MD HELICOPTERS INC.

CSP-HMI-2

HANDBOOK OF MAINTENANCE INSTRUCTIONS

FOR

MDHI 369D/E/FF - 500/600N HELICOPTERS
ISSUED: 31 OCTOBER 1990

NOTE
This manual has been reprinted and now contains
Revisions 1 through 36 (4/18/2005)

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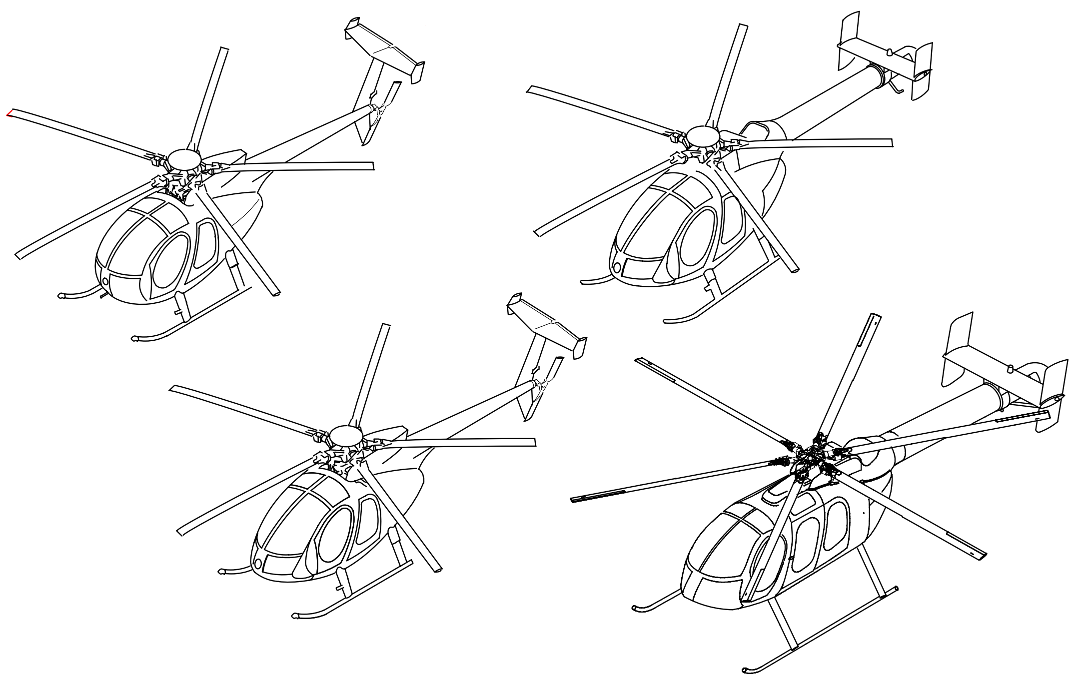
MDHI MODEL HELICOPTERS

MODELS 369D/E/FF - 500/600N

Basic Handbook of Maintenance Instructions

(CSP-HMI-2)

SERVICING AND MAINTENANCE



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MD HELICOPTER, INC.
TECHNICAL MANUAL RECOMMENDED CHANGE REPORT

This manual has been prepared and distributed by the Technical Publications Department and is intended for use by personnel responsible for the maintenance of MDHI Helicopters. Periodic revision of this manual will be made to incorporate the latest information. If, in the opinion of the reader, any information has been omitted or requires clarification, please direct your comments to this office via this form (or a duplicate). An endeavor will be made to include such information in future revisions.

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MD HELICOPTERS INC.

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FILING INSTRUCTIONS:

(1) Before inserting this change, ensure the manual is current.
Check the existing List of Effective Pages in the manual to ensure all prior revisions are inserted.
(Do not insert this revision if prior revisions are not inserted).

(2) Insert this page in front of Page A of the List of Effective Pages (LOEP).

(3) Incorporate this change by removing old pages and inserting new pages as indicated below.

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* Signifies latest Temporary Revision.

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Contents

NOTE: The following sections are applicable to the helicopter models denoted to the right of the section.

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SERVICE BULLETINS
INDEX

NOTE: As Service Information Notices are reissued, they will be identified as Service Bulletins using the helicopter model designation as the prefix.

1. Service Bulletins (Notices)

This Index provides a current list of Service Bulletins (Notices), active and cancelled or superceded.

2. Active Service Bulletins (Notices)

Table 1 is a list of Service Bulletins (SB), previously published as Service Information Notices (SIN) that have been issued and are currently active against the 369D/E/F/FF - 500/600N Model Helicopters.

3. Scope

The following is an explanation of how to read Table 1.

(1). **Model Effectivity** - The following is a list of the aircraft models effected by the following Service Bulletins.

DESIGNATION

MODEL		SERVICE DOCUMENT	
FAA	Marketing	New SB	Old SIN
369D	500D	SB369D-	DN-
369E	500E	SB369E-	EN-
369F	530F	SB369F-	FN-
369FF	530F Plus	SB369F-	FN-
500N	520N	SB500N-	NN-
600N	600N	SB600N-	N/A

(2). **Subject** - A brief description of the Bulletin.

(3). **Date** - Date of last issuance of the Bulletin.

Table 1. ACTIVE SERVICE BULLETINS

369D	369E	369F	500N	600N	SUBJECT	DATE
1					Inspection of Tail Rotor Output Shaft; Installation of Protective Dust Boot	3-23-77
3					Main Rotor Controls - Rigging of Cyclic and Collective Controls; Rework of Mixer Controls; Installation of Pitch Housing Striker Plate Support Nut	8-30-77
6					Main Rotor Pitch Control Rod Assembly - Replacement of 369A1009-3 Pitch Rod and Inspection of Rod End Bearings	8-30-77
8					Installation of 369D21808 Support Ring; 369D21806 Tail Rotor Stationary Boot	8-30-77
9.2					369A5350-603 Overrunning Clutch Assembly - Inspection of 369A5350-11 Clutch Subassembly 369A5361 Ball Bearing and 369A5368 Seal	10-27-78
10					Installation of Auxiliary Drain Valve; 369H92255 Fuel System Installation Drain Kit	10-3-77
11					Modification of 369A4516-N_1 Tach Indicator	10-3-77
12					Installation of Modified Rotor Brake Handle Trim Cover Panel Assembly	11-18-77
13					Inspection of 369H90085 Litter Door Installation	11-30-77
14					Modification Kit - 369D25167 Main Transmission Lubrication Pump	12-15-77
16					Rework of 369A4521-5 Turbine Outlet Temperature (TOT) Indicator and 369A4526-5 Torque Pressure Indicator	2-1-78
17					Installation of 369H92537 Engine Compressor Water Wash Kit	2-6-78
18					Removal of Capacitor - Voltage Regulator, AAE or LSI Model VR204; Installation of Varistor - Landing Light Relay, MS 24166D1	2-6-78
19					369H92537 Engine Compressor Water Wash Kit Installation - Inspection and Replacement of Rivets	4-14-78
20					Replacement of Plenum Chamber Fittings - Torque Pressure Gage Tubing and Engine Oil Pressure Gage Tubing	6-6-78
21					Rework of 369D26100-101 Standard Landing Gear Skid Assembly; Rework of 369D292114-101 Extended Landing Gear Skid Assembly	6-6-78
22					Sealing of 369D23600 and 369D23600-501 Vertical Stabilizer Assembly	6-26-78

Table 1. ACTIVE SERVICE BULLETINS (Cont.)

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23.2					Installation of Standoff Clamps - Heating System Hose and Main Transmission Oil Cooling Lines.	9-5-79
24					Field Inspection and Corrosion Repair of 369D25510 Main Rotor Drive Shaft	7-5-78
25.1					Rework of Fuselage Structure, Forward Section	3-7-80
26					Inspection and Possible Replacement of 369H6541-5 and -21 Seat Belt Assemblies	7-15-78
27.1					Inspection and Rework of 369A1725 and 369A1725-501 Tail Rotor Hub	12-8-78
30					Installation of 369H90022 Anti-Ice Fuel Filter	9-8-78
31					Installation of 369D21012 Rubber Washers; Attachment of Pitch Control Rods to Main Rotor Swashplate Assembly	9-8-78
34					Replacement of 369D28309 Hose Assembly - Engine Oil Cooler to Engine Oil Tank	10-17-78
35					Field Repair of 369A7170 Series and 369A7171 Series Cyclic Trim Actuator Assemblies	1-29-79
36					Installation of Air Baffle, Seal and Cover Assemblies - Transmission Compartment	11-14-78
37					369D21800 Tail Rotor Pitch Control Assembly - Seating of Dual Bearings Inner Races; Torque Increase for 369D21803-3 Locknut	12-1-78
39					Installation of 369D21104 Stainless Steel Abrasion Tape - Main Rotor Blade Leading Edge	6-1-79
40					Extension of 369A8010-615 Overboard Vent Tube, Engine Accessory Drive	12-15-78
42					369H7825 Droop Control Bellcrank Assembly (Sta 68.0) - Relocation of Locknut and Installation of Spacer	2-15-79
43					Field Repair of Trim Tab, 369D21100 Series Main Rotor Blade	2-15-79
44.1					369D23601 Horizontal Stabilizer Assembly - Adjustment or Replacement of 369D23678-3 Trailing Edge Tabs; Relocation of 369H6610-5 Static Pressure Tube	6-22-79
45.2					Internal Modification and Re-identification of 369D21400-501 Main Rotor Lead-Lag Elastomeric Damper Assembly	10-22-79
46.1					Field Modification of 369D21002 Scissors Crank Assembly, Main Rotor Hub Upgrade to 369D21002-21 Configuration	8-15-79
47					Field Rigging Check of 369A8013-503 Heater Control Valve Assembly	4-16-79
48					Replacement of Radio Transmit/Intercom Trigger Switch; Rework of Cyclic Pitch Stick Grip Assembly	5-10-79
49					Inspection and Repair of 369A3035-11 and 369A3035-15 Sta 142 Tail Rotor Control Bellcrank Supports	6-11-79
50.1					Installation of Voltage Transient Suppressors	11-26-79
51.8	42.6	31.6			Inspection of Main Rotor Blade Root Fitting Assemblies; Inspection of Main Rotor Hub Lead-Lag Link Assemblies	1-3-00
52.2					Kit Installation of 369D290140 Auxiliary Fairings and Seals, Engine Air Filter (Particle Separator)	9-15-80
54.1					Inspection of Collective Torque Tube Support Bracket (369A7304 Magnesium, 369N2608 Aluminum) and Collective Bungee Support Bracket (369A7339 Magnesium, 369N2650 Aluminum)	3-7-80
55					Rework of Ground Handling Wheel Assemblies (Float Type)	8-20-79
56					Installation of Fuselage Access Panels for Cyclic Trim Actuator Assemblies	3-7-80
58.2					Inspection and Repair of Aft Fuselage Skin Cracks; Installation of Doublers on Boom Fairing Longerons	5-11-81
59					Installation of 369D22009-101 and -103 Cabin Heat Duct (Fiberglass) Assemblies	1-15-80

Table 1. ACTIVE SERVICE BULLETINS (Cont.)

369D	369E	369F	500N	600N	SUBJECT	DATE
60					Installation of Filter Gasket - 369H90148-503, -505 and -507 Engine Air Inlet (Particle Separator) Filter Kit	3-3-80
62					Inspection and Rework of 369D25401 Tail Rotor Transmission Housing Assembly	3-3-80
63					Horizontal Stabilizer Assembly - Adding Drain Holes and Sealing Doubler Edges	3-3-80
65.1					Rework of Cooling Blower Mounting Bracket	12-19-80
66					Rework of 369D290125-21 Mist Eliminator Assembly - 369H90148-507 and -509 Engine Air Inlet Filter (Particle Separator) Assembly	5-16-80
67					Rework of 369A7010 Series One-Way Lock Assembly	6-2-80
68.1					Relocation of Tail Rotor Bungee Spring Forward Attachment; Tail Rotor Force Adjustment	12-8-80
69					Polarity Check of Diode Assemblies	6-30-80
70					Identification and Possible Rework of Seat Belt and Shoulder Harness Assemblies	7-1 1-80
71					Wiring Modification - Utility Light Circuit and Transmission Oil Pressure and Temperature Warning Light Circuit	9-30-80
72.1					Drain Kit Installation - 369D28300-501 Engine Oil Tank and Oil Cooler; Drain Kit Installation - 369D290120 Main Rotor Transmission Cooler	2-6-81
73					Periodic Inspection and Bonding Procedure for 369A1724 Tail Rotor Drive Fork Elastomeric Teeter Bearing	8-22-80
76					Rework of Static Pressure Tube Installation to Minimize Altimeter Needle Oscillation	12-8-80
78.1					Inspection of 369A7003-3 Swashplate Bearing	7-28-81
79					Sealing of Interface of Abrasion Strip and Main Rotor Blade Skin	1-30-81
80					Replacement of TAVCO 23111369 Solenoid Valve, Float Inflation System - Hughes 369D290121-501 and -505 Emergency Float Assemblies	3-20-81
81.1					Inspection of Overrunning Clutch Sprag Assembly	5-10-83
	3				Inspection of Overrunning Clutch Sprag Assembly	4-29-83
		3			Inspection of Overrunning Clutch Sprag Assembly	7-29-83
82					Field Inspection and Repair of 369D25301 and 369D25401-3 Tail Rotor Gearbox Main Housing Assembly	4-15-81
86					Shimming Procedure for Gas Producer Interconnecting Torque Tube Assembly	5-6-81
87					Replacement of 369A7706-3 RPM Governor Lever Control Rod	5-15-81
88					Elimination of Possible Interference of Safety Wire with Oil Cooler Blower Drive Belt	3-19-81
89.2					Balancing of 369D21200 Main Rotor Hub Assembly	9-24-82
91.1					Inspection of Main Rotor Hub Strap Pack Retention Bolts and Replacement of Bushings	7-22-81
92					Corrosion Inspection/Treatment of 369A7314 and 369N2648 One-Way Lock Support Assembly	6-4-81
93					Inspection/Modification of BL-16600-12 Breeze Corporation Inc. Hoist	6-18-81
94					Deactivation of Main Rotor Brake System (if installed); Periodic Inspection of 369A5501 or 369H92564 Tail Rotor Drive Shaft Forward Flexible Coupling	6-25-81
95					Installation of Fail Safe Device at 369A5501 or 369H92564 Tail Rotor Drive Shaft Forward Flexible Coupling; Periodic Check of Flexible Couplings	8-7-81
96					One-T ime Inspection of Attachment Hardware for Sta-Strap Securing Electric Wiring to Boom Fairing at Sta 138.50	8-21-81
97					Installation of 369D292585 Master Cylinder Stop on 369H90123 Series Main Rotor Brake System	10-5-81
99					Periodic Inspection of 369D25510 Main Rotor Drive Shaft	11-30-81
	4				Periodic Inspection of 369D25510 Main Rotor Drive Shaft	4-29-83

Table 1. ACTIVE SERVICE BULLETINS (Cont.)

369D	369E	369F	500N	600N	SUBJECT	DATE
		4			Periodic Inspection of 369D25510 Main Rotor Drive Shaft	7-29-83
100					Relocation of Auto Re-ignition Controls and Modification of System for Full-Time Operation	2-22-83
101					Installation of 369H4237-21 Resistor Board Assembly for Easier, More Accurate Adjustment of TOT Indicator	2-1-82
102					Inspection of 369A7006-5 Tail Rotor Control Rod; Rework of 369D290128-11 Particle Separator Fairing Assembly and 369D290128-31 Cover Assembly	2-1-82
103					M50459-505 Modification Kit - Double Layer Abrasion Tape for 369D21100-505 and -509 Main Rotor Blades	3-10-82
104					Instrument Cluster 3-Pack Conversion - AC to Rochester	3-5-82
106					Rework of 369A9905-Basic and -3 Ground Handling Wheel Assemblies to Accommodate Installation of New 369D26107 Landing Gear Skid Fitting	6-29-82
107					Installation of Fuselage Attach Points (369H90070-211, 212 Subassemblies) for Accessory Kit Attach Fittings	7-1-82
108					Replacement of Intercom (ICS) Switch and Jack Assembly	7-1-82
110.1	56	42			Inspection and Repair of 369D292028 Passenger Step Assembly, Aft Extended Landing Gear Foot Assembly	10-27-89
111					New Shimming Procedure for 369A5501 or 369H92564 Tail Rotor Drive Shaft Forward Flexible Coupling with Failsafe Device Installed	9-27-82
112					Inspection of Landing Gear Struts and Feet	11-19-82
113					Relocation of 369A8448 Engine Air Inlet Filter Bypass Door Aft Pulley, 369A8447 Bracket and 369H90152-3 or 369D290125-11 Particle Separator Filter Gasket Inspection	1-10-83
114					Main Rotor Transmission Drain Line Brackets Modification	2-1-83
115	5				Pilot's Compartment, Center Passenger Seat Lap Belt Installation Check; Preflight Check of Passenger Lap Belt and Shoulder Strap Adjustment	2-15-83
117					Installation of 510 ohm Resistor in 369D296303, 369D296303-701 and 369A4245 Fuel Quantity Sending Units	3-20-83
118	7				Inspection of 369A8131-19 Fuel Vent System Hose	5-2-83
119.1	11				Installation of Collective Stick Support Bracket Reinforcement Strap	11-23-83
120	8				Installation and Replacement of Protective Sleeve (084957 Speedi-Sleeve) on Tail Rotor Transmission Output Gearshaft	5-31-83
121					Button Plug Installation - Mast Support Structure Aft Channel	6-27-83
122	9				Inspection and Overhaul of 369A8104-5 Fuel Shutoff Valve	7-29-83
		5			Disarming N_2 Electronic Overspeed Control System	12-9-83
123					Battery Case and Main DC Power Wiring Inspection	10-28-83
124	10				Inspection of 369D25709 and 369D25710 Main Transmission Oil Line; Replacement of 369D25709 and 369D25710 Main Transmission Oil Line and Brackets with New 369D25709-11 and 369D25710-11 Lines and Brackets	11-10-83
125	12				Inspection and Possible Replacement of 369A7003-3 Main Rotor Swashplate Bearing	12-23-83
	13.1				Inspection of 3697011 Longitudinal Mixer Control Rod; Replacement of 369D22509-51 Doubler with 369DSK169-3 Repair Doubler	6-1-84
126	14				Pull Test of 369A8137-503 and -603 Fuel Shut-Off Valve Control Cable	4-9-84
127	15				Removal of Gray Coating from 369D21700 and 369D21700-3 Tail Rotor Hubs	6-12-84
	16	6			Alteration of Crew Compartment Seat Back Assemblies	6-13-84
129	18				Riveting Tip Cap-to-Tail Rotor Blade	8-27-84
130.2	19.2	17.1			One-Time Inspection of Tail Rotor Blade Leading Edge Abrasion Strip Bonding; Pilot Preflight Check of Tail Rotor Blade Leading Edge Abrasion Strip	3-23-87
131.1	20.1	8.1			Corrosion Removal - Main Rotor Drive Shaft ID	10-30-87

Table 1. ACTIVE SERVICE BULLETINS (Cont.)

369D	369E	369F	500N	600N	SUBJECT	DATE
132.1	21.1	9.1			Riveting Tail Rotor Tip Cap-to-Blade	5-1-85
133	22	10			Unauthorized Helicopter and Spares Distribution	3-18-85
134	23	11			Non-Airworthy Clutch Assemblies	3-18-85
135					Exit Warning Decal (Includes AC91-32 Safety In and Around Helicopters)	8-7-85
136	24	12			Main Rotor Transmission Cooling Installation Bracket Replacement	8-7-85
137	25	13			Inspection of 369D27514 and 369D27515 Tail rotor Bellcrank	12-20-85
138	26	14			Inspection and Rework of A1066-1082 (Fargo) Auxiliary Fuel Tank	1-10-86
139.1	27.1	15.1			Inspection of 369D25620, 369D25622, 369D25622-3 and 369D25624 Cooling Fan Pulleys	3-18-86
140	28	16			369D28318 Oil Tank Filler Nozzle Strainer Assembly	4-15-86
141	29	18			EON Seat Belt Removal	5-15-86
142	30	19			Inspection/Rework of United Instruments Inc. Altimeter	5-20-86
143.1	31.1				Installation/Inspection of Tail Rotor Driveshaft Aft Failsafe Device	11-28-86
145	33	22			Fabrication and Installation of 369D25704 Oil Flexline Hose Assemblies in the Main Transmission Oil Cooling Installation	4-9-87
146.1	34.1	23.1	002		Daily Pre-Flight Examination of Main Rotor Blade Leading Edge Abrasion Strip Bonding	9-10-92
147.1	35.1	24.1			One-Time Inspection of 369D25125-BSC, and -11 Main Transmission Tail Rotor Output Drive Pinion Shaft	10-30-87
148.1	36.1	25.1			Inspection of 369D25132-BSC or -5 Main Transmission Output Shaft Assembly Ring Gear Carrier	10-30-87
149	37	26			369A8010 Engine Oil Pressure and Torque Tube Pull Test	9-15-87
150	38	27			Start Pump Wire Routing and Fuel Quantity Sender Inspection	9-15-87
151	39	28			Inspection of Tail Rotor Transmission Mounting Studs	10-10-87
	40.1	29.1			Rework of 421-087 Horizontal Stabilizer Assembly	4-7-89
152	41	30			Replacement of 369A8442-Basic Latch Assembly on the Particle Separator Door	12-18-87
153.2	43.2	32.2			Inspection and Replacement of 369A1602 Tail Rotor Fork Bolt	4-21-89
154	44	33			Main Rotor Hub Strap Pack Lamination Inspection and Tri-Flow Wash Procedure	1-15-88
155	45				Main Rotor Blade Upper and Lower Trailing Edge Weight Rework	1-15-88
156.2	46.2	34.2	010		Inspection of 369A5352 Outer Race of Overrunning Clutch Assembly 369A5350	3-06-97
157	47	35			One-Time Inspection of 369H5660 Engine-to-Transmission Driveshaft Couplings	4-5-89
158.1	48.1	36.1			One-Time Inspection and Rework of 369A7007, 369A7009, 369A7011 and 369A7012 Main and Tail Rotor Control Tubes	7-21-89
159	49	37			One-Time Inspection of 369A8352, 369H8306, 369H8025, 369H8024-5 AND 369D28651 Aeroquip Hoses	6-12-89
160	50				One-Time Inspection of Four-Bladed Tail Rotor Hub Assembly	6-19-89
161	51	38			One-Time Inspection of 369D25420 Tail Rotor Transmission Output Shaft Duplex Bearings	7-10-89
		39			One-Time Rework of 250-C30 Lower Aft Engine Mount Installation	6-20-89
162	52	40			One-Time Inspection of Emergency and Utility Float Skid Tube Extension Assemblies	6-30-89
163	53	41			One-Time Inspection of 369A5358 Lockwasher in the Overrunning Clutch Assembly and Inspection of Engine Output Drive Splines	10-27-89
164.1	54.1	44.1			Conversion to 369A5350-41 Overrunning Clutch Sub-Assemblies	5-4-90
165	55	43			Installation of Oil Flow Restricting Devices into the Engine Oil and Torque Pressure Sensing Systems	10-27-89
166.1	57.1	45.1			One-Time Inspection and Replacement of Air Industries MS21250-04036 Bolts and Verification of Proper Installation of All MS21250-04036 Bolts in Main Transmission	3-14-90

Table 1. ACTIVE SERVICE BULLETINS (Cont.)

369D	369E	369F	500N	600N	SUBJECT	DATE
167	58	46			One-Time Check/Periodic Inspection/Replacement of Tail Rotor Swashplate Bearing Set	3-14-90
168	59	47			One-Time Replacement of 369A9817 Polycarbonate Cover Assemblies	6-15-90
169	60	48			One-Time Replacement of Tail Rotor Blade Pitch Arm Bolt Attaching Nuts	6-15-90
170.1	61.1	49.1			One-Time Torque Check and Inspection of Main Rotor Blades	5-15-91
171.1	62.1	50.1			One-Time Inspection of 369D25623 Oil Cooler Blower Belt	11-21-90
172.1	63.1	51.1			One-Time Installation of 369D24054-3 Warning Decals in the Engine Compartment Area	9-4-90
173	64	52			Inspection of Lead-Lag Link Attach Nuts	9-4-90
174	65	53			Inspection of 369D25434 Tail Rotor Input Gearshaft in the Tail Rotor Gearbox	11-21-90
175	66				One-Time Inspection of 369H8407 Engine Bleed Air Tube Flexible Area	11-21-90
176	67	54			One-Time Reinstallation of the 369A1602-3 Tail Rotor Fork Bolt	11-21-90
177.1	68.1	55.1			Pre-flight Check and One-time Inspection of Tail Rotor Blades	3-3-91
178	69	56			One-Time Rework of Main Transmission Oil Cooling Fan Mounting Bracket	2-1-91
179	70	57			One-Time Addition of Rivets to Tail Rotor Abrasion Strip	9-27-91
	71	58			One-Time Replacement of Diodes with Transzorbs	12-19-91
180	72	59			Inspection of Overrunning Clutch Outer Race (369A5352 Overrunning Clutch Assembly)	1-17-92
181.1	73.1	60.1			Inspection/Rework of Fuel Vent System (Helicopters Equipped with 369H8108, 369H8108-501 or 369H8108-503 Fuel Vent Line Emergency Shut-Off Valve	9-10-92
182	74	61			One-Time Inspection/Rework of Engine Inlet Area	3-20-92
183.2	75.2	62.2			Main Rotor Blade Inspection/Replacement	1-27-93
	76				Fuel Pressure Switch Inspection/Replacement	5-20-92
			003		Rate Gyro Inspection and Replacement	1-25-93
			004		Y.S.A.S. Actuator Inspection and Replacement	5-28-93
184	77	63	005		Four-Way Trim Switch Replacement	3-10-94
			006		Tailboom Decal Installation	4-10-94
185	78	64			Tail Rotor Swashplate Lockwasher Inspection	9-23-94
186	79	65	007		Firewall Fuel Fitting Modification	9-26-94
187	80	66			Tail Rotor Blade Abrasion Strip Modification	10-26-94
188	81	67	008		Main Rotor Blade Root End Inspection	10-27-95
		68			Tail Rotor Control Rod Replacement	11-22-96
189	82	69	009		Main Rotor Transmission Component Inspection (369D25127-11)	1-10-97
190	83	70	011		Overrunning Clutch Inspection	7-25-97
				001	Engine Cooling Improvement	9-12-97
191	084	071	012	002	Main Rotor Transmission Inspection	9-26-97
192	085	072	013	003	Input Shaft Coupling Assembly Inspection	9-26-97
193R1	086R1	073R1			Tail Rotor Blade Leading Edge Inspection for Cracks	5-3-99
				004	Cabin Seat Restraint Replacement	2-12-98
				005	Installation of Revised VNE Cards	3-4-98
				006	Thruster Tip Cap Removal	12-8-97
195R3	088R3	075R3	015R3	007R2	Main Rotor Blade Root End Fitting Inspection	7-13-98
				008	Generator Control Unit Replacement	2-19-98
				009	Collective Controls Life Reductions and Serializations	2-24-98
				010	Landing Gear Fairing Modification	4-28-98
				011	Cyclic Control Mixer Links Replacement	5-5-98
196	089	076	016	012	Oil Cooler Blower Bracket Replacement	4-28-98

Table 1. ACTIVE SERVICE BULLETINS (Cont.)

369D	369E	369F	500N	600N	SUBJECT	DATE
				013R1	Low Fuel Level Warning Light	4-15-98
	090R1	077R1	017R1	014R1	Socket Contact Assembly Inspection	9-25-98
				015	Engine Fuel Control Box Replacement	4-23-99
				016R1	Audio Warning System Replacement	9-19-00
				017	FADEC Manual Switch Guard Modification	10-6-98
				018R1	Torque Pressure Transducer High Intensity Radiated Fields (HIRF) Protection Modification	2-7-00
				019	FADEC Wire Harness Standoff Installation/Inspection	4-23-99
				020R2	Electromagnetic Compatability Test (EMC) for Optional Equipment Effects on the FADEC Control	4-14-03
				021R1	Inspection/Reidentification/Serialization of Cyclic Control Stick Sockets and Left Hand Command (Co-Pilot) Cyclic Tube	3-11-99
197	091		018		Engine Fuel Pressure Switch Replacement	2-23-99
198	092				Tail Rotor Fork Inspection, Four-Bladed	5-10-99
				022	Torque Transducer Replacement	4-23-99
				023R1	Cyclic Stick Replacement	7-30-99
				024R1	Link Assembly Replacement	4-6-99
				025	Fuel System Inspection	7-2-99
199	093		019		Turbine Outlet Temperature (TOT) Indicating System, One Time Inspection	1-11-00
				026	Turbine Outlet Temperature (TOT) Indicating System, One Time Inspection	1-11-00
			020R2	027R2	Forward and Center Thruster Control Cables, Conduit Cap Relief Area, Inspection	4-24-00
			021	028	Forward and Center Thruster Cables, Conduit Cap at Telescopic Swivel End, Inspection	11-19-99
200	094	078	022		Landing Gear Strut Inspection and Fairing Modification	4-7-00
				029	Motive Flow Restrictor Removal	1-10-01
				030R1	Inspection of Vertical Stabilizer and Torque Tube and Replacement of Attaching Hardware	5-25-01
201R2	095R2	079R2	023R2	031R2	Main Rotor Blade Torque Event Inspection	2-04-04
				032	Turbine Outlet Temperature (TOT) Indicator Replacement	12-13-01
				033	Main Rotor Drive Shaft Life Reduction	12-13-01
				034	Torque Transducer Electrical Connector One Time Inspection	12-13-01
			024	035	Fan Pitch Control Aft Tube Assembly One Time Inspection	10-23-01
				036	Tailboom Assembly Attach Fitting One Time Inspection and Repair	11-2-01
202	096	080	025	037	Main Transmission Bonding Jumper Inspection and Rework	8-14-02
				038	Exhaust Duct Inspection	5-6-03
		081			Minimum N1 Starting Speed Decal/Placard Installation	7-22-03
				039	Tailboom Attach Fittings and Upper Longerons Inspection	12-9-03
				040	Control Support Bracket Assembly Life Reduction with YSAS Installed	12-19-03
			026	041	Tailboom Assembly Overlap Inspection and Rework	11-26-03
			027	042	Forward and Center Thruster Cable Assemblies Connector One-Time Inspection	5-03-04

4. Cancelled or Superceded Service Information Notices

(1). Table 2 a list of Service Information Notices that have been cancelled or superceded.

(2). Updated information, pertinent to the Notice, has been incorporated into the appropriate manuals.

(3). If the Notice is superceded by another Notice, it will be noted in the Subject column after the description.

5. Scope

The following is an explanation of how to read Table 2.

(1). **DN**-369D Model Helicopters
EN-369E Model Helicopters
FN-369F and 369FF Model Helicopters
NN-500N Model Helicopters.

(2). **Subject** - A brief description of the Notice.

(3). **Date** - Date the Notice was cancelled or superceded.

Table 2. CANCELLED OR SUPERCEDED SERVICE INFORMATION NOTICES

369D	369E	369F	500N	600N	SUBJECT	DATE
2.3					Main Rotor Strap Pack Lamination Inspection (Superceded by DN-154)	1-15-88
4.1					Main Rotor Blade Phasing, Tracking and Balancing	8-2-93
5					600-Hour Periodic Inspection - Model 369D Cyclic Control System	8-2-93
7					Installation of 369D21008 Main Rotor Pitch Control Rod Assembly, Upper and Lower Rod End Bearings	8-2-93
15					Periodic Inspection of 369D26300 and 369D26301 Landing Gear Damper Assemblies	8-2-93
28					Field Modification of 369D29919 Main Rotor Blade Phasing Kit to new 369D29919-501 Configuration	8-2-93
29.3					Periodic Replacement of 369H5655-3 and -5 Oil Cooler Blower Fan Bearings; Inspection of Pulley Attach Hardware and Driveshaft Couplings; Inspection and Adjustment of Fan Drive Belt; Driveshaft Compression Check	8-2-93
32					New Periodic Inspection Intervals - Battery Overtemperature Warning System	8-2-93
33.1					Replacement of 369A1602 Tail Rotor Drive Fork Hinge Bolt and 369A1603 Nut; New Assembly Procedure for Tail Rotor Hub and Drive Fork Unit; Periodic Check of Flapping Hinge Bolt Preload	8-2-93
38					Daily Inspection of 369H5307 Tail Rotor Stop and 369D21724-3 Support	8-2-93
41.1					Operational Check of Engine Fuel Pump Filter Pressure (Bypass) Switch Assembly	8-2-93
	2				Inspection of Spare Main Rotor Blade Root Fitting Assemblies; Inspection of Main Rotor Hub Lead-Lag Link Assemblies (Superceded by EN-42)	11-13-87
		2			Inspection of Main Rotor Hub Lead-Lag Link Assemblies (Superceded by FN-31)	11-13-87
53.1					100-Hour Periodic Inspection of Fuel Tank Sending Unit and Fuel Low Warning Light Indicating System	8-2-93
57					Field Repair of 369D21300 Pitch Housing Assembly, Main Rotor Hub	8-2-93
61.2					Periodic Check of 369D21400-502 and M50452 Main Rotor Elastomeric Damper Assemblies	8-2-93
64					Pilot/Operator Check of 369D21210-501 Main Rotor Hub Strap Pack Assembly (Superseded by DN-154)	1-15-88
74					Un-Assigned	
75.1					Procedure for Installation of Tail Rotor Drive Shaft (Superceded by DN-95)	9-27-82
77.1					Main Rotor Strap Pack Lamination Inspection (Superceded by DN-154)	1-15-88

Table 2. CANCELLED OR SUPERCEDED SERVICE INFORMATION NOTICES (Cont.)

369D	369E	369F	500N	600N	SUBJECT	DATE
	1				Inspection of 369D21210-501 Main Rotor Strap Pack Laminations (Superceded by EN-44)	1-15-88
		1			Inspection of 369D21210-501 Main Rotor Strap Pack Laminations (Superceded by FN-33)	1-15-88
83					Simplified Procedure for Main Rotor Blade Phasing	8-2-93
84.1					Installation of 369D292044 Engine Air Inlet Deflector Kit	8-2-93
85					Installation of 369D292500-103 Four-Bladed Tail Rotor Drive System	8-2-93
90.2					Special Inspection of 369A7003-3 Swashplate Bearing Assembly and Time Between Overhaul (TBO) Change of 369D27609 Swashplate Assembly; Mobil 28 or Alternate Aeroshell 22 Grease Used for Lubrication of Swashplate	8-2-93
98					Inspection of 369D21200 Series Main Rotor Hub Assembly; Inspection of 369A1220 and 369D21220 Main Rotor Blade Lead-Lag Pivot Bolt (Vertical Hinge Pin)	8-2-93
105					Inspection of Main Transmission Output Shaft Ring Gear Carrier (Superceded by DN-148.1)	10-30-87
109					Preflight Check of Tail Rotor Blade Leading Edge Abrasion Strip	8-2-93
116	6				Fuel System Servicing, Maintenance and Testing	8-2-93
		20			Un-Assigned	
128					Oil Pressure and Torque Pressure Firewall Fitting Check (Superceded by DN-149)	9-15-87
			001		Static Port Rework	5-27-93
144	32	21			Tail Rotor Elastomeric Bearing Shimming Procedure	7-1 1-86
194	087	074	014		Main Rotor Blade Root End, One-Time Inspection (Superceded by DN-195)	12-24-97

Chapter

01

Introduction

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01-00-00

Introduction

INTRODUCTION
DESCRIPTION AND OPERATION

1. Proprietary Rights

2. Introduction

All helicopters described in this manual are manufactured by MD Helicopters Inc. (MDHI), Mesa, Arizona. The design features and performance characteristics of all helicopters are essentially the same. The main differences between helicopters are the type and arrangement of interior furnishings and equipment, the pilot's flight control position, engine power, anti-torque system and a variety of optional equipment.

3. 369D/E/FF - 500/600N Helicopter Description

NOTE: Throughout this manual, references to the 369FF model helicopters also includes the 369F model helicopters, unless otherwise stated.

(Ref. Figure 1) The Model 369D/E/FF - 500/600N helicopters are turbine-powered, rotary-wing aircraft constructed primarily of aluminum alloy. The main rotor system for the 369D/E/FF - 500N helicopter is five-bladed and fully-articulated. The main rotor system for the 600N helicopter is six-bladed and fully-articulated. The anti-torque system may be two bladed, an optional four-bladed installation or a NOTAR® anti-torque system. Engine output is delivered to the main and anti-torque system by drive shafts and two transmissions. A one-way overrunning clutch between the engine and main transmission permits the main rotor to freewheel for autorotational descent.

The fuselage is a semi-monocoque construction divided into three sections. The structure consists of a central framework, a mast support structure, two bulkheads and a center beam. The forward section includes the crew and cargo or passenger compartment. The crew compartment is equipped with seats for the pilot and either one or two passengers. The crew compartment left seat is the pilot's seat (LH command position) except in a RH command configuration helicopter. The cargo compartment is behind the crew compartment and contains provisions for bench-type or folding passenger seats. Passenger seats may be folded out of the way or completely removed to accommodate cargo. The aft section houses the engine and includes structure for tailboom attachment and in the case of the 500/600N, the fan assembly and fan transmission for the NOTAR® anti-torque system. The lower section is divided by a center beam and provides two bays containing two fuel cells that make up the fuel tank.

The 369D/E/FF tailboom is a monocoque structure of aluminum alloy frames and skin. The tailboom is the supporting structure for the vertical and horizontal stabilizers, tail rotor transmission and tail rotor. The tailboom also houses the tail rotor transmission drive shaft and tail rotor blade-angle control rod.

The 500/600N tailboom assembly is a fully monocoque construction of carbon fiber composites. The tailboom is the supporting structure for the stator assembly, horizontal stabilizer, two thruster assemblies and control cable assembly.

The main rotor group consists of five or six main rotor blades, a fully-articulated main rotor hub with offset flapping hinges, a scissors assembly, and a swashplate and associated mixer control mechanisms. The main rotor blades are secured to the rotor hub with standard hardware and quick-release pins.

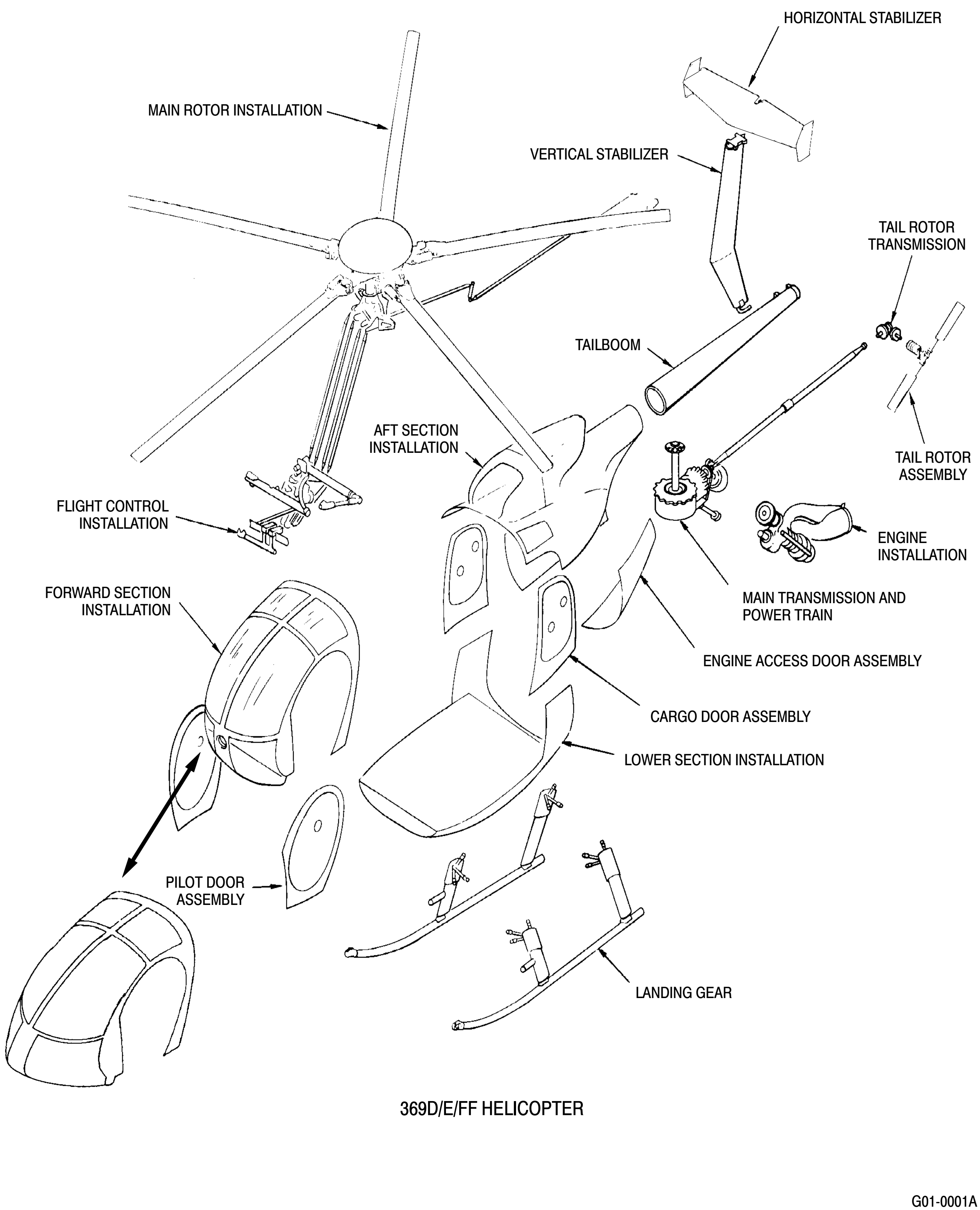

Figure 1. Helicopter - Major Components (Sheet 1 of 3)

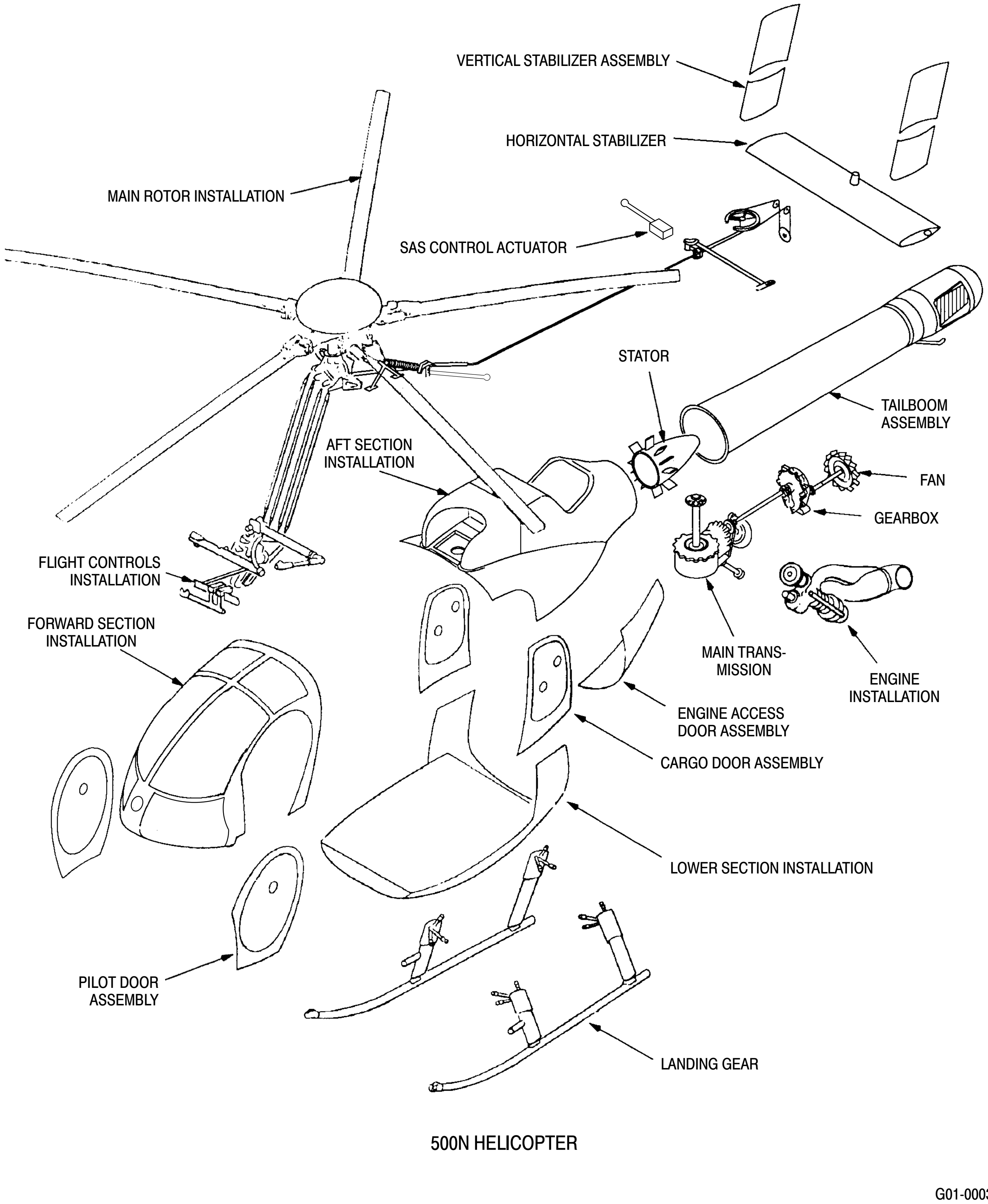

Figure 1. Helicopter - Major Components (Sheet 2 of 3)

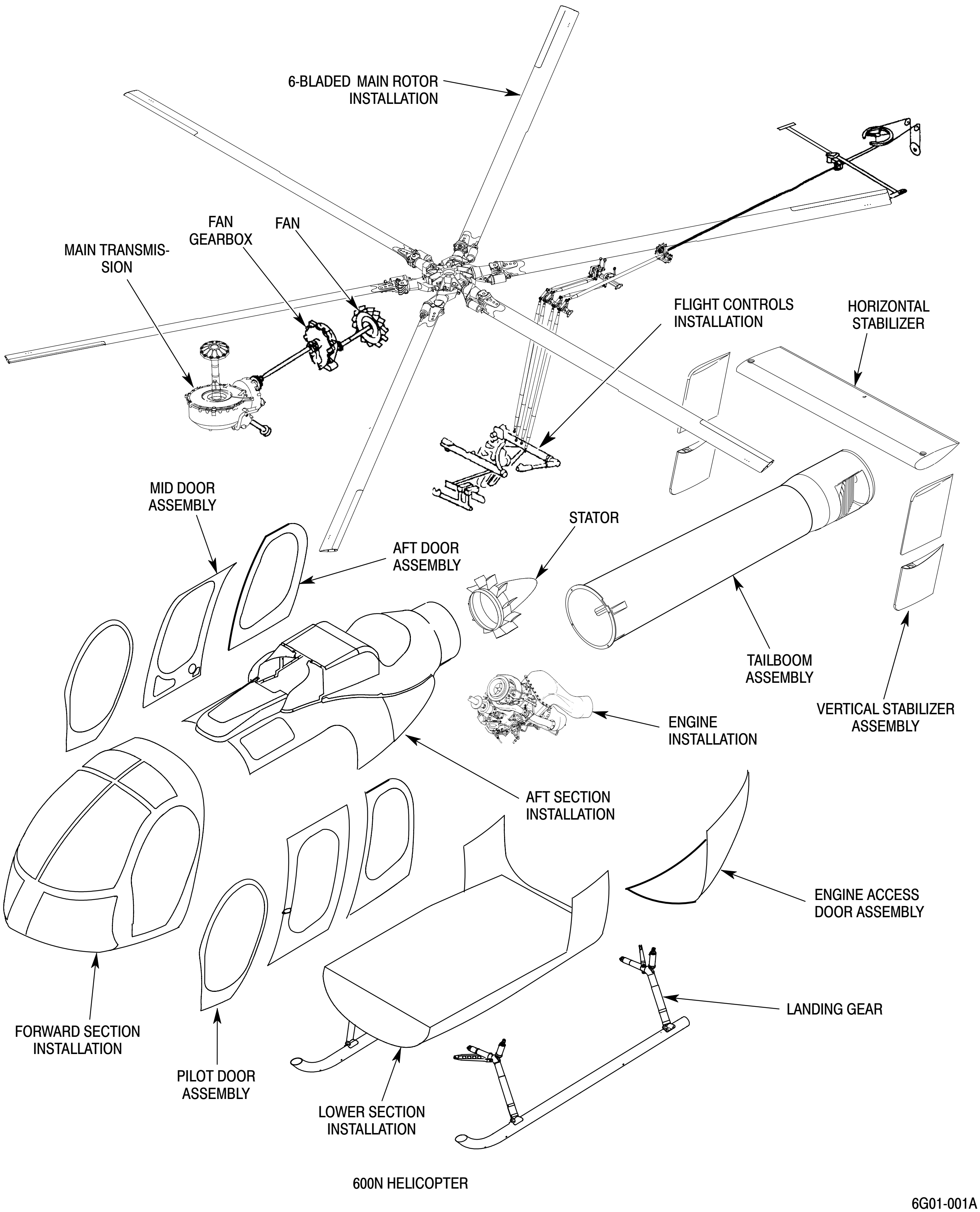

Figure 1. Helicopter - Major Components (Sheet 3 of 3)

The fixed skid landing gear is attached to the fuselage at 12 points. Fairings cover the struts from the fuselage to the skids. Nitrogen-charged dampers between the struts and structure cushion landing loads.

4. Scope

MDHI maintenance manuals provide system descriptions, servicing and maintenance procedures, periodic and special inspections, overhaul schedules, limited life component replacement schedules, and weight and balance calculations.

This manual is one of a group of publications that form the information file for the helicopter. The maintenance and inspection procedures are to be used for the 369D/E/FF - 500/600N helicopters only. Study the contents to gain an understanding of the arrangement and use of this and associated manuals before working on the aircraft.

Table 201, Related Publications and Directives, lists vendor/supplier manuals, catalogs, handbooks and other published documents by their titles and/or identifying numbers. These documents are the primary servicing, maintenance and repair information file for vendor-supplied helicopter components.

5. ATA Numbering System and Format

This MDHI Maintenance Manual and associated MDHI manuals are prepared in general compliance with Air Transport Association Specification for Manufacturers Technical Data (ATA-100).

The uniform numbering system established by ATA-100 is used. This numbering system provides a means for dividing material into Chapter, Section, Subject and Page. The number is composed of three elements, which consist of two digits each (Ref. Figure 2). The chapter and section elements (sub-assembly 10, 20, 30, etc.) are assigned by ATA-100. Subject/Unit element numbers are assigned by MDHI.

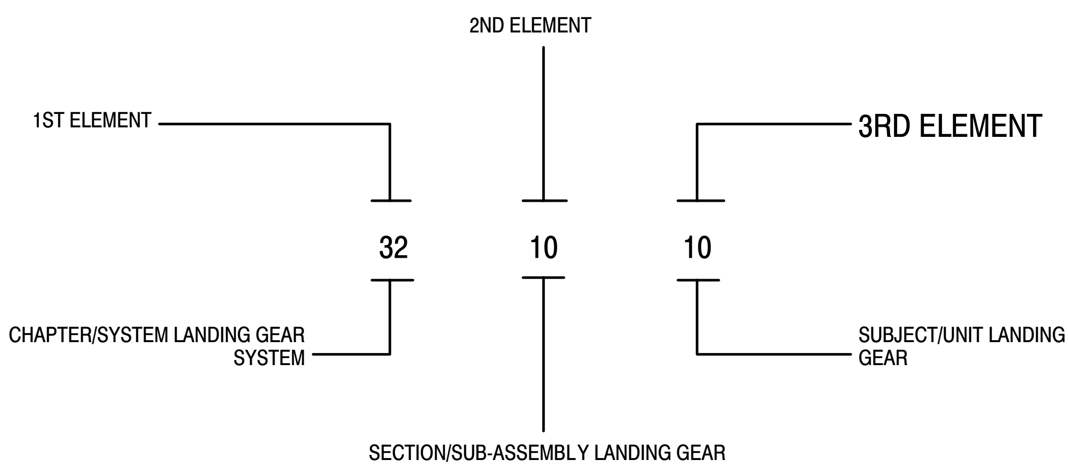

Figure 2. ATA Numbering System

6. Division of Subject Matter

This Maintenance Manual is contained in two books.

CSP-HMI-2 contains general mechanical maintenance data.

CSP-HMI-3 contains maintenance data on instruments, electrical and avionics.

7. Page Number Blocks

Page number blocks used for each Section in the Maintenance Manual logically arrange the material as follows:

NOTE:

- Maintenance Practices consists of either a brief subtopic or a combination of the following subtopics: Servicing, Removal/Installation, Adjustment/Test, Inspection/Check, Cleaning/Painting and Approved Repairs. Two methods are used for numbering maintenance practices page blocks:
- If a single subtopic or all subtopics under Maintenance Practices are brief, they are combined into one topic. All such topics are numbered within page number block 201 - 300.
- If individual subtopics become so lengthy that a combination would require numerous pages, each topic is broken out. Page number blocks accordingly are as follows:

Description and Operation 1

Fault Isolation 101

Maintenance Practices 201

Servicing 301

Removal/Installation 401

Adjustment/Test 501

Inspection/Check 601

Cleaning/Painting 701

Repairs 801

Initial Installation 901

Each page bears an effective date, either that of original issue or of the latest revision.

8. Figure and Table Numbering

Illustrations and tables use the same numbering as the page block in which they appear. For example, Figure 202 would be the second figure in a Maintenance Practices section. When referring to a figure or table within the same section, it is referenced as follows; (Ref. Figure 202). When referring to a figure or table within another section, it is referenced as follows; (Ref. Table 1, 91-00-00).

9. Associated MDHI Manuals

Information beyond the scope of the Maintenance Manual may be found in these basic associated manuals which are prepared as separate publications but should always be kept and used with this manual:

CSP-IPC-4, Illustrated Parts Catalog.

CSP-COM-5, Component Overhaul Manual.

CSP-SRM-6, Structural Repair Manual.

A. Illustrated Parts Catalog

(CSP-IPC-4) Illustrated Parts Catalog for Models 369D/E/FF - 500/600N
(CSP-D-7) Illustrated Structures Catalog for Model 369D and
(CSP-ISC-7) Illustrated Structures Catalog for Models 369E/FF - 500N provide, with text and illustrations, a complete definition of all repair parts and spare items available for the helicopter. Use the (IPC) only for the purpose of parts procurement.

B. Component Overhaul Manual (Overhaul Data)

The COM contains overhaul instructions for major components such as the main transmission, tail rotor transmission, overrunning clutch, etc. When components must be removed from service for overhaul, refer to the COM and/or contact the appropriate manufacturer or their field service representative for desired publication information (Ref. Table 201).

C. Structural Repair Manual

The CSP-SRM-6, SRM contains illustrated helicopter structural maintenance and repair information.

10. Engine Data

The Model 250 Series gas turbine engines are manufactured by the Allison Engine Company

Inc.. Refer to the applicable Allison Engine Repair and Maintenance Manual and the Illustrated Parts Catalog supplied with the engine for specific engine maintenance information (Ref. Table 201, Related Publications and Directives). Fault isolation and maintenance procedures for the helicopter/engine interface systems are in divisions specified by the index.

11. MDHI Publications Changes and Revisions

Changes in the helicopter, equipment, maintenance practices, procedures and additional information developed by experience affect manual content. To ensure that MDHI manuals continue to reflect current changes, revised information is provided by one or more of the following communications:

A. Revision

Alteration of portions of the manual by the replacement, addition and/or deletion of pages is accomplished by revision. The List of Effective pages (LOEP) that accompany each revision identifies all affected pages. Such pages should be removed from the manual and destroyed. Added or replaced pages should be inserted and checked against the LOEP.

B. Reprint

When large numbers of changes are involved, the manual is reprinted to include all prior revisions.

C. Service Information Notices and Letters

Service information is to be considered as part of the manual.

(1). Service Information Notices and Bulletins are broken into two categories as follows:

(a). <u>Red Border Notices</u>: The red border notices deal with critical items that must be corrected. These notices are mandatory and require a record of accomplishment. They may be re-occurring (flight-time or calendar) or one-time only notices.

(b). <u>Blue Border Notices</u>: The blue border notices are not mandatory and can be accomplished at the owner/operator's discretion. When instructed, these notices may require a record of accomplishment. These notices deal with non-critical or optional items only.

(c). <u>Service Bulletins</u>: The Service Bulletin deal with critical items that must be corrected. These bulletins are mandatory and require a record of accomplishment. They may be re-occurring (flight-time or calendar) or one-time only bulletins. The service bulletin replaces the red border notice.

(d). <u>Technical Bulletin</u>: The Technical Bulletins are not mandatory and can be accomplished at the owner/operator's discretion. When instructed, these bulletins may require a record of accomplishment. These bulletins deal with non-critical or optional items only. the technical bulletin replaces the blue border notice.

(e). For a complete listing and explanation of current and cancelled notices, refer to Service Information Notices Index.

(2). Service Information Letters are strictly information only. They may inform the owner/operator of options available, up-coming notices, bulletins, warranty/ repair changes, etc.

12. Application of Warnings, Cautions and Notes

Throughout this manual, and associated manuals, Warnings, Cautions and Notes are used to emphasize instructions or information considered to be unusual or critical.

<u>WARNING</u> and **<u>CAUTION</u>** statements are always placed before the information or instructions to which they apply.

A **<u>NOTE</u>** may appear in the text either before or after instructions to which it applies, depending on the relative significance of the information.

The conditions that warrant use of Warnings, Cautions and Notes are defined as follows:

WARNING **Operating procedures and practices which, if not strictly observed, may result in personal injury, or loss of life.**

CAUTION Operating procedures and practices which, if not strictly observed, may result in damage to or destruction of equipment.

NOTE: An operating procedure or condition that is essential to highlight.

13. Service and Operations Report Form 1601

MDHI Service and Operations Report Form 1601 may be used to report to MD Helicopters, Inc. in detail any service difficulties encountered with any MDHI helicopter. Use of the form is encouraged and recommended to enable MDHI to provide owners and operators improved service, support and product improvements. The form also serves as a convenient detailed record for owners and operators. Copies of the form may be procured by contacting the Product Support Dept.

INTRODUCTION
MAINTENANCE PRACTICES

1. Maintenance and Operational Check Requirements and Precautions

All helicopter maintenance is to comply with the following requirements and precautions.

A. Pilot's or Rotorcraft Flight Manual

Maintenance checks requiring helicopter operation must be performed in accordance with requirements and limitations specified in the applicable MDHI Flight Manual (PFM or RFM) and all applicable Optional Equipment Supplements.

B. Operational Checks

After maintenance, modification, disassembly, re-assembly, replacement, cleaning, repair or installation; the affected parts, assemblies, installations or systems shall be inspected and an operational check will be performed prior to releasing the helicopter for flight (Ref. Maintenance Information Requests).

2. Inspections

Inspections specified in this manual are visual inspections for cracks, corrosion, distortion, security and other obvious defects or damage.

Visual inspections of fuel and oil system hoses, tubes and fittings include checks for corrosion, leakage and distortion.

Specific inspection requirements, procedures and wear tolerances may be provided in the division text. Where inspection requirements are not listed, inspections should be made per Sections 05-10-00 thru 05-50-00.

Replace components that exhibit damage or wear beyond tolerances, or that negatively affect the proper function or integrity of an assembly.

3. Maintenance Information Requests

Address all questions regarding 369D/E/FF - 500/600N helicopter maintenance to the MDHI Field Service Representative assigned to the geographical area in which the helicopter is being operated. Should there be no factory representative in the area, contact Product Support Dept., Technical Publications, Mesa, Arizona. If the item in question is vendor supplied; i.e., engine, engine fuel control and governor, starter-generator, fuel cells, etc., contact the manufacturer directly to get definitive answers to your questions (Ref. Table 201. Related Publications and Directives, which lists component manufacturers, suppliers and their addresses).

4. Related Publications

Publications and directives that form part of the information file for helicopter component maintenance are listed in Table 201. Related Publications and Directives.

5. Optional Equipment

All optional equipment available for and usable on commercial model helicopters is listed in Table 202 Optional Equipment. Contact MDHI for compatibility of mixing options.

Table 201. Related Publications and Directives

Component and Manufacturer, or Source	Publication Title	Publication or Directive No.
General Information		
Superintendent of Documents U.S. Government Printing Office Division of Public Documents Washington, D.C. 20402	Acceptable Methods, Techniques and Practices - Aircraft Inspection and Repair (GPO Catalog No. TD 4-28/2:972)	FAA AC No. 43.13-1A (1)
	Advisory Circular - Corrosion Control for Aircraft	FAA AC No. 43-4 (1)
Aerospace Industries Association of America, Inc. 1725 De Sales Street, N.W. Washington, 6, D.C.	National Aerospace Standard (Title as applicable)	NAS No. as applicable
MDHI Publications		
MD Helicopters Inc. M615-G048 4555 E. McDowell Rd. Mesa, AZ 85215-9734 Technical Publications Order Desk: (480) 346-6373 or (800) 388-3378 FAX: (480) 346-6809	369D Pilot's Flight Manual (with applicable Equipment Supplements)	CSP-D-1 (1)
	369E Pilot's Flight Manual (with applicable Equipment Supplements)	CSP-E-1 (1)
	369FF Pilot's Flight Manual (with applicable Equipment Supplements)	CSP-FF-1 (1)
	500N Pilot's Flight Manual (with applicable Equipment Supplements)	CSP-520N-1 (1)
	600N Pilot's Flight Manual (with applicable Equipment Supplements)	CSP-600NRFM-1 (1)
	Illustrated Parts Catalog (IPC), Model 369D/E/F - 500/600N	CSP-IPC-4 (1)
	Basic Handbook of Maintenance Instructions (HMI-2) Servicing and Maintenance, Model 369D/E/F - 500/600N	CSP-HMI-2 (1)
	Basic Handbook of Maintenance Instructions (HMI-3) Instruments-Electrical-A vionics, Model 369D/E/F - 500/600N	CSP-HMI-3 (1)
	Component Overhaul Manual (COM), Model 369D/E/F - 500/600N	CSP-DEF-5 (1)
	Structural Repair Manual (SRM), Model 369D/E/F - 500N	CSP-DEF-6 (1)
	Illustrated Structures Catalog (ISC), Model 369D	CSP-D-7 (1)
	Illustrated Structures Catalog (ISC), Model 369D/E/FF - 500N	CSP-ICS-7 (1)
	Corrosion Control Manual	CSP-A-4

Table 201. Related Publications and Directives (Cont)

Component and Manufacturer, or Source	Publication Title	Publication or Directive No.
Battery		
Marathon Battery Company Cold Spring, NY 10516 Phone: (817) 776-0650 (formerly Sonotone)	Marathon Battery Instruction Manual	BA-89 (REV 2-71)
Engine		
Allison Engine Company, Inc. Parts Distribution Center 7100 Riverport Drive Louisville, KY 40258 USA	Operation and Maintenance Manual, Turboshaft Engine Model 250-C20, -C20B	10W2 (1)
	Overhaul Manual, Turboshaft Engine Model 250-C20, -C20B	10W3 (1)
	Illustrated Parts Catalog, Turboshaft Engine Model 250-C20, -C20B	10W4 (1)
	Installation Bulletin, Three Cubic Inch Accumulator for 250-C20 Bendix Fuel System	1005 (1)
	Operation and Maintenance Manual, Turboshaft Engine Model 250-C20R/2	GTP-5232-2 (1)
	Overhaul Manual, Turboshaft Engine Model 250-C20R/2	GTP-5232-3 (1)
	Illustrated Parts Catalog, Turboshaft Engine Model 250-C20R/2	GTP-5232-4 (1)
	Operation and Maintenance Manual, Turboshaft Engine Model 250-C30	14W2 (1)
	Overhaul Manual, Turboshaft Engine Model 250-C30	14W3 (1)
	Illustrated Parts Catalog, Turboshaft Engine Model 250-C30	14W4 (1)
	Operation and Maintenance Manual, Turboshaft Engine Model 250-C47M	CSP 21004 (1)
	Overhaul Manual, Turboshaft Engine Model 250-C47M	CSP 22004 (1)
	Illustrated Parts Catalog, Turboshaft Engine Model 250-C47M	CSP 23001 (1)
Starter-Generator		
Aircraft Parts Corporation 160 Finn Court Farmingdale, NY 11735 Phone: (516) 249-3053 Datafax: (516) 249-2577	Brush Seating - APC Brushes in High Speed Starter Generators: MDHI Part Nos. 369A4550 and 369D28550	SB150SG105
	Overhaul Manual With Illustrated Parts Breakdown	TM 101

Table 201. Related Publications and Directives (Cont)

Component and Manufacturer, or Source	Publication Title	Publication or Directive No.
TRW Aeronautical Systems Lucas Aerospace 30 Van Nostrand Ave. Englewood, NJ 07631-4396 Phone: (201) 541-3250 Datafax: (201) 894-1965	Overhaul Instructions with Parts Breakdown, Models 23032-010, 23032-011, 23032-020, 23032-022, 23032-028, 23081-001	Call or write
Fargo Manufacturing Co. 2750 North Elston Ave. Chicago, Illinois 606447	Starter/Generator Cooling System Supplemental Type Certificate	STC No. SH907GL
Avionics Equipment		
VHF/COMM Transceiver RCA Aviation Equipment Dept. 11819 W. Olympic Blvd. Los Angeles, CA 90064	AVC-110 VHF Communications Transceiver Instruction Manual	IB8029004
VHF/NAV Receiver RCA Aviation Equipment Dept.	AVN-210 Series Integrated Navigation Systems	IB96460
University Sound of LTV Ling Altec, Inc. Oklahoma City, OK	Operators Manual, SA-250 and SA-500 High Power Sound and Siren Systems	
	Operators Manual, Model 500 Super High Power Solid-State Amplifier and Model RMC-1 Remote Control	
Automatic Direction Finder King Radio Corp. 400 North Rogers Road Olathe, KS	KR 85 Automatic Direction Finder Installation Manual (has repair/overhaul information)	006-0043-00
	KR 86 Automatic Direction Finder Maintenance/Overhaul Manual	006-5084-00
	KR 87 Automatic Direction Finder Maintenance/Overhaul Manual	006-5184-00
NAV/COMM Receiver King Radio Corp.	KX 155 NAV COMM Receiver Maintenance/Overhaul Manual	006-5179-00
NAV/COMM Transceiver and COMM Transceiver King Radio Corp.	KX 170A/B - KX 175B NAV/COMM Transceiver and KY 195B Communications Transceiver Maintenance/Overhaul Manual	006-5053-00
COMM Transceiver King Radio Corp.	KY 196 VHF COMM Transceiver Maintenance/Overhaul Manual	006-5169-00
Transponder King Radio Corp.	KT 76A Transponder Maintenance/Overhaul Manual	006-5143-00
VOR Indicator King Radio Corp.	KI 201C VOR Indicator Maintenance/Overhaul Manual	006-5052-00
	KI 208 VOR Indicator Maintenance/Overhaul Manual	006-5137-00

Table 201. Related Publications and Directives (Cont)

Component and Manufacturer, or Source	Publication Title	Publication or Directive No.
Audio Control Panel King Radio Corp.	KMA 24H-70/71 Audio Selector Panel and Interphone System Maintenance/ Overhaul Manual	006-5586-00
Automatic Direction Finder System Collins General Aviation Division Avionics Group Rockwell International Corp. Cedar Rapids, Iowa 52498	ADF-60 Automatic Direction Finder System Instruction Book	523-0766184-0061 1A
	CTL-X2 Controls and CAD-62 Control Adaptor Instruction Book	523-0772494-001 11A
	Collins Pro Line II Com/Nav/Pulse System Instruction Book	523-0772719-0021 1A
ALT-55 Radio Altimeter System Collins General Aviation Division Publication Dept. 124-212 400 Collins Rd. NE Cedar Rapids, Iowa 52498	ALT-55 Radio Altimeter System Instruction Book (Repair Manual	523-0766793
Automatic Direction Finder System Collins General Aviation Division	ADF-650/650A Automatic Direction Finder System - RCR-650/650A Receiver, ANT-650 Antenna, IND-650/650A Indicator and ADA-650 ADF to RMI Adaptor Instruction Book	523-0766207-0041 1A
COMM Transceiver Collins General Aviation Division	VHF-22B VHF COMM Transceiver Instruction Book	523-0771854-0031 1A
	VHF-251 Communications Transceiver and PWC-150 Power Convertor Instruction Book	523-0766029-0051 1A
NAV Receiver Collins General Aviation Division	VIR-351 Navigation Receiver, IND-350 Indicator, and PWC-150 Power Convertor Instruction Book	523-0766030-0051 1A
Transponder Collins General Aviation Division	TDR-950 Transponder Instruction Book	523-0766464-0031 1A
VHF AM/FM AN/ARC-186(V) Collins Government Avionics Division Avionics & Missiles Group Rockwell International Cedar Rapids, Iowa 52406	Collins VHF-186 Transceiver Instruction Book	523-0770251-001 11A
ICS Control Panel (C-6533/ARC) Andrea Radio Corp. 11-40 45 Road Long Island City, NY 11101	A301-1 Communication Control Technical Manual - Installation, Operation and Maintenance	C46-5020 027
COMM Transceiver Sunair Electronics, Inc. 3101 S.W. Third Avenue Fort Lauderdale, FL 33315	ASB-125, ASB-60 SSB Communications Equipment Maintenance Manual	99655

Table 201. Related Publications and Directives (Cont)

Component and Manufacturer, or Source	Publication Title	Publication or Directive No.
Spilsbury & Tindall, Ltd. 120 E. Cordova Street Vancouver 4, B.C. Canada	Instruction Manual, “Stringer” Model AC-21 Mobile Antenna System	65-018
Fuel Cells		
Uniroyal, Inc. Engineered Systems Department Mishawaka, Indiana 46544 Phone: (219) 255-2181	Recommended Handling, Storage and Repair Procedures For Non-Self-Sealing Flexible Fuel, Oil And Water Alcohol Cells	FC-1473-73
	Repair Procedure For Self-Sealing Fuel Cells	RK-10-34
Engineered Fabrics Corp. Formerly: Loral Systems Group 669 Goodyear Street Rockmart, GA 30153-2417 Phone: (404) 684-7855	Maintenance and Repair Manual, VITHANE\R Fuel Tanks, July 1988, ATA 28-10-13	AP 368
	Quick Cure Repair for Engineered Fabrics Corp. Fuel Tanks of VITHANE\R Construction, March 1988, ATA 28-10-15	AP 472
	Repair & Maintenance Manual, Bladder, Self Sealing, & Non-Self-Sealing Tanks, ARM Type Constructions, April 1987, ATA 28-10-16	AP 430
	Repair & Maintenance Manual, Bladder Fuel Tanks, Nitrile Type Constructions, June 1988, ATA 28-10-1	AP 258-4
Naval Publications & Forms <u>East</u>: 5801 Tabor Avenue Philadelphia, PA 19120 Phone: (215) 697-2179 Datafax: (215) 697-5914 <u>West</u>: Bookstore No. 10 ARCO Plaza, Level C 505 S. Flower Street Los Angeles, CA 90071 Phone: (213) 894-5841	Military Standard Inspection & Acceptance Standards For Propulsion Fluid Cells & Fittings	MIL-STD-801A

NOTE: Naval Publications personnel do not accept telephone orders. You must mail or FAX your written request. There is no charge for the material.

Table 201. Related Publications and Directives (Cont)

Component and Manufacturer, or Source	Publication Title	Publication or Directive No.
Hoist Equipment		
Hoist Winch Assembly Breeze Corporations, Inc. 700 Liberty Avenue Union, NJ 07083	BL-16600-12 Series 300 Pound Capacity Hoist Operating Instructions BL-16600-40 Series Hoist Operating Instructions Use and Maintenance of Aircraft Hoist Cable	HB-136
Maintenance and Test Equipment		
Model 177M-6 Balancer Model 8350 Balancer Model 192A Balancer Model 8500 Balancer Model 135M-11 Strobex Blade Tracker Model 135M-12 Strobex Blade Tracker - must be used with Model 8500 Balancer Chadwick-Helmuth Co., Inc. 4601 N. Arden Drive El Monte, CA 91731 Phone: (818) 575-6161 Datafax: (818) 350-4236	Chadwick-Helmuth Operation and Service Instruction Handbooks are normally supplied with the equipment.	Call or write
Landing Gear Equipment		
Helicopter Float Assemblies Garrett-Air Cruiser Company P.O. Box 180 Belmar, NJ	Overhaul Manual with Illustrated Parts List, Helicopter Float Assemblies, Utility Floats 21D24368-1/-2, Emergency Floats D24484-5/-6	
Transmissions		
Threaded Inserts Newton Insert Co. 6500 Avalon Blvd. Los Angeles, CA 90003	Keenserts	Catalog D
Engine Oil Cooler		
Harrison Radiator Division General Motors Corp. Lockport, NY 14094	Service Overhaul Manual, Harrison Aluminum Plate Type Liquid-to-Air Coolers	HES-66 77F Revised Sept 30, 1973
Stewart Warner Corp. Southwind Division 1514 Drover Street Indianapolis, Indiana 46221 Phone: (317) 632-8411		

Table 201. Related Publications and Directives (Cont)

Component and Manufacturer, or Source	Publication Title	Publication or Directive No.
Scavenge Oil Filter		
Filter Products Division Facet Enterprises, Inc. 8439 Triad Drive Greensboro, NC 27409 Phone: (919) 668-4444 TWX 510-922-7331	Facet Kit No. 1741050-01 Installation and Service Manual Scavenge Lube Oil Filter	E-947, Rev. D 3/10/89 (1)
Engine Intake Air Particle Separator		
Pall Land Marine Corp. (PLM) Formerly: Aircraft Porous Media (APM) 7070 Moon Lake Road New Port Richey, FL 33552 Phone: (813) 849-9999	Vortex Tube Repair	PLM-TM-80-1
Fuel Filter Pressure Switch		
R.W. Jensen, Inc., 215 Arena Street El Segundo, CA 90245	Pressure Switch Repairs	
Trim Actuators		
CEF Industries, Inc., Calco Division TEL: (813) 422-6419 FAX: (813) 421-2069	Trim Actuator Overhaul	
Searchlight		
Alexair 25320 Bellanca Way Torrance, CA 90505 Phone: (213) 326-5222	SX Nightsun Searchlight (Spectrolab)	STC No. SH2288NM

NOTES:

(1) Publication should be maintained and treated as part of the primary information file for the helicopter.

Table 202. Optional Equipment List

Nomenclature	Part Number	369D	369E	369FF	500N	600N
10 - PARKING AND MOORING						
M/R blade stowage rack	369D299913	X	X	X		
21 - ENVIRONMENTAL CONTROL SYSTEM						
Heating system	369H90020	X	X	X	X	X
25 - EQUIPMENT / FURNISHINGS						
Seat assy. passenger compartment	369D290037	X				
Litter kit (bubble doors and flat glass)	369H90011-519	X	X			
Litter kit (W/O doors)	369H90011-521	X	X			
Seat and belts (four on the floor)	369H90035	X	X	X	X	
Seat (mesh)	369H90040	X	X	X	X	
Hoist	369H90070	X	X	X	X	
Cargo hook	369H90072	X	X	X	X	X
Seat belt assembly (pilot, co-pilot)	369H6541	X				
Shoulder harness and seat belt inertia reel	421-099		X	X	X	
Litter kit	369D290170	X	X			
Litter kit	TA-HH-0001	X	X	X		
Forward equipment tray	369D292200		X	X	X	
26 - FIRE PROTECTION						
Fire extinguisher	369H90001	X	X	X	X	X
28 - FUEL SYSTEM						
Anti-ice fuel filter	369H90022	X	X		X	
Airframe fuel filter	600N98110					X
Fuel tank, self-sealing	369H90029	X	X	X	X	
Drain, auxiliary engine fuel filter	369H92255	X				
32 - LANDING GEAR						
Extended landing gear	369D290007	X	X	X	X	
Extended landing gear	600N6000					X
Step assembly, extended landing gear	600N6501					X
Utility floats	369D290086	X	X			
Emergency floats	369D290121	X	X	X	X	
Ground handling wheels (pneumatic)	369H90045	X	X	X	X	
Ground handling wheels (compact)	369H90126	X	X	X	X	
Float lamp assembly	369D292032	X	X		X	X
Landing gear kit, winterized	369D290010	X	X	X	X	
Landing gear kit, mid-temp	369D290012	X	X	X	X	
Metal landing gear fairings	SA4344				X	

Table 202. Optional Equipment List (Cont)

Nomenclature	Part Number	369D	369E	369FF	500N	600N
52 - DOORS						
Door (litter)	369H90085	X				
53 - FUSELAGE						
Magnesium-to-aluminum conversion kit	M30251-501	X	X	X	X	
Clear windshield kit	369H90026	X				
Comfort window	369D290026		X	X	X	
Side window (fwd extended canopy)	369D292491		X	X		
Upper and lower windshield (Heliplex)	SH7443SW		X	X	X	
Window, crew (Heliplex)	SH7404SW		X	X	X	
Window, passenger (Heliplex)	SH7405SW		X	X	X	
63 - TRANSMISSION AND DRIVE SYSTEM						
M/R transmission oil cooler drain	369D290120	X				
Rotor brake	369H90123	X	X	X	X	X
64 - ANTI-TORQUE ASSEMBLY						
4-Bladed tail rotor drive system	369D292500	X	X			
67 - FLIGHT CONTROLS						
Dual controls, L/H command	369H90033	X	X	X	X	X
Cyclic stick grip kit	369H90129	X	X	X	X	
Right hand command kit	369D297001	X	X	X	X	X
Yaw Stability Augmentation System	600N97300					X
71 - POWER PLANT						
Engine air inlet deflector kit	369D292044	X	X			
Mist eliminator access panel	369D290270	X	X	X		
Foriegn particle diverter kit	369D292045	X	X			
250-C20R/2 conversion kit	369D298000	X	X			
Particle separator	369H90148	X	X	X	X	
Particle separator filter Particle separator Particle separator fairing	600N90148 600N90125 600N90128					X X X
Engine compressor water wash kit	369H92537	X	X	X	X	X
Mist eliminator	369D290125				X	
C30 maintenance fuel pump kit	369D298100			X	X	
Starter-Generator cooling system A1400-185	SH907GL				X	
95 - INSTRUMENTS						
IVSI	369D294508		X	X	X	
Heated pitot tube	369H90034	X	X	X	X	
Heated pitot tube	600N90034					X

Table 202. Optional Equipment List (Cont)

Nomenclature	Part Number	369D	369E	369FF	500N	600N
Attitude gyro indicator	369H90038	X	X	X	X	
AIM attitude gyro (510-1BL)	600N96501					X
Directional gyro indicator	369H90039	X	X	X	X	
AIM 200 directional gyro (200DCL)	600N96502					X
AIM 205 directional gyro (205-1BL)	600N96503					X
Instantaneous vertical speed indicator	369H90044	X	X	X		
Vertical speed indicator	600N96523					X
Instantaneous vertical speed indicator	600N96524					X
Auto direction finder (KR-85)	369H90067	X				
Auto direction finder (Collins ADF-650A)	369D24165		X	X		
Auto direction finder (KR-87)	600N96508					X
Compass system (KCS-55A)	600N96528					X
Altimeter indicator (millibar scale)	369H90124	X	X	X		
Radar altimeter	600N96506					X
Encoding altimeter (United 5035)	600N96522					X
AIM turn/bank indicator (TS400-1AL)	600N96504					X
Digital/Analog TOT indicator	369D294509	X	X		X	
96 - ELECTRICAL POWER						
17AH ni-cad battery	369D290011	X	X		X	X
Dual-starting kit	M30306	X				
FWD battery	369D222505		X			
13AH ni-cad battery	369D24296		X			
97 - AVIONICS						
Transponder, Mode S (KT-70)	600N96509					X
Transponder (KT-76A)	369H90073	X				
Transponder (King KT-76A)	369D24163		X	X		
Transponder (Collins TDR-950)	369H90009	X				
Transponder (Collins TDR-950)	369D24166		X	X		
Transponder, Mode A/C (KT-76A)	600N96511					X
GPS International (KLN 90B)	600N96507					X
NAV/COM (Collins)	369H90007	X				
NAV/COM transceiver (KX-170A)	369H90071	X				
NAV/COM transceiver (KX155)	369D24147		X	X		
NAV/COM transceiver (KX155)	600N96512					X
NAV/COM transceiver (King KX-1756)	369D24162		X	X		
NAV/COM (Collins VHF-251 and VIR-351)	369D24164		X	X		
Transceiver (VHF-22B)	369D24322		X			

Table 202. Optional Equipment List (Cont)

Nomenclature	Part Number	369D	369E	369FF	500N	600N
Comm. receiver (Bendix/King KY-196)	369D24167		X	X		
Comm. receiver (KY196A-30)	600N96513					X
ADF (Collins RCR-650)	369H90008	X				
ADF (King KR-87)	369D24161		X	X		
ADF (Collins 60A)	369D24333		X			
ICS system	369H90068	X				
ICS system	369D24118		X	X	X	X
NAT AA82/AA83 stereo ICS	600N96505					X
Copilot foot switch	600N96526					X
Rear seat transmit switch	600N96527					X
Radio (ASB/125/60)	369H90144	X				
Headset, microphone assembly	369H92042	X	X	X	X	
Switch and jack assembly, intercom	369H92492	X	X	X	X	
Headset microphone	H10-56	X	X	X	X	
Harness assembly (VHF-22B)	369D24321		X			
Instrument and electrical (R/H command)	369D24175				X	
Sterio audio control	600N96529					X
Audio control panel (KMA24-H)	600N96514					X
Middle seat wire harness	600N96515					X
Collective Hobbs	600N96525					X

Chapter

04

Airworthiness Limitations

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Airworthiness Limitations

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AIRWORTHINESS LIMITATIONS

Type Certificate No. H3WE

FAA Approved Airworthiness Limitations for MD Helicopters, Inc., Models 369D/E/F/FF and 500/600N.

1. General

The Airworthiness Limitations section is FAA approved and specifies maintenance required under Code of Federal Regulations (CFR), Title 14, Federal Aviation Regulation (FAR), Part 43.16 and 91.403 unless an alternative program has been FAA approved.

REVISION:	DATE	FAA SIGNATURE AND DATE
Original Issue:	October 31, 1990	Not FAA approved
Revision 1:	March 29, 1991	Not FAA approved this revision
Revision 2:	May 10, 1991	6/20/91
TR 91-001	August 12, 1991	8/14/91
Revision 3:	September 9, 1991	9/12/91
TR 91-002	November 5, 1991	11/7/91
Revision 4:	January 20, 1992	01/16/92
TR 92-004	May 20, 1992	05/27/92
Revision 5:	August 24, 1992	08/19/92
TR 92-005	November 20, 1992	11/12/92
Revision 6:	December 21, 1992	12/4/92
Revision 7:	June 1, 1993	Section 04-00-00 Not Affected This Revision
TR 93-002	May 27, 1993	5/27/93
Revision 8:	July 23, 1993	7/13/93
TR 94-001	January 21, 1994	02/09/94
Revision 9:	April 22, 1994	ACTING MGR. 3-23-94
Revision 10:	September 26, 1994	Section 04-00-00 Not Affected This Revision
TR 94-002	October 24, 1994	10/24/94

REVISION:	DATE	FAA SIGNATURE AND DATE
Revision 11:	January 18, 1995	[illegible] 01/23/95
Revision 12:	October 6, 1995	Section 04-00-00 Not Affected This Revision
TR 96-002:	April 24, 1996	[illegible] 04/24/96
Revision 13:	May 31, 1996	[illegible] 6/12/96 acting mgr ANM-120L
Revision 14:	September 13, 1996	[illegible] 09/09/96
Revision 15:	November 15, 1996	Section 04-00-00 Not Affected This Revision
Revision 16:	January 6, 1997	Section 04-00-00 Not Affected This Revision
Revision 17:	February 24, 1997	[illegible] 02/20/97
TR 97-001:	July 2, 1997	[illegible] 07/02/97
TR 97-002:	August 19, 1997	[illegible] 08/19/97
Revision 18:	October 17, 1997	Section 04-00-00 Not Affected This Revision T/R 97-001 and 97-002 Previously Signed
Revision 19:	December 16, 1997	[illegible] 12/19/97
TR 98-001:	March 25, 1998	[illegible] 03/25/98
Revision 20:	June 1, 1998	Section 04-00-00 Not Affected This Revision T/R 98-001 Previously Signed
TR 98-002:	June 22, 1998	[illegible] 7/10/98 ACTING MGR.
TR 98-003:	3 August 1998	[illegible] 8/3/98
Revision 21:	24 August 1998	Section 04-00-00 Not Affected This Revision T/R 98-002 and 98-003 Previously Signed
Revision 22:	10 March 1999	Section 04-00-00 Not Affected This Revision
Revision 23:	1 June 1999	Section 04-00-00 Not Affected This Revision
Revision 24:	7 December 1999	[illegible] 12/30/99 ACTING MGR
Revision 25:	28 April 2000	Section 04-00-00 Not Affected This Revision
Revision 26:	17 August 2000	[illegible] 8/11/00
Revision 27:	9 October 2000	Section 04-00-00 Not Affected This Revision
Revision 28:	30 November 2000	Section 04-00-00 Not Affected This Revision

REVISION:	DATE	FAA SIGNATURE AND DATE
Revision 29:	11 May 2001	[illegible] 5/4/01 [illegible] 5/14/01
Revision 30:	11 July 2001	Section 04-00-00 Not Affected This Revision
TR 01-001:	10 August 2001	[illegible] 8/9/01
Revision 31:	5 November 2001	Section 04-00-00 Not Affected This Revision T/R 01-001 Previously Signed
TR 02-002:	30 January 2002	[illegible] 1/23/02
Revision 32:	18 March 2002	[illegible] 3/15/02
Revision 33:	24 June 2002	[illegible] 6/11/02
TR 03-001:	18 June 2003	[illegible] 6/13/03
TR 03-002:	25 June 2003	[illegible] 7/7/03
Revision 34:	21 July 2003	Section 04-00-00 Not Affected This Revision T/R 03-001 and 03-002 Previously Signed
TR 03-003:	30 September 2003	[illegible] 12/3/03
TR 03-004:	17 December 2003	[illegible] 1/7/04
Revision 35:	20 May 2004	Section 04-00-00 Not Affected This Revision T/R 03-003 and 03-004 Previously Signed
TR 04-001:	28 May 2004	[illegible] 6/7/04
Revision 36:	11 November 2004	[illegible] 11/3/04

This document conforms to Main Rotor Stress Analysis 369D/E, Rev. U.
This document conforms to Stress Analysis 369FF, Rev. R.
This document conforms to Service Life Analysis 500N, Rev. T.
This document conforms to Service Life Analysis 600N, Rev. Y.

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AIRWORTHINESS LIMITATIONS

2. Component Mandatory Replacement

The Airworthiness Limitation Replacement Schedule specifies the mandatory replacement time, structural inspection interval and related structural inspection procedures approved per the certificate basis of the Type Certificate Data Sheet No. H3WE and CAR 6 (6.250, 6.251) and CFR 27.571 for models 500/600N unique components only. At the listed finite-life, components or assemblies must be removed from the helicopter and permanently retired from service. At the listed inspection interval, the components or assemblies must be inspected in accordance with the Handbook of Maintenance Instructions (HMI). The title of the task and section of the HMI are referred to which provide the inspection procedures and criteria.

NOTE: Refer to CFR Part 43.10 for latest requirements for the removal, installation, storage and disposition of life-limited parts.

(1). A “life-limited’ ’ part is a physical component of the helicopter to which a maximum number of allowable operating hours or cycles are assigned. Certain assemblies and components on the helicopter have a limited life established by MDHI and approved by FAA Engineering. For example, a part with an assigned limit of 1000 hours, may accumulate 1000 hours of operation in service. Upon completion of the 1000 hours of operation, useful life of the part is ended. The finite-life assigned to different parts varies according to engineering fatigue tests, part experience, etc. The parts listed in this section must be removed from the helicopter at the finite-life indicated and identified as to it’s expired life (Ref, Table 1, Note (1)).

(2). All parts not having an assigned life or stated to be of unlimited life, have a life of not less than 20,000 hours.

(3). When a life-limited part or an assembly that incorporates a life-limited part is installed on a new or used helicopter, the nomenclature, part number, serial number, component time and current helicopter hours are recorded in the Log Book and component log for the helicopter. Whether the life-limited part is new or used, the remaining number of useful life hours and previous inspection time, if applicable, for the part is added to the existing helicopter time. The total helicopter hours obtained then denotes the subsequent time at which the part must be removed from the helicopter or inspected.

(4). If a life-limited part, is part of an assembly, the assembly must be removed from the helicopter when the time expires. The assembly may be overhauled and restored to maximum number of hours of useful life by installing new life-limited parts plus all other parts specified in the overhaul instructions (Refer to Component Overhaul Manual).

(5). If interchanged between different model helicopters (for instance, Model 369D to 369FF or vice versa), any component having a limited life or overhaul schedule must be restricted to the lowest service life or TBO schedule indicated for the helicopter models and serial numbers affected.

(6). Refer to the appropriate Allison Operation and Maintenance Manual for engine component replacement requirements.

3. Component Mandatory Inspections

Some components with mandatory inspection intervals require inspections to be completed in accordance with procedures detailed in other sections of this maintenance manual. The appropriate inspection procedures are referenced in the **Notes** flagged to each component to be inspected. All maintenance manual procedures which are referenced in the FAA Approved Airworthiness Limitations Component Mandatory Replacement Schedule are FAA approved procedures which cannot be changed without FAA review and approval of the proposed changes.

4. Retirement Index Number (RIN)

(1). A Retirement Index Number (RIN) is a number that accounts for different usage spectra in assigning the retirement time for a component.

The RIN is calculated as the sum of an adjustment factor times flight hours plus another adjustment factor times Torque Events.

When a component reaches 1,000,000 RIN's, it has reached it's maximum life and is to be scrapped.

5. Torque Event (TE)

A Torque Event (TE) is defined as:

The transition to a hover from forward flight.

Any external lift operation.

NOTE: An external lift can either be on the cargo hook, external hoist or in external baskets.

For external lift operators, an external load is recorded as two (2) TE's (pick-up and drop-off).

Hover taxi with no external load will typically result in no TEs.

6. External Lift and Torque Event (TE) Requirements

The 369D/E/F/FF - 500/600N helicopters are multi-use helicopters. If the helicopter is used primarily for external lifts or training flights (high TE flights), there may be a reduction in inspection intervals of some components.

CAUTION For safe operation of the helicopter, TE's must be recorded in the Rotorcraft Log Book. Each external lift will be recorded as two (2) TE's.

(1). Determine the number of TE's and external lifts the helicopter accumulates per hour of flight time.

(2). Record all TE's in Rotorcraft Log Book and continue to record all TE's.

(3). Perform required TE inspections.

Table 1. Airworthiness Limitations Schedule

Component (1)	Model	Part Number (2)	Finite Life Hours (1)	Mandatory Inspection Hours
Main Rotor System				
Blade assembly, main rotor	369D/E (5) (6)	369D21100	3530 (37)	25 (11) (20)
		369D21100-516	3530 (37)	100 (20)
		369D21100-517	2500 (31)	25 (22)
		369D21100-517	3530 (37)	100 (20)
		369D21100-523	4000 (37)	100 (20)
		369D21120-501	3530 (37)	100 (20)
		369D21120-503	3530 (37)	100 (20)
	369F/FF (6)	369D21102	3430 (37)	25 (11) (20)
		369D21102-503	3430 (37)	100 (20)
		369D21102-517	2500 (31)	25 (22)
		369D21102-517	3430 (37)	100 (20)
		369D21102-523	4000 (37)	100 (20)
		369D21121-501	3430 (37)	100 (20)
		369D21121-503	3430 (37)	100 (20)
	500N (6)	369D21102-503	3430 (37)	100 (20)
		369D21102-517	2500 (31)	25 (22)
		369D21102-517	3430 (37)	100 (20)
		369D21102-523	4000 (37)	100 (20)
		369D21121-501	3430 (37)	100 (20)
		369D21121-503	3430 (37)	100 (20)
	600N (6)	369D21102-517 (21)	1900 (32) (37)	100 (20)
		369D21102-523	3200 (33) (37)	100 (20)
		369D21121-501	3200 (33) (37)	100 (20)
		369D21121-503	3200 (33) (37)	100 (20)
Folding pin, main rotor blade attach	369D/E/F/FF	369A1004	2850	
		369A1004-3	2850	
		369A1004-5	7600	
	500/600N	369A1004-5	7600	
Hub subassembly, main rotor	369D/E/F/FF 500N	369D21201	8900	
Pitch housing assembly, main rotor hub	369D	369D21300	9100	
		369D21300-501	9100	
	369E/F/FF 500N	369D21300-501	9100	

Table 1. Airworthiness Limitations Schedule (Cont.)

Component (1)	Model	Part Number (2)	Finite Life Hours (1)	Mandatory Inspection Hours
Retention strap assembly, main rotor hub	369D	369D21210	2770	100 (4)
		369D21210-501	2770	100 (4)
	369E/F/FF	369D21210-501	2770	100 (4)
	500/600N	369D21210-501	2770	100 (4)
Bolt - lead-lag hub, main rotor	369D	369A1220	6120	
	369D/E/F/FF 500N	369D21220	6120	
	600N	369D21220	5400 (34)	
Link assembly - lead lag hub, main rotor	369D/E	369H1203-BSC (39)	5762	25 (23)
		369H1203-21 (39)	5762	25 (23)
		369H1203-31 (39)	5762	25 (11)
		369H1203-51 (39)	11080	
		369H1203-53 (40)	11080	
		369H1203-61 (39)	11080	
	369F/FF	369H1203-21 (39)	5762	25 (23)
		369H1203-31 (39)	5762	25 (11)
		369H1203-51 (39)	11080	
		369H1203-53 (40)	11080	
		369H1203-61 (39)	11080	
	500N	369H1203-51 (39)	11080	
		369H1203-53 (40)	11080	
		369H1203-61 (39)	11080	
	600N	369H1203-51 (39)	11080	
		369H1203-53 (40)	11080	
Lead lag damper - main rotor	369D	369D21400-501	6060	
		M50452	On Cond.	(16)
	369D/E/F/FF 500/600N	369D21400-503	On Cond.	(16)
Drive shaft, main rotor	369D/E	369D25510	5020	300 (8)
	369F/FF	369D25510	3675	300 (8)
	500N	369D25510-21	3260	300 (15)
	369D/E	369F5510	5020	
	369F/FF	369F5510	3675	
	500N	369F5510	3260	
	600N	600N5510	14000 (35)	
Mast assembly, main rotor	369D/E/F/FF 500N	369D22014	10450	
	600N	369D22014	3500	
Drive Shafts, Couplings and Clutches				
Drive shaft, main rotor transmission	369D/E/F	369A5510	3790	

Table 1. Airworthiness Limitations Schedule (Cont.)

Component (1)	Model	Part Number (2)	Finite Life Hours (1)	Mandatory Inspection Hours
Coupling, main transmission drive shaft	369D/E/F/FF	369H5660	4300	
	500N	369H5660	3200	
Overrunning clutch assembly	369D/E/F/FF 500/600N	369F5450-501	On Cond.	100 (24)
Sprag assembly, overrunning clutch	369D/E/F/FF	369A5364 369D25351	(3)	300 (10)
	500N	369D25351	(3)	300 (10)
	369D/E/F/FF 500/600N	369F5456	(3)	300 (17)
Drive shaft, fan	500N	500N5200	2620	
	600N	500N5200	1200 (36)	
Drive shaft, tail rotor	369D/E	369D25518	13900	
	369F/FF	369DSK152-1 1 369D25518-503	13900 14610	
Coupling - tail rotor drive shaft (Bendix) (**NOTE**: Not certified on 369FF Model) (9)	369D/E/F	369A5501 369H92564 (7)	4980 4980	
Anti-T orque System				
Gearshaft assembly, tail rotor input	369D/E	369D25434	12000	
	369F/FF	369D25434	3365	
Gearshaft, tail rotor output pinion	369D/E/F/FF	369D25430	7290	
Blade assembly, tail rotor	369D/E	369D21613 369D21613-1 1 369D21613-31 369D21613-41 369D21613-51 369D21613-61 369D21613-71 369D21640-501 (38) 369D21640-503 (38) 369D21640-505 (38)	5200 5140 5140 5140 5140 5140 5140 400 5140 5140	
	369F/FF	369D21606 369D21642-501 (38) 369D21642-503 (38) 369D21642-505 (38)	5140 400 5140 5140	
Blade assembly, tail rotor (optional 4-blade)	369D/E	369D21615 369D21641-501 (38) 369D21641-503 (38) 369D21641-505 (38)	10000 400 10000 10000	
Hub, tail rotor	369D/E/F/FF	369A1725	3450	

Table 1. Airworthiness Limitations Schedule (Cont.)

Component (1)	Model	Part Number (2)	Finite Life Hours (1)	Mandatory Inspection Hours
Retention strap assembly, tail rotor	369D/E/F	369A1706	5100	
	369FF	369A1706-507	5100	
		369A1706-509	5100	
Blade assembly, NOTAR fan	500N	500N5310-15	7500	
		500N5310-19	7500	
	600N	500N5310-19	12500	
Hub, fan	500N	500N5352-7	7500	
		500N5352-9	7500	
	600N	500N5352-9	7500	
Shaft, NOTAR fan support	600N	500N5357-13	4000	
Pitch plate assembly	500/600N	500N5363-7	7500	
Tube assembly, fan pitch	500N	500N7113-3	600 (18)	
Rotating cone assembly	500N	500N3740-1	10000	
		500N3740-41	10000	
	600N	500N3740-61	10000	
Tailboom				
Bolts, tailboom attach	369D/E/F/FF	MS21250-06014	21950	
Tailboom assembly	369D/E	369D23500	10300	
	369F/FF	369D23500-507	10300	
	500N	500N3500-19	10000	100 (14)
		500N3500-29	10000	
		500N3500-501	10000	
		500N3600-501	2400 (19)	
	600N	600N3500-503	2500 (25)	
		600N3500-505	5900	
		600N3500-507	1000	
		600N3500-509	6000 (19)	
		600N3500-51 1	6000 (19)	
		600N3500-513	2500 (25)	
		600N3500-515	5900	
		600N3500-517	1000	
Empennage fittings	600N	500N3530-7/8	On Cond.	100 (26)
		500N3530-9/10	On Cond.	100 (26)
Vertical stabilizer assembly	369D/E	369D23600	12700	
	369F/FF	369D23600-505	3388	
Torque tube, horizontal stabilizer	500N	500N3950-5	5000	
	600N	500N3950-7	3000	
		600N3950	1000 (19)	

Table 1. Airworthiness Limitations Schedule (Cont.)

Component (1)	Model	Part Number (2)	Finite Life Hours (1)	Mandatory Inspection Hours
Horizontal stabilizer assembly	369D (12)	369D23601	7700	
	369E (12)	421-087-505	7700	
		421-087-905 (13)	7700	
	369F/FF (12)	421-087-503	7700	
		421-087-903	7700	
	600N	500N3910-25	10000 (19)	
		500N3910-27	10000 (19)	
Controls				
Longitudinal idler bellcrank assembly	369D	369A7301	6500	
		369A7301-501	6500	
	369E/F/FF	369A7301-501	6500	
	500N	369A7301-501	2870	
Idler assembly, longitudinal pitch mixer	369D/E/F/FF	369A7603	13600	
	500N	369A7603	6050	
Longitudinal control rod	500N	369A7011-13	7740	
		369A7011-15	7740	
Socket, cyclic stick	600N	369A7141	1000	8 (27)
Cyclic tube assembly	600N	369D27132-503	1200	8 (27)
Housing, collective stick	600N	369A7347	450	
Tube, collective pitch control	600N	369A7348	400	
Tube assembly, collective pitch (pilot)	600N	369H7354-3	600	
Socket, cyclic stick	600N	369A7802	1000	8 (27)
Tube, collective pitch (co-pilot)	600N	369A7809	1800	
Housing, collective stick	600N	369A7820	450	
Housing, collective stick	600N	369H7837	450	
Tube assembly, collective pitch (co-pilot)	600N	369H7838-3	1000	
Fuselage Sta. 75 controls support bracket	600N	369N2608-1 1	6000 (41)	
		600N2608-9	Unlimited	
Airframe				
Landing gear brace	600N	600N6010-17/19	5900 (28)	
Landing gear strut	600N	600N6022-7/8	696 (29)	
Landing gear foot	600N	600N6043-3	3900 (30)	
Floats				
Squib cartridge, used on Emergency float kit 369D292473-5, -6, -9, -10, -11, -12 **NOTE:** Life is based from original date of manufacture.	369D/E/F/FF 500N	12552-1 (Holex, Inc.)	5 years	
		281993 (Walter Kidde)	5 years	
		12754-1 (Holex, Inc.)	5 years	
		5003527 (Tavco)	5 years	

Table 1. Airworthiness Limitations Schedule (Cont.)

Component (1)	Model	Part Number (2)	Finite Life Hours (1)	Mandatory Inspection Hours
Stabilizer support, utility float	369D/E	369D292036 369DSK66	3190 3190	

NOTES:

(1) Life-limited components interchanged between models or configurations must be restricted to the lowest service life indicated for the models or configurations affected. Life-limited components removed at retirement are to be mutilated/destroyed or conspicuously marked to prevent inadvertent return to service. Parts are applicable only on models under which a service life is listed.
Life-limited components cannot be altered or permanently marked in any manner without compromising the part integrity. Part tagging or other record keeping system is required.
Related component records must be updated each time component is removed from service.

(2) Service life shown for the basic (no dash number) part numbers apply to all dash numbered versions unless otherwise indicated.

(3) With no cargo hook attached: - No retirement life assigned (Ref. Sec. 05-10-00, Component Overhaul or Recommended Replacement Schedule).
With cargo hook attached and no separate log: - 1800 hours.
With cargo hook attached and with separate log: - 1800 hours of external load operating time when logged separately.
(For 369D/E/F/FF helicopters with 369A5364 or 369D25351 sprag assembly, Refer to AD 90-19-02.)

(4) Inspect in accordance with Main Rotor Strap Pack Lamination Inspection at 100-hour intervals, or 25-hour intervals if 2 laminates (369D/E/F/FF - 500N) or 1 laminate (600N) have failed in any one leg or tongue area of any strap assembly. A single cracked laminate between the shoes at the outboard end of a strap pack is cause for rejection of the hub assembly
369D/E/F/FF - 500N: (Ref. Sec. 62-20-00, Main Rotor Strap Pack Lamination Inspection).
600N: (Ref. Sec. 62-20-60, Main Rotor Strap Pack Lamination Inspection).
(For 369D/E/F/FF helicopters, refer to AD 89-02-01.)

(5) The 369D21100-513, -515, 516, 517 and -523 main rotor blades are not interchangeable with any earlier configuration blades (Basic, -505 or -509); however, the -505 and -509 blades are interchangeable and the -513 and -515 blades are interchangeable. The -505 and -509 configuration blades may be modified to the -513M configuration, which is fully compatible with the -513 blade. (For information concerning modification, contact MDHI Customer Service Department.)

(6) For the 369D/E helicopters, the 369D21120-501, -503 main rotor blade has all the same inspections and interchangeability as the 369D21100-517 main rotor blade.
For the 369F/FF - 500N helicopters, the 369D21121-501, -503 main rotor blade has all the same inspections and interchangeability as the 369D21102-517 main rotor blade.
For the 600N helicopters, the 369D21121-501, -503 main rotor blade has all the same inspections and interchangeability as the 369D21102-523 main rotor blade.

(7) Used with 369H90123 Rotor Brake Kit.

(8) Inspect main rotor drive shaft every 300 hours (Ref. Sec. 63-10-00, Main Rotor Drive Shaft Inspection (300 Hour)) (Reference AD 81-26-01).

(9) Failsafe device, P/N 369D25530 bolt and 369D25531 socket, must be used at both ends of tail rotor driveshaft in accordance with Tail Rotor Drive Shaft Installation with Bendix Couplings (Reference AD 86-20-07).

(10) For helicopters equipped with a cargo hook, inspect overrunning clutch sprag assembly P/N 369D25351, clutch inner race P/N 369A5353 and outer race 369A5352 every 300 hours (Ref. C.O.M., Sec. 63-10-10, Overrunning Clutch Sprag Inspection (300 Hour)). To establish time in service, either clutch total time with hook attached or a separate and permanent log of external load operating time per CFR 91.417, may be used.
(For 369D/E/F/FF helicopters with 369A5364 or 369D25351 sprag assembly, Refer to AD 90-19-02.)

(11) Inspect main rotor blade root fittings and main rotor lead-lag link assemblies every 25 hours in accordance with Main Rotor Blade Upper and Lower Root Fitting Attach Lug and Lead-Lag Link Attach Lug Inspection (25 Hour) and every 100 hours in accordance with Main Rotor Blade Upper and Lower Root, Fitting Attach Lug and Lead-Lag Link Attach Lug Inspection (100 Hour) (Ref. Sec. 62-10-00) (Reference AD 95-03-13).

(12) Tip plates, tip weights (where applicable) and attaching hardware have no retirement life and may be reused on replacement horizontal stabilizers.

(13) 421-087-903 and -905 require addition of tip plates, tip weights and attaching hardware before installation.

(14) Inspect the three upper slot bridges for cracks (Ref. Sec. 05-20-00).

(15) Inspect main rotor drive shaft every 300 hours (Ref. Sec. 63-10-00, Main Rotor Drive Shaft Inspection (300 Hour)).

(16) Inspect for deterioration every 600 hours up to a total time of 4200 hours and every 300 hours thereafter until deterioration is sufficient to retire assembly
369D/E/FF - 500N: (Ref. Sec. 62-20-00, Main Rotor Damper and Attachments Inspection)
600N: (Ref. Sec. 62-20-60, Main Rotor Damper and Attachments Inspection).

(17) For helicopters equipped with a cargo hook, inspect overrunning clutch sprag assembly P/N 369F5456, clutch inner race P/N 369F5455 and outer race 369F5453 every 300 hours. To establish time in service, either clutch total time with hook attached or a separate and permanent log of external load operating time may be used.

(18) 500N7113-1 1 tube assembly, fan pitch is an On-Condition part and replaces the 500N7113-3 tube assembly.

(19) Interim hours: life extension testing in progress.

(20) Inspect upper and lower blade root fittings every 100 hours in accordance with Main Rotor Blade Upper and Lower Root, Fitting Attach Lug and Lead-Lag Link Attach Lug Inspection (100 Hour) (Ref. Sec. 62-10-00)
(For 369D/E/F/FF - 500N helicopters, Reference AD 96-10-09).

(21) Main rotor blades, P/N 369D21102-517 with S/N 1976 thru 2100, 2106 thru 2115 are not to be installed on 600N helicopter (Reference Service Bulletin SB600N-007R2) (Reference AD 98-15-26).

(22) Inspect main rotor blades with 600 or more hours of operation every 25 hours of helicopter operation with a 10X magnifying glass for cracking of the lower surface of the blade emanating from the root fitting and doubler at the inboard end of the blade and to detect debonding between the blade root end fitting and doubler if missing or cracked adhesive or paint is observed. (Reference Service Bulletins SB369D-195R3, SB369E-088R3, SB369F-075R3, SB500N-015R3) (Reference AD 98-15-26).

(23) Perform Main Rotor Blade Upper and Lower Root, Fitting Attach Lug and Lead-Lag Link Attach Lug Inspection (25 Hour) up to a total time of 500 hours and every 15 hours thereafter and every 100 hours in accordance with Main Rotor Blade Upper and Lower Root Fitting, Attach Lug and Lead-Lag Link Attach Lug Inspection (100 Hour) (Ref. Sec. 62-10-00) until retirement of 369H1203-BSC and -21 Lead-Lag Link Assembly. (Reference AD 95-03-13).

(24) Inspect clutch retainer and bearing carrier for evidence of spinning and/or wear (Ref. Sec. 05-20-20).

(25) The 600N3500-503 tailboom may be reworked to a 600N3500-505 tailboom, and the 600N3500-513 tailboom may be reworked to a 600N3500-515 tailboom by modifying the attachment fittings to all-steel fittings.

(26) (Ref. Sec. 05-20-00) Using a flashlight and 10X magnifying glass, inspect horizontal stabilizer mounting brackets for cracks (pay particular attention to the forward inboard legs) (Ref. Tailboom Inspection).

(27) Sockets must be inspected for cracks every eight hours after the initial 100 hour inspection.

(28) Log all landings: Brace life is limited to 35400 logged landings or 5900 hours flight time if landing are not logged (assumed six landings per one hour of flight time).

(29) Log all landings: Strut life is limited to 4170 logged landings or 696 hours flight time if landing are not logged (assumed six landings per one hour of flight time).

(30) Log all landings: Foot life is limited to 23780 logged landings or 3900 hours flight time if landing are not logged (assumed six landings per one hour of flight time).

(31) The following main rotor blades have a finite life of 2,500 hours or 15,000 torque events*, whichever occurs first;
P/N 369D21100-517 with S/N H664, H665, H667, H669, H671, H672, H674, H676, H679, H680, H683 thru H724, H726 thru H999 and J000 thru J039, J041 thru J055 and
P/N 369D21102-517 with S/N 1976 thru 2100, 2106 thru 2115.
* TORQUE EVENT (TE) - A TE is recorded for every transition from forward flight to a hover (Reference Service Bulletins SB369D-195R3, SB369E-088R3, SB369F-075R3, SB500N-015R3).

(32) RIN = (200 x Hrs.) + (52 x TE).

(33) RIN = (160 x Hrs.) + (24 x TE).

(34) RIN = (153 x Hrs.) + (3 x TE).

(35) RIN = (50 x Hrs.) + (3 x TE).

(36) RIN = (768 x Hrs.) + (11 x TE).

(37) After accumulation of 750 flight hours and 13,720 TE, perform Main Rotor Blade Torque Event Inspection (Ref. Sec. 62-10-00) every 35 flight hours or 200 TE's (whichever occurs first).

(38) The 369D21640-501, -503, -505 tail rotor blades are two-way interchangeable with the 369D21613 tail rotor blades in sets of two only.
The 369D21641-501, -503, -505 tail rotor blades are two-way interchangeable with the 369D21615 tail rotor blades in sets of two only (installed on the same inboard or outboard hub).
The 369D21642-501, -503, -505 tail rotor blades are two-way interchangeable with the 369D21606 tail rotor blades in sets of two only.

(39) The 369H1203-BSC, -11, -21, -31, -51 and -61 lead lag link assemblies can only be installed using the 369H1235-BSC bearing.

(40) The 369H1203-53 lead lag link assembly can only be installed using the 369H1235-1 bearing.

(41) The 369N2608-11 Control Support Bracket must be removed from 600N helicopters equipped with YSAS (Ref. SB600N-040).

Section

04-00-01

Airworthiness Limitations Supplements

UK CAA ALS SUPPLEMENT

1. UK CAA Airworthiness Limitations Section Supplement

NOTE:

- The following components are further limited when helicopters are operating under UK CAA TC.
- Refer to 04-00-00 for all other Component Mandatory Replacement Times and Component Mandatory Inspections.

Airworthiness Limitations
Component Mandatory Replacement Schedule

Component (1)	Part Number (2)	Finite Life Hours (RIN) (1)	Mandatory Inspection Hours
Main Rotor System			
Drive shaft, main rotor	600N5510	14000 (1,000,000) (3)	
Tailboom			
Tailboom assembly	600N3500-503	800 (4)	

NOTES:

(1) Life-limited components interchanged between models or configurations must be restricted to the lowest service life indicated for the models or configurations affected. Life-limited components removed at retirement are to be destroyed or conspicuously marked to prevent inadvertent return to service. Parts are applicable only on models under which a service life is listed.

(2) Service life shown for the basic (no dash number) part numbers apply to all dash numbered versions unless otherwise indicated.

(3) RIN = (50xHrs.) + (3xTE)

(4) The 600N3500-503 tailboom may be reworked to a 600N3500-505 tailboom by modifying the attachment fittings to all steel fittings.

REVISION:	DATE	FAA SIGNATURE AND DATE *
Initial Issue:	24 May 2000	5/8/00

* FAA approval in behalf of UK CAA per letter, Winnert to Wang, Ref. 9/33/0649/A26479, Dated 2 May 2000.

Chapter

05

Continued Airworthiness

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Section

05-00-00

Continued Airworthiness

CONTINUED AIRWORTHINESS CHECKS/INSPECTIONS

1. General Description of Inspections

The following Continued Airworthiness Sections specify inspections and other maintenance required under the Federal Aviation Regulations unless an alternative program has been FAA approved.

The inspection intervals designated herein are the maximum allowable and should not be exceeded. When unusual local conditions, such as environmental conditions, utilization, etc. dictate, it is the prerogative and responsibility of the operator to increase the scope and frequency of the inspections as necessary to ensure safe operation. Each item shall conform with the FAA Requirements, A.D.'s and Manufacturer Bulletins and Letters. Over flying the inspection interval, or any change desired to the requirements of this chapter, may be requested through the local aviation regulatory authority.

A. Airworthiness Limitations

Refer to section 04-00-00 for mandatory inspections and component mandatory retirement schedule.

B. Continued Airworthiness

This section contains the requirements for Component Overhaul/Recommended Replacement, 100-Hour or Annual Inspection Checklist, 300-Hour Inspection Checklist, Special Inspection Schedule and Conditional Inspections.

(1). **COMPONENT OVERHAUL/RECOMMENDED REPLACEMENT** (Ref. Sec. 05-10-00) is a schedule for the overhaul and recommended replacement of components and/or assemblies and scheduled maintenance checks.

(2). **100-HOUR OR ANNUAL INSPECTION CHECKLIST** (Ref. Sec. 05-20-00) is a schedule of inspections that must be accomplished every 100 hours of helicopter operation or on a 12-month (annual) basis.
An Annual Inspection is required on this helicopter for continued airworthiness and may be accomplished in combination with a 100-hour inspection.

NOTE:

- To comply with the requirements of service bulletins which have been incorporated into the appropriate maintenance and inspection manuals, the latest 100-Hour or Annual Inspection must be used.
- Refer to applicable Rolls- Royce Engine Operation and Maintenance Manual (Ref. Table 201, 01-00-00) for detailed requirements on inspection of the engine.

(3). **300-HOUR INSPECTION CHECKLIST** (Ref. Sec. 05-20-10) is a schedule of inspections that must be accomplished every 300 hours of helicopter operation.

(4). **YEARLY INSPECTION CHECKLIST** (Ref. Sec. 05-20-15) is a schedule of inspections that must be accomplished on a yearly basis.

(5). **SPECIAL INSPECTIONS** (Ref. Sec. 05-20-20) consist of inspections that are contingent upon elapsed flight time or calendar time.

(a). **Special Inspections Hourly** should be referred to for additional inspection requirements that must be performed at specified periodic hourly intervals.

(b). **Special Inspections Calendar** should be referred to for additional inspection requirements that must be performed at specified periodic calendar intervals.

(6). **CONDITIONAL INSPECTIONS** (Ref. Sec. 05-50-00) includes inspection requirements for unusual or other specific conditions or circumstances that might occur.

(7). Federal Aviation Regulations require pilot's, mechanics, owners and operators to be familiar with, and to maintain records of aircraft maintenance, inspections and repairs. This includes, but is not limited to, Airworthiness Directives, Manufacturers Notices, Scheduled Inspections and Time/Cycle limited-life components.

(8). Additional documentation is required to be available, or inside the aircraft, during operation. This documentation includes: Airworthiness and Registration Certificates, Rotorcraft Flight Manual, Weight and Balance information and Radio Permits. It is important that all required documentation be reviewed and revised as necessary during regular inspections, maintenance and operation of the helicopter.

NOTE: Because this manual pertains to MDHI model 369D, 369E, 369FF, 500N and 600N helicopters (including the basic 500MD configuration), it may contain inspection requirements applicable to specific equipment not installed on individual helicopters. When this situation is encountered, requirements that are not applicable should be disregarded.

Section

05-10-00

Continued Airworthiness

CONTINUED AIRWORTHINESS
COMPONENT OVERHAUL/RECOMMENDED REPLACEMENT

1. Component Overhaul or Recommended Replacement Schedule

Table 1 is the Overhaul Schedule. The listed components or assemblies should be removed from the helicopter and overhauled at intervals specified.

Table 2 is the Recommended Replacement Schedule. The listed components should be removed from the helicopter and scrapped at intervals specified.

Neither the assignment of an airworthiness life to a component nor failure to assign an airworthiness life constitutes a warranty of any kind. The only warranty applicable to the helicopter and any components is that warranty included in the Purchase Agreement for the helicopter or the component.

NOTE: Hours for the 369F Model helicopters will be the same as the 369FF unless otherwise noted.

Table 1. Component Overhaul Schedule

Component (1)	Model	Part Number (2)	Hours
Main rotor transmission assembly	369D/E/FF - 500N	369D25100	3000
		369D25100	4000 (12)
	369D/E/FF - 500N	369F5100	5000
	600N	369F5100	3000
Main rotor swashplate assembly	369D/E/FF - 500N	369D27609	2770 (3)(9)
	600N	600N7630-3	2700 (4)(9)
Main rotor hub assembly	369D/E/FF - 500N	369D21200	2770 (7)(9)
	600N	600N1200	2700 (7)(9)
Landing gear damper	369D/E/FF - 500N	369D26300	On Cond. (6)
		369D26301	On Cond. (6)
	600N	600N6300	On Cond. (6)
Overrunning clutch assembly	369D/E/FF - 500N	369A5350-603	1800 (5)
		369A5350-605	1800 (5)
	369D/E/FF - 500/600N	369F5450	1800 (10)(11)
Tail rotor transmission	369D/E	369D25400	4800
	369FF		3365
	369D/E	369D25300	4800
Starter/Generator (8)	369D/E - 500N	369A4550	1200
	369FF - 600N	369D28550	1200

NOTES:

(1) Components interchanged between models or configurations must be restricted to the lowest service life indicated for the models or configurations affected. Components removed at retirement are to be destroyed or conspicuously marked to prevent inadvertent return to service. Parts are applicable only on models under which a service life is listed.

(2) Service life shown for basic part number applied to all dash-numbered versions unless otherwise indicated.

(3) Bearing assembly must be relubricated every 2 years or 2770 hours, whichever occurs first (Ref. CSP-COM-5, Sec. 62-30-10).

(4) Bearing assembly must be relubricated every 2 years or 2700 hours, whichever occurs first (Ref. CSP-COM-5, Sec. 62-30-60).

(5) Under some operating conditions, overrunning clutch splines may need to be regreased more often than at the 100-hour intervals and bearings may need to be regreased more often than at the 300-hour intervals.

With no cargo hook attached, inspect and regrease splines every 100 hours and bearing every 300 hours (Ref. Sec. 63-10-00, Installation of Overrunning Clutch Subassembly and CSP-COM-5, Ball Bearing Inspection and Grease Repack).

With cargo hook attached, inspect sprag assembly, inner race and outer race every 300 hours or 300 hours of actual hook time when logged separately as per FAR 91.417, regrease clutch splines every 100 hours and bearing every 300 hours (Ref. Sec. 63-10-00, Installation of Overrunning Clutch Subassembly and CSP-COM-5, Ball Bearing Inspection and Grease Repack).

(6) When inspected per Landing Gear Damper Inspection (Ref. Sec. 32-10-00 for 369D/E/FF - 500N, or Sec. 32-10-60 for 600N).

(7) Use only main rotor hubs overhauled by MDHI or approved MDHI Licensees.

(8) Refer to data plate to determine start/generator manufacturer.

(9) The shelf life of bearings preserved with grease is limited to 4 years.

(10) Regrease overrunning clutch bearings every 300 hours (Ref. CSP-COM-5, Sec. 63-10-15).

(11) Interim hours: life extension testing in progress.

(12) The 369D25100 main rotor transmission overhaul time may be extended from a mandatory 3000 hour overhaul time to a mandatory 4000 hour overhaul time, provided, the transmission is operated with Mobil SHC626 since last overhaul and the transmission has not accumulated more than 750 hours of cargo hook time since last overhaul.

Table 2. Component Recommended Replacement Schedule

Component (1)	Model	Part Number (2)	Hours
Tail rotor swashplate (duplex) bearings	369D/E/FF	369D21832	On Cond. (3)(9)
Fan support bearing	500/600N	500N5364	2400 (8)(9)
Pitch plate bearing	500/600N	500N7120	2400 (8)(9)
Thrust bearing cup, upper Thrust bearing cone, upper	369D/E/FF - 500N 369D/E/FF - 500N	369D21255 369D21254	On Cond. (3)(9) On Cond. (3)(9)
Thrust bearing cup, upper Thrust bearing cone, upper	600N 600N	369D21255 369D21254	600 (5)(9) 600 (5)(9)
Thrust bearing cup, lower Thrust bearing cone, lower	369D/E/FF - 500N 369D/E/FF - 500N	369D21257 369D21256	On Cond. (3)(9) On Cond. (3)(9)
Thrust bearing cup, lower Thrust bearing cone, lower	600N 600N	369D21257 369D21256	5400 (4)(9) 5400 (4)(9)
Lead lag damper	369D/E/FF - 500N 369D/E/FF - 500N	369D21400-503 M50452	On Cond. (6) On Cond. (6)
Bearings, oil cooler blower	369D/E/FF - 500/600N 369D/E/FF - 500/600N	369H5655-3 369H5655-5	1200 1200
Belt, oil cooler blower	369D/E/FF - 500N 600N	369D25623 93920219	1200 1200
Cyclic stick trim switch (7)	369D/E/FF - 500N	A218-100646-02	1000

NOTES:

(1) Limited-life or scheduled replacement components interchanged between models or configurations must be restricted to the lowest service life indicated for the models or configurations affected. Limited-life or scheduled replacement components removed at retirement are to be destroyed or conspicuously marked to prevent inadvertent return to service. Parts are applicable only on models under which a service life is listed.

(2) Service life shown for basic part number applied to all dash-numbered versions unless otherwise indicated.

(3) Bearing assembly must be relubricated every 2 years or 2770 hours, whichever occurs first (Ref. Sec. 64-30-00, Tail Rotor Swashplate Bearing Regreasing).

(4) Bearing assembly must be relubricated every 2 years or 2700 hours, whichever occurs first (Ref. Sec. 62-20-60, Main Rotor Hub Tapered Bearing Grease Repack, Inspection and Replacement).

(5) Bearing assembly must be relubricated every 2 years or 300 hours, whichever occurs first (Ref. Sec. 62-20-60, Main Rotor Hub Upper Bearing Grease Repack, Inspection and Replacement).

(6) Inspect for deterioration every 600 hours up to a total time of 4200 hours and every 300 hours thereafter until deterioration is sufficient to retire assembly (Ref. Sec. 62-20-00, Main Rotor Damper and Attachments Inspection).

(7) Installed in 369D27133 grip assembly made by Guardian Electric Co., PN A218966714-00 (Ref. Sec. 67-10-20, Cyclic Stick Grip Switch Replacement (Standard Grip)).

(8) Bearing assembly must be relubricated every 2 years or 1200 hours, whichever occurs first (Ref. Sec. 64-25-30, Anti-Torque Fan Bearing Regreasing).

(9) The shelf life of bearings preserved with grease is limited to 4 years.

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Section

05-20-00

Continued Airworthiness

CONTINUED AIRWORTHINESS
100-HOUR OR ANNUAL INSPECTION CHECKLIST

1. 100-Hour or Annual Inspection

This check sheet is designed to be used when performing 100-Hour or Annual inspections as defined under FAR, Part 43, Appendix D. This checklist, when completed, should be kept as a permanent part of the helicopter's records. Adherence to Maintenance Manual information is required, and the manual should be consulted when using the checklist.

NOTE:

- The Chap/Sect column of the following table is for reference unless a specific inspection requirement is called out. If there is only two numbers in the column, it refers to the Chapter. If there is three numbers, it refers to the Section the inspection is found.
- Refer to applicable Rolls-Royce engine inspection check list for required engine maintenance.

Table 1. 100-Hour or Annual Inspection

Registration No.__________________ **Serial No.**________________________
Helicopter Hours__________________ **Torque Events**____________________

Model	Requirement	Chap/Sect	Initial
	GENERAL		
ALL	Thoroughly clean helicopter and engine prior to start of inspection.	20	
ALL	Remove trim panels, covers and access panels as necessary.	52-50-00	
ALL	Ensure all placards and markings are installed.	11-00-00	
ALL	Ensure compliance with component mandatory retirement schedule.	04-00-00	
ALL	Calculate and record TE's or RIN's, of all affected components, in Table 2.	04-00-00	
ALL	Ensure compliance with component overhaul schedule.	05-10-00	
ALL	Ensure compliance with all applicable airworthiness directives, service bulletins and special inspections.	N/A	
ALL	Review aircraft maintenance records for recorded discrepancies and correct discrepancies as applicable.	N/A	
ALL	Refer to related manufacturer's publications for detailed requirements on inspection of engine, starter/generator, battery and all installed STC equipment.	01-00-00	
	EXTERIOR		
ALL	* Air intake for cleanliness and foreign matter. * Visible portion of engine compressor inlet for foreign object damage.	71	
<u>CAUTION</u>:	Ensure that compressor cover is installed to prevent FOD.		
ALL	Engine air plenum chamber for: * Damage and cleanliness. * Wear and security of internal components. * Particle separator mounting structure for cracks or damage.	71 53	

Table 1. 100-Hour or Annual Inspection (Cont.)

Registration No.__________________ Serial No.________________________
Helicopter Hours__________________ Torque Events____________________

Model	Requirement	Chap/Sect	Initial
ALL	Fuselage upper surfaces for: * Damage and condition. * Mast base drain holes clean and free of debris (blow air thru holes to ensure no clogging). * Engine air inlet fairing free from damage. No delamination noted. Bypass door operationally checked. Seals free from damage. * Engine access doors for proper operation of latches and closure, distortion, damage, cracks and security.	52 53	
ALL	Fuselage for: * Damage and condition. * Compartment fresh air vents in doors and front of canopy for easy of operation and security. * Fuel cell vent fairings free of obstructions and obvious damage. * Pilot's and passenger/cargo compartment doors for condition of door glass, vents and proper operation of latching and locking mechanisms. * Door hinges and pins for play or wear. Ensure door pin locking tab is engaged with slot in frame. * No evidence of oil leakage around fuselage drain holes.	52 53	
369D/E/FF	Sta. 142.0 tail rotor control bellcrank support for cracking or damage, use bright light and mirror (Ref. Upper Fuselage and Tailboom Control Linkage Inspection).	67-20-10	
500/600N	Anti-torque fan inlet for: * Screen for cleanliness and damage. * Attaching hardware for security. * Interior of fan inlet for cleanliness and damage. * Driveshaft cover for damage.	53	
ALL	* Check for no gap between tailboom and fuselage at attach points. * Check tailboom skin around stabilizer fittings for cracks. * Tailboom attachment-to-fuselage for security, evidence of corrosion or cracks, loose rivets or buckling.	53	

Table 1. 100-Hour or Annual Inspection (Cont.)

Registration No.__________________	**Serial No.______________________**		
Helicopter Hours__________________	**Torque Events___________________**		
Model	**Requirement**	**Chap/Sect**	**Initial**
500/600N	* Thruster cones and tip cap (500N only) for damage and security. Inspect for wear between thruster cones and tailboom at points of contact. * Using a flashlight and 10X magnifying glass, inspect horizontal stabilizer mounting brackets for cracks (pay particular attention to the forward inboard legs) (Ref. Tailboom Inspection). * Using a bright flashlight, inspect fore and aft radii of the lower portion of the three upper slot bridges for cracks, illuminate area under the flap. The flap may be raised slightly, using finger pressure only, to aid in checking this area (Ref. Tailboom Inspection). * Using a bright light and 10X magnifying glass, inspect the four tailboom attachment lugs for cracks and fiber damage. Pay particular attention to area on top of the lug from the radius block to 2 inches aft (Ref. Tailboom Inspection). * Tailboom closeout fairings for security of attachment hardware. Inspect for damage and chafing between closeout fairing and tailboom.	53-40-30 53-50-30	
369D/E/FF	Horizontal stabilizer for: * Skin damage and loose rivets. * Tip plates for damage. Check for secure attachments (Ref. Horizontal Stabilizer and Tip Plates Inspection).	53-50-10	
500/600N	Horizontal stabilizer for: * Skin damage and loose rivets. * Mounting fittings for cracks and security. * Stabilizer attach bolts for security.	53	
369D/E/FF	Vertical stabilizer for: * Damage to leading and trailing edges and damaged stressed side panels (no repair of side panels permitted). * Mounting fittings for cracks and security. * Tail skid for obvious damage and security (Ref. Vertical Stabilizer Inspection).	53-50-10	
500/600N	Vertical stabilizers for: * Damage to leading or trailing edges and damaged side panels. * Cracks in skin, no cracks permitted (pay particular attention to areas around mounting bolts). * Stabilizer attach bolts for security. * Stabilizer mount bushings for wear. * Excess play in control linkage, bearings and security of attaching hardware.	53	

Table 1. 100-Hour or Annual Inspection (Cont.)

Registration No.__________________ Serial No.________________________
Helicopter Hours__________________ Torque Events____________________

Model	Requirement	Chap/Sect	Initial
	LANDING GEAR		
ALL	Landing gear skid tubes and fairings for: * Wear and damage in excess of permissible limits. * Upper fairing fillets for freedom of movement and general condition. * Strut attachment points for security and pivot (swivel) bearings for excessive play. * Landing gear dampers for correct extension, security of attachment and for signs of fluid leakage. Pivot bearings for excessive play. * Passenger steps for security and damage.	32	
369D/E/FF 500N	Remove landing gear fairing fillets and visually inspect landing gear strut assemblies for cracks and damage.		
369D/E/FF 500N	<u>For aircraft 369D; 001 & subs, 369E; 0001 thru 0528, 369FF; 0001 thru 0114 and 500N; 001 thru 077</u>: Remove plug button from inboard of fairing assembly. Using a bright light and 10X magnifying glass, inspect rivet hole in underside of strut for cracks. If crack is found, strut must be scrapped.		
	CABIN		
ALL	Compartment heat and anti-icing valve controls for: * Easy and correct operation and rigging. * Heating system heat diffusers for security.	21	
ALL	* Seat belts for condition and security. * Inertia reels for condition and proper extension/retraction.	25	
ALL	Pilot/copilot controls for: * Wear, looseness and general condition of control rods and rod end bearings. * Quick-release pins for condition. * Cyclic, collective and anti-torque controls for free movement. * Cyclic trim actuators for security. * Collective torque tube, support bracket and bungee support bracket for evidence of cracks, gouges or other visible damage in attach lug and bungee support bracket attach areas; gaps between bracket and cradle cap of collective torque tube (use bright light and mirror). * N_1 power controls for obvious damage. * Check for minimum cyclic friction adjustment (resistance to turning spring with fingers). * Flight control system one-way lock (Uniloc) for oil leakage, condition and security. Fluid reservoir 1/2 - 3/4 full; replenish if low.	67 76	

Table 1. 100-Hour or Annual Inspection (Cont.)

Model	Requirement	Chap/Sect	Initial
Registration No.__________ **Serial No.**__________ **Helicopter Hours**__________ **Torque Events**__________			
Model	**Requirement**	**Chap/Sect**	**Initial**
NOTE: With main rotor blades stationary, some friction drag is felt in the cyclic. The collective also has some drag, plus resistance of the collective bungee spring. Heavy drag is an indication of droop stop deformation caused by droop stop pounding.			
ALL	Engine N_1 and N_2 (N/A 600N) power controls for: * Free movement, full travel, security, obvious damage and proper rigging. * Pilot's and copilot's throttle rigging checks at **FULL**, **GROUND IDLE** and **CUTOFF** positions.	76	
MAIN ROTOR			
ALL	Main rotor mixer control push-pull rods, links, scissors and bellcranks for excessive bearing play, bent rods or links, worn bushings and cracked bellcranks or brackets; all rodends centered.	62 67	
ALL	Main rotor pitch control rod assemblies, upper and lower rod end bearing for evidence of axial play and for any extrusion, displacement or damage to the bearing teflon liner. Check that all rodends are centered and security of lockwire (Ref. Pitch Control Rod Inspection).	62-30-00 62-30-60	
ALL	Swashplate for evidence of galling or corrosion of spherical bearing, and seals for deterioration and evidence of grease leakage. Upper and lower dust boots free from damage and security. Swashplate interrupters and magnetic pick-up secure.	62	
ALL	Main rotor hub retention strap assemblies for breaks or cracks in strap pack laminations. Check visible portions of both lead and lag legs of pack in each pitch housing (Ref. Main Rotor Strap Pack Lamination Inspection). Refer to 04-00-00 for strap pack lamination airworthiness requirements.	62-20-00 62-20-60	
ALL	Outboard ends of main rotor hub retention strap assemblies for gaps between pack laminates (Ref. Main Rotor Strap Pack Lamination Inspection).	62-20-00 62-20-60	
ALL	* Main rotor hub feathering bearings for excessive wear (Ref. Main Rotor Hub Inspection). * Main rotor droop stop ring for corrosion, dents and scratches. * Main rotor droop stop striker plate rollers for play and excessive wear. * Main rotor droop stop follower attachment pins for proper installation. * Main rotor droop stop plunger for corrosion, dents and scratches.	62-20-00 62-20-60	
ALL	Main rotor blade damper assemblies for obvious damage, security and excessive play in blade and pitch housing bearings, bonding of elastomeric material and corrosion (Ref. Main Rotor Damper and Attachments Inspection).	62-20-00 62-20-60	
ALL	Using bright light and 5X magnifying glass, inspect all main rotor hub assembly lead-lag links for corrosion, discoloration, pitting, intergranular cracks or stress corrosion cracks. Any discoloration or pitting is evidence of more than superficial corrosion, and the main rotor hub must be removed for replacement of lead-lag links (Ref. Main Rotor Hub Inspection).	62-20-00 62-20-60	

Table 1. 100-Hour or Annual Inspection (Cont.)

Registration No.__________________ Serial No.________________________
Helicopter Hours__________________ Torque Events____________________

Model	Requirement	Chap/Sect	Initial
ALL	Main rotor hub bearings for roughness by rotating main rotor assembly several times by hand and listening for unusual noise (Ref. Main Rotor Hub Inspection).	62-20-00 62-20-60	
NOTE: Do not confuse with normal no-load transmission and overrunning clutch noise.			
ALL	Main rotor blade and damper attach pins tight and levers properly locked.	62	
ALL	Entire trailing edge and tabs for nicks, scratches and cracks generating from trailing edge (Ref. Main Rotor Blade Inspection).	62-10-00	
WARNING: Using a bright light and 5X to 10X magnifying glass, inspect root fitting, attach lugs and doublers for cracks and security.			
ALL	Inspect main rotor blade root fittings, attach lug and lead-lag link attach lug every 100 hours in accordance with Main Rotor Blade Upper and Lower Root Fitting, Attach Lug and Lead-Lag Link Attach Lug Inspection (100 Hour). Pay particular attention to the lower side of the root fitting.	62-10-00	
ALL	Using a bright light and 10X magnifying glass, inspect main rotor blade abrasion strips for security of bonding on lower and upper surfaces, and by tapping at bond lines. Any blisters, bubbling or lifting of abrasion strip indicates a void (Ref. Main Rotor Blade Inspection).	62-10-00	
ALL	Tip area of main rotor blades for evidence of corrosion; pay particular attention to mating area of blade skin-to-tip weight interface; verify integrity of sealant coating (Ref. Main Rotor Blade Forward Tip Cap Inspection and Corrosion Protection).	62-10-00	
ALL	Drain holes in main rotor blade aft tip cap and vent holes in lower skin for clogging. Main rotor tip caps for security and evidence of corrosion.	62	
369D/E/FF 500N	Main rotor hub fairing for cracks, damage and security.	62	
DRIVE TRAIN			
ALL	Main transmission lubrication and cooling system for: * Main transmission case and cooling installation for evidence of leakage and security of attachment. * Oil cooler blower, mount, ducting and hardware for security and damage. * Oil lines for chafing damage. * Clamps attached to oil lines for evidence of cushion wear or deterioration (if noted, remove clamp and inspect tube under clamp for chafing damage). * Pressure switch for security and deterioration; wiring for chafing.	63	
369D/E/FF 500N	Tach generator for security and deterioration; wiring for chafing.	63	
ALL	Rotor brake for: * Pucks and disc for wear and general condition. * Hydraulic lines for security and leaks. * Master cylinder for leaks. * Air in system (spongy feel at brake actuating handle when force is applied).	63	

Table 1. 100-Hour or Annual Inspection (Cont.)

Registration No.__________________ Serial No.______________________ Helicopter Hours_________________ Torque Events___________________			
Model	**Requirement**	**Chap/Sect**	**Initial**
ALL	Overrunning clutch for: * Evidence of oil leakage. * Proper operation: turn rotor in forward direction by hand - engine must decouple; turn rotor in reverse direction - engine must rotate (listen for turbine noise during reverse rotation). Rotor brake disc should not drag.	63	
NOTE: Normal seal drag may be sufficient to rotate engine at low rpm.			
369D/E/FF 500N	With 369A5350 overrunning clutch installed, regrease clutch splines.	63	
ALL	Engine- to- main transmission drive shaft couplings and shaft for condition and security of attachment. Bendix couplings only: inspect shaft coupling diaphragms for scratches, nicks or cracks (Ref. Main Transmission Drive Shaft Inspection (Bendix)).	63-10-00	
500/600N	* Main transmission-to-fan transmission drive shaft for dents, bulkhead chafing and obvious damage. * Inter-Connect drive shaft for dents and obvious damage. * Free movement of control rod thru interconnect drive shaft.	63	
369D/E	Bendix couplings only: Check tail rotor blade tip movement in excess of 0.75 inch, without main rotor blade movement, when tail rotor blades are rocked back and forth in plane of rotation.	63	
369D/E/FF	Tail rotor drive shaft for: * Evidence of buckling, dents, bulkhead chafing and obvious damage. * Align aft coupling index stripe with corresponding tail rotor transmission stripe and verify that bulkhead-to-drive shaft index stripes align (Ref. Tail Rotor Drive Shaft Twist Inspection).	63-15-10	
ANTI-T ORQUE			
Tail Rotor System			
369D/E/FF	Tail rotor transmission for: * Corrosion, excessive oil leakage, cracks and other damage. * Check torque of mounting nuts (also tailboom extension hardware on 369FF helicopters) (Ref. Tail Rotor Transmission Installation).	63-25-10	
369D/E/FF	Tail rotor pitch control assembly for: * Binding and unusual sounds (teeter blades to check for binding). * Teeter bearings for axial or radial play (no play allowed). * Control rod, pitch control links, hub and drive fork for play or damage. * Boots for installation and deterioration. * Retaining nut and lockwasher secure (no broken tangs noted and nut has not rotated). * Pitch control for evidence of seal rotation or loss of grease.	64	

Table 1. 100-Hour or Annual Inspection (Cont.)

Registration No.__________ Serial No.__________
Helicopter Hours__________ Torque Events__________

Model	Requirement	Chap/Sect	Initial
369D/E/FF	Drive fork for; * Elastomeric bearing elements for bond failure. * Apply teetering force by hand (stop-to-stop) to rotor blades and inspect elastomers for radial-molded ridges on each bearing face. Discontinuity in molded ridges indicates bearing failure. There should by no apparent motion between the cage and fork, observed motion indicates bond failure.	64	
NOTE: Light swelling, pock marks and crumbs are surface conditions and do not indicate bearing failure.			
369D/E	If equipped with conical-type teetering bearings, torque check teeter bolt.	64	
369D/E/FF	Tail rotor blades for: * Evidence of damage, including leading edges, trailing edges, skin. * Open vent and drain holes. * Loose or damaged tip caps. * Rivets securing tip cap for installation and condition. * Abrasion strips free of damage, no excessive erosion noted and no separation in bond around edges or at tip end of blade (Ref. Tail Rotor Blade Inspection). * While holding hub stationary, check tail rotor blade pitch bearings for lead-lag play in excess of 0.250 inch (6.35 mm) at blade tip. If excess play is found, remove blades, replace pitch bearings and inspect hub-to-pitch bearing contact surface of hub (Ref. COM).	64-10-00	
369D/E/FF	Perform Tail Rotor Balance.	18	
NOTAR® Anti-Torque System			
500/600N	* Rotate rotor system and check for unusual noises. * Fan assembly for cleanliness and damage. * Fan blades for excessive play. * Fan seal for cleanliness, cracks, damage and corrosion. * Check gap between fan blades and tip seal. * Check gap between fan blades and hub.	64	
NOTE: If any of these gaps for any blade exceeds the average gap of the other blades by more than 0.10 inch (2.54 mm), remove and inspect the tension-torsion strap for that blade.			
500/600N	Perform Fan Blade Inspection (100-Hour).	64-25-30	
500/600N	Fan Transmission for corrosion, excessive oil leakage, cracks, damage and security on mounting frame. Drain line for cracks and security.	63	
500/600N	Rotating cone control tubes and cables for freedom of movement and unusual sounds.	67	

Table 1. 100-Hour or Annual Inspection (Cont.)

Registration No.________ Serial No.________ Helicopter Hours________ Torque Events________			
Model	**Requirement**	**Chap/Sect**	**Initial**
	ELECTRICAL		
NOTE: When possible, use auxiliary power source, not battery, during **POWER ON** inspection.			
ALL	**XMSN OIL TEMP, FUEL FILTER** and **CHIPS** warning lights; electrical circuits for continuity to lamps by connecting jumper wire from each sender or chip detector terminal stud to an unpainted grounding surface; check each light for illumination (Ref. Caution/Warning System Operational Check).	95-00-00	
ALL	Push **PRESS TO TEST** switch: all caution and warning lights **ON**; depress instrument light rheostat knob; verify **CAUTION** lights dim.	95	
369D/E/FF 500N	Conduct operational check of automatic reignition system; igniter noise heard and reignition indicator light functions. Reset as required.	PFM	
CAUTION: Do not leave landing light **ON** for more that one minute during next check; lamp will overheat and lamp life will be shortened.			
ALL	Exterior lighting (landing, position and anti-collision lights) for proper operation; all switches **OFF** after check.	96	
WARNING: Do not leave pitot heater ON for more than one minute during next check; severe burns to personnel may result.			
ALL	**PITOT HTR** switch **ON** for a few seconds. Heated pitot tube will feel warm to the touch; turn switch to **OFF** after check.	95	
600N	Apply power to aircraft and disconnect CIT sensor (Ref. CIT (Compressor Inlet Temperature) Sensor Replacement); Verify ECU FAIL light illuminates. Re-connect CIT sensor.	76-00-00	
ALL	Clean battery and inspect for: * Connector pins for evidence of corrosion. * Leakage (if battery is leaking (wet), remove and replace battery). * Battery case for cracks in support flanges. * Dc wiring for chafing caused by wiring rubbing against battery case. * Deep cycle charge (recondition) battery every 100 hours or on conditional basis at operator's discretion.	96	
ALL	Functionally check and inspect all installed avionics, auxiliary or optional systems and equipment. Do not actuate hoist guillotine or emergency floats.	97	
	ENGINE COMPARTMENT		
ALL	Exhaust stack(s) and exhaust supports for cracks, defects and improper attachment.	78	
ALL	Engine compartment plumbing and electrical relay installation on left or right side oleo (landing gear damper) support fitting for good condition and security of mounting. Diodes for broken terminals and wires. Diode bracket for security and corrosion.	96	

Table 1. 100-Hour or Annual Inspection (Cont.)

Registration No.__________ Serial No.__________
Helicopter Hours__________ Torque Events__________

Model	Requirement	Chap/Sect	Initial
ALL	Entire engine for: * Loose bolts; loose or broken connections. * Accessories for security and broken or missing lockwire. * Fuel and oil lines for chafing and kinking. * Fuel drain line valve for leakage. * Oil cooler and cooler deflector for security and obvious damage. * Accessible areas for obvious damage; evidence of fuel and oil leaks. * Engine mounts for cracks and play in mounting hardware at engine and airframe (retorque any loose mounting bolts). * Fuel control and compressor exterior for condition and security.	71 75 76	
369D/E/FF 500N	RPM governor lever control rod (replace if aluminum).	76-10-00	
369D/E/FF 500N	Clean and lubricate drive splines of starter-generator drive shaft, and female splines in engine accessory gear case on dry spline installations.	96	
369D/E/FF 500N	Anti-ice air tubes and compressor scroll for cracks or breaks at the anti-ice air valve and bleed port. If cracks exist, check engine for possible vibration causes (Ref. Engine Anti-icing System and applicable Allison Engine Operation and Maintenance Manual).	75-10-00	
AFTER INSPECTION			
ALL	Touch-up all damaged paint and exterior markings, as necessary.	20	
ALL	Ensure all fluid levels are correct; service as required.	12	
ALL	Perform operational check of particle separator filter (Ref. Scavenge Air Operational Check).	71-10-10	
ALL	Install or close all stressed panels, covers and trim panels removed or opened for inspection. Check closure, fit and security. All loose equipment for proper stowage.	52-50-00	

CAUTION: Helicopter must not be flown unless controls access panel and fuel cell access panels in cargo compartment are securely installed. These are stressed panels.

POST INSPECTION RUN UP

See applicable Pilot's Flight Manual for cockpit check and engine starting procedures. For troubleshooting procedures, refer to applicable section of this manual.

100-HOUR OR ANNUAL INSPECTION CERTIFICATION

It is certified that this helicopter has been thoroughly inspected as required by FAR, found to be airworthy, and appropriate entries made in the helicopter log book. It is further certified that the helicopter conforms to FAA specifications, that all FAA Airworthiness Directives and Manufacturer's Service Notices and Maintenance Manual data have been complied with, and the helicopter records are in proper order

Signature ______________________________

Rating Type or Certificate No. ______________________________

Date ______________________________

2. Retirement Index Numbers Attachment

Table 2 is to be used for calculating and recording the Retirement Index Number (RIN) or Torque Events (TE) of components that are affected by Torque Events (TE).

This record of RINs/TE's should be kept as a permanent record.

Refer to Section 04-00-00 for components requiring calculation of RIN's/TE's and information pertaining to calculation of RIN's/TE's.

Component must be scrapped when it reaches 1,000,000 RIN's or maximum TE's (Ref. Sec. 04-00-00).

Table 2. Permanent Record of Retirement Index Numbers/Torque Events

Component	Part No.	Serial No.	Hours	TE's	RIN's	Signature

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Section

05-20-10

Continued Airworthiness

CONTINUED AIRWORTHINESS
300-HOUR INSPECTION CHECKLIST

1. 300-Hour Inspection

This check sheet is designed to be used when performing scheduled inspections as defined under FAR Part 91. This checklist, when completed, should be kept as a permanent part of the helicopter's records. Adherence to Maintenance Manual information is required, and the manual should be consulted when using the checklist.

NOTE:

- The Chap/Sect column of the following table is for reference unless a specific inspection requirement is called out. If there is only two numbers in the column, it refers to the Chapter. If there is three numbers, it refers to the Section the inspection is found.
- Refer to applicable Rolls-Royce engine inspection check list for required engine maintenance.

Table 1. 300-Hour Inspection

Registration No.________ Serial No.________ Helicopter Hours________			
Model	**Requirement**	**Chap/Sect**	**Initial**
	EXTERIOR		
ALL	Retorque tailboom attachment bolts.	53	
500/600N	Remove rotating cone and tip cap (500N) and inspect: * Cables, cable ends and pulleys for condition and security. Perform Forward and Center Cable Assembly Inspection and Sector Assembly and Control Cable Inspection (Ref. Sec. 67-20-30). * Aft cable ends and turnbuckles for condition and security. Evidence of corrosion pitting requires replacement. * Cone rollers for condition and security. * Four fasteners that attach 500N3760-1 upper input shaft to the stationary thruster for play (replace pins and collars if any play is found). * Three fasteners that attach 500N3759 support shaft assembly for play (if play is found in top bolt, retorque to **10 - 15 inch-pounds (1.13 - 1.69 Nm)**. Replace pins and collars if any play is found in bottom fasteners). Reinstall rotating cone and tip cap (500N).	53	
369D/E/FF	Remove engine inlet bypass door and check latches, hinges and hardware for wear and security. Remove and replace the latch retention cotter pin (located inside the attach "U" clamp) (Ref. Engine Air Inlet Bypass Door 300-Hour Inspection).	71-10-10	
369D/E/FF	Check horizontal and vertical stabilizer attach bolts for proper torque (Ref. Horizontal Stabilizer Tip Plate Installation and Vertical Stabilizer Installation).	53-50-10	
369D/E/FF	Check lower surface of horizontal stabilizer for drain holes. Also check for gaps between upper and lower doublers and stabilizer skin (Ref. Horizontal Stabilizer and Tip Plates Inspection).	53-50-10	
500/600N	Control tubes and bellcranks in horizontal stabilizer for condition and security.	53	

Table 1. 300-Hour Inspection (Cont.)

Registration No._________________Serial No._________________Helicopter Hours_________________

Model	Requirement	Chap/Sect	Initial
500/600N	Inspect S.A.S. system for: * Actuator for security and damage (no damage allowed). * Wiring for condition and security (no wire chaffing, fraying or insulation cracking allowed). * Actuator mounting bracket for cracks, pay particular attention to area around four rivet attach holes (no cracks allowed). * Rate gyro and control box for security in mount and electrical connector secure. Inspect mount for security and condition (no corrosion or cracks allowed).	67	
LANDING GEAR			
ALL	Perform Landing Gear Inspection.	32-10-00	
ALL	Perform Cabin Entry Step Inspection.	32-10-00	
CABIN			
ALL	Remove instrument console base covers and inspect anti-torque pedal crossover torque tube and bellcrank for cracks, damage and security.	67	
ALL	Push-pull rods for excessive bearing play, wear and security.	67	
ALL	Perform Tunnel-Routed Control Rod Inspection.	67-10-00	
ALL	Check oil tank for security and evidence of leakage and damage.	79	
MAIN ROTOR			
ALL	Perform Swashplate Inspection.	62	
ALL	Perform Lead-Lag Bolt Inspection.	62	
ALL	Perform Main Rotor Hub Droop Angle Check.	62	
ALL	Perform Main Rotor Blade Inspection.	62	
ALL	Inspect main rotor mast, mast base and mast base support structure for evidence of cracks. Check with bright light and 5X magnifying glass. Visually check mast support bolts for security and condition. Inspect internal bore for chipping, orange peeling or flaking paint (Ref. Main Rotor Static Mast Inspection and Repair).	63-30-00	
ALL	Inspect hoisting eye-bolts for cracks or corrosion.	63	
369D/E/FF 500N	369D25510 drive shaft only, perform Main Rotor Drive Shaft Inspection (300-Hour).	63-10-00	
DRIVE TRAIN			
ALL	Remove, inspect and clean main transmission chip detectors.	63	
369D/E/FF 500N	369A5350 Overrunning Clutch: Perform Ball Bearing Inspection and Grease Repack (300 Hour).	COM	
ALL	369F5450 Overrunning Clutch: Perform Ball Bearing Grease Repack (300 Hour).	COM	
369D/E/FF	Remove tail rotor drive shaft and check boom fairing and tail boom for buckles, dents, bulkhead chafing and obvious damage.	53	
369D/E/FF	Remove tailboom control rod and inspect for wear though hard anodized surface (Ref. Tailboom Control Rod Replacement); inspect grommets for wear and deterioration.	67-20-10	

Table 1. 300-Hour Inspection (Cont.)

Registration No.__________ Serial No.__________ Helicopter Hours__________			
Model	**Requirement**	**Chap/Sect**	**Initial**
369D/E/FF	Check shaft damper for proper friction drag. Inspect damper for damage and security (Ref. Tail Rotor Drive Shaft Damper Inspection).	63-15-10	
369D/E	Check forward and aft coupling bolt and socket for indication of contact, Bendix couplings only (Ref. Tail Rotor Drive Shaft Inspection).	63-15-10	
ANTI-T ORQUE			
Tail Rotor System			
369D/E/FF	Remove, inspect and clean chip detectors.	63	
369D/E/FF	Check for contact between tail rotor bellcrank and tail rotor transmission housing at extreme right pedal travel.	67	
369D/E/FF	Tail rotor assembly: Elastomeric teeter bearings for wear; bond between concentric metal cones and elastomer rings of bearing assembly (Ref. Elastomeric Bearing Inspection).	64-20-00	
369D/E/FF	Remove blade stop for thorough inspection; in particular, check for cracks or splits in stem area (Ref. Tail Rotor Blade Stop Inspection).	64-30-00	
NOTAR® Anti-Torque System			
500/600N	Check balance weights for security. If any balance weight stud is found to be loose, perform Fan Balance Stud Replacement.	64	
500/600N	Remove, inspect and clean fan transmission chip detector.	63	
500/600N	Remove tailboom: Perform visual inspection of fan assembly for: * Cracks, nicks or corrosion. * Blades for cracks, nicks or impact damage. * Check pitch horn counterweights for security. If counterweight(s) are found loose, perform Pitch Horn Counterweight Set Screw Replacement (Ref. Sec. 64-25-30). **NOTE:** Access the forward counterweights through the fan inlet (fan hub fairing must be removed). * Gap between fan blade and tip seal and gap between fan blade and hub (inboard end of the blade). If any of these gaps for any blade exceeds the average gap of the other blades by more than 0.10 inch (2.54 mm)., remove and inspect the tension-torsion strap for that blade. * Fan liner for cracks, debonding or corrosion of liner material. * P-seal for tears, deterioration and debonding. Reinstall tailboom (on 600N only, install new tailboom mounting bolts).	53 64	
ELECTRICAL			
NOTE: When possible, use auxiliary power source during **POWER ON** inspection, not battery.			
ALL	Perform Battery Temperature Sensing Switches - Testing.	96	
ALL	Check TOT indicating system for proper calibration (Ref. TOT Indicating System Calibration).	95-30-00	

Table 1. 300-Hour Inspection (Cont.)

Registration No.__________ Serial No.__________ Helicopter Hours__________			
Model	**Requirement**	**Chap/Sect**	**Initial**
ENGINE COMPARTMENT			
ALL	Inspect starter/generator for: * Condition of brushes, electrical connections and commutator. * Screens for clogging. * Condition of O-ring on drive spline. * Damper backplate and clutch for condition.	96	
ALL	Perform Fuel Filter (Bypass) Caution Light Pressure Switch Test.	28-00-00 28-00-60	
NOTE: Also, perform this operational check whenever low pressure fuel pump filter element is replaced for any reason, or if contaminated.			

Section

05-20-15

Continued Airworthiness

CONTINUED AIRWORTHINESS YEARLY INSPECTION CHECKLIST

1. Yearly Inspection

This check sheet is designed to be used when performing special inspections as defined under FAR Part 91. This checklist, when completed, should be kept as a permanent part of the helicopter's records. Adherence to Maintenance Manual information is required, and the manual should be consulted when using the checklist.

NOTE:

- The Chap/Sect column of the following table is for reference unless a specific inspection requirement is called out. If there is only two numbers in the column, it refers to the Chapter. If there is three numbers, it refers to the Section the inspection is found.
- Refer to applicable Allison engine inspection check list for required engine maintenance.

Table 1. Yearly Inspection

Registration No.__________ Serial No.__________ Helicopter Hours__________			
Model	**Requirement**	**Chap/Sect**	**Initial**
1 YEAR			
	EXTERIOR		
ALL	Perform Pitot Static System Inspection.	95-10-00	
ALL	Check outside air temperature probe for security and obvious damage.	95	
ALL	Particle separator for condition and servicing.	71	
NOTE: If equipped with a Donaldson Particle Separator, ensure O-rings for rubber boot are not deteriorated (Ref. Donaldson Particle Separator Inspection).		71-10-10	
ALL	Perform engine air inlet Air Pressure Sensing Switch Calibration Check.	71-10-10 71-10-60	
	LANDING GEAR		
369D/E/FF 500N	Perform Landing Gear Strut Inspection.	32-10-00	
	CABIN		
ALL	* First aid kit contents and security of attachment. * Fire extinguisher for charge pressure and security of attachment.	25 26	
ALL	* Inspect seats, interior trim, panels and covers for damage and security. * Inspect seat base structure for evidence of deformation.	25	
ALL	* Perform Tank Vent System Inspection.	28-00-00 28-00-60	
369D/E/FF 500N	Inspect fuel vent system rollover valve for condition and operation (Ref. Tank Vent System Inspection).	28-00-00	
NOTE: The 369H8108-505, 369H8108M, 369H8108-501M,-503M and 369D28108-1 rollover valves do not require a yearly inspection.			

Table 1. Yearly Inspection (Cont.)

Registration No.__________ Serial No.__________ Helicopter Hours__________			
Model	**Requirement**	**Chap/Sect**	**Initial**
ALL	* Actuate and visually inspect fuel shutoff valve for proper operation. * Inspect fuel cell sending unit for electrical terminals and wiring for security and condition. * Inspect wiring harness between sending unit and instrument cluster. * Check **FUEL LEVEL LOW** caution light for proper operation (Ref. Fuel Level Low Caution Light System Test).	28-00-00 28-00-60	
ALL	Inspect instrument plumbing and electrical wiring for chafing, damage and security.	95 96	
NOTE: In the following inspection, do not pull on torque or oil pressure lines.			
369D/E/FF 500N	Inspect torque and oil pressure lines from the firewall forward to the instruments for seepage, chafing, cracking, damage and security.	95	
ANTI-T ORQUE			
500/600N	Drain fan transmission. Flush with sufficient new oil to remove sludge accumulation. Refill with new oil.	12	
369D/E/FF	Drain tail rotor transmission. Flush with sufficient new oil to remove sludge accumulation. Refill with new oil.	12	
FLIGHT CONTROLS			
500/600N	Inspect forward thruster cable at Sta. 123.30 for crack in relieved area between threads and swage. Inspect the conduit cap of the telescopic swivel end for crack, corrosion and obvious damage to the cable swage area or evidence of ball separation.	67	
500N	Inspect center thruster cable at Sta. 264.00 for crack in relieved area between threads and swage. Inspect the conduit cap of the telescopic swivel end for crack, corrosion and obvious damage to the cable swage area or evidence of ball separation.	67	
600N	Inspect center thruster cable at Sta. 292.00 for crack in relieved area between threads and swage. Inspect the conduit cap of the telescopic swivel end for crack, corrosion and obvious damage to the cable swage area or evidence of ball separation.	67	
ELECTRICAL			
NOTE: When possible, use auxiliary power source, not battery, during **POWER ON** inspection.			
ALL	Check wiring from battery connector to warning lights for continuity, use an ohmmeter.	96	
ENGINE COMPARTMENT			
ALL	Inspect firewall insulator panels for security and obvious damage.	53	
ALL	Inspect overrunning clutch firewall seal and engine compressor firewall (plenum chamber) seal for proper sealing and good condition.	63 71	

Table 1. Yearly Inspection (Cont.)

Registration No.__________ Serial No.__________ Helicopter Hours__________			
Model	**Requirement**	**Chap/Sect**	**Initial**
4 YEARS			
NOTE: Shelf life of bearings preserved with grease is limited to 4 years. For this reason, it is of extreme importance that bearings carry the date of last lubrication or preservation and inspection. After 2 years of shelf life, it is advisable to relubricate bearings upon installation.			
ALL	Clean, inspect and relubricate (repack) main rotor swashplate bearings that have been in storage.	COM	
500/600N	Clean, inspect and relubricate (repack) fan support and pitch plate bearings that have been in storage.	64	
369D/E/FF	Clean, inspect and relubricate (repack) tail rotor swashplate (duplex) bearings that have been in storage.	64	

Section

05-20-20

Continued Airworthiness

CONTINUED AIRWORTHINESS
SPECIAL INSPECTIONS

1. Special Inspection Hourly and Calendar

This table is a schedule of time-phase inspections that are contingent upon elapsed flight time or calendar time. These inspections require a Log Book entry. Adherence to Maintenance Manual information is required, and the manual should be consulted when using this checklist.

NOTE:

- The Chap/Sect column of the following table is for reference unless a specific inspection requirement is called out. If there is only two numbers in the column, it refers to the Chapter. If there is three numbers, it refers to the Section the inspection is found.
- Refer to applicable Rolls-Royce engine inspection check list for required engine maintenance.

Table 1. Special Inspections Hourly

Model	What to Inspect	Chap/Sect
AFTER INSTALLATION OF NEW 369F5100 MAIN ROTOR TRANSMISSION		
ALL	Perform transmission run-in (Ref. Main Transmission Run-In Procedure)	63-20-25
2 - 10 HOURS AFTER INSTALLATION OF TAIL ROTOR TRANSMISSION		
369D/E/FF	Using drag torque previously recorded, apply a torque load of **95 ±3 inch-pounds (10.73 ±0.34 Nm) plus the noted drag torque** (noted for each individual nut) to each mounting nut of the transmission (Ref. Tail Rotor Transmission Installation).	63-25-10
EVERY 15 HOURS		
369D/E/FF	Effectivity: 369H1203-BSC or 369H1203-21 lead-lag link assemblies with at least 500 hours, perform Main Rotor Blade Upper and Lower Root Fitting Attach Lug and Lead-Lag Link Attach Lug Inspection (25 Hour) and every 100 hours in accordance with Main Rotor Blade Upper and Lower Root Fitting Attach Lug and Lead-Lag Link Attach Lug Inspection (100 Hour) until retirement of 369H1203-BSC or-21 Lead-Lag Link Assembly. (Reference AD 95-03-13).	62-10-00
25 HOURS AFTER REPLACING TAIL ROTOR DRIVE FORK HINGE BOLT		
369D/E/FF	Check rotational torque of bolt by applying **125 inch-pounds (14.12 Nm)** with torque wrench. If 125 inch-pounds (14.12 Nm) torque does not rotate bolt, preload is correct (Ref. COM, Hub and Fork Assembly).	64-20-10 64-20-20
25 HOURS AFTER INSTALLATION OF OIL COOLER BLOWER		
ALL	With two pounds of force applied, check belt tension for 0.17 to 0.20 inch (4.32 - 5.08 mm) deflection. Check pulley (Ref. Cooling Blower Belt Tension Check and Adjustment). Check oil cooler blower driven pulley retaining nut for minimum torque of **160 inch-pounds (18.08 Nm)**. If loss of torque is noted, remove pulley nut and inspect pulley shaft and splines for condition. Reinstall nut and torque to **160 - 190 inch-pounds (18.08 - 21.47 Nm) plus drag torque**.	63
EVERY 25 HOURS WITH 2 FAILED LAMINATES IN MAIN ROTOR STRAP ASSEMBLY		
369D/F/FF 500N	Inspect in accordance with Main Rotor Strap Pack Lamination Inspection at 25-hour intervals if 2 laminates have failed in any one leg or tongue area of any strap assembly. A single cracked laminate between the shoes at the outboard end of a strap pack is cause for rejection of the hub assembly (Ref. Main Rotor Strap Pack Lamination Inspection).	62-20-00

Table 1. Special Inspections Hourly (Cont.)

Model	What to Inspect	Chap/Sect
EVERY 25 HOURS WITH 1 FAILED LAMINATES IN MAIN ROTOR STRAP ASSEMBLY		
600N	Inspect in accordance with Main Rotor Strap Pack Lamination Inspection at 25-hour intervals if 1 laminate has failed in any one leg or tongue area of any strap assembly. A single cracked laminate between the shoes at the outboard end of a strap pack is cause for rejection of the hub assembly (Ref. Main Rotor Strap Pack Lamination Inspection).	62-20-60
EVERY 25 HOURS		
NOTE: This inspection does not apply to 369D21100-516, -517, -523 and 369D21102-503, -517, -523 main rotor blades or the 369H1203-51 and -61 lead-lag links.		
369D/E/FF	Visually inspect exposed portion of all installed main rotor blade upper and lower root fitting attach lugs and main rotor hub lead-lag link attach lugs for broken or cracked lugs, corrosion or other damage to the lug areas (Ref. Main Rotor Blade Upper and Lower Root Fitting Attach Lug and Lead-Lag Link Attach Lug Inspection (25-Hour)).	62-10-00
600N	(Effectivity: RN003-RN077, Ref. SB600N-039), Perform Tailboom Attach Fitting Inspection (Ref. EAD 2001-24-51).	53-30-30
EVERY 50 HOURS		
369D/E/FF 500N	Effectivity: On models equipped with Rotorcraft Litter Kit: visually inspect litter doors for condition and security of quick-release fasteners. Rubber gasket between window glass and door for proper sealing.	CSP-026
EVERY 50 HOURS IF CRACKS ARE FOUND IN FAN LINER		
NOTE: If cracks protrude into Felt Metal Seal, replace seal.		
500/600N	Inspect fan liner to ensure cracks do not protrude into Felt Metal Seal (Ref. Anti-Torque Fan Liner (Felt Metal Seal) Inspection).	64-25-30
EVERY 100 HOURS		
ALL	If installed, floats and associated components for condition and security.	32
ALL	Effectivity: With 369F5450-501 overrunning clutch installed, remove clutch assembly and inspect clutch retainer, bearing carrier and housing at pin and shoulder for evidence of spinning and/or wear. If spinning and/or wear is observed, replace clutch assembly.	63
EVERY 300 HOURS		
600N	Replace tailboom attach bolts with new bolts, scrap removed bolts (Ref. Tailboom Installation). Inspect radius blocks and tailboom attach points for corrosion and cracks (Ref Tailboom Inspection).	53-40-30
EVERY 300 HOURS OR ONE YEAR (Whichever occurs first)		
ALL	Effectivity: For 369D25100 main transmission serviced with MIL-L-23699 oil, drain main transmission oil system; Flush with sufficient new oil to remove sludge accumulation. Replace filter and refill with new oil.	12
500/600N	Effectivity: Forward and center cable couplings; Using a bright light and 10X magnifying glass, inspect inner coupling male and female connectors for corrosion pitting or cracks; none allowed.	67-20-30

Table 1. Special Inspections Hourly (Cont.)

Model	What to Inspect	Chap/Sect
EVERY 300 HOURS OR TWO YEARS (Whichever occurs first)		
600N	Main rotor upper thrust bearing assembly must be relubricated every 2 years or 300 hours, whichever occurs first (Ref. Main Rotor Hub Upper Bearing Grease Repack, Inspection and Replacement).	62-20-60
EVERY 300 HOURS		
ALL	Effectivity: 369D21400-503 (369D/E/FF - 500/600N) or M50452 (369D/E/FF - 500N) lead-lag dampers with at least 4200 hours, inspect for deterioration until deterioration is sufficient to retire assembly (Ref. Main Rotor Damper and Attachments Inspection and Main Rotor Damper Weight Loading and Extension Check).	62-20-00 62-20-60
NOTE: The following inspection does not apply to 369D25100-505 and -507 transmissions.		
369D/E/FF	Visually inspect upper surface of main transmission output shaft assembly (ring gear carrier) for bulging or raised surfaces. Using 10X magnifying glass, inspect upper surface of shaft for cracks. (Ref. COM, Output Drive Shaft Visual Inspection)	63-20-00
369D/E 500/600N	Replace anti-ice/airframe fuel filter element (if installed) (Ref. Anti-Ice Fuel Filter Replacement).	28-25-00
ALL	Mist eliminator and access door for proper installation (attaching hardware for security).	71
ALL	Hoist installation (if installed) for condition and security.	25
EVERY 600 HOURS OR ONE YEAR (Whichever occurs first)		
ALL	Effectivity: 369D25100 main transmission serviced with Mobil SHC 626 oil and 369F5100 main transmission, drain main transmission oil system; Flush with sufficient new oil to remove sludge accumulation. Replace filter and refill with new oil.	12
369D/E/FF 500N	Effectivity: 369F5510 Main Rotor Drive Shaft, perform 369F5510 Main Rotor Drive Shaft Inspection (Ref. 600N5510 and 369F5510 Main Rotor Drive Shaft Inspection).	63-10-00
600N	Effectivity: 600N5510 Main Rotor Drive Shaft, perform 600N5510 Main Rotor Drive Shaft Inspection (Ref. 600N5510 and 369F5510 Main Rotor Drive Shaft Inspection).	63-10-00
EVERY 600 HOURS		
ALL	Cyclic control system for excessive slack or free play. Cyclic control stick, at grip, for play in excess of 3/8 inch (9.53 mm) (Ref. Main Rotor Flight Control System 600-Hour Inspection).	67-10-00
ALL	Effectivity: 369D21400-503 (369D/E/FF - 500/600N) or M50452 (369D/E/FF - 500N) lead-lag dampers with less than 4200 hours, inspect for deterioration until deterioration is sufficient to retire assembly (Ref. Main Rotor Damper and Attachments Inspection and Main Rotor Damper Weight Loading and Extension Check).	62-20-00 62-20-60
500/600N	Using a dial indicator, measure the rotation of the fan pitch control clevis mounted on the fan pitch control tube. If clevis rotation is more than 0.025 in. (0.635 mm), inspect splines on fan pitch control tube (Ref. Fan Pitch Control Tube Inspection) and splines in tube support (Ref. Tube Support Inspection).	63-25-30 67-20-30
EVERY 1200 HOURS		
ALL	Test battery over temperature sensor unit for proper operation and accuracy (Ref. Battery Temperature Sensing Equipment Operational Check).	96-05-00
500/600N	Perform visual inspection, using a 10x magnifying glass, on horizontal stabilizer mounting brackets (pay particular attention to the forward inboard legs).	53
500N	Regrease YSAS actuator (Ref. YSAS Actuator Regrease Procedure).	67-20-30

Table 1. Special Inspections Hourly (Cont.)

Model	What to Inspect	Chap/Sect
EVERY 1200 HOURS OR 2 YEARS (WHICHEVER OCCURS FIRST)		
500/600N	Clean, inspect and relubricate (repack) fan support and pitch plate bearings (Ref. Anti-Torque Fan Bearing Regreasing).	64-25-30
500/600N	Perform Anti-Torque Fan Inspection.	64-25-30
500/600N	Check pitch bearing retainer for cracks or damage.	64
EVERY 2700 HOURS OR 2 YEARS (WHICHEVER OCCURS FIRST)		
600N	Main rotor lower thrust bearing assembly must be relubricated every 2 years or 2700 hours, whichever occurs first.	62-20-60
600N	Clean, inspect and relubricate (repack) main rotor swashplate bearings.	62-30-60
EVERY 2770 HOURS OR 2 YEARS (WHICHEVER OCCURS FIRST)		
369D/E/FF 500N	Clean, inspect and relubricate (repack) main rotor swashplate bearings and main rotor hub tapered bearings (Ref. Main Rotor Hub Tapered Bearing Replacement).	62-20-00
369D/E/FF	Clean, inspect and relubricate (repack) tail rotor swashplate bearings (Ref. Tail Rotor Swashplate Bearing Regreasing).	64-30-00
EVERY 6,000 HOURS		
369D	Replace the 369H6414 Edgelighted Panel (Ref. Instrument Panel Lights Description and Replacement).	96-40-00
AT 6000 HOURS AND EVERY 100 HOURS THEREAFTER		
600N	Remove tunnel control boot. Inspect interface between 369H2564 tunnel beams and 369D22508-7 web for cracks (Ref. Control Tunnel (FS 78.50) Beam Inspection).	53-30-30
600N	Perform Forward Upper Longeron Inspection (L137, R137).	53-30-30
AT 15,000 HOURS AND EVERY 1500 HOURS THEREAFTER		
600N	Perform Lower Longeron Inspection (L158, R158).	53-30-30

Table 2. Special Inspections Calendar

Model	What to Inspect	Section
(DAILY) BEFORE FINAL SHUTDOWN IN CORROSIVE ENVIRONMENT		
ALL	It is recommended that before shutdown from the last flight of the day, for helicopters operating in a corrosive environment, a Tri-Flow wash be preformed on the main rotor hub and strap pack assembly (Ref. Main Rotor Hub Corrosion Prevention (Tri-Flow Wash Procedure)).	20-40-00
(DAILY) AFTER FINAL SHUTDOWN IN CORROSIVE ENVIRONMENT		
500N	It is recommended that after shutdown from the last flight of the day, for helicopters operating in a corrosive environment, the splitter bungee spring be sprayed with Tri-Flow .	20
EVERY 6 MONTHS OR 5 INFLATIONS		
ALL	Inflate emergency floats to 4.5 psi (0.3164 kg/cm^2) for one hour. Check for leaks and condition. Continue inflation to 5.5 psi (0.3867 kg/cm^2) and check that chamber pressure relief valves operate. Pressure-test float compartments (Ref. Float Compartments Pressure Test).	32-82-00
AFTER COMPRESSOR WATER WASH/RINSE WITH PARTICLE SEPARATOR INSTALLED		
ALL	During engine run after compressor water wash with particle separator installed, it is recommended that scavenge air switch be switched on to remove any moisture that has accumulated in the solenoid air valve.	RFM
BEFORE OPERATION OF BREEZE HOIST SYSTEM		
ALL	Prior to daily hoisting operations: unreel and inspect entire length of hoist cable for broken strands (cluster of 7 wires), excessive broken wires, corrosion, and security of attachment to cable drums and swivel hook. Replace cable if broken strand or excessive broken wires are noted. (Refer to hoist manufacturer's handbook, Table 201.)	01

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Section

05-50-00

Continued Airworthiness

CONTINUED AIRWORTHINESS CONDITIONAL INSPECTIONS

1. Conditional Inspections

This table is a schedule of inspections that are contingent upon incidents that occur, such as hard landings, overspeed, blade strike, etc. These inspections are required only when, and because the specific conditions or incidents occur, to ensure continued airworthiness of the helicopter.

NOTE:

- Refer to the applicable Allison Engine Operation and Maintenance Manual (Ref. Table 203, 01-00-00) for detailed requirements on inspection of the engine for specific or unique conditions comparable to those listed.
- Inspections outlined in this table should be performed, at the times and for the conditions indicated, to ensure continued airworthiness of the helicopter. When there is the possibility of extensive damage, such as a hard landing or blade strike, the inspection outline presents the probable order in which damage occurs. **The following inspections are progressive and should be followed in sequence until no more damage is found.**
- Inspections in this table are for MDHI 369D/E/FF and 500/600N helicopters only. The first column of this table denotes which models of helicopters the inspections are applicable to.
- The Chap/Sect column of the following table is for reference unless a specific inspection requirement is called out. If there is only two numbers in the column, it refers to the Chapter. If there is three numbers, it refers to the Section the inspection is found.

WARNING

- **Any component, assembly or detailed part that is removed for overhaul must be identified as to the reason for removal.**
- **Components that require replacement must be scrapped.**

Table 1. Conditional Inspections

Model	Requirement	Chap/Sect
	AFTER HARD LANDING	
	WARNING: Any component, assembly or detailed part that is removed for overhaul must be identified as to the reason for removal. Components that require replacement must be scrapped.	
ALL	Main rotor blades for bending, cracks or wrinkles.	62
ALL	Main rotor blade droop stops for damage.	62
ALL	Main rotor hub assembly and strap pack assembly for evidence of damage.	62
ALL	Accessible areas of main rotor mast assembly and transmission attachment area for damage.	63
ALL	Perform Landing Gear Inspection. Forward and aft rub plates for condition.	32-10-00
ALL	Perform Tailboom Inspection; retorque mount bolts.	53-40-00 53-40-30
ALL	Inspect tailboom attachment area for damage.	53
500/600N	Inspect stationary thruster attachment flange for damage; retorque mount bolts.	53
369D/E/FF	Tail rotor drive shaft and damper, tail rotor transmission and tail rotor for distortion, loose mounting or attaching parts, buckling, breaks or other damage. Tail rotor drive shaft for contact with bulkheads.	63 64

Table 1. Conditional Inspections (Cont.)

Model	Requirement	Chap/Sect
500/600N	Main transmission-to-fan transmission drive shaft, fan transmission, fan drive shaft, fan and fan control rod for distortion, loose mounting or attaching parts, buckling, breaks or other damage. Drive shafts for contact with bulkheads. Fan control rod for freedom of movement.	63 67
ALL	Perform Engine Mounts and Fittings Inspection. Inspect mounting pads and firewall for damage and distortion. Inspect all suspected parts by magnetic particle or dye-penetrant methods, as applicable (Ref. CSP-SRM-6).	71
ALL	All flight and engine control system push-pull tubes, links, bellcranks and bearings for bends, cracks, security and free movement.	67
ALL	Tunnel area A-frame for distortion, buckling or any other damage.	53
ALL	Fuselage fittings for bends and cracks.	53
ALL	Main transmission chip detectors for metal particles. Main transmission mounting flanges for cracks.	63
ALL	Perform Main Transmission Drive Shaft Inspection.	63-10-00
ALL	All engine accessories for cracked flanges, loose bolts and nuts, connections and general condition.	79
ALL	Engine accessory drive housing for cracks.	79
ALL	Engine chip detectors for metal particles.	79
ALL	Engine oil tank, supports, tubing and hoses for leaks, cracks and security.	79
ALL	Fuel cells, supports, tubing and hoses for leaks, cracks and security.	28
ALL	Armor for security of attachment, buckling and distortion.	CSP-014
ALL	Rotor brake installation for security of attachment and disc alignment.	63
AFTER MAIN ROTOR OVERSPEED		
WARNING: Any component, assembly or detailed part that is removed for overhaul must be identified as to the reason for removal. Components that require replacement must be scrapped.		
If overspeed is between 523 and 549 (369D/E) or 508 and 533 (369FF, 500N) rpm, or 106 and 112 percent (600N):		
ALL	Main rotor blades for visible damage and distortion; main rotor blade tip caps for security; all bond lines for evidence of separation; root doublers and attachment fittings for security. Replace any blade with visible bond line separation. Main rotor blade dampers for security.	62
369D/E/FF	Tail rotor blades and hub for visible damage, free movement and security.	64
500/600N	NOTAR fan blades and hub for visible damage, free movement and security.	64
ALL	Main rotor hub and strap pack assembly for evidence of damage.	62
If overspeed is over 549 (369D/E) or 533 (369FF, 500N) rpm, or 112 percent (600N):		
ALL	Remove main rotor hub assembly for overhaul inspection.	MDHI
ALL	Remove and scrap main rotor blades.	62
500/600N	Inspect anti-torque fan assembly.	64
369D/E/FF	Remove tail rotor hub assembly for overhaul inspection.	64

Table 1. Conditional Inspections (Cont.)

Model	Requirement	Chap/Sect
	AFTER MAIN TRANSMISSION OVERTORQUE BEYOND TRANSIENT LIMITS	
ALL	Main transmission for freedom of movement.	63
ALL	Main transmission chip detectors for metal particles. Re-inspect after 8 hours of operation.	63
	AFTER AIRSPEED 10% BEYOND V^{NE} LIMIT	
	WARNING: Any component, assembly or detailed part that is removed for overhaul must be identified as to the reason for removal. Components that require replacement must be scrapped.	
ALL	Main rotor blades for visible damage and distortion; main rotor blade tip caps for security; all bond lines for evidence of separation; root doublers and attachment fittings for security. Replace any blade with visible bond line separation.	62
	Main rotor hub assembly and strap pack assembly for evidence of damage.	
	Main rotor blade dampers for security.	
369D/E/FF	Tail rotor blades and hub for visible damage, freedom of movement and security.	64
369D/E/FF	Horizontal stabilizer for skin damage and loose rivets.	53
	Tip plates and vertical stabilizer for damage to leading and trailing edges and damaged stressed side panels (no repair of side panels permitted).	
	Mounting fittings for cracks and security.	
	Retorque stabilizer attach bolts.	
500/600N	Horizontal stabilizer for skin damage and loose rivets.	53
	600N - Damage to gurney flap.	
	Vertical stabilizers for damage to leading and trailing edges and damaged side panels. Mounting fittings for cracks and security.	
	Retorque stabilizer attach bolts.	
ALL	Tailboom for visible deformation, loose or missing rivets, cracks and security; attaching points to fuselage for cracks and security.	53
ALL	Canopy glass for security	53
	AFTER MAIN ROTOR BLADE/DRIVE SYSTEM SUDDEN STOPPAGE	
	WARNING: Any component, assembly or detailed part that is removed for overhaul must be identified as to the reason for removal. Components that require replacement must be scrapped.	
	Sudden stoppage of the main rotor and rotor drive system is any rapid deceleration of the main rotor drive system. This may be caused by contact of one or more of the main rotor blades with the ground, water, snow, dense vegetation or any other object of sufficient mass to cause deceleration or impact damage to the main rotor blades.	
	A main rotor blade strike in which one or more of the main rotor blades exceed the repair limits in the maintenance manual is defined as sudden stoppage.	
	Sudden stoppage of the main rotor may also occur simultaneously with hard landing in which the blades contact the upper fuselage structure or the tailboom.	
	The inspection requirements, After Main Rotor Drive System Sudden Stoppage - Level 1, is to be used when sudden stoppage of the main rotor drive system has occurred.	

Table 1. Conditional Inspections (Cont.)

Model	Requirement	Chap/Sect
After Main Rotor Drive System Sudden Stoppage - Level 1		
ALL	Perform inspection of main rotor blades. Pay particular attention to the upper and lower root fittings and attach lug areas. If inspection determines that one or more blades have separation of the trailing edge bond, due to leading edge impact, the blade is bent or shows evidence of a significant impact, and the damage occurred with the engine running, perform the additional inspection in After Main Rotor Drive System Sudden Stoppage - Level 2.	62
ALL	Perform inspection of the main rotor hub and lead-lag link attach lugs. If the lead-lag lug is broken or the pitch housing striker strip shows evidence of contact with the main rotor hub and damage occurred the the engine running, perform the additional inspection in After Main Rotor Drive System Sudden Stoppage - Level 2.	62
ALL	Perform Main Rotor Strap Pack Lamination Inspection.	62-20-00 62-20-60
ALL	Perform Main Rotor Blade and Damper Attach Pin Disassembly and Special Inspection. If a pin is found cracked or bent and damage occurred with the engine running, perform the additional inspection in After Main Rotor Drive System Sudden Stoppage - Level 2.	62-10-00
ALL	Perform Main rotor Damper and Attachments Inspection. If damage to a damper is suspected, perform Main Rotor Damper Weight Loading and Extension Check.	62-20-00 62-20-60
ALL	Perform Main Rotor Drive Shaft Inspection. If main rotor drive shaft is rejected for broken shaft splines, straightness or sheared shaft, perform the additional inspection in After Main Rotor Drive System Sudden Stoppage - Level 2.	63-10-00
ALL	Inspect overrunning clutch sprag assembly (Ref. Detailed Inspection after Cleaning).	COM
CAUTION: Kamatic couplings are a balanced unit and cannot be disassembled.		
ALL	Perform a visual inspection of all power train drive shafts and couplings for distortion, breaks, cracks, contact with bulkheads and other damage.	63
ALL	Perform a visual inspection of the oil cooler blower assembly.	63
ALL	Check main rotor transmission for freedom of movement. Visually check main rotor transmission mounting flanges for cracks. Inspect main rotor transmission chip detectors for metal accumulation. Reinspect chip detectors after eight hours of helicopter operation.	63
ALL	Perform visual inspection of main rotor flight controls.	67
ALL	Perform visual inspection of the anti-torque system.	64
ALL	Perform visual inspection of engine mounts for security, cracks or misalignment.	71
ALL	Perform visual inspection of the engine control linkage for bends, breaks and proper alignment.	76
ALL	Inspect engine per the special inspection requirements in the appropriate Allison Operation and Maintenance Manual.	01
After Main Rotor Drive System Sudden Stoppage - Level 2		
WARNING: Any component, assembly or detailed part that is removed for overhaul must be identified as being removed due to Main Rotor Sudden Stoppage - Level 2. Components that require replacement must be scrapped.		
ALL	Overhaul main rotor hub.	62

Table 1. Conditional Inspections (Cont.)

Model	Requirement	Chap/Sect
ALL	Remove and scrap main rotor drive shaft.	63
ALL	Overhaul main transmission assembly (Ref. COM).	63
ALL	Remove and scrap engine-to-transmission drive shaft.	63
ALL	Overhaul overrunning clutch assembly (Ref. COM).	63
	AFTER TAIL ROTOR BLADE STRIKE	
	WARNING: Any component, assembly or detailed part that is removed for overhaul must be identified as to the reason for removal. Components that require replacement must be scrapped.	
	After tail rotor blade strike, inspect the following:	
369D/E/FF	If equipped with Bendix couplings, remove and scrap couplings.	63
369D/E/FF	Tail rotor blades for dents, nicks, scratches or separation of skin.	64
369D/E/FF	Tail rotor flapping hinge bolt for damage.	64
369D/E/FF	Tail rotor transmission for radial play and run-out of output shaft, cracks in mounting flanges, and chip detector for metal particles. Remove for overhaul tail rotor transmission if damage is indicated.	63
369D/E/FF	If equipped with Kamatics couplings: Perform Tail Rotor Drive Shaft Twist Inspection. Misaligned or missing stripes require removal and scrapping of drive shaft and Kamatics couplings, and an overhaul inspection of tail rotor transmission (Ref. COM).	63-15-10 63-25-10 63-25-20
369D/E/FF	Remove tail rotor drive shaft and inspect couplings for distortion and cracks; damper, damper bracket and bulkheads for damage.	63
	NOTE: If damage in excess of allowable limits due to blade strike is noted in above areas, continue with following inspections:	
369D/E/FF	Tail rotor drive fork, pitch links, swashplate, hub and pitch control bearing housing for obvious damage.	64
369D/E/FF	Upper fuselage and boom tail rotor control linkage. If tail rotor control rod is damaged, ensure that all rod bulkhead grommets are in place.	67
369D/E/FF	Aft frame of tailboom for cracks and boom skin for loosened or popped rivets.	53
369D/E/FF	Main transmission chip detectors and transmission lube pump oil filter for metal particles.	63
369D/E/FF	Main rotor hub assembly and strap pack assembly for evidence of damage.	62
	AFTER TAILBOOM STRIKE	
	WARNING: Any component, assembly or detailed part that is removed for overhaul must be identified as to the reason for removal. Components that require replacement must be scrapped.	
	If one or more main rotor blades strike tailboom while blades are rotating, inspect following:	
ALL	Perform Main Rotor Blade Inspection.	62-10-00
ALL	If excessive damage requires replacement of main rotor blade(s), inspect complete main rotor and scissors assembly, including droop stop mechanism and strap packs, for evidence of damage.	62

Table 1. Conditional Inspections (Cont.)

Model	Requirement	Chap/Sect
369D/E/FF	Remove and inspect tail rotor drive shaft for impact damage, buckling or twisting; couplings for cracks and distortion; damper, damper bracket and bulkheads for damage.	63
369D/E/FF	If excessive damage requires replacement of tail rotor drive shaft, replace couplings and perform overhaul inspection of tail rotor transmission (Ref. COM).	63
CAUTION: Any tailboom damage is significant (Ref. CSP-SRM-6).		
ALL	Perform Tailboom Inspection. Dye-check or remove and scrap tailboom attach bolts.	53-40-00 53-40-30
ALL	Structure forward of tailboom attachment for evidence of sheet metal yielding or buckling. Pay particular attention for signs of buckling at right side forward of tailboom attachment (Ref. CSP-SRM-6).	53
ALL	Perform Upper Fuselage and Tailboom Control Linkage Inspection.	67
ALL	Perform Horizontal Stabilizer Inspection. Perform Vertical Stabilizer Inspection. Retorque stabilizer attach bolts.	53-50-10 53-50-30
369D/E/FF	Tail rotor assembly.	64
369D/E/FF	Tail rotor transmission for radial play and run-out of output shaft; cracks in mounted flanges and chip detector for metal particles.	64
ALL	Main rotor brake, if installed, for condition and alignment of brake disc, calipers and security of attachment.	63
If tailboom strike occurred during POWER ON condition, also inspect the following:		
ALL	Remove and inspect main rotor drive shaft, main transmission drive shaft and couplings for distortion, breaks, cracks and other damage.	63
ALL	Main transmission chip detectors and transmission lube system oil filter for metal particles. Re-inspect chip detectors and oil filter after 8 hours of engine operation. Visually check transmission mounting flanges for cracks.	63
ALL	Engine air inlet and plenum chamber for foreign objects; motor engine and check for unusual noise. Engine mounts for security, cracks or distortion. Engine control linkage for bends, breaks and proper operation.	71 76
500/600N	Inspect stationary thruster attachment flange for damage; retorque mount bolts.	53
ALL	Inspect tailboom attachment area for damage; retorque mount bolts.	53
AFTER CHIP DETECTOR LIGHT COMES ON		
ALL	Remove chip detector leads, in turn, to determine which chip detector caused indicator to light. Remove and inspect applicable chip detector for metal accumulation.	63 71
ALL	If an engine chip detector caused indicator to light, refer to applicable Allison Engine Operation and Maintenance Manual.	01
ALL	If main transmission chip detector caused indicator to light, perform Main Transmission Filter Replacement.	63-21-00

Table 1. Conditional Inspections (Cont.)

Model	Requirement	Chap/Sect
ALL	If chips measure no longer than 0.125 inch (3.175 mm), drain and refill main and/or fan transmission with new oil. Recheck applicable chip detectors after 4 hours of flight.	12
	AFTER ENGINE CHANGE BECAUSE OF INTERNAL ENGINE FAILURE	
	NOTE: Oil coolers are NOT cleanable and must be scrapped if an engine failure produces metal and NO scavenge oil filter is installed or if a scavenge oil filter is installed and indicates a by-pass has occurred.	
ALL	Remove, flush and reinstall oil tank. Flush all lines, fittings and associated components. Remove and reverse flush or replace engine oil cooler.	12 79
	CAUTION: Failure to bleed fuel system can result in unexpected engine flameout or power loss.	
ALL	Bleed fuel system.	28
ALL	Remove and install new scavenge oil filter element (if installed).	79
	AFTER ENGINE FLAMEOUT CAUSED BY FUEL EXHAUSTION	
ALL	Bleed fuel system to remove any entrapped air.	28
	AFTER ENGINE SHUTDOWN USING EMERGENCY FUEL SHUTOFF VALVE	
ALL	Bleed fuel system to remove any entrapped air.	28
	AFTER MAIN TRANSMISSION CHANGE BECAUSE OF INTERNAL TRANSMISSION FAILURE	
ALL	Reverse flush or replace transmission oil cooler, all lines, fittings and associated components.	63
	AFTER FUEL FILTER CAUTION LIGHT COMES ON	
ALL	Check **FUEL FILTER** caution light and circuit for discrepancies.	95
ALL	Perform Fuel Filter (Bypass) Caution Light Pressure Switch Test.	28-00-00
ALL	Remove and install new engine-driven fuel pump filter. Remove and clean gas producer fuel control filter. Clean and flush all lines and fittings. Check bypass valve per applicable Allison Engine Operation and Maintenance Manual.	01
369D/E 500N	Inspect start pump inlet screen for contamination when large amounts of foreign material are found in the engine driven fuel pump filter (or optional airframe fuel filter, if installed).	28
ALL	Perform Fuel Cell Inspection.	28-00-00
	AFTER NEW OR REPLACEMENT MAIN ROTOR HUB IS INSTALLED	
ALL	Perform Main Rotor Hub Droop Angle Check.	62-20-00
	BEFORE INSTALLATION OF NEW BATTERY	
ALL	Perform Battery Charging - Deep Cycling Procedure. Repeat deep cycling procedure once to ensure complete stabilization of battery.	96-05-00
	AFTER MAIN TRANSMISSION DRIVE SHAFT IS REMOVED (ENGINE INSTALLED)	
ALL	Check overrunning clutch for correct oil level.	12

Table 1. Conditional Inspections (Cont.)

Model	Requirement	Chap/Sect
	AFTER COOLER BLOWER IS REMOVED	
ALL	Perform Cooling Blower Inspection (Disassembled). Check belt tension and clearance after installation.	63
	WHEN MAIN ROTOR DRIVE SHAFT IS REMOVED	
ALL	Perform Main Rotor Drive Shaft Inspection.	63-10-00
	AFTER LIGHTNING STRIKE	
WARNING: Any component, assembly or detailed part that is removed for overhaul must be identified as to the reason for removal. Components that require replacement must be scrapped.		
If lightning strike is evident on helicopter exterior:		
ALL	Inspect the fuselage interior and exterior, landing gear, rotor systems and ground wire connection for burn marks, cracks, pitting or other signs of high temperature stress, to determine the lightning entry and exit points.	25 32 53
ALL	Trace the path of the lightning strike to the extent possible using a magnetometer.	
ALL	Check the magnetic compass for accuracy (the degree of inaccuracy may serve as an indicator of the severity of the strike).	95
ALL	Inspect all wiring.	96
ALL	Inspect antenna(s) for burns and pitting.	97
ALL	Inspect all electrically operated components and lighting systems for damage.	96
ALL	Inspect communications and navigation equipment for damage.	97
ALL	If the preceding inspections reveal major damage has occurred, proceed as follows: Bench test all avionics and electrical system and components. Perform a continuity check on all wiring and cables. Perform a Voltage Standing Wave Ratio (VSWR) check on all antennas, antenna cables and connectors.	96 97
ALL	Perform specific inspection/replacements as required.	
500/600N	Check fan transmission and interconnecting drive shafts for magnetism and/or burns.	63
500/600N	If previous drive train items show magnetism, overhaul fan transmission.	COM
500/600N	Inspect anti-torque fan and components for evidence of arcing and magnetism; replace any part showing evidence of arcing or magnetism.	64
500/600N	Inspect bellcrank and control rod for any indications of arcing. Scrap parts with indications of arcing.	67
500/600N	Inspect thruster cables, bellcranks and control tubes for any indications of arcing. Scrap parts with indications of arcing.	67
500/600N	Inspect thruster rollers for any indications of arcing. Scrap parts with indications of arcing.	53
ALL	Check oil cooler blower assembly and overrunning clutch for residual magnetism; replace as necessary.	
ALL	Inspect oil cooler assembly for damage; replace as necessary.	
ALL	If previous drive train items show magnetism, overhaul transmission.	
ALL	If overrunning clutch assembly shows magnetism, remove engine and overrunning clutch and overhaul.	

Table 1. Conditional Inspections (Cont.)

Model	Requirement	Chap/Sect
ALL	Perform a ground run operational check on the aircraft. Functionally check the flight control system, and all avionics, electrical, lighting, communication, and navigation systems.	67 96 97
ALL	Repair any damage and replace damaged components as required.	
If lightning strike is evident on main rotor system:		
ALL	Inspect blades for damage such as burns, pitting, skin separation, etc. If damage is evident, scrap damaged blade(s).	62
ALL	Remove hub assembly and return for overhaul.	62
ALL	Inspect all bearings in the fixed and rotating control system located on the main rotor mast.	62
ALL	Remove transmission assembly and overhaul.	63
ALL	Inspect main rotor mast and drive shaft for evidence of burns.	63
ALL	Check drive shafts for residual magnetism. If magnetized or damaged, scrap drive shafts and remove engine for overhaul.	63 71
If lightning strike is evident on tail rotor system:		
369D/E/FF	Inspect blades for damage such as burns, pitting, skin separation, etc. If damage is evident, scrap damaged blade(s).	64
369D/E/FF	Overhaul tail rotor assembly.	COM
369D/E/FF	Scrap pitch change links and pitch change assembly.	64
369D/E/FF	Inspect bellcrank and control rod for any indications of arcing. Scrap parts with indications of arcing.	67
369D/E/FF	Overhaul tail rotor gearbox.	COM
369D/E/FF	Inspect tail rotor drive shaft and drive shaft damper for magnetism and/or burns.	63
369D/E/FF	Check oil cooler blower assembly, overrunning clutch and tail rotor drive shaft couplings for residual magnetism; replace as necessary.	63
369D/E/FF	Inspect oil cooler assembly for damage; replace as necessary.	63
369D/E/FF	If previous drive train items show magnetism, overhaul transmission.	COM
369D/E/FF	If overrunning clutch assembly shows magnetism, remove engine and overrunning clutch and overhaul.	71 COM
369D/E/FF	Inspect engine mounts and fitting for damage. Replace as necessary.	71
AFTER 369F5100 MAIN TRANSMISSION LUBRICATION PUMP IMPENDING BYPASS INDICATOR POPS		
ALL	Refer to Troubleshooting Power Train System	63-00-00
WHENEVER ENGINE IS REMOVED		
ALL	Remove soundproofing from above engine and inspect airframe above engine for evidence of cracks.	53

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Chapter

06

Dimensions and Areas

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Section

06-00-00

Dimensions and Areas

DIMENSIONS AND AREAS
MAINTENANCE PRACTICES

1. Principal Dimensions

(Ref. Figure 201 for Model 369D,
Figure 202 for Model 369E,
Figure 203 369FF,
Figure 204 for 500N and
Figure 205 for 600N)

2. Airframe Stations Locations

(1). Reference is occasionally made to Fuselage Station (STA or FS), Fuselage Station Plug (P. STA or FSP) and Waterline (WL) throughout the manual. P. STA or FSP refers to the stretched area or longer fuselage section of the 600N as compared to the 500 Series Helicopter. Fuselage Station and Waterline are the same as those referred to in the other 500 Series publications. To assist in locating components being discussed, station diagrams are provided (Ref. Figure 206 for Model 369D, Figure 207 for Models 369E/FF, Figure 208 for 500N and Figure 209 for 600N). Station and Waterline references are also necessary for weight and balance procedures (Ref. Sec. 08-10-00).

(2). For the 500 Series Helicopters, all dimensions are from two reference points designated as STA 0.00 and WL 0.00. STA 0.00 is 28.00 inches (71.12 cm) forward of the fuselage nose for Model 369D, and 15.00 inches (38.10 cm) forward of the fuselage nose for Models 369E/FF. WL 0.00 is tangential to bottom of fuselage at STA 90.61. Canted stations start at WL 0.00 unless otherwise specified. The canted station is not the same distance from STA 0.00 over its length, and should be referred to in association with a waterline reference.

(3). For the 600 Series Helicopter, all dimensions are from three reference points designated as STA 0.00, P. STA 0.00 and WL 0.00 for the fuselage/engineering station references. STA 0.00 is 15.00 inches (38.1 cm) forward of the fuselage nose. P. STA 0.00 is located at the forward lower edge of the mid door (also designated as canted STA 78.50). All references outside of the designated P. STA areas are labeled STA or FS. Waterline 0.00 is tangential to bottom of fuselage at fuselage station STA 90.61. Canted stations start at waterline 0.00 unless otherwise specified. The canted station is not the same distance from WL 0.00 over its length, and should be referred to in association with a waterline reference.

(4). Measurements from a station represented by a rib, frame, or bulkhead that is not accessible may be taken by noting flange bend direction and compensating on the correct side of visible external skin attachment rivet line.

GENERAL NOTES:

1. HELICOPTER ON GROUND, MAX. COMPRESSED DIMENSION: 6.8 IN. (17.272 CM).
2. IF OPTIONAL EXTENDED LANDING GEAR IS INSTALLED, ADD 0.63 FT. (10.19 M) TO ALL VERTICAL DIMENSIONS.

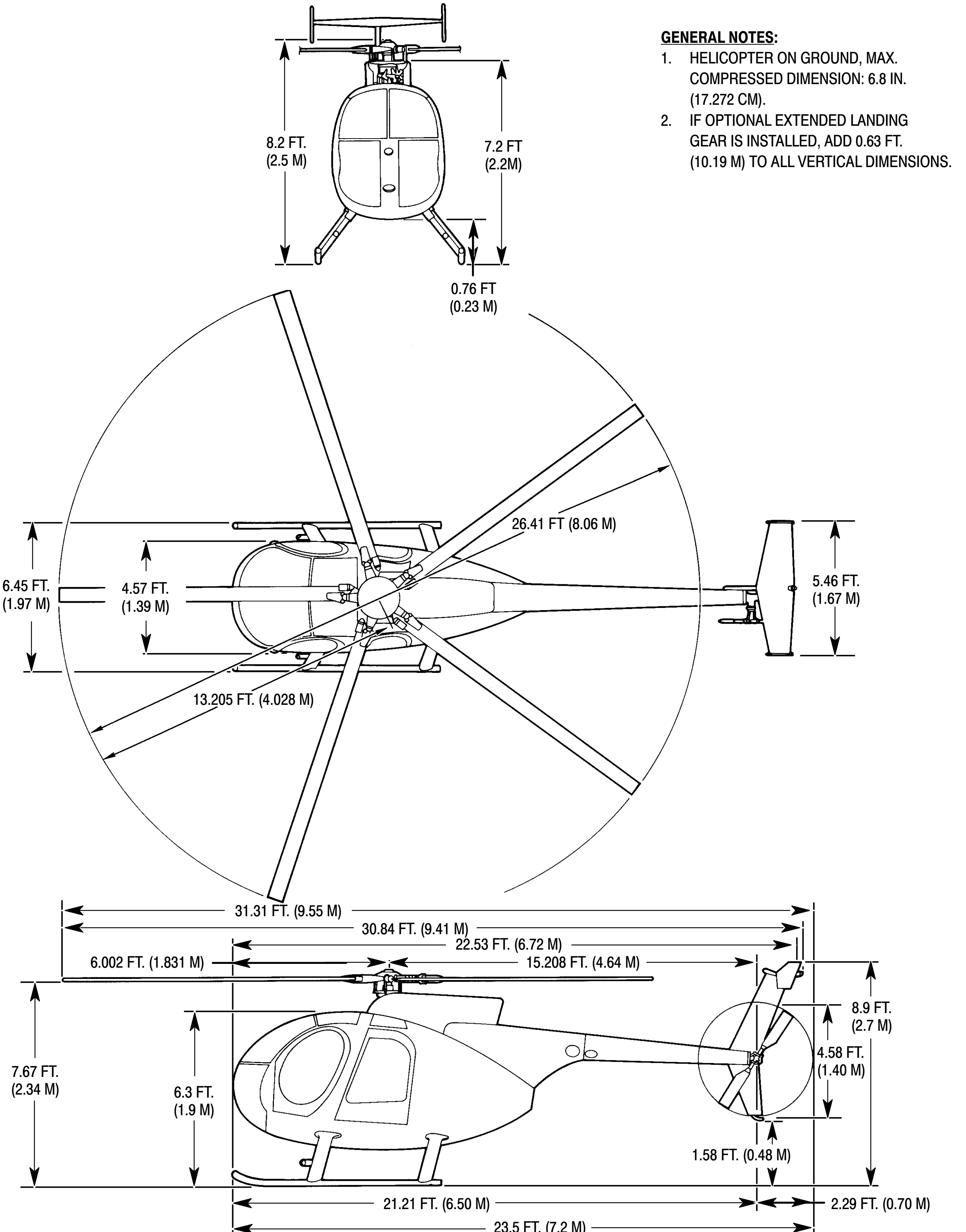


Figure 201. Principal Dimensions - Model 369D

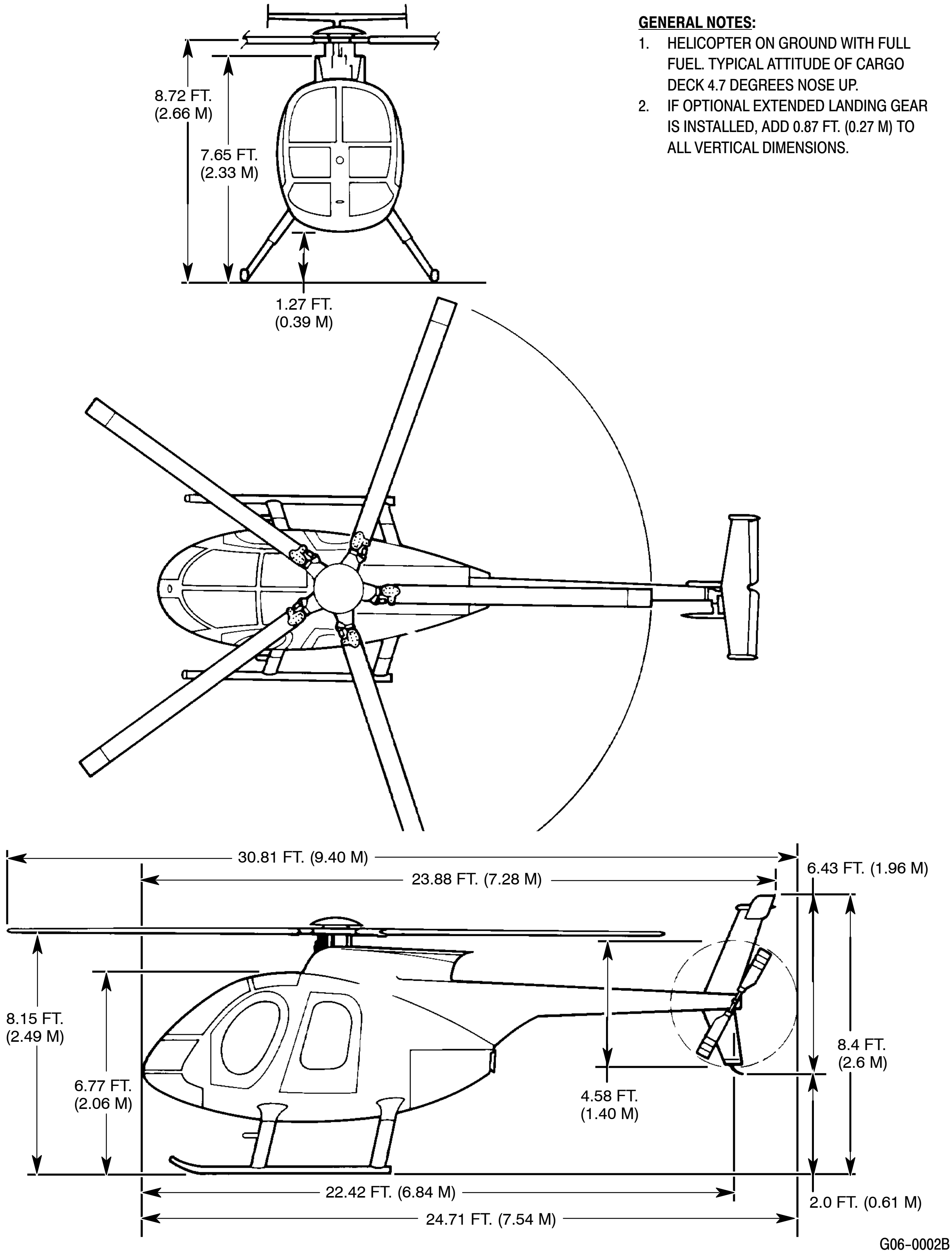


Figure 202. Principal Dimensions- Models 369E

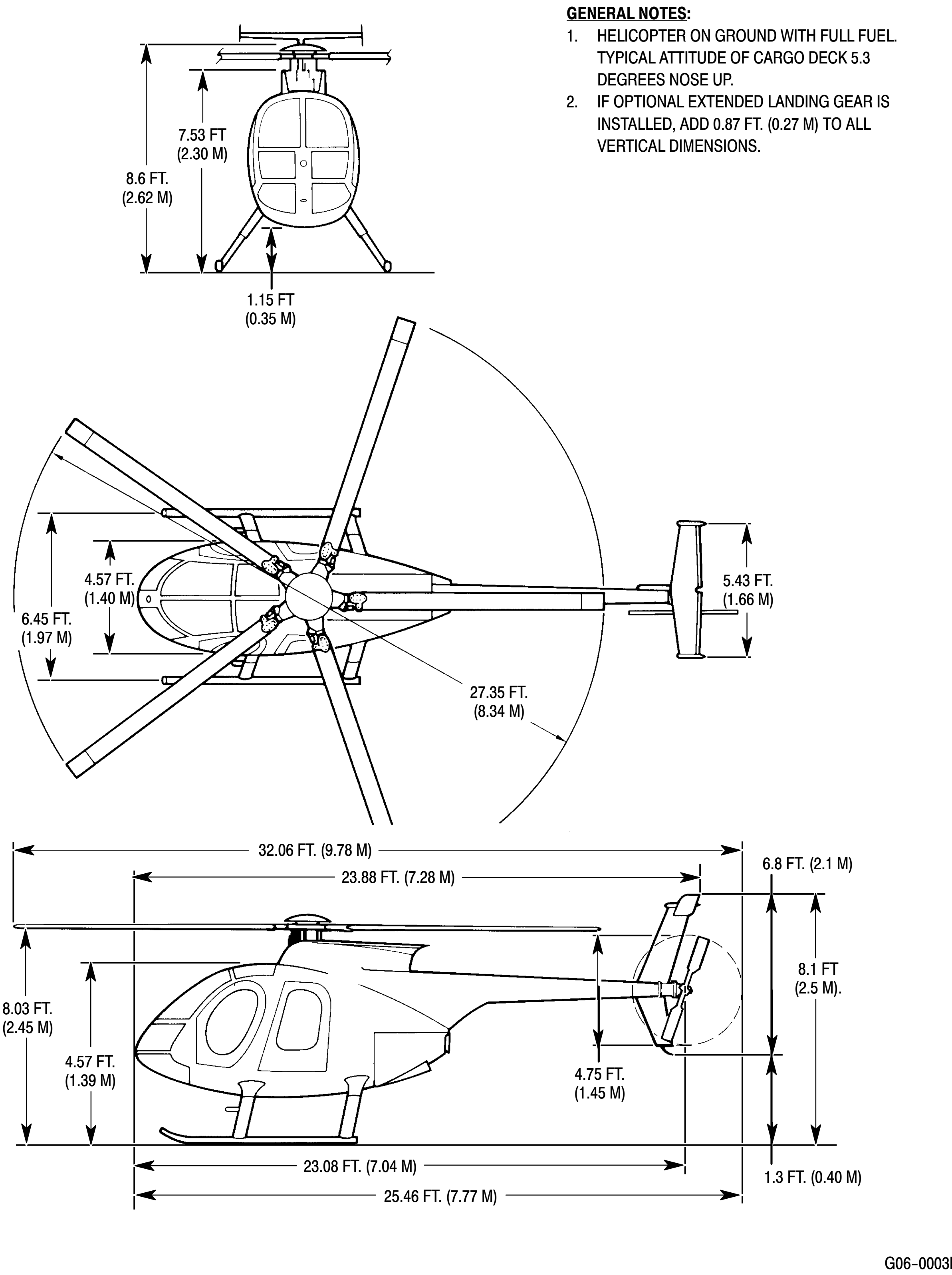


Figure 203. Principal Dimensions Model 369FF

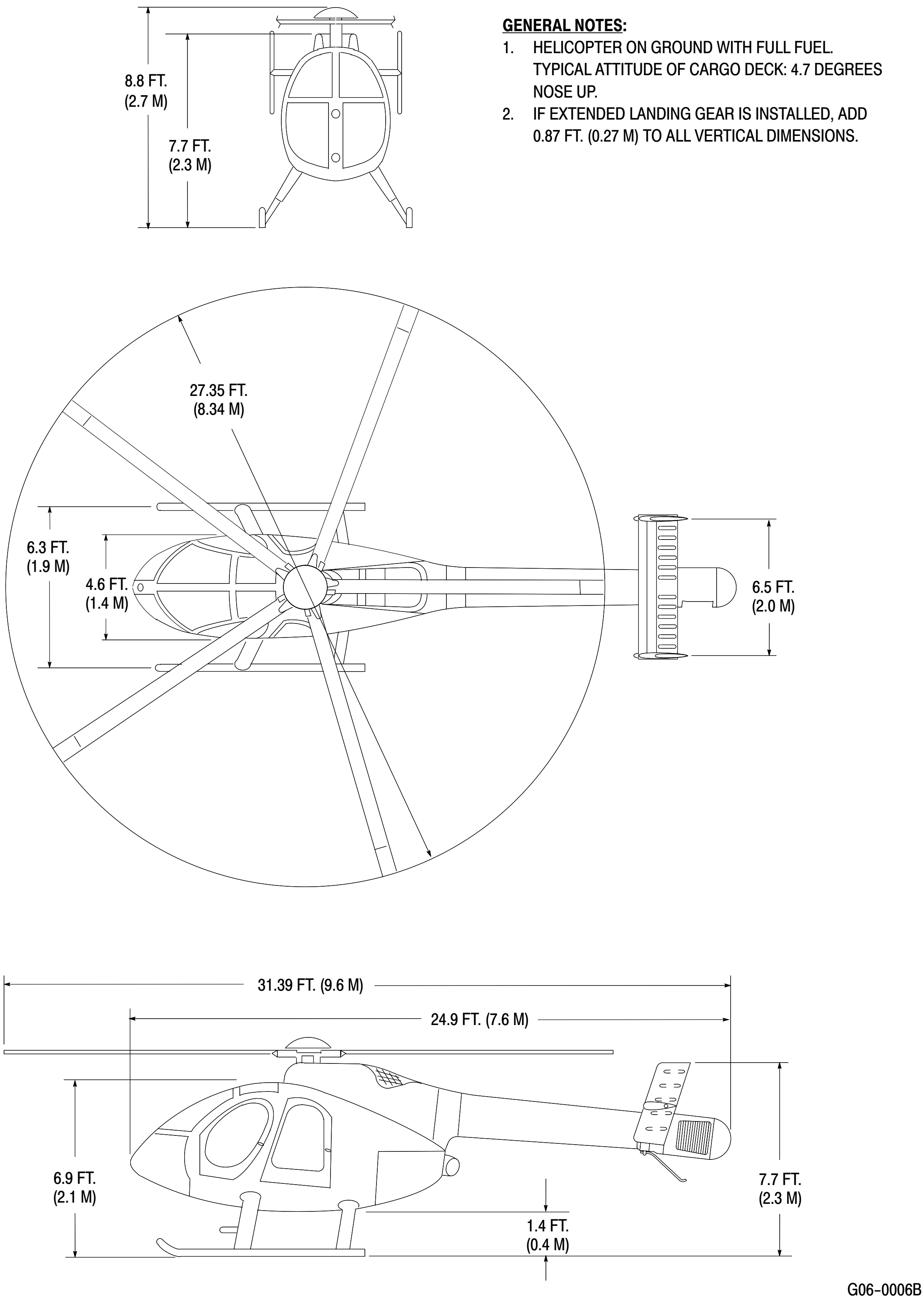
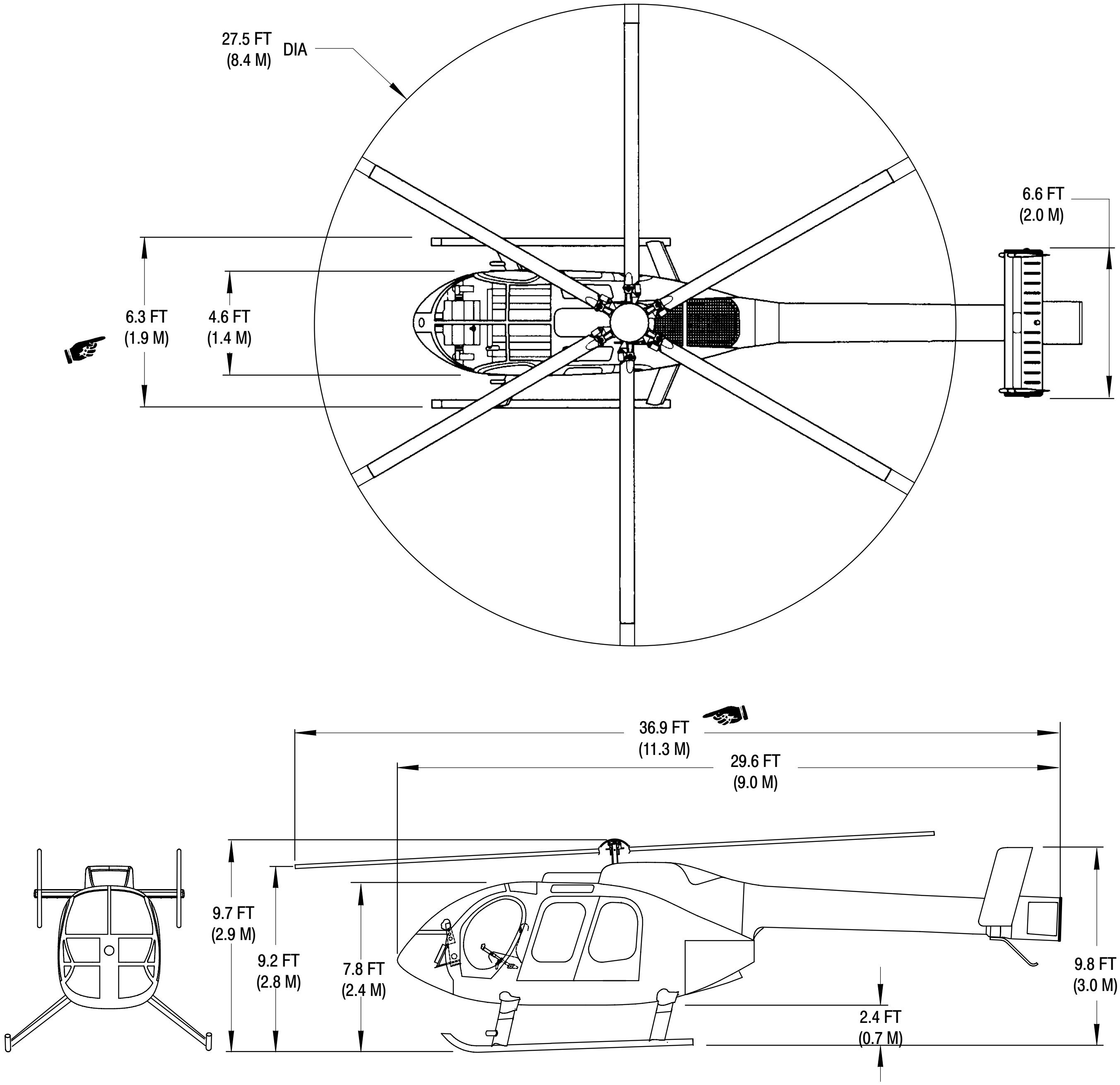


Figure 204. Principal Dimensions - Model 500N



GENERAL NOTES:

1. HELICOPTER ON GROUND WITH FULL FUEL.
   TYPICAL ATTITUDE OF CARGO DECK 5.3 DEGREES NOSE UP.
2. HEIGHT ABOVE GROUND DIMENSIONS VARY WITH INSTALLED EQUIPMENT, CENTER OF GRAVITY AND TERRAIN FEATURES.
3. ALL DIMENSIONS SHOWN DEPICT EXTENDED LANDING GEAR.

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Figure 205. Principal Dimensions - Model 600N (Sheet 1 of 2)

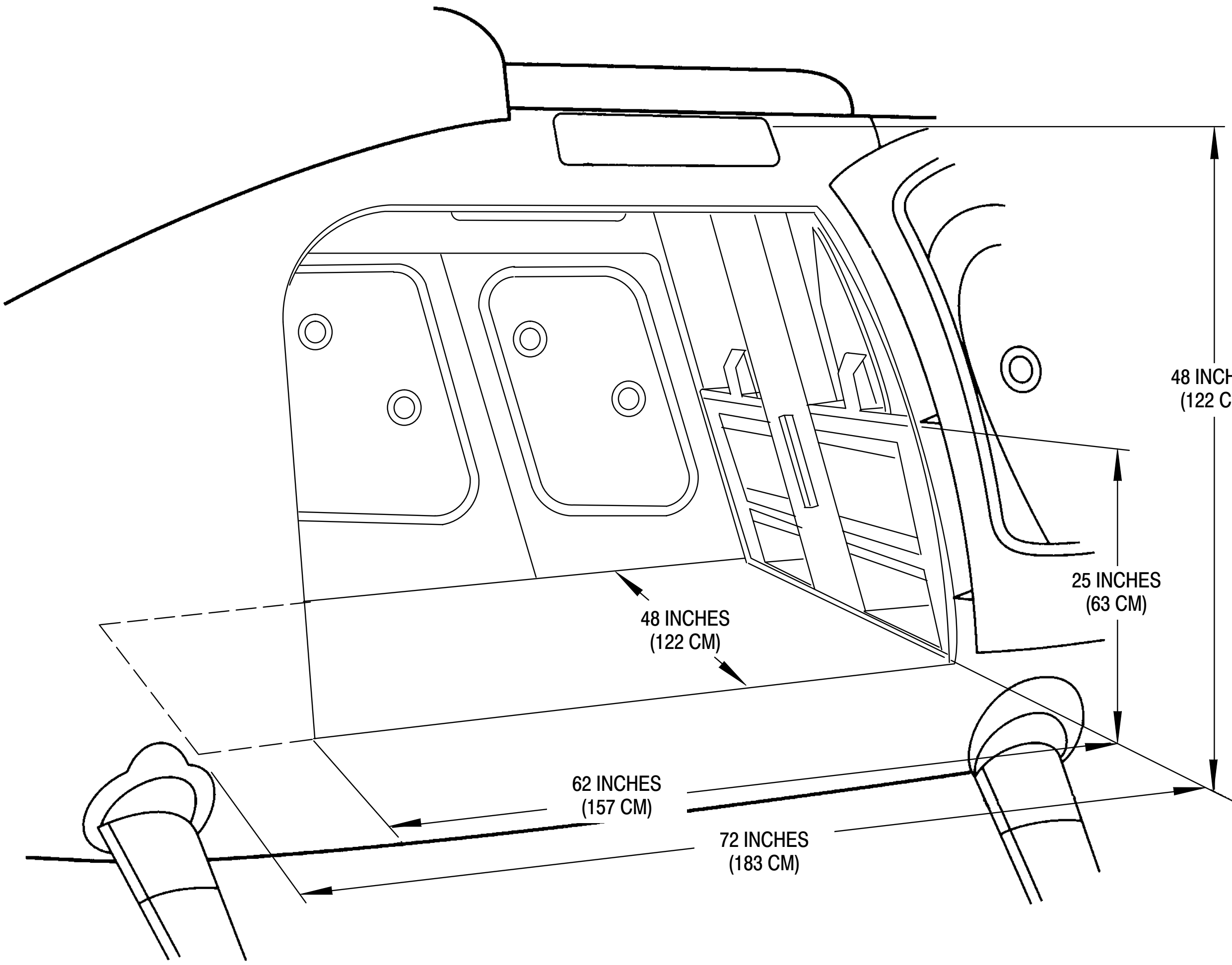
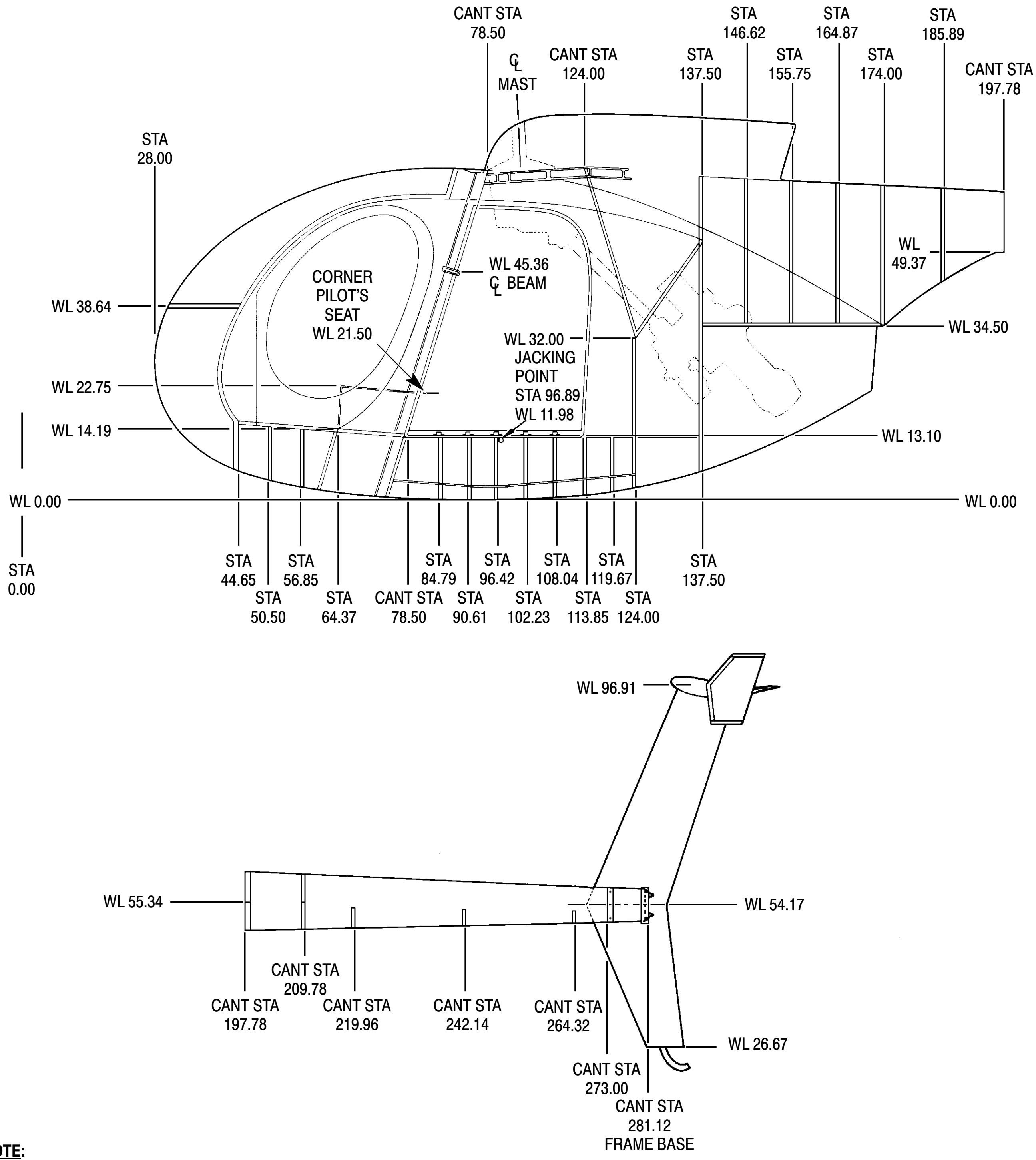
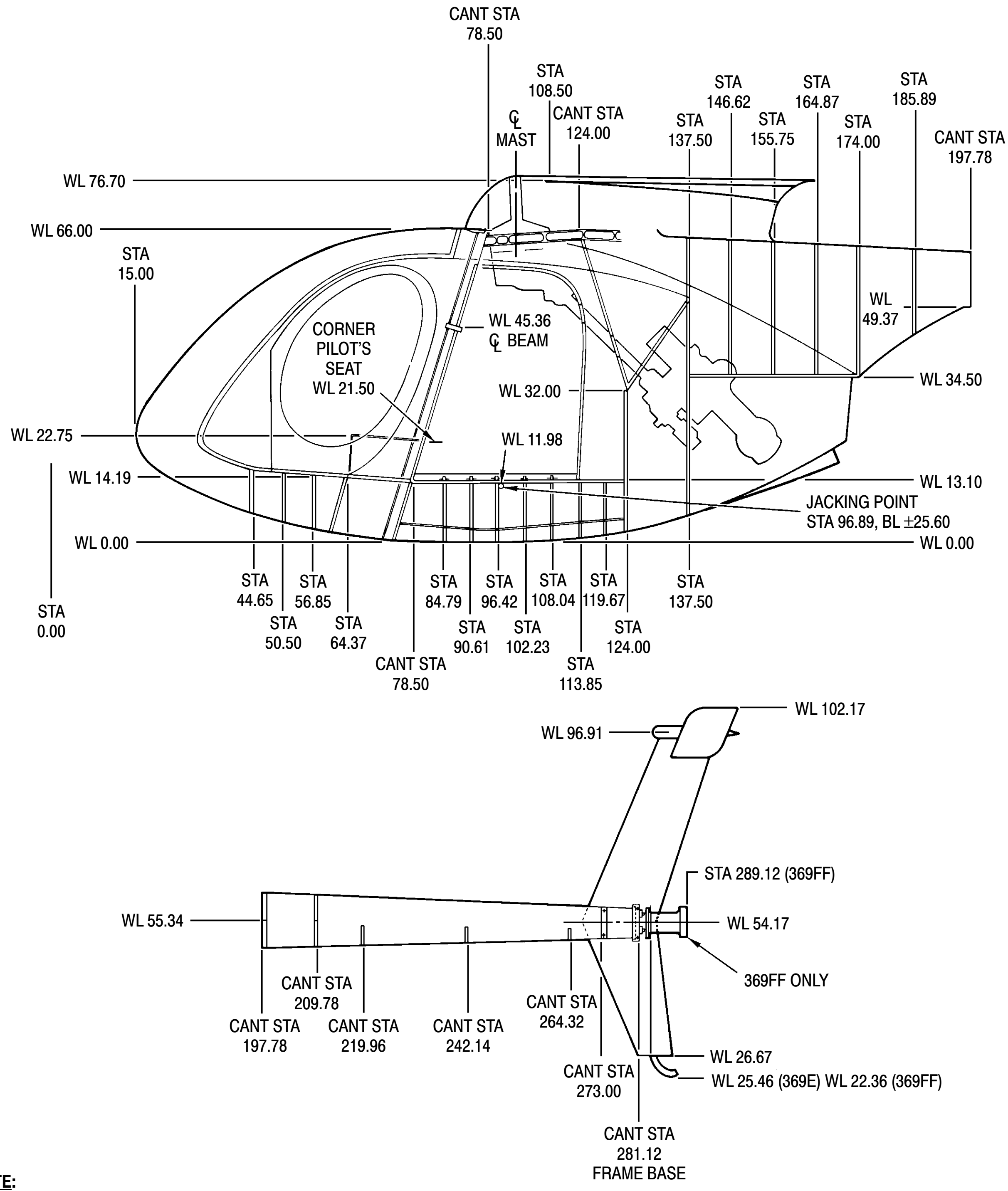


Figure 205. Principal Dimensions - Model 600N (Sheet 2 of 2)



NOTE:
WHEN MEASURING EXTERNALLY FROM RIVET LINES, NOTE THE SIDE AT BULKHEAD OR FRAME INDICATED AS THE STATION AND COMPENSATE FOR RIVET POSITION IN THE ATTACHMENT FLANGE.

Figure 206. Station Diagram - Model 369D



NOTE:
WHEN MEASURING EXTERNALLY FROM RIVET LINES, NOTE THE SIDE AT BULKHEAD OR FRAME INDICATED AS THE STATION AND COMPENSATE FOR RIVET POSITION IN THE ATTACHMENT FLANGE.

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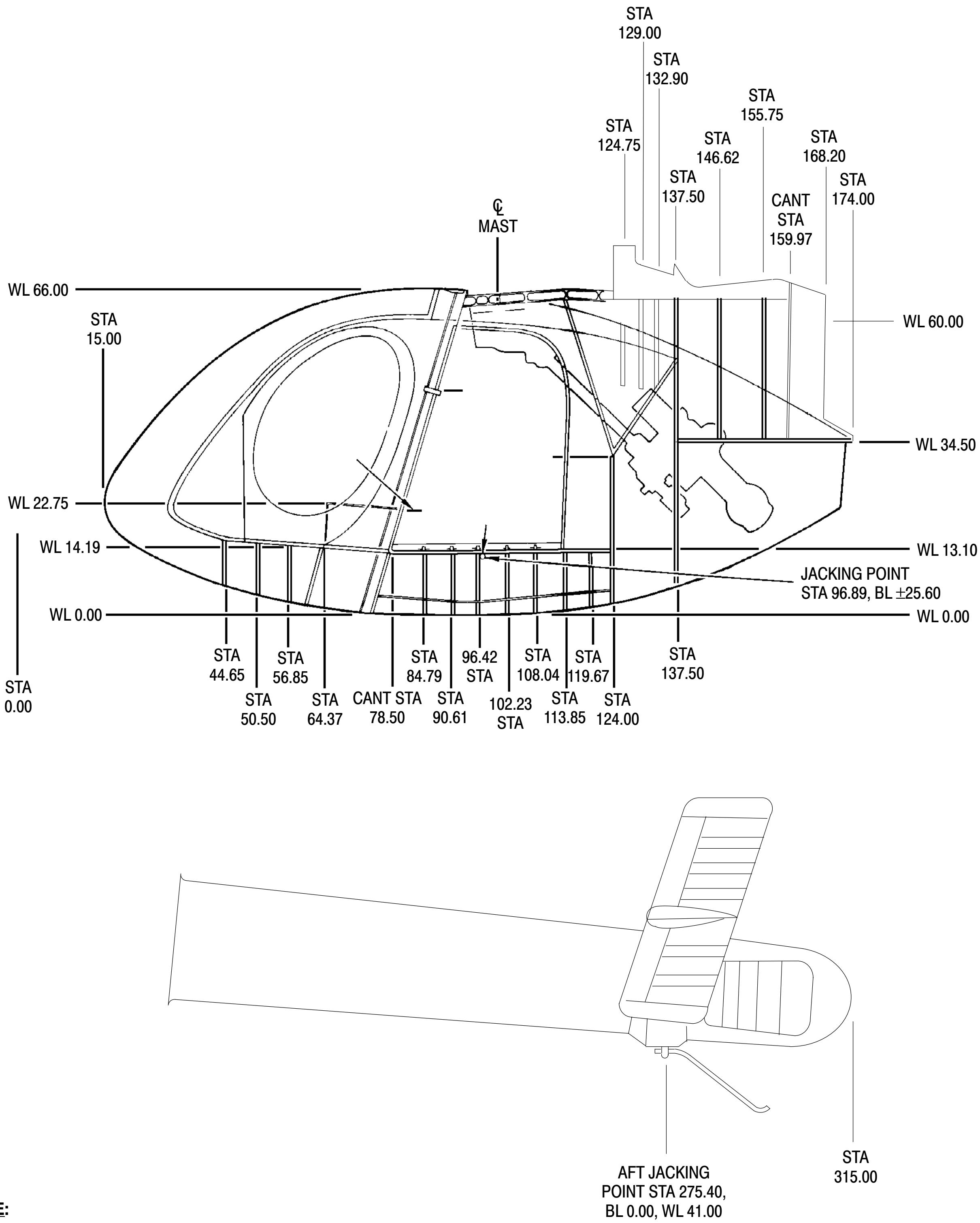
Figure 207. Station Diagram - Models 369E/FF



NOTE:
WHEN MEASURING EXTERNALLY FROM RIVET LINES, NOTE THE SIDE AT BULKHEAD OR FRAME INDICATED AS THE STATION AND COMPENSATE FOR RIVET POSITION IN THE ATTACHMENT FLANGE.

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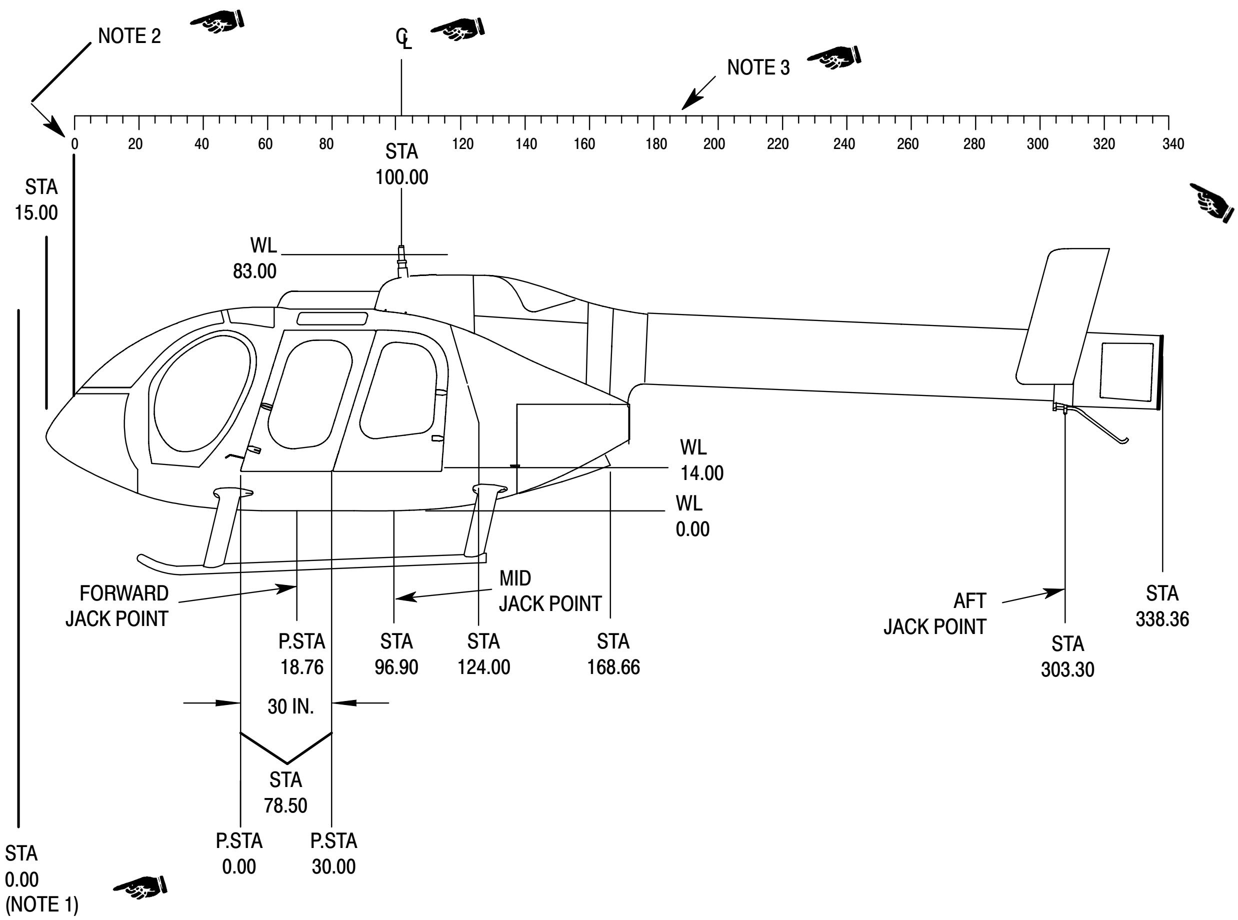
Figure 208. Station Diagram - Model 500N



NOTES:

1. STA. 0.00, 15 INCHES (381 MM) FORWARD OF NOSE OF AIRCRAFT.
2. THIS DIMENSION 15 INCHES (381 MM) AFT OF NOSE OF AIRCRAFT.
3. THESE DIMENSIONS IN INCHES.

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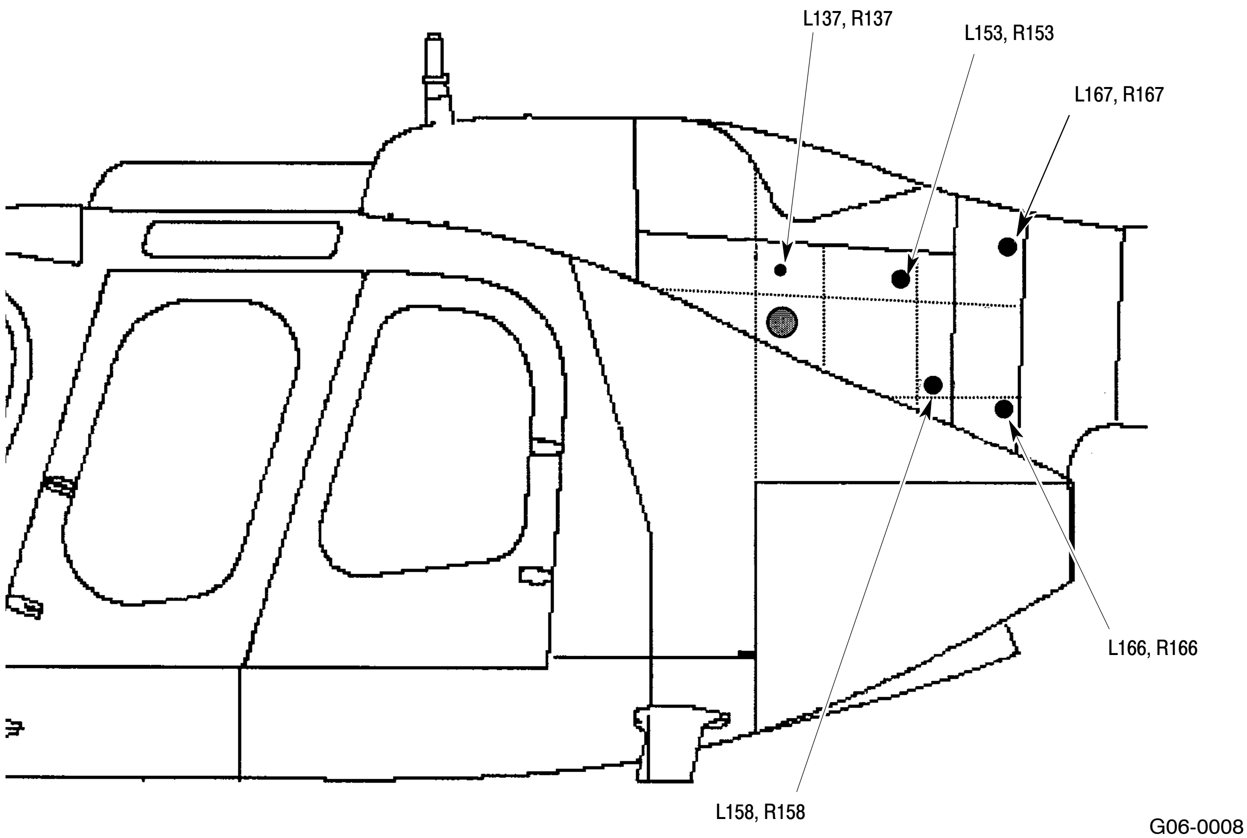
Figure 209. Fuselage Station Diagram - Model 600N



Item No.	Name	Permits Access To	Qty.	Type
L137	Plug	Left forward upper longeron	1	Plug Button
R137	Plug	Right forward upper longeron	1	Plug Button
L153	Plug	Left upper longeron	1	Plug Button
R153	Plug	Right upper longeron	1	Plug Button
L158	Plug	Left lower longeron	1	Plug Button
R158	Plug	Right lower longeron	1	Plug Button
L166	Plug	Left lower attach fitting	1	Plug Button
R166	Plug	Right lower attach fitting	1	Plug Button
L167	Plug	Left upper attach fitting	1	Plug Button
R167	Plug	Right upper attach fitting	1	Plug Button

Figure 210. Aft Empenage Access Plugs - Model 600N

Chapter

07

Lifting and Jacking

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07-00-00

Lifting and Jacking

LIFTING AND JACKING MAINTENANCE PRACTICES

1. Component Weights for Hoisting

(Ref. Table 201 thru Table 204) The maximum weights for large components that may require hoisting are listed.

CAUTION Use hoist with minimum 3500 pound (1589 kg) capacity when hoisting complete helicopter. Use hoisting equipment with minimum 20% overrate to hoist heavier components of helicopter (Ref. Table 201 thru Table 204 for approximate weights).

Table 201. Approximate Maximum Hoisting Weights of Components - 369D/E

Item	Wgt Lb/kg
Tailboom	18/8
Main rotor hub	85/39
Main transmission (wet) (369D25100)	105/48
Main transmission (wet) (369F5100)	140/64
Engine (built-up) C20B	192/87
Engine (built-up) C20R/2	207/94
Helicopter (less main rotor hub, swashplate, scissors and rotor blades)	1153/523
Helicopter (complete)	1361/618

Table 202. Approximate Maximum Hoisting Weights of Components - 369FF

Item	Wgt Lb/kg
Tailboom	23/10
Main rotor hub	92/42
Main transmission (wet) (369D25100)	105/48
Main transmission (wet) (369F5100)	140/64
Engine (built-up)	271/123
Helicopter (less main rotor hub, swashplate, scissors and rotor blades)	1369/622
Helicopter (complete)	1589/721

Table 203. Approximate Maximum Hoisting Weights of Components - 500N

Item	Wgt Lb/kg
Tailboom (w/o empennage, thruster)	35/16
Main rotor hub	92/42
Main transmission (wet) (369D25100)	105/48
Main transmission (wet) (369F5100)	140/64
Engine (built-up)	207/94
Helicopter (less main rotor hub, swashplate, scissors and rotor blades)	1314/597
Helicopter (complete)	1542/700

Table 204. Approximate Maximum Hoisting Weights of Components - 600N

Item	Wgt Lb/kg
Tailboom (w/o empennage, thruster)	55/25
Main rotor hub (with dampers, pins)	107/49
Main transmission (wet)	140/64
Engine (built-up) C47	292/133
Helicopter (less main rotor hub, swashplate, scissors and rotor blades)	1830/830
Helicopter (complete)	2100/953

2. Helicopter Hoisting

(Ref. Figure 201)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST201	Hoisting adapter
N/A	Cable or Rope

(1). Remove dome fairing (N/A 600N) from main rotor hub and install hoisting adapter (ST201) on hub so that hoisting eyebolts fit into slots on hoisting adapter.

(2). Install quick release pins.

(3). Attach cable from overhead hoist to adapter eye.

(4). Secure a line to tailboom. Have assistant hold line to keep helicopter from swinging.

(5). Hoist slowly and smoothly to maintain steady lifting force.

3. Helicopter Sling Lifting

Follow below procedures for sling lifting the helicopter.

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST201	Hoisting adapter

CAUTION Sling-lift helicopter only when other means of recovery are not available. Ensure recovery helicopter has adequate capabilities, performance and fuel to accomplish sling-lift recovery. Ensure recovery crew has experience level to assure optimum performance at assigned positions. Do not attempt lifting or lowering during adverse wind or weather conditions.

A. Helicopter Preparations

Prepare helicopter to be lifted before attempting lift to avoid damage or loss of equipment during flight.

(1). Remove dome fairing from main rotor hub (N/A 600N).

(2). Remove main rotor blades (Ref. Sec. 62-10-00).

(3). Replace and secure blade damper bolts and attaching pins.

(4). Tape elastomeric damper to pitch housing.

(5). Install hoisting adapter (ST201).

(6). Attach lifting straps or swivel-equipped cable slings that clear lead by 10 feet (3.048 M) to hoisting adapter.

(7). Secure tail rotor hub to Sta. 284 bellcrank with strap or rope (369D/E/FF only).

(8). Position one person to support tail of helicopter.

(9). Position one person to accomplish hookup to recovery helicopter.

(10). Position one person in view of recovery helicopter to act as ground guide during hookup.

B. Helicopter Lifting

WARNING **Tail of helicopter may come down sharply if helicopter is lifted abruptly.**

CAUTION Avoid dragging helicopter during lift before ground clearance is obtained. Dragging helicopter may cause extensive damage.

(1). Carefully lift helicopter. Ensure that person at tail of helicopter is familiar with above warning.

(2). Transport recovery crew and removed equipment to landing site before recovery helicopter with lifted helicopter arrives.

C. Helicopter Landing

(1). Indicate wind direction with smoke cannister.

(2). Ground guide recovery helicopter to hover into wind before lowering begins.

CAUTION Do not attempt lowering if helicopter is spinning.

(3). Lower helicopter.

(4). Restrain and support tail of helicopter as it contacts ground.

CAUTION Ground guide must signal recovery helicopter to move to one side before dropping sling or helicopter window damage may occur.

(5). Signal recovery helicopter to drop sling.

(6). Remove sling and hoist adapter.

(7). Inspect recovered helicopter to determine condition.

(8). Inspect main rotor blades prior to installation for damage caused during removal and transportation (Ref. Sec. 62-10-00).

4. Helicopter Jacking

(Ref. Figure 201) Provisions for jacking helicopter are provided by two (369D/E/FF - 500N) or four (600N) forward (side) jacking point fittings and an aft jacking pad. The aft jack pad locations differ for the 369D/E/FF and the 500/600N helicopters.

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST202	Jack fittings
ST203	Hydraulic jack: 1-5 ton (900-4500 kg)
ST204	Hydraulic jack: 80 inch (203 cm) leg

(1). Install jack fittings (ST202) in fuselage jacking points. Secure jack fittings with locking pins located in fuel cell access doors.

NOTE: When jacking the 600N helicopter, only use the forward and aft jacking points.

(2). Place suitable jacks (ST203 or ST204) under jack fittings and AFT jacking pad.

NOTE: If helicopter is jacked from one side only, in next step, a cushioned saddle-type support should be placed under tailboom at aft jacking pad location for extra stability.

(3). Raise helicopter to desired height.

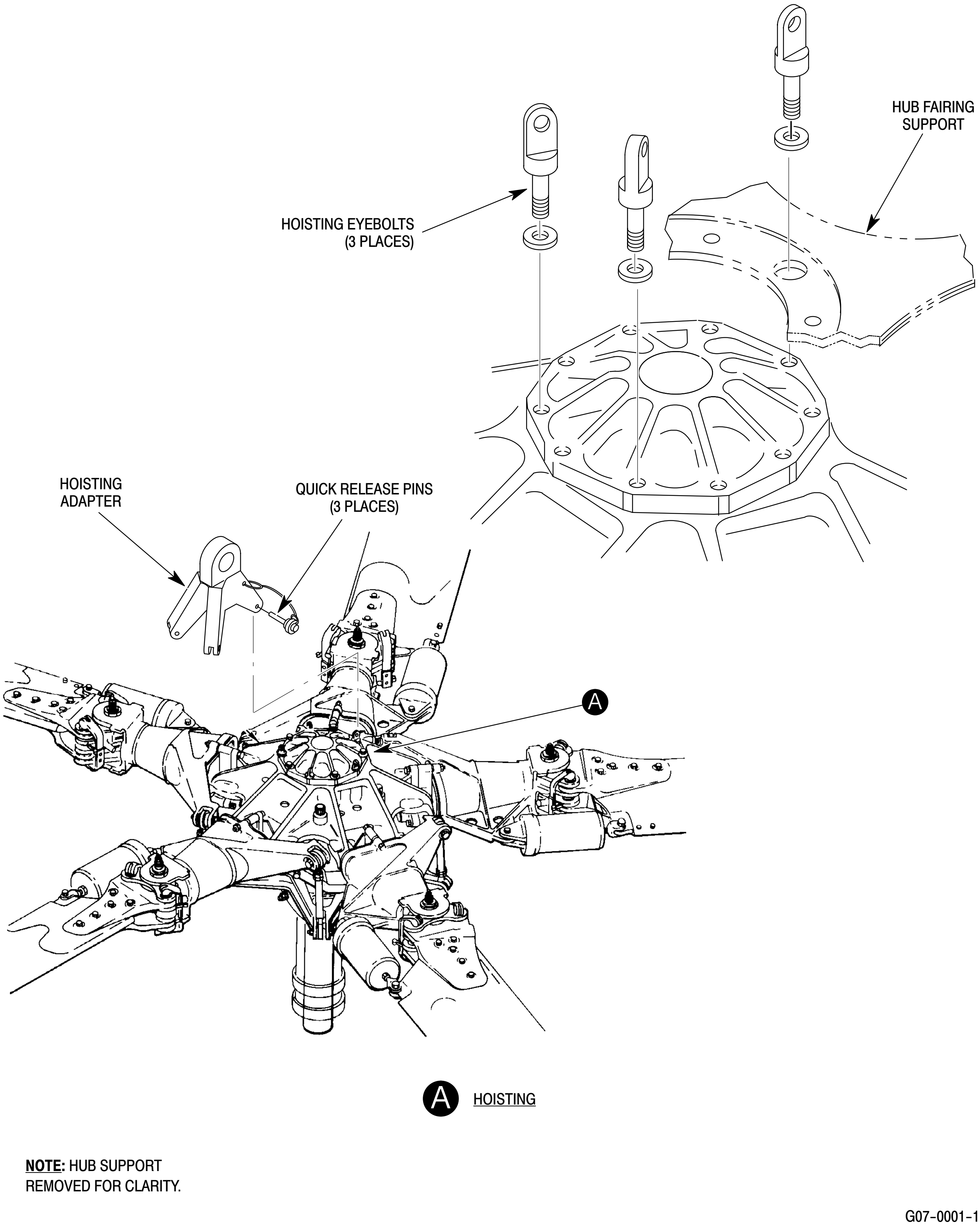

Figure 201. Hoisting and Jacking Helicopter (Sheet 1 of 3)

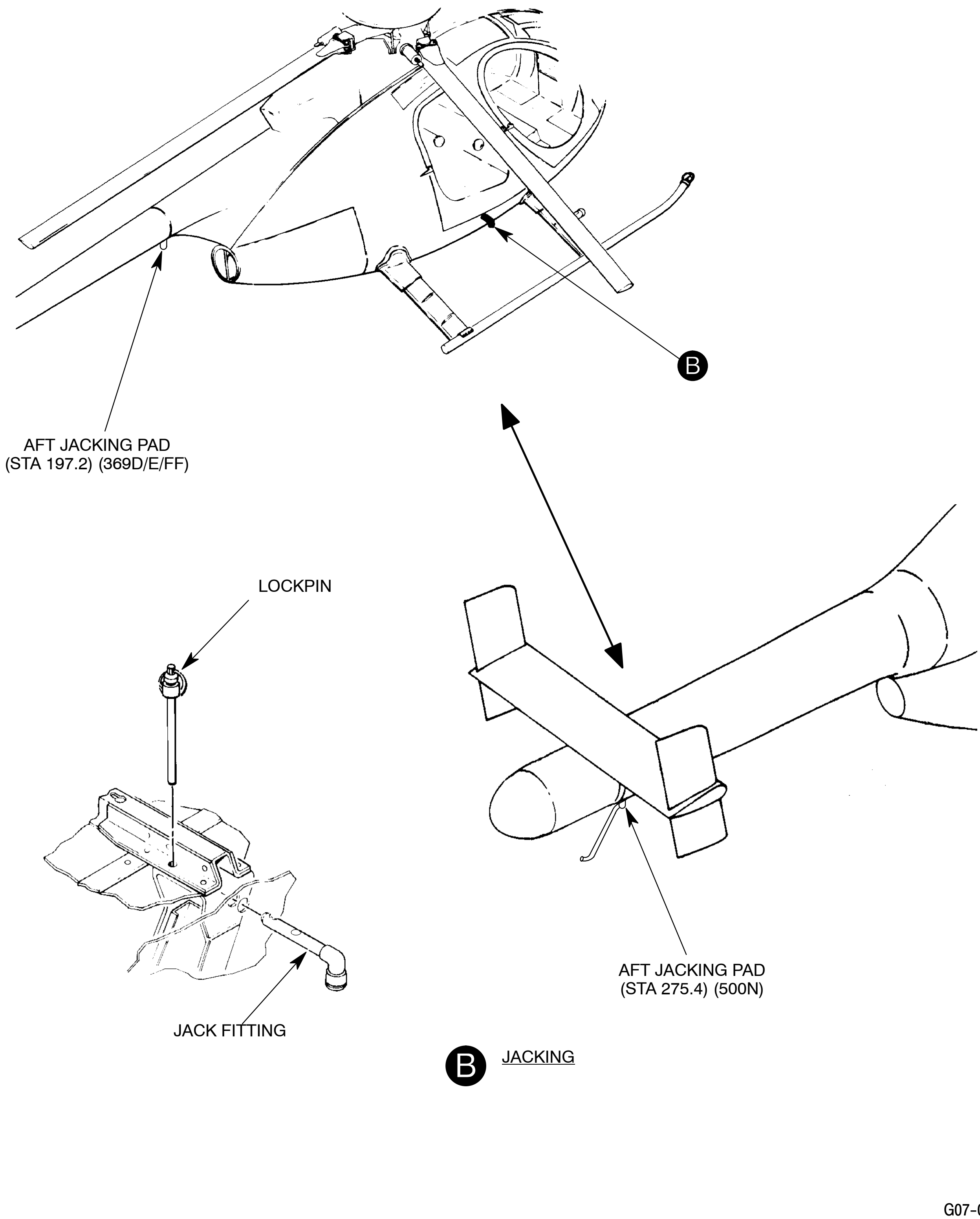

Figure 201. Hoisting and Jacking Helicopter (Sheet 2 of 3)

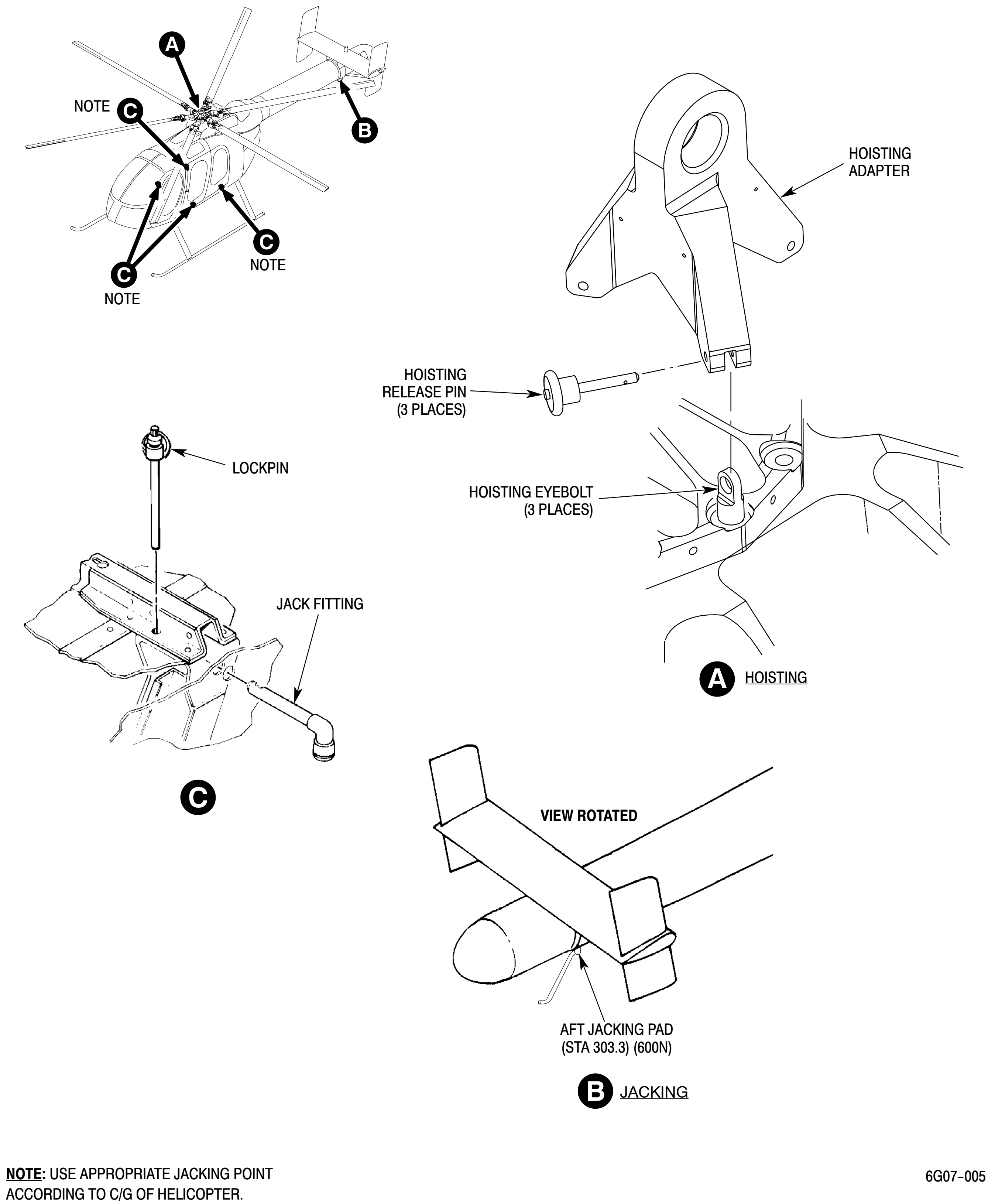

Figure 201. Hoisting and Jacking Helicopter (Sheet 3 of 3)

Chapter

08

Leveling/Weight and Balance

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08-00-00

Leveling

LEVELING
MAINTENANCE PRACTICES

1. Helicopter Leveling

(Ref. Figure 201) Leveling is accomplished by positioning helicopter to align a plumb bob with register marks on the target plate on cargo compartment floor.

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
N/A	Plumb bob (commercially available)
N/A	Twine
N/A	Electronic weighing kit
ST202	Jack fittings
ST203	Hydraulic jack: 1-5 ton (900-4500 kg)

NOTE: Access to plumb line support bracket and target plate on floor of passenger/cargo compartment requires removal of trim on right side of controls tunnel, and floor carpet in aft compartment (Ref. Chap. 25).

(1). Suspend plumb line from bracket on right side of controls tunnel at Sta. 92.64, BL+ 6.20.

(2). Adjust plumb line swing to leveling target plate on floor of passenger/cargo compartment.

(3). With weight of helicopter supported by load cells of electronic weighing kit or jacks (ST203), as applicable, adjust appropriate jack until plumb line is centered (Ref. Sec. 07-00-00, Helicopter Jacking).

(a). Adjust side jacks to level helicopter laterally.

(b). Adjust tailboom jack to level helicopter longitudinally.

(c). Recheck lateral and longitudinal levels until plumb bob exactly aligns with marks on target plate.

(4). After leveling helicopter, remove plumb bob, reinstall trim and carpet, and close compartment door.

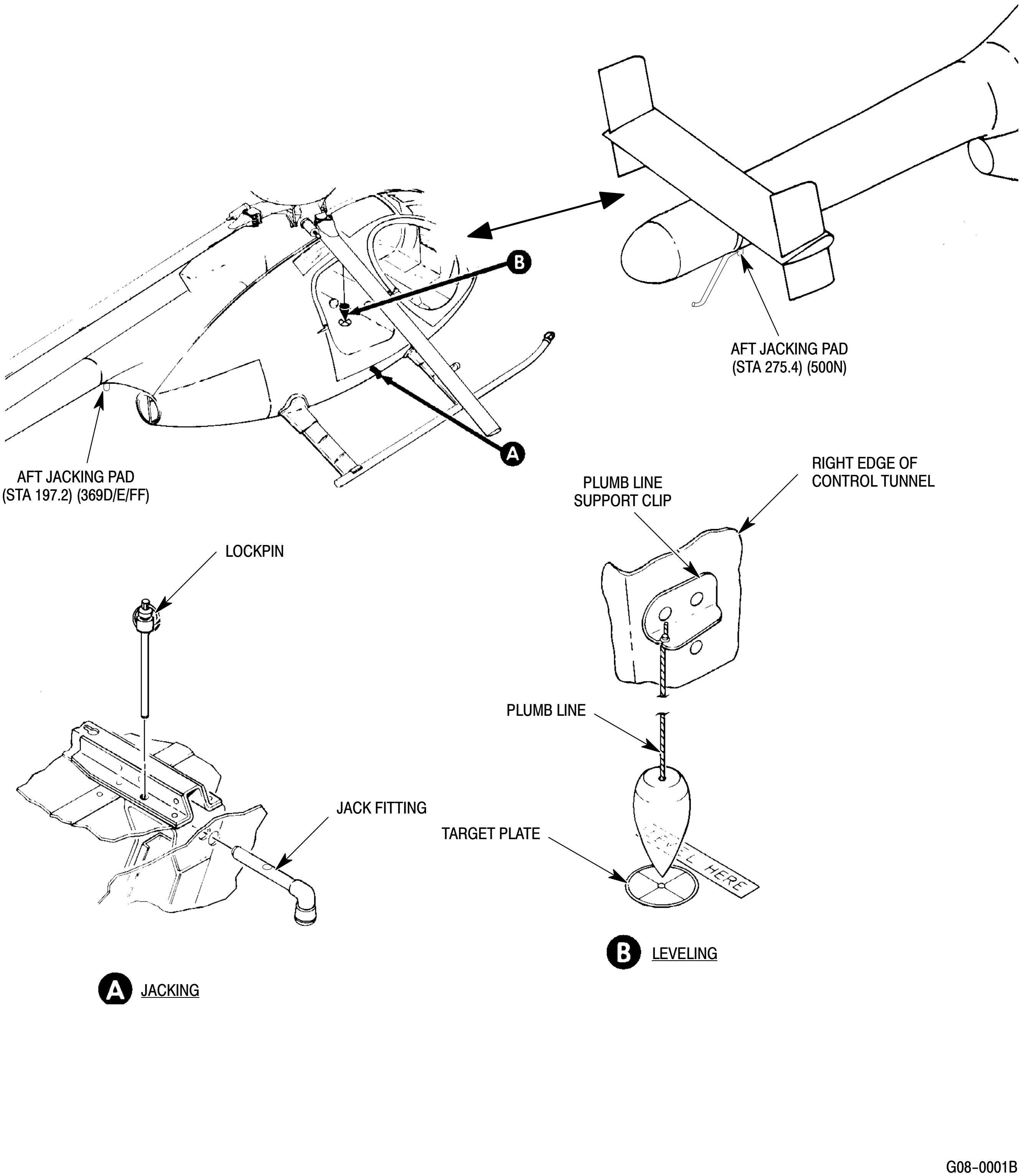

Figure 201. Leveling Helicopter (Sheet 1 of 2)

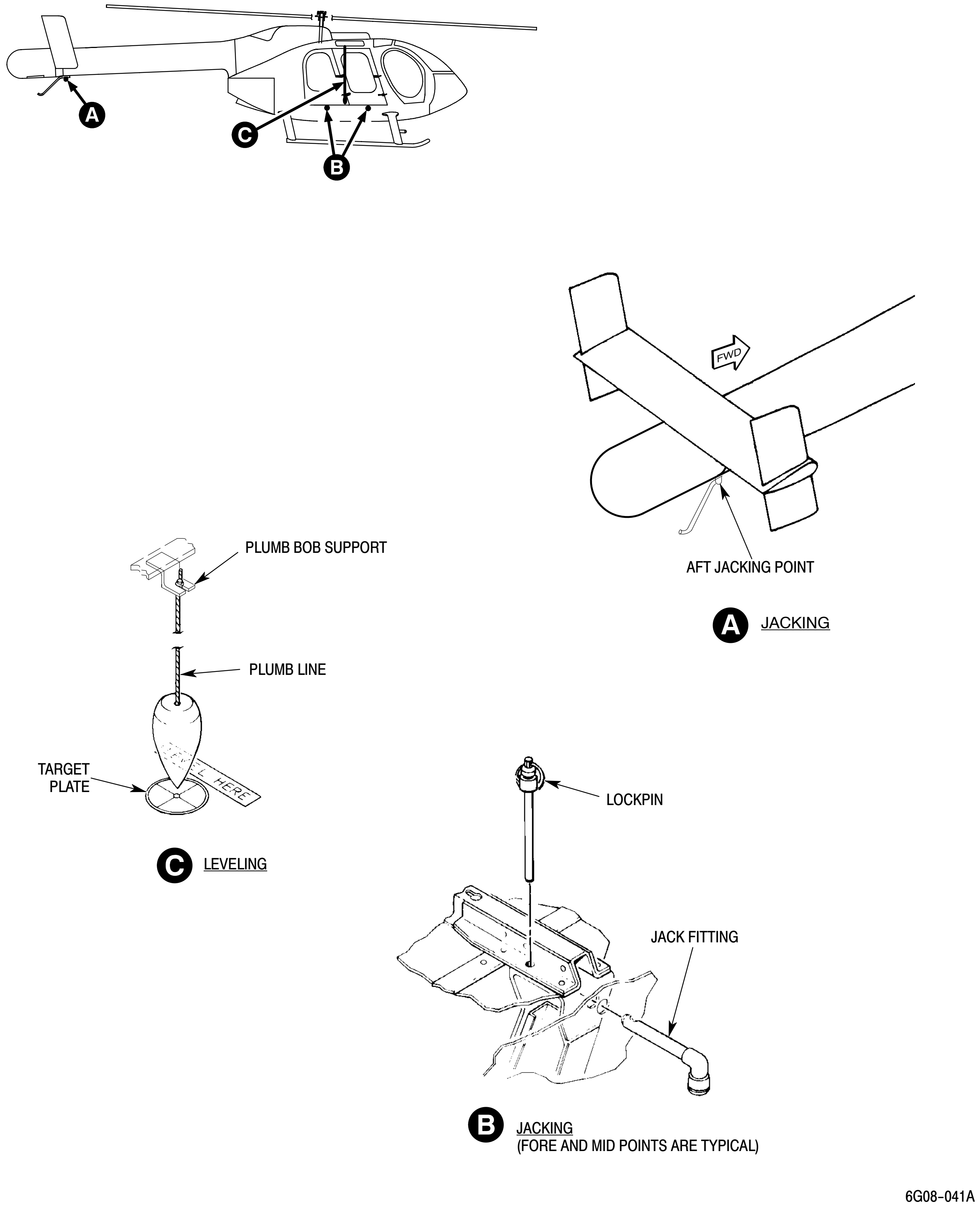

Figure 201. Leveling Helicopter (Sheet 2 of 2)

Section

08-10-00

Weight and Balance

WEIGHT AND BALANCE
MAINTENANCE PRACTICES

1. General Weight and Balance Information

(1). Removal or addition of fuel or equipment results in changes to weight and balance of a helicopter, and the permissible useful load is affected accordingly. These changes must be investigated to eliminate possible adverse effects on the helicopter's flight characteristics.

(2). Basic weight and corresponding center of gravity is determined by weighing the helicopter without crew and payload; however, basic weight does include trapped and unusable fuel, full operating fluids, lubricants, etc., and installed equipment.

(3). 369D/E/FF - 500N - The longitudinal reference datum is located 100 inches (254 cm) forward of the main rotor centerline. The lateral reference datum is located along the longitudinal centerline of the helicopter. The vertical reference datum is located at a point 100 inches (254 cm) below the center of the main rotor blades.

(4). 600N - The Weight and Balance longitudinal reference datum is located 100 inches (254 cm) forward of the main rotor centerline or 15 inches (38.1 cm) aft of the aircraft nose. The Weight and Balance (longitudinal) Reference Datum is different from the Fuselage/ Engineering Reference Datum (Ref. Section 06-00-00). The lateral reference datum is located along the longitudinal centerline of the helicopter. The vertical reference datum is located at a point 83 inches (210.8 cm) below the center of the main rotor blades.

(5). Refer to the following for balance diagrams
Figure 201 for Model 369D
Figure 202 for Model 369E
Figure 203 for Model 369FF
Figure 204 for Model 500N
Figure 205 for Model 600N.

NOTE: Weight and balance information for optional equipment is found in the Initial Installation section for the optional equipment.

Parameter	Wt lb/kg
Certified Gross Weight (369D/E)	3000/1362
Certified Gross Weight (369FF)	3100/1407
Certified Gross Weight (500N)	3350/1521
Certified Gross Weight (600N)	4700/2132
Cargo Deck Capacity (369D/E/FF - 500N)	1300/590
Cargo Deck Capacity (600N)	1350/613
Cargo Deck Capacity not to exceed 115 pounds per square foot	

A. Approved Center of Gravity Limits

(Ref. PFM)

B. Terminology

Following are terms with definitions, used when determining helicopter weight and balance:

(1). Arm: The distance in inches from the longitudinal (longitudinal arm) and lateral (lateral arm) reference datum of a part to the center of gravity (CG) of the part.

NOTE: When viewing helicopter from rear, items to left of lateral reference datum (center line of helicopter) will be expressed as having negative (-) lateral arm, and those items to right of reference datum, a positive (+) lateral arm.

(2). Center of gravity (CG): A point on a part where the part will be perfectly balanced. Center of gravity is measured in inches from a known reference. It can be determined using the following formula:

$$\text{CG(in)} = \frac{\text{Moment (in-lb)}}{\text{Weight (lb)}}$$

(3). Moment: Product of weight of a part and its arm, either longitudinal or lateral, and is expressed in inch-pounds (in-lb).
Longitudinal moment = weight x longitudinal arm;
Lateral moment = weight x lateral arm.

(4). Reaction point: A fixed point on helicopter where weight of helicopter counteracts on a weighing device. The main reaction points are;

(a). ALL: Long. Sta. 96.9.

(b). 369D/E/FF - 500N: Lat. Sta. ±25.6.

(c). 600N: Lat. Sta. ±26.0.

(d). 369D/E/FF: Tail reaction point is at Long. Sta. 197.2, Lat. Sta. 0.0.

(e). 500N: Tail reaction point is at Long. Sta. 275.4, Lat. Sta. 0.0.

(f). 600N: Tail reaction point is at Long. Sta. 303.3, Lat. Sta. 0.0.

2. Helicopter Weighing

Forms

Nomenclature	Form No.	Figure No.
Weight and Balance Report	765B	206
Surplus and Missing Items	1702	207
Basic Weight and Balance Record	885	208

CAUTION

- The controls access panel (aft side of Sta. 78.5 bulkhead) and the fuel cell access panels must be installed before jacking helicopter.
- 369D/E/FF - 500N: There are two methods approved for weighing the helicopter. The preferred method is by using electronic weighing equipment. If equipment for electronic weighing is unavailable, the second approved method, mechanical scales, may be used.
- 600N: There is one method approved for weighing the helicopter. The method is by using electronic weighing equipment.

A. Helicopter Weighing Preparation

The following items are required and should be readily available prior to preparing and weighing the helicopter, using the electronic weighing method.

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST202	Jack fittings

NOTE:

- Weigh helicopter without fuel if possible.
- 369D/E/FF - 500N: If fuel is drained from low point in cell, 1.4 pounds (0.64 kg) of trapped fuel at 93.5 inch (237.5 cm) arm will remain. If fuel is pumped out using start pump, 3.7 pounds (1.68 kg) of trapped (unusable) fuel at 93.5 inch (237.5 cm) arm will remain.
- 600N: If fuel is drained from low point in cell, 1.6 pounds (0.73 kg) of trapped (unusable) fuel at 93.5 inch (237.5 cm) arm will remain. If fuel is pumped out using start pump, 9.5 pounds (4.31 kg) of trapped (unusable) fuel at 93.5 inch (237.5 cm) arm will remain.

(1). If defueling is not possible, ensure that fuel cell is full.

(a). Fluid weights at 70° ambient are:

Fuel (Jet A)
6.75 Lb (3.06 kg) per U.S. gallon

Fuel (JP-4)
6.50 Lb (2.95 kg) per U.S. gallon

Fuel (JP-5)
6.80 Lb (3.09 kg) per U.S. gallon

Fuel (JP-8)
6.75 Lb (3.06 kg) per U.S. gallon

PRC Fuel (No 3)
6.75 Lb (3.06 kg) per U.S. gallon

Lubricating Oil
7.70 Lb (3.50 kg) per U.S. gallon

(2). De-fuel helicopter (Ref. Sec. 12-00-00).

(3). Select weighing area that is enclosed and draft-free, with hard-surfaced floor.

(4). Ensure that helicopter and weighing area is cleared of all tools and debris.

(5). 369D/E/FF - 500N: Verify that five main rotor blades are uniformly spaced (72 degrees apart).
600N: Verify that six main rotor blades are uniformly spaced (60 degrees apart).

(6). Check lubricant level at engine oil tank, main rotor gear box and tail rotor or fan gearbox sight gages. Add lubricant as necessary where less than full indication is noted (Ref. Sec. 12-00-00).

(7). Record weight, arm and moment of surplus equipment on board helicopter at time of weighing, which will not be part of basic helicopter weight (Ref. Figure 206).

(8). Record weight, arm and moment of missing equipment, to be installed after weighing and prior to flight, that will become part of basic helicopter weight (Ref. Figure 206).

(9). Install two fuselage jack fittings (ST202) for main weighing points at Longitudinal Sta. 96.9 and Lateral Sta. ±25.6. Secure fittings with pip pins.

B. Preparation for Weighing - Electronic Method

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
N/A	Electronic weighing kit/Platform Scales
N/A	Roll-away table (with weighing platform)
N/A	Plumb Bob
ST203	Hydraulic jack: 1-5 ton (900-4500 kg)
ST204	Hydraulic jack: 80 inch (203 cm) leg

(1). Position hydraulic jack (ST203) under each of main jacking points at Sta. 96.9, left and right sides of helicopter.

(2). Position third hydraulic jack (ST203 or ST204), on roll-away table if needed, and attached load cell at aft jacking point of helicopter.

(3). Attach electronic weighing kit load cell to each jack, and to weighing kit control unit.

(4). Turn electronic weighing kit power ON and allow warm up time as specified in electronic weighing kit operation manual.

(5). Calibrate and zero-in each load cell prior to applying aircraft load (Ref. Electronic Weighing Kit operation manual).

CAUTION On the 600N helicopter, never exceed aft (tailboom) jack load of 500 Lbs (227 kg).

(6). Exercise load cells by jacking all three jacks simultaneously until load is supported by load cells at all jack point stations. Do not check helicopter level at this time.

(7). Lower helicopter to floor so that no load is supported by load cells.

(8). Repeat above steps (exercise load cells and lower helicopter) twice.

(9). Recheck calibration and zero of each load cell.

C. Helicopter Weighing - Electronic Method

When preparations have been made (Ref. Helicopter Weighing Preparation and Preparation for Weighing - Electronic Method), weigh helicopter as follows:

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
N/A	Spirit level
N/A	Plumb Bob
ST203	Hydraulic jack: 1-5 ton (900-4500 kg)
ST204	Hydraulic jack: 80 inch (203 cm) leg
ST205	Inclinometer

(1). Operate three hydraulic jacks (ST203 and/or ST204) simultaneously until entire load is supported by load cells.

NOTE: If conditions permit, helicopter may be leveled using plumb bob instead of spirit level (Ref. Sec. 08-00-00).

(2). After landing gear skids are clear of floor, level helicopter as follows:

(a). Remove main rotor hub fairing (Ref. Sec. 62-20-00) (N/A 600N).

(b). Check lateral level by placing spirit level on main rotor mast, with axis of spirit level 90 degrees to longitudinal axis of helicopter. Adjust left or right jack at main jack points, as required, to center bubble in spirit level.

(c). Place protractor or inclinometer (ST205) on main rotor mast so that its axis is parallel to longitudinal axis of helicopter. Adjust jack at aft jacking point until protractor or inclinometer shows 3 degrees forward tilt.

(d). Reinstall hub fairing (N/A 600N).

(3). Record reading shown on weighing kit control unit for each load cell (Ref. Figure 209, example 1(a)).

(4). Lower helicopter to floor by bleeding off jacks, and clear load cells.

(5). Record reading on control unit for each load cell under NO LOAD condition (Ref. Figure 209, example 1(b)). This reading represents calibration correction for each load cell. Depending on sign shown on control unit (+ or -), reading will have to be added to or subtracted from reading in step (3). above to obtain corrected weight for each cell (Ref. Figure 209, example 1(c)).

(6). Add corrected readings for all three cells to determine total unadjusted net weight of helicopter (Ref. Figure 209, example 1(c).

D. Preparation for Weighing - Mechanical Scales Method (369D/E/FF - 500N Only)

When preparing to weigh helicopter using mechanical scales, complete preliminary procedure (Ref. Helicopter Weighing Preparation), then perform the following:

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
N/A	Roll-away table (with weighing platform)
N/A	Beam platform scales (two), 1000 lb. (450 kg) capacity with current calibration
N/A	Platform scale, 300 lb. (135 kg) capacity with current calibration
ST202	Jack fittings
ST203	Hydraulic jack: 1-5 ton (900-4500 kg)
ST204	Hydraulic jack: 80 inch (203 cm) leg

(1). Check 1,000 lb. (450 kg) capacity scales for zero.

(2). Place 300 lb. (135 kg) capacity scale on roll-away table with weighing platform, and check zero on scale.

(3). Hoist helicopter so that main landing gear skids are sufficiently clear of floor to enable 1,000 lb. (450 kg) capacity beam platform scales to be rolled under main skids on left and right sides.

(4). Roll 1,000 lb. (450 kg) capacity beam platform scales under main skids and position so main jack fittings (ST202) at Sta. 96.9 are on centerline of scale.

(5). Place jack (ST203) on 300 lb. (135 kg) capacity platform scale (67). Position roll-away table so that jack and 300 pound capacity scale are directly below AFT jacking point.

(6). Lower helicopter so its weight is supported by scales.

(7). Place jack on each 1,000 lb. (450 kg) capacity platform scale, inboard of main skids and directly below main jacking points at Sta. 96.9.

E. Weighing Procedures - Mechanical Scales Method (369D/E/FF - 500N Only)

Once preparations have been completed (Ref. Helicopter Weighing Preparation and Preparation for Weighing - Mechanical Scales Method), weigh helicopter as follows:

(1). Operate jacks (ST203 and/or ST204) simultaneously until helicopter is supported only by jacks at right and left Sta. 96.9 and AFT reaction points.

NOTE: If conditions permit, helicopter may be leveled using plumb bob instead of spirit level (Ref. Sec. 08-00-00).

(2). With main skids clear of 1,000 lb. (450 kg) capacity platform scales, level helicopter (Ref. Helicopter Weighting - Electronic Method).

(3). Record weight shown on scale at each reaction point (Ref. Figure 209, example 1(a)).

(4). Simultaneously bleed off hydraulic jacks until helicopter skids contact 1,000 lb. (450 kg) platform scales, and total weight of helicopter is supported by scales and AFT jack point.

(5). Remove jacks from 1,000 lb. (450 kg) capacity platform scales.

(6). Hoist helicopter until scales at right and left sides and jack at aft reaction point can be rolled clear of helicopter (Ref. Sec. 07-00-00).

(7). Lower helicopter to floor.

(8). Weigh each jack on same scale jack occupied during helicopter weighing to get the tare weight. Record the tare weight at each reaction point (Ref. Figure 209, example 1(b)).

(9). Subtract total tare weight for the three reaction points obtained in step h above from weight recorded in step c above to obtain total unadjusted net weight of helicopter (Ref. Figure 209, example 1(c)).

F. Longitudinal CG Determination for Unadjusted Net Weight (369D/E/FF - 500N Only)

(1). Multiply net weight obtained at each jacking point by its longitudinal arm, to obtain a moment (Ref. Figure 209, example 1(d)).

(2). Add three moments determined in step (1). to calculate total moment (Ref. Figure 209, example 1(e)).

(3). Divide total moment obtained in step (2). by total unadjusted net weight, to determine longitudinal CG (Ref. Figure 209, example 1(f)).

G. Lateral CG Determination for Unadjusted Net Weight

NOTE: Lateral CG is not critical with normal internal loading. Certain optional equipment, such as an external cargo hook, may induce lateral CG outside lateral CG limits, if weight and CG control is not provided. However, the Initial Installation section for each optional equipment installation provides complete instructions on lateral CG control, to ensure operation within approved limits.

(1). Multiply net weight for each jacking point by its lateral reaction point (369D/E/FF - 500N: left main, -25.6; right main, +25.6; and aft, zero) (600N: left main, -26.0; right main, +26.0; and aft, zero) to obtain moment for each jacking point (Ref. Figure 209, example 1(g)).

(2). Add three moments determined in step (1). above to calculate total moment (Ref. Figure 209, example 1(h)).

(3). Divide total moment by total unadjusted net weight to determine lateral CG (Ref. Figure 209, example 1(i)).

H. Basic Weight and CG Determination

Using unadjusted net weight and longitudinal moment, determine basic weight and CG of helicopter (Ref. Figure 209, example 1).

(1). Add total weight and moment of missing equipment to unadjusted net weight and moment of helicopter.

(2). Subtract total weight and moment of surplus equipment from weight and moment of helicopter determined in step (1). above.

(3). Enter total basic weight, CG and moment in Basic Weight and Balance Record (Ref. Figure 208).

NOTE: Any changes that will affect basic weight and CG of helicopter must be recorded on Basic Weight and Balance Record (Ref. Figure 208), and revised basic weight and CG of helicopter must be calculated (Ref. PFM for preflight weight and balance requirements).

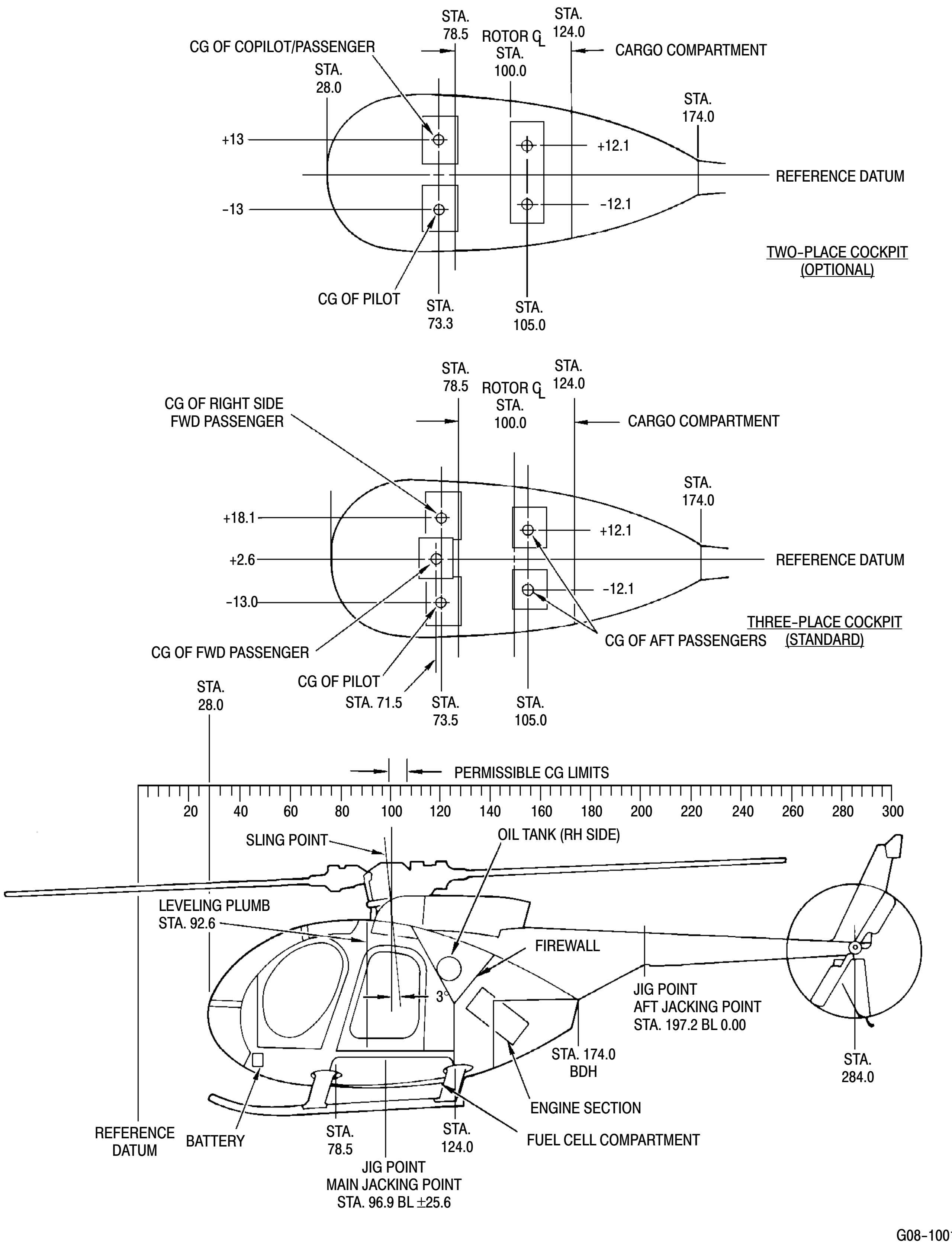

Figure 201. Balance Diagram - Model 369D

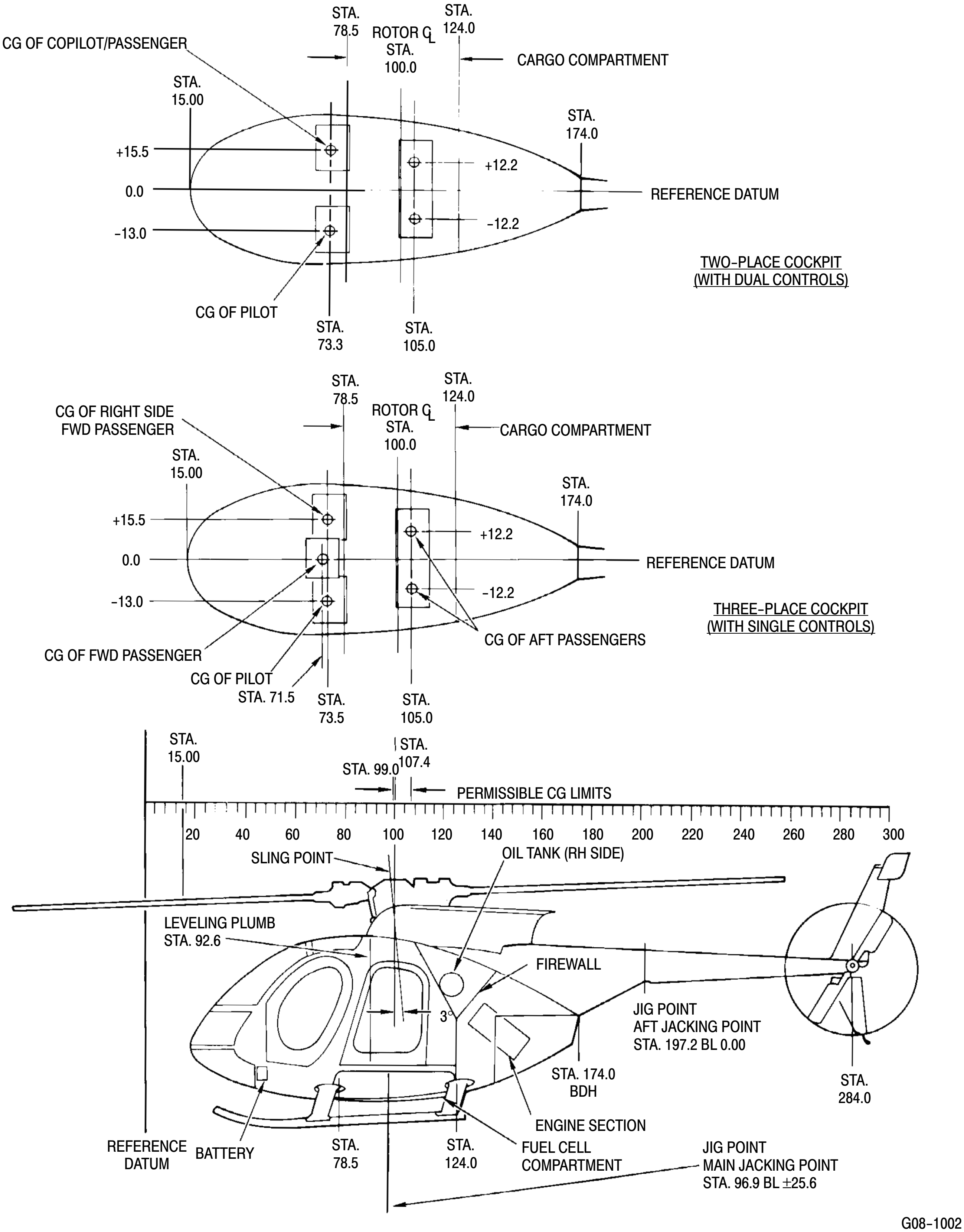

Figure 202. Balance Diagram - Model 369E

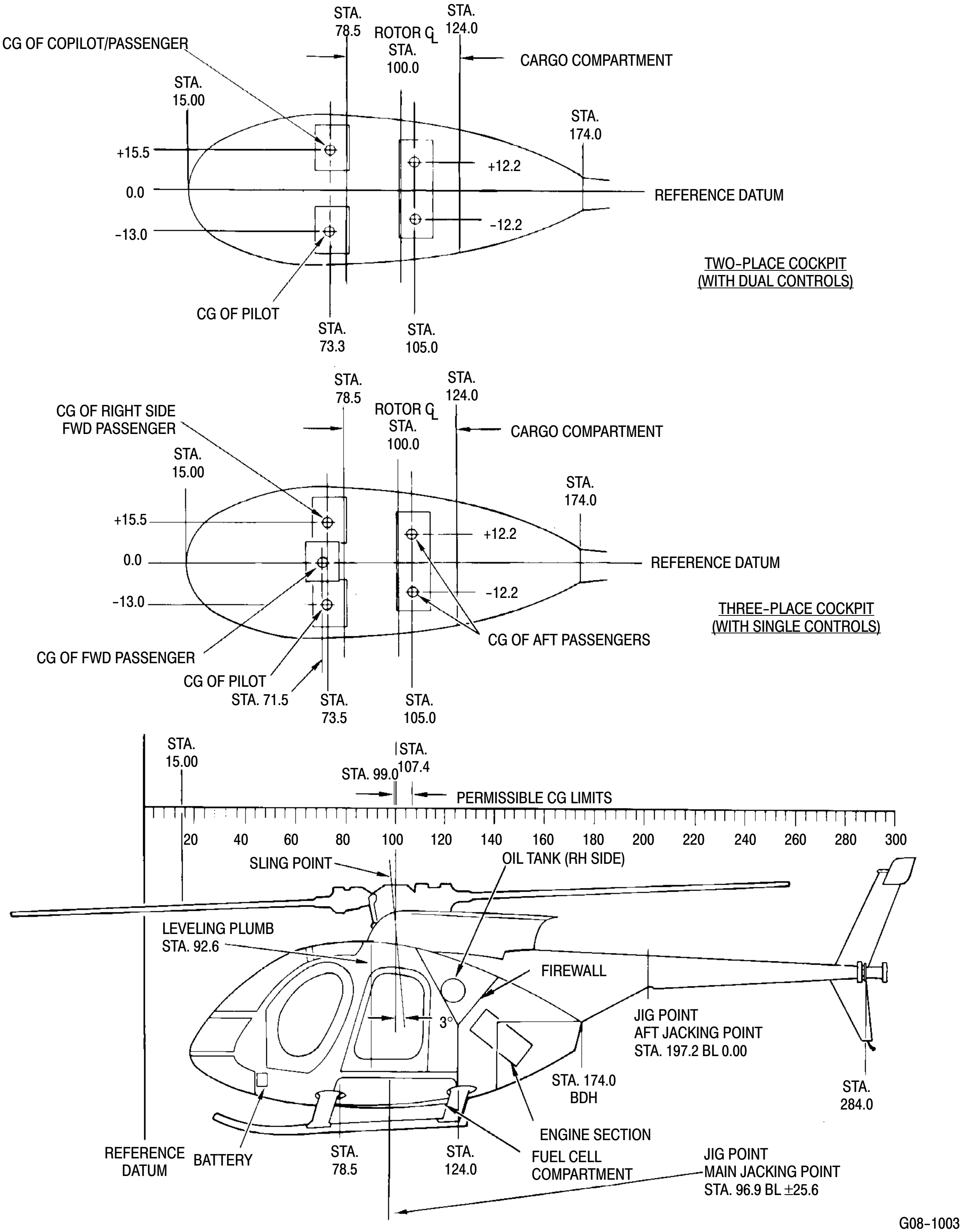

Figure 203. Balance Diagram - Model 369FF

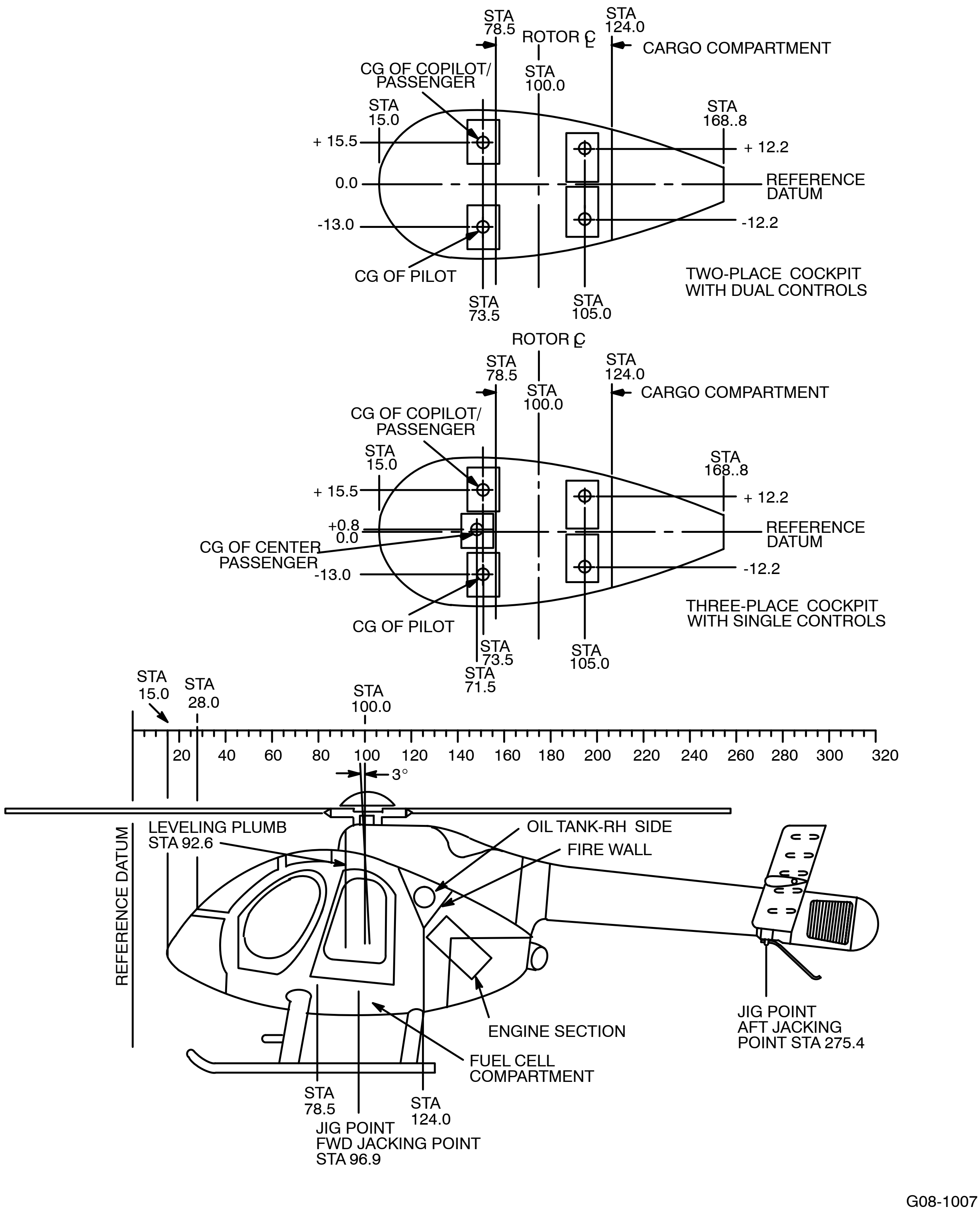

Figure 204. Balance Diagram - Model 500N

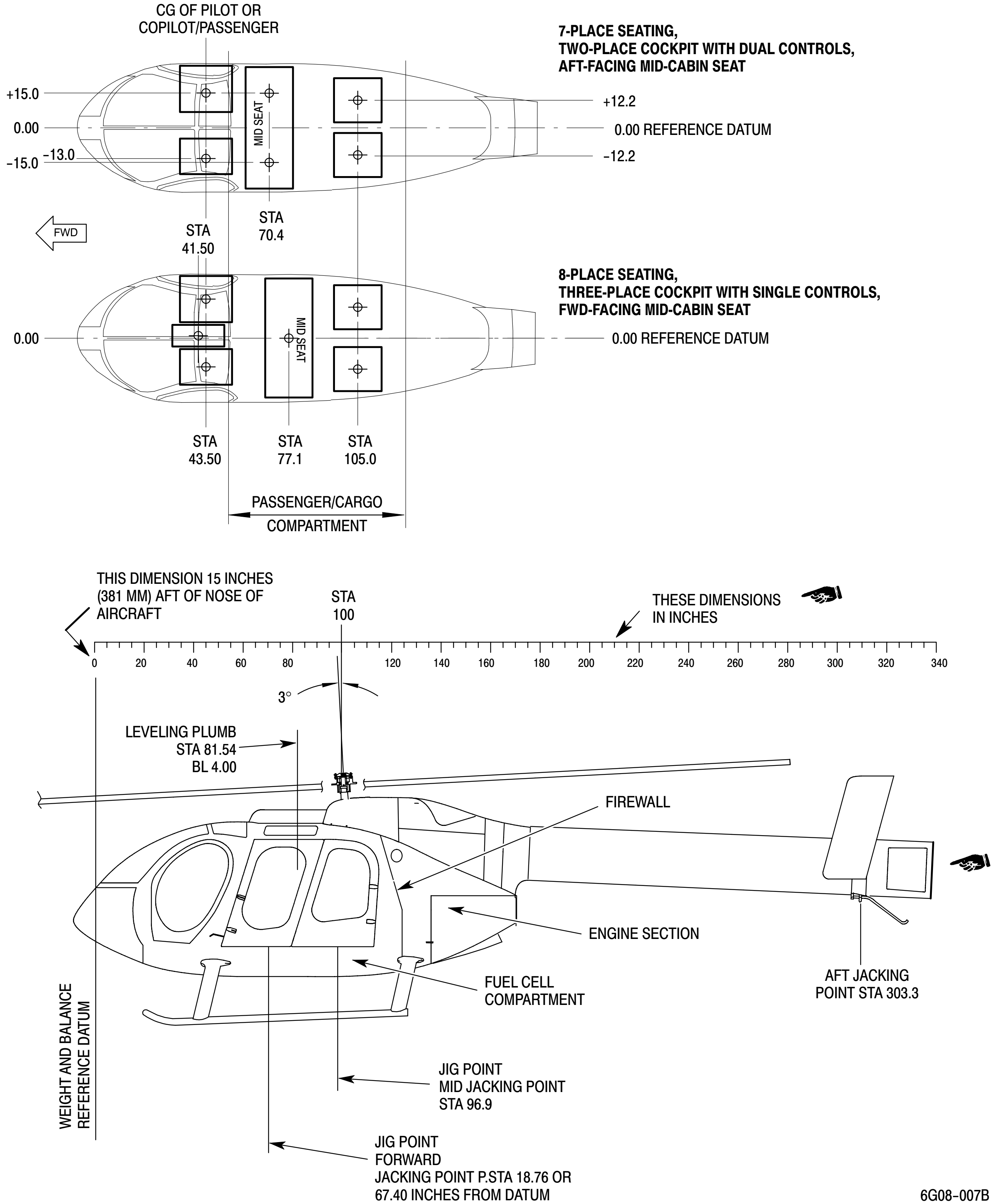

Figure 205. Balance Diagram - Model 600N

WEIGHT AND BALANCE REPORT

MODEL ____________

WEIGHED BY________________________________ CONFIGURATION______________________

MODEL____________ SERIAL NO.______________ REGISTRATION NO.__________ DATE_____________

WEIGHING POINTS	SCALE READING (LBS)	TARE OR CALIBRATION CORRECTION (LBS)	NET WEIGHT (LBS)	LONGITU-DINAL ARM (INCHES)	LATERAL ARM (INCHES)	LONGITU-DINAL MOMENT (INCH-LBS)	LATERAL MOMENT (INCH-LBS)
LEFT MAIN				96.9	-26.0		
RIGHT MAIN				96.9	+26.0		
TAIL				303.3	0.0		
TOTAL UNADJUSTED NET WEIGHT							
TOTAL WEIGHT OF SURPLUS EQUIPMENT (SEE TABLE 1)			-				
TOTAL WEIGHT OF MISSING EQUIPMENT (SEE TABLE 1)			+				
TOTAL BASIC WEIGHT							

FUEL/OIL ABOARD AT TIME OF WEIGHING:

	EMPTY	FULL
FUEL		
ENGINE OIL		
MAIN GEAR BOX		
TAIL GEAR BOX		

FORM 765B (REV 4-83) Page 1 of ______

McDonnell Douglas
Helicopter Company

Figure 206. Weight and Balance Report Form (Sheet 1 of 2)

MODEL ______________ SERIAL NO.__________________ REGISTRATION NO.____________________ DATE____________

EXAMPLES OF FORWARD, AFT AND LATERAL LOADING

EXAMPLE 1, FORWARD	WEIGHT (LBS)	LONG. ARM (IN.)	LONG. MOMENT (IN. LB.)
BASIC WEIGHT			
PILOT		43.5	
COPILOT		43.5	
FULL FUEL QUANTITY			
GROSS WEIGHT (CRITICAL FUEL) - FWD C.G.			

APPROVED FWD C.G. LIMIT FOR EXAMPLE 1 GROSS WEIGHT____*_____INCHES.

EXAMPLE 2, AFT	WEIGHT (LBS)	LONG. ARM (IN.)	LONG. MOMENT (IN. LB.)
BASIC WEIGHT			
PILOT			
GROSS WEIGHT (ZERO FUEL) - AFT C.G.			

APPROVED AFT C.G. LIMIT FOR EXAMPLE 2 GROSS WEIGHT_____*_____INCHES.

EXAMPLE 3, LATERAL	WEIGHT (LBS)	LATERAL ARM (IN.)	LATERAL MOMENT (IN. LB.)
BASIC WEIGHT			
PILOT			
GROSS WEIGHT (ZERO FUEL) - LATERAL C.G.			

APPROVED LATERAL C.G. FOR EXAMPLE 3 GROSS WEIGHT______*_____INCHES.

*SEE FLIGHT MANUAL, SECTION 6, FOR C.G. LIMITS AT GROSS WEIGHT

Figure 206. Weight and Balance Report Form (Sheet 2 of 2)

TABLE 1 SURPLUS AND MISSING EQUIPMENT

MODEL __________ SERIAL NO. ________________ REGISTRATION NO. ________________ DATE ___________

	WEIGHT	ARM - INCHES		MOMENT - IN/LBS	
EQUIPMENT - ITEM	LBS	LONG	LATR	LONG	LATR
SURPLUS EQUIPMENT TOTAL:	(1.3)	(96.9)	( )	(126)	( )
JACK PADS (2)	1.3	96.9		126	
MISSING EQUIPMENT TOTAL:	(15.9)	(97.4)	( )	(1549)	( )
ONE QT. ENGINE OIL	2.1	133.4		280	
UNUSABLE FUEL	12.0	93.0		1116	
FLIGHT MANUAL	1.8	85.0		153	

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Figure 207. Surplus and Missing Items Report

BASIC WEIGHT AND BALANCE RECORD

(CONTINUOUS HISTORY OF CHANGES IN STRUCTURE OR EQUIPMENT AFFECTING WEIGHT AND BALANCE)

AIRCRAFT MODEL | SERIAL NUMBER | REGISTRATION NUMBER | PAGE OF

DATE	ITEM NO. IN	ITEM NO. OUT	DESCRIPTION OF ARTICLE OR MODIFICATION	WEIGHT CHANGE ADDED (+) WEIGHT	ADDED (+) LONG. ARM	ADDED (+) MOMENT[1] IN LB	REMOVED (-) WEIGHT	REMOVED (-) LONG ARM	REMOVED (-) MOMENT[1] IN LB	RUNNING TOTAL BASIC AIRCRAFT WEIGHT	LONG ARM	MOMENT[1] IN LB
			Basic Weight - Delivery							1510.0	109.0	164561

[1] ENTER CONSTANT USED BELOW LINE

FORM 885 (REV 2/82)

McDonnell Douglas Helicopter Company

SAMPLE

G08-1006A

Figure 208. Basic Weight and Balance Record

Determining total unadjusted net weight and longitudinal CG - 369D/E/FF

Weighing Points	(a) Scale Reading (lbs)	(b) Tare or Calibration Correction (lbs)	(c) Net Weight (lbs)	Arm (inches)	(d) Moment (in.-lb)
Left Main	648.9	- 1.5	647.4	96.9	62733
Right Main	618.9	+ 0.5	619.4	96.9	60020
Tail	195.9	0	195.9	197.2	38631
Total Unadjusted Net Weight			1462.7	110.3 (f)	161384 (e)

Determining total unadjusted net weight, longitudinal and lateral CG - 500MD

Weighing Points	(a) Scale Reading (lbs)	(b) Tare or Calibration Correction (lbs)	(c) Net Weight (lbs)	Longitudinal Arm (inches)	Lateral Arm (inches)	(d) Longitudinal Moment (inch-lb)	(g) Longitudinal Moment (inch-lb)
Left Main	1020.0	0.0	1020.0	96.9	- 25.6	98838	62733
Right Main	939.0	0.0	939.0	96.9	+ 25.6	90989	60020
Tail	128.0	0.0	128.0	197.2	0.0	25242	0
Total Unadjusted Net Weight			2087.0	103.1 (f)	- 1.0 (i)	215069 (e)	- 2084 (h)

Determining total unadjusted net weight, longitudinal and lateral CG - 500N

Weighing Points	(a) Scale Reading (lbs)	(b) Tare or Calibration Correction (lbs)	(c) Net Weight (lbs)	Longitudinal Arm (inches)	Lateral Arm (inches)	(d) Longitudinal Moment (inch-lb)	(g) Longitudinal Moment (inch-lb)
Left Main	759.0	0.0	759.0	96.9	-25.6	73547.1	-19430.4
Right Main	738.8	0.0	738.8	96.9	+25.6	71589.7	18913.2
Tail	136.8	0.0	136.8	275.4	0	3764.7	0
Total Unadjusted Net Weight			1634.6	111.8 (f)	-.3 (i)	182811.5 (e)	-5172 (h)

Figure 209. Example 1 (Sheet 1 of 2)

Determining total unadjusted net weight, longitudinal and lateral CG - 600N

Weighing Points	(a) Scale Reading (lbs.)	(b) Tare or Calibration Correction (lbs.)	(c) Net Weight (lbs.)	Longitudinal Arm (inches)	Lateral Arm (inches)	(d) Longitudinal Moment (inch-lbs.)	(g) Lateral Moment (inch-lbs.)
Left Main	919.2	0.0	919.2	96.9	-26.0	89070	-23899
Right Main	885.4	0.0	885.4	96.9	+26.0	85795	23020
Tail	104.7	0.0	104.7	303.3	0	31756	0
Total Unadjusted Net Weight			1909.3	108.2 **(f)**	-.5 **(i)**	206621 **(e)**	-879 **(h)**

Determining basic weight and the longitudinal and lateral CG - 500MD

Weighing Points	Scale Reading (lbs)	Tare or Calibration Correction (lbs)	Net Weight (lbs)	Arm (in.)	Moment (in.-lb)
Left Main	648.9	- 1.5	647.4	96.9	62733
Right Main	618.9	+ 0.5	619.4	96.9	60020
Tail	195.9	0	195.9	197.2	38631
Total Unadjusted Net Weight			1462.7	110.3	161384
Total Weight of Missing Equipment (Ref. Figure 207)			+ 21.0	93.6	+ 1966
Total Weight of Surplus Equipment (Ref. Figure 207)			- 1.3	96.9	- 126
Total Basic Weight			1482.4	110.1	163224

Determining basic weight and the longitudinal and lateral CG - 600N

Weighing Points	Scale Reading (lbs.)	Tare or Calibration Correction (lbs.)	Net Weight (lbs.)	Longitudinal Arm (inches)	Lateral Arm (inches)	Longitudinal Moment (inch-lbs.)	Lateral Moment (inch-lbs.)
Left Main	919.2	0.0	919.2	96.9	-26.0	89070	-23899
Right Main	885.4	0.0	885.4	96.9	+26.0	85795	23020
Tail	104.7	0.0	104.7	303.3	0	31756	0
Total Unadjusted Net Weight			1909.3	108.2	-.5	206621	-879
Total Weight of Missing Equipment (Ref. Figure 207)			+15.9	97.4	0	1549	0
Total Weight of Surplus Equipment (Ref. Figure 207)			-1.3	96.9	0	-126	0
Total Basic Weight			1923.9	108.1	-.5	208044	-879

Figure 209. Example 1 (Sheet 2 of 2)

Chapter

09

Towing

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Section

09-00-00

Towing

TOWING

MAINTENANCE PRACTICES

1. Ground Handling Wheels

NOTE: At regular intervals, check wheel tire pressure and repack wheel bearings (Ref. Sec. 32-40-00/32-40-60).

A. Standard Ground Handling Wheels

(Ref. Figure 201) Standard ground handling wheels, available as a special tool for helicopters not equipped with floats, are used for moving helicopter by hand and for towing helicopter. The wheels are manually lowered with a detachable jack handle and are held in the down position (helicopter raised on wheels) by a mechanical lock. The wheels for the 369D/E/FF - 500N helicopters are equipped with tow bar attach fitting.

B. Special Ground Handling Wheels (Float-Equipped Helicopters, 369D/E/FF - 500N)

Special ground handling wheels are available for towing helicopters equipped with utility or emergency floats (Ref. Sec. 32-40-00).

2. Helicopter Towing and Manual Moving (369D/E/FF - 500N)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST101	Ground handling wheels
ST102	Handle-jack assembly, ground handling (straight)
ST103	Handle-jack assembly, ground handling (offset)
ST104	Ground handling wheels (one side)

CAUTION Excessive lead-lag load applied to the main rotor blades during ground handling can result in damage to the elastomeric damper buns and failure of the damper assembly. Operators and maintenance personnel should use extra caution to avoid lead-lag loads in excess of 35 lb. (16 kg) at the tip of the main rotor blades.

(1). Attach ground handling wheels (ST101 or ST104) as shown (Ref. Figure 201), and hold tail up while lowering the wheels (raising helicopter) with detachable jack handle (ST102 or ST103).

(2). Manually move helicopter on ground handling wheels by balancing at tailboom and pushing on rear fuselage portion of airframe.

CAUTION Except under extreme emergency conditions, do not tow helicopter at speeds over 5 mph (8 KmH). Do not allow front ends of skid tubes to drag on ground. Avoid sudden stops and starts, and short turns which could cause helicopter to turn over. Allow inside wheel to turn (not pivot) while helicopter is being turned. Safe minimum turning radius is approximately 20 ft. (6 M).

NOTE: If tow bar is not equipped to keep front end of skid tubes from dragging, have an assistant balance helicopter at tailboom.

(3). Tow helicopter on ground handling wheels by attaching suitable tow bar to tow bar fittings.

3. Helicopter Manual Moving (600N)

(Ref. Figure 202)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST101	Ground handling wheels

CAUTION Excessive lead-lag load applied to the main rotor blades during ground handling can result in damage to the elastomeric damper buns and failure of the damper assembly. Operators and maintenance personnel should use extra caution to avoid lead-lag loads in excess of 35 lb. (16 kg) at the tip of the main rotor blades.

(1). Ensure all stress panels are installed on helicopter before jacking.

NOTE:

- The ground handling wheel set can be attached to the skids facing either direction for ease of jacking.
- Ensure all four ground handling attach points are engaged in ground handling wheel set.

(2). Attach ground handling wheels (ST101) and hold tail up while lowering the wheels (raising helicopter).

(3). Manually move helicopter on ground handling wheels by balancing at tailboom and pushing on rear fuselage portion of airframe.

CAUTION Except under extreme emergency conditions, do not tow helicopter at speeds over 5 mph (8 KmH). Do not allow front ends of skid tubes to drag on ground. Avoid sudden stops and starts, and short turns which could cause helicopter to turn over. Allow inside wheel to turn (not pivot) while helicopter is being turned. Safe minimum turning radius is approximately 20 ft. (6 M).

4. Helicopter Towing (600N)

(Ref. Figure 202) The tow bar is equipped with caster wheels and is designed for use with the ground handling wheel set, allowing the helicopter to be moved by one person.

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST101	Ground handling wheels
ST105	Tow bar (600N)

CAUTION Excessive lead-lag load applied to the main rotor blades during ground handling can result in damage to the elastomeric damper buns and failure of the damper assembly. Operators and maintenance personnel should use extra caution to avoid lead-lag loads in excess of 35 lb. (16 kg) at the tip of the main rotor blades.

(1). Ensure all stress panels are installed on helicopter before jacking.

(2). Raise helicopter with ground handling wheel set (ST101).

(3). Position tow bar (ST105), with caster wheels, straddling front of skid tube assembly.

(4). Attach nylon straps under skid tube and ratchet skid tube into rubber cups on tow bar.

CAUTION Except under extreme emergency conditions, do not tow helicopter at speeds over 5 mph (8 KmH). Do not allow front ends of skid tubes to drag on ground. Avoid sudden stops and starts, and short turns which could cause helicopter to turn over. Allow inside wheel to turn (not pivot) while helicopter is being turned. Safe minimum turning radius is approximately 20 ft. (6 M).

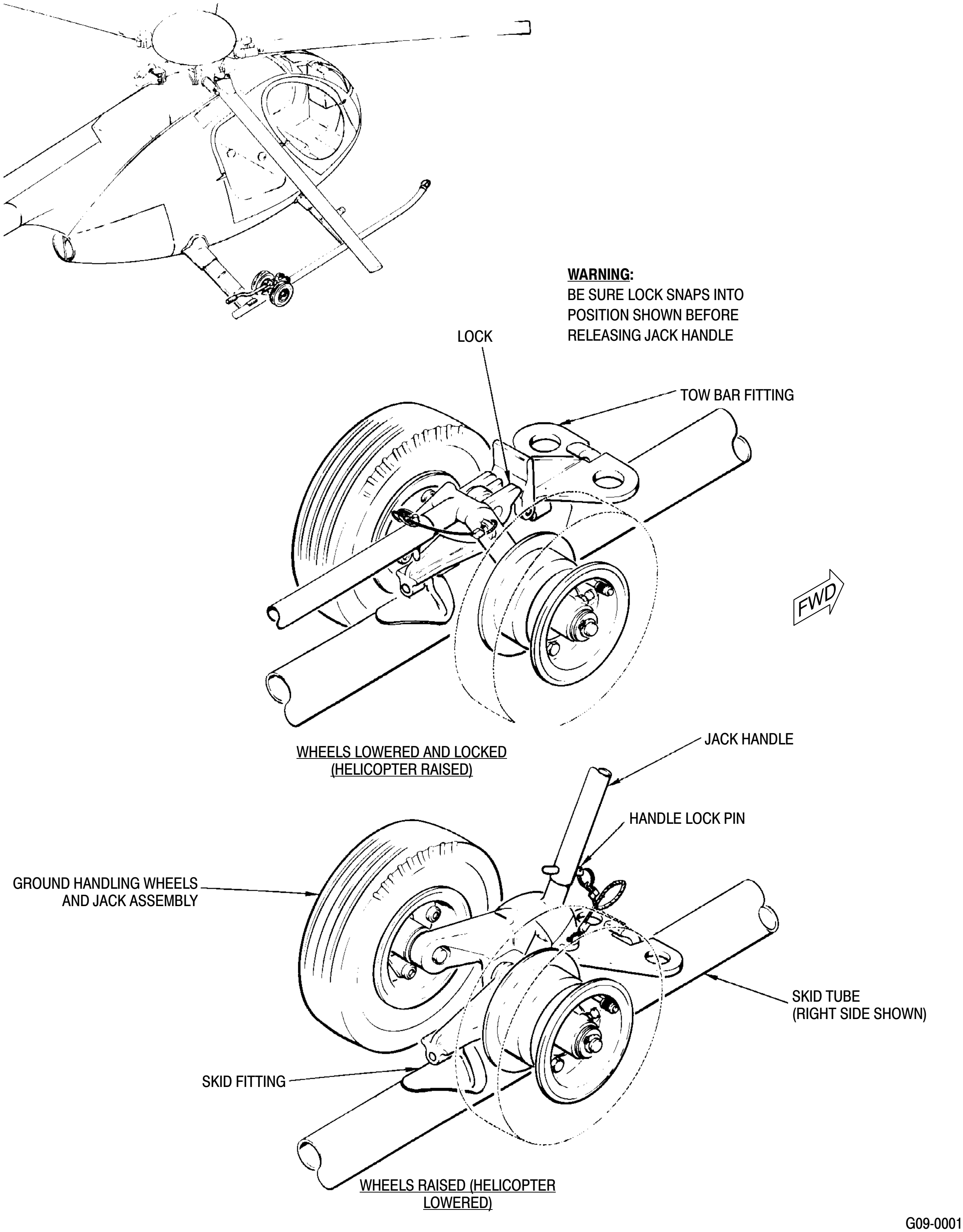

Figure 201. Towing Helicopter (369D/E/FF - 500N)

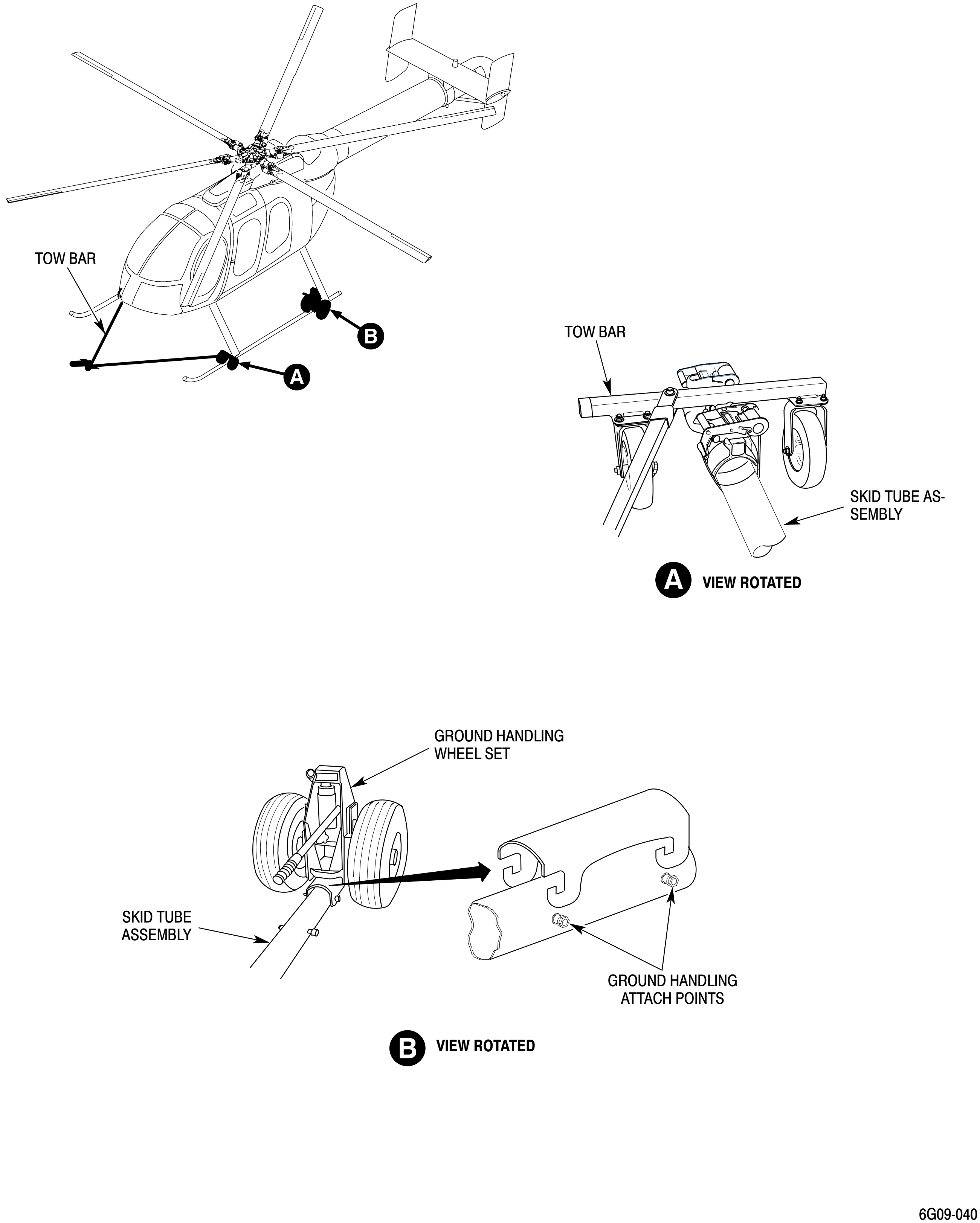

Figure 202. Towing Helicopter (600N)

Chapter

10

Parking and Mooring

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Section

10-10-00

Parking and Mooring

PARKING AND MOORING MAINTENANCE PRACTICES

1. Helicopter Parking

To park helicopter for short intervals, perform following steps (1). thru (4). For longer duration parking, also perform steps (5). and (6).

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST202	Jack fittings
ST2002	Blade socks
ST2004	Air inlet fairing cover
ST2005	Engine exhaust cover

CAUTION To prevent rotor damage from blade flapping (droop stop pounding) as a result of air turbulence from other aircraft landing, taking off or taxiing, or sudden wind gusts, rotor blades should be secured whenever helicopter is parked.

(1). Locate helicopter slightly more than blade clearance from nearby objects on most level ground available.

(2). Apply friction to lock cyclic and collective sticks so that friction control knobs are positioned as follows: neutral for cyclic stick and full down for collective stick.

NOTE: If not already accomplished, apply paint mark on edge of guide to locate neutral position for future reference (Ref. Sec. 67-10-00).

(3). Secure five-bladed main rotor blades as follows:

CAUTION When securing blade sock tiedown cords, take up slack but do not apply bending loads on blades.

(a). Turn blades until one blade is directly above tailboom (Ref. Figure 201).

(b). Install blade socks (ST2002) on all blades.

(c). Secure blade sock tiedown cord for blade located above tailboom to tailboom. Secure other blade sock tiedown cords to fuselage jack fittings (ST202).

(4). Secure six-bladed main rotor blades as follows:

CAUTION When securing blade sock tiedown cords, take up slack but do not apply bending loads on blades.

(a). Position blades so that three blades are on each side of helicopter (Ref. Figure 201).

(b). Install blade socks (ST2002) on all blades.

(c). Secure blade sock tiedown cords to fuselage jack fittings or cabin steps.

(5). Install air inlet fairing cover (ST2004) on air inlet front fairing (Ref. Figure 201).

(6). Install engine exhaust cover (ST2005) on exhaust tailpipe (Ref. Figure 201).

2. Helicopter Mooring

Whenever severe storm conditions or wind velocities higher than 40 knots are forecast, helicopter should be hangared or evacuated to a safer area. If these precautions are not possible, moor helicopter as follows.

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
N/A	Stakes or ground anchors (two)
N/A	Cable or rope
ST202	Jack fittings
ST2001	Pitot tube cover
ST2004	Air inlet fairing cover
ST2005	Engine exhaust cover

(1). Park helicopter (Ref. Helicopter Parking) or remove main rotor blades (Ref. Sec. 62-10-00) and install air inlet fairing cover (ST2004) and engine exhaust (ST2005) covers.

(2). Install pitot tube cover (ST2001).

(3). Fill fuel tank (if possible) (Ref. Sec. 12-00-00).

(4). Apply friction to lock cyclic and collective sticks (Ref. Helicopter Parking).

(5). Secure helicopter to ground by attaching restraining lines (cable or rope) between jack fittings (ST202) and stakes or ground anchors (Ref. Figure 201).

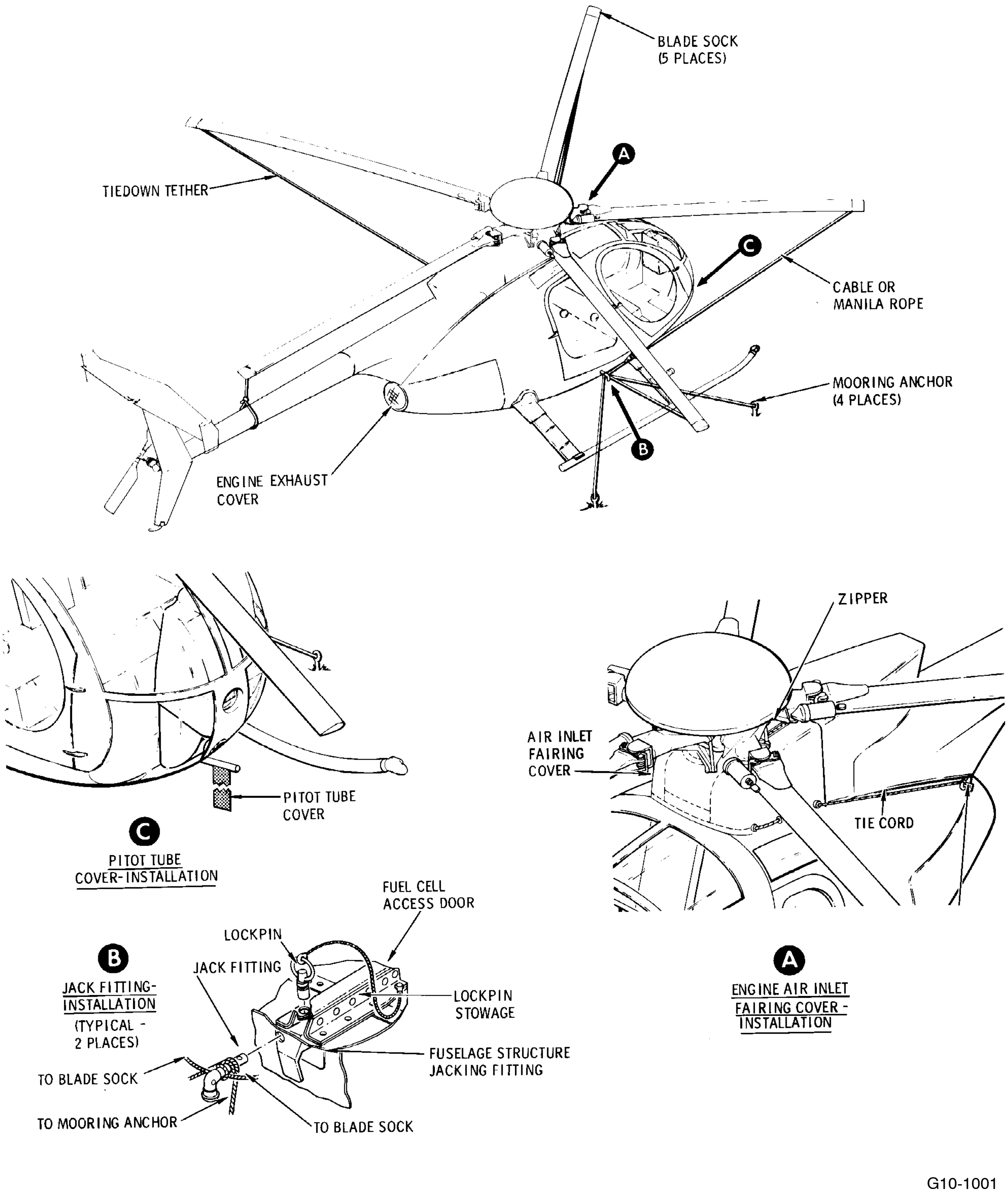

Figure 201. Parking and Mooring (Sheet 1 of 2)

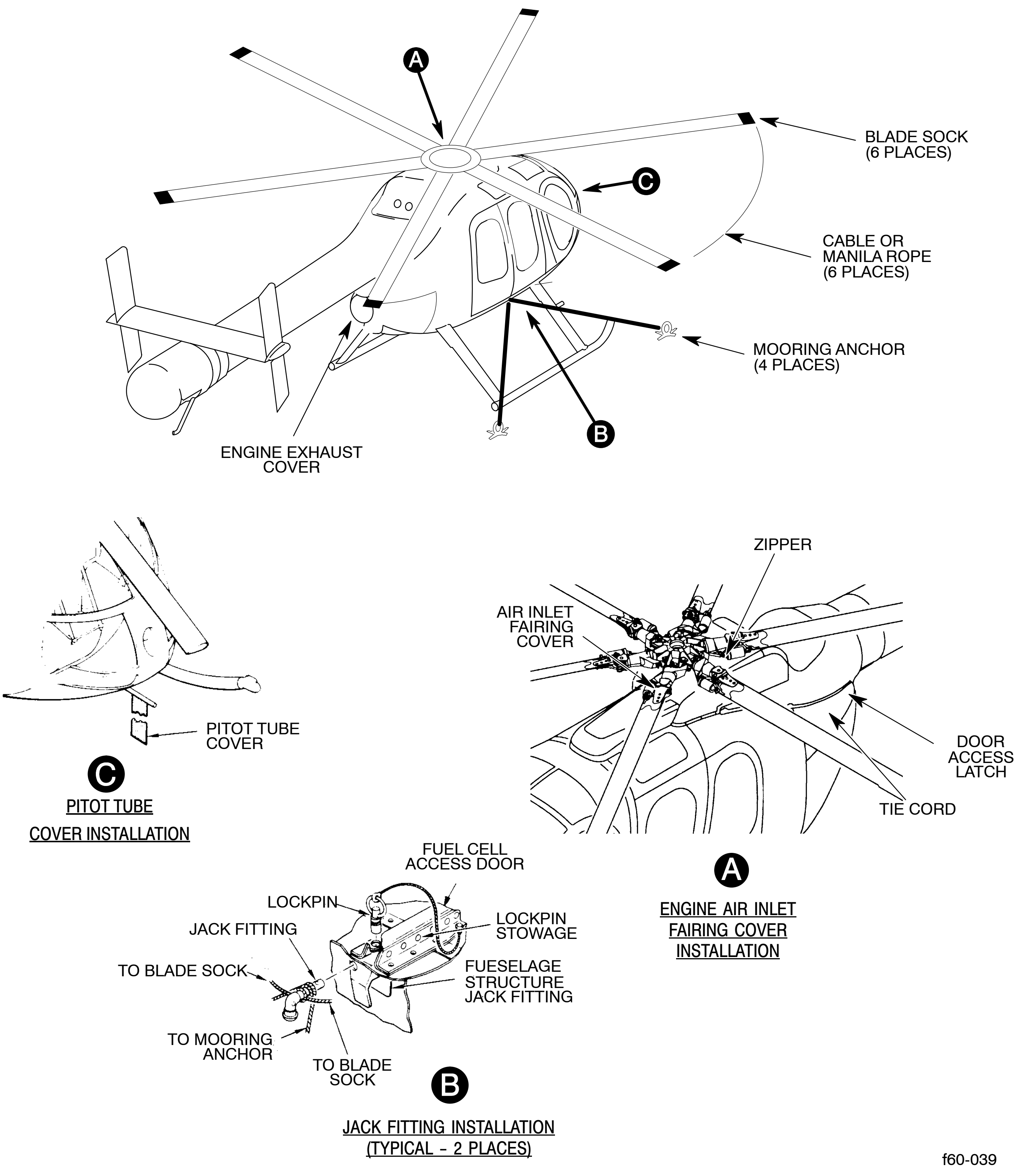

Figure 201. Parking and Mooring (Sheet 2 of 2)

Section

10-20-00

Storage

STORAGE
MAINTENANCE PRACTICES

1. Preservation and Storage

A helicopter to be placed in storage or non-operational status must have adequate inspection, maintenance and preservation to avoid unnecessary deterioration of airframe and components of equipment. Extent of preventive maintenance that is to be performed depends on anticipated time in storage. Following paragraphs describe what should be performed in helicopter: for flyable storage; for up to 45 days in storage; and for up to 6 months in storage.

2. Flyable Storage (No Time Limit)

A. Inspection Before Storage

(1). Perform Daily Pre-Flight Check (Ref. appropriate PFM or RFM).

(2). Ensure that fuel cells are full (topped off), and that oil in engine oil tank and main, fan and tail rotor transmissions is at FULL level (Ref. Sec. 12-00-00).

B. Storage

To maintain a flyable storage condition, perform the following:

(1). Perform Daily Pre-Flight Check (Ref. appropriate PFM or RFM).

(2). Perform ground runup at least once every five days (Ref. applicable PFM or RFM, Table 201, Sec. 01-00-00).

(a). Start engine. After idle stabilizes, accelerate engine to 100 percent N_2, collective full down. Operate until oil temperature is in normal operating range and ammeter indicates battery is fully charged.

(b). Shut down engine.

(c). Drain fuel cell sump (Ref. Sec. 12-00-00). (Replenish fuel as necessary.)

(d). Ensure that fuel shutoff valve is closed (Ref. Sec. 28-00-00).

(e). Open movable air vents in each door of cargo compartment. Position opening in each air vent downward. Close all other vents.

(f). Install covers and equipment used to park and moor helicopter.

(g). Install a static ground.

C. Return to Service

(1). Remove covers and equipment used to park and moor helicopter.

(2). Perform Daily Pre-Flight Check (Ref. appropriate PFM or RFM).

3. Storage Up to 45 Days

A. Inspection During Storage

(1). Where local average humidity exceeds 40 percent, carefully inspect helicopter every 15 days for corrosion. Perform corrosion control as necessary (Ref. Sec. 20-40-00). When inspecting for corrosion, pay particular attention to those areas where moisture deposits do not evaporate rapidly.

(2). Where local average humidity is 40 percent or less, inspect for corrosion every 30 days.

(3). If interior temperature of fuselage exceeds 160°F (71°C), ventilate helicopter by opening all doors and vents. If necessary, promote air circulation by use of fans or other forced air equipment.

(4). Ensure that fuel cells are full (topped off) and that rotor transmissions are at FULL level.

(5). Drain fuel cell sump daily. (Replenish fuel as necessary.)

(6). Check fuel and oil systems periodically for leakage. Replenish as necessary.

B. Storage

(1). Perform engine preservation according to applicable Allison Engine Operation and Maintenance Manual (Ref. Table 201, Sec. 01-00-00) and current engine service letters.

(2). Remove battery (Ref. Sec. 96-05-00) and store in cool, dry area.

(3). If necessary, clean battery compartment (Ref. Sec. 20-20-00).

(4). Ensure that fuel shutoff valve is closed (Ref. Sec. 28-00-00).

(5). Clean entire helicopter.

(6). Inspect all drain holes (blades, fuselage, etc.) for obstructions and clear where necessary.

(7). Open movable air vents in each door of cargo compartment; position opening in each air vent downward. Close all other air vents.

(8). Park and moor helicopter.

(9). Install a static ground.

(10). Remove from area any objects that are likely to strike helicopter during high wind conditions.

C. Return to Service

(1). Check that battery area is clean; then install and connect battery (Ref. Sec. 96-05-00).

(2). Check that fuel cells are full (Ref. Sec. 12-00-00).

(3). Remove covers and equipment used to park and moor helicopter.

(4). Inspect areas around mooring attachments for damage. Repair damage as necessary.

(5). Clean helicopter, as necessary.

(6). Check that all drain holes in helicopter are free of obstructions.

(7). Perform engine depreservation according to applicable Allison Engine Operation and Maintenance Manual (Ref. Table 201, Sec. 01-00-00) and current applicable engine service letters.

(8). Perform Daily Pre-Flight Check (Ref. appropriate PFM or RFM).

4. Storage Up to 6 Months

A. Inspection During Storage

(1). Perform same inspection as for 45 days of storage.

(2). Check main rotor, tail rotor and fan blades for damage every 15 days (Ref. Chap. 62 and 64).

(3). Check areas around mooring attachments for damage every 15 days.

B. Storage

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM201	Protective coating
CM210	Corrosive preventive
CM729	Tape, masking, pressure sensitive

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST2001	Pitot tube cover

(1). Perform engine preservation according to applicable Allison Engine Operation and Maintenance Manual (Ref. Table 201, Sec. 01-00-00) and current applicable engine service letters.

(2). Drain engine oil system (Ref. Sec. 12-00-00) and fill engine oil tank with corrosion preventive (CM210).

(3). Remove battery (Ref. Sec. 96-05-00) and store it in cool, dry area.

(4). Clean battery compartment, if necessary.

(5). Ensure that fuel shutoff valve is closed (Ref. Sec. 28-00-00).

(6). Seal static source openings in engine inlet fairing with masking tape (CM729) and cover pitot tube with pitot tube cover (ST2001).

(7). Clean entire helicopter.

(8). Inspect all drain holes (blades, fuselage, etc) for obstructions and clear them where necessary.

(9). Spray or brush on the canopy and all windows a 0.008 inch (0.203 mm) thickness of protective coating (CM201). Cover and overlap all edges.

(10). Inspect all external access doors for close fit. If doors are likely to admit moisture, seal edges with masking tape (CM729).

(11). Park and moor helicopter.

(12). Install a static ground.

(13). Remove any objects from area that are likely to strike helicopter during high wind conditions.

C. Return to Service

(1). Carefully lift protective coating along edges and peel it from canopy and windows.

(2). Remove masking tape from all external access doors.

CAUTION Do not use steam or unauthorized cleaning compounds to clean helicopter as damage to equipment may result.

(3). Drain corrosion preventive from oil tank and replenish with correct oil (Ref. Sec. 12-00-00).

(4). Perform same procedures as for return to service after 45 days of storage.

NOTE: Depreservation of engine fuel system can usually be accomplished by making a normal start. (Ref. applicable Allison Engine Operation and Maintenance Manual, Table 201, Sec. 01-00-00 and current applicable engine service letters for engine depreservation procedures.)

Section

10-30-00

Blade Folding

BLADE FOLDING
MAINTENANCE PRACTICES

1. Main Rotor Blades Storage Rack Description

(Ref. Figure 201)

(1). The main rotor blade storage rack stows and secures the main rotor blades on Model 369 helicopters during ground handling operations. The storage rack consists of fore and aft units which, when installed, provide blade protection for helicopters that cannot be placed in hangers or evacuated during adverse weather conditions.

(2). The aft blade storage rack supports three blades and consists of a plywood blade rack which incorporates shock (bungee) cords and nylon-webbing harness straps with buckles, pull tabs, and a grommet. The aft storage rack is installed on the tailboom at Sta. 197.78, just above the jack fitting. A decal on the aft side of the storage rack facilitates proper fore and aft positioning on the tailboom. The harness grommet engages the jack fitting and holds the storage rack in position when the harness straps are tightened and secured. Shock cords secure the blades.

(3). The forward blade storage rack supports two blades and consists of a plywood blade rack which incorporates shock cords, blade clamp (top blade only), rack support tubes, and landing gear clamps. The storage rack is installed forward of the fuselage so that the blade clamp support is positioned left of the helicopter centerline. The rack support tubes are secured with clamps to the landing gear just aft of the skid tip lights. Shock cords secure the blades.

2. Main Rotor Blades Storage Rack Inspection

(Ref. Figure 201)

(1). Verify that front and rear support assemblies are complete and tight in all details.

(2). Visually inspect for missing nuts, bolts, cushions, and shock cords.

(3). Verify that no support tubing is bent.

(4). Verify that plywood of rear support is not split, cushions not torn, or nylon webbing harness not missing its buckle.

3. Main Rotor Blades Folding and Unfolding

The following paragraphs provide instruction for operation of the main rotor blade storage rack: For the unpinning of the main rotor blades; for folding, unfolding, and repining of the blades. Adjustment and testing of main rotor flight controls, necessary after the blades have been re-pinned, is also covered here. (Ref. Sec. 20-40-00 for information about adjustment and corrosion protection of main rotor blade attaching pins.)

CAUTION If main rotor blades are to remain folded for a considerable length of time, main rotor hub must be covered with a suitable weather-resistant cover.

NOTE: A mechanic's assistant is needed for blade folding and unfolding.

A. Helicopter Location for Blade Folding

(1). Locate helicopter slightly more than rotor span from other aircraft or vehicles.

(2). Park helicopter on the most level ground available so that the load is balanced as much as possible.

B. Main Rotor Blades Folddown Preparation

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST2003	Main rotor blade storage rack
ST2004	Air inlet fairing cover
ST2005	Engine exhaust cover

(1). Inspect rack (Ref. Main Rotor Blades Storage Rack Inspection).

(2). Position main rotor so that one blade is directly above and parallel to helicopter tailboom.

(3). Lock cyclic control stick (by applying friction) in the following positions:

(a). Set collective pitch to mid position.

(b). Set longitudinal cyclic to full aft position.

(c). Set lateral cyclic to two thirds of total stick travel from full left toward full right.

CAUTION During blade folding, continually monitor stick positions to make sure no change occurs. Serious blade damage may result from improper stick placement.

(4). Disconnect wires or antennas (as applicable) at tailboom attach fitting, and coil them.

(5). Cover (ST2004 and ST2005) engine air inlet and exhaust openings to prevent entry of foreign objects during blade folding.

CAUTION During blade folding, use blade support pole (ST2003). Prevent scratching of blade by attaching pins or bolts. Avoid brushing of blades against one another or against any other surface. Lift blade near tip to remove load on blade attaching pins.

C. Aft Main Rotor Blades Folding

(Ref. Figure 201)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST2003	Main rotor blade storage rack

(1). Install aft storage rack (ST2003) to helicopter.

(a). Position rear blade support assembly on tailboom at Sta. 197.78, with its lower step on left side of helicopter.

(b). Attach and secure straps. Adjust strap pull tabs so that harness grommet engages jack fitting on tailboom.

(2). Install trailing rotor blade to aft storage rack.

(a). Into center cushioned support step of rear blade support assembly, position trailing rotor blade (blade that is directly above and parallel to tailboom).

CAUTION Blade movement must be restrained in the following steps to prevent damage since, with damper disengaged, the blade is free to pivot on blade attaching pin.

(b). Remove bolt or (alternatively) attaching pin from damper arm of trailing rotor blade, and move damper away from blade; replace bolt (or attaching pin) in damper arm.

NOTE: It is not necessary to remove a blade attaching pin in order to fold the first blade.

(c). Secure blade in support assembly with shock cord fastener.

(3). Install remaining blades to aft storage rack.

CAUTION Blade movement must be restrained in the following steps to prevent damage since, with damper disengaged, the blade is free to pivot on blade attaching pin.

NOTE: The right blade goes to the top holddown position, and the left blade to the bottom holddown position.

(a). Remove bolt or (alternatively) attaching pin from damper arm of rotor blade, and move damper away from blade; replace bolt (or attaching pin) in damper arm.

(b). Unlock (but do not remove) blade attaching pin that secures leading edge of blade to main rotor hub.

(c). Unlock and remove blade attaching pin that secures trailing edge of blade to lead-lag link, and position cam handle vertically above pin.

(d). Instruct mechanic's assistant using blade-support pole (ST2003) to guide rotor blade to its proper position on rear support assembly.

(e). Secure blade in support assembly with shock cord fastener.

(f). Reinstall blade attaching pin its original position in lead-lag link of main rotor hub.

D. Forward Main Rotor Blades Folding

(Ref. Figure 201)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST2003	Main rotor blade storage rack

(1). Install forward storage rack (ST2003) to helicopter.

(a). Position blade storage rack so that top holddown position on rack is approximately 15 degrees left of helicopter centerline.

(b). Attach U-bolt clamp subassemblies to forward ends of each landing gear skid. Secure with hardware provided. Ensure that each U-bolt is attached ahead of curved portion of skid (but aft of skid tip light) to assure ground clearance.

NOTE: Top adjustment holes in support tubes are for extended landing gear; bottom holes are for standard landing gear.

(c). Attach lower ends of support tubes to U-bolt clamp brackets. Attach short tube to left skid. Secure with hardware provided.

(d). Attach upper ends of support tubes to double blade support. Adjust tube length to proper height as required for extended or standard landing gear. Secure with hardware provided.

(2). Install left forward blade to forward storage rack. Observe that one blade is directly above the left side of the front blade support assembly. Secure that blade in support with shock cord fastener and hinged clamp fastener support.

NOTE: It is not necessary to remove blade attaching pins from the main rotor assembly or damper arm in order to secure this blade.

(3). Install right forward blade to forward storage rack.

CAUTION Blade movement must be restrained in the following steps to prevent damage since, with damper disengaged, the blade is free to pivot on blade attaching pin.

(a). Remove bolt or (alternatively) attaching pin from damper arm of right forward blade and move damper away from rotor blade; replace bolt (or attaching pin) in damper arm.

(b). Unlock and remove blade attaching pin that secures trailing edge of blade to lead-lag link, and position cam handle vertically above pin.

(c). Instruct mechanic's assistant using blade support pole to guide rotor blade to its proper position on right side of double blade front support.

(d). Secure blade in support assembly with shock cord fastener.

(e). Reinstall blade attaching pin into its original position in lead-lag link of main rotor hub.

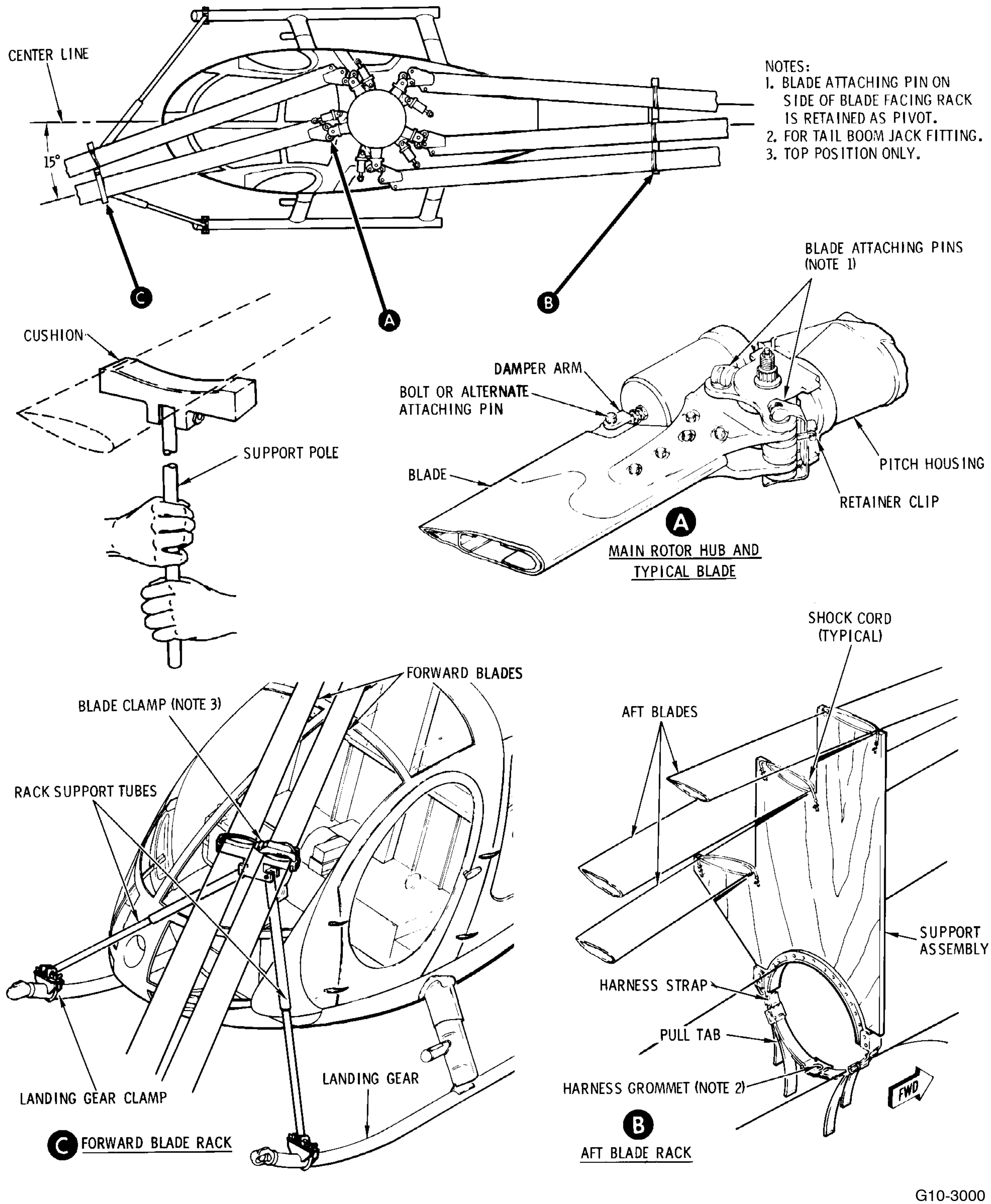

Figure 201. Folding and Stowing Main Rotor Blades

E. Main Rotor Blades Unfolding Preparation

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST2003	Main rotor blade storage rack
ST2004	Air inlet fairing cover
ST2005	Engine exhaust cover

Before unfolding the main rotor blades, perform the following steps:

(1). Lock cyclic control stick, by applying friction, in the following positions:

(a). Set collective pitch to mid position.

(b). Set longitudinal cyclic to full aft position.

(c). Set lateral cyclic to two thirds of total stick travel from full left toward full right.

CAUTION During blade unfolding, continually monitor stick positions to make sure no change occurs. Serious blade damage may result from improper stick placement.

(2). Cover (ST2004 and ST2005) engine air inlet and exhaust openings to prevent entry of foreign objects during blade folding.

CAUTION During blade unfolding, use blade support pole (ST2003). Prevent scratching of blade by attaching pins or bolts. Avoid brushing of blades against one another or against any other surface. Lift blade near tip to remove load on attaching pin.

F. Aft Main Rotor Blades Unfolding

(Ref. Figure 201)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST2003	Main rotor blade storage rack

(1). Begin with the trailing blade, the one supported by the center support step of the rear blade support assembly.

CAUTION Blade movement must be restrained in the following steps to prevent damage since, with damper disengaged, the blade is free to pivot on blade attaching pin.

(a). Remove damper arm bolt or (alternatively) attaching pin from damper arm clevis. Extend and align damper arm with bolt hole in trailing edge of blade. Insert bolt or attaching pin, but: If pin is used, do not lock pin at this time; if bolt is used, tighten to torque of **30 - 60 inch-pounds (3.39 - 6.78 Nm)** and insert cotter pin.

(b). Remove shock cord fastener and release blade from support.

NOTE: Only the damper arm attaching bolt (or pin) was removed from this blade during folding, not a lead-lag link attaching pin.

(2). For the remaining aft secured rotor blades, proceed as follows:

CAUTION Blade movement must be restrained in the following steps to prevent damage since, with damper disengaged, the blade is free to pivot on blade attaching pin.

(a). Remove shock cord fastener and release blade from support.

(b). Instruct mechanic's assistant using blade support pole (ST2003) to lift and rotate blade forward to align trailing edge of blade and attachment hole in lead-lag link of main rotor hub (remove attaching pin from lead-lag link to allow hole alignment). Re-insert attaching pin (but do not lock at this time).

(c). Remove damper arm bolt or (alternatively) attaching pin from damper arm clevis. Extend and align damper arm with bolt hole in trailing edge of blade. Insert bolt or attaching pin but: If pin is used, do not lock pin at this time; if bolt is used, tighten to torque of **30 - 60 inch-pounds (3.39 - 6.78 Nm)** and insert cotter pin.

G. Forward Main Rotor Blades Unfolding

(Ref. Figure 201)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST2003	Main rotor blade storage rack

(1). Begin with the blade stowed on the left side of the double blade front support assembly. No attaching pins were removed from this blade for storage. Release hinged clamp fastener support and shock cord fastener. Alignment is not necessary.

(2). For remaining forward rotor blade, proceed as follows:

CAUTION Blade movement must be restrained in the following steps to prevent damage since, with damper disengaged, the blade is free to pivot on blade attaching pin.

(a). Remove shock cord fastener and release blade from support.

(b). Instruct mechanic's assistant using blade support pole (ST2003) to lift and rotate blade aft to align trailing edge of blade and attachment hole in lead-lag link of main rotor hub (remove attaching pin from lead-lag link to allow hole alignment). Re-insert attaching pin (but do not lock at this time).

(c). Remove damper arm bolt or (alternatively) attaching pin from damper arm clevis. Extend and align damper arm with bolt hole in trailing edge of blade. Insert bolt or attaching pin, but: If pin is used, do not lock pin at this time; if bolt is used, tighten to torque of **30 - 60 inch pounds (3.39 - 6.78 Nm)** and insert cotter pin.

H. Main Rotor Blades Storage Rack Removal and Storage

(Ref. Figure 201)

(1). Remove covers from engine exhaust and air inlet fairing.

(2). Unbuckle nylon webbing harness of rear blade support assembly to disengage aft blade storage rack from tailboom. Further disassembly is not required.

(3). Loosen or remove wing nuts to disengage U-bolt clamp subassemblies from front end of landing gear skid assembly. Remove forward blade storage rack from helicopter.

(4). Store blade storage racks.

(5). Reconnect any wires or antennas disconnected for blade folding.

4. Main Rotor Flight Controls Adjustment and Testing

(Ref. Figure 201) Perform the following steps after main rotor blades have been unfolded and repined.

(1). Lock all attaching pins and check that locking force required to close pin handle is **25 - 35 pounds force (111.2 - 155.7 N)** (Ref. Sec. 62-10-00 Main Rotor Blade and Damper Attach Pin Installation and Adjustment, Sec. 62-10-00).

NOTE: Blade attaching pin handle is positioned behind retainer clip as shown.

(2). Loosen friction on cyclic and collective sticks and check movement of controls through complete range of travel.

Chapter

11

Placards and Markings

TABLE OF CONTENTS

Section

11-00-00

Placards and Markings

PLACARDS AND MARKINGS MAINTENANCE PRACTICES

1. General

(Ref. Figure 201 thru Figure 204 for placards and markings most common to 369D/E/FF - 500N Model Helicopters). Nomenclature corresponds to that used in the IPC. (Ref. Illustrated Parts Catalog for each decal part number and the quantity required.)

The following illustrations cover different areas of decal placement on the helicopter:

(1). Exterior - Figure 201.

(2). Interior - Figure 202.

(3). Instrument panels - Figure 203.

(4). Optional equipment (various exterior and interior locations) - Figure 204.

2. Decal Application

(1). Where a decal overlaps or covers drain holes, access doors, etc., the decal shall be cut out to provide proper draining or ease of opening or removing of doors, plates, etc.

(2). Where a decal is applied over a skin lap (one skin overlapping another), the decal must be cut so that it lies flat and makes a positive bond.

(3). Seal edges of all exterior decals, and only those interior decals in the engine compartment and cargo compartment aft of the transmission, with epoxy adhesive. Edge sealing to be a minimum of 1/32 inch (0.8mm) and a maximum of 1/8 inch (3mm) around perimeter of decal.

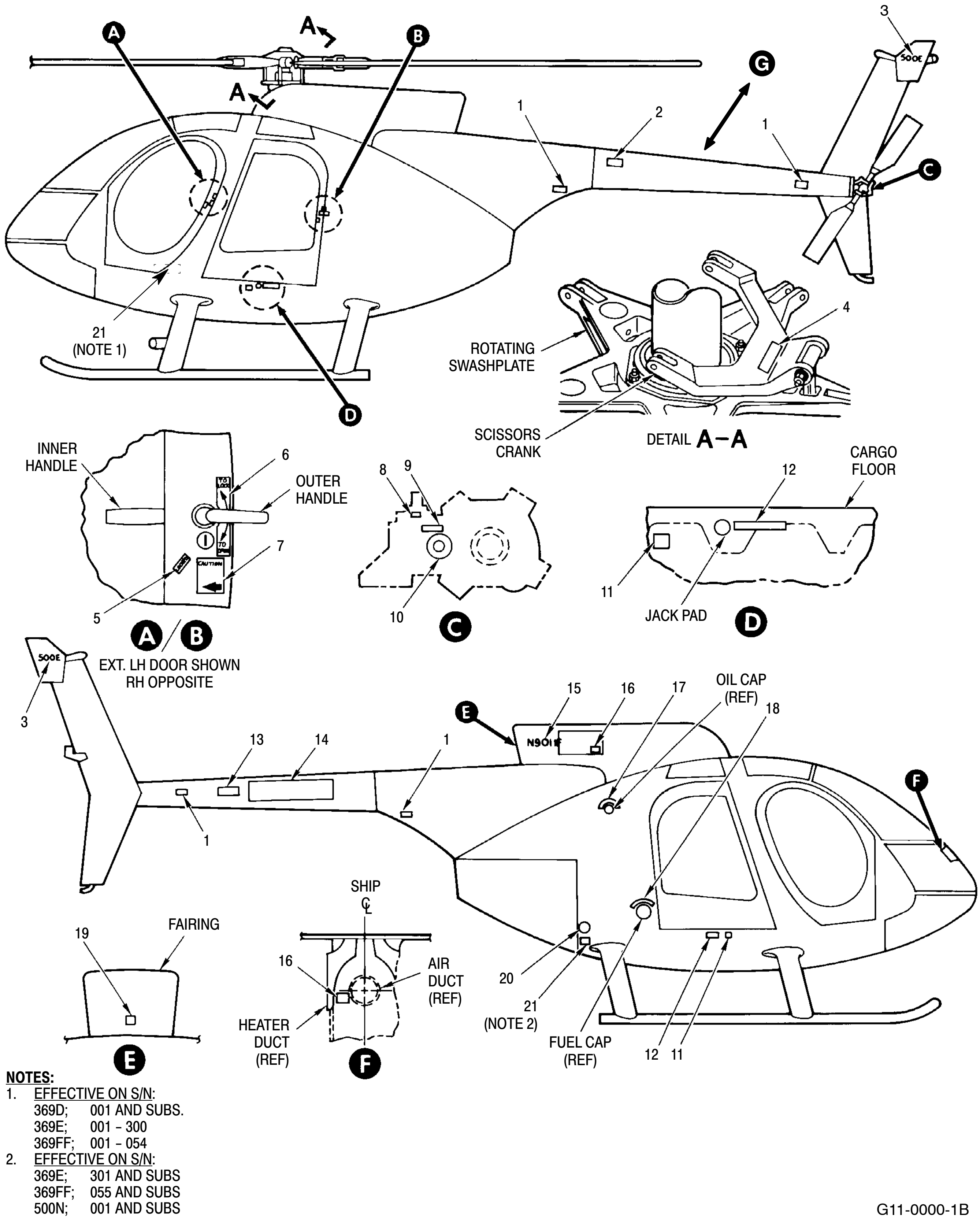

Figure 201. Placards - Exterior (Sheet 1 of 5)

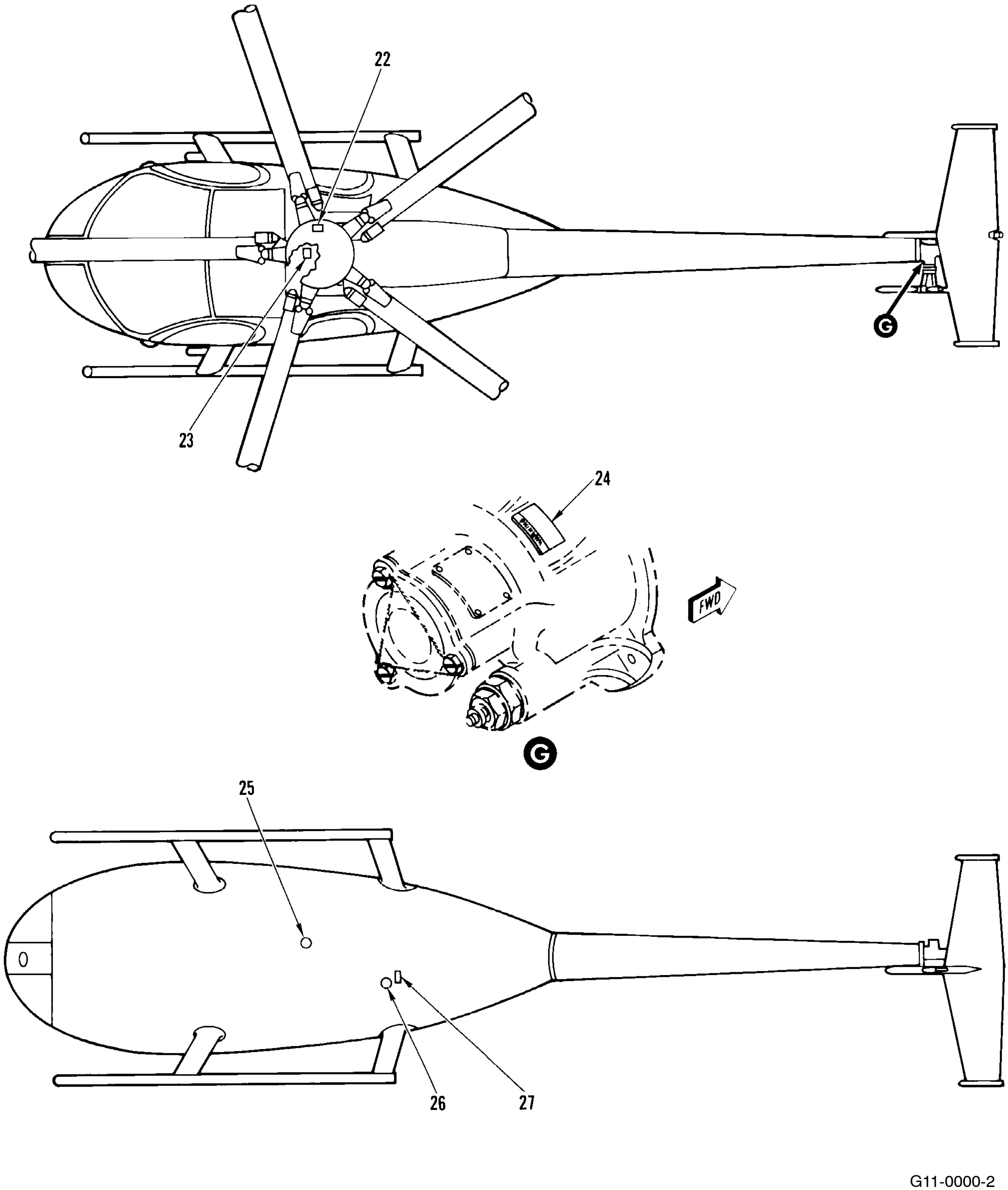

Figure 201. Placards - Exterior (Sheet 2 of 5)

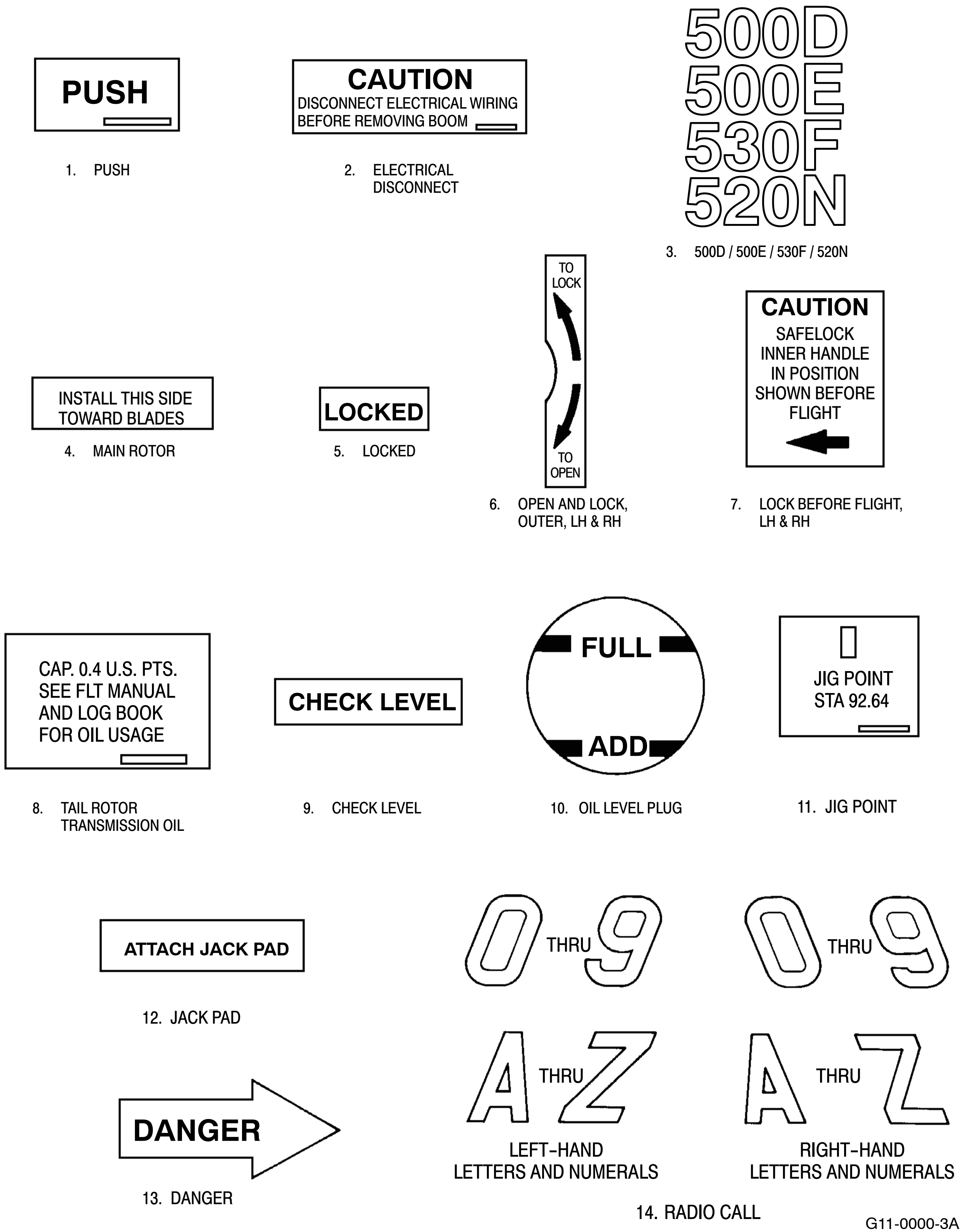

Figure 201. Placards - Exterior (Sheet 3 of 5)

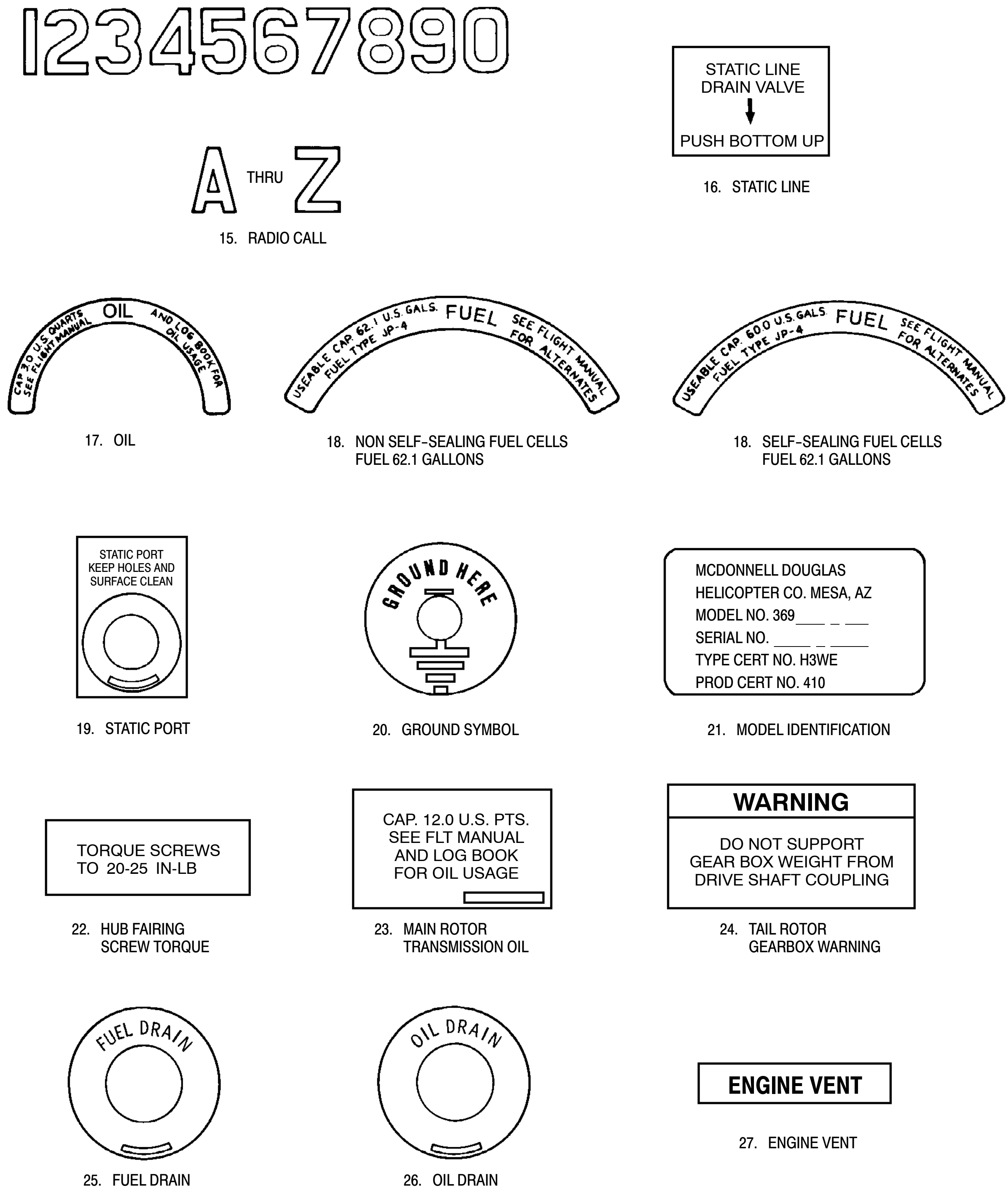

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Figure 201. Placards - Exterior (Sheet 4 of 5)

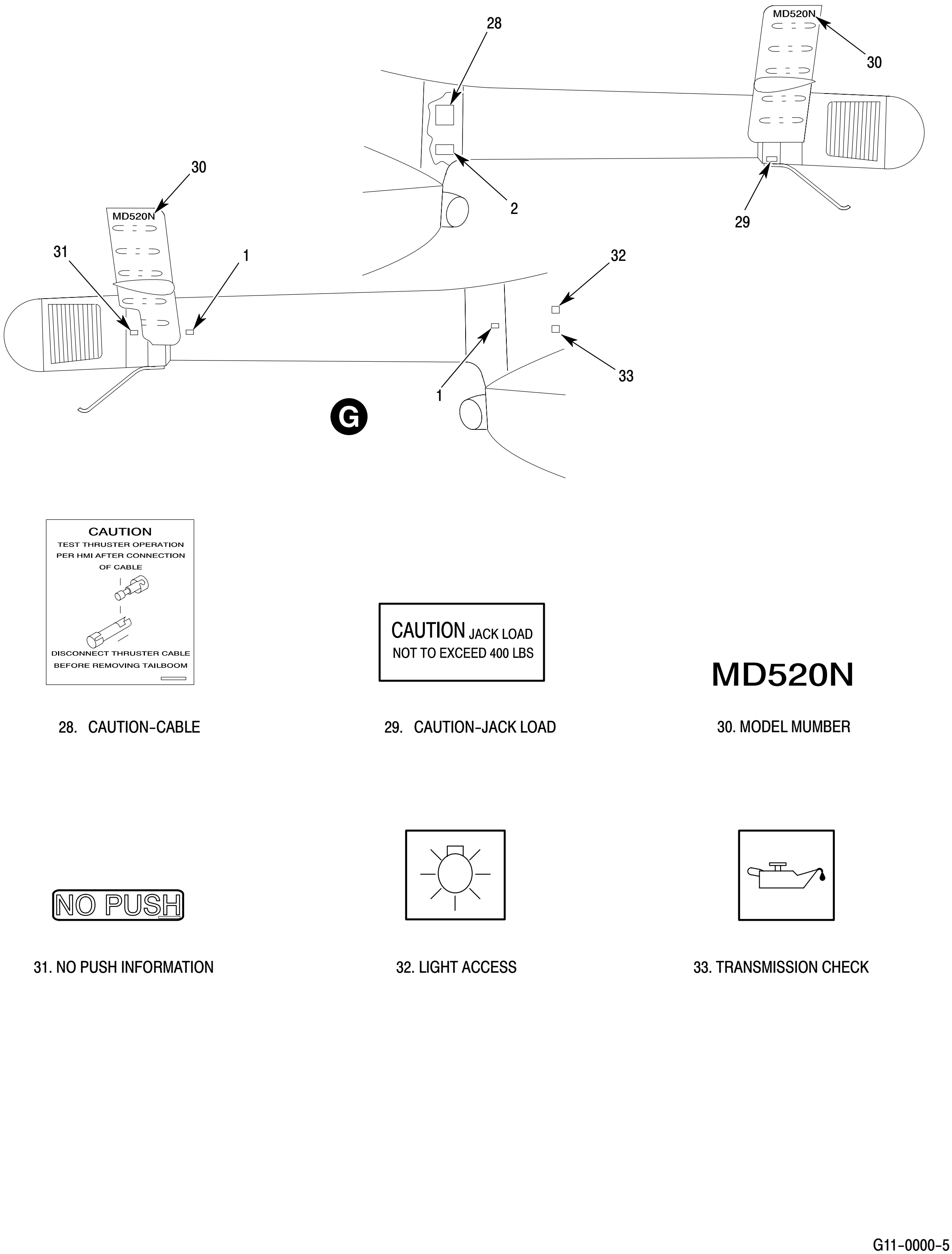


Figure 201. Placards - Exterior (Sheet 5 of 5)

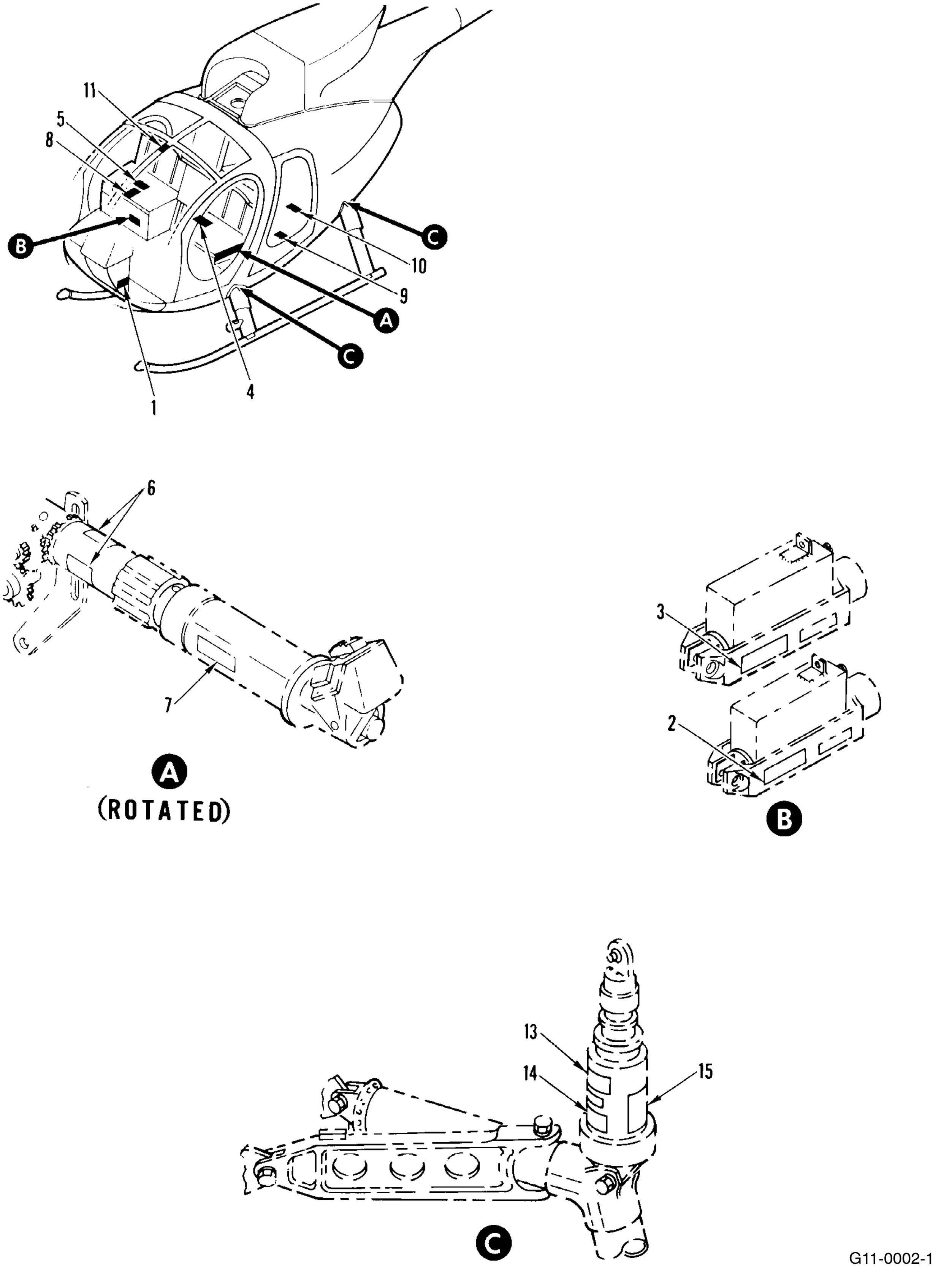


Figure 202. Placards - Interior (Sheet 1 of 5)

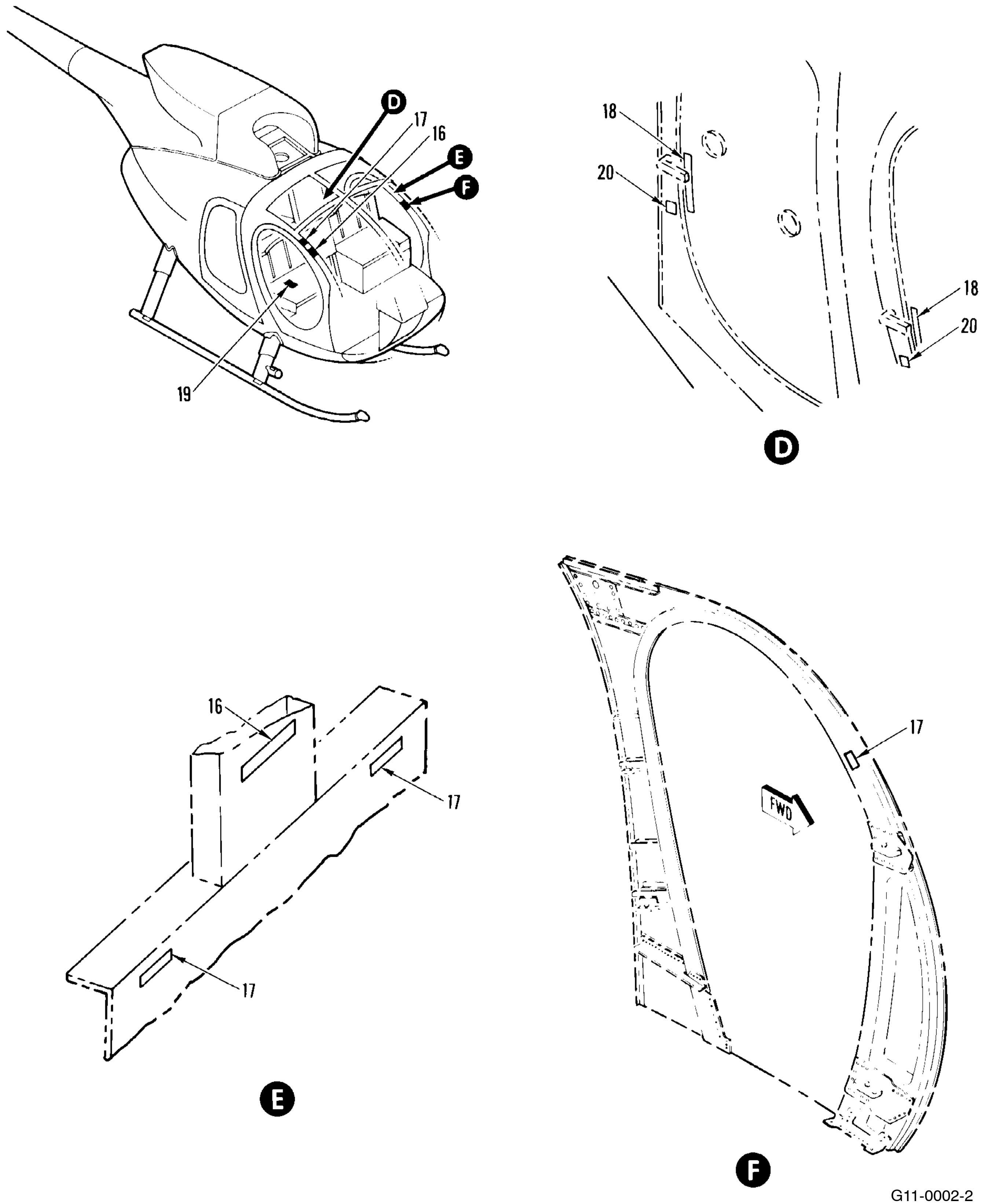
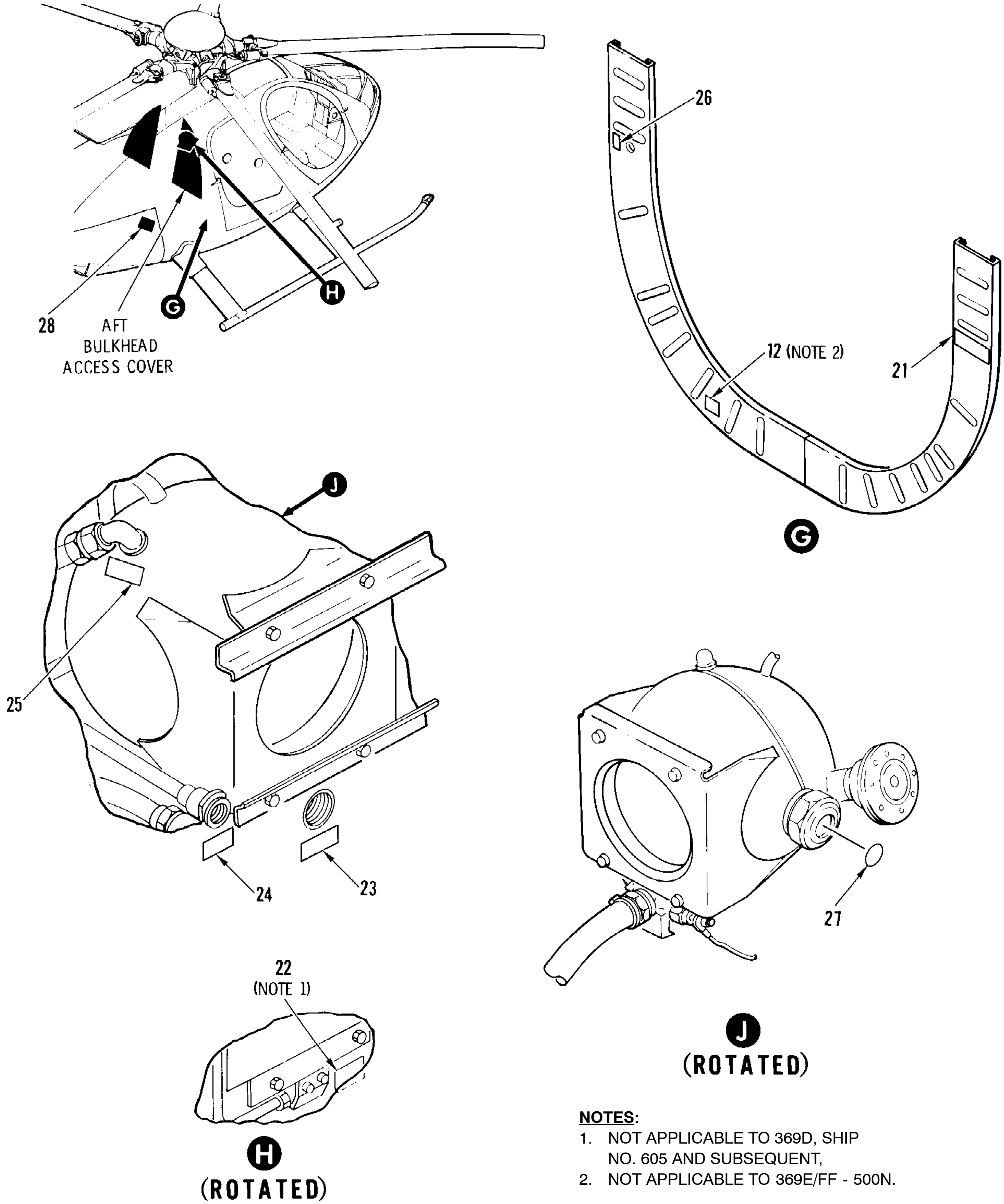


Figure 202. Placards - Interior (Sheet 2 of 5)



NOTES:

1. NOT APPLICABLE TO 369D, SHIP NO. 605 AND SUBSEQUENT,
2. NOT APPLICABLE TO 369E/FF - 500N.

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Figure 202. Placards - Interior (Sheet 3 of 5)

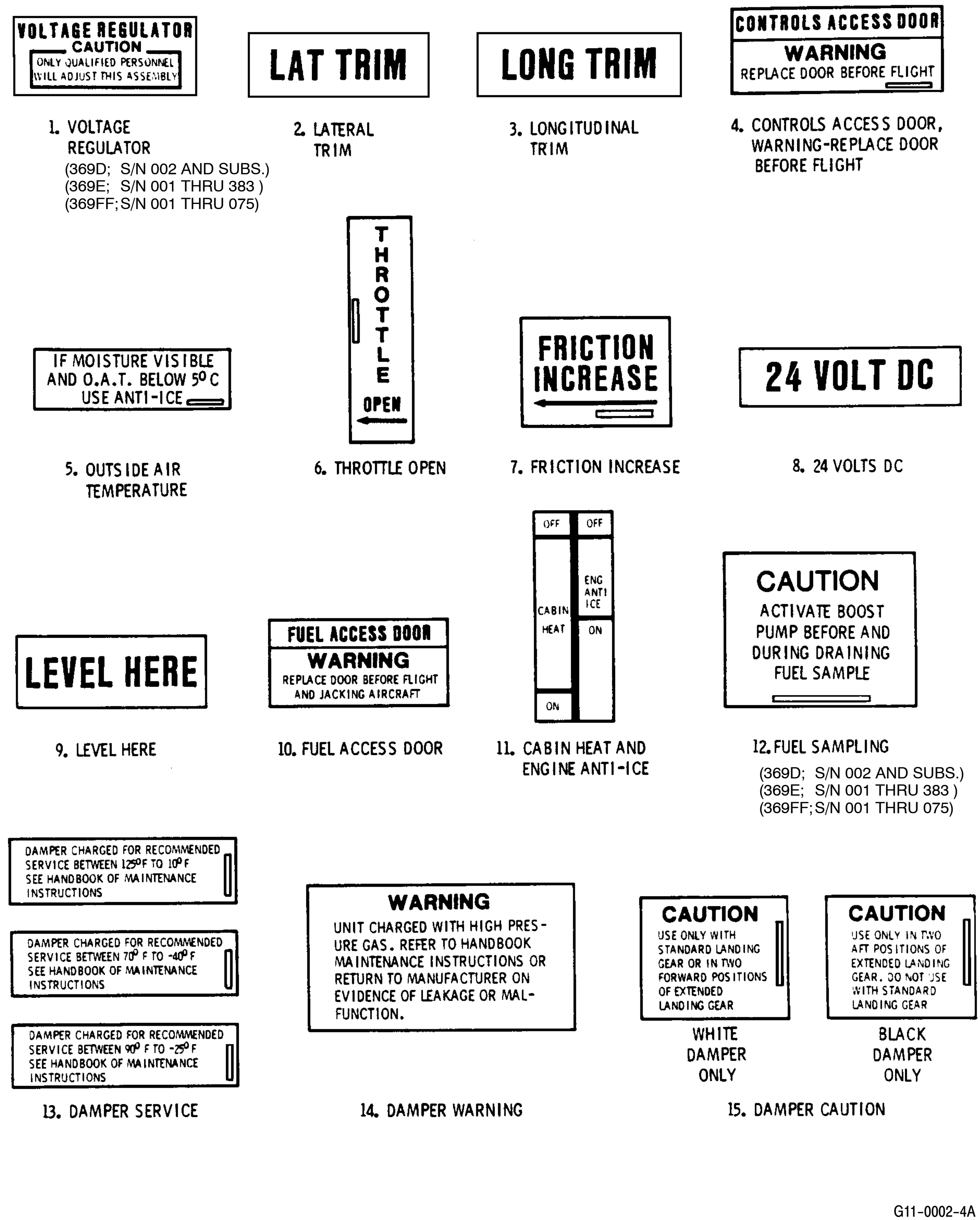


Figure 202. Placards - Interior (Sheet 4 of 5)

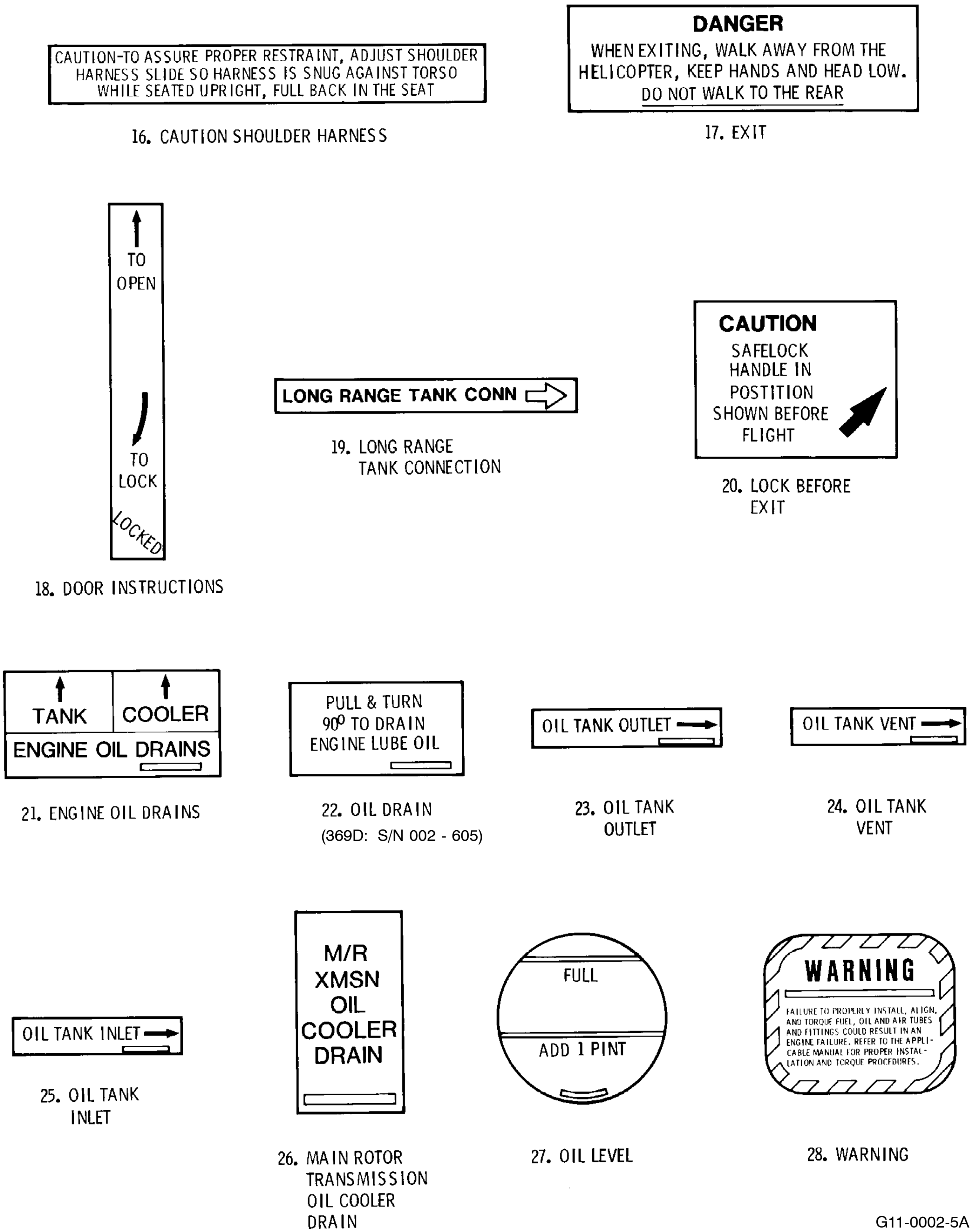


Figure 202. Placards - Interior (Sheet 5 of 5)

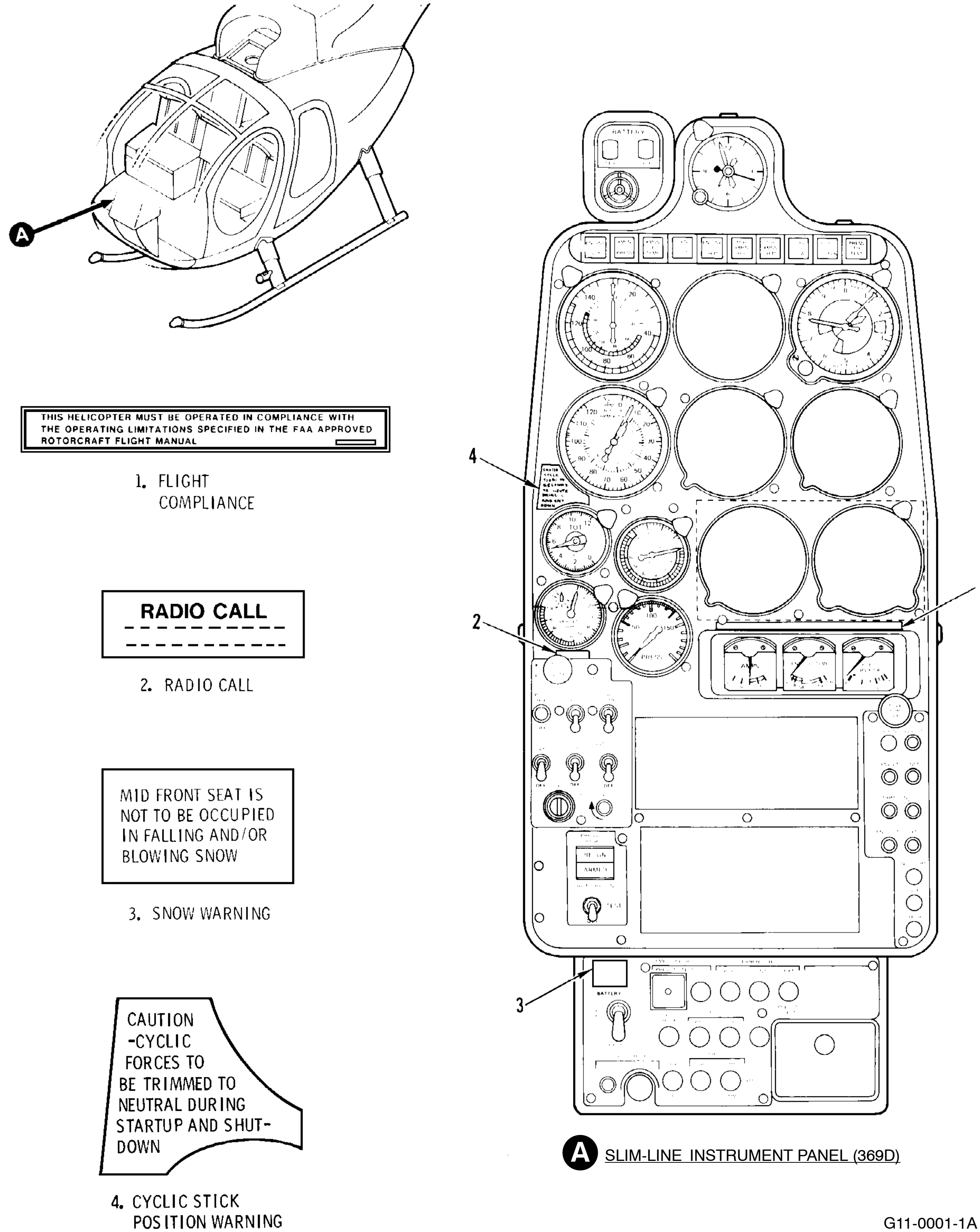


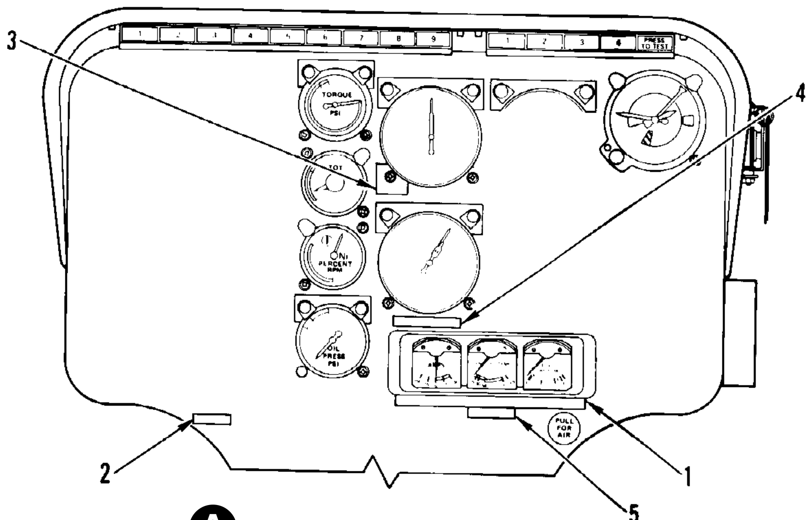
Figure 203. Placards - Instrument Panels (Sheet 1 of 2)

THIS HELICOPTER MUST BE OPERATED IN COMPLIANCE WITH THE OPERATING LIMITATIONS SPECIFIED IN THE FAA APPROVED ROTORCRAFT FLIGHT MANUAL

1. FLIGHT COMPLIANCE

RADIO CALL

2. RADIO CALL



A T-INSTRUMENT PANEL (369MD)

VNE
130KTS.I.A.S.
WITH LESS THAN
35LBS. FUEL

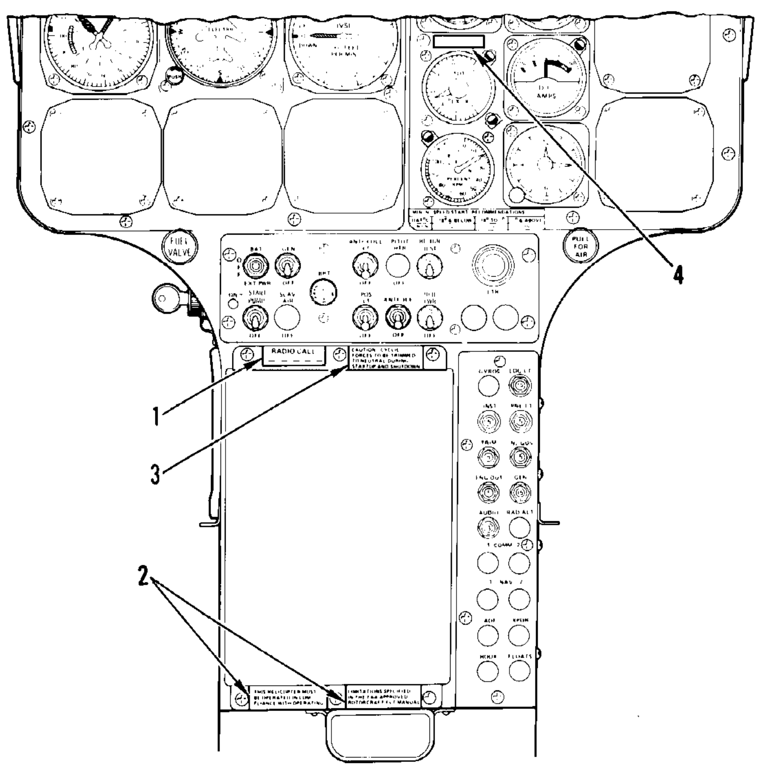
3. LOW FUEL WARNING

CAUTION-CYCLIC FORCES TO BE TRIMMED TO NEUTRAL DURING STARTUP AND SHUTDOWN

4. CYCLIC STICK POSTION WARNING

START RECOMMENDATIONS			
OAT °C	-32 TO -18	-18 TO 7	7 TO 46
N_1%	12	13	15

5. START RECOMMENDATIONS



A T-INSTRUMENT PANEL (369E/FF - 500N)

RADIO CALL

1. RADIO CALL

THIS HELICOPTER MUST BE OPERATED IN COMPLIANCE WITH OPERATING

LIMITATIONS SPECIFIED IN THE FAA APPROVED ROTORCRAFT FLT MANUAL

2. FLIGHT COMPLIANCE

CAUTION: CYCLIC FORCES TO BE TRIMMED TO NEUTRAL DURING START UP AND SHUTDOWN

3. CYCLIC STICK POSITION WARNING

VNE 50 KTS MAX WHEN TORQUE EXCEEDS 48.9 CONT.

4. WARNING HIGH TORQUE, 369FF

G11-0001-2A

Figure 203. Placards - Instrument Panels (Sheet 2 of 2)

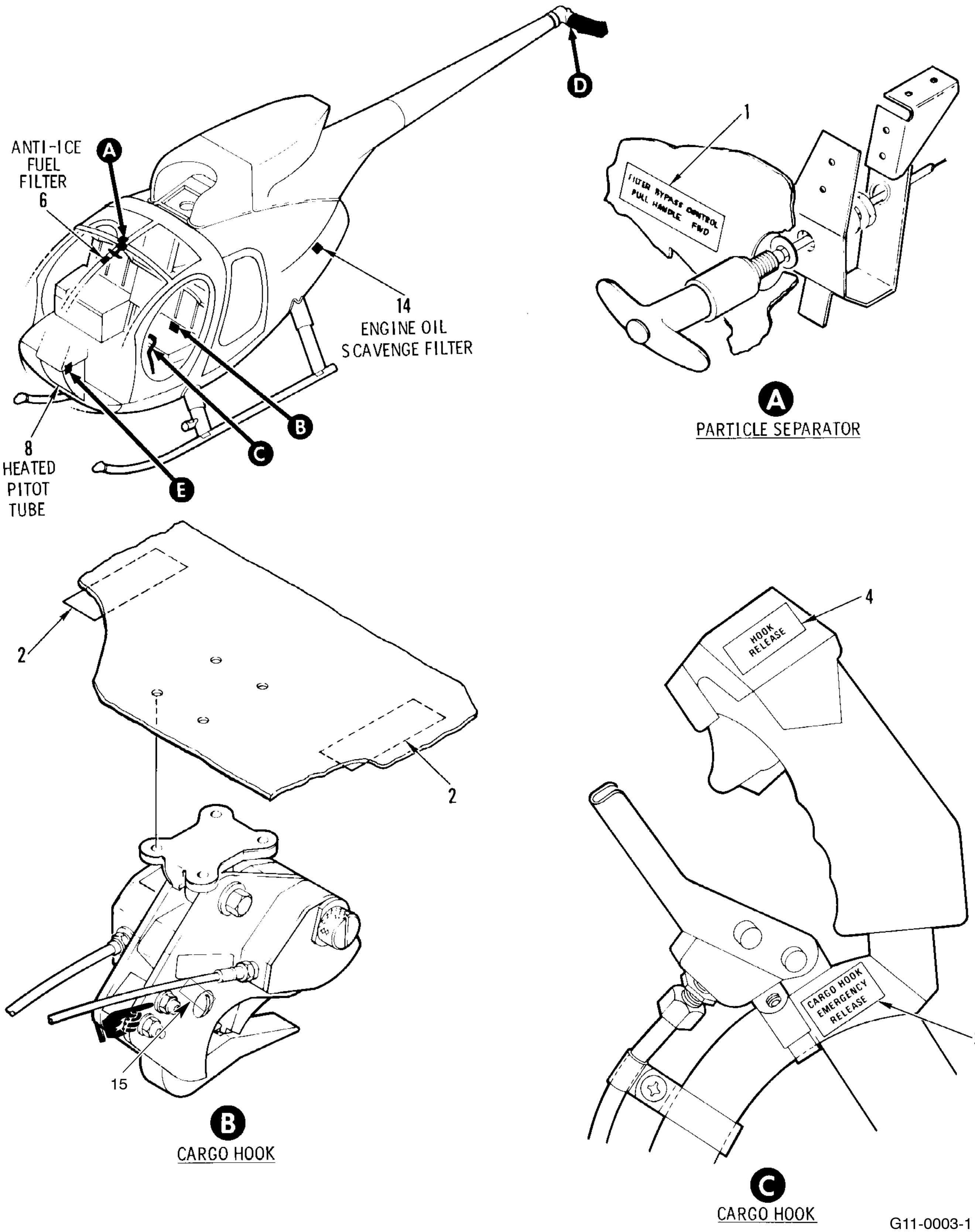


Figure 204. Placards - Optional Equipment (Sheet 1 of 4)

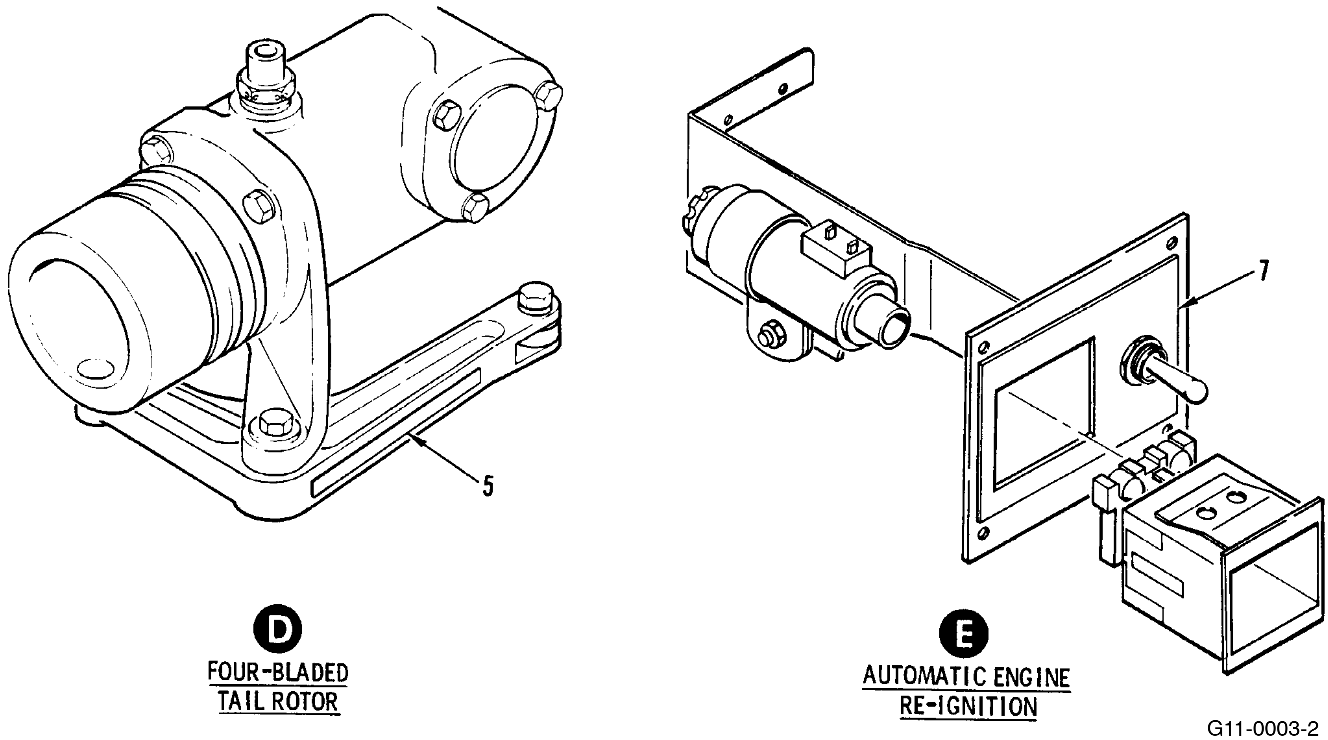
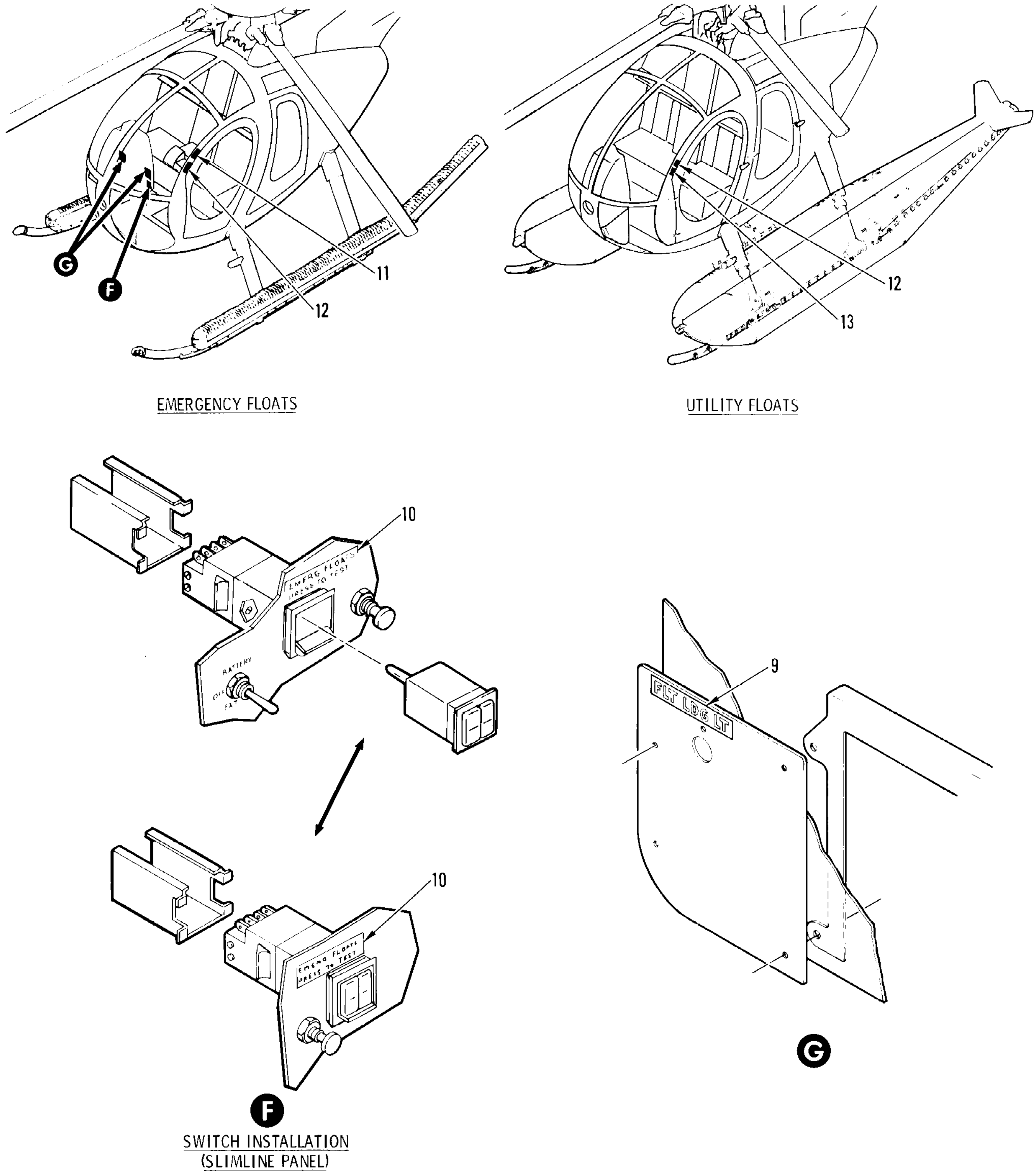


Figure 204. Placards - Optional Equipment (Sheet 2 of 4)



G11-0003-3

Figure 204. Placards - Optional Equipment (Sheet 3 of 4)

FILTER BY-PASS CONTROL
PULL HANDLE FWD

1. PARTICLE SEPARATOR

EXTERNAL LOAD LIMIT
2000 POUNDS

2.

**CARGO HOOK
EMERGENCY
RELEASE**

3.

**HOOK
RELEASE**

4.

CARGO HOOK

CAUTION: SPRING LOADED, DO NOT PUSH

5. FOUR-BLADED TAIL ROTOR

<u>ANTI-ICE</u>
<u>FUEL FILTER</u>
<u>INSTL</u>
FOR GROUND TEMP. OF 5° C OR LESS MAX. ALT. 12,000 FT.

FOR GROUND TEMP. GREATER THAN 5° C MAX. ALT. 14,000 FT.

<u>ANTI-ICE</u>
<u>AIRFRAME</u>
<u>FUEL FILTER</u>
<u>INSTL</u>
FOR GROUND TEMP. OF 5° C OR LESS. MAX. ALT. 12,000 FT.

FOR GROUND TEMP. GREATER THAN 5° C MAX. ALT. 14,000 FT.

6. ANTI-ICE FUEL FILTER

AUTO-RE-IGNITION
ARM
OFF
PRESS TO RESET

7. AUTOMATIC ENGINE REIGNITION

WARNING
PITOT MAY BE HOT
DO NOT TOUCH

8. HEATED PITOT TUBE

FLOAT LDG LT

9. LANDING LIGHT FLOAT

EMERGENCY FLOATS
PRESS TO TEST

10. AUXILIARY ELECTRICAL PANEL

WARNING
FLOAT INFLATION ABOVE 81 KNOTS IAS
AT LESS THAN 6000 FEET ALTITUDE,
77 KNOTS IAS AT 6000 FEET AND ABOVE,
IS PROHIBITED

11. WARNING

EMERGENCY FLOATS

NIGHT FLIGHT OVER
WATER BEYOND
AUTOROTATION CAPABILITY
TO GROUND PROHIBITED

12. NIGHT FLIGHT RESTRICTION (ALSO EMERGENCY FLOATS)

MINIMUM FLOAT
OPERATIONAL
PRESSURE IS
2.0 PSIG

13. MIN. OPERATIONAL PRESSURE

UTILITY FLOATS

Facet FILTER PRODUCTS DIVISION
GREENSBORO, NC 27409

A. INSPECT RED BUTTON ON BOTTOM OF BOWL FOR INDICATION OF FILTER BYPASS.
B. IF RED BUTTON IS NOT SHOWING PROCEED WITH PREFLIGHT.
C. RED BUTTON SHOWING, RESET BUTTON ONCE AND RUN ENGINE.
D. IF RED BUTTON REAPPEARS, DISCONTINUE OPERATIONS AND INVESTIGATE REASON FOR FILTER BYPASS INDICATION.

14. ENGINE OIL SCAVENGE FILTER (MODEL D AND E WITH A C20/R-2 ENGINE CONVERSION

WARNING
USE CORRECT LOAD
RINGS, RINGS WITH
INTERNAL DIM.
GREATER THAN
1.5 INCHES
CAN SLIP OFF

15. CARGO HOOK P/N 17149-1 THRU -5

G11-0003-4B

Figure 204. Placards - Optional Equipment (Sheet 4 of 4)

Section

11-40-00

Placards and Markings (600N)

PLACARDS AND MARKINGS
MAINTENANCE PRACTICES

1. General

(Ref. Figure 201 thru Figure 203 for placards and markings most common to Model 600N helicopters). Nomenclature corresponds to that used in the IPC. (Ref. Illustrated Parts Catalog for each decal part number and the quantity required.)

The following illustrations cover different areas of decal placement on the helicopter:

(1). Exterior - Figure 201.

(2). Interior - Figure 202.

(3). Instrument panels - Figure 203.

2. Decal Application

(1). Where a decal overlaps or covers drain holes, access doors, etc., the decal shall be cut out to provide proper draining or ease of opening or removing of doors, plates, etc.

(2). Where a decal is applied over a skin lap (one skin overlapping another), the decal must be cut so that it lies flat and makes a positive bond.

(3). Seal edges of all exterior decals, and only those interior decals in the engine compartment and cargo compartment aft of the transmission, with epoxy adhesive. Edge sealing to be a minimum of 1/32 inch (0.8mm) and a maximum of 1/8 inch (3mm) around perimeter of decal.

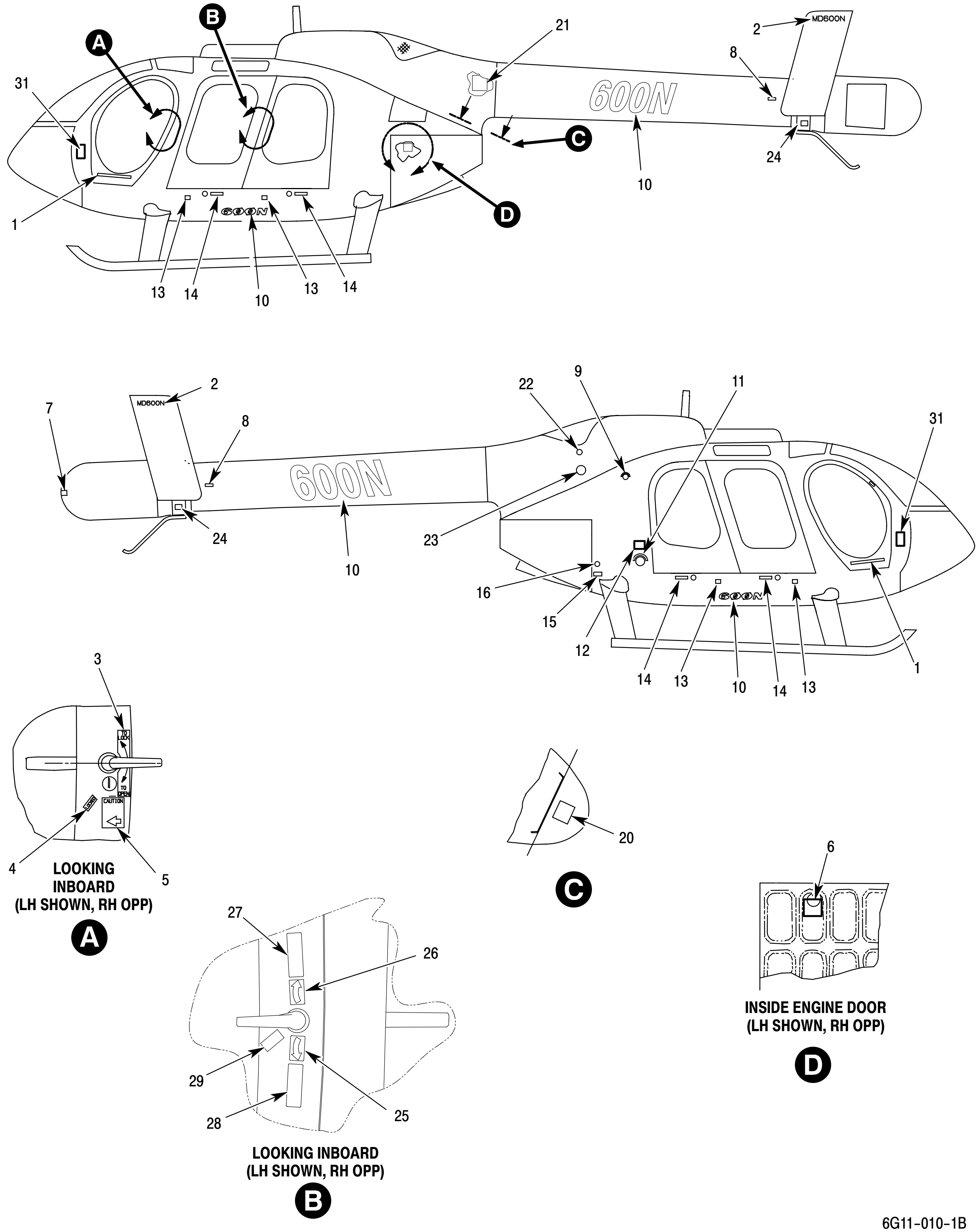


Figure 201. Exterior Placards and Markings (Sheet 1 of 4)

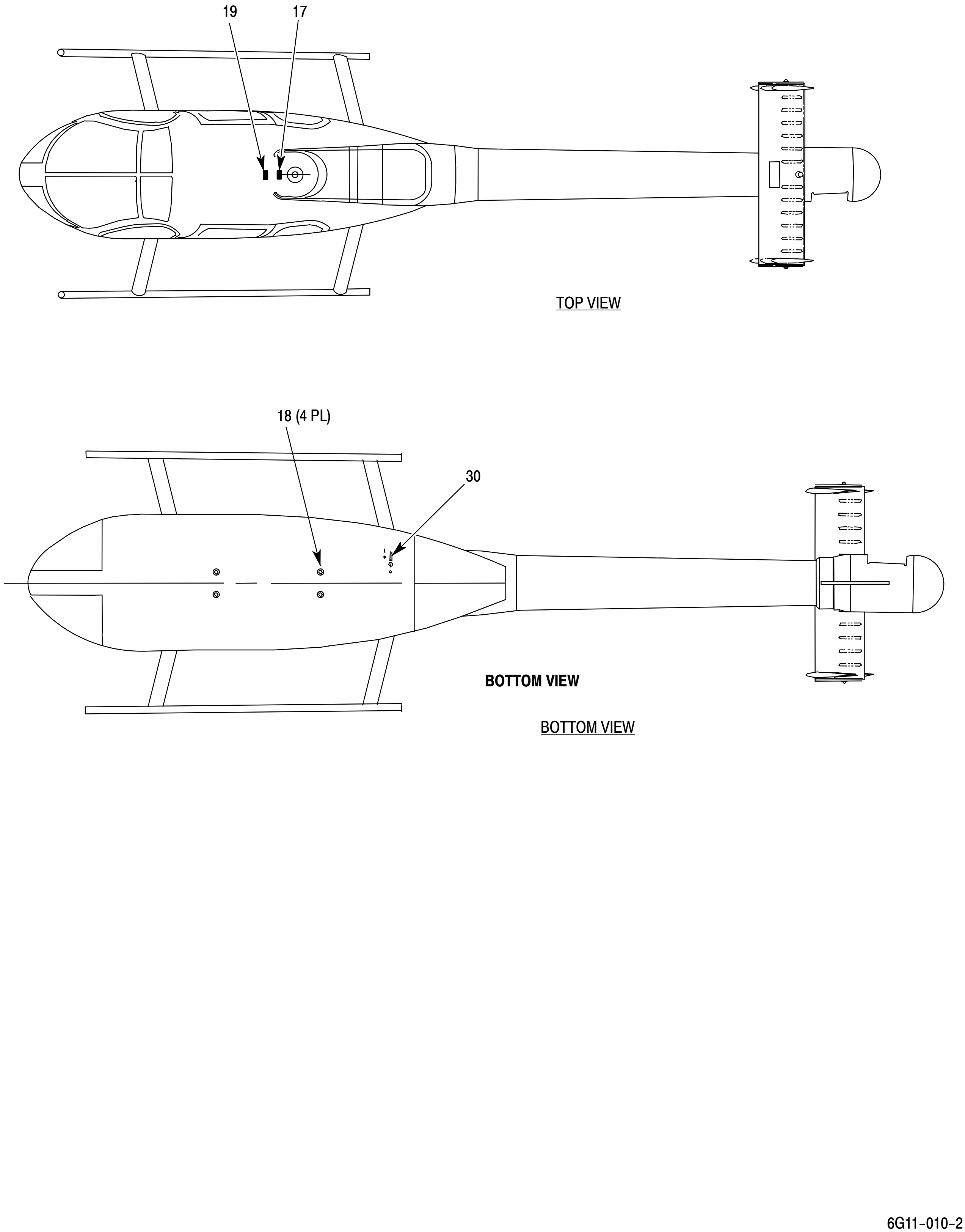


Figure 201. Exterior Placards and Markings (Sheet 2 of 4)

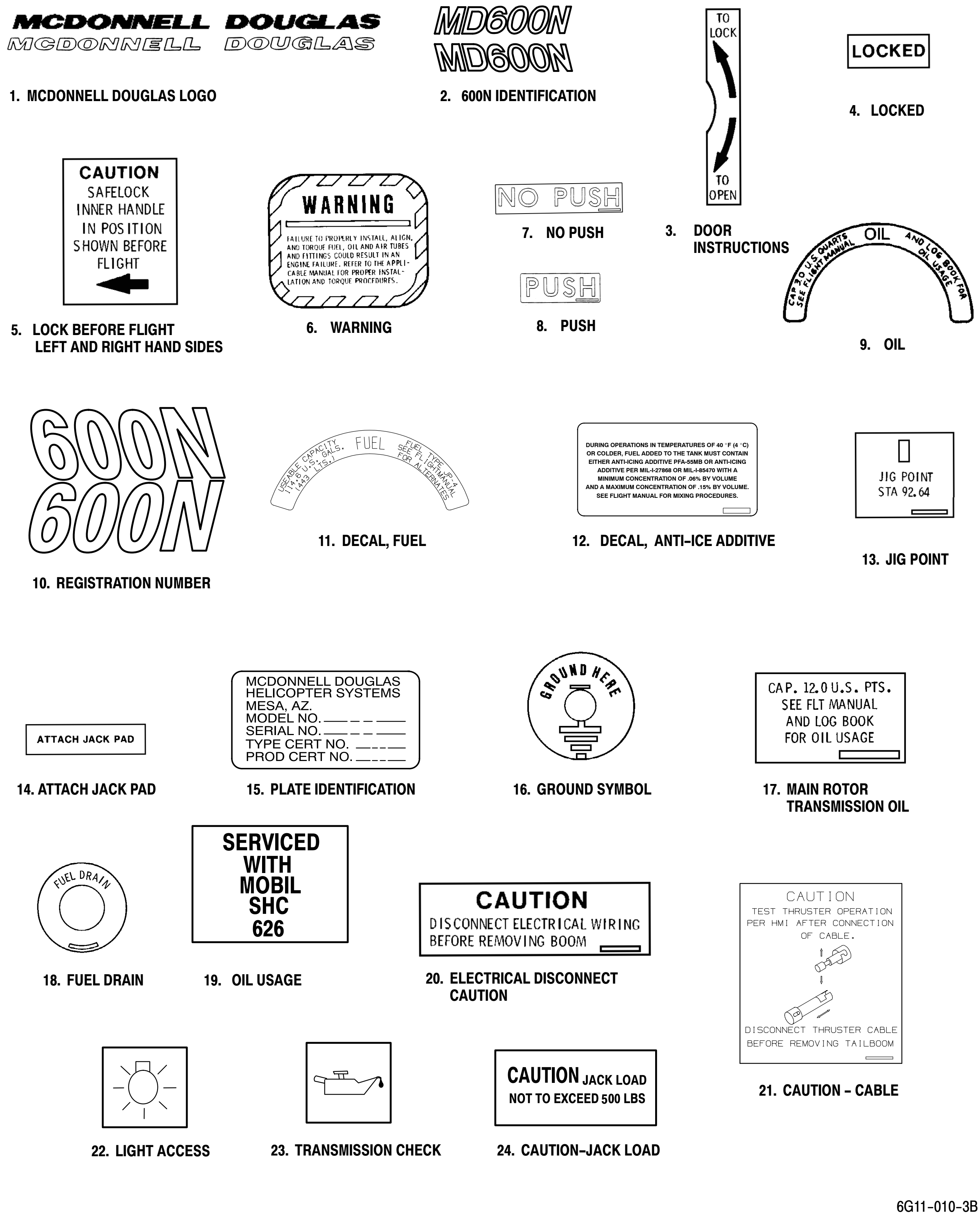
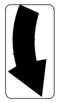
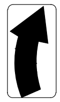


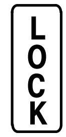
Figure 201. Exterior Placards and Markings (Sheet 3 of 4)



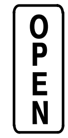
25. DECAL ARROW



26. DECAL ARROW



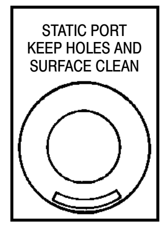
27. DECAL, LOCK



28. DECAL, OPEN

29. DECAL, LOCKED

30. DECAL, ENGINE VENT



31. DECAL, STATIC PORT

6G11-010-4A

Figure 201. Exterior Placards and Markings (Sheet 4 of 4)

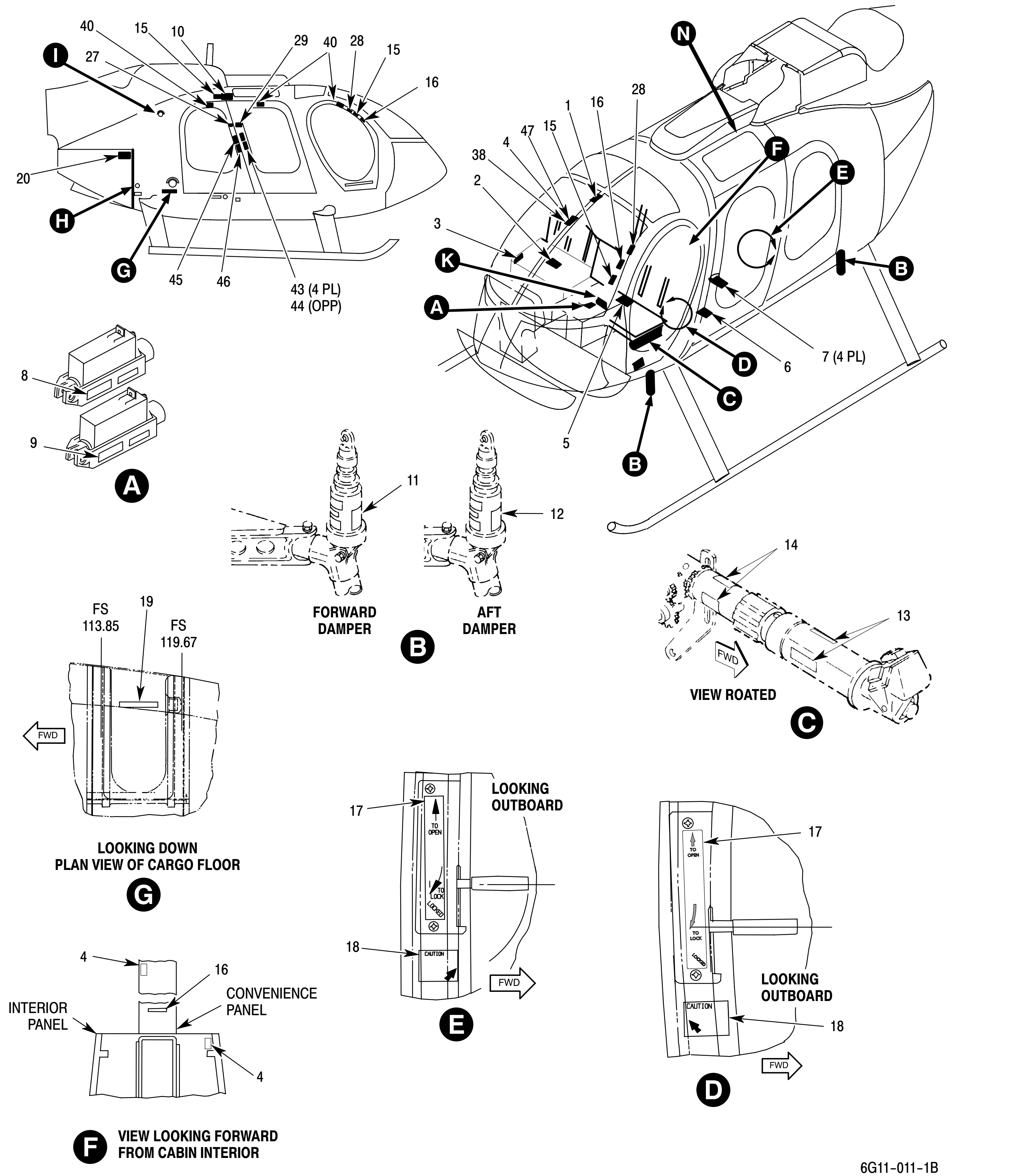


Figure 202. Interior Placards and Markings (Sheet 1 of 4)

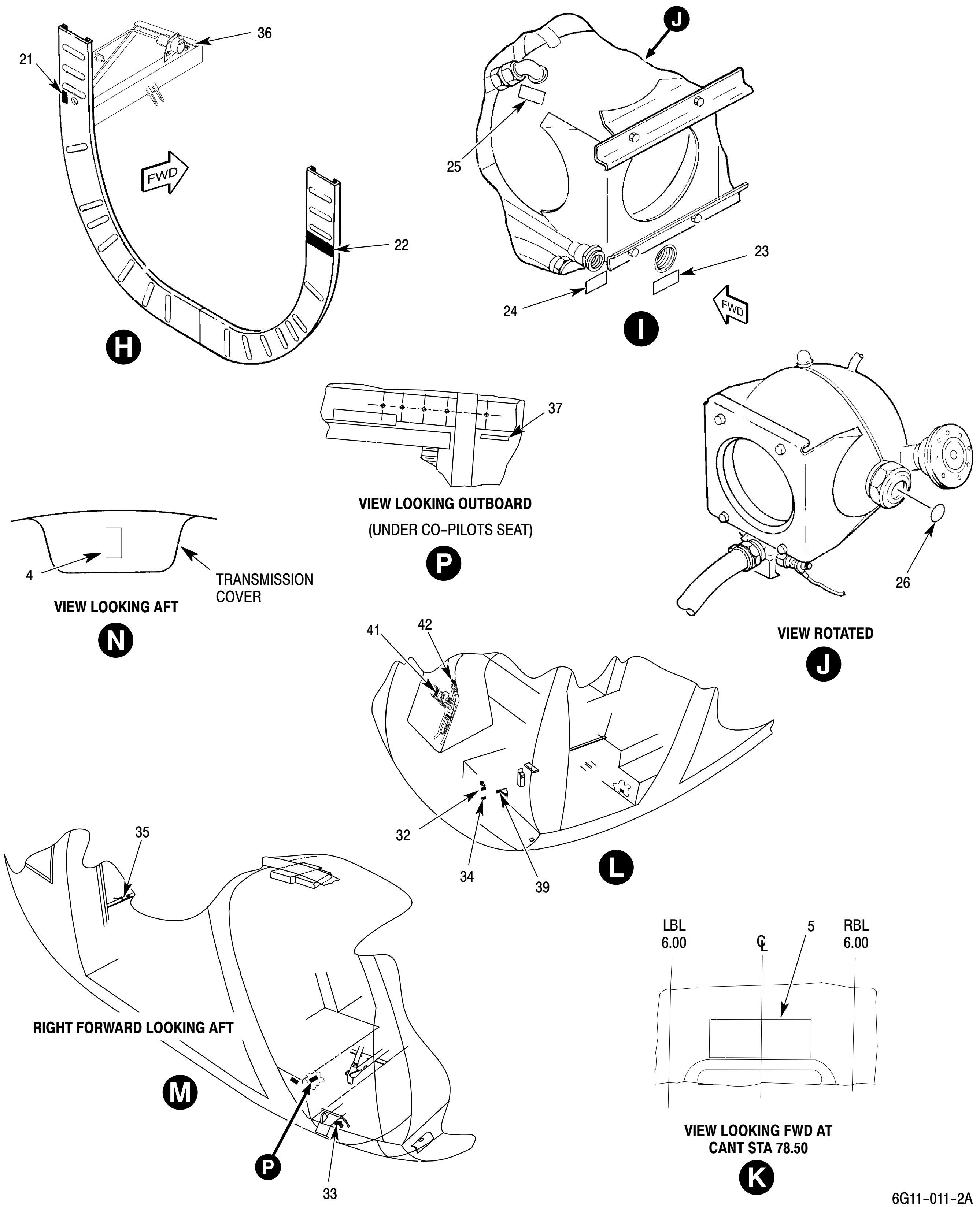


Figure 202. Interior Placards and Markings (Sheet 2 of 4)

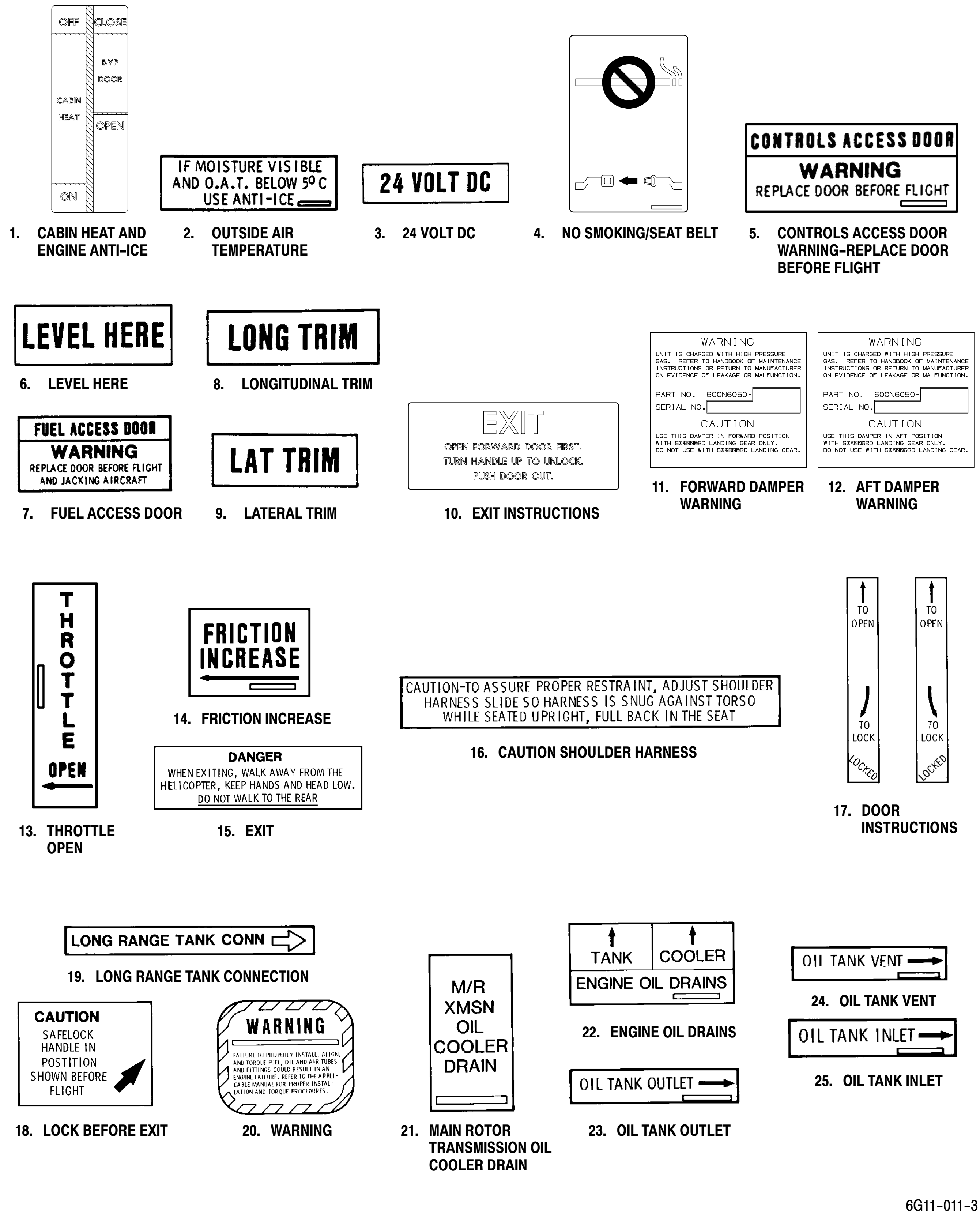


Figure 202. Interior Placards and Markings (Sheet 3 of 4)

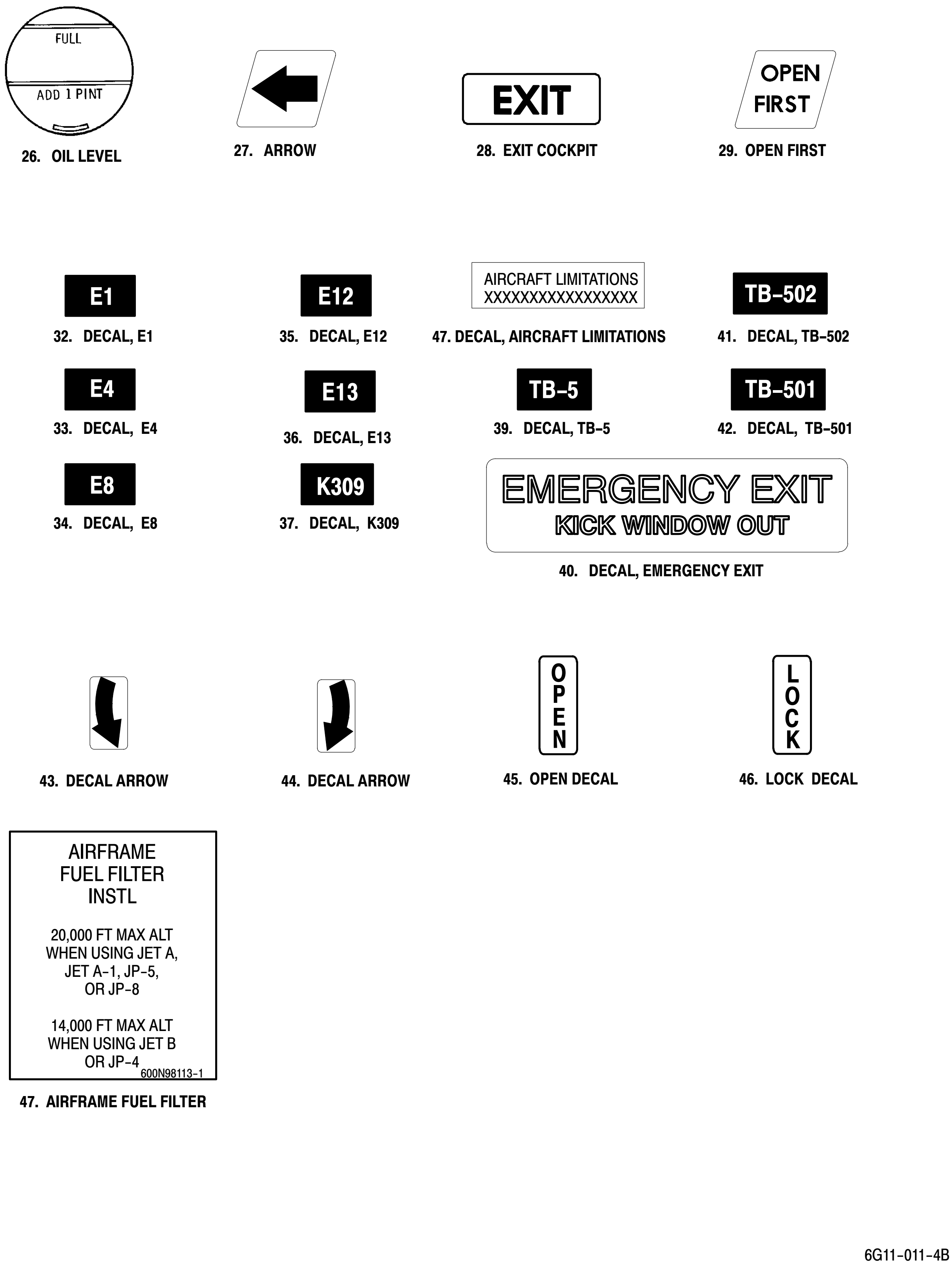


Figure 202. Interior Placards and Markings (Sheet 4 of 4)

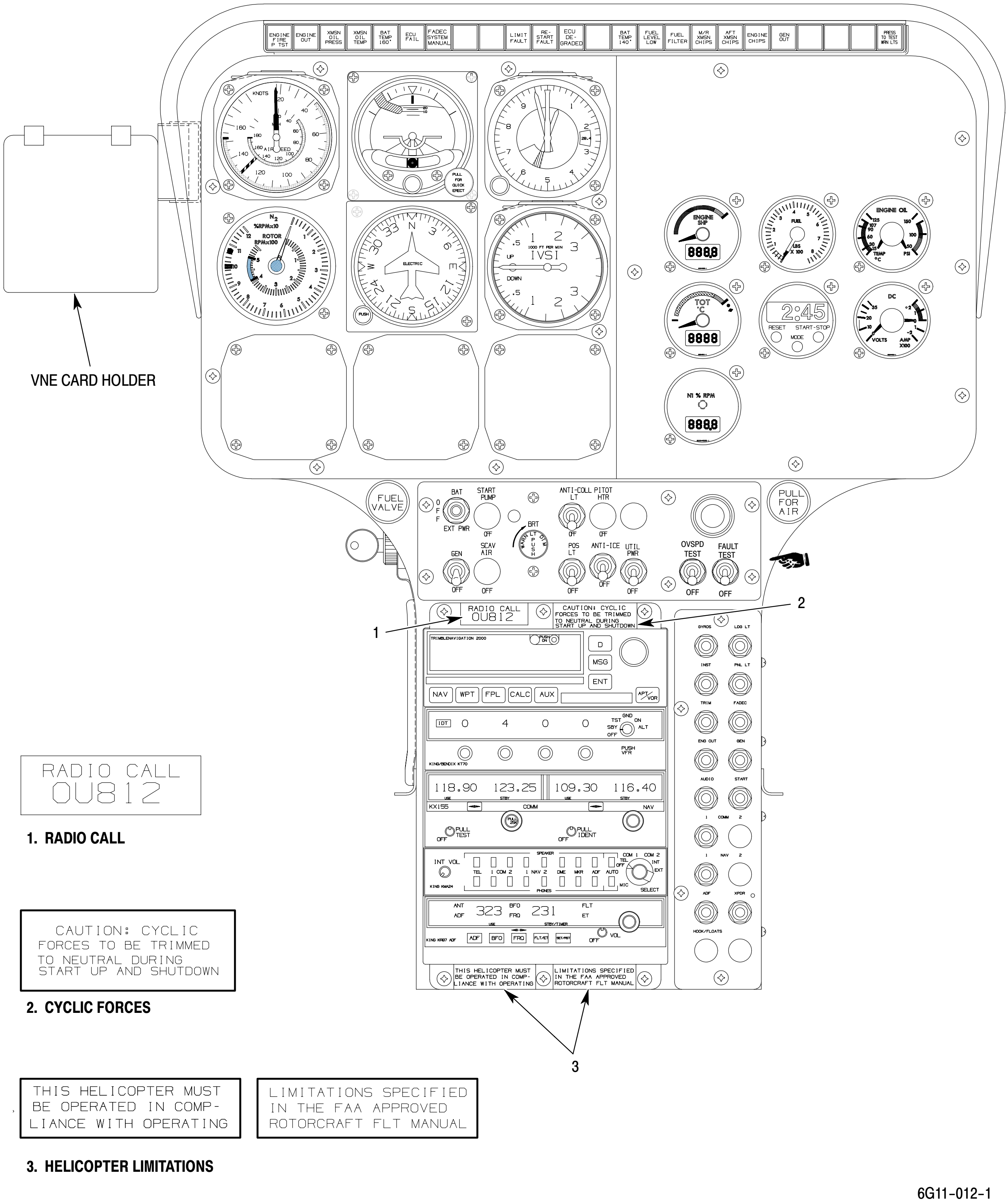


Figure 203. Instrument Panel Placards and Markings (Sheet 1 of 2)

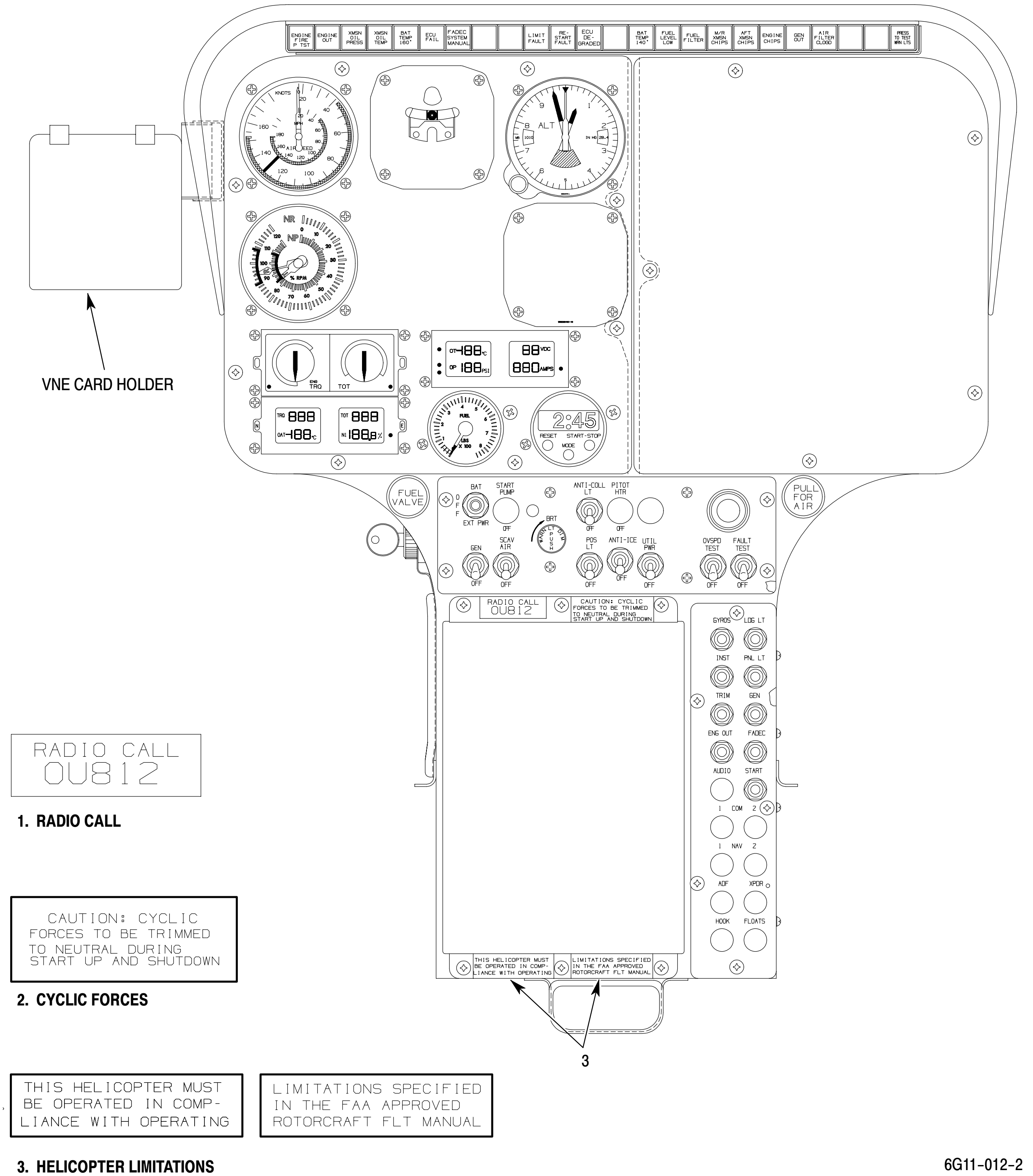


Figure 203. Instrument Panel Placards and Markings (Sheet 2 of 2)

Chapter

12

Servicing

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont.)

Section

12-00-00

Helicopter Servicing

HELICOPTER SERVICING
SERVICING

1. Servicing (General)

Servicing of helicopter includes replenishment of fuel, changing or replenishment of oil and other such maintenance functions.

For locations of servicing points of standard equipment Refer to Figure 301. For optional equipment servicing points Refer to Figure 302. For lubrication points Refer to Figure 304.

NOTE: The servicing intervals designated herein are the maximum allowable and should not be exceeded. When unusual local conditions such as environmental conditions, utilization, etc., dictate, it is the prerogative and responsibility of the operator to increase the scope and frequency of the inspections as necessary to ensure safe operation.

2. Servicing (Special)

Whenever helicopter operation has taken place over or around salt water environments and other environments found to be corrosive, the following wash procedures must be performed.

A. Main Rotor Hub Wash Procedure

(Ref. Main Rotor Hub Corrosion Prevention Tri-Flow Wash Procedure, Sec. 20-40-00)

B. Main Rotor Blades Washing and Waxing

(Ref. Main Rotor Blades Corrosion Arresting, Sec. 20-40-00)

C. Engine Compressor Wash

(Ref. Chap. 71 and applicable Allison Engine Operation and Maintenance Manual, Table 201, Sec. 01-00-00)

3. Fuel System Servicing

Fuel Cell Capacities 369D/E/FF - 500N

Nonself-Sealing	64.0 U.S. Gal. (242 Liters)
Usable Fuel	62.7U.S. Gal. (237 Liters)
Self-Sealing	62.0 U.S. Gal. (234 Liters)
Usable Fuel	60.7 U.S. Gal. (229 Liters)

Fuel Cell Capacities 600N

Total Fuel	116.2 U.S. Gal. (440 Liters)
Usable Fuel	114.6 U.S. Gal. (434 Liters)

A. Fuel System Servicing Precautions

Comply with following precautions when servicing fuel system.

WARNING **Turn off electrical switches and disconnect any external power from helicopter. Electrically ground helicopter prior to refueling or defueling. Static discharge spark in presence of fuel vapors can cause fire or an explosion.**

(1). Refueling vehicle should be parked a minimum of 20 ft. (6 M) from helicopter during fueling operation.

(2). Before starting fueling operation, always ground fueling nozzle or fuel truck to GROUND HERE receptacle or to another bare metal location.

B. Approved Fuels

Service the helicopter with one of the authorized fuels listed in the applicable Allison Engine Operation and Maintenance Manual (Ref. Table 201, Sec. 01-00-00). For operation under emergency conditions where authorized fuel is not available, or for operation under cold weather conditions, refer to same manual.

C. Fuel System Filling

The fuel system has two fuel cells that are interconnected for simultaneous flow and venting. Fuel system filler is on right side of helicopter.

(1). Refuel helicopter with correct fuel as soon after landing as possible to prevent moisture condensation and to keep helicopter as heavy as possible in case of winds.

(2). Keep fueling nozzle free of all foreign matter.

(3). Check filler cap for security after fueling.

D. Fuel System Draining

Fuel draining should be accomplished with helicopter as level as possible.

(1). Fuel system may be defueled in either of two ways:

CAUTION To avoid possible damage to fuel pump, do not operate fuel pump with fuel tanks drained.

(a). Defuel through filler port using a pump.

(b). Open system drain valves on fuselage underside and in engine compartment.

(2). Fuel supply line drain valves are spring loaded type and open by pushing valve and attached drain line.

(3). Fuel cells drain valve is spring-loaded closed and is opened by pressing internal plunger.

E. Fuel System Bleeding

(Ref. Chap. 28 and applicable Allison Engine Operation and Maintenance Manual, Table 201, Sec. 01-00-00) Purge entrapped air from the fuel system, if necessary.

F. Engine Fuel Filter Replacement

(Ref. Applicable Allison Engine Operation and Maintenance Manual, Table 201, Sec. 01-00-00)

4. Engine Oil System Servicing

Oil Tank Capacity	3.0 U.S. Qt. (2.84 Liter)

A. Approved Lubricants

Service the helicopter with one of the authorized oils listed.

For operation under emergency conditions where different oils must be mixed, or for operation under cold weather conditions, use alternate lubricants (Ref. applicable Allison Engine Operation and Maintenance Manual, Table 201, Sec. 01-00-00).

NOTE: If the type of engine oil or the oil group is changed, remove and inspect the oil filter each 25 hours of engine operation (Ref. applicable Allison Engine Operation and Maintenance Manual for further information).

B. Engine Oil Changing

(Ref. Applicable Allison Engine Operation and Maintenance Manual, Table 201, Sec. 01-00-00)

C. Engine Oil System Filling

The engine oil tank filler is on the right side of the helicopter. A liquid level sight gauge for checking oil level in tank is visible through a transparent window near the filler.

NOTE:

- Before adding oil, the oil container must be shaken to ensure proper mixture of the anti-foaming additive.
- If sight gauge does not permit positive determination, remove filler cap and visually check the oil level.

(1). Check oil level within 15 minutes of engine shutdown; replenish if low.

(2). If engine oil level is low after helicopter has set for more than 15 minutes;

(a). Run engine for at least 1 minute at ground idle.

CAUTION Ensure engine oil pressure is attained when starting engine (Ref. applicable Pilot's Flight Manual).

(b). Shut down engine, check oil level, replenish if low.

NOTE:

- Motoring engine can draw oil from the oil tank to the gearbox, giving low oil level indications.
- If engine oil level indicates a low condition after setting overnight, engine check valve may be leaking oil from tank to engine gearcase.

(3). Ensure oil tank filler cap is securely tightened immediately after servicing.

D. Engine Oil System Draining (Helicopters With Sta. 137.50 Bulkhead Drain Ports Installed)

(1). Open engine access doors.

(2). Place suitable container under engine oil tank drain and remove engine oil tank filler cap.

(3). Remove engine oil tank drain cap.

(4). After draining oil from tank, reinstall engine oil tank drain cap and filler cap.

(5). To drain residual oil from engine accessory gearbox drain, remove wire lead and lower chip detector. Use suitable container to catch oil. Check that detector O-ring is serviceable (replace as required); reinstall detector; torque to **50 - 60 inch-pounds (5.65 - 6.78 Nm)**; lockwire and reconnect wire lead.

E. Engine Oil System Draining (Helicopters with Drain Valve Installed)

(1). Remove interior trim and aft bulkhead right access cover.

(2). Place a suitable container under overboard oil drain line where it exits fuselage underside at firewall.

(3). Remove cap from engine oil tank filler. Pull out knurled spring-loaded button to open valve in engine oil drain line just below engine oil cooler (Ref. Figure 301). Rotate button and valve poppet so that locking pin rests on shoulders of pin slot.

(4). After draining oil from tank, reinstall filler cap and close oil drain valve; ensure that poppet pin is in stop slot.

(5). Reinstall access cover and interior trim.

(6). To drain residual oil from engine accessory gearbox drain, remove wire lead and lower chip detector (Ref. Sec. 79-00-00). Use suitable container to catch oil. Check that detector O-ring is serviceable (replace as required); reinstall detector, torque to **50 - 60 inch-pounds (5.65 - 6.78 Nm)** and reconnect wire lead.

F. Engine Oil System Flushing

The following procedure is for flushing oil that has been contaminated or when changing the type of oil.

(1). Drain oil from engine, oil tank and oil cooler (Ref. Engine Oil System Draining).

(2). Replace engine oil filter(s) (Ref. Applicable Allison Operation and Maintenance Manual).

(3). Refill engine oil system (Ref. Engine Oil System Filling).

(4). Operate engine for five minutes and repeat above procedures.

5. Main Rotor Transmission Servicing

Service the helicopter with one of the authorized oils listed (Ref. Sec. 91-00-00).

NOTE: Mobil oil SHC 626 can be formulated such that it may have two different colors. The oil can still be mixed with no adverse affects.

Main Transmission Capacities

369D25100	12.0 U.S. Pt. (5.67 Liter)
369F5100	14.0 U.S. Pt. (6.62 Liter)

A. Main Rotor Transmission Filling

Transmission (gearbox) oil should be replaced with new oil whenever it is drained. A liquid level sight gauge for checking main rotor transmission oil level is located on the right-hand side and visible through the clear panel of the main transmission interior cover.

NOTE:

- Replacement of oil pump filter (Ref. Sec. 63-21-00) is required after oil is drained from main rotor transmission and at intervals specified (Ref. Sec. 05-20-20).
- If oil was drained from transmission cooler, ground-operate helicopter for 15 minutes after replenishing oil (Ref. applicable PFM, Table 201, Sec. 01-00-00). Recheck oil level at liquid level sight gauge and replenish as necessary. This purges air from oil cooling system and ensures that entire oil cooling system is full.

(1). Replenish with correct oil until oil level is at FULL on sight gauge by lifting breather-filler cap and inserting spout of oil can into opening.

(2). Check that spring-loaded cap closes when oil can spout is removed. Replace trim cover.

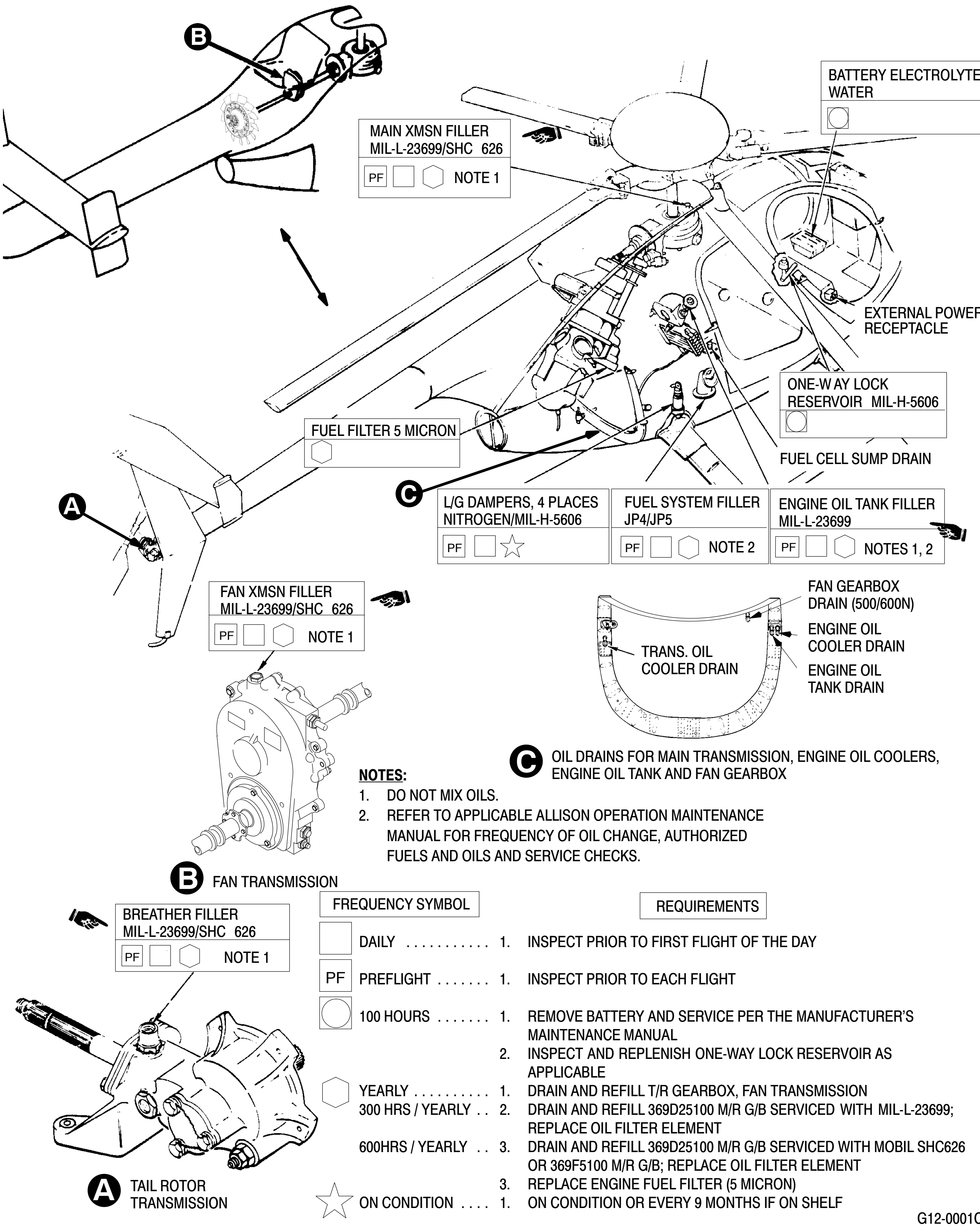
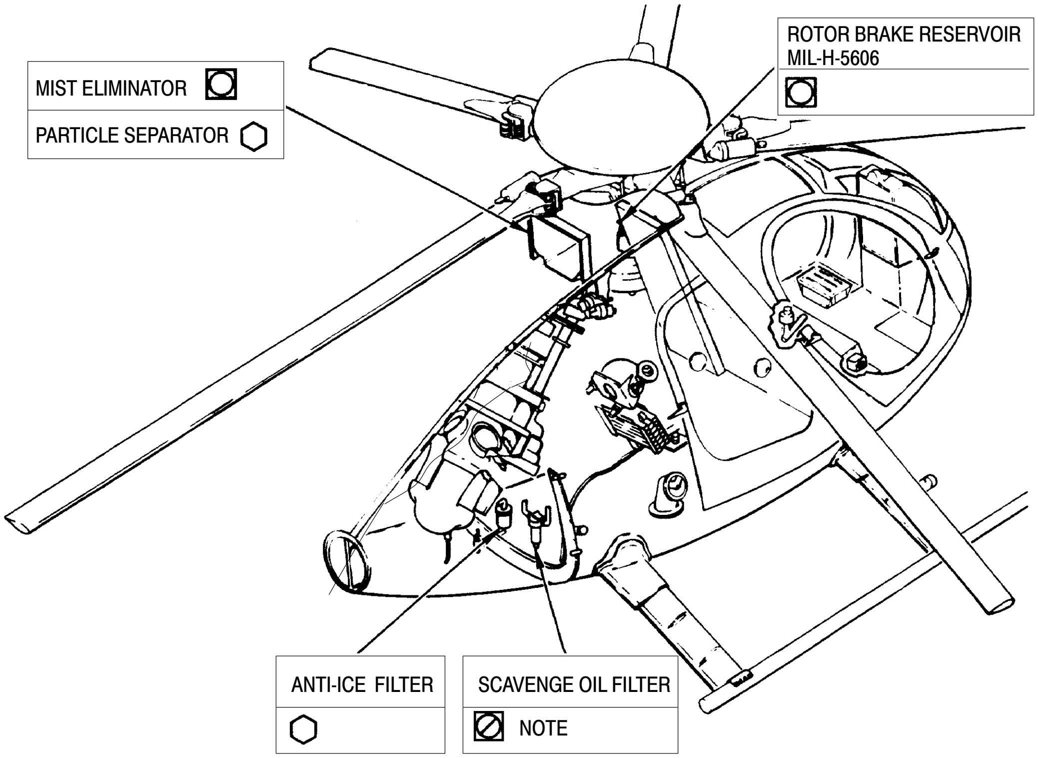


Figure 301. Servicing Points - Standard Equipment



NOTE:
APPLICABLE TO ALL ALLISON 250C20R/2 AND C47 ENGINES.
OPTIONAL EQUIPMENT FOR ALLISON 250C20B, C30 ENGINES.
REFER TO ALLISON OPERATION AND MAINTENANCE MANUAL
FOR FILTER ELEMENT REPLACEMENT SCHEDULE.

FREQUENCY SYMBOL		REQUIREMENT
100 HOURS	1.	CHECK ROTOR BRAKE RESERVOIR FOR PROPER LEVEL; REPLENISH IF LOW.
	2.	REMOVE AND CLEAN THE MIST ELIMINATOR.
NOTE	3.	REPLACE SCAVENGE OIL FILTER ELEMENT.
300 HOURS	4.	REPLACE ANTI-ICE FILTER ELEMENT.
	5.	REMOVE AND CLEAN PARTICLE SEPARATOR ASSEMBLY.

SERVICING MATERIAL

SPEC:	MATERIAL:	REF:
MIL-L-23699 MOBIL SHC 626	LUBRICATING OILS	TABLE 1, 91-00-00 ITEMS CM125 & CM126
JET A/JP4/JP5/JP8	ENGINE FUEL, TURBINE	TABLE 201, 01-00-00 ALLISON OPERATION AND MAINTENANCE MANUAL
MS36300 OR 0-B-41	DISTILLED WATER	ANY SOURCE ACCEPTABLE
DRY NITROGEN	OR EQUIVALENT	ANY SOURCE ACCEPTABLE

G12-0002B

Figure 302. Servicing Points - Optional Equipment

B. Main Rotor Transmission Draining

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST301	Main transmission drain hose

(1). Remove main rotor transmission cooler drain cap and drain oil into suitable container.

(2). Remove main rotor transmission drain access covers, wire leads and chip detectors.

(3). Using main rotor transmission drain hose (ST301), drain oil into suitable container.

(4). If damaged, replace O-rings used with chip detectors and self-closing valves.

(5). If removed, reinstall self-closing valve. Torque valve to **50 - 60 inch-pounds (5.65 - 6.78 Nm)** and chip detector to **40 - 50 inch-pounds (4.52 - 5.65 Nm)**. Lockwire valve to gearbox and detector to valve. Reconnect wire leads.

(6). Reinstall main rotor transmission access covers.

C. Main Rotor Transmission Oil System Flushing

The following procedure is for flushing oil that has been contaminated or when changing the type of oil.

(1). Drain oil from transmission and oil cooler (Ref. Main Rotor Transmission Draining).

(2). Replace transmission oil filter (Ref. Sec. 63-21-00, Main Transmission Filter Replacement).

(3). Refill transmission oil system (Ref. Main Rotor Transmission Filling).

(4). Operate aircraft for five minutes, shut down and repeat steps (1). thru (3).

6. Tail Rotor Transmission Servicing

Service the helicopter with one of the authorized oils listed (Ref. Table 1, Sec. 91-00-00).

NOTE: Mobil oil SHC 626 can be formulated such that it may have two different colors. The oil can still be mixed with no adverse affects.

Tail Rotor Transmission Capacity

369D25300	0.530 U.S. Pt. (0.250 Liter)
369D25400	0.530 U.S. Pt. (0.250 Liter)

A. Tail Rotor Transmission Filling

Tail rotor transmission oil should be replaced with new oil whenever it is drained. A liquid level sight gauge for checking oil level is located on the transmission housing.

(1). Check oil level.

(2). Remove lockwire and unscrew breather-filler cap.

(3). Fill with proper oil by pouring oil into transmission until oil level shows FULL on sight gauge.

(4). Check that filler O-ring is serviceable (replace if necessary). Reinstall breather-filler and torque to **45 - 55 inch-pounds (5.08 - 6.21 Nm)** with breather hole aft (Ref. Sec. 63-25-10) at completion of torquing. Secure with lockwire.

B. Tail Rotor Transmission Draining

(1). Position suitable container under tail rotor transmission drain.

(2). Remove wire lead, lockwire, chip detector and self-closing valve (Ref. Sec. 63-25-10).

(3). If damaged, replace O-rings used with chip detector and self-closing valve.

(4). After oil drains, install self-closing valve. Torque valve to **50 - 60 inch-pounds (5.65 - 6.78 Nm)** and chip detector to **40 - 50 inch-pounds (4.52 - 5.65 Nm)**. Lockwire valve to gearbox and detector to valve; reconnect wire leads.

C. Tail Rotor Transmission Flushing

The following procedure is for flushing oil that has been contaminated or when changing the type of oil.

(1). Drain oil from tail rotor transmission (Ref. Tail Rotor Transmission Draining).

(2). Refill tail rotor transmission (Ref. Tail Rotor Rotor Transmission Filling).

(3). Operate aircraft for five minutes, shut down and repeat steps (1). and (2).

7. Anti-Torque Fan Transmission Servicing

Service the helicopter with one of the authorized oils listed (Ref. Sec. 91-00-00).

NOTE: Mobil oil SHC 626 can be formulated such that it may have two different colors. The oil can still be mixed with no adverse affects.

Fan Transmission Capacity	8 U.S. Oz. (236 cc)

A. Anti-Torque Fan Transmission Filling

Anti-torque fan transmission oil should be replaced with new oil whenever it is drained. A liquid level sight gage for checking oil level is located on the transmission housing.

(1). Check oil level.

(2). If servicing is required, remove fan inlet screen and fan hub transmission fairing.

(3). Remove lockwire and remove filler plug.

(4). Fill by pouring oil into transmission filler plug hole, until oil level shows FULL on sight gauge.

(5). Check that plug O-ring is serviceable (replace as required). Reinstall filler plug and torque to **45 - 55 inch-pounds (5.08 - 6.21 Nm)**. Secure with lockwire.

B. Anti-Torque Fan Transmission Draining

(1). Remove fan inlet screen and transmission fairing.

(2). Cut lockwire and remove fan transmission filler plug.

(3). Open engine access doors and place suitable container under the fan transmission drain and remove cap. (Ref. Figure 301).

(4). After draining oil from transmission, reinstall drain cap.

C. Anti-Torque Fan Transmission Flushing

The following procedure is for flushing oil that has been contaminated or when changing the type of oil.

(1). Drain oil from fan transmission (Ref. Anti-Torque Fan Transmission Draining).

(2). Refill fan transmission (Ref. Anti-Torque Fan Transmission Filling).

(3). Operate aircraft for five minutes, shut down and repeat steps (1). and (2).

8. One-Way Lock Control System Servicing

Service the helicopter with one of the authorized hydraulic oils listed (Ref. Sec. 91-00-00).

One-Way Lock Capacity	0.67 U.S. Oz. (20 cc)

(1). To check oil level, remove control access cover.

NOTE: Reservoir should be 1/2 to 3/4 full.

(2). If oil level in reservoir is low, lift filler cap and add oil as needed.

(3). Reinstall pilot's seat cover.

NOTE: If oil level is consistently low, one-way lock should be repaired to stop oil leakage (Ref. Component Overhaul Manual).

9. Overrunning Clutch Servicing and Oil Leak Analysis

(Ref. Figure 303) When oil leakage or seepage is noticed at oil seals or assembly joint lines of overrunning clutch, clutch requires further inspection and investigation as follows.

NOTE: Mobil oil SHC 626 can be formulated such that it may have two different colors. The oil can still be mixed with no adverse affects.

Overrunning Clutch Capacities

369A5350-11, -21, -31	1.52 U.S. Oz. (45cc)
369A5350-41, -51	1.01 U.S. Oz. (30 cc)
369F5450	3.64 U.S. Oz. (110 cc)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM112	Anti-seize compound high temperature
CM125	Oil
CM126	Oil, turbine

CAUTION

- Checking clutch oil level requires removal of main rotor transmission drive shaft. Use care not to stress drive shaft diaphragms (early type) or flexible couplings (current type) during removal and installation. Deflection in these areas are limited due to material hardness.
- The 369F5450 clutch is only to be serviced with Mobil SHC 626 oil (CM125).
- The 369A5350 clutch is only to be serviced with MIL-L-23699 oil (CM126).

(1). Remove trim and blower access door.

(2). Remove main rotor transmission drive shaft (Ref. Sec. 63-10-00). Carefully slide shaft from drive couplings; do not strike shaft against any object.

(3). Remove coupling bolt and O-ring from end of clutch.

(4). Check that the three drain holes in clutch housing are clean and free of obstruction. Oil leakage may indicate engine power output seal leakage if clutch oil level is checked and within limits.

(5). For a 369A5350 Clutch:

(a). Using a clean 6 inch (15 cm) machinists scale, 1/2 inch (12.7 mm) width, slowly insert scale into center of clutch output shaft until scale bottoms. Scale must be inserted 4 7/8 inches (12.38 cm).

NOTE: Trim edge of scale as required to reduce width of scale and allow scale to bottom in clutch.

(b). Read scale to determine oil level and servicing required. Full oil level is indicated by oil level of 2 7/8 inches (7.30 cm) on scale. Minimum allowable quantity (13 cc) is 7/8 inch (22.23 mm) on scale. Recheck reading a minimum of three times.

CAUTION If oil quantity is less than 7/8 inch (22.23 cm) on scale, the clutch subassembly must be removed and inspected for evidence of overheating (Ref. CSP-DEF-5).

(6). For a 369F5450 clutch, there is two methods for checking the oil level:

(a). First Method: Full oil level is indicated by oil level of 3 1/8 inches (9.84 cm) on a 6 inch (15 cm) machinists scale, 1/2 inch (12.7 mm) width, inserted into clutch exactly 5 inches (12.7 cm). Minimum allowable quantity (60 cc) is 5/8 inch (15.88 mm) on scale. Recheck reading a minimum of three times.

(b). Second Method: Full oil level is indicated by oil level of 4 5/8 inches (11.77 cm) on a 12 inch (30 cm) machinists scale, 1/2 inch (12.7 mm) width, inserted to bottom of inner race. Minimum allowable quantity (60 cc) is 2 1/8 inch (5.40 cm) on scale. Recheck reading a minimum of three times.

CAUTION If oil quantity is less than 5/8 inch (15.88 mm) on scale for the first method or 2 1/8 inches (5.40 cm) for the second method, the clutch subassembly must be removed and inspected for evidence of overheating.

(7). Service clutch with lubricating oil (CM125 or CM126). If oil level readings indicate less than full level. Do not overfill. Recheck oil level as in previous step.

NOTE: Always check oil level after installing clutch in the helicopter.

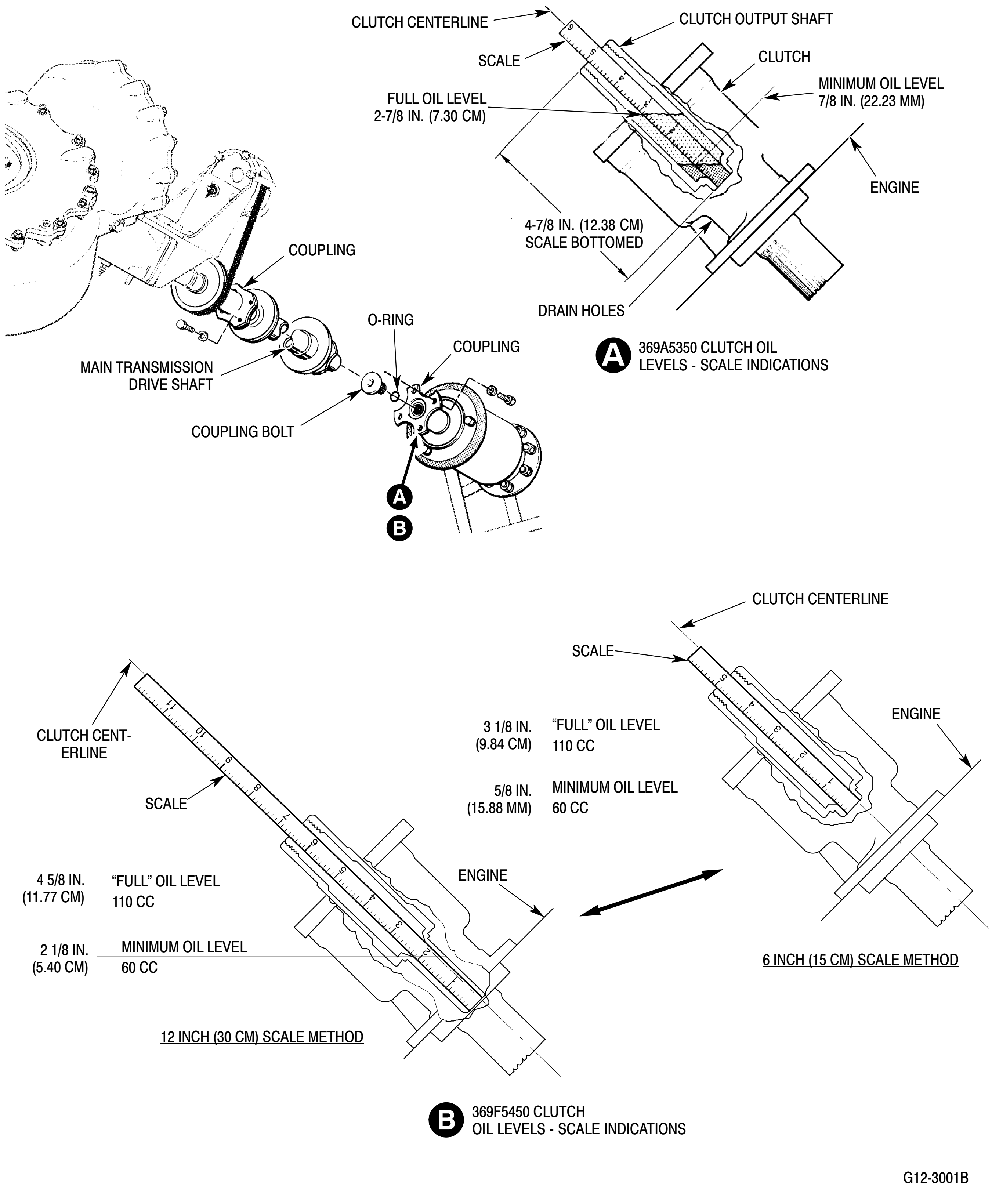


Figure 303. Checking Oil Level - Overrunning Clutch

(8). If coupling shimming was disturbed, shim coupling so that there is 0.035-0.055 inch (0.889-1.397 mm) O-ring gap. (Ref. Sec. 63-10-00 for clutch installation and shimming requirement details.)

CAUTION When installing clutch coupling bolt in next step, installation torque on the bolt must not be less than **250 - 300 inch-pounds (28.25 - 33.90 Nm) plus drag torque**. Torquing to lower value reduces clutch bearing clamp-up and may result in bearing race spinning.

(9). Coat bolt threads with oil (CM112). Install coupling bolt and O-ring (Drag torque for bolt self-locking serviceability is **25 inch-pounds (2.82 Nm) minimum, 200 inch-pounds (22.60 Nm) maximum**). Torque bolt to **250 - 300 inch-pounds (28.25 - 33.90 Nm) plus actual drag torque**.

(10). Position main rotor transmission drive shaft between drive couplings. Install four bolts and washers each end of drive shaft and torque bolts to **50 - 75 inch-pounds (5.65 - 8.47 Nm)**.

(11). Reinstall blower access door and trim.

10. Miscellaneous Component Servicing

A. Rotor Brake Servicing

(Ref. Sec. 63-22-00 for information on adding hydraulic fluid to the rotor brake master cylinder and bleeding the hydraulic system.)

B. Landing Gear Damper Servicing

Servicing of the landing gear damper is performed by overhauling the damper assembly, or if equipped with schrader valve, servicing with nitrogen if it does not meet the minimum extension requirements (Ref. 32-10-00).

C. Component Lubrication Chart

(Ref. Figure 304 for required lubrication points, lubricants to be used, and lubrication intervals.)

CAUTION Use extreme care when applying any type of lubrication (grease, oil, dry-film, etc) in vicinity of teflon bearings. Most lubricants allow a dirt-retaining film to form or have other detrimental effects that can cause rapid deterioration of bearing surface.

D. Tail Rotor Swashplate Dual Bearings Repack

Check ball bearing for excessive loss of grease and serviceability and relubricate (repack) (Ref. Sec. 64-30-00).

E. Main Rotor Swashplate Bearing Repack

Check seals for evidence of deterioration and grease leakage. Inspect bearing assembly for serviceability and repack (Ref. COM, Sec. 62-30-10).

F. Main Rotor Hub Tapered Bearings

Clean, inspect, and relubricate (repack). (Ref. Sec. 62-20--00).

G. Ground Handling Wheels Bearing Repack

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM111	Grease, aircraft

At regular intervals, repack wheel bearings with grease (CM111).

11. Overrunning Clutch Subassembly Bearing Repack

For 369A5350 overrunning clutch, repack bearing per CSP-COM-5, Sec. 63-10-10.

For 369F5450 overrunning clutch, repack bearing per CSP-COM-5, Sec. 63-10-15.

12. Component Fluid Leak Analysis

A. Main Rotor Transmission or Anti-Torque Transmission Oil Leaks

Oil leakage, seepage, or capillary wetting at oil seals or assembly joint lines of main or anti-torque transmissions are permissible if leakage rate does not exceed 2 cc per hour (one drop per minute). An acceptable alternate rate of leakage from either transmission is, if oil loss is not more than from the full to the add mark on the sight gauge within 25 flight hours (Repair leaks according to instructions in Component Overhaul Manual).

NOTE:

- On gearbox oil seals with less than 2 hours of operation, some seepage or wetting of adjacent surfaces is normal until seal is wetted and worn- in (seated). If seepage continues at rate of one drop per minute or less, seal may be continued in service. Check transmission oil level and observe seepage rate after every 2 hours of operation. Shorter inspection periods may be required if seal leakage appears to be increasing.
- If excessive gearbox oil seepage occurs, check breather filler for proper installation and operation (Ref. Component Overhaul Manual for cleaning procedures).

B. Engine Oil Leaks

(Ref. Applicable Allison Engine Operation and Maintenance Manual (Ref. Table 201, Sec. 01-00-00) for definition of permissible engine oil leakage.

C. Landing Gear Damper Hydraulic Fluid Leak

Hydraulic fluid leakage from any of landing gear dampers is not permissible. If leakage is present, damper assembly should be overhauled (Ref. Component Overhaul Manual) as required and a serviceable unit installed. If leaking landing gear damper is not replaced when leakage is noticed, continuation of damper in service can result in unequal and/or unacceptable dampening and/or ground resonance.

NOTE: It is normal for a thin hydraulic oil film to remain on damper piston as a result of wiping contact with piston seal. Newly installed dampers may also have slight oil seepage from oil trapped in end cap threads during damper assembly. Neither of these should be considered damper leakage or cause for damper replacement.

D. One-Way Lock Hydraulic Fluid Leak

Hydraulic fluid leakage from any part of one-way lock is not permissible. When leakage is observed, assembly should be overhauled (Ref. Component Overhaul Manual) as required and a serviceable unit installed. If leaking one-way lock is not replaced when leakage occurs, continuation in service may result in mechanical malfunction that could be hazardous to flight safety.

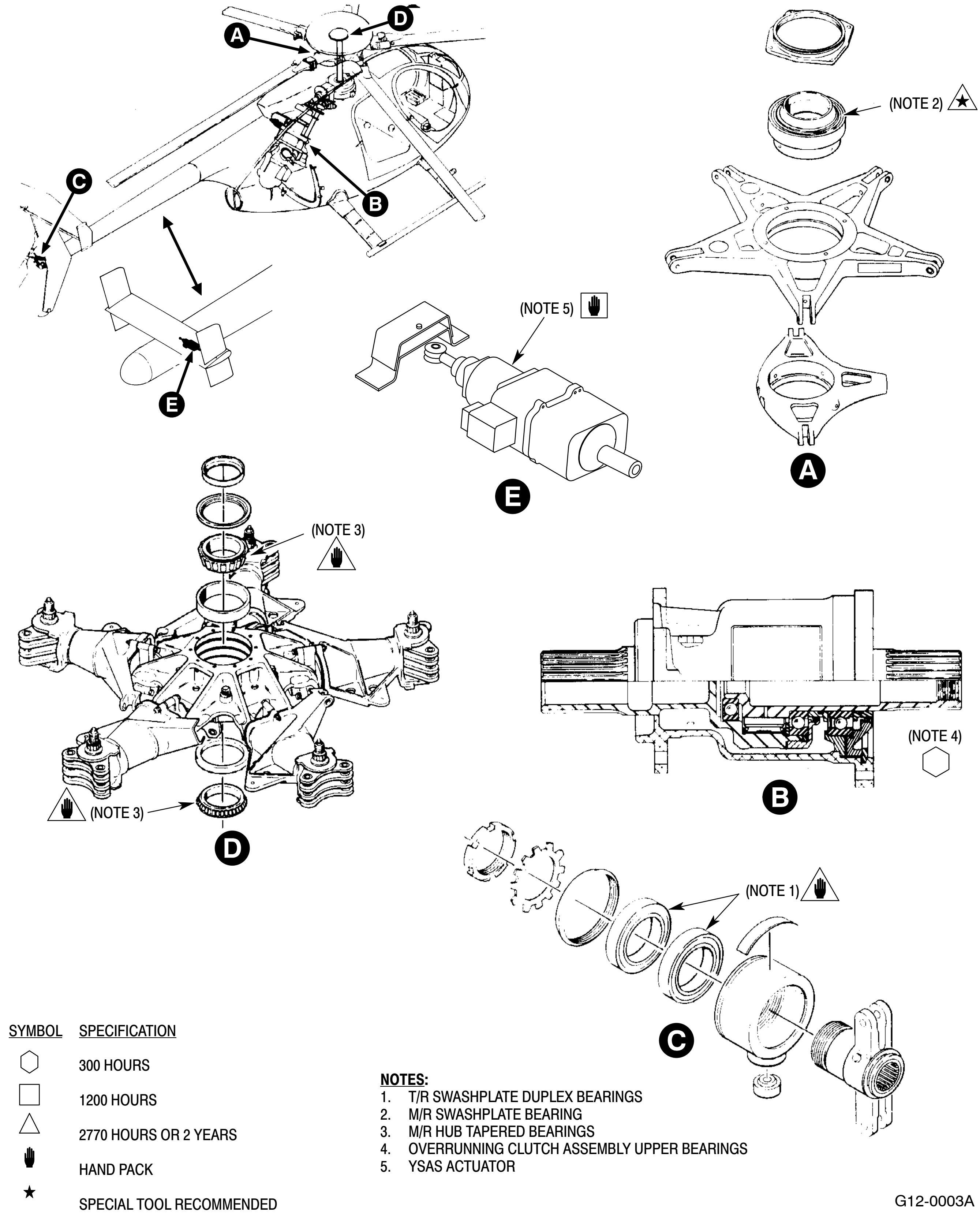


Figure 304. Lubrication Chart

Chapter

18

Vibration and Noise Analysis

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Section

18-10-00

Main Rotor Track and Balance

MAIN ROTOR TRACK AND BALANCE MAINTENANCE PRACTICES

1. Main Rotor Blade Tracking

Main rotor blade track is observed by means of reflective tip caps temporarily installed on each blade and a high-intensity strobe light. Blade track is determined by observing the apparent tip cap pattern created by strobe light pulses synchronized with the rotating blades. Strobe light electrical power is supplied by the helicopter electrical system.

WARNING **Immediately investigate the cause of a sudden onset of excessive or unusual main rotor vibration prior to continued flight. Under no circumstance should main rotor tracking be attempted to correct the problem until a thorough inspection of the main rotor blades, hub assembly and strap pack assembly has been performed.**

CAUTION When working near engine air inlet, comply with all precautions to prevent entry of foreign material. Carefully observe precautions in the Tracking and Balancing Manual relating to the placement and security of equipment (especially cables) fastened to the exterior of the helicopter.

NOTE: Refer to Table 201 to isolate ground or in-flight blade tracking problems.

(1). Tracking must be accomplished in the following sequence of six steps:

(a). Verification of proper blade phasing (Ref. Main Rotor Blade Phasing Check and/or Adjustment, Sec. 62-20-00).

(b). Ground tracking (Ref. Main Rotor Ground Tracking).

(c). Verification of proper rotor balance (Ref. Main Rotor System Balance Procedure).

(d). Hover verification (Ref. Hover Track Verification).

(e). Forward flight tracking (Ref. Forward Flight Tracking).

(f). Autorotation rpm adjustment (Ref. Main Rotor Autorotation RPM Check).

(2). No attempt should be made to verify or adjust blade track without first checking and adjusting blade phasing, a function of main rotor damper adjustment (Ref. Sec. 62-20-00).

CAUTION Understand the blade tracking sequence and related adjustments before attempting blade track procedures.

If main rotor hub balance is suspect, balance rotor hub prior to performing blade track.

A. Main Rotor Hub Balancing

Main rotor hub balancing is accomplished by adding or removing weight (flat washers) as required at the lead-lag bolts (Ref. Main Rotor Hub Balancing Procedure). Analysis of main rotor hub balance is accomplished using instrumentation that measures and localizes vibrations due to main rotor hub imbalance. Data provided by the instrumentation is plotted on a chart designed to indicate how much weight must be added or removed from the lead-lag bolt. No other means of balancing is to be used.

B. Main Rotor System Balancing

Main rotor system balancing is accomplished by adjusting the turnbuckle on the elastomeric damper. Analysis of main rotor system balance is accomplished using instrumentation that measures and localizes vibrations due to main rotor imbalance (Ref. Main Rotor System Balance Procedure). Data provided by the instrumentation is plotted on a chart designed to indicate how much rotor blade shall be shifted in leading or lagging direction by adjusting turnbuckle. No other means of balancing is to be used. Never add weight to, subtract weight from or redistribute weight on the main rotor blades. Do not attempt the blade balancing procedure without first tracking the blades (Ref. Blade Tracking Procedure).

C. Balancing Equipment and Balance Spare Kit

The balancing equipment contains all equipment needed to analyze main rotor balance.

Table 201. Isolating Tracking Problems

Symptom	Probable Cause	Corrective Action
GROUND TRACKING		
Rotor does not follow adjustments.	Turning turnbuckle wrong direction.	Adjust correctly.
	Pitch link bearing worn. Trim tab bent excessively.	Replace bearing. Zero trim tabs.
Excessive diving or climbing of blade from low speed ground track to high speed ground track.	Trim tab bent excessively.	Zero trim tabs.
	Pitch link control not coordinated with trim tab bend (Intermixing control input).	Set pitch link to 6.25 in. (15.875 cm) nominal and zero trim tabs.
	Damage to blade or tabs.	Inspect for damage.
Excessive torque and erratic high speed ground tracking.	Pitch change links too long.	Set to nominal 6.25 in. (15.875 cm).
IN-FLIGHT TRACKING		
Blade track changes with power and control changes.	Worn pitch bearing housing bearings.	Replace bearings.
	Missing pitch bearing liner.	Replace bearing.
	Broken or loose feathering studs.	Repair or replace studs.
	Binding rotating scissor crank at lower main rotor hub shoe.	Repair or replace crank.
	Play between longitudinal pitch mixer bellcrank and collective pitch mixer bellcrank.	Re-bond collective pitch mixer bearings and install shims between longitudinal pitch mixer bellcrank and collective pitch mixer bellcrank bearings (Ref. Sec. 62-30-00).
Helicopter has rough feeling with some vibration while appearing to be in track.	Tilted tracking images, no blade in track.	Retrack blades.
	Pitch link control not coordinated with trim tab bend (intermixing control input), with climbing or diving blades within acceptable track limits.	Set pitch link to nominal 6.25 in. (15.875 cm) and zero trim tabs.
Blades very erratic in response to tab bends.	Tab bent too much in wrong area.	Correct by limiting bending.
	Blade erosion, but within chordwise limits.	Track erratic blade to other blades.
	Tab bent too many degrees in one area.	Limit tab bending to smaller degree over larger area.

Table 201. Isolating Tracking Problems (Cont.)

Symptom	Probable Cause	Corrective Action
Blades climb or dive excessively at high speeds.	Too much tab bending in outboard tab areas.	Remove outboard bending and increase inboard bending.
Ground track off at low speed and stick shake at 103% N_2.	Excessive tab bending and pitch link control not coordinated with tab bend (intermixing control input).	Zero trim tabs and set pitch links to nominal 6.29 in. (15.875 cm)
Helicopter in track but has stick shake.	Blade out of phase.	Check phasing.
Feedback in collective control.	Main rotor hub out of balance.	Balance hub.
	Loose or binding rotating scissors.	Check and repair as required.
Heavy collective stick - climb and cruise.	Overcenter adjustment set too low.	Adjust.
	Trim tab bent down excessively.	Adjust.
Light collective stick - climb and cruise.	Overcenter adjustment set too high.	Adjust.
	Trim tabs bent up excessively.	Adjust.
Heavy collective lift-off - light flight.	Bungee spring adjusted too short.	Adjust to nominal.
Light collective lift-off - heavy flight.	Bungee spring adjusted too long.	Adjust to nominal.

MAIN ROTOR TRACK AND BALANCE REMOVAL/INSTALLATION

1. Main Rotor System Tracking Equipment Installation

(Ref. Figure 401 and Figure 402) Equipment needed to track main rotor blades consists of the main rotor tracking and tail rotor vibration analyzer equipment, tracking and balancing equipment and the tip cap assembly. Instructions for equipment installation are contained in Chadwick-Helmuth Operation and Service Instruction Handbook.

CAUTION When working near engine air inlet, comply with precautions to prevent entry of foreign material. During main rotor balancing the helicopter will be airborne. Carefully observe precautions in the Tracking and Balancing Manual relating to the placement and security of equipment (especially cables) fastened to the exterior of the helicopter.

NOTE: Main rotor tracking tip caps manufactured by the same firm that manufactures the tracking and balance equipment, are components of the tracking and balancing equipment and may be used instead of tip cap assembly. In procedures that follow, use of tip cap assembly is presumed. If tip caps from the balancing equipment are used, refer to the Tracking and Balancing Manual for tip cap data.

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST901	Tip cap assembly
ST903	Balancer/analyzer instrument kit

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM116	Grease, aircraft and instrument

A. Interrupter Installation

(Ref. Figure 401)

(1). The helicopter is equipped with five main rotor blade tracking interrupters located immediately inboard of each pitch control link attach clevis on the rotating swashplate.

(2). The interrupter installation incorporates a double interrupter which may be used for both tracking and balancing.

(3). Each interrupter insert is attached to the interrupter body at a different position (left, center, or right). The interrupters create five equally spaced horizontal reflective images, as viewed by the technician, when the main rotor blade tips are illuminated with the test strobe light.

(4). Interrupter blade spacing separates the image of each main rotor blade tip cap by approximately 0.25 inch (6.35 mm). This staggered relationship allows the technician to view the stopped image of each blade in order of rotation.

(5). The number one blade is seen on the extreme left, number two blade is seen second from left, and so on through number five which is seen on the extreme right.

(6). On current configuration helicopters, the pulse of the double interrupter is so short that it appears as a single pulse to the strobe light amplifier. The second pulse created by the double interrupter is used during main rotor balancing.

(7). If counterweights are installed, coat the two interrupter bolts passing through the swashplate counterweights with grease (CM116) before installation. Torque bolts to **30 - 60 inch-pounds (3.39 - 6.78 Nm)**.

(8). Torque the three remaining interrupter bolts to **30 - 60 inch-pounds (3.39 - 6.78 Nm)**.

B. Magnetic Pickup Installation

(Ref. Figure 401)

(1). The helicopter is originally equipped with a magnetic pickup support bracket installed with shim washers to prevent distortion of the bracket when the nut on the bolt that secures the link bearing is torqued to **30 - 60 inch-pounds (3.39 - 6.78 Nm)**.

(2). To preclude rocking movement of magnetic pickup support bracket when installed on stationary swashplate, check clearance between swashplate and lower flange of bracket. If gap exists, tap bent tip of lower flange (typical both sides of bracket) until bent tip touches swashplate.

(3). Reinstall by forcing bracket until elongated bracket holes align with hole in stationary swashplate.

(4). Install the magnetic pickup and cable as instructed in the Chadwick-Helmuth Operation and Service Instruction Handbook.

(5). After final adjustment, torque the adjustment nut to **15 - 20 inch-pounds (1.69 - 2.26 Nm)** and ensure the cable is routed and tied down in such a manner as not to be dislodged or interfere with control components at their extremes of travel.

(6). Ensure the interrupter passing closest over either early or current configuration magnetic pickup, clears pickup by not less than 0.030 inch (0.762 mm).

C. Tracking Tip Cap Installation

(Ref. Figure 401)

(1). The helicopter is originally equipped with five tip caps that must be removed and replaced with five tracking tip caps (ST901).

(2). When blade tracking has been accomplished or verified, the tracking tip caps must be removed and original tip caps installed.

(3). Torque the screw that secures the tip cap to **15 - 20 inch-pounds (1.69 - 2.26 Nm)**.

NOTE: When installing tip cap targets, position double interrupter over magnetic pickup. The blade positioned forward is number 5. By rotating rotor head in operating direction, the next blade pointing forward will be 4, then 3, 2 and 1.

D. Main Rotor System Balancing Equipment Installation

(Ref. Figure 401 and Figure 402) and Chadwick-Helmuth Operation and Service Instruction Handbook to install that portion of the balancing equipment (ST903) needed to balance the main rotor.

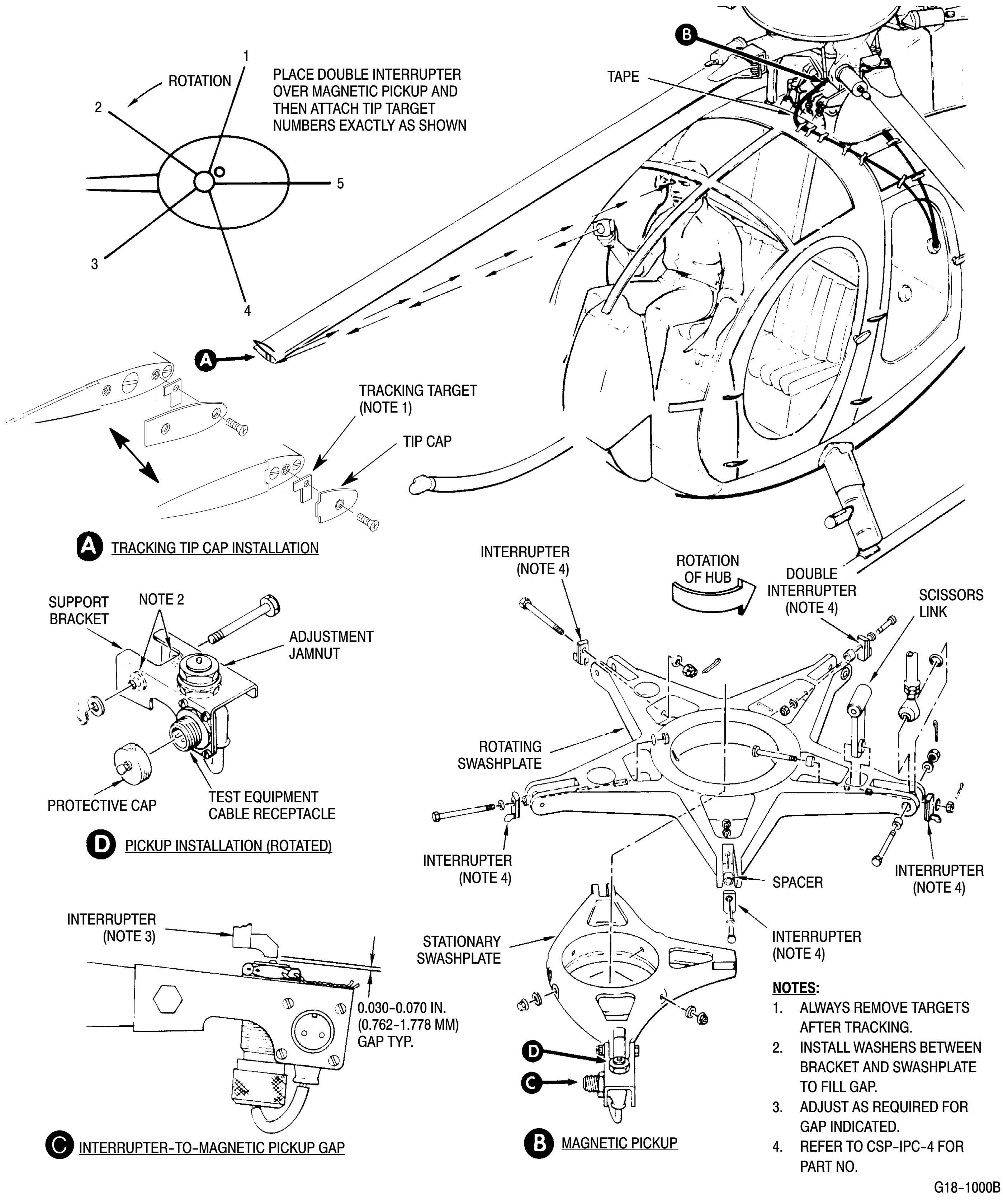


Figure 401. Blade Tracking Equipment

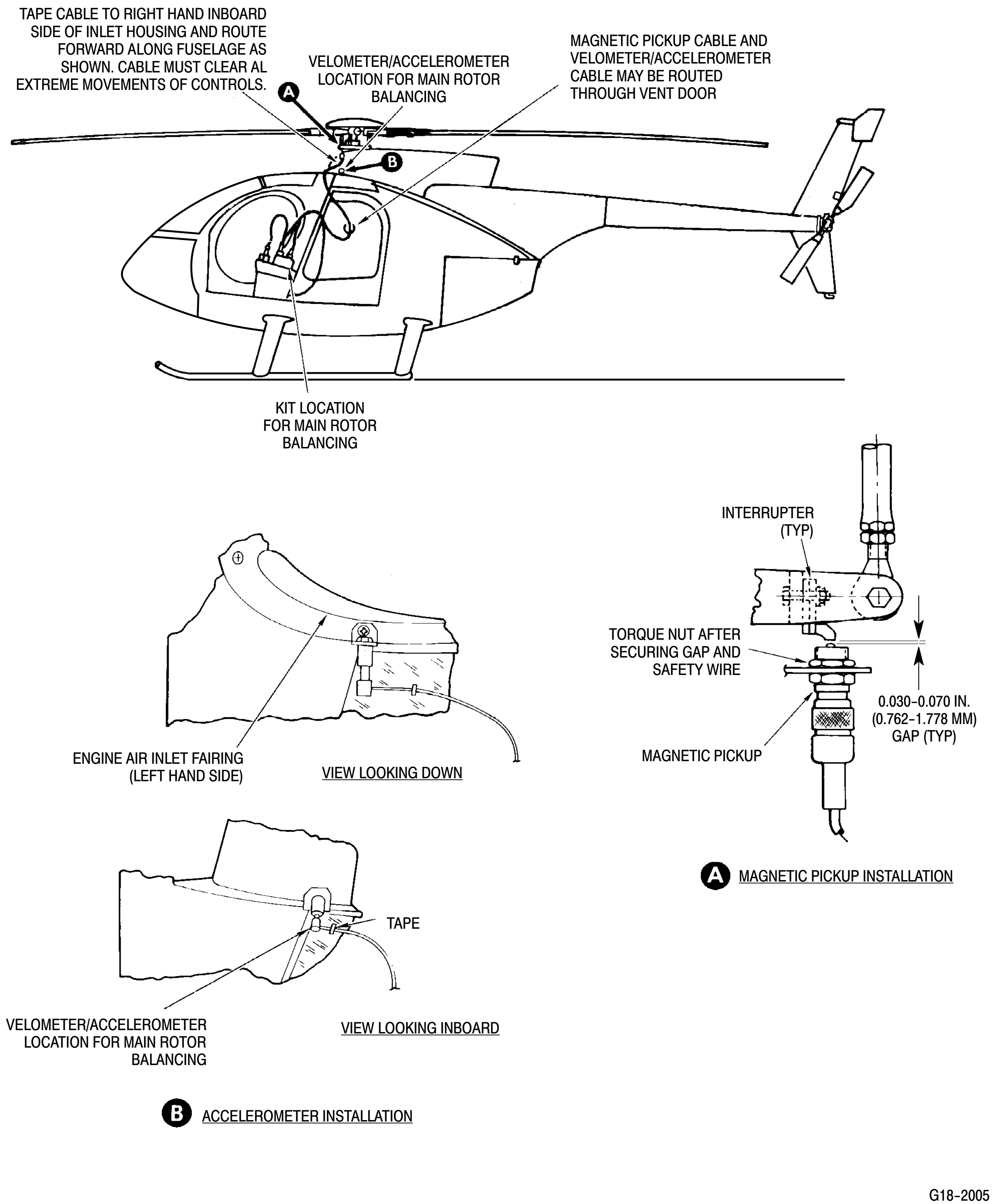


Figure 402. Main Rotor Balancing Equipment Installation

MAIN ROTOR TRACK AND BALANCE ADJUSTMENT/TEST

1. Blade Tracking Procedure

Table 501 is a summary of the sequence of required procedures for blade tracking.

(1). Install strobe light, blade tip cap reflectors and related equipment.

(2). Use 1/2 inch (12.7 mm) diameter tracking tip cap reflector as a guide for estimating track accuracy. For example:

(a). A tip cap reflector image displacement of 1/2 diameter up, or down, indicates blade tip is approximately 1/4 inch (6.35 mm) out of track.

(b). One full reflector diameter indicates 1/2 inch (12.7 mm) out of track.

NOTE: Rocking or stick shake caused by a correctly tracking rotor indicates improper blade phasing.

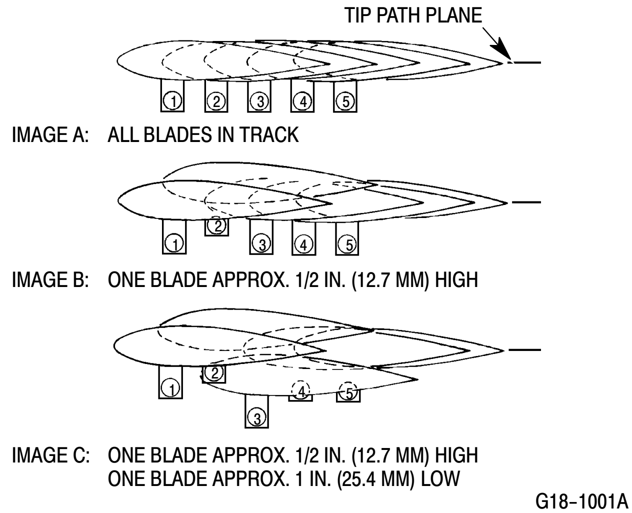
(3). Accomplish blade phasing (Ref. Sec. 62-20-00) when installing new rotor blades or if ground rock or stick shake is noted. This must be accomplished prior to starting tracking procedure.

NOTE: Final rotor system balance cannot be accomplished until blades are in track.

(4). Ground tracking is basically track-observation and adjustment of idle and flight rpm. Improper track at idle rpm is corrected by adjusting length of pitch control links connecting rotating swashplate and blade pitch housing. Ground track at flat pitch and flight rpm is corrected by blade tab adjustment.

(5). Hover track verification is essentially an observation to check for track variations between high rpm (flat pitch) ground track check and hovering.

NOTE: Track adjustments are not made on basis of track observations during hovering. However, track variations should be noted and recorded for use during check of track in forward flight.



CORRECTIVE ACTION

CONDITION	GROUND IDLE RPM	HIGH RPM AND FWD FLIGHT
IMAGE A	NONE REQUIRED	NONE REQUIRED
IMAGE B	SHORTEN PITCH CONTROL ROD (2ND BLADE)	MOVE TAB DOWNWARD (2ND BLADE) MOVE TAB UPWARD (3RD BLADE)
IMAGE C	SHORTEN PITCH CONTROL ROD (2ND BLADE): LENGTHEN CONTROL ROD (3RD BLADE)	MOVE TAB DOWNWARD (2ND BLADE): MOVE TAB UPWARD (3RD BLADE)

NOTE: Chordwise spacing of tracking images are not an accurate indication of blade phasing. Do not adjust blade phasing in an attempt to equalize spacing. Slight tilting of magnetic interrupters or balance of the main rotor system can move the image

Figure 501. Typical Track Conditions and Adjustments

(6). Forward flight track is corrected only by making blade tab adjustments. Forward flight tracking requires track observation during following airspeeds and maneuvers: Flight at 0-100 knots. Forty-five degree banked turns at 80-100 knots. Flight at 100-155 knots.

(7). Check for proper balance of rotor system prior to checking autorotation.

(8). Obtaining correct autorotation rpm consists of checking main rotor rpm during stabilized autorotation flight and adjusting rpm to specified limits as necessary. Autorotation rpm check must be accomplished to ensure that track adjustments do not alter rotor performance necessary for safe power-off landings.

A. Blade Track Adjustment

Although adjustment of pitch control links affects blade track at all rotor speeds, they should be adjusted only when necessary to establish acceptable track at ground idle speed; blade tabs are used for all other track corrections.

NOTE: Blade tab and/or track can make the collective heavy or light.

B. Pitch Control Link Adjustment

Repeat this adjustment procedure as necessary to establish ground idle track:

(1). To lower a blade tip, shorten pitch control link assembly. To raise a blade tip, lengthen pitch control link assembly. One-sixth of a turn of link (one flat) raises or lowers blade tip approximately 1/4 inch (6.35 mm).

CAUTION Center each rod end or (fitting wear) results. Make sure there is no binding in full up travel position.

(2). After adjusting pitch control link length, center each rod end in its fitting and hold while tightening jam nuts; safety with lockwire.

C. Blade Tab Adjustment

(Ref. Figure 502) Once ground idle track is obtained, all remaining tracking correction is accomplished by very slight bending of various blade tab zones with tab bending tool (ST902). Different zones of tabs are used to adjust blade track at different airspeeds. In general, tab zone A is used for high rpm, flat pitch ground tracking (369D/E - 103% N_2, 369FF/500N - 100% N_2) and zones C, D, and sometimes E, are used for tracking at higher airspeeds. Zone B is used to supplement zone A track correction when maximum tab (5 degrees) has been applied to zone A; if necessary, zone B may also be used for correction in 0-110 knot airspeed range.

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST902	Main rotor blade fixture and tab bending tool

CAUTION Minimize bending and restrict adjustments to very small increments so that bonded trailing edge joint between upper and lower skins is not damaged. Tabs must never be displaced more than five degrees above or below neutral position (parallel to chordline).

(1). To lower blade tip that tends to climb during ground tracking at high rpm or during forward flight, bend appropriate tab section slightly downward; to raise tip of blade that tends to descend, bend tab slightly upward. If only slight track correction is necessary, limit tab bending to width of bending tool. If more correction is necessary, bend a slightly wider section of tab. Use small adjustments to avoid excessive rebending of tabs.

NOTE: Tab zones on same blade can require bending in opposite directions. For example, after bending tab zone A downward to get good tracking at 60-90 knots, it might become necessary to bend tab zone D or E upward to correct track at redline airspeed. In any case, do not use larger tab corrections than are actually necessary.

(2). Each time blade tabs are adjusted, recheck ground idle track and readjust if necessary.

(3). After completion of forward flight tracking, balance and check autorotation rpm.

D. Main Rotor Ground Tracking

(Ref. Figure 502) For best results, tracking should be performed under calm air conditions. Wind velocity should not exceed six knots during adjustments. Accurate adjustment of initial ground track is very important. In most instances, forward flight tracking problems can be avoided or greatly reduced by setting initial track as nearly perfect as possible. Tolerances specified in following instructions should be considered maximum permissible deviation rather than desired goal.

NOTE: If main rotor hub or a pitch control rod end bearing has been replaced, adjust pitch control link(s) before proceeding with ground tracking.

(1). Before tracking blades that are not new, check that normally straight (not to be used) tab areas are in neutral position (centered on chordline) and straight.

NOTE: On new (untracked) blades, check that all tab areas are straight and in neutral position (centered on chordline 0° ±0.5°).

(2). Load helicopter to a gross weight of approximately 2350 pounds (1066 kg); then ground idle (approximately 64-65% N_1).

(3). Observe tracking tip cap reflector image by directing strobe light beam toward blade tip path and sweeping beam slowly back and forth until reflector images are clearly seen. Tracking image should appear directly in front of helicopter or slightly off helicopter centerline.

(4). If blades are in track, tip cap reflector image pattern should resemble image A (Ref. Figure 501), (no blade tip more than 1/4 of one tracking reflector diameter, 1/8 inch (3.175 mm) above or below adjacent reflectors). If blades are in track, proceed with (5). below. If blades are out of track, adjust pitch control links and repeat step (3). above.

(5). With collective pitch stick full down, increase engine speed to 103% N_2 - 369D/E, 100% N_2 - 369FF/500N and observe tip cap reflector image to see if blade track is changed from ground idle track. When all five blades are in track within 1/4 of one reflector diameter, 1/8 inch (3.175 mm), ground track is correct; proceed with hover verification. When a blade is out of track, adjust blade tab zone A until high rpm ground track is within tolerance.

E. Hover Track Verification

(Ref. Figure 502)

(1). Hover track verification must be performed after ground tracking and before forward flight tracking. Verification is only a check of hover track. Do not adjust pitch control links or blade tabs because of track images observed during hovering. Tab adjustments often cause variation between ground track and hovering track. A large track variation may indicate that one or more blades is beyond its chordwise balance tolerance, but this can only be determined during forward flight tracking. Perform hover track verification as follows.

NOTE: Collective pitch stick may be "heavy" after tracking reflectors are mounted on blade tips. This condition is not unusual and may be disregarded.

(2). Verify helicopter gross weight of 2000-2500 pounds (908-1135 kg).

(3). With collective pitch stick full down, increase N_2 to 103% - 369D/E, 100% - 369FF/500N.

(4). Observe tracking reflector images to verify that ground track is within limits.

(5). With helicopter in a stable hover, observe reflector images. If one or more blades are out of track, record condition(s) for reference during forward flight tracking.

(6). Proceed with forward flight tracking.

WARNING **Use of the tracking strobe light in night flight is not recommended. Such use can result in pilot disorientation or loss of vision with resultant damage to the helicopter and personal injury.**

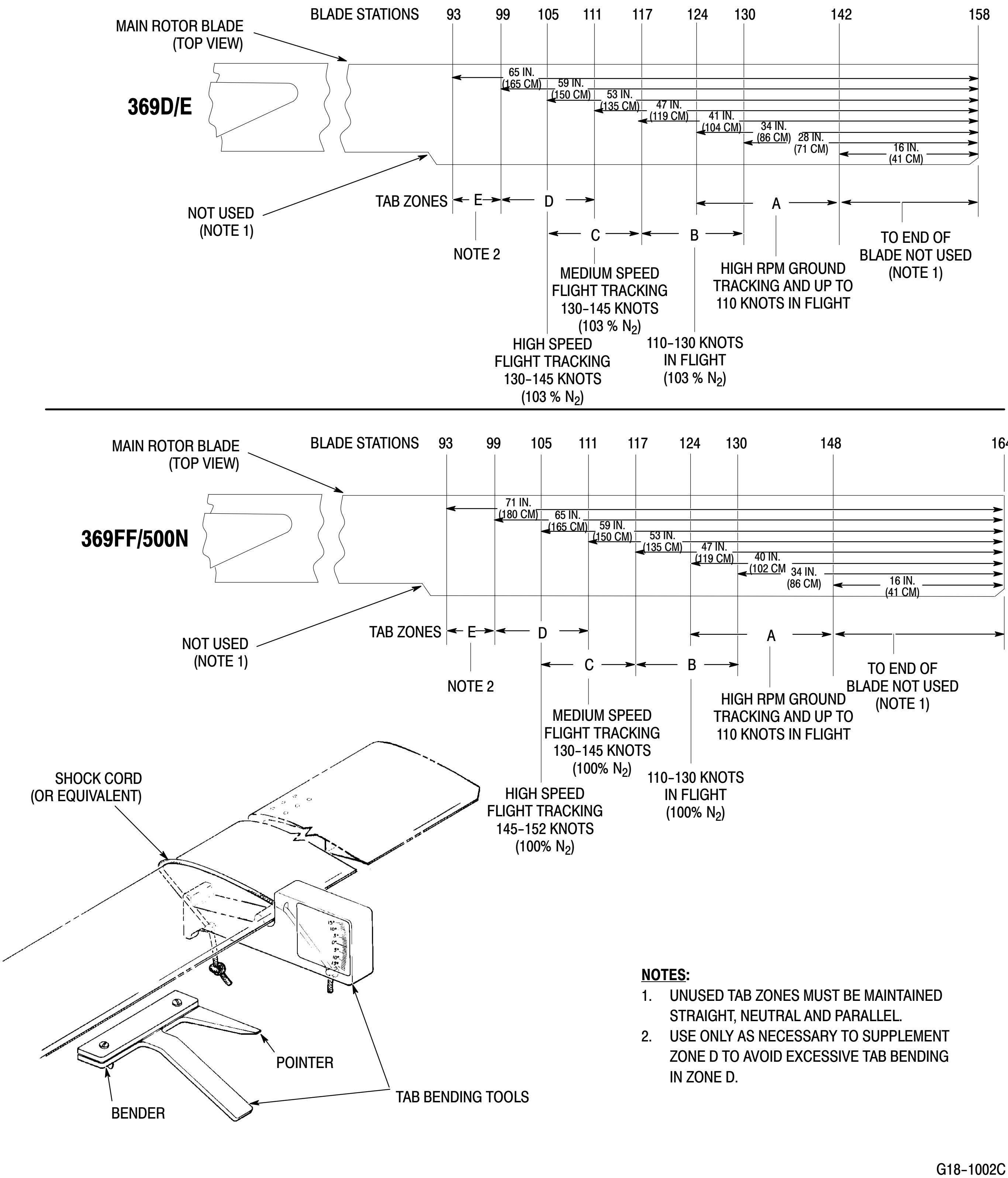


Figure 502. Main Rotor Blade Tab Adjustment

F. Forward Flight Tracking

(Ref. Figure 502) Forward flight tracking should be performed whenever vertical flight vibrations indicate that blades may be out of track.

(1). Verify helicopter gross weight of 2000-2500 pounds (907-1134 kg).

(2). Perform flight tracking from hover up to 110 knots at 103% N_2 - 369D/E, 100% N_2 - 369FF/500N. If flight track varies from hover track more than 1/2 inch (12.7 mm), bend tab zone A (five degrees maximum) to limit variation to tab zone B (five degrees maximum).

2. Main Rotor Blade Tab Adjustment

(1). Check autorotation rpm; rpm must not be less than 480.

CAUTION Do not attempt to adjust chordwise balance of a blade found to be faulty when performing banked turns. Chordwise balance corrections must be accomplished by manufacturer (MDHI).

(2). Perform a series of 45 degree banked turns at 100 knots and observe track change from level flight. If any blade climbs or dives more than one inch out of track with others, chordwise balance (center of gravity) of that blade is beyond its tolerance and blade must be replaced. (Hover track variations of this type that do not repeat during banked-turn maneuver may be disregarded.)

(3). Perform flight tracking at 110-155 knots and 103% N_2 - 369D/E, 100% N_2 - 369FF/500N. If necessary, adjust tab zone B (five degrees maximum) to limit track variation to 1/2 inch (12.7 mm) or less and to minimize excessive vertical (one-per revolution) vibration. If variation is excessive, bend tab zone C or D (five degrees maximum).

NOTE: When determining whether blade track is acceptable, overall vibration level of helicopter should be determining factor. Some combinations of rotor blades might produce higher five- per- revolution vibration as blade tips are brought into close track; in such cases, lowest vibration level is preferred, even though observed blade track may be beyond specified tolerances.

(4). After flight tracking is completed, perform a Main Rotor System Balance Procedure and Main Rotor Autorotation RPM Check.

3. Main Rotor System Balance Procedure

Balance the main rotor system according to instructions in the Tracking and Balancing Manual. Since vibration reduction is accomplished by slight adjustment in phasing, the instruction outline in the Tracking and Balancing Manual must be closely followed for best results. Safety damper turnbuckle after completing phasing balance adjustments.

4. Main Rotor Autorotation RPM Check

(Ref. Table 502 for 369D/E and Table 503 369FF and 500N). An autorotation rpm check is required after each blade tracking operation and whenever rpm is outside limits listed. Check rotor rpm and make adjustments as follows.

CAUTION

- All autorotation rpm adjustments shall be made at the main rotor pitch control links only. Do not re-adjust mixer control rods after rigging is accomplished. Failure to observe this precaution may result in serious damage to rotor system and controls. Do not adjust control rod end beyond witness hole.
- Tracking targets reduce blade to tailboom clearance, performing autorotations to the ground could result in boom strikes.

NOTE: Change length of all five pitch control links as necessary to adjust autorotation rpm. Be sure to lengthen or shorten all five links exactly same amount or blade track is changed. One flat (1/6 turn) of control link body causes approximately four rpm change in autorotation rpm.

(1). Autorotation Rpm Check: Load 369D/E helicopter to a gross weight of 2250 pounds (1021 kg): 2350 pounds (1066 kg) for 369FF and 500N. Perform a practice autorotative descent (Ref. PFM), taking care not to allow rpm to exceed rotor speed limitations. During autorotation take careful note of stabilized autorotation rpm at one of gross weight/density altitude combinations. After landing, compare observed rpm with values (Ref. Tables 502 and 503). If observed rpm is within limits in table, rpm setting is correct. If limits were exceeded, make corrective adjustments according to (2). below, until rpm is within limits.

NOTE: After autorotation rpm adjustments are satisfactorily accomplished, remove tracking equipment before returning helicopter to service. Be sure to correctly tighten and safety all bolts after they are reinstalled.

(2). Autorotation Rpm Adjustment: Change length of all five pitch control links as required to adjust autorotation rpm. Make certain all five links are shortened or lengthened exactly the same amount or blade track will be altered.

CAUTION

- Do not adjust (lengthen) pitch control link rodend threads beyond witness holes in rods.
- Do not readjust mixer control rods after rigging has once been accomplished. Failure to observe this precaution can result in serious damage to rotor system and controls.

5. Main Rotor Hub Balancing Procedure

Balance the main rotor hub according to the following instructions.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM420	Sealant

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST903	Balancer/analyzer instrument kit

NOTE:

- If swashplate has weights removed, there should be three AN970-3 washers at the green pitch housing bolt.
- In some instances, main rotor hub balance may not be achieved without addition of swashplate weights (Ref. Sec. 62-30-00, Counterweight and Interrupter Installation)

(1). Remove main rotor blades.

(2). Remove main rotor dampers.

(3). Hook up Phazor. Refer to Chadwick-Helmuth Operation and Service Instruction Handbook (ST903).

(4). Run engine at 103% N_2 - 369D/E, 100 N_2 - 369FF/500N.

(5). Record IPS reading and direction on main rotor balance chart (Ref. Figure 503).

(6). Plot IPS reading and direction on main rotor balance chart (Ref. Figure 503).

(7). Analyze chart for weight location and amount requirements.

CAUTION The maximum allowable balance weight per lead-lag bolt on the main rotor hub assembly is 150 grams.

(8). Install weights as follows: (Ref. Figure 504).

(a). Engage head of screw, inside lead-lag bolt, with Phillips screwdriver, then loosen locknut with 1/4 inch wrench.

(b). Hold screw in place with screwdriver while adding or removing flat washers as required, then reinstall locknut.

(9). Repeat steps (4). thru (8). until reading is 0.15 IPS, or less.

(10). After balance has been established satisfactorily, torque MS21042L08 locknuts to **20 - 35 inch-pounds (2.26 - 3.95 Nm)** or MS21042L3 locknuts to **30 - 60 inch-pounds (3.39 - 6.78 Nm)** as applicable. Coat screw threads, nuts and washers with sealant (CM420). (To prevent imbalance, do not use excessive amount of sealant.)

NOTE: Intermixing of P/N 369D21400-503 and M50452 main rotor blade damper assemblies in a shipset is not permitted. All dampers in shipset must be of same type and part number.

(11). Reinstall main rotor blades (Ref. Sec. 62-10-00).

NOTE: If main rotor dampers require more than four flats adjustment, re-phase main rotor dampers (Ref. 62-20-00, Main Rotor Damper Phasing Procedure).

(12). Perform main rotor system balance.

(13). Track main rotor blades (Ref. Blade Tracking Procedure).

Table 501. Summary Procedure for Blade Tracking

Step	Satisfactory Result	Unsatisfactory Result	Corrective Action
(1) Observe ground track.	Go to step (2).	Ref. Corrective Action.	Adjust pitch control links and blade tabs as required. Repeat track observation.
(2) Perform hover verification.	Go to step (3).	Ref. Corrective Action.	Record track verification and proceed with forward flight tracking.
(3) Perform forward flight tracking.	Go to step (4).	Ref. Corrective Action.	Adjust blade tabs and repeat forward flight tracking.
(4) Perform autorotation rpm check.	Go to step (5).	Ref. Corrective Action.	Adjust autorotation rpm and repeat rpm check.
(5) Remove tracking equipment and return helicopter to service.			

NOTE: Ground rock or stick shake with rotor blades in track during ground track indicates rotor blades are not properly phased.

Table 502. Autorotation Rpm Chart (369D/E)

Gross Wt lb/kg	Stabilized Autorotation Rpm at Density Chart					
	Sea Level	1000 Ft	2000 Ft	3000 Ft	4000 Ft	5000 Ft
2050/930	460 - 470	466.5 - 476.5	473 - 483	479.5 - 489.5	486 - 496	492.6 - 502.6
2150/975	470 - 480	476.5 - 486.5	483 - 493	489.5 - 499.5	496 - 506	502.6 - 512.6
2250/1021	480 - 490	486.5 - 496.5	493 - 503	499.5 - 509.5	506 - 516	---
2350/1066	490 - 500	496.5 - 506.5	503 - 513	509.5 - 519.5	---	---

NOTES:

(1) Chart values based upon 15°C (59°F) outside air temperature. At sea level, 8°C (14°F) temperature change is equal to 1000 feet (305 M) of change in density altitude.

(2) Perform autorotation rpm checks at gross weight/density altitude combinations for which rpm values are given. Blank spaces indicate that application of collective pitch may be necessary to avoid rotor overspeed.

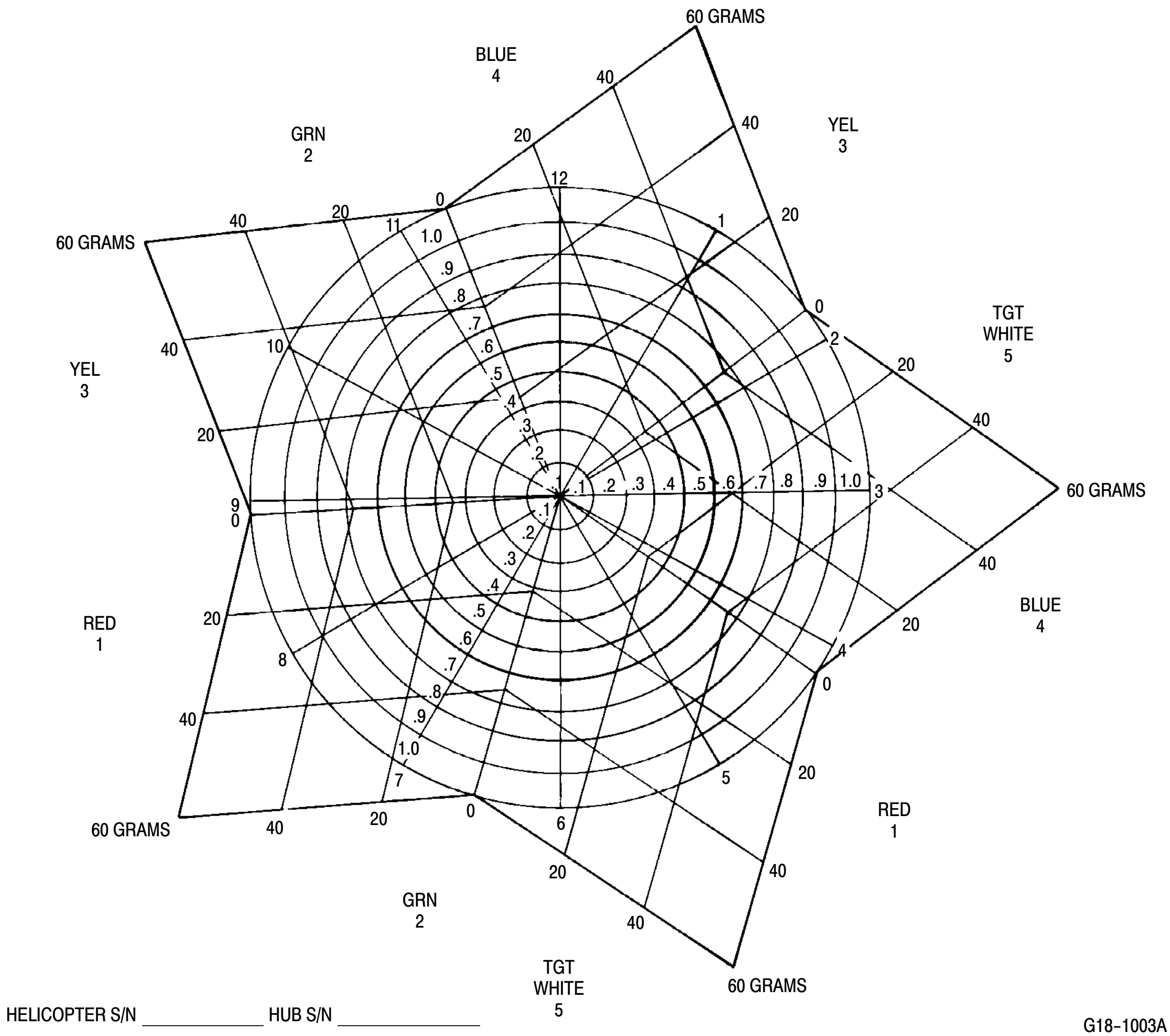
Table 503. Autorotation Rpm Chart (369FF/500N)

Gross Wt lb/kg	Stabilized Autorotation Rpm at Density Chart					
	Sea Level	1000 Ft	2000 Ft	3000 Ft	4000 Ft	5000 Ft
2216/1005	459-469	465-475	471-481	477-487	483-493	489-499
2316/1051	466-476	472-482	478-488	484-494	490-500	496-506
2416/1096	473-483	479-489	485-495	491-501	497-507	---
2516/1189	480-490	486-496	492-502	498-508	---	---

NOTES:

(1) Chart values based upon 15°C (59°F) outside air temperature. At sea level, 8°C (14°F) temperature change is equal to 1000 feet (305 M) of change in density altitude.

(2) Perform autorotation rpm checks at gross weight/density altitude combinations for which rpm values are given. Blank spaces indicate that application of collective pitch may be necessary to avoid rotor overspeed.



RUN NO.	IPS	CLOCK ANGLE	BALANCE WEIGHT AND LOCATION				
			(1) RED	(2) GREEN	(3) YELLOW	(4) BLUE	(5) WHITE

Figure 503. Main Rotor Hub Balancing Chart

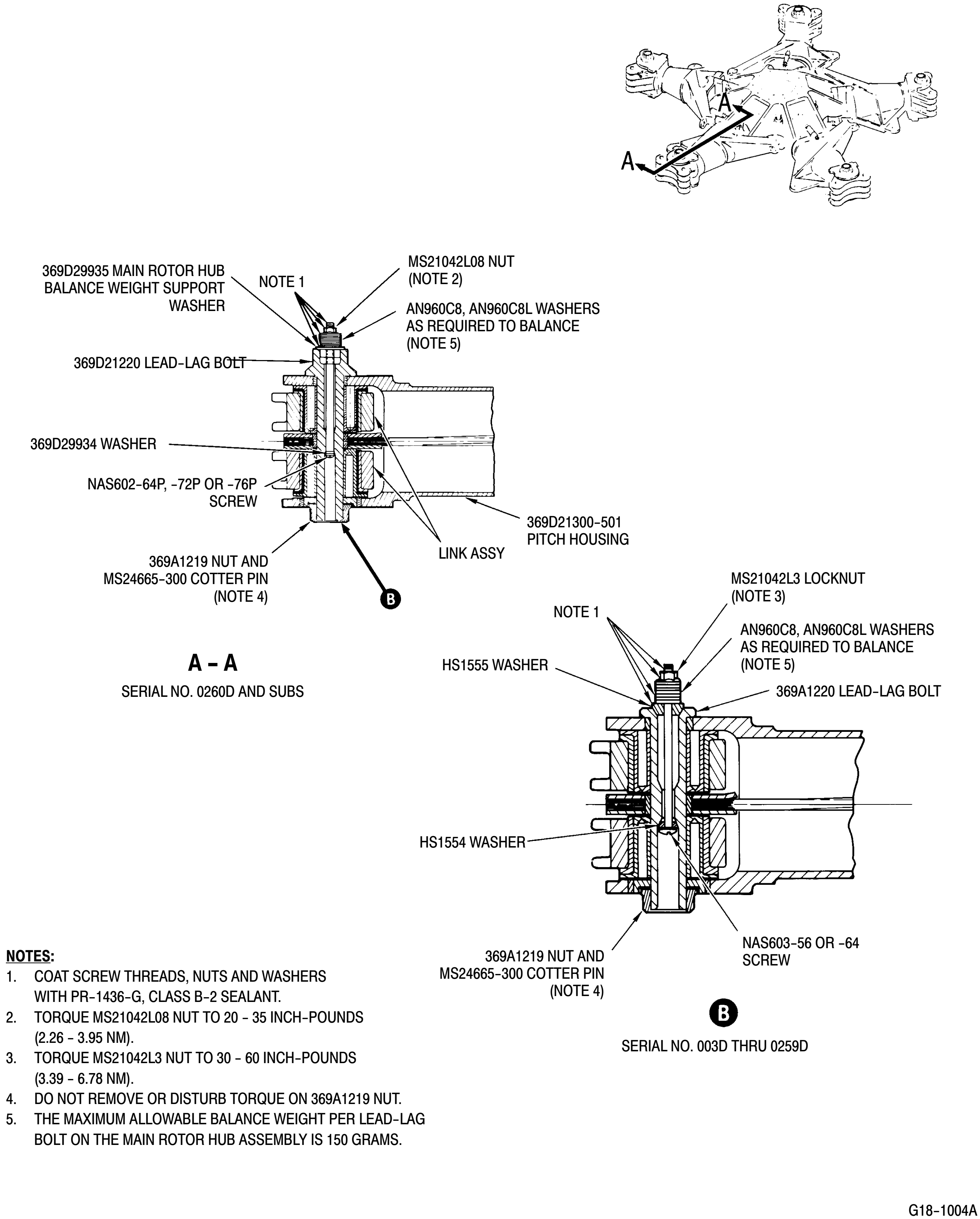


Figure 504. Main Rotor Hub Balancing

Section

18-10-60

Main Rotor Track and Balance (600N)

MAIN ROTOR TRACK AND BALANCE (600N) MAINTENANCE PRACTICES

1. Main Rotor Blade Tracking

WARNING **Immediately investigate the cause of a sudden onset of excessive or unusual main rotor vibration prior to continued flight. Under no circumstance should main rotor tracking be attempted to correct the problem until a thorough inspection of the main rotor blades, hub assembly and strap pack assembly has been performed.**

NOTE: Ref. Table 201 to isolate ground or inflight blade tracking problems.

Main rotor blade track is observed by means of reflective tip caps temporarily installed on each blade and a high-intensity strobe light. Blade track is determined by observing the apparent tip cap pattern created by strobe light pulses synchronized with the rotating blades. Strobe light electrical power is supplied by the helicopter electrical system.

a. Tracking must be accomplished in the following sequence of six steps:
   1). Verification of proper blade phasing (Ref. Main Rotor System Balance Procedure).
   2). Ground tracking (Ref. Main Rotor Ground Tracking).
   3). Verification of proper rotor balance (Ref. Main Rotor System Balance Procedure).
   4). Hover verification (Ref. Hover Track Verification).
   5). Forward flight tracking (Ref. Forward Flight Tracking).
   6). Autorotation rpm adjustment (Ref. Main Rotor Autorotation RPM Check).

b. No attempt should be made to verify or adjust blade track without first checking and adjusting blade phasing, a function of main rotor damper adjustment.

CAUTION

- Understand the blade tracking sequence and related adjustments before attempting blade track procedures.
- If main rotor hub balance is suspect, balance rotor hub prior to performing blade track.

2. Main Rotor System Balancing

Main rotor hub balancing is accomplished by adding or removing weight (flat washers) as required at the lead-lag bolts (Ref. Main Rotor Hub Balancing Procedure). Analysis of main rotor hub balance is accomplished using instrumentation that measures and localizes vibrations due to main rotor hub imbalance. Data provided by the instrumentation is plotted on a chart designed to indicate how much weight must be added or removed from the lead-lag bolt. No other means of balancing is to be used.

3. Balancing Equipment and Balance Spare Kit

Special Tools (Ref. Section 91-00-00)

Item	Nomenclature
ST903	Balancer/analyzer instrument kit

The balancing equipment (ST903) contains all equipment needed to analyze main rotor balance.

CAUTION When working near engine air inlet, comply with all precautions to prevent entry of foreign material. Carefully observe precautions in the Tracking and Balancing Manual relating to the placement and security of equipment (especially cables) fastened to the exterior of the helicopter.

Table 201. Isolating Tracking Problems

Symptom	Probable Cause	Corrective Action
GROUND TRACKING		
Rotor does not follow adjustments.	Turning P/C link wrong direction.	Adjust correctly.
	Pitch link bearing worn. Trim tab bent excessively.	Replace bearing. Zero trim tabs.
Excessive diving or climbing of blade from low speed ground track to high speed ground track.	Trim tab bent excessively.	Zero trim tabs.
	Pitch link control not coordinated with trim tab bend (Intermixing control input).	Set pitch link to nominal 6.25 inches (15.88 cm) and zero trim tabs.
	Damage to blade or tabs.	Inspect for damage.
Excessive torque and erratic high speed ground tracking.	Pitch change links too long or collective rigging too high.	Set to nominal 6.25 inches (15.88 cm). Check collective rigging.
IN-FLIGHT TRACKING		
Blade track changes with power and control changes.	Worn pitch bearing housing bearings.	Replace bearings.
	Missing pitch bearing liner.	Replace bearing.
	Broken or loose feathering studs.	Repair or replace studs.
	Binding rotating scissor crank at lower main rotor hub shoe.	Repair or replace crank.
	Play between longitudinal pitch mixer bellcrank and collective pitch mixer bellcrank.	Re-bond collective pitch mixer bearings and install shims between longitudinal pitch mixer bellcrank and collective pitch mixer bellcrank bearings (Ref. Sec. 62-30-60).
Helicopter has rough feeling with some vibration while appearing to be in track.	Tilted tracking images, no blade in track.	Retrack blades.
	Pitch link control not coordinated with trim tab bend (intermixing control input), with climbing or diving blades within acceptable track limits.	Set pitch link to nominal 6.25 inches (15.88 cm) and zero trim tabs.
Blades very erratic in response to tab bends.	Tab bent too much in wrong area.	Correct by limiting bending.
	Blade erosion, but within chordwise limits.	Track erratic blade to other blades.
	Tab bent too many degrees in one area.	Limit tab bending to smaller degree over larger area.
Blades climb or dive excessively at high speeds.	Too much tab bending in outboard tab areas.	Remove outboard bending and increase inboard bending.

Table 201. Isolating Tracking Problems (Cont.)

Symptom	Probable Cause	Corrective Action
Ground track off at low speed and stick shake at 100% N_2.	Excessive tab bending and pitch link control not coordinated with tab bend (intermixing control input).	Set pitch link to nominal 6.25 inches (15.88 cm) and zero trim tabs.
Helicopter in track but has stick shake.	Blade out of phase.	Check phasing.
Feedback in collective control.	Main rotor system out of balance.	Balance rotor system.
	Loose or binding rotating scissors.	Check and repair as required.
Heavy collective stick - climb and cruise.	Overcenter adjustment set too low.	Adjust.
	Trim tab bent down excessively.	Adjust.
Light collective stick - climb and cruise.	Overcenter adjustment set too high.	Adjust.
	Trim tabs bent up excessively.	Adjust.
Heavy collective lift-off - light flight.	Bungee spring adjusted too short.	Adjust to nominal.
Light collective lift-off - heavy flight.	Bungee spring adjusted too long.	Adjust to nominal.

MAIN ROTOR TRACK AND BALANCE (600N) REMOVAL/INSTALLATION

1. Main Rotor System Tracking Equipment Installation

(Ref. Figure 401 and Figure 402) Equipment needed to track main rotor blades consists of the tracking and balancing equipment (ST903) and the tip cap assemblies (ST901). Instructions for equipment installation are contained in Chadwick-Helmuth Operation and Service Instruction Handbook.

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST901	Tip cap assembly
ST903	Balancer/analyzer instrument kit

NOTE: Main rotor tracking tip caps manufactured by the same firm that manufactures the tracking and balance equipment, are components of the tracking and balancing equipment and may be used instead of tip cap assembly (ST901). In procedures that follow, use of tip cap assembly is presumed. If tip caps from the balancing equipment are used, refer to the Tracking and Balancing Manual for tip cap data.

A. Interrupter Installation

(1). The helicopter is equipped with a main rotor blade tracking interrupter located on the rotating swashplate.

(2). The interrupter creates six equally spaced horizontal reflective images, as viewed by the technician, when the main rotor blade tips are illuminated with the test strobe light.

(3). The balance analyzer separates the image of each main rotor blade tip cap by approximately 0.25 inch (6.35 mm). This staggered relationship allows the technician to view the stopped image of each blade in order of rotation.

(4). The number one blade is seen on the extreme left, number two blade is seen second from left, and so on thru number six which is seen on the extreme right.

(5). Additional interrupters can be added to be compatible with the older balance/ analyzer instrument kits.

(6). Torque the interrupter bolts to **30 - 60 inch-pounds (3.39 - 6.78 Nm)**.

B. Magnetic Pickup Installation

(1). The helicopter is originally equipped with a magnetic pickup support bracket installed with shim washers to prevent distortion of the bracket when the nut on the bolt that secures the link bearing is torqued to **30 - 60 inch-pounds (3.39 - 6.78 Nm)**.

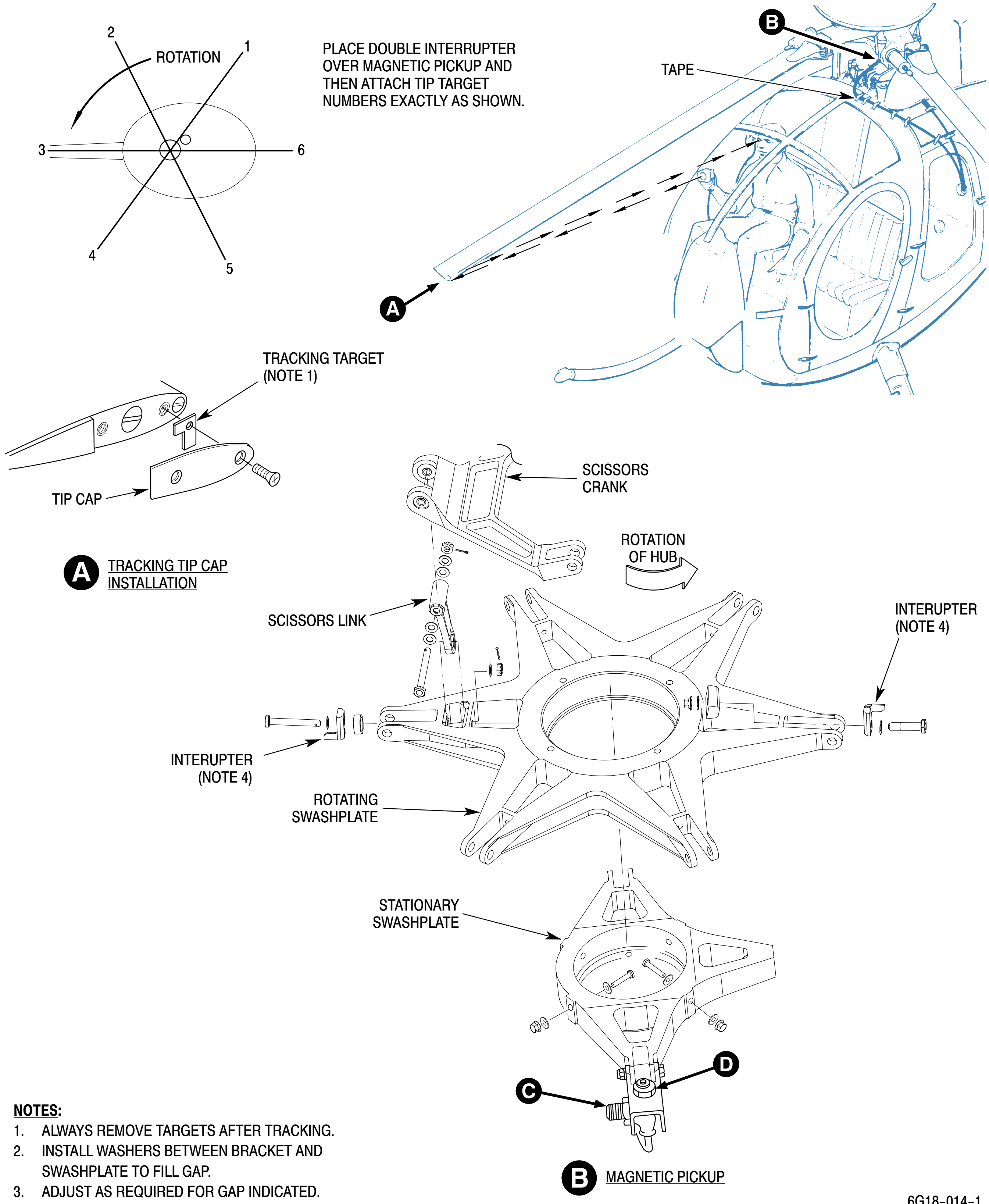
(2). To preclude rocking movement of magnetic pickup support bracket when installed on stationary swashplate, check clearance between swashplate and lower flange of bracket. If gap exists, tap bent tip of lower flange (typical both sides of bracket) until bent tip touches swashplate.

(3). Reinstall by forcing bracket until elongated bracket holes align with hole in stationary swashplate.

(4). Install the magnetic pickup and cable as instructed in the Chadwick-Helmuth Operation and Service Instruction Handbook.

(5). After final adjustment, torque the adjustment nut to **15 - 20 inch-pounds (1.69 - 2.26 Nm)** and ensure the cable is routed and tied down in such a manner as not to be dislodged or interfere with control components at their extremes of travel.

(6). Ensure the interrupter passing closest over magnetic pickup, clears pickup by not less than 0.030 inch (0.76 mm).



NOTES:

1. ALWAYS REMOVE TARGETS AFTER TRACKING.
2. INSTALL WASHERS BETWEEN BRACKET AND SWASHPLATE TO FILL GAP.
3. ADJUST AS REQUIRED FOR GAP INDICATED.
4. REFER TO IPC FOR PART NUMBER.

Figure 401. Blade Tracking Equipment - Main Rotor Components (Sheet 1 of 2)

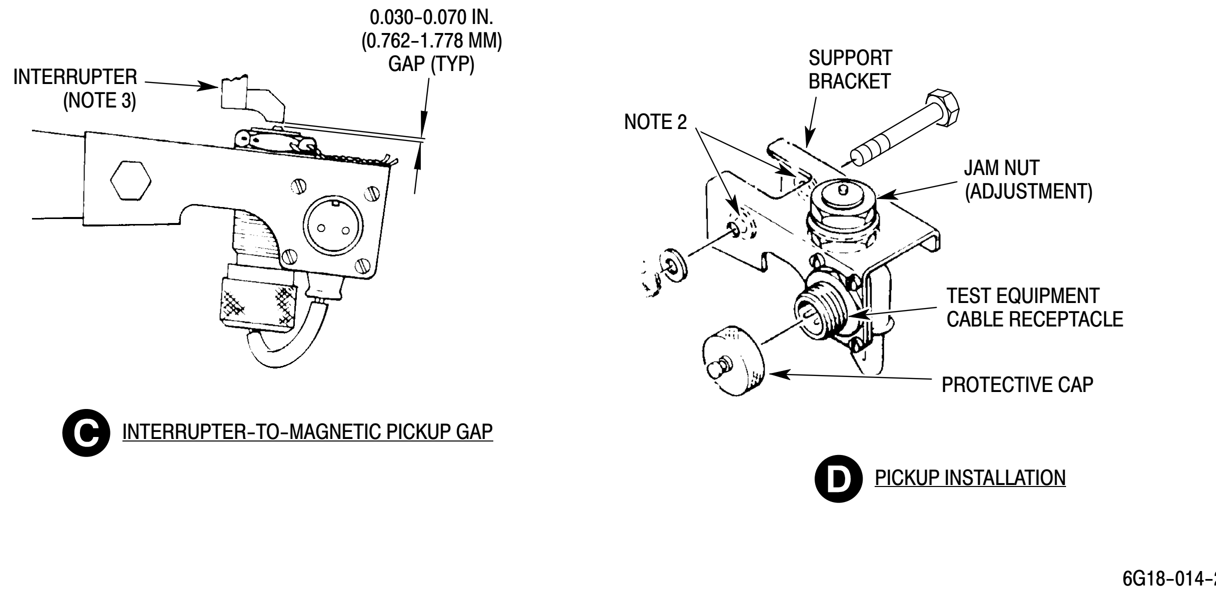


Figure 401. Blade Tracking Equipment - Main Rotor Components (Sheet 2 of 2)

C. Tracking Tip Cap Installation

(1). The helicopter is originally equipped with six tip caps that must be removed and replaced with six tracking tip caps (ST901).

(2). When blade tracking has been accomplished or verified, the tracking tip caps must be removed and original tip caps installed.

(3). Torque the screws that secures the tip cap to **15 - 20 inch-pounds (1.69 - 2.26 Nm)**.

NOTE: Position interrupter over magnetic pickup. The blade positioned forward is number 6. By rotating rotor head in operating direction, the next blade pointing forward will be 5 then 4, 3, 2 and 1.

D. Main Rotor System Balancing Equipment Installation

Refer to Chadwick-Helmuth Operation and Service Instruction Handbook to install that portion of the balancing equipment (ST903) needed to balance the main rotor.

CAUTION When working near engine air inlet, comply with precautions to prevent entry of foreign material. During main rotor balancing the helicopter will be airborne. Carefully observe precautions in the Tracking and Balancing Manual relating to the placement and security of equipment (especially cables) fastened to the exterior of the helicopter.

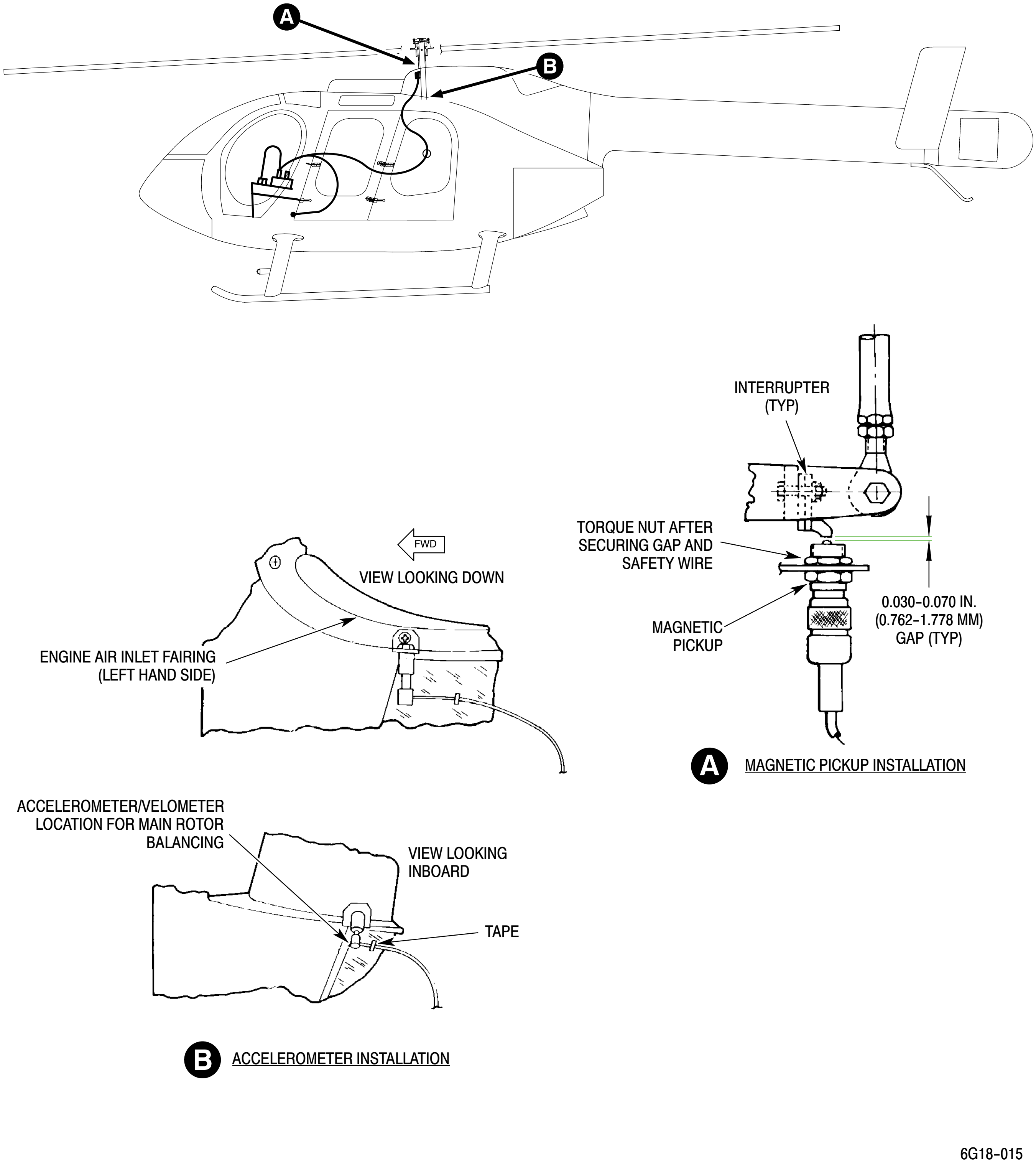


Figure 402. Main Rotor Balancing Equipment Installation

MAIN ROTOR TRACK AND BALANCE (600N) ADJUSTMENT/TEST

1. Blade Tracking Procedure

Table 501 is a summary of the sequence of required procedures for blade tracking.

(1). Install strobe light, blade tip cap reflectors and related equipment.

(2). Use 1/2 inch (12.7 mm) diameter tracking tip cap reflector as a guide for estimating track accuracy. For example:

(a). A tip cap reflector image displacement of 1/2 diameter up, or down, indicates blade tip is approximately 1/4 inch (6.35 mm) out of track.

(b). One full reflector diameter indicates 1/2 inch (12.7 mm) out of track.

NOTE: Rocking or stick shake caused by a correctly tracking rotor indicates improper blade phasing.

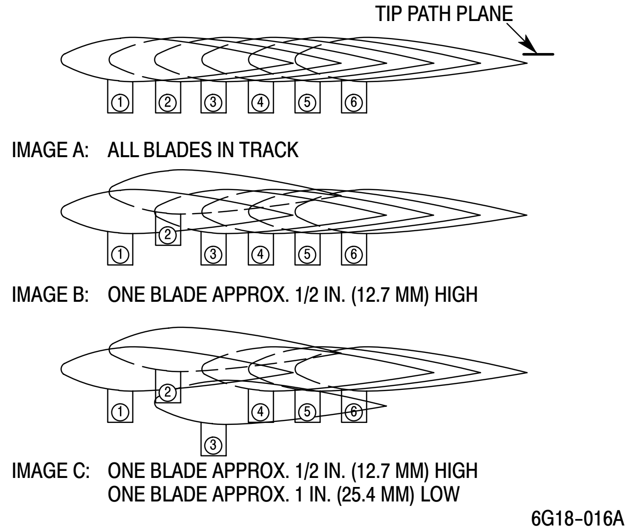
(3). Accomplish blade phasing (Ref. Sec. 62-20-60) when installing new rotor blades or if ground rock or stick shake is noted. This must be accomplished prior to starting tracking procedure.

NOTE: Final rotor system balance cannot be accomplished until blades are in track.

(4). Ground tracking is basically track-observation and adjustment of idle and flight rpm. Improper track at idle rpm is corrected by adjusting length of pitch control links connecting rotating swashplate and blade pitch housing. Ground track at flat pitch and flight rpm is corrected by blade tab adjustment.

(5). Hover track verification is essentially an observation to check for track variations between high rpm (flat pitch) ground track check and hovering.

NOTE: Track adjustments are not made on basis of track observations during hovering. However, track variations should be noted and recorded for use during check of track in forward flight.



CORRECTIVE ACTION

CONDITION	GROUND IDLE RPM	HIGH RPM AND FWD FLIGHT
IMAGE A	NONE REQUIRED	NONE REQUIRED
IMAGE B	SHORTEN PITCH CONTROL ROD (2ND BLADE)	MOVE TAB DOWNWARD (2ND BLADE) MOVE TAB UPWARD (3RD BLADE)
IMAGE C	SHORTEN PITCH CONTROL ROD (2ND BLADE): LENGTHEN CONTROL ROD (3RD BLADE)	MOVE TAB DOWNWARD (2ND BLADE): MOVE TAB UPWARD (3RD BLADE)

NOTE: Chordwise spacing of tracking images are not an accurate indication of blade phasing. Do not adjust blade phasing in an attempt to equalize spacing. Slight tilting of magnetic interrupters or balance of the main rotor system can move the image

Figure 501. Typical Track Conditions and Adjustments

(6). Forward flight track is corrected only by making blade tab adjustments. Forward flight tracking requires track observation during following airspeeds and maneuvers: Flight at 0-100 knots. Forty-five degree banked turns at 80-100 knots. Flight at 100-155 knots.

(7). Check for proper balance of rotor system prior to checking autorotation.

(8). Obtaining correct autorotation rpm consists of checking main rotor rpm during stabilized autorotation flight and adjusting rpm to specified limits as necessary. Autorotation rpm check must be accomplished to ensure that track adjustments do not alter rotor performance necessary for safe power-off landings.

A. Blade Track Adjustment

Although adjustment of pitch control links affects blade track at all rotor speeds, they should be adjusted only when necessary to establish acceptable track at ground idle speed; blade tabs are used for all other track corrections.

NOTE: Blade tab and/or track can make the collective heavy or light.

B. Pitch Control Link Adjustment

Repeat this adjustment procedure as necessary to establish ground idle track:

(1). To lower a blade tip, shorten pitch control link assembly. To raise a blade tip, lengthen pitch control link assembly. One-sixth of a turn of link (one flat) raises or lowers blade tip approximately 1/4 inch (6.35 mm).

CAUTION Center each rod end or pitch case and/or swashplate wear will result. Ensure there is no binding in full up travel position.

(2). After adjusting pitch control link length, center each rod end in its fitting and hold while tightening jam nuts; safety with lockwire.

C. Blade Tab Adjustment

(Ref. Figure 502) Once ground idle track is obtained, all remaining tracking correction is accomplished by very slight bending of various blade tab zones with tab bending tool (ST902). Different zones of tabs are used to adjust blade track at different airspeeds. In general, tab zone A is used for high-rpm, flat pitch ground tracking (100% N_2) and zones C, D, and sometimes E, are used for tracking at higher airspeeds. Zone B is used to supplement zone A track correction when maximum tab (5 degrees) has been applied to zone A; if necessary, zone B may also be used for correction in 0-110 knot airspeed range.

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST902	Main rotor blade fixture and tab bending tool

CAUTION Minimize bending and restrict adjustments to very small increments so that bonded trailing edge joint between upper and lower skins is not damaged. Tabs must never be displaced more than five degrees above or below neutral position (parallel to chordline).

(1). To lower blade tip that tends to climb during ground tracking at high rpm or during forward flight, bend appropriate tab section slightly downward; to raise tip of blade that tends to descend, bend tab slightly upward. If only slight track correction is necessary, limit tab bending to width of bending tool. If more correction is necessary, bend a slightly wider section of tab. Use small adjustments to avoid excessive rebending of tabs.

NOTE: Tab zones on same blade can require bending in opposite directions. For example, after bending tab zone A downward to get good tracking at 60-90 knots, it might become necessary to bend tab zone D or E (Ref. Figure 502) upward to correct track at redline airspeed. In any case, do not use larger tab corrections than are actually necessary.

(2). Each time blade tabs are adjusted, recheck ground idle track and readjust if necessary.

(3). After completion of forward flight tracking, balance and check autorotation rpm.

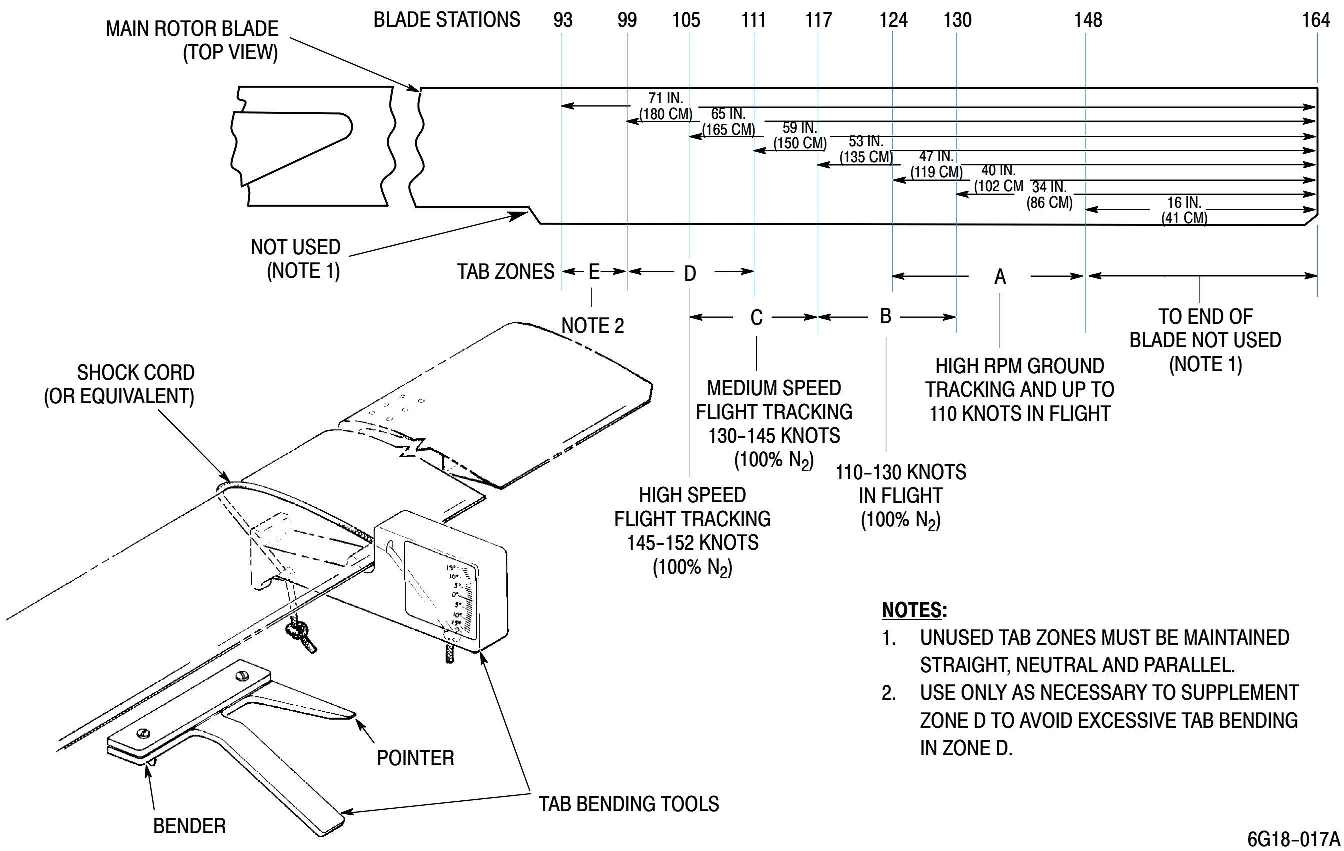


Figure 502. Adjustment - Main Rotor Blade Tab

D. Main Rotor Ground Tracking

For best results, tracking should be performed under calm air conditions. Wind velocity should not exceed six knots during adjustments. Accurate adjustment of initial ground track is very important. In most instances, forward flight tracking problems can be avoided or greatly reduced by setting initial track as nearly perfect as possible. Tolerances specified in following instructions should be considered maximum permissible deviation rather than desired goal.

NOTE: If main rotor hub or a pitch control rod end bearing has been replaced, adjust pitch control link(s) before proceeding with ground tracking.

(1). Before tracking blades that are not new, check that normally straight (not to be used) tab areas are in neutral position (centered on chordline) and straight.

NOTE: On new (untracked) blades, check that all tab areas are straight and in neutral position (centered on chordline 0.0° ±0.5°).

(2). Load helicopter to a gross weight of approximately 2350 pounds (1066.9 kg); then ground idle (approximately 64-65% N_1) with collective pitch stick full down.

(3). Observe tracking tip cap reflector image by directing strobe light beam toward blade tip path and sweeping beam slowly back and forth until reflector images are clearly seen. Tracking image should appear directly in front of helicopter or slightly off helicopter centerline.

(4). If blades are in track, tip cap reflector image pattern should resemble image A, (Ref. Figure 501) (no blade tip more than 1/4 of one tracking reflector diameter, 1/8 inch (3.175 mm), above or below adjacent reflectors). If blades are in track, proceed with step (5). below. If blades are out of track, adjust pitch control links and repeat step (3). above.

(5). With collective pitch stick full down, increase engine speed to 100% N_2 and observe tip cap reflector image to see if blade track is changed from ground idle track. When all six blades are in track within 1/4 of one reflector diameter, ground track is correct; proceed with hover verification. When a blade is out of track, adjust blade tab zone A until high rpm ground track is within tolerance.

E. Hover Track Verification

(Ref. Figure 504)

(1). Hover track verification must be performed after ground tracking and before forward flight tracking. Verification is only a check of hover track. Do not adjust pitch control links or blade tabs because of track images observed during hovering. Tab adjustments often cause variation between ground track and hovering track. A large track variation may indicate that one or more blades is beyond its chordwise balance tolerance, but this can only be determined during forward flight tracking. Perform hover track verification as follows.

NOTE: Collective pitch stick may be “heavy” after tracking reflectors are mounted on blade tips. This condition is not unusual and may be disregarded.

(2). Verify helicopter gross weight of 2000-2500 pounds (908-1135 kg).

(3). With collective pitch stick full down, increase N_2 to 100%.

(4). Observe tracking reflector images to verify that ground track is within limits.

(5). With helicopter in a stable hover, observe reflector images. If one or more blades are out of track, record condition(s) for reference during forward flight tracking.

(6). Proceed with forward flight tracking.

WARNING **Use of the tracking strobe light in night flight is not recommended. Such use can result in pilot disorientation or loss of vision with resultant damage to the helicopter and personal injury.**

F. Forward Flight Tracking

(Ref. Figure 502 and Figure 506 thru Figure 508) Forward flight tracking should be performed whenever vertical flight vibrations indicate that blades may be out of track.

(1). Verify helicopter gross weight of 2000-2500 pounds (908-1135 kg).

NOTE: When bending trim tabs, do not bend more than 1.5° between six inch sections.

(2). Perform flight tracking from hover up to 110 knots at 100% N_2. If flight track varies from hover track more than 1/2 inch (12.7 mm), bend tab zone A (five degrees maximum) to limit variation to tab zone B (five degrees maximum).

(3). Check autorotation percentage; percentage must not be less than 480 (90%).

CAUTION Do not attempt to adjust chordwise balance of a blade found to be faulty when performing banked turns. Chordwise balance corrections must be accomplished by manufacturer (MDHI).

(4). Perform a series of 45 degree banked turns at 100 knots and observe track change from level flight. If any blade climbs or dives more than one inch (2.54 cm) out of track with others, chordwise balance (center of gravity) of that blade is beyond its tolerance and blade must be replaced or balanced by an MDHI Field Representative. (Hover track variations of this type that do not repeat during banked-turn maneuver may be disregarded.)

(5). Perform flight tracking at 100% N_2. If necessary, adjust tab zone B (five degrees maximum) to limit track variation to 1/2 inch (12.7 mm) or less and to minimize excessive vertical (one-per revolution) vibration. If variation is excessive, bend tab zone C or D (five degrees maximum).

NOTE: When determining whether blade track is acceptable, overall vibration level of helicopter should be determining factor. Some combinations of rotor blades might produce higher six-per-revolution vibration as blade tips are brought into close track; in such cases, lowest vibration level is preferred, even though observed blade track may be beyond specified tolerances.

(6). After flight tracking is completed, perform a Main Rotor System Balance Procedure and Main Rotor Autorotation RPM Check.

2. Main Rotor System Balance Procedure

Balance the main rotor system according to instructions in the Chadwick-Helmuth Operation and Service Instruction Handbook.

CAUTION The maximum allowable balance weight per lead-lag bolt on the main rotor hub assembly is 143 grams.

3. Main Rotor Autorotation Percentage Check

(Ref. Table 502) An autorotation percentage check is required after each blade tracking operation and whenever rpm is outside limits listed. Check rotor rpm and make adjustments as follows.

CAUTION

- All autorotation percentage adjustments shall be made at the main rotor pitch control links only. Do not re-adjust mixer control rods after rigging is accomplished. Failure to observe this precaution may result in serious damage to rotor system and controls. Do not adjust control rod end beyond witness hole.
- Tracking targets reduce blade to tailboom clearance, performing autorotations to the ground could result in boom strikes.

NOTE: Change length of all six pitch control links as necessary to adjust autorotation percentage. Be sure to lengthen or shorten all six links exactly same amount or blade track is changed. One flat (1/6-turn) of control link body causes approximately one percent change in autorotation percent.

(1). Autorotation Percentage Check (Ref. Table 502) Load helicopter to a gross weight of 2800 ±25 pounds (1270 ±11 kg). Perform a practice autorotative descent (Ref. RFM), taking care not to allow percentage to exceed rotor speed limitations. During autorotation, take careful note of stabilized autorotation percentage at one of the gross weight/density altitude combinations. After landing, compare observed percentage with values. If observed percentage is within limits in table, percentage setting is correct. If limits were exceeded, make corrective adjustments according to Autorotation Percentage Adjustment, until percentage is within limits.

(2). Autorotation Percentage Adjustment: Change length of all six pitch control links as required to adjust autorotation percentage. Make certain all six links are shortened or lengthened exactly the same amount or blade track will be altered.

NOTE: After autorotation percentage adjustments are satisfactorily accomplished, remove tracking equipment before returning helicopter to service. Be sure to correctly tighten and safety all bolts after they are reinstalled.

Table 501. Summary Procedure for Blade Tracking

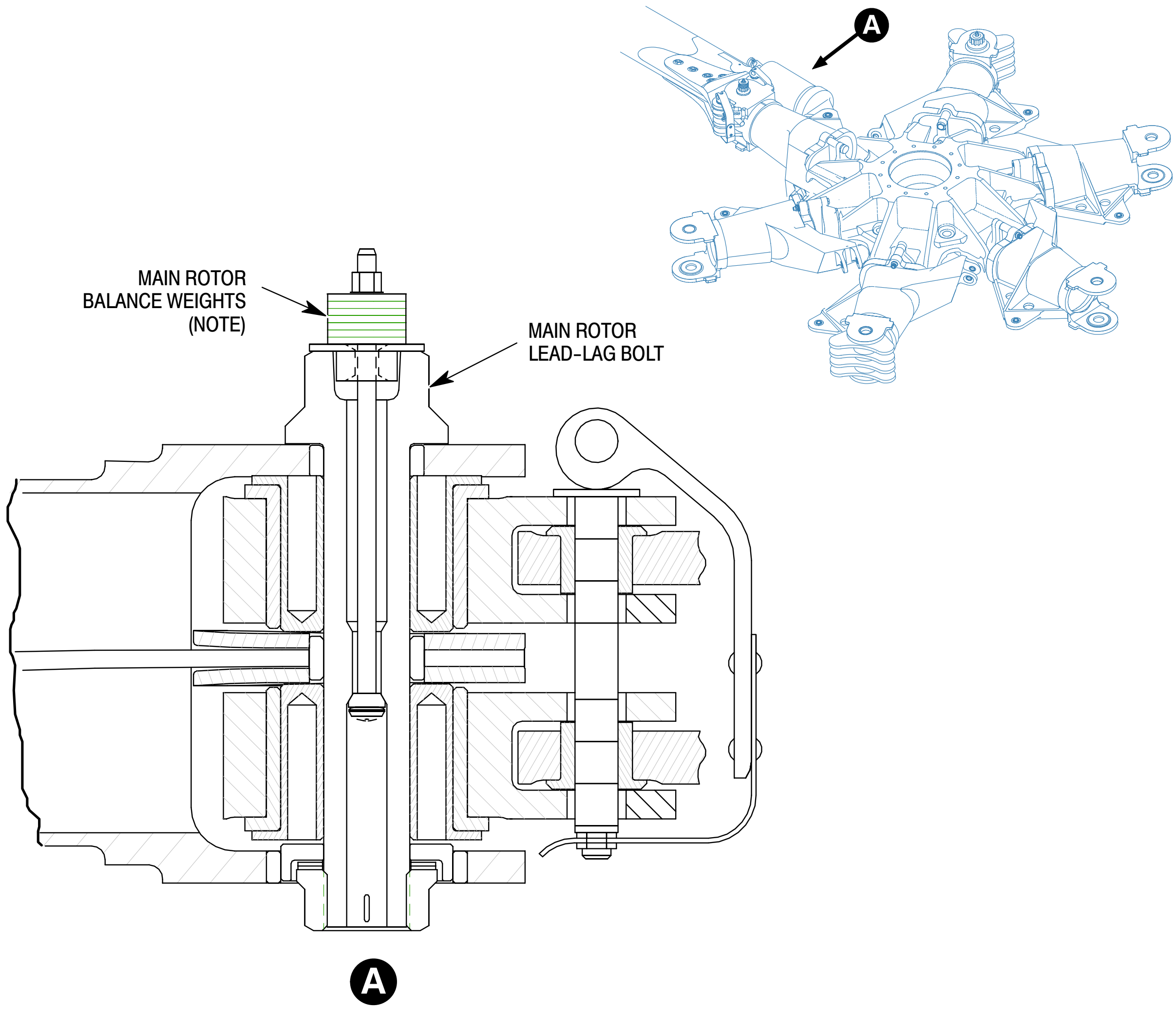
Step	Satisfactory Result	Unsatisfactory Result	Corrective Action
(1) Observe ground track.	Go to step (2).	Ref. Corrective Action.	Adjust pitch control rods and blade tabs as required. Repeat track observation.
(2) Perform hover verification.	Go to step (3).	Ref. Corrective Action.	Record track verification and proceed with forward flight tracking.
(3) Perform forward flight tracking.	Go to step (4).	Ref. Corrective Action.	Adjust blade tabs and repeat forward flight tracking.
(4) Perform autorotation percentage check.	Go to step (5).	Ref. Corrective Action.	Adjust autorotation percentage and repeat percentage check.
(5) Remove tracking equipment and return helicopter to service.			

NOTE: Ground rock or stick shake with rotor blades in track during ground track indicates rotor blades are not properly phased.

Table 502. Autorotation Percentage Chart

Gross Wt lb/kg	Stabilized Autorotation Percentage at Density Altitude					
	Sea Level	1000 Ft (305 M)	2000 Ft (610 M)	3000 Ft (915 M)	4000 Ft (1220 M)	5000 Ft (1525 M)
2500/1134	93.8 - 95.8	94.6 - 96.6	95.4 - 97.4	96.3 - 98.3	97.1 - 99.1	98.0 - 100.0
2600/1179	95.6 - 97.6	96.4 - 98.4	97.3 - 99.3	98.1 - 100.1	99.0 - 101.0	99.9 - 101.9
2700/1224	97.4 - 99.4	98.2 - 100.2	99.1 - 101.1	100.0 - 102.0	100.9 - 102.9	101.8 - 103.8
2800/1270	99.2 - 101.2	100.0 - 102.0	100.9 - 102.9	101.8 - 103.8	102.7 - 104.7	103.6 - 105.6
2900/1315	101.0 - 103.0	101.8 - 103.8	102.7 - 104.7	103.6 - 105.6	104.6 - 106.4	
3000/1361	102.7 - 104.7	103.6 - 105.6	104.5 - 106.4	105.4 - 106.4		

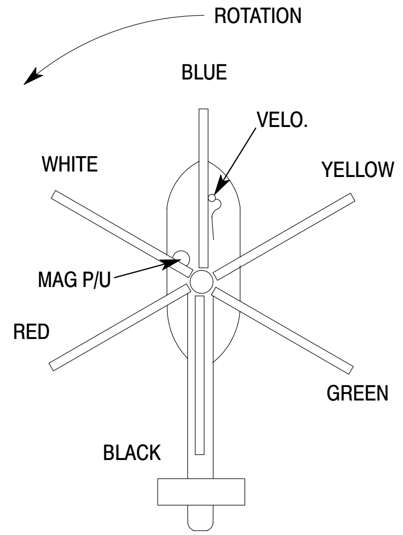
NOTE: Perform autorotation percentage checks at gross weight/density altitude combinations for which percentage values are given. Blank spaces indicate that application of collective pitch may be necessary to avoid rotor overspeed.



NOTE:
THE MAXIMUM ALLOWABLE BALANCE WEIGHT PER LEAD-LAG BOLT ON THE MAIN ROTOR HUB ASSEMBLY IS 143 GRAMS.

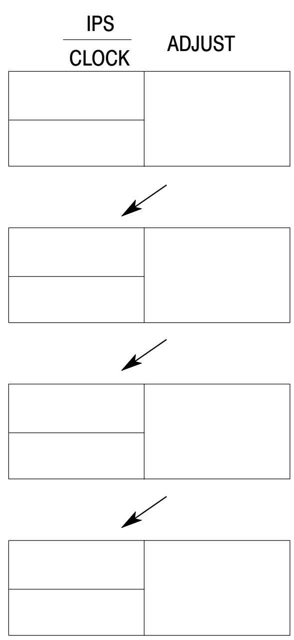
6G18-019A

Figure 503. Main Rotor System Balancing



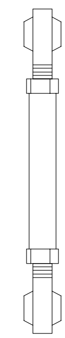
BLADE ORIENTATION WITH
DRIVE LINK INTERRUPTER

AIRCRAFT VIEWED FROM ABOVE

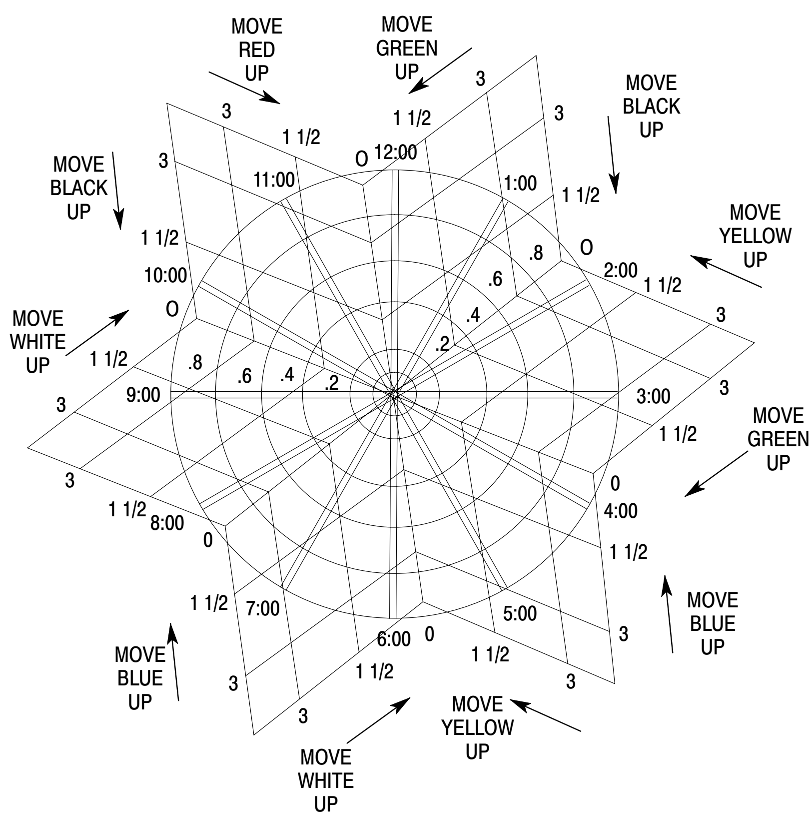


MD600N HOVER PITCH LINK ADJUSTMENT

1. TAKE READINGS AT IGE HOVER USING VERTICAL VELOCIMETER ON CONSOLE.
2. ADJUST PITCH CHANGE LINK IN FLATS. 1 FLAT=1/6 TURN OF PITCH CHANGE BARREL.
3. BLADE SEQUENCE IS SHOWN WITH SINGLE INTERRUPTER ATTACHED TO DRIVE LINK OF ROTATING SWASHPLATE.
4. TAKE READINGS FROM VERTICAL VELOCIMETER MOUNTED ON INSTRUMENT PEDESTAL POINTING DOWN.
5. ADJUST PITCH CHANGE LINK BEFORE BALANCING AT HOVER.



ADJUSTMENT IN FLATS
OF PITCH LINKS



NOTES:
1. ARROWS INDICATE DIRECTION POINT SHOULD GO WHEN ADJUSTMENT TO NOTED BLADE IS MADE.
2. MOVE TO OPPOSITE BLADE IN OPPOSITE DIRECTION HAS SAME EFFECT.

6G18-099

Figure 504. Main Rotor Track at Hover (Pitch Change Link Adjustment)

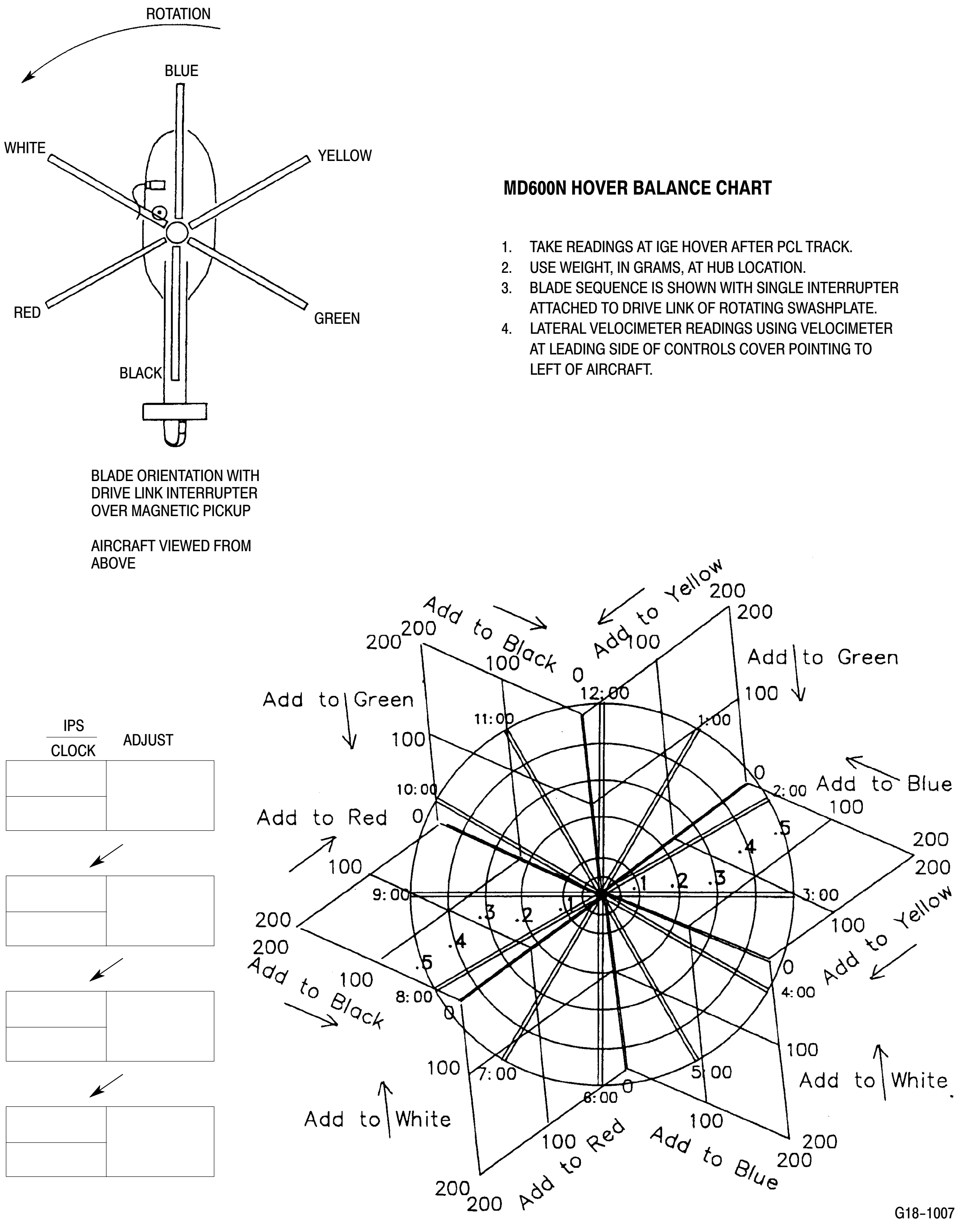
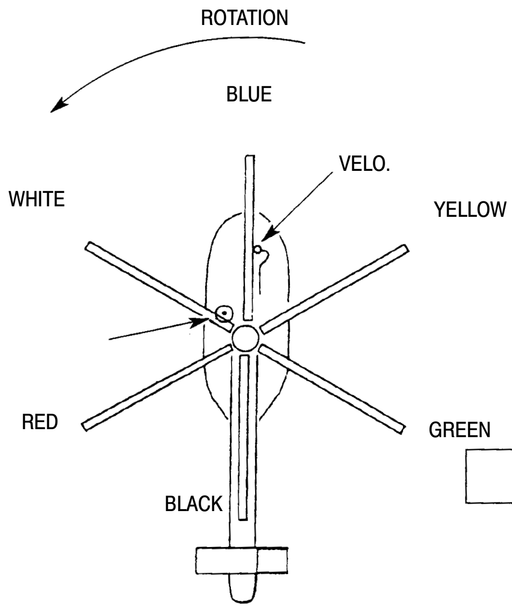


Figure 505. Main Rotor System Balance Chart

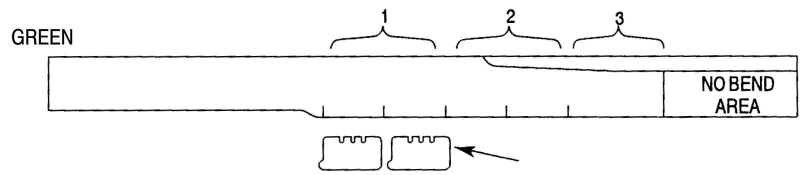


BLADE ORIENTATION WITH DRIVE LINK INTERRUPTER OVER MAGNETIC PICKUP

AIRCRAFT VIEWED FROM ABOVE

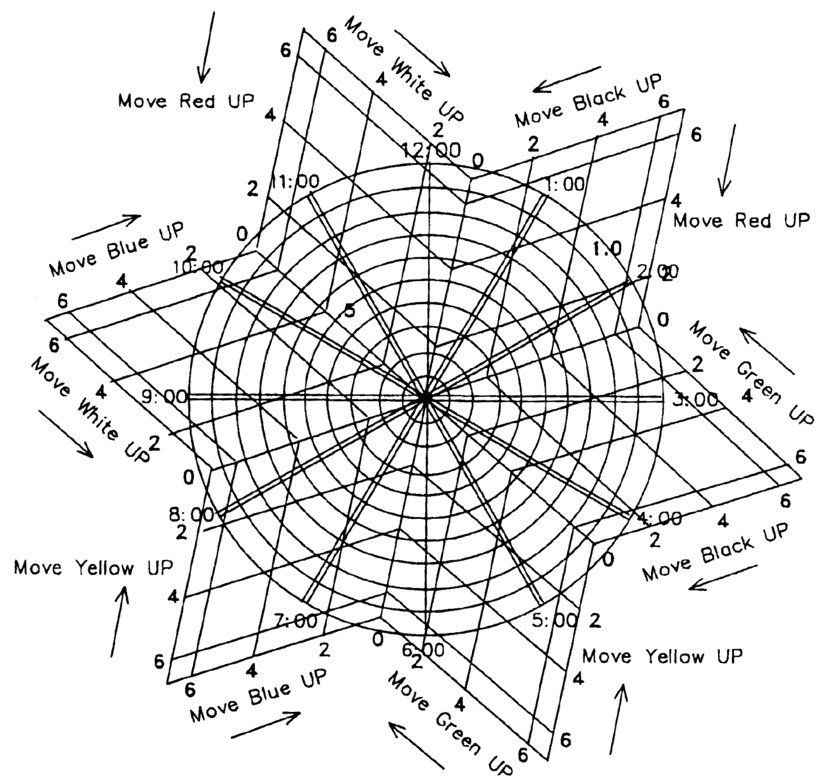
MD600N VERTICAL TAB CHART 100–130 KIAS

1. TAKE READINGS AT 100–130 KIAS.
2. TAB MEASUREMENTS ARE IN 0.001 IN. (0.0254 MM).
3. BLADE SEQUENCE IS SHOWN WITH SINGLE INTERRUPTER ATTACHED TO DRIVE LINK OF ROTATING SWASHPLATE.
4. TAKE READINGS FROM VERTICAL VELOCIMETER MOUNTED ON INSTRUMENT PEDESTAL POINTING OUT.



1. INNER TAB TWO WIDTHS OF BENDER (STA. 97 – 111)
2. MIDDLE TAB TWO WIDTHS OF BENDER (STA. 111 – 130)
3. OUTER TAB ONE WIDTH OF BENDER (STA. 130 – 142)

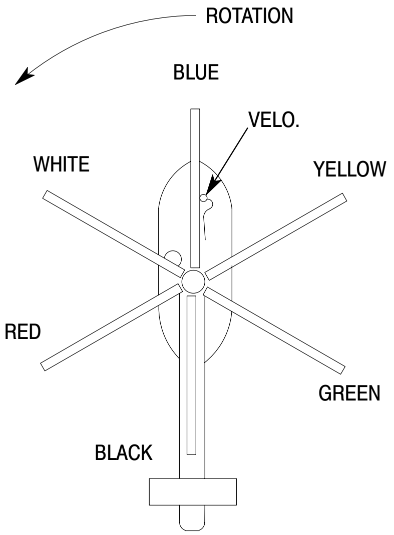
IPS / CLOCK	ADJUST



NOTE:
ARROWS INDICATE DIRECTION POINT SHOULD GO WHEN ADJUSTMENT TO NOTED BLADE IS MADE.

G18–1006

Figure 506. Main Rotor Tracking at 100 - 130 KIAS (Inner Tab Adjustment)

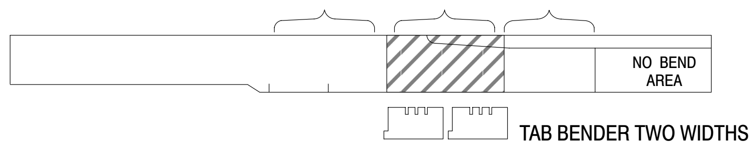


BLADE ORIENTATION WITH
DRIVE LINK INTERRUPTER
OVER MAGNETIC PICKUP

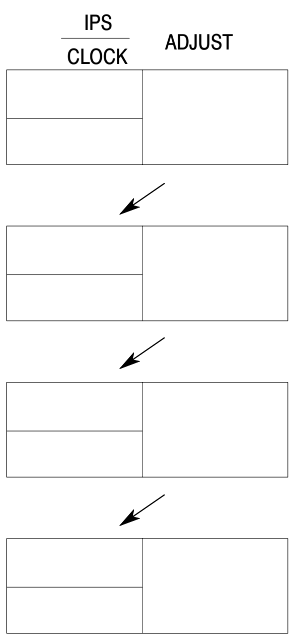
AIRCRAFT VIEWED FROM ABOVE

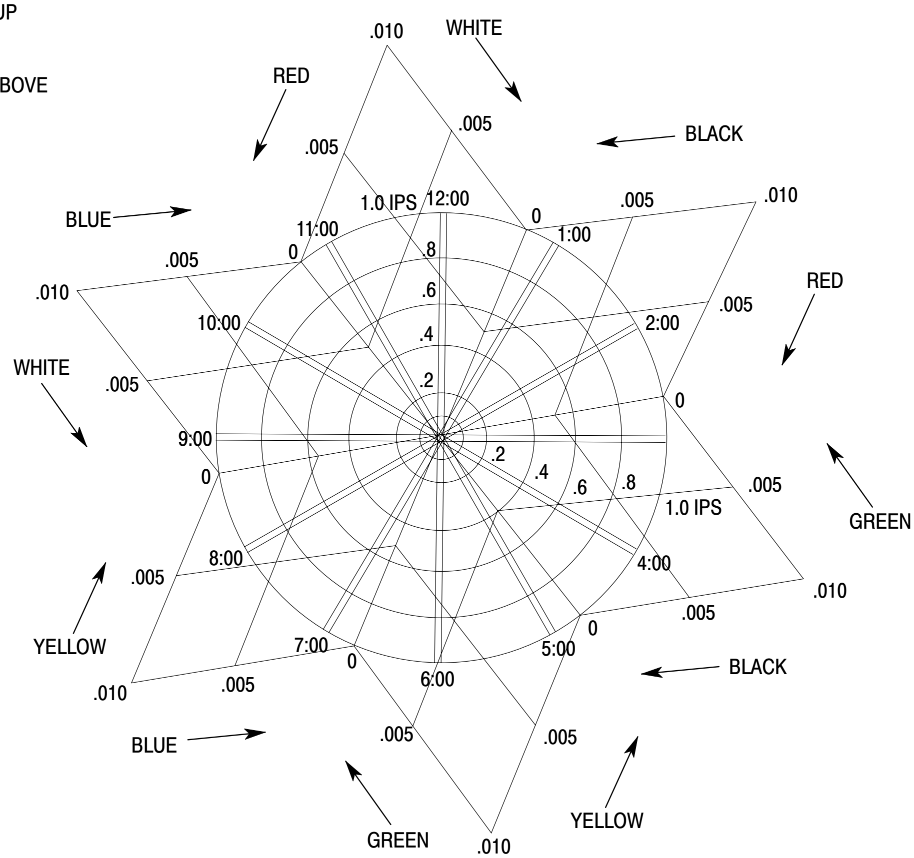
MD600N VERTICAL TAB CHART 100–130 KIAS

1. TAKE READINGS AT 100–130 KIAS.
2. TAB MEASUREMENTS ARE IN .001 INCH.
3. BLADE SEQUENCE IS SHOWN WITH SINGLE INTERRUPTER ATTACHED TO DRIVE LINK OF ROTATING SWASHPLATE.
4. TAKE READINGS FROM VERTICAL VELOCIMETER MOUNTED ON INSTRUMENT PEDESTAL POINTING DOWN.



1. UNDER TAB TWO WIDTHS OF BENDER (STA 97 – 111)
2. MIDDLE TAB TWO WIDTHS OF BENDER (STA 111 – 130)
3. OUTER TAB ONE WIDTH OF BENDER (STA 130 – 142)





6G18–100

Figure 507. Main Rotor Tracking at 100 - 130 KIAS (Mid Tab Adjustment)

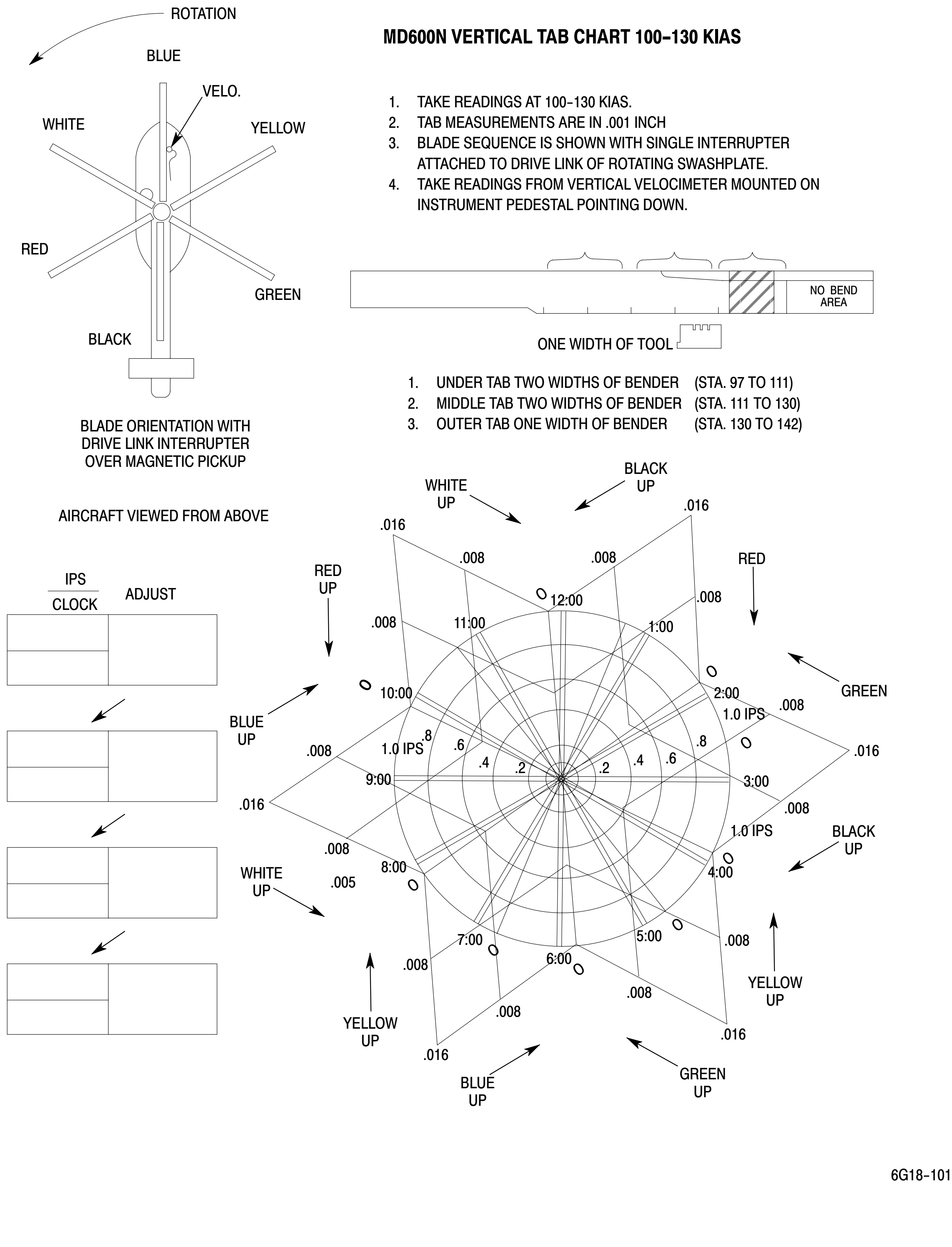


Figure 508. Main Rotor Tracking at 100 - 130 KIAS (Outer Tab Adjustment)

Section

18-20-00

Tail Rotor Balance

TAIL ROTOR BALANCE
MAINTENANCE PRACTICES

1. Tail Rotor Balancing

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST903	Balancer/analyzer instrument kit

Balancing is accomplished by use of a balancing kit (ST903). The carrying case of this kit contains all instrumentation, balance charts and miscellaneous items needed to balance the tail rotor. Also included is a track and balance handbook for use with the equipment to correct balance when such can be obtained by addition or subtraction of weight at pitch-arm studs or at blade tips.

Since vibration reduction by weight adjustment is dependent on proper mechanical condition of the tail rotor and tail rotor drive system, troubleshooting information (Ref. Chap. 64) should be used with balancing kit instructions. Acceptance criteria for balance and vibration are contained in the balancing kit and on each balance chart. Main rotor and tail rotor balancing spare kit contains spare screws, washers and tip weights.

NOTE: If tail rotor balance is difficult to achieve and horizontal stabilizer resonance is noted refer to 421- 087- 505 Horizontal Stabilizer Tab Weight Installation.

A. Balance at Blade Tip

When balancing procedures indicate that weight should be added to a tip, it is preferable, if possible, to instead remove an equivalent amount from the opposite tip to keep overall weight to a minimum. Installation of tip weights is not mandatory. However, open screw holes are not permitted; screws must be installed. Shorter than normal screws may be used for balance if minimal thread engagement of 5/16 inch (7.9375 mm) exists.

(1). Remove tip-weight screws and weights (Ref. Figure 201). Select balancing hardware indicated by balancing procedure. Tail rotor balance spare kit contains extra tip weights and screws.

(2). Install combination of weights required. Maximum weight permitted is thirty-four grams at each tip (Ref. Table 201). Torque screws to **21 - 24 inch-pounds (2.37 - 2.71 Nm).**

B. Balance at Blade Pitch Arm

(Ref. Figure 201) Weight increase at light pitch arm may be obtained by removal of equivalent washer weight from opposite pitch arm. Always remove washers from opposite pitch arm, if installed, and subtract from weight to be added before adding more weight. For washer data, refer to Table 201. Main rotor and tail rotor balancing spare kit contains extra washers. Maximum washer weight allowed at either pitch arm bolt is 26.91 grams (23 washers).

NOTE:

- A tail rotor out-of-balance condition that cannot be corrected by standard balancing procedures may be an indication of excessive play in tail rotor hub components.
- There is possibility of slight weight variation between pitch control links.

(1). If tail rotor has maximum balance washer weight allowed on one pitch arm, compare the two links.

(2). If pitch link opposite the weight requirement appears larger, exchange one link for the other and repeat vibration analysis.

(3). If, as a result of parts peculiarity, maximum allowable weight at one pitch arm does not correct assembly balance, tail rotor hub may be shifted in fork and hub-to-fork shimming adjusted, if maximum allowable play in fork bearings is not exceeded. This is done by transferring fork-to-hub spacing shims from balance weighted side to opposite side of hub, according to hub and fork assembly procedures (Ref. COM).

(a). Chordwise weight shift resulting from each 0.001 inch (0.0254 mm) of spacing thickness transferred reduces weight requirement at weighted pitch arm by one HS306-227L balance washer.

(b). Transferring one 369A1717-53 spacing shim, 0.010 inch (0.254 mm) thickness, allows initial removal of 10 thin washers from pitch arm and thereby allows more flexibility for further balance correction during vibration analysis.

(4). It should be noted that spanwise balance is probably affected by any chordwise shift of fork.

(5). If maximum allowable play in fork bearings is exceeded, bearings must be replaced (Ref. COM).

(6). Replacement or adjustment of parts requires balancing of tail rotor following re-assembly.

C. Short Method Balance Check

(Ref. Figure 201 and Figure 202) Use tail rotor vibration analyzer (ST903) throughout this procedure.

(1). Mount accelerometer into tail rotor gearbox breather plug as noted in Chadwick-Helmuth Operation and Service Handbook.

(2). Connect accelerometer and balancer DC power cables as noted in the Chadwick-Helmuth Operation and Service Handbook.

(3). Apply a retro-reflective target material on blade root fitting. For four-bladed tail rotor, one blade of the outboard tail rotor assembly.

(4). Connect cables and instruments and adjust settings as noted in Chadwick-Helmuth Handbook.

(5). Direct strobe at tail rotor and adjust per Chadwick-Helmuth instructions for VERIFY TUNE.

(6). Initially balance the tail rotor until vibration level is 0.1 IPS (0.85 MIL) or less as follows:

(a). Add weights to blade tips only. For four-bladed tail rotor, divide weights as necessary between the two lower blades to make the total weight vector in the downward direction.

NOTE: If more than 15 grams of tip weight (including screw) is necessary on any one blade, use the "long method" balance procedure.

(7). After initial balance, reset RPM TUNE dial, according to Chadwick-Helmuth Handbook for final balancing. Direct strobe at tail rotor and adjust per Chadwick-Helmuth instructions for VERIFY TUNE. Apply the same method used for initial balance to balance until vibration level is 0.1 IPS (0.85 MIL) or less.

D. Long Method Balance Check (Four-Bladed Tail Rotor)

(Ref. Figure 203 and Figure 204) A long method balance check must be accomplished each time hubs and fork of four-bladed tail rotor are reassembled. Use tail rotor vibration analyzer (ST903) throughout the procedure.

CAUTION First runup of tail rotor assembly should be accomplished in a cautious manner, increasing tail rotor rpm slowly so that vibrations from out- of- balance tail rotor assembly will not cause damage.

NOTE: Prior to performing long method balance check, ensure hub is centered on fork and elastomeric bearings are preloaded correctly.

(1). With outboard blade removed, balance inboard blade by adjusting tip weights and washers at pitch arm bolt to achieve 0.10 IPS (0.85 MIL) or less vibration level at 2100 rpm (input shaft of transmission). This corresponds to tail rotor rpm of 2168.

(2). Install outboard blade and hub assembly; check balance of outboard blades by adjusting weights to obtain 0.10 IPS

(0.85 MIL) vibration or less, using same method as used for inboard blade balancing, except as shown in Figure 204.

2. Horizontal Stabilizer Tuning

Installation of tab weight is optional on the 421-087 -505 horizontal stabilizer if difficulty in tail rotor balance and horizontal stabilizer tab resonance vibration is encountered.

(1). With helicopter on flat smooth surface, operate engine at 102%-105% N_2 and observe horizontal stabilizer tab.

(2). If tab resonance vibration occurs, remove the horizontal stabilizer assembly and balance the tail rotor assembly.

(3). After balancing the tail rotor assembly, reinstall the horizontal stabilizer.

(4). Run engine at 102%-105% N_2 and observe horizontal stabilizer tab.

(5). If tab resonance occurs and tail rotor balance is no longer acceptable, install tab weight to horizontal stabilizer right tab (Ref. Sec. 53-50-10, Horizontal Stabilizer Tab Weight Installation).

(6). If needed, a one ounce weight may also be installed on left tab.

(7). A maximum of two ounces may be installed on each tab.

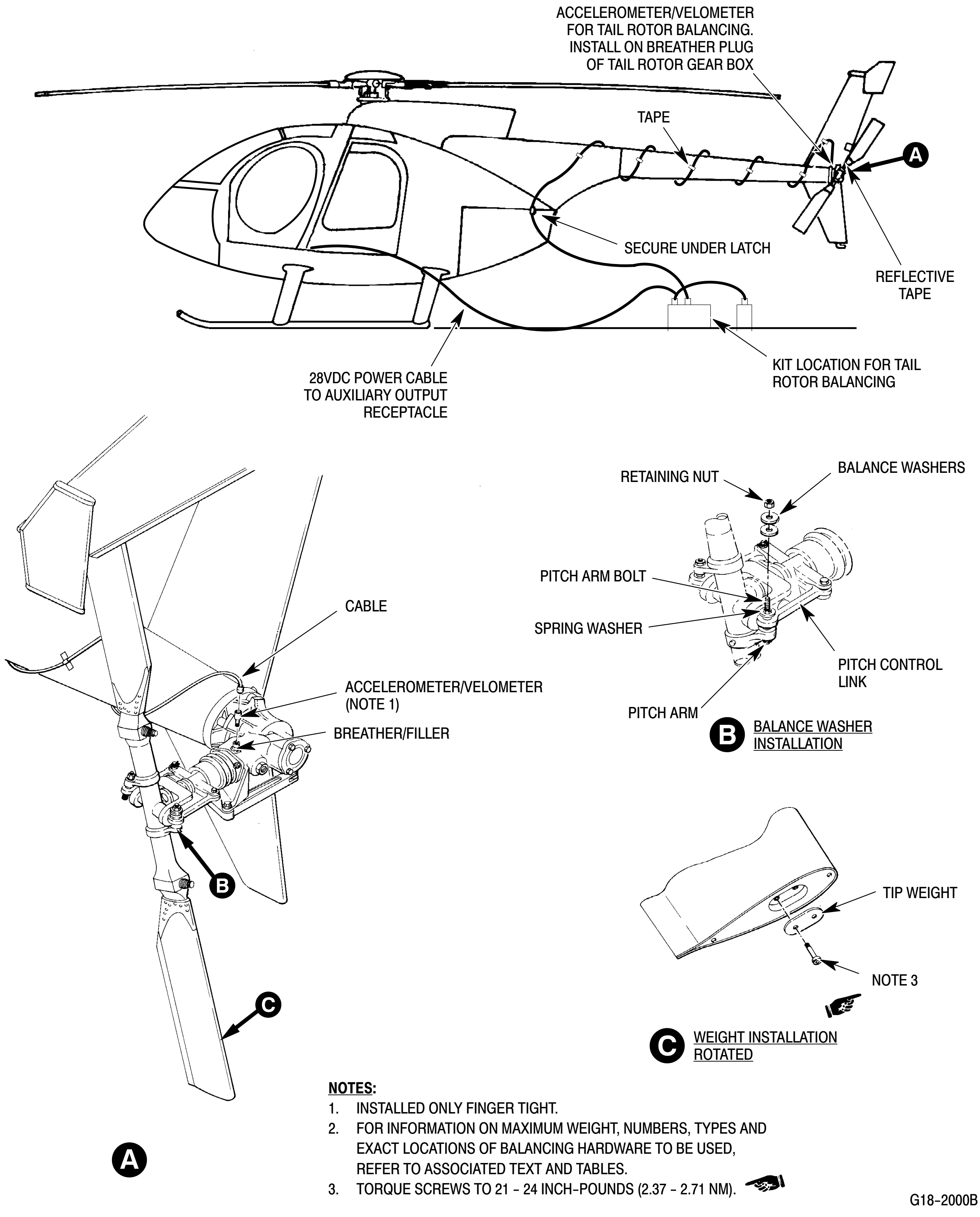


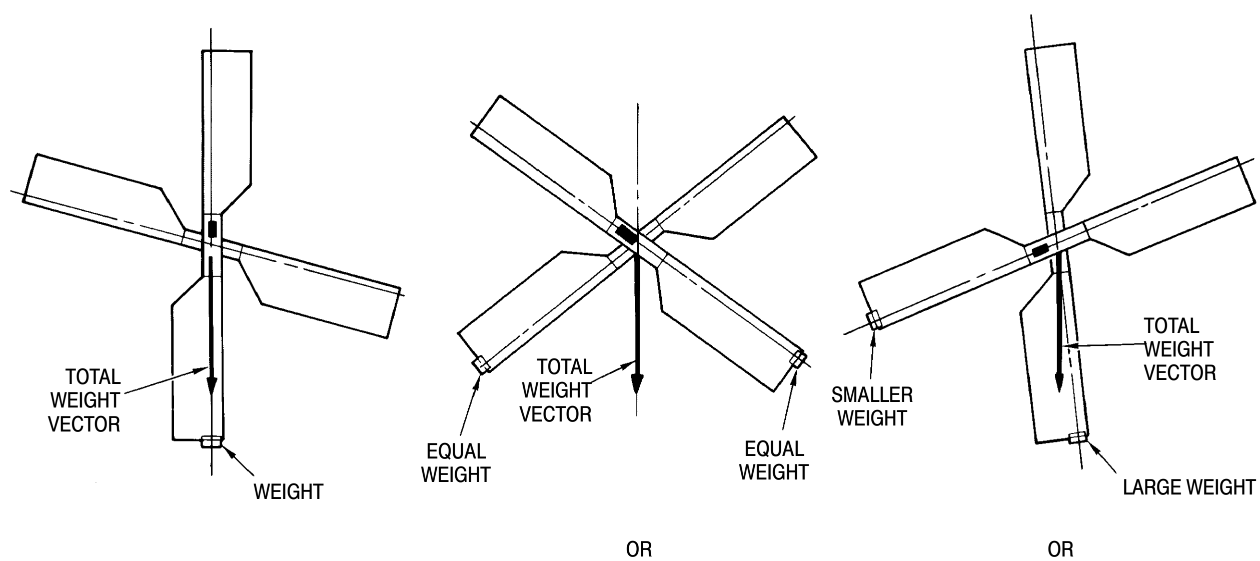
Figure 201. Tail Rotor Assembly Balancing (Two-Bladed Tail Rotor)

Table 201. Tail Rotor Balance Weight - Value Chart

At Blade Tip (4)			At Blade Pitch Arm (3)			
Screw (5)			Washer (1)(2)			
Part Number	Length (in./mm)	Weight (Grams)	Part Number	Thickness (in./mm)	Weight (Grams)	OD (in./mm)
NAS1352-8-12P	0.75/19.05	2.22	HS306-227L	0.016/0.4064	1.17	0.800/20.32
NAS1352-8-14P	0.875/22.23	2.44				
Weight						
	Thickness (In./mm)	Weight (Grams)				
369A1622-3	0.016/0.4064	0.29				
369A1622-5	0.036/0.9144	1.76				

NOTES:

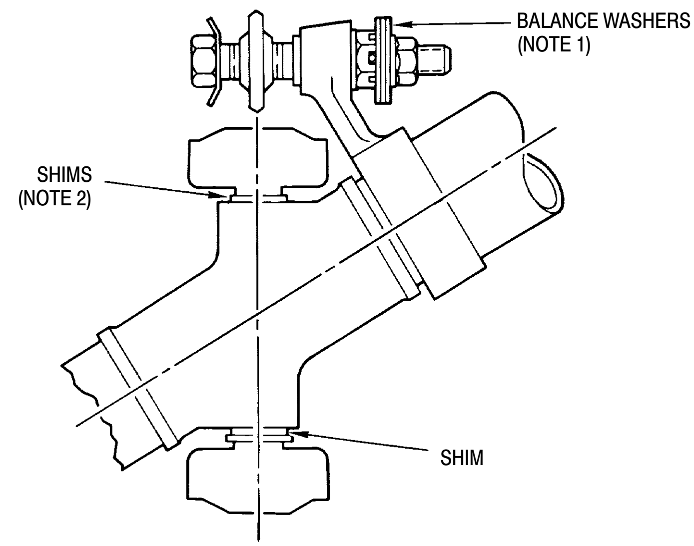
(1) Used on balance bolt.
(2) Maximum of 23 washers is permitted on each balance bolt.
(3) Minimum of two threads must extend past nut securing balance washers on balance bolt.
(4) Maximum weight, including screws, is 34 grams.
(5) Minimum screw thread engagement is 5/16 inch (7.9375 mm).



NOTE:
IF, WHEN ADDING WEIGHTS, OUT-OF-BALANCE VIBRATION LEVEL INCREASES, ADD WEIGHTS TO THE TOP BLADE(S).

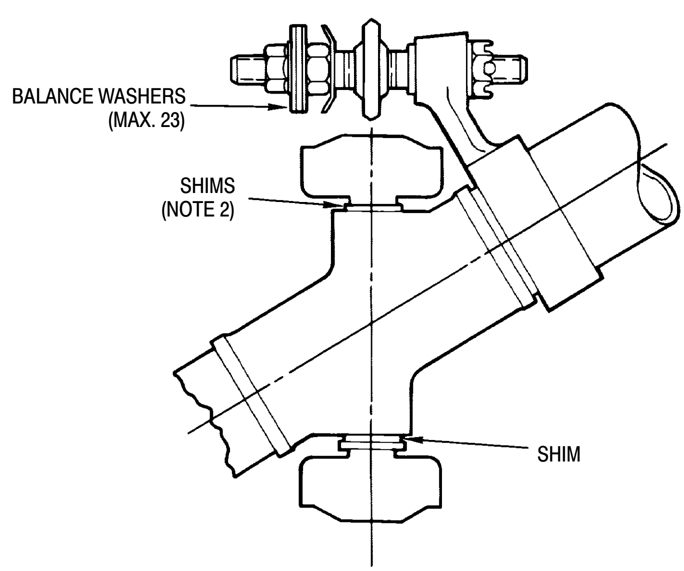
G18-2001

Figure 202. Short Method Tail Rotor Balancing (Four-Bladed Tail Rotor)



NOTES:
1. MAXIMUM ALLOWABLE NUMBER OF WASHERS AT PITCH ARM BOLT IS 23. WHENEVER THIS LIMIT IS REACHED AND REQUIRED BALANCE CANNOT BE MET, SHIFT THE CENTER OF THE HUB BY TRANSFERRING SHIMS, THICKNESS OF 0.010 IN. (0.254 MM), FROM WEIGHTED PITCH ARM SIDE TO THE OPPOSITE SIDE AS SHOWN AND RE-CHECK BALANCE, STARTING FROM ZERO WASHERS.
2. REMOVE 0.010 IN. (0.254 MM) THICK SHIM FROM PITCH ARM SIDES AND TRANSFER THE SHIM TO THE OPPOSITE SIDE.

Figure 203. Long Method Tail Rotor Balancing (Inboard Blade)



NOTES:
1. REMOVE 0.010 IN. (0.254 MM) THICK SHIM FROM WEIGHTED PITCH ARM SIDE AND TRANSFER THE SHIM TO THE OPPOSITE SIDE.
2. DURING BALANCE OF OUTBOARD BLADES, WEIGHTS ON INBOARD BLADES MUST NOT BE CHANGED.

Figure 204. Long Method Tail Rotor Balancing (Outboard Blade)

Section

18-20-30

NOTAR®

Anti-Torque System Fan Balance

NOTAR® ANTI-TORQUE SYSTEM FAN BALANCE MAINTENANCE PRACTICES

1. Fan Balancing

The NOTAR® anti-torque system uses a fan-driven air circulation system within the tailboom to control the directional heading of the helicopter. The rudder pedals in the cockpit control the blade angle of the fan assembly. The fan assembly operates at a constant speed of 5388 RPM at 100% N_2.

Balancing is accomplished by use of a balancing kit. The carrying case of this kit contains all instrumentation, balance charts and miscellaneous items needed to balance the fan assembly. Also included is a track and balance handbook for use with the equipment to correct balance when such can be obtained by addition or subtraction of weight at studs on the fan assembly.

Since vibration reduction by weight adjustment is dependent on proper mechanical condition of fan drive system, troubleshooting information (Ref. Chap. 64) should be used with balancing kit instructions. Acceptance criteria for balance and vibration are contained in the balancing kit and on each balance chart.

2. Fan Balance Check

(Ref. Figure 201)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST903	Balancer/analyzer instrument kit

NOTE: Use the vibration analyzer (ST903) throughout this procedure.

(1). Remove fan inlet screen.

(2). Remove upper portion of the fan/hub transmission fairing.

(3). Number balancing studs as shown in Figure 201 using a permanent marker.

(4). Install velometer on bracket located at the 6:00 o'clock position (Ref. Figure 203).

(5). Install magnetic pick-up and velometer wiring (Ref. Figure 203).

CAUTION Wiring must be secured to prevent them from being ingested into the fan assembly during run-up.

(6). Position the anti-torque pedals at neutral during fan balancing.

NOTE: The neutral position is 62% from full left or approximately one inch of right pedal from pedals centered. This pedal position produces minimum fan pitch and closes the thruster.

WARNING

- **Damage could occur if the anti-torque pedals are not kept at neutral while the helicopter is operating with the fan/hub transmission fairing removed.**
- **Operators and authorized observers should remain in the designated areas during balancing operations.**
- **Wearing loose clothing or having materials in shirt pockets during operations can result in injury to personnel and/or damage to aircraft.**

(7). Run helicopter to establish N_2 speed of 100% percent.

(8). Observe vibration reading.

(a). If vibration reading is greater than 0.2 ips, shut down helicopter and proceed with step (9).

(b). If vibration level is 0.2 ips or less, proceed with step (11).

(9). Add hardware to the balancing studs in any combination as required using Table 201 and Figure 202. Torque nuts on studs to **30 - 40 inch pounds (3.39 - 4.52 Nm)**.

CAUTION Do not over torque the nuts on the balancing studs. An over-torqued nut may cause the stud locking collar to become loose the next time the nut is removed.

(10). Repeat steps (6). thru (9). until fan dynamic balance is 0.2 ips or less.

(11). Remove balancing equipment wiring and attachments.

(12). Install the fan/hub transmission fairing and fan inlet screen.

Table 201. Preferred Hardware for Balancing Fan Assembly

Washer					Weight (grams)	
Aluminum	Stainless Steel	Thickness (in/mm)	ID (in/mm)	OD (in/mm)	Aluminum	Stainless Steel
AN960KD416L		0.016 / 0.406	0.265 / 6.731	0.500 / 12.700	0.103	
	AN960C416L	0.016 / 0.406	0.265 / 6.731	0.500 / 12.700		0.572
AN960KD416	AN960C416	0.063 /1.600	0.265 / 6.731	0.500 / 12.700	0.407	1.144
HS306-325L	HS306-225L	0.016 / 0.406	0.263 / 6.680	0.528 / 13.411	0.121	0.339
HS306-325	HS306-225	0.032 / 0.813	0.263 / 6.680	0.528 / 13.411	0.241	0.677
HS306-325H	HS306-225H	0.063 / 1.600	0.263 / 6.680	0.528 / 13.411	0.482	1.355
HS306-326L	HS306-226L	0.016 / 0.406	0.263 / 6.680	0.619 / 15.723	0.181	0.507
HS306-326	HS306-226	0.032 / 0.813	0.263 / 6.680	0.619 / 15.723	0.361	1.015
HS306-326H	HS306-226H	0.063 / 1.600	0.263 / 6.680	0.619 / 15.723	0.723	2.029
HS306-327L	HS306-227L	0.016 / 0.406	0.263 / 6.680	0.800 / 20.320	0.329	0.922
HS306-327	HS306-227	0.032 / 0.813	0.263 / 6.680	0.800 / 20.320	0.657	1.844
HS306-327H	HS306-227H	0.063 / 1.600	0.263 / 6.680	0.800 / 20.320	1.314	3.689
NOTE: Maximum washer stack-up thickness = 0.20 inch (5.08 mm).						

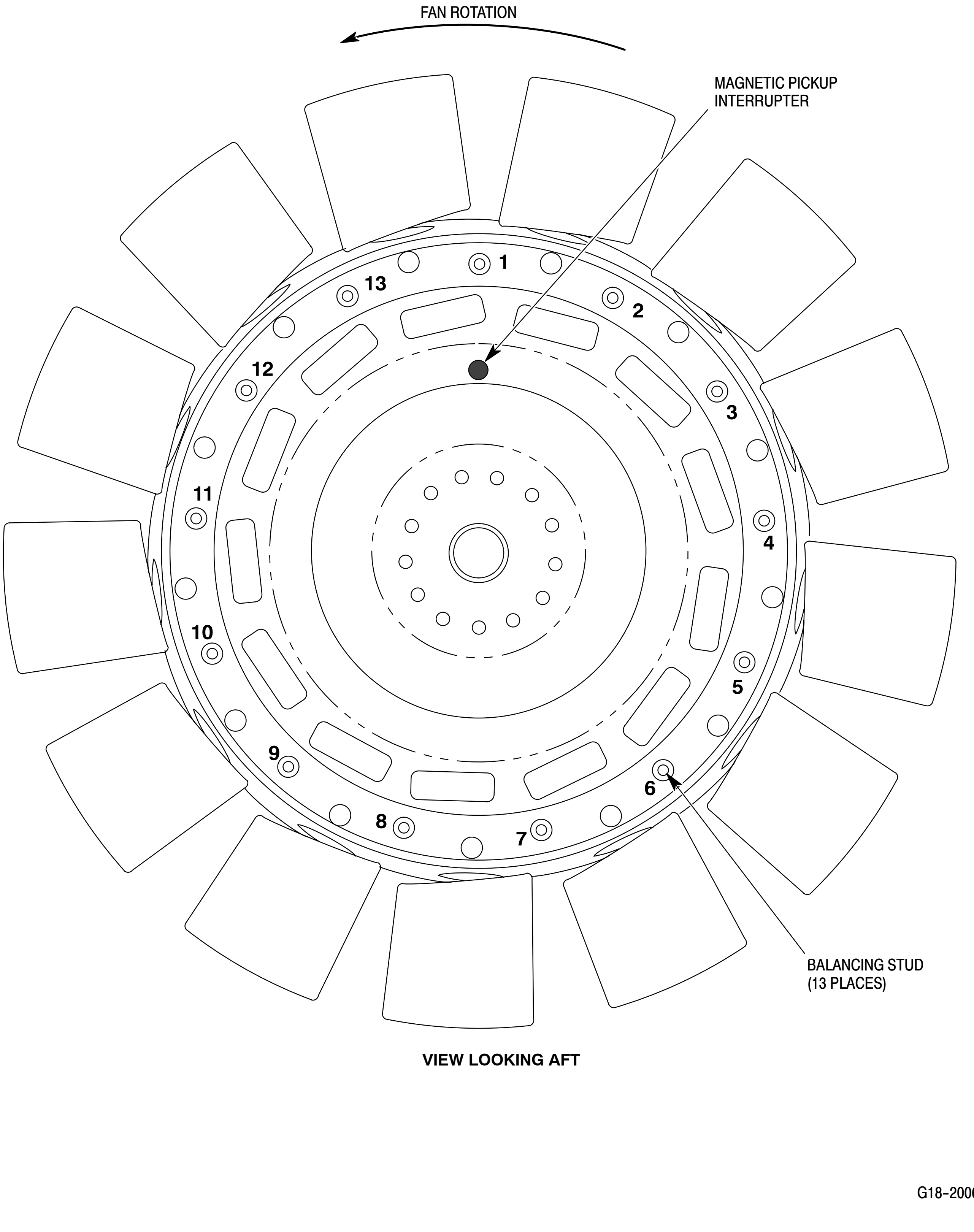


Figure 201. Fan Balancing Stud Numbering

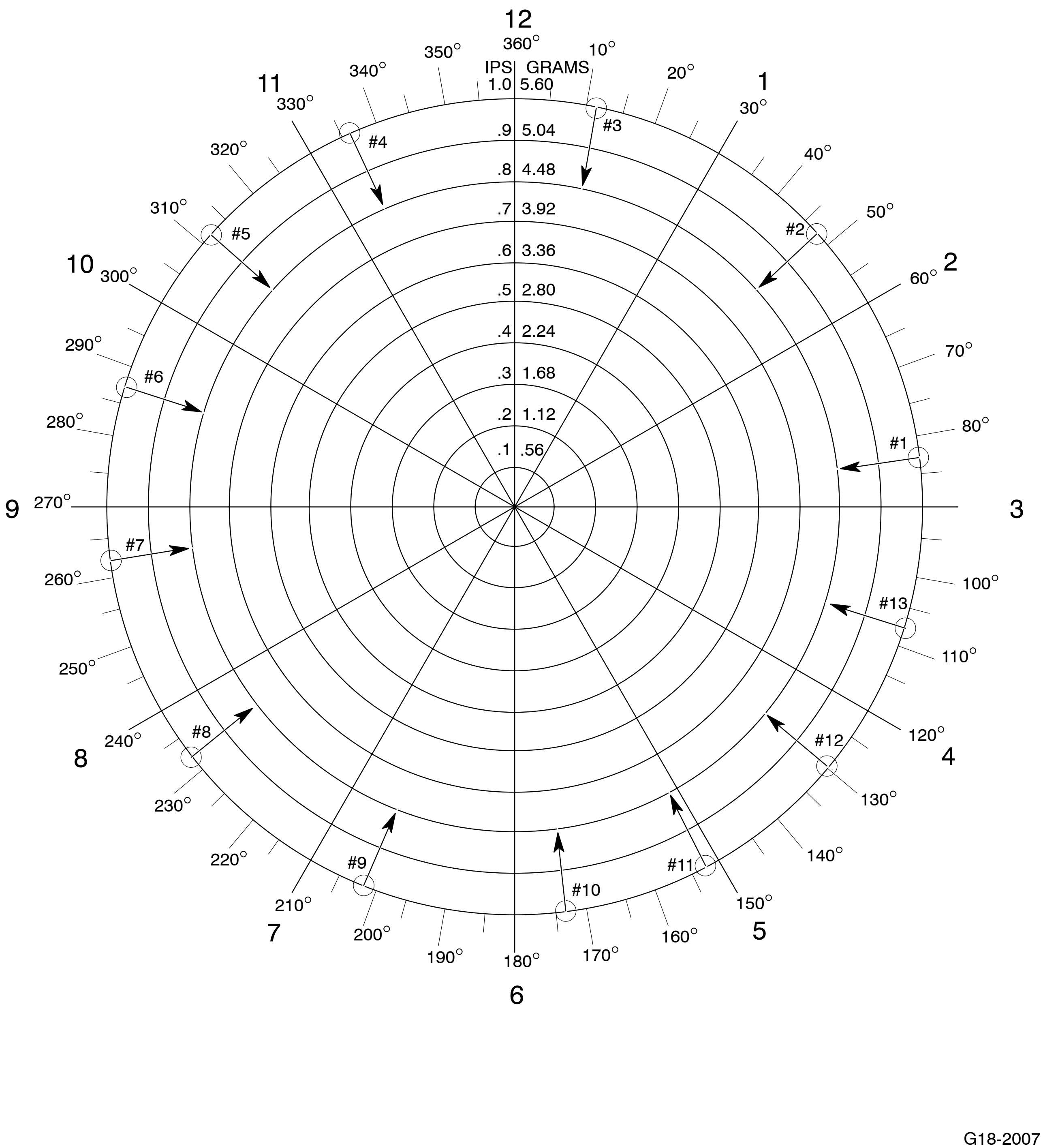


Figure 202. Fan Balance Chart

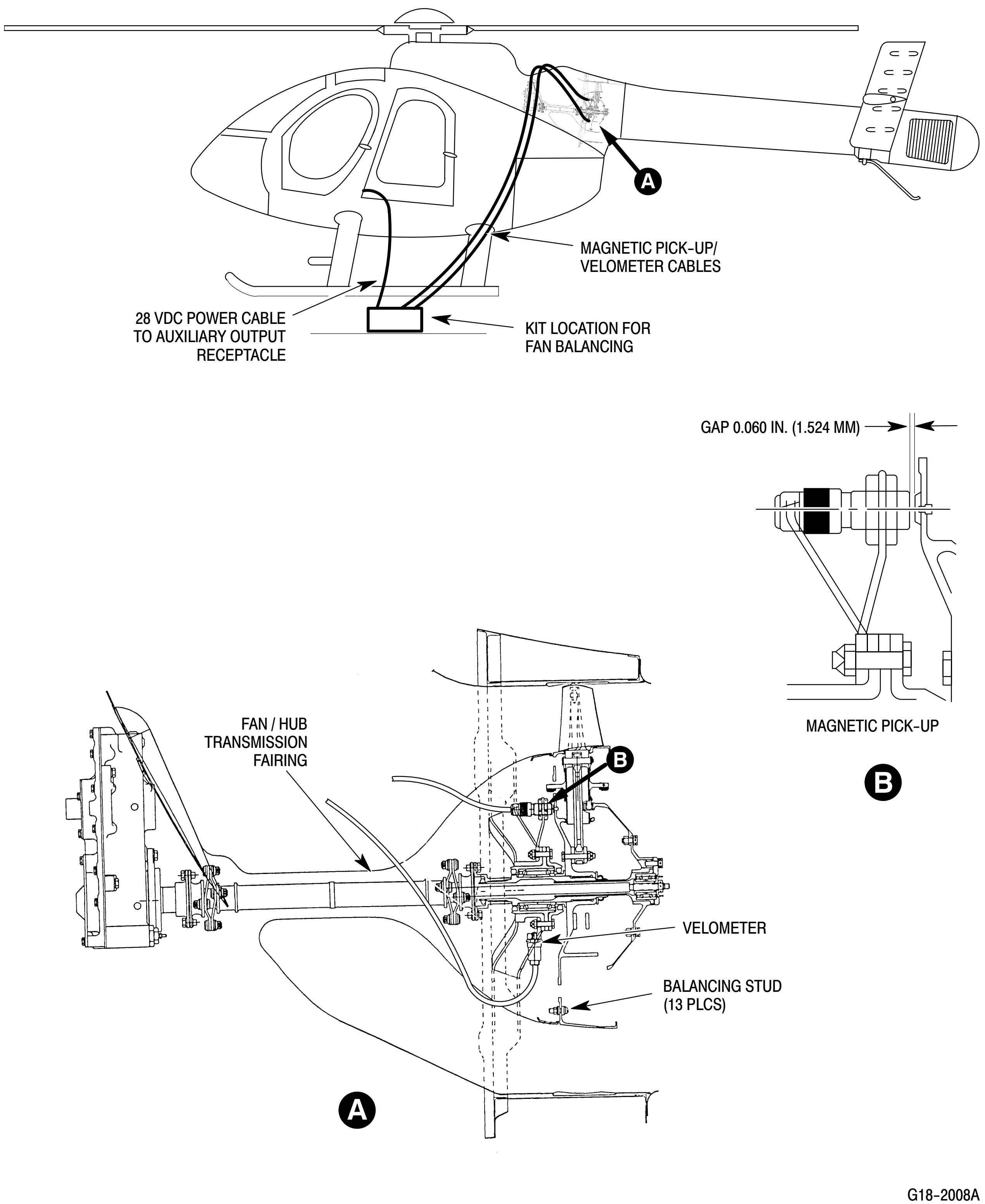


Figure 203. Fan Balancing Equipment Installation

Chapter

20

Standard Practices

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Section

20-10-00

Torque

TORQUE
MAINTENANCE PRACTICES

1. Torque Wrenches

Torque wrenches should be of good quality and calibration should be verified at regular intervals to verify accuracy. Torque wrench accuracy at room temperature, 70°F (22 °C) must be within following limits.

(1). From zero through 19 percent of torque wrench range, error may not exceed ±7 percent of load applied.

(2). From 20 thru 79 percent of torque wrench range, error may not exceed ±4 percent load applied.

(3). From 80 to 100 percent of torque wrench range, error may not exceed ±5 percent of load applied.

2. Application of Torque Wrench Loads

(Ref. Table 201 thru Table 204) Recommended tightening torque values and minimum drag torque values for fine and coarse thread nuts, and minimum breakaway torque for used self-locking bolts or screws are listed in Table 201 and Table 202. Requirements governing application of torque loads follow. These requirements apply throughout this manual except where otherwise specifically indicated.

(1). Values apply to cadmium-plated bolts, cadmium-plated nuts coated with molybdenum disulfide (MoS_2).

(2). Manufacturer applied lubricant must not be removed nor additional lubricant added.

(3). Bolts, nuts and surfaces they bear on must be clean, dry and free of lubricant except as stated in requirement above.

(4). Turning (drag) torque required to install self-locking nut or bolt up to point of final tightening must always be added to final torque value specified or the maintenance instruction, as applicable.

(5). Torque values specified in this manual are special torque values that apply instead of those listed.

(6). If adapters are used such that adapter and torque wrench are not at right angles (90 degrees) to each other, wrench or indicator reading must be corrected.

(7). Any reuse of self-locking nuts over 3/8 inch is governed by values listed in Table 203.

(8). Bolt must not be rotated during application of torque to mating nut.

3. Bearings Installation, Staking or Swaging Force

The following procedure explains how to convert from a given ‘Force‘ which is required to perform a task to a proper hydraulic pressure reading.

(1). Determine the diameter of the ram (staking or swaging contact surface) on the hydraulic press to be used.

NOTE: The hydraulic press to be used must have a pressure gauge.

(2). Divide the ram diameter by two to get the radius.

(3). Multiply 3.14159 (pi) times the Radius squared (R^2). This will give the area of the ram.

(4). Divide the force required for the task by the area of the ram. This gives the actual PSI reading for the hydraulic press pressure gauge needed to perform the task.

EXAMPLE:

Ram Diameter = 2.65 in. (6.731 cm)

Ram Radius (R) = 1.325 in. (3.366 cm)

Radius squared (R^2) = 1.756 in.^{2} (8.548 cm^2)

R^2 X 3.1416 = 5.517 in. (26.854 cm) (Area of ram)

Force required = 7500-8500 lbs. (3402-3856 kg) (variable)

7500-8500 lbs. (3402-3856 kg)/5.517 in. (26.854 cm) = 1359-1540 PSI (9370-10618 kPa)

PSI required =1359 PSI (9370 kPa) Min.
1540 PSI (10618 kPa) Max.

Force needed/(R^2) X 3.1416 = Pressure Gauge Reading

4. Control Tube Jam Nut Torquing

(1). Tighten jam nuts against control rods by holding rod end with wrench.

NOTE: Do not tighten with rod end against fitting.

(2). Ensure rod ends are not preloaded after torquing jam nuts.

5. Standard Hardware Torque Values

The following tables list torque values for standard hardware by part number.

NOTE: If unsure of hardware type, refer to CSP-IPC-4.

(1). Table 201 lists self-locking tension-type nut torque values.

(2). Table 202 lists shear-type nut torque values.

(3). Table 203 lists minimum self-locking nut drag (run-on) torque values.

(4). Table 204 lists self-locking bolt and screw minimum breakaway torque values.

CAUTION Table 203 lists only self-locking nut run- on torque values, i.e.; torque required to overcome the friction of the self- locking feature of a nut on bolt threads prior to clamp-up and final tightening. Any self- locking nut that can be run down with the fingers after the locking feature engages bolt threads must be replaced. Determine final nut torque value by adding the run- on torque to the specified final clamping torque. Final clamping torque values are listed in Table 201 and Table 202.

NOTE: Minimum breakaway torque will be the minimum torque required to start removal (turning) of the bolt or screw from the installed position. The installed position is after the self- locking device of the bolt or screw has been completely engaged plus two or three turns of engagement.

Table 201. Recommended Standard Torques for Tension-T ype Nut: Min. and Max. Torque Values; AN310, AN365, MS20365, MS21042, NAS1021, NAS1291, NAS679

Thread Size	Recommended Torque in. lb (Nm)	Maximum Allowable in. lb (Nm)	Thread Size	Recommended Torque in. lb (Nm)	Maximum Allowable in. lb (Nm)
8 - 36	12 - 15 (1.13 - 1.36)	20 (2.26)	8 - 32	12 - 15 (1.36 - 1.69)	20 (2.26)
10 - 32	20 - 25 (2.26 - 2.82)	40 (4.52)	10 - 24	20 - 25 (2.26 - 2.82)	35 (3.95)
1/4 - 28	50 - 70 (5.65 - 7.91)	100 (11.30)	1/4 - 20	40 - 50 (4.52 - 5.65)	75 (8.47)
5/16 - 24	100 - 140 (11.30 - 15.82)	225 (25.42)	5/16 - 18	80 - 90 (9.04 - 10.17)	160 (18.08)
3/8 - 24	160 - 190 (18.08 - 21.47)	390 (44.06)	3/8 - 16	160 - 185 (18.08 - 20.90)	275 (31.07)
7/16 - 20	450 - 500 (50.84 - 56.49)	840 (94.91)	7/16 - 14	235 - 255 (26.55 - 28.81)	475 (53.67)
1/2 - 20	480 - 690 (54.23 - 77.96)	1100 (124.3)	1/2 - 13	400 - 480 (45.19 - 54.23)	880 (90.39)
9/16 - 18	800 - 1000 (90.39 - 112.98)	1600 (180.8)	9/16 - 12	500 - 700 (56.49 - 79.09)	1100 (124.3)
5/8 - 18	1100 - 1300 (124.3 - 146.9)	2400 (271.2)	5/8 - 11	700 - 900 (79.09 - 101.69)	1500 (169.5)
3/4 - 16	2300 - 2500 (259.9 - 282.5)	5000 (565.0)	3/4 - 10	1150 - 1600 (129.95 - 180.8)	2500 (282.5)
7/8 - 14	2500 - 3000 (282.5 - 339.0)	7000 (791.0)	7/8 - 9	2200 - 3000 (248.6 - 339.0)	4600 (542.4)
1 - 14	3700 - 5500 (418.1 - 621.5)	10000 (1130.0)	1 - 8	3700 - 5000 (418.1 - 565.0)	7600 (858.8)
1-1/8 - 12	5000 - 7000 (565.0 - 791.0)	15000 (1695.0)	1-1/8 - 8	5500 - 6500 (621.5 - 734.5)	12000 (1356.0)
1-1/4 - 12	9000 - 11000 (1017.0 - 1243.0)	25000 (2825.0)	1-1/4 - 8	6500 - 8000 (734.5 - 904.0)	16000 (1469.0)

Table 202. Recommended Standard Torques for Shear-Type Nut: Min. and Max. Torque Values; AN320, AN364, MS20364, NAS1022, MS21083

Thread Size	Recommended Torque in. lb (Nm)	Maximum Allowable in. lb (Nm)	Thread Size	Recommended Torque in. lb (Nm)	Maximum Allowable in. lb (Nm)
8 - 36	7 - 9 (0.79 - 1.02)	12 (1.36)	8 - 32	7 - 9 (0.79 - 1.02)	12 (1.36)
10 - 32	12 - 15 (1.36 - 1.69)	25 (2.82)	10 - 24	12 - 15 (1.36 - 1.69)	21 (2.37)
1/4 - 28	30 - 40 (3.39 - 4.52)	60 (6.78)	1/4 - 20	25 - 30 (2.82 - 3.39)	45 (5.08)
5/16 - 24	60 - 85 (6.78 - 9.60)	140 (15.82)	5/16 - 18	48 - 55 (5.42 - 6.21)	100 (11.30)
3/8 - 24	95 - 110 (10.73 - 12.43)	240 (27.12)	3/8 - 16	95 - 110 (10.73 - 12.43)	170 (19.21)
7/16 - 20	270 - 300 (30.51 - 33.90)	500 (56.49)	7/16 - 14	140 - 155 (15.82 - 17.51)	280 (31.64)
1/2 - 20	290 - 410 (32.77 - 46.32)	660 74.57)	1/2 - 13	240 - 290 (27.12 - 32.77)	520 (58.75)
9/16 - 18	480 - 600 (54.23 - 67.79)	960 (108.47)	9/16 - 12	300 - 420 (33.90 - 47.45)	650 (73.44)
5/8 - 18	660 - 780 (74.57 - 88.13)	1400 (158.2)	5/8 - 11	420 - 540 (47.45 - 61.01)	900 (101.69)
3/4 - 16	1300 - 1500 (146.9 - 169.5)	3000 (339.0)	3/4 - 10	700 - 950 (79.09 - 107.34)	1500 (169.5)
7/8 - 14	1500 - 1800 (169.5 - 203.4)	4200 (474.6)	7/8 - 9	1300 - 1800 (146.9 - 203.4)	2700 (305.1)
1 - 14	2200 - 3300 (248.6 - 372.9)	6000 (678.0)	1 - 8	2200 - 3000 (248.6 - 339.0)	4500 (508.5)
1-1/8 - 12	3000 - 4200 (339.0 - 474.6)	9000 (1017.0)	1-1/8 - 8	3300 - 4000 (372.9 - 452.0)	7200 (813.6)
1-1/4 - 12	5400 - 6600 (610.2 - 745.8)	15000 (1695.0)	1-1/4 - 8	4000 - 5000 (452.0 - 565.0)	10000 (1130.0)

Table 203. Self-Locking Nut Minimum Run-On Torque Values

Fine Thread Series		Fine Thread Series	
Thread Size	Minimum Drag in. lb (Nm)	Thread Size	Minimum Drag in. lb (Nm)
7/16 - 20	8 (0.90)	7/16 - 14	8 (0.90)
1/2 - 20	10 (1.13)	1/2 - 13	10 (1.13)
9/16 - 18	13 (1.47)	9/16 - 12	14 (1.58)
5/8 - 18	18 (2.03)	5/8 - 11	20 (2.26)
3/4 - 16	27 (3.05)	3/4 - 10	27 (3.05)
7/8 - 14	40 (4.52)	7/8 - 9	40 (4.52)
1 - 12	55 (6.21)	1 - 8	51 (5.76)
1-1/8 - 12	73 (8.25)	1-1/8 - 7	68 (7.68)
1-1/4 - 12	94 (10.62)	1-1/4 - 7	88 (9.94)

Table 204. Minimum Breakaway Torque For Used Self-locking Bolts or Screws

Fine Thread Series (UNF)		Coarse Thread Series (UNC)	
Thread Size	Minimum Drag in. lb (Nm)	Thread Size	Minimum Drag in. lb (Nm)
		4 - 40	0.5 (0.06)
		6 - 32	1.0 (0.11)
		8 - 32	1.5 (0.17)
10 - 32	2.0 (0.23)	10 - 24	2.0 (0.23)
1/4 - 28	3.5 (0.40)	1/4 - 20	4.5 (0.51)
5/16 - 24	6.5 (0.73)	5/16 - 18	7.5 (0.85)
3/8 - 24	9.5 (1.07)	3/8 - 16	12.0 (1.36)
7/16 - 20	14.0 (1.58)	7/16 - 14	16.5 (1.86)
1/2 - 20	18.0 (2.03)	1/2 - 13	24.0 (2.71)
9/16 - 18	24.0 (2.71)	9/16 - 12	30.0 (3.39)
5/8 - 18	32.0 (3.62)	5/8 - 11	40.0 (4.52)
3/4 - 16	50.0 5.65)	3/4 - 10	60.0 (6.78)
7/8 - 14	70.0 (7.91)	7/8 - 9	82.0 (9.27)
1 - 12	90.0 (10.17)	1 - 8	110.0 (12.43)
1-1/8 - 12	117.0 (13.22)		
1-1/4 - 12	143.0 (16.16)		

Section

20-20-00

Cleaning

CLEANING
MAINTENANCE PRACTICES

1. Cleaning

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM234	Solvent, dry-cleaning

General cleaning of oil and dirt deposits from the helicopter and its components must be accomplished by using dry-cleaning solvent (CM234), standard commercial grade kerosene or a solution of detergent soap and water. Exceptions that must be observed are specified in the following cleaning paragraphs.

CAUTION Some commercial cleaning agents, such as readily available household cleaners, contain chemicals that can cause corrosive action and/or leave residue that can result in corrosion. Examples of cleaning agents that are not to be used are “Fantastic” and “409” type cleaners, or locally made strong soap cleaners.

2. Fuselage Interior Trim and Upholstery Cleaning

(1). Clean dirt or dust accumulations from floors and other metal surfaces with vacuum cleaner or small hand brush.

(2). Sponge soiled upholstery and trim panels with a mild soap and lukewarm water solution. Avoid complete soaking of upholstery and trim panels. Wipe solution residue from upholstery with cloth dampened by clean water.

(3). Remove imbedded grease or dirt from upholstery and carpeting by sponging or wiping with an upholstery cleaning solvent recommended for the “applicable” fabric (nylon, vinyl, leather, etc).

NOTE: If necessary, seat upholstery may be thoroughly dry-cleaned with solvent. When complete dry-cleaning is performed, upholstery must be re-flameproofed.

3. Airframe Exterior and Rotor Blades Cleaning

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM234	Solvent, dry-cleaning

CAUTION Use care to prevent scratching of aluminum skin when cleaning main rotor blades. Never use volatile solvents or abrasive materials. Never apply bending loads to blades or blade tabs during cleaning.

NOTE: Avoid directing soapy or clean water concentrations toward engine air intake area and instrument static source ports in aft fairing.

(1). Wash helicopter exterior, including fiberglass components and rotor blades, when necessary, using solution of clean water and mild soap.

(2). Clean surfaces stained with fuel or oil by wiping with soft cloth dampened by solvent (CM234), followed by washing with clean water and mild soap.

(3). Rinse washed areas with water and dry with soft cloth.

4. Transparent Plastic Cleaning

(1). Clean outside surfaces of plastic panels by rinsing with clean water and rubbing lightly with palm of hand.

(2). Use mild soap and water solution or aircraft type plastic cleaner to remove oil spots and similar residue.

CAUTION Never attempt to dry plastic panels with cloth. To do so causes any abrasive particles lying on plastic to scratch or dull surface. Wiping with dry cloth also builds up an electrostatic charge that attracts dust particles from air.

(3). After dirt is removed from surface of plastic, rinse with clean water and let air-dry or dry with soft, damp chamois.

(4). Clean inside surfaces of plastic panels by using aircraft type plastic cleaner and tissue quality paper wipers.

5. Engine Compressor Contamination Removal

(Ref. Chap. 71 and the applicable Allison Engine Operation and Maintenance Manual, Table 201, Sec. 01-00-00)

6. Cleaning Of Engine Air Inlet Screens

(1). Remove engine air inlet and engine cooling air screen (Ref. Chap. 71).

(2). Clean screens with soft brush to remove dirt accumulations.

(3). Immerse screen in solution of detergent and allow to soak approximately 15 minutes. Flush out clear water. Allow screen to drain and air-dry thoroughly.

Section

20-30-00

Painting

PAINTING
MAINTENANCE PRACTICES

1. Paint Finish

Polyurethane paint is used for the helicopter exterior finish. The primary interior finish is acrylic paint. A base coat of primer is used on most helicopter structure.

2. Paint Removal

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM229	Paint remover
CM230	Paint remover

Use paint remover (CM229 or CM230) when it becomes necessary to remove finish paint coatings. Ordinarily, use of paint remover should be limited to stripping of paint from parts that require magnetic-particle or fluorescent-penetrant inspection and to parts that require removal of excessive paint buildup. When possible, use high-pressure water spray to rinse off paint remover and paint particles and to neutralize paint remover. Solvent type paint remover usually does not remove primer coating; acid type solvent removes primer.

CAUTION If paint remover is used in vicinity of drive shaft couplings, be sure couplings are completely masked and covered. If paint remover contacts coupling diaphragms, rust spots will develop and coupling replacement is required. If acid type paint remover is used, comply with all special safety precautions listed on container.

3. Paint Touchup

Following procedures apply to application of both polyurethane and acrylic paints.

A. Touchup - Small Sanded Areas

The following procedure is for rework of scratches, nicks, gouges and other small blemishes.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM305	Lacquer, acrylic
CM318	Primer
CM320	Thinner, lacquer

(1). Apply applicable chemical surface treatment (Ref. Sec. 20-40-00) if metal protection is not adequate. If chemical surface treatment is undamaged, or has already been applied, wipe surface clean with thinner (CM320) and wipe dry immediately.

(2). Apply coat of primer (CM318). Feather primer coating onto surrounding color coat. Allow primer to air-dry for 30 minutes.

(3). Apply lacquer (CM305) color coats to match original finish color.

B. Touchup - Flaking or Dried Paint or Primer

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM801	Abrasive paper, silicon carbide

(1). Sand non-adherent surface to smooth featheredge with surrounding area, using 320-grit or finer abrasive paper (CM801), and wet or dry sanding method. Do not sand beyond point where chemical film protection begins to show through primer.

(2). Touchup sanded area [Ref. Touchup - Small Sanded Area).

C. Touchup - Primer Not Adhering to Metal Finish

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM801	Abrasive paper, silicon carbide

(1). Use 320-grit or finer abrasive paper (CM801) and wet or dry sanding method to sand through chemical film to bare metal. Feather surrounding surface with bare surface.

(2). Re-treat bare metal with applicable chemical film (Ref. Sec. 20-40-00) using brush application.

(3). Touchup re-treated surface [Ref. Touchup - Small Sanded Areas).

D. Touchup - Glass Fiber Laminate Parts

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM217	Isopropyl alcohol
CM219	Methyl-ethyl-ketone
CM305	Lacquer, acrylic
CM316	Epoxy coating / Thinner
CM801	Abrasive paper, silicon carbide

(1). Remove all gloss from area requiring finish with 100-grit or coarser abrasive paper (CM801) until there is a uniform dull condition.

WARNING **MEK solvent is flammable. Use only in well-ventilated area and away from heat and flame.**

(2). Wipe surface clean with 1:1 mixture of MEK (CM219) and isopropyl alcohol (CM217).

(3). Squeeze one coat of Poly-EP (CM316), thinned as required with thinner, into fiberglass pores until surface of fibers is smooth.

(4). Lightly sand surface with 320-grit abrasive paper (CM801). Normal grain appearance does not require further filling or sanding.

(5). Apply primer and color finish (CM305) [Ref. Touchup - Small Sanded Areas).

E. Touchup - Polycarbonate Plastic Parts

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM220	Naphtha aliphatic
CM217	Isopropyl alcohol
CM305	Lacquer, acrylic
CM317	Resin primer / Thinner

(1). Wipe surface clean with a 1:1 mixture of naphtha (CM220) and isopropyl alcohol (CM217). Mix equal parts (1:1) of primer resin (CM317) and thinner. Apply one coat to surface and allow to air-dry minimum of 3 hours. Apply epoxy primer and color finish (CM305) [Ref. Touchup - Small Sanded Areas).

F. Touchup - ABS Thermoplastic Parts

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM305	Lacquer, acrylic

Clean surface with mild soap and water. Dry thoroughly. Apply one coat of lacquer (CM305) [Ref. Touchup - Small Sanded Areas).

4. Main Rotor Blade Paint

The following procedures is to be used whenever the main rotor blades require either repainting or paint touch-up.

NOTE:

- Repaint main rotor blades only in sets to maintain rotor balance. Never completely repaint only one main rotor blade installed on helicopter.
- New main rotor blades have the inboard 24 inches (610 mm) painted gloss white. This aids in inspection of the blade.
- At owner-operators convenience, in-service main rotor blades may have the inboard 24 inches (610 mm) painted gloss white.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM206	Chemical coating
CM217	Isopropyl alcohol
CM304	Enamel, epoxy
CM318	Primer
CM729	Tape, masking, pressure sensitive
CM801	Abrasive paper, silicon carbide

A. Main Rotor Blade Paint Removal

(1). Position main rotor blade on a bench of sufficient length to provide support.

(2). Inspect main rotor blade (Ref. Sec. 62-10-00, Main Rotor Blade Inspection).

CAUTION When removing paint from main rotor blade, do not use any paint remover. Bonding agents used in manufacture of the blade may be damaged by the chemicals causing the blade to be unserviceable.

(3). Apply tape (CM729) to all bushings, bearing, data plates and the abrasion strip.

CAUTION

- When sanding paint from the main rotor blade, take care to not damage rivet heads and sealant.
- Do not sand through the paint and primer into the base metal.

(4). Using 320 grit, or finer, abrasive paper (CM801) and wet or dry sanding method, sand areas that require painting.

(5). Using a soft cloth, dampened in isopropyl alcohol (CM217), thoroughly clean main rotor blade.

(6). Inspect sanded areas for damage.

B. Main Rotor Blade Paint Application

NOTE: If inboard 24 inches (610 mm) of main rotor blade is to be painted white, paint is to be applied to the entire circumference of the blade. There is to be no ridges in the paint when completed.

(1). Inspect main rotor blade (Ref. Sec. 62-10-00, Main Rotor Blade Inspection).

(2). Ensure all bushings, bearing, data plates and the abrasion strip are protected from paint with tape (CM729).

(3). Using a soft cloth, dampened in isopropyl alcohol (CM217), thoroughly clean main rotor blade.

(4). Treat any bare metal areas of main rotor blade with chemical coating (CM206).

NOTE: Mix primer (CM318) according to manufacturer's recommendations.

(5). Allow mixed primer to stand for 15 to 30 minutes prior to use.

NOTE:

- Working life of mixed primer is four hours maximum.
- Primer allowed to stand for more than two hours must be stirred or shaken before use.
- Addition of freshly mixed primer to replenish an older mixture is not permitted.

(6). Apply primer (CM318) to sanded areas, feather into surrounding color coat.

(7). Allow to air-dry for one hour minimum.

NOTE: Mix paint (CM304) according to manufacturer's recommendations.

(8). Allow mixed paint to stand for 20 minutes minimum prior to use.

NOTE:

- Working life of mixed paint is four hours maximum.
- Addition of freshly mixed primer to replenish an older mixture is not permitted.

(9). Apply paint (CM318) to primed areas. Feather-edge paint while applying.

(10). Allow to air-dry for eight hours minimum.

(11). Remove protective tape from main rotor blade.

NOTE: Main rotor assembly may need to be rebalanced after painting.

5. Tail Rotor Blade Paint

The following procedures is to be used whenever the tail rotor blades require either repainting or paint touch-up.

NOTE: Repaint tail rotor blades only in sets to maintain rotor balance. Never completely repaint only one tail rotor blade installed on helicopter.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM206	Chemical coating
CM217	Isopropyl alcohol
CM304	Enamel, epoxy
CM318	Primer
CM729	Tape, masking, pressure sensitive
CM801	Abrasive paper, silicon carbide

A. Tail Rotor Blade Paint Removal

(1). Inspect tail rotor blade (Ref. Sec. 64-10-00, Tail Rotor Blade Inspection).

CAUTION When removing paint from tail rotor blade, do not use any paint remover. Bonding agents used in manufacture of the blade may be damaged by the chemicals causing the blade to be unserviceable.

(2). Apply tape (CM729) to all bushings, data plates and the abrasion strip.

(3). Plug root end of tail rotor blade to ensure no paint enters.

CAUTION

- When sanding paint from the tail rotor blade, take care to not damage rivet heads and sealant.
- Do not sand through the paint and primer into the base metal.

(4). Using 320 grit, or finer, abrasive paper (CM801) and wet or dry sanding method, sand areas that require painting.

(5). Using a soft cloth, dampened in isopropyl alcohol (CM217), thoroughly clean tail rotor blade.

(6). Inspect sanded areas for damage.

B. Tail Rotor Blade Paint Application

(1). Inspect tail rotor blade (Ref. Sec. 64-10-00, Tail Rotor Blade Inspection).

(2). Ensure all bushings, data plates and the abrasion strip are protected from paint with tape (CM729).

(3). Ensure root end of tail rotor blade is plugged to prevent entry of paint.

(4). Using a soft cloth, dampened in isopropyl alcohol (CM217), thoroughly clean tail rotor blade.

(5). Treat any bare metal areas of tail rotor blade with chemical coating (CM206).

NOTE: Mix primer (CM318) according to manufacturer's recommendations.

(6). Allow mixed primer to stand for 15 to 30 minutes prior to use.

NOTE:

- Working life of mixed primer is four hours maximum.
- Primer allowed to stand for more than two hours must be stirred or shaken before use.
- Addition of freshly mixed primer to replenish an older mixture is not permitted.

(7). Apply primer (CM318) to sanded areas, feather into surrounding color coat.

(8). Allow to air-dry for one hour minimum.

NOTE: Mix paint (CM304) according to manufacturer's recommendations.

(9). Allow mixed paint to stand for 20 minutes minimum prior to use.

NOTE:

- Working life of mixed paint is four hours maximum.
- Addition of freshly mixed primer to replenish an older mixture is not permitted.

(10). Apply paint (CM318) to primed areas. Feather-edge paint while applying.

(11). Allow to air-dry for eight hours minimum.

(12). Remove protective tape from tail rotor blade.

NOTE: Tail rotor assembly may need to be rebalanced after painting.

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Section

20-40-00

Corrosion Prevention

CORROSION PREVENTION MAINTENANCE PRACTICES

1. Corrosion Control

The airframe is fabricated primarily of aluminum and some magnesium alloys, with selective use of stainless steel and titanium, and should be checked regularly for any signs of corrosion, especially at points of dissimilar and overlapping metal contact. Corrosion of dissimilar metals is the result of several conditions; lack of sufficient insulation in areas of metal contact, tears or punctures in metal itself, and areas where protective finishes have been scuffed, scratched, chipped or worn away. Perform corrosion control according to MDHI Corrosion Control Manual (CSP-A-3) and instructions in the following paragraphs.

CAUTION Do not apply potassium hydroxide to or near bolts, fasteners, seams, or faying surfaces. Immediately after completing the magnesium and aluminum test (Ref. **NOTE** below), wash the tested area with water to prevent burns and continued action on the material.

NOTE: To differentiate between aluminum and magnesium alloy, apply one drop of ordinary potassium hydroxide (dropped from a glass rod) to the surface of the metal being tested. If the alloy is aluminum, a foaming or boiling action of the liquid, accompanied by a black discoloration of the metal, will immediately occur. If the alloy is magnesium, no reaction will be evidenced.

2. Magnesium Alloys - Insulation Against Corrosion

To prevent galvanic corrosion between magnesium and any dissimilar metals:

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer
CM425	Sealing compound

(1). Coat contacting surfaces with layer of sealing compound (CM425), in addition to primer (CM318).

CAUTION Do not use steel washers.

(2). Use 5056S aluminum alloy washers under boltheads and nuts that would otherwise contact magnesium. If 5056S aluminum is not available, use 5052S alloy washers.

(3). Apply primer on attaching hardware before installation.

3. Sealing Compound Application

Use sealing compound (CM425) to replace loose or missing sealant on exterior surfaces. Sealant is used to fill seams and joints that might trap water. Apply sealant as follows:

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM425	Sealing compound

(1). Check that seam or joint is clean and free of foreign matter and moisture.

(2). Apply sealant with putty knife or similar tool.

(3). Force sealant well down into seam to eliminate any air pockets.

(4). Fillet sealant to give joint or seam a smooth appearance.

4. Main Rotor Hub Corrosion Prevention (Tri-Flow Wash Procedure)

The following procedure will help prevent corrosion of main rotor hub components, especially on helicopters operated in marine environments. The procedure should be accomplished following the last flight each day for helicopters operated in marine or other corrosive environments, and at each 25-hour inspection (Ref. Chap. 05), or more often if desired, for helicopters not operated in corrosive environments.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM104	Lubricant, spray
CM227	Washing compound with wax

WARNING **Use care when working around turning rotor blades. Stay low. Remain on right side of helicopter to avoid tail rotor blades.**

NOTE: Perform the first step below prior to engine shutdown, following the last flight of the day if possible. When the rotor stops turning, the laminates of the strap- pack spread apart slightly. Contaminates collected on the edges of the strap-pack assembly can enter the area between the laminates as they spread apart. If the rotor continues turning until the contaminants are washed away, centrifugal force will keep the laminates compressed and not allow the corrosive substances to enter the area between the laminates.

(1). Bring engine to ground idle (64-65 % N_l); set SCAV AIR to ON (Ref. applicable PFM, Table 201, Sec. 01-00-00). Perform the following:

(a). Spray fine fresh water mist on main rotor blades.

(b). Direct a strong stream of fresh water into main rotor hub and control system at main rotor hub.

(c). Spray entire rotor hub with lubricant (CM104).

(2). Shut down engine and allow rotor blades stop turning.

NOTE: In the next step, spray directly between individual laminates.

(3). Lift main rotor blades to separate strap pack laminates and spray strap-packs with lubricant.

(4). Perform engine water wash (Ref. Chap. 71).

(5). Wash remainder of helicopter exterior using fresh water spray.

(6). Wash main rotor blades with Zip Wax (CM227) or equivalent, mixed per manufacturer's instructions.

5. Main Rotor Blades Corrosion Arresting

The following procedure will help prevent corrosion of main rotor blades. The procedure should be accomplished following the last flight each day on helicopters operated in marine or other corrosive environments, and weekly for helicopters not operated in corrosive environments.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM227	Washing compound with wax
CM228	Surface cleaner

WARNING **Wear rubber gloves when using phosphoric solution in next step.**

(1). Wipe down main rotor blades with surface cleaner (CM228).

(2). Rinse main rotor blades immediately with water and dry. (Ref. Sec. 20-20-00 for additional information on cleaning main rotor blades.)

(3). Wax main rotor blades with Zip Wax (CM227) or equivalent, mixed per manufacturer's instructions.

A. Main Rotor Blade and Damper Attach Pins - Corrosion Prevention

If helicopter is subject to salt-laden atmosphere, lubricate mating surfaces of barrel nut and cam handle at each periodic inspection, using corrosion preventive oil (CM120) (Ref. Chap. 62).

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM120	Oil, corrosion preventive

6. Magnesium Alloy Exterior Surface Touchup Treatment

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM207	Chromic acid solution
CM320	Thinner, lacquer

(1). Wash affected area with solution of mild soap and clean fresh water. Rinse area with clean water and wipe dry using clean soft lint-free cloth.

(2). Use thinner (CM320) on damaged area to remove any grease and old paint.

(3). Apply chromic acid solution (CM207) by swabbing exposed area for 10 to 30 minutes.

(4). Using clean cloth soaked in clean, fresh water, thoroughly rinse area where solution was applied. Allow area to thoroughly dry.

(5). Apply paint finish touchup (Ref. Sec. 20-30-00).

7. Aluminum Alloy Exterior Surface Touchup Treatment

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM206	Chemical coating

NOTE: If there is any question of whether or not the protective coating is removed, it should always be assumed that bare metal is exposed.

(1). Wash affected area with solution of mild soap and fresh water. Rinse area with clean water and wipe dry with clean soft lint-free cloth.

NOTE: Avoid letting chemical mixture dry on surface in next step. If it has dried, re-wet surface with solution.

(2). Using swab, liberally apply chemical film (CM206). Allow solution to remain on surface for 1 to 3 minutes, or until surface becomes amber to brown in color.

(3). Rinse treated surface thoroughly with clean water. After rinsing, wipe off excess moisture with clean lint-free cloth. If dry compressed air is available, blow any moisture from joints or crevices and allow to dry completely at room temperature for approximately 1 hour.

(4). Apply paint finish touchup (Ref. Sec. 20-30-00).

8. Steel Alloy Exterior Surface Touchup Treatment

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM228	Surface cleaner
CM801	Abrasive paper, silicon carbide

(1). Remove loose paint and corrosion products by scraping area with sharp phenolic scraper, brushing with heavy fiber brush and light sanding with 320-grit or finer abrasive paper (CM801).

(2). Wash off area with mild soap and clean fresh water; rinse thoroughly.

(3). Treat surface with surface cleaner (CM228).

(4). Allow solution to remain on surface for approximately 5 minutes. Keep surfaces wet.

(5). Rinse thoroughly with clean water. Dry with clean lint-free cloth and then allow to air-dry completely.

(6). Apply paint finish touchup (Ref. Sec. 20-30-00).

9. Splitter Bungee Spring Corrosion Control (500N)

It is recommended that after shutdown from the last flight of the day, for helicopters operating in a corrosive environment, the splitter bungee spring be sprayed with Tri-Flow.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM104	Lubricant, spray

(1). After helicopter shut-down, insert absorbent cloth into area around splitter bungee spring.

(2). Liberally spray spring with lubricant (CM104) until spring inner coils are coated.

(3). Remove absorbant cloth from around spring.

(4). Wipe excess spray from aircraft.

Table 201. Anti-Corrosion Chemical Finishes - Aluminum

Process	Applicable Specification	Normal Coating Thickness and Color
Dow #1 (Chrome Pickel)	MIL-M-3171, Type I	Removes metal. Iridescent yellow or red; gray coatings are unacceptable.
Dow #7 (Dichromate Treatment)	MIL-M-3171, Type III	No dimensional change. Wrought or extruded parts - chestnut brown; castings - light brown to black; AZ91C-T6 and AZ92A-T6 alloys - gray.
Dow #17 (Anodize)	MIL-M-45202, Type I - light coat	Class C: 0.0002-0.0003 inch (0.00508-0.00762 mm); light green.
	Type II - heavy coat	Class D: 0.0002-0.0035 inch (0.00508-0.08890 mm); dark green.
Dow #19 (Chromic Acid Brush-on Treatment)	MIL-M-3171, Type VI	No dimensional change; gray to black.

Chapter

21

Environmental Control System

TABLE OF CONTENTS

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Section

21-10-00

Ventilation Systems

VENTILATION SYSTEMS
MAINTENANCE PRACTICES

1. Environmental Systems

The cabin ventilation system consists of a ventilation valve, control cable and snapvents installed in the door windows. The ventilation valve contains a moveable vane operated by a push-pull cable mounted in the right center of the instrument panel. The control cable locks the vane in any selected position, controlling airflow. Fresh air forced through an opening in the lower front canopy passes through the valve and is directed into the cabin.

Adjustable snapvents are installed in each door window. The snapvents can be opened and rotated to face the airstream to supplement fresh air intake, or in the trail position, provide a vent-air exhaust outlet.

CAUTION Before high speed flight; ensure that all snapvents are positioned up, aft or down with outs in the trail position. Door damage and vibrations could occur if vent cutouts face the airstream.

NOTE:

- The following maintenance procedures cover round or pointed nose helicopters. Whenever reference is given to diffuser type valve this is for round nose military D model, and likewise the "Y" type is for civil models.
- For round nose model with diffuser or "Y" type valve, refer to Figure 202. For pointed nose "Y" type valve, refer to Figure 201.

2. Cabin Vent Control Cable Replacement

A. Cabin Vent Control Cable Removal

(1). Ensure that electrical power is OFF.

(2). Remove right side fairing from instrument panel.

(3). Disconnect control cable from swivel in valve shaft. Remove clip and separate control cable from support bracket.

(4). Remove control cable nut from plunger housing and pull entire control cable out aft through instrument panel mounting hole.

B. Cabin Vent Control Cable Installation

(1). Route replacement control cable through instrument panel and secure in place using lockwasher and control cable nut.

(2). Secure control cable sleeve to valve bracket with clip.

(3). Position shaft arm so that vane assembly is fully closed.

(4). Insert control cable wire through hole in swivel and move control knob to fully closed position.

(5). Tighten swivel on control cable wire and install cotter pin.

(6). Check swivel for free rotation by actuating control knob through full stroke. Inspect valve assembly for complete closure of inlet opening when control knob is pushed forward against cable panel fitting stop. Check valve door for looseness on shaft and deformation; valve door must be flat; a firm, snug fit is required in the inlet.

(7). Reinstall right side fairing on instrument panel.

3. Cabin Ventilating Valve Replacement

A. Cabin Ventilating Valve Removal

(1). Remove left and right side fairing from instrument panel; then remove ducts from rear of ventilating valve.

(2). Actuate control cable to full open position.

(3). Remove control cable clip and disconnect control cable from swivel on valve shaft.

(4). Drill out rivets and remove valve assembly from helicopter canopy panel.

B. Cabin Ventilation Valve Installation

(1). Position ventilating valve on canopy panel and align rivet holes. Attach valve to canopy panel with rivets spaced at 90 degrees.

NOTE: If rivet holes are elongated or oversize, install next larger rivets.

(2). Secure control cable sleeve to valve bracket with clip.

(3). Install swivel assembly loosely in arm of shaft.

(4). Position shaft arm so that vane assembly is fully closed.

(5). Insert control cable wire into swivel assembly and move control knob to fully closed position.

(6). Tighten swivel assembly on control cable wire; install cotter pin.

(7). Operate valve through several open-close cycles to assure ease of operation and to determine that valve locks in any position when control knob is released.

(8). Install ducts on rear of valve; then install instrument panel left and right side fairings.

4. Cabin Ventilation Valve Disassembly

(1). Remove screws and separate vane assembly from shaft.

(2). Remove cotter pins and slide shaft from valve body.

5. Cabin Ventilating Valve Reassembly

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM431	Sealing, locking and retaining compound

(1). Install cotter pin in hole at control arm end of shaft. Install washer on shaft to bear on cotter pin.

(2). Insert shaft in body of valve.

(3). Position vane assembly on shaft and secure with screws using loctite (CM431).

(4). Install washer on end of shaft and insert cotter pin.

(5). Operate valve several times to assure freedom of operation and positive closing.

6. Cabin Ventilating Valve Inspection

(1). Inspect for cracks, secure attachment to canopy panel and separation of bonded joints.

NOTE: Very small, widely separated spots or voids in plastic joints are not separation but air pockets produced during solvent bonding at manufacture.

(2). Inspect for bent shaft or vane assembly and excessive shaft wear in pivot areas.

(3). Inspect seal on vane assembly for wear.

7. Cabin Ventilating Valve Repair

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM418	Cement, epoxy

(1). Patch polycarbonate valve body cracks and repair seam separations according to repair methods specified for polycarbonate plastic (Ref. Sec. 20-30-00).

(2). Replace unserviceable seal if installed, using cement (CM418) according to container instructions.

8. Snap-Vent Replacement

A. Snap-Vent Removal

(1). Push snapvent outward in window (open position).

(2). Grasp open side of snapvent and gently squeeze it into an elliptical shape.

(3). Slip snapvent out of window hole at about a 30 degree angle to surface of window.

B. Snap-V ent Installation

(1). Hold open end of replacement snapvent and gently squeeze it into an elliptical shape.

(2). Slip snapvent flange into window hole at an angle of about 30 degrees to surface of window. Be sure ends of wire stiffener are inside window pole.

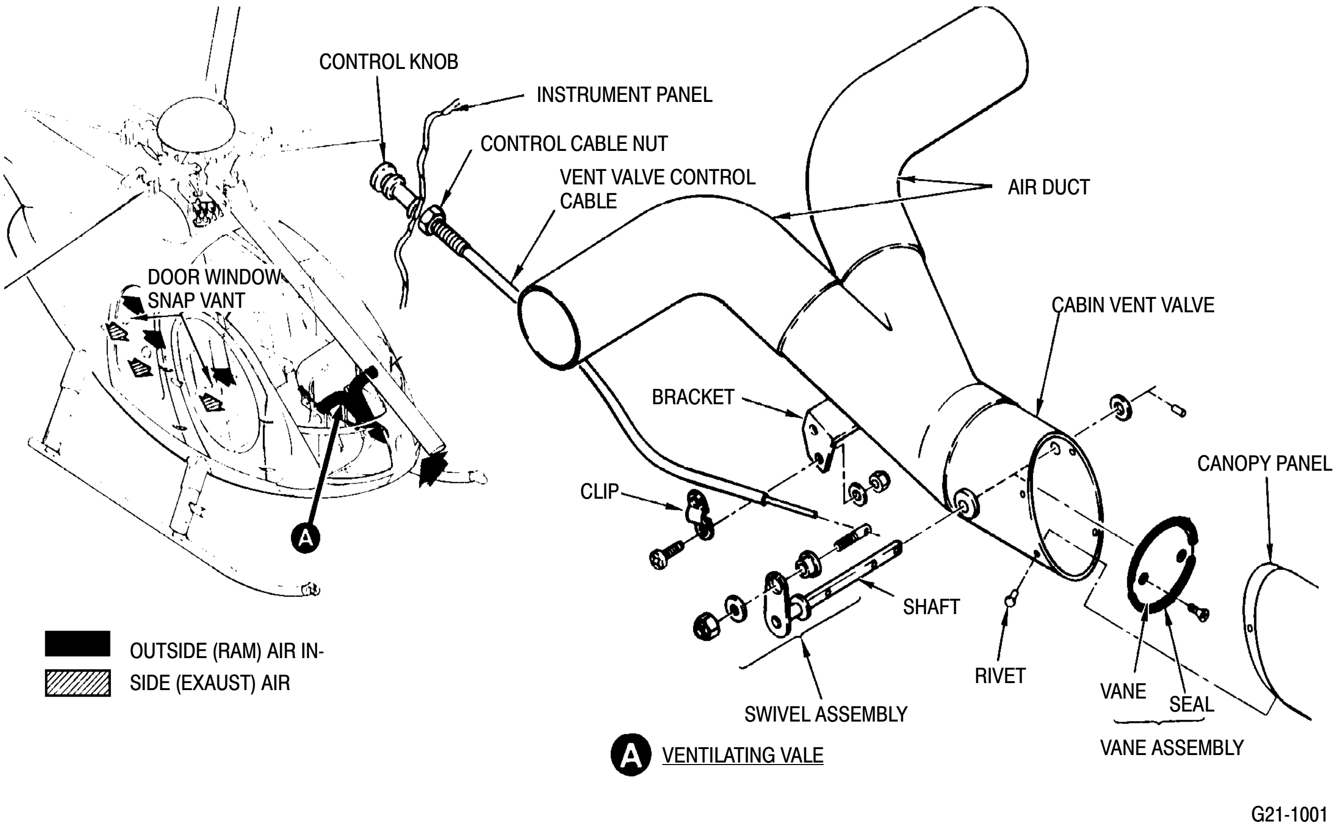


Figure 201. Ventilating System Pointed Nose

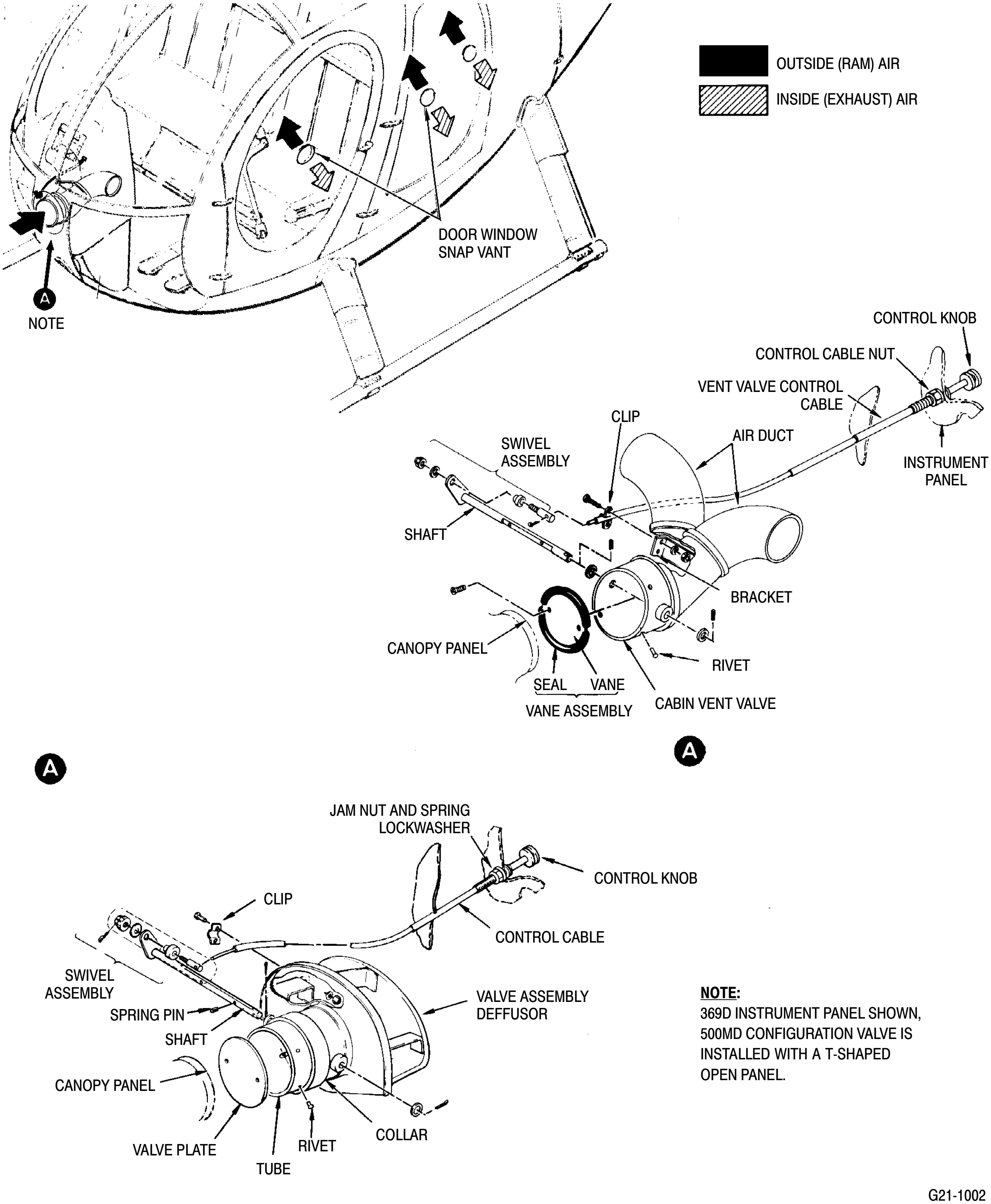


Figure 202. Ventilating System Round Nose

Section

21-40-00

Heating System

HEATING SYSTEM
DESCRIPTION AND OPERATION

1. Heating System Description and Operation

(1). The heating system mixes cold air supplied by the oil cooler blower and hot air extracted from the engine compressor scroll. Cabin air temperature is mechanically controlled with a handle in the crew compartment that positions a cable operated mixing valve. The system distributes temperature controlled air via a muffler and ducts to strategically located cabin outlets.

(2). The heat control valve is mounted on the forward left side of the firewall bulkhead. The valve consists of a housing that contains air control ports for mixing hot and cold air. A 90° inlet elbow attaches the valve to the compressor bleed air tube through the firewall bulkhead. The valve housing inlet contains a stainless steel bleed air flow control ball valve that is rotated by an attached drive pulley. A nozzle on the inlet body injects hot air downstream of cold air. A fitting supports the cold air control vane and drive pulley that is rotated by a drive belt. Hot air is mixed with cold air at a variable ratio. Because engine bleed air temperature is approximately 500°F (260°C), cold air is never completely shut off while the system is in use.

(3). The duct system and the direct air flow muffler are forward of the firewall and enclosed behind the heating system access cover. Air is Ducted overhead from the muffler into the cargo/passenger and crew compartments. Six fan-shaped diffusers distribute air throughout the cabin.

(4). The muffler consists of a laminated fiberglass housing, perforated aluminum core, and a one inch layer of fiberglass wool around the core.

(5). Air outlets are also provided for the cargo/passenger compartment through an overhead duct diffuser valve mounted in the passenger convenience panel. Diffuser valve airflow can be adjusted as required.

(a). The -519 heating system adds ducting to provide two floor-heated air outlets.

(b). The -521 heating system provides ducting for one floor-heated air outlet.

(6). The control handle, control cable and conduit assembly are incorporated in the left side of the duct attached to the overhead canopy structure. Moving the control handle forward opens the heat control valve. Control handle travel is approximately 2-3/4 inches (6.985 cm) from open to closed. Cable routing is along the left side of the main rotor mast support structure and down to the firewall mounted control valve.

2. Heating System Fault Isolation

(Ref. Table 201)

Table 201. Troubleshooting Heating System

Symptom	Probable Trouble	Corrective Action
Actuation of heat valve control lever produces no heated air at outlets	Control valve pulley drive belt broken	Replace faulty parts and adjust valve.
	Pulley shaft retaining pin sheared or control cable spring pin sheared	Replace faulty parts and adjust valve.
	Heat valve ball binding in housing	Shim between valve housing and elbow fitting.
	Heat control valve internally defective	Replace valve.
	Heat control clevis improperly adjusted for length	Adjust control cable clevis.
	Cracked, broken or disconnected ducting in system	Replace defective ducts.
Movement of heat valve does not shut off hot air	Same troubles as above	Replace faulty parts and adjust valve.
Movement of heat valve control lever very difficult	Control cable crushed or one or more routing bend radii less than 3 inch (7.62 cm) minimum	Check cable operation with clevis detached from pulley arm.
Heat valve control lever does not remain in selected position	Cable sleeve (sheath) damage causing preload spring-back	Replace defective parts.
Air excessively hot at diffusers (*)	Improper cold air mixing	Adjust valve.

(*) CAUTION: Do not operate engine until this condition is corrected. Canopy plastic or ducting may be badly damaged if operation is continued.

3. Heat Control Valve Replacement

(Ref. Figure 201)

A. Heat Control Valve Removal

(1). Remove interior trim and left aft bulkhead access cover.

(2). Remove cotter pin, washer, and pin attaching clevis to heat control valve.

(3). If particle separator is installed, loosen and back off tube coupling nut of 369H90149-51 tube assembly at end connected to elbow assembly.

(4). In left side of engine compartment, disconnect the hot bleed air line at the heat control valve elbow fitting.

(5). Loosen the elbow tube nut and remove elbow fitting and gasket.

(6). Remove hardware attaching the upper and lower end of control valve assembly to the canted firewall.

(7). Remove clamp securing cool air duct to valve.

(8). Remove attaching hardware connecting the muffler and valve. Remove heat control valve and gasket.

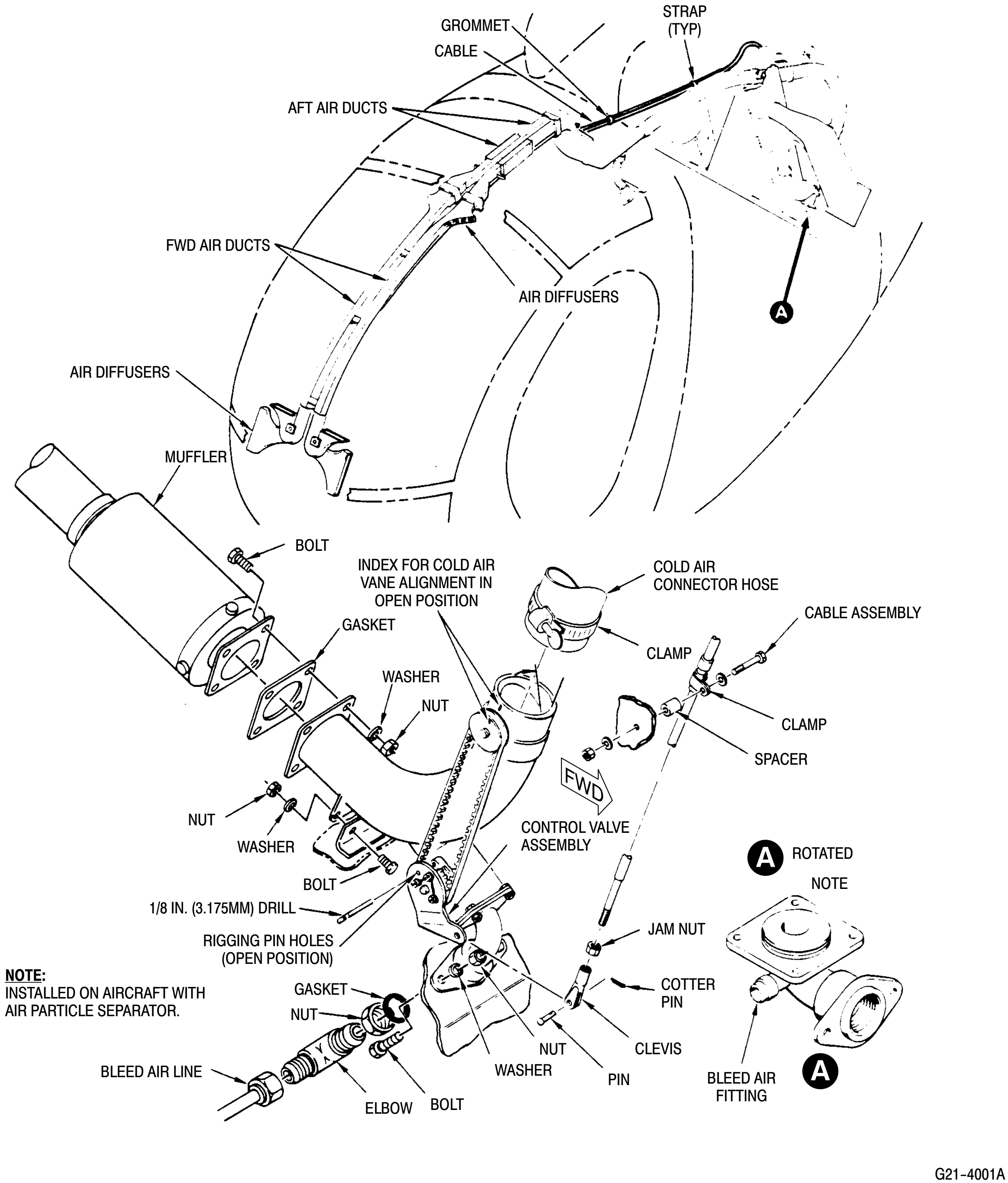


Figure 201. Heating Valve and Cable Installation

B. Heat Control Valve Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM113	Anti-seize compound low temperature

(1). Install control valve assembly on forward left side of firewall with bolts, washers and nuts, but do not tighten.

NOTE: Use anti- seize compound (CM113) on threaded fittings.

(2). For helicopters equipped with particle separator kit, re-engage tube coupling nut of the 369H90149-51 tube assembly with elbow assembly, and tighten fasteners.

(3). In left side of engine compartment, install elbow, nut and new gasket. Tighten retaining hardware on heating valve.

(4). Connect control valve flange to muffler, using new gasket and four nuts, washers, and bolts.

(5). Install cool air connector hose on control valve inlet and secure with clamps.

(6). Position control handle fully forward. Position lever on control valve to open, and insert a 1/8 inch (3.175 mm) rigging pin through lever and into valve boss.

(7). Loosen jam nut on control cable and adjust clevis so attach holes align with hole in valve lever. Install pin through clevis and valve lever, and safety with cotter pin.

(8). Tighten clevis jam nut. Remove rigging pin from valve lever.

(9). Move control handle full aft and forward several times to check ease of heat control operation.

(10). Reinstall left aft bulkhead cover and interior trim.

4. Heat Control Valve Cable Replacement

(Ref. Figure 202)

A. Heat Control Valve Cable Removal

(1). Remove left half of engine air inlet forward fairing, interior trim and left aft bulkhead access cover.

(2). Remove seven screws attaching heat duct outer box to heat duct and canopy frame.

(3). Remove clamps, straps, and grommets that attach cable to structure along its full length. Remove cotter pin and clevis pin from clevis at heater control valve arm.

B. Heat Control Valve Cable - Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM430	Sealant, solvent resistant

(1). Route the cable assembly into position. Check that grommet is in place on cable.

(2). Install clamps and straps that attach cable to structure. Install grommet at structure fairing that cable passes through using adhesive (CM430).

NOTE: The clamp nearest to the valve should not be tightened until after travel is checked.

(3). Attach heat duct outer box to heat duct and canopy frame with seven screws.

(4). For adjustment of clevis refer to initial installation.

(5). When assured that cable will operate the valve freely through full range of travel, tighten the clamp nearest the valve.

(6). Reinstall aft bulkhead access cover, interior trim, and left half of engine inlet fairing.

(7). After installation, adjust handle to be parallel to windshield glass.

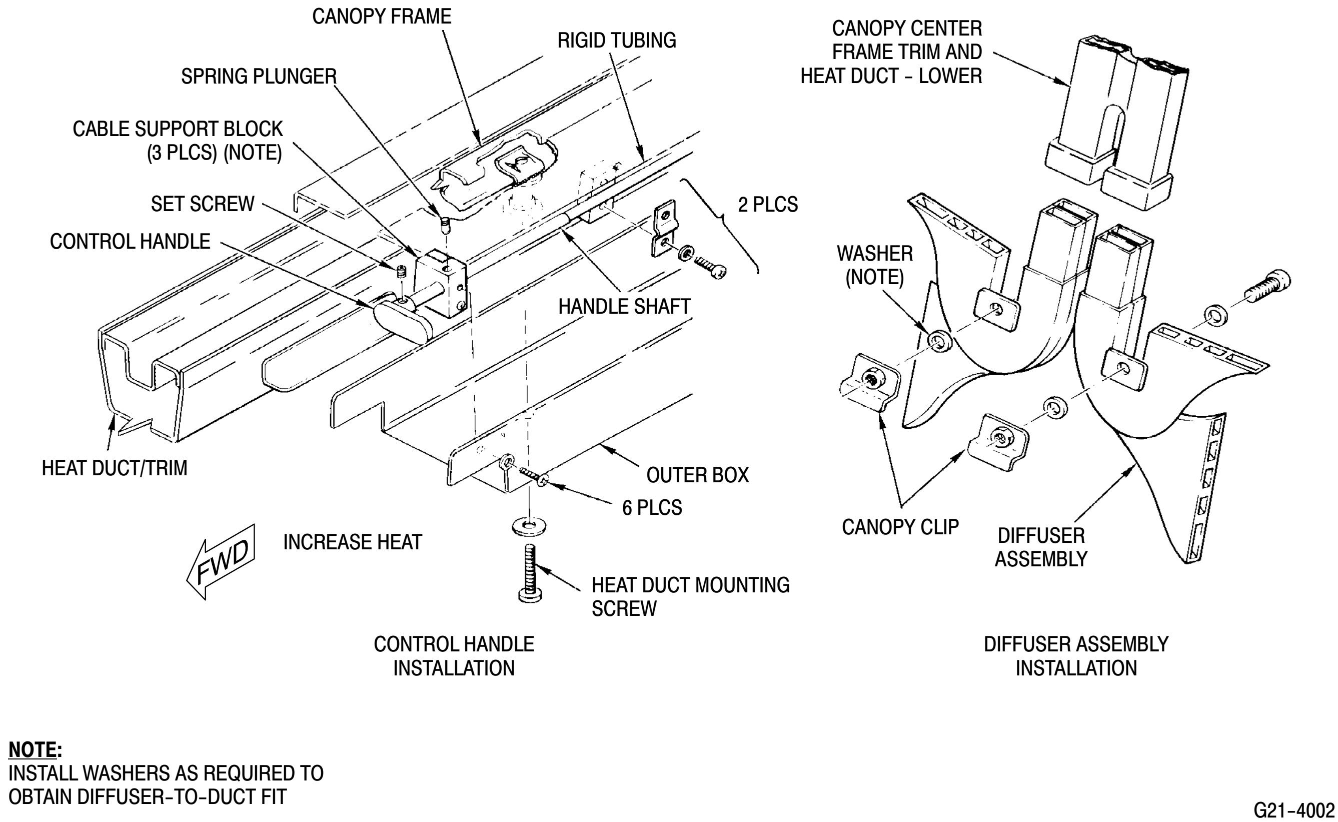


Figure 202. Cabin Heat Control Handle and Diffuser Installation

5. Heating System Inspection

(Ref. Figure 202)

(1). With the helicopter on the ground, perform the following:

(a). Inspect heat valve control lever and cable for freedom of operation.

(b). Remove interior trim and left aft bulkhead access cover in cargo compartment. Inspect cable for condition and security.

(c). Inspect cable clevis for security of jam nut and cotter pin.

(d). Inspect security of heat control valve to firewall; check pulley belt for condition.

(e). Inspect flexible fiberglass hose for tears and deformation due to failure of inner supporting wire or short radius bends.

(f). Inspect rubber hose for tears and evidence of deterioration.

(g). Inspect all ducts and muffler for security of attachment and coupling hardware and any duct section or muffler damage that would allow heated air leaks. Inspect diffuser outlets for condition of cemented joints or distribution ducts.

(h). In engine compartment, inspect tube connecting engine air bleed fitting to control valve for cracks and security of hex nuts.

(2). Perform an operational check (Ref. Heating System Operational Check).

A. Heat Control Valve Inspection

(1). Inspect timing belt for deterioration, stretching, worn teeth, or evidence of slipping.

(2). Inspect valve housing for deep dents and cracks, mating flanges and connecting area for bends or dents which would prevent tight connections, bearing bosses for galling and excessive wear, and interior seat and ball valve for galling.

(3). Inspect pulley shafts for galling and evidence of wear.

(4). Inspect ball valve and retainer for cracks, galling and evidence of wear; cold air vane for flatness and evidence of excessive edge wear.

B. Heat Control Valve Cable Inspection

(1). Inspect cables for kinks, crushed sleeve, and corrosion.

(2). Clean all corrosion from cable.

(3). If cable is kinked or crushed, locate problem and repair or replace cable as required.

6. Heating System Operational Check

(1). Perform an operational check of the heating system as follows:

(2). Move CABIN HEAT control handle full forward to open heat valve. Control handle should not creep away from ON position.

(3). Remove left aft bulkhead access cover.

(4). Check that valve is full open position by inserting a 1/8 inch (3.175 mm) drill shank (or rod) into the drive pulley alignment hole (Ref. Figure 201). The drill shank should pass through the pulley and enter a mating alignment hole in the valve housing inlet body.

(5). Check the cold air vane drive pulley alignment mark. The mark should align with a similar mark on the cold air vane housing.

7. Heat Control Valve Disassembly

(Ref. Figure 203)

(1). Rotate ball valve lever fully counterclockwise to position the ball valve open.

(2). Remove hardware (nut, washer, bolt) attaching elbow to valve housing and remove elbow and shims if installed.

(3). The O-ring, wave washer, retainer, ball valve and coupling are now free for removal.

(4). Cut lockwire and remove three screws from valve lever and drive pulley. Remove timing belt.

(5). Remove pin from drive pulley. Remove shaft from valve housing; inner and outer washers will fall free.

(6). Remove screws attaching cold air valve vane to shaft. Remove plate spring and spacers. Remove vane.

(7). Remove pulley, shaft, and washers from valve housing.

(8). Remove pin from driven pulley to complete disassembly.

8. Heat Control Valve Repair

(1). Repair small dents in valve housing by bumping out and burnishing. Repair warped flanges by straightening on a surface plate. No weld repairs are permitted.

(2). No repairs are permitted on moving parts, ball valve, retainer, coupling, or shafts which are cracked, bent or badly worn.

(3). Place valve housing upside down on a suitable workbench (Ref. Figure 204). Find the thickness of shims required between valve body and elbow fittings as follows:

(a). Measure diameter of the ball valve using an outside micrometer. Record as dimension A.

(b). Place ball valve in housing and use a depth micrometer to measure distance from housing flange to top of ball. Record as dimension B.

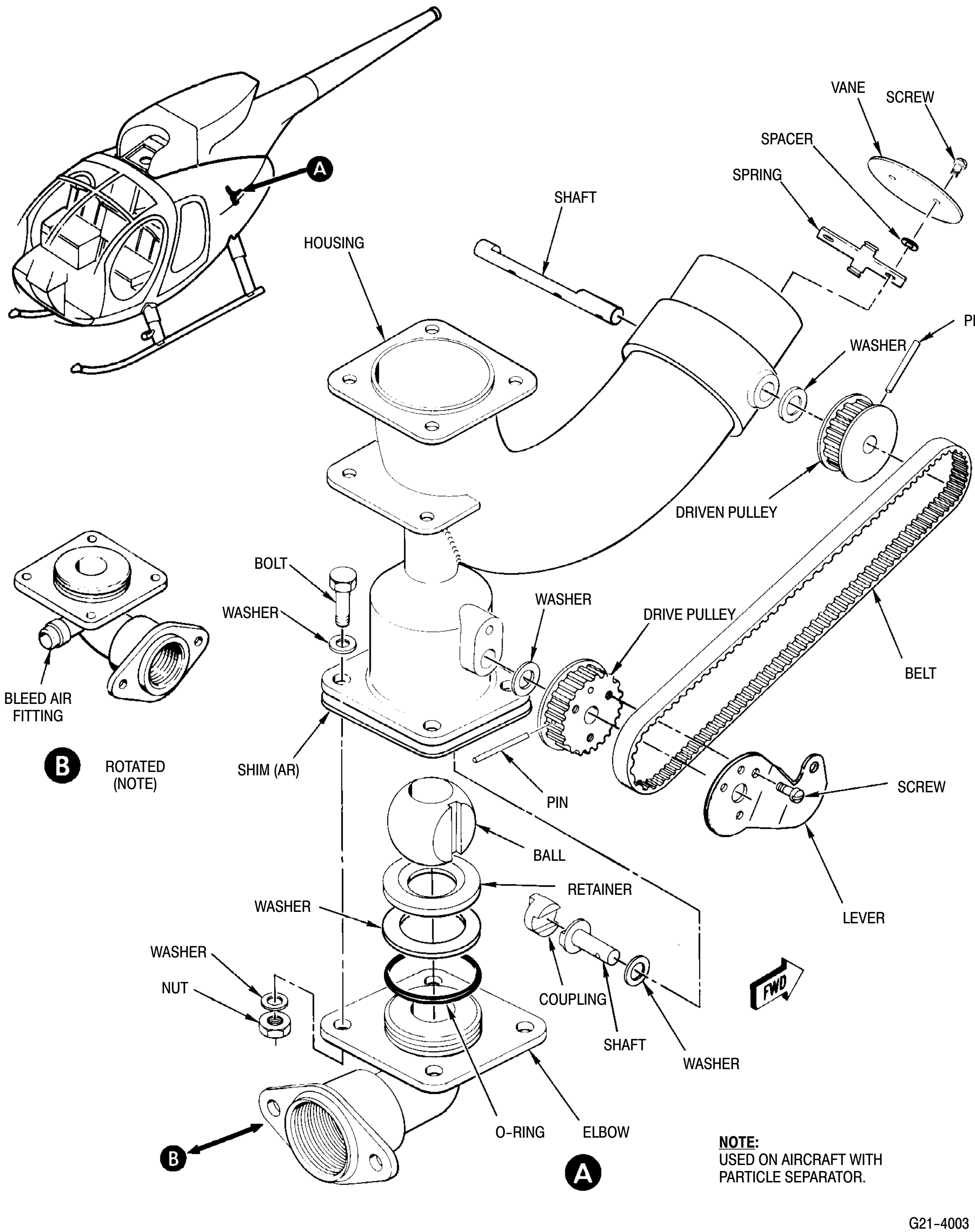


Figure 203. Heater Control Valve Assembly

(c). Multiply dimension A by 0.933; then subtract the result from 1.627 in. (4.1356 cm). Record as dimension C.

Example:

Ball dia. A = 1.441 in. (3.6601 cm)

1.441 in. (3.6601 cm) x 0.933 = 1.344 in. (3.4138 cm)

1.627 - 1.344 in. (3.4138 cm) = 0.283 in. (7.1882 mm) (dim. C)

(d). Compare dimension B with dimension C. If B is greater than C, no shims are required. If C is greater than B, add shims 369H8007 until B is equal to or greater, 0.010 in. (0.254 mm) max., than C.

Example:

B = 0.270 in. (6.858 mm) and C = 0.283 in. (7.1882 mm)

(e). Add a 0.015 in. (0.381 mm) shim to dimension B. B now equals 0.285 in. (7.239 mm), or 0.002 in. (0.0508 mm) more than dimension C, and is a correct total shim thickness for use.

(4). Install washer (Ref. Figure 203) on ball valve shaft; then insert this assembly into valve housing boss.

(5). Install coupling on shaft (check that the ball drive lug is chamfered); then position ball valve in housing to engage coupling (ball valve in open position).

(6). Install new O-ring in elbow flange groove.

(7). Install retainer and washer in housing on ball valve.

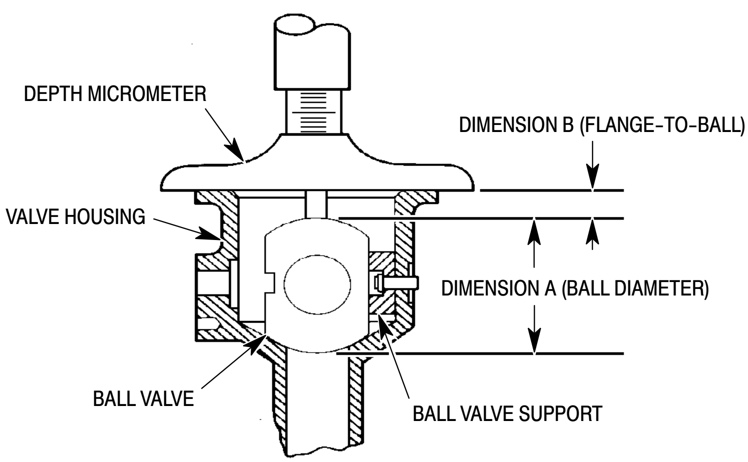
NOTE: A 1/2 inch (12.7 mm) wood dowel may be inserted through top of assembly to temporarily hold these parts in position.

(8). Install shim(s) of thickness determined in above steps; then install elbow on valve housing flange with four bolts and nuts. Washers are installed under both the bolt head and the nut. Use care to avoid nicking or cutting the O-ring during mating.

CAUTION The flanges of the valve housing and elbow should mate without the use of undue force. If flanges do not mate easily, the internal parts of the valve may be misaligned. Investigate before tightening bolts.

(9). Install washer and ball valve so that rigging pin holes in pulley and in valve housing boss are aligned (ball valve in open position).

(10). Install pin through ball valve pulley and shaft.



NOTE:
FIND DIMENSION C AS FOLLOWS:
C = 1.627 IN. (4.1356 CM) – A X 0.993).
REFER TO TEXT FOR USAGE.

G21-4004A

Figure 204. Control Valve Shim Thickness Determination

(11). Remove wood dowel if used to align internal parts; then rotate pulley through full travel several times to assure ease of operation and positive closing of ball valve. A valve torque check, step (18). below, is made after the timing belt is installed.

(12). Install cold air pulley and washer on shaft.

(13). Install cold air pulley and shaft assembly into valve housing.

(14). Attach cold air vane to shaft using two screws.

(15). Rotate ball valve pulley fully counter clockwise to full stop.

(16). Rotate cold air pulley so that the vane is 45 degrees from fully closed, or align yellow rigging marks, if present.

(17). Install a serviceable timing belt between pulleys while maintaining valve position located in steps (15).and (16). above.

(18). Check valve operation by applying **6 - 11 inch-ounces (0.0423 - 0.0777 Nm)** of torque on the ball valve shaft. If the ball valve does not operate within this range, change thickness of shims between the valve elbow and housing as required. Shims are provided inch 0.015 inch (0.381 mm), 0.010 in. (0.254 mm), and 0.005 inch (0.127 mm) thicknesses.

NOTE: Final total shim thickness should not exceed dimension C (step (c).) by more than 0.10 inch (2.54 mm).

(19). If rigging marks have not been applied, paint a yellow index mark, 1/16 inch (1.59 mm) wide, on pulley and housing (Ref. Figure 201).

(20). Reinstall and actuator belt pulley on ball valve using three screws (Ref. Figure 201). Note that the screw located 180 degrees from the rigging pinhole is 1/8 inch (3.175 mm) longer than the others. Remove rigging pin installed in step (10). above. Safety screws to each other with lockwire.

9. Heating System Muffler and Ducts Repair

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM432	Dichloromethane
CM433	Ethylene chloride

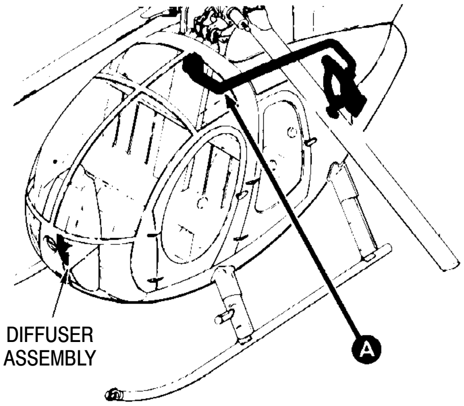
Expendable Materials Refer to Table 201, 91-00	
Nomenclature	Item
Dichloromethane	38
Ethylene dichloride	39

Repair of heat system ducting will depend upon the type of material used in the section that requires repair. Rubber hose or flexible fiberglass hose that is torn, flattened, or deteriorated must be replaced. When removing ducting for repair or replacement, use illustration as a guide (Ref. Figure 205).

(1). Repair rigid fiberglass or muffler according to the fiberglass repair procedures outlined in the SRM, except use fire-retardant resin.

(2). Repair rigid polycarbonate plastic sections by bonding a patch according to the criteria and methods specified for acrylic plastic in FAA AC 43.13-1A, Aircraft Inspection and Repair. Use dichloromethane ((10).) or ethylene dichloride (CM433) as the bonding agent.

(3). Repair small areas of rib or seam separation in plastic sections by injecting ethylene dichloride (CM433) into the void area and clamping together under light pressure.



NOTES:

1. REMOVE ADHESIVE BACKING COVER AND INSTALL PADS WHERE INTERFERENCE MAY EXIST BETWEEN HOSE AND STRUCTURE.
2. INSURE THAT HEATER HOSE DOES NOT CONTACT OIL FLEX LINES OR STRUCTURE.

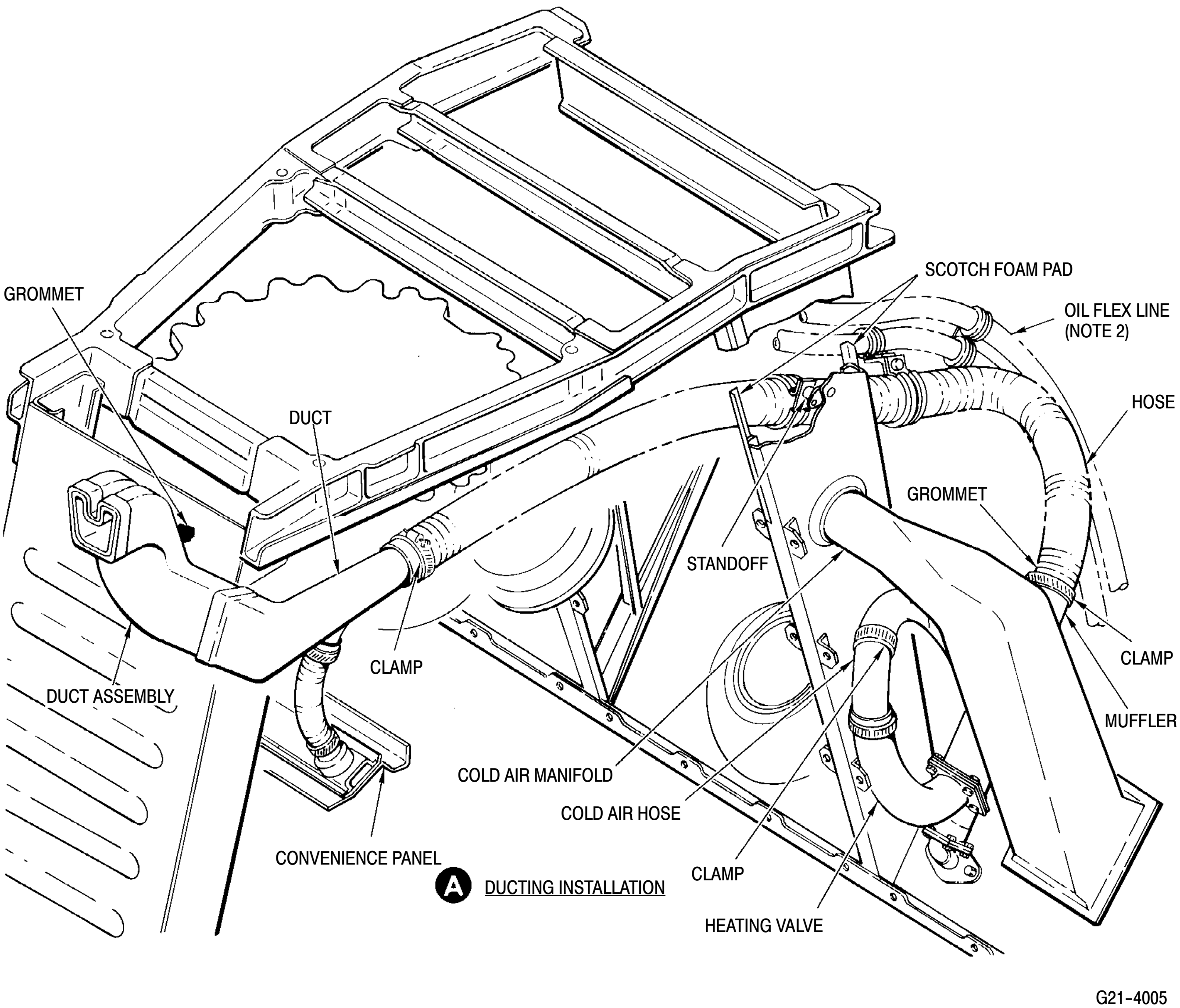


Figure 205. Hose and Ducting Installation

HEATING SYSTEM
INITIAL INSTALLATION

1. Heating System Initial Installation

Procedures in this section may be performed at the operator's discretion and are applicable to 369D/E/FF model helicopters.

A. Preparation for Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM702	Lockwire CRES

(1). Remove engine (Ref. Chap. 71).

(a). 250-C20B - 250-C20R/2: (Ref. Figure 902 or Figure 903)

1). Remove existing plugs and install tee and elbow.

CAUTION Tee and elbow must be installed so that no interference will exist between hose assembly and existing bleed air tube.

2). Install hose assembly and tube assembly. Do not reinstall engine at this time.

(b). 250-C30 : (Ref. Figure 904)

1). Remove existing plate and install fitting, using engine supplied washers and bolts. Safety with lockwire (CM702).

2). Install engine bleed assembly to fitting, and secure tube assembly by connecting one end of the strap to the inlet bell with bolt, nut and washers, but do not tighten. Attach clamp to bleed assembly. Secure to strap with attaching hardware. Tighten nut.

(2). Remove interior trim panels and aft bulkhead access.

(3). Remove left and right hand guide assemblies from forward end of duct assembly (Sta. 31.50); retain washers for use when installing diffuser assemblies.

(4). Remove attaching hardware and outer box from heat duct and canopy frame.

(5). Remove rubber plug from left side of convenience panel.

(6). Remove cap from cool air manifold duct.

B. Heating Valve Initial Installation

(1). Using hardware, install heating valve, but do not tighten.

(2). On aircraft equipped with engine air particle separator only, engage tube coupling nut of 369H90149-51 tube assembly and tighten fasteners.

(3). Install elbow, nut and gasket from aft side of firewall. Tighten heating valve attaching hardware.

(4). Reinstall engine (Ref. Chap. 71).

(a). 250-C20B - 250-C20R/2: (Ref. Figure 902 or Figure 903)

1). Connect tube assembly to elbow using nut and gasket. Torque both connecting nuts onto tube assembly to **350 inch-pounds (39.54 Nm)**.

(b). 250-C30 : (Ref. Figure 904)

1). Connect engine bleed assembly to elbow. Torque connecting nut to **350 inch-pounds (39.54 Nm)**.

C. Ducting Installation (-517)

(Ref. Figure 906)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM411	Adhesive, epoxy
CM821	Gasket material

(1). Using clamps, install air hose between heating valve and cold air manifold duct (Ref. Figure 905).

(2). Install muffler assembly with gasket and hardware; attach hose to muffler with clamp.

(3). Remove protective cap from existing duct assembly (1). Install grommets (2) with cement (CM411) to prevent chafing.

(4). Route heater hose (9) and secure to oil flex line (10) with clamps (11, 12), bracket (13), and attaching hardware (14, 15, and 16).

(5). Position standoff (17) on inboard side of channel (18) as shown. Drill two #40 holes and deburr. Attach standoff to channel using two rivets (19).

(6). Install clamp (20) around hose and secure to standoff, using attaching hardware (21 and 22). Install Scotch Foam (CM821) as required to prevent chafing.

(7). Connect duct (3) to duct assembly (1), and hose (5). Attach duct (3) to bulkhead using attaching hardware (6, 7, and 8). Attach hose (5) to duct with clamp (4).

NOTE: Ensure that heater hose does not contact transmission oil lines or structure.

(8). Install aft valve assembly (23) in convenience panel (24) and connect valve to duct (3) with hose (25) and clamps (26).

(9). Install diffuser assemblies (Ref. Figure 202); add washers as necessary to obtain diffuser to duct fit.

D. Ducting Installation (-519)

(Ref. Figure 906)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer
CM702	Lockwire CRES

(1). Perform installation as described (Ref. Ducting Installation (-517), steps (1). thru (4). and (6).) except that duct (27), replaces duct (3) and that hose (5) is not secured to duct (27) at this time.

(2). Install splitter duct (28) with attaching hardware (29, 30) and valve (23) into convenience panel (24).

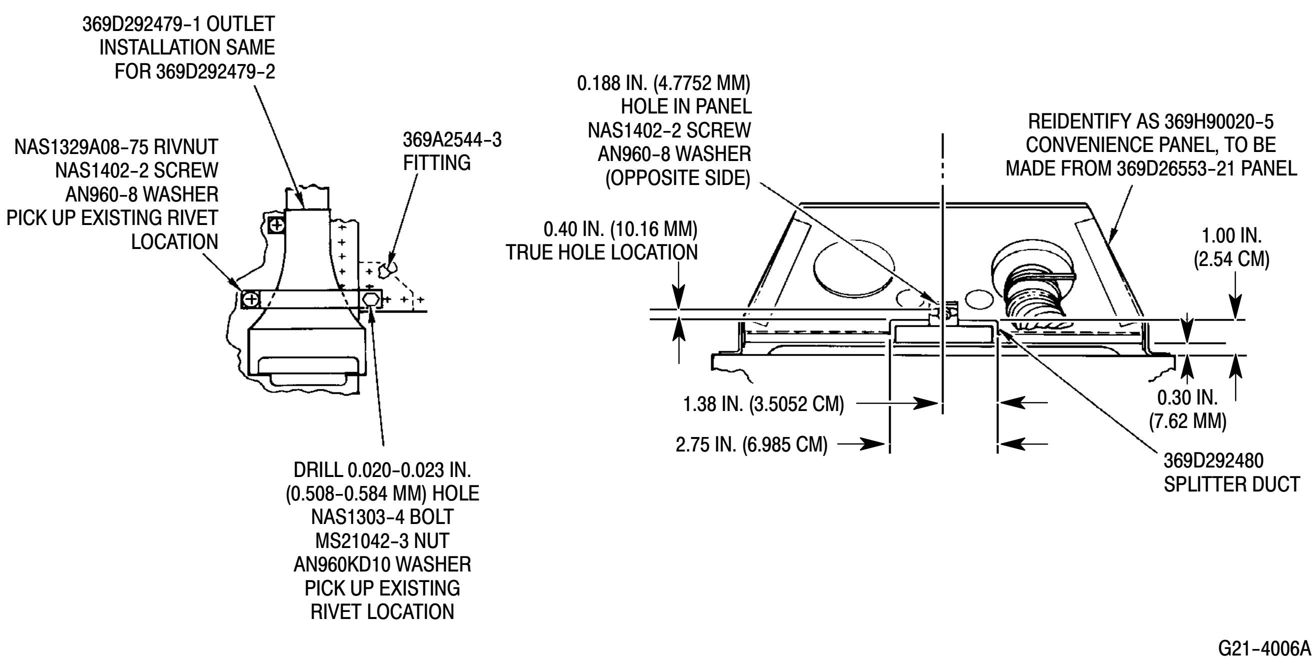


Figure 901. Outlet Installation and Convenience Panel Modification

(3). Attach hose (25) to valve (23) with clamp (26), and hose (31) to splitter duct (28) with lockwire (CM702).

(4). Attach hose (25) to lower outlet on duct (27) with clamp (26), and second hose (31) to upper outlet on duct (27) with lockwire.

(5). Mount convenience panel (24) with attached duct, valve, and hose to bulkhead with with attaching hardware (32, 33).

(6). Measure distance between splitter duct outlets. Using this dimension, position ducts (34, 35) and outlet ducts (36) parallel to each other on bulkhead. Match drill six 0.221-0.226 inch (5.6134-5.7404 mm) holes common to duct clips to bulkhead. Remove ducts. Deburr and apply primer (CM318) to bare metal surfaces. Install rivnuts (37). Reconnect ducts (34, 35) to splitter duct (28) and attach ducts to bulkhead with screws (38) and washers (39).

(7). Install outlets (36) on ducts (34, 35). Match drill holes through outlet duct clips into bulkhead (Ref. Figure 901). Remove outlets. Deburr and apply primer to bare metal. Install rivnuts (37) were applicable. Install outlets with attaching hardware (38, 39, 40, 41, and 42).

(8). Attach hose (5) to duct (27) with clamp (4).

E. Modification of Existing -517 to -519 Configuration

(Ref. Figure 906)

(1). The -517 heating system may be modified by replacing duct (3) with duct (27), modifying the convenience panel, as illustrated, and by installing additional hose (31), splitter duct (28), ducts (34 and 35), outlets (36), and associated hardware.

(2). Follow installation instructions (Ref. Ducting Installation (-519).

F. Ducting Installation (-521)

(Ref. Figure 906)

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

(1). Perform installation as described (Ref. Ducting Installation (-519), steps (1). thru (5). except replace splitter duct (28) with duct (43) (Ref. Figure 905).

(2). Position duct (35) and outlet duct (36) on bulkhead. Match drill three 0.221-0.226 inch (5.6134-5.7404 mm) holes common to clips into bulkhead. Remove outlet duct (36) and duct (35). Deburr and apply primer (CM318) to bare metal surfaces. Install rivnuts (37).

(3). Connect duct (43) to duct (35) and secure to bulkhead and convenience panel with attaching hardware (29, 30, 38, 39, 40, 41, and 42).

(4). Attach hose (5) to duct (27) with clamp (4).

G. Cabin Heat Control Cable Initial Installation

(Ref. Figure 201)

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM425	Sealing compound

(1). Remove clevis and jam nut assembly; install grommet on cable, remove existing plug button in canted frame structure, and route cable through hole in structure and hole in structure fairing.

(2). Remove clamps from duct assembly and secure control handle and rigid portion of control cable assembly with clamps.

(3). Tie control cable to existing tubing and cables with straps.

(4). Secure grommet in structure and seal hole at structure fairing that cable passes through, using adhesive (CM425).

(5). Secure lower end of cable assembly to structure with clamp and attaching hardware.

NOTE: Do not tighten clamp until after travel is checked.

(6). Install heat duct outer box to heat duct and canopy frame with seven screws.

(7). Install jam nut and clevis as follows;

(a). Position heat control handle full forward. Position lever on heat control valve to open and insert a 1/8 inch (0.125 mm) rigging pin through lever and valve boss.

(b). Loosen jam nut on control cable and adjust clevis so attach holes align with hole in valve lever. Install pin through clevis and valve lever. Install washer and secure pin with cotter pin.

(c). Tighten clevis jam nut. Remove rigging pin from valve lever.

(d). Move pilot's heat control handle full aft and forward several times to check ease of heat control operation.

(e). Tighten clamp nearest clevis end of control cable.

(f). Reinstall aft bulkhead access cover, interior trim, and left half of engine inlet fairing.

(g). After installation, adjust control handle to be parallel with windshield glass.

H. Weight and Balance

Weight and balance changes resulting from installation of heating system equipment are listed in Table 901. After installation of heating system equipment, incorporate changes in helicopter weight and balance record (Ref. Sec. 08-10-00).

Table 901. Weight and Balance Data

Configuration	Weight Pounds (kg)		Arm Inches (cm)		Moment in-lb (kg cm)	
369H90020-517						
Added	+8.2	(+3.719)	106.7	(271.02)	+874.9	(+1007.990)
Removed	0.0		-		-	
Change	+8.2	(+3.719)	106.7	(271.02)	+874.9	(+1007.990)
369H90020-519						
Added	+8.6	(+3.901)	110.1	(279-65)	+946.9	(+1090.942)
Removed	0.0		-		-	
Change	+8.6	(+3.901)	110.1	(279-65)	+946.9	(+1090.942)

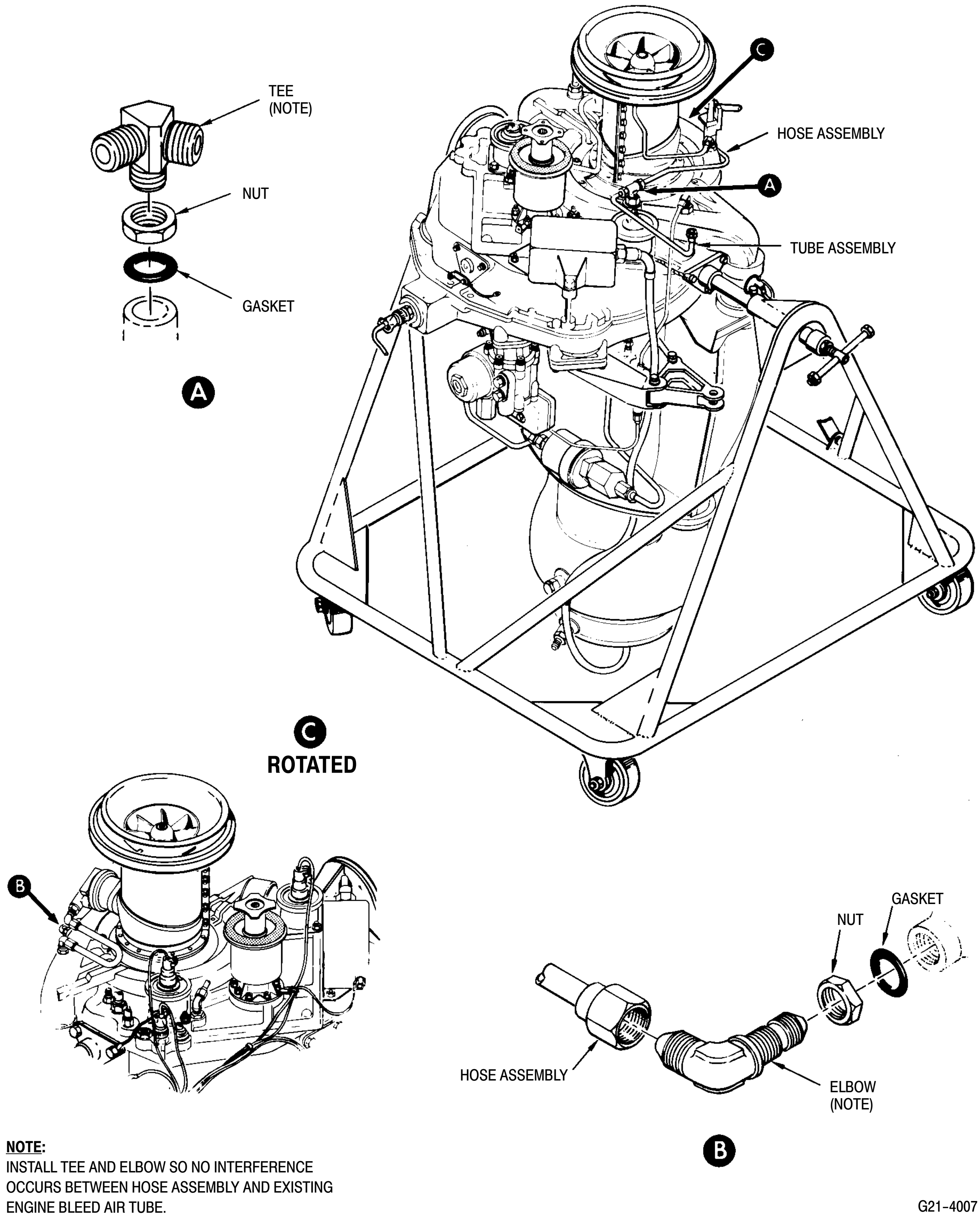


Figure 902. Engine Air Bleed Line Installation (250-C20B)

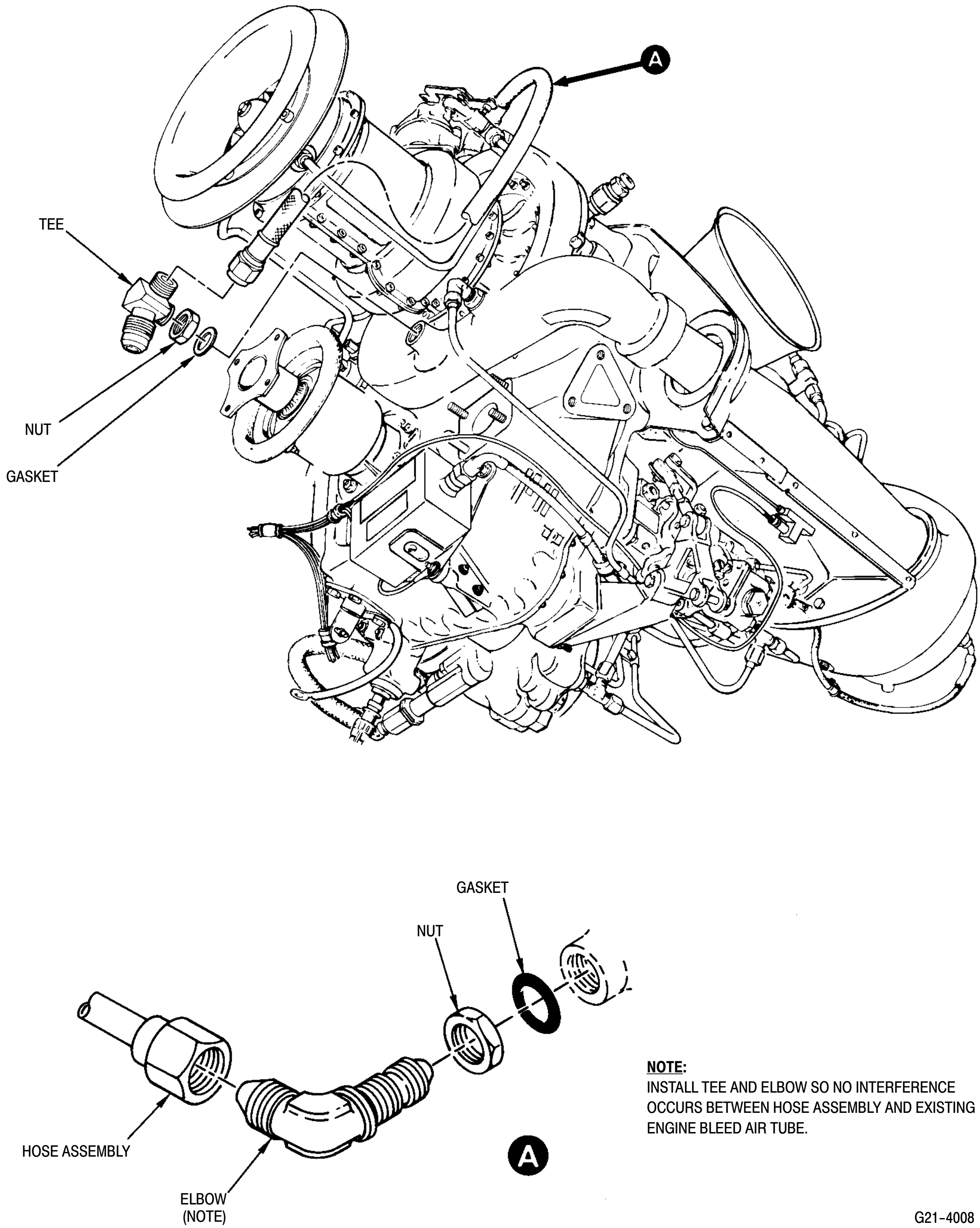


Figure 903. Engine Air Bleed Line Installation (250-C20R/2)

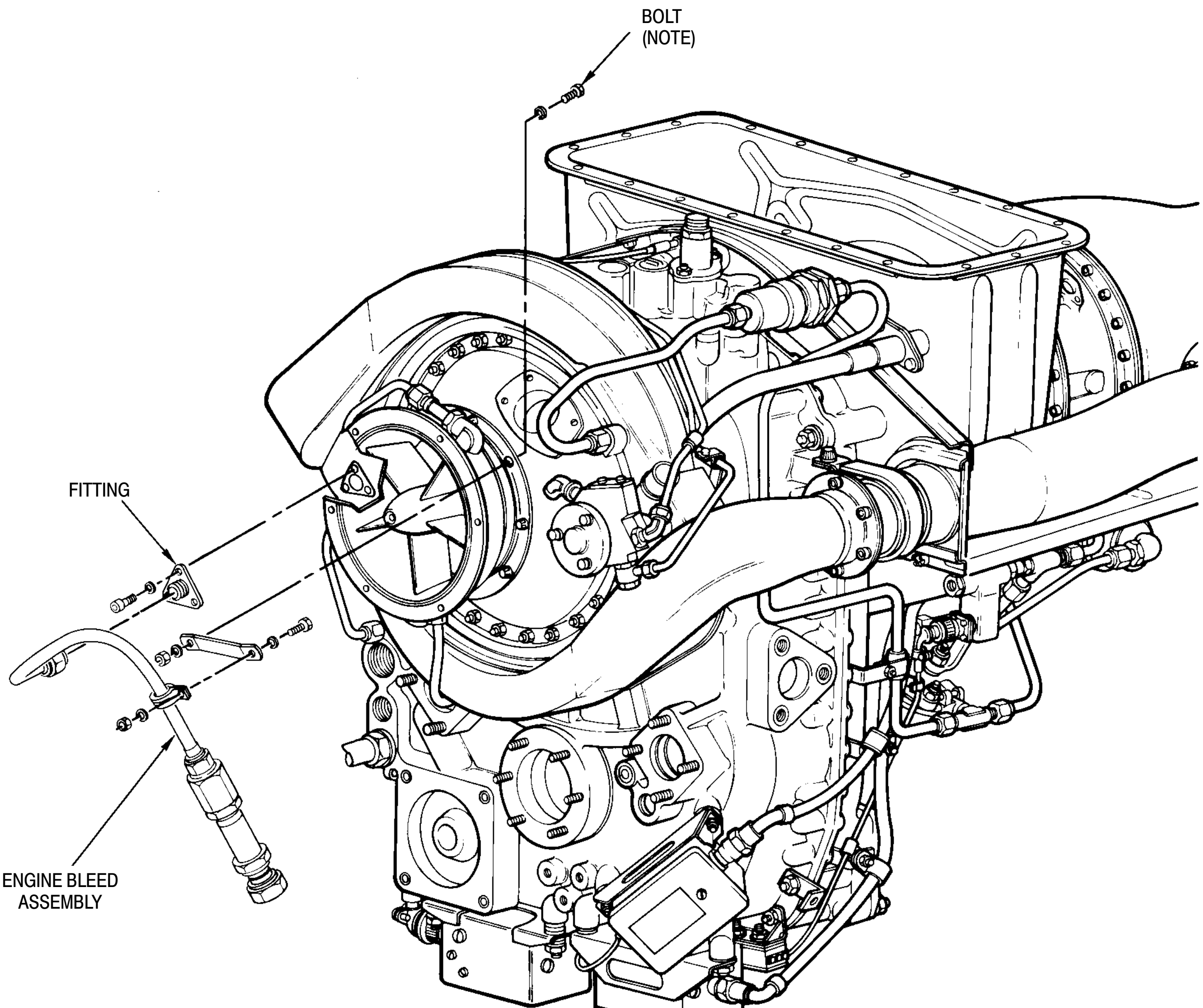


Figure 904. Engine Air Bleed Line Installation (250-C30)

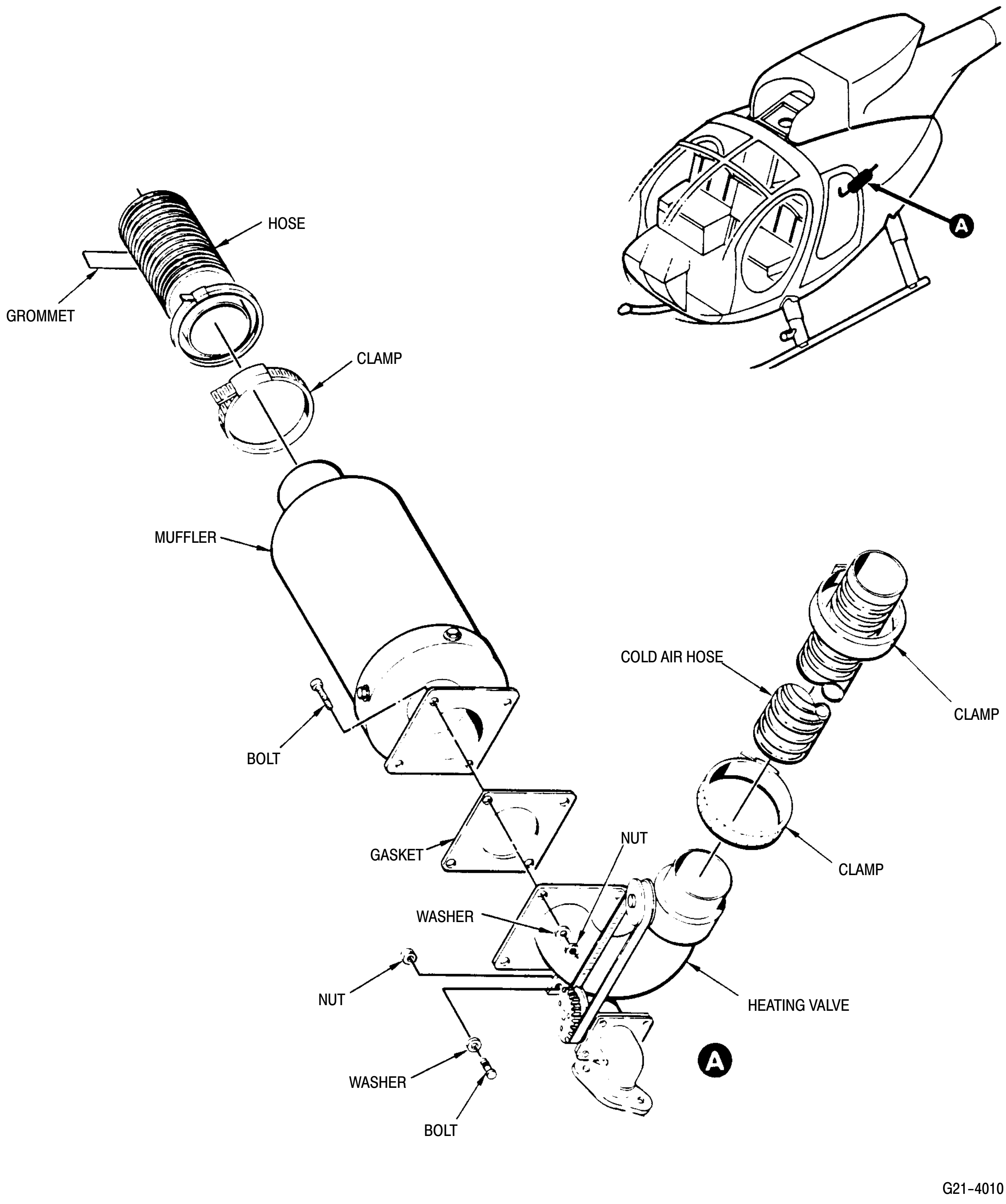


Figure 905. Heating Valve Installation

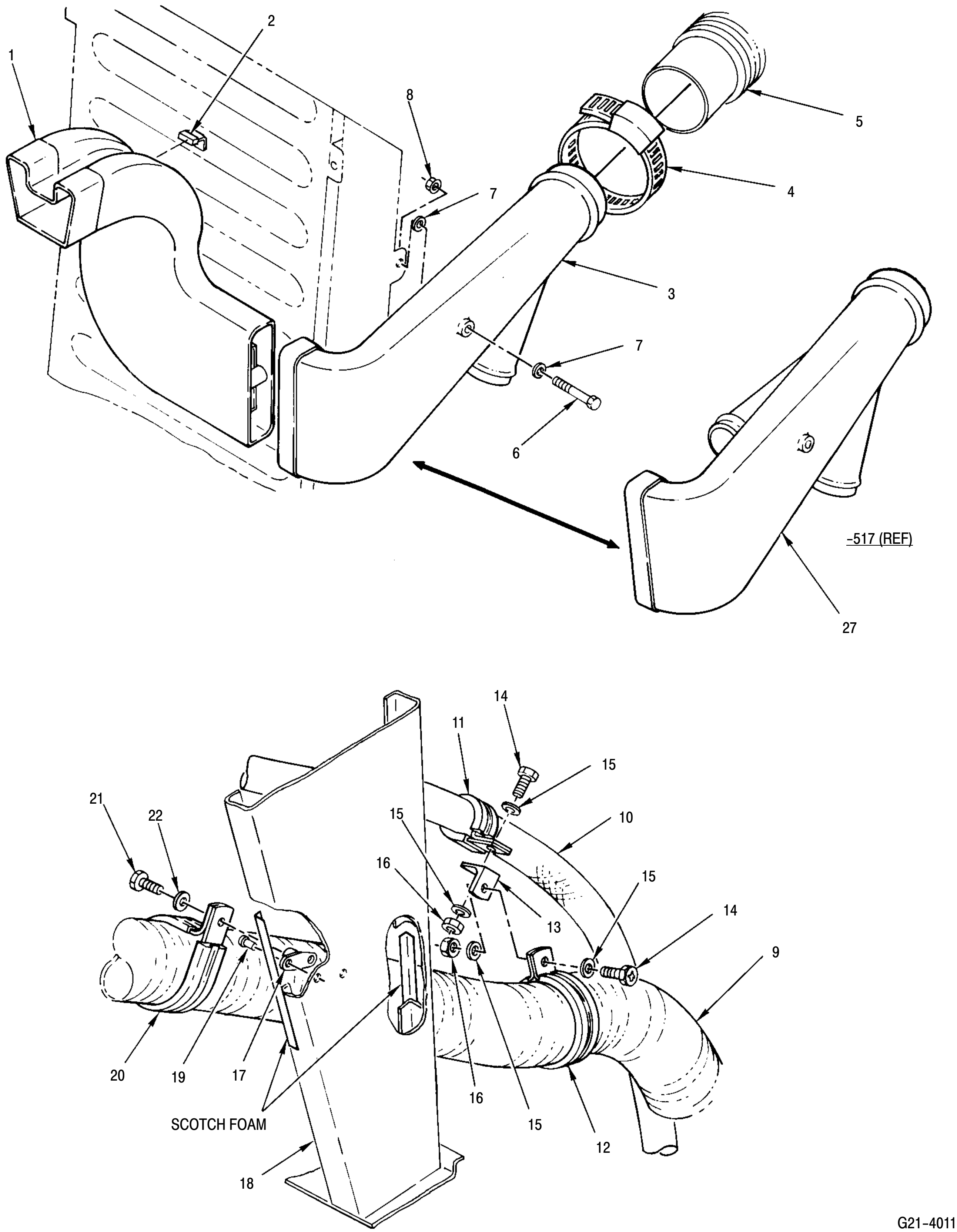


Figure 906. Duct, Hose and Convenience Panel Installation (Sheet 1 of 2)

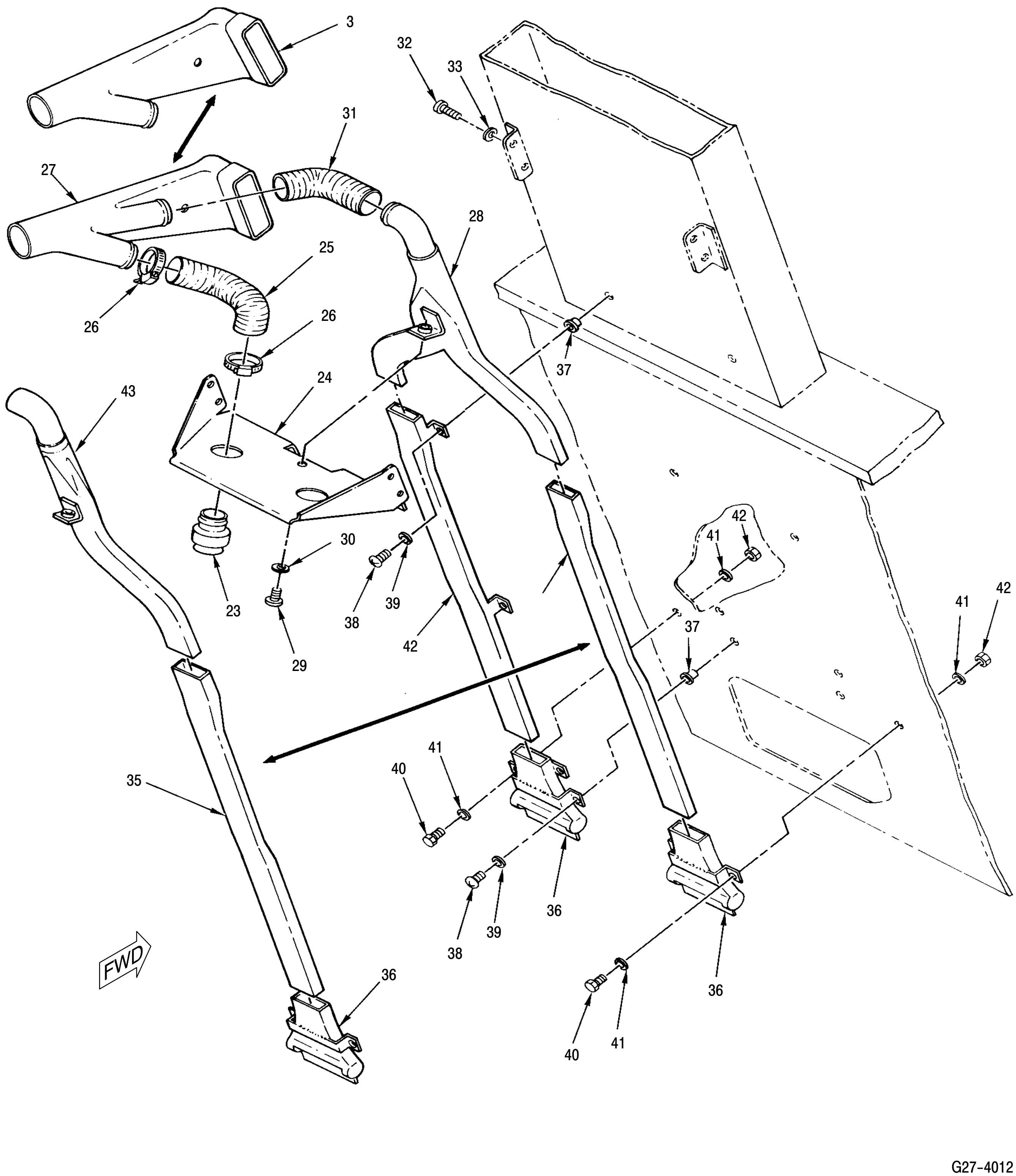


Figure 906. Duct, Hose and Convenience Panel Installation (Sheet 2 of 2)

Legend (Ref. Figure 906)

1. DUCT ASSEMBLY
2. GROMMET
3. DUCT
4. CLAMP
5. HOSE
6. BOLT
7. WASHER
8. NUT
9. HEATER HOSE
10. OIL FLEX LINE
11. CLAMP
12. CLAMP
13. BRACKET
14. BOLT
15. WASHER
16. NUT
17. STANDOFF
18. CHANNEL
19. RIVET
20. CLAMP
21. BOLT
22. WASHER
23. AFT VALVE ASSEMBLY
24. CONVENIENCE PANEL
25. HOSE
26. CLAMP
27. DUCT
28. SPLITTER DUCT
29. SCREW
30. WASHER
31. HOSE
32. SCREW
33. WASHER
34. DUCT
35. DUCT
36. OUTLET
37. RIVNUT
38. SCREW
39. WASHER
40. BOLT
41. WASHER
42. NUT
43. DUCT

Chapter

25

Equipment/ Furnishings

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Section

25-00-00

Equipment/ Furnishings

EQUIPMENT/FURNISHINGS
DESCRIPTION AND OPERATION

1. Interior Furnishings Description

Standard furnishings on the 369D/E/FF - 500/600N Helicopters include seats in the crew and passenger compartments, seat belts, interior trim, floor trim and covering, and other miscellaneous furnishing items.

A. Upholstered Seat Furnishings Configuration

The helicopters are equipped with the basic interior furnishings configuration. This includes upholstered seats with a bench type in the passenger compartment and three individual seats in the crew compartment. The center crew seat is removed for the dual controls option. Seat belts are provided at all seat locations. Interior trim finish is provided throughout interior cabin enclosure.

The 600N helicopter comes equipped with a mid position bench seat. At this position in the passenger compartment, the mid seat can be positioned in either the forward or aft facing configuration.

B. Mesh Seat Furnishings Configuration

The helicopters are equipped with a basic interior furnishings configuration. This includes two mesh seats and seat backs in the crew compartment and two stowable mesh seats in the passenger/cargo compartment. Seat belts are provided at all seat locations. Interior trim is provided for the passenger convenience panel, transmission, passenger aft bulkhead, inboard collective pitch stick, and cyclic controls.

C. Crew Upholstered Seating

The crew compartment on all models with single controls has a three-place seating arrangement. A two-place seating arrangement is provided for optional dual controls. Crew compartment seats consist of left and right side seat cushions and, if applicable, a center seat cushion. Each seat has a seat back cushion. Crew compartment seat structure is an integral part of the helicopter fuselage.

D. Crew Mesh Seating

The crew compartment is equipped with two-part seats. Each two-part seat consists of a seat back and a seat bottom constructed of aluminum tubing frames with a nylon mesh covering and rubber pads cemented to the frame mounting plates. The seat backs are mounted on the Station 78.50 canted frame. Seat bottoms are secured on top of the pilot's seat structure.

E. Passenger Upholstered Bench Seating

Passenger compartment seating is provided by a bench type tubular steel structure furnished with upholstered cushions. The bench seat is adjustable fore and aft as well as up and down, and may be folded or quickly removed when cargo space is required. All seat cushions are either upholstered and trimmed with vinyl, or may be all vinyl. Velcro strip fasteners secure seat cushions in place.

F. Mid Bench Seat (600N)

The mid bench seat provides additional three abreast seating in the passenger area. This seat can be positioned in either the forward or aft facing configuration. The seat belt/harness system is completely attached to the seat structure for quick removal and installation of the entire bench seat assembly.

G. Upholstered Passenger Individual Seat

Individual seat installations are also available for the passenger compartment. The seat frames are secured to the bulkhead attach fittings with ball-lock pins. When each seat is folded, the flat surface of the seat back serves as a barrier for cargo. Ref. P/N 369D290037 in the optional equipment list for a further description of individual passenger seat installations (Ref. Table 202, Sec. 01-00).

H. Passenger Mesh Seating

Two passenger seats are installed in the aft compartment of the helicopter. The seats are of welded tubular aluminum structure with nylon mesh covers. The seats may be folded for clear cargo space and, if desired, are easily removed by means of quick disconnect attachments.

I. Seat Belts and Shoulder Harnesses (369D/E/FF - 500N)

In the standard installation, Sam Browne type seat belts with shoulder harness straps are installed at each seat position. Seat belts and shoulder straps are fabricated from nylon webbing with sewn-in buckles and attach fittings. Lengths of seat belts and shoulder straps are not adjustable. Inertia reels are provided to take up slack and allow free movement of the seat occupant.

Comfort clips are available for helicopters equipped with Sam Browne type seat belt assemblies. The comfort clip is designed to maintain proper strap tension and relieve excessive pressure of the inertia reel shoulder harness on the crew or passengers during flight.

After each seat belt and shoulder harness assembly is fastened and adjusted for individual comfort and safety, the comfort clip is moved from its original position next to the buckle and relocated by sliding up on the harness strap as close as possible to the inertia reel. The clip prevents any further retraction of the strap into the inertia reel, thus keeping a constant yet comfortable tension of the harness strap against the user. After each flight, the comfort clip is to be returned to its original location.

J. Seat Belts and Shoulder Harness (600N)

The crew seats in the helicopter utilize a four-point restraint harness that combines the lap seat belts with double shoulder straps for greater occupant security and comfort. Both mid and aft passenger seats are equipped with a three-point restraint system. The lap seat belt and shoulder strap are joined at the end into a single unit for ease of attachment and convenience. In one motion, the lap and shoulder belts together can be attached to the seat buckle. All seat belt/harness systems are equipped with an automatic locking inertia reel mechanism.

K. Interior Trim

Interior trim used in the crew compartment and the passenger compartment is of thermoplastic material contoured to cover interior structure. Trim panels and covers provide interior finish, compartment insulation and mounting surfaces for convenience items, and certain optional equipment. Trim panels and covers are attached with Velcro fasteners and with upholstery screws with rivnuts or isolator nut mounts on the fuselage structure.

L. Floor Trim and Covering

Interior floor trim and covering consists of fire-resistant carpeting and two foot fairing trim assemblies. The lower part of Sta. 78.50 bulkhead and access doors are also covered with fire-resistant carpeting.

M. Miscellaneous Furnishings

Miscellaneous furnishings include a stowage compartment, heat duct, V_{NE} card holder, foot rest assembly, helicopter checklist, operational record holder, ashtrays, and LH/RH passenger step assemblies. The stowage compartment is under the right floor access door (Ref. Sec. 52-50). The compartment has a uniformly-distributed load capacity of 50 pounds maximum when optional avionics equipment is not installed in the crew area underfloor compartment. The heat duct provides interior trim for the canopy frame and mounting surface for the magnetic compass (Ref. Sec. 95-20). The V_{NE} card holder is located on the left side of the instrument panel. The helicopter checklist is stored with the magnetic compass card in the map case. The operational record holder is attached to the outboard side of the right instrument panel fairing. Ashtrays and cigarette lighters are provided in the lower portion of the instrument panel and on the back side of the station 78.50 canted bulkhead. The removable passenger steps are attached to the helicopter side jacking points.

Section

25-10-00

Upholstered Seats

UPHOLSTERED SEATS
MAINTENANCE PRACTICES

1. Upholstered Crew Seat Replacement

(Ref. Figure 201, Figure 202 and Figure 204) Upholstered Seats for the 369D/E/FF - 500/600N Helicopters are the same. The addition of the mid position bench seat is unique to the Model 600N.

(1). Clear seats of seat belts and shoulder straps.

(2). Lift seat cushions away from fuselage seat structure to release Velcro strip and fasteners.

(3). To replace, position seat cushions so that Velcro fastener strips mate. Apply slight pressure to secure seat cushions in place.

2. Upholstered Passenger Aft Bench Seat Replacement

(Ref. Figure 201 or Figure 202)

(1). Clear seats of seat belts and shoulder straps.

(2). Release seat quick-disconnect fittings at bulkhead, then at floor points.

NOTE: For height adjustment, install ball-lock pins in desired position at support legs and bulkhead fittings. For fore and aft adjustment, move and secure seat back at desired position on lower frame.

(3). To replace, position bench seat so that quick-disconnect fittings align with floor and bulkhead attach points.

(4). Lock seat in place, first at floor fittings then at bulkhead fittings.

3. Mid Bench Seat Assembly Replacement (600N)

(Ref. Figure 204)

A. Mid Bench Seat Removal

(1). Remove quick release pins that attach seat support fittings to floor rails.

(2). Remove seat assembly.

B. Mid Bench Seat Installation

(1). Install seat assembly in aircraft.

(2). Align seat support fittings with floor rails.

(3). Install quick release pins to secure seat assembly to floor.

4. Upholstered Passenger Individual Seat Replacement

(Ref. Figure 205)

(1). Clear seat of seat belts and shoulder straps.

(2). Remove ball-lock pins from bulkhead attach fittings.

(3). To replace, position seats so that quick-disconnect pins align with bulkhead attach points and lock seats in place.

5. Upholstered Seat Inspection

(Ref. Figure 201, Figure 202 and Figure 204)

(1). Inspect upholstery material for cuts, loose stitching or other unserviceable condition.

(2). Inspect Velcro fastener strips for security of attachment and condition.

(3). On passenger seat structure, inspect quick-disconnect mechanisms for proper operation or damage that may prevent positive locking.

A. Upholstered Seat Cleaning

(Ref. Sec. 20-20-00, Fuselage Interior Trim and Upholstery Cleaning)

6. Upholstered Seat Repair

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM219	Methyl-ethyl-ketone
CM405	Adhesive

(1). Lapstitch frayed or worn upholstery.

WARNING **MEK solvent is flammable. Use only in well-ventilated area and away from heat and flame.**

NOTE: Loosened Velcro strips may be reactivated for adhesion by wiping original adhesive film with MEK (CM219).

(2). Replace unserviceable Velcro fastener strips. Install new Velcro strips to mate. Bond in place with adhesive (CM405).

(3). Make welded or riveted sleeve-type repairs on tubular structure according to FAA AC 43.13-1A, Aircraft Inspection and Repair.

7. Optional Mid Business Seat Replacement (600N)

(Ref. Figure 206) This option replaces the standard mid bench seat with two fore and aft adjustable seats attached through four seat tracks that allow seat location adjustment over a 10 inch span when seats are facing forward.

NOTE:

- With the seats in the full aft position and facing forward, the rear passenger seats become unusable for passenger seating.
- The seats are removable and may be placed in the aft facing position.
- In the aft facing position, only two seat locations are available.

A. Business Seat Removal

(1). Remove quick release pins that attach seat support fittings to floor rails.

(2). Remove seat assembly.

B. Business Seat Installation

(1). Install seat on tracks with forward guide pin in track cutout first.

(2). Once seat guide pin is in track, slide seat forward until 2 rear guide pins are in the track cutouts.

(3). When installing seat facing aft, tilt seat-back full forward during installation.

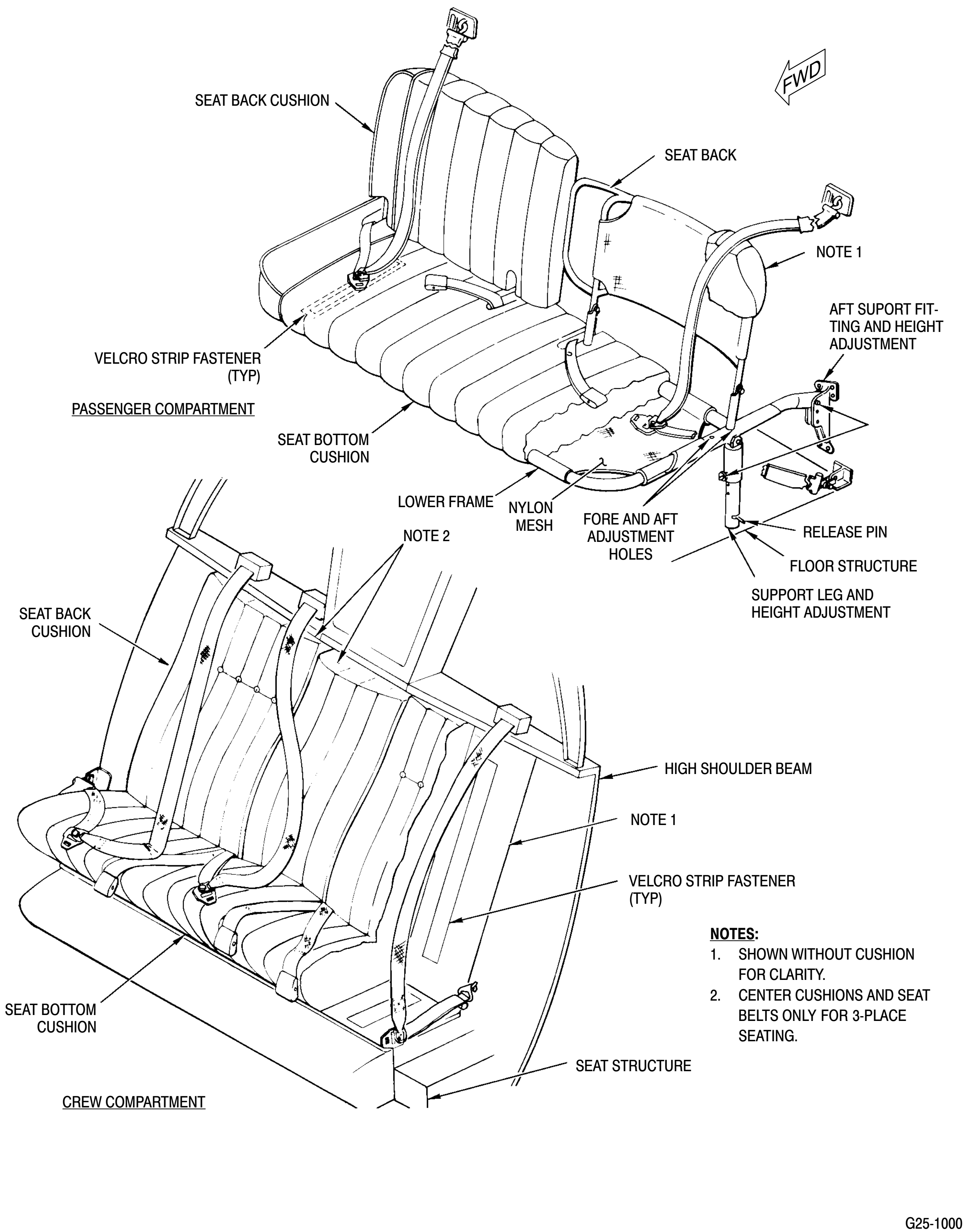


Figure 201. Upholstered Seat Installation (369D)

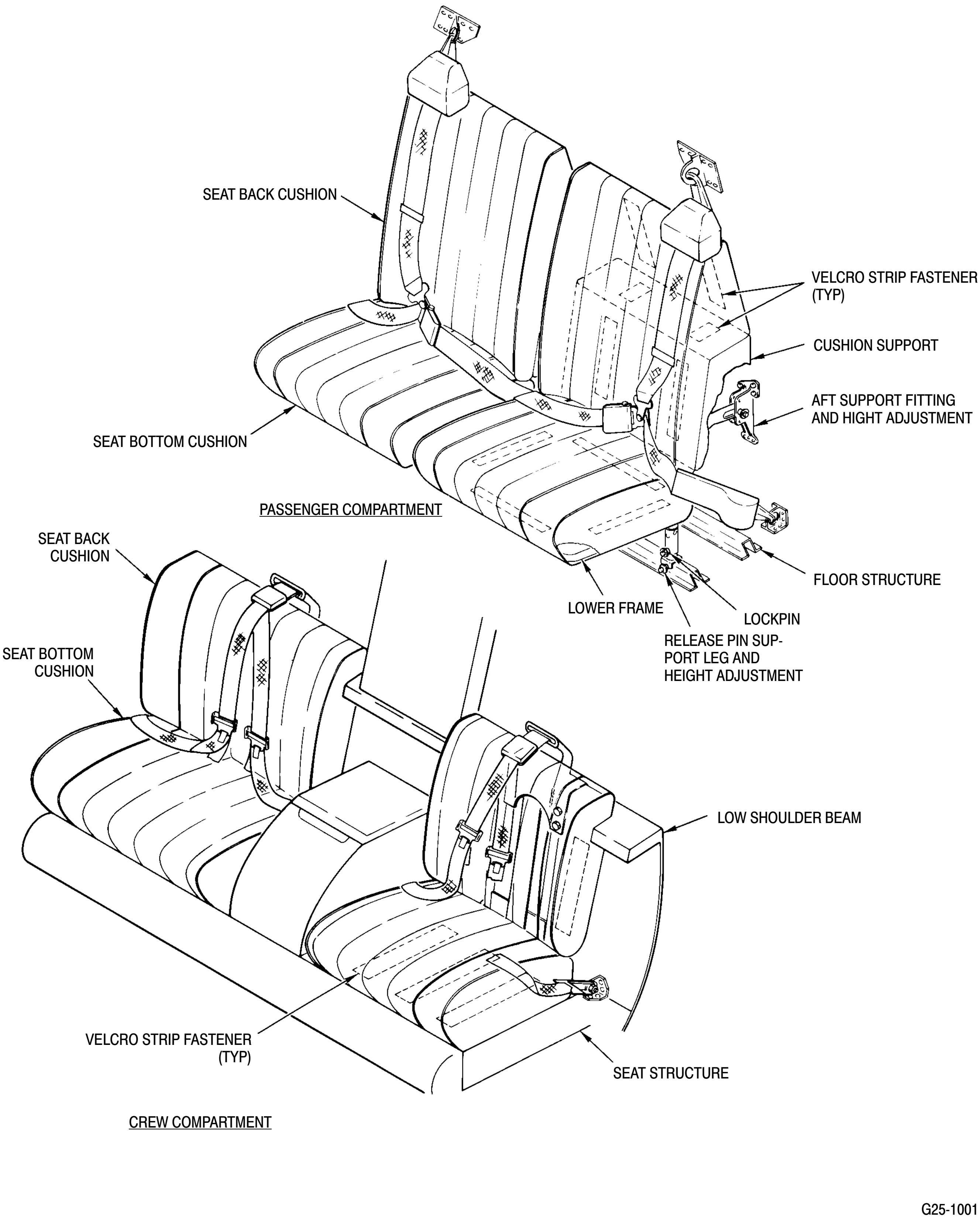


Figure 202. Upholstered Seat Installation (369E/FF - 500/600N)

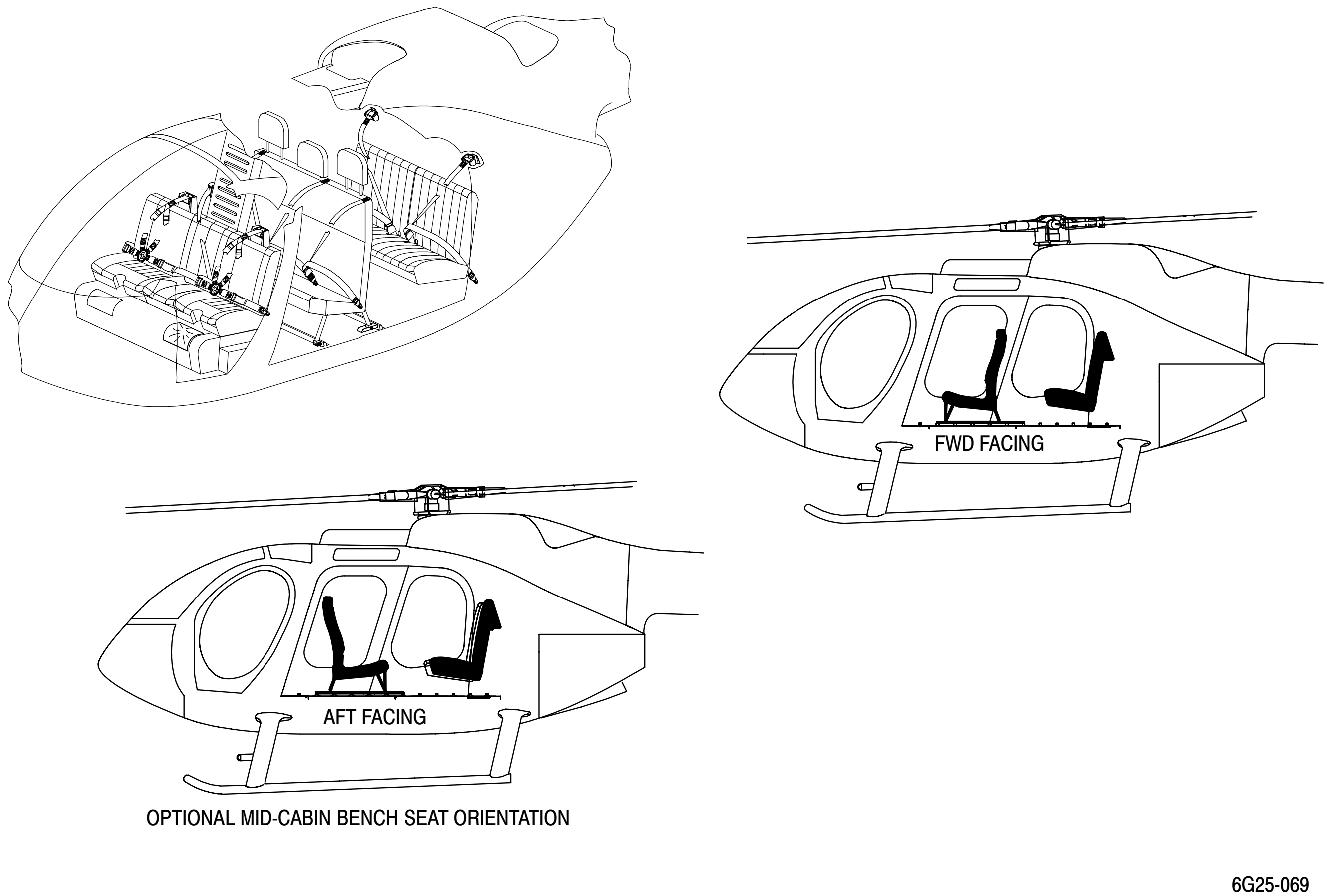


Figure 203. Mid and Aft Seating Configuration (600N)

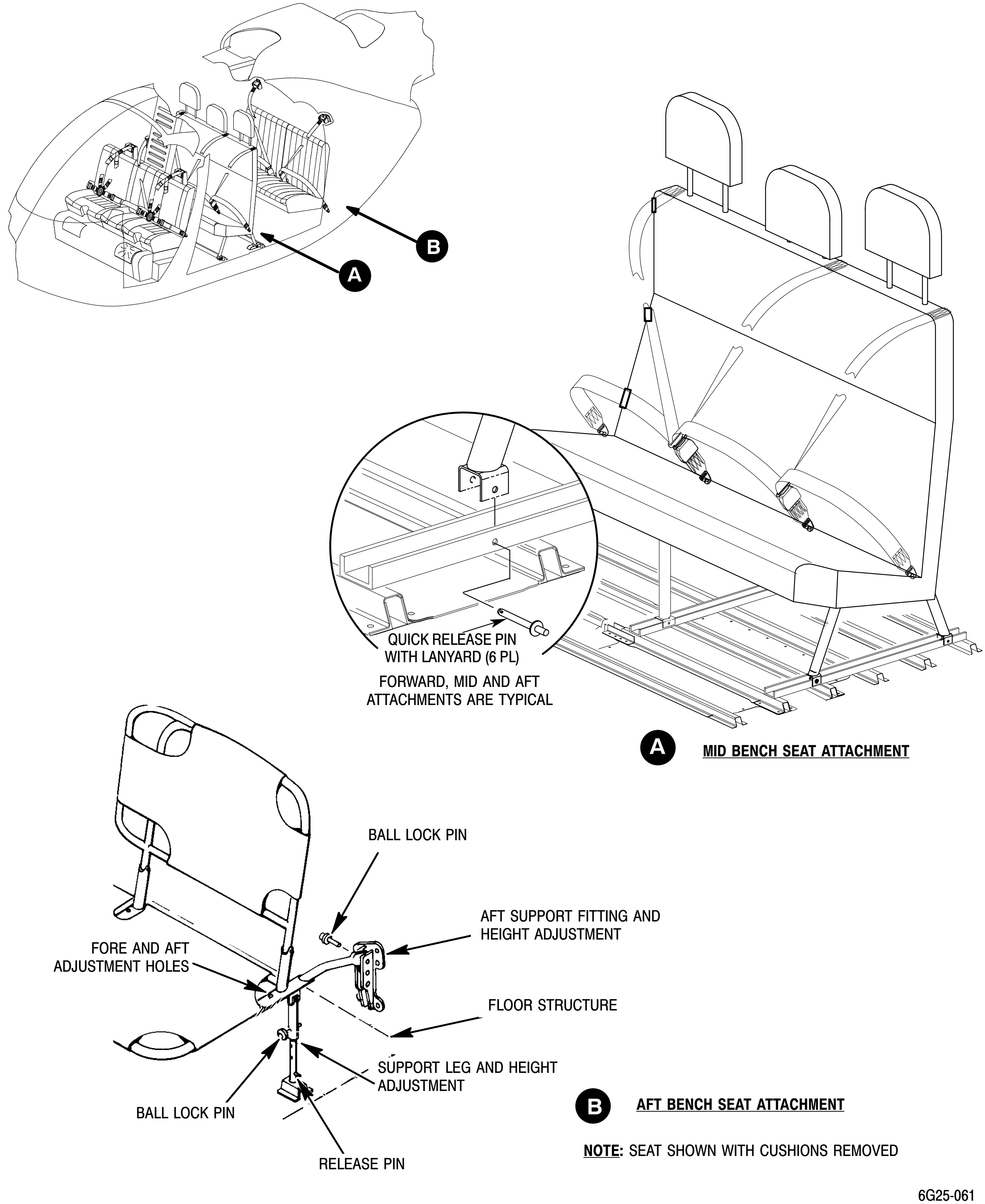


Figure 204. Mid and Aft Bench Seat Assembly Installation (600N)

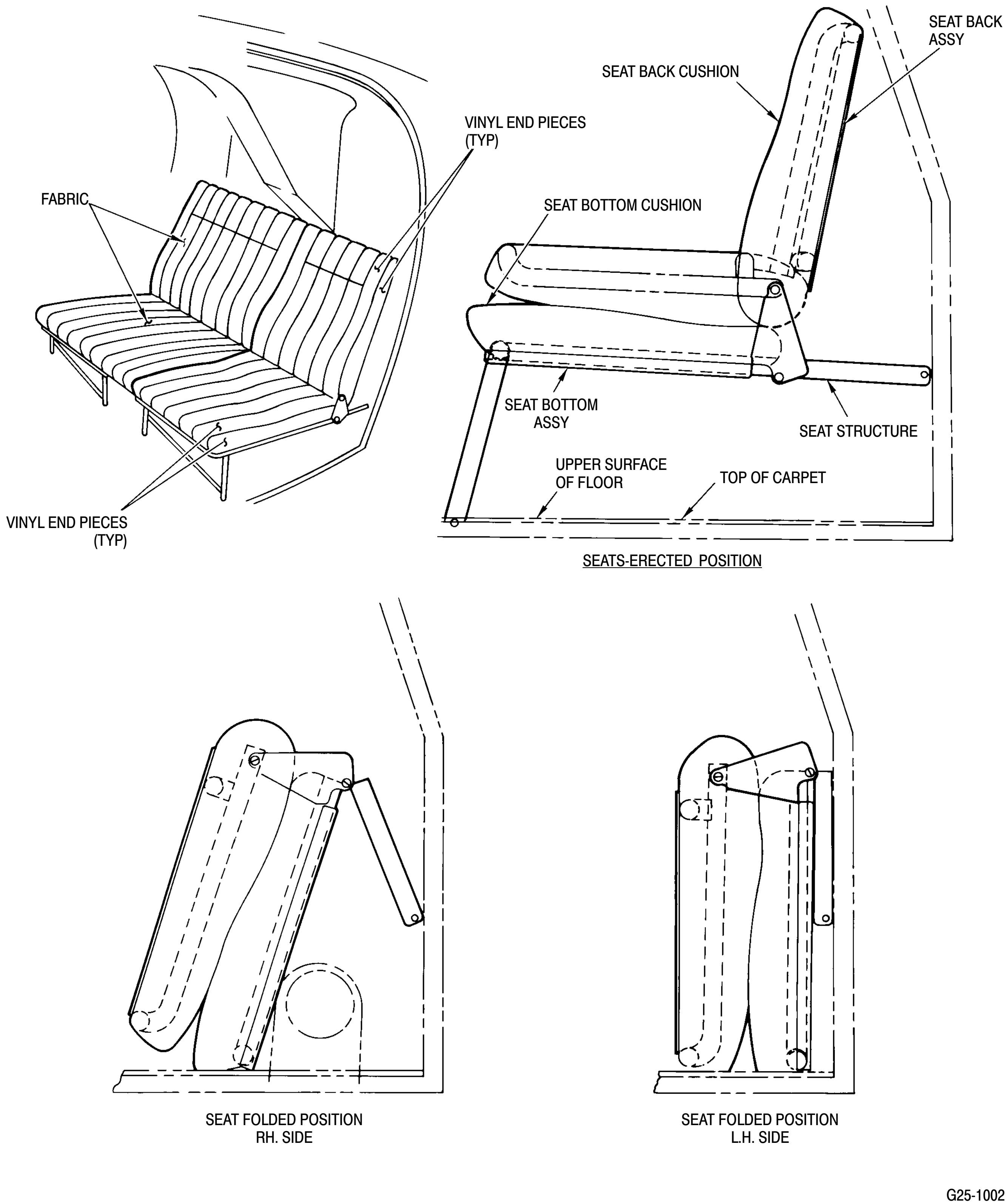


Figure 205. Upholstered Passenger Individual Seat Installation (369D)

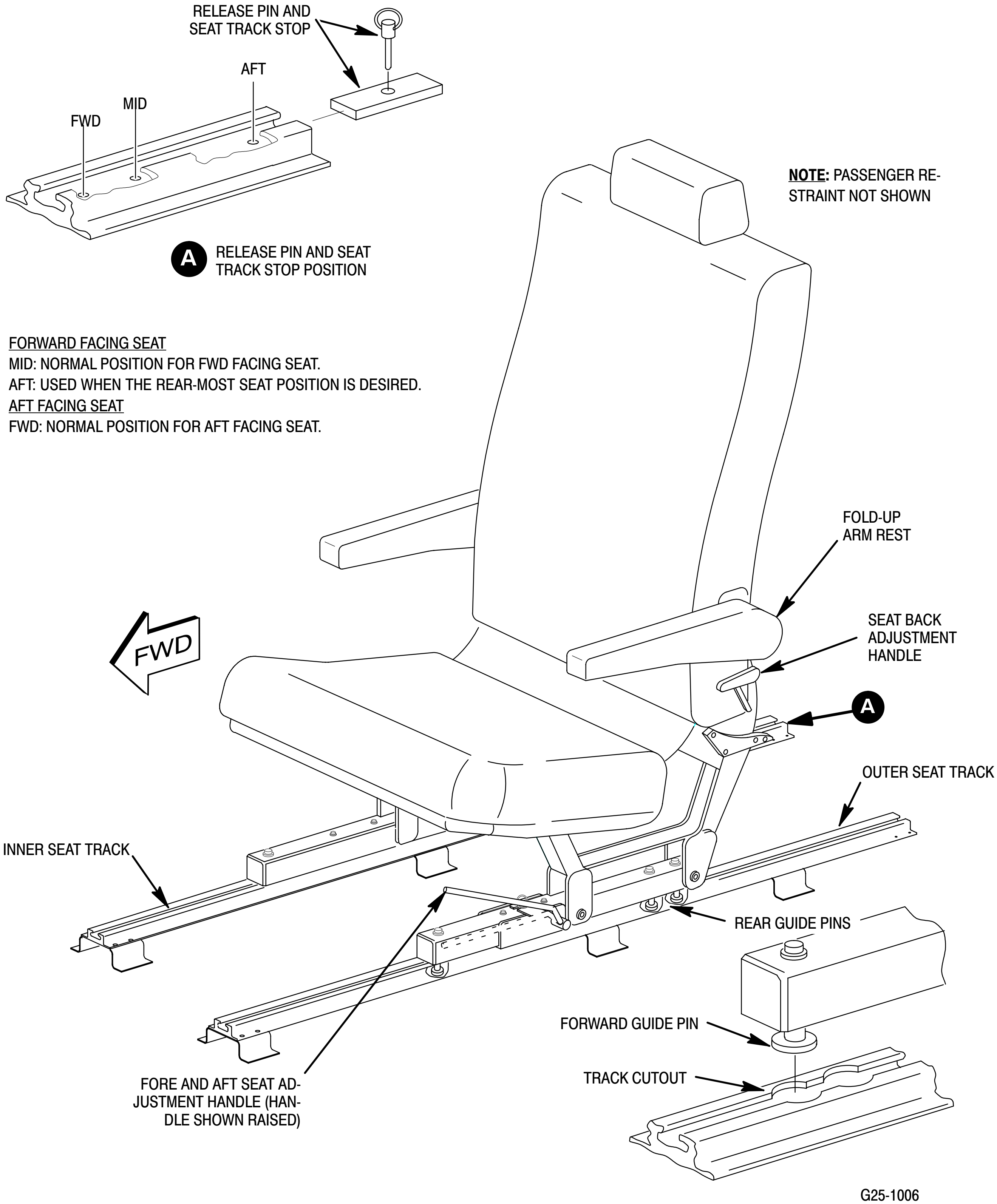


Figure 206. Mid-Cabin Business Seat Installation (600N)

Section

25-15-00

Mesh Seats

MESH SEATS
MAINTENANCE PRACTICES

1. Crew/Passenger Mesh Seats

(Ref. Figure 201 thru Figure 203) The typical mesh seat installation consists of lightweight nylon mesh-covered seats installed in the crew and passenger compartments. For description of the various installations, consult the Optional Equipment List (Ref. Table 202, 01-00-00). Some installations have a bench-type passenger seat, some have individual passenger seats, and others have no passenger seats at all. Installations differ depending on whether the helicopter has a high shoulder beam or a low shoulder beam, and various seat colors.

2. Crew Mesh Seat Replacement

(Ref. Figure 201)

NOTE: Identify and retain all components and hardware removed from the helicopter.

(1). Remove or clear area of seat belts and shoulder straps.

(2). Remove installing hardware and lift seat bottoms and seat backs from the helicopter.

(3). To replace, install seat backs and seat bottoms with attaching hardware.

(4). When removed, reinstall seat belt and shoulder harness.

3. Passenger Mesh Seat Replacement

(Ref. Figure 202 or Figure 203)

NOTE: Identify and retain all components and hardware removed from helicopter.

(1). Remove or clear area of seat belts and shoulder straps.

(2). Release seat quick-disconnects at aft fittings, then at floor points.

(3). Lift seats from helicopter.

(4). To replace, attach horizontal support legs to aft attach fittings with lockpins.

(5). Insert vertical legs into floor structure and secure.

(6). If removed, reinstall seat belts and shoulder harness.

4. Passenger Mesh Seat Adjustment

(1). (Ref. Figure 203) The height of the bench seat may be adjusted by installing the ball lock pins in any of the three holes in the vertical support legs, and by installing the ball lock pins that support the horizontal legs in any of the three holes in each aft support fitting.

(2). For the fore and aft adjustment of the bench seat, insert the seat back legs into either pair of holes in the seat frame.

(3). (Ref. Figure 202) The height of the individual seats may be adjusted by inserting lock pins into any of three pairs of holes in the aft support fittings to secure the horizontal legs of the seat.

(4). The individual seats may be folded up out of the way to permit cargo storage by first releasing the quick-disconnects at the forward legs and folding the legs aft. The seat back is then folded forward at the upper hinge point. As the seat is swung up at the aft fitting, the seat back and the seat bottom are rotated forward and down at the lower hinge point.

5. Crew Mesh Seat Inspection

(1). Inspect upholstery material for cuts or other unserviceable conditions.

(2). Check rubber pads cemented to each mounting plate.

6. Passenger Mesh Seat Inspection

(1). Inspect upholstery material for cuts or other unserviceable conditions.

(2). Inspect quick-disconnect mechanisms for proper operation and for damage that may prevent positive locking.

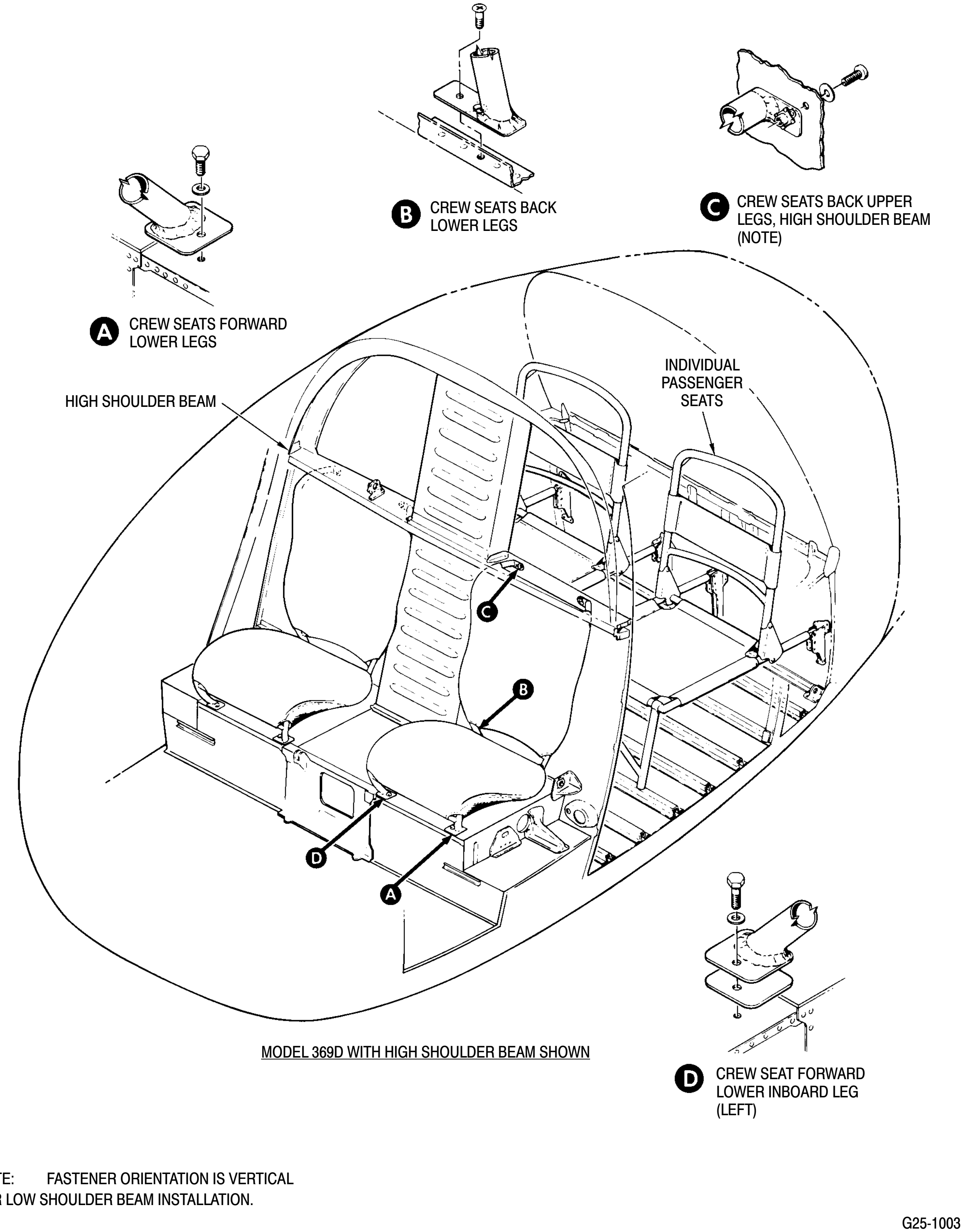


Figure 201. Mesh Seat Installation

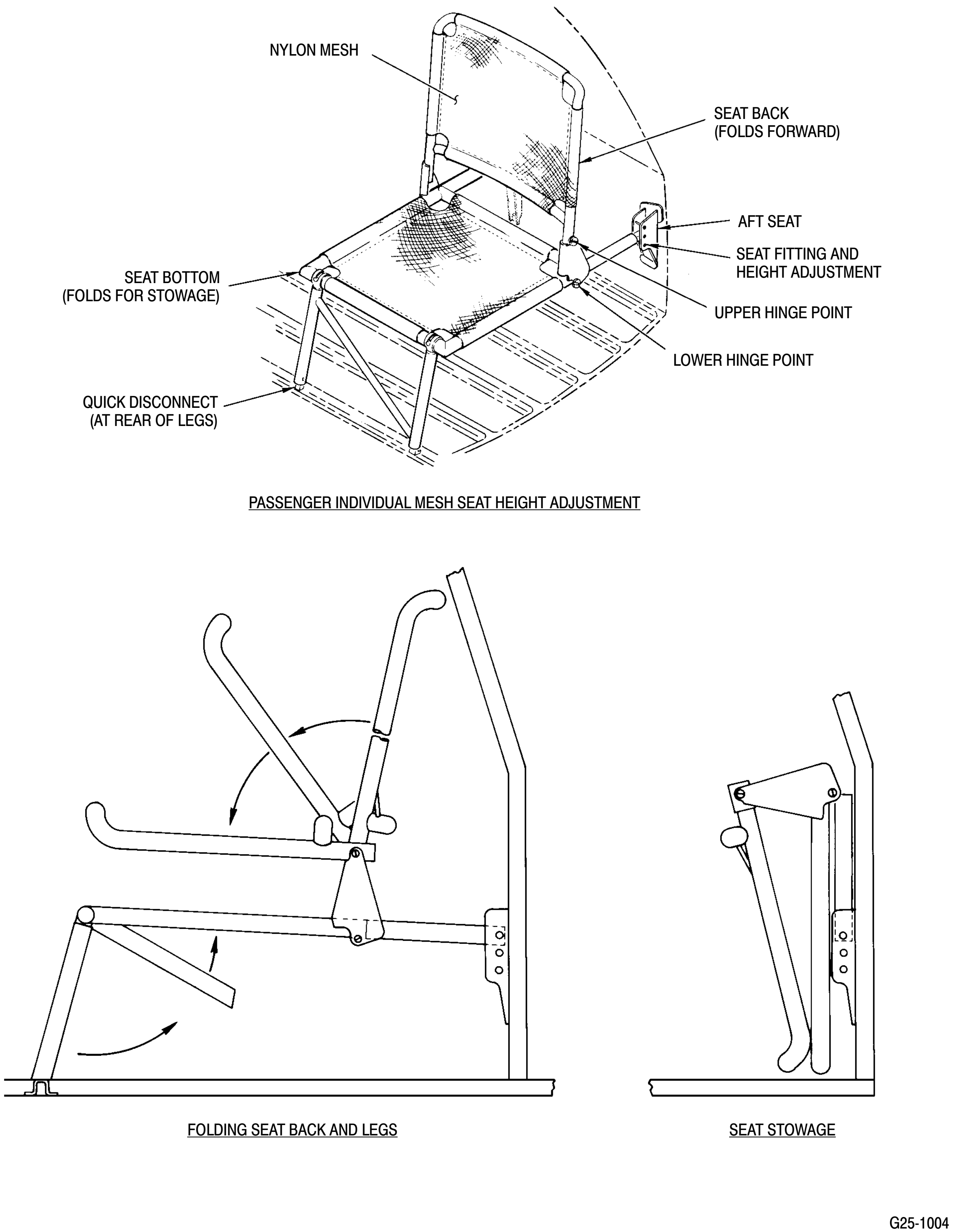


Figure 202. Passenger Individual Mesh Seat Adjustment and Storage

7. Mesh Seats Cleaning

(Ref. Sec. 20-20-00, Fuselage Interior Trim and Upholstery Cleaning)

8. Mesh Seats Repair

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM234	Solvent, dry-cleaning
CM405	Adhesive

Repair of seats is limited to the following:

(1). Lap stitch frayed or torn nylon webbing, or replace if damaged beyond repair.

(2). Install new rubber pads.

(3). Clean seat mounting plate with clean cloth dampened with solvent (CM234).

(4). Apply cement (CM405) and attach pad to seat mounting plate.

(5). Replace damaged nutplates.

(6). Weld repairs may be performed according to FAA AC 43.13-1A, Aircraft Inspection and Repair.

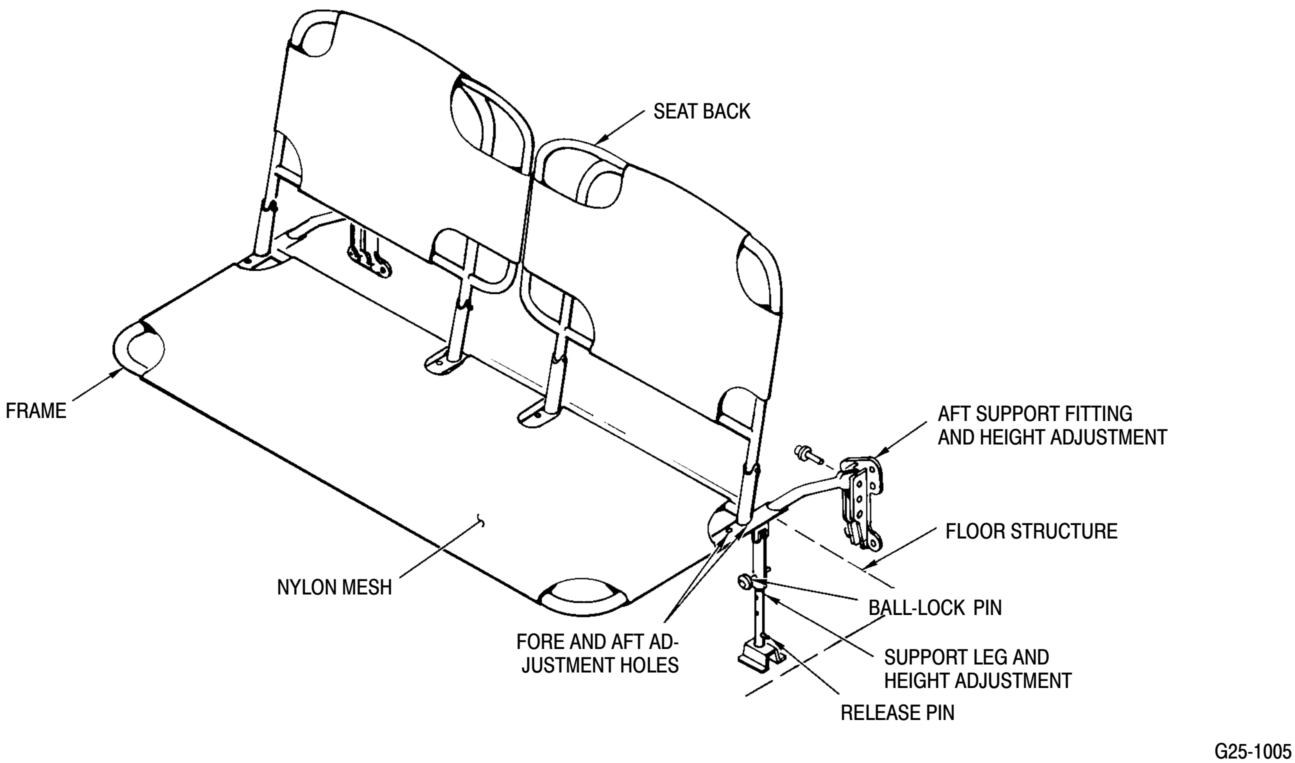


Figure 203. Passenger Bench Mesh Seat Adjustment

MESH SEATS
INITIAL INSTALLATION

1. Mesh Seat Initial Installation

Procedures in this section are for initial installation of 369H90040-BSC, -501, and -503 mesh seat installations on Model 369D helicopters with to replace the existing cushion seats.

A. Model Applicability

To determine the applicability of the mesh seat installation for use on each model helicopter, consult the Optional Equipment List (Ref. Table 202, 01-00-00).

B. Preparation for Installation

(1). Check all electrical switches for OFF position. Ensure that BATTERY-OFF-EXT switch is OFF.

(2). Identify all components and hardware to be removed for access to work areas. Protect components from damage and foreign matter until reinstalled.

C. Helicopter Equipment Removal

Prior to installing the mesh seats, a limited number of items must be removed from the helicopter to accommodate seat installation.

(1). Clear seats of seat belts and shoulder straps.

(2). Lift crew compartment seat cushions away from fuselage seat structure to release Velcro strips and fasteners. Remove seats from helicopter (Ref. Sec. 25-10-00).

(3). In passenger compartment, release existing seat quick-disconnect fittings at aft bulkhead, then at floor points. Remove existing installed seats from helicopter.

D. Passenger Compartment Bench Seat Installation

(Ref. Figure 203)

(1). Position bench seat horizontal support legs in aft support fittings.

(2). Install ball lock pins.

(3). With release pins raised and locked, insert the two vertical legs into keyhole fitting slots in floor.

NOTE: For height adjustment, install ball lock fittings in any of the three attachment holes, in the vertical support legs, and in the aft support fittings. For fore and aft adjustment, insert the seat back lower legs in either pair of holes in lower frame.

(4). Move vertical support legs to right in keyhole fittings and unlock release pins in legs. The pins will drop to bottom of slots and secure support legs to fittings in floor.

E. Passenger Compartment Individual Seat Installation

(Ref. Figure 202)

NOTE: Installation procedures for left and right seats are identical.

(1). Position passenger seat horizontal support legs in aft support fittings.

(2). Install ball lockpins.

(3). Depress pushbutton quick disconnects at front legs of seat.

(4). Insert legs into keyhole fittings in floor. Move legs outboard and release pushbuttons to secure legs in place.

F. Crew Compartment Mesh Seat Installation

(Ref. Figure 201) Installation includes installing a shim under the inboard forward leg of the left crew seat.

(1). Position mesh seat back halves in crew compartment.

(2). Attach upper ends of seat backs to canted stations with screws and washers.

(3). Attach lower legs to helicopter seat structure with screws.

(4). Position lower halves of mesh seats on helicopter seat structure.

(5). Insert shim under inboard forward leg of left seat. Attach leg to seat structure with bolt and washer.

(6). Attach remaining forward legs of seats to seat structure with bolts and washers.

G. Helicopter Equipment Installation

After installation of mesh seats, a limited number of items must be replaced in the helicopter.

(1). Install seat belts and shoulder harness in crew compartment (Ref. Sec. 25-20-00, Seat Belt/Inertia Reel Replacement).

(2). Install seat belts and shoulder harness in passenger compartment.

H. Weight and Balance Data

Weight and balance data resulting from -BSC, -501 and -503 mesh seat installations are listed in Table 901. After installation, incorporate changes in helicopter weight and balance records (Ref. Sec. 08-10-00).

Table 901. Weight and Balance Data

Configuration	Weight Pounds (kg)		Arm Inches (cm)		Moment in-lb (kg cm)	
-BSC Installation	+20.80	(+9.435)	99.7	(253.24)	+2074	(+2389.5)
-501 Installation	+20.35	(+9.231)	99.6	(252.98)	+2027	(+2335.3)
-503 Installation	+20.80	(+9.435)	99.7	(253.24)	+2074	(+2389.5)

Section

25-20-00

Seat Belts/Inertia Reel

SEAT BELTS/INERTIA REEL MAINTENANCE PRACTICES

1. Seat Belts/Inertia Reel Description and Operation (369D/E/FF - 500N)

Inertia reel-type seat belt/harness equipment consists of a shoulder harness, an inertia reel, and a two-piece adjustable seat belt for both the pilot and copilot.

The shoulder harnesses and seat belts are of nylon web material with sewn-in length adjusters and end adapters for attachment of the harnesses to the seat belts. Inertia reels, furnished as part of the harnesses, are mounted on the Sta. 78.50 canted frame. The reels permit the pilot and copilot freedom for slow, deliberate shoulder movement, but lock with any sudden forward movement. Full extension or retraction of the straps on the spring-loaded reels is approximately 25 inches (63.5 cm).

Some installations have a handle: with the handle up, the inertia reel operates normally; with the handle down, the inertia reel is locked up to restrain movement.

2. Seat Belts/Inertia Reel Description and Operation (600N)

The crew seats utilize a four-point restraint harness. This harness combines the lap seat belts with double shoulder straps attached to an inertia reel mechanism. Both mid and aft passenger seats are equipped with a three-point restraint system. The lap seat belt and shoulder strap are joined at the end into a single unit for ease of attachment and convenience. In one motion, the lap and shoulder belts together can be attached to the seat buckle.

3. Crew Seat Belt/Harness Cleaning

The harness and seat belt may be cleaned using a soft-bristle brush and a mild solution of warm water and laundry detergent.

4. Seat Belt/Inertia Reel Replacement (369D/E/FF - 500N)

(Ref. Figure 201, Figure 202 and Figure 203)

(1). For access to seat belt attach fittings, remove crew compartment seats.

(2). Remove inertia reel, with harness, from canted bulkhead lateral beam by removing four bolts.

(3). Install replacement harness by securing inertia reel, with harness, to canted bulkhead lateral beam.

(4). Install replacement seat belts and shoulder straps as shown. Place snap end fittings up or down to eliminate any twist in seat belt.

(5). Tongue portion of center passenger lap belt must be installed on right side and buckle portion on left side as shown.

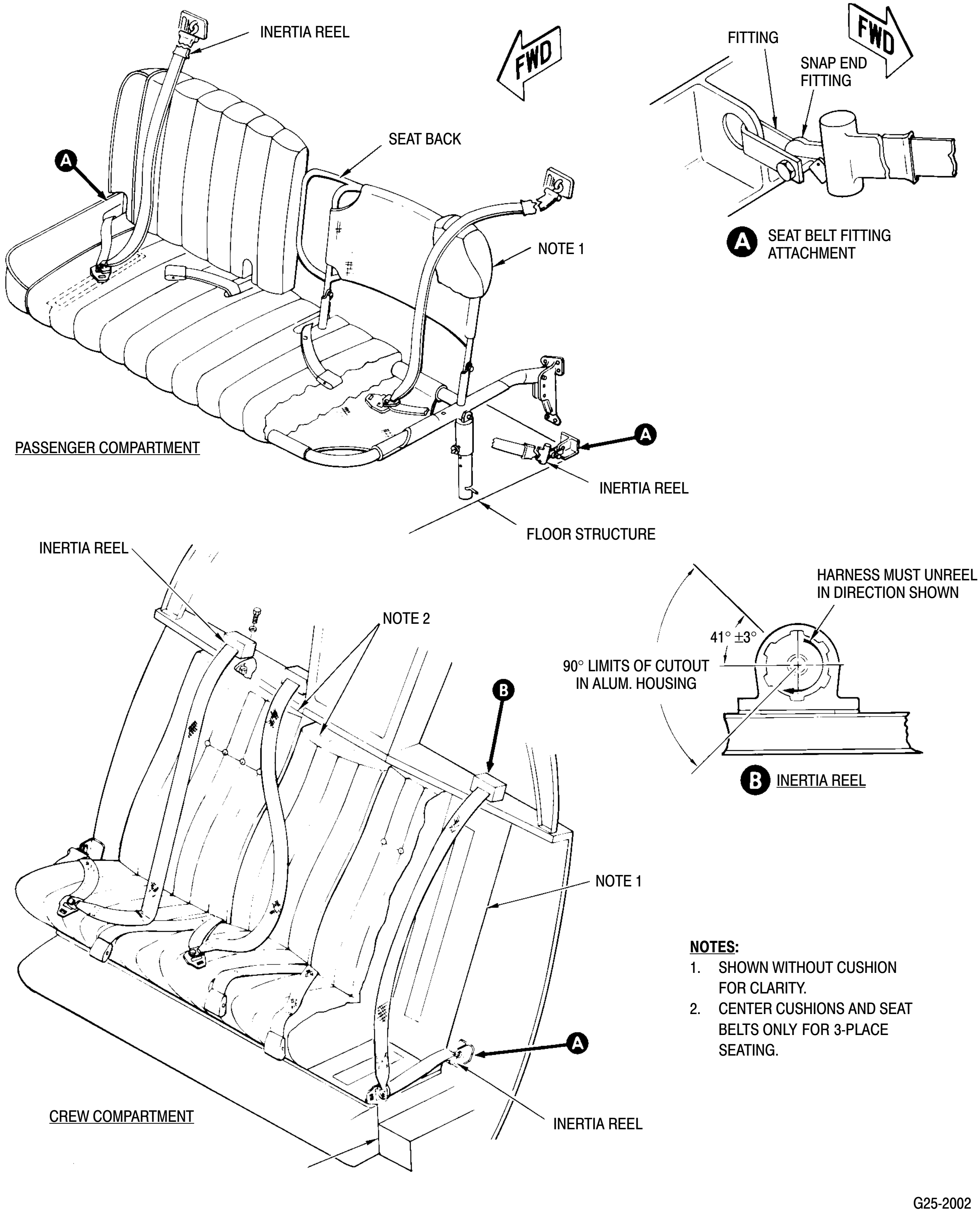


Figure 201. Seat Belt/Inertia Reel Installation (Sam Browne Style) (369D)

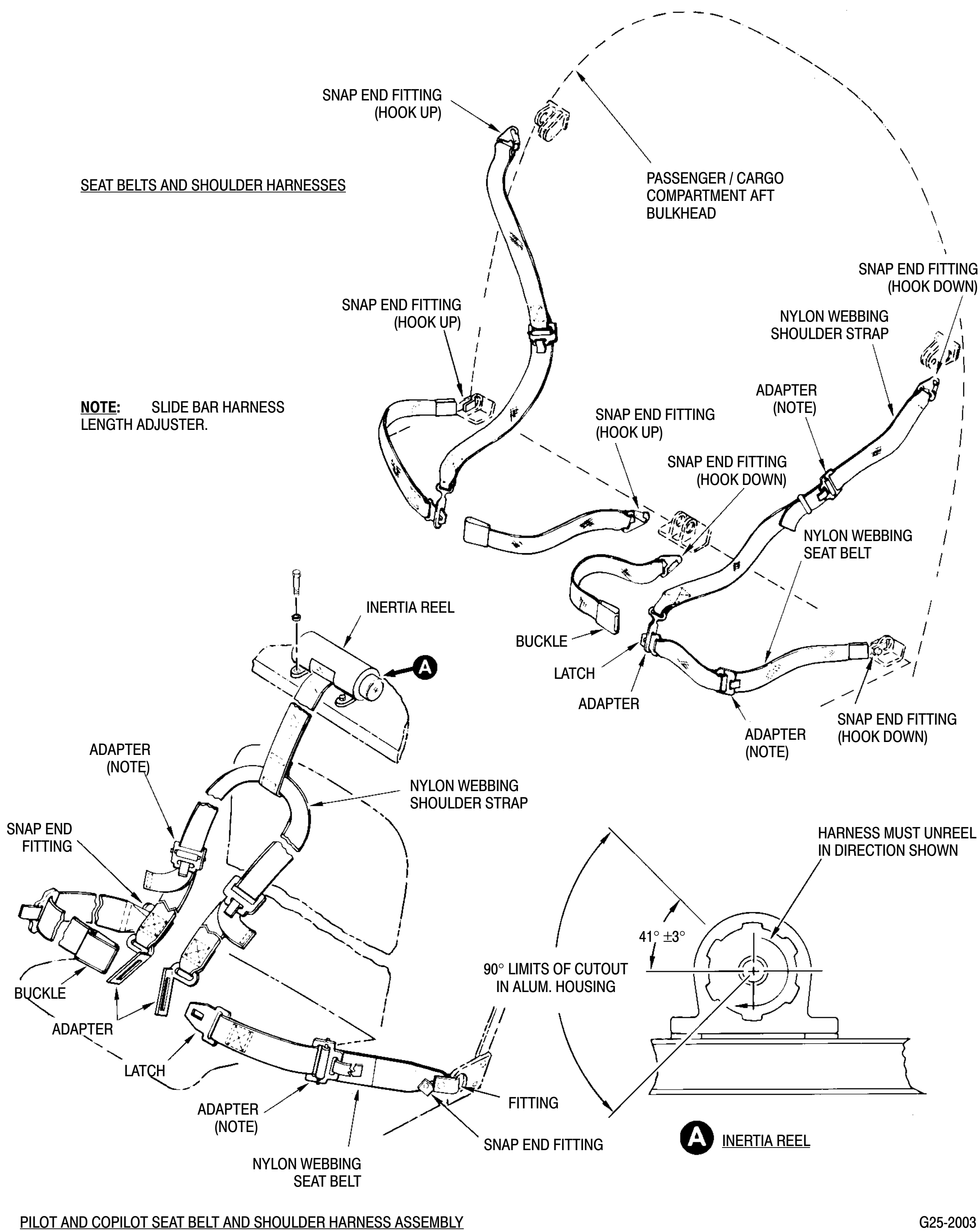


Figure 202. Seat Belt/Inertia Reel Installation (Yoke Style) (369D)

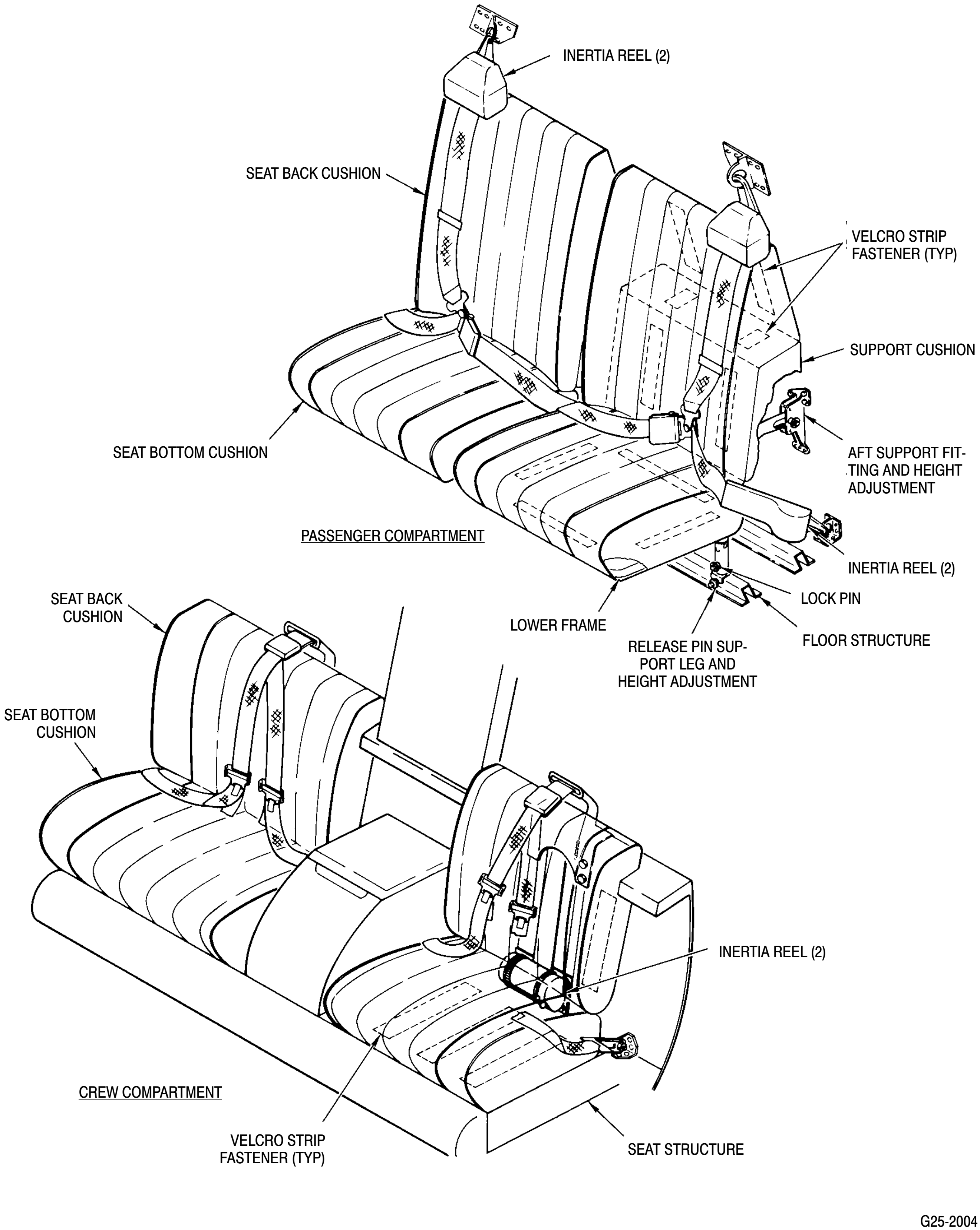


Figure 203. Seat Belt/Inertia Reel Installation (Yoke Style) (369E/FF - 500N)

5. Crew Seat Belt/Harness Replacement With Manual Lock Option (369D/E/FF - 500N)

(Ref. Figure 204 and Figure 205)

(1). Remove seatbelts by unfastening snap type end fittings from bulkhead structure fittings.

(2). Remove inertia reel, with harness, from fiberglass mount by loosening four bolts and upper ferrule nut.

(3). Install seatbelts by fastening snap type end fittings to bulkhead structure fittings.

(4). Install inertia reel, with harness, to fiberglass mount with ferrule nut and four bolts, nuts and washers.

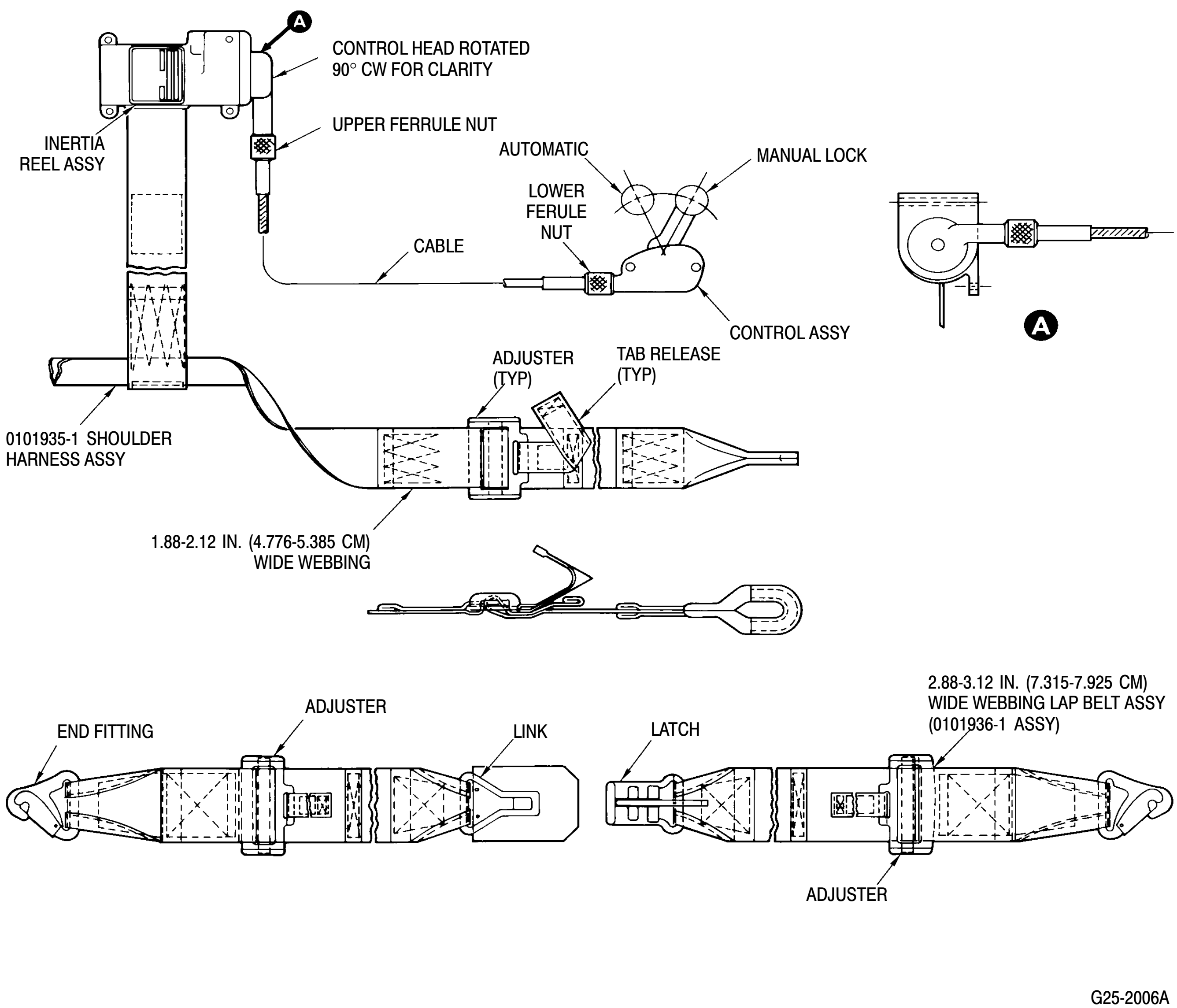
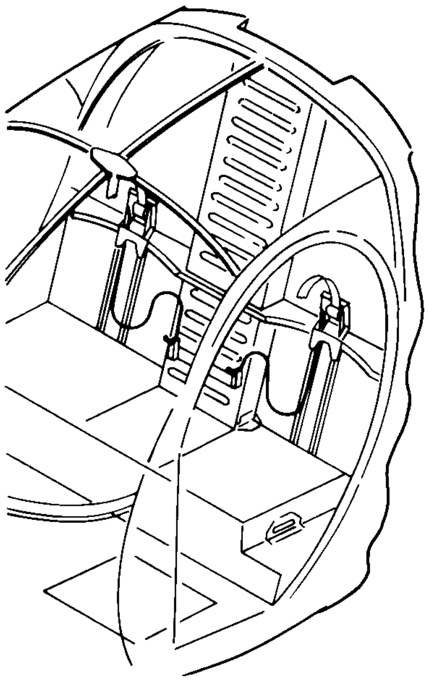


Figure 204. Webbed Shoulder Harness and Seat Belt Installation with Manual Inertia Reel Lock (369D)



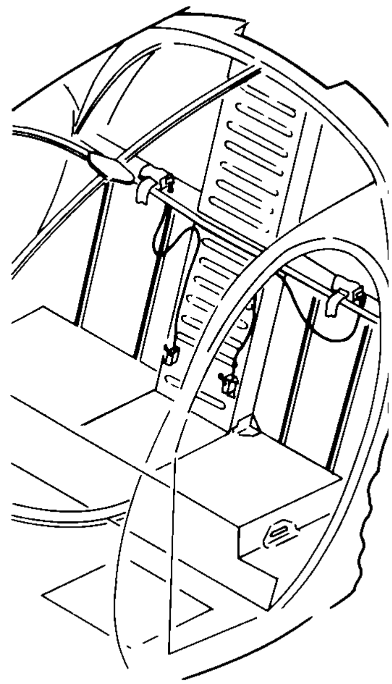


Figure 205. Crew Inertia Reel Installation with Manual Inertia Reel Lock (369D/E/FF - 500N)

6. Seat Belt/Inertia Reel Testing

(Ref. Pull tests of seat belts and shoulder strap harnesses shall be accomplished in accordance with FAA AC 43.13-1A, Aircraft Inspection and Repair, and TSO C22.

7. Seat Belt/Inertia Reel Inspection

WARNING **Ensure center passenger lap belt is installed with tongue portion to the right of the seat and buckle portion to the left. (Quick release of the lap belt and shoulder strap may be impaired if the assembly is improperly installed.) If tongue and buckle portions are reversed, remove and reinstall in correct positions and document reinstallation in Compliance Record of Helicopter Log Book.**

(1). Pull seat belt or shoulder strap out of inertia reel to full extended length. Ensure harness strap cannot be pulled out of inertia reel. With tension released, harness strap should automatically reel back into reel. Exert a sudden forward pull on seat belt or shoulder strap to ensure inertia reel locks.

(2). Inspect inertia reels, snap end fittings, adjusters, links, buckles, latches and belt attachment fittings for cracks, wear, corrosion and deformation. Check for freedom from binding, ease of adjustment and operation as applicable. If doubt exists as to strength, perform pull test (Ref. Seat Belts/Inertia Reel Testing).

(3). Inspect shoulder harnesses and seat belts for worn, frayed or deteriorated condition, and loose stitching.

(4). (Manual Lock Option) Check mechanical inertia lock mechanism for proper operation, with handle up and with handle down. Inspect fiberglass mounts for cracking and separation. Inspect laminates for debonding.

8. Seat Belt/Inertia Reel Repair

(1). Replace seat belts and shoulder straps if fabric is frayed, worn, deteriorated, stitching is loose, or if enertia reels are destroyed or do not function properly.

(2). Polish minor nicks and scratches. Restore protective finish to aluminum parts as required.

(3). Repair fiberglass mounts (Ref. Sec. 25-30-00, Boltaron Trim Panels Repair).

9. Seat Belt/Restraint Harness, Crew Seat, Replacement (600N)

(Ref. Figure 206)

A. Seat Belt/Restraint Harness Removal

(1). Release end fittings to remove lap seat belts.

(2). Remove hardware that attaches inertia reel to mounting surface.

(3). Remove complete seat belt restraint harness from seat.

B. Seat Belt/Restraint Harness Installation

(1). Position lap seat belt and shoulder harness into seat assembly.

(2). Engage end fittings attaching lap seat belts.

(3). Install hardware attaching inertia reel to mounting surface.

(4). Ensure proper engagement and release of seat buckle and inertia reel mechanism.

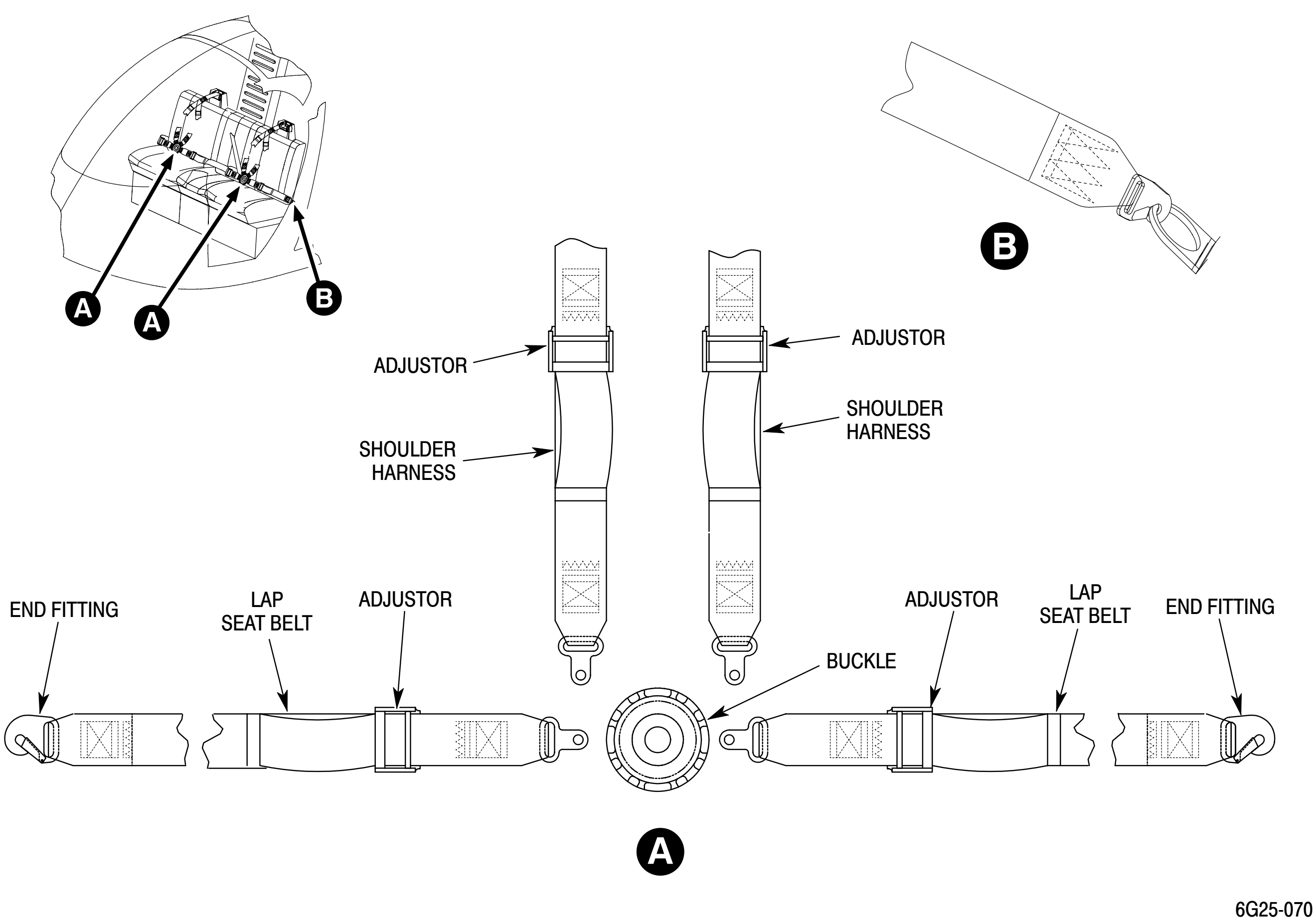


Figure 206. Seat Belt/Restraint Harness Installation, Crew Seat (600N)

10. Seat Belt/Restraint Harness, Mid Passenger Seat, Replacement (600N)

(Ref. Figure 207) These three individual seat belt harnesses are completely contained in the seat assembly and attach to the seat frame. This feature aids in the quick removal and installation of the mid bench seat assembly.

A. Seat Belt/Restraint Harness Removal

(1). Remove hardware that attaches inertia reel end of harness to seat back.

(2). Release end fitting that attaches lap seat belt to seat frame.

(3). Release end fitting that attaches buckle end of harness to seat frame.

(4). Remove seat belt/restraint harness.

B. Seat Belt/Restraint Harness Installation

(1). Position seat belt/restraint harness into seat assembly.

(2). Engage end fitting attaching buckle end of harness to seat frame.

(3). Engage end fitting attaching lap belt to seat frame.

(4). Install hardware attaching inertia reel end of harness to seat back.

(5). Ensure proper engagement and release of seat buckle and inertia reel mechanism.

11. Seat Belt/Restraint Harness, Aft Passenger Seat, Replacement (600N)

(Ref. Figure 207)

A. Seat Belt/Restraint Harness Removal

(1). Remove hardware that attaches inertia reel end of harness to mounting surface.

(2). Release end fitting that attaches lap belt to mounting surface.

(3). Release end fitting that attaches buckle end of harness to mounting surface.

(4). Remove seat belt/restraint harness.

B. Seat Belt/Restraint Harness Installation

(1). Position seat belt/restraint harness into seat assembly.

(2). Engage end fitting attaching buckle end of harness to mounting surface.

(3). Engage end fitting attaching lap belt to mounting surface.

(4). Install hardware attaching inertia reel end of harness to mounting surface.

(5). Ensure proper engagement and release of seat buckle and inertia reel mechanism.

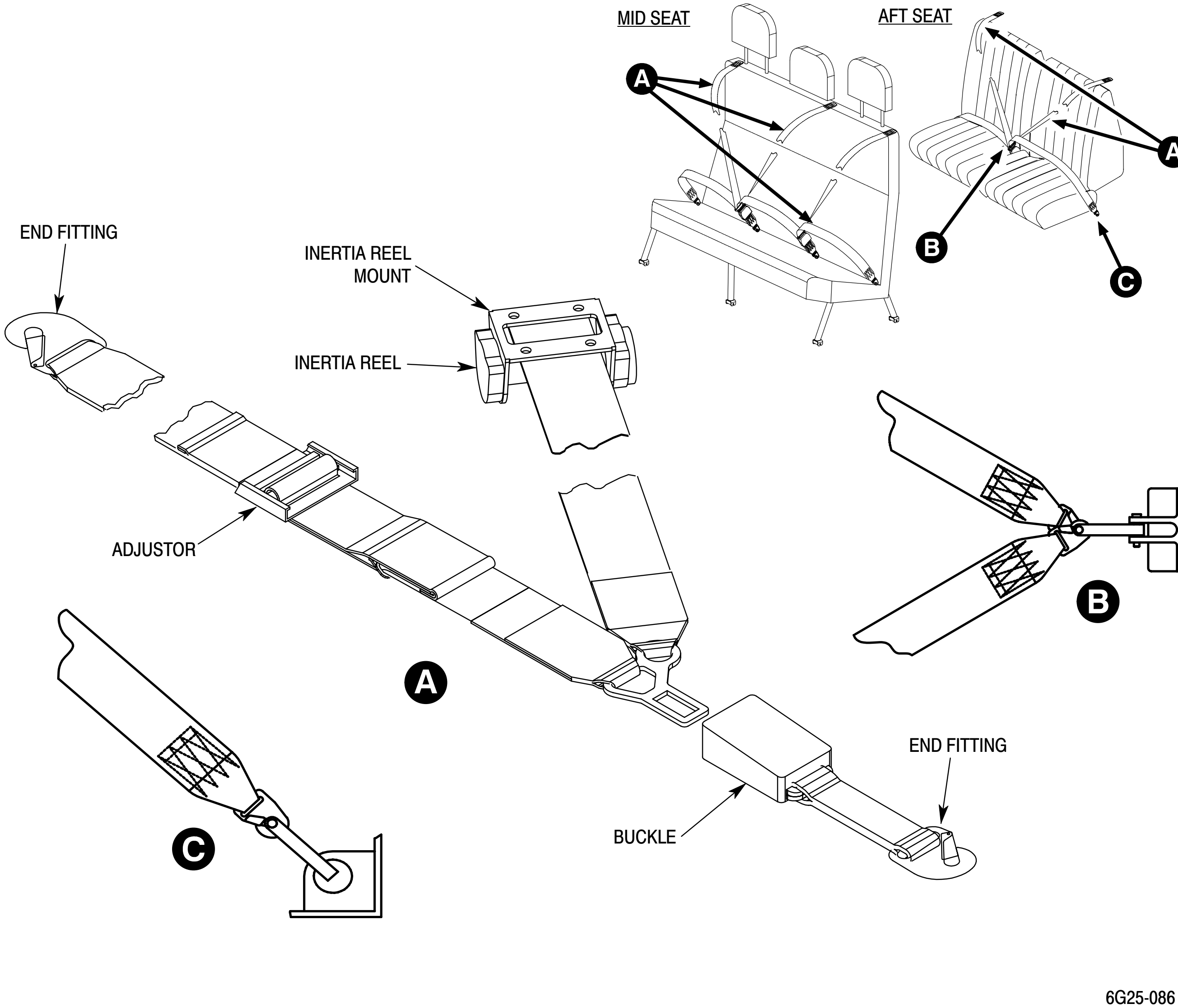


Figure 207. Seat Belt/Restraint Harness Installation, Passenger Seats (600N)

12. Comfort Clip Installation and Decal Application (369D/E/FF - 500N)

(Ref. Figure 208 and Figure 209) The comfort clip is designed to maintain proper strap tension and relieve excessive pressure of the inertia reel shoulder harness on the pilot or passenger during flight. It is available for installation on helicopters equipped with Sam Browne style seat belt assemblies.

(1). Pry open slot on underside of clip.

(2). Insert harness strap in slot.

(3). After seat belt and shoulder harness assembly is fastened and adjusted for individual comfort and safety, slide comfort clip up on harness strap and position as close as possible next to inertia reel.

(4). After each flight, reposition comfort clip on harness strap at original position next to buckle.

(5). Clean panel or door frame where decal is to be applied. Decals will not adhere to a greasy or soapy film.

(6). Mark location(s) of decal per the illustrations.

(7). Peel backing off decal and position. Use a cloth to squeeze all bubbles from under the decal, working from the center outward.

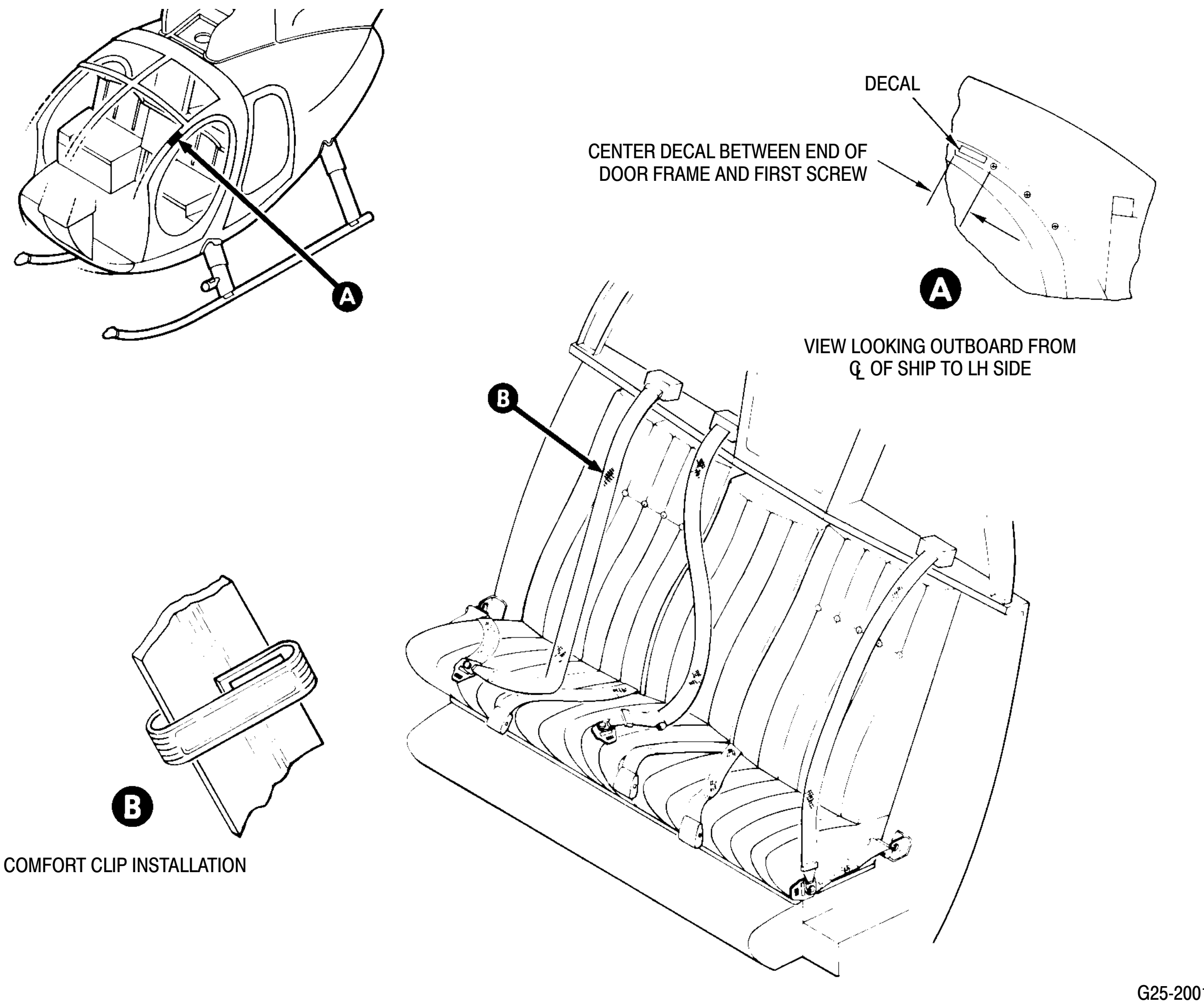


Figure 208. Comfort Clip Installation and Crew Compartment Decal Application (369D/E/FF - 500N)

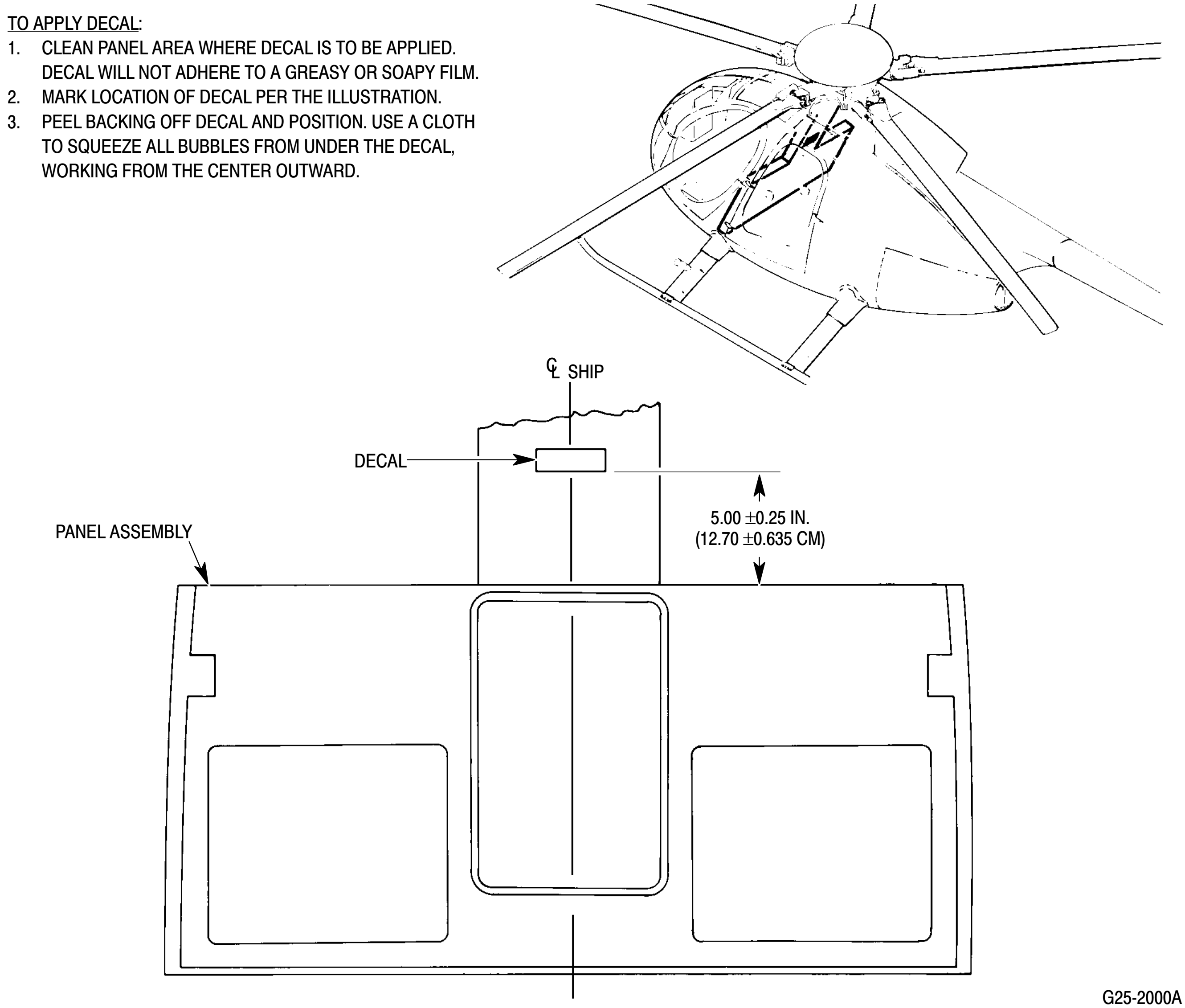


Figure 209. Comfort Clip Decal Application - Passenger Compartment (369D/E/FF - 500N)

Section

25-21-00

Seating/Belts (Four on the Floor)

SEATING/BELTS (FOUR ON THE FLOOR) MAINTENANCE PRACTICES

1. General

NOTE: This option has an aircraft effectivity limit. Refer to CSP-IPC-4 for effectivity.

The four on the floor seating and belt installation is designed for maximum use of the passenger compartment for transportation of personnel. The installation consists of four floor-installed seat assemblies with seat belts and shoulder straps at each position. The two aft-facing seat positions include head and back restraint panels mounted on Cant. Sta. 78.50 structure.

The shoulder strap is adjusted to cross the passenger's chest from outboard shoulder to center of lap where it joins the seat belt assembly. Seat belts are adjusted by individual passengers for a close and comfortable fit.

The installation for the early configuration is designed for use with a high shoulder beam. The current configuration installation is used for a low shoulder beam.

NOTE: Shoulder straps for aft-facing passengers are installed on early configuration helicopters only.

2. Seating/Belt Replacement

A. Seating/Belt Removal

(Ref. Figure 902 and Figure 903)

(1). Remove seat assemblies by lifting tabbed rivets from holes in floor stiffeners (two per seat), then lift seat up (Ref. Figure 903).

(2). Remove restraint panels by removing four screws and washers from each panel bracket assembly (Ref. Figure 902).

(3). Remove seat belt assemblies and shoulder straps by unsnapping hooks at structure-mounted fittings.

B. Seating/Belt Installation

(Ref. Figure 902 and Figure 903)

(1). Install seat assemblies by placing seat in position and inserting tabbed rivets into holes in floor stiffeners (Ref. Figure 903).

(2). Install restraint panels by securing each panel at bracket assemblies with four screws and washers (Ref. Figure 902).

(3). Install seat belt assemblies and shoulder straps by snapping hooks to structure-mounted fittings.

3. Seating/Belt Inspection

(Ref. Sec. 25-20-00, Seat Belt/Inertia Reel Inspection)

4. Seating/Belt Cleaning

(Ref. Sec. 20-20-00, Fuselage Interior Trim or Upholstery Cleaning or 25-20-00, Crew Seat Belt/Harness Cleaning)

5. Seating/Belt Repair

(1). Repair minor tears and cuts to the seat and restraint panel coverings (Ref. Sec. 25-20-00, Seat Belt/Inertia Reel Repair).

(2). Replace unserviceable seats and restraint panels.

(3). Seat belts or shoulder straps that show signs of wear, deterioration, fraying, or loose stitching must be replaced.

SEATING/BELTS (FOUR ON THE FLOOR) INITIAL INSTALLATION

1. Seating/Belts (Four on the Floor) Initial Installation

NOTE: This option has an aircraft effectivity limit. Refer to CSP-IPC-4 for effectivity.

Consult the optional equipment table (Ref. Table 202, Sec. 01-00-00) for model applicability for seating/belts (369H90035) installations. The -501 and -503 installations are covered in the following paragraphs.

A. Preparation for Installation

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

(1). Ensure all electrical switches are set to OFF position. Recheck master switch for OFF position.

(2). Identify all components and attaching hardware to be removed for access to work areas. Protect components from damage and foreign matter until reinstalled.

(3). After drilling or cutting, remove burrs and metal particles. Apply a thin coat of primer (CM318) to all bare metal areas.

NOTE: An application of color-matched paint may be applied to primer painted reworked areas and to installed hardware.

B. Removal of Existing Equipment

Prior to installing the seating and belts for four, a limited number of items must be removed from the helicopter passenger compartment to accommodate installation.

(1). Remove passenger compartment seats by releasing quick-disconnects on seating structure at floor and firewall fittings.

(2). Remove existing passenger compartment seat belt and shoulder strap assemblies.

(3). Remove passenger compartment carpet floor covering.

(4). Remove aft trim panel from Cant. Sta. 78.50 and disconnect cigarette lighter wiring.

(5). Remove bulkhead trim panels or insulation blankets at Sta. 124.00 in area of WL 40.00 and BL 20.00 right and left seats.

(6). (369D only) Remove crew compartment outboard seat backs.

C. Seating and Belts Installation - General

Installation of the seating and belts for four includes procedures for installing restraint panels on Cant. Sta. 78.50, seat assemblies, shoulder straps, and seat belt assemblies.

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

NOTE:

- Use Cleco clamps and fasteners as required to facilitate rivet installation, and install rivets with wet primer (CM318).
- Rivets are equally spaced and are normally positioned twice the diameter of the rivet shank from the outside edge of the material, edge joggle, or flange radius.

D. Cant. Sta. 78.50 Brackets, Fittings and Restraint Panels Installation

(Ref. Figure 901, Figure 902 and Figure 904)

(1). On Cant. Sta. 78.50, WL 22.45, remove four existing bracket rivets in area of LBL 8.25 and four rivets in area of LBL 19.25.

(2). Position bracket assemblies to match holes in removed rivet pattern. Locate and drill four 0.1285 inch (3.2639 mm) holes in each bracket.

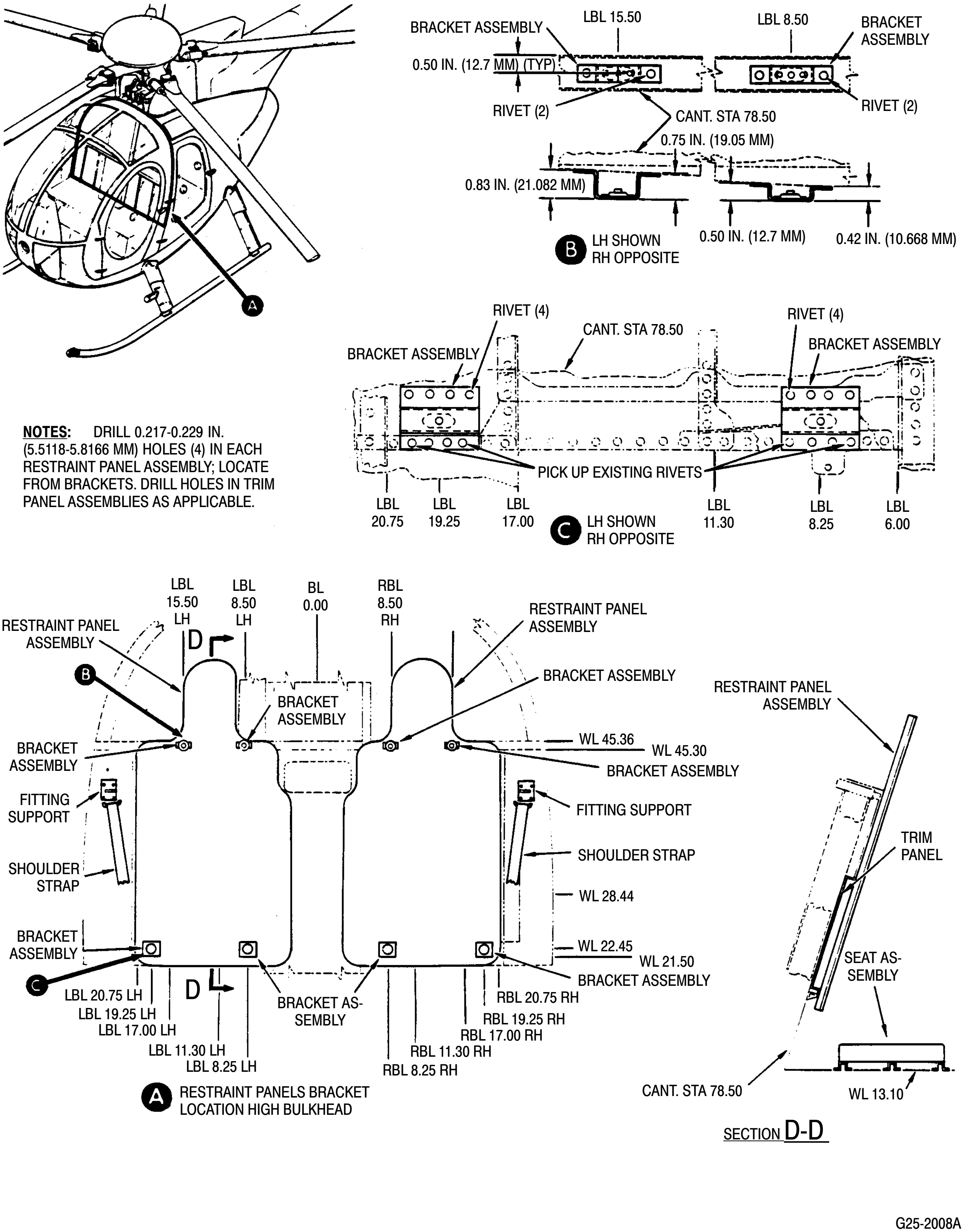


Figure 901. Restraint Panel Assemblies and Hardware Installation (369D)

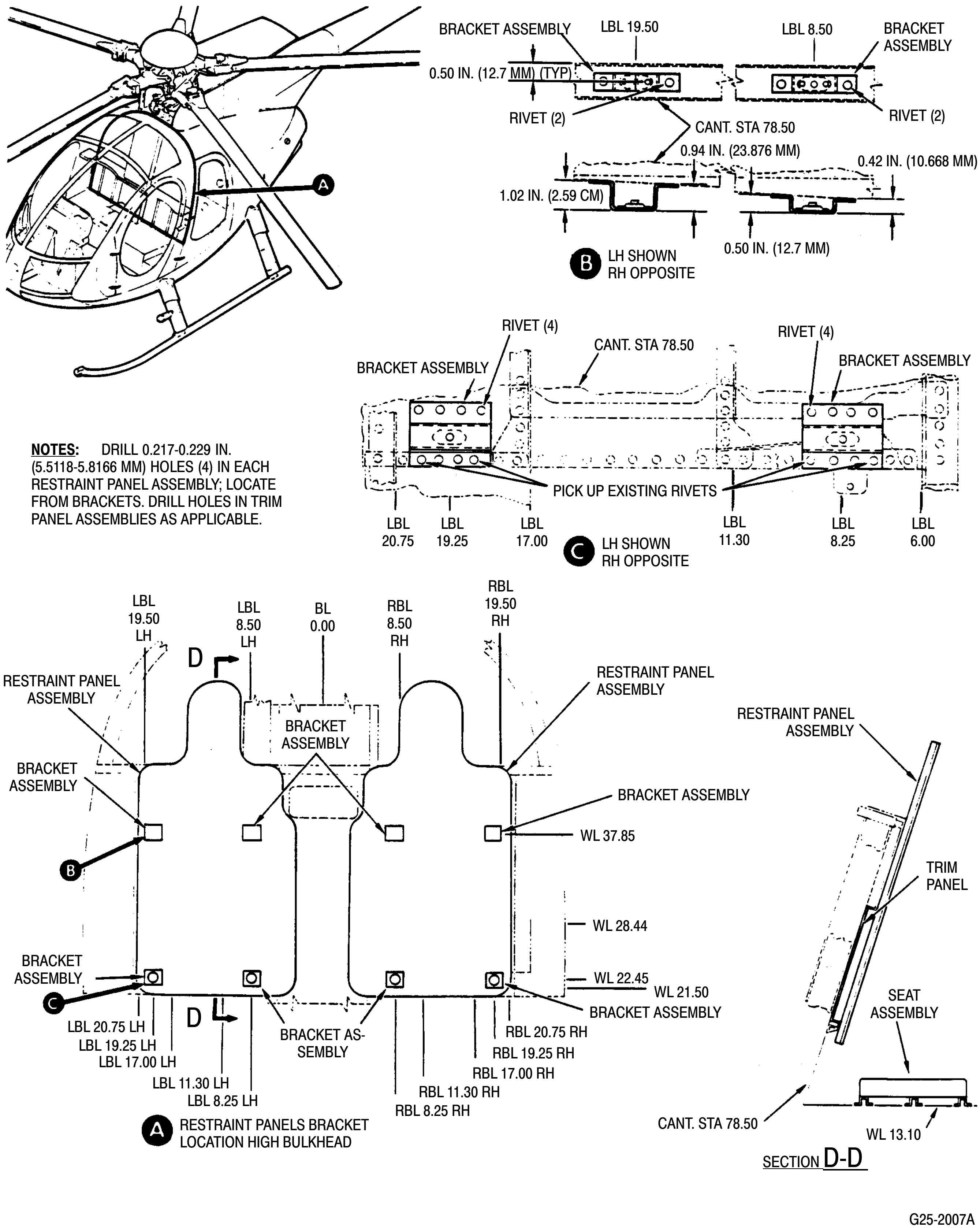


Figure 902. Restraint Panel Assemblies and Hardware Installation (369E/FF - 500N)

(3). Hold brackets in position with Cleco fasteners and drill four 0.1285 inch (3.2639 mm) holes through upper flange of each bracket and through Cant. Sta. 78.50 web.

(4). Install bracket assemblies with 16 rivets.

(5). Repeat last four steps to install two bracket assemblies to opposite side.

(6). (369D only) Install bracket assemblies as follows:

(a). On WL 45.33, position bracket assembly at LBL 15.50 and drill two 0.1285 inch diameter holes through bracket and Cant. Sta. 78.50 channel.

(b). Install bracket assembly with two blind rivets.

(c). On WL 45.33 L/H, position bracket assembly at LBL 8.50 and drill two 0.1285 inch diameter holes through bracket and Cant. Sta. 78.50 channel.

(d). Install bracket assembly with two blind rivets.

(e). Repeat last four steps to install two bracket assemblies R/H opposite.

(7). (369E/FF only) Install bracket assemblies as follows:

(a). On WL 37.85, position bracket assembly at LBL 19.50 L/H. Drill two 0.1285 inch (3.2639 mm) holes through bracket and Sta. 78.50 channel.

(b). Install bracket assembly with two blind rivets.

(c). On WL 37.85, position bracket assembly at LBL 8.50 L/H. Drill two 0.1285 inch (3.2639 mm) holes through bracket and Cant. Sta. 78.50 channel.

(d). Install bracket assembly with two blind rivets.

(e). Repeat last four steps to install R/H bracket assemblies.

(8). (369D only) Install shoulder strap fittings for aft-facing passenger seat as follow:

(a). On left side of Cant. Sta. 78.50 bulkhead frame, locate four existing nutplates in area of WL 41.06 and BL 24.74.

(b). Attach shoulder strap fitting with four screws.

(c). On right side of Cant. Sta. 78.50 bulkhead frame, locate four existing nutplates in area of WL 41.06 and BL 24.74.

(d). Attach shoulder strap fitting with four screws.

(e). Attach L/H fitting to nutplates in L/H tee using four screws.

(f). Attach R/H fitting to nutplates in R/H tee using four screws.

(g). Cut out slots in removed passenger compartment forward trim panels to accommodate lugs of shoulder strap fittings.

(9). Drill four 0.217-0.229 inch (5.5118-5.8166 mm) holes in forward trim panel, and four holes in each restraint panel. Locate holes from bracket assemblies and install as in steps (1). thru (8).

(10). Reinstall forward trim panel (connect cigarette lighter wiring).

(11). Install passenger compartment carpet floor covering.

(12). (369D only) Install fitting cap to L/H and R/H shoulder strap fittings with two screws each side.

(13). Install restraint panel to L/H side over trim panel with four washers and screws.

(14). Install restraint panel to R/H side over trim panel with four washers and screws.

(15). Reinstall crew compartment seat back assemblies.

E. Seat Assemblies Installation

(Ref. Figure 903)

NOTE: Seat assemblies are position- interchangeable.

(1). Position seat assemblies on floor structure to locations specified.

(2). Secure seats in position by pressing tabbed rivets into holes in floor stiffeners.

F. Aft Seat Belt Assemblies and Shoulder Straps Installation

(Ref. Figure 903)

(1). On both left and right sides of Cant. Sta. 128.00 locate four existing nutplates in areas of WL 40.0 and BL 20.0.

(2). Attach a shoulder strap support fitting on each side, using four washers and screws for each fitting.

(3). Cut out slots in removed trim panels or insulation blankets to accommodate lugs of new support fittings.

(4). Reinstall trim panels or insulation blankets.

(5). Connect a shoulder strap to each fitting.

NOTE: Adjust shoulder strap to cross passenger's chest from outboard shoulder to inner center of lap.

(6). Locate the three existing cargo floor seat belt fittings on the passenger compartment floor at Sta. 124.00.

NOTE: All seat belt assemblies are to be installed as shown and as noted on cloth identification labels attached to each seat belt assembly. The two center belts are installed with hooks down.

(7). Connect adjustable portion of seat belt assembly to the R/H fitting and nonadjustable portion to center fitting.

(8). Connect adjustable portion of seat belt assembly to L/H fitting and nonadjustable portion to center fitting.

G. Forward Seat Belt Assemblies and Shoulder Straps Installation

(Ref. Figure 904)

(1). (369D only) Connect a shoulder strap to each shoulder strap fitting on Cant. Sta. 78.50.

NOTE: Adjust shoulder strap to cross passenger's chest from outboard shoulder to inner center lap area.

(2). Locate the four tiedown fitting holes on the first floor stiffener aft of Cant. Sta. 78.50.

(3). Install a cargo tiedown fitting in each floor stiffener hole.

(4). Connect adjustable portion of seat belt assembly to the L/H fitting and the nonadjustable portion to the L/H center fitting.

(5). Connect adjustable portion of seat belt assembly to the R/H fitting and the nonadjustable portion to the R/H center fitting.

H. Weight and Balance Data

(Ref. Table 901) After installation, incorporate changes to helicopter weight and balance records as instructed (Ref. Sec. 08-10-00).

Table 901. Weight and Balance Data

Configuration	Weight Pounds (kg)		Arm Inches (cm)		Moment in-lb (kg cm)	
369H90035-501						
Added	+30.2	(+13.698)	+93.5	(+237.49)	+2824	(+3253.6)
Removed	- 32.7	(-14.832)	+108.6	(+275.84)	- 3551	(-4091.2)
369H90035-503						
Added	+31.2	(+14.152)	+92.1	(+233.93)	+2874	(+3311.2)
Removed						
Seat Belts (2)	- 5.1	(-2.313)	+117.2	(+297.69)	- 598	(-689.0)
Bench Seat	- 24.7	(-11.204)	+111.0	(+281.94)	- 2742	(-3159.1)

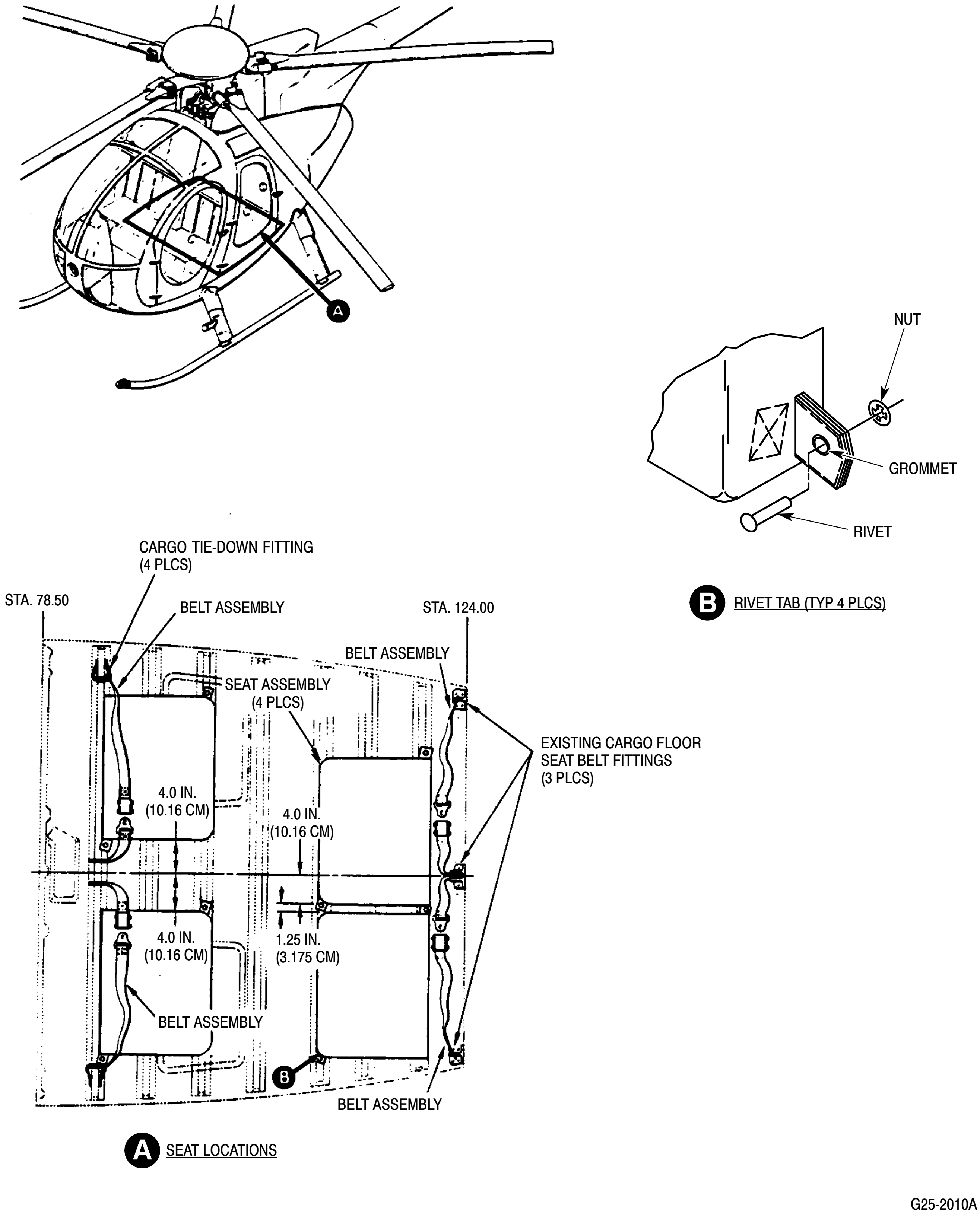
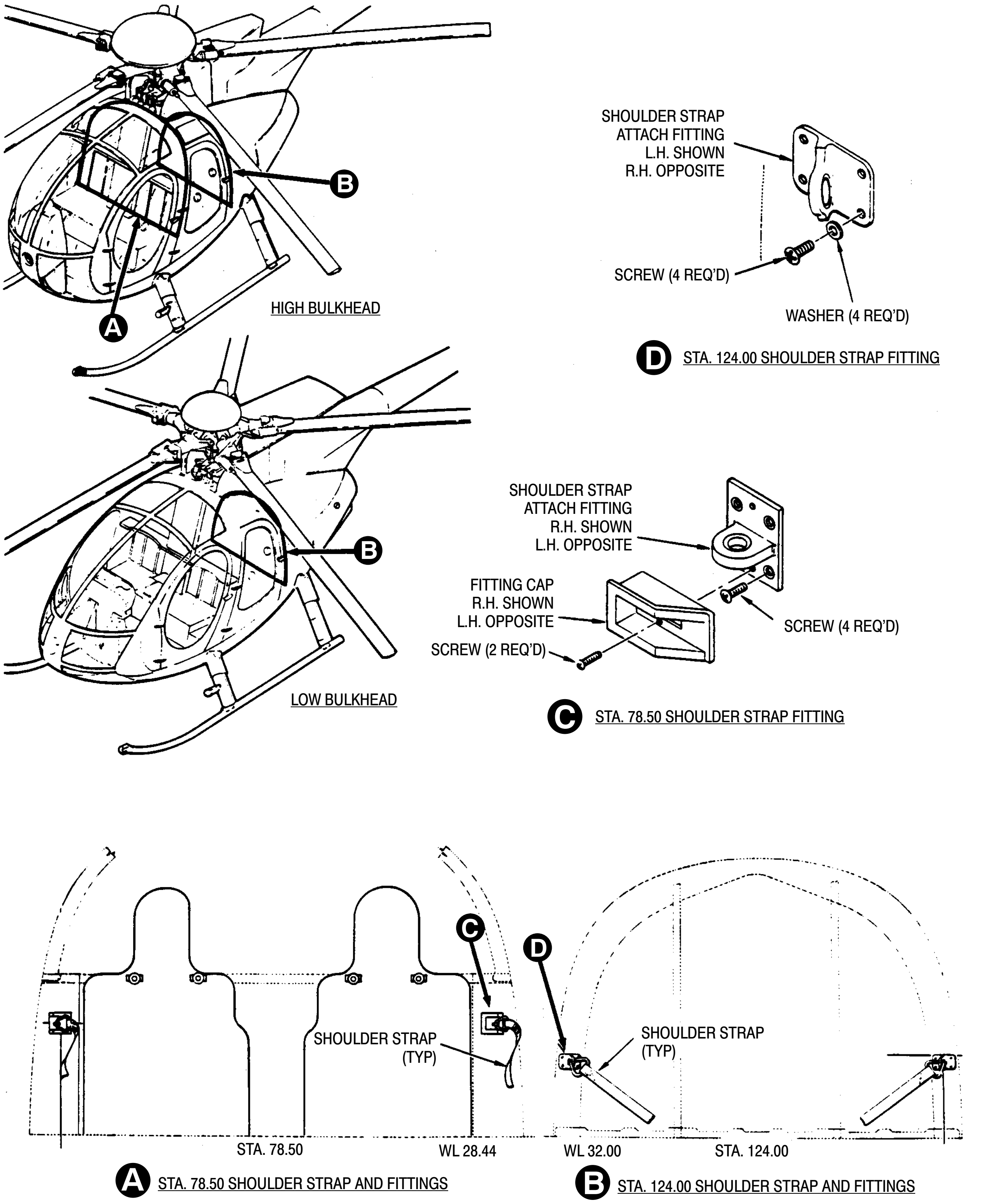


Figure 903. Seat Belt and Seat Assemblies Installation (369D/E/FF - 500N)



NOTE: PICK UP EXISTING NUTPLATES LOCATED ON CANT. STA. 78.50 BULKHEAD FRAME AND CANT. STA. 124 BULKHEAD FRAME.

G25-2009

Figure 904. Shoulder Straps and Fittings Installation (369D/E/FF - 500N)

Section

25-30-00

Interior Trim

INTERIOR TRIM
MAINTENANCE PRACTICES

1. Interior Trim

Trim panels, covers, and applicable attaching devices are found in the following locations:

(1). Models 369D/E/FF - 500N crew compartment (Ref. Figure 201).

(2). Models 369D/E/FF - 500N passenger compartment (Ref. Figure 202).

(3). Model 369D crew and passenger compartments - R/H command helicopters with center console (Ref. Figure 203).

(4). Floor trim covering and applicable methods of attachment (Ref. Figure 204).

A. Cyclic Stick Control Cover

(Ref. Figure 201) A cyclic stick control cover protects the cyclic control linkage from objects that might jam or foul control linkage. The cover extends between the pilot's and copilot's cyclic sticks at the seat bulkhead and covers the cyclic control linkage. Cyclic stick openings in the cover are protected by boot assemblies (dust covers) secured to the cover with Velcro hook and pile fasteners. The cyclic sticks pass through elastic ringed openings in the dust covers.

B. Copilot's Inboard Collective Pitch Stick Cover

The inboard collective pitch stick cover on L/H command helicopters provides access to the underseat flight controls linkage and forms a protective guard for the collective friction mechanism on the inboard collective pitch stick. A sliding protective cover at the collective pitch stick slotted opening guards against foreign object entry.

2. Interior Trim Replacement

NOTE: Electrical wires from passenger compartment cigarette lighter, optional utility light, and running time meter must be disconnected before removing and reconnected before installing associated trim panel or cover (Ref. Chap. 96).

A. Cyclic Stick Control Cover Replacement (L/H Command)

(Ref. Figure 201)

(1). Remove four upper attaching cover screws. Remove velcro attached boot assemblies from cover. Tip cover forward to remove two lower attaching screws.

(2). Remove cover from cyclic stick assembly and slip boot assemblies over cyclic stick grips.

(3). To replace, slip boot assemblies over cyclic stick grips and position cover in place. Attach boot assemblies to cover with the velcro fasteners.

(4). Tip cover forward and install two lower attaching screws. Install four upper attaching screws.

B. Copilot's Collective Pitch Stick Cover Replacement (L/H Command)

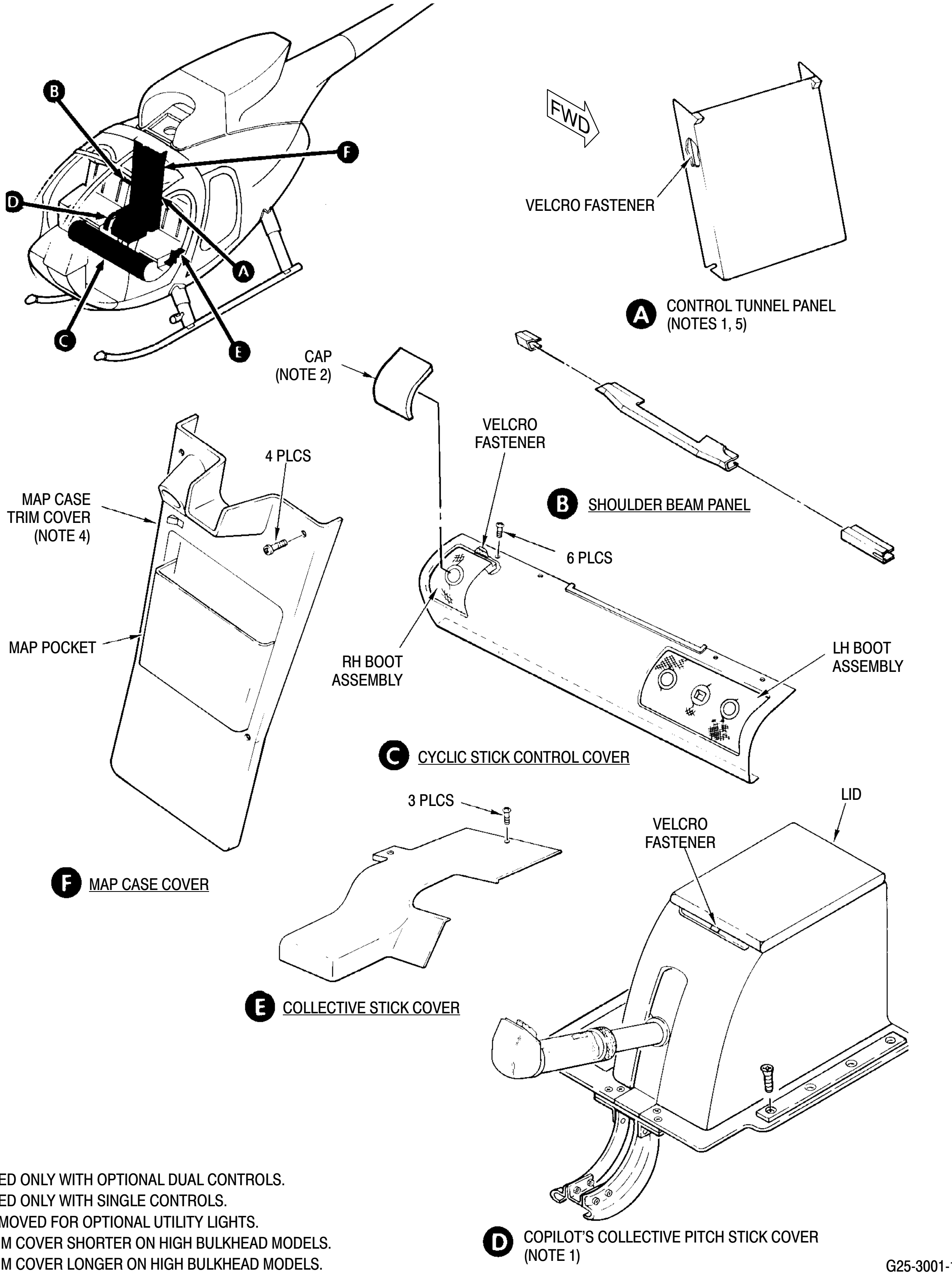
(Ref. Figure 201)

(1). Remove crew seats.

(2). Remove attaching hardware. While carefully removing cover, ensure sliding protective cover remains fixed to collective pitch stick. Partial removal of the cyclic stick control cover may be required.

(3). Spread sliding cover at collective stick and remove. If necessary, remove nylon grommet on stick (Ref. Sec. 67-10-00, Pilot's Collective Pitch Stick Replacement).

(4). To replace, install nylon grommet on collective stick. Spread sliding cover at collective stick hole and fit over nylon grommet.



NOTES:

1. USED ONLY WITH OPTIONAL DUAL CONTROLS.
2. USED ONLY WITH SINGLE CONTROLS.
3. REMOVED FOR OPTIONAL UTILITY LIGHTS.
4. TRIM COVER SHORTER ON HIGH BULKHEAD MODELS.
5. TRIM COVER LONGER ON HIGH BULKHEAD MODELS.

Figure 201. Crew Compartment Interior Trim (Sheet 1 of 2)

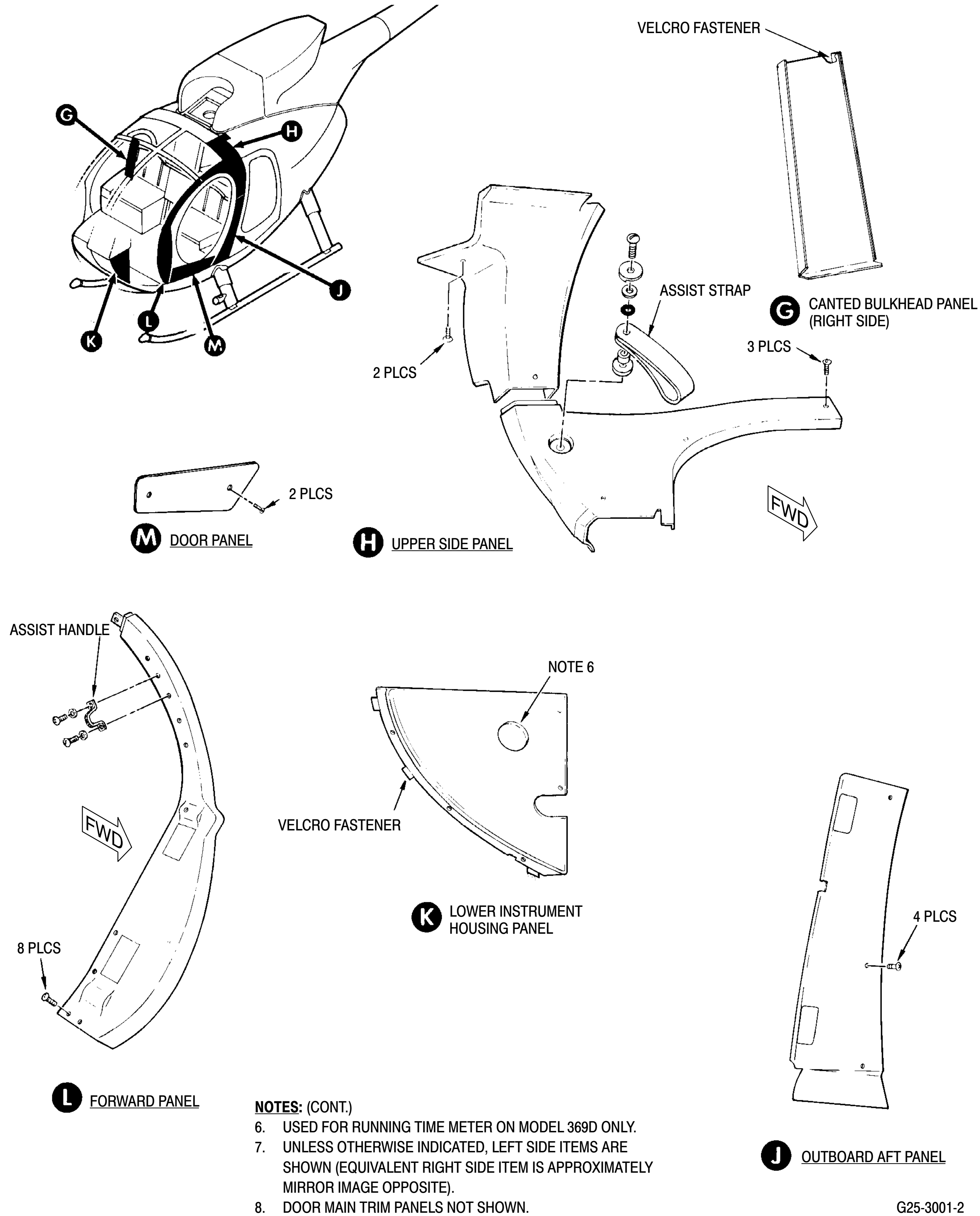


Figure 201. Crew Compartment Interior Trim (Sheet 2 of 2)

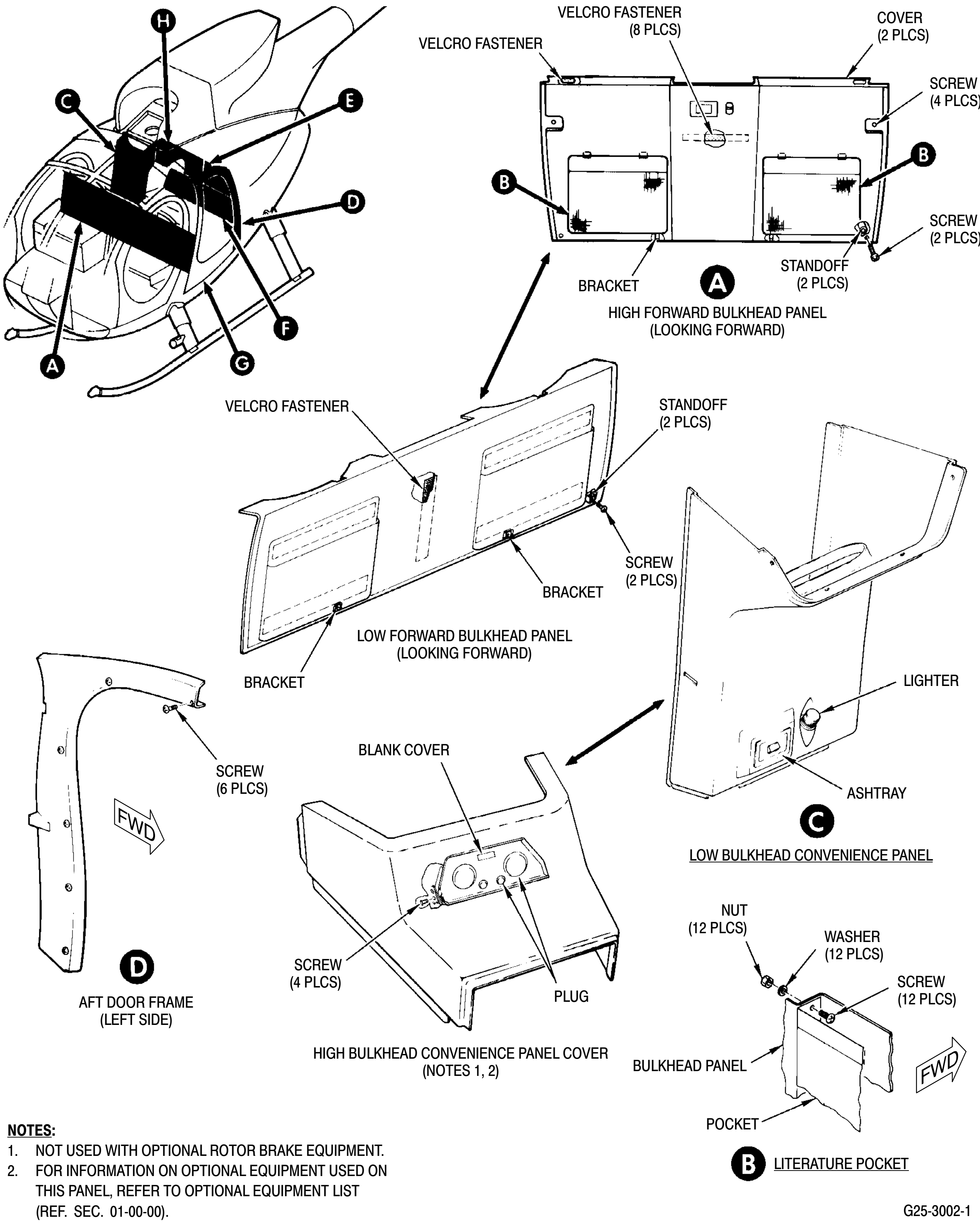


Figure 202. Passenger Compartment Interior Trim (Sheet 1 of 2)

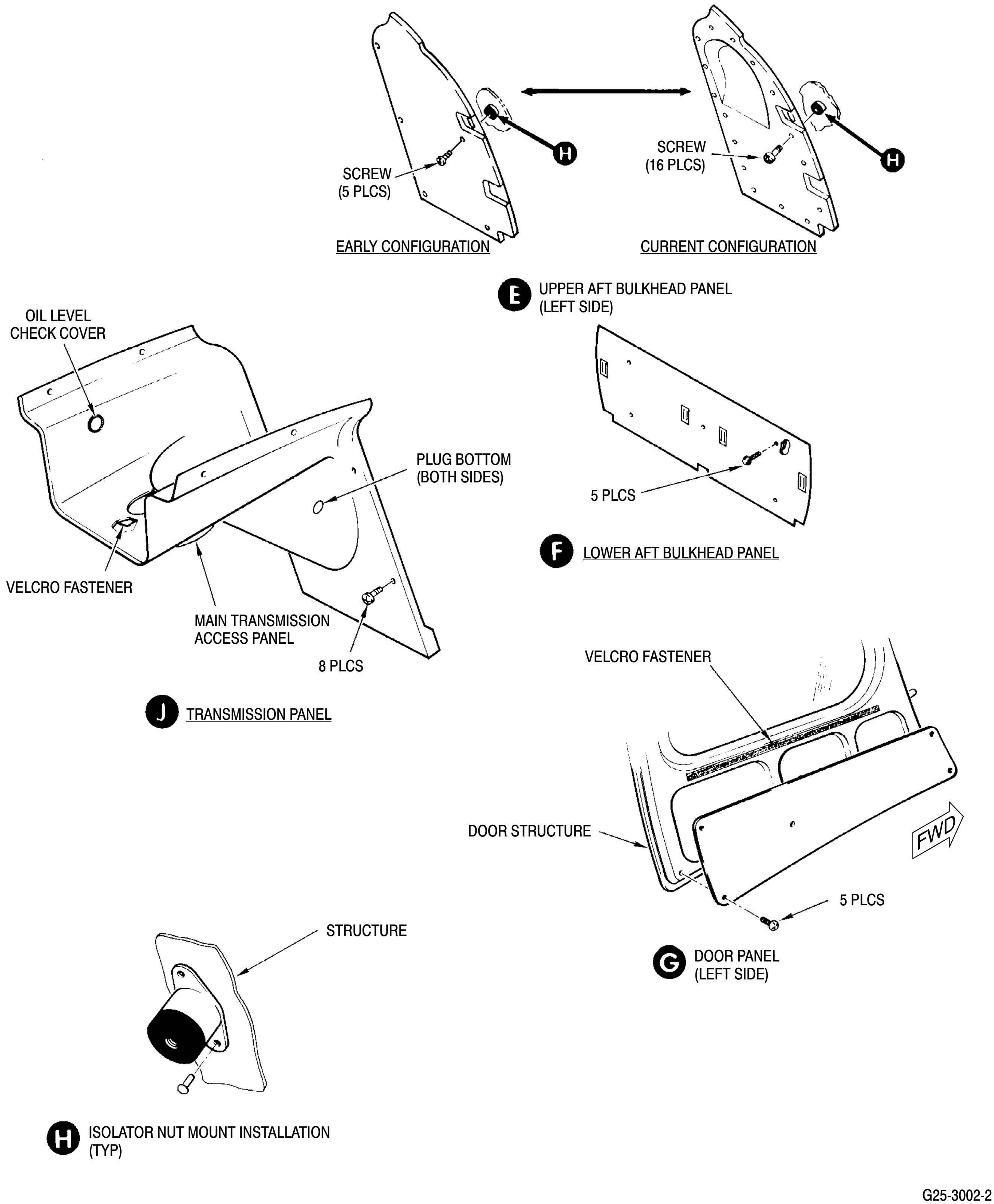


Figure 202. Passenger Compartment Interior Trim (Sheet 2 of 2)

(5). Position cover over collective stick and start upper end of sliding cover into cover tracks.

(6). Slowly lower cover and guide remainder of sliding cover upward in cover tracks.

(7). Secure with screws and washers.

(8). Install crew seats.

C. Inboard Collective Pitch Stick Cover Replacement (R/H Command)

(Ref. Figure 203) At installation, tuck bottom edge of lower curtain under support.

CAUTION Curtains must not fold inward through full travel of the collective stick. Folding inward may result in entanglement with collective stick friction gear mechanism.

D. Transmission Panel

(Ref. Figure 203) Remove low or high bulkhead convenience panel before removing transmission panel.

E. Log Book Holder (Optional for R/H Command)

(Ref. Figure 203)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM217	Isopropyl alcohol
CM432	Dichloromethane
CM433	Ethylene chloride

(1). Remove upper two screws and loosen the bottom screws.

(2). Lift holder up and out.

(3). Repair cracks or separation by cleaning with isopropyl alcohol (CM217); then apply ethylene dichloride (CM433) or dichloromethane (CM432) to patch or mate surfaces.

(4). Join immediately with light pressure to cement joint.

F. Carpeting

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM405	Adhesive
CM718	Tape, double-faced

NOTE: Carpeting is secured in place with double-faced tape or bonded with adhesive, and should not be removed unless replacement or repair is required.

(1). Tear away carpeting (if bonded) and clean surface with wire brush. Bond replacement carpeting using adhesive (CM718).

(2). Lift carpeting (if taped) away from floor and remove double-faced tape. Apply new double-faced tape (CM718) and press replacement carpeting in position.

3. Interior Trim Inspection

(1). Inspect interior trim for tears, cuts, breaks, or other evidence of unserviceable condition.

(2). Inspect trim panels and covers for loose, damaged, or missing Velcro fasteners, as applicable.

(3). Inspect fuselage structure for loose, damaged, or missing Velcro fasteners, rivnuts or isolator nut mounts, as applicable.

(4). Inspect carpeting for cuts, tears, or other unserviceable condition.

(5). Inspect foot fairings, floor trim, and access doors for cuts, breaks or cracks.

(6). Inspect Velcro fasteners on access flap for security of attachment or other damage.

(7). (L/H command helicopters) Inspect sliding cover of copilot's collective pitch stick cover for freedom of movement in cover tracks. Inspect stowage lid for condition and positive fastening.

A. Interior Trim Cleaning

(Ref. Sec. 20-20-00, Fuselage Interior Trim and Upholstery Cleaning)

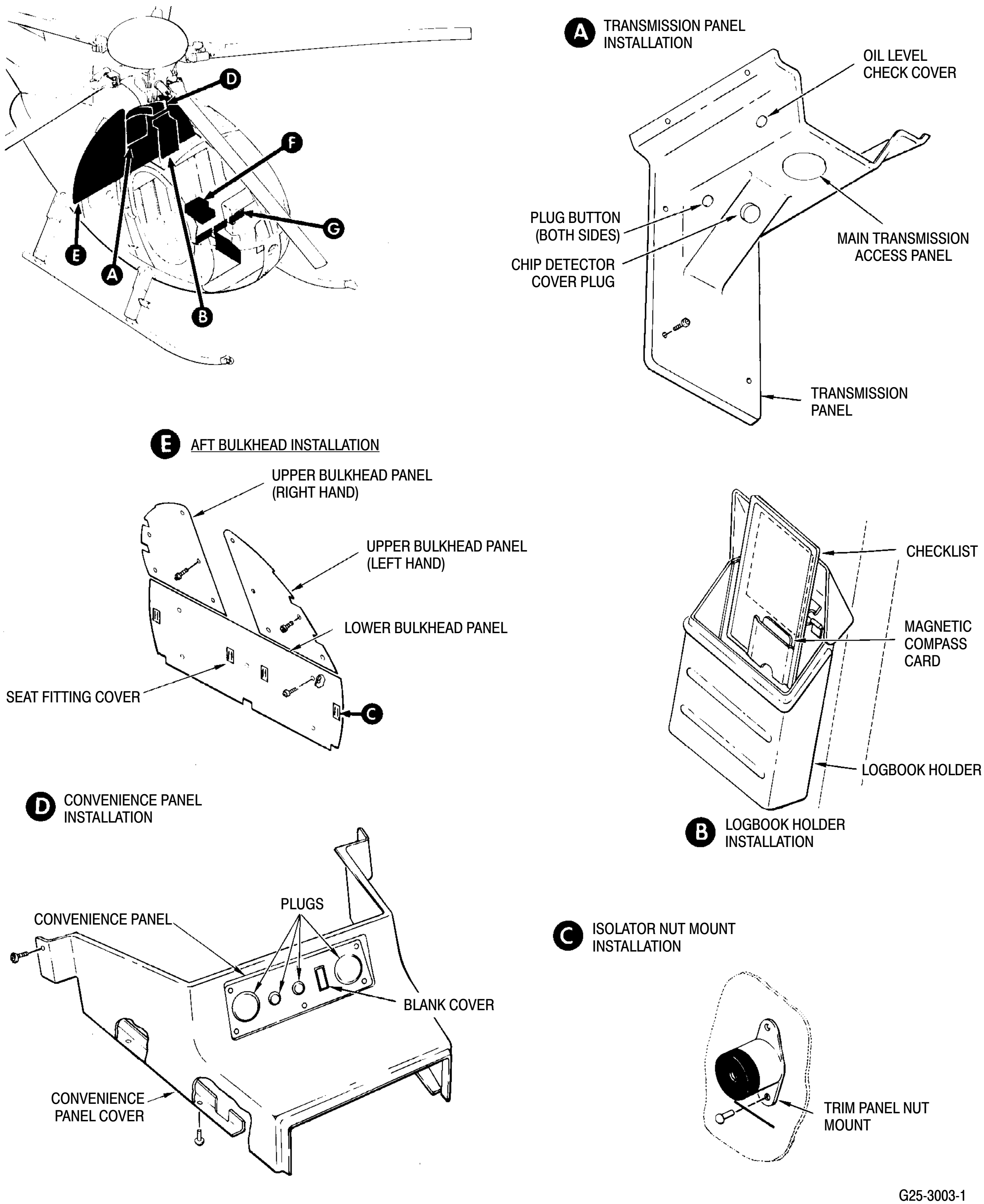


Figure 203. Crew and Passenger Compartment Interior Trim - R/H Command (Sheet 1 of 2)

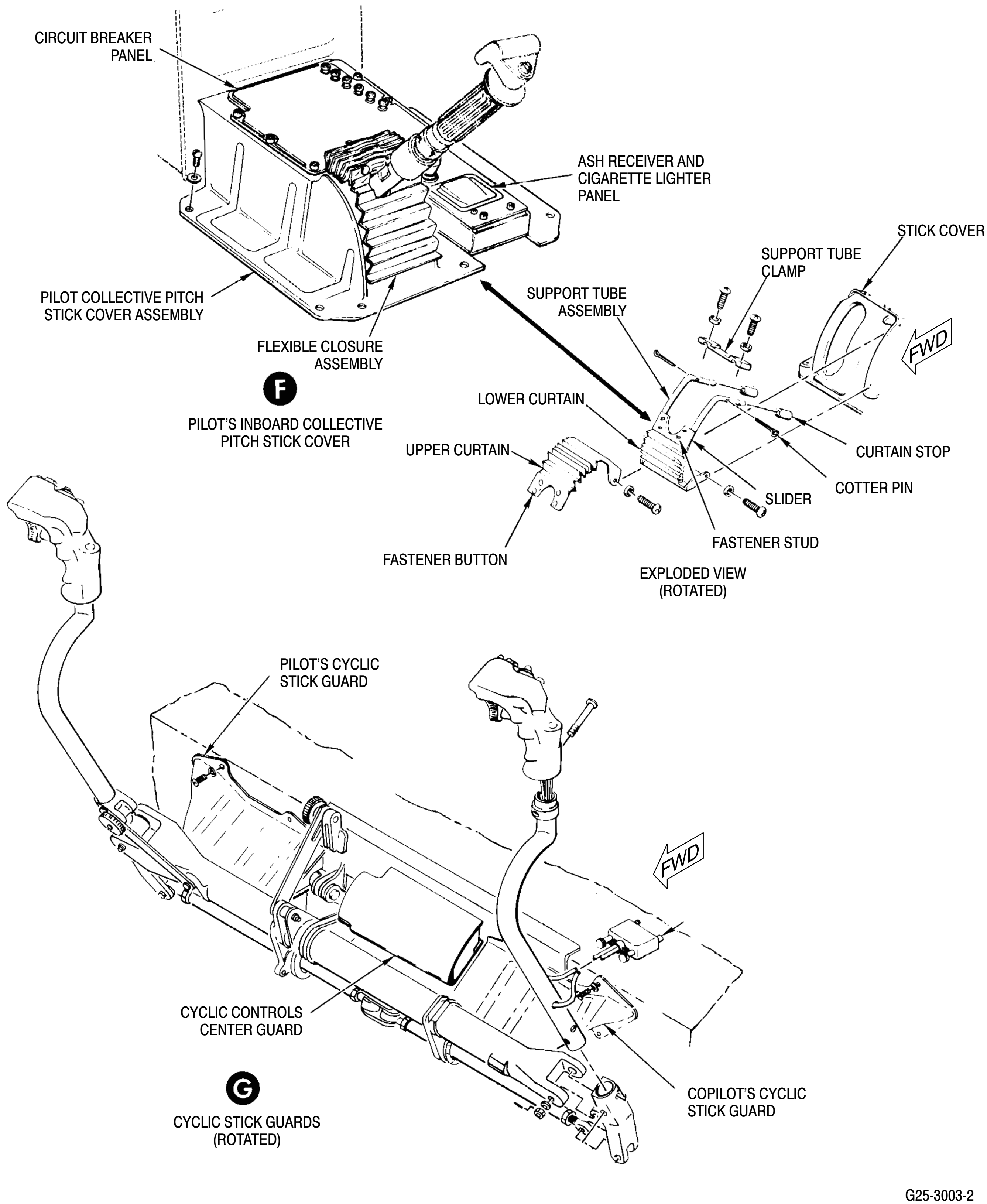


Figure 203. Crew and Passenger Compartments Interior Trim - R/H Command (Sheet 2 of 2)

4. Interior Trim and Carpeting General Repair

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM219	Methyl-ethyl-ketone
CM405	Adhesive
CM718	Tape, double-faced

(1). Remove and replace broken or missing rivnuts or isolator nut mounts, as applicable.

(2). Bond loose insulation material on underside of trim panel or cover using adhesive (CM405).

(3). Repair cut or torn floor trim or carpeting with new application of double-faced tape (CM718) or adhesive (CM405), as applicable.

WARNING MEK solvent is flammable. Use only in well-ventilated area and away from heat and flame.

NOTE: Loosened Velcro fasteners may be reactivated for adhesion by wiping original adhesive with MEK (CM219).

(4). Replace unserviceable Velcro fasteners on access flap using adhesive (89).

5. Boltaron Trim Panels Repair

A. Fiberglass Patch Method

(Ref. Figure 205)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM222	1,1,1-Trichloroethane
CM228	Surface cleaner
CM501	Fiberglass cloth
CM505	Polyester laminating resin
CM804	Emery cloth, fine

(1). Remove damaged panel.

(2). Stop-drill end(s) of crack.

(3). Deburr stop drill(s) and clean any jagged area of crack.

(4). Cut patch from fiberglass cloth to overlap damaged area or crack, minimum 1 inch (2.54 cm) in all directions.

(5). Cut second patch to overlap first, minimum 1/2 inch (12.7 mm) in all directions. If required, cut third patch to overlap second, minimum 1/2 inch (12.7 mm) in all directions.

(6). Abrade surface of panel in area to be patched with emery cloth (CM804).

(7). Clean surface by wiping with cloth, dampened not saturated, with 1,1,1-trichloroethane (CM222) or surface cleaner (CM228).

(8). Place panel in horizontal position. Tape around area to be repaired with masking tape, to catch residual resin.

(9). Apply glass cloth (CM501) to panel one ply at a time.

(10). Apply resin (CM505) to material with a brush or squeegee.

(11). Continue adding material and resin until desired thickness has been achieved.

NOTE: Heat lamp should be placed a minimum of 12 inches from fiberglass repair area.

(12). Allow repair to cure, minimum 45 minutes, at 265° ±10°F (129° ±5°C). Or alternatively, heat lamp may be used (minimum 2 hours).

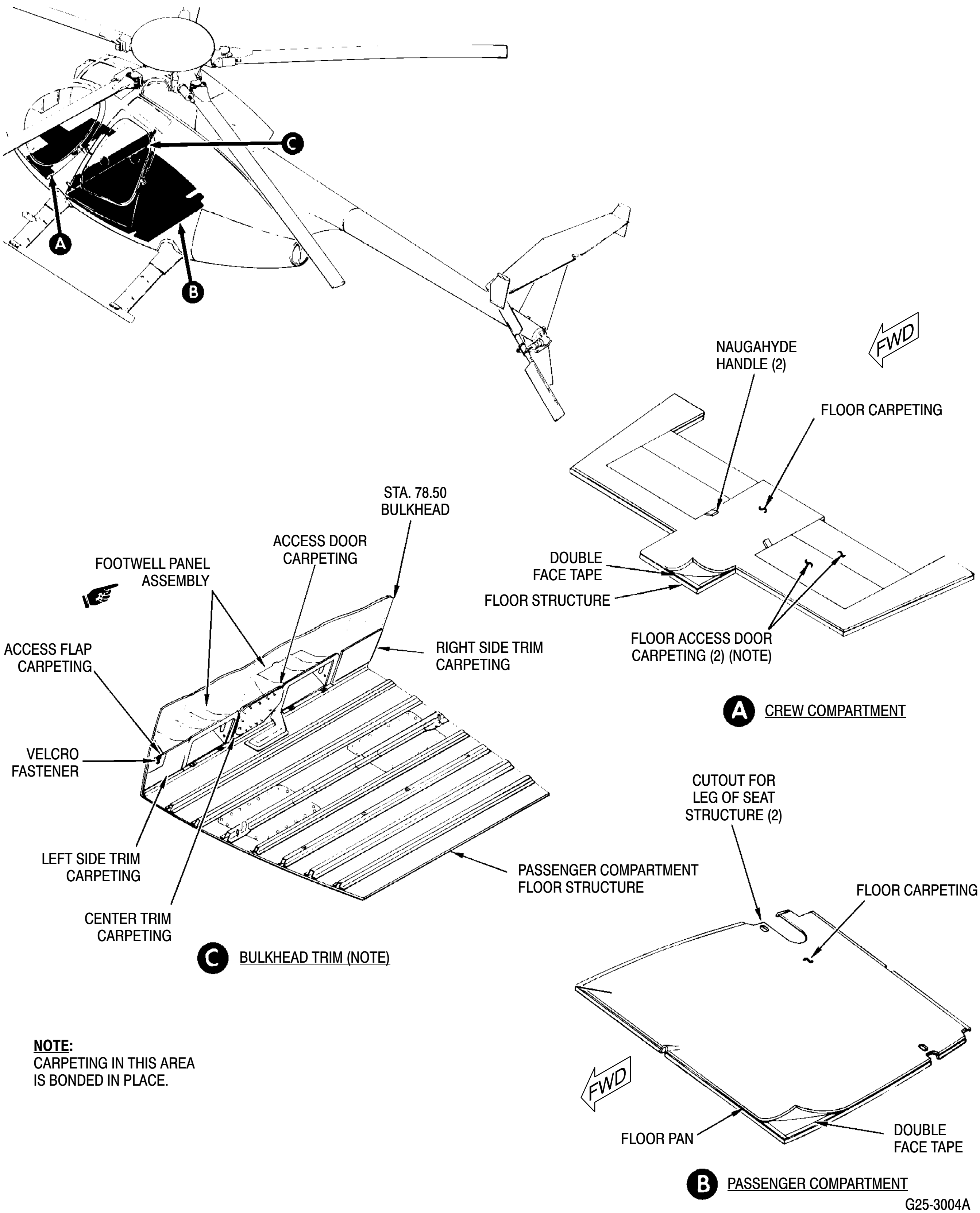


Figure 204. Floor Trim and Covering

B. Solvent Bonding Patch Method

(Ref. Figure 205)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM220	Naphtha aliphatic
CM435	Tetrahydrofuran

(1). Remove damaged panel.

(2). Stop-drill end(s) of crack.

(3). Deburr stop drill(s) and clean any jagged area of crack.

(4). Select a piece of boltaron material with same contour as patch area. Plating surfaces must provide a snug fit. Patch material to overlap damaged area a minimum of 1 inch (2.54 cm) in all directions.

(5). Clean mating surfaces with aliphatic naphtha (CM220). Ensure surfaces are free from oil, grease or other contaminates.

(6). Assemble patch with mating surface of patch in contact with panel but without application of pressure.

WARNING **Tetrahydrofuran bonding solvent is a flammable liquid. Care must be exercised in handling.**

CAUTION Solvent shall be applied carefully so no excess material will run over other surfaces and mar the finish.

NOTE: On larger parts, solvent shall be applied evenly to mating surfaces with brush.

(7). Inject tetrahydrofuran (CM435) between mating surfaces by means of syringe or eye dropper.

(8). Assemble mating surfaces as quickly as possible by firmly pressing together.

(9). Apply clamps to assembly immediately after solvent application. Use sufficient pressure to force out air bubbles.

(10). After forcing out bubbles, adjust clamps to minimum pressure required to hold parts together.

(11). If solvent has evaporated at or near edge of patch, apply more solvent between mating surfaces using syringe or eye dropper.

(12). Leave clamps in place for a minimum of 20 minutes.

(13). Allow the panel to cure for 24 hours prior to reinstallation.

C. Epoxy Adhesive Patch Method

(Ref. Figure 205)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM228	Surface cleaner
CM411	Adhesive, epoxy
CM804	Emery cloth, fine

(1). Remove damaged panel.

(2). Stop-drill end(s) of crack.

(3). Deburr stop drill(s) and clean any jagged area of cracks.

(4). Select a piece of boltaron material with same contour as patch area. Mating surfaces must provide a snug fit. Patch to overlap damaged area a minimum of 1 inch (2.54 cm) in all directions.

(5). Lightly abrade mating surfaces with emery cloth (CM804) and clean with surface cleaner (CM228).

(6). Air dry for 30 minutes at ambient temperature. Apply adhesive (CM411) within 2 hours of drying.

(7). Thoroughly mix equal parts of adhesive by weight. Color should be uniform green. Use unwaxed disposable container and wooden tongue depressor or metal spatula for mixing. Pot life of mixed adhesive is 45 minutes at ambient temperature.

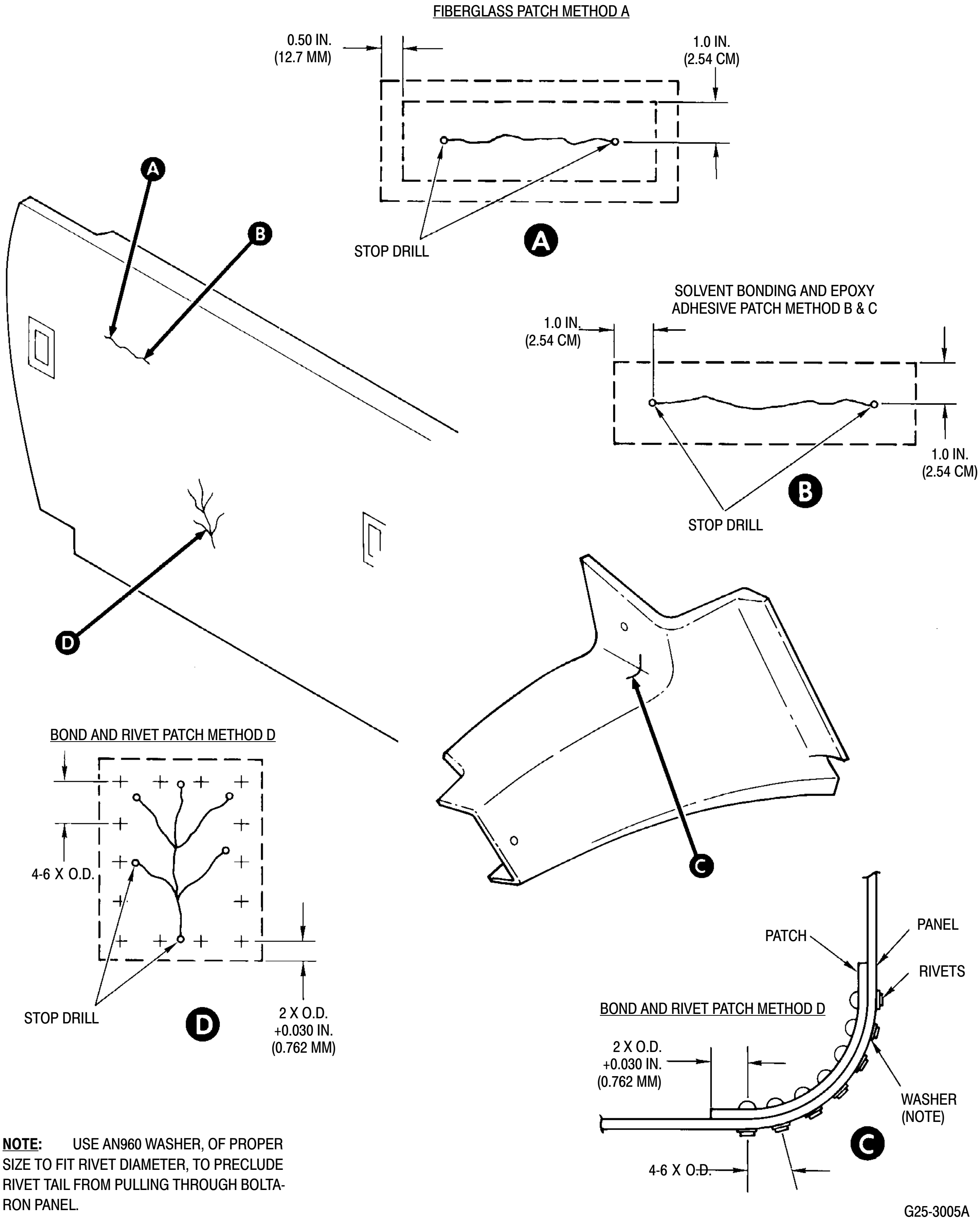


Figure 205. Boltaron Panel Repair

(8). Spread thin uniform layer (0.002-0.010 inch) (0.0508-0.254 mm) of adhesive lightly on mating surfaces and clamp lightly together.

(9). Wipe excess adhesive from bond line.

(10). The clamps are to remain in place for 8 hours minimum at ambient temperature or 2 hours at 160° ±10°F (72° ±5°C).

(11). Allow panel to cure for 24 hours prior to installation.

D. Bond and Rivet Patch Method

(Ref. Figure 205) The following procedure may be used in conjunction with one of the above bonding procedures (Ref. Solvent Bonding Patch Method or Epoxy Adhesive Patch Method). If cracks are excessive and/or a piece of boltaron is not available that fits contour in repair area, rivets may be used to help secure patch to panel.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM220	Naphtha aliphatic
CM228	Surface cleaner
CM411	Adhesive, epoxy
CM435	Tetrahydrofuran
CM804	Emery cloth, fine

(1). Cut patch to proper size.

(2). Determine rivet spacing.

(a). Rivet spacing to be 4-6 times rivet diameter.

(b). Minimum edge distance to be 2 times rivet diameter ±0.030 inch (0.762 mm).

Example :For #4 rivet, minimum edge distance is 0.028 inch (0.7112 mm). Rivet diameter 0.125 inch (3.175 mm) X 2 + 0.030 inch (0.762 mm) = 0.280 inch (7.112 mm).

(3). Lay out rivet pattern on patch and drill holes. Position patch on panel and drill holes.

(4). Deburr all holes on both sides of patch and panel.

(5). Countersink holes on patch if using MS20426A4 rivets.

(6). Comply with the following procedures if using Solvent Bonding Patch Method (tetrahydrofuran).

(a). Clean mating surfaces with naphtha aliphatic (CM220). Ensure surfaces are free from oil, grease or other contaminates.

(b). Set patch in place. Use a minimum amount of clecos required to hold patch in contact with panel without applying too much pressure.

WARNING **Tetrahydrofura bonding solvent is a flammable liquid. Care must be exercised in handling.**

CAUTION Solvent shall be applied carefully so no excess material will run over other surfaces and mar the finish.

NOTE: On larger parts, solvent shall be applied evenly to mating surfaces with brush.

(c). Inject tetrahydrofuran (CM435) between mating surfaces by means of syringe or eye dropper.

(d). Assemble mating surfaces as quickly as possible by firmly pressing together.

(e). Apply clamps to assembly immediately after solvent application, with sufficient pressure to force out air bubbles.

(f). After forcing out bubbles, adjust clamps to minimum pressure required to hold parts together.

(g). If solvent has evaporated at or near edge of patch, apply more solvent between mating surfaces using syringe or eye dropper.

(h). Leave clamps in place for a minimum of 20 minutes.

NOTE: If gap exists between patch and panel prior to installing rivets, inject tetrahydrofuran between mating surfaces in immediate area of each rivet hole that has a gap using a syringe or eye dropper.

(i). Rivet patch to panel.

(j). Allow panel to cure for a minimum of 24 hours prior to installation.

(7). Comply with the following procedures if using the Epoxy Adhesive Patch Method.

(a). Lightly abrade mating surfaces with emery cloth (CM804) and clean with surface cleaner (CM228).

(b). Air dry for 30 minutes at ambient temperature. Apply adhesive (CM411) within 2 hours of drying.

(c). Thoroughly mix equal parts, of adhesive by weight. Color should be uniform green. Use unwaxed disposable container and wooden tongue depressor or metal spatula for mixing. Pot life of mixed adhesive is 45 minutes at ambient temperature.

(d). Spread a thin uniform layer, 0.002-0.010 inch (0.0508-0.254 mm), of adhesive on mating surfaces. Try to keep adhesive out of the rivet holes.

(e). Install the patch on the panel with clecos.

(f). Rivet the patch to the panel.

(g). Wipe excess adhesive from bond line and from around the rivets.

(h). Allow the panel to cure for 24 hours prior to installation.

Section

25-40-00

Miscellaneous Furnishings

MISCELLANEOUS FURNISHINGS MAINTENANCE PRACTICES

1. Crew Compartment Miscellaneous Furnishings Replacement

Methods for removal and installation are obvious for most miscellaneous furnishing items. Some maintenance instructions are provided in the following procedures.

Crew compartment furnishings for the 600N Helicopter are the same as for the 369D/E/FF - 500N Helicopters.

A. Stowage Box

Access to stowage box is thru crew compartment right side floor access door (Ref. Sec. 52-50-00).

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM117	Grease

NOTE: Helicopters equipped with certain optional communications and avionics installations do not have stowage box installed.

When installing replacement stowage box, cover screwheads with tape (CM717).

B. Heat Duct

The heat duct consists of an upper and lower section with a magnetic compass mounted on the lower section just above the instrument panel. The anti-icing control (Ref. Sec. 75-10-00) and cabin heat control (Ref. Sec. 21-40-00) mount on the upper section of the heat duct. Removal of magnetic compass is not required for removal of heat duct. However, wiring to the light must be disconnected at the splices.

C. Foot Rest (L/H Command)

For access to foot rest attaching hardware, remove stowage box. Position replacement foot rest on floor support bulkhead and install attaching hardware. When necessary, use additional thin aluminum washers to shim between foot rest and bulkhead for correct four-point contact.

D. Ash Receiver and Cigarette Lighter Panel

(1). The cigarette lighter panel may be removed by releasing four turnlock fasteners.

(2). Disassembly of the cigarette lighter and panel for maintenance purposes is shown in the figure.

2. Passenger Compartment Miscellaneous Furnishings Replacement

Methods for removal and installation are obvious for most miscellaneous furnishing items. Some maintenance instructions are provided in the following procedures.

Passenger compartment furnishings for the 600N Helicopter are the same as for the 369D/E/FF - 500N Helicopters except, where applicable, panels and ducting is 30 inches longer.

A. Convenience Panel Replacement (R/H Command)

(1). Remove attachment screws. Lower panel and disconnect any wiring and heat valve connectors before removing panel.

(2). Reinstall using reverse procedure.

3. Passenger Step Assembly Description

(Ref. Figure 203) Due to the extended fuselage of the 600N Helicopter, the addition of an elongated passenger step is unique to this aircraft. The step is secured at two positions on each side of the fuselage, as compared to one position on the 369D/E/FF - 500N Helicopters. The step is available in either a high or low step configuration depending on the landing gear option installed.

4. Passenger Step Assembly Inspection

(1). Inspect step attach point(s) for security of installation and general condition.

(2). Inspect "no skid" surface of step for general condition. Replace or reattach if worn excessively.

5. Passenger Step Assembly Replacement

A. Passenger Step Assembly Removal

(1). Gain access to passenger step assembly attaching hardware under floor covering of passenger/cargo compartment.

(2). Remove quick release pin(s) that secure step assembly in mounting hole(s).

(3). Remove step assembly.

B. Passenger Step Assembly Installation

(1). Align and insert passenger step assembly into mounting hole(s) in fuselage.

(2). Insert quick release pin(s) to secure step assembly.

(3). Secure floor covering in passenger/cargo compartment.

6. Passenger Step Assembly Repair

The passenger step has black, non-slip, pressure-sensitive, safety-walk tape applied to the upper surface of the step plate.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM220	Naphtha aliphatic
CM724	Tape, non-slip

(1). To replace worn or lost safety-walk tape, carefully scrape away damaged tape. Remove all residual adhesive by wiping with naphtha (CM220) wetted cloth.

(2). Install new tape (CM724) and press firmly into place. Expel air bubbles by pressing down tape from center out to the edges.

7. Miscellaneous Furnishings Inspection

(1). Inspect for cracks, breaks or other unserviceable condition.

(2). Inspect helicopter checklist and magnetic compass card for condition and legibility.

(3). Inspect for loose, damaged or missing rivnuts and other attaching hardware as applicable.

8. Miscellaneous Furnishings Repair

(1). Repair cracks or breaks in thermoplastic material (Ref. Sec. 20-30-00, Boltaron Trim Panels Repair).

(2). Perform weld and rivet repairs according to FAA AC 43.13-1A, Aircraft Inspection and Repair.

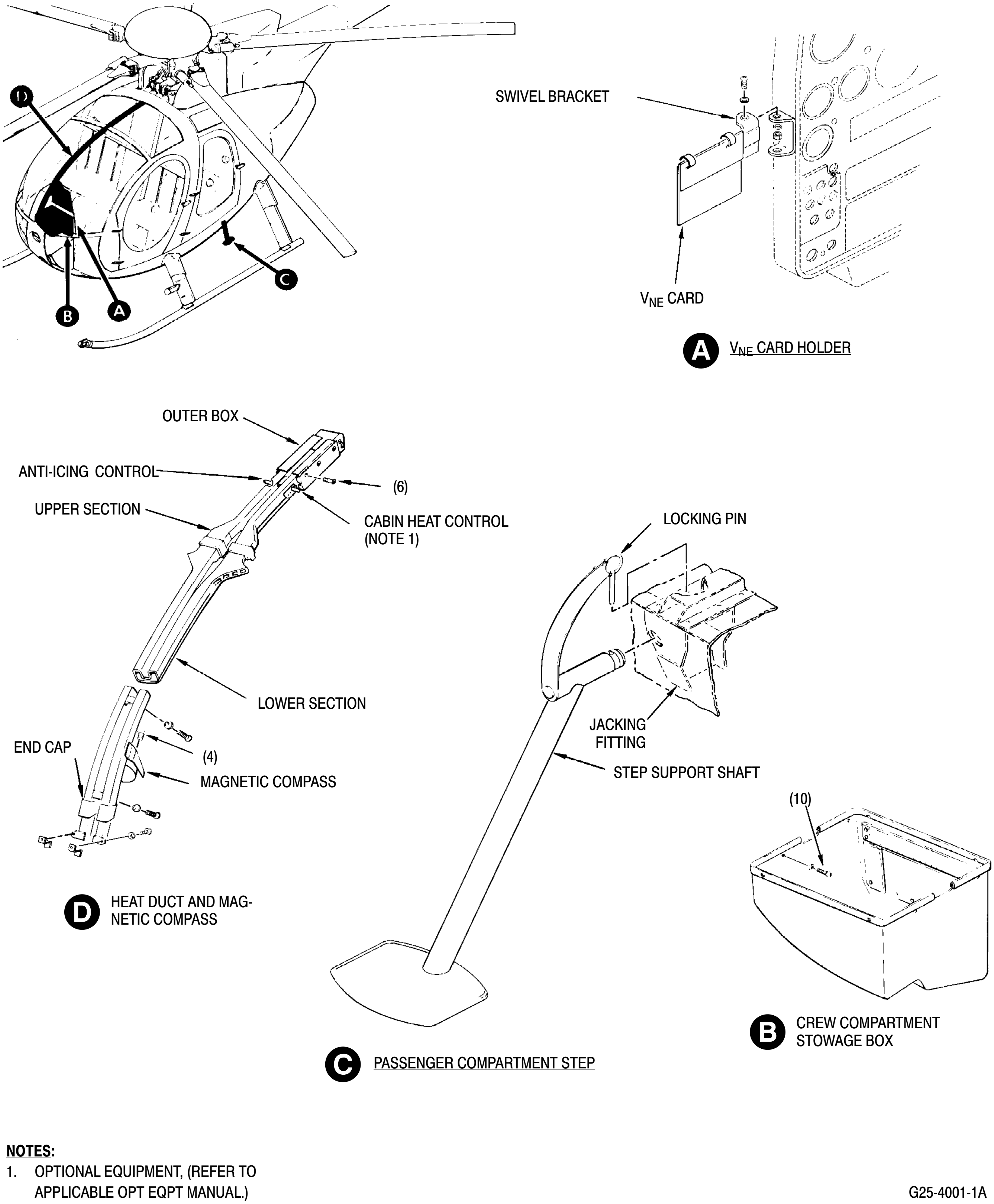


Figure 201. Miscellaneous Furnishings (369D) (Sheet 1 of 2)

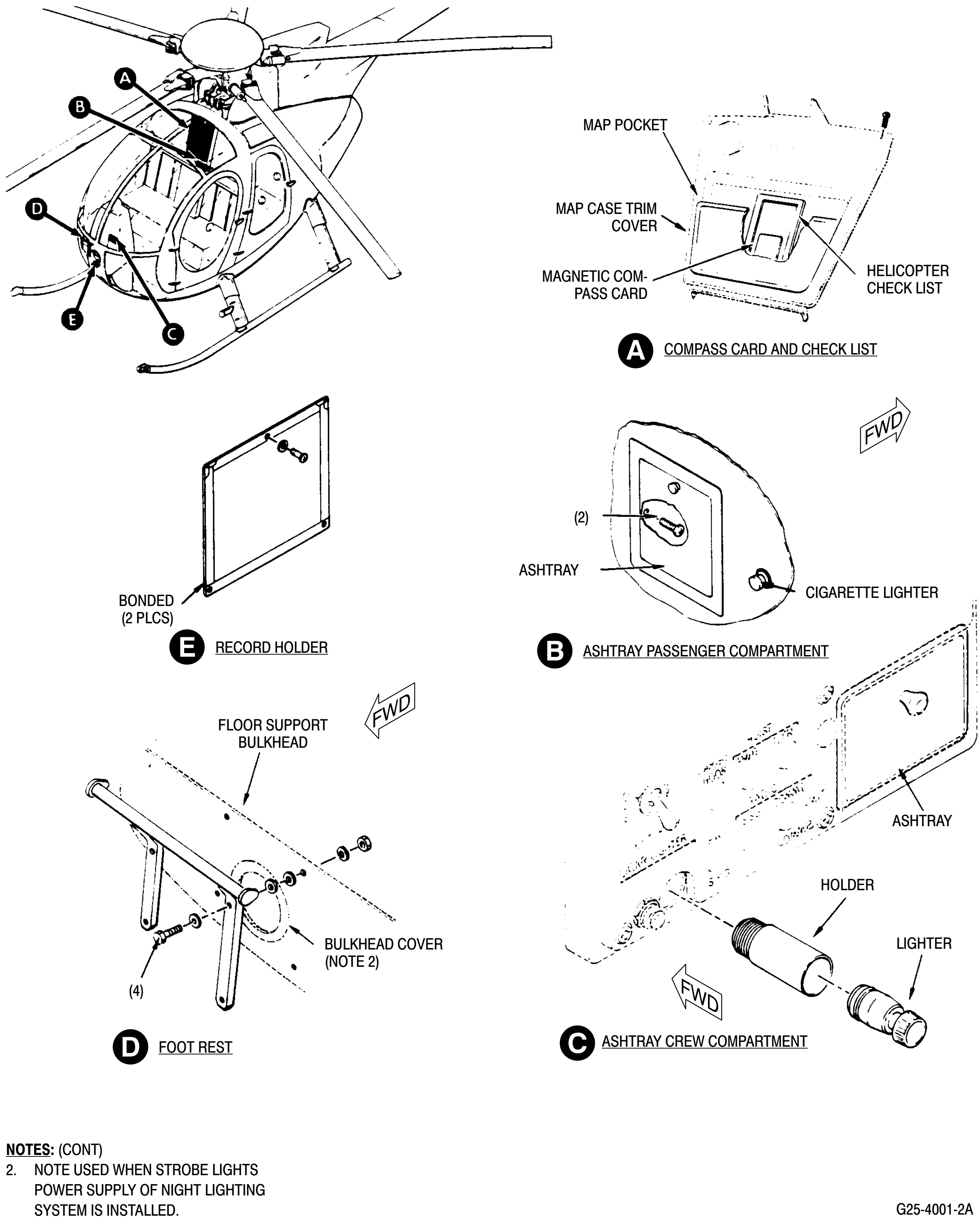


Figure 201. Miscellaneous Furnishings (369D) (Sheet 2 of 2)

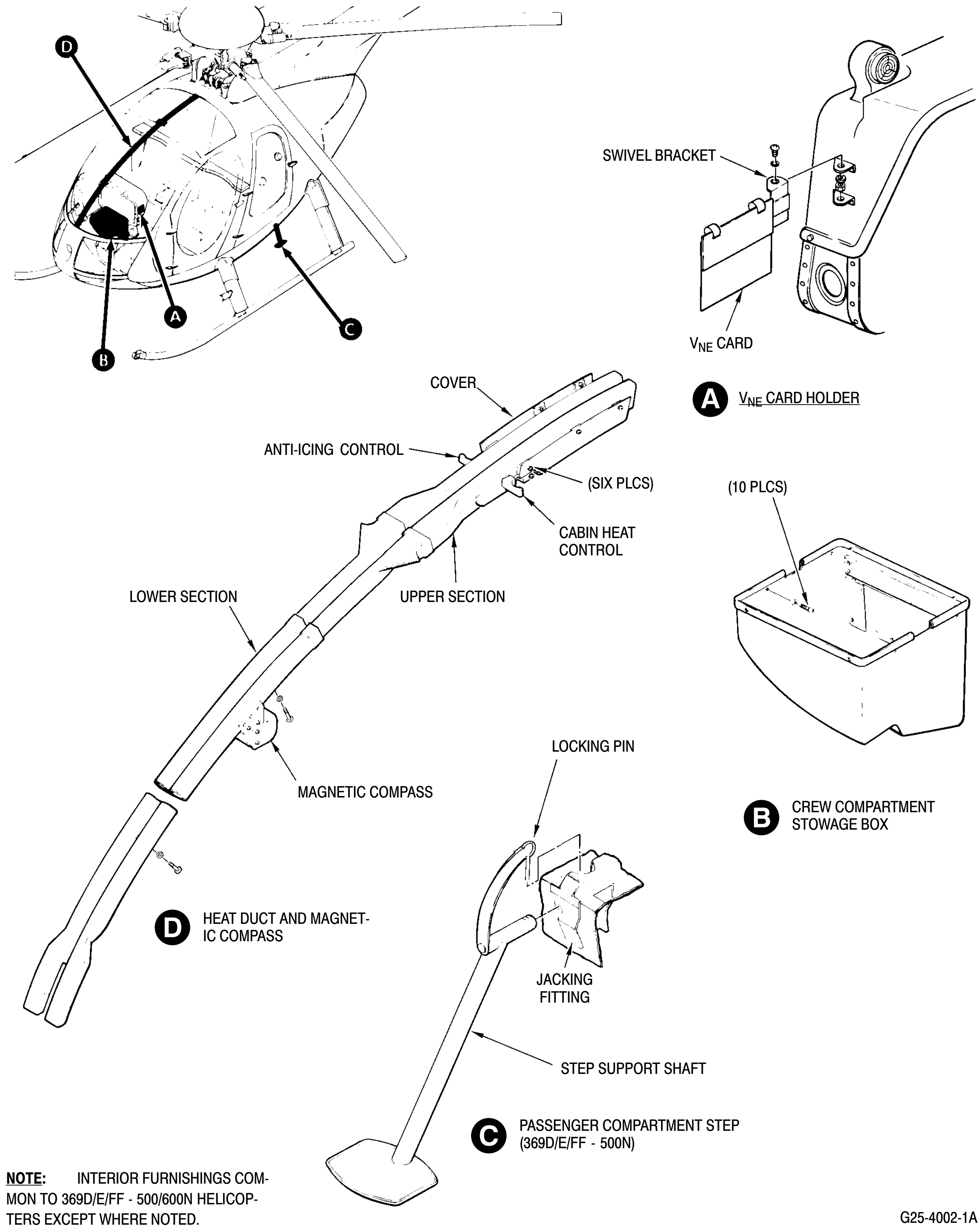


Figure 202. Miscellaneous Furnishings (369E/FF - 500/600N) (Sheet 1 of 2)

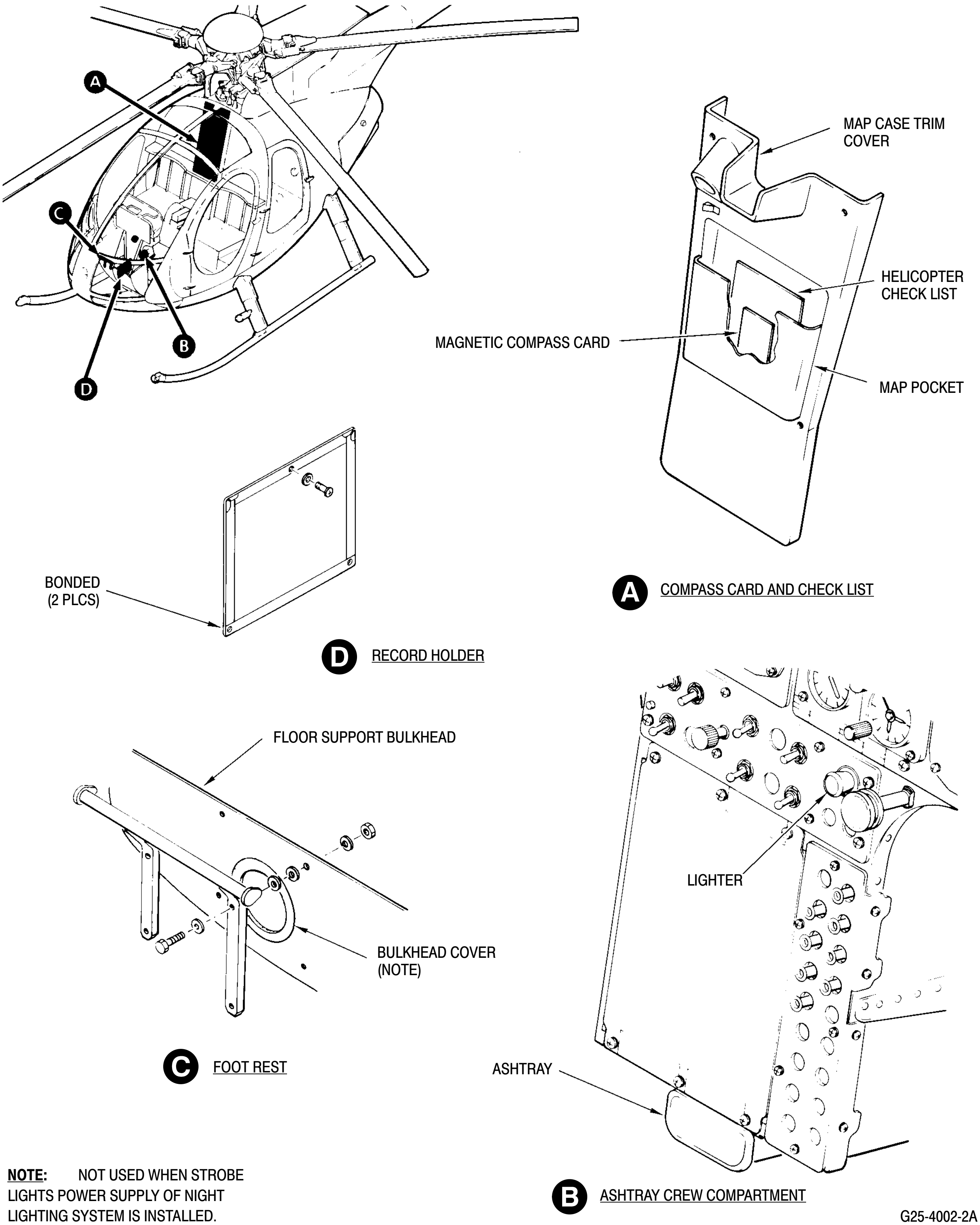


Figure 202. Miscellaneous Furnishings (369E/FF - 500/600N) (Sheet 2 of 2)

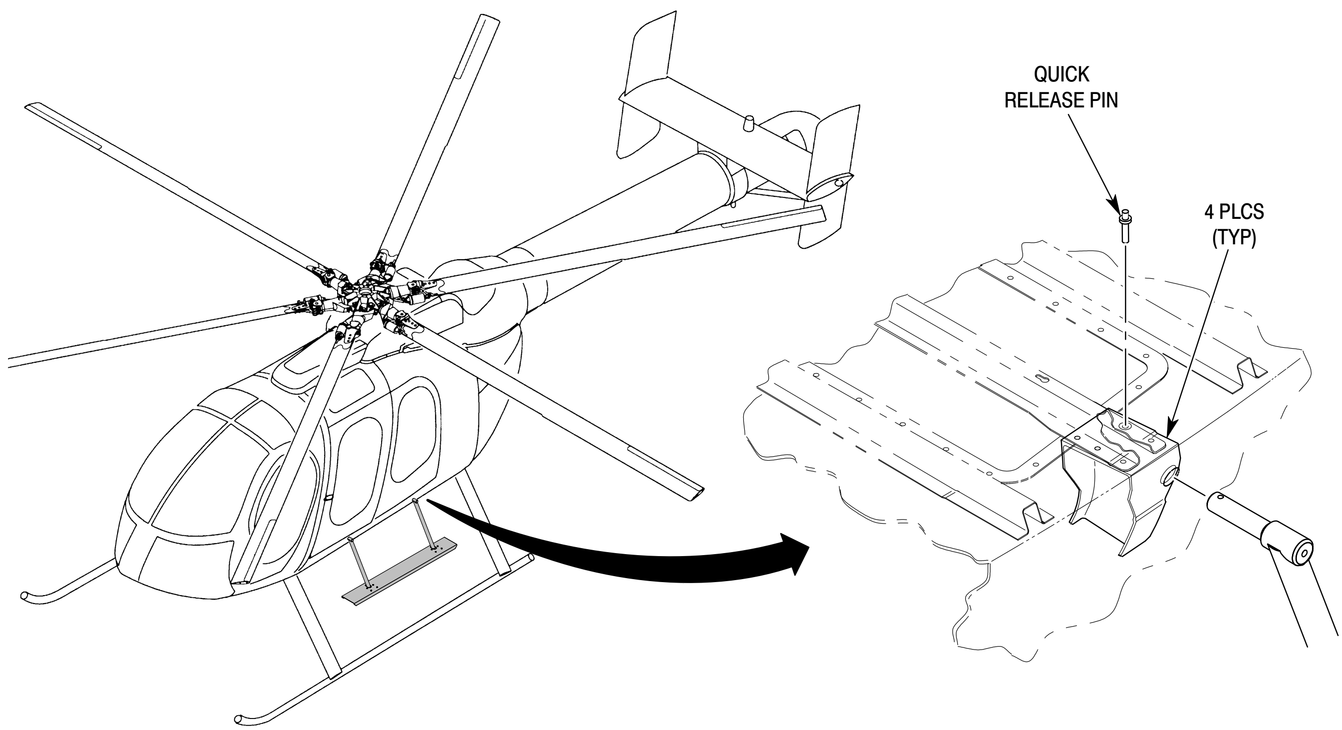


Figure 203. Passenger Step Assembly (600N)

Section

25-50-00

Cargo Hook

CARGO HOOK
FAULT ISOLATION

1. Cargo Hook Description

The cargo hook provides a means of transporting external cargo. The cargo hook installation consists of a cargo hook assembly, electrical hook release equipment and backup emergency manual release equipment. The cargo hook assembly is externally attached to the center beam of the helicopter at Station 99.325. The cargo hook operational rating (external load limit) is 2000 pounds.

The cargo hook and swivel assembly are mounted on the helicopter center beam by four bolts at Station 99.325. The swivel assembly allows the cargo hook to swing in any direction through a 30-degree arc.

2. Cargo Hook Operation

The cargo hook is normally operated electrically by pressing the CARGO HOOK switch on the pilot's cyclic stick grip (Ref. Figure 403). Actuation of the CARGO HOOK switch energizes a solenoid in the cargo hook. The maximum electrical current required to operate the cargo hook solenoid is 14 amperes at 28 Vdc. however, the solenoid is designed to operate with voltage as low as 23 Vdc. Actuation of the cargo hook solenoid releases the hook (load beam).

In the event of an electrical malfunction, the hook can be released (opened) by pulling a manual release cable lever attached to the pilot's cyclic stick (Ref. Figure 401). The manual release cable releases (opens) the cargo hook in the same manner as the electrically operated solenoid. The hook can be released for testing or by cargo personnel by turning (clockwise) a cargo hook release knob located on the left side of the hook body. Regardless of the method used to release the hook, the hook will return to the closed (retracted) position.

3. Cargo Hook Fault Isolation

(Ref. Table 101) Cargo hook system malfunctions might be caused by any one of several general conditions which are easily corrected. Before starting specific troubleshooting procedures, make the following checks and take indicated action for troubleshooting procedures.

(1). Refer to applicable wiring diagram and check for loose or damaged wires and/or terminals and connectors; reconnect or replace as required.

(2). Check for damaged interconnect wires and/or equipment (Ref. Chap. 96).

(3). Check for loose or defective terminal board connections; repair or replace as required.

(4). Check for loose ground wires.

(5). Make certain circuit breaker is pushed to full in (closed) position.

(6). Check system power source.

4. Wiring Diagrams

(Ref. Figure 101) Wiring diagrams of the various cargo hook electrical system circuits have been illustrated. Wire charts are provided in Table 102 and Table 103. For helicopter electrical system interface information refer to DC Electrical Load Distribution (Ref. Chap. 96).

Table 101. Troubleshooting - Cargo Hook Installation

Symptom	Probable Cause	Corrective Action
NOTE: Following procedures are to be performed with electrical system power on and CARGO HOOK circuit breaker (CB603) closed.		
Hook release operates manually (by lever) but fails to operate electrically (by HOOK RELEASE switch).	Defective hook ground	Replace hook assembly.
	Defective ground	Secure ground wire.
	Defective HOOK RELEASE switch	Replace switch.
	Defective CARGO HOOK circuit breaker (CB603)	Replace circuit breaker (CB603).
Hook release operates electrically (by HOOK RELEASE switch) but fails to operate manually (by lever).	Manual release cable housing adjusted incorrectly at lever.	Reset adjustment nut at lever-end of cable housing.
	Defective hook assembly	Replace hook assembly.

Table 102. Wire Chart, 369D/E/FF Right or Left Hand Command.

	From		To	
Wire No.*	Terminal	Termination	Terminal	Termination
M532A20	TB1-18D	MPCM20M-H2**	K104-X1	Solder
	TB1-19B	MPCM20M-H2**	K104-X1	Solder
M531A16	TB3-1D	AYH11-H1**	K104-D2	Solder
M523A20N	J104-X2***	Solder	E24	MS25036-103
M522C16	K104-D1***	Solder	TB3-4A	AYH14-H1**
M520AA16	SP92-B	32447	TB3-1C	AYH14-H1**
	J616-q	Crimp	TB3-1C	AYH14-H1**
M520A16	CB603-2	MS25036-106	SP92-A	32447
	CB603-2	MS25036-106	P616-q	- -
M520B20	TB1-18C	MPCM20M-H2**	TB3-1D	AYH14-H1**
	TB1-18A	MPCM20M-H2**	TB3-1D	AYH14-H1**
	TB1-19A	MPCM20M-H2**	TB3-1D	AYH14-H1**

*(Ref. Figure 101 sheets 1 & 2) for applicable wiring diagrams.

**Burndy Corp., Norwalk, Conn.

***K312-X2, _D1 for helicopters equipped with 369D24153 “Tee” console.

Table 103. Wire Chart, 369E/FF T-Panel with Center Electrical Console, R/H Command.

	From		To	
Wire No.*	Terminal	Termination	Terminal	Termination
M520AA16	K104-X2	Solder	E24	MS25036-103
M532A20	K104-X1	Solder	TB1-8F	M39029/22-192
M531A16	K104-D2	Solder	TB3-1C	M39029/22-193
M531B16	K104-D1	Solder	TB3-8B	M39029/22-193
M520B20	TB3-1E	M39029/22-193	TB1-8E	M39029/22-192
M523C20N	J605-C	MS3193A16-16A	E20	M7928/1-24
M520A16	CB118-2	M7928/1-41	P616- Q	M39029/31-228
M520AA16	J616- Q	M39029/32-247	TB3-1	M39029/22-193

*(Ref. Figure 101 sheet 3) for applicable wiring diagram.

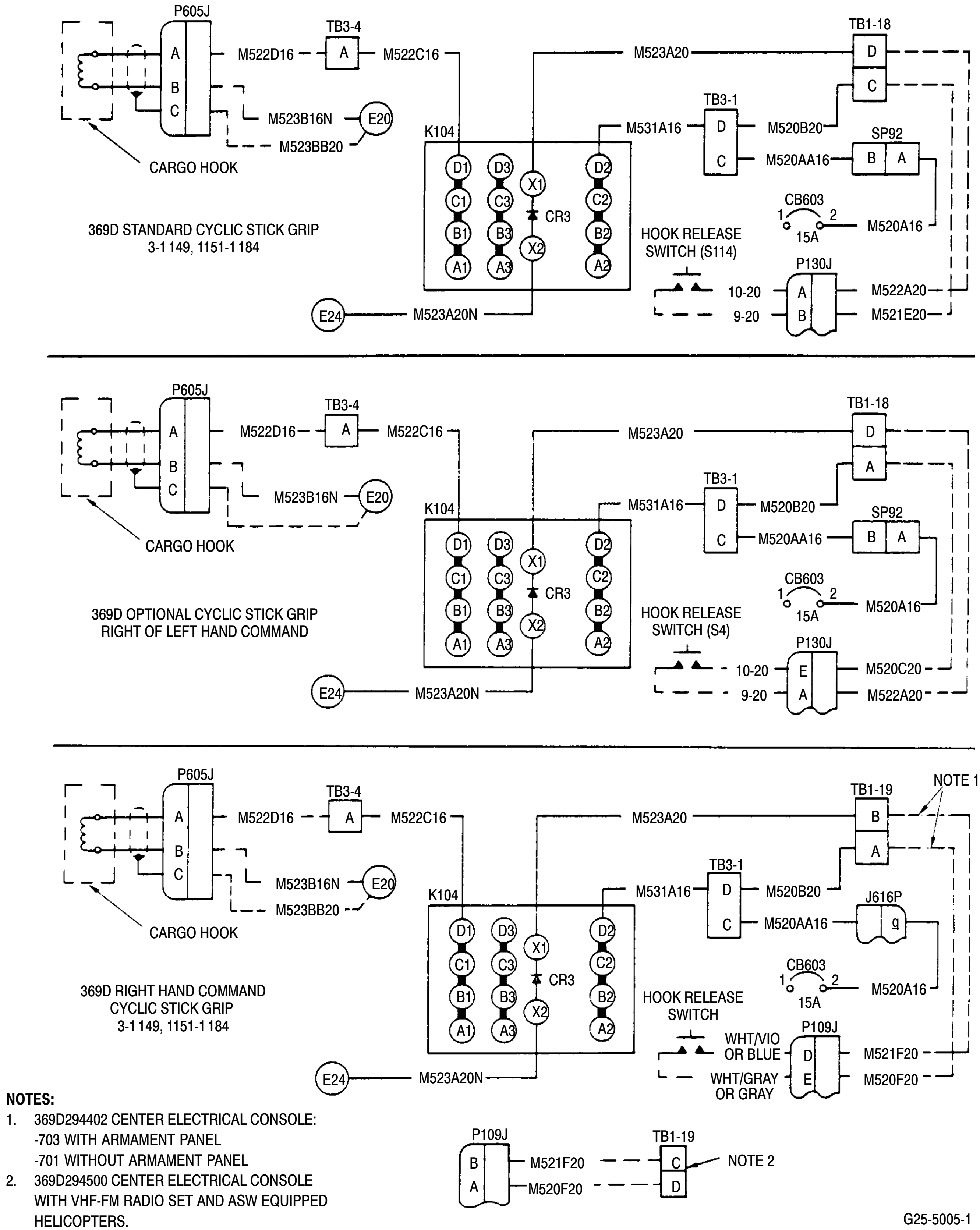


Figure 101. Cargo Hook - Wiring Diagrams (Sheet 1 of 4)

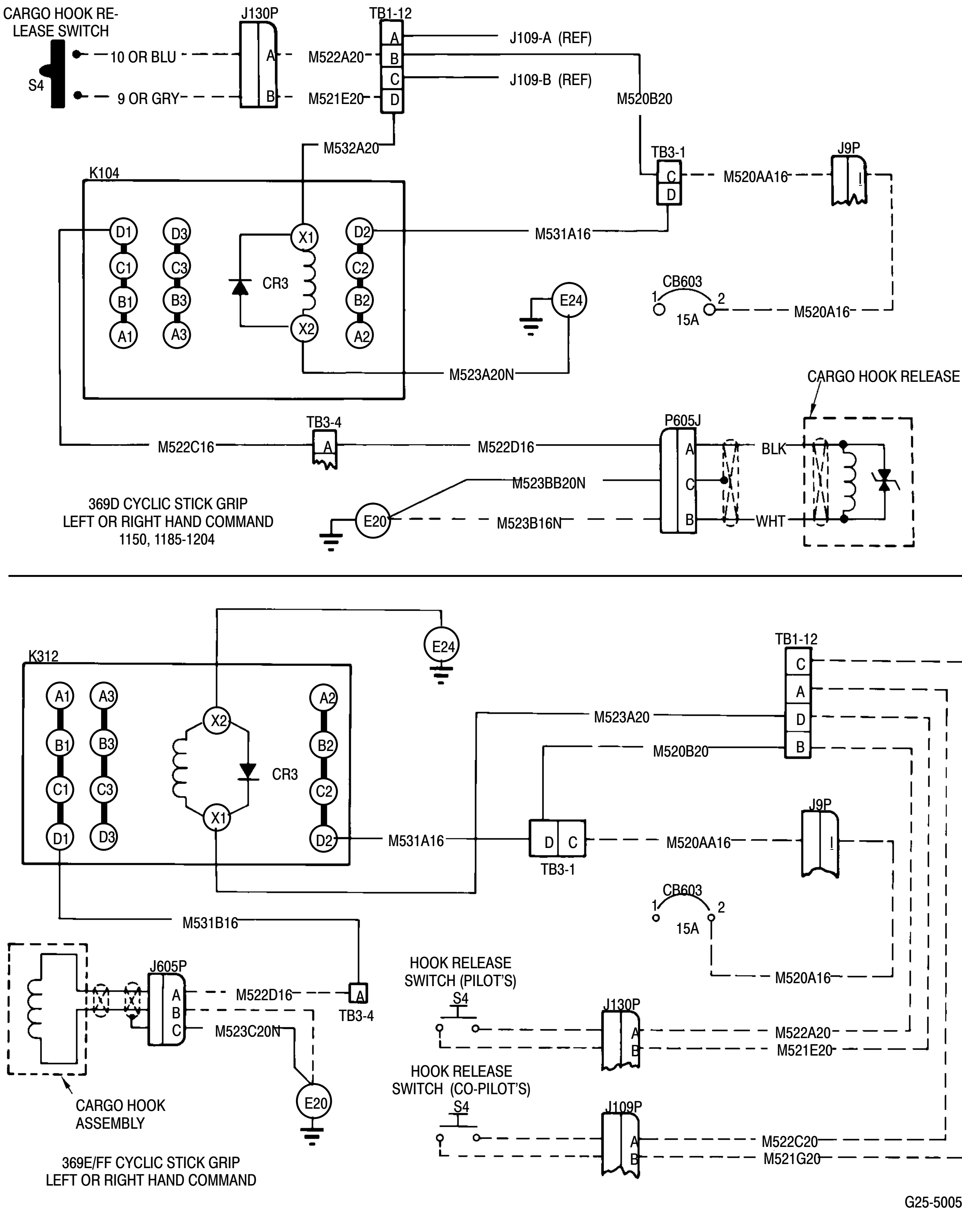


Figure 101. Cargo Hook - Wiring Diagrams (Sheet 2 of 4)

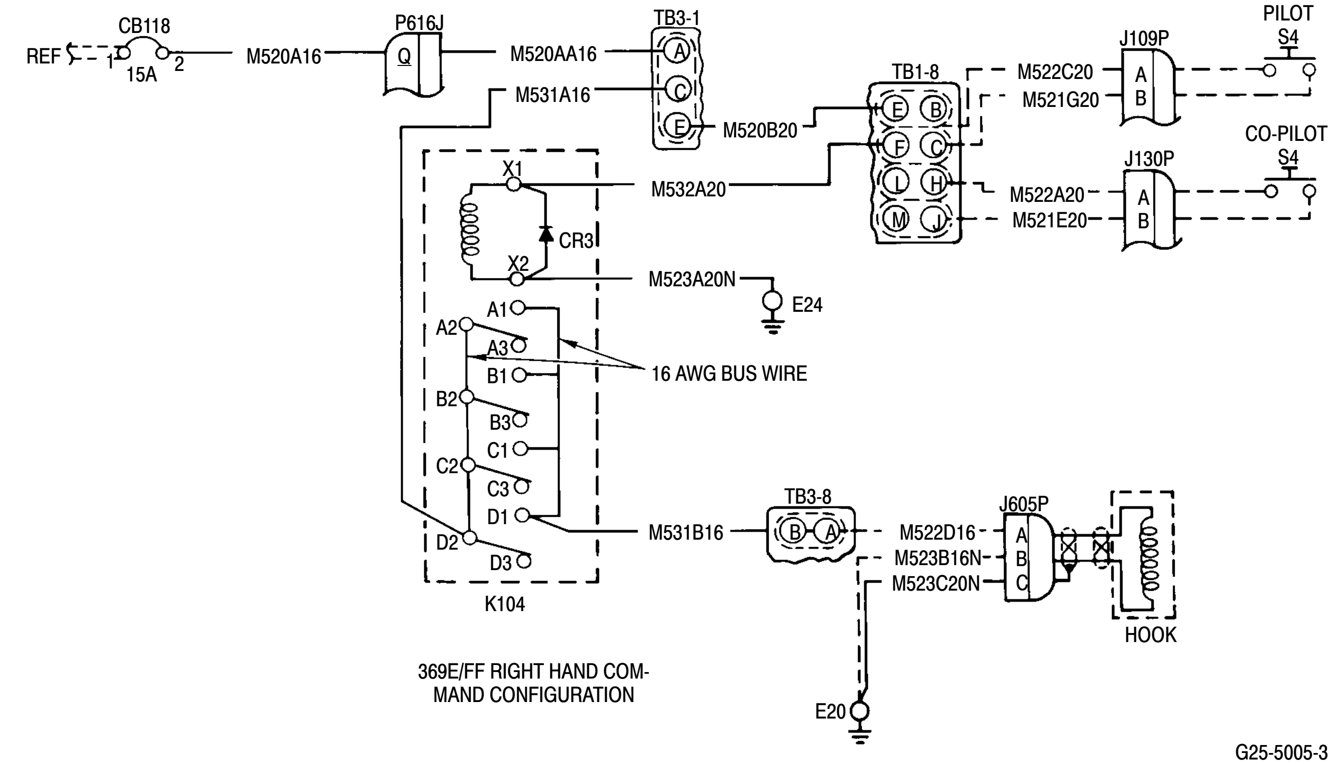


Figure 101. Cargo Hook - Wiring Diagrams (Sheet 3 of 4)

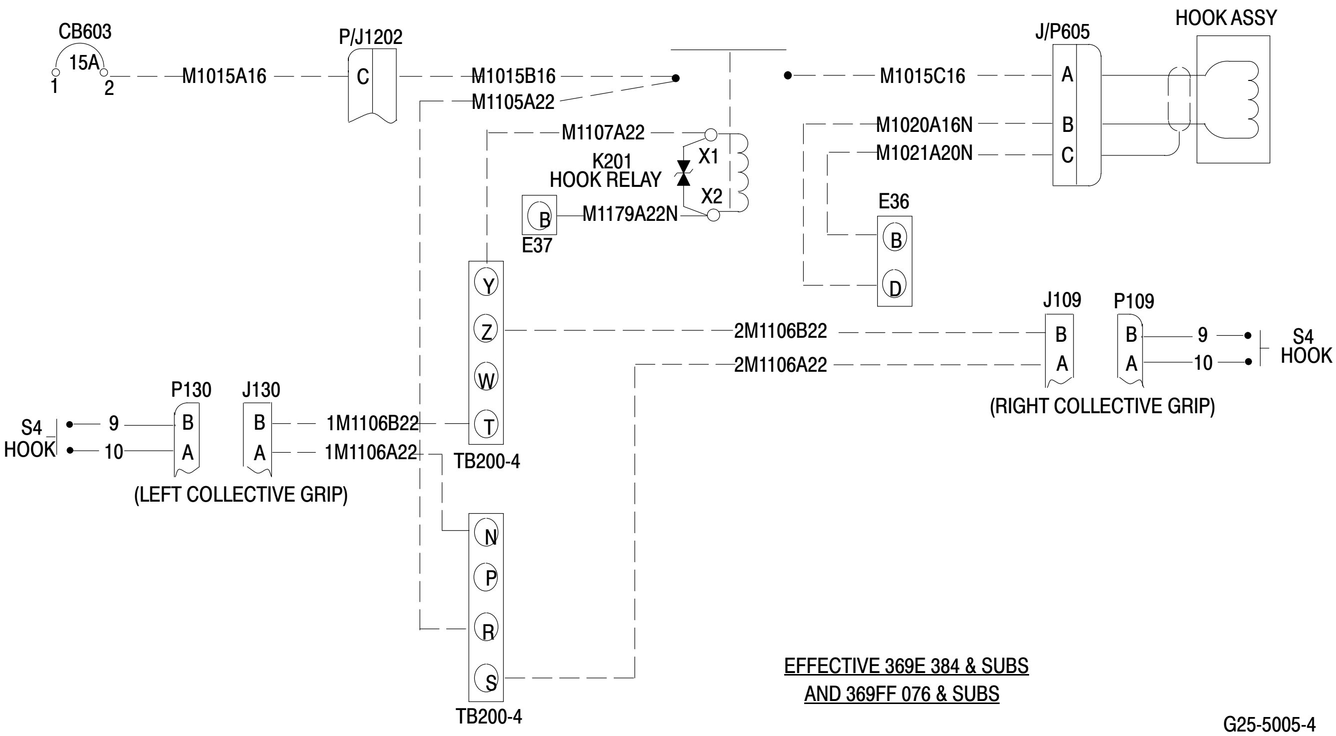


Figure 101. Cargo Hook - Wiring Diagrams (Sheet 4 of 4)

CARGO HOOK REMOVAL/INSTALLATION

1. Cargo Hook Replacement

A. Cargo Hook Removal

Remove the cargo hook assembly including the cargo hook manual release cable and electrical harness as follows:

(1). Remove cotter pin (Ref. Figure 405), washer, and slotted bushing from manual release lever on pilot's cyclic stick.

(2). Loosen locking nut securing adjustment nut shaft to release lever bracket.

(3). Remove screws (Ref. Figure 401), nuts, washers, and clamps securing manual release cable to cyclic stick.

(4). Remove adjustment nut shaft (Ref. Figure 405) from release lever bracket.

(5). Loosen dust cover from pilot's cyclic stick control trim cover (Ref. Sec. 25-30-00).

(6). Remove passenger/cargo compartment left foot fairing trim (Ref. Sec. 25-30-00).

(7). Carefully push manual release cable (Ref. Figure 401) down through grommets in pilot's floor and fuselage skin. Do not pull on cable housing.

(8). Remove cargo hook electrical harness plug from receptacle in fuselage; install protective caps on receptacle and plug.

(9). Remove clamps (Ref. Figure 402) securing cable and harness to clips on fuselage underside.

(10). Remove four bolts (Ref. Figure 404) securing cargo hook base to attach holes in fuselage keel.

B. Cargo Hook Installation

Installation of the cargo hook kit consists of attaching the hook, and electrical/manual release cables on the underside of the helicopter, routing and securing the manual release cable, installation and adjustment of the manual release lever as follows:

(1). Secure base of cargo hook assembly (Ref. Figure 404) to fuselage underside with bolts and washers.

(2). Remove protective cap from cargo hook electrical receptacle (J605); check that BATTERY switch is in OFF position and connect plug (P605) to receptacle.

(3). Insert free end of hook manual release cable through elongated hole adjacent to electrical receptacle (Ref. Figure 402). Push manual release cable up into fuselage and insert cable through hole in pilot's floor.

(4). Loosely attach harness and manual release cable using clamps (Ref. Figure 402) screws, washers, and nuts. Adjust harness and cable to allow sufficient slack for hook to swing 30 degrees conically from centerline without creating strain on harness and cable. Arrange harness and cable to form smooth flow to cutouts in fuselage skin; tighten clamps. Install tie straps approximately as shown (Ref. Figure 402).

NOTE: The 600N helicopters equipped with emergency floats require the manual release handle to be mounted on the collective stick (Ref. Figure 406).

(5). Loosely attach manual release cable to cyclic stick with clamps, screws, washers, and nuts (Ref. Figure 401).

(6). Engage approximately half of the threads on the manual release cable adjustment nut shaft into the bracket portion of the manual release lever assembly (Ref. Figure 405).

(7). Engage swaged ball on release cable in lever bushing (Ref. Figure 405). Secure bushing with washer and cotter pin.

(8). Attach manual release lever assembly to cyclic stick with clamp and screws. Adjust cable and/or release lever as shown (Ref. Figure 405).

(9). Tighten three sets of clamps securing release cable to cyclic stick.

(10). Perform adjustment/test of cargo hook installation.

(11). Readjust cable lever (Ref. Figure 405) as required to obtain smooth consistent release of hook.

NOTE: The manual release lever clamp may be loosened and the lever assembly moved on cyclic stick to simplify adjustment, providing the 2.250 ±0.250 inch (5.715 ±0.635 cm) dimension limit is maintained (Ref. Figure 405).

(12). Install grommet (Ref. Figure 401) in crew compartment floor cutout.

(13). Install grommet (Ref. Figure 402) in elongated hole in fuselage lower skin and doubler.

(14). Safetywire manual release lever clamp screws with lockwire (Ref. Figure 405).

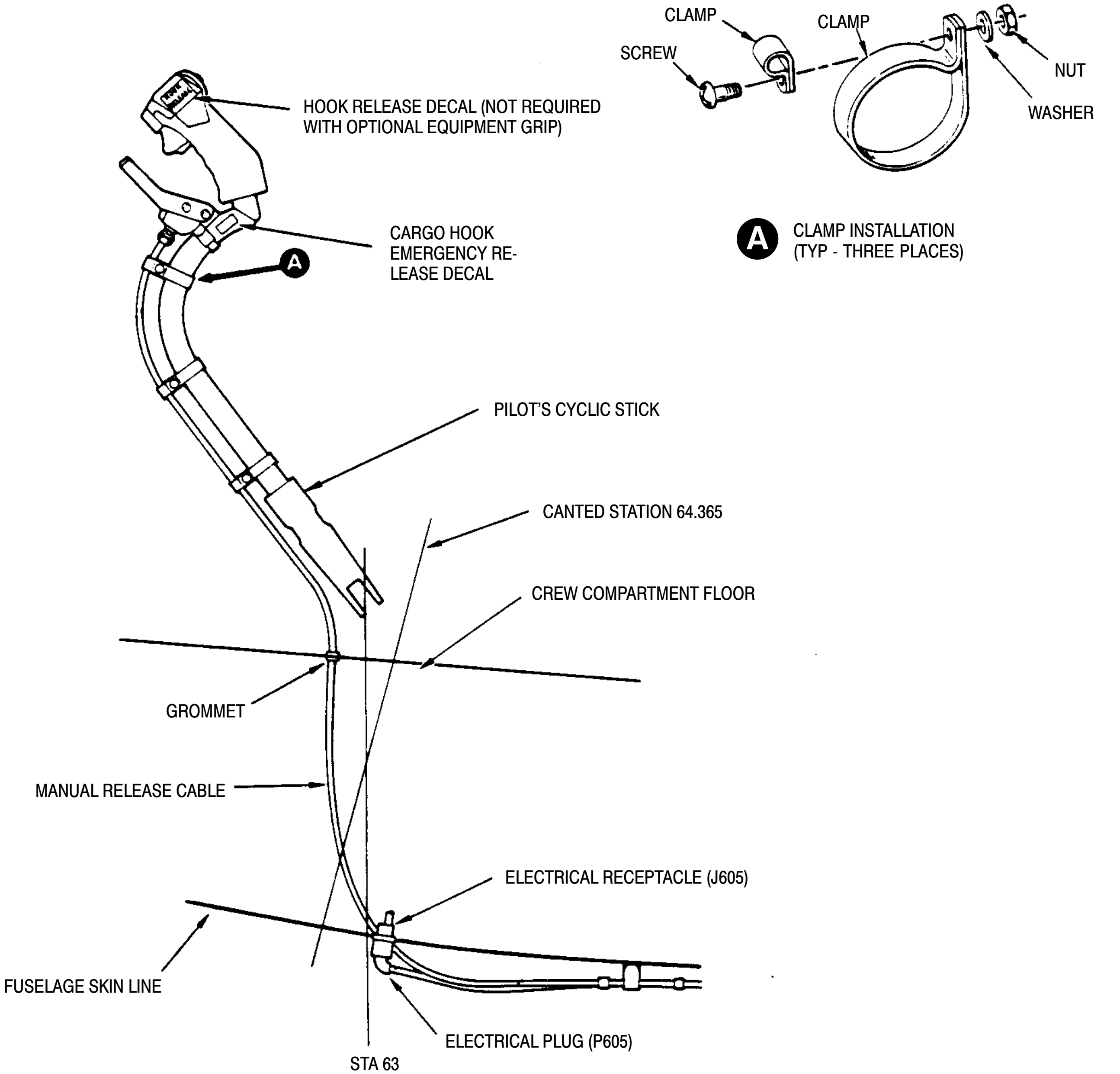


Figure 401. Manual Release Cable Routing - Interior

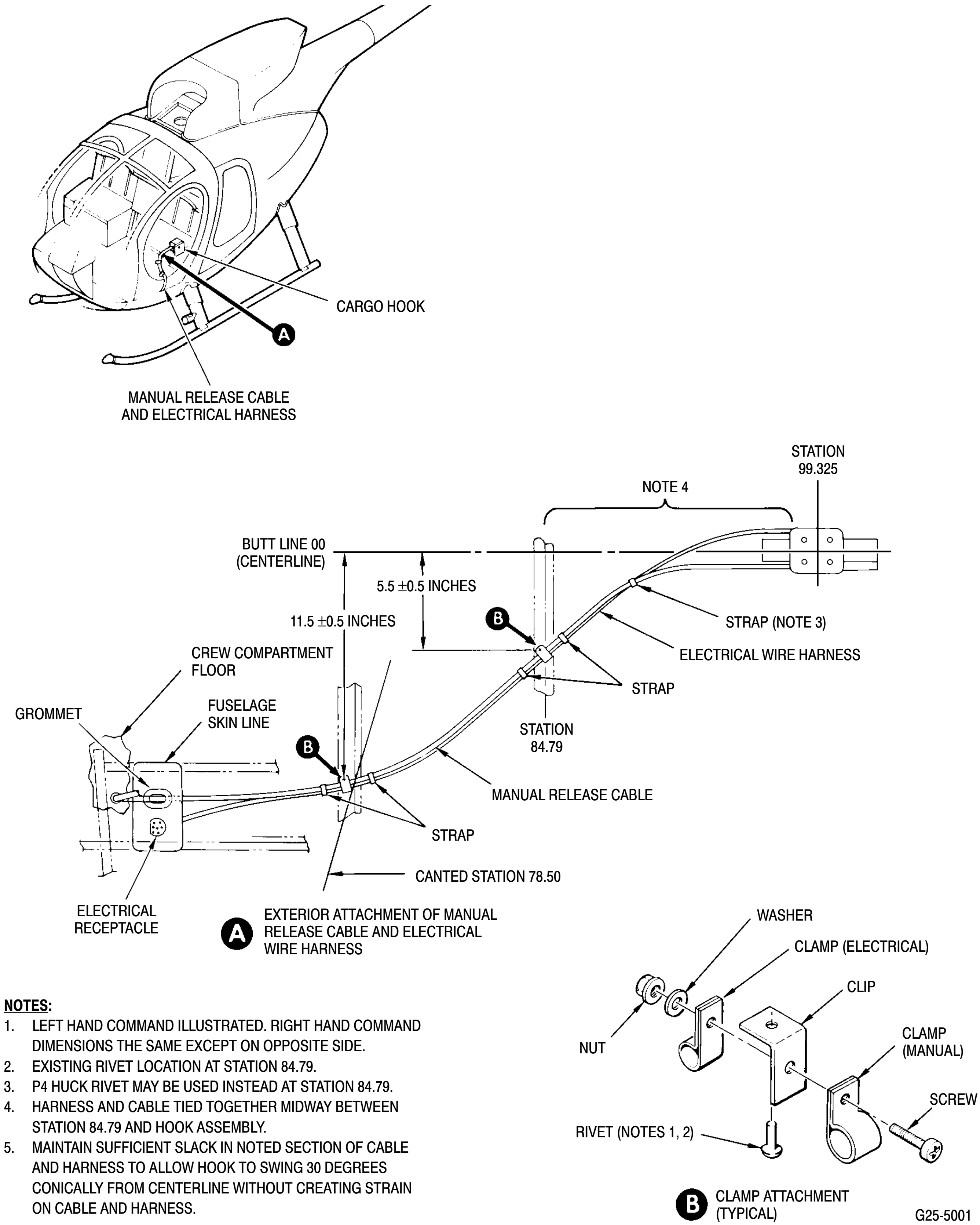


Figure 402. Manual Release Cable and Electrical Wire Harness Routing - Exterior

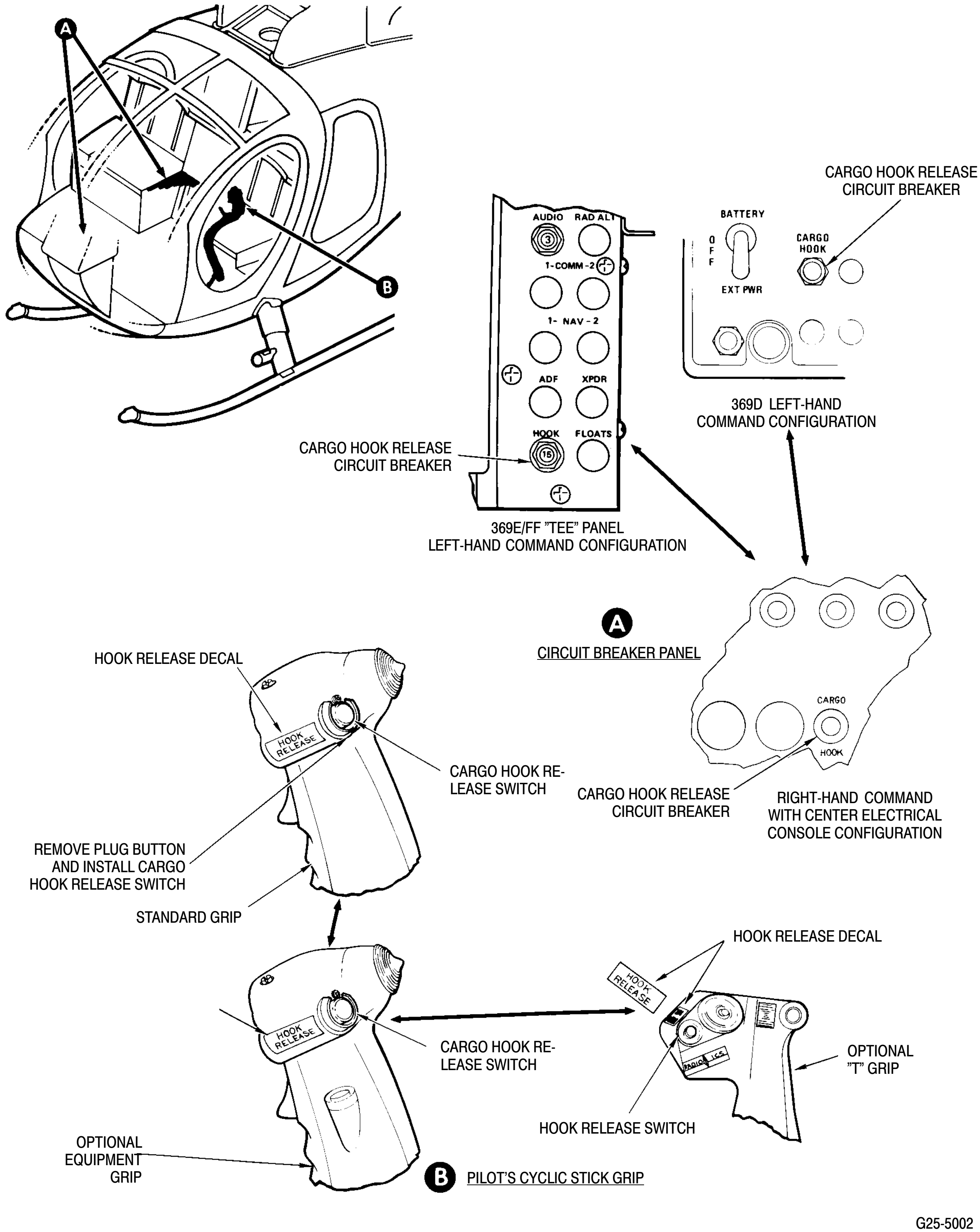


Figure 403. Cargo Hook Electrical Equipment Installation

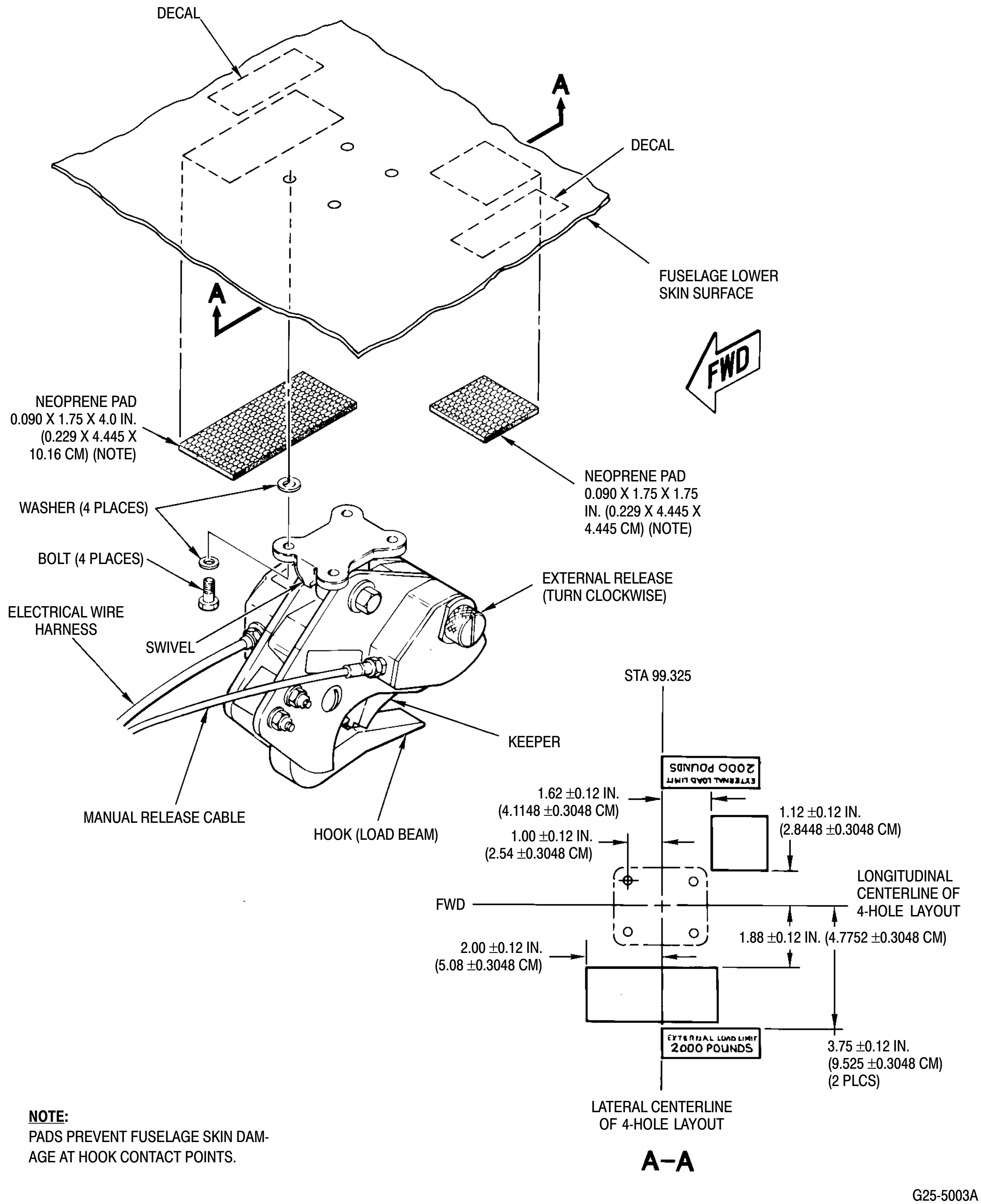
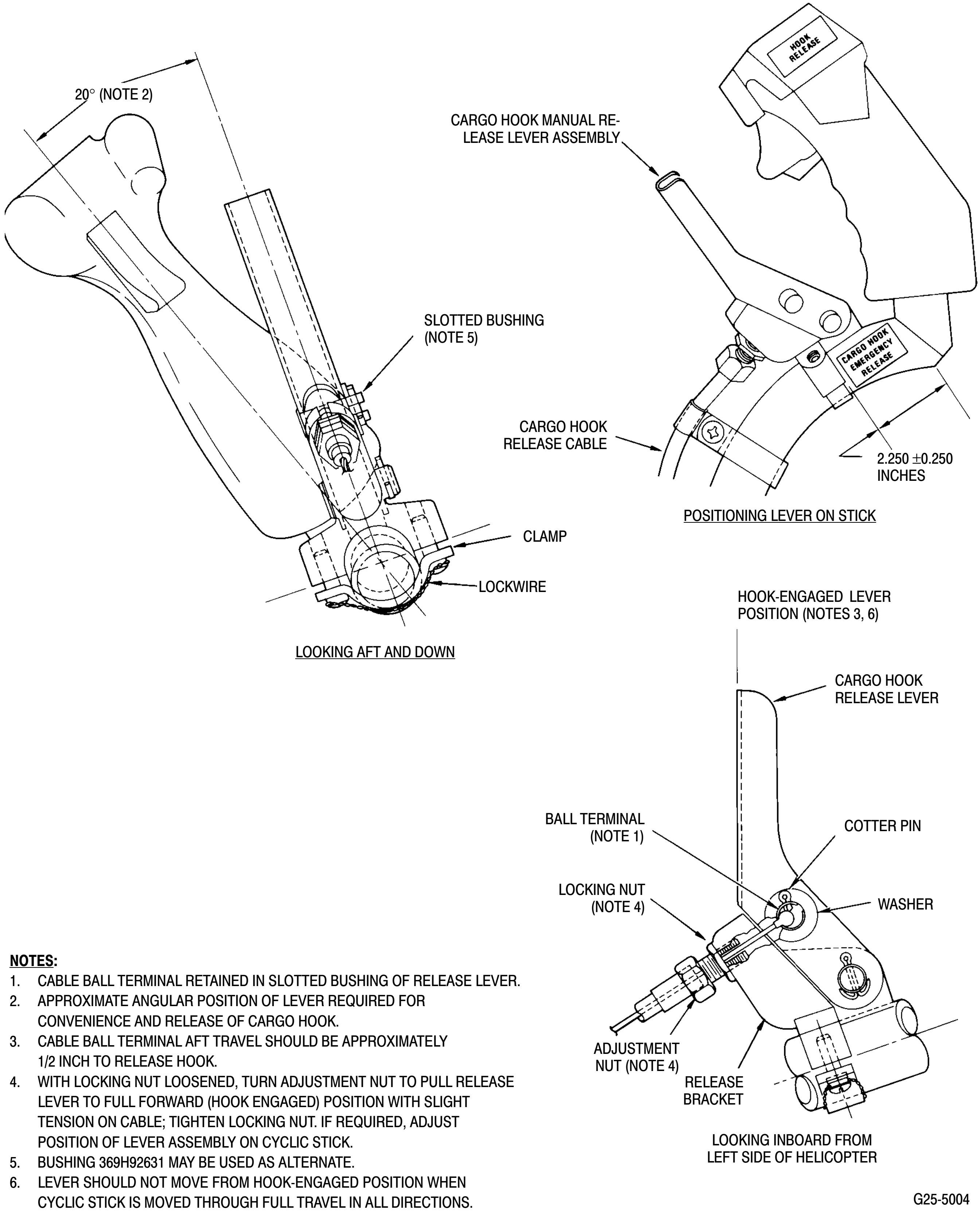


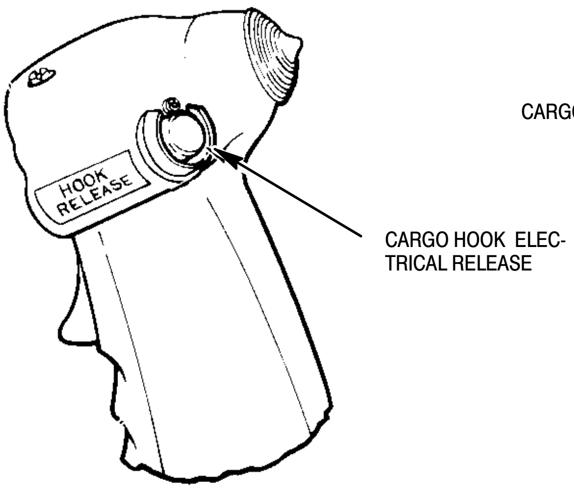
Figure 404. Hook and Pad - Installation



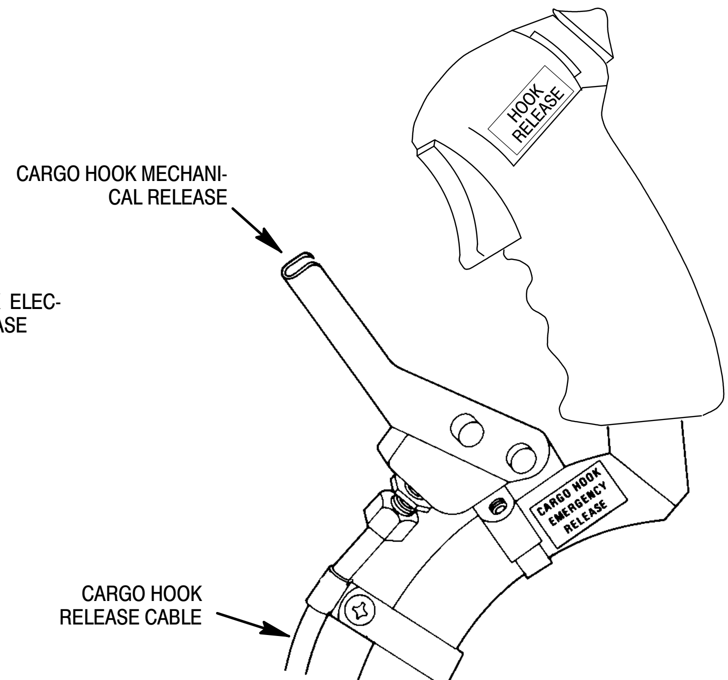
NOTES:

1. CABLE BALL TERMINAL RETAINED IN SLOTTED BUSHING OF RELEASE LEVER.
2. APPROXIMATE ANGULAR POSITION OF LEVER REQUIRED FOR CONVENIENCE AND RELEASE OF CARGO HOOK.
3. CABLE BALL TERMINAL AFT TRAVEL SHOULD BE APPROXIMATELY 1/2 INCH TO RELEASE HOOK.
4. WITH LOCKING NUT LOOSENED, TURN ADJUSTMENT NUT TO PULL RELEASE LEVER TO FULL FORWARD (HOOK ENGAGED) POSITION WITH SLIGHT TENSION ON CABLE; TIGHTEN LOCKING NUT. IF REQUIRED, ADJUST POSITION OF LEVER ASSEMBLY ON CYCLIC STICK.
5. BUSHING 369H92631 MAY BE USED AS ALTERNATE.
6. LEVER SHOULD NOT MOVE FROM HOOK-ENGAGED POSITION WHEN CYCLIC STICK IS MOVED THROUGH FULL TRAVEL IN ALL DIRECTIONS.

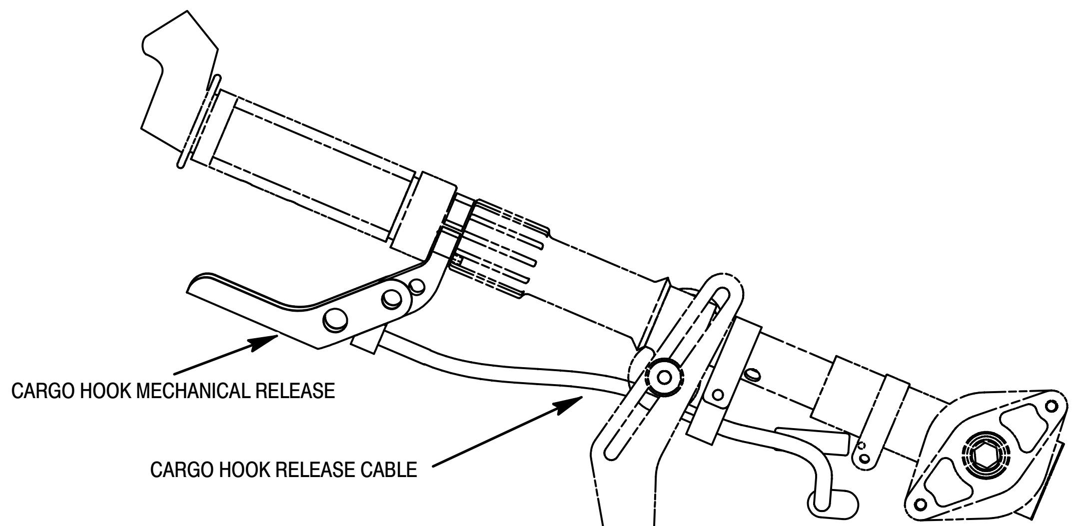
Figure 405. Cargo Hook Manual Release Lever - Installation



CYCLIC-MOUNTED electrical hook release



STANDARD CYCLIC-MOUNTED mechanical hook release



collective-MOUNTED mechanical hook release (note)

NOTE: for 600N MODEL helicopters equipped with the optional emergency float installation, stc# sr00471la.

60-052-1

Figure 406. Cargo Hook Release for 600N Helicopters

CARGO HOOK
INSPECTION/CHECK

1. Cargo Hook Operational Check

Perform the following operational check procedure whenever it is necessary to verify that the cargo hook system is operating properly:

(1). Place battery switch in BATTERY position.

(2). Check that CARGO HOOK/HOOK circuit breaker is pressed to full in position (Ref. Figure 402).

NOTE: Cargo load rings (or equivalent check tool) with a maximum cross-section thickness of 3/4 inch can be used for testing or for cargo transport operations.

(3). Push cargo load ring forward into hook throat (Ref. Figure 404); keeper should permit easy entrance to hook throat.

(4). Pull aft and downward on load ring; hook must remain in locked position.

(5). Rotate external release knob located on left side of cargo hook body, while pulling downward on load ring; hook (load beam) bar should drop and release load ring.

(6). Reinsert load ring in hook throat. Pull CARGO HOOK EMERGENCY RELEASE (manual release) lever on pilot's cyclic stick while load ring is being pulled downward; hook (load beam) should release load ring. Reinsert load ring and move pilot's cyclic stick to all extreme positions; CARGO HOOK EMERGENCY RELEASE lever must not move from hook-engaged position and hook load beam must remain in locked position.

(7). Press CARGO HOOK switch on pilot's cyclic stick grip (Ref. Figure 403) while load ring is being pulled downward; hook load beam should release load ring.

WARNING **Cargo hook must remain closed while moving through all positions of extreme travel fore and aft as well as side-to-side.**

(8). Grasp load ring and pull downward while moving cargo hook manually full travel side-to-side. Ensure hook (load beam) remains in locked position.

2. Adjustment

Adjust the manual release cable so that the 2.250 ±0.250 inch (5.715 ±0.635 cm) dimension shown (Ref. Figure 405) is maintained.

3. Exterior Components Inspection

WARNING **On cargo hooks, manufactured by Breeze-Eastern, Model 2A20B, P/N 17149-1 thru -5, ensure Warning Plate P/N 13830-1 is attached to the manual release side of the cargo hook. If Warning Plate is not installed, contact Breeze-Eastern for Warning Plate and installation instructions.**

(1). Make certain that neoprene pads (Ref. Figure 404) are securely bonded to skin. Check pads for excessive wear.

(2). Verify security of four bolts attaching hook assembly to fuselage (Ref. Figure 404); examine hook assembly for damage or excessive wear. Check that hook body swivels freely in all directions.

(3). Verify security of clips and clamps attaching electrical wire harness and manual release cable housing to fuselage (Ref. Figure 402).

(4). Verify presence and security of grommet (Ref. Figure 401) through which manual release cable passes at fuselage skin.

(5). Check electrical wire harness for cuts, wear, and skinned insulation.

(6). Examine manual release cable housing for nicks, cuts, kinks, dents, or general damage that would restrict movement of cable within housing.

4. Interior Components Inspection

(1). Verify security of electrical receptacle (J605) at fuselage connection (Ref. Figure 401).

(2). Examine electrical wire harness for cuts, wear, or skinned insulation.

(3). Check manual release cable housing for nicks, cuts, kinks, dents, or general damage that would restrict movement of cable within housing.

(4). Verify presence and security of grommet where manual release cable passes through pilot's floor (Ref. Figure 401).

(5). Check security of manual release cable housing adjustment nut; verify that release lever freely returns to hook-engaged position (Ref. Figure 405).

NOTE: The 600N helicopters equipped with emergency floats require the manual release handle to be mounted on the collective stick (Ref. Figure 406)

(6). Verify security of clamps attaching manual release cable housing to pilot's cyclic stick (Ref. Figure 401); check for damage to manual release cable housing that might restrict movement of cable.

(7). Check security of manual release lever attachment to pilot's cyclic stick (Ref. Figure 405).

(8). Examine decals (Ref. Figure 403) for secure attachment and legibility.

(9). Examine cargo hook circuit wiring for damage and/or loose connections.

(10). Verify secure installation of CARGO HOOK circuit breaker and HOOK RELEASE push-button switch (Ref. Figure 403).

CARGO HOOK
INITIAL INSTALLATION

1. Cargo Hook Initial Installation

Procedures in this section may be performed at the operator's discretion and are applicable to 369D/E/FF - 500N helicopters. These instructions provide for the installation of the cargo hook assembly.

A. Preparation for Installation

Preparation for installation of the cargo hook assembly includes the following:

(1). Identify all components, including attaching hardware, or components to be removed for access to work areas. Protect components from damage and contamination until installed.

(2). Check that all electrical switches are in OFF position.

(3). Make certain BATT-OFF-EXT switch is in OFF position.

B. Helicopter Equipment Removal

(Ref. Figure 404) Prior to installing the cargo hook, a limited number of items must be removed from the helicopter to accommodate cargo hook installation.

(1). Remove plug button from cargo switch hole in stick grip; discard plug button.

(2). Remove passenger/cargo compartment left support fairing.

(3). Remove passenger/cargo compartment seat.

(4). Remove cyclic stick control cover.

(5). Remove pilot's floor left covering.

(6). Remove pilot's floor left access door.

C. Modification of Helicopter

Modification of the helicopter consists of cutouts in the pilot's floor and fuselage lower skin to accommodate routing of the cargo hook manual control cable and electrical harness.

NOTE: Fuselage cutouts for left and right hand command are as illustrated (Ref. Figure 901). Use applicable dimensions according to the model helicopter being modified.

(1). Make cutouts in three places as illustrated (Ref. Figure 901).

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

(2). Deburr cutouts and apply thin coat of primer (CM318) to exposed bare metal.

D. Cargo Hook Provisions Installation

(Ref. Figure 404) The following procedure involves installation of the cargo hook provisions exclusive of the cargo hook assembly kit. To complete installation of the cargo hook system, both cargo hook provisions, and the cargo hook assembly kit installations must be accomplished. Hook provision equipment omitted in the following procedure is included in the cargo hook installation procedure. Install cargo hook provisions as follows:

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM206	Chemical coating
CM228	Surface cleaner
CM230	Paint remover
CM318	Primer
CM418	Cement, epoxy

NOTE: The cargo hook and provision kits are supplied with as many parts assembled as practical, however, some parts might require assembly at installation. The operator should omit those steps which may have already been accomplished.

(1). Install cargo hook neoprene pads as follows:

(a). Remove paint from fuselage skin in pad installation areas as shown; use paint remover (CM230).

(b). Clean metal in areas where paint as removed; use surface cleaner (CM228).

(c). Bond neoprene pads to skin at locations shown; use adhesive (CM418).

(2). Prime and touch-up border areas around pads as follows:

(a). Wash affected area with solution of mild soap and fresh water. Rinse area with clean water and wipe dry with clean lint-free cloth.

(b). Using swab, liberally apply chemical film (CM206).

(c). Allow solution to remain on surface for 1 to 3 minutes, or until surface becomes amber to brown in color.

NOTE: Avoid letting chemical mixture dry on surface. If it has dried, re-wet surface with solution.

(d). Rinse treated surface with clean water. After rinsing, wipe off excess moisture with clean lint-free cloth. Allow area to dry completely at room temperature for 1 hour.

(e). Wipe surface clean with thinner and dry off immediately.

(f). Apply primer (CM318) and allow to dry for 30 minutes.

(g). Apply lacquer to match original factory finish color.

NOTE: Installation of the cargo hook manual release lever assembly and clamp assemblies is accomplished during installation of the cargo hook kit.

E. Electrical Components and Wiring Installation (Left and Right Hand Command)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM404	Adhesive, epoxy
CM614	Sleeving, heat-shrink
CM704	Tie strap, nylon

NOTE: The order and manner of installation for left or right hand command is the same. Refer to dimensions given in applicable figures, for model of helicopter being modified.

(1). Make certain BATTERY switch is in OFF position.

(2). Disconnect battery connector.

(3). Connect cargo hook switch to existing wires according to stick grip and model helicopter being modified. Insulate wires and contacts on switch with sleeving (CM614). Ref. Table 901 and applicable wiring diagrams (Ref. Figure 101).

(4). Install switch guard on switch. Apply small amount of adhesive (CM404) to O.D. of switch.

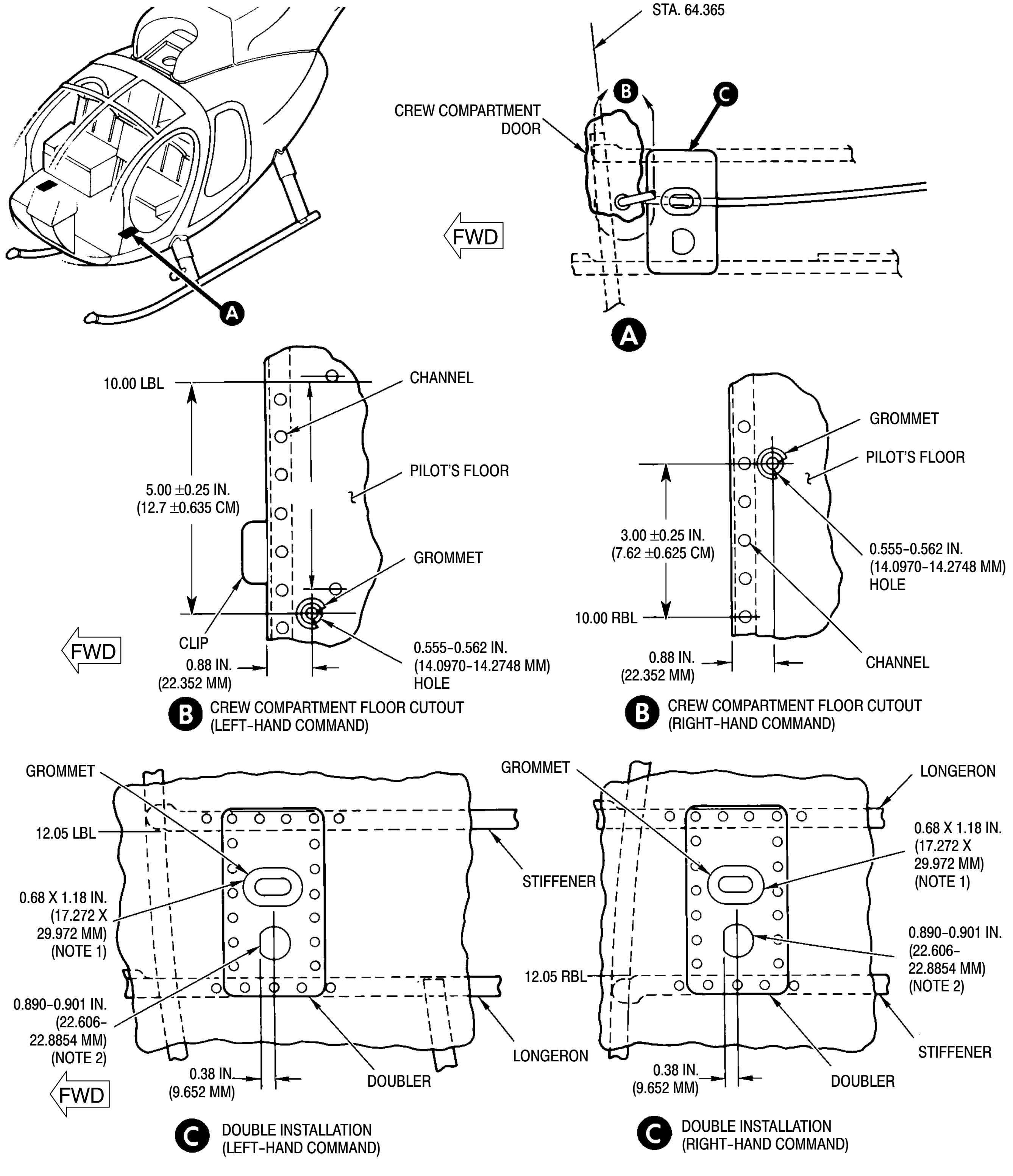
(5). Install switch in grip. Allow minimum cure time of 24 hours ±30 minutes.

(6). Install relay on bracket with screws, washers, and nuts (Ref. Figure 902).

Table 901. Cargo Hook Relay Installation

Relay	Model	Location	Remarks
K104	D	369A2519 Bulkhead	Slim console
K312	E/FF	369H2500 Bulkhead	T-Panel

(7). Locate existing mounting holes according to model of helicopter being modified. (Ref. Table 902 and Figure 902). Using relay bracket as a template, mark and drill attachment hole(s) 0.165-0.177 inch (4.191-4.4958 mm) in bulkhead as required.



NOTES:

1. SLOT IN SKIN TO MATCH SLOT IN DOUBLER.
2. HOLE IN SKIN TO MATCH HOLE IN DOUBLER.

G25–5006A

Figure 901. Fuselage Skin Cutouts

(8). Attach relay bracket to bulkhead with screws, washers and nuts. Identify relay as indicated (Ref. Table 902), using a suitable contrasting permanent ink.

(9). On left hand command helicopters, remove edgelighted panel from lower switch and circuit breaker panel: loosen lower circuit breaker panel. Remove hole cover button; install circuit breaker (CB603) (Ref. Figure 402).

(10). On right hand command helicopters with center electrical console, remove edgelighted panel from circuit breaker panel located on the pilot's collective pitch stick cover; loosen circuit breaker panel remove hole cover button; install circuit breaker (Ref. Figure 402).

(11). On right or left hand command helicopters with standard cyclic stick grip, install module and cover on TB3.

(12). Install cargo hook circuit wiring; see applicable wiring diagram (Ref. Figure 101). For wire termination and terminal hardware, refer to Table 102.

(13). Install cargo hook electrical connector with washer and connector nut. Install protective cap on receptacle if cargo hook kit is not being installed concurrent with provisions.

(14). Secure cargo hook circuit wiring with tie-straps (CM704) as required. Check that wires and terminals are not stressed.

(15). Check all wiring for correct installation and security of attachment.

(16). Connect battery connector.

F. Cargo Hook Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM429	Sealing compound, silicone
CM702	Lockwire CRES
CM704	Tie strap, nylon

The cargo hook installation consists of attaching the hook and emergency electrical/manual release cables on the underside of the helicopter, routing and securing the manual release cable, and installation and adjustment of the manual release lever.

(1). Secure base of cargo hook assembly to fuselage underside with bolts and washers (Ref. Figure 404).

(2). If installed, remove protective cap from cargo hook electrical receptacle (J605); check that BATTERY switch is in OFF position and connect plug (P605) to receptacle.

(3). Insert free end of hook manual release cable through elongated hole adjacent to electrical receptacle; push manual release cable up into fuselage and insert cable through hole in pilot's floor (Ref. Figure 401).

(4). Install electrical harness and manual release cable clamp (provision) clips with rivets (Ref. Figure 402).

(5). Loosely attach harness and cable clamps with screws, washers and nuts; adjust harness and cable to allow sufficient slack for hook to swing 30 degrees conically from centerline without creating strain on harness and cable. Arrange harness and cable to form smooth flow to cutouts in fuselage skin; tighten clamps. Install tie straps (CM704) approximately as shown (Ref. Figure 402).

(6). Loosely attach manual release cable to cyclic stick with clamps, screws, washers, and nuts (Ref. Figure 401).

(7). Engage swaged ball on release cable in lever bushing; secure bushing with washer and cotter pin (Ref. Figure 405).

(8). Attach manual release lever assembly to cyclic stick with clamp and screws; adjust cable and/or release lever as shown (Ref. Figure 401).

(9). Tighten three sets of clamps securing release cable to cyclic stick.

(10). Check that hook does not release when cyclic stick is moved to extremes in all directions.

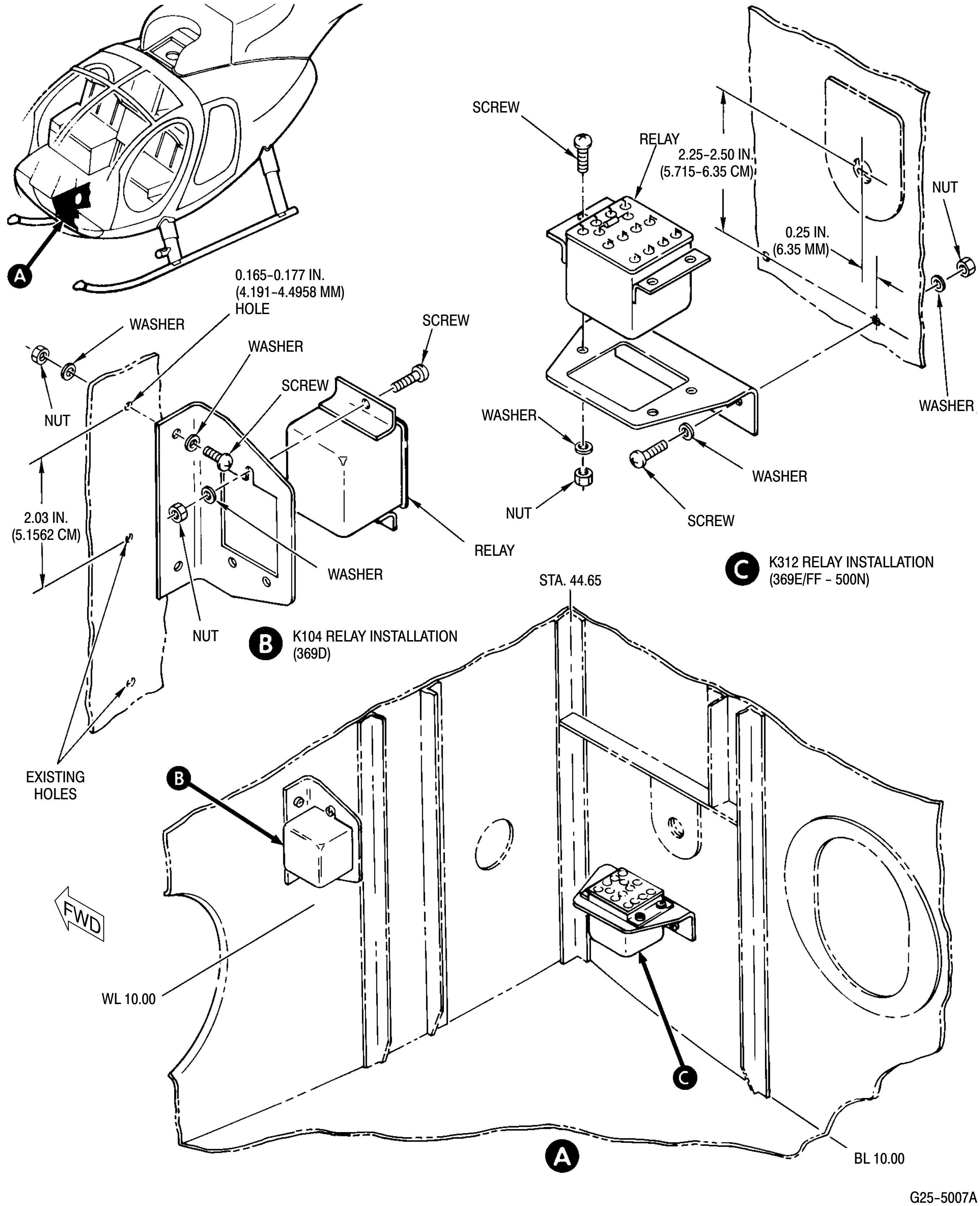


Figure 902. Relay and Bracket Installation Pilots Floor (369D/E/FF)

(11). Pull manual release lever; check that hook load beam opens. Repeat operation several times to ensure proper release of hook.

(12). Re-adjust cable/lever as required to obtain smooth consistent release of hook.

NOTE: The manual release lever clamp may be loosened and the lever assembly moved on cyclic stick to simplify adjustment, providing the 2.250 ±0.250 inch (5.715 ±0.635 cm) dimension limit is maintained (Ref. Figure 405).

(13). Install grommet in crew compartment floor cutout (Ref. Figure 401). Fill any voids between grommet and cable. Use sealant (CM429).

(14). Install grommet in elongated hole in fuselage lower skin and doubler (Ref. Figure 402). Fill any voids between grommet and manual release cable. Use sealant (CM429).

(15). Safety manual release lever clamp screws with lockwire (CM702), (Ref. Figure 405).

(16). Install HOOK RELEASE decal on left or right hand cyclic stick grip (Ref. Figure 403).

(17). Install CARGO HOOK EMERGENCY RELEASE decal on cyclic stick (Ref. Figure 405).

(18). Install EXTERNAL LOAD LIMIT 2000 POUNDS decal (Ref. Figure 404).

Table 902. VNE Card Installation

Part Number	Model	Effectivity
369D29571 -17, -19	D	003 - 523
-21, -23	D/E	D 524 & Subs E 001 & Subs
369D292588	FF	001 & Subs

(19). Replace V_{NE} card on instrument panel as applicable (Ref. to Table 903).

G. Helicopter Equipment Installation

Reinstall equipment initially removed in reverse order of removal.

NOTE: At completion of installation, perform an operational check of cargo hook installation.

Table 903. Cargo Hook Switch Installations - Stick Grip

Part Number	Model	Remarks
369H90153-BSC	D/E/FF	For models equipped with emergency floats, left or right hand command (Ref. Figure 403).
-3	D/E/FF	For models equipped with hoist, left or right hand command (Ref. Figure 403).
369D27133	D/E/FF	Standard grip, left hand command (Ref. Figure 403).
369D297846-BSC	D	Center electrical console, “T” grip right hand command (Ref. Figure 403).
-3	D	Center electrical console, “T” grip right hand command (Ref. Figure 403).
369H92805	D	Center electrical console, “T” grip right hand command (Ref. Figure 403).

H. Weight and Balance Data

Weight and balance changes resulting from installation of the cargo hook are listed in Table 904. After installation of the cargo hook incorporate changes in helicopter weight and balance record as instructed.

Table 904. Weight and Balance Data

	Weight Pounds (kg)		Arm Inches (cm)		Moment in-lb (kg cm)	
Added	+6.3	(+2.858)	+87.0	(+220.98)	+548.1	(+631.48)

Section

25-60-00

Emergency First Aid Kit

EMERGENCY FIRST AID KIT MAINTENANCE PRACTICES

1. Emergency First Aid Kit

(Ref. Figure 201)

(1). The Emergency First Aid Kit uses a plastic case that meets Federal Aviation Regulation (FAR) 27.8530 requirements for fire protection. The kit is installed on the lower right front of the seat structure in the crew compartment and centered at right buttline 20.75 just above the pilot's floor mold line. It attaches to the station bulkhead with two parallel velcro pile strips, 1 x 8 inches (2.54 x 20.32 cm), bonded two inches (5.08 cm) apart in the horizontal position. Two matching velcro hook strips are bonded across the width of the case back.

(2). The kit is easily detached from its velcro tape mount by a firm pull on the handle. The case is opened by off-setting the snap fastener.

(3). Kit contents include a direction sheet and the following eight packaged items: adhesive and plain bandage compresses, iodine, swabs, ammonia inhalants, burn ointment, tourniquet, forceps, and scissors. The contents of the kit meet or exceed the requirements of Federal Aviation Authority (FAA) Specification 121, Appendix A for aircraft with a passenger capacity of five persons or less.

2. Emergency First Aid Kit Contents Check

Periodically check kit contents to ensure an adequate supply of medical items. Purchase individual items locally. To purchase a replacement kit, contact:

MD Helicopters Inc.,
5000 East McDowell Road,
Mesa, AZ 85205,
Att: New Parts Sales.

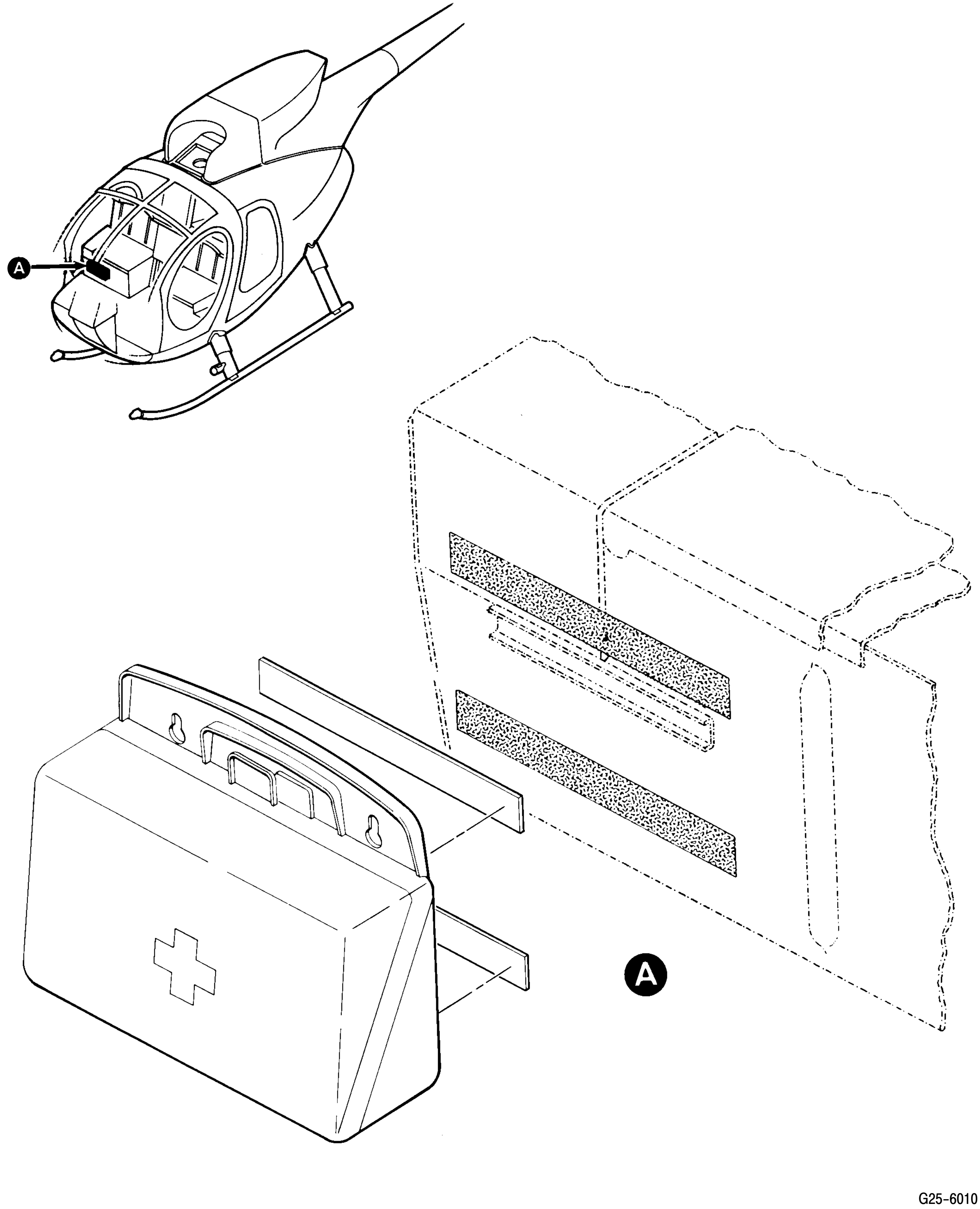


Figure 201. Emergency First Aid Kit

Section

25-63-00

Hoist Passenger/Cargo

HOIST PASSENGER/CARGO MAINTENANCE PRACTICES

1. Hoist Passenger/Cargo

(Ref. Figure 201)

(1). The hoist configuration is installed on the right side of L/H command helicopters. The configuration for R/H command is identical except that the hoist is installed on the opposite (left) side of the helicopter. The passenger/cargo hoist assembly consists of an electrically-operated winch mounted on a support tube, a hoist operator's safety harness, a passenger door (hold open) retainer assembly, a passenger door sill antichafing bar assembly, a control pendant, and associated electrical equipment. The hoist provides a means for lifting and lowering personnel or objects weighing up to 300 pounds (136 kg). The hoist system employs lightweight, readily-attachable and -detachable exterior-mounted equipment without using passenger or cargo space in the helicopter. For safety purposes, a guillotine-type cable cutting device is incorporated in the hoist winch assembly. The hoist function is identical when operated from either side of the helicopter.

NOTE: When the hoist is installed on L/H command helicopters equipped with emergency floats, the floats must be in a stowed condition during hoisting operations. Emergency floats must be removed from R/H command before conducting hoisting operations.

(2). (Ref. Figure 202) The weatherproof winch consists of a 28 Vdc motor that drives a cable drum to which a 110 foot (33.5 M) stainless steel cable with a swivel hook is attached. The winch is equipped with an automatic brake system; up (full-in) and down (full out) limit stop switches; and an explosive, electrically-activated guillotine-type cable cutter for cutting the cable in an emergency. The hoist assembly is mounted on a support tube attached with quick-release pins to three fittings located on the exterior of the fuselage on either side and above the passenger/cargo door. The support tube positions the winch to allow raising and lowering the cable between the side of the fuselage and landing gear skid. Two modified mounting brackets are used to accommodate installation of the winch on the support tube. The winch incorporates a disc-type brake, housed on the end of the hoist drum, which consists of spring-loaded friction plates and an actuating solenoid. The solenoid is energized to release the brake at the same time the motor is energized. Once the control pendant switch is released to the off position, the brake solenoid is deenergized and the brake sets, preventing any possibility of uncontrolled cable payout. Cable up (full-in) and down (full out) limit switches are incorporated in the winch brake system. When either limit switch is in the closed position, the brake solenoid is energized, releasing the brake discs and allowing the winch drum to rotate. Conversely, when either limit switch is in the open position the brake solenoid is deenergized and the winch brake automatically sets and stops the winch.

(3). (Ref. Figure 203) The passenger/cargo door retainer assembly consists of a tubular housing attached with four clamps securing the housing horizontally across the canted bulkhead in the passenger/cargo compartment. With the passenger/cargo door in full open position, a smaller tube stowed inside the tubular housing extends in a telescoping effect and engages a bracket located on the outboard frame of the door, thus retaining the door in an open position. The telescoping tube can be used in either end of the tubular housing to hold the left or right passenger/cargo door open as required.

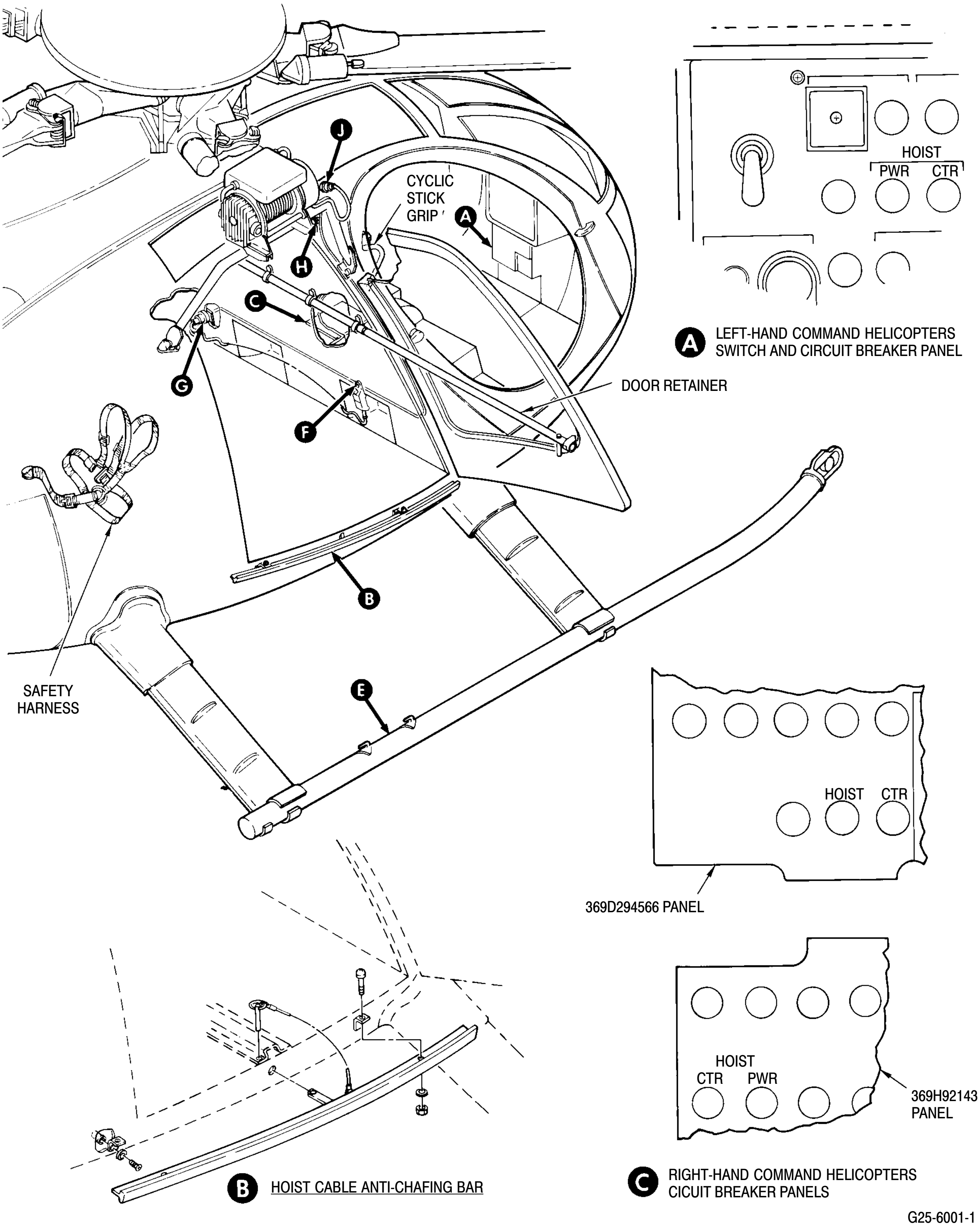


Figure 201. Hoist System Components (Sheet 1 of 3)

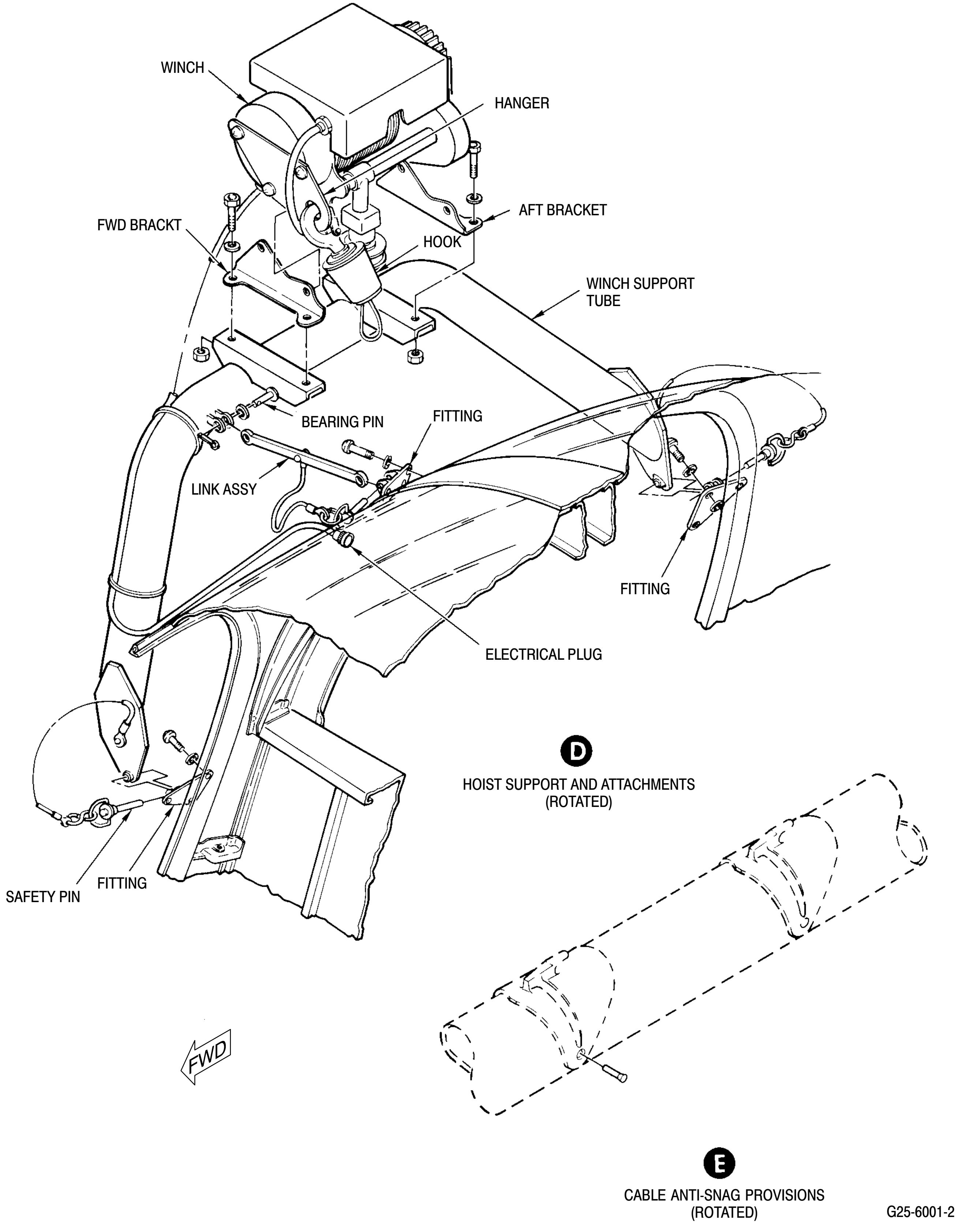


Figure 201. Hoist System Components (Sheet 2 of 3)

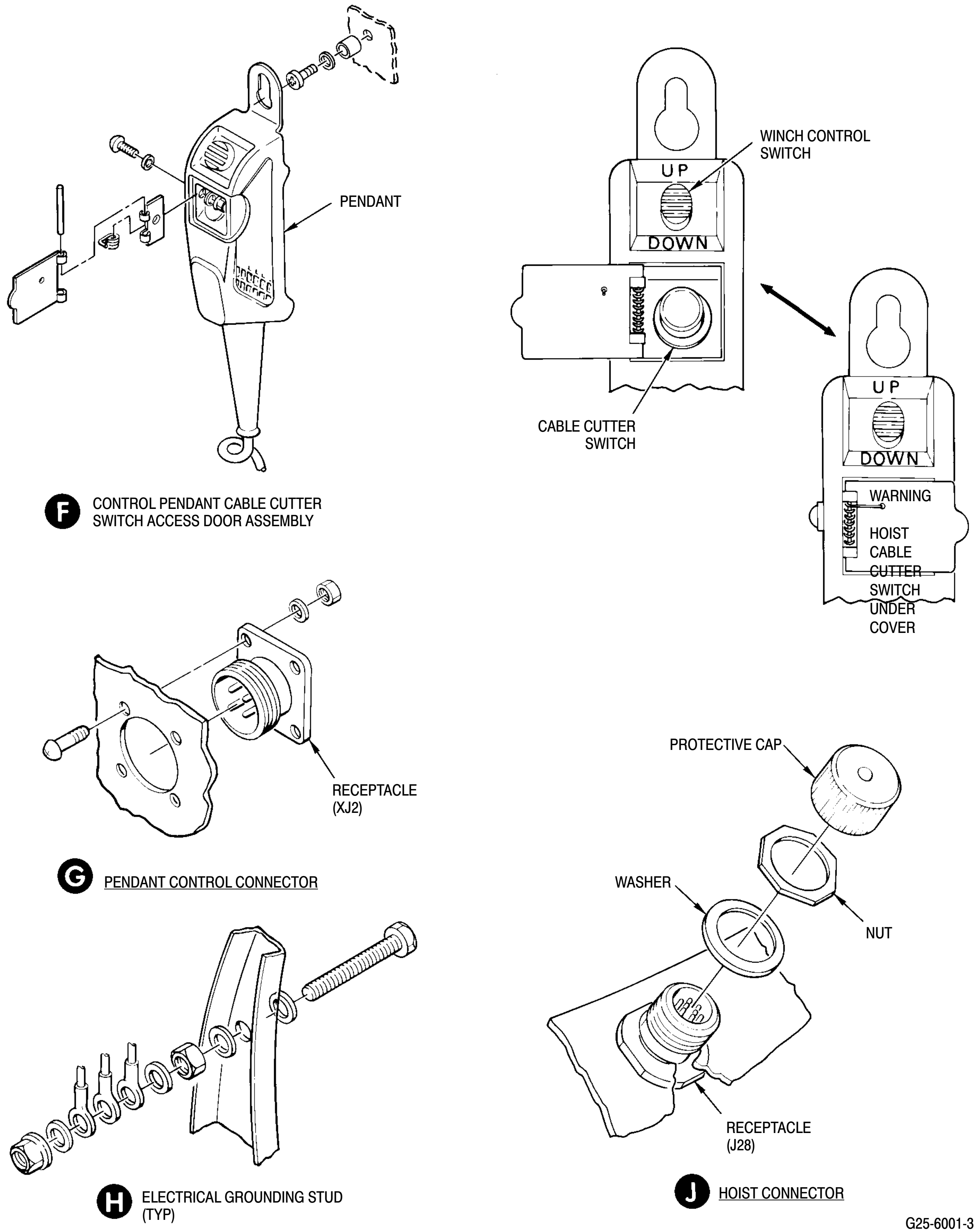


Figure 201. Hoist System Components (Sheet 3 of 3)

(4). (Ref. Figure 201) An antichafing bar, installed just below the passenger/cargo door sill, prevents the hoist cable from cutting the door frame during hoisting operations. A hoist operator's safety harness. provided with the hoist, is connected to the seat belt anchor fitting on the side of the passenger/cargo compartment opposite the side where the hoist is installed.

(5). The hoist system electrical equipment consists of a hand held electrical pendant control for use in the passenger/cargo or crew compartments to operate the winch, an emergency cable cutter switch on the pilot's cyclic stick, circuit breaker equipment, and associated electrical wiring. The pendant control contains a three position switch, spring loaded to the off position, for raising and lowering the swivel hook, and a guarded switch for cutting the cable at the winch in an emergency. The pilot's cyclic stick cable cutter switch allows the pilot to cut the hoist cable independent of the pendant control. The circuit breakers are mounted on the lower switch and circuit breaker panel in L/H command, and on the circuit breaker panel located aft of the pilot's collective stick on R/H command. The cable cutter circuits are independently protected by a separate lower-amperage circuit breaker located adjacent to the hoist power circuit breaker. Electrical wiring, plugs, receptacles, and terminals interconnect the various electrical components.

(6). Differences in hoist installations and electrical circuitry for L/H and R/H command is described in subsequent text and illustrations. Refer to manufacturer's publications (Ref. Table 201, Sec. 01-00-00, BL-16600 Series 300 Lb Capacity Hoist Operating lnstructions - Hoist Winch Assembly, Breeze Corporation, Inc)) for additional hoist, hook, cable, and parts information.

2. Preparation for Hoisting Operations

CAUTION To avoid inadvertent firing of cable cutter, ensure cable cutter electrical circuits are not energized.

(1). Connect external electrical power to helicopter.

(2). Place BATTERY switch in EXT position.

(3). Open passenger/cargo door; extend and secure door (hold-open) retainer tube.

(4). Using hoist system control pendant, exercise winch by paying out 3 or 4 feet of cable under approximately 15 pounds (6.8 kg) tension, pulling cable straight down to avoid rubbing cable on cable bellmouth. Reverse control and reel cable in. Check that cable winds on winch drum evenly and that winch operation is smooth and consistent. Make certain winch stops automatically when top of swivel hook pushes against winch bumper pad.

(5). If installed, remove cable cutter jumper wire (Ref. Figure 202).

WARNING **Cable cutter jumper wire must be removed to allow cable cutter electrical circuit to be completed by switch control, providing instantaneous in-flight cable cutting capability should such emergency action be required.**

(6). If winch has not been used for an extended period of time, or if cable has been replaced, perform an operational check (Ref. Hoist System Operational Check).

(7). Check that winch support tube attach safety pins are secure and fully seated.

(8). Check that winch electrical connector plug is secure on receptacle on side of fuselage.

(9). Connect hoist system operator's safety harness to seat belt fitting on opposite side of passenger/cargo compartment from where winch is installed.

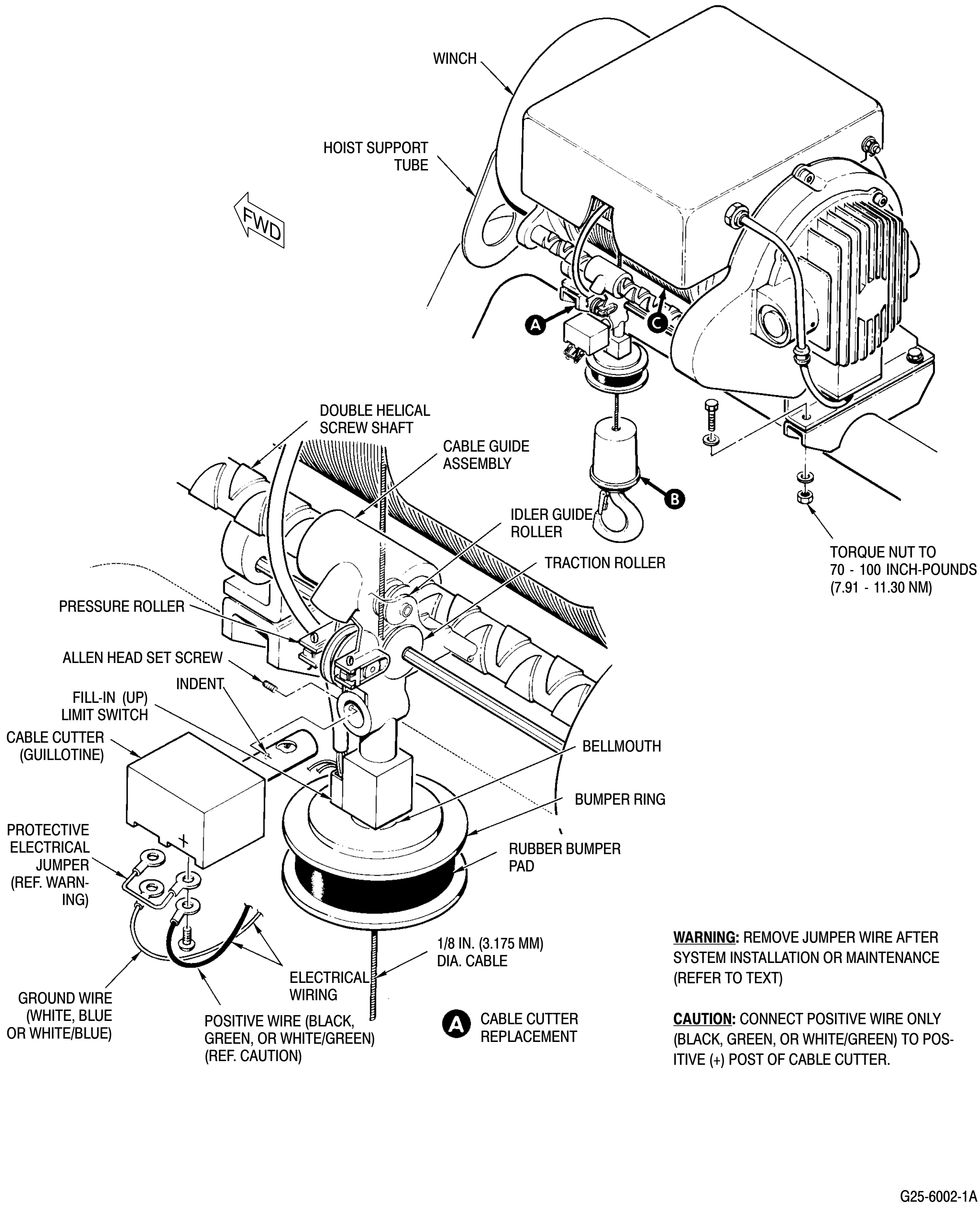
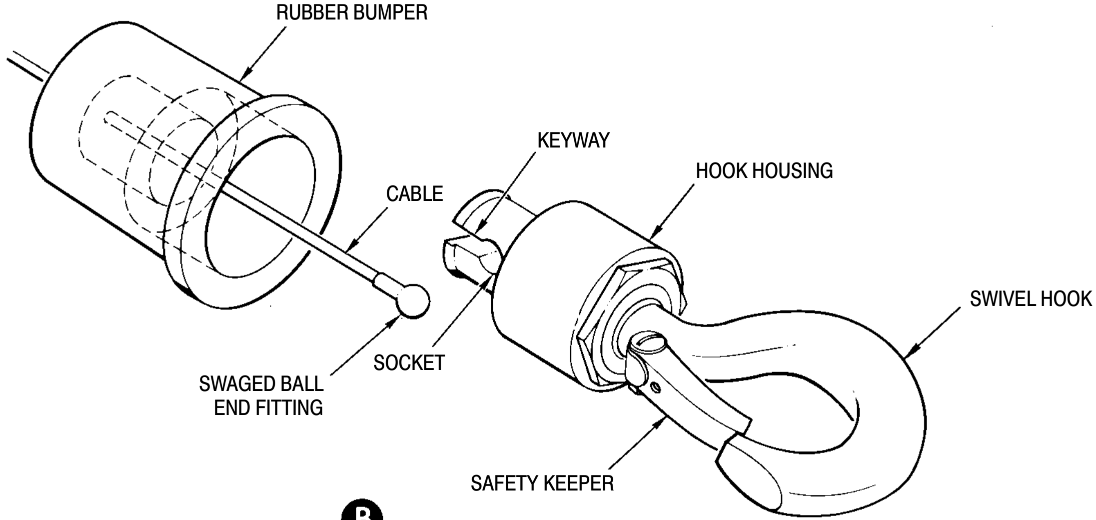
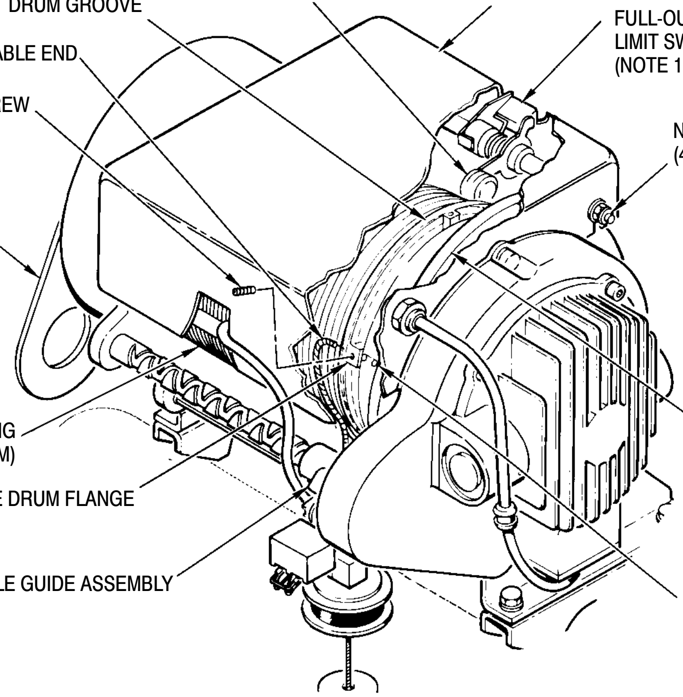


Figure 202. Winch Cable, Cable Cutter, and Swivel Hook Replacement (Sheet 1 of 2)



B
CABLE-T O-HOOK
ATTACHMENT



C
CABLE-T O-DRUM
ATTACHMENT

NOTES:
1. EXCESSIVE TIGHTENING MAY AFFECT FULL-OUT SWITCH SETTING.
2. USED FOR HOOK STOWAGE.

G25-6002-2

Figure 202. Winch Cable, Cable Cutter, and Swivel Hook Replacement (Sheet 2 of 2)

(10). Place BATTERY switch in OFF position.

(11). Remove external electrical power from helicopter.

3. Hoist System Troubleshooting

(Ref. Table 201) Wiring diagrams are provided for the hoist systems used on L/H command (Ref. Figure 204) and R/H command helicopters (Ref. Figure 205). A schematic diagram of the winch is also provided (Ref. Figure 206).

(Ref. Chap. 96 for interfacing schematics and wiring diagrams)

4. Cyclic Stick Grip and Cyclic Stick Cable Cutter Switch (S600) Replacement

(Ref. Sec. 67-10-20)

5. Hoist Assembly Replacement

A. Hoist Assembly Removal

(1). Check that cable is fully retracted on winch drum.

(2). Check that BATTERY switch is in OFF position.

(3). Install safety jumper wire on cable cutter electrical terminals (Ref. Figure 202).

CAUTION Protective jumper wire should remain on cable cutter electrical terminals until winch is reinstalled for use.

(4). Disconnect winch electrical plug (Ref. Figure 201) from receptacle on fuselage; install protective cap on receptacle.

(5). Support winch; remove three quick-disconnect safety pins securing winch support tube to fittings on fuselage.

(6). Remove winch and support tube from fuselage.

(7). Remove cotter pin, washer, and bearing pin securing link assembly to winch support tube.

NOTE: If support tube fittings are to be removed from fuselage, make certain nylon screws are installed in attachment holes.

(8). Remove bolts securing winch to support tube brackets.

B. Hoist Assembly Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM703	Tie strap

NOTE: If support tube fittings (Ref. Figure 201) were removed from fuselage, remove nylon screws installed in support fitting attachment holes on fuselage.

(1). If required, install winch support tube attach fittings on fuselage using screws and washers.

(2). Attach winch to support tube using bolts, washers, and nuts. Torque bolts to **70 - 100 inch-pounds (7.91 - 11.30 Nm)**.

(3). Attach link assembly to support tube using bearing pin, washer, and cotter pin.

(4). Attach winch support tube to fuselage fittings using quick-disconnect pins.

NOTE: Install pins in positions shown.

CAUTION Check that all electrical power is OFF to eliminate possibility of inadvertent firing of cable cutter.

(5). Remove protective cap from electrical receptacle on side of fuselage. Connect winch electrical plug to fuselage receptacle. Secure wire harness to support tube using tie-straps (CM703).

WARNING **Remove protective electrical jumper wire (Ref. Figure 202) from cable cutter whenever winch is installed on helicopter. Jumper wire will prevent operation of cable cutter in an in-flight emergency.**

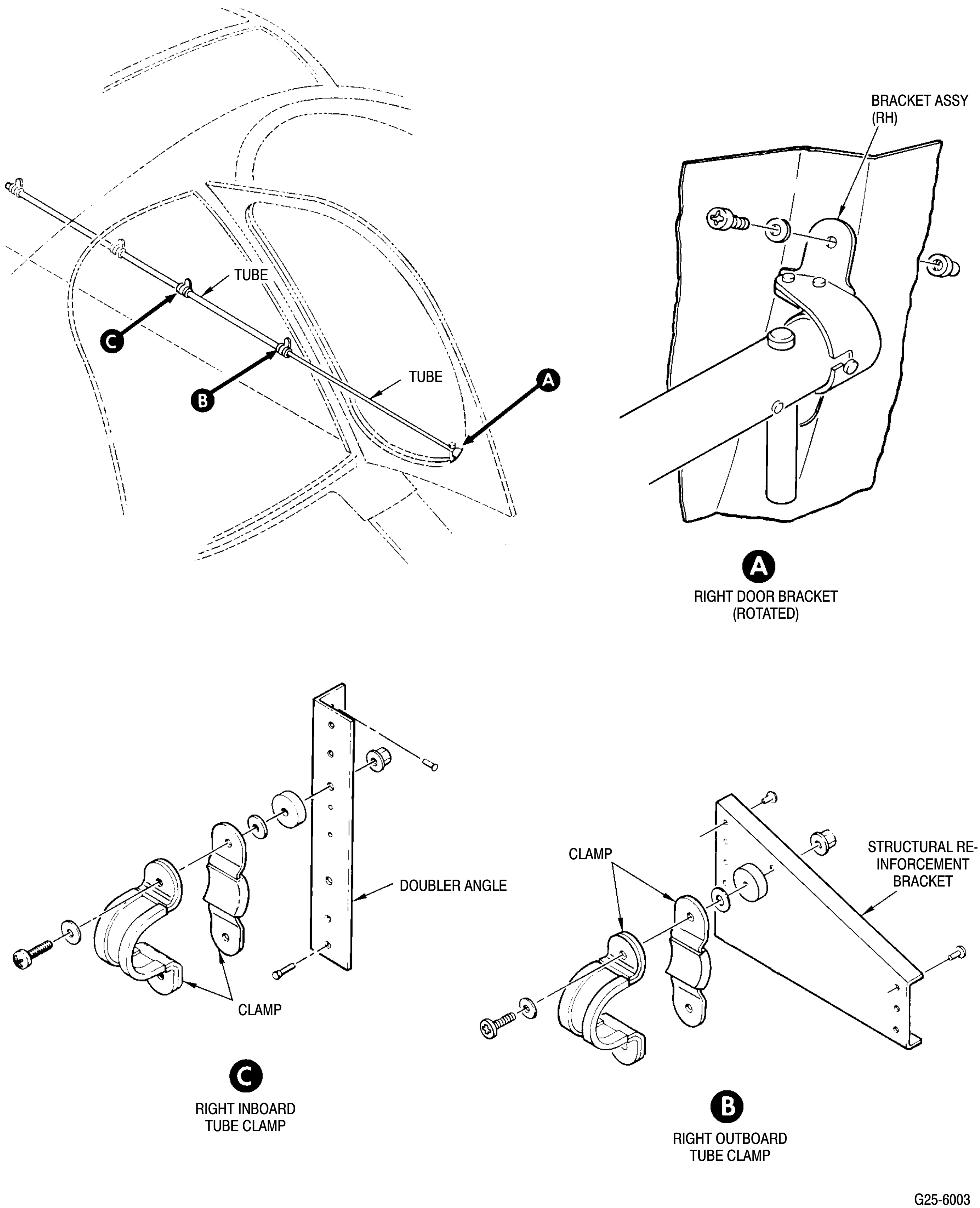


Figure 203. Passenger/Cargo Door Retainer Installation

6. Winch Components Replacement

A. Winch Cable Replacement

(Ref. Replacement of the winch cable (Ref. Figure 202) is required if cable is damaged, worn excessively, or cable cutter has been fired (Ref. Hoist Equipment Inspection for inspection requirements and for cable replacement criteria).

(1). Install hoist and support on helicopter (Ref. Hoist Assembly Installation).

CAUTION When electrical power is present, make certain cable cutter electrical circuits remain deenergized to eliminate the possibility of inadvertent actuation of cable cutter. To avoid possibility of cutting cable, install jumper wire between cable cutter electrical terminals.

NOTE: An external power source should be connected to the helicopter to prevent excessive battery discharge. Hoist uses up to 40 amperes electrical current during operation.

(2). Connect external electrical power source to helicopter.

(3). Place BATTERY switch in EXT position.

(4). Using hoist pendant control (Ref. Figure 201), reel off all cable from winch drum as follows:

NOTE: Two persons can facilitate cable removal; one person to operate winch and a second person to handle and coil cable.

(a). Operate winch and start reeling cable off winch drum.

CAUTION To prevent bellmouth wear, cable should not be pulled against side of bellmouth on cable guide.

(b). As cable unwinds, maintain straight downward tension, approximately 15 pounds (6.8 kg); lay or coil cable in a clean clear area. Position cable so that cable will not kink or tangle, to facilitate rewinding.

(c). Continue unwinding cable until down (full-out) limit switch (Ref. Figure 202) activates (opens) and allows brake to engage, thus stopping cable payout.

NOTE: Three turns of cable will remain on winch drum when down limit switch opens.

(d). Remove winch cable drum cover.

(e). Manually raise roller wheel, at top right rear of winch drum, to close the down limit switch (release brake) and allow remaining cable to be reeled off cable drum.

(f). Using control pendant, finish unwinding cable. Stop winch when cable is fully unwound from drum.

(5). Remove winch cable from drum as follows:

(a). Loosen Allen head setscrew securing cable end in drum anchor hole. Remove cable end from winch by pulling cable down through cable guide, cable cutter, and bumper guide.

CAUTION Anchor hole setscrew should be temporarily tightened to prevent fouling winch mechanism if winch is inadvertently operated.

(b). Retighten setscrew in anchor hole.

(6). Remove swivel hook from cable (Ref. Swivel Hook Replacement).

NOTE: Replacement cable must be 0.125 inch (3.175 mm) diameter stainless steel, 19 by 7 cable strand, extra strength, antispin cable with a minimum breaking strength of 1800 pounds. Make certain any replacement cable, other than cable supplied by winch manufacturer, is approximately 113 feet (34.442 M) long, is equipped with a swaged ball fitting, and is proof-tested to a minimum load of 1850 pounds (840 kg).

(7). Install swivel hook on replacement cable (Ref. Swivel Hook Replacement).

(8). Attach new replacement cable to winch as follows:

(a). Insert free end of replacement cable up through bumper pad guide center, bellmouth, switch, cable cutter, and between cable rollers in the cable guide assembly (Ref. Figure 202).

(b). Ensure cable guide assembly is centered and aligned with first groove on double helical screw shaft. Facing cable guide mechanism, check that guide will travel from right to left when winding cable on drum.

(c). Secure cable to drum by loosening set screw and inserting cable end into drum cable anchor hole until cable end bottoms, approximately 3/8 inch (9.525 mm); tighten setscrew.

(d). Check that replacement cable is positioned in first drum groove at right when facing cable guide mechanism.

(9). Operate hoist and wind replacement cable on winch as follows:

(a). Deactivate down limit switch by manually raising teflon roller wheel at top right rear of winch drum; use control pendant to wind replacement cable on winch. Release the down limit switch after three turns of cable are on drum.

(b). Maintain sufficient tension, approximately 15 pounds (6.8 kg) on cable while winding cable on drum; check that cable winds straight, smooth, and snug, without kinking against cable windings on drum. Avoid cable rubbing on side of bellmouth during cable winding.

(c). Continue winding operation until entire cable is wound on drum: check that winch stops automatically when top of swivel hook pushes against winch rubber bumper pad. (Bumper pad upward movement actuates (opens) full-in (up) limit switch at cable guide base.

NOTE: The up limit switch should actuate before excessive cable pressure is applied to vertically compress bumper pad. Permanent damage can result if rubber bumper pad is stowed in a compressed state over an extended period of time; rubber bumper will remain in a compressed (set) state.

(d). Install cover on winch.

(10). Perform an operational check of hoist system (Ref. Hoist System Operational Check).

B. Swivel Hook Replacement

(Ref. Figure 202)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM114	Petrolatum

(1). Remove swivel hook assembly from cable as follows:

(a). Remove rubber bumper covering swivel hook housing by pulling bumper upward off top of hook housing.

(b). Remove cable swaged ball end fitting from hook housing socket: pull cable swaged ball fitting through rubber bumper.

(2). Install swivel hook on cable as follows:

(a). Lubricate cable swaged ball end fitting with petrolatum (CM114).

(b). Insert cable through top of rubber bumper.

(c). Insert cable ball fitting in hook housing keyway and socket.

CAUTION Ensure hook rubber bumper completely covers hook housing.

(d). Secure cable ball fitting in housing socket by sliding rubber bumper down over hook housing.

NOTE: Hook rubber bumper should completely cover housing, and bumper base will overlap inward around housing base by approximately 1/16 inch when fully seated on housing.

C. Cable Cutter Replacement (Guillotine-T ype)

(Ref. Figure 202)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM425	Sealing compound

Cable must be removed from winch (Ref. Winch Cable Replacement) before guillotine-type cable cutter can be replaced. Replace a spent cable cutter guillotine on winch as follows:

WARNING **The cable cutter contains an explosive squib that is electrically fired. A protective short-circuiting electrical jumper should remain connected to cable cutter, not installed on the winch, to eliminate possibility of inadvertent accidental firing.**

(1). Disconnect two electrical wire terminal lugs from spent cable cutter.

(2). Loosen two Allen head setscrews at side of movable cable guide and remove spent cable cutter from guide.

(3). Check that all electrical power is OFF.

WARNING **Do not use an ohmmeter or any other device containing an internal voltage source which could fire cable cutter.**

(4). Using a voltmeter, check for zero voltage between electrical wiring terminal lugs; also check for zero current between lugs with a milliammeter.

(5). Insert cylindrical end of new cable cutter into winch movable cable guide, with shorting jumper positioned downward, and secure cable cutter to guide with two Allen head setscrews. Setscrew mates with indent on cable cutter.

(6). Connect one electrical terminal lug to cable cutter terminal, leaving protective short-circuiting jumper installed on cable cutter. Then connect second wire to remaining cable cutter terminal in the same way.

CAUTION Protective jumper wire should remain connected to cable cutter electrical terminals until hoist is to be used.

(7). Cover exposed electrical terminal areas with sealing compound (CM425).

7. Hoist System Operational Check

The following procedure is used to verify the capability of the hoist system to function correctly. The procedure should be performed any time a malfunction is suspected, and prior to normal use after repair.

WARNING **Remove protective electrical jumper wire (Ref. Figure 202) from cable cutter whenever winch is installed on helicopter. Jumper wire will prevent operation of cable cutter in an in-flight emergency.**

(1). Open applicable passenger/cargo door; extend door retainer tube to hold door in full open position.

CAUTION Avoid inadvertent operation of cable cutter. Make certain cable cutter switches are not actuated when hoist system circuits are energized.

(2). Energize helicopter electrical system; check that both HOIST PWR (power) and CBL CTR (cable cutter) circuit breakers are in closed position (Ref. Figure 201).

(3). Using hoist system control pendant, exercise hoist winch by paying out 3 to 4 feet (1.2 M) of cable under approximately 15 pounds (6.8 kg) tension; pull cable straight down to avoid cable rubbing on cable bellmouth. Reverse control and reel cable in. Check that cable winds on winch drum evenly and that winch operation is smooth and consistent. Check that winch stops automatically when top of swivel hook rubber bumper pushes against winch bumper pad.

(4). Test hoist lifting capability with 300 pound weight. Check that hoist operates smoothly throughout hoisting and lowering operations.

NOTE: Cable retraction rate should be approximately 55-60 feet (16.8-18.3 M) per minute. The full usable cable length should unwind in approximately 95 seconds and rewind in approximately 103 seconds.

(a). With helicopter hovering approximately 100 feet (45.4 M) above test weight, lower hoist hook between fuselage and landing gear skid. Continue lowering hook until hook can be connected to test weight.

(b). Gradually maneuver helicopter to remove cable slack and to center hoist over test weight.

(c). Slowly elevate helicopter to raise test weight approximately 20 feet (6.1 M) from ground.

(d). Using pendant control, payout full usable length of cable. Check that hoist down limit switch stops winch with three turns of cable on winch drum. If required, adjust position at which down limit switch activates.

(e). Reverse pendant control. Lift test weight to within approximately 10 feet (3.0 M) of helicopter skid.

(f). Lower helicopter and remove hoist hook from test weight; raise hoist hook and check that hoist winch automatically stops when top of swivel hook rubber bumper pushes up against hoist bumper pad.

NOTE: Up limit switch should actuate before excessive cable pressure is applied to vertically compress bumper pad (Ref. Figure 202).

(g). Land helicopter; deenergize electrical system.

(5). Stow pendant control.

(6). Stow door retainer tube; close passenger/cargo door.

8. Hoist Equipment Inspection

General inspection procedure for the hoist system is as follows:

(1). Inspect components for security of attachment, damage, deformation, cracks, and excessive wear.

WARNING

- **Human life might depend on cable condition. Inspect full length of cable carefully and thoroughly.**
- **Use heavy leather gloves to protect hands from injury due to broken cable strands.**

CAUTION Keep cable clean. Provide a clean area to coil cable during inspection. Dirt and oil grime will create an abrasive wear on cable and winch components.

(2). Inspect cable for fraying, corrosion, broken strands, and security of attachment to winch drum and cable ball swivel hook attachment. General criteria for cable replacement are as follows:

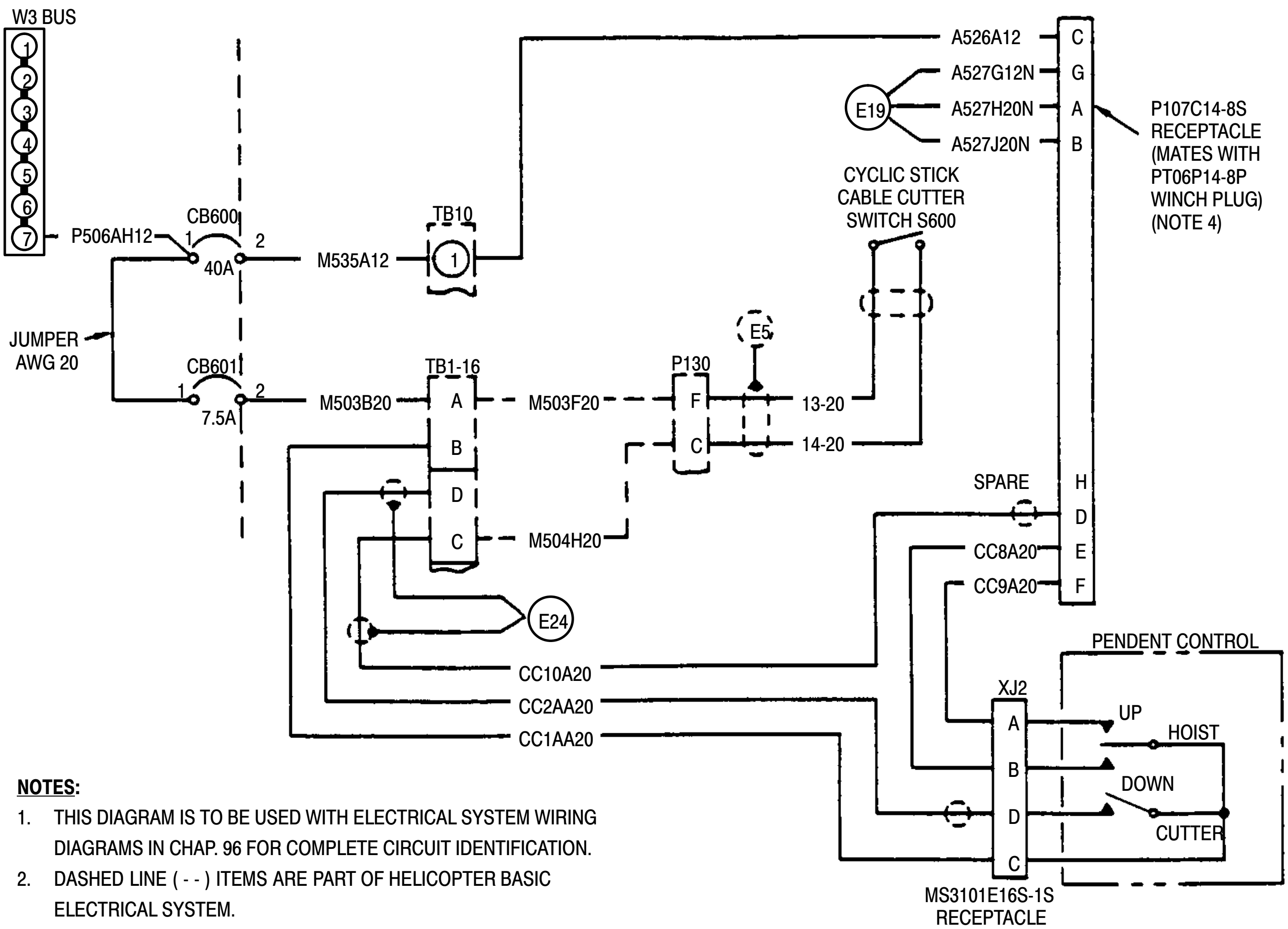
(a). Any single broken strand (cluster of 7 individual wires) requires cable replacement.

(b). Both ends of individual broken wires should be tucked into cable to prevent fouling when cable travels through cable guides and nonfouling mechanisms. Breaks of individual wires are allowable, unless the number is excessive as defined in next criterion.

(c). Generally, one individual broken wire (two ends) for each foot of cable is permissible, up to a total of 20 individual wire breaks for each 100 foot (30.5 M) length of cable. A greater number of breaks requires cable replacement.

Table 201. Troubleshooting Hoist System

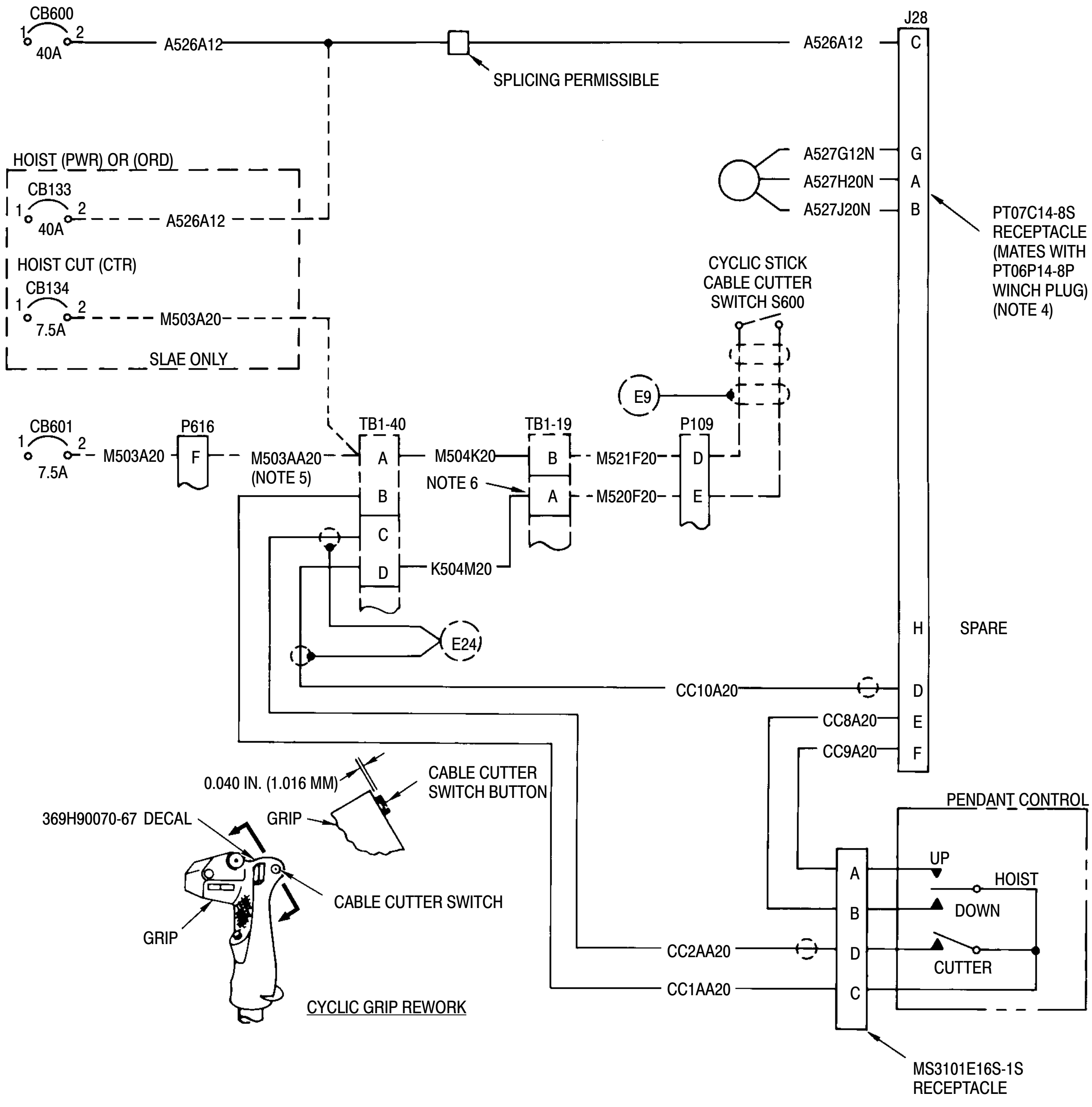
Symptom	Probable Trouble	Corrective Action
Winch will not raise or lower cable.	Tripped circuit breaker.	Reset circuit breaker.
	Defective pendant control.	Repair pendant control.
	Defective winch assembly.	Repair winch assembly.
Improper lower cable travel limit.	Down (full-out) limit switch out of adjustment.	Reset lower limit adjustment.



NOTES:

1. THIS DIAGRAM IS TO BE USED WITH ELECTRICAL SYSTEM WIRING DIAGRAMS IN CHAP. 96 FOR COMPLETE CIRCUIT IDENTIFICATION.
2. DASHED LINE (- -) ITEMS ARE PART OF HELICOPTER BASIC ELECTRICAL SYSTEM.
3. COMPONENT TERMINAL NUMBERS ARE FOR REFERENCE AND MAY NOT BE SHOWN ON COMPONENT.
4. REFER TO WINCH SCHEMATIC DIAGRAM FOR INTERNAL CONNECTIONS.

Figure 204. Wiring Diagram - Hoist System (L/H Command)



NOTES:

1. THIS DIAGRAM IS TO BE USED WITH ELECTRICAL SYSTEM WIRING DIAGRAM IN CHAP. 96 FOR COMPLETE CIRCUIT IDENTIFICATION.
2. DASHED LINE (- -) ITEMS ARE PART OF HELICOPTER BASIC ELECTRICAL SYSTEM.
3. COMPONENT TERMINAL NUMBERS ARE FOR REFERENCE AND MAY NOT BE SHOWN ON COMPONENT.
4. REFER TO WINCH DIAGRAM FOR INTERNAL CONNECTIONS.
5. EXISTING WIRE, RELOCATED TO TB1-40A.
6. REMOVE EXISTING WIRE M520B20.

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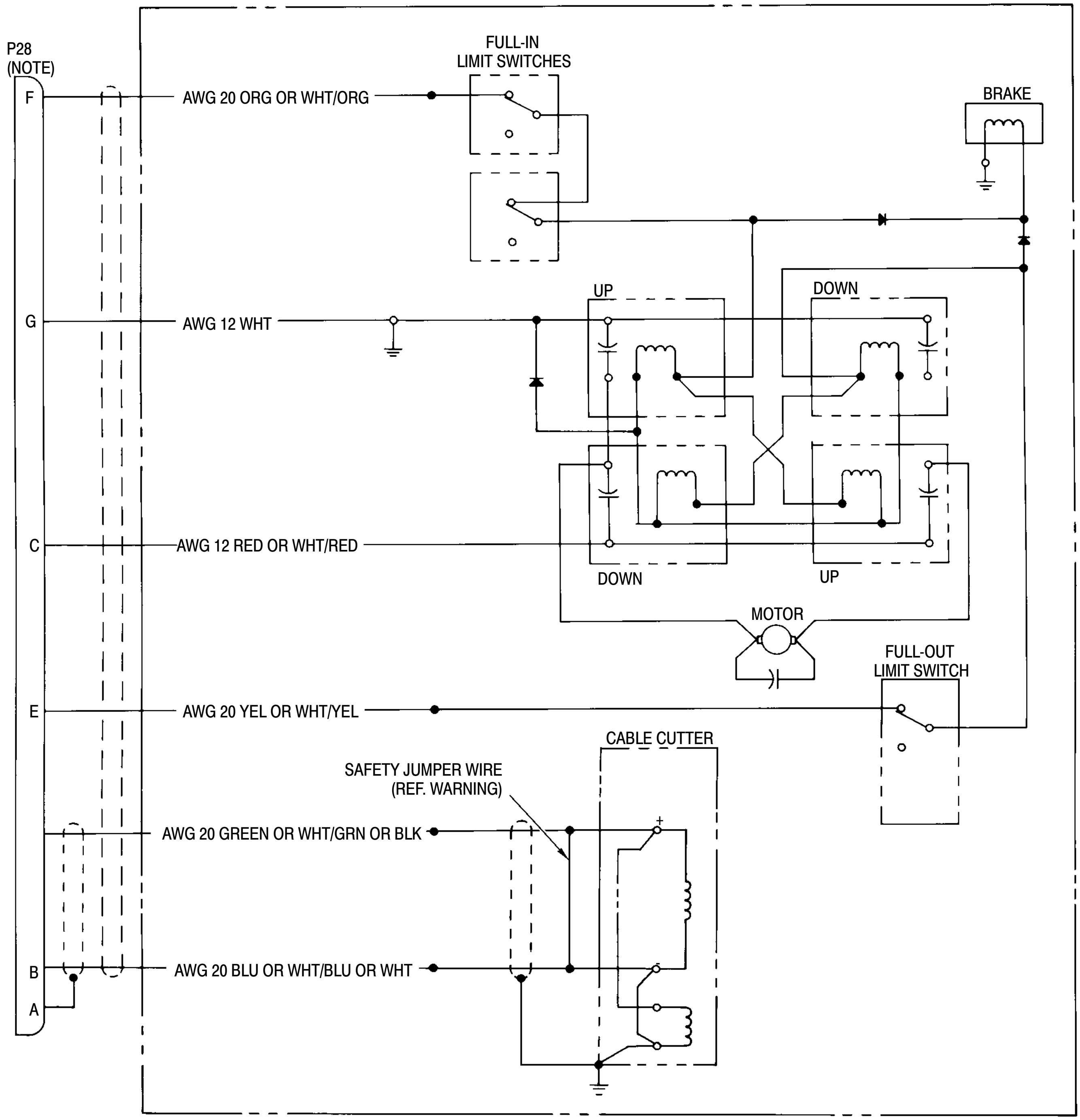
Figure 205. Wiring Diagram - Hoist System (R/H Command)



NOTE: REFER TO HOIST SYSTEM INTERCONNECT WIRING DIAGRAMS (REF CHAP. 96) FOR EXTERNAL CONNECTION.
WARNING: REMOVE JUMPER WIRE AFTER INSTALLATION OR MAINTENANCE (REF. TEXT).

G25-6005

Figure 206. Schematic Diagram - Hoist System Winch

HOIST PASSENGER/CARGO INITIAL INSTALLATION

1. Hoist Passenger/Cargo Initial Installation

The passenger/cargo hoist can be installed on any L/H command or R/H command Model 369D helicopter. On L/H command, the hoist winch is installed on the right side of the fuselage. On R/H command, the hoist winch is installed on the left side of the fuselage. Subsequent procedures provide separate instructions for electrical installations in L/H command and R/H command to accommodate differences in component location and wire routing.

Installation instructions include procedures for installing a passenger/cargo door retainer assembly, a door sill antichafing bar assembly, a winch and winch support tube assembly, and the electrical wiring and components required for operation of the hoist system.

The hoist passenger/cargo installations may be performed at the discretion of the operator, or the helicopter may be returned to the factory for modification. The instructions which follow are for the 369H90070-521 and -522 installations only.

A. Preparation for Installation

Instructions in the following paragraphs are applicable to both left and right hoist installations, except as noted.

(1). Identify all components that are to be installed, along with those removed to gain access to work areas. Protect components from damage and contamination.

(2). Check that all electrical switches are in OFF position.

CAUTION Ensure BATTERY switch is in OFF position.

B. Helicopter Equipment Removal

Remove following panels, access doors, and equipment as applicable to accommodate installation of the hoist system components:

(1). Remove battery (Ref. Chap. 96).

(2). Remove left and right foot support fairings in passenger/cargo compartment.

(3). Remove passenger/cargo compartment forward bulkhead trim panel (L/H command) and controls access door.

(4). Remove fuel cell forward vent from control tunnel (Ref. Sec. 28-00-00).

NOTE: Fuel vent must be removed to avoid damage during structural modification hole drilling operations.

(5). Remove crew compartment seat and back cushions.

(6). Remove left (outboard) collective stick cover.

(7). Remove crew compartment lower aft trim panels (left and right).

(8). Remove crew compartment left or right bulkhead panel and lower portion of right upper side panel.

(9). Remove edgelighted panel face from lower switch and circuit breaker panel (Ref. Chap. 96). Loosen lower switch and circuit breaker panel to accommodate installation of additional circuit breakers.

C. Helicopter Modification

(Ref. Figure 901) Modification of the helicopter involves cutting a hole in the fuselage skin to facilitate installation of an electrical receptacle (J28) to receive a winch electrical plug, and a hole in the lower left area of the canted bulkhead and forward bulkhead trim panel to facilitate installation of an electrical receptacle (XJ2) to receive a control pendant plug.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

(1). Cut and deburr holes, remove chips, and apply a thin coat of primer (CM318) to exposed metal surfaces.

(2). Fit forward bulkhead trim panel to canted bulkhead; locate and cut hole in trim panel to match XJ2 receptacle hole in bulkhead. Remove trim panel to accommodate installation of door retainer assembly.

NOTE: Hoist electrical connector (J28) doubler is located in the crew compartment, below the aft lower corner of the upper canopy windshield, and immediately forward of the canted frame (Sta. 78.50) for either right side (L/H command) or left side (R/H command) hoist winch installation.

D. Electrical Equipment Installation (L/H Command)

Install hoist kit electrical wire harness assembly, general wiring, and components on L/H command as follows:

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM614	Sleeving, heat-shrink
CM703	Tie strap
CM807	Twine, nylon
CM815	Solder

CAUTION Ensure wires and/or wire bundles do not chafe or bind control mechanisms.

NOTE: When providing ground contact for electrical components, clean the contacting surfaces to bare metal (Ref. Chap. 96). Route wire and wire bundles with existing wires and bundles. Temporarily tie wires in place with existing bundles until installation is complete, then secure wires with nylon twine (CM807), tie- straps (CM703), or clamps as required.

(1). Install cyclic stick grip (Ref. Figure 201 and Sec. 67-10-20).

(2). From inside crew compartment, temporarily install J28 receptacle through hole provided in right side of ship (Ref. Figure 901). Install washer (Ref. Figure 201) and receptacle nut externally to retain J28 receptacle in place.

NOTE: The J28 receptacle is temporarily installed to provide a means of determining wire length to receptacle.

(3). Install circuit breakers in positions CB60l and CB600 respectively, on lower switch and circuit breaker panel (Ref. View A).

(4). (Ref. Figure 204) Install terminal on circuit breaker jumper wire; install jumper wire on contact 1 of CB60l.

(5). Install terminal on wire P506AH12 and install on contact 1 of CB600 together with jumper wire fabricated in previous step. Route wire P506AH12 to contact 7 of BUSS W3; cut wire to length and install terminal. Connect wire P506AH12 to contact 7 of BUSS W3.

(6). Install terminal on wire M535A12 and connect wire to contact 1 of TB10. Route wire M535A12 to contact 2 of CB600 and install terminal. Connect wire M535A12 to contact 2 of CB600.

(7). Install terminal on wire M503B20 and connect to contact 2 of CB601. Route opposite end of wire M503B20 to TB1-16, install pin and insert pin in TB1-16, contact A.

(8). Connect terminal of wire A526A12 to TB10, contact 1, and route wire below floor through center beam, below crew compartment right seat and up right side aft of door frame to J28 receptacle.

NOTE: Temporarily tie wires in place. Do not cut wires until all wires are adjusted and tied in place.

(9). Insert pin of wire CC10A20 in TB1-16, contact C. Connect terminal on shielding of wire CC10A20 to ground stud E24. Do not tighten ground stud nut. Route wire CC10A20 to J28 receptacle and tie in place.

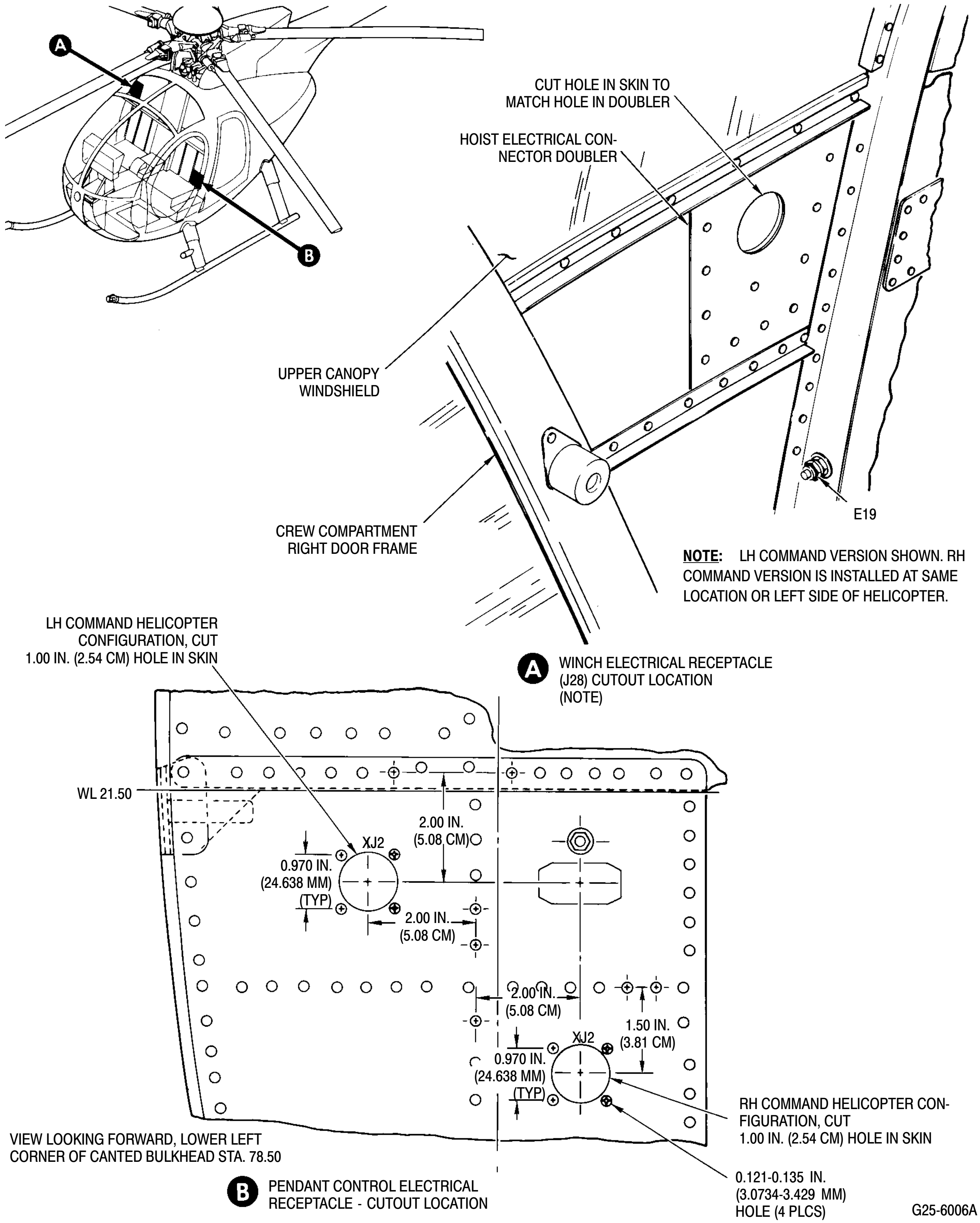


Figure 901. Helicopter Modification

(10). Install XJ2 receptacle.

(a). Insert XJ2 receptacle (Ref. Figure 201) in hole provided in lower left corner of canted bulkhead (Ref. Figure 901). Using XJ2 receptacle bracket as a template, mark and drill four 0.121-0.133 inch (3.0734-3.3782 mm) attach holes. Protect attached wires during drilling operation.

(b). Install XJ2 receptacle (Ref. Figure 201) from forward side of canted bulkhead, with screws, washers, and nuts.

(11). Route wires CC1AA20 and CC2AA20 (Ref. Figure 203) from XJ2 receptacle to TB1-16; install pin of wire CC1AA20 in contact B and pin of wire CC2AA20 in contact D. Connect terminal on shielding of wire CC2AA20 to ground stud E24; tighten ground stud nut.

(12). Route wires CC8A20 and CC9A20 to J28 receptacle and tie in place.

(13). Wire J28 receptacle.

(a). Cut and strip wires at J28 receptacle. Ensure sufficient wire length to provide a smooth right angle wire flow to J28 receptacle.

(b). Install approximately 6 inches (15.24 cm) of 0.50 inch (12.7 mm) insulation tubing (CM614) on wire bundle to cover all wires extending from J28 receptacle.

(c). Ensure that all electrical contact installations are correct and secure.

(d). Adjust wires at J28 receptacle and make certain sufficient wire slack remains to avoid stress on terminals and contacts below floor and seat areas. Use twine (CM807) and tie-straps (CM703) to secure wires in place.

CAUTION Ensure wires do not chafe or bind throughout full travel of any control mechanism.

(14). Remove J28 receptacle from side of ship. Install insulation sleeving (CM614) and, using solder (CM815), connect wires A526A12, A527G12N, A527H20N, A527J20N, CCl0A20, CC8A20, and CC9A20 to J28 receptacle contacts as indicated (Ref. Figure 203).

(15). Install J28 receptacle and secure with washer and nut. Install protective cap (Ref. Figure 201).

(16). Install ground stud on forward side of canted bulkhead frame (Ref. Figure 901). Identify ground stud as E19.

(17). Install wires A527G12N, A527H20N, and A527J20N, from J28 receptacle, on ground stud E19. Adjust and trim insulation tubing (CM614) to accommodate ground wire connection as required; heat shrink tubing.

(18). Replace existing cyclic stick grip with part number 369H90129-505 (Ref. Sec. 67-10-20). Wire cyclic stick cable cutter switch S600 as shown (Ref. Figure 204).

E. Electrical Equipment Installation (R/H Command)

Install hoist kit electrical wire harness assembly, general wiring, and components on R/H command helicopters, as follows:

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM614	Sleeving, heat-shrink
CM703	Tie strap
CM725	Tape, electrical, plastic
CM807	Twine, nylon
CM815	Solder

CAUTION Ensure wires and/or wire bundles do not chafe or bind control mechanisms.

NOTE: When providing ground contact for electrical components, clean the contacting surfaces to bare metal (Ref. Chap. 96). Route wire and wire bundles with existing wires and bundles. Temporarily tie wires in place with existing bundles until installation is complete, then secure wires with nylon twine (CM807), tie- straps (CM703), or clamps as required.

(1). From inside crew compartment, temporarily install J28 electrical receptacle (Ref. Figure 201) through hole provided in left side of ship (Ref. Figure 901). Install washer (Ref. Figure 201) and receptacle nut externally to retain J28 receptacle in place.

NOTE: The J28 receptacle is temporarily installed to provide a means of determining proper length of wires to be connected to receptacle.

(2). On standard R/H command equipped with 369H92143 circuit breaker panel, install circuit breaker CB600 (Ref. View B), and a circuit breaker CB601 in circuit breaker panel located on the pilot's collective pitch stick cover. Make certain circuit breaker connections to buss bar are secure.

(3). On SLAE-equipped R/H command with 369D294566 circuit breaker panel, install circuit breaker CB133 and circuit breaker CB134 in circuit breaker panel located on the pilot's collective pitch stick cover. Make certain circuit breaker connections to buss bar are secure.

(4). (Ref. Figure 205) Install terminal on wire A526A12 and connect to contact 2 of CB600 on standard R/H command, or to contact 2 of CB133 on SLAE-equipped R/H command. Route opposite end of wire A526A12 with existing wire bundles to J28 receptacle and temporarily tie in place.

(5). On standard R/H command, locate existing wire M503A20, install terminal on wire M503A20, and connect to contact 2 of CB601. Locate existing wire M503AA20, remove from TB16 contact A, and relocate to TB1-40, contact A.

(6). On SLAE-equipped R/H command, install pin on wire M503A20, insert pin in contact A of TB1-40. Route wire M503A20 to CB134; install terminal and connect to contact 2 of CB134.

(7). Install pin on wire M504K20, insert in contact B of TB1-19, and route opposite end of wire M504K20 to TB1-40. Install pin and insert pin in contact A of TB1-40.

(8). Remove existing wire M520B20 from TB1-19A. Wire end is left open insulated with tape (CM725), and secured to basic electrical system tie-strap (CM703). Install pin on wire K504M20 and insert in contact A of TB1-19. Route wire K504M20 to TB1-40, install pin, and insert pin in contact C of TB1-40.

(9). Insert pin of wire CC10A20 in contact C of TB1-40, route wire to J28 receptacle, and temporarily tie in place. Connect terminal on shielding of wire CC10A20 to ground stud E24. Do not tighten ground stud nut.

(10). Install XJ2 receptacle.

(a). Insert XJ2 receptacle in hole provided in lower left corner of canted bulkhead (Ref. Figure 901). Using XJ2 receptacle bracket as a template, mark and drill four 0.121-0.133 inch (3.0734-3.3782 mm) attach holes.

(b). Install XJ2 receptacle (Ref. Figure 201) from forward side of canted bulkhead, using screws, washers, and nuts.

(11). Route wires CC1AA20 and CC2AA20 (Ref. Figure 205) from XJ2 receptacle to TB1-40, install pin of wire CC1AA20 in contact B, and pin of wire CC2AA20 in contact D. Contact terminal on shielding of wire CC2AA20 to ground stud E24; tighten ground stud nut.

(12). Route wires CC8A20 and CC9A20 to J28 receptacle and temporarily tie in place.

(13). Wire J28 receptacle.

(a). Cut and strip wires at J28 receptacle. Ensure sufficient wire length to form a smooth right angle wire flow to J28 receptacle.

(b). Install approximately 6 inches (15.24 cm) of 0.50 inch (12.7 mm) insulation tubing (CM614) on wire bundle to cover all wires extending from J28 receptacle.

(c). Ensure that all hoist system electrical installations are correct and secure.

(d). Adjust wires at J28 receptacle and make certain sufficient wire slack remains to avoid stress on terminals and contacts below floor seat areas. Use twine (CM807) and tie straps (CM703) to secure wires in place.

CAUTION Ensure wires do not chafe or bind throughout full travel of any control mechanism.

(14). Remove J28 receptacle from side of ship. Install insulation sleeving (CM614) and, using solder (CM815), connect wires A526A12, A527G12N, A527H20N, A527J20N, CC10A20, CC8A20, CC9A20 to J28 receptacle contacts as indicated (Ref. Figure 205).

(15). Install J28 receptacle and secure with washer (Ref. Figure 201) and nut. Install protective cap.

(16). Install ground stud on forward side of canted bulkhead frame (Ref. Figure 901). Identify stud as E19.

(17). Install wires A527G12N, A527H20N, and A527J20N from J28 receptacle on ground stud E19. Adjust and trim insulation tubing (CM614) to accommodate ground wire connection as required; heat shrink tubing.

(18). (Ref. Figure 205) Check switch MS25089-4AR (S600) on cyclic stick grip to verify that button is flush with guard. If it is not, the switch must be reworked, as follows:

(a). Remove switch from grip (unsolder wiring).

(b). Grind off end of switch button as shown.

CAUTION Do not allow file chips to get into switch base.

(c). Install modified switch in grip and resolder wiring as shown.

(d). Install decal 369H90070-67 to grip as shown.

F. Passenger/Cargo Door Retainer Installation

The passenger/cargo door retainer installation consists of a tubular assembly attached to the aft side of Sta. 78.50 canted bulkhead with four clamps. With the passenger/cargo doors in the open position, a telescoping tube slides out of the tubular assembly to engage a bracket attached to the door frame, and thus retains the door in an open position. Install the passenger/cargo door retainer as follows:

(1). Install doubler angles.

(a). Locate doubler angles (Ref. Figure 203) on forward side of Sta. 78.50 canted bulkhead, using two existing 0.070 inch (1.778 mm) tooling holes (Ref. Figure 902). Use angles (Ref. Figure 203) as templates and determine rivet hole locations on Sta. 78.50 bulkhead.

(b). Drill rivet attach holes, 0.069-0.074 inch (1.7526-1.8796 mm).

(c). Attach angles to Sta. 78.50 bulkhead using rivets.

(2). Install structural reinforcement brackets.

(a). Position structural reinforcement brackets on forward side of Sta. 78.50 canted bulkhead as shown (Ref. Figure 902). Locate nine existing rivets which must be removed prior to installation of reinforcement brackets. Remove rivets using drill motor and appropriate drill bit.

(b). Use brackets as templates and determine rivet hole locations on Sta. 78.50 bulkhead. Drill rivet attach holes, 0.069-0.074 inch (1.7526-1.8796 mm).

(c). Attach brackets to Sta. 78.50 canted bulkhead using rivets.

(3). Drill eight 0.190-0.199 inch (4.826-5.0546 mm) holes through Sta. 78.50 canted bulkhead and structural reinforcement angles and brackets at locations shown (Ref. Figure 902).

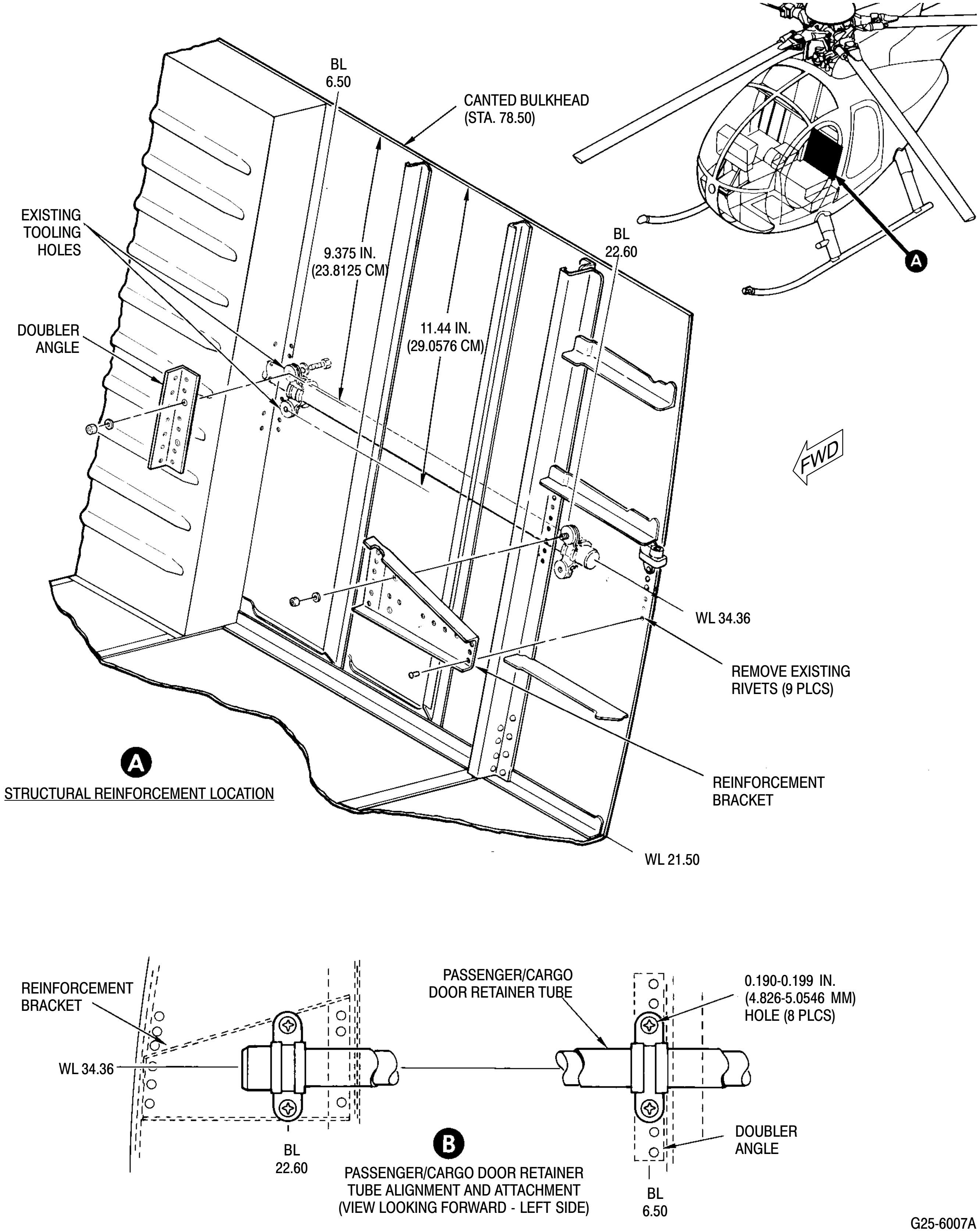


Figure 902. Passenger/Cargo Door Retainer Tube Installation

NOTE: Drill retainer tube outboard clamp holes first; install retainer tube and outboard clamps to ensure proper alignment for marking and drilling inboard clamp holes.

(4). Install the retainer assembly (Ref. Figure 203) on Sta. 78.50 canted bulkhead, using clamps, washers, spacers, screws, and nuts.

(5). Locate bracket on applicable passenger/cargo door in such a manner as to allow tube to engage bracket when door is in open position. Install bracket on passenger/cargo door frame using rivnuts, washers, and screws.

G. Hoist Assembly

(Ref. Figure 201) The hoist assembly consists of a winch assembly, pendant control assembly, hook, hanger, and two attach brackets. To assemble the hoist, proceed as follows:

NOTE: Pendant assembly is shipped assembled with no additional assembly required.

(1). Install hanger on winch, using screws, lockwashers, and washers.

(2). Remove existing attach brackets from winch. Install replacement brackets on winch frame, using existing hardware.

H. Hoist Installation

The hoist system winch is mounted on a support tube and attached with quick-release safety pins to three fittings installed on either side and above the passenger/cargo compartment door. The support tube positions the winch to raise and lower the cable between the side of the fuselage and the landing gear skid. The winch and support can be installed for use on either the left or right side of the helicopter as applicable. Install the hoist system as follows:

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM703	Tie strap

(1). Remove nylon screws installed in support fitting attachment holes on fuselage.

(2). Install support tube attachment fittings (Ref. Figure 201) on fuselage using screws and washers.

(3). Attach winch to support tube, using bolts, washers, and nuts. Torque bolts to **70 - 100 inch-pounds (7.91 - 11.30 Nm)**.

(4). Attach link assembly to support tube using bearing pin, washer, and cotter pin.

(5). Attach winch support tube to fuselage fittings, using quick-disconnect pins.

NOTE: Install pins in position shown (Ref. Figure 201).

CAUTION Ensure all electrical power is off, eliminating possibility of inadvertent firing of cable cutter.

(6). Remove protective cap from electrical receptacle on side of fuselage. Connect winch electrical plug to fuselage receptacle. Secure wire harness to support tube, using tie-straps (CM703).

WARNING **Remove protective electrical jumper wire (Ref. Figure 202) from cable cutter whenever winch is installed on helicopter. Jumper wire will prevent operation of cable cutter in an emergency.**

(7). Install the hoist operator's body harness (Ref. Figure 201).

(8). Install flush rivets in wheel fittings after removing existing rivets from locations shown (Ref. Figure 903).

NOTE: Do not install rivets if wheel fittings have been previously equipped with flush rivets.

(9). Install rivnuts at locations shown (Ref. Figure 903). Secure clips (Ref. Figure 201) to fuselage, using screws and washers. Install bar assembly, using screws, washers, and nuts.

(10). On R/H command, install landing gear skid chafing bar assembly (369D292556) as follows (Ref. Figure 903):

(a). Remove bolts from inboard side of aft abrasion strip (369H6102), and aft bolt from inboard side of forward abrasion strip (369H6102), on left landing gear skid.

(b). Install screw (NAS603-8) in forward attach hole of aft abrasion strip (369H6102).

(c). Position chafing bar on inboard side of left skid with bent end of bar aft, and 3/8 inch (9.525 mm) recess hole in chafing bar over aft abrasion strip forward attach screw.

(d). Align chafing bar aft screwhole with aft abrasion strip aft attach hole; install screw (NAS603-8) to secure aft portion of chafing bar.

(e). Hold chafing bar against skid; locate bar forward screw hole over forward abrasion strip aft attach hole; drill 0.190-0.200 inch (4.826-5.08 mm) screw hole through chafing bar.

(f). Install screw (NAS603-8) to secure forward end of chafing bar.

I. Helicopter Equipment Installation

Install equipment and panels as follows:

CAUTION Remove all tools and foreign materials from helicopter before panel installations.

(1). Prior to closing access areas, check integrity of entire hoist system installation.

(2). Install edgelighted and circuit breaker panels as applicable (Ref. Chap. 96).

(3). Install crew compartment left or right bulkhead panel and lower portion of left or right upper side panel as applicable.

(4). Install crew compartment lower aft trim panels (left and right).

(5). Install left (outboard) collective stick cover.

(6). Install seats and back cushions.

(7). In passenger/cargo compartment, install fuel cell forward vent in control tunnel (Ref. Sec. 28-00-00).

(8). In passenger/cargo compartment, install controls access door and foot support fairings.

NOTE: The forward bulkhead, Sta. 78.50, trim panel is not installed during use of the hoist system door retainer equipment.

(9). Install battery.

(10). Perform operational check of hoist system (Ref. Hoist System Operational Check).

J. Weight and Balance Data

(Ref. After installation of the hoist system, incorporate changes in the helicopter weight and balance records as instructed (Ref. Sec. 08-10-00).

Table 901. Weight and Balance Data

Configuration	Weight Pounds (kg)		Arm inches (cm)		Moment in-lb (kg cm)	
369H90070-521 (R/H Command)	+42.3	(+19.187)	+98.0	(+248.92)	+4145	(+4775.5)
369H90070-522 (L/H Command)	+39.3	(+17.826)	+98.7	(+250.70)	+3879	(+4469.1)

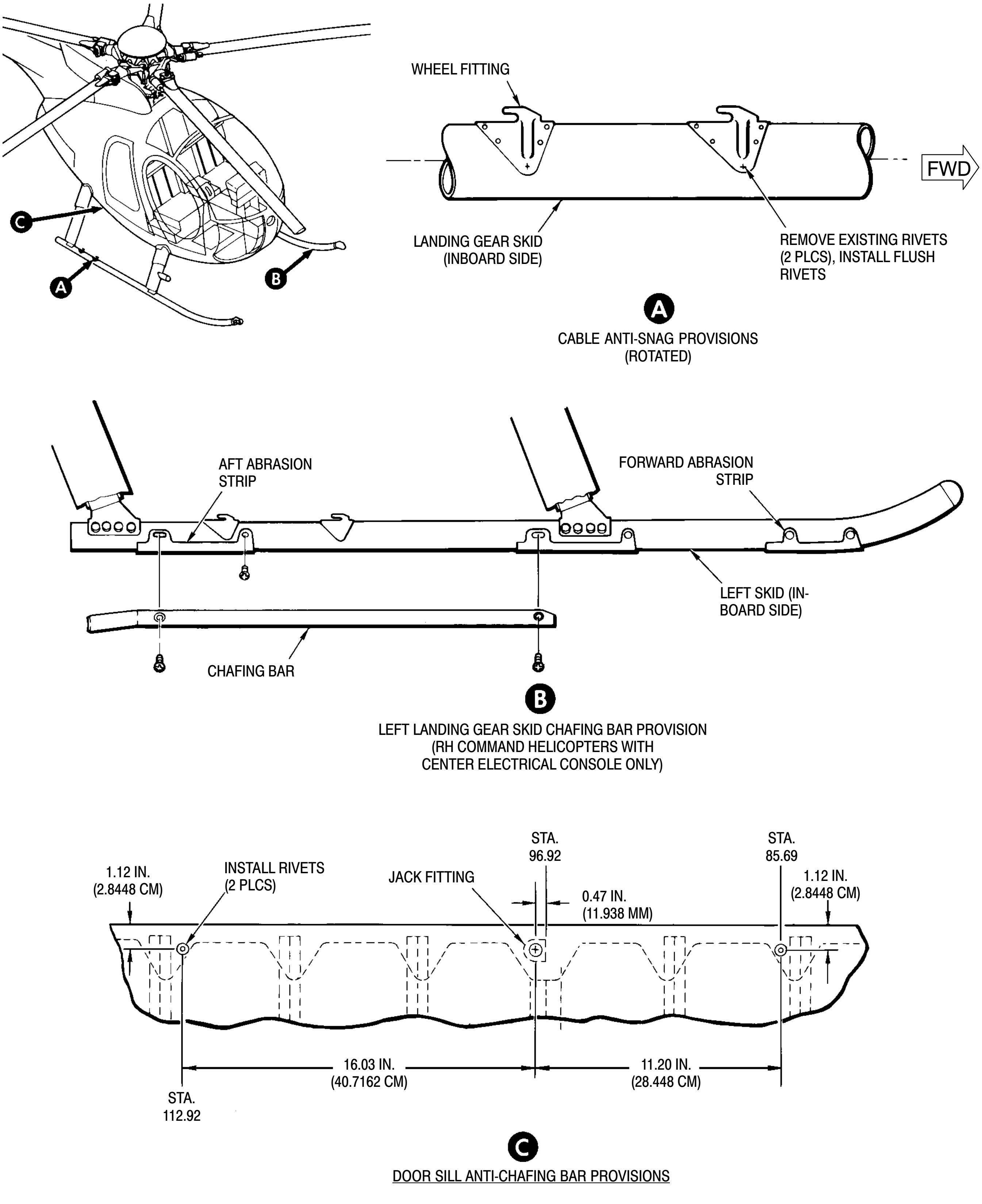


Figure 903. Cable Antichafing Bar Installation

Chapter

26

Fire Protection

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Section

26-10-00

Engine Fire Detection System

FIRE DETECTION SYSTEM
MAINTENANCE PRACTICES

1. Fire Detector System Description and Operation

The fire detection system is located in the aft section of the fuselage encircling the engine bay area. The fire detector cable is looped around the inboard structure of the engine compartment. The fire detection system is held in place by stainless steel positive locking cable clips and clamps attached to the airframe.

The detector consists of a pressure switch connected to a small diameter tube. Inside the tube is helium gas and a core material that contains trapped hydrogen. The detector can provide an output signal when heat is applied to it in two ways. If the detector tube average temperature exceeds a preset amount, the helium gas pressure increase will trigger the output signal. If there is a local hot spot on the detector tube, the core will outgas hydrogen. The release of hydrogen gas will cause a pressure increase inside the tube, triggering the output signal. Both of these processes are reversible. When the tube cools, the output signal ceases, the hydrogen is readsorbed into the core, and the system is reset. The detector core has a spiral groove cut into its outside diameter, so that crushing, flattening, or kinking of the detector tube will not prevent gas pressure from reaching the pressure switch. Loss of tube integrity through cracking or breakage will make the detector inoperative, but the detector incorporates a built in test for tube integrity.

2. Fire Detector System Troubleshooting

(Ref. Figure 201)

3. Fire Detection System Replacement

(Ref. Figure 202)

A. Fire Detection System Removal

(1). Disconnect wire harness from fire detector unit.

(2). Remove hardware securing clamps from cable and fire detector unit.

(3). Disconnect fire detection cable quick release clips.

(4). Careful remove fire detection cable from engine compartment.

(5). Replace any broken quick release clips.

B. Fire Detection System Installation

NOTE:

- Replace any damaged or broken quick release clips.
- Do not exceed minimum bend radius 0.375 inch (9.53 mm) when installing fire detection cable.

(1). Form fire detection cable to fit original mounting locations.

(2). Secure fire detector cable in quick release clips.

(3). Install clamps to fire detector unit using previously removed hardware.

(4). Attach electrical connector to fire detection cable connector.

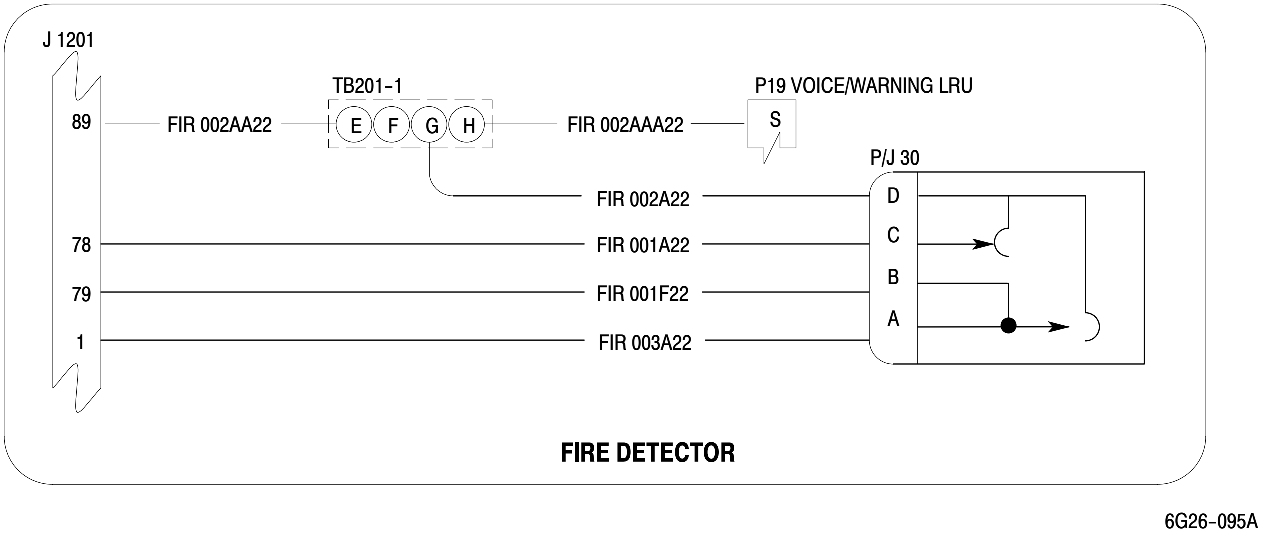

Figure 201. Fire Detection System Interconnect Data

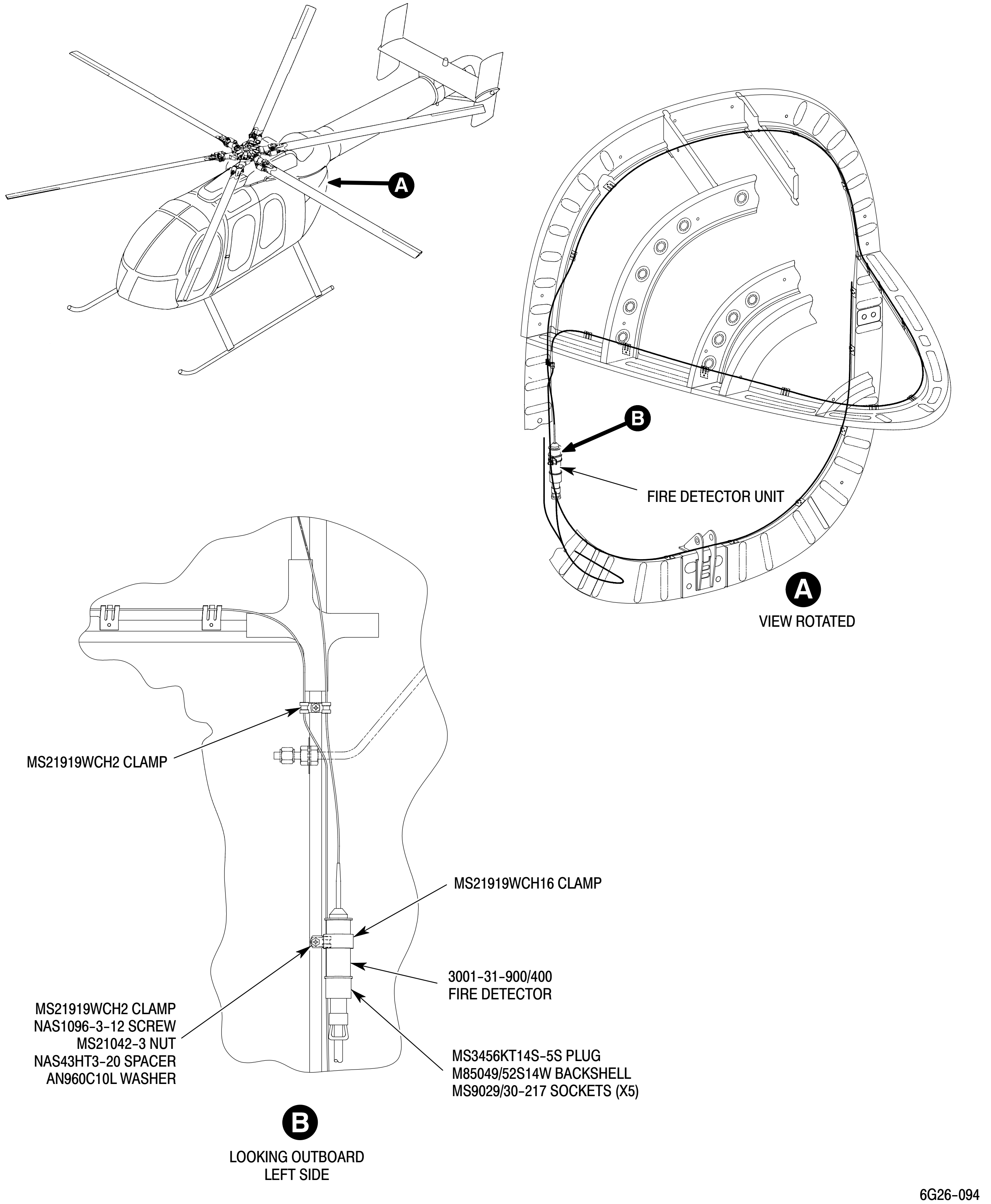

Figure 202. Fire Detection System Installation

Section

26-20-00

Fire Extinguisher

FIRE EXTINGUISHER
MAINTENANCE PRACTICES

1. Fire Extinguisher Description

(Ref. Figure 201) The early model helicopters use the pressurized, dry chemical type of fire extinguisher. The current models use a liquified gas which discharges as a vapor at high nozzle velocity (Halon 1211). The L/H and R/H command fire extinguishers mount on the forward door frame between the crew door and the canopy. The fire extinguisher quickly detaches from the mounting bracket by unfastening the quick-release clasps. Note the current fire extinguishers are equipped with two straps for extra high vibration applications.

2. Fire Extinguisher Operation

(1). Grasp fire extinguisher handle with one hand. Use the thumb and forefinger of the other hand to unfasten the quick-release clasp.

(2). Remove fire extinguisher from mounting bracket.

(3). Remove safety pin from handle. Point nozzle toward base of flame and squeeze the handle.

3. Fire Extinguisher Servicing/Inspection

The fire extinguishers are equipped with a pressure gage that indicates normal, charge, and overcharge pressures.

(1). Dry chemical type - white area indicates normal operating range of 150 psi (1034 kPa). Red area indicates CHARGE or OVERCHARGE.

(2). Halon type - green area indicates normal operating range of 125 psi (862 kPa). Red area indicates CHARGE or OVERCHARGE.

Service the fire extinguishers in accordance with manufacturer’s instructions.

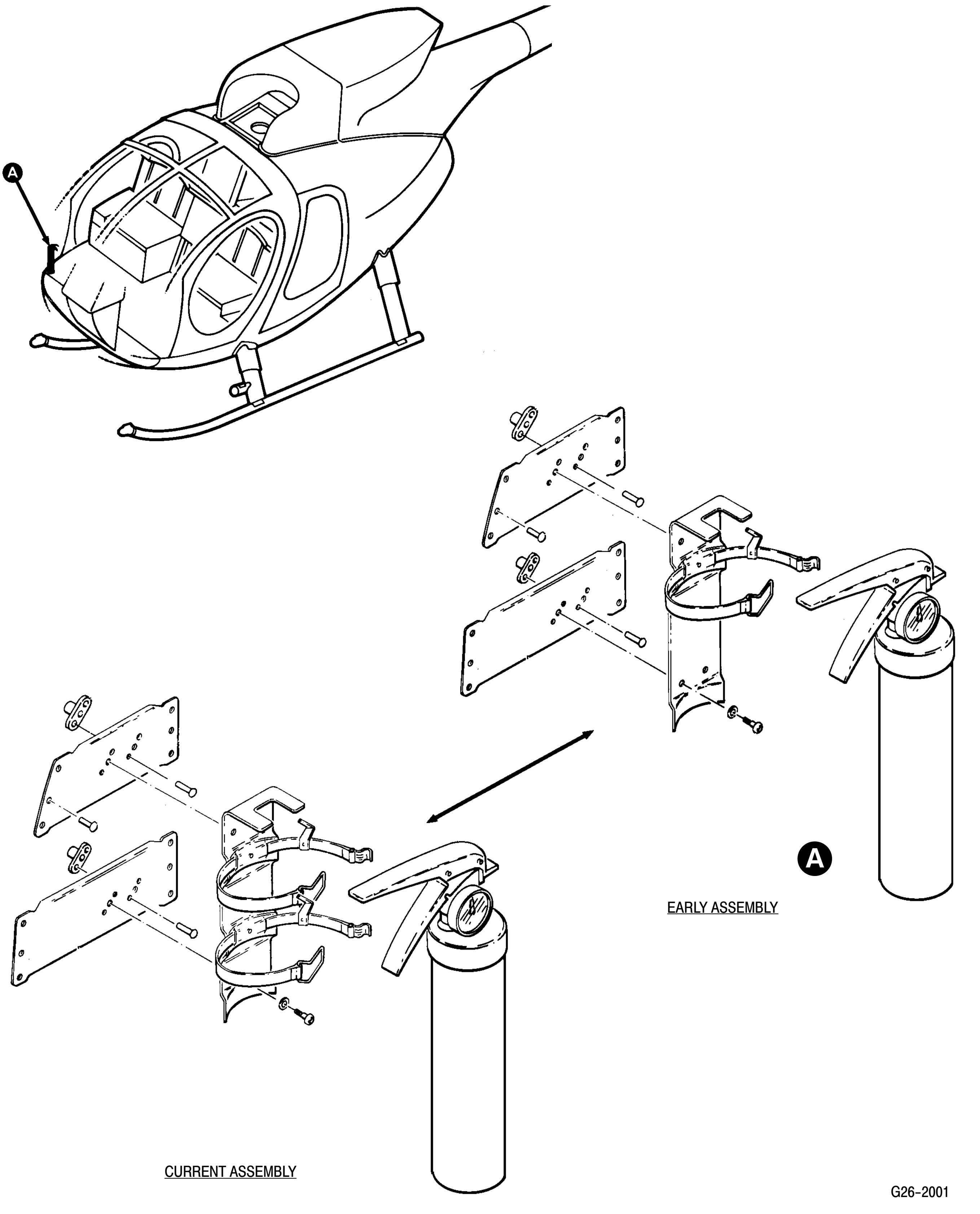

Figure 201. Fire Extinguisher Installation (R/H Command)

Chapter

28

Fuel System

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Section

28-00-00

Fuel System

(369D/E/FF - 500N)

FUEL SYSTEM
DESCRIPTION AND OPERATION

1. Engine Fuel System

(1). Engine fuel system operational information is provided in the applicable Allison Engine Operation and Maintenance Manuals (Ref. Sec. 01-00-00).

2. Fuel Cells

(1). The MDHS helicopter standard fuel tank consists of two interconnected non-self-sealing bladder cells having a total capacity of 64 U.S. gallons (242.3 L), with 62 gallons (234.7 L) usable. Alternate self-sealing cells may be installed having a capacity of 62 U.S. gallons (234.7 L), with 60.7 gallons (229.7 L) usable. Bladder and self sealing fuel cells are supplied by Engineered Fabrics Corporation and Uniroyal, Inc. (Ref. Sec. 01-00-00).

(2). Cells are located in separate fiberglass lined bays below the passenger compartment floor. Both cells are supported by a system of airframe brackets, hangers, grommets and nylon suspension cords.

(3). Each fuel cell is equipped with an access cover fitting, cover, forward and aft vent crossover fittings, fuel interconnect fittings, internal baffles and baffle support rods.

(4). The right fuel cell contains the male portion of the cell interconnect fitting, filler neck, cap and attached filler shield.

(5). The left fuel cell contains the female half of the cell interconnect fitting, sump plate, sump/tank drain valve, engine start fuel pump (C20 series engine installation) or fuel inlet fitting (C30 engine installation). The left cell cover supports the fuel quantity transmitter, manually actuated fuel shutoff valve, fuel supply tubes, hoses and attaching hardware.

(6). Fuel tank servicing is through the tank filler neck on the right side of the fuselage.

3. Fuel Quantity System

(1). The fuel quantity system is powered by 24 - 28 Vdc current and consists of a float operated quantity transmitter mounted on the left fuel cell cover and a quantity indicator gauge and **FUEL LEVEL LOW** caution light on the instrument console. Early series helicopters incorporate the gauge as part of a three-pack instrument cluster. Current helicopters feature an individual quantity gauge. The system is protected by the **INSTR CLUSTER** 5 ampere circuit breaker. Power is supplied to the system from the DC bus through the **INSTR CLUSTER** circuit breaker, CB101. With power on and approximately 35 or 70 pounds of fuel remaining, depending on customer requirements, the fuel quantity transmitter float arm contacts a spring wire that completes a circuit to ground through a transistor located on a circuit board inside the transmitter assembly. The transistor switches on the **FUEL LEVEL LOW** caution light. Refueling raises the float, breaks the transistor circuit and switches off the **FUEL LEVEL LOW** caution lamp. The float operates a rheostat that controls electrical current through the quantity indicator circuit. Fuel level changes alter transmitter resistance values that effect the fuel quantity indicator needle position.

4. Vent System

(1). Tank cells are vented to atmosphere through bottom and side fuselage ports by a system of interconnected hoses and tubes attached to the forward and aft ends of each fuel cell. A fuel vent emergency shutoff valve automatically closes to prevent fuel loss through the vent system when a 45° helicopter pitch or roll angle limit is exceeded.

5. Fuel Shutoff Valve Control

(1). A red fuel shutoff control knob labeled **FUEL, PULL TO CLOSE** is located on the instrument panel face. The flexible cable and housing is routed aft under the floor to the shutoff valve lever on the left fuel cell access cover.

6. Fuel Shutoff Valve

(1). The cable actuated, mechanically detented fuel shutoff valve is located on the left fuel cell access cover. Valve lever arm travel from full open to closed is 90°.

7. Start Pump

NOTE: Helicopters with C30 engines are not equipped with a start pump. Fuel is drawn from the tank by the engine- driven fuel pump.

(1). Helicopters with C20 series engines are equipped with a submerged, single stage centrifugal, 24 - 28 Vdc, 4.5 ampere, negative ground, electric start pump bolted to the sump plate in the left fuel cell. Pump delivery volume at sea level is 300 lbs/hr (136 kg/hr), nominal at 10 psi (68.95 kPa), minimum. Delivery at 20,000 feet (6100 M) is 120 lbs/hr (54.48 kg/hr), nominal at 11 psi (75.84 kPa), minimum. The start pump is controlled by a 7.5 ampere circuit breaker/switch on the instrument panel.

8. Fuel Filter Caution Light Pressure Switch

(1). A differential pressure switch is installed across the engine fuel pump filter pressure AF (after filter) and BF (before filter) ports just upstream of the engine fuel pump. The switch is sensitive to a preset differential pressure. An increase in BF pressure with a concurrent decrease in AF pressure due to partial or complete filter blockage may intermittently or completely close the switch depending on the nature of the filtered material. Switch contacts complete an electrical circuit through a case ground that switches on the **FUEL FILTER** caution lamp, a part of the instrument console caution and warning light array.

9. Drain System and Drain Valves

(1). One spring loaded plunger drain valve is installed in the fuel tank sump plate.

WARNING **Air in the fuel system will cause a power reduction or flameout. Do a fuel system vacuum leak check and system air bleed after opening fuel system to atmosphere and prior to releasing helicopter for flight.**

NOTE: The tank sump drain valve is installed in the tank sump mount plate on the bottom of the left fuel cell. The valve is accessed from under the helicopter.

(2). An additional drain valve and associated tubing is installed on helicopters equipped with an optional anti-ice (airframe) fuel filter.

10. Fuel Supply Lines

(1). The engine fuel supply lines consist of:

(a). A hose between the start pump (C20 engines) or fuel pickup fitting (C30 engines) to the fuel shutoff valve.

(b). A tube between the fuel shutoff valve and firewall fitting.

(c). A hose from the firewall fitting to the engine filter inlet port.

(d). Associated elbows, fittings and unions.

FUEL SYSTEM
FAULT ISOLATION

1. Fuel System Fault Isolation

Table 101. Fuel Supply System Fault Isolation

Symptom	Probable Trouble	Corrective Action
Start pump supplies insufficient or no fuel to engine.	Fuel tank empty.	Refuel helicopter.
	Defective start pump.	Replace start pump.
	Disconnected or ruptured fuel line.	Check all fuel lines for security and condition. Repair or replace parts as required.
	Clogged fuel line.	Repair as required.
	Clogged fuel cell and start pump inlet screens.	Clean as required.
	Twisted or kinked fuel supply hose.	Repair as required.
	Defective fuel shutoff valve.	Repair or replace fuel shutoff valve.
	Fuel shutoff valve control cable failed or disconnected.	Repair or replace control cable.
FUEL FILTER warning light on.	Clogged engine fuel filters.	Replace pump and gas producer fuel control filters. Clean fuel control pneumatic (air) circuits (refer to Allison Engine Operation and Maintenance Manual). When installed, replace anti-ice (airframe) filter. Bench check **FUEL FILTER** caution light pressure switch.
	Fuel contamination	Inspect and clean the fuel cell and start pump inlet screens if large amounts of foreign material are found in the engine driven fuel pump filter (or the optional airframe fuel filter if installed).
	Defective fuel filter pressure switch.	Replace pressure switch.
	Wiring fault.	Repair wiring.
Engine power surge or flameout with start pump ON and adequate fuel on board.	Water/ice in fuel system.	Drain water out of tank and fuel supply system.
Engine power surge or flameout with start pump **OFF**.	Water/ice in fuel system.	Same as above.
	Air in fuel system.	Bleed fuel system.
	Air leaking into system.	Vacuum leak check fuel supply system.

Table 101. Fuel Supply System Fault Isolation

Symptom	Probable Trouble	Corrective Action
Bottom of fuselage stays wet with fuel.	Loose or broken lines or fittings.	Inspect and repair as required.
	Fuel tank leak.	Remove, test and repair, or replace cells.
FUEL LEVEL LOW caution light stays on, glows or flickers with known quantity above low level.	Transistor current leakage through **FUEL LEVEL LOW** caution lamp.	Install resistor in transmitter circuit.
	Defective fuel quantity transmitter.	Remove, test, calibrate and repair or replace fuel quantity transmitter.
Erroneous fuel quantity gauge readings.	Loose or defective wiring or connections.	Inspect wiring and repair.
	Defective gauge.	Remove, test and replace a defective gauge.
	Defective fuel quantity transmitter.	Remove, test, calibrate and repair or replace transmitter.

NOTE: 369FF Helicopters are not equipped with a start pump.

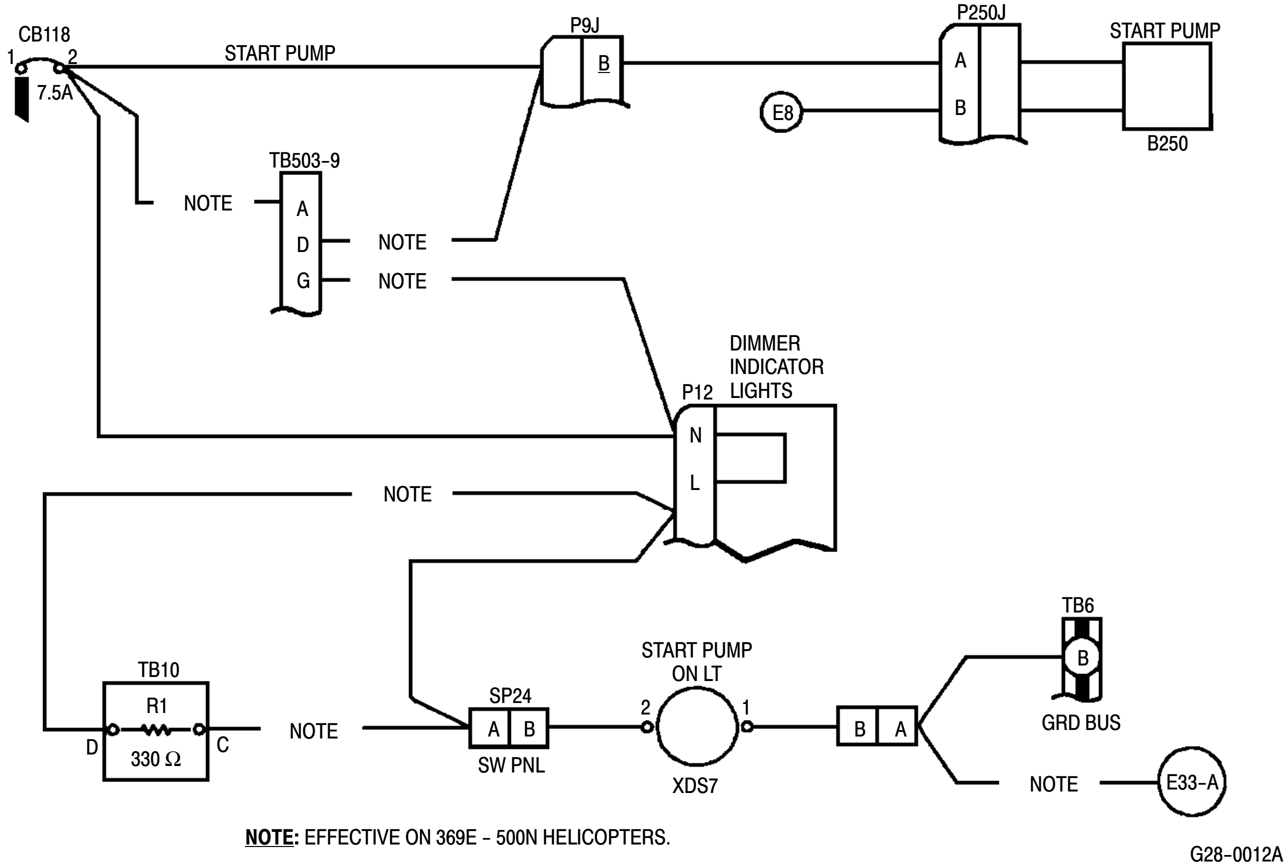


Figure 101. Fuel System Wiring Diagram (Model 250-C20B/R2 Engines)

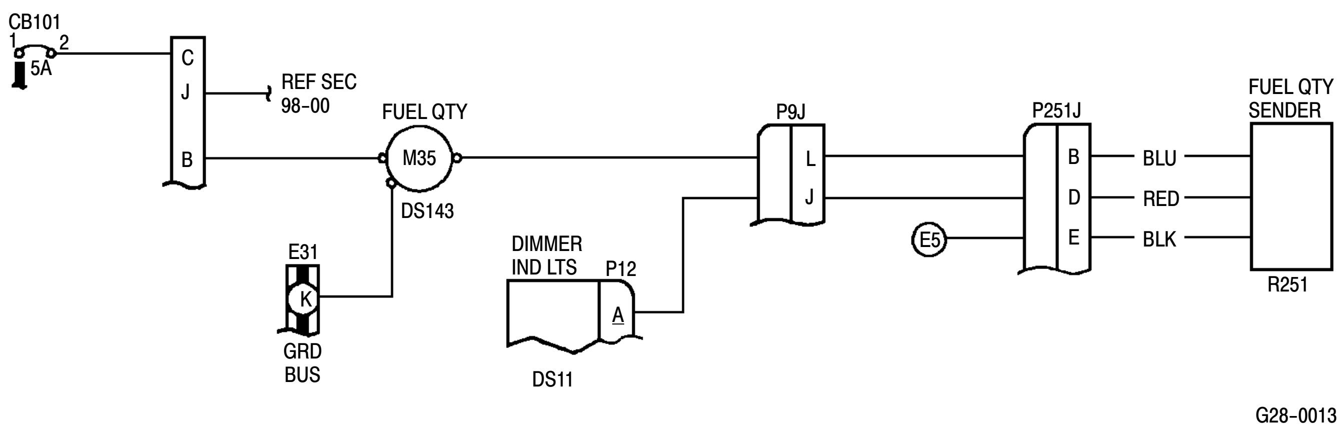
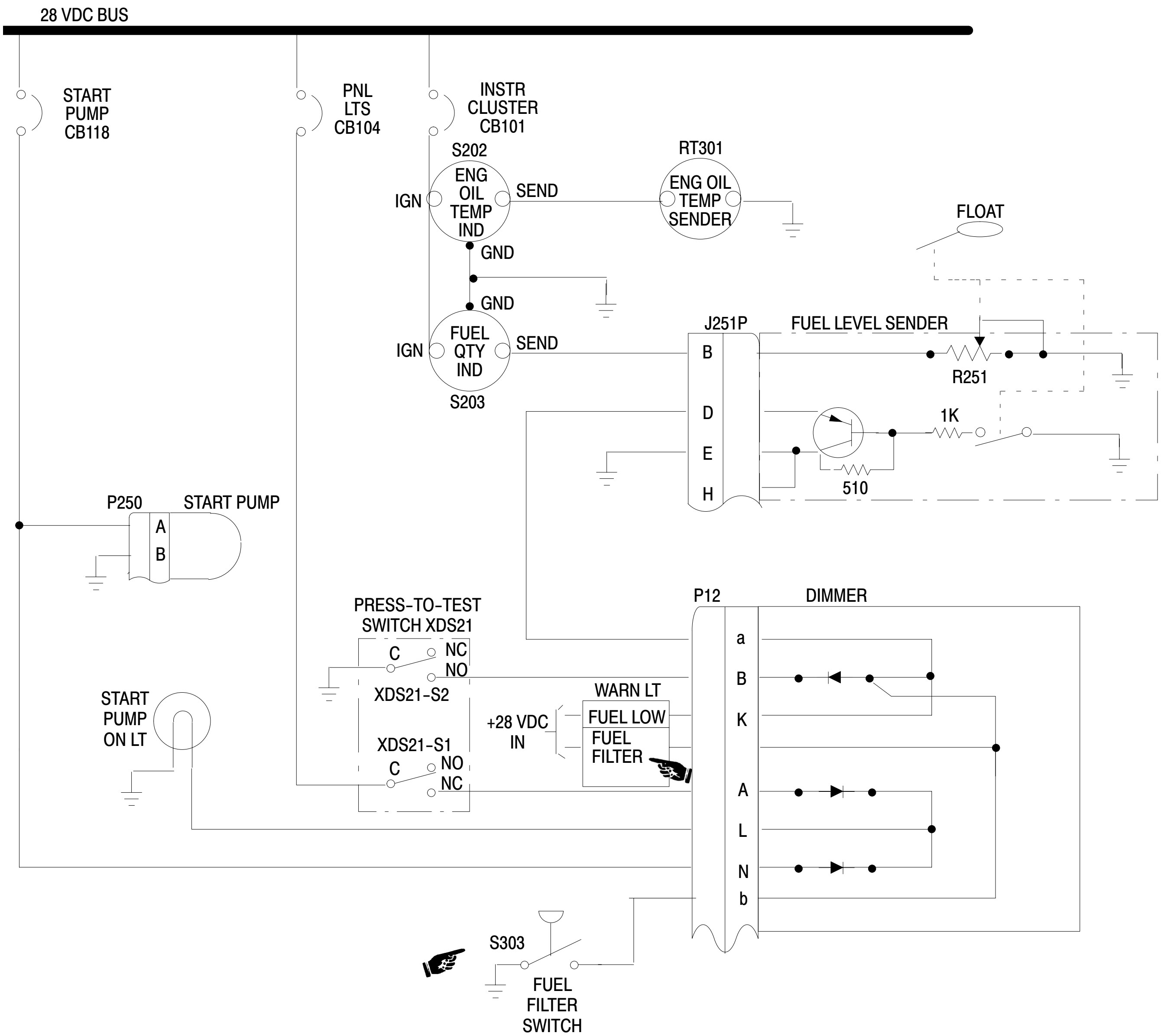


Figure 102. Fuel Quantity System Wiring Diagram



NOTES: START PUMP CIRCUITRY NOT EFFECTIVE ON 369FF HELICOPTERS.

G28-0014A

Figure 103. Fuel System Schematic

FUEL SYSTEM
MAINTENANCE PRACTICES

1. Fuel Cell Cleaning - General

(1). Fuel cells are susceptible to fungus growth after contact with contaminated fuel. Fungus trapped in the fuel filters indicates fuel tank contamination. Remove, inspect, clean or replace filter elements per applicable Allison Engine Operation and Maintenance Manual. Where installed, service anti-ice (airframe) filter (Ref. Sec. 28-25-00).

(2). Periodic incorporation of an FAA approved anti-fungal fuel additive will kill and prevent new fungus growth.

2. Uniroyal Fuel Cell Cleaning

CAUTION Steam cleaning may cause irreparable cell damage. Do not use MEK, soap or commercial cleaning detergents to clean rubberized fabric fuel cells. Some cleaning agents leave a residue that will react with fuel to form materials that can block fuel filters.

(1). Clean Uniroyal fuel cell interior/exterior surfaces with lint free cloth moistened with water, alcohol or kerosene. No other cleaning materials should be used.

3. Engineered Fabrics Corp. Fuel Cell Cleaning

CAUTION Do not steam clean Engineered Fabrics Corp. fuel cells. Steam cleaning may cause irreparable damage.

(1). Clean cell exterior and interior surfaces with warm soapy water and clean lint free cloth. Rinse away all soap residue and wipe dry.

4. Fuel Cell Handling, Storage and Shipping

CAUTION Do not use cell fittings as hand holds. Do not store fuel cells uncrated or exposed to direct sunlight, ozone, dirt, moisture, solvents, chemicals, or extremes of heat and humidity.

(1). Store and ship cells in a suitable protective container.

(a). Apply protective tape over all cell machined fittings.

(b). Use packing material to keep the cell from shifting in transit.

(c). Suspended self-sealing cells to maintain cell shape.

5. Fuel Cell Preservation and Storage (Uniroyal Cells)

CAUTION

- Uniroyal cells removed from service must not be left dry for more than 10 days without the application of oil as a plasticizing agent. The cell liner will loose pliability if left dry for extended periods and subsequent flexing may cause the material to crack.
- Do not work on cell in ambient temperatures below 50°F (10°C).

(1). Before removing cell from airframe:

(a). Spray or wipe exposed internal and external cell surfaces with SAE 10 petroleum based oil.

(b). Allow oil to soak into cell for 24 hours to soften cell material prior to handling or folding.

(c). Mop up puddled oil.

6. Fuel Cell Preservation and Storage (Engineered Fabrics Corp. Cells)

NOTE: Engineered Fabrics Corp. VITHANE/R fuel cells do not require oiling for preservation.

(1). Thoroughly clean cell with warm soapy water. Wipe completely dry.

CAUTION Do not work on cell in ambient temperatures below 70°F (21°C).

(a). Fold cell over protective wadding as loosely as possible and with a minimum number of folds.

(b). Wrap the cell in a protective cover.

(c). Put cell in a suitable storage/shipping container. Use wadding as required to prevent movement. Do not stuff cell into an undersized container.

(d). Store cell at 70°F (21°C) away from sunlight and moisture.

7. Fuel System Air Bleed (Model 250-C30 Engine Installation)

WARNING **Fuel/air vapor discharged during bleeding is a fire hazard. Prevent fuel vapor accumulation, ignition and fire. Perform work in an open, well ventilated area away from all potential ignition sources. Attach helicopter to an approved electrical ground. Wear approved eye protection.**

(1). Helicopters with C30 engines fuel supply systems are not equipped with a start pump. However, the helicopter fuel system has an engine driven self priming pump that will fill the fuel system when the engine is motored with the starter. Motor engine per the appropriate Pilot's Flight Manual.

(2). Bleed air out of helicopter engine fuel controls per Allison Engine Operation and Maintenance Manual.

NOTE: Check fuel supply system for leakage with vacuum (Ref. Fuel System Vacuum Leak Inspection).

8. Fuel System Air Bleed (Model 250-C20B/R2 Engine Installation)

WARNING **Fuel/air vapor discharged during bleeding is a fire hazard. Prevent fuel vapor accumulation, ignition and fire. Perform work in an open, well ventilated area away from all potential ignition sources. Attach helicopter to an approved electrical ground. Wear approved eye protection.**

(1). Bleed air from helicopter fuel systems as follows:

CAUTION Do not operate start pump in an empty fuel tank.

(2). Refuel helicopter as required.

(a). Connect battery.

(b). Open engine access doors.

(c). In crew compartment; push **FUEL** shutoff valve knob in to open shutoff valve.

(d). Set helicopter master switch to **BATTERY**.

(e). Set **START PUMP** switch **ON** to pressurize fuel system. Check; start pump is operating.

NOTE: Refer to applicable Allison Engine Operation and Maintenance Manual for specific engine fuel system air bleed information.

(f). Purge air from engine fuel system per Allison Engine Operation and Maintenance Manual.

(3). Set **START PUMP** and battery switches **OFF**.

FUEL SYSTEM
REMOVAL/INSTALLATION

1. Fuel Shutoff Valve Control Cable Replacement

A. Fuel Shutoff Valve Control Cable Removal

(Ref. Figure 401)

(1). Remove left fuel cell floor access panel.

(2). Disconnect control wire from fuel shutoff valve swivel.

(3). Remove control cable ty-raps and clamps.

(4). Remove instrument panel left fairing and lower cover panels (instrument panel mounted).

(5). Completely back jamnut away from cable plunger housing (Ref. Figure 401, view A).

(6). Remove straps securing cable in nose (instrument panel mounted) or remove clamp in compartment under pilot's seat (console mounted).

NOTE: Attach a trace wire or cord to the valve end of the cable before pulling assembly out of the instrument panel. Trace will guide replacement cable into correct position.

(7). Pull cable assembly out through washer, jamnut and instrument panel.

B. Fuel Shutoff Valve Control Cable Installation

(Ref. Figure 401)

CAUTION Pulling detent knob out of cable housing two or more inches may result in loss of the detent ball.

(1). Thread cable assembly aft through instrument panel or console, lockwasher, jamnut and grommets to fuel shutoff valve. Maintain a cable bend radius greater than 3.5 inches (8.89 cm).

(2). Secure forward end of cable with lockwasher and jamnut.

(3). Slip control cable wire through fuel shutoff valve lever swivel.

(4). Secure end of cable housing to cell cover with a clamp, washer and screw.

(5). Install remaining clamps and ty-raps.

(6). Rig cable with shutoff valve lever hard against open stop. Adjust cable to get a 0.090-0.150 inch (2.286-3.810 mm) gap between bottom of control knob and cable housing end fitting. Tighten cable swivel pinch nut. Install cotter pin.

CAUTION Control action must move valve to full open against mechanical stop without bottoming control knob on cable housing. Control cable operation shall be smooth with no binding.

(7). Pull valve control knob out with a spring scale. Required valve actuation force to be not more than 12 pounds (53.38 N).

(8). Repair, adjust or replace valve control system components to meet force limit.

(9). Reinstall left fuel cell floor access panel.

(10). Reinstall instrument panel left fairing and lower cover panels (instrument panel mounted).

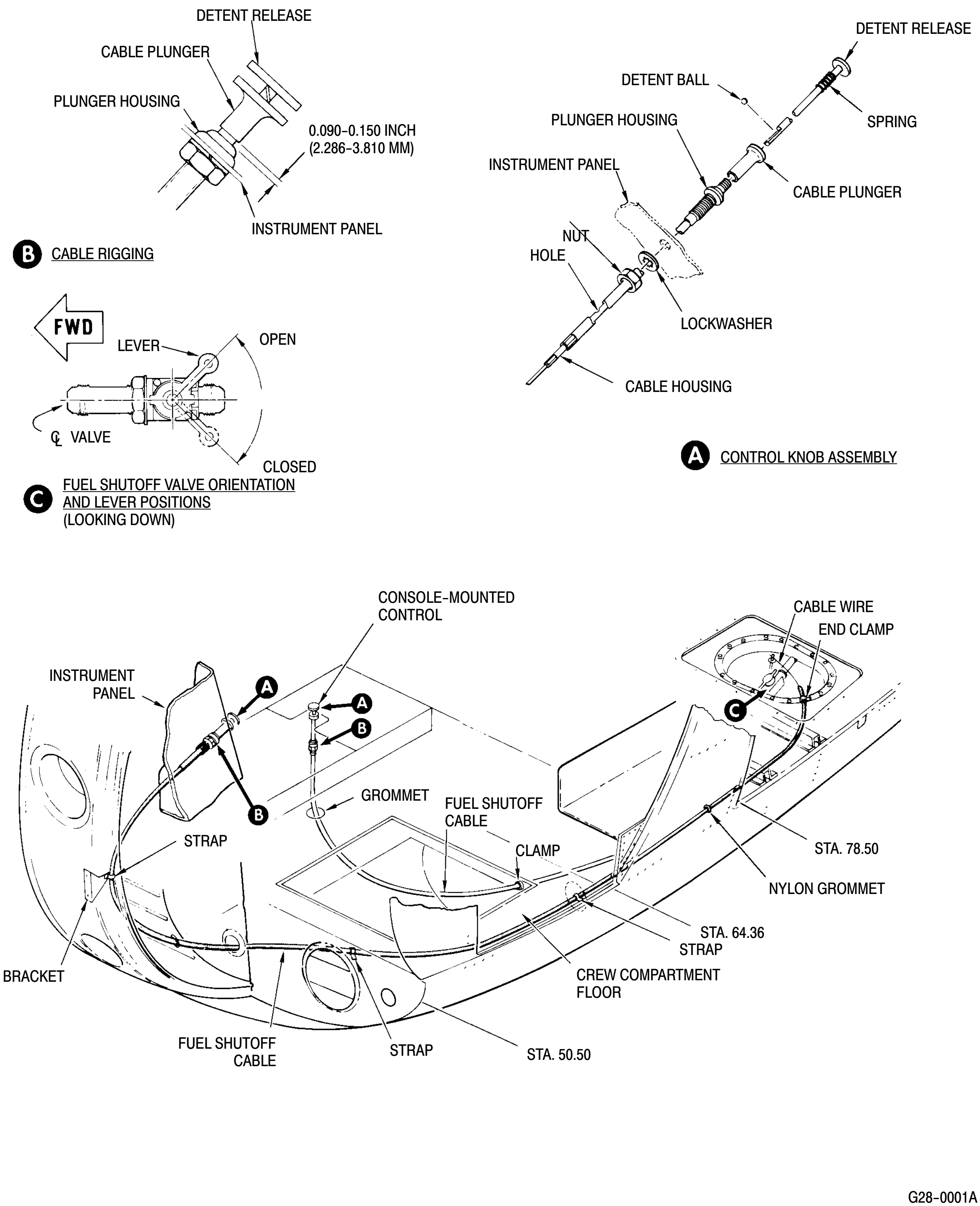


Figure 401. Fuel Shutoff Valve Cable Installation

2. Fuel Shutoff Valve Replacement

A. Fuel Shutoff Valve Removal

(Ref. Figure 402)

WARNING **Avoid fuel vapor ignition and fire. Use only nonsparking tools and explosion proof work lights. Attach helicopter to an approved electrical ground. Switch OFF all electrical power. Disconnect external power and battery before opening fuel system. Ensure work area is adequately ventilated.**

CAUTION

- Air in fuel system may cause power surges or flameout. Bleed off trapped air after opening system at any point between fuel tank and engine fuel nozzle.
- Prevent fuel system contamination. Install caps on the ends of hoses, tubes and fittings as parts are removed. Bag and identify small parts to prevent loss or damage.

(1). Defuel helicopter. Drain remaining fuel from tank sump drain valve into a suitable container.

(2). Remove left fuel tank access panel from passenger/cargo compartment floor.

(3). Unclamp fuel supply tube between fuel shutoff valve and Sta. 124.00 bulkhead elbow. Using backup wrench on bulkhead elbow so it will not rotate, disconnect and remove tube.

(4). With 250-C20B/R2 Engine: Unclamp start pump wire harness and disconnect plug from cell cover receptacle.

(5). Unplug fuel quantity transmitter connector from cell cover receptacle.

(6). Unclamp and disconnect control cable from fuel shutoff valve.

(7). Unfasten and remove Sta. 91.00 and 102.00 left fuel cell cover support brackets.

CAUTION

- Do not strain or bend fuel quantity transmitter float arm.
- Handle fuel cell cover with care. Prying cover from cell opening or rough handling may damage seal or cell fitting.

(8). Remove fuel quantity transmitter flange screws. Lift transmitter assembly out of cover opening.

(9). Unbolt cell access cover. Prop cover open with suitably padded blocks.

(10). Using a backup wrench on valve, separate fuel supply hose from fuel shutoff valve.

(11). Remove fuel shutoff valve and attaching hardware.

B. Fuel Shutoff Valve Installation

(Ref. Figure 402, Fuel Cell Cover Installation)

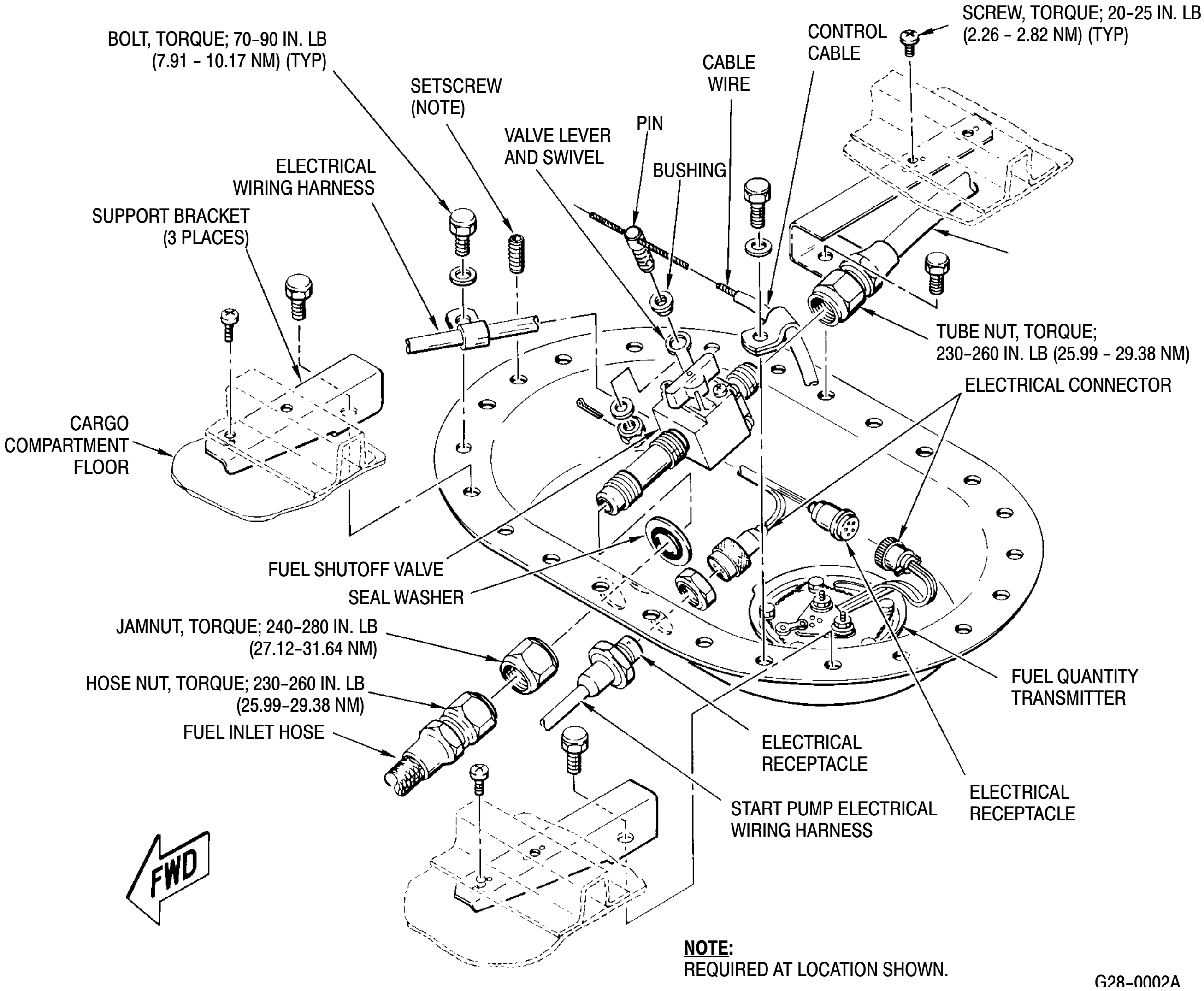


Figure 402. Left Fuel Cell Cover Installation

3. Fuel Tank Vent System Component Replacement

WARNING **Avoid fuel vapor ignition and fire. Use only nonsparking tools and explosion proof work lights. Attach helicopter to an approved electrical ground. Switch OFF all electrical power. Disconnect external power and battery before opening fuel system. Ensure work area is adequately ventilated.**

CAUTION Prevent fuel system contamination. Install caps on the ends of hoses, tubes and fittings as parts are removed. Bag and identify small parts to prevent loss or damage.

(1). Defuel helicopter. Drain remaining fuel from tank sump drain valve into a suitable container.

WARNING **Prevent spontaneous combustion or explosion. Never use oxygen to purge or ventilate fuel tank or fuel system components. Fuel, either vapor or liquid, will violently react with an oxygen rich atmosphere.**

(2). Ventilate fuel tank with an inert gas, such as nitrogen, or low pressure compressed air applied through filler neck.

A. Vent Tube/Emergency Valve Assembly Removal

(Ref. Figure 403)

(1). Unbolt and remove right fuel cell access cover.

(2). Remove right foot support, controls, and fuel vent access panels.

(3). Remove right seat from crew compartment.

(4). Move collective pitch stick full down.

(5). In passenger/cargo compartment; remove right and left fuel tank floor access panels.

(6). Remove lockwire from vent connector hoses and main rotor mast pan drain tube.

(7). Remove vent tube/emergency valve assembly attaching hardware. Remove flexible tubing from lower vent tube tee.

(8). Rotate emergency shutoff valve inboard and slip assembly down over landing gear structure. Remove tube assembly through controls access panel opening.

(9). Unclamp flexible tubing from side vent fairing. Remove tubing through controls access opening.

B. Forward Vent Crossover Fitting Removal

(Ref. Figure 403)

(1). Unbolt forward vent crossover fitting flanges.

(2). Remove fitting, clamps, seals and washers.

(3). Cover cell vent fittings and aft vent line tube openings.

C. Aft Vent Crossover Fitting Removal

(Ref. Figure 403)

NOTE: Left and right fuel cell access covers must be removed to get at aft vent crossover U-tube attaching hardware.

(1). Remove left and right fuel cell floor access panels.

(2). Unclamp fuel supply tube between fuel shutoff valve and Sta. 124.00 bulkhead elbow. Using backup wrench on bulkhead elbow so it will not rotate, disconnect and remove tube.

(3). With 250-C20 Series Engines: Unclamp start pump wire harness and disconnect plug from cell cover receptacle.

(4). Unplug fuel quantity transmitter connector from cell cover receptacle.

(5). Unclamp and disconnect control cable from fuel shutoff valve.

(6). Unfasten and remove Sta. 91.00 and 102.00 left fuel cell cover support brackets.

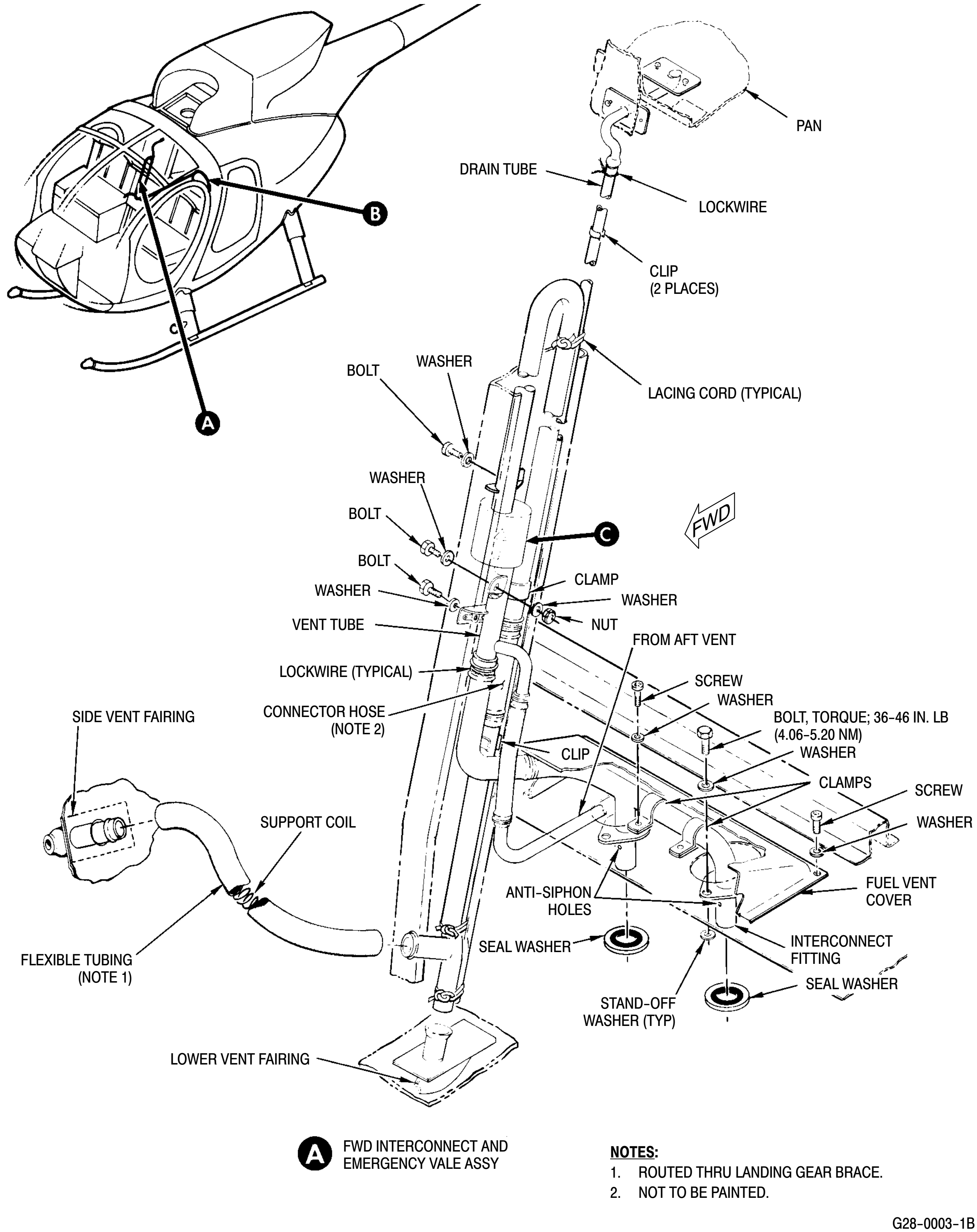


Figure 403. Vent System (Sheet 1 of 2)

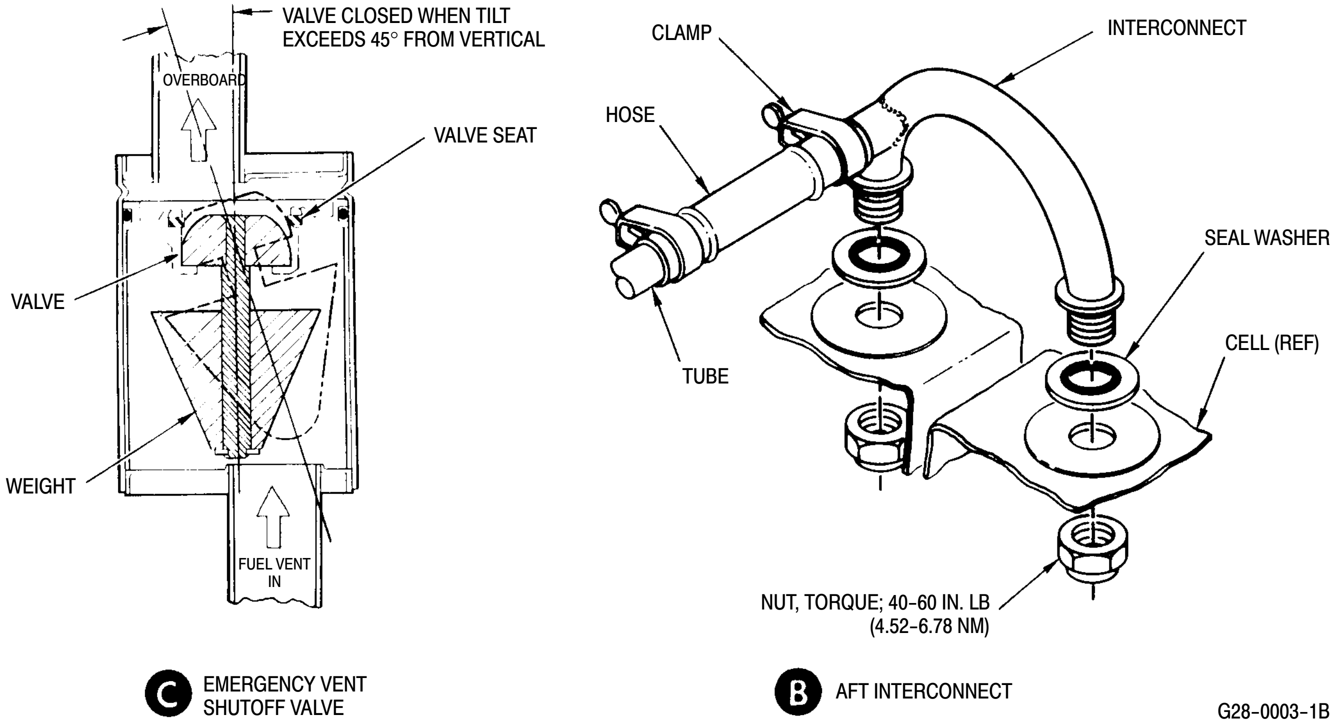


Figure 403. Vent System (Sheet 2 of 2)

CAUTION

- Do not strain or bend fuel quantity transmitter float arm.
- Do not damage cell cover bonded seal. Handle fuel cell covers with care. Prying covers from cell openings or rough handling may damage seal or cell fitting.

(7). Remove fuel quantity transmitter flange screws. Lift transmitter assembly out of cover opening.

(8). Unbolt and prop fuel cell access cover open with suitably padded blocks.

(9). Use a backup wrench on valve and separate fuel supply hose from fuel shutoff valve. Move fuel cell cover to get at remaining hardware.

(10). Reach back inside cells and remove vent interconnect nuts. Separate aft U-tube interconnect from cells.

(11). Unclamp and remove hose between U-tube interconnect tee and straight tube. Remove U-tube interconnect. Discard sealwashers.

(12). Cap tube and cell openings.

(13). Inspect all vent system components (Ref. Fuel Tank Vent System Inspection).

D. Fuel Tank Vent System Installation

(Ref. Figure 403)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM124	Kerosene

WARNING **Avoid fuel vapor ignition and fire. Use only nonsparking tools and explosion proof work lights. Attach helicopter to an approved electrical ground. Switch OFF all electrical power. Disconnect external power and battery before opening fuel system. Ensure work area is adequately ventilated.**

(1). Wipe forward and aft cell vent fittings and crossover tube flanges clean with kerosene (CM124) or equivalent on a clean shop towel. Wipe dry.

NOTE: Do not lubricate fitting sealwashers. Lubricants may cause seal cold flow and subsequent leakage.

(2). Install new sealwashers on aft vent tube ends. Insert tube ends through cell fittings. Reach inside cell and install nuts.

(3). Torque aft vent U-tube interconnect nuts to **40 - 60 inch-pounds (4.52 - 6.78 Nm)**.

(4). Install hose and clamps between interconnect U-tube and straight tube.

(5). Position new sealwashers on cell forward vent fittings. Slip vent tube into cell fitting.

NOTE: Permatex Form-A-Gasket No.1 may be used to hold metal stand- off washers in place.

(6). Sandwich one AN960-10 washer on each side of seal washer between vent tube flanges and cell fittings. Align washers with bolt holes. Install bolts with one washer under each bolt head.

(7). Torque forward vent interconnect tube flange bolts to **36 - 46 inch-pounds (4.07 - 5.20 Nm)**.

(8). Connect powerplant supply tube to Sta. 124.00 bulkhead elbow. Loosely install tube support clamps, screws, washers and nuts. Using backup wrench on bulkhead elbow so it will not rotate, torque tube nut to **230 - 260 inch-pounds (25.99 - 29.38 Nm)**.

(9). Install fuel cell covers (Ref. Fuel Cell Cover Installation).

E. Vent Tube/Emergency Valve Assembly Installation

(Ref. Figure 403)

(1). Move collective pitch stick full down.

(2). Remove protective covers from fittings and tubes.

(3). Work emergency valve and vent tube assembly through landing gear brace then into position in tunnel.

(4). Insert vent tube assembly in bottom vent fairing.

(5). Loosely install vent tube support clamps, washers and bolts.

(6). Install flexible tubing between side vent fairing and vent tube assembly tee.

(7). Clamp flex tube ends in position with two or three wraps of lockwire.

(8). Tighten vent tube assembly support clamp and bracket fasteners.

(9). Install and secure remaining vent system connector hoses with lockwire.

(10). Operate all flight controls through full range of motion to ensure no interference exists between control linkages and vent system. No interference is allowed. Adjust vent system hardware as required.

(11). Install fuel vent access panel.

(12). Install controls access and foot support panels.

(13). Install crew seat.

4. Fuel Supply Lines Replacement

A. Fuel Supply Lines Removal

(Ref. Figure 404)

WARNING **Avoid fuel vapor ignition and fire. Use only nonsparking tools and explosion proof work lights. Attach helicopter to an approved electrical ground. Switch OFF all electrical power. Disconnect external power and battery before opening fuel system. Ensure work area is adequately ventilated.**

CAUTION

- Air in fuel system may cause power surges or flameout. Bleed off trapped air after opening system at any point between fuel tank and engine fuel nozzle.
- Prevent fuel system contamination. Install caps on the ends of hoses, tubes and fittings as parts are removed. Bag and identify small parts to prevent loss or damage.

(1). Defuel helicopter. Drain remaining fuel from tank sump drain valve into a suitable container.

(2). Disconnect, remove and cap fittings and lines as required.

B. Fuel Supply Lines Installation

(Ref. Figure 404)

(1). Install and torque engine fuel supply lines (Ref. Table 401).

NOTE: It may be necessary to install a peelable shim washer between the Sta. 124.00 firewall and the bulkhead elbow washer to obtain the proper clocking angle and clearance needed for line installation.

(2). Install Sta. 124.00 firewall elbow, with jam nut on forward side of firewall, flat of nut against stiffener, and washer against elbow. Torque elbow to **145 - 155 inch-pounds (16.38 - 17.51 Nm)**. Ensure elbow is clocked 12° - 16° to the right from vertical after torquing.

(3). Connect flexible drain lines to drain valves and clamp in place with lockwire.

(4). Apply a torque alignment stripe to fuel line tube, hose and fitting fasteners.

5. Start Pump Replacement (Model 250-C20B/R2 Engine Installation)

A. Start Pump Removal

(Ref. Figure 404)

WARNING **Avoid fuel vapor ignition and fire. Use only nonsparking tools and explosion proof work lights. Attach helicopter to an approved electrical ground. Switch OFF all electrical power. Disconnect external power and battery before opening fuel system. Ensure work area is adequately ventilated.**

CAUTION Prevent fuel system contamination. Install caps on the ends of hoses, tubes and fittings as the parts are removed. Bag and identify small parts to prevent loss or damage.

(1). Defuel helicopter. Drain remaining fuel from tank sump drain valve into a suitable container.

(2). Remove left fuel tank access panel from passenger/cargo compartment floor.

(3). Unclamp fuel supply tube between fuel shutoff valve and Sta. 124.00 bulkhead elbow. Using backup wrench on bulkhead elbow so it will not rotate, disconnect and remove tube.

(4). Unclamp start pump wire harness and disconnect plug from cell cover receptacle.

(5). Unplug fuel quantity transmitter connector from cell cover receptacle.

(6). Unclamp and disconnect control cable from fuel shutoff valve.

(7). Unfasten and remove Sta. 91.00 and 102.00 left fuel cell cover support brackets.

Table 401. Fuel Line Torque Values

Item/Position	Torque Inch-Pounds (Nm)
Tube end-nuts; fuel shutoff valve; Sta. 124.00 Bulkhead elbow	230 - 260 (25.99 - 29.38)
Bulkhead elbow jamnut; Sta. 124.00	145 - 155 (16.38 - 17.51)
Three-port elbow jamnut; Sta. 124.00 (if equipped)	145 - 155 (16.38 - 17.51)
Drain valves (all)	95 - 105 (10.73 - 11.86)
Hose end-nuts; firewall/engine	230 - 260 (25.99 - 29.38)

CAUTION

- Do not strain or bend fuel quantity transmitter float arm.
- Handle fuel cell covers with care. Prying covers from cell openings or rough handling may damage the cover seal or cell fitting.

(8). Remove fuel quantity transmitter flange screws. Lift transmitter assembly out of cover opening.

(9). Unbolt and prop fuel cell access cover open with suitably padded blocks.

(10). Use a backup wrench on valve and separate fuel supply hose from fuel shutoff valve.

(11). Remove pump electrical receptacle from cover. Remove fuel cell cover.

(12). Unbolt fuel pump from sump mount plate. Remove fuel pump and hose.

(13). Remove hose and union from pump pressure port.

B. Start Pump Installation

(Ref. Figure 404)

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM114	Petrolatum

(1). Apply a thin coat of petrolatum (CM114) to a new O-ring and pump pressure port union threads. Install O-ring on union. Install union in start pump pressure port and torque to **280 - 305 inch-pounds (31.64 - 34.46 Nm)**.

(2). Attach fuel supply hose to start pump pressure port union. Torque hose nut to **230 - 260 inch-pounds (25.99 - 29.38 Nm)**.

CAUTION

- Ensure start pump wire lead is wrapped around or tie-wrapped to fuel supply hose so that there is no possibility of its interfering with fuel quantity transmitter float mechanism. Ensure electrical connections will not be strained by G-induced hose movements.
- Do not mark torque alignment stripes on fuel cell internal hardware.

NOTE: Use only MS3367 ty- raps inside fuel tanks.

(3). Tie-wrap or wrap pump wire around supply hose. Secure wire with ty-raps as required.

(4). Clean start pump and sump plate mount contact surfaces to establish an electrical bond per requirements of FAA publication, EA-AC43.13-1A and 2A.

(5). Install start pump on sump plate with bolts and washers. Torque bolts to **36 - 46 inch-pounds (4.07 - 5.20 Nm)**.

(6). Install fuel cell cover (Ref. Fuel Cell Cover Installation).

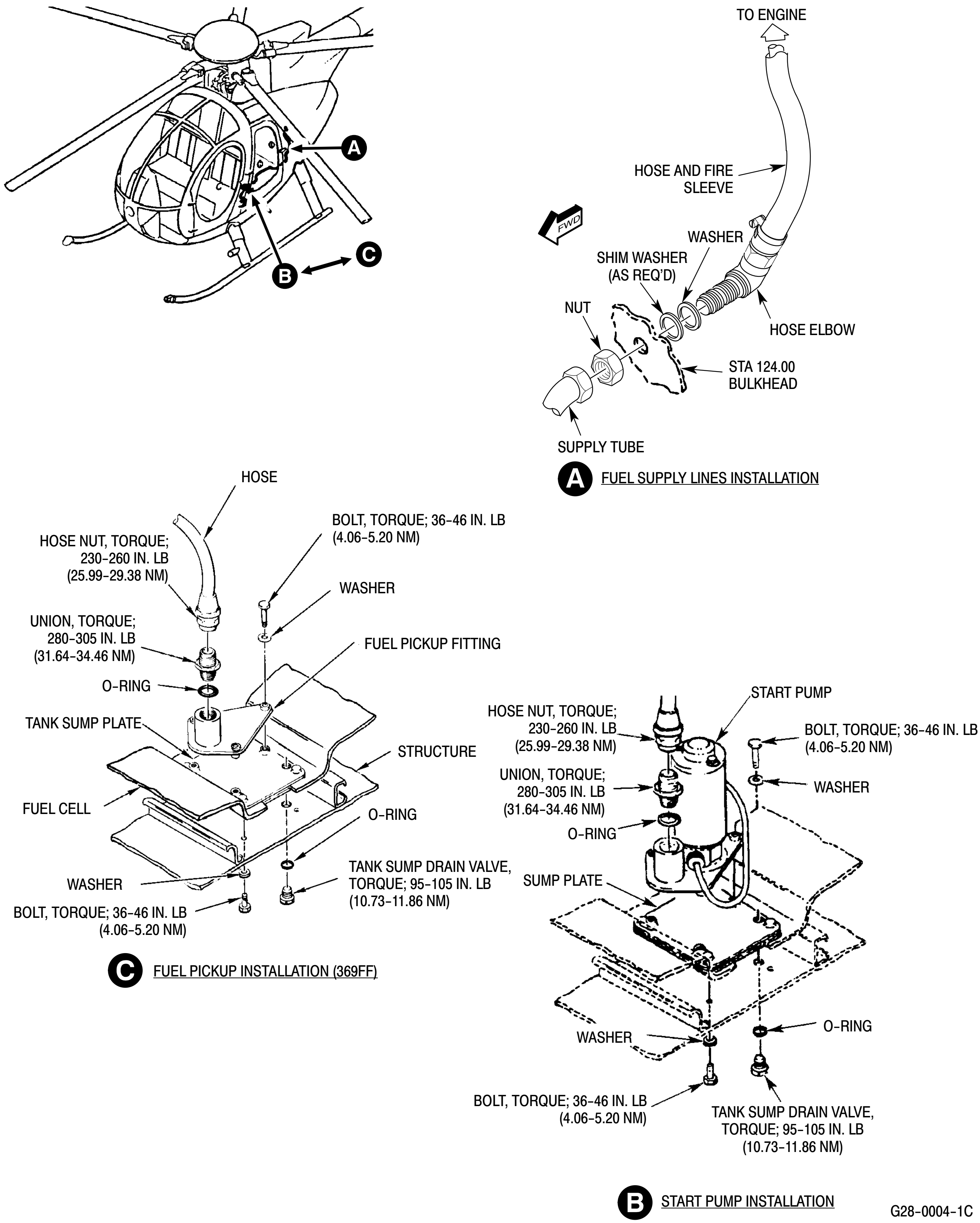
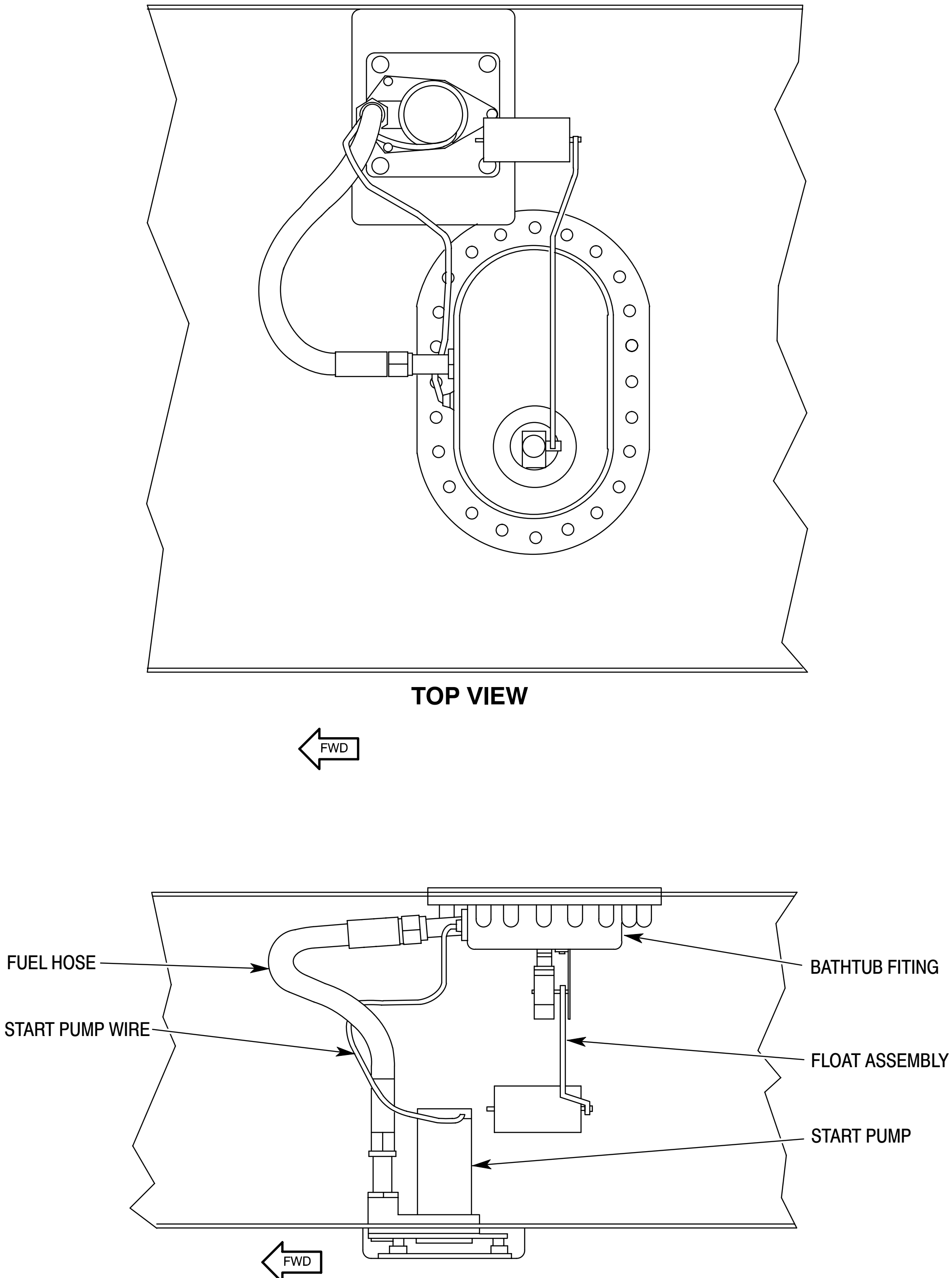


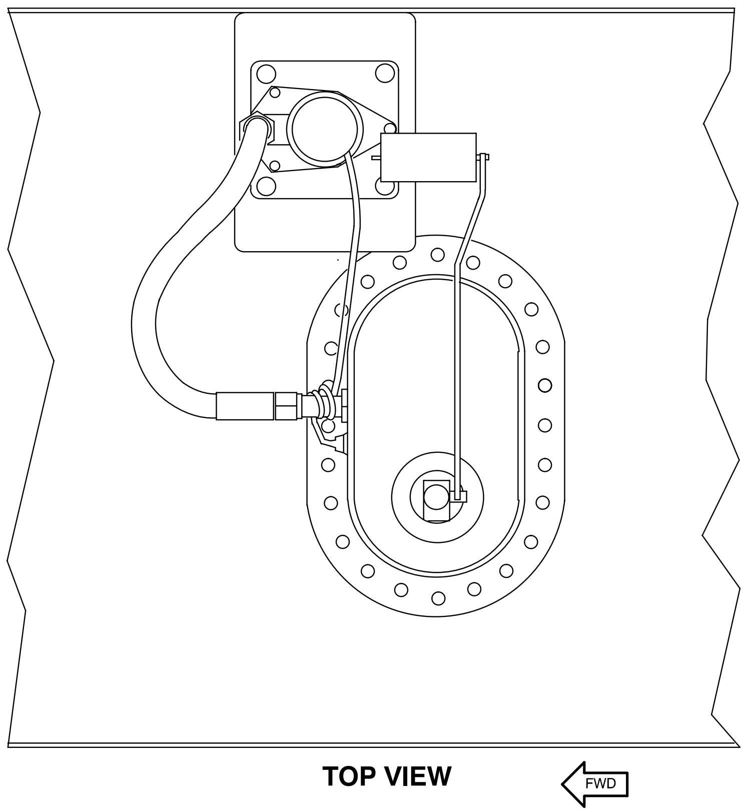
Figure 404. Start Pump and Fuel Lines Installation (Sheet 1 of 4)

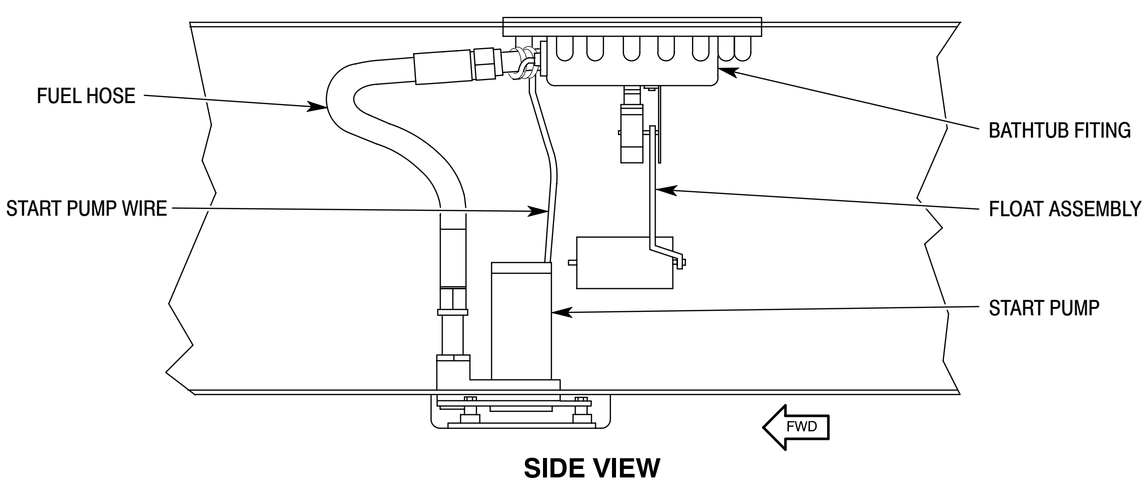


NOTE:
WRAP WIRE AROUND FUEL INLET HOSE TO
PREVENT INTERFERENCE WITH FLOAT.

G28-0004-2

Figure 404. Start Pump and Fuel Lines Installation (Sheet 2 of 4)





NOTE:
WRAP WIRE AROUND FUEL INLET HOSE TO
PREVENT INTERFERENCE WITH FLOAT.

G28-0004-3

Figure 404. Start Pump and Fuel Lines Installation (Sheet 3 of 4)

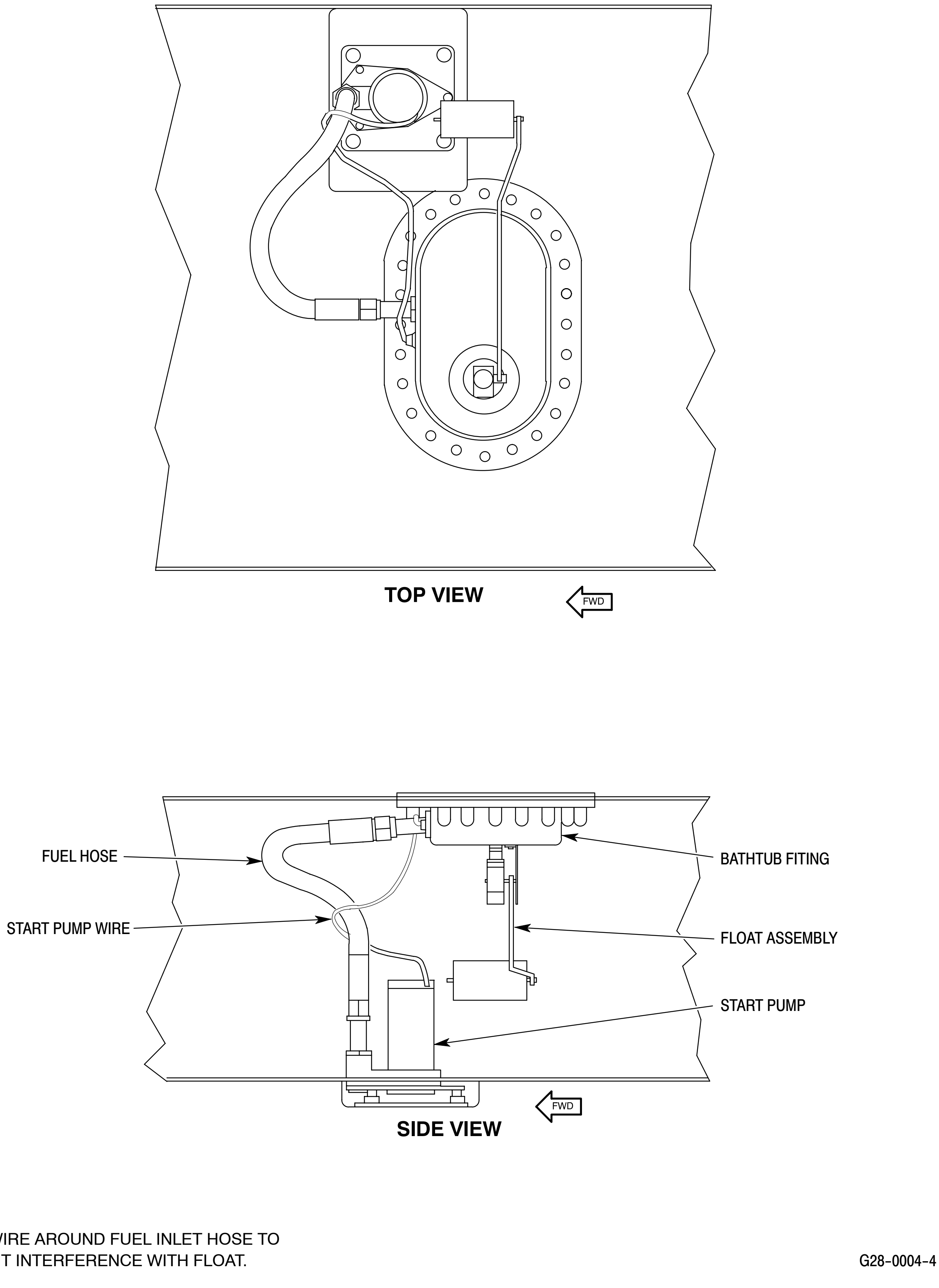


Figure 404. Start Pump and Fuel Lines Installation (Sheet 4 of 4)

6. Fuel Quantity Transmitter Replacement

A. Fuel Quantity Transmitter Removal

(Ref. Figure 404)

WARNING **Avoid fuel vapor ignition and fire. Use only nonsparking tools and explosion proof work lights. Attach helicopter to an approved electrical ground. Switch OFF all electrical power. Disconnect external power and battery before opening fuel system. Ensure work area is adequately ventilated.**

(1). Defuel helicopter. Drain remaining fuel from tank sump drain valve into a suitable container.

WARNING **Prevent spontaneous combustion or explosion. Never use oxygen to purge or ventilate fuel tank or fuel system components. Fuel, either vapor or liquid, will violently react with an oxygen rich atmosphere.**

(2). Ventilate fuel tank with an inert gas such as nitrogen or low pressure compressed air applied through filler neck.

(3). Remove left fuel tank access panel from passenger/cargo compartment floor.

(4). Unplug fuel quantity transmitter connector from cell cover receptacle. Unclamp wire harness.

CAUTION

- Do not strain or bend fuel quantity transmitter float arm.
- Prevent fuel system contamination. Install a cover over quantity transmitter cell opening. Bag small parts to prevent loss or damage.

(5). Remove fuel quantity transmitter flange screws. Lift transmitter assembly out of cover opening. Discard gasket.

(6). Inspect fuel quantity transmitter as required (Ref. Fuel Quantity Transmitter Inspection).

(7). Calibrate quantity transmitter as required (Ref. Fuel Quantity Transmitter Calibration and Adjustment).

B. Fuel Quantity Transmitter Installation

(Ref. Figure 404)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM124	Kerosene

(1). Wipe fuel quantity transmitter flange and cell fitting clean with kerosene (CM124) on a clean lint free cloth. Wipe parts dry.

(2). Position fuel quantity transmitter and flange gasket on cell with float inboard and clear of obstructions.

(3). Install screws and washers. Progressively torque screws to **20 - 25 inch-pounds (2.26 - 2.82 Nm)**. Lockwire screws.

(4). Attach fuel quantity electrical connector to receptacle. Lockwire connector.

(5). Perform a Fuel Quantity Transmitter Functional Check.

(6). Install left fuel tank floor access panel (Ref. Fuel Cell Cover Installation).

7. Fuel System Drain Valve Replacement

A. Fuel System Drain Valve Removal

WARNING **Avoid fuel vapor ignition and fire. Use only nonsparking tools and explosion proof work lights. Attach helicopter to an approved electrical ground. Switch OFF all electrical power. Disconnect external power and battery before opening fuel system. Ensure work area is adequately ventilated.**

CAUTION Helicopter must be defueled and drained prior to removing tank sump drain valve.

(1). Defuel helicopter, as required. Drain remaining fuel from tank sump drain valve into a suitable container.

(2). Remove lockwire from tank sump drain valve.

(3). Using appropriate socket or wrench, remove drain valve.

B. Fuel System Drain Valve Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM114	Petrolatum
CM124	Kerosene
CM702	Lockwire CRES

(1). Replace drain valve O-ring packings. Lubricate packings with kerosene (CM124), petrolatum (CM114) or jet fuel.

(2). Install and torque sump drain valve to **95 - 105 inch-pounds (10.73 - 11.86 Nm)**. Lockwire valve.

(3). Apply a torque alignment stripe to fuel line tube, hose and fitting fasteners.

(4). Refuel helicopter.

(5). Check drain valve for leakage.

(6). Apply external power.

(7). In crew compartment; set battery switch to **EXT PWR** position.

(8). Push fuel shutoff valve control knob in to open valve.

(9). With 250-C20B/R2 Engine: Set **START PUMP** switch **ON** to pressurize fuel system.

8. Fuel Cell Replacement

CAUTION

- Do not work on Uniroyal fuel cell in ambient temperatures below 50°F (10°C).
- Do not work on Engineering Fabric Corp. fuel cell in ambient temperatures below 70°F (21°C).

A. Fuel Cell Removal

WARNING **Avoid fuel vapor ignition and fire. Use only nonsparking tools and explosion proof work lights. Attach helicopter to an approved electrical ground. Switch OFF all electrical power. Disconnect external power and battery before opening fuel system. Ensure work area is adequately ventilated.**

CAUTION Prevent fuel system contamination. Install caps on the ends of hoses, tubes and fittings as parts are removed. Bag and identify small parts to prevent loss or damage.

(1). Defuel helicopter. Drain remaining fuel from tank sump drain valve into a suitable container.

WARNING **Prevent spontaneous combustion or explosion. Never use oxygen to purge or ventilate fuel tank or fuel system components. Fuel, either vapor or liquid, will violently react with an oxygen rich atmosphere.**

(2). Ventilate fuel tank with low pressure forced air or an inert gas such as nitrogen through filler neck.

(3). Remove right and left fuel tank access panels from passenger/cargo compartment floor.

NOTE: The following procedures are required to access and separate the fuel cell interconnect fitting and vent system aft crossover before either cell can be removed from its bay.

(4). Unclamp fuel supply tube between fuel shutoff valve and firewall Sta. 124.00 bulkhead elbow. Using a backup wrench on bulkhead elbow so it will not rotate, disconnect and remove tube.

(5). With 250-C20B/R2 Engine: Unclamp start pump wire harness and disconnect plug from cell cover receptacle.

(6). Unplug fuel quantity transmitter connector from cell cover receptacle.

(7). Unclamp and disconnect control cable from fuel shutoff valve.

(8). Unfasten and remove Sta. 91.00 and 102.00 left fuel cell cover support brackets from airframe structure.

CAUTION

- Do not strain or bend fuel quantity transmitter float arm.
- Handle fuel cell covers with care. Prying covers from cell openings or rough handling may damage the cover seal or cell fitting.

(9). Remove fuel quantity transmitter flange screws. Lift transmitter assembly out of cover opening.

(10). Unbolt and prop fuel cell access cover open with suitably padded blocks.

(11). Using a backup wrench on valve, separate fuel supply hose from fuel shutoff valve. Move fuel cell cover to get at remaining hardware.

(12). With 250-C20B/R2 Engine: Unbolt start pump from sump mount plate. Remove start pump, hose and cell cover. Remove pump electrical receptacle from cover.

(13). With 250-C30 Engine: Unbolt fuel inlet fitting from sump plate. Remove fuel inlet fitting, hose and cell cover.

(14). Unbolt and remove right fuel cell access cover.

(15). Mop up any remaining fuel in both cells with clean lint free cloth. Purge fuel cells with dry, forced air or inert gas.

(16). Have an assistant hold the male end of the cell interconnect fitting with the special spanner wrench. Disassemble fuel cell interconnect fitting (Ref. Figure 405). Discard packing.

(17). Remove aft vent crossover U-tube nuts from inside cells.

(18). Remove forward vent crossover tube flange bolts and washers (Ref. Figure 403).

NOTE: At this point either cell may be removed, as required.

(19). Remove left fuel cell as follows:

(a). Remove cell suspension cords (Ref. Figure 406).

(b). Remove and discard forward and aft vent sealwashers.

(c). Lift inboard and outboard cell clips at each end of baffle support rod out of airframe hangers (Ref. Figure 405).

(d). Inside cell, work baffle support rod ends out of cell nipples (Ref. Figure 405, detail B).

(e). Remove support rod and baffle.

CAUTION Cells are thin-walled and fragile. Avoid snagging or dragging cell over pointed or sharp edges. Do not scratch or nick any of the cell's metal fittings.

(f). Collapse and fold cell lengthwise and remove through floor access opening.

(20). Remove right fuel cell as follows:

(a). Remove fuel filler cap and shield. Unclamp and remove filler from cell filler neck.

(b). Remove cell suspension cords.

(c). Remove and discard forward and aft vent sealwashers.

(d). Lift inboard and outboard cell clips at each end of baffle support rod out of airframe hangers.

(e). Inside cell, work baffle support rod ends out of cell nipples.

(f). Remove support rod and baffle.

CAUTION Cells are thin-walled and fragile. Avoid snagging or dragging cell over pointed or sharp edges. Do not scratch or nick any of the cell's metal fittings.

(g). Collapse and fold cell lengthwise and remove through floor access opening.

B. Fuel Cell Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM114	Petrolatum
CM124	Kerosene
CM809	Nylon cord

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST802	Spanner wrench

WARNING **Avoid fuel vapor ignition and fire. Use only nonsparking tools and explosion proof work lights. Attach helicopter to an approved electrical ground. Switch OFF all electrical power. Disconnect external power and battery before opening fuel system. Ensure work area is adequately ventilated.**

NOTE:

- Discard used O- rings and sealwashers. Apply a thin coat of petrolatum (CM114) to all new O-rings except cell vent system sealwashers and interconnect fitting gasket.
- Always test and inspect a repaired fuel cell for leaks using soap bubble, phenolphthalein or liquid stand method before installing the cell in the helicopter.

(1). Air-vacuum all debris from cell bays. Ensure compartment liner will protect cell from airframe points and edges. Repair liner as required.

(2). Wipe left and right cell interconnect fitting halves clean with kerosene (CM124) on a clean lint free shop towel. Wipe dry.

(3). Fold cell lengthwise and position in bay through floor opening and unfold cell.

(4). Align cell openings with airframe openings.

(5). Insert baffle support rods through baffle tabs (Ref. Figure 405)..

(6). Insert baffle rod ends in nipples.

(7). Attach baffle external support hooks to airframe hangers.

(8). Wipe cell forward and aft vent fittings and vent tube flanges clean with kerosene (CM124) or equivalent on a clean shop towel. Wipe dry.

NOTE: Do not lubricate fitting sealwashers. Lubricants may cause seal cold flow and subsequent leakage.

(9). Install new sealwashers on aft vent tube ends. Insert tube ends through cell fittings and install nuts finger tight. Do not torque at this time.

(10). Position new sealwashers on cell forward vent fittings. Slip cell fitting over vent tube.

NOTE: Permatex Form- A- Gasket No. 1 may be used to hold stand-off washers in place.

(11). Sandwich one AN960-10 washer on each side between vent tube flanges and cell fittings. Align washers with bolt holes. Install bolts with one washer under each bolt head and engage several threads to keep bolt in place. Do not torque bolts at this time.

(12). Fasten fuel cell sump plate to airframe with washers and bolts. Torque bolts to **36 - 46 inch-pounds (4.07 - 5.20 Nm)**. Lockwire bolts.

(13). Install a new O-ring on sump drain valve. Install valve and torque to **95 - 105 inch-pounds (10.73 - 11.86 Nm)**. Lockwire valve.

NOTE: Do not lubricate fuel cell interconnect fitting gasket. Lubrication may cause seal cold flow and subsequent leakage.

(14). Thread gasket and nut onto cell interconnect fitting. While having an assistant hold the opposite end of fitting with spanner wrench (ST802) tighten nut. Gap between nut and female fitting shall not be more than 0.005 inch (0.127 mm) after tightening.

(15). Connect powerplant supply tube to firewall Sta. 124.00 bulkhead elbow. Loosely install tube support clamps, screws, washers and nuts (Ref. Figure 404, detail A). Using a backup wrench on bulkhead elbow so it will not rotate, torque tube nut to **230 - 260 inch-pounds (25.99 - 29.38 Nm)**.

(16). Torque aft vent U-tube interconnect nuts to **40 - 60 inch-pounds (4.52 - 6.78 Nm)**.

(17). Torque forward vent interconnect tube flange bolts to **36 - 46 inch-pounds (4.07 - 5.20 Nm)** (Ref. Figure 403).

(18). Install nylon support lacing (CM809). Anchor both ends of cord with a bowline knot (Ref. Figure 406).

(19). With 250-C20B/R2 Engine: Install union in start pump pressure port with a new O-ring packing. Torque union to **280 - 305 inch-pounds (31.64 - 34.46 Nm)** (Ref. Figure 404, detail B). Attach fuel supply hose to start pump pressure port union. Torque hose nut to **230 - 260 inch-pounds (25.99 - 29.38 Nm)**.

CAUTION Ensure start pump wire lead is wrapped around or tie-wrapped (using only MS3367 Ty-Raps) to fuel supply hose so that there is no possibility of its interfering with fuel quantity transmitter float mechanism. Ensure electrical connections will not be strained by G-induced hose movements.

(20). Wrap pump wire around supply hose or secure wire with ty-raps as required.

(21). Clean start pump and sump plate mount contact surfaces to establish an electrical bond per requirements of FAA publication, EA-AC43.13-1A and 2A.

(22). Install start pump on sump plate with bolts and washers. Torque bolts to **36 - 46 inch-pounds (4.07 - 5.20 Nm)**.

(23). With 250-C30 Engine: Attach fuel inlet fitting to cell sump plate with bolts and washers. Torque bolts to **36 - 46 inch-pounds (4.07 - 5.20 Nm)**.

(24). Install filler on right fuel cell filler neck with clamp and fuel filler shield. Install filler cap (Ref. Figure 405).

C. Fuel Cell Cover Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM114	Petrolatum
CM124	Kerosene

(1). Inspect both cell cover seals for debonding, nicks or cuts and any other damage having a leak producing potential. Replace covers as required.

(2). Wipe fuel cell and cover sealing surfaces clean with kerosene (CM124) on a clean lint free cloth.

(3). Install right cell cover bolts and washers (Ref. Figure 405). Progressively torque cover bolts to **70 - 90 inch-pounds (7.91 - 10.17 Nm)** in a cross pattern.

(4). Apply a coating of petrolatum (CM114) to a new fuel shutoff valve/cover sealwasher. Install valve on cell cover with sealwasher next to valve body and valve properly aligned to make connection with valve control cable. Install and torque valve jamnut to **240 - 280 inch-pounds (27.12 - 31.64 Nm)** (Ref. Figure 402).

(5). With 250-C20B/R2 Engine: Plug start pump wire harness cell cover hole with a bulkhead union, sealwasher inside cover and a plain washer outside. Install jamnut and torque to **120 - 150 inch-pounds (13.56 - 16.95 Nm)**. Install cap outside of cell. Torque cap to **120 - 150 inch-pounds (13.56 - 16.95 Nm).**

(6). Position cover over cell opening. Connect fuel supply hose to fuel shutoff valve. Torque hose nut to **230 - 260 inch-pounds (25.99 - 29.38 Nm)**. Ensure hose will not be twisted when cover is installed.

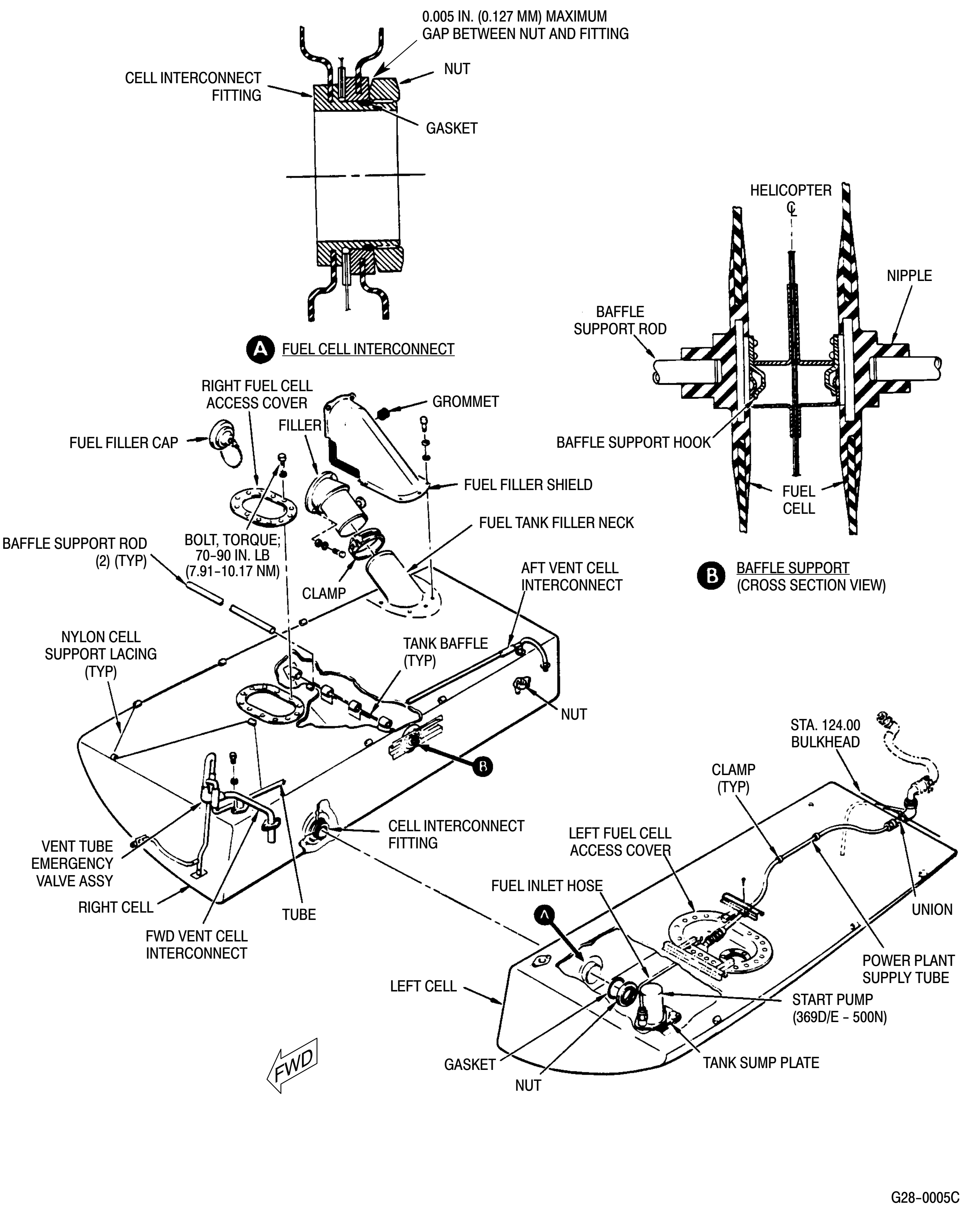


Figure 405. Fuel Cells

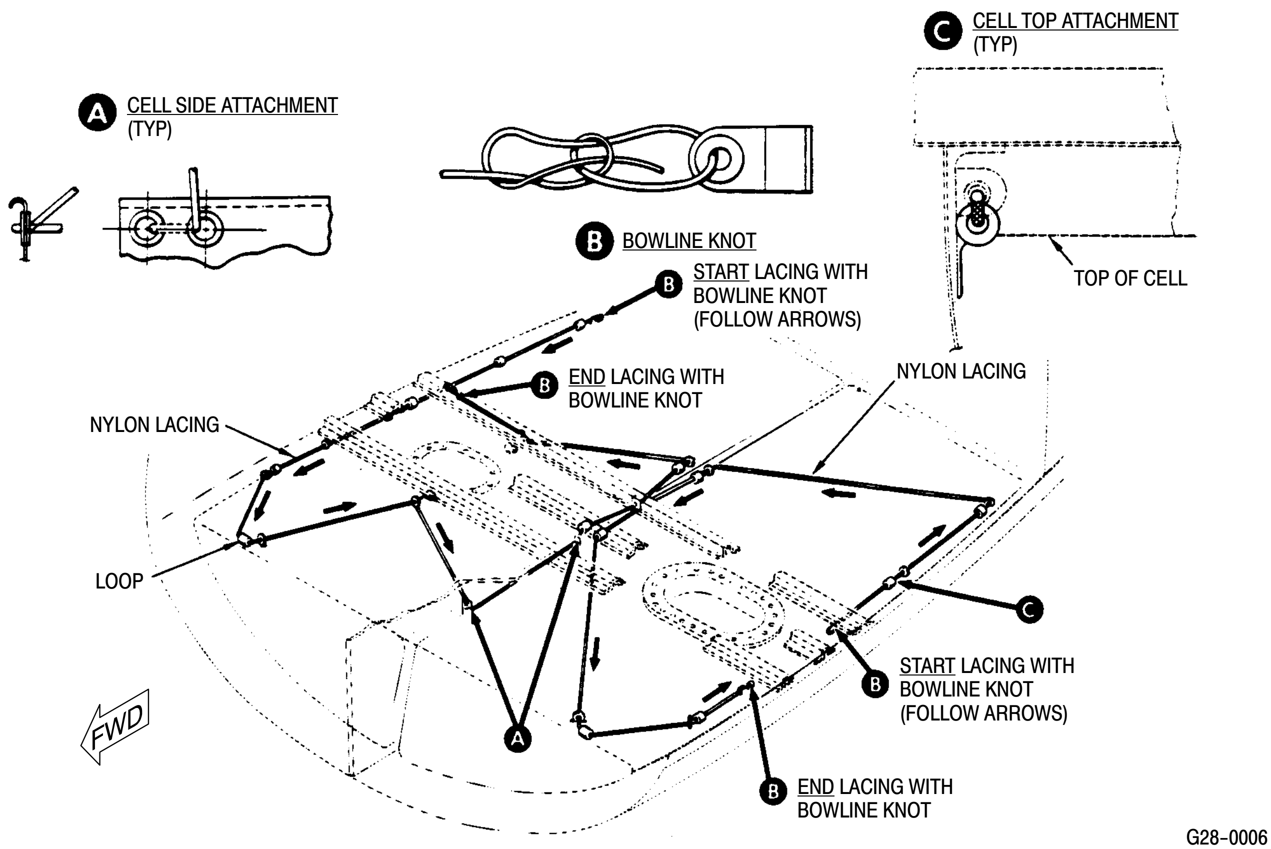


Figure 406. Fuel Cell Support Lacing

(7). With 250-C20B/R2 Engine: Install start pump wiring harness receptacle on fuel cell cover.

(8). Install three support brackets on Sta. 91.00 and 102.00 floor cross-members with washers and screws. Torque screws to **20 - 25 inch-pounds (2.26 - 2.82 Nm)**.

(9). Finger tighten fuel supply tube nut onto fuel shutoff valve. Position control cable and electrical harness clamps on cover.

(10). Install cover bolts and washers. Install drilled-head bolt one bolt hole inboard of pump electrical receptacle. Progressively torque cover bolts to **70 - 90 inch-pounds (7.91 - 10.17 Nm)** in a cross pattern.

(11). Lockwire electrical receptacle nut to drilled bolt.

(12). Inspect fuel quantity transmitter flange gasket for condition. Replace gasket if damaged or deteriorated. Position fuel quantity transmitter in cell with float inboard and clear of obstacles. Install screws and washers. Progressively torque screws to **20 - 25 inch-pounds (2.26 - 2.82 Nm)**. Lockwire screws.

(13). Torque power plant fuel supply tube nut to **230 - 260 inch-pounds (25.99 - 29.38 Nm)**. Tighten supply tube clamp fasteners.

(14). Slip control cable through hole in fuel shutoff valve lever swivel.

(15). Rig cable control system (Ref. Fuel Shutoff Valve Control Cable Installation).

(16). Attach fuel quantity electrical connector to receptacle. Lockwire connector.

(17). With 250-C20B/R2 Engine: Attach start pump electrical connector to receptacle. Lockwire connector.

NOTE: To ensure that the C30 engine installation fuel system is free of leaks you must perform a vacuum leak test.

(18). Perform a vacuum leak inspection on all helicopter models.

(19). With 250-C20B/R2 Engine: Perform a start pump operation and system pressurization check with a concurrent leak inspection (Ref. Start Pump Operational Check (Model 250-C20 Series Engines).

(20). Apply a torque alignment stripe to fuel line tube, hose and fitting fasteners.

(21). Install left and right cell access panels on cargo compartment floor.

FUEL SYSTEM
ADJUSTMENT/TEST

1. Fuel Level Low Caution Light System Test

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
N/A	Inclinometer, Sperry Model 45

WARNING

- **FUEL LEVEL LOW warning light-on point, either 35 pounds for commercial helicopters or 70 pounds fuel remaining for noncommercial machines, must comply with the fuel low level caution light calibration specified in the Pilot's Flight Manual.**
- **A 70 pound fuel level low warning light calibration is not approved for commercial applications.**

(1). Refuel to bring fuel quantity above 35 or 70 pound low level warning point, as appropriate.

(2). Plug in and switch on 24 - 28 Vdc external power.

(3). Set battery switch to **EXT PWR**.

(4). Reset **INSTR** circuit breaker.

(5). Set caution and warning light dimmer control on **BRT**.

(6). Test caution and warning light array. Replace lamps as required.

(7). With known fuel quantity above 35 or 70 pounds, caution lamp must be off. Check warning light to ensure it does not glow or flicker. A glowing caution lamp with fuel quantity above the low level warning point indicates that current is leaking past the low level warning transistor (switch) through the caution lamp. This problem is corrected by installing a resistor in the transmitter warning light circuit (Ref. Fuel System Repairs). If resistor has been previously installed, replace quantity transmitter and calibrate system.

(8). Remove left fuel cell floor access panel.

(9). Ground fuel quantity transmitter terminal No. 2 to airframe with a jumper wire.

(10). **FUEL LEVEL LOW** caution lamp should show a steady bright light.

(11). If the light is intermittent or does not come on at all, disconnect all power and run a continuity check on the warning light and wiring between the **INSTR** circuit breaker and transmitter.

(12). If the wiring and light check out, remove and bench check the transmitter assembly (Ref. Fuel Quantity Transmitter Calibration and Adjustment).

2. Fuel Quantity Transmitter Calibration and Adjustment

(Ref. Figure 501)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
N/A	Test harness and No. 328 lamp

WARNING **Prevent fuel vapor accumulation, ignition and fire. Attach helicopter to an approved electrical ground. Switch OFF and disconnect external power and battery before opening fuel system. Perform work in an open, well ventilated area away from all potential ignition sources. Use only nonsparking tools and explosion proof work lights.**

(1). Remove fuel quantity transmitter from tank. Install a cover on cell opening.

(2). Fabricate a stand to support quantity transmitter level about 11 inches (28 cm) above work table surface. Support stand must allow access to float arm.

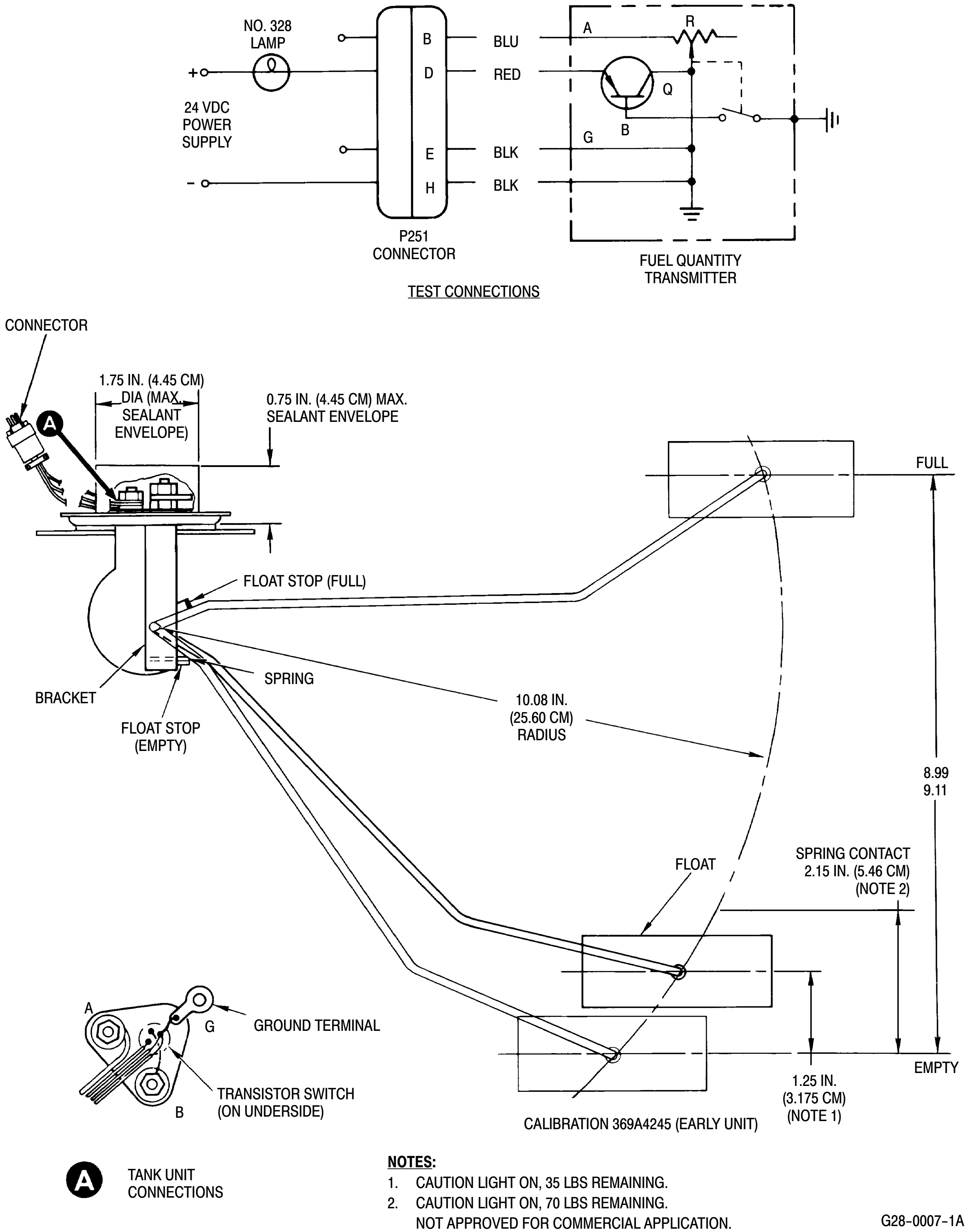


Figure 501. Fuel Quantity Transmitter Calibration (Sheet 1 of 2)

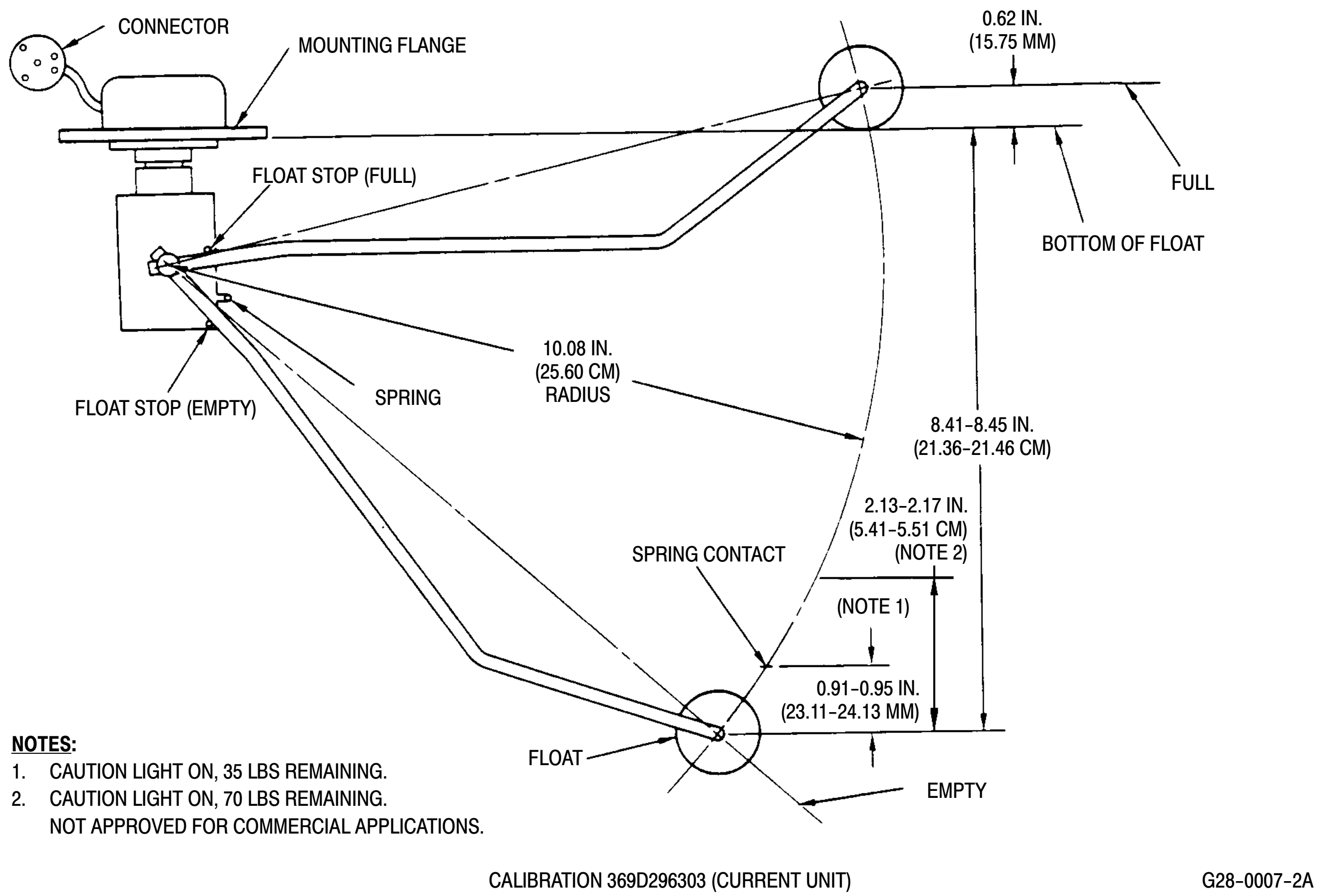


Figure 501. Fuel Quantity Transmitter Calibration (Sheet 2 of 2)

A. Fuel Level Calibration

(1). Let float arm rest on lower stop.

(2). Set an ohmmeter on its low resistance scale. Measure resistance across connector pins B and H.

Part number 369A4245 (early) quantity transmitter resistance must be 0 - 3 ohms.

P/N 369D296303 (current) units must register 0.10 - 2.00 ohms.

(3). Bend float stop down to decrease, or up to increase resistance.

(4). Raise float arm to contact upper stop.

(5). On 369A4245 (early) quantity transmitters only, measure resistance between steel wire spring support bracket and mounting flange. Resistance must be greater than 2 megohms.

(6). On part Nos. 369A4245 (early) and 369D296303 (current) transmitters:

(a). Attach ohmmeter leads to connector pins B and H.

(b). Raise float arm against upper stop.

(c). Indicated resistance shall be 88 - 95 ohms.

(d). Bend stop to adjust resistance value.

(e). Measure float travel between empty and full stops. Ensure travel is within limits (Ref. Figure 501).

(7). Disconnect ohmmeter.

B. Fuel Level Low Warning Light Calibration

(1). Fabricate test harness incorporating a No. 328 lamp bulb and P251 female connector half. Alternatively, fabricate test wires with individual insulated tubular pin connectors.

(2). Attach test harness to transmitter connector pins D and H and power source.

(3). Switch on 24 Vdc power.

(4). Check P/N 369A4245 (early) transmitter units as follows:

(a). Hold float arm between stops. Test lamp must be off. A glowing lamp indicates that current is leaking past transistor (lamp switch). The problem is corrected by installing a 510 ohm resistor in the transmitter caution light circuit (Ref. Fuel System Repairs). If resistor has been previously installed, replace quantity transmitter.

(b). Lower float arm until it just contacts bracket supported steel wire:

(c). Test lamp should come on.

(d). Mark arm/float centerline position on a ruler or stick at point where lamp comes on.

(e). Lower float. Mark ruler at arm/float centerline position with float bottomed on stop.

WARNING

- **FUEL LEVEL LOW warning light-on point, either 35 pounds for commercial helicopters or 70 pounds fuel remaining for noncommercial machines, must comply with the fuel low level caution light calibration specified in the Pilot's Flight Manual.**
- **A 70 pound fuel level low warning light calibration is not approved for commercial applications.**

(f). Distance between upper and lower marks shall be:

1.25 inch (3.18 cm) for 35 pounds (nominal) fuel remaining.

2.15 inch (5.46 cm) for 70 pounds (nominal) fuel remaining.

(5). Check P/N 369D296303 and 369D296303-701 (current) transmitter units as follows:

(a). Hold float arm between stops. Test lamp must be off. A glowing lamp indicates that current is leaking past transistor (lamp switch).

The problem is corrected by installing a 510 ohm resistor in the transmitter caution light circuit (Ref. Fuel System Repairs).

If resistor has been previously installed, replace quantity transmitter.

(b). Lower float arm to just touch bracket supported steel wire.

(c). Test lamp should come on.

(d). Mark arm/float centerline position on a ruler or stick where lamp comes on.

(e). Lower float. Mark ruler at arm/float centerline position with float bottomed on stop.

(f). Measured distance between upper and lower marks shall be:

0.91 - 0.95 inch (23.11 - 24.39 mm) for 35 pounds (nominal) fuel remaining.

2.13 - 2.17 inch (5.41 - 5.51 cm) for 70 pounds (nominal) fuel remaining.

(6). Bend transmitter bracket spring wire to adjust light-on position as required.

(7). Check that lamp operation and float dimensions are within specified tolerances.

(8). Disconnect electrical power and test equipment.

3. Fuel Quantity Transmitter Functional Check

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
N/A	Inclinometer, Sperry Model 45

WARNING Avoid fuel vapor accumulation, ignition and fire. Use only non-sparking tools and explosion proof work lights. Attach helicopter to an approved electrical ground. Switch OFF all electrical power. Disconnect external power and battery before opening fuel system. Ensure work area is adequately ventilated.

(1). Attach helicopter to an approved electrical ground.

(2). Defuel and drain fuel tank.

(3). Locate inclinometer on rear deck between Sta. 100 and 104.

(4). Jack and level helicopter or spot helicopter on level ground.

(5). Jack helicopter to get a 2° nose down attitude on the inclinometer. Stabilize helicopter with blocks as required.

(6). Reset **INST** and **PNL LT** circuit breakers.

(7). Apply external power. Set battery switch to **EXT PWR**.

NOTE: All gauge readings are taken from the centerline of the fuel quantity indicator pointer.

(8). Check that fuel quantity gauge needle points to empty, **E** with the pointer centerline between the outer and inner edge of the **E** graduation mark. Check that **FUEL LEVEL LOW** warning light is on.

NOTE: Do not bend float arm for adjustment of fuel quantity indicating system.

(9). If adjustments are required; shut down external electrical power, and remove transmitter, bend float stops as required and re-install transmitter.

(10). Pump seven gallons of fuel into tank.

(11). Apply external power. Set battery switch to **EXT PWR**.

FUEL LEVEL LOW warning light should be out, and gauge should indicate approximately 45 pounds.

(12). Disconnect fuel supply hose from engine.

(13). Have an assistant direct fuel hose into a suitable 10 gallon (37.85 L) container. Push fuel control valve knob in to open fuel shutoff valve.

(14). (C20 Series Engines) Set fuel start pump switch to **START PUMP**.

(15). (C30 Engine) Attach a siphon pump to fuel supply hose to suck fuel out of tank.

(16). Pump 0.5 - 1.5 gallons (1.89 - 5.68 L), 3.0 - 10.0 pounds (1.36 - 4.54 kg) out of the fuel tank while observing fuel gauge for erratic or hung movement. Fuel quantity gauge needle shall range between 34 - 42 pounds.

NOTE:

- **(C20 Series Engines)** A stuck needle on a new, calibrated and tested gauge may be due to transmitter float contact with the start pump wire, pump or supply hose.
- **(C30 Engine)** Transmitter float interference may be caused by the supply hose or sump pickup fitting.

(17). Loosen fuel quantity transmitter mounting flange screws. Rotate transmitter clockwise as far as it will move and tighten screws. Check gauge needle position.

(18). If float interference problem persists, remove quantity transmitter and determine action required to eliminate problem; i.e. reposition transmitter float arm, fuel supply hose and, or start pump wire.

(19). Install transmitter and repeat functional check.

(20). When 10 pounds (4.54 kg), 1.53 gallons (5.79 L) has been pumped, needle pointer should be aligned on center of the 35 pound red dot mark and **FUEL LOW** caution light should come on.

(21). Drain remaining fuel and observe that gauge needle falls to empty (E) as tank runs dry.

(22). Repeat adjustments as required. Additional adjustments to float arm or low level contact wire requires a verification check and repetition of the entire check procedure sequence.

(23). Connect fuel supply hose to engine inlet port. Torque hose nut to **230 - 260 inch-pounds (25.99 - 29.38 Nm)**.

(24). Install quantity transmitter (Ref. Fuel Quantity Transmitter Installation).

4. Fuel Filter (Bypass) Caution Light Pressure Switch Test

WARNING

- **Air in the fuel system will cause a power reduction or flameout. Do a fuel system vacuum leak check and system air bleed after opening fuel system to atmosphere and prior to releasing helicopter for flight.**
- **(Model 250-C20 Series Engines) Ensure start pump is operating before taking fuel samples from system supply line drain valves.**

(1). Set all switches; **OFF**. Disconnect external electrical power. Disconnect battery.

(2). Open engine access doors.

(3). Locate pressure switch on engine fuel pump filter (Ref. Figure 503, Figure 504 or Figure 505). Disconnect bypass switch wire knife splice.

CAUTION

- Pressure switch is easily damaged. A slight shearing force applied to half the pressure switch can cause leakage and, or operational failure. Always grip both halves of pressure switch hex flats with wrench when loosening or torquing attaching hardware.
- Bypass pressure switch is not field repairable. Do not disassemble switch. Return faulty switches to vender for repair.

NOTE: For all torques in the following procedures, refer to Figure 503, Figure 504 or Figure 505.

(4). Disconnect hose from from switch bushing. Cap hose.

(5). Remove fuel pressure switch with bushing intact from after filter (AF) port adapter. Install an O-ring on a suitable airtight plug and tighten into adapter fitting.

(6). Bench test 369H8144 bypass pressure switch as follows (denoted by three housing screws):

(a). Assemble test equipment shown in Figure 502. Connect tester to pressure switch lead and connect ground test lead to one of three screws on the housing body.

(b). Remove bushing and O-ring from switch. Attach tubing to switch inlet port as shown. Wipe switch completely dry so any leakage can be detected during the test.

(c). Add fuel to tube. Ohmmeter must indicate switch contact closure as fuel column height passes between 24.5 and 35.0 inches (62.23 and 88.90 cm).

(d). Check switch for leakage around diaphragm. No leaks allowed. Replace a leaking switch.

(e). Separate switch from test apparatus.

(f). Install new O-ring and bushing on switch. Torque switch bushing.

(7). Bench test 369D28144 bypass pressure switch as follows (denoted by six housing screws):

(a). Assemble test equipment shown in Figure 502. Connect tester to pressure switch lead and connect ground test lead to one of six screws on the housing body.

(b). <u>Pressure Method</u>:

1). Remove bushing and O-ring from switch. Attach tubing to switch port A as shown. Tubing has to be airtight.

2). Add pressure to the tube. Ohmmeter must indicate switch contact closure as pressure passes between 8 - 9 psig (16.3 - 18.3 in. hg.).

3). Hold pressure for five minutes and check for bleed-off. Any bleed-off indicates a leak in the switch and requires switch replacement.

4). Slowly release pressure. Ohmmeter must indicate switch contact opening by 4 psig (8.1 in. hg).

(c). Vacuum Method:

1). Remove bushing and O-ring from switch. Attach tubing to switch port B as shown. Tubing has to be airtight.

2). Add vacuum to the tube. Ohmmeter must indicate switch contact closure as vacuum passes between 8 - 9 psig (16.3 - 18.3 in. hg.).

3). Hold vacuum for five minutes and check for bleed-off. Any bleed-off indicates a leak in the switch and requires switch replacement.

4). Slowly release vacuum. Ohmmeter must indicate switch contact opening as vacuum reaches 4 psig (8.1 in. hg).

(d). Separate switch from test apparatus.

(e). Install new O-ring and bushing on switch. Torque switch bushing.

(8). (Model 250-C20B/R2 Series Engines) Perform a switch operational check as follows:

(a). Uncap and attach bypass hose to bushing. Torque hose nut.

(b). Install a suitable airtight plug and O-ring in adapter fitting.

(c). Connect and insulate switch wire knife splice.

(d). Have an assistant hold switch clear of adjacent structures. Connect battery and external electrical power.

(e). Set battery switch to **EXT PWR**.

(f). Reset **INSTR** circuit breaker.

(g). Set caution and warning light dimmer control on **BRT**.

(h). Test caution and warning light array. Replace lamps as required.

(i). Connect a jumper wire between switch body and airframe ground E12.

(j). Set start pump switch; **ON**. **FUEL FILTER** caution light should come on. If **FUEL FILTER** caution light fails to light but works when tested, switch is probably faulty. Replace switch and repeat operational test.

(k). Check switch diaphragm for leakage through open port while pressurized. Replace a leaky switch.

(l). Disconnect jumper wire between pressure switch and ground. Set start pump switch; **OFF**. Set battery switch; **OFF**. Disconnect external power and battery.

(m). Disconnect bypass hose from switch bushing. Install an airtight cap on hose.

(n). Remove plug from adapter fitting. Install bypass switch assembly and a new O-ring in adapter fitting. Torque switch assembly.

(o). Remove plug from bypass hose. Attach hose to switch bushing. Torque hose nut.

(p). Install insulating sleeve and connect switch wire knife splice.

(q). Bleed fuel system.

(r). Operate engine per Pilot's Flight Manual and check fuel system for correct operation. Shut down engine. Inspect fuel system for leaks.

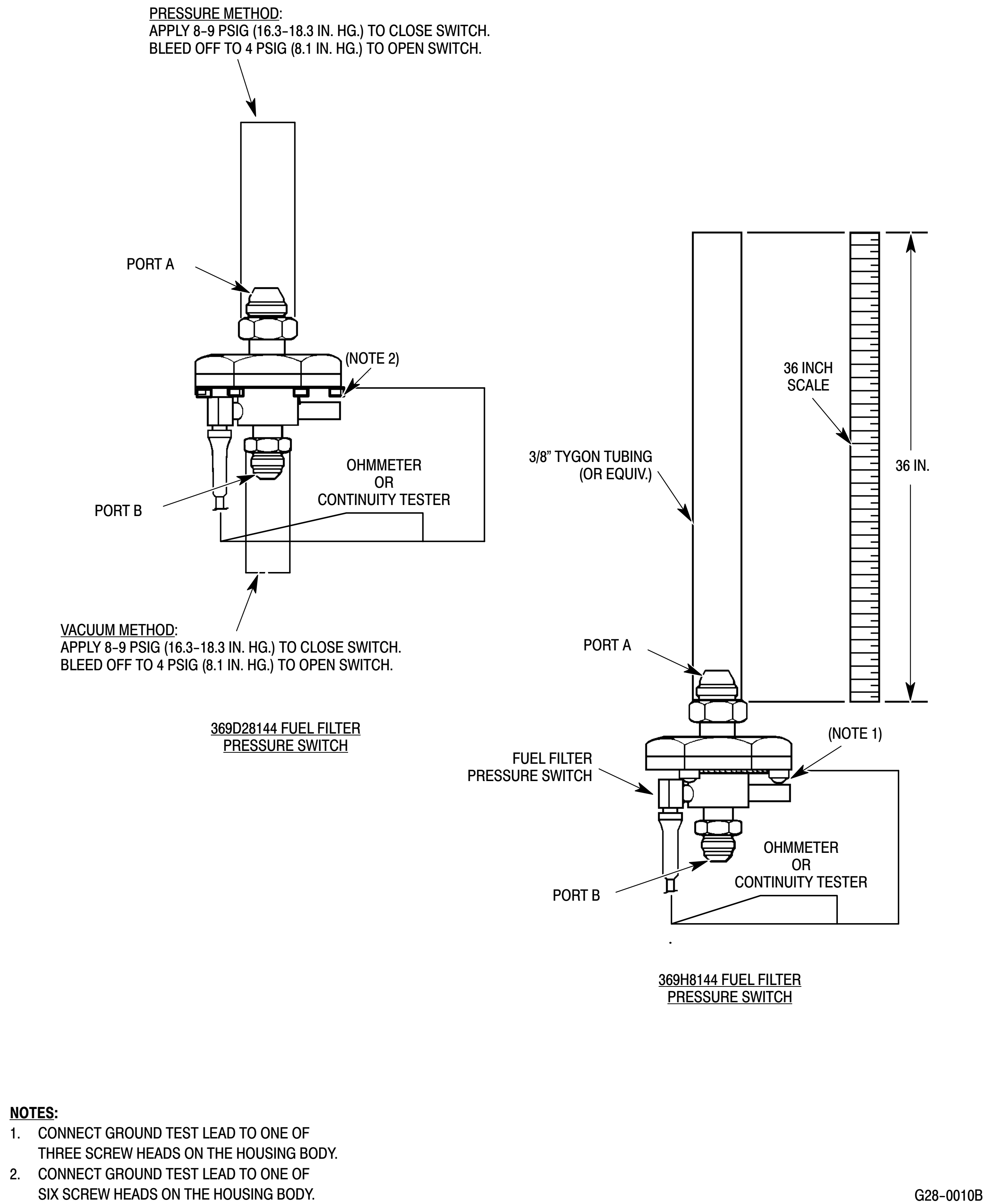


Figure 502. Fuel Filter Caution Light Pressure Switch Test (C20/C30 Engines)

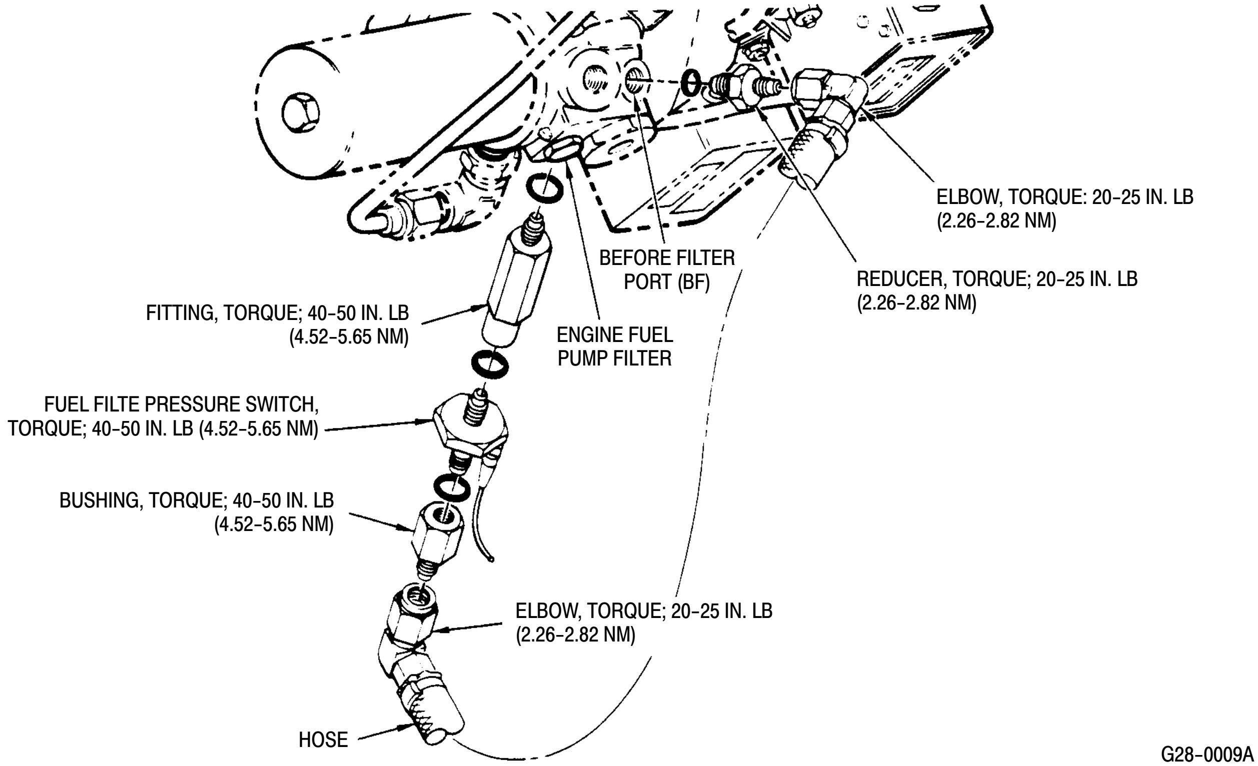


Figure 503. Fuel Filter Caution Light Pressure Switch (C30 Engine)

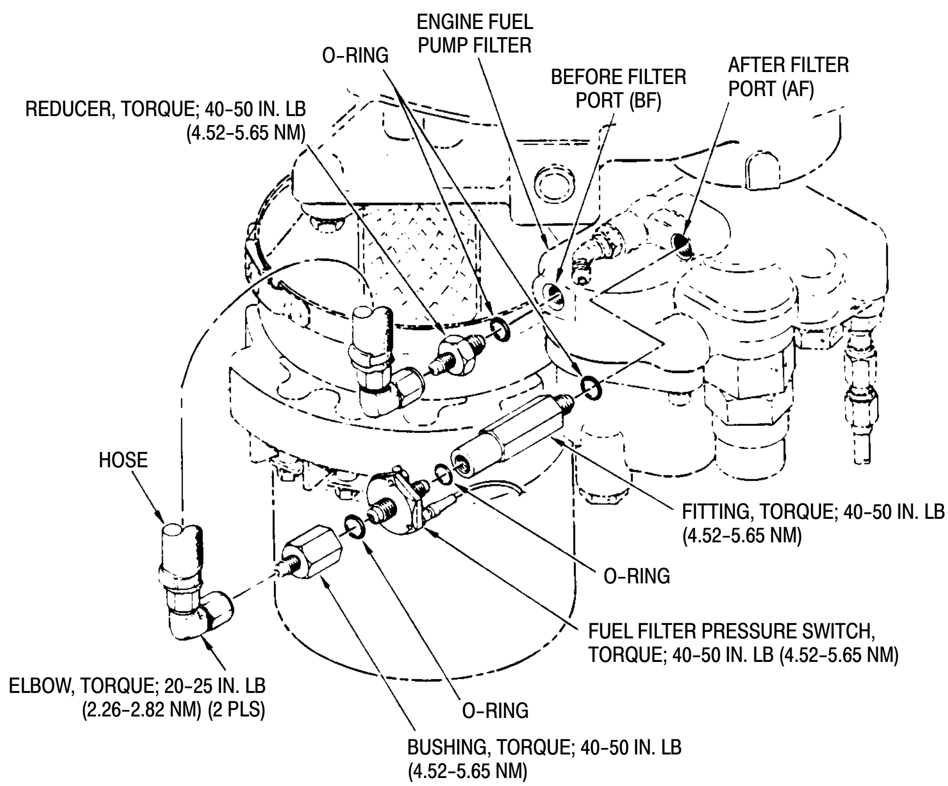


Figure 504. Fuel Filter Caution Light Pressure Switch (C20 Engines)

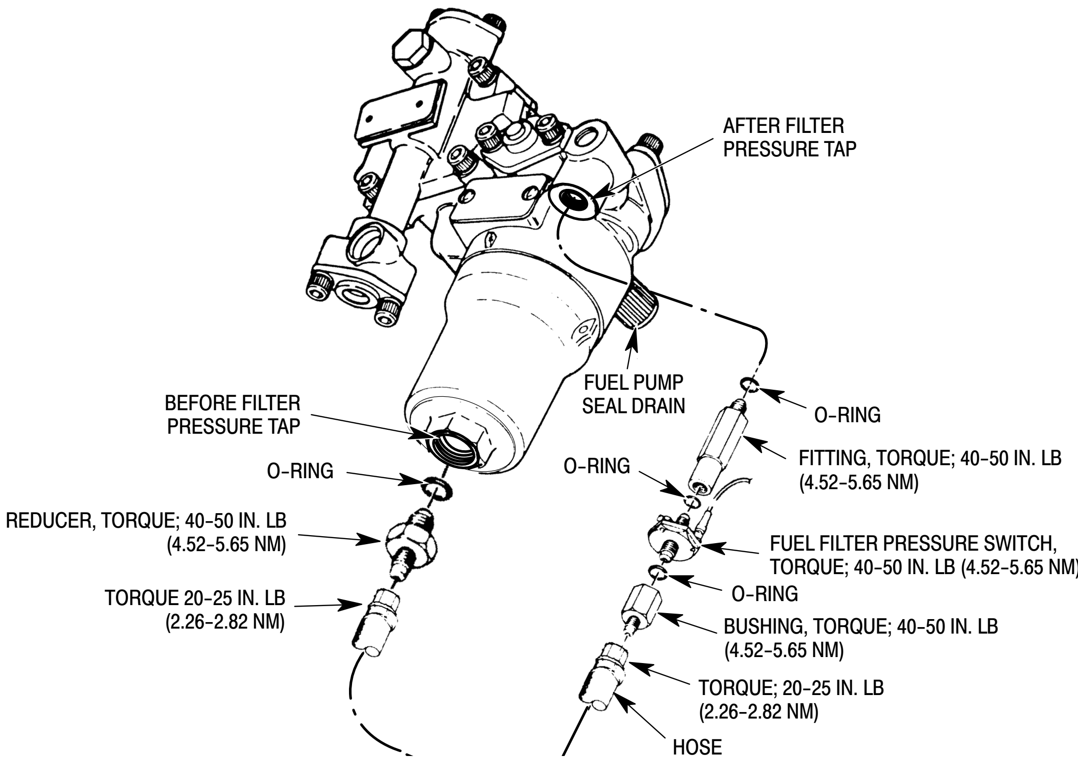


Figure 505. Fuel Filter Caution Light Pressure Switch (C20R/2 Engines with CECO Pump)

FUEL SYSTEM INSPECTION/CHECK

WARNING

- **Avoid fuel vapor ignition and fire. Use only nonsparking tools and explosion proof work lights. Attach helicopter to an approved electrical ground. Switch OFF all electrical power. Disconnect external power and battery before opening fuel system. Ensure work area is adequately ventilated.**
- **Air entering the airframe fuel supply lines may cause a power reduction or flameout. Fuel system vacuum leak check and fuel air bleed procedures must be performed after opening fuel the supply system for any reason, prior to releasing helicopter for flight.**

1. Fuel System General Inspection

(1). Remove right and left fuel tank floor access panels.

(2). Inspect fuselage bottom skin for evidence of fuel leakage. No leaks allowed. Determine source and repair as required.

(3). Inspect fuel lines, fittings, cell access covers, fuel quantity unit, clamps and attaching hardware for leakage, corrosion and security. Inspect fire sleeves for cuts, tears and punctures. No leakage allowed. Repair or replace components as required.

(4). Inspect electrical wiring and connectors for corrosion and security. Replace or repair wiring as required.

(5). If start pump wire is ty-rapped to start pump line, inspect security and condition of ty-raps.

2. Fuel Shutoff Valve Control Cable Swage Test (369D/E)

(Ref. Figure 601)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM309	Lacquer, green
N/A	Lockwire CRES
CM714	Tape, pressure sensitive

(1). Remove left instrument panel fairing. Check for control cables marked (Jairen Inc. 16722 PN 110262-15N) with a date of (5/18) or later, and having a swage less than 0.50 inch (12.70 mm) in length. These cables are MDHS part numbers 369A8137-503 and -603.

(a). Inspect cable casing for a green stripe. The green stripe indicates that cable has been previously pull tested.

(2). Unpainted control cables, P/N 369A8137-503 and -603 fitting the preceding description require a mandatory 50 pound (222.4 N) pull test to determine cable swage integrity.

(a). Unclamp cable from canopy or instrument panel support structure (Ref. Figure 401).

(b). Behind instrument panel; back cable retaining nut completely off threaded portion of casing.

(c). Wrap a 12 inch (30.48 cm) length of two inch 5.08 cm) wide duct tape or equivalent around cable casing about 0.50 inch (12.70 mm) behind casing swage or instrument panel, whichever is furthest from front of instrument panel.

(d). Wrap one end of 0.042 lockwire around cable and attach the other end to the spring scale (Ref. Figure 601).

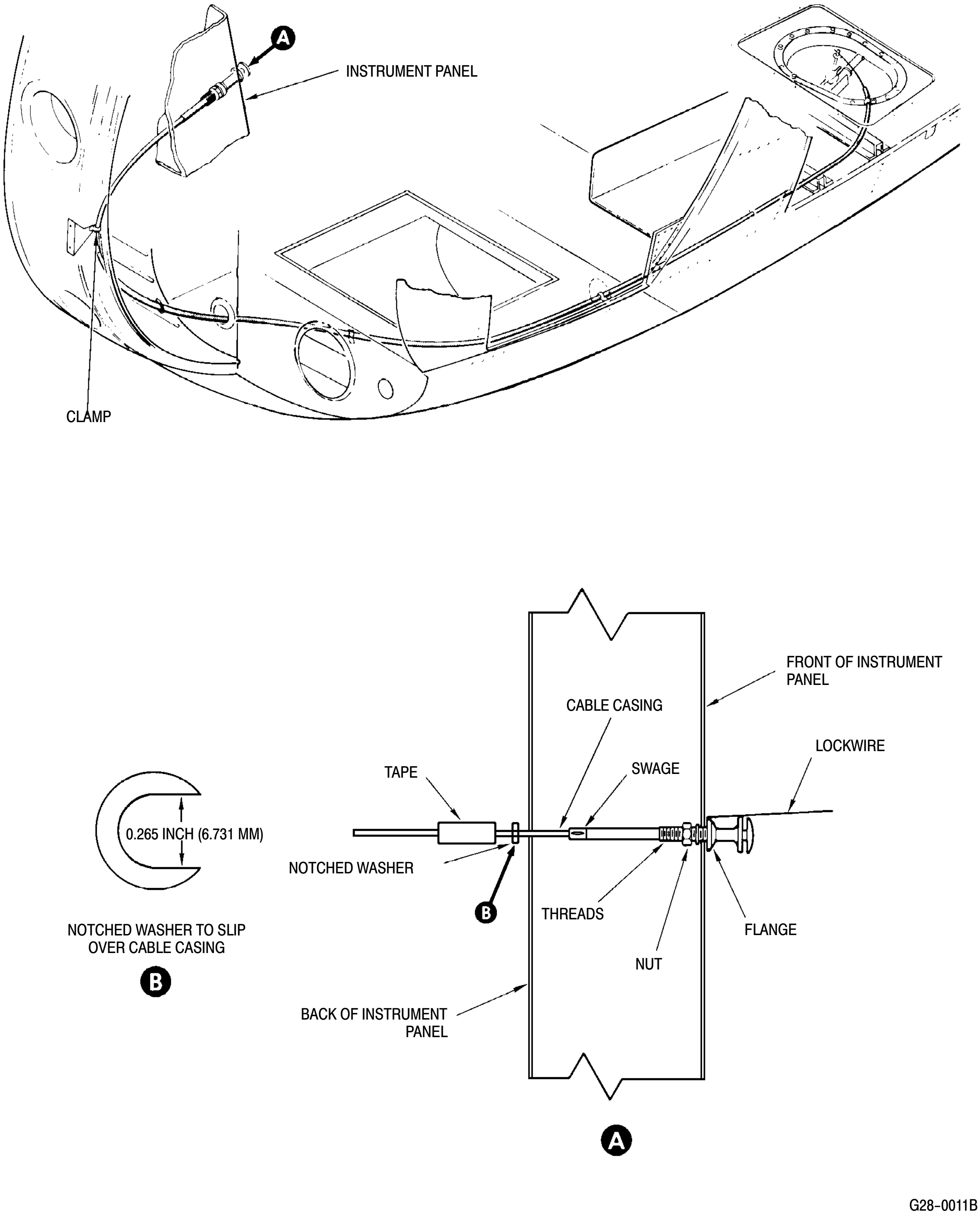


Figure 601. Fuel Shut-Off Control Cable, PN 369A8137-503 Pull Test

(e). Notch a 0.265 ID x 0.063 inch (6.73 ID x 1.60 mm) thick washer and position over cable between tape and back of instrument panel.

WARNING **Sudden cable separation may cause serious personal injury. Be properly braced while pulling on the cable.**

(f). Apply a steady tension through the spring scale up to 50 pounds (222.4 N). Relax the tension.

(g). Inspect cable casing swage for separation.

(h). Replace separated/unserviceable cable assemblies.

(i). If the swage held without apparent damage, paint a green lacquer (CM309) stripe around the swage/casing joint.

(3). Install and secure cable hardware.

(4). Perform the following inspections and checks on all model helicopters.

(a). Remove left fuel cell floor access panel.

(b). Inspect fuel shutoff cable, nylon grommets and attaching hardware for condition and security.

(c). Operate cable and check for binding. Cable bend radius to be 3.5 inches, minimum.

(d). Push knob in and check for 0.090 - 0.150 inch (2.286 - 3.81 mm) gap between bottom of plunger and top of plunger housing (Ref. Figure 401).

3. Fuel Shutoff Valve Inspection

(1). Shut down and disconnect all electrical power.

(2). In cargo/passenger compartment, open left fuel cell access panel.

(3). Disconnect fuel supply tube from fuel shutoff valve.

(4). Use an inspection mirror and flashlight to check shutoff valve ball position.

(5). Ensure shutoff valve control knob is pushed in. Valve ball must be wide open.

(6). Pull control knob out to stop. Valve ball should be closed.

(7). Valves that can not be fully closed or opened must be overhauled or replaced prior to further flight.

(8). Disconnect control cable from valve.

(9). Inspect shutoff valve lever and cable swivel hardware for corrosion and wear. Check lever for smooth movement from closed to open stops.

(10). Use a spring scale to check tension required to move valve lever from full open to closed. Design force requirement is 1.5 - 3.5 pounds (6.7 - 15.6 N) maximum.

(11). Inspect valve for evidence of external leakage. External leakage not allowed.

(12). Check that lever detents at open and closed positions. Repair or replace valve as required.

(13). Connect and rig valve control cable. Install cotter pin on cable swivel.

4. Fuel Quantity Transmitter Inspection

(1). Remove left fuel cell floor access panel.

(2). Check 369D helicopters for potting compound on top of transmitter. Apply missing potting compound per repair instructions. Check transmitter electrical terminals and wire harness where exposed for security and condition.

(3). Where potting compound has been installed, use a pointed probe and bright light to inspect interface between potting compound and flange plate for voids, debonding and separations. Inspect area around terminal fasteners for voids. No separations or voids are allowed.

(4). Remove and test unit as required.

(5). Repair or replace potting compound.

5. Tank Vent System Inspection

(1). Remove controls access door. Disconnect hoses from forward and aft vent crossover tubes.

(2). Blow low-pressure compressed air through vent system to verify passages are clear.

(3). Check vent fairing passages for obstructions and condition. Repair or replace fairings as required.

(4). Inspect vent system hoses for deterioration. Pinch or bend hoses and look for surface cracks. Replace hose if cracks are apparent.

(5). Inspect vent tubes for dents, cracks, deformation or corrosion. Smooth nonrestrictive dents are permissible except at lower end which must fit flush within vent fairing flared riser.

(6). Inspect crossover fittings for cracks, dents or corrosion. Smooth nonrestrictive dents are permissible.

(7). Check that forward crossover anti-siphon holes are open and clean.

(8). With vent tube removed inspect vent tube emergency shutoff valve for condition. Valve should remain open when held vertical. Valve should be closed when held in the 45° from vertical position. While held in the 45° position, blow in the valve assembly and check that valve is closed (Do not use compressed air). Valve shall open when returned to the 25° position. Replace obstructed valve assembly.

6. Fuel System Vacuum Leak Inspection

Fuel is drawn out of the tank by the engine driven fuel pump when the **START PUMP** is switched **OFF** on Model 250-C20 Series engine installations and at all times in Model 250-C30 engine installations. Water, ice, dirt, fungus or a few pinhole leaks in the supply system between the fuel tank sump pickup and engine driven fuel pump may cause power surges, deceleration and, or flameout. A vacuum leak inspection will determine whether or not air is being drawn into the engine fuel supply system.

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST801	Hand operated vacuum pump kit

WARNING **Air entering the airframe fuel supply lines may cause a power reduction or flameout. Fuel system vacuum leak check and fuel air bleed procedures must be performed after opening the fuel supply system for any reason, prior to releasing helicopter for flight.**

(1). Remove left fuel cell floor access panel.

(2). Pull **FUEL** shutoff valve knob out to stop. Verify that fuel shutoff valve lever is hard against its **OFF** stop.

(3). In engine compartment; remove the upper drain plug from the fuel pump filter bowl.

(4). On C30 and C20R installations, remove and plug the fuel vapor return line.

(5). Assemble vacuum pump (ST801) hoses, filter port adapter, shutoff valve and vacuum gauge.

(6). Install the vacuum gauge in the line between the filter port adapter and shutoff valve. Attach the vacuum pump above the shutoff valve.

(7). Attach vacuum test vacuum pump to engine fuel filter upper drain port. Apply 8.0 Hg vacuum. Close vacuum line shutoff valve.

(8). Fuel system shall hold vacuum between 8.0 and 7.5 Hg for two minutes.

NOTE: Vacuum loss exceeding 0.5 Hg in two minutes indicates a leak in the system between, and including, the fuel shutoff valve and engine.

(9). If test is satisfactory, remove test vacuum. Inspect and replace filter plug O-ring as required. Install filter plug.

(10). On C30 and C20R installations, reconnect and torque the fuel vapor return line.

(11). Retorque fuel line connections (Ref. Table 401) and where installed, anti-ice (airframe) fuel filter fittings and line nuts (Ref. Sec. 28-25-00). Repeat vacuum test.

(12). If system continues to leak, disconnect and install airtight caps on lines and fitting ports in a progressive sequence from fuel shutoff valve toward engine. The fuel shutoff and drain valve installations should be especially suspect. Apply vacuum at each stage until leak has been isolated. Replace parts as required.

NOTE: If the vacuum held at 7.5 Hg or better, airframe system seal is satisfactory and leak is due to an engine fuel system problem. Refer to the applicable Allison and Bendix manuals for additional information.

(13). Apply a torque stripe to all effected fuel line fittings and nuts.

7. Start Pump Operational Check (Model 250-C20 Series Engines)

(1). Remove fuel cell floor access panels.

CAUTION Do not operate start pump in an empty fuel tank.

(2). Refuel helicopter.

(3). Connect battery and external power.

(4). Set battery switch to **EXT PWR**.

(5). Push **FUEL** shutoff valve knob in to open shutoff valve.

(6). Set **START PUMP** switch **ON** to pressurize fuel system.

(7). Inspect all line connections for leaks.

(8). Shut down start pump.

(a). Repair leaks as required.

8. Drain Valve Inspection

(1). Inspect tank sump drain valve for leakage and security. No leakage allowed.

(2). Replace valve as required.

9. Fuel Cell Inspection

CAUTION

- Do not work on Uniroyal fuel cell in ambient temperatures below 50°F (10°C).
- Do not work on Engineering Fabric Corp. fuel cell in ambient temperatures below 70°F (21°C).
- Do not remove fuel cells unless absolutely required.
- The barrier can be invisibly torn, punctured or cracked by careless handling.
- Do not carry or move cell by its metal fittings.
- Never probe cell material with sharp edged or pointed tools.

NOTE:

- Non- self- sealing and self- sealing cells are primarily a 0.002 inch (0.051 mm) thick nylon barrier membrane sandwiched between lightweight constructions of either rubberized (Uniroyal) or plasticized (Engineered Fabrics Corp.) nylon fabric that protects and strengthens the barrier.
- Self-sealing cells may have one or more thin layers of natural rubber sandwiched between the barrier and fabric plies.

(1). Apply protective tape to all machined metal fittings.

(2). Perform cell inspection on a padded, clean, craft paper covered surface.

(3). Inspect fuel cells per applicable manufacturers requirements.

10. Fuel Cell Leak Inspection

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
N/A	Ammonia
N/A	Cloth, cotton flannel
N/A	Phenolphthalein, crystalline
CM218	Alcohol, denatured
CM810	Leak detector, liquid
CM820	Cheesecloth

Any one of three techniques can be used to find leaks in non-self-sealing and self-sealing fuel cells. The methods are listed in ascending order of effectiveness and complexity in terms of required equipment, materials, time, and effort.

Soap bubble leak inspection.

Phenolphthalein stain inspection.

Liquid stand inspection.

NOTE: The soap bubble and phenolphthalein inspections require the cell to be inflated with air.

(1). Manufacture or supply the following equipment necessary to do soap bubble or phenolphthalein inspections:

(a). Rigid, airtight closures or plugs to seal all cell openings. Fit one cover plate with:

(b). An air pressurization inlet fitting.

(c). A manometer or an extremely accurate and sensitive low pressure air gauge.

A. Soap Bubble Leak Test Procedures

NOTE: Soap bubble test reliability is good for bladder type non-self-sealing cells.

(1). Remove cell from helicopter.

(2). Lay cell out on a padded table. Install cell closures.

(3). Inflate cell to 1/4 psi (1.7 kPa), maximum.

(4). Unless leak is immediately evident, maintain 1/4 psi (1.7 kPa) pressure for two hours to allow any air trapped in cell exterior laps and seams to escape.

(5). Run soap solution around all patches, lap joints, seams, fittings, creases, abrasions and any other suspicious areas. Bubbles will appear over a leak.

(6). Mark leak areas with a white or yellow crayon.

(7). Repair cell as required.

B. Phenolphthalein Stain Inspection Procedures

(1). Remove cell from helicopter.

(2). Lay cell out on a padded table. Install all but one of the cell closures.

(3). Make phenolphthalein solution as follows:

(a). Add 40 grams phenolphthalein crystals to 1/2 gallon (1.9 L) of denatured alcohol (CM218) and stir.

(b). Add 1/2 gallon (1.9 L) of water. Allow to stand 30 minutes. Stir before using.

(4). Pour commercial ammonia on an absorbent cloth in a ratio of one teaspoon (3 ml) per cubic foot of cell capacity (minimum of 10 ml or 3.3 teaspoons).

(a). Place the ammonia saturated cloth inside the cell and install the remaining cover.

(b). Inflate cell with air to 1/4 psi (1.7 kPa) maximum. Maintain 1/4 psi (1.7 kPa) pressure for 15 minutes minimum, before proceeding.

(c). Soak a large white cloth in the phenolphthalein solution. Thoroughly wring cloth out.

(d). Spread and smooth cloth onto cell. Do not let cloth dry out.

(e). A red spot will appear on the cloth where there is a leak in the cell wall. Mark each leak.

(f). Inspect the entire exterior surface of the cell.

(5). Repair cell as required.

C. Liquid Stand Inspection

NOTE:

- Engineered Fabrics Corp. recommends VITHANE\R cells be supported in a fixture for the liquid stand inspection.
- Uniroyal rubberized fabric cells do not require support for this test.

(1). Remove cell from helicopter and place on a clean, padded, kraft paper covered table.

(2). Fabricate closure plates for each cell opening as follows:

(a). The object is to completely fill the cell and eliminate all air pockets.

(b). Equip one of the plates with liquid filler and vent stand pipes at least six inches (15 cm) tall.

(3). Fill the cell with Stoddard solvent, Stanisol or Varsoline.

(4). Permit cell to stand undisturbed for 24 hours.

(5). Inspect paper to determine where cell is leaking.

(6). Change paper as required. Drain, turn over, refill and let cell stand for another 24 hours to ensure liquid has contacted all cell surfaces.

(7). Repair cell as required.

11. Fuel Tank Pressure Leak Test

Check installed fuel tanks and plumbing for leaks as follows:

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
N/A	Manometer

(1). Plug vent system.

(2). Remove left and right cell floor access panels.

(3). Install manometer and air pressurization equipment.

(4). Apply 2 psi (14 kPa) air pressure for 10 minutes to precondition cells. This forces trapped air from between fuel cells and helicopter structure. If necessary, repeat until cells adjust to contour of cell bay.

(5). Apply 2 psi (14 kPa) air pressure for 15 minutes with no visible, less than 1/4 inch (6.35 mm) drop on manometer.

NOTE: If pressure drop occurs, check all vent plugs, fittings and re-test cells.

(6). Repair or replace parts as necessary to eliminate pressure drop.

(7). Unplug vent system. Remove manometer and pressurization equipment.

(8). Install left and right cell floor access panels.

FUEL SYSTEM
REPAIRS

1. Fuel Shutoff Valve Control Cable Repair

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM118	Grease

NOTE: Worn fuel shutoff valve control cables are normally replaced as an assembly.

(1). The only authorized repair is replacement of a missing detent ball, as follows:

(a). Disconnect cable from fuel shutoff valve lever swivel.

(b). Pull plunger out until detent ball hole is visible. Insert detent release rod in plunger. Align notch in detent release rod with plunger detent ball hole.

(c). Apply grease (CM118) between plunger and plunger housing.

(d). Insert detent ball in plunger hole. Push release rod and plunger to full open position.

(e). Rig fuel shutoff valve cable.

2. Fuel Shutoff Valve Repair

(1). Overhaul Dukes Inc. valves with repair kit, part No. 1595-1000. No other repairs are authorized.

(2). Electric pencil the letter M at the end of the part number, i.e., 369A8104-5M.

3. Fuel Cell Repair

(1). MDHS cannot guarantee the currency, completeness or technical accuracy of fuel cell repair procedures provided herein. Since cell repair materials, techniques, and procedures may be changed or deleted by the cell manufacturers without notice to MDHS light helicopter publications; we strongly recommend that:

(a). Only personnel specifically trained to inspect and repair the fuel cells installed in 369/500 series helicopters perform the work.

(b). Customers planning to do their own fuel cell repairs order manuals from the applicable cell manufacturer before beginning repair tasks (Ref. Sec. 01-00-00).

(c). Cell inspections, maintenance and repair be only per the cell manufacturers advice and instructions.

(2). Bladder or self sealing fuel cells are supplied to MDHS by Uniroyal, Inc., and Engineered Fabrics Corporation.

CAUTION Engineered Fabrics Corp., and Uniroyal fuel cell construction materials, inspection requirements, repair methods and requirements, supplies and materials are not compatible or interchangeable.

(3). Cells manufactured by Uniroyal are an assembly of nitrile rubber impregnated woven nylon inner and outer coverings with an impervious 0.002 inch (0.051 mm) thick, nylon barrier membrane sandwiched between the coverings.

(4). Fuel cells produced by Engineered Fabrics Corp. are constructed of VITHANE/R polyurethane plastic impregnated fabric.

4. Uniroyal Self-Sealing and Non-Self-Sealing Cell Repairs

Procedures in this section cover **Uniroyal** self-sealing and non-self-sealing fuel cell repairs as follows:

- Scuff Mark Repairs.
- Reinforcements, Hangers and Splice Repairs.
- Loose Patch Repair.
- Patch Installation.
- Loose Edges and Lap Seam Repair.

- Blister Repairs.

CAUTION Fuel cells are fragile. Do not attempt to fold/unfold or handle cells in temperatures below 50°F (10°C). Cell material is easily cut, torn or punctured. Never use sharp edged or pointed tools to probe damage or to puncture blisters. Puncturing the 0.002 inch (0.051 mm) thick nylon fuel barrier of a non-self-sealing cell will cause the cell to leak. Puncturing the nylon barrier of a self-sealing cell will allow fuel to activate the rubber sealing agent that will swell over time and possibly rupture the cell. In any case, cells with activated seal compound are not repairable. Barrier membrane can be invisibly torn by rough handling or impact. Handle cells with care and no more than necessary. Protect metal fittings from damage.

NOTE: Accomplish fuel cell repair work in temperatures ranging from 60 - 80°F (16 - 27°C) and in less than 50% humidity.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
N/A	Polyethylene plastic, sheet or roll
CM211	Solvent
CM219	Methyl-ethyl-ketone
CM603	Patching material
CM604	Patching material
CM605	Fuel cell repair kit
CM607	Cement
CM608	Cement
CM609	Repair kit
CM804	Emery cloth, fine
CM820	Cheesecloth

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
N/A	C-Clamp, 8 - 12 inch
N/A	Patch pressure plates, 1/2 inch thick aluminum stock
N/A	Brayer

A. Scuff Mark Repair

(1). Fabric exposed by a scuff mark may be buffed, cleaned, coated with cement and allowed to air-dry for 8 hours.

(2). No patch is required unless fabric is torn.

(3). Install patches where required (Ref. Patch Installation).

B. Reinforcements, Hangers and Splice Repairs

(1). Loose reinforcement edges, hangers or lap splices must be lifted, buffed, cleaned, cemented and cured under pressure per applicable instructions provided (Ref. Patch Installation).

C. Loose Patch Repair

(1). Replace loose patches with new patch installations (Ref. Patch Installation).

(2). Where two opposing patches have been installed over cell wall damage, unless otherwise indicated by inspection, replace only the loose patch.

D. Patch Installation

(1). Drain, remove and thoroughly dry cell as soon as possible after determining cell repair is required. Drying time may be accelerated by keeping cell at 80°F (27°C) and ventilating interior with dry, low pressure air.

(2). Inspect fuel cell.

CAUTION

- Do not repair tears or holes over two inches long using cold patch repair. Do not attempt to repair bonded fittings or corners. Contact Uniroyal, Inc. when corner or fitting damage is discovered or when cell wall damage exceeds two inch (5.08 cm) length limit.
- Never expose a dry cell to high temperatures and, or direct sunlight for long periods of time. If repairs will not be started within ten days, prepare cell for storage.

NOTE: Damp air, especially in combination with low temperatures, will cause water to condense on cement applications. Water inhibits patch adhesion.

(3). Both sides of a cell must be patched to repair any one hole or tear.

(4). Thoroughly clean cell internal and external repair areas with cheese cloth (CM820) dampened with solvent (CM211) or MEK (CM219).

(5). Collapse cell and expose external damage area on a clean, flat working surface.

(6). Use a greaseless silver pencil to outline patch installation area two inches beyond damage in all directions.

(7). Hand-buff an area 1/2 inch (12.7 mm) larger than space occupied by patch with fine emery cloth (CM804) to provide a roughened substrate for cement application. Do not cut through cell fabric.

(8). Select a patch (CM604) of #5218 material for non-self-sealing cell exterior, or Uniroyal #5241/5241 sandwich material for self-sealing cells. Trim patch to extend two inches (5.08 cm) beyond edges and ends of damage in all directions. Tilt scissors to bevel patch edges away from cell surface. Radius all patch corners.

(9). Hand-buff patch gummed surface with fine emery cloth. Ensure entire patch joint surface has been abraded.

(10). Repeat buffing procedures on cell interior surface. Buff internal patch (CM603) trimmed from Uniroyal #5200/5187/5194 sandwich material.

CAUTION Fuel cell and patch contact surfaces must be perfectly clean and dry prior to adhesive and patch application. Rubber and fabric particles, moisture, and fuel or oil from fingers will prevent proper patch/cell adhesive cure and may subsequently provide a leak path. Wear clean, lint free gloves to handle patch and cell after preparing surfaces for cement and patch application.

(11). Install exterior patch first. Wipe cell exterior and patch faying surfaces with clean cheesecloth dampened with Uniroyal #3339 solvent or MEK.

(12). Continue to wipe cell and patch, changing cheesecloth and applying clean solvent as required, until no stain or particles appear on cheesecloth pad after the last wipe.

CAUTION Use cement sparingly. Two, thin, even coats provide better adhesion than one thick coat.

(13). Position a sheet of polyethylene plastic beneath cell damage to keep cement off opposite cell wall.

NOTE: Determine cement adhesive tack with a test specimen. Apply cement to a piece of buffed, scrap patch material each time cement is spread on cell and repair patch.

(14). Coat patch, test specimen, and fuel cell, including edges of damage, with EC678 cement (CM607) or Uniroyal #3230 cement (CM608). Allow cement to dry 15 minutes before application of a second coat. Allow second coat to dry 15 minutes.

(15). Press a bare knuckle into cement on test specimen. Cement that tears away from skin leaving a rough, finely peaked imprint without transferring to knuckle, is ready for patch installation.

(16). Wipe cement with cheesecloth moistened with solvent to reactivate adhesive when required.

NOTE: A brayer or similar tool is required to systematically roll patch into contact with cell. Apply patch as follows:

(17). Center patch on repair area. Stick one edge down and double check patch alignment. If required, release adhesive by flooding joint with solvent. Check adhesive tack again before proceeding with patch installation.

NOTE: The object of the next step is to get the patch down without trapping any air under it.

(18). Hold free edge of patch off cell. Follow one line and roll tool back and forth over patch. Advance toward loose end, 1/4 inch (6.35 mm) per pass until patch is down and free of trapped air.

(19). An alternate technique is to lay prepared patch on a perfectly clean sheet of polyethylene plastic about twice the size of the patch. Locate plastic sheet and patch over cell repair area; then, slip sheet from under patch as patch is rolled down, 1/4 inch (6.35 mm) at a time.

(20). Fabricate two smooth, flat, rigid, metal plates with no sharp edges or corners. Plates must be larger than cemented repair area.

CAUTION Excessive clamp pressure may deform cell and, or squeeze cement out of joint.

(21). Cover both sides of repair with sheet polyethylene plastic or oiled paper large enough to cover entire cemented area.

NOTE: Do not include opposite cell wall in clamp up. Work through cell access opening and arrange cell as necessary to clamp only the wall with the patch installation.

(22). Sandwich repair area and barrier material between pressure plates. Install at least two C-clamps over pressure plates. Equalize clamp pressure.

(23). Do not disturb cell. Maintain pressure for six hours, minimum, after which cell is ready for internal patch installation.

(24). Remove clamps and plates.

(25). Clean patch and cell internal repair area with solvent or MEK saturated cheesecloth swabs.

(26). Apply two coats of cement, allowing 15 minutes drying time between coats. Allow 15 minutes for second coat to set.

(27). Install and roll out patch.

(28). Position a barrier sheet under each pressure plate. Clamp and cure installation for a minimum of 24 hours at 60 - 80°F (16 - 27°C) before leak testing and returning cell to service.

E. Loose Edge and Lap Seam Repairs

CAUTION Loose lap seams should be repaired as soon as possible after discovery.

NOTE: Loose lap seam edges not more than two inches long on cell interior or exterior surfaces may be repaired. Contact Uniroyal, Inc. for repair data addressing lap seam separations exceeding two inch (5.08 cm) length limit. Seam separation repairs require buffing, cementing and a patch installation.

(1). Lift seam separation and buff flap and cell faying surfaces with emery cloth (CM804).

(2). Buff an area on exterior surface extending 2 inch (5.08 cm) in all directions from seam separation.

CAUTION

- Fuel cell and patch contact surfaces must be perfectly clean and dry prior to adhesive and patch application. Rubber and fabric particles, moisture, and fuel or oil from fingers will prevent proper patch/cell adhesive seal and may subsequently provide a leak path. Wear clean, lint free gloves to handle patch and cell after preparing surfaces for cement and patch application.
- Careless application of compressed air between lap joints may separate seam further.

(3). Either air-vacuum or blow buffing dust out of separation with dry, <u>low pressure</u> compressed air.

(4). Wipe inside and outside of repair area clean with cheesecloth (CM820) moistened with solvent (CM211) or MEK (CM219). Continue wiping with fresh solvent dampened cheesecloth as required until no stain or particle appears on the swab after the last wipe. Allow area to dry.

CAUTION Use cement sparingly. Two, thin, even coats provide better adhesion than one thick coat.

NOTE: Determine cement adhesive tack with a test specimen. Apply cement to a piece of buffed, scrap patch material each time cement is spread on cell and repair patch.

(5). Apply two coats of EC678 cement (CM607) or Uniroyal #3230 (CM608) allowing 15 minutes between applications. Allow second coat to dry 15 minutes.

(6). Roll separation together starting from the bottom of the pocket toward the open end, 1/4 inch (6.35 mm) per pass. Ensure no air is trapped underneath.

(7). Cover repair with a sheet of polyethylene plastic or oiled paper large enough to cover entire cemented area.

(8). Fabricate two smooth, flat, rigid, metal plates with no sharp edges or corners. Plates must be larger than cemented repair area.

CAUTION Excessive clamp pressure may deform cell and, or squeeze cement out of joint.

(9). Cover both sides of repair with polyethylene plastic or oiled paper sheets large enough to cover entire cemented area.

NOTE: Do not include opposite cell wall in clamp up. Work through cell access opening and arrange cell as necessary to clamp only the wall containing the seam repair.

(10). Sandwich cell wall repair area and barrier material between pressure plates. Install at least two C-clamps over pressure plates. Equalize clamp pressure.

(11). Do not disturb cell. Maintain pressure for six hours, minimum, after which cell is ready for patch installation.

(12). Remove clamps and plates.

(13). Use Uniroyal #5200/5187/5194 sandwich patch material (CM603) on non-self-sealing and self-sealing cell interiors.

(14). Use Uniroyal #5241/5241 sandwich patch material (CM604) on self-sealing cell exterior surfaces or Uniroyal #5218 patch material on non-self-sealing cell exterior surfaces.

(15). Prepare cell wall and patch for installation (Ref. Patch Installation). Install patch.

F. Blister Repair

(1). Blisters can occur on cell interior and exterior surfaces. blisters are caused by a separation of the cell laminates and may contain air or a combination of air and fuel.

NOTE: Exterior blisters that contain fuel indicate that the barrier has been penetrated. Contact Uniroyal for repair information before proceeding. Blisters inside cell measuring under one inch (2.54 cm) diameter are acceptable and need not be disturbed.

(2). Buff surface of blister and area extending two inch (5.08 cm) in all directions from its edge.

CAUTION Avoid damaging nylon barrier membrane. Do not probe, cut, or puncture blisters with tool perpendicular to cell wall.

(3). Slit blister open with an X cut to expose all of the delaminated surface. Lift flaps and mop interior with clean cheesecloth (CM820) and solvent (CM211) or MEK (CM219). Buff underlying cell surface and blister flaps with emery cloth (CM804). Air-vacuum or blow away all traces of buffing dust.

(4). Wipe inside and outside of repair area clean with cheesecloth moistened with solvent or MEK. Continue wiping with fresh solvent dampened cheesecloth as required until no stain or particle appears on the swab after the last wipe. Allow area to dry.

CAUTION Use cement sparingly. Two, thin, even coats provide better adhesion than one thick coat.

NOTE: Determine cement adhesive tack with a test specimen. Apply cement to a piece of buffed, scrap patch material each time cement is spread on cell and repair patch.

(5). Apply two coats of EC678 cement (CM607) or Uniroyal #3230 (CM608) allowing 15 minutes between applications. Allow second coat to dry 15 minutes.

(6). Roll blister together starting from the bottom of each flap pocket toward the open end, 1/4 inch (6.35 mm) per pass. Ensure no air is trapped underneath.

(7). Fabricate two smooth, flat, rigid, metal plates with no sharp edges or corners. Plates must be larger than cemented repair area.

CAUTION Excessive clamp pressure may deform cell and, or squeeze cement out of joint.

(8). Cover both sides of repair with polyethylene plastic or oiled paper sheets large enough to cover entire cemented area.

NOTE: Do not include opposite cell wall in clamp up. Work through cell access opening and arrange cell as necessary to clamp only the wall containing the blister repair.

(9). Sandwich cell wall repair area and barrier material between pressure plates. Install at least two C-clamps over pressure plates. Equalize clamp pressure.

(10). Do not disturb cell. Maintain pressure for six hours, minimum, after which cell is ready for patch installation; remove clamps and plates.

(11). Use #5200/5187/5194 sandwich patch material (CM603) on non-self-sealing and self-sealing cell interiors.

(12). Use Uniroyal #5241/5241 sandwich patch material (CM604) on self-sealing cell exterior surfaces or Uniroyal #5218 patch material (51) on non-self-sealing cell exterior surfaces.

(13). Prepare cell wall and patch for installation per instructions (Ref. Patch Installation). Install patch.

5. Fuel Quantity Transmitter Repair

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM220	Naphtha aliphatic
CM425	Sealing compound
CM815	Solder

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
N/A	Solder gun

A. Resistor installation, Transmitters PN 369D296303, 369D296303-701 and 369A4245

(1). Remove transmitter from helicopter.

(2). Remove potting compound from top of transmitter to expose terminals and circuit board.

(3). Solder resistor to transmitter circuit with tin alloy solder (Ref. Figure 501).

(4). Perform **FUEL LEVEL LOW** Caution Light System Test and Fuel Quantity Transmitter Calibration and Adjustment procedures.

WARNING **Naptha is a fire hazard. Perform work in a well ventilated area away from potential sources of ignition.**

NOTE: All transmitters with exposed wire terminals and, or circuit boards must be sealed (potted) before they can be returned to service.

(5). Remove all grime and oily residue from sealing compound application area with naptha (CM220) and a soft bristle brush. Blow away excess solvent with dry low pressure compressed air.

(6). Ensure transmitter terminal connections are clean, tight, free of corrosion and dry.

(7). Heat soak transmitter assembly in an oven set at 100°F (38°C), maximum for one hour to vaporize trapped volatiles. A heat gun may be used as an alternate drying method. Pot transmitter electrical connections with sealing compound (CM425).

B. MIL-S-8802 Application

(1). Combine MIL-S-8802 sealing compound components per manufacturers instructions.

(2). Apply to top of transmitter (Ref. Figure 501).

(3). Cure material per instructions before returning transmitter to service.

Section

28-00-60

Fuel System (600N)

FUEL SYSTEM
DESCRIPTION AND OPERATION

1. Engine Fuel System

(1). Engine fuel system operational information is provided in the applicable Allison Engine Operation and Maintenance Manuals (Ref. Sec. 01-00-00).

2. Fuel Cells

(1). The MDHS helicopter standard fuel cell consists of two interconnected crash-resistant non-self-sealing bladder type cells having a total capacity of 116.2 U.S. gallons (439.9 Liter), with 114.6 U.S. gallons (433.8 Liter) usable.

(2). Bladder crash-resistant non-self sealing fuel cells are supplied by Engineered Fabrics Corporation (Ref. Sec. 01-00-00).

(3). Cells are located in separate fiberglass lined bays below the passenger compartment floor. Both cells are supported by a system of airframe brackets, hangers, grommets and nylon suspension cords.

(4). Each fuel cell is equipped with two access covers, forward fuel vent aft fuel vent forward vent crossover fittings and fuel interconnect fittings.

(5). Each fuel cell contains two sump plates and two fuel drain valves

(6). Each fuel cell is divided by an internal lateral baffle which reduces fuel sloshing during changes in flight attitudes. The baffles have openings across their face to allow fuel to pass through them. This reduces the load on the baffles and provides even fuel distribution within the cell.

(7). Fuel tank servicing is through the cell filler neck on the right side of the fuselage. The right side fuel cell contains the gravity filler port, filler check valve, neck, cap and attachment hardware.

(8). A check valve attaches to the filler neck fitting. The check valve located within the fuel cell. opens when the fuel cap is removed by pulling a lanyard for refueling and defueling operations. The valve closes when the fuel cap is secured to the filler neck fitting preventing fuel leakage.

(9). The left-rear cell cover supports the manually actuated fuel shutoff valve, fuel supply hose, motive flow hose, fuel quantity probe wire harness and attaching hardware.

3. Fuel Distribution

(1). The fuel distribution system supplies fuel to the engine. The engine driven fuel pump sucks fuel from the fuel cell.

(2). Fuel is supplied from the fuel cell through supply lines located under the passenger/cargo compartment floor and within the fuel cell.

(3). The ejector pump is driven by pressurized fuel (motive flow) returning from the engine driven fuel pump.

(4). The ejector pump scavenges fuel from the forward portion of fuel cell and transfer fuel to the aft portion of the cell, thus motive flow.

4. Fuel Vent System

(1). Fuel cells are vented to the atmosphere through the bottom and side fuselage ports by a system of interconnected hoses and tubes attached to the forward inboard and aft inboard ends of each fuel cell.

(2). The fuel vent float/rollover valves are located internally at each inboard upper corner of the fuel cell. The vent float/rollover valve allows the fuel cell to vent to the atmosphere during aircraft fueling/defueling.

(3). Each vent float/rollover valve is designed so that when not submerged in fuel and with airflow through the valve between zero and the rated flow, the valve remain open within 25° conical angle from vertical.

(4). The valve automatically closes when the fuel level is at or above the float actuation level to prevent fuel loss through the vent system. The valve will also close with changes in aircraft ground attitudes from 25° to 180° with fuel present.

(5). Flame arrestors located in the outlet vent tube or standpipe prevents any potential flames from reaching the vent float/rollover valves and fuel cell.

5. Fuel Quantity System

(1). The fuel quantity system is powered by 24 - 28 Vdc current and consists of an electromechanical fuel quantity indicator, a signal conditioner, two capacitance type fuel quantity probes mounted in the left fuel cell, a float switch located on the aft fuel quantity probes, a **FUEL LEVEL LOW** caution light on the instrument console and interconnecting wire harness.

(2). The system is protected by a 5 ampere circuit breaker. Power is supplied to the system from the DC bus, through a circuit breaker.

(3). The float switch provides a electrical signal to the **FUEL LEVEL LOW** caution light panel located on the instrument panel. Refueling breaks the float switch circuit and switches off the **FUEL LEVEL LOW** caution lamp. The switch is fixed to the aft fuel quantity probe and is not adjustable.

(4). Calibrating of the fuel system is accomplished on the fuel quantity indicator calibration switch. By holding the switch in the empty or full calibration positions a resistance is stored in the gauge memory circuit.

6. Fuel Shutoff Valve Control

(1). A red fuel shutoff control knob labeled **FUEL, PULL TO CLOSE** is located on the instrument panel face. The flexible cable and housing is routed aft under the floor to the shutoff valve lever on the left fuel cell access cover.

7. Fuel Shutoff Valve

(1). The cable actuated, mechanically detented fuel shutoff valve is located on the left fuel cell access cover. Valve lever arm travel from full open to closed is 90°.

8. Fuel Filter Caution Light Pressure Switch

(1). A differential pressure switch is installed across the engine fuel pump filter pressure AF (after filter) and BF (before filter) ports just upstream of the engine fuel pump. The switch is sensitive to a preset differential pressure. An increase in BF pressure with a concurrent decrease in AF pressure due to partial or complete filter blockage may intermittently or completely close the switch depending on the nature of the filtered material. Switch contacts complete an electrical circuit through a case ground that switches on the **FUEL FILTER** caution lamp, a part of the instrument console caution and warning light array.

9. Drain System and Drain Valves

(1). Two spring loaded plunger tank sump drain valve are installed in each cell sump mount plate on the bottom of the left and right fuel cell. The valve is accessed from under the helicopter.

10. Fuel Supply Lines

(1). The engine fuel supply lines consist of:

(a). A fuel inlet hose between the inlet screen to the fuel shutoff valve.

(b). A engine feed hose between the fuel shutoff valve and firewall fitting.

(c). A hose from the firewall fitting to the engine filter inlet port.

(d). A return flow hose from engine to the firewall fitting.

(e). A motive flow hose assembly between the firewall fitting and a flow check valve on the left aft cell cover.

(f). A submerged motive flow hole from aft cell cover to the ejector pump.

(g). A scavenge fuel cell hose from the ejector pump to the bottom of aft cell cover.

(h). Associated elbows, fittings and unions.

FUEL SYSTEM
FAULT ISOLATION

1. Fuel System Fault Isolation

Table 101. Fuel Supply System Fault Isolation

Symptom	Probable Trouble	Corrective Action
Insufficient or no fuel to engine.	Fuel tank empty.	Refuel helicopter.
	Disconnected or ruptured fuel line.	Check all fuel lines for security and condition. Repair or replace parts as required.
	Clogged fuel line.	Repair as required.
	Clogged fuel cell and start pump inlet screens.	Clean as required.
	Twisted or kinked fuel supply hose.	Repair as required.
	Defective fuel shutoff valve.	Repair or replace fuel shutoff valve.
	Fuel shutoff valve control cable failed or disconnected.	Repair or replace control cable.
FUEL FILTER warning light on.	Clogged engine fuel filters.	Replace pump and gas producer fuel control filters. Clean fuel control pneumatic (air) circuits (refer to Allison Engine Operation and Maintenance Manual). When installed, replace anti-ice (airframe) filter (Ref. Sec. 28-25-00). Bench check **FUEL FILTER** caution light pressure switch.
	Fuel contamination.	Inspect and clean the fuel cell and start pump inlet screens if large amounts of foreign material are found in the engine driven fuel pump filter (or the optional airframe fuel filter if installed).
	Defective fuel filter pressure switch.	Replace pressure switch.
	Wiring fault.	Repair wiring.
Engine power surge or flameout.	Water/ice in fuel system.	Drain water out of tank and fuel supply system.
	Air in fuel system.	Bleed fuel system.
	Air leaking into system.	Vacuum leak check fuel supply system.

Table 101. Fuel Supply System Fault Isolation (Cont)

Symptom	Probable Trouble	Corrective Action
Bottom of fuselage stays wet with fuel.	Loose or broken lines or fittings.	Inspect and repair as required.
	Fuel cell leak.	Remove, test and repair, or replace cells.
	Fuel cell interconnects leak	Replace cell interconnect O-rings.
FUEL LEVEL LOW caution light stays on, glows or flickers with known quantity above low level.	Defective aft fuel quantity probe low level switch.	Replace fuel quantity probe.
Erroneous fuel quantity gauge readings.	Loose or defective wiring or connections.	Inspect wiring and repair.
	Loose or incorrect wiring at the fuel quantity probes.	Inspect wiring and repair.
	Defective gauge.	Remove, test and replace a defective gauge.
	Defective forward or aft fuel quantity probe.	Remove, test, calibrate and repair or replace probe.

Table 102. Fuel Quantity System Wire Data List

Wire No.	From	Termination	To	Termination	Specification
FQ1A22-WHT	J251-1	HSD4123-915	600N8107-7-1	87F5544	M27500-22SP2T23
FQ1A22-BLU	J251-2	HSD4123-915	600N8107-7-2	87F5544	M27500-22SP2T23
FQ2A22-WHT	J251-3	HSD4123-915	600N8107-7-S	87F5547	M27500-22SP2T23
FQ3A22-WHT	600N8107-9-S	87F5547	600N8107-7-S	87F5547	M27500-22SP3T23
FQ2A22-BLU	J251-4	HSD4123-915	600N8107-7-R	87F5546	M27500-22SP2T23
FQ3A22-BLU	600N8107-9-R	87F5546	600N8107-7-R	87F5546	M27500-22SP3T23
FQ2A22-ORN	J251-5	HSD4123-915	600N8107-7-L	87F5548	M27500-22SP2T23
FQ3A22-ORN	600N8107-9-L	87F5548	600N8107-7-L	87F5548	M27500-22SP3T23
JMPR	J251-6	HSD4123-915	OUTER SHLD		
FQ4A22N	OUTER SHLD	OVERBRAID	600N8107-7	NOTE	M27500-22SP2T23
FQ5A22N	OUTER SHLD	OVERBRAID	600N8107-9	NOTE	M27500-22SP2T23
JMPR	J251-2 SHLD	HSD4123-830	J251-5 SHLD	HDS4123-915	
JMPR	J251-5 SHLD	HSD4123-830	J251-7 SHLD	HDS4123-817	
JMPR	P1A22 SHLD	HSD4123-830	P2A22 SHLD	HDS4123-817	
	J251-8		SPARE		
	J251-9		SPARE		
	J251-10		SPARE		
	J251-1 1		SPARE		
	J251-12		SPARE		
	J251-13		SPARE		

NOTE: To -3 probe flange mount bolt.

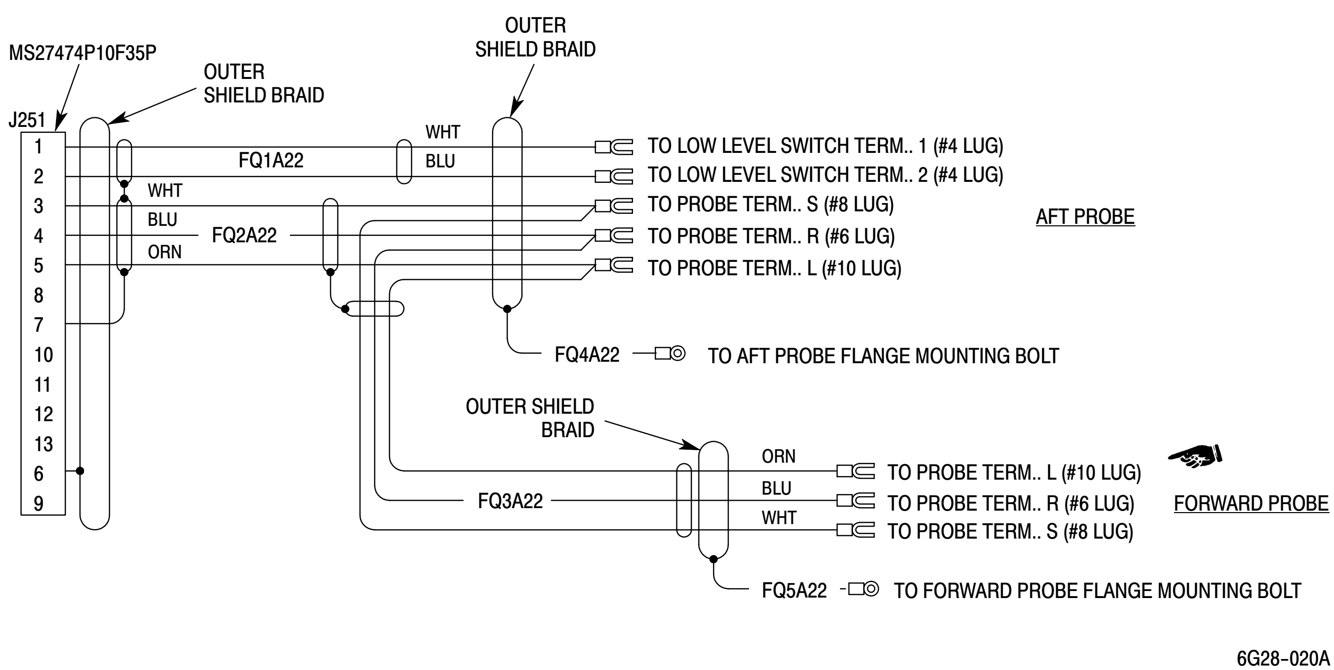


Figure 101. Fuel Quantity System Wiring Diagram

FUEL SYSTEM
MAINTENANCE PRACTICES

1. Fuel Cell Cleaning - General

(1). Fuel cells are susceptible to fungus growth after contact with contaminated fuel. Fungus trapped in the fuel filters indicates fuel tank contamination. Remove, inspect, clean or replace filter elements per applicable Allison Engine Operation and Maintenance Manual. Where installed, service anti-ice (airframe) filter (Ref. Sec. 28-25-00).

(2). Periodic incorporation of an FAA approved anti-fungal fuel additive will kill and prevent new fungus growth.

2. Engineered Fabrics Corp. Fuel Cell Cleaning

CAUTION Do not steam clean Engineered Fabrics Corp. fuel cells. Steam cleaning may cause irreparable damage.

(1). Clean cell exterior and interior surfaces with warm soapy water and clean lint free cloth. Rinse away all soap residue and wipe dry.

3. Fuel Cell Handling, Storage and Shipping

CAUTION Do not use cell fittings as hand holds. Do not store fuel cells uncrated or exposed to direct sunlight, ozone, dirt, moisture, solvents, chemicals, or extremes of heat and humidity.

(1). Store and ship cells in a suitable protective container.

(a). Apply protective tape over all cell machined fittings.

(b). Use packing material to keep the cell from shifting in transit.

(c). Suspended self-sealing cells to maintain cell shape.

4. Fuel Cell Preservation and Storage (Engineered Fabrics Corp. Cells)

(1). Thoroughly clean cell with warm soapy water. Wipe completely dry.

(2). If a fuel cell that has previously contained fuel is to be stored for longer than three days, coat inside of cell with a light coating of #10 weight, non-synthetic engine oil.

CAUTION

- Engineered Fabrics Corp. cells removed from service must not be left dry for more than 3 days without the application of oil as a plasticizing agent. The cell liner will loose pliability if left dry for extended periods and subsequent flexing may cause the material to crack.
- Do not work on fuel cell in ambient temperatures below 70°F (21°C).

(a). Fold cell over protective wadding as loosely as possible and with a minimum number of folds.

(b). Wrap the cell in a protective cover.

(c). Put cell in a suitable storage/shipping container. Use wadding as required to prevent movement. Do not stuff cell into an undersized container.

(d). Store cell at 70°F (21°C) away from sunlight and moisture.

5. Fuel System Air Bleed (Model 250-C47 Engine Installation)

WARNING **Fuel/air vapor discharged during bleeding is a fire hazard. Prevent fuel vapor accumulation, ignition and fire. Perform work in an open, well ventilated area away from all potential ignition sources. Attach helicopter to an approved electrical ground. Wear approved eye protection.**

(1). Helicopters with C47 engines and standard fuel supply systems are not equipped with a start pump.

(2). Helicopters equipped with an airframe mounted fuel filter are equipped with an airframe mounted fuel pump inside the left fuel cell and can be primed using the same procedure as helicopters with the 250-C20 Series engines.

(3). The standard helicopter fuel system only has an engine driven self priming pump that will fill the fuel system when the engine is motored with the starter. Motor engine per the appropriate Pilot's Flight Manual.

(4). Bleed air out of helicopter engine fuel controls per Rolls-Royce Engine Operation and Maintenance Manual.

(5). If fuel system fails to bleed properly, proceed as follows:

(a). Field fabricate a primer bulb assembly (Ref. Figure 201).

(b). Disconnect fuel line between CEFA and HMU at HMU side.

(c). Disconnect fuel line from fuel nozzle.

(d). Install primer bulb assembly in line between HMU GEAR INLET and the CEFA.

(e). Open fuel shutoff valve.

(f). Open throttle to ground idle position.

(g). Squeeze primer bulb until fuel comes out of fuel line.

NOTE: When reinstalling fuel lines, refer to appropriate Rolls-Royce Operation and Maintenance Manual for proper torques.

(h). Remove primer bulb assembly from fuel line and reconnect fuel line to HMU.

(i). Crank engine for approximately 15 seconds to verify fuel to fuel nozzle is free of air in the system.

(j). Repeat above procedure as required.

(k). Reinstall fuel line to fuel nozzle.

(l). Close throttle.

(m). Close fuel shutoff valve.

NOTE: Check fuel supply system for leakage with vacuum (Ref. Fuel System Vacuum Leak Inspection).

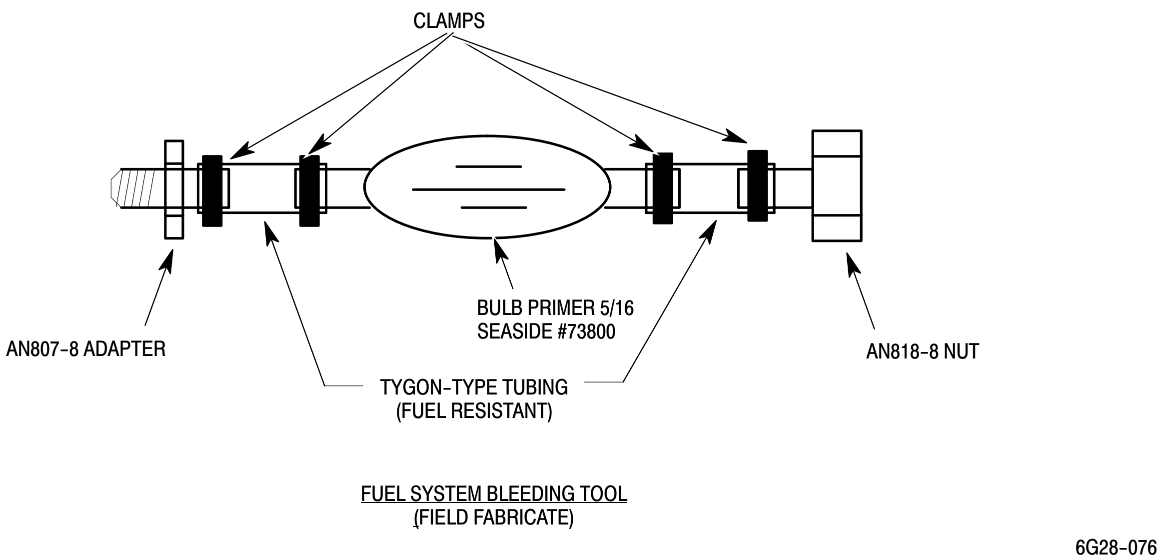


Figure 201. Field Fabricated Fuel System Bleeding Tool

FUEL SYSTEM
REMOVAL/INSTALLATION

1. Fuel Shutoff Valve Control Cable Replacement

A. Fuel Shutoff Valve Control Cable Removal

(Ref. Figure 401)

(1). Remove left aft access panel from passenger/cargo compartment floor.

(2). Disconnect control cable from fuel shutoff valve swivel.

(3). Remove control cable ty-raps and clamps.

(4). Remove instrument panel left fairing and lower cover panels.

(5). Completely back jamnut away from cable plunger housing (Ref. Figure 401, view A).

NOTE: Attach a trace wire or cord to the valve end of the cable before pulling assembly out of the instrument panel. Trace will guide replacement cable into correct position.

(6). Pull cable assembly out through washer, jamnut and instrument panel.

B. Fuel Shutoff Valve Control Cable Installation

(Ref. Figure 401)

CAUTION Pulling detent knob out of cable housing two or more inches may result in loss of the detent ball.

(1). Thread cable assembly aft through instrument panel, lockwasher, jamnut and grommets to fuel shutoff valve. Maintain a cable bend radius greater than 3.5 inches (8.89 cm).

(2). Secure forward end of cable in instrument panel with lockwasher and jamnut.

(3). Slip control cable wire through fuel shutoff valve lever swivel.

(4). Secure end of cable housing to cell cover with a clamp, washer and screw.

(5). Install remaining clamps and ty-raps.

(6). Rig cable with shutoff valve lever hard against open stop. Adjust cable to get a 0.090 - 0.150 inch (2.29 - 3.81 mm) gap between bottom of control knob and cable housing end fitting. Tighten cable swivel pinch nut. Install cotter pin.

CAUTION Control action must move valve to full open against mechanical stop without bottoming control knob on cable housing. Control cable operation shall be smooth with no binding.

(7). Pull valve control knob out with a spring scale. Required valve actuation force not to be more than 12 pounds (5.443 kg).

(8). Repair, adjust or replace valve control system components to meet force limit.

(9). Install left aft fuel cell access panel from passenger/cargo compartment floor.

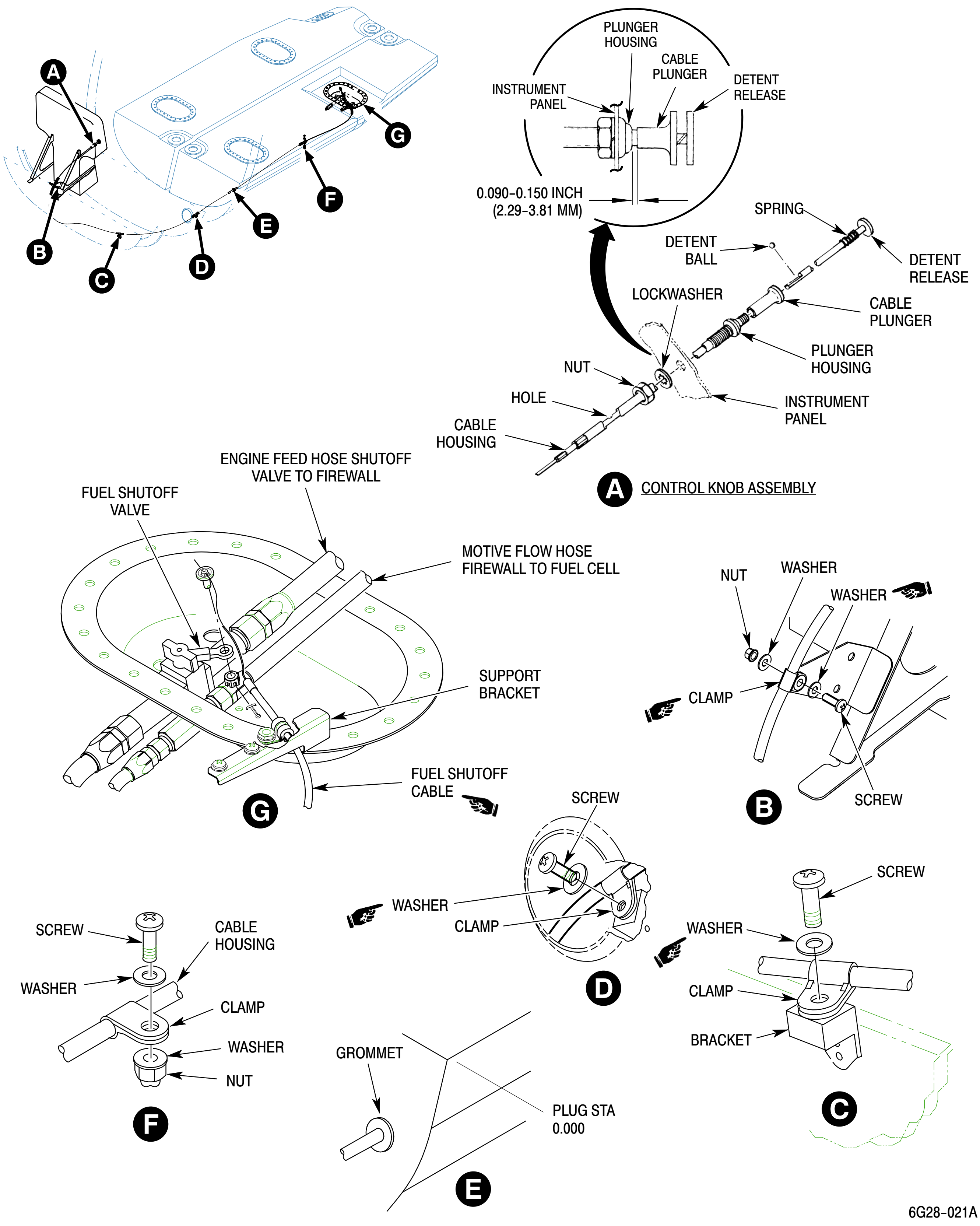


Figure 401. Fuel Shutoff Valve Cable Installation

2. Fuel Shutoff Valve Replacement

WARNING **Avoid fuel vapor ignition and fire. Use only nonsparking tools and explosion proof work lights. Attach helicopter to an approved electrical ground. Switch OFF all electrical power. Disconnect external power and battery before opening fuel system. Ensure work area is adequately ventilated.**

CAUTION

- Air in fuel system may cause power surges or flameout. Bleed off trapped air after opening system at any point between fuel tank and engine fuel nozzle.
- Prevent fuel system contamination. Install caps on the ends of hoses, tubes and fittings as parts are removed. Bag and identify small parts to prevent loss or damage.

(1). Defuel helicopter. Drain remaining fuel from cell sump drain valve into a suitable container.

(2). Disconnect electrical power.

A. Fuel Shutoff Valve Removal

(Ref. Figure 402)

(1). Remove left aft fuel cell access panel from passenger/cargo compartment floor.

(2). Disconnect fuel quantity probe wire harness connector from cell cover receptacle.

(3). Unfasten and remove Sta. 91.00 and 102.00 left aft fuel cell cover support brackets.

(4). Disconnect motive flow fuel hose assembly between Sta 124.00 bulkhead and fuel cell access cover. Use backup wrench on check valve so it will not rotate.

(5). Disconnect engine feed fuel supply hose assembly between fuel shutoff valve and Sta. 124.00 bulkhead. Use backup wrench on fuel shutoff valve so it will not rotate.

(6). Unclamp and disconnect control cable from fuel shutoff valve (Ref. Fuel Shutoff Valve Control Cable Replacement).

CAUTION Handle fuel cell cover with care. Prying cover from cell opening or rough handling may damage seal or cell fitting.

(7). Unbolt cell access cover. Prop cover open with suitably padded blocks.

(8). Using a backup wrench on valve, separate engine feed fuel cell supply hose from fuel shutoff valve.

(9). Remove fuel shutoff valve attaching hardware.

B. Fuel Shutoff Valve Installation

(Ref. Figure 402)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM114	Petrolatum

(1). Apply a coating of petrolatum (CM114) to a new fuel shutoff valve/cover sealwasher.

(2). Install fuel shutoff valve with sealwasher and nut. Use a backup wrench on shutoff valve so it will not rotate. Torque nut **240 - 280 inch-pounds (27.12 - 31.64 Nm)**.

(3). Connect engine feed fuel supply hose to fuel shutoff valve. Using a backup wrench on valve, torque fuel supply hose **230 - 260 inch-pounds (25.99 - 29.38 Nm)**.

(4). Start bolts onto aft fuel cell access cover.

(5). Install and fasten Sta. 91.00 and 102.00 left fuel cell cover support brackets.

(6). Connect engine feed fuel supply hose assembly between fuel shutoff valve and Sta. 124.00 bulkhead. Torque hose assembly **230 - 260 inch-pounds (25.99 - 29.38 Nm)**.

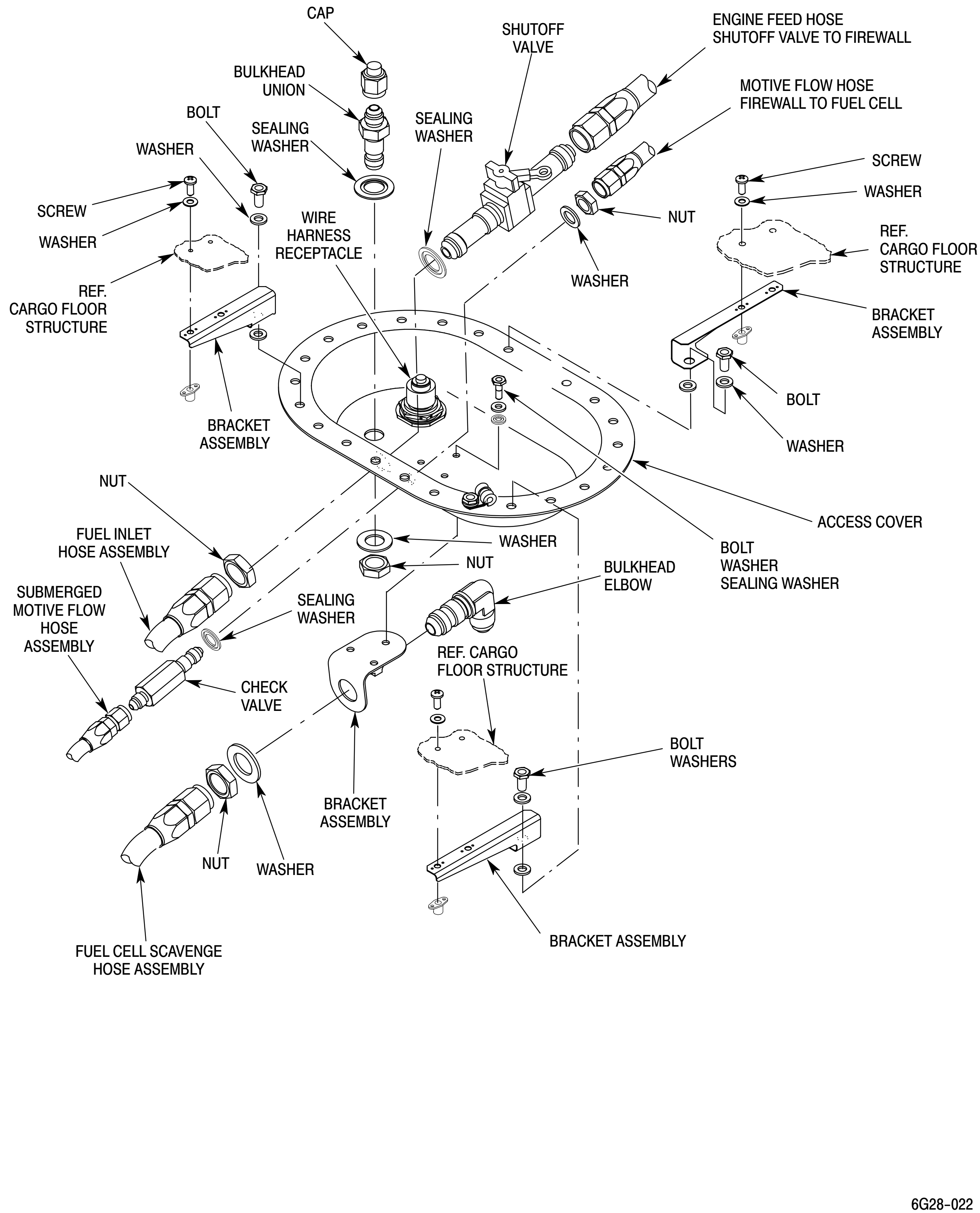


Figure 402. Fuel Shutoff Valve and Fuel Cell Cover Installation

(7). Connect motive flow fuel hose assembly between Sta 124.00 bulkhead and fuel tank access cover. Torque hose assembly **55 - 65 inch-pounds (6.21 - 7.34 Nm)**.

(8). Connect fuel quantity transmitter connector from cell cover receptacle.

(9). Progressively torque fuel cell cover bolts to **70 - 90 inch-pounds (7.91 - 10.17 Nm)** in a cross pattern.

(10). Clamp and connect control cable to fuel shutoff valve. Rig fuel shutoff valve control cable (Ref. Fuel Shutoff Valve Control Cable Replacement).

(11). Install left aft access passenger/cargo compartment floor panel.

3. Fuel Cell Cover Replacement

WARNING **Avoid fuel vapor ignition and fire. Use only nonsparking tools and explosion proof work lights. Attach helicopter to an approved electrical ground. Switch OFF all electrical power. Disconnect external power and battery before opening fuel system. Ensure work area is adequately ventilated.**

CAUTION

- Air in fuel system may cause power surges or flameout. Bleed off trapped air after opening system at any point between fuel tank and engine fuel nozzle.
- Prevent fuel system contamination. Install caps on the ends of hoses, tubes and fittings as parts are removed. Bag and identify small parts to prevent loss or damage.

(1). Defuel helicopter. Drain remaining fuel from cell sump drain valve into a suitable container.

(2). Disconnect electrical power.

A. Fuel Cell Cover Removal

(1). To remove right side fuel cell access covers (Ref. Figure 406).

(a). Remove right side floor panels from passenger/cargo compartment floor.

(b). Remove bonding jumpers then remove fuel cell access cover bolts and washers.

(2). To remove left aft fuel cell access cover (Ref. Figure 402):

(a). Remove left aft fuel cell access panel from passenger/cargo compartment floor.

(b). Unclamp and disconnect control cable from fuel shutoff valve (Ref. Figure 401).

(c). Disconnect engine feed fuel supply hose assembly between fuel shutoff valve and Sta. 124.00 bulkhead. Use backup wrench on fuel shutoff valve so it will not rotate.

(d). Disconnect motive flow fuel hose assembly between Sta 124.00 bulkhead and fuel cell access cover.

(e). Disconnect fuel quantity probe wire harness connector from fuel cell cover receptacle.

(f). Unfasten and remove Sta. 91.00 and 102.00 left aft fuel cell cover support brackets.

(g). Remove cover bolts and washers. Prop cover open with suitably padded blocks.

(h). Using a backup wrench on valve, separate engine feed fuel cell supply hose from fuel shutoff valve and fuel inlet from fuel cell access cover.

(i). Disconnect submerged motive flow fuel hose assembly between fuel check valve and ejector pump from fuel cell access cover.

(j). Disconnect fuel cell scavenge hose assembly from bottom of fuel cell access cover bracket assembly to ejector pump (Ref. Figure 404).

(k). Cut safety wire from fuel probe electrical connector base nut and remove connector from fuel cell access cover.

(l). If applicable, remove fuel cell scavenge hose bracket assembly,bulkhead union and fuel shutoff valve from fuel cell cover.

B. Fuel Cell Cover Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM114	Petrolatum
CM124	Kerosene
CM702	Lockwire CRES

(1). Wipe fuel cell and cover sealing surfaces clean with kerosene (CM124) on a clean lint free cloth.

(2). Inspect fuel cell cover seals for debonding, nicks or cuts and any other damage having a leak producing potential. Replace covers or left aft cover as required.

(3). Install bonding jumper with right cell access covers, bolts and washers (Ref. Figure 406). Progressively torque cover bolts to **70 - 90 inch-pounds (7.91 - 10.17 Nm)** in a cross pattern.

(4). To install left aft fuel cell access cover (Ref. Figure 402):

(a). Apply a coating of petrolatum (CM114) to a new fuel shutoff valve/cover sealwasher. Install valve on cell cover with sealwasher next to valve body and valve properly aligned to make connection with valve control cable. Install and torque valve jamnut to **240 - 280 inch-pounds (27.12 - 31.64 Nm)**.

(b). Apply a coating of petrolatum (CM114) to sealwasher. Install check valve and sealwasher to inside cover and a plain washer outside. Install jamnut and torque to **85 - 105 inch-pounds (9.6 - 11.86 Nm)**.

(c). Install bulkhead elbow to support bracket. with washer and nut. Torque jamnut to **240 - 280 inch-pounds (27.12 - 31.64 Nm).**

(d). Install support bracket to cover with bolts, washer, and sealwashers. Apply a coating of petrolatum (CM114) to sealwasher. Torque bolts **36 - 46 inch-pounds (4.06 - 5.19 Nm)**.

(e). Install bulkhead union to cover with sealwasher next to union. Apply a coating of petrolatum (CM114) to sealwasher. Install washer and jamnut. Torque jamnut. **120 - 150 inch-pounds (13.56 - 16.95 Nm).** Install cap outside of cell. Torque cap to **110 - 130 inch-pounds (12.43 - 14.69 Nm).**

(5). Place left forward fuel cell access cover into position on fuel cell.

(6). Connect fuel quantity probe wire harness connector to cell cover. Torque connector jamnut and safetywire to bulkhead union with (CM702) lockwire.

CAUTION

- On early aircraft, the fuel inlet hose and the fuel cell scavenge hose have the same size end fitting. Care must be taken to not misconnect these two hoses (Ref. Figure 404).
- The fuel inlet hose is the hose that runs from the fuel inlet fitting at the bottom of the fuel cell aft of the fuel cell baffle.
- The fuel cell scavenge hose is the hose that runs forward over the fuel cell baffle.

(7). Install left hand fuel cell inlet hose assembly to access cover fuel shutoff valve. Torque hose assembly **230 - 260 inch-pounds (25.99 - 29.38 Nm)**.

(8). Install submerged motive flow hose assembly to access cover check valve. Torque hose assembly **50 - 65 inch-pounds (5.65 - 7.34 Nm)**.

(9). Install scavenge fuel cell hose assembly to access cover bulkhead elbow. Torque hose assembly **230 - 260 inch-pounds (25.99 - 29.38 Nm)**.

(10). Install three support brackets on Sta. 91.00 and 102.00 floor cross-members with washers and screws. Torque screws to **20 - 25 inch-pounds (2.26 - 2.82 Nm)**.

(11). Install cover bolts and washers. Progressively torque cover bolts to **70 - 90 inch-pounds (7.91 - 10.17 Nm)** in a cross pattern.

(12). Connect engine feed fuel supply hose to fuel shutoff valve. Torque hose nut to **230 - 260 inch-pounds (25.99 - 29.38 Nm)**.

(13). Connect fuel motive flow hose to access cover/check valve. Torque hose nut **(50 - 65 inch-pounds (5.65 - 7.34 Nm)**.

(14). Connect fuel quantity probe connector to wire harness receptacle.

(15). Slip control cable through hole in fuel shutoff valve lever swivel.

(16). Rig cable control system (Ref. Fuel Shutoff Valve Control Cable Replacement).

(17). Apply a torque alignment stripe to fuel line tube, hose and fitting fasteners.

(18). Install access panels on passenger cargo compartment floor.

4. Fuel Supply Lines Replacement

WARNING **Avoid fuel vapor ignition and fire. Use only nonsparking tools and explosion proof work lights. Attach helicopter to an approved electrical ground. Switch OFF all electrical power. Disconnect external power and battery before opening fuel system. Ensure work area is adequately ventilated.**

CAUTION

- Air in fuel system may cause power surges or flameout. Bleed off trapped air after opening system at any point between fuel tank and engine fuel nozzle.
- Prevent fuel system contamination. Install caps on the ends of hoses, tubes and fittings as parts are removed. Bag and identify small parts to prevent loss or damage.

(1). Defuel helicopter. Drain remaining fuel from tank sump drain valve into a suitable container.

(2). Cap fittings and lines as required.

A. Fuel Supply Lines Removal

(Ref. Figure 402, Figure 403 and Figure 404)

(1). Remove left aft fuel cell access panel from passenger/cargo compartment floor.

(2). Disconnect motive flow fuel hose assembly between Sta 124.00 bulkhead and fuel cell access cover. Use backup wrench so fittings will not rotate.

(3). Disconnect engine feed fuel supply hose assembly between fuel shutoff valve and Sta. 124.00 bulkhead. Use backup wrench on fittings so they will not rotate.

(4). Remove Sta. 91.00 and Sta.102.00 fuel cell cover support brackets.

(5). Remove clamps and attaching hardware from passenger/cargo compartment floor.

(6). Remove engine feed fuel supply hose and motive flow fuel hose assemblies.

(7). Remove Sta. 124.00 bulkhead unions.

B. Fuel Supply Lines Installation

(Ref. Figure 402, Figure 403 and Figure 404)

(1). Install Sta. 124.00 firewall bulkhead unions, with washer and jam nut on forward side of firewall. Torque engine feed fuel supply union nut to **240 - 280 inch-pounds (27.12 - 31.64 Nm)**. Torque fuel return by-pass union to **85 - 105 inch-pounds (9.60- 11.86 Nm)**.

(2). Connect fuel cell engine feed supply hose to fuel shutoff valve and bulkhead union. Use a backup wrench on valve and bulkhead union. Torque fuel supply hose **230 - 260 inch-pounds (25.99 - 29.38 Nm)**.

(3). Connect motive flow fuel hose assembly between Sta 124.00 bulkhead and fuel tank access cover. Torque hose assembly **50 - 65 inch-pounds (5.65 - 7.34 Nm)**.

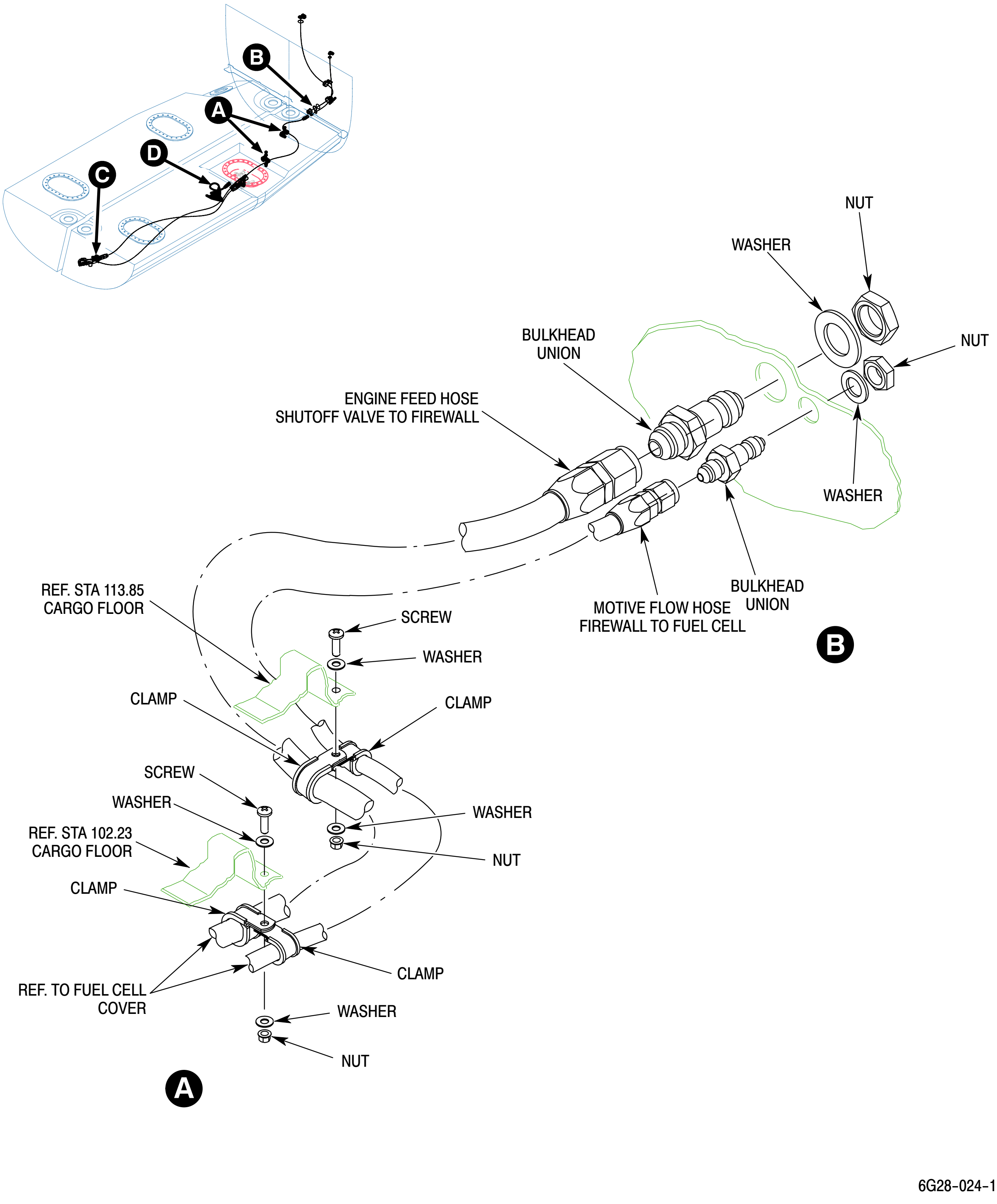


Figure 403. Fuel Lines Installation

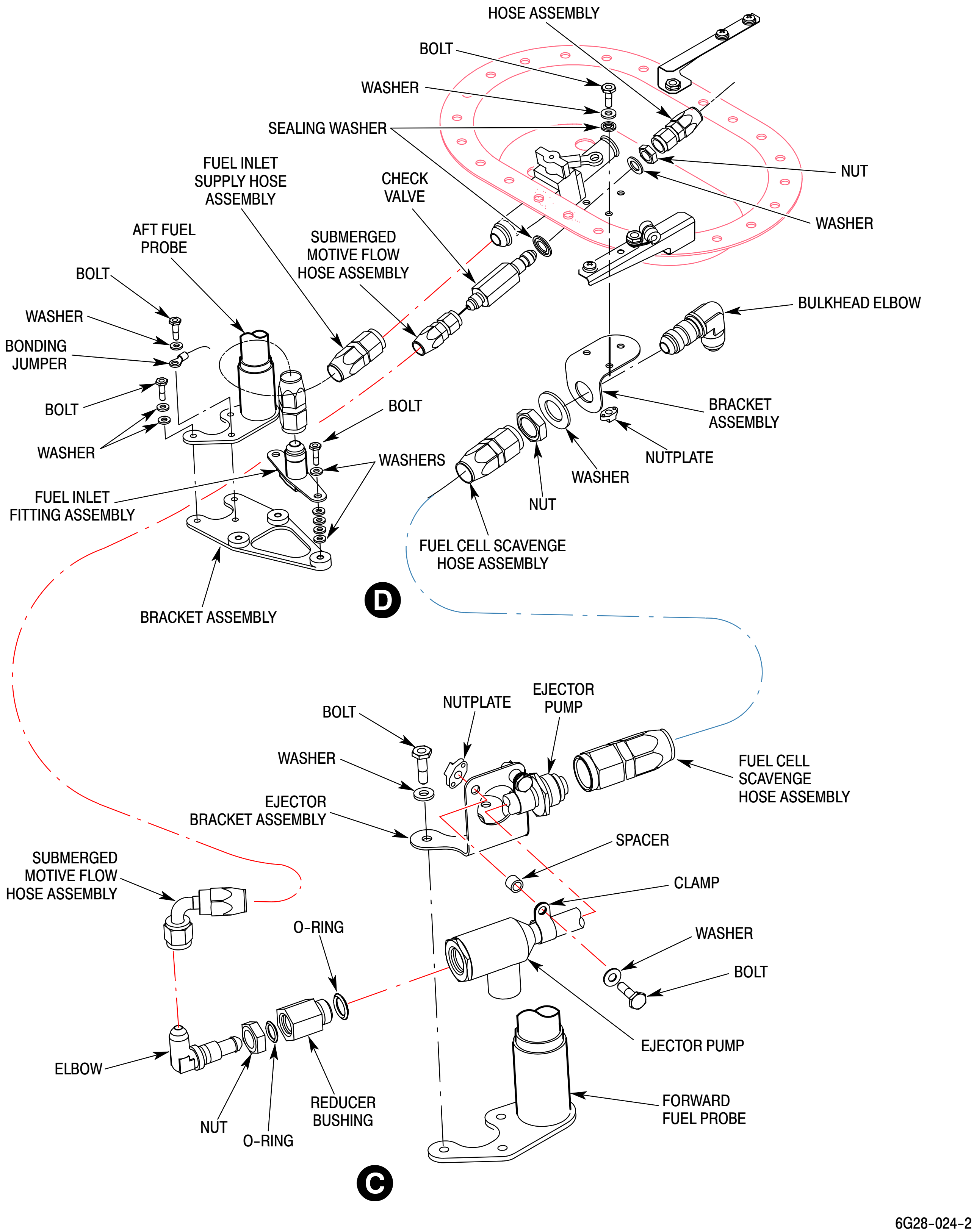


Figure 404. Ejector Pump and Fuel Lines Installation

(4). Apply a torque alignment stripe to fuel line tube, hose and fitting fasteners.

(5). Apply chaffing tape between hose assemblies and fuel cell cover assembly to prevent chaffing.

(6). Secure engine feed hose assembly and motive flow hose assembly underneath passenger/cargo floor with clamps and attaching hardware.

(7). Secure fuel cell to Sta. 91.00 and Sta.102.00 cell cover support brackets.

(8). Install aft fuel cell access panel from passenger/cargo compartment floor.

5. Fuel Cell Vent System Components Replacement

WARNING **Avoid fuel vapor ignition and fire. Use only nonsparking tools and explosion proof work lights. Attach helicopter to an approved electrical ground. Switch OFF all electrical power. Disconnect external power and battery before opening fuel system. Ensure work area is adequately ventilated.**

CAUTION Prevent fuel system contamination. Install caps on the ends of hoses, tubes and fittings as parts are removed. Bag and identify small parts to prevent loss or damage.

(1). Defuel helicopter. Drain remaining fuel from tank sump drain valve into a suitable container.

(2). Disconnect electrical power.

WARNING **Prevent spontaneous combustion or explosion. Never use oxygen to purge or ventilate fuel tank or fuel system components. Fuel, either vapor or liquid, will violently react with an oxygen rich atmosphere.**

(3). Ventilate fuel tank with an inert gas, such as nitrogen, or low pressure compressed air applied through filler neck.

A. Fuel Cell Vent System Components Removal

(Ref. Figure 405)

(1). Remove fuel vent cross over tube access cover and Sta.78.50 chanted bulkhead stress panel.

(2). Remove flame arrestor/tube assembly with clamps and attaching hardware.

(3). Disconnect hoses from vent cross-over-tube and attaching hardware and remove crossover tube.

(4). Remove passenger/cargo compartment floor fuel cell access panels.

(5). Disconnect hoses from aft fuel vent valves, remove bonding jumper and attaching hardware from vent tubes and remove fuel vent tubes from under cargo floor.

(6). Remove bonding jumper and fell cell access covers as required.

(7). Remove retaining ring and spring from fuel vent valve and remove fuel vent valve from inside of fuel cell.

B. Fuel Cell Vent System Components Installation

(Ref. Figure 405)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM114	Petrolatum
CM411	Adhesive, epoxy
CM702	Lockwire CRES

(1). Coat O-rings with (CM114) lubricant and install on vent valves.

(2). Insert vent valves thru cell from inside and secure using springs and retainers.

(3). Bond prep aft vent fittings at bond jumper location.

(4). Coat O-rings with lubricant (CM114) and install on vent fittings.

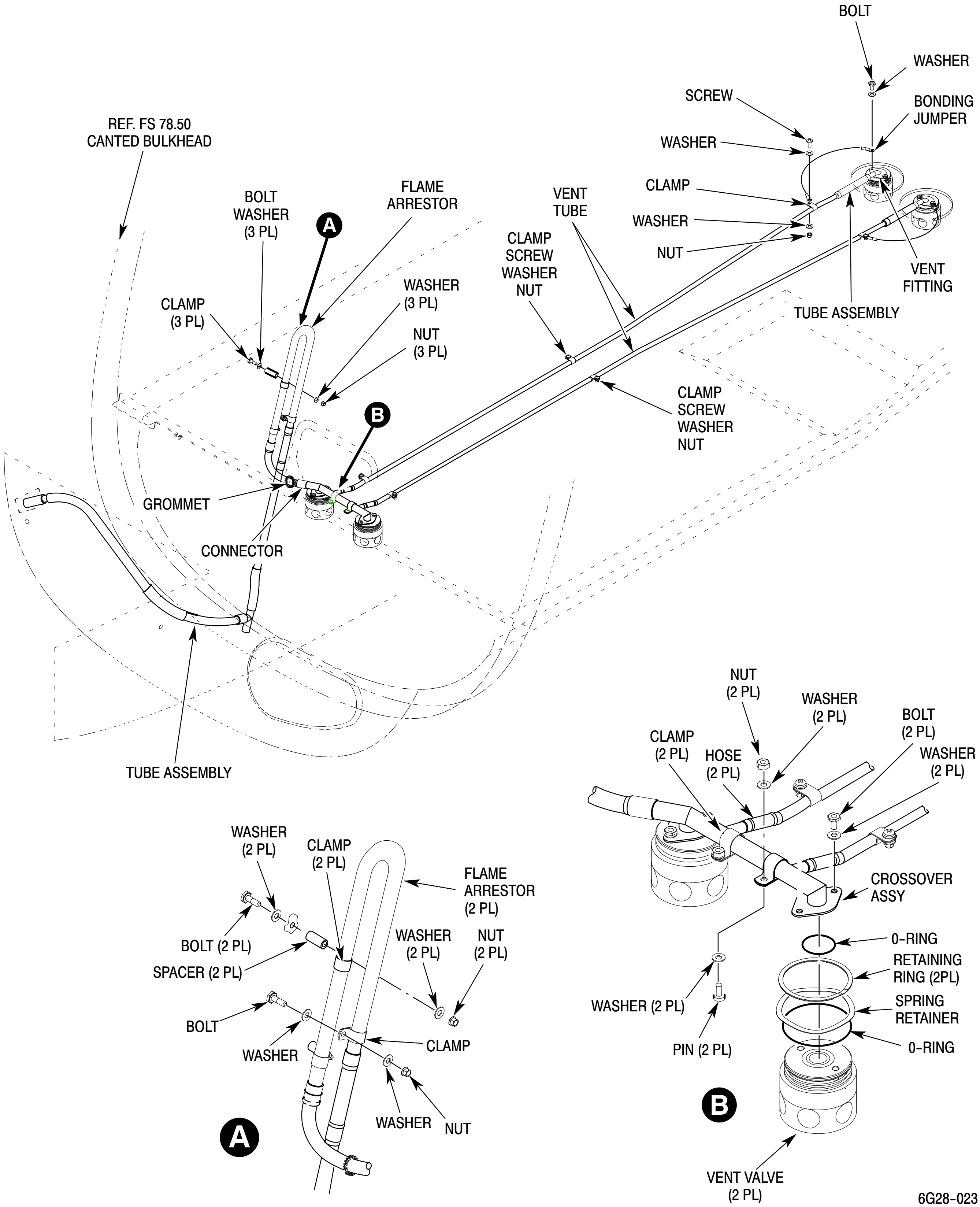


Figure 405. Fuel Cell Vent System Components

(5). Install aft vent fittings and bond jumpers to vent valves with hardware. Torque bolts to **36 - 46 inch-pounds (4.0 - 5.2 Nm)**.

(6). Bond prep six vent tube clamp screw holes on cargo deck.

(7). Install hoses to aft vent fittings with lockwire (CM702), two wrap around turns minimum.

(8). Slide vent tubes under cargo floor and connect to hoses with lockwire (CM702), two wrap around turns minimum.

(9). Attach forward end of tube to cargo floor with clamps.

(10). Install bonding jumpers at aft clamps.

(11). Install hoses on forward ends of vent tubes and safety using lockwire (CM702), two wrap around turns minimum.

(12). Coat O-rings with lubricant (CM114) and install on cross-over tube.

(13). Attach vent cross-over tube with hardware to tops of vent valves. Torque bolts to **36 - 46 inch-pounds (4.06 - 5.19 Nm)**.

(14). Bond prep two nutplate holes for attaching cross-over tube.

(15). Install clamps on cross-over tube and attach to airframe.

(16). Install grommet in Sta. 78.50 skin at vent outlet using epoxy adhesive (CM411).

(17). Attach connector to the flame arrestor and safety with lockwire (CM702), two wrap around turns minimum.

(18). Attach tube to flame arrestor and safety with lockwire (CM702) two wrap around turns minimum.

(19). Bond prep one of the three attaching screw holes for the flame arrestor.

(20). Install flame arrestor/tube assembly with clamps.

(21). Safety connector to cross-over tube with lockwire (CM702).

(22). Tie-rap tube assembly to forward bulkhead of Sta. 78.50.

(23). Route tube assembly to vent fairing and bond using sealant (CM425).

(24). Bond prep fuel cell access covers.

(25). Install bonding jumpers and fell cell access covers. Torque bolts **70 - 90 inch-pounds (7.91 - 10.17 Nm)**. Install fuel vent access cover.

(26). Install passenger/cargo compartment floor access panels.

6. Fuel Cell Replacement

WARNING **Avoid fuel vapor ignition and fire. Use only nonsparking tools and explosion proof work lights. Attach helicopter to an approved electrical ground. Switch OFF all electrical power. Disconnect external power and battery before opening fuel system. Ensure work area is adequately ventilated.**

CAUTION

- Do not work on cell in ambient temperatures below 70°F (21°C).
- Prevent fuel system contamination. Install caps on the ends of hoses, tubes and fittings as parts are removed. Bag and identify small parts to prevent loss or damage.

(1). Defuel helicopter. Drain remaining fuel from tank sump drain valve into a suitable container.

(2). Disconnect electrical power.

A. Fuel Cell Removal

(Ref. Figure 406)

NOTE: The following procedures are required to access and separate the fuel cell interconnect fitting, vent system and gravity fill port before either cell can be removed from its bay.

(1). Remove forward fuel vent crossover tube cover, right and left fuel cell access panels from passenger/cargo compartment floor.

(2). Disconnect fuel quantity probe wire harness connector from fuel cell access cover receptacle.

(3). Unclamp and disconnect control cable from fuel shutoff valve.

(4). Unfasten and remove Sta. 91.00 and 102.00 left fuel cell cover support brackets from passenger/cargo floor structure (Ref. Figure 402).

(5). Remove attaching hardware from Sta 102.230 and Sta 113.850 passenger/cargo compartment floor structure that secures engine feed fuel supply hose and motive flow firewall to fuel cell hose to bottom of floor (Ref. Figure 403).

(6). Disconnect engine feed fuel supply hose between fuel shutoff valve and firewall Sta. 124.00 bulkhead union. Using a backup wrench on bulkhead union so it will not rotate, disconnect and remove engine feed fuel supply hose assembly (Ref. Fuel Supply Line Replacement).

(7). Disconnect motive flow fuel hose assembly between fuel cell access cover and Sta 124.00 bulkhead. Using a backup wrench on bulkhead union so it will not rotate, disconnect and remove motive flow fuel hose assembly.

CAUTION Handle fuel cell covers with care. Prying covers from cell openings or rough handling may damage the cover seal or cell fitting.

(8). Unbolt and prop left aft fuel cell access cover open with suitably padded blocks.

(9). Disconnect fuel inlet supply hose between fuel shutoff valve fuel cell access cover and fuel inlet support bracket (Ref. Figure 402 and Figure 404).

(10). Disconnect submerged motive flow fuel hose assembly between fuel check valve fuel cell access cover and ejector pump.

(11). Disconnect submerged fuel cell scavenge hose assembly from bottom of fuel cell access cover bracket assembly to ejector pump (Ref. Figure 404).

(12). Cut safety wire from fuel probe electrical connector base nut and remove connector from fuel cell access cover.

(13). Unbolt and remove right hand fuel cell access cover(s) and bonding jumpers. Remove left hand forward fuel cell access cover.

WARNING **Prevent spontaneous combustion or explosion. Never use oxygen to purge or ventilate fuel tank or fuel system components. Fuel, either vapor or liquid, will violently react with an oxygen rich atmosphere.**

(14). Mop up any remaining fuel in both cells with clean lint free cloth. Purge fuel cells with dry, forced air or inert gas such as nitrogen through filler neck.

(15). Disconnect wire harness from forward and aft fuel quantity probe and remove wire harness (Ref. Fuel Quantity Probe Replacement).

(16). Remove aft fuel quantity probes, fuel inlet with fuel supply hose and bracket assembly, forward fuel quantity probe, ejector pump with submerged motive flow fuel hose assembly and fuel cell scavenge hose as a subassembly (Ref. Figure 404 and Figure 407).

(17). Disconnect and remove fuel vent system components necessary to remove fuel cell (Ref. Fuel Cell Vent System Component Replacement).

NOTE: At this point either cell may be removed, as required.

(18). Remove sump drain valve.

(19). Remove retaining ring and spring from fuel cell interconnect fittings (Ref. Figure 406).

(20). Remove cell suspension cords.

(21). For right fuel cell removal:

(a). Remove fuel filler neck fairing from passenger/cargo compartment floor.

(b). Unclamp fuel gravity filler port from fill valve, remove hose from fill valve and disconnect lanyard.

CAUTION Cells are thin-walled and fragile. Avoid snagging or dragging cell over pointed or sharp edges. Do not scratch or nick any of the cell's metal fittings.

(22). Collapse and fold cell lengthwise and remove through floor access opening.

B. Fuel Cell Installation

(Ref. Figure 406)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM114	Petrolatum
CM220	Naphtha aliphatic
CM702	Lockwire CRES
CM809	Nylon cord

WARNING **Avoid fuel vapor ignition and fire. Use only nonsparking tools and explosion proof work lights. Attach helicopter to an approved electrical ground. Switch OFF all electrical power. Disconnect external power and battery before opening fuel system. Ensure work area is adequately ventilated.**

NOTE: Discard used O-rings and sealwashers. Apply a thin coat of petrolatum (CM114) to all new O- rings except cell vent system sealwashers.

(1). Air-vacuum all debris from cell bays. Ensure compartment liner will protect cell from airframe points and edges. Repair liner as required.

(2). Bond prep fill valve with fuel cell fitting. Coat O-rings with lubricant (CM114) and install fill valve into right fuel cell with O-ring, spring and retaining ring. Ensure clocking of fill valve with flat at top lines up with shoulder on fuel cell fitting.

(3). Hook up fuel cell interconnect fittings into left fuel cell. Ensure short end of interconnects are facing into left fuel cell. Coat O-rings with lubricant (CM114) and install O-ring, spring and retaining ring.

CAUTION Cells are thin-walled and fragile. Avoid snagging or dragging cell over pointed or sharp edges. Do not scratch or nick any of the cell's metal fittings. Avoid hard contact between cell and fuselage structure when inserting.

(4). Fold cells lengthwise and position in bay through floor opening. Unfold cell and smooth out all creases.

(5). Align cell openings with airframe openings. Hook up fuel cell cross over interconnects into right fuel cell. Coat O-rings with lubricant (CM114) and install O-ring, spring and retaining ring.

(6). Install a new O-ring on sump drain valve. Install valve and torque to **95 - 105 inch-pounds (10.73 - 11.86 Nm)**. Safety wire drain valve with lockwire (CM702).

(7). For right fuel cell installation:

(a). Install rubber hose to fill valve and filler neck, hose should be approximately six an one half inches (16.5 cm) long. Secure hose to fill valve and filler neck with clamps.

(b). Insure lanyard on filler valve is accessible with fill cap removed. Slip lanyard on fuel cap onto ring of fill valve. Install fuel cap.

(c). Connect lanyard of fill valve to gravity filler port. Install hose and clamp.

(8). Connect engine feed fuel supply hose and motive flow fuel hose assembly to Sta. 124.00 bulkhead union (Ref. Fuel Supply Line Replacement).

(9). Install fuel vent system components (Ref. Fuel Vent System Components Replacement).

(10). Route suspension nylon cord (CM809) thru grommet of fuel cell and thru eyelets of fuselage. Tighten and tie cord using a bowline knot. Leave at least twelve inches of excess cord at end after knot.

(11). Secure opposite end of cord using a trucker's slip knot. Leave at least twelve inches (30.5 cm) of excess cord at end after knot.

(12). Forward fuel probe and ejector pump subassembly installation (Ref. Ejector Pump and Fuel Line Installation):

(a). Bond prep ejector pump bracket assembly with forward fuel probe and ejector pump assembly.

(b). Coat O-rings with lubricant (CM114) and install reducer bushing with O-rings into ejector pump. Torque to **50 - 65 inch-pounds (5.65 - 7.34 Nm)**.

(c). Coat O-rings with lubricant (CM114) and install jamnut, bulkhead elbow to reducer bushing. Torque jamnut to **85 - 105 inch-pounds (9.60 - 11.86 Nm)**.

(d). Install fuel cell scavenge hose to ejector pump. Torque hose nut to **230 - 260 inch-pounds (25.99 - 28.81 Nm).**

(e). Install submerged motive flow fuel hose assembly to elbow and torque to **50 - 65 inch-pounds (5.65 - 7.34 Nm)**.

(f). Bond prep ejector pump in area of clamp up and install forward fuel quantity probe, ejector pump with submerged motive flow hose assembly and fuel cell scavenge hose assembly as a subassembly.

(g). Install ejector pump subassembly to bracket assembly with clamps, bolts and washers. Torque bolts to **36 - 46 inch-pounds (4.06 - 5.19 Nm)**.

(h). Connect wire harness to forward fuel probe. Route submerged motive flow fuel hose assembly, fuel cell scavenge hose assembly and wire harness thru fuel cell fabric retaining loops and baffle (Ref. Fuel Quantity Probe Replacement).

(13). Aft fuel probe and fuel supply inlet hose installation (Ref. Ejector Pump and Fuel Line Installation):

(a). Bond attachment holes on fuel cell aft sump fitting assembly, bracket assembly, aft fuel probe attachment holes and fuel inlet fitting assembly.

(b). Install fuel inlet fitting assembly to bracket assembly with four washers each between fuel inlet fitting and bracket assembly.

(c). Install aft fuel probe to bracket assembly and fuel cell aft sump fitting with bolts and two washers under the head of each bolt, except bolt with ground wire, only one washer is required.

(d). Connect wire harness to aft fuel probe. Attach bonding jumper to outboard bolt of probe. Torque bolts to **36 - 46 inch-pounds (4.06 - 5.19 Nm)** (Ref. Fuel Quantity Probe Replacement).

(14). Install attaching hardware from Sta 102.230 and Sta 113.850 passenger/cargo compartment floor structure that secures engine feed fuel supply hose and motive flow firewall to fuel cell hose to bottom of floor (Ref. Figure 403).

(15). Install right hand fuel cell access covers, left hand forward and left hand aft access cover (Ref. Fuel Cell Cover Replacement).

(16). Connect fuel quantity probe wire harness connector from fuel cell access cover receptacle.

(17). Connect and clamp control cable from fuel shutoff valve (Ref. Fuel Shutoff Valve Control Cable Replacement).

(18). Install forward fuel vent crossover tube cover, right and fuel cell access panels from passenger/cargo compartment floor.

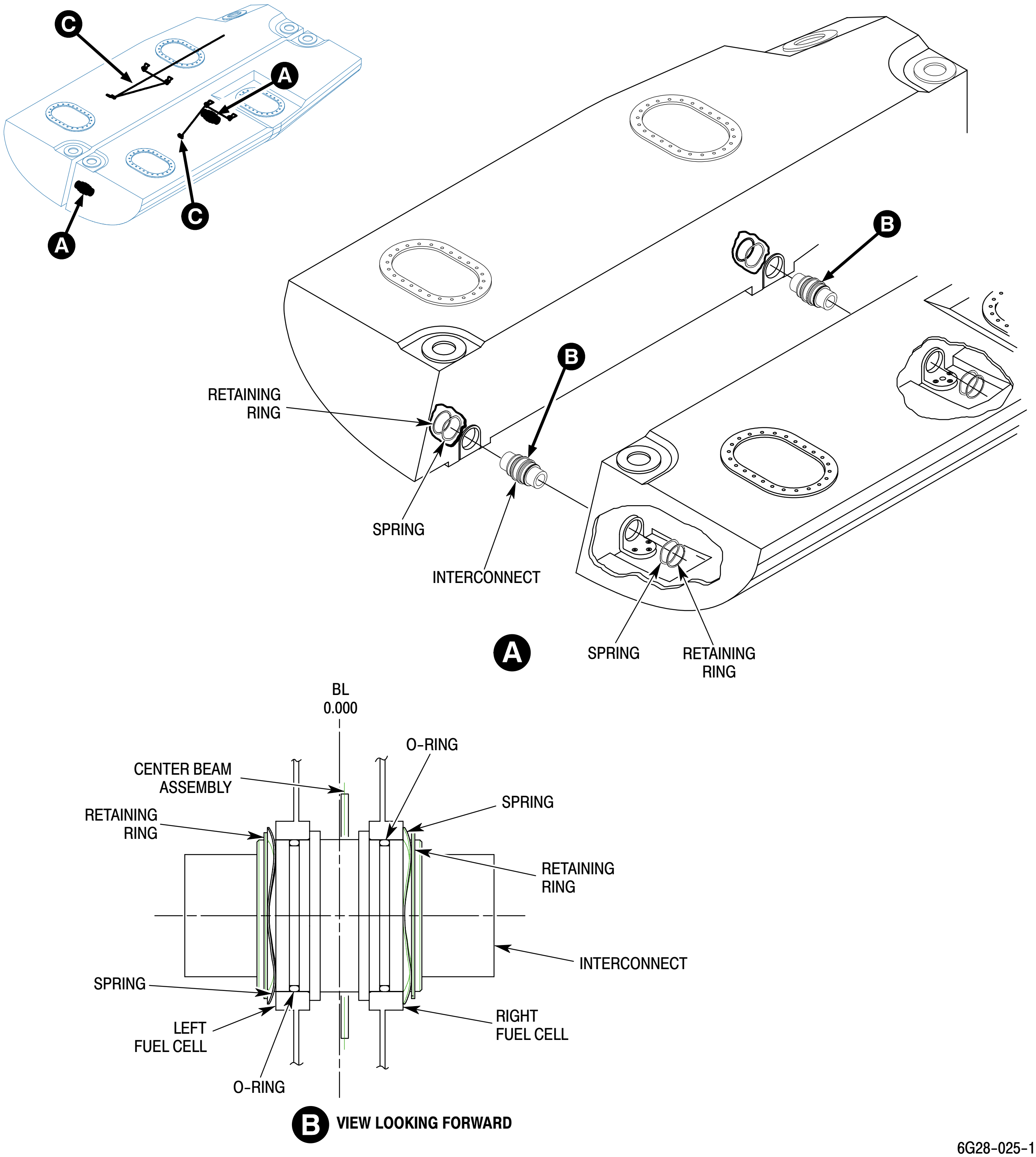
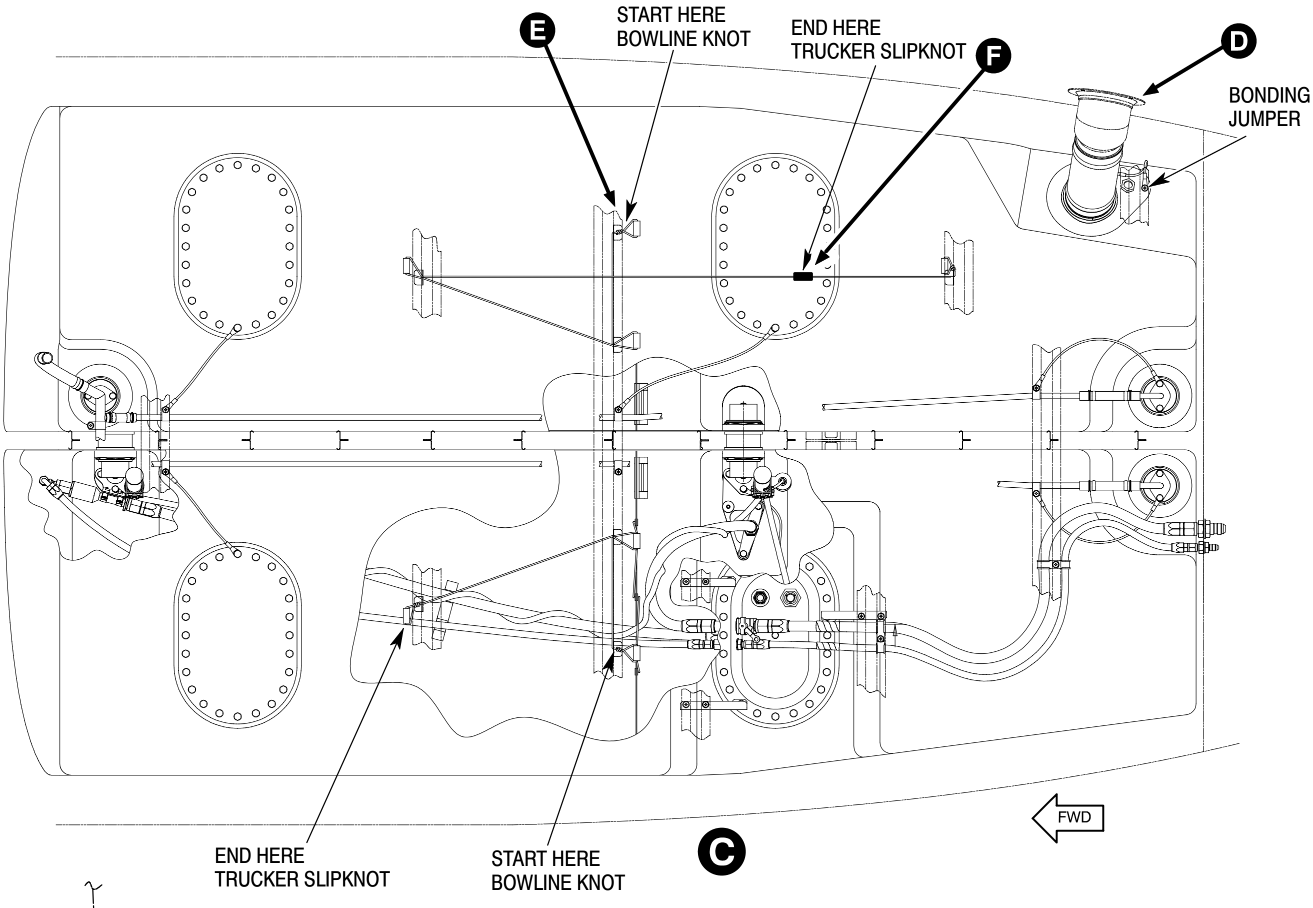
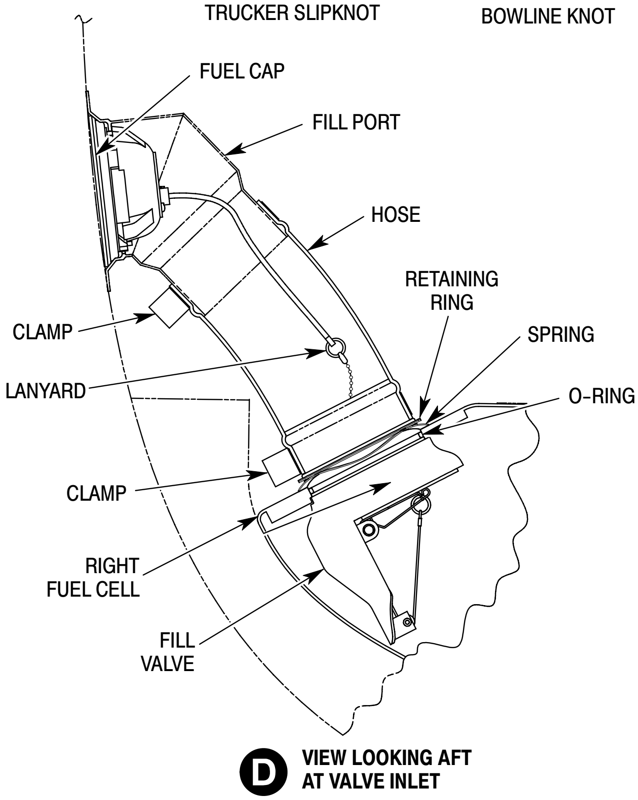


Figure 406. Fuel Cell Interconnect and Support Lacing (Sheet 1 of 3)





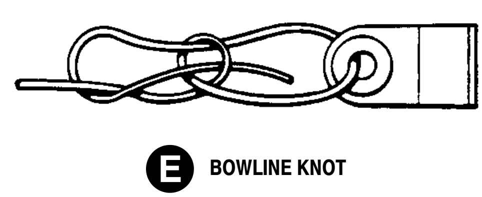


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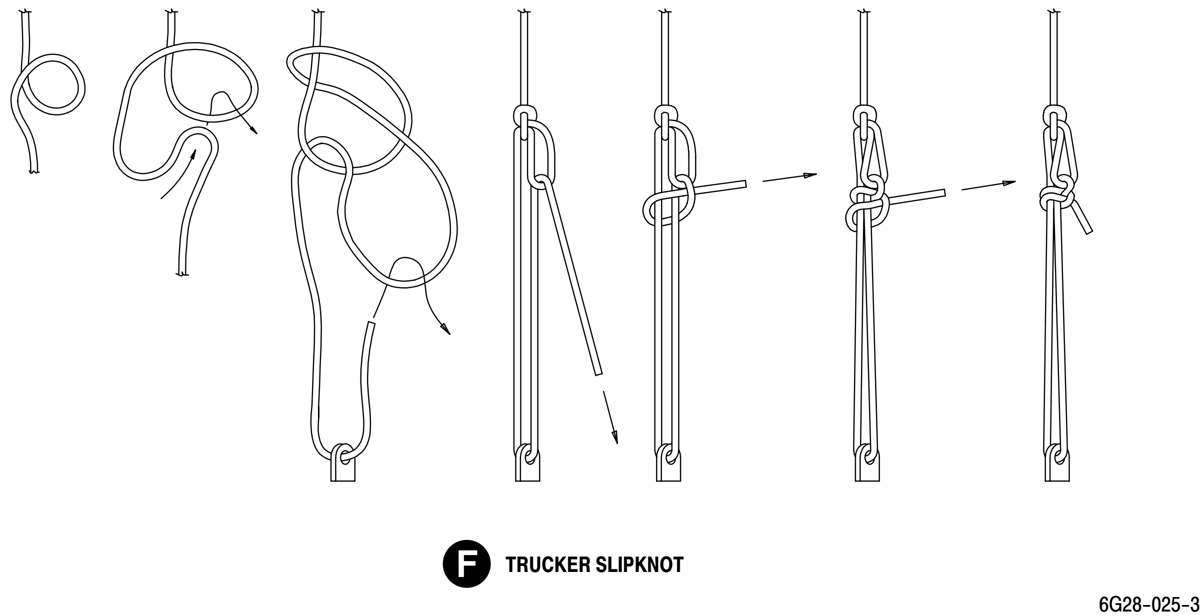
Figure 406. Fuel Cell Interconnect and Support Lacing (Sheet 2 of 3)



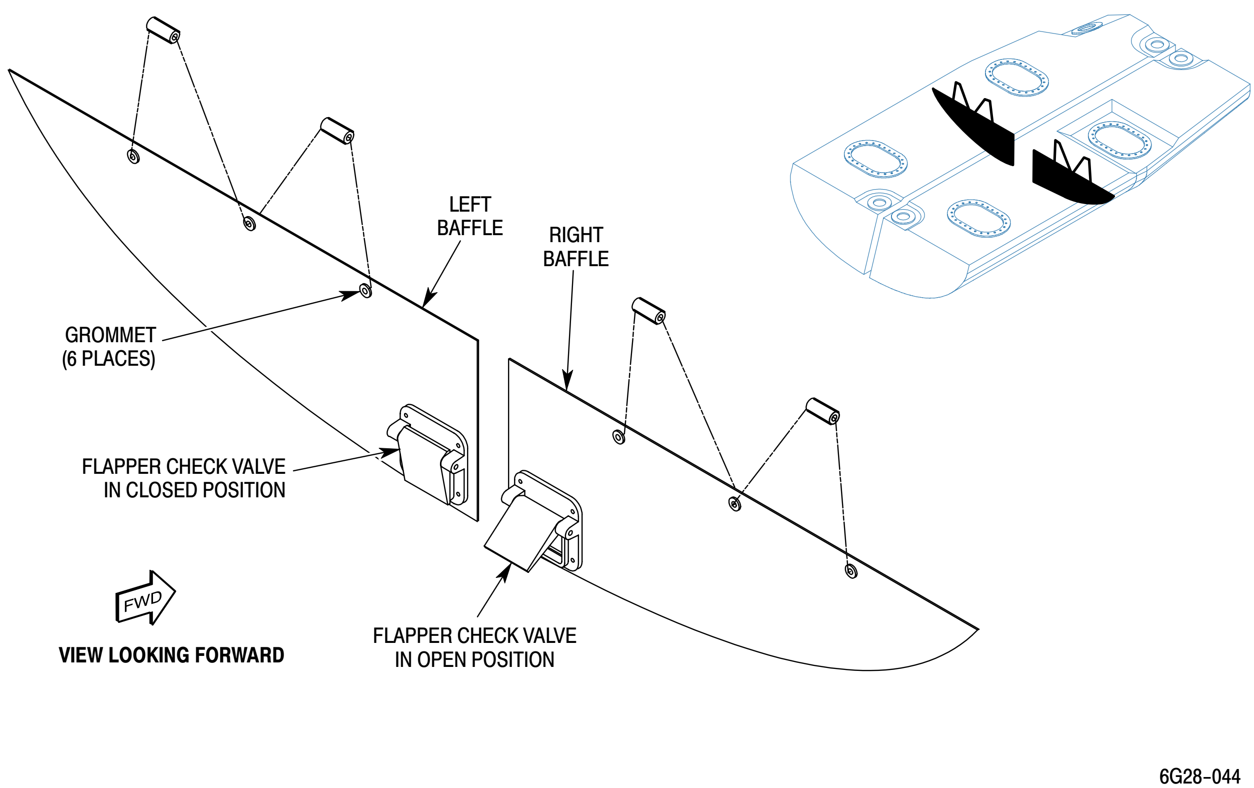


Figure 406. Fuel Cell Interconnect and Support Lacing (Sheet 3 of 3)

7. Fuel Filler Neck Gravity Fill Port Replacement

(Ref. Figure 406)

WARNING **Avoid fuel vapor ignition and fire. Use only nonsparking tools and explosion proof work lights. Attach helicopter to an approved electrical ground. Switch OFF all electrical power. Disconnect external power and battery before opening fuel system. Ensure work area is adequately ventilated.**

CAUTION Helicopter must be defueled and drained prior to removing gravity fill port.

(1). Defuel helicopter. Drain remaining fuel from cell sump drain valve into a suitable container.

(2). Disconnect electrical power.

A. Fuel Filler Neck Gravity Fill Port Removal

(1). Remove fuel filler neck fairing from passenger/cargo compartment floor.

(2). Unclamp fuel gravity filler port from fill valve, remove hose from fill valve and disconnect lanyard.

(3). Remove bolts and washers from filler neck mounting flange and remove gravity fill port.

B. Fuel Filler Neck Gravity Fill Port Installation

(1). Bond prep attach points for bonding jumper near fuel fill area. Attach bonding jumper to fuel cell with screw and washer. Attach opposite end of bonding jumper to passenger/cargo compartment flooring with screw, washers and nut.

(2). Install bolts and washers from filler neck mounting flange and install gravity fill port.

(3). Install rubber hose to fill valve and filler neck. Note, hose should be approximately six an one half inches long. Secure hose to fill valve and filler neck with clamps.

(4). Insure lanyard on filler valve is accessible with fill cap removed. Slip lanyard on fuel cap onto ring of fill valve. Install fuel cap.

(5). Connect lanyard of fill valve to gravity filler port. Install hose and clamp.

8. Fuel System Drain Valve Replacement

WARNING **Avoid fuel vapor ignition and fire. Use only nonsparking tools and explosion proof work lights. Attach helicopter to an approved electrical ground. Switch OFF all electrical power. Disconnect external power and battery before opening fuel system. Ensure work area is adequately ventilated.**

CAUTION Helicopter must be defueled and drained prior to removing tank sump drain valve.

(1). Defuel helicopter, as required. Drain remaining fuel from tank sump drain valve into a suitable container.

(2). Disconnect electrical power.

A. Fuel System Drain Valve Removal

(1). Remove lockwire from tank sump drain valve.

(2). Using appropriate socket or wrench, remove drain valve.

B. Fuel System Drain Valve Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM114	Petrolatum
CM124	Kerosene
CM702	Lockwire CRES

(1). Replace drain valve O-ring packings. Lubricate packings with kerosene (CM124), petrolatum (CM114) or jet fuel.

(2). Install and torque sump drain valve to **95 - 105 inch-pounds (10.73 - 11.86 Nm)**. Safety valve with lockwire (CM702).

(3). Apply a torque alignment stripe to fuel line tube, hose and fitting fasteners.

(4). Refuel helicopter.

(5). Check drain valve for leakage.

9. Fuel Quantity Probe Replacement

WARNING **Avoid fuel vapor ignition and fire. Use only nonsparking tools and explosion proof work lights. Attach helicopter to an approved electrical ground. Switch OFF all electrical power. Disconnect external power and battery before opening fuel system. Ensure work area is adequately ventilated.**

(1). Defuel helicopter. Drain remaining fuel from tank sump drain valve into a suitable container.

(2). Disconnect electrical power.

WARNING **Prevent spontaneous combustion or explosion. Never use oxygen to purge or ventilate fuel tank or fuel system components. Fuel, either vapor or liquid, will violently react with an oxygen rich atmosphere.**

(3). Ventilate fuel tank with an inert gas such as nitrogen or low pressure compressed air applied through filler neck.

A. Forward Fuel Quantity Probe Removal

(Ref. Figure 407)

(1). Remove left forward fuel cell access panel from passenger/cargo compartment floor.

(2). Remove left forward fuel cell access cover.

(3). Disconnect wire harness connector ends from forward fuel probe.

(a). Remove ORANGE wire from terminal L.

(b). Remove BLUE wire from terminal R.

(c). Remove WHITE wire from terminal S.

(4). Remove GROUND wire from probe mount flange, remaining attachment hardware and remove probe.

B. Forward Fuel Quantity Probe Installation

(Ref. Figure 407)

(1). Install fuel quantity probe ground wire and attaching hardware. Torque bolts to **36 - 46 inch-pounds (4.06 - 5.19 Nm).**

(2). Connect wire harness connector ends to forward fuel probe in the same locations as removed.

(3). Bond prep fuel cell access cover.

(4). Install left forward fuel cell access cover. Install bonding jumper to fuel cell access cover. Torque bolts to **70 - 90 inch pounds (7.91 - 10.17 Nm)**.

(5). Install left forward fuel cell access panel from passenger/cargo compartment floor.

C. Aft Fuel Quantity Probe Removal

(Ref. Figure 407)

(1). Remove left aft fuel cell access panel from passenger/cargo compartment floor.

(2). Remove left aft fuel cell access cover (Ref. Fuel Cell Cover Replacement).

(3). Disconnect wire harness connector ends from aft fuel probe.

(a). Remove ORANGE wire from terminal L.

(b). Remove BLUE wire from terminal R.

(c). Remove WHITE wire from terminal S.

(d). Remove low level switch WHITE wire from terminal 1.

(e). Remove low level switch BLUE wire from terminal 2.

(f). Remove GROUND wire from probe mount flange, remove remaining attachment hardware and remove probe.

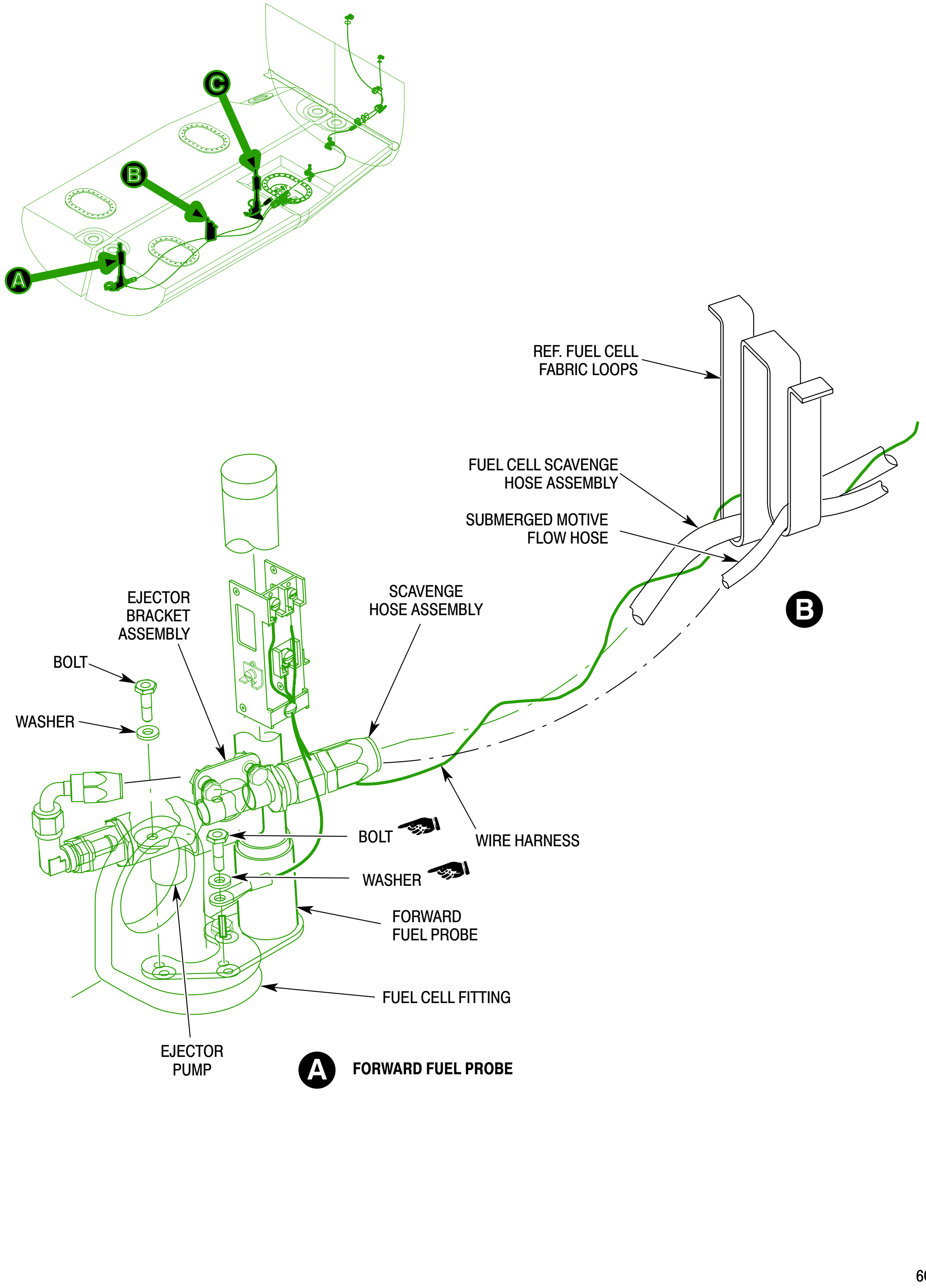


Figure 407. Fuel Quantity Probes (Sheet 1 of 2)

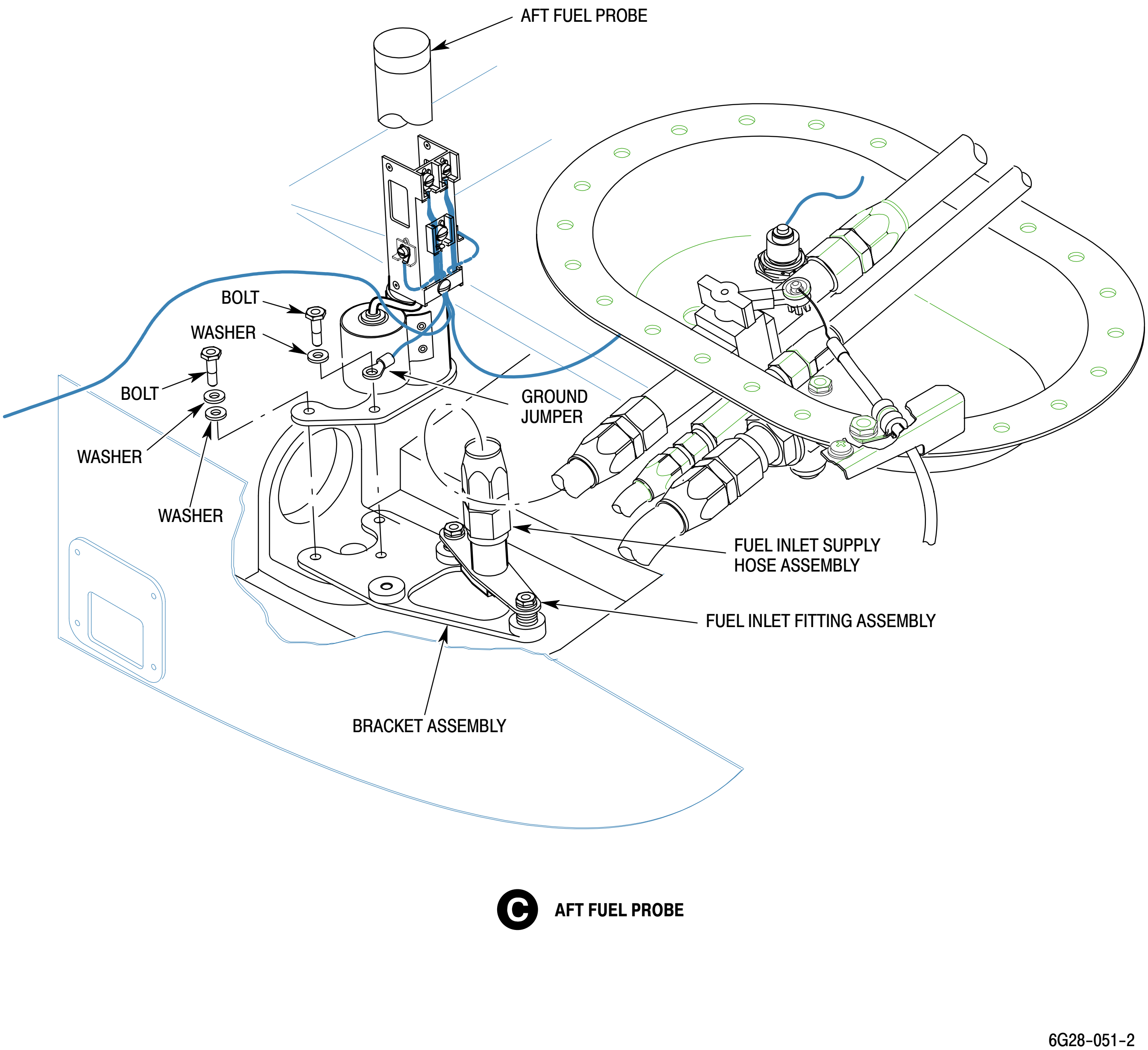


Figure 407. Fuel Quantity Probes (Sheet 2 of 2)

D. Aft Fuel Quantity Probe Installation

(Ref. Figure 407)

(1). Install fuel quantity probe ground wire and attaching hardware. Torque bolts to **36 - 46 inch-pounds (4.06 - 5.19 Nm).**

(2). Connect wire harness connector ends to forward fuel probe in the same locations as removed.

(3). Install left aft fuel cell access cover (Ref. Fuel Cell Cover Replacement).

(4). Install left forward fuel cell access panel from passenger/cargo compartment floor.

FUEL SYSTEM
ADJUSTMENT/TEST

1. Fuel Level Low Light/Fuel Quantity Indicator System Test and Calibration

The following procedure is for calibrating the fuel quantity system when the fuel cell, fuel probes or fuel quantity indicator have been replaced.

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST203	Hydraulic jack: 1-5 ton (900-4500 kg)
ST205	Inclinometer

WARNING **Prevent fuel vapor accumulation, ignition and fire. Attach helicopter to an approved electrical ground. Switch OFF and disconnect external power and battery before opening fuel system. Perform work in an open, well ventilated area away from all potential ignition sources. Use only nonsparking tools and explosion proof work lights.**

(1). Attach helicopter to a approved electrical ground.

(2). Defuel and drain fuel cell sumps of all fuel from all four sump drains with the helicopter at normal ground attitude.

(3). Place an aircraft jack (ST203) under the aft jacking point.

CAUTION Do not apply more than 500 lb. (227 kg) pressure on aft jacking point, damage to tailboom and attachment points will occur.

(4). Locate a inclinometer (ST205) on the passenger/cargo compartment floor at approximately fuselage Sta. 100.00 - 104.00. Raise the helicopter at Sta. 303.03 with jack (ST204) and P.Sta. 18.76 with jacks (ST203) to obtain a 3 degree nose down simulated flight attitude as observed on the inclinometer scale.

(5). Level the helicopter laterally across the passenger/cargo compartment floor.

(6). Plug in and switch on 27.5 ±0.5 Vdc external power. Set BAT master switch to EXT PWR. Make sure the INST and PNL LT circuit breakers are pushed in.

NOTE: All readings are taken from the centerline of the fuel quantity indicator pointer.

(7). Verify the FUEL LEVEL LOW light is illuminated.

(8). Add 1.3 gals (4.92 Liter) of fuel from a calibrated delivery system to the fuel cell. This amount of fuel is trapped fuel or unusable fuel. Calibrate empty.

(a). Calibrate zero on the fuel quantity indicator by holding the fuel quantity gauging system calibration switch in the empty calibration position (down) for a minimum of 5 - 10 seconds.

(b). Verify the the fuel quantity indicator now reads empty. Empty is the E with the pointer centerline between the outer and inner edge of the E graduation mark.

(9). Add 11.4 gals (44.3 Liter) of fuel from a calibrated delivery system to the fuel cell.

(10). Verify the FUEL LEVEL LOW light is not illuminated.

(11). Wait 15 minutes and verify the FUEL LEVEL LOW light is not illuminated. If light illuminates:

(a). Inspect baffles for damage, tears, punctures or delamination.

(b). Inspect flappers for proper seating. Flappers should seat flush with gravity or very light finger pressure and should move freely.

(12). Fill the fuel cell and secure the fuel filler cap.

(a). Calibrate full on the fuel quantity indicator by holding the fuel quantity gauging system calibration switch in the full calibration position (up) for a minimum of 5 seconds.

(b). Verify the the fuel quantity indicator now reads approximately 759 pounds (344.28 kg).

(13). Place the BAT master switch to OFF position. Disconnect external power.

2. Fuel Filter (Bypass) Caution Light Pressure Switch Test

(Ref. Figure 501)

WARNING **Air in the fuel system will cause a power reduction or flameout. Do a fuel system vacuum leak check and system air bleed after opening fuel system to atmosphere and prior to releasing helicopter for flight.**

NOTE: For all torques in the following procedures, refer to Engine Build- Up, Section 71-00-47.

(1). Set all switches; OFF. Disconnect external electrical power. Disconnect battery.

(2). Open engine access doors.

(3). Locate pressure switch on engine fuel pump filter. Disconnect bypass switch wire knife splice.

CAUTION

- Pressure switch is easily damaged. A slight shearing force applied to half the pressure switch can cause leakage and, or operational failure. Always grip both halves of pressure switch hex flats with wrench when loosening or torquing attaching hardware.
- Bypass pressure switch is not field repairable. Do not disassemble switch. Return faulty switches to vender for repair (Ref. Sec. 01-00-00).

(4). Disconnect hose from fuel filter pressure switch. Install an airtight plug to hose.

(5). Remove fuel pressure switch with reducer bushing.

(6). With reducer bushing removed from tee fitting, install an O-ring on a suitable airtight plug and tighten into tee fitting.

(7). Bench test 600N8131 bypass pressure switch as follows (denoted by six housing screws):

(a). Assemble test equipment shown in Figure 501. Connect tester to pressure switch lead and connect ground test lead to one of three screws on the housing body.

(b). Remove reducer bushing and O-ring from switch. Wipe switch completely dry so any leakage can be detected during the test.

(c). Apply 2.0 to 3.0 psig (13.8 - 20.68 Kpa) at port “A” .

1). There shall be no evidence of leakage. Replace a leaky switch.

2). When air pressure is applied, switch shall be close when pressure at port “A” is 2.1 - 2.9 psid, pound per square inch differential (4.3 - 5.9 in. Hg, inch of mercury).

3). When air pressure is bled off, switch shall be open when pressure at port “A” is 1.0 psid (2.0 in. Hg).

(d). Remove test equipment.

(8). Remove plug from tee fitting. Install reducer bushing and bypass switch assembly with new O-rings on reducer bushing and bypass switch. Torque switch assembly.

(9). Remove plug from bypass hose. Attach hose to switch bushing. Torque hose nut.

(10). Install insulating sleeve and connect switch wire knife splice.

(11). Bleed fuel system.

(12). Operate engine per Pilot’s Flight Manual and check fuel system for correct operation. Shut down engine. Inspect fuel system for leaks.

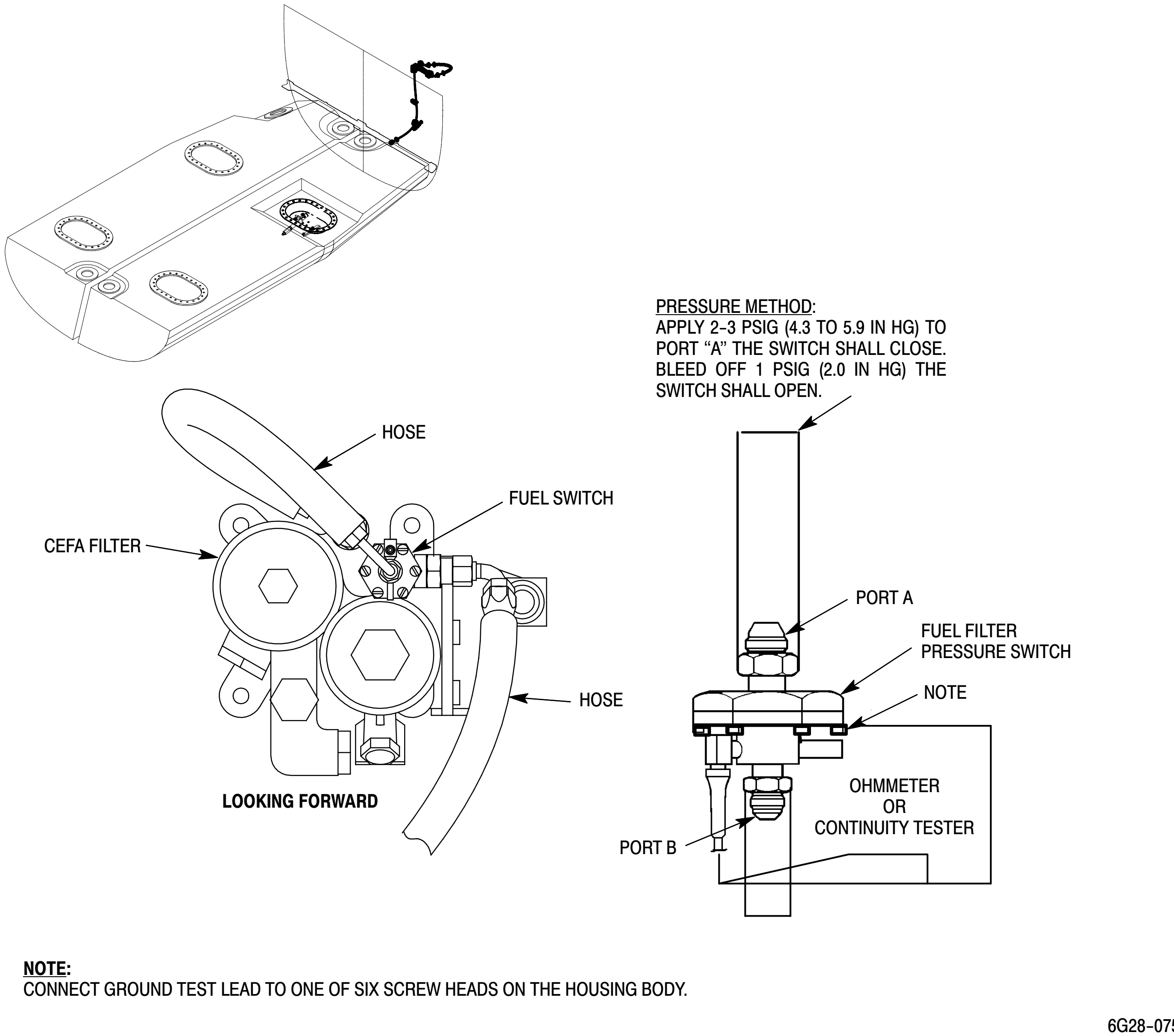


Figure 501. Fuel Filter Caution Light Pressure Switch Test Apparatus (C47 Engine)

FUEL SYSTEM
INSPECTION/CHECK

WARNING

- **Avoid fuel vapor ignition and fire. Use only nonsparking tools and explosion proof work lights. Attach helicopter to an approved electrical ground. Switch OFF all electrical power. Disconnect external power and battery before opening fuel system. Ensure work area is adequately ventilated.**
- **Air entering the airframe fuel supply lines may cause a power reduction or flameout. Fuel system vacuum leak check and fuel air bleed procedures must be performed after opening fuel the supply system for any reason, prior to releasing helicopter for flight.**

1. Fuel System General Inspection

(1). Remove all fuel tank floor access panels.

(2). Inspect fuselage bottom skin for evidence of fuel leakage. No leaks allowed. Determine source and repair as required.

(3). Inspect fuel lines, fittings, cell access covers, fuel quantity unit, clamps and attaching hardware for leakage, corrosion and security. Inspect fire sleeves for cuts, tears and punctures. No leakage allowed. Repair or replace components as required.

(4). Inspect electrical wiring and connectors for corrosion and security. Replace or repair wiring as required.

2. Fuel Shutoff Valve Inspection

(1). Shut down and disconnect all electrical power.

(a). In cargo/passenger compartment, open left aft fuel cell access panel.

(b). Disconnect fuel supply tube from fuel shutoff valve.

(c). Use an inspection mirror and flashlight to check shutoff valve ball position.

(d). Ensure shutoff valve control knob is pushed in. Valve ball must be wide open.

(e). Pull control knob out to stop. Valve ball should be closed.

(2). Valves that can not be fully closed or opened must be overhauled or replaced prior to further flight.

(3). Disconnect control cable from valve.

(a). Inspect shutoff valve lever and cable swivel hardware for corrosion and wear. Check lever for smooth movement from closed to open stops.

(b). Use a spring scale to check tension required to move valve lever from full open to closed. Design force requirement is 1.5 - 3.5 pounds (6.7 - 15.6 N) maximum.

(c). Inspect valve for evidence of external leakage. External leakage not allowed.

(d). Check that lever detents at open and closed positions. Repair or replace valve as required.

(4). Connect and rig valve control cable. Install cotter pin on cable swivel.

3. Tank Vent System Inspection

WARNING **Avoid fuel vapor ignition and fire. Use only nonsparking tools and explosion proof work lights. Attach helicopter to an approved electrical ground. Switch OFF all electrical power. Disconnect external power and battery before opening fuel system. Ensure work area is adequately ventilated.**

CAUTION Prevent fuel system contamination. Install caps on the ends of hoses, tubes and fittings as parts are removed. Bag and identify small parts to prevent loss or damage.

(1). Defuel helicopter. Drain remaining fuel from tank sump drain valve into a suitable container.

(2). Disconnect electrical power.

(3). Remove all four passenger/cargo access panels.

(4). Remove fuel vent cross over tube access cover and disconnect hoses from forward vent crossover tubes.

(5). Blow low-pressure compressed air through vent system to verify passages are clear.

(6). Check vent fairing passages for obstructions and condition. Repair or replace fairings as required.

(7). Inspect vent system hoses for deterioration. Pinch or bend hoses and look for surface cracks. Replace hose if cracks are apparent.

(8). Inspect vent tubes for dents, cracks, deformation or corrosion. Smooth nonrestrictive dents are permissible except at lower vent end which must fit flush within vent fairing flared riser.

(9). Inspect crossover fittings for cracks, dents or corrosion. Smooth nonrestrictive dents are permissible.

(10). Inspect fuel vent float/rollover valves for serviceable condition, leakage and corrosion. Inspect for loose or missing hardware. Repair or replace vent float/rollover valve as required.

4. Fuel Quantity Probe Inspection

(1). Inspect probe wire harness electrical connector for serviceable conditional.

(2). Inspect for bent or broken pins, frayed or broken wires. Repair or replace as required,

5. Fuel System Vacuum Leak Inspection

(Ref. Figure 601) Water, ice, dirt, fungus or a few pinhole leaks in the supply system between the fuel tank sump pickup and engine driven fuel pump may cause power surges, deceleration and, or flameout. A vacuum leak inspection will determine whether or not air is being drawn into the engine fuel supply system.

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST801	Hand operated vacuum pump kit

WARNING **Air entering the airframe fuel supply lines may cause a power reduction or flameout. Fuel system vacuum leak check and fuel air bleed procedures must be performed after opening the fuel supply system for any reason, prior to releasing helicopter for flight.**

(1). Remove left fuel cell floor access panel.

(2). Pull FUEL shutoff valve knob out to stop. Verify that fuel shutoff valve lever is hard against its OFF stop.

(3). In engine compartment; remove and plug the motive fuel line at the CEFA.

(4). Assemble vacuum pump (ST801) hoses, filter port adapter, shutoff valve and vacuum gauge.

(a). Install the vacuum gauge in the line between the filter port adapter and shutoff valve. Attach the vacuum pump above the shutoff valve.

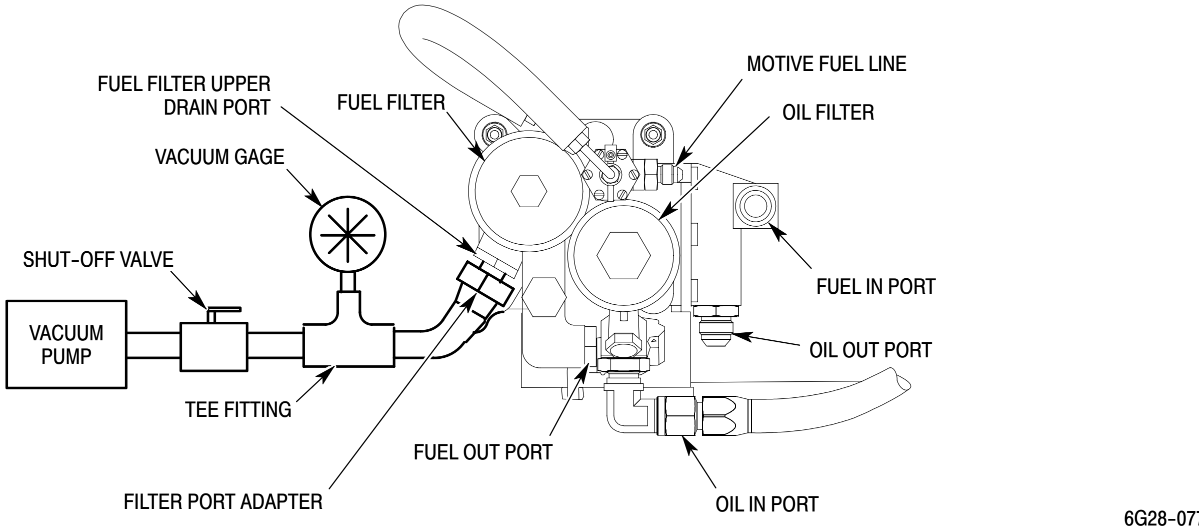


Figure 601. Fuel System Vacuum Leak Inspection

(5). Attach vacuum test pump to engine fuel filter upper drain port. Apply 8.0 Hg vacuum. Close vacuum line shutoff valve.

(6). Fuel system shall hold vacuum between 8.0 and 7.5 Hg for two minutes.

(7). If test is satisfactory, remove test vacuum.

(8). Reconnect and torque the fuel vapor return line.

NOTE: Vacuum loss exceeding 0.5 Hg in two minutes indicates a leak in the system between, and including, the fuel shutoff valve and engine.

(9). Retorque fuel line connections and where installed, anti-ice (airframe) fuel filter fittings and line nuts (Ref. Sec. 28-25-00). Repeat vacuum test.

(10). If system continues to leak, disconnect and install airtight caps on lines and fitting ports in a progressive sequence from fuel shutoff valve toward engine. The fuel shutoff and drain valve installations should be especially suspect. Apply vacuum at each stage until leak has been isolated. Replace parts as required.

NOTE: If the vacuum held at 7.5 Hg or better, airframe system seal is satisfactory and leak is due to an engine fuel system problem. Refer to the applicable Allison and Bendix manuals for additional information.

(11). Apply a torque stripe to all effected fuel line fittings and nuts.

6. Drain Valve Inspection

WARNING **Air in the fuel system will cause a power reduction or flameout. Do a fuel system vacuum leak check and fuel system air bleed after opening fuel system to atmosphere and prior to releasing helicopter for flight.**

(1). Inspect tank sump drain valves for leakage and security. No leakage allowed. Replace valve as required.

7. Fuel Cell Inspection

CAUTION

- Do not work on Engineered Fabric Corp. fuel cell in ambient temperatures below 70°F (21°C).
- Do not remove fuel cells unless absolutely required.
- The barrier can be invisibly torn, punctured or cracked by careless handling.
- Do not carry or move cell by its metal fittings.
- Never probe cell material with sharp edged or pointed tools.

NOTE:

- Non- self- sealing and self- sealing cells are primarily a 0.002 inch (0.051 mm) thick nylon barrier membrane sandwiched between lightweight constructions of either rubberized (Uniroyal) or plasticized (Engineered Fabrics Corp.) nylon fabric that protects and strengthens the barrier.
- Self-sealing cells may have one or more thin layers of natural rubber sandwiched between the barrier and fabric plies.

(1). Apply protective tape to all machined metal fittings.

(2). Perform cell inspection on a padded, clean, craft paper covered surface.

(3). Inspect fuel cells per applicable manufacturers requirements (Ref. Sec. 01-00-00).

8. Fuel Cell Leak Inspection

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
N/A	Ammonia
N/A	Cloth, cotton flannel
N/A	Phenolphthalein, crystalline
CM218	Alcohol, denatured
CM810	Leak detector, liquid
CM820	Cheesecloth

Any one of three techniques can be used to find leaks in non-self-sealing and self-sealing fuel cells. The methods are listed in ascending order of effectiveness and complexity in terms of required equipment, materials, time, and effort.

Soap bubble leak inspection.

Phenolphthalein stain inspection.

Liquid stand inspection.

NOTE: The soap bubble and phenolphthalein inspections require the cell to be inflated with air.

(1). Manufacture or supply the following equipment necessary to do soap bubble or phenolphthalein inspections:

(a). Rigid, airtight closures or plugs to seal all cell openings. Fit one cover plate with:

(b). An air pressurization inlet fitting.

(c). A manometer or an extremely accurate and sensitive low pressure air gauge.

A. Soap Bubble Leak Test Procedures

NOTE: Soap bubble test reliability is good for bladder type non-self-sealing cells.

(1). Remove cell from helicopter.

(2). Lay cell out on a padded table. Install cell closures.

(3). Inflate cell to 1/4 psi (1.7 kPa), maximum.

(4). Unless leak is immediately evident, maintain 1/4 psi (1.7 kPa) pressure for two hours to allow any air trapped in cell exterior laps and seams to escape.

(5). Run soap solution around all patches, lap joints, seams, fittings, creases, abrasions and any other suspicious areas. Bubbles will appear over a leak.

(6). Mark leak areas with a white or yellow crayon.

(7). Repair cell as required.

B. Phenolphthalein Stain Inspection Procedures

(1). Remove cell from helicopter.

(2). Lay cell out on a padded table. Install all but one of the cell closures.

(3). Make phenolphthalein solution as follows:

(a). Add 40 grams phenolphthalein crystals to 1/2 gallon (1.9 L) of denatured alcohol (CM218) and stir.

(b). Add 1/2 gallon (1.9 L) of water. Allow to stand 30 minutes. Stir before using.

(4). Pour commercial ammonia on an absorbent cloth in a ratio of one teaspoon (3 ml) per cubic foot of cell capacity (minimum of 10 ml or 3.3 teaspoons).

(a). Place the ammonia saturated cloth inside the cell and install the remaining cover.

(b). Inflate cell with air to 1/4 psi (1.7 kPa) maximum. Maintain 1/4 psi (1.7 kPa) pressure for 15 minutes minimum, before proceeding.

(c). Soak a large white cloth in the phenolphthalein solution. Thoroughly wring cloth out.

(d). Spread and smooth cloth onto cell. Do not let cloth dry out.

(e). A red spot will appear on the cloth where there is a leak in the cell wall. Mark each leak.

(f). Inspect the entire exterior surface of the cell.

(5). Repair cell as required.

C. Liquid Stand Inspection

(1). Remove cell from helicopter and place on a clean, padded, kraft paper covered table.

(2). Fabricate closure plates for each cell opening.

(a). The object is to completely fill the cell and eliminate all air pockets. Equip one of the plates with liquid filler and vent stand pipes at least six inches (15 cm) tall.

(b). Fill the cell with Stoddard solvent, Stanisol or Varsoline.

(c). Permit cell to stand undisturbed for 24 hours.

(d). Inspect paper to determine where cell is leaking.

(e). Change paper as required. Drain, turn over, refill and let cell stand for another 24 hours to ensure liquid has contacted all cell surfaces.

(f). Repair cell as required.

9. Fuel Tank Pressure Leak Test

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
N/A	Manometer

NOTE: Always test and inspect a repaired fuel cell for leaks using soap bubble, phenolphthalein or liquid stand method before installing the cell in the helicopter.

(1). Use the following procedures to check installed fuel tanks and plumbing for leaks.

(a). Plug vent system.

(b). Remove cell floor access panels.

(c). Install manometer and air pressurization equipment.

(d). Apply 2 psi (14 kPa) air pressure for 10 minutes to precondition cells. This forces trapped air from between fuel cells and helicopter structure. If necessary, repeat until cells adjust to contour of cell bay.

(e). Apply 2 psi (14 kPa) air pressure for 15 minutes with no visible, less than 1/4 inch (6.35 mm) drop on manometer. If pressure drop occurs, check all vent plugs, fittings and re-test cells. Repair or replace parts as necessary to eliminate pressure drop.

(f). Unplug vent system. Remove manometer and pressurization equipment.

(g). Install cell floor access panels.

FUEL SYSTEM
REPAIRS

1. Fuel Shutoff Valve Control Cable Repair

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM118	Grease

NOTE: Worn fuel shutoff valve control cables are normally replaced as an assembly.

(1). The only authorized repair is replacement of a missing detent ball, as follows:

(a). Disconnect cable from fuel shutoff valve lever swivel.

(b). Pull plunger out until detent ball hole is visible. Insert detent release rod in plunger. Align notch in detent release rod with plunger detent ball hole.

(c). Apply grease (CM118) between plunger and plunger housing.

(d). Insert detent ball in plunger hole. Push release rod and plunger to full open position.

(e). Rig fuel shutoff valve cable.

2. Fuel Cell Repair

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM219	Methyl-ethyl-ketone
CM603	Patching material
CM604	Patching material
CM605	Fuel cell repair kit
CM607	Cement
CM804	Emery cloth, fine
CM820	Cheesecloth
N/A	Polyethylene plastic, sheet or roll

NOTE: MDHS cannot guarantee the currency, completeness or technical accuracy of fuel cell repair procedures provided herein. Since cell repair materials, techniques, and procedures may be changed or deleted by the cell manufacturers without notice to MDHS light helicopter publications; we strongly recommend that:

(1). Only specially trained personnel are allowed to inspect and repair the fuel cells installed in 369/500/600 series helicopters.

(2). Customers planning to do their own fuel cell repairs must order any required manuals from the applicable cell manufacturer before beginning repair tasks (Ref. Sec. 01-00-00).

(a). Cell inspections, maintenance and repair must be per the cell manufacturers advice and instructions.

(3). Bladder or self sealing fuel cells are supplied to MDHS by Engineered Fabrics Corporation.

CAUTION Use only approved inspection requirements, repair methods, materials and supplies designed for Engineered Fabrics Corp.

(4). Fuel cells produced by Engineered Fabrics Corp. are constructed of Nitrile polyurethane plastic impregnated fabric.

3. Scuff Mark Repair

Fabric exposed by a scuff mark may be buffed, cleaned, coated with cement and allowed to air-dry for 8 hours. No patch is required unless fabric is torn. Install patches where required (Ref. Patch Installation).

4. Reinforcements, Hangers and Splice Repairs

Loose reinforcement edges, hangers or lap splices must be lifted, buffed, cleaned, cemented and cured under pressure per applicable instructions (Ref. Patch Installation).

5. Loose Patch Repair

Replace loose patches with new patch installations (Ref. Patch Installation). Where two opposing patches have been installed over cell wall damage, unless otherwise indicated by inspection, replace only the loose patch.

6. Patch Installation

(1). Drain, remove and thoroughly dry cell as soon as possible after determining cell repair is required. Drying time may be accelerated by keeping cell at 80°F (27°C) and ventilating interior with dry, low pressure air.

(2). Inspect fuel cell.

CAUTION Do not repair tears or holes over two inches (5.08 cm) long using cold patch repair. Do not attempt to repair bonded fittings or corners. Contact Engineered Fabrics Corporation when corner or fitting damage is discovered or when cell wall damage exceeds two inch length limit.

(3). Accomplish fuel cell repair work in temperatures ranging from 60 - 80°F (16 - 27°C) and in less than 50% humidity.

NOTE: Damp air, especially in combination with low temperatures, will cause water to condense on cement applications. Water inhibits patch adhesion.

CAUTION Never expose a dry cell to high temperatures and, or direct sunlight for long periods of time. If repairs will not be started within ten days, prepare cell for storage.

(4). Both sides of a cell must be patched to repair any one hole or tear.

(5). Thoroughly clean cell internal and external repair areas with cheese cloth (CM820) dampened with solvent MEK (CM219).

(a). Collapse cell and expose external damage area on a clean, flat working surface.

(b). Use a greaseless silver pencil to outline patch installation area two inches beyond damage in all directions.

(6). Hand-buff an area 1/2 inch (12.7 mm) larger than space occupied by patch with fine emery cloth (CM804) to provide a roughened substrate for cement application. Do not cut through cell fabric.

(7). Select a patch of #5218 material (CM604) for cell exterior. Trim patch to extend two inches beyond edges and ends of damage in all directions. Tilt scissors to bevel patch edges away from cell surface. Radius all patch corners.

(8). Hand-buff patch gummed surface with fine emery cloth. Ensure entire patch joint surface has been abraded.

(9). Repeat buffing procedures on cell interior surface. Buff internal patch (CM603) trimmed from #5200/5187/5194 sandwich material.

CAUTION Fuel cell and patch contact surfaces must be perfectly clean and dry prior to adhesive and patch application. Rubber and fabric particles, moisture, and fuel or oil from fingers will prevent proper patch/cell adhesive cure and may subsequently provide a leak path. Wear clean, lint free gloves to handle patch and cell after preparing surfaces for cement and patch application.

(10). Install exterior patch first. Wipe cell exterior and patch faying surfaces with clean cheesecloth (CM820) dampened with MEK (CM219).

(a). Continue to wipe cell and patch, changing cheesecloth and applying clean solvent as required, until no stain or particles appear on cheesecloth pad after the last wipe.

CAUTION Use cement sparingly. Two, thin, even coats provide better adhesion than one thick coat.

(11). Position a sheet of polyethylene plastic beneath cell damage to keep cement off opposite cell wall.

NOTE: Determine cement adhesive tack with a test specimen. Apply cement to a piece of buffed, scrap patch material each time cement is spread on cell and repair patch.

(12). Coat patch, test specimen, and fuel cell, including edges of damage, with EC678 cement (CM607). Allow cement to dry 15 minutes before application of a second coat. Allow second coat to dry 15 minutes.

(13). Press a bare knuckle into cement on test specimen. Cement that tears away from skin leaving a rough, finely peaked imprint without transferring to knuckle, is ready for patch installation.

NOTE: Wipe cement with cheesecloth moistened with solvent to reactivate adhesive when required.

(14). A brayer or similar tool is required to systematically roll patch into contact with cell. Apply patch as follows:

(a). Center patch on repair area. Stick one edge down and double check patch alignment. If required, release adhesive by flooding joint with solvent. Check adhesive tack again before proceeding with patch installation.

NOTE: The object of the next step is to get the patch down without trapping any air under it.

(b). Hold free edge of patch off cell. Follow one line and roll tool back-and-forth over patch. Advance toward loose end, 1/4 inch (6.35 mm) per pass until patch is down and free of trapped air.

(c). An alternate technique is to lay prepared patch on a perfectly clean sheet of polyethylene plastic about twice the size of the patch. Locate plastic sheet and patch over cell repair area; then, slip sheet from under patch as patch is rolled down, 1/4 inch (6.35 mm) at a time.

(15). Fabricate two smooth, flat, rigid, metal plates with no sharp edges or corners. Plates must be larger than cemented repair area.

CAUTION Excessive clamp pressure may deform cell and, or squeeze cement out of joint.

(a). Cover both sides of repair with sheet polyethylene plastic or oiled paper large enough to cover entire cemented area.

NOTE: Do not include opposite cell wall in clamp up. Work through cell access opening and arrange cell as necessary to clamp only the wall with the patch installation.

(b). Sandwich repair area and barrier material between pressure plates. Install at least two C-clamps over pressure plates. Equalize clamp pressure.

(16). Do not disturb cell. Maintain pressure for six hours, minimum, after which cell is ready for internal patch installation.

(17). Remove clamps and plates.

(18). Clean patch and cell internal repair area with MEK saturated cheesecloth swabs.

(a). Apply two coats of cement, allowing 15 minutes drying time between coats. Allow 15 minutes for second coat to set.

(b). Install and roll out patch.

(19). Position a barrier sheet under each pressure plate. Clamp and cure installation for a minimum of 24 hours at 60 - 80°F (16 - 27°C) before leak testing and returning cell to service.

7. Loose Edge and Lap Seam Repairs

CAUTION Loose lap seams should be repaired as soon as possible after discovery.

NOTE: Loose lap seam edges not more than two inches long on cell interior or exterior surfaces may be repaired. Seam separation repairs require buffing, cementing and a patch installation.

(1). Lift seam separation and buff flap and cell faying surfaces with emery cloth (CM804).

(a). Buff an area on exterior surface extending 2 inches (5.08 cm) in all directions from seam separation.

CAUTION

- Fuel cell and patch contact surfaces must be perfectly clean and dry prior to adhesive and patch application. Rubber and fabric particles, moisture, and fuel or oil from fingers will prevent proper patch/cell adhesive seal and may subsequently provide a leak path. Wear clean, lint free gloves to handle patch and cell after preparing surfaces for cement and patch application.
- Careless application of compressed air between lap joints may separate seam further.

(b). Either air-vacuum or blow buffing dust out of separation with dry, low pressure, compressed air.

(c). Wipe inside and outside of repair area clean with cheesecloth (CM820) moistened with MEK (CM219). Continue wiping with fresh solvent dampened cheesecloth as required until no stain or particle appears on the swab after the last wipe. Allow area to dry.

CAUTION Use cement sparingly. Two thin, even coats provide better adhesion than one thick coat.

NOTE: Determine cement adhesive tack with a test specimen. Apply cement to a piece of buffed, scrap patch material each time cement is spread on cell and repair patch.

(d). Apply two coats of EC678 cement (CM607) allowing 15 minutes between applications. Allow second coat to dry 15 minutes.

(e). Roll separation together starting from the bottom of the pocket toward the open end, 1/4 inch (6.35 mm) per pass. Ensure no air is trapped underneath.

(f). Cover repair with a sheet of polyethylene plastic or oiled paper large enough to cover entire cemented area.

(2). Fabricate two smooth, flat, rigid, metal plates with no sharp edges or corners. Plates must be larger than cemented repair area.

CAUTION Excessive clamp pressure may deform cell and, or squeeze cement out of joint.

(a). Cover both sides of repair with polyethylene plastic or oiled paper sheets large enough to cover entire cemented area.

NOTE: Do not include opposite cell wall in clamp up. Work through cell access opening and arrange cell as necessary to clamp only the wall containing the seam repair.

(3). Sandwich cell wall repair area and barrier material between pressure plates. Install at least two C-clamps over pressure plates. Equalize clamp pressure.

(4). Do not disturb cell. Maintain pressure for six hours, minimum, after which cell is ready for patch installation.

(a). Remove clamps and plates.

(5). Use #5200/5187/5194 sandwich patch material on cell interiors.

(6). Use #5218 patch material on cell exterior surfaces.

(7). Prepare cell wall and patch for installation per (Ref. Patch Installation): Install patch.

8. Blister Repair

Blisters can occur on cell interior and exterior surfaces. blisters are caused by a separation of the cell laminates and may contain air or a combination of air and fuel.

NOTE: Exterior blisters that contain fuel indicate that the barrier has been penetrated. Blisters inside cell measuring under one inch diameter are acceptable and need not be disturbed.

(1). Repair blisters as follows:

(a). Buff surface of blister and area extending two inches (5.08 cm) in all directions from its edge.

CAUTION Avoid damaging nylon barrier membrane. Do not probe, cut, or puncture blisters with tool perpendicular to cell wall.

(b). Slit blister open with an X cut to expose all of the delaminated surface. Lift flaps and mop interior with clean cheesecloth (CM820) and MEK (CM219). Buff underlying cell surface and blister flaps with emery cloth (CM804). Air-vacuum or blow away all traces of buffing dust.

(c). Wipe inside and outside of repair area clean with cheesecloth moistened with solvent or MEK. Continue wiping with fresh solvent dampened cheesecloth as required until no stain or particle appears on the swab after the last wipe. Allow area to dry.

CAUTION Use cement sparingly. Two, thin, even coats provide better adhesion than one thick coat.

NOTE: Determine cement adhesive tack with a test specimen. Apply cement to a piece of buffed, scrap patch material each time cement is spread on cell and repair patch.

(d). Apply two coats of EC678 cement allowing 15 minutes between applications. Allow second coat to dry 15 minutes.

(e). Roll blister together starting from the bottom of each flap pocket toward the open end, 1/4 inch (6.35 mm) per pass. Ensure no air is trapped underneath.

(2). Fabricate two smooth, flat, rigid, metal plates with no sharp edges or corners. Plates must be larger than cemented repair area.

CAUTION Excessive clamp pressure may deform cell and, or squeeze cement out of joint.

(a). Cover both sides of repair with polyethylene plastic or oiled paper sheets large enough to cover entire cemented area.

NOTE: Do not include opposite cell wall in clamp up. Work through cell access opening and arrange cell as necessary to clamp only the wall containing the blister repair.

(3). Sandwich cell wall repair area and barrier material between pressure plates. Install at least two C-clamps over pressure plates. Equalize clamp pressure.

(4). Do not disturb cell. Maintain pressure for six hours, minimum, after which cell is ready for patch installation; remove clamps and plates.

(5). Use #5200/5187/5194 sandwich patch material on cell interiors.

(6). Use #5218 patch material on non-self-sealing cell exterior surfaces.

(7). Prepare cell wall and patch for installation per instructions for Patch Installation. Install patch.

(8). Heat soak transmitter assembly in an oven set at 100°F (38°C), maximum for one hour to vaporize trapped volatiles. A heat gun may be used as an alternate drying method. Pot transmitter electrical connections with sealing compound MIL-S-8802 (CM425).

Section

28-25-00

Anti-Ice / Airframe | Fuel Filter (369D/E - 500/600N)

ANTI-ICE/AIRFRAME FUEL FILTER DESCRIPTION AND OPERATION

Table 1. Anti-Ice Fuel Filter Effectivity

Installation	Model & Production Number	Features
369H90022-BSC	369D, 003 and subsequent	Helicopters equipped with slimline instrument panel.
369H90022-503	369E, 001 and subsequent	Helicopters equipped with T-instrument panel.
369H90022-505	500N, 001 and subsequent	Helicopters equipped with T-instrument panel.
600N98110-501	600N, 003 and subsequent	Helicopters equipped with T-instrument panel.

NOTE: Anti-ice / airframe fuel filter is not certified for installation on C30 engine installation.

NOTE: On the 600N helicopter, the airframe fuel filter is not certified as an anti-ice fuel filter. Throughout this section, the airframe fuel filter will be refered to as an anti-ice fuel filter.

1. Description

(1). The airframe mounted anti-ice fuel filter is installed on the aft face of the firewall upstream of the engine fuel pump filter. The 10 micron, 500 square inch disposable filter element strips ice and other solids from the fuel before it enters the engine fuel system.

2. Operation

(1). A flow pressure sensing switch in the filter body furnished with all installations closes when flow differential pressure across the filter drops to a preset level.

(2). On the 369H90022-BSC installation, pressure switch contact closure directs 28Vdc current across the S2 contacts of the **FUEL FILTER** relay K254 to activate the RT170-277 time delay relay (TDR). The TDR energizes relay K254 after a two to five second delay, closing switches S1, S2, and S3; energizing the **FUEL FILTER** caution light, start pump and **START PUMP ON** light.

(3). On 369H90022-503, -505 and 600N98110-501 fuel filter installations, pressure switch closure only advises the pilot of an impending or total fuel filter blockage by lighting the **AIRFRAME FILTER** caution lamp in the caution/ warning panel. The pilot must manually set the **START PUMP** switch **ON** to pressurize the fuel system.

(4). On all installations, total filter blockage forces a filter bypass valve in the filter body open to second supply unfiltered fuel to the engine.

(5). Pressing the **FUEL FILTER** caution light/switch supplied with 369H90022-BSC installations resets relay K254 and the time delay relay, shuts down the start pump and **START PUMP ON** light and switches off the **FUEL FILTER** caution light.

(6). The caution light dimmer switch on the lower left control panel of -BSC installations controls only **FUEL FILTER** caution light intensity with **DIM** or **BRT** positions. **FUEL FILTER** caution lamp test is executed with the **PRESS TO TST WARN LT** switch on the caution/warning light panel.

(7). On -503, -505 and -501 installations, caution light intensities, including the **AIRFRAME FILTER** light are controlled through the **WARN LT DIM** potentiometer on the pedestal switch panel.

(8). Circuit protection is provided by the 7.5 ampere anti-ice **FUEL FILTER** circuit breaker on the anti-ice fuel filter panel.

CAUTION Determine why a circuit breaker popped before pushing the reset button (Ref. Table 101).

(9). A press-to-test button located on top of the filter body is featured in all installations. Pressing the button simulates a blocked filter condition for power-on ground test.

(10). On all installations, a filter bowl drain valve plumbed into the drain manifold provides for filter draining and fuel sampling.

WARNING **Air in the fuel system will cause a power reduction or flameout. Do a fuel system vacuum leak check and system air bleed after opening fuel system to atmosphere and prior to releasing helicopter for flight. Ensure start/boost pump is operating before taking fuel samples from system drain valves.**

(11). Refer to Table 101 for anti-ice fuel filter fault isolation information.

ANTI-ICE/AIRFRAME FUEL FILTER FAULT ISOLATION

NOTE: On the 600N helicopter, the airframe fuel filter is not certified as an anti-ice fuel filter. Throughout this section, the airframe fuel filter will be refered to as an anti-ice fuel filter.

1. Anti-Ice Fuel Filter System Fault Isolation

Table 101. Anti-Ice Fuel Filter System Fault Isolation

Symptom	Probable Trouble	Corrective Action
FUEL FILTER caution lamp does not light.	No power. Battery switch **OFF**.	Supply power. Set battery switch to **BATT** or **EXT PWR** position.
	Circuit breaker reset button pulled out. (369D/E - 500N)	Press circuit breaker reset button.
	Defective wiring or connection.	Locate circuit defect and repair as required.
FUEL FILTER caution light on.	System not reset.	Press **FUEL FILTER** caution light to reset.
	Clogged fuel filter.	Drain filter bowl into a suitable container. Inspect sample for foreign substances. Remove and replace filter element.
	Defective wiring.	Locate circuit defect and repair as required.
START PUMP ON lamp fails to light.	No power. Battery switch **OFF**.	Supply power. Set battery switch to **BATT** or **EXT PWR**.
	Circuit breaker reset button pulled out. (369D/E - 500N)	Press circuit breaker reset button.
	Defective lamp.	Replace lamp.
	Defective wiring.	Locate circuit defect and repair as required.

ANTI-ICE/AIRFRAME FUEL FILTER MAINTENANCE PRACTICES

NOTE: On the 600N helicopter, the airframe fuel filter is not certified as an anti-ice fuel filter. Throughout this section, the airframe fuel filter will be refered to as an anti-ice fuel filter.

1. Anti-Ice Fuel Filter Replacement

(Ref. Figure 201)

A. Anti-Ice Fuel Filter Removal

WARNING **Prevent fuel vapor ignition. Turn OFF and disconnect all electrical power. Electrically ground helicopter before opening fuel system.**

(1). Disconnect battery and external power (Ref. Sec. 96-05-10).

(a). Pull **FUEL VALVE** knob to close fuel shut off valve.

(b). Open engine access doors.

(c). Drain fuel from filter bowl and supply line drain valves.

(d). Unclamp and disconnect filter drain tube.

(e). Remove fuel supply hose between engine driven fuel pump and anti-ice filter. Cap hose ends and fittings.

(f). Remove hose assembly between anti-ice filter and firewall fitting. Cap hose ends and fittings.

(g). Remove anti-ice filter electrical connector.

(h). Unbolt and remove filter body assembly.

(i). Unscrew filter bowl from body, as required.

B. Anti-Ice Fuel Filter Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM113	Anti-seize compound low temperature

(1). Attach assembled filter to bracket with bolts, washers and spacers. Torque bolts **50 - 70 inch-pounds (5.65 - 7.91 Nm)**. Install lockwire.

(a). Apply a thin coat of anti-seize compound (CM113) to all male fuel line fittings.

CAUTION Do not twist hoses while torquing hose nuts. Use a backup wrench to stabilize hose.

(b). Install hose between filter and engine. Install hose between filter and firewall fitting. Torque hose nuts **230 - 260 inch-pounds (25.99 - 29.38 Nm)**.

(c). Connect wire harness connector to fuel filter plug.

(d). Connect drain tube to filter drain valve. Clamp tube to valve with lockwire.

WARNING **Air in the fuel system will cause a power reduction or flameout. Do a fuel system vacuum leak check and system air bleed after opening fuel system to atmosphere and prior to releasing helicopter for flight. Ensure start pump is operating before taking fuel samples from system drain valves.**

(e). Perform a fuel system vacuum leak check (Ref. Fuel System Vacuum Leak Check).

(f). Bleed fuel system (Ref. Fuel System Air Bleed).

2. Fuel System Air Bleed

WARNING **Prevent fuel vapor accumulation, ignition and fire. Perform work in an open, well ventilated area away from all potential ignition sources. Attach helicopter to an approved electrical ground. Wear approved eye protection.**

CAUTION Do not operate start pump in an empty fuel tank.

NOTE: The object of fuel system bleeding is to remove all air trapped in the fuel supply system.

(1). Refuel helicopter as required.

(a). Connect battery.

(b). Open engine access doors.

(c). In crew compartment; push **FUEL** shutoff valve knob in to open shutoff valve.

(d). Set helicopter master switch to **BATT**.

(e). Set **START PUMP** switch **ON** to pressurize fuel system. Check start pump for operation.

(f). Loosen engine filter bowl plug. Let fuel flow until a steady, bubble free, uninterrupted fuel stream emerges without any evidence of trapped air. Tighten plug.

(2). Refer to applicable Allison Engine Operation and Maintenance Manual for specific engine fuel system air bleed information.

(a). Purge air from engine fuel system per Allison Engine Operation and Maintenance Manual.

(3). Set **START PUMP** and battery switches **OFF**.

(4). Reassemble drain system as required and install lockwire.

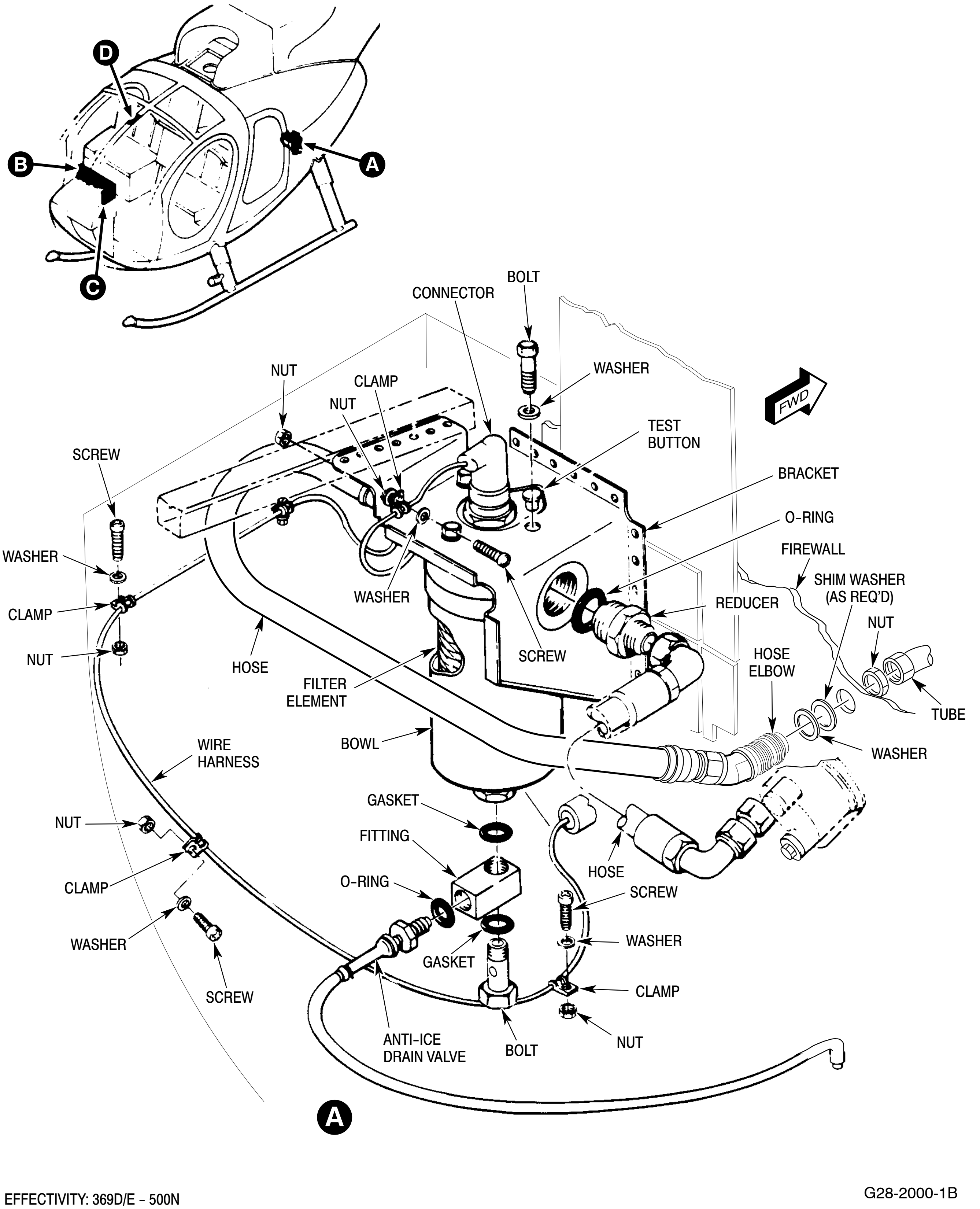


Figure 201. Anti-Ice Fuel Filter (Sheet 1 of 3)

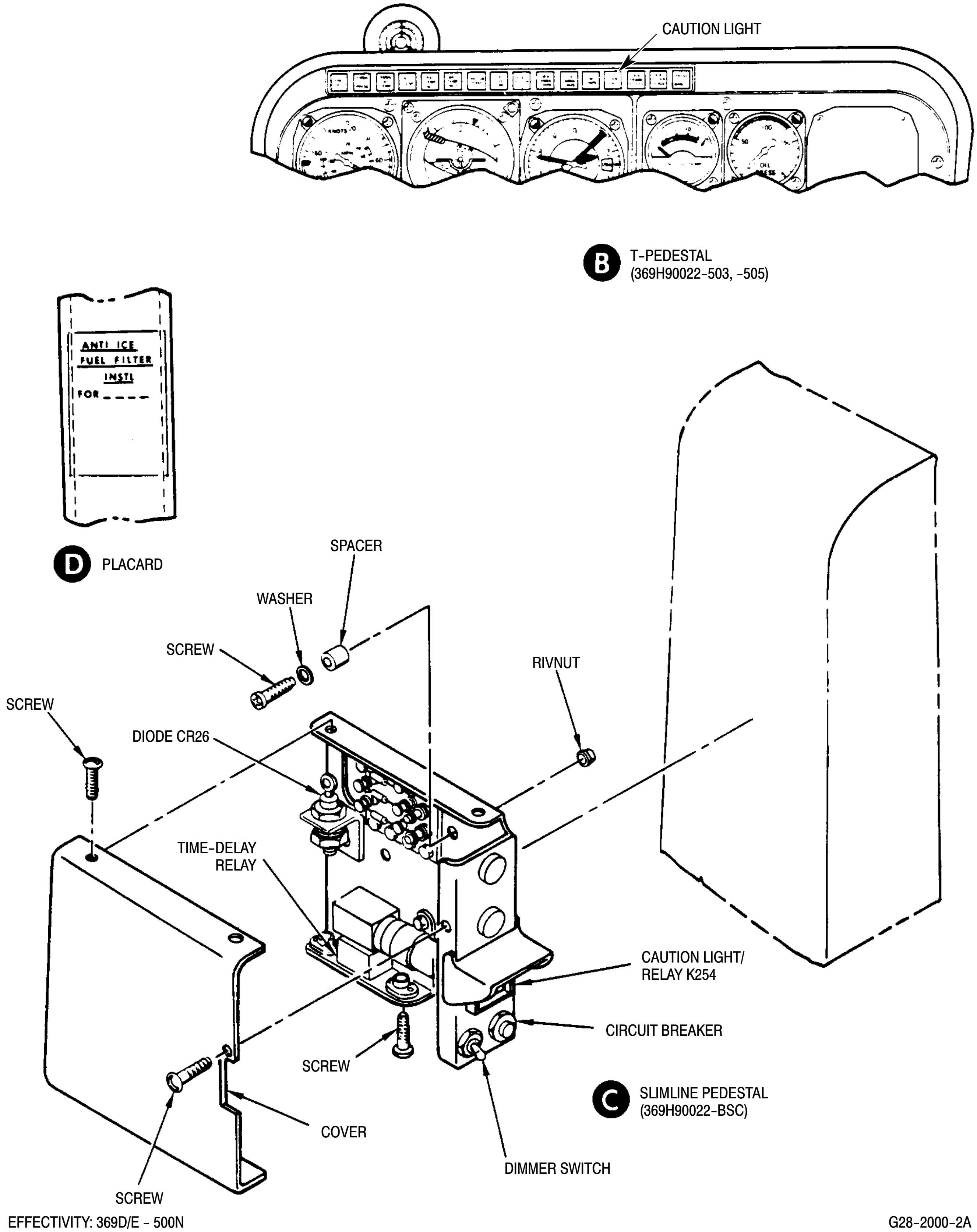
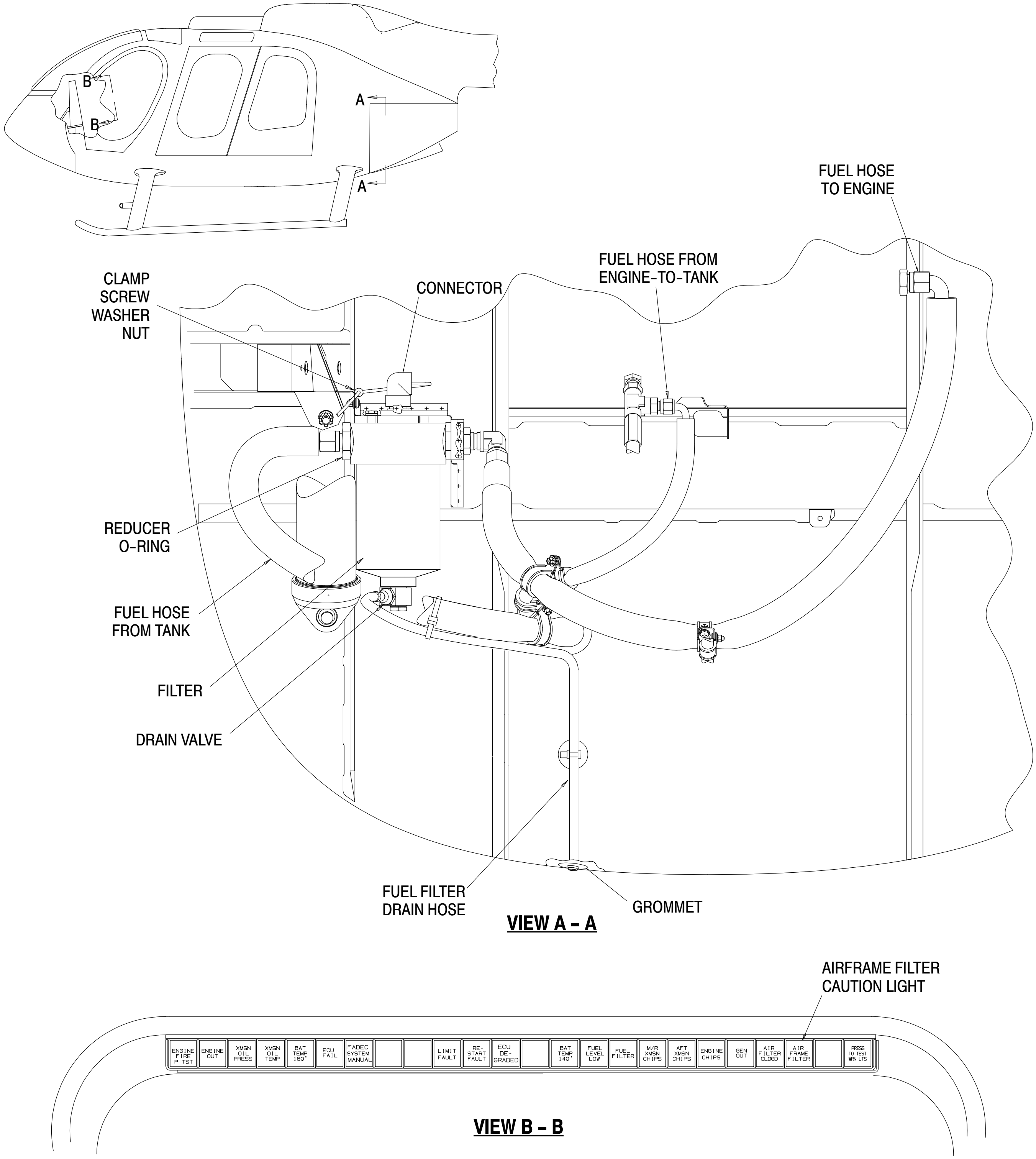


Figure 201. Anti-Ice Fuel Filter (Sheet 2 of 3)



EFFECTIVITY: 600N

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Figure 201. Anti-Ice Fuel Filter (Sheet 3 of 3)

ANTI-ICE/AIRFRAME FUEL FILTER INSPECTION/CHECK

NOTE: On the 600N helicopter, the airframe fuel filter is not certified as an anti-ice fuel filter. Throughout this section, the airframe fuel filter will be refered to as an anti-ice fuel filter.

1. Anti-Ice Fuel Filter System Inspection

CAUTION A one time diode inspection and polarity check is mandatory for helicopters equipped with a 369H90022-BSC anti-ice fuel filter installation and, or 369H90118 auto- reignition installation on helicopters delivered in 1979. The following procedures address only the anti-ice fuel filter installation.

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
N/A	Ohmmeter
N/A	Voltmeter

(1). Determine ohmmeter lead polarity with voltmeter.

(a). In crew compartment; remove cover from anti-ice caution/warning light panel.

(b). Find part number stamped on diode C26 (Ref. Figure 201).

(c). Diodes, part numbers 1N3210 do not require a polarity check.

(d). Replace diodes, part number 1N3210R with a new part number 1N3210 diode.

(e). If the diode is unidentifiable, test diode to determine polarity.

1). Check for low forward resistance with ohmmeter positive lead attached to terminal end and negative lead attached to stud end. Reverse leads and check for very high resistance.

(f). Replace diode with a new 1N3210 unit if polarity is reversed.

(g). Do an anti-ice fuel filter functional check (Ref. Anti-Ice Fuel Filter Installation Operational Check: 369H90022-BSC).

(2). Inspect wiring for damage and security. Repair or replace damaged components.

WARNING **Air in the fuel system will cause a power reduction or flameout. Do a fuel system vacuum leak check and system air bleed after opening fuel system to atmosphere and prior to releasing helicopter for flight. Ensure start pump is operating before taking fuel samples from system drain valves.**

(3). Inspect fuel system as follows:

(a). Apply external power to the helicopter.

(b). Open the engine compartment doors.

(c). Set battery switch to **EXT PWR**.

(d). Push **FUEL VALVE** knob in to open fuel shutoff valve.

(e). Set **START PUMP** switch; **ON**. Check start pump operation.

NOTE: Failure to drain in freezing temperatures may be due to ice buildup.

(f). Drain several ounces of fuel from filter bowl into a suitable container. Inspect sample for solids and water contamination. Dismantle and clean filter bowl as required. Replace filter element.

(g). Inspect hose assemblies for evidence of leakage, swelling or dampness, kinks, cuts, twists, tears and fraying. Check hose nut threads for damage. Replace damaged parts.

(h). Disconnect drain tubes from drain valves. Check each drain valve for leakage. Replace damaged drain valves.

(i). Inspect filter fuel line fittings for leakage. Repair or replace parts as required.

(j). Connect drain tubes to drain valves. Inspect drain tubes for security and correct routing without fluid traps or kinks.

(k). Inspect fuel filter press-to-test button for security.

2. Anti-Ice Fuel Filter Installation Operational Check: 369H90022-BSC

NOTE: The system may be operated with a fully charged battery that can provide more than the 23.8 Vdc required to actuate system solenoids. If battery state is an unknown, use external power.

(1). Apply external power to the helicopter. Set battery switch to **EXT PWR**.

(a). Reset **PNL LT** and **FUEL ANTI-ICE** circuit breakers.

(b). Press **PRESS TO TST WRN LT** on the caution/warning light panel. Check entire caution/warning light array. Replace lamps as required.

(c). Push **FUEL VALVE** knob in to open fuel shutoff valve.

(d). Open the engine compartment doors.

(2). Press the red press-to-test button on top of the filter body for five or more seconds. Test results shall be as follows:

(a). **FUEL FILTER** caution light comes on.

(b). **START PUMP ON** indicator light comes on and start pump pressurizes fuel system.

(3). Release the press-to-test button.

(a). **FUEL FILTER** and **START PUMP ON** lights remain on and start pump continues to operate.

(4). Press **FUEL FILTER** caution light to reset system. Result shall be:

(a). **FUEL FILTER** caution light goes out.

(b). **START PUMP ON** indicator light goes out.

(c). Start pump stops running.

(5). Inspect fuel system for leakage.

3. Anti-Ice Fuel Filter Installation Operational Check: 3659H90022-503, -505 and 600N98110-501

(1). Apply external power to the helicopter. Set battery switch to **EXT PWR**.

(a). Reset **PNL LT** circuit breaker.

(b). Press **PRESS TO TST WRN LT** on the caution/warning light panel. Check entire caution/warning light array. Replace lamps as required.

(c). Push **FUEL VALVE** knob in to open fuel shutoff valve.

(2). Set **START PUMP** switch **ON**.

(a). **START PUMP ON** indicator light comes on and start pump pressurizes fuel system.

(3). Open the engine compartment doors.

(4). Press the red press-to-test button on top of airframe filter body. Result shall be:

(a). **AIRFRAME FILTER** caution light comes on.

(5). Release the press-to-test button.

(a). **AIRFRAME FILTER** caution light goes out.

(6). Set **START PUMP** switch **OFF**.

(7). Inspect fuel system for leaks.

4. Fuel System Vacuum Leak Check

(1). Fuel is drawn out of the tank by the engine driven fuel pump when the start pump is switched off. Water, ice, dirt, fungus, trapped air or a few pinhole leaks in the supply system between the fuel tank sump pickup and engine combustion chamber nozzles may cause power surges, deceleration and, or flameout. A vacuum leak inspection will determine whether or not air can be drawn into the fuel system by the engine driven fuel pump.

(2). An automotive vacuum test pump and hardware that will provide 8 Hg vacuum or better is required to do the vacuum leak check.

(3). Assemble vacuum pump, hoses, filter port adapter, shutoff valve and vacuum gage as follows:

(a). Insert a vacuum gage in the vacuum hose between the engine fuel filter port adapter and vacuum shutoff valve. Attach the vacuum pump to the vacuum hose above the shutoff valve.

(b). Plug vacuum hose and pull 5 - 10 Hg vacuum. Apparatus should hold the selected pressure indefinitely. Repair leaky equipment before proceeding with fuel system test.

(c). Open engine access doors.

(d). Remove left fuel cell floor access panel.

(e). In crew compartment; pull **FUEL** shutoff valve knob out to stop. Verify that fuel shutoff valve lever on left fuel cell access cover is hard against its **OFF** stop. Rig control cable as required.

(f). In engine compartment; remove the upper drain plug from the fuel pump filter bowl.

(4). Disconnect the fuel bleed return line at Sta. 124.00 (if equipped) and cap off.

(5). Attach vacuum test apparatus to engine fuel filter upper drain port.

(a). Apply 8 Hg vacuum. Close vacuum line shutoff valve.

(b). Fuel system shall hold vacuum between 8 and 7.5 Hg for two minutes.

(c). If test is satisfactory, remove test apparatus. Inspect and replace filter plug O-ring as required. Install filter plug.

(6). Vacuum loss exceeding 0.5 Hg in two minutes indicates a leak somewhere in the system between the fuel shutoff valve and engine.

(a). Torque fuel line connections (Ref. Table 601). Repeat vacuum test.

(b). If system continues to leak, disconnect and install airtight caps or plugs in tubes, hoses and fitting ports in a progressive sequence from fuel shutoff valve toward engine. The fuel shutoff and drain valve installations should be especially suspect. Apply vacuum at each stage until leak has been isolated. Replace parts as required.

(c). Apply a torque stripe to all effected fuel line fittings and nuts.

(d). If the airframe system vacuum held at 7.5 Hg or better, system seal is satisfactory and malfunction is probably due to an engine system leak. Refer to the applicable Allison and Bendix manuals for additional information.

Table 601. Fuel Supply System Torque Values

Item & Location	Torque Range Inch-Pounds (Nm)
Tube end-nuts; fuel shutoff valve; Sta. 124.00 Blkhd elbow	230 - 260 (25.99 - 29.38)
Blkhd elbow jamnut; Sta. 124.00	145 - 155 (16.38 - 17.51)
Three-port elbow jamnuts	145 - 155 (16.38 - 17.51)
Anti-ice filter drain fitting bolt	185 - 200 (20.90 - 22.60)
Anti-ice filter in/out reducers	550 - 600 (62.14 - 67.79)
Hose end-nuts; firewall/filter	230 - 260 (25.99 - 29.38)
Hose end-nuts; filter/engine	230 - 260 (25.99 - 29.38)
Drain valves (all)	95 - 105 (10.73 - 11.86)

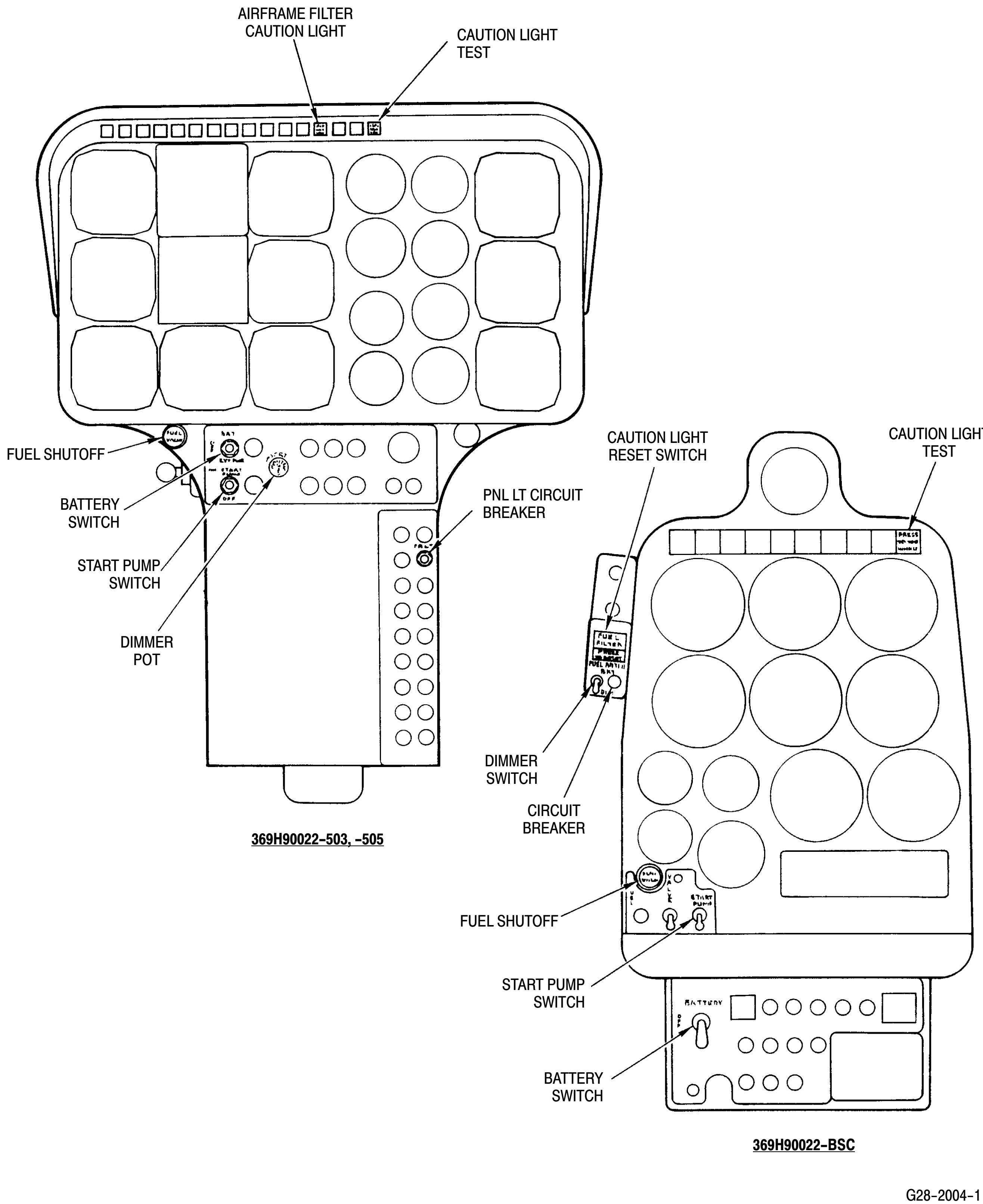


Figure 601. Anti-Ice Fuel Filter Controls (Sheet 1 of 2)

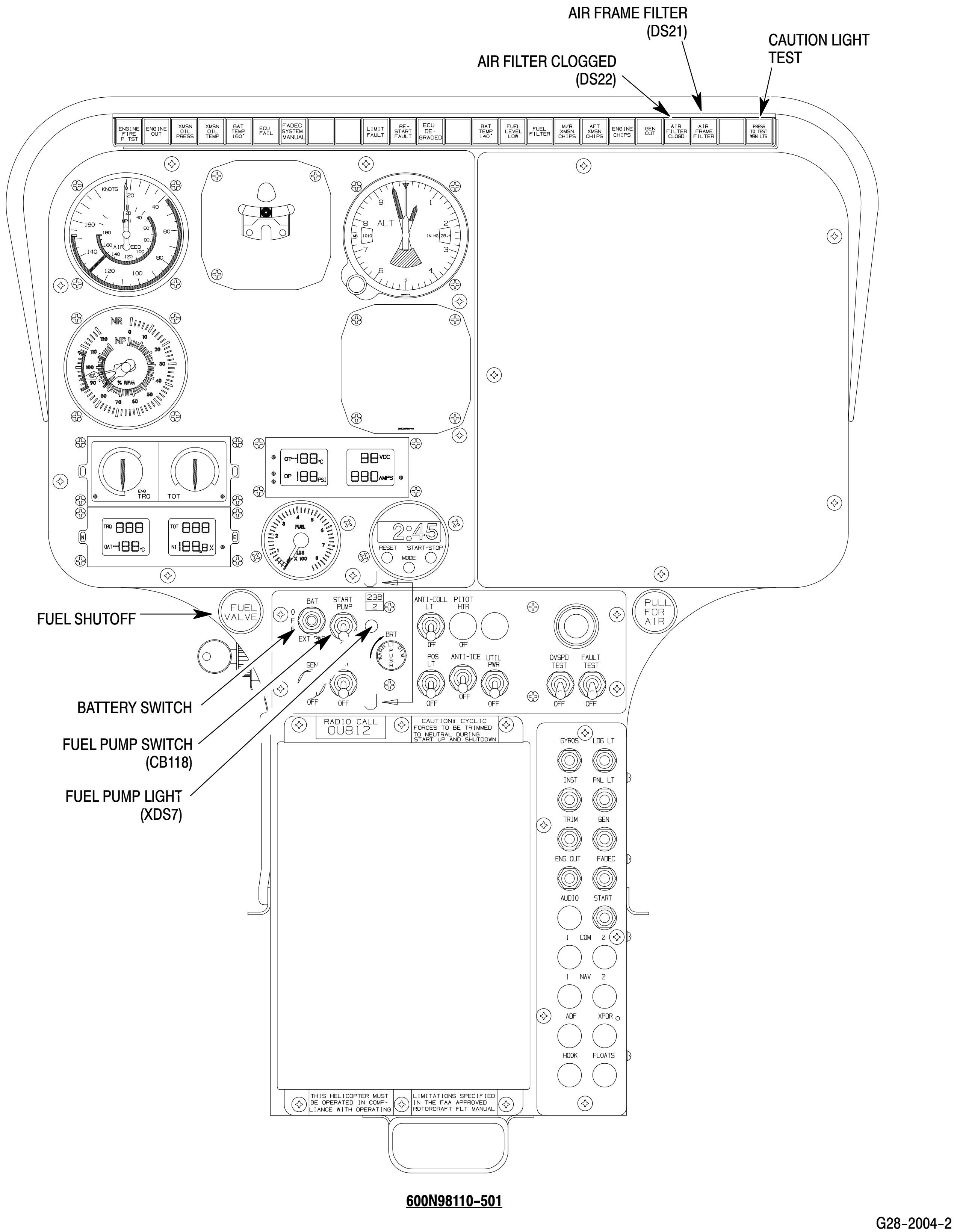


Figure 601. Anti-Ice Fuel Filter Controls (Sheet 2 of 2)

ANTI-ICE/AIRFRAME FUEL FILTER INITIAL INSTALLATION

NOTE: On the 600N helicopter, the airframe fuel filter is not certified as an anti-ice fuel filter. Throughout this section, the airframe fuel filter will be refered to as an anti-ice fuel filter.

1. Anti-Ice Fuel Filter Initial Installation

A. Preparations for Installation

WARNING **Prevent fuel vapor ignition. Turn OFF and disconnect all electrical power. Attach helicopter to approved grounding points before opening fuel system.**

(1). Disconnect external power and battery.

(2). Remove aft compartment seats.

(3). Remove aft upper left bulkhead panel.

(4). Remove lower aft bulkhead panel.

(5). Remove pilot compartment left floor access door.

(6). Remove instrument panel hood and left fairing.

(7). Pull **FUEL VALVE** knob to close fuel shut off valve.

B. Anti-Ice Fuel Filter Control Panel Installation: 369H90022-BSC

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM430	Sealant, solvent resistant

(1). Pull filter wire harness forward through conduit and along an existing wire bundle to instrument pedestal. Secure to engine compartment airframe with clamps, screws, washers and nuts and to wire bundle with ty-raps (Ref. Figure 901).

(2). Use anti-ice fuel filter subpanel as a template on left side of slimline pedestal and drill three 0.219 inch (5.56 mm) diameter holes in pedestal.

(3). Make cutout shown in instrument pedestal fairing.

(4). Deburr holes and cutout edges. Remove debris.

(5). Install rivnut and attach anti-ice fuel filter panel to instrument pedestal with screws, washers and spacers.

(6). Connect wires (Ref. Figure 903).

(7). Install cover and screws.

(8). Install **ANTI-ICE FUEL FILTER INSTALLATION** placard decal on heater duct three inches (7.62 cm) above standby compass bracket. Roll placard edges to follow duct contour.

(9). Seal both ends of electrical conduit with silicone adhesive/sealant (CM430).

C. Anti-Ice Fuel Filter Control Panel Installation: 369H90022-503, and -505

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM430	Sealant, solvent resistant

(1). Pull fuel filter wire harness forward through conduit and along an existing wire bundle to instrument pedestal.

(2). Secure wire to engine compartment airframe with clamps, screws, washers and nuts and to wire bundle with ty-raps (Ref. Figure 901).

(3). Install 20 gage bus wire and insulating sleeve on back side of caution light DS31 (Ref. Figure 904).

(4). Remove fourth plug from the right on caution/warning light panel.

(5). Wire and connect electrical system (Ref. Figure 904).

(6). Install caution light in panel.

(7). Install **ANTI-ICE FUEL FILTER INSTALLATION** placard decal on heater duct three inches (7.62 cm) above standby compass bracket. Roll placard edges to follow duct contour.

(8). Seal both ends of electrical conduit with silicone adhesive/sealant (CM430).

D. Anti-Ice Fuel Filter Control Panel Installation: 600N98110-501

(Ref. Figure 601)

(1). To install caution/warning light:

(a). Remove third plug from the right on caution/warning light panel.

(b). Install caution light in panel.

(c). Install 22 gage jumper wire on back side of caution lights between DS21C and DS22C.

(d). Run O506D22 wire from DS21-2 to P12-14 and secure to existing wires.

(2). To install fuel pump switch and light:

(a). Remove edge-lighted switch panel.

(b). Remove tape from start pump switch and light holes in instrument panel.

(c). Install CB118 in panel.

(d). Run 22 gage jumper wire from CB115-1 to CB118-1.

(e). Run Q1169A22 wire from CB118-2 to TB503-2-2.

(f). Install light (XDS7) from back side of panel.

(g). Run E1181A22 wire from P13-46 to XDS7.

(h). Run E1181B22N wire from XDS7 to E31-E.

(i). Reinstall edge-lighted switch panel.

(3). Install **ANTI-ICE FUEL FILTER INSTALLATION** placard decal on heater duct three inches (7.62 cm) above standby compass bracket. Roll placard edges to follow duct contour.

E. Firewall Modifications and Bracket Installation

(Ref. Figure 901 for 369H90022-BSC, -503 and -505)

(Ref. Figure 902 for 600N96110-501)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

(1). Open engine access doors.

(2). Drain fuel from supply lines into a suitable container.

(3). Remove fuel supply hose between engine driven fuel pump and firewall fitting elbow. Cap hose ends, firewall elbow and fuel pump port.

(4). Reposition firewall elbow 18 - 22° clockwise (Ref. view A).

CAUTION Do not score, scratch or gouge firewall surface when trimming insulation blanket.

(5). Lay out and remove insulation strips from firewall to eliminate interference with filter support bracket installation.

(6). Position doubler on Sta. 124.00 firewall. Identify, mark and drill-out existing rivets used in doubler installation. Do not enlarge rivet holes.

(7). Locate doubler on firewall forward surface. Drill doubler through existing rivet holes.

(8). Deburr holes and remove debris.

(9). Cleco doubler to firewall.

(10). Apply primer (CM318) to rivet holes and rivets.

(11). Install rivets while primer is wet.

(12). Use filter support bracket as a template. Mark and drill filter bracket rivet holes.

(13). Deburr holes and remove debris.

(14). Cleco bracket in position.

(15). Apply primer to rivet holes and rivets.

(16). Rivet bracket in place while primer is wet.

(17). Install electrical bonding jumper between bracket and airframe.

(18). Position double aft of Sta. 124.00 between LBL 4.250 and LBL 8.450. Drill rivet holes and cleco in place.

(19). Drill hole for drain hose.

(20). Remove doubler , deburr and remove debris.

(21). Apply primer (CM318) to rivet and drain holes.

(22). Install doubler while rivets are still wet.

F. Fuel Filter Installation

WARNING **Air in the fuel system will cause a power reduction or flameout. Do a fuel system vacuum leak check and system air bleed after opening fuel system to atmosphere and prior to releasing helicopter for flight. Ensure start pump is operating before taking fuel samples from system drain valves.**

(Ref. Figure 901 for 369H90022-BSC, -503 and -505)

(Ref. Figure 902 for 600N96110-501)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM113	Anti-seize compound low temperature
CM438	Adhesive, epoxy

(1). Remove engine gearcase cooling duct clip and attaching hardware.

(2). Drill a 0.250 inch (6.35 mm) diameter hole and relocate clip.

(3). Install filter assembly on bracket with bolts, washers and spacers. Torque bolts **50 - 70 inch-pounds (5.65 - 7.91 Nm)**. Install lockwire.

(4). Apply a thin coat of anti-seize compound (CM113) to fitting-bolt threads. Stack fitting and gaskets on bottom of filter. Install and torque bolt **185 - 200 inch-pounds (20.90 - 22.60 Nm)**.

(5). Lubricate drain valve O-ring packing with clean jet fuel and install on drain valve. Apply a thin coat of anti-seize compound to drain valve threads.

(6). Install drain valve with O-ring packing on fuel filter drain fitting. Torque drain valve **95 - 105 inch-pounds (10.73 - 11.86 Nm)**.

(7). Install and clamp drain tube to drain valve with lockwire.

NOTE: Provide enough slack in drain tubes to allow unrestrained drain valve operation.

(8). On 600N96110-501 installation, install mount to firewall using adhesive (CM438).

(9). Clamp tube to bulkhead frame or mount at LBL 8.45 with TY-25M TYRAP.

(10). Lubricate the two reducer O-rings with clean jet fuel. Install O-rings on large ends of reducers. Apply a thin coat of anti-seize compound to reducer threads.

(11). Install reducers with O-rings in filter inlet and outlet ports. Torque reducers to **550 - 600 inch-pounds (62.14 - 67.79 Nm).**

CAUTION Do not allow hose to twist when torquing hose nuts. Use a back-up wrench to stabilize hose.

(12). Connect hose between filter outlet port and engine fuel pump filter inlet port. Torque hose nuts **230 - 260 inch-pounds (25.99 - 29.38 Nm)**.

(13). Install hose between filter inlet port and firewall fitting elbow. Torque hose nuts **230 - 260 inch-pounds (25.99 - 29.38 Nm)**.

(14). Secure hoses with clamps, screws, washers and nuts.

(15). Install wire connector plug on filter receptacle.

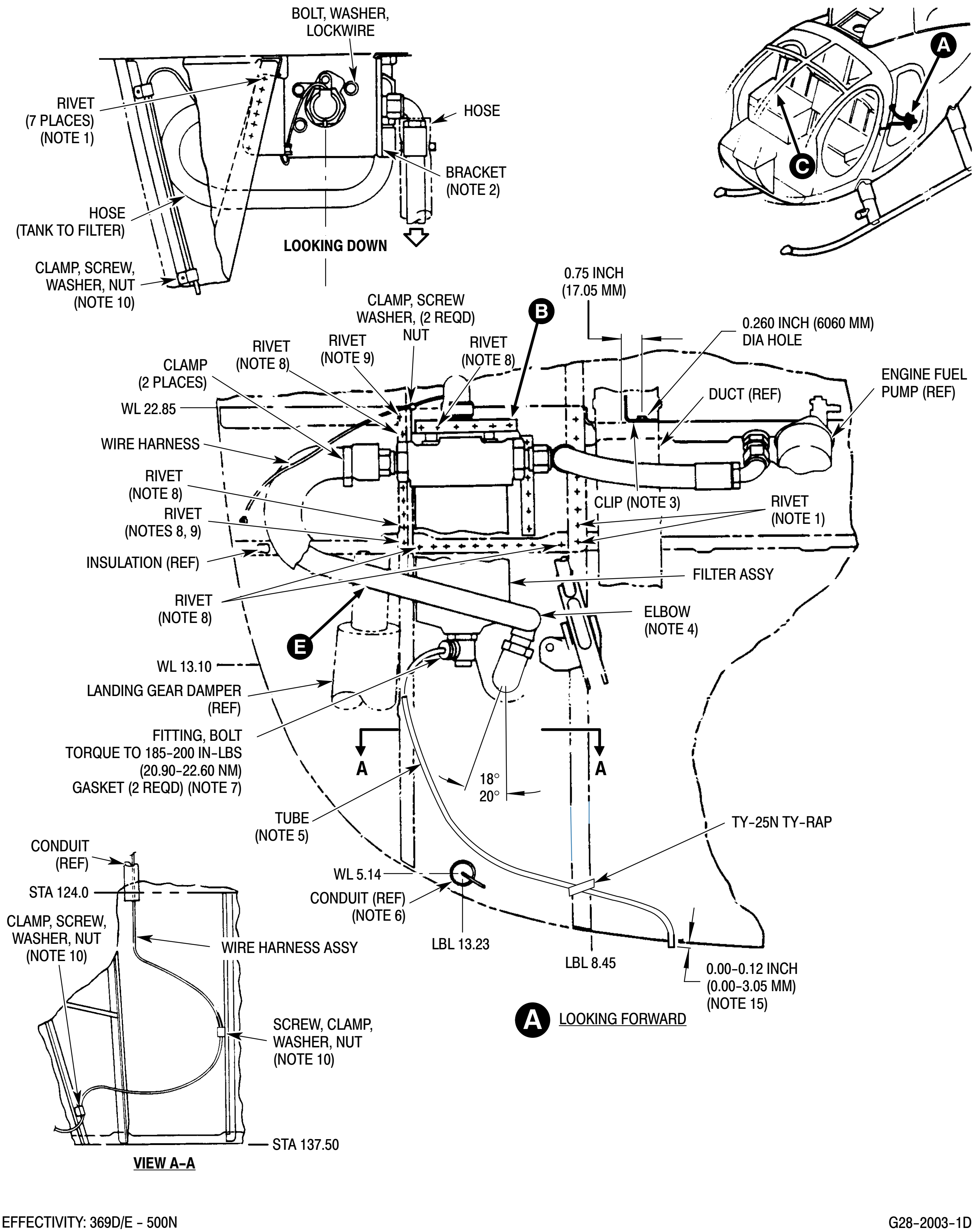
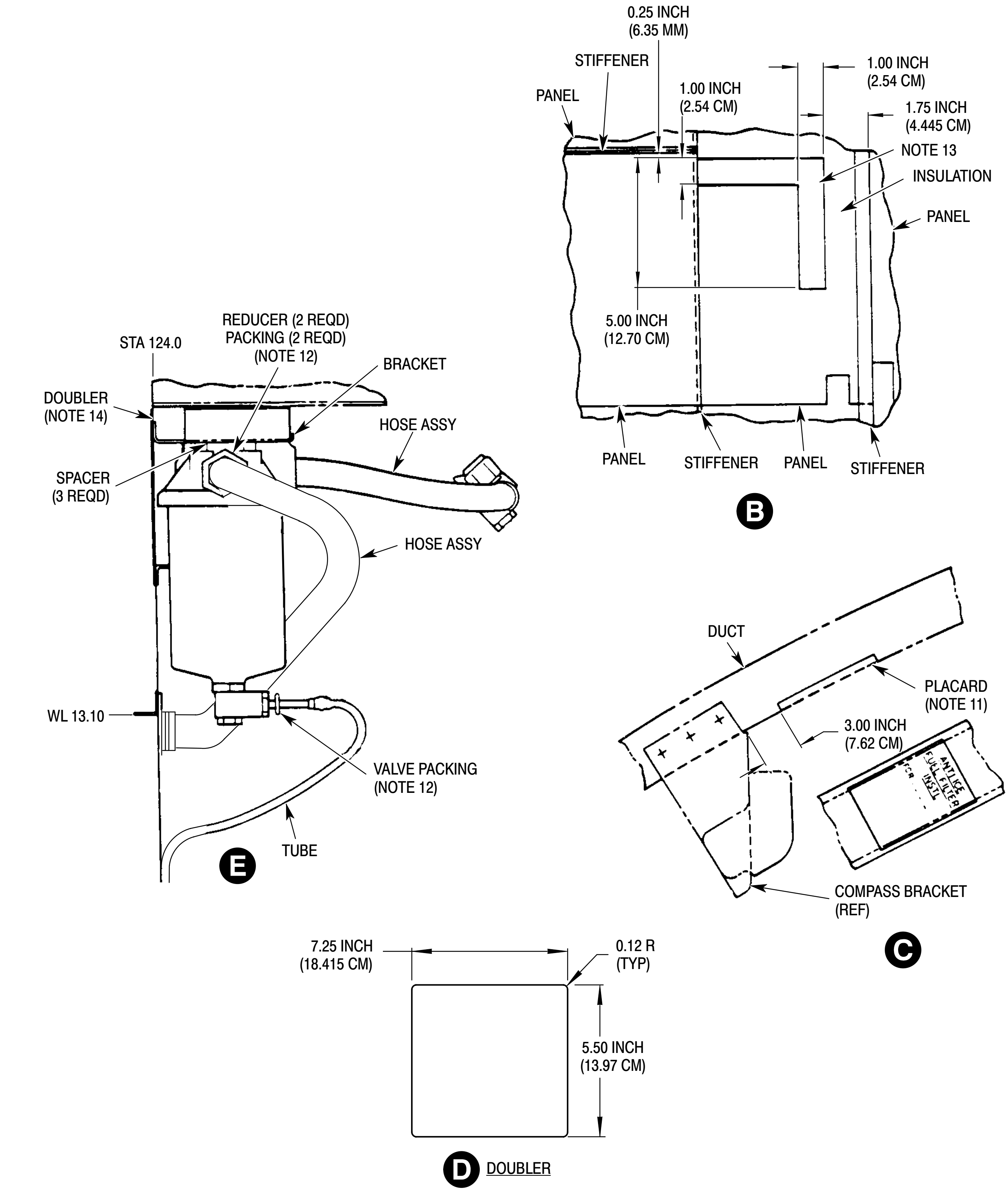


Figure 901. Anti-Ice Fuel Filter Modifications and Installation (369D/E - 500N) (Sheet 1 of 2)



EFFECTIVITY: 369D/E - 500N

G28-2003-2D

Figure 901. Anti-Ice Fuel Filter Modifications and Installation (369D/E - 500N) (Sheet 2 of 2)

NOTE:

(1) Pick up existing rivet locations, seven places. Install MS29615-4M rivets or NAS1738 M4 alternates. Install rivets in wet MIL-P-23377 Type 1, Class 1, epoxy primer or, MIL-P-8585 primer.

(2) Electrically bond bracket to firewall with an approved bonding jumper installed per requirements of FAA publication EA-AC43.13-1A and 2A.

(3) Reposition clip 0.75 inch (19.05 mm) inboard.

(4) Shim elbow to 18-22 degrees clockwise.

(5) Route filter drain tube to clear landing gear damper while allowing unrestrained drain valve operation.

(6) Seal both ends of conduit with RTV 732 sealant/adhesive after wire harness installation.

(7) Apply low temperature anti-seize compound, MIL-T-5544B Thread Lube or equivalent to assembly threads prior to installation. Torque bolt **185 - 200 inch-pounds (20.90 - 22.60 Nm).**

(8) Install MS20615-3M rivets in wet MIL-P-23377, Type 1, Class 1, epoxy primer or, MIL-P-8585 primer.

(9) Install MS20615-4M or alternate NAS-1738M4 rivets in wet MIL-P-23377, Type 1, Class, 1 epoxy primer or, MIL-P-8585 primer.

(10) Clamp wire harness in place as shown using existing tool holes.

(11) Roll placard edges to follow heater duct contour.

(12) Apply MIL-T-5544B low temperature anti-seize compound to threads prior to assembly.

(13) Cut away insulation blanket per dimensions shown for bracket installation. Remove blanket debris. Do not scratch firewall surface.

(14) Install doubler on forward firewall surface as shown. Pick up all existing rivet holes in doubler installation.

(15) Trim drain tube protrusion flush to 0.12 inch (3.048 mm) below grommet surface.

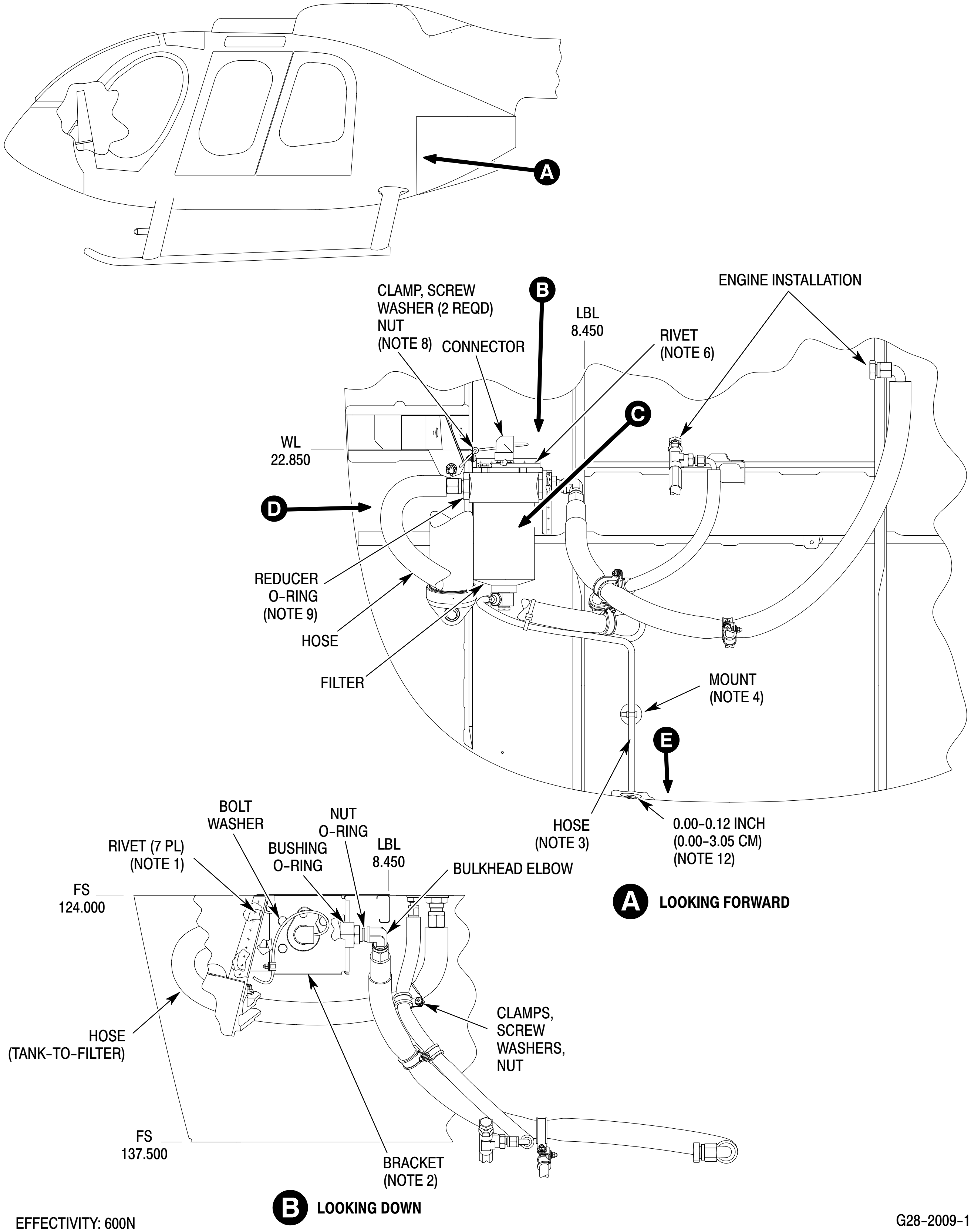


Figure 902. Anti-Ice Fuel Filter Modifications and Installation (600N) (Sheet 1 of 2)

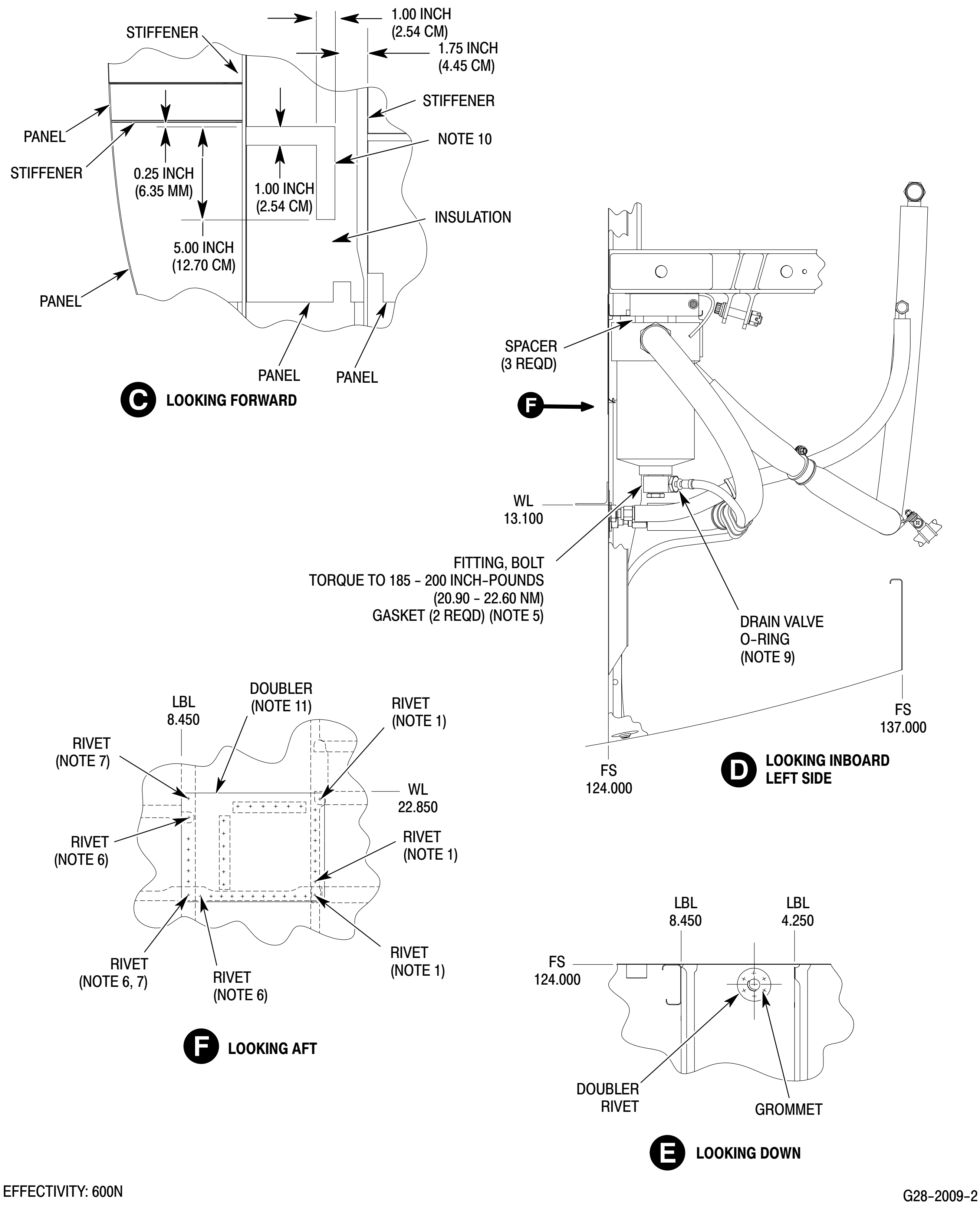


Figure 902. Anti-Ice Fuel Filter Modifications and Installation (600N) (Sheet 2 of 2)

NOTE:

(1) Pick up existing rivet locations, seven places. Install MS29615-4M rivets or NAS1738 M4 alternates. Install rivets in wet MIL-P-23377 Type 1, Class 1, epoxy primer or, MIL-P-8585 primer.

(2) Electrically bond bracket to firewall with an approved bonding jumper installed per requirements of FAA publication EA-AC43.13-1A and 2A.

(3) Route filter drain tube to clear landing gear damper while allowing unrestrained drain valve operation.

(4) Install with adhesive CM438.

(5) Apply low temperature anti-seize compound, MIL-T-5544B Thread Lube or equivalent to assembly threads prior to installation. Torque bolt **185 - 200 inch-pounds (20.90 - 22.60 Nm).**

(6) Install MS20615-3M rivets in wet MIL-P-23377, Type 1, Class 1, epoxy primer or, MIL-P-8585 primer.

(7) Install MS20615-4M or alternate NAS-1738M4 rivets in wet MIL-P-23377, Type 1, Class, 1 epoxy primer or, MIL-P-8585 primer.

(8) Clamp wire harness in place as shown using existing tool holes.

(9) Apply MIL-T-5544B low temperature anti-seize compound to threads prior to assembly.

(10) Cut away insulation blanket per dimensions shown for bracket installation. Remove blanket debris. Do not scratch firewall surface.

(11) Install doubler on forward firewall surface as shown. Pick up all existing rivet holes in doubler installation.

(12) Trim drain tube protrusion flush to 0.12 inch (3.048 mm) below grommet surface.

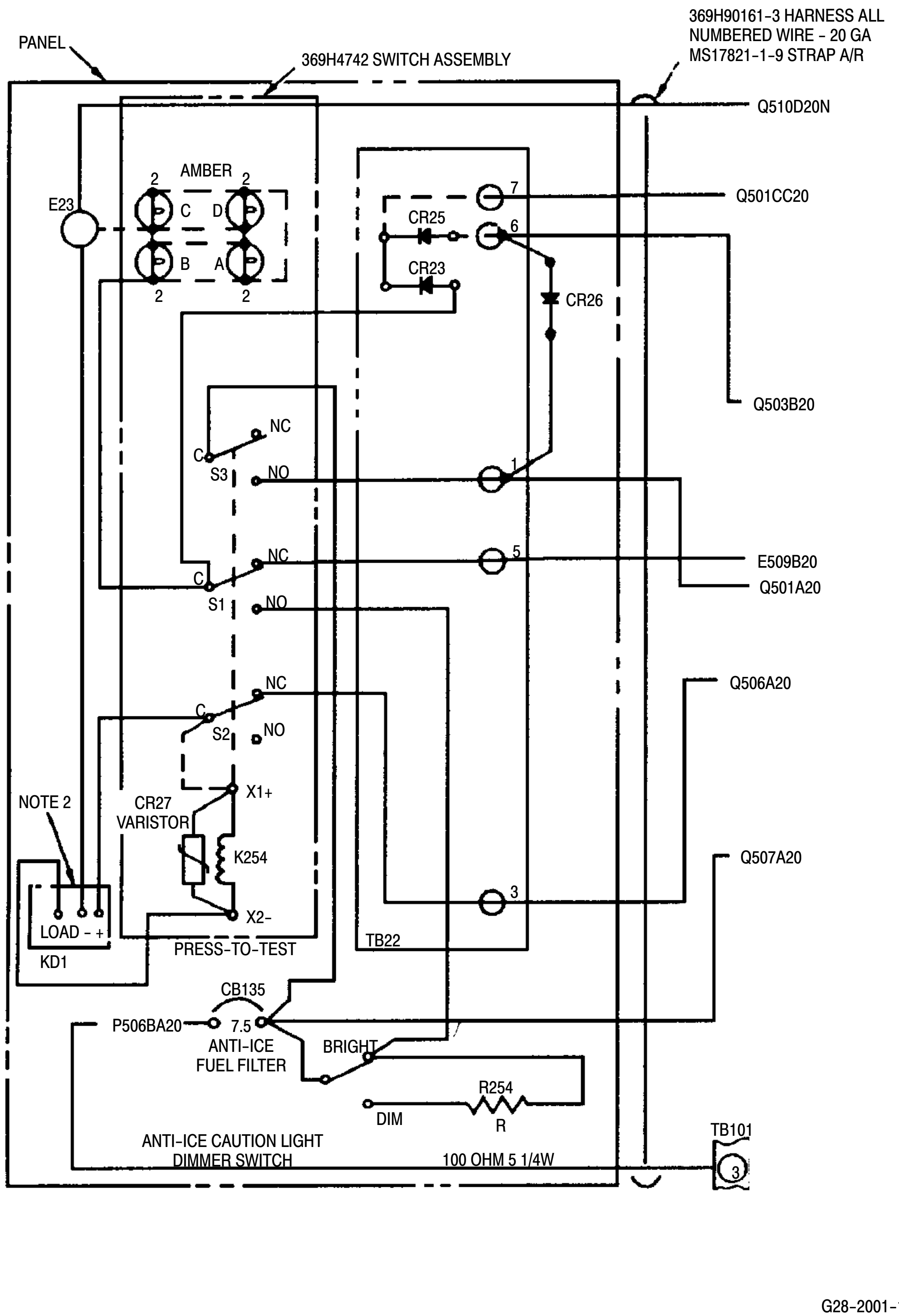
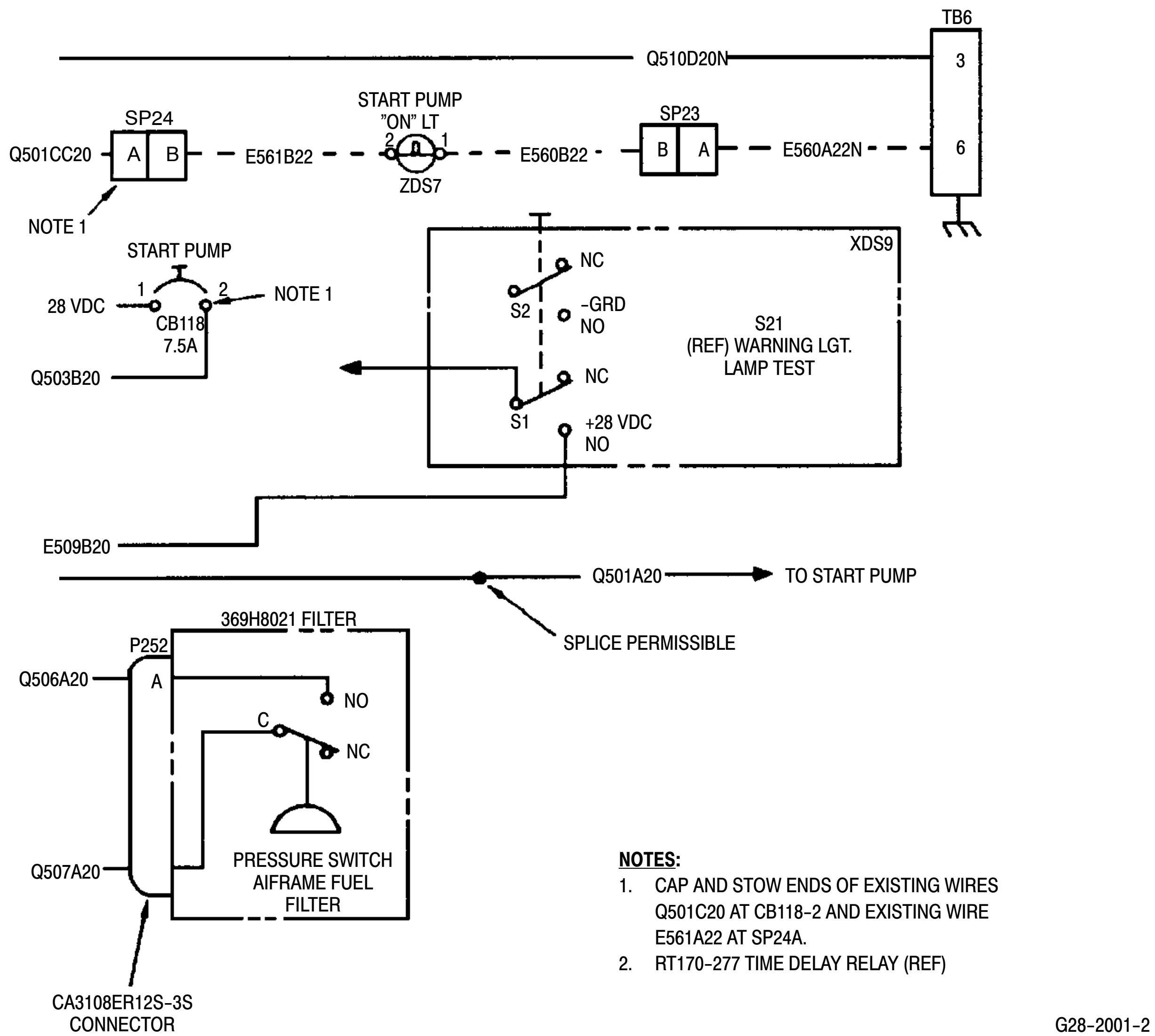


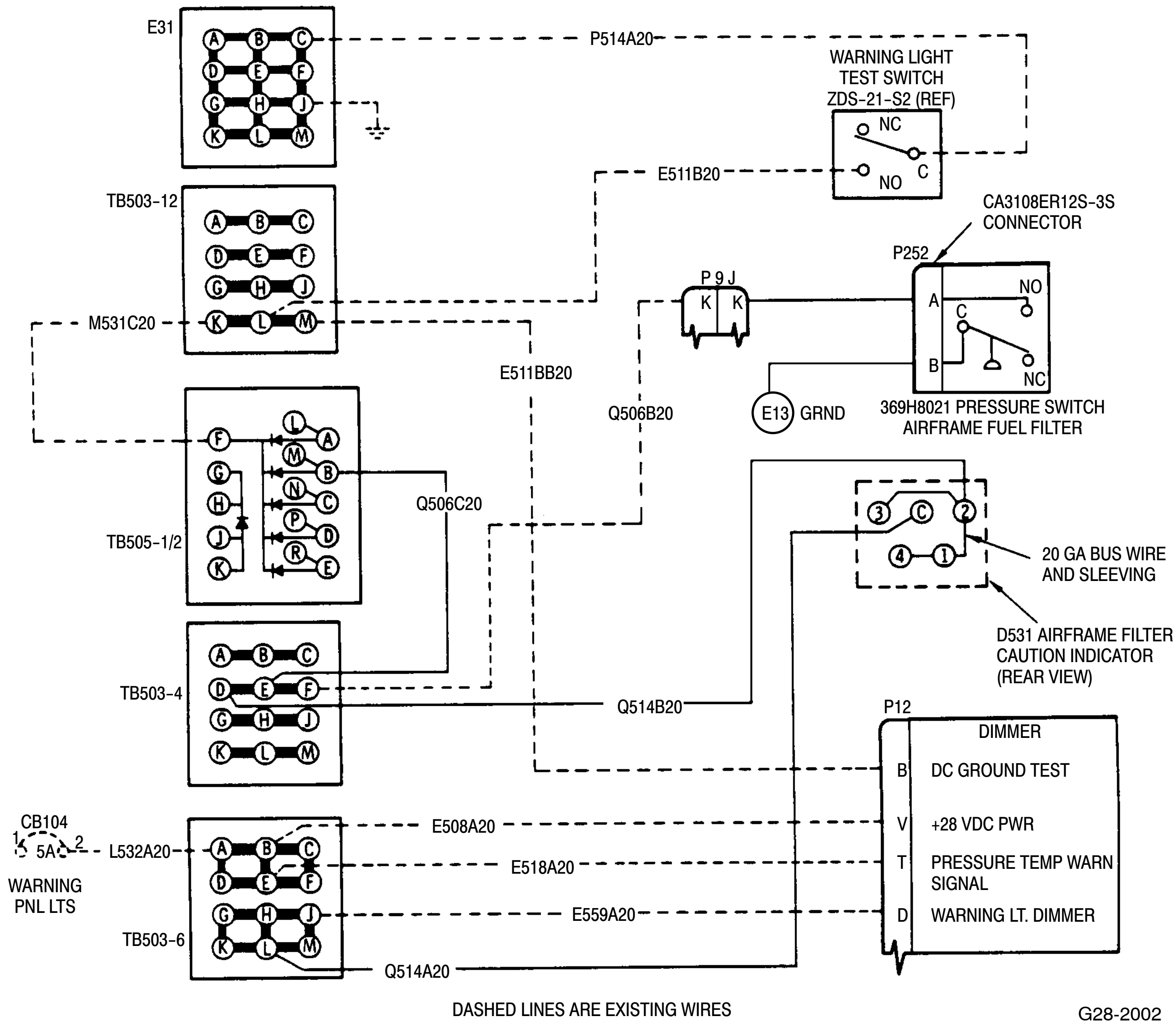
Figure 903. Anti-Ice Fuel Filter Wiring Diagram (369D S/N 0001 - 1204) (Sheet 1 of 2)



Wire Data List

Wire No.	From	Termination	To	Termination
Q507A20	CB135-2	MS25036-149	P252-B	CRIMP
Q506A20	TB22-3	MS25036-101	P252-A	CRIMP
Q501A20 (REF)	TB22-1	MS25036-101	TO START PUMP	
E509B20	TB22-5	MS25036-101	S21-S1 (NO)	SOLDER
Q503B20	TB22-6	MS25036-101	CB118-2	MS25036-149
Q501CC20	TB22-7	MS25036-101	SP24A	32445 (AMP)
Q510D20N	E23	MS25036-101	TB6-3	MS25036-101
P506BA20	CB135-1	MS25036-149	TB101-3	MS25036-101

Figure 903. Anti-Ice Fuel Filter Wiring Diagram (369D S/N 0001 - 1204) (Sheet 1 of 2)



Wire Data List

Wire No.	Wire Type	From	Termination	To	Termination
Q506A230	M81381/11-20N	J9-K	MS3192A20A	P252-A	CRIMP
Q510F20N	M81381/11-20N	E13	M7928/1-24	P252-B	CRIMP
Q506C20	M81381/11-20N	TB505-1/2B	M39029/22-20-20	TB503-4E	MS39029/22-20-20
Q514B20	M81381/11-20N	TB503-4D	M39029/22-20-20	DS31-2	SOLDER
Q514A20	M81381/11-20W	TB503-6L	M39029/22-20-20	DS31-C	SOLDER

Figure 904. Anti-Ice Fuel Filter Wiring Diagram (369D S/N 1205 & Subs and 369E S/N 001 - 383)

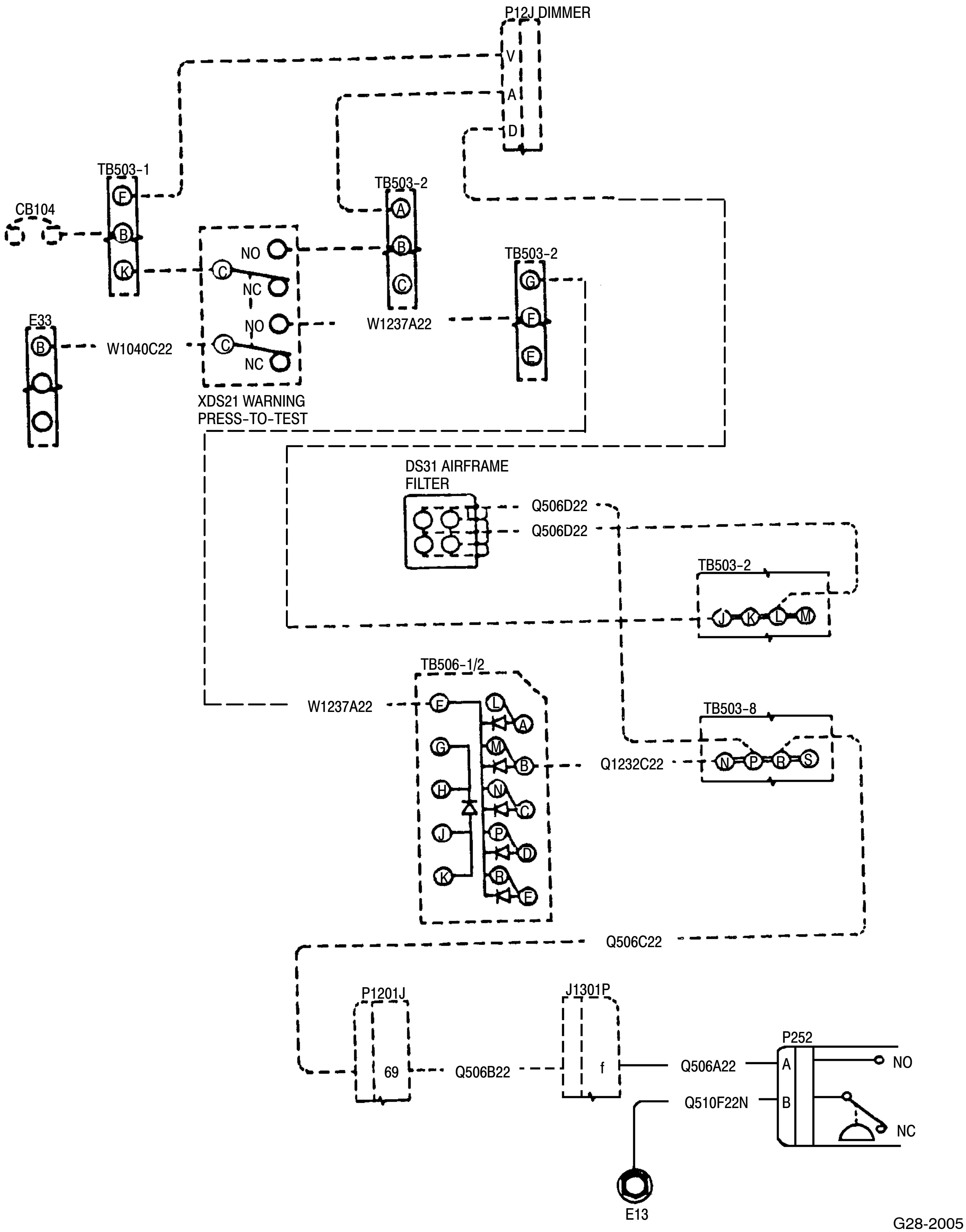


Figure 905. Anti-Ice Fuel Filter Wiring Diagram (369E S/N 384 & Subs and 500N S/N 001 & Subs)

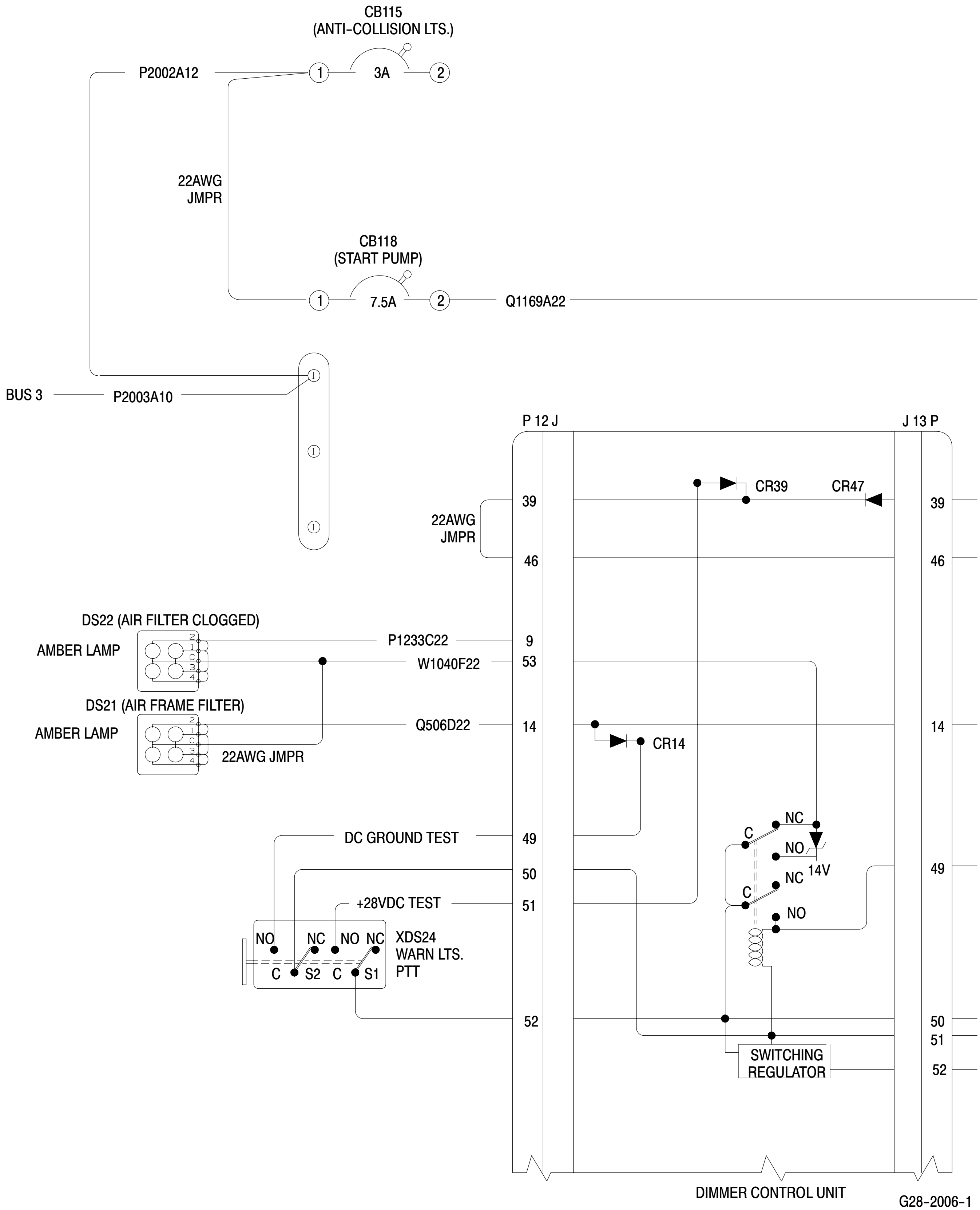
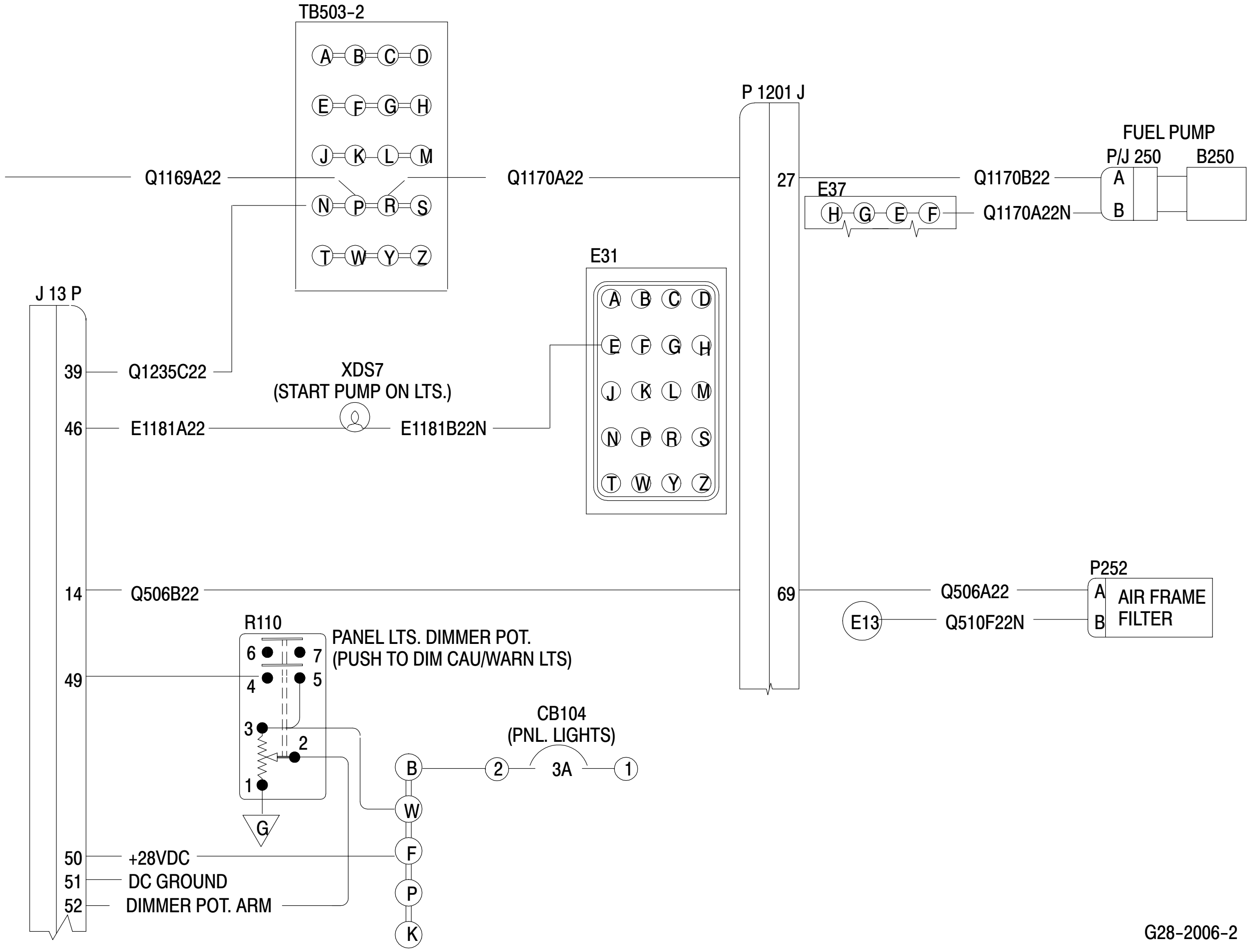


Figure 906. Anti-Ice Fuel Filter Wiring Diagram (600N S/N 003 & Subs) (Sheet 1 of 2)



Wire Data List

	Wire No.	From	Termination		To	Termination
	JUMPER-22	CB115-1	HDS4123-126		CB118-1	HDS4123-126
	O1169A22	CB118-2	HDS4123-126		TB503-2-2	HDS4123-904
(1)	O1170A22	TB503-2R	HDS4123-904		P1201-27	HDS4123-916
	O1236C22	TB503-2N	HDS4123-904		P13-39	HDS4123-926
(2)	JUMPER	P12-39	HDS4123-926		P12-46	HDS4123-926
(3)	E1181A22	P13-46	HDS4123-926		XDS7	HDS4123-999
	E1181B22N	XDS7	HDS4123-999		E31-E	HDS4123-904
(2)	JUMPER-22	DS22-C	HDS4123-999		DS21-C	HDS4123-999
(1)	O506D22	DS21-2	HDS4123-999		P12-14	HDS4123-926
(1)	O506A22	J1201-69	HDS4123-915		P252-A	CRIMP
(3)	O510F22N	P252-B	CRIMP	(4)	E13	HDS4123-135

NOTES:

(1) Wire capped and stowed (part of existing wire harness).

(2) Do not exceed three inches (7.62 cm).

(3) Wire connected to ground.

(4) E13 Ground stud mounted on left oleo support.

Figure 906. Anti-Ice Fuel Filter Wiring Diagram (600N S/N 003 & Subs) (Sheet 2 of 2)

(16). Measure electrical resistance between filter bowl and firewall. Resistance shall not be more than 0.003 ohms.

G. Post-Installation Inspection

(1). Ensure that all installation debris has been removed.

(2). Check all electrical connections for correct routing and security.

(3). Ensure that all hardware, tubes, and hoses are properly secured.

(4). Ensure that no fuel can be trapped by the drain system.

H. Furnishings, Panels and Equipment Installation

(1). Install instrument panel hood and instrument panel left side fairing.

(2). Install pilot's compartment left floor access panel.

(3). Install upper left aft bulkhead panel and lower aft bulkhead panel.

(4). Install aft compartment seats.

(5). Close engine access doors.

(6). Connect battery.

2. Anti-Ice Fuel Pump Initial Installation (600N98110-501 Installation)

(Ref. Figure 907)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM114	Petrolatum
CM124	Kerosene
CM702	Lockwire CRES

WARNING **Avoid fuel vapor ignition and fire. Use only nonsparking tools and explosion proof work lights. Attach helicopter to an approved electrical ground. Switch OFF all electrical power. Disconnect external power and battery before opening fuel system. Ensure work area is adequately ventilated.**

CAUTION Prevent fuel system contamination. Install caps on the ends of hoses, tubes and fittings as the parts are removed. Bag and identify small parts to prevent loss or damage.

(1). Defuel helicopter (Ref. Sec. 12-00-00). Drain remaining fuel from tank sump drain valve into a suitable container.

(2). Disconnect electrical power.

A. Fuel Cell Cover Removal

(1). To remove left aft fuel cell access cover:

(a). Remove left aft fuel cell access panel from passenger/cargo compartment floor.

(b). Unclamp and disconnect control cable from fuel shutoff valve.

(c). Disconnect engine feed fuel supply hose assembly between fuel shutoff valve and Sta. 124.00 bulkhead. Use backup wrench on fuel shutoff valve so it will not rotate.

(d). Disconnect motive flow fuel hose assembly between Sta 124.00 bulkhead and fuel cell access cover.

(e). Disconnect fuel quantity probe wire harness connector from fuel cell cover receptacle.

(f). Unfasten and remove Sta. 91.00 and 102.00 left aft fuel cell cover support brackets.

(g). Remove cover bolts and washers. Prop cover open with suitably padded blocks.

(h). Using a backup wrench on valve, separate engine feed fuel cell supply hose from fuel shutoff valve and fuel inlet from fuel cell access cover.

(i). Disconnect submerged motive flow fuel hose assembly between fuel check valve and ejector pump from fuel cell access cover.

(j). Disconnect fuel cell scavenge hose assembly from bottom of fuel cell access cover bracket assembly to ejector pump.

(k). Cut safety wire from fuel probe electrical connector base nut and remove connector from fuel cell access cover.

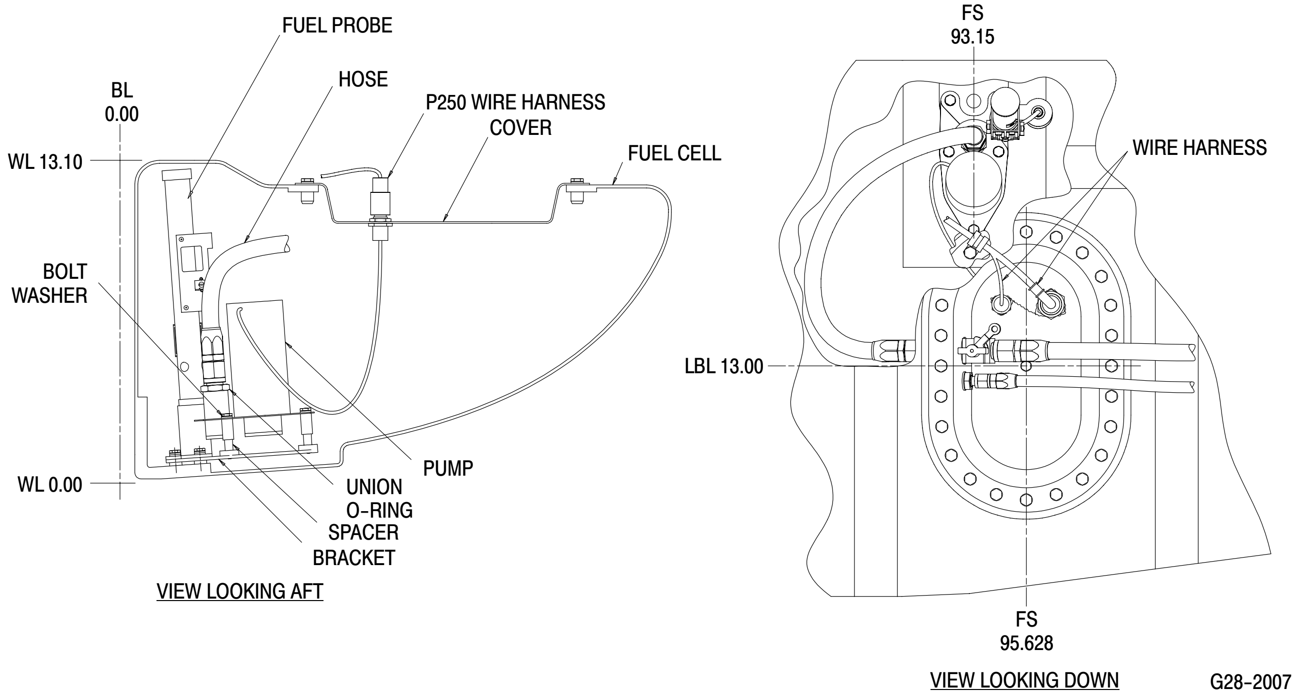


Figure 907. Fuel Pump Initial Installation (600N)

(l). Remove fuel cell scavenge hose bracket assembly, bulkhead union and fuel shutoff valve from fuel cell cover.

(2). Remove unused bulkhead union from cover.

B. Pump Installation

(1). Disconnect fuel feed hose from fuel inlet plate and remove plate.

(2). Clean pump and sump plate mount contact surfaces to establish an electrical bond.

CAUTION Do not mark torque alignment stripes on fuel cell internal hardware.

(3). Install pump on sump plate with bolts, washers and spacers. Torque bolts to **36 - 46 inch-pounds (4.07 - 5.20 Nm)**.

(4). Apply a thin coat of petrolatum (CM114) to a new O-ring and pump pressure port union threads. Install O-ring on union. Install union in pump pressure port and torque to **280 - 305 inch-pounds (31.64 - 34.46 Nm)**.

(5). Attach fuel supply hose to pump pressure port union. Torque hose nut to **230 - 260 inch-pounds (25.99 - 29.38 Nm)**.

C. Fuel Cell Cover Installation

(1). Wipe fuel cell and cover sealing surfaces clean with kerosene (CM124) on a clean lint free cloth.

(2). Inspect fuel cell cover seals for debonding, nicks or cuts and any other damage having a leak producing potential. Replace covers or left aft cover as required.

(3). Install left aft fuel cell access cover as follows:

(a). Apply a coating of petrolatum (CM114) to a new fuel shutoff valve/cover sealwasher. Install valve on cell cover with sealwasher next to valve body and valve properly aligned to make connection with valve control cable. Torque valve jamnut to **240 - 280 inch-pounds (27.12 - 31.64 Nm)**.

(b). Apply a coating of petrolatum to sealwasher. Install check valve and sealwasher to inside cover and a plain washer outside. Torque jamnut to **85 - 105 inch-pounds (9.6 - 11.86 Nm)**.

(c). Install bulkhead elbow to support bracket. with washer and nut. Torque jamnut to **240 - 280 inch-pounds (27.12 - 31.64 Nm).**

(d). Install support bracket to cover with bolts, washer, and sealwashers. Apply a coating of petrolatum to sealwasher. Torque bolts to **36 - 46 inch-pounds (4.06 - 5.19 Nm)**.

(4). Place left aft fuel cell access cover into position on fuel cell.

NOTE: Install new seal washer, AS3578-024, on wire harness connector.

(5). Connect fuel quantity probe and pump wire harness connectors to cell cover. Torque connector jamnuts and safety-wire to bulkhead union with lockwire (CM702).

(6). Install fuel cell inlet hose assembly to access cover fuel shutoff valve. Torque hose assembly **230 - 260 inch-pounds (25.99 - 29.38 Nm)**.

(7). Install submerged motive flow hose assembly to access cover check valve. Torque hose assembly **50 - 65 inch-pounds (5.65 - 7.34 Nm)**.

(8). Install scavenge fuel cell hose assembly to access cover bulkhead elbow. Torque hose assembly **230 - 260 inch-pounds (25.99 - 29.38 Nm)**.

(9). Install three support brackets on Sta. 91.00 and 102.00 floor cross-members with washers and screws. Torque screws to **20 - 25 inch-pounds (2.26 - 2.82 Nm)**.

(10). Install cover bolts and washers. In a cross pattern, progressively torque cover bolts to **70 - 90 inch-pounds (7.91 - 10.17 Nm)**.

(11). Connect engine feed fuel supply hose to fuel shutoff valve. Torque hose nut to **230 - 260 inch-pounds (25.99 - 29.38 Nm)**.

(12). Connect fuel motive flow hose to access cover/check valve. Torque hose nut **(50 - 65 inch-pounds (5.65 - 7.34 Nm)**.

(13). Connect fuel quantity probe and pump connectors to wire harness receptacles.

(14). Slip control cable through hole in fuel shutoff valve lever swivel.

(15). Rig cable control system. (Ref. Sec. 28-00-60, Fuel Shutoff Valve Control Cable Installation).

(16). Apply a torque alignment stripe to fuel line tube, hose and fitting fasteners.

(17). Install access panels on passenger cargo compartment floor.

3. Anti-Ice Fuel Filter Installation Weight and Balance

(1). After installation of the anti-ice fuel filter, incorporate changes to helicopter weight and balance record (Ref. Sec. Section 08-10-00).

Table 901. Weight and Balance Data

Configuration	Weight Pounds (kg)		Arm inches (cm)		Moment in.-lb (kg cm)	
369H90022-BSC	+6.6	(+2.996)	107.8	(273.81)	+711.48	(+819.710)
369H90022-503	+5.3	(+2.406)	122.7	(311.66)	+650.31	(+749.235)
369H90022-505	+5.3	(+2.406)	122.7	(311.66)	+650.31	(+749.235)
600N98110-501	+7.3	(+3.311)	112.7	(286.26)	+822.7	(+947.807)

Chapter

32

Landing Gear

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Section

32-10-00

Landing Gear System (369D/E/FF - 500N)

LANDING GEAR SYSTEM
DESCRIPTION AND OPERATION

1. Landing Gear

The landing gear consists of two strut-mounted, shock-dampened skids aligned longitudinally along the helicopter fuselage. Both right and left skids pivot as the damper assemblies extend and retract. Replaceable abrasion strips are installed on each skid to retard wear on hard surfaces.

A. Skid

Landing gear skids provide helicopter rest mounts. Skid tubes are constructed from seamless, extruded aluminum alloy tubing. Abrasion strips attached to undersides of skid tubes retard wear and damage. Ground handling fittings riveted to skid tubes are the ground handling attach points. Forward end of skid contains provisions for night lighting equipment. An adapter sleeve at the aft end of skid tube provides a nonrigid mount for the aft foot bearing and skid extension.

B. Strut

The landing gear struts attach to the fuselage center beam. Landing gear braces between the landing gear strut and fuselage center beam prevent shearing of the strut and keep the strut in alignment with the landing gear. At the lower ends of the struts, foot-shaped components attach the landing gear skids to the struts. Feet for the aft strut are bearing-mounted to provide a nonrigid and pivotal mount.

C. Damper

Landing gear assemblies are equipped with front and rear damper assemblies. Dampers absorb vertical shock to landing gear struts during helicopter landings. Front damper assemblies are attached to oleo attachment fittings on the outboard side of the pilot's compartment seat structure. Aft damper assemblies are attached to oleo support fittings in the engine compartment.

The damper assemblies are approximately 12.21 inches (31.01 cm) long when extended and 8.96 inches (22.76 cm) long when compressed. The dampers are poppet-type and consist of a barrel, upper and lower mounting cap, main poppet, rebound poppet and a piston. Damper exterior surfaces are painted white for surface protection and as an aid to identification.

A damper must be replaced if damaged, or if loss of pneumatic pressure (nitrogen gas) or hydraulic oil occurs.

D. Entry Step

Entry steps mounted on the landing gear struts allow for easy access into cabin. The landing gear step is covered with non-skid tape and attached to the landing gear strut with lockbolts.

E. Fairing

Fiberglass/aluminum fairings on each strut reduce aerodynamic drag during flight. The fairings extend from the fuselage to the skids to form streamlined enclosures for the landing gear struts. Each fairing assembly is constructed of three main parts: a fillet, an upper, and lower two-piece fairing. The fillet is spring-loaded to remain in firm contact with a fiberglass rubbing plate that is bonded and riveted to the fuselage. The fairing is secured to the landing gear and telescopes up inside the fillet to allow movement of the strut as the landing gear dampers compress or extend. A seal on the bottom edge of the fairing forms a fillet between the fairing and the skid tube. Fairings also have openings for cabin entry steps.

LANDING GEAR SYSTEM
SERVICING

1. Landing Gear Damper Nitrogen Servicing

(Ref. Figure 301) Service landing gear dampers equipped with schrader valve according to the following steps.

CAUTION Do not recharge a damper if there is evidence of fluid leakage. Recharging of damper will cause further leakage of both gas and damper fluid, posing a danger to the helicopter.

(1). Place helicopter on jacks or hoist.

NOTE: A minimum of two dampers shall be recharged; either the two forward dampers, two aft dampers, or both forward and aft dampers.

(2). For forward damper servicing, remove footwell panel located in passenger compartment (Ref. Sec. 25-30-00). For aft damper servicing, open engine access doors.

(3). Remove cap from schrader valve and connect servicing hose, but do not tighten.

(4). Ensure low side of nitrogen pressure regulator is backed off to the unpressurized position. Slowly open the high pressure nitrogen bottle valve.

(5). Slowly turn regulator control until nitrogen begins to flow at the loose servicing hose-schrader valve connection.

(6). Tighten servicing hose while nitrogen is flowing. Allow nitrogen pressure to build to the valve according to dash number and part number of damper (Ref. Table 301 or Table 302).

CAUTION To prevent damage to damper or loss of damper fluid do not open schrader valve without pressurizing the servicing line. If fluid loss occurs, damper will require overhaul.

(7). Once pressure level is reached open schrader valve by turning outside nut counter clockwise, allowing system and damper pressure to equalize for a minimum of 2 minutes. If slightly over pressurized, bleed off excess very slowly.

(8). Close schrader valve by turning the outside nut clockwise. Torque nut to **60 inch pounds (6.78 Nm)** and safety wire.

(9). Reduce charge pressure to zero, and remove servicing hose. Install cap on schrader valve.

(10). Inspect damper for leakage approximately two hours after servicing. Check damper extension according to Table 601 of this section.

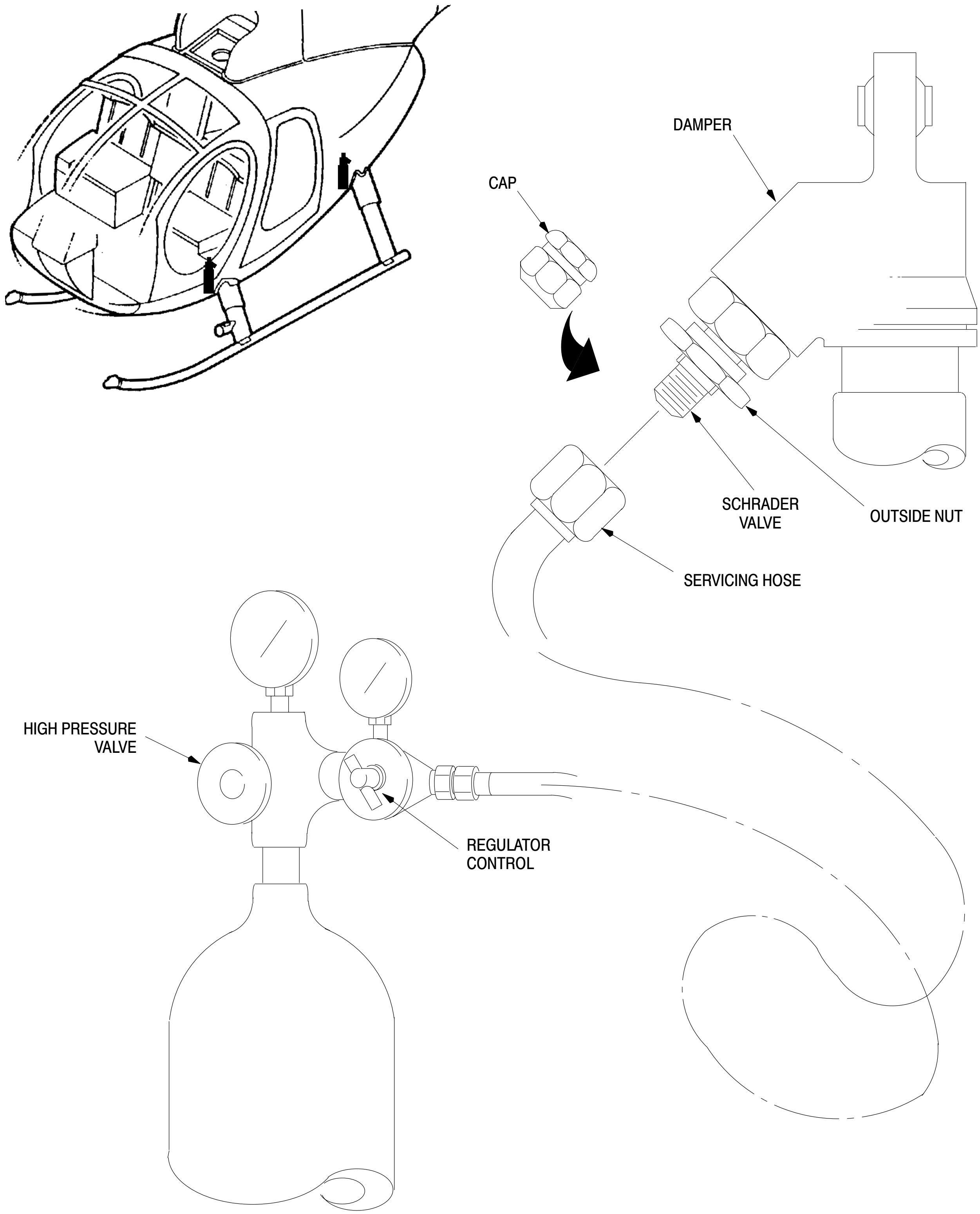


Figure 301. Landing Gear Damper Nitrogen Servicing - On Helicopter

Table 301. Nitrogen Service Schrader Valve Equipped 369D26301 Extended Landing Gear Dampers - on Helicopter

Degrees		Winterized Recharge Pressure (1)		Mid-Temp Recharge Pressure (2)		Ambient Recharge Pressure (3)	
°F	°C	psi	kPa	psi	kPa	psi	kPa
-40	-40	1,262	8,702				
-38	-39	1,264	8,715				
-36	-38	1,266	8,728				
-34	-37	1,268	8,740				
-32	-36	1,270	8,753				
-30	-34	1,271	8,766				
-28	-33	1,273	8,778				
-26	-32	1,275	8,791	1,051	7,247		
-24	-31	1,277	8,804	1,052	7,255		
-22	-30	1,279	8,816	1,053	7,262		
-20	-29	1,281	8,829	1,054	7,270		
-18	-28	1,282	8,842	1,056	7,278		
-16	-27	1,284	8,855	1,057	7,286		
-14	-26	1,286	8,867	1,058	7,293		
-12	-24	1,288	8,880	1,059	7,301		
-10	-23	1,290	8,893	1,060	7,309		
-8	-22	1,292	8,905	1,061	7,316		
-6	-21	1,293	8,918	1,062	7,324		
-4	-20	1,295	8,931	1,063	7,332		
-2	-19	1,297	8,943	1,065	7,340		
0	-18	1,299	8,956	1,066	7,347		
2	-17	1,301	8,969	1,067	7,355		
4	-16	1,303	8,981	1,068	7,363		
6	-14	1,305	8,994	1,069	7,371		
8	-13	1,306	9,007	1,070	7,378		
10	-12	1,308	9,019	1,071	7,386	1,145	7,891
12	-11	1,310	9,032	1,072	7,394	1,146	7,900
14	-10	1,312	9,045	1,074	7,401	1,147	7,908
16	-9	1,314	9,057	1,075	7,409	1,148	7,917
18	-8	1,316	9,070	1,076	7,417	1,150	7,925
20	-7	1,317	9,083	1,077	7,425	1,151	7,934
22	-6	1,319	9,096	1,078	7,432	1,152	7,943
24	-4	1,321	9,108	1,079	7,440	1,153	7,951

Table 301. Nitrogen Service Schrader Valve Equipped 369D26301 Extended Landing Gear Dampers - on Helicopter

Degrees		Winterized Recharge Pressure (1)		Mid-Temp Recharge Pressure (2)		Ambient Recharge Pressure (3)	
°F	°C	psi	kPa	psi	kPa	psi	kPa
26	-3	1,323	9,121	1,080	7,448	1,154	7,960
28	-2	1,325	9,134	1,081	7,455	1,156	7,968
30	-1	1,327	9,146	1,082	7,463	1,157	7,977
32	0	1,328	9,159	1,084	7,471	1,158	7,985
34	1	1,330	9,172	1,085	7,479	1,159	7,994
36	2	1,332	9,184	1,086	7,486	1,161	8,002
38	3	1,334	9,197	1,087	7,494	1,162	8,011
40	4	1,336	9,210	1,088	7,502	1,163	8,019
42	6	1,338	9,222	1,089	7,510	1,164	8,028
44	7	1,339	9,235	1,090	7,517	1,166	8,037
46	8	1,341	9,248	1,092	7,525	1,167	8,045
48	9	1,343	9,260	1,093	7,533	1,168	8,054
50	10	1,345	9,273	1,094	7,540	1,169	8,062
52	11	1,347	9,286	1,095	7,548	1,171	8,071
54	12	1,349	9,299	1,096	7,556	1,172	8,079
56	13	1,351	9,311	1,097	7,564	1,173	8,088
58	14	1,352	9,324	1,098	7,571	1,174	8,096
60	16	1,354	9,337	1,099	7,579	1,176	8,105
62	17	1,356	9,349	1,100	7,587	1,177	8,113
64	18	1,358	9,362	1,102	7,594	1,178	8,122
66	19	1,360	9,375	1,103	7,602	1,179	8,131
68	20	1,362	9,387	1,104	7,610	1,181	8,139
70	21	1,363	9,400	1,105	7,618	1,182	8,148
72	22	1,365	9,413	1,106	7,625	1,183	8,156
74	23	1,367	9,425	1,107	7,633	1,184	8,165
76	24	1,369	9,438	1,108	7,641	1,185	8,173
78	26			1,109	7,649	1,187	8,182
80	27			1,110	7,656	1,188	8,190
82	28			1,112	7,664	1,189	8,199
84	29			1,113	7,672	1,190	8,208
86	30			1,114	7,679	1,192	8,216
88	31			1,115	7,687	1,193	8,225
90	32			1,116	7,695	1,194	8,233

Table 301. Nitrogen Service Schrader Valve Equipped 369D26301 Extended Landing Gear Dampers - on Helicopter

Degrees		Winterized Recharge Pressure (1)		Mid-Temp Recharge Pressure (2)		Ambient Recharge Pressure (3)	
°F	°C	psi	kPa	psi	kPa	psi	kPa
92	33					1,195	8,242
94	34					1,197	8,250
96	36					1,198	8,259
98	37					1,199	8,267
100	38					1,200	8,276
102	39					1,202	8,284
104	40					1,203	8,293
106	41					1,204	8,302
108	42					1,205	8,310
110	43					1,207	8,319
112	44					1,208	8,327
114	46					1,209	8,336
116	47					1,210	8,344
118	48					1,212	8,353
120	49					1,213	8,361
122	50					1,214	8,370
124	51					1,215	8,379
126	52					1,216	8,387

NOTES:

(1) For 369D26301-221, and -231 extended landing gear dampers.

(2) For 369D26301-241, and -251 extended landing gear dampers.

(3) For 369D26301-211 extended landing gear dampers.

Table 302. Nitrogen Service Schrader Valve Equipped 369D26300 Standard Landing Gear Dampers - on Helicopter

Degrees		Winterized Recharge Pressure (1)		Mid-Temp Recharge Pressure (2)		Ambient Recharge Pressure (3)	
°F	°C	psi	kPa	psi	kPa	psi	kPa
-40	-40	704	4,854				
-38	-39	705	4,864				
-36	-38	707	4,873				
-34	-37	708	4,882				
-32	-36	709	4,891				
-30	-34	711	4,901				
-28	-33	712	4,910				
-26	-32	714	4,919	704	4,855		
-24	-31	715	4,929	705	4,862		
-22	-30	716	4,938	706	4,869		
-20	-29	718	4,947	707	4,876		
-18	-28	719	4,956	708	4,883		
-16	-27	720	4,966	709	4,889		
-14	-26	722	4,975	710	4,896		
-12	-24	723	4,984	711	4,903		
-10	-23	724	4,994	712	4,910		
-8	-22	726	5,003	713	4,916		
-6	-21	727	5,012	714	4,923		
-4	-20	728	5,021	715	4,929		
-2	-19	730	5,031	715	4,936		
0	-18	731	5,040	716	4,942		
2	-17	732	5,049	717	4,949		
4	-16	734	5,058	718	4,955		
6	-14	735	5,068	719	4,962		
8	-13	736	5,077	720	4,968		
10	-12	738	5,086	721	4,974	637	4,392
12	-1 1	739	5,096	722	4,980	638	4,397
14	-10	740	5,005	723	4,987	639	4,403
16	-9	742	5,114	724	4,993	639	4,409
18	-8	743	5,123	725	4,999	640	4,415
20	-7	744	5,133	725	5,005	641	4,420
22	-6	746	5,142	726	5,011	642	4,426
24	-4	747	5,151	727	5,017	643	4,432

Table 302. Nitrogen Service Schrader Valve Equipped 369D26300 Standard Landing Gear Dampers - on Helicopter

Degrees		Winterized Recharge Pressure (1)		Mid-Temp Recharge Pressure (2)		Ambient Recharge Pressure (3)	
°F	°C	psi	kPa	psi	kPa	psi	kPa
26	-3	748	5,160	728	5,023	644	4,438
28	-2	750	5,170	729	5,029	645	4,444
30	-1	751	5,179	730	5,035	645	4,449
32	0	753	5,188	731	5,041	646	4,455
34	1	754	5,198	732	5,047	647	4,461
36	2	755	5,207	732	5,052	648	4,467
38	3	757	5,216	733	5,058	649	4,473
40	4	758	5,225	734	5,064	650	4,478
42	6	759	5,235	735	5,070	650	4,484
44	7	761	5,244	736	5,075	651	4,490
46	8	762	5,253	737	5,081	652	4,496
48	9	763	5,263	737	5,087	653	4,502
50	10	765	5,272	738	5,092	654	4,507
52	11	766	5,281	739	5,098	655	4,513
54	12	767	5,290	740	5,103	655	4,519
56	13	769	5,300	741	5,109	656	4,525
58	14	770	5,309	741	5,114	657	4,531
60	16	771	5,318	742	5,120	658	4,536
62	17	773	5,327	743	5,125	659	4,542
64	18	774	5,337	744	5,130	660	4,548
66	19	775	5,346	744	5,136	660	4,554
68	20	777	5,355	745	5,141	661	4,559
70	21	778	5,365	746	5,146	662	4,565
72	22	779	5,374	747	5,152	663	4,571
74	23	781	5,383	747	5,157	664	4,577
76	24	782	5,392	748	5,162	665	4,583
78	26			749	5,167	666	4,588
80	27			750	5,172	666	4,594
82	28			750	5,177	667	4,600
84	29			751	5,182	668	4,606
86	30			752	5,188	669	4,612
88	31			753	5,193	670	4,617
90	32			753	5,198	671	4,623

Table 302. Nitrogen Service Schrader Valve Equipped 369D26300 Standard Landing Gear Dampers - on Helicopter

Degrees		Winterized Recharge Pressure (1)		Mid-Temp Recharge Pressure (2)		Ambient Recharge Pressure (3)	
°F	°C	psi	kPa	psi	kPa	psi	kPa
92	33					671	4,629
94	34					672	4,635
96	36					673	4,641
98	37					674	4,646
100	38					675	4,652
102	39					676	4,658
104	40					676	4,664
106	41					677	4,670
108	42					678	4,675
110	43					679	4,681
112	44					680	4,687
114	46					681	4,693
116	47					681	4,698
118	48					682	4,704
120	49					683	4,710
122	50					684	4,716
124	51					685	4,722
126	52					686	4,727

NOTES:

(1) For 369D26300-221, and -231 standard landing gear dampers.

(2) For 369D26300-241, and -251 standard landing gear dampers.

(3) For 369D26300-211 standard landing gear dampers.

LANDING GEAR SYSTEM REMOVAL/INSTALLATION

1. Landing Gear Replacement

(Ref. Figure 401)

A. Landing Gear Removal

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM729	Tape, masking, pressure sensitive

NOTE: Following procedures apply to removal of entire right or left landing gear assembly. For component disassembly, refer to applicable section. For removal, two persons are needed.

(1). Jack up helicopter until landing gear dampers are fully extended (Ref. Sec. 07-00-00). Place support beneath skid tubes at strut locations.

(2). Pull strut fairing fillet downward against spring tension and secure with tape (CM729).

(3). Open compartment access doors for access to forward brace, strut and damper. Disconnect brace, strut and damper from attachment points.

(4). For access to aft landing gear attachment points, open engine access doors. Disconnect aft brace, strut and damper from attachment points.

(5). Remove clamp attaching electrical bonding jumper to aft strut.

(6). Disconnect electrical wiring connections at upper area forward strut.

(7). Remove supports from below skid and carefully remove struts, skid and fairings as an assembled unit.

B. Landing Gear Installation

NOTE: Following procedures apply to installation of right or left landing gear assemblies.

(1). For access to landing gear attachment points, open or remove fuselage access doors, engine access doors and foot supporting fairings.

(2). With helicopter supported by jacks, position landing gear to align struts with openings in fuselage structure.

NOTE: Check that fairing fillet guide pins engage fairing guide holes before positioning struts for attachment to structure.

(3). Lift and carefully position landing gear; then place supports beneath landing gear to hold it in place.

NOTE: Install left forward damper upper bolt with bolt head aft. Bolt direction on right side is optional.

(4). Be sure that slotted bushing (view C) is in place. Align lower bearing of damper with mating holes in strut and install attaching hardware.

(5). Align struts with mating bearings in fuselage support fittings. Install bolt, slotted bushing, two washers, nut and cotter pin.

(6). Align inboard end of each brace with mating bearing in fuselage supporting fitting. Install slotted bushing and attaching hardware.

(7). Secure electrical bonding jumper with clamp and attaching hardware to aft strut.

CAUTION Do not over- tighten brace- to- strut hardware. Maximum permissible nut torque is **finger-tight**; then backed off to nearest cancellation for installation of cotter pin.

(8). If brace is detached from strut, align outboard end of each brace with mating holes in strut. Attach brace to strut with attaching hardware. Torque nut to **5 inch-pounds (0.56 Nm) maximum**.

(9). Connect wiring at forward strut.

(10). Remove skid supports, lower helicopter, and remove jacks.

(11). Close or replace all access doors.

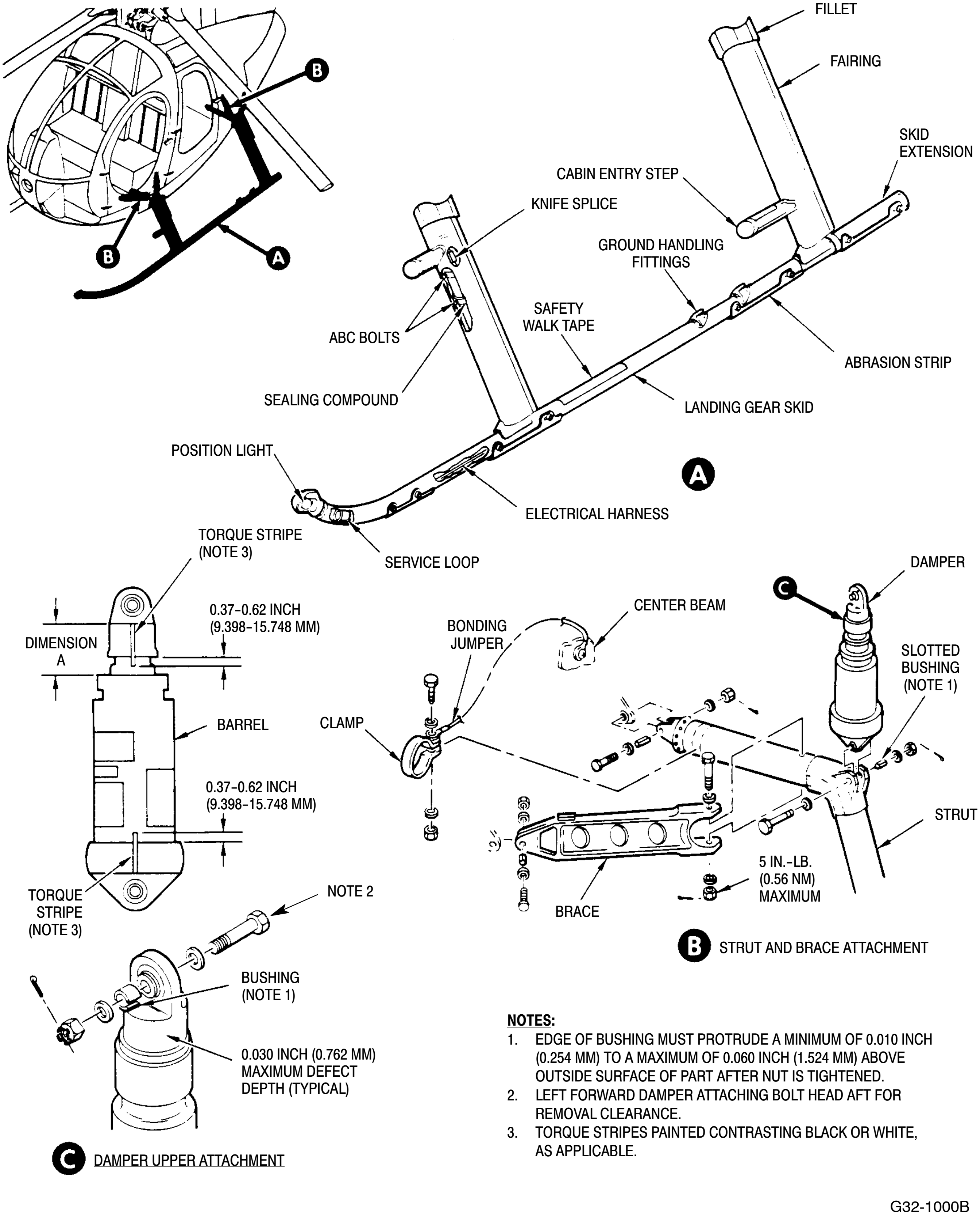


Figure 401. Landing Gear and Damper Installation

2. Landing Gear Damper Replacement

(Ref. Figure 401)

A. Landing Gear Damper Removal

(1). Jack up or hoist helicopter on level surface until landing gear skids just clear resting surface.

(2). For forward damper removal, remove foot well fairings located in passenger compartment. For access for aft damper removal, open engine access doors.

(3). Remove hardware (except bushings) attaching forward damper assemblies to fuselage attachment fittings and landing gear struts.

(4). Remove hardware from damper attachment points.

B. Landing Gear Damper Installation

(1). Jack up helicopter on level surface until landing gear skids (Ref. Sec. 07-00-00) just clear resting surface.

NOTE:

- Always be sure that replacement damper is correct for the helicopter. Ensure that cap torque stripes will be visible for inspection after installation.
- If installing schrader valve equipped dampers, ensure fwd damper is installed with schrader valve facing forward and aft damper with schrader valve facing aft.

(2). Install replacement damper in upper and lower mounting position with attaching hardware. Ensure bushings are in place.

NOTE: Left forward damper upper bolt must be installed with bolt head aft. Bolt direction on right side is optional.

(3). Torque nuts to **48 - 55 inch-pounds (5.42 - 6.21 Nm)** and cotter pin.

(4). Check installation for proper alignment of torque stripes.

(5). Install foot support fairings and close engine access doors.

3. Landing Gear Skid Replacement

(Ref. Figure 401)

A. Landing Gear Skid Removal

(1). If landing gear assembly is attached to helicopter, jack up helicopter until dampers are fully extended (Ref. Sec. 07-00-00). Place supports beneath skid tubes at strut locations.

(2). Remove lower fairing from two-piece fairing assembly.

(3). Remove bolts attaching forward skid-to-foot assembly.

(4). Disconnect electrical connections at forward strut.

(5). Remove bolts attaching extension to skid adapter sleeve. Remove extension, index plug and bearing from skid.

B. Landing Gear Skid Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer
CM420	Sealant
CM425	Sealing compound

NOTE: Left or right replacement skids are interchangeable by using or removing nylon screws from side of skid at forward strut.

(1). Position skid in place with aft foot bearing installed over skid adapter sleeve. Connect electrical connections for skid position light at forward strut.

(2). Apply thin coating of primer (CM318) to forward strut and skid tube mating surfaces.

(3). Align mating parts and install bolts with wet coating of zinc chromate primer. Torque bolts **40 - 60 inch-pounds (4.52 - 6.78 Nm)**. Apply sealant (CM420) to head of bolt and to nuts.

(4). Align skid extension with skid tube adapter sleeve. Coat attaching bolts with primer and install while wet.

(5). Seal edges of all rigid parts on skid with an approximate 0.060 inch (1.524 mm) fillet of sealing compound (CM425).

(6). Install lower fairing.

4. Landing Gear Fairing Replacement

(Ref. Figure 402)

A. Landing Gear Fairing Removal

The following instructions are typical for and apply to all four fairing assemblies.

(1). Remove lower fairing from fairing assembly as follows.

(a). Remove attaching hardware that secures lower fairing to two strut brackets, and that secures trailing edge of lower fairing.

(b). Carefully spread trailing edge of lower fairing and remove in forward direction.

NOTE: Ensure that doublers between laminations at trailing edge are retained for reuse.

(2). Remove fillet from upper part of fairing assembly as follows.

(a). Remove rivets from trailing edge of fillet.

(b). Drill out one of the rivets securing fillet to upper guide. Replace rivet with sheet metal hole fastener (Cleco, or equivalent). Repeat this step on other rivets.

(c). Open underfloor compartment or engine compartment doors for access to strut cutout in fuselage skin. Have an assistant push down on upper guide with suitable tool (wood dowel or equivalent), to relieve spring tension.

(d). With spring tension off guide, remove fasteners. Slowly relax dowel pressure on guide until springs fully expand.

(e). Carefully spread fillet at trailing edge and remove in forward direction.

(3). Remove upper part of fairing as follows.

(a). Remove rivets that secure trailing edge of fairing.

(b). Remove rivets that secure fairing to strut bracket.

(c). Use putty knife or similar thin-bladed tool to carefully pry apart bonding and separate upper 5 inches of trailing edge; then separate fairing from flange of lower guide.

(d). Carefully spread trailing edge of fairing and remove in forward direction.

B. Landing Gear Fairing Installation

The following instructions apply to all four fairing assemblies. Where riveting is required, use rivets of type shown in Figure 802.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer
CM411	Adhesive, epoxy

(1). Install upper part of the fairing as follows.

(a). Assemble upper guide, pin assembly, inner guide half, outer guide half, springs and lower guide on landing gear strut. Install rivets with wet primer (CM318) to secure lower guide to strut.

(b). Push guide pins into matching holes of lower guide. Wedge temporary holding device between upper guide and strut to keep pins engaged.

NOTE: Use two small wood blocks or any similar suitable means to keep springs compressed. Device used must be small enough to be removed through strut cutout in skin after fillet is assembled.

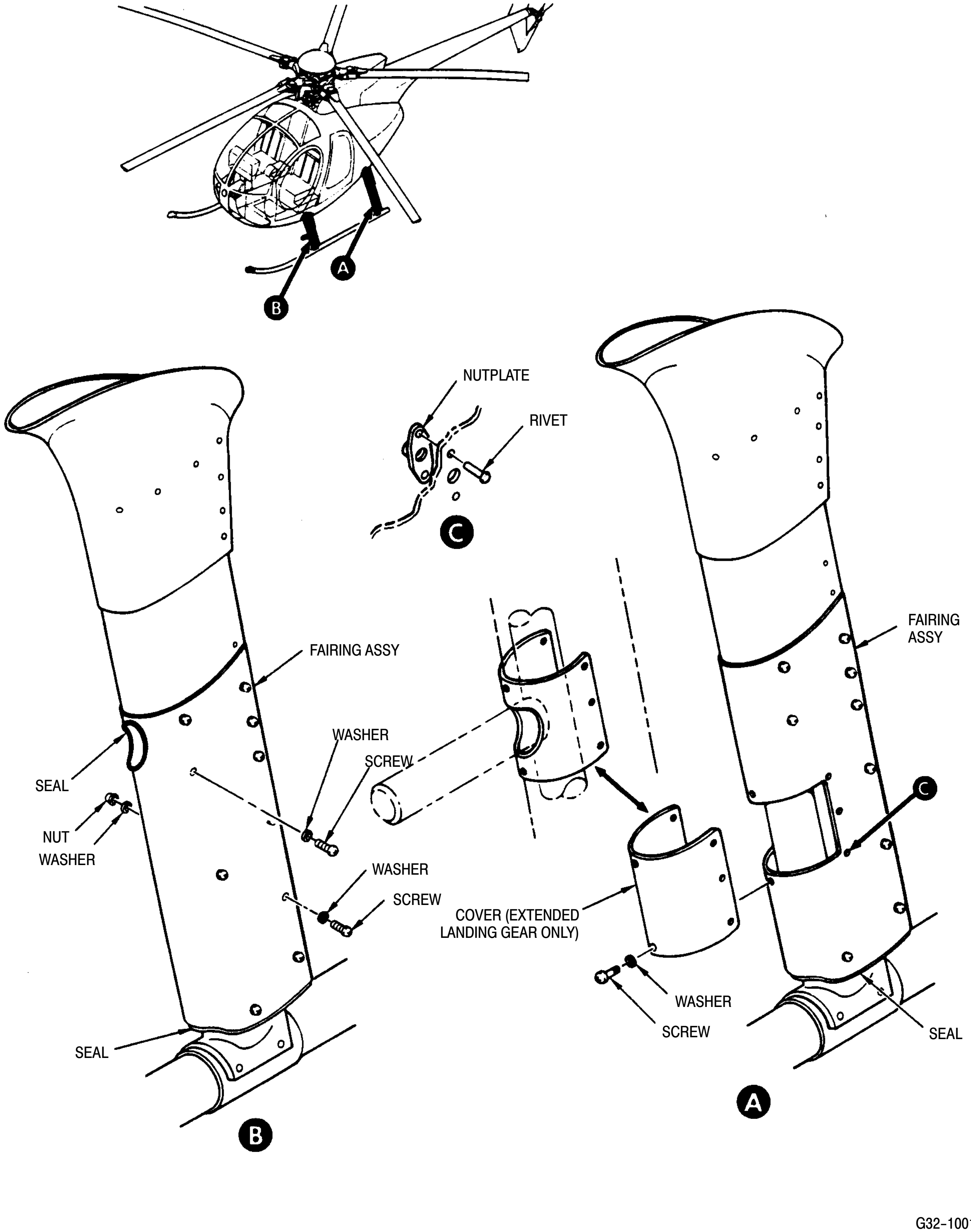


Figure 402. Fairing Installation

(c). Install blind hole transfer punches (two or four places, as applicable) or fabricate suitable tools as shown (Ref. Figure 802). Install tool(s) between opposing holes in strut bracket(s).

(d). Carefully spread trailing edge of fairing and position fairing on strut bracket(s) and lower guide. Have an assistant hold fairing in this position.

(e). Back up fairing with a fiber block at transfer punch location. Using plastic hammer, carefully strike opposite side of fairing to transfer hole centers.

(f). Remove fairing and check that all transfer marks appear within outline of small laminated doublers. Drill out located holes.

(g). Carefully bond fairing to lower guide (Ref. Figure 802). Use adhesive (CM411) according to container instructions.

(h). Install rivets to secure fairing to strut bracket(s).

(i). Install rivets to secure trailing edge of fairing.

(j). Using soft lead pencil, draw a continuous line along horizontal center of upper guide flange.

(2). Install fillet as follows.

(a). Drill a #40 hole in center of each 3/8 inch (9.525 mm) square doubler in fillet. (There are six doublers in the fiberglass fairings.)

(b). Carefully spread trailing edge of fillet and position about upper guide. Clamp lower end of fillet trailing edge to upper end of fairing trailing edge. Clamping prevents fillet movement when fillet rivets are installed. Have an assistant remove temporary holding device and push down on upper guide with suitable tool (wood dowel, etc). Have guide pushed down where a pencil line drawn on guide flange is visible through one #40 hole in fillet. Match-drill guide and secure fillet and guide with hole fastener (Cleco, or equivalent). Repeat procedure for all rivet locations. Remove pushing tool from strut opening.

(c). Remove one fastener at a time, and install screws and washers (Ref. Landing Gear Fairing Fillet Modification).

(d). Install screws, washers and nuts to secure fillet trailing edge together.

(e). Check for smooth telescoping action of fairing into fillet by manually sliding fillet up and down several times.

(f). Close access doors.

(3). Install lower part of two-piece fairing as follows.

(a). Carefully spread trailing edge of fairing and position on upper fairing and lower strut bracket; at correct position there should be 0.020 - 0.080 inch (0.508 - 2.032 mm) compression of fairing seal against skid tube. Have an assistant hold fairing at this position.

(b). Back up fairing with fiber block at transfer punch location. Using plastic hammer, carefully strike opposite side of fairing to transfer hole centers.

(c). Remove fairing and check that all transfer marks appear within outline of small laminated doublers. Drill out located holes.

(d). Reinstall fairing in mounting position and secure to upper and lower strut brackets with screws and washers.

(e). Secure fairing trailing edge with attaching hardware.

NOTE: Be sure doublers are installed between laminations at trailing edge.

5. Cabin Entry Step Replacement

(Ref. Figure 801)

A. Cabin Entry Step Removal

(1). Remove landing gear fairing.

(2). Remove four lockbolts and step from forward landing gear strut, or two bolts, washers and nuts from aft landing gear strut (extended gear only).

B. Cabin Entry Step Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

(1). Install replacement step on forward landing gear strut, using four lockbolts with wet primer (CM318). Four holes in step collar must be drilled out to 0.164 - 0.167 inch (4.166 - 4.242 mm) for installation of lockbolts. If holes are elongated, use next size larger lockbolts.

NOTE: At strut replacement, locate step by using skid centerline-to-step centerline measurement of 11.78 inches (29.92 cm).

(2). Install step on aft landing gear strut, using two bolts, washers and nuts with wet primer. Torque nuts to **60 - 85 inch-pounds 6.78 - 9.60 Nm).**

(3). Install lower fairing on strut.

LANDING GEAR SYSTEM
INSPECTION/CHECK

1. Landing Gear Inspection

(Ref. Figure 801)

NOTE: Inspection should be performed with helicopter skids clear of ground.

(1). Inspect skids, skid abrasion strips, struts, feet, braces and fairings for dents, cracks, loose components or rivets, loose nuts and for missing hardware.

(2). Inspect skid-to-foot and foot-to-strut attachments for loose bolts. Check aft foot-to-bearing rivet installation for security.

NOTE: Loose or defective bolts at forward foot-to- skid locations requires replacement of nutplates.

(3). Using 10X glass and bright light, visually inspect area at, around and between foot-to-strut attach bolts not covered by sealant for cracks and corrosion.

NOTE: If cracks or corrosion other than light surface corrosion is found, replace affected part.

(4). Inspect keel beam areas where the strut assemblies attach for loose bearings, condition of hardware and strut adapters.

(5). Check condition of beaded seal around edges of all rigid-mounted skid tube components.

2. Landing Gear Skid Inspection

(Ref. Figure 801)

NOTE: If landing gear assembly has not been removed from helicopter, perform following steps (1). and (2). before proceeding with inspection.

(1). Jack helicopter until landing gear dampers are fully extended.

(2). Remove lower fairing from two-piece fairing assembly.

(3). Inspect for dents. If dents exceed a depth of 0.20 inch (5.08 mm), they will require repair.

(4). Inspect for punctures and cracks.

(5). Perform fluorescent-penetrant inspection of all crack areas, and of those areas adjacent to all punctures. These areas will require repair.

(6). Inspect from aft end of tube to a point 10 inches (25.40 cm) forward of aft strut for scratches and nicks. If scratches and nicks exceed a length of 0.25 inch (6.35 mm) and a depth of 0.015 inch (0.381 mm), they will require repair.

(7). Inspect from forward end of tube to 10 inches (25.40 cm) forward of aft strut for scratches and nicks. If scratches and nicks exceed a length of 0.25 inch (6.35 mm) and a depth of 0.020 inch (0.508 mm), they will require repair.

(8). Inspect ground handling fittings for cracks, loose rivets, corrosion and other damage.

(9). Inspect abrasion strips for damage, excessive wear, and for loose bolts and screws.

(10). Check skid adapter sleeve rivet attachment for security. On early configurations, check sleeve slots for wear and damage.

(11). Check condition of plug installed in skid adapter sleeve.

(12). Check aft foot bearing and extension for wear, damage and corrosion. On early configurations, check condition of extension packing.

3. Landing Gear Strut Inspection

(Ref. Table 801 and Figure 601)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

(1). Check landing gear dampers for correct servicing by observing stance of helicopter. Check rear dampers for correct extension and signs of leakage.

(2). Remove foot support fairings in passenger/cargo compartment and open engine access doors.

(3). Visually inspect strut attachment points and pivot bearing for signs of fretting, wear and damage. Fretting will be evident by gray or black material around bearing, rivets or seams.

(4). Jack helicopter until landing gear dampers are fully extended.

(5). Shake landing gear assemblies and note any play or looseness at pivot bearings, inboard strut assembly fittings and drag brace holes.

(6). If any play or looseness is noted, remove landing gear (Ref. Landing Gear Removal) and inspect drag brace and strut.

(7). Inspect strut bolt hole where drag brace attaches as follows:

(a). If bushing is installed in drag brace attach hole in strut, proceed as follows:

1). Check bushing for looseness then remove bushing.

2). Using 10X glass and bright light, inspect strut around drag brace attach holes (top and bottom surfaces) for cracks.

3). Check drag brace attach holes in strut for elongation.

a). Diameter of top hole (DIM. A) should be 0.5313 inch (13.495 mm) maximum in any direction.

b). Diameter of bottom hole (DIM. B) should be 0.50 inch (12.70 mm) maximum in any direction.

4). If no cracks are found around drag brace attach hole in strut and hole is not elongated, install new bushing in hole with wet primer (CM318).

5). If either hole is oversized or cracking is noted, rework strut (Ref. Landing Gear Strut Drag Brace Hole Repair).

(b). If no bushing is installed in drag brace attach hole in strut, proceed as follows:

1). Using 10X glass and bright light, inspect strut around drag brace attach holes (top and bottom surfaces) for cracks. If any cracks longer than 0.030 inch (0.762 mm) in length are noted, strut must be scrapped and serviceable strut installed.

2). Check drag brace attach holes in strut for elongation.

3). If any cracks, 0.030 inch (0.762 mm) in length or less, are noted or hole is elongated, rework strut (Ref. Landing Gear Strut Drag Brace Hole Repair).

(8). Reinstall landing gear (Ref. Landing Gear Installation).

(9). Inspect strut for cracks or dents.

(a). If strut is cracked, scrap strut and replace with serviceable strut.

(b). If dents in strut exceed 0.060 inch (1.524 mm) depth; or, if scratches and repair area depth would exceed 0.010 inch (0.254 mm) when measured to surrounding unrepaired surface strut must be scrapped and serviceable strut installed.

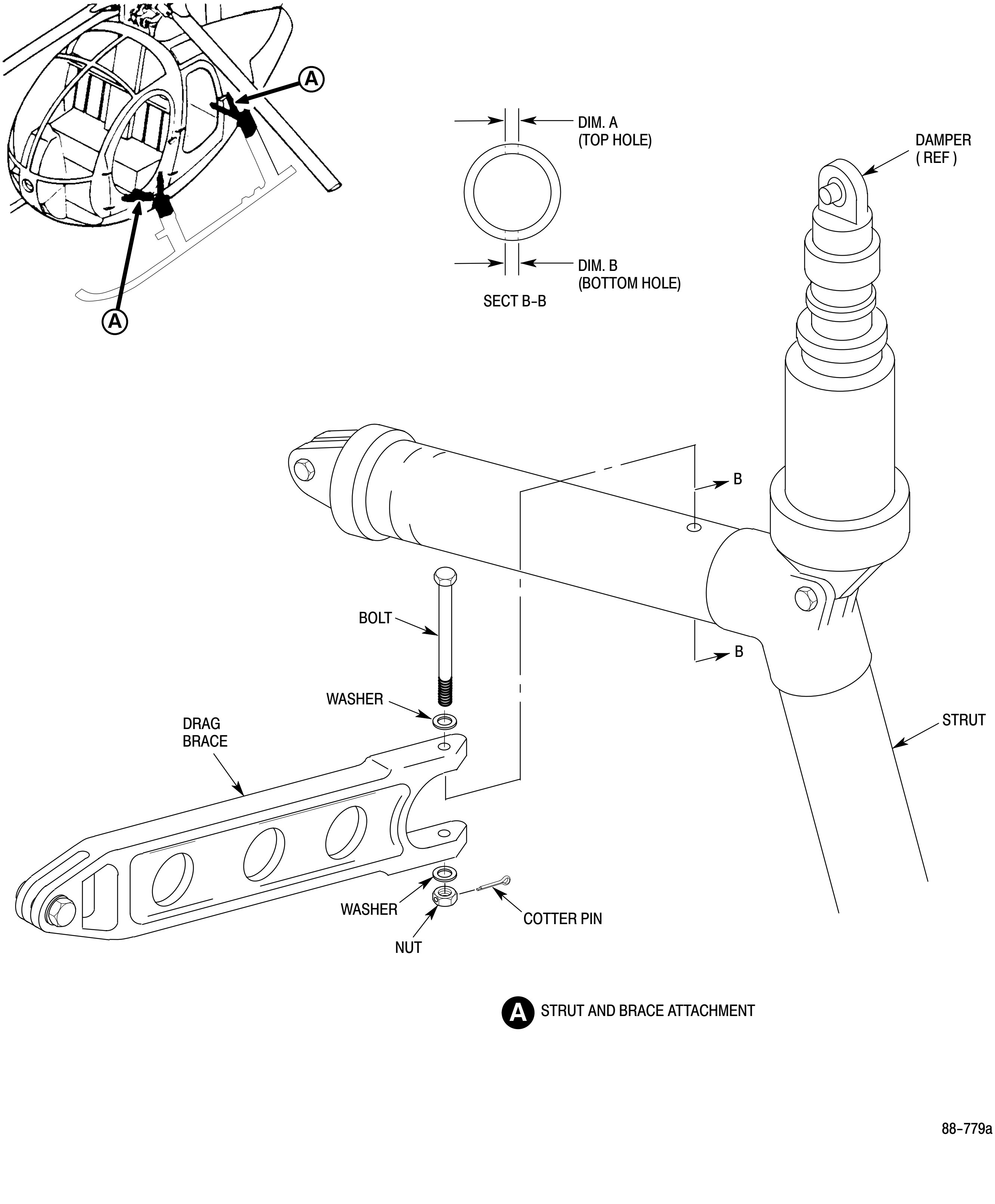


Figure 601. Landing Gear Strut Inspection

(10). For aircraft 369D; 001 & subs, 369E; 0001 thru 0528, 369FF; 0001 thru 0114 and 500N; 001 thru 077: Remove plug button from underside of fairing assembly. Using a bright light and 10X magnifying glass, inspect rivet hole in underside of strut for cracks. If crack is found, strut must be scrapped and serviceable strut installed.

4. Landing Gear Damper Inspection

(Ref. Table 601, Table 602 and Figure 401)

NOTE: It is normal for a thin hydraulic oil film to remain on damper as a result of wiping contact with piston seal. Newly- installed dampers may also have slight oil seepage from oil trapped in end cap threads during damper assembly. Neither of these should be considered damper leakage or cause for damper replacement.

(1). Inspect for hydraulic oil leakage. If leakage is visible, wipe oil from damper after last flight of the day. Re-inspect the following day for oil leakage. If leakage persists, perform bench check (Ref. COM).

(2). With helicopter on jacks, inspect damper assemblies for evidence of bearing looseness in upper and lower caps, worn bearings (excessive radial play), loose or cracked caps and oil leakage. Any misalignment of torque stripes on caps, piston and barrel indicates loosening of caps. Replace immediately and repair removed damper.

(3). Inspect damper attaching hardware for security.

NOTE: Dampers which have been modified (winterized) for cold weather operation are to be checked at not more than 30°F above the coldest temperature at which the helicopter is operated.

(4). Inspect landing gear dampers for condition by observing stance of helicopter (normal stance is slightly nose up). If stance indicates excessive nose up/nose down attitude, perform damper extension check.

NOTE:

- The landing gear damper assemblies are to be checked at a helicopter gross weight of 1925 - 2075 pounds (874 - 942 kg) at a longitudinal CG of approximately 103, exclusive of skid mounted flotation gear. The empty weight of the 369D with full fuel, but no passengers or cargo, is 1775 - 1925 pounds (806 - 874 kg). Therefore achieve the test configuration by adding 75 pounds (34 kg) of ballast to both sides of the cabin floor, just aft of the tail rotor pedals, 150 pounds (68 kg) total. Place the helicopter on a smooth concrete or equivalent surface (not asphalt).
- Dampers which have been modified (winterized) for cold weather operation are to be checked out no more than 30°F (-1°C) above the coldest temperature at which the helicopter is operated.

(a). Raise and lower tailboom above and below the normal at-rest position three times. On the last cycle, allow the tailboom to slowly settle to the at-rest position.

(b). Measure and record dimension from upper end cap to upper end of barrel on all four damper assemblies.

(c). Repeat steps (a). and (b). two more times.

(d). Lower and raise tailboom below and above the normal at-rest position three times. On the last cycle, allow the tailboom to slowly rise to the at-rest position.

(e). Measure and record dimension from upper end cap to upper end of barrel on all four damper assemblies.

(f). Repeat steps (d). and (e). two more times.

(g). Determine average extension from all six readings for each damper assembly. Remove and overhaul any damper assembly not meeting dimensions (Ref. Table 601).

NOTE: If two damper assemblies fail to meet the minimum extension (Ref. Table 601), replace the damper having the greater amount of deflection with a known serviceable damper and repeat steps (a). thru (g). If the original damper again fails to meet minimum extension requirements, replace it with the known serviceable damper, reinstall the first damper and repeat steps (a). thru (g). This will determine whether one or both dampers require overhaul. For owners and operators having suitable equipment, any damper not meeting minimum extension requirements can be bench-checked by applying a single load and measuring the deflection when compressed. (Ref. Table 602 for load and compression requirements.) Dampers meeting specifications in Table 602 may be returned to service if other defects are not noted.

5. Cabin Entry Step Inspection

(Ref. Figure 801)

(1). Remove landing gear fairing assembly.

(2). Inspect step-to-strut attachment for loose attaching hardware by checking for relative motion between mating parts.

(3). Inspect welded joint of step for cracks.

(4). Inspect safety walk tape for condition and security. Replace unserviceable tape.

(5). Inspect fairing seal for condition.

(6). Install landing gear fairing assembly.

6. Landing Gear Fairing Inspection

(Ref. Figure 802)

(1). Inspect fairing support brackets for security of attachment to strut, cracks and deformation.

(2). Inspect fairing-to-skid seal for deterioration and bonding.

(3). Inspect fuselage rubbing plate for security of bond and excessive wear.

(4). On forward fairings (aft fairings with steps attached to struts), inspect fairing step seal for deterioration and bonding.

Table 601. Minimum Damper Extension

Standard Landing Gear (in/cm)		Extended Landing Gear (in/cm)	
Aft	3.40 / 8.64	Aft	3.20 / 8.13
Fwd	3.25 / 8.26	Fwd	2.90 / 7.37

Table 602. Landing Gear Damper Bench Test Requirements

Damper P/N (1)		Test Load		Compression Stroke	
		Pounds	(kg)	Inches	(mm/cm)
369D26300	(2)	1200	(545)	0.80	(20.32 mm)
369D26300-31		1320 ±100	(599 ±45)	0.80	(20.32 mm)
		3780 ±400	(1716 ±182)	2.75	(6.99 cm)
369D26301	(2)	1700	(772)	0.80	(20.32 mm)
369D26301-31		1900 ±100	(863 ±45)	0.80	(20.32 mm)
		3950 ±400	(1793 ±182)	2.75	(6.99 cm)

NOTES:

(1) Conduct all tests at 70 ±2° F except as noted.

(2) Cold-soak winterized dampers at 0 ±3° F for 24 hours minimum before testing.

LANDING GEAR SYSTEM
REPAIRS

1. Landing Gear System Repairs

(Ref. Figure 801) For more extensive repairs, refer to CSP-SRM-6.

(1). Repair scratches and nicks by smoothing sharp edges.

(2). Repair elongated, enlarged or worn holes in strut fittings, either inboard or outboard.

(3). Repair bolt holes at large end of brace that attaches to strut.

(4). Replace strut; if cracked, if dents in strut exceed 0.060 inch (1.524 mm) depth or if scratched and repaired area depth would exceed 0.010 inch (0.254 mm) when measured to surrounding unrepaired surface.

(5). Replace defective or badly damaged fairing.

(6). Repair fairing fiberglass damage, such as small tears or punctures that do not impair the telescoping action of the fairing.

(7). Replace cracked, dented or distorted braces.

(8). Repair or replace damaged skid tube.

(9). Replace center beam-to-landing-gear attachment bearings that exceed 0.040 inch (1.016 mm) axial play.

(10). Repair loose or defective rivets securing foot to bearing; replace defective bearing.

2. Skid Adapter Sleeve Replacement

(Ref. Figure 801)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer
CM425	Sealing compound

NOTE: Following applies to early configuration landing gear skids. Installation differences for current configuration landing gear skids are noted in Figure 801.

(1). Remove abrasion strip. Drill out rivets securing adapter sleeve and remove residue from end of tube.

(2). Coat mating surface of replacement sleeve with a thin coat of sealing compound (CM425) and install in skid tube with 9.06 inch (23.012 cm) overhang (Ref. Figure 801).

(3). Drill holes for replacement rivets and abrasion strip attachment bolt.

(4). Coat replacement rivets with primer (CM318) and install while wet; Maintain 9.06 inch (23.012 cm) overhang during installation.

(5). Install replacement plug in sleeve 4 inches (10.16 cm) inside skid from aft end). Secure in place with bead of sealant.

(6). Install aft abrasion strip.

3. Abrasion Strip Replacement

(Ref. Figure 801)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM209	Zinc chromate putty
CM318	Primer
CM425	Sealing compound

(1). Remove bolts securing defective abrasion strip(s) to skid.

(2). Remove screws securing abrasion strip to skid extension sleeve. Completely remove any residual zinc chromate putty.

(3). Apply putty (CM209) to any bare metal.

(4). Coat new screws or bolts for replacement abrasion strip with primer

(CM318) and install while primer is still wet.

(5). After installation, seal all of parting edges of abrasion strip next to skid tube with an approximate 0.060 inch (1.524 mm) bead (fillet) of sealing compound (CM425) to make watertight.

Table 801. Maximum Damage Limits - Landing Gear Components

Component	Dents in / mm	Nicks in / mm	Scratches in / mm	Cracks in / mm	Holes in / mm
Skid tube (2)	0.200 / 5.08 (1)	0.010 / 0.254, from aft side of aft strut to 10 inches (25.4 cm) forward of the strut, with cleanup not exceeding 0.015 / 0.381; 0.015 / 0.381 if forward of that point to start of curved section, with cleanup not exceeding 0.020 / 0.508 (1)	(Same as for nicks) (1)	No cracks allowed	0.250 / 6.350 (1) (3)
Forward foot	0.060 / 1.524	0.060 / 1.524	0.010 / 0.254	No cracks allowed	No holes allowed
Strut	0.060 / 1.524	(1)	(1)	No cracks allowed	No holes allowed
Brace	0.050 / 1.270	0.010 / 0.254	0.005 / 0.127	No cracks allowed	No holes allowed
Damper assembly	0.060 / 1.524	0.010 / 0.254	0.010 / 0.254	No cracks allowed	No holes allowed
Fittings	0.010 / 0.254	0.010 / 0.254	0.010 / 0.254	No cracks allowed	No holes allowed
Aft foot	0.060 / 1.524	0.060 / 1.524	0.010 / 0.254	No cracks allowed	No holes allowed
Foot bearing	0.010 / 0.254	0.010 / 0.254	0.010 / 0.254	No cracks allowed	No Holes allowed
Indexing plug	0.040 / 1.016	0.040 / 1.016	0.040 / 1.016	No cracks allowed	No holes allowed
Skid extension	0.010 / 0.254 (4)	0.010 / 0.254 (4)	0.010 / 0.254 (4)	No cracks allowed	No holes allowed

NOTES:

(1) For other repair data, refer to CSP-SRM-6.

(2) Repair of minor skid tube damage aft of rear strut and on forward (curved) section is not required, but surface finish must be restored.

(3) Hole must be plugged with correct size blind rivet.

(4) No damage is allowed on skid extension where skid and sleeve are attached.

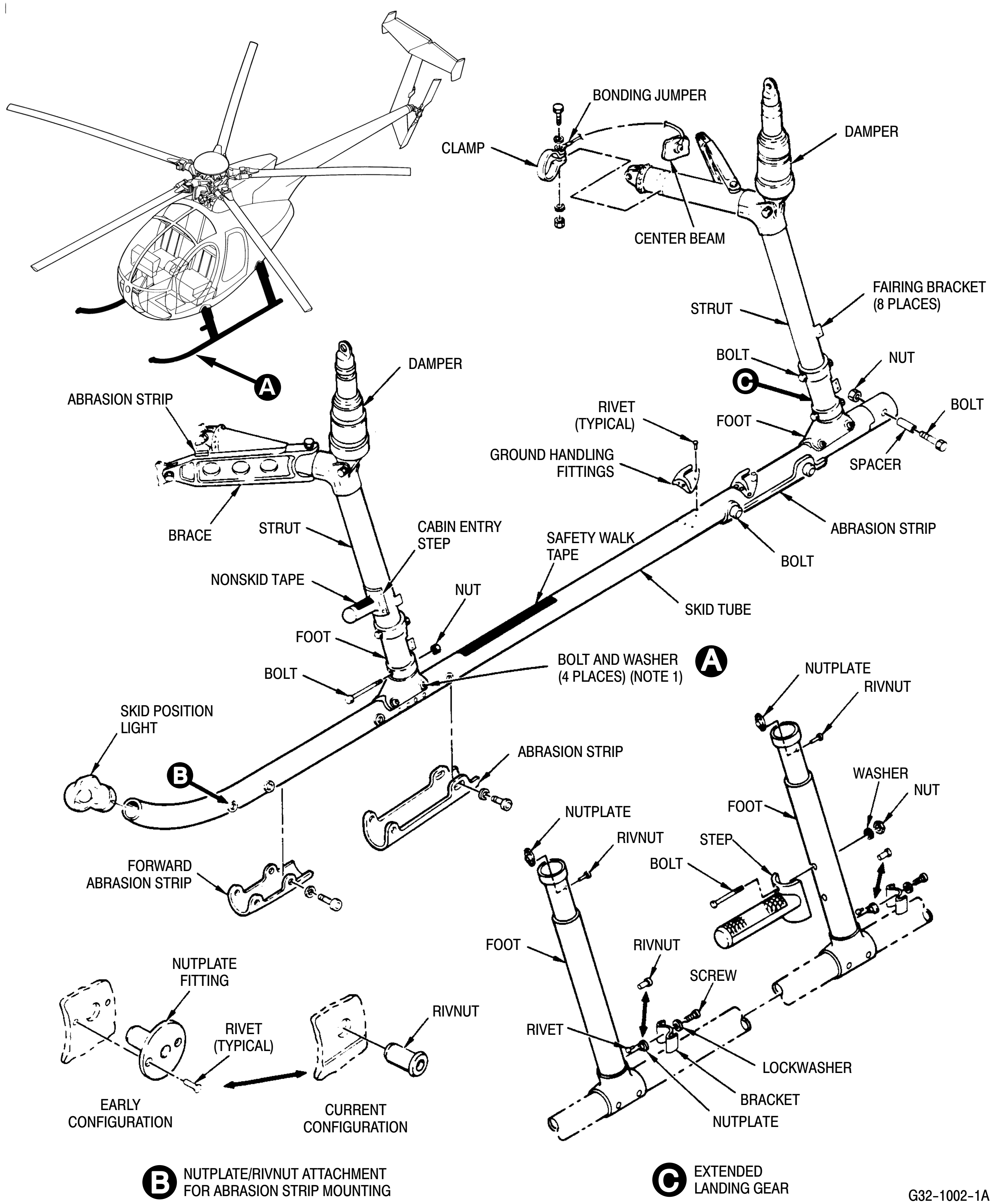
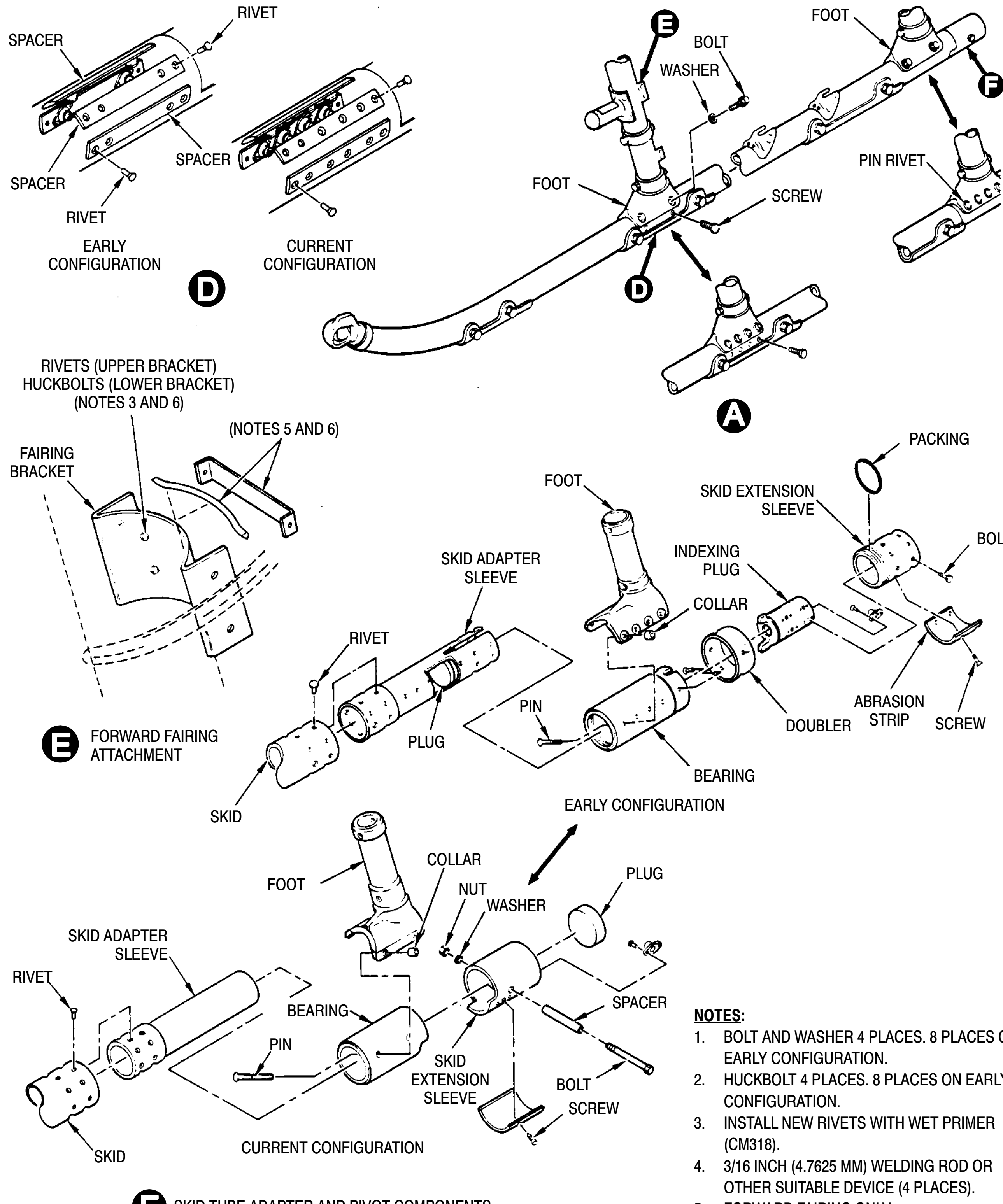


Figure 801. Landing Gear Repairs (Sheet 1 of 2)



NOTES:

1. BOLT AND WASHER 4 PLACES. 8 PLACES ON EARLY CONFIGURATION.
2. HUCKBOLT 4 PLACES. 8 PLACES ON EARLY CONFIGURATION.
3. INSTALL NEW RIVETS WITH WET PRIMER (CM318).
4. 3/16 INCH (4.7625 MM) WELDING ROD OR OTHER SUITABLE DEVICE (4 PLACES).
5. FORWARD FAIRING ONLY.
6. HUCKBOLT HEAD COUNTERSUNK INSIDE STRUT; NO PORTION OF HEAD TO PROTRUDE INSIDE STRUT.

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Figure 801. Landing Gear Repairs (Sheet 2 of 2)

4. Ground Handling Fitting Replacement

(Ref. Figure 801)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM209	Zinc chromate putty
CM318	Primer
CM425	Sealing compound

(1). Drill out rivets securing defective fitting.

(2). Coat mating surfaces with zinc chromate putty (CM209) and install replacement fitting in place.

(3). Coat new rivets with primer (CM318) and install while primer is wet.

(4). Seal edges with an approximate 0.060 (1.524 mm) inch bead of sealing compound (CM425) for waterproofing.

5. Safety Walk Tape Replacement

(Ref. Figure 801)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM220	Naphtha aliphatic
CM724	Tape, non-slip

(1). Carefully pull or scrape away damaged tape.

(2). Remove all residual adhesive from skid tube by wiping with a clean cloth wetted by naphtha (CM220).

(3). Install new tape (CM724) and press firmly into place. Expel air bubbles while pressing down tape.

6. Landing Gear Fairing Repair

(Ref. Figure 802) Repair fairings according to SRM. If upper fairing is damaged beyond fiberglass repair limits, the fillet and fairing must be removed.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM418	Cement, epoxy

(1). Replace an excessively damaged lower fairing.

(2). Replace damaged fairing bracket or lower guide. Remove rivets, locate new part and install blind rivets. Use next larger size rivets if mating holes in strut are enlarged.

(3). Replace damaged guide/pin assembly or guide half if guide is cracked, pins are bent or badly worn or teflon pad is loose or badly worn.

(4). Replace springs that are badly worn or rusty, or if free length is less than 8.72 inches.

(5). Replace fillet if teflon strip is loose or badly worn.

(6). Replace damaged strut bracket. Remove rivets, locate new part and install blind rivets. Use next larger size rivets if mating holes in strut are enlarged.

(7). Replace unserviceable rubber seals; use cement (CM418).

7. Landing Gear Fairing Fillet Modification

The following is a procedure for modifying the landing gear fairing fillet for easy removal and better access to the landing gear struts.

(1). Remove fillet from upper part of fairing assembly (Ref. Landing Gear Fairing Removal).

(2). Enlarge existing holes in fairing fillets and fillet guides to 0.220 - 0.230 inch (5.588 - 5.842 mm).

(3). Install A1133-4-3 Nut-Clips on fillet guides over enlarged holes.

(4). Reinstall fillets using NAS603-6P screws and AN960KD10L washers through fillet into fairing guides.

(5). Secure trailing edge of fillet using NAS603-6P screws, AN960KD10L washers and MS21042-3 nuts (washer under screw head and nut).

(6). Finish reinstalling fillet (Ref. Landing Gear Fairing Installation).

8. Landing Gear Strut Drag Brace Hole Repair

(Ref. Figure 601) The following procedure is for repair of the bolt hole in the landing gear strut where the drag brace attaches. This rework is for either elongated or cracks in the bolt hole area (Ref. Landing Gear Strut Inspection).

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

A. Landing Gear Strut with Bushing Installed

(1). Ream out top hole (DIM. A) to 0.5608-0.5613 inch (12.244-14.257 mm) and ream out bottom hole (DIM. B) to 0.5295-0.530 inch (13.449-13.462 mm).

(2). Perform fluorescent penetrant inspection of reworked areas for cracks.

(a). If any cracks are noted, rework strut per step (3).

(b). If no cracks are noted, install new 369H6023-1 bushing in hole with wet primer (CM318).

(3). Ream out top hole (DIM. A) to 0.5908-0.5913 inch (15.006-15.019 mm) and ream out bottom hole (DIM. B) to 0.5595-0.560 inch (14.211-14.224 mm).

(4). Perform fluorescent penetrant inspection of reworked areas for cracks.

(a). If crack is found, strut must be scrapped and serviceable strut installed.

(b). If no cracks are noted, install new 369H6023-3 bushing in hole with wet primer.

B. Landing Gear Strut with No Bushing Installed

(1). Ream out top hole (DIM. A) to 0.5308-0.5313 inch (13.482-13.495 mm) and ream out bottom hole (DIM. B) to 0.4995-0.50 inch (12.687-12.70 mm).

(2). Perform fluorescent penetrant inspection of reworked areas for cracks.

(a). If any cracks are noted, rework strut per step (3).

(b). If no cracks are noted, install new 369H6002-1 1 bushing in hole with wet primer (CM318).

(3). Ream out top hole (DIM. A) to 0.5608-0.5613 inch (12.244-14.257 mm) and ream out bottom hole (DIM. B) to 0.5295-0.530 inch (13.449-13.462 mm).

(4). Perform fluorescent penetrant inspection of reworked areas for cracks.

(a). If any cracks are noted, procede with step (5).

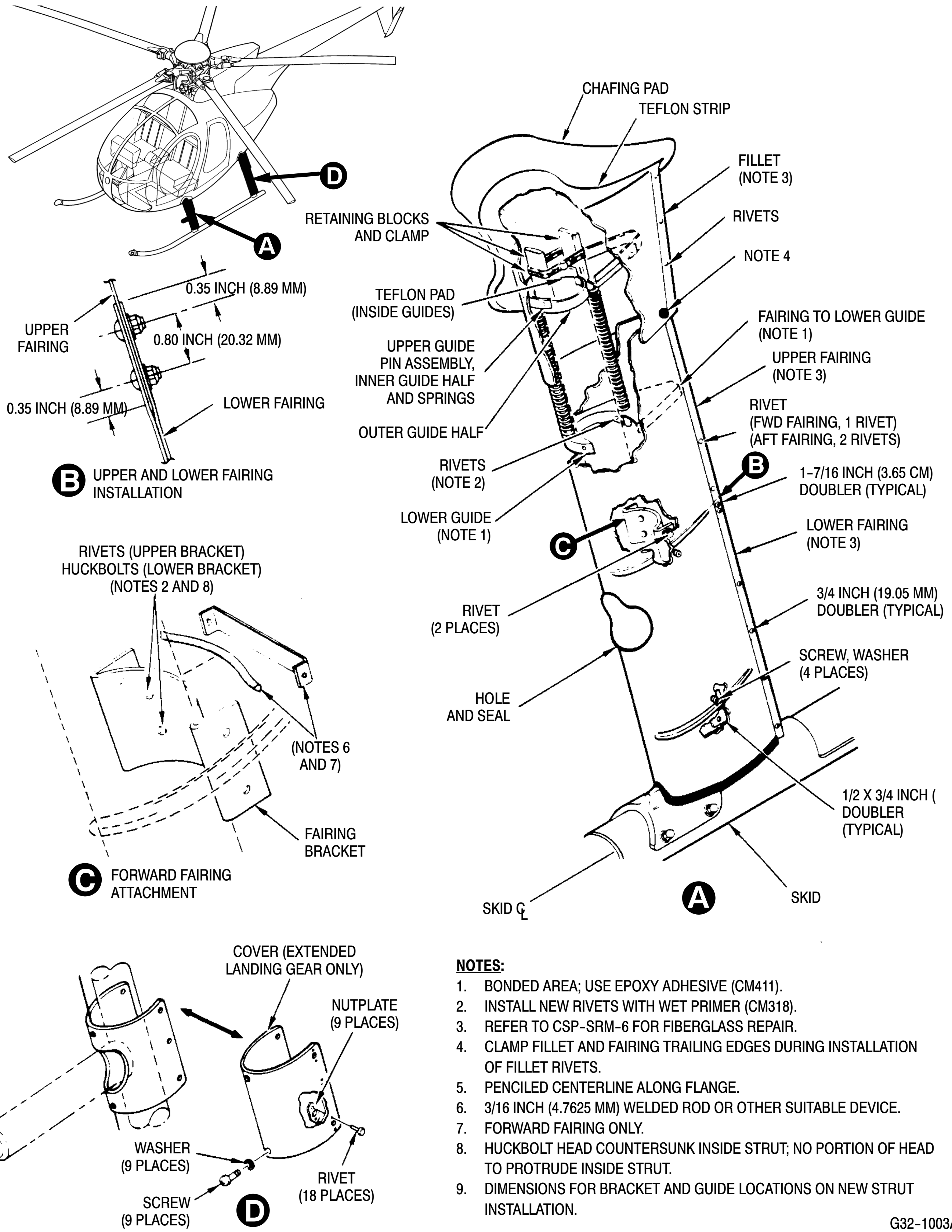
(b). If no cracks are found around drag brace attach hole in strut and hole is not elongated, install new 369H6023-1 bushing in hole with wet primer (CM318).

(5). Ream out top hole (DIM. A) to 0.5908-0.5913 inch (15.006-15.019 mm) and ream out bottom hole (DIM. B) to 0.5595-0.560 inch (14.211-14.224 mm).

(6). Perform fluorescent penetrant inspection of reworked areas for cracks.

(7). If crack is found, strut must be scrapped and serviceable strut installed.

(8). If no cracks are noted, install new 369H6023-3 bushing in hole with wet primer.



NOTES:

1. BONDED AREA; USE EPOXY ADHESIVE (CM411).
2. INSTALL NEW RIVETS WITH WET PRIMER (CM318).
3. REFER TO CSP-SRM-6 FOR FIBERGLASS REPAIR.
4. CLAMP FILLET AND FAIRING TRAILING EDGES DURING INSTALLATION OF FILLET RIVETS.
5. PENCILED CENTERLINE ALONG FLANGE.
6. 3/16 INCH (4.7625 MM) WELDED ROD OR OTHER SUITABLE DEVICE.
7. FORWARD FAIRING ONLY.
8. HUCKBOLT HEAD COUNTERSUNK INSIDE STRUT; NO PORTION OF HEAD TO PROTRUDE INSIDE STRUT.
9. DIMENSIONS FOR BRACKET AND GUIDE LOCATIONS ON NEW STRUT INSTALLATION.

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Figure 802. Landing Gear Fairing Repairs

EXTENDED LANDING GEAR INITIAL INSTALLATION

1. Extended Landing Gear Initial Installation

The following instructions are for both left and right landing gear assemblies.

(1). Identify all components, including attaching hardware, or components removed for access to work area. Protect components from damage and foreign matter until installed.

(2). Ensure all cockpit electrical switches are **OFF**.

NOTE: Ensure **BATT-OFF-EXT** switch is **OFF**.

(3). Using jacking or hoisting methods, raise helicopter clear of ground.

A. Standard Landing Gear Removal

Removal of complete landing gear is not required.

(1). Open engine access doors.

(2). Remove hardware attaching aft damper assemblies to fuselage fittings and landing gear struts; remove aft damper assemblies. Retain attaching hardware for reuse.

(3). Remove screws attaching position light assemblies to skid assembles. Retain screws for reuse. Disconnect electrical harness and remove position light assemblies.

(4). Remove hardware that secures trailing edge of forward and aft lower fairings. Remove hardware attaching lower fairings to strut assemblies. Carefully spread trailing edge of lower fairings and remove in forward direction.

NOTE: If preload condition prevents removal of skid assemblies, disconnect forward foot assemblies from skid assemblies to eliminate preload.

(5). Remove ABC bolts from forward and aft strut assemblies. Retain ABC hardware for reuse. Remove skid assemblies with foot assemblies attached.

B. Standard Landing Gear Disassembly

Complete disassembly of landing gear is not required; however, certain items must be removed.

(1). On current configuration standard landing gear, disassemble as follows:

(a). Remove bolt, washer and nut attaching aft foot assembly and skid extension to skid tubes.

(b). Remove bolts and washers attaching forward foot assembly to skid tubes.

(2). On early configuration standard landing gear, disassemble as follows:

(a). Remove screws and abrasion strip at aft section of skid tubes.

(b). Remove bolts attaching skid extension, indexing plug and aft foot assembly to skid tube.

(c). Remove bolts and washers attaching forward foot assembly to skid tube.

C. Extended Landing Gear Assembly

Extended landing gear is shipped with as many parts assembled as practical; however, certain items require assembly at installation.

Early configuration forward foot assembly and skid tube have an eight-hole mounting pattern; current configuration foot assembly and skid tube have a four-bolt mounting pattern.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer
CM425	Sealing compound

(1). If early foot assembly is used with current skid tube:

(a). Drill out four rivets (48, Figure 902) and remove two spacers (49) from skid tube.

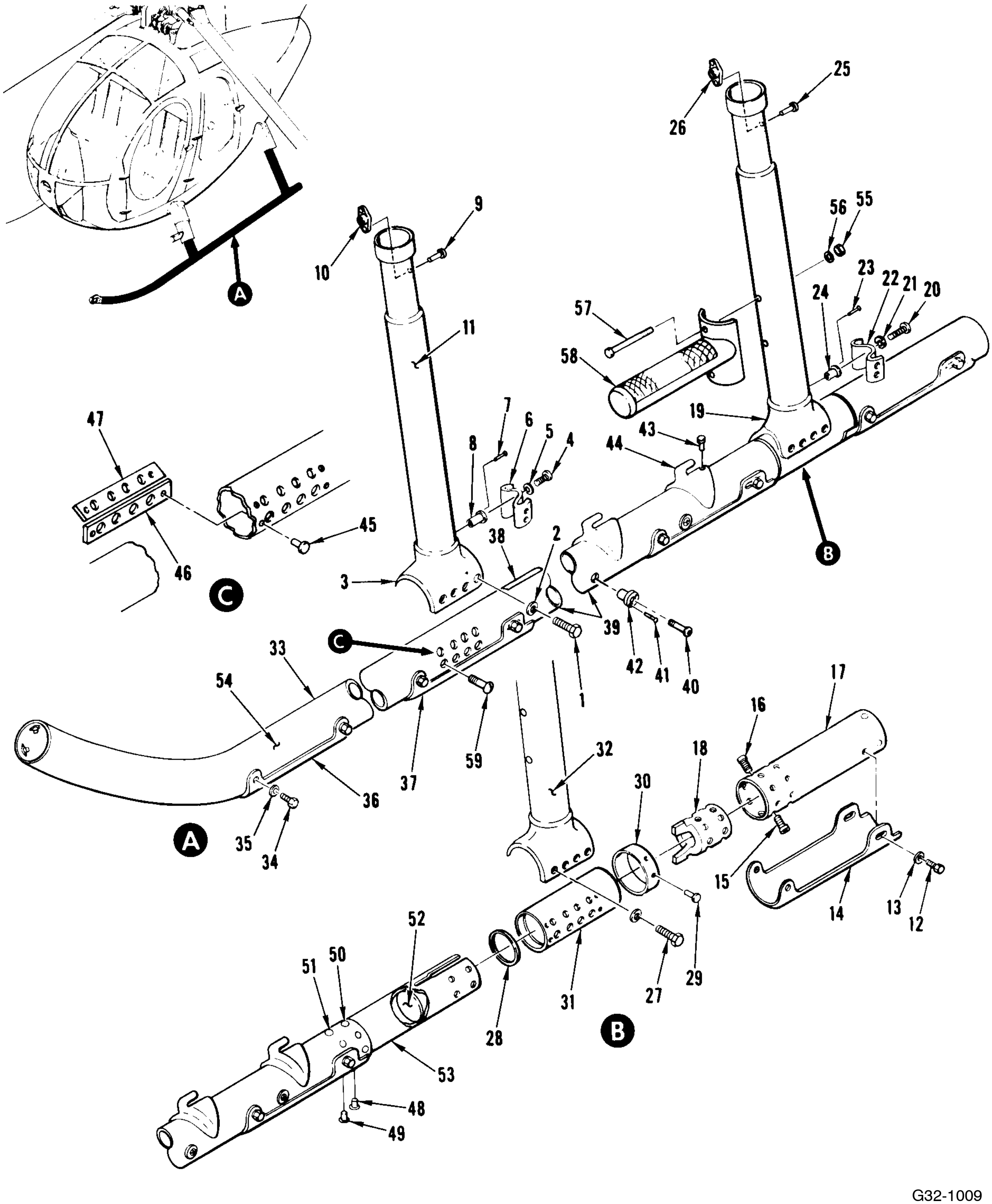


Figure 901. Extended Landing Gear Assembly (Early Configuration)

Legend (Ref. Figure 901)

1. Bolt (MS21250-04006)
2. Washer (MS20002C4)
3. Foot assy (369D292113-1 LH FWD) (369D292113-2 RH FWD)
4. Screw (NAS1403-1)
5. Lockwasher (MS35338-43)
6. Bracket (369H92111-1 1)
7. Rivet (NAS1921M04-03)
8. Nutplate (369H92507)
9. Rivet (CCR26455-3-5)
10. Nutplate (NAS1068A3)
11. Foot (369D29113-3 LH FWD) (369D29113-4 RH FWD)
12. Bolt (NAS1223C1)
13. Washer (HS306-222)
14. Abrasion strip (369H6102)
15. Screw (NAS56HK3-6)
16. Bolt (NAS1223C8P)
17. Extension assy (369D26038)
18. Index plug (369D26037)
19. Foot assy (369D292111-101 LH AFT) (369D292111-102 RH AFT)
20. Screw (NAS1403-1)
21. Lockwasher (MS35338-43)
22. Bracket (369H92111-1 1)
23. Rivet (ML5100M4-3)
24. Nutplate (369H92507)
25. Rivet (MS20605AD3C3)
26. Nutplate (NAS1068A3)
27. Pin rivet (HL3375K8A6)
28. Packing (H53113E142)
29. Rivet (MS20426AD4)
30. Doubler (369D26031)
31. Bearing (369D26030-1 LH) (369D26030-2 RH)
32. Foot (369D29113-3 LH AFT) (369D29113-4 RH AFT)
33. Skid assy (369D292114)
34. Bolt (NAS1223C1)
35. Washer (HS306-222)
36. Abrasion strip (369H92583)
37. Abrasion strip (369H6102)
38. Tape (369D292114-3)
39. Tube assy (369D292114-5)
40. Screw (NAS1190C3P3)
41. Rivet (NAS1921M04-03)
42. Nutplate (369H92507)
43. Rivet (NAS1919M04-03)
44. Fitting (369A6107-3)
45. Rivet (NAS1399D4-4)
46. Spacer (369A6100-7)
47. Spacer (369A6100-5)
48. Rivet (NAS1399C5-3)
49. Rivet (NAS1399C5-2)
50. Rivet (NAS1398C5-3)
51. Rivet (NAS1398C5-2)
52. Plug (369D26040)
53. Adapter sleeve (369D26032)
54. Tube (369D292115)
55. Nut (MS21045-5)
56. Washer (AN960KD513)
57. Bolt (NAS1305-36)
58. Step assy (369D292028)
59. Screw (1030-428-8M)

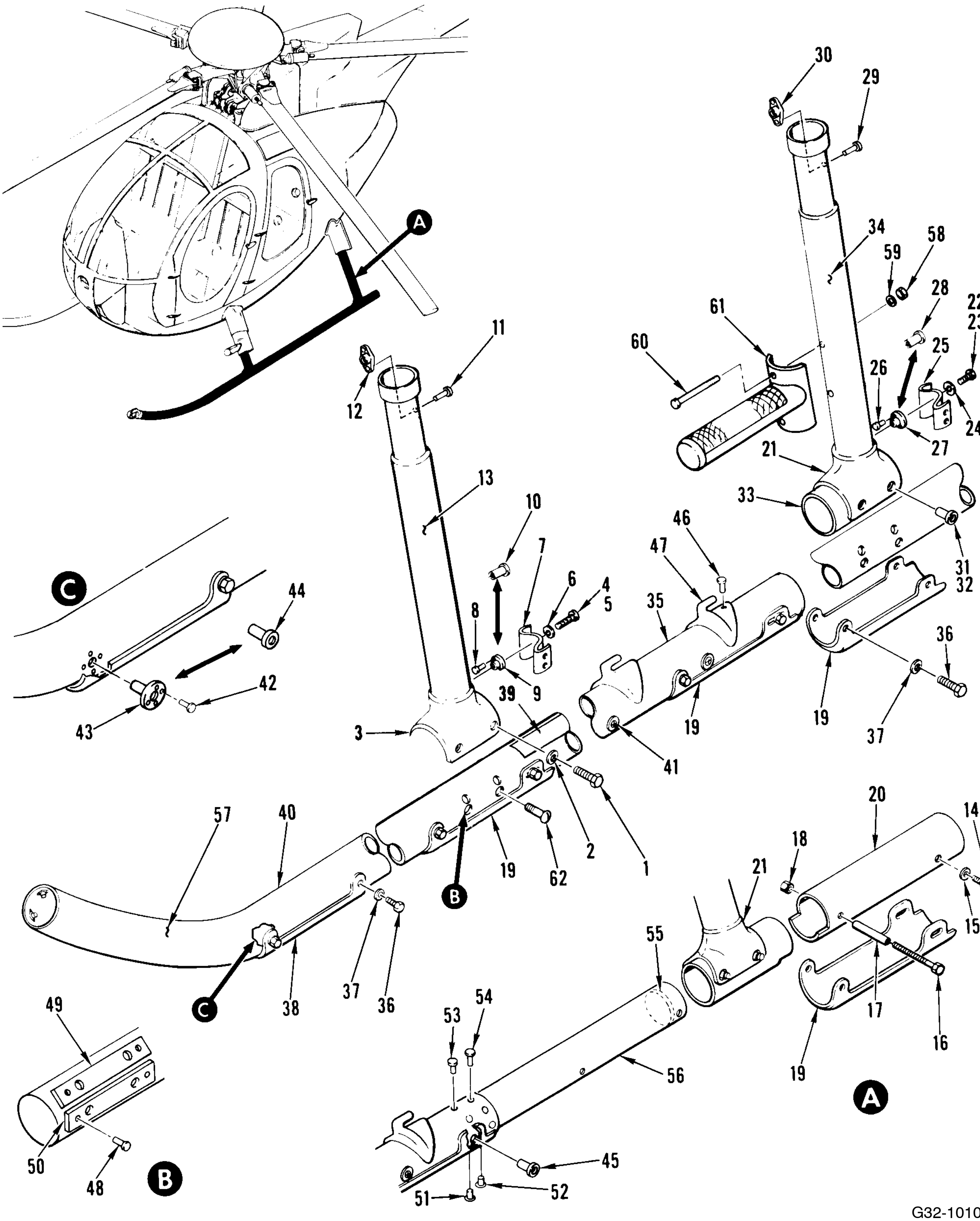


Figure 902. Extended Landing Gear Assembly (Current Configuration)

Legend (Ref. Figure 902)

1. Bolt (MS2125004006)
2. Washer (MS20002C4)
3. Foot assy. (369D292113-103 LH FWD)
   (369D292113-104 RH FWD)
   (369D292113-101 LH FWD)
   (369D292113-102 RH FWD)
4. Screw (NAS1403-1)
5. Screw (NAS1403-5)
6. Lockwasher (MS35338-43)
7. Bracket (369H92111-1 1)
8. Rivet (NAS1921M04-03)
9. Nutplate (369H92507)
10. Rivnut (NAS1329C3KB180)
11. Rivnut (CCR26455-3-5)
12. Nutplate (NAS1068A3)
13. Foot (369D292113-5 LH FWD)
    (369D292113-6 RH FWD)
14. Bolt (NAS1223C1 (-101 assy))
    (NAS1223C5 (-103 assy))
15. Washer (HS306-222)
16. Bolt (NAS1104-44)
17. Spacer (369D26013)
18. Nut (NAS21042-4)
19. Abrasion strip (369H6102)
20. Extension assy (369D26045)
21. Foot assy (369D292111-105 LH AFT)
    (369D292111-106 RH AFT)
    (369D292111-103 LH AFT)
    (369D292111-104 RH AFT)
22. Screw (NAS1403-1)
23. Screw (NAS1403-5)
24. Lockwasher (MS35338-43)
25. Bracket (369H92111-1 1)
26. Rivet (ML5100-M4-3)
27. Nutplate (369H92507)
28. Rivnut (NAS1329C3KB180)
29. Rivet (MS20605AD3C3)
30. Nutplate (NAS1068A3)
31. Pin rivet (HL3375K8A6)
32. Pin rivet (HL3375K8A6)
33. Bearing (369D26010-1 LH)
    (369D26010-2 RH)
34. Foot (369D292113-5 LH AFT)
    (369D292113-6 RH AFT)
35. Skid assy (369D292114-101/-103)
36. Bolt (NAS1223C1 (-101 assy))
    (NAS1223C4 (-103 assy))
37. Washer (HS306-222)
38. Abrasion strip (369H92583)
39. Tape (369D292114-3)
40. Tube assy (369D292114-7/-9)
41. Screw (NAS1190C3P3 (-101 assy))
    (NAS1130C3P8 (-103 assy))
42. Rivet (NAS1921M04-03)
43. Nutplate (369H92507)
44. Rivnut (C2R1947-1)
45. Rivnut (C2R1947-2)
46. Rivet (NAS1919M04-03)
47. Fitting (369A6107-3)
48. Rivet (NAS1399D4-4)
49. Spacer (369D26014)
50. Spacer (369D26015)
51. Rivet (NAS1399C5-3)
52. Rivet (NAS1399C5-2)
53. Rivet (NAS1398C5-3)
54. Rivet (NAS1398C5-2)
55. Plug (369D26040)
56. Adapter sleeve (369D26012)
57. Tube (369D292115)
58. Nut (MS21045-5)
59. Washer (AN960KD516)
60. Bolt (NAS1305-36)
61. Step (369D292028)
62. Screw (1030-428-8M)

(b). Apply primer (CM318) to replacement spacers (47, Figure 901) and install into skid tube with four NAS1399D4-4 rivets.

(c). Position foot assembly on skid tube and locate center four holes.

(d). Mark holes and drill the needed 0.254 - 0.260 inch (6.452 - 6.604 mm) holes as required.

(2). If current foot assembly is used with early skid tube:

(a). Fill center four holes with sealing compound (CM425).

(3). Attach extended wire harness to position light and install light in forward end of skid tube (Ref. Figure 903) using screws retained from standard landing gear.

D. Early Configuration Extended Landing Gear Assembly Buildup

(Ref. Figure 901)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer
CM425	Sealing compound

(1). Coat mating surface of forward foot assembly (3) and skid tube (54) with primer (CM318).

(a). Position forward foot assembly on skid tube.

(b). Apply primer to bolts (1) and washers (2) and install; torque bolts to **80 - 100 inch-pounds (9.04 - 11.30 Nm)**.

(2). Coat mating surfaces of extension (17), indexing plug (18) and aft foot assembly (32) with primer.

(a). Position indexing plug, aft foot assembly and extension on skid tube.

(b). Coat screw (15) and bolts (16) with primer and install.

(3). Coat mating surface of abrasion strip and hardware with primer.

(a). Position abrasion strip (14) on aft section of skid tube.

(b). Install abrasion strip using bolts (12) and washers (13).

(c). Seal mating edge of abrasion strip with 0.060 inch (1.524 mm) bead of sealing compound (CM425).

E. Current Configuration Extended Landing Gear Skid Tube Assembly Buildup

(Ref. Figure 903)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer
CM425	Sealing compound

(1). Coat mating surface of forward foot assembly (3) and skid tube (57) with primer (CM318).

(a). Position forward foot assembly on skid tube.

(b). Apply primer to bolts (1) and washers (2) and install; torque bolts to **80 - 100 inch-pounds (9.04 - 11.30 Nm)**.

(2). Coat mating surfaces of aft foot assembly (21) and extension (20) with primer. Position extension and aft foot assembly on adapter sleeve (56).

(3). Coat mating surface of abrasion strip (19) and hardware with primer and position on extension (20).

(a). Install aft foot assembly (21), extension (20) and abrasion strip (19) using bolts (14 and 16), washers (15), spacer (17) and nut (18).

(b). Seal mating edge of abrasion strip with 0.060 inch (1.524 mm) bead of sealing compound (CM425).

F. Extended Landing Gear Installation

(Ref. Figure 901)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer
CM420	Sealant
CM612	Tube, silicone
CM613	Sleeve, vinyl
CM703	Tie strap
CM812	Splice, knife
N/A	Wire, AWG 20, 47108-B-20

(1). Align foot and skid assembly with strut assembly.

(2). Slide foot assembly into strut assembly.

(3). Coat ABC bolts with primer (CM318).

(4). While primer is wet, install ABC bolts; torque bolts to **40 - 60 inch-pounds (4.52 - 6.78 Nm)**.

(5). Seal ABC bolts with sealant (CM420).

NOTE: Leave a minimum of one full service loop in electrical harness to ensure that tension is not applied to position lights, if installed.

(6). Route extended wire harness from position light through forward foot assembly.

(a). Attach wire with splice (CM812); cover splice with silicon tube (CM612) and tie tube with strap (CM703).

(b). Cover entire length of extended electrical harness with vinyl sleeve (CM613).

(7). Install extended landing gear aft damper assemblies using serviceable hardware removed from standard landing gear (Ref. Landing Gear Damper Replacement).

(8). Apply 0.060 inch (1.524 mm) bead of sealant (CM420) to mating edge of foot assemblies and strut assemblies.

(9). Install fairings (Ref. Landing Gear Fairing Replacement).

G. Weight and Balance

Weight and balance changes that result from installation of extended landing gear are listed in Table 901. After installation of extended landing gear, incorporate changes to helicopter weight and balance record as instructed in Section 08-10-00.

Table 901. Weight and Balance Data

	Weight lbs (kg)	Arm in. (cm)	Moment in.-lb/100 (kg mm/100)
Added	+94 (+42.638)	92.3 (234.44)	+86.8 (+10000.04)
Removed	-73 (-33.1 12)	97.0 (246.38)	-70.8 (-815.70)
Change	+21 (+9.525)	76.0 (193.04)	+16.0 (+184.34)

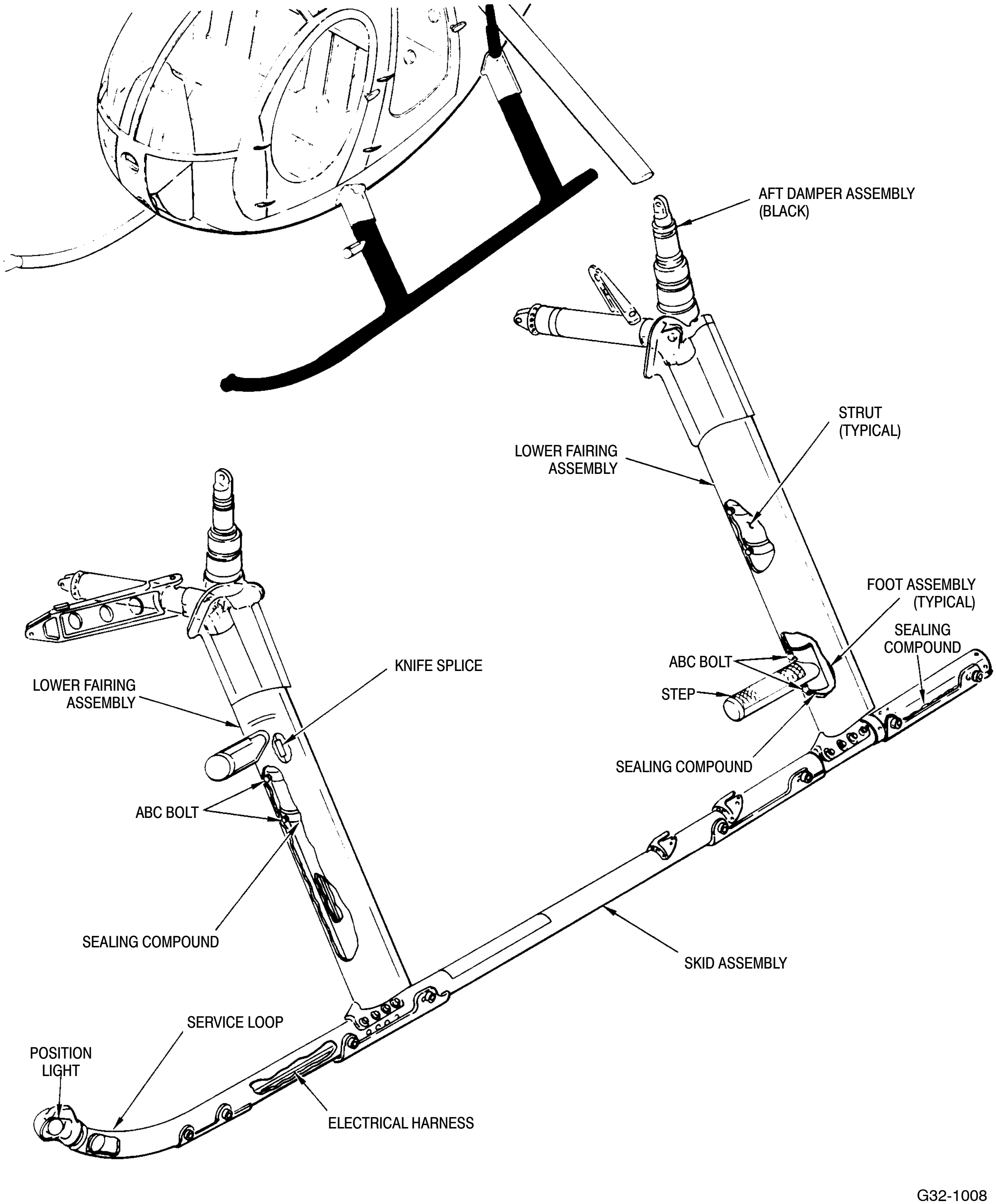


Figure 903. Extended Landing Gear

Section

32-10-60

Landing Gear System (600N)

LANDING GEAR SYSTEM
DESCRIPTION AND OPERATION

1. Landing Gear System

The landing gear consists of two strut-mounted, shock-dampened skids aligned longitudinally along the helicopter fuselage. Both right and left skids pivot as the damper assemblies extend and retract. Replaceable abrasion strips are installed on each skid to retard wear on hard surfaces.

A. Skid

Landing gear skids provide helicopter rest mounts. Skid tubes are constructed from seamless, extruded aluminum alloy tubing. Abrasion strips attached to undersides of skid tubes retard wear and damage. Ground handling bolts, bolted through the skid tubes, are the ground handling attach points. An adapter sleeve at the aft end of skid tube provides a nonrigid mount for the aft foot bearing and skid extension.

B. Strut

The landing gear struts attach to the fuselage center beam. Landing gear braces between the landing gear strut and fuselage center beam prevent shearing of the strut and keep the strut in alignment with the landing gear. At the lower ends of the struts, foot-shaped components attach the landing gear skids to the struts. Feet for the aft strut are bearing-mounted to provide a nonrigid and pivotal mount.

C. Damper

Landing gear assemblies are equipped with front and rear damper assemblies. Dampers absorb vertical shock to landing gear struts during helicopter landings and help prevent ground resonance. Front damper assemblies are attached to oleo attachment fittings on the outboard side of the pilot's compartment seat structure. Aft damper assemblies are attached to oleo support fittings in the engine compartment.

The damper assemblies are approximately 12.19 (31 cm) inches long when extended and 8.94 (22.7 cm) inches long when compressed. The dampers are nozzle-type and consist of a barrel, upper and lower mounting cap and a piston.

Damper exterior surfaces are painted white for the standard gear and black for the extended gear as an aid to identification and for surface protection.

A damper must be replaced if damaged, or if loss of hydraulic oil occurs.

D. Entry Step

Entry steps mounted on the forward landing gear struts allow for easy access into the cabin. The landing gear step is covered with non-skid tape and attached to the landing gear strut with rivets.

E. Fairing

Aluminum fairings on each strut reduce aerodynamic drag during flight. The fairings extend from the fuselage to the skids to form streamlined enclosures for the landing gear struts. Each fairing assembly is constructed of three main parts: a fillet, an mid and lower fairing. The fillet is spring-loaded to remain in firm contact with a plastic rubbing plate that is bonded and riveted to the fuselage. The fairing is secured to the landing gear and telescopes up inside the fillet to allow movement of the strut as the landing gear dampers compress or extend. A seal on the bottom edge of the fairing forms a fillet between the fairing and the skid tube. Forward fairings also have openings for cabin entry steps.

LANDING GEAR SYSTEM
SERVICING

1. Landing Gear Damper Nitrogen Servicing

(Ref. Figure 301) Service landing gear dampers equipped with schrader valve according to the following steps.

CAUTION Do not recharge a damper if there is evidence of fluid leakage. Recharging of damper will cause further leakage of both gas and damper fluid, posing a danger to the helicopter.

(1). Place helicopter on jacks or hoist and elevate until dampers are fully extended..

(2). For forward damper servicing, remove foot support fairings located in passenger compartment. For aft damper servicing, open engine access doors.

(3). Remove cap from schrader valve and connect servicing hose, but do not tighten.

(4). Ensure low side of nitrogen pressure regulator is backed off to the unpressurized position. Slowly open the high pressure nitrogen bottle valve.

(5). Slowly turn regulator control until nitrogen begins to flow at the loose servicing hose-schrader valve connection.

(6). While the nitrogen is still flowing, tighten servicing hose. Allow nitrogen pressure to build to the value according to part and dash number of damper (Ref. Table 401).

CAUTION To prevent damage to damper or loss of damper fluid do not open schrader valve without pressurizing the servicing line. If fluid loss occurs, damper will require overhaul.

(7). Once pressure level is reached, open schrader valve by turning outside nut counter clockwise. Allow system and damper pressure to equalize for a minimum of 2 minutes. If slightly over pressurized, bleed off excess very slowly.

(8). Close schrader valve by turning the outside nut clockwise. Torque nut to **50 - 60 inch pounds (5.65 - 6.78 Nm)**. Remove servicing hose and install valve cap finger-tight.

(9). Remove aircraft from jacks or hoist.

(10). Inspect damper for leakage approximately two hours after servicing.

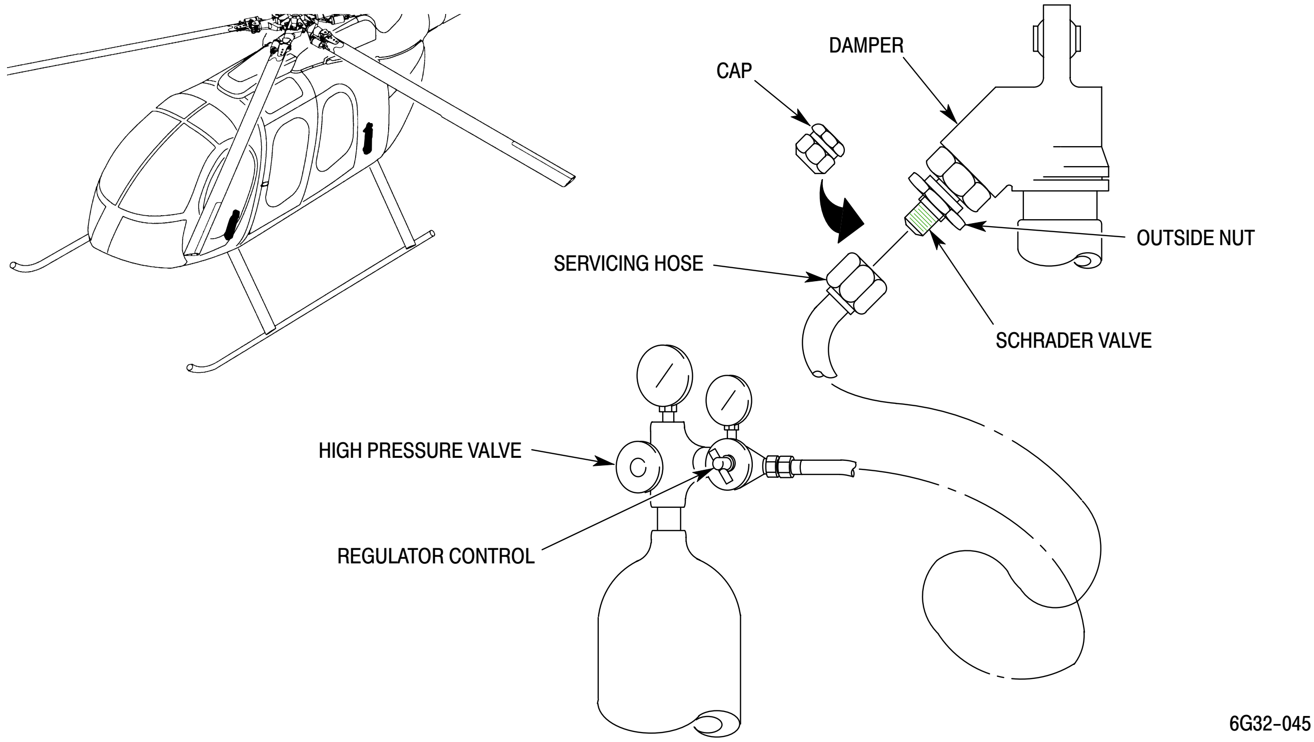


Figure 301. Landing Gear Damper Nitrogen Servicing - On Helicopter

Table 301. Nitrogen Recharge Pressure

Ambient Temperature ° F (° C)	600N6050-33 Psig (kPa)	600N6050-31 Psig (kPa)
-40 (-40)	263 (1813)	151 (1041)
-35 (-37)	268 (1848)	153 (1055)
-30 (-34)	272 (1875)	156 (1076)
-25 (-32)	277 (1910)	158 (1089)
-20 (-29)	281 (1937)	161 (1110)
-15 (-26)	286 (1972)	163 (1124)
-10 (-23)	291 (2006)	166 (1145)
-5 (-21)	295 (2034)	169 (1165)
0 (-18)	300 (2068)	171 (1179)
5 (-15)	305 (2103)	174 (1200)
10 (-12)	310 (2137)	177 (1220)
15 (-9)	315 (2172)	179 (1234)
20 (-7)	320 (2206)	182 (1255)
25 (-4)	325 (2241)	185 (1276)
30 (-1)	330 (2275)	188 (1296)
35 (2)	335 (2310)	191 (1317)
40 (4)	340 (2344)	194 (1338)
45 (7)	345 (2379)	197 (1358)
50 (10)	351 (2420)	199 (1372)
55 (13)	356 (2455)	202 (1393)
60 (16)	361 (2489)	205 (1413)
65 (18)	367 (2530)	208 (1434)
70 (21)	372 (2565)	211 (1455)
75 (24)	378 (2606)	215 (1482)
80 (27)	383 (2641)	218 (1503)
85 (29)	389 (2682)	221 (1524)
90 (32)	395 (2723)	224 (1544)
95 (35)	400 (2758)	227 (1565)
100 (38)	406 (2799)	230 (1586)
105 (41)	412 (2841)	234 (1613)
110 (43)	418 (2882)	237 (1634)
115 (46)	424 (2923)	240 (1655)
120 (49)	430 (2965)	244 (1682)
125 (52)	436 (3006)	247 (1703)

LANDING GEAR SYSTEM
REMOVAL/INSTALLATION

1. Landing Gear Strut Replacement

(Ref. Figure 401)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer
CM729	Tape, masking, pressure sensitive

A. Landing Gear Strut Removal

NOTE: For component disassembly, refer to applicable section. For removal, two persons are needed.

(1). Jack up or hoist helicopter until skid assemblies clear surface by 10 - 20 inches (25 - 50 cm) (Ref. Sec. 07-00-00).

(2). Remove skid assemblies (Ref. Landing Gear Skid Replacement).

(3). Pull strut fairing fillet downward against spring tension and secure with tape (CM729).

NOTE: Bushings must be removed from strut to enable strut to clear bearing in fuselage support fittings.

(4). For access to forward brace, strut and damper, open compartment access doors.

(5). For access to aft landing gear attachment points, open engine access doors.

(6). Disconnect brace and damper from strut.

(7). Remove hardware from strut pivot point.

(8). Use an ezy-out to pull both bushings from strut clevis at pivot point.

(9). Remove electrical bonding jumper attaching aft strut to airframe.

(10). Gently work strut around bearing in fuselage support fitting and remove.

B. Landing Gear Strut Installation

(1). For access to forward brace, strut and damper, open compartment access doors.

(2). For access to aft landing gear attachment points, open engine access doors.

NOTE: New bushings must be installed when installing struts. Torquing of the bolt will press bushing into place.

(3). Gently work struts around bearings in fuselage support fittings.

(4). Install attaching hardware with new bushing coated with wet primer (CM318).

(5). Torque nut to **85 - 110 inch-pounds (9.60 - 12.43 Nm) plus drag torque** and install cotter pin.

(6). Check for minimum 0.010 inch (0.254 mm) gap between washer and airframe clevis at slotted bushing.

NOTE: Install forward damper upper bolts with bolt heads facing aft. Install all other damper bolts with bolt head facing forward.

(7). Install damper (Ref. Landing Gear Damper Replacement).

(8). Align inboard end of each brace with mating bearing in fuselage supporting fitting and install attaching hardware.

(9). Torque nut to **60 - 85 inch-pounds (6.78 - 9.60 Nm) plus drag torque** and install cotter pin.

(10). Check for minimum 0.010 inch (0.254 mm) gap between washer and airframe clevis at slotted bushing.

(11). Secure electrical bonding jumpers to airframe.

(12). Align outboard end of each brace with mating holes in strut.

CAUTION Do not over- tighten brace- to- strut hardware.

(13). Attach brace to strut with attaching hardware.

(14). Torque nut to **2 - 10 inch-pounds (0.226 - 1.13 Nm) plus drag torque** and install cotter pin.

(15). Reinstall skid assemblies (Ref. Landing Gear Skid Replacement).

(16). Remove skid supports, lower helicopter, and remove jacks.

(17). Close or replace all access doors.

2. Landing Gear Damper Replacement

(Ref. Figure 401)

A. Landing Gear Damper Removal

(1). Jack up or hoist helicopter on level surface until landing gear skids just clear resting surface.

(2). For forward damper removal, remove footwell fairings located in passenger compartment. For access for aft damper removal, open engine access doors.

(3). Remove hardware (except bushings) attaching damper assemblies to fuselage attachment fittings and landing gear struts.

(4). Remove damper from aircraft.

B. Landing Gear Damper Installation

(1). Jack up or hoist helicopter on level surface until landing gear skids (Ref. Sec. 7-00) just clear resting surface.

NOTE:

- Always be sure that replacement damper is correct for the helicopter.
- Check for proper alignment of cap torque stripes before installation.
- Install aft dampers with schrader valves facing aft.
- Install fwd dampers with schrader valves facing forward.

(2). Install replacement damper in upper and lower mounting position with attaching hardware. Ensure bushings are in place.

NOTE: Install forward damper upper bolts with bolt heads facing aft. Install all other damper bolts with bolt head facing forward.

(3). Align forward upper damper bearing with airframe and install attaching hardware.

(4). Torque nuts to **60 - 85 inch-pounds (6.78 - 9.60 Nm) plus drag torque** and install cotter pin.

(5). Check for minimum 0.010 inch (0.254 mm) gap between washer and airframe clevis at slotted bushing.

(6). Align aft upper damper bearing with airframe and install attaching hardware.

(7). Torque nuts to **95 - 110 inch-pounds (10.73 - 12.43 Nm) plus drag torque** and install cotter pin.

(8). Check for minimum 0.010 inch (0.254 mm) gap between washer and airframe clevis at slotted bushing.

(9). Align lower bearing of damper (forward and aft) with mating holes in strut and install attaching hardware.

(10). Torque nut to **95 - 110 inch-pounds (10.73 - 12.43 Nm) plus drag torque** and install cotter pin.

(11). Check for minimum 0.010 inch (0.254 mm) gap between washer and airframe clevis at slotted bushing.

(12). Install footwell fairings and close engine access doors.

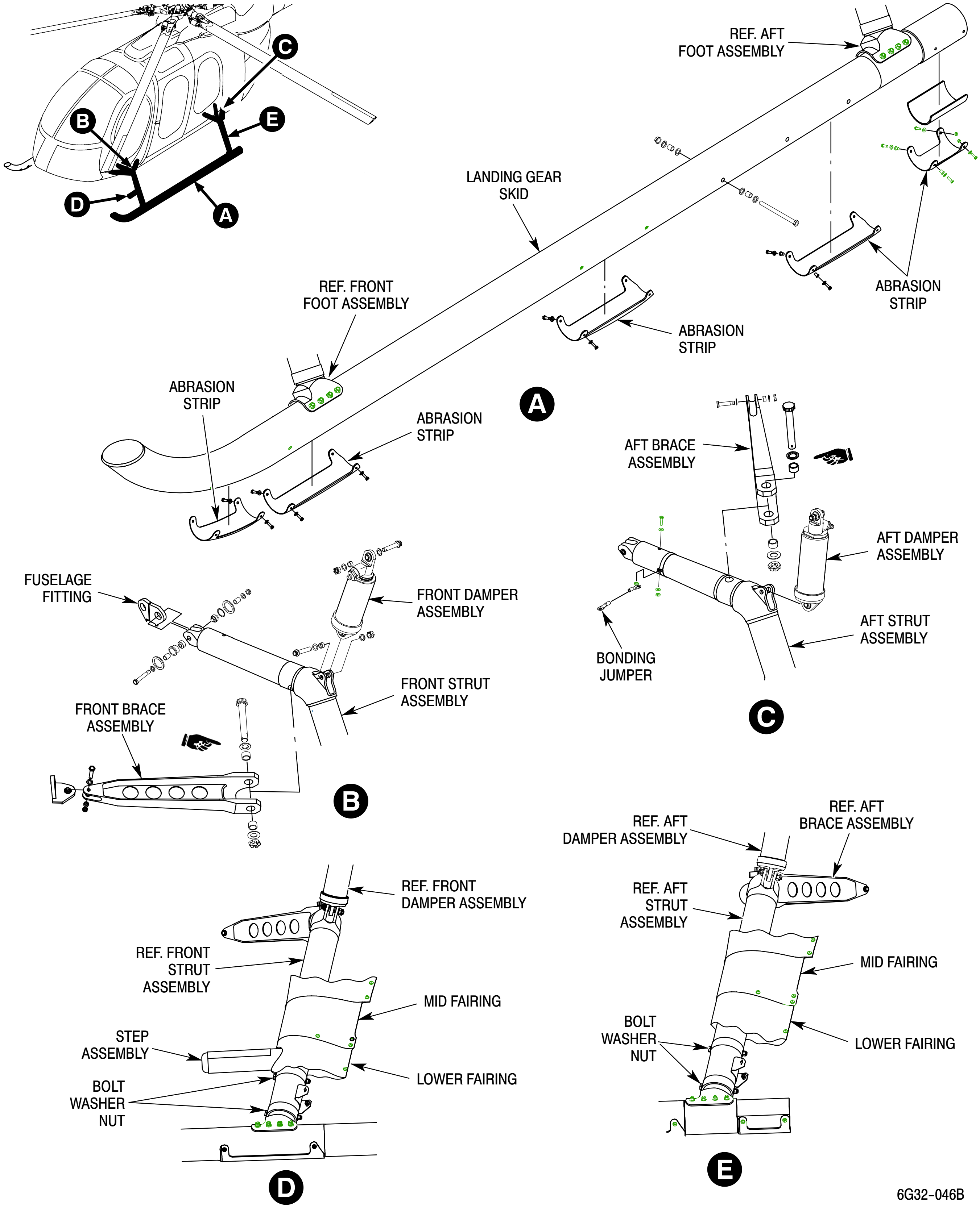


Figure 401. Landing Gear and Damper Installation

3. Landing Gear Skid Replacement

(Ref. Figure 401)

A. Landing Gear Skid Removal

(1). Jack up or hoist helicopter until skid assemblies clear surface by 10 - 20 inches (Ref. Sec. 07-00).

(2). Remove mid and lower fairings.

(3). Remove bolts attaching forward and aft feet to forward and aft struts.

(4). Simultaneously, slide front and rear feet from struts.

B. Landing Gear Skid Installation

(1). Simultaneously, slide front and rear feet onto struts.

(2). Install bolts attaching forward and aft feet to forward and aft struts; torque bolts to **95 - 110 inch-pounds (10.73 - 12.43 Nm) plus drag torque**.

(3). Install mid and lower fairings.

4. Landing Gear Fairing Replacement

A. Landing Gear Fairing Removal

(Ref. Figure 402 and Figure 403) The following instructions are typical for and apply to all four fairing assemblies.

(1). Remove lower fairing from fairing assembly as follows.

(a). Remove attaching hardware that secures lower fairing to two strut brackets, and that secures trailing edge of lower fairing.

(b). Carefully spread trailing edge of lower fairing and remove in forward direction.

(2). Remove fillet from upper fairing assembly as follows.

(a). Remove hardware that secure trailing edge of fillet.

(b). Open underfloor compartment or engine compartment doors for access to strut cutout in fuselage skin. Have an assistant push down on upper guide with suitable tool (wood dowel or equivalent), to relieve spring tension.

(c). With spring tension off guide, remove screws attaching fillet to upper guide. Slowly relax dowel pressure on guide until springs fully expand.

(d). Carefully spread fillet at trailing edge and remove in forward direction.

(3). Remove mid fairing as follows.

(a). Remove hardware that secure trailing edge of mid fairing.

(b). Remove hardware that secure fairing to strut bracket.

(c). Carefully spread trailing edge of fairing and remove in forward direction.

B. Landing Gear Fairing Installation

(Ref. Figure 402 and Figure 403) Following instructions apply to all four fairing assemblies.

(1). Install mid fairing as follows.

(a). Assemble upper guide, pin assembly, inner guide half, outer guide half, springs and lower support on landing gear strut (guide pins must be installed through matching holes of lower guide).

(b). Wedge temporary holding device between upper guide and strut to keep pins engaged.

NOTE: Use two small wood blocks or any similar suitable means to keep springs compressed. Device used must be small enough to be removed through strut cutout in skin after fillet is assembled.

(c). Carefully spread trailing edge of fairing and position fairing on strut bracket(s) and lower guide.

(d). Install hardware in top hole of trailing edge of mid fairing.

(2). Install fillet as follows.

(a). Carefully spread trailing edge of fillet and position about upper guide.

(b). Have an assistant remove temporary holding device and push down on upper guide with suitable tool (wood dowel, etc).

(c). Install hardware securing fillet to upper guide.

(d). Install hardware to secure fillet trailing edge together.

(e). Check for smooth telescoping action of fairing into fillet by manually sliding fillet up and down several times.

(f). Close access doors.

(3). Install lower fairing as follows.

(a). Carefully spread trailing edge of fairing and position under the mid fairing and over the lower strut bracket.

(b). Secure to upper and lower strut brackets with hardware.

(c). Secure fairing trailing edge with attaching hardware.

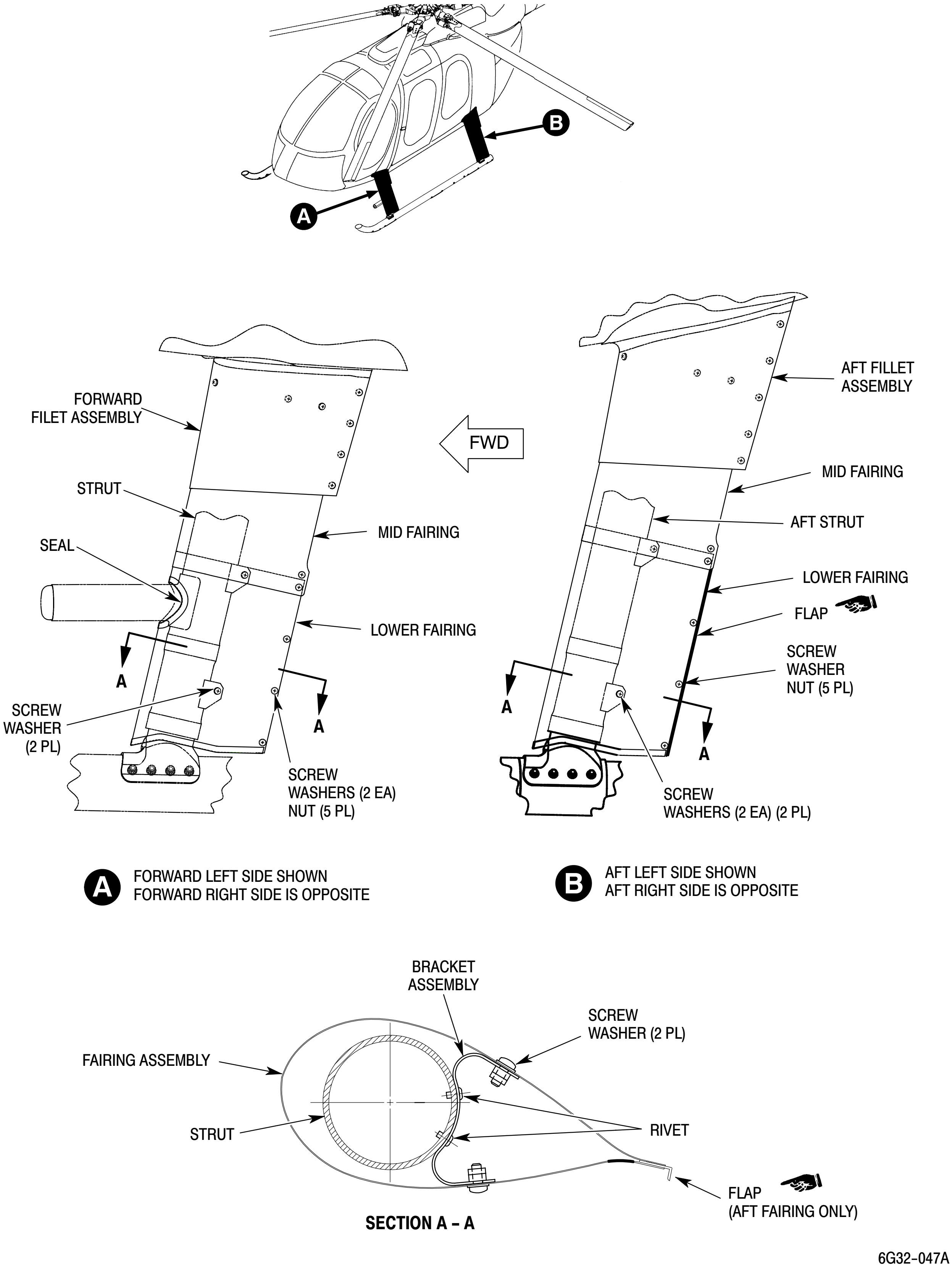


Figure 402. Fairing Installation

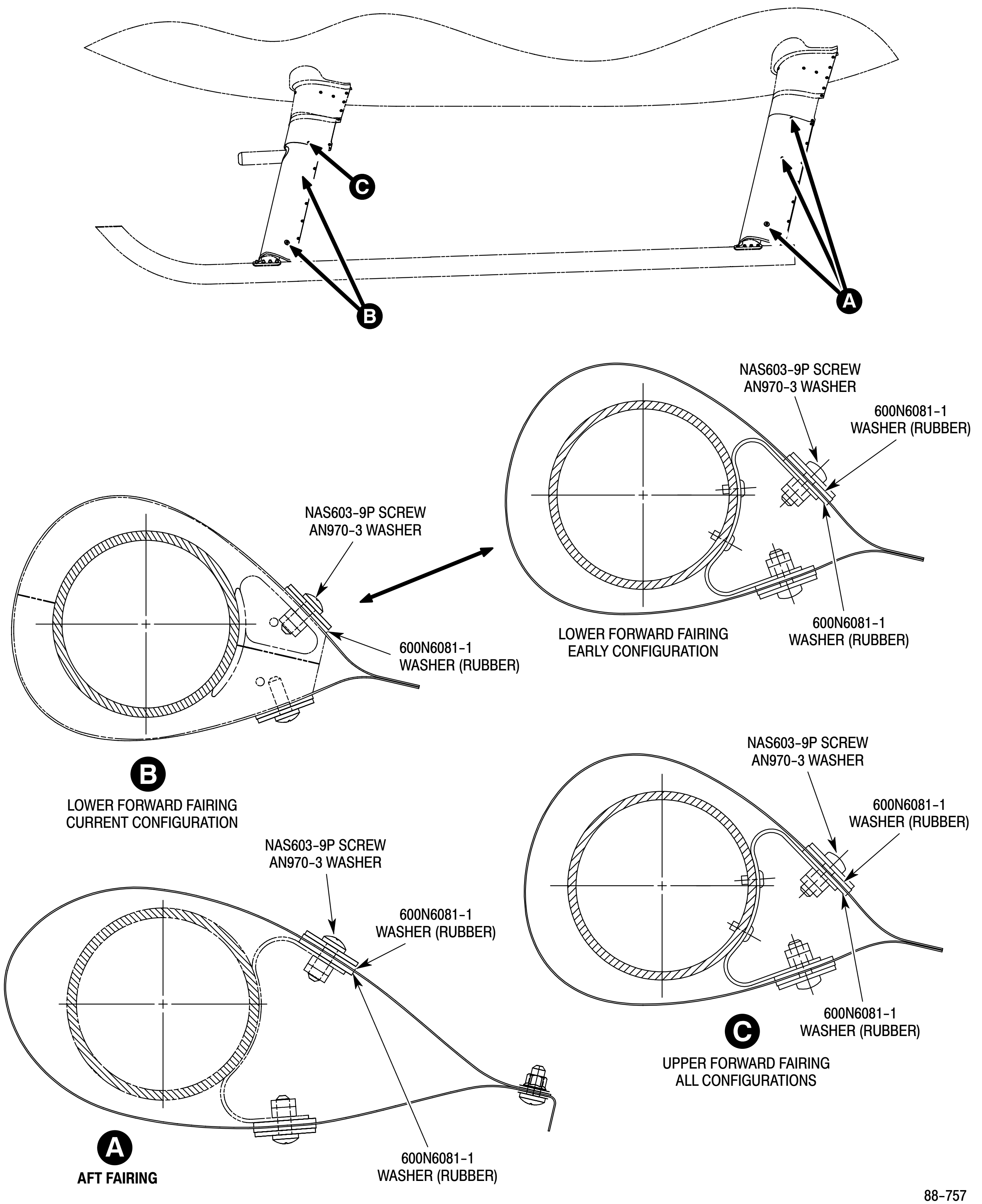


Figure 403. Landing Gear Rubber Washer Locations

LANDING GEAR SYSTEM
INSPECTION/CHECK

1. Landing Gear Inspection

(Ref. Figure 401)

NOTE: If landing gear is installed, perform inspection with helicopter skids clear of ground.

(1). Inspect skids, skid abrasion strips, struts, feet, braces and fairings for dents, cracks, loose components or rivets, loose nuts and for missing hardware.

(2). Inspect skid-to-foot and foot-to-strut attachments for loose bolts. Check aft foot-to-bearing rivet installation for security.

(3). Using 10X glass and bright light, visually inspect area at, around and between foot-to-strut attach bolts not covered by sealant for cracks and corrosion.

NOTE: If cracks or corrosion other than light surface corrosion is found, replace affected part.

(4). Inspect keel beam areas where the strut assemblies attach for loose bearings, condition of hardware and strut adapters.

(5). Check condition of beaded seal around edges of all rigid-mounted skid tube components.

2. Landing Gear Skid Inspection

(Ref. Figure 401)

NOTE: If landing gear assembly has not been removed from helicopter, perform following steps (1). and (2). before proceeding with inspection.

(1). Jack helicopter until landing gear dampers are fully extended.

(2). Remove lower fairing from two-piece fairing assembly.

(3). Inspect skid for dents. If dents exceed a depth of 0.20 inch (5.08 mm), they will require repair.

(4). Inspect for punctures and cracks.

(5). Perform fluorescent-penetrant inspection of all crack areas, and of those areas adjacent to all punctures. These areas will require repair.

(6). Inspect from aft end of tube to a point 10 inches (25.4 cm) forward of aft strut for scratches and nicks.

(7). Inspect from forward end of tube to 10 inches (25.4 cm) forward of aft strut for scratches and nicks. If scratches and nicks exceed a length of 0.25 inch (6.35 mm) and a depth of 0.020 inch (0.508 mm), they will require repair.

(8). Inspect abrasion strips for minimum thickness of 0.040 inch (1 mm), damage and for loose bolts and screws.

(9). Check skid extension rivet attachment for security.

(10). Check condition of plug installed in skid extension.

(11). Check aft foot bearing and extension for wear, damage and corrosion.

3. Landing Gear Strut Inspection

(Ref. Table 801)

(1). Repair elongated, enlarged or worn holes in strut, either inboard or outboard (Ref. SRM).

(2). Replace strut if cracked; if dents in strut exceed 0.060 inch (1.524 mm) depth; or, if scratches and repair area depth would exceed 0.010 inch (0.254 mm) when measured to surrounding unrepaired surface.

4. Landing Gear Damper Inspection

(Ref. Table 601 and Figure 401)

NOTE: It is normal for a thin hydraulic oil film to remain on damper as a result of wiping contact with piston seal. Newly- installed dampers may also have slight oil seepage from oil trapped in end cap threads during damper assembly. Neither of these should be considered damper leakage or cause for damper replacement.

(1). Inspect for hydraulic oil leakage. If leakage is visible, wipe oil from damper after last flight of the day. Re-inspect the following day for oil leakage. If leakage persists, replace damper.

(2). With helicopter on jacks, inspect damper assemblies for evidence of bearing looseness in upper and lower caps, worn bearings (excessive radial play), loose or cracked caps and oil leakage. Any misalignment of torque stripes on caps, piston and barrel indicates loosening of caps. Replace immediately and repair removed damper.

(3). Inspect damper attaching hardware for security.

NOTE: The landing gear damper assemblies are to be checked at a helicopter gross weight of 2130 - 2230 pounds (967 - 1012 kg) at a longitudinal CG of 94 ±1, exclusive of skid mounted flotation gear. Place the helicopter on a smooth concrete or equivalent surface (not asphalt).

(a). Raise and lower tailboom above and below the normal at-rest position three times. On the last cycle, allow the tailboom to slowly settle to the at-rest position.

(b). Measure and record dimension from bottom of upper end cap to top of barrel on all four damper assemblies.

(c). Repeat steps (a). and (b). two more times.

(d). Lower and raise tailboom below and above the normal at-rest position three times. On the last cycle, allow the tailboom to slowly rise to the at-rest position.

(e). Measure and record dimension from bottom of upper end cap to top of barrel on all four damper assemblies.

(f). Repeat steps (d). and (e). two more times.

(g). Determine average extension from all six readings for each damper assembly. Remove and overhaul any damper assembly not meeting dimensions (Ref. Table 601).

NOTE: If two damper assemblies fail to meet the minimum extension (Ref. Table 601), replace the damper having the greater amount of deflection with a known serviceable damper and repeat steps (a). thru (g). If the original damper again fails to meet minimum extension requirements, replace it with the known serviceable damper, reinstall the first damper and repeat steps (a). thru (g). This will determine whether one or both dampers require overhaul. For owners and operators having suitable equipment, any damper not meeting minimum extension requirements can be bench- checked. Dampers meeting specifications may be returned to service if other defects are not noted.

5. Forward Cabin Entry Step Inspection

(1). Remove landing gear fairing assembly.

(2). Inspect step-to-strut attachment for loose attaching hardware by checking for relative motion between mating parts.

(3). Inspect welded joint of step for cracks.

(4). Inspect safety walk tape for condition and security. Replace unserviceable tape.

(5). Install landing gear fairing assembly.

6. Landing Gear Fairing Inspection

(Ref. Figure 402)

(1). Inspect fairing support brackets for security of attachment to strut, cracks and deformation.

(2). Inspect fairing seals for deterioration and bonding.

(3). Inspect fuselage rubbing plate for security of bond and excessive wear.

(4). Inspect rubber washers for cracks or deterioration.

Table 601. Minimum Damper Extension

	inches (cm)
Fwd	1.60 (4.06)
Aft	1.71 (4.34)

LANDING GEAR SYSTEM
REPAIRS

1. Landing Gear System Repairs

(1). Repair scratches and nicks by smoothing sharp edges.

(2). Repair elongated, enlarged or worn holes in strut, either inboard or outboard.

(3). Repair bolt holes at large end of brace that attaches to strut.

(4). Replace strut; if cracked, if dents in strut exceed 0.060 inch (1.524 mm) depth or if scratched and repaired area depth would exceed 0.010 inch (0.254 mm) when measured to surrounding unrepaired surface.

(5). Replace defective or badly damaged fairing.

(6). Replace cracked, dented or distorted braces.

(7). Repair or replace damaged skid tube.

(8). Replace center beam-to-landing gear attachment bearings that exceed 0.040 inch (1.016 mm) axial play.

(9). Repair loose or defective pins and nuts securing foot to bearing; replace defective bearing.

2. Abrasion Strip Replacement

(Ref. Figure 401)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM426	Sealing compound

(1). Remove bolts securing defective abrasion strip(s) to skid.

(2). Remove bolts securing abrasion strip to skid extension. Completely remove any residual sealant.

(3). Install new abrasion strip. Torque bolts to **12 - 15 inch-pounds (1.36 - 1.69 Nm) plus drag torque**.

(4). After installation, seal around bolts and all of parting edges of abrasion strip next to skid tube with an approximate 0.060 inch (1.524 mm) bead (fillet) of sealing compound (CM426) to make watertight.

3. Ground Handling Bolt Replacement

(Ref. Figure 401)

(1). Remove nut, washers and spacer from skid tube.

(2). Slide bolt with washers and spacer from skid tube.

(3). Install, in order, bolt, washer, new spacer and washer through skid tube from outside-to-inside.

(4). Install, in order, washer, spacer, washer and nut onto bolt. Torque nut to **10 - 20 inch-pounds (1.13 - 2.26 Nm) plus drag torque**.

4. Safety Walk Tape Replacement

(Ref. Figure 401)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM220	Naphtha aliphatic
CM724	Tape, non-slip

(1). Carefully pull or scrape away damaged tape.

(2). Remove all residual adhesive from step by wiping with a clean cloth wetted by naphtha (CM220).

(3). Install new tape (CM724) and press firmly into place. Expel air bubbles while pressing down tape.

5. Landing Gear Fairing Repair

(Ref. Figure 402)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM412	Adhesive, bonding, vulcanized

(1). Replace an excessively damaged lower fairing.

(2). Replace damaged fairing bracket or lower guide. Remove rivets, locate new part and install blind rivets. Use next larger size rivets if mating holes in strut are enlarged.

(3). Replace damaged guide/pin assembly or guide half if guide is cracked, pins are bent or badly worn.

(4). Replace springs that are badly worn or rusty, or if free length is less than 8.72 inches (22.149 cm).

(5). Replace fillet if teflon strip is loose or badly worn.

(6). Replace damaged strut bracket. Remove rivets, locate new part and install blind rivets. Use next larger size rivets if mating holes in strut are enlarged.

(7). Replace unserviceable rubber seals; use adhesive (CM412).

Table 801. Maximum Damage Limits - Landing Gear Components

Component	Dents in / mm	Nicks in / mm	Scratches in / mm	Cracks in / mm	Holes in / mm
Skid tube (2)	0.200 / 5.08 (1)	0.010 / 0.254, from aft side of aft strut to 10 inches (25.4 cm). forward of the strut, with cleanup not exceeding 0.015 / 0.381; 0.015 / 0.381 if forward of that point to start of curved section, with cleanup not exceeding 0.020 / 0.508 (1)	(Same as for nicks) (1)	No cracks allowed	0.250 / 6.350 (1) (3)
Forward foot	0.060 / 1.524	0.060 / 1.524	0.010 / 0.254	No cracks allowed	No holes allowed
Strut	0.060 / 1.524	(1)	(1)	No cracks allowed	No holes allowed
Brace	0.050 / 1.270	0.010 / 0.254	0.005 / 0.127	No cracks allowed	No holes allowed
Damper assembly	0.060 / 1.524 (5)	0.010 / 0.254	0.010 / 0.254	No cracks allowed	No holes allowed
Fittings	0.010 / 0.254	0.010 / 0.254	0.010 / 0.254	No cracks allowed	No holes allowed
Aft foot	0.060 / 1.524	0.060 / 1.524	0.010 / 0.254	No cracks allowed	No holes allowed
Foot bearing	0.010 / 0.254	0.010 / 0.254	0.010 / 0.254	No cracks allowed	No Holes allowed

Table 801. Maximum Damage Limits - Landing Gear Components

Component	Dents in / mm	Nicks in / mm	Scratches in / mm	Cracks in / mm	Holes in / mm
Skid extension	0.010 / 0.254 (4)	0.010 / 0.254 (4)	0.010 / 0.254 (4)	No cracks allowed	No holes allowed

NOTES:

(1) For other repair data, refer to CSP-SRM-6.

(2) Repair of minor skid tube damage on forward (curved) section is not required, but surface finish must be restored.

(3) Hole must be plugged with correct size blind rivet.

(4) No damage is allowed on skid extension where skid and sleeve are attached.

(5) No dents allowed in damper barrel.

Section

32-40-00

Ground Handling Wheels (369D/E/FF - 500N)

GROUND HANDLING WHEELS MAINTENANCE PRACTICES

1. Ground Handling Wheel Assembly

The standard ground handling wheel assemblies provide a means of moving the helicopter by hand or by towing.

The special ground handling wheel assemblies for use with helicopters equipped with emergency or utility floats provide a means of moving the helicopter by hand only.

A. Ground Handling Wheel Description and Operation

(1). Standard ground handling wheel assembly consists of one detachable jack handle and two two-wheeled jacking assemblies that can be straddle-mounted to the left and right landing gear skids by use of existing ground handling wheel fittings. The wheels are manually lowered with a detachable jack handle and are held in the down position (helicopter raised on wheels) by a mechanical lock. The jacking assemblies are equipped with two tow bar attach fittings for towing.

(2). Special ground handling wheels are needed in place of standard ground handling wheel assemblies for moving a helicopter equipped with emergency or utility floats. These wheel assemblies are specially designed for use with emergency floats and raise the landing skids higher off the ground than standard ground handling wheels. A channel provides support for the underside of the landing gear skid. A rubber pad on the channel furnishes sufficient skid retaining friction without need for attachment of wheel assembly to skid. Guards above the wheel on each side of the channel prevent wheel chafing of floats.

2. Standard Ground Handling Wheel Installation and Use

(1). Position ground handling wheel assembly over the skid tube at the location of the skid fittings.

(2). With ground handling wheels in the retracted position, align and engage the skid fittings.

NOTE: Slide wheel assembly for and aft to ensure locking mechanism is securely locked into place.

(3). Install jack handle over the wheel assembly socket, install lock pin and rotate handle downward to lower the wheels and raise the helicopter.

WARNING **Hold downward pressure on jack handle until the extend lock snaps into locked position. If the lock is not properly engaged and the handle is released, the upward swing of the handle could cause serious personal injury.**

(4). Check that the extend lock is engaged; then release downward pressure and remove jack handle.

(5). Install second ground handling wheel assembly on the other skid in the same manner.

3. Special Ground Handling Wheel Installation and Use

(Ref. Figure 201)

CAUTION Damage may result from pushing up and/or pulling down on the tail boom to facilitate installation of special ground handling wheels.

NOTE: When the helicopter is jacked from one side only, a cushion saddle- type support should be placed under the tail boom at the jacking pad location for extra stability.

(1). Install and use special ground handling wheel assemblies as follows.

(a). Jack up one side of the helicopter for clearance to place ground handling wheel assembly under the landing gear skid.

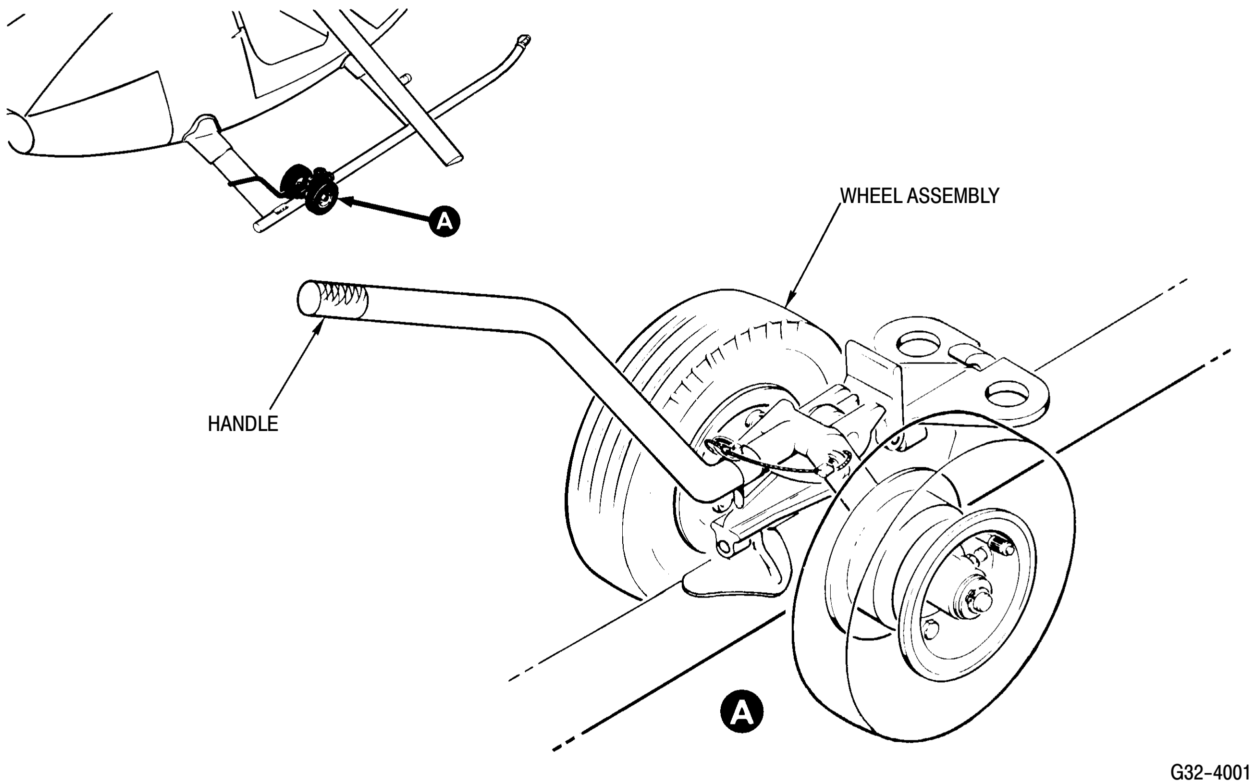


Figure 201. Ground Handling Wheel Assembly (Standard)

(b). Position ground handling wheel assembly below the ground handling fittings, which is the approximate center of gravity (CG) point.

4. Standard Ground Handling Wheel Disassembly (Early Configuration)

(1). Remove cotter pin and washer from axle shaft and slide hub-and-wheel assembly off axle.

(2). Remove three nuts securing wheel to hub.

WARNING **Severe personal injury or damage to property can occur if tire is not deflated before attempting to separate wheel halves.**

(3). Deflate tire and remove six nuts, washers and screws securing wheel halves.

(4). Remove tire and tube from wheel.

(5). Using suitable bearing press, remove bearings from hub.

(6). To remove axle shaft from housing, remove roll pin and slide shaft from housing.

5. Standard Ground Handling Wheel Re-assembly (Early Configuration)

(1). If previously removed, install axle shaft into housing and secure with roll pin.

(2). Using suitable bearing press, install bearings in hub.

(3). Install washer, hub assembly and washer on axle. Shim hub assembly, 0.010 inch maximum, using AB2578-24 washers, as required, between bearing and outer washer and install cotter pin.

(4). Using talcum powder, insert tube into tire and install on wheel halves.

(5). Secure wheel halves together using six screws, washers and nuts.

(6). Inflate tire in accordance with manufacturers specifications.

(7). Install wheel on hub assembly using three nuts and washers.

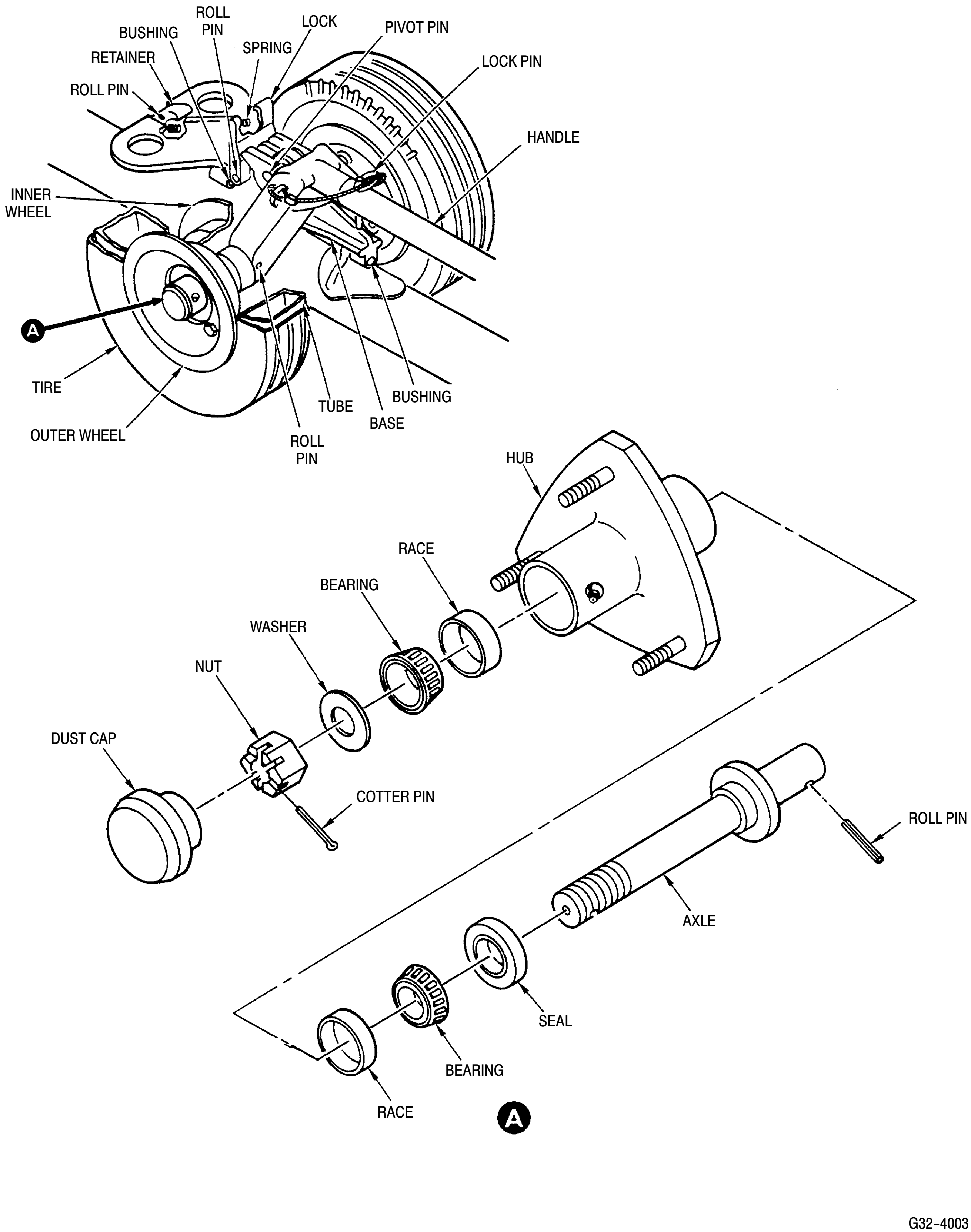


Figure 202. Ground Handling Wheel Assembly/Disassembly

6. Standard Ground Handling Wheel Disassembly (Current Configuration)

(Ref. Figure 202)

(1). Remove three nuts and washers securing wheel and tire assembly to hub and axle assembly.

(2). Remove dust cap, cotter pin, nut and washers from hub and axle assembly.

WARNING **Severe personal injury or damage to property can occur if tire is not deflated before attempting to separate wheel halves.**

(3). Deflate tire and remove six nuts, washers and screws securing wheel halves.

(4). Remove tire and tube from wheel.

CAUTION Do not remove spacer from hub body. Spacer is a close tolerance press fit and should not be removed.

(5). Remove seal, bearings and races from hub body.

(6). To remove axle shaft from housing, remove roll pin and slide shaft from housing.

7. Standard Ground Handling Wheel Re-assembly (Current Configuration)

(Ref. Figure 202)

(1). If previously removed, install axle into housing and secure with roll pin.

(2). Install races, bearings and seal in hub.

(3). Install hub assembly on axle shaft and secure with washer and nut.

(4). Tighten nut until there is a maximum of 0.010 inch axial play. Remove excess axial play by inserting AB2578-24 washers, as required, between bearing and outer washer.

(5). Install cotter pin and dust cap.

(6). Using talcum powder, insert tube into tire and install on wheel halves.

(7). Secure wheel halves together using six screws, washers and nuts.

(8). Inflate tire in accordance with manufacturers specifications.

(9). Install wheel on hub assembly using three nuts and washers.

8. Standard Ground Handling Wheel Servicing

At regular intervals, Ground Handling Wheel Assemblies should be maintained to provide safe use and longer life of components.

(1). Ensure tire pressure is within manufacturer's specifications.

(2). Grease bearing using MIL-G-81322, Mobil Grease 28 or alternate grease MIL-G-25537, Aero Shell using available grease zerk (primary method) or hand pack (alternate method).

(3). Remove excess play of hub-to-axle by inserting AB2578-24 washers, as required, between bearing and outer washer to maintain 0.010-inch axial play.

9. Special Ground Handling Wheel Disassembly

(Ref. Figure 204)

(1). Remove cotter pin, nut and washer and remove wheel assembly.

(2). To remove axle shaft, remove slotted pin and slide shaft from housing.

(3). Using suitable bearing press, remove bearings from hub.

10. Special Ground Handling Wheel Re-assembly

(Ref. Figure 204)

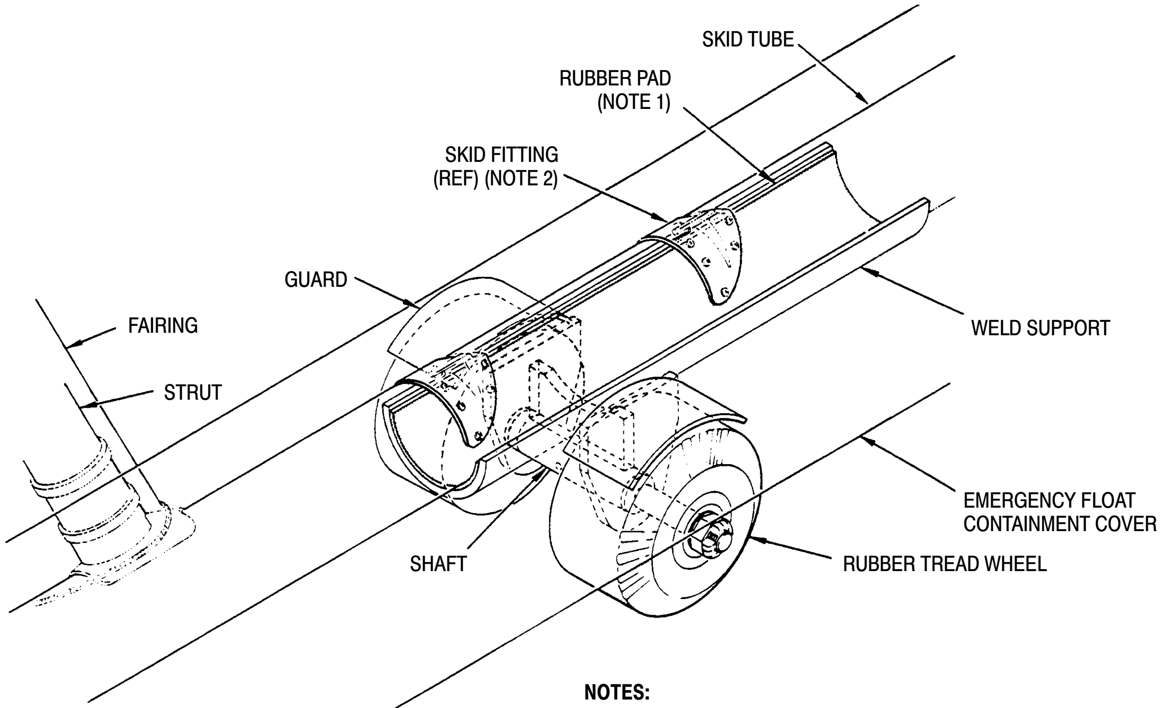
(1). Insert axle shaft into housing and insert slotted pin.

(2). Using suitable bearing press, install bearings into hub.

(3). Install wheel on axle using washer, nut and cotter pin. Adjust axial play, 0.010 inch maximum, using AN960C1016 washers as required.

11. Special Ground Handling Wheel Servicing

(Ref. Figure 204) The special ground handling wheel assemblies have sealed bearings and solid rubber tires and therefore require no servicing.



CAUTION: BE SURE THAT FLOAT CONTAINMENT COVER CLEARS AND IS NOT PINCHED BY HANDLING WHEEL ASSEMBLY.

NOTES:

1. LANDING GEAR SKID TUBE UNDERSIDE RESTS ON RUBBER PAD AND IS SUPPORTED BY WELD SUPPORT WITHOUT RESTAINING ATTACHMENT.
2. NOT USED WITH GROUND HANDLING WHEELS SHOWN.
3. MAXIMUM LOAD RATE 800 LBS. (363 KG) AT 8 RPM.

G32-4000A

Figure 203. Special Ground Handling Wheel Assembly (Float Type)

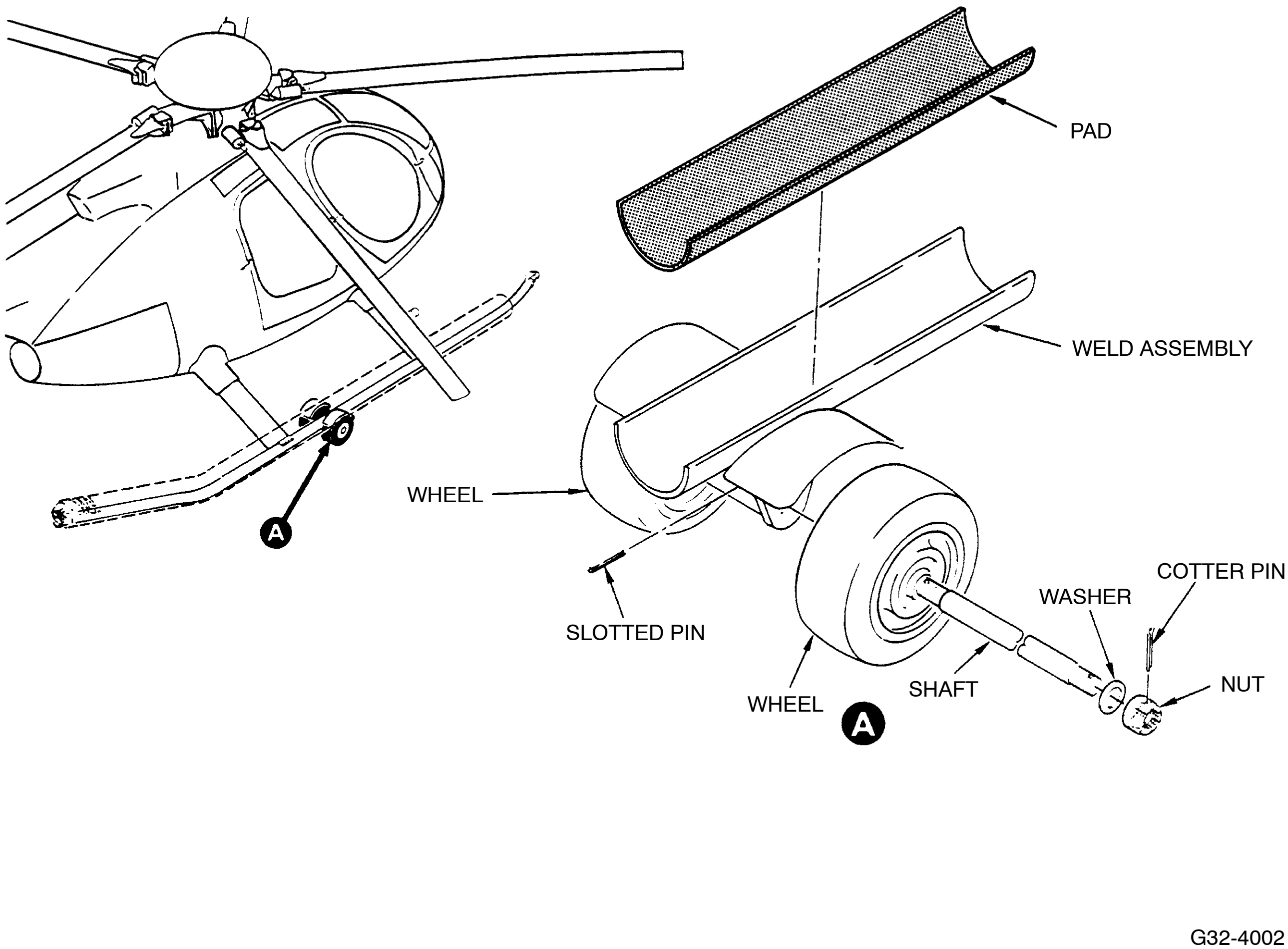


Figure 204. Special Ground Handling Wheel Assembly/Disassembly

Section

32-40-60

Ground Handling Wheels (600N)

GROUND HANDLING WHEELS MAINTENANCE PRACTICES

1. Ground Handling Wheel Assembly

The standard ground handling wheel assemblies provide a means of moving the helicopter by hand or by towing.

A. Ground Handling Wheel Assembly Description and Operation

The ground handling wheel set consists of two dual wheel assemblies, which are designed to support a fully equipped helicopter. The wheel assembly consists of two pneumatic tires, rims, spindles, hydraulic jack and attach cradle.

(1). Tires:

The tires are 10 ply with a maximum rating of 1120 lb at 65 psi (508 kg at 448 kPa).

(2). Rims:

The rim rotates on a spindle by means of inner and outer tapered roller bearings with an external grease fitting on the hub for periodic servicing.

(3). Hydraulic Jacks:

A six ton jack is held in place on the main frame by a support plate.

The jack retains a vertical position during raising and lowering of the wheels.

The ram of the jack is in constant contact with the upper cross frame of the main body, providing vertical pumping leverage forcing the wheels down.

(4). Attach Cradle and Main Frame Body:

The attach cradle is attached to the main frame body by means of two pins with cotter pins. The contoured cradle is slotted to lock onto the skids.

2. Ground Handling Wheel Assembly Maintenance

(1). Ensure tire pressure is within manufacturer's specifications.

(2). Inspect tires for wear and cuts, none allowed.

(3). Inspect wheels for cracks and defects, none allowed.

(4). At regular intervals, repack wheel bearings and grease spindle assembly guides.

(5). At regular intervals, inspect hydraulic jacks for proper fluid levels.

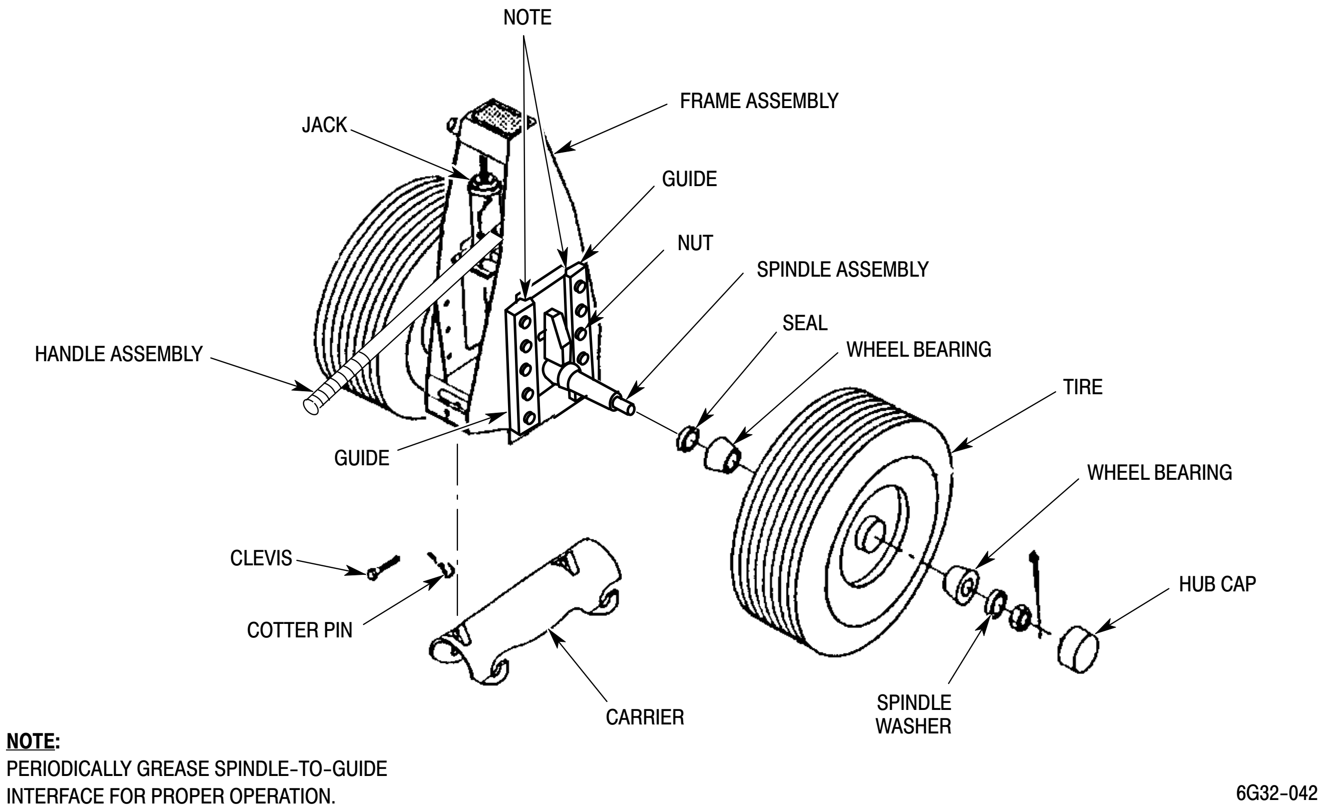


Figure 201. Ground Handling Wheel Assembly

Section

32-81-00

Utility Float System (369D/E)

UTILITY FLOAT SYSTEM MAINTENANCE PRACTICES

1. Utility Float Description and Operation

Utility floats consists of neoprene airtight chambers separated by internal walls that provide six individual watertight compartments. Skid attachment strips (girts), bonded to underside of floats, are bolted to landing gear skids and extensions. Floats are inflated to a normal operating pressure of 2.0 psig (14 kPa). Relief valves release air pressure if compartment pressure becomes excessive. A stabilizer assembly is attached at the aft end of the skid tube extension.

NOTE: If a helicopter with utility floats is tilted back on the tail skid to install ground handling wheels, approximately 1 pint (0.437 liter) of oil is trapped in the tail rotor transmission. This condition gives a false sight plug oil level indication immediately after return to a level attitude. After ground runup, oil level indication is normal.

A. Utility Float Operational Check

With helicopter on the ground and utility floats inflated to normal operating pressure, perform the following operational checks:

(1). Check all float compartments for 2.0 psig (14 kPa).

NOTE: Changes in atmospheric pressure, and temperature of float compartments affects pressure gage readings. A temperature change of 1 degree equals 0.032 psig (0.2206 kPa).

(2). Check for pressure drop with pressure gage that indicates 0 - 15 psi (0 - 103 kPa), graduated in 0.5 psi (3.447 kPa) increments. Maximum allowable pressure drop in 24 hours is limited to 0.5 psig (3.447 kPa) for each compartment.

(3). Place **BATTERY-OFF-EXT PWR** switch at **BATTERY**. Actuate **POS LT** switch to the **ON** position. Observe that left and right position lights illuminate. Place all switches at **OFF** position.

2. Utility Float Inspection

(1). Inspect float chambers for correct air pressure.

(2). Inspect float bags for abrasion and chafing.

(3). Inspect pressure relief and fill valves for condition and closure.

A. Skid Tube and Extension Assembly Inspection

Inspection of skid tube and extension assembly is identical to that described in Sec. 32-10-00.

B. Utility Float Repair

Repair materials and information are available from the float manufacturer. Make repairs to utility floats using materials according to manufacturer’s instructions.

3. Utility Float Troubleshooting

Refer to Table 201 for troubleshooting information. Troubles presented are listed in order of possible occurrence during performance of operational check. This information is provided to aid in isolating faults found during operational check or normal operation of the system. The fault is then removed by repair or replacement to return the system to trouble-free operation. Troubleshooting and repair of internal components of the float is beyond the scope of this section.

Table 201. Troubleshooting Utility Floats

Symptom	Probable Trouble	Corrective Action
Low air pressure	Damaged float	Repair float.
	Defective fill valve	Replace fill valve.
	Defective pressure relief valve	Replace pressure relief valve.
Position lights do not illuminate	**POS LT** switch not at **ON** position	Actuate switch to **ON** position.
	Position light lamp defective	Replace lamp.
	Defective electrical wire splice	Repair electrical splice.

4. Utility Float Replacement

(Ref. Figure 201)

A. Utility Float Removal

Prior to removal of utility floats, jack or hoist helicopter until landing gear dampers are fully extended and landing gear skid tubes are at least six inches (15cm) from ground. Skid and fairing assemblies must be removed to remove float assemblies Ref. Sec. 32-10-00).

CAUTION Maintain helicopter in level attitude during jacking or hoisting. Do not raise one side of helicopter at a time.

(1). Remove position light cover screws, then remove cover. Remove position light mounting screws and position light. Retain electrical wire for installation.

(2). Remove bolts and washers attaching stabilizer assembly to aft section of floats.

(3). Open fill valve at each of six float chambers. A suction device such as a vacuum cleaner speeds air evacuation.

(4). Remove bolts, washers, gravel guards and abrasion strip attaching float to skid assembly and skid extension.

(5). Depress float around strut assemblies and pull float free from skid tube assembly and skid extension.

B. Utility Float Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM209	Zinc chromate putty
CM318	Primer
CM425	Sealing compound
CM717	Tape, pressure sensitive

NOTE: Prior to assembly, apply primer (CM318) to all mating surfaces.

(1). On early configuration extended landing gear, coat abrasion strip with zinc chromate putty (CM209) and install using screws.

(2). Install bolt covers using existing screws and wrap with two overlapping layers of tape (CM717).

(3). Install tyrap bracket on forward struts.

(4). Align extension and bearing sleeve holes; install rivets using wet primer (CM318).

(5). On early configuration extended landing gear, install skid tube extension as follows:

(a). Install indexing plug in float kit extension tube.

(b). Align indexing plug tabs with slots in foot bearing sleeve on helicopter; install indexing plug and forward end of extension tube over bearing sleeve. Use care not to damage packing during installation.

(c). Align bolt holes in bearing sleeve, indexing plug and extension tube; install rivets with wet primer.

(d). Coat mating surfaces of abrasion strip with zinc chromate putty.

(e). Install abrasion strip on extension tube with rivets and wet primer.

(f). Seal all edges of abrasion strip with approximately 0.060 (1.524 mm) bead of sealing compound (CM425).

(6). Position floats on skid and extension assembly. Align bolt holes in float girt and skid assembly. Secure floats in place using gravel guards, abrasion strips, bolts and washers. Coat bolts and washers with primer and torque to **25 - 35 inch-pounds (2.82 - 3.95 Nm)**.

(7). Position stabilizer cap on skid tube extension. Coat mating surfaces with sealing compound and secure with bolts and washers.

(8). Position stabilizer assembly on aft section of skid extension and secure in place using bolts and washers. Torque bolts to **25 - 35 inch-pounds (2.82 - 3.95 Nm)**.

(9). Connect wiring to position light then install position light with screws. Install cover and secure with screws.

5. Skid Tube Extension Replacement

(Ref. Figure 901)

A. Skid Tube Extension Removal

(1). Remove bolts and washers; then remove stabilizer support from aft end of skid extension.

(2). Remove bolts and nuts attaching extension to skid tube assembly.

(3). Separate skid extension from skid tube.

B. Skid Tube Extension Installation

(1). Insert skid extension into aft section of skid tube.

(2). Align bolt holes and secure in place using bolts and nuts as applicable.

(3). Position stabilizer support on aft end of skid extension and secure in place using bolts and washers.

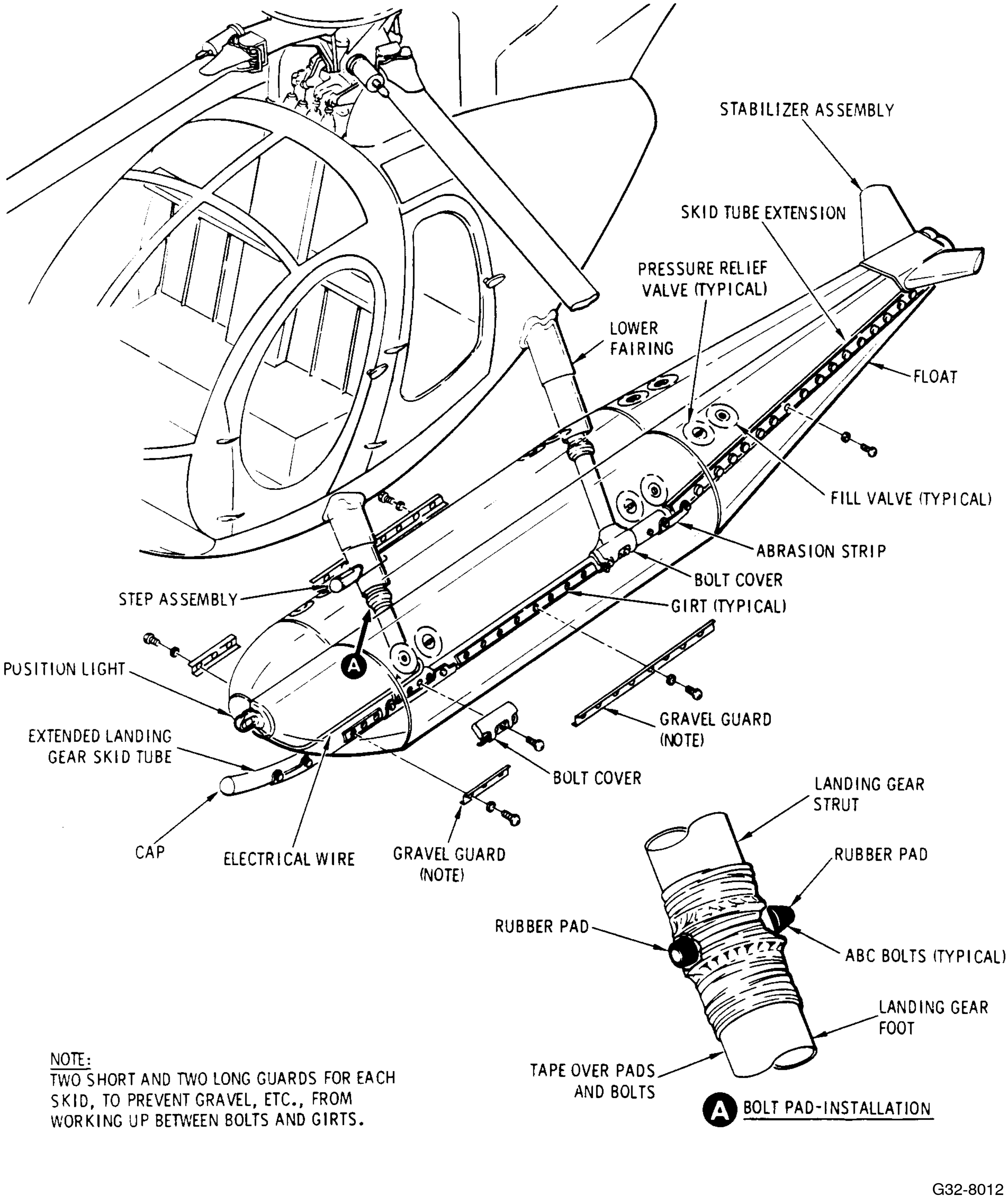


Figure 201. Utility Float Installation

UTILITY FLOAT SYSTEM
INITIAL INSTALLATION

1. Utility Float Initial Installation

The utility float kit may not be installed in combination with the following:
Passenger steps
Hoist kit
Litter kit
Four-bladed tail rotor

A. Preparation for Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM425	Sealing compound

Instructions in the following paragraphs are applicable to both left and right landing gear assemblies. Preparation for installation of utility floats includes the following:

NOTE: Make sure that the **BATT-OFF-EXT** switch is set to **OFF**.

(1). Check all cockpit electrical switches in the **OFF** position.

(2). Identify all components, including attaching hardware, or components removed for access to work areas. Protect components from damage and foreign matter until installed.

(3). Using jacking or hoisting methods, raise helicopter 6 inches (15 cm) clear of ground.

(4). Remove landing gear (Ref. Sec. 32-10-00). Removal of landing gear is identical to that described in Sec. 32-10-00, except that removal of complete landing gear is not required. Remove extended landing gear according to Sec. 32-10-00, except as follows:

(5). Remove screws attaching position light assemblies to skid assemblies. Retain screws for reuse. Disconnect electrical harness and remove position light assemblies.

(6). Remove cargo compartment and aft landing gear steps.

NOTE: Passenger steps, 369D26505 and 369D292028, may not be installed in combination with utility floats. Upon removal of 369D292028 step assembly, install PLT210-10-3 bolts (2 per assembly) coated with sealing compound (CM425) into holes where step attaching hardware was located.

(7). Remove hardware that secures trailing edge of lower fairings to strut assemblies. Carefully spread trailing edge of lower fairings and remove fairings.

NOTE: If preload condition prevents removal of skid assemblies, disconnect one brace assembly from skid assemblies to eliminate preload (Ref. Sec. 32-10-00).

(8). Remove ABC bolts from forward and aft strut assemblies (Ref. Sec. 32-10-00). Retain ABC hardware for reuse. Remove skid assemblies with foot assemblies attached.

B. Disassembly of Extended Landing Gear

(Ref. Figure 901) Complete disassembly of landing gear is not required; however, certain items must be removed.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

(1). Remove screws from float attach fittings.

(2). Remove bolts and abrasion strip from skid extension.

(3). Remove bolts attaching skid tube extension.

(4). Remove skid tube extension.

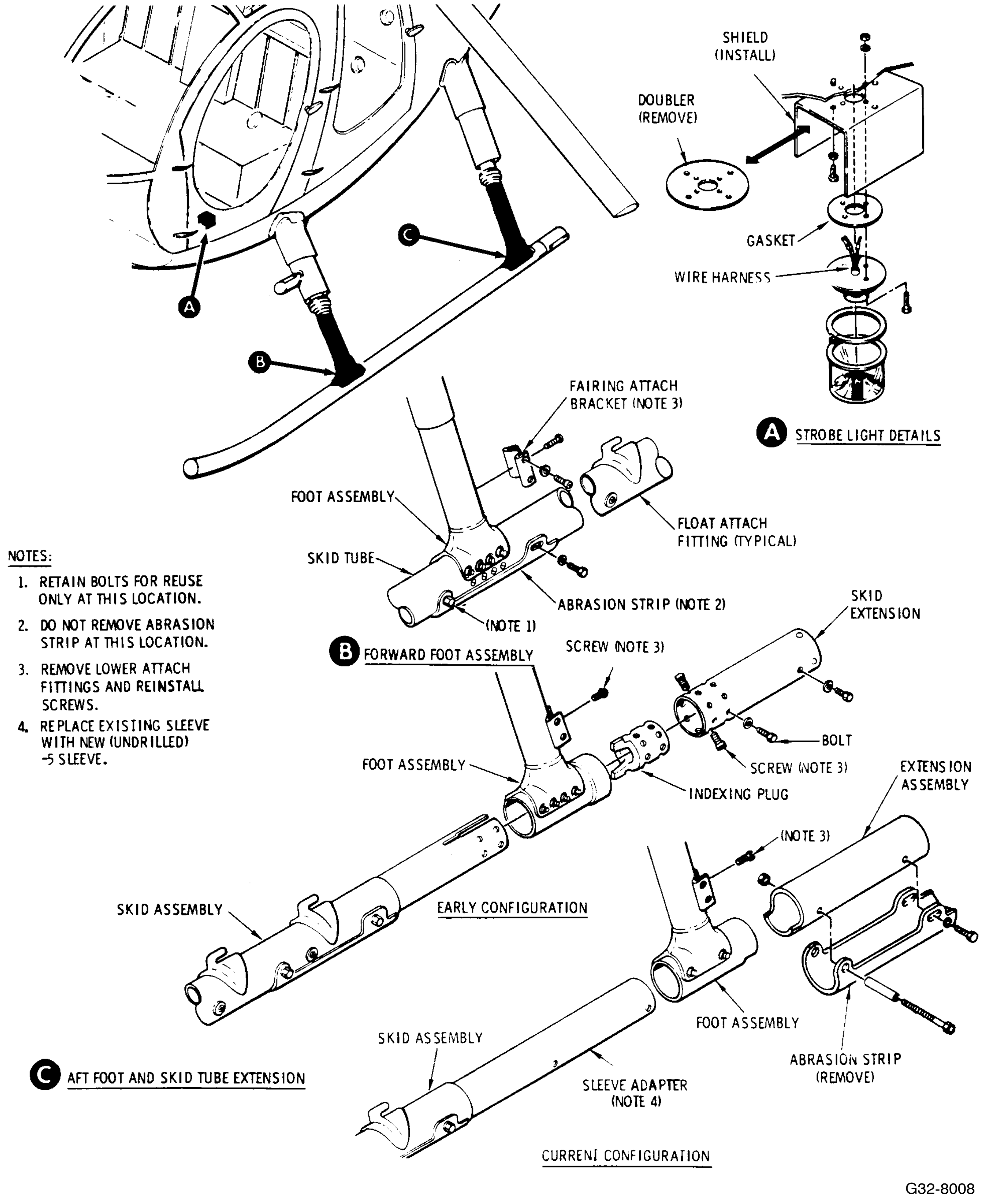


Figure 901. Extended Landing Gear - Disassembly

NOTE: When installing the 369D292808- 17 and -18 extension tubes, it will be necessary to remove and replace the 369D26012 or the 369D26012-5 sleeve adapter with a new -5 (undrilled at aft end) sleeve adapter (Ref. Sec. 32-10-00).

(5). Remove bolts attaching abrasion strip to skid tube. Do not remove abrasion strips. Retain four bolts for reuse.

(6). Remove fairing attach brackets from foot assemblies. Coat screws and washers with primer (CM318) and reinstall screws and washers.

C. Landing Gear Strut Modification

(Ref. Figure 902) For modification of landing gear strut assemblies to accommodate installation of utility floats and return to extended landing gear configuration when utility floats are removed, perform the following:

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer
CM425	Sealing compound

(1). Using drill motor and number 15 drill bit, drill two holes through lower fairing attach brackets and aft wall of landing gear strut assemblies (view A). Enlarge holes to 0.250 inch (6.350 mm) diameter using 1/4 inch (6.35 mm) drill bit.

(2). Using number 30 drill bit, drill out huckbolts attaching bracket to strut. Remove bracket. Seal huckbolt attach holes in strut with sealing compound (CM425). Coat bare metal with primer (CM318).

(3). Remove rivets attaching nutplates (view B).

NOTE: When floats are removed from landing gear assembly, modified foot assembly brackets may be reinstalled by using screws and washers.

D. Landing Gear Skid Extension Assembly

(Ref. Figure 903)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM209	Zinc chromate putty
CM318	Primer
CM425	Sealing compound

(1). On all types of landing gear skid tube extensions:

(a). Coat mating surfaces of the correct plug with zinc chromate putty (CM209); assemble plug to tube with rivets coated with primer (CM318). Seal edges with sealing compound (CM425).

(b). Coat mating surface of support assembly and tube with zinc chromate putty; install using bolts and washers.

(2). Assembly of landing gear skid extension (369D292808-17 and -18) on current configuration landing gear:

NOTE: The 369D292808-17 and -18 skid tube extension assemblies may only be installed on extended skid gear having new (undrilled) 369D26012-5 adapter, sleeve-skid installed. For replacing the 369D26012 basic sleeve with the -5 sleeve (Ref. Sec. 32-10-00).

(a). Insert skid tube extension on to -5 adapter sleeve. Align skid tube rivnut centerline with extension tube rivnut centerline. Secure both assemblies with a suitable fixture.

(b). Mark and match drill eight 0.1945 - 0.1965 inch (4.9403 - 4.9911 mm) diameter holes through tube and sleeve (use locations and dimensions as stated in Figure 903); separate skid tube extension from adapter sleeve.

(c). Countersink holes, 100° x 0.378 - 0.385 inch (100° x 9.6012 - 9.779 mm) diameter in skid tube extension, deburr and apply primer to bare metal surfaces.

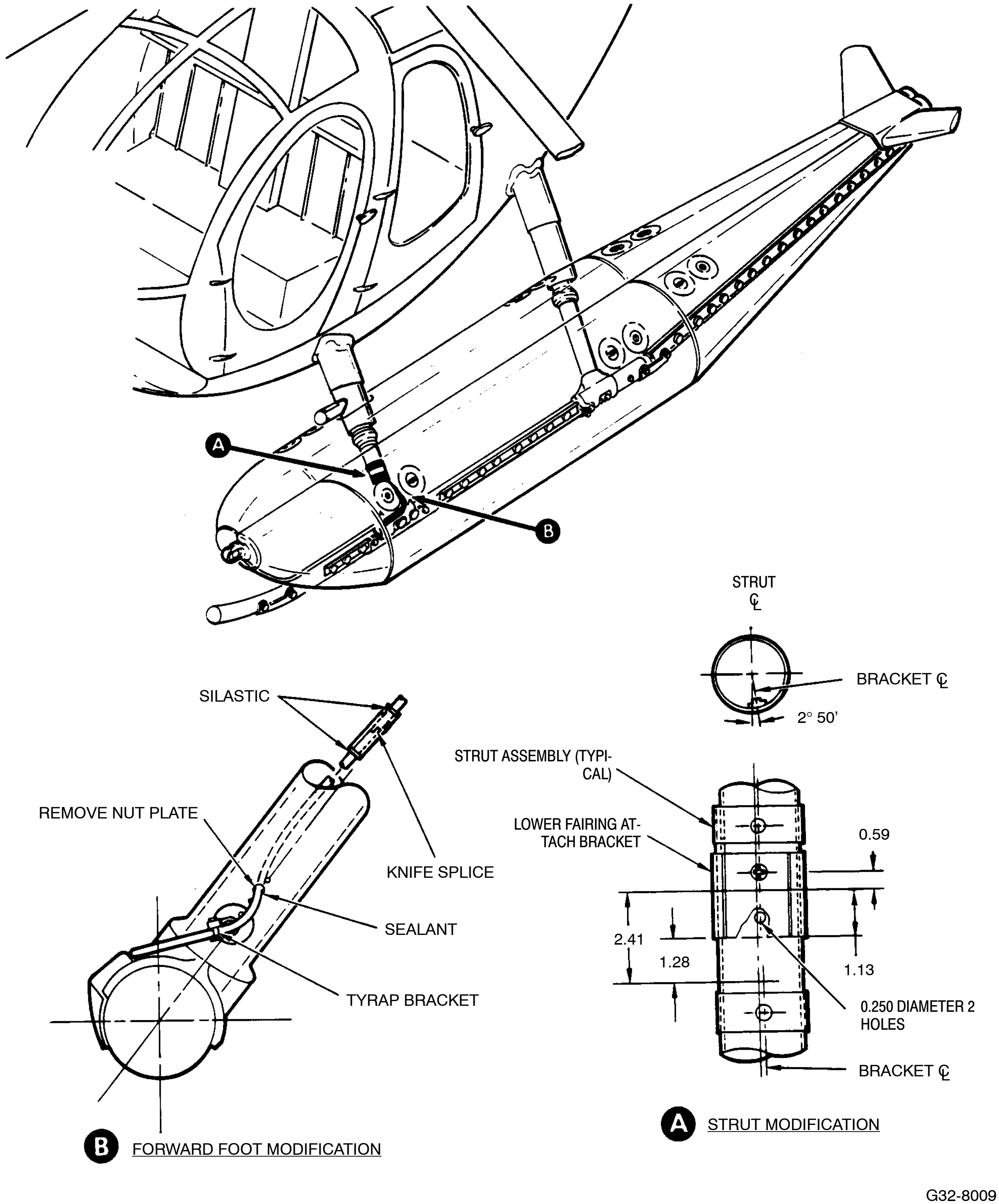
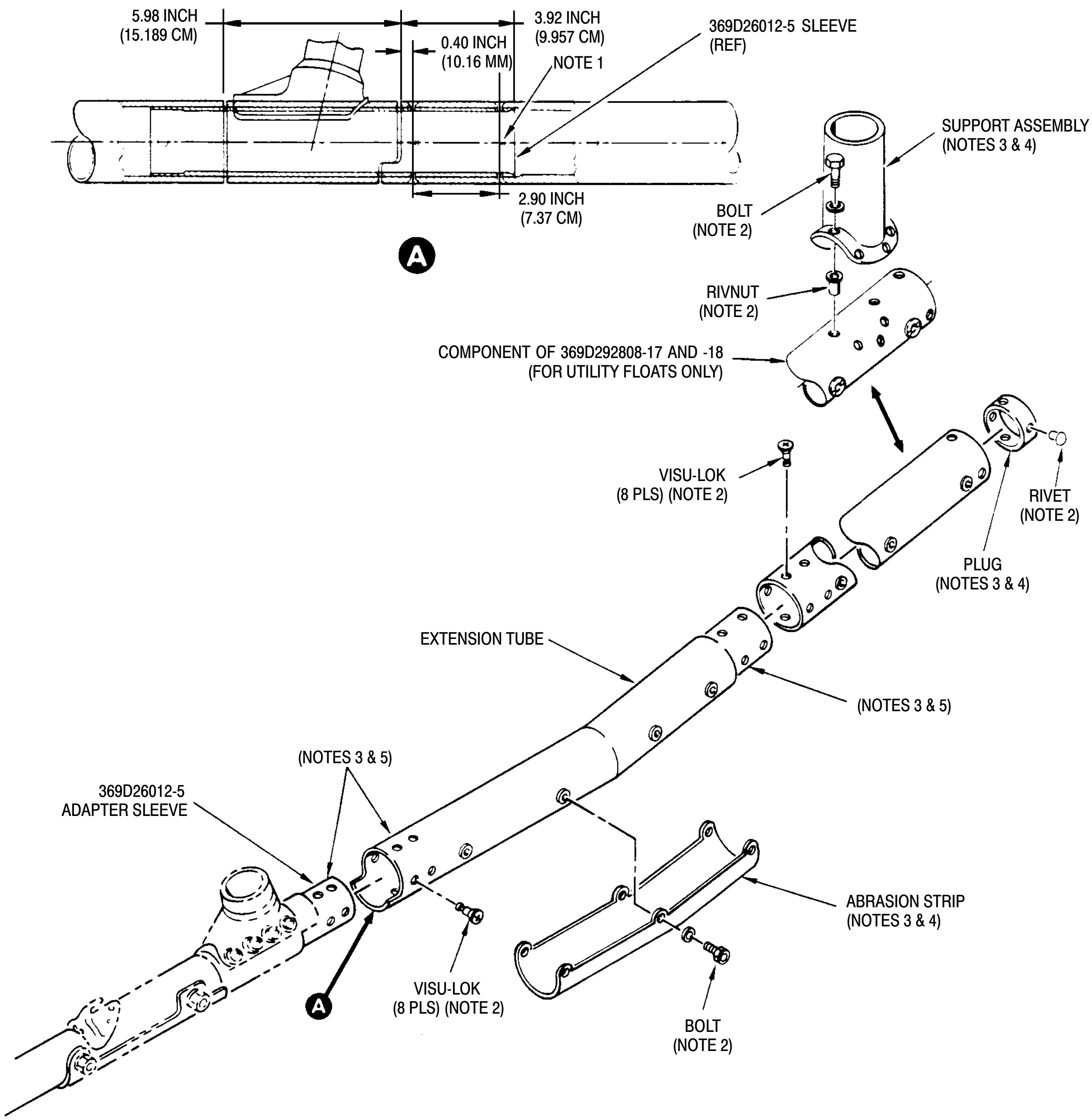


Figure 902. Extended Landing Gear Modification



NOTES:

1. MATCH-DRILL 8 - 0.1945/0.1965 INCH (4.9403/4.9911 MM) DIAMETER HOLES THRU BOTH TUBES AND CSK, 1005 X 0.378/0.385 INCH (9.6012/9.779 MM) DIAMETER. APPLY PRIMER TO BARE METAL SURFACES.
2. COAT ATTACHING HARDWARE WITH PRIMER.
3. COAT MATING SURFACES WITH ZINC CHROMATE PUTTY.
4. SEAL MATING EDGES WITH SEALING COMPOUND.
5. SEAL MATING EDGES WITH SEALING COMPOUND.

G32-8010

Figure 903. Skid Tube Extension Installation

(d). Reinstall skid tube extensions on to -5 adapter sleeve using a thin coat of sealing compound on mating surfaces. Seal with sealing compound. Secure with eight visu-lok fasteners coated with primer.

(e). Install abrasion strip to each extension tube with bolts and washers. Coat attaching hardware with primer. Coat mating surfaces with zinc chromate putty and seal mating edges with approximately 0.060 inch (1.524 mm) bead of sealing compound to insure watertight fit.

(3). Assembly of landing gear skid extension - On current configuration extended landing gear:

(a). Insert float kit extension tube over adapter sleeve.

(b). Align extension tube and sleeve holes, attach tube to skid with bolt spacer and nut.

(4). Assembly of landing gear skid extension - On early configuration extended landing gear:

(a). Seal all edges of skid plug with sealing compound; install in tube by using using rivets.

(b). Coat all surfaces of indexing plug and sleeve with sealing compound.

(c). Insert sleeve adapter in tube and install using rivets.

(d). Install packing and indexing plug in tube; align holes in sleeve, plug assembly and tube with skid assembly. Install rivets and bolts with primer (4).

(e). Coat mating surfaces of abrasion strip with zinc chromate putty (71). Install abrasion strips with screws and primer (4). Seal all edges with approximately 0.06 in. bead of sealant (3).

E. Utility Float to Landing Gear Assembly

(Ref. Figure 904) The Utility Float Kit is shipped with as many parts assembled as practical; however, certain items require assembly at installation.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM209	Zinc chromate putty
CM318	Primer
CM425	Sealing compound
CM717	Tape, pressure sensitive

NOTE: Prior to installation, apply primer (CM318) to all attaching hardware.

(1). On early configuration extended landing gear, coat abrasion strip with zinc chromate putty (CM209) and install with screws (view D).

(2). Install bolt cover pads using existing screws and wrap with two overlapping layers of tape (CM717) (view B).

(3). Coat mating surfaces of cap with sealing compound (CM425) and install using position light attaching screws.

(4). Temporarily install tyrap bracket with screw (view E).

(5). Position utility floats over landing gear skids.

(6). Align bolt holes in floats with bolt holes in skid assembly. Position gravel guards, coat bolts and washers with primer (CM318); attach floats, gravel guards and abrasion strip using bolts and washers. Torque bolts to **25 - 35 inch-pounds (2.82 - 3.95 Nm)**.

(7). Position cap assembly (view C) on skid tube extension. Coat mating surfaces with sealing compound and secure with bolts and washers.

(8). Assemble structure assembly and support assembly (view C). Coat mating surfaces with sealing compound and secure with bolts, washers, nuts and plate. Secure assembled stabilizer assembly using bolts and washers.

F. Utility Floats/Landing Gear Installation

(Ref. Figure 902 and Figure 904)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer
CM425	Sealing compound
CM430	Sealant, solvent resistant
CM717	Tape, pressure sensitive

(1). At forward strut, install approximately 3 feet (92 cm) of wire to position light electrical harness using splice and silicone tube. Apply sealant (CM430) to ends of splice. Route wire through nutplate hole in forward foot (Ref. Figure 902, view A) and seal gaps and holes with sealing compound (CM425).

(2). Connect wire harness to position light using bracket, screw, washer and nut (Ref. Figure 904, view A). Secure wire harness to bracket with strap. Seal connection with sealant (CM430).

(3). Apply sealing compound (CM425) to mating surfaces of foot and strut assemblies. Insert forward and aft foot assemblies into strut assemblies. Align bolt holes, apply thin coat of primer (CM318) to ABC bolts and install bolts while primer is still wet. Torque bolts to **40 - 60 inch-pounds (4.52 - 6.78 Nm)**.

If a preload condition prevents alignment, disconnect one brace from strut assembly to eliminate preload (Ref. Sec. 32-10-00).

(4). Secure new wire to forward foot using tyrap bracket and screw (view E). Route wire to position light location through tunnel provided in float. Use tie strap as required. Attach wire to position light.

(5). Install bracket using screws. Secure tab and position light to bracket using screws, washers and nuts. Install cover using screws (view A).

(6). Install bolt cover pads using tape (CM717) (view B).

(7). Locate strobe light (Ref. Figure 901 view A). Remove attaching hardware and disconnect wire harness. Remove strobe light and doubler. Retain attaching hardware and strobe light.

(8). Position shield and strobe light (Ref. Figure 904). Connect wire harness to strobe light and install shield and strobe light using hardware retained from removal.

(9). Install landing gear fairings (Ref. Sec. 32-10-00).

G. Weight and Balance

Weight and balance changes that result from installation of utility floats are listed in Table 901. After installation of utility floats, incorporate changes to helicopter weight and balance record as instructed in Section 08-10-00.

Table 901. Weight and Balance Data

Configuration	Weight lbs	(kg)	Arm in.	(cm)	Moment in.-lb/100	(kg mm/100)
369D290086-Basic						
Added	+131.8	(59.783)	122.2	(310.39)	+161.06	(1855.60)
Removed	-9.5	(4.309)	103.9	(263.91)	-9.87	(113.71)
Change	+122.3	(55.474)	123.6	(313.94)	+151.19	(1741.89)
369D290086-501						
Added	+143.1	(64.909)	125.5	(318.77)	+179.59	(2069.09)
Removed	-8.1	(3.674)	99.8	253.49)	-8.08	(93.09)

Table 901. Weight and Balance Data

Configuration	lbs	(kg)	in.	(cm)	in.-lb/100	(kg mm/100)
Change	+135.0	(61.235)	127.0	(322.58)	+171.51	(1976.00)
369D290086-503						
Same as -501 except delete:	-143.1	(64.909)	125.5	(318.77)	-179.59	(2069.09)
369D292035-3	-71.5	(32.432)	125.5	(318.77)	-8.97	(103.35)
369D292035-4	-71.5	(32.432)	125.5	(318.77)	-8.97	(103.35)
and install:						
369D292035-5	+25.7	(11.657)	162.0	(411.48)	+4.16	(47.93)
369D292035-6	+25.7	(11.657)	162.0	(411.48)	+4.16	(47.93)
Change	+51.5	(23.360)	161.9	(411.23)	+8.33	(95.97)

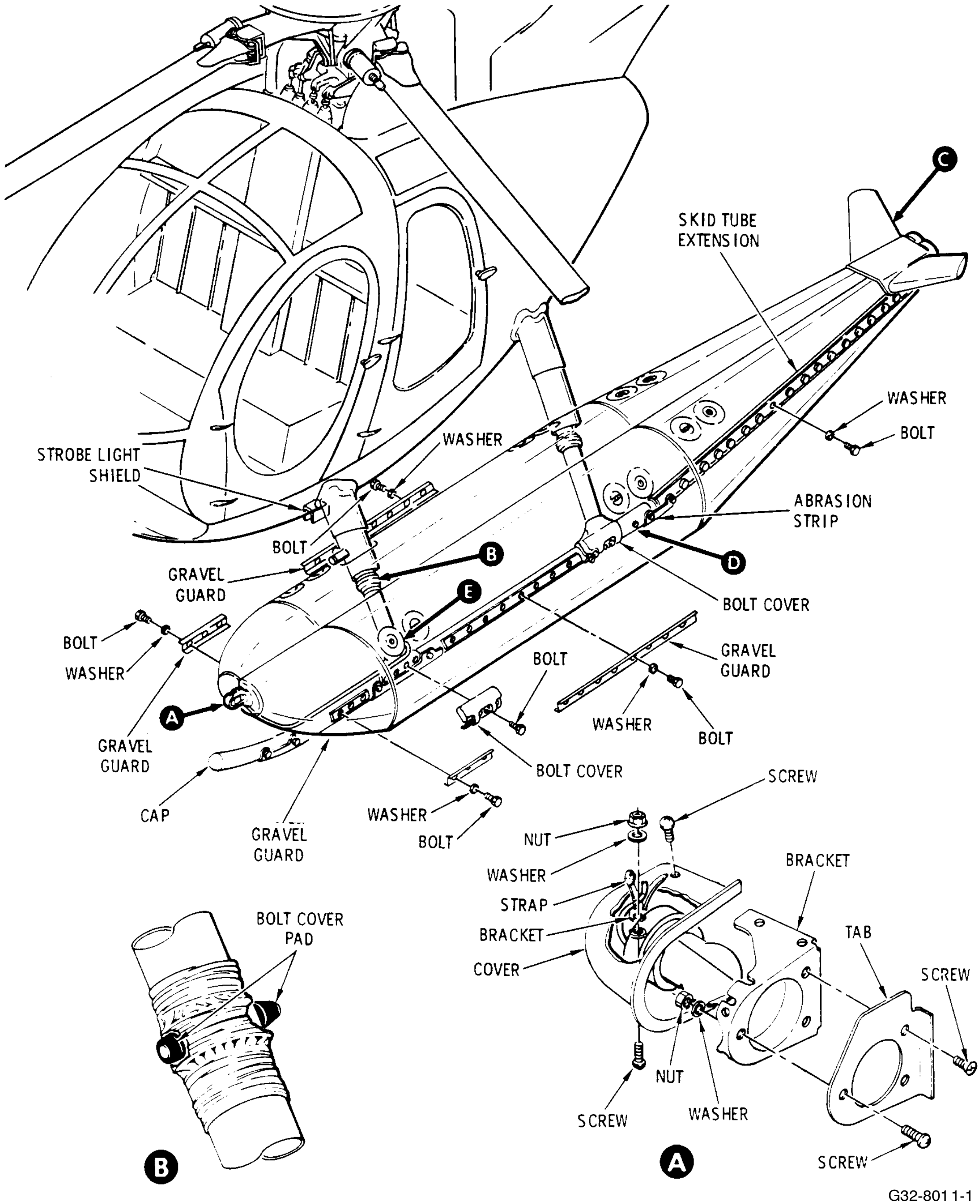


Figure 904. Utility Float Buildup (Sheet 1 of 2)

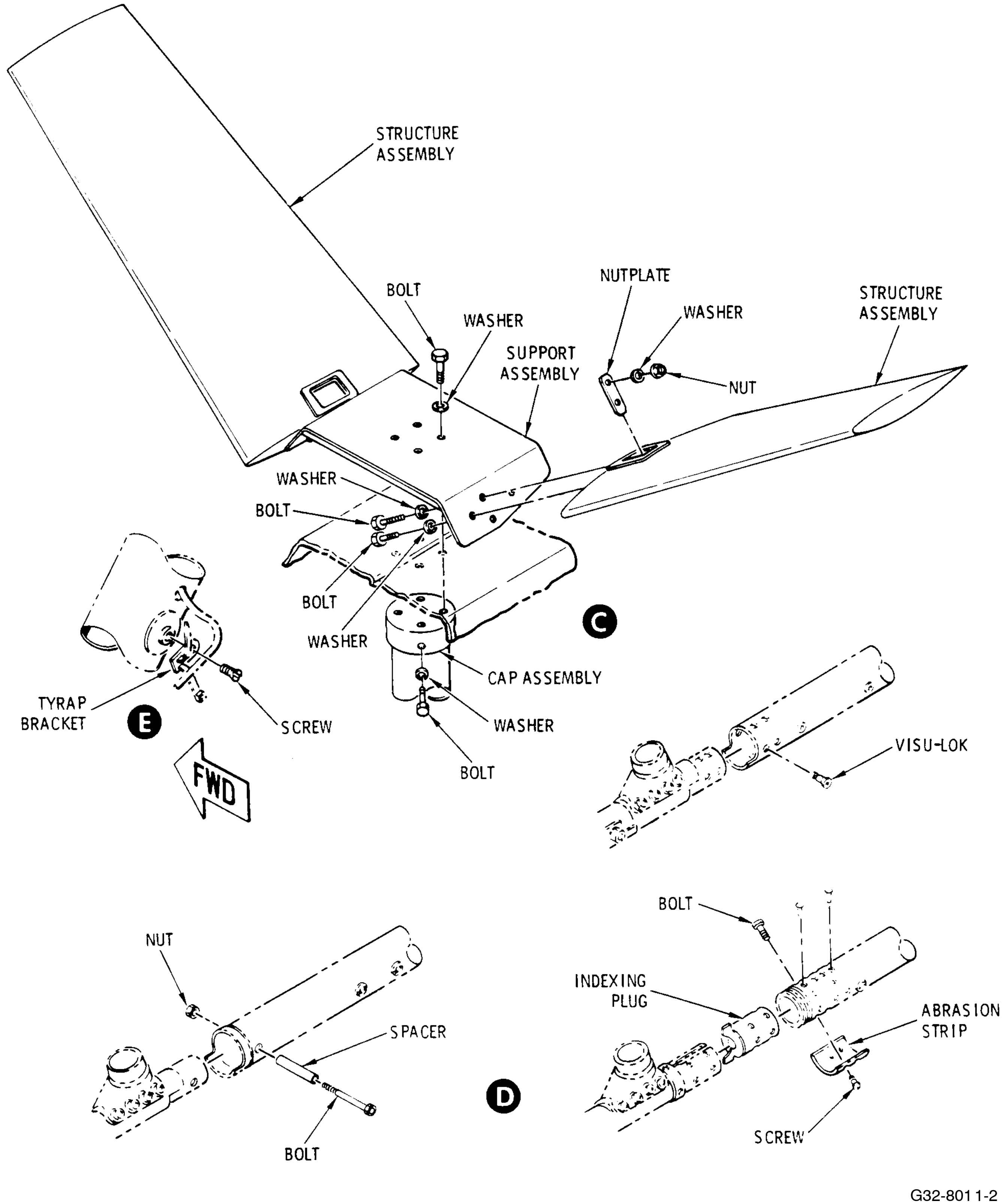


Figure 905. Utility Float Buildup (Sheet 2 of 2)

Section

32-82-00

Emergency Float System (369D/E/FF - 500N)

EMERGENCY FLOAT SYSTEM MAINTENANCE PRACTICES

1. Emergency Float System Description and Operation

A collapsed emergency float with an emergency inflation system (stowed condition) is attached to each landing gear skid. The floats may be fully inflated during flight in approximately five seconds. The electrically controlled inflation system includes a self-test capability to provide the pilot with a visual indication of the electrical circuit reliability. Landing on water or land is permitted when emergency floats are inflated.

Emergency flotation equipment in the stowed condition does not restrict normal land operation of the helicopter. When inflated, the floats will support the helicopter on water at maximum gross weight. After emergency inflation, the inflation system may be serviced with fully charged dry air or nitrogen pressure vessels, and the floats repackaged to a streamlined stowed condition.

A. Emergency Float Description

(1). Electrical System The emergency float electrical installation assumes prior incorporation of the 369H90129-31, 369H90129-505 or 369H90129-511 pilot's cyclic stick grip kit. The emergency float electrical system includes a circuit breaker, visual indicator switch for testing circuit operation reliability, and a relay. The pilot's cyclic stick grip is equipped with an **EMERG/FLOAT** push-button switch. When the pilot's grip switch is actuated, the electrical system energizes and provides electrical power for simultaneous operation of the left and right emergency float inflation system. The float inflation system consists of an electrically operated solenoid valve, or squib valve, attached to a compressed dry air or dry nitrogen pressure vessel. When the solenoid is energized or the squib is actuated, the pressure vessel valve opens and releases compressed dry air or dry nitrogen into compartments of each float.

(2). Flotation Equipment Emergency flotation equipment consist of two inflatable emergency floats, electronically controlled inflation equipment, four landing gear fairings and landing gear skid tube extensions. Nutplates on each skid tube and extension provide for float attachment. A cabin entry step may be used with the landing gear without interference with the floats.

(3). Inflatable Emergency Floats Each of the two inflatable neoprene emergency floats consists of sealed airtight chambers separated by internal walls that provide five individual watertight compartments. Skid attachment strips (girts), bonded to the underside of the floats, are bolted to the landing gear skids. In addition, fore and aft web support straps secure the floats to the skids. The floats are inflated to a nominal operating pressure of 4.0 psig (28 kPa) by the emergency inflation system upon pilot activation of the inflation system electrical control equipment. Relief valves provide for air pressure release at a compartment pressure of 4.5 psi (31 kPa) or above.

A snap-on containment cover with lacing restrains the float in the stowed configuration until the emergency inflation system inflates the float. The containment cover inboard side automatically unsnaps and is pushed outboard as the float inflates. After emergency float use, deflation, pressure vessel recharging and folding, the cover is again snapped in place over the float and replaced for subsequent reuse.

A mooring ring atop each end of the float is furnished for towing and mooring. An extended landing gear skid tube extension supports the float aft section on the landing gear. Forward and aft restraining straps are provided at landing gear strut and fairing locations. Gap covers close off the inboard cutouts for the strut fairings.

(4). Emergency Inflation System The emergency inflation system consists of a charged compressed pressure vessel, air hoses, valves and associated components for inflation of the emergence floats. A complete emergency inflation system is installed on and is part of each float.

When actuated by inflation system electrical control equipment, a solenoid valve or squib valve attached to the pressure vessel releases compressed dry air or dry nitrogen for distribution through the air hoses and inlet check valves for the five float compartments. A relief valve on each float compartment opens if compartment pressure exceeds 5 ±0.5 psi (34.5 ±3.5 kPa).

The pressure vessel operating pressure is 3000 - 3575 psig (20684 - 24649 kPa) at 65 - 85°F (18 - 30°C); 3500 ±75 psig (24132 ±517 kPa) at 65 - 85°F (18 - 30°C) is preferred. The manifold is attached to the pressure vessel along with an indicating pressure gage, filler valve and a pressure relief valve. The pressure vessel relief valve operates at and above 4250 ±250 psig (29303 ±1724 kPa). Detachable rubber boots cover the filler and pressure relief valves for protection against chafing. The pressure vessel may be detached from the float for servicing.

2. Certification and Shelf/Service Life

The Federal Aviation Administration (FAA) has granted Squib PN 5003527-1 of the squib-actuated emergency float valve a provisional five-year life limit. This life limit is established by date of manufacture, which is ink-stamped on the body of the squib (Ref. Sec. 04-00-00).

3. Emergency Float Inspection (Stowed Configuration)

NOTE: The following inspections must be performed daily and before each flight.

(1). Observe vessel pressure through inspection window.

(2). Check girt to skid attaching hardware for condition and corrosion.

(3). Check float cover fasteners and lacing for security.

(4). Examine float stowage cover for abrasive damage that may have disturbed package float.

(5). Perform an operational check of float inflation system electrical control equipment.

4. Emergency Float Inspection

NOTE: To be performed every six months or as necessary.

(1). Check for proper air pressure indication on pressure gage.

(2). If float is stowed, unsnap containment cover and loosen restraining lacing for access to emergency inflation system components.

(3). Remove pressure vessel, inspect for damage and scratched, nicked or otherwise damaged paint coating.

NOTE: Superficial paint coating damage should be repaired by paint touchup.

(4). Inspect valves, air hoses and other air distribution components for damage, deformity, strain, chafing or corrosion.

NOTE: Corrosion of the electrically operated solenoid/squib valve may occur as a result of improper charging of the pressure vessel. Ensure that only dry air or dry nitrogen is used to charge the pressure vessel.

(5). Perform an inflation system electrical control equipment operational check to ensure electrical continuity and connection of solenoid/squib valve.

CAUTION Ensure that pressure vessel gage is visible through inspection window.

(6). Tighten and re-tie the lacing and snap the containment cover in place if not continuing to Float Compartment Pressure Test.

Table 201. Troubleshooting Emergency Flotation Equipment

Symptom	Probable Trouble	Corrective Action
CAUTION A charged float pressure vessel must be discharged before the associated float valve is removed from the pressure vessel. Use care to prevent accidental float inflation.		
No reliability light indication, either left or right.	Burned-out lamp.	Replace lamp.
	Defective connection or wiring.	Repair connection or wiring.
	Open circuit to solenoid float valve.	Replace float valve.
No reliability light indication, both left and right.	Defective connection or wiring.	Repair connection or wiring.
Reliability light indication for both floats; neither float inflates.	Defective actuating switch.	Replace actuating switch.
	Defective actuating switch wiring.	Repair wiring.
Float leaks air.	Damaged float.	Repair float.

5. Emergency Float Compartment Pressure Test

To be performed every 6 months or after 5 inflations (Ref. Sec. 04-00-00).

(1). Inflate all float compartments at the fill valves to 4.5 psi (31 kPa) for one hour. Check for leaks and condition.

(2). Continue inflation to 5.5 psi (38 kPa) and check that chamber pressure relief valves operate.

(3). Lower pressure in all five float compartments to 2.0 psi (14 kPa) and let stand for 24 hours.

NOTE: Changes in atmospheric pressure and temperature during pressure test of float compartments will affect pressure gage readings. A temperature change of 1 degree equals 0.032 psig (0.2206 kPa).

(4). Check the pressure drop with a pressure gage that indicates 0 - 15 psi (0 - 103 kPa), graduated in 0.5 psi (5 kPa) increments. The maximum allowable pressure drop in 24 hours is limited to 0.5 psi (5 kPa) per compartment.

(5). If a pressure drop occurs, check floats for soundness.

(6). Tighten and re-tie the lacing and snap the containment cover in place.

6. Emergency Float Inspection (After Inflation)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM220	Naphtha aliphatic

(1). Clean float as follows:

(a). Clean away any oil or grease with naptha (CM220).

(b). Wash down with soapy water; flush with clear fresh water and allow to air dry.

(c). Clean air pressure gage inspection window with a clean cloth and fresh water.

(d). After inspection is complete, dust with talc.

(2). Recharge pressure vessel to 3500 psig (24132 kPa) at 75°F (24°C).

(3). Inspect float bags for abrasion and chafing.

(4). Inspect pressure relief valves for condition and closure.

(5). Inspect check valves for condition.

(6). Inspect all hoses and connectors for condition and security.

(7). Check float girts, web support and restraining straps for condition and secure attachment to skid tube.

(8). Check all release snaps and fasteners for condition and serviceability.

(9). Check that pressure vessel relief valve and filler valve boots are installed.

(10). Repack floats.

7. Emergency Float Test

WARNING **The squib is an electrically fired explosive device. Keep squibs away from all sources of heat, open flame, sparks and electrical contacts. Squib plugs are to be in place until squibs are installed in aircraft.**

(1). Perform inflation operational reliability test of float inflation electrical system as follows:

(a). Press **LH/FLT** and **RH/FLT** combination press-to-test switch located below the lower switch and circuit breaker panel on the sllmline instrument panel and at the top-center of the ”T” panel, to test float inflation electrical circuit reliability.

NOTE: Pressing the press- to- test switch applies low voltage (insufficient to energize/ actuate the pressure vessel valve solenoid/ squib) to the emergency float circuit. Internal light bulbs in the switch will illuminate if the circuit is operational.

(b). Observe that each switch faceplate is illuminated when pressed and goes out when switch is released.

NOTE: Failure to illuminate indicates a burned-out light bulb in the switch or a defective circuit. Extreme brightness indicates a defective circuit.

(2). Check each pressure vessel for proper (normal) air pressure, 3500 psig (24132 kPa) at 70°F (24°C).

8. Float Compartments Pressure Test

(1). Inflate all five float compartments to 2.0 psi (14 kPa) and let stand for 24 hours.

NOTE: Changes in atmospheric pressure and temperature during pressure test of float compartments will affect pressure gage readings. A temperature change of 1 degree equals 0.032 psig (0.2206 kPa).

(2). Check the pressure drop with a pressure gage that indicates 0 - 15 psi (0 - 103 kPa), graduated in 0.5 psi (5 kPa) increments. The maximum allowable pressure drop in 24 hours is limited to 0.5 psi (5 kPa) per compartment.

(3). If a pressure drop occurs, check floats for soundness.

9. Emergency Float Repair

Contact MDHS Field Service Department for repair information.

10. Solenoid-to-Squib Rework Procedure

The following is a procedure to replace the solenoid, which is no longer manufactured, to the squib valve.

(1). Turn off electrical power.

(2). Unpack emergency floats.

(3). Remove valve protector and unlace cylinder sling lacing cords (Ref. Figure 402).

(4). Disconnect solenoid valve electrical wiring knife splice at (SP4, SP5, SP9 and SP10) solenoid.

(5). Loosen nut at outlet port of solenoid valve. Disconnect valve assembly from union by unscrewing cylinder and valve assembly in counterclockwise direction. Remove cylinder and valve assembly.

(6). If cylinder is not empty, discharge as follows:

WARNING **Exercise care when discharging cylinder. Personnel can be injured by high pressure air or flying debris.**

(a). Secure cylinder in chain vise or equivalent. Point filler valve outlet in safe direction.

(b). Use two open end wrenches, one on filler valve body and one on nut. Turn nut slowly counterclockwise 2-1/4 turns and allow all pressure to escape. Check gage to verify that no pressure remains in cylinder.

(7). Remove solenoid valve from cylinder. Discard solenoid valve and packing.

(8). Install new squib valve (PN 23111380-3 LH float, PN 23111380-4 RH float) with PN MS28778-12 packing on cylinder. Torque to **360 - 504 inch pounds (40.67 - 56.95 Nm)** (Ref. Figure 403).

(9). Install fitting with PN MS28778-6 packing on existing union.

(10). Recharge cylinder and test for air leaks.

(11). Install charge cylinder and squib valve assembly with PN MS28778-6 packing on fitting.

(12). Revise emergency float electrical system as follows:

(a). Remove access panels and/or covers as necessary to expose emergency float wiring.

(b). Remove all emergency float wiring except as noted in Figure 903.

(c). Remove and discard relay installation, doubler and attaching hardware located on pilot's floor support, left bulkhead.

(d). Remove emergency float switch light assembly and install new switch light assembly.

(e). Install wiring as shown in Figure 902. Do not plug in electrical connectors (P101 and P102) until after electrical system check.

(f). Reinstall access panels and/or covers.

(13). Turn on electrical power.

(14). Perform inflation system electrical control equipment operational check as follows:

(a). Test light check;

1). Check ship voltage with VOM. Voltage should be 27.5 Vdc.

2). Open emergency float circuit breaker (CB121).

3). Install one lead of 0.5 ohm ±5%, 10W resistor in pin A of left-hand connector (P101). Connect one test lead of ammeter (VOM) to other lead of resistor. Connect other test lead of ammeter (VOM) to pin D of connector (P101).

4). Close emergency float circuit breaker (CB121).

5). Press **PRESS-TO-TEST** switch and observe current reading on ammeter and brilliance of lamps. Current should be 75 MA minimum and brilliancy of lamps should be fairly bright.

6). Open emergency float circuit breaker (CB121).

7). Remove meter and resistor from connector (P101).

8). Repeat steps 3). through 7). for right-hand connector (P102).

(b). System check;

1). Ensure that circuit breaker (CB121) is open and connectors (P101 and P102) are disconnected.

2). Install one lead of 40 ohm ±1%, 20W resistor in pin A of left-hand connector (P101) and install other lead of resistor in pin D of connector (P101).

3). Connect test leads of voltmeter (VOM) across resistor.

4). Close emergency float circuit breaker (CB121).

5). Press firing switch on pilot's grip and observe voltage on meter. Voltage should be 25.5 Vdc minimum.

6). Open circuit breaker (CB121).

7). Remove meter and resistor from connector (P101).

8). Repeat steps 2). through 7). for right-hand connector (P102).

(c). Connect connectors (P101 and P102) to squib valves.

(d). Close emergency float circuit breaker (CB121).

(e). Press PRESS-TO-TEST switch and observe that lamps light.

(f). Open circuit breaker (CB121).

(15). Ensure that cylinder is positioned so that pressure gage is visible through inspection window when floats are stowed, pressure gage axis inclined outboard approximately 40°.

(16). Repack emergency floats (Ref. Figure 404).

(17). Remove existing V_{NE} cards (solenoid valve, floats stowed (3) and solenoid valve, floats inflated (1)).

(18). Install PN 369D292574-49, -51 and -53 V_{NE} cards (squib valve, floats stowed) and PN 369D292573-19 V_{NE} card (squib valve, floats inflated).

EMERGENCY FLOAT SYSTEM REMOVAL/INSTALLATION

1. Emergency Float Replacement

A. Emergency Float Removal

(Ref. Figure 401)

(1). If float is in stowed configuration, release fasteners to gain access to float package.

(2). Detach lower restraining strap and gap cover at forward and aft struts.

(3). Disconnect solenoid valve electrical wiring at knife splice at solenoid valve or disconnect squib valve electrical connector at squib and install shunt.

(4). Remove strut fairing, insulate strut wire end knife splices, attach wiring to strut in a stowed position and reinstall fairing.

(5). Remove bolts and washers attaching for and aft web support strap fittings to skid tube.

(6). Remove bolts and washers attaching float girts to skid tube extension; remove float assembly.

B. Emergency Float Installation

(Ref. Figure 401)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM209	Zinc chromate putty

NOTE: The float assembly must be removed from the stowage envelope for installation.

(1). Open float package and release restraining straps.

NOTE: If extension tubes are not installed on helicopter, refer to Skid Tube Extension Replacement.

(2). Position float girts over skid tube attach points.

(3). Temporarily attach float web support strap fittings at forward location; Secure strap fitting at aft attach location with bolts and washers.

(4). Place gravel guards over float girts and secure with bolts and washers. Torque all bolts securing float girts to skid tubes to **25 - 35 inch-pounds (2.82 - 3.95 Nm)**.

(5). Apply zinc chromate putty (CM209) to contact surfaces of previously removed abrasion strips, and skid extension abrasion strips to ensure watertight fit on landing gear skids.

(6). Loosen float forward web strap fitting and position abrasion strip on skid below strut; position web strap fitting over forward attach hole on abrasion strip and secure strip to skid with bolts and washers. Install remaining abrasion strips; remove excess zinc chromate putty.

(7). Install remainder of bolts and washers securing float girts to skid tube extension.

(8). Adjust and secure float landing gear strut cutout restraining straps.

(9). Unsnap float containment cover and loosen restraining lacing to gain access to emergency inflation system components.

(10). Connect squib valve electrical connector at squib.

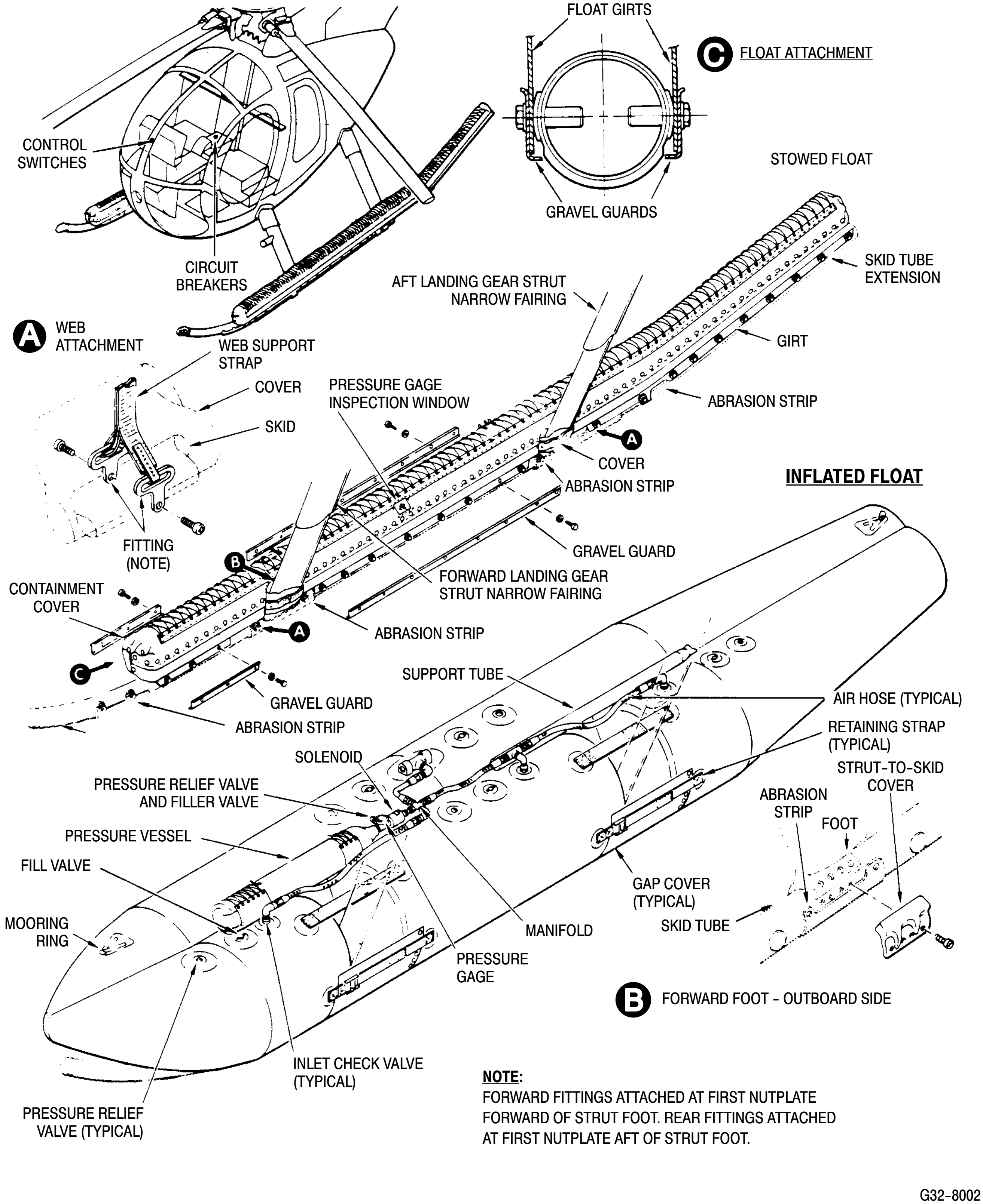


Figure 401. Emergency Float Installation

2. Emergency Float Pressure Vessel Servicing and Replacement

(Ref. Figure 401) Maximum allowable temperature during charging is 165°F (75°C). Detaching the pressure vessel from the float during charging is the preferred procedure. Maximum pressure vessel pressure is 3500 psig (24132 kPa) at room temperature, 70°F (21°C). As outside air temperature will affect the day-to-day gage reading, temperature versus pressure readings are important during servicing or inspection of the pressure vessel air pressure. The indicated pressure on the gage will increase or decrease 6.6 psig (45.5 kPa) per 1°F (0.4°C) increase or decrease, respectively, in vessel air temperature. Slow variations in ambient air temperature will be reflected in the vessel air temperature; however, it must be considered that direct or reflected solar radiation will result in higher pressure than would be anticipated for the existing ambient air temperature.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM810	Leak detector, liquid

(1). If float is stowed, unsnap containment cover to extent required for access to pressure vessel.

(2). Open manifold change valve to verify that there is no pressure remaining in pressure vessel.

(3). Remove the three air hoses at air manifold. Do not allow the manifold to turn when disconnecting the hoses.

(4). Disconnect solenoid valve electrical wiring knife splice at solenoid or disconnect squib valve electrical connector at squib and install plug.

CAUTION Use a wide-strap wrench, 2 inch (5 cm) minimum width, to apply torque on the pressure vessel, taking care not to damage it. Use crowfoot adapter on the torque wrench at the valve body.

NOTE:

- Solenoid valve: Do not remove solenoid and relief valve assembly from pressure vessel.
- Squib valve: If actuated, replace with a serviceable valve. Install valve on pressure vessel and torque to **380 - 420 inch-pounds (42.93 - 47.45 Nm)**.

(5). Detach restraining lacing and remove pressure vessel from float.

(6). Recharge pressure vessel with dry nitrogen or compressed dry air to 3000 - 3500 psi (20684 - 24132 kPa) at 75°F (24°C); 3500 psig (24132 kPa) at 75°F (24°C) is preferred. Cool cylinder with water and charge slowly to maintain vessel surface temperature below 250°F (122°C).

NOTE: The pressure vessel may also be serviced by weight. When servicing by weight, use a scale and weigh the empty vessel with attaching hardware installed. Charge the empty vessel until a weight increase of 3.7 - 4.4 pounds (1.68 - 2.0 kg) is obtained; 4.4 ±0.1 pounds (2.0 ±0.05 kg) is preferred. When charging by weight, air temperature variation will have no affect. Observe vessel cooling precaution.

(7). Test for air leaks by applying liquid leak detector (CM810) to the valve-pressure vessel interface. No air bubbles are permitted.

(8). Dry with clean lint-free cloth and then allow to air-dry completely.

(9). Inspect the emergency inflation system.

(10). Cover vessel with bag and tie closure lacing.

(11). Reinstall vessel and bag on float; re-connect air hose fittings and solenoid/squib valve electrical wiring knife splice/squib valve electrical connectors. The pressure vessel must be positioned so that air hose connections place no strain on the solenoid/squib and the pressure gage is visible through the pressure gage inspection window when the floats are stowed.

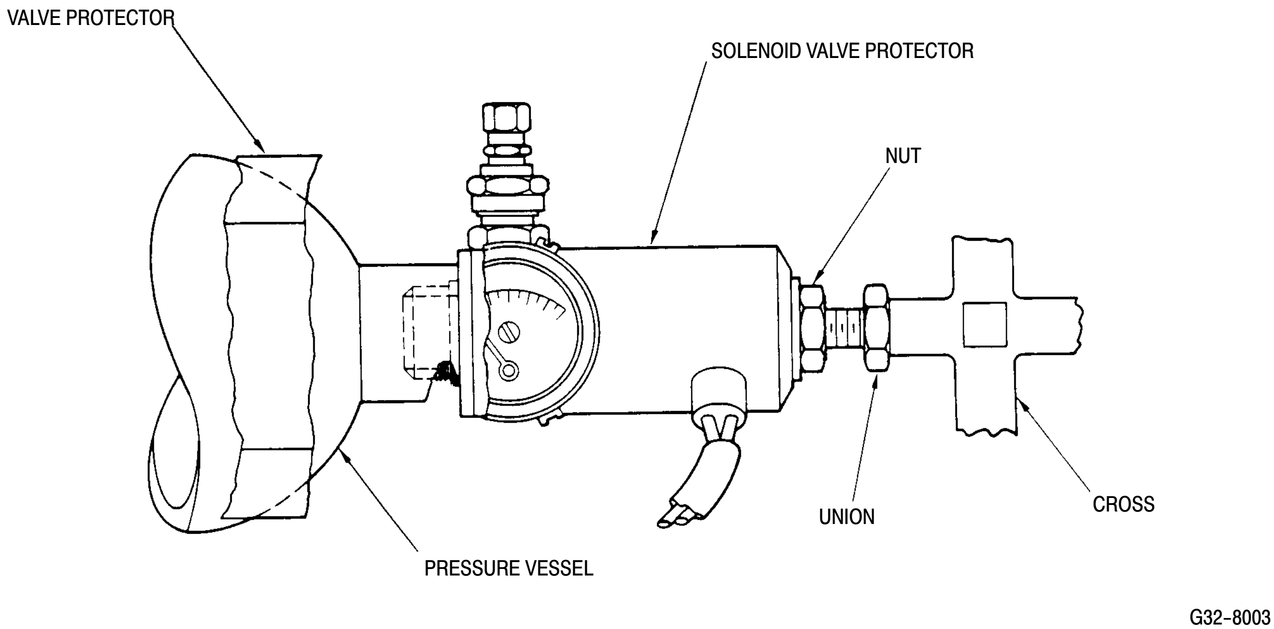


Figure 402. Solenoid Valve Assembly

(12). Reinstall manifold cover.

(13). Perform an inflation system electrical control equipment reliability test.

3. Squib and Squib Actuated Valve Replacement

(Ref. Figure 402 and Figure 403) Each time the emergency floats are inflated using the emergency float inflation system, the squib and squib actuating valve must be replaced.

NOTE: Solenoid valves used in the emergency float system are no longer available from the manufacturer. Emergency float systems equipped with the solenoid valve must be converted to the squib valve system when the service life of the solenoid valve is exceeded.

(1). Open manifold change valve to verify that there is no pressure remaining in pressure vessel.

(2). Remove pressure vessel with squib valve assembly attached.

(3). Note orientation of squib with respect to pressure gage.

(4). Spread plastic cover at it's parting line until small round end of white plastic buttons pull through the black plastic and over the squib connector, allowing access to four screws that retain the actuating valve body.

(5). Using Allen wrench, remove four screws near the outlet port retaining the actuated valve body. Retain screws for installation of new valve.

(6). Pull spent valve and squib off vessel. Discard activated valve and squib.

(7). Lightly lubricate O-ring on new valve with MIL-G-4343 or equivalent pneumatic grease.

WARNING **The squib is an electrically fired explosive. Ensure connector plug is installed in connector prior to installation.**

(8). Maintain squib orientation noted in step (3).. Install squib actuated valve, with squib installed, into manifold. Squib actuated valve must bottom metal-to-metal on face of manifold.

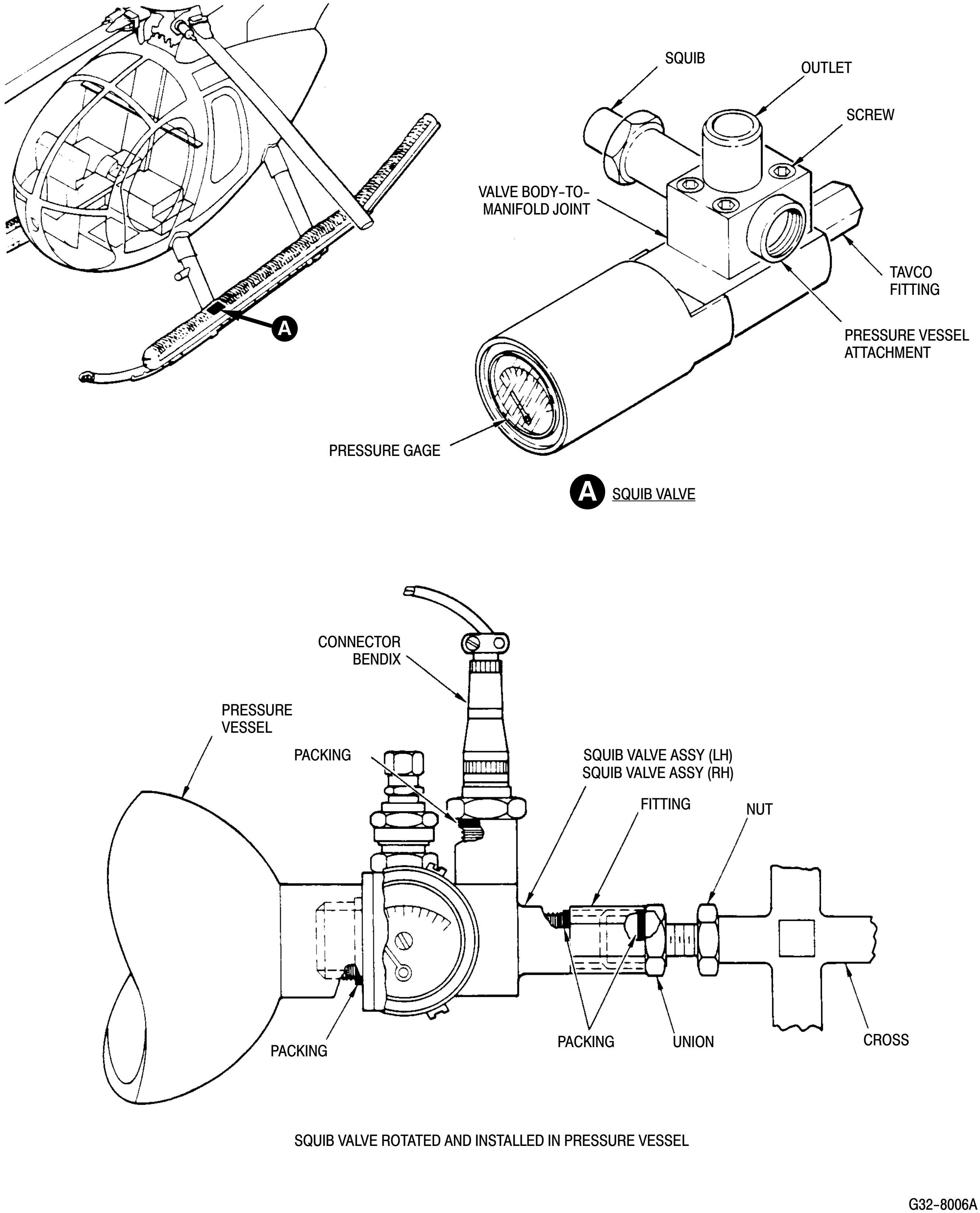


Figure 403. Squib Valve Assembly

(9). Install four screws removed in step e. hand tight until locking thread of helicoil insert in manifold is engaged.

(10). Using Allen wrench, tighten the four screws evenly until bottomed. Torque screws to **38 - 43 inch-pounds (4.29 - 4.86 Nm)**.

(11). Remove plug from squib connector. Note that plug only fits one way. Realign black plastic cover and pull it back over the squib connector. Replace squib connector plug.

(12). Snap white plastic buttons back through holes in black plastic cover. Check plug in squib connector to ensure it is bottomed.

(13). Charge pressure vessel and reinstall on emergency float assembly.

4. Emergency Float Folding

(Ref. Figure 404) Folding instructions contained in this procedure are provided as a general guide for float packing. Float folding will require the aid of an assistant and considerable care in preparing the smallest float package possible during the initial folding steps. A minimum amount of wrinkles and complete air evacuation is essential to final closure of cover snap fasteners.

(1). Position deflated float (five fill valves **OPEN**).

NOTE: The float assembly must be removed from the stowage envelope for installation. Do not attempt to position the float for packaging with the float chambers fully collapsed.

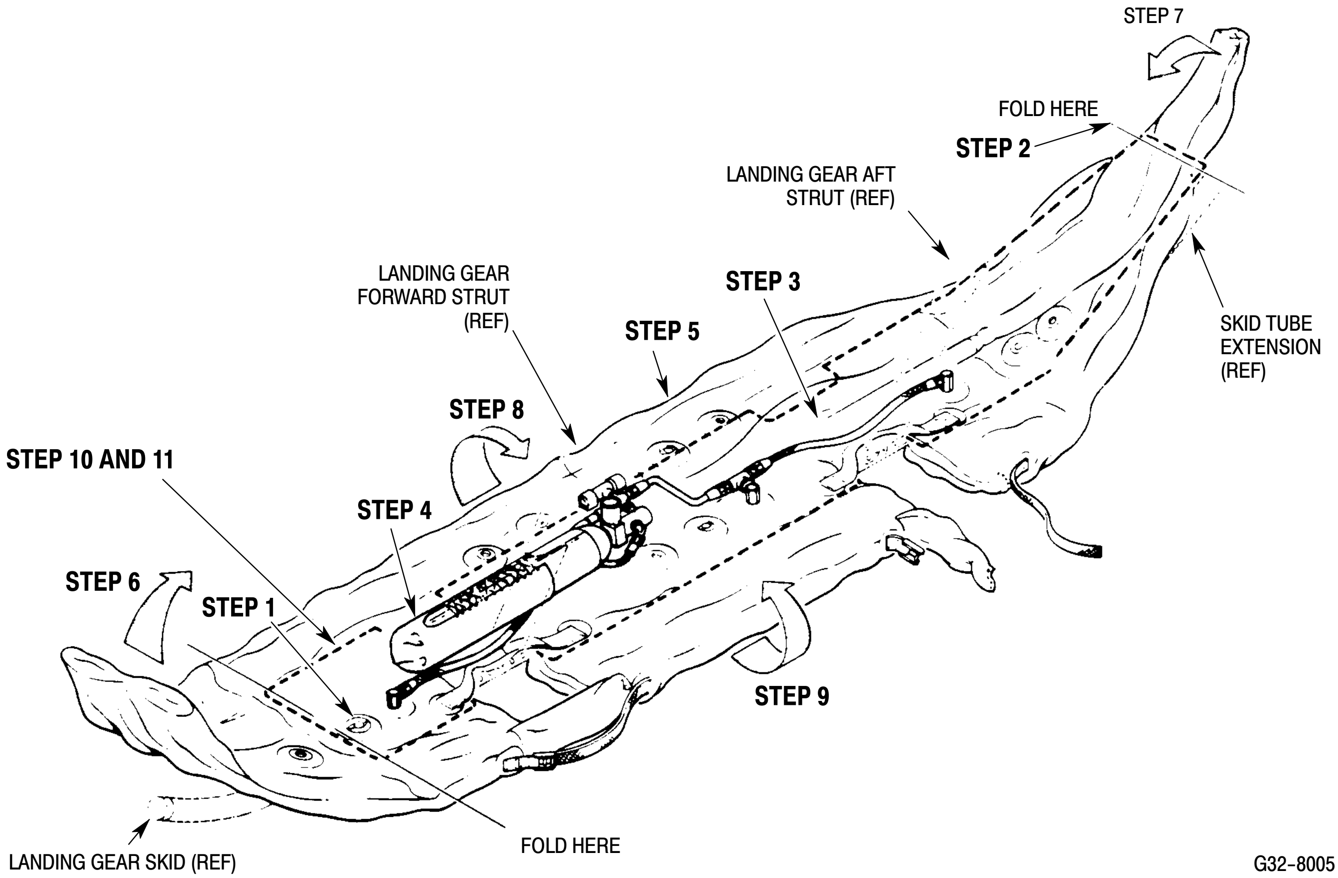
(2). Fold the float as outlined in the figure. On completion, the folded float must be contained within the float stowage cover, all snaps must be closed and the pressure vessel pressure gage must be visible in the inspection window. Special attention should be paid to the following information which is presented as an aid in establishing a final float folding technique.

(a). Accomplish float folding in two stages, first performing float arrangement (pre-folding) to the extent necessary to position the float and float components in approximate required positions and then proceeding with the final folding.

NOTE: Partial inflation of float compartments is required to enable float arrangement during initial pre-folding.

(b). During pre-folding and before air evacuation of the forward compartments (cells) as outlined in step 4, do the following. Gather and compress the float fabric tightly against the vessel and pull the cover over the inboard-facing pressure gage to estimate final cover window-to-gage relationship. This fabric bunching/ cover pulling action may be required several times before an approximation (best guess) of final window position is established. When cover position appears good, evacuate all air from the forward cells and recheck the window-to-gage relationship.

(c). As soon as a float chamber is arranged in the desired position, hold the components in place, flatten as many wrinkles as possible and evacuate air from the float chamber. While the vacuum is still being applied, close the fill valves.



STEP 1 OPEN ALL FILL VALVES OF INFLATED FLOAT AND COMPRESS CELLS LIGHTLY BY HAND SO THAT FLOAT IS FLAT AND AS SMOOTH AS POSSIBLE.

STEP 2 PLACE FOLD AT AFT END OF SKID EXTENSION THEN EVACUATE AFT OUTBOARD AIR COMPARTMENT (CELL) UNTIL FOLD IS FIRM AND SHARP. CLOSE FILL VALVE.

STEP 3 WHILE COMPRESSING SUPPORT TUBE AND HOLDING FLOAT CENTER FORWARD AND DOWN, PLACE A FOLD IN INBOARD CENTER CELL BETWEEN INLET CHECK VALVE AND FILL VALVE. REARRANGE AIR HOSE AS REQUIRED. CONTINUE HOLDING PRESSURE ON SUPPORT TUBE. EVACUATE CENTER CELL THEN AFT INBOARD CELL UNTIL FOLDS ARE SHARP AND SUPPORT TUBE IS FIRMLY HELD FROM MOVING AFT. CLOSE FILL VALVE.

STEP 4 POSITION PRESSURE VESSEL SNUG AGAINST OUTBOARD SIDE OF FORWARD STRUT. WHILE HOLDING VESSEL IN POSITION, EVACUATE FORWARD OUTBOARD CELL THEN FORWARD INBOARD CELL UNTIL CREASES ARE FIRM AND SHARP. CLOSE FILL VALVE.

STEP 5 RECHECK FLOAT. CHECK THAT FLOAT IS AS FLAT AS POSSIBLE AND FREE OF ALL AIR POCKETS. DOUBLE CHECK FIRMNESS OF ALL CREASES AND RE-EVACUATE CELLS AS NECESSARY.

NOTE: ANY REMAINING AIR MIGHT CAUSE FLOAT OPENING AT ALTITUDE AND DIFFICULTY IN PACKING.

STEP 6 FOLD FLOAT AFT AT FORWARD END. REPOSITION HOSES AS REQUIRED. STOWAGE COVER MUST BE OUTSIDE OF FOLD LINE.

STEP 7 FOLD FLOAT FORWARD AT AFT END. REPOSITION AIR HOSES AS REQUIRED. STOWAGE COVER MUST BE OUTSIDE OF FOLD LINE.

STEP 8 ROLL AND FOLD LENGTH OF FLOAT TOWARDS CENTER. DO NOT COVER PRESSURE GAGE.

STEP 9 ROLL AND FOLD LENGTH OF FLOAT TOWARDS CENTER. FASTEN SNAPS STARTING AT FORWARD END. ENSURE THAT PRESSURE GAGE IS VISIBLE IN INSPECTION WINDOW. DO NOT FASTEN END COVER SNAPS.

STEP 10 TIGHTEN LACING. ENSURE THAT SNAP FASTENERS REMAIN CLOSED.

STEP 11 SECURE END COVER SNAPS. ALL SNAP FASTENERS MUST BE USED.

Figure 404. Emergency Float Folding

EMERGENCY FLOAT SYSTEM
INITIAL INSTALLATION

1. Emergency Float System Initial Installation

A. General

Procedures in this section may be performed at the operator's discretion. Instructions are provided for installation of emergency float kit on either the current or early configurations of the extended landing gear. Subsequent installation instructions for the emergency floats and the float electrical control system are identical for the current and early extended landing gear configurations. Equipment removal and modification differences between the current and early configurations are noted in the subsequent instructions.

The emergency float kits are provided with as many assembled parts as practicable to facilitate initial installation on the helicopter. Installation of electrical equipment assumes prior incorporation of pilot's cyclic stick grip kit (369D90129-507 or 369D90129-511).

B. Initial Preparation

Instructions in the following paragraphs are applicable to both left and right landing gear assemblies. Prepare the aircraft for installation of emergency floats as follows:

NOTE: When installing emergency floats, the V_{NE} cards must be replaced with the cards that come with the floats (Ref. appropriate PFM).

(1). Identify all components, including attaching hardware, and components removed for access to work areas. Protect components from damage and contamination until installed.

(2). Raise aircraft clear of ground; Use authorized hoisting or jacking methods (Ref. Sec. 07-00-00). Place support beneath skid tubes at strut locations.

C. Existing Equipment Removal

(1). Remove Battery (Ref. Sec. 96-05-00).

(a). Ensure that all flight compartment switches are in **OFF** position.

CAUTION Make certain **BATT-OFF-EXT** switch is in **OFF** position.

(2). Remove landing gear strut fillets and fairings (Ref. Sec. 32-10-00). Retain all doublers, guides, pins and springs for reinstallation.

(3). On current configuration landing gear, remove forward nut, bolt and spacer attaching existing extension to aft end of skid tube; retain nut for reinstallation.

(4). On early configuration landing gear, remove abrasion strip attached to existing skid tube extension (Ref. Sec. 32-10-00).

(5). Remove screws and bolts securing skid tube extension; retain early configuration indexing plugs for reinstallation.

(6). Remove skid abrasion strips below for and aft fairings; retain abrasion strips for reinstallation.

D. Landing Gear Skid Extension Assembly

(Ref. Sec. 32-81-00)

E. Emergency Float System Electrical Equipment Installation

(Ref. Figure 901)

(1). Remove attaching hardware and separate lower switch and circuit breaker panel from instrument panel structure.

(2). Remove covers from emergency float press-to-test switch and circuit breaker cutouts from lower switch and circuit breaker panel.

(3). Install emergency float circuit breaker in panel.

NOTE: Press-to-test switch is installed during subsequent wiring installation procedure.

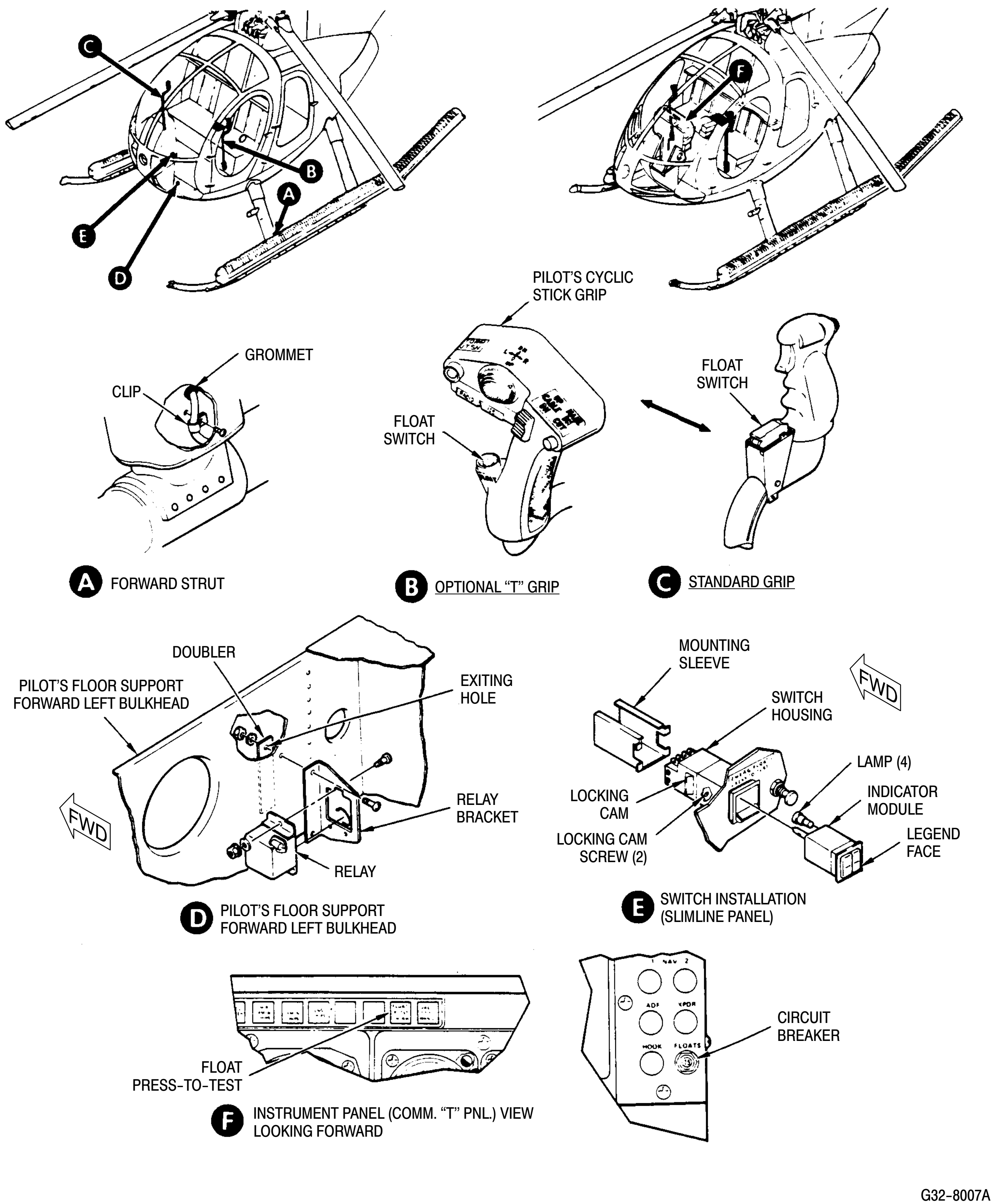


Figure 901. Emergency Float Kit - Electrical Installation

F. Emergency Float System Electrical Wiring Installation

(Ref. Figure 902 thru Figure 905)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer
CM601	Insulation sleeving, electrical

(1). Identify wires as required and form wire bundle of applicable wires to emergency float circuit breaker and press-to-test switch on lower switch and circuit breaker panel.

(2). From battery compartment area, route wire bundle forward and up through instrument panel support structure; route wire bundle with existing bundles where possible.

(3). Install insulation sleeving (CM601) and connect applicable wires to contacts on press-to-test switch and circuit breaker; assemble and secure press-to-test switch to panel.

(4). Adjust wire bundle and allow sufficient slack for maintenance; strap and string tie bundle to form smooth flow of wires to battery compartment area.

(5). Ensure all switch and circuit breaker contacts are secure and that sleeving is properly installed; remove paint from panel and console in upper screw area to ensure good ground contact. Install panel on console.

(6). Install wiring through landing gear struts as follows:

(a). Drill 0.442 inch (11.2268 mm) hole centered on outboard side of forward struts located five inches (12.7 cm) above centerline of skid tube; deburr holes internally and externally.

(b). Coat bare metal in holes with primer (CM318); allow primer to dry.

(c). Remove left and right foot support fairing in passenger compartment for access to landing gear forward struts.

(d). Install insulation sleeving on float valve squib wires.

(e). Locate position light wire bundle exit holes on top inboard portion of left and right landing gear struts; Insert respective float squib wire bundles through position light wire bundle exit holes. Locate wires through previously drilled wire exit hole at bottom of each strut. Carefully pull wires through holes allowing sufficient length for connections at either end.

(f). Slide grommet over wire bundle on both struts; Install grommet in previously drilled wire exit holes.

(g). Attach clip (Ref. Figure 901, view G).

(h). Coil and stow wires to avoid damage during float equipment installation.

(7). Complete balance of all wiring. Install insulation sleeving as required to prevent shorting and chafing throughout circuit wiring.

NOTES:

1. THIS WIRING DIAGRAM SHOULD BE USED WITH THE ELECTRICAL SYSTEM WIRING DIAGRAM IN CSP-HMI-3 FOR COMPLETE CIRCUIT IDENTIFICATION.
2. DASHED LINE (- - -) ITEMS ARE PART OF HELICOPTER BASIC ELECTRICAL SYSTEM, UNLESS OTHERWISE NOTED.
3. PART OF SOLENOID FLOAT VALVE.
4. ENDS OF WIRE A507B20 (PART OF BASIC ELECTRICAL SYSTEM) MUST BE DISCONNECTED AND INSULATED.

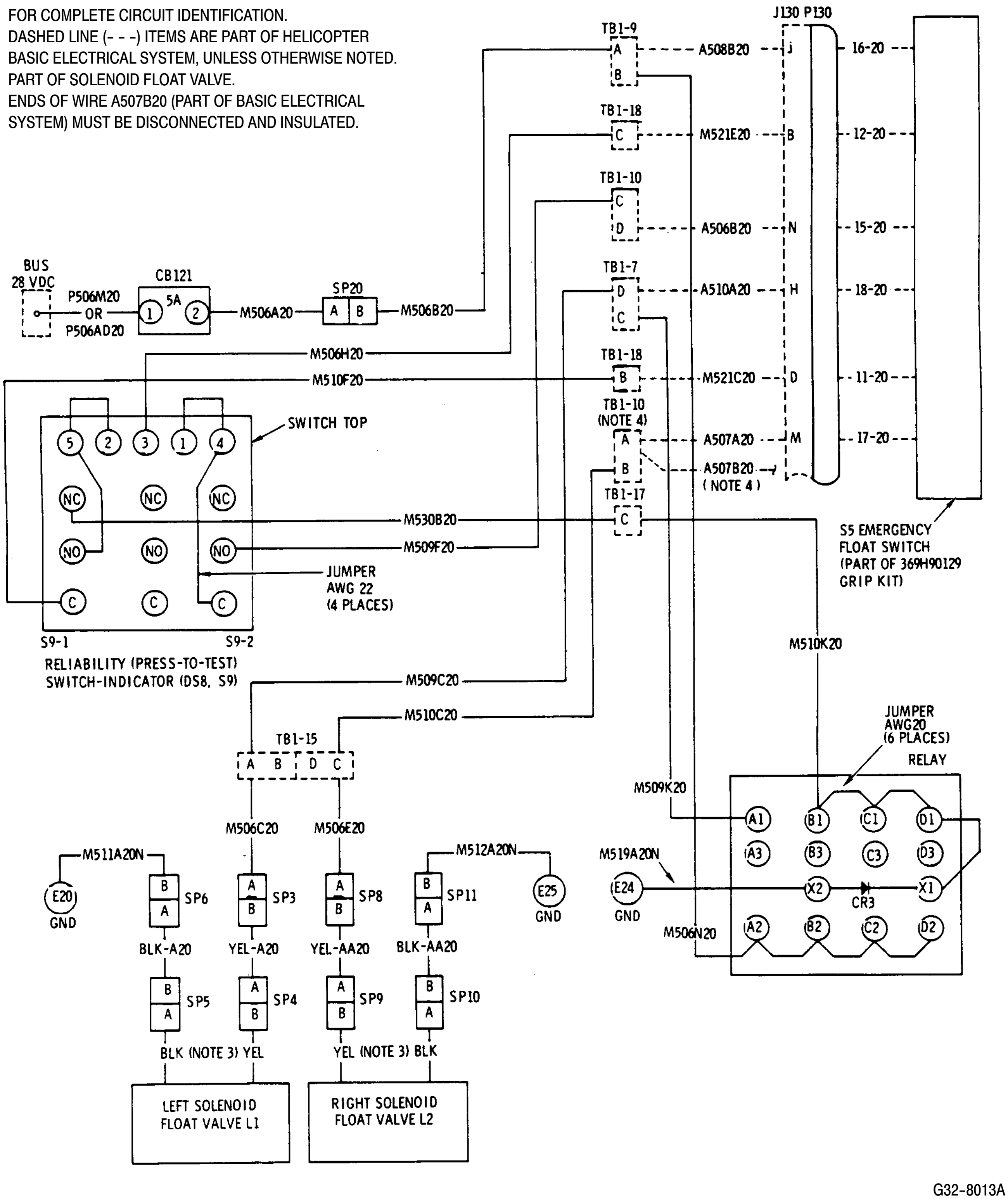
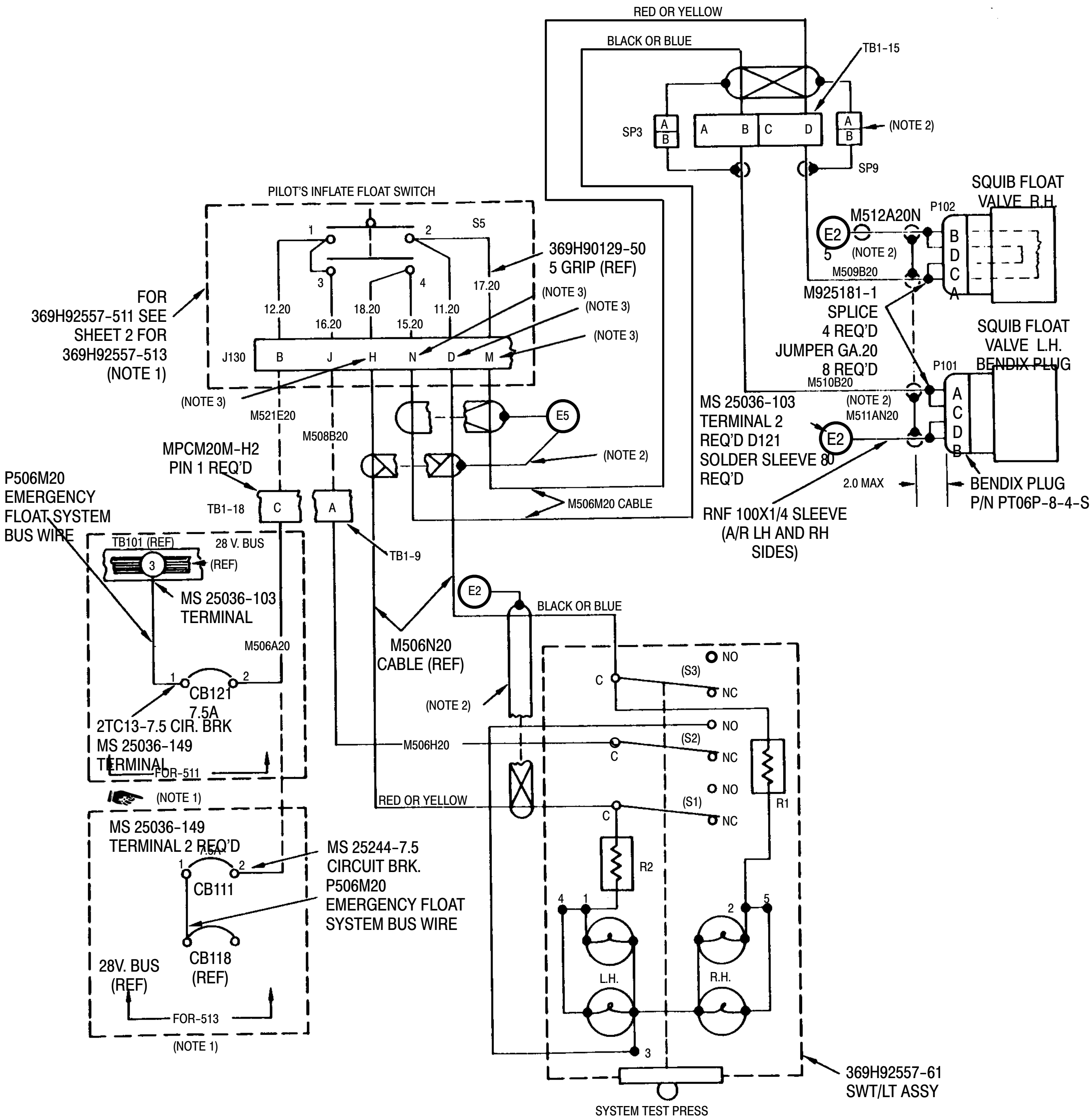


Figure 902. Emergency Float Inflation System Wiring Diagram (369D290121-501 and -505)



NOTES:

1. EXISTING EMERGENCY FLOAT SYSTEM WIRING. DO NOT REMOVE.
2. SHIELDS TO BE TERMINATED 0.50 INCH (12.70 MM) MAX. FROM END OF INSULATION ON WIRE (EXCEPT AS NOTED). JUMPERS TO BE MIN. LENGTH.
3. REMOVE WIRE A510A20 FROM PIN J130-H, M521C20 FROM PIN J130-D, A507A20 FROM PIN J130M, A506B20 FROM J130-N AND STOW WITH 3/16 PD CAPS.

PARTS REQUIRED:

JUMPER #22 GA.	4 REQ'D
3/16 PD CAPS	4 REQ'D
32445 SPLICE	4 REQ'D
SLEEVING	A/R
MS 25036-103 TERMINAL	2 REQ'D
MPCM20M-H2 PIN	2 REQ'D
D121 SOLDER SLEEVE	2 REQ'D

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Figure 903. Emergency Float Inflation System Wiring Diagram (369D290121-515, -517 and -519) (Sheet 1 of 2)

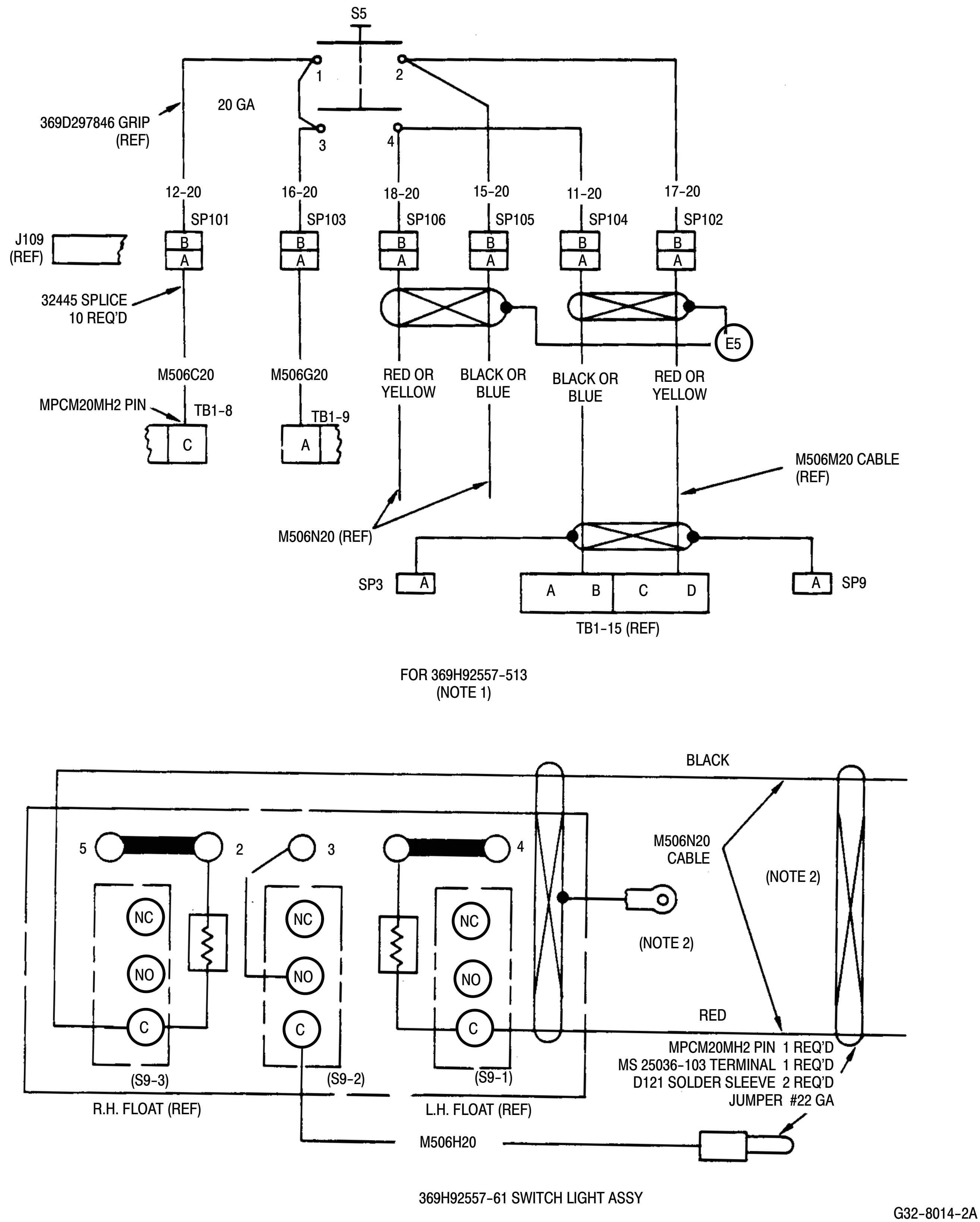
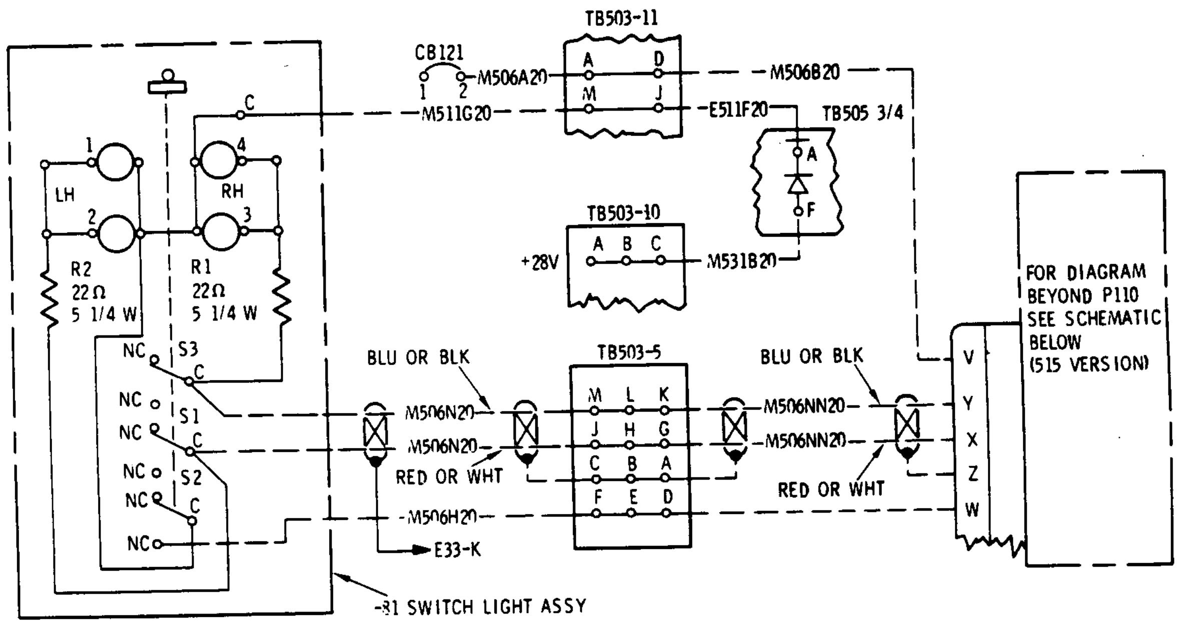


Figure 903. Emergency Float Inflation System Wiring Diagram (369D290121-515, -517 and -519) (Sheet 2 of 2)



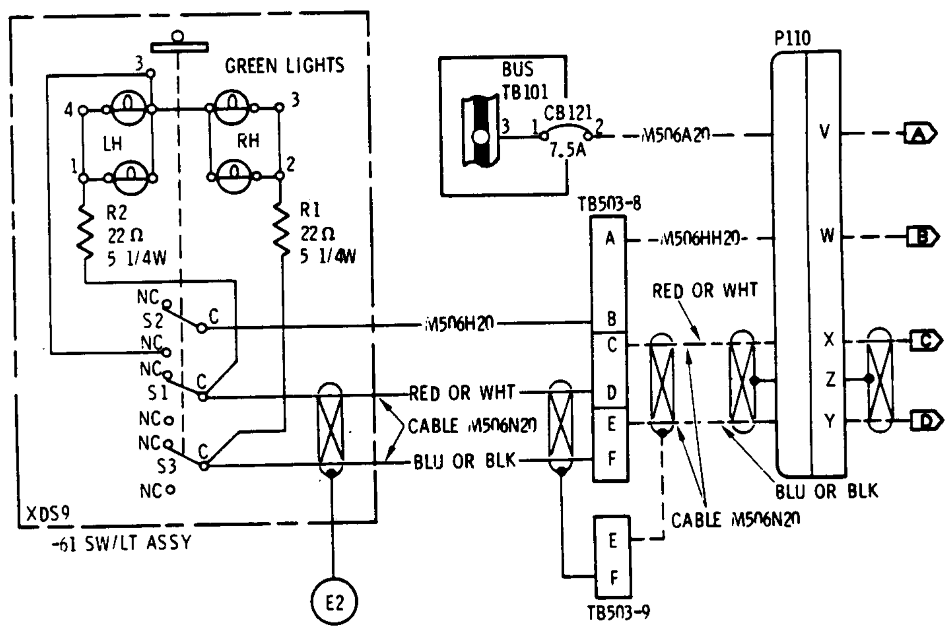


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Figure 904. Emergency Float Inflation System Wiring Diagram (369D290121-521, -523, -525 and -527) (Sheet 1 of 2)

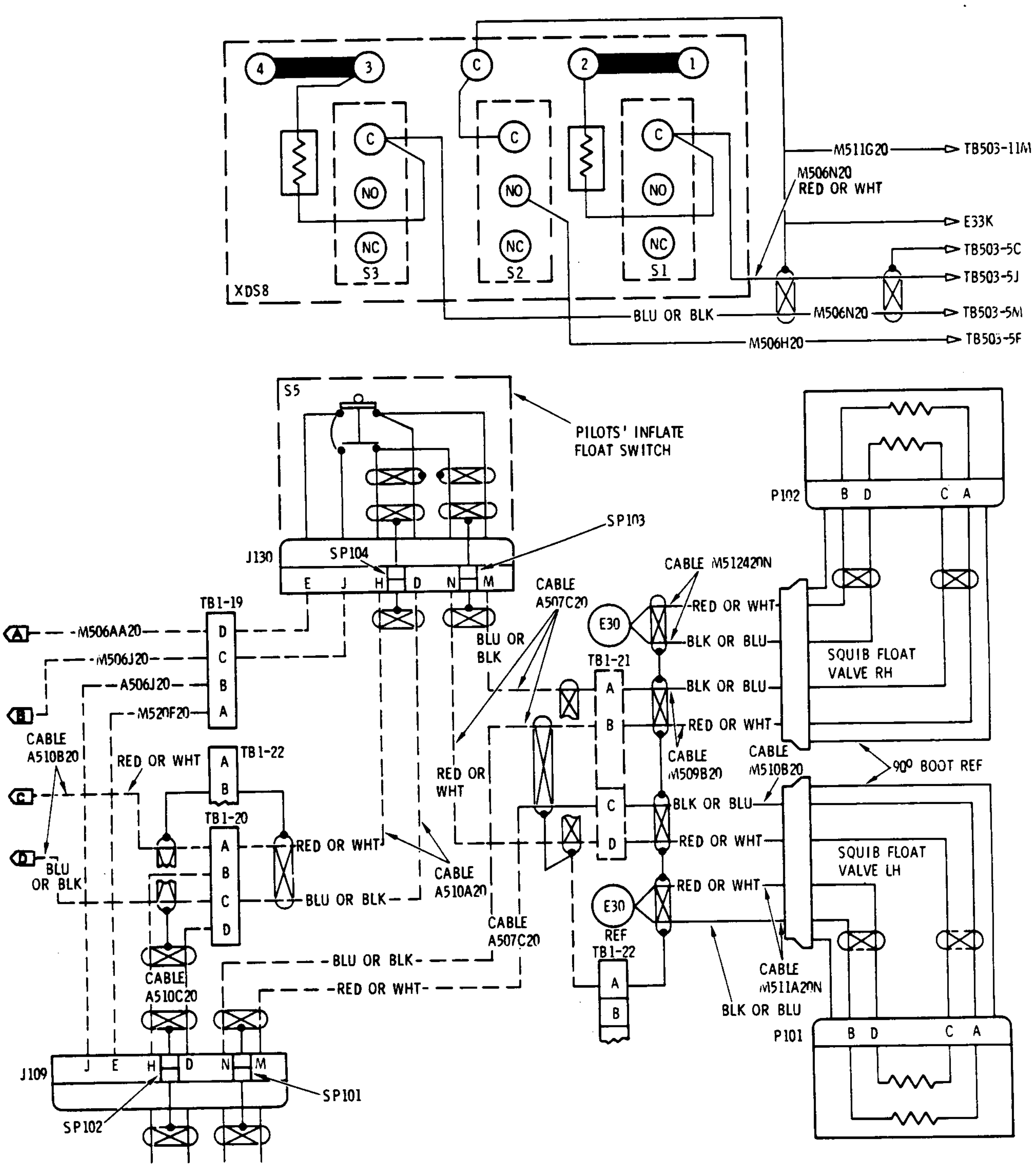

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Figure 904. Emergency Float Inflation System Wiring Diagram
(369D290121-521, -523, -525 and -527) (Sheet 2 of 2)

NOTES:
1. DASHED LINES (- - -) ARE PART OF BASIC SHIP WIRING.
2. EFFECTIVE ON HELICOPTERS 369E S/N 384 AND SUBS. 369FF S/N 076 AND SUBS. 500N S/N 001 AND SUBS.

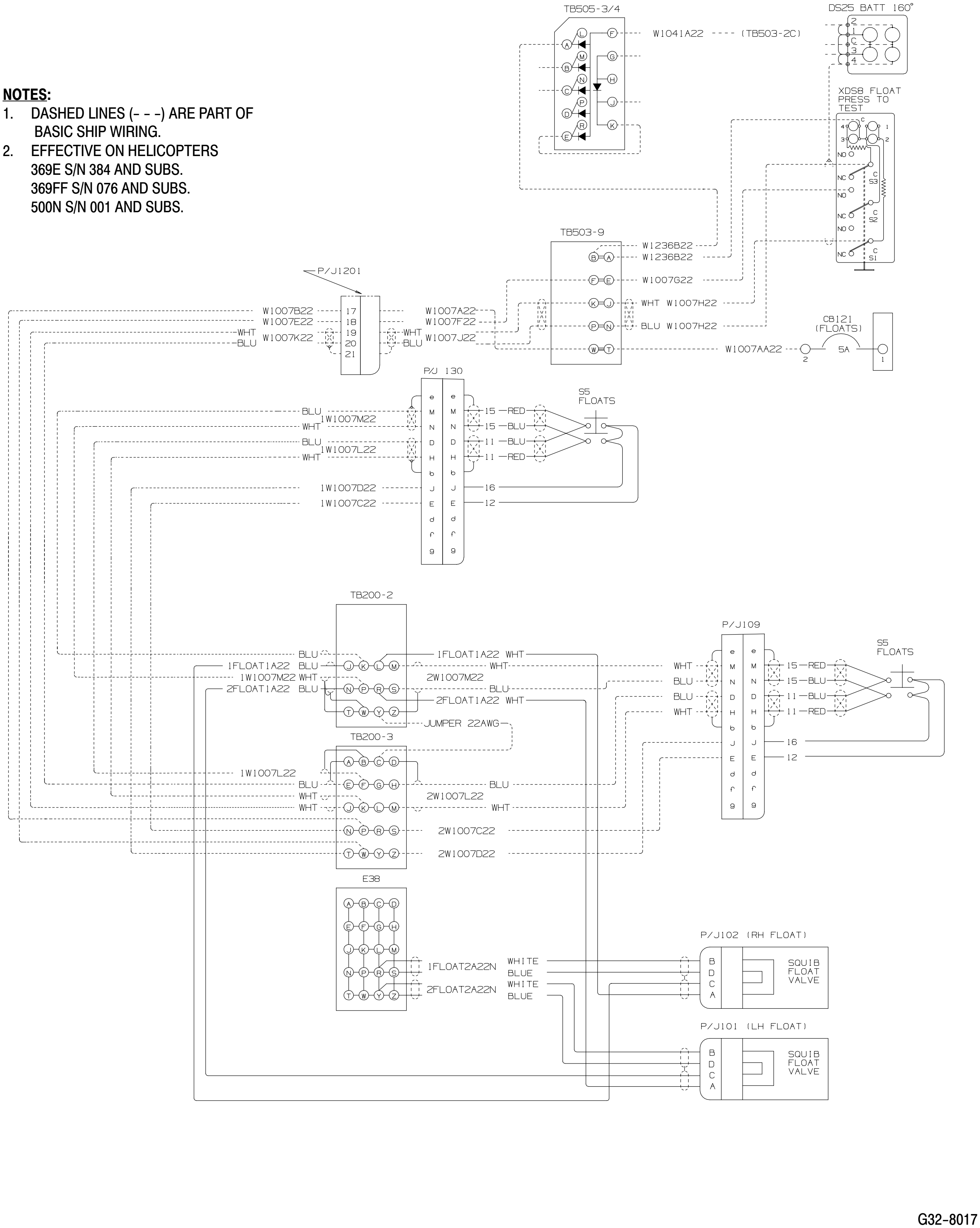

Figure 905. Emergency Float Installation with Generic Wire Harness

G. Emergency Float Electrical System Inspection

Before connecting battery plug, the following wiring installation inspection must be performed.

(1). Inspect all wiring connections for security and insulation.

(2). Inspect all wiring for interference with moving parts and for areas where chafing could occur.

(3). Inspect all wiring for conformance with wiring diagrams.

(4). Install all access panels, doors and access covers previously removed.

(5). Remove insulation and temporarily connect each set of float squib wires.

(6). Install battery, connect battery plug and place **BATT-OFF-EXT** switch in **BATT** position.

(7). Momentarily press emergency float press-to-test switch to verify proper wiring continuity; all four switch lamps should illuminate.

(8). Separate float squib wires at base of struts.

(9). Actuate **EMERG/FLOAT** switch on pilot's cyclic stick grip; use voltmeter to check for proper voltage and continuity through float squib valve circuits.

(10). Pull out emergency float circuit breaker to remove power and release relay; push circuit breaker in again to prepare circuit for emergency use.

CAUTION Ensure that the **BATT-OFF-EXT** switch is in the **OFF** position.

H. Emergency Float System Strut Fairing Installation

(Ref. Figure 906)

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM209	Zinc chromate putty

The following installation instructions are typical for all four strut fairing assemblies. Where riveting is required, Refer to referenced instructions for proper rivet types.

(1). Install center fairing, fillet and lower fairing in respective order, and generally in accordance with instructions (Ref. Sec. 32-10-00).

(2). During installation of fairings, ensure that doublers, removed during disassembly, are installed between fairings and fillers at screw attach points.

(3). Ensure blocks are installed at lower trailing edge of fillets to ensure free action of fillet with strut movement.

(4). Ensure that float solenoid/squib wire bundles are free at bottom of lower fairings on forward struts.

(5). Install bolt covers over inboard bolt heads on strut foot/skid attach point. Apply sufficient zinc chromate putty (CM209) to fill all voids between cover and bolt head area; secure forward strut bolt covers with existing nylon hardware. Torque screws to **25 - 35 inch-pounds (2.82 - 3.95 Nm)**.

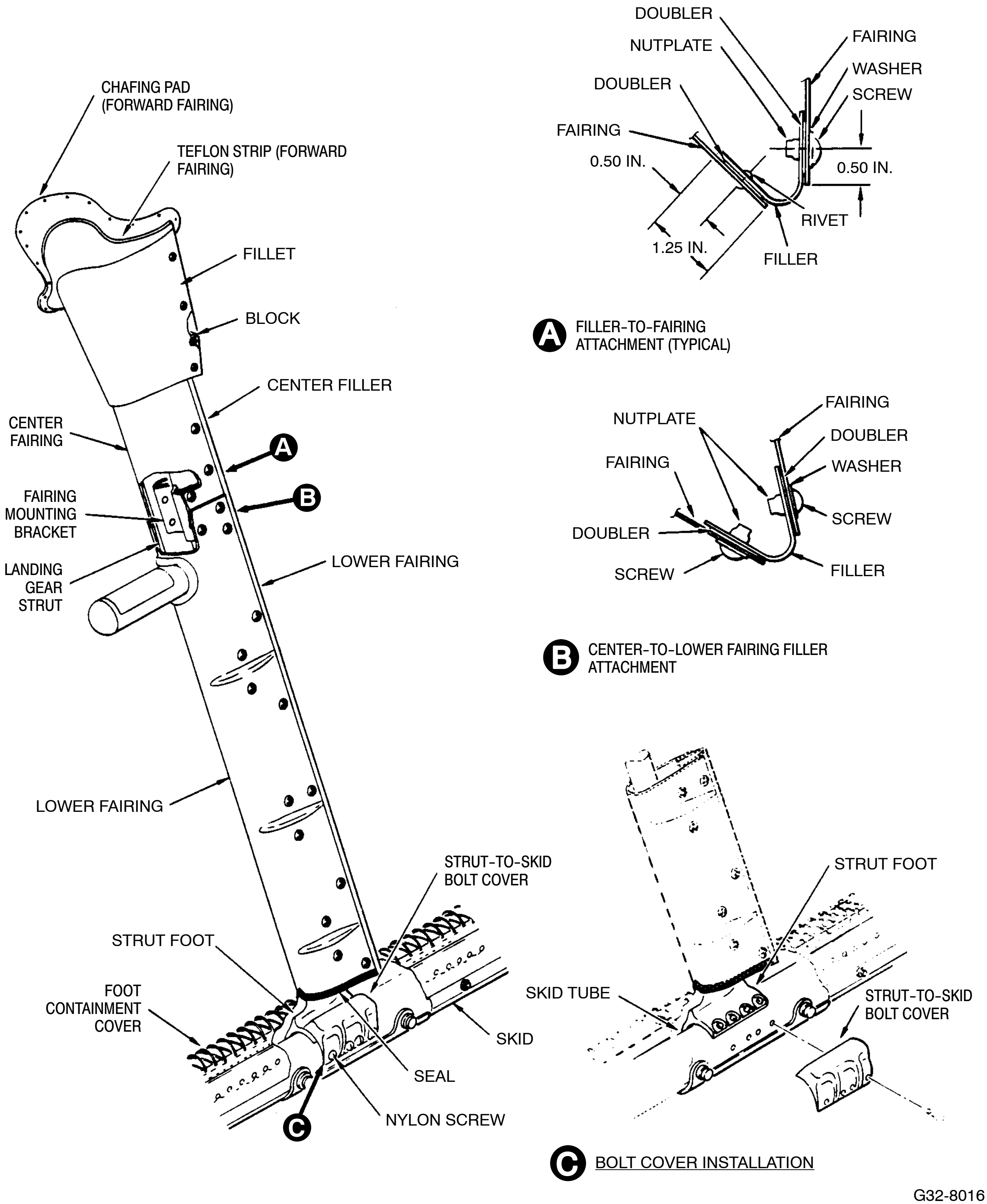

Figure 906. Emergency Float System Strut Fairing Installation

I. Emergency Float Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM209	Zinc chromate putty

Installation of the left and right emergency floats is identical except for opposite positions.

(1). Open float package and release restraining straps.

(2). Position float girts over skid tube attach points.

(3). Temporarily attach float web support strap fittings at forward location; secure strap fitting at aft attach location with bolts and washers.

(4). Place gravel guards over float girts and secure with bolts and washers.

(5). Apply zinc chromate putty (CM209) to contact surfaces of previously removed abrasion strips, and skid extension abrasion strips, to ensure watertight fit on landing gear skids.

(6). Loosen float forward web strap fittings and position abrasion strip on skid below strut; position web strap fitting over forward attach hole on abrasion strip and secure strip to skid with bolts and washers. Install remaining abrasion strips; remove excess zinc chromate putty.

(7). Install balance of bolts and washers securing float girts to skid tube extensions. Torque all bolts to **25 - 35 inch-pounds (2.82 - 3.95 Nm)**.

(8). Adjust and secure float landing gear strut cutout restraining straps.

(9). Unsnap float containment cover and loosen restraining lacing to gain access to emergency inflation system components.

(10). Connect squib valve electrical connector at squib.

(11). Perform inspection of emergency float inflation system (Ref. Emergency Float Inspection - Stowed Configuration).

Table 901. Weight and Balance Data

Configuration	Weight lbs (kg)	Arm in. (cm)	Moment in.-lb/100 (kgmm/100)
-501	+151.7 (+68.872)	95.9 (243.59)	+145 (+1670.57)
-505	+150.8 (+68.463)	96.0 (243.84)	+145 (+1670.57)
-515	+129.1 (+58.611)	99.1 (251.71)	+128 (+1474.71)
-517	+127.7 (+57.976)	98.9 (251.21)	+126 (+1451.67)
-519	+152.7 (+69.326)	96.4 (244.86)	+147 (+1693.62)
-521	+152.6 (+69.280)	96.5 (245.11)	+147 (+1693.62)
-523	+152.5 (+69.235)	96.5 (245.11)	+147 (+1693.62)
-525	+127.5 (+57.885)	99.0 (251.46)	+126 (+1451.67)
-527	+152.5 (+69.235)	96.5 (245.11)	+147 (+1693.62)
-529	+152.5 (+69.235)	96.5 (245.11)	+147 (+1693.62)
-531	+152.5 (+69.235)	96.5 (245.11)	+147 (+1693.62)

Chapter

52

Doors

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Section

52-10-00

Crew, Passenger, Cargo Doors and Windows

CREW, PASSENGER, CARGO DOORS AND WINDOWS MAINTENANCE PRACTICES

1. Crew and Passenger/Cargo Door Description and Operation

The pilot and passenger/cargo doors are bonded aluminum alloy frames containing large smoke-grey-tinted cast acrylic windows.

Plastic snapvents are installed in each door window. An acrylic stop, bonded to the doubler, prevents normal airflow from pulling the snapvent from the window during flight. These units may be rotated for intake or exhaust of ventilating air and may be pulled inward for complete closure. Damaged snapvents should be replaced, (Ref. Snapvent Replacement); repair is not practical.

Pilot and passenger/cargo doors are equipped with an automatic latching mechanism. Two door hinges on each door are provided with quick-removal type ball-lock hinge pins.

Pilot and passenger/cargo doors are equipped with automatic latching mechanisms. The latching mechanisms permit the door to be closed and safelocked from inside or outside. Each installation contains a key-operated cam lock, actuated from outside. Opening door from inside overrides key-operated cam lock. Pilot and cargo door latching mechanisms are essentially the same except for length of interconnecting rods.

A. Early Door-Latching System

Early mechanisms, installed within the door panel, consist of four latch blocks that house spring-loaded latch bolts and safelock triggers together with latch sliders.

The latch sliders are interconnected to rods and clevis devices and are moved by turning inside or outside door handle.

Movement of either handle into safelock position is prevented until door is closed and safelock position is prevented until door is closed and safelock triggers are actuated by the strikes. This actuation causes the safelock triggers to clear notches on latch sliders, allowing the latch sliders and linkage to move into safelock position.

B. Current Door Latching System (Hook-Latch)

Current door latching mechanisms used on pilot and passenger/cargo compartment doors consist of four hook type latches mounted on the door frame. The four latches are actuated by latch sliders which are synchronized and connected by steel connector rods to the door handle.

With the door handle at the rest position, the door may be firmly shut and the hooks will ride up over and engage their striker pins. Safelocking is accomplished by moving the door handle to the lock position, which causes the latch slider that operates each hook latch to engage a pin within the latch block, preventing further movement until the handle is moved to the open position. When the handle is moved to the open position, the latch sliders fully extend the latch hooks from their latch blocks, disengaging them from their striker pins and allowing the door to open.

2. Hook-Latch Automatic Door Latching System Troubleshooting

Table 201. Hook-Latch Automatic Door Latching System Troubleshooting

Problem	Probable Cause	Repair
Hooks fail to engage striker pin, or more than 0.050 inch (1.27 mm) gap between latch hook and striker pin (Latch hooks extend normally).	Door seal swollen or bonding to door frame failed.	Repair seal (Ref. Door Seal Repair).
	Striker assembly mounted too far inboard or outboard on door frame.	Loosen striker assembly mounting screws and adjust striker assembly position.
	Latch block assembly too far from striker pin.	Add or remove 0.063 inch (1.60 mm) and 0.032 inch (0.81 mm) washers as shims under latch block mounting screws, as required (1). Remove or add shims under striker assembly, as required.
	Striker assembly hitting or rubbing on door waffle.	Route out waffle enough to clear.
	Striker assembly hitting latch cover (2).	Check latch covers for dents or chipped paint that indicates contact between latch cover and striker assembly. Remove material from latch cover to allow striker assembly clearance.
Latches fail to extend from latch block when handle moved to open position.	Latch hooks or latch sliders sticking in latch block.	Lubricate latch block moving parts.
	Connector rod(s) improperly adjusted.	Adjust connector rod(s) by removing clevis from sliding cam and raising or lowering threaded connector as required on threaded portion of rod. Threads of rod and connector must be engaged through solid portion of connector. Rod end may be flush with or extend beyond bottom, of solid part of connector.
	Connector rod bent or damaged.	Check connector rods and clevis. Replace damaged part.
Door does not safelock when door handle is moved to lock position.	Connector rod(s) improperly adjusted.	Check witness hole in latch blocks. Semi-circle cutout in each latch slider must be fully seated around pin when safe locking is engaged. Adjust connector rods until correct pin engagement is achieved for each latch slider.

NOTES:

(1) If latch block protrudes beyond middle line or door after shimming, slot mounting holes in latch block cover 0.20 inch (5.08 mm) downward from center of existing hole to allow cover to shift up above middle line of door waffle.

(2) Door should be closed from inside helicopter to determine if striker pin assembly is hitting or rubbing latch cover. Enough force can be applied when closing door from outside to prevent detection of contact between striker pin assembly and latch cover.

3. Crew Compartment Door Replacement (369D/E/FF - 500/600N)

(Ref. Figure 201)

A. Crew Compartment Door Removal (369D/E/FF - 500/600N)

(1). Remove cover plates from interior trim forward of crew doors.

(2). While supporting door, turn hinge pins to unlock the tabs.

(3). Remove lower pin, then remove top pin.

(4). Remove door from helicopter.

B. Crew Compartment Door Installation (369D/E/FF - 500/600N)

(1). Slide door hinges into slots on side of airframe.

(2). Insert pins, from inside the aircraft, into airframe holes and though hinges.

(3). Turn hinge pins to lock tabs into slots in airframe.

(4). Install interior trim covers.

4. Passenger/Cargo Compartment Door Replacement (369D/E/FF - 500N)

A. Passenger/Cargo Compartment Door Removal (369D/E/FF - 500N)

(1). Remove cover plates from interior trim aft of crew doors.

(2). Remove safety from top hinge pin.

(3). While supporting door, turn hinge pins to unlock the tabs.

(4). Remove lower pin, then remove top pin.

(5). Remove door from helicopter.

B. Passenger/Cargo Compartment Door Installation (369D/E/FF - 500N)

(1). Slide door hinges into slots on side of airframe.

(2). Insert pins, from inside the aircraft, into airframe holes and though hinges.

(3). Turn hinge pins to lock tabs into slots in airframe.

(4). Re-safety from top hinge pin.

(5). Install interior trim covers.

5. Mid and Aft Door Replacement (600N)

A. Mid and Aft Door Removal (600N)

(1). Remove nuts and washers from door hinge bolts.

(2). While supporting door, slide bottom bolt, and then top bolt from hinges.

(3). Remove door from helicopter.

B. Mid and Aft Door Installation (600N)

(1). Position door so door-mounted hinge aligns with airframe-mounted hinge.

(2). Insert bolt, with washer, into each hinge.

(3). Install washer and nut on bolt and torque to **50 - 70 inch-pounds (5.65 - 7.91 Nm)**.

6. Door Seal Compression Check

(Ref. Figure 208) Inspect rubber weatherstrip compression seal for tight compression between the door and frame as follows:

(1). Open door.

(2). Hold a strip of heavy paper against door seal so that strip extends approximately 1/4 inch (6.35 mm) beyond seal toward outside of doorway.

(3). While holding paper strip in place, close door.

(4). Attempt to pull paper strip from between door frame and seal. Strip should not pull out unless a moderately heavy pull is exerted.

NOTE: Correct fit is indicated by an approximate 0.060 inch (1.524 mm) interference fit between door seal and bumper. Where strip can be withdrawn with a light pull, fit of door against frame is not sufficiently tight to provide an adequate seal. This condition may be due to deterioration of weatherstrip compression seal, deformation of door frame, worn hinges or improper latching.

(5). Repeat this procedure at approximately 1 foot (30 cm) increments along length of door seal.

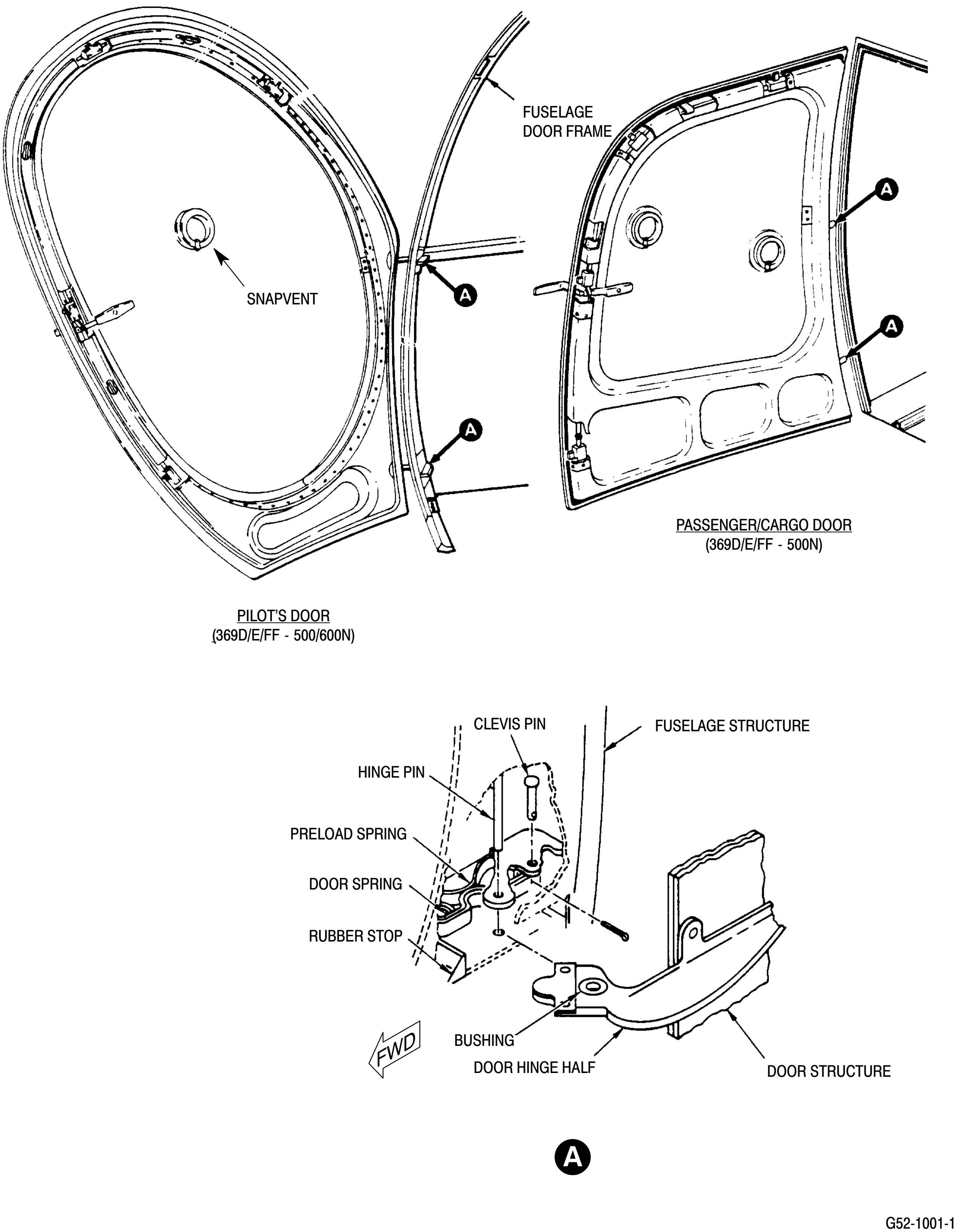


Figure 201. Crew and Passenger/Cargo Door Installation (Sheet 1 of 2)

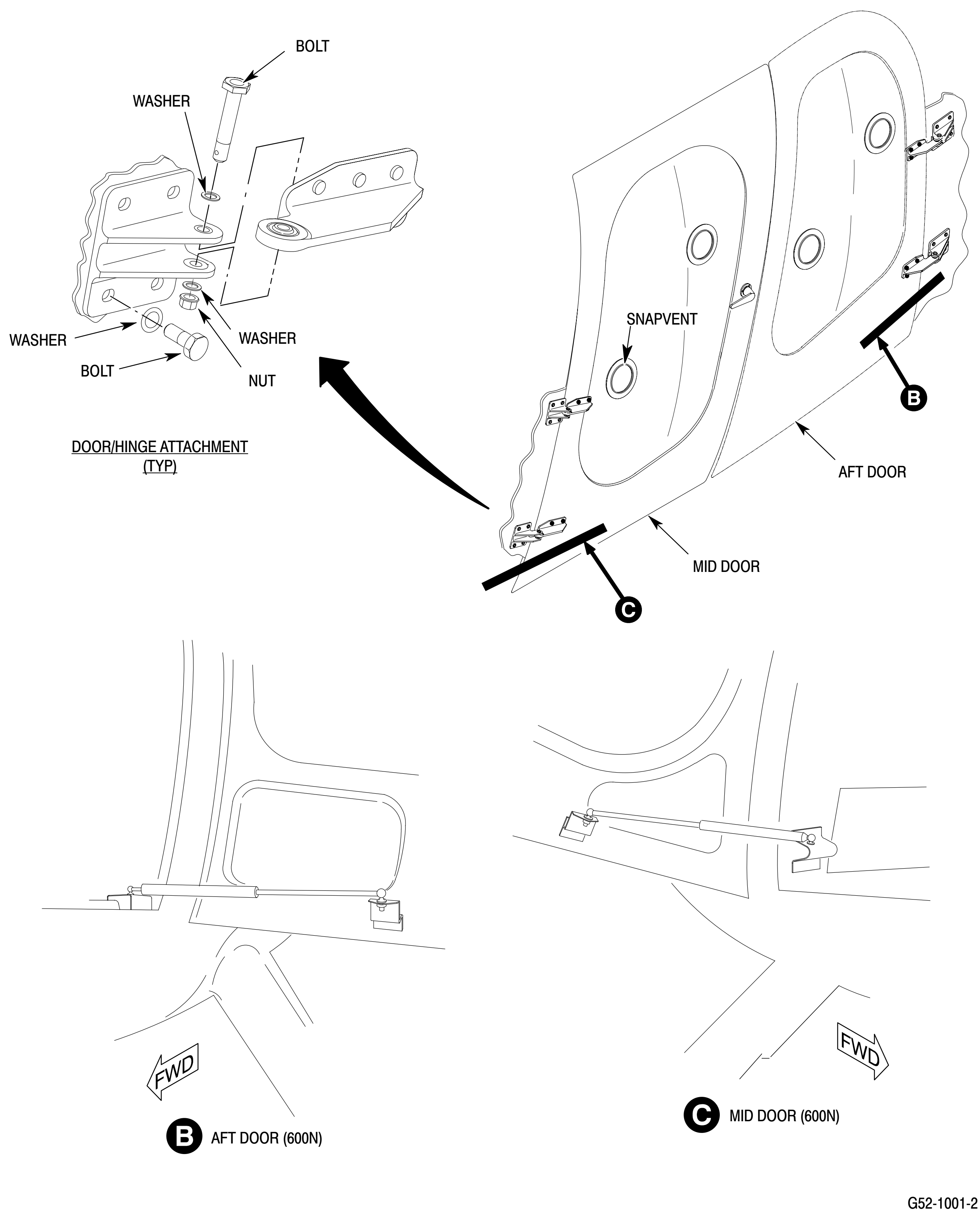


Figure 201. Crew and Passenger/Cargo Door Installation (Sheet 2 of 2)

7. Mid and Aft Door Strut Replacement (600N)

(Ref. Figure 201)

A. Mid and Aft Door Strut Removal (600N)

(1). Remove nut and washer that secures gas strut pivot post ball to door fitting.

(2). Remove nut and washer that secures gas strut pivot post ball to airframe fitting.

(3). With door in open position, pull gas strut up away from fittings to remove.

B. Mid and Aft Door Strut Installation (600N)

(1). Insert pivot post ball fitting, at shaft end of strut, into outboard hole in airframe fitting and install washer and nut.

(2). Insert pivot post ball fitting, at tube end of strut, into hole in door fitting and install washer and nut.

(3). While holding pivot post ball fitting to prevent rotation, torque nuts to **60 - 85 inch-pounds (6.78 - 9.60 Nm)**.

(4). Adjust strut pressure after installation by carefully loosening screw at end of strut and releasing pressure until door opens fully and operates smoothly through full range of travel.

8. Snapvent Replacement

(Ref. Figure 201)

A. Snapvent Removal

(1). Push snapvent outward in window (open position).

(2). Grasp open side of snapvent and gently squeeze it into an elliptical shape.

(3). Slip snapvent out of window hole at about a 30° degree angle to surface of window.

B. Snapvent Installation

(1). Grasp open end of snapvent and gently squeeze it into an elliptical shape.

(2). Slip snapvent flange into window hole at an angle of about 30° degrees to window surface.

(3). Be sure that ends of wire stiffener are inside window hole.

9. Outside Handle or Spindle Replacement

(Ref. Figure 202)

A. Outside Handle or Spindle Removal

(1). Remove three screws and washers securing escutcheon to door exterior.

(2). Drive spring pin from handle and slide handle from spindle.

B. Outside Handle or Spindle Installation

(1). Attach replacement handle to escutcheon with handle washers. Use maximum number of handle washers possible without impeding free movement between handle and escutcheon.

(2). Slide handle on spindle and secure escutcheon to door with washers and screws.

10. Automatic Latch Block Assembly Replacement

(Ref. Figure 202)

A. Automatic Latch Block Removal

(1). Perform this procedure with door in open position and handles at latched rest position.

(2). Remove screws securing latch cover.

(3). Mark lockplate/nutplate so that replacement latch block can be installed at approximately same position as latch that is to be removed.

(4). Remove four screws and washers securing latch block to lockplate/nutplate. Note any washers found between latch block and lockplate/nutplate. These are adjustment shims and should be reinstalled at same location and position at reinstallation of latch block.

(5). Remove cotter pin, washer and pin securing rod end clevis to latch block.

(6). Remove latch block from door.

(7). Lubricate moving parts of latch block (Ref. Automatic Latch Block Assembly Repair).

B. Automatic Latch Block Installation

(1). Reconnect link and connector rod end to handle arm with cotter pin and washer.

NOTE: Cotter pin and washer are to be installed on outboard side of connector rod end to eliminate possibility of interference. To eliminate excess play, use extra washers for shimming.

(2). Secure latch block to lock plate with four screws and washers.

(3). Check door latching and safelocking operation and make any necessary adjustment.

11. Cam Lock Replacement

(Ref. Figure 202)

A. Cam Lock Removal

(1). Remove outside handle.

(2). Remove latch block.

(3). Note position of lock boss and handle torsion spring to aid at reinstallation.

(4). Hold handle, lock boss and torsion spring in position and withdraw spindle. Then slide handle lock boss and torsion spring out of lock plate.

(5). Remove handle grip from handle arm by loosening setscrew and sliding grip from arm.

NOTE: When lock is set to locked position, be sure that cam actuates hinged lock bar. When lock is in correct position, secure it in place by center- punching surface of lock plate assembly close to flat on hexagonal locking nut.

(6). Replace key-operated cam lock by unscrewing hexagonal nut.

B. Cam Lock Installation

NOTE: Currently available cam lock is longer than early cam lock and requires a spacer between lock flange and outside surface of door skin.

(1). Position lock boss, torsion spring, washer and replacement handle into position and insert spindle.

(2). Install spindle washers and screw to secure spindle in lock plate.

(3). Attach one spring hook in hole of lock boss and attach other spring hook at notch in lock plate. Use wire to pull spring hook into place.

(4). Install outside handle.

(5). Check door latching and safelocking operation and make any necessary adjustment.

12. Latch Assembly or Striker Adjustment

(Ref. Figure 203)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM425	Sealing compound

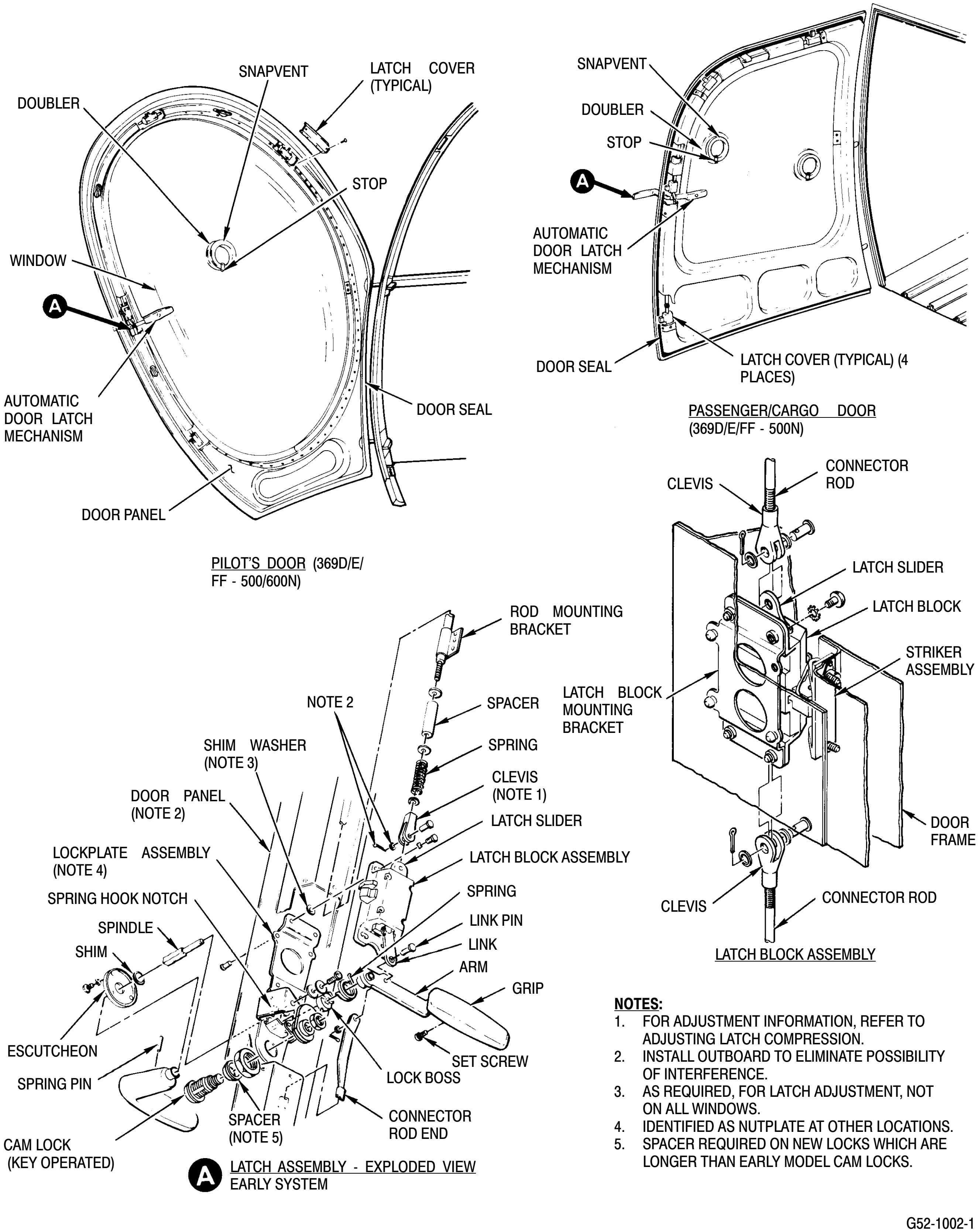
(1). Adjust latch assemblies and strike as necessary to ensure proper door latching, safelocking and keylocking functions.

(2). After adjustments are made, perform a final inspection of all latching and locking functions, then install latch covers.

(3). Fill in gaps and fair-in area between strikes and bumper stripes at each position with sealant (CM425).

A. Door Seal Compression Adjustment

To adjust door seal compression, remove latch covers. Move strikes as necessary in their slotted mounting holes.



NOTES:
1. FOR ADJUSTMENT INFORMATION, REFER TO ADJUSTING LATCH COMPRESSION.
2. INSTALL OUTBOARD TO ELIMINATE POSSIBILITY OF INTERFERENCE.
3. AS REQUIRED, FOR LATCH ADJUSTMENT, NOT ON ALL WINDOWS.
4. IDENTIFIED AS NUTPLATE AT OTHER LOCATIONS.
5. SPACER REQUIRED ON NEW LOCKS WHICH ARE LONGER THAN EARLY MODEL CAM LOCKS.

Figure 202. Door Latching System Installation (Sheet 1 of 2)

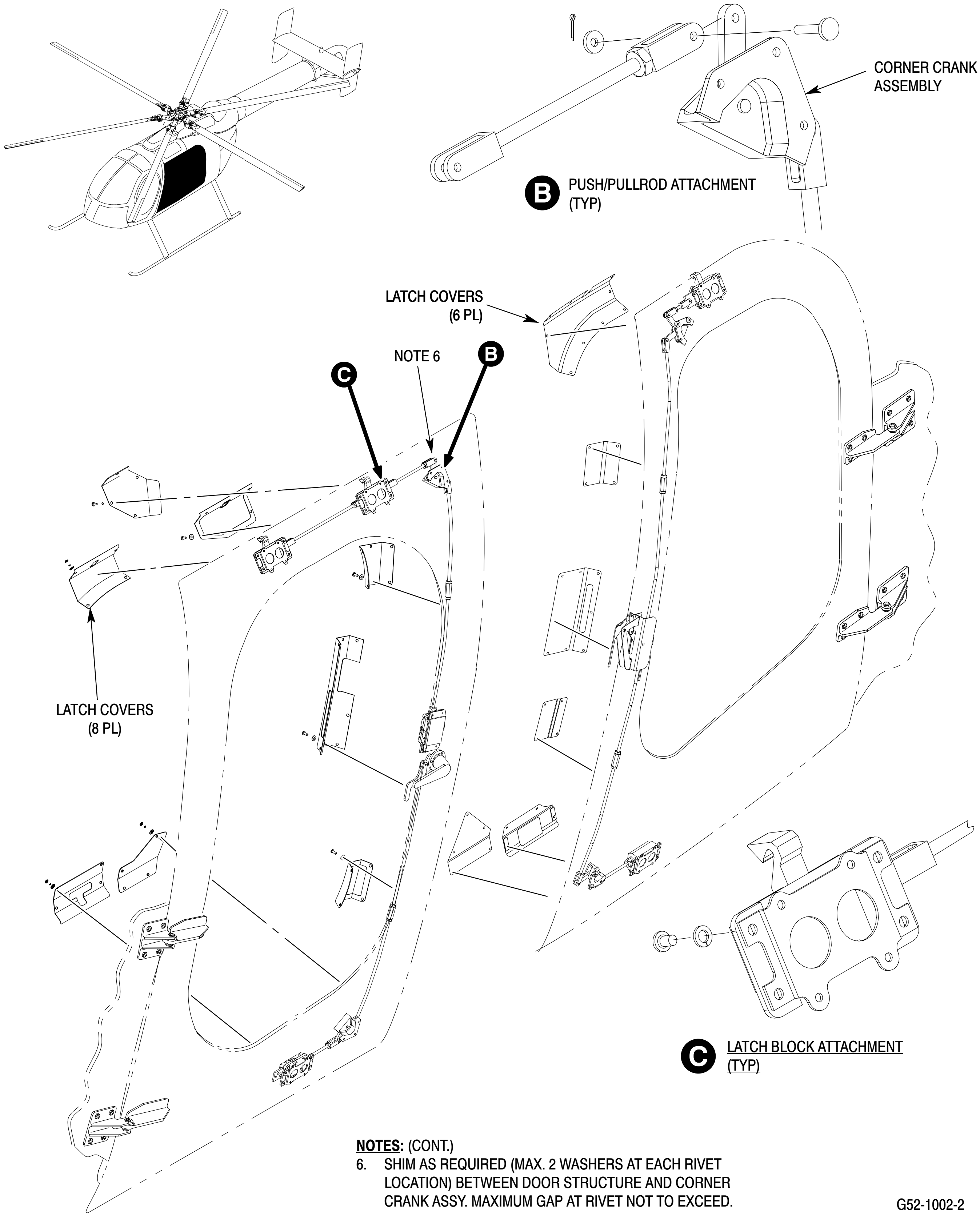


Figure 202. Door Latching System Installation (Sheet 2 of 2)

B. Engagement Depth of Latch Bolts with Striker Adjustment

Adjust engagement depth of latch bolts with strikes by removing latch covers and moving latch assemblies as necessary in their slotted mounting holes or by adding shims under strikes.

NOTE: Complete safelocking exists when latch bolt extension is at maximum and roller on safelock trigger is engaged in safelock slot in latch slider. At this condition, safelock trigger retracts when latch slider is moved slightly in unlatch direction.

C. Connector Rod Adjustment

(1). Open door or remove from helicopter.

(2). Remove latch cover.

(3). Press all safelock triggers and rotate handle to safelock position. Remove clevis pin from connector rod or latch being adjusted.

(4). Move latch slider manually to complete safelock position. Adjust connector rod length so that clevis pin can be installed easily.

NOTE: Position of fourth and first latches can be individually adjusted without disturbing adjustment of other latches. If position of second or third latches is adjusted, then all should be checked. When adjusting all four, start with third latch, and proceed to second, first and then fourth.

D. Latch Compression Adjustment (Early System)

Latch compression spring adjustment may be necessary and should be checked if part replacement, particularly in stack-up between upper clevis on third latch and first mounting bracket or change in position of clevis has been made.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM425	Sealing compound

(1). Readjust spring load using shorter or longer spring compressor spacer and by modifying as required to compress spring 0.060 - 0.080 inch (1.524 - 2.032 mm) when mechanism is at safelocked position.

(2). Fill gaps and fair-in area between latch strikes and bumper strips at each position, using sealant (CM425).

13. Latching Mechanism Operational Check (Early System)

(1). Check inside and outside door handle at all positions for function.

(2). Close door from inside. Entire beveled face of each bolt must make contact with strike and must hold door firmly against door seals. Bolts must be positioned on strike such that there is sufficient space for bolt to extend an additional minimum 0.125 inch (3.175 mm) into strike for safelocking latches (Ref. Figure 203).

(3). Check that each latch bolt makes contact with mating strike. Unequal striking and latching indicates latch assembly or strike require adjustment or shimming.

(4). Safelock door and observe that door is forced inward for seal compression at each latch position. Unequal safelocking may indicate that connector rods are not properly adjusted for complete extension of latch bolts.

14. Hook-Latch Door Latching System Operational Check

(Ref. Figure 203)

Perform following operational check of hook-latch door-latching system. If malfunction is noted, refer to Table 201 for troubleshooting and repair information.

(1). Check inside and outside door handle at all positions for function. From open and lock positions door handle should spring back to rest position when released.

(2). Move handle to open position. Ensure all four latch hooks are fully extended from their latch blocks.

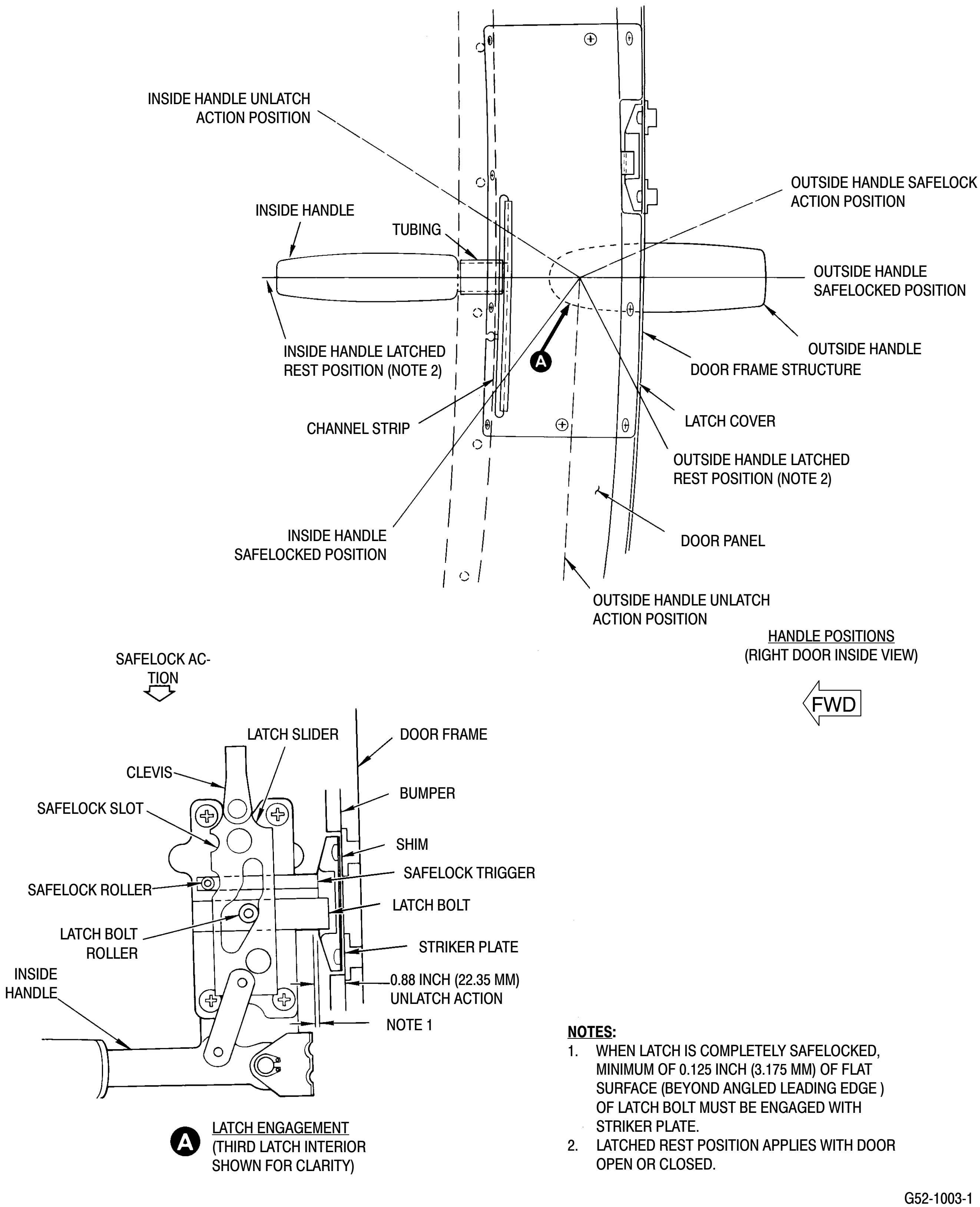


Figure 203. Door Handle Positions and Latch Engagement (Sheet 1 of 3)

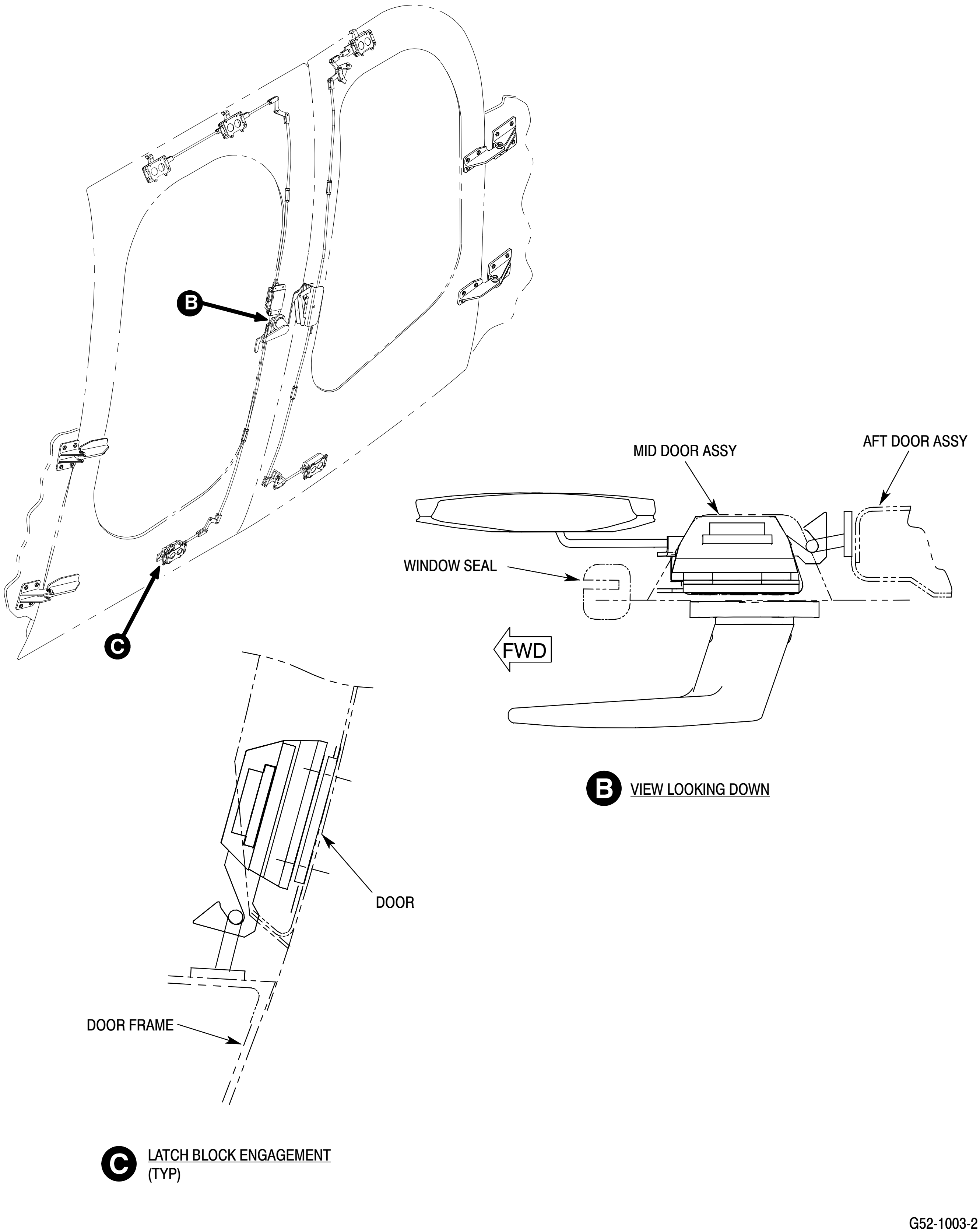


Figure 203. Door Handle Positions and Latch Engagement (Sheet 2 of 3)

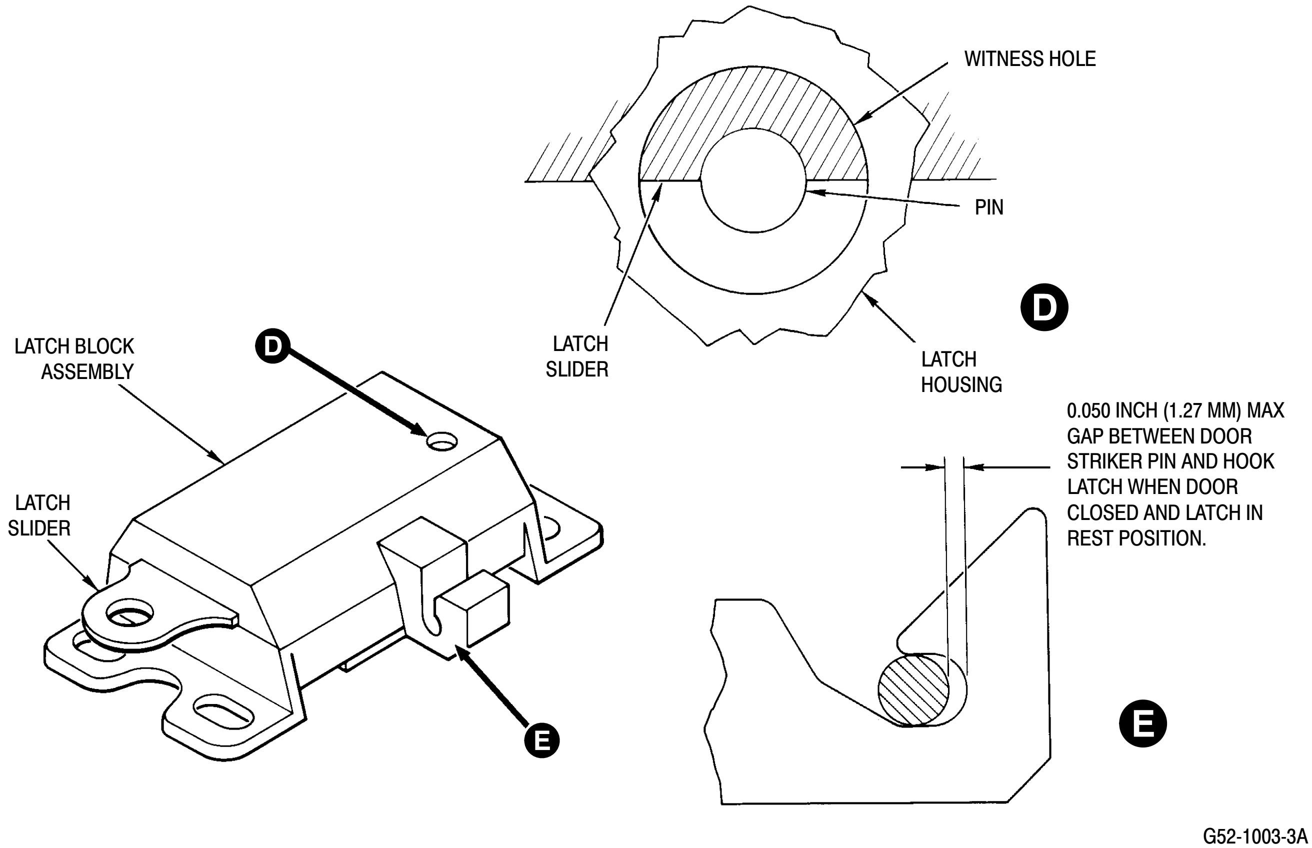


Figure 203. Door Handle Positions and Latch Engagement (Sheet 3 of 3)

(3). Check latch blocks, latch sliders, door waffle and striker pin assemblies for any nicks, dents, scratches, chipped paint or other evidence of contact caused by misalignment of door latches or striker pin assemblies.

NOTE: Extreme temperatures may cause door seal to swell or door seal- to- door frame bonding failure. Door seal protrusions caused by swelling or bonding failure may interfere with latching function.

(4). Check door seal and repair as required.

(5). Close door firmly from inside helicopter. Check that all four latch hooks engage their striker pins and that there is not more than 0.050 inch (1.27 mm) between each hook and striker pin.

(6). Move handle to lock (full down). With door locked, use flashlight to check witness hole on each latch block. Note that semi-circle cutout on latch slider is fully seated around pin on latch block.

(7). Move handle to open. Note that all four latch hooks extend fully from their latch blocks and fully disengage their striker pins, allowing the door to open. Handle should spring back to rest position when released.

15. Autolatching Pilot and Cargo Doors Operational Check

NOTE: When opening door, apply light inward force on door. This reduces wear of latching mechanism by overcoming door seal pressure.

(1). Open and close door to check for smooth operation of handles and latch mechanism. Check operation of door stop.

(2). Close door from inside. Check all inside latches for correct engagement at latch and safelock positions of interior and exterior handle. (Ref. Figure 203).

(3). Check that setting interior and exterior handles to safelock position pulls door inward for proper closure and sealing.

(4). Check that key locks and unlocks door handle.

16. Door-Latching Mechanism Inspection (All Systems)

(Ref. Figure 202 and Figure 203)

Make following checks with magnification glass and strong light:

(1). All parts for excessive wear, nicks, cracks and corrosion.

(2). Threaded parts for worn, crossed or otherwise damaged threads.

(3). Early latch block assemblies for broken springs and wear on strike contact surfaces of latching bolts; and for undue wear of latch sliders, bolts and bolt rollers. Current latch block assemblies for wear, damage or distortion of latch sliders and latch hook.

(4). Cam lock for jamming when key is operated.

(5). Link for wear or distortion.

(6). Handles for distortion, worn pivot holes and worn finish.

(7). Escutcheon and handle for looseness, distortion, thread damage and breakage.

(8). Lockplate assembly for wear, distortion, thread damage and breakage.

(9). Latch block nutplates for thread damage and loose rivets.

(10). Rods and clevis for wear in clevis pin holes, thread damage, and distortion.

17. Anti-Chafing Tape on Door Frame Repair

(Ref. Figure 208) Inspect condition of anti-chafing tape installed on pilot's and cargo compartment door frames. For minor repair, remove defective tape where necessary. Clean frame surface with MEK (CM219). Replace with polyurethane pressure-sensitive tape (CM717).

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM219	Methyl-ethyl-ketone
CM717	Tape, pressure sensitive

18. Window Replacement

A. Early Style Window Replacement

(Ref. Figure 205) For repair of plastics refer to FAA AC 43.13-1A. Replace window as follows:

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM415	Cement
CM418	Cement, epoxy
CM425	Sealing compound
CM432	Dichloromethane
CM433	Ethylene chloride
CM717	Tape, pressure sensitive

(1). Remove snapvent from window (Ref. Snapvent Replacement).

(2). Drill out rivets attaching window retainers to door structure and remove window. Remove two screws, washers and nuts from door hinge doubler.

(3). If door frame or window is to be reused, carefully scrape off sealant around edge of door or window frame using a wooden, plastic or other suitable nonmetallic scraper.

(4). Repair retainer-to-window bond, if applicable, with dichloromethane (CM432) or ethylene chloride (CM433); or use PS-18 or S147 cement (CM415).

(5). Trim retainer as required to provide clearance for door handle and end butt joint.

(6). Place window in position and check for 0.380 inch (9.652 mm) minimum engagement and flush fit with window frame. Trim excess if required.

(7). Use 1/2 inch (12.70 mm) pressure-sensitive tape (CM717) on edge of window. Bond seals to retainer and to door frame using cement, epoxy (CM418); bond inside of seals to window using sealant (CM425). Do not stretch seals when bonding.

(8). With retainer and window in position on door frame, press down firmly and evenly on retainer so that seals are compressed tightly against window around full circumference of door frame.

(9). Locate existing holes in door-reinforcing frame. Mark and drill holes in retainer. It is permissible to install new rivets between existing holes in rivet pattern.

(10). Rivet window to door using rivets of correct length. Blind rivets are used for retainers riveted to door reinforcing frame.

(11). Install doubler over retainer at hinge area with two screws, washers and nuts. Drill (No. 21 drill) and ream to 0.166 inch (4.216 mm) diameter window panel for screws, using slow speed drill (700-800 rpm).

(12). Install snapvent (Ref. Snapvent Replacement).

(13). Remove protective covering and clean window (Ref. Sec. 20-20-00).

B. Current Style Window Replacement

(Ref. Figure 206)

(1). Using a blunt plastic spatula or probe, pull back edge of window seal and gradually work window out from groove in seal.

(2). Remove seal and clean for re-installation of window, discard if not pliable.

(3). Mask around new glass for marking.

(4). Place new glass against door and center over the window opening.

(5). Trace line on glass from window opening in door.

NOTE: The following step is to ensure the glass is larger than the door opening so glass will not blow out in flight.

(6). Apply 0.250 inch (6.35 mm) tape around outside of drawn line.

(7). Trim glass to the outside of applied 0.250 inch (6.35 mm) tape.

(8). Remove tape and gently smooth the edges.

NOTE:

- It is best to have ends of seal on aft side of window to help keep moisture out while in flight.
- Ensure seal is firmly worked onto door to prevent seal from being cut too short.

(9). Install window seal around periphery of window opening with groove for glass to the inside. Cut seal to size if new.

(10). Gently trim seal, where needed, around top door hinges.

CAUTION Do not use any tools with sharp edges to aid in installing glass into seal, glass is easily damaged.

NOTE: To aid in installation of glass into seal, use a mild mixture of soapy water liberally applied to the edge of the glass and into groove in seal. Do not use any lubricants.

(11). Install glass from inside by sliding up into the seal.

(12). With hands on either side of glass, work glass firmly into seal.

(13). Using a blunt plastic spatula or probe, gradually work edge of window into groove of window seal.

(14). If there is a gap at the seal ends, use commercially available clear silicone seal to fill gap.

19. Hinge Replacement

(Ref. Figure 204)

(1). Remove door and drill out hinge-attaching rivets.

(2). Install replacement hinges at body attach points with door hinge pins.

(3). With damaged hinges removed, install doors in closed position. Have an assistant retain door in place by actuating door handle locking levers.

(4). If required for door fit, use one-piece solid aluminum alloy shim, up to 0.040 inch (1.016 mm) maximum thickness trimmed flush with hinge outer edges, under upper or lower hinge (between hinge and door exterior).

(5). Mark hinge rivet attach locations through existing holes in door. Locate and mark blind rivet attach points (cargo door only).

(6). Remove door hinges and check for proper edge distance.

(7). Drill holes with a No. 28 drill at pilot's door upper and lower hinge aft attach points. Use a No. 21 drill at all other pilot and cargo door attach points.

(8). On pilot's door upper hinge, install rivets with washers under bucked heads.

(9). Install rivets at remaining pilot's door attach points.

(10). Install two mechanically-expanding rivets at aft cargo door hinge attach points.

(11). Install four rivets at remaining attach points.

(12). Paint as required.

(13). Install doors and perform an operational check (Ref. Automatic Latching Mechanism (Early System) Operational Check).

A. Preload Spring Replacement

(Ref. Figure 205)

Consumable Materials (Ref. Section 91-00-00)	
Item	Nomenclature
CM424	Sealing compound

NOTE: The following procedures apply to both upper and lower hinges.

(1). Remove two cotter pins and clevis pins.

(2). Remove door spring first; then remove preload spring.

(3). Replace preload spring; with longest flat area outboard and aft in hinge body recess.

(4). Replace door spring; with longest flat area also outboard and aft in body hinge recess.

NOTE: Forward curved area of door hinge presses against preload spring inboard curved area, at installed position.

(5). Install hinge pins and cotter pins. Pins may be installed upward if interference does not permit installation with cotter pin hole down.

(6). Cover exposed sharp edges of cotter pins and pins with sealer (CM424).

(7). Install doors and perform operational check (Ref. Automatic Latching Mechanism (Early System) Operational Check.

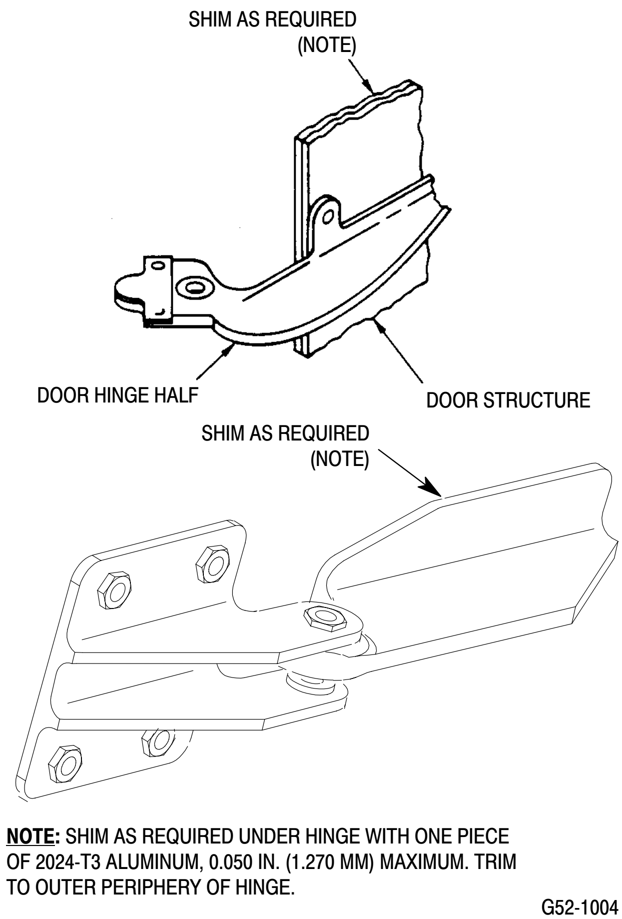


Figure 204. Door Hinge Replacement

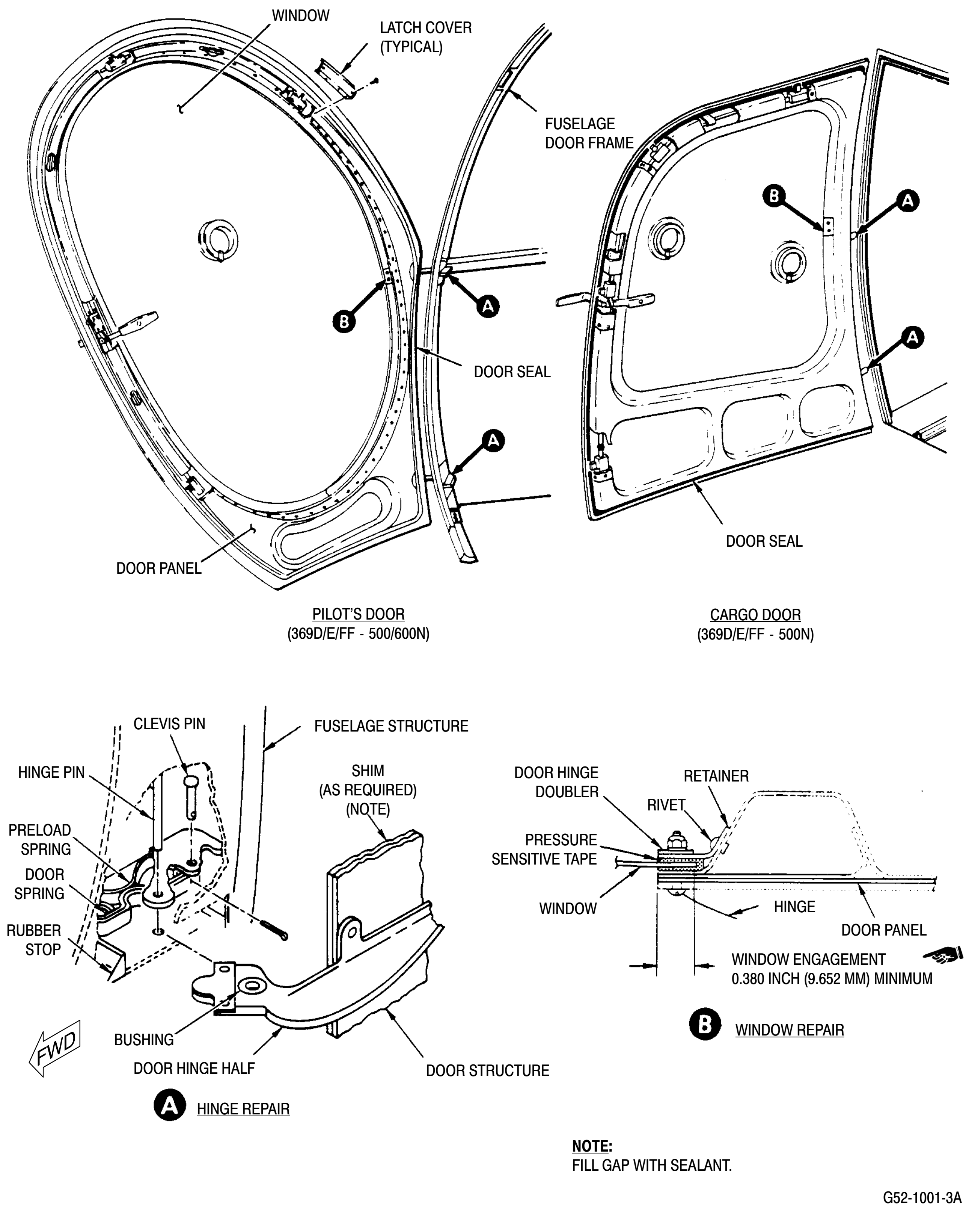


Figure 205. Window and Hinge Repair

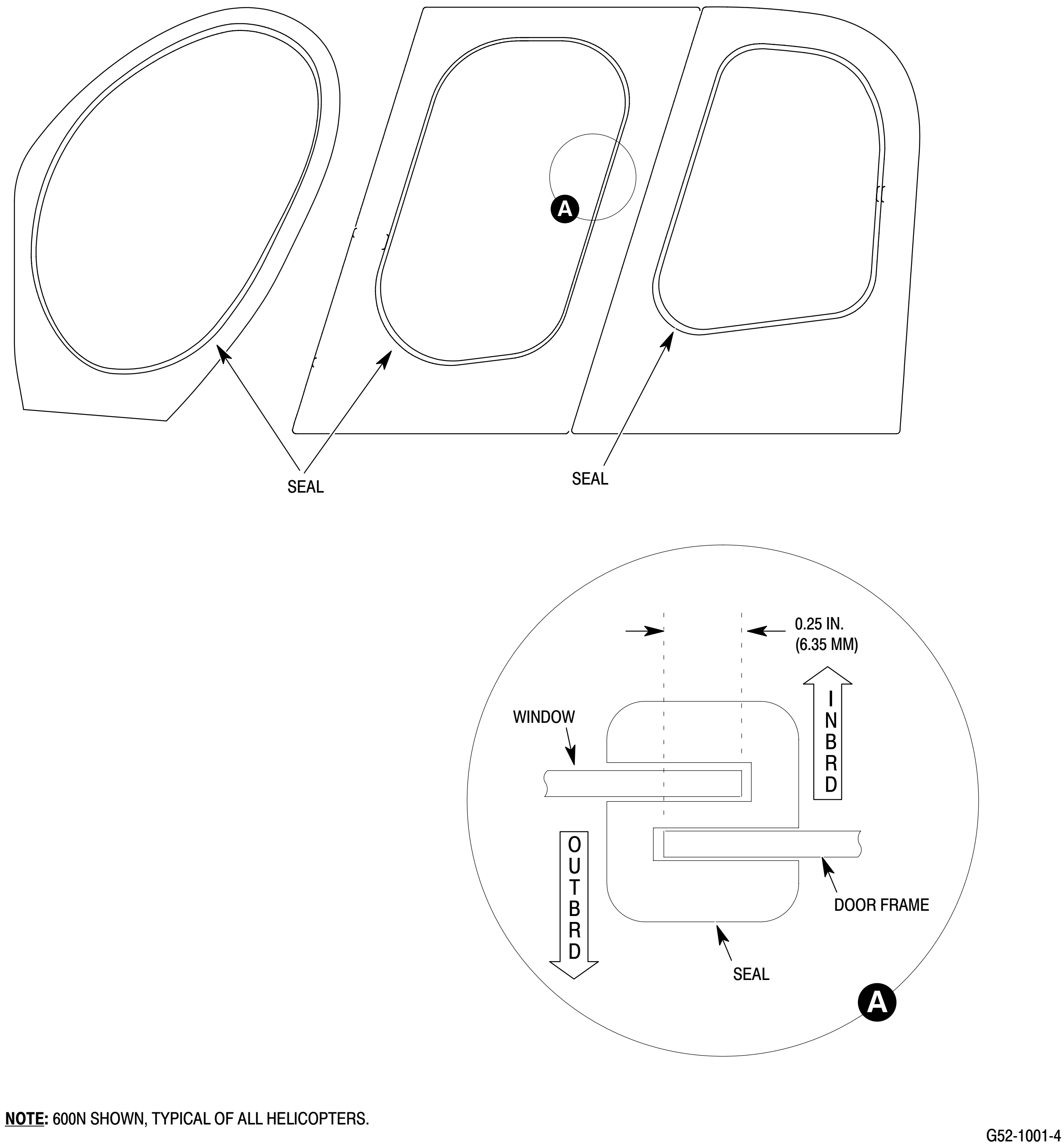


Figure 206. Current Style Window Installation

B. Rubber Stop Replacement

(Ref. Figure 205) Replace rubber door stop if damaged or partially separated. Remove door stops by carefully prying bonded rubber out of hinge recess. Bond new stop to forward end of hinge recess with adhesive (CM411).

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM411	Adhesive, epoxy

20. Automatic Latch Block Assembly Repair

(Ref. Figure 201 and Figure 207, Sheet 1 of 2) Replace worn or damaged parts as necessary. Disassemble only to extent required for replacement of parts. Perform following steps as required:

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM108	Graphite, powdered
CM118	Grease
CM234	Solvent, dry-cleaning
CM307	Lacquer, acrylic semi-gloss

(1). Lubricate all moving parts except lock, with grease (CM118) to prevent binding.

(2). Lubricate lock with powdered graphite (CM108).

(3). At time of disassembly clean reusable parts except locks, using soft bristle brush dipped in solvent (CM234).

(4). Dry parts using clean, lint-free cloth or dry compressed air at 20 psi maximum.

(5). Clean key-operated cam locks, using dry compressed air at 20 psi maximum.

(6). Touchup handles with semigloss black acrylic lacquer (CM307).

(7). Eliminate binding by lubricating moving parts.

21. Strike Pin Repair

(Ref. Figure 207)

NOTE: The 369 model has three different configurations. Select the configuration that pertains to your specific application.

(1). Remove screws, strike pin, dam (if applicable), shim and washers (if applicable) from door frame.

(2). Replace anti-chafing tape if damaged.

(3). Install washer (if applicable), shims, dam (if applicable), strike pin and secure with screws.

22. Litter Door Inspection (50 Hour)

The following is a procedure for inspecting the litter door installation for proper condition and security of the quick-release fastener assemblies and the rubber seal (gasket) installed between the window glass and door frame. The visual inspection is applicable to the PN 369H92733-1 / -2 bubble window assemblies (or PN 369H92731-1 / -2 flat window assemblies, if installed) in the PN 369H90085 litter door installation.

(1). Remove quick-release fasteners securing bubble (or flat) windows to litter doors.

(2). Visually inspect each fastener for condition, and each anchor receptacle in door structure for condition and security of attachment.

(a). Replace each fastener if stud is loose or worn.

(b). Replace anchor receptacle and/or rivets as required.

(3). Visually inspect rubber seal (gasket) on window assemblies for condition. Seal must be fully intact; rebond seal to door structure as required.

(a). Replace seal if worn, cracked or hard.

(4). Reinstall window assemblies to litter doors using quick-release fasteners.

(5). Check for gaps between window glass, rubber seal and door structure.

(6). Replace seal and/or use shorter length studs if any gap is noted.

(7). If seal is extruded, use longer length studs; replace seal if extrusion still exists.

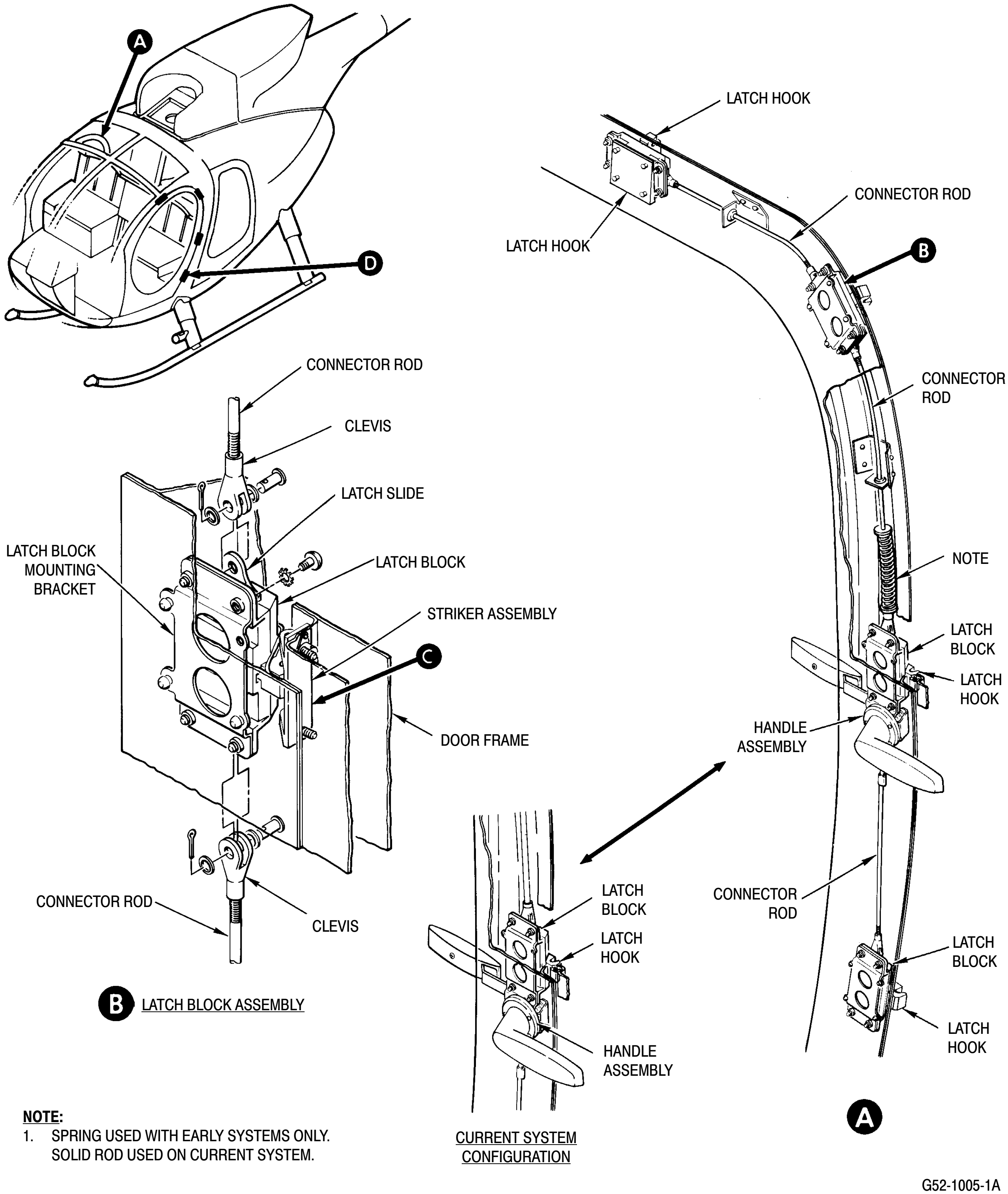


Figure 207. Automatic Latch Block and Striker Repairs (Sheet 1 of 2)

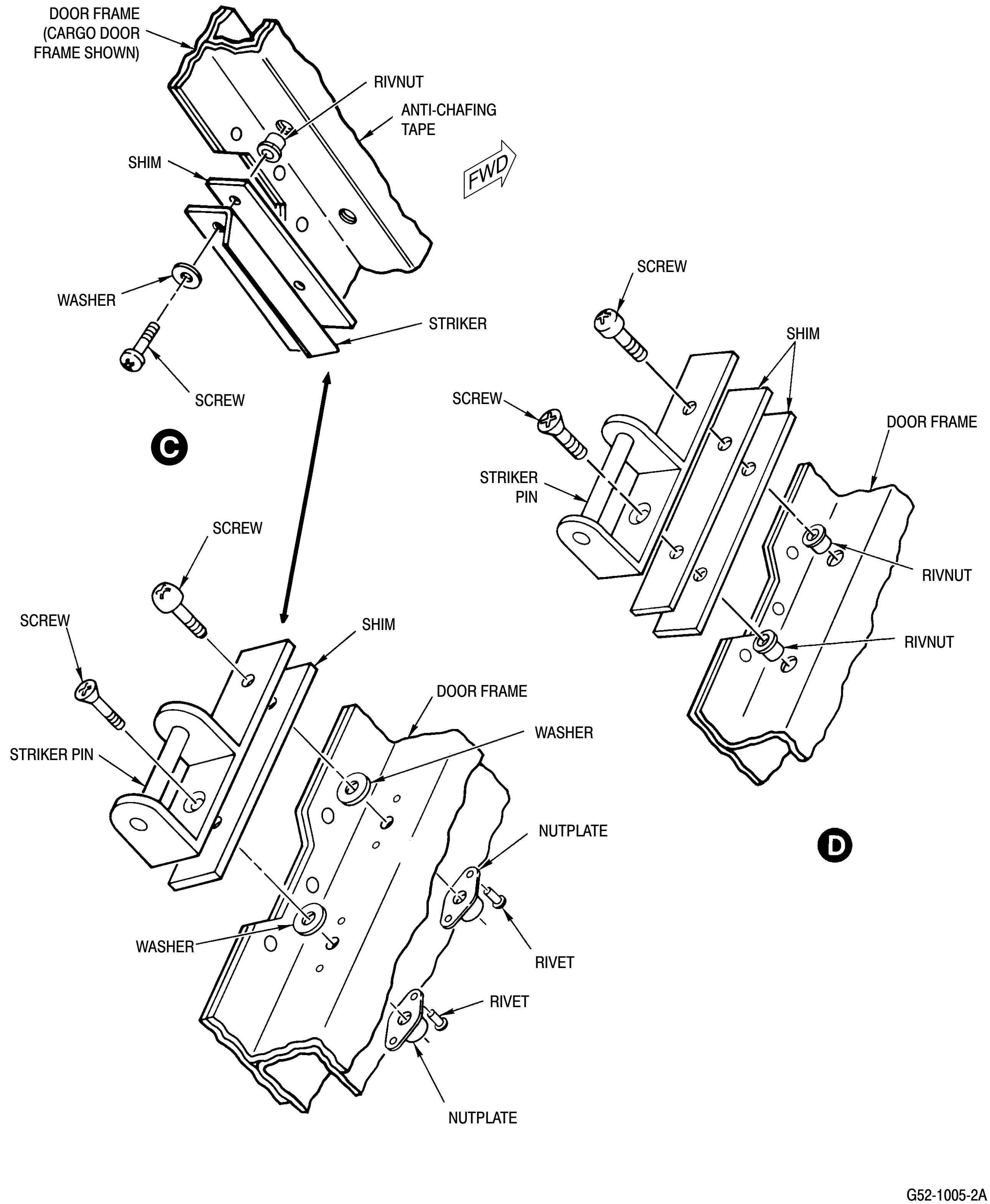


Figure 207. Automatic Latch Block and Striker Repairs (Sheet 2 of 2)

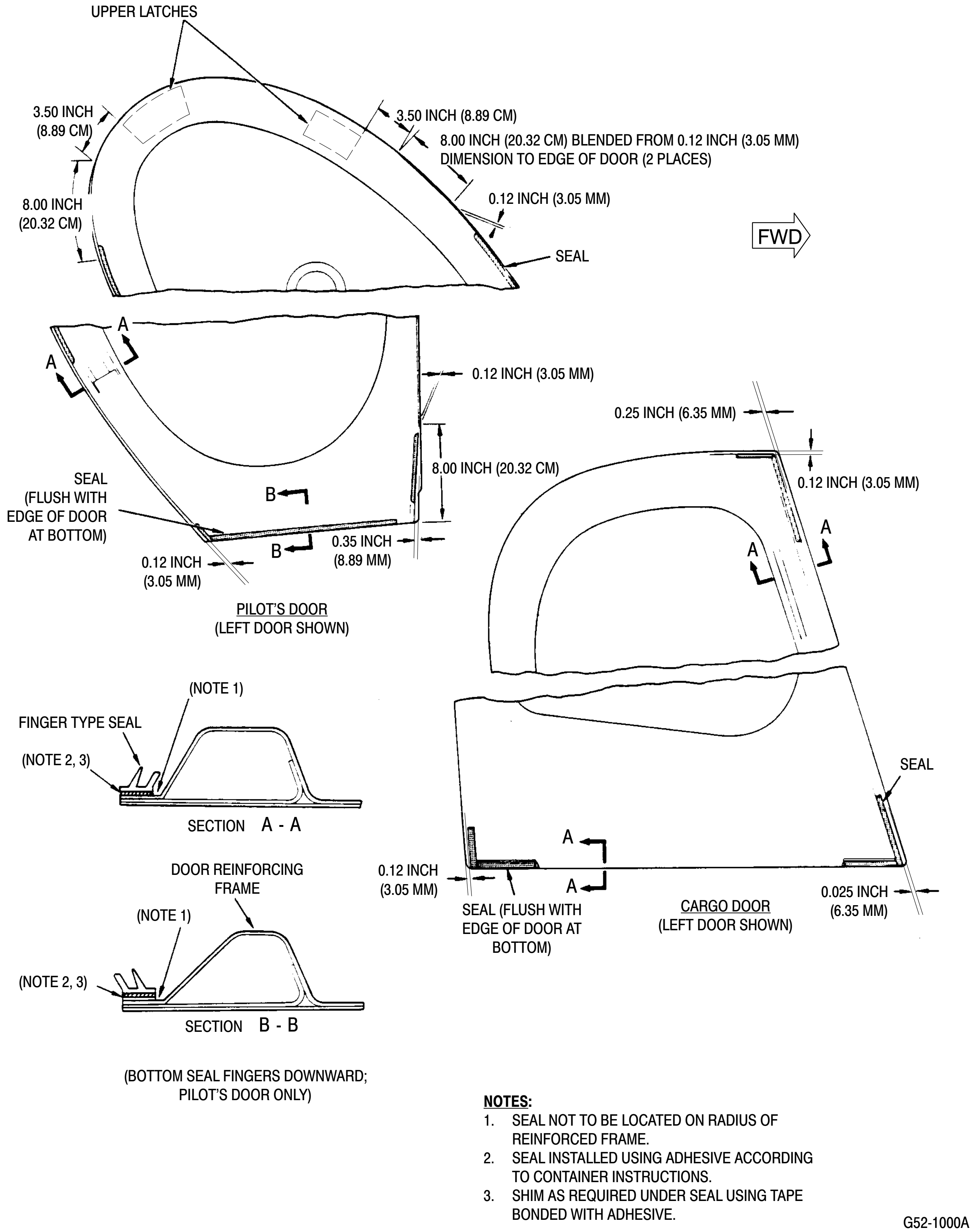


Figure 208. Door Seal Repair

23. Pilot and Cargo Door Repair

A. Seal Repair

(Ref. Figure 208)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM418	Cement, epoxy

(1). Carefully pull or scrape away damaged seal.

(2). Restore chemical film protection to any base metal exposed during cleaning process (Ref. Sec. 20-20-00).

(3). Clean seal contact area on metal and rubber seal.

(4). Carefully align and bond seal to mounting surface with cement, epoxy (CM418) according to container instructions.

NOTE: Correct seal mounting position results in an approximately 0.060 inch (1.52 mm) interference fit between door seal and bumper.

B. Partially-Separated Seal Repair

(Ref. Figure 208)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM220	Naphtha aliphatic
CM418	Cement, epoxy

(1). Clean separated area with naphtha (CM220) and allow to dry for minimum of 20 minutes.

(2). Apply one uniform brush coat of cement, epoxy (CM418) to rubber seal and mating surface contact area. Allow to dry for 5 minutes and press mating surfaces together.

24. Improved Door Seal Installation

(Ref. Figure 209) The following procedure is for installation of QGR2178 door seals on the cargo/passenger doors.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM220	Naphtha aliphatic
CM235	Cleaner
CM322	Primer, Silicone, Red
CM414	Adhesive, cyanoacrylic / Accelerator
CM439	Adhesive

(1). Remove existing door seals using Desoclean 45 (CM235) or naphtha aliphatic (CM220). Ensure that all surfaces are clean to allow proper adhesion of new seal material. Allow surface to air-dry a minimum of 15 minutes.

NOTE:

- On the 369D/E/FF - 500N helicopters, seals are to be installed around the entire circumference of the aft doors.
- On the 600N helicopters, seals are to be installed around the entire circumference of the mid doors. Seals are to the applied to the top, bottom and aft edges of the aft-cabin doors.

(2). Prime seal faying surface with red silicone primer (CM321) and allow to air-dry a minimum of 15 minutes.

(3). Apply a thin uniform coat of adhesive (CM439) to faying surface of door and seal. Allow to air-dry a minimum of five minutes.

(4). Apply a second thin uniform coat of adhesive to faying surface of door and seal. Allow to air-dry a minimum of five minutes.

(5). Test glue with clean knuckle. If adhesive does not transfer to knuckle, press the seal into place.

(6). Butt joints at forward and aft lower locations.

(7). Maximum gap of 0.030 inch (0.762 mm) at butt joints.

(8). Miter joints at upper locations.

(9). Bond mitered joints with adhesive (CM414).

NOTE: Use glue very sparingly to achieve best bond.

(10). Trim seal flush with edge of door.

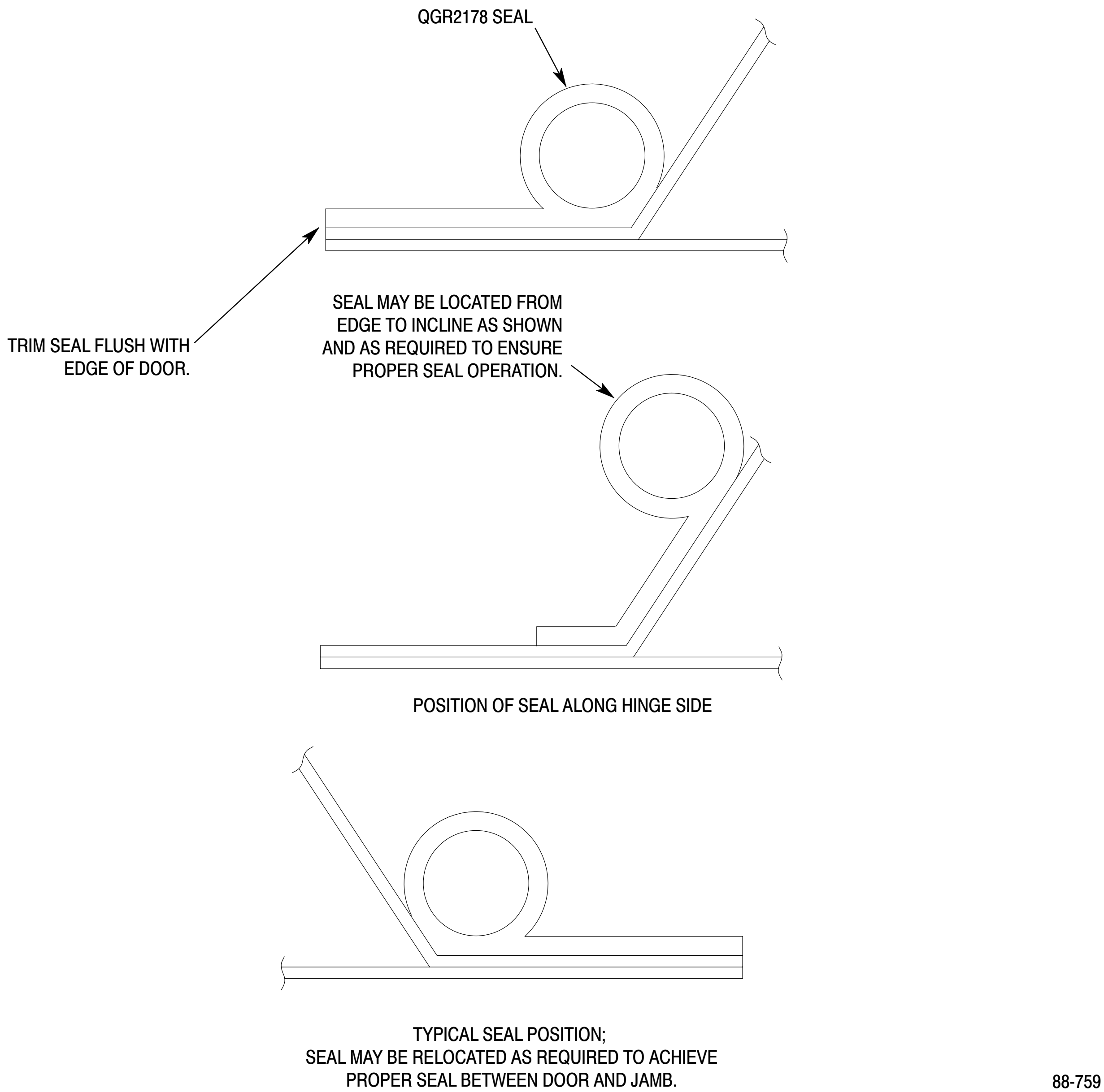


Figure 209. Improved Door Seal Installation

Section

52-40-00

Engine Access Doors

ENGINE ACCESS DOORS MAINTENANCE PRACTICES

1. Engine Access Door - General

(Ref. Figure 201) Engine access doors have upper and lower door hinges that allow door fit adjustment. Fore and aft adjustment and fit of doors is made possible by slotted holes in hinges and serrated mating surfaces between hinges and doors. Lateral adjustment is obtained with laminated shims under door hinges. Closed-door alignment is provided by spring-type retainers on door frames at the lower latch, and two locating pins that engage holes in lower fuselage structure.

2. Engine Access Door Replacement

A. Engine Access Door Removal

(1). Release three latches to open access doors. Index mark hinge, shim and serrated plate to door structure. Remove three engine access door hinge attachment screws with washers. Forward screws are attached with nuts and aft screws attach to rivnuts.

(2). For inspection (Ref. Engine Access Door Inspection).

B. Engine Access Door Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM425	Sealing compound

(1). Position door and temporarily install shim, serrated plate and attachment hardware.

(2). Align indexing marks on shim, serrated plate and hinge with those on door and then tighten screws.

(3). Close and latch doors and check for firm fit with no deflections.

(4). Apply sealing compound (CM425) to all cotter pins.

(5). For adjustment (Ref. Engine Access Door Adjustment).

3. Engine Access Door Inspection

(1). Check door hinges, door-attaching hardware and latches for looseness, cracks and damage.

(2). Check outside edge of door for security of bonding between outer and inner skin. Any separation requires repair.

(3). Inspect doors for corrosion, distortion, breaks or cracks and condition of abrasion strip tape along upper inside door edge and under retainers.

(4). For repairs (Ref. Engine Access Doors Repairs).

4. Engine Access Door Repair

A. Sheet Metal Repair

(Ref. CSP-SRM-6, Structural Repair Manual) Abrasion strip tape along upper inside door edge and on area that mates with retainers must be replaced when worn.

B. Abrasion Strip Replacement

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM220	Naphtha aliphatic
CM710	Tape, high temperature
CM717	Tape, pressure sensitive

(1). Replace worn abrasion strip tape along upper inside door edge by cleaning contact area with naphtha (CM220); allow to air-dry a minimum of 30 minutes. Install 0.50 x 40.0 inch (1.27 x 101.60 cm) strip of polyurethane tape (CM717) to clean, dry surface. Apply hand pressure to ensure firm contact and trim as required.

(2). Replace worn abrasion strip on area that mates with retainers by cleaning retainers with naphtha (CM220). Install high temperature tape (CM710) to clean, dry surface. Apply hand pressure to ensure firm contact. Trim as required.

C. Hinge Replacement

Replace door hinges as follows:

Consumable Materials (Ref. Section 91-00-00)	
Item	Nomenclature
CM318	Primer

(1). Remove door from fuselage structure (Ref. Engine Access Door Removal).

(2). Remove nut, washers and hinge pivot screw.

(3). Carefully press out hinge pivot point spacer and separate hinge halves. Retain two nylon washers.

(4). Carefully drill out rivets that secure defective hinge half to fuselage structure.

(5). Transfer existing hole pattern in fuselage structure to replacement fuselage hinge half and drill out holes. Install hinge and shim on fuselage structure and secure with replacement rivets.

(6). Assemble hinge halves with nylon washers as shown. Press steel pivot spacer coated with primer (CM318) through mating holes. Install pivot screw with washer and nut.

NOTE: Install shims under door hinge to obtain firm fit without binding at door-to-fuselage contact surfaces when door is closed. Use slotted holes in hinge and serrated surfaces to obtain forward and aft adjustment. When adjustments are complete, tighten screws that secure hinge to access door.

(7). Refinish repaired area (Ref. Sec. 20-30-00).

D. Catch/Latch Hook Replacement

Replace defective catches or latch hooks as follows:

(1). Carefully drill out rivets and remove defective latch hook or catch from engine access door or fuselage structure Replace defective stops or serrated adjustment plates, if required, by drilling out attaching rivets.

(2). Locate existing rivet holes and install replacement latch, catch, door stop or adjustment plate. Secure with replacement rivets.

(3). Adjust latches as required for proper tension of latch lever to catch without deflecting door (Ref. Engine Access Door Adjustment).

(4). Refinish area (except latch lever assembly) as required (Ref. Sec. 20-30-00).

5. Engine Access Door Adjustment

Door alignment is provided by means of spring-type retainers riveted in door frames adjacent to lower latch.

Consumable Materials (Ref. Section 91-00-00)	
Item	Nomenclature
CM702	Lockwire CRES

(1). Remove lockwire from threaded (adjustment) end of hooks.

(2). Loosen all hooks until spring type retainers engage in light contact with no door deflection when hooks are latched.

(3). Unlatch doors and tighten all hooks four to five turns. Check door latching and make additional minor adjustments as required.

(4). Install lockwire (CM702) in hook threaded end in a manner to allow latching and unlatching without interference.

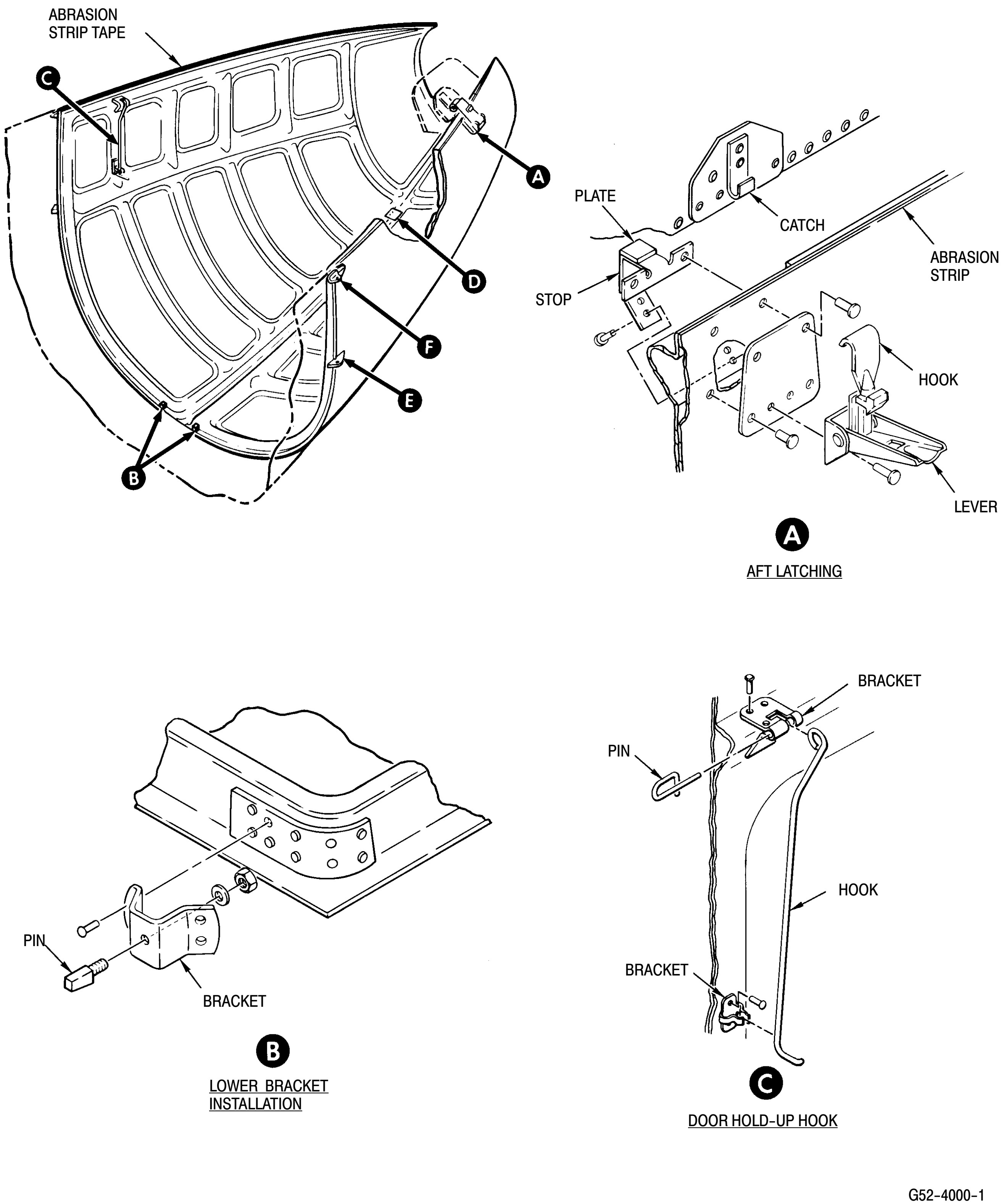


Figure 201. Engine Access Doors (Sheet 1 of 3)

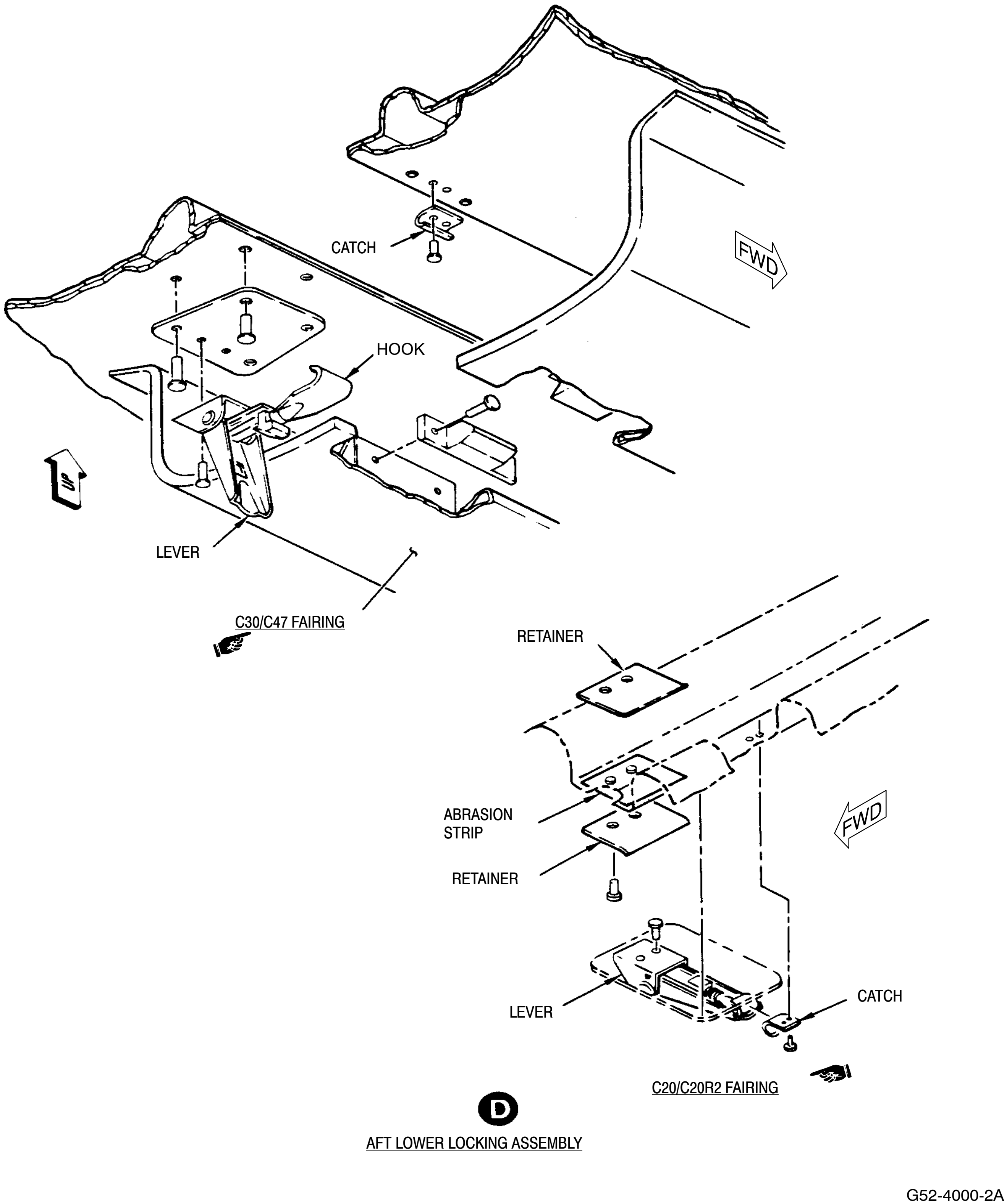
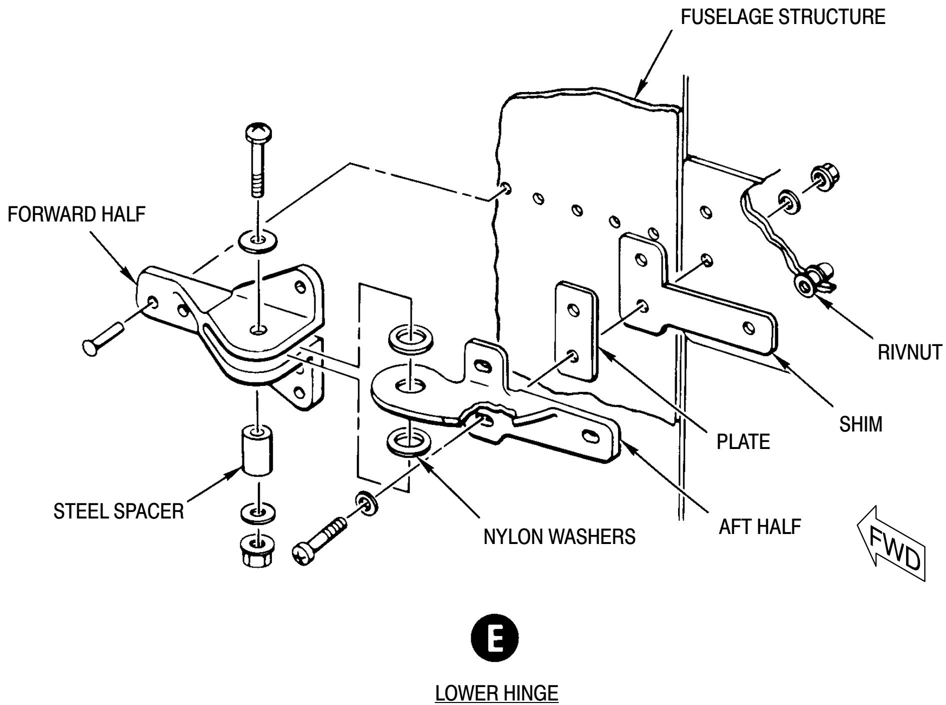


Figure 201. Engine Access Doors (Sheet 2 of 3)



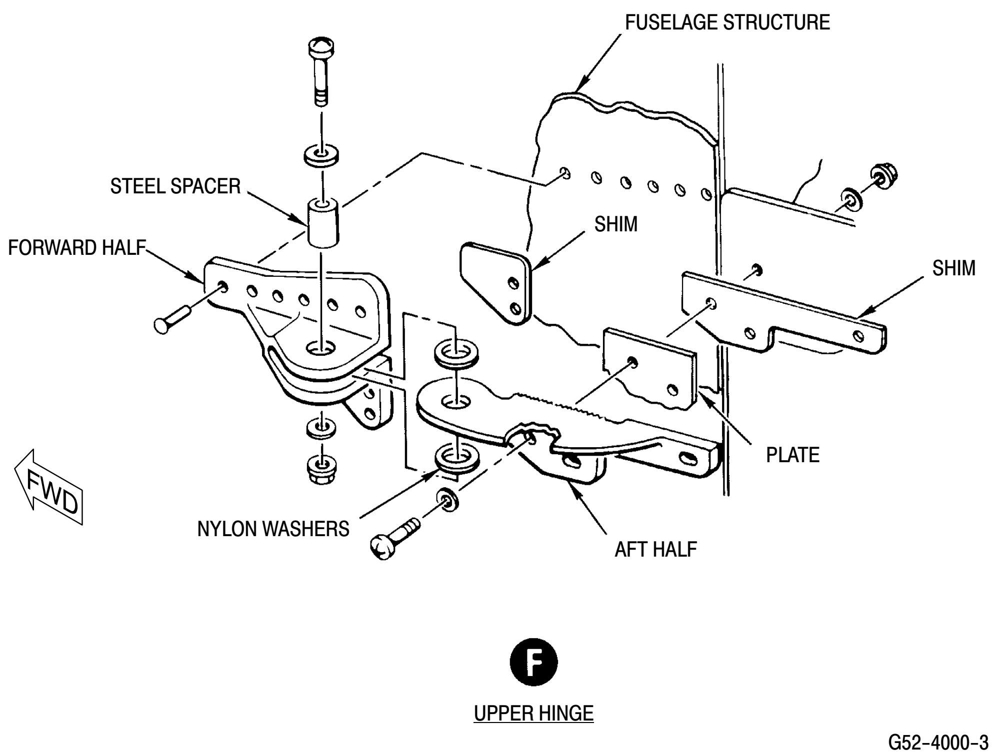


Figure 201. Engine Access Doors (Sheet 3 of 3)

Section

52-50-00

Miscellaneous Access Doors

MISCELLANEOUS ACCESS DOORS MAINTENANCE PRACTICES

1. Access and Inspection Provisions

CAUTION Any time maintenance work is to be performed near engine air and engine cooling air inlets, use care to prevent entry of foreign objects that might later be sucked into compressor or cooling air blower. Tape covers of cardboard or other suitable material in place over engine cooling air screens. Covers should not be removed until work is completed and debris is thoroughly cleaned out of the area.

Removable access doors and covers are provided in the helicopter for servicing, inspection, removal, installation and adjustment of components.

Locations of access and inspections provisions are shown in Figure 201 for 369D/E/FF, Figure 202 for 500N and Figure 203 for 600N helicopters.

Areas, components and items accessible through locations shown in the figures are in Table 201. Screws are used to secure access doors in stress areas.

Liquid level sight gages allow inspection of lubricant levels for main transmission, engine oil tank and tail rotor transmission (369 D/E/FF) or fan transmission (500/600N).

Methods for removal and installation are obvious for most doors and covers.

For information on access doors and covers that are also used for interior trim, Refer to Sections 25-30-00 and 25-40-00.

2. General Access Doors Inspection

(1). Check door hinges, door-attaching hardware and latches for looseness, cracks and damage.

(2). Check outside edge of door for security of bonding between outer and inner skin. Any separation requires repair, refer to Structural Repair Manual.

(3). Inspect doors for corrosion, distortion, breaks and cracks.

3. Pilot Compartment Floor Access Doors

Each of the two pilot's compartment floor access doors are formed by two hinged panels, hinged at the forward edge to the pilot's compartment floor.

A latch at the rear, secures each door in place. Two stainless steel heel strips are hinged and held in place over each door by a spring.

NOTE: Remove heel strips for better access. Detach springs from clips on underside of strips. Remove hinge pins attaching forward ends of strips to natatorium pedal mounting bracket.

4. Pilot Compartment Floor Access Door Replacement

A. Pilot Compartment Floor Access Door Removal

(1). Remove floor access doors by releasing latch at rear of door.

(2). Raise and hold up rear of heel strips for access to hinge pins at forward end of door.

(3). Remove hinge pin securing forward edge of door to pilot's compartment floor and remove door.

B. Pilot Compartment Floor Access Door Installation

(1). Position door and secure forward edge to floor using hinge pin.

(2). If removed, heel strips are reinstalled by inserting hinge pins through brackets on forward end of strip and anti-torque pedal mounting bracket and connecting springs to clips on underside of heel strips.

Table 201. Access and Inspection Provisions Information

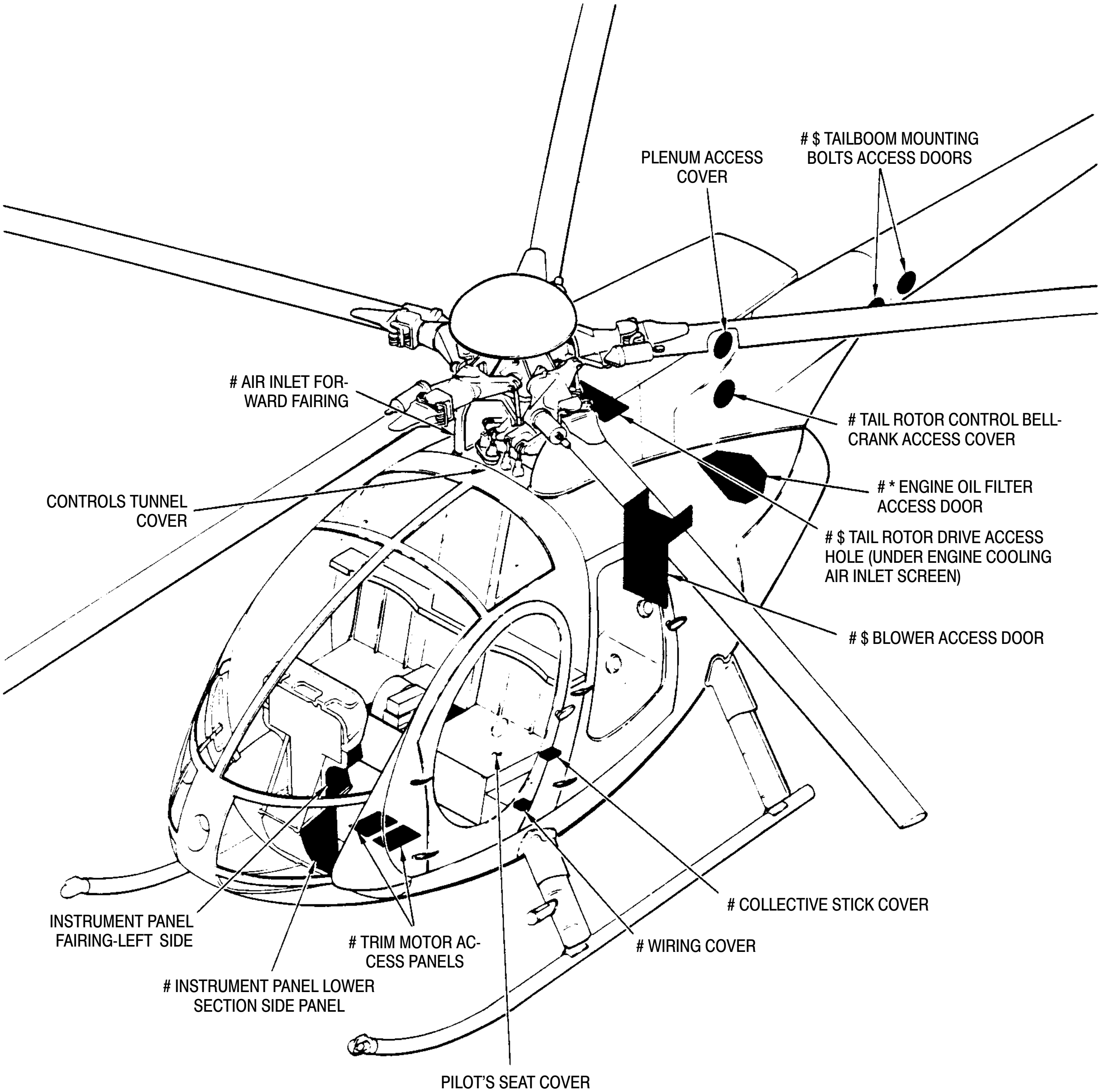
Door, Cover or Access Provision	Provides Access To
Air inlet forward fairings	Main rotor mixer controls, main rotor mast base and supporting structure.
Collective stick cover	Aft end of collective stick and associated electrical wiring.
Wiring cover	Electrical wiring at seat structure and auxiliary power receptacle.
Pilot's seat cover or inboard collective pitch stick cover	Underseat controls for engine and flight control systems.
Plenum chamber access door (air inlet bypass door)	Interior of engine air inlet aft fairing.
Tail rotor drive shaft access door	Tail rotor drive shaft and interior of air inlet forward fairing.
Pilot's compartment floor access door	Left door - battery. Right door - optional avionics equipment and controls linkage.
Aft bulkhead access covers	Right side - oil tank, oil cooler and oil system drain valve. Left side - components of optional cabin heating installation and main transmission oil cooler.
Footwell fairing	Forward landing gear struts and dampers, controls of engine and flight control systems and electrical wiring. Outboard windows allow inspections of forward landing gear dampers.
Control access door (1)	Lower end of tunnel-routed flight control rods and other control components in underseat area.
Fuel vent cover	Fuel cells vent system crossover fitting.
Tail rotor control bellcrank access fitting	Bellcrank connecting tail rotor control rod to tailboom control rod.
Boom bolts access covers	Bolts that secure tailboom to fuselage aft section, tail rotor drive shaft, tailboom control rod, and damper for tail rotor drive shaft.
Engine access doors	Engine, transmission oil cooler, and components in engine compartment.
Fuel cell access covers (1)	Left door - fuel quantity transmitter, fuel shutoff valve, fuel cell cover (for access to engine starting pump), and left fuel cell. Right door - right fuel cell.
Tail rotor drive access hole (below engine cooling air inlet screen)	Forward end of tail rotor drive shaft and limited access to aft end of main transmission.
Instrument panel lower section front panel	Electrical and avionics wiring at lower forward area of instrument panel.
Instrument panel lower section side panels	Wiring, tubing, fuel shutoff control cable, and anti-torque control torque tube. Right side cover is mounting surface for landing light relay. Left side cover mounting running time meter.

Table 201. Access and Inspection Provisions Information

Door, Cover or Access Provision	Provides Access To
Cargo hook access cover	Mount fitting and electrical connectors for optional cargo hook installation.
Convenience trim panel and main transmission trim panel (Ref. Sec. 25-00)	Sight gage to check main transmission oil level. Chip detectors and main transmission drain valve.
Blower access door	Main transmission, air cooler blower, and engine-to transmission drive shaft.
Instrument panel fairings	Avionics, gages and electrical wiring.
Engine oil filter access panel	Gain access for replacement of engine oil filter. (369FF - 600N)
Access Provisions Unique to 500/600N	
Air inlet forward fairings	Main rotor mixer controls, main rotor mast base and supporting structure. Anti-torque splitter assembly, forward, intermediate and aft control tube.
Engine plenum access fairing	Inner area of air inlet aft fairing.
Fan inlet screen	Fan blades and fan/gearbox access cover.
Fan gearbox access cover	Fan gearbox and forward driveshaft.
Driveshaft door	Forward driveshaft rear coupling.
Pressure relief screens	Fan gearbox oil level sight gauge (L/H side).
Tailboom fairing (1)	Tailboom attach bolts. Anti-torque control cable quick disconnect and electrical connectors.
Horizontal stabilizer end plates (1)	Vertical stabilator controls and YSAS actuator (R/H side).
Horizontal stabilizer access panel (1)	Vertical stabilator controls.
Thruster fairing	Rotating thruster attachment.
Access Provisions Unique to 600N	
Forward floor access covers	Fuel cell components.
Engine air bypass door	Interior of engine.

NOTE:

(1) Items are stressed and must be installed prior to helicopter flight.



CAUTION:
ITEMS PREFIXED WITH AN ASTERISK (*) ARE STRESSED AND MUST BE INSTALLED PRIOR TO HELICOPTER FLIGHT.

NOTES:
ITEMS TO BE REMOVED FOR 100-HOUR OR ANNUAL INSPECTIONS.
$ ITEMS TO BE REMOVED FOR 300-HOUR INSPECTIONS.

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Figure 201. Access and Inspection Provisions and Locations (369D/E/FF) (Sheet 1 of 3)

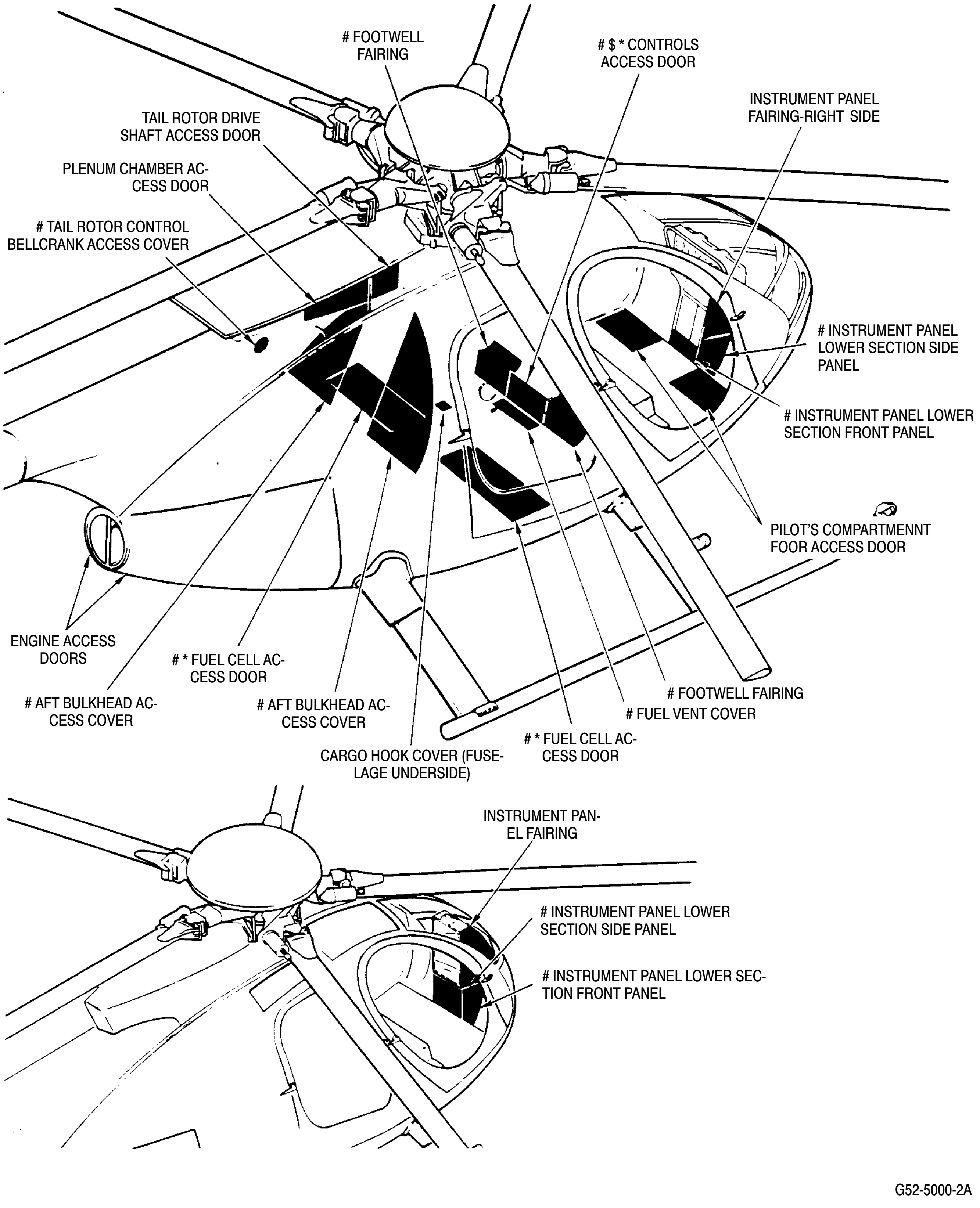


Figure 201. Access and Inspection Provisions and Locations (369D/E/FF) (Sheet 2 of 3)

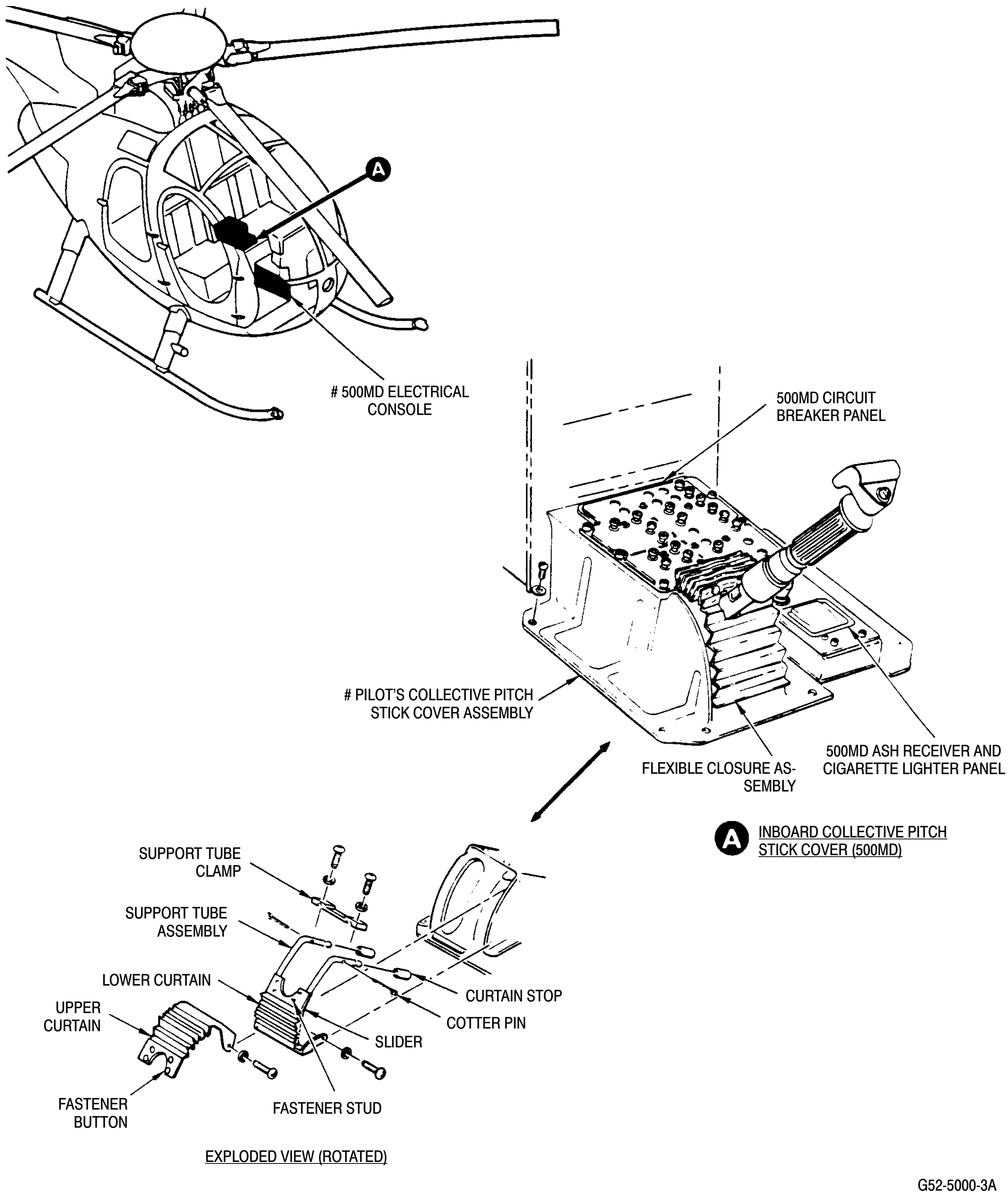
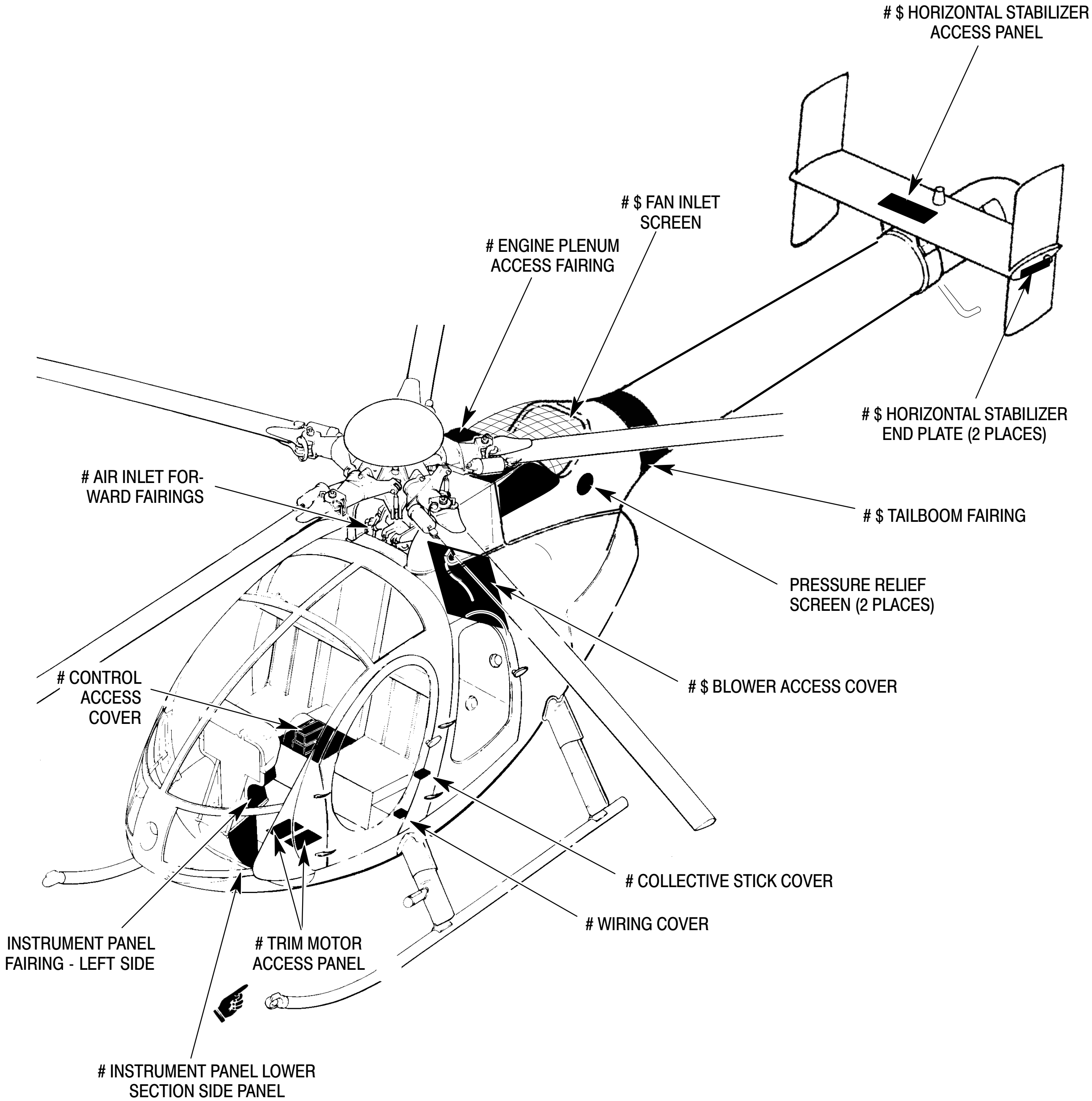


Figure 201. Access and Inspection Provisions and Locations (369D/E/FF) (Sheet 3 of 3)



CAUTION:
ITEMS PREFIXED WITH AN ASTERISK (*) ARE STRESSED AND MUST BE INSTALLED PRIOR TO HELICOPTER FLIGHT.

NOTES:
ITEMS TO BE REMOVED FOR 100-HOUR OR ANNUAL INSPECTIONS.
$ ITEMS TO BE REMOVED FOR 300-HOUR INSPECTIONS.

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Figure 202. Access and Inspection Provisions and Locations (500N) (Sheet 1 of 2)

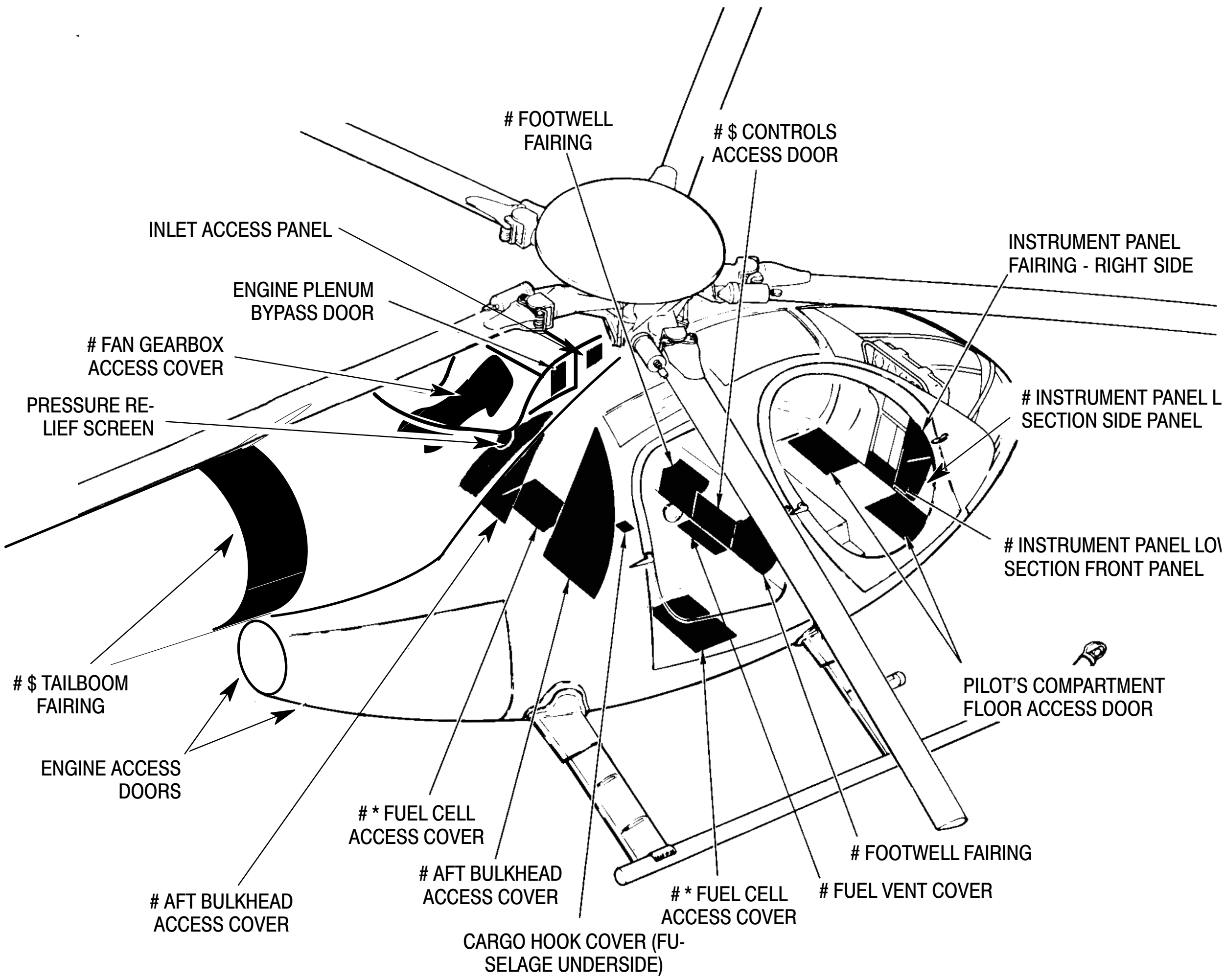
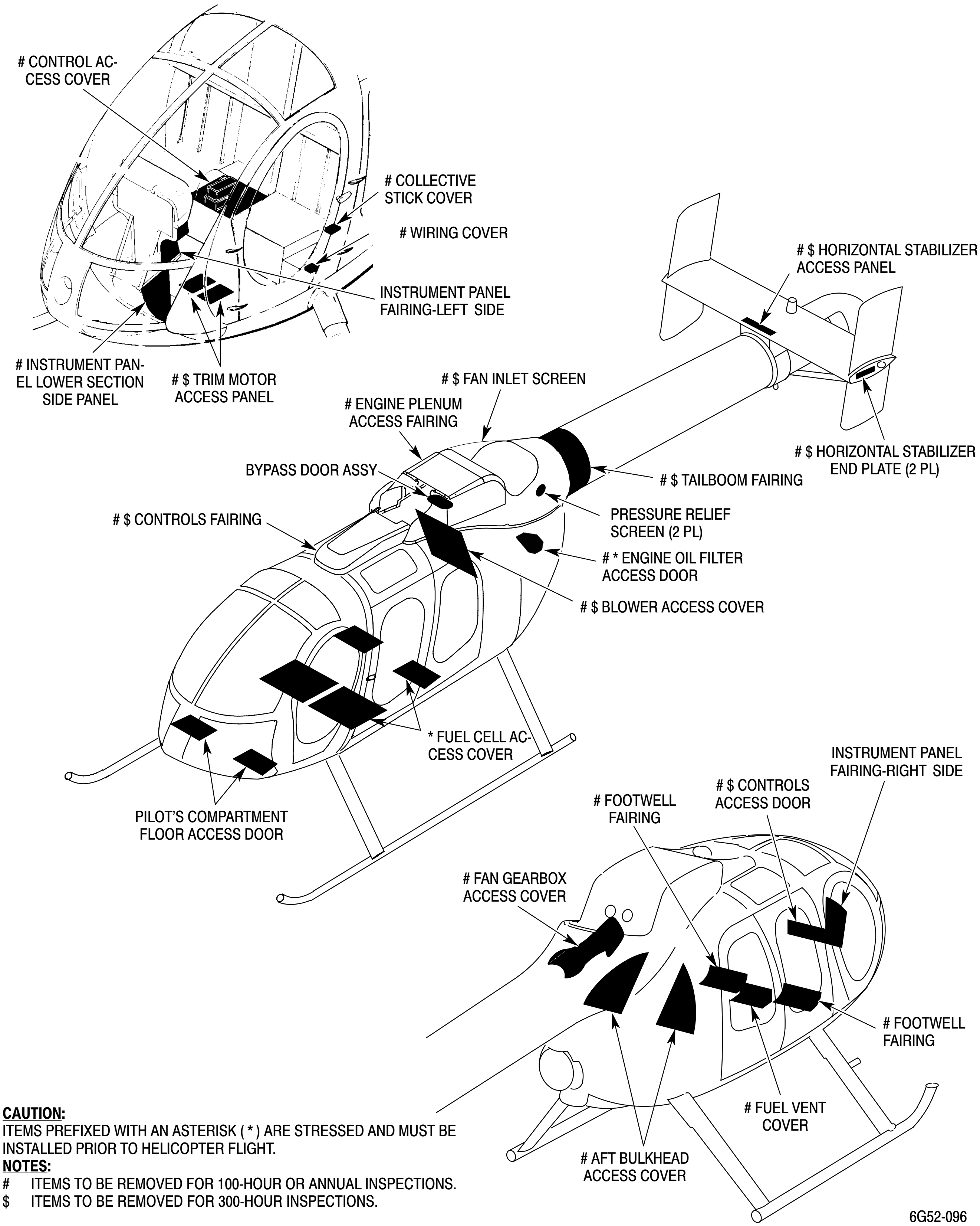


Figure 202. Access and Inspection Provisions and Locations (500N) (Sheet 2 of 2)



CAUTION:
ITEMS PREFIXED WITH AN ASTERISK (*) ARE STRESSED AND MUST BE INSTALLED PRIOR TO HELICOPTER FLIGHT.

NOTES:
ITEMS TO BE REMOVED FOR 100-HOUR OR ANNUAL INSPECTIONS.
$ ITEMS TO BE REMOVED FOR 300-HOUR INSPECTIONS.

Figure 203. Access and Inspection Provisions and Locations (600N)

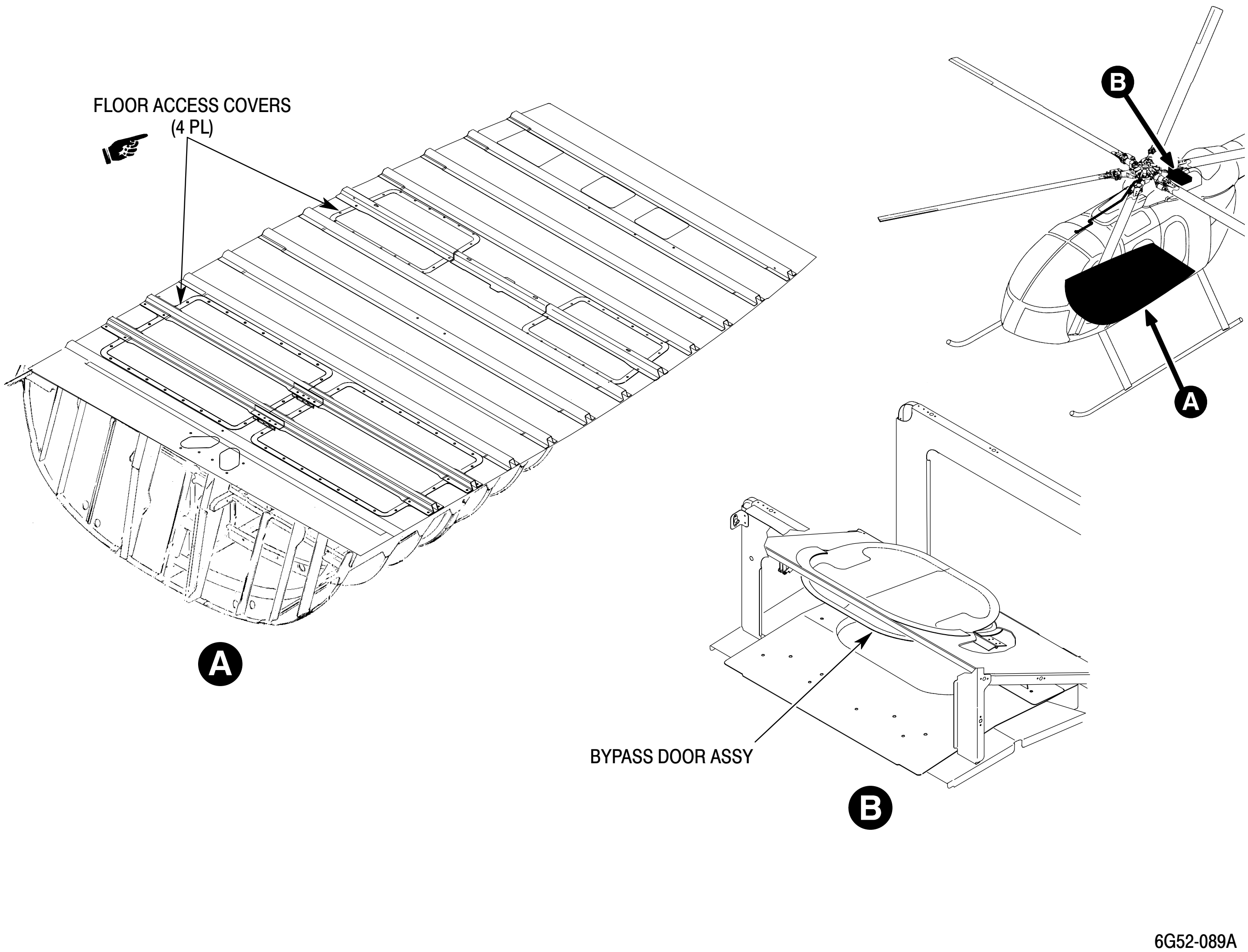


Figure 204. Floor Access Covers and Engine Bypass Door (600N)

Chapter

53

Fuselage

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Section

53-00-00

Fuselage

FUSELAGE
MAINTENANCE PRACTICES

1. Fuselage - General

(Ref. Figure 201) The helicopter fuselage consists of three major structural sections; the forward, lower and aft fuselage sections. For classification and definition of types of negligible damage, and for guidelines defining extent of damage requiring repair or replacement, (Ref. Stressed Sheet Metal Panels, Non-Stressed Sheet Metal Panels and Table 201).

(Ref. Figure 202) The fuselage of the 600N helicopter is a stretched version of the 500N Series helicopter with numerous upgrades and improvements. (shaded areas indicate new sections to fuselage) The longer cabin area of the 600N greatly increases passenger and/or cargo carrying capacity. Upper deck area fairings and covers were added or modified to accommodate control surfaces or air inlet passages.

The tailboom on the 600N helicopter is essentially the same as the 500N Series, only longer. The vertical stabilizers or endplates are longer than on the 500N model, providing an increased control surface area.

An extended passenger step alongside the passenger/cargo compartment allows for easy entrance and exit through either mid or aft cabin doors.

2. Stressed Sheet Metal Panels

Stressed sheet metal panels consist primarily of helicopter fuselage skins and bulkhead webs. The most-highly-stressed skin sections are those that form the cylindrically-tapered tailboom assembly (Ref. Sec. 53-40).

NOTE: No damage can be considered negligible. All damage shall be repaired upon detection.

3. Stressed Sheet Metal Panel Inspection

Cracks, tears or punctures in stressed sheet metal panels that do not exceed 0.20 inch (5.08 mm) diameter and can be removed by drilling out with 1/4 inch (6.35 mm) or smaller diameter drill do not require structural doublers. If cracks, tears or punctures exceed 0.20 inch (5.08 mm) diameter, they are to be repaired or the panel must be replaced per instructions in the FAA AC 43.13-1A & 2A and Structural Repair Manual.

4. Non-Stressed Sheet Metal Panels

Non-stressed sheet metal members consist primarily of hinged covers and doors, except fuel cell access and controls access doors, which are stressed (Ref. Stressed Sheet Metal Panels).

5. Negligible Damage Inspection

(Ref. Table 201) Panels damaged in excess of negligible damage limits (Ref. Table 201) should be repaired, or damaged panel should be replaced per instructions in FAA AC 43.13-1A & 2A and CSP-SRM-6 (Structural Repair Manual).

Table 201. Negligible Damage Inspection - Fuselage

Area	*Damage	Maximum Depth	Maximum Length or Surface	Remarks
Stressed sheet metal panels.				No unrepaired damage allowed (For tailboom, Ref. Sec. 53-40).
Non-stressed sheet metal panels.	Dents.			Small dents allowed.**
	Scratches/nicks.			Minor scratches/nicks allowed.**
	Cracks.		Smaller of 0.250 inch (6.35 mm) or one-fourth panel width.	Must be one inch or more from any attachment fitting and/or panel edge.
Main rotor mast.				No unrepaired damage allowed (Ref. Figure 201)
Firewalls.				No unrepaired damage allowed.
Fuselage fittings.	Longitudinal scratches, dents, and nicks.	0.010 inch (0.254 mm)	15% of fitting length.	After polishing or repair.
	Transverse scratches, dents, and nicks.	0.010 inch (0.254 mm)	10% of fitting thickness.	After polishing or repair.

NOTES:

* All damage to fuselage exceeding limits given requires repair or replacement of effected panel or component.

** Dents, scratches and nicks that penetrate aluminum protective coating (4% of panel thickness with paint or other surface finishes removed) will allow corrosion of aluminum panel, and should be repaired.

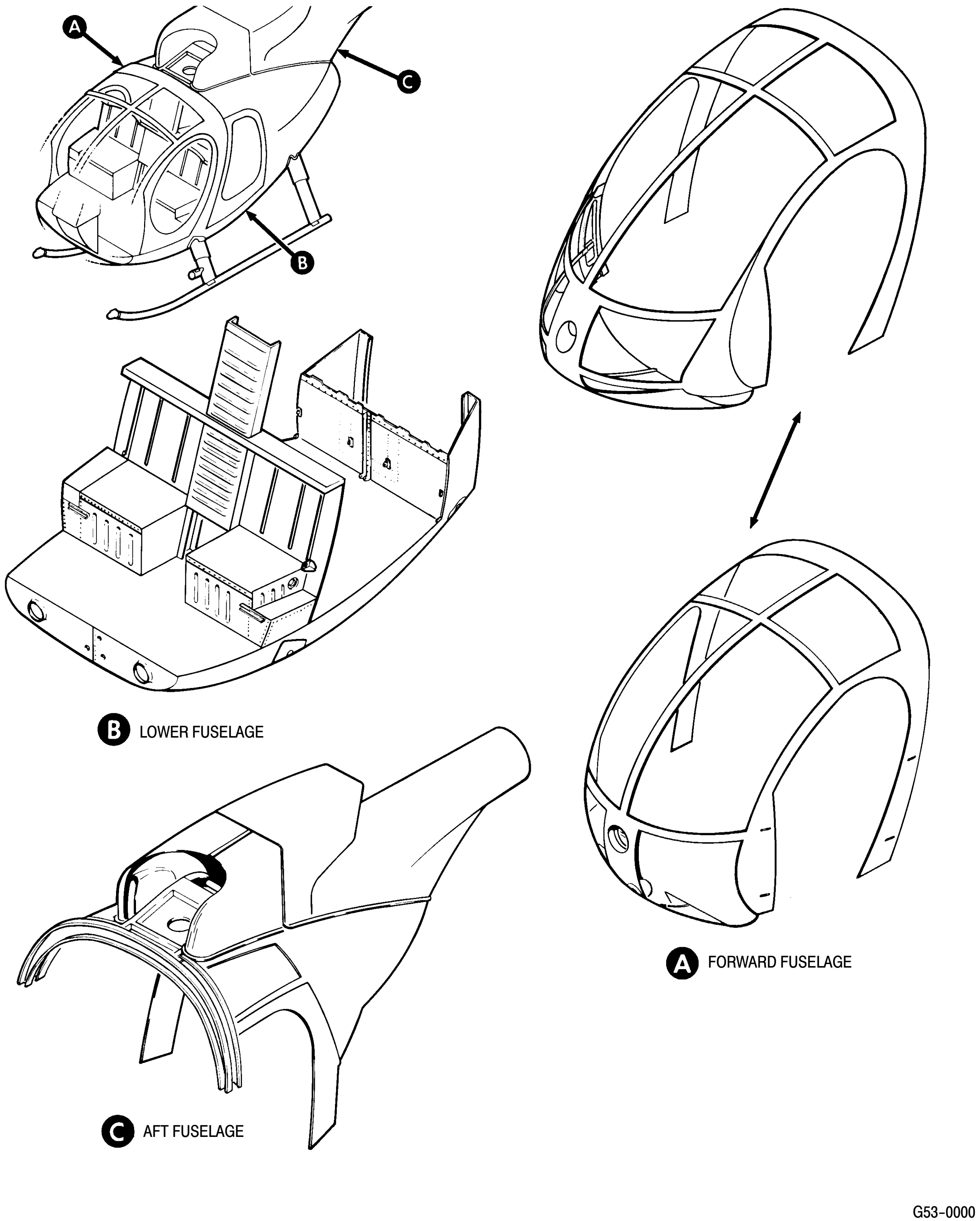


Figure 201. Fuselage - Major Sections

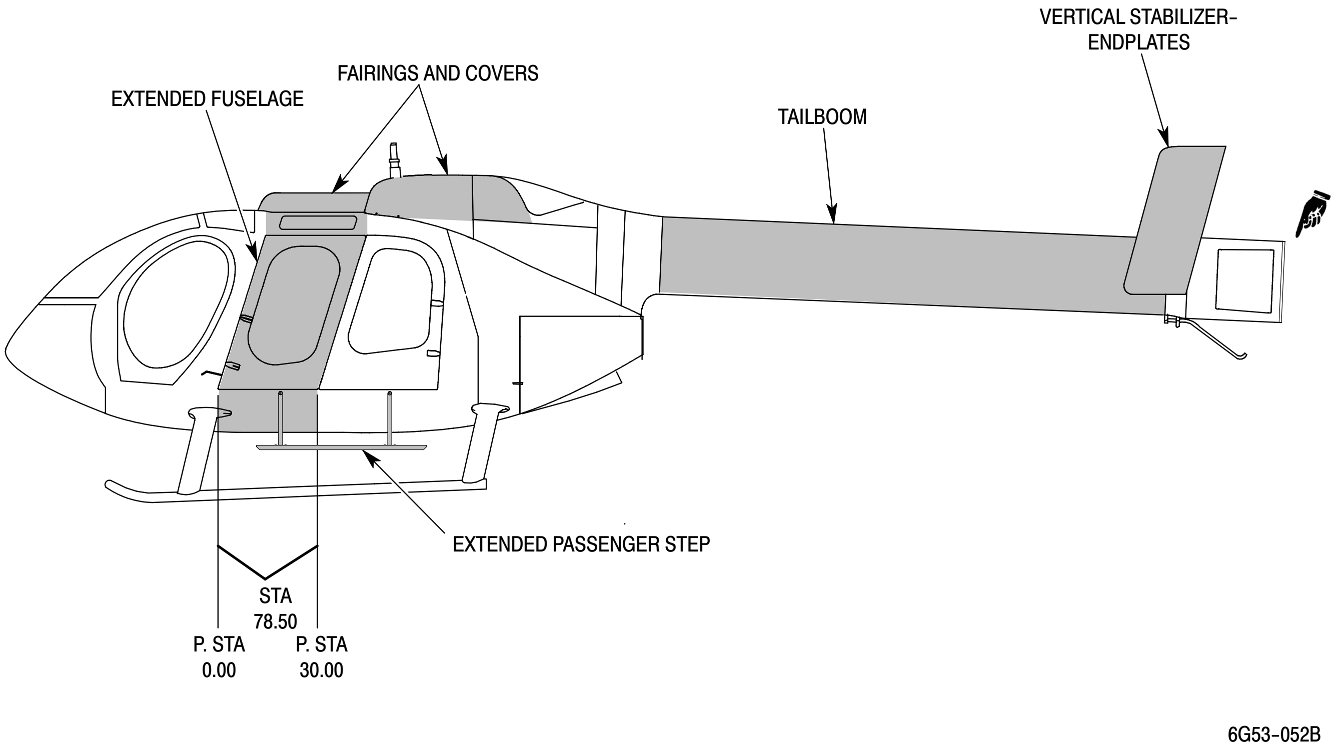


Figure 202. Fuselage - Model 600N

Section

53-10-00

Windshields and Aft Section Windows

WINDSHIELDS AND AFT SECTION WINDOWS MAINTENANCE PRACTICES

1. Windshields

Center and lower windshield panels are clearest acrylic (Ref. Figure 201 and Figure 202). Upper windshield panels are smoke-grey-tinted cast acrylic. The center windshield panels are approximately 0.100 inch (2.540 mm) thick.

2. Aft Section Windows

For repair of plastics, Ref. FAA AC 43.13-1A. Replace aft section window if it is damaged beyond practical repair, according to applicable instructions in Structural Repair Manual.

(Ref. Figure 204) On the 600N helicopter the ”Aft Section Windows” refer to the upper mid section windows located above the mid passenger/cargo doors. On the 500 Series helicopters this area was referred to as the ”Aft Section”.

3. Aft Section Windows Replacement

(Ref. Figure 204)

A. Aft Section Windows Removal

(1). Remove old sealing compound from around edge of window and window seal.

(2). Using a blunt plastic spatula or probe, pull back flap of window seal and gradually work window out from under flap of seal.

(3). Remove seal and clean for re-installation of window.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM425	Sealing compound

B. Aft Section Windows Installation

(1). Install window seal around periphery of window opening in fuselage.

(2). Using a blunt plastic spatula or probe, gradually work edge of window under flap surface of window seal.

(3). Maintain pressure on window until entire perimeter of window is under seal.

(4). Apply an even amount of sealing compound (CM425) to form a water-tight seal around window seal to fuselage and from window seal to window.

4. Windshield Frame Replacement

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM305	Lacquer, acrylic
CM425	Sealing compound

For older model helicopters with riveted-in windshields, remove or replace windshield according to applicable instructions in the Structural Repair Manual.

A. New-Style Windshield Installation

(1). Install windshields in place and install hardware (Ref. Figure 203 and Figure 204).

(2). After normal installation of windshield, grind two screws flush with nuts (Ref. Figure 203).

(3). Touch-up with lacquer (CM305).

(4). Seal all windshield seams with sealing compound (CM425).

5. Windshield Inspection

Minor defects or imperfections that do not impair pilot’s critical visibility, or that obviously are not signs of impending structural failure may be considered as negligible. (For allowable damage limits, Refer to Table 201.)

6. Windshield Repair

For repair of plastics, Ref. FAA AC 43.13-1A. Replace windshields if damage beyond practical repair, according to applicable instructions in Structural Repair Manual.

7. Water Leak Prevention

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM425	Sealing compound

If water leakage through geon strips of the forward canopy occurs, remove any existing sealant using a plastic or other non-metallic scraper which will not scratch the canopy glass. Apply 0.060 inch (1.524 mm) bead of sealant (CM425) along gaps between geon strips. Apply sealant as directed by sealant manufacturer.

8. Geon Strips Repair

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM220	Naphtha aliphatic
CM414	Adhesive, cyanoacrylic / Accelerator
CM722	Tape, polyethylene

Fill voids between geon strips and transparencies as follows:

(1). Measure the insertion depth of acrylic windshield into geon slot, reject parts having less than 0.125 inch (3.175 mm) insertion. Replace parts with debonding areas over 8 inches (20.32 cm) in length.

(2). Mask the geon weatherstrip and windshield on both sides with tape (CM722).

(3). Wipe all faying surfaces with aliphatic naphtha (CM220) and dry for a minimum of 15 minutes.

(4). For small voids:

(a). Apply adhesive (CM414) to all faying surfaces using syringe if necessary.

(b). Use light pressure to hold the joint closed for a minimum of 2 minutes.

(5). For large voids:

(a). Apply accelerator to the acrylic transparency and air dry for a minimum of 2 minutes.

(b). Apply adhesive to the geon weatherstrip only.

(c). Apply local pressure to insure complete contact between adherents and maintain pressure for a minimum of 30 seconds.

(d). Remove tape and remove excess residue with aliphatic naphtha.

Table 201. Negligible Damage of Canopy/Windshield

Area	Damage	Maximum Depth	Maximum Length or Surface Area	Remarks
Canopy and Windshield.	Nicks	0.010 inch (0.254 mm)	0.250 inch (6.35 mm)	One per square foot only.
	Scratches	0.010 inch (0.254 mm)	5.000 inch (12.7 cm)	
	Spots or stains			If removable by light polishing.
Panels (not windshields or windows).	Punctures		0.200 inch (5.08 mm) dia	
Windshield.	Polarization faults (distortion)			Small area near edges.

Table 201. Negligible Damage of Canopy/Windshield

Area	Damage	Maximum Depth	Maximum Length or Surface Area	Remarks
Doublers or stiffeners.	Delamination			No more than one area within each square foot of windshield.
	Grazing around delamination	0.010 inch (0.254 mm)		

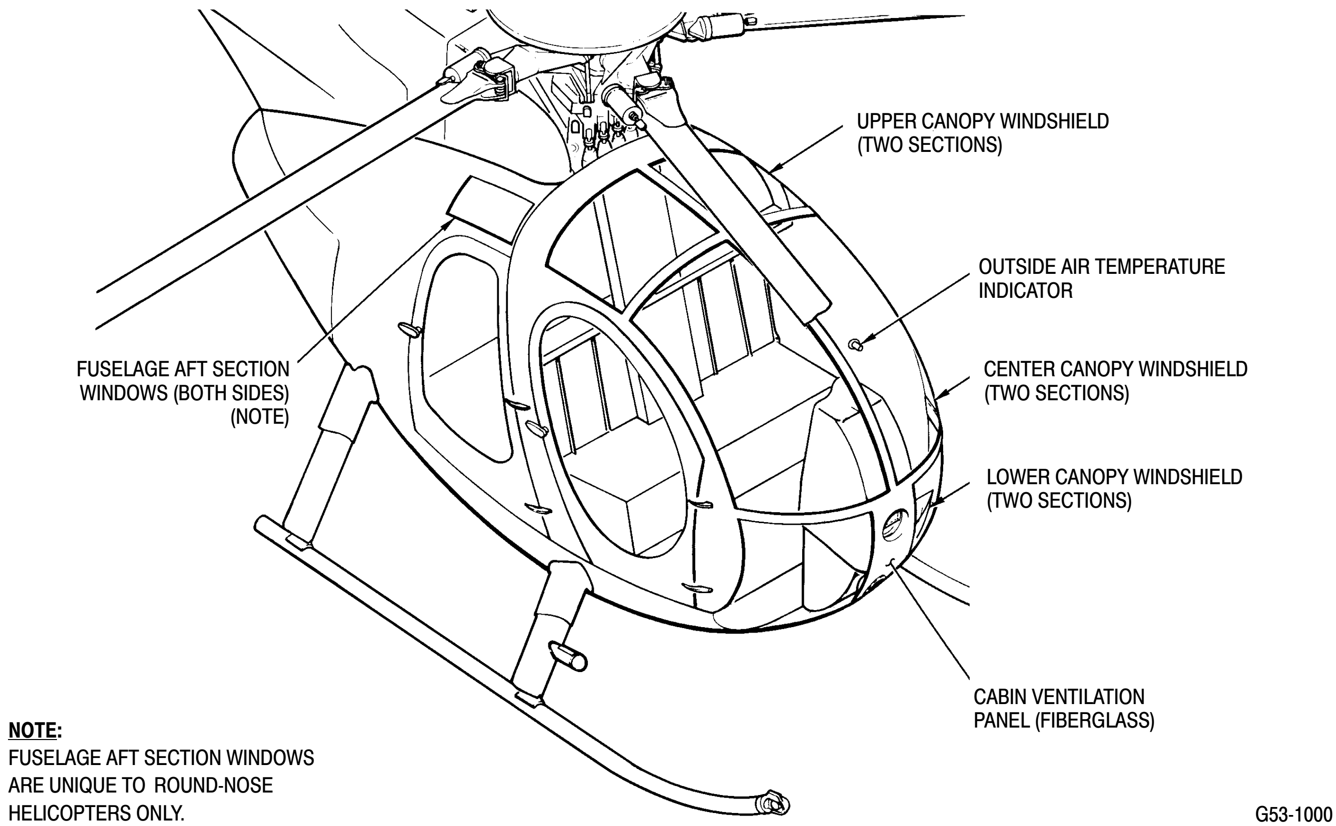


Figure 201. (Round Nose) Windshields and Aft Section Windows

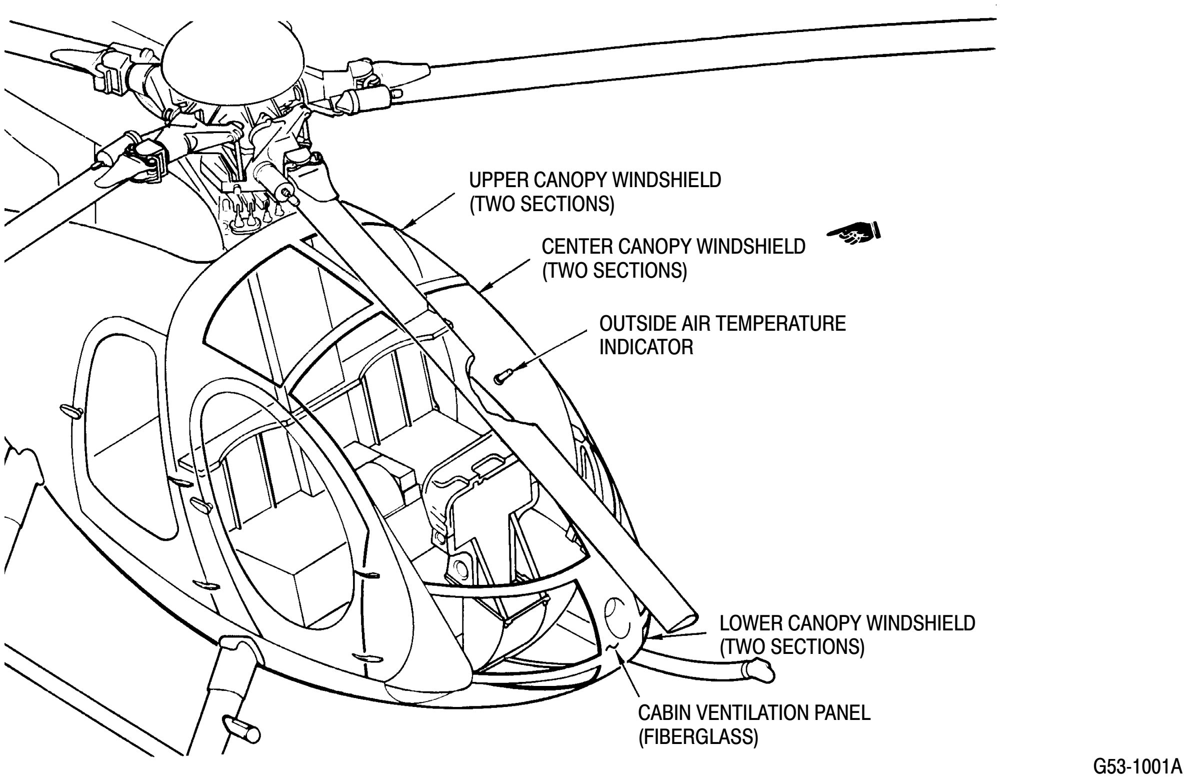


Figure 202. (Extended Nose) Windshield and Aft Section Windows

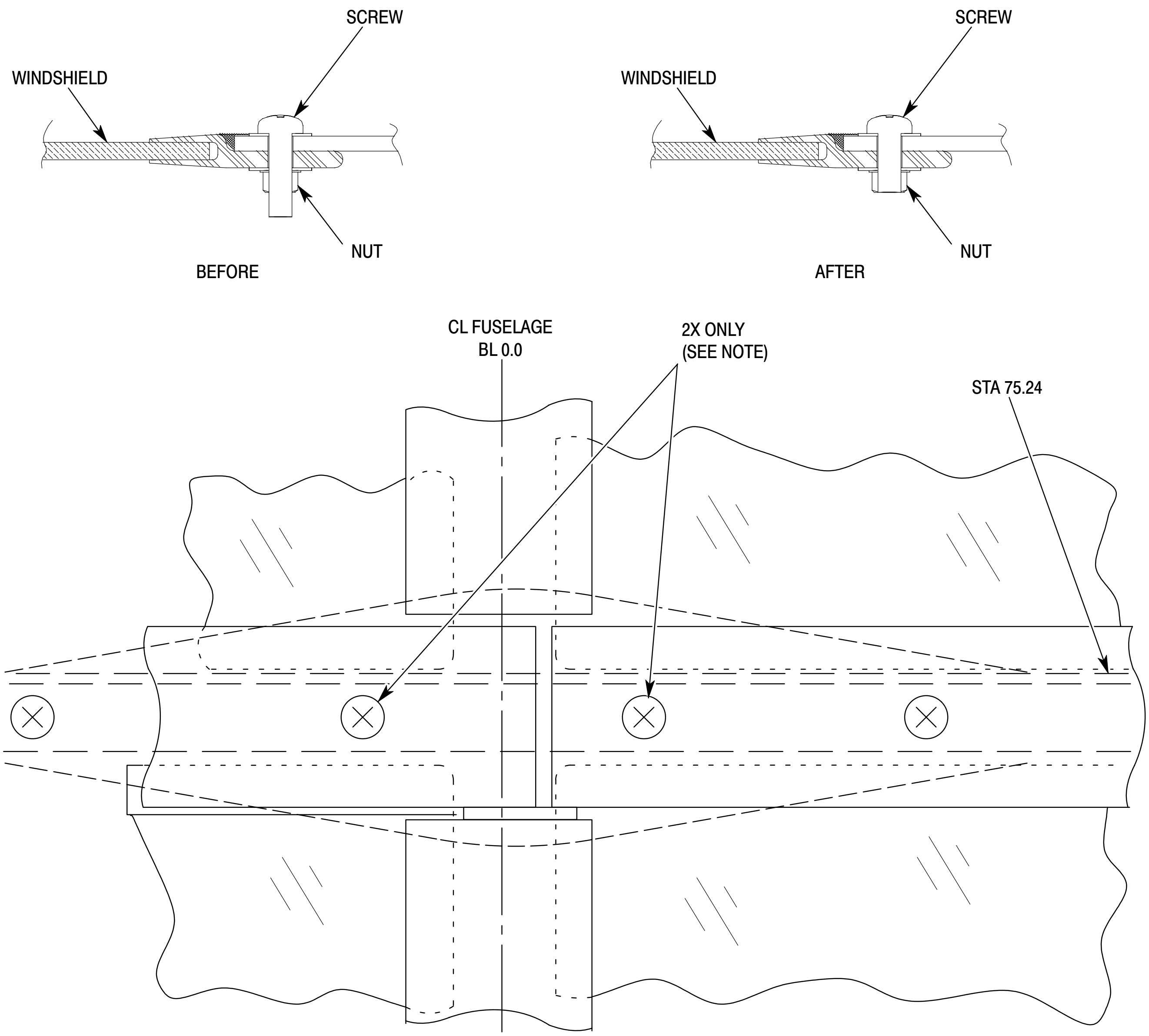


Figure 203. Windshield Installation (New Style)

NOTE:
SCREW LENGTH INTERFERES WITH INSTALLATION OF AIR DUCT INSIDE COCKPIT.

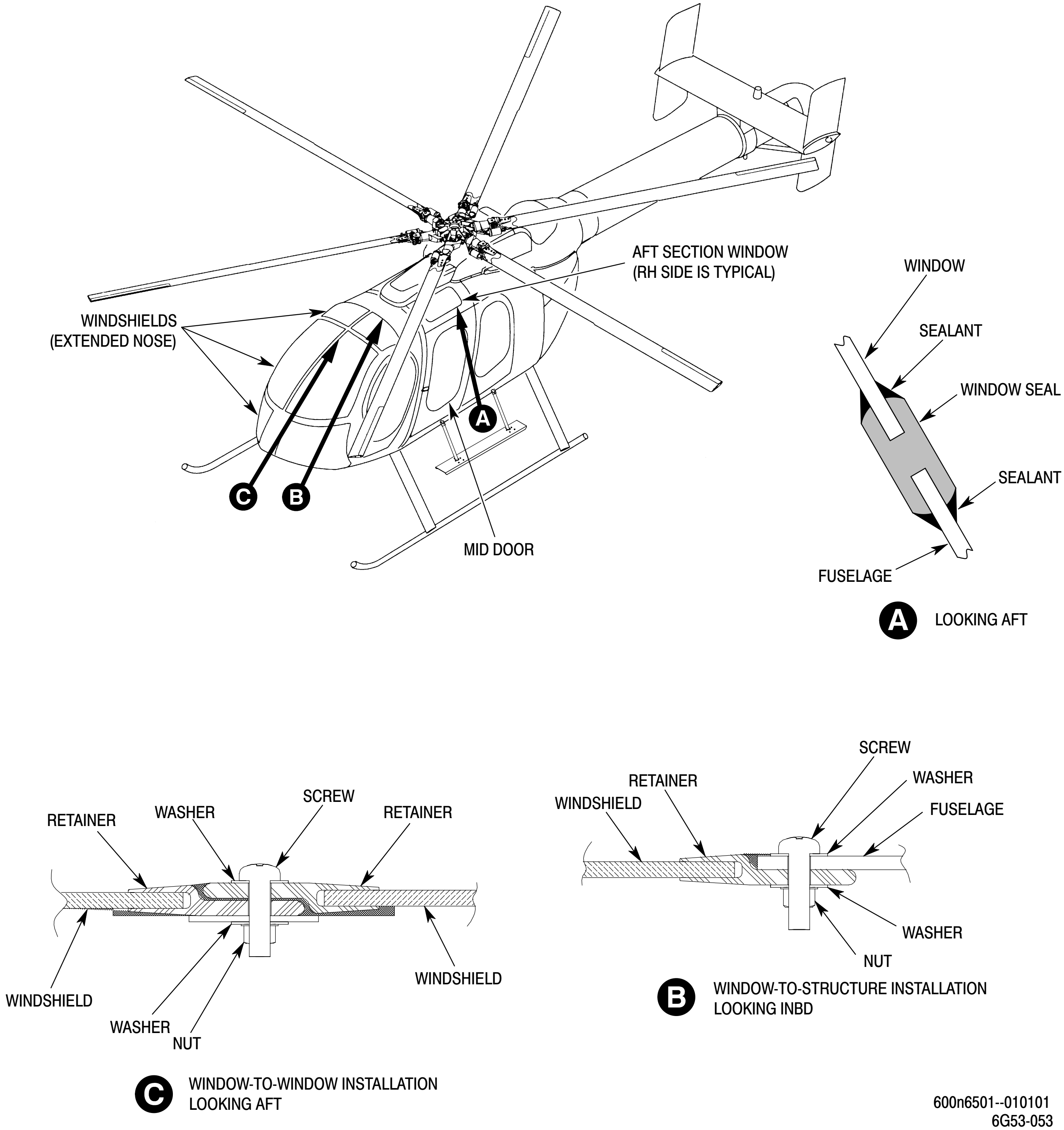


Figure 204. (Extended Nose) Windshields and Aft Section Windows (New Style)

Section

53-20-00

Lower Center Fuselage

LOWER CENTER FUSELAGE MAINTENANCE PRACTICES

1. Lower Center Fuselage - General

(Ref. Figure 201) Lower center fuselage is those areas below fuselage floor level (WL 13.10) on both sides of the center beam and between Sta. 78.50 and Sta. 124.00.

(Ref. Figure 202) The Lower Center Fuselage for the Model 600N helicopter is similar to that of the 500 Series helicopters except for the additional stretched or extended fuselage ″plug″ station. The extended lower center fuselage section is located at Sta. 78.50 (designated P. Sta. 0.00 thru 30.00) (Ref. Section 06-00-00). Additional floor access covers for the fuel cell are also contained within this section of fuselage.

2. Lower Center Fuselage Inspection

(1). Ref. FAA AC 43.13-1A Aircraft Inspection and Repair and Structural Repair Manual for standard sheet metal repair.

(2). Inspect electrical harnesses and wiring for frayed insulation and grounding terminals for corrosion.

(3). If cargo floor is bent or punctured, remove appropriate fuel cell access cover and inspect fuel cell.

(4). Perform repair (Ref. Fuel Tank Support Skins Repair (Fuel Cells Removed)).

3. Fuel Tank Support Skin Inspection (Fuel Cells Removed)

(1). Check security of fiberglass skin attachment to support angles and brackets.

(2). Inspect anti-abrasion tape for security of adhesion over rivet heads, all sharp edges and lap joints.

(3). Negligible damage (Ref. Table 201, 53-00-00).

4. Fuel Tank Support Skins Repair (Fuel Cells Removed)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM711	Tape, pressure sensitive

(1). Repair fuel tank support skins according to applicable instructions in FAA AC 43.13-1A & 2A or Structural Repair Manual.

(2). Cover exposed rivet heads with 10 mil by 1 inch (2.54 cm) tape (CM711) to prevent chafing fuel cell fabric.

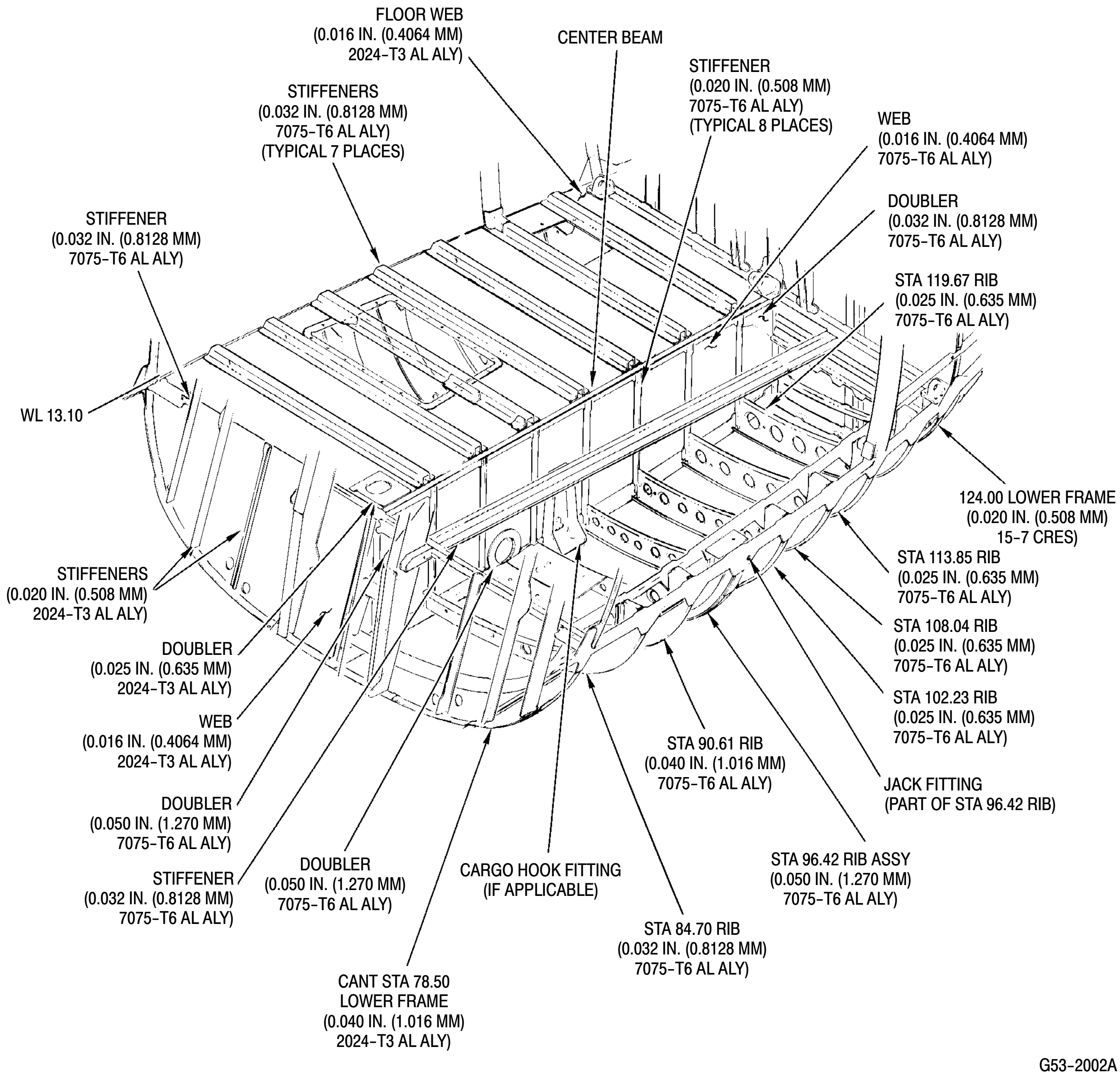


Figure 201. Lower Center Fuselage (369D/E/FF - 500N)

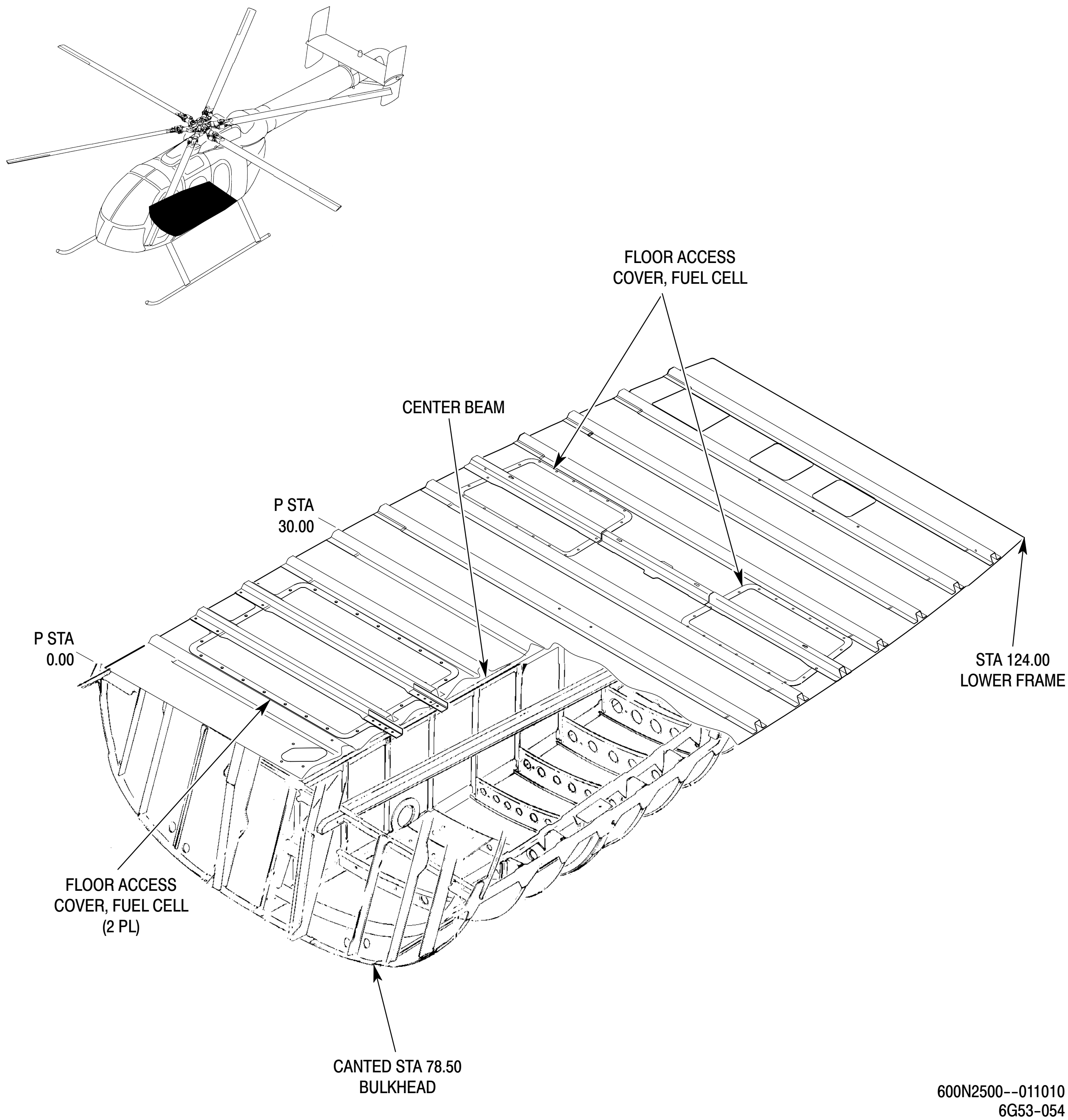


Figure 202. Lower Center Fuselage (Model 600N)

Section

53-30-00

Upper Aft Section Fuselage (369D/E/FF)

UPPER AFT SECTION FUSELAGE (369D/E/FF) MAINTENANCE PRACTICES

1. Upper Firewall Replacement

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM234	Solvent, dry-cleaning
CM721	Tape, aluminum foil

CAUTION Use care when working on or around firewall shell because of its light-weight construction.

(1). Remove tailpipes (Ref. Chap. 78, Exhaust System Replacement).

(2). Remove tape covering fasteners and firewall edges.

(3). Detach compressor cooling air duct support bracket (Ref. Chap. 71, Engine Cooling System Repair and Replacement). Remove firewall shell by pulling out button head fasteners (Ref. Figure 203).

(4). If burn marks are detected on firewall shell or button head fasteners, inspect airframe above burn marks for damage.

(5). Replace damaged or corroded fasteners.

(6). Replace aft firewall shell if damaged beyond practical repair. Trim replacement shell to fit installation. Allow sufficient trim excess for folding back to provide double thickness at attach points.

(7). Pierce fastener holes in new firewall shell to align holes in surrounding fuselage rings and waterline 34.96 rib.

(8). Place firewall shell in position and secure in place by pressing fasteners into holes. Attach compressor cooling air duct support bracket to hoist fitting (Ref. Chap. 75, Engine Cooling System Repair and Replacement).

(9). Using solvent (CM234), clean forward flanges, lower flanges and surface where tape routing covers fasteners; then apply tape (CM721).

(10). Install compressor cooling air duct support bracket.

(11). Install tailpipes.

2. Firewall and Plenum Chamber Panels Replacement

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM234	Solvent, dry-cleaning
CM419	Sealer

Replace all defective, torn or fraying soundproofing panels. Loose panels may be pressed back in place. (For part number identification of individual panels, refer to the IPC.)

(1). Open engine compartment access doors.

(2). Remove individual panels (Ref. Figure 201, Sheet 1 of 2) by pulling away from structure.

(3). (If applicable) Remove individual panels (Ref. Figure 201, Sheet 2 of 2) by removing fasteners.

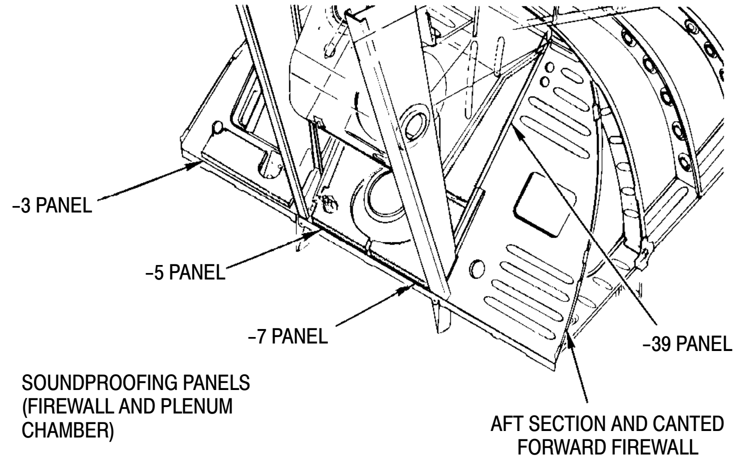
NOTE: Panels have pressure- sensitive tape backing.

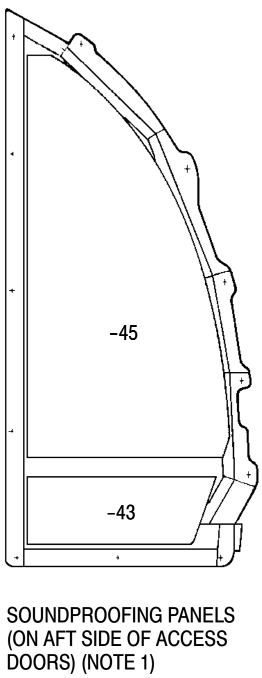
(4). Prior to installing replacement panel, clean surfaces with solvent (1, Table 201, 91-00).

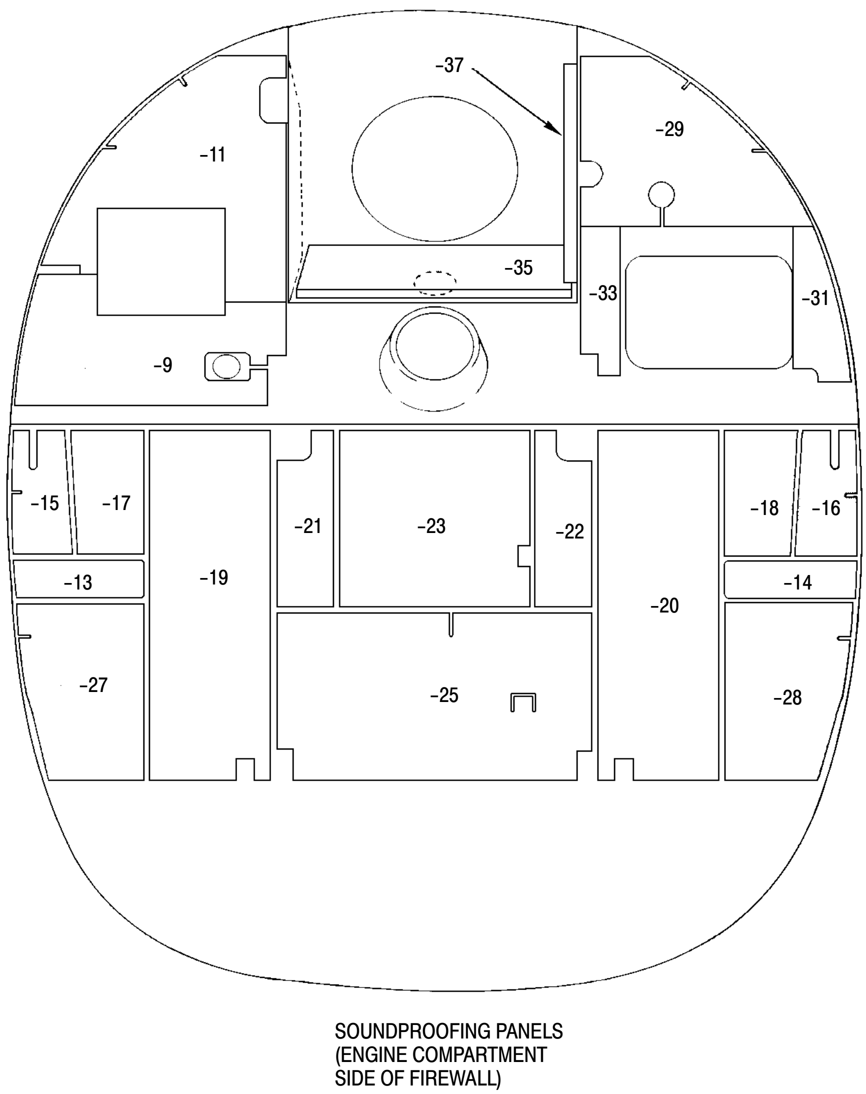
(5). Install replacement panel in place and trim edges as necessary. Press panel in place to secure.

(6). Seal edges of replacement panel with sealer (130).

(7). Reinstall trim (Ref. Sec. 25-30, Interior Trim Replacement) and close engine access doors.







NOTES:

1. RIGHT PANEL SHOWN. OPPOSITE SIDE LEFT PANEL (-41) IS SAME; EXCEPT MIRROR IMAGE AND A SOLID PANEL.
2. ALL DASH NUMBERS SHOWN APPLY TO BASIC PART NO. 369H2008. (EXAMPLE: -25 INDICATES PART NO. 369H2008-25.)

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Figure 201. Soundproofing Insulation - Firewall and Plenum Chamber (Sheet 1 of 2)

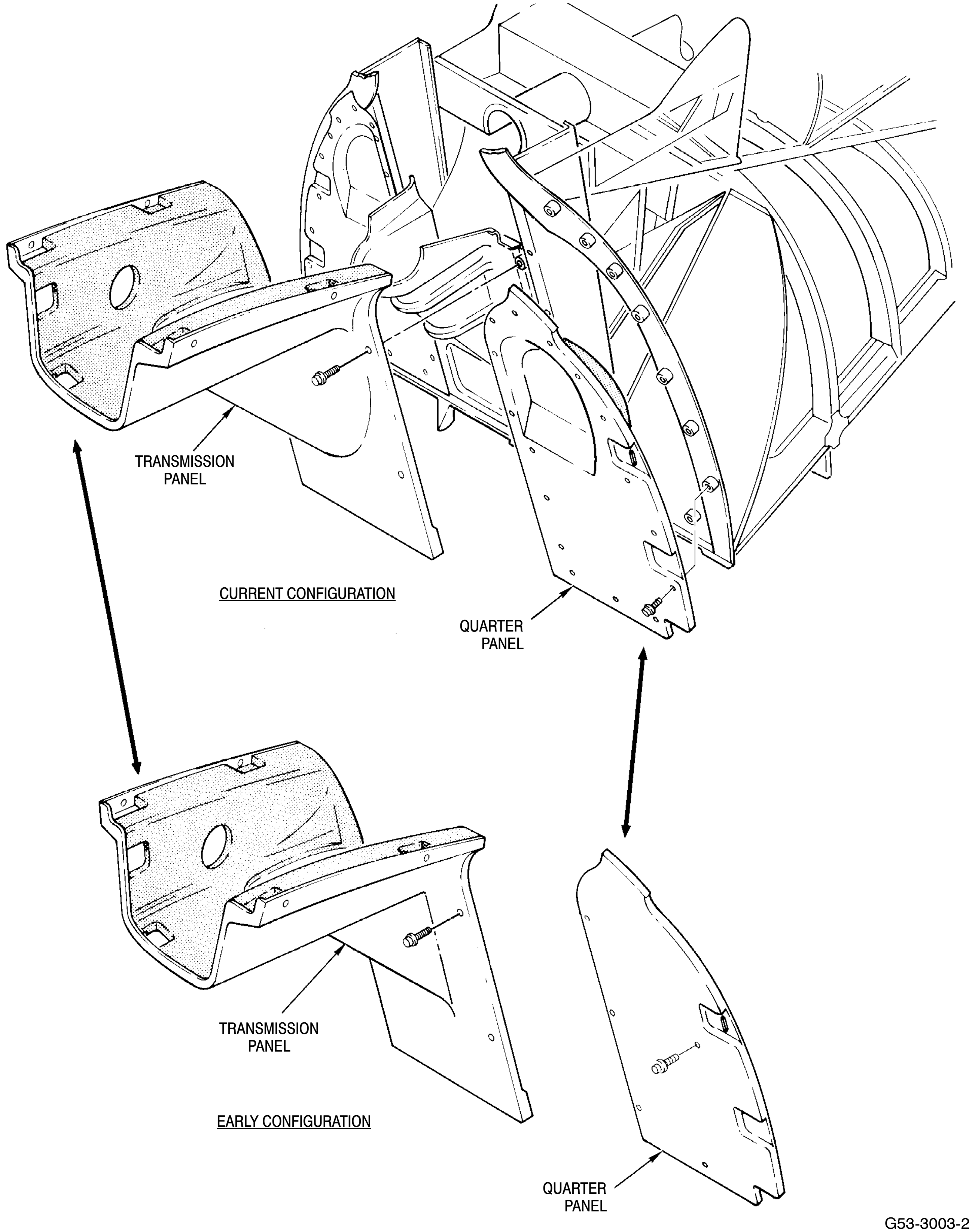


Figure 201. Soundproofing/Insulation - Firewall and Plenum Chamber (Sheet 2 of 2)

A. Mast Support Structure

(Ref. Figure 202) The mast support structure is part of the fuselage structure and is composed of two longitudinal forged fittings, a lower pan and an aft pan. The mast support structure supports and mounts the main rotor mast.

3. Mast Support Structure Inspection

Accomplish the following inspection at specified intervals (Ref. Chap. 05).

CAUTION When working near or around engine air and cooling inlets, use care to prevent entry of foreign objects (Ref. Sec. 71).

(1). Remove left and right sections of air inlet forward fairing (Ref. Engine Inlet Fairing Replacement).

(2). Remove interior trim (Ref. Sec. 25-30, Interior Trim Replacement) and main gearbox access cover (same section).

(3). Detach control tunnel cover from structure and slide out of way.

NOTE: Use bright light and 5-power magnifying glass to carefully inspect areas described in steps below for evidence of cracks. (Ref. Figure 202).

(4). Inspect visible areas of mast support fitting, mast base and mast tube, with particular attention to base attachment areas and shaded areas.

(5). Inspect both side of channels on aft canted bulkhead from mast support fitting down to waterline 34.00 with particular attention to points of attachment.

(6). Inspect side channels and fore and aft webs of controls tunnel, from mast support fitting down to top of pilot's seatback (canted bulkhead waterline 45.36).

(7). Clean and inspect any suspected area; use dye-penetrant to determine if a crack does exist. If a crack is found, part must be replaced.

(8). Inspect mast support structure for corrosion, loose bolts and rivets and general condition of finish.

(9). Check that mast support structure pan drain hole is open.

(10). Reinstall controls tunnel cover.

(11). Reinstall left and right forward sections of air inlet fairing (Ref. Engine Inlet Fairing Replacement).

(12). Reinstall main gearbox access cover and trim.

4. Main Rotor Mast Replacement

A. Main Rotor Mast Removal

(Ref. Figure 202)

CAUTION The main rotor mast is highly stressed. Do not allow tools to strike mast or mast to strike any object. Any impact damage may require replacement of mast.

(1). Remove main rotor hub.

(2). Remove main rotor controls.

(3). On aircraft equipped with the 369D25100 main transmission, proceed as follows:

(a). Remove main transmission.

NOTE: Nuts securing studs have left- hand threads.

(b). Remove four studs, washers and nuts.

(c). Remove shaft support hold-down nuts, washers and bolts.

(4). On aircraft equipped with the 369F5100 main transmission, proceed as follows:

(a). With assistance, remove main transmission.

(b). Remove bolts from inner mast base holes.

(5). Lift main rotor mast from helicopter.

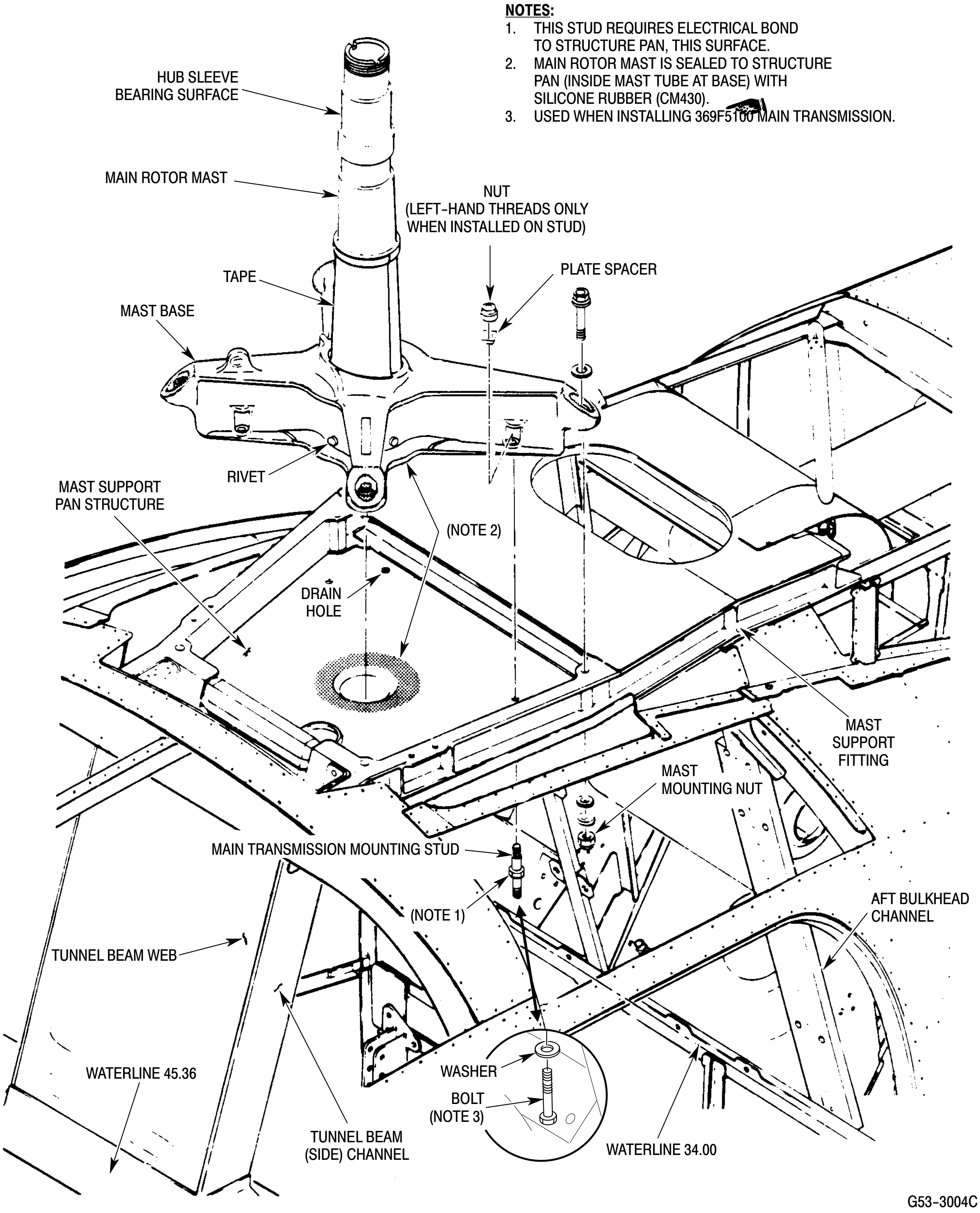


Figure 202. Main Rotor Mast and Support Structure

B. Main Rotor Mast Installation

(Ref. Figure 202)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM306	Lacquer, clear
CM430	Sealant, solvent resistant

(1). Apply silicone sealant (CM430) to bottom surface of mast tube and at drive shaft opening of mast support structure.

(2). Position main rotor mast so that holes in base align with holes in mast support structure.

(3). On aircraft equipped with the 369D25100 main transmission, proceed as follows:

(a). Install hold-down bolts, washers and mast mounting nuts; torque nuts to **700 - 820 inch-pounds (79.09 - 92.65 Nm)**.

NOTE: Check underside of mast support structure at left aft stud hole location. Stud-to-pan doubler surface must be clean to bare metal for electrical bonding.

(b). Install main transmission mounting studs, plate spacers and nuts; torque studs to **160 - 190 inch-pounds (18.08 - 21.47 Nm)**.

(c). Using a 0.001-0.0015 inch (0.0254-0.0381 mm) feeler gage, check for gap between self-locking nuts and plate spacer; no gap is allowed.

(d). If gap exists, remove nut and replace with new self-locking nut. Torque studs into replacement nuts to **160 - 190 inch-pounds (18.08 - 21.47 Nm)** and repeat step (c). Seal bare bond area with clear lacquer (CM306).

(e). Install main transmission.

(4). On aircraft equipped with the 369F5100 main transmission, proceed as follows:

(a). Install bolts, washers, plate spacers and nuts in inner bolt holes. Torque bolts to **160 - 190 inch-pounds (18.08 - 21.47 Nm) plus drag torque**.

(b). Using a 0.001-0.0015 inch (0.0254-0.0381 mm) feeler gage, check for gap between self-locking nuts and plate spacer; no gap is allowed.

(c). If gap exists, remove nut and replace with new self-locking nut. Torque bolts into replacement nuts to **160 - 190 inch-pounds (18.08 - 21.47 Nm)** and repeat step (b). Seal bare bond area with clear lacquer (CM306).

(d). With assistance, lift transmission in place and install washers and nuts on bolts. Torque nuts to **900 - 1100 inch-pounds (101.69 - 124.28 Nm) plus drag torque**.

(5). Install main rotor controls.

(6). Install main rotor hub.

5. Main Rotor Mast Inspection

(Ref. Figure 202)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM115	Grease, oscillating bearing

(1). Inspect all areas of main rotor mast for cracks, nicks, scratches and evidence of impact damage.

(2). Inspect bearing surfaces for scoring and galling.

(3). Inspect threads for damage.

(4). Inspect rivets that secure base-to-mast tube for security.

(5). Check that tape on forward edge of mast tube is secure and undamaged; replace if defective.

NOTE: To inhibit corrosion of mast when operating in salt water environment, check tape at frequent intervals. Also, apply thin grease film (CM115) to bearing journals.

A. Firewalls

(Ref. Figure 203) A shell-like aft section upper firewall surrounds the upper portion of engine combustion chamber and exhaust pipe assembly. The design contains engine heat as well as any fire that might develop within the engine compartment. Upper firewall is thin, 0.0015 inch (0.0381 mm) thick sheet, rigidized CRES sheet covered with double thickness of nonflammable ceramic fiber blanket.

6. Firewalls Inspection

No unrepaired damage is permissible. (For repairs to forward firewall, Ref. FAA AC 43-13-1A & 2A or Structural Repair Manual.) For repairs of the upper firewall (Ref. Silver Brazing Upper Firewall Shelf Patch).

(1). Inspect forward firewall for punctures and corrosion.

(2). Inspect upper firewall for punctures, corrosion and evidence of contact with discoloration. If contact with discoloration is observed on the firewall attachment button heads, remove the upper firewall and inspect the attach frames for discoloration or damage; contact MDHI for further directions.

(3). Inspect for complete seal around openings for overrunning clutch, engine compressor air inlet and oil cooler.

A. Firewall, Station 124.00 Insulation and Soundproofing

(Ref. Figure 201, Sheet 1 of 2) Engine compartment forward firewall is insulated and soundproofed for heat and noise reduction in passenger/cargo compartment.

7. Firewall and Plenum Chamber Soundproofing Panel Inspection

(Ref. Figure 201, Sheet 1 of 2 and Figure 203)

(1). Remove trim (Ref. Sec. 25-30-00, Interior Trim Replacement) for access to passenger/cargo compartment firewall areas. Open engine access doors to inspect engine compartment panels.

(2). Check for defective, torn, loose or missing panels.

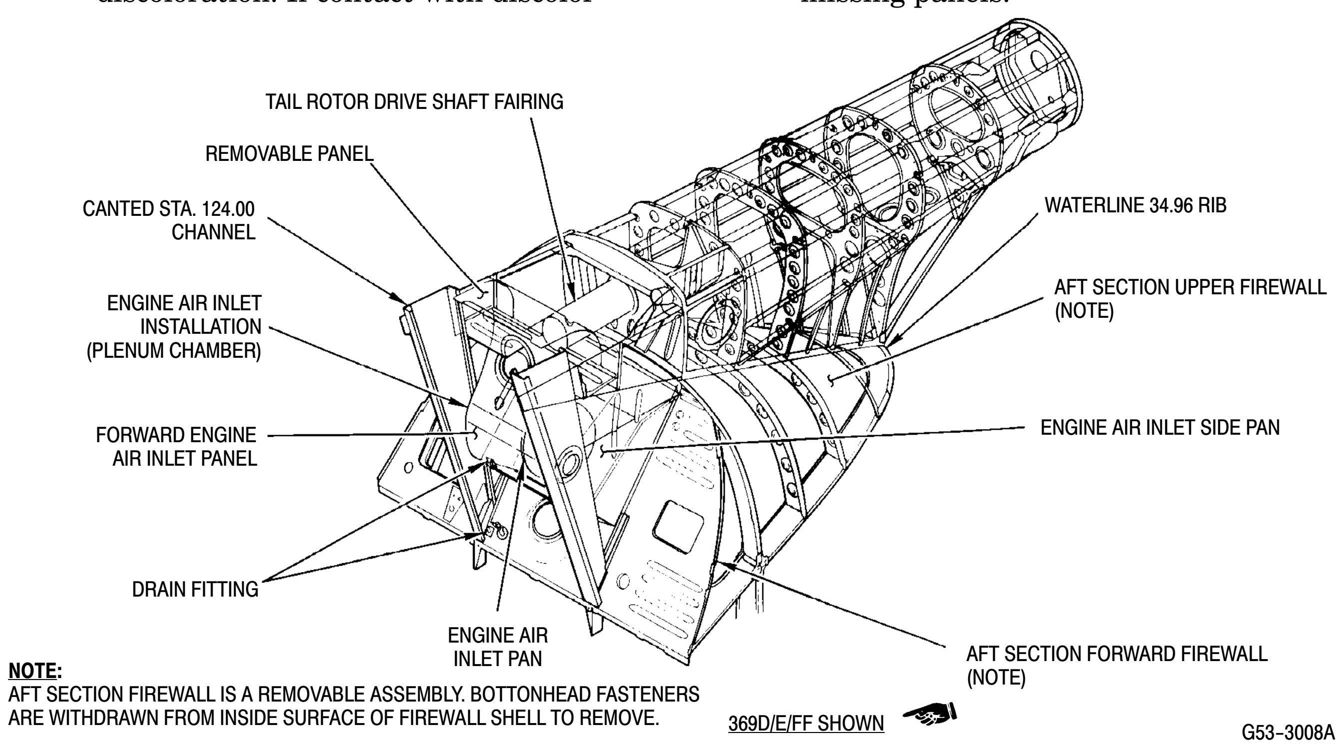


Figure 203. Firewall and Aft Section

(3). Inspect aft firewall for security, punctures and corrosion.

(4). Check that all individual panels are securely attached to firewall and plenum areas with no loose edges.

(5). Check panels in passenger compartment of defects, tears, looseness, or missing panels.

(6). For applicable repairs refer to Plenum Chamber Hole Sealing reference.

A. Engine Air Inlet Fairing

The engine air inlet fairing on top of the fuselage structure directs ambient outside air to the engine air inlet and oil cooler blower. The fairing installation consists of a forward fairing section and an aft fairing section. Right and left halves of forward fairing are removable. The aft fairing is riveted to fuselage structure. A UHF/VHF antenna is bonded to the aft vertical face and is part of aft fairing.

8. Engine Air Inlet (Plenum Chamber) Inspection

(1). For access, open bypass door on right side of engine air inlet and engine compartment access doors for view of rear side of plenum (Ref. Figure 203).

(2). Inspect all panels for evidence of corrosion, security of rivets and punctures.

(3). Inspect engine air shield mounting clips for secure attachment.

(4). Inspect aft section strut for rivet corrosion and edge clearance where it passes through cutout in forward panel. For applicable repairs (Ref. Aft Section Strut Repair).

(5). Ensure that removable forward panels are secure. Inspect rubber seals for security and partial compression.

(6). Inspect drive shaft tube fairing for dents, buckled or wrinkled areas and signs of corrosion.

(7). Close engine compartment access doors and two air inlet access doors.

A. Upper Aft Section General Repair

Ref. FAA AC 43.13-1A & 2A and Structural Repair Manual for additional repair procedures.

B. Aft Fuselage Fittings

Mast support structure fitting and fuselage boom fairing frame fitting are critical fatigue-loaded parts. Any damage in excess of negligible limits specified in (Ref. Aft Section Strut Repair) requires replacement of part.

C. Aft Fuselage Fittings General Repair

Repair of cast and forged fittings should only be temporary and be performed only when replacement components are not immediately available. Replacement of bushings or inserts that become part of fitting assembly are considered insertion repairs. (Insertion repairs are described in FAA AC 43.13-1A & 2A and Structural Repair Manual.)

(1). Negligible Damage (Ref. Table 201, 53-00-00).

(2). Replacement. Replace fittings according to Structural Repair Manual.

9. Aft Section Strut Repair

Repair of strut is limited to smoothing out minor dents, scratches or nicks. Replace strut if it is badly damaged according to Structural Repair Manual.

10. Silver Brazing Procedure - Upper Firewall Shell Patch

(Ref. Figure 204)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM234	Solvent, dry-cleaning
CM721	Tape, aluminum foil
CM817	Brazing flux
CM818	Brazing alloy

(1). Remove aft section upper firewall (Ref. Upper Firewall Replacement).

(2). Remove tape and ceramic fiber blankets from firewall shell.

(3). Clean firewall shell with stiff bristle brush moistened with solvent (CM234) and wipe dry with clean, dry cloth.

(4). Smooth out rigidized pattern in area on which patch will be brazed.

(5). Cut suitable repair patch for Type 321 stainless steel sheet in thickness range of 0.0015-0.0018 inch (0.0381-0.04572 mm).

(6). Contour patch to match contour of firewall shell repair area.

CAUTION Use only stainless steel wire brush in next step. Particles from bristles of other metals can contaminate the patch area and cause brazing to fail.

(7). Use stainless steel wire brush to clean and abrade inner and outer surfaces of stainless steel patch and firewall.

(8). Rinse patch and firewall shell thoroughly with clean water and allow to air dry.

(9). Coat surfaces to be joined with a thin even coating of silver alloy brazing flux (CM817).

(10). Use clamp or other suitable device to hold patch in place during brazing operation.

CAUTION Use extreme care not to overheat and burn through firewall shell.

(11). Braze patch in place with Class 8 silver brazing alloy (CM818), using suitable torch to heat patch area to temperature moderately above 1295°F (707°C) flow point of brazing alloy.

(12). Allow joint to cool for at least 60 seconds before removing clamping device.

(13). Remove flux by immersing repaired area in water at 160°-212 °F (72°-101 °C) for 40 minutes.

(14). Thoroughly rinse in clear, running water; air dry, or wipe dry with clean, dry cloth.

(15). Install ceramic blanket on outer surface of firewall shell.

(16). Install aft section upper firewall shell (Ref. Upper Firewall Replacement).

(17). Install tape (CM721) on flanges of firewall shell.

11. Plenum Chamber Hole Sealing

(Ref. Figure 204)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM418	Cement, epoxy
CM424	Sealing compound
CM713	Tape, pressure sensitive

CAUTION All tape must be applied to outside of inlet surfaces, so that any subsequently loosened tape cannot enter plenum chamber to cause engine damage.

(1). Using 10 mil by 1 inch (2.54 cm) pressure-sensitive tape (CM713), tape all 0.130 inch (3.302 mm) diameter or larger holes.

(2). Using sealant (CM424), seal all holes less than 0.130 inch (3.302 mm) diameter.

(3). Rebond loose rubber seals with adhesive (CM418) according to container instructions.

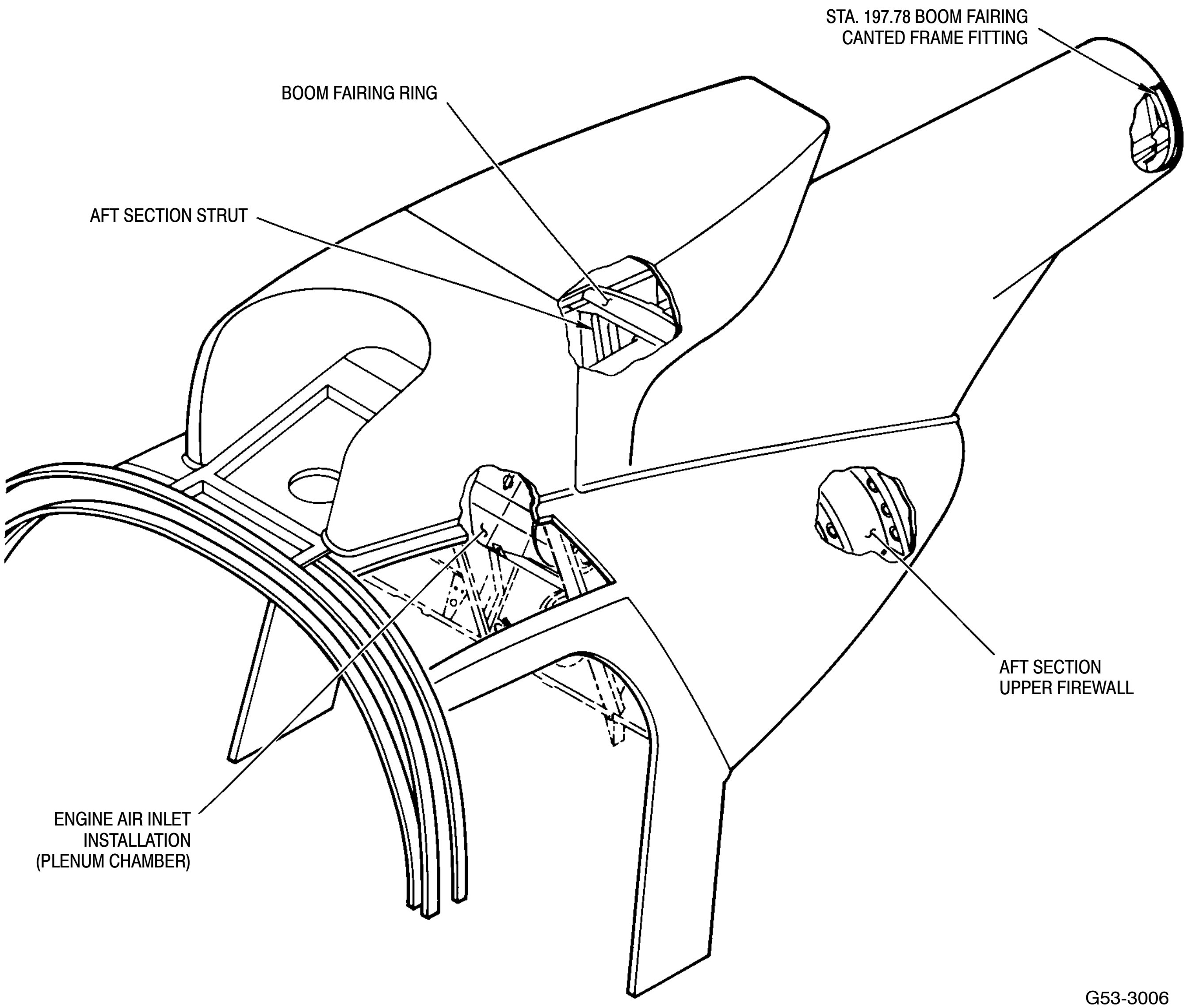


Figure 204. Major Bulkheads and Structural Members - Aft Fuselage

12. Forward Fuselage Section Structure Rework

(Ref. Figure 205) The following information is a procedure for installing support assemblies to the fuselage frame structure to provide reinforcement at the forward attach points for the engine inlet fairing assemblies.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

(1). Remove engine inlet forward fairing assemblies from helicopter (Ref. Engine Inlet Fairing Replacement).

(2). Remove interior trim panels and wire harnesses, as applicable, to gain access to work area at forward area at forward attach nutplate assembly for L/H and R/H engine inlet forward fairings.

(3). Remove existing forward nutplate (for both L/H and R/H fairing assemblies) from fuselage frame structure.

(4). Inspect upper fuselage skin for cracks or damage at area of forward nutplate attachment holes. Also inspect repair doublers if, previously installed, on upper fuselage skin.

NOTE: If cracking or damage to fuselage skin or repair doublers is noted, perform the following:

(a). Stop drill all cracks or remove damaged skin area or damaged repair doublers prior to rework. Perform all work in accordance with FAA AC 43.13-1A, Aircraft Inspection and Repair.

(b). Field fabricate and install doublers on outer fuselage skin. Drill 0.196-0.204 inch (4.978-5.182 mm) diameter hole in each doubler to match existing hole in fuselage skin for fairing attach screw. Use existing rivet pattern as shown; install MS20470AD3 rivets with primer (CM318).

(c). Prime and paint double to match finish color of helicopter.

(5). Inspect fuselage frame structure (channel) for cracks or damage at forward nutplate attach areas.

NOTE: If no cracking or damage to fuselage frame is noted, install 80-369D22400-3 and -4 support assemblies at FWD side of frame structure using rivets. Drill holes in support assemblies for nutplates and for conduit clearances as required. Install nutplate rivets (MS20470AD3) through support, frame, upper skin and doubler, if installed.

(6). If cracking or damage to fuselage frame is noted, perform the following:

(a). Stop drill all cracks or remove damaged area prior to installation of repair angles and support assemblies. Perform all work in accordance with FAA AC 43.13-1A, Aircraft Inspection and Repair.

(b). Field fabricate and install repair angles at AFT side of fuselage frame structure (channel) and install 80-369D22400-3 and -4 support assemblies at FORWARD side of frame structure using MS20470AD3 rivets. Drill 0.096 inch (2.4384 mm) diameter holes in angles to match support assemblies.

(c). Drill holes in support assemblies and repair angles for nutplates and for conduit clearance as required. Install nutplate rivets through support, frame, angle, upper skin and doubler, if installed.

(7). Check installation of 80-369D22400-3 and -4 assemblies and repair angles and doublers, if installed, for discrepancies.

(8). Reinstall removed components.

13. Transmission Compartment Air Baffle, Seal and Cover Initial Installation

(Ref. Figure 206) (Serial No. 0003D thru 0333D only)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
N/A	Calking compound
CM425	Sealing compound
CM712	Tape, pressure sensitive

(1). Remove engine air inlet forward fairings.

(2). Remove cooling fan inlet screen.

(3). Remove aft compartment interior trim panels and blower access door.

(4). Install PN 369D26541-19 upper baffle assembly as follows;

(a). Position baffle between main transmission and mast support structure. Align four attach holes in baffle with existing holes in structure.

(b). Install baffle with screws, washers and nuts. Seal screw heads with sealant (CM425).

(5). Install PN 369D26542 lower baffle to upper baffle with two screws and washers at matching nutplates in upper baffle.

(6). Disconnect 5/8 inch (15.875 mm) diameter drain tube at mast support base and insert tube though hole in baffle. Safetywire drain tube to structure.

(7). Reinstall blower access door.

(8). Position and install PN 369D26543-11 and -12 seal assemblies at lower baffle and blower access door as shown. Install seal assemblies with screws and washers at matching clipnuts on lower baffle and on blower.

NOTE: If excessive gap, 0.060 inch (1.524 mm) or more, exists between structure and rubber extrusion on seals, fill gap by bonding strip of adhesive- backed gasket to structure.

(9). Position PN 369D26545-11 and -21 cover assemblies as shown; align cover attach holes with existing fairing attach nutplates. Temporarily secure cover assemblies with screws and washers, 5 places each.

(10). Using caulking compound, seal all gaps between fuselage structure and baffle; seal and cover assemblies.

(11). Remove screws securing cover assemblies. Reinstall engine air inlet forward fairings.

(12). Reinstall aft compartment trim.

(13). For helicopters equipped with Rotor Brake Kit, perform the following;

NOTE: Not applicable if modified rotor brake handle trim cover panel has already been installed.

(a). Carefully trim modified trim cover panel assembly (for LH or RH rotor brake handle assembly). Locate and drill screw attach holes in modified panel.

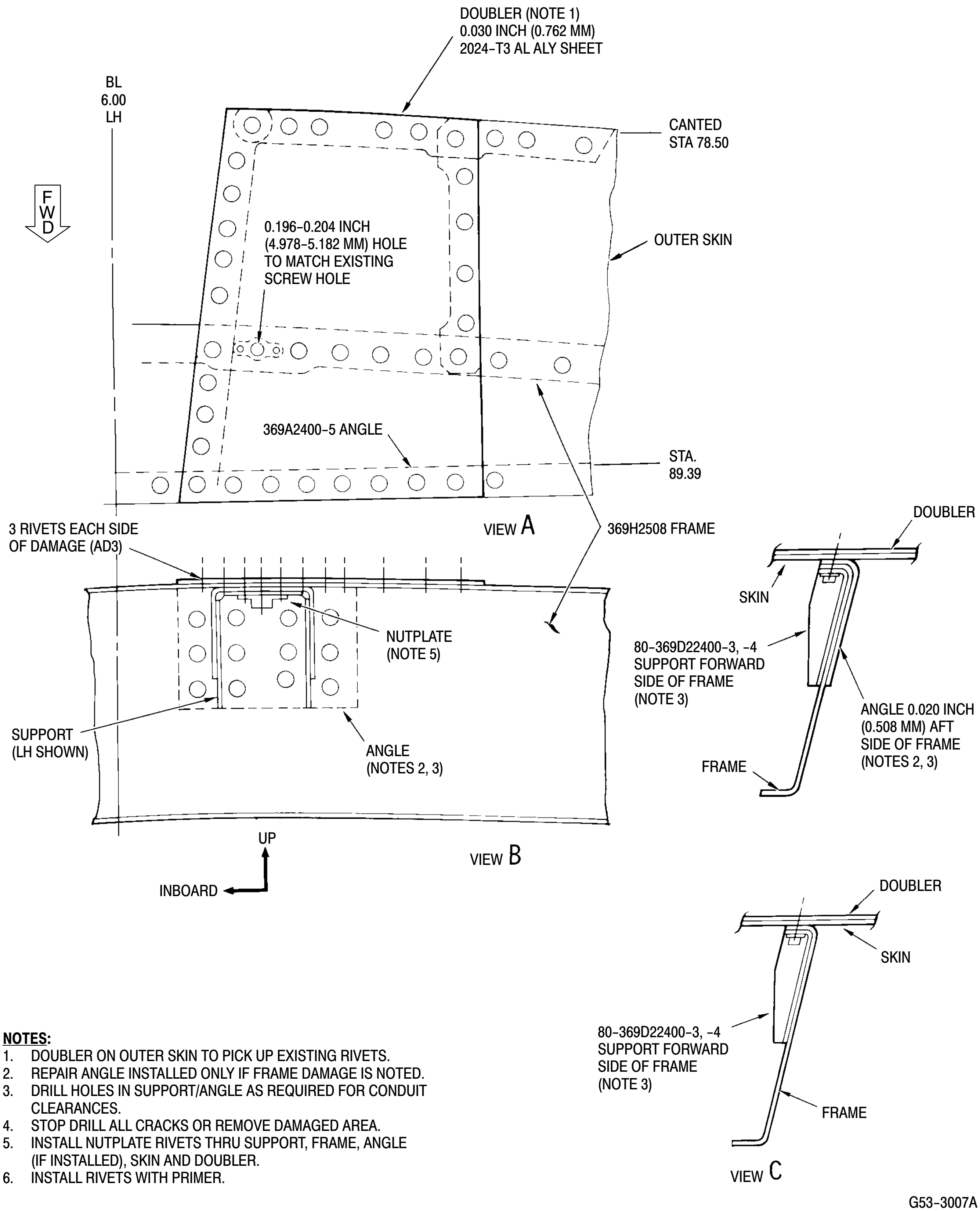
(b). Slide modified trim panel boot over brake handle. Align screw holes and check panel for fit. Remove panel and make minor trim adjustments as required.

(c). Install panel if removed and secure panel with attaching hardware.

(d). Push panel boot aft on brake handle approximately two inches and secure with fastener tape.

Table 201. Weight and Balance Data

Weight		Arm		Moment	
lbs	(kg)	inches	(cm)	in-lbs	(kg-mm)
+1.5	(+0.681)	110.2	(279.908)	+169	(+1947.0828)



NOTES:
1. DOUBLER ON OUTER SKIN TO PICK UP EXISTING RIVETS.
2. REPAIR ANGLE INSTALLED ONLY IF FRAME DAMAGE IS NOTED.
3. DRILL HOLES IN SUPPORT/ANGLE AS REQUIRED FOR CONDUIT CLEARANCES.
4. STOP DRILL ALL CRACKS OR REMOVE DAMAGED AREA.
5. INSTALL NUTPLATE RIVETS THRU SUPPORT, FRAME, ANGLE (IF INSTALLED), SKIN AND DOUBLER.
6. INSTALL RIVETS WITH PRIMER.

Figure 205. Forward Fuselage Section Structure Rework

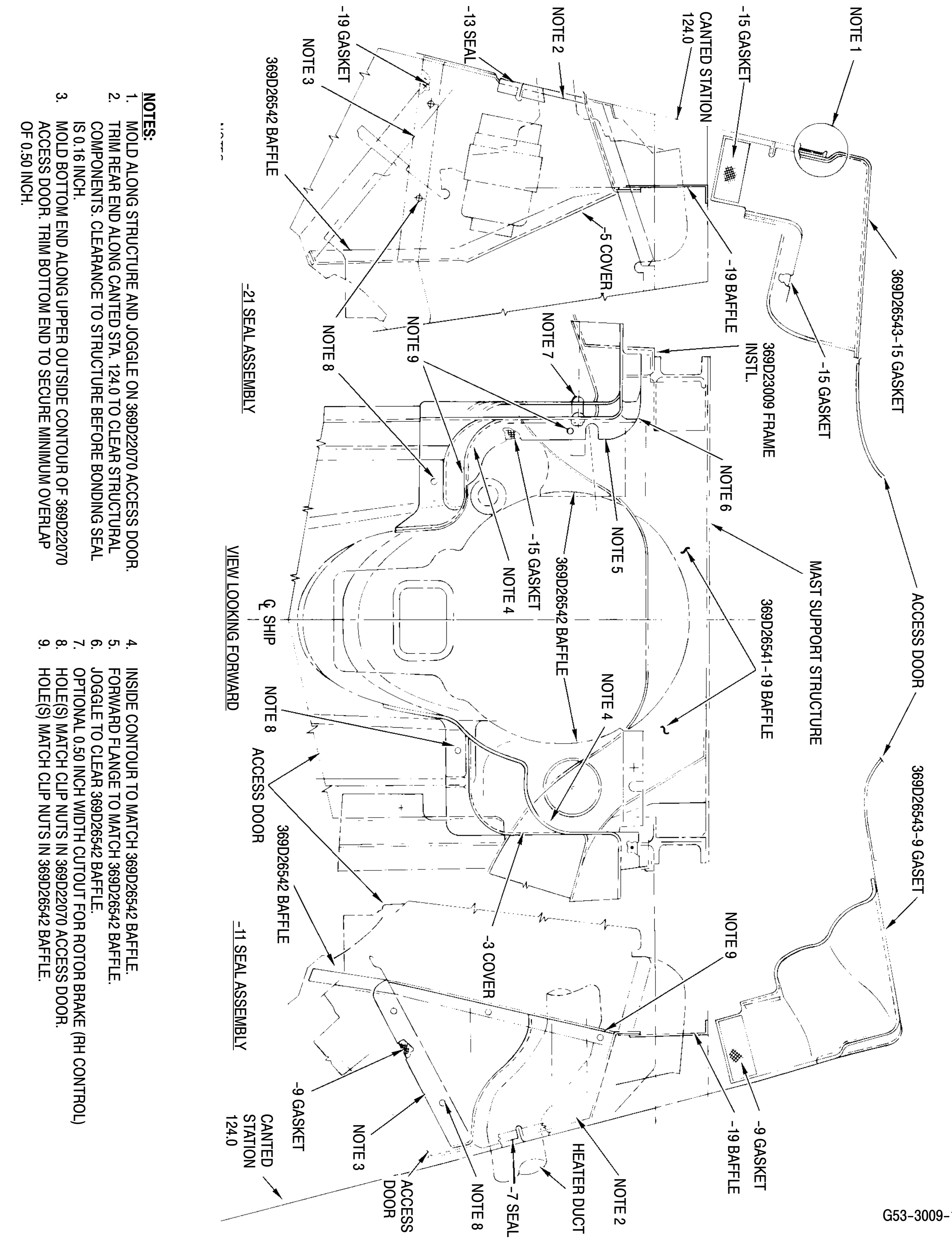
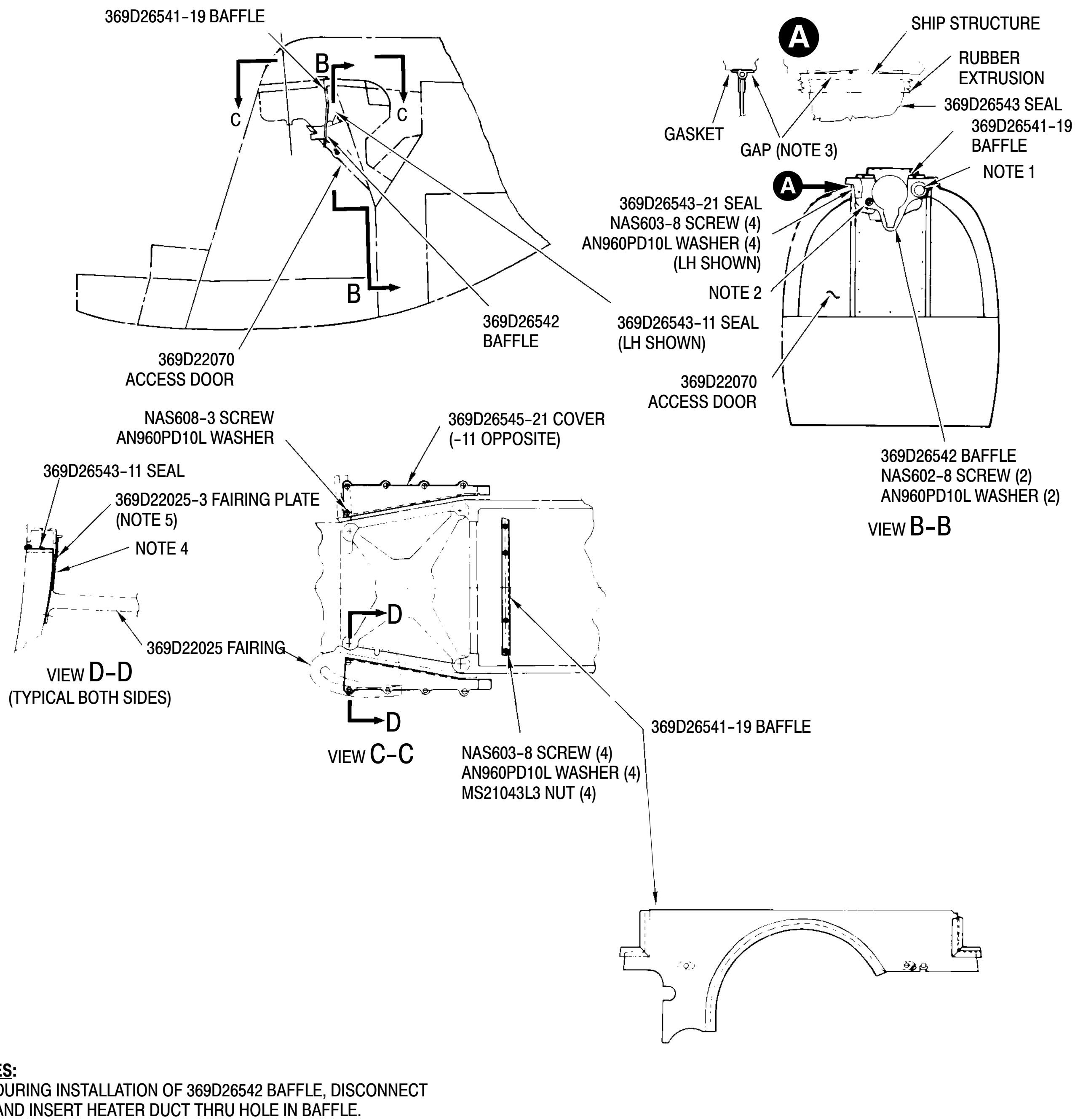


Figure 206. Installation of Air Baffle, Seal and Cover Assemblies (Sheet 1 of 2)



NOTES:
1. DURING INSTALLATION OF 369D26542 BAFFLE, DISCONNECT AND INSERT HEATER DUCT THRU HOLE IN BAFFLE.
2. AFTER 369D26542 BAFFLE IS INSTALLED, DISCONNECT AND ROUTE DRAIN TUBE THRU HOLE IN BAFFLE.
3. IF EXCESSIVE GAP (0.06 X 1.00 OR MORE)EXISTS BETWEEN STRUCTURE AND RUBBER EXTENSION ON SEALS, FILL GAP BY BONDING STRIP OF ADHESIVE-BACKED GASKET TO STRUCTURE.
4. NO. 10 SCREW HOLE IN FAIRING ON SHIPS. DO NOT USE THIS HOLE TO INSTALL COVER OR FAIRING.

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Figure 206. Installation of Air Baffle, Seal and Cover Assemblies (Sheet 2 of 2)

Section

53-30-30

Upper Aft Section Fuselage (500/600N)

UPPER AFT SECTION FUSELAGE (500/600N) MAINTENANCE PRACTICES

NOTE: For all the following items, refer to Sec. 53-30-00.
Upper Firewall
Firewall and Plenum Chamber Panels
General Inspection
Mast Support Structure
Main Rotor Mast
Firewalls
Firewall Insulation and Soundproofing

1. Engine/Anti-Torque Air Inlet Fan Fairings

CAUTION When working near or around engine air and cooling inlets, use care to prevent entry of foreign objects.

(Ref. Figure 201) On the 500N, the engine air inlet fairing on top of the fuselage structure directs ambient outside air to the engine air inlet and the oil cooler blower. The fairing installation consists of a forward fairing section and an aft fairing section. Right and left halves of forward fairing are removable.

(Ref. Figure 202) On the 600N, the engine air inlet fairing on top of the fuselage structure directs ambient outside air to the engine air inlet bypass door and the oil cooler blower. The fairing installation consists of a forward inlet fairing sections and an aft fairing section. The controls cover and right and left halves of forward fairing are removable.

On the 600N, the engine inlet or particle separator is mounted aft of the inlet fairings and wraps around the engine plenum for increased air flow due to the larger engine installation.

The aft section consists of an air inlet screen on top of the fuselage structure which directs ambient air to the anti-torque fan assembly. The engine plenum access cover bolted to the fuselage and is removable to provide access to the engine plenum, particle separator and mist eliminator (optional equipment) if installed.

The engine plenum access cover on the 600N helicopter mounts to the aft end of the particle separator/bypass door frame. The plenum cover directs air downward for the engine air intake and when removed provides access to the engine plenum chamber area. With the installation of a particle separator, ejector outlets are positioned on each side of the plenum cover.

On the 500N, the R/H side of the aft fairing is the inlet bypass door which remains on the fuselage when the aft fairing is removed.

On the 600N, the inlet bypass door is just aft of the mast assembly and just forward of the engine plenum access cover.

A removable fan hub and transmission gear box fairing is also located in the fan plenum chamber.

For general maintenance practices for the upper aft section (Ref. Sec. 53-30-00).

2. Engine Air and Fan Inlet (Plenum Chamber Area) Inspection

(Ref. Figure 201 and Figure 202)

CAUTION Avoid FOD, Cover compressor inlet prior to working in plenum chamber area. Vacuum all FOD debris out of the plenum chamber before removing the protective cover from the inlet bell. Severe damage to the engine may result from entry of foreign objects.

(1). Open the plenum chamber bypass door by pulling the handle located in the cockpit. Open the engine access doors to inspect the rear side of the plenum panels.

(2). For access, remove the fan air inlet screen and engine plenum fairing assemblies.

(3). Inspect all panels for evidence of corrosion, punctures and security of rivets and fasteners.

(4). Inspect the engine air inlet bypass door attaching hardware and installation (Ref. Sec. 71-10-10, Engine Air Intake System).

(5). Inspect engine air shield mounting for secure attachment.

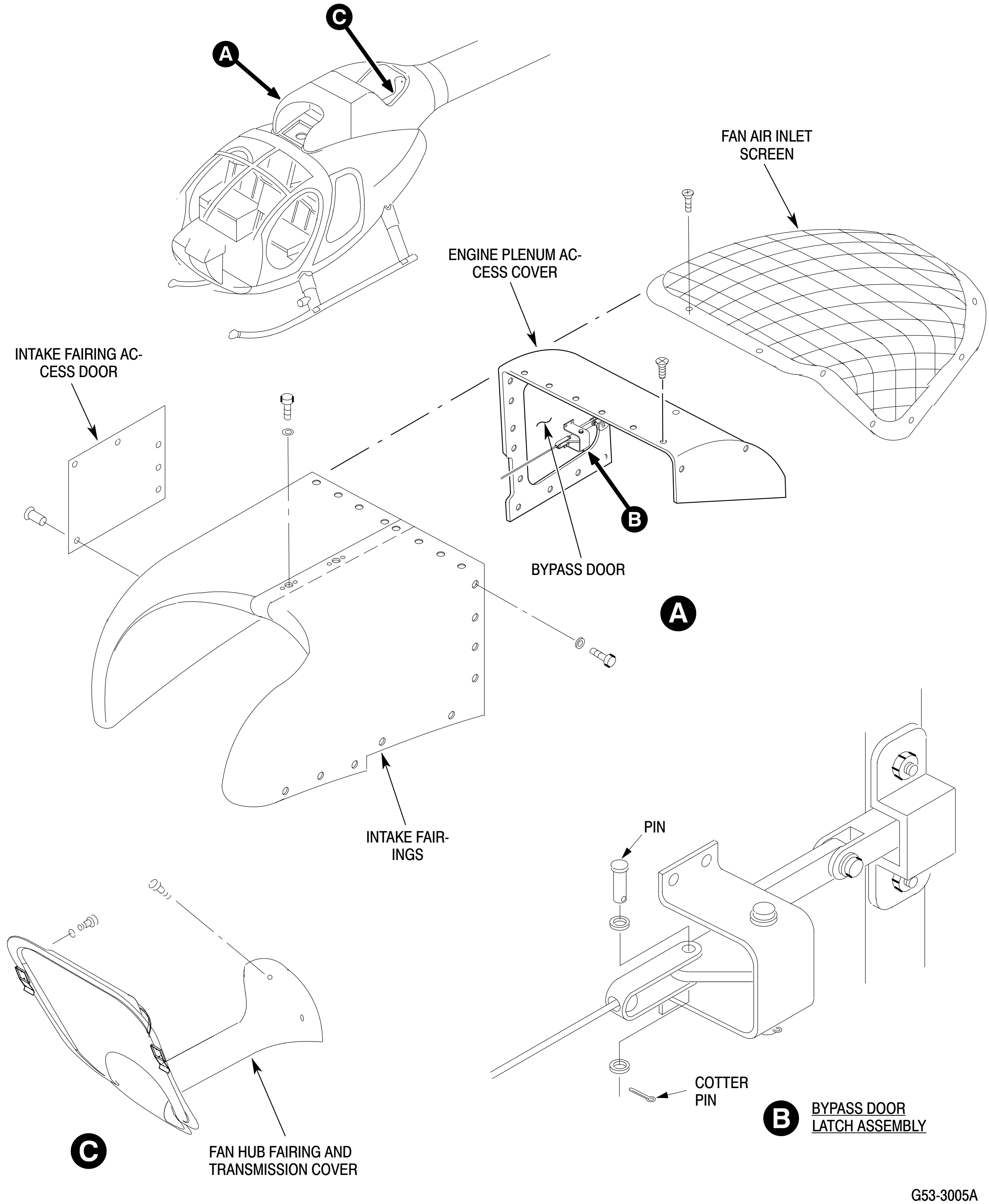


Figure 201. Upper Aft Section (500N)

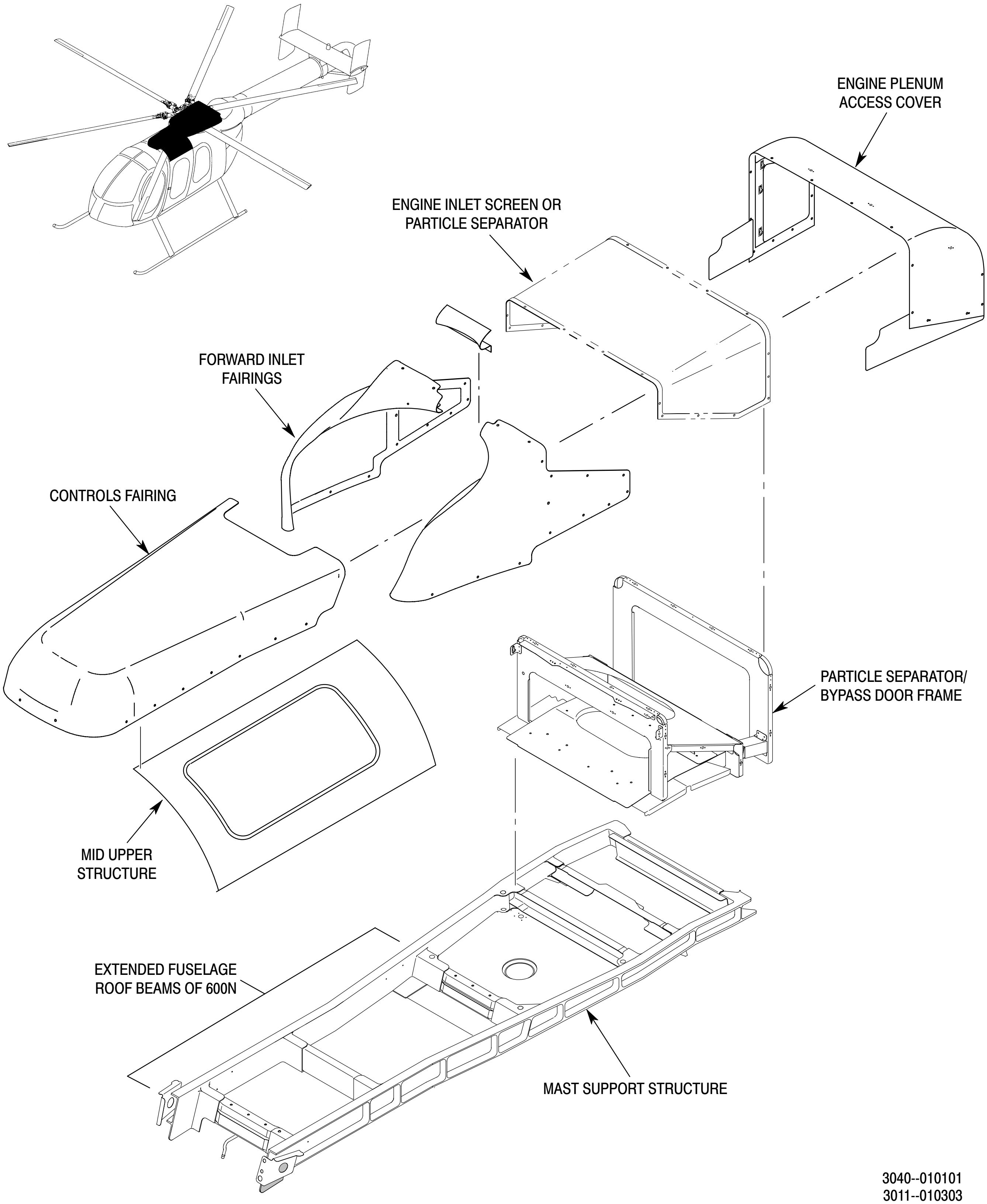


Figure 202. Upper Aft Section Fuselage (600N)

(6). Inspect aft section strut for rivets corrosion and edge clearance where it passes though cutout in forward panel.

(7). Inspect engine air cooling inlet screen for damage, seal deterioration and security.

(8). Inspect fan transmission driveshaft tube fairing and access panel for dents, buckled or wrinkled areas and signs of corrosion.

(9). Inspect the fan inlet screen mesh for condition and security.

(10). If fan inlet screen needs repair, re-welded using 0.063 inch (1.600 mm) annealed cres 302 or 304 wire per AMS5336 or AMS5639.

(11). Visually inspect through the fan inlet screen for security of the transmission fairing and FOD.

(12). Ensure that forward removable inlet fairings and engine access doors are secure.

A. Upper Aft Section General Repair

(Ref. FAA AC 43.13-1A & 2A and Structure Repair Manual for additional repair procedures.

3. Upper Fuselage Controls Fairing (600N)

The Upper Fuselage Controls Fairing covers the flight control rods that travel longitudinally aft along the roof of the fuselage for the rotor collective and cyclic controls.

4. Upper Fuselage Controls Fairing Replacement (600N)

The Upper Fuselage Controls Fairing is made of a lightweight Kevlar fabric and is used on the 600N installation only.

A. Upper Fuselage Controls Fairing Removal

(1). Remove hardware that attaches upper fuselage controls fairing to mounting surfaces.

(2). Remove controls fairing.

B. Upper Fuselage Controls Fairing Installation

(1). Inspect upper fuselage controls fairing for cracks, delaminations and overall general condition.

(2). Position controls fairing to align with holes in mounting surfaces.

(3). Install attaching hardware.

5. Engine Inlet Fairings Replacement

The R/H and L/H engine inlet fairings are made of a lightweight Kevlar fabric and are used on the 500/600N installation only.

A. Engine Inlet Fairing Removal

(1). Remove hardware from left-hand inlet fairing and remove fairing.

(2). Remove hardware from right-hand inlet fairing and remove fairing.

B. Engine Inlet Fairing Installation

(1). Inspect fairings for cracks, delaminations and condition of pressure sensitive tape.

(2). Install right-hand inlet fairing and attaching hardware.

(3). Install left-hand inlet fairing and attaching hardware.

(4). Ensure that 1-1/2 threads protrude through nutplates.

6. Anti-Torque Fan Air Inlet Screen Replacement

A. Fan Air Inlet Screen Removal

(1). Remove attaching hardware and remove air inlet screen.

B. Fan Air Inlet Screen Installation

(1). Install air screen and attaching hardware.

7. Fan Hub and Transmission Cover Fairing Replacement

A. Fan Hub and Transmission Cover Removal

(1). Remove attaching hardware on the fan hub transmission fairing.

B. Fan Hub and Transmission Cover Installation

(1). Inspect fairing for cracks and general condition.

(2). Install attaching hardware.

(3). Check for minimum run-on torque of attaching screws, **2 inch-pounds (0.226 Nm) minimum**.

8. Engine Plenum Access Cover Replacement

CAUTION Avoid FOD, Cover compressor inlet prior to working in plenum chamber area. Vacuum all FOD debris out of the plenum chamber before removing the protective cover from the inlet bell. Severe damage to the engine may result from entry of foreign objects.

A. Engine Plenum Access Cover Removal

NOTE: If particle separator is installed, ejector ducting is not removed with plenum access cover.

(1). Remove hardware that attaches engine plenum access cover to supporting structure.

(2). Remove plenum cover.

B. Engine Plenum Access Cover Installation

(1). Position engine plenum access cover to align with mounting holes in fuselage.

(2). Install hardware attaching plenum cover to structure.

9. Tailboom Attach Fitting Inspection

(Ref. Figure 203) Inspect the upper left-hand and right-hand tailboom attach fittings, angles and nutplates as follows:

(1). Remove button plug from attach fitting access cover.

(2). Using a bright light, inspect fitting and angle:

(a). Inspect attach fittings for cracks.

NOTE: Pay particular attention to area around aft rivet holes. No cracks are allowed.

(b). Inspect angle for cracks.

(c). If any cracks are found in attach fitting or angle, contact MDHI Field Service Dept. for replacement instructions.

(3). Inspect nutplate for thread damage and cracks.

NOTE: Cracks would appear from top of self-locking nut split to base of nut.

(a). Replace nutplate if threads are damaged or cracked.

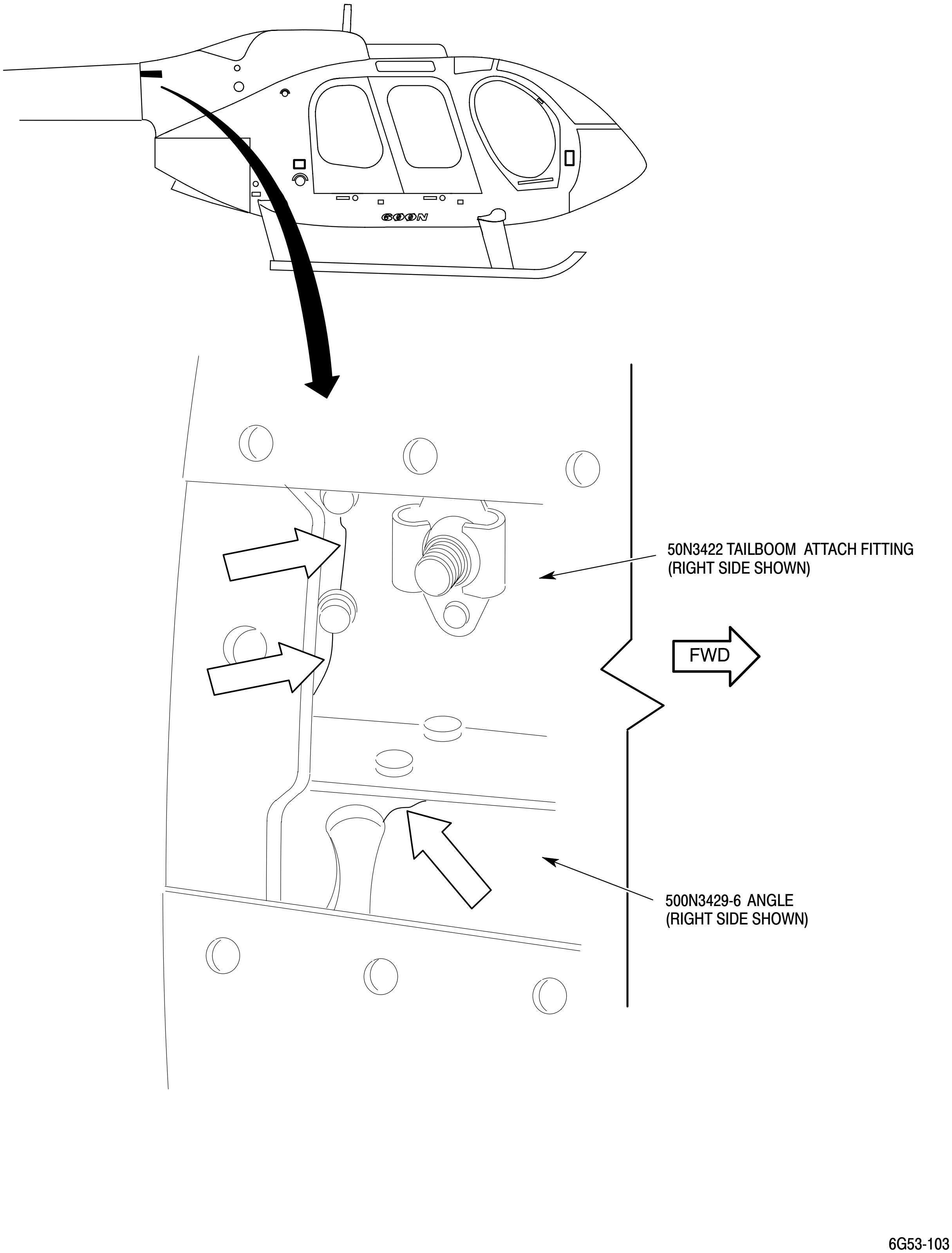


Figure 203. Tailboom Attach Fitting Inspection

10. Lower Longeron Inspection (L158, R158)

(Ref. Figure 204) Inspect the lower left-hand and right-hand longerons as follows:

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM425	Sealing compound

(1). Remove button plugs (L158, R158) from side of helicopter.

(2). Using bright light and mirror, or borescope, inspect the longeron, Sta. 155.75 frame and Cant. Sta. 159.97 frame for cracks.

(3). If any cracks are found, contact MDHI Field Service Dept. for repair instructions.

(4). Install button plugs in inspection hole and seal with sealing compound (CM425).

11. Forward Upper Longeron Inspection (L137, R137)

(Ref. Figure 204) Inspect the foreword upper left-hand and right-hand longerons as follows:

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM425	Sealing compound

(1). Remove button plugs (L137, R137) from side of helicopter.

(2). Using a borescope, inspect the longeron and Sta. 137.50 frame for cracks.

(3). If any cracks are found, contact MDHI Field Service Dept. for repair instructions.

(4). Install button plugs in inspection hole and seal with sealing compound (CM425).

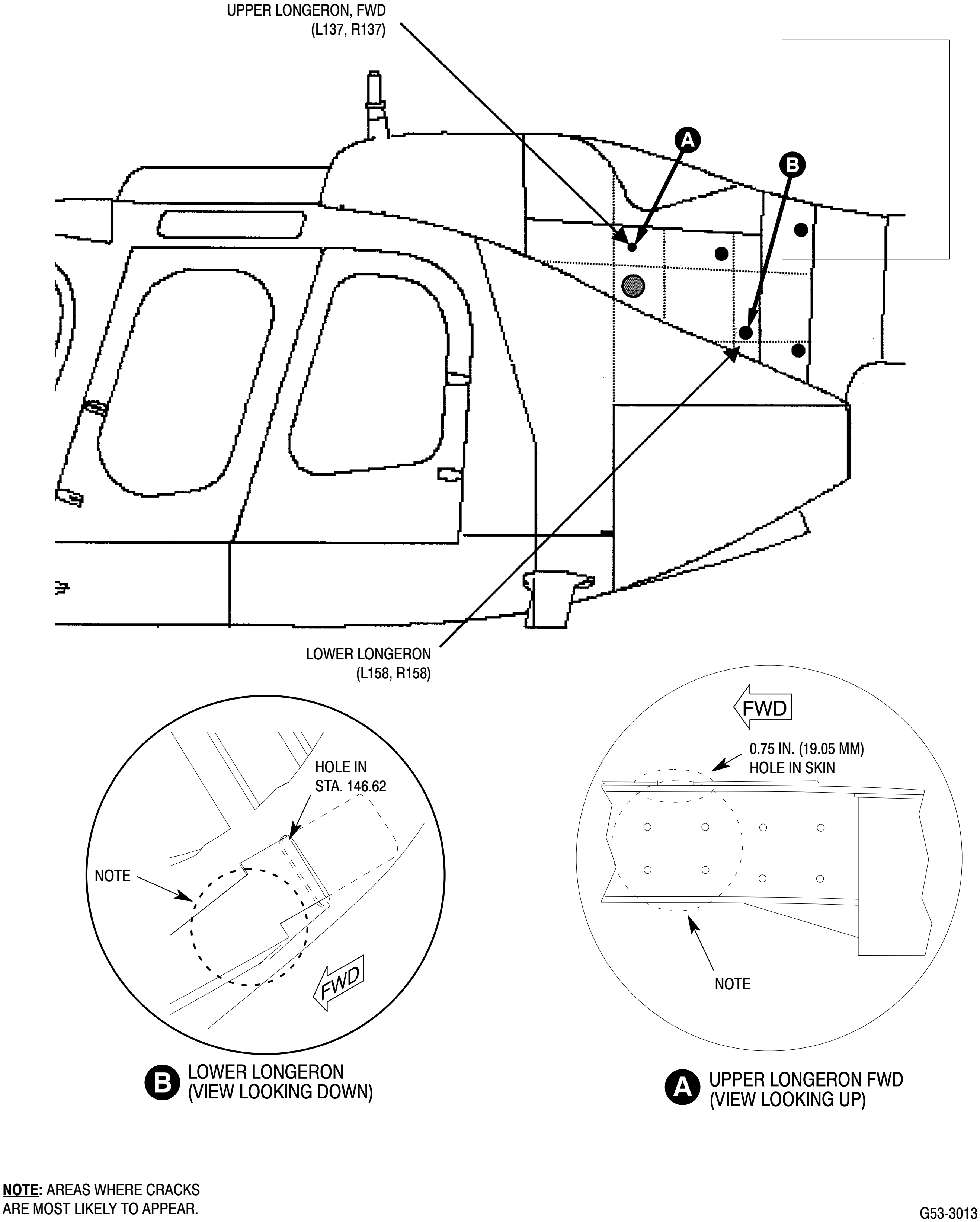


Figure 204. Inspection Hole Locations

12. Control Tunnel (FS 78.50) Beam Inspection

(Ref. Figure 205)

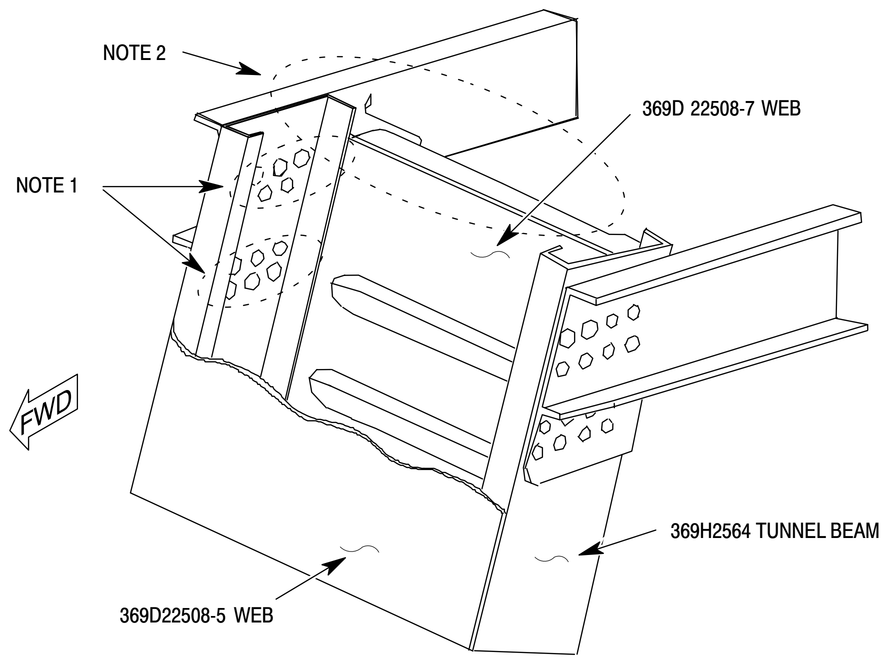
(1). Remove Ty-Raps securing boots to control tubes and shelf assembly.

(2). Slide boots up to top of tubes.

(3). Using a mirror and bright light, inspect tunnel beams, both sides, for cracks in the rivet area; no cracks allowed.

If cracks are found, contact MDHI field service department for repair instructions.

(4). Slide boots down over shelf assembly and secure top and bottom of boots with Ty-Raps.



NOTE:
1. INSPECT THESE AREAS FOR CRACKS (BOTH SIDES OF TUNNEL).
2. REMOVE CONTROL TUBE BOOTS TO GAIN ACCESS FOR INSPECTION.

G53-3014

Figure 205. Control Tunnel (FS 78.50) Beam Inspection

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Section

53-40-00

Tailboom

(369D/E/FF)

TAILBOOM
MAINTENANCE PRACTICES

1. Tailboom - General

(Ref. Figure 201) The tailboom assembly, a monocoque structure of aluminum skin over forged aluminum frames, houses the tail rotor drive shaft and tail rotor control rod, and supports the horizontal and vertical stabilizers.

2. Tailboom Replacement

A. Tailboom Removal

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST1005	Insertion/extraction tool
ST1006	Insertion/extraction tool

(1). Remove vertical stabilizer (Ref. Sec. 53-50-10).

(2). Remove tail rotor transmission and tail rotor drive shaft as a unit (Ref. Sec. 63-15-00).

(3). Remove tail rotor control rod (Ref. Sec. 67-20-10).

(4). (369FF Model Only) Remove tailboom extension (Ref. Tailboom Extension Replacement).

(5). Position suitable cradles under tailboom at Cant. Sta. 209.78 frame fitting and the forward stabilizer boom mounting frame (Cant. Sta. 273.00) (Ref. Figure 202).

CAUTION To avoid damage, ensure that boom is properly supported before removing boom attach bolts.

(6). Open boom bolts access doors and remove bond jumper from boom.

(7). Disconnect connector of chip detector wiring and night lighting system wiring. Disconnect knife splice by hand or use appropriate connector insertion/extraction tool (ST1005 or ST1006) for wire mate type connector.

(8). Remove nuts and washers from bolts that attach boom to fuselage. Remove lower bolts first and top bolt last; then remove boom.

B. Tailboom Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM103	Solid film lubricant

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST2010	Adapter, torque wrench

(1). Support tailboom so that mating bulkheads are flush.

NOTE: Prior to tailboom installation, coat threads of external wrenching bolts and attaching nuts with lubricant (CM103).

(2). Slide countersunk washers on external wrenching bolts with countersunk side facing bolt heads.

CAUTION If washers are installed backwards, structural failure may result due to insufficient surface in bearing that can cause spreading or cracking of washers and result in loss of clamp- up torque.

(3). Install bolts through aft section fuselage frame into boom frame and place flat washer(s) on each bolt as required for correct bolt grip. Use no more than three flat washers under each nut. Install nuts and torque only the nuts to **380 - 410 inch-pounds (42.93 - 46.32 Nm)**.

NOTE: Bolts may be reversed for access to torque nuts. Torque wrench adapter (ST2010) or a thin- walled deep socket is used for torquing.

(4). Install vertical stabilizer.

(5). (369FF Model Only) Install tailboom extension.

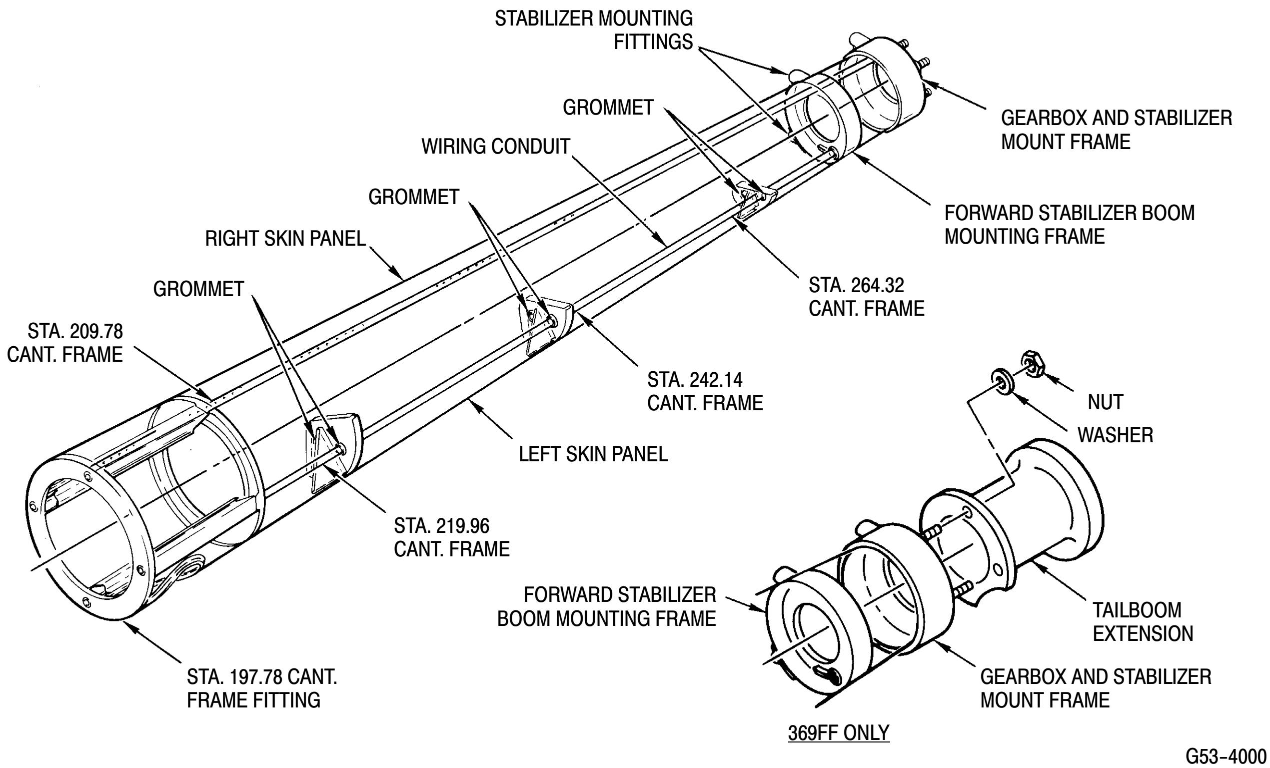


Figure 201. Tailboom Assembly and Tailboom Extension

(6). Install tail rotor transmission and tail rotor drive shaft as a unit.

(7). Install control rod.

(8). Perform tail rotor control rigging (Ref. Sec. 67-20-10).

(9). Install bond jumper to boom and connect chip detector wiring. Connect night lighting wiring.

3. Tailboom Extension Replacement (369FF)

(Ref. Figure 201)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

(1). Remove tail rotor transmission and tail rotor drive shaft as a unit (Ref. Sec. 63-15-00).

(2). Remove four nuts and four washers from tailboom assembly.

(3). Remove tailboom extension from tailboom assembly.

(4). Apply primer (CM318) in holes, on faying surfaces and on the grip area of the mounting studs and install tailboom extension while primer is still wet.

NOTE:

- Note the drag torque for each nut and it’s location on the extension, in the helicopter for later use.
- Torque nuts while primer is still wet.

(5). Install tailboom extension on tailboom assembly and secure with four washers and four nuts.

(6). Torque nuts to **75 - 95 inch-pounds (8.47 - 10.73 Nm) plus drag torque.**

(7). Apply torque stripe paint.

(8). Between 2 and 10 hours of helicopter operation (to allow parts to seat), check the torque of each mounting nut as follows:

(a). Using the drag torque previously measured and noted, apply a torque load of **95 ±3 inch-pounds (10.73 ±0.34 Nm) plus the noted drag torque** (noted at each individual nut) to each mounting nut of the extension.

(b). Re-apply torque stripe paint.

(9). Install tail rotor driveshaft and tail rotor transmission as a unit.

4. Tailboom Inspection

(Ref. Figure 201)

(1). Inspect boom interior skin and frames for corrosion and cracks.

(2). Check attaching nuts and bolts in boom Cant. Sta. 197.78 frame fitting for security.

(3). Inspect tail rotor control rod grommets in boom frames for evidence of deterioration.

(4). Inspect bond jumper for security and corrosion.

(5). Inspect boom exterior for loose or missing rivets.

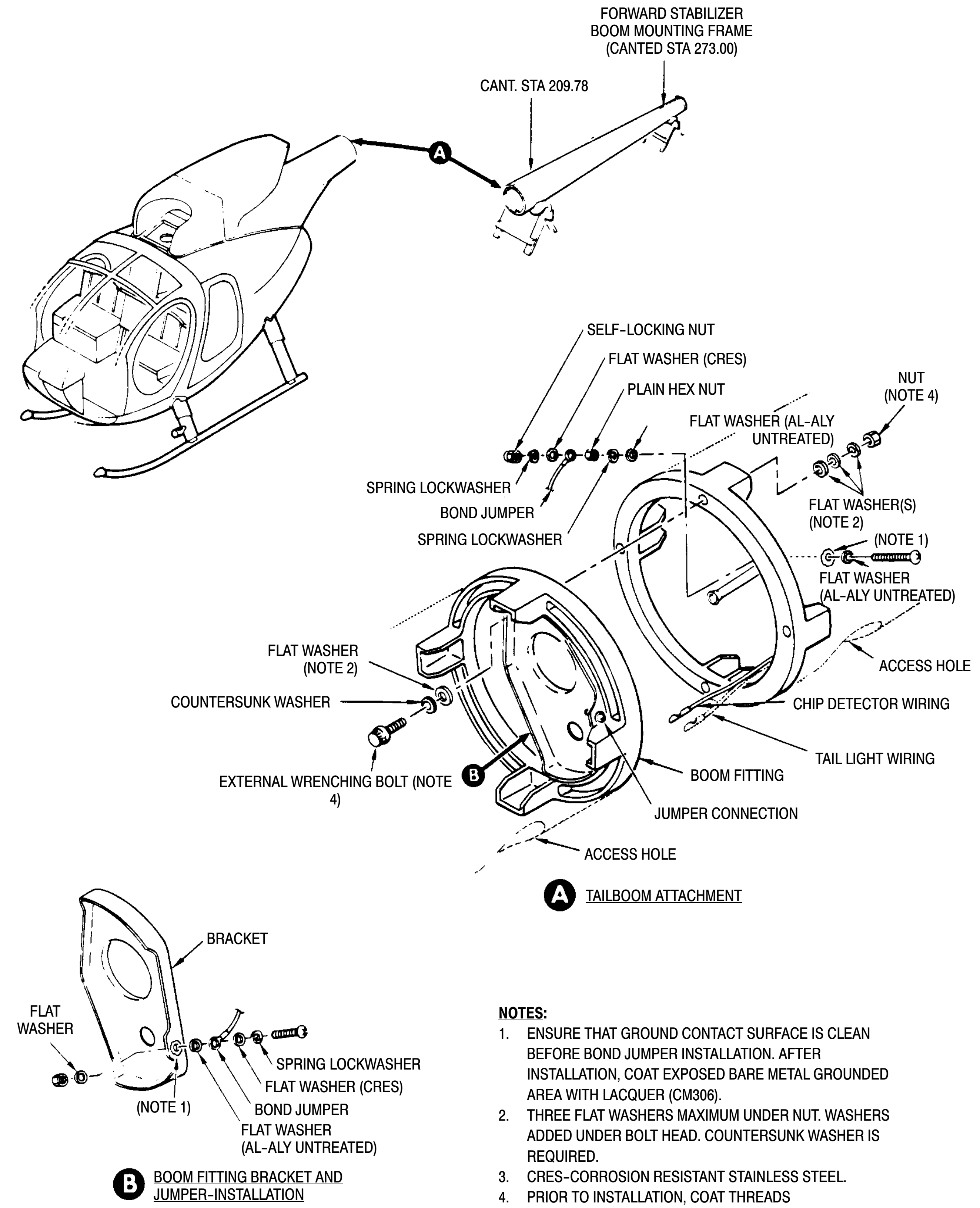
(6). Inspect boom and gearbox stabilizer mounting frames for cracks, security of attachment, elongated holes or condition of mounting studs.

(7). Replace damaged or deformed studs (Ref. CSP-SRM-6, Structural Repair Manual).

5. Tailboom Repair

CAUTION There is no damage that can be considered negligible. All damage must be repaired upon detection (Ref. CSP-SRM-6, Structural Repair Manual).

NOTE: The skins forming the monocoque boom assembly are highly stressed (Ref. Figure 201).



NOTES:

1. ENSURE THAT GROUND CONTACT SURFACE IS CLEAN BEFORE BOND JUMPER INSTALLATION. AFTER INSTALLATION, COAT EXPOSED BARE METAL GROUNDED AREA WITH LACQUER (CM306).
2. THREE FLAT WASHERS MAXIMUM UNDER NUT. WASHERS ADDED UNDER BOLT HEAD. COUNTERSUNK WASHER IS REQUIRED.
3. CRES-CORROSION RESISTANT STAINLESS STEEL.
4. PRIOR TO INSTALLATION, COAT THREADS WITH LUBRICANT (CM103).

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Figure 202. Tailboom Installation and Removal

Section

53-40-30

Tailboom (500/600N)

TAILBOOM (500/600N) MAINTENANCE PRACTICES

1. Tailboom Description

(Ref. Figure 201) The tailboom assembly is a fully monocoque construction of graphite composites, it provides directional control for the helicopter.

The tailboom for the Model 600N helicopter is a similar version to that on the Model 500N helicopter. One of the obvious differences is the length, approximately 28 inches (71.12 cm) longer on the 600N. Also, two of the four mounting bolts that hold the boom to the fuselage are a larger diameter. These two points have been reinforced both on the boom and on the fuselage for added strength.

(1). The tailboom converts energy from the main rotor downwash to an anti-torque force. In order to accomplish this, a variable pitch fan pushes low pressure air through two longitudinal slots on the right side of the tailboom and two thrusters ports at the end of the tailboom. These slots located at 130° and 76° degrees, direct low pressure air downward over the tailboom surface.

(2). Slot air flow mixes with main rotor downwash air, delaying its separation at the bottom of the tailboom and effectively creating a lifting force.

(3). Air from the main rotor passing over the boom provides directional control to neutralize the main rotor torque.

(4). Approximately 60% of the anti-torque force required in a hover, is provided by the tailboom lift, the remaining 40% is by metered air flowing out the end of the tailboom rotating thruster cone.

(5). A stationary thruster cone port directs air flow to the left or to the right.

(6). The rotating thruster cone (a can-shaped structure) meters exit air for left or right directional control.

(7). Pedal movement opens and closes the thruster cone ports and changes fan blade pitch angle for engine power changes.

(8). A Strake, a composite strip bonded to the left side of the tailboom, breaks up airflow on the left side of the boom for hovering stability.

(9). A Stator located directly behind the fan and mounted inside the tailboom straightens low pressure air flowing through the boom. The stator has eleven composite removable blades, and is accessible by removing the tailboom.

(10). A tail skid mounted bottom aft on the tailboom is constructed of aluminum tubing.

(11). A jack pad is located on the tailboom underside. The jackpad can be accessed by removing the tail skid.

(12). The tailboom provides for the mounting of the horizontal stabilizer and a control cable conduit for the flight controls.

2. Tailboom Replacement

(Ref. Figure 201)

NOTE: When removing tailboom as an assembly with the horizontal and vertical stabilizers installed, precaution should be taken to adequately support and balance the tailboom assembly equally due to the mass of the stabilizers.

A. Tailboom Removal

(1). Remove tailboom fairing.

(2). Disconnect the forward end of the anti-torque control cable by turning outside collar sleeve counter-clockwise and back to expose the inner cable. Apply sufficient right pedal to expose engagement pin and pull collar sleeve outward.

(3). Disconnect electrical connector.

(4). Have assistants support tailboom.

(5). Remove four mounting bolts and washers and remove tailboom. Inspect bolts for corrosion.

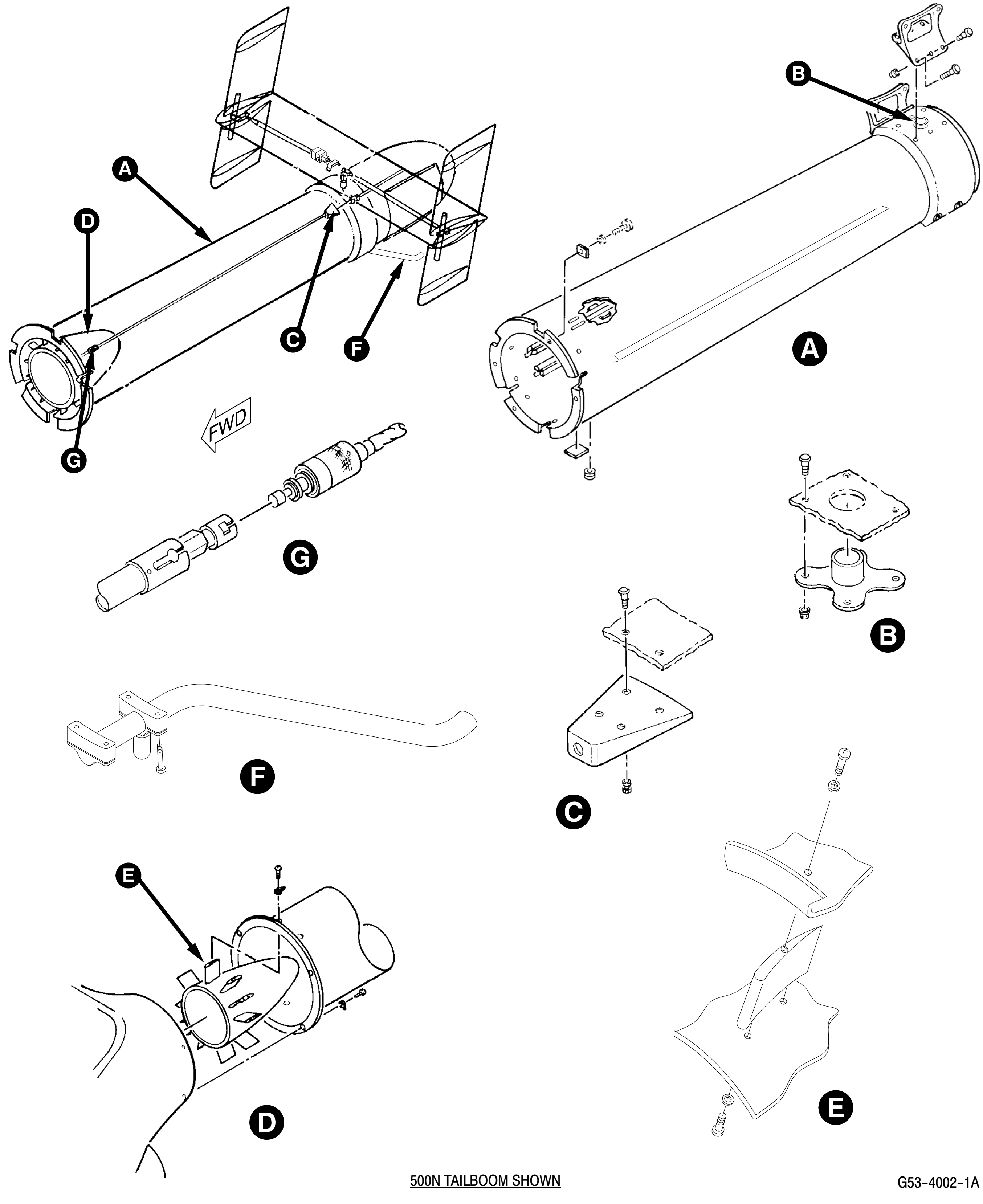

Figure 201. Tailboom Assembly (Sheet 1 of 3)

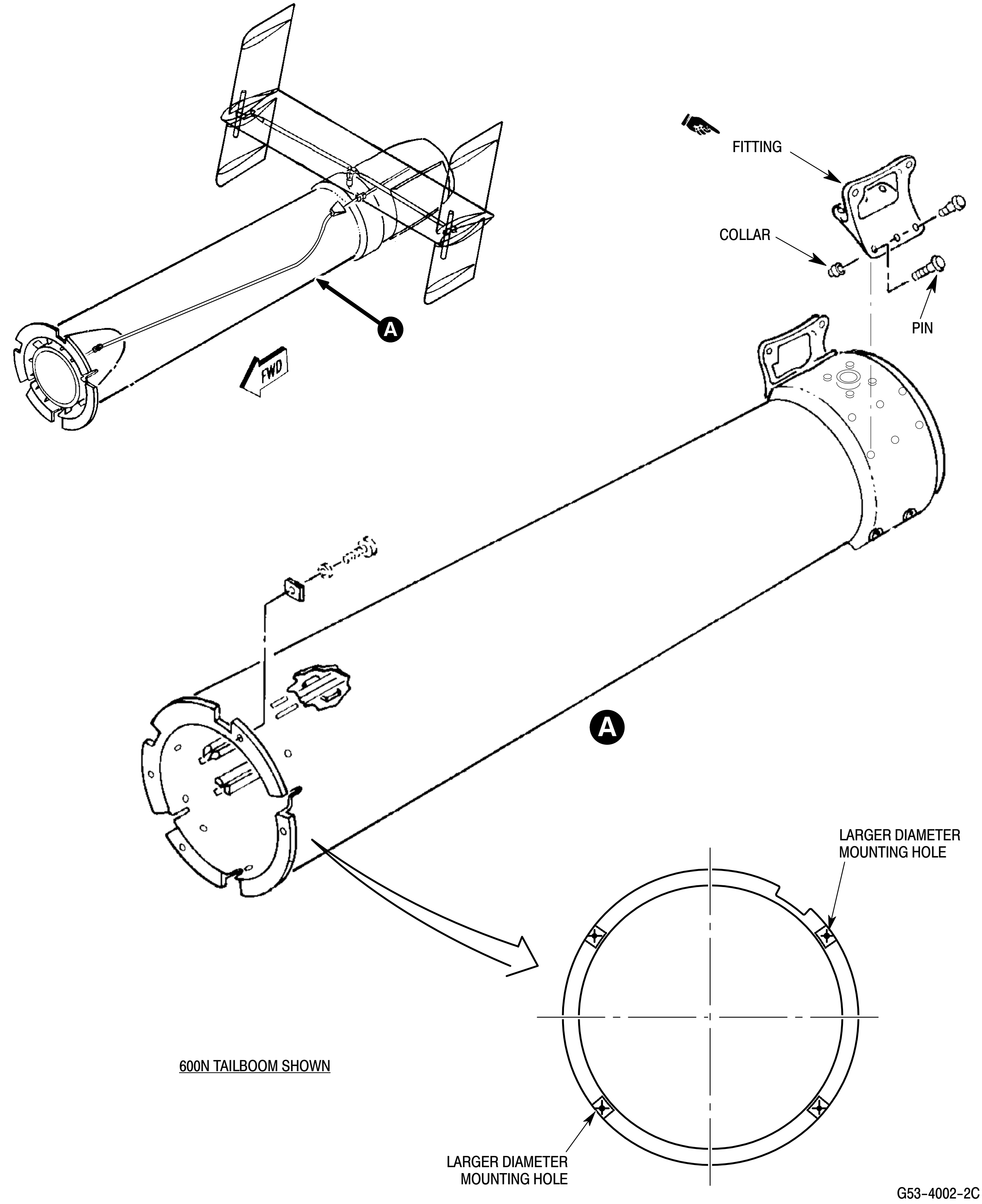

Figure 201 Tailboom Assembly (Sheet 2 of 3)

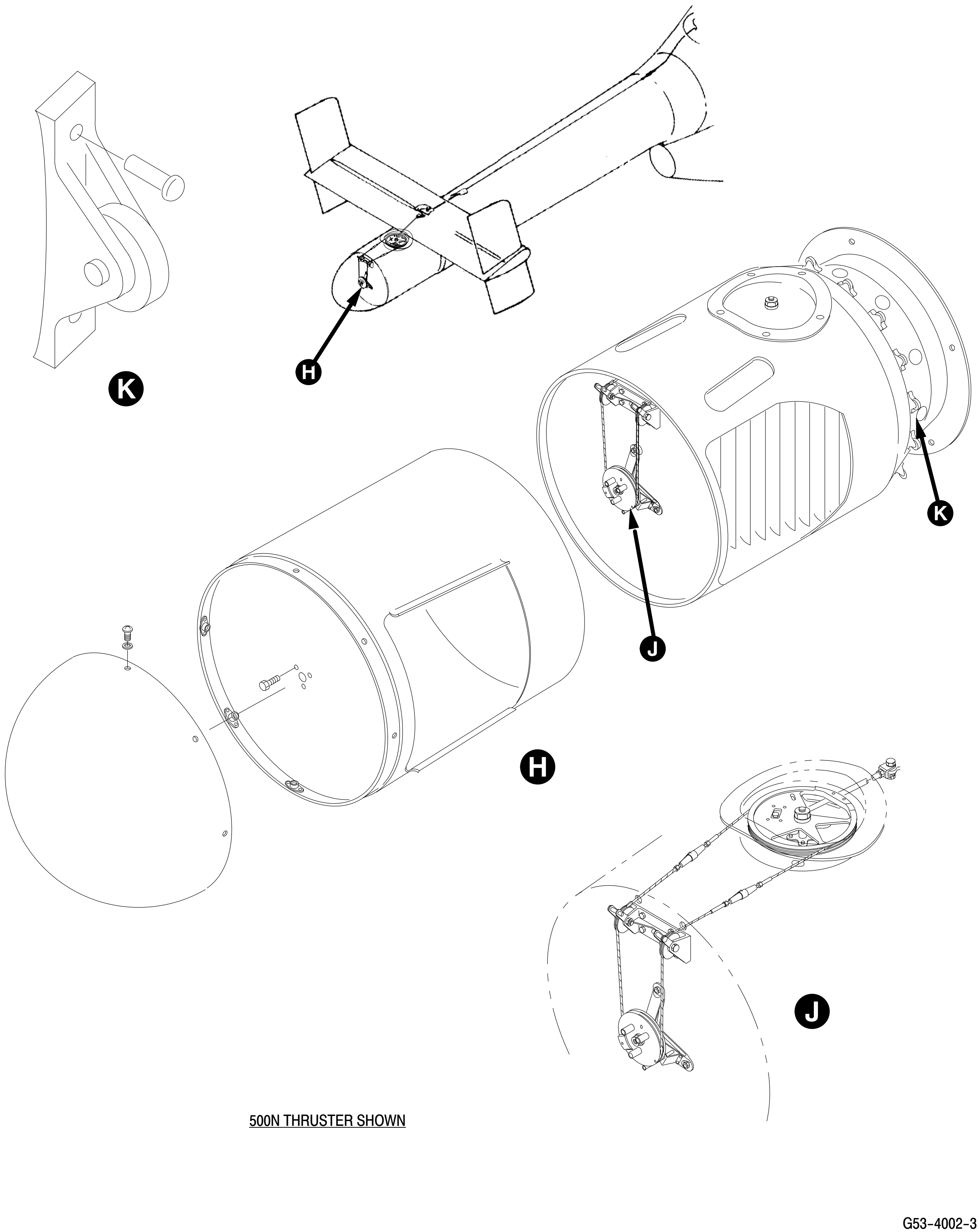

Figure 201 Tailboom Assembly (Sheet 3 of 3)

B. Tailboom Installation

CAUTION Before tailboom installation, inspect radius blocks for brinneling, corrosion, cracks and indication of indent on face; none allowed.

NOTE: If installing a new tailboom, the 500N3500-5 cover will have to be installed after internal tailboom components are installed (Ref. 500N3500-5 Cover Installation).

(1). Support tailboom so that the mating bulkhead surfaces are flush.

(2). Slide countersunk/chamber washers on external wrenching bolts with countersunk side facing bolt head.

CAUTION If washers are installed backwards, structural failure may result due to insufficient surface in load bearing area that can cause spreading or cracking of washers and result in loss of clamp-up torque.

(3). With the tailboom supported in place, install four bolts with washers.

(a). 500N:

Torque bolts to **130 - 150 inch-pounds (14.69 - 16.95 Nm) plus drag torque**. Verify minimum run on torque of 6.5 inch-pounds (0.73 Nm).

(b). 600N:

RN003 - RN059 without TB600N-007 complied with; torque the two smaller diameter bolts to **130 - 150 inch-pounds (14.68 - 16.94 Nm) plus drag torque** and the two larger diameter bolts to **180 - 220 inch-pounds (20.33 - 24.85 Nm) plus drag torque**. Safety bolts.

RN003 - RN059 with TB600N-007 complied with and RN060 & subs; torque bolts to **180 - 220 inch-pounds (20.33 - 24.85 Nm) plus drag torque**. Safety bolts.

(4). Re-connect electrical connectors.

(5). Re-connect control cable assembly.

(6). Install tailboom fairing.

3. Tailboom Inspection

(Ref. Figure 201)

(1). Inspect tailboom exterior as follows:

(a). Inspect tailboom fairing for cracks and delaminations.

(b). Inspect tailboom flange and mounting bolt holes attachment area for cracks at Sta. 168.20.

(c). Inspect radius blocks for brinneling, corrosion and indication of indent on face; none allowed. If found, scrap radius block and install new radius block.

(d). Inspect strake for cracks, delaminations, debonding, dents, nicks and separation.

NOTE: Damage to slots can cause significant degradation of aircraft performance in a hover.

(e). Inspect tailboom surface area and tailboom circulation control slots surface area for cracks, voids, dents, holes, scratches, separation, delaminations at tailboom and security.

1). Using a bright light, inspect fore and aft radii of the lower portion of the three upper slot bridges for cracks, illuminate area under the flap.

NOTE: The flap may be raised slightly, using finger pressure only, to aid in checking this area.

(f). Inspect flaps for cracking and debonding (Ref. Figure 202):

1). A crack of any length, in line with aft edge of flap, is permissible at interface between flap and tailboom.

2). A crack of 1.25 inch (3.175 cm) maximum length, in line with the forward edge of flap, is permissible at interface between flap and tailboom.

NOTE: If crack in forward edge of flap is longer than 1.25 inch (3.175 cm), contact your local MDHI Field Service Representative for disposition.

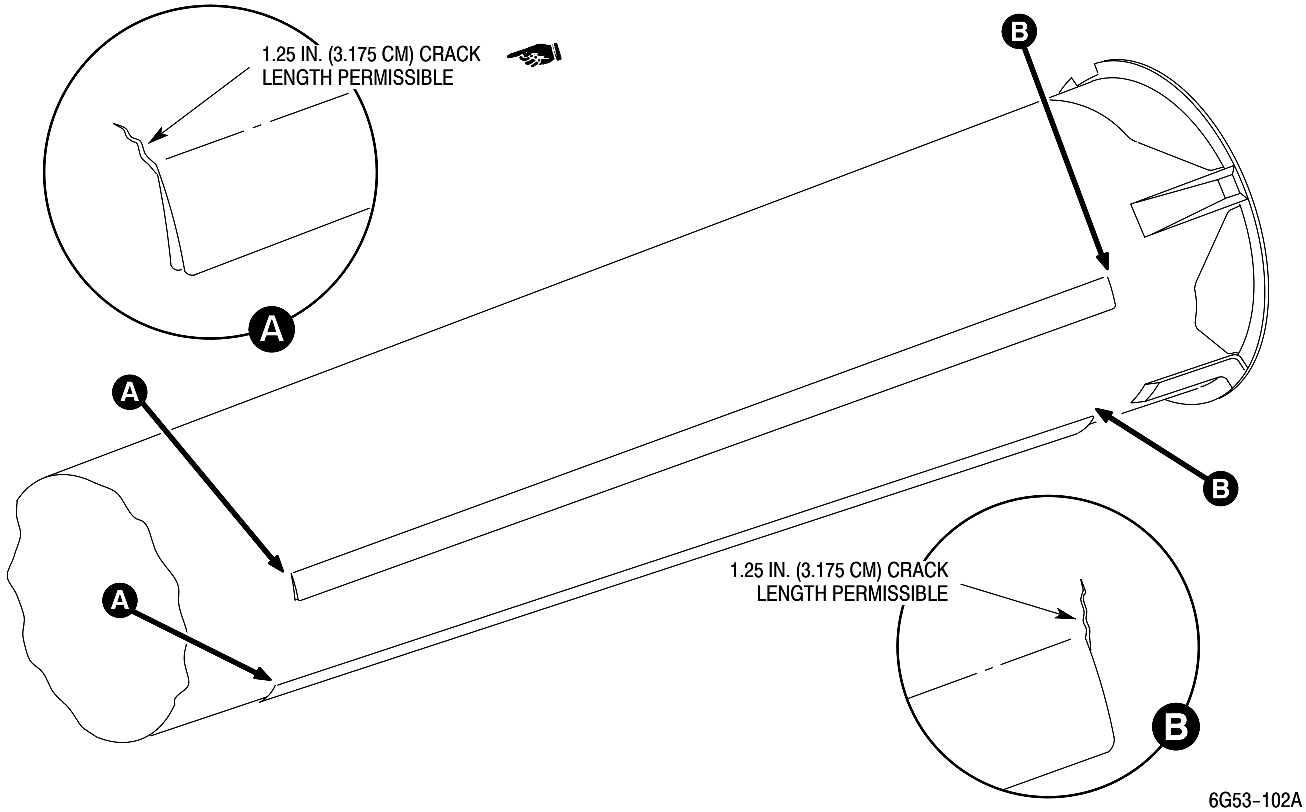

Figure 202. Tailboom Flap Inspection

(g). Inspect horizontal stabilizer mounting brackets (pay particular attention to the forward inboard legs) and attachment fittings for cracks, voids, separation and delamination.

(h). Inspect stabilizers (Ref. Sec. 53-50-30).

(i). Inspect (tail-skid) for cracks, dents, holes and delamination.

(j). Inspect rotating thruster cone for freedom of operation, cracks, holes, separation and delamination.

(k). Inspect tailboom grommets (2) places for cracks and proper fit.

(2). Inspect tailboom interior as follows:

(a). Check stator vanes and stator diffuser cone for cracks, delaminations and separation.

1). Maximum allowable cracks found emanating from stator vane inserts should not exceed 0.10 inch (2.54 mm) span-wise.

2). No cracks allowed running cordwise towards leading or trailing edge

(b). Inspect slot air foils for cracks, delamination and separation from boom.

(c). Inspect control cable assembly attachment points for looseness, cracks and condition.

(d). Inspect cable conduit for cracks, separation and delamination.

(e). Inspect air circulation area for FOD and cleanliness. If necessary, clean with mild soap and water.

(3). Inspect rotating thruster cone collar strap ring rivets for looseness, strap for cracks and condition.

4. Tailboom Repair

There are no repair procedures for the tailboom at this time. Refer to MDHI Field Service Representative.

5. Stator Replacement

(Ref. Figure 201, View D)

A. Stator Removal

(1). Remove tailboom.

(2). Note or index top of stator for reassemble. Support stator and remove seven exterior screws and washers mounted around the forward part of the tailboom.

B. Stator Installation

(1). Support stator and align stator vanes in tailboom, install seven screws and washers, torque screws to **3 - 6 inch-pounds (0.34 - 0.68 Nm) plus drag torque**. Total torque should not exceed **15 inch-pounds (1069 Nm)** total torque.

(2). Install tailboom.

(3). Verify that stator does not rub against the fan and for clearance of 0.020-0.080 inch (0.508-2.032 mm) between stator and fan.

6. Stator Blade Replacement

(Ref. Figure 201, View E)

(1). Stator Blade Removal: Remove two self-locking screws and two surface washers.

(2). Stator Blade Installation: Install two surface washers and two self-locking screws. Torque screws to **3 - 6 inch-pounds (0.34 - 0.68 Nm) plus drag torque**. Total torque should not exceed **15 inch-pounds (1069 Nm)** total torque.

7. Rotating Thruster Cone Replacement

(Ref. Figure 201, View H)

A. Rotating Thruster Cone Removal

(1). Remove cone tip cap by removing eight screws and washers.

(2). Support rotating thruster cone and remove three bolts and washers that attach the rotating thruster cone, carefully slide rotating cone aft to clear stationary cone, bearings and followers and the cable and drum assembly.

B. Rotating Thruster Cone Installation

(1). Carefully slide rotating thruster cone over stationary cone, bearings, rollers and followers.

(2). With the thruster supported in place, install three bolts with washers attaching the rotating thruster to thruster gear box. Torque bolts **70 - 90 inch-pounds (7.91 - 10.17 Nm).** Safety wire bolts.

(3). Install cone tip cap with eight screws and washers, torque screws per general aircraft practices.

8. Rotating Thruster Cone Inspection

(1). Inspect for cracks and separation of composite laminates.

(2). Check for freedom of rotational movement within the control range of thruster.

(3). When the thruster is removed from helicopter, check roller surface area (strap) for cracks and condition.

NOTE: Refer to MD Helicopters Inc. Representative for structural repairs, cracks, etc.

9. Stationary Thruster Cone Replacement

(Ref. Figure 201)

A. Stationary Thruster Cone Removal

(1). Remove rotating thruster cone (Ref. Rotating Thruster Cone Removal).

(2). Remove eight off wing screws from pan cover, remove cotter pin, nut and washer from sector input shaft and remove pan cover. Remove washer and bushing from sector bellcrank input shaft.

(3). Remove bolt, washer and bushing from thruster input sector bellcrank clevis (Ref. View J).

(4). Remove thruster cone fairings.

(5). Support stationary thruster cone and remove eight bolts and washers, with cable assembly attached to cone, carefully lift cone off tailboom so that the control rod passes through the thruster cone cutout.

B. Stationary Thruster Cone Installation

(1). Support stationary thruster cone to tailboom so that the control rod passes through the cutout of the stationary cone, and that the mating surfaces are flush to the tailboom. Slide countersunk/chamber washers on external wrenching bolts with countersunk side facing bolt head.

CAUTION If washers are installed backwards, structural failure may result due to insufficient surface clamp-up in load bearing areas that can cause spreading or cracking, resulting in loss of clamp-up torque.

(2). With the stationary thruster cone support in place, install eight bolts and washers. Torque bolts **30 - 40 inch-pounds (3.39 - 4.52 Nm) plus drag torque.**

(3). Connect control rod to input sector bellcrank clevis and install bushing, washer and bolt, torque bolt per standard aircraft torque values and safety wire.

(4). Install thruster cone fairings.

(5). Install rotating thruster (Ref. Rotating Thruster Cone Installation).

10. Stationary Thruster Cone Inspection

(1). Inspect for cracks and delamination of composites structure for the following: Internal ducts, air foil supports, pan cover and pan (hat section).

(2). Inspect rollers and bearings for condition and freedom of rotation. Inspect for cleanliness.

(3). Inspect sector bellcrank, cable assemblies, pulleys and support brackets for condition, inspect of cleanliness.

(4). Inspect upper input shaft for damage and wear. Check for play in mounting pins. If mounting pins are found to have play, replace with new pins and collars.

(5). Inspect thruster aft support shaft for damage and wear. Check for play in mounting hardware. If top bolt is found to be loose, retorque to **10 - 15 inch-pounds (1.13 - 1.69 Nm)**. If bottom mounting pins are found to be loose, replace with new pins and collars.

11. Conduit and Support Strap Rebonding

(Ref. Figure 203) The following procedure is for rebonding of the conduit supports.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM217	Isopropyl alcohol
CM402	Adhesive

(1). Lightly abrade faying surfaces with Scotchbrite until surface gloss of the laminate is gone.

(2). Solvent-wipe parts using a clean lint-free cloth dampened with isopropyl alcohol (CM217).

(3). Wipe dry using a clean, lint-free, dry cloth and allow to air dry for 15 minutes at ambient temperature.

CAUTION Do not heat conduit to more than 170°F (77°C). Conduit and tailboom can be damaged from too much heat.

(4). If conduit is bent away from tailboom, heat conduit to make more flexible for re-bonding.

NOTE: Adhesive must be applied within 2 hours of preparation. If more than 2 hours elapse before adhesive application, re-prepare surfaces.

(5). Mix adhesive (CM402) according to manufacturer's instructions and apply to faying surfaces.

(6). Secure parts together with light pressure and allow to cure for 24 hours at ambient temperature.

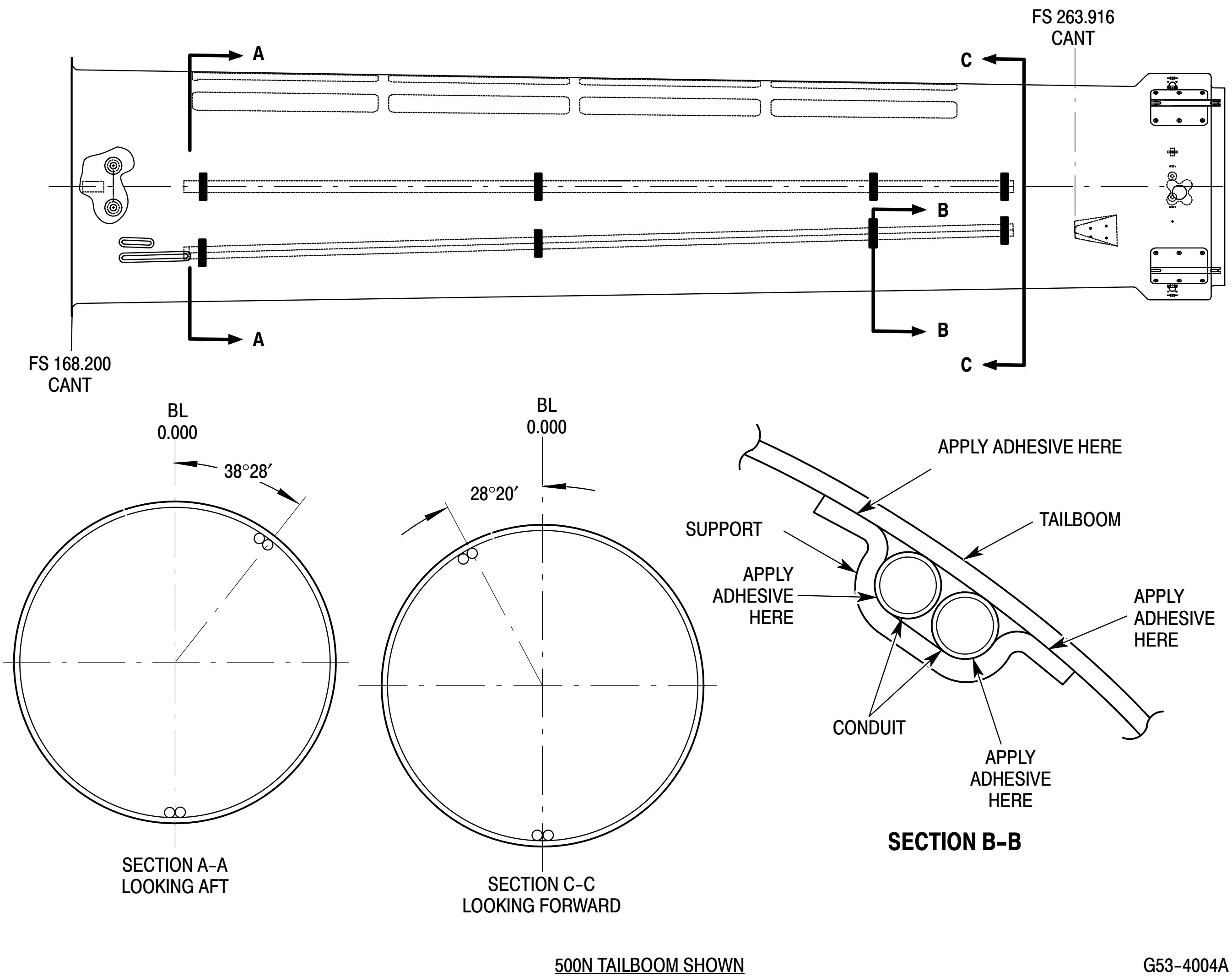

Figure 203. Conduit and Support Strap Rebonding

12. Horizontal Stabilizer Mount Fitting Replacement

(Ref. Figure 201)

Empennage Fitting	Part No.
L/H, Aluminum	500N3530-3, -7
R/H, Aluminum	500N3530-4, -8
L/H, CRES	500N3530-9
R/H, CRES	500N3530-10

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM101	Solid film lubricant
CM206	Chemical coating
CM222	1,1,1-T richloroethane
CM304	Enamel, epoxy
CM315	Adhesive primer
CM318	Primer
CM418	Cement, epoxy
CM425	Sealing compound
CM801	Abrasive paper, silicon carbide

(1). Remove horizontal stabilizer (Ref. Sec. 53-50-30, Horizontal Stabilizer Replacement).

(2). Remove rotating thruster cone (Ref. Rotating Thruster Cone Replacement).

(3). Remove stationary thruster cone (Ref. Stationary Thruster Cone Replacement).

(4). Remove collars from pins in mount fittings.

(5). Drive pins out of fittings.

CAUTION Do not allow fittings to reach 200°F (94°C), damage to tailboom composite material will occur.

NOTE: Heating the fitting to 150°F (66°C) may assist in removing them from tailboom.

(6). Carefully pop fittings loose from tailboom while not damaging fiberglass sheets under fitting.

(7). Clean area with 1,1,1-Trichloroethane (CM222).

(8). Locate new fitting on tailboom.

(9). Back-drill fittings to 0.186-0.188 inch (4.724-4.775 mm).

(10). Remove fitting and deburr rivet holes.

(11). Touch up rivet holes with solid film lubricant (CM101) for steel fittings or chemical coating (CM206) for aluminum fittings.

(12). Steel fittings only:

(a). Using abrasive paper (CM801), lightly abrade tailboom where fitting is to be mounted.

(b). Clean fitting and tailboom abraded area with 1,1,1-Trichloroethane (CM222).

(c). Prime fitting with adhesive primer (CM315).

(d). Apply a thin layer of cement (CM418) between fitting and tailboom.

NOTE:

- Use HTS12-6-4/-5 pin rivets with HTS1176DU-6AWU collars or alternate HTS48-6-4/-5 pin rivets with HST2000-6AW collars.
- Gage rivet holes to ensure proper length pin rivets.

(13). Relocate fitting on tailboom and install with pin rivets wet with primer (CM318).

(14). Seal edges around fittings with sealing compound (CM425).

(15). If installing steel fittings, prime with adhesive primer (CM315).

(16). Touch up with paint (CM304).

(17). Reinstall stationary thruster cone (Ref. Stationary Thruster Cone Replacement).

(18). Reinstall rotating thruster cone (Ref. Rotating Thruster Cone Replacement).

(19). Reinstall horizontal stabilizer (Ref. Sec. 53-50-30, Horizontal Stabilizer Replacement).

(20). Check rigging of thruster (Ref. Sec. 67-20-30).

(21). Check rigging of vertical stabilizers (Ref. Sec. 67-20-30).

13. 500N3500-5 Cover Installation

(Ref. Figure 204) New tailbooms come with the 500N3500-5 cover separate. This cover must be bonded in place after the wiring and cables are installed.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM222	1,1,1-Trichloroethane
CM410	Adhesive, epoxy (parts A & B)
CM802	Abrasive cloth, aluminum oxide
CM819	Kimwipe

(1). With cutout facing down and forward, gently role cover to shape of tailboom and position inside aft end of tailboom.

Slide cover in until aft end is flush with tailboom.

NOTE: Right edge of cover should be just to the right of the torque tube housing (8° to the right of centerline). Left edge should be under the left horizontal stabilizer empennage fitting.

(2). Check holes in cover to ensure they line up with electrical connectors on tailboom.

(3). If holes do not line up with electrical connectors, remove cover, role 180° and reposition in tailboom.

NOTE: Tailboom is manufactured with 1.0 x 1.0 inch (25.4 x 25.4 mm) spots marked for abrasion.

(a). If tailboom is not previously marked, place a mark every 2.0 inches (50.8 mm) around cover and tailboom.

(b). Do not bond the bottom 8.0 inches (203.2 mm) on aft end of cover.

(4). Abrade around the cover mating surface with 240 grit abrasive cloth (CM802) to remove gloss.

NOTE:

- Use care to avoid damage to the fiber reinforcement.
- Metallic faying surfaces do not require abrading.

(5). Using 240 grit abrasive cloth (CM802), lightly abrade spots, where marked, around the tailboom until the surface gloss is removed.

(6). Wipe abraded surfaces with kimwipes (CM819) dampened with 1,1,1-Trichloroethane (CM222). Allow to air dry for 15 minutes.

(7). Mix adhesive according to manufacturer's instructions.

NOTE: Adhesive must be applied within two hours of cleaning. Repeat solvent prep if more than two hours elapses before bonding.

(8). Apply adhesive to abraded areas and position cover in tailboom. Clean up excessive adhesive.

(9). Allow to cure per manufacturer's instructions.

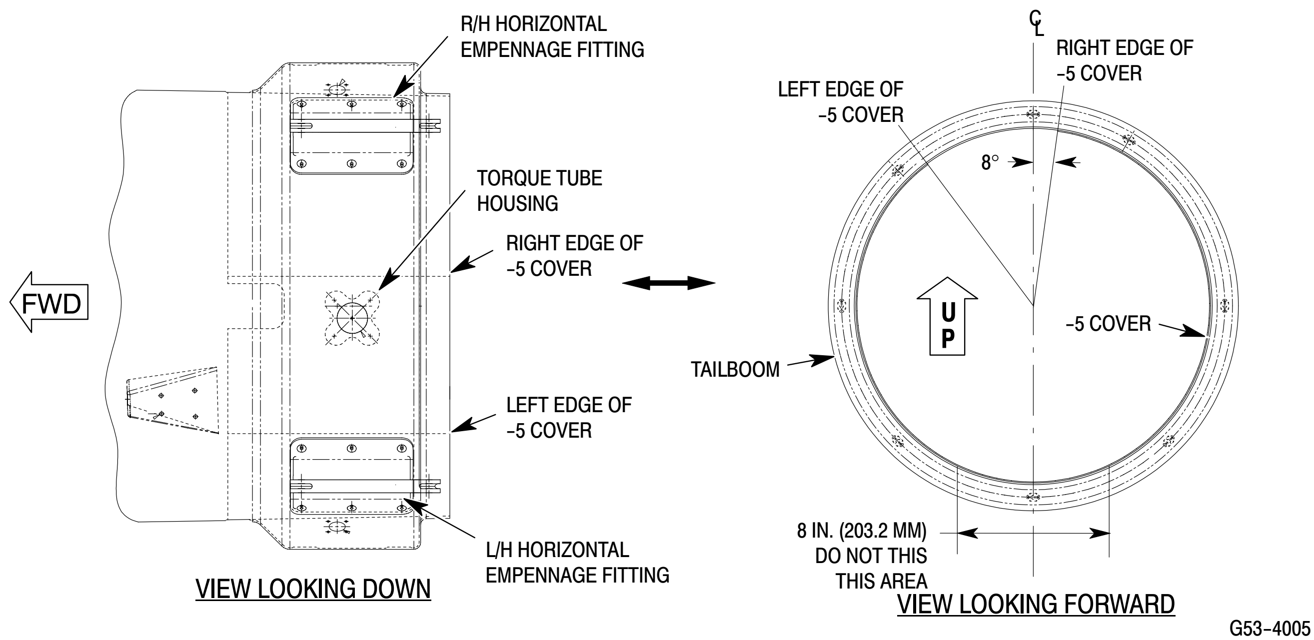

Figure 204. 500N3500-5 Cover Installation

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Section

53-50-10

Stabilizer (T-Tail) (369D/E/FF)

STABILIZER (T-TAIL) (369D/E/FF) MAINTENANCE PRACTICES

1. Stabilizer - General

(Ref. Figure 201) The tail surfaces (empennage) stabilize the helicopter and maintain it in a relatively level attitude during high speed forward flight. The tail surfaces consist of a vertical and horizontal stabilizer attached to the aft end of the tailboom.

The horizontal stabilizer mounts atop of the vertical stabilizer in a T-shaped arrangement. Tip plates are attached to ends of the horizontal stabilizer with a steel tip weight between each tip plate and the stabilizer. The horizontal stabilizer is constructed of aluminum alloy skins riveted to formed ribs and spars.

The vertical stabilizer is constructed of aluminum alloy skins bonded to formed spars.

The vertical stabilizer includes fittings, honeycomb core, and non-structural leading and trailing edges. The tip plates are constructed of aluminum alloy skins bonded over a honeycomb core. The vertical stabilizer is mounted aft right of the tail boom and is bolted to the gearbox and stabilizer mount frame and a upper and lower mount fitting. The vertical stabilizer fitting supports the horizontal stabilizer. The lower end of the vertical stabilizer incorporates a tail skid assembly.

Lighting provisions are provided on both vertical and horizontal stabilizers. (Ref. Sec. 96-40 contains information on exterior lights.)

A. Stabilizer Troubleshooting

(Ref. Table 201)

2. Horizontal Stabilizer and Tip Plate Replacement

A. Horizontal Stabilizer and Tip Plate Removal

(Ref. Figure 201)

NOTE: Tip weights are installed at manufacturing and are only required to reduce T-Tail vibration.

(1). Remove four screws securing tip plate and tip weight (if applicable, right and left tip plates and/or tip weights are interchangeable) to horizontal stabilizer.

(2). Remove nuts and washers securing horizontal stabilizer to vertical stabilizer fitting.

(3). Disconnect position light electrical connection and bond jumper.

NOTE: MDHI Notice DN-63 contains information relative to adding drain holes and sealing doubler edges on some 369D helicopters. MDHI Notice DN- 44.1 contains information relative to replacement of trailing edge tabs, relocation of static pressure tube and adding doublers to some 369D helicopters.

(4). Inspect horizontal tip plates and stabilizer (Ref. Horizontal Stabilizer and Tip Plate Inspection).

B. Horizontal Stabilizer and Tip Plate Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM425	Sealing compound

(1). Support helicopter at rear jackpoint (Ref. Sec. 07-00-00) when installing horizontal stabilizer to ensure that helicopter angle of incidence does not change during measurements.

(2). Measure inclination angle of horizontal stabilizer at B.L. 10.66 inches (27.076 cm) to right (S RIGHT) and left (S LEFT) of horizontal stabilizer centerline (Ref. Figure 202). If angles S RIGHT and S LEFT differ by more than one degree, replace horizontal stabilizer.

(3). For aircraft 0003D - 0286D (Ref. Figure 204);

(a). Apply a 0.030 - 0.040 inch (0.762 - 1.016 mm) bead of sealant (CM425) around perimeter of top rib assemblies and at attach fitting.

NOTE: Do not seal drain holes.

(b). Apply sealant around electrical conduit and seal over tooling holes.

(4). Position horizontal stabilizer on vertical stabilizer fitting (Ref. Figure 201).

(5). Connect position light electrical connection and bond jumper.

(6). Install nuts and washers. Torque nuts to **90 - 110 inch-pounds (10.17 - 12.43 Nm)**.

(7). Check angle of incidence (Ref. Angle of Incidence Measurement).

(8). Install tip plates with tip weight between tip plate and horizontal stabilizer, using four screws.

(9). Remove support from rear jackpoint.

3. Vertical Stabilizer Replacement

A. Vertical Stabilizer Removal

(Ref. Figure 201)

(1). Remove horizontal stabilizer (Ref. Horizontal Stabilizer and Tip Plates Removal).

(2). Disconnect anti-collision light electrical connection.

(3). Remove bolts and washers securing stabilizer to tailboom.

(4). Inspect vertical stabilizer (Ref. Vertical Stabilizer Inspection).

B. Vertical Stabilizer Installation

(Ref. Figure 201)

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM109	Molybdenum disulfide powder lubricant

(1). Align stabilizer with mounting holes on the tailboom fitting. Spray bolt threads with lubricant (CM109) and install.

(2). Torque bolts **190 - 220 inch-pounds (21.47 - 24.86 Nm)**; then lockwire bolts in pairs.

(3). Connect anti-collision light electrical connection.

(4). Install horizontal stabilizer, refer to (Ref. Horizontal Stabilizer and Tip Plate Installation).

4. Horizontal Stabilizer and Tip Plate Inspection

(1). Inspect metal skin for holes, cracks, loose rivets or corrosion. Any crack is to be stop drilled or patched.

(2). Inspect attach fittings and light mounting bracket for cracks, loose rivets or corrosion.

(3). Inspect attach studs and mating holes for evidence of wear caused by looseness in service. Inspect questionable studs by dye-penetrant or magnetic particle method, as applicable.

(4). Inspect drain holes on lower surface. Ensure they are not blocked or clogged with debris.

(5). Inspect seal around upper and lower doublers. Ensure all gaps/edges between doublers and stabilizer skin are sealed.

(6). Repair horizontal stabilizer and tip plates (Ref. Horizontal Stabilizer and Tip Plates Repair).

5. Vertical Stabilizer Inspection

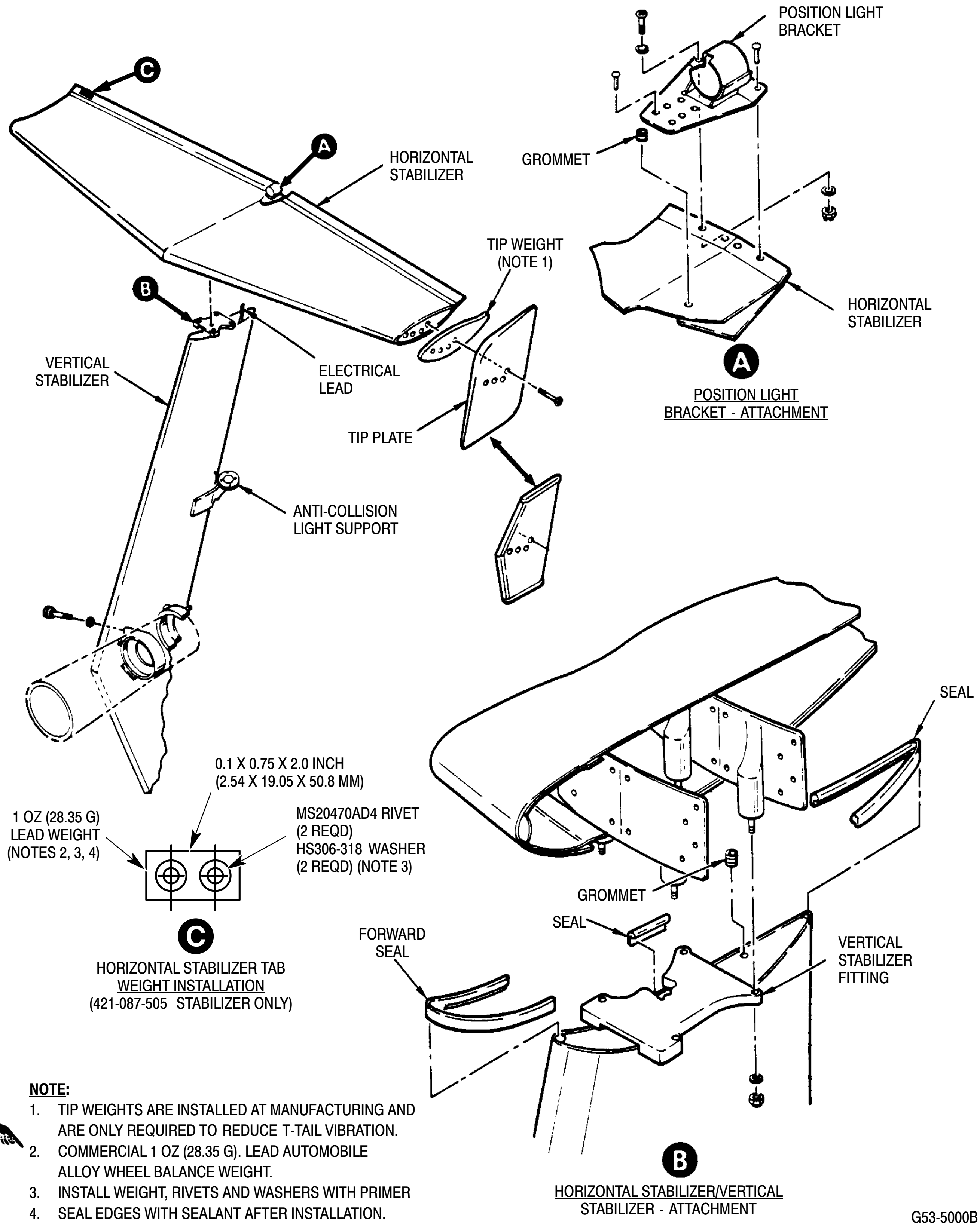
(1). Inspect skin for holes, cracks, bonding separation or corrosion.

(2). Inspect attach fitting for cracks, loose rivets or corrosion.

(3). Inspect tail skid for cracks, deformation and loose or missing rivets.

(4). Inspect anti-collision light bracket for cracks, loose rivets or screws and corrosion.

(5). Check condition of grommets.



NOTE:

1. TIP WEIGHTS ARE INSTALLED AT MANUFACTURING AND ARE ONLY REQUIRED TO REDUCE T-TAIL VIBRATION.
2. COMMERCIAL 1 OZ (28.35 G). LEAD AUTOMOBILE ALLOY WHEEL BALANCE WEIGHT.
3. INSTALL WEIGHT, RIVETS AND WASHERS WITH PRIMER
4. SEAL EDGES WITH SEALANT AFTER INSTALLATION.

Figure 201. Stabilizer T-Tail Removal and Installation

(6). Check mount holes for elongation.

(7). For repair (Ref. Vertical Stabilizer Repair).

6. Horizontal Stabilizer and Tip Plate Repair

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM220	Naphtha aliphatic
CM425	Sealing compound

(1). Seal gaps/edges between doublers and stabilizer skin with sealant (CM425). Remove excess sealant with naphtha (CM220).

(2). Repaint sealed areas.

(3). Make other horizontal stabilizer repairs according to applicable instructions in Structural Repair Manual.

NOTE: Support helicopter at rear jackpoint when installing horizontal stabilizer.

(4). Install horizontal stabilizer (Ref. Horizontal Stabilizer and Tip Plate Installation).

7. Vertical Stabilizer Repair

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM418	Cement, epoxy

(1). For allowable repairs and additional inspection criteria, Ref. Structural Repair Manual.

(2). Replace damaged or worn seals; bond replacement seal with cement (CM418).

(3). Replace damaged, worn or missing grommets.

(4). Install vertical stabilizer (Ref. Vertical Stabilizer Installation).

8. Angle of Incidence Measurement

(Ref. Figure 202 and Figure 203)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST2014	Angle measuring tool

Table 201. Horizontal Stabilizer Angle of Incidence

Angle	Model
8° 55’ - 9° 25’	369D
8° 55’ - 9° 25’	369E
7° 30’ - 8° 00’	369FF

NOTE: It is not necessary to level helicopter when establishing horizontal stabilizer angle of incidence.

(1). Remove hub fairing from main rotor hub assembly.

(2). Measure incidence angle of horizontal stabilizer (Ref. Figure 202) using angle measurement tool (ST2014) at B.L. 10.66 inches (27.076 cm) to right (S RIGHT) and left (S LEFT) of horizontal stabilizer centerline. If angles S RIGHT and S LEFT differ by more than one degree, replace horizontal stabilizer.

(3). Measure inclination of top of main rotor hub (Ref. Figure 203). Record as angle H.

(4). Compute average of angles S RIGHT and S LEFT. Record results as angle S.

(5). (**D/E Only**) Determine incidence of stabilizer by adding angles H and S. If H plus S is between 8 degrees 55 minutes and 9 degrees 25 minutes, angle of incidence is correct.

(6). (**FF Only**) Determine incidence of stabilizer by adding angles H and S. If H plus S is between 7 degrees 30 minutes and 8 degrees 00 minutes, angle of incidence is correct.

(7). If angle of incidence is not acceptable (Ref. Angle of Incidence Adjustment).

(8). Install hub fairing onto main rotor hub assembly.

9. Angle of Incidence Adjustment

(1). Remove bolts and washers attaching horizontal stabilizer to vertical stabilizer fitting.

CAUTION Do not add more than two washers under each boss.

(2). Lift horizontal stabilizer and add equal number of AN960PD416L washers under each of two front, or each of two rear bosses.

(3). Install horizontal stabilizer with washers and bolts.

(4). Torque bolts to **90 - 110 inch-pounds (10.17 - 12.43 Nm)**.

(5). Repeat angle of incidence measurement (Ref. Angle of Incidence Measurement).

10. Horizontal Stabilizer Tab Weight Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer
CM425	Sealing compound

(Ref. Figure 201) Installation of tab weight is optional on the 421-087 -505 horizontal stabilizer if difficulty in tail rotor balance and horizontal stabilizer tab resonance vibration is encountered (Ref. Sec. 18-20-00, Horizontal Stabilizer Tuning).

(1). Temporarily apply one ounce tab weight to upper right trailing edge of the right tab using tape.

(2). Locate weight spanwise to the point of observed maximum amplitude vibration.

NOTE: Tab weight can be made from commercial automobile alloy wheel balance weight (0.100 x 0.75 x 2.00 inch).

(3). Run engine at 102% - 105% N_2 and observe horizontal stabilizer tab, weight may be moved inboard or outboard on tab depending on response.

(4). If needed, a one ounce weight may also be installed on left tab.

(5). A maximum of two ounces may be installed on each tab.

(6). Once correct position and amount of weight has been established, install weight(s) as follows:

(a). Cleco weight in place on stabilizer.

(b). Drill two #31 holes through each weight and stabilizer.

(c). Remove weight and deburr holes; touch up stabilizer holes with primer (CM318).

(d). Install weight, rivets and washers with wet primer.

(e). Seal mating edges of weight with sealing compound (CM425).

(7). Touch up with paint to match.

Table 202. Troubleshooting Tailboom and Tail Surfaces

Symptom	Probable Trouble	Corrective Action
High frequency vibration.	Loose vertical stabilizer.	Retorque bolts to **190 - 220 inch-pounds (21.47 - 24.86 Nm).**
NOTE: High frequency vibrations in helicopter can be caused by components in other systems (Ref. Chap. 63, 64 and 71).	Loose horizontal stabilizer.	Retorque nuts to **90 - 110 inch-pounds (10.17 - 12.43 Nm).** Check angle of incidence, (Ref. Angle of Incidence Measurement).

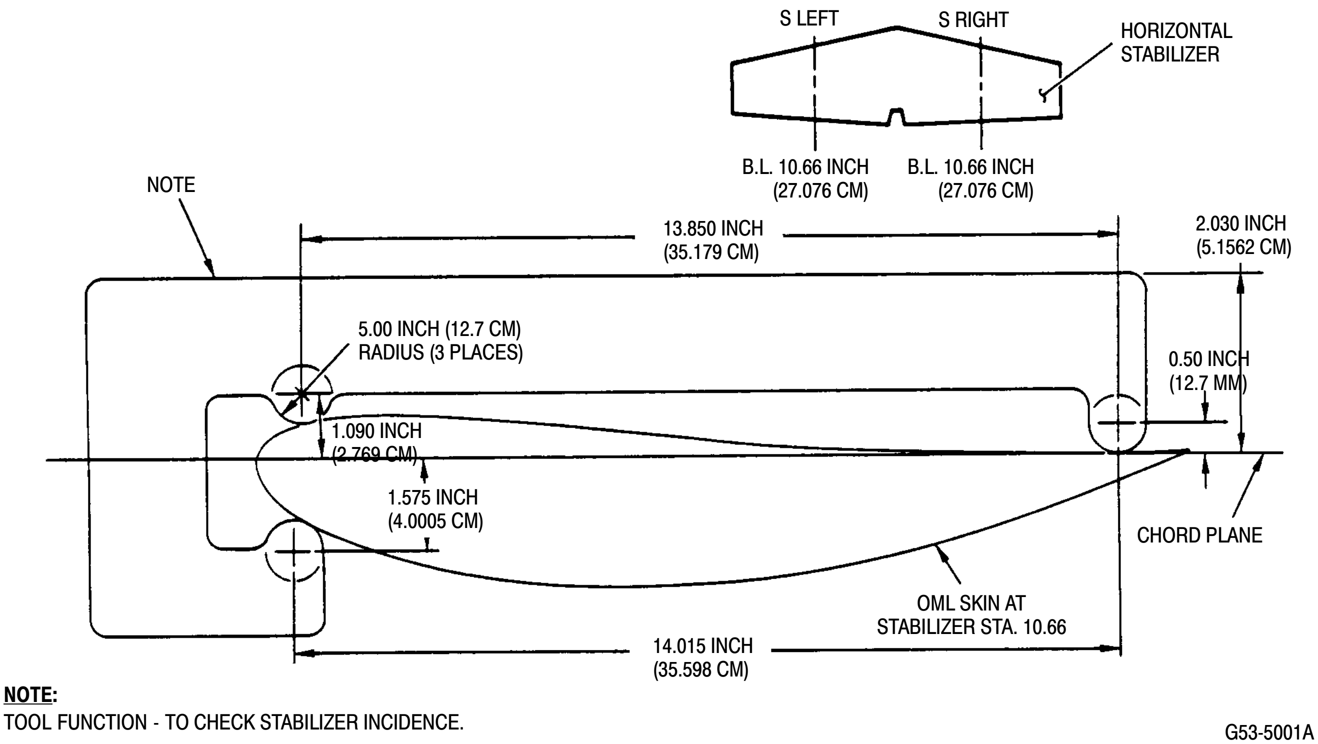


Figure 202. Horizontal Stabilizer Incidence Angle Measuring Tool

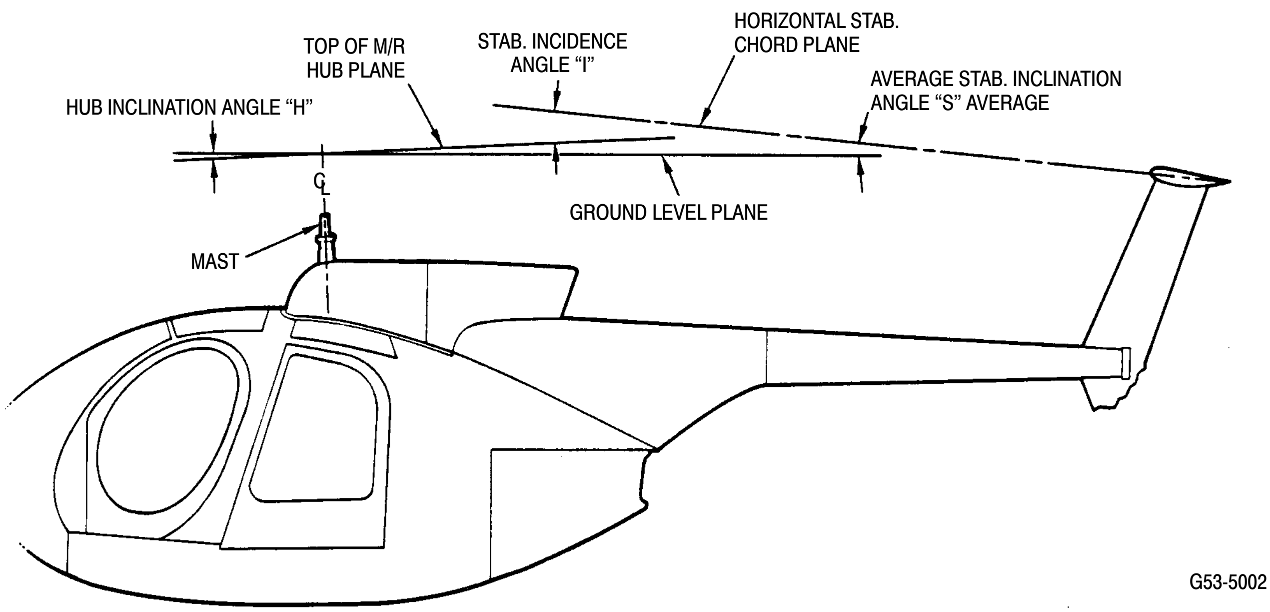


Figure 203. Establishing Horizontal Stabilizer Angle of Incidence

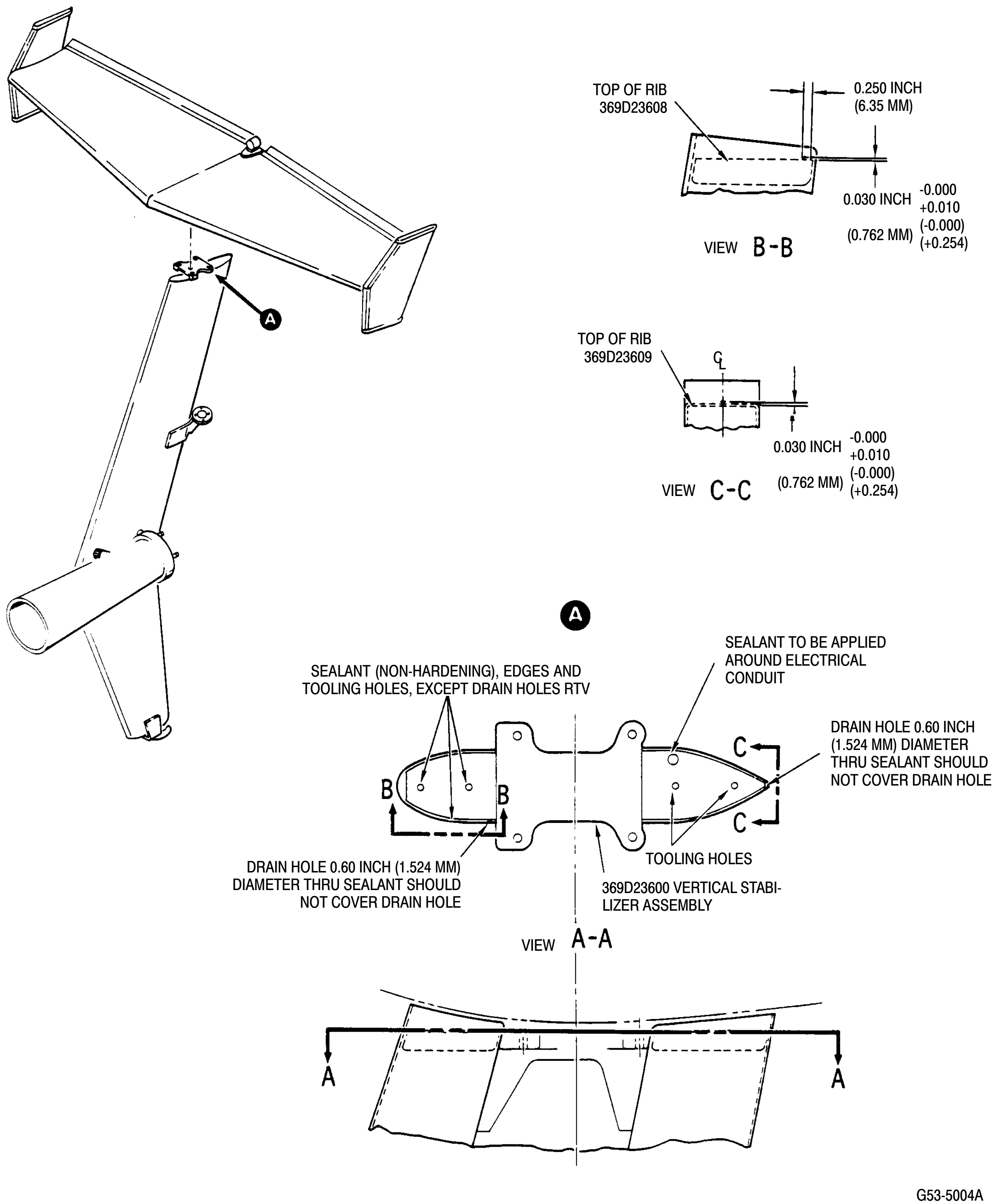


Figure 204. Sealing - Vertical Stabilizer (0003D - 0286D)

Section

53-50-30

Stabilizer (500/600N)

STABILIZER
MAINTENANCE PRACTICES

1. Stabilizers Description

The tail surfaces consist of two verticals and a horizontal stabilizer. The tail surfaces (empennage) stabilize the helicopter and maintain it in a relatively contain level attitude and heading during autorotation and forward flight.

A. Horizontal Stabilizer Description

The horizontal stabilizer is constructed of laminated fiber glass composite ribs and skin, bonded to a formed graphite composite spar. The horizontal stabilizer includes a non-structural leading and trailing edges. hollow core spar, sparbox fittings, access panels, torque tubes, bellcranks and control rods.

On the 500N and optional on the 600N, a stability augmentation system (S.A.S.) is attached to the right-hand vertical stabilizer, the early 600N does not have a S.A.S system.

The horizontal stabilizer mounts atop the tailboom. Four eye bolts from the horizontal attach to clevis attachment points on the tailboom. Access plates are attached to the ends caps of the horizontal stabilizer and at center line for access to the control rods, S.A.S. and bellcranks. Two control rods, S.A.S. and bellcranks are routed in the center aft of the sparbox. The angle of incidence of the horizontal stabilizer is preset at -2°. An anti-collision light is mounted in the top center of the stabilizer. Position lighting provisions are provided on both ends of the stabilizers.

On the 600N without S.A.S., gurney flaps were added to the trailing edge of the horizontal for the purpose of increasing lift without increasing the stabilizer area or weight.

Refer to Section 96-40-00 for information on exterior lights and Section 67-20-30 for rigging requirements.

B. Vertical Stabilizers Description

The vertical stabilizers (upper and lower) are constructed of laminated fiber glass composite ribs and skin, bonded to a formed fiberglass composite spar. The vertical stabilizers include a hollow core spar, retainer fittings and nonstructural leading and trailing edges.

The differences on the 600N are that the vertical stabilizers are slightly longer, the skin is thicker and on standard 600N helicopters, are both controlled by the directional control pedals. The lower vertical stabilizer angle of attack is eight degrees clockwise relative to the upper vertical stabilizer. Refer to Section 67-20-30 for flight controls linkage details.

The left vertical stabilizer is mounted to the horizontal on a torque tube fitting assembly and has approximately 6.5 inches (16.51 cm) of travel.

On the 500N and S.A.S. equipped 600N, the right vertical stabilizer, also mounted on a torque tube, is controlled by the stability augmentation system. From the fully extended to the fully retracted position on the S.A.S. actuator, the tip of the right vertical stabilizer trailing edge will travel a minimum of 2.70 inches (6.86 cm). The amount of travel is determine by the S.A.S. computer and gyro.

NOTE: The anti-torque control system must be re-rigged immediately after removal or replacement of control rods, linkages, and components or if helicopter operation reveals a rigging deficiency.

2. Vertical Stabilizer Replacement

(Ref. Figure 201 and Figure 202)

A. Vertical Upper and Lower Stabilizer Removal

(1). Remove nuts, washers, and bolts. Remove by lifting vertical stabilizer off torque tube.

B. Vertical Upper and Lower Stabilizer Installation

(1). Installation with Standard Hardware:

(a). Install stabilizer onto torque tube fittings.

(b). Install bolts, washers and nuts. Torque to **30 - 40 inch-pounds (3.39 - 4.52 Nm) plus drag torque**.

(2). Installation with Expandable Bolts: (Ref. Figure 203)

(a). Install bolt with washer under bolt head and thick washer under nut.

NOTE:

- Do not remove any expanding elements from bolt.
- If 600N2012- 5 spacers are not present, up to two spacers may be added to achieve proper installation.

(b). Remove one (1) or two (2) 600N2012-5 spacers, as required) to obtain 0.005-0.035 inch (0.127-0.889 mm) gap between the washers and the vertical stabilizer, equal on each side.

(c). Install nut and note drag torque.

(d). Perform a break in cycle by torquing the nut to **20 - 25 inch-pounds (2.26 - 2.82 Nm)** plus drag torque.

(e). Back off nut until bolt moves freely in hole.

CAUTION Do not over-torque nut. Over-torquing nut can crack vertical stabilizer fitting.

(f). Torque nut to **20 inch-pounds (2.26 Nm)** plus drag torque.

(g). Check for equal gap of 0.005-0.035 inch (0.127-0.889 mm) between the washers and the vertical stabilizer.

NOTE: NAS1149C0332R or NAS1149C0363R washers may be added under the nut for adequate cotter pin engagement.

(h). If necessary, tighten nut until cotter pin hole aligns with castillation in nut.

(i). Install cotter pin.

3. Horizontal Stabilizer Replacement

(Ref. Figure 201 and Figure 202)

NOTE: Horizontal stabilizer can be removed with vertical stabilizers installed. Support stabilizer during removal.

A. Horizontal Stabilizer Removal

(1). Remove seven screws securing center access plate to horizontal stabilizer.

(2). Disconnect position light electrical interconnect.

(3). On 500N, disconnect S.A.S. electrical interconnect.

(4). Remove cotter pin, nut, washer and bolt from center bellcrank shaft. Index mark bellcrank with grease pencil in relationship to shaft. Disconnect bellcrank.

(5). Remove nuts, washers and expandable bolts securing horizontal stabilizer to tailboom attachment clevis fittings. Remove horizontal stabilizer.

B. Horizontal Stabilizer Installation

NOTE: When installing horizontal stabilizer it may be necessary to loosen eye bolts and nuts to align with clevises, if so, install mounting expandable bolts first and torque per step (2). below, then torque clevis nuts to **80 - 120 inch-pounds (9.04 - 13.56 Nm).**

(1). Position horizontal stabilizer on tailboom attach fittings.

(2). Install expandable bolts, washers and nut. Torque to **30 - 40 inch-pounds (3.39 - 4.52 Nm)**. Install cotter pin.

(3). Connect position light/strobe light electrical connector.

(4). On 500N, connect S.A.S. electrical interconnect.

CAUTION When installing bellcrank on center bellcrank shaft it is possible to be one spline tooth off in either direction, install bellcrank centered on shaft (Ref. Sec. 67-20 -30).

(5). Connect bellcrank to center bellcrank shaft and install bolt, washers and nut. Torque nut to **30 - 40 inch-pounds (3.39 - 4.52 Nm)** and install cotter pin.

(6). Install center access plate with seven screws and washers.

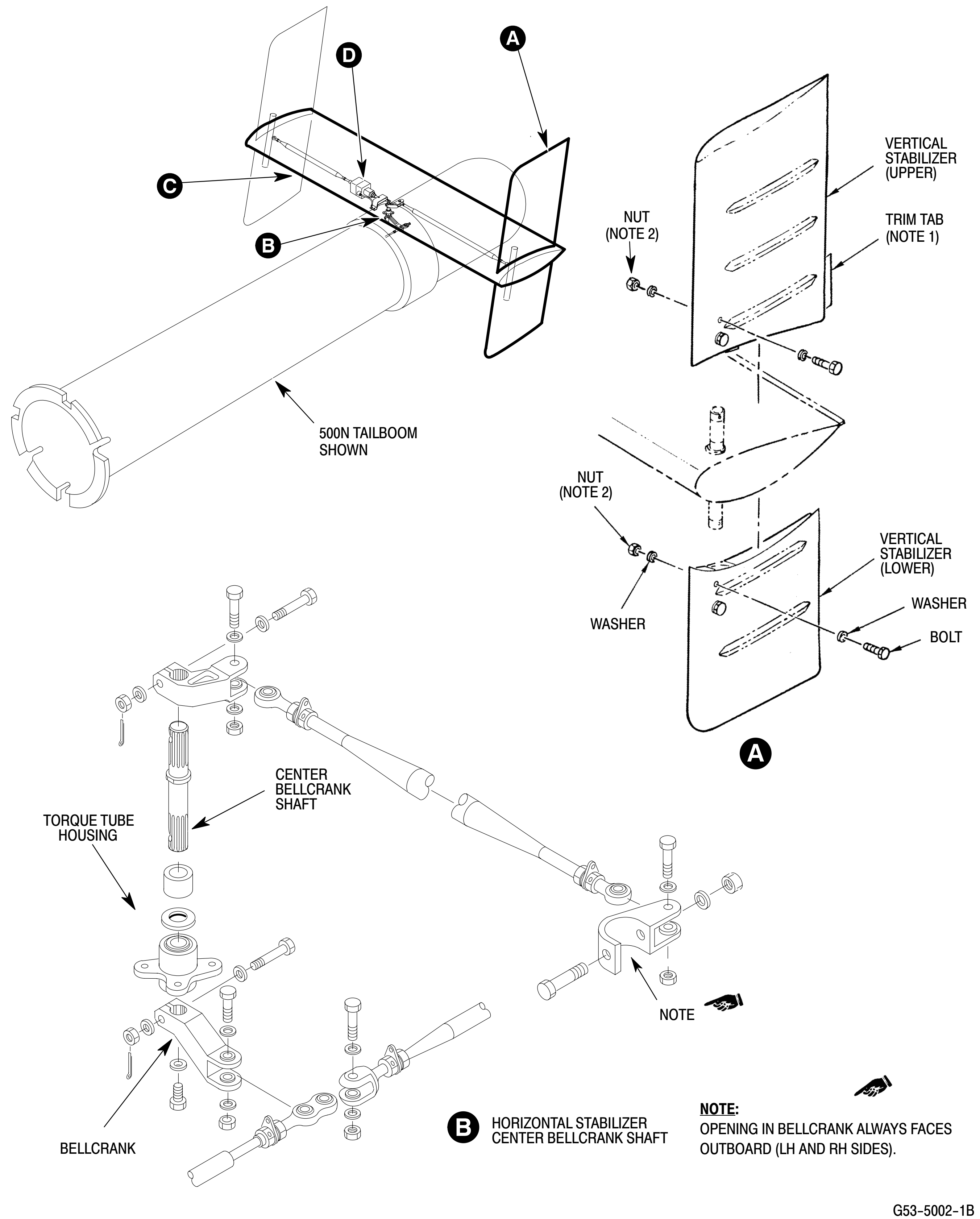
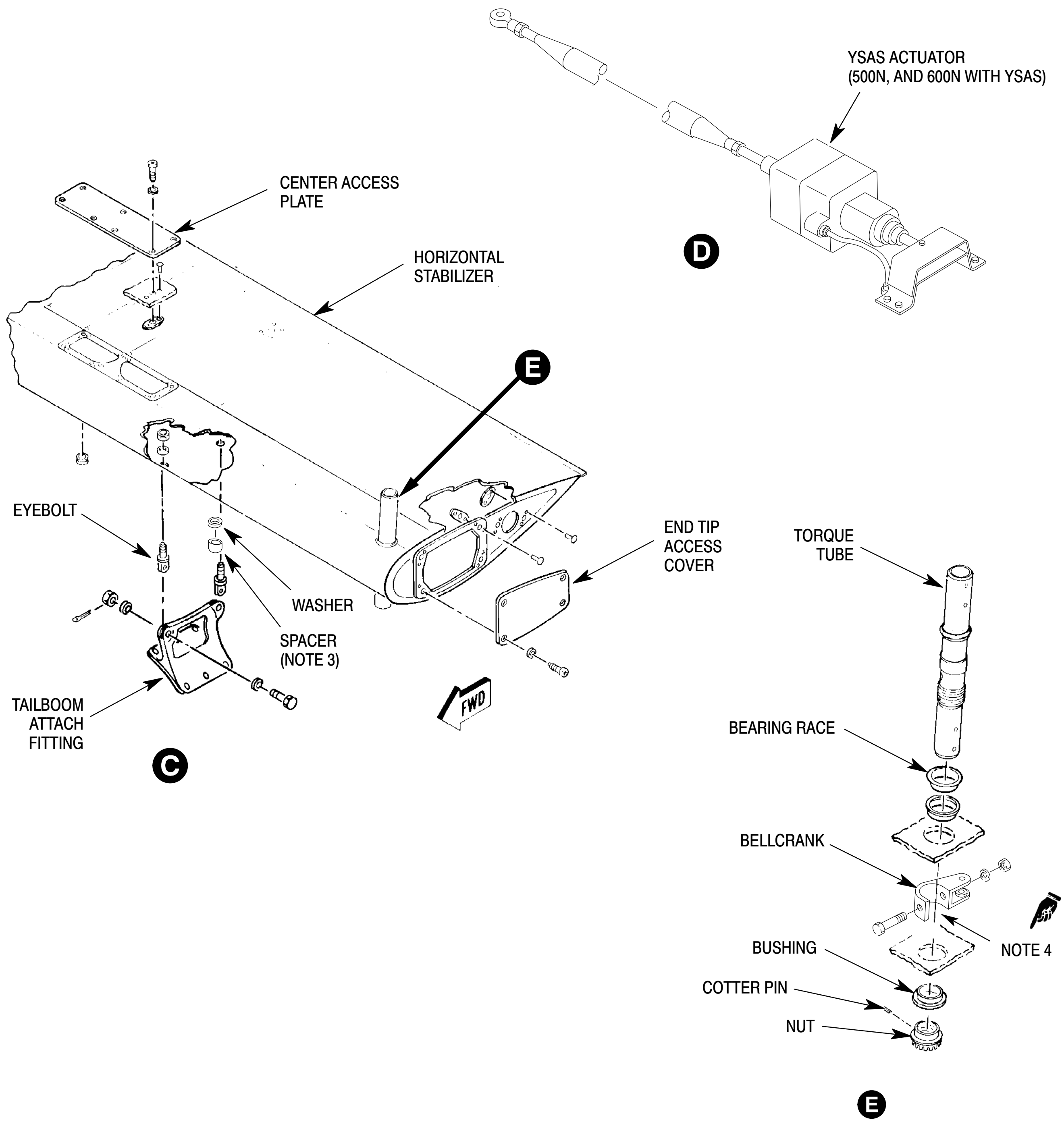


Figure 201. Stabilizer Installation with YSAS (Sheet 1 of 2)



NOTES:
1. TYPICAL LEFT AND RIGHT STABILIZERS (500/600N).
2. TORQUE 30 - 40 INCH-POUNDS (3.39 - 4.52 NM) PLUS DRAG TORQUE.
3. SPACERS INSTALLED ON AFT BOSS ONLY.
4. OPENING IN BELLCRANK ALWAYS FACES OUTBOARD (LH AND RH SIDES).

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Figure 201. Stabilizer Installation with YSAS (Sheet 2 of 2)

4. Horizontal Stabilizer Eye Bolt Replacement

A. Horizontal Stabilizer Eye Bolt Removal

(1). Remove horizontal stabilizer.

(2). Remove eye bolts by holding the flat surface of eye bolt with a wrench and removing nut.

B. Horizontal Stabilizer Eye Bolt Installation

(1). Install eye bolts in horizontal stabilizer, the short eye bolts in the forward holes and the longer eye bolts with spacer to the aft holes of horizontal stabilizer.

(2). Torque eye bolts to **80 - 120 inch-pounds (9.04 - 13.56 Nm) plus drag torque**.

(3). Install horizontal stabilizer.

5. Horizontal/Vertical Stabilizer Control Tube and Bellcrank Replacement

(Ref. Figure 201 and Figure 202)

A. Horizontal/Vertical Stabilizer Control Tube and Bellcrank Removal

(1). Remove horizontal stabilizer end tip covers and center access cover for access to bellcranks and control tubes.

(2). Remove cotter pin, nut, washer and bolt from center bellcrank shaft. Index mark bellcrank with grease pencil in relationship to shaft. Disconnect bellcrank.

(3). Disconnect control tube from vertical stabilizer torque tube bellcrank. Remove controls from horizontal stabilizer as required for maintenance.

B. Horizontal/Vertical Stabilizer Control Tube and Bellcrank Installation

Refer to adjustment and test control rigging during installation.

(1). Connect bellcrank to center bellcrank shaft and install bolt, washers and nut. Torque bolt to standard aircraft torque values and install cotter pin.

(2). Install control tubes and bellcranks as required, safety wire or cotter pin.

(3). Install center access plate with seven screws and washers.

6. Vertical Stabilizer Inspection

(Ref. Figure 201 and Figure 202)

(1). Inspect skin for cracks, bonding separation, delamanation and obvious damage.

(2). Inspect stabilizer for freedom of movement through pedal travel range, check for clearance between vertical to horizontal.

(3). Check mounting fitting holes for elongation.

NOTE: Internal stabilizer fitting may display cracking after installation of expandable bolts. This cracking, internal fitting only, is acceptable for continued service. Cracking of the external skin from the mounting bolt holes is unacceptable and stabilizer must be removed from service and scrapped.

7. Vertical Stabilizer Repair

Refer to MDHI Field Service Representative.

8. Horizontal Stabilizer Inspection

(1). Inspect skin for cracks, bonding separation, delamination and obvious damage.

(2). Inspect mounting fitting and attachment hardware for condition.

(3). Inspect center access panel and nut plate fasteners for condition, end tip plate access covers and position lights for condition.

(4). Inspect vertical stabilizer torques tubes for excessive axial and radial movement, 0.010 inch (0.254 mm) axial end play maximum allowable.

9. Vertical Stabilizer Torque Tube Replacement

A. Vertical Stabilizer Torque Tube Removal

(1). Remove vertical stabilizers (Ref. Vertical Stabilizer Replacement).

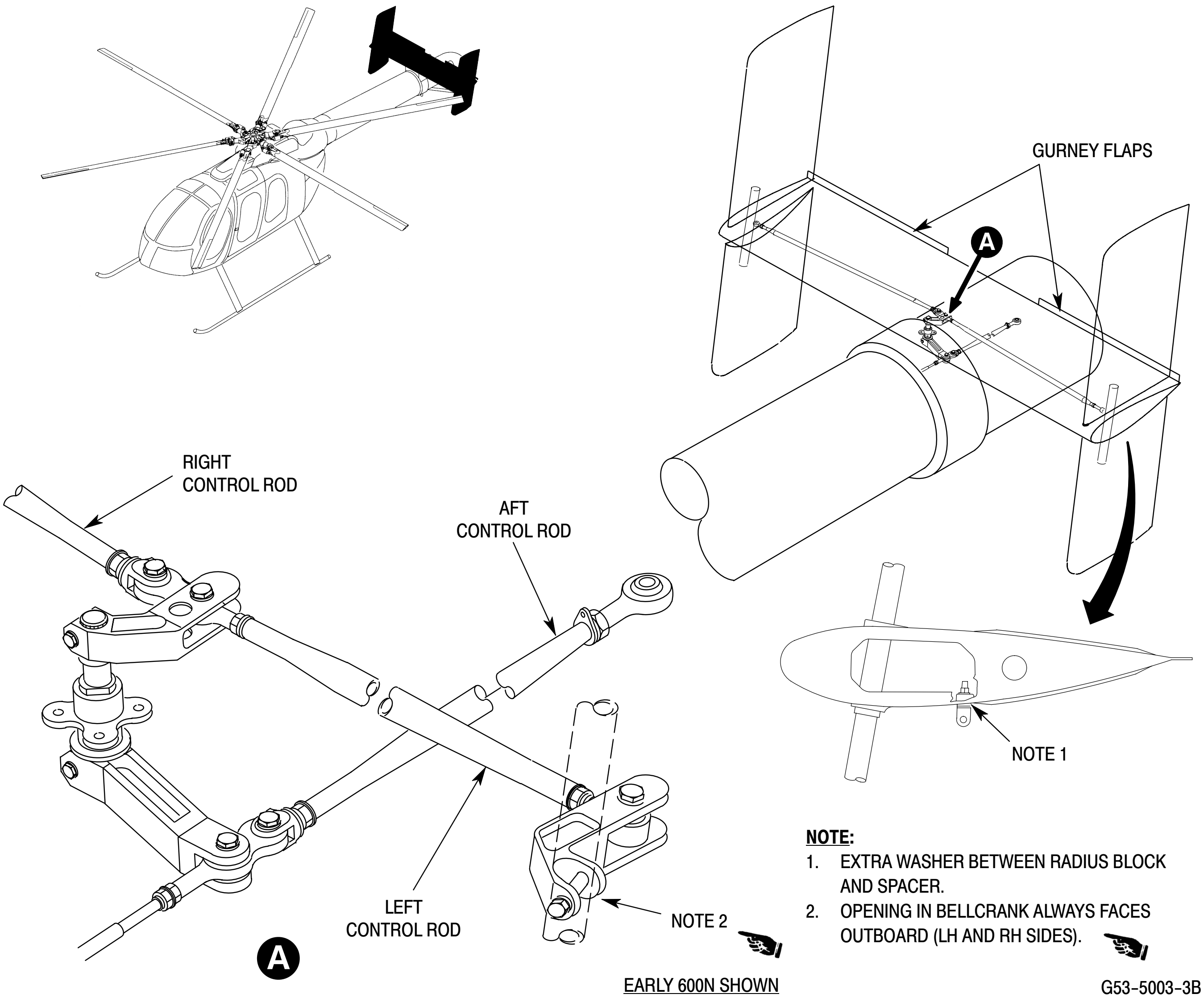

Figure 202. Stabilizer Installation without YSAS

(2). Remove horizontal tip plate access cover and disconnect YSAS torque tube (if installed) from vertical stabilizer bellcrank.

(3). Remove bellcrank from torque tube by removing expandable bolt.

(4). Remove cotter pin, locknut and bushing from torque tube. Remove torque tube by lifting upward.

B. Vertical Stabilizer Torque Tube Installation

(1). Slide torque tube from the top thru the horizontal stabilizer.

(2). Apply one layer of teflon tape (CM726) to threads of torque tube prior to installing locknut.

(3). Install locknut, hand tighten and adjust to a 0.005-0.010 inch (0.127-0.254 mm) gap; Install cotter pin.

NOTE: When installing the bellcrank, opening in bellcrank must face outboard.

(4). Install bellcrank, with opening facing outboard, on torque tube and install expandable bolt; Torque to **30 - 40 inch-pounds (3.39 - 4.52 Nm) plus drag torque**; Install cotter pin.

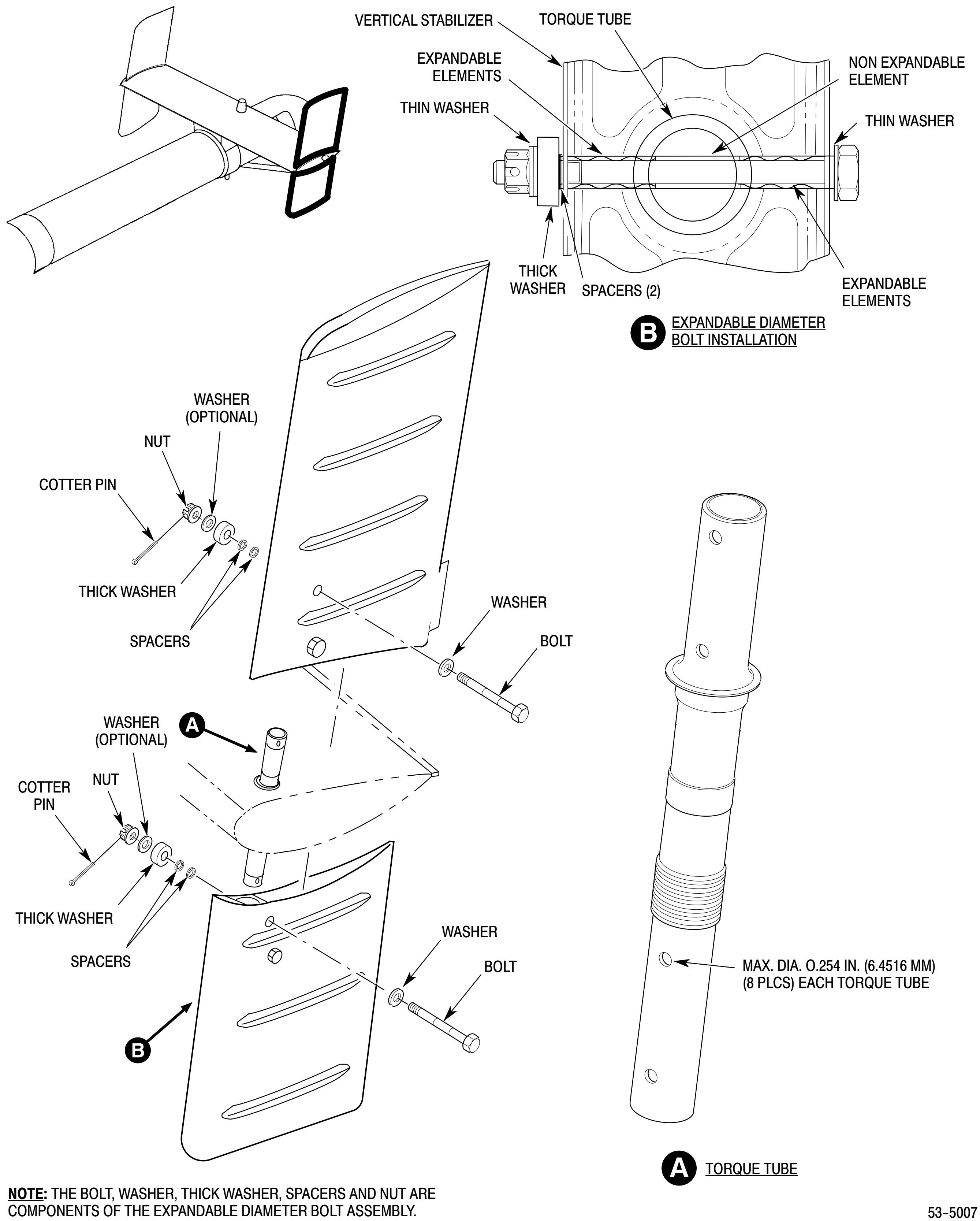

Figure 203. Vertical Stabilizer Installation with Expandable Bolts

(5). Connect YSAS actuator to vertical stabilizer torque tube bellcrank. Torque nut to **30 - 40 inch-pounds (3.39 - 4.52 Nm)** and install cotter pin.

(6). Install end plate access covers.

(7). Install vertical stabilizer (Ref. Vertical Stabilizer Replacement).

10. Horizontal Stabilizer Repair

Refer to MDHI Field Service Representative.

11. Vertical Stabilizer Torque Tube and/or Bushing Replacement (Non-Bonded Bushings)

(Ref. Figure 201) The following procedure is for replacing the early style (non-bonded) torque tube bushings.

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM726	Tape, teflon

(1). Remove vertical stabilizers (Ref. Vertical Stabilizer Replacement).

(2). Remove horizontal tip plate access cover and disconnect YSAS torque tube (if installed) from vertical stabilizer bellcrank.

(3). Remove bellcrank from torque tube by removing expandable bolt.

(4). Remove cotter pin, locknut and bushing from torque tube. Remove torque tube by lifting upward.

(5). Remove bushing from bearing race of torque tube.

(6). Install one bushing on bearing race of torque tube and insert torque tube through fitting of horizontal stabilizer from the top downward.

(7). Apply one layer of teflon tape (CM726) to threads of torque tube prior to installing locknut.

(8). Install bushing and locknut, hand tighten locknut and adjust to a 0.005-0.010 inch (0.127-0.254 mm) gap; Install cotter pin.

NOTE: Ensure shouldered bushings are installed in bellcrank.

(9). Install bellcrank on torque tube and install expandable bolt and washers; Torque to **30 - 40 inch-pounds (3.39 - 4.52 Nm) plus drag torque**; Install cotter pin.

(10). Connect YSAS actuator to vertical stabilizer torque tube bellcrank. Torque nut to **30 - 40 inch-pounds (3.39 - 4.52 Nm)** and install cotter pin.

(11). Install end plate access covers.

(12). Install vertical stabilizer (Ref. Vertical Stabilizer Replacement).

12. Vertical Stabilizer Torque Tube and/or Bushing Replacement (Bonded Bushings)

(Ref. Figure 201) The following procedure is for replacing the current style (bonded) torque tube bushings.

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM222	1,1,1-T richloroethane
CM402	Adhesive
CM726	Tape, teflon
CM802	Abrasive cloth, aluminum oxide

(1). Remove vertical stabilizers (Ref. Vertical Stabilizer Replacement).

(2). Remove horizontal tip plate access cover and disconnect YSAS torque tube (if installed) from vertical stabilizer bellcrank.

(3). Remove bellcrank from torque tube by removing expandable bolt.

(4). Remove cotter pin, locknut and bushing from torque tube. Remove torque tube by lifting upward.

CAUTION In the following steps, care must be taken to not damage the fibers of the horizontal stabilizer.

(5). Remove bushing(s) from horizontal stabilizer by gently working a sharp scraper between bushing and stabilizer.

(6). Sand excess sealant from horizontal stabilizer taking care not to disturb the composite fibers of the stabilizer.

(7). Clean faying surfaces of horizontal stabilizer, where bushings are to be bonded, with 1,1,1-trichloroethane (CM222).

(8). Wipe dry using a clean dry rag and then allow to air dry for 15 minutes.

(9). Lightly abrade the faying surface of the new bushings with abrasive cloth (CM802) until all gloss is removed. Wipe clean with 1,1,1-trichloroethane.

(10). Wipe dry using a clean dry rag and then allow to air dry for 15 minutes.

(11). Mix adhesive (CM402) according to manufacturers instructions. Apply adhesive within 2 hours of cleaning.

(12). Apply a thin uniform layer of adhesive to faying surfaces.

CAUTION Do not apply too much pressure, damage to horizontal stabilizer may occur.

(13). Press the faying surfaces firmly together and maintain contact pressure or apply 50 psi (3.45 kPa) maximum for 24 hours at ambient temperature.

(14). Using 1,1,1-trichloroethane, clean excess adhesive from parts before adhesive has had time to cure.

(15). Slide torque tube from the top thru the horizontal stabilizer.

(16). Apply one layer of teflon tape (CM726) to threads of torque tube prior to installing locknut.

(17). Install locknut, hand tighten and adjust to a 0.005-0.010 inch (0.127-0.254 mm) gap; Install cotter pin.

(18). Install bellcrank on torque tube and install expandable bolt; Torque to **30 - 40 inch-pounds (3.39 - 4.52 Nm) plus drag torque**; Install cotter pin.

(19). Connect YSAS actuator to vertical stabilizer torque tube bellcrank. Torque nut to **30 - 40 inch-pounds (3.39 - 4.52 Nm)** and install cotter pin.

(20). Install end plate access covers.

(21). Install vertical stabilizer (Ref. Vertical Stabilizer Replacement).

13. Vertical Stabilizer Torque Tube Bushing Rework (Non-Bonded Bushings to Bonded Bushings)

(Ref. Figure 201) The following procedure is for converting the vertical stabilizer torque tube to the current 500N3980-3 bushings, 500N3970-3 locknuts and MS24665-361 cotter pins.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM222	1,1,1-Trichloroethane
CM402	Adhesive
CM726	Tape, teflon
CM802	Abrasive cloth, aluminum oxide

(1). Remove vertical stabilizers (Ref. Vertical Stabilizer Replacement).

(2). Remove cotter pins, locknuts and bushings, and scrap. Remove torque tube by lifting upward. Remove bushing and scrap.

(3). Clean faying surfaces of horizontal stabilizer, where bushings are to be bonded, with 1,1,1-trichloroethane (CM222).

(4). Wipe dry using a clean dry rag and then allow to air dry for 15 minutes.

(5). Lightly abrade the faying surface of the new bushings with abrasive cloth (CM802) until all gloss is removed. Wipe clean with 1,1,1-trichloroethane.

(6). Wipe dry using a clean dry rag and then allow to air dry for 15 minutes.

(7). Mix adhesive (CM402) according to manufacturers instructions. Apply adhesive within 2 hours of cleaning.

(8). Apply a thin uniform layer of adhesive to faying surfaces.

CAUTION Do not apply too much pressure, damage to horizontal stabilizer may occur.

(9). Press the faying surfaces firmly together and maintain contact pressure or apply 50 psi (3.45 kPa) maximum for 24 hours at ambient temperature.

(10). Using 1,1,1-trichloroethane, clean excess adhesive from parts before adhesive has had time to cure.

(11). Slide torque tube from the top thru the horizontal stabilizer.

(12). Apply one layer of teflon tape (CM726) to new 500N3970-3 locknut.

(13). Install locknut, hand tighten and adjust to a 0.005-0.010 inch (0.127-0.254 mm) gap; Install MS24665-361 cotter pin.

(14). Install bellcrank on torque tube and install expandable bolt; Torque to **30 - 40 inch-pounds (3.39 - 4.52 Nm) plus drag torque**; Install cotter pin.

(15). Install end plate access covers.

(16). Install vertical stabilizer (Ref. Vertical Stabilizer Replacement).

14. Vertical Stabilizer Torque Tube Bearing Race Replacement

(Ref. Figure 201) The following procedure is for removal of the bearing race from the vertical stabilizer torque tube. Some special tools will need to be manufactured for this procedure.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM234	Solvent, dry-cleaning
CM318	Primer
CM730	Tape, duct

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
N/A	Arbor press

(1). Remove vertical stabilizers (Ref. Vertical Stabilizer Replacement).

(2). Remove vertical stabilizer torque tubes (Ref. Vertical Stabilizer Torque Tube Replacement).

(3). Fabricate the following tool for bearing race removal.

(a). Locate a steel plate of approximately 0.250 inch (6.35 mm) thickness.

(b). Drill a 1.510 inch (38.3540 mm) hole in the plate.

(c). Deburr edges of hole to prevent damage to torque tube.

(d). Apply tape (CM730) to tool to prevent damage to bearing race.

(4). Insert torque tube through the removal tool and install on arbor press.

CAUTION In the following steps, care must be taken to not damage the horizontal stabilizer torque tube.

(5). Place suitable device over torque tube end to protect tube from damage from arbor press.

(6). Remove bearing from the torque tube by gently pressing torque tube through the removal tool.

(7). Using solvent (CM234), clean primer residue from torque tube.

(8). Inspect torque tube for damage to bearing race contact surface.

(9). Fabricate the following tool for bearing race installation.

(a). Locate a steel plate of approximately 0.250 inch (6.35 mm) thickness.

(b). Drill a 1.390 inch (35.306 mm) hole in the plate.

(c). Deburr edges of hole to prevent damage to torque tube.

(d). Apply tape (CM730) to tool to prevent damage to bearing race.

(10). Insert bearing race into tool and mount on arbor press.

(11). Coat torque tube bearing race mating surface with primer (CM318).

CAUTION In the following steps, care must be taken to not damage the the horizontal stabilizer torque tube.

(12). Place suitable device over torque tube end to protect tube from damage from arbor press.

CAUTION In the following step, ensure bearing race is not cocked on torque tube, this will cause non-repairable damage to bearing race and torque tube.

(13). While primer is wet, press torque tube down through the bearing race until bearing race is tight against flange on torque tube.

(14). Inspect bearing race flanged surface to ensure no warpage occurred during installation.

(15). Reinstall vertical stabilizer torque tubes (Ref. Vertical Stabilizer Torque Tube Replacement).

(16). Reinstall vertical stabilizers (Ref. Vertical Stabilizer Replacement).

15. Stabilizer Troubleshooting

(Ref. Table 201)

Table 201. Troubleshooting Tailboom and Tail Surfaces

Symptom	Probable Trouble	Corrective Action
High frequency vibration	Fan assembly out of balance	Re-balance fan assembly.
	Loose fan blades	Replace and re-balance fan assy.
	Loose bolts/nuts on Horizontal or Vertical stabilizer	Inspect mounting hardware; adjust or replace as necessary.

NOTE: High frequency vibrations in helicopter can be caused by components in other systems (Ref. Sec. 64-00-00, 63-25-10, 63-25-30 and 71-00-00).

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Chapter

62

Main Rotor

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Section

62-00-00

Main Rotor (369D/E/FF - 500/600N)

MAIN ROTOR
FAULT ISOLATION

1. Main Rotor System - General Information

NOTE: Auto-Rotation RPM charts are found in Chapter 18.

The main rotor located over the helicopter center-of-gravity provides lift, lateral and longitudinal control. The fundamental components of the rotor are five or six removable blades, pitch housings and a hub. Each articulated blade is controlled through a pitch housing and link arrangement which transfers flight control inputs into the rotor blades. Rotor blades, pitch housings and links are secured to the hub by five sets of laminated steel straps. The collective, stick working through linkages, increases or decreases rotor blade angle affecting helicopter ascent and descent (collective pitch). Helicopter pitch and roll angles are controlled by the cyclic stick. Mixed collective and cyclic control inputs are simultaneously transferred into the main rotor for coordinated flight control. The four main equipment groups of the main rotor and control system are the rotor blades, hub, upper exterior controls, and cyclic and collective controls in the pilot's compartment.

(1). Main rotor blades (Ref. Sec. 62-10-00).

(2). Main rotor hub (Ref. Sec. 62-20-00 and 62-20-60).

(3). Main rotor swashplate and mixer (Ref. Sec. 62-30-00 and 62-30-60).

(4). Main rotor flight controls (Ref. Chap. 67).

NOTE: Unless specifically indicated in the text and illustrations, information applies to all model helicopters. Where information is limited to a specific model helicopter or configuration, the text or effectivity block will indicate.

2. Main Rotor System Troubleshooting

WARNING **Sudden onset of excessive and/or unusual main rotor vibration should be investigated immediately as to the cause, prior to continued flight. Under no circumstance should main rotor tracking be attempted to correct the problem until a thorough inspection of the main rotor blades, hub assembly and strap pack assembly has been performed.**

(1). First determine which major installation is defective.

(2). Isolate each linkage installation from others until area of malfunction is located.

(3). Investigate and determine exact location of malfunction.

(4). Repair or replace defective components.

NOTE: First indications of trouble are usually felt through cyclic or collective controls. Isolation procedures (Ref. Table 101, Sec. 67-10) indicate symptoms detected through these controls.

Table 101. Troubleshooting Main Rotor Vibrations

Symptom	Probable Trouble	Corrective Action
Unusual or excessive vibration.	Main rotor blades damaged.	Inspect blades (Ref. Sec. 62-10-00).
Vertical or Lateral vibration.	Main rotor hub or hub components damaged.	Inspect main rotor hub assembly (Ref. Sec. 62-20-00/62-20-60). Inspect strap pack assemblies.
One-per revolution lateral beat in hover and cruise. May also occur on ground during warmup or shutdown.	Defective damper or blade phasing.	Check damper nominal adjustment (Ref. Sec. 62-20-00/62-20-60) Replace defective damper.
Five-per-revolution or medium-frequency beat.	Worn pitch control bearings.	Replace pitch control bearings (Ref. Chap. 67).
One-per revolution vertical beat. Beat may appear throughout entire flight regime, becoming more pronounced at higher airspeeds.	Main rotor blades out of track.	Track main rotor blades (Ref. Sec. 18-10-00/18-10-60).
Lateral feedback (beat) in cyclic control stick with no longitudinal feedback detected.	Rotor blades out of track.	Track main rotor blades (Ref. Sec. 18-10-00/18-10-60).
One-per-revolution lateral beat, continuous.	Main rotor blade tip balance weights not secure.	Check balance weights for security; repair as necessary: (Ref. Sec. 62-10-00).
	Incorrect blade phasing.	Check main rotor track and balance (Ref. Sec. 18-10-00/18-10-60).
High frequency vibrations.	Loose or defective component in another system.	(Ref. Chaps. 18, 62, 64 and 67)
Main rotor track and/or balance inconsistant.	Play between longitudinal pitch mixer bellcrank and collective pitch mixer bellcrank.	Re-bond collective pitch mixer bearings and install shims between longitudinal pitch mixer bellcrank and collective pitch mixer bellcrank bearings (Ref. Sec. 62-30-00 or 62-30-60).

Section

62-10-00

Main Rotor Blade (369D/E/FF - 500/600N)

MAIN ROTOR BLADE REMOVAL/INSTALLATION

1. Main Rotor Blade - General

Each of the main rotor blades are a balanced airfoil consisting primarily of a wraparound, aluminum alloy skin bonded to an extruded aluminum alloy spar, an upper root fitting and a lower root fitting (Ref. Figure 401). Two pre-set balance weights are installed in the tip end of each blade. A removable forward tip cap, at the outboard end of each blade, is replaced with a tracking cap when tracking. Blade trailing edge tab may be bent up or down to compensate for differences in diving or climbing characteristics between individual blades during forward flight.

A. Main Rotor Blade Leading Edge Erosion Protection - General

Rotor blades produced since 1980 have an 18 inch or 36 inch leading edge abrasion strip to reduce wear. Earlier model blades without the abrasion strip that are used in a highly abrasive environment should have outer 24 inches of each blade (PN 369D21100-503 or -507, Ref. Figure 804) or outer 18 inches of each blade (PN 369D21100-505 or -509, Ref. Figure 805) leading edge covered equally by protective tape so blade life is not reduced by excessive erosion.

2. Main Rotor Blade Replacement

A. Main Rotor Blade Removal

(Ref. Figure 401)

(1). Relieve load on blade attachment points by supporting main rotor blade from below.

(2). Identify blade attaching hardware and pins for location (grease pencil, tape, etc). Detach damper clevis from blade. Remove two blade fitting attaching pins.

(3). If rotor system is not already color coded, use masking tape and/or grease pencil, to mark each blade and its respective pitch housing links so that blades can be reinstalled in same relative positions.

(4). Slide blade from lead-lag links.

B. Main Rotor Blade Installation

(Ref. Figure 401)

(1). Position main rotor blade in its (marked) pitch housing links. Install blade attaching pins.

CAUTION If new blade is to be installed, or if blades are not reinstalled in same positions from which removed or are installed on new rotor hub, blade attach pins must be adjusted. It is also necessary to track blades.

(2). Align damper clevis on fitting of main rotor blade; install damper attach bolt to attach clevis to blade.

(3). Remove blade-to-pitch housing link match-markings.

3. Main Rotor Blade and Damper Attach Pin Installation and Adjustment

CAUTION Whenever new attach pin is installed, main rotor blade is replaced, or rotor hub assembly is replaced, adjustment is required to ensure that pins properly fit in mating holes.

(1). Check main rotor blade and damper arm attach pins for cracks, wear and corrosion.

(2). Support blade tip to establish alignment of holes in blade root fittings and pitch housing lead-lag links; install pin.

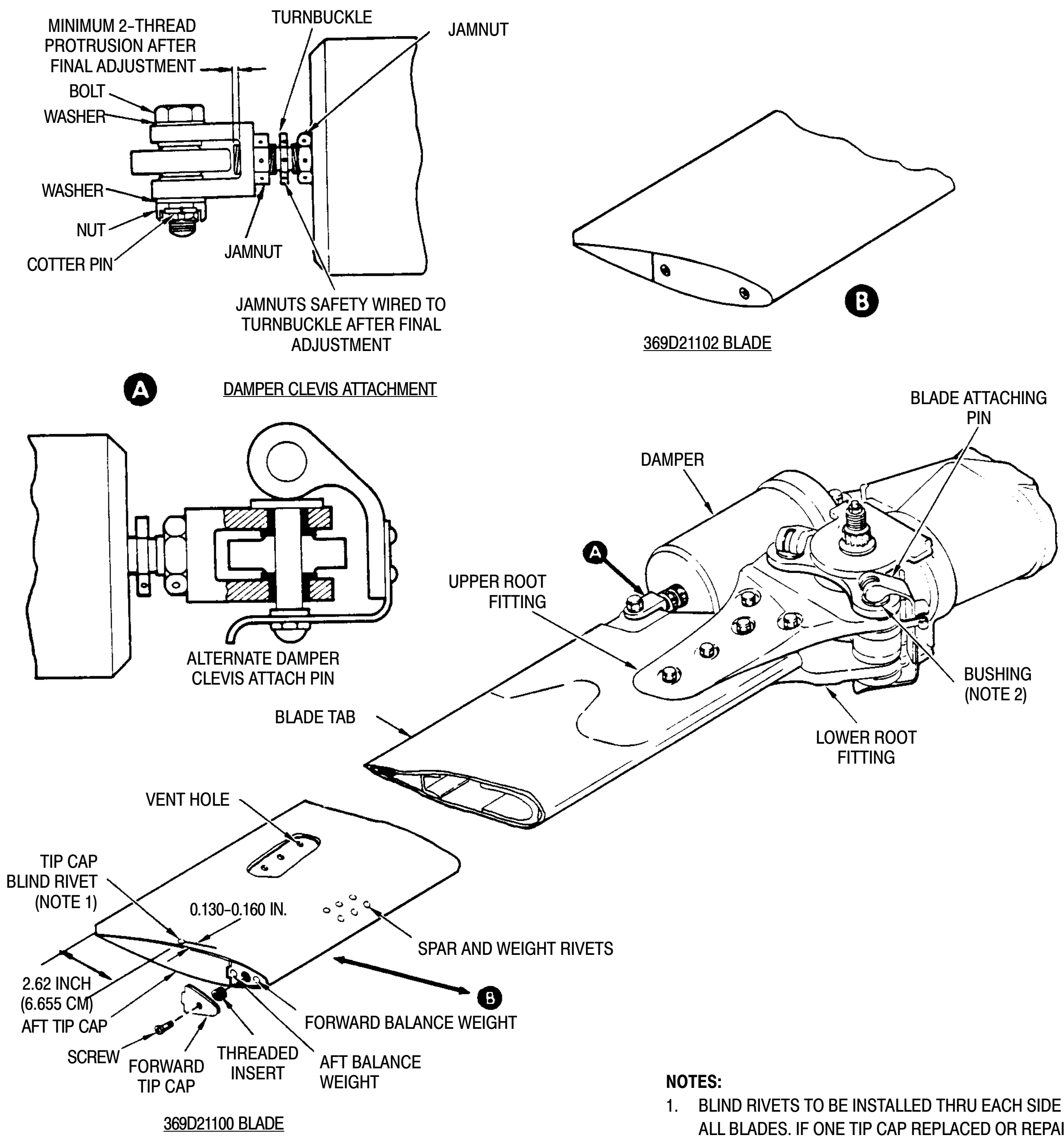
NOTE: After final adjustment of main rotor blade and damper attach pins, thread protrusion from adjuster nut of 1/2 to 1 thread is acceptable if adjuster nut run-on torque is a **minimum of 4 inch-pounds (0.45 Nm)** and attach pin safety latch is securely latched over adjuster nut.

(3). Adjust pin for correct fit by rotating small hex nut at end of pin until **25 -**

35 pounds force (111.2 - 155.68 N) is required to snap safety latch into place over nut.

NOTE: After adjustment, measure installed length of pins from face of thrust washer to outer edge of last bushing, dimension should be 0.99-1.04 inch (2.515-2.642 cm) for damper pins and 2.84- 2.89 inches (7.214-7.341 cm) for main rotor blade pins.

(4). At final installation, locking levers of both blade root fitting pins should be located inboard of (behind) stop springs of pitch housing lead-lag links.



NOTES:

1. BLIND RIVETS TO BE INSTALLED THRU EACH SIDE OF ALL BLADES. IF ONE TIP CAP REPLACED OR REPAIRED, ASSEMBLY BALANCE IS NOT AFFECTED.
2. BUSHING INSTALLED IN EACH OF UPPER AND LOWER ATTACHMENT LUGS.

G62-1000A

Figure 401. Main Rotor Blade - Attachment and Outboard End

MAIN ROTOR BLADE INSPECTION/CHECK

1. Main Rotor Blade Inspection

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
N/A	Plastic inspection tool (Fabricate from 0.001-0.002 inch (0.025-0.051 mm) thick plastic material)

(1). Inspect skin for evidence of cracks and holes. Cracks or holes in blade skin surface, regardless of location, are cause for rejection of blade. Scratches, dents, nicks and other surface defects in blade skin are limited according to (3). below. Use suitable dial indicator to check depth of blade dents and scratches.

CAUTION Repairable limit dimensions in following procedures apply to surfaces that have not been repaired before. Be sure that material has not been removed from damaged areas before determining that damage depth limit has not been exceeded. Refer all questionable surface damage not covered by following information to MDHI.

(2). (Ref. Figure 601) Limitations for surface scratches, nicks, gouges and erosion in seven areas of blade skin are described below. Scratches that do not penetrate clad surface are acceptable without reword in all areas except **AREAS 5** and **8**.

AREA 1: Minor scratches, nicks and gouges without skin penetrations are acceptable without repair. Skin deformation with holes is cause for replacement. Blade leading edge erosion may be repaired if skin is not eroded through. If leading edge skin is eroded through, no matter how slightly, blade must be replaced immediately.

AREA 2: Scratches to 0.005 inch (0.127 mm) depth if oriented 0-30 degrees from spanline and to 0.003 inch (0.076 mm) depth if oriented between 30 and 90 degrees from spanline are acceptable without repair. Nicks and gouges not exceeding 0.003 inch (0.076 mm) depth are acceptable without repair and to 0.005 inch (0.127 mm) with repair.

AREA 3: Scratches to 0.005 inch (0.127 mm) depth if oriented 0-30 degrees from spanline and to 0.003 inch (0.076 mm) deep if oriented between 30-40 degrees from spanline must be removed. No sharp nicks or gouges requiring more than 0.005 inch (0.127 mm) removal of skin surface are permissible.

AREA 4: Scratches to 0.003 inch (0.076 mm) depth if oriented 0-30 degrees and to 0.003 inch (0.076 mm) depth if oriented between 30-90 degrees from spanline must be removed. No sharp nicks or gouges requiring more than 0.003 inch (0.076 mm) removal of skin surface are permissible.

AREA 5: Scratches exceeding a depth of 0.001 inch (0.025 mm) are cause for rejection. Remove scratches to a depth of 0.001 inch (0.025 mm). Area inside outboard two root fitting bolt holes (both upper and lower surfaces) and including skin surface adjacent to these bolt holes within radius of 1.00 inch (2.54 cm) from each hole must be free of scratches, nicks, or gouges as would be detected under 5X magnification (minimum).

AREA 6: Scratches to 0.005 inch (0.127 mm) depth and oriented 0-15 degrees from spanline are acceptable without repair. Scratches to 0.005 inch (0.127 mm) depth and oriented from 15-30 degrees from spanline must be removed. Scratches 0.003 inch (0.076 mm) deep and oriented from 15-30 degrees from spanline are acceptable without repair. Scratches to 0.003 inch (0.076 mm) depth and oriented from 30-90 degrees from spanline must be repaired. Nicks and gouges not exceeding 0.005 inch (0.127 mm) depth must be repaired. All gouges, nicks, scratches and cracks on trailing edge not exceeding 0.030 inch (0.076 mm) depth must be smoothed and radiused out over 0.120 inch (3.048 mm) area on each side of damage. Defects beyond 0.030 inch (0.762 mm) depth are cause for rejection.

AREA 7: Scratches, nicks, or gouges up to 0.005 inch (0.127 mm) deep and detectable with 5X magnification are not acceptable without repair. Defects beyond 0.005 inch (0.127 mm) depth are cause for rejection. Gouges, nicks, scratches and cracks not exceeding 0.250 inch (6.35 mm) depth on trailing edge, except for **AREA 8**, must be smoothed and radiused out to 0.250 inch (6.35 mm) area on each side of damage center. Defects beyond 0.250 inch (6.35 mm) depth require blade replacement.

AREA 8: Check for gouges, nicks, scratches and cracks detected by using a bright light and 5X magnification at trailing edge corners where blade and tabs join. View area from different angles during inspection. Damage at this point not exceeding 0.030 inch (0.762 mm) depth must be smoothed and radiused out over a 0.120 inch (3.048 mm) area on each side of damage. Defects beyond 0.030 inch (0.762 mm) depth (Ref. Trim Tab Damage Repair).

(3). (Ref. Figure 602) Depth limitations for surface dents or depressions in eight areas of blade skin are described below. A dent or depression is defined as a smooth depression or discontinuity with no sharp changes in section.

AREA A: Dents and depressions exceeding 0.015 inch (0.381 mm) without sharp changes in section to a maximum of 0.062 inch (1.575 mm) must be repaired.

AREA B: Dents and depressions to a maximum of 0.010 inch (0.254 mm) are acceptable without repair. No repairs are permitted in this area.

AREA C: No repairs permitted.

AREA D: Dents and depressions exceeding 0.005 inch (0.127 mm) without sharp change in section to a maximum of 0.030 inch (0.762 mm) must be repaired.

AREA E: Dents and depressions exceeding 0.010 inch (0.254 mm) without sharp change in section to a maximum of 0.040 inch (1.016 mm) must be repaired.

AREA F: Dents and depressions exceeding 0.010 inch (0.254 mm) without sharp change in section to maximum of 0.040 inch (1.016 mm) must be repaired.

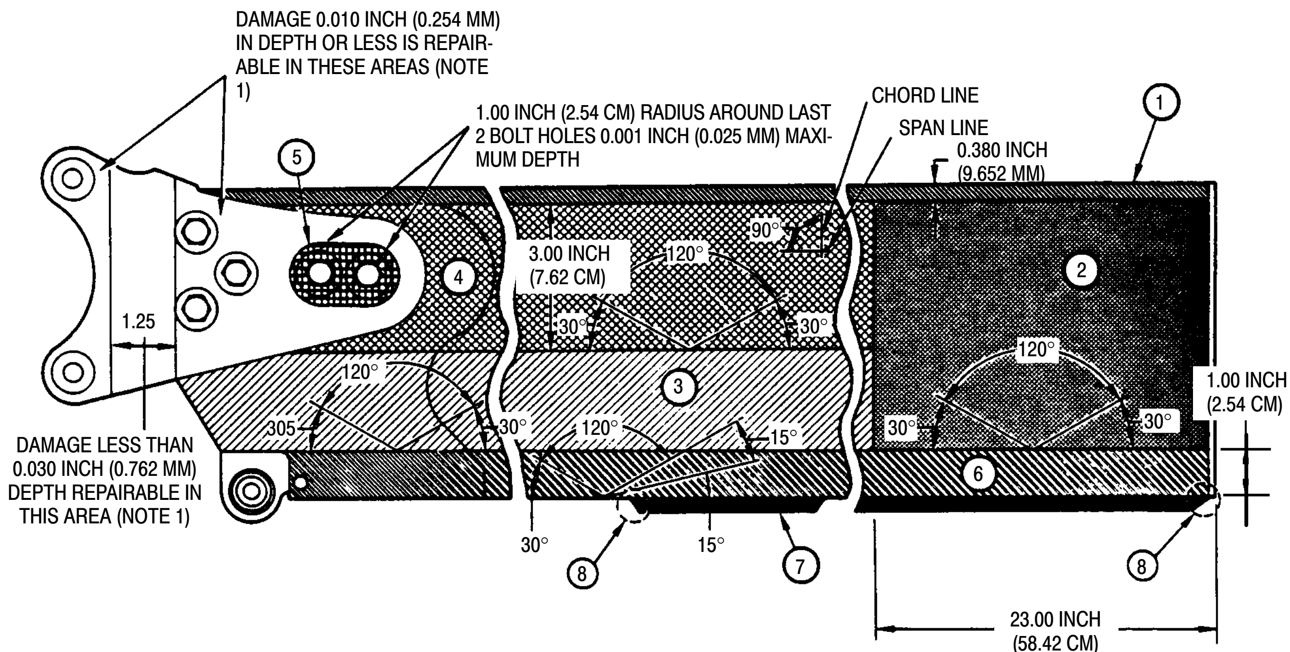
AREA G: No repairs permitted.

AREA H: Dents and depressions exceeding 0.010 inch (0.254 mm) without sharp change in section to maximum of 0.040 inch (1.016 mm) must be repaired.

AREA J: Dents and depressions exceeding 0.010 inch (0.254 mm) without sharp change in section to maximum of 0.040 inch (1.016 mm) must be repaired. Dents and depressions exceeding these limitations, refer to trim tab damage repair.

(4). Inspect surface areas of upper and lower root fittings (other than **AREA 5**) for evidence of nicks, scratches, and wear spots. Nicks, scratches, and wear spots deeper than 0.010 inch (0.254 mm) in attachment lug area, and bolt hole area are not repairable. Damage 0.010 inch (0.254 mm) deep or less must be repaired.

(5). Inspect four attachment lug bushings in root fittings (Ref. Figure 401) for security, and evidence of cracks or severe scoring.



SCRATCHES				GOUGES AND NICKS		GOUGES, NICKS AND CRACKS TRAILING EDGE ONLY	
AREA	ORIENTATION FROM SPANLINE	MAXIMUM DEPTH WITHOUT REPAIR	MAXIMUM DEPTH WITH REPAIR	MAXIMUM DEPTH WITHOUT REPAIR	MAXIMUM DEPTH WITH REPAIR	MAXIMUM DEPTH WITHOUT REPAIR	MAXIMUM DEPTH WITH REPAIR
1	0°-90°	MINOR WITHOUT SKIN PENETRATION	MINOR WITHOUT SKIN PENETRATION	MINOR WITHOUT SKIN PENETRATION	MINOR WITHOUT SKIN PENETRATION	N/A	N/A
2	0°-30° 30°-90°	0.005 INCH (0.127 MM) 0.003 INCH (0.076 MM)	0.005 INCH (0.127 MM) 0.003 INCH (0.076 MM)	0.003 INCH (0.076 MM) 0.003 INCH (0.076 MM)	0.005 INCH (0.127 MM) 0.005 INCH (0.127 MM)		
3	0°-30° 30°-90°	NONE NONE	0.005 INCH (0.127 MM) 0.003 INCH (0.076 MM)	NONE NONE	0.005 INCH (0.127 MM) 0.005 INCH (0.127 MM)		
4	0°-30° 30°-90°	NONE NONE	0.003 INCH (0.076 MM) 0.002 INCH (0.051 MM)	NONE NONE	0.003 INCH (0.076 MM) 0.003 INCH (0.076 MM)		
5 (NOTE 2)	0°-90°	NONE	0.001 INCH (0.025 MM) (NOTE 2)	NONE	0.001 INCH (0.025 MM) (NOTE 2)		
6	0°-15° 15°-30° 30°-90°	0.005 INCH (0.127 MM) 0.003 INCH (0.076 MM) NONE	0.005 INCH (0.127 MM) 0.005 INCH (0.127 MM) 0.003 INCH (0.076 MM)	NONE NONE NONE	0.005 INCH (0.127 MM) 0.005 INCH (0.127 MM) 0.005 INCH (0.127 MM)	NONE	0.030 INCH (0.762 MM) (NOTES 2, 4)
7	0°-90°	NONE	0.005 INCH (0.127 MM) (NOTE 2)	NONE	0.005 INCH (0.127 MM) (NOTES 2, 5)	NONE	0.250 INCH (6.35 MM) (NOTES 2, 3, 5)
8 TAB END	NOT APPLICABLE					NONE	0.030 INCH (0.762 MM) (NOTES 2, 4, 5)

NOTES:

1. DAMAGE LIMITS APPLY TO BOTH UPPER AND LOWER ROOT FITTING SURFACES.
2. INSPECTION UNDER 5X MAGNIFICATION (MINIMUM) REQUIRED.
3. AREAS NOTED: 0.250 INCH (6.35 MM) SMOTHERED AND RADIUSED CLEANOUT ALLOWED.
4. SMOOTHED AND RADIUSED CLEANOUT OVER 0.120 INCH (3.048 MM) AREA ON EACH SIDE OF DAMAGE.
5. REFER TO TRIM TAB DAMAGE REPAIR.

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Figure 601. Main Rotor Blade Damage and Repair Limits - Nicks, Scratches, Gouges and Cracks

(6). Inspect damper-attachment bearing for binding, evidence of galling or scoring in bore and wear. No radial play is permissible. Maximum axial play is 0.015 inch (0.381 mm).

(7). Inspect all bonded areas for evidence of separation. If there appears to be separation of trailing edge bond, lightly probe joint with a 0.001-0.002 inch (0.025-0.051 mm) plastic inspection tool. If plastic inspection tool can be inserted to a depth of 1/2 inch (12.70 mm) or more, either above or below V insert, separation is excessive.

NOTE: Trailing edge structural bond line to V insert starts 1/4 inch (6.35 mm) in (chordwise) from trailing edge joint: therefore above tolerance allows 1/4 inch (6.35 mm) separation. Be sure measurement is taken from trailing edge joint, not tab trailing edge. Maximum trailing edge joint gap allowed during fabrication is 0.080 inch (2.032 mm).

(8). Inspect doubler shown in **AREA G** (Ref. Figure 602) for bonding voids between doubler and blade skin top and bottom. Use a heavy coin and lightly tap doubler surface. A void is detected by a distinct change in sound. Note that tapping sounds differ slightly due to blade structure in leading and trailing edge, internal channel and doubler areas. Allowable voids or debonds on main rotor blade ribs are as follows:

(a). 50% void or debond.

(b). Maximum four (4) ribs, no more than two (2) adjacent for the 369D21100 and 369D21102 blades.

(9). Ensure that vent holes are open (Ref. Figure 401).

(10). Inspect fasteners that secure upper and lower root fittings, and six rivets that secure skin to spar near tip, for security. Inspect forward tip cap screw insert for security and thread damage. Inspect trailing edge upper and lower weights for debonding and loose rivets.

(11). When continuous one-per-revolution lateral vibration occurs, inspect forward and aft balance weights (Ref. Figure 401) for security. Weights are normally recessed 0.050 inch (1.270 mm) inside end surface of tip. Security of weights may be checked by using torque wrench with screwdriver socket in slot of weight to detect if weight can be rotated by less than **20 inch-pounds (2.26 Nm)**. If torque wrench is not available, check weight security by fitting small coin in weight slots and applying maximum force that can be exerted by only index finger and thumb. If weights are found to be loose, retighten (Ref. Loose Balance Weight Repair).

2. Main Rotor Blade and Damper Attach Pin Inspection and Corrosion Protection

(Ref. Figure 603)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM120	Oil, corrosion preventive

(1). Inspect pin cam handle lobe for cracks and excessive wear. Remove pin from service if cracking or excessive wear is noted.

NOTE: If hard anodizing surface of cam lobes is worn, cam lobes can be re- anodized or treated with corrosion preventive oil (CM120).

(2). Inspect attach pin for evidence of corrosion, or wear, and for straightness. Pay particular attention to area along edges of barrel nut and bore in cam handle. Remove pin from service if corrosion or wear is noted or if pin is bent.

NOTE: If subject to salt laden atmosphere, following corrosion prevention treatment is to be applied at each periodic inspection to ensure continued serviceability of attach pin; and at each pin removal.

(3). With attach pin removed, lubricate mating surfaces of barrel nut and cam handle, using corrosion preventive oil (CM120). Rotate cam handle back and forth on barrel nut several times to ensure that oil penetrates all sections of pin operating mechanism. Wipe excess oil from pin surfaces.

3. Main Rotor Blade and Damper Attach Pin Disassembly and Special Inspection

(Ref. Figure 603) This inspection is to be preformed in event of a main rotor blade strike.

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM217	Isopropyl alcohol

CAUTION Do not intermix bushings, spacers and thrust washers between bolts. Component parts make up a single bolt assembly.

(1). Remove adjusting nut and remove adjusting bushings, spacers and thrust washers from pin.

(2). Using brush and clean cloth, clean parts with isopropyl alcohol (CM217). Dry with clean cloth.

(3). Inspect pin as follows:

(a). Fluorescent inspect pin per MIL-STD-6866.

(b). Magnetic particle inspect thrust washers, bushings and spacer per MIL-STD-1949.

(4). Reassemble pin in sequence as follows; install thrust washer, three (3) adjustable bushings, spacer, three (3) adjustable bushings and secure with adjusting nut.

4. Main Rotor Blade Forward Tip Cap Inspection and Corrosion Protection

(Ref. Figure 603)

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM217	Isopropyl alcohol
CM232	Rust inhibitor spray

(1). Inspect tip caps for evidence of corrosion, with particular attention at mating area of blade skin to tip weight interface. Verify integrity of sealant coating.

(2). If damage is evident, remove tip caps and apply penetrating oil to blade tip weight area. Oil arrests any corrosion between blade skin and weight assembly.

(3). Using brush and clean cloth, clean area with isopropyl alcohol (CM217). Dry with clean cloth.

(4). Spray area with light film of rust inhibitor (CM232); then apply thin film of primer and paint lightly as required (Ref. Sec. 20-40-00).

5. Main Rotor Blade Upper and Lower Root Fitting Attach Lug and Lead-Lag Link Attach Lug Inspection (25 Hour)

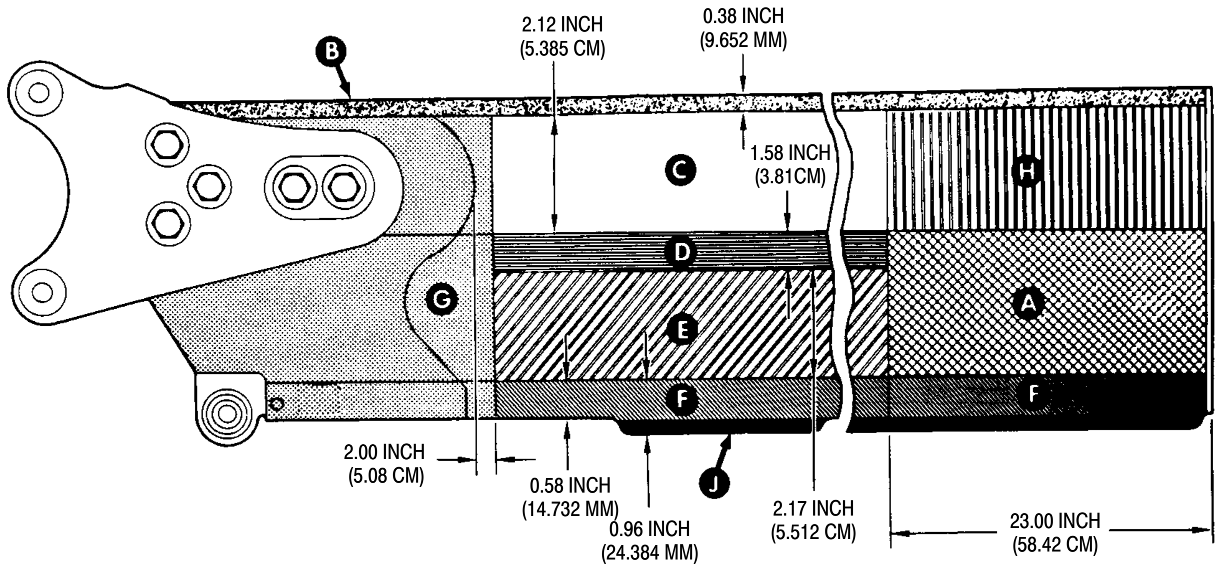
(Ref. Figure 604 and Figure 605) The following procedure pertains to helicopters equipped with 369D21100-BSC thru -515 and 369D21102-BSC and -501 main rotor blades and/or 369H1203-BSC, -11, -21 and -31 lead-lag link assemblies.

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM805	Dye penetrant kit

NOTE: Main rotor blades and hub assemblies installed on helicopters operating in a salt water or corrosive environment should be cleaned and washed on a daily basis as a preventative measure to arrest corrosion (Ref. Main Rotor Hub Corrosion Prevention (Tri-Flow Wash Procedures)).

(1). Visually inspect exposed portion of all installed main rotor blade upper and lower root fitting attach lugs, and main rotor hub lead-lag link attach lugs, for broken or cracked lugs, corrosion or other damage to the lug areas.



DENTS AND DEPRESSIONS					
AREA	MAXIMUM DEPTH WITHOUT REPAIR	MAXIMUM DEPTH WITH REPAIR	MAXIMUM ALLOWED AREA	MAXIMUM NUMBER OF DEFECTS	MAXIMUM DISTANCE BETWEEN DEFECT CENTERS
A	0.015 INCH (0.381 MM)	0.062 INCH (1.575 MM)	1.5 INCH (3.81 MM) X 1.5 INCH (3.81 MM)	1	N/A
B	0.010 INCH (0.254 MM)	0.000	0.250 INCH (6.35 MM) X 0.25 INCH (6.35 MM)	2	18
C	0.000	0.000	0.000	NONE AL-LOWED	N/A
D	0.005 INCH (0.127 MM)	0.030 INCH (0.762 MM)	1.5 INCH (3.81 MM) X 1.5 INCH (3.81 MM)	2	18
E	0.010 INCH (0.254 MM)	0.040 INCH (1.016 MM)	1.5 INCH (3.81 MM) X 1.5 INCH (3.81 MM)	2	18
F	0.010 INCH (0.254 MM)	0.040 INCH (1.016 MM)	1.5 INCH (3.81 MM) X 1.5 INCH (3.81 MM)	3	18
G	0.000	0.000	0.000	NONE AL-LOWED	N/A
H	0.010 INCH (0.254 MM)	0.040 INCH (1.016 MM)	1.5 INCH (3.81 MM) X 1.5 INCH (3.81 MM)	1	N/A
J	0.010 INCH (0.254 MM)	0.350 INCH (8.89 MM) (NOTE 2)	1.5 INCH (3.81 MM) X 1.5 INCH (3.81 MM)	N/A	N/A

NOTES:
1. N/A - NOT APPLICABLE.
2. REFER TO TRIM TAB DAMAGE REPAIR.

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Figure 602. Main Rotor Blade Damage Limits for Dents and Depressions

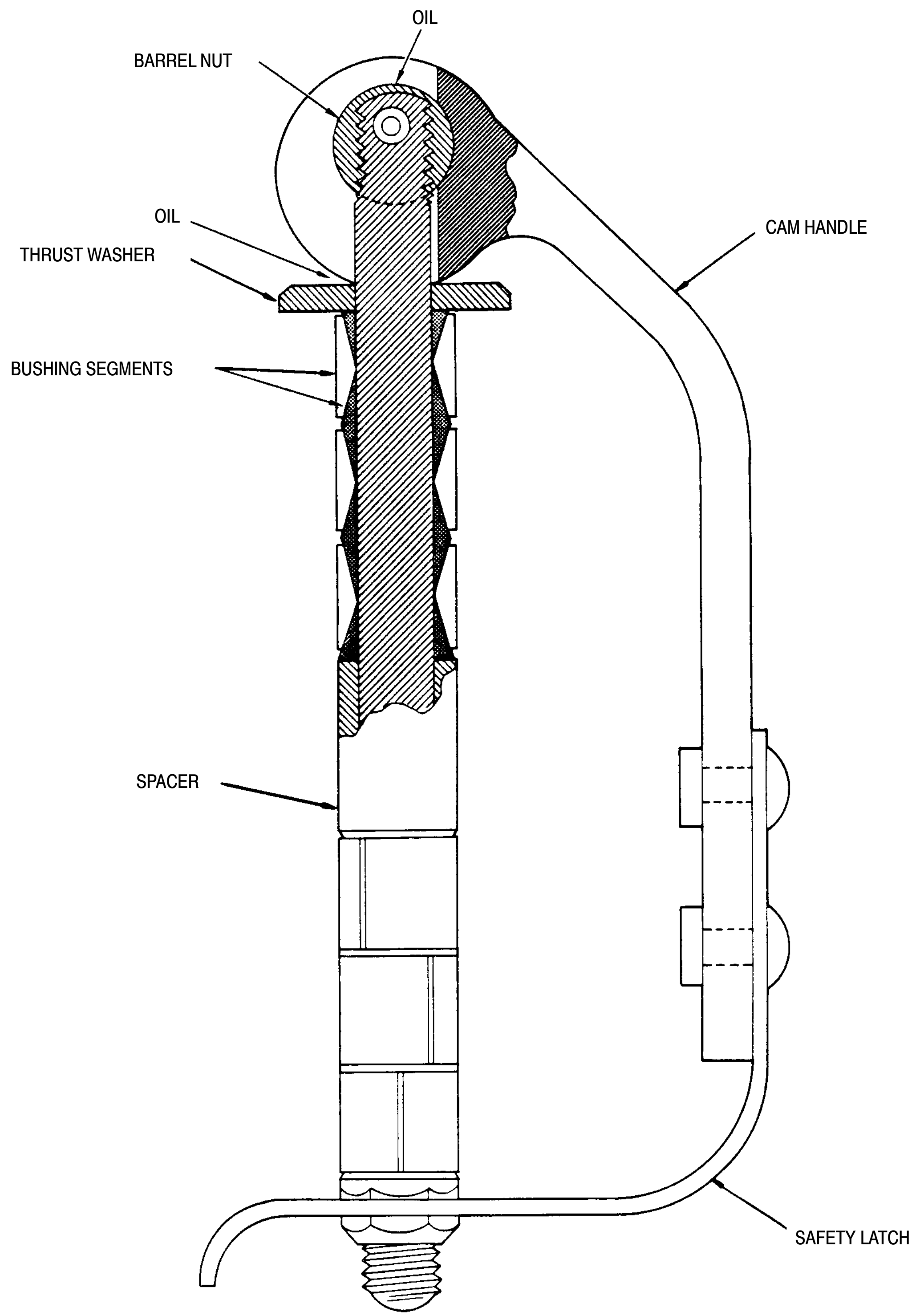


Figure 603. Main Rotor Blade Attach Pin

G62-1008

NOTE: If movement is suspected but cannot be verified with the blades installed, remove those blades and inspect bushings for movement.

(2). Using a bright light, inspect slippage marks on the root fitting bushings to ensure there has been no movement of the bushings. If bushings have moved, replace main rotor blade before next flight. Return those main rotor blades where bushing movement has occurred to MDHI for possible rework.

CAUTION

- If broken or cracked lugs are noted in main rotor blade upper and lower root fittings, replace main rotor blade before further flight (Ref. Main Rotor Blade Removal).
- If broken or cracked lugs are noted in main rotor lead-lag links, replace main rotor hub (Ref. Sec. 62-20) (Ref. **NOTE:** below).
- If cracking is suspected in either the rotor blade or hub lead- lag link attach lugs, perform dye penetrant (CM805) inspection of lugs per MIL-I-25135. If cracking is noted, replace main rotor blade (Ref. Main Rotor Blade Removal) or replace or repair main rotor hub assembly (Ref. Sec. 62-20), before further flight (Ref. **NOTE:** below).

NOTE: Lead-Lag link assemblies may only be replaced by MDHI authorized personnel or under MDHI supervision. Contact your local MDHI Field Service Representative for further information.

6. Main Rotor Blade Upper and Lower Root Fitting, Attach Lug and Lead-Lag Link Attach Lug Inspection (100 Hour)

(Ref. Figure 604 and Figure 605) The following procedure pertains to helicopters equipped with 369D21100-BSC thru -523, 369D21120-501, 369D21102-BSC thru -523 and 369D21121-501 main rotor blades and/or 369H1203-BSC, -11, -21 and -31 lead-lag link assemblies.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM217	Isopropyl alcohol
CM318	Primer
CM420	Sealant
CM805	Dye penetrant kit

(1). Remove affected main rotor blades (Ref. Main Rotor Blade Removal).

CAUTION

- If cracked or broken lug is noted in main rotor blade upper and lower root fittings, replace main rotor blade (Ref. Main Rotor Blade Removal) before further flight.
- If cracked or broken lug is noted in main rotor lead- lag links, replace or repair main rotor hub before further flight (Ref. Sec. 62-20) (Ref. **NOTE:** below).
- If a crack is suspected in either the rotor blade or lead-lag link attach lug, perform dye penetrant (CM805) inspection per MIL-I-25135 of lug. If a crack in noted, replace main rotor blade (Ref. Main Rotor Blade Removal) or replace or repair main rotor hub assembly (Ref. Sec. 62-20) (Ref. **NOTE:** below).

NOTE: Do not remove bushings or corrosion inhibiting sealer.

(2). Using bright light and 5X magnifying glass, visually inspect the attach lugs of all main rotor blade upper and lower root fitting and main rotor lead-lag links for broken or cracked lugs, corrosion or other damage to the lug areas.

NOTE:

- Pay particular attention to area around attach pin hole bushings in the lugs.
- Pay particular attention to the cross-hatched areas.

(3). If slippage marks have already been applied, inspect the root fitting for any indication of movement of the bushings; no movement is allowed. Return main rotor blades that have root fitting bushing movement to MDHI for possible rework. If slippage mark is degraded, reapply.

(4). Perform main rotor blade upper and lower root fitting inspection as follows:

(a). Inspect main rotor blade root fitting for missing (no squeeze-out) or cracked adhesive/paint around the periphery of the root fitting. If this condition exists, proceed as follows:

1). Loosen, but do not remove the extreme outboard bolt.

2). Insert a 0.004 inch (0.102 mm) thick piece of mylar/viewfoil between the fitting and the doubler.

3). If the mylar can be inserted, contact Field Service Representative for disposition of blade.

4). If the insertion is 0.10 inch (2.54 mm) or greater, remove blade from service.

NOTE: Measurement of the insertion is from the edge of the root fitting.

5). Retorque root fitting outboard bolt to **60 - 65 inch-pounds (6.78 - 7.34 Nm) plus drag torque**.

CAUTION In the following step, a crack might be difficult to detect if bright light is not used.

NOTE: The lower side of the blade is more susceptible to cracking.

(b). Using a bright light, inspect doubler and root fitting, paying particular attention to the lower side, for cracks. If crack is found, blade is to be scrapped.

NOTE: Lead-Lag link assemblies may only be replaced by MDHI authorized personnel or under MDHI supervision. Contact your local Field Service Representative for further information.

(5). Inspect lead-lag link blade attach pin hole bushings for any indication of movement of the bushings in the links. If any of the bushings have movement, replace the links.

CAUTION If required, apply a light but thorough coat of sealer (CM420) or primer (CM318) around bushings. Note that excessive amounts of sealant or primer around the bushings are not desirable and can unbalance the main rotor system.

(6). If sealing compound is not already installed or becomes loose, clean and then seal all junctions between all the steel bushings and the main rotor blade root fitting attach lugs with a film of sealing compound or zinc-chromate primer without removing the bushings.

(7). For the main rotor blade root fitting attach lugs, carefully remove sufficient amount of sealant and paint from only the bushing in the area where the slippage mark is to be applied (if not already done). Using isopropyl alcohol (CM217), clean the area where the slippage mark is going to be applied to allow adequate adherence of epoxy paint.

NOTE:

- Locate slippage mark in a position that can be viewed at subsequent inspections with main rotor blade installed in the hub. Slippage marks should not be applied to cross-hatched areas to preclude masking possible cracks.
- Insure that slippage mark is applied to bushing at upper and lower root fitting inside surfaces.
- Do not use torque seal.

(8). Apply epoxy paint slippage marks to four locations as shown.

(9). Install main rotor blades (Ref. Main Rotor Blade Installation).

7. Main Rotor Blade Leading Edge Abrasion Strip Check

The leading edge abrasion strip should be checked prior to each flight or on every daily check. The following is a comprehensive checklist:

NOTE: If void is noted towards end of blade, remove tip cap and check for presence of balance weights. If weights are not installed, a false indication of a void is possible.

(1). Check for any blistering, bubbling or lifting of the abrasion strip; this indicates a void.

(a). Voids cannot be closer than 0.50 inch (12.70 mm) to any outside edge of abrasion strip.

(b). Voids exceeding 1.5 square inch (9.677 square cm) are unacceptable.

(c). Voids cannot be closer than one inch (2.54 cm) to any other void.

(2). Number of acceptable voids depends upon length of abrasion strip.

(a). There cannot be more than three voids on either the top or bottom of the 36 inch (91.44 cm) long abrasion strip surface.

(b). There cannot be more than two voids on either the top or bottom of the 18 inch (45.72 cm) long abrasion strip surface.

(3). Record all voids in regards to size and location in the helicopter log book and check each void prior to each flight for growth and acceptable criteria.

8. Main Rotor Blade Torque Event Inspection

(Ref. Figure 604)

NOTE: This inspection requires the use of a bright light.

(1). Lifting from the outboard end of the blade, lift blade off the droop stop.

(2). Inspect the bottom-side of the blade as follows:

(a). Using a bright light and 10x magnifying glass, inspect for chordwise cracks protruding from under root fitting and doubler (View C and Note 7).

(b). Inspect the area around the root fitting, doubler and skin for cracks.

(c). Inspect the attach lugs at the bushings for cracks.

(d). Inspect the entire length of the blade for cracks.

(e). Lower blade back onto droop stop.

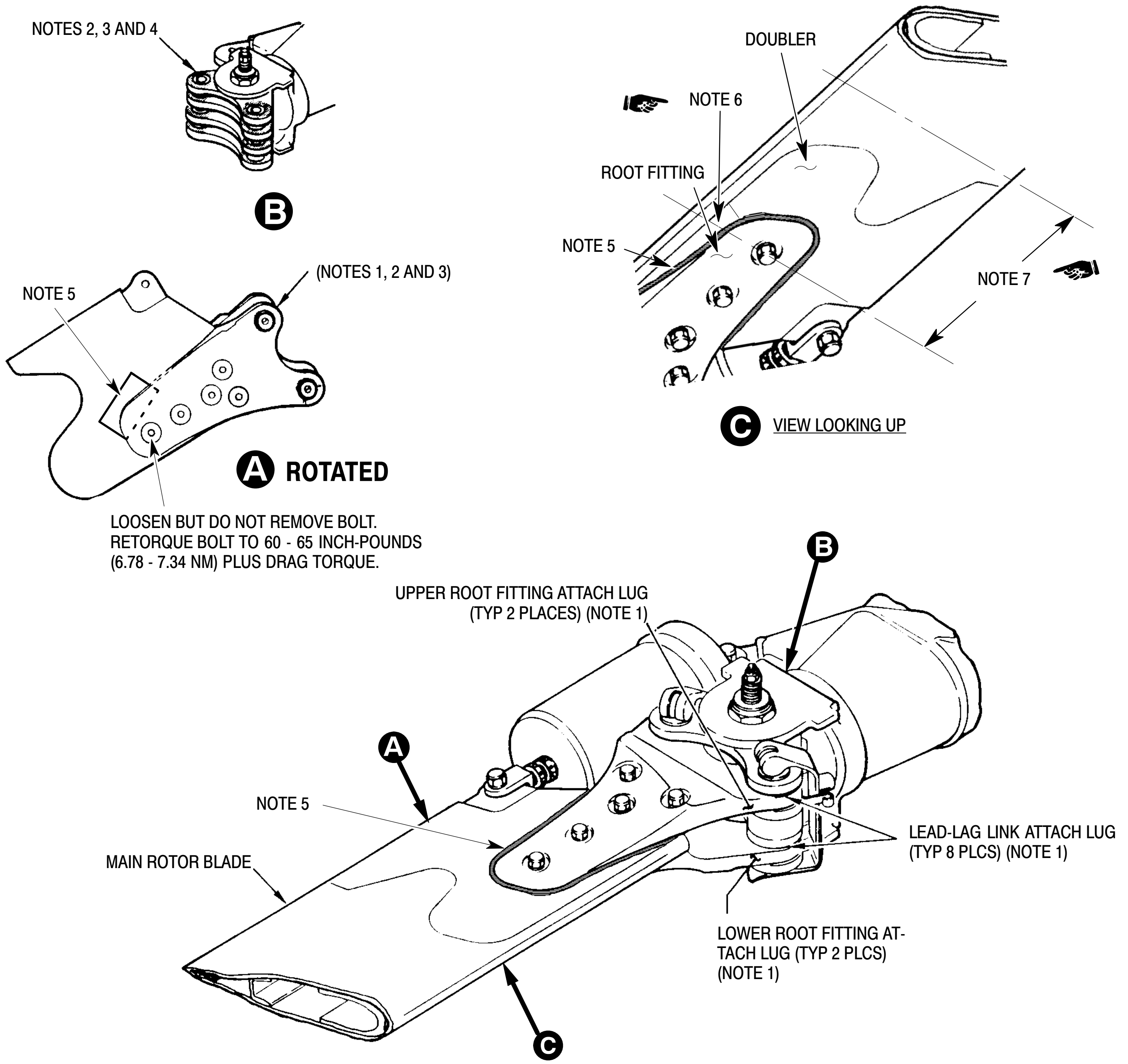
(3). With blade resting on the droop stop, inspect the top-side of the blade as follows:

(a). Inspect the area around the root fitting, doubler and skin for cracks.

(b). Inspect the attach lugs at the bushings for cracks.

(c). Inspect the entire length of the blade for cracks.

(4). If any of the above defects are found, the main rotor blade is to be rejected and scrapped.



NOTES:
1. VISUALLY INSPECT AREAS OF ALL ROOT FITTINGS AND LEAD-LAG ATTACH LUGS FOR CRACKS OR BREAKS. INSPECT BLADE ATTACH BUSHINGS FOR LOOSENESS. IF LOOSE, REPLACE LEAD-LAG LINKS.
2. PAY PARTICULAR ATTENTION TO AREA AROUND ATTACH PIN HOLES IN LUGS.
3. SEAL ALL JUNCTIONS BETWEEN BUSHINGS AND ATTACH LUGS WITH SEALER OR PRIMER (CM318).
4. LEAD-LAG LINK ASSEMBLIES ARE SUB-ASSEMBLIES OF THE MAIN ROTOR HUB ASSEMBLY.
5. INSPECT MAIN ROTOR BLADE UPPER AND LOWER ROOT FITTING FOR MISSING OR CRACKED ADHESIVE.
6. USING BRIGHT LIGHT, INSPECT MAIN ROTOR BLADE DOUBLER FOR CRACKS. PAY PARTICULAR ATTENTION TO BOTTOM SIDE OF BLADE, JUST BEYOND ROOT FITTING AND IN LINE WITH ROOT FITTING ATTACH BOLTS.
7. USING A BRIGHT LIGHT AND 10X MAGNIFYING GLASS, INSPECT FOR CHORDWISE CRACKS PROTRUDING FROM UNDER ROOT FITTING AND DOUBLER.

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Figure 604. Main Rotor Blade Root Fitting, Attach Lugs and Lead-Lag Link Assembly Inspection

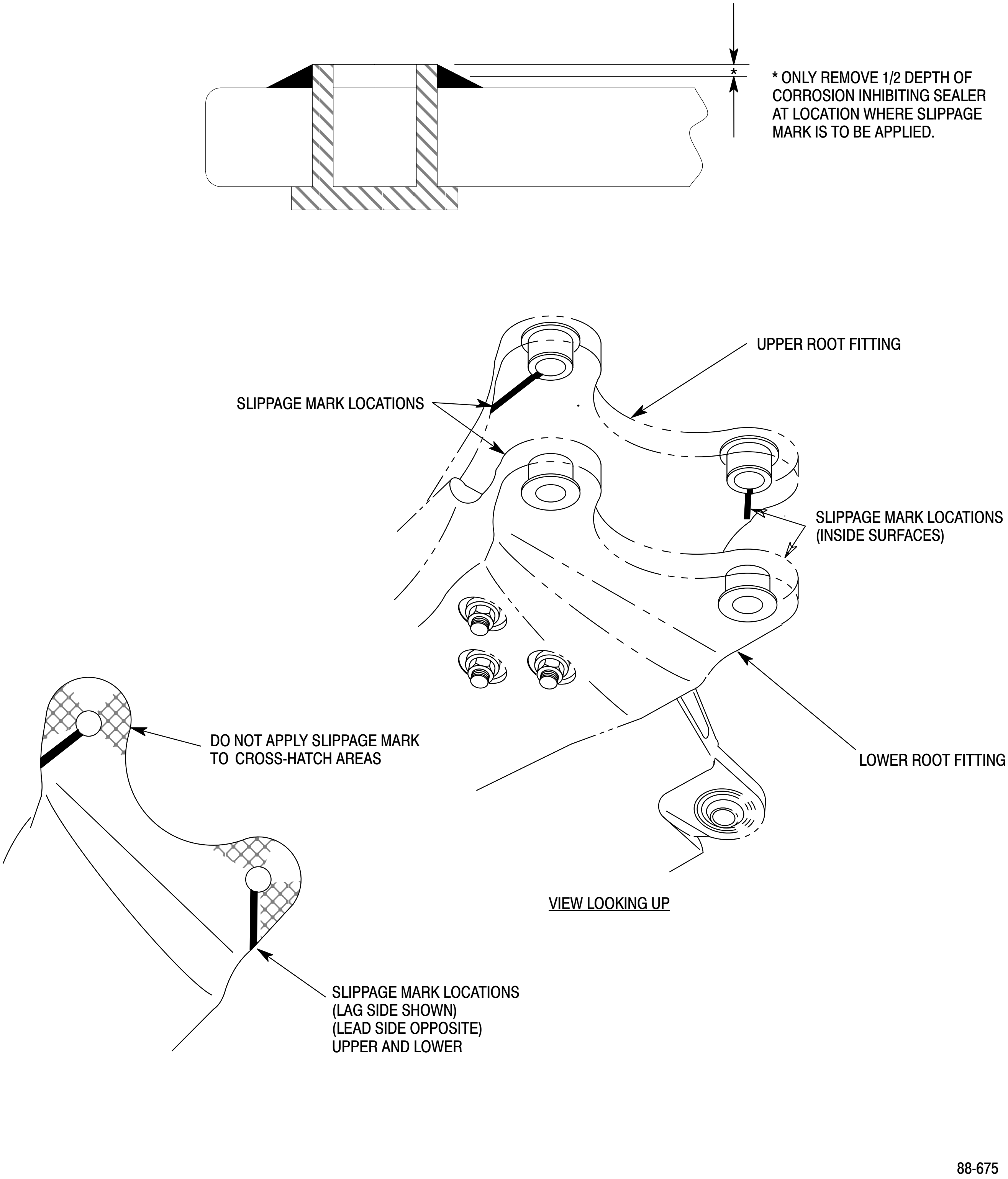


Figure 605. Application of Slippage Mark to Main Rotor Blade Bushings and Root Fittings

MAIN ROTOR BLADE REPAIRS

1. Main Rotor Blade Repair (Nicks, Scratches and Wear Spots)

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM206	Chemical coating
CM801	Abrasive paper, silicon carbide

(Ref. Figure 601)

CAUTION Do not use chemical paint remover to remove paint from abrasion strip. Chemicals can attack the abrasion strip to blade bonding agent.

(1). Using abrasive paper (CM801), not coarser than grade 320, remove nicks, scratches and wear spots from upper and lower root fittings, and from blade skin.

(2). Use finer grade of paper, as necessary to restore surface roughness to original finish.

(3). Remove material in such a manner that no abrupt changes occur in surface contours.

(4). Apply chemical film surface treatment (CM206) to repaired surface(s) (Ref. Sec. 20-30).

2. Main Rotor Blade Repair (Dents, Depressions and Erosion)

(Ref. Figure 602)

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM220	Naphtha aliphatic
CM229	Paint remover
CM234	Solvent, dry-cleaning
CM304	Enamel, epoxy
CM507	Resin, filler
CM508	Resin, filler
CM708	Tape
CM801	Abrasive paper, silicon carbide

CAUTION

- Repair only those damaged areas that are within repairable limits specified.
- Do not use chemical paint remover to remove paint from abrasion strip. Chemicals can attack the abrasion strip to blade bonding agent.

(1). Using abrasive paper (CM801), not coarser than grade 320, remove paint from surface area to be repaired.

(2). Clean abraded area with clean cloth dampened by solvent (CM234). Allow to dry for minimum of 15 minutes.

(3). Mask edges of repair areas with one layer of tape (CM708).

CAUTION Do not cut tape after it is applied to blade.

(4). Mix filler (CM507), three parts ”A” and two parts ”B” by weight. Mix thoroughly until mixture is dark red in color. An alternate filler (CM508) may be used if equal parts ”A” and ”B” by weight are mixed.

(5). Allow filler to cure for minimum of 24 hours at room temperature.

(6). Smooth filler area with grade 400 abrasive paper (CM801). Limit smoothing to masked area.

(7). Remove the tape and inspect alclad coating of area around repair. Penetration of coating is cause for blade replacement.

(8). Clean repaired area with a cloth dampened by solvent (CM220).

(9). Apply chemical film treatment to repaired surface (Ref. Sec. 20-30-00).

(10). Touch-up reworked area with paint (CM304) as required.

3. Trim Tab Damage Repair

(Ref. Figure 802)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM206	Chemical coating
CM220	Naphtha aliphatic
CM234	Solvent, dry-cleaning
CM304	Enamel, epoxy
CM318	Primer

CAUTION Provide protective surface and/or covering to prevent scratching, nicking or other damage to blade during rework. Position blade on work bench or equivalent.

NOTE: No minimum length of trim tab is required. In addition, the entire trim tab, or portion of the trim tab, may be removed if required. Removal of entire trim tab eliminates adjustment of blade tracking capability for that blade. Main rotor blades with and without trim tabs are 100% interchangeable, individually and in ship sets.

(1). Remove main rotor blade with damaged trim tab.

(2). Wipe away dirt on and around trim tab area with clean cloth dampened with dry cleaning solvent (CM234).

(3). Mask edges of blade area around trim tab area with tape; do **NOT** cut tape after it has been applied to blade.

(4). Remove damaged area of trim tab by making V-type cut with 45° sides joined by a 0.25 inch (6.35 mm) radius at the bottom of the V. Maximum V-cut depth is 0.35 inch (8.89 mm); do not cut past trim tab area into main portion of blade.

(5). If damage occurs within 1 inch (2.54 cm) of either or both ends of trim tab, remove tab end(s) and restore contour as shown.

(6). If excessive damage requires full or partial removal of trim tab from blade, perform the following (no minimum length of trim tab is required):

(a). Position blade on workbench so that a straight edge is provided for cutting or filing off trim tab.

CAUTION Cutting, grinding or filing to remove trim tab, and deburring of reworked blade trailing edge, are to be performed in a **SPANWISE** direction only. Do **NOT** use shears or clippers to remove trim tab.

(b). Use metal cutting saw or equivalent to remove the 0.38 inch (9.65 mm) wide trim tab per dimensions shown Ref. Figure 802, View A-A). Deburr edges in a **SPANWISE** direction only.

(7). Peel and remove tape from blade and inspect area around repair; clean repaired area with cloth dampened in naptha (CM220).

(8). Apply chemical film treatment (CM206) to reworked area of blade trailing edge or trim tab; apply a thin film of primer (CM318) and paint (CM304) lightly.

(9). Reinstall main rotor blade and perform track and balance (Ref. Sec. 18-10).

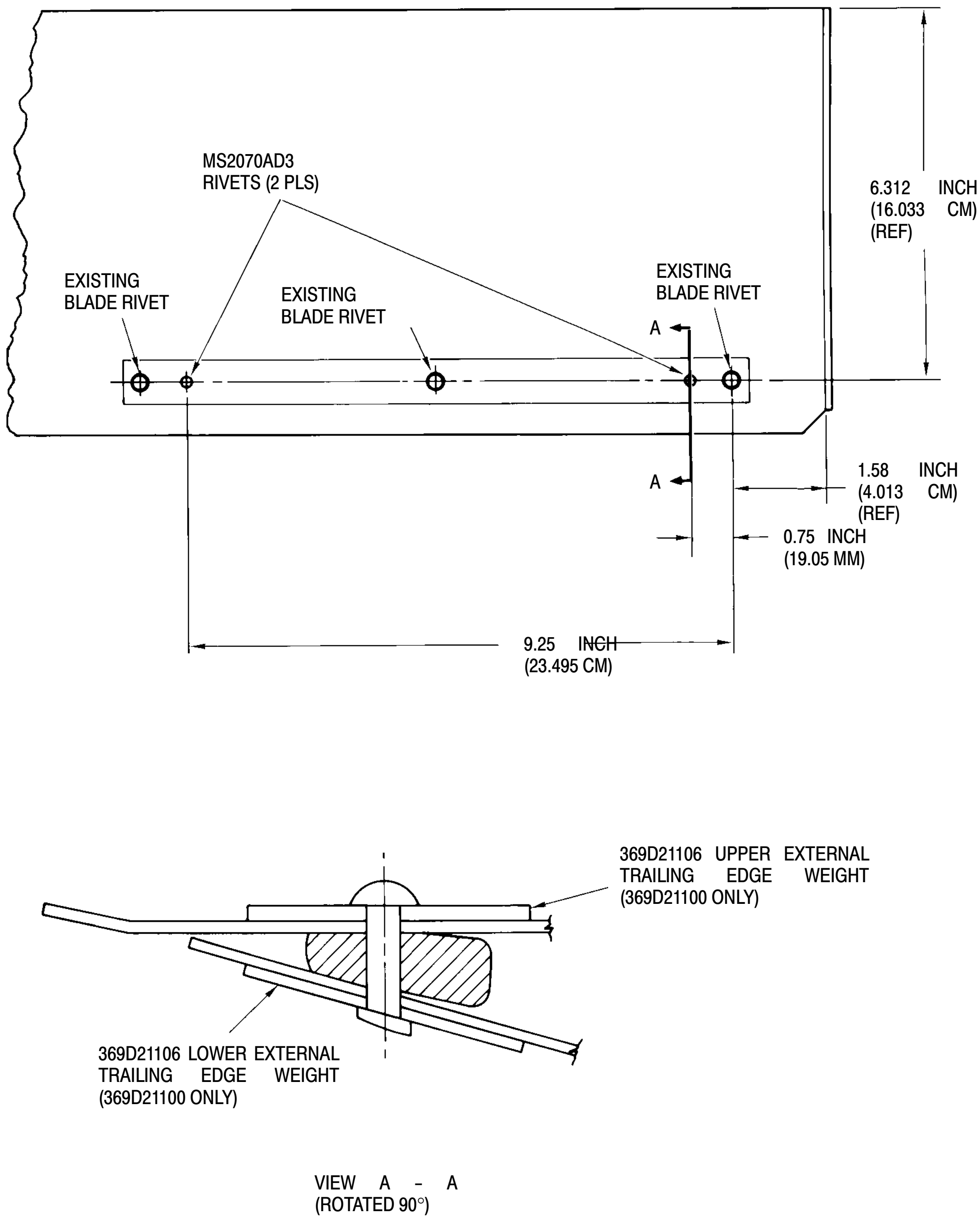
NOTE: Removal of entire trim tab eliminates adjustment of blade tracking capability for that blade.

4. Forward Tip Cap Threaded Insert Repair

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

Replace a loose or stripped insert. Use self-locking insert of correct size and install with wet primer (CM318). Comply with replacement requirements of applicable NAS standard.



NOTES: POSITION WEIGHT ONTO BLADE (ONE EACH ON UPPER AND LOWER SURFACES) BY ALIGNING CENTERS OF HOLES IN WEIGHT TO EXISTING RIVETS ON BLADE.

G62–1003A

Figure 801. Main Rotor Blade Trailing Edge Weight Rework.

5. Loose Balance Weight Repair

(Ref. Figure 401) Reinstall loose forward and aft balance weights as follows:

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM431	Sealing, locking and retaining compound

(1). Unscrew loose weight until it projects approximately one-half inch (12.7 mm) and remove old accumulation of powdered compound.

(2). Apply grade A locking compound (CM431) and screw weight back into blade until slotted end of weight is recessed 0.050 inch (1.27 mm) below tip surface. Wipe off excess compound.

CAUTION Allow to cure for a minimum of 12 hours. If faster cure is desired, complete cure can be obtained by allowing part to set for 30 minutes at room temperature and then heating for 30 minutes at approximately 212°F (101°C).

(3). If locking compound is not available, screw weight into normal position and centerpunch end of weight into mating threads at three evenly spaced points to prevent rotation.

6. Loose Trailing Edge Weight Repair

(Ref. Figure 801)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM220	Naphtha aliphatic
CM318	Primer
CM409	Adhesive, epoxy
CM804	Emery cloth, fine

(1). Carefully remove loose or partially debonded weights.

(2). Abrade debonded surface using #200-300 grit emery cloth (CM804).

(3). Clean bonding surfaces with naptha aliphatic (CM220).

(4). Mix epoxy adhesive (CM409) per manufacturer's instructions and apply to bonding surfaces.

(5). Position weights on blade by aligning holes in weights to existing rivet holes on blade and apply light pressure to weights until epoxy sets.

(6). Install (3 ea.) rivets in existing holes.

(7). If not already installed, install two more rivets as follows.

(a). Mark location of rivets to be installed.

(b). Drill holes at marked locations.

(c). Deburr and clean debris from holes.

(d). Coat all exposed surfaces with primer (CM318).

(e). Install rivets.

(f). Allow epoxy adhesive to cure per manufacturer's instructions before flying aircraft.

7. Loose or Missing Rivets or Aft Tip Cap Repair

(Ref. Figure 401) Replace all loose or missing rivets. Reinstall or replace loose or missing aft tip cap as follows:

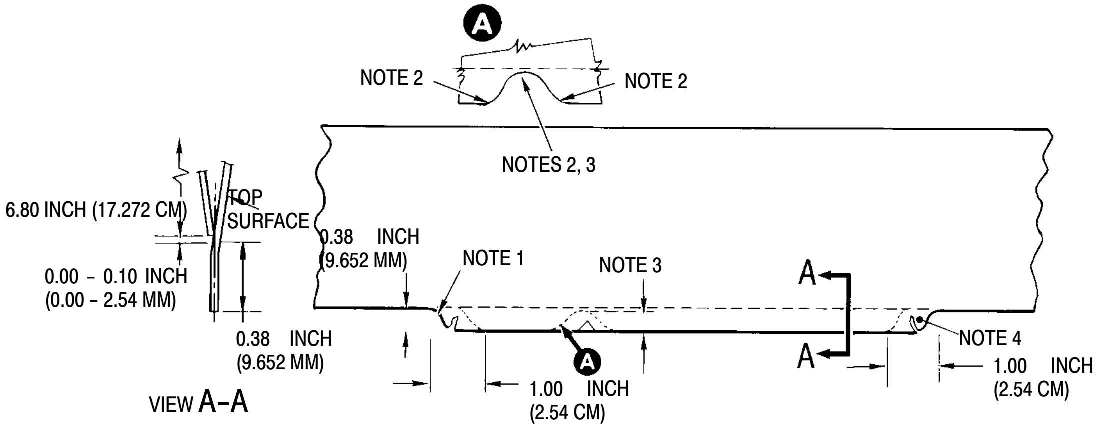
Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM234	Solvent, dry-cleaning
CM318	Primer
CM411	Adhesive, epoxy
CM801	Abrasive paper, silicon carbide

NOTE: Spare tip caps are supplied with bonding surface coated with nylon primer to facilitate installation. Main rotor balance is not affected by following repair.

(1). Lightly abrade primed surfaces of tip cap with grade 180 abrasive paper (CM801). Wipe away residue with cloth dampened in solvent (CM234) and allow tip cap to dry at room temperature for 30 minutes.

(2). Mix two-part bonding adhesive (CM411) in equal proportions by weight.



NOTES:

1. REMOVE DAMAGED END(S) IF THEY OCCUR WITHIN 1 INCH (2.54 CM) OF TAB ENDS.
2. 0.25 INCH (6.35 MM) RADIUS CLEANUP. FINISH PER BASIC HMI.
3. MAXIMUM DEPTH OF REPAIR 0.35 INCH (8.89 MM).
4. NO MINIMUM LENGTH OF TAB REQUIRED. IF DAMAGE OCCURS AT BOTH ENDS, IT IS PERMISSIBLE TO REMOVE AT BOTH ENDS.
5. ENTIRE TAB MAY BE REMOVED IF REQUIRED.

Figure 802. Repair and Removal of Trim Tab, Main Rotor Blade

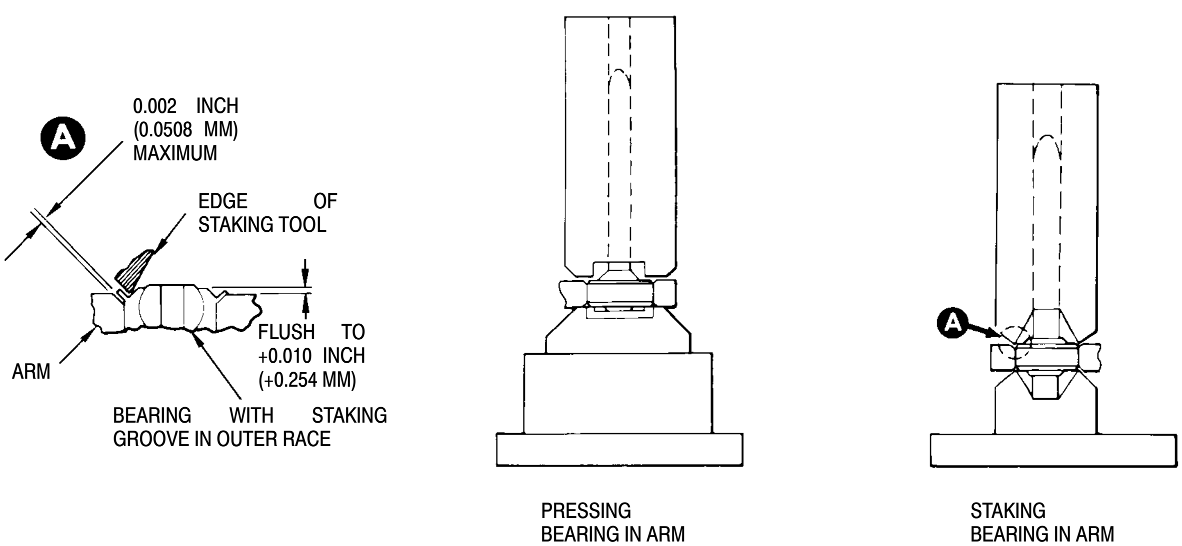


Figure 803. Bearing Replacement - Main Rotor Blade Damper Attach Fitting

(3). Apply bonding adhesive to abraded tip cap and mating surfaces at rotor blade tip. To extent possible, be sure that there are no adhesive voids.

(4). Install tip cap in blade tip, apply uniform clamping pressure to joint, and wipe away excessive adhesive. Allow to cure for eight hours at room temperature or two hours at 150°F (66°C).

(5). Install two MS20604AD3C2 blind rivets, one though each side of blade tip and tip cap.

8. Damper Attach Blade Fitting Bearing Replacement

(Ref. Figure 803)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM216	Loctite remover
CM219	Methyl-ethyl-ketone
CM318	Primer

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST709	Arbor press fixture
ST710	Staking tool

(1). Use fly or circle cutter with 5/16 inch (7.9375 mm) pilot to remove staked lip from one side of bearing without removing any material from fitting. If fitting is damaged by cutter, blade must be replaced.

(2). Use an arbor press to press bearing from fitting.

(3). Clean primer residue from fitting bore with MEK (CM219). Remove locking compound residue, if any, with locking compound remover (CM216).

(4). Using 10-power magnifying glass, inspect fitting bore for cracks. No cracks are permitted.

(5). Measure fitting bore diameter. Acceptable limits are 0.7488-0.7493 inch (19.01952-19.03222 mm).

(6). Apply thin coat of primer (CM318) to fitting bore.

(7). Press bearing into fitting with arbor press and fixture (ST709). Wipe away excess primer.

(8). Stake bearing at both sides of fitting with staking tool (ST710) in hydraulic press with 6000-8000 pounds (2722-3629 Kg) of force. When staked, outer race of bearing shall be flush to not more than 0.010 inch (0.254 mm) above fitting surface (both sides). Gap between staked lip of bearing race and chamfered surface of fitting bore shall not exceed 0.002 inch (0.0508 mm) as checked with feeler gage. Staking operation shall produce no cracks in fitting or bearing.

(9). Fill staking gap, if any, with primer (CM318).

9. Leading Edge Protective Tape Replacement

(Ref. Figure 804 and Figure 805) Replace protective tape when it is abraded. Operation in rain reduces tape life and more frequent replacement is necessary.

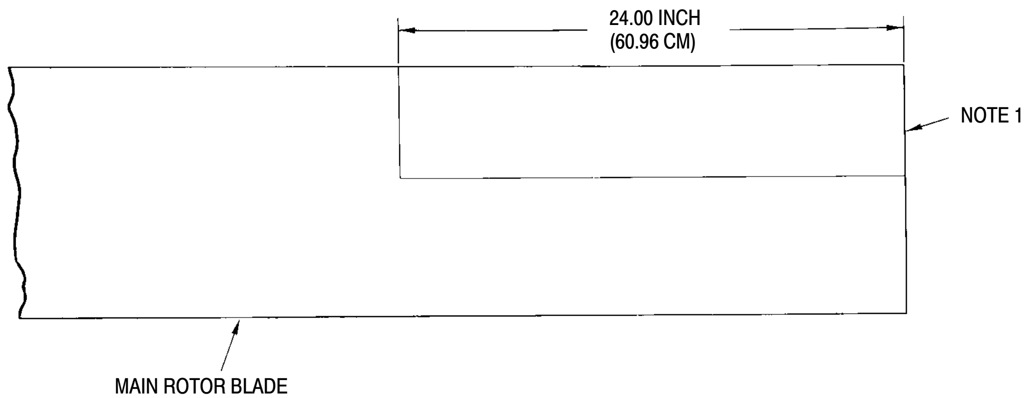
Consumable Materials
(Ref. Section 91-00-00)

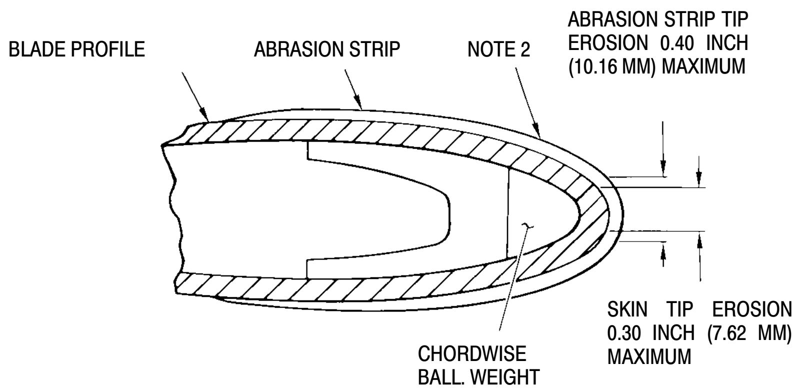
Item	Nomenclature
CM220	Naphtha aliphatic
CM801	Abrasive paper, silicon carbide

(1). Lightly abrade faying surface of main rotor blade with 400 grit abrasive paper (CM801).

(2). Wipe faying surface of blade with naptha aliphatic (CM220) to eliminate grease or dirt film.

(3). Use heat gun or equivalent to warm blade faying surface. Temperature must not exceed 120°F (49°C).





NOTES:

1. END OF TAPE TO BE FLUSH WITH OUTBOARD END OF BLADE SKIN. TAPE TO BE SYMMETRICAL ABOUT LEADING EDGE.
2. ABRASION TAPE MUST BE ALIGNED AT TOP PART OF BLADE.

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Figure 804. Installation/Replacement of Stainless Steel Abrasion Tape (Main Rotor Blade Leading Edge)

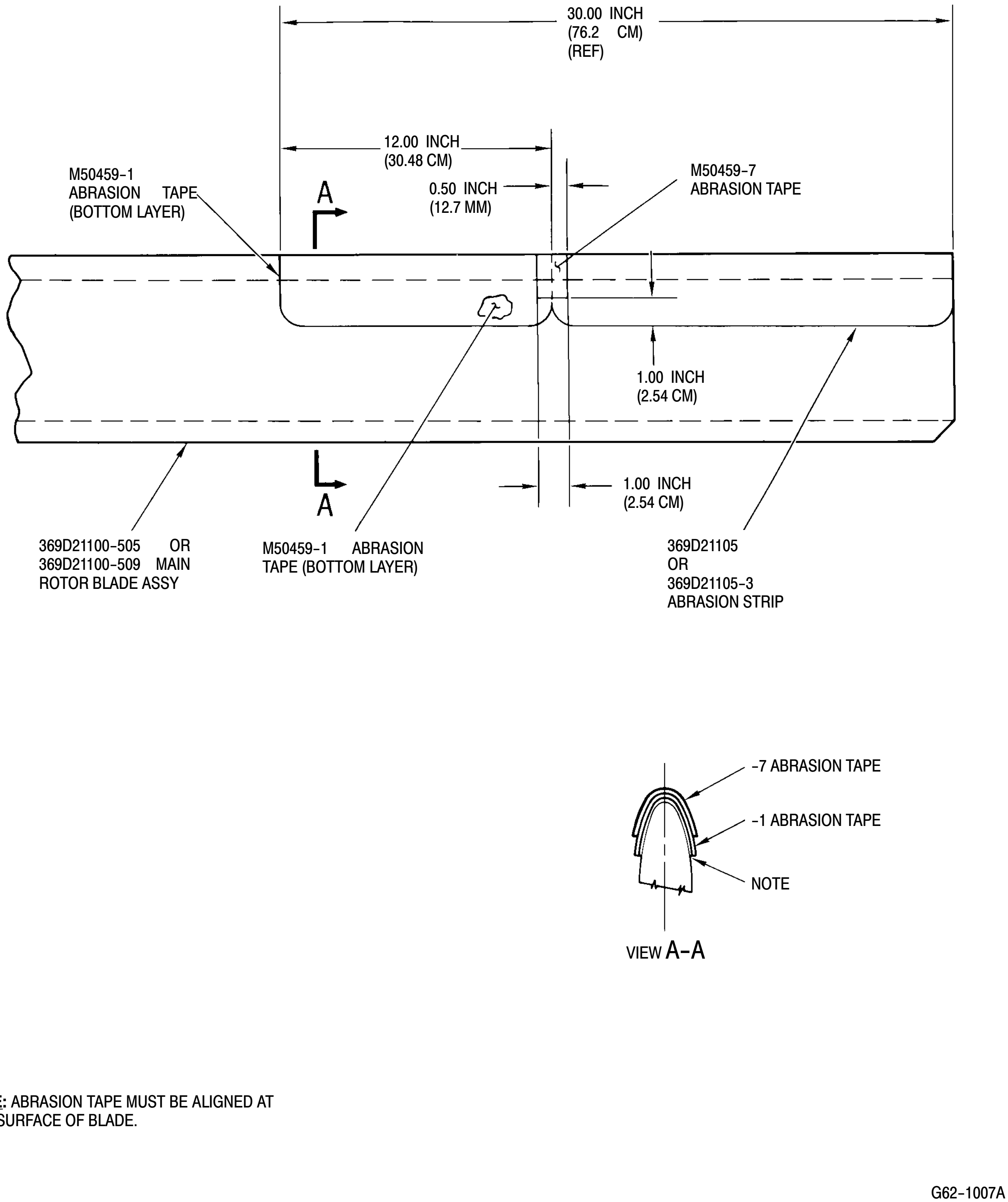


Figure 805. Installation/Replacement of Double Layer Abrasion Tape (369D21100-505 and -509 Rotor Blades)

(4). Remove backing and apply stainless steel abrasion tape to outboard leading edge of main rotor blade as follows:

(a). Apply 6.50 inch (16.5 cm) wide and 24 inch (61 cm) long abrasion tape along blade leading edge (Ref. Figure 804) so tape overlaps bottom and top of blade edge equally or (Ref. Figure 805) for 369D21100-505 and -509 blades.

(b). Smooth and press abrasion tape into place by hand. Use heat gun or equivalent to maintain temperature.

(c). Re-apply pressure by hand following initial installation to ensure proper bonding. Abrasion tape must be free of surface wrinkles or air bubbles.

NOTE: A second abrasion tape may be applied on top of the first tape to facilitate replacement when top tape becomes eroded. To apply second tape, wipe surface of installed strip clean with naptha aliphatic (CM220) and repeat steps (3). and (4). above. Second abrasion tape must be evenly aligned with first at top surface of blade (Ref. Figure 804) for 369D21100 blades or (Ref. Figure 805) for 369D21100-505 and -509 blades.

10. Leading Edge Abrasion Strip Sealing

(Ref. Figure 805)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM219	Methyl-ethyl-ketone
CM228	Surface cleaner
CM404	Adhesive, epoxy

(1). Remove screw and tip cap from main rotor blade.

(2). Remove any loose or cracked sealant or adhesive from areas of main rotor blade.

WARNING **MEK is flammable. Use in well ventilated area and away from open flame.**

(3). Clean areas to be sealed with clean cloth moistened with solvent (CM228). For hard to clean problem areas, MEK (CM219) may be used.

(4). Prepare adhesive (CM404) per manufacturer's instructions.

(5). Apply bead of adhesive to interface of abrasion strip and blade skin. Ensure there are no gaps or bridges in bead.

(6). Cure adhesive per manufacturer's instructions.

11. Tip Cap Sealing

(Ref. Figure 805)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM212	Releasing agent
CM213	Releasing agent
CM318	Primer
CM420	Sealant
CM427	Sealing compound
CM428	Sealing compound

(1). Apply release agent (CM212 or CM213) to inside of tip cap per manufacturer's instructions.

(2). Prepare and apply a 0.010-0.020 inch (0.254-0.508 mm) coating of sealant (CM420, CM427 or CM428) to faying surfaces per manufacturer's instructions.

(3). Attach tip cap to blade and install screw with primer (CM318).

(4). Wipe off squeezed out sealant flush with surface.

NOTE: To inhibit moisture entering bond joint of abrasion strip after initial application, reapply sealant, when sealant is worn away or becomes cracked.

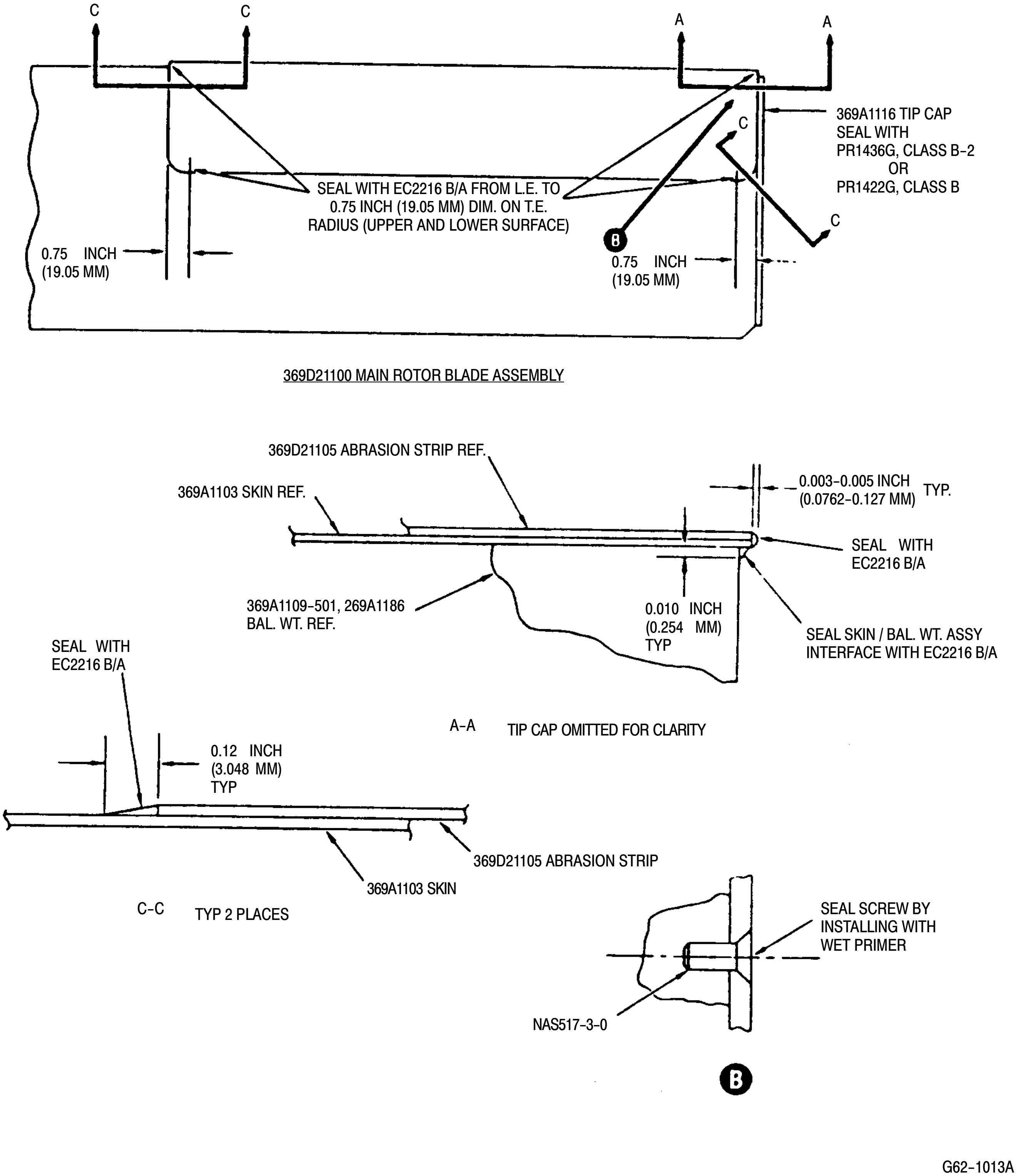


Figure 806. Main Rotor Blade Abrasion Strip and Tip Cap Sealing

12. Main Rotor Blade Protective Tape Installation

In an effort to reduce the amount of erosion in the area inboard of the abrasion strip, MDHS has approved the installation of stainless steel or Mylar tape to the blade leading edge. Installation of the tape is optional.

The approved 3M Mylar tape, P/N 8671-1, is one inch (2.54 cm) wide and the 304 stainless steel tape, P/N 87-369D21104, is 0.027 inch (0.6858 mm) thick and two inch (5.08 cm) wide.

The length of the tape can vary, up to 8.0 inches (20.32 cm) in length, but must be equal on all blades.

It is recommended to start with 2.5 inch (6.35 cm) length and increase the length as erosion occurs by replacing the tape.

NOTE:

- This installation is only approved on main rotor blades equipped with the 36 inch (91.44 cm) abrasion strips.
- For installation of the Mylar tape, refer to manufacturer's instructions. Use of aerosol primer Promoter 86 may be used to speed cure time of the tapes adhesive. Mylar tape comes in rolls one inch (2.54 cm) wide by 36 yards (329184 m) in length and the promoter comes in 36 ounce (1.065 L) cans. Mylar tape can be purchased from RS Hughes Company (1-800-453-81 16).

A. Stainless Steel Tape Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM220	Naphtha aliphatic
CM801	Abrasive paper, silicon carbide

CAUTION Do not cut or trim tape after installation on blade, damage to blade will occur.

(1). Measure length of eroded area on blade with the most erosion.

NOTE: Tape must be of equal length on all blades to ensure proper balance.

(2). Cut tape long enough to cover erosion plus approximately one-half inch (12.7 mm) overlap on leading edge abrasion strip.

(3). Round off square corners of tape to reduce peeling.

(4). Lightly abrade faying surface of main rotor blade in area where tape is to be installed with 400-grit abrasive paper (CM801).

(5). Wipe abraded area with naphtha aliphatic (CM220) to eliminate grease and dirt film.

(6). Treat any bare metal with epoxy-type paint.

NOTE: Do not allow temperature to exceed 120°F (49°C).

(7). Using a heat gun, or equivalent, heat abraded area.

(8). Apply aerosol primer to bonding area and allow to dry.

(9). Remove backing and apply tape to leading edge of blade.

(a). Apply tape so it overlaps each side of blade equally.

(b). Tape should overlap the inboard end of abrasion strip 0.5 ±0.03 inch (12.7 ±0.762 mm) at the leading edge of blade.

NOTE: Tape must be free of surface wrinkles or air bubbles.

(10). Smooth and press tape into place by hand.

(11). Re-apply pressure by hand following initial installation to ensure proper bonding.

(12). Perform main rotor balance (Ref. Sec. 18-10-00 or 18-10-60).

Section

62-20-00

Main Rotor Hub (369D/E/FF - 500N)

MAIN ROTOR HUB
REMOVAL/INSTALLATION

1. Main Rotor Hub - General

The main rotor hub consists of a central hub, five identical pitch housings spaced 72 degrees apart horizontally around the hub with associated mechanisms and linkages.

Lead-lag links, a lead-lag damper, a droop stop striker strip and spacer, and a pitch control bearing with each pitch housing produce the pivoting axis, blade flapping stop contact surfaces and lead-lag hinge function for the rotor blades.

Five laminated retention strap assemblies that are flexible both vertically and torsionally extend through the pitch housings and connect to the lead-lag links.

A lower shoe, attached to the central hub, contains a droop stop ring and droop restrainers that support the blades at rest and distribute droop loads at low blade rpm.

The following instructions provide field maintenance and repair procedures for the main rotor hub.

2. Main Rotor Hub Replacement

A. Main Rotor Hub Removal

(Ref. Figure 401)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST201	Hoisting adapter
ST701	Main rotor wrench assembly
ST702	Hub puller

(1). Remove all main rotor blades.

(2). Remove main rotor drive shaft; then reinstall hoisting eyebolts, washers and nuts in rotor hub. Locate them to correspond with lugs of hoisting adapter (ST201).

(3). Remove lockwire and disconnect flexible boot from lower end of hub liner.

(4). Disconnect each pitch control rod from pitch housing.

(5). Disconnect scissors crank from main rotor hub or scissors link.

NOTE: To facilitate assembly, color code each pitch control rod to match pitch housing to which it is attached.

(6). Remove two screws securing retainer to main rotor hub nut.

(7). Remove nut retainer.

(8). Using main rotor mast nut wrench (ST701), remove nut from mast.

(9). Using hub puller (ST702), break loose main rotor hub (Ref. Figure 401). Remove hub puller.

(10). Attach hoisting adapter, to eyebolts and hoist hub from mast.

B. Main Rotor Hub Installation

(Ref. Figure 402)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM111	Grease, aircraft
CM115	Grease, oscillating bearing
CM204	Compound, corrosion preventative
CM702	Lockwire CRES

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST201	Hoisting adapter
ST701	Main rotor wrench assembly
ST703	Main rotor hub driver

CAUTION Main rotor hub is a highly stressed component. Use extreme care to prevent it from striking any object. Any impact damage may require replacement of hub.

NOTE:

- Removal of recessed spacer, upper bearing cone, upper seal and seal retainer is not mandatory for installation of the main rotor hub. If these items are installed, perform steps (1). thru (4). and (11). thru (22). Caution should be used when installing hub to prevent damage to these parts.
- If recessed spacer, upper bearing cone, upper seal and seal retainer have been removed, these parts should not be assembled in hub before installation of hub on helicopter. These items are reassembled in hub after seating hub on mast. Prior to installing main rotor hub, insure that all bearings are adequately serviced with grease (CM111).
- Replacement main rotor hubs do not come balanced from MDHS. If installing a replacement hub, perform a main rotor hub balance (Ref. Sec. 18-10-00, Main Rotor Hub Balance Procedure).

(1). Attach hoisting adapter (ST201) to eyebolts in main rotor hub and connect suitable hoist.

CAUTION If hub assembly (with sleeve bushing, spacer, upper bearing and seal retainer installed) does not seat properly onto mast, do not attempt to force it into position. Remove hub assembly from mast and determine cause of hub not seating, correct the problem and follow the procedures for reinstallation.

(2). Check that rotor mast is clean. Hoist main rotor hub and position over mast; then lower hub onto mast.

NOTE: To inhibit mast corrosion when operating in salt water environment, lightly coat bearing journals of mast with grease (CM115).

(3). Remove adapter, hoist and eyebolts.

(4). Check that hub is fully seated on mast.

(5). Hand-pack hub cavity, between sleeve bushing and hub, with grease (CM111).

(6). Place recessed spacer, recess down, on top of sleeve bushing.

(7). Hand-pack upper bearing cup and cone with grease; then install cone on mast and use hub drive tool (ST703), to fully seat cone.

(8). Fill remaining cavity to upper seal with grease.

(9). Position upper seal in seal retainer with lip up; then press seal and retainer in hub counterbore.

(10). Using a soft drift, carefully tap seal outer ring to seat in counterbore. Wipe away any excess grease.

(11). Apply grease (CM111) to exposed threads on mast.

CAUTION Be sure that seal is properly positioned against seal retainer and that seal retainer does not pinch seal. Check by inserting a loop of approximately 0.050 inch (1.27 mm) diameter lockwire, round feeler gage or other suitable tool without sharp edges between seal lip and retainer.

NOTE: To insure that hub is seated onto mast properly before torquing, 2 - 4 threads should be showing above the mast nut with nut installed finger tight.

(12). Install mast nut, using wrench (ST701); torque nut to **200 foot-pounds (271 Nm)**. Apply coat of corrosion preventive compound (CM204) to screw holes in mast nut.

(13). Place retainer on nut and check retainer-to-nut screw hole alignment.

(14). Increase nut torque to not more than **250 foot-pounds (339 Nm)** to align holes in retainer and nut.

NOTE: If holes cannot be aligned in **200 - 250 foot-pound (271 - 339 Nm)** torque range, remove and invert nut and repeat procedures in (12). thru (14). to align holes.

(15). Secure retainer to nut with two screws; lockwire screws.

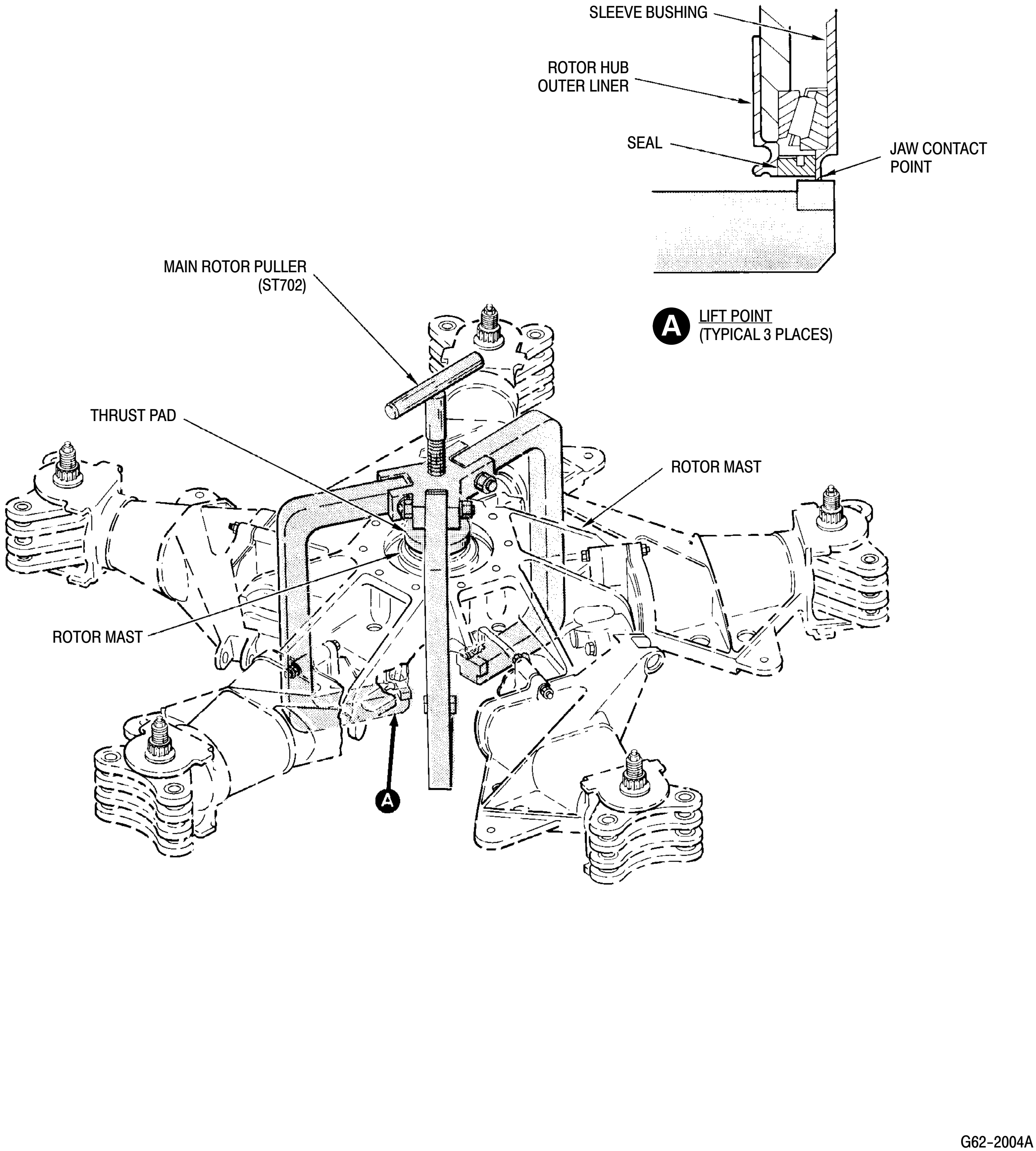


Figure 401. Pulling Hub Assembly

CAUTION Ensure that no washers are used under screwheads and that screwheads are free of burrs.

(16). Verify that screwheads do not project more than 0.020 inch (0.508 mm) above hub upper surface, for adequate clearance between screwheads and driveshaft flange.

(17). Connect scissors crank to main rotor hub lower shoe and/or to scissors link.

NOTE: Ensure pitch control rods are installed at same locations from which removed.

(18). Install five pitch control rods to pitch housings (Ref. Sec. 62-30-00, Pitch Control Rod Replacement).

(19). Connect flexible boot to lower end of rotor hub liner and secure with lockwire (CM702).

(20). Install main rotor drive shaft (Ref. Sec. 63-10-00).

(21). Install five main rotor blades.

(22). Perform main rotor blade droop angle check if hub is new or replacement.

(23). Perform main rotor hub balance (Ref. Sec. 18-10-00, Main Rotor Hub Balance Procedure) if a new or rebuilt hub is installed.

3. Main Rotor Damper

(Ref. Figure 603) A main rotor damper is attached to each pitch housing of the rotor hub. The damper is connected to the inboard trailing edge of the associated main rotor blade by an adjustable clevis to prevent lateral vibrations from occurring in main rotor blades. Neither damper travel nor stiffness is adjustable on the helicopter. Phasing of rotor blades is affected by turnbuckle adjustment. Any phasing problem caused by a defective damper should be corrected by replacing damper.

CAUTION Excessive lead-lag load applied to the main rotor blades during ground handling can result in damage to the elastomeric damper buns and failure of the damper assembly. Operators and maintenance personnel should use extra caution to avoid lead-lag loads in excess of **35 pounds (155.68 N)** at the tip of the main rotor blades.

NOTE:

- Refer to MDHS Notice DN-45.2 for information concerning required modification of dampers produced prior to October 1979. If lead- lag dampers, P/N 369D21400-501 are installed, they must be modified to M50452 or be replaced with P/N 369D21400-503 dampers.
- If one or more main rotor blades strike an object while rotating or the drive system has been subjected to sudden stop, inspect damper.

4. Main Rotor Damper Replacement

A. Main Rotor Damper Removal

(1). Note and record location from which damper is to be removed from main rotor hub.

NOTE: At reinstallation, if damper is not reinstalled at same location, a check of and/or blade phasing is required.

(2). Support blade parallel to ground.

(3). Remove damper.

NOTE: If damper is to be reinstalled at same location, do not disturb damper clevis, jam nuts or turnbuckle setting. Otherwise, blade phasing is required at reinstallation of damper.

(4). If damper is not to be reinstalled, remove bushing from damper ear and retain with hub.

B. Main Rotor Damper Installation

(1). Check, and if necessary, preset main rotor damper length (Ref. Nominal Damper Adjustment Procedure). Leave jamnuts fingertight.

NOTE: Ensure that bushing is installed in large hole of damper ears.

(2). With damper rotational direction decal facing outboard so it can be read, attach damper ears to pitch housing lug with bolt (head up), washers, and nut. Torque nut to **30 - 60 inch-pounds (3.39 - 6.78 Nm)** and install cotter pin.

(3). Adjust main rotor blade phasing for associated main rotor blade.

(4). After final phasing adjustments, torque jamnuts to **95 - 110 inch-pounds (10.73 - 12.43 Nm)**. Safety jamnuts to turnbuckle with new lockwire. Lockwire must be located out-board, away from pitch housing.

NOTE: Threaded end of damper turnbuckle shaft must protrude through clevis base a minimum of two full threads and must clear blade damper attach fitting.

(5). Connect damper to blade.

(6). Remove blade support.

5. Main Rotor Damper Nominal Adjustment

(1). Remove all five main rotor blade dampers from helicopter if installed.

NOTE: If dampers are being replaced, do not mix part numbers.

(2). Store all five dampers together in horizontal position for minimum of six hours. Preferred ambient temperature during storage is 55° to 85°F (13° to 30°C).

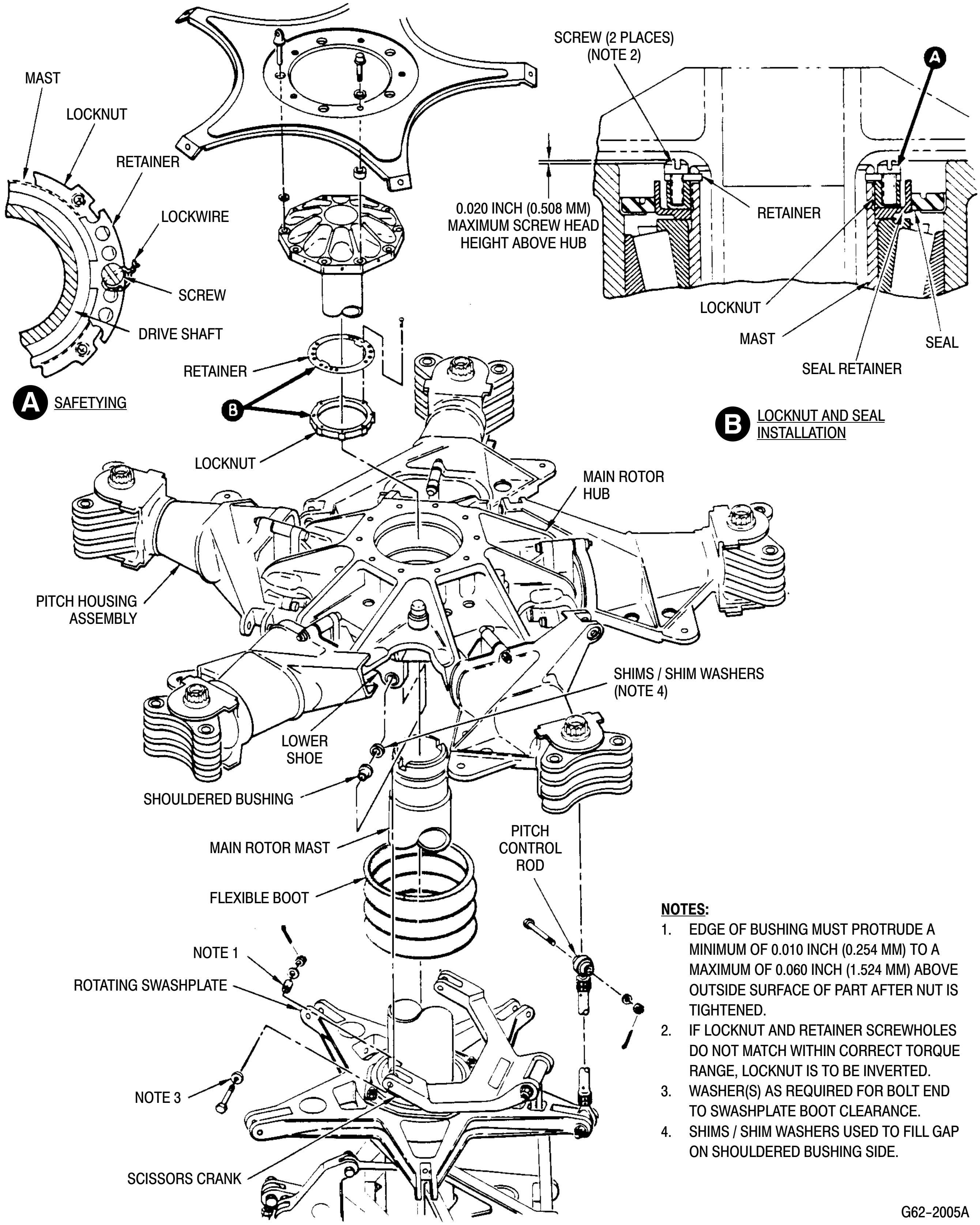
(3). Set damper length, centerline-to-centerline of bolt attach holes, for initial installation.
369D/E
8.229 ±0.005 inch (209.017 ±0.127 mm)
369F/FF
8.132 ±0.005 inch (206.553 ±0.127 mm)
500N
8.132 ±0.005 inch (206.553 ±0.127 mm).

(4). Install dampers on helicopter.

NOTE: If ground rock or stick shake is noted, complete following step.

(5). Length of damper may be adjusted after initial setting by checking main rotor system balance (Ref. Sec. 18-10, Main Rotor Balancing Procedure). Check of main rotor system balance should be accomplished only after main rotor blades have been tracked.

CAUTION If more than four flats turn of turnbuckle adjustment is necessary to correct balance, return to step (1). and repeat procedure.



NOTES:

1. EDGE OF BUSHING MUST PROTRUDE A MINIMUM OF 0.010 INCH (0.254 MM) TO A MAXIMUM OF 0.060 INCH (1.524 MM) ABOVE OUTSIDE SURFACE OF PART AFTER NUT IS TIGHTENED.
2. IF LOCKNUT AND RETAINER SCREWHOLES DO NOT MATCH WITHIN CORRECT TORQUE RANGE, LOCKNUT IS TO BE INVERTED.
3. WASHER(S) AS REQUIRED FOR BOLT END TO SWASHPLATE BOOT CLEARANCE.
4. SHIMS / SHIM WASHERS USED TO FILL GAP ON SHOULDERED BUSHING SIDE.

Figure 402. Main Rotor Hub - Installation

MAIN ROTOR HUB INSPECTION/CHECK

1. Main Rotor Hub Balancing - General

(Ref. Sec. 18-20) Main rotor hub balancing is accomplished by adding or removing weight (flat washers) as required at the lead-lag bolts. Analysis of main rotor hub balance is accomplished using instrumentation that measures and localizes vibrations due to main rotor hub imbalance. Data provided by the instrumentation is plotted on a chart designed to indicate how much weight must be added or removed from the lead-lag bolt. No other means of balancing is to be used.

2. Main Rotor Blade Phasing Check and/or Adjustment

Main rotor blade phasing (alignment) is necessary at damper installation or replacement, and may be necessary if there is ground rocking, or if one-to-one lateral (main rotor) vibration occurs during flight (Ref. Main Rotor Damper Nominal Adjustment).

3. Main Rotor Hub Inspection

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM232	Rust inhibitor spray

(1). Inspect pitch housing for scratches, nicks and cracks. No cracks are permissible. Scratches and nicks must be cleaned up before measuring depth of damage to determine housing serviceability.

(2). Inspect sleeve bushing for snug fit in pitch housing arm clevis lug (Ref. Figure 805); lug must not show evidence of wear caused by bushing movement. Maximum allowable diameter for hole in bushed lug is 0.5004 inch (12.71016 mm); for unbushed lug, not more than 0.3135 inch (7.9629 mm). Inspect inner surfaces of all pitch housing arm clevis lugs for chafing caused by misaligned pitch control rod end bearings. Chafing is in form of crescent-shaped grooves. If chafing wear exists, repair or replace. Chafed area must be cleaned up before measuring depth of damage to determine housing serviceability.

(3). Inspect droop stop ring for corrosion, dents and scratches. If defects are found, repair or replace.

NOTE: To inhibit corrosion, spray droop stop ring, rollers and pitch bearings with rust inhibitor (CM232).

(4). Inspect droop stop roller for flat spots, pit marks and looseness on roller shaft.

(5). Inspect striker plate for dents and pit marks that exceed 0.030 inch (0.762 mm) depth. Damage exceeding this limit requires replacement of striker plate.

(6). Press each pitch housing downward several times and check for evidence of binding pitch bearing or droop restrainer follower. Inspect visible portion of droop restrainer for cracks and follower spring for breaks.

NOTE: Do not remove tetrafluoroethylene (TFE) debris which works out of pitch bearing edge. Debris is normal and helps lubricate bearing. Removal of debris increases bearing wear rate.

(7). Use bright light and 5-power magnifying glass to inspect all main rotor hub lead-lag links (Ref. Figure 802) for discoloration, pitting, intergranular cracks or stress corrosion cracks. Any discoloration or pitting is evidence of more than superficial corrosion and main rotor hub must be removed for replacement of lead-lag links.

NOTE: Normal or premature overhaul requires visual inspection plus dye- penetrant inspection of links for same conditions.

(8). Inspection lead-lag link stop for broken spring, cracks, breaks or visible bond line cracks.

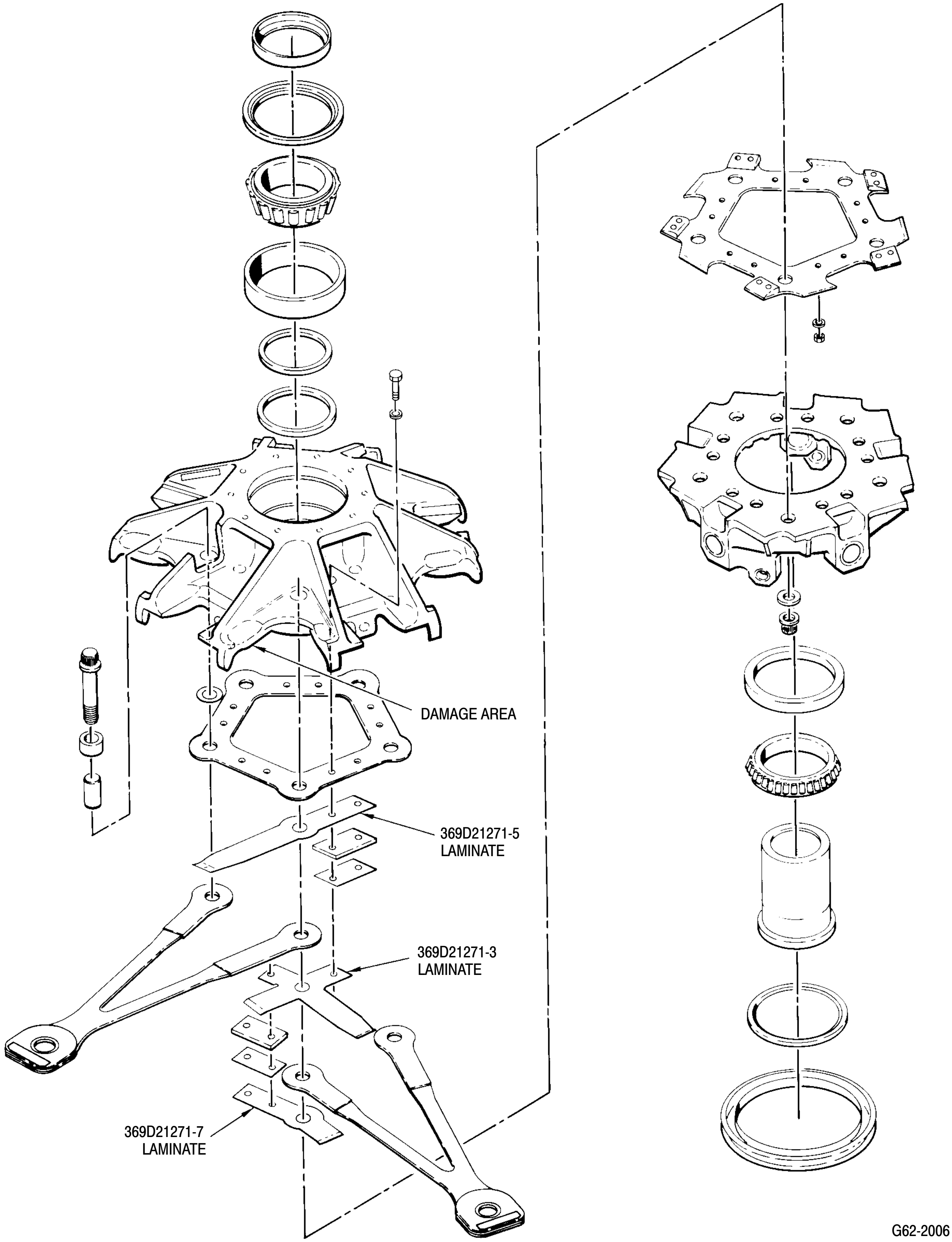


Figure 601. Strap Pack Lamination - Exploded View

(9). Inspect interiors of lead-lag bolts using bright light and 5X glass for cracks or corrosion per Lead-Lag Bolt Inspection.

(10). Inspect each striker strip for cracks, deformation and badly worn contact surfaces.

(11). Inspect all parts of main rotor hub for cracks, breaks, scratches and nicks. (Refer all questionable damage to MDHI for disposition.)

(12). Inspect lower shoe scissors attach bearings for binding, looseness in bore and wear. Maximum wear limits are 0.010 inch (0.254 mm) radial and 0.020 inch (0.508 mm) axial.

(13). Inspect each of five main rotor retention strap packs (Ref. Main Rotor Strap Pack Lamination Inspection) at specified intervals (Ref. Sec. 5-10). (Ref. MDHI Notices DN-154 / EN-44 / FN-33 for specific inspection requirements.)

4. Lead-Lag Bolt Inspection

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer
CM420	Sealant

(1). Inspect interiors of lead-lag bolts using bright light and 5X glass for cracks or corrosion.

(a). Remove cotter pin securing nut to lower end of lead-lag bolt. Do not disturb torque on nut or remove nut.

(b). Remove screw, nut, washers and balance hardware, if installed, from lead-lag bolt.

(c). Inspect bolt interior. Treat minor surface corrosion if noted. If corrosion pitting or cracks are noted remove and replace hub.

(d). Swab entire ID of bolt with primer (CM318).

(e). Reinstall screw, nut, washers and balance hardware removed in step 2. Ensure hardware is installed exactly as removed. Torque MS21042L08 locknut on screw to **20 - 35 inch-pounds (2.26 - 3.95 Nm)**. Torque MS21042L3 locknut on screw to **30 - 60 inch-pounds (3.39 - 6.78 Nm)**. Coat exposed screw threads, washers and nut with sealant (CM420).

NOTE: Excessive amount of sealant can unbalance rotor system. Apply light but thorough coat of sealant.

(f). Install new cotter pin to secure nut to lead-lag bolt.

NOTE: There are prebalanced rotor hubs in service. Lead-lag bolts of prebalanced hubs may contain balancing hardware. If so, remove balancing hardware to perform inspection. Each set of removed hardware should be tagged or color-coded to ensure correct reinstallation.

5. Main Rotor Strap Pack Lamination Inspection

CAUTION

- Figure 601 and Figure 602 depict the main rotor hub and strap pack assembly disassembled for clarity of location and area to be inspected for cracks. Under no circumstances should the strap pack or main rotor hub assembly ever be disassembled in the field. MDHI and MDHI Approved Licensees are the only approved repair stations for main rotor hub assembly overhaul.
- If a hub assembly or strap pack assembly (other than new parts in storage) are subjected to extended periods of non- use, whether installed on the helicopter or not, the strap assembly should be inspected critically for corrosion and pitting before return to service. If corrosion is found on the strap pack assemblies, contact MDHI for disposition.
- It is acceptable to operate a helicopter with a hub assembly having a strap pack with up to two failed laminates in any one leg of the strap assembly. When a laminate in the strap assembly fails, the remaining laminates pick up and carry the

load. This increased load causes slightly more elongation in the remaining laminates of that leg thus shifting the mass of the rotor system. Any time a vibration develops or there is an increase in vibration level over a short period of time, the main rotor strap pack assembly should be inspected for cracked or failed laminates.

NOTE: Conduct inspection indoors, if possible, or in a shaded area to eliminate glare of sun or bright outdoor light. To facilitate inspection, field fabricate and use plastic inspection tool and wooden probe (Ref Figure 602).

(1). Remove main rotor blades.

(2). If required, trim teflon from edges of laminates using a aluminum chisel. Fabricate from stock 0.250 x 6.00 x 0.100 inch (6.35 x 152.4 x 2.54 mm). Carefully scrape excess interlaminate teflon sheets from both sides of strap pack between top and bottom shoes at outboard attachment bolt of all five strap packs.

NOTE:

- Do not pry at strap pack assemblies with sharp or hard edged tools. If edges become nicked or laminates get scratched, additional cracking can occur thus causing hub replacement.
- Where accessible, ends of acceptable cracked or broken laminates should be taped to prevent scratching and damaging of adjacent laminates.

(3). (Ref. Figure 602) Field fabricate plastic tool. Run plastic inspection tool in both directions along each laminate, feeling for a ”catch” from a crack on a single laminate. Use the wooden or phenolic probe and probe at upper and lower end of pack. Failed laminate in lead or lag will move away from the other laminates.

(4). Using a light and mirror, visually inspect each of the main rotor strap pack assemblies for evidence of cracks or breaks in strap pack laminates in the areas of the outboard shoes and pitch housing assemblies.

(5). Using a 10X magnifying glass, visually inspect the edge of strap pack laminates on both sides at outboard end of blade pitch housing (area between outboard shoes).

(6). Use the following as acceptance/rejection criteria for laminate inspection:

(a). A **laminate** has failed if cracked in tongue area or in lead and lag legs of the same laminate.

(b). Reject **strap pack** and return hub for overhaul when:

1). Three or more laminates in a single strap pack have failed.

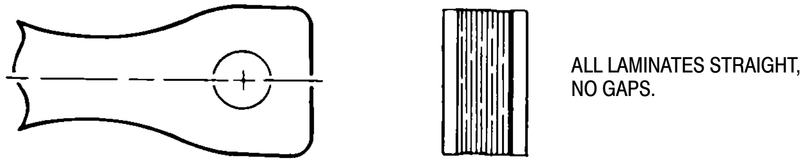
2). Three or more laminates in a single strap pack are cracked in the same lead or lag leg.

3). One laminate is cracked at the outboard end in the area between outboard shoes (Ref. Figure 602).

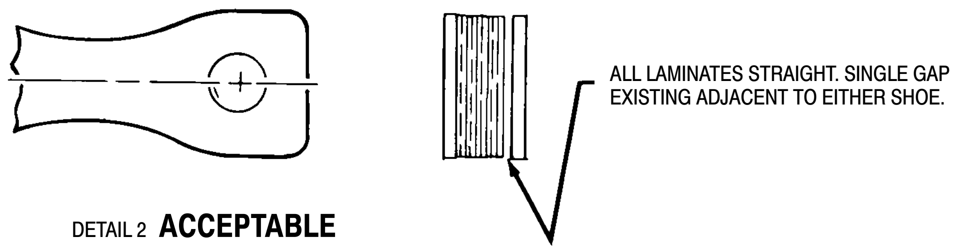
4). There are two or more gaps in the same strap pack. A single gap in any one strap pack assembly is allowed.

(7). Visually inspect strap pack assemblies for evidence of corrosion. If corrosion is found on strap pack laminates contact MDHI service department for disposition.

(8). Using a blunt-nosed wooden or phenolic pin, pencil size with 1/16 inch (1.5875 mm) radius point, probe at the upper and lower strap laminations at the outboard ends of the blade pitch housings for evidence of laminate failure. A failed laminate, either at the lead or lag end of the strap pack, will move away from the other laminates. If the adjacent upper and lower laminates remain in tension under the probing operation, no laminate failures have occurred. Refer to Step (5). Caution for gap limitations.

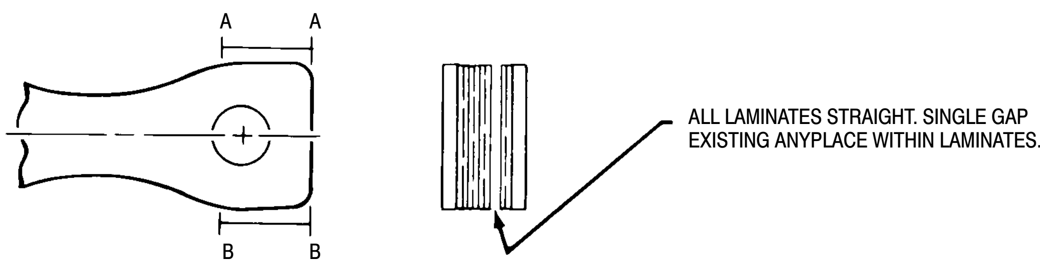


DETAIL 1 **ACCEPTABLE**



DETAIL 2 **ACCEPTABLE**

NOTE:
WHILE TEFLON MAY APPEAR WRINKLED AND EXTEND PAST END OF LAMINATES, PREVENTING CLEAR VIEW OF LAMINATES. WHEN THIS OCCURS, LOOK ALONG EITHER SIDE IN AREA A-A OR B-B (DETAIL 3).



DETAIL 3 **ACCEPTABLE**

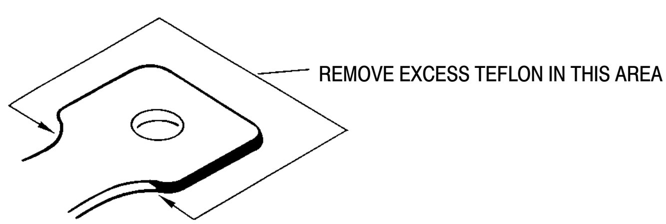


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Figure 602. Strap Pack Lamination Inspection (Sheet 1 of 2)

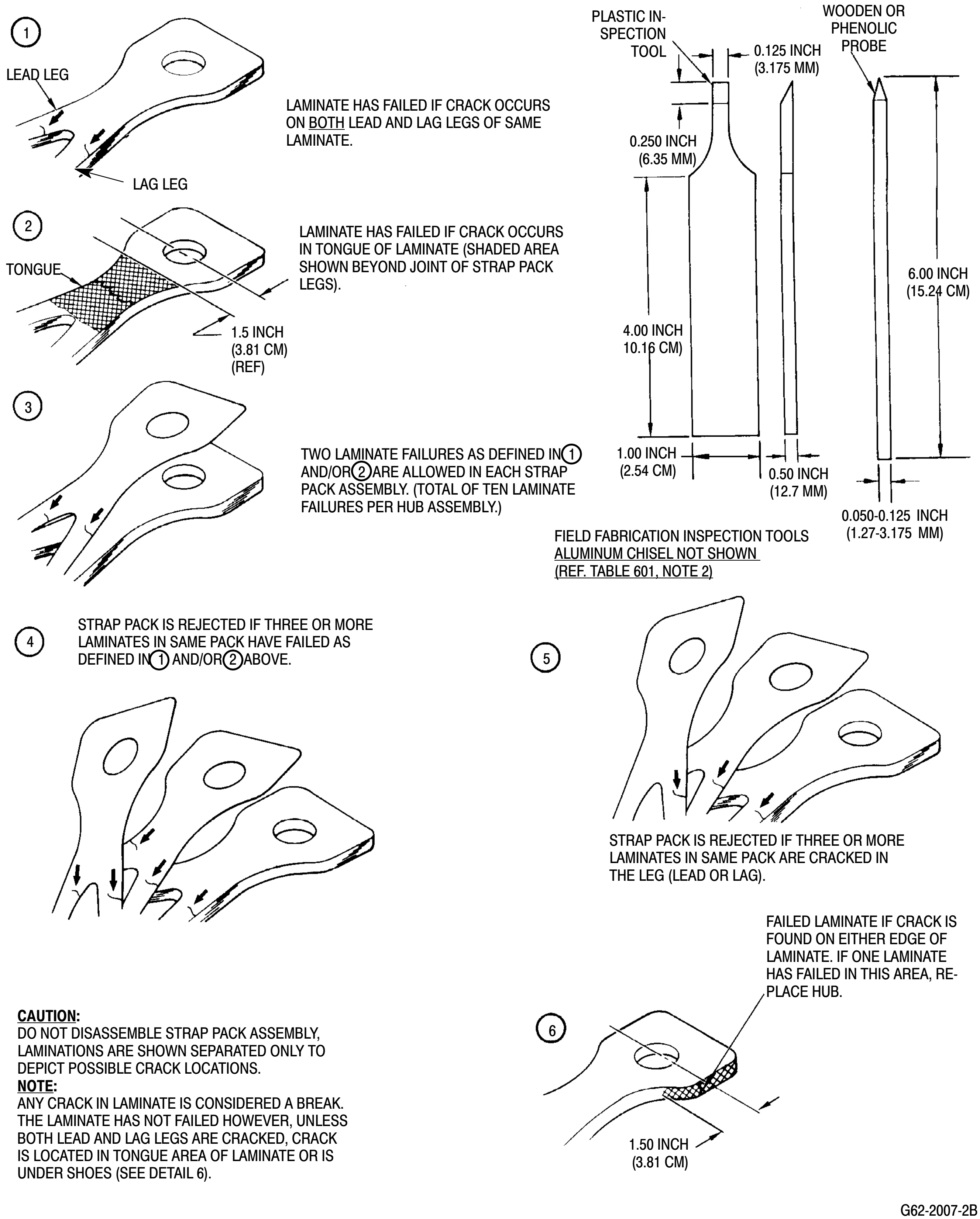


Figure 602. Strap Pack Lamination Inspection (Sheet 2 of 2)

Table 601. Strap Pack Inspection

Inspect	Procedure (1)	For	Acceptable	Replace or Return Hub for Overhaul
Outboard end.	Visually. Use blunt nosed wooden or phenolic probe (Figure 602). Probe at upper and lower end of pack. Failed laminate in lead or lag leg will move away from other laminates.	Failed laminates (3).	Two or less per pack.	Three or more laminate failures in one pack.
	Visually.	Gaps between laminates.	Single straight gap not exceeding 0.030 inch (0.762 mm) within pack or next to either upper or lower outer shoe.	More than one gap found; gap exceeds acceptable limit.
	Visually using light and mirror (2).	Cracks or breaks.	None.	Cracks or breaks are noted.
In area of and within pitch housing assemblies.	Visually with light and mirror (2).	Cracks or breaks.	Two or less laminate failures per strap pack (2).	Three or more laminate failures (2) in a pack; three or more laminates in pack with crack in same leg (lead or lag).
Shims at each of two attach points.	Visually with light and mirror.	Crack or break.	Inspect top laminate around shim (4).	Top laminate is cracked in area of cracked or broken shim.

NOTES:

(1) Conduct visual inspections indoors or in shaded area to eliminate glare of sun or bright outdoor light.

(2) Removal of teflon covering is required for visual inspection of laminate edges. Use aluminum chisel, fabricated from stock 0.025 x 6.00 x 0.100 inch (0.635 x 152.4 x 25.4 mm) to carefully scrape excess interlaminate teflon sheets from both sides of strap pack between top and bottom shoes at outboard attachment bolt of all five strap packs. Remove excess teflon from a point 1/2 inch (12.70 mm) outboard of bolt centerline to 1-1/2 inches (38.1 mm) inboard of bolt centerline. Field fabricate and use plastic tool (Ref. Figure 602). Run plastic tool in both directions along each laminate feeling for cracked laminate. Use of plastic tool will ensure that shreds of teflon still hanging free does not obscure small cracks.

(3) Laminate has failed if crack is found in tongue area or if crack is found in both legs (lead and lag).

(4) Pay particular attention to shim installed at upper side of lead leg of each strap pack assembly. Maximum of two shims may have been installed on top side of lead leg of strap pack to accommodate tolerance buildup during strap pack assembly. If more than one shim is installed, pay particular attention to lower shim when checking for cracks or breaks.

NOTE: Laminate failures are defined in step (6).

(9). Inspect upper, lower and center laminates for cracks and breaks (Ref. Figure 601).

NOTE: Cracks, breaks or other noticeable damage to the laminate/shims require main rotor hub overhaul/replacement.

(10). Install main rotor blades.

(11). Perform tracking of main rotor blades (Ref. Sec. 18-20-00).

CAUTION The maximum allowable balance weight per pitch case housing on the main rotor hub assembly is 150 grams.

(12). Record location of all cracked/broken laminates in helicopter Log Book including strap serial number, blade color, leg, lead or lag, and laminate position, if possible numbering from the top down.

6. Main Rotor Hub Droop Angle Check

(Ref. Figure 805) Whenever new or replacement main rotor hub is installed or whenever excessive droop angle is suspected, measure static droop angle of all five rotor blades. Droop angle must be 5.5 ±0.5 degrees.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
Left-Hand Command:	
ST501	Collective rigging fixture (LH command)
ST504	Longitudinal rigging fixture (LH command)
ST506	Lateral rigging fixture (LH command)
Right-Hand Command	
ST502	Collective rigging fixture (RH command)
ST505	Longitudinal rigging fixture (RH command)
ST507	Lateral rigging fixture (RH command)

(1). Install cyclic lateral rigging fixture (ST506 or ST507), cyclic longitudinal rigging fixture (ST504 or ST505), and collective rigging fixture (ST501 or ST502).

(2). Rotate main rotor to position one blade over tailboom.

(3). Raise and support other four blades until four corresponding droop stop rollers no longer contact their striker plates.

(4). Place accurate propeller protractor on top of main rotor drive shaft. Adjust protractor to zero setting.

(5). Place protractor on machined surface of outboard end of blade pitch housing, alongside lead-lag bolthead. Measure and record static droop angle.

(6). Repeat (2). thru (5). above for remaining blades.

(7). Maximum allowable static droop angle is six degrees. If measured droop angle exceeds six degrees, inspect striker plate and roller for excessive wear and adjust droop angle (Ref. Main Rotor Hub Droop Angle Adjustment).

7. Main Rotor Damper and Attachments Inspection

CAUTION Excessive lead-lag load applied to the main rotor blades during ground handling can result in damage to the elastomeric damper buns and failure of the damper assembly. Operators and maintenance personnel should use extra caution to avoid lead-lag loads in excess of **35 pounds (155.68 N)** at the tip of the main rotor blades.

(1). Inspect bearing in rotor blade and bearing in the pitch housing for looseness around outer race. No degree of radial or axial play is permitted.

(2). Inspect pitch housing and blade bearings for binding, galling, or scoring in bore and for wear. No radial play is permitted. Maximum allowable axial play is 0.015 inch (0.381 mm).

(3). Inspect clevis bushings for wear and looseness.

(4). Inspect damper flange bushing for wear and play.

(5). Inspect lower bolt hole in damper flange for wear.

(6). Inspect damper housing (including flanges) for damage.

(7). Inspect damper turnbuckle, jamnuts and safetywire for security. No end play is permitted when manually tested.

NOTE: When performing lead-lag of main rotor blades, apply rotor brake (if installed) or have assistant hold main rotor hub from moving. A second assistant is recommended to measure approximate damper extension and compression.

(8). Lead-lag each main rotor blade in turn to provide approximately 0.10 inch (2.54 mm) extension and compression of the damper elastomer.

(9). Visually check each damper in turn for cracks in elastomer or in elastomer-to-metal bond at end face of damper: If bonding or elastomer cracks are noted, measure depths of cracks, using depth gage fabricated of shim stock or equivalent having a 0.20 inch (5.08 mm) indication. If depth of crack exceeds 0.20 inch (5.08 mm), remove and check damper.

8. Main Rotor Damper Weight Loading and Extension Check

(Ref. Figure 603)

(1). Remove damper assembly (Ref. Main Rotor Damper Removal).

(2). Attach dial indicator or equivalent to outer case of damper; position indicator arm on center aluminum disc as shown.

NOTE: Fabricate holding bar or fixture capable of sustaining 100 pound (45.359 kg) static load (Ref. Figure 603).

(3). Attach damper end cap to holding bar or fixture.

NOTE: Perform weight loading and extension check at ambient temperature of 70° ±l0°F (21° ±5°C). Apply total 100 pound (45.359 kg) weight load to damper at one time, not in weight increments.

(4). Using hydraulic jack or equivalent, raise and attach 100 pound (45.359 kg) weight load at damper clevis end. Slowly lower jack to avoid shock loading. After period of two minutes under load, measure damper extension on dial indicator.

(5). If extension exceeds 0.056 inch (1.4224 mm) for M50452 damper, or 0.063 inch (1.6002 mm) for 369D21400-503 damper, replace the damper assembly.

(6). Reinstall existing damper; or as required; install replacement damper of same type and part number (Ref. Main Rotor Damper Installation). Do not intermix PN 369D21400-503 damper with any other part number damper assemblies.

NOTE: If replacement damper is installed, record part number, serial number, and other pertinent information in Components Record of helicopters Log Book.

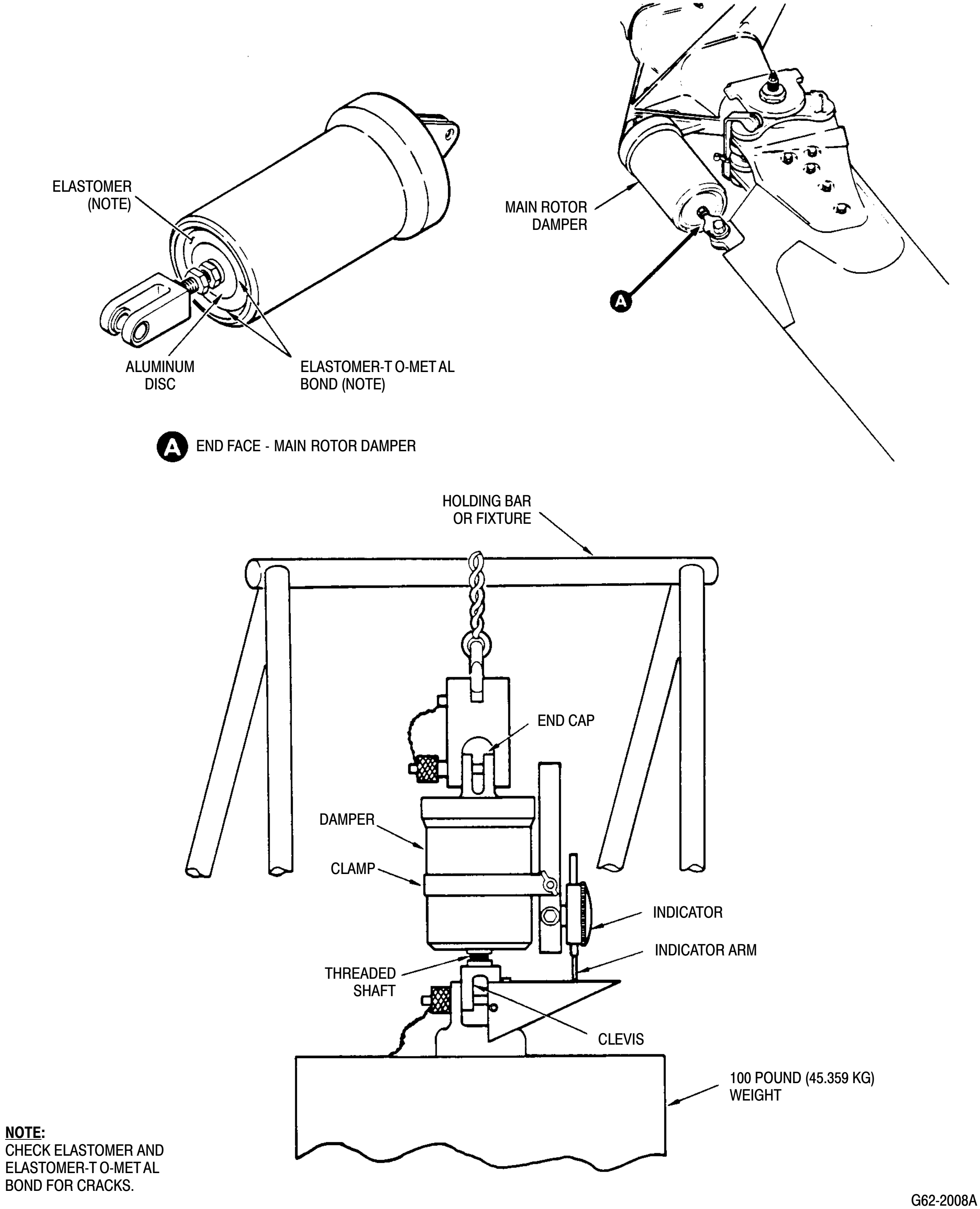


Figure 603. Periodic Check of Main Rotor Damper Assembly

MAIN ROTOR HUB
REPAIRS

1. Main Rotor Retention Strap Pack Repair

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM234	Solvent, dry-cleaning
CM725	Tape, electrical, plastic

(Ref. Table 601) Where accessible, ends of permissible cracks or broken laminates should be taped to prevent scratching and damaging adjacent laminates.

CAUTION Do not bend broken ends excessively and scratch adjacent straps.

(1). Carefully wipe ends of broken strap with a clean soft cloth moistened with solvent (CM234).

(2). Use mild blast of filtered air to dislodge any foreign particles between broken strap ends and adjacent strap.

(3). Carefully tape broken ends of strap with plastic electrical tape (CM725).

2. Pitch Housing Repair

(Ref. Figure 801)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM206	Chemical coating
CM318	Primer
CM802	Abrasive cloth, aluminum oxide

CAUTION During repair of pitch housing, comply with precautions for covering engine air inlet fairing opening to prevent entry of foreign objects into air intake.

(1). Use grade 320 abrasive cloth (CM802) to smooth scratches, nicks and chafing wear in pitch housing.

(2). After smoothing (removal of all sharp or raised edges) repair depth must not exceed 0.010 inch (0.254 mm) in any area of housing except inner surfaces of arm clevis lugs.

(3). Maximum repair depth of 0.050 inch (1.27 mm) is acceptable in clevis lug with sleeve bushing.

(4). On opposite clevis lug repair depth of 0.030 inch (0.762 mm) is permissible in area of spot faces and maximum of 0.050 inch (1.27 mm) in area outside spot faces.

(5). Touch up repaired areas with chemical film (CM206) followed by primer (CM318) and remove main rotor hub for pitch housing replacement.

3. Unbushed Outboard Clevis Lug Hole Repair

(Ref. Figure 801) Repair elongated outboard hole in unbushed side of clevis lug if inside diameter of hole exceeds 0.3135 inch (7.9629 mm).

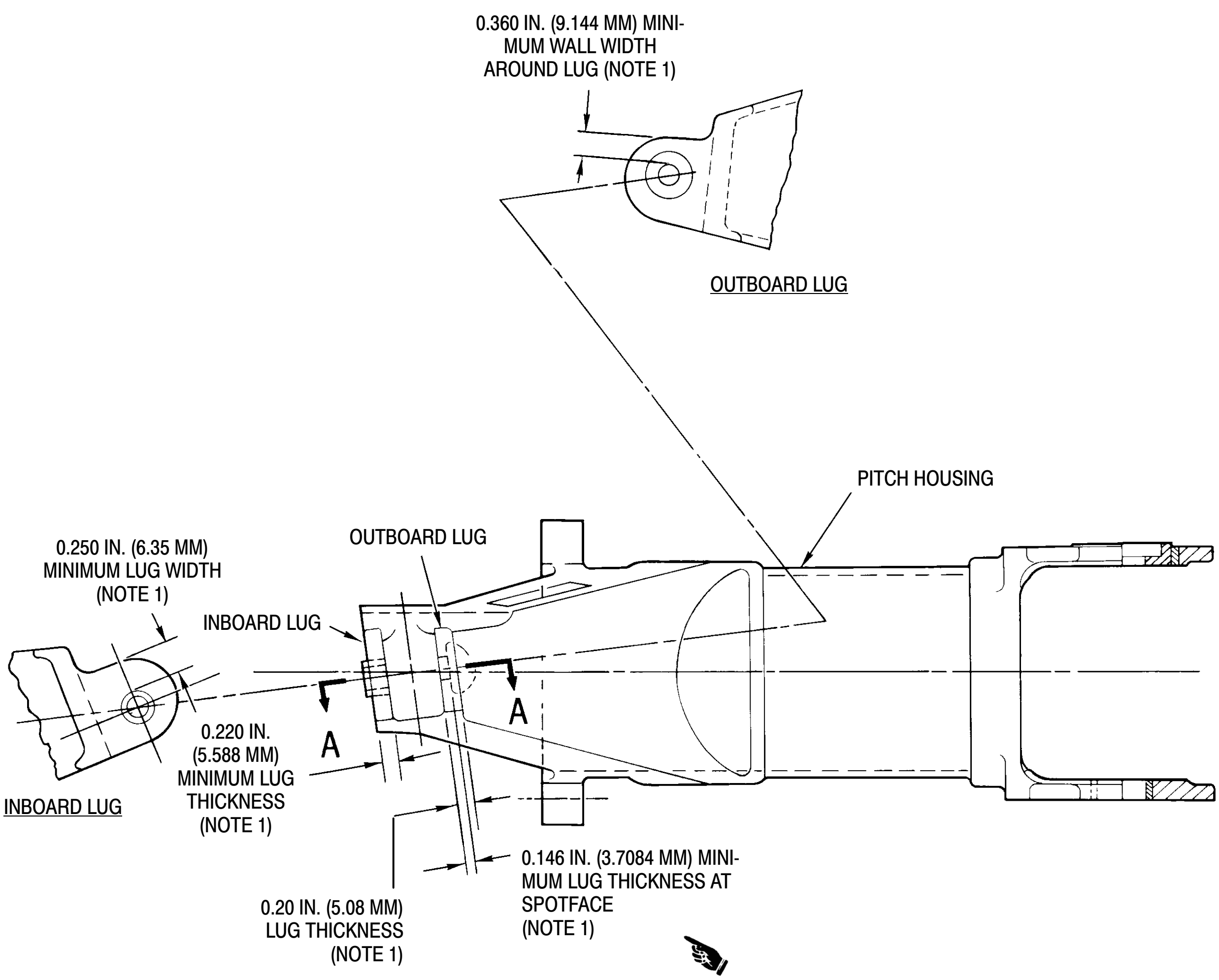
Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM118	Grease
CM318	Primer
CM431	Sealing, locking and retaining compound

(1). Remove existing bushing from inboard lug.

(2). Drill elongated hole in outboard lug to 0.3680 inch (9.3472 mm). Use drill bushing as guide.

(3). Line ream hole to 0.3760-0.3770 inch (9.5504-9.5758 mm) diameter.



NOTES:

1. MAINTAIN MINIMUM WALL THICKNESS AROUND LUG AND MINIMUM LUG THICKNESS FOR FIELD REPAIR OF CLEVIS LUG.
2. NO PAINT OR PRIMER PERMISSIBLE IN THIS AREA.
3. BRUSH CADMIUM PLATE GROUND SURFACE BEFORE INSTALLATION IF POSSIBLE. IF NOT, COAT GROUND SURFACE THOROUGHLY WITH PRIMER (CM318) AND INSTALL WHILE WET.

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Figure 801. Field Repair of Main Rotor Hub Pitch Control Lugs (Sheet 1 of 2)

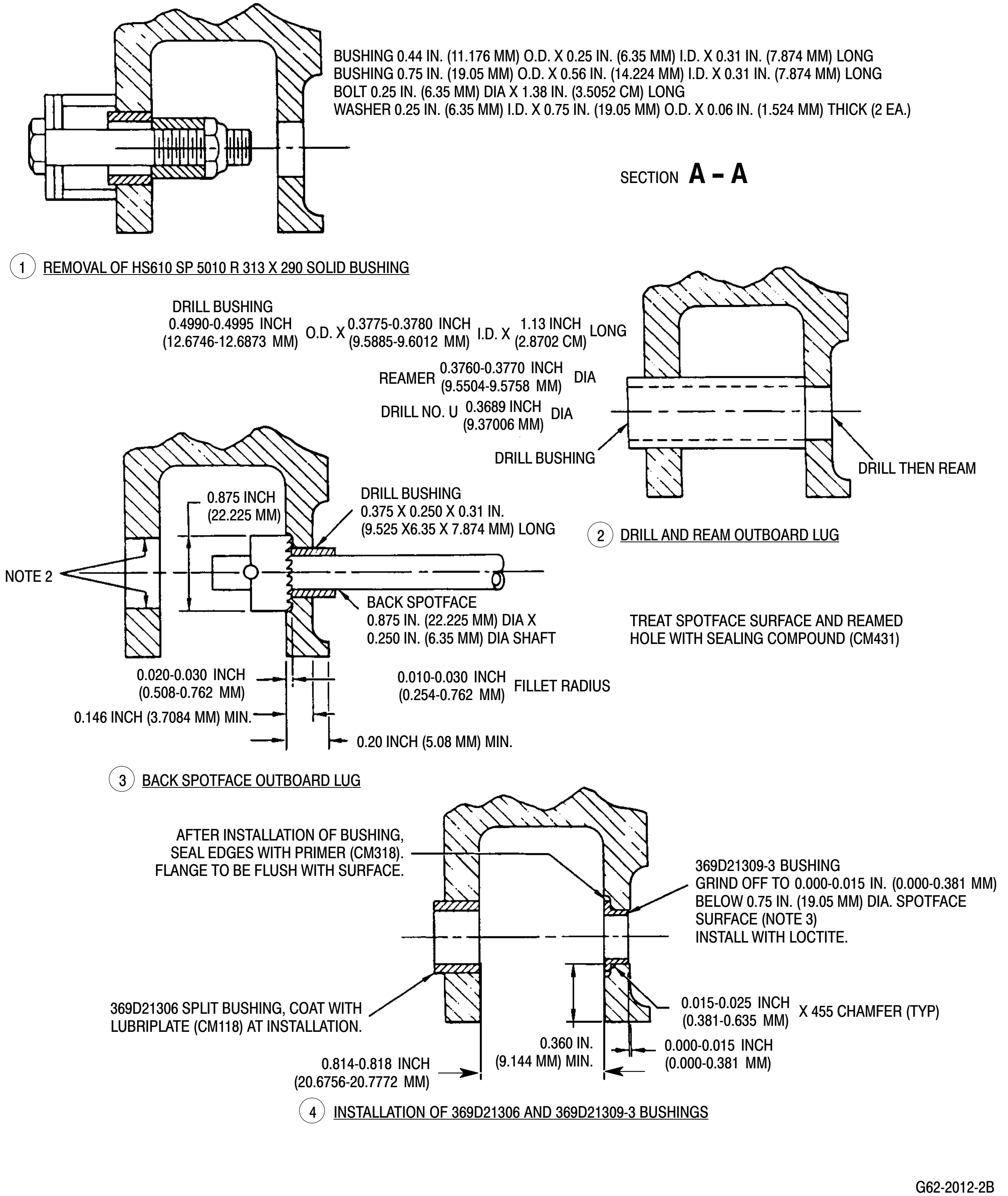


Figure 801. Field Repair of Main Rotor Hub Pitch Control Lugs (Sheet 2 of 2)

NOTE: Check outboard lug two places for minimum wall thickness of 0.146 inch (3.7084 mm) and 0.20 inch (5.08 mm).

(4). Back spotface inside surface of outboard lug to 0.875 inch (22.225 mm) diameter and 0.020-0.030 inch (0.508-0.762 mm) depth. Use drill bushing as guide for spotface pilot. Add chamfer to clear bushing two places.

NOTE: Measure height of bushing and thickness of lug prior to installation. Grind off end surface of bushing as required to secure 0.000- 0.015 inch (0.000- 0.381 mm) clearance. Brush cadmium plate ground end of bushing before installation. If equipment is not available coat ground end thoroughly with primer (CM318) and install while wet. If primer is used check for corrosion around lug hole and bushing.

(5). Install flanged bushing using loctite (CM431). Use attach bolt or assembly pin as guide to ensure proper alignment. Seal edges with loctite.

(6). Install slotted bushing with grease (CM118) in inboard lug.

NOTE: Check outboard and inboard lugs of pitch control horn for interference with upper jamnut on pitch control rod. Use file or portable grinder to carefully trim off interfering corner of pitch housing lugs to provide sufficient pitch control rod clearance. It is not necessary to trim to minimum wall thickness. Do not exceed rework limitations. Touch up reworked area with chemical film and primer. Paint with matching color.

(7). Reconnect pitch control rod assembly. Check for proper clearance between outboard lug and upper jamnut on pitch control rod.

CAUTION Use care during removal of parts from around strap pack. Any nicks or scratches on straps require scrapping of strap pack.

4. Pitch Control Bearing Housing Assembly, Spacer or Striker Strip Replacement

(Ref. Figure 802)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM222	1,1,1-T richloroethane
CM425	Sealing compound

(1). Support blade and pitch housing from beneath. Remove nuts. washers, and bolts that secure bearing housing.

CAUTION If droop shim washers are installed between spacer and striker strip, they must be retained for reinstallation to establish correct static droop angle between pitch housing and hub.

(2). Carefully remove spacer by sliding it downward past striker strip. Retain exact number of droop shim washers, if installed.

(3). Slide bearing housing assembly off pivot pin. Inspect pivot pin for grooving or excessive wear.

NOTE: Do not remove tetrafluoroethylene (TFE) debris which works out of pitch bearing edge. Debris is normal and helps lubricate bearing. Removal of debris increases bearing wear rate.

(4). Remove and discard pitch bearing if defective, total radial looseness of assembled ball and pivot pin must not exceed 0.010 inch (0.254 mm).

(5). Replace striker strip if it is cracked or lead-lag contact areas are worn through hard anodized surface.

(6). Remove sealant between pitch housing and striker strip. use care not to scratch pitch housing. Remove striker strip from pitch housing.

(7). Cut old striker strip to facilitate removal from retention strap assembly. <u>Do not scratch strap assembly</u>.

(8). Clean old sealant from pitch housing using 1,1,1, trichloroethane (CM222).

(9). Cut out area of new striker strip (Ref. Figure 803). Deburr, smooth and radius cut edges.

(10). Apply sealant (CM425) to faying surfaces of the striker strip and pitch housing.

(11). Position pitch control bearing housing on pivot pin (Ref. Figure 802).

CAUTION If droop shim washers were removed from between spacer and striker strip, same exact thickness removed must be reinstalled. There must be an equal number of washers on each of all three bolts. These washers establish correct static droop between pitch housing and hub.

(12). Slide spacer into position between bearing housing assembly and striker strip on pitch housing. Install exact thickness of droop shim washers removed at time of disassembly. Align holes for all three bolts.

(13). Install bolts, washers and nuts; torque to **50 - 70 inch-pounds (5.65 - 7.91 Nm)** and install safety wire.

(14). Seal all parting lines (joints) of the assembly with bead of sealing compound (CM425).

(15). Perform droop angle check (Ref. Main Rotor Hub Droop Angle Adjustment).

5. Pitch Control Bearing Housing Modification

(Ref. Figure 802) To replace riveted striker plate with screw held striker plate, refer to following instructions.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM206	Chemical coating
CM234	Solvent, dry-cleaning
CM305	Lacquer, acrylic
CM318	Primer

(1). Remove housing, striker plate and pitch control bearing.

(2). Place housing on drill press, striker surface down.

(3). Drill rivet hole out to 0.192-0.198 inch (4.8768-5.0292 mm) dia.

(4). Using a 0.453 inch (11.5062 mm) dia. counterbore, counterbore rivet hole 0.396 inch (10.0584 mm) deep.

NOTE: The screw-held striker plate is dimensionally thicker.

(5). Counterbore should have a 0.030 inch (0.762 mm) radius. Deburr counterbore.

(6). Clean drilled and counterbored surfaces with solvent (CM234) and treat with chemical film (CM206).

(7). Prime and paint counterbored surface with primer (CM318) and black paint (CM305).

(8). Reinstall pitch control bearing and striker plate and reinstall housing.

6. Pitch Control Bearing Replacement

(Ref. Figure 802)

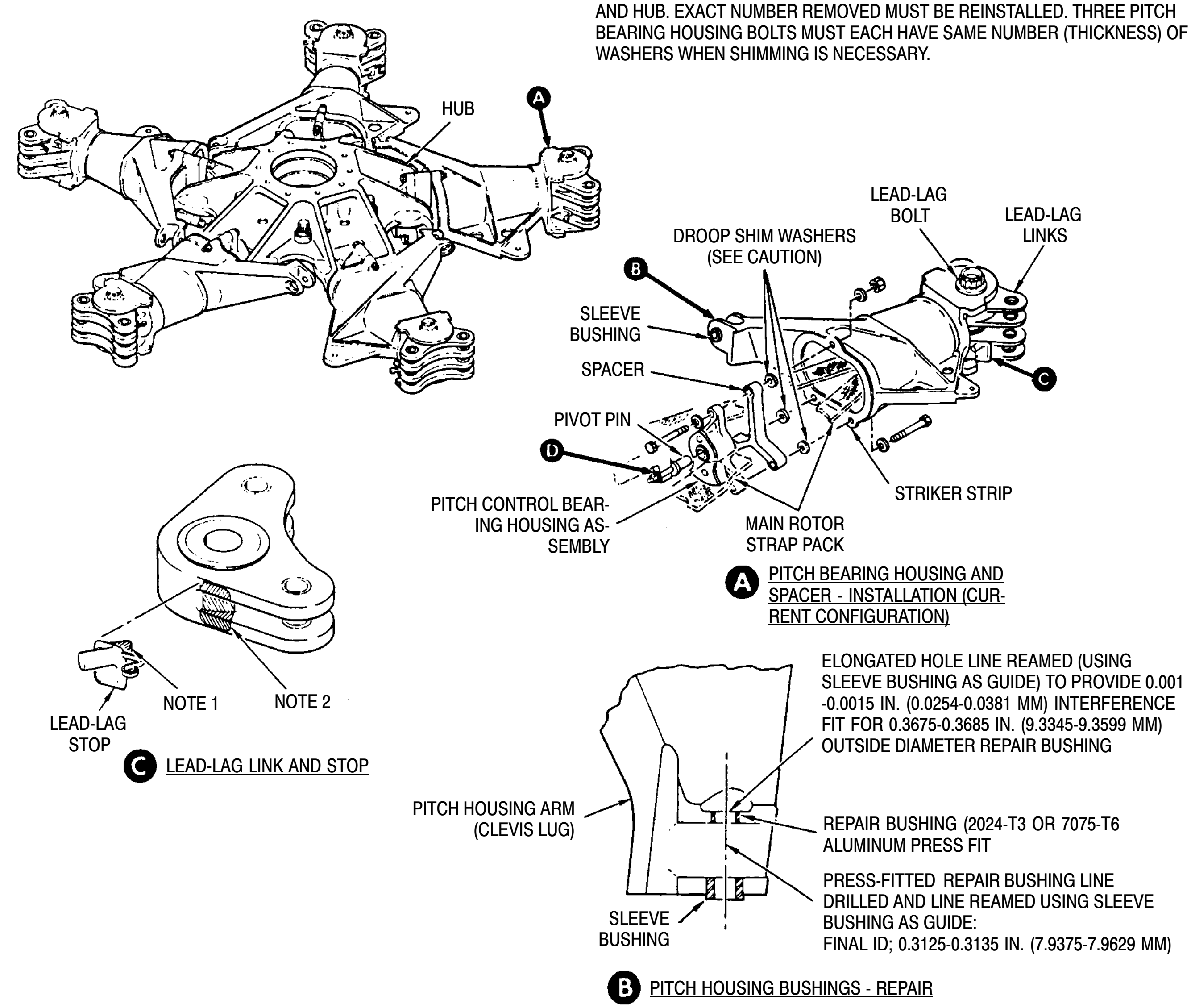
Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM206	Chemical coating
CM219	Methyl-ethyl-ketone
CM318	Primer
CM425	Sealing compound
CM803	Crocus cloth

(1). To remove striker plate, remove screw, nut and washer or drill out rivets as required. Discard striker plate if brinnelling or pits exceed 0.030 inch (0.762 mm) depth.

(2). Press bearing from housing bore. Clean any residual primer from housing bore with MEK solvent (CM219).

CAUTION: WASHERS ARE INSTALLED BETWEEN SPACERS AND STRIKER STRIP TO ESTABLISH CORRECT STATIC DROOP ANGLE BETWEEN HOUSING AND HUB. EXACT NUMBER REMOVED MUST BE REINSTALLED. THREE PITCH BEARING HOUSING BOLTS MUST EACH HAVE SAME NUMBER (THICKNESS) OF WASHERS WHEN SHIMMING IS NECESSARY.



NOTES:
1. FOR REMOVAL, WOOD DOWEL PLACED HERE AND STRUCK SHARPLY WITH HAMMER TO BREAK STOP BOND.
2. ALL STOP-T O-LINK SHADED CONTACT SURFACES BONDED WITH ADHESIVE (CM405 OR CM410).
3. INSTALL WITH WET PRIMER (CM318).
4. WET PRIMER (CM318) ON WASHER AND MATING SURFACES BEFORE INSTALLATION.
5. NUT RETAINING BRACKET IS BONDED TO HUB.
6. EARLY CONFIGURATION MODIFIED BY HUGHES SERVICE NOTICE DN-3.

NOTES: (CONT)

7. COUNTERSUNK RIVET HEAD OR SCREW HEAD MUST BE FLUSH WITH HOUSING. UPSET END MUST BE FLUSH WITH PLATE.
8. UPSET END MUST BE FLUSH WITH PLATE.
9. MANUFACTURED RIVET HEAD MUST BE FLUSH WITH PLATE IN ALTERNATE RIVET INSTALLATION.
10. REPLACEMENT HOUSING FOR BOTH VERSIONS ATTACHED TO STRIKER PLATE WITH SCREW, WASHER AND NUT FOR EASE OF REMOVAL.

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Figure 802. Main Rotor Hub Components - Repair and Installation (Sheet 1 of 2)

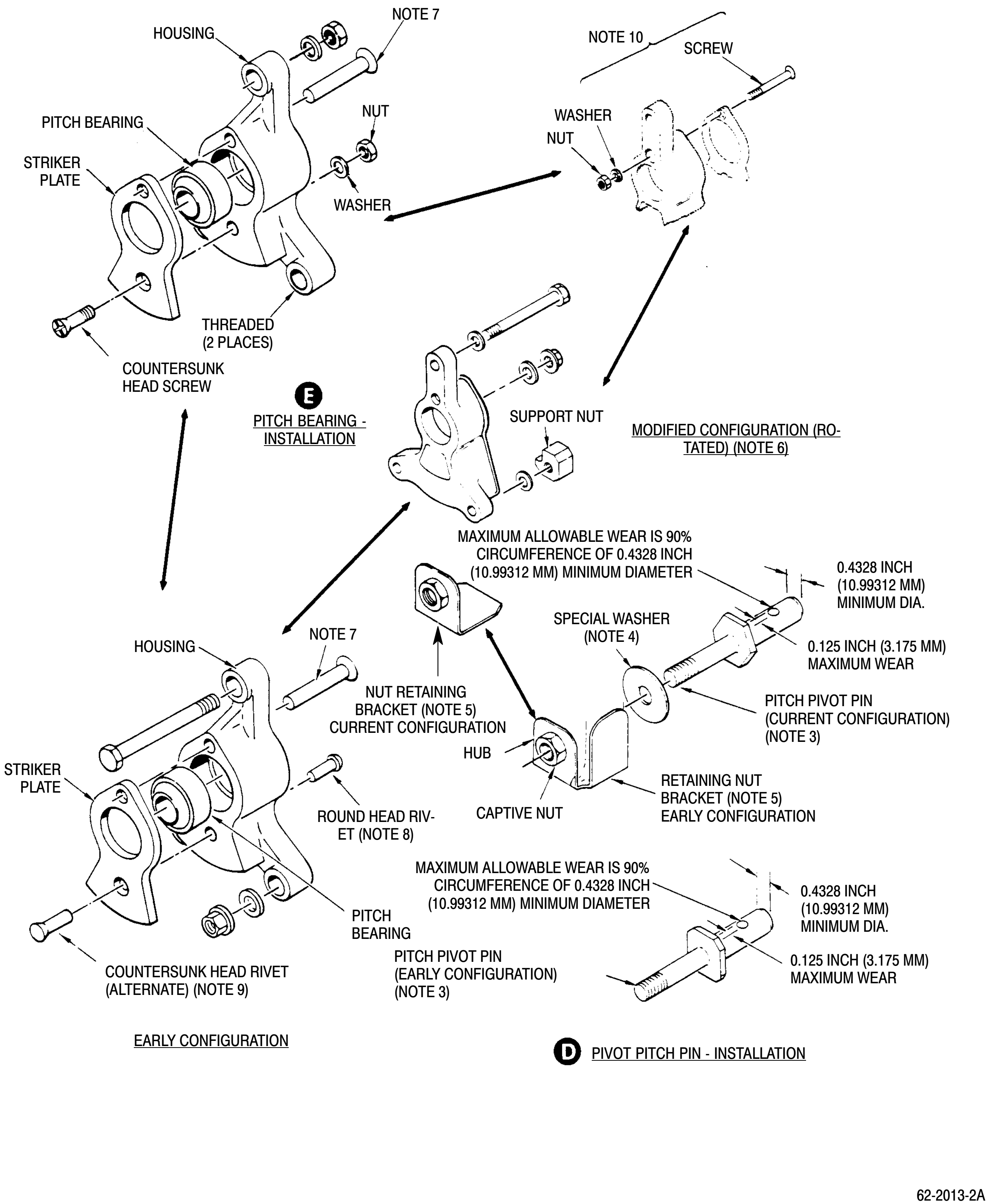


Figure 802. Main Rotor Hub Components - Repair and Installation (Sheet 2 of 2)

NOTE: Diameter of bearing bore, after cleanup, should not exceed 1.1880 inch (3.01752 cm). Localized areas of clean up should not exceed 0.003 inch (0.0762 mm) within an area of 25% of the circumference.

(3). Rework minor surface abrasion in housing bore by polishing with crocus cloth (CM803). Restore chemical film (CM206), where removed.

(4). Press bearing into bore using wet primer (CM318). Wipe away any excess primer using care to keep it out of bearing. Check teflon linings of bearing after installation to determine that no damage occurred from pressing operation.

NOTE: Ensure bearing is seated completely in bore of housing and striker plate fits flush on housing.

(5). Apply sealant (CM425) to faying surfaces and install striker plate with screw, washer and nut or rivets. Head of countersunk screw or rivet must be completely flush.

7. Lead-Lag Link Blade Stop Replacement

(Ref. Figure 802) Replace blade stop if it is broken, cracked, has broken spring, or if there are visible bond line cracks.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM206	Chemical coating
CM217	Isopropyl alcohol
CM228	Surface cleaner
CM411	Adhesive, epoxy
CM802	Abrasive cloth, aluminum oxide
CM803	Crocus cloth

CAUTION Lead- lag link assembly must not be removed from pitch control housing for this repair, since retention bolt cannot be retorqued without special adapter.

(1). Provide a backup support for link assembly. Use 0.5 inch (12.7 mm) wood dowel and hammer to drive stop from link. Strike dowel sharply to break adhesive bond.

(2). Using sharp-edge metal scraper, carefully scrape any adhesive residue from link. If scraper penetrates through paint and chemical surface film, surface must be refinished. Depth of gouges or nicks is limited to 0.010 inch (0.254 mm) maximum after rework. Rework by smooth blending into surrounding area with grade 320 abrasive cloth (CM802). Final polish with crocus cloth (CM803). Restore chemical film protection (CM206).

(3). Clean bond area of all contact surfaces by wiping with cleaner (CM228). Flush-wipe cleaned surface four times with mixture of equal parts of distilled water and isopropyl alcohol (CM217) to remove all traces of phosphoric acid. Rinse cleaned surface with tap water, followed by a rinse of distilled water until surface is ”water break” free. Dry for 30 minutes minimum at 150°F (66°C).

(4). Check fit of stop in link. Flange and radius contact surfaces of stop must mate with link within 0.010 inch (0.254 mm). Maximum clearance between stop and inside surfaces of link ears is limited to 0.020 inch (0.508 mm). This tolerance applies to both sides of stop.

(5). Prepare mixture of epoxy adhesive (CM411). Apply uniform coating of mixed adhesive to all contact surfaces. Hand press stop into place between link ears until all mating surfaces are in firm contact. Apply a clamping device so that contact is maintained. Cure for minimum of eight hours at room temperature, or two hours at 150°F (66°C).

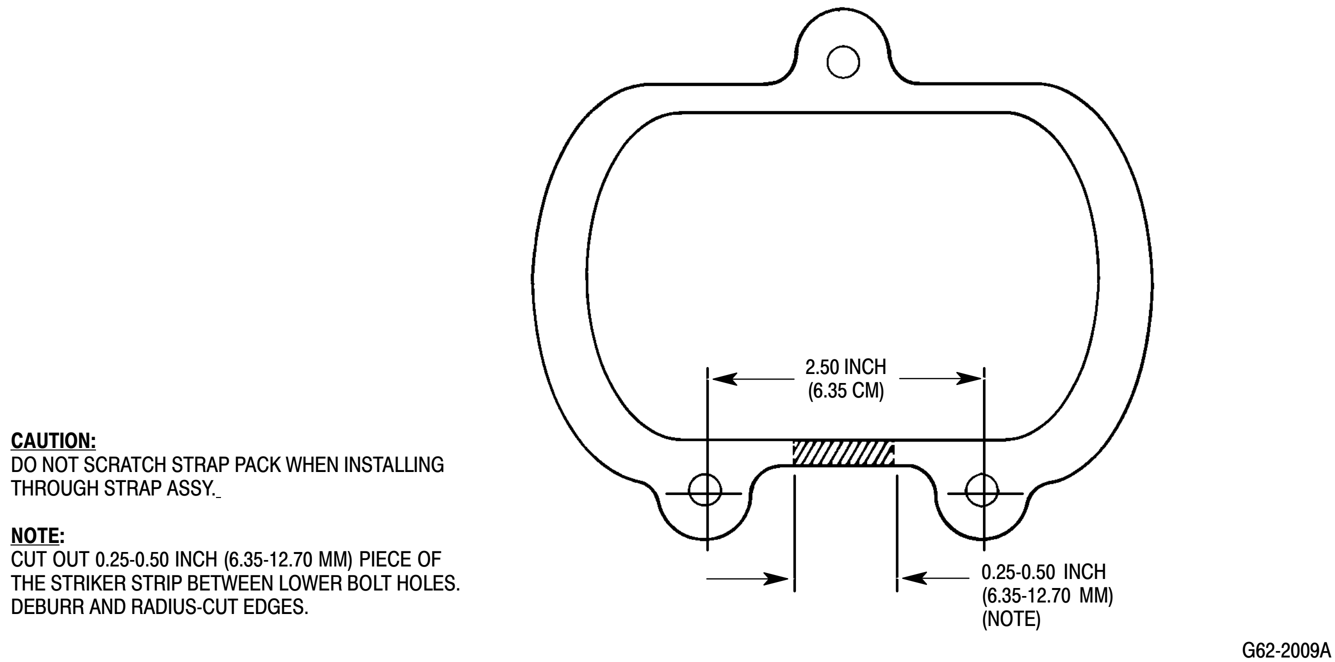


Figure 803. Striker Strip Replacement

8. Damper Attach Lug Bearing Replacement

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM216	Loctite remover
CM219	Methyl-ethyl-ketone
CM318	Primer

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST706	Arbor press fixture
ST707	Staking tool

(1). Use fly or circle cutter with 0.25 inch (6.35 mm) pilot to remove staked lip from one side of bearing without removing any material from fitting. If fitting is damaged by cutter, blade must be replaced.

(2). Use an arbor press to press bearing from fitting.

(3). Clean primer residue from fitting bore with MEK (CM219). Remove locking compound residue (if any) with locking compound remover (CM216).

(4). Using 10-power magnifying glass, inspect fitting bore for cracks. No cracks are permitted.

(5). Measure fitting bore diameter. Acceptable limits are 0.6548-0.6552 inch (16.63192-16.64208 mm).

(6). Apply thin coat of primer (CM318) to fitting bore.

(7). Press bearing into fitting with arbor press and fixture (ST706). Wipe away excess primer.

(8). Stake bearing at both sides of fitting with staking tool (ST707) in hydraulic press with 6000-8000 pounds (26688-35584 N) of force. When staked, outer race of bearing shall be flush to not more than 0.010 inch (0.254 mm) above fitting surface (both sides). Gap between staked lip of bearing race and chamfered surface of fitting bore shall not exceed 0.002 inch (0.0508 mm) as checked with feeler gage. Staking operation shall produce no cracks in fitting or bearing.

(9). Fill staking gap (if any) with primer (CM318).

9. Lead-Lag Bolt Corrosion Control

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM219	Methyl-ethyl-ketone
CM318	Primer
CM425	Sealing compound
CM802	Abrasive cloth, aluminum oxide

CAUTION Do not disturb torque on lead-lag bolts. Special adapter is needed to retorque lead-lag bolts.

(1). Remove and tag or color-code each set of balance hardware that is installed.

(2). Remove corrosion with grade 180 abrasive cloth (CM802) and finish with grade 400 abrasive cloth.

(3). Swab cleaned surface with MEK (CM219) and apply unthinned zinc chromate primer (CM318).

(4). Reinstall original balance hardware that was removed. Using sealant (CM425), reseal balance hardware.

10. Pitch Control Bearing Pivot Pin Repair or Replacement

(Ref. Figure 802) Minimum allowable pin diameter is 0.4328 inch (10.99312 mm). Pivot pin grooving or excessive side wear may be polished to original finish as long as minimum allowable pin diameter, 0.4328 inch (10.99312 mm), remains after rework. Replace any pin requiring more rework as follows.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer
CM420	Sealant

(1). Remove pivot pin.

(2). Install replacement pivot pin wet with primer (CM318).

NOTE: Torque pivot pin to **70 - 80 inch-pounds (7.91 - 9.04 Nm)**, then use 0.002 inch (0.0508 mm) feeler gage and check for gap between pin flange and washer on mounting lug surface. No gap is allowed.

(3). Install pivot pin in mounting lug with washer (Ref. Figure 802). Torque pivot pin to **250 - 280 inch-pounds (28.25 - 31.64 Nm)**. Apply sealant (CM420) at junctures of pivot pin flange, washer and hub.

11. Droop Stop Roller Repair or Replacement

(Ref. Figure 804) Replace defective droop stop roller if clearance between roller bearing liner and shaft is more than 0.015 inch (0.381 mm). Roller shaft outside diameter must not be less than 0.4370 inch (11.0998 mm).

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM217	Isopropyl alcohol

(1). Remove pitch control bearing housing that contacts lower shoe roller to be removed.

NOTE: Only one roller can be removed at one time. Two opposing droop stop followers must be pressed against droop stop ring to force opposite follower out and expose roller shaft for removal. Same condition exists at installation.

(2). Press down on pitch housing that is opposite roller that is to be removed. Remove cotter pin and shaft.

(3). Remove droop stop roller.

(4). Wet down and clean plunger and mating shoe bushing with isopropyl alcohol (CM217).

(5). To install replacement roller, press down on pitch housings at opposite sides of hub from roller to be installed. Install roller, shaft and new cotter pin.

(6). Install pitch control bearing housing.

12. Droop Stop Ring Repair

(Ref. Figure 804)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM103	Solid film lubricant

(1). Repair depth limit for corrosion, nicks or scratches in droop stop ring is 0.007 inch (0.1778 mm) for all surfaces except outer edges of ring outer flanges. Depth limit is 0.030 inch (0.762 mm). All reworked areas must be blended smoothly with 15 to 1 ratio into surrounding area.

(2). Spray repaired areas of rings with solid film lubricant (CM103).

(3). Replace droop stop ring if repair limits are exceeded.

13. Droop Stop Ring Replacement

(Ref. Figure 804)

(1). With hub upside down, support hub so that pitch housings unload cam followers and provide maximum clearance between striker plates and droop stop rollers.

(2). Release retaining (snap) ring of each droop stop restrainer from its groove. Move retaining ring flush against droop stop follower (T-head) to provide additional clearance and reduce spring tension.

(3). Remove five droop stop rollers.

(4). Starting from either scissors crank attach lug, number all five droop stop follower assemblies in clockwise direction for location identification at replacement. This number code should be placed on outer, upper end of plunger and on adjacent area of lower shoe. Make sure codes are not accidentally removed during remaining steps.

(5). Push droop stop ring toward number 3 and 4 followers. Pull number 1 follower T-head from droop stop ring channel. When T-head is free of ring channel, turn it perpendicular (vertical) to channel.

NOTE: Followers can be easily rotated by use of nonmetallic drift in hole for droop stop roller shaft.

(6). Push droop stop ring toward number 4 and 5 followers. Pull number 2 follower T-head from droop stop ring channel. When T-head is free of channel, turn it perpendicular to channel.

(7). Push droop stop ring toward number 1 and 5 followers. Pull number 3 follower T-head from droop stop ring channel. When T-head is free of channel, turn in perpendicular to channel.

(8). Tilt ring up on number 1, 2, and 3 T-heads as far as possible.

(9). While pulling upward on ring, rotate (in succession) number 1, 2, and 3 T-heads so that they are out of, and below, droop stop ring.

(10). Withdraw number 4 and 5 T-heads from droop stop ring channel and remove ring.

(11). Install replacement droop stop ring by reversing removal procedure, steps (1). through (10)., making certain to reinstall followers according to markings placed thereon prior to removal.

(12). Compress follower spring and install retaining (snap) ring in its groove on each follower.

(13). Reinstall droop stop rollers.

14. Droop Stop Follower (T-Head) Replacement

(Ref. Figure 804) Replace the droop stop follower (T-head) if it is worn, scored or is causing damage to the droop stop ring. After the droop stop ring has been removed, the droop stop follower assemblies may be removed from hub.

(1). Remove droop stop follower assembly from hub.

(2). Remove pins that secure follower to plunger.

(3). Insert new follower. T-head must be at right angle to roller shaft in plunger.

(4). Drill two 0.156-0.158 inch (3.9624-4.0132 mm) diameter holes through follower in line with holes in plunger.

(5). Insert pins and stake ends. No burrs or roughness permissible after staking.

(6). Install follower assembly in hub.

(7). Reinstall droop stop ring.

15. Droop Stop Plunger Removal, Inspection and Installation

(Ref. Figure 804)

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM217	Isopropyl alcohol

(1). Remove droop stop ring.

(2). Remove pitch control bearing housing assembly that contacts the lower shoe roller.

(3). Remove cotter pin and shaft from droop stop follower assembly.

(4). Remove droop stop roller.

(5). Check droop stop plunger for wear by using the following criteria:

(a). The minimum acceptable diameter after wearing in service should be 0.996 inch (25.2984 mm).

(b). The acceptable amount of wear though the anodized coating shall not exceed 40% or 2.1 square inches (13.55 cm^2) of the total sliding surface area of the cylinder.

(c). The maximum wear condition may exist in one spot or in several spots totaling 2.1 square inches (13.55 cm^2).

(6). Wet down and clean plunger and mating shoe bushing with isopropyl alcohol (CM217).

(7). Install droop stop plunger into lower shoe.

(8). Install roller, shaft and new cotter pin.

(9). Complete droop stop ring installation.

16. Main Rotor Hub Droop Angle Adjustment

(Ref. Figure 802) If static droop angle exceeds six degrees, adjust as follows.

(1). Remove main rotor blade.

(2). Use flat washers of thickness required to adjust spacing between spacer and striker strip. Any one type, or combination, of correct part number washers (IPC) may be used; however, an identical washer selection must be installed on each of three bolts that secure pitch control bearing assembly to pitch housing.

(3). Remove nuts and washers and separate spacer from striker strip. The use of one 0.016 inch washer raises static droop angle approximately one-half degree. Add sufficient washers to adjust droop angle within range of 5.5 ±0.5 degrees. Reinstall nuts and washers.

(4). If more than 0.063 inch (1.6002 mm) spacing is required (above factory spacing), inspect striker plate and droop stop roller or follower and droop stop ring for excessive wear. Replace as required.

NOTE: The average factory spacing on new and rebuilt hubs is 0.063 inch (1.6002 mm).

(5). Reinstall blade. Repeat measurement of static droop angle.

(6). As required, repeat above procedures for remaining blades.

(7). Following reinstallation or replacement of parts, check track of main rotor blades.

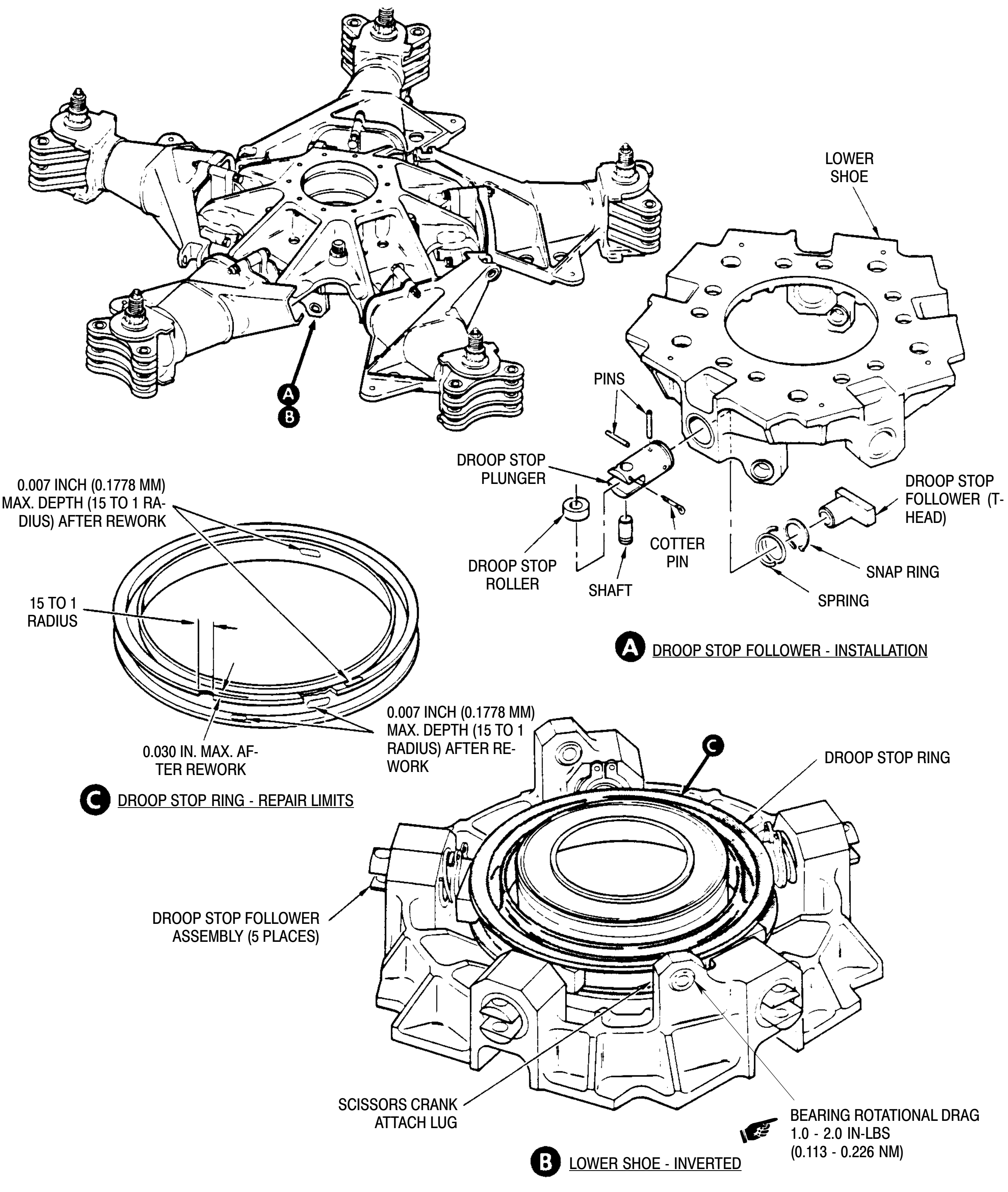


Figure 804. Main Rotor Hub Assembly - Repair

17. Main Rotor Hub Tapered Bearing Grease Repack, Inspection and Replacement

(Ref. Figure 805) Replace tapered roller bearing cup or cone if it has any flat spots, scoring, pitting, grooving, discoloration (blue) or if it feels rough when rotated.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM111	Grease, aircraft
CM121	Preservation oil
CM234	Solvent, dry-cleaning
CM802	Abrasive cloth, aluminum oxide
CM803	Crocus cloth

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST701	Main rotor wrench assembly

CAUTION Do not intermix Timken or NTN bearing cups and cones at upper and lower tapered roller bearing locations of main rotor hub.

NOTE:

- Roller bearing cones and cups should always be replaced as a set.
- Replace tapered roller bearing cup and cone if it has any flat spots, scoring, pitting, grooving, discoloration (blue) or if it feels rough when rotated.

(1). Use pressing tools equivalent to items A and B (Ref. Figure 806) to press upper and lower bearing cups from hub. A press ram of one to two tons is sufficient for removal.

(2). Press lower bearing cone from sleeve bushing.

CAUTION In next step, do not spin reusable bearings while cleaning. Coat bearings lightly with oil (CM121) after cleaning.

(3). Clean hub bore, sleeve bushing, seal retainer and reusable bearings using filtered solvent (CM234) spray.

(4). Check bearing cup hub bore for scoring. Smooth out any roughness with grade 400-600 abrasive cloth (CM802). Restore chemical film protection where removed. Maximum diameter of hub bore for upper bearing cup (Ref. Figure 805) is 4.4335 inch (11.26109 cm), measured in any direction. Maximum diameter of hub bore for lower bearing cup is 4.3095 inch (10.94613 cm), measured in any direction.

(5). Check upper seal retainer. No cracks, sharp nicks or burrs are allowed. Minor corrosion or other surface defects may be polished out using crocus cloth (CM803). Grooving on seal contact surfaces must not exceed 0.004 inch (0.1016 mm) depth after polishing.

WARNING **Bearing cups are installed in hub by differential temperature (shrink-fit) method. Take appropriate precautions to prevent burns when handling parts that are cooled to sub-zero temperatures.**

(6). Place bearing cups in closed container of dry ice and cool for not less than 20 minutes to -40°F (-40°C).

(7). Coat bore of hub with grease (CM111). Use care to maintain cup-to-hub bore alignment and press cup into bore, using tools D and E (Ref. Figure 806), until cup is seated.

(8). Apply film of grease to sleeve bushing. Use pressing tool equivalent to tool C, and press bearing cone onto sleeve bushing.

(9). With lip on center seal up, hand press it into hub (Ref. Figure 805).

(10). Apply film of grease on mast. Install preassembled sleeve bearing and bearing cone on mast. Do not apply any additional lubricant to roller bearing set. Wipe any excess preservative oil from bearing cone and cup.

(11). Place assembled hub over mast and seat on lower roller bearing cone.

(12). Install lead spacer 369A1224-5 (thickness gage substitute for recessed spacer) over mast. Rest spacer on top of sleeve bushing.

NOTE: If lead spacer is not available, fabricate its equivalent from lead sheet. Spacer dimensions are; 2.96 inch (7.5184 cm) outside diameter; 2.68 inch (608072 cm) ID; 0.075-0.085 inch (1.905-2.159 mm) thick.

(13). Install upper bearing cone into hub and on top of lead spacer.

(14). Install steel ring washer, equivalent to tool F (Ref. Figure 806), as substitute for seal retainer (Ref. Figure 805).

NOTE: Step (14). is not required. However, use of substitute washer for retainer prevents unnecessary scoring of retainer. Several tightening and loosening actions may be required to get correct rotational drag on hub bearings.

(15). Install mast nut on mast using mast nut wrench (ST701), tighten until bearings are preloaded to **10 - 12 inch-pounds (1.13 - 1.36 Nm) of rotational drag**. Measure rotational drag using **0 - 10 pound (0 - 4.536 kg)** spring scale hooked over one of hub support web bosses, 6.5 inch (16.51 cm) from hub centerline). A 1.50 - 1.75 pound (0.681 - 0.7945 kg) pull with hub in motion indicates correct rotational drag.

(16). Remove mast nut, tool F (Ref. Figure 806), (or seal retainer), and upper bearing cone. Remove lead spacer and measure compressed thickness. Obtain serviceable recessed spacer of same thickness, or grind new recessed spacer to required dimension. Discard lead spacer after recessed spacer is correctly ground.

NOTE: To insure that hub is seated onto mast properly before torquing, 2 - 4 threads should be showing above the mast nut with nut installed finger tight.

(17). Install recessed spacer, recess down, on top of sleeve bushing. Reinstall upper bearing cone, seal retainer and mast nut. Torque nut to **200 - 250 foot-pounds (271 - 339 Nm)** and check for rotational drag of **10 - 15 inch-pounds (1.13 - 1.69 Nm)**. This will be **1.5 - 3 pounds (0.681 - 1.362 kg)** on spring scale used as in step (15). above.

(18). Remove hub and sleeve bushing with lower bearing cone from mast.

(19). Position hub upside-down. Hand-pack lower hub cavity (Ref. Figure 805) and bearing cone on sleeve bushing with grease.

(20). Install sleeve bushing with bearing cone in hub. Hand-pack cavity between bearing and hub liner with grease; then press in lower seal with seal lip toward top of hub. Wipe off excess grease.

(21). Turn hub assembly right side up.

(22). Complete reassembly of hub by installing recessed spacer, upper bearing cone, upper seal and seal retainer in hub at installation of hub on mast.

18. Main Rotor Hub Scissors Attach Lug Bearing Replacement

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM206	Chemical coating
CM216	Loctite remover
CM304	Enamel, epoxy
CM321	Surface primer locking compound
CM431	Sealing, locking and retaining compound

(1). Remove main rotor hub (Ref. Main Rotor Hub Replacement).

(2). Invert hub and place on work bench.

(3). Remove droop stop ring (Ref. Droop Stop Ring Replacement).

(4). Press bearing from hub lug.

(5). Clean bearing bore with locktite remover (CM216).

(6). Inspect bearing bore for nicks, scratches and grooves.

(7). Inspect bore for diameter of 0.6551-0.6556 inch (16.63954-16.65224 mm).

(8). Touch up bearing bore with chemical coating (CM206).

(9). Apply surface primer (CM321) to mating surfaces of bearing and boreas per manufacturer's instructions.

NOTE: Do not allow primer to enter bearing.

(10). Apply locking compound (CM431) to faying surfaces of bearing and bore, press bearing into bore while locking compound is wet.

(11). Remove excess sealant, do not allow sealant to enter bearing.

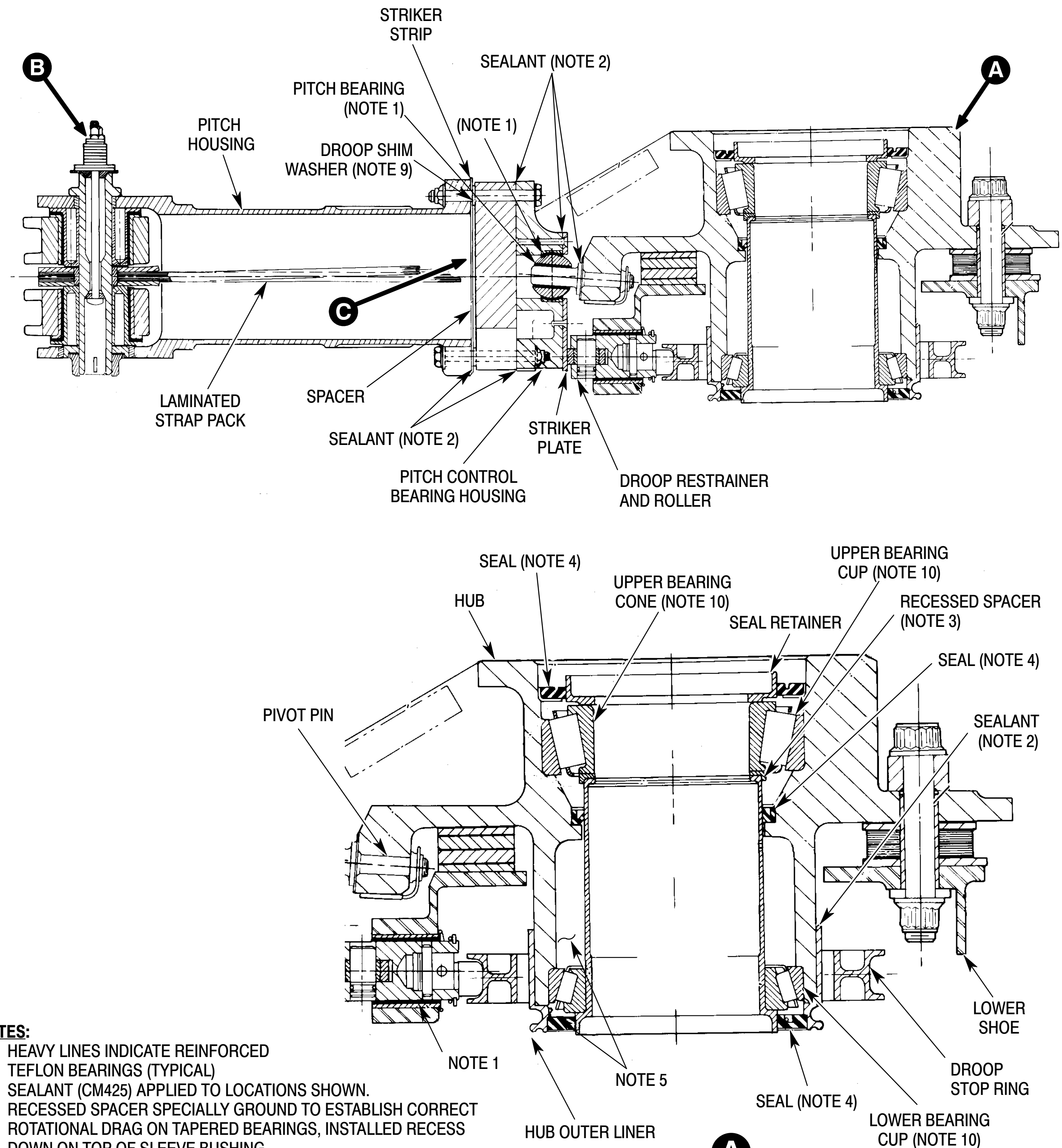
(12). Apply a small fillet of sealant around bearing and allow to dry for 24 hours at room temperature or heat to 140° - 160°F (60° - 72°C) for one hour.

(13). As required, touch up bearing lug with paint (CM304).

(14). Check bearing for a no-load rotational drag of **1.0 - 2.0 inch-pounds (0.113 - 0.226 Nm)**.

(15). Reinstall droop stop ring (Ref. Droop Stop Ring Replacement).

(16). Reinstall main rotor hub (Ref. Main Rotor Hub Replacement).



NOTES:

1. HEAVY LINES INDICATE REINFORCED TEFLON BEARINGS (TYPICAL)
2. SEALANT (CM425) APPLIED TO LOCATIONS SHOWN.
3. RECESSED SPACER SPECIALLY GROUND TO ESTABLISH CORRECT ROTATIONAL DRAG ON TAPERED BEARINGS, INSTALLED RECESS DOWN ON TOP OF SLEEVE BUSHING.
4. SEAL TO BE UPWARD.
5. BEARING AND CAVITY TO BE FILLED WITH GREASE (CM111).
6. EARLY CONFIGURATION MODIFIED BY HUGHES SERVICE NOTICE DN-3.
7. ON CURRENT CONFIGURATION, RIVET IS REPLACED BY SCREW, WASHER, AND NUT.
8. SEALANT (CM420) APPLIED TO SURFACES SHOWN.
9. DROOP SHIM WASHERS ARE INSTALLED AS REQUIRED TO OBTAIN PROPER ROTOR DROOP ANGLE.
10. DO NOT INTERMIX TIMKEN AND NTN BEARING CUPS AND CONES AT UPPER AND LOWER TAPERED BEARING LOCATIONS.

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Figure 805. Main Rotor Hub - Cross Section (Sheet 1 of 2)

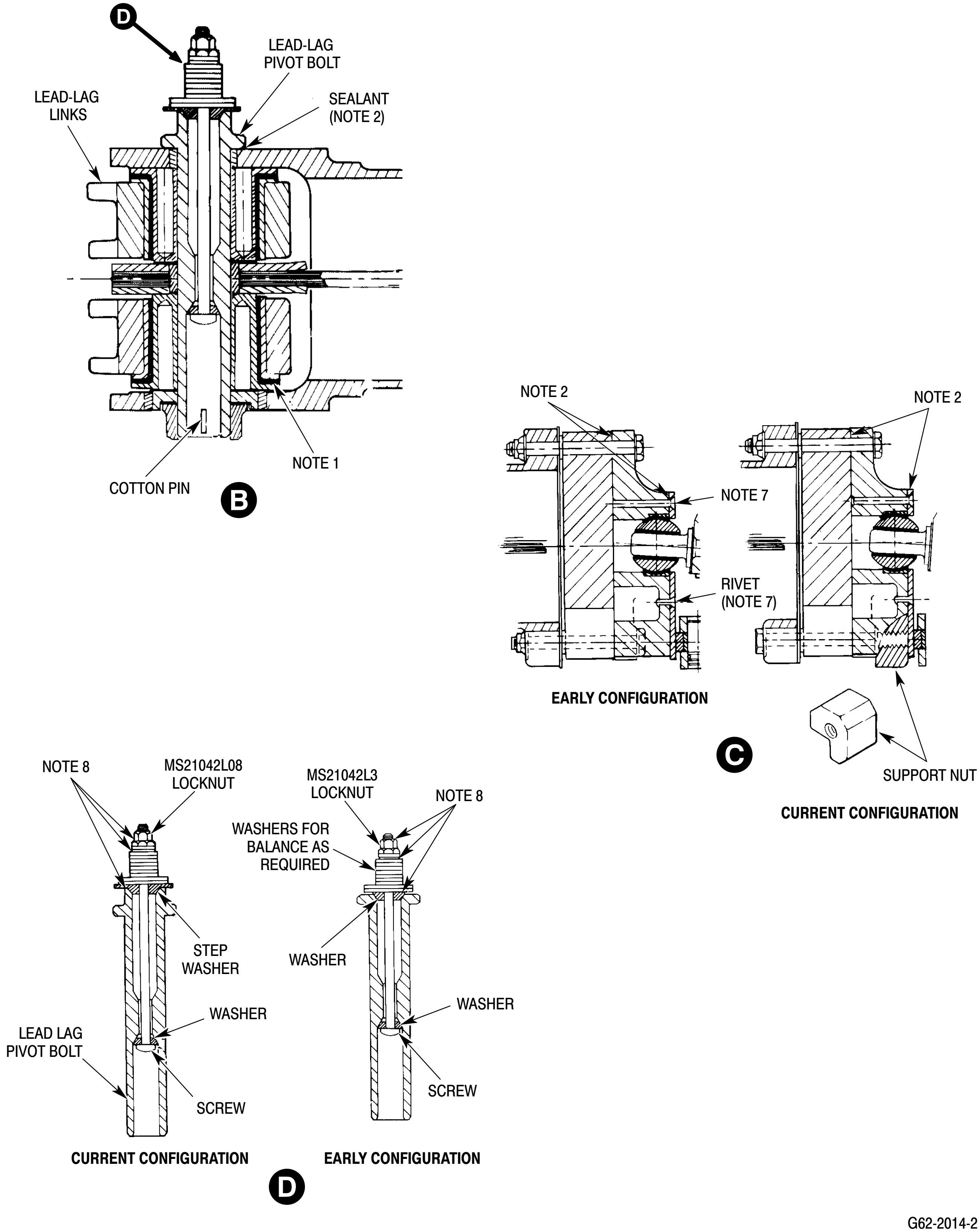
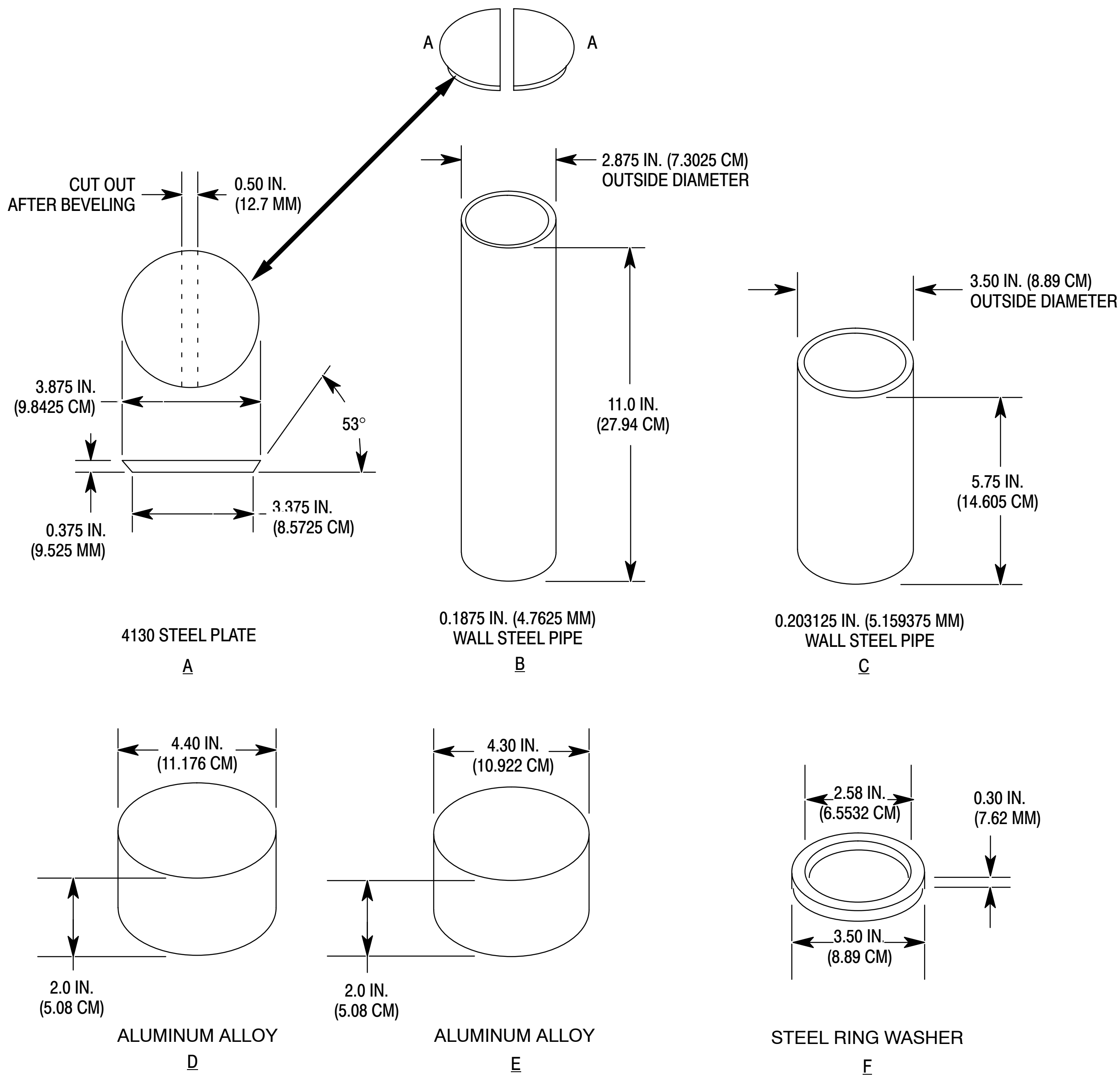


Figure 805. Main Rotor Hub - Cross Section (Sheet 2 of 2)



TOOL USE:

A & B - PRESS BEARING CUPS OUT OF HUB
C - PRESS LOWER BEARING CONE ON SLEEVE BUSHING
D - PRESS UPPER BEARING CUP INTO HUB
E - PRESS LOWER BEARING CUP ONTO HUB
F - IN PLACE OF UPPER SEAL RETAINER WHILE ADJUSTING ROTATIONAL DRAG
G - HUB BEARING REMOVAL - FABRICATION

G62-2010-1

Figure 806. Tapered Bearing Tools - Main Rotor Hub

Section

62-20-60

Main Rotor Hub (600N)

MAIN ROTOR HUB REMOVAL/INSTALLATION

1. Main Rotor Hub - General

(Ref. Figure 402) The main rotor hub consists of a central hub, six identical pitch housings spaced 60 degrees apart horizontally around the hub with associated mechanisms and linkages. Lead-lag links, a lead-lag damper, a droop stop striker strip and spacer, and a pitch control bearing with each pitch housing produce the pivoting axis, blade flapping stop contact surfaces and lead-lag hinge function for the rotor blades. Six laminated retention strap assemblies that are flexible both vertically and torsionally extend through the pitch housings and connect to the lead-lag links. A lower shoe, attached to the central hub, contains a droop stop ring and droop restrainers that support the blades at rest and distribute droop loads at low blade rpm. The following instructions provide field maintenance and repair procedures for the main rotor hub.

2. Main Rotor Hub Replacement

A. Main Rotor Hub Removal

(Ref. Figure 401)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST201	Hoisting adapter
ST701	Main rotor wrench assembly
ST702	Hub puller

(1). Remove main rotor blades.

(2). Remove main rotor drive shaft; then reinstall hoisting eyebolts, washers and nuts in rotor hub. Locate them to correspond with lugs of hoisting adapter (ST201).

(3). Remove lockwire and disconnect flexible boot from lower end of hub liner.

(4). Disconnect each pitch control rod from pitch housing.

(5). Disconnect scissors crank from main rotor hub or scissors link.

NOTE: To facilitate assembly, color code each pitch control rod to match pitch housing to which it is attached.

(6). Remove two screws securing retainer to main rotor hub nut.

(7). Remove nut retainer.

(8). Using main rotor mast nut wrench (ST701), remove nut from mast.

(9). Using hub puller (ST702), break loose main rotor hub. Remove hub puller.

(10). Attach hoisting adapter (ST201), to eyebolts and hoist hub from mast.

B. Main Rotor Hub Installation

(Ref. Figure 402)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM111	Grease, aircraft
CM115	Grease, oscillating bearing
CM204	Compound, corrosion preventative
CM702	Lockwire CRES

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST201	Hoisting adapter
ST701	Main rotor wrench assembly
ST703	Main rotor hub driver

CAUTION Main rotor hub is a highly stressed component. Use extreme care to prevent it from striking any object. Any impact damage may require replacement of hub.

NOTE:

- Removal of recessed spacer, upper bearing cone, upper seal and seal retainer is not mandatory for installation of the main rotor hub. If these items are installed, perform steps (1). thru (4). and (11). thru (22). Caution should be used when installing hub to prevent damage to these parts.
- If recessed spacer, upper bearing cone, upper seal and seal retainer have been removed, these parts should not be assembled in hub before installation of hub on helicopter. These items are reassembled in hub after seating hub on mast. Prior to installing main rotor hub, insure that all bearings are adequately serviced with grease (CM111).
- Replacement main rotor hubs do not come balanced from MDHS. If installing a replacement hub, perform a main rotor system balance (Ref. Sec. 18-10-60, Main Rotor System Balance Procedure).

(1). Attach hoisting adapter (ST201) to eyebolts in main rotor hub and connect suitable hoist.

CAUTION If hub assembly (with sleeve bushing, spacer, upper bearing and seal retainer installed) does not seat properly onto mast, do not attempt to force it into position. Remove hub assembly from mast and determine cause of hub not seating, correct the problem and follow the procedures for reinstallation.

(2). Check that rotor mast is clean. Hoist main rotor hub and position over mast; then lower hub onto mast.

NOTE: To inhibit mast corrosion when operating in salt water environment, lightly coat bearing journals of mast with grease (CM115).

(3). Remove adapter, hoist and eyebolts.

(4). Check that hub is fully seated on mast.

(5). Hand-pack hub cavity, between sleeve bushing and hub, with grease (CM111).

(6). Place recessed spacer, recess down, on top of sleeve bushing.

(7). Hand-pack upper bearing cup and cone with grease; then install cone on mast and use hub driver (ST703), to fully seat cone.

(8). Fill remaining cavity to upper seal with grease.

(9). Position upper seal in seal retainer with lip up; then press seal and retainer in hub counterbore.

(10). Using a soft drift, carefully tap seal outer ring to seat in counterbore. Wipe away any excess grease.

(11). Apply grease (CM111) to exposed threads on mast.

CAUTION Ensure that seal is properly positioned against seal retainer and that seal retainer does not pinch seal. Check by inserting a loop of approximately 0.050 inch (1.27 mm) diameter lockwire, round feeler gage or other suitable tool without sharp edges between seal lip and retainer.

NOTE: To insure that hub is seated onto mast properly before torquing, two to four threads should be showing above the mast nut with nut installed finger tight.

(12). Install mast nut, using wrench (ST701); torque nut to **200 foot-pounds (271 Nm)**. Apply coat of corrosion preventive compound (CM204) to screw holes in mast nut.

(13). Place retainer on nut and check retainer-to-nut screw hole alignment.

(14). Increase nut torque to not more than **250 foot-pounds (339 Nm)** to align holes in retainer and nut.

NOTE: If holes cannot be aligned in **200 - 250 foot-pound (271 - 339 Nm)** torque range, remove and invert nut and repeat procedures in (12). thru (14). to align holes.

(15). Secure retainer to nut with two screws; safety screws with lockwire (CM702).

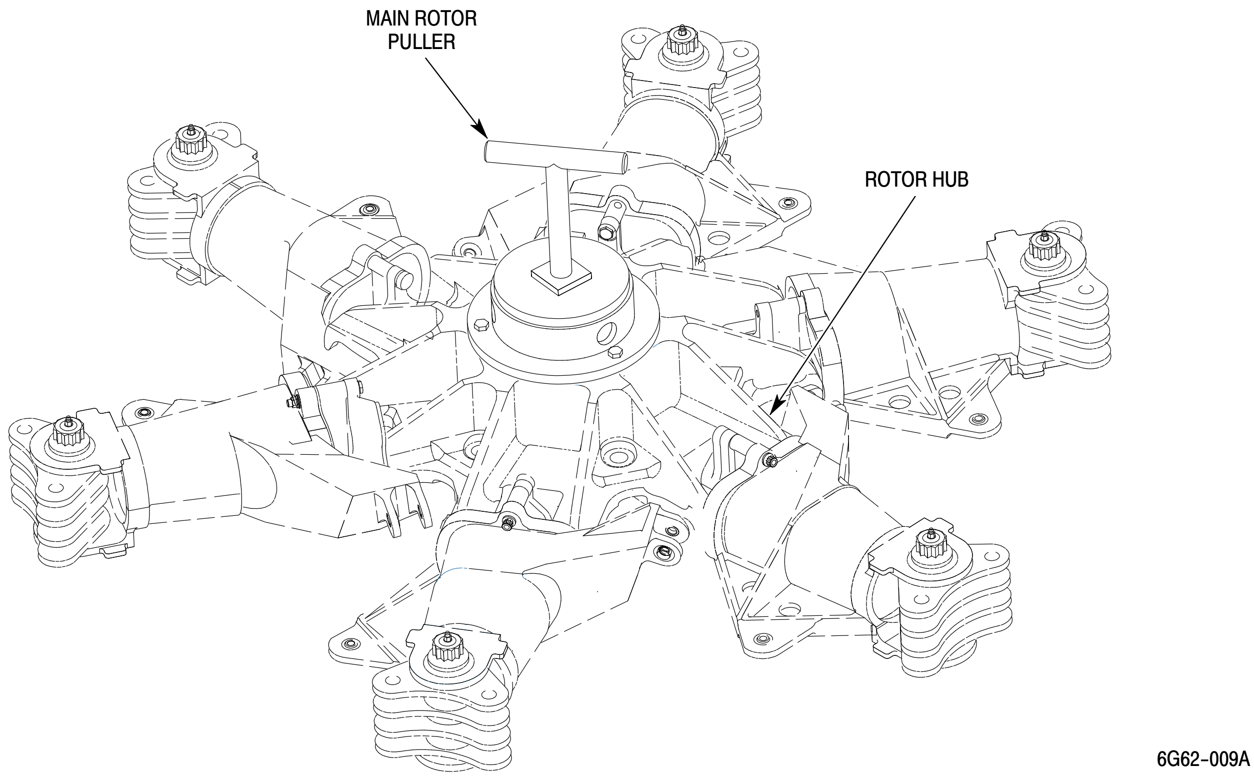


Figure 401. Pulling Hub Assembly

CAUTION Ensure that no washers are used under screw heads and that screw heads are free of burrs.

(16). Verify that screwheads do not project more than 0.020 inch (0.508 mm) above hub upper surface, for adequate clearance between screw heads and driveshaft flange.

(17). Connect scissors crank to main rotor hub lower shoe and/or to scissors link.

NOTE: Ensure pitch control rods are installed at same locations from which removed.

(18). Install pitch control rods to pitch housings (Ref. Sec. 62-30-60, Pitch Control Rod Replacement).

(19). Connect flexible boot to lower end of rotor hub liner and secure with lockwire (CM702).

(20). Install main rotor drive shaft (Ref. Sec. 63-10-00).

(21). Install main rotor blades.

(22). Perform main rotor blade droop angle check if hub is new or replacement.

(23). Perform main rotor system balance (Ref. Sec. 18-10-60, Main Rotor System Balance Procedure) if a new or rebuilt hub is installed.

3. Main Rotor Damper

(Ref. Figure 603) A main rotor damper is attached to each pitch housing of the rotor hub. The damper is connected to the inboard trailing edge of the associated main rotor blade by an adjustable clevis to prevent lateral vibrations from occurring in main rotor blades. Neither damper travel nor stiffness is adjustable on the helicopter. Phasing of rotor blades is affected by turnbuckle adjustment. Any phasing problem caused by a defective damper should be corrected by replacing damper.

CAUTION Excessive lead-lag load applied to the main rotor blades during ground handling can result in damage to the elastomeric damper buns and failure of the damper assembly. Operators and maintenance personnel should use extra caution to avoid lead-lag loads in excess of **35 pounds (155.68 N)** at the tip of the main rotor blades.

NOTE: If one or more main rotor blades strike an object while rotating or the drive system has been subjected to sudden stop, inspect damper.

4. Main Rotor Damper Replacement

A. Main Rotor Damper Removal

(1). Note and record location from which damper is to be removed from main rotor hub.

NOTE: At reinstallation, if damper is not reinstalled at same location, a check of and/or blade phasing is required.

(2). Support blade parallel to ground.

(3). Remove damper.

NOTE: If damper is to be reinstalled at same location, do not disturb damper clevis, jam nuts or turnbuckle setting. Otherwise, blade phasing is required at reinstallation of damper.

(4). If damper is not to be reinstalled, remove bushing from damper ear and retain with hub.

B. Main Rotor Damper Installation

(1). Check, and if necessary, preset main rotor damper length (Ref. Nominal Damper Adjustment Procedure). Leave jamnuts fingertight.

NOTE: Ensure that bushing is installed in large hole of damper ears.

(2). With damper rotational direction decal facing outboard so it can be read, attach damper ears to pitch housing lug with bolt (head up), washers, and nut. Torque nut to **30 - 60 inch-pounds (3.39 - 6.78 Nm)** and install cotter pin.

(3). Adjust main rotor blade phasing for associated main rotor blade.

(4). After final phasing adjustments, torque jamnuts to **95 - 110 inch-pounds (10.73 - 12.43 Nm)**. Safety jamnuts to turnbuckle with new lockwire. Lockwire must be located out-board, away from pitch housing.

NOTE: Threaded end of damper turnbuckle shaft must protrude through clevis base a minimum of two full threads and must clear blade damper attach fitting.

(5). Connect damper to blade.

(6). Remove blade support.

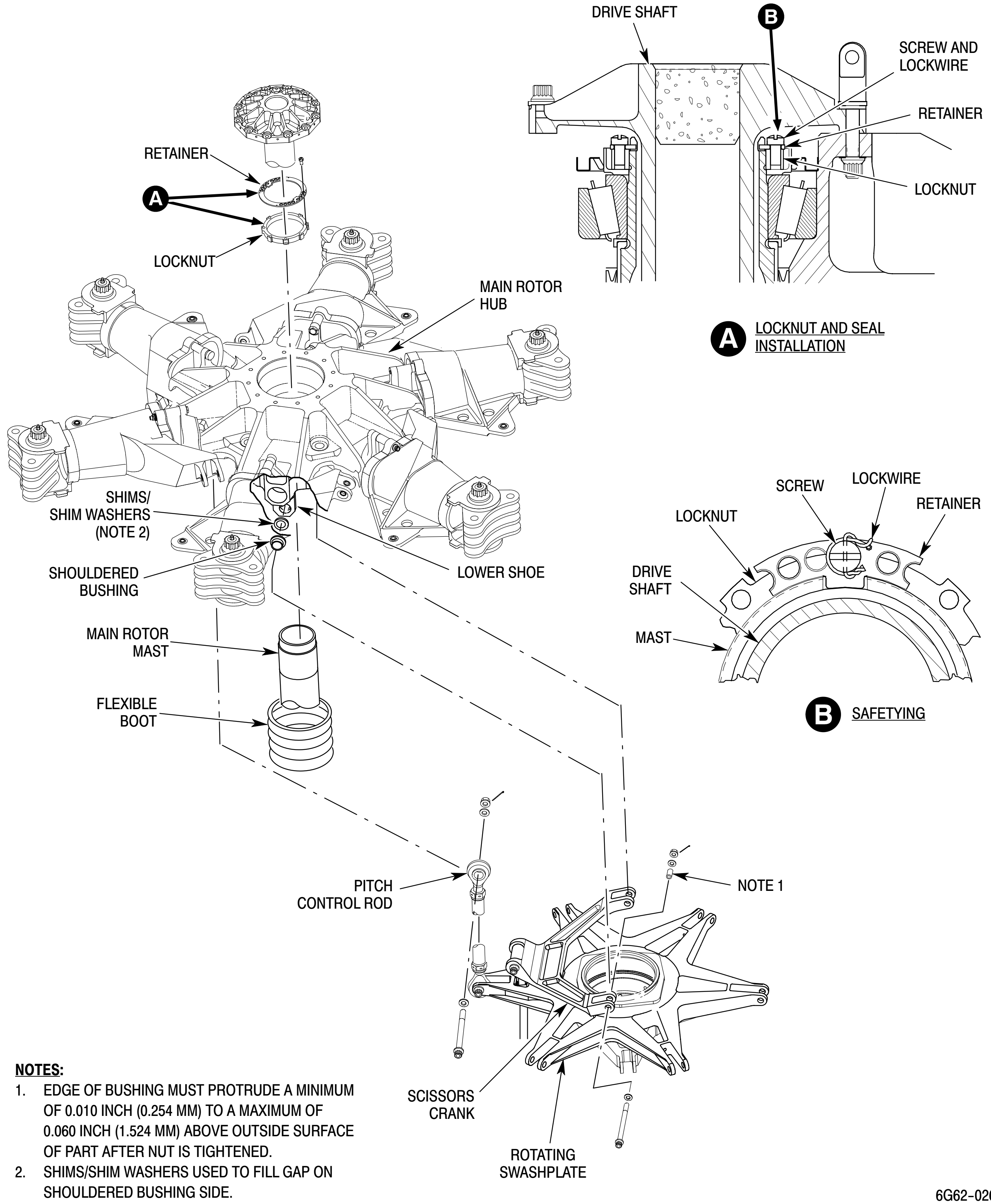
5. Main Rotor Damper Nominal Adjustment

(1). Remove main rotor blade dampers from helicopter if installed.

(2). Store all dampers together in horizontal position for minimum of six hours. Preferred ambient temperature during storage is 55° to 85°F (13° to 30°C).

(3). Set damper length, centerline-to-centerline of bolt attach holes, for initial installation.
600N
8.132 ±0.005 inch (206.553 ±0.127 mm.

(4). Install dampers on helicopter.



NOTES:

1. EDGE OF BUSHING MUST PROTRUDE A MINIMUM OF 0.010 INCH (0.254 MM) TO A MAXIMUM OF 0.060 INCH (1.524 MM) ABOVE OUTSIDE SURFACE OF PART AFTER NUT IS TIGHTENED.
2. SHIMS/SHIM WASHERS USED TO FILL GAP ON SHOULDERED BUSHING SIDE.

Figure 402. Main Rotor Hub Installation

MAIN ROTOR HUB INSPECTION/CHECK

1. Main Rotor System Balancing - General

Main rotor system balancing is accomplished by adding or removing weight (flat washers) as required at the lead-lag bolts. Analysis of main rotor system balance is accomplished using instrumentation that measures and localizes vibrations due to main rotor system imbalance. Data provided by the instrumentation is plotted on a chart designed to indicate how much weight must be added or removed from the lead-lag bolt. No other means of balancing is to be used. If there is ground rocking, or if one-per-rev lateral (main rotor) vibration occurs during flight refer to Sec. 18-10-60, Main Rotor System Balance Procedure.

2. Main Rotor Hub Inspection

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM104	Lubricant, spray

(1). Inspect pitch housing for scratches, nicks and cracks. No cracks are permissible. Scratches and nicks must be cleaned up before measuring depth of damage to determine housing serviceability.

(2). Inspect sleeve bushing (Ref. Figure 805) for snug fit in pitch housing arm clevis lug; if bushings are loose, remove and inspect. Inspect lug for evidence of wear caused by bushing movement. Maximum allowable diameter for hole in each lug is 0.4380 inch (11.13 mm). Inspect inner surfaces of all pitch housing arm clevis lugs for chafing caused by misaligned pitch control rod end bearings. Chafing is in form of crescent-shaped grooves. If chafing wear exists, repair or replace. Chafed area must be cleaned up before measuring depth of damage to determine housing serviceability.

(3). Inspect droop stop ring for corrosion, dents and scratches. If defects are found, repair or replace.

NOTE: To inhibit corrosion, spray droop stop ring, rollers and pitch bearings with spray lubricant (CM104).

(4). Inspect droop stop roller for flat spots, pit marks and looseness on roller shaft.

(5). Inspect striker plate for dents and pit marks that exceed 0.030 inch (0.762 mm) depth. Damage exceeding this limit requires replacement of striker plate.

(6). Press each pitch housing downward several times and check for evidence of binding pitch bearing or droop restrainer follower. Inspect visible portion of droop restrainer for cracks and follower spring for breaks.

NOTE: Do not remove tetrafluoroethylene (TFE) debris which works out of pitch bearing edge. Debris is normal and helps lubricate bearing. Removal of debris increases bearing wear rate.

(7). Use bright light and 5-power magnifying glass to inspect all main rotor hub lead-lag links (Ref. Figure 805) for discoloration, pitting, intergranular cracks or stress corrosion cracks. Any discoloration or pitting is evidence of more than superficial corrosion and main rotor hub must be removed for replacement of lead-lag links.

NOTE: Normal or premature overhaul requires visual inspection plus dye- penetrant inspection of links for same conditions.

(8). Inspect lead-lag link stop for broken spring, cracks, breaks or visible bond line cracks.

(9). Inspect interiors of lead-lag bolts using bright light and 5X glass for cracks or corrosion per Lead-Lag Bolt Inspection.

(10). Inspect each striker strip for cracks, deformation and badly worn contact surfaces.

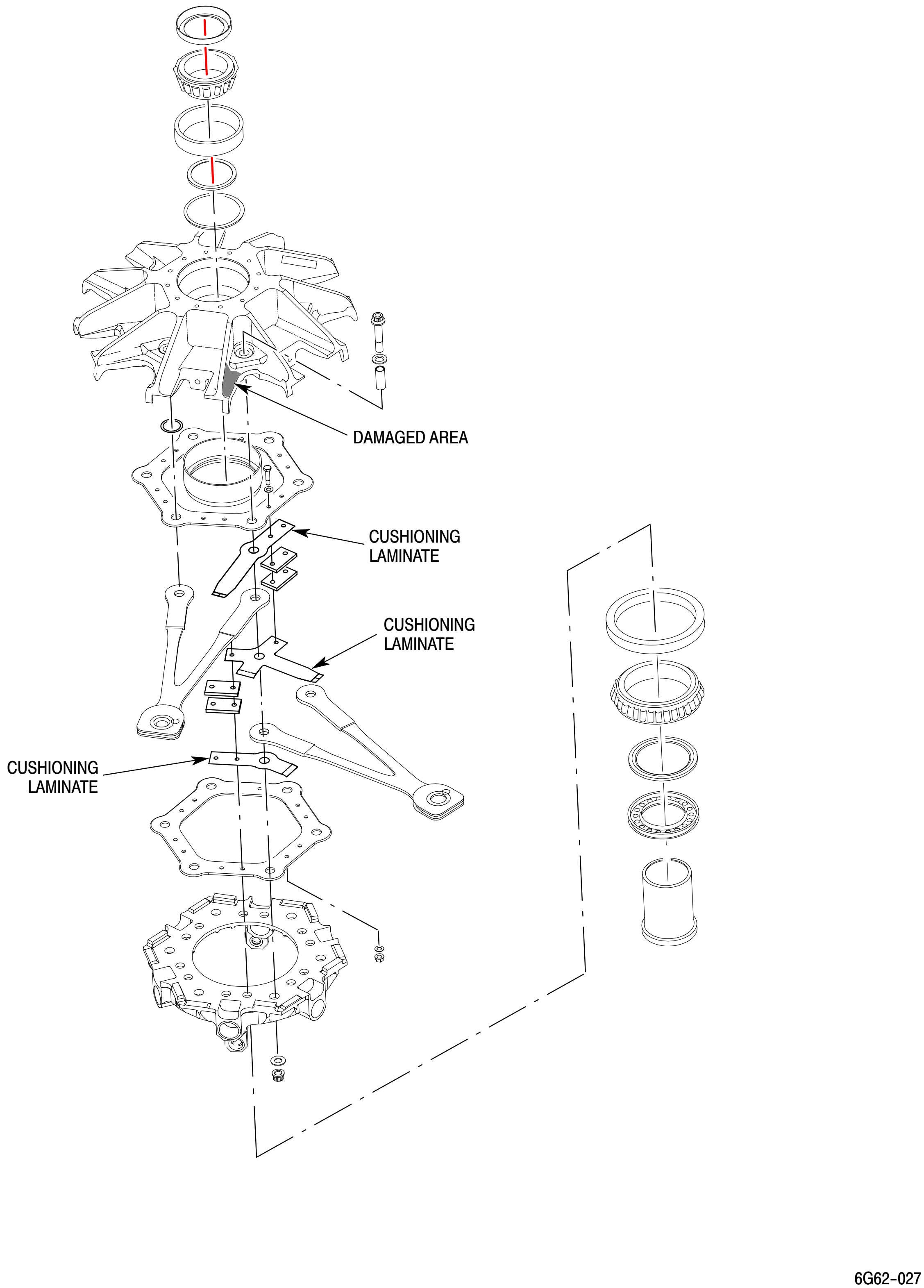


Figure 601. Strap Pack Lamination - Exploded View

(11). Inspect all parts of main rotor hub for cracks, breaks, scratches and nicks. (Refer all questionable damage to MDHI for disposition.)

(12). Inspect lower shoe scissors attach bearings for binding, looseness in bore and wear. Maximum wear limits are 0.010 inch (0.254 mm) radial and 0.020 inch (0.508 mm) axial.

(13). Inspect each of six main rotor retention strap packs (Ref. Main Rotor Strap Pack Lamination Inspection) at specified intervals (Ref. Section 05-10).

3. Lead-Lag Bolt Inspection

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer
CM425	Sealing compound

(1). Inspect interiors of lead-lag bolts using bright light and 5X glass for cracks or corrosion.

(a). Remove cotter pin securing nut to lower end of lead-lag bolt. Do not disturb torque on nut or remove nut.

(b). Remove screw, nut, washers and balance hardware, if installed, from lead-lag bolt.

(c). Inspect bolt interior. Treat minor surface corrosion if noted (Ref. Lead-Lag Bolt Corrosion Control). If corrosion pitting or cracks are noted remove and replace hub.

(d). Swab entire ID of bolt with primer (CM318).

(e). Reinstall screw, nut, washers and balance hardware removed in step 2. Ensure hardware is installed exactly as removed. Torque MS21042L08 locknut on screw to **20 - 35 inch-pounds (2.26 - 2.82 Nm)**. Torque MS21042L3 locknut on screw to **30 - 60 inch-pounds (3.39 - 6.78 Nm)**. Coat exposed screw threads, washers and nut with sealant (CM425).

NOTE: Excessive amount of sealant can unbalance rotor system. Apply light but thorough coat of sealant.

(f). Install new cotter pin to secure nut to lead-lag bolt.

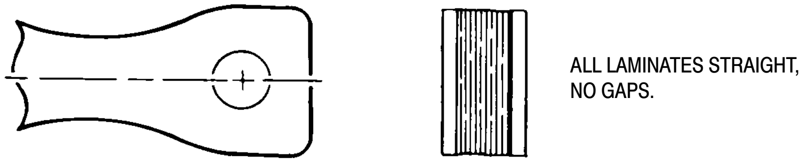
4. Main Rotor Strap Pack Lamination Inspection

CAUTION

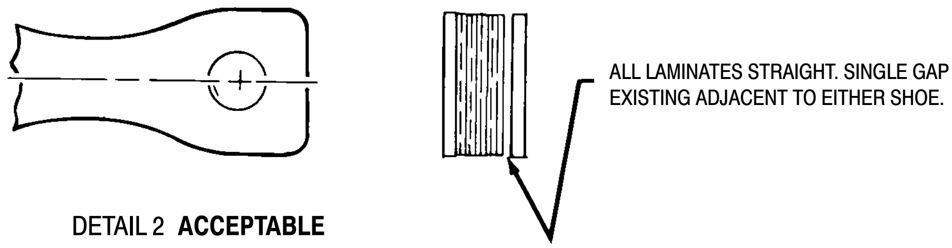
- Figure 601 and Figure 602 depict the main rotor hub and strap pack assembly disassembled for clarity of location and area to be inspected for cracks. Under no circumstances should the strap pack or main rotor hub assembly ever be disassembled in the field. MDHI and MDHI Approved Licensees are the only approved repair stations for main rotor hub assembly overhaul.
- If a hub assembly or strap pack assembly (other than new parts in storage) are subjected to extended periods of non- use, whether installed on the helicopter or not, the strap assembly should be inspected critically for corrosion and pitting before return to service. If corrosion is found on the strap pack assemblies, contact MDHI for disposition.
- It is acceptable to operate a helicopter with a hub assembly having a strap pack with one failed laminate in any one leg of the strap assembly. When a laminate in the strap assembly fails, the remaining laminates pick up and carry the load. This increased load causes slightly more elongation in the remaining laminates of that leg thus shifting the mass of the rotor system. Any time a vibration develops or there is an increase in vibration level over a short period of time, the main rotor strap pack assembly should be inspected for cracked or failed laminates.

NOTE: Conduct inspection indoors, if possible, or in a shaded area to eliminate glare of sun or bright outdoor light. To facilitate inspection, field fabricate and use plastic inspection tool and wooden probe (Ref Figure 602).

(1). Remove main rotor blades.

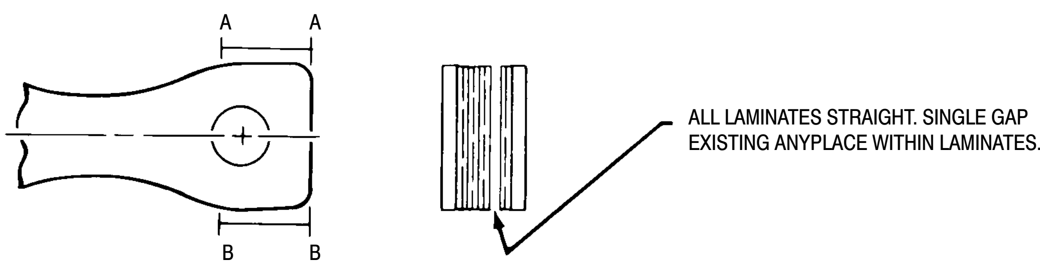


DETAIL 1 **ACCEPTABLE**



DETAIL 2 **ACCEPTABLE**

NOTE:
WHILE TEFLON MAY APPEAR WRINKLED AND EXTEND PAST END OF LAMINATES, PREVENTING CLEAR VIEW OF LAMINATES. WHEN THIS OCCURS, LOOK ALONG EITHER SIDE IN AREA A-A OR B-B (DETAIL 3).



DETAIL 3 **ACCEPTABLE**

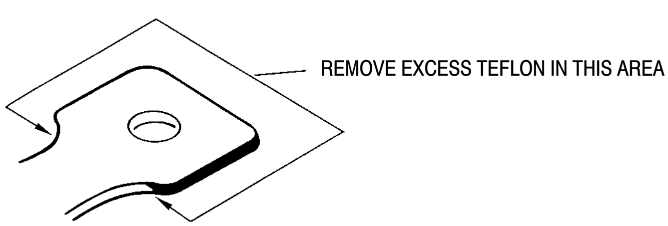


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Figure 602. Strap Pack Lamination Inspection (Sheet 1 of 2)

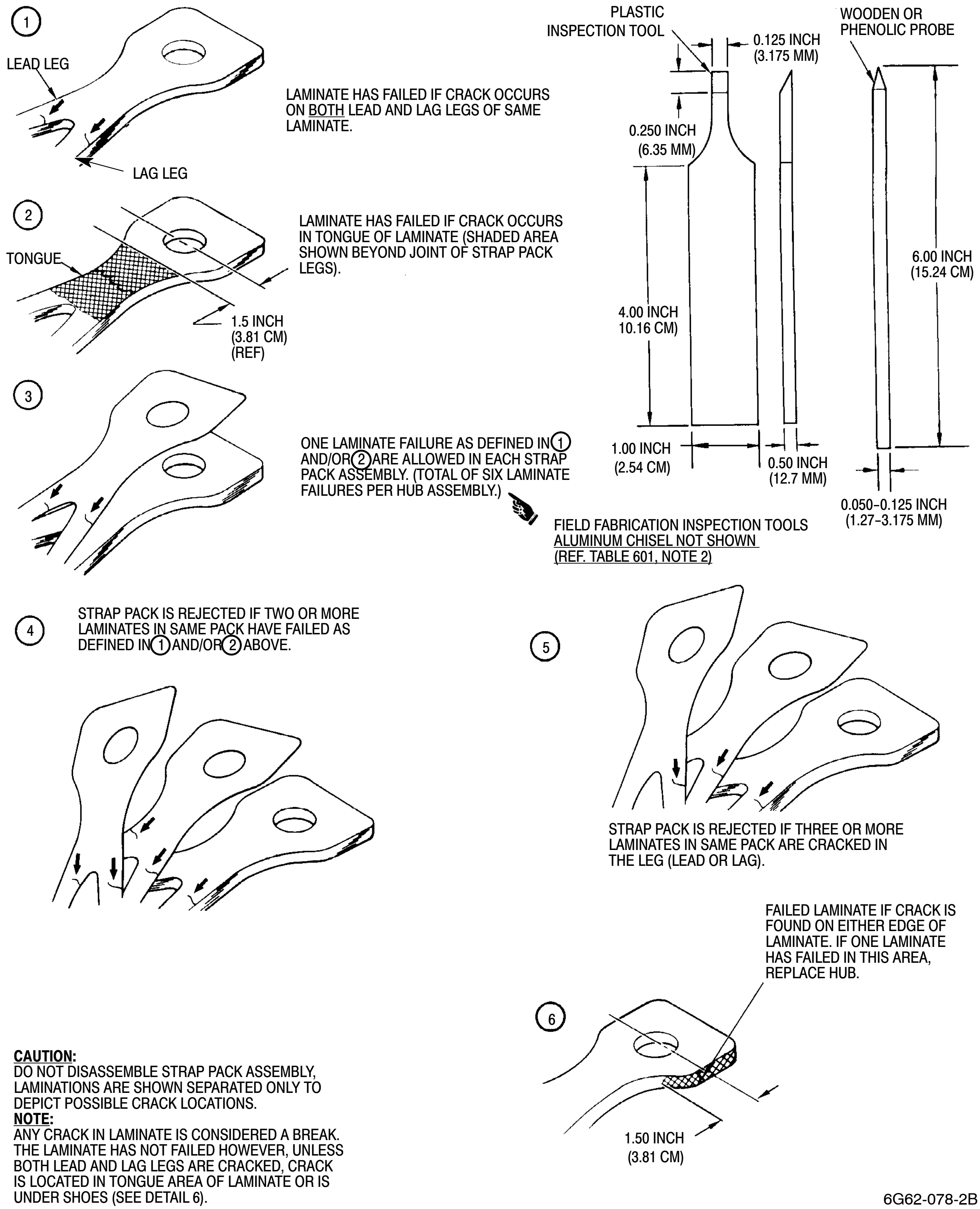


Figure 602. Strap Pack Lamination Inspection (Sheet 2 of 2)

Table 601. Strap Pack Inspection

Inspect	Procedure (1)	For	Acceptable	Replace or Return Hub for Overhaul
Outboard end.	Visually. Use blunt nosed wooden or phenolic probe (Figure 602). Probe at upper and lower end of pack. Failed laminate in lead or lag leg will move away from other laminates.	Failed laminates (3).	One or less per pack.	Two or more laminate failures in one pack.
	Visually.	Gaps between laminates.	Single straight gap not exceeding 0.03 inch (0.762 mm) within pack or next to either upper or lower outer shoe.	More than one gap found; gap exceeds acceptable limit.
	Visually using light and mirror (2).	Cracks or breaks.	None.	Cracks or breaks are noted.
In area of and within pitch housing assemblies.	Visually with light and mirror (2).	Cracks or breaks.	One or less laminate failures per strap pack (2).	Two or more laminate failures (2) in a pack; two or more laminates in pack with crack in same leg (lead or lag).
Cushioning laminates at each of two attach points.	Visually with light and mirror.	Crack or break.	None	Cracks or breaks are noted.

NOTES:

(1) Conduct visual inspections indoors or in shaded area to eliminate glare of sun or bright outdoor light.

(2) Removal of teflon covering is required for visual inspection of laminate edges. Use aluminum chisel, fabricated from stock 0.025 x 6.00 x 0.100 (6.35 x 152.4 x 25.4 mm) to carefully scrape excess interlaminate teflon sheets from both sides of strap pack between top and bottom shoes at outboard attachment bolt of all six strap packs. Remove excess teflon from a point 0.50 inch (12.7 mm) outboard of bolt centerline to 1.50 inches (38.1 mm) inboard of bolt centerline. Field fabricate and use plastic tool (Ref. Figure 602). Run plastic tool in both directions along each laminate feeling for cracked laminate. Use of plastic tool will ensure that shreds of teflon still hanging free does not obscure small cracks.

(3) Laminate has failed if crack is found in tongue area or if crack is found in both legs (lead and lag).

(2). If required, trim teflon from edges of laminates using a aluminum chisel. Fabricate chisel from stock, 0.250 x 6.00 x 0.100 inch (6.35 x 152.4 x 25.4 mm). Carefully scrape excess interlaminate teflon sheets from both sides of strap pack between top and bottom shoes at outboard attachment bolt of all six strap packs.

NOTE:

- Do not pry at strap pack assemblies with sharp or hard edged tools. If edges become nicked or laminates get scratched, additional cracking can occur thus causing hub replacement.
- Where accessible, ends of acceptable cracked or broken laminates should be taped to prevent scratching and damaging of adjacent laminates.

(3). (Ref. Figure 602 for field fabricate plastic tool) Run plastic inspection tool in both directions along each laminate, feeling for a “catch” from a crack on a single laminate. Use the wooden or phenolic probe and probe at upper and lower end of pack. Failed laminate in lead or lag will move away from the other laminates. If the adjacent upper and lower laminates remain in tension under the probing operation, no laminate failures have occurred.

(4). Using a light and mirror, visually inspect each of the main rotor strap pack assemblies for evidence of cracks or breaks in strap pack laminates in the areas of the outboard shoes and pitch housing assemblies.

(5). Using a 10X magnifying glass, visually inspect the edge of strap pack laminates on both sides at outboard end of blade pitch housing (area between outboard shoes).

(6). Use the following as acceptance/rejection criteria for laminate inspection:

(a). A **laminate** has failed if cracked in tongue area or in lead and lag legs of the same laminate.

(b). Reject **strap pack** and return hub for overhaul when:

1). Two or more laminates in a single strap pack have failed.

2). Two or more laminates in a single strap pack are cracked in the same lead or lag leg.

3). One laminate is cracked at the outboard end in the area between outboard shoes (Ref. Figure 602).

4). There are two or more gaps in the same strap pack. A single gap in any one strap pack assembly is allowed.

(7). Visually inspect strap pack assemblies for evidence of corrosion. If corrosion is found on strap pack laminates contact MDHI service department for disposition.

(8). Inspect upper, lower and center cushioning laminates for cracks and breaks (Ref. Figure 601).

NOTE: Cracks, breaks or other noticeable damage to the cushioning laminates require main rotor hub overhaul/replacement.

(9). Record location of all cracked/broken laminates in Helicopter Log Book including strap serial number, blade color, leg (lead or lag) and laminate position, if possible, numbering from the top down.

(10). Install main rotor blades.

5. Main Rotor Hub Droop Angle Check

(Ref. Figure 805) Whenever new or replacement main rotor hub is installed or whenever excessive droop angle is suspected, measure static droop angle of all six rotor blades. Droop angle must be 5.5 ±0.5 degrees.

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST206	Prop protractor
Left-Hand Command:	
ST501	Collective rigging fixture (LH command)
ST504	Longitudinal rigging fixture (LH command)
ST506	Lateral rigging fixture (LH command)
Right-Hand Command	
ST502	Collective rigging fixture (RH command)
ST505	Longitudinal rigging fixture (RH command)
ST507	Lateral rigging fixture (RH command)

(1). Install cyclic lateral rigging fixture (ST506 or ST507), cyclic longitudinal rigging fixture (ST504 or ST505), and collective rigging fixture (ST501 or ST502).

(2). Rotate main rotor to position one blade over tailboom.

(3). Raise and support other five blades until five corresponding droop stop rollers no longer contact their striker plates.

(4). Place accurate prop protractor (ST206) on top of main rotor drive shaft. Adjust protractor to zero setting.

(5). Place protractor on machined surface of outboard end of blade pitch housing, alongside lead-lag bolthead. Measure and record static droop angle.

(6). Repeat (2). thru (5). above for remaining blades.

(7). Maximum allowable static droop angle is six degrees. If measured droop angle exceeds six degrees, inspect striker plate and roller for excessive wear and adjust droop angle (Ref. Main Rotor Hub Droop Angle Adjustment).

6. Main Rotor Damper and Attachments Inspection

CAUTION Excessive lead-lag load applied to the main rotor blades during ground handling can result in damage to the elastomeric damper buns and failure of the damper assembly. Operators and maintenance personnel should use extra caution to avoid lead-lag loads in excess of **35 pounds (155.68 N)** at the tip of the main rotor blades.

(1). Inspect bearing in rotor blade and bearing in the pitch housing for looseness around outer race. No degree of radial or axial play is permitted.

(2). Inspect pitch housing and blade bearings for binding, galling, or scoring in bore and for wear. No radial play is permitted. Maximum allowable axial play is 0.015 inch (0.381 mm).

(3). Inspect clevis bushings for wear and looseness.

(4). Inspect damper flange bushing for wear and play.

(5). Inspect lower bolt hole in damper flange for wear.

(6). Inspect damper housing (including flanges) for damage.

(7). Inspect damper turnbuckle, jamnuts and safetywire for security. No end play is permitted when manually tested.

NOTE: When performing lead-lag of main rotor blades, apply rotor brake (if installed) or have assistant hold main rotor hub from moving. A second assistant is recommended to measure approximate damper extension and compression.

(8). Lead-lag each main rotor blade in turn to provide approximately 0.10 inch (2.54 mm) extension and compression of the damper elastomer.

(9). Visually check each damper in turn for cracks in elastomer or in elastomer-to-metal bond at end face of damper: If bonding or elastomer cracks are noted, measure depths of cracks, using depth gage fabricated of shim stock or equivalent having a 0.20 inch (5.08 mm) indication. If depth of crack exceeds 0.20 inch (5.08 mm), remove and check damper.

7. Main Rotor Damper Weight Loading and Extension Check

(Ref. Figure 603)

(1). Remove damper assembly (Ref. Main Rotor Damper Removal).

(2). Attach dial indicator or equivalent to outer case of damper; position indicator arm on center aluminum disc as shown.

NOTE: Fabricate holding bar or fixture capable of sustaining 100 pound (45.359 kg) static load (Ref. Figure 603).

(3). Attach damper end cap to holding bar or fixture.

NOTE: Perform weight loading and extension check at ambient temperature of 70° ±l0°F (21° ±5°C). Apply total 100 pound (45.359 kg) weight load to damper at one time, not in weight increments.

(4). Using hydraulic jack or equivalent, raise and attach 100 pound (45.359 kg) weight load at damper clevis end. Slowly lower jack to avoid shock loading. After period of two minutes under load, measure damper extension on dial indicator.

(5). If extension exceeds 0.063 inch (1.6002 mm), replace the damper assembly.

(6). Reinstall existing damper; or as required; install replacement damper.

NOTE: If replacement damper is installed, record part number, serial number, and other pertinent information in Components Record of helicopters Log Book.

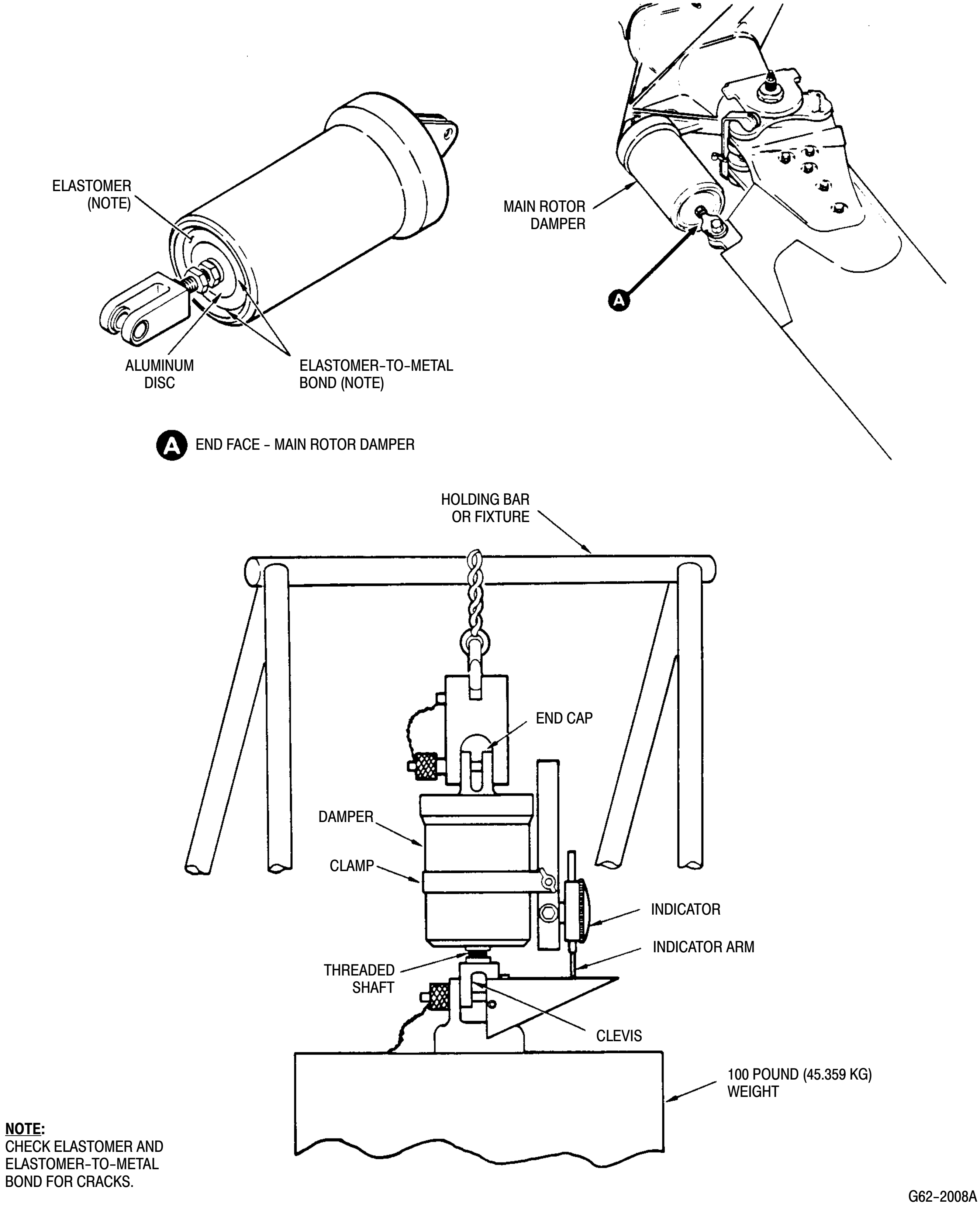


Figure 603. Periodic Check of Main Rotor Damper Assembly

MAIN ROTOR HUB
REPAIRS

1. Main Rotor Retention Strap Pack Repair

Where accessible, ends of permissible cracks or broken laminates (Ref. Table 601) should be taped to prevent scratching and damaging adjacent laminates.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM234	Solvent, dry-cleaning
CM725	Tape, electrical, plastic

CAUTION Do not bend broken ends excessively and scratch adjacent straps.

(1). Carefully wipe ends of broken strap with a clean soft cloth moistened with solvent (CM234).

(2). Use mild blast of filtered air to dislodge any foreign particles between broken strap ends and adjacent strap.

(3). Carefully tape broken ends of strap with plastic electrical tape (CM725).

2. Pitch Control Bearing Housing Assembly, Spacer or Striker Strip Replacement

(Ref. Figure 801)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM222	1,1,1-T richloroethane
CM425	Sealing compound

(1). Support blade and pitch housing from beneath. Remove nuts. washers, and bolts that secure bearing housing.

CAUTION If droop shim washers are installed between spacer and striker strip, they must be retained for reinstallation to establish correct static droop angle between pitch housing and hub.

(2). Carefully remove spacer by sliding it downward past striker strip. Retain exact number of droop shim washers, if installed.

(3). Slide bearing housing assembly off pivot pin. Inspect pivot pin for grooving or excessive wear.

NOTE: Do not remove tetrafluoroethylene (TFE) debris which works out of pitch bearing edge. Debris is normal and helps lubricate bearing. Removal of debris increases bearing wear rate.

(4). Remove and discard pitch bearing if defective, total radial looseness of assembled ball and pivot pin must not exceed 0.010 inch (0.254 mm).

(5). Replace striker strip if it is cracked or lead-lag contact areas are worn through hard anodized surface.

(6). Remove sealant between pitch housing and striker strip. use care not to scratch pitch housing. Remove striker strip from pitch housing.

(7). Cut old striker strip to facilitate removal from retention strap assembly. <u>Do not scratch strap assembly</u>.

(8). Clean old sealant from pitch housing using 1,1,1, trichloroethane (CM222).

(9). Cut out area of new striker strip. Deburr, smooth and radius cut edges.

(10). Apply sealant (CM425) to faying surfaces of the striker strip and pitch housing.

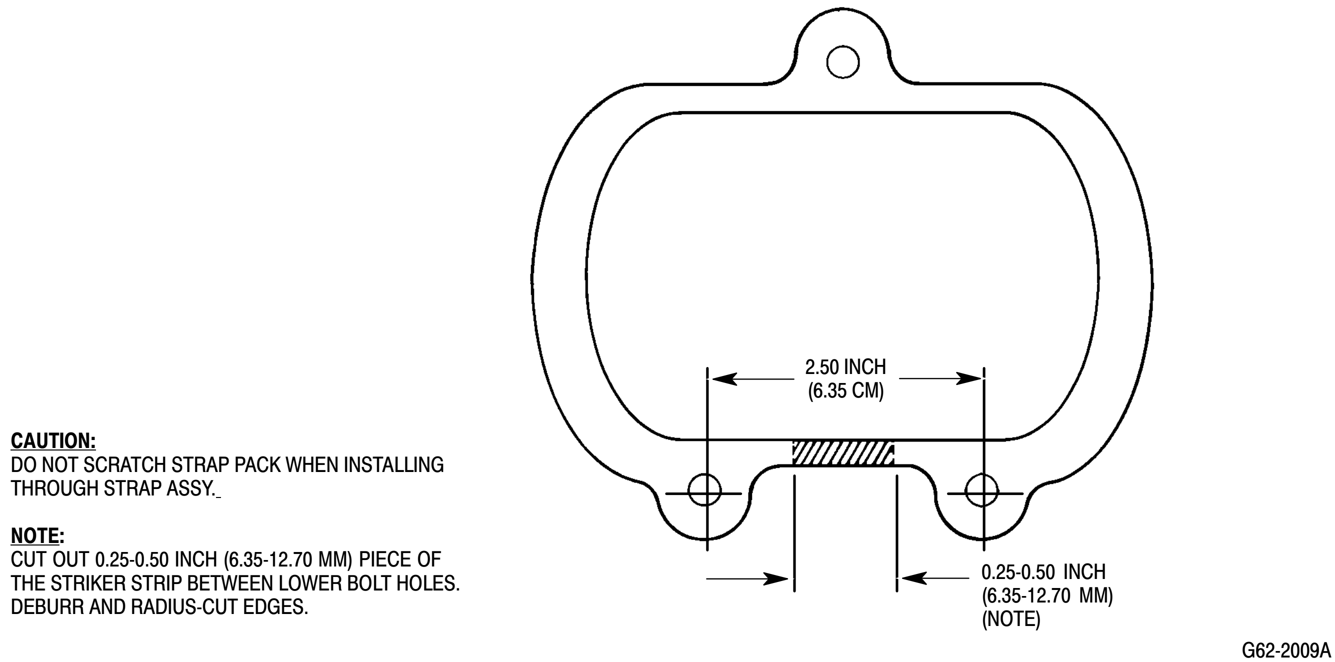


Figure 801. Striker Strip Replacement

(11). Position pitch control bearing housing on pivot pin (Ref. Figure 802).

CAUTION If droop shim washers were removed from between spacer and striker strip, same exact thickness removed must be reinstalled. There must be an equal number of washers on each of all three bolts. These washers establish correct static droop between pitch housing and hub.

(12). Slide spacer into position between bearing housing assembly and striker strip on pitch housing. Install exact thickness of droop shim washers removed at time of disassembly. Align holes for all three bolts.

(13). Install bolts, washers and nuts; torque to **50 - 70 inch-pounds (5.65 - 7.91 Nm)** and install safety wire.

(14). Seal all parting lines (joints) of the assembly with bead of sealing compound (CM425).

(15). Perform droop angle check (Ref. Main Rotor Hub Droop Angle Adjustment).

3. Lead-Lag Link Blade Stop Replacement

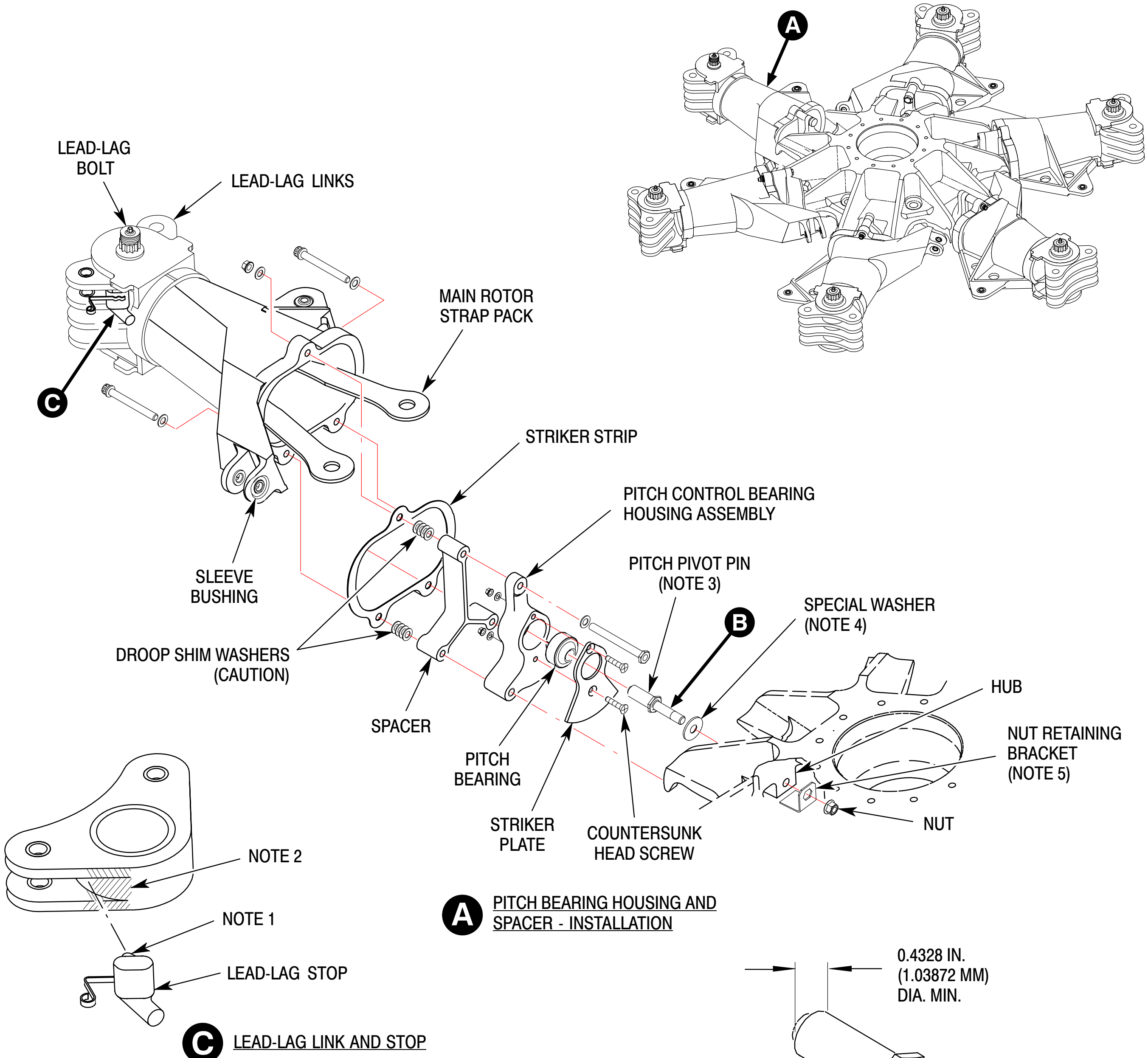
Replace blade stop if it is broken, cracked, has broken spring, or if there are visible bond line cracks (Ref. Figure 802).

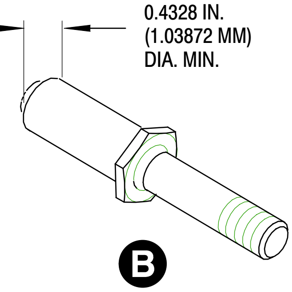
Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM206	Chemical coating
CM217	Isopropyl alcohol
CM228	Surface cleaner
CM411	Adhesive, epoxy
CM802	Abrasive cloth, aluminum oxide
CM803	Crocus cloth

CAUTION Lead- lag link assembly must not be removed from pitch control housing for this repair, since retention bolt cannot be retorqued without special adapter.

(1). Provide a backup support for link assembly. Use 1/2 inch (12.7 mm) wood dowel and hammer to drive stop from link. Strike dowel sharply to break adhesive bond.





CAUTION:
WASHERS ARE INSTALLED BETWEEN SPACERS AND STRIKER STRIP TO ESTABLISH CORRECT STATIC DROOP ANGLE BETWEEN HOUSING AND HUB. EXACT NUMBER REMOVED MUST BE REINSTALLED. THREE PITCH BEARING HOUSING BOLTS MUST EACH HAVE SAME NUMBER (THICKNESS) OF WASHERS WHEN SHIMMING IS NECESSARY.

NOTES:
1. FOR REMOVAL, WOOD DOWEL PLACED HERE AND STRUCK SHARPLY WITH HAMMER TO BREAK STOP BOND.
2. ALL STOP-T O-LINK SHADED CONTACT SURFACES BONDED WITH ADHESIVE.
3. THREADED SHANK LIGHTLY LUBRICATED WITH GREASE BEFORE INSTALLATION.
4. WET PRIMER ON WASHER AND MATING SURFACES BEFORE INSTALLATION.
5. NUT RETAINING BRACKET IS BONDED TO HUB.

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Figure 802. Main Rotor Hub Components Repair and Installation

(2). Using sharp-edge metal scraper, carefully scrape any adhesive residue from link. If scraper penetrates through paint and chemical surface film, surface must be refinished. Depth of gouges or nicks is limited to 0.010 inch (0.254 mm) maximum after rework. Rework by smooth blending into surrounding area with grade 320 abrasive cloth (CM802). Final polish with crocus cloth (CM803). Restore chemical film protection (CM206).

(3). Clean bond area of all contact surfaces by wiping with cleaner (CM228). Flush-wipe cleaned surface four times with mixture of equal parts of distilled water and isopropyl alcohol (CM217) to remove all traces of phosphoric acid. Rinse cleaned surface with tap water, followed by a rinse of distilled water until surface is “water break” free. Dry for 30 minutes minimum at 150°F (66°C).

(4). Check fit of stop in link. Flange and radius contact surfaces of stop must mate with link within 0.010 inch (0.254 mm). Maximum clearance between stop and inside surfaces of link ears is limited to 0.020 inch (0.508 mm). This tolerance applies to both sides of stop.

(5). Prepare mixture of epoxy adhesive (CM411). Apply uniform coating of mixed adhesive to all contact surfaces. Hand press stop into place between link ears until all mating surfaces are in firm contact. Apply a clamping device so that contact is maintained. Cure for minimum of eight hours at room temperature, or two hours at 150°F (66°C).

4. Lead-Lag Bolt Corrosion Control

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM219	Methyl-ethyl-ketone
CM318	Primer
CM425	Sealing compound
CM802	Abrasive cloth, aluminum oxide

CAUTION Do not disturb torque on lead-lag bolts. Special adapter is needed to retorque lead-lag bolts.

(1). Remove and tag or color-code each set of balance hardware that is installed.

(2). Remove corrosion with grade 180 abrasive cloth (CM802) and finish with grade 400 abrasive cloth.

(3). Swab cleaned surface with MEK (CM219) and apply unthinned primer (CM318).

(4). Reinstall original balance hardware that was removed. Using sealant (CM425), reseal balance hardware.

5. Pitch Control Bearing Pivot Pin Repair or Replacement

(Ref. Figure 802) Minimum allowable pin diameter is 0.4328 inch (10.993 mm). Pivot pin grooving or excessive side wear may be polished to original finish as long as minimum allowable pin diameter remains after rework. Replace any pin requiring more rework as follows.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM115	Grease, oscillating bearing
CM420	Sealant

(1). Remove pivot pin.

(2). Lightly lubricate shank of replacement pivot pin with grease (CM115).

NOTE: Torque pivot pin to **70 - 80 inch-pounds (7.91 - 9.04 Nm)**, then use 0.002 inch (0.0508 mm) feeler gage and check for gap between pin flange and washer on mounting lug surface. No gap is allowed.

(3). Install pivot pin in mounting lug with washer. Torque pivot pin to **250 - 280 inch-pounds (28.25 - 31.64 Nm)**. Apply sealant (CM420) at junctures of pivot pin flange, washer and hub.

6. Droop Stop Roller Repair or Replacement

(Ref. Figure 803) Replace defective droop stop roller if clearance between roller bearing liner and shaft is more than 0.015 inch (0.381 mm). Roller shaft outside diameter must not be less than 0.4370 inch (11.0998).

Consumable Materials (Ref. Section 91-00-00)	
Item	Nomenclature
CM217	Isopropyl alcohol

(1). Move pitch control bearing housing out of the way that contacts lower shoe roller to be removed.

NOTE: It may be easier if only one roller is removed at one time. The opposing pitch housing may be pressed against it's follower to force opposite follower out and expose roller shaft for removal. Same condition exists at installation.

(2). Remove droop stop roller.

(3). Wet down and clean plunger and mating shoe bushing with isopropyl alcohol (CM217).

(4). Install roller, shaft and new cotter pin.

(5). Install pitch control bearing housing.

7. Droop Stop Ring Repair

(Ref. Figure 803)

Consumable Materials (Ref. Section 91-00-00)	
Item	Nomenclature
CM103	Solid film lubricant

(1). Repair depth limit for corrosion, nicks or scratches in droop stop ring is 0.007 inch (0.1778 mm) for all surfaces except outer edges of ring outer flanges where the depth limit is 0.030 inch (0.762 mm). All reworked areas must be blended smoothly with 15 to 1 ratio into surrounding area.

(2). Spray repaired areas of rings with solid film lubricant (CM103).

(3). Replace droop stop ring if repair limits are exceeded.

8. Droop Stop Ring Replacement

(Ref. Figure 803)

(1). With hub upside down, support hub so that pitch housings unload droop stop followers and provide maximum clearance between striker plates and droop stop rollers.

(2). If necessary, release retaining (snap) ring of each droop stop restrainer from its groove. Move retaining ring flush against droop stop follower (T-head) to provide additional clearance and reduce spring tension.

(3). Remove six droop stop rollers.

(4). Starting from either scissors crank attach lug, number, or color code, all six droop stop follower assemblies in clockwise direction for location identification at replacement. This number code should be placed on outer, upper end of plunger and on adjacent area of lower shoe. Ensure codes are not accidentally removed during remaining steps.

(5). Compress each droop stop follower and insert a small wedge from the back side to hold follower away from droop ring.

(6). After all followers are compressed, remove droop stop ring.

(7). Install replacement droop stop ring by reversing removal procedure, steps (1). thru (6)., making certain to reinstall followers according to markings placed thereon prior to removal.

(8). Compress follower spring and install retaining (snap) ring, if removed, in its groove on each follower.

(9). Reinstall droop stop rollers, shafts and cotter pins.

9. Droop Stop Follower (T-Head) Replacement

(Ref. Figure 803) Replace the droop stop follower (T-head) if it is worn, scored or is causing damage to the droop stop ring. After the droop stop ring has been removed, the droop stop follower assemblies may be removed from hub.

(1). Remove droop stop follower assembly from hub.

(2). Remove pins that secure follower to plunger.

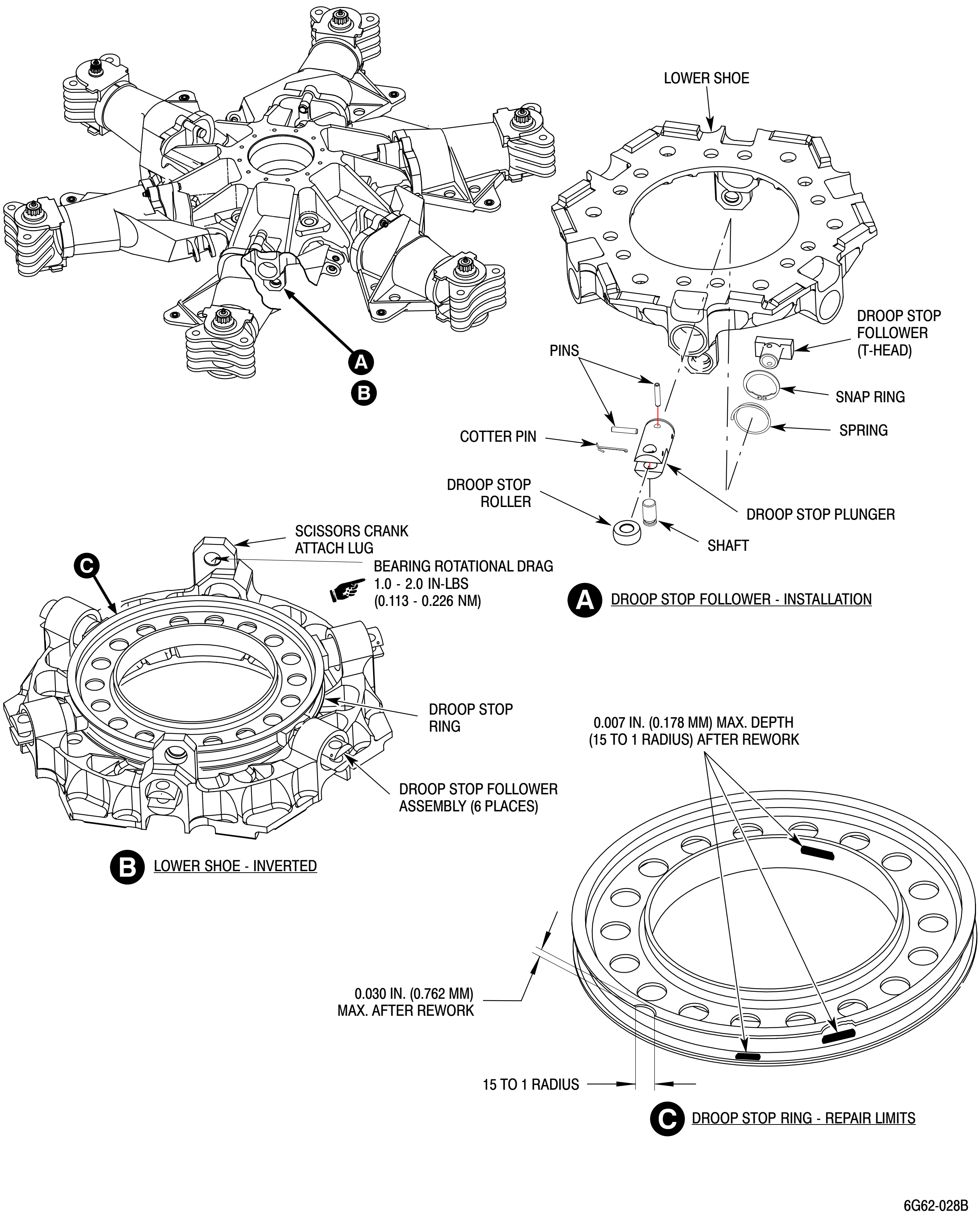


Figure 803. Droop Stop Ring Replacement and Repair

(3). Insert new follower. T-head must be at right angle to roller shaft in plunger.

(4). Drill two 0.156-0.158 inch (3.962-4.013 mm) diameter holes through follower in line with holes in plunger.

(5). Insert pins and stake ends. No burrs or roughness permissible after staking.

(6). Install follower assembly in hub.

(7). Reinstall droop stop ring.

10. Droop Stop Plunger Removal, Inspection and Installation

(Ref. Figure 803)

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM217	Isopropyl alcohol

(1). Remove droop stop ring (Ref. Droop Stop Ring Replacement).

(2). Check droop stop plunger for wear by using the following criteria:

NOTE: The minimum acceptable diameter after wearing in service should be 0.996 inch (25.298 mm). The acceptable amount of wear though the anodized coating shall not exceed 40% or 2.1 square inches (28.45 square cm) of the total sliding surface area of the cylinder. The maximum wear condition may exist in one spot or in several spots totaling 2.1 inches (28.45 square cm).

(3). Wet down and clean plunger and mating shoe bushing with isopropyl alcohol (CM217).

(4). Install droop stop plunger into lower shoe.

(5). Complete droop stop ring installation.

(6). Install roller, shaft and new cotter pin.

11. Main Rotor Hub Droop Angle Adjustment

(Ref. Figure 802) If static droop angle exceeds six degrees, adjust as follows.

(1). Remove main rotor blade.

(2). Use flat washers of thickness required to adjust spacing between spacer and striker strip. Any one type, or combination, of correct part number washers (IPC) may be used; however, an identical washer selection must be installed on each of three bolts that secure pitch control bearing assembly to pitch housing.

(3). Remove nuts, washers and bolts, and separate spacer from striker strip. The use of one 0.016 inch (0.406 mm) washer raises static droop angle approximately one-half degree. Add sufficient washers to adjust droop angle within range of 5.5 ±0.5 degrees. Reinstall nuts, washers and bolts.

(4). If more than 0.063 inch (1.6 mm) spacing is required (above factory spacing), inspect striker plate and droop stop roller or follower and droop stop ring for excessive wear. Replace as required.

(5). Reinstall blade. Repeat measurement of static droop angle.

(6). As required, repeat above procedures for remaining blades.

(7). Following reinstallation or replacement of parts, check track of main rotor blades.

12. Main Rotor Hub Tapered Bearing Grease Repack, Inspection and Replacement

(Ref. Figure 805)

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM111	Grease, aircraft
CM121	Preservation oil
CM234	Solvent, dry-cleaning
CM802	Abrasive cloth, aluminum oxide
CM803	Crocus cloth

Special Tools (Ref. Section 91-00-00)

Item	Nomenclature
ST701	Main rotor wrench assembly

CAUTION Do not intermix Timken or NTN bearing cups and cones at upper and lower tapered roller bearing locations of main rotor hub.

NOTE:

- Roller bearing cones and cups should always be replaced as a set.
- Replace tapered roller bearing cup and cone if it has any flat spots, scoring, pitting, grooving, discoloration (blue) or if it feels rough when rotated.

(1). Use pressing tools equivalent to items A and B (Ref. Figure 804) to press upper and lower bearing cups from hub. A press ram of one to two tons is sufficient for removal.

(2). Press lower bearing cone from sleeve bushing.

CAUTION In next step, do not spin reusable bearings while cleaning. Coat bearings lightly with oil (CM121) after cleaning.

(3). Clean hub bore, sleeve bushing, seal retainer and reusable bearings using filtered solvent (CM234) spray.

(4). Check bearing cup hub bore for scoring:

(a). Smooth out any roughness with grade 400-600 abrasive cloth (CM802).

(b). Restore chemical film protection where removed.

(c). Maximum diameter of hub bore for upper bearing cup (Ref. Figure 805) is 4.4335 inches (11.25 cm), measured in any direction.

(d). Maximum diameter of hub bore for lower bearing cup is 4.3095 inches (10.95 cm), measured in any direction.

(5). Check upper seal retainer:

(a). No cracks, sharp nicks or burrs are allowed.

(b). Minor corrosion or other surface defects may be polished out using crocus cloth (CM803).

(c). Grooving on seal contact surfaces must not exceed 0.004 inch (0.10 mm) depth after polishing.

WARNING **Bearing cups are installed in hub by differential temperature (shrink-fit) method. Take appropriate precautions to prevent burns when handling parts that are cooled to sub-zero temperatures.**

(6). Place bearing cups in closed container of dry ice and cool for not less than 20 minutes to -40°F (-40°C).

(7). Coat bores of hub with grease (CM111).

(8). Use care to maintain cup-to-hub bore alignment and press cup into bore, using tools D and E (Ref. Figure 804), until cup is seated.

(9). Apply film of grease (CM111) to sleeve bushing. Use pressing tool equivalent to tool C, and press bearing cone onto sleeve bushing.

(10). With lip on center seal up, hand press it into hub (Ref. Figure 805).

(11). Apply film of grease (CM111) on mast. Install preassembled sleeve bearing and bearing cone on mast. Do not apply any additional lubricant to roller bearing set. Wipe any excess preservative oil from bearing cone and cup.

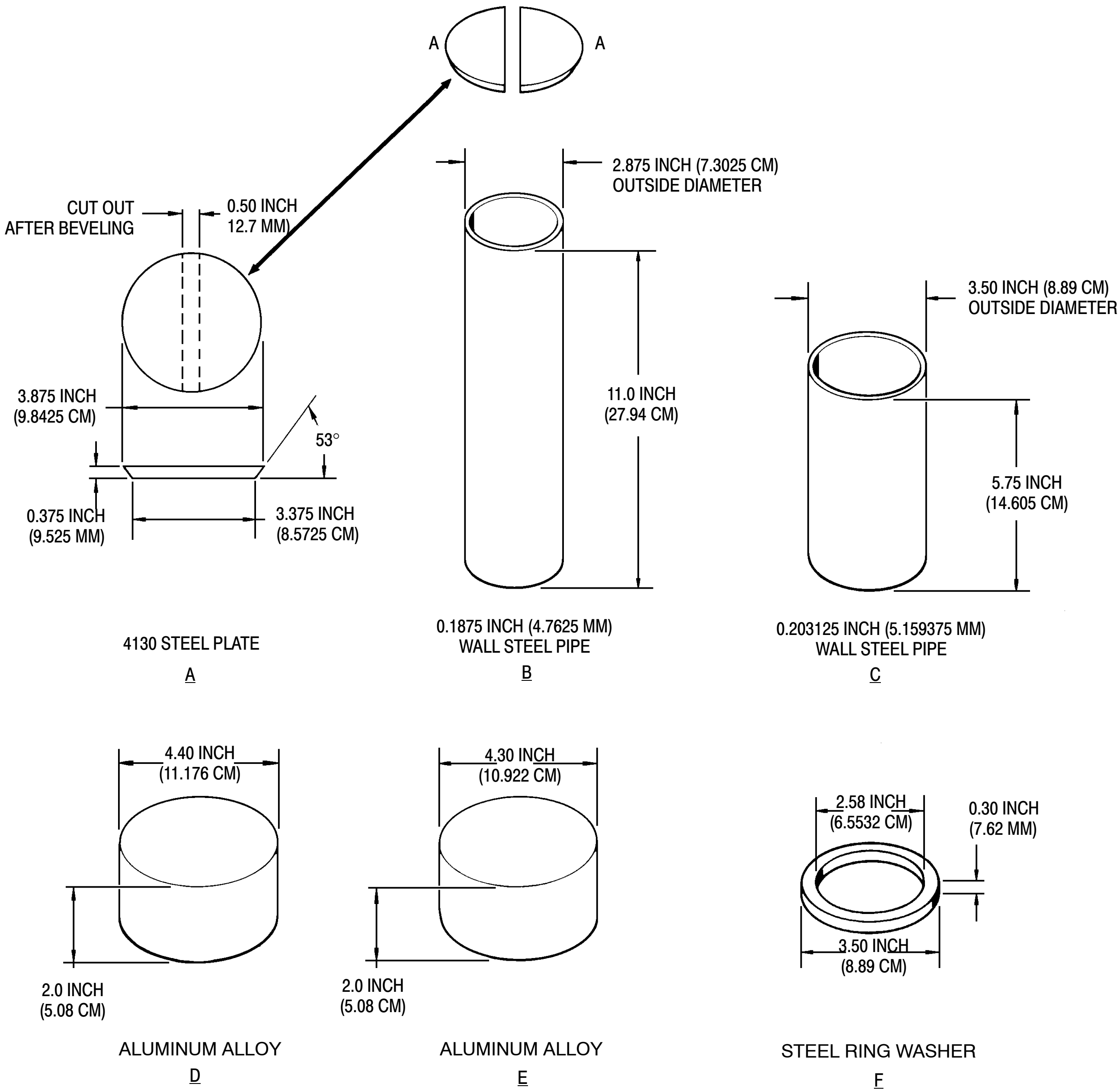
CAUTION If hub assembly does not seat properly onto mast, do not attempt to force it into position. Remove hub assembly from mast and determine cause of hub not seating, correct the problem and follow the procedures for reinstallation.

(12). Place assembled hub over mast and seat on lower roller bearing cone.

(13). Install upper bearing cone into hub.

NOTE: Use of substitute steel ring washer for retainer prevents unnecessary scoring of retainer. Several tightening and loosening actions may be required to get rotational drag on hub bearings.

(14). Install steel ring washer, equivalent to tool F (Ref. Figure 804), as substitute for seal retainer (Ref. Figure 805)



TOOL USE:

A & B - PRESS BEARING CUPS OUT OF HUB
C - PRESS LOWER BEARING CONE ON SLEEVE BUSHING
D - PRESS UPPER BEARING CUP INTO HUB
E - PRESS LOWER BEARING CUP ONTO HUB
F - IN PLACE OF UPPER SEAL RETAINER WHILE ADJUSTING ROTATIONAL DRAG
G - HUB BEARING REMOVAL - FABRICATION

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Figure 804. Tapered Bearing Tools - Main Rotor Hub (Sheet 1 of 2)

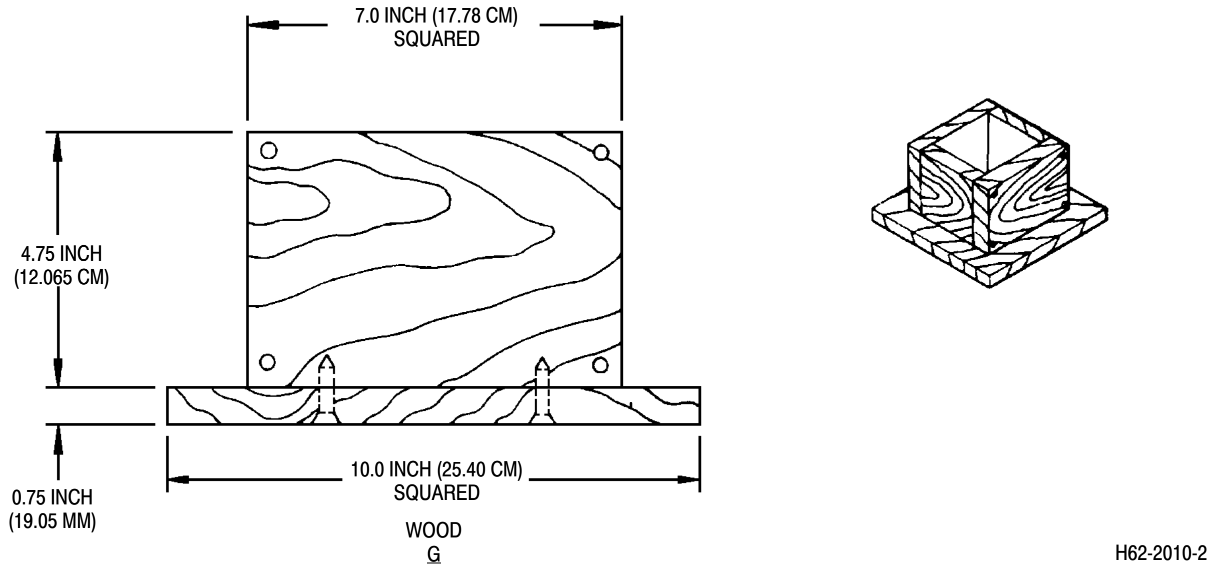


Figure 804. Tapered Bearing Tools - Main Rotor Hub (Sheet 2 of 2)

(15). Install mast nut on mast using mast nut wrench (ST701), tighten until bearings are preloaded to **10 - 12 inch-pounds (1.13 - 1.36 Nm) of rotational drag**. Measure rotational drag using **0 - 10 pound (0 - 4.536 kg)** spring scale hooked over one of hub support web bosses, 6.5 inch (16.51 cm) from hub centerline). A **1.50 - 1.75 pound (0.681 - 0.795 kg)** pull with hub in motion indicates correct rotational drag.

(16). Remove locknut, washer and cone.

(17). To determine thickness required for spacer:

NOTE: When determining spacer thickness, start with thick spacer and work down to thinner spacer.

(a). Install subsequently thinner spacers, from kit K-600N-1200A, starting with a thick spacer, along with cone, substitute washer for retainer and locknut.

(b). Torque nut to to **200 - 250 foot-pounds (271 - 339 Nm)** until **10 - 15 inch-pounds (1.13 - 1.69 Nm) of rotational drag (not break-away torque)** is obtained on hub.

(18). When proper torque has been reached, disassemble and remove steel ring washer.

(19). Alternative method for determining thickness required for spacer:

(a). Install 369A1224-5 lead spacer in place of the 369A1224-3 spacer.

(b). Place steel ring washer for retainer and locknut on the mast and gradually tighten the retaining nut until rolling torque of **10 - 15 inch-pounds (1.13 - 1.69 Nm) of rotational drag (not break-away torque)** is obtained on hub. If the **10 - 15 inch-pounds (1.13 - 1.69 Nm) of rotational drag** is exceeded, discard the lead washer, install new washer and continue.

(c). When proper torque has been reached, disassemble and measure thickness of the lead washer in the bearing seat area. Grind the 369A1224-3 spacer to the same thickness as measured on the lead washer. Check thickness of ground washer at six locations to ensure thickness does not vary by more than 0.0005 inch (0.0127 mm).

(d). Re-assemble with the ground steel washer, steel ring washer and locknut and torque to **200 - 250 foot-pounds (271 - 339 Nm)** until **10 - 15 inch-pounds (1.13 - 1.69 Nm) of rotational drag (not break-away torque)** is obtained on hub.

(20). Remove hub and sleeve bushing with lower bearing cone from mast.

(21). Position hub upside-down. Hand-pack lower hub cavity (Ref. Figure 805) and bearing cone on sleeve bushing with grease (CM111).

(22). Install sleeve bushing with bearing cone in hub. Hand-pack cavity between bearing and hub liner with grease (CM111); then press in lower seal with seal lip toward top of hub. Wipe off excess grease.

(23). Turn hub assembly right side up.

(24). Complete reassembly of hub by installing recessed spacer, upper bearing cone, upper seal and seal retainer in hub at installation of hub on mast.

13. Main Rotor Hub Upper Bearing Grease Repack, Inspection and Replacement

The following procedure is for greasing, inspection and replacement of the main rotor hub upper bearing only.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM111	Grease, aircraft
CM204	Compound, corrosion preventative
CM121	Preservation oil
CM234	Solvent, dry-cleaning
CM702	Lockwire CRES
CM802	Abrasive cloth, aluminum oxide

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST701	Main rotor wrench assembly
ST703	Main rotor hub driver

(1). Remove main rotor hub assembly (Ref. Main Rotor Hub Removal) and place on bench.

(2). Remove upper bearing cone.

CAUTION Do not intermix Timken or NTN bearing cups and cones at upper and lower tapered roller bearing locations of main rotor hub.

NOTE:
- Roller bearing cones and cups should always be replaced as a set.
- Replace tapered roller bearing cup and cone if it has any flat spots, scoring, pitting, grooving, discoloration (blue) or if it feels rough when rotated.

(3). Use pressing tools equivalent to items A and B (Ref. Figure 804) to press upper bearing cup from hub. A press ram of one to two tons is sufficient for removal.

CAUTION In next step, do not spin reusable bearing while cleaning. Coat bearings lightly with oil (CM121) after cleaning.

(4). Clean hub bore, sleeve bushing, seal retainer and reusable bearing using filtered solvent (CM234) spray.

(5). Check bearing cup hub bore for scoring:

(a). Smooth out any roughness with grade 400-600 abrasive cloth (CM802).

(b). Restore chemical film protection where removed.

(c). Maximum diameter of hub bore for upper bearing cup (Ref. Figure 805) is 4.4335 inches (11.25 cm), measured in any direction.

(6). Check upper seal retainer.

(a). No cracks, sharp nicks or burrs are allowed.

(b). Minor corrosion or other surface defects may be polished out using crocus cloth (CM803).

(c). Grooving on seal contact surfaces must not exceed 0.004 inch (0.10 mm) depth after polishing.

WARNING **Bearing cups are installed in hub by differential temperature (shrink-fit) method. Take appropriate precautions to prevent burns when handling parts that are cooled to sub-zero temperatures.**

(7). Place bearing cup in closed container of dry ice and cool for not less than 20 minutes to -40°F (-40°C).

(8). Coat bore of hub with grease (CM111).

(9). Use care to maintain cup-to-hub bore alignment and press cup into bore, using tools D and E (Ref. Figure 804), until cup is seated.

CAUTION If hub assembly does not seat properly onto mast, do not attempt to force it into position. Remove hub assembly from mast and determine cause of hub not seating, correct the problem and follow the procedures for reinstallation.

(10). Check that rotor mast is clean. Hoist main rotor hub and position over mast; then lower hub onto mast.

NOTE: To inhibit mast corrosion when operating in salt water environment, lightly coat bearing journals of mast with grease (CM111).

(11). Remove adapter, hoist and eyebolts.

(12). Check that hub is fully seated on mast.

(13). Hand-pack hub cavity, between sleeve bushing and hub, with grease (CM111).

(14). Apply film of grease (CM111) on upper bearing cone and place into hub.

NOTE: Use of substitute steel ring washer for retainer prevents unnecessary scoring of retainer. Several tightening and loosening actions may be required to get rotational drag on hub bearings.

(15). Install steel ring washer, equivalent to tool F (Ref. Figure 804), as substitute for seal retainer (Ref. Figure 805)

(16). Install mast nut on mast using mast nut wrench (ST701), tighten until bearings are preloaded to **10 - 12 inch-pounds (1.13 - 1.36 Nm) of rotational drag**. Measure rotational drag using **0 - 10 pound (0 - 4.536 kg)** spring scale hooked over one of hub support web bosses, 6.5 inch (16.51 cm) from hub centerline). A **1.50 - 1.75 pound (0.681 - 0.795 kg)** pull with hub in motion indicates correct rotational drag.

(17). Remove locknut, washer and cone.

(18). To determine thickness required for spacer:

NOTE: When determining spacer thickness, start with thick spacer and work down to thinner spacer.

(a). Install subsequently thinner spacers, from kit K-600N-1200A, starting with a thick spacer, along with cone, steel ring washer for retainer and locknut.

(b). Torque nut to to **200 - 250 foot-pounds (271 - 339 Nm)** until **10 - 15 inch-pounds (1.13 - 1.69 Nm) of rotational drag (not break-away torque)** is obtained on hub.

(19). When proper torque has been reached, disassemble and remove steel ring washer.

(20). Alternative method for determining thickness required for spacer:

(a). Install 369A1224-5 lead spacer in place of the 369A1224-3 spacer.

(b). Place steel ring washer for retainer and locknut on the mast and gradually tighten the retaining nut until rolling torque of **10 - 15 inch-pounds (1.13 - 1.69 Nm) of rotational drag (not break-away torque)** is obtained on hub. If the **10 - 15 inch-pounds (1.13 - 1.69 Nm) of rotational drag** is exceeded, discard the lead washer, install new washer and continue.

(c). When proper torque has been reached, disassemble and measure thickness of the lead washer in the bearing seat area. Grind the 369A1224-3 spacer to the same thickness as measured on the lead washer. Check thickness of ground washer at six locations to ensure thickness does not vary by more than 0.0005 inch (0.0127 mm).

(d). Re-assemble with the ground steel washer, steel ring washer and locknut and torque to **200 - 250 foot-pounds (271 - 339 Nm)** until **10 - 15 inch-pounds (1.13 - 1.69 Nm) of rotational drag (not break-away torque)** is obtained on hub.

(21). Complete reinstallation of main rotor hub assembly (Ref. Main Rotor Hub Installation).

14. Main Rotor Hub Scissors Attach Lug Bearing Replacement

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM206	Chemical coating
CM216	Loctite remover
CM304	Enamel, epoxy
CM321	Surface primer locking compound
CM431	Sealing, locking and retaining compound

(1). Remove main rotor hub (Ref. Main Rotor Hub Replacement).

(2). Invert hub and place on work bench.

(3). Remove droop stop ring (Ref. Droop Stop Ring Replacement).

(4). Press bearing from hub lug.

(5). Clean bearing bore with Loctite remover (CM216).

(6). Inspect bearing bore for nicks, scratches and grooves.

(7). Inspect bore for diameter of 0.6551-0.6556 inch (16.63954-16.65224 mm).

(8). Touch up bearing bore with chemical coating (CM206).

(9). Apply surface primer (CM321) to mating surfaces of bearing and bores per manufacturer’s instructions.

NOTE: Do not allow primer to enter bearing.

(10). Apply locking compound (CM431) to faying surfaces of bearing and bore, press bearing into bore while locking compound is wet.

(11). Remove excess sealant, do not allow sealant to enter bearing.

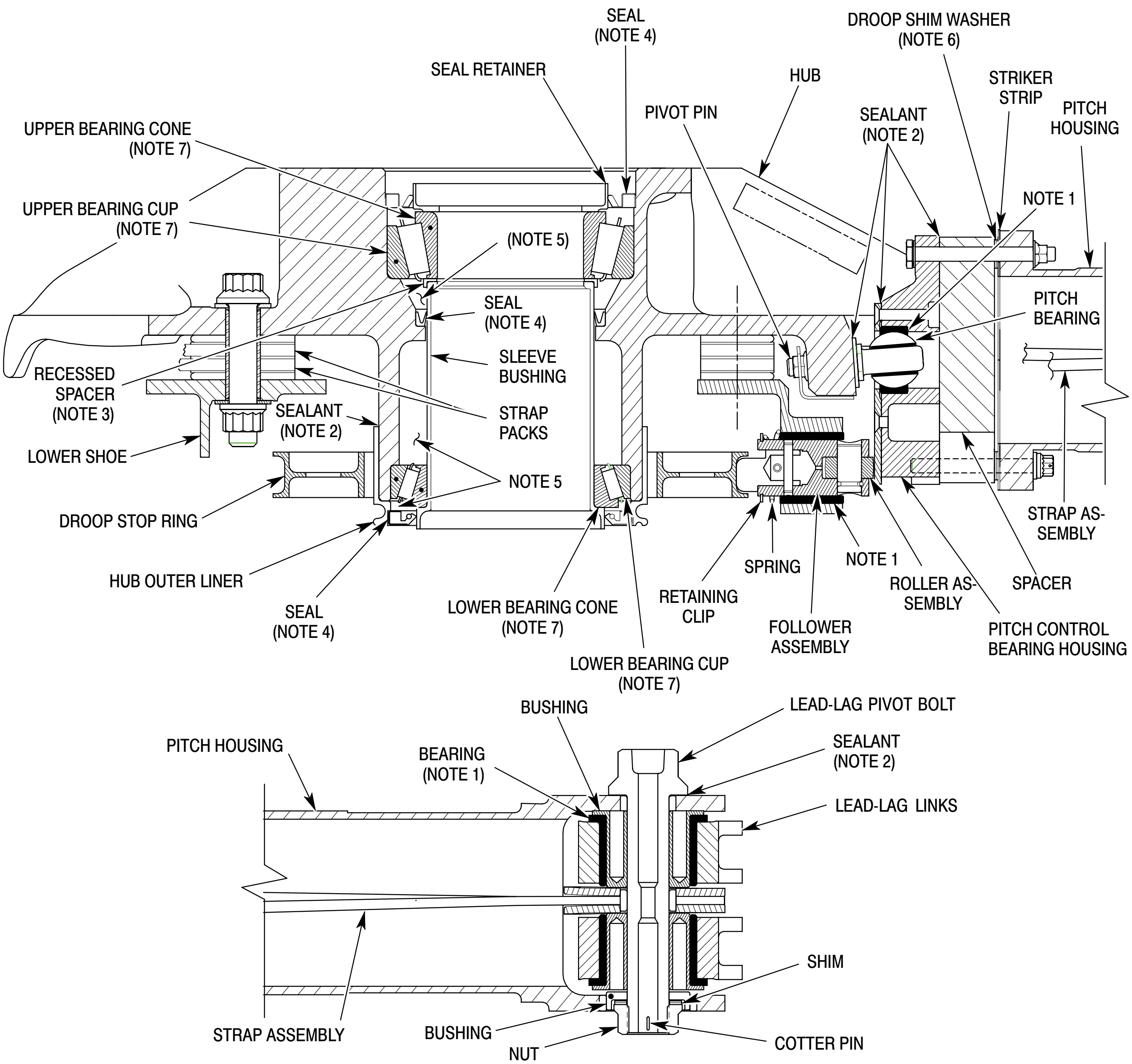
(12). Apply a small fillet of sealant around bearing and allow to dry for 24 hours at room temperature or heat to 140° - 160°F (60° - 72°C) for one hour.

(13). As required, touch up bearing lug with paint (CM304).

(14). Check bearing for a no-load rotational drag of **1.0 - 2.0 inch-pounds (0.113 - 0.226 Nm)**.

(15). Reinstall droop stop ring (Ref. Droop Stop Ring Replacement).

(16). Reinstall main rotor hub (Ref. Main Rotor Hub Replacement).



NOTES:
1. HEAVY LINES INDICATE REINFORCED TEFLON BEARING LININGS (TYPICAL).
2. SEALANT APPLIED TO LOCATIONS SHOWN.
3. RECESSED SPACER SPECIALLY GROUND TO ESTABLISH CORRECT ROTATIONAL DRAG ON TAPERED BEARINGS. INSTALL RECESS DOWN ON TOP OF SLEEVE BUSHING.
4. SEAL TO BE UPWARD.
5. BEARING AND CAVITY TO BE FILLED WITH GREASE.
6. DROOP SHIM WASHERS ARE INSTALLED, AS REQUIRED, TO OBTAIN PROPER ROTOR DROOP ANGLE.
7. DO NOT INTERMIX TIMKEN AND NTN BEARING CUPS AND CONES AT UPPER AND LOWER TAPERED BEARING LOCATIONS.

6G62-030

Figure 805. Main Rotor Hub - Cross Section

Section

62-30-00

Swashplate and Mixer (369D/E/FF - 500N)

SWASHPLATE AND MIXER REMOVAL/INSTALLATION

1. Main Rotor Swashplate

(Ref. Figure 403) The main rotor swashplate includes a rotating swashplate, stationary swashplate, bearing and retainer and two counterweights.

2. Swashplate Replacement

A. Swashplate Removal

(1). Tag or color-identify five pitch control rods (Ref. Figure 401) to simplify replacement at same locations.

CAUTION Failure to reinstall pitch control rods at correct locations probably will result in main rotor blades excessively out of track.

(2). Disconnect pitch control rods from rotating swashplate.

(3). Remove scissors.

(4). Remove main rotor hub.

(5). Disconnect longitudinal link (Ref. Figure 402) from stationary swashplate.

(6). Disconnect right and left side mixer links (Ref. Figure 402) from stationary swashplate.

(7). Remove protective boot from groove in lower side of stationary swashplate (Ref. Figure 403).

CAUTION Do not strike rotating swashplate or bearing assembly (Ref. Figure 403) with tools or in any way deface these components. Rotating swashplate is a stressed part; all surfaces are shot peened. Use particular care to protect teflon liner in bearing bore. A damaged swashplate bearing must not be retained in service.

(8). Lift swashplate carefully up and off of mast.

(9). To remove boot from mast, remove self-clinching nylon strap.

B. Swashplate Installation

(1). If swashplate lower boot was removed, install boot on mast (Ref. Figure 403).

(2). Position swashplate over main rotor mast and carefully lower into place.

(3). Engage upper end of boot in groove at lower side of stationary swashplate. Secure boot with self-clinching nylon strap (Ref. Figure 403).

(4). Align longitudinal link with stationary swashplate (Ref. Figure 402).

(5). Install flanged bushing, if removed, bolt, two washers, nut and cotter pin to secure upper end of longitudinal link.

(6). Align upper ends of mixer links with stationary swashplate. Install slotted bushing (if removed), bolt, two washers, nut and cotter pin to secure each link to swashplate.

(7). Install scissors.

(8). Using color code, reinstall pitch control rods at same locations from which removed.

(9). Check track of main rotor blades (Ref. Chap. 18) following any maintenance activity that could result in a dimensional variation affecting rigging or tracking.

3. Mixer Controls

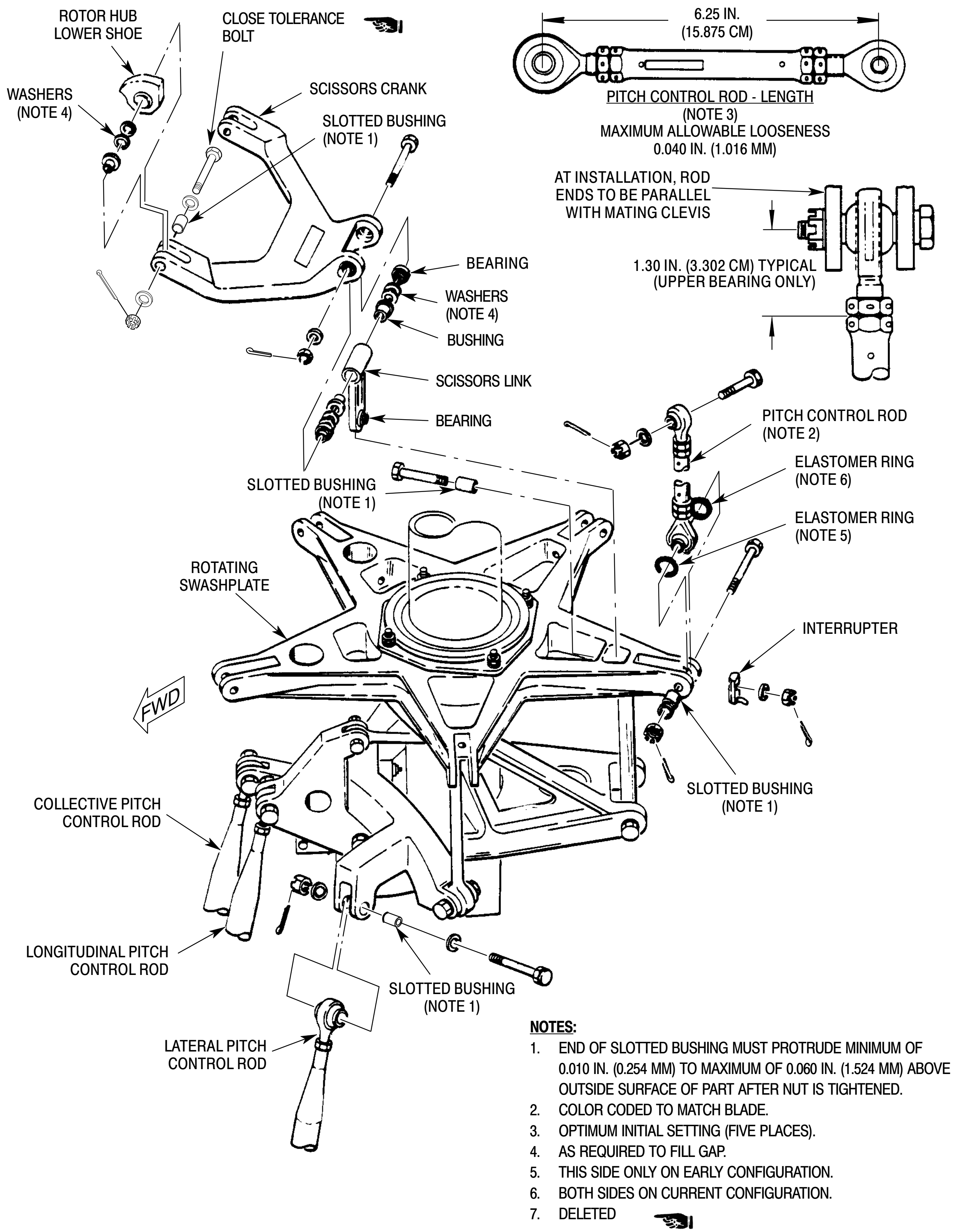
Mixer controls consist of various links, bellcranks, idlers, support bracket and associated fasteners that secure these components in place and to the control rods and main rotor swashplate.

4. Mixer Controls Replacement

A. Mixer Controls Removal

(Ref. Figure 402)

(1). Remove air intake forward fairing for access.



NOTES:

1. END OF SLOTTED BUSHING MUST PROTRUDE MINIMUM OF 0.010 IN. (0.254 MM) TO MAXIMUM OF 0.060 IN. (1.524 MM) ABOVE OUTSIDE SURFACE OF PART AFTER NUT IS TIGHTENED.
2. COLOR CODED TO MATCH BLADE.
3. OPTIMUM INITIAL SETTING (FIVE PLACES).
4. AS REQUIRED TO FILL GAP.
5. THIS SIDE ONLY ON EARLY CONFIGURATION.
6. BOTH SIDES ON CURRENT CONFIGURATION.
7. DELETED

G62- 3000D

Figure 401. Pitch Control Rods and Swashplate Scissors - Installation

(2). Disconnect upper ends of collective mixer, lateral mixer and longitudinal mixer control rods (Ref. Figure 401).

NOTE: Control rods are attached by slightly different length bolts. Reinstall each bolt in its bellcrank following control rod removal to simplify reinstallation at correct locations.

(3). Remove mixer links. (Mixer link bearings are not replaceable.)

(4). Disconnect longitudinal link from stationary swashplate.

(5). Remove longitudinal control mixer link.

(6). Disconnect lateral bellcrank from collective pitch mixer bellcrank.

(7). Remove connecting hardware (including flanged bushing) from each side of longitudinal pitch mixer bellcrank. Carefully remove bellcrank. Retain any shims that may be installed.

(8). Remove bolt from hingeline of support bracket, longitudinal pitch idler and collective pitch mixer bellcrank. Separate the three parts.

(9). Remove mixer support bracket from mast base.

CAUTION To prevent washing dirt into bearings, or washing grease out of bearings, do not permit solvent to enter bearings when cleaning mixer control components.

B. Mixer Controls Installation

(Ref. Figure 402)

(1). Position support bracket over forward lug on mast base.

(2). Install two aft bolts and washers in support bracket and mast base. Install two thin washers and nuts; torque nuts to **80 - 100 inch-pounds (9.04 - 11.30 Nm) above drag torque**.

(3). Using ball hole gage and standard micrometer, check that misalignment between forward bolt hole bore in support bracket and bore in mast base lug is 0.015 inch (0.381 mm) or less.

NOTE: If necessary, loosen aft two bracket-to-fitting nuts, position support bracket to minimize misalignment and retighten nuts.

(4). Install mixer support attaching bushing in bracket and mast base lug.

(5). Check that sleeve bushing is in place; then install bolt, two washers and nut. Torque nut to **80 - 100 inch-pounds (9.04 - 11.30 Nm)**.

(6). Position longitudinal pitch idler and collective pitch mixer bellcrank on support bracket. Position washer between right side of longitudinal pitch idler bearing and center bearing of mixer support bracket. Install left-hand bearing, with attaching hardware.

(7). Position lateral bellcrank between collective pitch mixer bellcrank bearings and install attaching hardware.

(8). Position longitudinal pitch mixer bellcrank with collective pitch mixer bellcrank; insert two flanged bushings. Install two bolts.

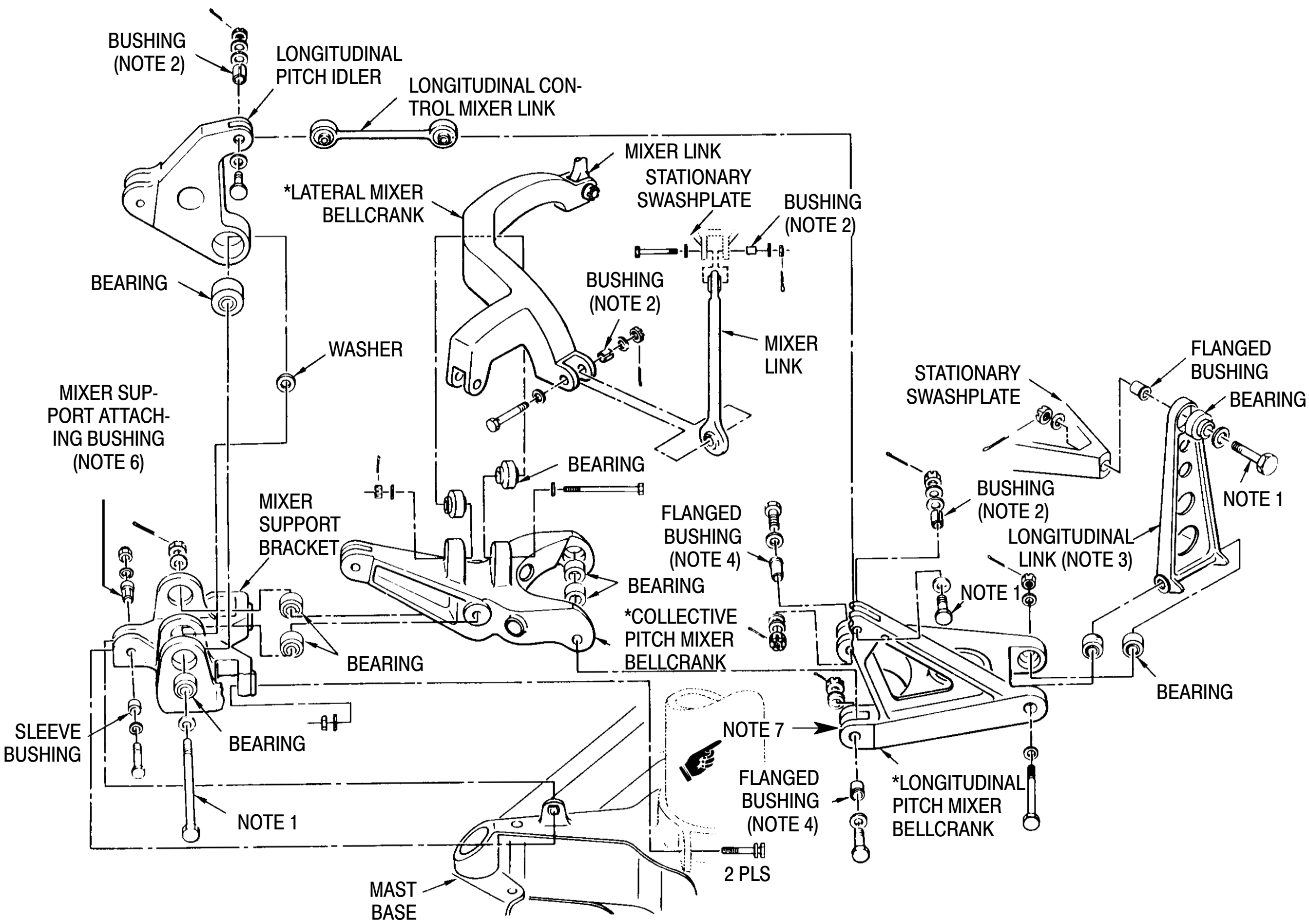
(9). Push longitudinal bellcrank to one side and measure gap between bellcrank and bearings in collective pitch bellcrank.

(10). Using HS5079-2646 laminated washer(s), shim evenly to take up gap.

(11). Insert flanged bushings, bolts, six washers (two under each nut) shims and nuts. Torque nut to **30 - 40 inch-pounds (3.39 - 4.52 Nm)** and install cotter pin.

(12). Position longitudinal control mixer link between longitudinal pitch idler and longitudinal pitch mixer bellcrank; check that two slotted bushings are in place. Install bolt, three washers (two under each nut), nut and cotter pin at each end of link.

(13). Position longitudinal link between longitudinal pitch mixer bellcrank bearings. Install attaching hardware.



NOTES:
1. DIRECTION OF BOLT OPTIONAL.
2. EDGE OF BUSHING MUST PROTRUDE MINIMUM OF 0.010 IN. (0.254 MM) TO MAXIMUM OF 0.060 IN. (1.524 MM) ABOVE OUTSIDE OF PART AFTER NUT IS TIGHTENED.
3. LONGITUDINAL LINK DETAILS ROTATED FOR CLARITY.
4. MUST BE PULLED OUT FIRST TO REMOVE BELLCRANK.
5. ASTERISK (*) INDICATES PART THAT MAY BE EITHER MAGNESIUM OR ALUMINUM ALLOY. (FOR ALLOY IDENTIFICATION AND CORROSION CONTROL, REF. SEC. 20-40-00).
6. INSTALL BUSHING AFTER THE TWO AFT ATTACHING BOLTS WITHOUT EXCESSIVE MISALIGNMENT, 0.015 IN. (0.381 MM).
7. USING HS5079-2646 SHIMS, SHIM EQUALLY TO REMOVE GAP.

G62-3003C

Figure 402. Mixer Controls - Assembly

(14). Position mixer links in stationary swashplate and lateral bellcrank; check that slotted bushings are in place. Install attaching hardware.

(15). Place collective mixer, lateral mixer longitudinal mixer control rods (Ref. Figure 401) in mounting position; check that slotted bushing in place. Install attaching hardware.

(16). Install air intake forward fairing.

(17). Check rigging of collective and cyclic controls.

5. Scissors

The scissors provide a movable connection between the rotating swashplate and main rotor hub.

6. Scissors Replacement

A. Scissors Removal

(Ref. Figure 401)

CAUTION Removal of all pitch control rods is recommended prior to scissors removal. Failure to observe this precaution could result in damage to pitch control rods, swashplate and/or hub.

(1). Disconnect lower end of pitch control rod that is in line with scissors link in rotating swashplate.

(2). Remove cotter pin, nut, washer, and bolt from each leg of scissors crank. Disconnect crank from hub lower shoe.

(3). Remove cotter pin, nut, washer, and bolt connecting scissors link to swashplate; remove scissors.

B. Scissors Installation

(Ref. Figure 401)

(1). Place scissors link in mounting position, chamfered edge of link must face outboard.

(2). Check that slotted bushing is in swashplate web and install attaching hardware. Torque nut to **15 - 20 inch-pounds (1.69 - 2.26 Nm)**.

CAUTION Scissors crank must be positioned (Ref. Figure 401) with decal up and proper direction towards lower side lugs.

NOTE: Ensure crank- to- hub lower shoe lugs are not preloaded.

(3). Position scissors crank on hub lower shoe lugs; install connecting hardware (Ref. Figure 401). Torque nuts to **30 - 60 inch-pounds (3.39 - 6.78 Nm);** install cotter pin.

NOTE: Shim washers may be required on shouldered bushing side of clevis.

(4). Position elastomer rings and lower end of pitch control rod in swashplate lug and install attaching hardware. (Nut is to be adjacent to bushing in swashplate.) Torque nut to **30 - 60 inch-pounds (3.39 - 6.78 Nm)**.

7. Scissors Link Replacement

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM103	Solid film lubricant

(1). Remove cotter pin, nut, washer and bolt that join link and crank.

(2). Remove two bushings from link only if replacement is necessary.

(3). Do not remove bearing from link, replace complete link if bearing is defective.

NOTE: Install new bushings using solid film lubricant (CM103); **do not use zinc chromate.**

(4). If bushings were removed at disassembly, install new bushings. After installation, dimension between outer faces of bushings should be 1.579-1.586 inches (4.0107-4.0284 cm).

(5). Align bore of link with bore of crank; install bolt, washer and nut. Torque nut to **30 - 40 inch-pounds (3.39 - 4.52 Nm),** install cotter pin.

8. Pitch Control Rods

Five pitch control rods transfer pitch control from the rotating swashplate to the main rotor blades.

9. Pitch Control Rod Replacement

A. Pitch Control Rod Removal

(Ref. Figure 401)

NOTE:

- If rod is not to be reinstalled, but is to be replaced, measure and record length of removed rod. Optimum length may have been changed at previous rigging; pre-adjust replacement rod to length of rod removed.
- Rods are color coded for reinstallation at correct locations. If more than one rod is being removed and color coding is not visible, identify each by color or similar means to points of connection to simplify reinstallation.

(1). Remove cotter pin, nut, washer and bolt from each end of pitch control rod.

(2). Remove pitch control rod and O-ring.

B. Pitch Control Rod Installation

(Ref. Figure 401)

CAUTION At installation, install rod at correct color code location. Center bearing rodends between attach clevis. If rod length is changed, blades must be tracked.

(1). If actual rod length is incorrect or either actual or required rod length is unknown, preset rod length to optimum length of 6.25 inches (15.875 cm).

NOTE: Install both pitch change rod bolts in direction of rotation.

(2). Install rod with elastomeric rings on both sides of lower bearing.

NOTE: Add washers as required to align nut with cotter pin hole.

(3). Torque upper nut to **100 - 130 inch-pounds (11.30 - 14.69 Nm).**

NOTE: Bushing must project 0.010-0.060 inch (0.254-1.524 mm) after nut is torqued.

(4). Torque lower nut to **30 - 60 inch-pounds (3.39 - 6.78 Nm)**.

(5). Secure nuts with cotter pins.

(6). Rotate pitch change rod assembly fore and aft to ensure clearance exists between rod end bearing and pitch housing clevis at both ends.

(7). If installation is final and tracking is not required, safetywire rod ends to rod; ensure rod ends are centered.

(8). As necessary, repeat above procedures for remaining pitch control rods.

10. Counterweight and Interrupter Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM111	Grease, aircraft
CM409	Adhesive, epoxy

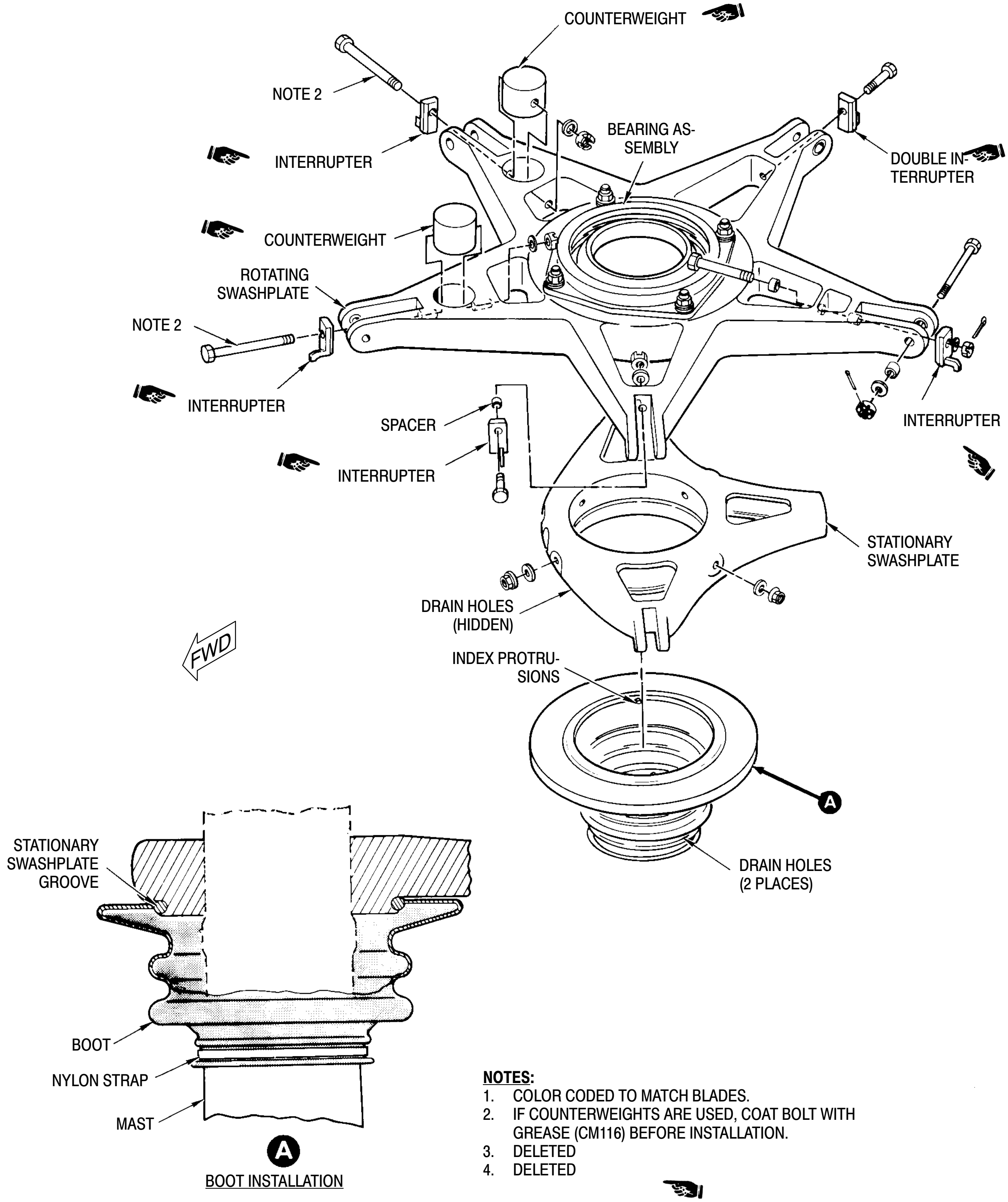
NOTE: If counterweights are to be added, one thick and one thin (any position) is recommended for ease of balancing; Hub must be re-balanced.

(1). Apply coat of adhesive (CM409) to counterweight OD. Reinstall weight with smaller hole outboard, using dummy bolt to align weight to rotating swashplate. Remove bolt and allow adhesive to cure according to container instructions.

NOTE: Ensure interrupters are installed with same type and number of washers removed at disassembly, and that correct part number interrupter is installed in each swashplate arm. (Ref. CSP-IPC-4 for correct part numbers and corresponding locations).

(2). Install interrupters, beveled edges inboard, with bolts, washers, nuts and new cotter pins. Coat bolts with grease (CM111) prior to installation. Torque nuts to **30 - 60 inch-pounds (3.39 - 6.79 Nm)**.

(3). Install interrupters using bolts, washers and nuts; torque nuts to **15 - 20 inch-pounds (1.69 - 2.26 Nm)**.



NOTES:
1. COLOR CODED TO MATCH BLADES.
2. IF COUNTERWEIGHTS ARE USED, COAT BOLT WITH GREASE (CM116) BEFORE INSTALLATION.
3. DELETED
4. DELETED

G62-3001A

Figure 403. Main Rotor Swashplate

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SWASHPLATE AND MIXER INSPECTION/CHECK

1. Swashplate Inspection

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM217	Isopropyl alcohol

CAUTION When cleaning swashplate for inspection, prevent solvent from entering either spherical ball bearing or double row ball bearing. Use cloth moistened in alcohol (CM217) to wipe clean spherical ball, ball bore liner and exterior of double row ball bearing.

NOTE:

- Stationary swashplate may be constructed of either magnesium or aluminum alloy. For corrosion control and identification of magnesium and aluminum alloys (Ref. Sec. 20-40-00).
- In the following inspection, the rotating and stationary swashplates must be disconnected (Ref. Swashplate and Mixer Removal/Installation).

(1). Inspect swashplate bearing assembly (Ref. Figure 403 for evidence of binding in either radial or axial movement.

(2). Inspect teflon liners for condition.

(3). Ensure that all flexible rubber seals enclosing ball bearing races are in place; inspect for deterioration and indication of grease leakage. (For bearing maintenance information (including lubrication), Ref. COM).

NOTE: New swashplate bearing assembly normally shows some signs of grease leakage for first 10-15 hours of operation after installation.

(4). Inspect swashplate spherical ball and double row ball bearing for radial or axial play.

(a). Maximum radial play between sliding surface liner and stationary mast is 0.020 inch (0.508 mm).

(b). Maximum axial play between spherical ball and teflon liner is 0.010 inch (0.254 mm).

(c). If play is suspected in double row ball bearing, turn rotating swashplate until arms line up with those of stationary swashplate and check motion between arms at control bolt in stationary swashplate.

(d). Maximum total vertical movement of 0.015 inch (0.381 mm) is allowable.

(e). If movement limit is exceeded replace double row ball bearing (Ref. COM).

(5). Inspect swashplate spherical and double row ball bearings for condition.

(a). Nicks and dents that do not deform ID chamfered edge of hard anodized ball, and not more than 0.10 inch (0.254 mm) deep along spherical ball surface from edge are allowed.

(b). Scratches, any length, on OD of spherical ball are allowed if they are no deeper than 0.010 inch (0.254 mm) or wider than 0.060 inch (1.524 mm).

(c). Not more than two scratches are permitted in a one inch wide area.

(6). Check existing preload on spherical bearing.

(a). Hook spring scale over one of the bolts securing stationary swashplate to the bearing flange.

(b). With stationary swashplate in motion, drag should be no more than **30 pounds (13.61 kg)**. (Use average of four readings taken 90 degrees apart).

(c). If readings are more than **30 pounds (13.61 kg)**, clean spherical bearing with isopropyl alcohol and recheck drag.

(d). Repair damage or replace bearings (Ref. COM).

(7). Check double row ball bearing for serviceability, with seals in place and unbroken.

(a). Check for correct operation and lubrication.

(b). Bearing must rotate smoothly, without roughness. Binding or catching should not exist when bearings are rotated 360°.

(c). Replace defective double row ball bearings (Ref. COM).

(8). Perform careful visual inspection of stationary and rotating swashplate for cracks, wear in bolt and bushing bores, and fork inner surfaces; and for corrosion, nicks and dents.

(9). Perform dye penetrant check on questionable areas.

(10). Check that counterweights are securely bonded in rotating swashplate.

2. Mixer Controls Inspection

(Ref. Figure 402)

(1). Inspect all bushings for security of fit.

(2). Inspect longitudinal link, support bracket, longitudinal control mixer link, mixer links, longitudinal pitch idler, longitudinal pitch mixer bellcrank, lateral bellcrank and collective pitch mixer bellcrank for scratches, cracks, corrosion and similar surface defects. For components that are questionable, perform fluorescent dye penetrant inspection.

(3). Inspect spherical, teflon (or equivalent) lined, bearings in longitudinal link, mixer link, and longitudinal control mixer link for binding, play in link bore and wear. Wear limit is 0.008 inch (0.203 mm) radially and 0.040 inch (1.016 mm) axially. Replace complete mixer link if bearings are faulty. Inspect bearings in other linkage for binding and looseness in mating bores.

3. Scissors Inspection

(Ref. Figure 401)

WARNING **Any evidence of failure, damage, or deformation of crank or link is justification for replacement of either crank, link, or complete scissors assembly. Failure of any of these components in flight can result in failure of movable flight controls, loss of helicopter, and possible injury or loss of life.**

(1). Inspect crank and link for evidence of impact damage and deformation. If condition is questionable, perform fluorescent dye penetrant inspection.

(2). Inspect bearings for binding, looseness in bore and wear. Maximum wear limits are 0.010 inch (0.254 mm) radial and 0.020 inch (0.508 mm) axial.

4. Pitch Control Rod Inspection

(Ref. Figure 401)

CAUTION Ensure that rod end bearings are centered and do not contact attach clevis.

(1). Visually inspect upper and lower rod end bearings for evidence of excessive axial play, 0.040 inch (1.016 mm) maximum; and for any extrusion, displacement or damage to the bearing teflon liner.

(2). Replace rod end bearing if discrepancies are noted.

SWASHPLATE AND MIXER REPAIRS

1. Swashplate Repairs

(Ref. Figure 403) Disassembly other than as illustrated is considered a part of swashplate overhaul (Ref. COM). If tracking interrupters are to be removed, mark them for reinstallation at original locations.

2. Mixer Controls Repair

(Ref. Figure 402)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM321	Surface primer locking compound
CM431	Sealing, locking and retaining compound
CM802	Abrasive cloth, aluminum oxide

NOTE: Following depth limits are total limits, including effects of all previous repairs to any given area.

(1). Repair minor surface defects such as scratches, nicks and corrosion using abrasive cloth, grade 400 - 600 (CM802) to smooth out and blend in such defects.

(2). Cast and forged surfaces may be reworked to depth of 0.020 inch (0.508 mm).

(3). Flat machined surfaces, except clevis inner ears, may be reworked to depth of 0.015 inch (0.381 mm). Clevis inner ear surfaces may be reworked to depth of 0.020 inch (0.508 mm).

(4). Machined holes may have 0.003 inch (0.076 mm) removed from bore wall in an area no greater than 15 percent of circumference and 50 percent of depth.

(5). All edges may have 0.030 inch (0.762 mm) removed except around machined holes which are limited to 0.010 inch (0.254 mm) chamfer.

(6). All rework must be smoothly blended into adjacent surfaces and finish must be restored on magnesium and aluminum parts.

(7). Replace defective bearings and bushings, except swaged spherical bearings in mixer links which require link replacement. Remove bearings or bushings by pressing them out. Install new bearing with surface primer and grade A locking compound (CM321 and CM431).

NOTE: Left-hand bearing in support bracket is not supplied as part of bracket. This bearing is installed at time support bracket and longitudinal pitch idler are assembled. Install new bearing by seating flush with inner face of support bracket flange.

3. Scissors Bushing and Bearing Replacement

(Ref. Figure 401)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM103	Solid film lubricant
CM222	1,1,1-T richloroethane
CM318	Primer
CM321	Surface primer locking compound
CM431	Sealing, locking and retaining compound

(1). Remove cotter pin, nut, washer, and bolt that join link and crank.

(2). Remove two bushings from link only if replacement is necessary.

(3). Do not remove bearing from link. Replace complete link if bearing is defective.

(4). Remove slotted bushings and bearings from crank, only if replacement is necessary.

CAUTION During cleaning, do not allow solvent to enter bearings.

(5). Install new bushings using solid film lubricant (CM103); **do not use zinc**

chromate. Press in bushing until end is flush with inside surface of crank inboard ears.

(6). If bearings were removed from crank at disassembly, reinstall using the following procedure:

NOTE: Do not allow sealant to enter bearing race.

(a). Clean bearing outer face, counterbore and faying surfaces with trichloroethane (CM222). Do not allow trichloroethane to enter bearing.

(b). Coat the faying surfaces with surface primer (CM321) as per manufacturer's instructions.

(c). Apply locking compound (CM431) to faying surfaces.

(d). Press bearing until outer face is seated firmly against shoulder of counterbore.

(e). Remove excess sealant. Do not allow sealant to enter bearing race.

(f). Apply a small fillet of sealant to the faying edges of bearing housing. Use cellophane or masking tape to exclude air and allow sealant to cure for 24 hours at ambient temperature or force cure by heating to 140°-160 °F (60°-72 °C for one hour prior to use of assembly.

(7). If bushings were removed from link at disassembly, install new bushings. After installation, dimension between outside faces of bushings should be 1.579-1.586 inches (4.0107-4.0284 cm).

(8). Align bore of link with bore of crank; install bolt, washer and nut. Torque nut to **30 - 40 inch-pounds (3.39 - 4.52 Nm)**.

4. Scissors Modification

(Ref. Figure 801) The following procedure is for modification of 369D21002 main rotor hub scissors to 369D21002-21 configuration to preclude shimming problems experienced with the early crank configuration. Field rework consists primarily of relocating existing bushings in the crank outboard attach lugs to the inboard lugs, and installing new flange type bushings in the outboard lugs. The wall thickness of the crank outboard attach lugs must be reduced to accommodate installation of the flange bushings.

Instructions are also provided for replacement of existing hardware for the crank assembly. Existing attach bolts may have insufficient thread length which, in some cases, can cause loosening of the bolt in service.

It is to be noted that the field modification and installation of the PN 369D21002-21 crank assembly with new attach hardware also upgrades the PN 369D21001 scissors assembly to PN 369D2101-501 configuration.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM206	Chemical coating
CM318	Primer

(1). Disconnect scissors crank from hub lower shoe and scissors link.

(2). Remove existing HS626-S-4-500 bushings from outboard lugs of scissors crank.

(3). Using grinder or file, remove minimum 0.063 inch (1.6002 mm) material from inner side of both outboard attach lugs, to obtain distance of 9.735 inches (24.7295 cm) between lugs. After removal of material, wall thickness of lugs should not be less than 0.230 inch (5.842 mm). Coat reworked area of lug with iridite (CM206) or equivalent corrosion protective chemical film.

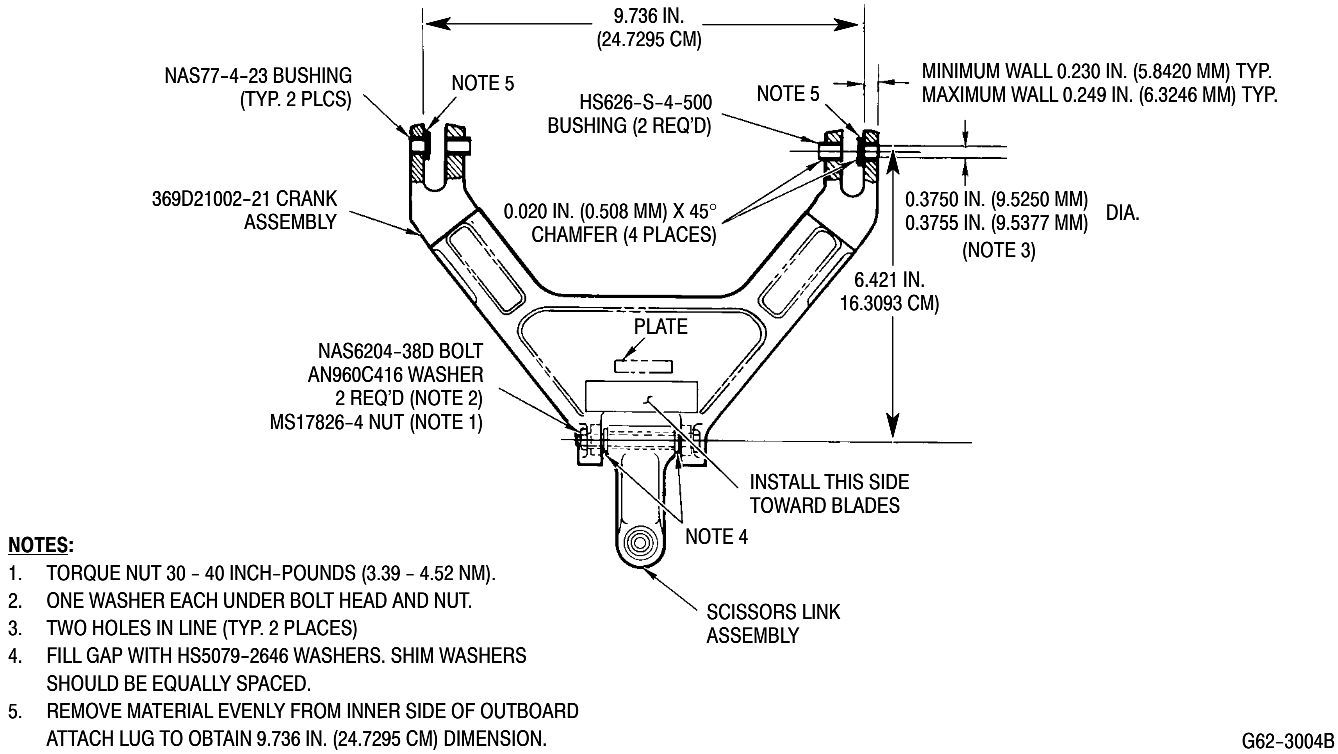


Figure 801. Field Modification - 369D21002-11 Crank Assembly to 369D21002-21 Configuration

NOTE: Remove material only from inner side of existing crank outboard attach lugs.

(4). Using existing hole in outboard lug as guide, drill and ream 0.252 inch (6.4008 mm) dia. hole in outboard lugs to 0.3750-0.3755 inch (9.5250-9.5377 mm) dia. for press fit of HS626-S-4-500 bushings.

(5). Install HS626-S-4-500 bushings in inboard lugs of scissors crank with primer (CM318).

(6). Install new NAS77-4-23 flanged bushings with primer (CM318) in outboard lugs.

(7). Re-identify crank assembly as PN 369D21002-21 on ID plate.

(8). zinc chromate

(9). Reinstall scissors crank assembly using new attach hardware as follows:

(a). Install scissors crank to hub lower shoe with NAS6204-18D bolts, AN960PD416L washers, MS17826-4 nuts and cotter pins (Ref. Figure 802).

(b). Install scissors link to scissors crank assembly with NAS6204-38D bolt, AN960C416 washers, MS17826-4 nut and cotter pins (Ref. Figure 801). Torque nut to **30 - 40 inch-pounds (3.39 - 4.52 Nm)**.

(10). Record upgrade of PN 369D21002 main rotor hub scissors crank assembly to PN 369D21002-21 configuration per DN-46.1 in Component Record of Helicopter Log Book.

(11). Record upgrade of PN 369D21001 main rotor hub scissors assembly to PN 369D21001-501 configuration per DN-46.1 in Component Record of Helicopter Log Book.

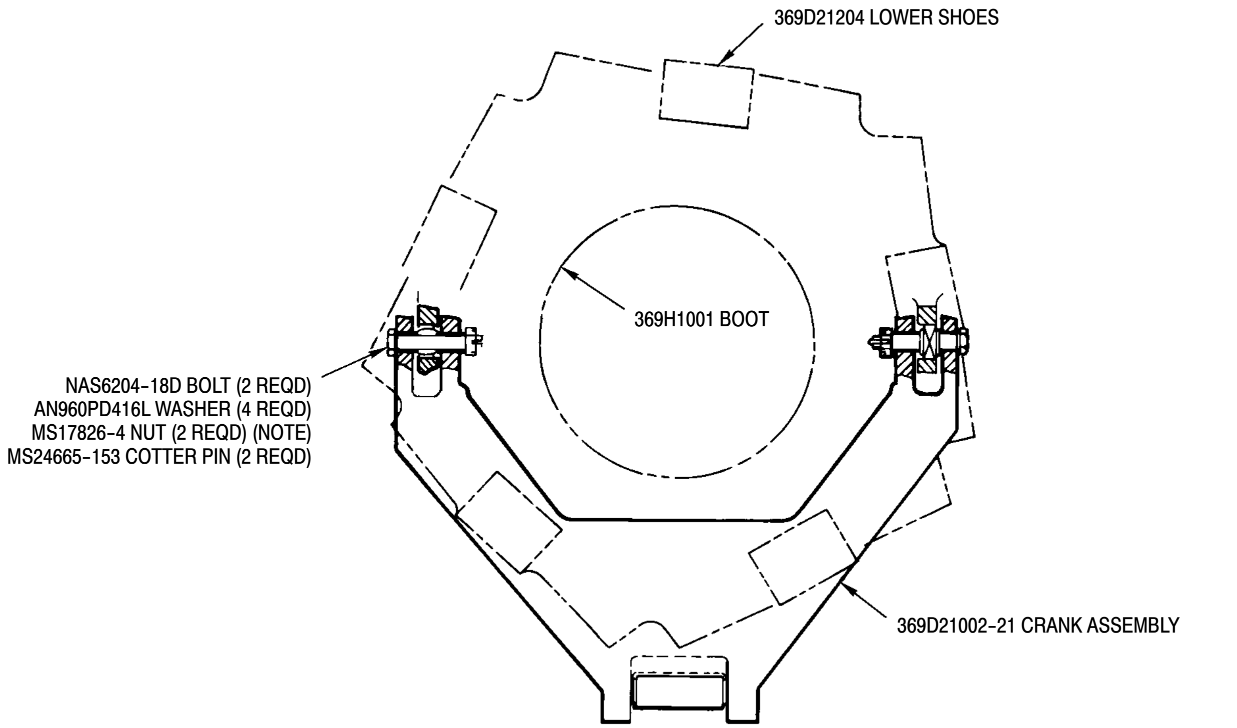


Figure 802. Installation of 369D21002-21 Crank to Hub Lower Shoes

5. Mixer Controls Rework

(Ref. Figure 803) The following lists instructions and criteria for rework of the mixer controls to preclude interference between mixer components. Rework is applicable to 369D helicopter, Serial No. 0001D thru 0129D only, unless already accomplished, and is to be performed prior to rigging the main rotor controls.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM206	Chemical coating
CM305	Lacquer, acrylic
CM312	Ink stamp, permanent
CM314	Varnish, moisture resistant
CM318	Primer

(1). Remove and rework the 369D21002-3 scissors crank assembly and scissors link assembly as follows:

(a). Chamfer 369D21002-3 scissors crank and 369A1003 link assembly per dimensions shown (Ref. Figure 803).

(b). Touch up reworked area with chemical film (CM206) and refinish with primer (CM318) and black paint (CM305).

(c). Using permanent ink stamp (CM312), reidentify scissors link part number as 369A1003-501.

(d). Apply a coat of varnish (CM314) over ink stamp.

(2). Rework installed 369D27611 rotating swashplate as follows:

(a). Chamfer 369D27611 swashplate per dimensions shown (Ref. Figure 803).

(b). Touch up reworked area with chemical film and refinish with primer and black paint.

(c). Using permanent ink stamp, reidentify rotating swashplate assembly part number as 369A27611-501.

(d). Apply a coat of varnish over ink stamp.

(3). Remove and rework 369N2664 collective mixer bellcrank and 369N2670 lateral mixer bellcrank as follows:

(a). Chamfer collective and lateral bellcrank assemblies per dimensions shown (Ref. Figure 803).

(b). Touch up reworked area with chemical film and refinish with primer and black paint.

(c). Using permanent ink stamp, re-identify collective bellcrank part number as 369N2664-501; reidentify lateral bellcrank part number as 369N2670-501.

(d). Apply a coat of varnish over ink stamp.

NOTE: The 369N2666-503 longitudinal mixer idler is compatible installed with the 369N2668 basic longitudinal mixer bellcrank only. If the 369N2666-505 idler is installed, the 369N2668-503 bellcrank must be used.

(4). Reinstall removed components.

(5). Perform rigging of main rotor controls (Ref. Sec. 67-10-00).

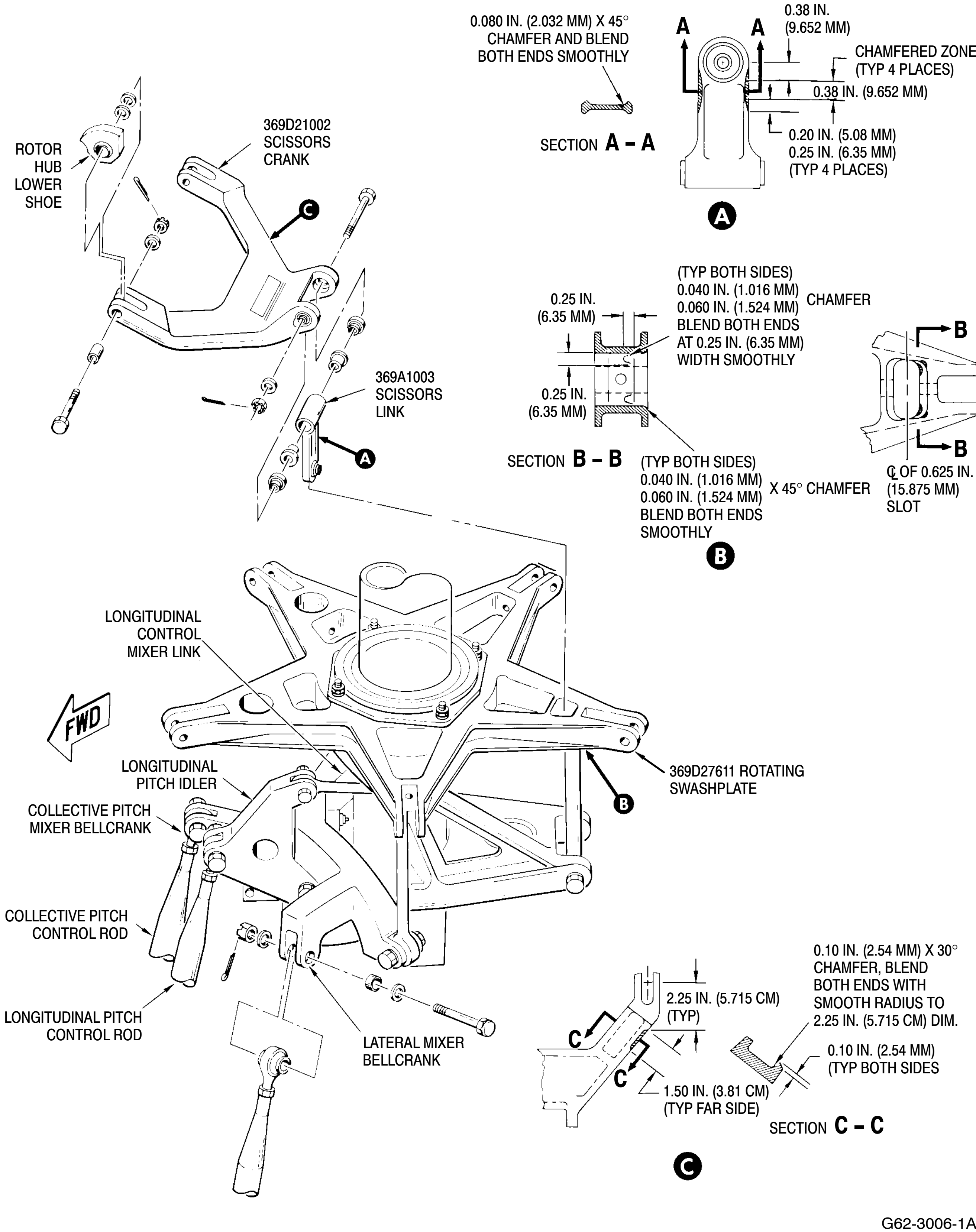


Figure 803. Rework of Main Rotor and Mixer Controls (Sheet 1 of 2)

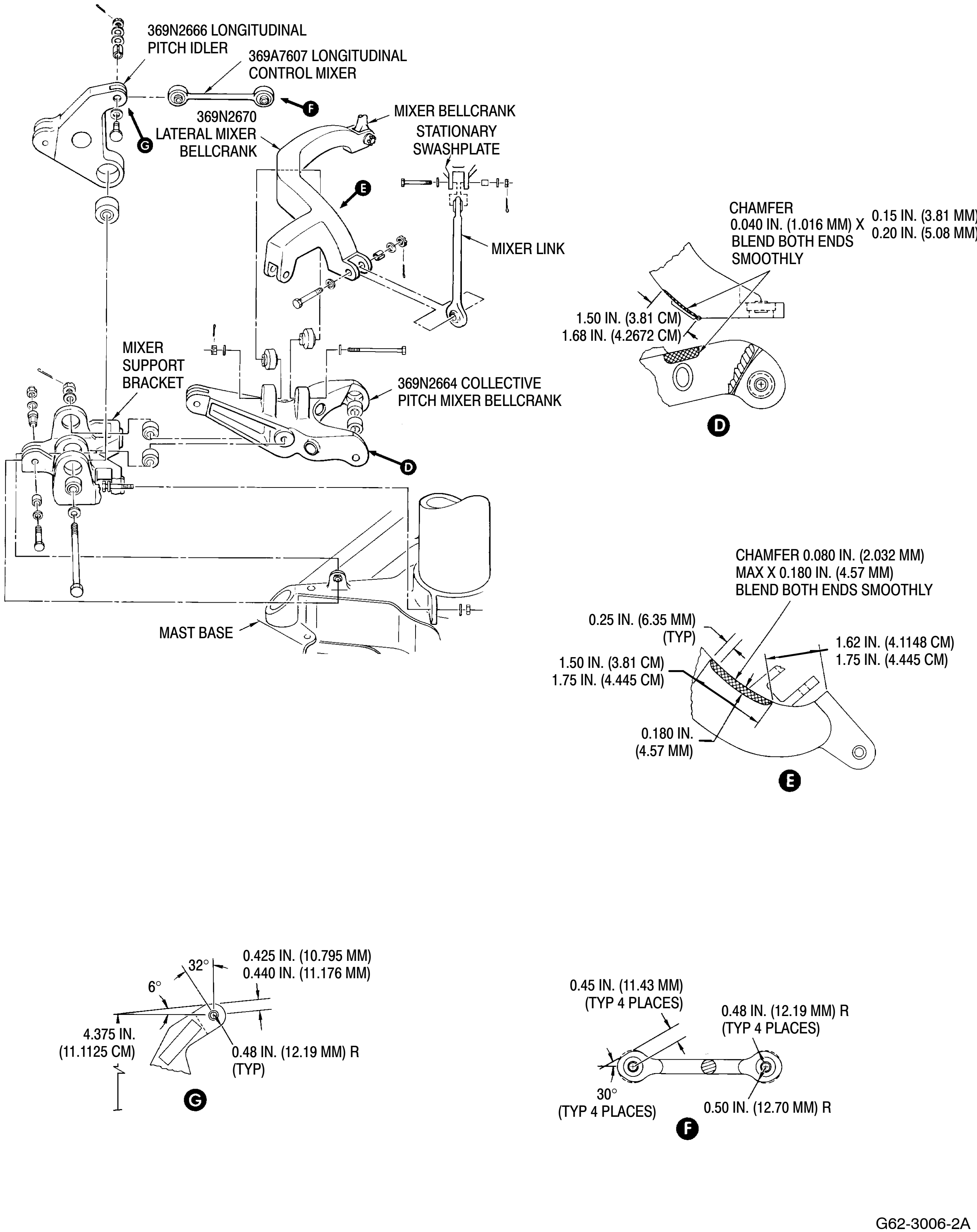


Figure 803. Rework of Main Rotor and Mixer Controls (Sheet 2 of 2)

Section

62-30-60

Swashplate and Mixer (600N)

SWASHPLATE AND MIXER REMOVAL/INSTALLATION

1. Main Rotor Swashplate

(Ref. Figure 403) The main rotor swashplate includes a rotating swashplate, stationary swashplate, bearing and retainer and one counterweight. The rotating swashplate converts movement from the stationary swashplate into rotating motion and transfers it to the main rotor hub assembly for lift, and longitudinal and lateral control of the helicopter.

2. Swashplate Replacement

A. Swashplate Removal

(1). Tag or color-identify six pitch control rods (Ref. Figure 401) to simplify replacement at same locations.

CAUTION Failure to reinstall pitch control rods at correct locations may result in main rotor blades excessively out of track.

(2). Disconnect pitch control rods from rotating swashplate.

(3). Remove scissors.

(4). Remove main rotor hub.

(5). Disconnect longitudinal link (Ref. Figure 402) from stationary swashplate.

(6). Disconnect right and left side mixer links (Ref. Figure 402) from stationary swashplate.

(7). Remove protective boot from groove in lower side of stationary swashplate (Ref. Figure 403).

CAUTION Do not strike rotating swashplate or bearing assembly (Ref. Figure 403) with tools or in any way deface these components, the rotating swashplate is a stressed part. Use particular care to protect teflon liner in bearing bore. A damaged swashplate bearing must not be retained in service.

(8). Lift swashplate carefully up and off of mast.

(9). To remove boot from mast, remove self-clinching nylon strap.

B. Swashplate Installation

(1). If swashplate lower boot was removed, install boot on mast (Ref. Figure 403).

(2). Position swashplate over main rotor mast and carefully lower into place.

(3). Engage upper end of boot in groove at lower side of stationary swashplate. Secure boot with self-clinching nylon strap (Ref. Figure 403).

(4). Align longitudinal link with stationary swashplate (Ref. Figure 402).

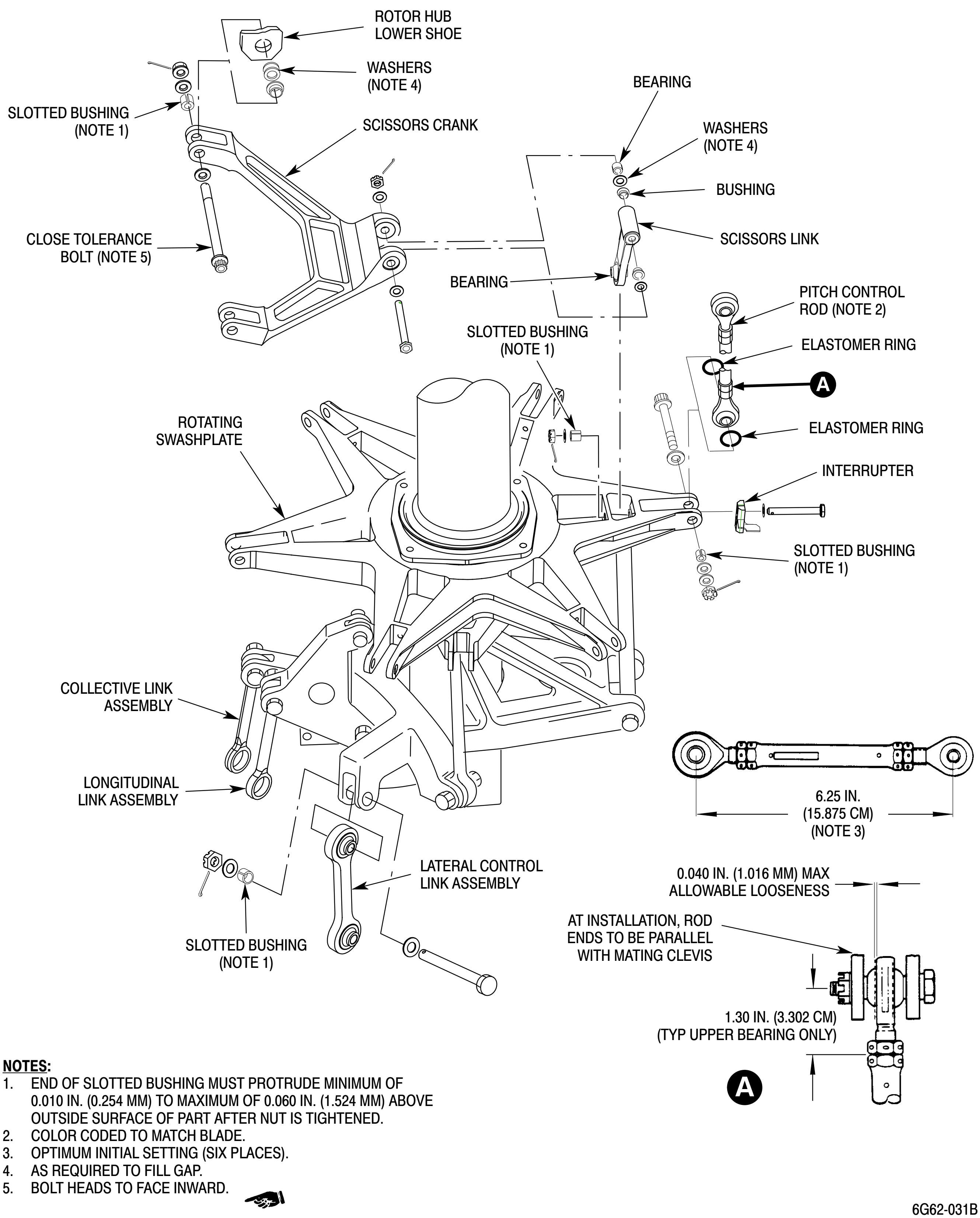
(5). Install flanged bushing, if removed, bolt, two washers, nut and cotter pin to secure upper end of longitudinal link.

(6). Align upper ends of mixer links with stationary swashplate. Install slotted bushing (if removed), bolt, two washers, nut and cotter pin to secure each link to swashplate.

(7). Install scissors.

(8). Using color code, reinstall pitch control rods at same locations from which removed.

(9). Check track of main rotor blades (Ref. Sec. 18-10-60) following any maintenance activity that could result in a dimensional variation affecting rigging or tracking.



NOTES:
1. END OF SLOTTED BUSHING MUST PROTRUDE MINIMUM OF 0.010 IN. (0.254 MM) TO MAXIMUM OF 0.060 IN. (1.524 MM) ABOVE OUTSIDE SURFACE OF PART AFTER NUT IS TIGHTENED.
2. COLOR CODED TO MATCH BLADE.
3. OPTIMUM INITIAL SETTING (SIX PLACES).
4. AS REQUIRED TO FILL GAP.
5. BOLT HEADS TO FACE INWARD.

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Figure 401. Pitch Control Rods and Swashplate Scissors - Installation

3. Controls Mixer

Controls mixer includes links, bellcranks, idlers, support bracket and fasteners to secure these components in place and to the control rods and main rotor swashplate.

4. Controls Mixer Replacement

A. Controls Mixer Removal

(Ref. Figure 402)

(1). Remove air intake forward fairing for access.

(2). Disconnect upper ends of collective, lateral and longitudinal control links (Ref. Figure 401).

NOTE: Control links are attached by slightly different length bolts. Reinstall each bolt in its bellcrank following control rod removal to simplify reinstallation at correct locations.

(3). Remove mixer links. (Mixer link bearings are not replaceable.)

(4). Disconnect longitudinal link from stationary swashplate.

(5). Remove longitudinal control mixer link.

(6). Disconnect lateral mixer bellcrank from collective pitch mixer bellcrank.

(7). Remove connecting hardware (including flanged bushing) from each side of longitudinal pitch mixer bellcrank. Carefully remove bellcrank. Retain any shims that may be installed.

(8). Remove bolt from hingeline of support bracket, longitudinal pitch idler and collective pitch mixer bellcrank. Separate the three parts.

(9). Remove mixer support bracket from mast base.

CAUTION To prevent washing dirt into bearings, or washing grease out of bearings, do not permit solvent to enter bearings when cleaning mixer control components.

B. Mixer Controls Installation

(Ref. Figure 402)

(1). Position support bracket over forward lug on mast base.

(2). Install two aft bolts and washers in support bracket and mast base. Install two thin washers and nuts; torque nuts to **80 - 100 inch-pounds (9.04 - 11.30 Nm) plus drag torque**.

(3). Using ball hole gage and standard micrometer, check that misalignment between forward bolt hole bore in support bracket and bore in mast base lug is 0.015 inch (0.381 mm) or less.

NOTE: If necessary, loosen aft two bracket-to-fitting nuts, position support bracket to minimize misalignment and retighten nuts.

(4). Install mixer support attaching bushing in bracket and mast base lug.

(5). Check that sleeve bushing is in place; then install bolt, two washers and nut. Torque nut to **80 - 100 inch-pounds (9.04 - 11.30 Nm)**.

(6). Position longitudinal pitch idler and collective pitch mixer bellcrank on support bracket. Position washer between right side of longitudinal pitch idler bearing and center bearing of mixer support bracket. Install left-hand bearing, with attaching hardware.

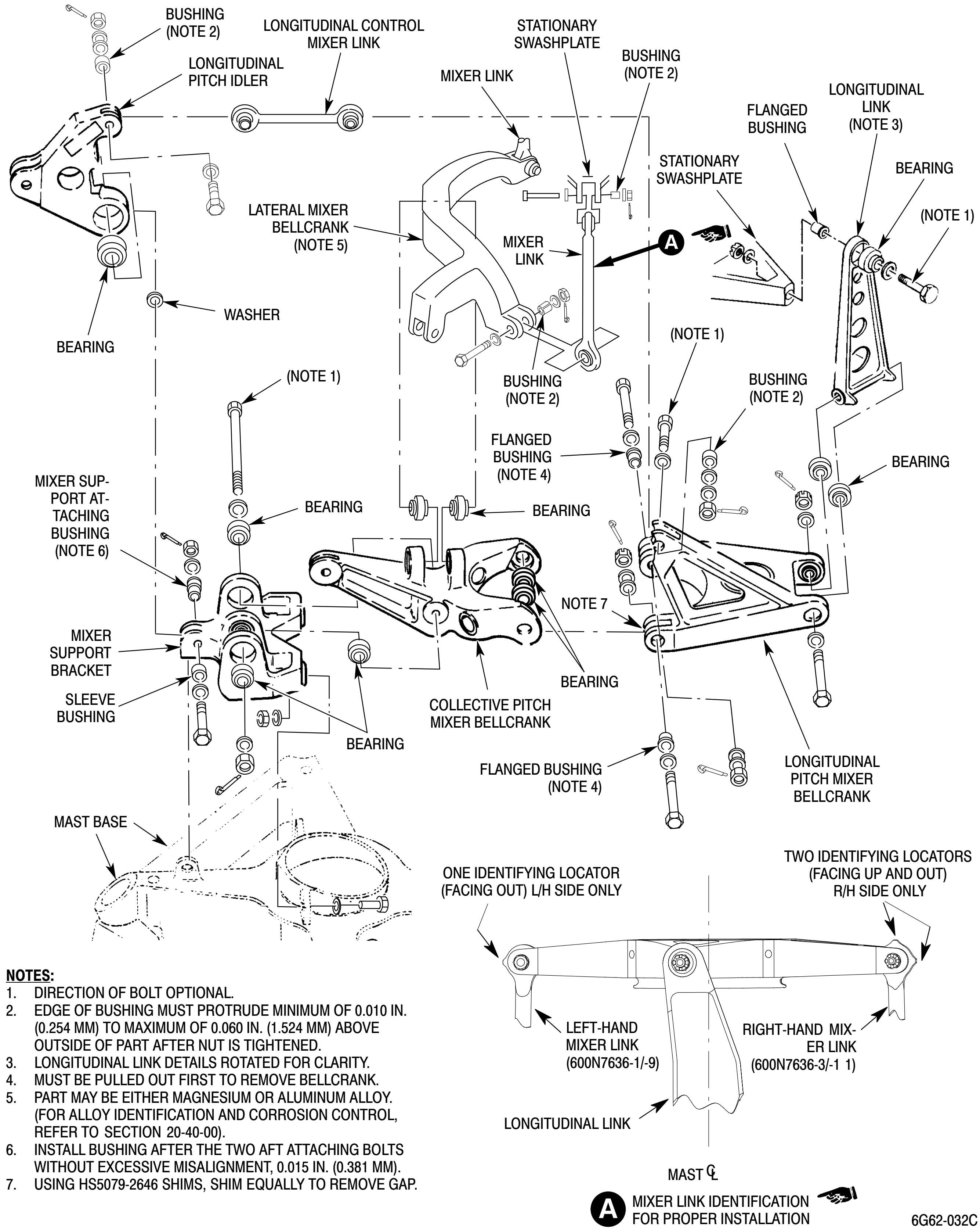
(7). Position lateral bellcrank between collective pitch mixer bellcrank bearings and install attaching hardware.

(8). Position longitudinal pitch mixer bellcrank with collective pitch mixer bellcrank; insert two flanged bushings. Install two bolts.

(9). Push longitudinal bellcrank to one side and measure gap between bellcrank and bearings in collective pitch bellcrank.

(10). Using HS5079-2646 laminated washer(s), shim evenly to take up gap.

(11). Insert flanged bushings, bolts, six washers (two under each nut) shims and nuts. Torque nut to **30 - 40 inch-pounds (3.39 - 4.52 Nm)** and install cotter pin.



NOTES:

1. DIRECTION OF BOLT OPTIONAL.
2. EDGE OF BUSHING MUST PROTRUDE MINIMUM OF 0.010 IN. (0.254 MM) TO MAXIMUM OF 0.060 IN. (1.524 MM) ABOVE OUTSIDE OF PART AFTER NUT IS TIGHTENED.
3. LONGITUDINAL LINK DETAILS ROTATED FOR CLARITY.
4. MUST BE PULLED OUT FIRST TO REMOVE BELLCRANK.
5. PART MAY BE EITHER MAGNESIUM OR ALUMINUM ALLOY. (FOR ALLOY IDENTIFICATION AND CORROSION CONTROL, REFER TO SECTION 20-40-00).
6. INSTALL BUSHING AFTER THE TWO AFT ATTACHING BOLTS WITHOUT EXCESSIVE MISALIGNMENT, 0.015 IN. (0.381 MM).
7. USING HS5079-2646 SHIMS, SHIM EQUALLY TO REMOVE GAP.

Figure 402. Controls Mixer - Assembly

(12). Position longitudinal control mixer link between longitudinal pitch idler and longitudinal pitch mixer bellcrank; check that two slotted bushings are in place. Install bolt, three washers (two under each nut), nut and cotter pin at each end of link.

(13). Position longitudinal link between longitudinal pitch mixer bellcrank bearings. Install attaching hardware.

NOTE: In the following step, ensure mixer links are not installed inverted and are installed in the correct position (Ref. Figure 402, View A).

(14). Position mixer links in stationary swashplate and lateral mixer bellcrank; check that slotted bushings are in place. Install attaching hardware.

(15). Place collective, lateral longitudinal control links (Ref. Figure 401) in mounting position; check that slotted bushing is in place. Install attaching hardware.

(16). Install air intake forward fairing.

(17). Check rigging of collective and cyclic controls.

5. Scissors

The scissors provide a movable connection between the rotating swashplate and main rotor hub.

6. Scissors Replacement

A. Scissors Removal

(Ref. Figure 401)

CAUTION Removal of all pitch control rods is recommended prior to scissors removal. Failure to observe this precaution could result in damage to pitch control rods, swashplate and/or hub. Ensure all rods are color-coded or marked so they will be reinstalled in the correct location.

(1). Disconnect lower end of pitch control rod that is in line with scissors link in rotating swashplate.

(2). Remove cotter pin, nut, washer, and bolt from each leg of scissors crank. Disconnect crank from hub lower shoe.

(3). Remove cotter pin, nut, washer, and bolt connecting scissors link to swashplate; remove scissors.

B. Scissors Installation

(Ref. Figure 401)

(1). Place scissors link in mounting position, chamfered edge of link must face outboard.

(2). Check that slotted bushing is in swashplate web and install attaching hardware. Torque nut to **15 - 20 inch-pounds (1.69 - 2.26 Nm)**.

CAUTION Scissors crank must be positioned (Ref. Figure 401) with decal up and proper direction towards lower side lugs.

NOTE: Ensure crank- to- hub lower shoe lugs are not preloaded.

(3). Position scissors crank on hub lower shoe lugs; install connecting hardware. Install bolts with bolt heads facing inward and a washer under head of bolt (Ref. Figure 401). Torque nuts to **30 - 60 inch-pounds (3.39 - 6.78 Nm)**.

NOTE: Shim washers may be required on shouldered bushing side of clevis.

(4). Position elastomer rings and lower end of pitch control rod in swashplate lug and install attaching hardware. (Nut is to be adjacent to bushing in swashplate.) Torque nut to **30 - 60 inch-pounds (3.39 - 6.78 Nm)**.

7. Scissors Link Replacement

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM103	Solid film lubricant

(1). Remove cotter pin, nut, washer and bolt that join link and crank.

(2). Remove two bushings from link only if replacement is necessary.

(3). Do not remove bearing from link, replace complete link if bearing is defective.

NOTE: Install new bushings using solid film lubricant (CM103); **do not use zinc chromate.**

(4). If bushings were removed at disassembly, install new bushings. After installation, dimension between outer faces of bushings should be 1.579-1.586 inches (4.011-4.028 cm).

(5). Align bore of link with bore of crank; install bolt, washer and nut. Torque nut to **30 - 40 inch-pounds (3.39 - 4.52 Nm)**; install cotter pin.

8. Pitch Control Rods

Six pitch control rods transfer pitch control from the rotating swashplate to the main rotor blades.

9. Pitch Control Rod Replacement

A. Pitch Control Rod Removal

(Ref. Figure 401)

NOTE:

- If rod is not to be reinstalled, but is to be replaced, measure and record length of removed link. Optimum length may have been changed at previous rigging; pre-adjust replacement link to length of link removed.
- Rods are color coded for reinstallation at correct locations. If more than one rod is being removed and color coding is not visible, identify each by color or similar means to points of connection to simplify reinstallation.

(1). Remove cotter pin, nut, washer and bolt from each end of pitch control rod.

(2). Remove pitch control rod and O-ring.

B. Pitch Control Rod Installation

(Ref. Figure 401)

CAUTION At installation, install rod at correct color code location. Center bearing rodends between attach clevis. If rod length is changed, blades must be tracked.

(1). If actual rod length is incorrect or either actual or required rod length is unknown, preset link length to optimum length of **<u>6.25 inches (15.88 cm)</u>**.

NOTE: Install both pitch change rod bolts in direction of rotation.

(2). Install rod with elastomeric rings on both sides of lower bearing.

NOTE: Add washers as required to align nut with cotter pin hole.

(3). Torque upper nut to **100 - 130 inch-pounds (11.30 - 14.69 Nm).**

NOTE: Bushing must project 0.010-0.060 inch (0.254-1.524 mm) after nut is torqued.

(4). Torque lower nut to **30 - 60 inch-pounds (3.39 - 6.78 Nm)**.

(5). Secure nuts with cotter pins.

(6). Rotate pitch control rod assembly fore and aft to ensure clearance exists between rod end bearing and pitch housing clevis at both ends.

(7). If installation is final and tracking is not required, safetywire rod ends to rod; ensure rod ends are centered.

(8). As necessary, repeat above procedures for remaining pitch control rods.

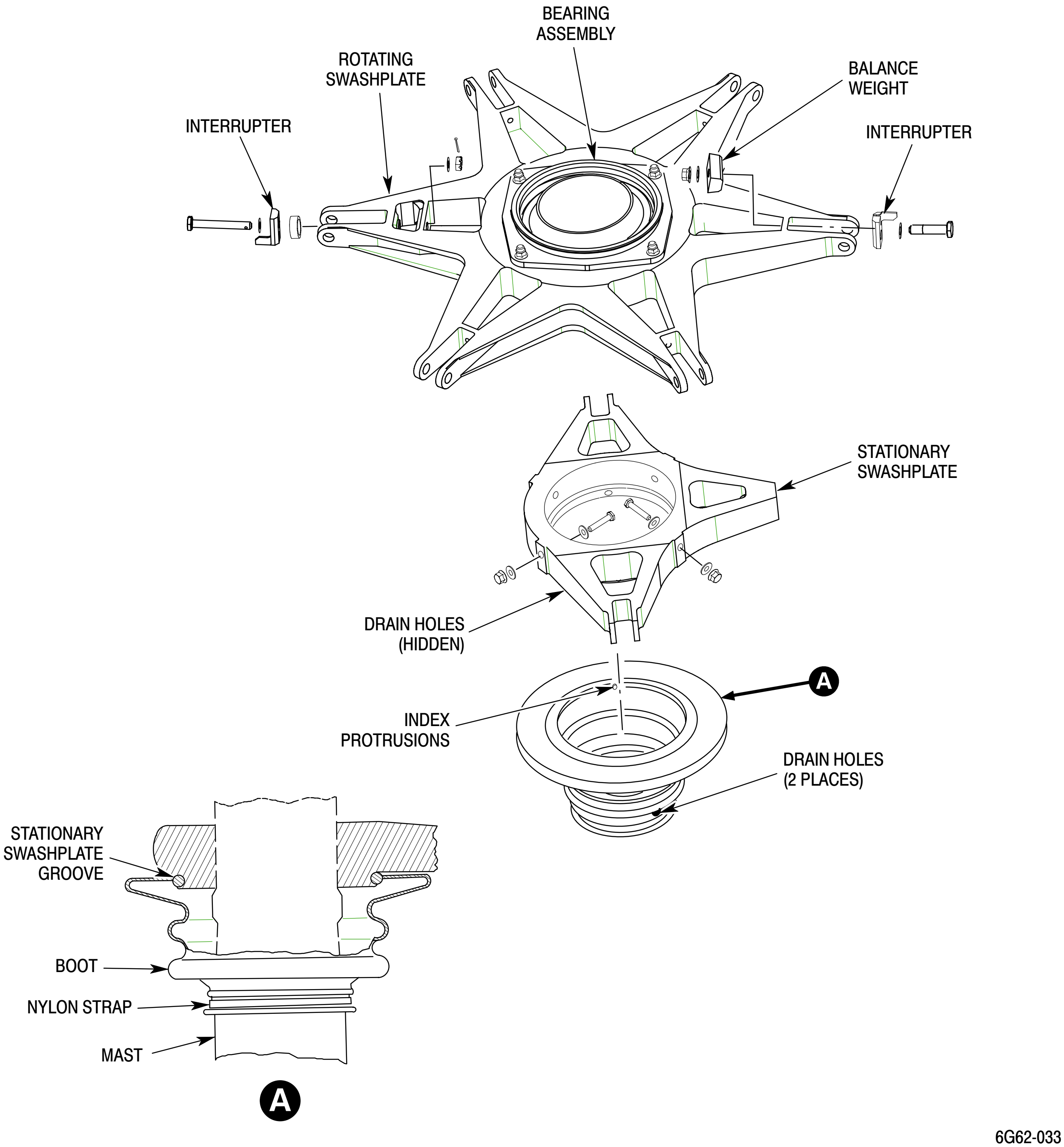


Figure 403. Main Rotor Swashplate

SWASHPLATE AND MIXER INSPECTION/CHECK

1. Swashplate Inspection

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM217	Isopropyl alcohol

CAUTION When cleaning swashplate for inspection, prevent solvent from entering either spherical ball bearing or double row ball bearing. Use cloth moistened in alcohol (CM217) to wipe clean spherical ball, ball bore liner and exterior of double row ball bearing.

NOTE:

- Stationary swashplate may be constructed of either magnesium or aluminum alloy. For corrosion control and identification of magnesium and aluminum alloys (Ref. Sec. 20-40-00).
- In the following inspection, the rotating and stationary swashplates must be disconnected (Ref. Swashplate and Mixer Removal/Installation).

(1). Inspect swashplate bearing assembly (Ref. Figure 403 for evidence of binding in either radial or axial movement.

(2). Inspect teflon liners for condition.

(3). Ensure that all flexible rubber seals enclosing ball bearing races are in place; inspect for deterioration and indication of grease leakage. (For bearing maintenance information (including lubrication), Ref. COM).

NOTE: New swashplate bearing assembly normally shows some signs of grease leakage for first 10-15 hours of operation after installation.

(4). Inspect swashplate spherical ball and double row ball bearing for radial or axial play.

(a). Maximum radial play between sliding surface liner and stationary mast is 0.020 inch (0.508 mm).

(b). Maximum axial play between spherical ball and teflon liner is 0.010 inch (0.254 mm).

(c). If play is suspected in double row ball bearing, turn rotating swashplate until arms line up with those of stationary swashplate and check motion between arms at control bolt in stationary swashplate.

(d). Maximum total vertical movement of 0.015 inch (0.381 mm) is allowable.

(e). If movement limit is exceeded replace double row ball bearing (Ref. COM).

(5). Inspect swashplate spherical and double row ball bearings for condition.

(a). Nicks and dents that do not deform ID chamfered edge of hard anodized ball, and not more than 0.10 inch (0.254 mm) deep along spherical ball surface from edge are allowed.

(b). Scratches, any length, on OD of spherical ball are allowed if they are no deeper than 0.010 inch (0.254 mm) or wider than 0.060 inch (1.524 mm).

(c). Not more than two scratches are permitted in a one inch wide area.

(6). Check existing preload on spherical bearing.

(a). Hook spring scale over one of the bolts securing stationary swashplate to the bearing flange.

(b). With stationary swashplate in motion, drag should be no more than **30 pounds (13.61 kg)**. (Use average of four readings taken 90 degrees apart).

(c). If readings are more than **30 pounds (13.61 kg)**, clean spherical bearing with isopropyl alcohol and recheck drag.

(d). Repair damage or replace bearings (Ref. COM).

(7). Check double row ball bearing for serviceability, with seals in place and unbroken.

(a). Check for correct operation and lubrication.

(b). Bearing must rotate smoothly, without roughness. Binding or catching should not exist when bearings are rotated 360°.

(c). Replace defective double row ball bearings (Ref. COM).

(8). Perform careful visual inspection of stationary and rotating swashplate for cracks, wear in bolt and bushing bores, and fork inner surfaces; and for corrosion, nicks and dents.

(9). Perform dye penetrant check on questionable areas.

(10). Check that counterweights are securely bonded in rotating swashplate.

2. Mixer Controls Inspection

(Ref. Figure 402)

(1). Inspect all bushings for security of fit.

(2). Inspect longitudinal link, support bracket, longitudinal control mixer link, mixer links, longitudinal pitch idler, longitudinal pitch mixer bellcrank, lateral bellcrank and collective pitch mixer bellcrank for scratches, cracks, corrosion and similar surface defects. For components that are questionable, perform fluorescent dye penetrant inspection.

(3). Inspect spherical, teflon (or equivalent) lined, bearings in longitudinal link, mixer link, and longitudinal control mixer link for binding, play in link bore and wear. Wear limit is 0.008 inch (0.203 mm) radially and 0.040 inch (1.016 mm) axially. Replace complete mixer link if bearings are faulty. Inspect bearings in other linkage for binding and looseness in mating bores.

3. Scissors Inspection

(Ref. Figure 401)

WARNING **Any evidence of failure, damage, or deformation of crank or link is justification for replacement of either crank, link, or complete scissors assembly. Failure of any of these components in flight can result in failure of movable flight controls, loss of helicopter, and possible injury or loss of life.**

(1). Inspect crank and link for evidence of impact damage and deformation. If condition is questionable, perform fluorescent dye penetrant inspection.

(2). Inspect bearings for binding, looseness in bore and wear. Maximum wear limits are 0.010 inch (0.254 mm) radial and 0.020 inch (0.508 mm) axial.

4. Pitch Control Rod Inspection

(Ref. Figure 401)

CAUTION Ensure that rod end bearings are centered and do not contact attach clevis.

(1). Visually inspect upper and lower rod end bearings for evidence of excessive axial play, 0.040 inch (1.016 mm) maximum; and for any extrusion, displacement or damage to the bearing teflon liner.

(2). Replace rod end bearing if discrepancies are noted.

SWASHPLATE AND MIXER REPAIRS

1. Swashplate Repairs

(Ref. Figure 403) Disassembly other than as illustrated is considered a part of swashplate overhaul (Ref. COM). If tracking interrupters are to be removed, mark them for reinstallation at original locations.

2. Mixer Controls Repair

(Ref. Figure 402)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM321	Surface primer locking compound
CM431	Sealing, locking and retaining compound
CM802	Abrasive cloth, aluminum oxide

NOTE: Following depth limits are total limits, including effects of all previous repairs to any given area.

(1). Repair minor surface defects such as scratches, nicks and corrosion using abrasive cloth (CM802), grade 400 - 600 to smooth out and blend in such defects.

(2). Cast and forged surfaces may be reworked to depth of 0.020 inch (0.508 mm).

(3). Flat machined surfaces, except clevis inner ears, may be reworked to depth of 0.015 inch (0.381 mm). Clevis inner ear surfaces may be reworked to depth of 0.020 inch (0.508 mm).

(4). Machined holes may have 0.003 inch (0.076 mm) removed from bore wall in an area no greater than 15 percent of circumference and 50 percent of depth.

(5). All edges may have 0.030 inch (0.762 mm) removed except around machined holes which are limited to 0.010 inch (0.254 mm) chamfer.

(6). All rework must be smoothly blended into adjacent surfaces and finish must be restored on magnesium and aluminum parts.

(7). Replace defective bearings and bushings, except swaged spherical bearings in mixer links which require link replacement. Remove bearings or bushings by pressing them out. Install new bearing with surface primer and grade A locking compound (CM321 and CM431).

NOTE: Left-hand bearing in support bracket is not supplied as part of bracket. This bearing is installed at time support bracket and longitudinal pitch idler are assembled. Install new bearing by seating flush with inner face of support bracket flange.

3. Scissors Bushing and Bearing Replacement

(Ref. Figure 401)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM103	Solid film lubricant
CM222	1,1,1-Trichloroethane
CM318	Primer
CM321	Surface primer locking compound
CM431	Sealing, locking and retaining compound

(1). Remove cotter pin, nut, washer, and bolt that join link and crank.

(2). Remove two bushings from link only if replacement is necessary.

(3). Do not remove bearing from link. Replace complete link if bearing is defective.

(4). Remove slotted bushings and bearings from crank, only if replacement is necessary.

CAUTION During cleaning, do not allow solvent to enter bearings.

(5). Install new bushings using solid film lubricant (CM103); **do not use zinc**

chromate. Press in bushing until end is flush with inside surface of crank inboard ears.

(6). If bearings were removed from crank at disassembly, reinstall using the following procedure:

NOTE: Do not allow sealant to enter bearing race.

(a). Clean bearing outer face, counterbore and faying surfaces with trichloroethane (CM222). Do not allow trichloroethane to enter bearing.

(b). Coat the faying surfaces with surface primer (CM321) as per manufacturer's instructions.

(c). Apply locking compound (CM431) to faying surfaces.

(d). Press bearing until outer face is seated firmly against shoulder of counterbore.

(e). Remove excess sealant. Do not allow sealant to enter bearing race.

(f). Apply a small fillet of sealant to the faying edges of bearing housing. Use cellophane or masking tape to exclude air and allow sealant to cure for 24 hours at ambient temperature or force cure by heating to 140°-160 °F (60°-72 °C) for one hour prior to use of assembly.

(7). If bushings were removed from link at disassembly, install new bushings. After installation, dimension between outside faces of bushings should be 1.579-1.586 inches (4.0107-4.0284 cm).

(8). Align bore of link with bore of crank; install bolt, washer and nut. Torque nut to **30 - 40 inch-pounds (3.39 - 4.52 Nm)**.

Chapter

63

Transmission and Drive System

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Section

63-00-00

Transmission and Drive System (369D/E/FF - 500/600N)

TRANSMISSION AND DRIVE SYSTEM FAULT ISOLATION

1. Power Train System

(Ref. Figure 101) The power train system, starting at the engine power takeoff pad, consists primarily of the overrunning clutch, drive shafts, and transmissions.

2. Power Train System Troubleshooting

(Ref. Table 101) Diagnose and repair power train system malfunctions using procedures as follows.

Table 101. Troubleshooting Power Train System

Symptom	Probable Trouble	Corrective Action
Main drive shaft vibrates excessively. (For serviceability limits, refer to Section 63-10-00).	Coupling flange bolts on main drive shaft are loose.	Retorque bolts to **50 - 70 inch-pounds (5.65 - 7.91 Nm)**.
Excessive noise or vibration in cooling blower.	Defective impeller or damaged scroll.	Replace impeller or scroll (Ref. Sec. 63-21-00).
Main drive shaft turns erratically or not at all.	Defective overrunning clutch.	Replace overrunning clutch (Ref. Sec. 63-10-00).
Main transmission requires frequent addition of oil.	Leakage at main transmission input or output seals.	If leakage is found at input shaft or tail rotor shaft, replace seal according to instructions (Ref. COM). If leakage is at main rotor drive shaft, replace transmission (Ref. Sec. 63-20-00).
	Oil leak around accessory drive cover.	Tighten cover or replace transmission (Ref. Sec. 63-20-00).
Oil temperature warning light comes on when oil temperature is normal.	Defective oil temperature sender.	Replace oil temperature sender (Ref. Sec. 63-21-00).
Oil temperature warning light comes on when oil temperature is abnormally high.	Defective cooling blower.	Repair or replace cooling blower (Ref. Sec. 63-21-00).
	Low or high oil level in transmission.	Establish correct oil level (Ref. Sec. 12-00-00).
	Defective lubrication pump.	Replace pump (Ref. COM).
	Defective oil cooler bypass valve.	Replace valve. (Ref. Sec. 63-21-00).
	Defective bearings or gears.	Replace transmission (Ref. Sec. 63-20-00).

Table 101. Troubleshooting Power Train System (Cont.)

Symptom	Probable Trouble	Corrective Action
NOTE: Noise that indicates a defective transmission should not be confused with normal gear backlash noise at rundown or low rpm and power conditions.		
Excessive noise in main transmission.	Inadequate oil supply.	Service main transmission (Ref. Sec. 12-00-00).
	Defective bearings or gears.	Replace transmission (Ref. Sec. 63-20-00).
Oil pressure warning light (low oil pressure) remains lighted at above 55% N_2.	Low oil in main transmission.	Service main transmission (Ref. Sec. 12-00-00).
	Defective oil pressure switch.	Replace oil pressure switch (Ref. Sec. 63-21-00).
	Defective lube pump.	Replace lube pump (Sec. 63-20-00).
	Filter clogged.	Replace filter (Ref. Sec. 63-21-00).
369F5100 Transmission impending bypass indicator popped.	Filter clogged.	Reset indicator. On second pop-up, replace filter (Ref. Sec. 63-21-00).
	Defective differential pressure indicator.	Replace differential pressure indicator (Ref. COM).
369F5100 Transmission impending bypass indicator popped in less than 100 hours since filter change.	Defective differential pressure indicator.	Replace differential pressure indicator (Ref. COM).
Tail rotor drive shaft damper vibrates.	Damper out of adjustment.	Adjust damper (Ref. Sec. 63-15-00).
	Damper defective.	Replace damper (Ref. Sec. 63-15-00).
	Tail rotor drive shaft bent or dented.	Replace defective drive shaft (Ref. Sec. 63-15-00).
	Tail rotor out of balance.	Adjust tail rotor balance (Ref. Sec. 18-10-00).
Tail rotor transmission output shaft vibrates.	Worn or damaged bearing or gear in tail rotor transmission.	Replace tail rotor transmission (Ref. Sec. 63-25-10).
	Excessive shaft wobble or end play (Ref. Sec. 63-15-10).	Replace tail rotor transmission (Ref. Sec. 63-25-10).
Excessive noise in tail rotor transmission.	Inadequate oil supply.	Service tail rotor transmission (Ref. Sec. 12-00-00).
	Defective bearings or gears in tail rotor transmission.	Replace tail rotor transmission (Ref. Sec. 63-25-10).

Table 101. Troubleshooting Power Train System (Cont.)

Symptom	Probable Trouble	Corrective Action
Chip detector caution light on.	Metallic chips in either main transmission, fan transmission or tail rotor transmission.	Inspect and clean chip detector magnetic plugs. If there are heavy chip deposits (chips larger than 1/8 inch in any direction), replace transmission. If chips are smaller, drain and refill transmission with new oil. Reinstall chip detector and check after four hours of flight. If more chips are found, replace transmission (main - Sec. 63-20-00 or 63-20-25; tail rotor - Sec. 63-25-10; fan - 63-25-30).
Chip detector caution light is on, but no chips are on detector.	Defective chip detector circuit components.	Troubleshoot chip detector circuit (Ref. CSP-HMI-3).
NOTE: High frequency vibrations in helicopter can also be caused by components in other systems.		
High frequency vibrations.	Loose tail rotor drive shaft coupling(s).	Tighten coupling bolts (Ref. Sec. 63-15-00).
	Tail rotor drive shaft coupling shimmed improperly.	Shim correctly (Ref. Sec. 63-15-00).
	Loose, mismatched or bottomed hardware retaining tail rotor drive shaft coupling to main transmission.	Tighten or install correct hardware and be sure hardware is installed correctly (Ref. Sec. 63-15-00).
	Cooling blower impeller has cracks, loose rivets, defective blades or other damage.	Replace impeller (Ref. Sec. 63-21-00).
	Tail rotor drive shaft damper out of adjustment.	Adjust damper friction (Ref. Sec. 63-15-00).
	Defective overrunning clutch.	Replace overrunning clutch (Ref. Sec. 63-10-00).
	Tail rotor drive shaft damaged.	Replace shaft (Ref. Sec. 63-15-00).
Abnormal drag in drive system.	Excessive drag in main transmission.	Replace transmission (Ref. Sec. 63-20-00).
NOTE: Drag is excessive when force required to rotate transmission input shaft exceeds 25 inch-pounds (2.82 Nm) with all shafting disconnected and transmission temperature between 50°F (10°C) and 100°F (38°C).		

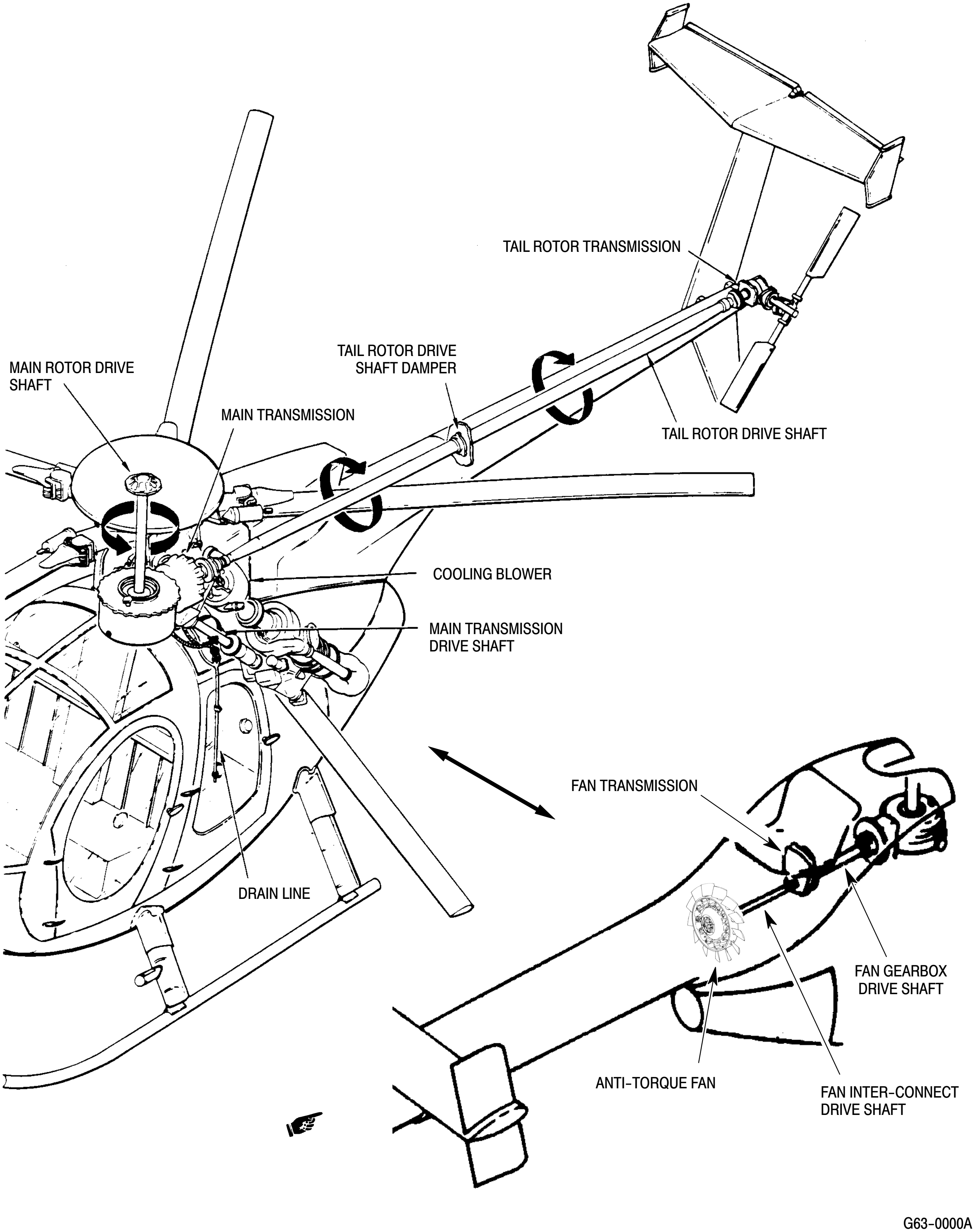


Figure 101. Power Train System

Section

63-10-00

Drive Shafts / Clutches / Couplings (369D/E/FF - 500/600N)

DRIVE SHAFTS / CLUTCHES / COUPLINGS REMOVAL/INSTALLATION

1. Main Rotor Drive Shaft

The main rotor drive shaft is a shot-peened, steel alloy forging having a nitrided spline at one end that mates with the transmission output shaft, and a flanged opposite end that attaches to the rotor hub with seven bolts and three eyebolts.

2. Main Rotor drive Shaft Replacement

(Ref. Figure 401)

CAUTION When removing or installing the main rotor drive shaft external-wrenching bolts or eyebolts, always hold bolts stationary while installing or removing nuts. Never turn external- wrenching bolts or eyebolts while inserting or removing from drive shaft holes.

A. Main Rotor Drive Shaft Removal

CAUTION Main rotor drive shaft is a highly stressed part. Do not allow tools to strike shaft, or shaft to strike any object. Any impact damage may require replacement of drive shaft.

(1). Remove main rotor fairing.

(2). Remove seven external-wrenching bolts; and associated hardware. Lift off main rotor fairing support and remove seven spacers.

CAUTION Any time drive shaft is removed, cover opening in top of main rotor hub to prevent possible entry of foreign matter into hub, mast and transmission.

NOTE: If special washers between fairing support and drive shaft dome are not bonded to the underside of fairing support, remove washers before proceeding.

(3). Remove three eyebolts and associated hardware and lift drive shaft clear of main rotor hub.

B. Main Rotor Drive Shaft Installation

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST704	Adapter, torque wrench

CAUTION Damage to main rotor drive shaft or transmission splines can occur during installation. Care should be taken while meshing driveshaft splines into transmission output splines to prevent damage.

(1). Slowly and carefully lower drive shaft through main rotor hub and mast until rotor shaft splines and transmission shaft splines engage.

(2). Rotate hub to align holes in flange with holes in drive shaft.

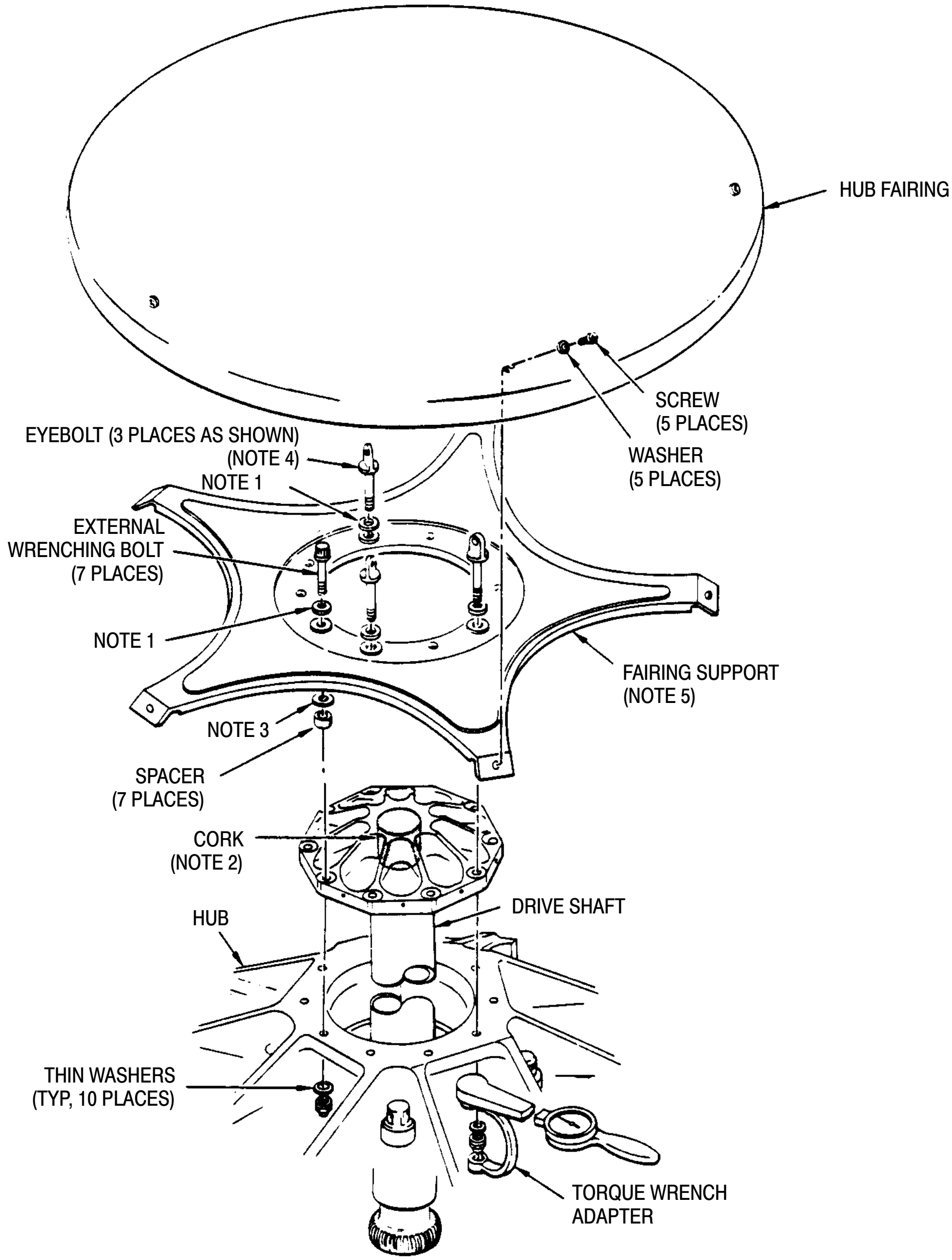
(3). Install three eyebolts, washers, and nuts. Using torque wrench adapter (ST704), torque nuts to **120 - 140 inch-pounds (13.56 - 15.82 Nm)**.

(4). With fairing support spacers and special washers in place, position main rotor fairing support so that eyebolt shoulders are inserted in large holes in fairing support. Make certain that support extensions are between pitch housings.

(5). Install seven external-wrench bolts, seven washers and nuts as in step (3). above.

NOTE: Phillips screws, used to attach main rotor hub fairing, may be replaced with hex head Phillips screws (PN NAS1096- 3- 10) and washers (PN HS306- 223). The hex head will make torquing the screws easier.

(6). Install main rotor fairing with five screws. Torque screws to **20 - 25 inch-pounds (2.26 - 2.82 Nm)**.



369D/E/FF – 500N INSTALLATION

NOTES:
1. INSTALLED WITH COUNTERSINK NEXT TO BOLT HEAD, WASHERS UNDER NUT ARE FLAT.
2. INSTALLED WITH SEALING COMPOUND.
3. MAY BE BONDED TO FAIRING SUPPORT.
4. WHEN INSTALLING EYEBOLTS, ENSURE FAIRING SUPPORT ARMS ARE NOT POSITIONED OVER PITCH HOUSINGS.
5. THREE HOLES IN FAIRING SUPPORT ARE LARGER TO GO OVER EYEBOLTS AND TO AID IN FAIRING SUPPORT ALIGNMENT.

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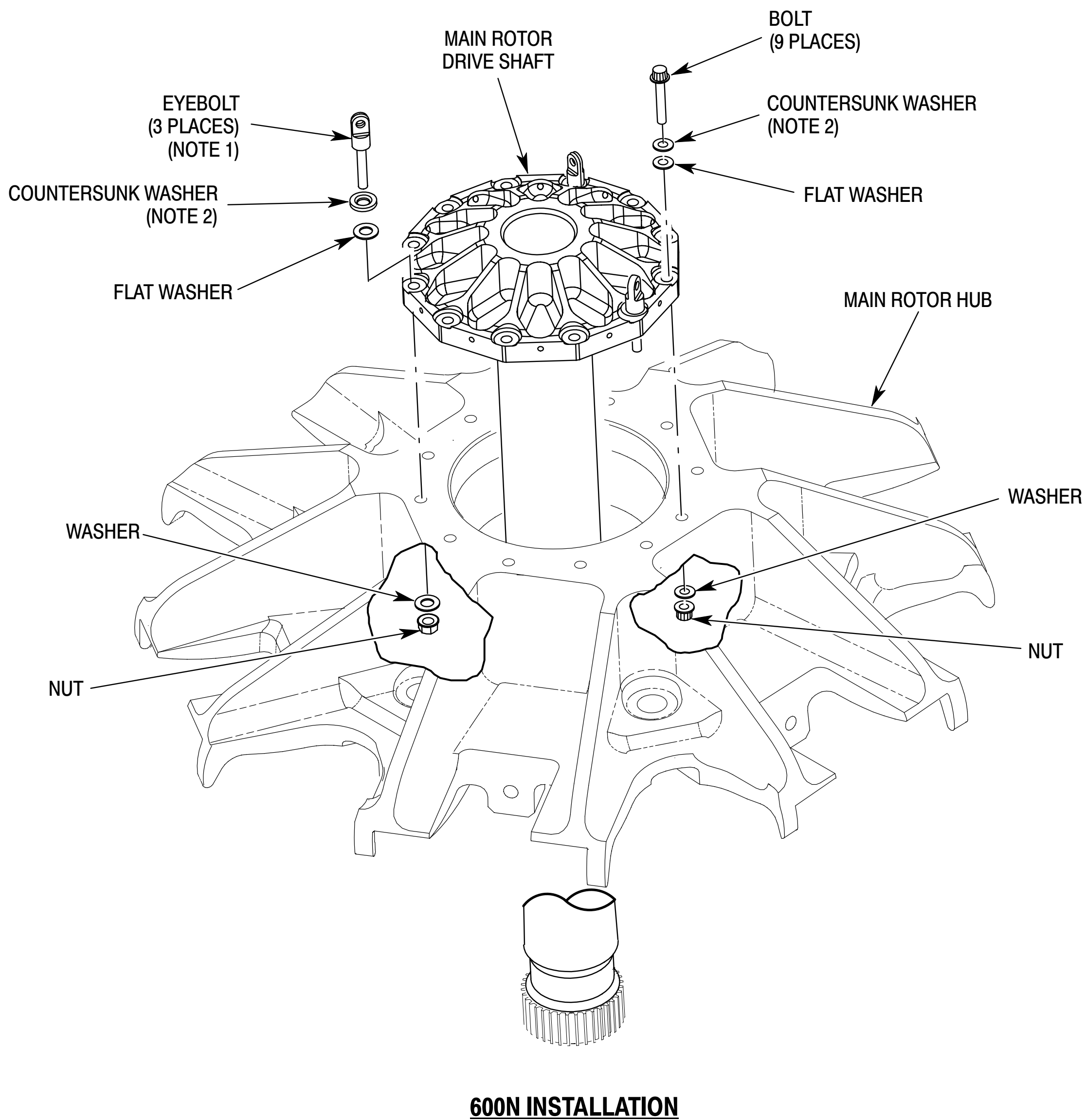
Figure 401. Main Rotor Drive Shaft Installation (Sheet 1 of 2)



NOTES:
1. ALIGN HOLES IN EYE BOLTS TO MATCH HOISTING ADAPTER.
2. COUNTERSINK IN WASHER TO FACE BOLT HEAD.

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Figure 401. Main Rotor Drive Shaft Installation (Sheet 2 of 2)

3. Main Transmission Drive Shaft

The main transmission drive shaft is equipped with a flexible diaphragm-type joint and mounting flange (coupling) at each end. The shaft connects the overrunning clutch and the transmission input shaft.

4. Main Transmission Drive Shaft Replacement

(Ref. Figure 402)

A. Main Transmission Drive Shaft Removal (Bendix and Kamatic)

(1). Remove sound insulation and main transmission access cover over main transmission drive shaft in cargo compartment.

(2). Remove eight bolts and washers that secure shaft to couplings.

(3). Remove drive shaft; use care to keep it from striking any object.

NOTE: Clutch oil level should be checked any time engine or main drive shaft is removed (Ref. Sec. 12-00-00).

B. Main Transmission Drive Shaft Installation (Bendix and Kamatic)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM111	Grease, aircraft
CM112	Anti-seize compound high temperature

(1). Check overrunning clutch for correct oil level, indications of oil seepage, drive shaft couplings for corrosion and that coupling bolt securing clutch coupling is torqued to:

(a). For 369A5350 clutch, **actual drag torque plus 250 - 300 inch-pounds (28.25 - 33.90 Nm)**. If bolt is not seated and/or existing torque is found to be less than **250 - 300 inch-pounds (28.25 - 33.90 Nm)**, ensure self-locking drag torque is not less than **25 inch-pounds (2.82 Nm)** before torquing bolt.

(b). For 36F5450 clutch, **actual drag torque plus 315 - 365 inch-pounds (35.59 - 41.24 Nm)**. If bolt is not seated and/or existing torque is found to be less than **315 - 365 inch-pounds (35.59 - 41.24 Nm)**, ensure self-locking drag torque is not less than **25 inch-pounds (2.82 Nm)** before torquing bolt.

CAUTION Compression of drive shaft diaphragms (static state) is limited to 0.020 inch (0.508 mm). Do not stress diaphragms by forcing drive shaft into position for installation in step (2). below.

NOTE: If original shaft and couplings are being reinstalled, a check of shimming as described below is not necessary. Install drive shaft to clutch and transmission couplings as described in steps (1). above and (4). below.

(2). Position drive shaft alongside transmission input and clutch couplings. If compression is required to fit shaft between couplings, continue with step (3). below. If there is a gap between drive shaft flanges and coupling flanges, continue with step (6). below.

NOTE: Removal or addition of shims should be accomplished at transmission input coupling only. Shims at overrunning clutch coupling are of predetermined thickness to prevent O-ring damage and oil leakage.

(3). Remove coupling bolt that secures transmission input coupling; remove coupling and shims.

CAUTION

- The 0.010 inch (0.254 mm) minimum measurement between the bolt seating surface and the input shaft must be obtained to ensure proper clamp up. Warped shims or foreign material could provide a false 0.010 inch (0.254 mm) minimum measurement and improper clamp up could result during normal operation which may damage the main transmission input shaft.

- Do not use clutch coupling shims under transmission input coupling. Inside diameter of clutch coupling shims, 1.260-1.270 inches (3.2004- 3.2258 cm), is approximately 0.070 inch (1.778 mm) larger than inside diameter of shims used at transmission coupling. Incorrect diameters can cause an improperly seated shim, misalignment and cocked coupling.

NOTE: Transmission input coupling shims are laminated stock. Each lamination is 0.002 inch (0.051 mm) thick. Peel to thickness required.

(4). Add sufficient shims to get a measurement of 0.010 inch (0.254 mm) minimum between bolt seating surface on coupling and transmission input shaft.

(5). Lubricate input shaft splines with grease (CM111). Coat bolt threads with anti-seize compound (CM112). Reinstall coupling and bolt. Check coupling bolt for minimum drag of **25 inch-pounds (2.82 Nm)**. Torque bolt to **250 - 300 inch-pounds (28.25 - 33.90 Nm) plus drag torque**.

(6). Attach drive shaft to clutch coupling with four bolts and washers. Torque bolts to **50 - 70 inch-pounds (5.65 - 7.91 Nm)**.

(7). Manually align drive shaft and transmission input coupling flanges:

(8). Using feeler gage, measure gap between flanges. Gap should be 0.010 inch (0.254 mm) gap to 0.020 inch (0.508 mm) compression.

(a). If gap is 0.010 inch (0.254 mm) or less, attach upper end of drive shaft to transmission input coupling with four bolts and washers. Torque bolts to **50 - 70 inch-pounds (5.65 - 7.91 Nm)**.

(b). If gap exceeds 0.010 inch (0.254 mm), repeat step (3). thru (5). above, except install thickness of shims equal to measured gap, plus thickness that results in not more than 0.010 inch (0.254 mm) gap between coupling and drive shaft nor more than 0.020 inch (0.508 mm) compression of flexible couplings. Install four bolts and washers and torque bolts to **50 - 70 inch-pounds (5.65 - 7.91 Nm)**.

(9). Install access door and sound insulation over main transmission drive shaft.

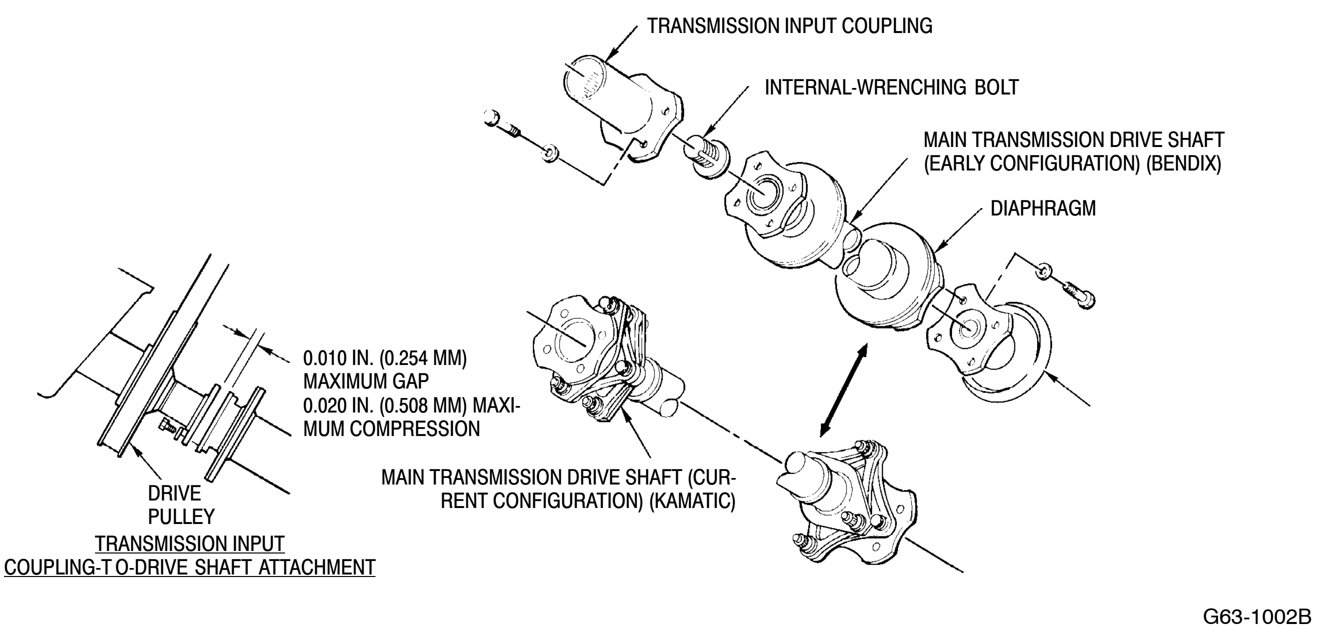


Figure 402. Main Transmission Drive Shaft Installation

5. Overrunning Clutch

The overrunning clutch transmits power from the engine to the main transmission drive shaft. The clutch disengages the engine from the remainder of the drive system in case of engine failure and during autorotations.

The clutch contains a sprag unit that disengages automatically when N_2 rpm is less than corresponding main rotor rpm.

Repair and overhaul information for the overrunning clutch can be found in COM.

6. Overrunning Clutch Replacement

(Ref. Figure 403 or Figure 404)

A. Overrunning Clutch Removal

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM208	Barrier material

NOTE: For removal of only the internal clutch subassembly as an alternative to complete clutch removal, refer to Overrunning Clutch Subassembly Removal.

(1). Remove engine.

(2). Remove bolts, washers, nuts and engine shaft firewall seal from clutch.

NOTE: Removal of clutch coupling from clutch is unnecessary unless clutch is being replaced.

(3). Remove coupling bolt, packing, clutch coupling and coupling shim(s). Keep shim(s) with coupling for reuse. Reinstall bolt and packing to prevent spillage of lubricating oil from clutch housing during final steps of removal.

(4). On 369F5450 clutch, remove output shaft cover plate from back of engine accessory drive to gain access to clutch bolt.

(a). Insert tool (Ref. Figure 405) to engage bolt in back of clutch.

(b). Insert a long 3/8 inch (9.525 mm) hex wrench, approximately 10 inches (25.4 cm) long, through tool and into back of clutch assembly.

(c). While holding internal hex wrench [3/8 inch (9.525 mm)], turn external hex wrench [1.00 inch (2.54 cm)] counter-clockwise to remove bolt from back of clutch.

(5). Remove nuts and washers that secure overrunning clutch; remove clutch.

(6). If clutch is being replaced, install spare coupling bolt and O-ring or suitable plug in output shaft (clutch inner race bore) to prevent contamination during clutch handling, shipping or storage.

NOTE: Operating lubricant is an approved preservative for shipping or storage.

(7). Wrap clutch in barrier material (CM208) to protect splined areas of shafts.

B. Overrunning Clutch Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM111	Grease, aircraft
CM112	Anti-seize compound high temperature
CM125	Oil
CM126	Oil, turbine

(1). If clutch is new, (369A5350 clutch only) drain preservative oil. Trapped oil can be removed by inverting clutch a minimum of three times. Add lubricating oil (CM125 or CM126) (Ref. Sec. 12-00-00). Temporarily install coupling bolt and packing.

NOTE: Relubricate splines on clutch input shaft and splines inside engine power and accessory gearbox with grease (CM111) prior to reinstalling overrunning clutch.

(2). Coat clutch splines and internal splines of engine power accessory gearbox with lubricant (CM111). Insert overrunning clutch outer-race spline into engine and install six washers and nuts. Torque nuts to **15 - 20 inch-pounds (1.69 - 2.26 Nm) plus drag torque**.

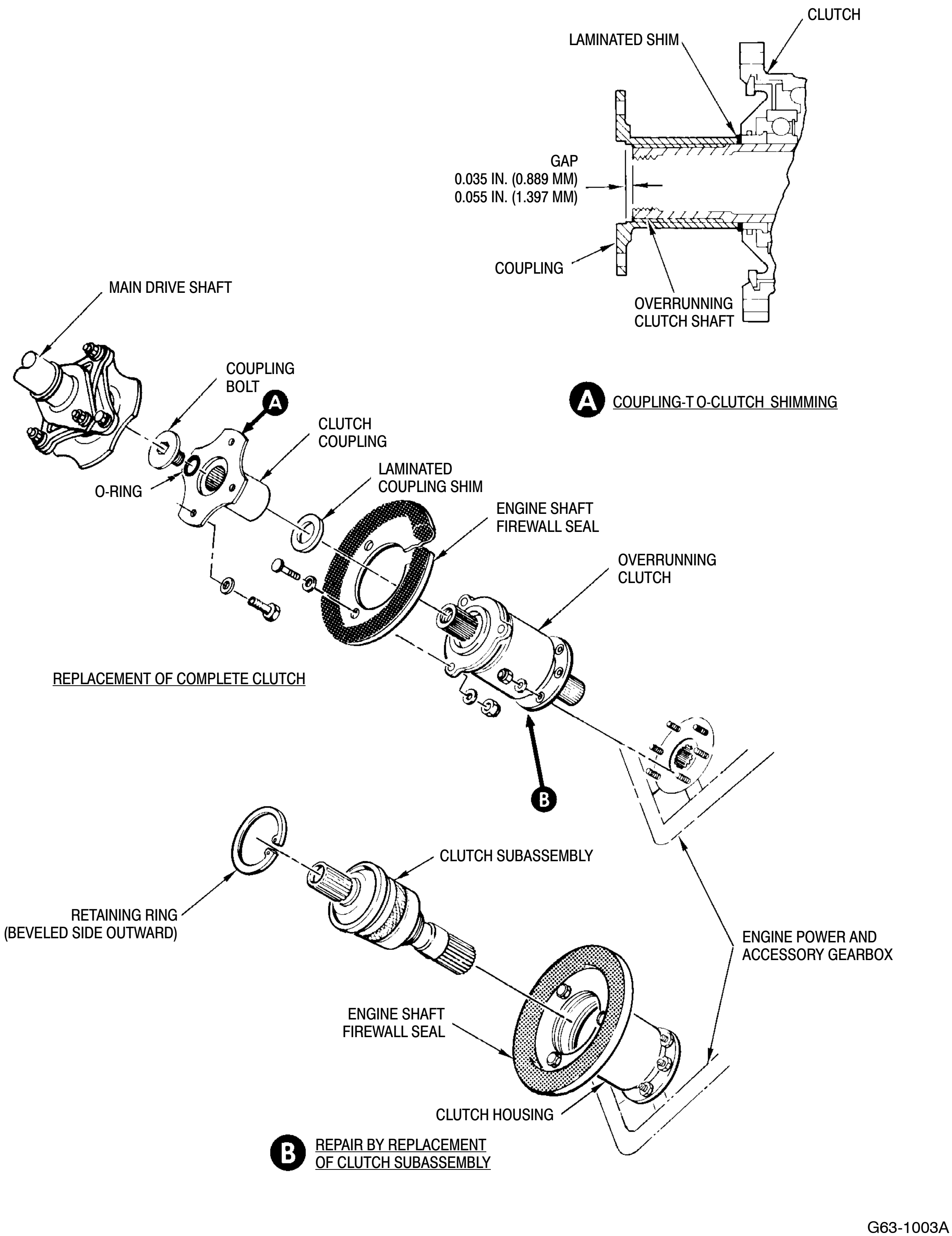


Figure 403. 369A5350 Overrunning Clutch Installation

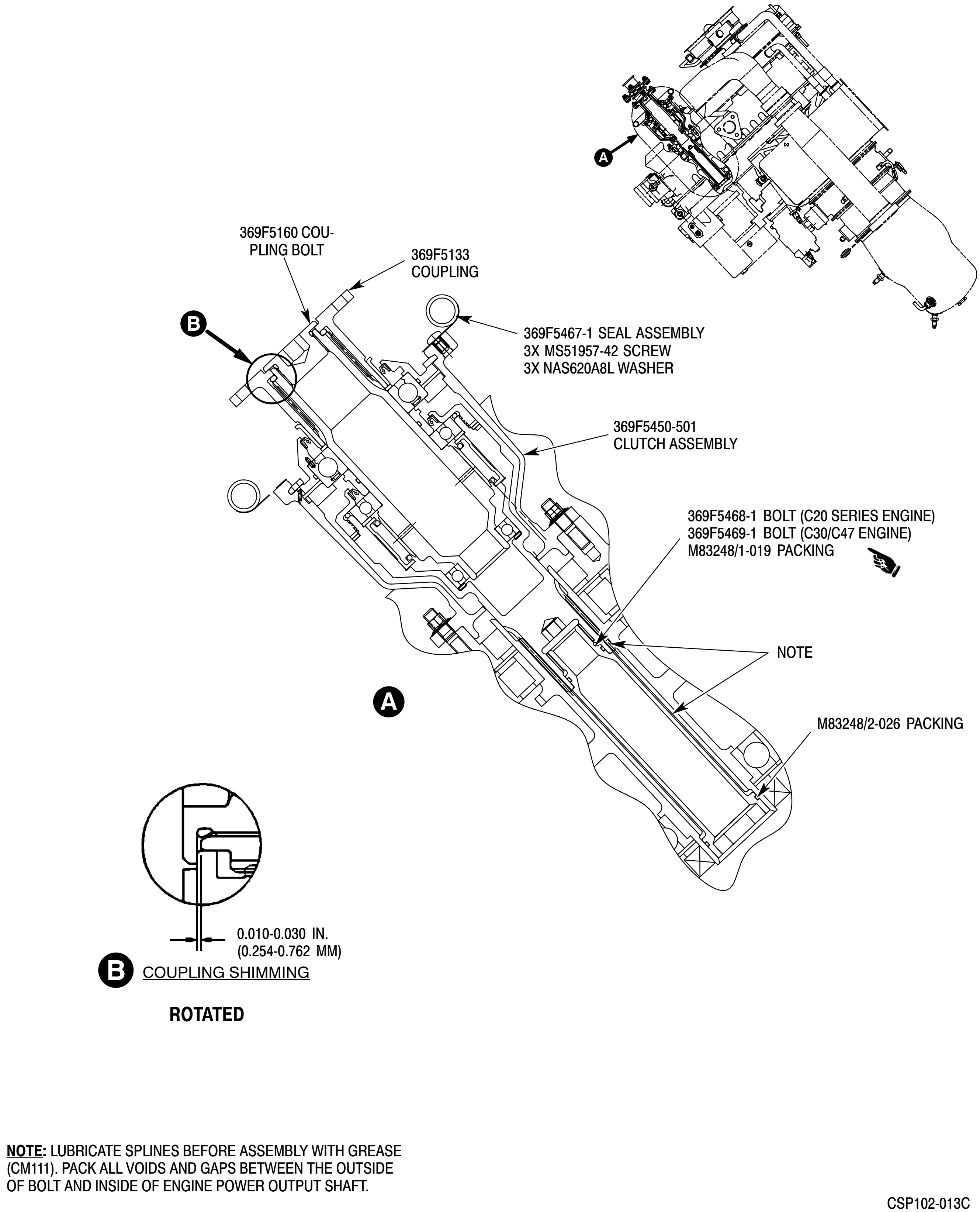


Figure 404. 369F5450 Overrunning Clutch Installation

(3). For 369F5450 clutch installation:

(a). Remove power output shaft cover plate from back of engine (Ref. Sec. 01-00-00, Allison Engine Operation and Maintenance Manual).

(b). Install O-rings on 369F5469 (C30/C47 engine) or 369F5468 (C20 series engines) bolt (Ref. Figure 404).

NOTE: Fill all voids and gaps between the outside of bolt and inside of engine shaft with grease.

(c). Lubricate internal spline area of engine output shaft with grease (CM111).

(d). Lubricate bolt threads with anti-seize compound (CM112) and insert through engine into overrunning clutch assembly.

(e). Using bolt removal tool (Ref. Figure 405) either hold output coupling to prevent overrunning clutch from turning or insert hex wrench through bolt to engage and hold clutch.

(f). Torque bolt to **250 - 300 inch-pounds (28.25 - 33.90 Nm) plus drag torque**.

(g). Using existing hardware, reinstall power output shaft cover plate on back of engine (Ref. Sec. 01-00-00, Allison Engine Operation and Maintenance Manual).

(4). Shim coupling on 369F5450 clutch assembly as follows:

(a). Remove output coupling bolt and coupling.

(b). Shim coupling to achieve 0.010-0.030 inch (0.254-0.508 mm) step above clutch output shaft.

(5). Shim coupling on 369A5350 clutch assembly as follows:

(a). Remove output coupling bolt and coupling.

(b). Shim coupling to achieve 0.035-0.055 inch (0.889-1.397 mm) step above clutch output shaft.

CAUTION When installing clutch coupling bolt, installation torque on the bolt must be **250 - 300 inch-pounds (28.25 - 33.90 Nm)** for the 369A5350 clutch or **315 - 365 inch-pounds (35.59 - 41.24 Nm)** for the 369F5450 clutch. Torquing to lower value reduces clutch bearing clamp-up and can result in bearing race spinning.

(6). Coat clutch-to-coupling splines with grease (CM111); install shim(s) and clutch coupling. Coat coupling bolt threads with anti-seize compound (CM112); install bolt with new O-ring. Check for bolt self-locking drag torque of **25 inch-pounds (2.82 Nm) minimum to 200 inch-pounds (22.60 Nm) maximum**. Replace bolt if torque values are exceeded.

(a). For 369A5350 clutch, torque coupling bolt to **actual drag torque plus 250 - 300 inch-pounds (28.25 - 33.90 Nm)**.

(b). For 36F5450 clutch, torque coupling bolt to **actual drag torque plus 315 - 365 inch-pounds (35.59 - 41.24 Nm)**.

(7). Install engine shaft firewall seal, bolts, washers, and nuts.

(8). Reinstall engine.

7. Overrunning Clutch Subassembly Replacement

(Ref. Figure 403 or Figure 404)

A. Overrunning Clutch Subassembly Removal

(1). Remove main transmission drive shaft.

(2). For 369F5450 clutch installation:

(a). Remove power output shaft cover plate from back of engine (Ref. Sec. 01-00-00, Allison Engine Operation and Maintenance Manual).

(b). Insert tool (Ref. Figure 405) to engage bolt in back of clutch.

(c). Insert a long 3/8 inch (9.525 mm) hex wrench, approximately 10 inches (25.4 cm) long, through tool and into back of clutch assembly.

(d). While holding internal hex wrench [3/8 inch (9.525 mm)], turn external hex wrench [1.00 inch (2.54 cm)] counter-clockwise to remove bolt from back of clutch.

(3). Remove coupling bolt, clutch coupling and shims.

(4). Remove retaining ring from clutch housing. Then pull complete clutch subassembly out of housing.

B. Overrunning Clutch Subassembly Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM111	Grease, aircraft
CM125	Oil
CM126	Oil, turbine

(1). Remove shipping plug and O-ring from end of shaft in replacement clutch subassembly.

(2). Drain preservative oil from clutch subassembly by inverting it several times. Add lubricating oil (CM125 or CM126) (Ref. Sec. 12-00-00).

(3). Coat clutch splines with grease (CM111).

(4). Using care to avoid oil spillage, insert clutch subassembly into clutch housing and install retaining ring with beveled side outward.

(5). Check fluid level of clutch assembly before installing clutch coupling (Ref. Sec. 12-00-00).

(6). For 369F5450 clutch installation:

(a). Remove power output shaft cover plate from back of engine (Ref. Sec. 01-00-00, Allison Engine Operation and Maintenance Manual).

(b). Install O-rings on 369F5469 (C30/C47 engine) or 369F5468 (C20 series engines) bolt (Ref. Figure 404).

NOTE: Fill all voids and gaps between the outside of bolt and inside of engine shaft with grease.

(c). Lubricate internal spline area of engine output shaft with grease (CM111).

(d). Lubricate bolt threads with anti-seize compound (CM112) and insert through engine into overrunning clutch assembly.

(e). Using bolt removal tool (Ref. Figure 405) either hold output coupling to prevent overrunning clutch from turning or insert hex wrench through bolt to engage and hold clutch.

(f). Torque bolt to **250 - 300 inch-pounds (28.25 - 33.90 Nm) plus drag torque**.

(g). Using existing hardware, reinstall power output shaft cover plate on back of engine (Ref. Sec. 01-00-00, Allison Engine Operation and Maintenance Manual).

(h). Lubricate coupling bolt threads with anti-seize compound (CM112).

(7). Install clutch coupling, shims and coupling bolt.

(8). Install main transmission drive shaft.

8. Overrunning Clutch-to-Firewall Seal

The overrunning clutch-to-firewall seal consists of a stamped steel backing and a seal bonded to the cupped diameter of the backing.

9. Overrunning Clutch-to-Firewall Seal Replacement

(Ref. Figure 403)

(1). Remove engine.

(2). Remove three bolts, six washers and three nuts that attach firewall seal to overrunning clutch.

(3). Position replacement clutch-to-firewall seal assembly on flange of clutch with seam orientated at the 6 o'clock position and secure with attaching hardware.

10. Main Transmission Drive Shaft Couplings

The main transmission drive shaft couplings connect the overrunning clutch to the drive shaft and the drive shaft to the main transmission.

11. Main Transmission Drive Shaft Coupling Replacement

(Ref. Figure 402)

A. Main Transmission Drive Shaft Coupling Removal

(1). Remove drive shaft; use care to keep it from striking any object.

(2). Remove coupling bolt from main transmission and overrunning clutch. Retain shim(s) with couplings for reinstallation.

B. Main Transmission Drive Shaft Coupling Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM111	Grease, aircraft
CM112	Anti-seize compound high temperature

CAUTION

- The 0.010 inch (0.254 mm) minimum measurement between the bolt seating surface and the input shaft must be obtained to ensure proper clamp up. Warped shims or foreign material could provide a false 0.010 inch (0.254 mm) minimum measurement and improper clamp up could result during normal operation which may damage the main transmission input shaft.
- Do not use clutch coupling shims under transmission input coupling. Inside diameter of clutch coupling shims, 1.260-1.270 inches (3.2004- 3.2258 cm), is approximately 0.070 inch (1.778 mm) larger than inside diameter of shims used at transmission coupling. Incorrect diameters can cause an improperly seated shim, misalignment and cocked coupling.

NOTE: Transmission input coupling shims are laminated stock. Each lamination is 0.002 inch (0.051 mm) thick. Peel to thickness required.

(1). Install previously removed shims or refer to Main Transmission Drive Shaft Installation for shim thickness calculation.

(2). Lubricate drive shaft splines with grease (CM111) and install in place. Coat bolt threads with anti-seize compound (CM112) and install.

(a). For 369D25100 transmission installation, torque coupling bolt to **actual drag torque plus 250 - 300 inch-pounds (28.25 - 33.90 Nm)**. If bolt is not seated and/or existing torque is found to be less than **250 - 300 inch-pounds (28.25 - 33.90 Nm)**, ensure self-locking drag torque is not less than **25 inch-pounds (2.82 Nm)** before torquing bolt.

(b). For 369F5100 transmission installation, torque coupling bolt to **actual drag torque plus 315 - 365 inch-pounds (35.59 - 41.24 Nm)**. If bolt is not seated and/or existing torque is found to be less than **315 - 365 inch-pounds (35.59 - 41.24 Nm)**, ensure self-locking drag torque is not less than **25 inch-pounds (2.82 Nm)** before torquing bolt.

(3). Reinstall main transmission drive shaft, main transmission access cover and sound insulation.

12. Tail Rotor Drive Shaft Coupling Replacement

A. Tail Rotor Drive Shaft Coupling Removal

(1). Remove tail rotor drive shaft (Ref. Sec. 63-15-10).

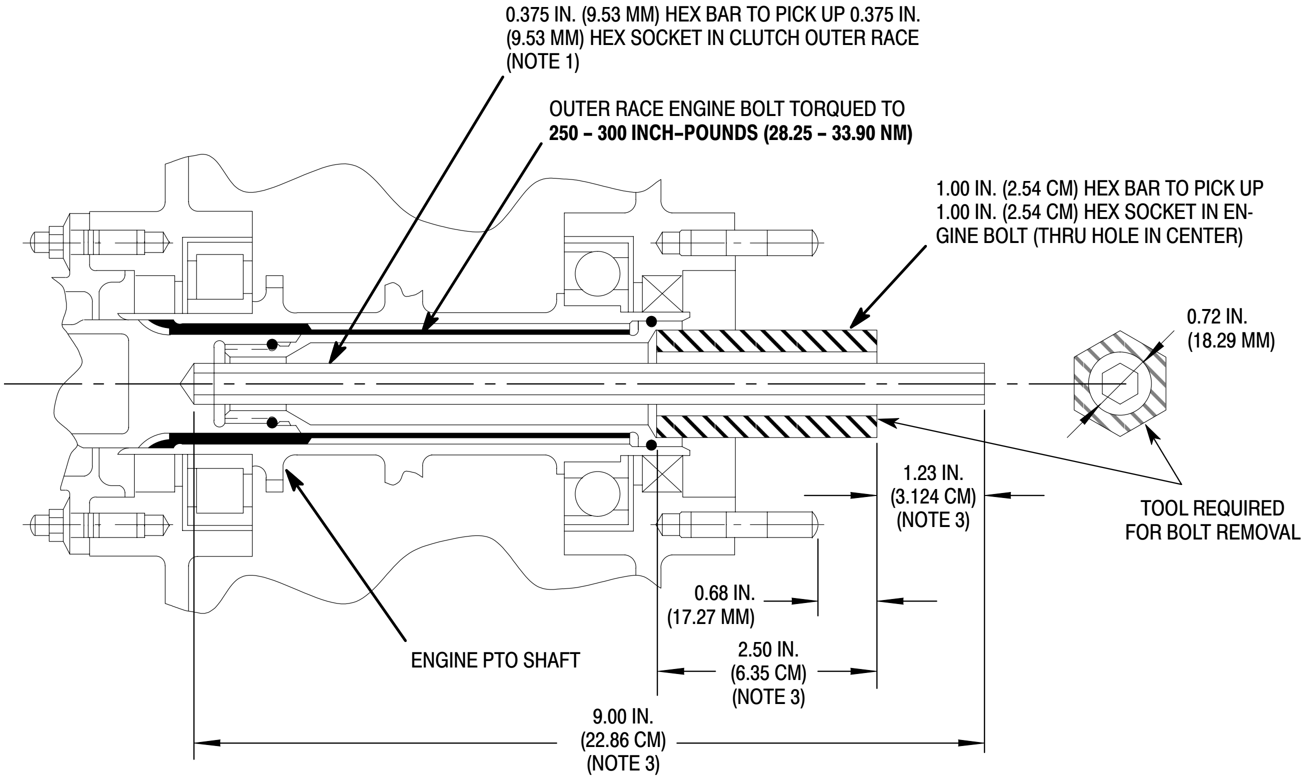
NOTE: With Bendix coupling installed, remove socket from main transmission coupling only if visual inspection reveals signs of contact between coupling bolt and socket.

(2). Remove couplings from main and tail rotor transmissions. Retain shims with couplings for reinstallation.

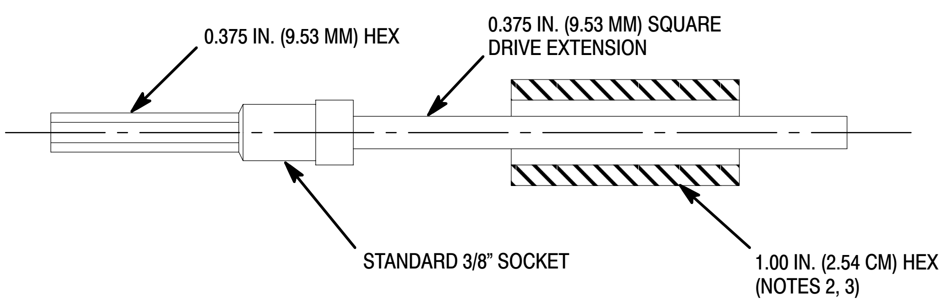
CAUTION Do not immerse Bendix flexible couplings in fluid or cleansers such as magnetic particle, fluorescent penetrant, visible dye etc. Do not apply corrosion protection fluids unless coupling has been cleaned with solvent or detergent. Apply any corrosion protection very sparingly to outside only.

B. Tail Rotor Drive Shaft Coupling Installation

According to type of coupling installed, installation of tail rotor shaft requires shimming of couplings, and in some instances, tail rotor gearbox-to-tailboom shimming (Ref. Sec. 63-15-10, Tail Rotor Drive Shaft Installation).



369F5450 CLUTCH ASSEMBLY



369F5468/5469 BOLT REMOVAL TOOL

NOTES:

1. HOLD HEX BAR STEADY WHEN TORQUING BOLT.
2. TOOL TO BE A MINIMUM OF 2.5 INCHES IN LENGTH TO CLEAR STUDS ON ENGINE.
3. THIS IS MINIMUM LENGTH, TOOL MAY BE MADE LONGER FOR EASE OF MAINTENANCE.

G63-1024A

Figure 405. 369F5468/5469 Bolt Removal Tool

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DRIVE SHAFTS / CLUTCHES / COUPLINGS INSPECTION/CHECK

1. 369D25510 Main Rotor Drive Shaft Inspection

(Ref. Figure 601)

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM234	Solvent, dry-cleaning
CM425	Sealing compound

(1). Inspect all surfaces of drive shaft for dents, nicks, scratches and evidence of deformation. No damage of any kind is permissible in the area within two inches of the spline. Dents less than 0.050 inch (1.270 mm) deep and 0.050 inch (1.270 mm) diameter are permissible in other areas. A dent is defined as a smooth depression of surface with no sharp edges or abrupt changes in contour. No nicks or scratches are permitted.

(2). If shaft condition is questionable, perform magnetic particle inspection according to Specification MIL-I-6868. No surface or subsurface defects are permissible.

(3). Inspect all external surfaces of shaft for corrosion.

(4). Remove cork plug and inspect shaft interior for corrosion. Remove light surface corrosion and pitting which can be removed without causing shaft ID to exceed 1.655 inches (4.2037 cm).

(5). Inspect splines on end of drive shaft for excessive wear by measuring distance across two 0.108 inch (2.7432 mm) diameter pins placed in opposite spline grooves. Dimension should be 2.2625 inches (5.74675 cm) minimum.

(6). Inspect shaft spline for cracks-using bright light and 5X to 10X magnifying glass.

(a). Thoroughly clean shaft spline with dry cleaning solvent (CM234) to remove oil, dirt and grease.

(b). Using magnifying glass and light, inspect spline for cracks. Pay particular attention to side of each tooth with large wear pattern (hairline cracks appear crescent-shaped usually at center bottom of tooth in root area).

(c). Inspect neck of spline (area where spline and shaft meet) for cracks.

(7). Check shaft straightness. When rotated between centers, run-out must not exceed 0.040 inch (1.016 mm) TIR (allowable dents excluded).

2. 600N5510 and 369F5510 Main Rotor Drive Shaft Inspection

(Ref. Figure 601 and Figure 602)

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM234	Solvent, dry-cleaning

CAUTION Anytime main rotor drive shaft is removed, cover opening at top of main rotor hub to prevent entry of any foreign material into hub, mast and transmission.

(1). Inspect overtorque verification stripe for straightness.

(2). Inspect all surfaces of drive shaft for dents, nicks, scratches and evidence of deformation. No damage of any kind is permissible in the area within two inches of the spline. Dents less than 0.050 inch (1.270 mm) deep and 0.050 inch (1.270 mm) diameter are permissible in other areas. A dent is defined as a smooth depression of surface with no sharp edges or abrupt changes in contour. No nicks or scratches are permitted.

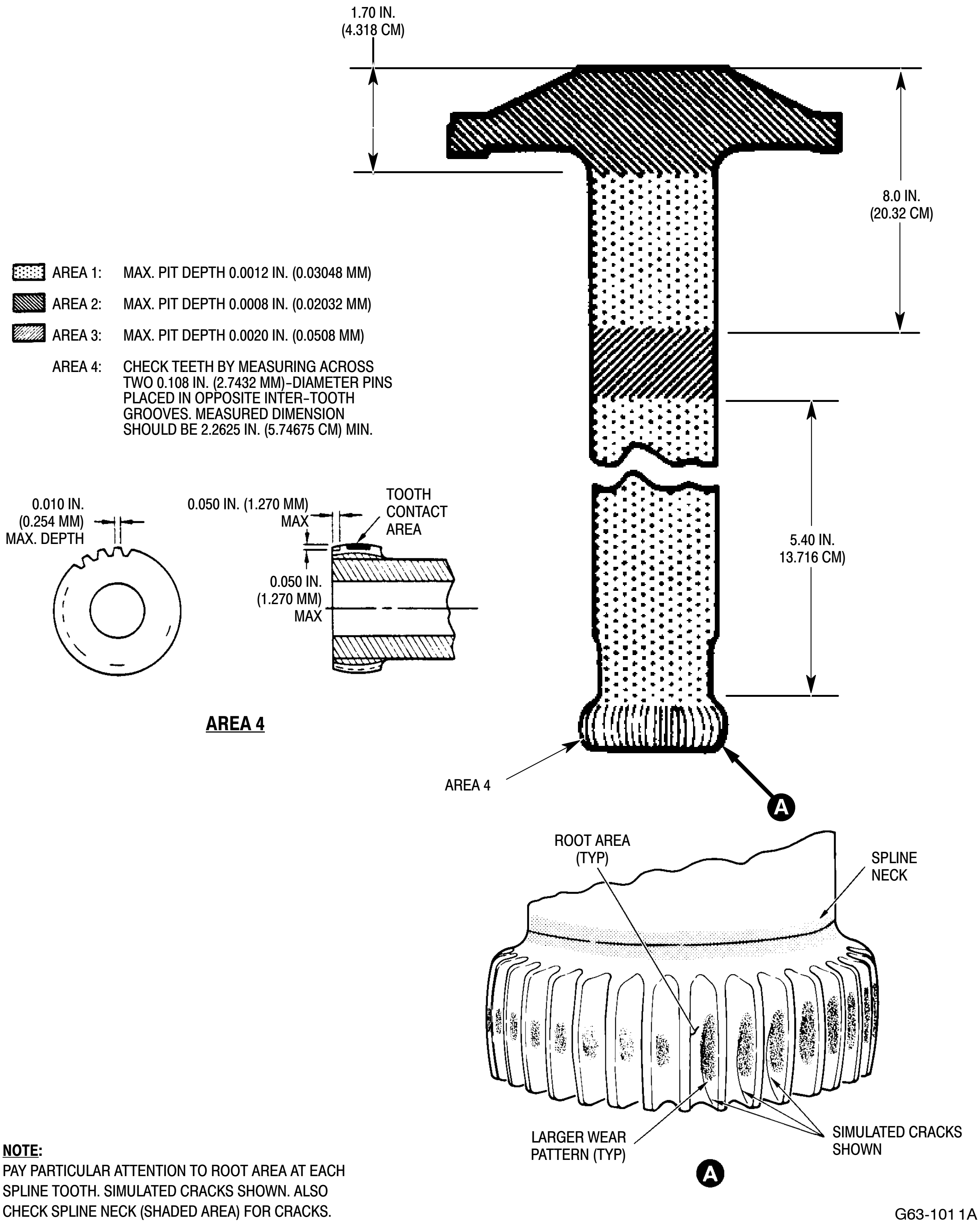


Figure 601. Main Rotor Drive Shaft Inspection

(3). If shaft condition is questionable, perform magnetic particle inspection according to Specification MIL-I-6868. No surface or subsurface defects are permissible.

(4). Inspect all external surfaces of shaft for corrosion.

(5). Remove cork plug and inspect shaft interior for corrosion. Remove light surface corrosion and pitting which can be removed without causing shaft ID to exceed 1.655 inches (4.2037 cm).

(6). Inspect splines on end of drive shaft for excessive wear by measuring distance across two 0.108 inch (2.7432 mm) diameter pins placed in opposite spline grooves. Dimension should be 2.2625 inches (5.74675 cm) minimum.

(7). Inspect shaft spline for cracks-using bright light and 5X to 10X magnifying glass.

(a). Thoroughly clean shaft spline with dry cleaning solvent (CM234) to remove oil, dirt and grease.

(b). Using magnifying glass and light, inspect spline for cracks. Pay particular attention to side of each tooth with large wear pattern (hairline cracks appear crescent-shaped usually at center bottom of tooth in root area).

(c). Inspect neck of spline (area where spline and shaft meet) for cracks.

(8). Check shaft straightness. When rotated between centers, run-out must not exceed 0.040 inch (1.016 mm) TIR (allowable dents excluded).

(9). Apply thin coat of sealing compound (CM425), mixed according to container instructions, to all cork plug surfaces; press cork into drive shaft until top of cork is flush with top of drive shaft. Allow sealing compound to cure according to container instructions. Apply second coat of sealing compound to exposed surfaces of cork; allow to dry.

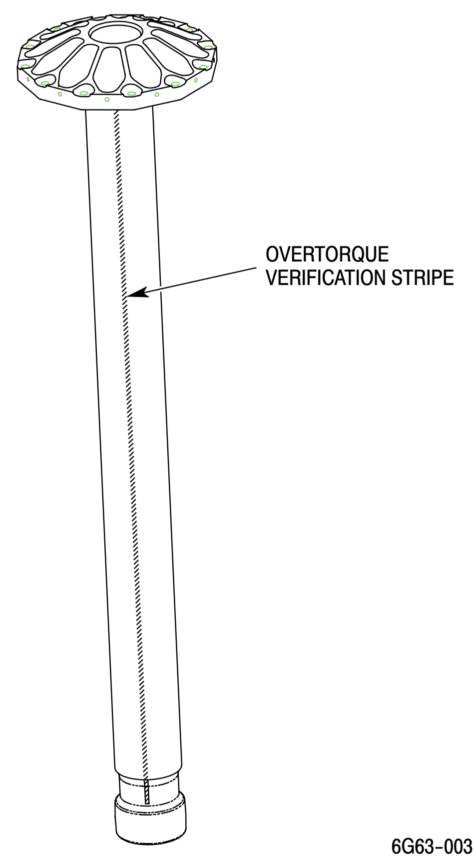


Figure 602. Main Rotor Drive Shaft Overtorque Verification Stripe

3. Main Transmission Drive Shaft Inspection (Bendix)

(Ref. Figure 402)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

(1). Inspect drive shaft diaphragms for dents, cracks, scratches, nicks, rust spots and evidence of joint separation from shaft or outside edges. Evidence of any such defects on either diaphragm requires removal of shaft from service.

(2). Inspect drive shaft tube between diaphragms for dents, scratches, cracks or corrosion pits.

(a). Measure depth and diameter of dents. Dents that blend smoothly into surrounding surface area with no sharp change in contour and do not exceed 0.015 inch (0.381 mm) depth are acceptable. Dents not within these limits require removal of shaft from service.

(b). Measure depth of cracks, nicks, corrosion pits, or scratches; length and direction are not limited. Maximum depth allowed before rework is 0.003 inch (0.076 mm).

(c). Check suspected cracks using dye penetrant. If crack indication appears, remove black (phenolic compound) coating from area.

NOTE: Drive shaft is coated with special phenolic thermosetting compound. It is a brittle coating that may indicate a crack that does not penetrate tube.

(d). Re-inspect suspected area using magnetic-particle or dye-penetrant methods. If crack does not reappear, touch up cleaned area with primer coating (CM318) and return part to service.

NOTE: Perform inspection steps (3). and (4). only if shaft damage is suspected.

(3). Inspect shaft tube for out-of-round condition, which shall not exceed 0.060 inch (1.524 mm).

(4). Inspect shaft for straightness. Shaft shall be straight within 0.030 inch (0.762 mm) at all locations relative to centerlines of two flange mounting bolt patterns.

(5). Inspect all attaching hardware for serviceable condition. Check nut plates for drag torque. Discard and replace defective hardware.

4. Main Transmission Drive Shaft Inspection (Kamatic)

(Ref. Figure 402)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

(1). Inspect drive shaft for dents, cracks, scratches, nicks, rust spots and evidence of joint separation from shaft or outside edges.

(2). Inspect drive shaft tube between couplings for dents, scratches, cracks or corrosion pits.

(a). Measure depth and diameter of dents. Dents that blend smoothly into surrounding surface area with no sharp change in contour and do not exceed 0.010 inch (0.254 mm) in depth are acceptable. Dents not within these limits require removal of shaft from service.

(b). Measure depth of cracks, nicks, corrosion pits or scratches; length and direction are not limited. Maximum depth allowed before rework is 0.005 inch (0.127 mm).

(c). Check suspected cracks using dye penetrant. If crack indication appears, remove coating from surface.

(d). Re-inspect suspected area using magnetic particle or dye penetrant methods. If crack does not reappear, touch up cleaned area with primer coating (CM318) and return part to service. If shaft is found to be cracked, remove shaft from service.

CAUTION Kamatic parts cannot be interchanged between drive shafts.

(3). Inspect all attaching hardware for serviceable condition. Discard and replace defective hardware.

NOTE: Perform the following inspections if shaft damage is suspected.

(4). Inspect shaft tube for out-of-round condition not to exceed 0.060 inch (1.524 mm).

(5). Inspect shaft for straightness. Shaft shall be straight within 0.030 inch (0.762 mm) at all locations relative to centerlines of two flange mounting bolt patterns.

5. Overrunning Clutch Inspection

(Ref. Figure 403 and Figure 404) Perform the following inspections any time the helicopter engine or overrunning clutch assembly is removed from the helicopter. For further inspection requirements, refer to Chapter 05 and Component Overhaul Manual.

NOTE: Overrunning clutch subassembly can be replaced with engine installed.

(1). Check clutch oil level (Ref. Sec. 12-00-00).

(2). Remove grease and visually check clutch input shaft splines for wear (Ref. COM).

NOTE: Component Overhaul Manual contains information relative to inspection of overrunning clutch on helicopters equipped with any cargo hook.

6. Overrunning Clutch-to-Firewall Seal Inspection

Inspect firewall seal and backing for cracks, breaks, corrosion or other damage that may prevent complete sealing of firewall opening.

7. Bendix Tail Rotor Drive Shaft Coupling Inspection

(1). Inspect coupling diaphragms for dents, cracks, nicks, rust spots and joint separation at weld junction.

(2). Inspect coupling splined section and flange for scratches, nicks, dents, cracks and corrosion pits. No cracks are allowed. Maximum depth of other defects allowed before rework is 0.005 inch (0.127 mm).

(3). Measure overall length of couplings at three different points. If average of readings exceed 2.541 inches (6.45414 cm), coupling must be replaced.

(4). Inspect socket and main transmission coupling bolt for signs of contact. If signs of contact are noted, remove and reinstall coupling bolt and socket (Ref. Sec. 63-15-00). Reposition socket and or bolt so maximum clearance between bolt key and socket is obtained.

8. Kamatic Coupling Inspection

(1). Inspect coupling springs for dents, cracks, nicks and rust spots.

(2). Inspect coupling splined section and flange for scratches, nicks, dents, cracks and corrosion pits. No cracks are allowed. Maximum depth of other defects allowed before rework is 0.005 inch (0.127 mm).

(3). Measure overall length of coupling at three different points. If average of readings exceed 2.630 inch (6.6802 cm), coupling must be replaced.

(4). Inspect drive shaft flange for signs of contact. If signs of contact are noted, remove coupling bolt, re-shim coupling and reinstall coupling bolt (Ref. Sec. 63-15-00).

9. Main Rotor Drive Shaft Inspection (300 Hour)

(Ref. Figure 601)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM234	Solvent, dry-cleaning

CAUTION Anytime main rotor drive shaft is removed, cover opening at top of main rotor hub to prevent entry of any foreign material into hub, mast and transmission.

(1). Remove main rotor drive shaft (Ref. Main Rotor Drive Shaft Removal).

(2). Perform a visual inspection of the shaft spline as follows:

(a). Thoroughly clean with cleaning solvent (CM234) to remove oil, dirt, etc.

(b). Use 5X to 10X magnifying glass and bright side light (45° or less; downward lighting may not define cracks).

(c). Pay particular attention to side of (each) tooth with larger wear pattern. Hairline cracks appear crescent-shaped and at the center and bottom of tooth in the root area. Also, inspect neck (shaded area) of spline for cracks.

NOTE:

- If cracking is suspected, perform magnetic particle inspection of shaft spline and teeth.
- If cracking or damage is found, the shaft is no longer airworthy. Discard drive shaft and return it to MDHS Customer Service Department.
- Inspect replacement drive shaft per steps (a). thru (c). prior to installation of shaft on helicopter.

(3). Inspect all other surfaces of the drive shaft (Ref. Main Rotor Drive Shaft Inspection).

NOTE: If surface corrosion or pitting of the shaft surface is noted, perform field repair of drive shaft (Ref. Main Rotor Drive Shaft - Exterior Repair and Main rotor Drive Shaft - Corrosion Removal).

(4). Remove protective cover and install main rotor drive shaft (Ref. Main Rotor Drive Shaft Installation).

DRIVE SHAFTS / CLUTCHES / COUPLINGS REPAIRS

1. Main Rotor Drive Shaft Exterior Repair

(Ref. Figure 601) No repair of drive shaft is permitted except for removal of light surface corrosion and polishing of minor nicks and chips in noncritical spline areas indicated below.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM121	Preservation oil
CM222	1,1,1-T richloroethane
CM228	Surface cleaner
CM302	Epoxy primer / Catalyst reducer
CM803	Crocus cloth

(1). Remove corrosion as follows:

(a). Degrease corroded area of drive shaft with clean cloth saturated with trichloroethane (CM222).

WARNING **Surface cleaner, used in step below, irritates hands on repeated exposure. Rubber gloves should be worn.**

(b). Swab shaft exterior with diluted solution of surface cleaner (CM228). (Mix one part surface cleaner with four parts water.) Keep wet with solution for 10 minutes or until corrosion appears to be removed. Wipe clean and inspect. Repeat as necessary until there is no further evidence of corrosion.

(c). Rinse with water and dry with compressed air.

CAUTION Exercise care when removing pits to ensure that shot peening is not completely penetrated. Remove only minimum material necessary to remove pits. Minimum wall thickness of 0.1775 inch (4.5085 mm) must be maintained.

(d). Lightly abrade corroded surface with crocus cloth (CM803) to remove pits. If pit removal exceeds depth of 0.0012 inch (0.03048 mm) in Area 1 or 0.0008 inch (0.02032 mm) in Area 2, shaft is unserviceable and must be replaced.

(e). Repeat steps (a). thru (c). above.

(f). Spray two coats of epoxy primer and catalyst reducer (CM302), mixed per manufacturers instructions, on shaft exterior. Do not prime spline teeth or mounting surface.

(2). Polish out minor nicks and chips on shaft spline teeth as follows:

(a). Using 320 - 400 grit abrasive stone, carefully grind, blend and polish out nicks and chips which are outside the critical (active) spline tooth contact areas (Area 4 profile and end views for permissible repair areas).

(b). If the repair (grind and polish) operation extends beyond limits shown, or if any tooth damage exists within the critical tooth contact area, shaft is unserviceable and must be replaced.

(c). Perform magnetic particle inspection according to Specification MIL-I-6868. No surface or subsurface defects are permissible.

(3). Apply preservation oil (CM121) to spline teeth.

(4). Immediately reinstall main rotor drive shaft.

2. Main Rotor Drive Shaft Corrosion Removal

(Ref. Figure 601)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM222	1,1,1-T richloroethane
CM228	Surface cleaner
CM302	Epoxy primer / Catalyst reducer
CM303	Wash primer
CM304	Enamel, epoxy
CM425	Sealing compound

(1). Degrease entire shaft inner diameter (ID), using 1, 1, 1, trichloroethane (CM222).

(2). Using a fine wire rotary brush or wire brush, remove corrosion and contaminants from drive shaft ID.

WARNING Turco WO-1 will irritate the skin; always use rubber gloves when handling this material. Wash skin exposed to Turco WO- 1, thoroughly with water.

(3). Using swab and extension rod, swab ID of driveshaft with Turco WO-1 (CM228), diluted one part to four parts water.

(4). Thoroughly rinse drive shaft ID with clear water; dry with compressed air.

(5). Using suitable light or borescope, inspect shaft ID for corrosion pitting. Remove pitting by honing locally. Shaft ID may not exceed 1.655 inches (4.2037 cm) after honing. Blend honed area with existing surrounding area. If pitting removal causes or would cause shaft ID to exceed 1.655 inches (4.2037 cm), replace shaft.

(6). Apply one coat of wash primer (CM303) to shaft ID according to primer manufacturer's instructions.

CAUTION Do not allow epoxy primer or epoxy enamel to contact driveshaft splines or mounting surfaces.

(7). Fill shaft with epoxy primer (CM302) mixed according to manufacturer's instructions. Drain primer from shaft. Ensure that shaft ID is completely coated. Allow primer to dry one hour at room temperature.

(8). Apply one coat of black epoxy enamel (CM304) to driveshaft by filling and draining shaft. Allow enamel to dry 48 hours at room temperature or let dry 30 minutes at room temperature, then cure for three hours in oven at 250° - 275°F (122° - 136°C).

(9). Apply thin coat of sealing compound (CM425), mixed according to container instructions, to all cork plug surfaces; press cork into drive shafts until top of cork is flush with top of drive shaft. Allow sealing compound to cure according to container instructions. Apply second coat of sealing compound to exposed surfaces of cork; allow to dry.

3. Main Transmission Drive Shaft Repair (Bendix)

(Ref. Figure 402)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer
CM801	Abrasive paper, silicon carbide
CM803	Crocus cloth

(1). Repair of drive shaft diaphragms (Bendix) is not permissible.

(2). Repair all damage that is no deeper than 0.003 inch (0.076 mm).

(a). Completely remove defect. Maintain smooth transition into surrounding surface.

(b). Use grade 400 wet or dry abrasive paper (CM801) for preliminary finishing, and then polish with crocus cloth (CM803). Restore surface until it equals original finish of shaft.

(c). After rework, check shaft tube wall thickness in repair area. Wall thickness shall not be less than 0.025 inch (0.635 mm).

(d). Apply primer coating (CM318) for corrosion protection.

4. Main Transmission Drive Shaft Repair (Kamatic)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer
CM801	Abrasive paper, silicon carbide
CM803	Crocus cloth

(1). Repairs of Kamatic drive shaft flexible couplings are limited. Repairs to spring area are not allowed. No cracks are allowed.

(2). Repair drive shaft tube area damage that is no deeper than 0.005 inch (0.127 mm). Maximum depth after repair is 0.010 inch (0.254 mm). The maximum thickness of material removed shall not be more than 10 percent of the original material thickness.

(a). Completely remove defect. Maintain smooth transition into surrounding surface.

(b). Use grade 400 wet or dry abrasive paper (CM801) for preliminary finishing, then polish with crocus cloth (CM803). Restore surface until it equals original finish of shaft.

(c). After rework, check shaft tube wall thickness in repair area.

(d). Apply primer coating (CM318) for corrosion protection.

(3). Replace nutplates on Kamatics drive shafts as follows:

CAUTION Care should be taken when removing or installing nutplates in Kamatic drive shafts. Damage to flex frames could cause drive shaft replacement.

(a). Carefully drill out rivets securing nutplate.

(b). Using two MS20605-MP3W3 rivets, install a new MS21075-L4 nutplate in place.

5. Overrunning Clutch Repair/Overhaul

Accomplish repair/overhaul of overrunning clutch according to instructions in COM.

6. Overrunning Clutch-to-Firewall Seal Repair

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM411	Adhesive, epoxy

Replace engine firewall seal by bonding new seal to backing with adhesive (CM411).

7. Main Transmission Drive Shaft Coupling Corrosion Removal

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM801	Abrasive paper, silicon carbide
CM804	Emery cloth, fine

(1). Prior to installing original drive shaft coupling (369A5512 or 369H5560 only), inspect flange face of coupling for corrosion. Evidence of corrosion may be removed by hand lapping the affected parts by using a sheet of #440 (or finer) emery cloth (CM804) or wet or dry abrasive paper (CM801) placed on a surface table with a figure eight motion, using care not to let the part rock.

NOTE: Couplings may be reused if flange is not less than 0.100 inch (2.540 mm) after cleanup. Recheck shimming.

8. Bendix Coupling Repair

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM202	Metal protector, aerosol
CM318	Primer
CM801	Abrasive paper, silicon carbide
CM803	Crocus cloth

NOTE: If coupling is cleaned with solvent or detergent, spray a light coating of metal protector (CM202) on interior and exterior of coupling diaphragm. Dip flange of coupling in liquid or spray with aerosol metal protector. Wipe away excess liquid. Metal protector cures in eight hours at room temperature or 15 minutes at 150°F (66°C).

WARNING **Metal protector (CM202) must only be used in a well ventilated area. Persons using the metal protector must follow all safety precautions normally used with a chlorinated solvent and all safety precautions on the product label.**

(1). Repairs to flexible web areas of diaphragms are not allowed.

(2). Repair damage to splined section and flange of coupling that is no deeper than 0.005 inch (0.127 mm). Use abrasive paper (CM801) grade 400 - 600 and crocus cloth (CM803) to completely remove and polish out defect. Maximum depth after rework is 0.010 inch (0.254 mm). Apply primer (CM318) to repaired area.

(3). Repair damage to outer welded portion of diaphragm halves as in step (2). above, except that maximum thickness of material removed shall be not more than 10 percent of original material thickness.

9. Kamatic Coupling Repair

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer
CM801	Abrasive paper, silicon carbide
CM803	Crocus cloth
CM804	Emery cloth, fine

(1). Repairs to coupling spring areas are not allowed.

(2). Repair damage to splined section and flange of coupling that is no deeper than 0.005 inch (0.127 mm). Use abrasive paper grade 320 grit or finer (CM801) and crocus cloth (CM803) to completely remove and polish out defect. Maximum depth after rework is 0.007 inch (0.178 mm). Apply primer (CM318) to repaired area.

NOTE: Flange may be hand- lapped using a sheet of #440 emery cloth (CM804), placed on a surface table. A figure “8” motion should be used while lapping the coupling, using care not to let part “rock”.

(3). Minimum flange thickness after cleanup is 0.100 inch (2.540 mm).

(4). Replace nutplates on Kamatics couplings as follows:

CAUTION Care should be taken when removing or installing nutplates in Kamatic couplings. Damage to flex frames could cause coupling replacement.

(a). Carefully drill out rivets securing nutplate.

(b). Using two MS20605-MP3W3 rivets, install a new MS21075-L4 nutplate in place.

Section

63-15-10

Tail Rotor Drive Shaft (369D/E/FF)

TAIL ROTOR DRIVE SHAFT REMOVAL/INSTALLATION

1. Tail Rotor Drive Shaft

The tail rotor drive shaft connects the main transmission and the tail rotor transmission. The total drive shaft length is approximately 13 feet long for 369D/E and approximately 14 feet long for 369FF. Flanges at each end of the shaft attach to flexible joint couplings on the transmission shafts.

2. Tail Rotor Drive Shaft Replacement

A. Tail Rotor Drive Shaft Removal

(Ref. Figure 401, and Figure 402)

(1). Remove (or open) tail rotor drive shaft access doors.

(2). Remove three bolts and washers that secure tail rotor drive shaft to output shaft coupling on main transmission.

(3). Disconnect chip detector wire from tail rotor transmission.

(4). Detach Sta. 284.00 bellcrank from tail rotor transmission.

(5). Remove nuts and washers that attach tail rotor transmission to tailboom.

CAUTION To prevent damage to transmission input shaft coupling during and after shaft removal, provide level support for both transmission and tail rotor, as weight of these items might buckle coupling diaphragm.

(6). With assistance in guiding shaft through damper, remove tail rotor, tail rotor transmission and tail rotor drive shaft as an assembly. Slowly and carefully slide assembly aft until drive shaft clears tailboom.

CAUTION Do not carry or otherwise support transmission by use of coupling. Use care with removal tools to prevent scratching of coupling diaphragms.

(7). Support assembly along its entire length, remove three coupling bolts and washers, and remove drive shaft from tail rotor transmission.

B. Tail Rotor Drive Shaft Installation with Bendix Couplings

(Ref. Figure 401) Whenever main transmission, tail rotor transmission, forward coupling bolt and/or socket, transmission couplings or coupling shims, tail rotor drive shaft or tailboom assembly have been replaced, start installation with step (1). below. If none of these components has been replaced, and only installation is involved, start with step (7). below.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM111	Grease, aircraft
CM112	Anti-seize compound high temperature
CM115	Grease, oscillating bearing
CM311	Coating, logo white / Thinner
CM318	Primer

NOTE: If tail rotor drive shaft is replaced for torsional buckling, replace and discard transmission output gear shaft coupling bolt and socket, and tail rotor gearbox coupling and coupling bolt.

(1). Remove existing shims. Coat coupling splines with grease (CM111) and coupling failsafe bolt threads with anti-seize compound (CM112) before assembly. Install coupling and tighten failsafe coupling bolt to **250 – 300 inch-pounds (28.25 – 33.90 Nm) plus drag torque**. (Check coupling bolt for drag torque serviceability of 25 inch-pounds (2.82 Nm) minimum, 200 inch-pounds (22.60 Nm) maximum.)

(2). Determine shim thickness required at forward flexible coupling:

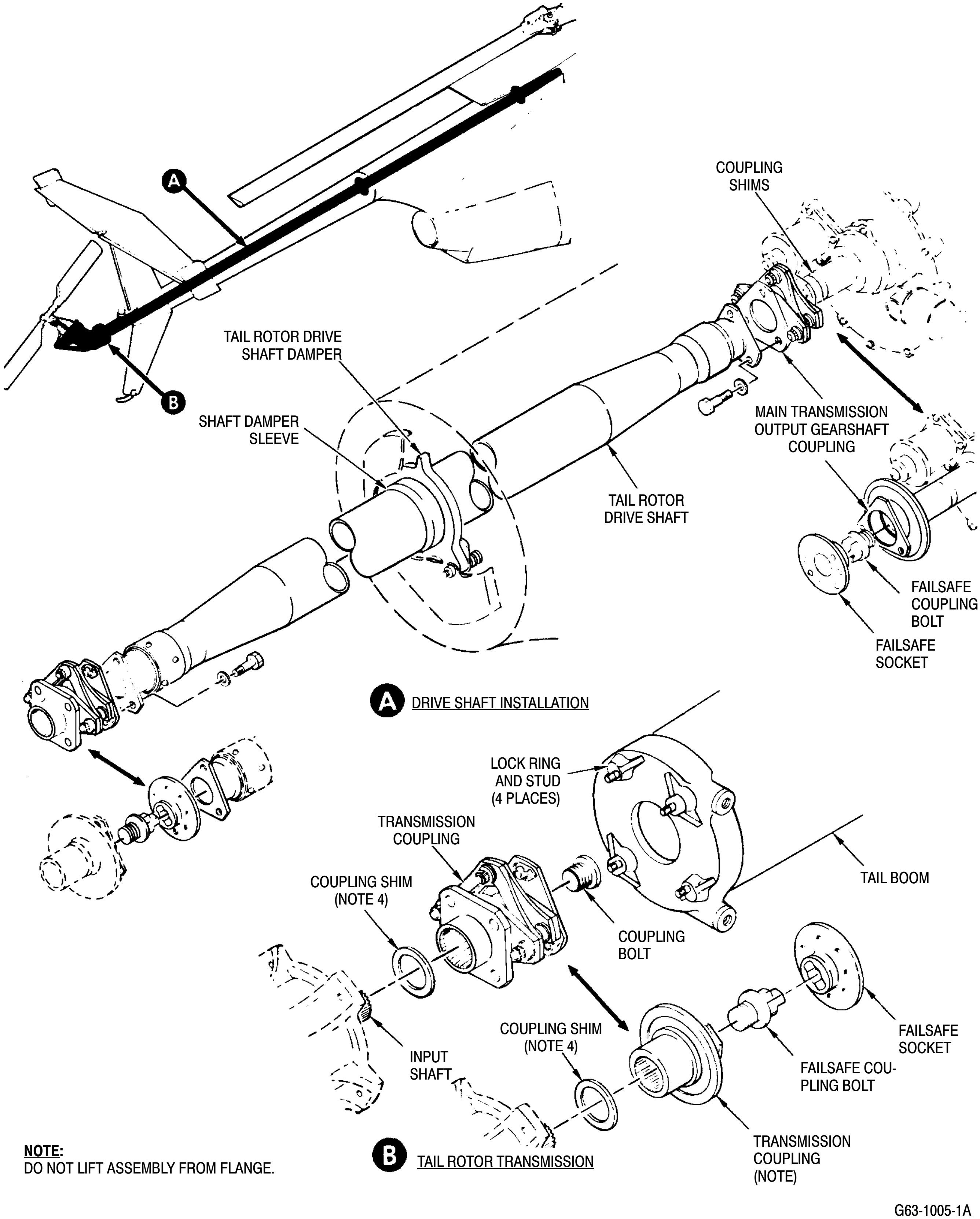


Figure 401. Tail Rotor Drive Shaft Installation (369D/E/FF) (Sheet 1 of 3)

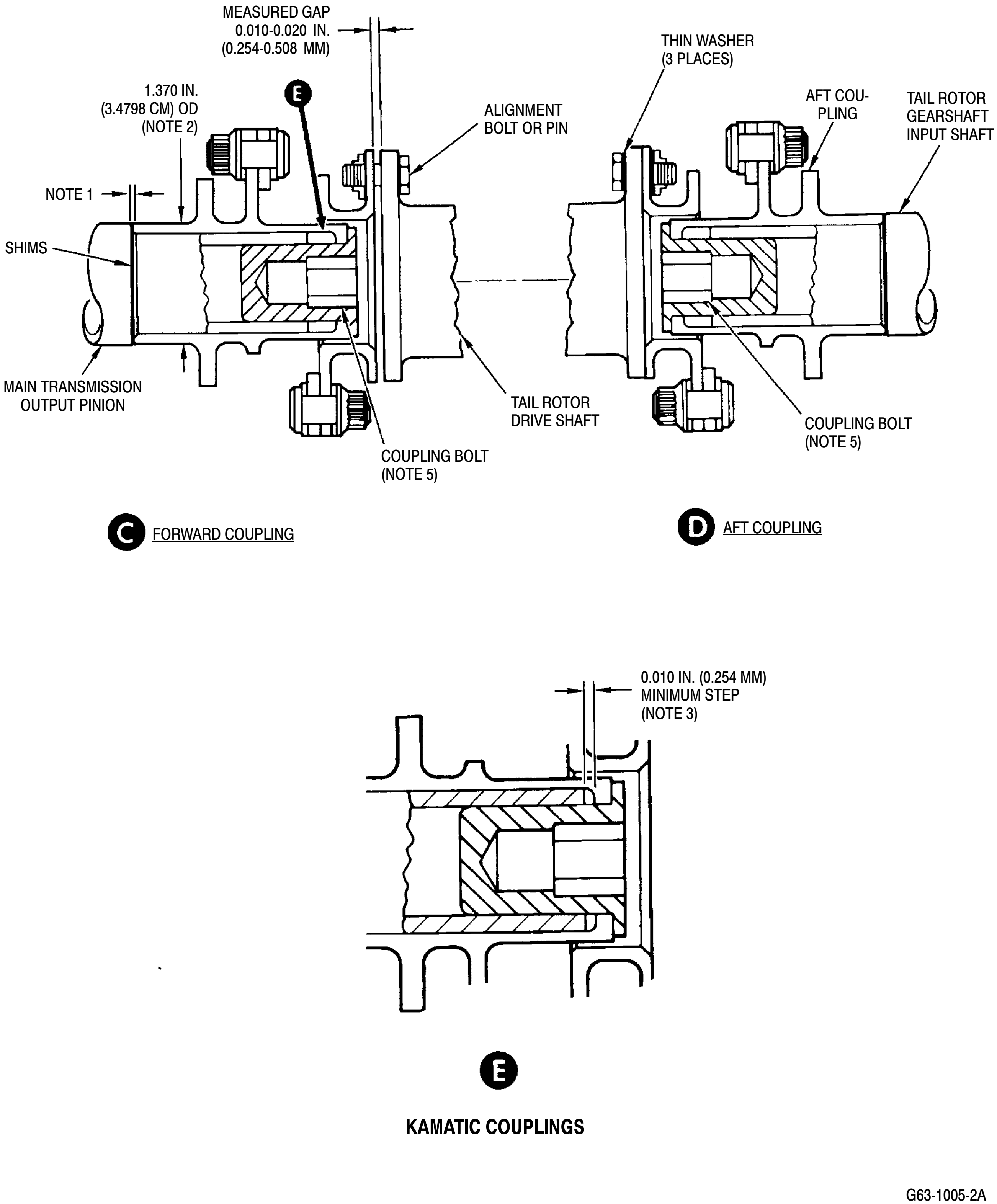
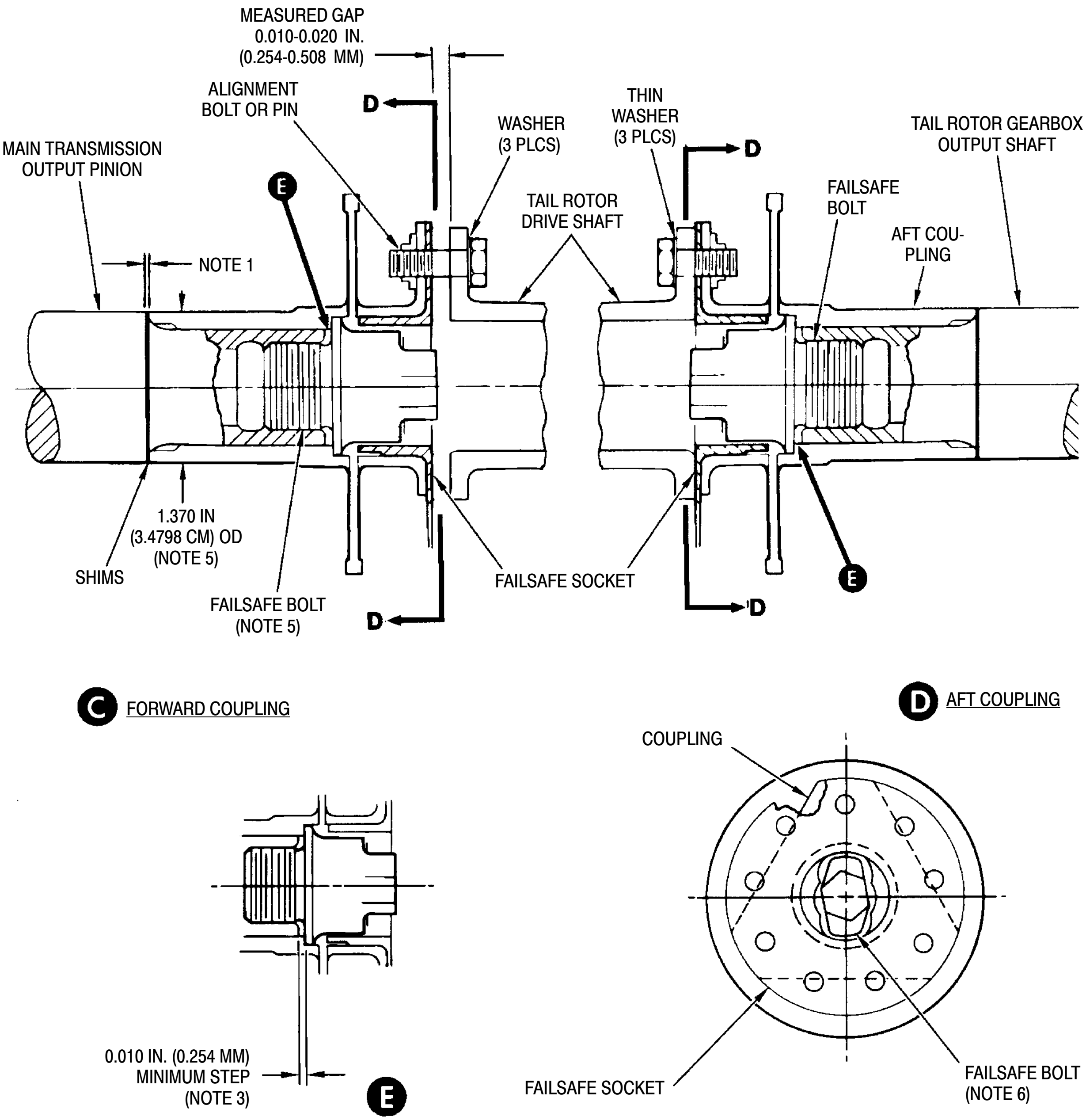


Figure 401. Tail Rotor Drive Shaft Installation (369D/E/FF) (Sheet 2 of 3) G63-1005-2



NOTES:

1. ADD 0.005 IN. (0.127 MM) TO MEASURED GAP FOR MINIMUM SHIM THICKNESS.
2. HOLD COUPLING AT 1.370 IN. (3.4798 CM) OD ONLY, TO BOTTOM COUPLING.
3. MINIMUM 0.010 IN. (0.254 MM) STEP BETWEEN AFT END OF OUTPUT SHAFT AND SHOULDER OF FORWARD COUPLING.
4. SHIM AS REQUIRED.
5. INSTALL BOLT WITH ANTI-SEIZE COMPOUND.
   MINIMUM DRAG TORQUE FOR COUPLING BOLT, 25 INCH-POUNDS (2.82 NM).
6. INSTALL WITH GAP EITHER SIDE OF FAILSAFE BOLT.

G63-1005-3C

Figure 401. Tail Rotor Drive Shaft Installation (369D/E/FF) (Sheet 3 of 3)

(a). Install minimum shim thickness on main transmission output shaft.

CAUTION Bottom the flexible coupling by holding at the 1.370 inch (3.4798 cm) OD of coupling. Do not bottom coupling by pushing on drive shaft attach flange; doing so may damage coupling.

(b). Bottom forward coupling on main transmission output shaft.

(c). Measure step between aft end of output shaft and shoulder of flexible coupling, by bottoming coupling against shims (refer to **CAUTION** above).

NOTE: Maintain minimum 0.010 inch (0.254 mm) step between aft end of output shaft and coupling shoulder to prevent coupling bolt from bottoming on output shaft.

(d). Install additional shims to maintain 0.010 inch (0.254 mm) minimum step as required.

(3). Position failsafe socket on aft face of forward coupling so that three of the nine holes are indexed to the three nutplates of the coupling in such a way that maximum clearance is obtained between the bolt key and socket. Visually verify proper clearance before installing tail rotor drive shaft.

(4). Repeat previous step to install failsafe socket on input coupling of tail rotor transmission.

(5). Support entire length of tail rotor drive shaft and position end stamped **AFT** to align with tail rotor transmission coupling.

(6). Install three bolts and washers to connect tail rotor transmission coupling to shaft; torque bolts to **80 - 100 inch-pounds (9.04 - 11.30 Nm) plus drag torque**.

CAUTION

- Ensure security of tail rotor gearbox mount studs. Maximum allowable side play at end of stud is 0.004 inch (0.102 mm), maximum allowable axial play is 0.005 inch (0.127 mm) (Ref. Sec. 63-25-10).
- When installing tail rotor transmission and drive shaft, do not compress the forward or aft couplings as damage to the coupling could result.

(7). With assistance, support transmission and shaft in line, for minimum deflection of coupling, and guide drive shaft carefully through tailboom and damper into position.

(8). Secure transmission to four tailboom mounting studs (Ref. Sec. 63-25-10). Install four washers and nuts, torque nuts to **75 - 95 inch-pounds (8.47 - 10.73 Nm) plus drag torque**.

(9). Align forward end of drive shaft with coupling on main transmission output gearshaft. Partially install two bolts as an alignment aid but do not tighten. Align drive shaft inspection markings. If any of four white stripes is indistinct or does not exist, paint (CM311) replacement stripe:

(10). Obtain 0.010-0.020 inch (0.254-0.508 mm) gap between forward flange of tail rotor drive shaft and aft end of socket, using the following procedure:

(a). Back off three attach bolts on forward flange of tail rotor drive shaft assembly 0.050-0.100 inch (1.270-2.540 mm).

(b). Push and hold tail rotor output shaft of main rotor transmission forward (into transmission) to remove end play. If rotor brake is installed, make certain that brake pucks do not restrict axial travel of tail rotor output shaft.

(c). Remove end play in tail rotor transmission by applying force to tail rotor blades in opposite direction of operational rotation (while holding forward coupling of tail rotor driveshaft on main transmission output shaft to prevent rotation). Do not push tail rotor drive shaft fore or aft.

(d). Using feeler gage, measure gap between socket and flange of tail rotor drive shaft. Socket flange must be in full contact with flange of flexible coupling.

(e). With assistance, remove tail rotor transmission and driveshaft in line for minimum deflection of coupling.

(f). Using measured gap from step (d). above, add or remove required number of shims at main transmission between output pinion shaft and forward coupling to obtain specified gap of 0.010-0.020 inch (0.254-0.508 mm).

NOTE:

- Maintain minimum 0.010 inch (0.254 mm) step between coupling shoulder and output shaft (Ref. step (2).).
- If less than specified gap, 0.010- 0.020 inch (0.254-0.508 mm) exists under minimum shim requirements, install a maximum of one HS306-326 or HS306-326H washer on each of the four tail rotor transmission mounting studs, between gearbox housing and boom fitting. Apply primer (CM318) to both sides of washer at installation. After washer installation, repeat step (10).

(11). Coat forward coupling splines with grease (CM111) and coupling bolt threads with antiseize compound (36) before assembly. Install coupling and torque failsafe bolt to **250 - 300 inch-pounds (28.25 - 33.90 Nm) plus drag torque**. (Check coupling bolt for drag torque serviceability of 25 inch-pounds minimum (2.82 Nm), 200 inch-pounds (22.60 Nm) maximum.)

(12). With assistance, support transmission and shaft in line for minimum deflection of coupling and guide drive shaft carefully through tailboom and damper into position.

(13). Apply primer (CM318) to the four gearbox mounting studs. Install nuts and washers while the primer is still wet; torque evenly to **75 - 95 inch-pounds (8.47 - 10.73 Nm) plus drag torque**.

CAUTION Verify that a minimum of (1) one thread protrudes through each nut from the four tail rotor transmission mounting studs. If less than one thread is showing, refer to CSP- DEF- 6, Structural Repair Manual, to replace with a longer MS1992A803-14 stud and insert.

(14). Install three bolts and washers at forward end of tail rotor drive shaft to connect to forward coupling; torque bolts to **80 - 100 inch-pounds (9.04 - 11.30 Nm) plus drag torque**.

(15). Connect electrical wire to tail rotor transmission chip detector. Torque nut to **12 - 15 inch-pounds (1.36 - 1.69 Nm)**.

(16). Coat pin of Sta. 284.00 bellcrank with grease (CM111) and insert it into bearing in tail rotor pitch control. Pivot bellcrank to align with mating hole in tail rotor transmission and install bolt, washers, nut and cotter pin.

(17). Check transmission oil level and service as required.

(18). Slowly rotate drive shaft and visually check to ensure shaft is not bent and for not less than 0.250 inch (6.35 mm) clearance between shaft and fairing tube at Sta. 137.5. In addition, check for minimum clearance of 0.190 inch (4.83 mm) between shaft and cooling blower scroll.

(19). Install all access doors and covers.

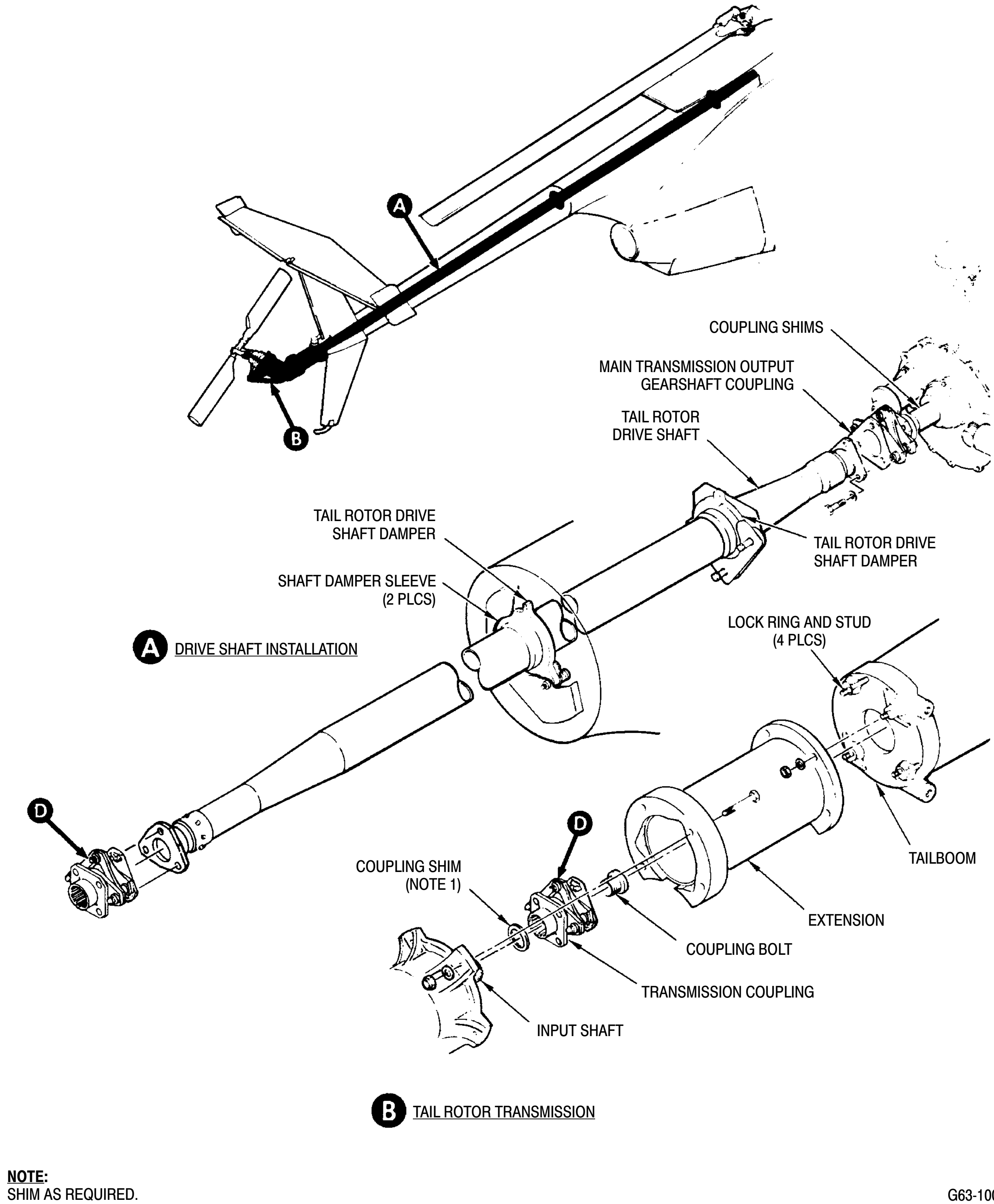


Figure 402. Tail Rotor Drive Shaft Installation (369FF)

C. Tail Rotor Drive Shaft Installation with Kamatic Couplings

(Ref. Figure 401 and Figure 402) Whenever main transmission, tail rotor transmission, transmission couplings, coupling shims, tail rotor drive shaft or tailboom assembly have been replaced, start installation with step (1). below. If none of these components have been replaced, and only installation is involved, start with step (5). below.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM111	Grease, aircraft
CM112	Anti-seize compound high temperature
CM115	Grease, oscillating bearing
CM311	Coating, logo white / Thinner
CM318	Primer

NOTE:

- Kamatic couplings do not require failsafe bolts or sockets.
- When installing 369D25501-3 Kamatic coupling, install SKCP2554-13 coupling bolt supplied with the Kamatic coupling.
- If tail rotor drive shaft is replaced for torsional buckling, replace and discard main transmission output gear shaft coupling, tail rotor gearbox coupling and both coupling bolts.

(1). Coat coupling splines with grease (CM111) and coupling bolt threads with anti-seize compound (CM112) before assembly. Install coupling onto tail rotor gearbox and torque coupling bolt to **250 - 300 inch-pounds (28.25 - 33.90 Nm) plus drag torque** (Check coupling bolt for drag torque serviceability of 25 inch-pounds (2.82 Nm) minimum, 200 inch-pounds (22.60 Nm) maximum.)

(2). Coat forward coupling splines with grease (CM111) and coupling bolt threads with anti-seize compound (CM112) before assembly. Install coupling onto main transmission; torque coupling bolt to **250 - 300 inch-pounds (28.25 - 33.90 Nm) plus drag torque**. (Check coupling bolt for drag torque serviceability of 25 inch-pounds (2.82 Nm) minimum, 200 inch-pounds (22.60 Nm) maximum.)

(3). Support entire length of tail rotor drive shaft and position end marked **AFT** to align with tail rotor transmission coupling.

(4). Install three bolts and washers to connect tail rotor gearbox coupling to shaft; torque bolts to **80 - 100 inch-pounds (9.04 - 11.30 Nm) plus drag torque**.

CAUTION Ensure security of tail rotor gearbox mount studs. Maximum allowable side play at end of stud is 0.004 inch (0.102 mm), maximum allowable axial play is 0.005 inch (0.127 mm) (Ref. Sec. 63-25-10).

(5). With assistance, support tail rotor transmission and shaft in line, for minimum deflection of coupling, and guide drive shaft carefully through tailboom and damper into position.

(6). Secure transmission to four tailboom mounting studs with washers and nuts; torque to **75 - 95 inch-pounds (8.47 - 10.73 Nm) plus drag torque**.

(7). Align forward end of driveshaft with coupling on main transmission output gearshaft. Partially install two bolts as an alignment aid but do not tighten. Align drive shaft inspection markings. If any of four white stripes is indistinct or does not exist, paint replacement stripes.

(8). Obtain 0.010-0.020 inch (0.254-0.508 mm) gap between forward flange of tail rotor drive shaft and flange of forward coupling using the following procedure:

(a). Ensure alignment bolts in previous step are backed off between 0.050-0.100 inch (1.270-2.540 mm).

(b). Push and hold tail rotor output shaft of main rotor transmission forward (into transmission) to remove end play. If rotor brake is installed, ensure that brake pucks do not restrict axial travel of tail rotor output shaft.

(c). Remove end play in tail rotor transmission by applying force to tail rotor blades in opposite direction of operation (while holding forward coupling of tail rotor drive shaft on main transmission to prevent rotation). Do not push tail rotor drive shaft fore or aft.

(d). Using feeler gage, measure gap between forward coupling flange and flange of tail rotor drive shaft. Record the gap.

(e). With assistance, remove tail rotor transmission and driveshaft in line for minimum deflection of coupling.

(f). Using measured gap from step (d). above, add or remove required number of shims at main transmission between output pinion shaft and forward coupling to obtain specified gap of 0.010-0.020 inch (0.254-0.508 mm).

NOTE:

- Maintain minimum 0.010 inch (0.254 mm) step between coupling shoulder and output shaft (Ref. Figure 401).
- If less than specified gap, 0.010- 0.020 inch (0.254-0.508 mm) exists under minimum shim requirements, install a maximum of one HS306-326 or HS306-326H washer on each of the four tail rotor transmission mounting studs, between gearbox housing and boom fitting. Apply primer (CM318) to both sides of washer at installation. After washer installation, repeat step (10).

(9). Re-install coupling and torque coupling bolt to **250 - 300 inch-pounds (28.25 - 33.90 Nm) plus drag torque**.

(10). With assistance, support tail rotor transmission and shaft in line for minimum deflection of coupling and guide drive shaft carefully through tailboom and damper into position.

(11). Secure transmission to four tailboom mounting studs with washers and nuts; torque to **75 - 95 inch-pounds (8.47 - 10.73 Nm) plus drag torque.**

(12). Install three bolts and washers at forward coupling; torque bolts to **80 - 100 inch-pounds (9.04 - 11.30 Nm) plus drag torque**.

(13). Connect electrical wire to tail rotor transmission chip detector. Torque nut to **12 - 15 inch-pounds (1.36 - 1.69 Nm)**.

(14). Coat pin of Sta. 284.00 bellcrank with grease (CM111) and insert into bearing in tail rotor pitch control. Pivot bellcrank to align with mating hole in tail rotor transmission and install bolt, washers, nut and cotter pin.

(15). Check transmission oil level and service as required (Ref. Sec. 12-10-00).

(16). Slowly rotate driveshaft and check for not less than 0.25 inch (6.35 mm) clearance between shaft and fairing tube at Sta. 137.50. In addition, check for minimum clearance of 0.190 inch (4.83 mm) between shaft and cooling blower scroll.

(17). Install all access doors and covers.

3. Tail Rotor Drive Shaft Damper

(Ref. Figure 603) The tail rotor drive shaft damper is a graphite-filled teflon plate that controls and limits deflection of the tail rotor drive shaft about its approximate mid-point. The damper is spring-loaded against a structural support bracket mounted on the aft section tailboom fairing. On 369FF Model helicopters, a second damper is located at Sta. 137.50 (Ref. Figure 602).

4. Tail Rotor Drive Shaft Damper Replacement

(Ref. Figure 602)

(1). Remove boom-bolts access covers.

(2). Remove tail rotor drive shaft.

(3). Remove two bolts, washers, springs, thin washers, plate and spacers and damper.

NOTE: The damper at Sta. 137.50 (369FF only) has 369DSK152- 13 bushings installed inside the Teflon Graphite Damper in conjunction with the spacers.

(4). Position new damper over mounting holes in support bracket. Install plate and spacers with bolts, washers, springs and spacer washers.

CAUTION Ensure washers under boltheads are seated against spacer when tightened. Bolts wear rapidly if clamp-up is not solid.

(5). Adjust damper friction.

(6). Install tail rotor drive shaft.

(7). Displace damper so that it touches tail rotor drive shaft.

(8). Use wire gage to measure damper to shaft clearance 180° from contact point. Minimum acceptable clearance is 0.020 inch (0.508 mm).

(9). Repeat steps (7). and (8). above at 90° intervals from initial check point.

(10). Install boom-bolts access covers.

TAIL ROTOR DRIVE SHAFT INSPECTION/CHECK

1. Tail Rotor Drive Shaft Inspection

Inspect shaft as described below. Replace bent shaft. Other damage (scratches, nicks, etc) that exceeds repairable limits also requires shaft replacement.

(1). Inspect for scratches in shaft section that passes through plenum chamber fairing tube. Such scratches indicate possible contact with tube edges at bulkhead openings.

(2). Inspect for evidence of torsional buckling or shaft bending as result of blade strike or hard ground contact by lower stabilizer.

(3). Inspect for corrosion.

(4). Inspect for evidence of shaft damper sleeve bond failure (sleeve shifting) from excessive heat or loads.

(5). If there is abnormal shaft vibrations, check damper friction and shaft straightness. When rotated between centers, or with ends plugged and rolled over roller, runout of large diameter must not exceed 0.060 inch (1.524 mm) (allowable dents excluded).

2. Tail Rotor Drive Shaft Twist Inspection

(Ref. Figure 601 and Figure 602) Following inspection determines if drive shaft has been torsionally strained to extent that permanent twist exists.

(1). Hand-turn main rotor until two white stripes (A, Figure 601) are aligned.

(2). Look inboard from tail rotor side of helicopter and locate two white stripes (B, Figure 601). Stripe on input shaft bearing retainer flange of tail rotor transmission is located at approximately 2 o'clock, looking aft. Stripe on coupling should be at approximately 10 o'clock, looking forward. Both stripes should be aligned.

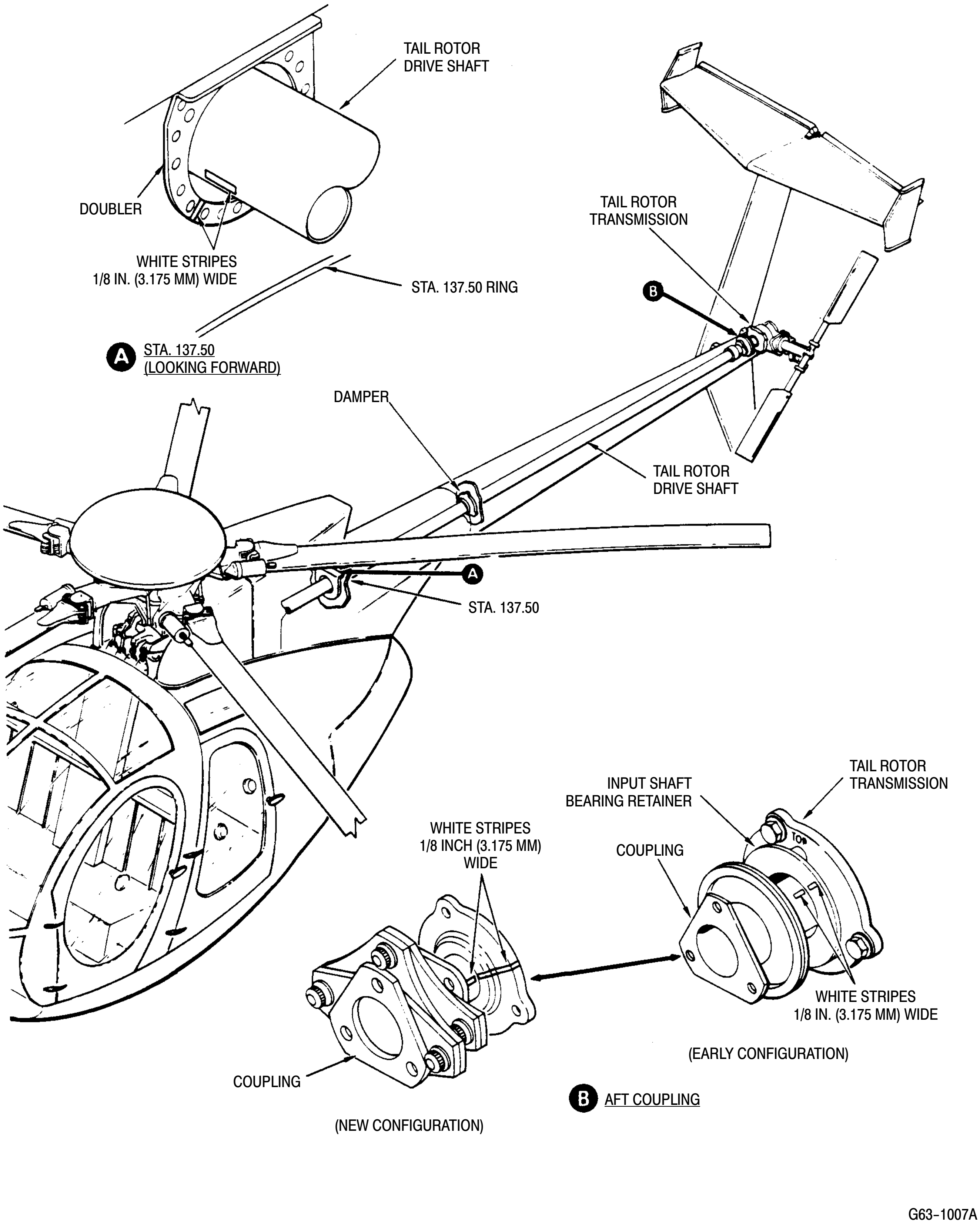


Figure 601. Tail Rotor Drive Shaft - Inspection Markings

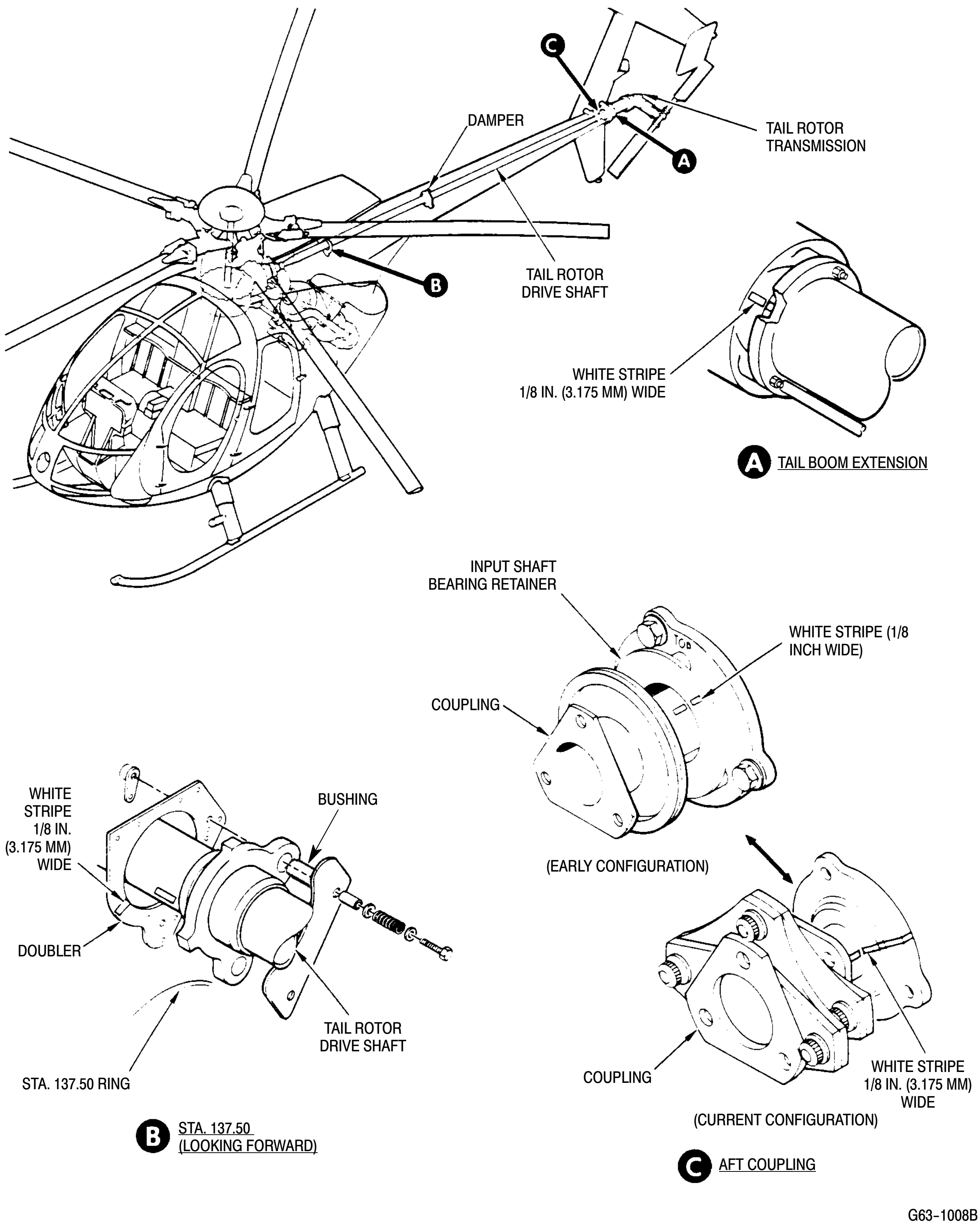


Figure 602. Tail Rotor Drive Shaft - Inspection Markings (Extended Tailboom)

3. Tail Rotor Drive Shaft Damper Inspection

(Ref. Figure 603)

NOTE: If there is excessive drive shaft vibration as shaft passes through first critical rpm range, probable cause is defective or loose damper.

(1). Inspect damper for shaft clearance as follows:

(a). Remove boom-bolts access cover.

(b). Inspect tail rotor drive shaft damper and support structure for broken, cracked or bent parts.

(c). Displace damper so that it touches tail rotor drive shaft.

(d). Use wire gage to measure damper to shaft clearance 180° from contact point. Minimum acceptable clearance is 0.020 inch (0.508 mm).

(e). Repeat steps (c). and (d). above at 90° intervals from initial check point.

(f). Dampers not meeting minimum clearance of 0.020 inch (0.508 mm) at four equidistant points are to be replaced.

NOTE: Tail rotor drive shaft must be removed to perform following inspection.

(2). Inspect damper for correct drag friction adjustment.

(3). Inspect inside diameter of damper for excessive wear. If diameter is more than 3.035 inches (7.7089 cm), damper must be replaced.

(4). Adjust friction damper as necessary to achieve the required drag as follows:

(a). Fabricate friction-checking tool.

(b). Using 0-10 pound spring scale, measure force required to move damper radially on bulkhead. Friction must be adjusted so that pull of 2 ±1/4 pounds (0-4.5 Kg) is required to slide damper between plate and support bracket.

NOTE: Minimum of one washer must always remain between each spring and plate.

(c). To increase friction, add thin washers between springs and plate. To decrease friction, remove washers. (Add or remove same number of washers at each spring.)

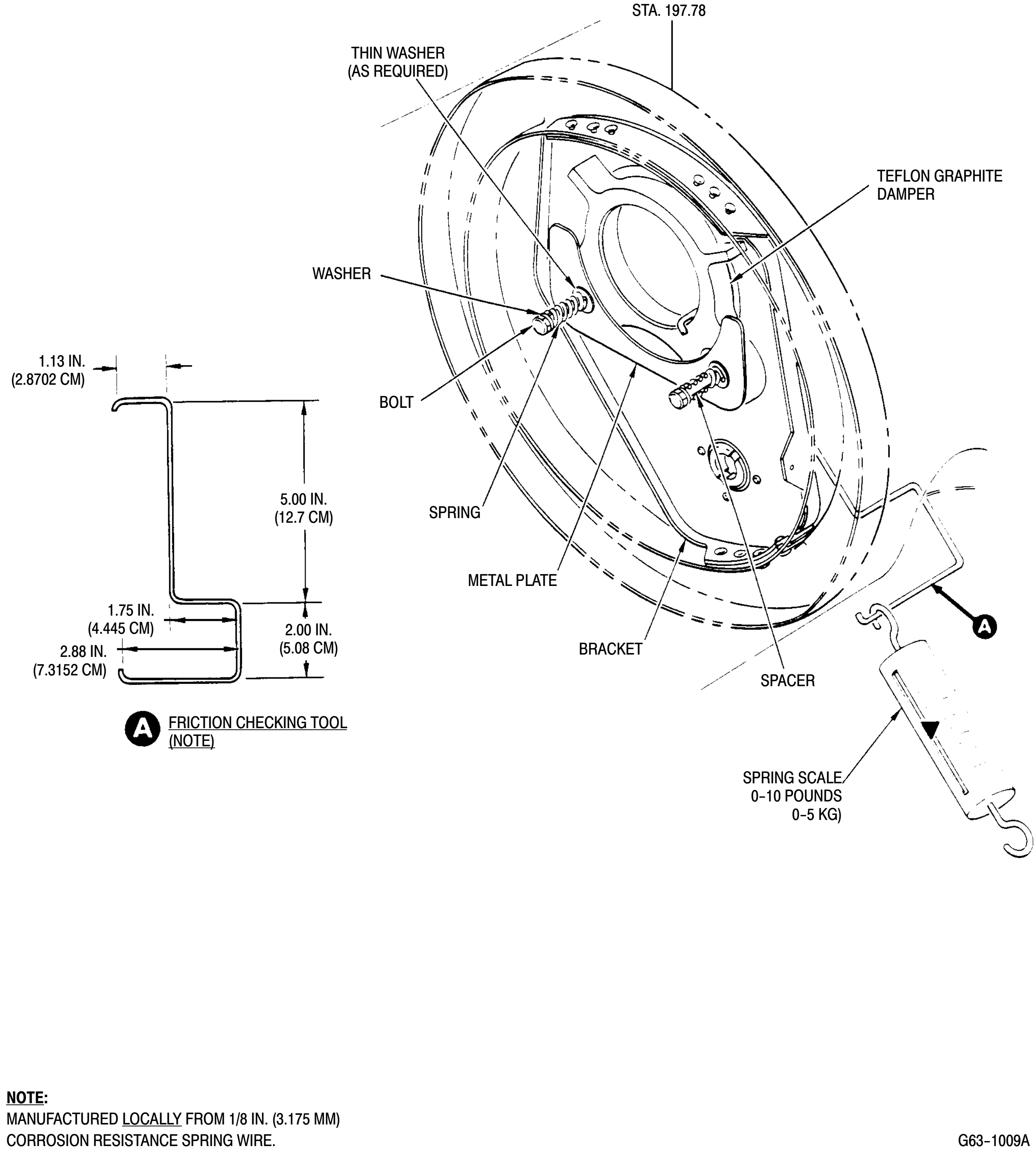


Figure 603. Tail Rotor Drive Shaft Damper - Inspection

TAIL ROTOR DRIVE SHAFT REPAIRS

1. Tail Rotor Drive Shaft Repair Procedure

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM206	Chemical coating
CM318	Primer
CM801	Abrasive paper, silicon carbide
CM803	Crocus cloth

Nicks and scratches no deeper than 0.0015 inch (0.0381 mm) are allowable without rework but require finish protection with chemical film (CM206). Other surface damage shall be evaluated and repaired according to limits specified below. Use grade 400 abrasive paper (CM801) to smooth out and blend repair area into surrounding material until damage is completely removed; then polish with crocus cloth (CM803) to equal original finish. Apply finish protection with chemical film and two coats of primer (CM318).

CAUTION Any section of shaft that appears to be scratched, nicked or corroded in a previously reworked area must not be repaired a second time. Remove such shaft from further service. Replace any shaft that has damage in excess of following limits.

(1). Scratches 0.007 inch (0.178 mm) deep to maximum length of 1.00 inch (2.54 cm) at any random angle may be repaired.

(2). Scratches 0.010 inch (0.254 mm) deep to maximum length of 0.250 inch (6.35 mm) at any random angle may be repaired.

(3). Circumferential scratches 0.004 inch (0.102 mm) deep may be repaired.

(4). Smoothly contoured dents are allowable when ratio of dent diameter to dent depth is at least 15:1; for example, when depth is 0.040 inch (1.016 mm) minimum acceptable diameter is 0.60 inch (15.24 mm). Maximum acceptable depth of a dent is 0.040 inch (1.016 mm). Dents that raise material require that shaft be replaced.

2. Tail Rotor Drive Shaft Index Stripe Application

(Ref. Figure 601 and Figure 602)

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM311	Coating, logo white / Thinner

If any of the four white index stripes used for twist inspection of tail rotor drive shaft are indistinct or do not exist, paint (CM311) replacement aligning index stripes as follows:

CAUTION To prevent damage to gearbox coupling during and after shaft removal, provide good level support for both tail rotor transmission and shaft, as the weight of these items might buckle the coupling.

NOTE: Any time the associated tail rotor drive shaft units are removed or replaced, an indexing check and re- application of index marks is required.

(1). Remove tail rotor transmission and drive shaft as an assembly.

(2). Inspect tail rotor drive shaft for evidence of torsional twist or buckling.

(3). Remove any old index stripes.

(4). Apply white index stripe 0.120 inch (3.048 mm) wide and 0.250 inch (6.35 mm) long onto tail rotor transmission input shaft bearing flange, at approximate 10 o'clock position (viewed looking forward), so it can be seen when viewed on left side of tailboom.

(5). Apply white index stripe 0.120 inch (3.048 mm) wide and any length, on the aft coupling in line with index stripe on tail rotor gearbox retainer.

(6). Install tail rotor drive shaft.

(7). Align index stripes on tail rotor gearbox bearing retainer and aft coupling.

(8). Remove tail rotor bellcrank access door at the forward left side of fuselage boom fairing and observe the area where tail rotor drive shaft passes through the fairing forward bulkhead.

(9). Apply white index stripe 0.120 inch (3.048 mm) wide and 0.50 inch (12.70 mm) long on boom bulkhead doubler (Sta. 137.50), at approximately 6 - 8 o'clock position looking forward.

(10). Apply a corresponding joining index stripe on the tail rotor drive shaft at Sta. 137.50, approximately 0.120 inch (3.048 mm) wide and 0.50 inch (12.70 mm) long.

(11). Install all access doors and covers.

Section

63-15-30

NOTAR®
Anti-Torque System
Drive Shafts
(500/600N)

NOTAR® ANTI-TORQUE SYSTEM DRIVE SHAFTS MAINTENANCE PRACTICES

1. Anti-Torque System Drive Shafts

The Fan Gearbox Drive Shaft connects the main transmission and the fan gearbox. The total drive shaft length is approximately 14 inches long. Flanges on each end of the shaft attach to flexible (Kamatic) type joint coupling on the main transmission output shaft and fan gearbox input shaft.

The Fan Inter-Connecting Drive Shaft is equipped with a kamatic flexible-type joint and mounting flange (coupling) at each end. The shaft connects the fan gearbox to the fan assembly by (two) couplings mounted on the output shaft of the fan gearbox and input shaft of the fan assembly. The fan pitch control rod is routed through the center of the inter-connect drive shaft.

2. Fan Gearbox Drive Shaft Replacement

A. Fan Gearbox Drive Shaft Removal

(Ref. Figure 201)

(1). Remove fan gearbox drive shaft access doors and covers, upper aft section fuselage and interior trim panels as required.

(2). Remove tailboom fairing and tailboom (Ref. Sec. 53-40-30).

(3). Remove fan pitch control rod (Ref. Sec. 67-20-30).

(4). Remove fan inter-connecting drive shaft (Ref. Fan Inter-Connect Drive Shaft Replacement).

WARNING

- **To prevent damage to the engine install F.O.D. cover over engine air inlet.**
- **To prevent damage to shaft provide level support for fan transmission drive shaft during removal or installation.**

(5). Gain access thru plenum chamber and remove drive shaft access panel to aft coupling and remove three bolts and washers that secure fan gearbox drive shaft to input shaft coupling on fan transmission gearbox. Support drive shaft and output shaft coupling on main transmission.

(6). Remove fan gearbox (Ref. Sec. 63-25-30).

(7). Remove fan gearbox drive shaft by removing three bolts and washers from output shaft couping on main transmission.

B. Fan Gearbox Drive Shaft Installation

(Ref. Figure 201) Whenever main transmission, fan gearbox, transmission couplings, coupling shims, fan gearbox drive shaft assembly have been replaced, start installation with step (1). below. If none of these components have been replaced, and only installation is involved, start with step (3). below.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM111	Grease, aircraft
CM112	Anti-seize compound high temperature
CM115	Grease, oscillating bearing
CM318	Primer

NOTE: Kamatic couplings do not require fail-safe bolts or sockets. When installing 369D25501-9 Kamatic coupling, install SKCP2554-15 coupling bolt supplied with the Kamatic coupling or 369D25503-1 bolt. If fan gearbox drive shaft is replaced for torsional buckling, replace and discard main transmission output gear shaft coupling, fan gearbox coupling and both coupling bolts.

(1). Coat coupling splines with grease (CM111) and coupling bolt threads with anti-seize compound (CM112) before assembly. Install coupling onto fan gearbox input shaft and torque coupling bolt to **250 - 300 inch-pounds (28.25 - 33.90 Nm) plus drag torque**. Check coupling bolt for drag torque serviceability of 25 inch-pounds (2.82 Nm) minimum, 200 inch-pounds (22.60 Nm) maximum.

(2). Coat forward coupling splines with grease (CM111) and coupling bolt threads with anti-seize compound (CM112) before assembly. Install coupling onto main transmission output shaft and torque coupling bolt to **250 - 300 inch-pounds (28.25 - 33.90 Nm) plus drag torque**. Check coupling bolt for drag torque serviceability of 25 inch-pounds (2.82 Nm) minimum, 200 inch-pounds (22.60 Nm) maximum.

(3). Support drive shaft and position to align with fan transmission coupling on main transmission.

(4). Install fan gearbox with four mounting bolts and torque to **70 - 90 inch pounds (7.90 - 10.17 Nm)**; torque-stripe bolts.

NOTE: If re- shimming is required, removal and installation of the fan gearbox is necessary to obtain the specified gap between the coupling flange and flange of drive shaft.

(5). Install three bolts and washers to connect fan gearbox coupling to drive shaft; torque bolts to **80 - 100 inch-pounds (9.04 - 11.30 Nm) plus drag torque**.

(6). Align forward end of drive shaft with coupling on main transmission output gearshaft. Partially install three bolts as an alignment aid but do not tighten.

(7). Obtain 0.010-0.020 inch (0.254-0.508 mm) gap between forward flange of the fan gearbox drive shaft and flange of forward coupling using the following procedure:

(a). Ensure alignment bolts in previous step are backed off between 0.050-0.100 inch (1.270-2.540 mm).

(b). Push and hold fan output pinion shaft of main rotor transmission forward (into transmission) to remove end play. If rotor brake is installed, ensure that brake pucks do not restrict axial travel of fan output shaft.

(c). Remove end play in fan transmission by applying force to the coupling in opposite direction of operation while still holding forward coupling of drive shaft on main transmission. Do not push fan drive shaft fwd or aft.

(d). Using feeler gage, measure gap between forward coupling flange and flange of fan drive shaft using average of 3 readings. Record the gap.

(e). Adjust the number of shims (369A5516-3, -5, -7, or -9). Using measured gap from step 4 above, add or remove required number of shims behind the coupling of main transmission output pinion shaft or between fan gearbox forward coupling to obtain specified gap of 0.010-0.020 inch (0.254-0.508 mm).

NOTE: All shims may be removed from forward or aft coupling if required.

(f). Coat forward coupling splines with grease (CM111) and coupling bolt threads with anti-seize compound (CM112) before assembly. Install coupling and torque coupling bolt to **250 - 300 inch-pounds (28.25 - 33.90 Nm) plus drag torque.** Check coupling bolt for drag torque serviceability of 25 inch-pounds (2.82 Nm) minimum, 200 inch-pounds (22.60 Nm) maximum.

(8). Install three bolts and washers at forward coupling; torque bolts to **80 - 100 inch-pounds (9.04 - 11.30 Nm) plus drag torque**.

(9). Slowly rotate drive shaft and check for not less than 0.25 inch (6.35 mm) clearance between shaft and fairing tube at Sta. 137.50. In addition, check for minimum clearance of 0.190 inch (4.83 mm) between shaft and cooling blower scroll.

(10). Install fan gearbox (Ref. Sec. 63-25-30).

(11). Install inter-connecting drive shaft (Ref. Fan Inter-Connect Drive Shaft Replacement)

(12). Install fan pitch control; control rod (Ref. Sec. 67-20-30).

(13). Install tailboom and fairing (Ref. Sec. 53-40-30).

(14). Check anti-torque flight control rigging (Ref. Sec. 67-20-30).

(15). Install all access doors and covers, and interior trim panels.

3. Fan Gearbox Drive Shaft Inspection

Inspect shaft as described below.

(1). Replace bent shaft. Other damage (scratches, nicks, etc.) that exceeds repairable limits also requires shaft replacement.

(2). Inspect for scratches in shaft section that passes through plenum chamber fairing tube. Such scratches indicate possible contact with tube edges at bulkhead openings.

(3). Inspect for evidence of torsional twist, buckling or shaft bending as result of blade strike or hard ground contact.

(4). Inspect for corrosion.

4. Fan Gearbox Drive Shaft Repair Procedure

For information on repair procedures, refer to Sec 63-15-10, Tail Rotor Drive Shafts Repair Procedure.

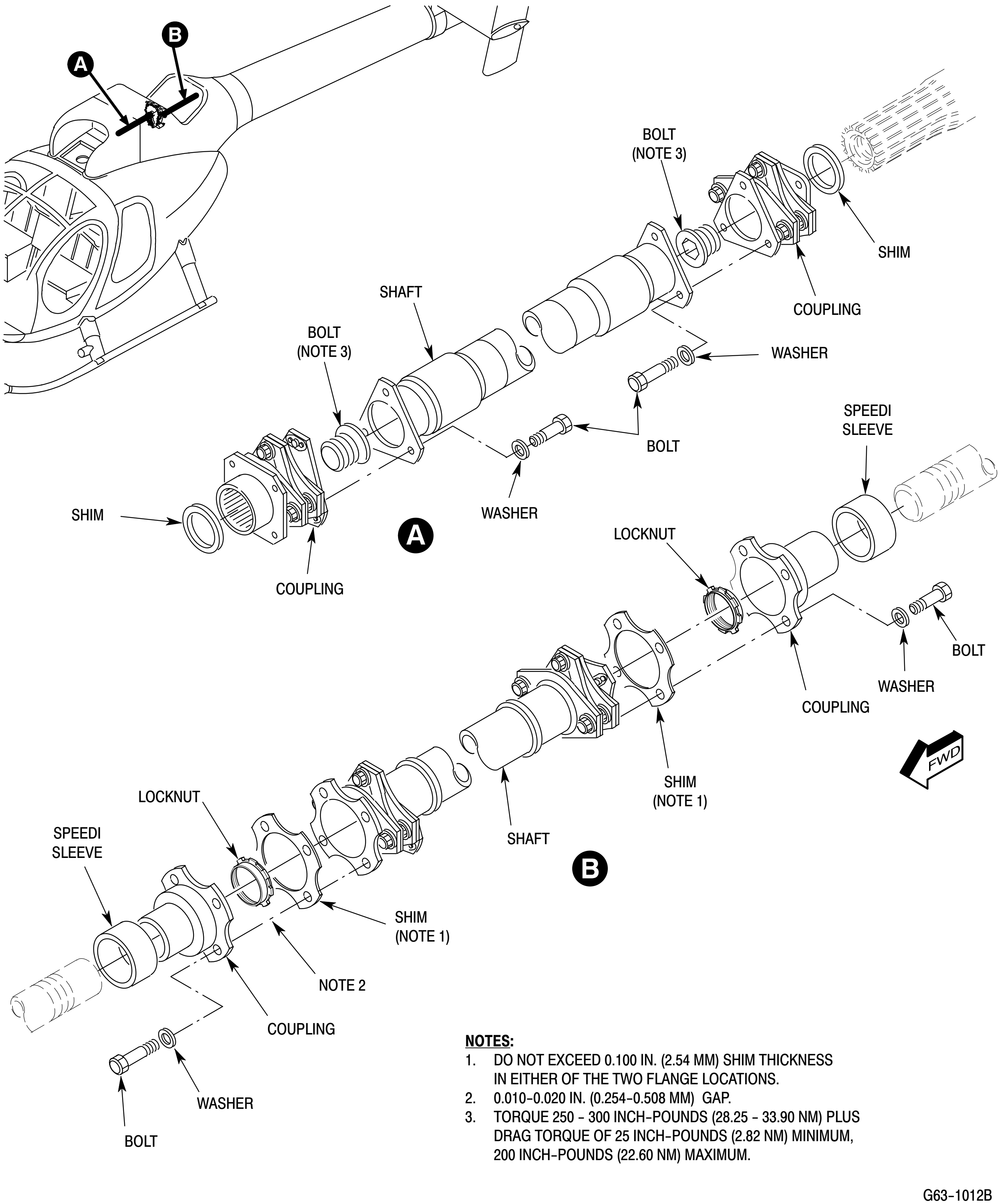


Figure 201. Fan Gearbox and Inter-Connecting Drive Shafts

5. Fan Inter-Connect Drive Shaft Replacement

(Ref. Figure 201)

A. Fan Inter-Connect Drive Shaft Removal

(1). Remove fan inlet screen and fan transmission cover (Ref. Sec. 53-30-30).

(2). Remove tailboom fairing and tailboom (Ref. Sec. 53-40-30).

(3). Remove fan pitch control rod (Ref. Sec. 67-20-30).

CAUTION To prevent damage to the shaft and couplings during and after removal, provide level support for inter-connecting drive shaft.

(4). Remove four mounting bolts and washers (2 places) and remove shims at both ends of inter-connect drive shaft, remove inter-connect drive shaft. Retain shims for reinstallation.

B. Fan Inter-Connect Drive Shaft Installation

Install inter-connect drive shaft to obtain 0.010-0.020 inch (0.254-0.508 mm) gap between the forward flange of the inter-connect drive shaft and the coupling aft flange as follows:

(1). Install inter-connect drive shaft, install 8 mounting bolts and washers except leave the 4 mounting bolts on the forward flange of the inter-connect drive shaft backed off 0.050-0.100 inch (1.270-2.540 mm) and torque the four aft mounting bolts **50 - 70 inch-pounds (5.65 - 7.91 Nm)**.

(2). Pull and hold the coupling on the fan gearbox Aft to remove end play.

(3). With a feeler gage measure gap (average of 4 readings) between the flange of the inter-connect drive shaft and the coupling.

CAUTION Do not exceed 0.100 inch (2.540 mm) shim thickness in either of the two flange locations. Shim thickness in both locations to be within 0.020 inch (0.508 mm) of each other.

(4). Adjust the shim thickness between the forward flange and the aft flange of the inter-connect drive shaft and the two couplings.

(5). Install shims to obtain the specified 0.010-0.020 inch (0.254-0.508 mm) gap. Install inter-connect drive shaft with eight mounting bolts and washers. Torque forward and aft mounting bolts **50 - 70 inch-pounds (5.65 - 7.91 Nm) plus drag torque.**

(6). Install fan pitch control; control rod (Ref. Sec. 67-20 -30).

(7). Install tailboom and fairing (Ref. Sec. 53-40-30).

(8). Check control rigging (Ref. Sec. 67-20-30).

(9). Install access panels and covers (Ref. Sec. 53-30-30).

6. Inter-Connect Drive Shaft Inspection

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

(1). Inspect drive shaft coupling for dents, cracks, scratches, nicks, rust spots and evidence of joint separation from shaft or outside edges.

(2). Inspect drive shaft tube between coupling for dents, scratches, cracks or corrosion pits.

(a). Measure depth and diameter of dents. Dents that blend smoothly into surrounding surface area with no sharp change in contour and do not exceed 0.010 inch (0.254 mm) depth are acceptable. Dents not within these limits require removal of shaft from service.

(b). Measure depth of cracks, nicks, corrosion pits or scratches; length and direction are not limited. Maximum depth allowed before rework is 0.005 inch (0.127 mm).

(c). Check suspected cracks using dye penetrant. If crack indication appears, remove coating from area.

(d). Re-inspect suspected area using magnetic-particle or dye-penetrant methods. If crack does not reappear, touch up cleaned area with primer coating (CM318) and return part to service.

(3). Inspect all attaching hardware for serviceable condition. Discard and replace defective hardware.

NOTE: Perform inspection steps (4). and (5). below only if shaft damage is suspected.

(4). Inspect shaft tube for out-of-round condition, which shall not exceed 0.060 inch (1.524 mm).

(5). Inspect shaft for straightness. Shaft shall be straight within 0.030 inch (0.762 mm) at all locations relative to centerlines of two flange mounting bolt patterns.

7. Inter-Connect Drive Shaft Repair

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer
CM801	Abrasive paper, silicon carbide
CM803	Crocus cloth

(1). Repair of drive shaft Kamatic flexible type joint is limited. Repairs to spring area are not allowed. No cracks are allowed.

(2). Repair drive shaft tube area damage that is no deeper than 0.005 inch (0.127 mm). Maximum depth after repair is 0.010 inch (0.254 mm). The maximum thickness of material removed shall not be more than 10 percent of original material thickness.

(a). Completely remove defect. Maintain smooth transition into surrounding surface.

(b). Use grade 400 wet or dry abrasive paper (CM801) for preliminary finishing, and then polish with crocus cloth (CM803).

(c). After rework, check shaft tube wall thickness in repair area.

(d). Apply primer coating (CM318) for corrosion protection.

8. Transmission and Fan Coupling Inspection

The following procedures is for inspection of fan gearbox and fan input coupling. For information on Kamatics coupling inspection, refer to Sec. 63-10-00.

(1). Inspect coupling splined section and flange for cracks, scratch, nicks, dent and corrosion pits. No cracks are allowed. Maximum depth of other defects allowed before rework is 0.005 inches.

(2). Inspect coupling speedi-sleeve for wear, security of attachment to coupling.

9. Gearbox and Fan Coupling Repair

The following procedures is for repair of fan gearbox and fan input coupling. For information on Kamatic coupling repair, refer to Sec. 63-10-00.

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer
CM801	Abrasive paper, silicon carbide
CM803	Crocus cloth

(1). Repair damage to splines section and flange of coupling that is no deeper than 0.005 inch (0.127 mm). Use abrasive paper (CM801) grade 400 - 600 and crocus cloth (CM803) to completely remove and polish out defect. Maximum depth after rework is 0.010 inch (0.254 mm). Apply primer (CM318) to repaired area.

(2). After rework, check coupling wall thickness in repair area. The maximum thickness of material removed shall not be more than 10 percent of original material thickness.

10. Transmission Coupling / Fan Coupling Replacement

(Ref. Figure 202)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM113	Anti-seize compound low temperature

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST604	Coupling socket

A. Transmission Coupling / Fan Coupling Removal

(1). Remove nut from shaft using coupling socket (ST604) and coupling holding fixture tool; remove coupling.

B. Transmission Coupling / Fan Coupling Installation

(1). Slide coupling onto support shaft.

(2). Install nut using anti-seize compound (CM113) as required. Torque nut to **800 - 1000 inch-pounds (90.39 - 112.98 Nm) plus drag torque** using coupling socket (ST604) and holding fixture.

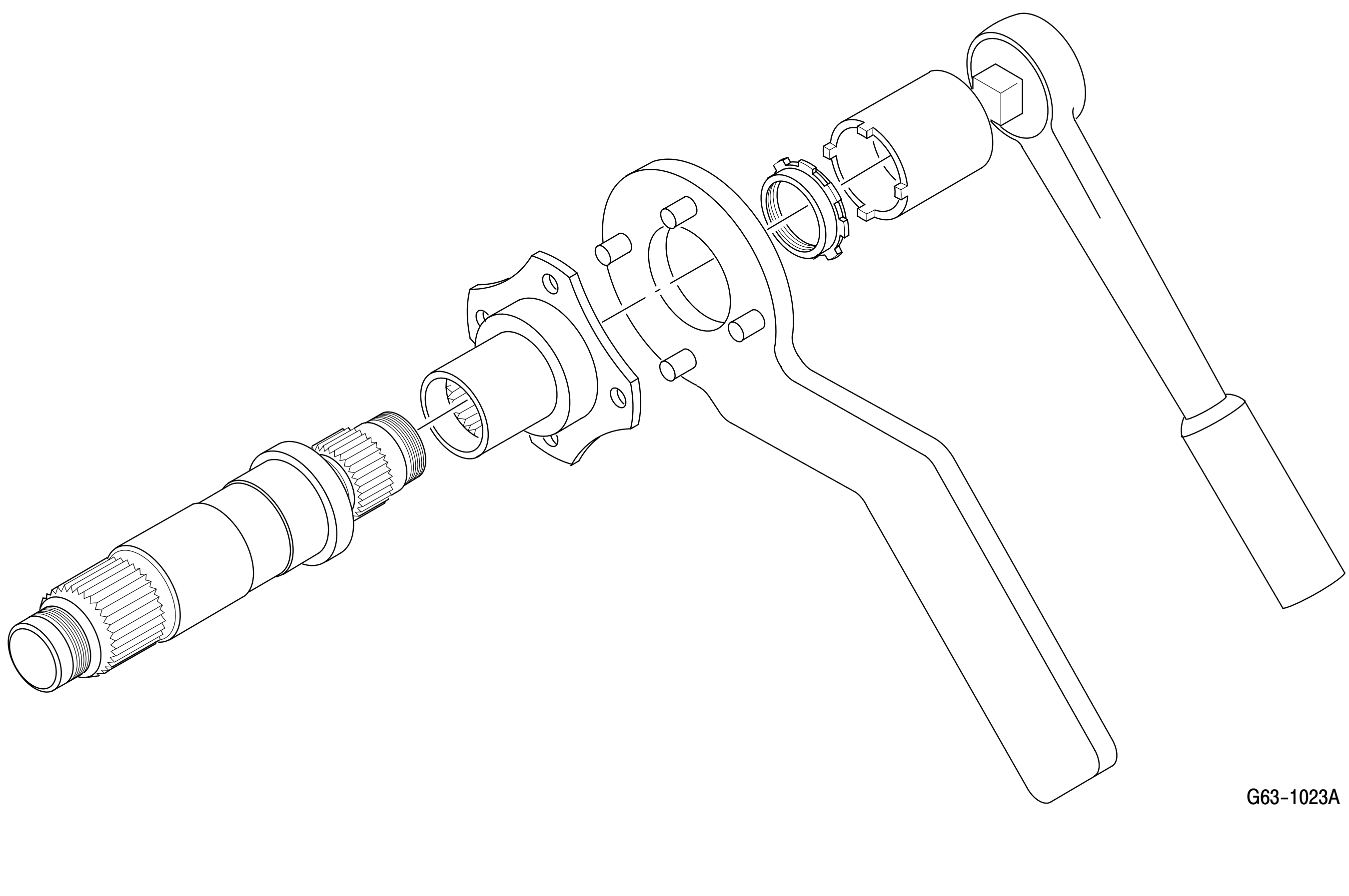


Figure 202. Fan Interconnect Drive Shaft Coupling Installation

Section

63-20-00

369D25100 Main Transmission (369D/E/FF - 500N)

369D25100 MAIN TRANSMISSION MAINTENANCE PRACTICES

1. Main Transmission

The main transmission is secured to the underside of the main rotor mast support structure pan by four structure bolts, washers, and nuts. The transmission is a two-stage speed reduction unit. The first reduction stage is for the tail rotor drive system and accessory drive trains. The second stage is for further reducing rpm for the main rotor. The transmission housing is magnesium alloy. The accessory gear train drives a rotor tachometer generator and the transmission oil pump that are mounted on drive pads at the aft end of the transmission. The transmission is cooled by air drawn through a cooling blower and routed through the transmission oil cooler. Access to the main transmission is attained by entrance into the passenger compartment.

2. Main Transmission Buildup and Replacement

A. Main Transmission Removal

(Ref. (Ref. Figure 201)

(1). Remove sound insulation and transmission access covers (Ref. Sec. 52-40-00).

(2). Remove main transmission drive shaft (Ref. Sec. 63-10-00).

(3). Remove cooling blower (Ref. Sec. 63-21-00).

(4). Remove anti-torque drive shaft (Ref. Sec. 63-15).

NOTE: Removal of main rotor drive shaft (step e. below) is optional. If help is not available to rotate rotor hub for spline alignment, shaft removal simplifies reinstallation of transmission.

(5). Remove main rotor drive shaft (Ref. Sec. 63-10-00).

(6). Disconnect wires from tachometer generator, two chip detectors and oil pressure sender.

(7). Drain oil from transmission.

(8). Disconnect tail rotor output shaft seal drain line, input shaft seal drain line and two hoses that attach to lubrication pump.

(9). With assistance, support transmission; then remove four nuts and washers from mast support structure studs.

CAUTION Lower transmission with extreme care to prevent contact between tail rotor drive coupling and surrounding structure. Any dents, nicks or scratches on coupling diaphragm requires that coupling be scrapped. Use care to protect oil pressure sender and chip detector terminal studs from damage during handling or when placing transmission on any surface.

(10). With assistance, carefully lower transmission from mounting studs.

NOTE: Cover top opening of transmission to prevent entry of foreign material. Residual operating lubricant is an approved preservative for transmission shipment or storage.

(11). Perform the following steps as applicable to strip main transmission.

(a). Remove tachometer generator.

(b). Remove coupling bolt, coupling and shim from tail rotor output shaft.

(12). Remove coupling bolt, coupling, shim, drive pulley and pulley guard from main transmission input shaft.

(a). Remove input shaft seal drain connector (Ref. Figure 202).

(b). Install suitable covers and plugs to protect all openings, including threaded holes.

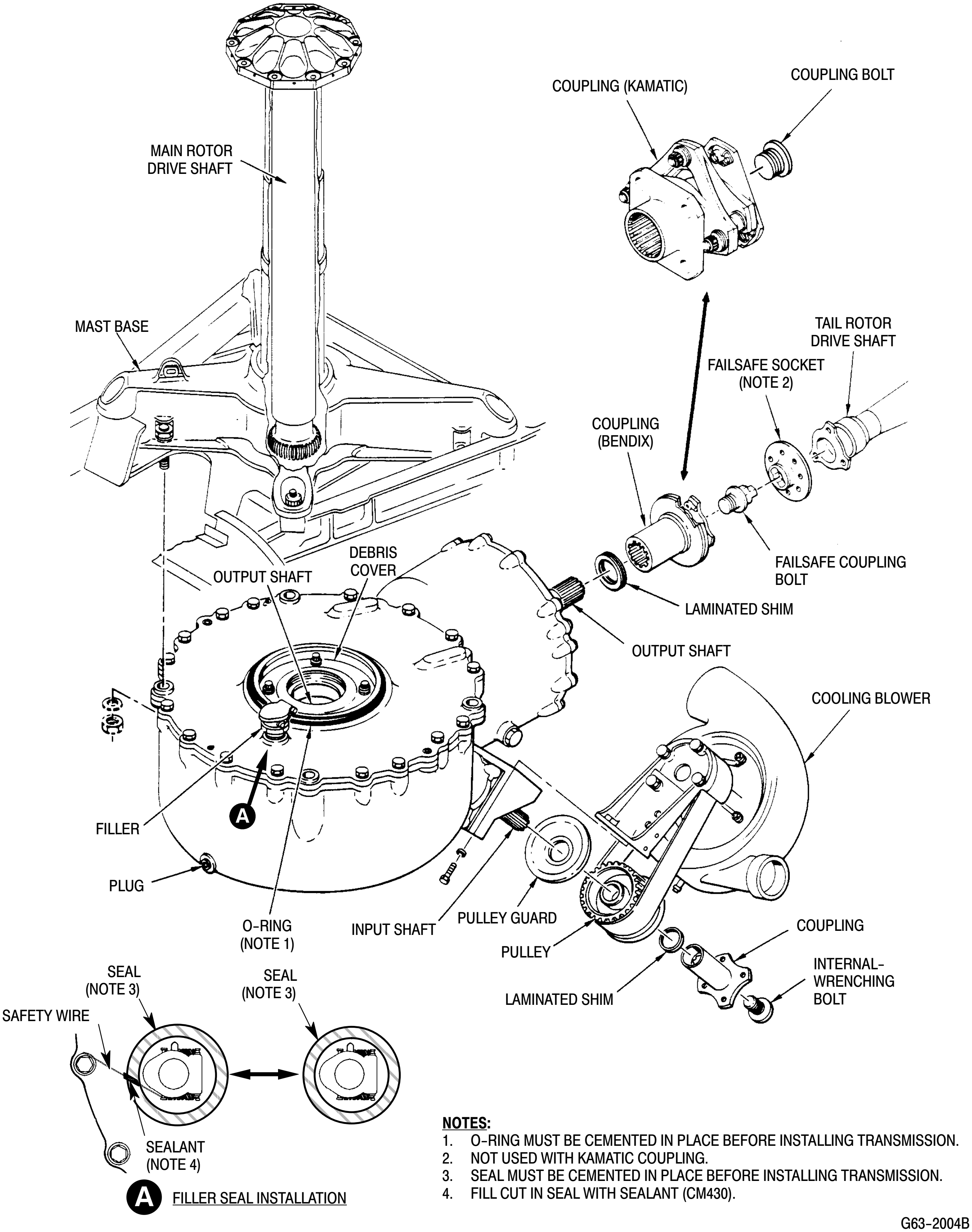


Figure 201. 369D25100 Main Transmission Installation

B. Main Transmission Installation

(Ref. Figure 201)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM111	Grease, aircraft
CM112	Anti-seize compound high temperature
CM121	Preservation oil
CM125	Oil
CM126	Oil, turbine
CM234	Solvent, dry-cleaning
CM417	Cement
CM425	Sealing compound
CM430	Sealant, solvent resistant

(1). Perform the following steps as applicable to build up main transmission prior to installation.

(a). Install one preliminary 0.010 inch (0.250 mm) shim on tail rotor output shaft to prevent coupling bolt from bottoming in shaft.

(b). Coat coupling splines with grease (CM111) and coat bolt threads with anti-seize compound (CM112) before assembly. Install shaft coupling and temporarily tighten coupling bolt to approximately **250 inch-pounds (28.25 Nm)**.

(c). Install tachometer generator. With rotor brake installed, ensure electrical receptacle is at 11 o'clock position.

(d). Install input shaft seal drain connector, bonding it in place with sealing compound (CM425).

(e). Bond main rotor output shaft O-ring in place with cement (CM417).

(f). Bond filler seal to transmission with cement (CM417).

(g). If filler is safetied to case bolt, cut a small section from seal and bond in place. After bonding, fill gap in seal with sealant (CM430).

(2). Use clean, absorbent cloth to clean pan beneath main rotor mast support, especially area contacted by O-ring on top of transmission.

CAUTION Damage to main rotor drive shaft or main transmission splines can occur during installation. Care should be taken while meshing drive shaft splines into transmission output splines to prevent damage.

(3). With assistance, slowly and evenly lift and position transmission in place on mounting studs.

(4). Install four washers and nuts; torque to **60 - 80 inch-pounds (6.78 - 9.04 Nm)**.

(5). If transmission is new, drain any residual preservative oil. Service transmission with lubricating oil (CM125 or CM126) (Ref. Sec. 12-00-00).

(6). Connect wiring to tachometer generator, two chip detectors and oil pressure switch.

(7). Install anti-torque drive shaft (Ref. Sec. 63-15-10/30).

CAUTION When reinstalling main rotor drive shaft, check that there is no gap between shaft mounting flange and rotor hub before tightening installation bolts. Gap indicates that shaft splines are not correctly meshed in transmission.

(8). If main rotor drive shaft has been removed, apply coating of lubricating oil (CM121) on shaft before reinstallation and install drive shaft (Ref. Sec. 63-10-00).

(9). Connect tail rotor output shaft seal drain line and input shaft seal drain line and two hoses that attach to lubrication pump.

(10). Install cooling blower (Ref. Sec. 63-21-00).

(11). Coat input drive coupling splines with grease (CM111) and coat bolt threads with anti-seize compound (CM112) before assembly. Install pulley guard, drive pulley, shim, coupling and coupling bolt and temporarily tighten coupling bolt to approximately **250 inch-pounds (28.25 Nm)**.

NOTE: Refer to Sec. 63-10-00, Main Transmission Drive Shaft Installation for coupling shimming, coupling torque and drive shaft installation.

(12). Install main transmission drive shaft (Ref. Sec. 63-10-00).

(13). Ground run helicopter (refer to appropriate PFM) and check drive system for excessive vibration and unusual noise. Verify absence of oil over-temperature and low pressure indications. Inspect for oil leakage.

(14). Install access covers and sound insulation (Ref. Sec. 52-40-00).

3. Main Transmission Inspection Procedure

(Ref. Figure 201) The following procedures provide information for checking the main transmission for oil leakage and mechanical defect.

(1). Remove sound insulation and transmission access covers (Ref. Sec. 52-40-00).

(2). Inspect transmission for oil leaks, cracks, corrosion, secure electrical connections and correct oil level. Evaluate oil leakage according to Fluid Leak Analysis.

CAUTION Inspect all fluid lines for adequate clearance between structure and components. Vibration may cause chafing of lines and subsequent leaking.

(3). Inspect four mounting flanges on main transmission housing for corrosion and cracks. Check that transmission mounting studs and nuts are secure. This should be accomplished from fuselage interior as well as exterior at main rotor mast base.

(4). Check that all safety wiring is intact.

4. Main Transmission Repair Procedure

(Ref. Figure 201) Replace electrical components, breather-filler, filler screen, externally accessible O-rings, lubrication pump, filter, input shaft oil seal and tail rotor output shaft oil seal if defective. Dents in outer surface of transmission housing deeper than 0.10 inch or covering more than 0.60 square inch (3.87 cm^2) area require replacement of transmission (for repairs not covered in this section, Ref. COM). This procedure is applicable to dents not exceeding specified limits.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM234	Solvent, dry-cleaning
CM318	Primer
CM411	Adhesive, epoxy
CM801	Abrasive paper, silicon carbide

NOTE: Any evidence of lubricating oil leakage in a repair area requires replacement of transmission.

(1). Clean area with solvent (CM234) and remove sharp edges with grade 320 abrasive paper (CM801).

(2). Apply coat of primer (CM318) on repaired surface.

(3). If dent is deeper than 0.030 inch (0.76 mm), fill depression with epoxy adhesive (CM411) and blend to surrounding surfaces.

(4). Touch up re-worked area with paint (Ref. Sec. 20-30).

5. Input Drive Assembly - Oil Leakage Repair Procedure

(Ref. Figure 202) Use the following repair procedure when oil leakage occurs between the main transmission housing and the pinion bearing sleeve flange. Replace the 369D25184-3 O-ring as follows.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM218	Alcohol, denatured

(1). Remove the shaft interconnect, transmission input coupling, drive pulley and guard, and cooling blower assembly (Ref. Sec. 63-21-00).

(2). Drain oil from input drive assembly through the lower chip detector plug (Ref. Sec. 12-00-00).

(3). Remove attaching hardware securing blower mount assembly (Ref. Sec. 63-21-00).

(4). Install four alignment bolts in place of attaching hardware for blower mount assembly. (Use any type of 2.00 inch (5.08 cm) length x 1/4-28 diameter bolt.)

(5). Install slide hammer tool on input drive assembly pinion.

NOTE:

- It may be necessary to heat main housing to move input drive assembly.
- Any movement of more than 0.150 inch (3.81 mm) may cause disengagement of scavenge pump drive.

(6). Gently tap input drive assembly away from main housing no more than 0.150 inch (3.81 mm) to gain access to O-ring between main housing and input pattern shim.

(7). Remove slide hammer tool from input drive assembly pinion.

(8). If required, cut defective O-ring for removal.

(9). Clean and inspect pattern shim for distortion and ensure no overlap condition exists at butt/split line of shim.

(10). Clean area between main housing and input drive sleeve with alcohol (CM218) to remove paint chips or other foreign matter.

(11). Install new 369D25184-3 O-ring by slipping over blower mount. Seat O-ring in contact with the main housing.

(12). Remove alignment bolts and install assembly aid tool halves between O-ring and input bearing sleeve flange. (Refer to Figure 203 for locally fabricated assembly aid tool.)

(13). Install attaching hardware in blower mount, input pinion bearing sleeve, and assembly aid tool.

(14). Tighten attaching hardware as follows:

(a). Maintain an inward preload of the assembly aid tool halves against the input pinion bearing sleeve while tightening the four attaching bolts equally.

(b). Tighten hardware until attaining a positive clamp-up between the main housing, assembly aid tool halves, and input pinion bearing sleeve flange.

(15). Remove attaching hardware and slide out the assembly aid tool halves.

(16). Ensure the O-ring is seated in main housing groove.

(17). When O-ring is seated correctly, reinstall input pattern shim between main housing and input pinion bearing sleeve flange and reinstall hardware.

(18). Tighten attaching hardware as follows:

(a). Maintain an inward preload on input pattern shim during the tightening sequence.

(b). Torque attaching hardware **65 - 75 inch-pounds (7.34 - 8.47 Nm)**.

(19). Inspect pattern shim to ensure no overlap condition exists at butt/split line.

(20). Reinstall the shaft interconnect, transmission input coupling, drive pulley and guard, and cooling blower assembly (Ref. Sec. 63-21-00).

(21). Add oil to input drive assembly (Ref. Sec. 12-00-00).

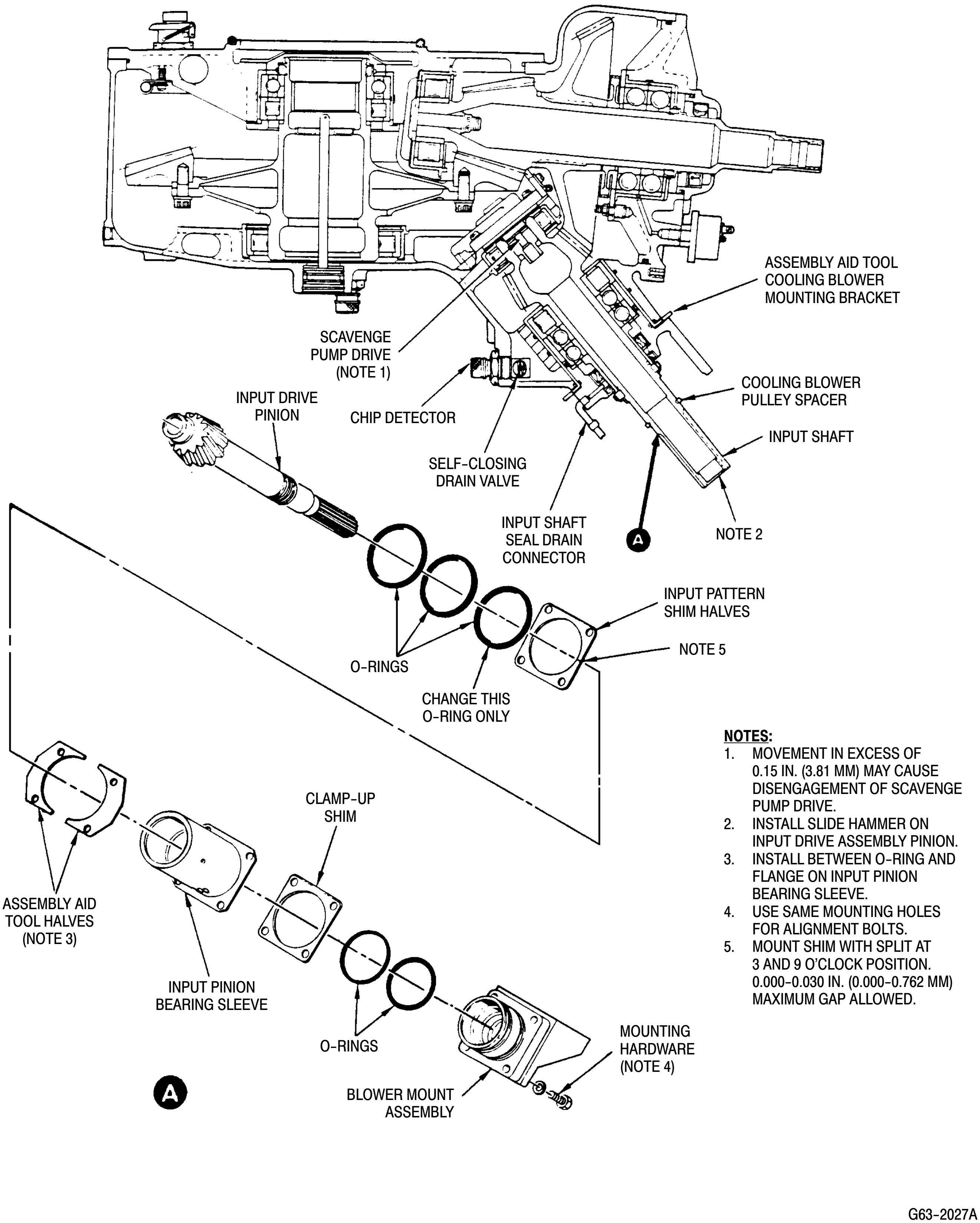


Figure 202. Input Drive Assembly O-Ring Replacement

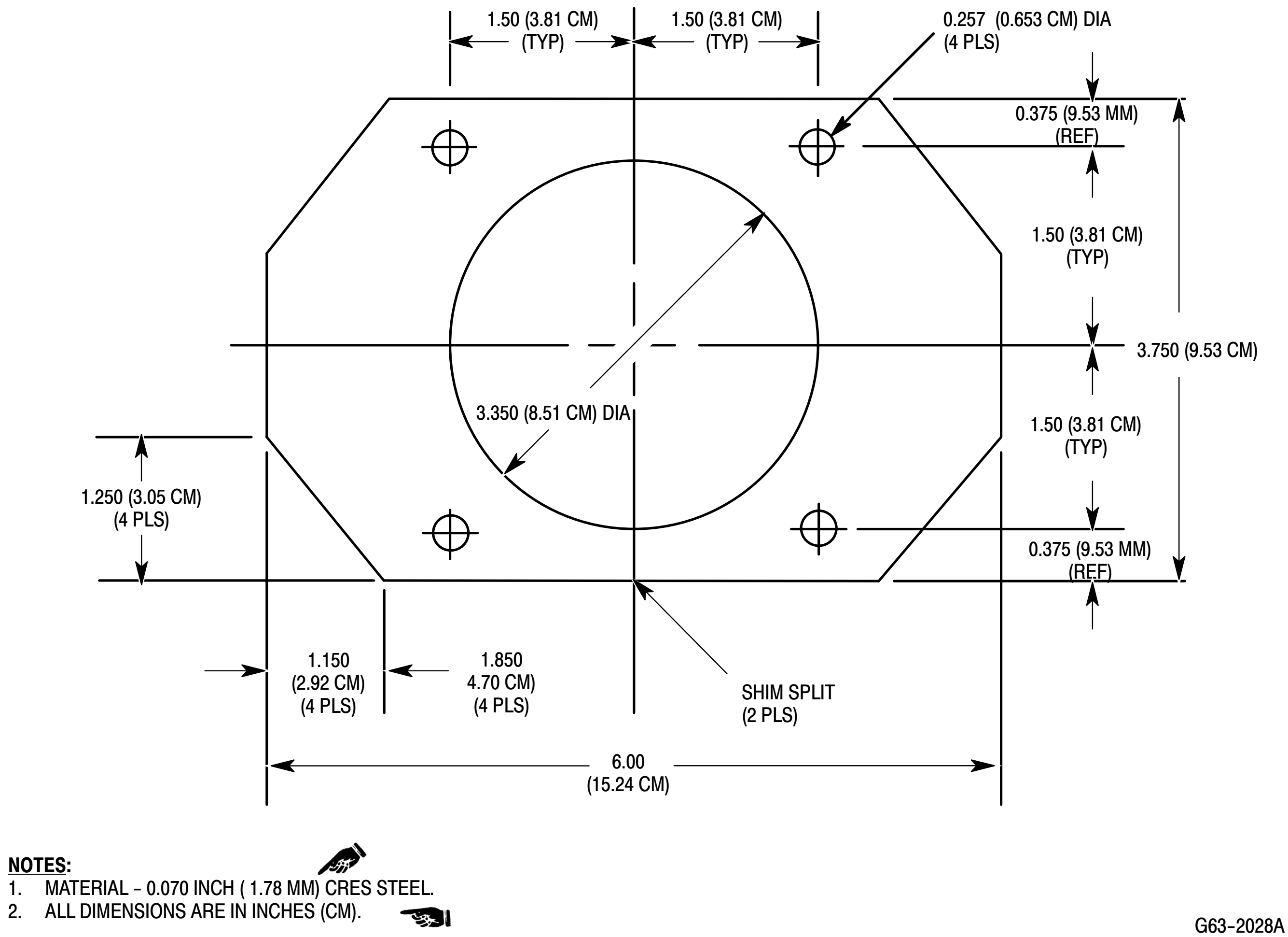


Figure 203. Assembly Aid Tool for Input Drive

Section

63-20-25

369F5100 Main Transmission (369D/E/FF - 500/600N)

369F5100 MAIN TRANSMISSION MAINTENANCE PRACTICES

1. Main Transmission

The main transmission is secured to the underside of the main rotor mast support structure pan by four structure bolts, washers, and nuts. The transmission is a two-stage speed reduction unit. The first reduction stage is for the tail rotor drive system and accessory drive trains. The second stage is for further reducing rpm for the main rotor. The transmission housing is magnesium alloy. The accessory gear train drives a rotor tachometer generator and the transmission oil pump that are mounted on drive pads at the aft end of the transmission. The transmission is cooled by air drawn through a cooling blower and routed through the transmission oil cooler. Access to the main transmission is attained by entrance into the passenger compartment.

2. Main Transmission Replacement

A. Main Transmission Removal

(Ref. Figure 201)

(1). Remove sound insulation and transmission access covers.

(2). Remove main transmission drive shaft (Ref. Sec. 63-10-00).

(3). Remove cooling blower (Ref. Sec. 63-21-00).

(4). Remove anti-torque drive shaft (Ref. Sec. 63-15-10/30).

NOTE: Removal of main rotor drive shaft is optional. If help is not available to rotate rotor hub for spline alignment, shaft removal simplifies reinstallation of transmission.

(5). Remove main rotor drive shaft (Ref. Sec. 63-10-00).

(6). Disconnect wires from tachometer generator, two chip detectors and oil pressure sender.

(7). Drain oil from transmission.

(8). Disconnect anti-torque output shaft seal drain line, input shaft seal drain line and two hoses that attach to lubrication pump.

NOTE: The following step will require an assistant to hold the transmission mount bolts from the top of the helicopter and an assistant to remove the nuts and washers.

(9). With assistance, support transmission; then remove hardware securing transmission to mast support structure.

CAUTION Lower transmission with extreme care to prevent contact between anti-torque drive coupling and surrounding structure. Any dents, nicks or scratches on coupling requires that coupling be scrapped. Use care to protect oil pressure sender and chip detector terminal studs from damage during handling or when placing transmission on any surface.

(10). With assistance, carefully lower transmission.

NOTE: Cover top opening of transmission to prevent entry of foreign material. Residual operating lubricant is an approved preservative for transmission shipment or storage.

B. Main Transmission Installation

(Ref. Figure 201)

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM111	Grease, aircraft
CM112	Anti-seize compound high temperature
CM121	Preservation oil
CM125	Oil

(1). Use clean, absorbent cloth to clean pan beneath main rotor mast support, especially area contacted by O-ring on top of transmission.

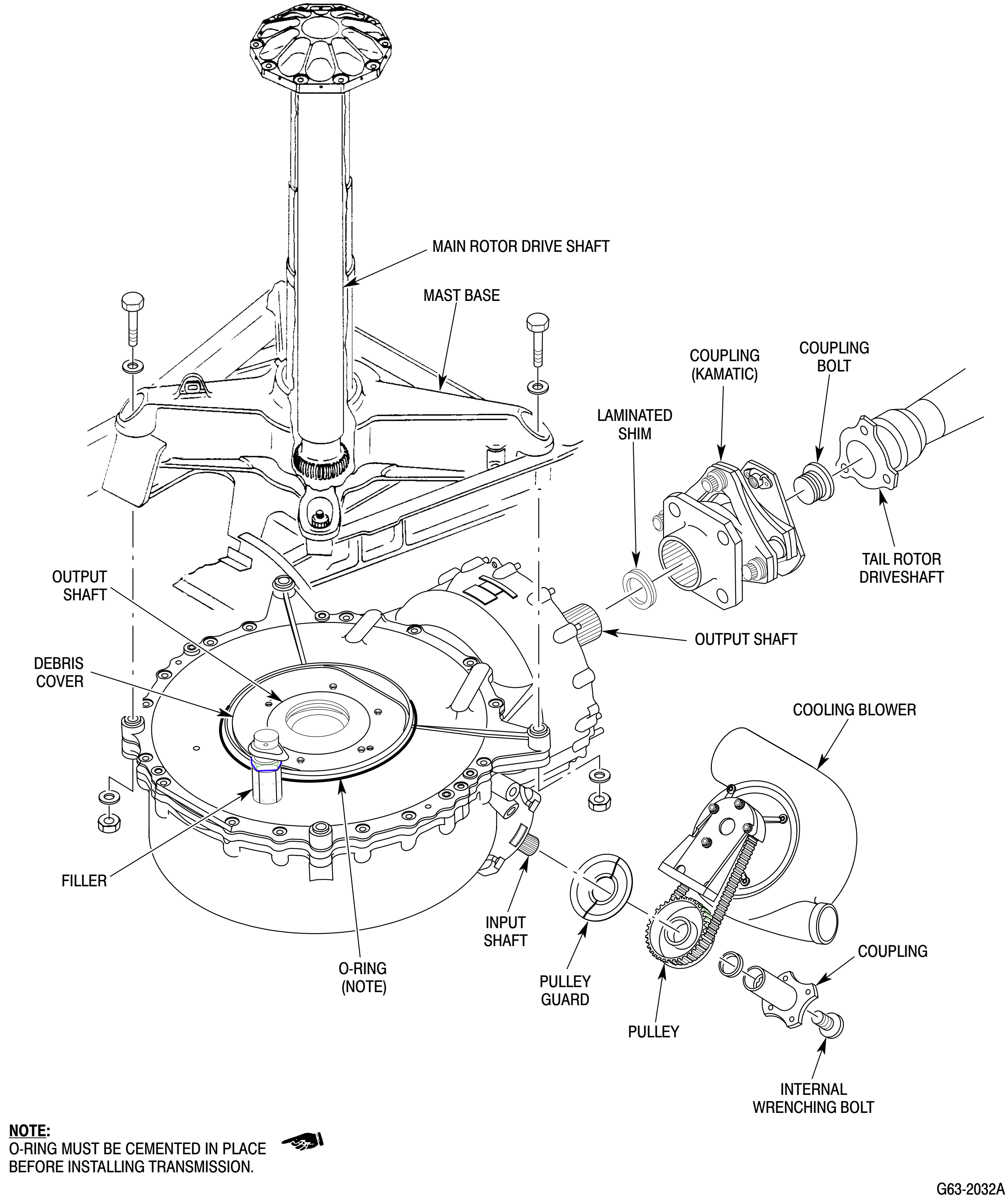


Figure 201. 369F5100 Main Transmission Installation

CAUTION Damage to main rotor drive shaft or main transmission splines can occur during installation. Care should be taken while meshing drive shaft splines into transmission output splines to prevent damage.

NOTE: The following procedure will require the assistance of another person.

(2). With assistance, slowly and evenly lift and position transmission in place.

(3). Install four washers and nuts; torque to **900 - 1100 inch-pounds (101.69 - 124.28 Nm) plus drag torque**.

(4). If transmission is new, drain any residual preservative oil. Service transmission with lubricating oil (CM125) (Ref. Sec. 12-00-00).

(5). Connect wiring to tachometer generator, two chip detectors and oil pressure switch.

(6). Install anti-torque drive shaft (Ref. Sec. 63-15-10/30).

CAUTION When reinstalling main rotor drive shaft, check that there is no gap between shaft mounting flange and rotor hub before tightening installation bolts. Gap indicates that shaft splines are not correctly meshed in transmission.

(7). If main rotor drive shaft has been removed, apply coating of preservative oil (CM121) on shaft before reinstallation and install drive shaft (Ref. Sec. 63-10-00).

(8). Connect anti-torque output shaft seal drain line and input shaft seal drain line and two hoses that attach to lubrication pump.

(9). Install cooling blower (Ref. Sec. 63-21-00).

(10). Coat input drive coupling splines with grease (CM111) and coat bolt threads with anti-seize compound (CM112) before assembly.

CAUTION When installing pulley and guard, ensure spring pin in pulley is fully engaged inside hole in pulley guard.

(11). Install pulley guard, drive pulley, shim, coupling and coupling bolt and temporarily tighten coupling bolt to approximately **250 inch-pounds (28.25 Nm)**.

NOTE: Refer to Sec. 63-10-00, Main Transmission Drive Shaft Installation and for coupling shimming, coupling torque and drive shaft installation.

(12). Install main transmission drive shaft (Ref. Sec. 63-10-00).

(13). Ground run helicopter (refer to appropriate PFM) and check drive system for excessive vibration and unusual noise. Verify absence of oil over-temperature and low pressure indications. Inspect for oil leakage.

(14). Install access covers and sound insulation.

3. Main Transmission Stripping

(Ref. Figure 202)

(1). Remove tachometer generator.

(2). Remove coupling bolt, coupling and shim from anti-torque output shaft.

(3). Remove coupling bolt, coupling, shim, drive pulley and pulley guard from main transmission input shaft.

(4). Remove input shaft seal drain connector (Ref. Sec. 12-00-00).

(5). Install suitable covers and plugs to protect all openings, including threaded holes.

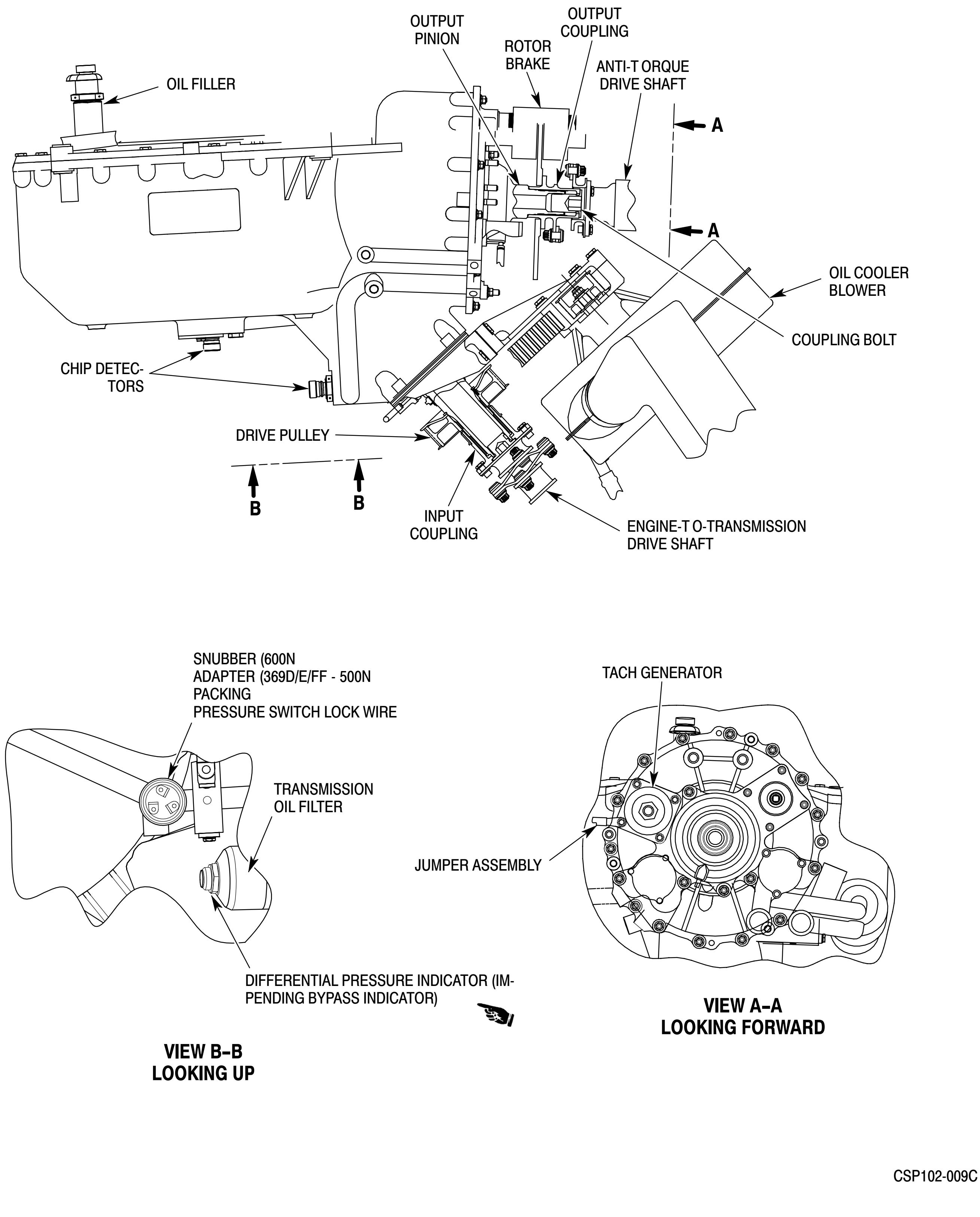


Figure 202. 369F5100 Main Transmission Build-Up

4. Main Transmission Build-Up

(Ref. Figure 202)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM111	Grease, aircraft
CM112	Anti-seize compound high temperature
CM417	Cement
CM425	Sealing compound
CM702	Lockwire CRES

(1). Install one preliminary 0.010 inch (0.254 mm) shim on anti-torque output shaft to prevent coupling bolt from bottoming in shaft.

(2). Coat coupling splines with grease (CM111) and coat bolt threads with anti-seize compound (CM112) before assembly. Install shaft coupling and temporarily tighten coupling bolt to approximately **250 inch-pounds (28.25 Nm)**.

(3). Install tachometer generator. With rotor brake installed, ensure electrical receptacle is at 11 o'clock position. Torque nuts to **30 - 40 inch-pounds (3.39 - 4.52 Nm) plus drag torque**.

(4). Install input shaft seal drain connector, bonding it in place with sealing compound (CM425).

NOTE: On the 369F5100 transmission, the oil pressure switch is mounted on the bottom, right side, facing down.

(5). 600N: Using a new O-ring, install 147D-2 snubber and torque to **155 - 165 inch-pounds (17.51 - 18.64 Nm)**. 369D/E/FF - 500N: Using a new O-ring, install 369F5195-1 adapter with teflon tape wrapped around threads as required and torque to **155 - 165 inch-pounds (17.51 - 18.64 Nm)**.

(6). Using a new O-ring, install oil pressure switch and safety with lockwire (CM702).

(7). Bond main rotor output shaft O-ring in place with cement (CM417).

(8). Using two new O-rings, install extension, screen and filler on transmission. Use 369A5169 shims to ensure filler is angled no more than 30° from center facing forward.

5. Main Transmission Inspection Procedure

(Ref. Figure 201) The following procedures provide information for checking the main transmission for oil leakage and mechanical defect.

(1). Remove sound insulation and transmission access covers.

(2). Inspect transmission for oil leaks, cracks, corrosion, secure electrical connections and correct oil level. Evaluate oil leakage according to Fluid Leak Analysis.

CAUTION Inspect all fluid lines for adequate clearance between structure and components. Vibration may cause chafing of lines and subsequent leaking.

(3). Inspect four mounting flanges on main transmission housing for corrosion and cracks. Check that transmission mounting nuts are secure.

(4). Check that all safety wiring is intact.

6. Main Transmission Repair Procedure

(Ref. Figure 201) Replace electrical components, breather-filler, filler extension, filler screen, externally accessible O-rings, scavenge pump, lubrication pump, filter, input shaft oil seal and anti-torque output shaft oil seal if defective. Dents in outer surface of transmission housing deeper than 0.10 inch (2.54 mm) or covering more than 0.60 square inch (3.87 cm^2) area require replacement of transmission (for repairs not covered in this section, Ref. CSP-COM-5).

This procedure is applicable to dents not exceeding specified limits.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM234	Solvent, dry-cleaning
CM318	Primer
CM411	Adhesive, epoxy
CM801	Abrasive paper, silicon carbide

NOTE: Any evidence of lubricating oil leakage in a repair area requires replacement of transmission.

(1). Clean area with solvent (CM234) and remove sharp edges with grade 320 abrasive paper (CM801).

(2). Apply coat of primer (CM318) on repaired surface.

(3). If dent is deeper than 0.030 inch (0.762 mm), fill depression with epoxy adhesive (CM411) and blend to surrounding surfaces.

(4). Touch up re-worked area with paint (Ref. Sec. 20-30-00).

7. Input Drive Assembly - Oil Leakage Repair Procedure

A. Input Pinion O-Ring Replacement

(Ref. Figure 203) Use the following repair procedure when oil leakage occurs between the main transmission housing and the pinion bearing sleeve flange.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM218	Alcohol, denatured

(1). Remove the shaft interconnect, transmission input coupling, drive pulley and guard, and cooling blower assembly (Ref. Sec. 63-21-00).

(2). Drain oil from input drive assembly through the lower chip detector plug (Ref. Sec. 12-00-00).

(3). Remove attaching hardware securing blower mount assembly.

(4). Using NAS603-64 jack screws at two corners of the input quill, begin pulling the input quill from the transmission housing. As required, operators may use 0.5-1.0 inch (12.70-25.40 mm) bar stock or equivalent as spacers to put under the jack screws to assist removing the input quill.

NOTE: It may be necessary to heat main housing to move input drive assembly.

(5). Gently screw input drive assembly away from main housing no more than 0.150 inch (3.81 mm) to gain access to O-ring between main housing and input pattern shim.

(6). Remove jack screws from input drive assembly pinion.

(7). If required, cut defective O-ring for removal.

(8). Clean and inspect pattern shim for distortion and ensure no overlap condition exists at butt/split line of shim.

(9). Clean area between main housing and input drive sleeve with alcohol (CM218) to remove paint chips or other foreign matter.

(10). Install new O-ring by slipping over blower mount. Seat O-ring in contact with the main housing.

(11). Remove alignment bolts and install attaching hardware in blower mount and input pinion bearing sleeve.

(12). Tighten attaching hardware as follows:

(a). Tightening the four attaching bolts equally.

(b). Tighten hardware until attaining a positive clamp-up between the main housing and input pinion bearing sleeve flange.

(13). Remove attaching hardware.

(14). Ensure the O-ring is seated in main housing groove.

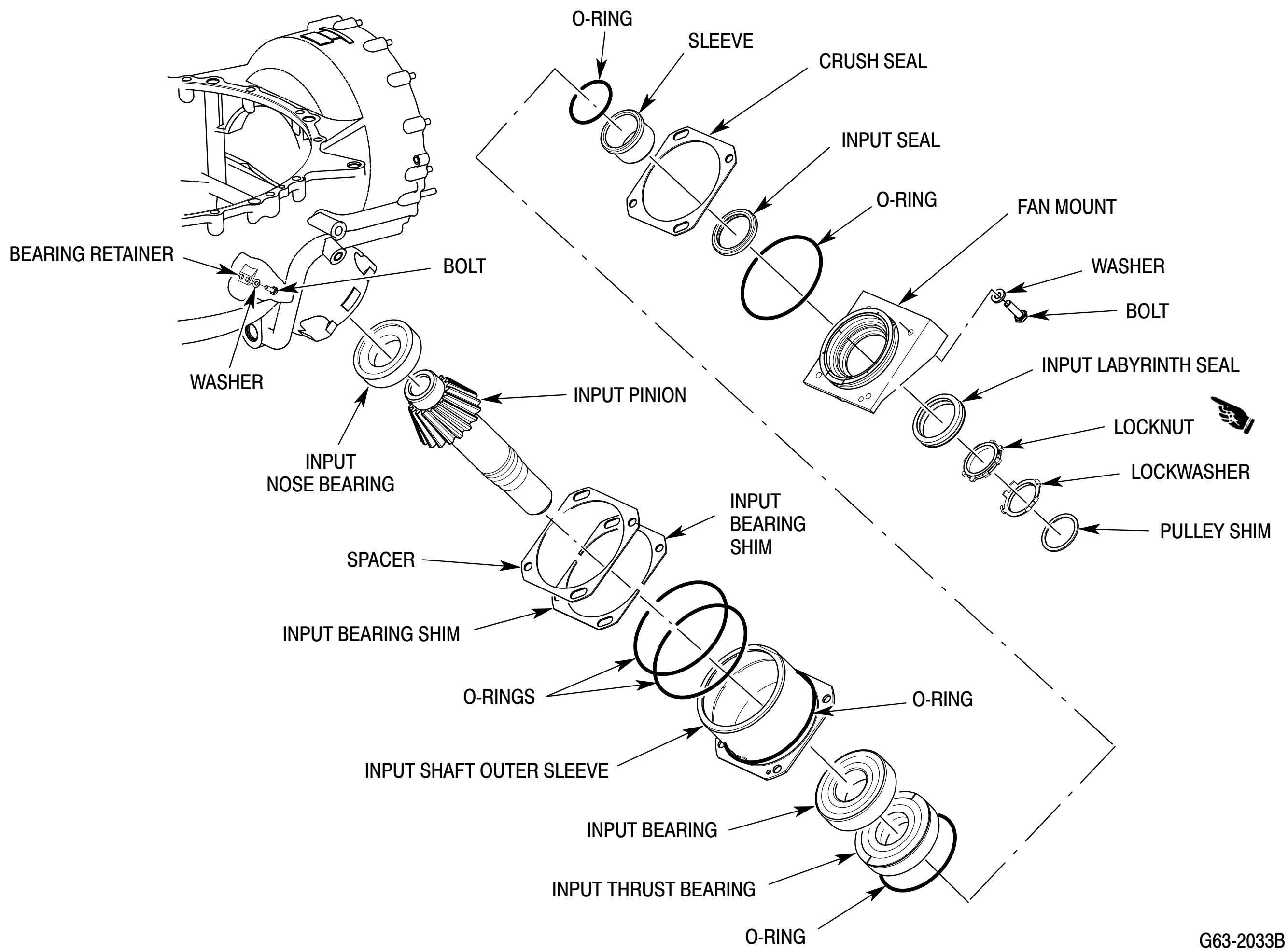


Figure 203. Drive Assembly O-Ring Replacement

(15). When O-ring is seated correctly, reinstall input pattern shim between main housing and input pinion bearing sleeve flange and reinstall hardware.

(16). Tighten attaching hardware as follows:

(a). Maintain an inward preload on input pattern shim during the tightening sequence.

(b). Torque attaching hardware **50 - 70 inch-pounds (5.65 - 7.91 Nm) plus drag torque**.

(17). Inspect pattern shim to ensure no overlap condition exists at butt/split line.

(18). Reinstall the shaft interconnect, transmission input coupling, drive pulley and guard, and cooling blower assembly.

(19). Service the transmission (Ref. Sec. 12-00-00).

B. Input Pinion Seal Replacement

(Ref. Figure 203) Use the following repair procedure when oil leakage occurs at the input pinion seal.

NOTE:

- If replacing a magnetic seal with a labrynth seal, a speedi- sleeve must be installed (Ref. COM, Sec. 63-20-25).
- If installing a 369F5165-1 labrynth seal, seal must be modified (Ref. COM, Sec. 63-20-25).

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM112	Anti-seize compound high temperature
CM218	Alcohol, denatured
CM425	Sealing compound

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
N/A	369F5100ATP-1 Locknut removal tool

(1). Remove the main transmission drive shaft (Ref. Sec. 63-10-00, Main Transmission Drive Shaft Replacement).

(2). Remove nut from transmission input coupling, drive pulley and guard (Ref. Sec. 63-10-00, Main Transmission Drive Shaft Replacement), keep all shims with coupling.

(3). Drain oil from input drive assembly through the lower chip detector plug (Ref. Sec. 12-00-00).

(4). Remove lockwasher.

(5). Using locknut removal tool, remove locknut.

NOTE: The following procedure requires two people to accomplish.

(a). Insert tee over locknut and put cheater bar over one ear of tee.

(b). Insert socket through center of tee to engage splines on input shaft.

(c). Insert adapter and breaker bar into socket.

(d). Turn locknut removal tee counter-clockwise, while holding spline socket stationary, to remove nut.

(6). Using seal removal tool, remove seal from input quill.

(7). Clean sealant from seal seating surface in blower mount with denatured alcohol (CM218).

(8). Allow to air dry.

(9). Apply sealing compound (CM425) to seal edge and mating surface in blower mount.

(10). Insert seal into blower mount.

(11). Clean any excess sealant and allow sealant to cure per manufacturer's instructions.

(12). Apply anti-seize compound (CM112) to non-serrated threads on pinion and install locknut.

NOTE: The following procedure requires two people to accomplish.

(a). Insert tee over locknut and put cheater bar over one ear of tee.

(b). Insert socket through center of tee to engage splines on input shaft.

(c). Insert adapter and breaker bar into socket.

(d). Turn input shaft counter-clockwise, while holding locknut stationary, to install nut.

(e). Torque nut to **250 foot-pounds (339 Nm)**. Loosen locknut and re-torque to **183 - 225 foot-pounds (248 - 305 Nm)**.

(13). Install lockwasher.

(14). Reinstall input coupling with shims previously removed (Ref. Sec. 63-10-00, Main Transmission Drive Shaft Replacement).

(15). Reinstall main transmission drive shaft (Ref. Sec. 63-10-00, Main Transmission Drive Shaft Replacement).

(16). Service transmission (Ref. Sec. 12-00-00).

8. Main Transmission Filter Replacement

(Ref. Figure 202)

(1). Remove interior trim and blower access door.

(2). Position container or cloth to catch residual oil. Loosen and remove filter housing by turning counterclockwise.

(3). Remove filter element.

(4). Inspect filter element for metal particles. If metal particles are present, remove main transmission chip detectors and inspect for other evidence of internal failure in gearbox.

(5). If filter is excessively clogged, flush system and check filter bypass valve for operation (Ref. COM).

(6). Install new filter element and new O-rings.

(7). Install housing and torque to **90 - 100 inch-pounds (10.17 - 11.30 Nm)**.

(8). If necessary, replenish transmission oil supply.

(9). Perform ground runup of helicopter and check for oil leakage.

(10). Reinstall, in order, blower access door and interior trim.

9. Main Transmission Run-In Procedure

New (from the factory) transmissions must have a run-in period to remove the corrosion preventive coating from the coast-side of the drive gears. If not done at installation, the coating will come off, over time, and cause the impending bypass button to pop.

(1). Fly aircraft normally, monitoring the transmission chip detectors for metal particles, for the first 10 hours.

NOTE: Ignore the impending bypass indicator in the first 10 hours of flight.

(2). During the first 10 hours of flight time, perform at least three partial autorotations (Ref. Pilots Flight Manual) to load the transmission on the coast side of the gears.

NOTE: Each autorotation should be at least 30 seconds in duration.

(3). After 10 hours flight time has elapsed, replace filter element (Ref. Main Transmission Filter Replacement).

NOTE:

- Coating particles are black in color. Some silver non- magnetic metallic particles could be in the filter bowl, which are magnesium machining debris from manufacturing.
- Flushing transmission oil is preferred but not necessary.

(4). Reset the impending bypass indicator.

Section

63-21-00

Main Transmission Lubrication and Cooling System (369D/E/FF - 500/600N)

MAIN TRANSMISSION LUBRICATION AND COOLING SYSTEM

REMOVAL/INSTALLATION

1. Main Transmission Lubrication System

The main transmission lubrication system consists of a lubrication pump driven by the transmission, an oil filter, oil cooler, oil cooler bypass valve, oil temperature sender, oil pressure sender, liquid level plug, two chip detectors, a drain line from the tail rotor output shaft seal and a drain line from the input shaft seal.

2. Main Transmission Lubrication Pump Replacement (369D25100 Transmission)

(Ref. Figure 401)

A. Main Transmission Lubrication Pump Removal (369D25100 Transmission)

(1). Remove sound insulation and transmission access covers.

(2). Remove hardware that secure pump housing to mounting pad.

(3). Remove pump and discard three O-rings.

B. Main Transmission Lubrication Pump Installation (369D25100 Transmission)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM114	Petrolatum

(1). Install new O-rings in ports and in groove of pump sleeve. Apply light coating of petrolatum (CM114) to both O-rings and mating bores in transmission to prevent damage to O-rings.

(2). Align square drive of pump with drive shaft in transmission and carefully press pump into place.

(3). Install attaching hardware; torque to **50 - 70 inch-pounds (5.65 - 7.91 Nm)**.

(4). Ground run helicopter (Ref. PFM) and check pump interface for leaks per Fluid Leak Analysis (Ref. Sec. 63-20). Verify that pressure warning light is not on at 55% N_2.

(5). Reinstall access covers and sound insulation.

3. Main Transmission Lubrication Pump Replacement (369F5100 Transmission)

(Ref. Figure 402)

A. Main Transmission Lubrication Pump Removal (369F5100 Transmission)

(1). Remove sound insulation and transmission access covers (Ref. Sec. 52-40).

(2). Remove hardware that secure pump housing to mounting pad.

(3). Remove pump and discard O-rings.

B. Main Transmission Lubrication Pump Installation (369F5100 Transmission)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM114	Petrolatum

(1). Install new O-rings in ports and in groove of pump sleeve. Apply light coating of petrolatum (CM114) to both O-rings and mating bores in transmission to prevent damage to O-rings.

(2). Align square drive of pump with drive shaft in transmission and carefully press pump into place.

(3). Install attaching hardware; torque to **40 - 50 inch-pounds (4.52 - 5.65 Nm) plus drag torque**.

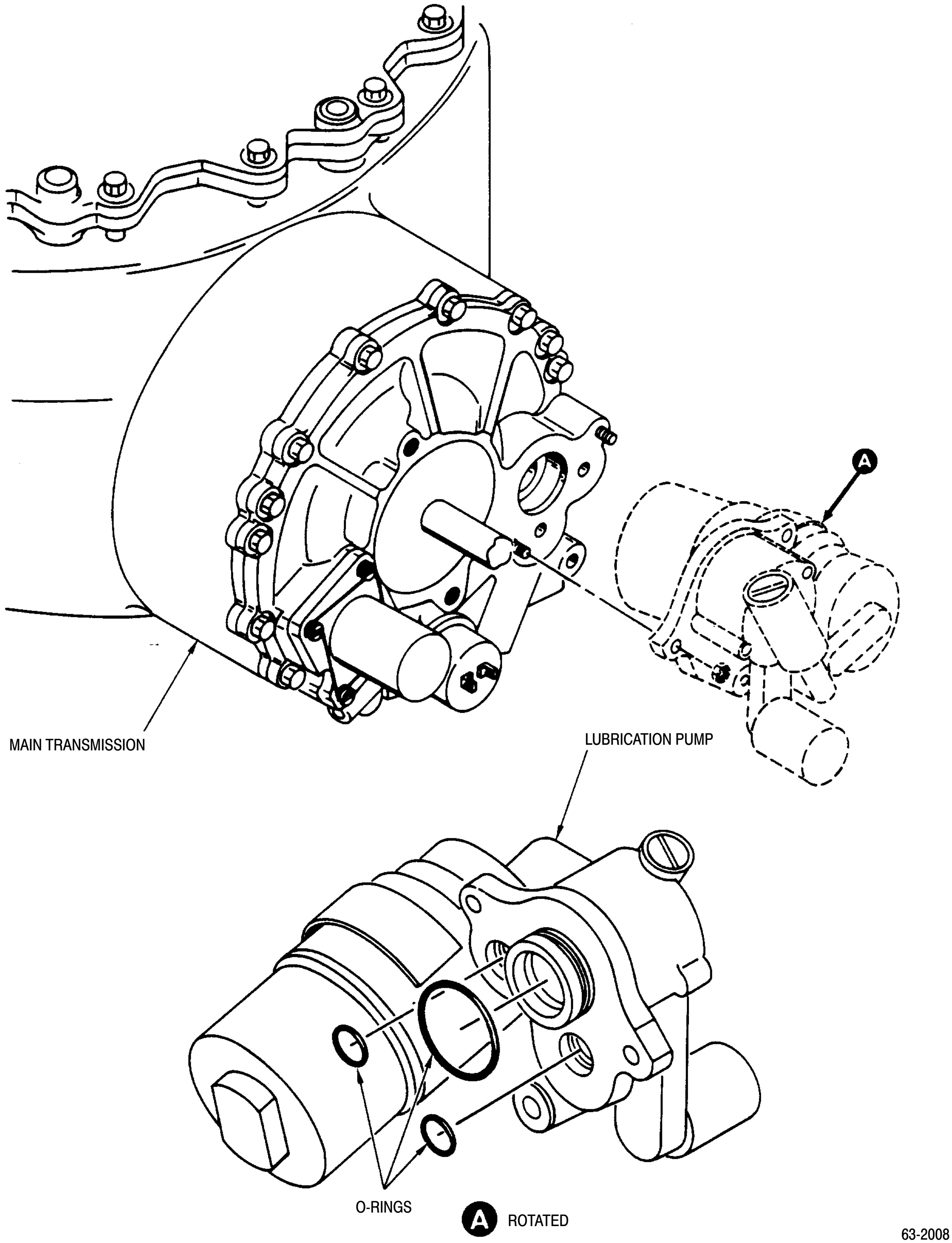


Figure 401. Main Transmission Lubrication Pump (369D25100 Transmission)

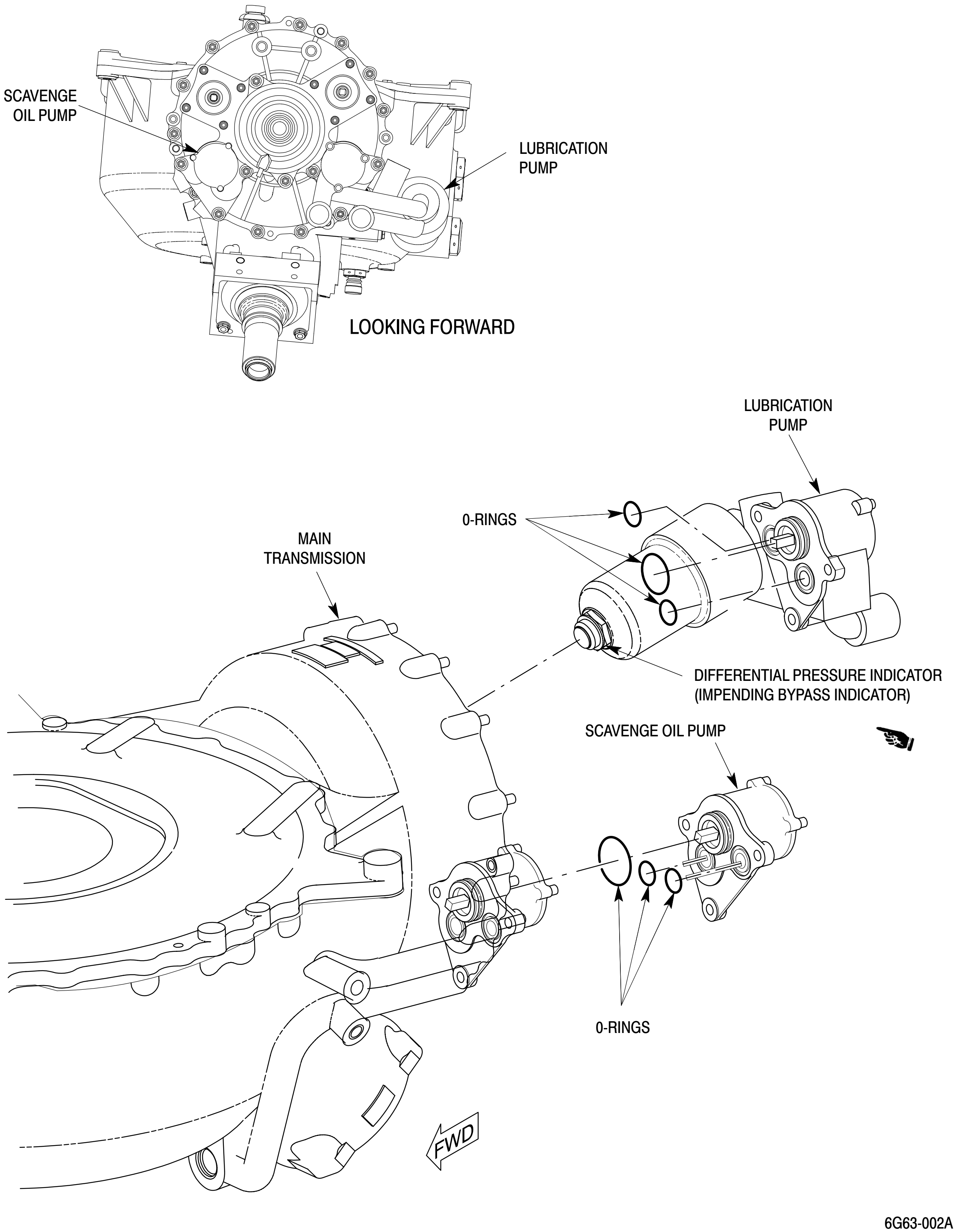


Figure 402. Main Transmission Lubrication Pump (369F5100 Transmission)

(4). Ground run helicopter (Ref. PFM) and check pump interface for leaks per Fluid Leak Analysis (Ref. Sec. 63-20). Verify that pressure warning light is not on at 55% N_2.

(5). Reinstall access covers and sound insulation (Ref. Sec. 52-40).

4. Main Transmission Filter Replacement (369D25100 Transmission)

(1). Remove interior trim and blower access door.

(2). Position container or cloth to catch residual oil. Loosen and remove filter housing by turning counterclockwise.

(3). Remove filter element.

(4). Inspect filter element for metal particles. If metal particles are present, remove main transmission chip detectors and inspect for other evidence of internal failure in gearbox.

(5). If filter is excessively clogged, flush system and check filter bypass valve for operation (Ref. COM).

(6). Install new filter element and new O-rings.

(7). Install housing and torque to **70 - 100 inch-pounds (7.91 - 11.30 Nm)**.

(8). If necessary, replenish transmission oil supply; Then perform ground runup of helicopter and check for oil leakage.

(9). Reinstall, in order, blower access door and interior trim.

5. Main Transmission Filter Replacement (369F5100 Transmission)

(1). Remove interior trim and blower access door.

(2). Position container or cloth to catch residual oil. Loosen and remove filter housing by turning counterclockwise.

(3). Remove filter element.

(4). Inspect filter element for metal particles. If metal particles are present, remove main transmission chip detectors and inspect for other evidence of internal failure in gearbox.

(5). If filter is excessively clogged, flush system and check filter bypass valve for operation (Ref. COM).

(6). Install new filter element and new O-rings.

(7). Install and tighten housing.

(8). If necessary, replenish transmission oil supply; then perform ground runup of helicopter and check split line for oil leakage.

(9). Reinstall blower access door and interior trim.

6. Main Transmission Scavenge Pump Replacement (369F5100 Transmission)

(Ref. Figure 402)

A. Main Transmission Scavenge Pump Removal (369F5100 Transmission)

(1). Remove sound insulation and transmission access covers (Ref. Sec. 52-40).

(2). Remove hardware that secure pump housing to mounting pad.

(3). Remove pump and discard O-rings.

B. Main Transmission Scavenge Pump Installation (369F5100 Transmission)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM114	Petrolatum

(1). Install new O-rings in ports and in groove of pump sleeve. Apply light coating of petrolatum (CM114) to both O-rings and mating bores in transmission to prevent damage to O-rings.

(2). Align square drive of pump with drive shaft in transmission and carefully press pump into place.

(3). Install attaching hardware; torque to **40 - 50 inch-pounds (4.52 - 5.65 Nm) plus drag torque**.

(4). Ground run helicopter (Ref. PFM) and check pump interface for leaks per Fluid Leak Analysis (Ref. Sec. 63-20).

7. Main Transmission Oil Cooler Bypass Valve Replacement

(Ref. Figure 403) The oil cooler bypass valve causes main transmission lubrication oil to bypass the oil cooler when oil temperature is 178° ±2°F (82° ±1°C) or less, or the following conditions exist: pressure differential of 25 psi (172 kPa) or higher across oil cooler with oil temperature of 190°F (88°C) or higher. Excessive transmission oil temperature can be caused by failure of oil cooler bypass valve to seat in housing. Before installing new valve, inspect seat within housing. If housing seat is damaged, housing must also be replaced.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM112	Anti-seize compound high temperature

(1). Prepare container for draining oil from transmission oil cooler lines upstream of bypass valve housing through bypass valve port. Unscrew valve and drain oil in container. Install an AN806-12 plug in housing to eliminate residual drip.

(2). Apply light coat of antiseize compound (CM112) to valve threads and install O-ring on valve. Torque valve to **50 - 60 inch-pounds (5.65 - 6.78 Nm)**.

(3). Replenish transmission oil lost during bypass valve removal (Ref. Sec. 12-00-00).

8. Main Transmission Oil Cooler Replacement

A. Main Transmission Oil Cooler Removal

(1). Drain main transmission lubrication system (Ref. Sec. 12-00-00).

(2). Remove two tubes that connect oil cooler to oil cooler bypass valve housing.

NOTE: MDHS Notice DN- 72.1 provides instructions for modifying oil cooler drain system on early model helicopters to current configuration.

(3). Remove oil drain tube and drain fitting.

(4). Detach oil cooler outlet duct.

(5). Remove compressor cooling duct and pull oil cooler outlet duct away from oil cooler.

(6). Remove hardware that secures oil cooler and oil cooler inlet duct to firewall; remove oil cooler.

(7). Remove covers from oil cooler by breaking lockwire and cutting sealant.

NOTE: MDHS Notice DN-23.2 contains information relative to installation of oil cooling lines.

B. Main Transmission Oil Cooler Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM112	Anti-seize compound high temperature
CM408	Adhesive, silicone rubber
CM702	Lockwire CRES
CM715	Tape, pressure sensitive

(1). Scrape old sealant and remnants of pressure-sensitive tape seals from oil cooler covers and reinstall covers with (CM702) lockwire and sealant (CM408). Use sealant to fill gaps (four places) at ends of covers.

(2). Make up four 0.125 inch (3.175 mm) thick and four 0.250 inch (6.35 mm) thick seals, all 0.750 inch (19.05 mm) wide, from pressure-sensitive tape (CM715).

(3). Apply seals, fabricated in previous step, on oil cooler and oil cooler covers. Cut holes in seals to accommodate bolts (eight places).

(4). Secure oil cooler and oil cooler inlet duct to firewall with four bolts, washers and nuts.

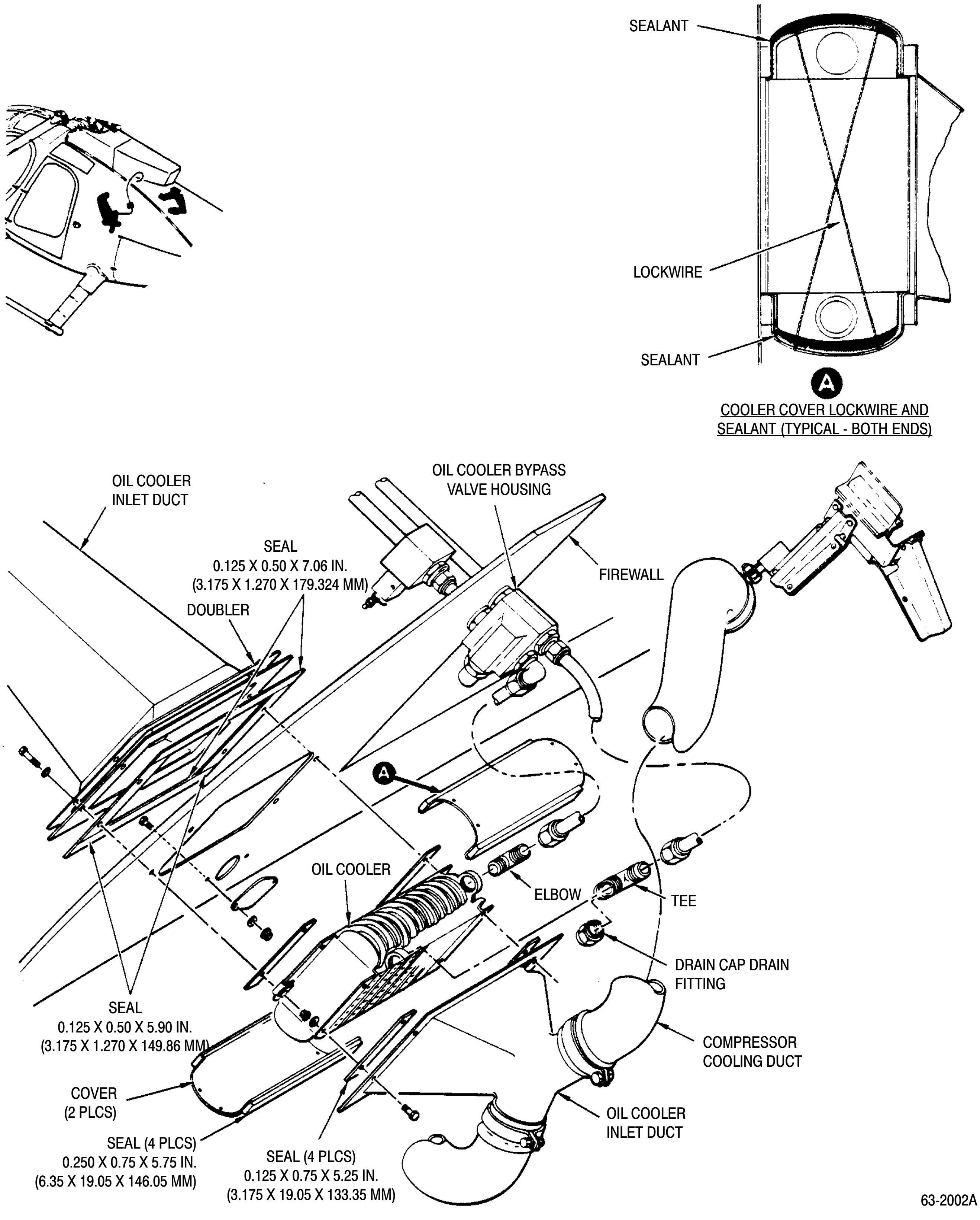


Figure 403. Main Transmission Oil Cooler Installation

(5). Secure oil cooler outlet duct to oil cooler with four bolts, washers and nuts.

(6). Install tee (with drain cap), elbow and tubes that run from oil cooler to oil cooler bypass valve housing, applying light coat of antiseize compound (CM112) to threads.

(7). Install oil drain tube and fitting on tee.

(8). Install compressor cooling duct.

(9). Fill main transmission lubrication system (Ref. Sec. 12-00-00).

9. Main Transmission Oil Temperature Sender Replacement

(Ref. Figure 404) The oil temperature sender for the main transmission lubrication system is installed in a housing inserted in the 1/2 inch oil line to **IN** port of lubrication pump. Switch contacts close when oil temperature exceeds 240° ±l0°F (116° ±5°C).

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM112	Anti-seize compound high temperature
CM726	Tape, teflon

(1). Remove lockwire and detach electrical wire from sender terminal post. Position container for draining transmission oil cooler line. Remove two set screws securing sender within sender housing. Unscrew sender and drain oil in container. Plug housing to prevent oil drainage.

(2). Apply a light coat of antiseize compound (CM112) or tightly wrap two or three turns of teflon tape (CM726) on tapered threads of sender. Screw temperature sender into housing; torque to **30 - 40 inch-pounds (3.39 - 4.52 Nm)**. Install set screws until light contact is made with sender. Lockwire hex of sender to drilled head of ground wire screw in sender housing. Connect electrical wire to sender terminal and replenish transmission with oil lost (Ref. Sec. 12-00-00).

10. Main Transmission Oil Pressure Sender Replacement

(Ref. Figure 404) The main transmission oil pressure sender provides a ground to cause the **XMSN OIL PRESS** warning light to illuminate when oil Pressure is low. It also provides a ground to the running-time meter. Sender's normally-closed contacts open when oil pressure increases to 15 ±2 psi (103 ±14 kPa); simultaneously the sender's normally-open contacts close.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM112	Anti-seize compound high temperature
CM726	Tape, teflon

(1). Detach electrical wire or wires and using absorbent cloth, unscrew sender from transmission.

(2). Apply light coat of antiseize compound (CM112) or wrap two or three turns of teflon tape (CM726) on tapered threads of sender. Screw in sender; torque to **30 - 40 inch-pounds (3.39 - 4.52 Nm)**. Connect wire; make sure that connection is clean and tight. If three wires are present, for information on connection of third wire refer to wiring diagram for running time meter.

11. Liquid Level Plug Replacement

(1). Drain oil from transmission until oil level is well below edge of plug port (Ref. Sec. 12-00-00).

(2). Remove safetywire from plug.

(3). Remove plug by unscrewing counterclockwise.

(4). Remove and discard O-ring. Install new O-ring on plug.

(5). Install plug by screwing clockwise. Torque plug to **80 - 90 inch-pounds (9.04 - 10.17 Nm)**; install safetywire.

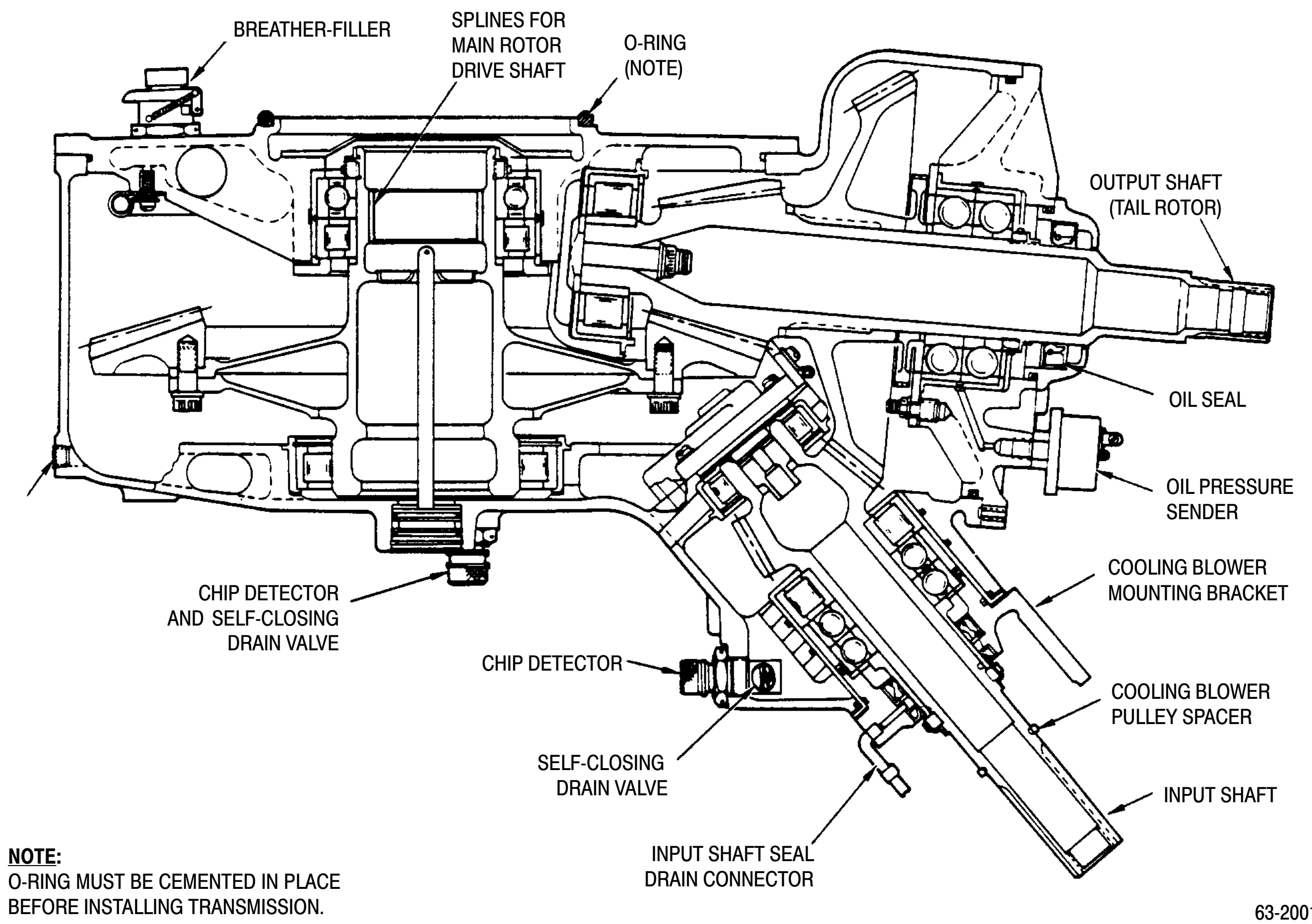


Figure 404. Main Transmission - Cross-Section View

12. Chip Detector Replacement

(Ref. Figure 404) For removal and installation instructions, refer to Draining Main Transmission (Ref. Sec. 12-00-00). For functional test information for detector circuit, refer to Sec. 95-30-00.

A. Cooling Blower

(Ref. Figure 405) The cooling blower is mounted to a bracket on the aft underside of the main transmission and coupled to the transmission input shaft by a pulley-driven belt. The blower exhausts air through the engine oil cooler and the main transmission oil cooler. Exhaust air from transmission and engine oil coolers is directed at various external portions of the engine and engine accessories.

13. Cooling Blower Replacement

A. Cooling Blower Removal

(Ref. Figure 405)

(1). Remove main transmission drive shaft and blower access door.

(2). Remove coupling bolt, coupling, shim(s) and pulley from transmission input shaft.

(3). Disconnect cooling blower drain tube. Loosen tie-down straps on blower duct rubber connectors and roll back connectors to disconnect ducts from cooling blower.

(4). Cut lockwire and remove four bolts attaching mounting bracket to transmission. Remove two shims inserted between bracket and transmission pad.

(5). Remove mounting bracket (with blower, pulley and belt) from helicopter.

NOTE: For 369D25100 transmission installation only; If equipped with 369D25626-11 mount bracket, examine bolts securing mount bracket to cooling blower assembly. If safety wired, remove and discard bolts. Replace with NAS1224-1L self-locking bolts.

(6). Disassemble cooling blower if required.

B. Cooling Blower Installation (369D25100 Transmission)

(Ref. Figure 405)

(1). Install pulley guard on main transmission input shaft.

(2). With belt looped around transmission input shaft, position mounting bracket on main transmission pad and loosely install four bolts and washers. Before tightening bolts, insert two shims between bracket and transmission pad. Verify that blower scroll clears tail rotor drive shaft by at least 0.190 inch (4.83 mm). Torque bolts to **65 - 75 inch-pounds (7.34 - 8.47 Nm)**. Lockwire bolt heads after belt tension is checked.

(3). Connect drain tube to cooling blower scroll fitting. Clamp tube to fitting with two turns of lockwire.

(4). Roll exhaust duct rubber connectors onto scroll outlets and secure with tie-down straps (Transmission oil cooler duct and engine oil cooler duct).

CAUTION In the following step do not use levers or other tools on belt, or in any way force belt onto pulley.

(5). Slide pulley onto transmission input shaft to engage belt in teeth of both pulleys.

(6). Adjust belt tension.

NOTE: Instructions in step (7). below, apply only when original shim(s) (same shim thickness) are installed and drive shaft, overrunning clutch and couplings remain unchanged. A distance of 0.010 inch (0.254 mm) between bolt seating surface on coupling and transmission input shaft is required to ensure coupling bolt will not bottom out shaft and to provide proper assembly clamp up. (Ref. Sec. 63-10-00).

CAUTION The 0.010 inch (0.254 mm) minimum measurement between the bolt seating surface and the input shaft must be obtained to ensure proper clamp up. Warped shims or foreign material could provide a false 0.010 inch (0.254 mm) minimum measurement and improper clamp up could result during normal operation which may damage the main transmission input shaft.

(7). Install laminated shim and coupling on transmission input shaft. Secure coupling with coupling bolt; torque to **250 - 300 inch-pounds (28.25 - 33.90 Nm) plus drag torque**.

(8). Install main transmission drive shaft (Ref. Sec. 63-10-00).

(9). Install access panels.

14. Oil Cooler Blower Installation (369F5100 Transmission)

(Ref. Figure 406)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM111	Grease, aircraft
CM112	Anti-seize compound high temperature
CM425	Sealing compound
CM702	Lockwire CRES

(1). With belt looped around driven pulley, install oil cooler fan bracket.

NOTE: NAS1304 series bolts may be used in place of NAS6604 series bolts.

(a). Install four bolts with washers through oil cooler mounting bracket into fan bracket.

(b). Before tightening bolts, displace cooler toward the transmission flange to eliminate slack in that direction.

(c). Torque bolts to **70 - 90 inch-pounds (7.91 - 10.17 Nm)** and safety with lockwire (CM702).

(d). After bolts are torqued, seal around bolt heads with sealant (CM425).

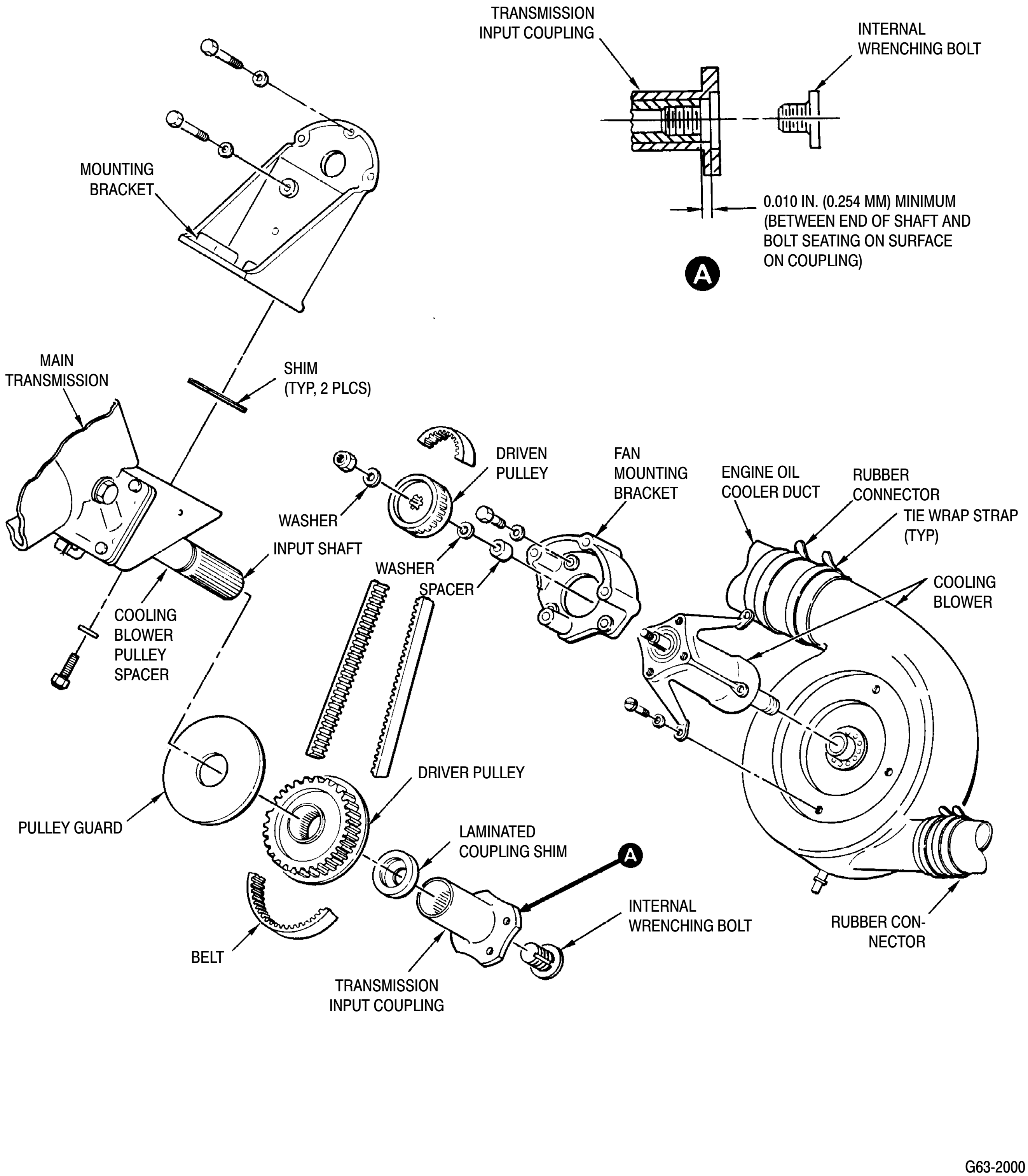


Figure 405. Cooling Blower Installation (369D25100 Transmission)

CAUTION When installing pulley and guard, ensure spring pin in pulley is fully engaged inside hole in pulley guard.

(2). Install pulley guard on main transmission input shaft.

(3). With belt looped around transmission input shaft, position mounting bracket on main transmission pad and loosely install two bolts with washers from the bottom of bracket and two bolts with washers from top of bracket.

(4). Before tightening bolts, insert two shims between bracket and transmission pad.

(5). Verify that blower scroll clears anti-torque drive shaft by a minimum of 0.190 inch (4.826 mm).

CAUTION In the following step, do not use levers or other tools on belt, or in any way force belt onto pulley.

(6). Slide driver pulley onto transmission input shaft to engage belt in teeth of both pulleys.

CAUTION

- The minimum of 0.010 inch (0.254 mm) measurement between the bolt seating surface and the input shaft must be obtained to ensure proper clamp-up. Warped shims or foreign material could provide a false 0.010 inch (0.254 mm) minimum measurement and improper clamp-up could result, which during normal operation, may damage the main transmission input shaft.
- Do not use clutch coupling shims under transmission input coupling. Inside diameter of clutch coupling shim is different than shim used on transmission input coupling. Incorrect diameters can cause an improperly seated shim, misalignment and cocked coupling.

(7). Torque bolts to **70 - 90 inch-pounds (7.91 - 10.17 Nm)**.

(8). Coat threads of coupling bolt with anti-seize compound (CM112).

(9). Lubricate input shaft splines and coupling splines with grease (CM111).

(10). Install input coupling shim and coupling on transmission input shaft with coupling bolt.

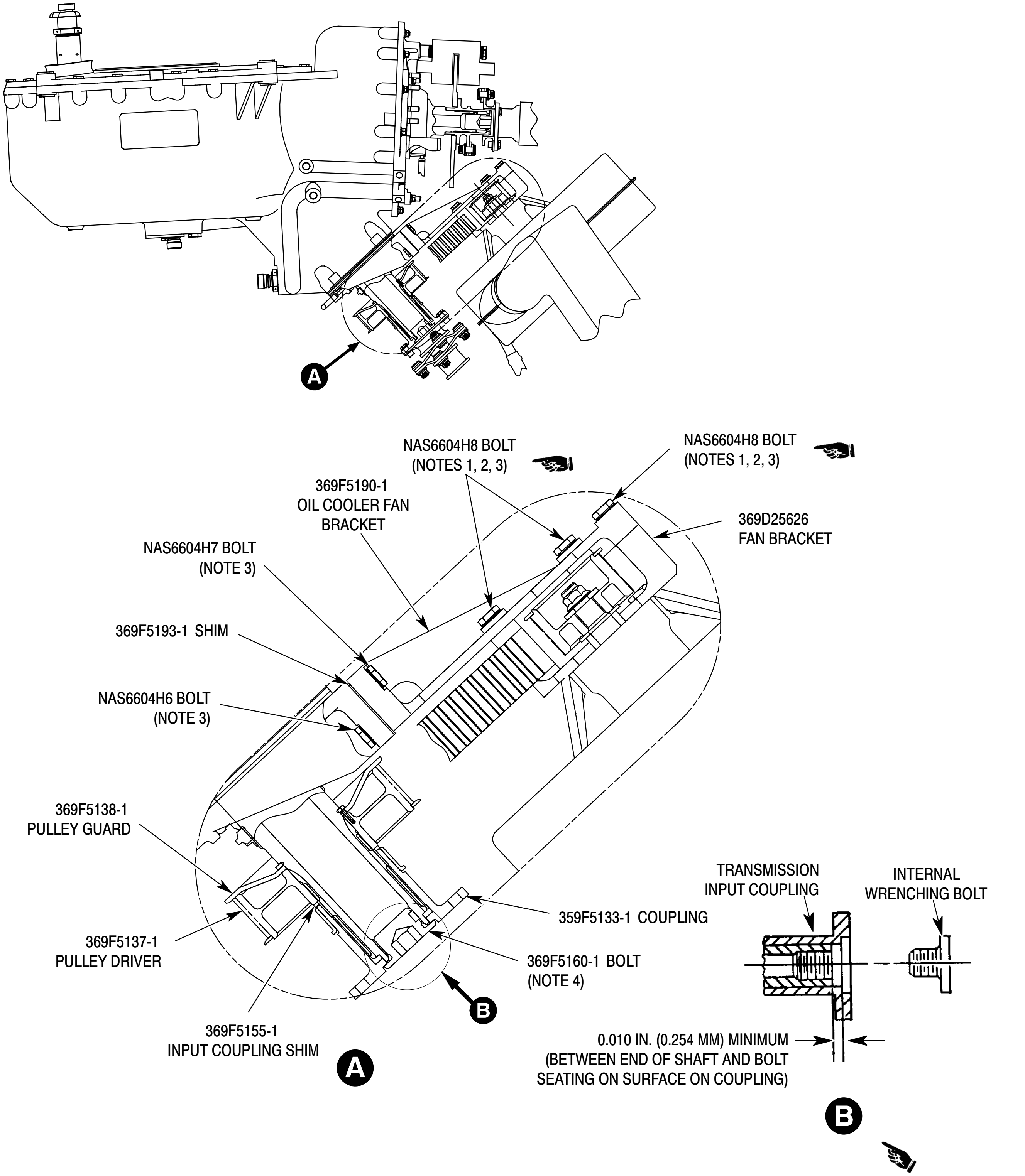
(11). Adjust belt tension (Ref. Sec. 63-21-00, Cooling Blower Belt Tension Check and Adjustment).

NOTE: Check coupling bolt for a minimum of **25 inch-pounds (2.82 Nm)** drag torque.

(12). Torque coupling bolt to **315 - 365 inch-pounds (35.59 - 41.24 Nm) plus drag torque**.

(13). Connect drain tube to cooling blower scroll fitting. Clamp tube to fitting with two turns of lockwire (CM702).

(14). Roll exhaust duct rubber connectors onto scroll outlets (transmission oil cooler duct and engine oil cooler duct) and secure with tie straps.



NOTES:
1. TORQUE BOLTS TO 70 - 90 INCH-POUNDS (7.91 - 10.17 NM).
2. AFTER TORQUING, SEAL BOLT HEADS WITH SEALANT (CM425).
3. TORQUE BOLTS TO 70 - 90 INCH POUNDS (7.91 - 10.17 NM) AND SAFETY WITH LOCKWIRE (CM702).
4. TORQUE COUPLING BOLT TO 315 - 365 INCH POUNDS (25.59 - 41.24 NM) PLUS DRAG TORQUE (DRAG TORQUE TO BE NOT LESS THAN 25 INCH-POUNDS (2.82 NM)).

CSP102-012B

Figure 406. Oil Cooler Blower Installation (369F5100 Transmission)

MAIN TRANSMISSION LUBRICATION AND COOLING SYSTEM

INSPECTION/CHECK

1. Lubrication System Inspection

(Ref. Figure 601)

(1). Inspect plumbing and system components from oil cooler to lubrication pump for leaks, secure attachment and damage.

(2). Inspect oil cooler, lubrication pump, oil filter, oil pressure switch, liquid level plug, and chip detectors for leaks, secure attachment and damage.

(3). Inspect electrical connections at oil temperature switch, oil pressure switch, and chip detectors for absence of corrosion, secure attachment and damage.

2. Cooling Blower Inspection

(Ref. Figure 405)

(1). Remove blower access door and inspect belt for damage or excessive wear. Belt should be fully seated in pulley grooves. Limited cracking or separation of belt.

(a). Belt should be fully seated in pulley grooves.

(b). Limited cracking or separation of belt between pulley grooves is acceptable. Visually monitor any propagation. Belt should be replaced if any one separation exceeds three inches in length or if total separation exceeds 50 percent of peripheral length of belt. (For belt replacement schedule, refer to Section 05-10-00).

(2). Check belt tension.

(3). Hand-rotate main rotor to examine all visible areas of driven pulley and driver pulley for damage or excessive wear. Listen for sounds of defective bearings or of impeller touching scroll while rotor is turned.

(4). Examine scroll for cracks or breaks, and for secure attachment to hub.

(5). Examine rubber connectors at engine oil cooler duct and transmission oil cooler duct where they attach to scroll. Examine ducts for damage.

(6). Look through hub support legs and, to extent possible, inspect impeller for damage. A crack, loose rivet or distorted vane is cause for impeller replacement. Inspect mount screws and bolts for evidence of broken slippage mark paint.

(7). Examine scroll drain tube for damage, secure attachment and clear passage.

(8). Examine mounting bracket and fan mounting bracket for secure attachment. Check for broken lockwire at bolt heads securing mounting bracket cooling blower assembly.

3. Cooling Blower Inspection (Disassembled)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM206	Chemical coating
CM318	Primer
CM801	Abrasive paper, silicon carbide

(1). Examine belt for damage or excessive wear (Ref. Figure 405).

(2). Examine driver pulley, pulley guard and driven pulley for damage or excessive wear.

(3). Check driven pulley retaining nut for a minimum of **160 inch-pounds (18.08 Nm) plus drag torque**. If loss of torque is indicated, remove pulley nut and inspect washer for evidence of elongation and wear.

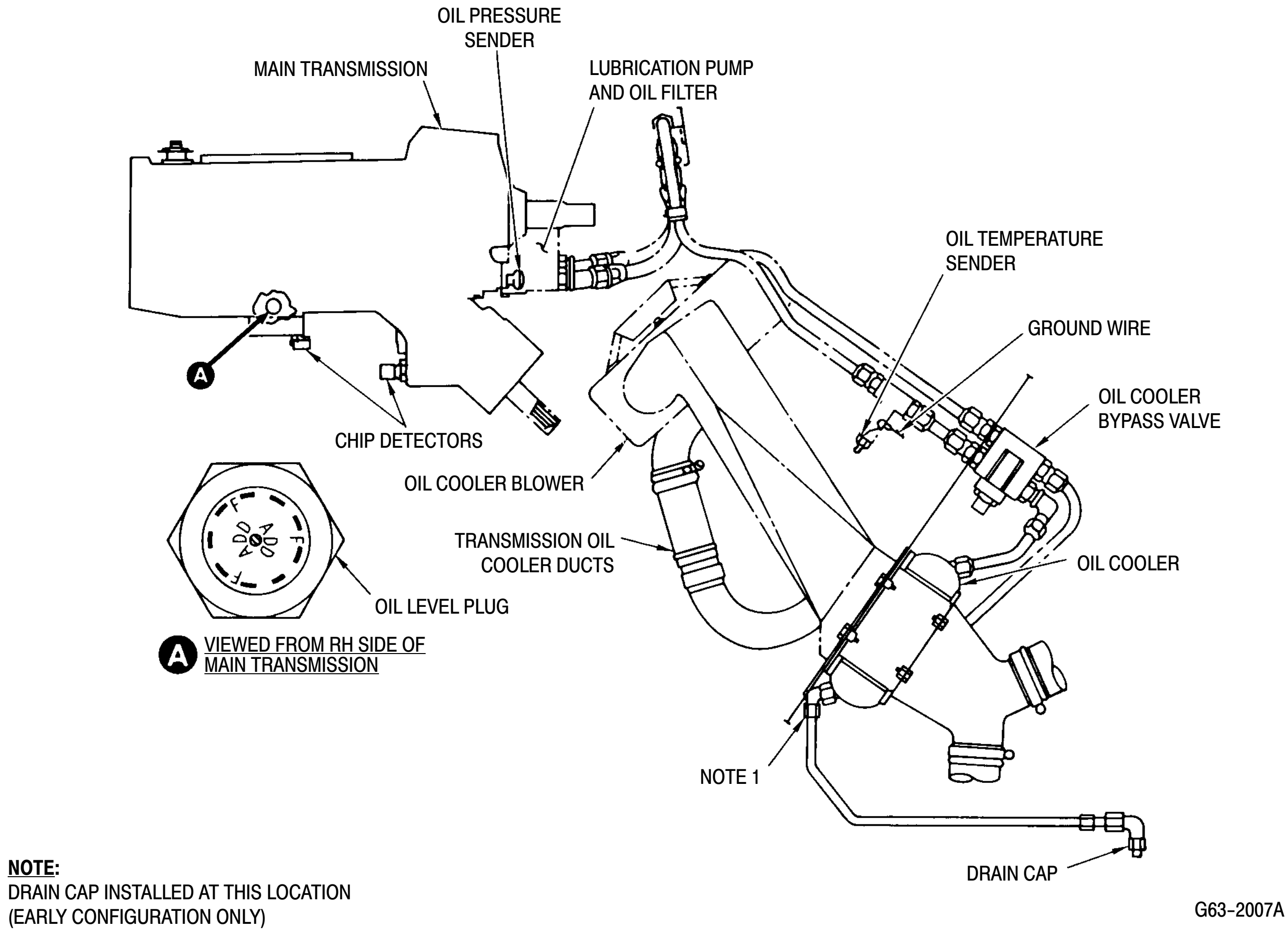


Figure 601. Main Transmission Cooling Blower and Duct

(4). Check pulley shaft and splines for condition. Replace damaged flat washer or ring washer with flat washer. Install and torque nut to **160 - 190 inch-pounds (18.08 - 21.47 Nm) plus drag torque**.

(5). Examine mounting bracket and fan mounting bracket for cracks and breaks.

(6). Examine web of mounting bracket for wear.

(a). Remove nicks, scratches or grooves leaving sharp impressions in web. Minimum acceptable web thickness: 0.125 inch (3.175 mm).

(b). Replace mounting bracket if web does not meet 0.125 inch (3.175 mm) minimum after repair.

(7). Examine scroll (Ref. Figure 801) for cracks, breaks and distortion.

CAUTION Handle impeller carefully to prevent damage that could cause imbalance and require replacement of impeller.

(8). Visually (minimum 10X magnification) examine impeller (Ref. Figure 801) for cracks, deformation and separation.

(a). Look for foreign material attached to impeller. None is permitted.

(b). Check for loose rivets at hub.

(c). Use electroprobe or gage of equivalent accuracy to measure depth of scratches or nicks.

(d). Use penetrating dye to examine suspected cracks.

(e). Scratches and nicks not exceeding 0.006 inch (0.152 mm) depth are repairable by sanding with grade 320 abrasive paper (CM801) to blend defect into surrounding area.

1). Treat blended areas with chemical coating (CM206) and touch-up with primer (CM318).

2). All other defects require replacement of impeller.

(9). Examine shaft for damage or excessive wear. Discard seal (Ref. Figure 801).

4. Cooling Blower Belt Tension Check and Adjustment

(1). Check that laminated shims are in position between mounting bracket and transmission fan mount assembly. Tighten the four mounting bolts. Rotate pulley by hand a few turns to even out belt tension.

(2). Measure belt deflection three times at approximate center of one of the spans. The force required to deflect the belt 0.170-0.200 inch (4.32-5.08 mm) must be 1.75-2.00 pounds (0.7938-0.9072 Kg). This load is to be applied at a right angle to the outside face of the belt. Measure belt deflection without turning driven pulley, then turn driven pulley 1/2 turn and repeat belt deflection measurement. Turn driven pulley an additional 1/4 turn and measure belt deflection again.

(a). If the tension is too high, greater than 2.00 pounds (0.9072 Kg), tension can be reduced by peeling off a layer of the laminated shim, one at a time equally from both shims, until tension falls into proper range.

(b). If the tension is too low: Add layers from a spare shim in the same manner as removed in step (2).(a). above, until tension falls into proper range.

(3). Make a final check of bolt torque, **60 - 75 inch-pounds (6.78 - 8.47 Nm)**, and then lockwire drilled heads.

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MAIN TRANSMISSION LUBRICATION AND COOLING SYSTEM REPAIRS

1. 369D25630 Cooling Blower Disassembly

(Ref. Figure 801)

NOTE: Disassemble cooling blower only to extent necessary to perform inspection, replacement or repair of specific items. Replace cooling blower bearings and belt per replacement schedule (Ref. Sec. 05-10-00). Bolts used to secure mount bracket to cooling blower must be self-locking type only. Discard bolts if safety wired and replace with self-locking bolts (Ref. Figure 405).

(1). Remove mounting bracket (Ref. Sec. 63-20-00).

(2). Remove scroll cover.

(3). Hold impeller retaining nut with socket wrench and remove driven-pulley retaining nut and washer.

(4). Remove driven pulley. Do not forcefully tap or pry; if necessary, use pulling device.

(5). Remove spacer from impeller shaft.

(6). Remove four screws and washers that attach scroll to hub.

CAUTION In following step, do not use tools or other devices to hold impeller. Tool damage can affect impeller balance. Holding device must not damage shaft splines and must hold shaft with **250 - 300 inch-pounds (28.25 - 33.90 Nm)** of torque applied to impeller retaining nut.

(7). Secure splined end of impeller shaft in holding device meeting requirements of caution above, and remove impeller retaining nut and washer.

CAUTION Be careful to prevent impeller damage. Slight impeller deformation or damage can cause imbalance. Protect shaft threads and use nonmetallic mallet when performing step (8). below.

(8). Manually support impeller and separate impeller from shaft by carefully tapping end of shaft. Remove impeller, scroll, key, spacer and any shimming present.

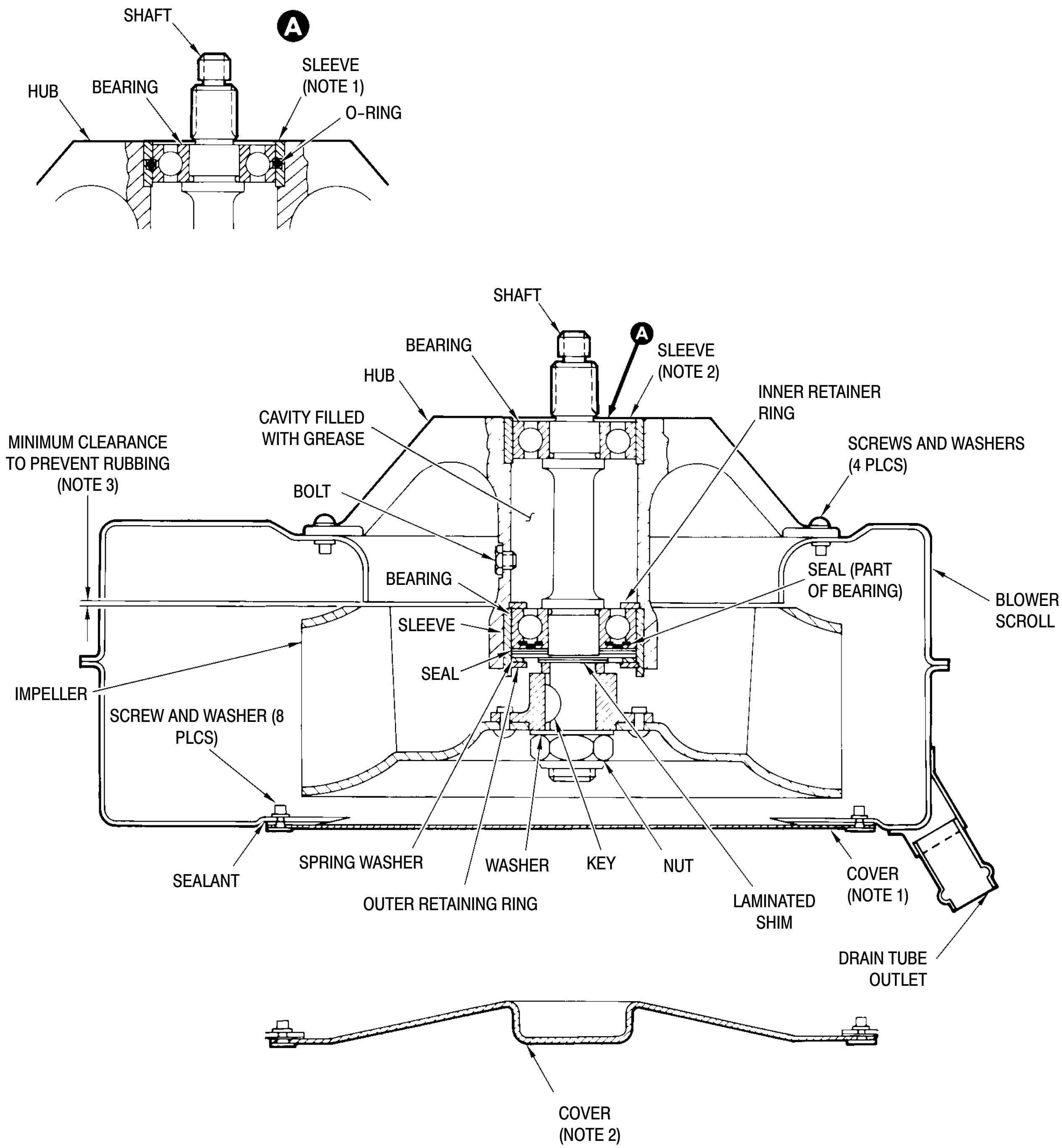
(9). Remove bolt, retaining ring and spring washer from hub.

(10). Use non-metallic mallet on splined end of shaft to drive impeller-end bearing, seal, and portion of the shaft from hub. Do not attempt to remove sleeves from hub. Sleeves are line-reamed. If either sleeve is defective, hub must be replaced. Remove inner retaining ring from hub. Remove and discard O-ring in upper sleeve if installed.

(11). If necessary, use pulling device to extract bearing and seal from shaft.

(12). If remaining bearing cannot be driven from hub by tapping outer race from inside with nonferrous tube and mallet, re-insert shaft into bearing, drive bearing out and remove it from shaft as described in steps (10). and (11). above.

(13). Discard bearings. They are not to be re-used.



NOTES:
1. CURRENT CONFIGURATION.
2. EARLY CONFIGURATION.
3. CLEARANCE SHALL BE 0.020-0.040 IN. (0.508-1.016 MM) MINIMUM.

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Figure 801. 369D25630 Cooling Blower - Cross-Section View

2. 369D25630 Cooling Blower Reassembly

(Ref. Figure 801)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM111	Grease, aircraft
CM219	Methyl-ethyl-ketone
CM220	Naphtha aliphatic
CM222	1,1,1-T richloroethane
CM321	Surface primer locking compound
CM425	Sealing compound
CM431	Sealing, locking and retaining compound

NOTE: Following procedure covers assembly of completely disassembled cooling blower, together with those items (belt, brackets, etc) that form a complete unit. Use only applicable steps of procedure when disassembly is less than complete. New bearings and new seal are required; those removed are not to be reused.

(1). Install inner retaining ring in hub and if removed at disassembly install new O-ring in upper bearing sleeve.

(2). Lightly grease (CM111) smaller bearing journal of shaft, and bore of corresponding bearing.

NOTE: This bearing does not have a metal shield.

(3). Place bearing on shaft so that rubber seal of bearing faces splined end of shaft.

(4). Using tube that contacts only edge of inner race of bearing, arbor-press bearing onto journal until inner race contacts shaft shoulder.

(5). Clean outer race of both bearings and faying surfaces of both hub sleeves with trichloroethane (CM222) and clean cloth or paper towel.

(6). Arbor-press bearing (with shaft installed) into sleeve. Exert pressure only on bearing outer race and on impeller-end of hub casting (no pressure on impeller-end sleeve).

(7). Lightly grease (CM111) larger bearing journal of shaft and bore of remaining bearing.

CAUTION On current configuration Cooling blowers, apply locking compound (CM431) to outer race of lower bearing (impeller end) only. Do not apply locking compound to upper bearing (pulley end).

(8). Apply primer (CM321) and locking compound (CM431) to faying surfaces of outer bearing race and sleeve according to container instructions. Be careful to prevent compounds from entering bearing.

NOTE: On newer style bearings, the metal shield is replaced by a blue shield.

(9). Insert bearing so that shield side (metal shield or blue disc) faces interior of hub and seal side (rubber disc) faces impeller end of shaft.

(10). Arbor-press bearing simultaneously onto shaft journal and into sleeve. Exert pressure equally on both races of bearing. At same time, exert equal pressure on splined end of shaft and pulley end of hub casting. Bearing is to firmly contact shaft shoulder and inner retaining ring.

WARNING **MEK solvent is flammable. Use only in well-ventilated area and away from heat and flame.**

(11). Wipe away excess locking compound. Use methyl ethyl keytone (CM219) if hardening begins. Leave assembled parts undisturbed to permit locking compound to cure for two hours at 75°-100 °F (24°-38 °C), or for ten minutes at 220° ±l0°F (105° ±5°C).

(12). Temporarily install lubrication fitting.

(13). Install new seal, spring washer and outer retaining ring.

(14). Fill hub cavity with grease (CM111) through lubrication fitting until grease seeps out around seal of bearing nearest splined end of shaft. After lubrication, remove lubrication fitting and install screw and washer. Lockwire screwhead.

(15). Install hub on scroll with four screws and washers. Torque screws to **12 - 15 inch-pounds (1.36 - 1.69 Nm)**.

(16). Install spacer and impeller on shaft.

(17). Install washer and locknut on end of shaft. Using holding device on splined end of shaft, tighten locknut sufficiently to remove all end clearance from stack-up of parts.

(18). Using feeler gage through an air outlet port, measure minimum clearance between impeller and scroll lip.

NOTE: If minimum clearance is 0.020- 0.040 inch (0.508-1.016 mm), steps (19). and (20). below may be bypassed.

(19). If clearance is more than 0.040 inch (1.016 mm), remove impeller and spacer. Replace spacer with 369H5654 shims as required between impeller and seal to obtain 0.020-0.040 inch (0.508-1.016 mm) clearance. Reinstall impeller, washer and locknut. Tighten to remove all end clearance, and then rotate impeller and check for rubbing. If rubbing occurs, perform step (20)., otherwise proceed to step (21)..

(20). If clearance is less than 0.020 inch (0.508 mm), or if rubbing occurs when performing previous step, disassemble and install shim(s) between seal and spacer to ensure 0.020-0.040 inch (0.508-1.016 mm) minimum clearance and prevent rubbing.

(21). When clearance is properly adjusted, remove impeller, install key, impeller, washer and locknut. Torque locknut to **250 - 300 inch-pounds (28.25 - 33.90 Nm)**. Use care to avoid placing stress on impeller or scroll. Hold splined end of shaft in suitable device.

NOTE: Install two self-locking bolts in place of safety- wired bolts if not previously installed.

(22). (Ref. Figure 405) Secure fan mounting bracket on hub with four bolts and washers on early configurations, or two self-locking bolts, two screws and four washers on current versions. Before tightening bolts, fully displace bracket in direction that causes it to be closest to main transmission drive shaft when cooling blower is installed, then torque bolts to **65 - 75 inch-pounds (7.34 - 8.47 Nm)**. Apply slippage mark paint.

(23). (Ref. Figure 405) Install spacer, washer, pulley, washer and nut on shaft. Hold nut on impeller end of shaft with socket wrench and tighten pulley nut to **160 - 190 inch-pounds (18.08 - 21.47 Nm) plus drag torque**.

(24). (Ref. Figure 405) Install belt on pulley and secure mounting bracket to fan mounting bracket with four bolts and washers. Before tightening bolts, fully displace bracket in direction that causes it to be closest to main transmission drive shaft when cooling blower is installed, then torque bolts to **65 - 75 inch-pounds (7.34 - 8.47 Nm)** and lockwire drilled heads.

(25). Clean faying surfaces of scroll and cover with naphtha (CM220); apply sealant (CM425) according to container instructions before securing cover to scroll with eight screws and washers.

3. 600N5630 Cooling Blower Disassembly

(Ref. Figure 802)

NOTE: Disassemble cooling blower only to extent necessary to perform inspection, replacement or repair of specific items. Replace cooling blower bearings and belt per replacement schedule (Ref. Sec. 05-10-00).

(1). Remove mounting bracket (Ref. Sec. 63-20-25).

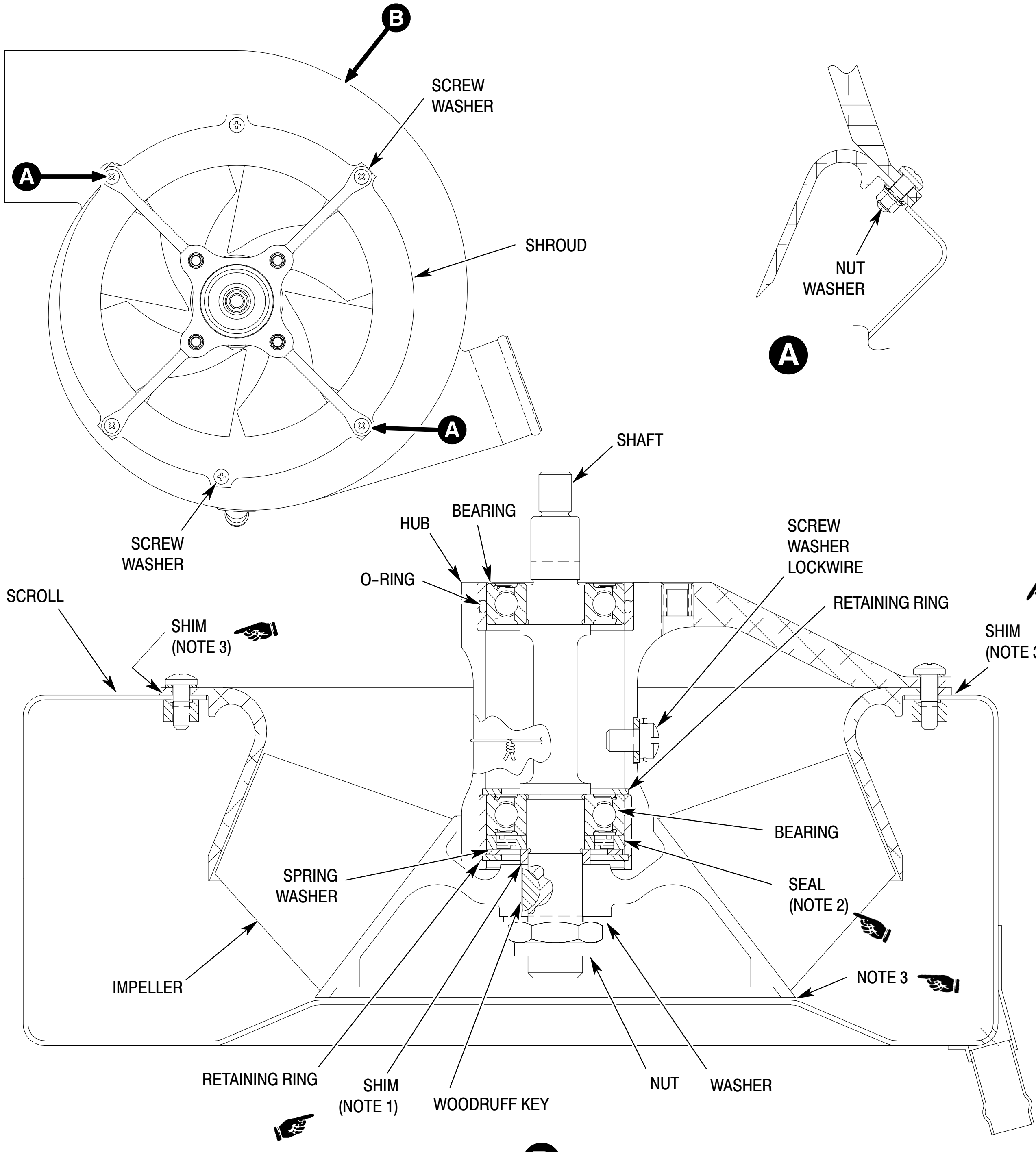
(2). Hold impeller retaining nut with socket wrench and remove driven-pulley retaining nut and washer.

(3). Remove driven pulley. Do not forcefully tap or pry; if necessary, use pulling device.

(4). Remove spacer from impeller shaft.

(5). Remove two screws and washers that attach scroll to shroud.

(6). Remove four screws six washers, and two nuts that attach hub to shroud and scroll. Retain shim if installed.



NOTE:

1. SHIM IMPELLER TO PROVIDE 0.020-0.030 IN. (0.508-0.762 MM) AVERAGE BLADE TRAILING EDGE TIP CLEARANCE-TO-SHROUD, MEASURED PERPENDICULARLY TO THE SHROUD FACE. THE BLADE TRAILING EDGE IS AT THE LARGEST BLADE DIAMETER. SHIM PRIOR TO INSTALLING SCROLL.
2. INSTALL SEAL WITH SMALL DIAMETER GAP IN RINGS FACING OUTSIDE OF HUB.
3. SHIM HUB TO PROVIDE 0.020 IN. (0.508 MM) MINIMUM GAP BETWEEN SCROLL AND IMPELLER.

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Figure 802. 600N5630 Cooling Blower - Cross-Section View

CAUTION In following step, do not use tools or other devices to hold impeller. Tool damage can affect impeller balance. Holding device must not damage shaft splines and must hold shaft with **250 - 300 inch-pounds (28.25 - 33.90 Nm)** of torque applied to impeller retaining nut.

(7). Secure splined end of impeller shaft in holding device meeting requirements of caution above, and remove impeller retaining nut and washer.

CAUTION Be careful to prevent impeller damage. Slight impeller deformation or damage can cause imbalance. Protect shaft threads and use nonmetallic mallet when performing step (8). below.

(8). Manually support impeller and separate impeller from shaft by carefully tapping end of shaft. Remove impeller, scroll, key, spacer and any shimming present.

(9). Remove bolt, retaining ring and spring washer from hub and shroud.

(10). Use non-metallic mallet on splined end of shaft to drive impeller-end bearing, seal, and portion of the shaft from hub. Do not attempt to remove sleeves from hub. Sleeves are line-reamed. If either sleeve is defective, hub must be replaced. Remove inner retaining ring from hub. Remove and discard O-ring in upper sleeve if installed.

(11). If necessary, use pulling device to extract bearing and seal from shaft.

(12). If remaining bearing cannot be driven from hub by tapping outer race from inside with nonferrous tube and mallet, re-insert shaft into bearing, drive bearing out and remove it from shaft as described in steps (10). and (11). above.

(13). Discard bearings. They are not to be re-used.

4. 600N5630 Cooling Blower Reassembly

(Ref. Figure 802)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM111	Grease, aircraft
CM219	Methyl-ethyl-ketone
CM220	Naphtha aliphatic
CM222	1,1,1-Trichloroethane
CM321	Surface primer locking compound
CM425	Sealing compound
CM431	Sealing, locking and retaining compound

NOTE: Following procedure covers assembly of completely disassembled cooling blower, together with those items (belt, brackets, etc) that form a complete unit. Use only applicable steps of procedure when disassembly is less than complete. New bearings and new seal are required; those removed are not to be reused.

(1). Install inner retaining ring in hub and if removed at disassembly install new O-ring in upper bearing sleeve.

(2). Lightly grease (CM111) smaller bearing journal of shaft, and bore of corresponding bearing.

NOTE: This bearing does not have a metal shield.

(3). Place bearing on shaft so that rubber seal of bearing faces splined end of shaft.

(4). Using tube that contacts only edge of inner race of bearing, arbor-press bearing onto journal until inner race contacts shaft shoulder.

(5). Clean outer race of both bearings and faying surfaces of both hub sleeves with trichloroethane (CM222) and clean cloth or paper towel.

(6). Arbor-press bearing (with shaft installed) into sleeve. Exert pressure only on bearing outer race and on impeller-end of hub casting (no pressure on impeller-end sleeve).

(7). Lightly grease (CM111) larger bearing journal of shaft and bore of remaining bearing.

CAUTION Apply locking compound (CM431) to outer race of lower bearing (impeller end) only. Do not apply locking compound to upper bearing (pulley end).

(8). Apply primer (CM321) and locking compound (CM431) to faying surfaces of outer bearing race and sleeve according to container instructions. Be careful to prevent compounds from entering bearing.

(9). Insert bearing so that shield side (metal disc) faces interior of hub and seal side (rubber disc) faces impeller end of shaft.

(10). Arbor-press bearing simultaneously onto shaft journal and into sleeve. Exert pressure equally on both races of bearing. At same time, exert equal pressure on splined end of shaft and pulley end of hub casting. Bearing is to firmly contact shaft shoulder and inner retaining ring.

WARNING **MEK solvent is flammable. Use only in well-ventilated area and away from heat and flame.**

(11). Wipe away excess locking compound. Use methyl ethyl keytone (CM219) if hardening begins. Leave assembled parts undisturbed to permit locking compound to cure for two hours at 75°-100 °F (24°-38 °C), or for ten minutes at 220° ±l0°F (105° ±5°C).

(12). Temporarily install lubrication fitting.

NOTE: Install seal with small diameter gap in rings facing outside of hub.

(13). Install new seal, spring washer and outer retaining ring.

(14). Fill hub cavity with grease (CM111) through lubrication fitting until grease seeps out around seal of bearing nearest splined end of shaft. After lubrication, remove lubrication fitting and install screw and washer. Lockwire screwhead.

(15). Install shim on scroll.

(16). Install hub and shroud on scroll with six screws, eight washers and two nuts. Torque screws to **12 - 15 inch-pounds (1.36 - 1.69 Nm)**.

(17). Using feeler gage through an air outlet port, measure for 0.020 inch (0.508 mm) minimum gap between impeller and scroll.

(18). Check for proper thread protrusion of six screws through nutplates and nuts on inside of scroll.

(19). Install spacer and impeller on shaft.

(20). Install washer and locknut on end of shaft. Using holding device on splined end of shaft, tighten locknut sufficiently to remove all end clearance from stack-up of parts.

(21). Using feeler gage through an air outlet port, measure minimum clearance between impeller and scroll lip.

NOTE: If minimum clearance is 0.020- 0.030 inch (0.508-0.762 mm), steps (19). and (20). below may be bypassed.

(22). If clearance is more than 0.030 inch (0.762 mm), remove impeller and spacer. Replace spacer with 369H5654 shims as required between impeller and seal to obtain 0.020-0.030 inch (0.508-0.762 mm) clearance. Reinstall impeller, washer and locknut. Tighten to remove all end clearance, and then rotate impeller and check for rubbing. If rubbing occurs, perform step (20)., otherwise proceed to step (21)..

(23). If clearance is less than 0.020 inch (0.508 mm), or if rubbing occurs when performing previous step, disassemble and install shim(s) between seal and spacer to ensure 0.020-0.030 inch (0.508-0.762 mm) minimum clearance and prevent rubbing.

(24). When clearance is properly adjusted, remove impeller, install key, impeller, washer and locknut. Torque locknut to **250 - 300 inch-pounds (28.25 - 33.90 Nm)**. Use care to avoid placing stress on impeller or scroll. Hold splined end of shaft in suitable device.

(25). (Ref. Figure 406) Secure fan mounting bracket on hub with two self-locking bolts, two screws and four washers. Before tightening bolts, fully displace bracket in direction that causes it to be closest to main transmission drive shaft when cooling blower is installed, then torque bolts to **50 - 70 inch-pounds (5.65 - 7.91 Nm)** and screws to **65 - 75 inch-pounds (7.34 - 8.47 Nm)**. Apply slippage mark paint.

(26). (Ref. Figure 406) Install spacer, washer, pulley, washer and nut on shaft. Hold nut on impeller end of shaft with socket wrench and tighten pulley nut to **160 - 190 inch-pounds (18.08 - 21.47 Nm) plus drag torque**.

(27). (Ref. Figure 406) Install belt on pulley and secure mounting bracket to fan mounting bracket with four bolts and washers. Before tightening bolts, fully displace bracket in direction that causes it to be closest to main transmission drive shaft when cooling blower is installed, then torque bolts to **65 - 75 inch-pounds (7.34 - 8.47 Nm)** and lockwire drilled heads.

(28). Clean faying surfaces of scroll and cover with naphtha (CM220); apply sealant (CM425) according to container instructions before securing cover to scroll with eight screws and washers.

5. Cooling Blower Cleaning (Disassembled)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM234	Solvent, dry-cleaning

(1). Clean all usable metal parts with solvent spray (CM234). Remove remnants of locking compound with loctite remover (CM216).

6. Transmission and Cooling Blower Drain Tube Repair and Replacement

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM702	Lockwire CRES
CM717	Tape, pressure sensitive

(1). Disconnect drain tubes from transmission cooling blower, and from drain fittings and weld assemblies at firewall. Release supporting nylon straps and remove drain tubes (Ref. Figure 601).

(2). Inspect drain tubes, drain fittings, weld assemblies and connectors for damage and clear passage.

(3). Repair damaged flexible drain tubes with tape (CM716).

(4). Install drain tubes as follows:

(a). Attach upper ends of drain tubes to transmission and cooling blower. Secure with double wraps of lockwire (CM702).

(b). Route drain tubes and secure with nylon straps. Position tubes so that no drainage traps are formed.

(c). Secure lower ends of drain tubes to fittings and weld assemblies with double wraps lockwire (CM702).

(d). Insert lower end of metal drain tube through grommet in skin and slip upper end of tube into weld assembly. Wrap tube with one layer of 1 inch (2.54 cm) wide tape (CM717) at clamp-attach point, and install clamp.

7. Installation of Heating System and Oil Cooling Line Standoff Clamps (0003D - 0539D)

(Ref. Figure 803) The following information list a procedure for installing standoff clamps on the 369D292490 heating system hose and on the 369D25710 main rotor transmission oil cooling line to eliminate chafing between the oil cooling lines and chafing of the oil cooling lines by the heating system hose. A protective bushing is also installed to prevent chafing between the oil cooling lines.

(1). Remove aft compartment interior trim panels and left Sta. 124.00 bulkhead access door to gain access to work area.

NOTE: Inspect the 369D292490 heating system hose and 369D25709 and 369D25710 main transmission oil cooling lines for evidence of chafing, kinking or damage at area of L/H aft section channel assembly.

(2). If not already installed, install NAS1713D30N clamp on heating system hose and NAS1713D8N clamp on 369D25710 oil cooling line. Connect clamps with screw, washer and nut.

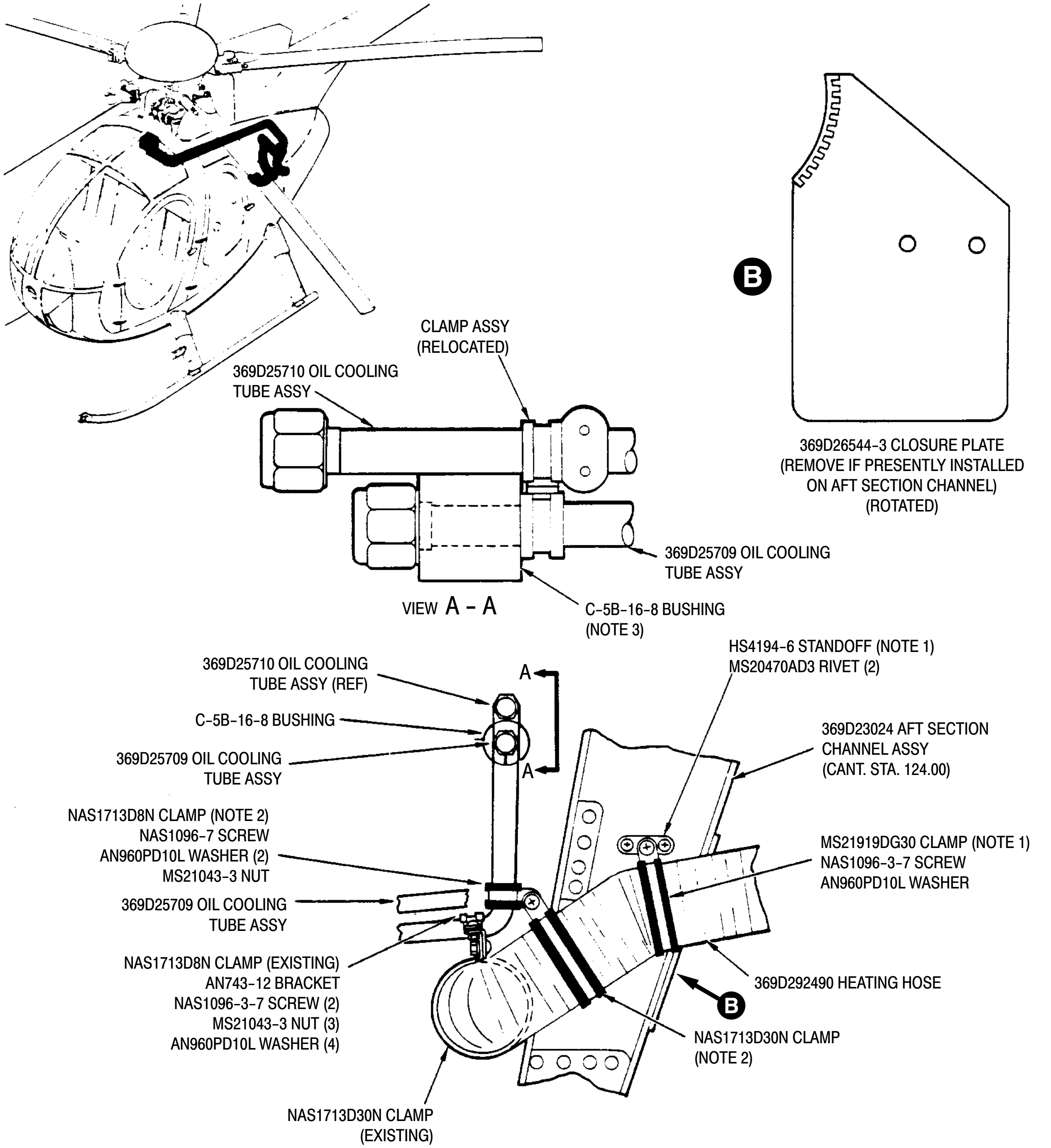
(3). If not already installed, install new C-SB-16-8 bushing snug against nut on 369D25709 oil cooling tube assembly (View A-A). Reposition clamp assembly securing 369D25709 (lower) and 369D25710 (upper) oil cooling tube assemblies to accommodate installation of bushing.

(4). Check installation of standoff clamps to ensure adequate clearance between 369D25709 and 369D25710 oil cooling lines and between oil cooling lines and 369D292490 heating system hose.

NOTE:

- Later Model 369D helicopters have 369D26544-3 closure plate (with grommet) installed on L/H aft section channel. Remove plate from channel, if presently installed, to preclude interference with oil cooling lines.
- Later model 500D helicopters have HS4194-6 standoff bracket installed on channel with MS21919DG30 clamp to secure heating hose. Install standoff bracket and clamp, if not presently installed on helicopter.

(5). Reinstall bulkhead access door and interior trim panels.



NOTES:

1. PRESENTLY INSTALLED ON LATE-MODEL HELICOPTERS.
2. LOCATE NEW CLAMPS APPROXIMATELY AS SHOWN ON COOLING TUBE AND HEATING HOSE ASSEMBLIES.
3. AFTER INSTALLATION OF BUSHING, ROTATE BUSHING SO THAT SPLIT IN BUSHING IS FACING DOWN.

G63-2026A

Figure 803. Installation of Standoff Clamps - Heating and Oil Cooling Lines

Section

63-22-00

Rotor Brake (369D/E/FF - 500/600N)

ROTOR BRAKE
MAINTENANCE PRACTICES

WARNING **When working with hydraulic systems, special care must be taken to prevent entrance of dust, moisture or other foreign material. System contamination can cause malfunctions which could cause injury to personnel or equipment damage.**

1. Rotor Brake

The rotor brake enables the pilot to manually brake the rotor system to a stop by operating a single brake handle. The handle is installed on the upper left (or upper right, depending on helicopter seating configuration) side of the canted bulkhead 78.50 control tunnel in the pilot's compartment. Operation of the brake handle actuates a master cylinder, causing dual pucks to grip a brake disc installed on the tail rotor drive shaft. Braking force is transmitted through the main transmission to the main rotor. A friction clip secures the handle in an out-of-the-way position when the brake is not in use.

The rotor brake installation includes:

(1). A master cylinder with an actuating handle mechanism (master cylinder and linkage assembly).

(2). A caliper assembly with dual opposing pistons to which friction pads (brake pucks) are attached.

(3). A brake disc installed on the tail rotor drive shaft coupling at the aft end of the main transmission.

(4). A hydraulic pressure relief valve.

(5). A tachometer generator.

(6). Six stainless steel hydraulic tubing assemblies and associated fittings.

(7). Attaching and mounting hardware.

(8). A trim panel assembly and installation.

2. Rotor Brake Operation

When manual force is applied to the brake handle (master cylinder piston), hydraulic pressure is produced; this pressure is transmitted through the tubing to the caliper assembly where it acts on the pistons. This causes the pucks to apply clamping pressure (braking force) to the brake disc. System pressure is held within safe limits, regardless of the force applied to the brake handle, by operation of the pressure-relief valve. When hydraulic pressure exceeds 500 psig (3447 kPa), the pressure-relief valve opens, venting excess pressure back to the master cylinder. When application of force is discontinued, caliper pistons (and the pucks) are retracted by return springs in the caliper assembly. Puck-to-disc clearance is maintained by action of a self-adjusting mechanism in the caliper assembly. The original equipment tachometer generator is replaced by a new unit that is included in the rotor brake installation to provide clearance between the tachometer generator and the brake disc. The original equipment electrical connector (P202), installed on the aft fuselage wiring harness near the main transmission, is replaced with a new plug which mates with the receptacle on the new tachometer generator.

3. Rotor Brake Troubleshooting Procedure

(Ref. Table 201)

4. Master Cylinder Servicing

(Ref. Figure 401)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM123	Hydraulic fluid

Rotor brake installation servicing includes adding hydraulic fluid (CM123) to the master cylinder reservoir, and bleeding air from the system.

(1). Remove interior trim to gain access to master cylinder.

(2). Disconnect tube assembly from forward nipple and move end of tube assembly carefully aside to permit removal of master cylinder cap.

(3). Remove attaching screws, cap with assembled hydraulic parts, and gasket from master cylinder. Replace gasket.

(4). Fill master cylinder reservoir with clean hydraulic fluid (CM123) within 1/8 to 1/4 inch (3.175-6.35 mm) of the top. Install cap with assembled hydraulic parts, new gasket, and attaching screws. Do not tighten screws if hydraulic system is to be bled.

(5). If hydraulic system has been opened, e.g. as for replacement of components, perform procedural steps to bleed the hydraulic system.

NOTE: It is not necessary to bleed the system if only a small amount of fluid is required to fill the reservoir, and if the system has not been opened.

(6). Tighten attaching screws to secure cap on master cylinder. Connect tube assembly to nipple.

(7). Reinstall components removed for access to the master cylinder assembly.

5. Rotor Brake Hydraulic System Bleeding

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM123	Hydraulic fluid

The rotor brake hydraulic system must be bled to remove entrapped air whenever the system has been opened for any reason.

(1). Remove interior trim for access to the master cylinder assembly and bleed screws on caliper assembly (if applicable).

(2). Disconnect tube assembly from reducer in relief valve and nipple in master cylinder cap.

NOTE: Hose material should be resistant to deterioration from exposure to hydraulic fluid. A glass container should be used to catch bleed screw outflow so that bubbles of escaping air are clearly visible. The following filling and bleeding procedure is best performed by two persons, one to operate the brake handle, and one to open and close the bleed screws.

(3). Connect a length of 1/4 inch (6.35 mm) ID hose on reducer and insert free end of hose in a container to catch any hydraulic fluid that may be bypassed by the relief valve. Connect a second length of 1/4 inch (6.35 mm) ID hose on one bleed screw on caliper assembly and submerge free end of hose in clean hydraulic fluid (CM123) in a glass container.

(4). Remove attaching screws and master cylinder cap. Fill reservoir with clean hydraulic fluid (CM123) within 1/8 - 1/4 inch (3.175-6.35 mm) of top of chamber. Replace cap, do not tighten attaching screws.

NOTE: Verify that master cylinder reservoir is kept full of fluid throughout the bleeding process.

(5). Open one bleed screw and operate brake handle slowly through a full down stroke to force hydraulic fluid out of master cylinder reservoir and into all other parts of the system. Close bleed screw and return handle to ”up” position. Remove cap, refill master cylinder reservoir, and replace cap.

(6). Repeat step (5). several times to ensure that entire hydraulic system is filled with fluid, and that no air remains in system.

NOTE: The presence of bubbles in the bleed screw outlet flow indicates air is being forced out of the system and absence of bubbles indicates all air has been bled from the system.

(7). Remove bleeder hose from first bleed screw and connect it on second bleed screw.

(8). Repeat steps (5). and (6). until bleed screw outlet flow is clear of bubbles.

(9). Remove fluid catch containers and hoses. Ensure both bleed screws are tightly closed. Raise brake handle to stowed position and engage in handle retainer assembly. Verify that caliper pistons (and attached brake pucks) are retracted when handle is raised.

(10). Make final check of fluid level in master cylinder reservoir and replenish, if necessary. Secure gasket and cap with attaching screws.

(11). Connect tube assembly to nipple in cap and to reducer in relief valve and tighten tube nuts.

6. Rotor Brake Component Repair

The master cylinder assembly on caliper assembly may be overhauled as necessary. Overhaul kits are available from McDonnell Douglas Helicopter Company. Other parts must be replaced when damaged or otherwise unserviceable.

7. Master Cylinder Assembly Overhaul

(1). Remove defective master cylinder assembly.

(2). Disassemble unit and replace defective parts with components of overhaul kit (Vendor PN 12-8310), using manufacturer's instructions supplied with kit.

(3). Install overhauled master cylinder assembly.

8. Caliper Assembly Overhaul

(1). Remove defective caliper assembly.

(2). Disassemble unit and replace defective parts with components of overhaul kit (Vendor PN 12-11780), using manufacturer's instructions supplied with kit.

(3). Install overhauled caliper assembly.

Table 201. Troubleshooting Rotor Brake Installation

Symptom	Isolating Step	Corrective Action
Brake actuating handle creeps downward under sustained force, with hydraulic fluid leakage from master cylinder assembly.	Defective master cylinder assembly.	Remove defective master cylinder assembly and replace with new unit, or overhaul and reinstall old unit.
Brake actuating handle creeps downward under sustained force, with hydraulic fluid leakage from caliper assembly.	Defective caliper assembly.	Remove defective caliper assembly and replace with new unit, or overhaul and reinstall old unit.
'Spongy' feel at brake actuating handle when force is applied.	Air in hydraulic system.	Bleed air from hydraulic system.
	Hydraulic fluid at low level in master cylinder reservoir.	Add fluid to master cylinder assembly and bleed air from hydraulic system.
Rotor brake system fails to slow rotor effectively.	Any of above components or system faults.	Follow applicable corrective action procedures.
	Brake pucks worn excessively.	Remove defective caliper assembly, replace defective pucks and reinstall repaired unit.
Brake pucks create noises, such as squeals or squeaks, when brakes are applied.	Glazed or worn brake pucks.	Remove defective caliper assembly, replace defective pucks and reinstall repaired unit.
Brake disc creates noises, such as squeals or squeaks, when brakes are applied.	Scored or damaged brake disc.	Remove defective brake disc and replace with new disc.

ROTOR BRAKE REMOVAL/INSTALLATION

WARNING **When working with hydraulic systems, special care must be taken to prevent entrance of dust, moisture or other foreign material. System contamination can cause malfunctions which could cause injury to personnel or equipment damage.**

1. Rotor Brake Component Access

The following items must be removed to gain access for removal of rotor brake components. Removal should be limited to damaged or defective parts for repair, overhaul or replacement, or to remove certain items for access to other components.

The master cylinder assembly, linkage assembly and hydraulic relief valve are installed on or attached to the helicopter structure. Removal of these components require access from the crew compartment. Hydraulic tube assembly is not attached to the helicopter structure. Access from the passenger/cargo compartment is required for removal of hydraulic tube assembly.

The caliper assembly and related hydraulic items, caliper mounting bracket, tachometer generator, brake disc and tail rotor drive coupling are installed on the main transmission. Removal of these components require that certain access provisions be made and that the main transmission, and attached rotor brake components, be removed from the aircraft.

NOTE: Component removal can be accomplished with the doors in place. However, operations are facilitated with the doors removed.

(1). Remove both crew compartment and cargo/passenger compartment doors.

(2). Remove crew compartment seats.

(3). Remove map case assembly from forward side of canted bulkhead 78.50 structure. Remove both (LH and RH) upper forward panel assemblies from bulkhead structure. Remove convenience panel cover assembly from convenience panel assembly.

(4). Disconnect electrical wiring and communications cables from components on back of convenience panel assembly. If cabin heating option is installed on aircraft, disconnect heated air duct from panel-mounted diffuser. Remove attaching screws and convenience panel assembly from aft side of canted bulkhead 78.50 structure.

(5). Remove transmission cover panel assembly from fuselage structure.

(6). Cover exposed trim panels to prevent damage and soiling.

(7). Remove main transmission from aircraft (Ref. Sec. 63-20-00/25).

(8). Remove tail rotor (Ref. Sec. 64-20-00), tail rotor transmission (Ref. Sec. 63-25-10) and tail rotor drive shaft (Ref. Sec. 63-15-10).

2. Master Cylinder Assembly Replacement

(Ref. Figure 401 and Figure 402)

A. Master Cylinder Assembly Removal

The master cylinder assembly is bolted to the bracket of the master cylinder linkage assembly and is connected hydraulically to the caliper assembly. Remove master cylinder assembly as follows:

(1). Remove trim panels to gain access to master cylinder.

(2). Disconnect tube assembly from nipple, and tube assembly from elbow, taking special care to catch any hydraulic fluid that drains or drips from tube assemblies or fittings when the system is opened.

NOTE: If old master cylinder assembly is to be reinstalled, removal of tube assembly, nipples, and elbow may not be necessary unless the tube assembly or fittings are damaged or defective.

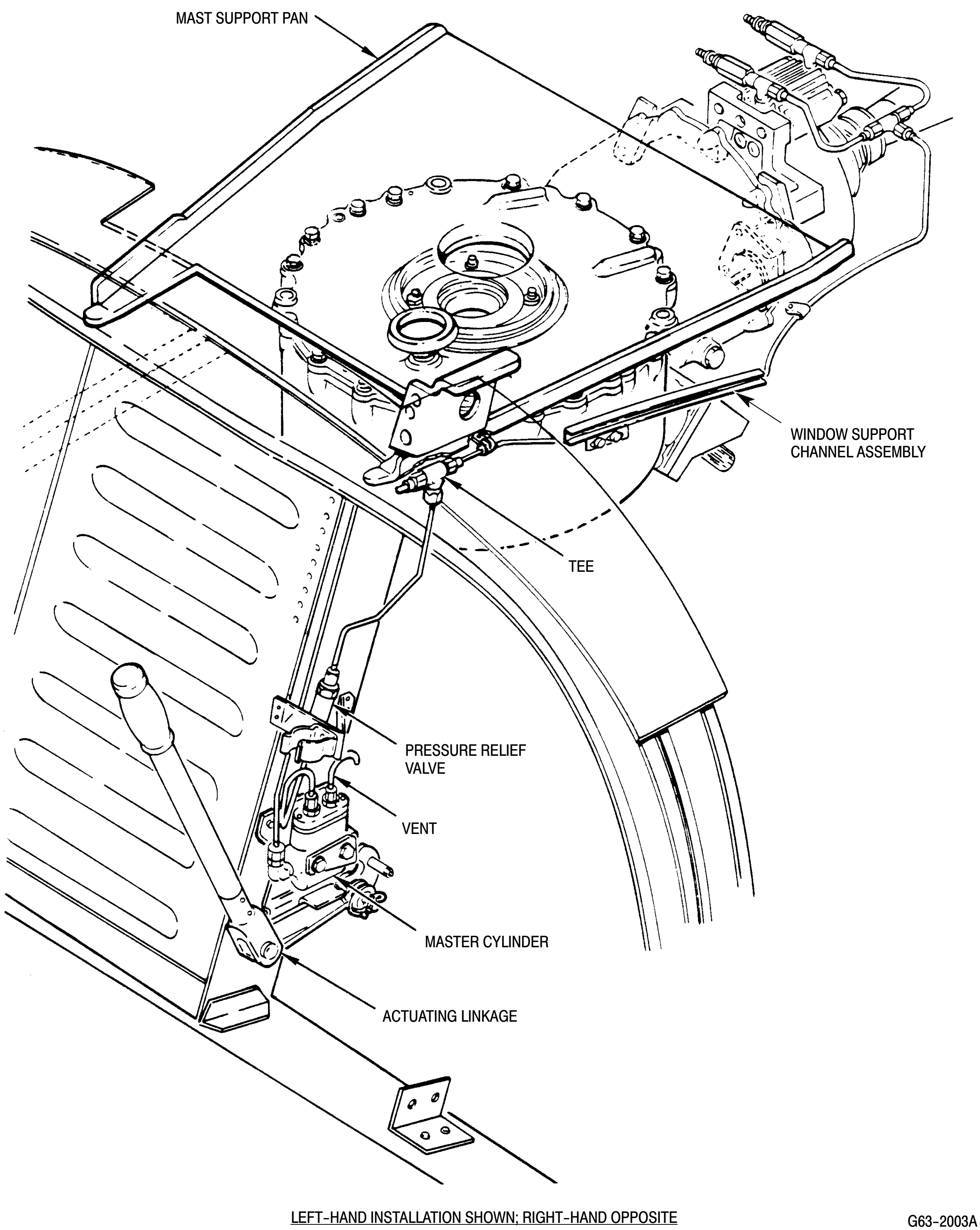


Figure 401. Airframe-Mounted Rotor Brake Components

(3). Remove tube assembly from nipple. Remove nipples from cap, and elbow from master cylinder.

(4). Remove nuts, washers, bolts, stop, and master cylinder assembly from bracket. Drain residual hydraulic fluid from master cylinder assembly.

(5). Install protective caps or plugs on open ends of disconnected tube assemblies, and open ports or fittings in master cylinder assembly to prevent entry of contaminants.

B. Master Cylinder Assembly Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM434	Thread sealant

NOTE: Steps (1). thru (3). below apply only to installation of a new master cylinder assembly.

(1). Remove attaching screws and vendor-supplied cap from master cylinder. Vendor supplied cap is not used.

(2). Rework vendor-supplied gasket (Ref. Figure 906).

(3). Replace reworked gasket and new cap on master cylinder and secure with attaching screws installed finger tight.

NOTE: Cap must be installed correctly with respect to taper of threaded holes.

(4). If new master cylinder assembly is being installed, or if hydraulic fittings have been removed from a usable unit, coat all but first two tapered pipe threads of nipples and elbow with thread sealant (CM434). Install nipples in cap and elbow in master cylinder.

(5). Place one washer and stop on bolts and insert bolts through master cylinder. Place two washers on each bolt as spacers. Position assembled parts on bracket (Ref. Figure 402) and install one washer on each bolt. Install nuts finger tight to hold master cylinder assembly and stop in position.

NOTE: Mounting holes in bracket are elongated to enable lateral position adjustment of master cylinder assembly.

(6). With actuating handle in stowed position, adjust position of master cylinder assembly so that clearance (measured with a thickness gage) between actuating lever (Ref. Figure 905) and master cylinder piston is 0.020-0.040 inch (0.508-1.016 mm).

(7). Install tube assembly on aft nipple. Connect tube assembly to forward nipple and connect tube assembly to elbow.

(8). Fill and bleed the hydraulic system.

(9). Reinstall components removed for access to the master cylinder assembly.

3. Master Cylinder Linkage Assembly Replacement

(Ref. Figure 402)

A. Master Cylinder Linkage Assembly Removal

The bracket assembly of the master cylinder linkage assembly is permanently installed on the canted bulkhead Sta. 78.50 vertical member by four Jo-bolt blind fasteners. Once installed, the Jo-bolts cannot be removed except by destructive procedures. The master cylinder and linkage assembly may be disassembled, leaving the bracket assembly attached to the structure. Disassembly should be limited to that necessary for removal of damaged or defective parts.

(1). Remove master cylinder.

WARNING **When components are assembled, spring force is constantly exerted to inhibit inadvertent brake application. Care must be exercised as the spring is disengaged to prevent injury to personnel or equipment damage.**

(2). Manually restrain movement of lever and attached parts. Carefully disengage end of spring from under head of clevis pin. Release spring force carefully.

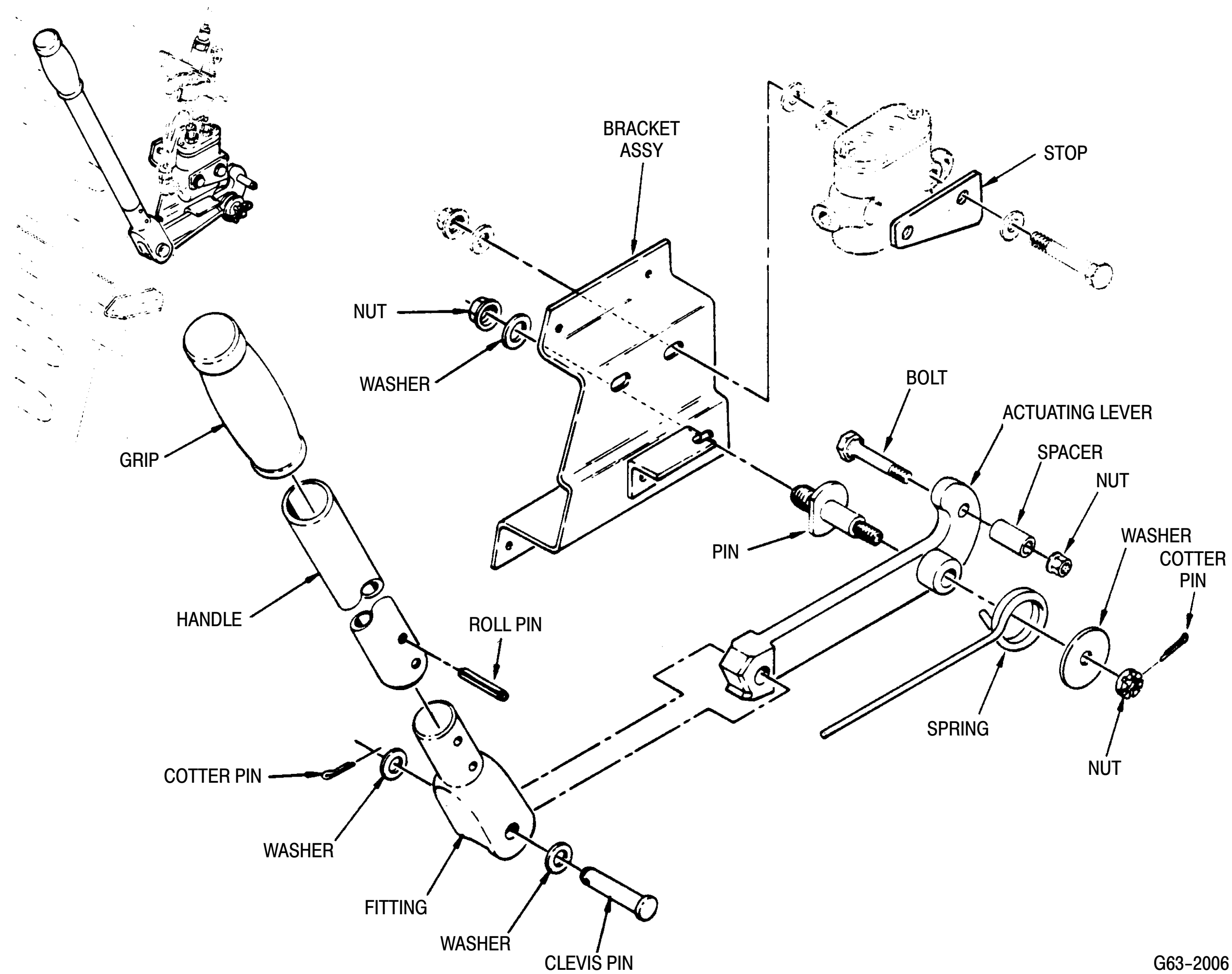


Figure 402. Master Cylinder Linkage Assembly

(3). Remove cotter pin, nut, washer, spring, and lever with assembled handle parts from pin.

(4). Remove cotter pin, washers, and clevis pin, and separate assembled handle parts from lever. Remove nut, spacer, and bolt from lever.

(5). Drive two spring pins out of fitting and handle and separate parts. Remove grip from handle.

(6). Remove nut and washer from pin, and remove pin from bracket assembly.

B. Master Cylinder Linkage Assembly Installation

Installation of the master cylinder linkage assembly will be limited to re-assembly of components to the bracket assembly.

WARNING **When the unit is assembled, the spring is under restraint and, if accidentally or inadvertently released, could cause injury to personnel or equipment damage.**

(1). Re-assembly procedures are essentially the reverse of disassembly procedures, with special care being given to steps involving spring.

(2). If cotter pins or spring pins have been removed, use new parts for reassembly.

4. Caliper Assembly, Brake Disc, and Drive Coupling Replacement (369D25100 Transmission)

(Ref. Figure 403)

A. Caliper Assembly, Brake Disc, and Drive Coupling Removal (369D25100 Transmission)

The caliper assembly is bolted to a mounting bracket which is installed on the main transmission tail rotor cover. The brake disc is bolted on the drive coupling which is installed on the transmission output shaft. For clarity, the brake disc and drive coupling are considered as a single item (disc/coupling unit).

Although the caliper assembly and the disc/coupling unit are not mechanically connected, they are installed on the transmission with the outer portion of the disc positioned between the two halves of the caliper assembly (Ref. Figure 404). This arrangement makes it necessary to remove both units (partially, at least) at the same time. Removal operations require that the main transmission be removed from the aircraft with the rotor brake components installed. Proceed as follows:

(1). Remove main transmission and attached rotor brake components from aircraft (Ref. Sec. 63-20-00/25).

(2). Disconnect tube assembly from caliper mounted tees. Remove tube assembly and interconnect tee as a unit.

NOTE:

- It is not necessary to disconnect tube assemblies from tee except for replacement of defective and damaged parts.
- New bleed screws are included with the new caliper assembly.

(3). If caliper assembly is to be replaced by a new unit, remove two bleed screws from adapters, remove adapters from tees, and remove tees from caliper assembly.

NOTE: If old caliper assembly is to be reinstalled, it is not necessary to remove hydraulic fittings except for replacement of defective or damaged parts.

(4). Remove coupling bolt that is used to secure drive coupling on transmission output shaft so that disc/coupling unit is free to slide on shaft splines.

(5). Note and record, for re-assembly reference, placement of 18 washers used as spacers between caliper assembly and mounting bracket, or under heads of attaching bolts.

CAUTION The caliper assembly consists of two identical halves held together by the attaching bolts. Care should be used to avoid dropping parts when bolts are removed.

(6). Hold caliper assembly and unscrew attaching bolts out of mounting bracket. Slide disc/coupling unit away from transmission and remove caliper assembly and attaching hardware.

(7). If caliper assembly is to be reused and some time will elapse before re-assembly, remove disc/coupling unit, position caliper assembly (and assembled parts) on mounting bracket and screw bolts into bracket to hold parts until time for re-assembly.

(8). If disc/coupling unit is to be reinstalled, and some time will elapse before re-assembly, slide unit back on transmission shaft and install coupling bolt finger tight to hold parts until time for re-assembly.

WARNING **Axial position of the drive coupling is critical as it controls the mechanical interface between the coupling and the tail rotor drive shaft. Out-of-tolerance axial coupling loads can contribute to coupling failure which could result in injury to personnel and equipment damage. Refer to Sec. 63-10-00 for coupling reinstallation.**

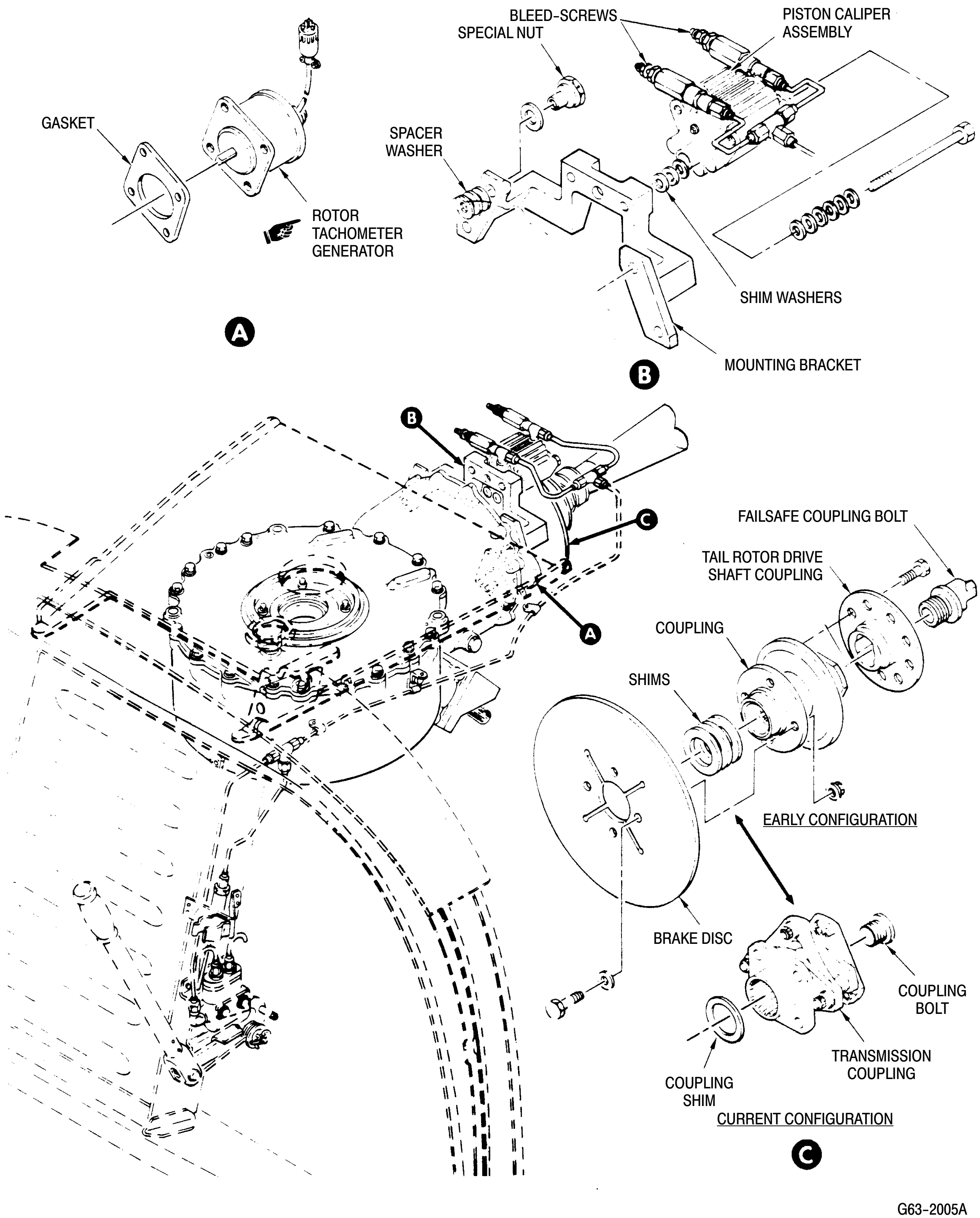


Figure 403. Transmission-Mounted Rotor Brake Components

(9). If either disc or coupling is to be replaced by a new part, slide disc/coupling unit off shaft, leaving shim washers in place. Remove nuts, washers, and bolts and separate disc and coupling. If coupling is being replaced, measure (and record for re-assembly reference) overall length of old coupling at three separate peripheral locations. Calculate and record the average value.

B. Caliper Assembly, Brake Disc and Drive Coupling Installation (369D25100 Transmission)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM112	Anti-seize compound high temperature
CM117	Grease
CM202	Metal protector, aerosol
CM434	Thread sealant
CM702	Lockwire CRES

(1). Position brake disc on drive coupling with raised center side of disc seated firmly on shoulder of coupling, and with bolt holes aligned. Insert four bolts through disc and coupling flange, install washers and nuts on bolts, and torque nuts (in an alternating sequence) to **100 - 140 inch-pounds (11.30 - 15.82 Nm)**.

WARNING **The main transmission must be installed in the aircraft with special care to avoid damage to rotor brake components. Installation damage could lead to system failure which could result in injury to personnel and equipment damage.**

(2). Install transmission in aircraft (Ref. Sec. 63-20-00/25).

(3). Determine correct shimming for coupling (Ref. Sec. 63-10-00).

WARNING **Molykote metal protector contains perchloroethylene. It should be used in a well-ventilated area, and the precautions normally followed when working with the chlorinated solvent should be implemented. Solvents used to dilute this material, as well as metal-cleaning or alkali cleansers, should only be used with adequate ventilation. Follow handling precautions on the solvent's container label.**

NOTE: Couplings should be treated with molykote metal protector (CM202) after each washing with any solvent or detergent.

(4). Spray molykote metal protector (CM202) on the interior and exterior surfaces of Bendix coupling diaphragm packs. Spray or dip flange in molykote metal protector. Eliminate excess liquid by gently blowing with compressed air (dilute to 10% perchloroethylene). Cure for 8 hours at room temperature, or 15 minutes at 150°F (65°C).

(5). Coat, completely but sparingly, splines of transmission output shaft with grease (CM117) and threads of coupling bolt with anti-seize compound (CM112), or equivalent. Start disc/coupling unit on shaft.

CAUTION To ensure optimum brake operation and minimize equipment damage, caliper-to-disc clearances on both sides of disc should be equal, or as nearly equal as possible. Clearance adjustment is accomplished by varying number of shim washers, 0.032 inch (0.8128 mm) thick, placed between the caliper assembly and its mounting bracket. Nine washers are provided for each attaching bolt; those not used as shims should be placed under bolt heads. Washer distribution should be the same for both bolts.

(6). Hold assembled parts with caliper assembly over edge of disc, slide disc/coupling unit on shaft, and move caliper assembly against mounting bracket at the same time. Screw bolts into bracket to hold caliper assembly firmly in position. Screw coupling bolt into shaft to secure disc/coupling unit.

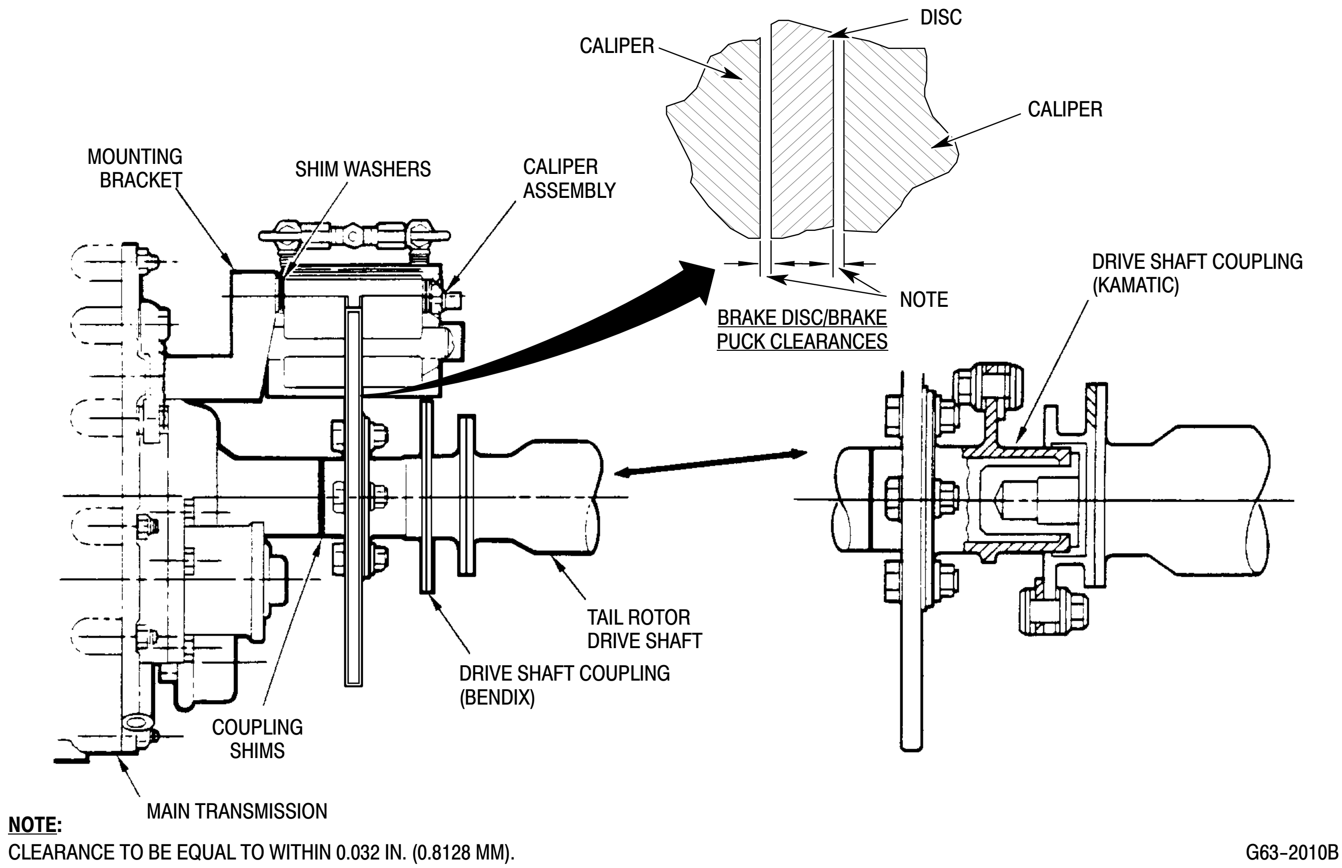


Figure 404. Caliper Assembly and Brake Disc Interface (369D25100 Transmission)

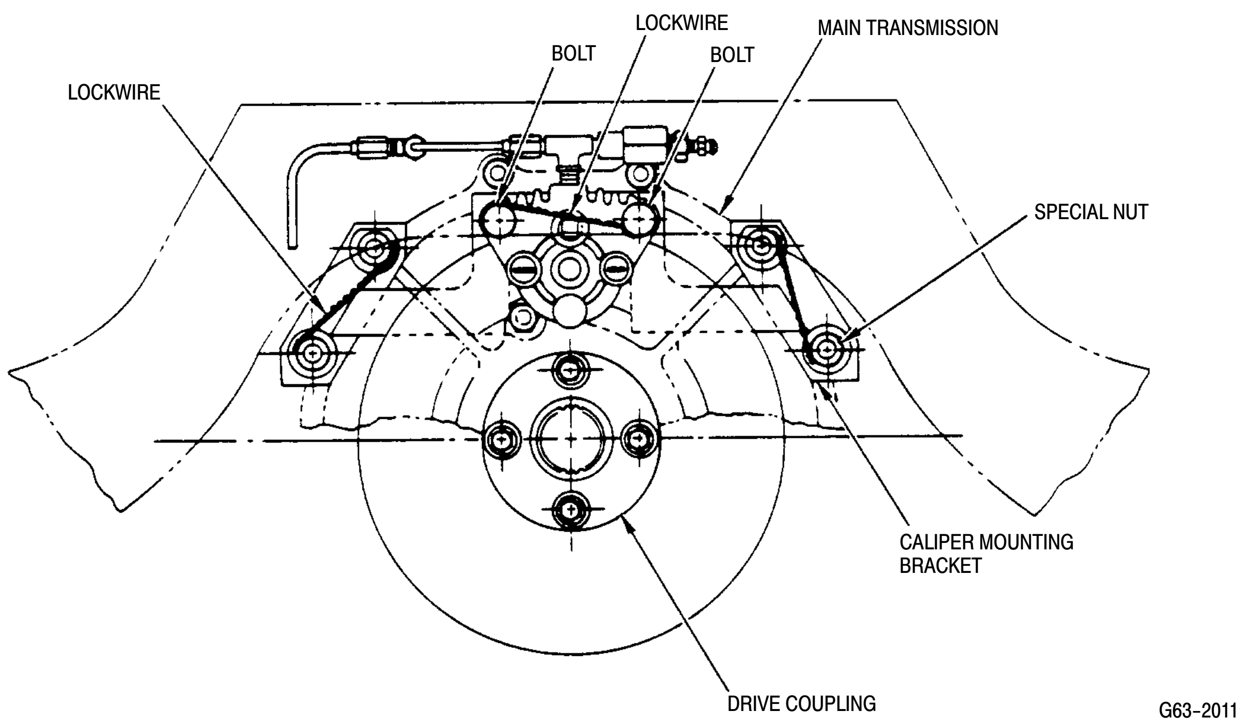


Figure 405. Lockwire Installation (369D25100 Transmission)

(7). Measure brake caliper housing-to-disc clearances on both sides of disc with a thickness gage. If clearances are equal within 0.032 inch (0.8128 mm), torque attaching bolts to **160 - 190 inch-pounds (18.0821.47 Nm)** and secure with corrosion-resistant lockwire (CM702) (Ref. Figure 405). Torque coupling bolt per Section 63-10-00.

NOTE: Clearance differences greater than 0.032 inch (0.8128 mm) can be reduced by rearranging washers on caliper attaching bolts.

(8). To adjust clearances, hold caliper assembly and unscrew bolts from mounting bracket. Transpose washers on bolts as required. Reassemble parts, and recheck clearances.

(9). If new caliper assembly was installed or if hydraulic fittings were removed from old unit, coat all but first two threads of two bleed screws, tees, and plugs with thread sealant (CM434) or equivalent. Install plugs and tees in caliper assembly, screw adapters on tees, and install bleed screws in adapters.

(10). Connect tube assemblies and tee unit to tees.

5. Caliper Mounting Bracket Replacement (369D25100 Transmission)

(Ref. Figure 403)

A. Caliper Mounting Bracket Removal (369D25100 Transmission)

The caliper mounting bracket is attached to the main transmission tail rotor cover by special nuts installed on four of the studs used for installation of the cover. The caliper assembly is bolted to the mounting bracket. Bracket removal requires that the main transmission be removed from the aircraft with the rotor brake components installed.

(1). Remove main transmission (and attached rotor brake components) from aircraft (Ref. Sec. 63-20-00/25).

(2). Remove attaching nuts and washers, and remove mounting bracket from studs.

NOTE: It is not necessary to remove washers used as spacers except for replacement. Nuts may be replaced on studs until time for re-assembly to prevent loss of parts.

B. Caliper Mounting Bracket Installation (369D25100 Transmission)

The following procedures assume that the transmission has been removed from the aircraft for removal of the mounting bracket.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM702	Lockwire CRES

(1). Place three washers on each of the four mounting studs (1, 2, 10, and 11 o'clock positions) as spacers. Position mounting bracket on studs, install washers and nuts, and torque nuts to **50 - 75 inch-pounds (5.65 - 8.47 Nm)**.

(2). Secure installation with lockwire (CM702) (Ref. Figure 405).

(3). Reinstall transmission as required (Ref. Sec. 63-20-00/25).

6. Caliper Assembly, Brake Disc, and Drive Coupling Replacement (369F5100 Transmission)

(Ref. Figure 406)

A. Caliper Assembly, Brake Disc, and Drive Coupling Removal (369F5100 Transmission)

The caliper assembly is bolted to the main transmission anti-torque cover. The brake disc is bolted on the drive coupling which is installed on the transmission output shaft. For clarity, the brake disc and drive coupling are considered as a single item (disc/coupling unit). Although the caliper assembly and the disc/coupling unit are not mechanically connected, they are installed on the transmission with the outer portion of the disc positioned between the two halves of the caliper assembly. This arrangement makes it necessary to remove both units (partially, at least) at the same time. Removal operations require that the main transmission be removed from the aircraft with the rotor brake components installed.

(1). Remove main transmission (and attached rotor brake components) from aircraft (Ref. Sec. 63-25).

(2). Disconnect tube assembly from caliper mounted tees. Remove tube assembly and interconnect tee as a unit.

NOTE: It is not necessary to disconnect tube assemblies from tee except for replacement of defective and damaged parts.

(3). If caliper assembly is to be replaced by a new unit, remove two bleed screws from adapters, remove adapters from tees, and remove tees from caliper assembly.

NOTE: If old caliper assembly is to be reinstalled, it is not necessary to remove hydraulic fittings except for replacement of defective or damaged parts.

(4). Remove coupling bolt that is used to secure drive coupling on transmission output shaft so that disc/coupling unit is free to slide on shaft splines.

(5). Note and record, for re-assembly reference, placement of 18 washers used as spacers between caliper assembly and mounting bracket, or under heads of attaching bolts.

CAUTION The caliper assembly consists of two identical halves held together by the attaching bolts. Care should be used to avoid dropping parts when bolts are removed.

(6). Hold caliper assembly and unscrew attaching bolts. Slide disc/coupling unit away from transmission and remove caliper assembly and attaching hardware.

(7). If caliper assembly is to be reused and some time will elapse before re-assembly, remove disc/coupling unit, position caliper assembly (and assembled parts) on transmission and insert bolts to hold parts until time for re-assembly.

NOTE: New bleed screws are included with the new caliper assembly.

(8). If disc/coupling unit is to be reinstalled, and some time will elapse before re-assembly, slide unit back on transmission shaft and install coupling bolt finger tight to hold parts until time for re-assembly.

WARNING **Axial position of the drive coupling is critical as it controls the mechanical interface between the coupling and the tail rotor drive shaft. Out-of-tolerance axial coupling loads can contribute to coupling failure which could result in injury to personnel and equipment damage. Refer to Sec. 63-15 for coupling reinstallation.**

(9). If either disc or coupling is to be replaced by a new part, proceed as follows:

(a). Slide disc/coupling unit off shaft, leaving shim washers in place.

(b). Remove nuts, washers, and bolts and separate disc and coupling.

(c). If coupling is being replaced, measure (and record for re-assembly reference) overall length of old coupling at three separate peripheral locations.

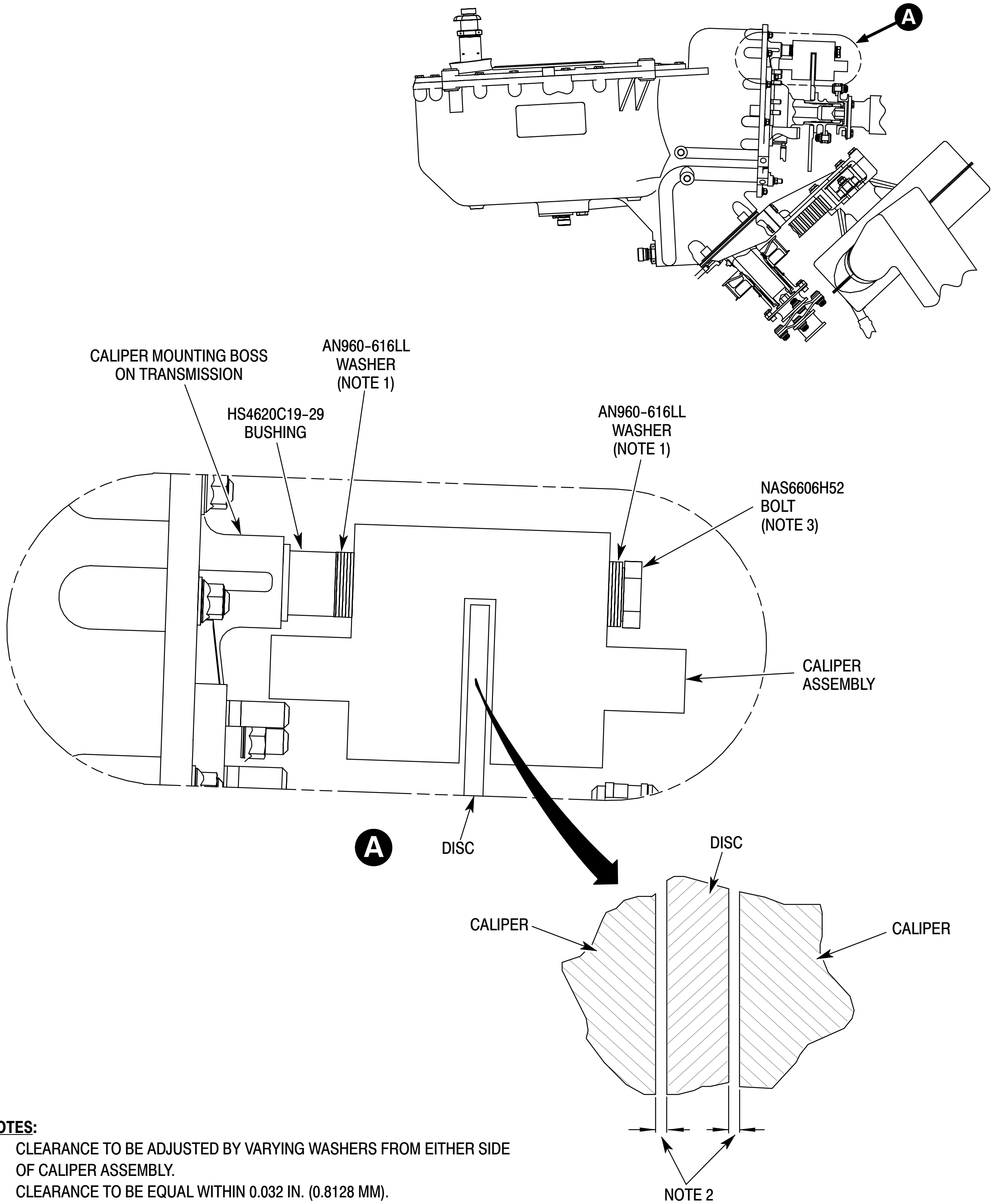
(d). Calculate and record the average value.

B. Caliper Assembly, Brake Disc and Drive Coupling Installation (369F5100 Transmission)

The following procedure is for installation of the rotor brake caliper assembly. The caliper assembly should be installed on the transmission before the transmission is installed in the helicopter.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM434	Thread sealant
CM702	Lockwire CRES



NOTES:
1. CLEARANCE TO BE ADJUSTED BY VARYING WASHERS FROM EITHER SIDE OF CALIPER ASSEMBLY.
2. CLEARANCE TO BE EQUAL WITHIN 0.032 IN. (0.8128 MM).
3. TORQUE TO **160 – 190 INCH POUNDS (18.08 – 21.47 NM)** AND SAFETY WITH LOCKWIRE (CM702).

CSP102-010A

Figure 406. Rotor Brake Caliper Installation (369F5100 Transmission)

NOTE:

- AN960-616LL washers are to be used for adjusting caliper-to-disc clearance.
- Nine washers are used on each attaching bolt; those not used as shims should be placed under bolt heads. Washer distribution should be the same for both bolts.

(1). Insert two bolts with equal number of washers through the caliper (washers can be on either side of caliper as needed) and install two bushings.

NOTE: On the 369F5100 transmission, the brake caliper bolts directly to the transmission.

(2). Mount the caliper assembly over disc and thread bolts into transmission.

CAUTION To ensure optimum brake operation and minimize equipment damage, caliper-to-disc clearances on both sides of disc should be equal, or as nearly equal as possible. Clearance adjustment is accomplished by varying number of 0.032 inch (0.8128 mm) thick shim washers placed between the caliper assembly and transmission.

(3). Measure brake caliper housing-to-disc clearances on both sides of disc with a feeler gage. If clearances are equal within 0.032 inch (0.8128 mm), torque attaching bolts to **160 - 190 inch-pounds (18.08 - 21.47 Nm)** and secure with lockwire (CM702).

NOTE: Clearance differences greater than 0.032 inch (0.8128 mm) can be reduced by re- arranging washers on caliper attach bolts.

(4). To adjust clearances, hold caliper assembly and unscrew bolts from mounting bracket. Transpose washers on bolts as required. Reassemble parts and recheck clearances.

NOTE: If new caliper assembly was installed or if hydraulic fittings were removed from old unit, coat all but first two threads of two bleed screws, tees and plugs with thread sealant (CM434) or equivalent.

(5). Install plugs and tees in caliper assembly, screw adapters on tees and install bleed screws in adapters.

(6). Connect tube assemblies and tee units to tees.

7. Hydraulic Relief Valve Replacement

(Ref. Figure 401)

A. Hydraulic Relief Valve Removal

The hydraulic relief valve is attached by means of a clamp to the canted bulkhead 78.50 vertical member, and is connected hydraulically between the master cylinder assembly and the caliper assembly. Remove the relief valve as follows:

(1). Remove crew compartment hardware and fittings for access to hydraulic relief valve assembly.

(2). Disconnect tube assembly from reducer installed in relief valve. Disconnect tube assembly from relief valve, taking special care to catch any hydraulic fluid that drains or drips from tube assemblies, reducer, or relief valve when the system is opened. Remove reducer and O-ring packing from relief valve. Discard O-ring packing.

NOTE: Because of limited access, it may be more convenient to disconnect tube assembly from tee before removing tube assembly from relief valve. If so, remove tube assembly from tee; remove relief valve and tube assembly from helicopter; and remove tube from relief valve. Reinstall tube assembly on tee finger tight for storage until required for replacement of relief valve.

(3). Remove screw, washer, and clamp, and remove relief valve from canted bulkhead 78.50 structure.

(4). Install protective caps or plugs on open relief valve ports and open ends of disconnected tube assembly to prevent entrance of contaminants.

B. Hydraulic Relief Valve Installation

Installation procedures are essentially the reverse of removal procedures, with these special considerations:

(1). Install new O-ring packing on reducer.

(2). After relief valve is installed and connected into the hydraulic system, fill and bleed the system.

(3). Reinstall components removed for access to the hydraulic relief valve.

8. Hydraulic Tube Assembly Replacement

(Ref. Figure 904)

A. Hydraulic Tube Assembly Removal

The hydraulic tube assembly is attached to the main rotor mast pan and to the window channel by four clamps. It is connected between tees. The assembly removal requires access from the cargo/passenger compartment.

(1). Remove attaching screws and both (LH and RH) upper forward trim panel assemblies. Remove convenience panel cover assembly. Remove attaching screws and transmission cover panel assembly.

(2). Disconnect tube assembly from tees, taking special care to catch any hydraulic fluid that drains or drips from tube assembly or tees when system is opened.

(3). Remove (and discard) grommet from tube assembly and air baffle.

(4). Remove nuts, washers, screws, clamps, and tube assembly.

(5). If some time is to elapse before re-assembly, install protective caps on open ends of tees to prevent entrance of contaminants.

B. Hydraulic Tube Assembly Installation

Tube assembly installation is essentially the reverse of removal procedures, with these specific considerations.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM418	Cement, epoxy

(1). Make a straight radial cut into center hole of new grommet and install grommet on tube assembly. Position parts and bond grommet into slot in air baffle with epoxy cement (CM418).

(2). Fill and bleed the hydraulic system.

(3). Reinstall components removed for access to the hydraulic tube assembly.

9. Rotor Brake Forward Cover Assembly Installation

(Ref. Figure 908)

(1). Position cover assembly on map case assembly with rotor brake handle and handle retaining clip through cover openings. Aft edge of cover must overlap forward edge of convenience panel cover assembly. Install attaching screw through cover assembly and map case panel into isolation mount on canted bulkhead 78.50 structure.

(2). On the 369D, secure cover assembly and doublers to angle assembly with attaching screw. On the 369E/FF, secure cover assembly to convenience panel, using shims and attaching screws.

ROTOR BRAKE
INSPECTION/CHECK

WARNING **When working with hydraulic systems, special care must be taken to prevent entrance of dust, moisture. and other foreign material. System contamination can cause malfunctions that could result in injury to personnel and equipment damage.**

1. Rotor Brake Assembly Inspection

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM123	Hydraulic fluid

(1). Visually inspect rotor brake components for general condition, security of installation, and evidence of hydraulic fluid leakage.

NOTE: Excessively low fluid level indicates a system fault that must be isolated and corrected.

(2). Disconnect tube assembly (Ref. Figure 902) from nipple installed in master cylinder cap. Move end of tube assembly carefully aside, remove attaching screws and cap with gasket, and check that hydraulic fluid level is 1/8 - 1/4 inch (3.175-6.35 mm) from top of reservoir. If level is low, add hydraulic fluid (CM123). Take special care to avoid getting contaminants into the hydraulic system.

(3). Visually inspect gasket for tears, cuts, or other damage; replace gasket, if defective. Visually inspect sealing surfaces of cap and master cylinder body for nicks, cracks, scratches, or other defects; repair minor damage or replace defective parts.

(4). Replace cap and gasket on master cylinder and secure with attaching screws. Connect tube assembly to nipple and tighten tube nut securely.

(5). Verify that clip (Ref. Figure 901) on handle retainer assembly holds brake handle securely in the stowed (raised) position.

(6). Actuate brake handle to check that components of master cylinder linkage assembly (Ref. Figure 402) operate freely without binding or excessive play at pivot points. Verify that spring force holds lever in **BRAKE OFF** position.

(7). Visually inspect friction surfaces of brake disc (Ref. Figure 403) for excessive wear, galling, scoring, cracking, distortion, or other evidence of damage.

(8). Rotate the drive system and check that caliper brake pucks are not dragging on the disc.

(9). Apply sufficient force on brake handle to actuate master cylinder assembly to pressurize hydraulic system.

NOTE: System pressurization (brake actuation) is indicated by the feel of firm resistance to handle movement. A cushioned (spongy) feel indicates that the system contains air which must be removed (bled off) before proceeding with the inspection.

(10). Maintain force on brake handle and verify that pistons in caliper assembly operate to force brake pucks against friction surfaces of brake disc. Visually inspect brake pucks for extent of wear and evidence of damage.

CAUTION Do not apply a side load to brake handle as damage to support bracketry may result.

NOTE: Pucks must be extended to the **BRAKE ON** position to permit adequate inspection. If parting line between piston face and puck is visible, puck is worn excessively and must be replaced.

(11). Monitor feel of resistance and increase force applied to brake handle until hydraulic relief valve opens.

NOTE: When working properly, the hydraulic relief valve opens and routes pressurized hydraulic fluid back to the master cylinder reservoir when system pressure reaches 500 psig (3447 kPa). Valve opening can be detected by a momentary decrease of resistance to handle movement. If movement is solidly resisted, regardless of force applied, the relief valve is defective and must be replaced.

(12). Maintain steady force (just short of that required to initiate relief valve opening) on brake handle and observe handle movement. Check that actuating lever spacer and master cylinder stop do not contact.

CAUTION Check for installation of master cylinder stop to prevent over travel of piston in master cylinder. If stop is not installed, damage to master cylinder components may occur.

NOTE: Continued handle movement indicates the presence of an internal leak condition which must be located and corrected.

(13). Release force on brake handle and verify that caliper pistons (and attached brake pucks) are retracted.

NOTE: Failure of pistons to retract indicates that caliper assembly is defective and must be overhauled or replaced.

(14). Reinstall components that were removed for access to the rotor brake system.

(15). Raise brake handle to stowed position and engage it in clip on handle retainer assembly.

2. Rotor Brake Operational Check

After rotor brake hydraulic system has been filled with fluid, an operational checkout of the rotor brake installation must be performed.

(1). Start engine, run up rotor to operating speed, and then make a normal shutdown (refer to applicable Pilot's Flight Manual).

CAUTION Incorrect application of the rotor brake can result in sudden stopping and kick-back of the main rotor, an action which can cause damage to the rotor blades and strap packs in the rotor hub. Collective pitch must never be applied to slow rotor rotation as this can cause damage to the rotor blades and strap packs. Application of a side load to brake handle may damage support bracketry.

(2). When rotor slows to approximately 205 or less rpm, disengage brake handle from retaining clip and pull handle down to apply braking force. Make certain that collective pitch stick is in full down position, and that cyclic control stick is in neutral position.

(3). Release brake pressure during last revolution of rotor.

(4). Raise brake handle to stowed position and engage it in handle retaining clip.

ROTOR BRAKE
INITIAL INSTALLATION

WARNING **When working with hydraulic systems, special care must be taken to prevent entrance of dust, moisture, or other foreign material. Hydraulic system contamination can cause malfunctions that could result in injury to personnel or equipment damage.**

1. Rotor Brake Initial Installation

This section provides detailed instructions for accomplishing initial installation of the rotor brake components into the aircraft. In general, procedures are applicable to either left hand or right hand command configurations. Where pertinent, differences are specified.

Illustrations are included to provide data pertinent to aircraft modifications required for installation of the rotor brake components. All items and tools required to install the rotor brake are standard and should be procured locally. Alternate items of comparable characteristics and equal quality may be used.

A. Aircraft Preparation

Preparation for installation of rotor brake components include removal of certain original equipment items to gain access, or for replacement. Preparations also include permanent installation of certain rotor brake components.

B. Installation Access

NOTE: The main transmission must be removed from the aircraft to permit installation of the transmission- mounted rotor brake components.

(1). Remove both crew compartment and cargo/passenger compartment doors.

(2). Remove crew compartment seats.

(3). Remove map case assembly from forward side of canted bulkhead 78.50 structure. Remove both (LH and RH) upper forward panel assemblies from bulkhead structure. Remove convenience panel cover assembly from convenience panel assembly.

NOTE: A new design convenience panel cover assembly (Ref. Figure 908) must be installed to cover the aft portion of the brake master cylinder assembly.

(4). Disconnect electrical wiring and communications cables from components on back of convenience panel assembly. If cabin heating option is installed on aircraft, disconnect heated air duct from panel-mounted diffuser. Remove attaching screws and convenience panel assembly from aft side of canted bulkhead 78.50 structure.

(5). Remove transmission cover panel assembly from fuselage structure.

(6). Cover exposed trim panels to prevent damage and soiling.

(7). Remove main transmission from aircraft (Ref. Sec. 63-20-00/25).

(8). Remove tail rotor (Ref. Sec. 64-20-00), tail rotor transmission (Ref. Sec. 63-25-10) and tail rotor drive shaft (Ref. Sec. 63-15-10).

C. Removing Components to be Replaced

Certain rotor brake and related components are mounted on the main transmission, and are installed in the aircraft as a unit with the transmission. Some of these transmission-mounted components replace similar item counterparts that were used in the original installation.

(1). The tail rotor drive coupling installed on the transmission output shaft must be replaced by a new drive coupling on which the brake disc is mounted. Remove coupling and failsafe device (if used) from transmission output shaft (Ref. Sec. 63-15-10). Leave laminated shim washers on output shaft and retain coupling bolt for reassembly use.

(2). The tachometer generator installed on the tail rotor cover assembly on main transmission must be replaced by a new unit that provides clearance for the rotor brake disc. Remove attaching nuts and washers, tachometer generator and gasket from tail rotor cover assembly. Retain nuts and washers for re-assembly use. Tachometer generator will not be reinstalled. Discard gasket.

(3). The tail rotor cover assembly is installed on the main transmission housing with nuts and washers installed on twelve studs. Four of the studs, with special nuts and washers, will be used for installing the rotor brake caliper mounting bracket. Remove four nuts and washers (at 1, 2, 10, and 11 o'clock positions). These nuts and washers will not be used at reinstallation.

D. Angle Assembly Installation (500D)

(Ref. Figure 901) The angle assembly must be installed on canted bulkhead 78.50 shoulder beam as a means of attachment for the convenience panel cover assembly and the rotor brake forward cover assembly.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

(1). Lay out and mark location for angle assembly on portion of forward bulkhead aft panel assembly that covers canted bulkhead 78.50 shoulder beam.

(2). Insert piece of cardboard (or similar material) under aft panel assembly to protect shoulder beam and use a sharp knife to make panel cut out to accommodate angle assembly, taking special care not to cut outside marked area.

(3). Position angle assembly on shoulder beam as a guide and drill two 0.128-0.132 inch (3.2512-3.3528 mm) diameter holes through angle assembly and one wall of shoulder beam, taking care that point of drill bit does not penetrate into shoulder beam more than 1/4 inch (6.35 mm). Deburr holes in both parts and touch up raw metal surfaces with primer (CM318).

(4). Attach angle assembly to shoulder beam with blind rivets.

E. Master Cylinder Linkage Assembly and Mount Bracket Installation

(Ref. Figure 901) The master cylinder linkage assembly bracket must be installed on canted bulkhead 78.50 vertical member as a means of attachment for the master cylinder assembly and the other components of the master cylinder linkage assembly.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

NOTE: Because of its method of attachment, it may be more convenient to install the linkage assembly bracket and then assemble the other components on the bracket. Although the procedures given in steps (1). thru (3). below consider installation of the assembly, they are also applicable for installation of the bracket. Steps (4). thru (7). below describe procedures for assembling components to the bracket.

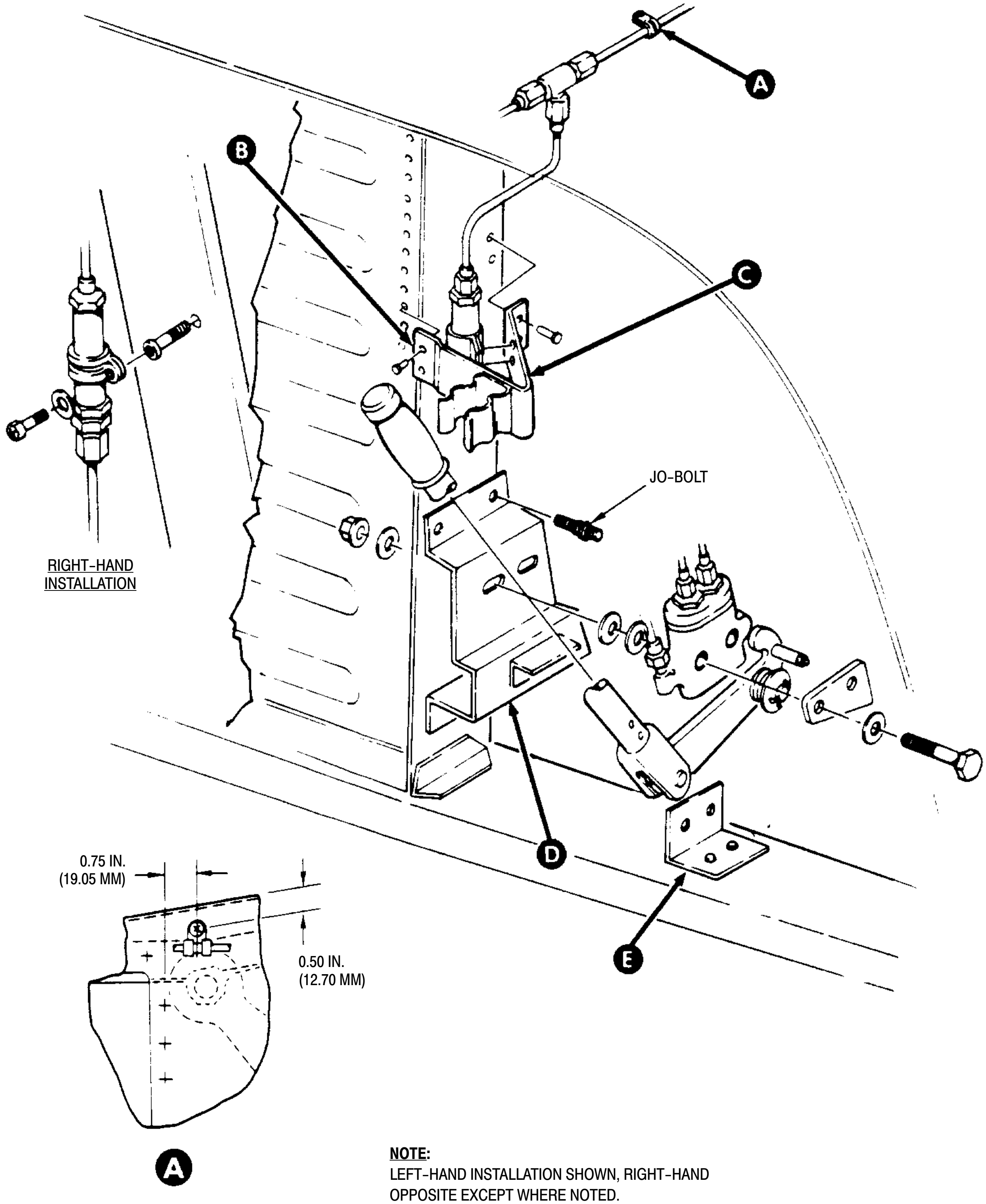
(1). Position master cylinder linkage assembly on canted bulkhead 78.50 vertical member. Hold assembly (with bracket) firmly in position as a guide and use a No. 15 drill bit to line drill four holes in vertical member, taking care to prevent point of drill bit from penetrating into vertical member more than 1/4 inch (6.35 mm).

(2). Line ream holes 0.199-0.202 inch (5.0546-5.1308 mm) diameter. Remove linkage assembly, deburr holes in both parts, and touch up raw metal surfaces with primer (CM318).

(3). Attach bracket to vertical member with Jo-bolt blind fasteners.

(4). Secure pin (Ref. Figure 402) in bracket with nut and washer.

(5). Install grip on handle. Install new roll pins through handle and fitting.



NOTE:
LEFT-HAND INSTALLATION SHOWN, RIGHT-HAND OPPOSITE EXCEPT WHERE NOTED.

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Figure 901. Locating Permanently Installed Components (Sheet 1 of 2)

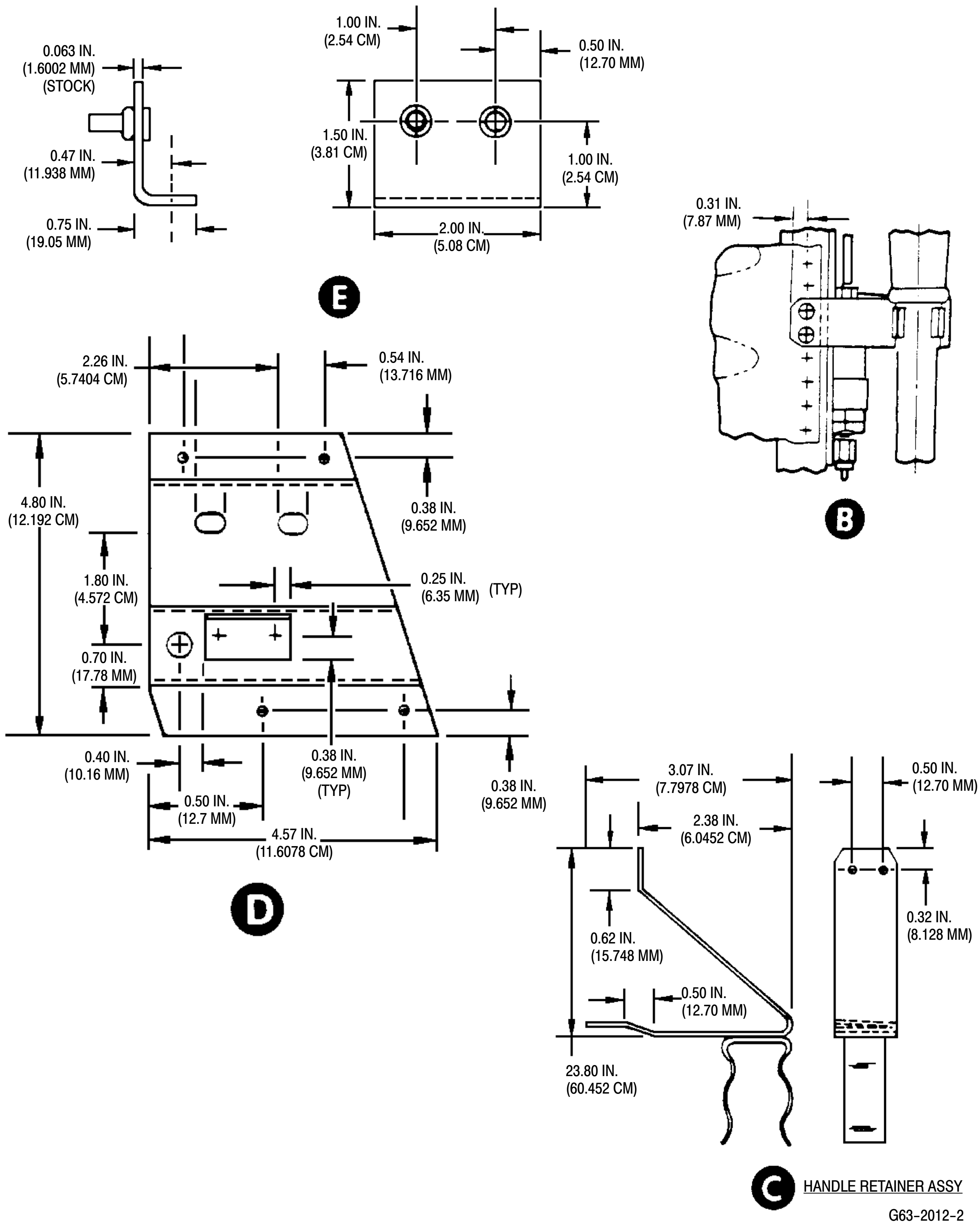


Figure 901. Locating Permanently Installed Components (Sheet 2 of 2)

(6). Install bolt, spacer, and nut on lever. Attach assembled handle parts to lever, with clevis pin, washers, and new cotter pin.

WARNING **When parts are assembled, spring force is constantly exerted to inhibit inadvertent brake application. Care must be taken as the spring is engaged to prevent injury to personnel or equipment damage.**

(7). Install lever with attached parts, and spring on pin and secure with washer, nut, and new cotter pin. Engage free end of spring under head of clevis pin.

F. Handle Retainer Assembly Installation

(Ref. Figure 901) The handle retainer assembly must be installed on canted bulkhead 78.50 vertical member to secure the rotor brake operating handle in the stowed (raised) position.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

NOTE: The master cylinder linkage assembly must be installed so that the handle retainer assembly can be positioned correctly.

(1). Position handle retainer assembly on canted bulkhead 78.50 vertical member so that when rotor brake operating handle is in the stowed position, retainer clip engages handle just below the rubber grip.

CAUTION To prevent damage to components, point of drill bit must not be allowed to penetrate through wall of vertical member more than 1/4 inch (6.35 mm).

NOTE: The tunnel beam web is secured to the vertical members by a series of rivets. Two of these rivets must be removed and replaced by rivets that also attach the handle retainer assembly.

(2). Mark two rivets on front of vertical member that most closely match position of handle retainer assembly. Remove retainer assembly and use a 1/8 inch (3.175 mm) drill bit to drill out marked rivets.

(3). Lay out hole patterns on handle retainer assembly to match drilled rivet holes. Use No. 30 drill bit to drill two holes in retainer.

(4). Cleco retainer assembly in place. Use retainer as guide and use a No. 15 drill bit to drill two holes into face of vertical member. Remove handle retainer assembly from vertical member.

(5). Deburr holes and touch up with primer (CM318).

(6). Attach handle retainer assembly to vertical member with four blind rivets.

G. Rivnut Installation

(Ref. Figure 902) A rivnut must be installed in the main rotor mast pan as an attachment point for one of the clamps used to secure hydraulic tube assembly. For R/H rotor brake installation, a rivnut must be installed in the canted bulkhead 78.50 vertical member for attachment of the hydraulic relief valve.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

CAUTION Care must be taken when drilling the mast pan for rivnut installation to prevent damage to wiring harnesses which are installed on the upper side of the pan, or to critical structure members to which the pan is riveted. A drill stop or other suitable means should be used to prevent point of drill from penetrating more than 1/4 inch (6.35 mm) into vertical member.

(1). Lay out location for hole in transmission pan. Use 1/4 inch (6.35 mm) drill bit to drill hole through pan, deburr hole, and touch up raw metal surfaces with primer (CM318). Install rivnut in accordance with standard shop practice and manufacturer's instructions.

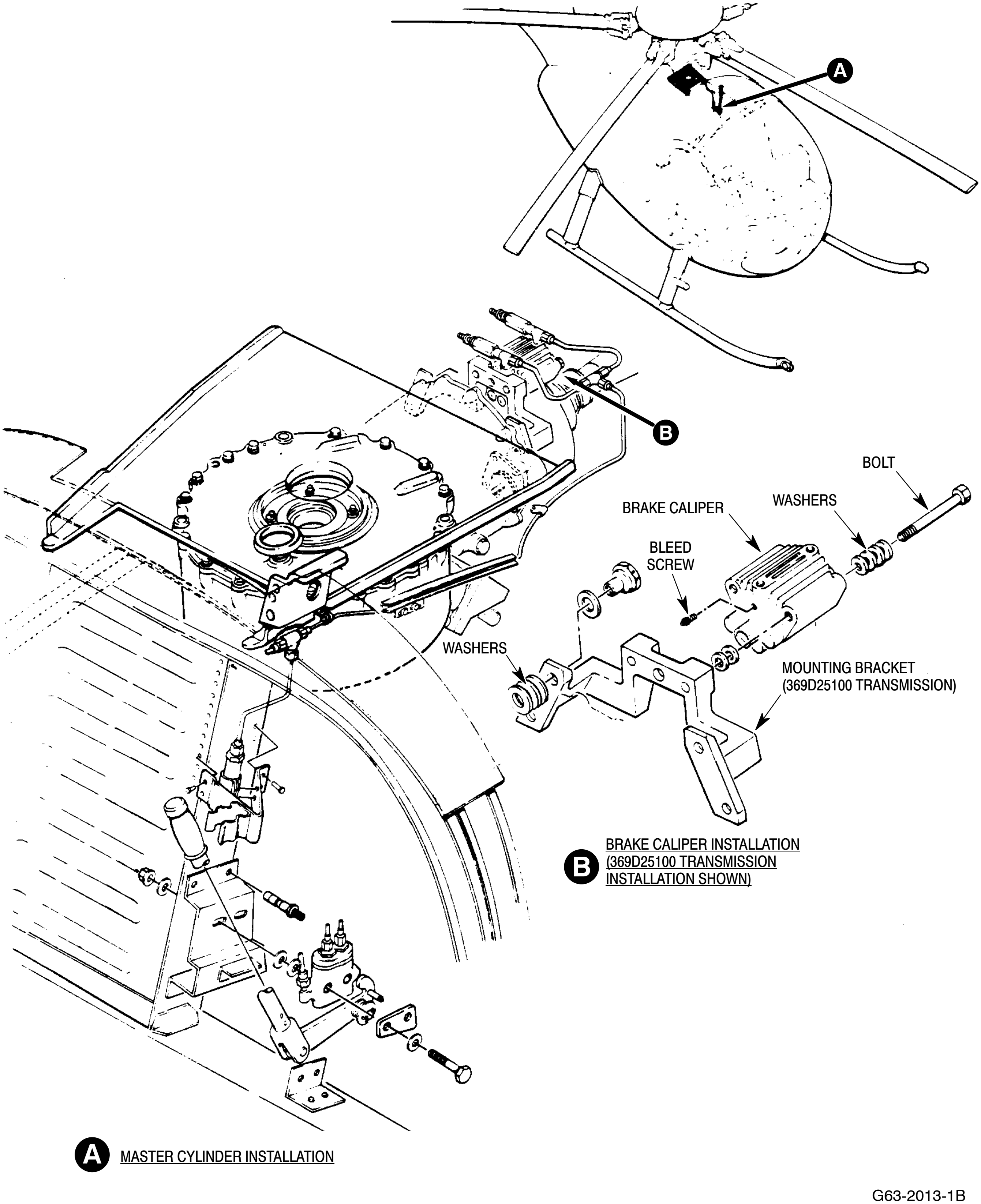


Figure 902. Rotor Brake Installation (Sheet 1 of 2)

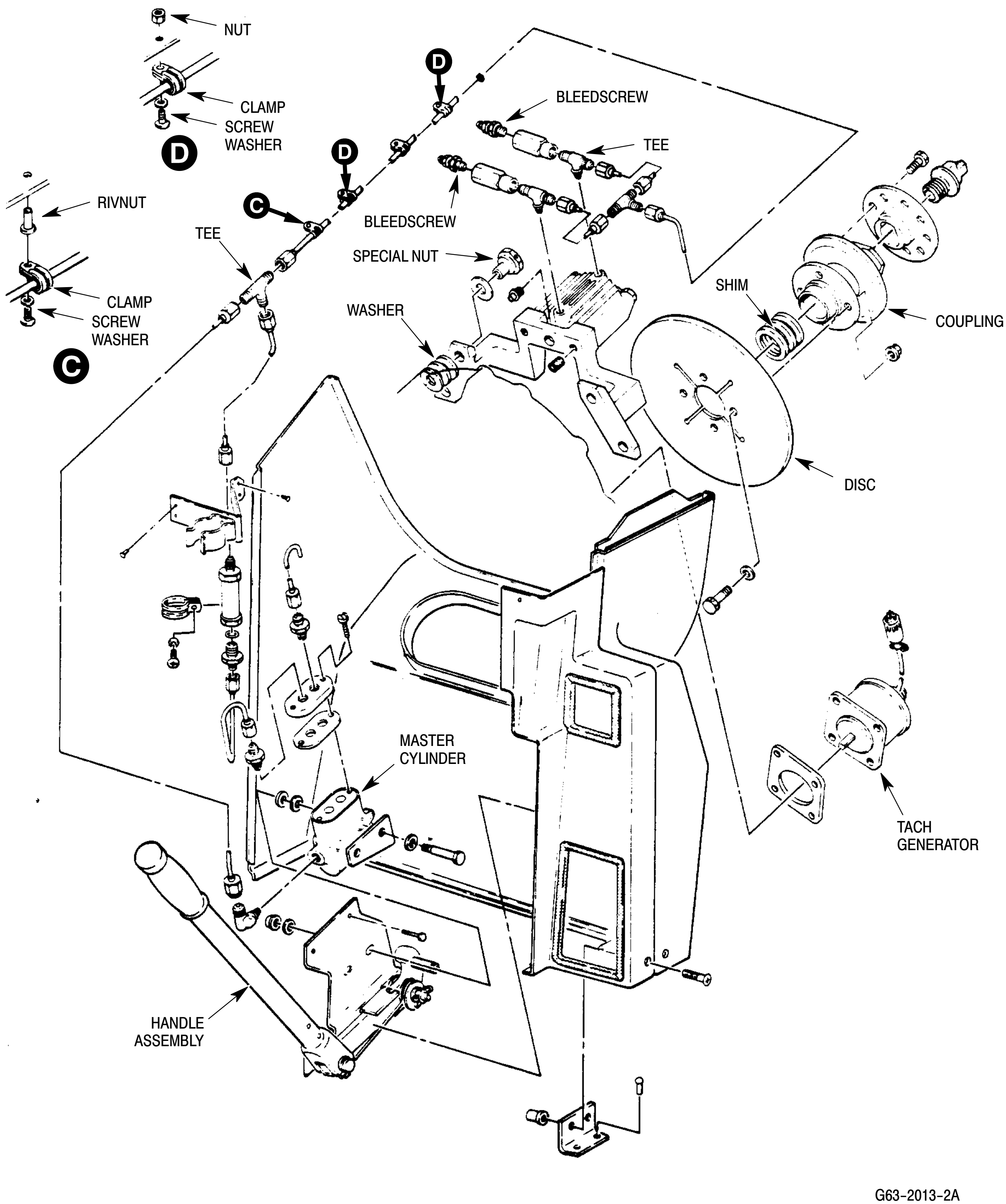


Figure 902. Rotor Brake Installation (Sheet 2 of 2)

(2). Lay out location for hole in vertical member. Use 1/4 inch (6.35 mm) drill bit to drill hole through outer face of vertical member. Deburr hole and touch up raw metal surfaces with primer. Install rivnut in accordance with standard shop practice and manufacturer's instructions.

H. Window Support Channel Modification

(Ref. Figure 903) Three clamps are used to attach hydraulic tube assembly to the window support channel. Modifications to the channel are required to accommodate two of the clamps.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

(1). Use 1/8 inch (3.175 mm) drill bit to remove one (3rd rivet from front) of the four rivets used to attach forward nutplate angle clip to channel. Enlarge hole to 0.188-0.218 inch (4.7752-5.5372 mm) with 3/16 inch (4.7625 mm) drill bit, deburr hole, and touch up raw metal surfaces with primer (CM318).

(2). Lay out location for hole in channel as shown. Use 3/16 inch (4.7625 mm) drill to drill hole in channel, deburr hole, and touch up raw metal surfaces with primer.

I. Caliper Mounting Bracket Initial Installation

(Ref. Figure 902) The caliper mounting bracket is installed on four of the twelve studs used to secure the tail rotor cover assembly on the main transmission housing.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM702	Lockwire CRES

(1). Place three washers on each of the four studs (1, 2, 10, and 11 o'clock positions) in tail rotor cover assembly for use as spacers. Position caliper mounting bracket on studs and secure with washers and nuts. Torque nuts to **50 - 70 inch-pounds (5.65 - 7.91 Nm)**.

(2). Secure installation with lockwire (CM702).

J. Caliper Assembly, Brake Disc and Drive Coupling Installation

(Ref. Figure 902) The caliper assembly is bolted to a mounting bracket which is installed on the main transmission tail rotor cover. The brake disc is bolted on the drive coupling which is installed on the transmission output shaft. For clarity, the brake disc and drive coupling are considered as a single item, herein referred to as the disc/coupling unit. Although the caliper assembly and the disc/coupling unit are not mechanically connected, they are installed on the transmission with the outer portion of the disc positioned between the two halves of the caliper assembly. This arrangement makes it necessary to install both units at the same time.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM113	Anti-seize compound low temperature
CM117	Grease
CM434	Thread sealant
CM702	Lockwire CRES

WARNING **Axial positioning of the drive coupling is critical as it controls the mechanical interface between the coupling and the tail rotor drive shaft. Excessive axial loads can contribute to coupling failure which could result in injury to personnel or equipment damage. Refer to Section 63-15-10 for shimming procedures for installing coupling disc on shaft.**

NOTE: Before installing caliper, brake disc and drive coupling, install new tachometer generator and gasket. Ensure that mechanical drive components are correctly engaged and electrical receptacle is at the 11 o'clock position.

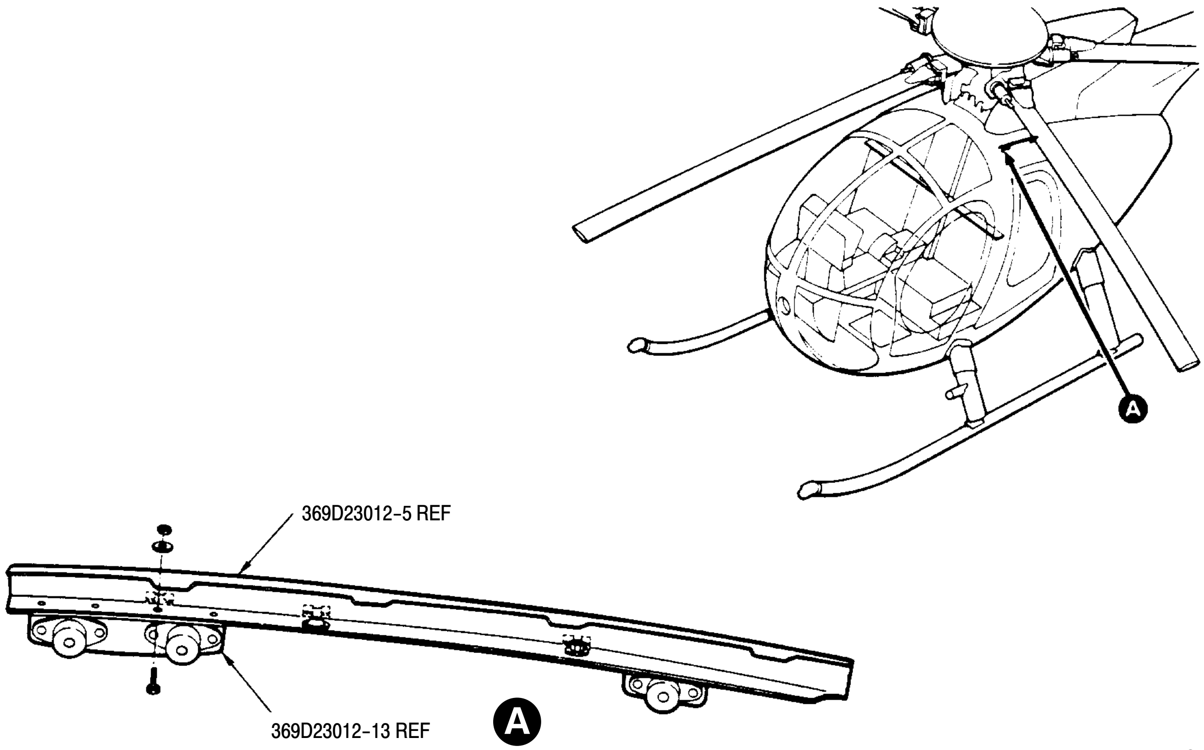


Figure 903. Modifying Window Support Channel

(1). Measure (with a micrometer) and record thickness of brake disc at four locations around the disc. Calculate and record average of thickness measurements.

(2). Position brake disc on tail rotor drive coupling with raised center side of disc seated firmly on shoulder of coupling and with bolt holes aligned. Secure disc to coupling with attaching hardware and torque nuts (in an alternating sequence) to **100 - 140 inch-pounds (11.30 - 15.82 Nm)**.

(3). Measure (with an inside micrometer) and record gap between brake puck faces. Subtract brake disc thickness calculated in step (1). from gap measurement and divide the difference by two to determine the optimum puck-to-disc clearance.

(4). Remove bleed screws from ports in ends of caliper assembly. Coat all but first two threads of bleed screws, tees, and plugs with thread sealant (CM434). Install plugs in bleed screw ports and tees in caliper bodies, install adapters on tees, and install bleed screws in adapters. Remove and discard hardware used to hold caliper halves together.

NOTE: The caliper assembly consists of two identical halves. When received, the halves are held together by commercial hardware. This hardware is replaced by qualified standard hardware which also secures the caliper assembly on the mounting bracket.

(5). Insert bolts through one caliper half, position assembled parts of mounting bracket and screw bolts into bracket finger tight to maintain alignment of caliper half. Use a C-clamp or other suitable means to clamp caliper half firm against bracket.

(6). Coat, completely but sparingly, splines of transmission output shaft with grease (CM117) and threads of coupling with anti-seize compound (CM113), or equivalent. Install coupling/disc unit on shaft and install bolt into end of shaft to ensure that coupling is seated firmly against shim washers on shaft.

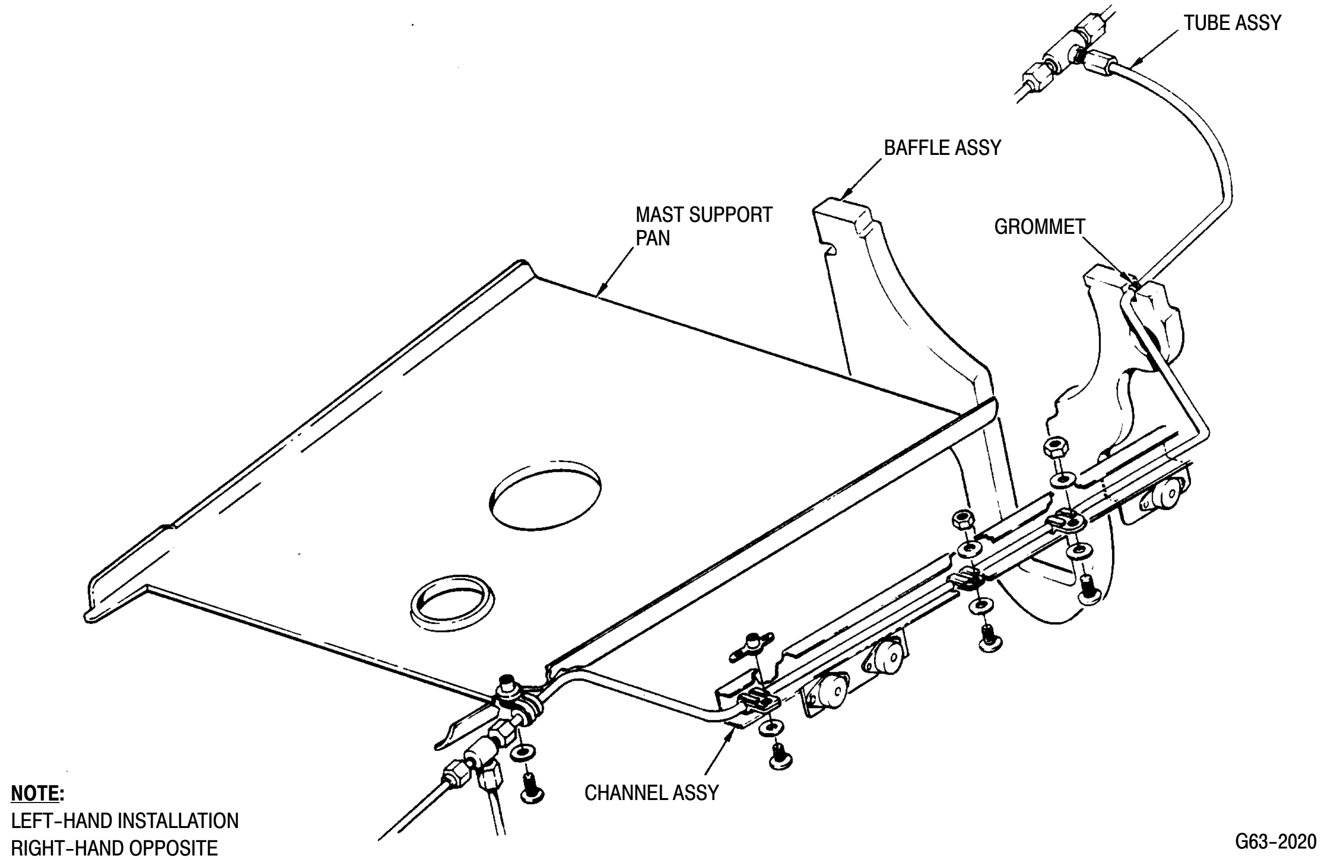


Figure 904. Hydraulic Tube Installation

WARNING **The caliper assembly must be installed so that caliper-to-disc clearances on both sides of disc are approximately equal. Improper installation can cause malfunctions which could result in injury to personnel or equipment damage.**

(7). Measure gap between brake caliper housing and forward face of disc with a thickness gage. Subtract desired caliper-to-disc clearance calculated in step (3). from this measurement to determine amount of shimming (washers) to be installed between caliper assembly and mounting bracket. Divide the difference by 0.032 inch (0.8128 mm) (washer thickness) to determine number of shim washers needed.

NOTE: Fore-and-aft positioning of the caliper assembly, which determines the puck- to-disc clearance relationship, is established by installing shim washers between the caliper assembly and the mounting bracket. Nine washers are provided for each attaching bolt; those not required for shimming must be installed under the bolt heads.

(8). Remove bolts and place the correct number (nine less the number required for shimming) of washers on each bolt. Insert bolts through caliper halves and screw one bolt finger tight into mounting bracket. Release clamped caliper half and move it away from bracket, place required number of shim washers on second bolt as it is pushed through caliper assembly, and screw bolt into bracket a few turns. Repeat procedure to install shim washers on other bolt. Tighten bolts firmly to secure installation.

(9). Check caliper-to-disc clearances with a thickness gage. If clearances are approximately equal, torque mounting bolts to **160 - 190 inch pounds (18.08 - 21.47 Nm)** and secure with lockwire (CM702). Torque coupling bolt to **250 - 300 inch-pounds (28.25 - 33.90 Nm) plus drag torque**.

(10). After the rotor brake components have been installed on the main transmission, the built-up unit must be installed in the aircraft (Ref. Sec. 63-20-00/25).

WARNING **The main transmission must be installed in the aircraft with special care to avoid damage to rotor brake components. Installation damage could lead to system failure which could result in injury to personnel or equipment damage.**

(11). If tachometer generator is installed on transmission, connect electrical plug (P202) on aircraft wiring harness to receptacle on tachometer generator.

K. Master Cylinder Assembly Initial Installation

(Ref. Figure 902) The master cylinder assembly is mounted on the master cylinder linkage assembly bracket.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM434	Thread sealant

(1). Remove attaching screws and vendor-supplied cap from master cylinder. Vendor cap is not used.

(2). Rework vendor-supplied gasket (Ref. Figure 906).

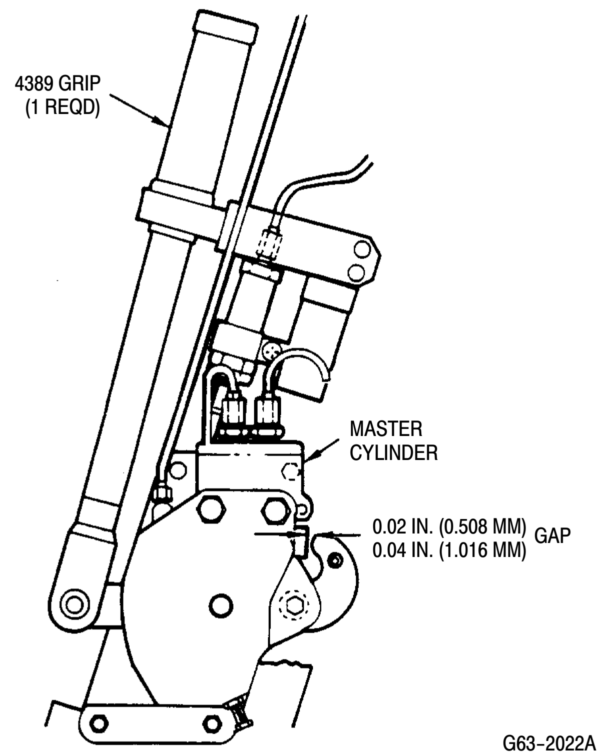


Figure 905. Positioning Master Cylinder

(3). Install new cap and reworked gasket on master cylinder with attaching screws installed finger tight.

(4). Coat all but first two tapered pipe threads of nipples and elbow with thread sealant (CM434). Install nipples in cap and elbow in master cylinder.

(5). Place one washer on each bolt, place stop on bolts and insert bolts through master cylinder. Place two washers on each bolt as spacers. Position assembled parts on linkage assembly bracket and secure installation with washers and nuts. Tighten nuts only finger tight.

NOTE: Mounting holes in bracket are elongated to enable lateral position adjustment of master cylinder assembly.

(6). With actuating handle in stowed position, adjust position of master cylinder assembly so that clearance (measured with a thickness gage) between actuating lever (Ref. Figure 905) and master cylinder piston is 0.020-0.040 inch (0.508-1.016 mm). Tighten nuts to hold master cylinder assembly firmly in position.

L. Hydraulic Relief Valve Initial Installation

(Ref. Figure 902) The hydraulic relief valve is attached by means of a clamp to the canted bulkhead 78.50 vertical member, and is connected hydraulically, by means of tube assemblies, between the master cylinder assembly and the caliper assembly.

(1). Place new O-ring on reducer and screw reducer into relief valve. Connect relief valve to tube assembly and tighten tube nut. Install clamp on relief valve.

(2). Position assembled parts with relief valve in “V” of handle retainer assembly. Install attaching hardware loosely to hold assembled parts on canted bulkhead 78.50 vertical member.

NOTE: Screw is threaded into nutplate for LH installation, and into rivnut for RH installation.

M. Hydraulic Tube Assemblies Initial Installation

(Ref. Figure 902) Two tube assemblies are installed to connect the master cylinder assembly and the caliper assembly.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM418	Cement, epoxy

(1). Connect tee loosely to tube assembly. Make straight radial cut into center hole of grommet and install grommet and clamps on tube assembly.

(2). Position assembled parts on window channel so that grommet can be engaged in slot of air baffle. Connect tube assembly loosely to tee on caliper assembly and connect tee loosely to tube assembly on hydraulic relief valve.

(3). Bond grommet into air baffle slot with epoxy cement (CM418). Install attaching hardware loosely to hold clamps (and tube assembly) to pan and window channel.

(4). Connect tube assembly loosely to elbow in master cylinder and to tee.

(5). With all tube assemblies and fittings connected, tighten nuts on tube assemblies. Tighten attaching hardware for all clamps.

NOTE: It is not necessary to tighten tube assembly nuts at this time. The tube assembly will have to be removed to permit filling the hydraulic system.

(6). Connect tube assembly to nipple in master cylinder cap and tighten tube nut.

N. Rotor Brake Installation Servicing

After all operating components of the rotor brake system have been installed, the hydraulic system must be filled with hydraulic fluid and have all entrapped air bled off. Refer to Rotor Brake Hydraulic System Bleeding.

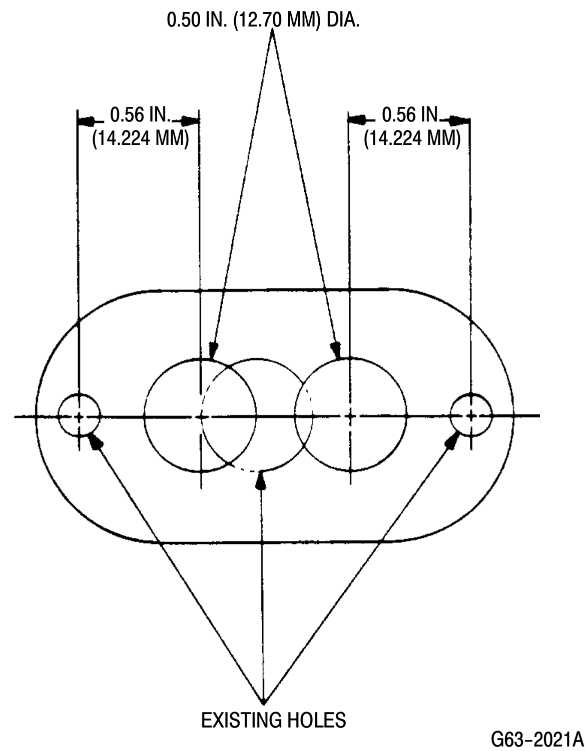


Figure 906. Reworking Master Cylinder Gasket

O. Installing Interior Furnishings

After the operating components of the rotor brake installation have been checked out, the various items of interior furnishings (trim panels, cover assemblies, seats, etc.) and the fuselage doors must be reinstalled. This includes those items that are specific for the rotor brake installation, and those that were removed to permit access for installing the rotor brake components.

P. Map Case Assembly Modification and Installation

(Ref. Figure 907) Before the map case assembly can be reinstalled, it must be modified to accommodate the rotor brake forward cover assembly.

(1). Mark map case panel for cutout. Use a sharp knife to cut out marked area, taking special care to avoid cutting outside of marked area.

(2). Install map case assembly on canted bulkhead 78.50 structure with three attaching screws.

NOTE: A fourth screw will also be used to attach the rotor brake forward cover assembly (Ref. Figure 908).

Q. Convenience Panel Cover Assembly Modification and Installation

(Ref. Figure 908) The convenience panel cover assembly mates with the rotor brake forward cover assembly to enclose and protect the rotor brake components installed on the canted bulkhead 78.50 structure.

(1). Position new convenience panel cover assembly with the aft edge overlapping the forward edge of the transmission cover panel. Install attaching screws to hold panels in position.

(2). On the 500D, mark location for hole in the forward corner of convenience panel cover assembly to line up with nutplate on angle assembly on canted bulkhead 78.50 shoulder beam. On the others, mark location for holes in forward corner of convenience panel cover assembly to line up parallel with holes to be drilled on rotor brake forward cover panel.

(3). Use No. 42 drill bit to drill holes at marked location for attaching screws.

NOTE: It may be more convenient to remove convenience panel cover assembly while drilling hole.

(4). On the 5000D, secure convenience panel cover assembly with doublers to angle assembly with attaching screw. On the others, the convenience panel cover assembly will be permanently fastened down when mated with the rotor brake forward cover assembly.

R. Rotor Brake Forward Cover Assembly Installation

(Ref. Figure 908) The rotor brake forward cover assembly mates with the convenience panel cover assembly to enclose and protect the rotor brake components (master cylinder, etc.) installed on the canted bulkhead 78.50 structure. It is installed over the forward portion of the master cylinder assembly and incorporates cutouts to accommodate the brakes handle and retaining clips.

(1). Position rotor brake forward cover assembly on map case assembly with aft edge overlapping forward edge of convenience panel cover assembly and with brake and retaining clips extending through cutouts.

NOTE: If aircraft is equipped with optional particle separator, it may be necessary to trim the forward cover assembly for clearance.

(2). On the 500D, mark location for hole in upper corner of forward cover assembly to line up with isolator mount, and in lower corner to line up with nutplate in angle assembly on canted bulkhead 78.50 shoulder beam. On the others, mark location for hole in upper corner of forward cover assembly to line up with isolator mount and in upper and lower outboard corners to line up parallel with holes previously drilled in the convenience panel cover assembly.

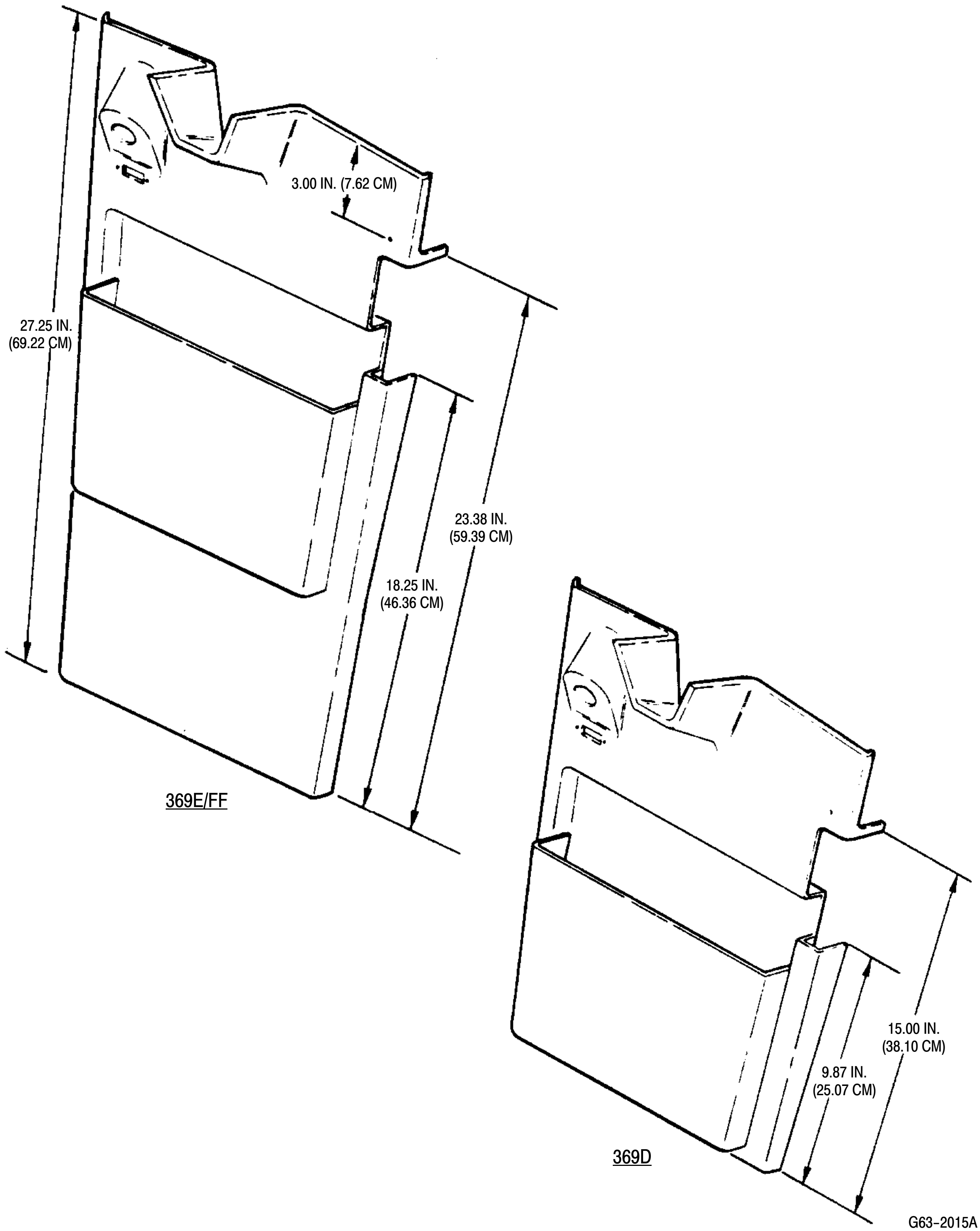


Figure 907. Modifying Map Case Panel

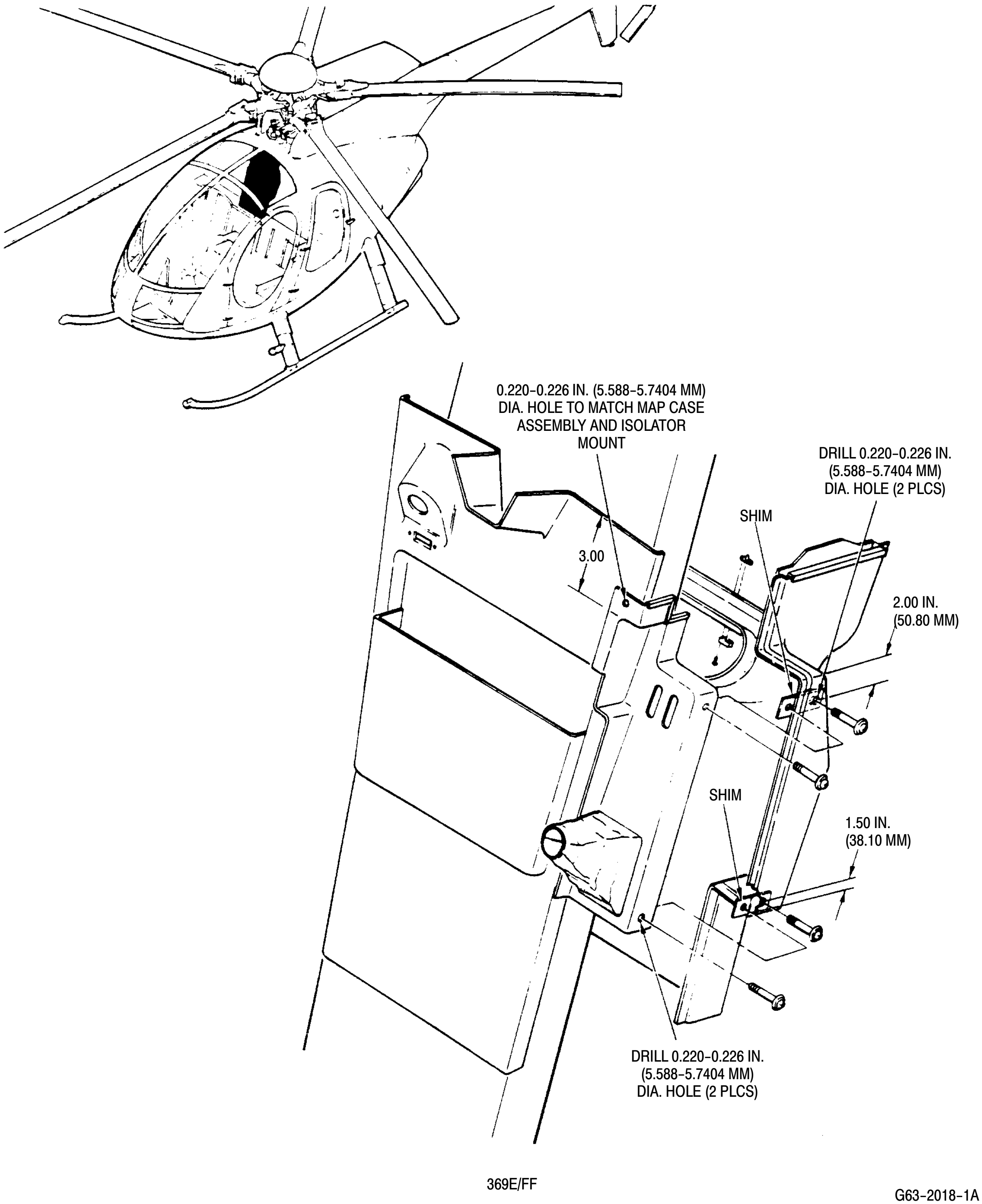


Figure 908. Modifying Rotor Brake Cover Panel Assemblies (Sheet 1 of 2)

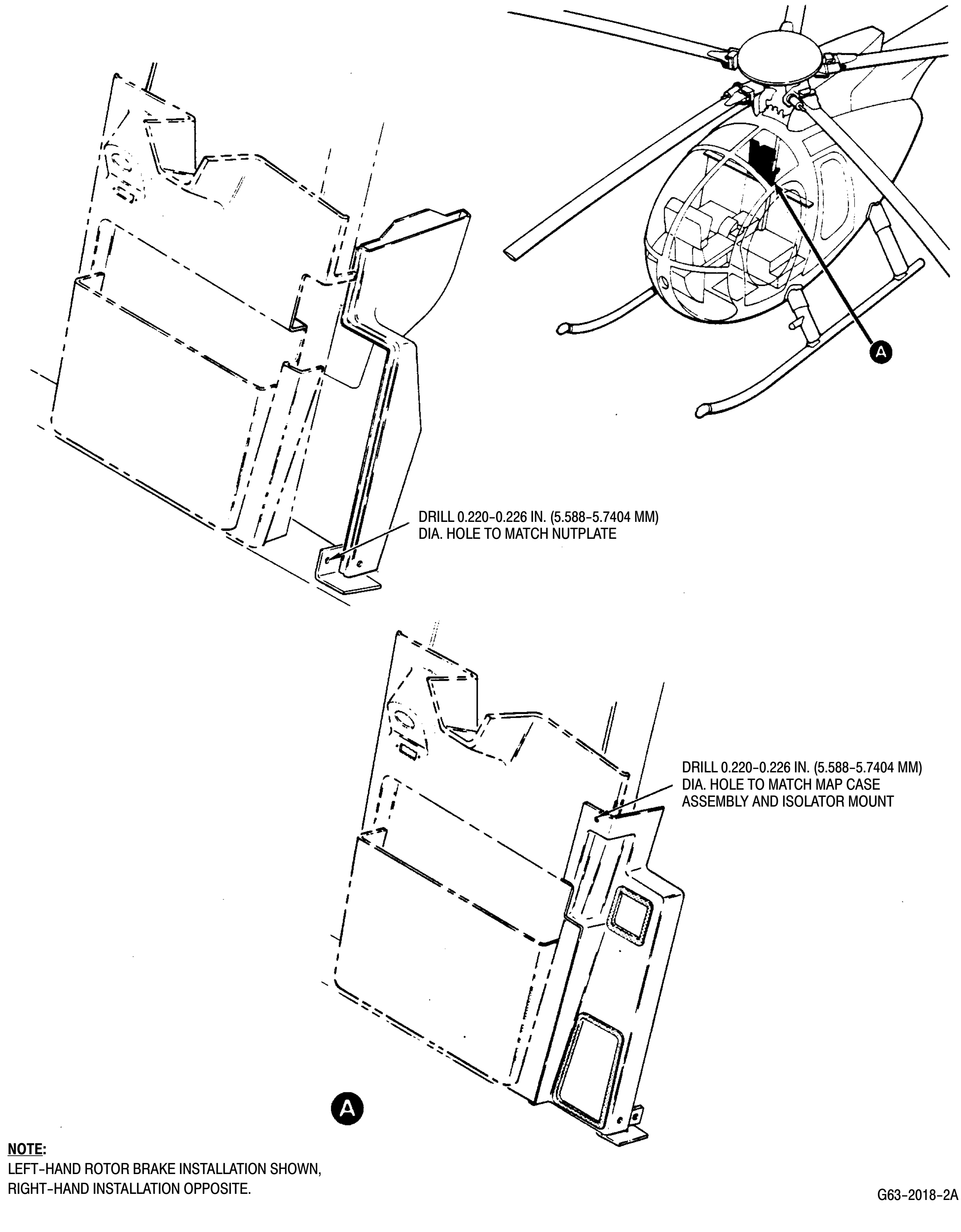


Figure 908. Modifying Rotor Brake Cover Panel Assemblies (Sheet 2 of 2)

(3). Use No. 42 drill bit to drill holes at marked locations for attaching screws.

NOTE: It may be more convenient to remove forward cover panel assembly while drilling holes.

(4). Secure forward cover assembly and map case panel assembly with attaching screws. On the 500D, install screw through nutplate in angle assembly. On the others, install screws into shims on the outboard edge of forward cover assembly and convenience panel cover assembly.

(5). Push panel boot aft on brake handle approximately 2 inches (5.08 cm) and secure boot fastener tape.

S. Weight and Balance

(Ref. Table 901) After installing the rotor brake, incorporate changes in helicopter weight and balance record.

Table 901. Weight and Balance Data

Configuration	Weight lb (kg)	Arm in. (cm)	Moment in-lb (kg-cm)
500D (left side)			
Added	+7.5 (+3.40)	106.6 (270.764)	+800 (9216.96)
Removed	0.0	-	0.0
Changed	+7.5 (+3.40)	106.6 (270.764)	+800 (9216.96)
500D (right side)			
Added	+6.8 (3.08)	108.9 (276.606)	+741 (8537.21)
Removed	0.0	-	0.0
Changed	+6.8 (3.08)	108.9 (276.606)	+741 (8537.21)
369E/FF - 500N (left and right)			
Added	+7.5 (+3.40)	106.5 (270.51)	+799 (9205.44)
Removed	0.0	-	0.0
Changed	+7.5 (+3.40)	106.5 (270.51)	+799 (9205.44)
600N (left and right)			
Added	+7.6 (+3.45)	98.4 (294.44)	+748 (862.3)
Removed	0.0	-	0.0
Changed	+7.6 (+3.45)	98.4 (294.44)	+748 (862.3)

Section

63-25-10

Tail Rotor Transmission (Two and Four Blade) (369D/E/FF)

TAIL ROTOR TRANSMISSION (TWO AND FOUR BLADE) MAINTENANCE PRACTICES

1. Tail Rotor Transmission

(Ref. Figure 201) The tail rotor transmission is a right-angle transmission with a magnesium alloy housing. A magnetic chip detector is located on the aft end of the transmission, a breather-filler is located on the top and a sight gage is mounted on the aft end (two-bladed) or on the right side (four-bladed) of the transmission.

2. Tail Rotor Transmission Replacement

A. Tail Rotor Transmission Removal

(1). Disconnect tail rotor driveshaft from transmission (Ref. Sec. 63-15-10).

(2). Disconnect chip detector wire.

(3). (369D/E) Remove four nuts and washers from transmission mount studs.

(4). (369FF) Remove four bolts, eight washers and four nuts between transmission and tailboom extension.

NOTE: Retain any shimming washers that may be between tail rotor transmission and tail boom for transmission installation.

(5). With assistance, support transmission and shaft in line for minimum deflection of coupling and remove tail rotor drive shaft and transmission as a unit.

(6). Remove tail rotor from tail rotor transmission (Ref. Sec. 64-20-00).

(7). Remove tail rotor drive shaft from tail rotor transmission (Ref. Sec. 63-15-10).

B. Tail Rotor Transmission Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

CAUTION Do not carry or otherwise support transmission by coupling, as coupling diaphragm may be permanently distorted. During performance of all maintenance on transmission, use extra care to keep contaminants such as paint, dirt, etc from areas around input and output shaft seals.

(1). Install tail rotor drive shaft on tail rotor transmission (Ref. Sec. 63-15-10).

CAUTION (Ref. Figure 203) Ensure security of tail rotor transmission mount studs. Maximum allowable side play at end of stud is 0.004 inch (0.102 mm), maximum allowable axial play is 0.005 inch (0.127 mm). For stud replacement, refer to the Structural Repair Manual (SRM).

NOTE: Ensure all paint and sealant is removed from mating surfaces. Remove excessive sealant, as required, from transmission to gain clean mounting surfaces. Ensure that no gap in sealant coverage exists around the transmission bearing cover assembly.

(2). Visually inspect mounting studs for damage or deformation. Replace damaged or deformed stud (Ref. SRM).

(3). Apply primer (CM318) in holes, on faying surfaces and on the grip area of the mounting studs. Install tail rotor transmission or tailboom extension while primer is still wet.

(4). With assistance, support transmission and shaft in line for minimum deflection of coupling and install tail rotor drive shaft and transmission as a unit (Ref. Sec. 63-15-10).

NOTE: Note the drag torque for each nut and it’s location on the transmission in the helicopter for later use.

(a). (369D/E) Secure tail rotor transmission to four tailboom mounting studs with washers and nuts. Torque nuts to **75 - 95 inch-pounds (8.47 - 10.73 Nm) plus drag torque**.

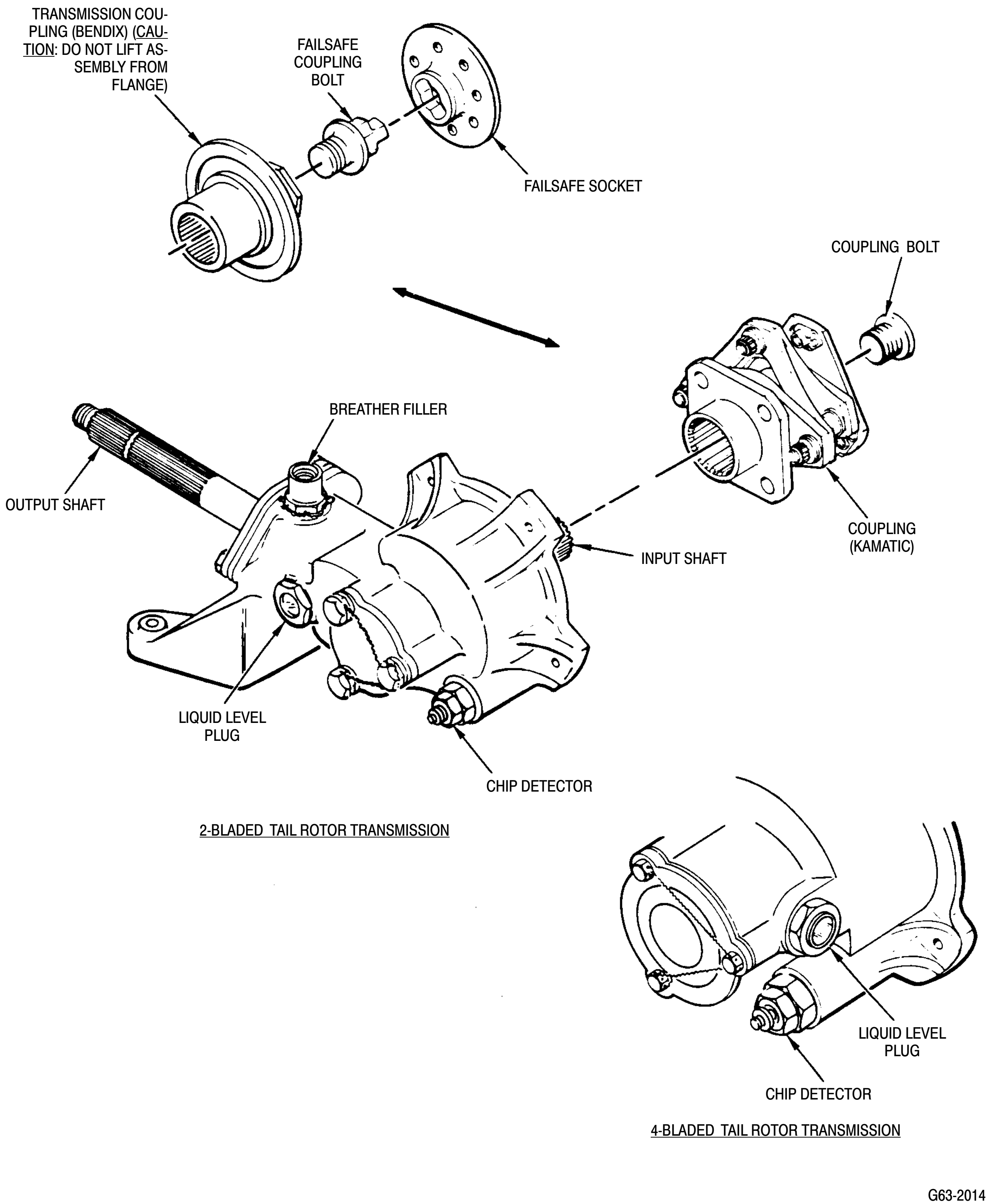


Figure 201. Tail Rotor Transmission - Stripping/Buildup

(b). (369FF) Secure tail rotor transmission to tailboom extension with four bolts, eight washers and four nuts. Torque nuts to **75 - 95 inch-pounds (8.47 - 10.73 Nm) plus drag torque**.

(5). Apply torque stripe paint.

(6). Between 2 and 10 hours of helicopter operation (to allow parts to seat), check the torque of each mounting nut as follows:

(a). Using the drag torque previously measured and noted, apply a torque load of **95 ±3 inch-pounds (10.73 ±0.339 Nm) plus the noted drag torque** (noted for each individual nut) to each mounting nut of the transmission.

(b). Re-apply torque stripe paint.

(7). Install tail rotor on tail rotor transmission (Ref. Sec. 64-20-00).

(8). Connect chip detector wire. Torque nut to **12 - 15 inch-pounds (1.36 - 1.69 Nm)**.

(9). Connect tail rotor drive shaft to main transmission (Ref. Sec. 63-15-10).

(10). Drain residual preservative oil and service transmission with lubricating oil (Ref. Sec. 12-00-00).

3. Tail Rotor Transmission Inspection

(Ref. Figure 201)

NOTE: If following inspections reveal damage, repair according to instructions in CSP-COM-5.

(1). Check transmission for leaks, cracks and corrosion. To evaluate oil leakage, refer to Fluid Leak Analysis (Ref. Sec. 12-00-00).

(2). Inspect Sta. 284 bellcrank hole for elongation; if elongation is suspected, measure hole diameter. Hole diameter to be 0.312-0.313 inch (7.9248-7.9502 mm) (Ref. CSP-COM-5 for bolt hole repair).

(3). Check input shaft for:

(a). Axial play by moving shaft in and out; transmission must be cold. Axial play is limited to 0.004 inch (0.102 mm) maximum.

(b). Measure runout; mark high and low extremes on outer end of shaft with grease pencil. Total indicated runout should be less than 0.002 inch (0.051 mm).

(4). Check output shaft for:

(a). Axial play; no axial movement is permitted.

(b). Measure runout; mark high and low extremes on outer end of shaft with grease pencil. Total indicated runout should be less than 0.0025 inch (0.0635 mm).

(5). While gently pulling out on input shaft, check gearset backlash:

(a). Two-bladed gearset backlash should be 0.004-0.008 inch (0.102-0.203 mm).

(b). Four-bladed gearset backlash should be 0.0025-0.0050 inch (0.0635-0.127 mm).

NOTE: Although not required, placing marks on end of output shaft provides guides for subsequent installation of tail rotor assembly in a manner that reduces chances of high frequency vibrations and lessens possibility of requirement for tail rotor balancing.

(6). Inspect all scoring or scratching of output shaft to determine if marks penetrate through cadmium plating and into steel shaft. Penetration of steel shaft is allowable to maximum depth of 0.010 inch (0.254 mm).

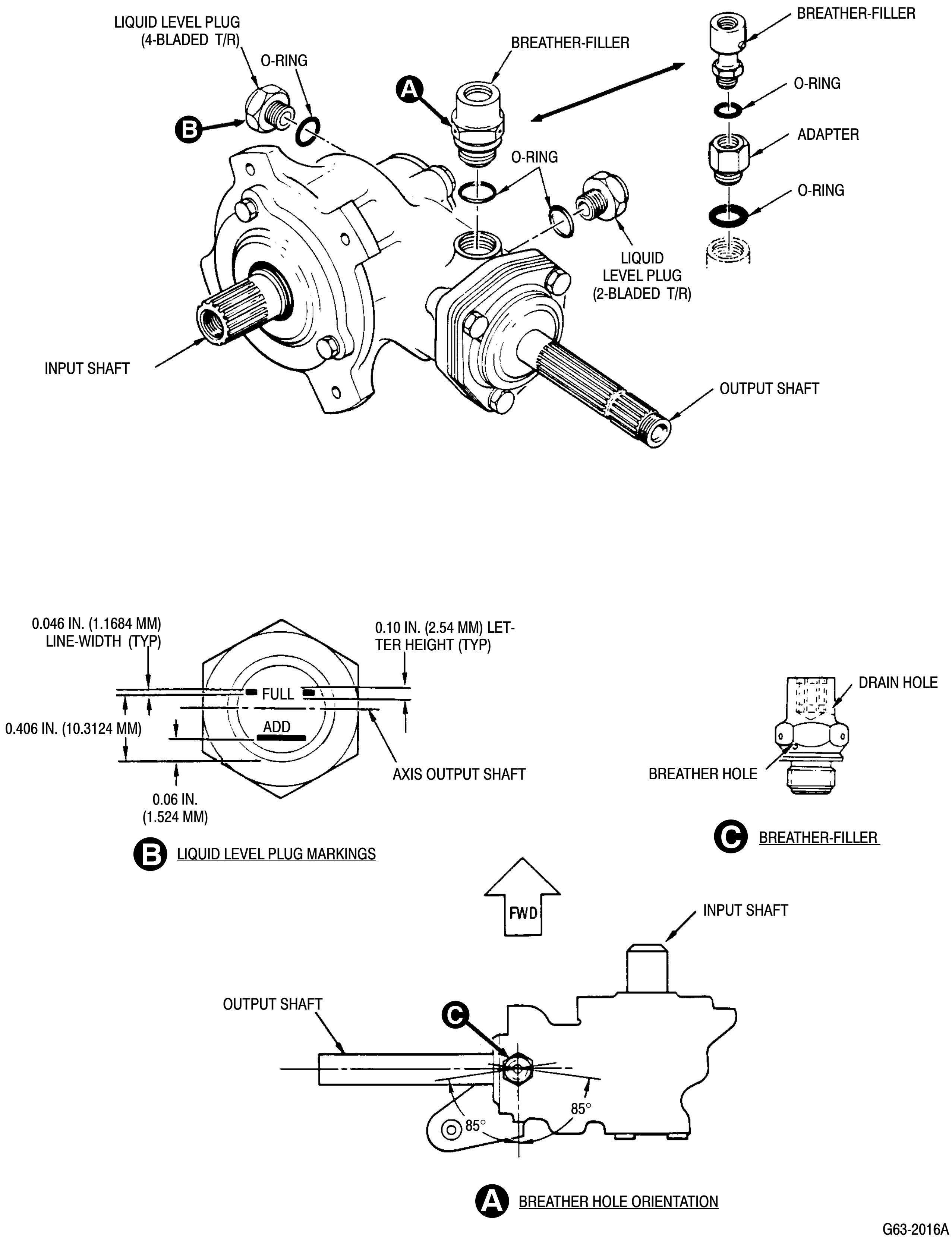


Figure 202. Replacement of Liquid Level Plug and Breather-Filler

4. Tail Rotor Transmission Stripping

(Ref. Figure 201) Stripping of the tail rotor transmission is not required following its removal from the helicopter. Perform the following stripping procedure if in preparation for transmission shipment or storage only.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM208	Barrier material

(1). Remove coupling bolt and coupling from input shaft.

NOTE: For tail rotor transmission replacement, further stripping is not required. A replacement transmission is equipped with all other accessories.

(2). Drain oil from transmission (Ref. Sec. 12-00-00). Residual operating lubricant is approved internal preservative for shipping or storage.

(3). Wrap transmission in barrier material (CM208) to protect shaft splines and chip detector stud during handling, shipping or storage.

5. Tail Rotor Transmission Buildup

(Ref. Figure 201)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM111	Grease, aircraft
CM112	Anti-seize compound high temperature

(1). Coat coupling splines with grease (CM111) and coupling bolt threads with anti-seize compound (CM112) before re-assembly.

(2). Install coupling and bolt. Torque coupling bolt to **250 - 300 inch-pounds (28.25 - 33.90 Nm) plus drag torque**. Check coupling bolt for drag torque serviceability of **25 inch-pounds (2.82 Nm) minimum, 200 inch-pounds (22.60 Nm) maximum**.

6. Tail Rotor Transmission Parts Replacement

(Ref. Figure 202)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM114	Petrolatum
CM222	1,1,1-Trichloroethane
CM311	Coating, logo white / Thinner
CM702	Lockwire CRES

NOTE: Replace liquid level plug, chip detector and breather-filler using torque values in following paragraphs. Lubricate mating bores of O-rings with petrolatum (CM114) to prevent damage to O-rings. Repair other components or replace tail rotor transmission oil seals (Ref. COM).

(1). Chip Detector Torque valve body **50 - 60 inch-pounds (5.65 - 6.78 Nm)**; detector **40 - 50 inch-pounds (4.52 - 5.65 Nm)**. Safety with lockwire (CM702).

(2). Liquid Level Plug Torque liquid level plug to **50 - 60 inch-pounds (5.65 - 6.78 Nm)**. If level-lines and lettering of liquid level plug cannot be made parallel with axis of transmission output shaft when plug is torqued within 50 - 60 inch-pound (5.65 - 6.78 Nm) range, clean glass by firmly rubbing with soft cloth, then mix white coating (CM311) with equal amount of thinner and apply lines and lettering. Safety with lockwire.

NOTE: Some models use an adapter with an additional O-ring. On those models, install adapter with O-ring, then install breather-filler.

(3). Oil Breather-Filler Torque breather-filler to **45 - 55 inch-pounds (5.08 - 6.21 Nm)**. If equipped with a 369A5429 breather, hole in breather filler must be directed rearward at final torque. Locating vent at any angle aft of output shaft centerline (viewed from above) adequately directs vent rearward. One or two washers may be added between O-ring and breather flange (one washer changes orientation by approximately 100 degrees). Safety with lockwire.

NOTE: If oil breather-filler assembly becomes clogged, use light air pressure, approximately 5 psig (34 kPa) or a 0.125 inch (3.175 mm) dia. rod applied into the threaded end to dislodge debris. Ultrasonically clean breather in solvent (CM222) for ten minutes.

7. Input and Output Gearshaft Cover Oil Leak Repair

Repair oil leaks at input and output gearshaft cover by installing a protective sleeve (Speedi-Sleeve) on the gearshaft area contacted by the oil seal lip (Ref. COM).

8. Tail Rotor Transmission Housing Assembly Rework (PN 369D25401)

(Ref. Figure 204) An interference condition may exist between the tail rotor transmission housing and the tail rotor control bellcrank with the tail rotor pedal at extreme right position. The following procedure provides inspection criteria and rework instructions, if necessary, for the tail rotor transmission housing to correct this condition should it exist.

(1). With assistance, depress and hold right tail rotor pedal to extreme right position and inspect web area of tail rotor transmission housing that comes in close contact with tail rotor control bellcrank. If adequate clearance exist between transmission housing and control bellcrank, no rework action is necessary.

(2). Sign off aircraft logbook to indicate completion of this inspection.

(3). If contact occurs, rework tail rotor transmission housing as follows:

(a). Chamfer the web on transmission housing to dimensions shown in Figure 204.

WARNING **Do not remove material in excess of specified dimension.**

(b). Blend chamfer into existing radius at the bottom and radius it at the top. Width of chamfer must be 0.060-0.090 inch (1.524-2.286 mm).

(c). Apply surface touchup treatment (Ref. Sec. 20-30-00).

(4). Record compliance of this rework in the aircraft logbook.

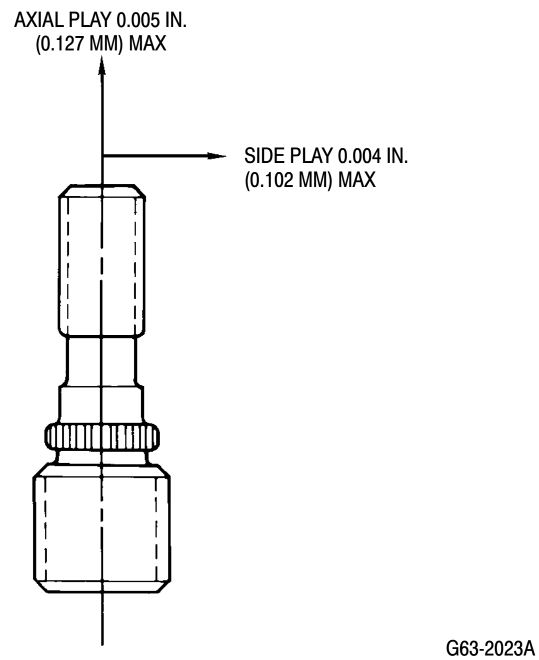


Figure 203. Tail Rotor Transmission Mount Stud Limits

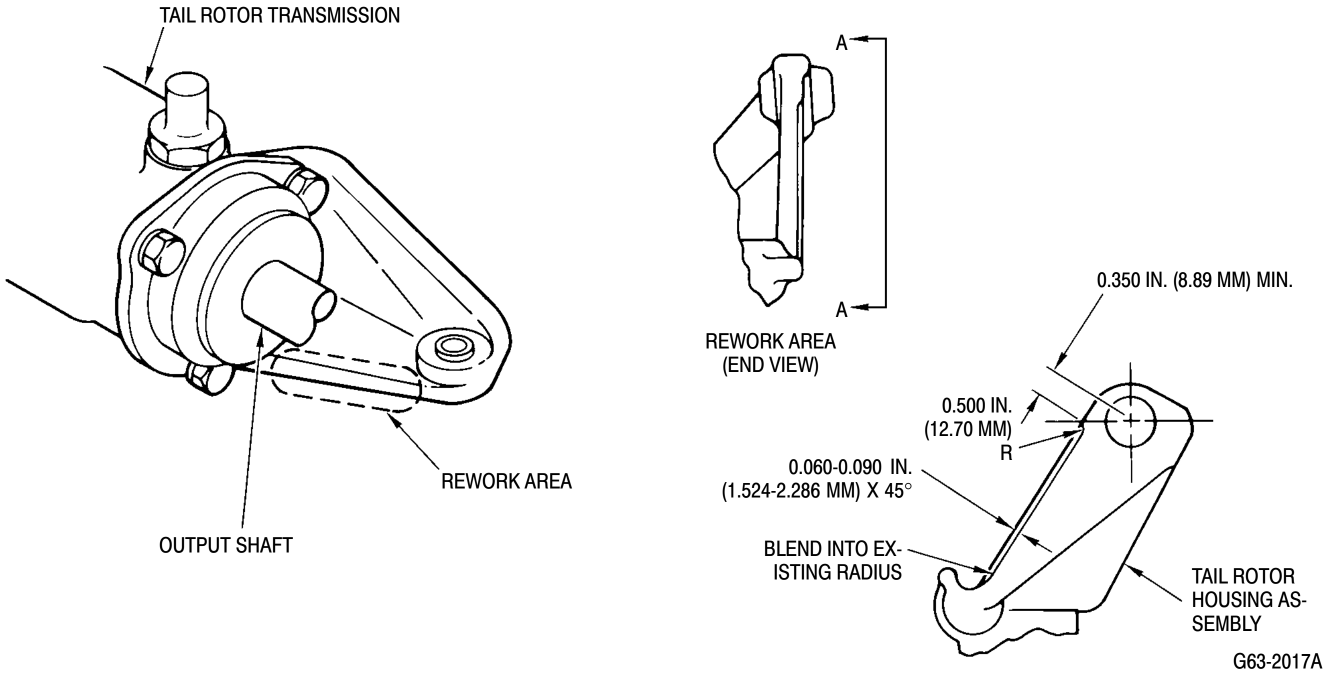


Figure 204. Rework of Tail Rotor Transmission Housing Assembly

Section

63-25-30

NOTAR®
Anti-Torque System
Fan Transmission
(500/600N)

NOTAR® ANTI-TORQUE SYSTEM FAN TRANSMISSION MAINTENANCE PRACTICES

1. Fan Transmission

The function of the fan transmission is to step up RPM from the main transmission output to the fan via fan drive shaft, gears, and interconnect shaft. The transmission housing is made of magnesium, and contains input and output gear shafts, two angular contact bearings, coupling, seals, packings, output cover assy, chip detector, sight glass, and oil breather assembly.

2. Fan Transmission Replacement

Remove and install fan transmission according to the following procedures.

A. Fan Transmission Removal

(Ref. Figure 201)

(1). Remove inlet screen, inlet fairing, engine plenum access cover, and fan hub transmission fairing (Ref. Sec. 53-30-30).

(2). Remove tailboom (Ref. Sec. 53-40-30).

(3). Drain fan transmission of oil. Disconnect drain line and cap elbow at bottom of transmission.

(4). Remove fan drive shaft (Ref. Sec. 63-15-30).

(5). Remove fan pitch control rod (Ref. Sec. 67-20-30).

(6). Remove fan interconnect shaft (Ref. Sec. 63-15-30).

NOTE: Identify chip detector wires for future re-installation.

(7). Disconnect chip detector wires.

(8). Remove four transmission mounting bolts, washers, and transmission from helicopter.

B. Fan Transmission Installation

(Ref. Figure 201)

CAUTION Do not carry or support transmission by coupling as damage can occur to coupling. During performance of maintenance on transmission, use extra care to keep contaminants such as paint, dirt etc from areas around input and output shaft seals.

(1). Install fan drive shaft (Ref. Sec. 63-15-30).

(2). Locate and align transmission with mounting holes on helicopter. Install four bolts and washers on transmission. Torque bolts to **70 - 90 inch pounds (7.90 - 10.17 Nm)**; torque-stripe bolts.

(3). Connect previously identified chip detector wires.

(4). Remove cap and connect drain line on elbow at bottom of transmission.

(5). Install fan interconnect shaft (Ref. Sec. 63-15-30).

(6). Install fan pitch control rod (Ref. Sec. 67-20-30).

(7). Drain any residual preservative oil (if new transmission) and service with lubricating oil (Ref. Sec. 12-00-00).

(8). Install fan hub transmission fairing (Ref. Sec. 53-30-30).

(9). Install engine plenum access cover (Ref. Sec. 53-30-30).

(10). Install engine inlet fairing (Ref. Sec. 53-30-30).

(11). Install inlet screen (Ref. Sec. 53-30-30).

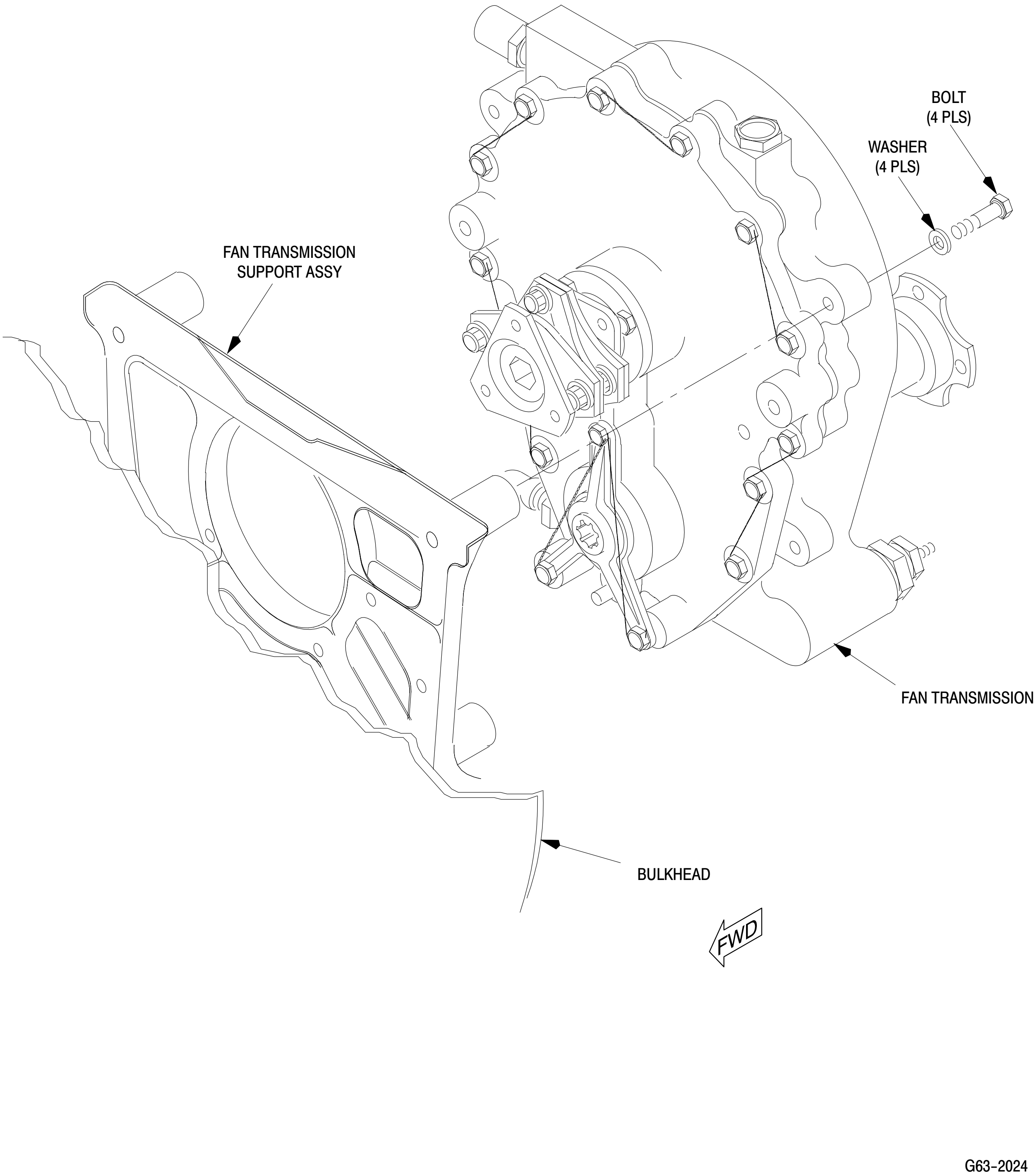


Figure 201. Fan Transmission Removal/Installation

3. Fan Transmission Inspection

(1). Check transmission for leaks, cracks, and corrosion. To evaluate oil leakage refer to Component Fluid Leak Analysis (Ref. Sec. 12-00-00). For further inspection criteria, please contact MDHC Customer Support Department.

4. Tube Support Inspection

(1). Inspect mount bolts for security and corrosion, lockwire intact.

(2). Inspect tube support for dents, scratches, nicks, gouges and corrosion, none allowed.

(3). Inspect for visible step in splined area.

(4). If step is evident:

(a). Measure between splines using 0.0864 in. (2.19456 mm) diameter pins.

(b). Maximum measurement between pins is 0.390 in. (9.906 mm).

5. Fan Transmission Parts Replacement

(Ref. Figure 202)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM114	Petrolatum
CM222	1,1,1-T richloroethane
CM311	Coating, logo white / Thinner
CM702	Lockwire CRES

NOTE: Replace liquid level plug, chip detector, and breather assy using torque values in the following paragraphs. Lubricate O-rings with petrolatum (CM114) to prevent damage to O-rings. Repair other components or replace transmission oil seals if required (Ref. COM).

(1). Chip Detector Torque valve body (large hex) to **50 - 60 inch pounds (5.65 - 6.78 Nm)** or **40 - 50 inch pounds (4.52 - 5.65 Nm)** (smaller hex).

(2). Liquid Level Plug Torque liquid level plug to **50 - 60 inch pounds (5.65 - 6.78 Nm)**. If level lines and lettering of liquid level plug cannot are not parallel with axis of transmission output shaft when torqued within **50 - 60 inch pound (5.65 - 6.78 Nm)** range, clean glass by firmly rubbing with soft cloth, then mix white coating (CM311) with equal amount of thinner and apply lines and lettering. Safety with lockwire (CM702).

(3). Oil Breather Assy Torque breather assy to **45 - 55 inch pounds (5.08 - 6.21 Nm)**. Ensure breather hole is facing up. Safety with lockwire (CM702).

NOTE: If oil breather assy becomes clogged, use light air pressure, approximately 5 psig (34 kPa) or a 0.125 inch (3.175 mm) dia. rod applied into the threaded end to dislodge debris. Ultrasonically clean breather in solvent (CM222) for ten minutes.

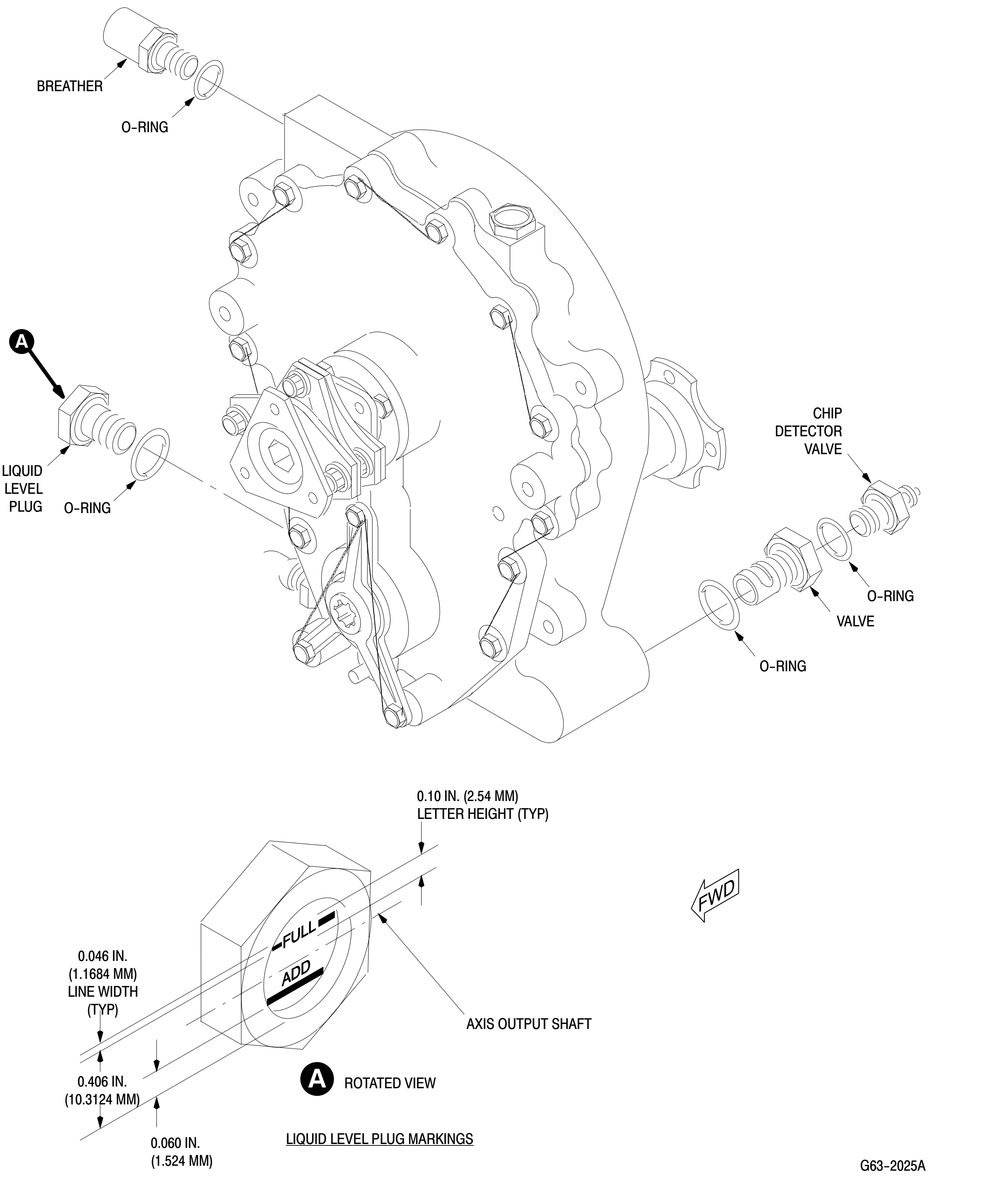


Figure 202. Fan Transmission Parts Replacement

Section

63-30-00

Main Rotor Static Mast (369D/E/FF - 500/600N)

MAIN ROTOR STATIC MAST
MAINTENANCE PRACTICES

1. Main Rotor Static Mast

(Ref. Figure 201) The main rotor mast provides support for the main rotor, main transmission and drive shaft, and consists of an assembled machined steel tube with a machined aluminum forged base.

2. Main Rotor Static Mast Replacement (369D25100 Transmission Installation)

A. Main Rotor Static Mast Removal (369D25100 Transmission Installation)

(Ref. Figure 201)

CAUTION Main rotor mast is highly stressed. Do not allow tools to strike mast or mast to strike any object. Any impact damage may require replacement of mast.

(1). Remove main rotor hub (Ref. Sec. 62-20-00/60).

(2). Remove main rotor controls (Ref. Chap. 67).

(3). Remove main transmission (Ref. Sec. 63-20-00/25).

(4). Remove four studs, washers and nuts.

NOTE: Nuts securing studs have left- hand threads.

(5). Remove shaft support holddown nuts, washers and bolts.

(6). Lift main rotor mast from helicopter.

B. Main Rotor Static Mast Installation (369D25100 Transmission Installation)

(Ref. Figure 201)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM306	Lacquer, clear
CM430	Sealant, solvent resistant

(1). Apply silicone sealant (CM430) on bottom surface of mast tube and base at drive shaft opening to seal base to mast support structure at installation.

(2). Position main rotor mast so that holes in base align with holes in mast support structure.

(3). Install holddown bolts, washers and mast mounting nuts; torque nuts to **700 - 820 inch-pounds (79.09 - 92.65 Nm)**.

(4). Check underside of mast support structure at left aft stud hole location. Stud-to-pan doubler surface must be clean to bare metal for electrical bonding. Install main transmission mounting studs, plate spacers and nuts. Torque studs to **160 - 190 inch-pounds (18.08 - 21.47 Nm)**.

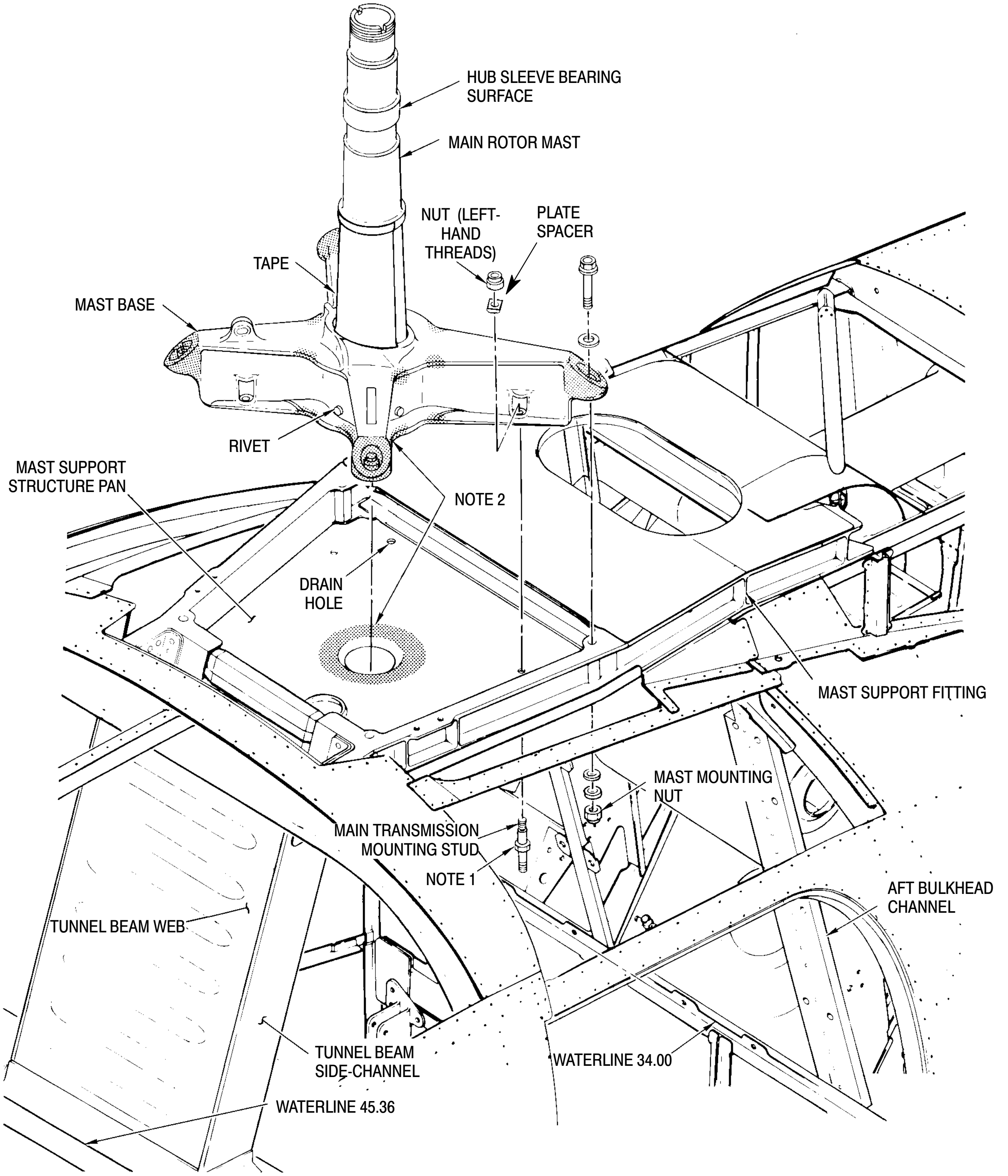
(5). Using 0.0010-0.0015 inch (0.254-0.0381 mm) feeler gage, check for gap between self-locking nuts and plate spacers. No gap is allowed.

(6). If gap exists, remove nut and replace with new self-locking nut. Torque studs into replacement nuts to **160 - 190 inch-pounds (18.08 - 21.47 Nm)** and repeat step (5). above. Continue until each nut is flush against its spacer. Seal bare bond area with clear lacquer (CM306).

(7). Install main transmission (Ref. Sec. 63-20-00/25).

(8). Install main rotor controls (Ref. Chap. 67).

(9). Install main rotor hub (Ref. Sec. 62-20-00/60).



NOTES:
1. THIS STUD REQUIRES ELECTRICAL BOND TO STRUCTURAL PAN.
2. MAIN ROTOR MAST IS SEALED TO STRUCTURE PAN (INSIDE MAST TUBE AT BASE) WITH SILICONE RUBBER (CM430).

G63-3000A

Figure 201. Main Rotor Mast and Support Structure (369D25100 Transmission Installation)

3. Main Rotor Static Mast Replacement (369F5100 Transmission Installation)

(Ref. Figure 202)

A. Main Rotor Static Mast Removal (369F5100 Transmission Installation)

CAUTION Main rotor mast is highly stressed. Do not allow tools to strike mast or mast to strike any object. Any impact damage may require replacement of mast.

(1). Remove main rotor hub (Ref. Sec. 62-20).

(2). Remove main rotor controls (Ref. Sec. 67-10).

(3). Remove main transmission (Ref. Sec. 63-25).

(4). Remove four bolts, washers and nuts.

(5). Lift main rotor mast from helicopter.

B. Main Rotor Static Mast Installation (369F5100 Transmission Installation)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM306	Lacquer, clear
CM430	Sealant, solvent resistant

(1). Apply silicone sealant (CM430) on bottom surface of mast tube and base at drive shaft opening to seal base to mast support structure at installation.

(2). Position main rotor mast so that holes in base align with holes in mast support structure.

(3). Check underside of mast support structure at left aft stud hole location. Stud-to-pan doubler surface must be clean to bare metal for electrical bonding. Install main transmission mounting bolts, plate spacers and nuts. Torque nuts to **160 - 190 inch-pounds (18.08 - 21.47 Nm) plus drag torque**.

(4). Using 0.0010-0.0015 inch (0.0254-0.0381 mm) feeler gage, check for gap between self-locking nuts and plate spacers. No gap is allowed.

(5). If gap exists, remove nut and replace with new self-locking nut. Torque bolts into replacement nuts to **160 - 190 inch-pounds (18.08 - 21.47 Nm) plus drag torque** and repeat step e. above. Continue until each nut is flush against its spacer. Seal bare bond area with clear lacquer (CM306).

(6). Install main transmission (Ref. Sec. 63-25).

(7). Install main rotor controls (Ref. Sec. 67-10).

(8). Install main rotor hub (Ref. Sec. 62-20).

4. Main Rotor Static Mast Inspection and Repair

(Ref. Figure 203)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM115	Grease, oscillating bearing
CM234	Solvent, dry-cleaning
CM235	Cleaner
CM304	Enamel, epoxy
CM305	Lacquer, acrylic
CM318	Primer
CM323	Primer
CM713	Tape, pressure sensitive
CM802	Abrasive cloth, aluminum oxide
CM803	Crocus cloth

(1). Inspect all areas of main rotor mast for cracks, nicks, scratches and evidence of impact damage.

(2). Inspect bearing surfaces for scoring and galling.

(3). Inspect threads for damage.

(4). Inspect rivets that secure base to mast tube for security.

(5). Check that tape (Ref. Figure 201) on forward edge of mast tube is secure and undamaged; replace if defective.

(a). Peel defective tape from mast.

(b). As required, polish area to remove burrs and sharp areas with abrasive cloth (CM802) or crocus cloth (CM803).

(c). Clean mast thoroughly with cleaner (CM235) and allow to dry.

(d). Apply primer (CM318) and paint (CM305) to affected area.

(e). Apply pressure sensitive tape (CM713) to mast.

NOTE: To inhibit corrosion of mast when operating in salt water environment, check tape at frequent intervals. Also, apply thin grease film (CM115) to bearing journals.

(6). Inspect internal bore for paint chipping, orange peeling or flaking, none allowed.

NOTE: Chipping, orange peeling or flaking paint will normally be at the base of the static mast tube.

(7). Re-apply finish to mast internal bore as follows:

(a). Remove main rotor hub (Ref. Sec. 62-20-00 or 62-20-60, Main Rotor Hub Replacement).

(b). Remove main transmission (Ref. Sec. 63-20-00 or 63-20-25, Main Transmission Replacement).

(c). Remove static mast (Ref. Main Rotor Static Mast Replacement).

(d). Thoroughly clean interior tube with Solvent (CM234).

(e). Inspect for any corrosion, none allowed.

(f). Remove paint from bad areas and lightly feather paint edge with crocus cloth (CM803), remove any residue from feathering.

(g). Apply primer (CM318), or (CM323), to repair areas.

(h). Allow to cure per manufacturer's instructions.

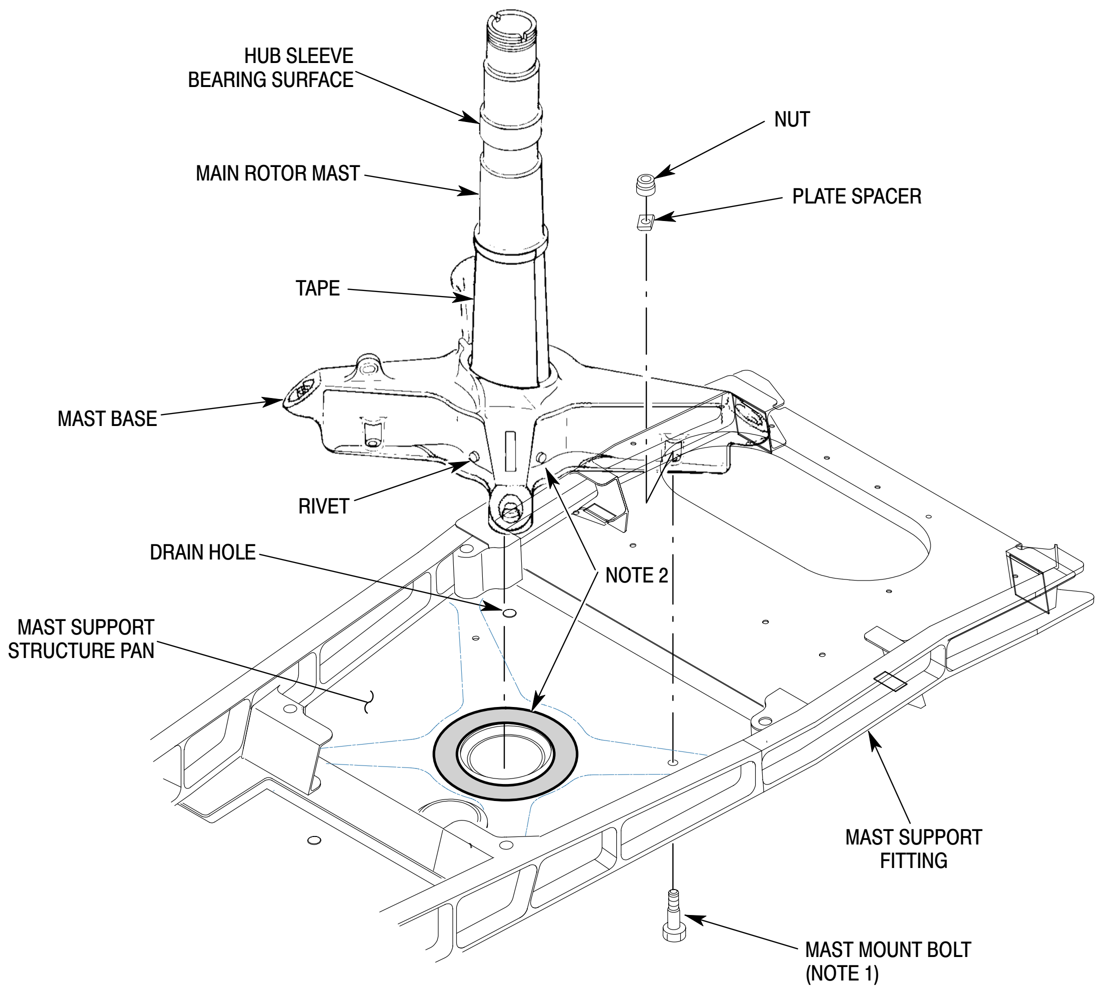
(i). Apply white paint (CM304) to internal bore of mast.

(j). Allow to cure per manufacturer's instructions.

(k). Reinstall static mast.

(l). Reinstall main transmission.

(m). Reinstall main rotor hub.



NOTES:
1. THIS BOLT REQUIRES ELECTRICAL BOND TO STRUCTURAL PAN.
2. MAIN ROTOR MAST IS SEALED TO STRUCTURE PAN (INSIDE MAST TUBE AT BASE) WITH SILICONE RUBBER (CM430).

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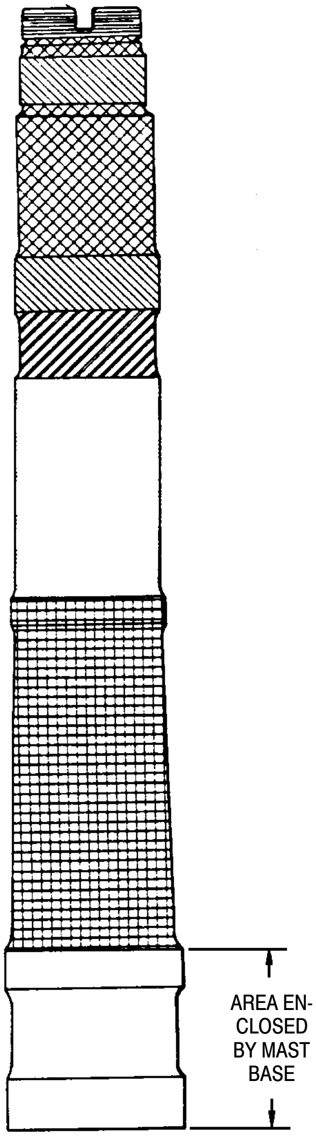
Figure 202. Main Rotor Mast and Support Structure (369F5100 Transmission Installation)



AREA	REPAIRABLE DAMAGE	MAXIMUM REMOVAL OF MATERIAL (DEPTH)	REPAIR PROCEDURE
	CORROSION AND SCRATCHES	0.010 IN. (0.254 MM)	POLISH DEFECTIVE AREA SMOOTH WITH ABRASIVE CLOTH (CM802 AND CM803) IF CADMIUM PLATING HAS BEEN PENETRATED. TREAT REWORKED AREA WITH PRIMER (CM318).
	CHIPPING OF CADMIUM PLATING	THICKNESS OF CADMIUM PLATING (0.0035 IN. (0.0889 MM MAXIMUM)	POLISH AREA SMOOTH WITH ABRASIVE CLOTH (CM802 AND CM803). TREAT REWORKED AREA WITH PRIMER (CM318) AND LACQUER (CM306).
	LONGITUDINAL SCRATCHES THAT DO NOT PENETRATE THROUGH NICKEL PLATE. SCRATCHES MUST BE A MINIMUM OF 0.25 IN. (6.35 MM) APART. RADIAL SCRATCHES ARE NOT PERMITTED.	MUST NOT PENETRATE NICKEL PLATING, 0.003-0.007 IN. (0.076-0.178 MM) THICK	POLISH AREA WITH ABRASIVE CLOTH (CM802 AND CM803) TO REMOVE BURRS AND SHARP EDGES ONLY.
	CORROSION AND SCRATCHES	MUST NOT PENETRATE THICKNESS OF SILVER PLATING BY AN AREA NO LARGER THAN 0.5 IN.^{2} (3.2258 CM^2). NO MORE THAN TWO SUCH AREAS NO CLOSER THAN 1.5 IN. (3.81 CM) APART MAY EXIST. IF WEAR EXCEEDS LIMITS, CONTACT MDHS WARRANTY REPAIR DEPARTMENT FOR REWORK DISPOSITION. ONLY MDHS CAN PERFORM PLATING REPAIRS.	WIPE AREA CLEAN USING CHEESE CLOTH (CM820) DAMPENED IN SOLVENT (CM222). SPRAY UNIFORM COATING, 0.002-0.005 IN. (0.051-0.127 MM) THICK, ON WORN AREA WITH LUBRICANT (CM103).
	CORROSION AND REPLACEMENT OF TAPE.	0.010 IN. (0.254 MM)	REMOVE DEFECTIVE TAPE. POLISH DEFECTIVE AREAS TO REMOVE BURRS AND SHARP SURFACES WITH ABRASIVE CLOTH (CM802 AND CM803). TOUCH UP REWORKED AREAS WITH PRIMER (CM318) AND LACQUER (CM305). REPLACE TAPE (CM713).

NOTE: FOR MAGNETIC PARTICLE INSPECTION, REMOVE PAINT FROM APPLICABLE SURFACE

G63-3001B

Figure 203. Main Rotor Mast - Inspection and Repair

Chapter

64

Anti-Torque Assembly

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Section

64-00-00

Anti-Torque Assembly (369D/E/FF - 500/600N)

ANTI-TORQUE ASSEMBLY FAULT ISOLATION

1. Tail Rotor Assembly

The tail rotor, mounted on the tail rotor transmission at the end of the tailboom, counteracts main rotor torque and controls heading of the helicopter. The tail rotor control system changes the pitch of the tail rotor blades. The antitorque pedals move a system of bellcranks and control rods routed through the fuselage and tailboom to a pitch control assembly which moves links that attach to blade-pitch arms on the blades.

The pitch control assembly slides axially on the tail rotor transmission output shaft. Pushing forward on the left pedal changes heading to the left; forward right pedal movement changes heading to the right.

For **two-bladed** tail rotor system, blade pitch movement is -13 degrees to -15 degrees thrust to the left and +27 degrees to +29 degrees to the right.

For **four-bladed** tail rotor system, blade pitch movement is -13 degrees to -15 degrees thrust to the left, +31 degrees to +32 degrees thrust to the right and +6.5 degrees to +8.5 degrees thrust to the right at neutral.

During flight, pedal position and pressure required to maintain a desired heading varies with main rotor torque variations, altitude and airspeed conditions. Control linkage includes a bungee spring that relieves left pedal forces in flight.

When the helicopter is on the ground, pedal-to-seat distance is adjusted by removing quick-release pins on top of pedal arms and repositioning pedals.

The **two-bladed** tail rotor assembly consists mainly of two tail rotor blades, a hub, drive fork, two pitch control links, and a pitch control assembly.

The **four-bladed** tail rotor assembly consists of four tail rotor blades, two hubs, drive fork, four pitch control links and a pitch control assembly. The blades are held together on the hub by a laminated tension-torsion strap pack that permits the blades to rotate axially on the hub. The hub pivots in the drive fork. Control of blade pitch is from the pitch control assembly through pitch control links that connect to pitch arms on the blade root fittings.

2. Anti-Torque Fan Assembly

The anti-torque fan is an axial fan with thirteen variable pitch blades. The fan provides anti-torque by furnishing variable flow of low pressure high volume air through the tailboom and thrusters.

During flight, pedal position and pressure required to maintain a desired heading varies with main rotor torque variations, altitude and airspeed conditions. Control linkage includes a bungee spring that relieves left pedal forces in flight.

When the helicopter is on the ground, pedal-to-seat distance is adjusted by removing quick-release pins on top of pedal arms and repositioning pedals.

Table 101. Troubleshooting Tail Rotor and Vibrations

Symptom	Probable Trouble	Corrective Action
Heavy medium-frequency vibration in tail rotor assembly; vibration sometimes felt in pedals as a buzzing sensation.	Tail rotor out of balance.	Rebalance tail rotor assembly (Ref. Sec. 18-20-00).
	Runout of tail rotor transmission output shaft excessive.	Replace transmission if shaft runout exceeds 0.0025 inch (0.0635 mm) T.I.R. No axial play allowed. (Ref. Sec. 63-25-10).

Table 101. Troubleshooting Tail Rotor and Vibrations

Symptom	Probable Trouble	Corrective Action
High frequency vibration, primarily in pedals as a buzzing sensation.	Tail rotor blades slightly out of balance.	Rebalance tail rotor assembly (Ref. Sec. 18-20-00).
	Tail rotor blade pitch bearings worn.	Replace tail rotor pitch bearings (Ref. COM).
	Excessive wear in pitch control link bearings.	Replace pitch control link bearings (Ref. COM).
NOTE: High frequency vibrations in the helicopter can also be caused by components of other systems (Ref. Sec. 18-20-00, 53-40-00, 63-25-10 and Chap. 71).	Excessive wear of swashplate or large bearings in housing of pitch control assembly.	Replace swashplate or repair pitch control assembly (Ref. COM).
	Excessive play in tail rotor fork bearings.	Replace fork bearings (Ref. COM).
	Tail rotor hub-to-fork play.	Repair (Ref. COM).
	Excessive dents in leading edge of blades.	Replace blade(s) or tail rotor assembly. (Ref. COM).
	Insufficient torque on stabilizer mount bolts.	Retorque mount bolts (Ref. Chap. 53).
	Insufficient torque on tail rotor assembly retaining nut.	Retorque retaining nut (Ref. Sec. 64-30-00).
Excessive play in pitch control link assemblies.	Worn pitch control link bearings.	Replace pitch control link bearings (Ref. COM).
High left pedal forces required in flight.	Bungee spring (Sta. 63) disconnected, broken or stretched.	Reconnect or replace bungee spring (Ref. Sec. 67-20-00).
Pedals binding.	Excessive drag of pitch control swashplate on transmission shaft.	Clean swashplate bore and transmission shaft splines. Re-lubricate splines.
Snapping noise heard in non-operating tail rotor when pitch angle changed from one extreme to the other.	Noise is normal action of strap pack and caused by laminates twisting and bending when blade is feathered without centrifugal load present.	None required.

Section

64-00-05

Four-Bladed Tail Rotor Assembly Initial Installation (369D/E)

FOUR-BLADED TAIL ROTOR ASSEMBLY INITIAL INSTALLATION

1. Four-Bladed Tail Rotor Initial Installation

This section contains procedures for initial installation of four-bladed tail rotor kit, which includes tail rotor; tail rotor transmission; and parts for modifying over-center trim system controls and engine/rotor tachometer indicator. This kit may be installed on all Model 500D and 500E helicopters at the owner's/operator's discretion.

NOTE: Components of the four-bladed tail rotor drive system kit are assembled and balanced at the factory. Prior to installation of the kit, some existing equipment must be removed from the helicopter, and other equipment must be modified.

A. Tail Rotor and Transmission Initial Installation

Install the four-bladed tail rotor transmission and tail rotor assembly according to the following procedures.

B. Existing Tail Rotor and Transmission Removal

Remove the following equipment from helicopter before installing four-bladed tail rotor transmission and tail rotor assemblies.

(1). Remove existing two-bladed tail rotor (Ref. Sec. 64-20-00).

(2). Remove tail rotor transmission and driveshaft (Ref. Sec. 63-25-10).

NOTE: Retain bolt for use when building up four- bladed tail rotor transmission, coupling is a limited-life item. If sufficient serviceable life remains on coupling, it may be reused with four-bladed tail rotor installation. If not, discard and replace coupling bolt.

(3). Remove bolt, coupling and shims from transmission output shaft (Ref. Sec. 63-15-10).

(4). Remove index stripe on drive shaft at Sta. 137.5.

(5). Remove existing station 284 bellcrank and tail rotor control rod (Ref. Sta. 284 Bellcrank Removal).

C. Four-Bladed Tail Rotor Transmission Build-Up

(Ref. Figure 901) Build-up the four-bladed tail rotor transmission as follows.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM112	Anti-seize compound high temperature
CM305	Lacquer, acrylic

CAUTION Do not lift transmission assembly by coupling flange.

(1). Install shims, coupling and coupling bolt. Coat threads of bolt with anti-seize compound (CM112). Torque bolt to **250 - 300 inch-pounds (28.25 - 33.90 Nm) plus drag torque.**

(2). Add stripe of white paint (CM305) approximately 0.0125 inch (3.175 mm) wide between ends of decal to allow for indexing of aft end of drive shaft.

NOTE: To locate new coupling index, use flashlight and look through control tube rod hole in aft tailboom fitting. Rotate output shaft until index stripe on coupling is at six o'clock position.

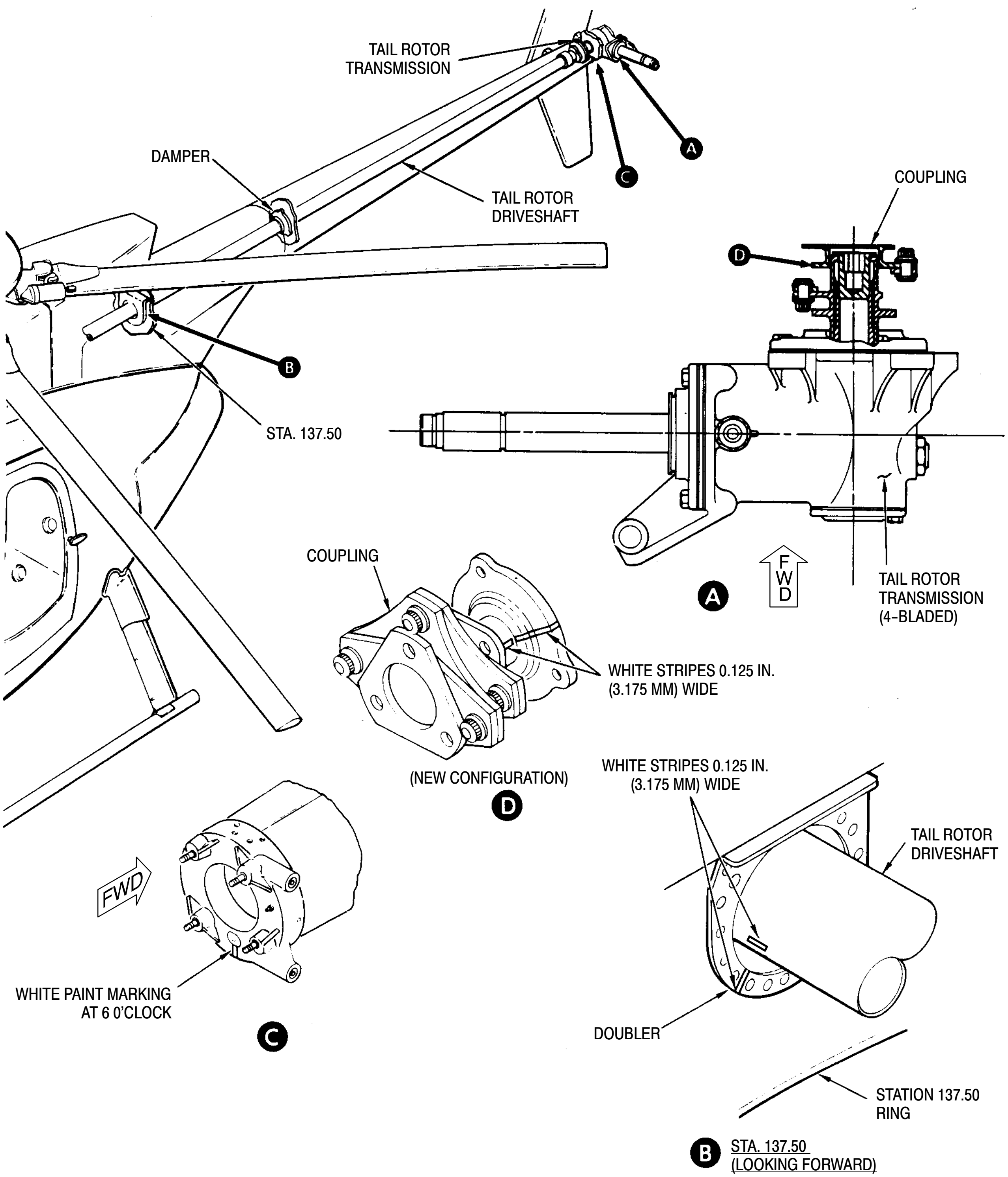
D. Drive Shaft, Tail Rotor Transmission and Tail Rotor Installation

(Ref. Figure 901) Install drive shaft, transmission and tail rotor on helicopter as a unit. Do not install with blades mounted.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM305	Lacquer, acrylic

(1). Install existing drive shaft on tail rotor transmission (Ref. Sec. 63-15-10).



NOTE: ADD STRIPE OF WHITE PAINT ON COUPLING AT LOCATION SHOWN, APPROXIMATELY 0.125 IN. (3.175 MM) WIDTH AND LENGTH, AND AT CONTROL ROD HOLE AT AFT SIDE OF HOUSING.

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Figure 901. Tail Rotor Index Stripe Requirements

(2). Install assembled unit on helicopter (Ref. Sec. 63-15-10).

(3). Paint 0.125 inch (3.175 mm) wide and 0.125 inch (3.175 mm) long stripe (contrasting color to aft tailboom fitting) at six o'clock position of control rod in aft tailboom fitting to align stripe on coupling.

(4). Add white index stripe (CM305) on tail rotor drive shaft to match stripe on doubler at Sta. 137.5.

(5). Install new tail rotor control rod.

(6). Attach new Sta. 284 bellcrank to new tail rotor pitch control assembly.

(7). Temporarily install bellcrank to new control rod assembly.

(8). Install blades on hubs. Install inboard blades first (Ref. Sec. 64-10-00).

E. Tail Rotor Control Over-Center Trim System Rework

The tail rotor over-center trim system must be reworked when four-bladed tail rotor is installed. Necessary parts for this rework are included with four-bladed tail rotor kit.

F. Two-Bladed Over-Center Trim System Removal

Prior to rework of over center trim system, following existing equipment must be removed and preparations made.

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST508	Collective bungee installation tool

(1). Remove tail rotor bungee; disconnect floor-routed tail rotor control rod and remove and discard spring fitting from rod. Remove tail rotor idler bellcrank under pilot seat.

(2). Disconnect tunnel-routed tail rotor control rod and lateral mixer control rod at lower rod end.

WARNING **Install bungee installation tool (ST508) before disconnecting any pilot's collective stick hardware. There is strong bungee spring pressure present in stick linkage. If suddenly released, spring reaction in linkage can cause personal injury or parts damage.**

(3). Remove bellcranks and collective bungee spring and bracket; disconnect and retract lateral cyclic trim actuator assembly.

WARNING **Turn off electrical switches and disconnect any external power from helicopter prior to refueling or defueling. Static discharge spark in presence of fuel vapors can cause fire or an explosion.**

(4). Drain all fuel from fuel cells; purge cells with dry filtered compressed air.

(5). Fold and displace left fuel cell to permit bucking of rivets at aft side of canted wall.

G. Four-Bladed Over Center Trim System Initial Installation

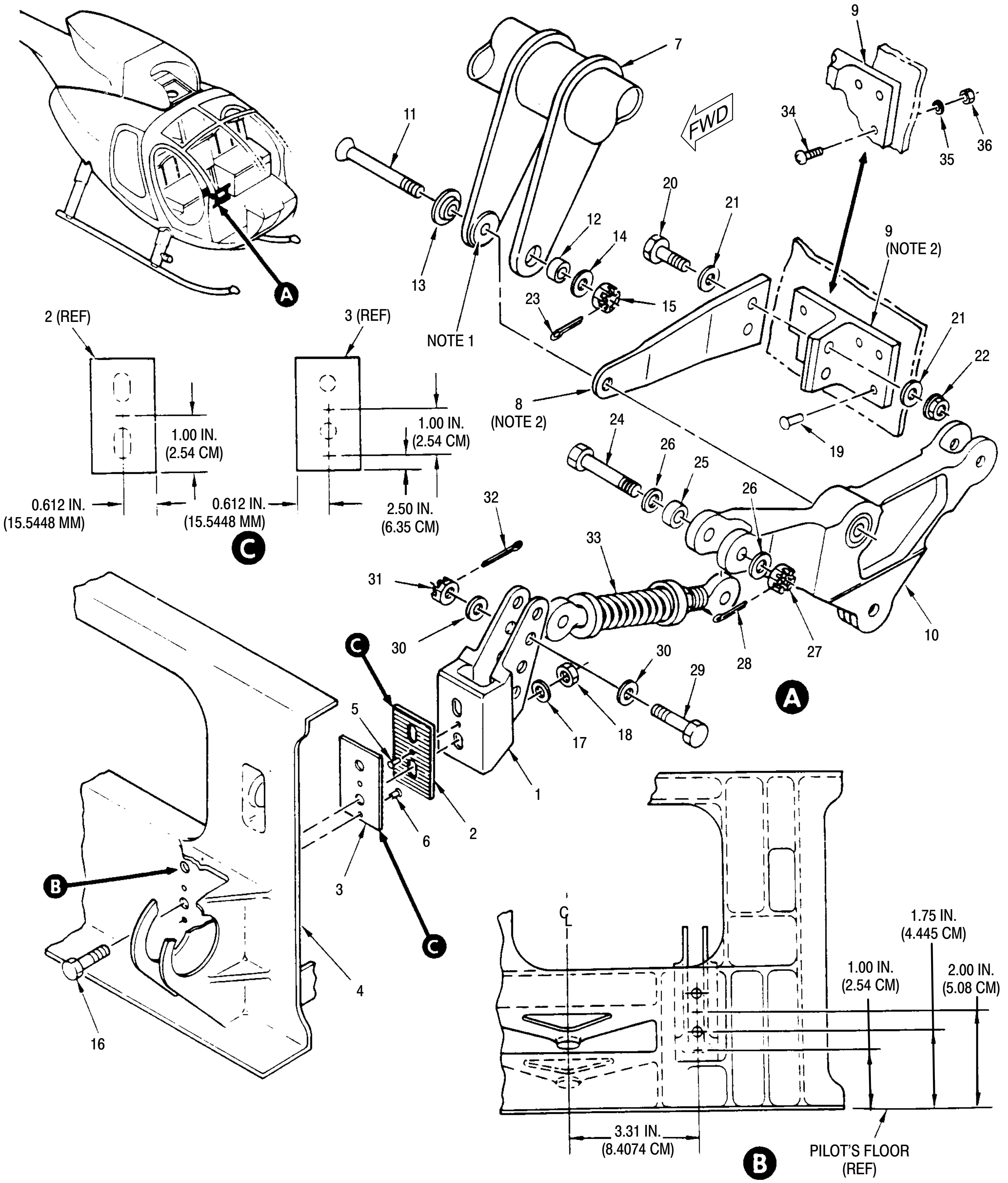
(Ref. Figure 902)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST508	Collective bungee installation tool

(1). Locate and clamp fitting (1) and serrated plate (2) together with serrations facing away from fitting. Drill one 0.159 inch (4.0386 mm) diameter rivet hole with a #21 bit and countersink hole.

(2). Locate serrated plate (3) and clamp to seat support structure (4). Ensure serrations are facing away from seat support structure. Mark rivet and screw holes on serrated plate (3) and seat support structure. Remove serrated plate from seat support structure.



NOTES:

1. REMOVE 0.12-0.14 IN. (3.048-3.556 MM) ON 369A7304 BRACKET.
2. NOT REQUIRED WHEN 369D27304 BRACKET IS INSTALLED.

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Figure 902. Over Center Trim System Installation

Legend (Ref. Figure 902)

1. FITTING
2. SERRATED PLATE
3. SERRATED PLATE
4. SEAT SUPPORT STRUCTURE
5. RIVET
6. RIVET
7. BRACKET
8. BRACE
9. BRACKET
10. BELLCRANK
11. BOLT
12. BUSHING
13. WASHER
14. WASHER
15. NUT
16. BOLT
17. WASHER
18. NUT
19. RIVET
20. BOLT
21. WASHER
22. NUT
23. COTTER PIN
24. BOLT
25. BUSHING
26. WASHER
27. NUT
28. COTTER PIN
29. BOLT
30. WASHER
31. NUT
32. COTTER PIN
33. TAIL ROTOR BUNGEE
34. SCREW
35. WASHER
36. NUT

NOTE: Head of rivets not to protrude past base of serrations.

(3). Attach fitting (1) and serrated plate (2) together with one rivet (5).

(4). Locate and drill two 0.250-0.254 inch (6.35-6.4516 mm) diameter screw holes and two 0.098 inch (2.4892 mm) diameter rivet holes using a #40 bit through seat support structure to match previously marked locations (step (2).). Countersink rivet holes.

(5). Drill two 0.098 inch (2.4892 mm) diameter rivet holes with a #40 bit thru serrated plate (with round bolt holes) using previously marked locations (step (2).). Attach serrated plate (3) to seat support structure using two rivets (6).

NOTE: Check part number of bracket (7). If bracket is a 369A7304, proceed with step (6). If 369D27304 bracket is installed, brace (8) and bracket (9) are not required, proceed to step (14).

(6). Remove 0.12-0.14 inch (3.048-3.556 mm) maximum material, as required, from bracket (7) boss lug to achieve a snug fit between brace (8), bracket (7) and bellcrank (10).

(7). Temporarily attach bellcrank (10), brace (8) and bracket (7) with bolt (11), bushing (12), washers (13, 14) and nut (15) finger tight.

(8). Install fitting (1) on seat support structure using bolts (16), washers (17) and nuts (18).

NOTE: Shim -BSC bracket (9), as required, for proper fit on canted wall. Shims are not required for -3 bracket (9).

(9). Locate and clamp bracket (9). Drill five 0.193-0.199 inch (4.9022-5.0546 mm) diameter holes using existing rivet pattern (Ref. Figure 903).

(10). Attach bracket (9) to canted wall using five rivets (19) or alternate method of five screws (34), washers (35) and nuts (36).

(11). Grasp brace (8) and hold against bracket (9). Mark mating holes on brace (8) with those on bracket (9).

(12). Remove brace (8) from bellcrank (10) and bracket (7). Drill two 0.250-0.254 inch (6.35-6.4516 mm) diameter holes at locations marked in step (11)..

(13). Install brace (8) on bracket (9) with bolts (20), washers (21) and nuts (22). Align opposite end of brace (8) between bracket (7) and bellcrank (10).

(14). Install bolt (11), bushing (12) and washers (13, 14) thru bracket (7) and bellcrank (10). Install nut (15) and cotter pin (23).

(15). Reinstall tunnel-routed control rods and floor-routed control rods, with spring fitting removed.

WARNING **Always use bungee installation tool (ST508) when removing attaching hardware. Reaction of spring when pressure is suddenly released can cause personal injury or parts damage.**

NOTE: Adjust tail rotor pedal force by tightening or loosening the 0.120 inch (3.048 mm) thread adjustment on bungee female bearing assembly. Tighten to maximum 0.120 inch (3.048 mm) thread adjustment on bungee female bearing assembly increases pedal force approximately five pounds; loosening decreases pedal force. Bungee spring may be attached to any of four holes in fitting (1). If excessive left pedal force is required, position spring at lower hole.

H. Four-Bladed Tail Rotor Controls Rigging

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM111	Grease, aircraft

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST508	Collective bungee installation tool
ST510	Bungee spring compression tool rod and channel
ST606	T/R swashplate rigging tool

Rigging of four-bladed tail rotor controls is to be done with tail rotor bungee spring removed. Tail rotor pitch angles at 3/4 radius shall be:

Full right pedal	$14° \pm 1°$
Full left pedal	$31° +1° -0°$
Neutral pedal	$7.5° \pm 1°$

Rig tail rotor controls per Tail Rotor Controls Rigging except use four-bladed tail rotor control rigging tool (ST606). After rigging, reinstall tail rotor bungee and carefully remove bungee installation tool (ST508) using bungee compression tool rod and channel (ST510).

(1). Assemble bungee using bungee installation tool (ST508) and instructions for assembly of collective bungee. Coat parts with grease (CM111) as instructed. Ensure that 0.120 inch (3.048 mm) of threads are visible between nut and rod end of bungee female bearing assembly.

WARNING **Remove bungee installation tool only as instructed. There is strong bungee spring pressure present with four-bladed tail rotor bungee installed. If suddenly released, spring could cause personal injury and/or parts damage.**

(2). Attach assembled bungee to fitting (1) using attaching hardware (29 thru 32) and to bellcrank (10) using attaching hardware (24 thru 28). Ensure bushing (25) extends 0.010-0.080 inch (0.254-2.032 mm) beyond surface of bungee rod end.

I. Horizontal Stabilizer Tip Weight Removal

Tip weights installed in horizontal stabilizer for two-bladed tail rotor operation are not used with four-bladed tail rotor system. Remove and discard four screws securing tip plates and weights to horizontal stabilizer. Reinstall tip plates using four new screws (P/N NAS1403-15).

J. N_2 and N_R (Rotor) Tachometer Indicator Replacement

Remove and replace existing tach indicator with indicator supplied in four-bladed tail rotor kit (Ref. Sec. 95-30-00).

K. Four-Bladed Tail Rotor System Completion of Installation

Upon completion of kit installation, the following actions must be completed.

(1). Replace all components, access panels, covers, etc. removed to gain access to work area.

(2). Check installation of four-bladed tail rotor control linkage for discrepancies.

(3). Fill tail rotor transmission with oil (Ref. Sec. 12-00-00).

(4). Refuel helicopter and perform operational check of four-bladed tail rotor control system (Ref. PFM).

(5). Ensure that Pilot Flight Manual Supplement is inserted in Section IX, Rotorcraft Flight Manual.

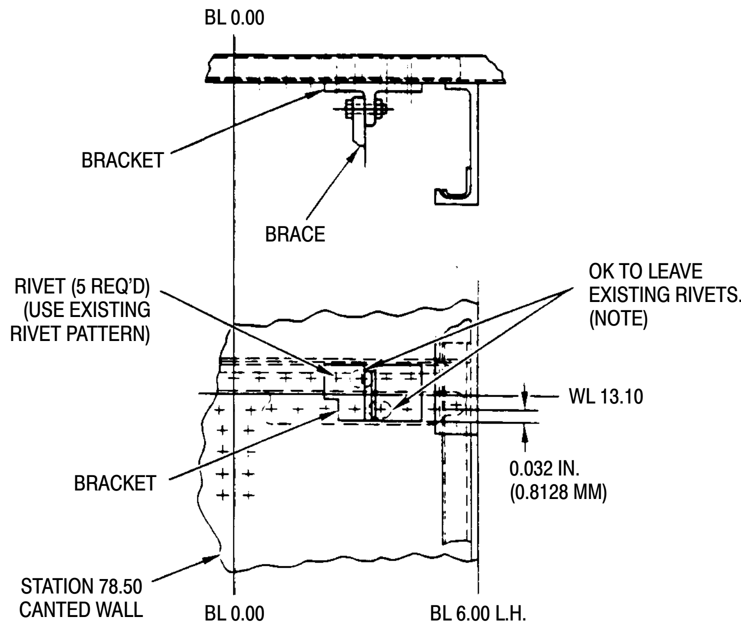
(6). Ensure that installation of four-bladed tail rotor kit and appropriate part numbers, serial numbers and limited-life data are recorded in helicopter log book.

L. Weight and Balance

Weight and balance changes resulting from installation of four-bladed tail rotor kit are listed in Table 901. After kit installation, incorporate changes in helicopter weight and balance record as instructed (Ref. Sec. 08-10-00).

Table 901. Weight and Balance Data

Configuration	Weight Pounds (kg)		Arm inches (cm)		Moment in-lb (kg cm)	
Added	+9.4	(+4.2638)	257.2	(653.228)	+2417.68	(27854.574)
Removed	0.0		0.0		0.0	
Net Change	+9.4	(+4.2638)	257.2	(653.228)	+2417.68	(27854.574)



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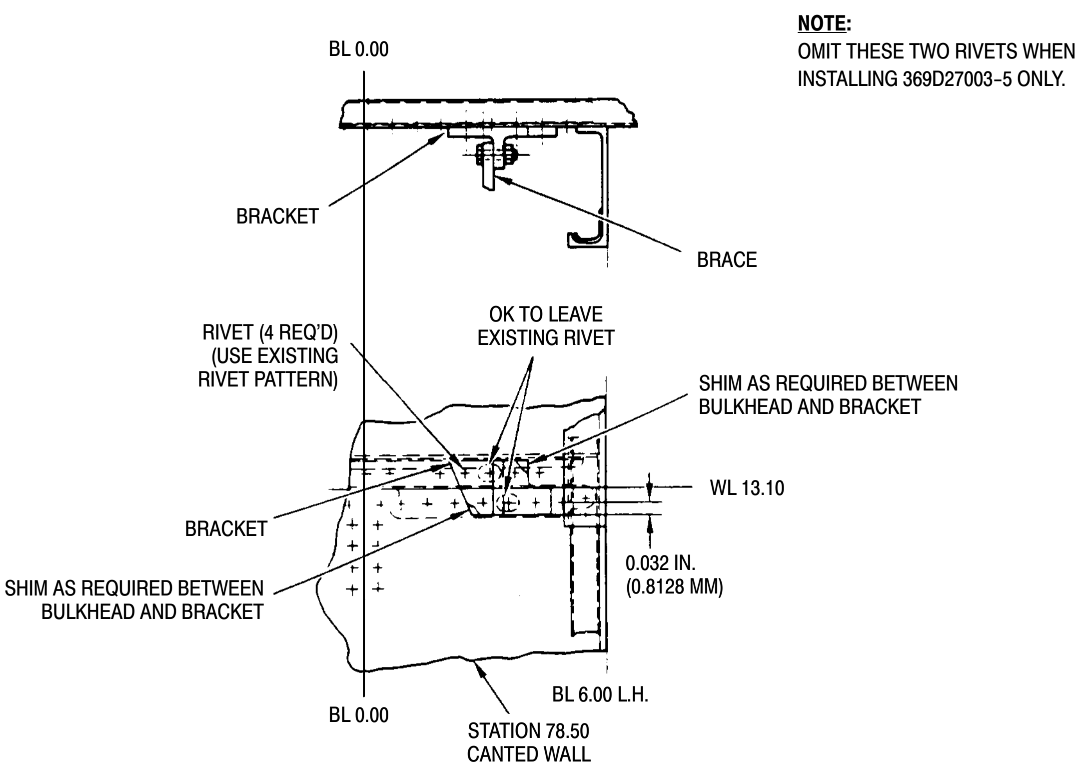

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Figure 903. Bracket Installation - Sta. 78.50 Canted Wall

Section

64-10-00

Tail Rotor Blades (369D/E/FF)

TAIL ROTOR BLADES
MAINTENANCE PRACTICES

1. Tail Rotor Blades

Blades are cambered for high thrust to provide directional control at high altitude. Each consists of an aluminum honeycomb spar, aluminum skin, riveted aluminum blade fittings and an aluminum tip cap; all structurally bonded together.

At manufacture, static balancing moments of all blades are within plus or minus 40 gram inches of each other by use of a special balancing fixture and prebalancing with tip weights. Although erosion or allowable repairs may cause minor balance moment changes, such changes are considered negligible enough to allow direct replacement of any used blade with a new one and interchangeable use of blades with remaining service life. In any case of blade selection or use, inspection, repair and serviceability requirements must be complied with. Retirement schedule and remaining service life of a used blade should always be considered when making decision to replace a single blade (Ref. Sec. 04-00-00).

2. Tail Rotor Blade Inspection

(Ref. Figure 201) Perform balance check at intervals specified (Ref. Sec. 05-20-00). If any of following conditions exist, perform appropriate detailed inspections and allowable repairs (Ref. COM).

(1). Surface cracks, scratches, nicks, gouges, dents, pits or corrosion.

(2). Leading edge erosion or dents. Visually check abrasion strip for paint cracking or chipping along abrasion strip/airfoil bond line. Use 10X glass to check abrasion strip/airfoil bond line for debonding between epoxy adhesive and abrasion strip. If debonding has occurred, remove blade from service.

NOTE: If abrasion strip debonding is suspected, but cannot be confirmed by visual inspection, (Ref. Abrasion Strip Dye Penetrant and Tap Test Inspection).

(3). Root fitting cracks, scratches, nicks and gouges. No cracks are allowable. Scratches that do not exceed 0.020 inch (0.508 mm) depth are permissible if repaired.

(4). Loose or missing tip weights and attachment hardware.

(5). Clogged drain openings.

(6). Adhesive separation at exposed edges.

(7). Debonding of tip cap from tail rotor blade (Ref. Tail Rotor Blade Tip Cap Repair).

(8). Tip cap rivets for installation and condition (Ref. Tail Rotor Blade Tip Cap Repair).

(9). Tail rotor blade pitch bearings for a maximum 0.250 inch (6.350 mm) play measured at tip of blade.

3. Abrasion Strip Dye Penetrant and Tap Test Inspection

(Ref. Figure 202)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM729	Tape, masking, pressure sensitive
CM801	Abrasive paper, silicon carbide

(1). Using a 1/8 inch (3.175 mm) drill bit and a pencil, fabricate a tapping hammer by taping drill bit to pencil. Drill bit should be a minimum of six inches (15.24 cm) from end of pencil that is to be held while tapping.

NOTE: Voids are indicated by a dull, dead tone. Slight tone changes will occur near the tip cap and along the length of the strip. These should not be mistaken for voids.

(2). Using the fabricated tapping hammer, tap test the entire abrasion strip. Hold end of pencil opposite drill bit and tap with shank (rounded) end of drill bit. If void indications are noted, remove blade from service.

(3). Mask area of blade around abrasion strip with masking tape (CM729).

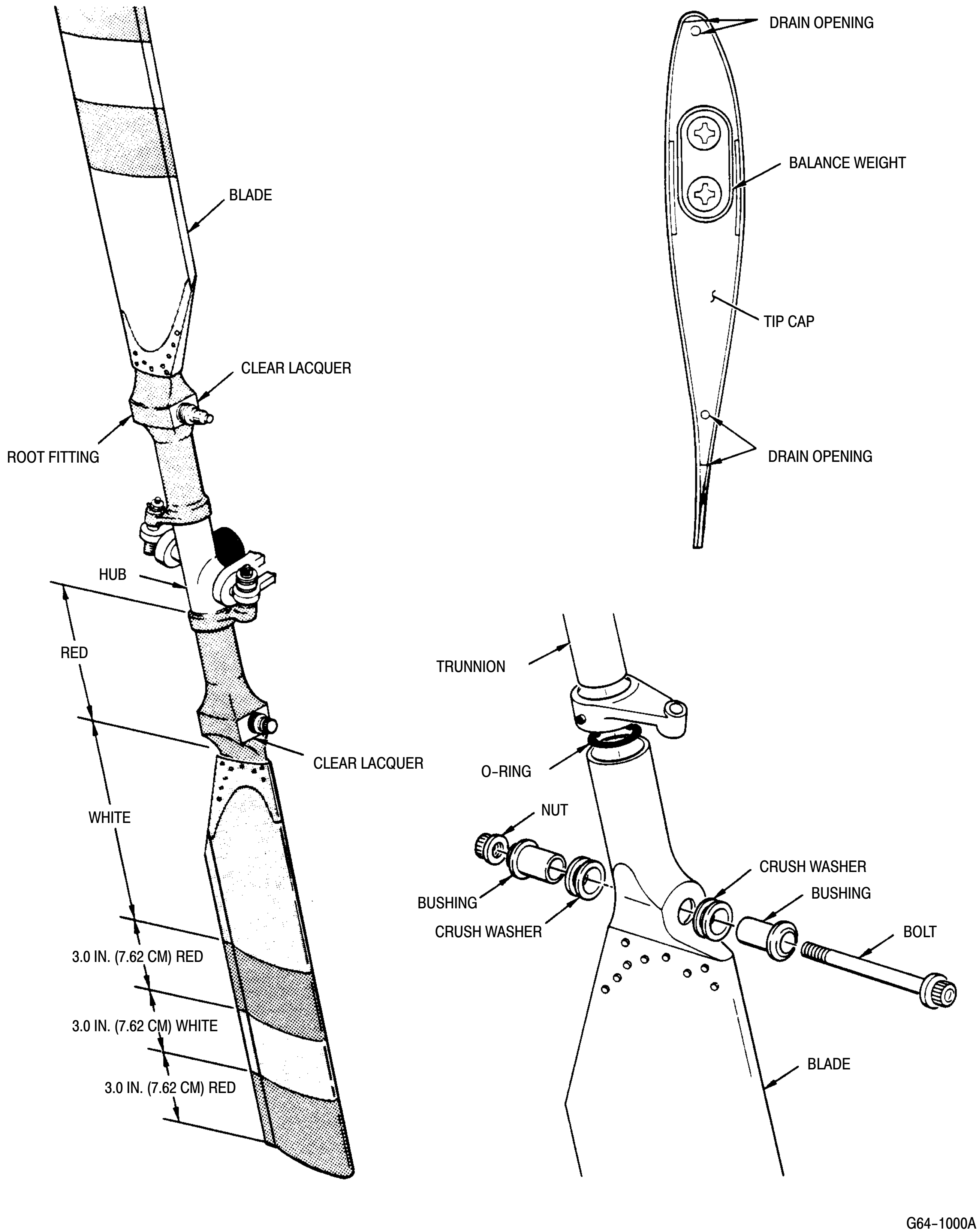
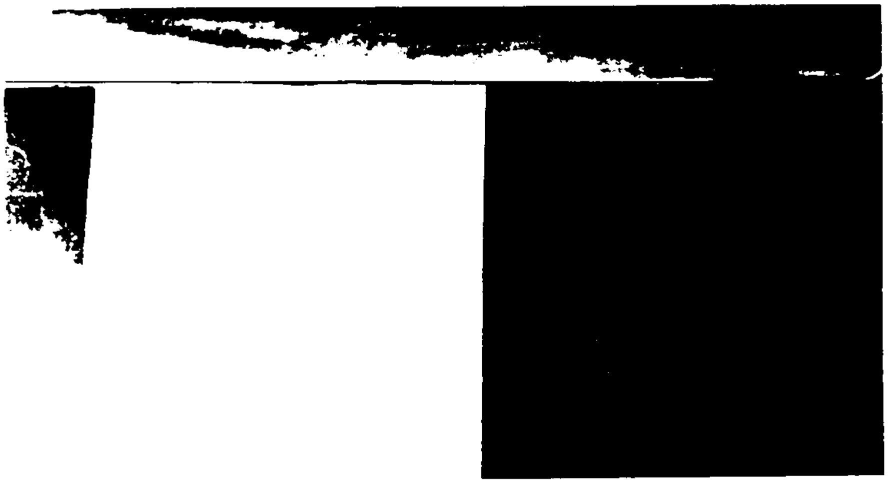
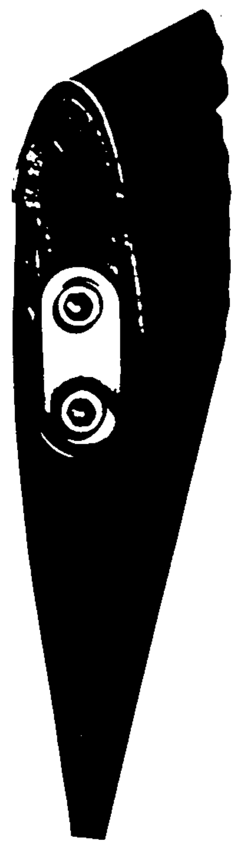


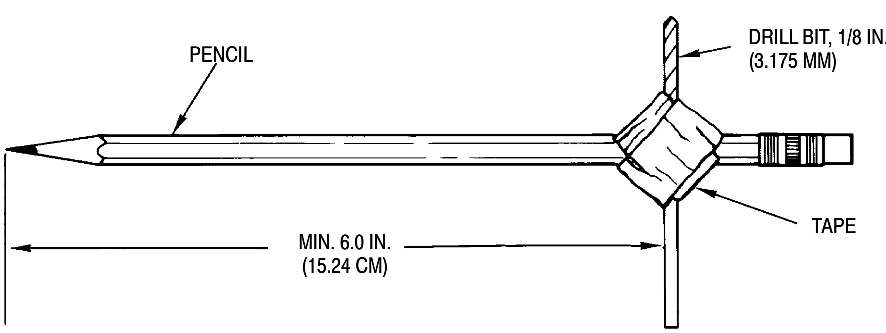
Figure 201. Tail Rotor Blade



SHOWN ABOVE: UNBONDING OF EPOXY ADHESIVE AND ABRASION STRIP WITH SEPARATION BETWEEN ABRASION STRIP AND AIRFOIL SURFACE, BLADE UNACCEPTABLE FOR SERVICE.

SHOWN RIGHT: UNBONDED AND DISPLACED ABRASION STRIP AT BLADE TIP; SEPARATION BETWEEN ABRASION STRIP/AIRFOIL SURFACE ALONG BOND LINE, BLADE UNACCEPTABLE FOR SERVICE.





TAPPING TOOL FOR FABRICATION

G64-1002A

Figure 202. Inspection of Tail Rotor Blade Abrasion Strip

CAUTION Do not use chemical paint remover to remove paint from abrasion strip. Chemicals can attack the abrasion strip to blade bonding agent.

(4). Using 220 grit abrasive paper (CM801), sand dry, removing all paint from the abrasion strip. Ensure abrasion to airfoil bondline is exposed. Clean paint dust from blade.

NOTE: Do not remove masking tape from blade until completion of dye penetrant inspection.

(5). Visually check abrasion strip to blade bonding using a 10X magnifying glass. If bond failure is obvious, remove blade from service.

(6). Dye penetrant inspect, according to manufacturer's instructions.

(a). Inspect entire abrasion strip to blade bond line, including abrasion strip bond in blade tip cap area.

(b). Apply penetrant using a small brush or swab to prevent damage to blade paint, and to minimize clean-up.

(c). Allow penetrant to remain on surface of abrasion strip bondline for five minutes minimum.

(d). Use dry lint free cloth or paper towel to remove excess penetrant.

(e). Apply remover to cloth or lint free towel to remove remaining surface penetrant.

NOTE: Never spray or flush area of inspection with cleaner.

(f). Ensure thorough penetrant removal from surface before applying developer.

(7). Apply a light film of developer on the area of examination.

NOTE: The epoxy adhesive used to bond abrasion strip to blade may have porosity voids. The penetrant will form a circular pattern around voids resulting from porosity. These circular patterns do not indicate bond failure. Bond failure is indicated by penetrant bleedout from under the abrasion strip, and will appear as a line along the edge of the strip. The 5X magnifying glass will aid distinguishing between porosity voids and bleedout from under the abrasion strip. It may be necessary to wipe off, then reapply the developer to distinguish between porosity voids and bond separations. The most positive indication of bond failure will normally appear during the first one to seven minutes following developer application.

(8). Using a 5X magnifying glass, examine bond line to determine if penetrant dye is indicating a bond separation. If bond separation is noted, remove blade from service.

(9). Remove masking tape from blade.

(10). Inspect blade for cleanliness and paint damage. Clean and repair paint damage as necessary (Ref. Sec. 20-30).

NOTE: Do not repaint abrasion strip or abrasion strip to blade bond line.

(11). Check tail rotor balance (Ref. Sec. 18-20-00).

(12). If blade is removed from service because of separation or voids, notify an Approved MDHS Service Center or Distributor for disposition. Those blades in which voids are found shall be sent to an approved repair station for abrasion strip replacement.

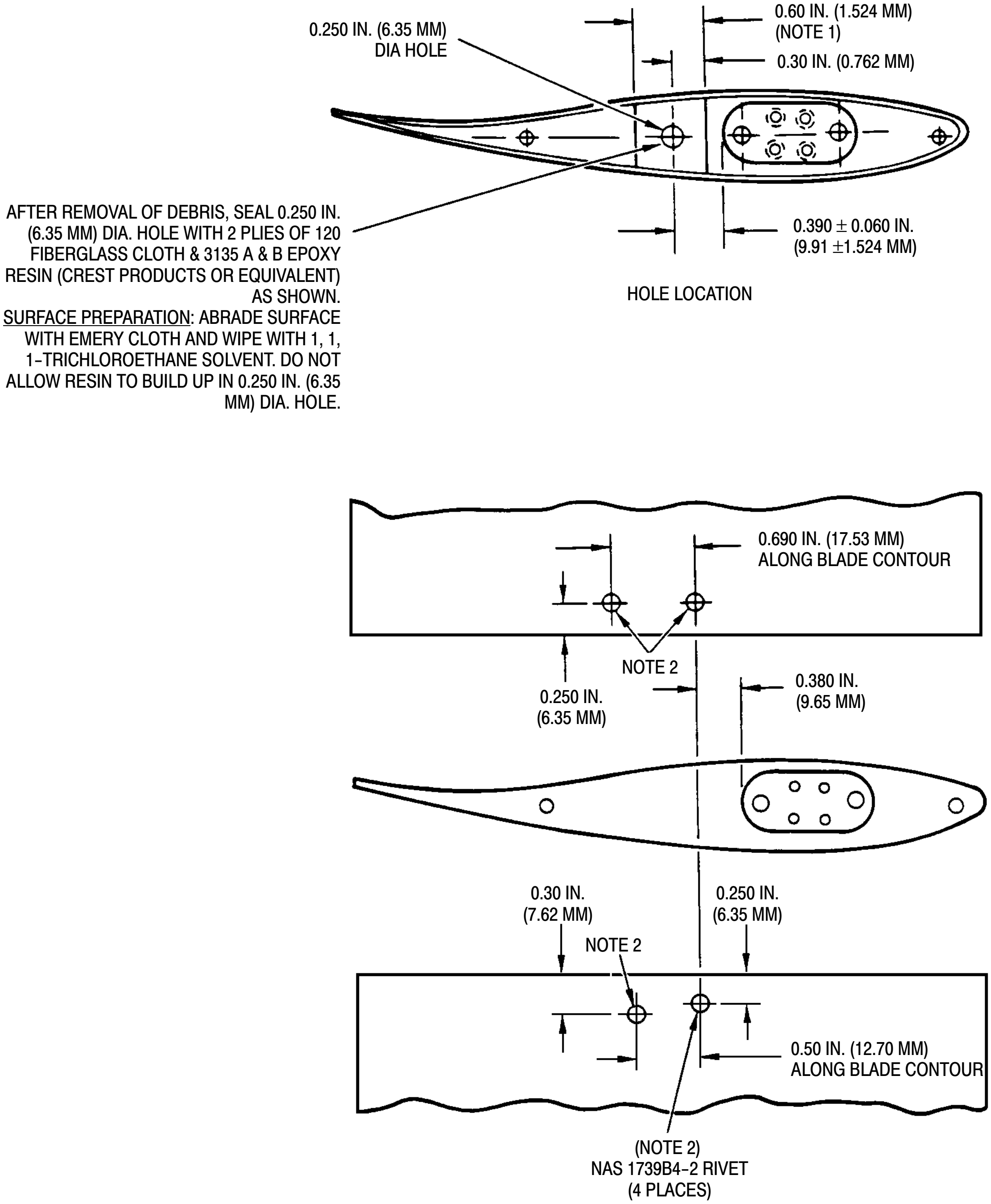
4. Tail Rotor Blade Tip Cap Repair

(Ref. Figure 203)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM222	1,1,1-T richloroethane
CM318	Primer
CM411	Adhesive, epoxy
CM804	Emery cloth, fine

(1). Remove tail rotor blade from helicopter (Ref. Tail Rotor Blade Replacement Procedure).



NOTES:

1. FIBERGLASS THIS AREA. DO NOT PLACE FIBERGLASS CLOTH OVER OPENING FOR BALANCE WEIGHTS.
2. USE NO.27 DRILL AND 1005 COUNTERSINK WITH NO. 30 PILOT. COUNTERSINK TO MAXIMUM 0.035 IN. (0.889 MM) DEPTH. INSTALL NAS 1739B4-2 RIVET. SEAL RIVET WITH CLEAR EPOXY (CM411).

G64-1001A

Figure 203. Installation of Tip Cap-To-Tail Rotor Blade Rivets

CAUTION Handle blade carefully. Dents, nicks or scratches may cause balance problems at reinstallation, or make blade unserviceable.

(2). With blade on a clean hard surface, measure and mark locations for rivet holes.

(3). Using No. 27 drill, carefully drill holes at locations marked on outboard and inboard surfaces of blade.

(4). Using 100 ±1° countersink with No. 30 pilot, countersink holes to 0.035 inch (0.889 mm) maximum depth.

(5). Apply primer (CM318) to holes and install rivets while primer is wet.

(6). Coat installed rivets with clear epoxy (CM411).

(7). Drill a 0.250 inch (6.35 mm) diameter hole through tip cap (Ref. Figure 203). Tip cap is 0.070 inch (1.778 mm) thick at point to be drilled.

(8). Remove FOD from blade interior through hole.

CAUTION Trichloroethane may damage blade paint finish.

(9). Abrade surface surrounding hole using emery cloth (CM804); wipe clean using clean cloth dampened with trichloroethane (CM222).

CAUTION Do not allow resin to build-up in hole.

(10). Bond two plies of 120 fiberglass cloth over hole with 3135A and B epoxy resin or equivalent. Allow epoxy to cure according to manufacturer's instructions.

(11). Reinstall tail rotor blade on helicopter (Ref. Tail Rotor Blade Replacement Procedure).

(12). Check and adjust tail rotor blade balance (Ref. Sec. 18-20-00).

5. Tail Rotor Blade Replacement Procedure

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

NOTE: Always record number and location of existing balance washers when replacing blade. This record aids in dynamic balance troubleshooting.

(1). Remove cotter pin, nut, washer and pitch arm bolt from outboard end of pitch control link.

CAUTION Bolt, nut, washers and bushings may be reinstalled if serviceable. If bushing and crush washers are to be reused, they must be installed in the exact location from which they were removed. If either the blade or strap pack assembly from which they were removed is replaced, replace crush washers and bushing. Bushings must be free of nicks and burrs.

NOTE: If same blade is to be reinstalled, retain intact for reuse. Note and record number and type of balance washers and attachment hardware used on bolt at blade pitch arm.

(2). Remove bolt that secures blade to outboard strap pack shoes.

(3). Withdraw blade from hub trunnion.

CAUTION Do not disassemble strap shoes from end of strap pack protruding from trunnion. Strap pack parts are not individually replaceable and must remain assembled. Avoid damaging strap pack. Scratches or nicks on strap pack laminates may make strap pack unserviceable.

NOTE: No axial play is allowed in the strap assembly shoes. Rotational movement is permissible.

(4). If strap pack is to remain exposed for any length of time, wrap exposed end of strap pack with wax paper or other similar non-abrasive material to protect from damage.

(5). If blade being removed is to be reinstalled, do not remove blade tip screw, any balance washers or weight from blade.

NOTE: Remove old primer from mating surfaces and attaching hardware prior to reassembly.

(6). To install blade, remove any protective covering from strap pack extending from hub trunnion.

(7). Install O-ring and slide blade on hub with blade leading edge facing in counterclockwise direction. Use care to keep blade correctly aligned so that hub trunnion slides into blade pitch bearings. Do not use force.

(8). Align bolt holes in root fitting with hole through bushing in outboard shoes of strap pack.

(9). Coat contacting surfaces of bushings, washers, nuts and bolts with unthinned primer (CM318) and immediately perform following steps.

(10). Assemble and install bolt, bushings and washers in sequence (Ref. Figure 201). Make certain that direction of bolt is opposite to that of opposing blade. Do not force bolt; it must have an easy but snug fit through blade, shoes and bushings.

NOTE: It is recommended that the MS 21250 bolt be replaced with any of the alternate bolts with the higher torque at the operators earliest convenience.

(11). If an MS 21250 bolt is installed, install nut and torque to **600 - 650 inch-pounds (67.79 - 73.44 Nm)** while primer is wet. If an HS5482-6, HS4441-6, or an LWB22-6 bolt is installed, torque nut to **750 - 775 inch-pounds (84.74 - 87.56 Nm)**.

CAUTION After blade is secured to strap pack assembly, do not allow blade pitch travel from neutral to exceed 30 degrees in either direction. Rotating blade to excessive pitch angles may result in undetected damage to strap assembly.

(12). Check that bolthead is flat against bushing. No gap is permitted. If gap is found, replace bolt and bushing.

(13). Install pitch control links (Ref. Sec. 64-30-00).

NOTE: If same blade that was removed is being reinstalled, install same number of balance washers on pitch arm bolt that were present prior to removal of blade. For different blade, install balance washers required for static chordwise balance of assembled tail rotor which have been determined with a balance fixture.

(14). Balance tail rotor (Ref. Sec. 18-20-00).

6. Tail Rotor Abrasion Strip Riveting

(Ref. Figure 204) The following procedure is for adding rivets at the outboard ends of the abrasion strip to provide a secondary failsafe method of attachment.

This procedure is effective on tail rotor blades:
369A1613-7, -503, -505,
369D21606-BSC,
369D21613-1 1, -31, -41, -51,
369D21615-BSC, -21,
421-088

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM222	1,1,1-T richloroethane
CM318	Primer
CM804	Emery cloth, fine
N/A	Fiberglass cloth, No. 120
N/A	Epoxy resin, Spec. 3135A and B or any 2 part (1:1) clear epoxy resin

CAUTION Do not attempt to perform this procedure with the tail rotor blades installed on the helicopter. Failure to comply with this caution may result in defective rivet installation and possible blade damage.

(1). Remove tail rotor blades from helicopter (Ref. Tail Rotor Blade Replacement Procedure).

(2). Using a 10X magnifying glass, perform a visual inspection of the tail rotor blade abrasion strip bond lines for debonding.

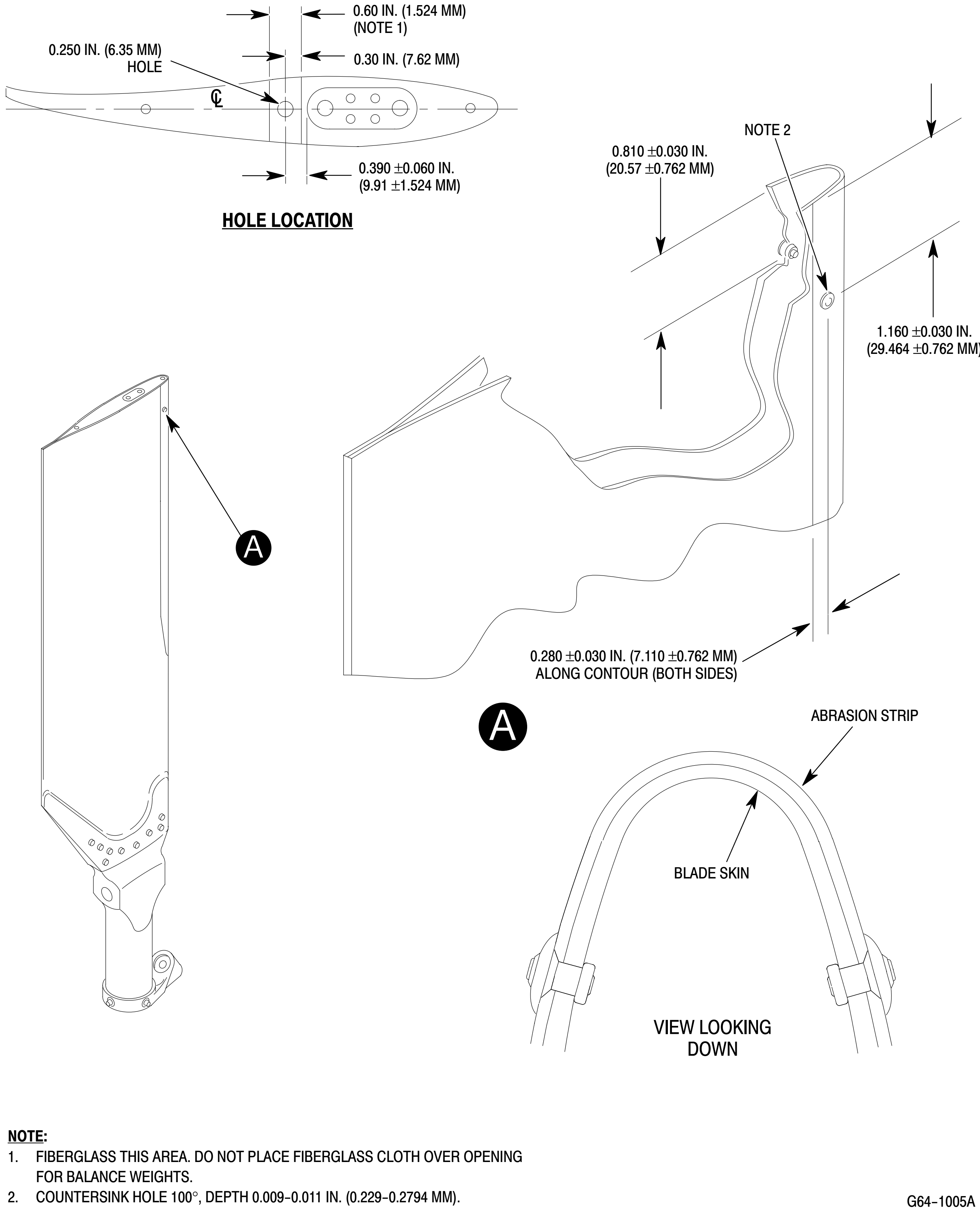


Figure 204. Tail Rotor Blade Abrasion Strip Riveting

(3). If abrasion strip debonding is suspected but cannot be confirmed by visual inspection, perform Abrasion Strip Dye Penetrant and Tap Test Inspection.

NOTE: Tail rotor blades removed for voids must be removed in ship sets.

(4). If voids are found in blade, remove and send to an authorized repair station for repair.

(5). Carefully secure tail rotor blade in a suitable holding fixture.

NOTE: When performing the following step, use drill bit stop to prevent drilling through both sides of blade.

(6). Using a No. 27 cobalt drill bit, drill holes at locations shown (light center punch prior to drilling is allowed).

(7). Deburr holes with a 100° countersink to a depth of not more than 0.011 inch (0.2794 mm).

(8). Apply primer (CM318) to holes and install CS2545-4-1 or CR3555-4-1 rivets while primer is wet.

CAUTION Installed rivet stems may be deburred using a file. Do not remove material from locking collar.

(9). Inspect installed rivets.

(10). If rivet installation is not satisfactory, remove as follows:

CAUTION During removal of defective rivet, observe the following:
Do not damage or enlarge hole.
Do not drive or force rivet stem from hole.
Do not remove rivets common to tip cap.

(a). Carefully grind off locking collar and upper portion of rivet head.

(b). Carefully push center stem through rivet sleeve.

(c). Using a drill stop, drill through rivet sleeve using care to prevent hole enlargement.

(d). Push remaining rivet sleeve through hole.

(e). Inspect hole in abrasion strip.

(11). Remove FOD from interior of blade as follows:

(a). Drill 0.250 inch (6.35 mm) hole through tip cap as shown.

(b). Remove FOD from blade interior through hole (there is space at tip cap end for debris to pass aft of spar).

(c). Install new rivet.

(d). Abrade surface surrounding tip cap hole using emery cloth (CM804); wipe clean using clean, lint-free cloth dampened with 1,1,1-trichloroethane (CM222).

CAUTION Do not allow resin to build up in hole.

(e). Bond two plies of fiberglass cloth over hole with epoxy resin.

(12). Repeat inspection of abrasion strip.

(13). Reinstall tail rotor blades.

(14). Perform tail rotor balance (Ref. Sec. 18-20-00, Tail Rotor Blade Balancing).

7. Tail Rotor Blade Abrasion Strip Modification

(Ref. Figure 205) The following procedure is for application of a 0.0027 inch (0.06858 mm). thick strip of stainless steel tape over the inboard end of the abrasion strip.

This procedure is effective on tail rotor blades:
369A1613-7, -503, -505, -509,
369D21606-BSC, -509,
369D21613-1 1, -31, -41, -51, -71,
369D21615-BSC, -21, -41,
421-088

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM220	Naphtha aliphatic
CM801	Abrasive paper, silicon carbide

NOTE: Abrasion strip must have rivets installed before applying stainless steel tape.

(1). Using a 10X magnifying glass, perform a visual inspection of the tail rotor blade abrasion strip bond lines for debonding.

(2). If abrasion strip debonding is suspected but cannot be confirmed by visual inspection, remove blades and perform Abrasion Strip Dye Penetrant and Tap Test Inspection.

NOTE: Tail rotor blades removed for voids must be removed in ship sets.

(3). If voids are found in blade, remove and send to an authorized repair station for repair.

(4). Lightly abrade faying surface of tail rotor blade in area where tape is to be installed with 400-grit abrasive paper (CM801).

(5). Wipe abraded area with naphtha (CM220) to eliminate grease and dirt film.

NOTE: Do not allow temperature to exceed 120°F (49°C).

(6). Using a heat gun, or equivalent, heat abraded area.

(7). Remove backing and apply stainless steel tape to leading edge of tail rotor blade.

(a). Apply tape so it overlaps each side of blade equally.

(b). Tape should overlap the inboard end of abrasion strip 0.50 ±0.03 inch (12.70 ±0.762 mm) at the leading edge of blade.

NOTE: Abrasion tape must be free of surface wrinkles or air bubbles.

(8). Smooth and press tape into place by hand.

(9). Re-apply pressure by hand following initial installation to ensure proper bonding.

(10). Perform tail rotor balance (Ref. Sec. 18-20-00, Tail Rotor Blade Balancing).

8. Tail Rotor Blade Protective Tape Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM220	Naphtha aliphatic
CM304	Enamel, epoxy
CM801	Abrasive paper, silicon carbide
N/A	3M aerosol primer MITO-0081
N/A	3M mylar tape P/N Y8671-1

NOTE: This installation is only approved on tail rotor blades equipped with the new abrasion strips.

In an effort to reduce the amount of erosion in the area inboard of the abrasion strip, MDHS has approved the installation of mylar tape to the blade leading edge. Installation of the tape is optional.

The length of the tape can vary, up to 2.0 inches in length, but must be equal on both blades.

It is recommended to start with 1.5 inch (3.81 cm) length and increase the length as erosion occurs by replacing the tape.

CAUTION Do not cut or trim tape after installation on blade, damage to blade will occur.

(1). Measure length of eroded area on blade with the most erosion.

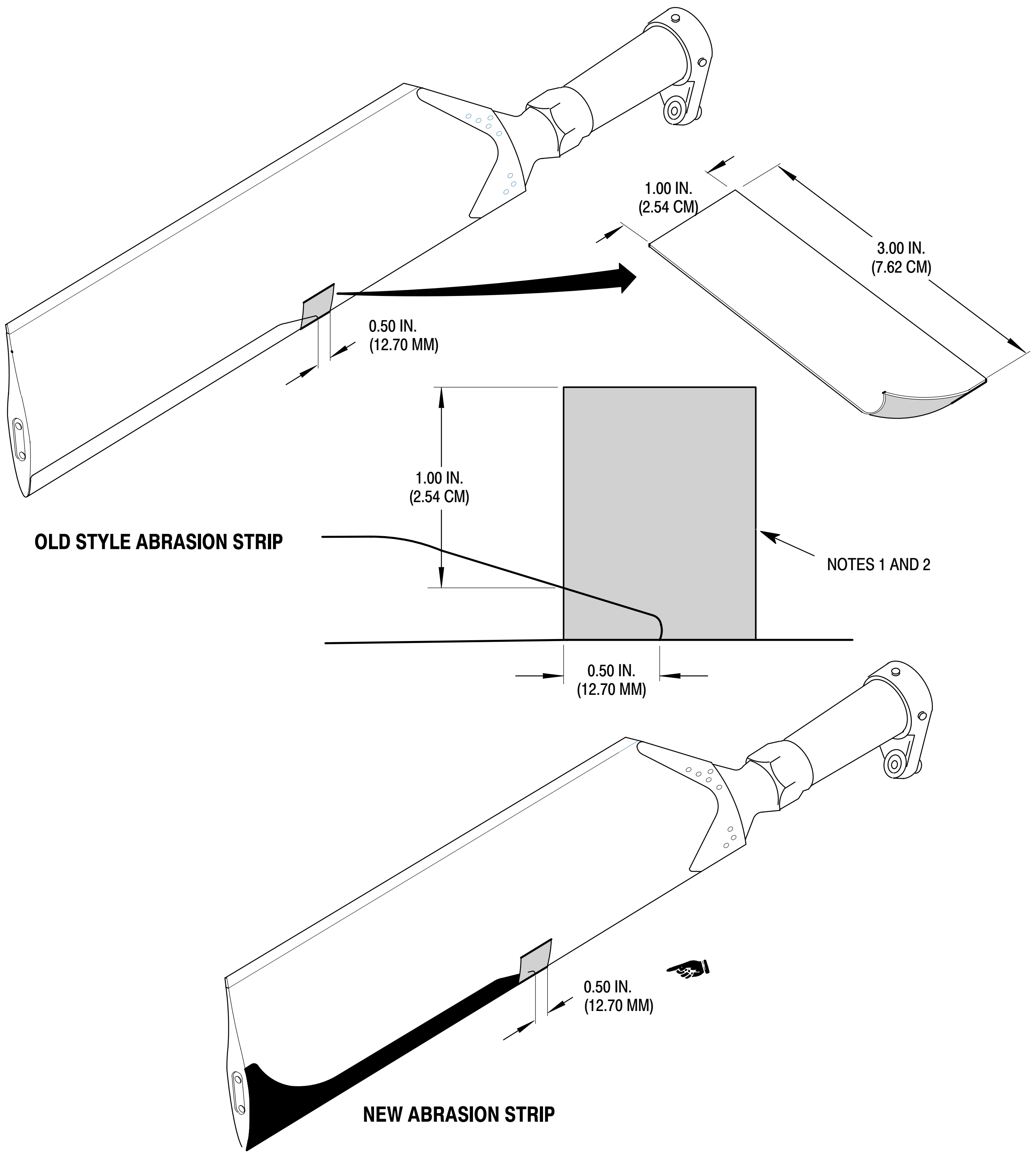
NOTE: Tape must be of equal length on both blades to ensure proper balance.

(2). Cut tape long enough to cover erosion plus approximately 0.50 inch (12.70 mm) overlap on leading edge abrasion strip.

(3). Round off square corners of tape to reduce peeling.

(4). Lightly abrade faying surface of tail rotor blade in area where tape is to be installed with 400 grit abrasive paper (CM801).

(5). Wipe abraded area with naphtha (CM220) to eliminate grease and dirt film.



NOTES:

1. 304 STAINLESS STEEL OR MYLAR TAPE SHALL BE APPLIED; 0.50 IN. (12.70 MM) TO ABRASION STRIP AND 0.50 IN. (12.70 MM) TO TAIL ROTOR BLADE.
2. APPLY TAPE EQUALLY TO BOTH SIDES OF BLADE.

G64-1006C

Figure 205. Tail Rotor Blade Abrasion Strip Modification

(6). Treat any bare metal with epoxy-type paint (CM304).

NOTE: Do not allow temperature to exceed 120°F.

(7). Using a heat gun, or equivalent, heat abraded area.

(8). Apply aerosol primer to bonding area and allow to dry.

(9). Remove backing and apply tape to leading edge of blade.

(a). Apply tape so it overlaps each side of blade equally.

(b). Tape should overlap the inboard end of abrasion strip 0.50 ±0.03 inch (12.70 ±0.762 mm) at the leading edge of blade.

NOTE: Tape must be free of surface wrinkles or air bubbles.

(10). Smooth and press tape into place by hand.

(11). Re-apply pressure by hand following initial installation to ensure proper bonding.

(12). Perform tail rotor balance (Ref. Sec. 18-20-00).

9. Tail Rotor Blade Leading Edge Crack Inspection

(Ref. Figure 206)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM220	Naphtha aliphatic
CM801	Abrasive paper, silicon carbide

CAUTION Do not use any chemicals to remove the paint and do not penetrate the metal skin of the blade.

A. Tail Rotor Blades with New-Style Abrasion Strips

(1). Inspect leading edge for any evidence of cracking in the area shown; no cracks are allowed.

(2). If cracks are suspected, perform a dye penetrant inspection of the suspect area as follows:

(a). Lightly abrade faying surface of tail rotor blade in area where tape is to be installed with 400-grit abrasive paper (CM801).

(b). Wipe abraded area with naphtha (CM220) to eliminate grease and dirt film.

(c). Perform dye penetrant inspection on the suspected area per MIL-I-25135, or equivalent.

(d). Tail rotor blades with evidence of cracking must be removed from service.

NOTE: Tail rotor blades with the new abrasion strip configuration cannot be intermixed with tail rotor blades that have the old abrasion strip configuration.

(e). If there is no evidence of cracking, the blade can be cleaned and touch-up epoxy paint applied to the affected area.

(3). To reduce erosion, apply protective tape to the blades (Ref. Tail Rotor Blade Protective Tape Installation).

(4). Perform tail rotor balance (Ref. Sec. 18-20-00, Tail Rotor Blade Balancing).

B. Tail Rotor Blades with Old-Style Abrasion Strips

(1). Remove stainless steel tape from the leading edge at the inboard end of the abrasion strip.

(2). Inspect that area for evidence of cracks; no cracks are allowed.

(3). If cracks are suspected, perform a dye penetrant inspection of the suspect area as follows:

(a). By lightly abrading the blade skin, carefully remove the paint from the suspected area.

(b). Perform dye penetrant inspection on the suspected area per MIL-I-25135, or equivalent.

(c). Tail rotor blades with evidence of cracking must be removed from service.

NOTE: Tail rotor blades with the new abrasion strip configuration cannot be intermixed with tail rotor blades that have the old abrasion strip configuration.

(d). If there is no evidence of cracking, the blade can be cleaned and touch-up epoxy paint applied to the affected area.

(4). Install new 0.0027 inch (0.06858 mm) thick stainless steel tape in the same location as follows (Ref. Figure 205):

(a). Lightly abrade faying surface of tail rotor blade in area where tape is to be installed with 400-grit abrasive paper (CM801).

(b). Wipe abraded area with naphtha (CM220) to eliminate grease and dirt film.

NOTE: Do not allow temperature to exceed 120°F (49°C).

(c). Using a heat gun, or equivalent, heat abraded area.

(d). Remove backing and apply stainless steel tape to leading edge of tail rotor blade.

1). Apply tape so it overlaps each side of blade equally.

2). Tape should overlap the inboard end of abrasion strip 0.50 ±0.03 inch (12.70 ±0.762 mm) at the leading edge of blade.

NOTE: Abrasion tape must be free of surface wrinkles or air bubbles.

(e). Smooth and press tape into place by hand.

(f). Re-apply pressure by hand following initial installation to ensure proper bonding.

(5). Perform tail rotor balance (Ref. Sec. 18-20-00, Tail Rotor Blade Balancing).

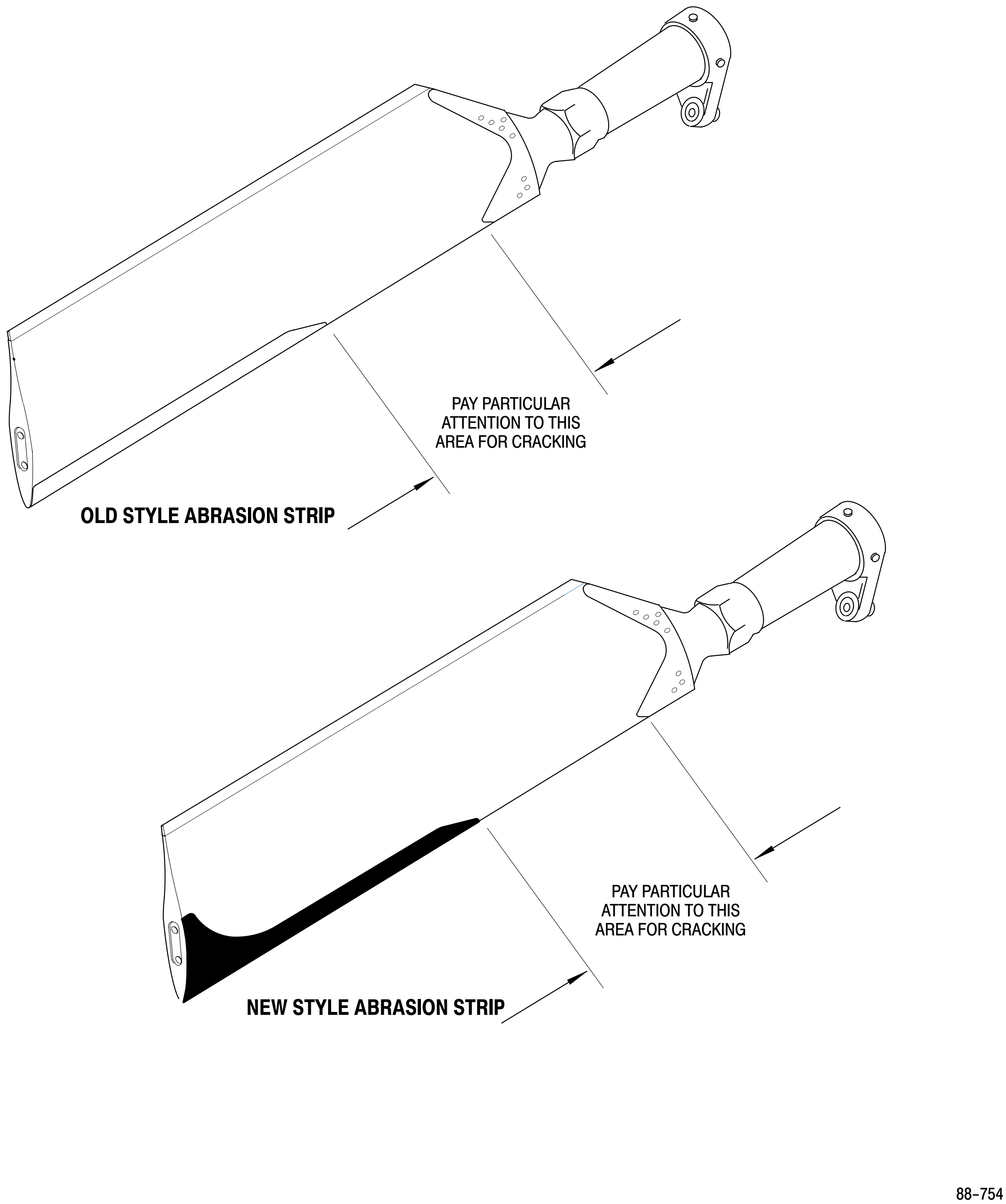


Figure 206. Tail Rotor Blade Leading Edge Crack Inspection

Section

64-20-00

Tail Rotor Hub and Fork (369D/E/FF)

TAIL ROTOR HUB AND FORK
MAINTENANCE PRACTICES

1. Tail Rotor Hub and Fork

(Ref. Figure 201) This section covers maintenance of the hub, strap pack and fork as an assembled unit. For all other maintenance instructions pertaining to hub and fork assembly, and the hub assembly, strap pack and fork assemblies as separately-maintainable components, Ref. COM.

CAUTION When blades are removed from hub, exposed ends of strap pack should be protected with covering (Ref. Sec. 64-10-00). Hub and fork should be handled carefully to avoid damage to strap pack.

2. Tail Rotor Hub and Fork Replacement

A. Tail Rotor Hub and Fork Removal

(Ref. Figure 202 and Figure 203)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST607	Adapter, torque wrench

WARNING **On four-bladed tail rotor system, there is strong spring pressure in installed tail rotor linkage. Disconnect the in-line bungee before beginning disassembly. Failure to disconnect the bungee can result in personal injury and/or parts damage.**

(1). On **four-bladed** tail rotor, disconnect in-line bungee (Ref. Sec. 67-20-10) if tail rotor is installed on helicopter.

CAUTION

- Whenever blades and hub are removed as an assembly, or whenever pitch control links are disconnected, do not allow blade pitch to exceed **30 degrees** from neutral pitch position. This is equal to blade pitch control arm movement of approximately one inch in either direction. Unrestricted rotation of blades on hub can excessively bend or stretch strap pack and cause undetected damage to strap pack and an out- of- balance tail rotor when reassembled.
- To prevent balance problems at reassembly of parts and hardware, mark exact number, locations and positions of all items before removal for correct reinstallation.
- On **two-bladed** tail rotor system do not remove hub- to- drive fork hinge bolt to remove tail rotor assembly. On **four-bladed** tail rotor system hub- to- drive fork hinge bolt removal is required. This bolt should only be removed according to instructions Ref. COM. Damage to strap pack may occur if any other procedure is used.

(2). Disconnect pitch control links from blade pitch control arms.

(3). Pull rotating boot out of groove in fork.

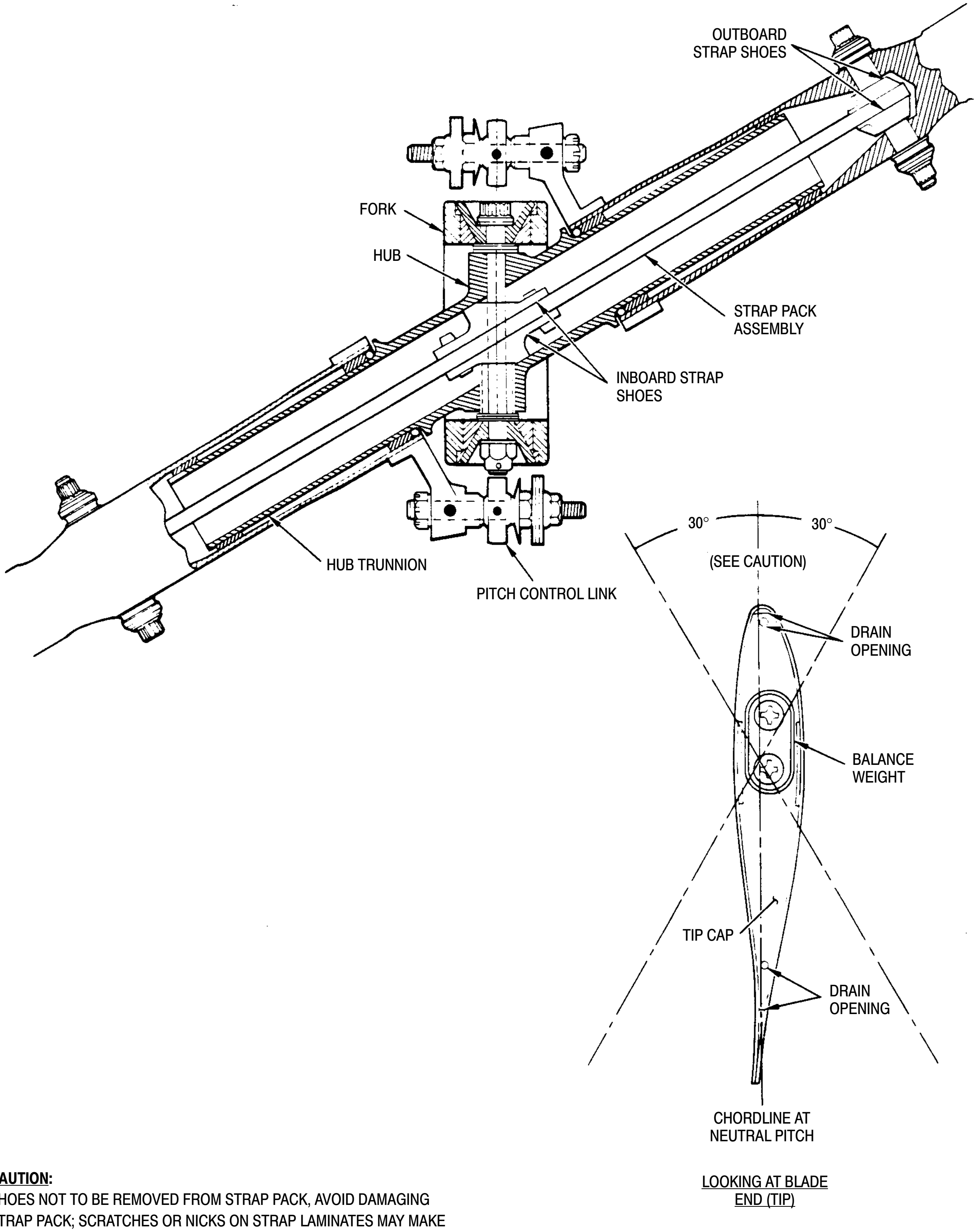
(4). On **four-bladed** tail rotor system remove inboard and outboard blades and hubs to access fork tang washer and nut.

NOTE: Helicopters Serial Nos. D0003 thru D1024 had a two-piece retaining nut and stop support. Helicopters subsequent to D1024 have a one-piece retaining nut and stop support.

(5). Straighten tang of tang washer.

(6). Using torque wrench adapter (ST607), loosen retaining nut and slide tail rotor outward on output shaft of tail rotor transmission to remove blade stop and stop support.

(7). Remove nut, tang washer, tapered ring, and split-ring halves that fit into recess at inboard end of fork.



CAUTION:
SHOES NOT TO BE REMOVED FROM STRAP PACK, AVOID DAMAGING STRAP PACK; SCRATCHES OR NICKS ON STRAP LAMINATES MAY MAKE STRAP PACK UNSERVICEABLE.

Figure 201. Tail Rotor Hub and Strap Pack

CAUTION Tail rotor tang washer must not be reused.

NOTE: Placing grease pencil mark on drive fork to key it to transmission output shaft enables subsequent installation of tail rotor assembly at same position.

Application of small painted matchmark next to centerline splined groove on both pitch control assembly and tail rotor drive fork aids reassembly at same position on transmission shaft.

One spline groove of fork is located directly on centerline passing through centers of the two fork bearings while, at opposite side of spline bore, same centerline passes through a spline tooth. A similar condition exists with respect to swashplate splines, except that reference centerline originates between swashplate arms.

For illustrations showing matchmarks and additional information, Ref. COM.

(8). Slide tail rotor assembly off output shaft.

B. Tail Rotor Hub and Fork Installation

(Ref. Figure 202 and Figure 203)

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM115	Grease, oscillating bearing
CM318	Primer
CM702	Lockwire CRES

Special Tools (Ref. Section 91-00-00)

Item	Nomenclature
ST607	Adapter, torque wrench

(1). Attach rotating boot; attach to pitch control assembly using safety wire (CM702).

(2). Install split ring on output shaft of transmission.

CAUTION It is possible for pitch control swashplate to be misaligned by one- half spline in relation to drive fork. Make sure drive fork, pitch links and swashplate are in exact alignment with transmission shaft centerline. If incorrectly assembled, swashplate will be misaligned approximately 10 degrees from drive fork. To correct this condition, remove tail rotor assembly (leaving pitch control assembly installed), rotate tail rotor assembly 180 degrees and reinstall it.

(3). Slide tail rotor assembly onto shaft with drive fork-to-hub pivot bolt aligned with swashplate lugs. Position tail rotor assembly on shaft so that approximately two threads at shaft end are exposed outboard of drive fork.

(4). Coat tapered ring with primer (CM318) and install it on shaft, making certain that tapered edge parallels chamfer in fork. Perform the following steps while primer is wet.

NOTE: Pre-assembly of tang washer, nut, stop support and stop as a unit aids in their installation when performing steps (5). thru (7). below. Marking outer tang that is next to inner key on tang washer, before assembly of parts, simplifies alignment with keyway on shaft. Teeter blades to start tang washer on shaft.

(5). Slip new tang washer over exposed threads of shaft; key tang must face inboard toward gearbox. Install nut approximately two full turns on shaft threads to verify threads engaged.

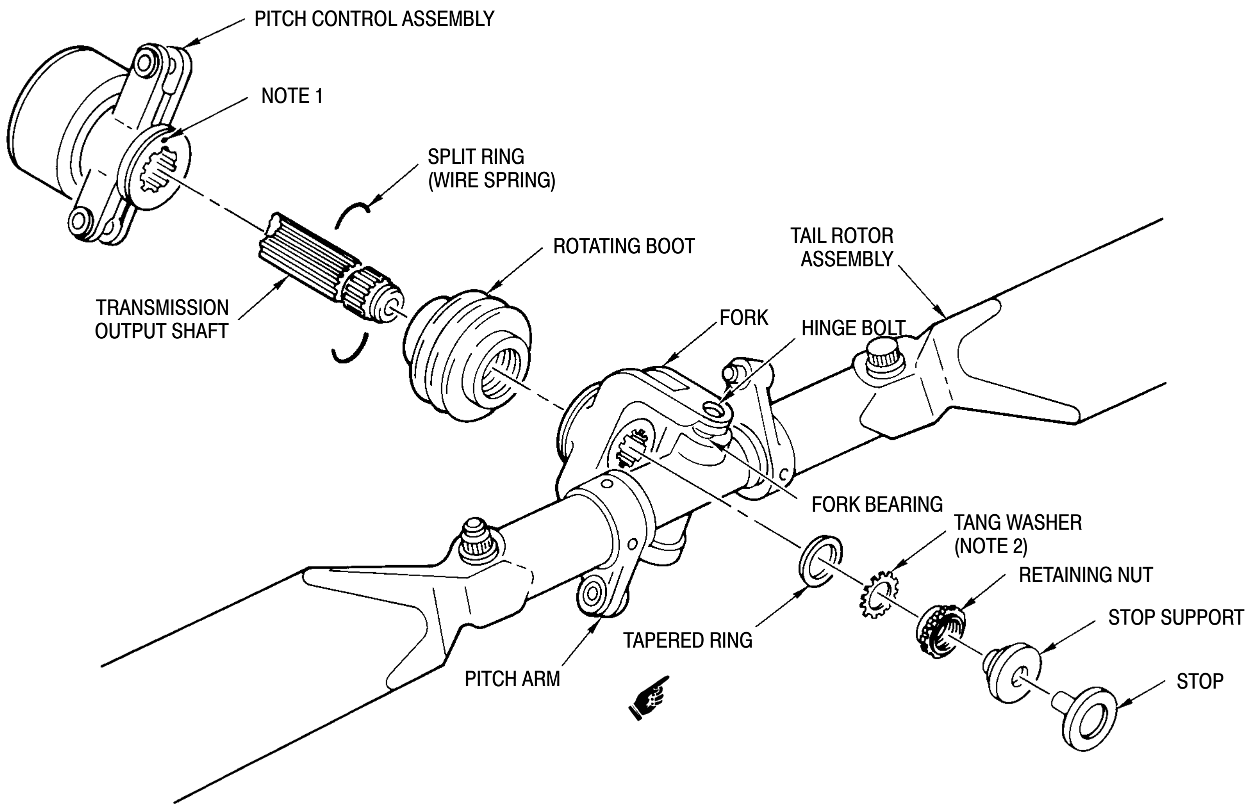
(6). Slide tail rotor assembly outboard against nut. Install stop support by inserting it in drive shaft end.

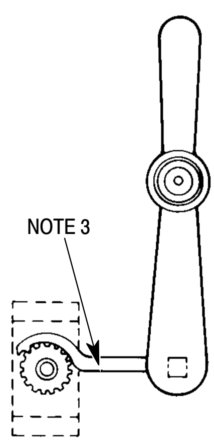
CAUTION In next step do not force stop into position with screwdriver; this can crack the stop.

(7). Coat contacting surfaces of stop with grease (CM115) and insert it in stop support.

(8). Install split ring halves in shaft groove and slide fork inboard until ring halves are secured by recess in fork.

(9). Visually align a tang on tang washer with any convenient reference point.





NOTES:
1. CENTERLINE TOOTHSPACE MATCHMARK MUST ALIGN WITH CENTERLINE TOOTH-SPACE MARK ON FORK WHEN ASSEMBLED ON OUTPUT SHAFT.
2. DISCARD USED TANG WASHER; BEND TWO TANGS TO SECURE NUT.
3. TOOL PN 369D29823 (ST607).

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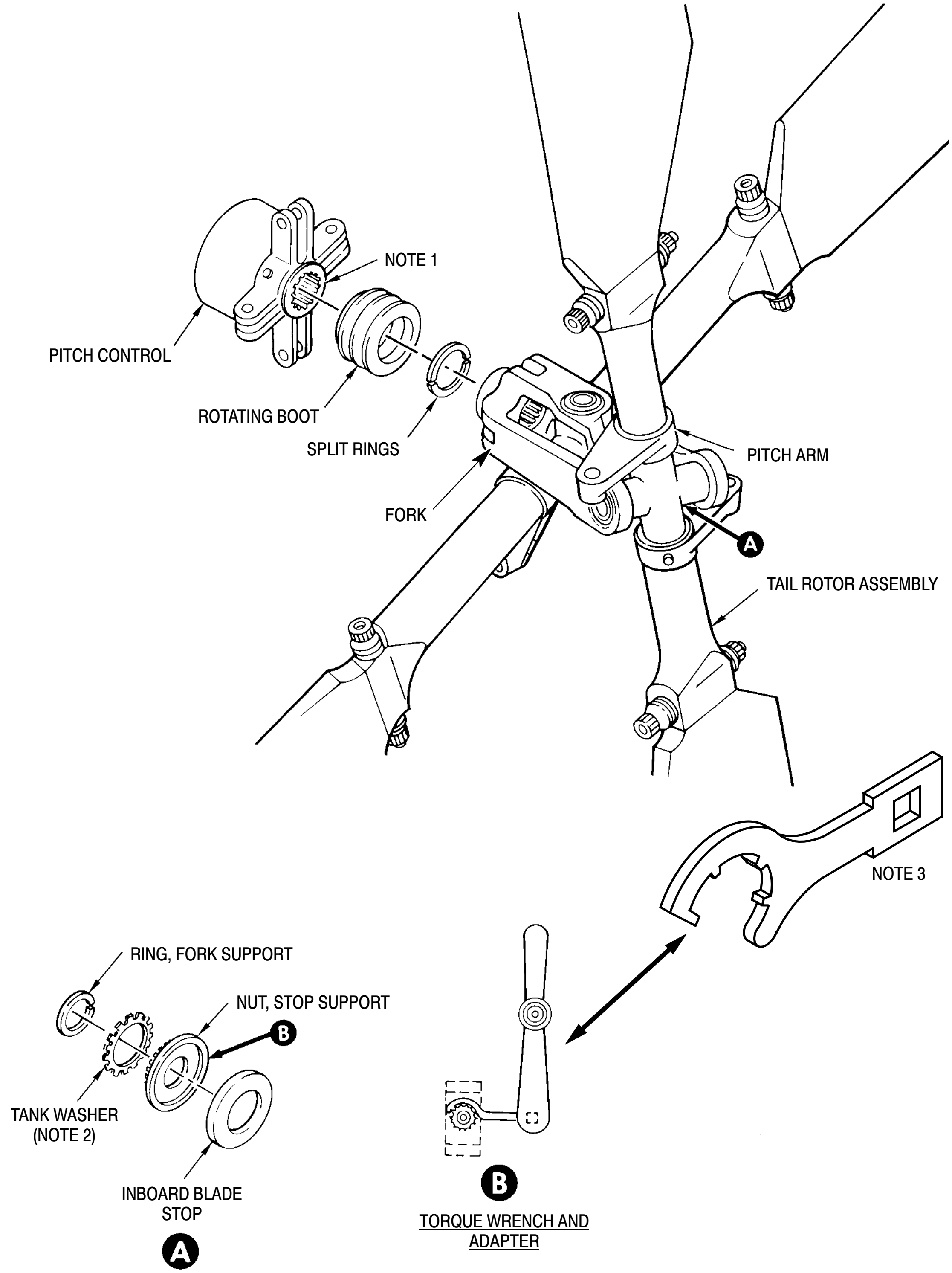
Figure 202. Hub and Fork Assembly Installation (Two-Bladed)



NOTES:

1. CENTERLINE TOOTHSPACE MATCHMARK MUST ALIGN WITH CENTERLINE TOOTH-SPACE MARK ON FORK WHEN ASSEMBLED ON OUTPUT SHAFT.
2. DISCARD USED TANG WASHER; BEND TWO TANGS TO SECURE NUT.
3. TOOL PN 369D29826 (ST607).

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Figure 203. Hub and Fork Assembly Installation (Four-Bladed)

(10). Torque retaining nut, using torque wrench adapter (ST607), to:

(a). Torque **two-bladed** retaining nut to **450 - 500 inch-pounds (50.84 - 56.49 Nm)**.

(b). Torque **four-bladed** retaining nut to **550 - 600 inch-pounds (62.14 - 67.79 Nm)** and ensure wire-spring split ring halves are firmly imbedded in fork recess.

NOTE: Tang washer movement of more than one tang width is an indication that tang washer inner key tang is sheared. This condition requires replacement of tang washer and reassembly of parts according to initial installation procedure.

(11). Check that tang has not moved more than one tang width in relation to reference point noted in step (9)..

NOTE: When clearance is less than 0.005 inch (0.127 mm) or clearance does not exist, replace tapered ring and/or fork assembly.

(12). Bend two tangs on tang washer to lock retaining nut. When bending tangs, do not force-form tang to match nut contour; maintain natural bend radius that develops at tang root.

(13). Apply torque stripe paint across nut, tang washer and fork assembly in location that can be checked visually.

(14). Insert edge of rotating boot into groove of drive fork.

(15). Install pitch control links (Ref. Sec. 64-30-00).

(16). Position tail rotor pedals in neutral position and recheck that drive fork, pitch links and swashplate are in exact alignment with transmission shaft centerline.

(17). On **four-bladed** tail rotor system, reconnect bungee (Ref. Sec. 67-20-10).

(18). Check rigging of tail rotor controls (Ref. Sec. 67-20-10).

3. Tail Rotor Hub and Fork Inspection

(Ref. Figure 201) Hub inspection is accomplished with tail rotor blades removed.

(1). Inspect areas on hub trunnions that mate with blade pitch bearings for excessive wear and for damage.

(2). Check hub and fork for axial play or bearing roughness when hub is pivoted from one extreme to the other.

(3). Check torque of fork hinge bolt. Apply **125 inch-pounds (14.12 Nm)** torque to nut or bolt. If bolt or nut does not rotate, preload is correct. If bolt or nut rotates, retorque. (For repair limit, torquing requirements and replacement criteria, Ref. COM.)

(4). Check visible areas of strap pack for nicks or scratches on strap laminates, cracked or kinked laminates and sharp bends or permanent twists in laminates. Any one of these defects, except minor outer surface defects that can be removed by abrasive polishing, requires replacement of strap pack. (For information on allowable repairs, serviceability requirements and replacement, Ref. COM.)

4. Conical Bearing Inspection

Visually inspect conical bearings installed in fork assembly, at intervals specified (Ref. Sec. 05-20-00).

(1). Play is not permitted in conical drive fork bearings.

5. Elastomeric Fork Bearing Inspection

Visually inspect elastomeric bearings installed in fork assembly, at intervals specified (Ref. Sec. 05-20-00) for damage and debonding from fork as follows.

CAUTION Elastomeric materials can be damaged by solvents, grease or oil. If cleaning is necessary, refer to Elastomeric Bearing - Care and Cleaning.

(1). Apply teetering force by hand to rotor blades (stop-to-stop). Check for fork-to-bearing bond failure. Failure is indicated by any motion between outer bearing cage and fork (bearing turns in fork). If failure is noted, remove bearing and rebond in fork according to instructions in the COM.

(2). Teeter blades stop-to-stop. Observe four radial molded ridges on each bearing as teetering takes place. If ridges assume continuous curved shape, bearings are intact. Discontinuity in molded ridges indicates bearing failure and bearing must be replaced.

(3). Check bearing for general condition. Replace bearing if damaged. Evidence of light swelling, pock marks and crumbs are surface conditions and are not indications of bearing failure.

(4). Elastomeric bearings are suspected of being unserviceable if visual inspection reveals rubber deterioration or separation, or a vibration is reported. Perform following steps to check blade flapping resistance measurement to determine if suspected elastomeric bearing has failed.

(5). To perform measurement, remove rubber blade stop between tail rotor hub and fork on inboard hub. The outboard tail rotor assembly can be checked without any disassembly.

CAUTION Do not remove hub-to-drive fork hinge bolt to remove 2-bladed tail rotor assembly. This bolt should only be removed according to instructions in the COM. Damage to strap pack may occur if any other procedure is used.

(6). The rubber blade stop must be removed. Reassemble tail rotor with rubber blade stop removed.

(7). Measure flapping resistance of blades using spring scale attached within 1.00 inch (2.54 cm) for 369D/E or 2.00 inch (5.08 cm) for 369FF inboard of blade tip (Ref. Figure 204). Block or hold tail rotor pedal in neutral position. While pulling 90 degrees from plane of rotation, record spring scale value when blade tip is 3.00 inches (7.62 cm) inboard and outboard from no-load position. Scale must indicate 1.5-5.0 pounds (6.672-22.24 N). If load is not within specified limit, replace bearing.

(8). Reinstall rubber blade stop.

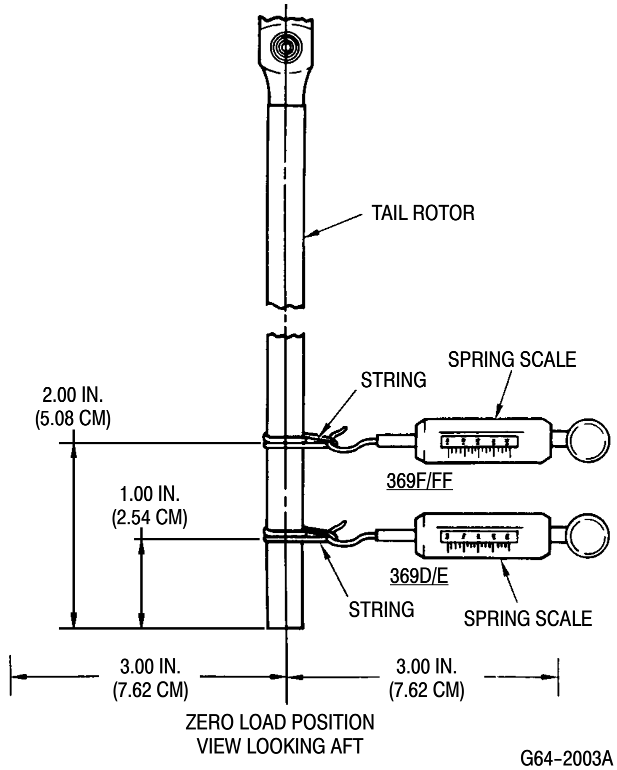

Figure 204. Blade Flapping Resistance Check

6. Elastomeric Bearing Care and Cleaning

Elastomeric bearings are not inherently resistant to grease, oils or solvents if immersed. They are, however, somewhat resistant to occasional splash or spoilage of these materials if exposed on an occasional basis. If elastomeric materials do come in contact with these fluids, the elastomer surface should be immediately cleaned. If cleaning is accomplished properly, the effect of greases, oils or solvents on the performance of the elastomeric material will be minimal. If replacement of elastomeric bearing is required, refer to COM.

(1). If greases, oils or solvents come in contact with the elastomeric material, wipe immediately with clean, dry rag.

(2). If wiping is not sufficient (oil or grease is too thick), clean the affected area of the elastomer with a soft bristle brush and a solution of pure soap and water.

(3). Rinse with tap water.

Section

64-25-30

Anti-Torque Fan (500/600N)

ANTI-TORQUE FAN REMOVAL/INSTALLATION

1. Anti-Torque Fan Assembly

The purpose of the fan is to provide anti-torque control using a variable flow of air, across variable pitch blades, down the tailboom. The anti-torque fan liner, felt metal seal, provides a controlled gap between the fan and the felt metal seal for optimum efficiency of the fan during flight.

NOTE: The NOTAR® anti-torque control system must be re-rigged immediately after replacement of any component, control rods, or linkages, and if helicopter operation reveals a rigging deficiency.

2. Anti-Torque Fan Replacement

(Ref. Figure 401 and Figure 402)

Special Tools (Ref. Section 91-00-00)

Item	Nomenclature
ST605	Fan nut socket

A. Anti-Torque Fan Removal

(1). Remove tailboom (Ref. Sec. 53-40-30).

(2). Remove nut and lock washer from aft tube assembly.

(3). Remove fan pitch control tube (Ref. Sec. 67-20-30, Fan Pitch Control Tube Removal).

(4). Remove six bolts, washers and pitch control housing from fan.

(5). Remove lock washer from nut and shaft by releasing the holding tangs from lock nut and pull locking ring from support shaft knurl.

(6). Remove locknut in a counter-clockwise direction, using coupling socket (ST605) and coupling holding fixture tool.

(7). Remove washer from shaft.

(8). Remove fan from helicopter.

B. Anti-Torque Fan Installation

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM702	Lockwire CRES

(1). Align and install fan assembly on support shaft.

(2). Install washer on shaft.

(3). Install locknut and torque nut to **40 - 42 foot-pounds (54 - 57 Nm)**. Install lock washer.

(4). Install pitch bearing housing using six bolts and washers, Torque bolts to **80 - 100 inch-pounds (9.04 - 11.30 Nm) and lockwire** (CM702).

(5). Install fan pitch control tube (Ref. Sec. 67-20-30, Fan Pitch Control Tube Installation).

(6). Install tailboom (Ref. Sec. 53-40-30).

3. Anti-Torque Fan Blade Replacement

(Ref. Figure 401)

NOTE: When a blade needs replacement for any reason, whether it be service related or at overhaul, replace the associated retention pin.

A. Anti-Torque Fan Blade Removal

(1). Remove anti-torque fan from helicopter (Ref. Anti-Torque Fan Removal).

(2). Remove fan blade from strap assembly by removing cotter pin, washer and pin.

B. Anti-Torque Fan Blade Installation

(1). Install fan blade and align retention hole with upper strap assembly retention hole.

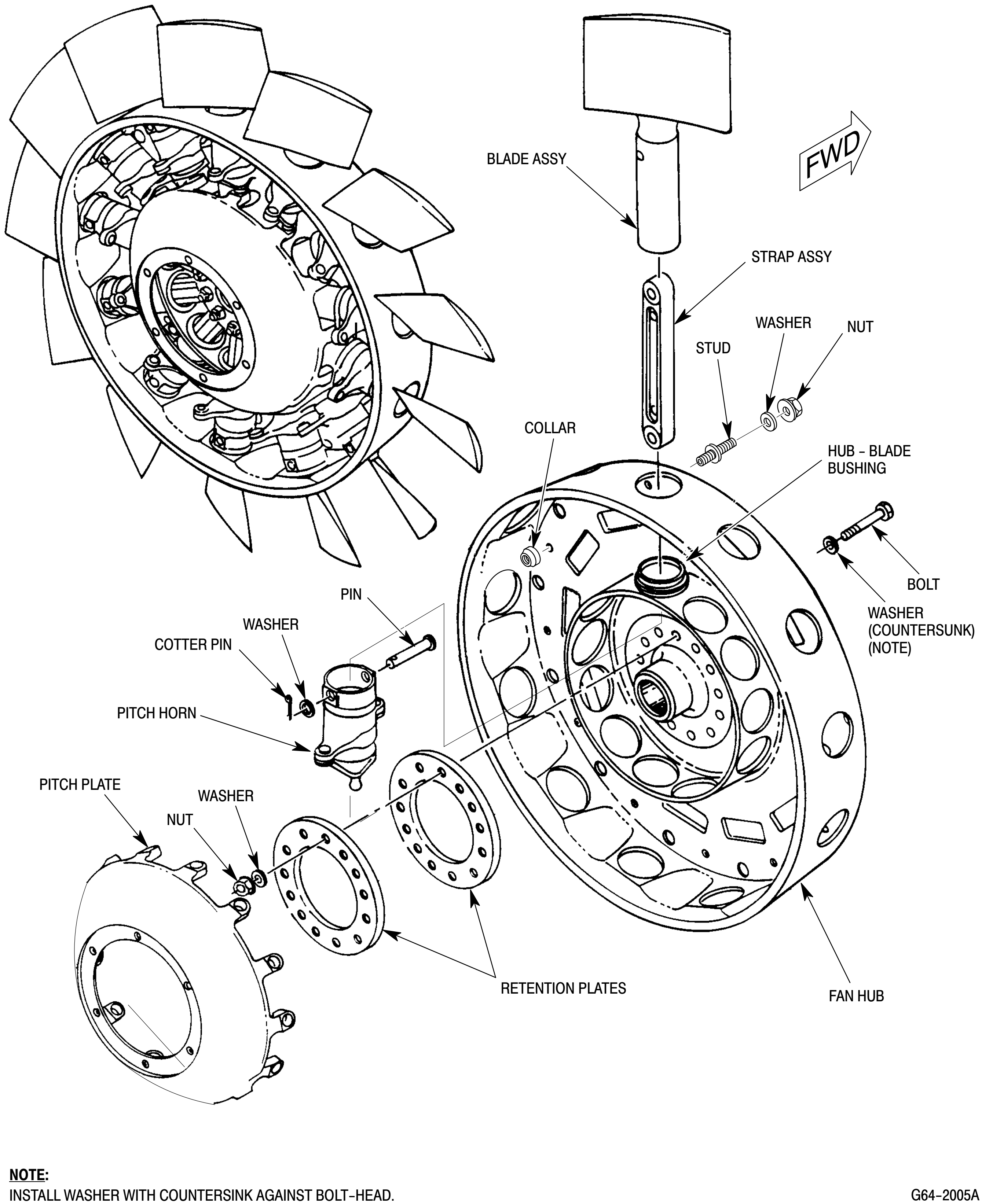

Figure 401. Anti-Torque Fan

(2). Install pin, washer and cotter pin.

(3). Reinstall anti-torque fan in helicopter (Ref. Anti-Torque Fan Installation).

(4). Perform fan balance check (Ref. Sec. 18-20-30, Fan Balance Check).

4. Fan Blade Strap and Pitch Horn Replacement

(Ref. Figure 401) Remove and install the pitch horn and strap assembly using the following procedures.

NOTE:

- The following procedure covers the individual removal of one strap assembly and pitch horn. If disassembly of all is required, use the following steps for each one requiring removal.
- When a strap needs replacement for any reason, whether it be service related or at overhaul, replace the associated retention pin.

A. Fan Blade Strap and Pitch Horn Disassembly

(1). Remove anti-torque fan from helicopter (Ref. Anti-Torque Fan Removal).

(2). Remove fan blade(s) (Ref. Anti-Torque Fan Blade Replacement).

(3). Remove bolt and washer retaining bottom half of strap assembly between two retention plates.

(4). Remove strap assembly thru top hole of fan hub.

(5). Remove pitch horn from fan hub.

B. Fan Blade Strap and Pitch Horn Reassembly

NOTE: Counterweights on pitch arms are set by the factory; do not attempt to adjust.

(1). Install pitch horn in fan assembly. Ensure ball on lower side of pitch horn is inserted in bushing of pitch plate.

NOTE: Inspect strap assembly for condition. Pay particular attention to area around the two spools. Inspect for cracks in the polyurethane coating. If any cuts or breaks are found that exceed 0.020 inch (0.508 mm) in depth or 0.25 inch (6.35 mm) in length, replace the strap.

(2). Insert strap assembly thru top of fan hub and pitch horn until lower (smaller diameter) hole is aligned between holes of two retention plates.

(3). Install blade and align spar before torquing inboard nut, this ensures proper alignment of strap with blade.

(4). Install <u>new</u> strap assembly mounting bolt, washers (countersunk washer against bolt-head), and nut thru holes of retention plates and of strap assembly.

(5). Install fan blade(s) and torque bolts to **100 inch-pounds (11.30 Nm)** (Ref. Anti-Torque Fan Blade Installation).

(6). Reinstall anti-torque fan in helicopter (Ref. Anti-Torque Fan Replacement).

(7). Perform fan balance (Ref. Sec. 18-20-30, Fan Balance Check).

5. Retention Plate and Pitch Plate Replacement

(Ref. Figure 401) Remove and install the retention strap and pitch plate using the following procedures.

A. Retention Plate and Pitch Plate Disassembly

(1). Remove anti-torque fan from helicopter (Ref. Anti-Torque Fan Removal).

(2). Remove fan blades (Ref. Anti-Torque Fan Blade Replacement).

(3). Remove strap assemblies and pitch horns.

(4). Remove pitch plate and retention plates from fan hub.

B. Retention Plate and Pitch Plate Resassembly

(1). Position retention plates in fan hub.

(2). Install pitch horn and strap assemblies (Ref. Strap and Pitch Horn Reassembly).

(3). Place pitch plate over retention plates within fan hub.

(4). Install fan blades (Ref. Anti-Torque Fan Blade Installation).

(5). Reinstall anti-torque fan in helicopter (Ref. Anti-Torque Fan Installation).

6. Support Shaft Replacement

(Ref. Figure 402) Remove and install the support shaft using the following procedures.

NOTE: When replacing pitch plate and/or support shaft bearings, do not use 900R bearings in the 500/600N helicopters.

A. Support Shaft Disassembly

(1). Remove anti-torque fan from helicopter (Ref. Anti-Torque Fan Removal).

(2). Remove fan pitch control tube (Ref. Sec. 67-20-30).

(3). Remove fan interconnect driveshaft (Ref. Sec. 63-15-30).

(4). Remove fan interconnect shaft coupling from support shaft (Ref. Sec. 63-15-30).

(5). Remove support shaft and fan hub housing from fan support assembly by removing four cotter pins, nuts, washers and bolts.

(6). Remove hub spacer from shaft.

(7). Remove bearing retainer from support housing.

(8). Press shaft and fan support bearing out of support housing.

NOTE: Removal of bearing seal at disassembly is not required unless seals need replacement.

(9). Remove bearing seal from support housing and bearing retainer.

(10). Press bearing off support shaft using removal ring.

B. Support Shaft Reassembly

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM111	Grease, aircraft
CM425	Sealing compound

(1). Install removal ring on support shaft until firmly seated against shoulder of support shaft.

(2). Install support bearing on support shaft.

(3). Install bearing seal in support housing and bearing retainer using sealant (CM425).

(4). Fill seal cavity with 3.3-4.0 CCs of grease (CM111).

(5). Install support bearing and shaft in support housing.

(6). Install bearing retainer and align bolt holes on support housing.

(7). Install hub spacer on shaft.

(8). Install support shaft and housing on fan support assembly. using four bolts, washers, and nuts. Torque nuts to **40 - 50 inch-pounds (4.52 - 5.65 Nm)**. Install cotter keys.

(9). Install fan interconnect shaft coupling on support shaft (Ref. Sec. 63-15-30).

(10). Install fan interconnect driveshaft (Ref. Sec. 63-15-30).

(11). Install fan pitch control tube (Ref. Sec. 67-20-30).

(12). Install anti-torque fan on helicopter (Ref. Anti-Torque Fan Installation).

(13). Check fan balance (Ref Sec. 18-00-30, Fan Balance Check).

7. Fan Balance Stud Replacement

A. Fan Balance Stud Removal

The following procedure is for removal of the balance studs when the lock collars have become loose and allow the stud to rotate.

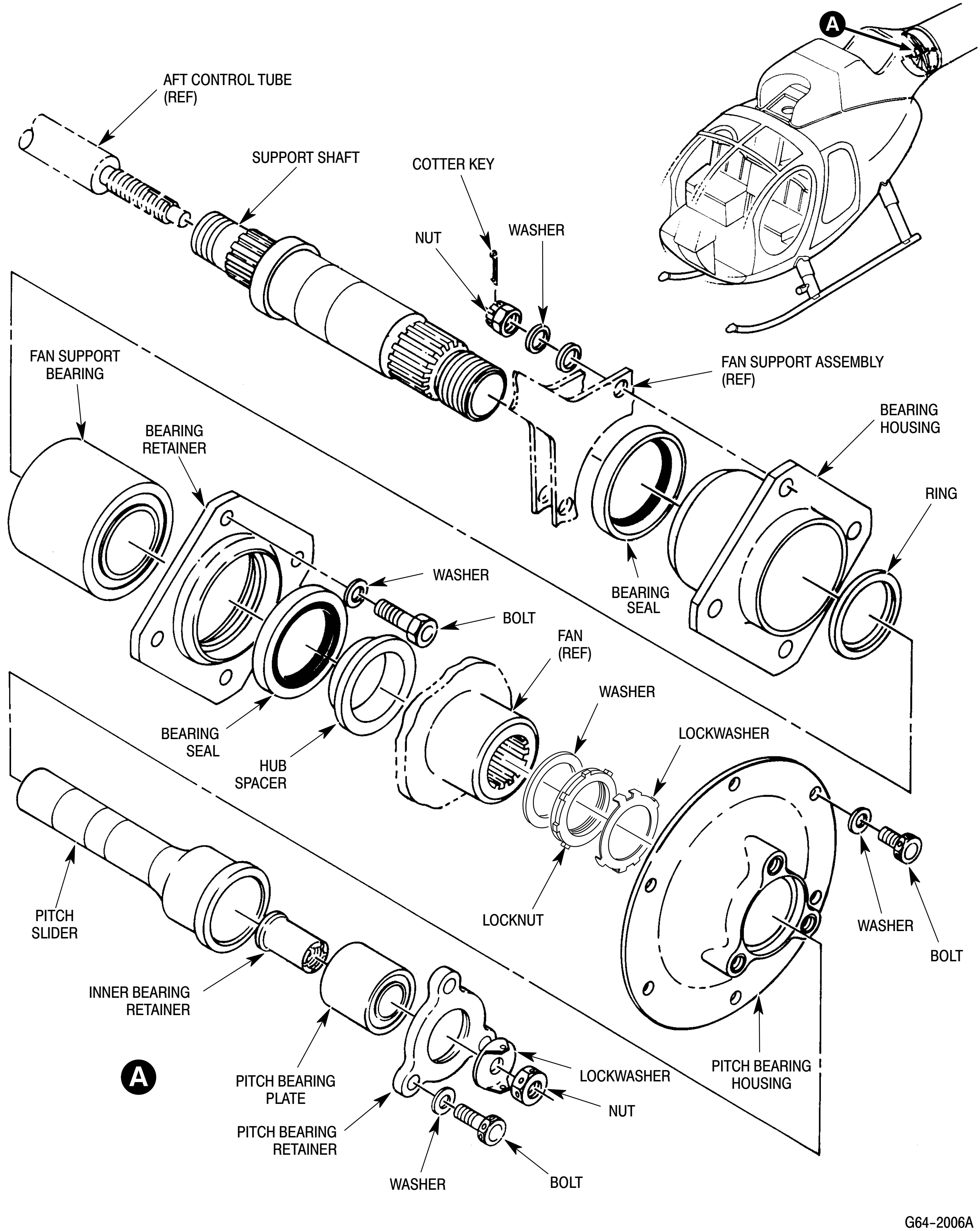

Figure 402. Anti-Torque Fan Support Shaft

(1). Removal with Pneumatic Tool: Pneumatic tools may be used only on fasteners in interference fit holes and fasteners with aluminum collars.

(a). Select the applicable removal tool. Fit removal tool to a 0.375 inch (9.525 mm) square socket drive that will fit a reversible screwdriver motor.

(b). Place the collar removal tool over the collar and press firmly.

(c). Rotate the tool counterclockwise by hand until the teeth bite into the collar.

(d). Place the motor on the drive socket and unscrew the collar using reverse drive.

(e). Tap out the pin with a nonmetallic-faced mallet.

(2). Removal with Hand Tool:

(a). Insert the applicable size hex wrench into the pin wrenching cavity and hold securely to prevent pin rotation.

(b). Rotate the collar counterclockwise with pliers or vise grips to remove.

(c). Tap out pin with a nonmetallic-faced mallet.

B. Fan Balance Stud Installation

Pins may be reused, provided the finish has not been marred and the threads and wrenching cavity are in acceptable condition.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM409	Adhesive, epoxy

(1). Apply adhesive (CM409) to pin and insert, while wet, using a nonmetallic-faced mallet or rivet set into hole. Ensure Pin is seated flush against fan hub.

(2). Manually screw the collar onto the pin a minimum of two threads.

(3). Installation with Pneumatic Tool:

(a). Insert the hex wrench tip of the power driver into the wrenching cavity in the pin

(b). Press the power driver socket firmly against the collar and actuate the driver until the collar wrenching device is torqued off.

(c). Withdraw the hex wrench tip from the wrenching cavity and discard the wrenching collar.

(4). Installation with hand tool:

(a). Press socket from hand tool firmly onto collar.

(b). Insert hex wrench though center of tool and hold pin to prevent it from rotating.

(c). Turn socket clockwise, while holding hex wrench, until collar is firmly seated against fan hub; wrenching collar will torque off when proper torque is reached. Discard wrenching collar.

8. Pitch Horn Counterweight Set Screw Replacement

(Ref. Figure 403) If, during fan inspection, a counterweight is found to be loose, the set screw must be replaced.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM216	Loctite remover
CM321	Surface primer locking compound

(1). Apply heat to loose counterweight.

(2). Remove and discard set screw.

(3). Remove retaining ring and washer.

(4). Inspect threads in counterweight for condition and cleanliness.

(5). Clean pitch horn threads with Loctite remover (CM216).

(6). Apply grade T primer (CM321) to threads of new set screw, allow to dry for 30 minutes at ambient temperature.

NOTE: Ensure counterweight- to- pitch horn index mark aligns correctly. All counterweights are index the same.

(7). Align index mark on counterweight to match with mark on pitch horn and install into pitch horn.

(8). Apply grade B locking compound (CM321) to threads of set screw and install into pitch horn. Tighten set screw.

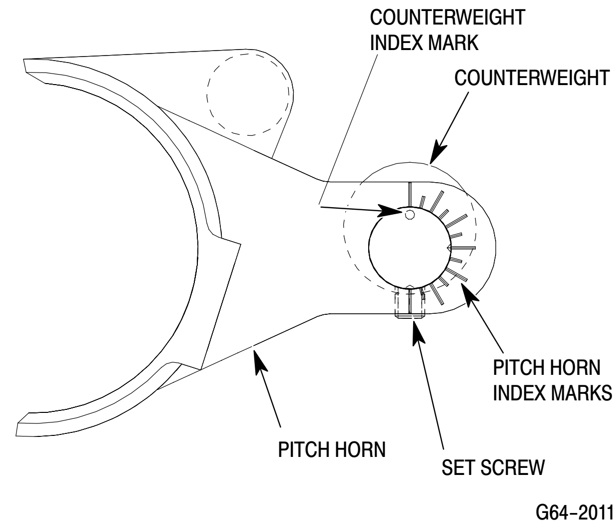

Figure 403. Pitch Horn Counterweight Set Screw Replacement

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ANTI-TORQUE FAN INSPECTION/CHECK

1. Anti-Torque Fan Inspection

Inspect the anti-torque fan for the following conditions:

(1). All components for cracks, nicks, corrosion or excessive wear.

(2). Tension-torsion straps for nicks or cuts in polyurethane coating. No exposed kevlar fibers allowed. Spools for cracks.

(3). Hub-to-blade bushings for cracks.

(4). Pitch horn for excessive wear (out-of-round condition).

(5). Counterweights on pitch horn for security. If loose, perform Pitch Horn Counterweight Set Screw Replacement.

NOTE: Access the forward counterweights through the fan inlet. Fan hub fairing must be removed for access (Ref. Sec. 53-30-30).

(6). Pitch plate bushing for excessive wear, grooves or cracking.

(7). Blades for cracks, nicks or impact damage.

(8). Inspect gap between fan blade and tip seal. Inspect gap between fan blade and hub (inboard end of the blade). If any of these gaps for any blade exceeds the average gap of the other blades by more than 0.10 inch (2.54 mm), removed and inspected the tension-torsion strap for that blade.

2. Support Shaft Inspection

Inspect the support shaft and its associated components as follows:

NOTE: Ensure proper pitch plate and/or support shaft bearings are installed. 900R bearings are not to be used in the 500/600N helicopters.

(1). Support shaft for:

(a). Cracks; none allowed.

(b). Wear.

(c). Scoring; axial marks from bearing installation or removal.

(d). Damaged spines; none allowed.

(e). Corrosion and pitting.

(2). Fan support bearing for free movement of set.

(3). Fan support bearing retainer and housing for:

(a). Cracks; none allowed.

(b). Wear.

(c). Scoring; axial marks from bearing installation or removal.

(4). Bearing seals for condition.

(5). Hub spacer for cracks and wear.

3. Anti-Torque Fan Liner (Felt Metal Seal) Inspection

(1). Inspect for cracks and debonding of liner material.

(2). Inspect for cracks around the radius cutouts of fan support.

(3). If cracks are found, stop drill and inspect every 50 hours (Ref. Sec. 05-20-20).

NOTE: Cracks protruding into the Felt Metal Seal are unacceptable, replace seal (Ref. Anti- Torque Fan Liner (Felt Metal Seal) Replacement).

(4). Inspect aft P-seal for tears, deterioration and debonding.

4. Fan Blade Inspection (100-Hour)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM437	Sealing compound

(1). Inspect polypropylene portion of fan blade for nicks, scratches, abrasions and bulges; pay particular attention to leading edge and area around the pin near the outboard edge of blade.

(a). Nicks and abrasion pits that are less than 0.040 inch (1.016 mm) deep and 0.25 inch (6.35 mm) in diameter may be blended out. (No more than two such repairs can be made per blade.)

(b). Nicks, scratches and abrasion pits less than 0.020 inch (0.508 mm) and 1.5 inch (3.81 cm) long may be blended out. (Total length of all repairs not to exceed 2.0 inch (5.08 cm).)

(2). Any bulges or blisters over 0.10 inch (2.54 mm) long in area of pin near outboard end of blade are reason for blade rejection.

(3). Seal cracks up to 0.10 inch (2.54 mm), coming from area of pin with sealing compound (CM437).

(4). If any cracks larger than 0.10 inch (2.54 mm) are found, replace blade.

ANTI-TORQUE FAN REPAIRS

1. Anti-Torque Fan Liner (Felt Metal Seal) Replacement

(Ref. Figure 801)

A. Anti-Torque Fan Liner (Felt Metal Seal) Removal

(1). Remove tailboom (Ref Sec. 53-40-30).

(2). Disconnect safety wire and remove nut, lockwasher, 3 bolts, washers and pitch bearing retainer plate.

(3). Remove pitch bearing and inner pitch bearing retainer; remove pitch slider from pitch bearing housing (Ref. Sec. 67-20-30).

(4). Remove fan assembly (Ref. Anti-Torque Fan Replacement).

(5). Remove sealant around liner edges with plastic scraper.

(6). Remove four screws that secure the liner to the aircraft structure.

NOTE: Mark liner to aircraft structure to ensure proper clocking upon installation. If liner is not installed in same position, felt metal seal machining will be necessary for correct fan clearance.

(7). Carefully slide liner aft through support structure and fan support struts.

B. Anti-Torque Fan Liner (Felt Metal Seal) Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM425	Sealing compound

(1). Install fan liner so that the larger cutouts fit around the fan support struts and the smaller cutouts fit around the rivets that secure the fan inlet fairing.

NOTE: On installation of liner assembly, peel shim laminates equally among the four shims to provide a tight fit without deforming the liner at screw holes and aircraft structure.

(2). Install four screws. Torque screws per standard aircraft practices.

CAUTION Do not install sealant in butt splices of liner until after felt-metal is turned/cut to correct clearance. Doing so will damage cutting tool and cause incorrect cutting radius to liner seal.

(3). Install sealant (CM425) in mating bores (cutouts) and around liner edges.

(4). After installing the fan liner and before installing the fan, trim liner felt metal seal (Ref. Anti-Torque Fan Liner (Felt Metal Seal) Machining Instructions). Refer to McDonnell Douglas Field Service Representative for additional information.

2. Anti-Torque Fan Liner (Felt Metal Seal) Machining Instructions

(Ref. Figure 801 and Figure 802)

NOTE: Use only cutting tools and equipment supplied with Felt Metal Seal Cutting Kit.

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST603	Tip seal cutter

A. Bench Calibration

(Ref. Figure 802, View B)

(1). Calibrate tool cutting edge so that the mating surface just touches as it passes through the arch of calibrating arm.

(2). Adjust the cutting edge as required by loosening jam nut and turning the arbor threaded end as necessary to meet the calibrating requirements.

(3). Tighten jam nut and recheck calibration.

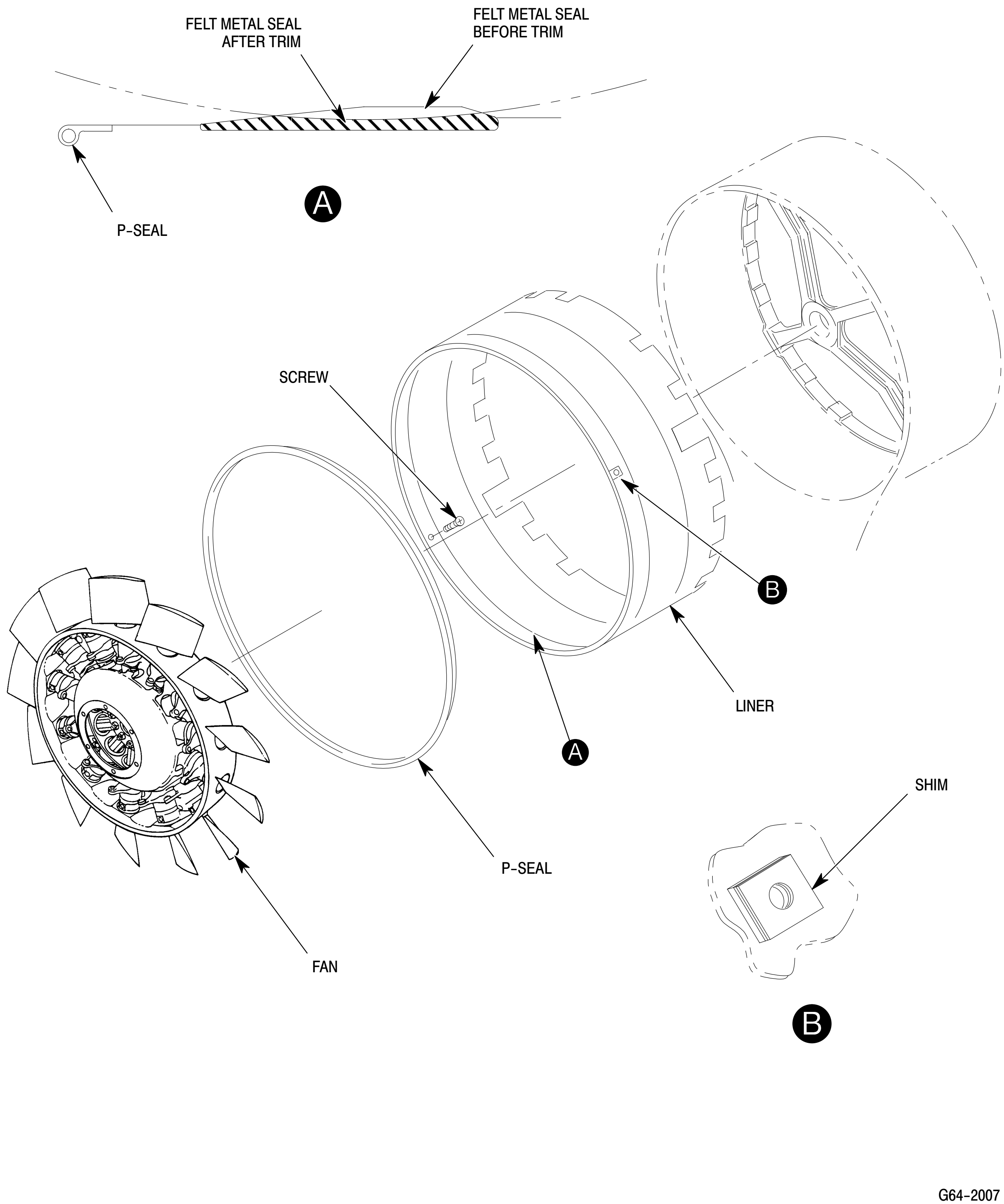
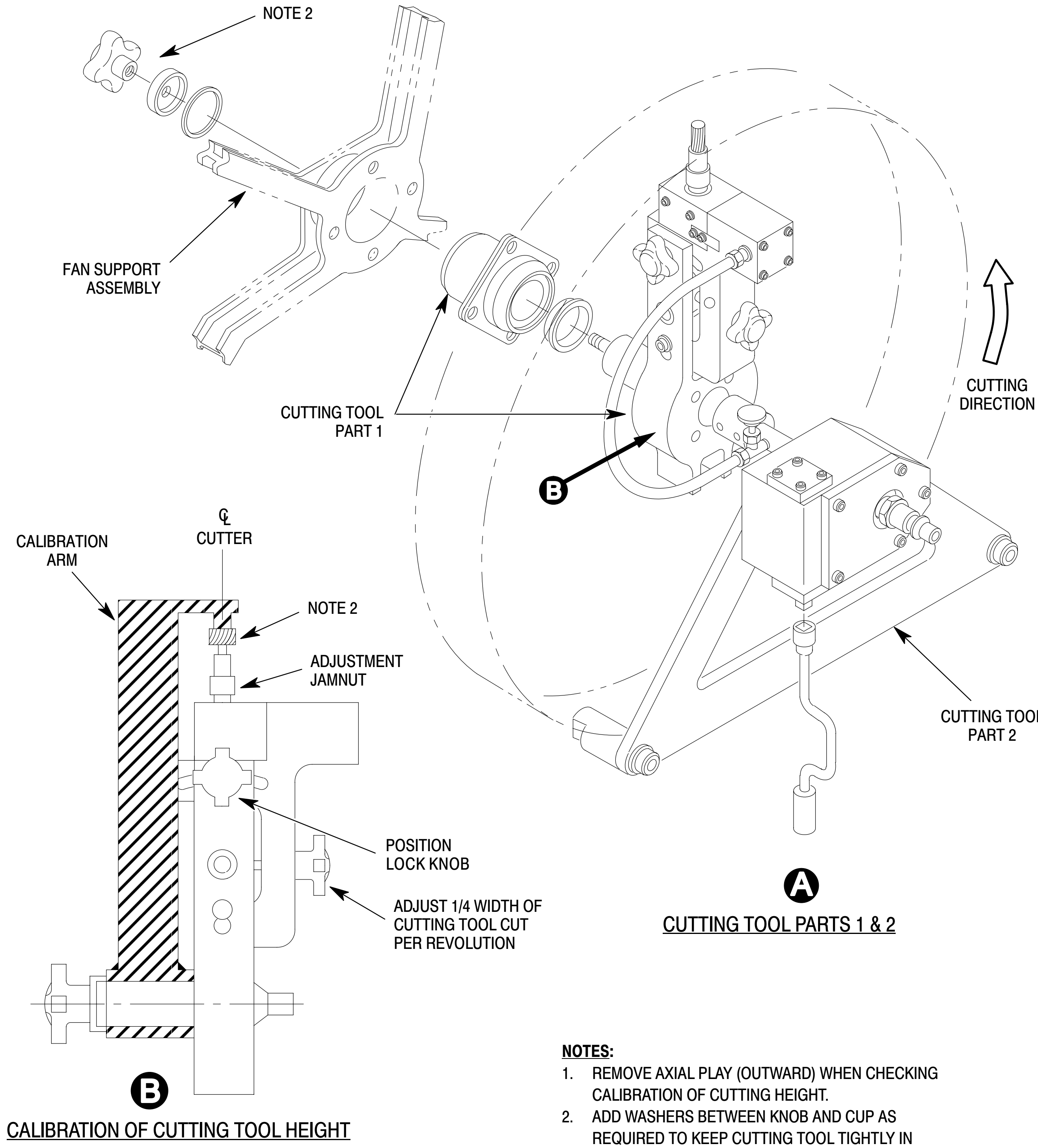


Figure 801. Anti-Torque Fan Liner (Felt Metal Seal)



NOTES:

1. REMOVE AXIAL PLAY (OUTWARD) WHEN CHECKING CALIBRATION OF CUTTING HEIGHT.
2. ADD WASHERS BETWEEN KNOB AND CUP AS REQUIRED TO KEEP CUTTING TOOL TIGHTLY IN PLACE AGAINST THE FAN HUB.

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Figure 802. Anti-Torque Fan Liner Felt Metal Seal Cutting Tool Installation

NOTE: The following checks ensure for an accurate cut of the felt metal seal.

(4). Check for:

(a). No radial movement in cutting edge tool.

(b). No axial movement in cutting edge tool.

B. Installation and Operation of Felt Metal Seal Cutting Tool

(Ref. Figure 802, View A)

(1). Install bearing housing (provided) in fan support assembly.

(2). Install cutting tool Part 1 with spacer into fan bearing housing and through fan support assembly.

(3). Install ring collar on opposite end of cutting tool with cupped end over shaft.

(4). Install a minimum of three washers and tighten with threaded knob securely.

(5). Add washers as required to keep cutting tool tight in place on fan bearing.

(6). Move cutter to aft position of arc cutting range.

(7). Rotate cutting tool 360 degrees in hub assembly and check for free rotational movement without binding through circular range.

(8). Install cutting tool Part II onto Part I shaft and alignment keyway. Set setscrew.

WARNING **Ensure the keyway keywedge is capturing both Part I and Part II tools. If, during the cutting operation, keywedge becomes loose and falls out, tool will freewheel and damage to the liner, tool and personnel could occur.**

(9). Attach triangle support bracket to bulkhead and install bolts, bushings and washers. Tighten bolts to support bracket.

NOTE:

- Oil pneumatic cutting tool motor before starting cuts; use pneumatic tool oil.
- For each revolution, cutting tool needs to be reset or re-adjusted for not more than one-fourth cutting tool width (View B).
- Do not cut more than one fourth of the width of the cutting tool in one revolution.

(10). Adjust cutting tool for first cutting pattern rotation around liner.

(11). Turn the cutting tool in a counter-clockwise rotation at a moderate-to-slow rate. Do not force feed cut (View A).

(12). Continue cuts through the entire liner until the cut resembles View A, Figure 801.

NOTE: The following clearance may vary because of variations in blade length.

(13). Install fan assembly and check for a 0.10 inch (2.54 mm) maximum clearance between fan blades and felt metal seal.

NOTE: The anti-torque control system must be re-rigged immediately after removal or replacement of control rods, linkages and components or if helicopter operation reveals a rigging deficiency.

(14). Install fan assembly (Ref. Anti-Torque Fan Replacement).

(15). Install interconnect driveshaft (Ref. Sec. 63-15-30).

(16). Install fan pitch control rod (Ref. Sec. 67-20-30).

(17). Install pitch slider and inner pitch bearing retainer (Ref. Sec. 67-20-30).

(18). Install tailboom (Ref. Sec. 53-40-30).

3. Anti-Torque Fan Bearing Regreasing

(Ref. Figure 803) The following procedure is for the regreasing of the 500N5364 and 500N7120 bearings.

Consumable Materials (Ref. Section 91-00-00)	
Item	Nomenclature
CM111	Grease, aircraft

NOTE:

- Ensure proper pitch plate and shaft support bearings are installed. 900R bearings are not to be used in the 500/600N helicopters.
- Refer to Figure 804 for instructions on the manufacture of a regreasing tool.

(1). Remove bearings from fan assembly (Ref. Support Shaft Disassembly).

(2). Carefully remove both seals from bearings (seals will be reused at reassembly).

(3). Inspect seals for damage; no damage is allowed.

(4). Install bearings between regreasing tools with a 4 inch (10 cm) 10-24 threaded bolt, washers and wing nut.

NOTE: The following procedure provides 100% grease fill. Normal grease fill is 30 to 50%. Excess grease will extrude past seals for several hours of operation until the proper level is met.

(5). Purge bearing with grease (CM111) until clean grease protrudes from all four holes in back of tool.

(6). Remove regreasing tool.

(7). Hand spin bearing to purge excess grease.

NOTE: Ensure seals are serviceable. If new seals are required, seals and bearings must come from the same vendor.

(8). Carefully install seals.

(9). Reinstall bearings (Ref. Support Shaft Reassembly).

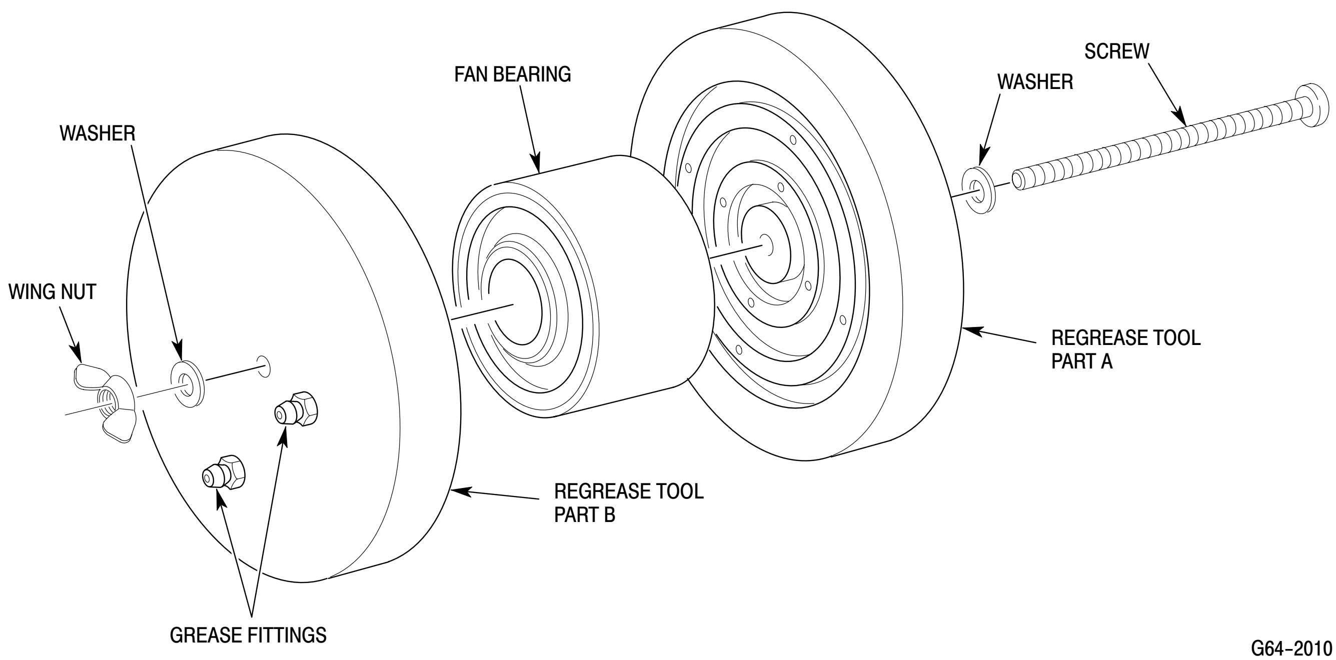
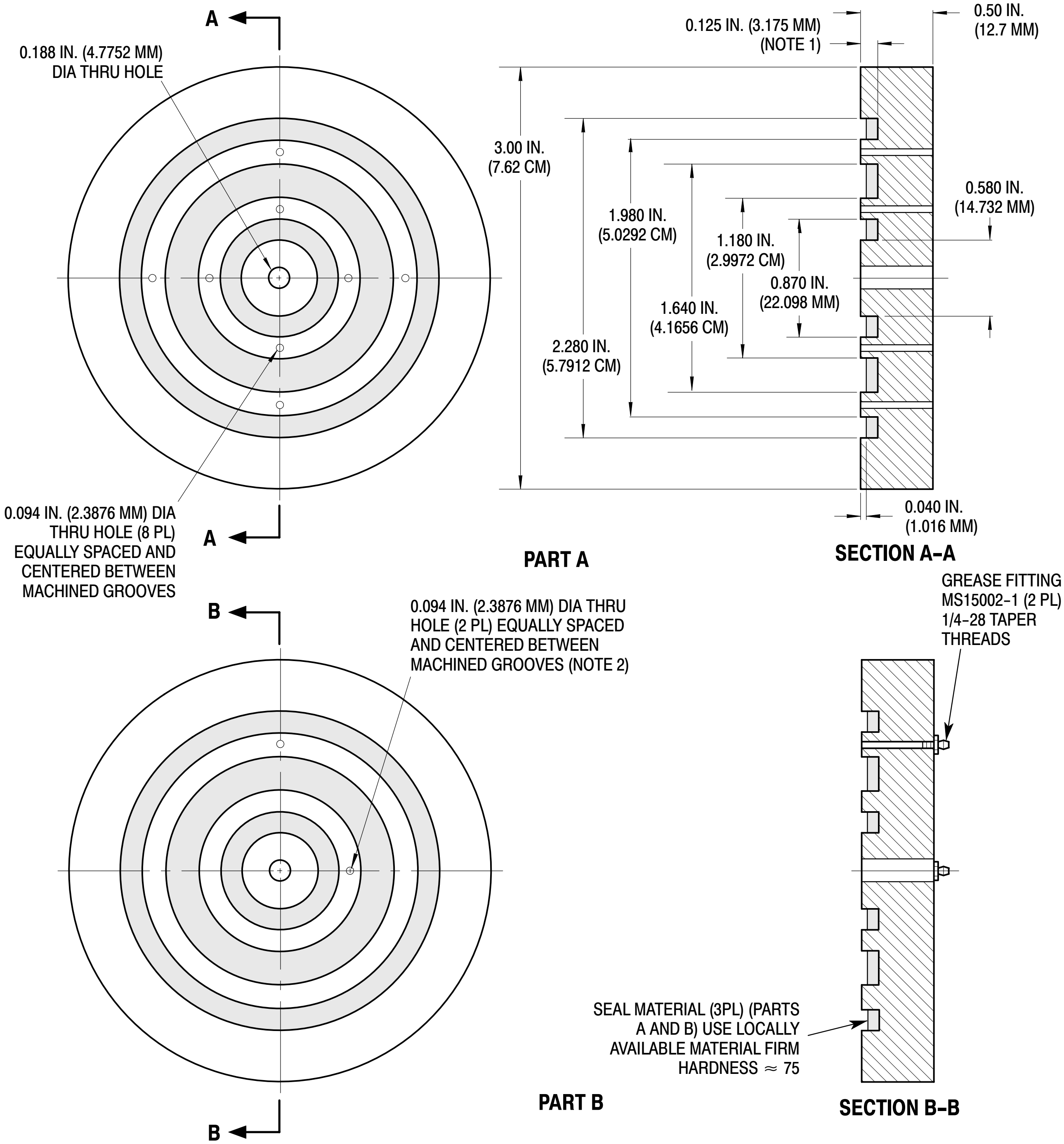


Figure 803. Fan Bearing Regreasing Procedure



NOTES:

1. DIMENSION MAY VARY DEPENDING ON SEAL MATERIAL THICKNESS AVAILABLE.
2. ALL OTHER DIMENSIONS SAME AS PART A.

MATERIALS:

1. 6061–T651 ALUMINUM PER QQ–A–250/11 OR EQUIVALENT.
2. SURFACE FINISH 125 RMS.
3. BREAK SHARP EDGES 0.002–0.015 IN. (0.0508–0.381 MM).
4. CHEMICAL FILM TREAT PER MIL–C–5541.
5. DIMENSION TOLERANCE ±0.010 IN. (±0.254 MM).
6. GROOVE DIAMETERS TO BE CONCENTRIC TO 0.188 IN. 4.7752 MM) DIA WITHIN 0.002 IN. (0.0508 MM).

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Figure 804. Fan Bearing Regreasing Tool

Section

64-30-00

Tail Rotor Pitch Control Assembly (369D/E/FF)

TAIL ROTOR PITCH CONTROL ASSEMBLY MAINTENANCE PRACTICES

1. Tail Rotor Pitch Control Assembly

(Ref. Figure 203 and Figure 204) The pitch control assembly consists of a swashplate that rotates in a matched set of two bearings swaged inside a housing. A self-aligning bearing staked in place at the underside of the housing provides a pivot for transferring motion of Sta. 284 bellcrank to the housing. Clevis ears on end of the swashplate provide for connection of pitch control links. Movement of Sta. 284 bellcrank shifts the housing axially on the output shaft of the tail rotor transmission and moves pitch control links inward and outward to change pitch of tail rotor blades. The swashplate is retained in the pitch control housing by a washer and locknut.

2. Tail Rotor Pitch Control Assembly Replacement

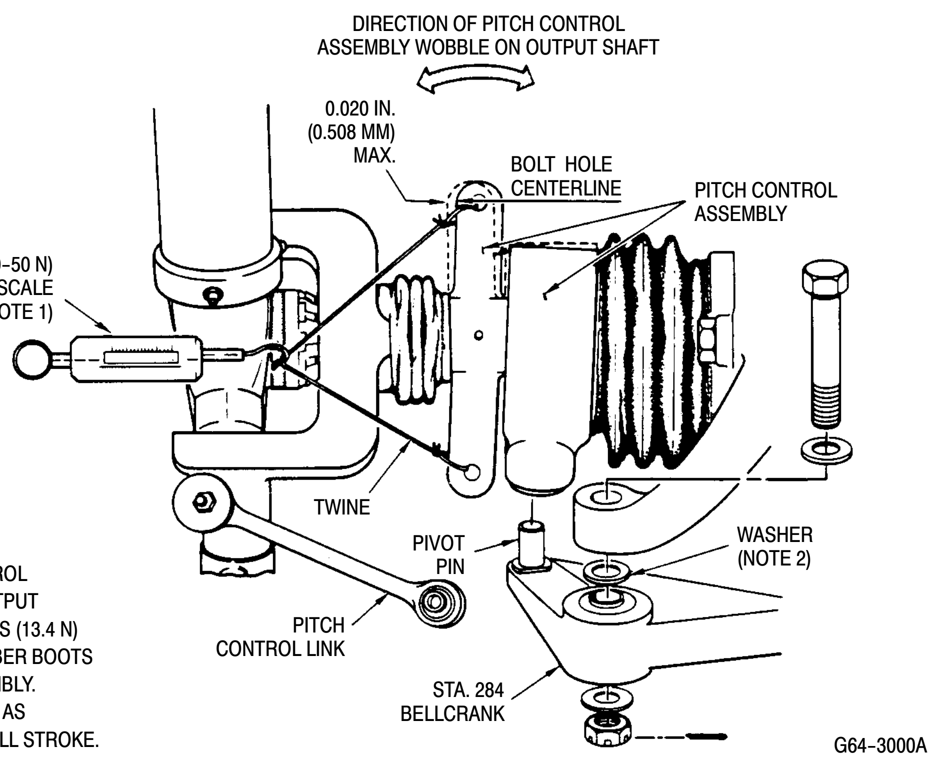
A. Tail Rotor Pitch Control Assembly Removal

(Ref. Figure 203 and Figure 204)

WARNING **On four-bladed tail rotor system, there is strong spring pressure in installed tail rotor linkage. Disconnect the in-line bungee before beginning disassembly. Failure to disconnect the bungee can result in personal injury and/or parts damage.**

(1). Remove tail rotor hub and fork assembly (Ref. Sec. 64-20-00).

NOTE: The manner in which the pitch control assembly is installed determines rotor-blade orientation to transmission splined shaft. Installing rotor blades at 90 degrees to high and low extremes of shaft runout, using reference marks placed on shaft at time of shaft inspection (Ref. Sec. 63-25-10) reduces chance of high-frequency vibration and lessens likelihood of having to rebalance tail rotor.



NOTES:
1. FORCE REQUIRED TO SLIDE PITCH CONTROL ASSEMBLY INWARD OR OUTWARD ON OUTPUT SHAFT MUST NOT EXCEED THREE POUNDS (13.4 N) WITH PITCH LINKS, BELLCRANK AND RUBBER BOOTS DETACHED FROM PITCH CONTROL ASSEMBLY.
2. ADD ONE OR TWO AN960KD516 WASHERS AS REQUIRED FOR CLEARANCE AT PEDAL FULL STROKE.

Figure 201. Pitch Control Assembly - Wobble Check

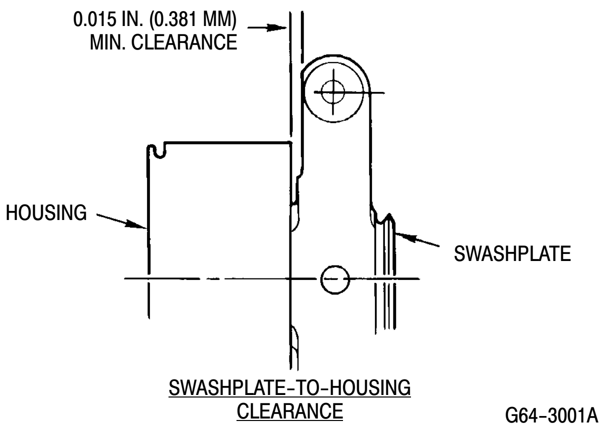


Figure 202. Swashplate-to-Pitch Control Housing Clearance

(2). Remove Sta. 284 bellcrank from transmission (Ref. Sec. 67-20-10) so that pivot pin in bellcrank is disengaged from self-aligning pivot bearing in pitch control housing.

(3). Cut lockwire and pull non-rotating boot from groove in pitch control housing.

(4). Slide pitch control assembly off transmission output shaft.

B. Tail Rotor Pitch Control Assembly Installation

(Ref. Figure 203 and Figure 204)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM115	Grease, oscillating bearing
CM702	Lockwire CRES

(1). Insert edge of small end of non-rotating boot into tail rotor transmission housing groove. Make certain that drain holes in boot are downward.

(2). Align spline index marks and slide pitch control assembly on shaft.

(3). Insert non-rotating boot edge into groove of pitch control housing and secure with lockwire (CM702).

(4). Apply grease (CM115) to Sta. 284 bellcrank pivot pin, insert pin into pitch housing self-aligning bearing and install Sta. 284 bellcrank. Rotate bellcrank back and forth to align bellcrank bearing with transmission arm.

(5). If previously disconnected, reconnect tail rotor bungee.

3. Tail Rotor Pitch Control Link Replacement

(Ref. Figure 203 and Figure 204)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

CAUTION Prior to removal of pitch control links, color-code pitch arm bolt and all washers used at each arm. The bolt, or an identical one, and same combination of washers must be reassembled at locations from which removed, or tail rotor balance can be seriously affected. Do not allow blade angles to exceed 30 degrees, approximately one inch (2.54 cm), in each direction. Undetected damage to tension-torsion strap pack may occur.

(1). Disconnect ends of pitch control link from clevis ear of swashplate and from blade pitch control arm.

(2). To install, insert either end of pitch control link between clevis ears of swashplate.

(3). Install color-coded attaching hardware and tighten nut to **30 - 40 inch-pounds (3.39 - 4.52 Nm)**; install cotter pin with wet primer (CM318).

(4). Pull pitch control assembly inboard or outboard as required to align pitch control link bearing with pitch control arm bushing.

(5). Place special (reduced outside diameter) washer and large-diameter spring washer on pitch arm bolt so that concave surface of spring washer is against bolt head. With washers in place on bolt, insert bolt through bearing of pitch control link and bushing in pitch control arm.

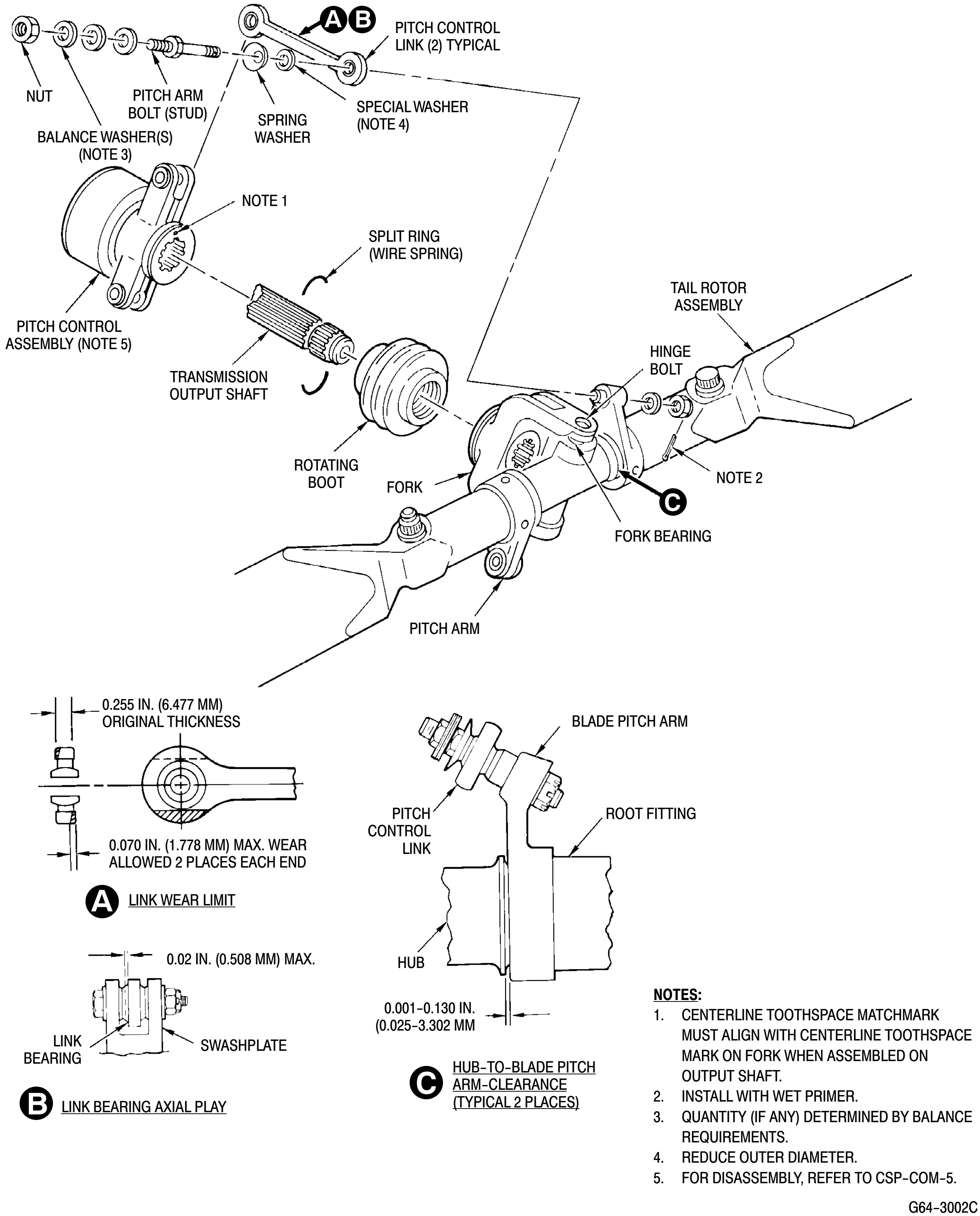
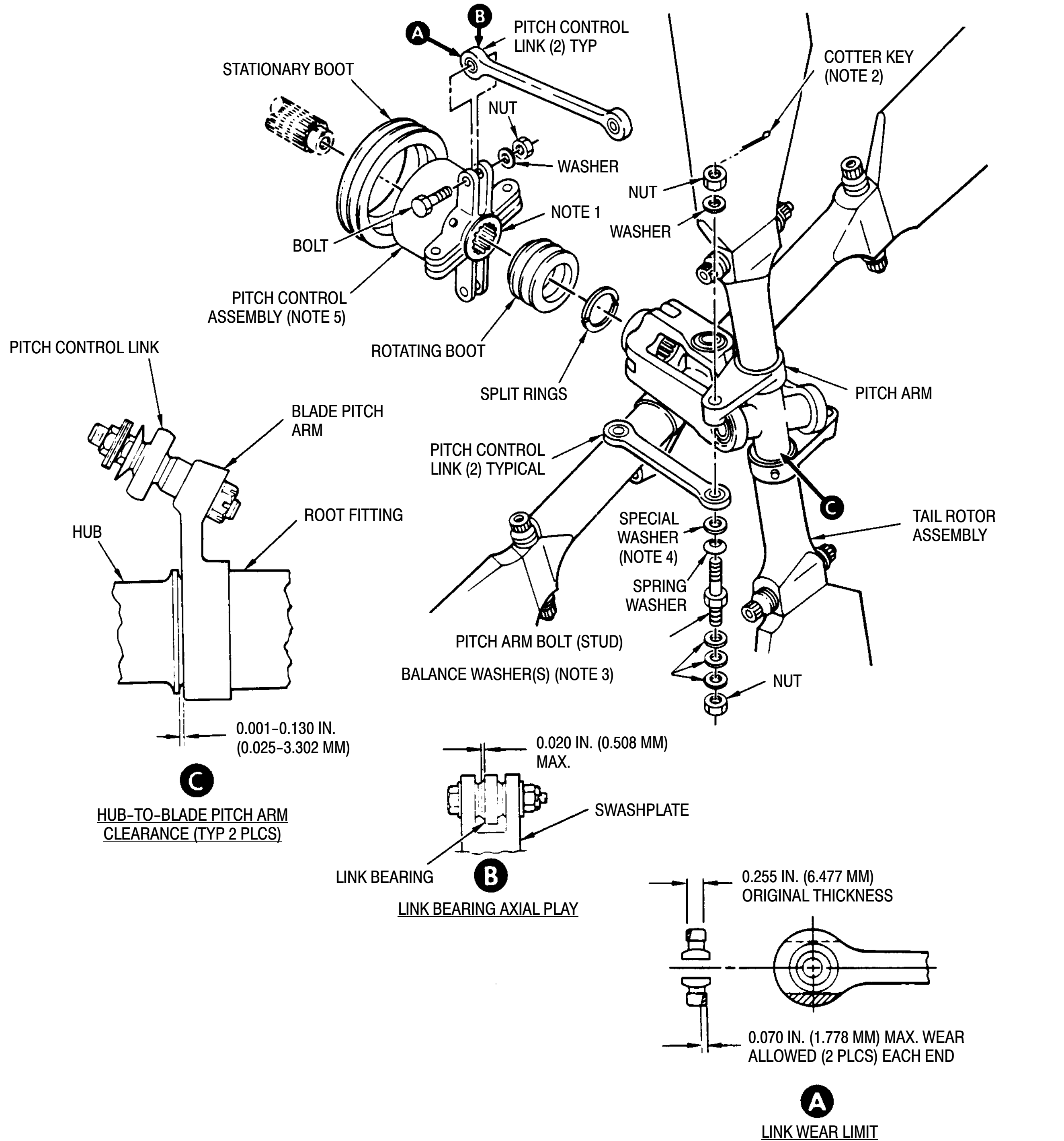


Figure 203. Tail Rotor Pitch Control Assembly (Two-Bladed)



NOTES:

1. CENTERLINE TOOTHSPACE MATCHMARK MUST ALIGN WITH CENTERLINE TOOTHSPACE MARK ON FORK WHEN ASSEMBLED ON OUTPUT SHAFT.
2. INSTALL WITH WET PRIMER.
3. QUANTITY (IF ANY) DETERMINED BY BALANCE REQUIREMENTS.
4. REDUCE OUTER DIAMETER.
5. FOR DISASSEMBLY, REFER TO CSP-COM-5.

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Figure 204. Tail Rotor Pitch Control Assembly (Four-Bladed)

(6). Install washer and nut on end of the bolt that extends through pitch arm. Torque nut to **50 - 60 inch-pounds (5.65 - 6.78 Nm)**; install cotter pin with wet primer (CM318).

(7). Check for clearance between pitch link and tail rotor hub pivot bolt.

(8). If removed from pitch arm bolt, install balance washer(s) of same color code as pitch control arm and secure with nut.

4. Tail Rotor and Pitch Control Assembly Repair

(Ref. Figure 203 and Figure 204)

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM801	Abrasive paper, silicon carbide

Repair allowable surface defects on fork and hub that may be reworked by using grade 320 abrasive paper (CM801) to round out and blend defect. Apply exterior surface touchup treatment and paint touchup (Ref. Sec. 20-30-00). (Repairable damage limits are defined in the Component Overhaul Manual.)

5. Tail Rotor Pitch Control Assembly Inspection

(Ref. Figure 203 and Figure 204)

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM115	Grease, oscillating bearing
CM234	Solvent, dry-cleaning
CM801	Abrasive paper, silicon carbide
CM803	Crocus cloth

(1). If tail rotor control system drag or friction is suspected, use spring scale (Ref. Figure 201) to measure drag (sliding friction) of pitch control assembly on shaft of tail rotor transmission. Note that pitch control links, Sta. 284 bellcrank and rubber boots must be detached from the assembly during drag check. If drag exceeds three pounds (13.4 N), remove pitch control assembly and clean swashplate and transmission shaft splines. Use solvent (CM234) and grade 400 abrasive paper (CM801) or crocus cloth (CM803). Clean again with solvent (CM234) and coat output shaft splines with light film of grease (CM115).

(2). Inspect fork and hub for scratches, nicks, dents, cracks, corrosion and similar surface defects. Check for wear caused by rubbing of aluminum support. Scratches and nicks that do not exceed 0.005 inch (0.127 mm) depth, 0.120 inch (3.048 mm) depth at inside corner of fork, may be repaired (Ref. COM). Worn areas resulting from rubbing of aluminum support up to 0.060 inch (1.524 mm) depth may be repaired (Ref. COM).

(3). Check wire-spring split ring halves for damage.

(4). If brinelling wear of inner surfaces of swashplate clevis ears is detected, 0.003 inch (0.076 mm) depth is allowable without rework or repair. For wear of greater depth, Ref. COM, for limits and allowable repairs.

(5). If there is evidence of swashplate contact with housing, check that minimum clearance of 0.010 inch (0.254 mm) exists through 360 degrees of rotation with axial loading applied. If contact is apparent or if axial play can be measured, replace swashplate or bearings (Ref. COM).

NOTE: Wobble may be accurately measured by attaching dial indicator support to tail rotor drive fork, with indicator probe contacting swashplate clevis ear. Use care not to allow pitch control assembly to slide on output shaft while measuring wobble.

(6). If pitch control assembly wobbles on transmission output shaft, up to 0.020 inch (0.508 mm) is allowable. If greater amount of wobble is present, replace swashplate, pitch control housing, bearings (Ref, COM) or the complete assembly.

(7). Check that hub-to-blade pitch arm clearance is 0.001-0.130 inch (0.025-3.302 mm).

(8). Inspect all bolts and nuts for security.

(9). Inspect boots for installation and deterioration.

(10). Perform following inspections for pitch control bearings at times specified (Ref. Sec. 05-20-00) and when bearing condition is questionable.

(a). Remove cotter pin, nut, washers and bolt securing Sta. 284 bellcrank to transmission. Separate pivot pin on bellcrank from pitch control assembly.

(b). Rotate pitch control housing by hand; check for rough, binding or hard turning. Inspect for grease leakage. If any of these conditions exist, remove pitch control assembly and inspect for further evidence of damage.

(c). Check that self-aligning bearing on underside of pitch control housing is adequately lubricated (packed approximately 40 percent full) with grease (CM115), is movable and is serviceable.

(d). Ensure that pivot pin on Sta. 284 bellcrank is lubricated with grease (CM115). Position bellcrank to engage pivot pin with pitch control assembly. Secure bellcrank to transmission with bolt, washers, nut and cotter pin.

NOTE: For more detailed information, refer to inspection, damage, wear and repair limits, and requirements for pitch control assembly (Ref. COM).

(11). Inspect for evidence of rotational binding by hand-turning tail rotor assembly a few turns while listening for unusual sounds. If condition is questionable, perform applicable inspection.

6. Tail Rotor Blade Stop Inspection

NOTE: Change of blade pitch angle when tail rotor is not rotating can produce audible snapping noise. Noise results as laminations of blade strap pack are twisted and bent without a centrifugal load. Such noise is normal and does not indicate a defect.

(1). Teeter blades back and forth and check for evidence of abnormal binding. Some stiffness is normal, especially when blade stop is newer.

(2). Inspect blade stop for deterioration. Be sure to check for cracking or splitting in stem area of stop. Allowable wear for rubber stop is to surface of aluminum support. Stop (and support) may be rotated 90 degrees if stop is excessively worn at contact point. Replace rubber stop if damaged, or if worn area cannot be rotated away from contact point.

NOTE: If replacement of stop support is required, replace with one-piece stop support and retaining nut.

(3). Check aluminum support for condition and wear. Replace aluminum support if damaged, or if excessive wear reduces clearance between tail rotor blade and tail boom to less than 0.50 inch (12.70 mm) minimum. Measure allowable clearance between tip of tail rotor blade and tail boom while holding hub against support, and with assistant applying full right tail rotor pedal.

NOTE: For any questionable items, refer to complete and detailed inspection, damage, wear and repair limits, and requirements for tail rotor assembly in COM.

7. Tail Rotor Pitch Control Link Inspection

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

(1). Maximum axial play for bearing in pitch control link is 0.020 inch (0.508 mm).

NOTE: Since bearing wear usually occurs only at blade pitch control arm from displacement during operation, links can be reversed and continued in service until either or both bearings exceed wear tolerance.

(2). Replace pitch control link if worn beyond 0.070 inch (1.778 mm) limit. If wear area(s) are within limits, touch-up with primer (CM318) and paint (Ref. Sec. 20-30-00) at inspection.

8. Tail Rotor Conical Bearing Inspection

(1). Play is not permitted in conical drive fork bearings (Ref. COM).

9. Tail Rotor Pitch Bearing Inspection

NOTE: In the following step, physical check for pitch bearing wear that causes root fitting play on hub can be made by holding one blade firmly and measuring flapping play at tip of opposite blade. Measured play indicates combined wear of pitch bearings.

(1). Maximum allowable pitch bearings play is 0.250 inch (6.350 mm).

10. Tail Rotor Swashplate Bearing Regreasing

(Ref. Figure 205)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM111	Grease, aircraft
CM217	Isopropyl alcohol

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST608	Pitch control assembly holding block
ST609	Adapter, torque wrench

(1). Remove tail rotor from helicopter (Ref. 64-20-00, Tail Rotor Hub and Fork Replacement).

(2). Remove swashplate from helicopter (Ref. Tail Rotor Pitch Control Assembly Replacement).

(3). Remove pitch control links from swashplate assembly.

CAUTION Tail rotor swashplate bearings cannot be removed from housing without damage to the bearings. If bearings are removed from housing, install new bearings.

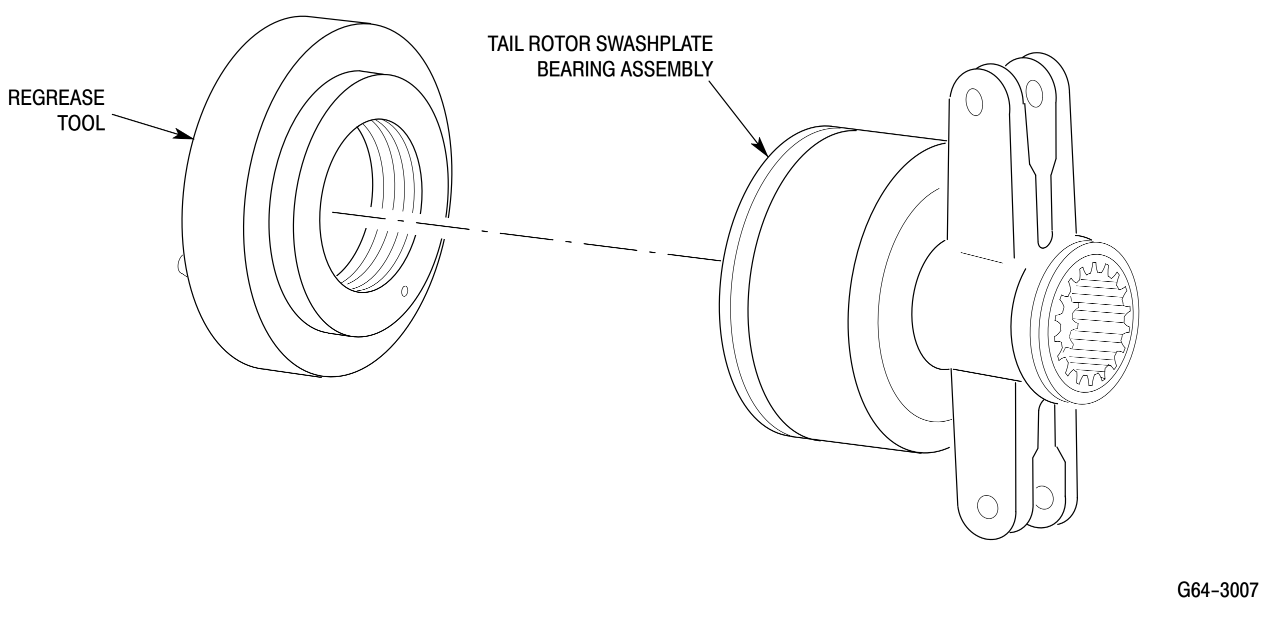


Figure 205. Tail Rotor Swashplate Bearing Regreasing

NOTE: For 4- Bladed tail rotor swashplates, holding block (ST608) will need to be modified. Accomplish modification, or build new block, as per Figure 207.

(4). Using wrench (ST609) and holding block (ST608), Remove nut and tang washer from threaded end of swashplate. Discard tang washer.

(5). Carefully remove bearing grease seal at gearbox end of housing (seal will be reused at reassembly).

(6). Inspect seal for damage; no damage is allowed.

(7). Install regreasing tool (Ref. Figure 206) and plug tang washer groove with locally fabricated plastic wedge (or equivalent plug).

NOTE: The following procedure provides 100% grease fill. Normal grease fill is 20 to 40%. Excess grease will extrude past seals for several hours of operation until the proper level is met.

(8). Purge bearings with grease (CM111).

(a). Purge bearings slowly to prevent damage to outer seal.

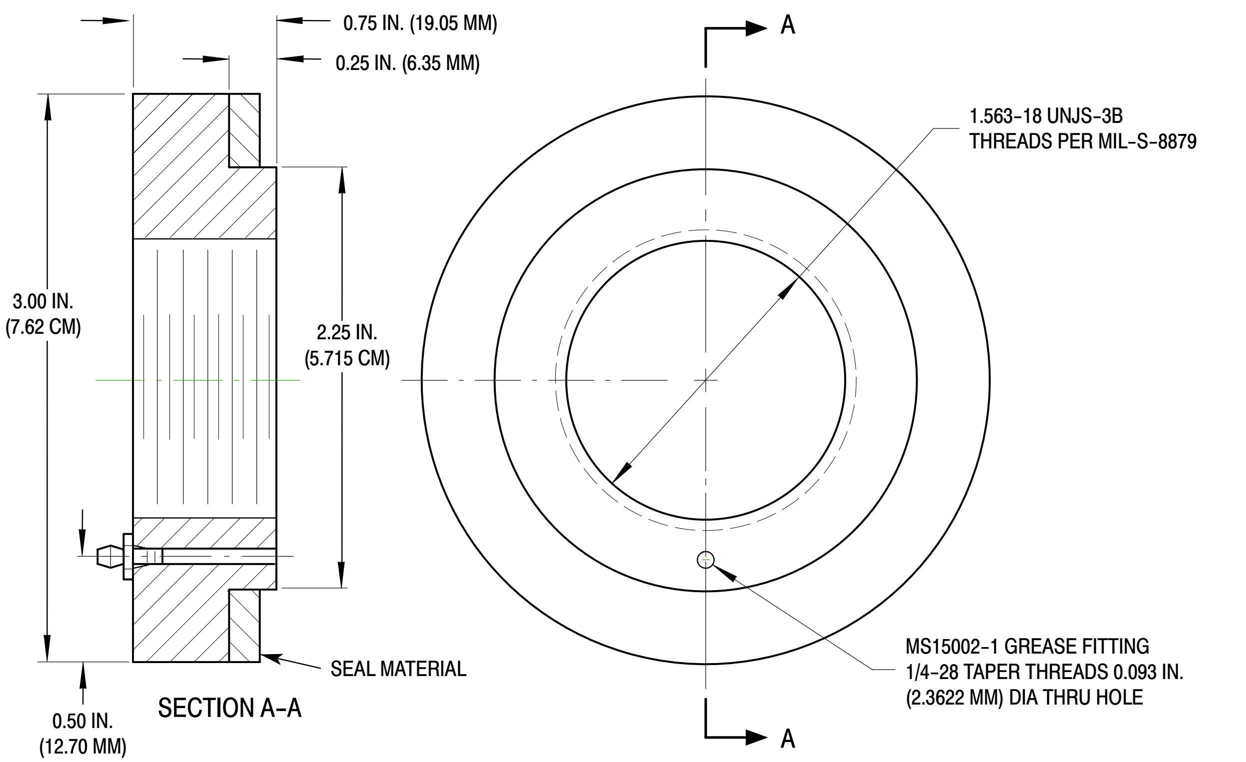
(b). Rotate bearings while greasing.

(9). Remove plastic wedge (or equivalent plug) and regreasing tool.

(10). Hand rotate bearing to remove excess grease.

NOTE: Ensure seal is serviceable. If new seal is required, seals and bearings must come from the same vendor.

(11). Install serviceable seal.



MATERIAL:
1. MATERIAL 6061-T651 ALUM PER QQ-A-250/11 OR EQUIVALENT.
2. SURFACE FINISH 125 RMS.
3. BREAK SHARP EDGES 0.002-0.015 IN. (0.051-0.381 MM).
4. CHEMICAL FILM TREAT PER MIL-C-5541.
5. DIMENSIONAL TOLERANCE ±.030 IN. (±0.762 MM); DIAMETERS TO BE CONCENTRIC TO CENTERLINE WITHIN 0.002 IN. (0.051 MM).

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Figure 206. Tail Rotor Swashplate Bearing Regreasing Tool

NOTE: Using a 5X to 10X magnifying glass, inspect tang washer center tang to ensure it is acceptable (Ref. Figure 208).

(12). Install nut with a new tang washer. Using wrench (ST609) and holding block (ST608), torque nut to **550 - 600 inch-pounds (62.14 - 67.79 Nm)**.

(13). Bend one tang of washer into any aligned slot on nut.

NOTE: Avoid getting alcohol in bearings.

(14). Clean surface of locknut and swashplate with a lint-free cloth dampened with alcohol (CM217).

NOTE: Avoid getting torque seal in swashplate splines.

(15). Apply a 0.125 inch (3.175 mm) wide torque strip, using torque seal or equivalent, to surface of swashplate assembly and locknut in two places (Ref. Figure 208).

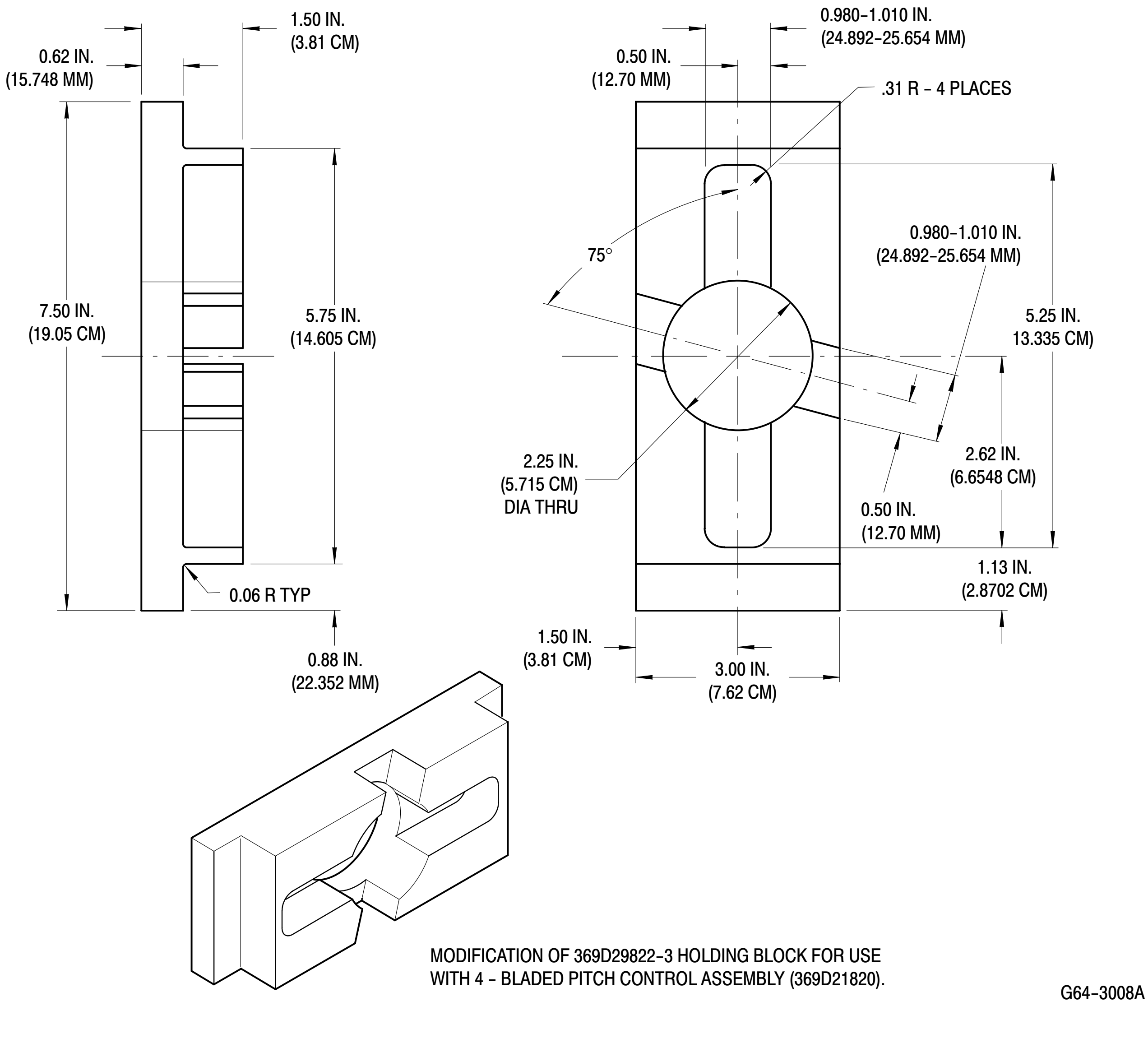

Figure 207. Tail Rotor Swashplate Holding Block

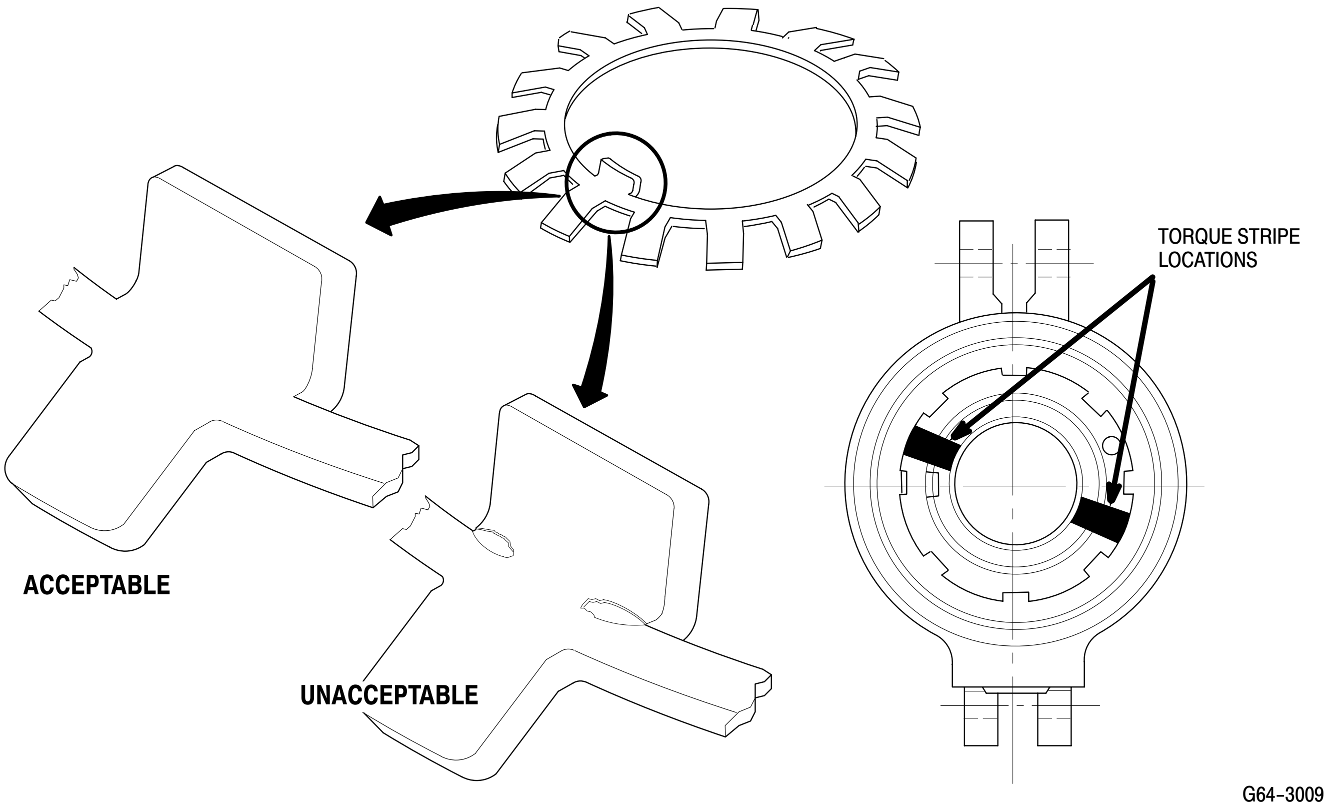

Figure 208. Tang Washer Inspection and Application of Torque Stripe

Chapter

67

Flight Controls

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Section

67-00-00

Flight Controls (369D/E/FF - 500/600N)

FLIGHT CONTROLS
FAULT ISOLATION

1. Main Rotor Flight Control System Troubleshooting

CAUTION Ensure that rotor controls are not struck by any object. Many of the components are highly stressed and must not be returned to service if surface damage occurs. When maintenance work is performed near engine air inlet, comply with precautions (Ref. Chap. 71) to prevent entry of foreign objects.

Troubleshooting information is divided into: (1) investigation of main rotor vibrations (Ref. Chap. 62); (2) investigation of symptoms (Ref. Table 101); and (3) isolation of troubles (Ref. Table 102).

First determine which major installation is defective. Isolate each linkage installation from others until area of malfunction is located. Then investigate and determine exact location of malfunction and repair or replace defective component(s). Since first indication of trouble usually is felt at cyclic or collective pitch stick, isolation procedures in Table 101 and Table 102 begin with symptoms detected during operation of these controls.

WARNING **Sudden onset of excessive and/or unusual main rotor vibrations should be investigated as to cause, prior to continued flight. Under no circumstance should main rotor tracking be attempted to correct the problem until a thorough inspection of the main rotor blades, hub assembly and strap pack assembly has been performed.**

2. Anti-Torque Flight Controls

Anti-Torque flight controls consist of anti-torque pedals, torque tube, floor-routed control tube, tunnel-routed control tube, Sta. 120 control tube and tail boom control rod transmitting input through a series of bellcranks and idlers.

3. Anti-Torque and Control System Troubleshooting

Troubleshooting information is divided into (1) investigation of operational vibration problems originating with the tail rotor or symptoms that can be recognized (Ref. Chap. 64) and (2) isolation and localization of an unusual controls malfunction (Ref. Table 103 or Table 104).

4. Stability Augmentation System Troubleshooting

Troubleshooting the Yaw Stability Augmentation System (YSAS) shall be performed using the wiring diagram (Ref. Figure 101) in conjunction with the fault isolation tree (Ref. Figure 102) and the ground test box (Ref. Figure 103).

Troubleshooting the YSAS by field maintenance personnel shall be limited to isolating the trouble to a malfunctioning or defective system unit/component.

For removal or replacement of YSAS components refer to applicable section.

WARNING **Death or injury can occur if proper safety precautions are not taken while performing electrical system checks with electrical power on.**

CAUTION Maintenance personnel other than approved manufacturer's representative shall not attempt to repair any part of the YSAS system.

Table 101. Troubleshooting Main Rotor Controls

Symptom	Probable Trouble	Corrective Action
Cyclic stick pressure in one direction; hands off condition - stick drifts in direction of pressure.	Check for continuity between pin S and pins R, U, V, and X of connector(s) P109 and/or P130.	If continuity exists, replace cyclic trim switch, Cyclic Stick Grip Switch Replacement (Standard Grip).
Symptom remains.	Isolate wiring to circuit components. Check for short circuit between ground and suspect trim mode circuit.	If short exists, repair as necessary. If short does not exist, replace cyclic trim actuator.
Cyclic control stick pressures cannot be reduced by operating trim switch.	Trim actuator inoperative.	Replace actuator.
	Defective components in trim actuator control circuit.	Troubleshoot control circuits: replace defective electrical component(s).
Trim change is too slow.	Defective trim actuator.	Replace actuator.
Cyclic control sticks have tendency to move to aft position.	Low fluid in one-way lock fluid reservoir.	Add fluid to one-way lock reservoir.
Inadequate cyclic control during flight.	Helicopter loaded out of center of gravity range.	Check and correct weight and balance.
	Incorrect cyclic rigging.	Correct cyclic rigging.
Excessive pressure required for lateral and/or longitudinal movement of cyclic control stick on ground and during flight. (Some droop friction is always felt when there is no rotor rpm.)	Lateral and/or longitudinal friction device improperly adjusted.	Loosen lateral and/or longitudinal friction device.
	Swashplate spherical bearing surface damaged.	Replace swashplate bearing assembly if torque required to rotate bearing exceeds 32 inch-pounds (3.61 Nm).
	Scissors crank bearings or hub lower shoe bearings binding or frozen.	Replace defective bearings.
	Lateral and/or longitudinal interconnecting rod end bearing binding due to incorrect alignment.	Realign rod end bearing.
	Droop stop plungers sticking.	Clean plungers and mating shoe bushings with isopropyl alcohol (CM217).
	Droop stop followers, rollers and/or stop ring rusty or corroded.	Apply rust inhibitor and lubricants (CM204) to followers, rollers and droop stop ring.
	Droop stop striker plate(s) or cam roller(s) damaged.	Replace striker plate and/or cam roller.
	One-way lock check valve, or push rod shaft that unseats the valve, is galled or seized.	Replace one-way lock assembly.

Table 102. Isolating Main Rotor Control System Troubles

Symptom	Isolating Step	Corrective Action
Binding, locking-up and erratic action of cyclic control stick.	Disconnect one-way lock.	If symptom gone, replace one-way lock.
Symptom remains.	Disconnect upper ends of longitudinal and lateral control rods.	If symptom gone and rod ends are serviceable, disassemble and inspect main rotor mixer controls until defective part is located.
Symptom remains.	Reconnect upper ends of longitudinal and lateral control rods, and disconnect lower ends.	If symptom gone and rod ends are serviceable, disassemble and inspect pilot compartment controls until defective part is located.
Trouble corrected (Reconnect all control linkage).		
Binding, locking-up and erratic action of collective control stick.	**CAUTION:** Before disconnecting collective pitch control rod, install collective bungee installation tool (ST508) to prevent spring reaction on control rod.	
	Disconnect upper end of collective pitch control rod and operate stick.	If symptom gone and rod end is serviceable, disassemble and inspect main rotor mixer controls until defective part is located.
Symptom remains.	Leave upper end of collective pitch control rod disconnected.	Trouble is in pilot compartment collective control linkage.
Symptom remains.	**WARNING:** Do not disconnect any hardware from pilot‘s collective stick unless collective bungee installation tool (ST508) is installed. Strong bungee spring pressure can cause linkage reaction and severe personal injury, or parts damage.	
	Disconnect gas producer control rod from collective stick. Disconnect droop control override link from collective controls torque tube.	If symptom gone, trouble is in engine controls.
Symptom remains.	Leave gas producer control rod and droop control override link disconnected.	Disassemble and inspect pilot compartment collective control linkage until defective part is located.
Trouble corrected (Reconnect all control linkage)		

Table 103. Isolating Tail Rotor Control System Troubles

Symptom	Isolating Step	Corrective Action
Binding, locking up and erratic action of foot pedals. (Do not force controls)	Disconnect pitch control links from pitch control assembly.	If symptom gone, replace tail rotor assembly or repair (Ref. COM).
Symptom remains.	Disconnect Sta. 284 aft boom bellcrank from pitch control assembly.	If symptom gone, clean swashplate bore and output shaft splines. Lubricate splines. Replace swashplate if necessary. Check for elongation of bolt hole in support arm portion of main housing assembly of tail rotor gear box, caused by looseness of bellcrank fulcrum bolt and nut. Repair (Ref. COM).
Symptom remains.	Disconnect floor-routed tail rotor control rod from foot pedal torque tube fitting.	If symptom gone, inspect tail rotor control rods and bellcranks until defective part is located.
Symptom remains.	Loosen foot pedal torque tube brackets mounted on front of floor structure.	If symptom gone, pedal torque tube misaligned; shim for correct alignment. If symptom remains, disassemble and inspect tail rotor foot pedal installation until defective part is located (same section).
Trouble corrected.		

Table 104. Anti-torque Fan System Troubleshooting

Symptom	Probable Trouble	Corrective Action
Excessive resistance against pedal movements.	Binding in controls linkage.	Isolate damage or obstruction and remove.
	Restriction against rotating cone.	Isolate restriction or damage and remove.
Binding, locking up or erratic action of pedal movement.	Control rod or cable restrictions or misalignment.	Inspect control rod and control cable connections, rod end condition and bearing movement, replace components as required.
Pedals feel rachety.	Flat spotting on thruster rollers.	Replace rollers (Ref. Sec. 53-40-30).
Degraded movement or response of fan control linkage.	Restriction or malfunction at splitter assembly.	Inspect splitter range and freedom of movement.
	Degraded travel of force limiting control rod or diffuser bellcrank connections.	Isolate damage or malfunction and replace components.
	Incorrect rigging.	Correct rigging.
Inadequate anti-torque/directional movement or response during flight.	Incorrect rigging.	Correct rigging.

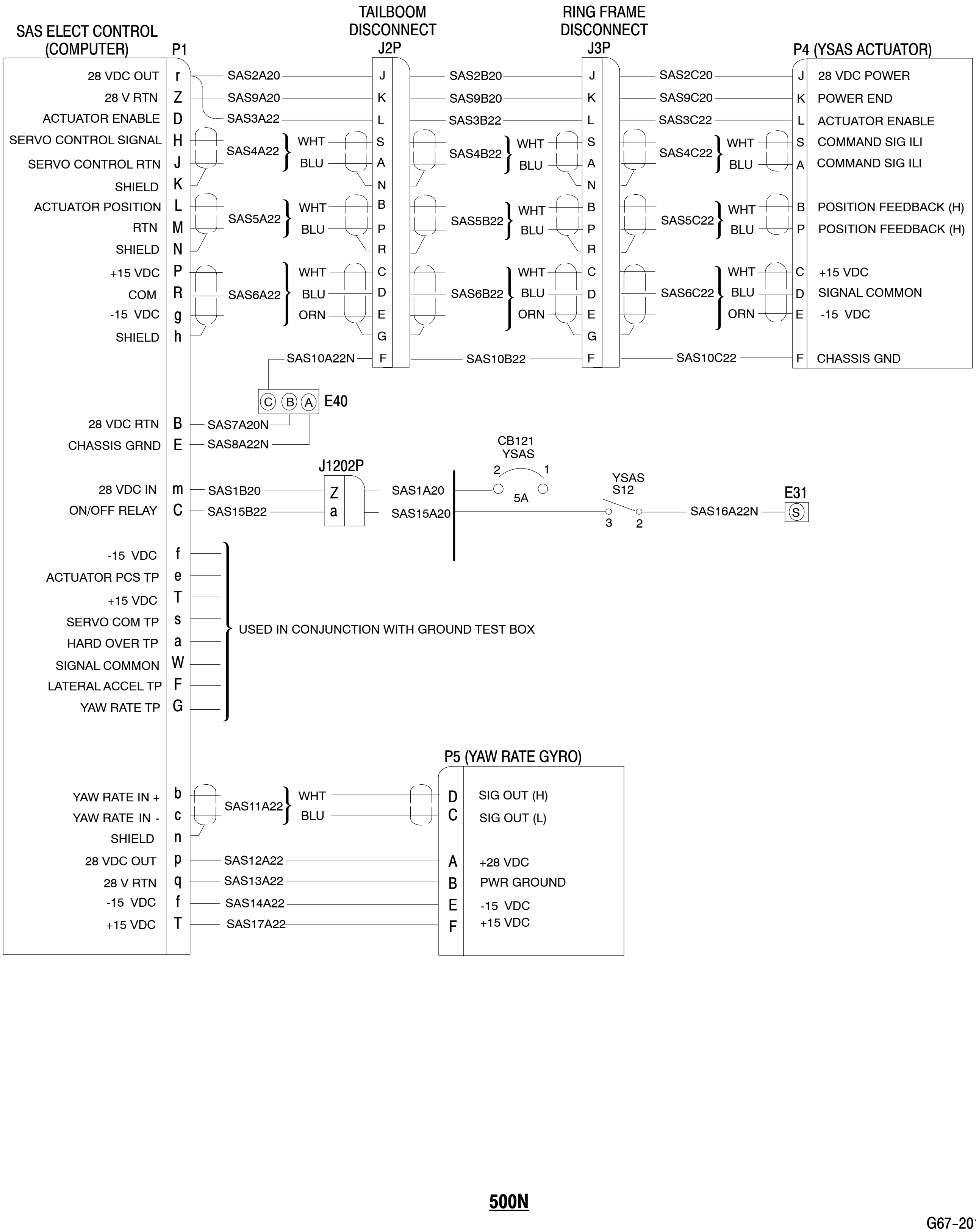

Figure 101. YSAS Electrical Diagram (Sheet 1 of 2)

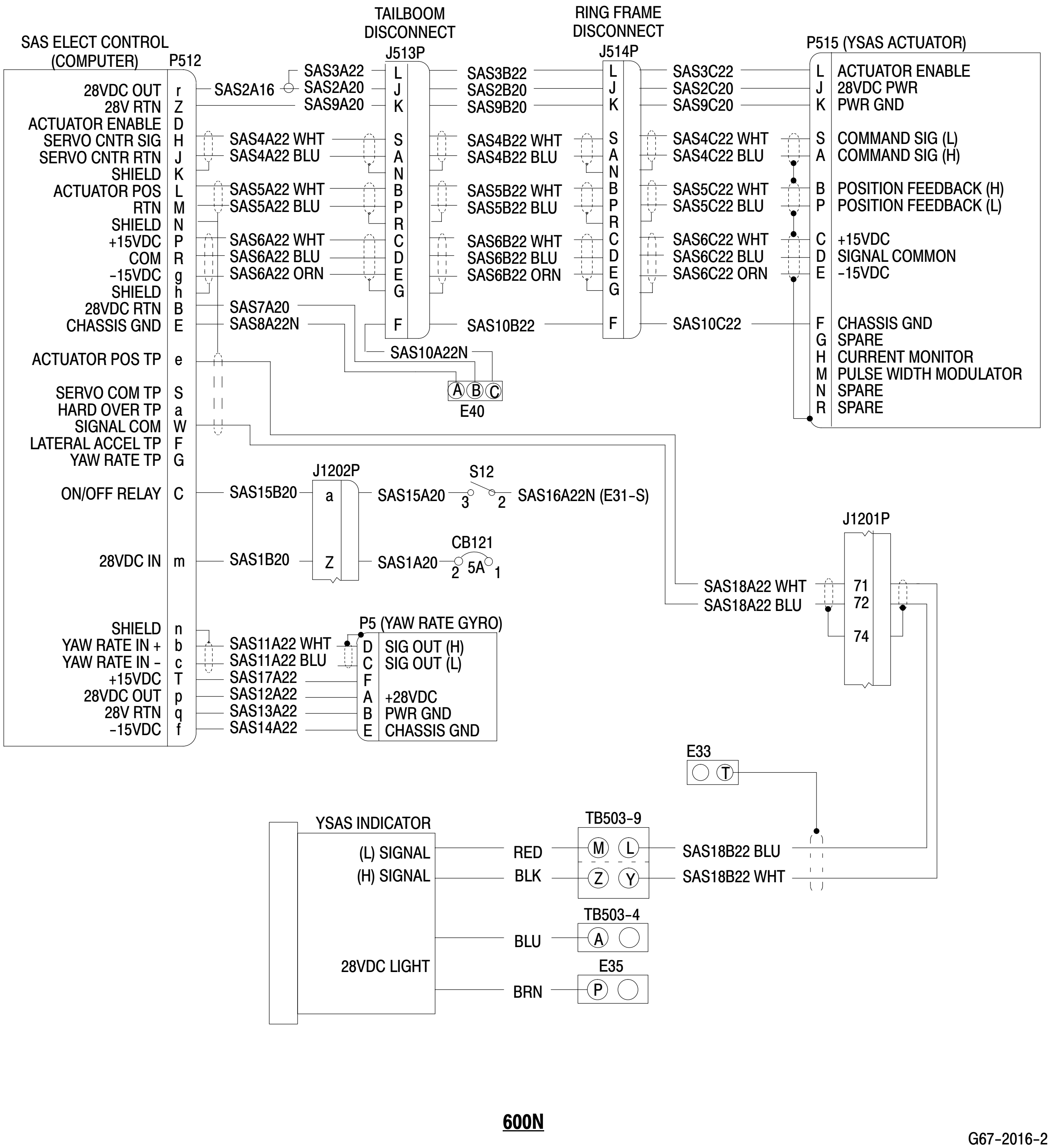

Figure 101. YSAS Electrical Diagram (Sheet 2 of 2)

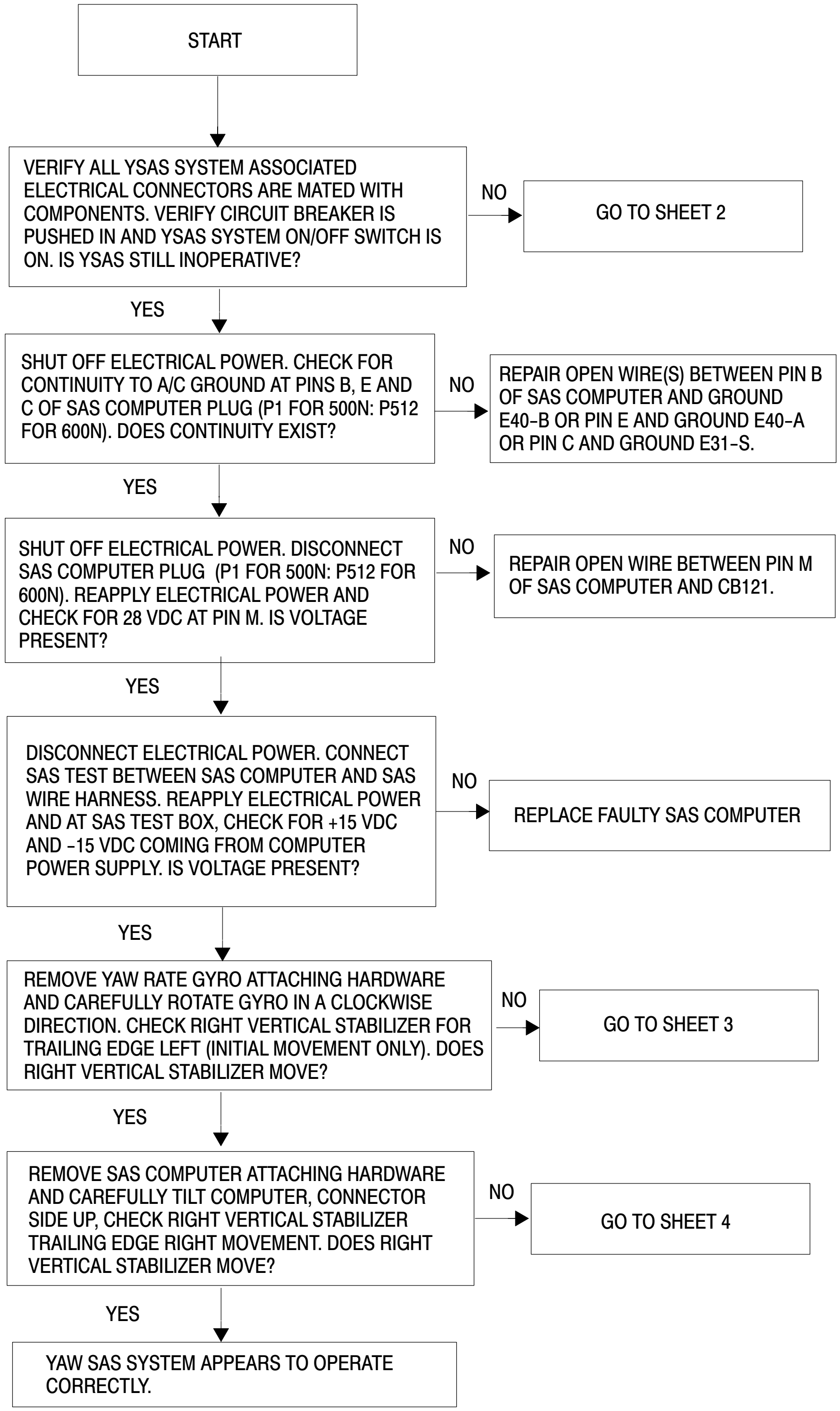

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Figure 102. YSAS Troubleshooting (Sheet 1 of 4)

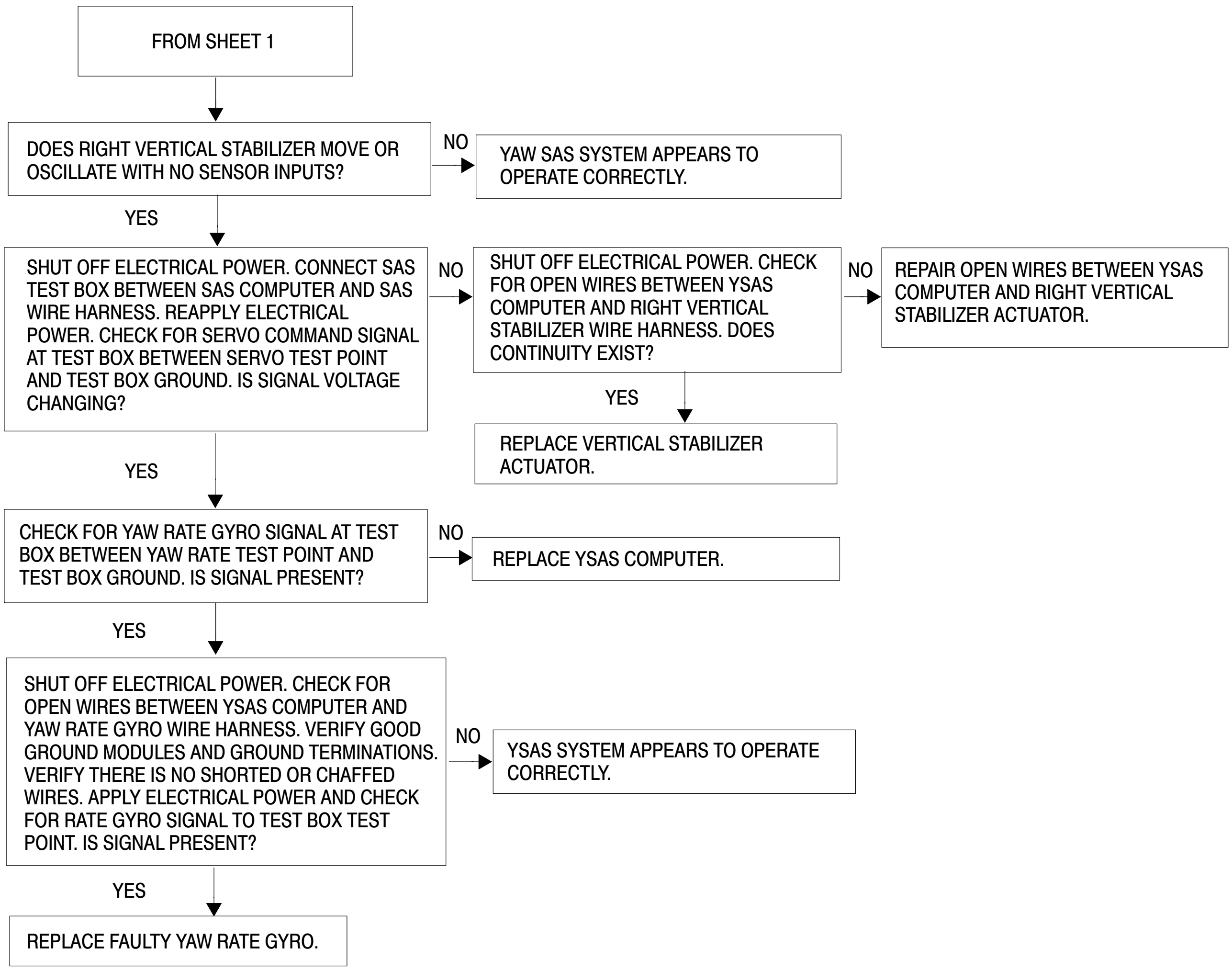

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Figure 102. YSAS Troubleshooting (Sheet 2 of 4)

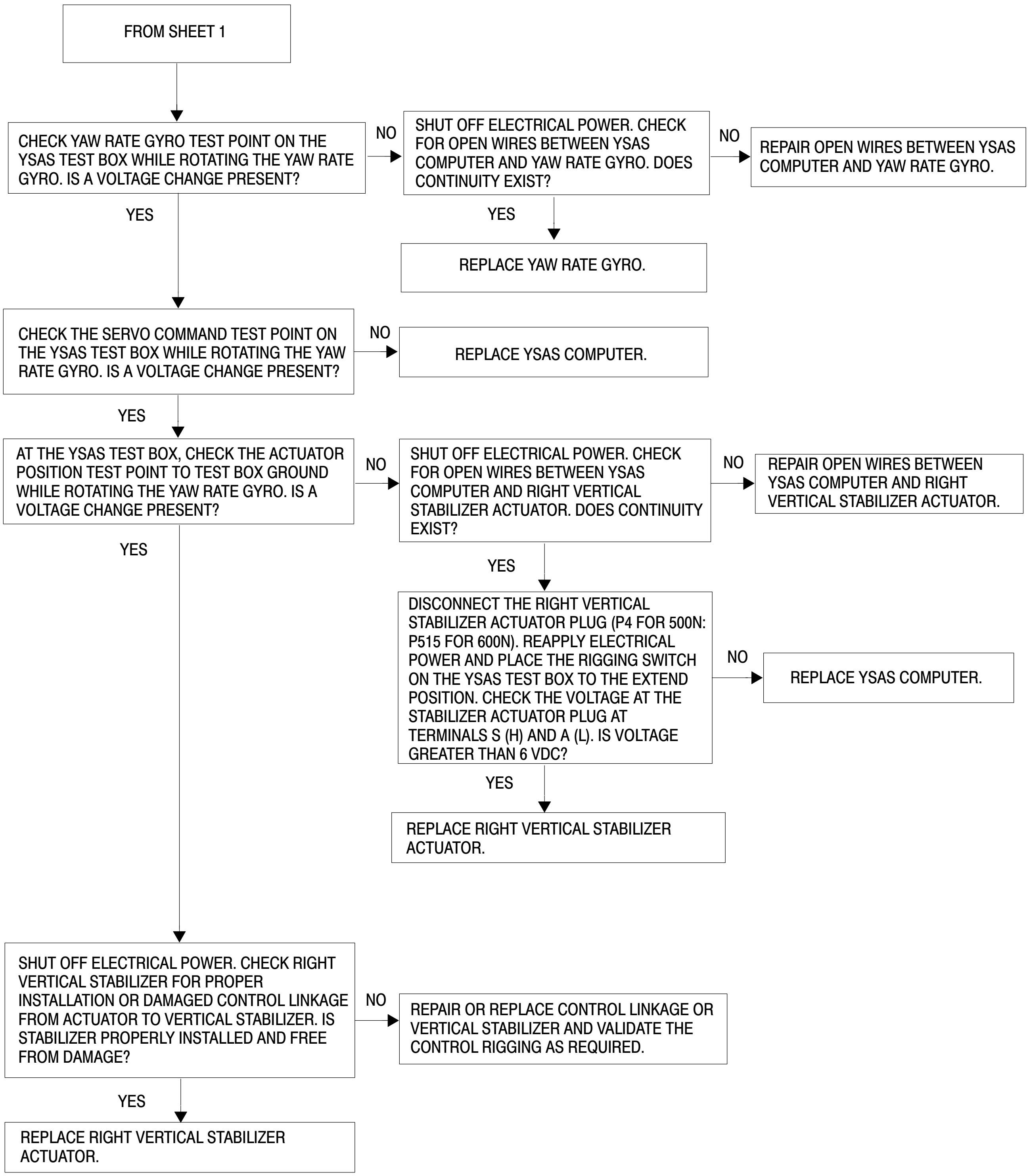

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Figure 102. YSAS Troubleshooting (Sheet 3 of 4)

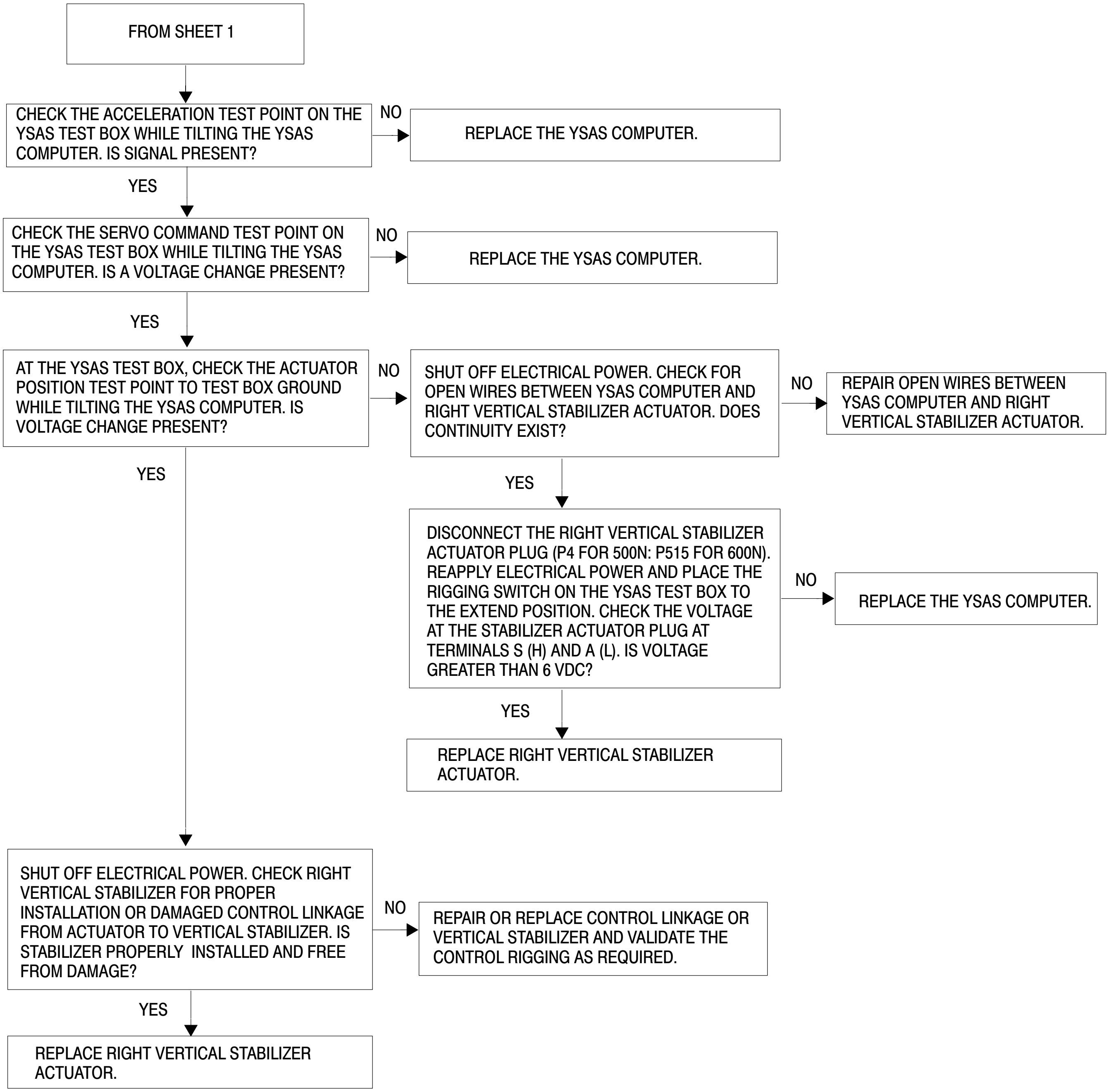

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Figure 102. YSAS Troubleshooting (Sheet 4 of 4)

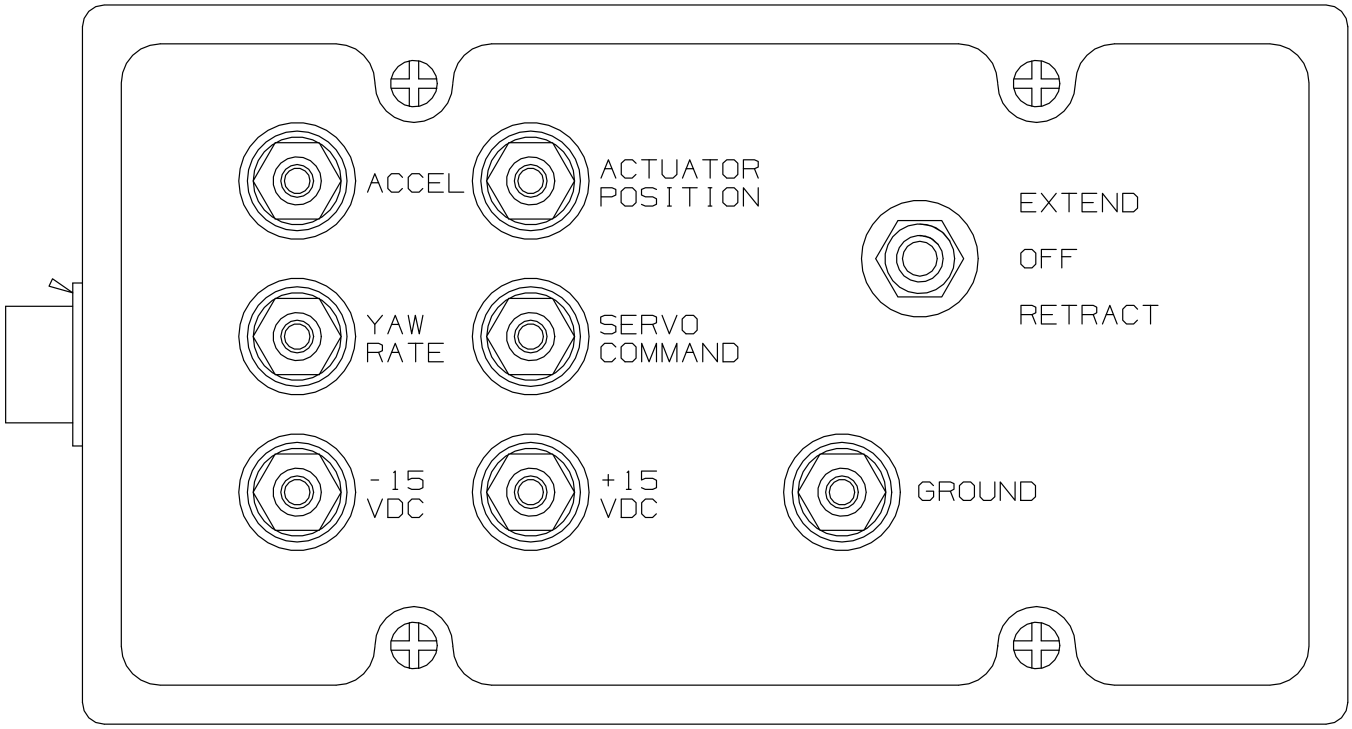


Figure 103. YSAS Ground Test Box

Section

67-10-00

Main Rotor Flight Controls (369D/E/FF - 500/600N)

MAIN ROTOR FLIGHT CONTROLS
DESCRIPTION AND OPERATION

1. Main Rotor Flight Controls

Main rotor flight controls consist of scissors, rotating swashplate, stationary swashplate, mixer controls (lateral bellcrank, longitudinal idler, collective pitch mixer bellcrank, longitudinal bellcrank, longitudinal control-mixer link, longitudinal link, and two mixer links) and five pitch control rods.

Movement of collective pitch cyclic control sticks is transferred to mixer controls through control rods routed up through the controls tunnel at the center of Sta. 78.50 bulkhead. Mixer controls transfer required combination of collective, longitudinal and lateral travel through swashplates to main rotor blades. The helicopter may be equipped with either right-hand or left-hand control configurations consisting of cyclic, collective and anti-torque controls. The main rotor hub and blades, swashplate and control linkage to the crew compartment controls are identical on either basic configuration.

NOTE: This section contains information for both L/H command and R/H command helicopters. Unless otherwise denoted, the information in this section pertains to both type helicopters.

A. Collective Mixer, Lateral and Longitudinal Mixer (Tunnel-Routed) Control Rods

Tunnel-routed control rods mechanically transfer displacement of flight controls to associated bellcranks and the idler at the front of main rotor mast base. All tunnel-routed control rods are removed, inspected, repaired and installed in same manner.

B. Controls Support Bracket and Bellcranks

The controls support bracket is below the pilot's seat cover, between right and left inboard sides of the seat structure. The bracket provides the hingeline for longitudinal and lateral idler bellcrank, tail rotor bellcrank, and the engine droop control bellcrank. It also provides inboard support for the collective torque tube.

C. Collective Controls

Pilot's compartment collective controls consist of collective pitch stick, collective bungee, and the interconnecting shaft and linkage. All components, except the stick and tunnel-routed collective mixer control rod, are located within the pilot's seat structure. Dual control provisions are incorporated into the pilot's compartment collective controls installation.

D. Pilot's Collective Pitch Stick

The pilot's collective pitch stick consists primarily of a switch housing, throttle grip and friction mechanism, collective stick tube and friction mechanism and gas producer control shaft with right angle (pinion and bevel gear) drive. Collective pitch stick controls include: the N_1 throttle and idle stop release ring, N_2 governor trim switch, landing light switch, stick friction adjustment grip throttle friction nut and a starter-ignition switch.

E. Copilot's Collective Pitch Stick

The copilot's collective stick consists primarily of a switch housing, N_1 throttle grip, stick tube, and internal gas producer control shafts having right angle (pinion and bevel) gear drive. The gear drive linkage is essentially the same as in pilot's collective stick housing. Copilot's collective controls include an N_2 governor trim switch.

F. Collective Pitch Stick Friction

Pilot's collective pitch stick friction allows the pilot to vary amount of effort required to raise and lower the collective pitch stick as well as increasing stick resistance to position change resulting from sudden changes in main rotor collective forces. The grip is marked with arrows indicating direction of rotation for increasing or decreasing friction. Friction can be applied or released with one hand by rotating the friction adjustment grip.

CAUTION Collective stick friction mechanism is designed so that stick cannot be locked in maximum friction point. Safety of flight considerations require that pilot be able to instantly change any established collective pitch stick position, without changing friction adjustment in event of a power failure. There is no suitable check that pilot can make, with helicopter on the ground, to determine if maintenance adjustment of collective friction is correct. This is due to large force application necessary to override collective bungee and blades resting on droop stops. If stick friction is inadequate during flight, a maintenance check should be performed. Once friction adjustment is determined to be correct at low friction point, any further mechanical adjustment to alter (increase) friction at low point can cause stripping of mechanism when grip is fully rotated for maximum friction.

G. Collective Control Interconnecting Torque Tube

The collective interconnecting torque tube consists of the tube, bungee bracket, bungee fitting and a tube support bearing. The torque tube interconnects the pilot's collective pitch stick and the inboard collective stick socket assembly. The torque tube is supported at the left end by a bearing installed in seat structure, and at the right end by the controls support bracket.

H. Collective Bungee

The collective bungee installation consists of a male bearing assembly, female bearing assembly, spring and retainer. This unit attaches between the bungee over-center fitting and bungee bracket of collective interconnecting torque tube. The collective bungee helps maintain selected collective pitch stick position in flight by counteracting forces that are fed back in collective pitch stick(s) (blade pitching moments, rotor head strap pack torsion when collective pitch stick is raised or lowered from mid-position, and combined imbalance of forces in the controls system). Flight characteristics of the helicopter are such that collective forces are relatively low during most stick travel from low to high blade pitch. At a point near full pitch, stick forces reverse and become heavy. The purpose of the adjustable bungee and the overcenter bracket attachment is to counteract these forces so that collective stick loads are relatively constant throughout full range of travel. There are two adjustments provided to establish or correct collective flight loads. The collective bungee spring corrects variation in collective load from low pitch (level flight) to high pitch (climb). Setting of overcenter bolt to raise or lower bungee fitting reduces or increases overall collective forces in both low pitch (level flight) and high pitch (climb).

I. Inboard Collective Stick Socket Assembly

Inboard collective stick socket assembly is a cast magnesium housing that contains gas producer linkage and provisions for attachment of dual collective controls. Internal gas producer drive gear linkage is essentially the same as that in the pilot's collective stick housing with the addition of a splined N_1 pinion gear for simplified installation or removal of a copilot's collective stick. The lower end of the collective mixer (tunnel-routed) control rod is attached to the socket housing and the exterior bellcrank, idler and link transfer movement of the pilot's collective stick throttle to the gas producer controls routed through the fuselage to the engine.

J. Cyclic Controls

The cyclic pitch control system is a fully mechanical control system. Any combination of lateral and longitudinal cyclic pitch stick movement is mixed by cyclic lateral and longitudinal control mixers and transferred to the main rotor swashplate, which applies the combined motion through pitch control rods to the main rotor blades. Forward and rearward movement of the cyclic pitch stick causes helicopter motion in a longitudinal direction, while side-to-side movement provides motion in a lateral direction. This action varies lift developed by main rotor blades and serves as primary control by horizontal flight. Pilot's compartment cyclic controls include the control stick, a lateral interconnecting rod, lateral cyclic bellcrank, longitudinal cyclic control interconnecting torque tube and lateral and longitudinal friction mechanism.

K. Pilot's Cyclic Control Stick

The pilot's cyclic control stick consists of a grip and a tube riveted in a socket. The cyclic grip contains a toggle switch for cyclic trim control and a trigger switch for radio/interphone communication. A blank switch socket is provided at the left of the trim switch for optional equipment. Coiled, insulated and open-ended wiring is provided in the grip for connection to an optional switch.

L. Copilot's Cyclic Control Stick

The copilot's cyclic control stick is similar to the pilot's except electrical wiring exits above the stick socket. The copilot's cyclic stick is detachable and may be removed or installed by use of two quick-release pins.

M. Pilot's Compartment Lateral and Longitudinal Cyclic Control Linkage

Pilot's compartment lateral and longitudinal cyclic control linkage consists of two control rods and a bellcrank that interconnect lateral control movement, and the cyclic torque tube and one-way lock control system that interconnect longitudinal control movement of pilot's cyclic stick to tunnel-routed mixer control rods. R/H command configuration is identical to L/H command except for an additional lateral control rod that attaches lower end of copilot's cyclic control stick to lateral cyclic bellcrank.

N. One-W ay Lock Control System

The one-way lock of the cyclic control system is located in longitudinal control linkage within the pilot's seat structure. The one-way lock control system is essentially a self-contained, closed-loop hydraulic unit - consisting of a check valve, relief valve and pushrod mechanism. The check valve is seated when longitudinal control force (feed-back) originated by main rotor tends to move the one-way lock (and cyclic stick) in an aft direction. Seating the check valve prevents unwanted aft movement of cyclic stick and shunts feed-back force to helicopter structure. Normally, only very slight aft movement of the cyclic stick is required to unseat the check valve. Should the check valve (or pushrod shaft that unseats the valve) gall and freeze in the valve-closed position, a force of approximately 30 pounds is necessary to open the relief valve and bypass the check valve. This force is then required for each subsequent aft movement of the cyclic stick. Conversely, should the check valve spring fail, the one-way lock does not function to shunt longitudinal feedback forces to structure. The unit is mounted in two pivoting supports attached to seat structure, and has a transparent, vented reservoir with a capacity of approximately 0.67 fluid ounce (20 cc). The one-way lock control system is serviced through the filler with hydraulic oil (6, Table 203).

O. Cyclic Trim Actuators

Each of the two cyclic trim actuators consists of an actuator, housing support, trim tube and spring assembly. The actuator is essentially a motor-driven, variable length shaft that compresses a spring assembly, counteracting feedback forces from the main rotor and compensating for imbalance conditions such as those imposed by crosswinds or unevenly distributed cargo. Cyclic trim is controlled by the cyclic trim switch on top of cyclic stick grip. The cyclic trim switch has five positions: normally **OFF** at the center, and momentary **FORWARD, AFT, LEFT,** and **RIGHT**. When the trim switch is moved off center to any of the four trim positions, one of the trim motors operates to provide trim spring force in the desired direction. By momentarily activation of the switch, very small trim increments are obtained. Trim forces cannot be applied in two directions simultaneously; when both lateral and longitudinal trim corrections are required, it is necessary to apply first one, then the other. Travel of the cyclic pitch control stick is not limited by the cyclic trim mechanism; trim spring tension can be overridden at any time.

P. Roof-Mounted Control Rods (600N)

The roof-mounted control rods transmit cyclic and collective flight control input from the tunnel-routed control rods, via the forward roof-mounted bellcranks, to the link assemblies, via the aft roof-mounted bellcranks, at the mixer assembly.

Q. Roof-Mounted Bellcranks (600N)

The forward roof-mounted bellcrank transfer controls input from the tunnel-routed control rods to the roof-mounted control rods. The aft roof-mounted control rods transfer controls input from the roof-routed control rods to the link assemblies.

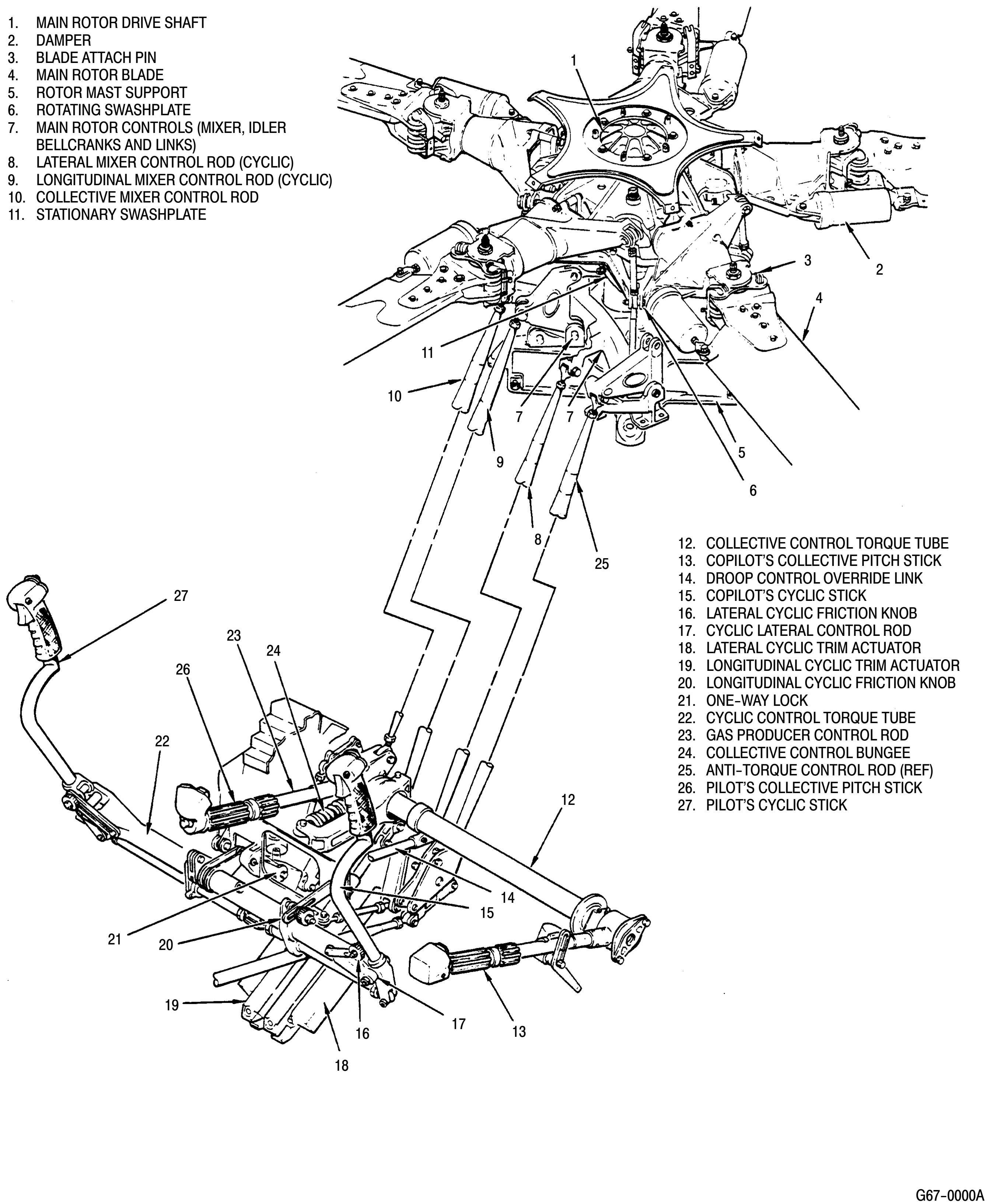


Figure 1. Main Rotor and Control System (369D/E/FF - 500N)

1. MAIN ROTOR DRIVE SHAFT
2. DAMPER
3. BLADE ATTACH PIN
4. MAIN ROTOR BLADE
5. ROTATING SWASHPLATE
6. MAIN ROTOR CONTROLS (MIXER, IDLER BELLCRANKS AND LINKS)
7. LATERAL MIXER CONTROL ROD (CYCLIC)
8. LONGITUDINAL MIXER CONTROL ROD (CYCLIC)
9. COLLECTIVE MIXER CONTROL ROD
10. COLLECTIVE CONTROL TORQUE TUBE
11. COPILOT'S COLLECTIVE PITCH STICK
12. COPILOT'S CYCLIC STICK
13. LATERAL CYCLIC FRICTION KNOB
14. CYCLIC LATERAL CONTROL ROD
15. LATERAL CYCLIC TRIM ACTUATOR
16. LONGITUDINAL CYCLIC TRIM ACTUATOR
17. LONGITUDINAL CYCLIC FRICTION KNOB
18. ONE-WAY LOCK
19. CYCLIC CONTROL TORQUE TUBE
20. GAS PRODUCER CONTROL ROD
21. COLLECTIVE CONTROL BUNGEE
22. ANTI-TORQUE CONTROL ROD (REF)
23. PILOT'S COLLECTIVE PITCH STICK
24. PILOT'S CYCLIC STICK

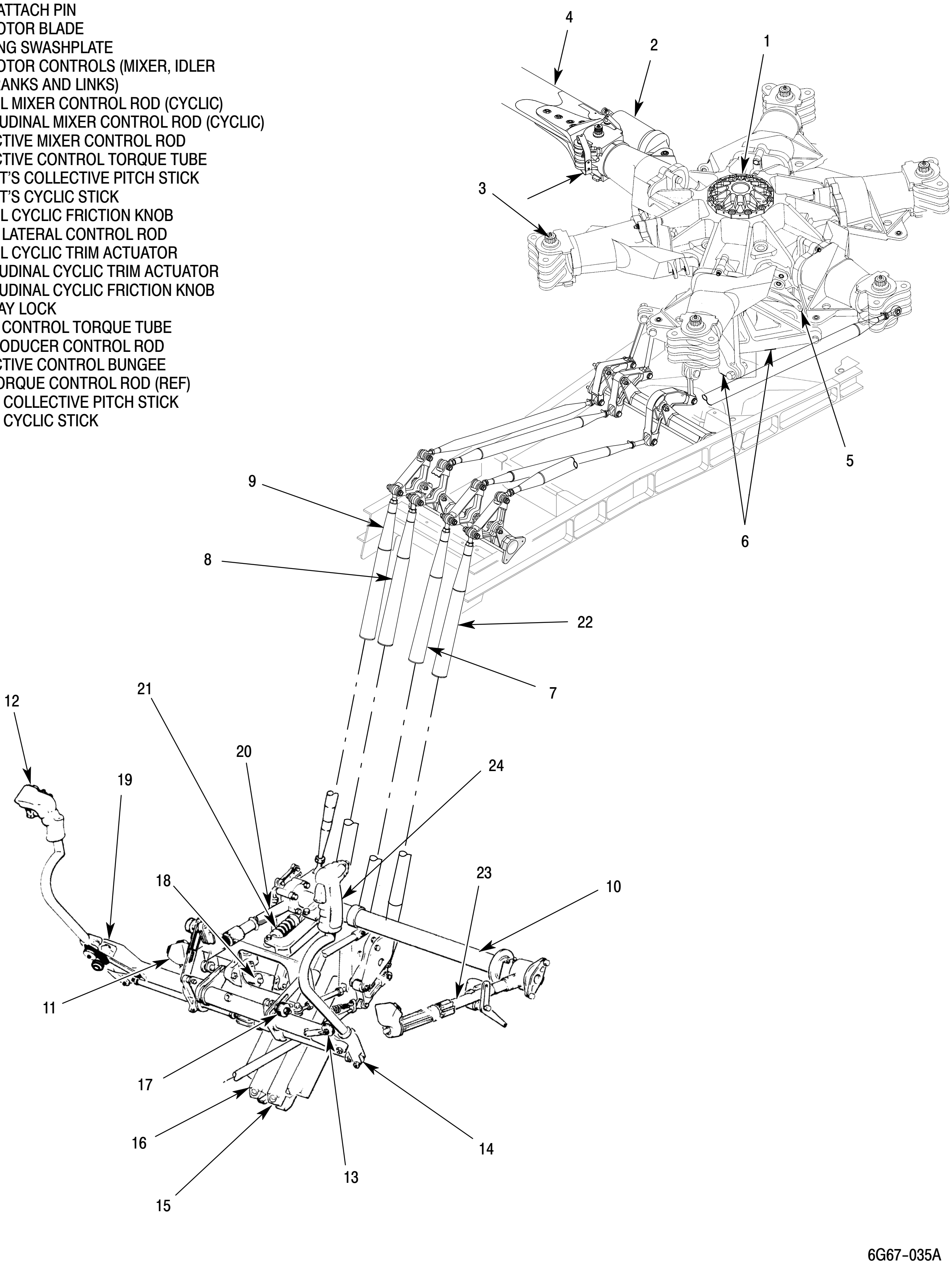


Figure 2. Main Rotor and Control System (600N)

MAIN ROTOR FLIGHT CONTROLS REMOVAL/INSTALLATION

1. Tunnel-Routed Control Rod Replacement

(Ref. Figure 401)

A. Tunnel-Routed Control Rod Removal

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST508	Collective bungee installation tool

WARNING **Before disconnecting collective pitch control rod, install collective bungee installation tool to prevent spring reaction due to droop stop load on control rod.**

(1). Install collective bungee installation tool (ST508) and remove collective bungee.

(2). For access to lower rod ends, remove controls access door at base of canted bulkhead in cargo compartment.

(3). Hand turn main rotor blades to align blue blade to right side of aircraft.

(4). Disconnect upper end of control rod.

(5). Remove double boot from control tunnel cover. All tubes will be removed through the double hole.

CAUTION Use care during removal of control rods. Any surface damage caused by hasty removal may result in unserviceable control rods.

(6). Move blue blade pitch housing down as far as it will go. This will allow the tubes to go past the housing.

(7). Remove bolts from bottom of 369A7009 and 7011 tubes.

(8). Move cyclic controls so that the 7012 tube moves to its highest point. Place 7009 tube to the far right and lower out of way. Lower 7011 tube to the left side of center beam. This will allow 7011 tube to angle up through the double hole.

(9). Remove bolt from bottom of 7012 tube and lower to belly of aircraft and angle up through the double hole.

(10). Remove bolts from bottom of 7007 tube and lower to the belly of aircraft, then angle up through the double hole.

(11). Move 7009 tube to the other side of center beam and angle up through the double hole.

B. Tunnel-Routed Control Rod Installation

To reinstall tunnel-routed control rods, reverse the sequence of Tunnel-Routed Control Rod Removal.

2. Roof-Mounted Control Rod Replacement (600N)

(Ref. Figure 402)

A. Roof-Mounted Control Rod Removal (600N)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST508	Collective bungee installation tool

(1). Install collective bungee installation tool (ST508) and remove collective bungee.

(2). For access to roof-mounted control rods, remove upper fuselage controls fairing.

NOTE: If same rods are to be reinstalled, mark rods for proper positioning upon reinstallation. If new rods are installed, main rotor flight controls must be re-rigged.

(3). Mark control rod for proper reinstallation.

(4). Remove hardware from control rods and remove rods from aircraft.

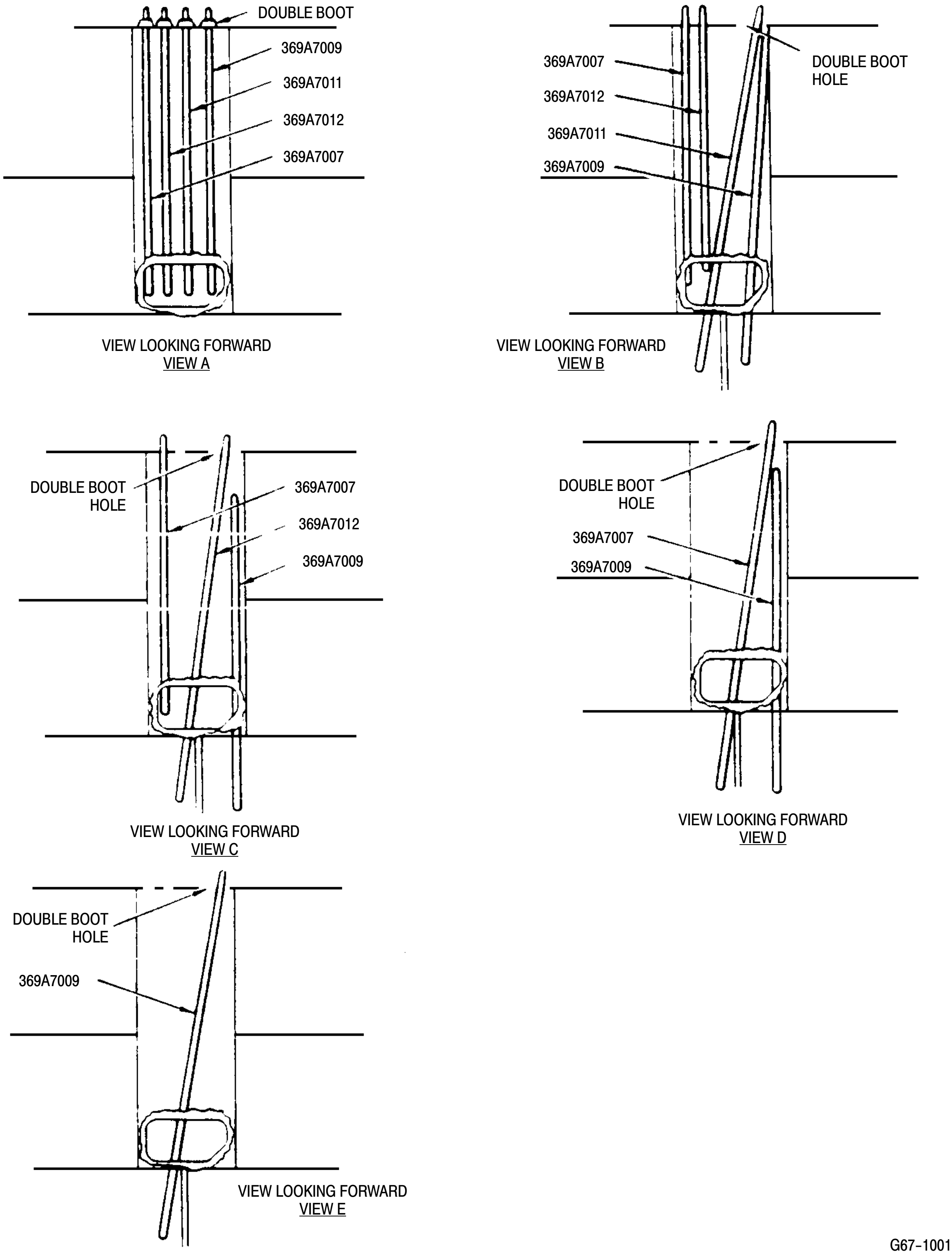


Figure 401. Tunnel-Routed Control Rod Installation

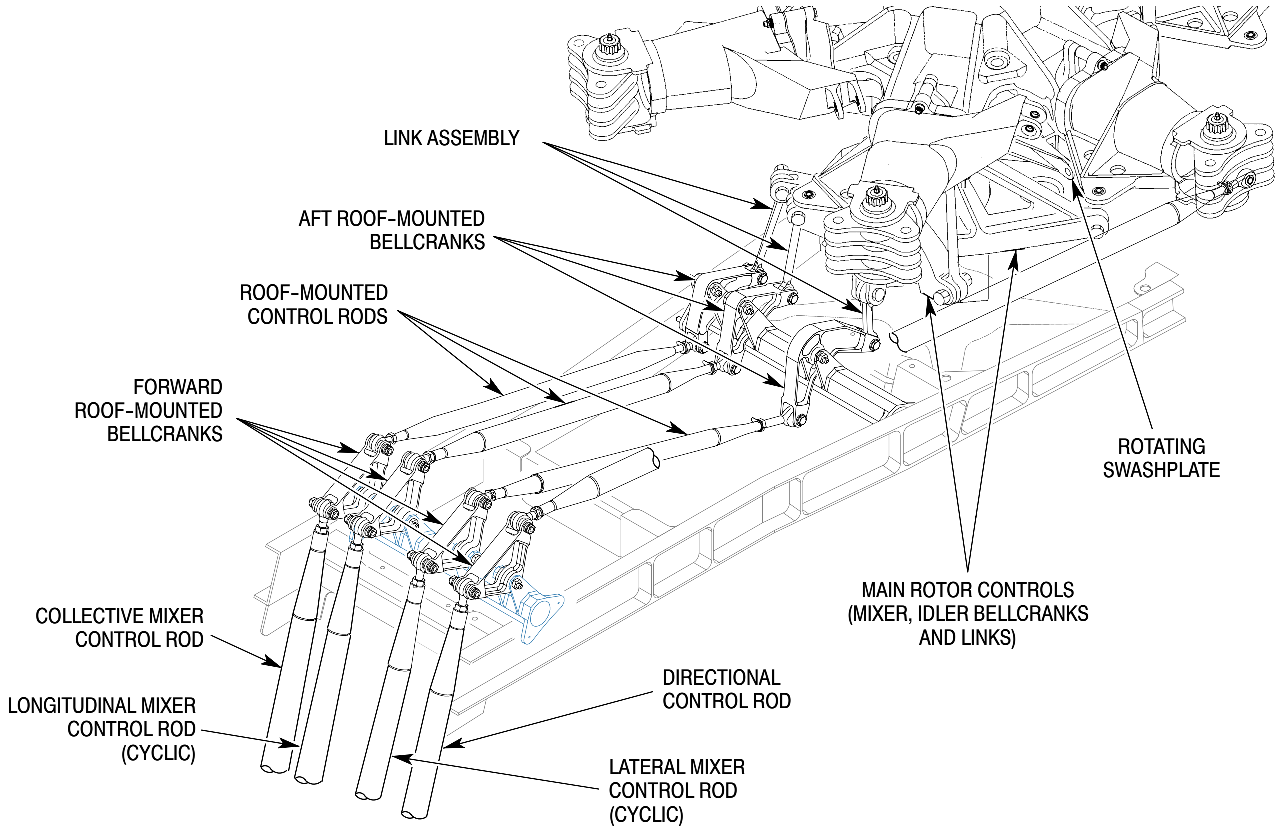


Figure 402. Roof-Mounted Controls Installation

B. Roof-Mounted Control Rod Installation (600N)

(1). Install control rods in bellcranks ensuring RH threaded rod end is forward.

(2). Install hardware connecting control rods. Torque nuts to **30 - 40 inch-pounds (3.39 - 4.52 Nm)** and install cotter pin.

(3). Remove collective bungee installation tool.

(4). Reinstall upper fuselage controls fairing.

(5). Perform flight controls rigging check.

3. Roof-Mounted Bellcrank Replacement (600N)

(Ref. Figure 402) Replacement of the roof-mounted bellcranks is the same procedure for the forward and aft bellcranks.

A. Roof-Mounted Bellcrank Removal (600N)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST508	Collective bungee installation tool

(1). Install collective bungee installation tool (ST508) and remove collective bungee.

(2). For access to roof-mounted control rods and bellcranks, remove upper fuselage controls fairing.

(3). Remove hardware connecting rod from bellcrank.

(4). Remove hardware from bellcrank pivot point and remove bellcrank.

B. Roof-Mounted Bellcrank Installation (600N)

NOTE: Ensure bellcranks are installed in proper position. If bellcranks are install in the wrong position, rigging will be impossible (Ref. Illustrated Parts Catalog).

(1). Install bellcrank in mount with word FORWARD facing up and arrow pointing towards front of aircraft.

(2). Install hardware connecting bellcrank to mount. Torque nuts to **30 - 40 inch-pounds (3.39 - 4.52 Nm)** and install cotter pin.

(3). Reinstall disconnected control rods.

(4). Remove collective bungee installation tool.

(5). Reinstall upper fuselage controls fairing.

4. Link Assembly Replacement (600N)

(Ref. Figure 402)

A. Link Assembly Removal (600N)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST508	Collective bungee installation tool

(1). Install collective bungee installation tool (ST508) and remove collective bungee.

(2). Remove upper fuselage controls fairing.

NOTE: Upper link bolt has a bushing in the mixer bellcrank.

(3). Remove hardware from link and remove link from aircraft.

B. Link Assembly Installation (600N)

(1). Install link between lower bellcrank and mixer bellcrank with hardware previously removed.

(2). Ensure bushing protrudes a minimum of 0.010 inch (0.254 mm) to a maximum of 0.060 inch (1.524 mm) beyond the surface of mixer.

(3). Torque nuts to **30 - 40 inch-pounds (3.39 - 4.52 Nm)** and install cotter pin.

(4). Remove collective bungee installation tool.

(5). Reinstall upper fuselage controls fairing.

5. Controls Support Bracket and Bellcrank Replacement

(Ref. Figure 403)

A. Controls Support Bracket and Bellcrank Removal

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST508	Collective bungee installation tool

(1). Remove foot fairings and controls access door (Sta. 78.50) and pilot’s seat cover.

WARNING **Before disconnecting collective pitch control rod, install collective bungee installation tool to prevent spring reaction due to droop stop load on control rod.**

(2). Install collective bungee installation tool (ST508) and remove collective bungee.

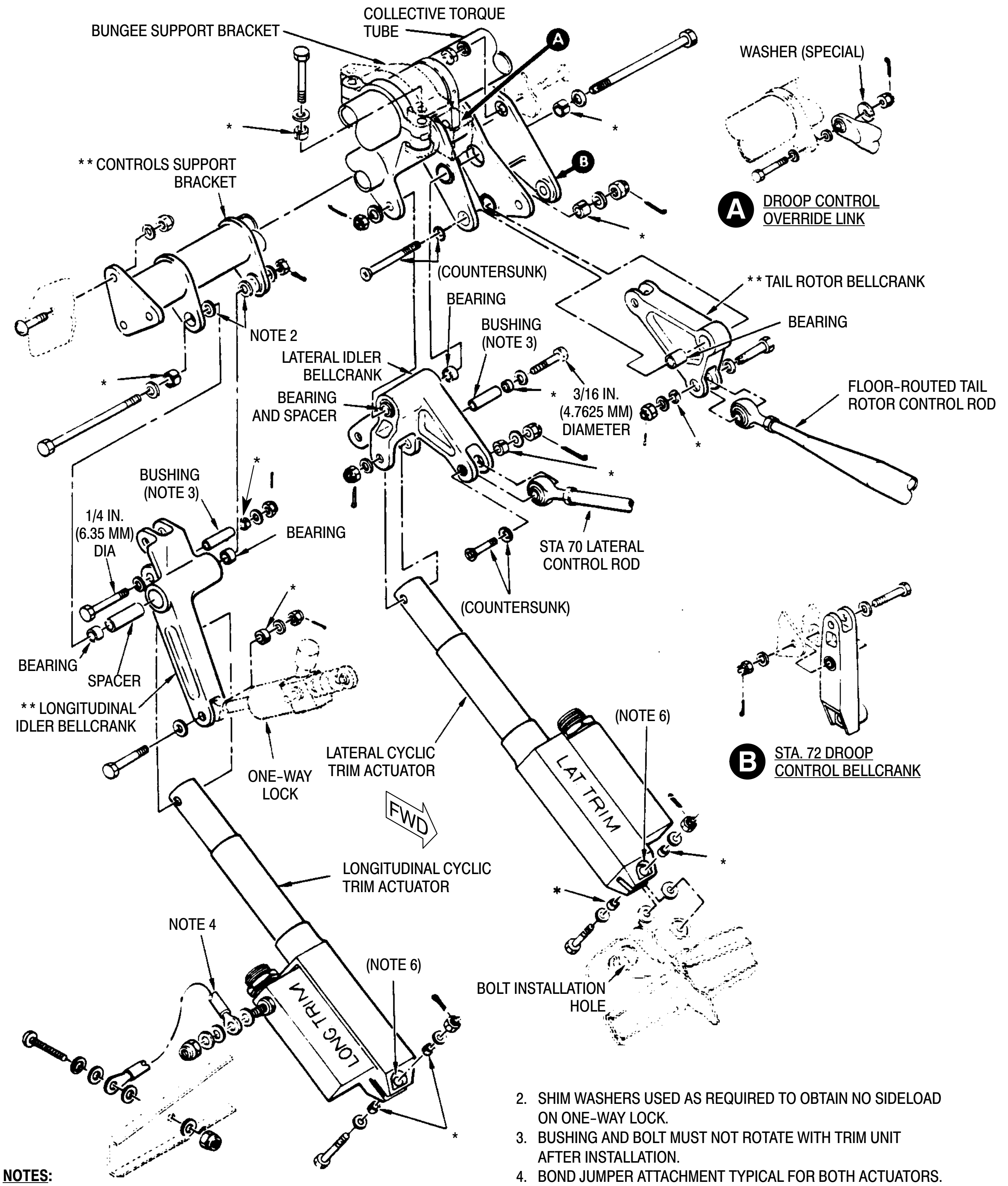
(3). Disconnect tunnel-routed control rods.

(4). Disconnect upper end of each cyclic trim actuator.

(5). Disconnect floor-routed tail rotor control rod from tail rotor bellcrank.

(6). Disconnect Sta. 70 lateral control rod from lateral idler bellcrank.

(7). Disconnect one-way lock from longitudinal idler bellcrank.



NOTES:

1. ASTERISK (*) IDENTIFIES SLOTTED BUSHINGS. EDGE OF BUSHINGS MUST PROTRUDE A MINIMUM OF 0.010 IN. (0.254 MM) TO A MAXIMUM OF 0.080 IN. (2.032 MM) ABOVE OUTSIDE SURFACE OF PART AFTER NUT IS TIGHTENED.
2. SHIM WASHERS USED AS REQUIRED TO OBTAIN NO SIDELOAD ON ONE-WAY LOCK.
3. BUSHING AND BOLT MUST NOT ROTATE WITH TRIM UNIT AFTER INSTALLATION.
4. BOND JUMPER ATTACHMENT TYPICAL FOR BOTH ACTUATORS.
5. DOUBLE ASTERISK (**) INDICATES PARTS THAT MAY BE EITHER MAGNESIUM OR ALUMINUM ALLOY.
6. REPLACEMENT PARTS HAVE NUTPLATE RIVETED IN PLACE. WASHER, NUT AND COTTER PIN NOT REQUIRED.

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Figure 403. Controls Support Bracket, Idler Bellcranks and Cyclic Trim Actuators Installation

(8). Remove pilot's collective pitch stick.

(9). Provide support for collective torque tube. Remove bolts, washers and nuts securing bungee support bracket and collective torque tube to controls support bracket.

(10). Disconnect aft end of droop control override link from collective torque tube bracket.

(11). Remove Sta. 72 droop control bellcrank from support bracket.

(12). Disconnect and remove support bracket from seat structure. Avoid striking any bellcranks and pushrods.

B. Controls Support Bracket and Bellcrank Installation

(1). Carefully position assembled support bracket and bellcranks between seat structure bulkheads and secure with attaching hardware.

(2). Position Sta. 72 droop control bellcrank in support bracket and install.

NOTE: Cap is matched to cradle of each control support bracket. Check that numbers on each part are identical before accomplishing step (3). below.

(3). Check that two slotted bushings are in place in bungee support bracket. Position collective torque tube and bungee bracket on support bracket cradle and install cradle bolts, washers and nuts. Ensure index groove, in edge of cap that clamps torque tube to support bracket cradle, mates with matching index at bracket cradle parting surface.

(4). Install pilot's collective pitch stick.

(5). Connect aft end of droop control override link to collective torque tube droop control bracket.

(6). Connect one-way lock to longitudinal idler bellcrank.

NOTE: For following steps, ensure that slotted bushing is in bellcrank ear.

(7). Connect Sta. 70 lateral control rod to lateral idler bellcrank.

(8). Connect floor-routed tail rotor control rod to tail rotor bellcrank.

(9). Connect upper end of each cyclic trim actuator.

NOTE: Lateral actuator uses 3/16 inch (4.7625 mm) diameter bolt. The longitudinal actuator requires 1/4 inch (6.035 mm) diameter bolt.

(10). Connect lower ends of tunnel-routed control rods.

(11). Install collective bungee and remove collective bungee installation tool.

6. Pilot's Collective Pitch Stick Replacement (L/H Command)

(Ref. Figure 404)

A. Pilot's Collective Pitch Stick Removal (L/H Command)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST508	Collective bungee installation tool

(1). Remove outboard collective stick cover.

(2). Disconnect pilot's collective stick electrical plug.

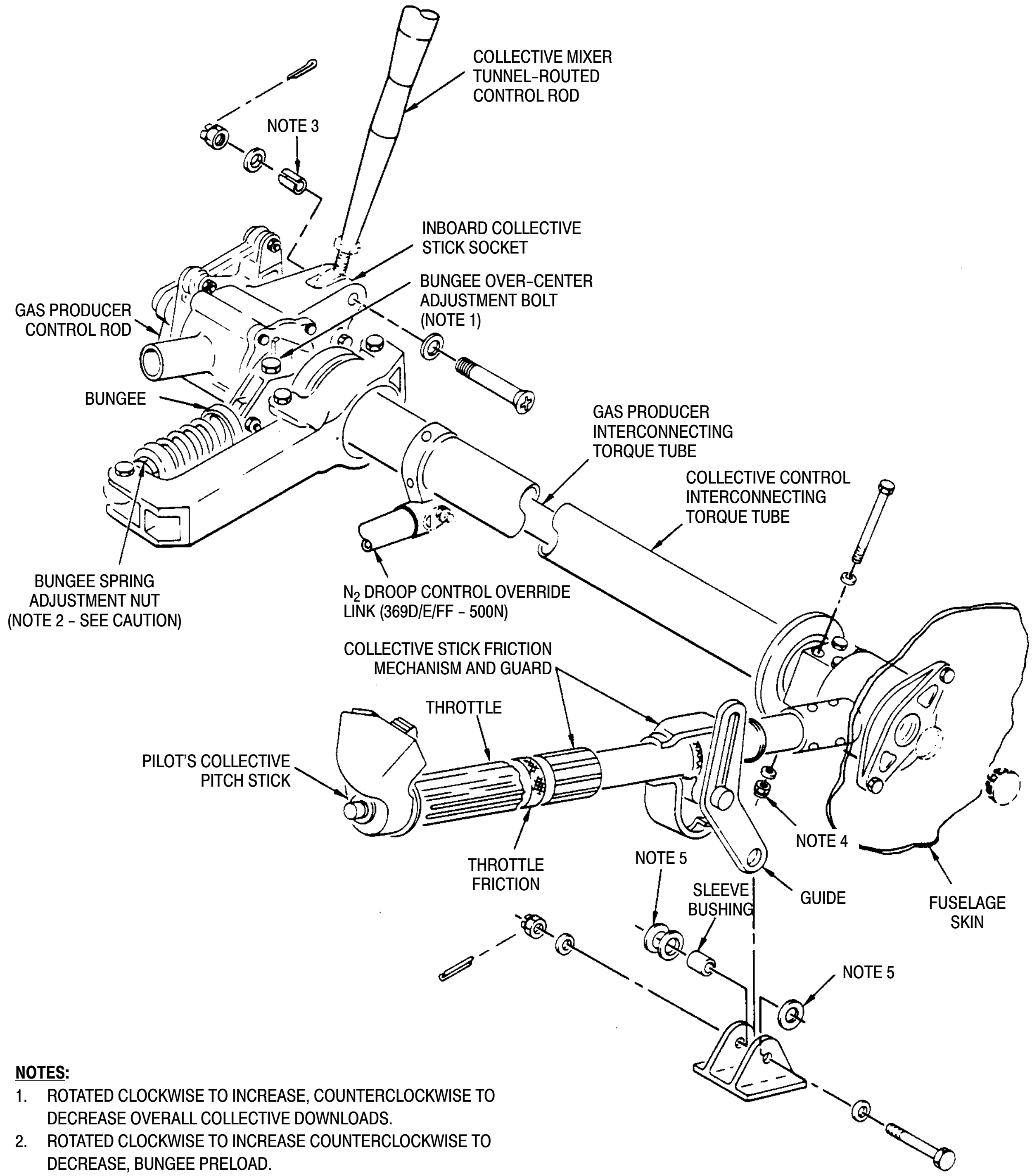
(3). Remove attaching hardware that secures guide to seat structure bracket.

WARNING **Before disconnecting collective stick, install collective bungee installation tool to prevent spring reaction due to droop stop load on controls.**

(4). Install collective bungee installation tool (ST508).

(5). Remove collective bungee and inboard collective socket. Disconnect droop control override link (369D/E/FF - 500N only), slide bungee bracket to side, remove cradle cap and slide collective torque tube inboard.

(6). Remove attaching hardware that connects stick housing to torque tube.



NOTES:

1. ROTATED CLOCKWISE TO INCREASE, COUNTERCLOCKWISE TO DECREASE OVERALL COLLECTIVE DOWNLOADS.
2. ROTATED CLOCKWISE TO INCREASE COUNTERCLOCKWISE TO DECREASE, BUNGEE PRELOAD.

CAUTION: DO NOT ADJUST BUNGEE SPRING TENSION WHILE BUNGEE INSTALLATION TOOL IS INSTALLED. USE OVER-CENTER ACTION OF STICK TO COMPRESS SPRING TO REMOVE TOOL.

3. BUSHINGS MUST PROTRUDE A MINIMUM OF 0.010 IN. (0.254 MM) TO A MAXIMUM OF 0.060 IN. (1.524 MM) AFTER BOLT IS TIGHTENED.
4. FOUR NUTS TORQUED EQUALLY AND BY SMALL INCREMENTS.
5. WASHERS ARRANGED TO ALIGN GUIDE WITH STICK; LOOSELY SPACED WITH THREE WASHERS.

G67-1003B

Figure 404. Dual Collective Controls (L/H Command)

(7). Remove stick by sliding it outboard off torque tube.

B. Pilot's Collective Pitch Stick Installation (L/H Command)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM116	Grease, aircraft and instrument

(1). Lubricate stick housing socket with grease (CM116).

(2). Install stick by sliding housing on collective control interconnecting torque tube. Install bolts, washers and nuts. Tighten nuts equally and by small increments until correct torque is applied.

(3). Connect electrical plug.

(4). Install outboard collective stick cover. Raise and lower stick; verify that wiring does not foul.

(5). Remove snap plug from exterior skin, rotate throttle and visually check for zero backlash between gas producer interconnect torque tube and hexagonal interior surfaces of drive gearshaft in stick housing. Eliminate any backlash by tightening pipe plug in end of torque tube; zero backlash is required at both ends of tube.

(6). Check that inboard stick socket gears are at mid-travel when pilot's stick throttle grip is set to mid-travel. If not, adjust collective stick gas producer control linkage.

7. Pilot's Collective Pitch Stick Replacement (R/H Command)

(Ref. Figure 405)

A. Pilot's Collective Pitch Stick Removal (R/H Command)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST508	Collective bungee installation tool

(1). Remove stick cover from seat structure.

(2). Disconnect pilot's collective stick electrical plug.

(3). Remove attaching hardware that secures guide to seat structure bracket.

WARNING **Before disconnecting collective stick, install collective bungee installation tool to prevent spring reaction due to droop stop load on controls.**

(4). Install collective bungee installation tool (ST508).

(5). Remove collective bungee and inboard collective socket. Disconnect droop control override link (369D/E/FF - 500N only), slide bungee bracket to side, remove cradle cap and slide collective torque tube inboard.

(6). Disconnect gas producer control rod.

(7). Remove attaching hardware that connects stick housing to torque tube.

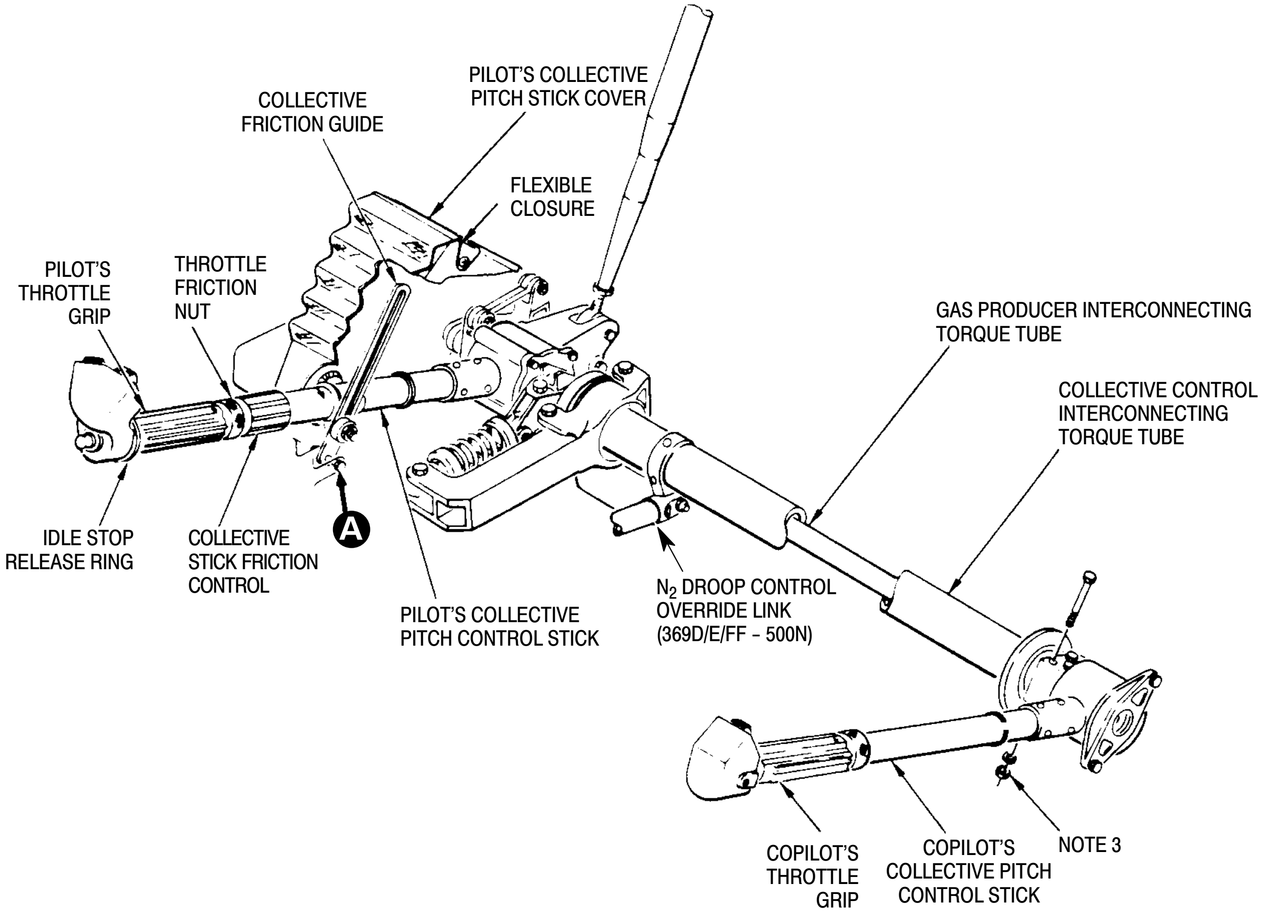
B. Pilot's Collective Pitch Stick Installation (R/H Command)

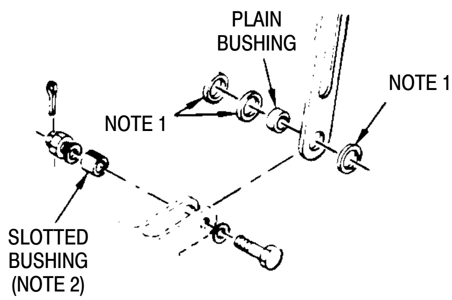
Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM116	Grease, aircraft and instrument

(1). Lubricate surfaces that are in contact during rotation with grease (CM116).

(2). Ensure that pilot's and copilot's throttle grips are in same relative positions. Slide pilot's stick housing on collective interconnecting torque tube, align matching holes and secure stick to torque tube. Connect gas producer control rod. Align and/or match bellcrank centerline, gearshaft assembly gear cutout and pilot's throttle.





A BUSHING INSTALLATION

NOTES:

1. ARRANGE WASHERS TO LINE UP GUIDE WITH STICK; SPACE LOOSELY WITH THREE WASHERS.
2. SLOTTED BUSHING MUST PROTRUDE A MINIMUM OF 0.010 INCH (0.254 MM) TO A MAXIMUM OF 0.060 INCH (1.524 MM) AFTER BOLT IS TIGHTENED.
3. FOUR NUTS TORQUED; EQUALLY AND BY SMALL INCREMENTS.
4. ALLOWABLE FREE PLAY IN CO-PILOT'S TWIST GRIP IS ±5°.

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Figure 405. Dual Collective Controls (R/H Command)

(3). Position friction guide in seat structure bracket with plain bushing, slotted bushing, and three washers loosely spaced between bracket ears so guide is in line (parallel) with stick. Install bolt, two washers, nut and new cotter pin.

(4). Connect electrical plug.

(5). Perform operational check of collective stick friction and adjust friction mechanism as necessary.

(6). Install collective stick cover on seat structure. Check that wiring is not fouled when stick is raised and lowered.

8. Copilot's Collective Pitch Stick Replacement (L/H Command)

(Ref. Figure 406)

A. Copilot's Collective Pitch Stick Removal (L/H Command)

(1). Remove collective stick cover from seat structure.

(2). Disconnect electrical plug.

(3). Remove hardware from stick tube socket adapter and remove pitch stick assembly by sliding it forward and off the inboard stick housing.

B. Copilot's Collective Pitch Stick Installation (L/H Command)

Consumable Materials
(Ref. Section 91-00-00)

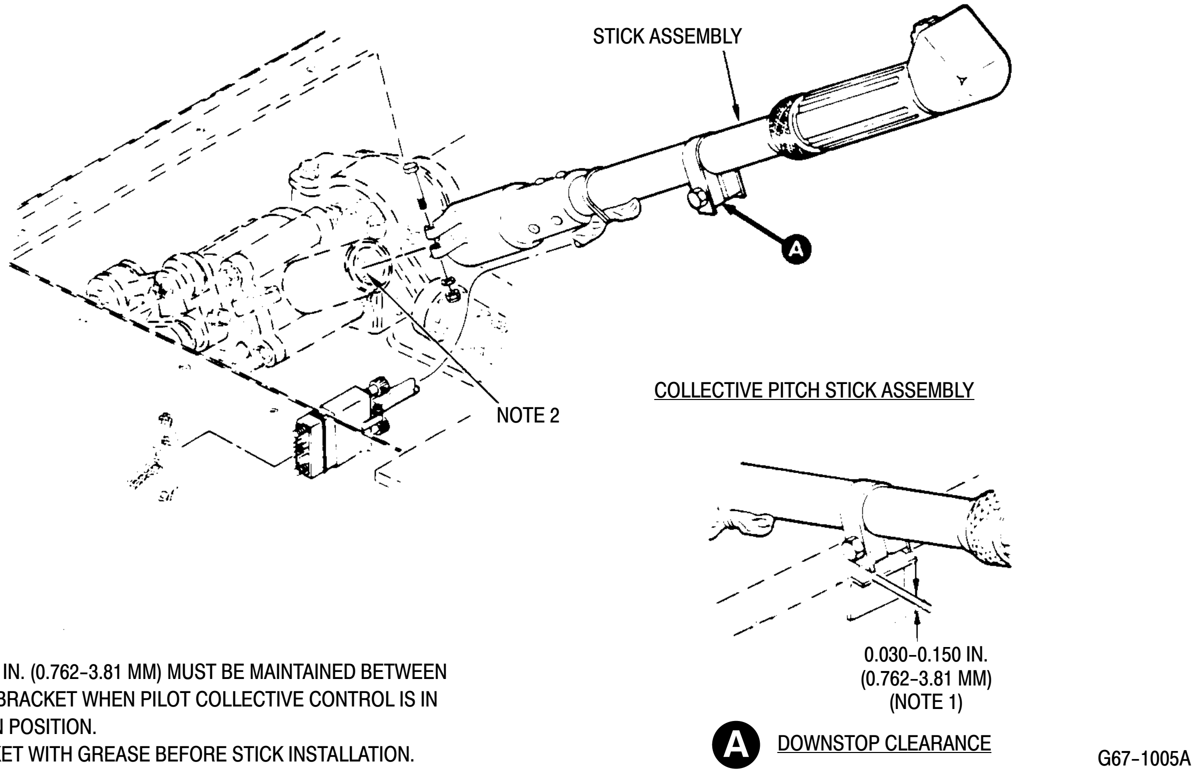
Item	Nomenclature
CM116	Grease, aircraft and instrument

(1). Lubricate stick housing socket with grease (CM116).

(2). Rotate pilot's or copilot's throttle grips so that the grip attach bolts are down.

(3). Install copilot's stick socket adapter on the inboard housing socket extension and, while moving copilot's throttle back and forth slightly to get engagement of the socket pinion and adapter splines, slide the adapter into place.

(4). Install attaching hardware to secure socket adapter.



NOTES:
1. 0.030–0.150 IN. (0.762–3.81 MM) MUST BE MAINTAINED BETWEEN STOP AND BRACKET WHEN PILOT COLLECTIVE CONTROL IS IN FULL DOWN POSITION.
2. LUBE SOCKET WITH GREASE BEFORE STICK INSTALLATION.

Figure 406. CoPilot's Collective Stick Assembly Installation (L/H Command)

(5). Connect electrical plug.

(6). Position downstop assembly. Check that 0.030-0.150 inch (0.762-3.302 mm) clearance exists between downstop and seat structure with collective pitch stick in full down position.

(7). Install collective cover on seat structure. Check that wiring is not fouled when stick is raised and lowered.

9. Copilot's Collective Pitch Stick Replacement (R/H Command)

(Ref. Figure 404)

A. Copilot's Collective Pitch Stick Removal (R/H Command)

Remove copilot's collective stick according to instructions in **Pilot's Collective Pitch Stick Removal (L/H Command)** except disregard information on friction guide.

B. Copilot's Collective Pitch Stick Installation (R/H Command)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM116	Grease, aircraft and instrument

(1). Lubricate stick housing socket with grease (CM116).

(2). Slide stick housing on collective control interconnecting torque tube. Align matching holes and install bushings, bolts, washers and nuts. Tighten equally and by small increments until proper torque is applied.

(3). Install outboard collective stick cover. Secure electrical plug and check that wiring will not foul when stick is raised and lowered.

(4). Remove snap plug from exterior skin, rotate throttle and visually check for zero backlash between gas producer interconnect tube and hexagonal ID of drive gearshaft in stick housing. Eliminate any backlash by tightening pipe plug in end of torque tube; zero backlash is required at both ends of tube.

NOTE: The R/H command configuration collective friction mechanism is the same as L/H command except no separate friction guard is provided, since the pilot's collective pitch cover also functions as a guard for the friction mechanism.

10. Collective Control Interconnecting Torque Tube Replacement

(Ref. Figure 407)

A. Collective Control Interconnecting Torque Tube Removal

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST508	Collective bungee installation tool

WARNING **Before disconnecting collective pitch control rod, install collective bungee installation tool to prevent spring reaction due to droop stop load on control rod.**

(1). Install collective bungee installation tool (ST508) and remove collective bungee.

(2). Remove inboard collective socket assembly.

(3). Disconnect aft end of droop control override link (369D/E/FF - 500N only) from torque tube droop control bracket.

(4). Remove hardware securing bungee support bracket reinforcement strap and torque tube to controls support bracket. Slide bungee bracket aside and remove controls bracket cradle cap and reinforcement strap.

(5). Slide collective control torque tube sufficiently toward right side of seat structure to remove pilot's collective pitch stick housing from end of tube.

(6). Remove hardware that connects stick housing to torque tube.

(7). Remove stick by sliding it outboard and off torque tube.

(8). Remove torque tube by sliding it approximately three inches toward right side of seat structure to disengage left end from support bearing inside left torque tube support. Provide support at seat structure lightening hole and care, fully withdraw torque tube from structure.

(9). Remove gas producer interconnect torque tube by carefully sliding it out of collective torque tube.

B. Collective Control Interconnecting Torque Tube Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM116	Grease, aircraft and instrument

(1). Install gas producer interconnect torque tube by sliding it carefully into place in collective control interconnecting torque tube.

(2). Insert torque tube into lightening hole in seat structure. Use care when inserting tube into place to prevent scraping on edge of hole. Insert tube only to a position that provides sufficient space between tube end and fuselage skin for installation of pilot's stick housing on end of tube.

(3). Lubricate pilot's stick housing with grease (CM116).

(4). Slide pilot's stick housing on collective control interconnecting torque tube.

NOTE: Stick housing must be placed on torque tube before installing torque tube attaching hardware.

(5). Complete insertion of tube and position left end of tube in fixed bearing bore. Rotate torque tube slowly back and forth until right end bearing rests in cradle of controls support bracket.

(6). Check that two slotted bushings are in place in upper lugs of bungee bracket. Position torque tube, controls bracket cradle cap, reinforcement strap and bungee bracket on controls support bracket. Check that cap-to-cradle index grooves are matched. Install with hardware removed. Apply thin layer of grease (CM116) to sliding surfaces of bungee overcenter fitting.

(7). Install droop control override link (369D/E/FF - 500N only) to torque tube droop control bracket.

(8). Install inboard collective socket assembly.

(9). Complete installation of pilot's collective stick.

(10). Install collective bungee.

11. Collective Bungee Replacement

(Ref. Figure 407)

A. Collective Bungee and Over-Center Fitting - Removal

Special Tools
(Ref. Section 91-00-00)

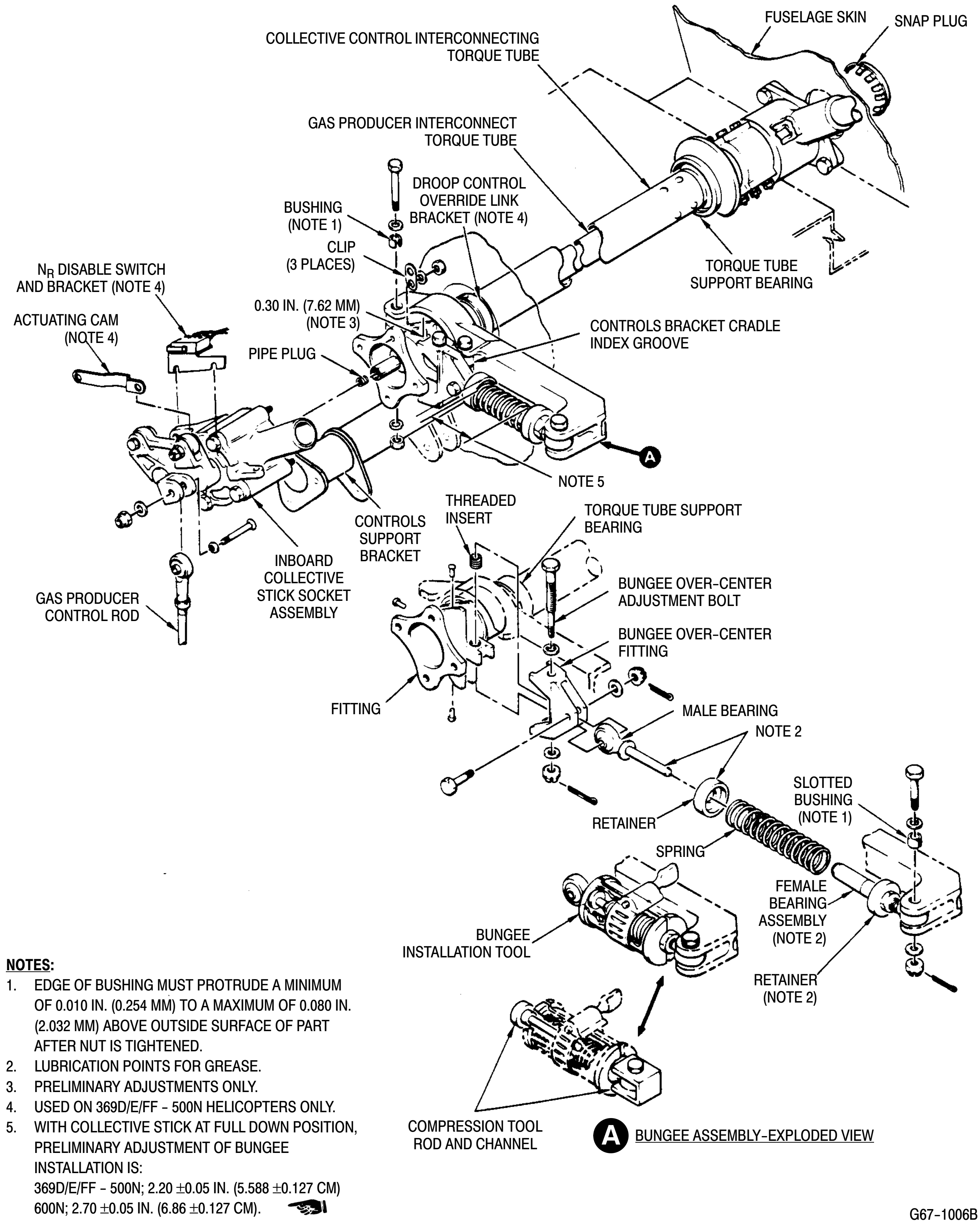
Item	Nomenclature
ST508	Collective bungee installation tool

WARNING **Before disconnecting collective pitch control rod, install collective bungee installation tool to prevent spring reaction due to droop stop load on control rod.**

(1). Remove pilot's seat cover from seat structure.

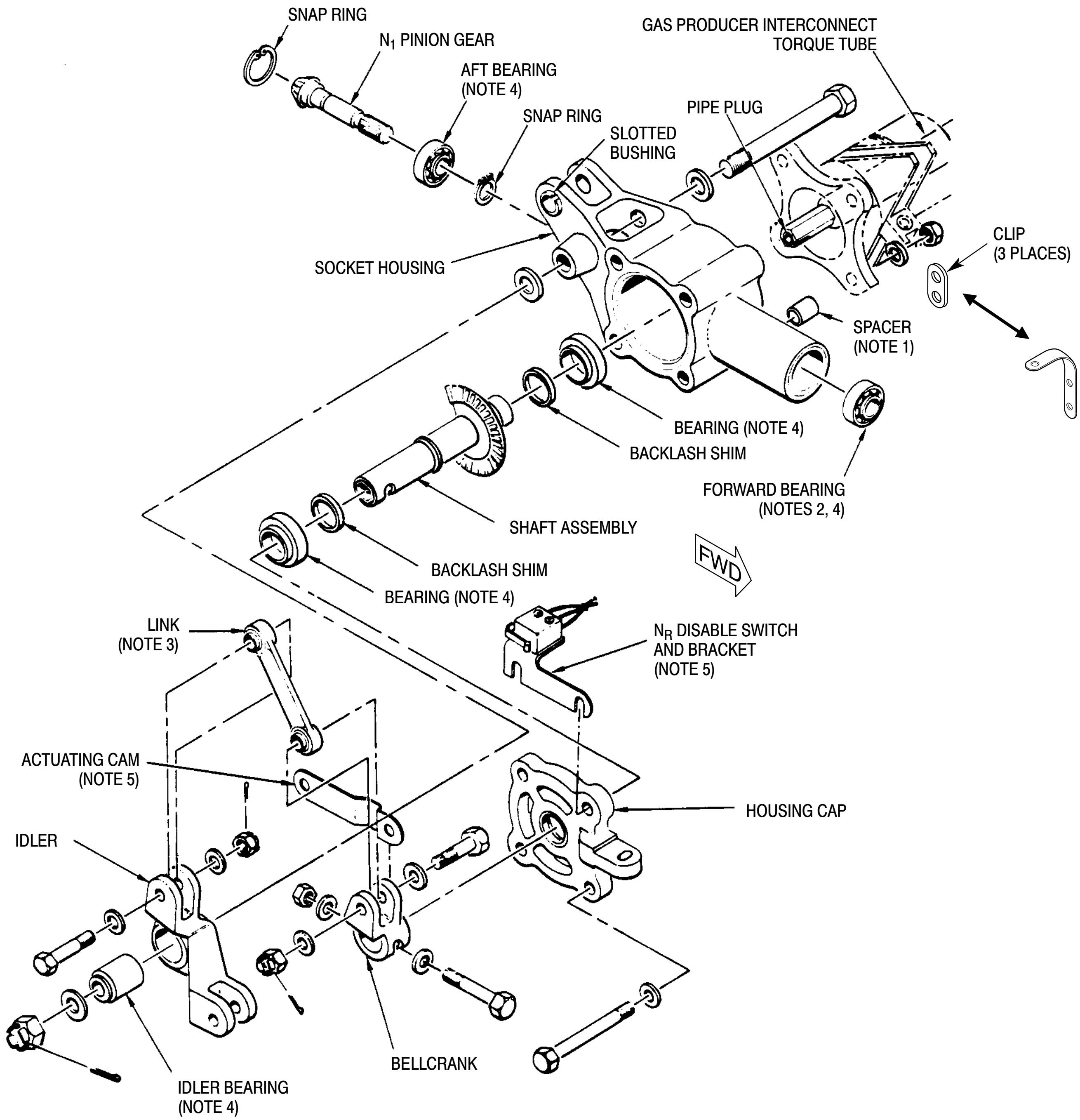
(2). Raise collective stick and use torque tube over-center action to compress bungee spring until bungee installation tool (ST508) fits over spring retainers. Secure tool halves in place with clamp.

(3). With stick in over-center position, remove cotter pin, nut, washer and bolt that secure male bearing to bungee over-center fitting.



NOTES:
1. EDGE OF BUSHING MUST PROTRUDE A MINIMUM OF 0.010 IN. (0.254 MM) TO A MAXIMUM OF 0.080 IN. (2.032 MM) ABOVE OUTSIDE SURFACE OF PART AFTER NUT IS TIGHTENED.
2. LUBRICATION POINTS FOR GREASE.
3. PRELIMINARY ADJUSTMENTS ONLY.
4. USED ON 369D/E/FF - 500N HELICOPTERS ONLY.
5. WITH COLLECTIVE STICK AT FULL DOWN POSITION, PRELIMINARY ADJUSTMENT OF BUNGEE INSTALLATION IS:
   369D/E/FF - 500N; 2.20 ±0.05 IN. (5.588 ±0.127 CM)
   600N; 2.70 ±0.05 IN. (6.86 ±0.127 CM).

Figure 407. Collective Torque Tube, Gas Producer Torque Tube and Collective Bungee



NOTES:

1. FOUR SPACERS USED ONLY ON REMOVED SOCKET ASSEMBLY TO KEEP ASSEMBLY INTACT.
2. N_1 PINION FORWARD BEARING IS LIGHT PRESS FIT IN HOUSING BORE.
3. LINK MUST BE BOLTED TO BELLCRANK BEFORE BELLCRANK AND SHAFT ASSEMBLY ARE INSTALLED.
4. BEARINGS INSTALLED WITH LOCKING COMPOUND. THE TWO SHAFT ASSEMBLY BEARINGS BONDED ONLY AFTER SHIMMING FOR BACKLASH.
5. USED ON 369D/E/FF - 500N HELICOPTERS ONLY.

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Figure 408. Inboard Collective Stick Socket Assembly (L/H Command)

(4). Remove cotter pin, nut, two washers and bolt that attach female bearing end of bungee to the bungee bracket.

(5). Remove collective bungee and installation tool as a unit.

(6). Remove cotter pin, nut and washer from over-center fitting.

(7). Remove bolt that secure over-center fitting to collective torque tube and remove fitting.

B. Collective Over-Center Fitting and Bungee - Installation and Preliminary Adjustment

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM116	Grease, aircraft and instrument

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST508	Collective bungee installation tool

(1). Lubricate sliding surfaces of over-center fitting with grease (CM116) and position on collective torque tube.

(2). Install bolt and washer though fitting and torque tube, and adjust to obtain 0.30 in. (7.62 mm) preliminary adjustment between upper surface of fitting and tips on torque tube fitting.

(3). Install washer and nut on bolt and torque to **30 - 40 inch-pounds (3.39 - 4.52 Nm)**; install cotter pin.

(4). Position collective bungee, compressed in installation tool (ST508), so that female bearing assembly is forward and aligns with mating hole in bungee bracket. Check that slotted bushing for bracket lug is in place, install bolt, two washers, nut and cotter pin.

(5). Position male bearing to align with mating hole in bungee over-center fitting. Install bolt, washers, nut and install cotter pin.

CAUTION Do not turn female bearing assembly spring retainer while bungee installation tool is spring loaded.

(6). Raise collective stick so that torque tube over-center action compresses spring until bungee installation tool can be removed; remove tool.

(7). With collective stick at full down position, preliminary adjustment of bungee installation is:
369D/E/FF - 500N; 2.2 ±0.05 inch (5.588 ±0.127 cm)
600N; 2.70 ±0.05 inch (6.86 ±0.127 cm).

(8). Flight test helicopter and complete adjustment of collective bungee.

12. Inboard Collective Stick Socket Assembly Replacement

(Ref. Figure 408)

A. Inboard Collective Stick Socket Assembly Removal

(1). Remove pilot's seat cover and controls access door.

(2). Disconnect collective mixer tunnel-routed control rod.

(3). Disconnect gas producer control rod from idler.

(4). Remove N_R disable switch (369D/E/FF - 500N only) (Ref. Chap. 95).

(5). Remove four nuts and washers that attach socket assembly to collective torque tube and remove assembly.

NOTE: If disassembly is not intended, install four spacers and reinstall washers and nuts on protruding bolts to keep assembly intact.

B. Inboard Collective Stick Socket Assembly Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

(1). Remove four nuts washers and spacers from socket assembly mounting bolts.

(2). With throttle grip on pilot's collective stick at midtravel, rotate bellcrank back and forth slightly to engage socket assembly to gearshaft on hexagonal end of gas producer interconnect torque tube. Bellcrank centerline, N_1 pinion gear centerline toothspace and pilot's throttle must be as shown.

NOTE:

- With pilot's throttle grip at midtravel, two grip attach bolts should be approximately straight down. Simultaneously, idler-to-gas producer control rod bolt holes should be in line with centerline of inboard stick assembly housing cap.
- At midtravel, inboard N_1 pinion gear spline wide toothspace should be at approximately one o'clock as viewed looking aft into open end of socket.

(3). Install N_R disable switch (369D/E/FF - 500N only) (Ref. Sec. 95) and secure socket assembly housing to collective torque tube.

(4). Rotate pilot's throttle and check for zero backlash between gas producer interconnect torque tube and hexagonal interior of drive gearshaft in socket assembly housing.

(5). Eliminate backlash by removing housing cap and gearshaft, and then removing pipe plug in end of torque tube.

(6). Coat pipe plug with wet zinc chromate primer (CM318), reinstall and tighten it so there is no backlash between torque tube and control gearshaft at each end of the tube.

(7). If the normally installed plug does not sufficiently expand tube, a 1/8-27 internal-wrenching pipe plug 0.38 inch (9.65 mm) long may be substituted. Whichever plug is used, it must not protrude more than 0.030 inch (0.762 mm) when tightened.

(8). Zero degree backlash is required at both ends of tube.

(9). After plug is tightened, reinstall gearshaft and housing cap.

(10). Connect gas producer control rod to idler.

(11). Connect collective mixer tunnel-routed control rod.

(12). Remove bungee installation tool.

(13). Reinstall pilot's seat cover and the controls access door.

(14). Check that inboard collective pitch stick socket gears are at midtravel when pilot's collective pitch stick throttle grip is set to midtravel. If not, adjust collective pitch stick(s) gas producer control linkage.

(15). Adjust N_R disable switch (369D/E/FF - 500N only) (Ref. Chap. 95).

13. Cyclic Control Stick Replacement (Inboard)

(Ref. Figure 409)

A. Cyclic Control Stick Removal (Inboard)

(1). Disconnect control stick electrical plug.

(2). Remove hardware that secures pilot's lateral control rod to stick socket.

(3). Remove hardware that attaches lateral friction mechanism link to cyclic torque tube.

(4). Remove hardware that attaches stick socket to end of cyclic torque tube; remove stick with lateral friction mechanism attached.

B. Cyclic Control Stick Installation (Inboard)

(1). Position pilot's cyclic control stick to align with mating holes in torque tube.

(2). Install attaching hardware.

(3). Check that slotted bushing is in place; then align pilot's lateral control rod with stick socket. Install attaching hardware.

(4). Position guide link to align with mating hole in torque tube. Install bolt, sleeve bushing three washers, nut and cotter pin.

(5). Connect electrical plug.

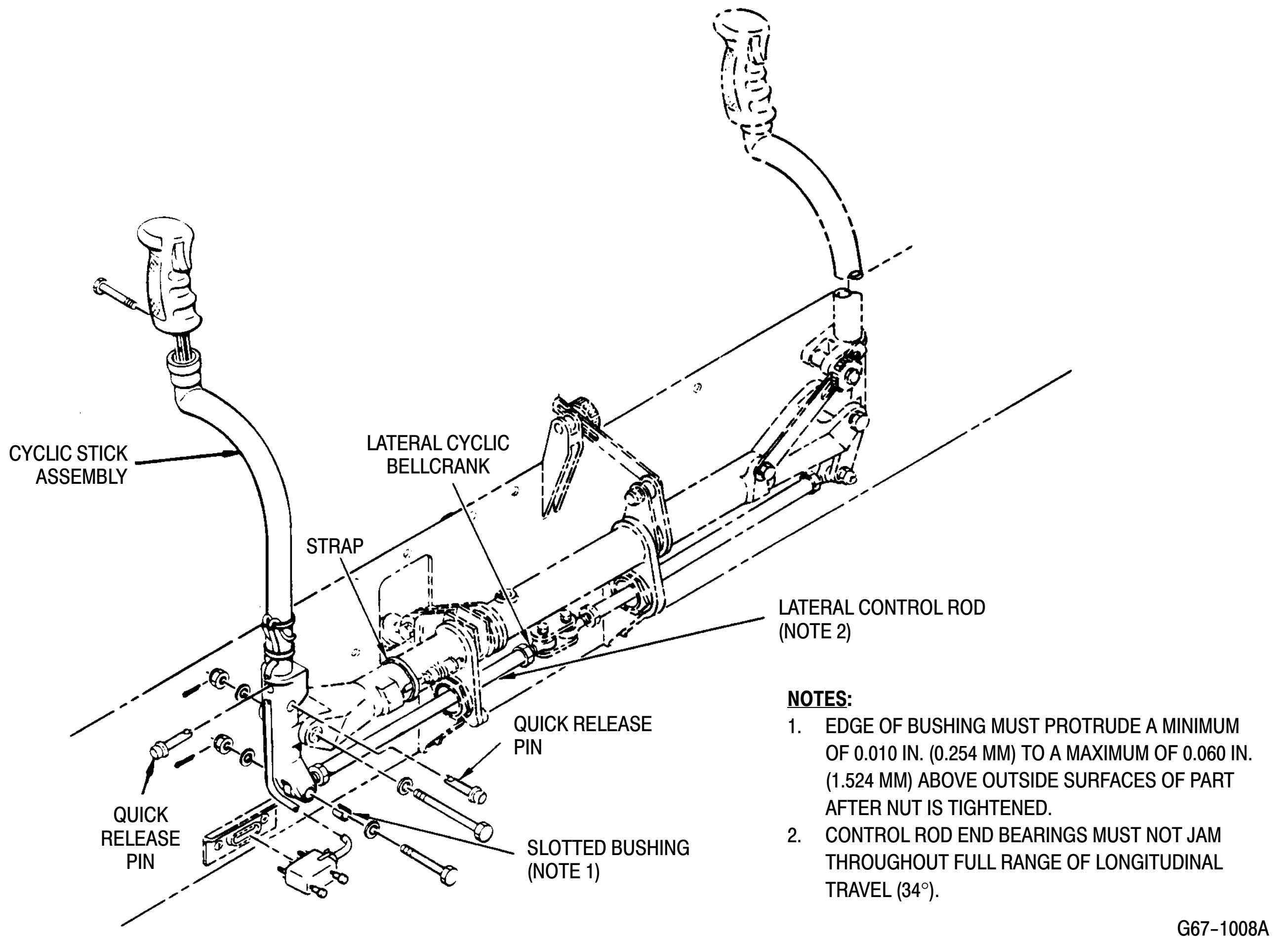


Figure 409. Cyclic Stick Assembly Installation (Inboard)

14. Cyclic Control Stick Replacement (Outboard)

(Ref. Figure 410)

A. Cyclic Control Stick Removal (Outboard)

(1). Disconnect control stick electrical plug.

NOTE: Omit steps (2). and (3). below to remove stick without removing stick socket.

(2). Remove cotter pin, nut, washers and bolt securing copilot's lateral control rod to stick socket.

(3). Remove cotter pin, nut, washers and bolt attaching stick socket to end of cyclic torque tube. Remove stick tube with stick socket attached.

(4). Remove two quick-release pins attaching stick tube to stick socket.

(5). Remove stick tube from socket.

B. Cyclic Control Stick Installation (Outboard)

(1). Insert stick tube into stick socket and install two quick-release pins.

NOTE: Omit steps (2). thru (4). when installing stick without socket.

(2). Position cyclic stick to align holes in socket with mating holes in torque tube.

(3). Install bolt, two washers, nut and new cotter pin.

(4). Check that slotted bushing is in place; then align copilot' s lateral control rod with stick socket. Install bolt, two washers, nut and new cotter pin.

(5). Connect electrical plug.

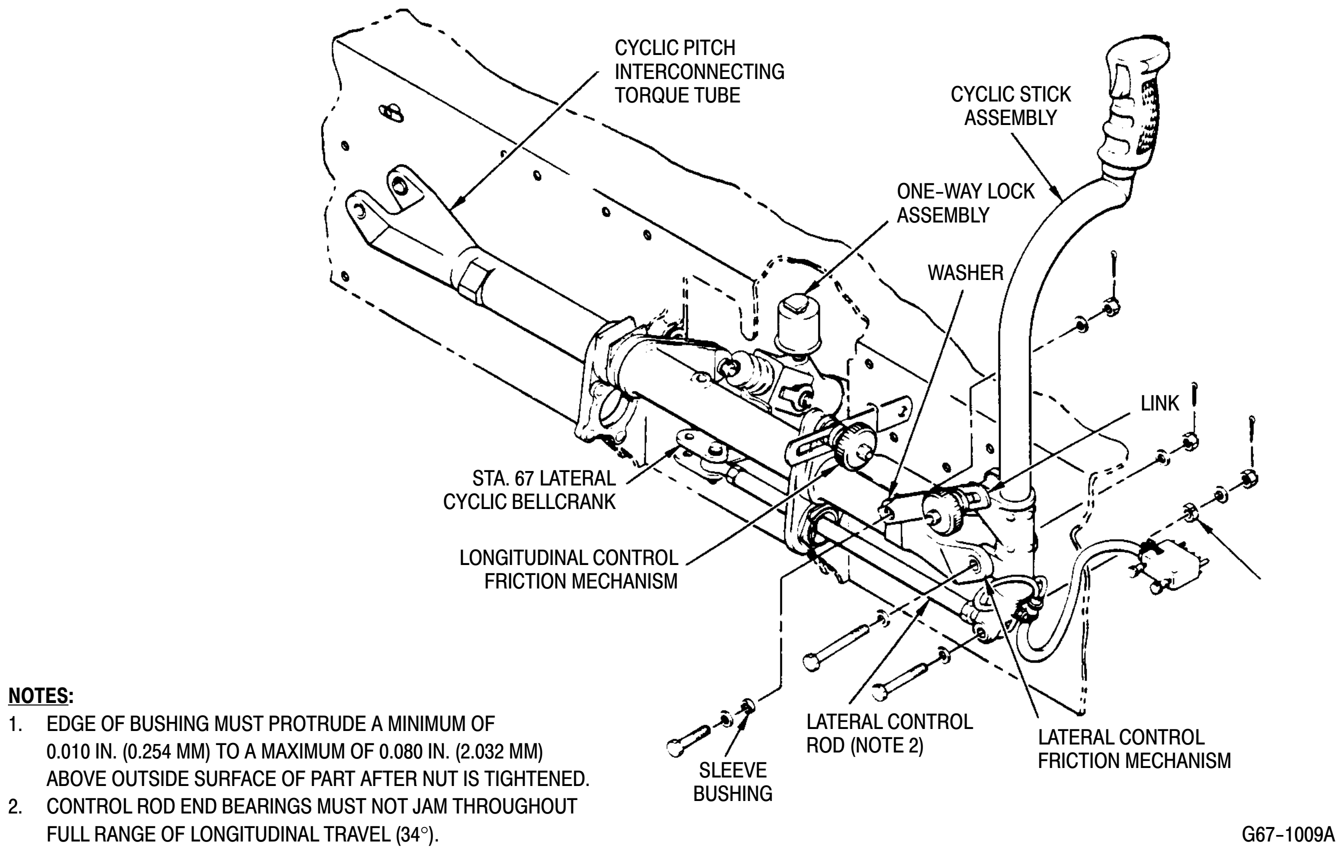


Figure 410. Cyclic Stick Assembly Installation (Outboard)

15. Lateral Control Rods and Sta. 67 Lateral Cyclic Bellcrank Replacement (L/H Command)

(Ref. Figure 411)

A. Lateral Control Rods and Sta. 67 Lateral Cyclic Bellcrank Removal (L/H Command)

(1). Remove large (central) cyclic stick guard.

(2). Remove pilot's seat cover, and controls access door from Sta. 78.50 canted bulkhead.

(3). Remove pilot's lateral control rod, or Sta. 70 lateral control rod, as applicable.

(4). Remove Sta. 67 lateral cyclic bellcrank from seat structure fitting.

(5). If rod or rod ends require replacement, accurately measure and record distance between rod end bearing centers for use at replacement.

B. Lateral Control Rods and Sta. 67 Lateral Cyclic Bellcrank Installation (L/H Command)

(1). Check that slotted bushing is in upper web of seat structure fitting. Align Sta. 67 lateral cyclic bellcrank and install attaching hardware.

(2). Check that slotted bushings are in place and install Sta. 70 lateral control rod and pilot's lateral control rod.

(3). Move cyclic stick full forward, then full aft and set pilot's lateral control rod end bearing angularity so that bearings do not jam at full travel positions.

(4). If control rod or rod ends are replaced, perform a cyclic control rigging check.

NOTES:

1. ASTERISK (*) IDENTIFIES SLOTTED BUSHING. EDGE OF BUSHING MUST PROTRUDE A MINIMUM OF 0.010 IN. (0.254 MM) TO A MAXIMUM OF 0.060 IN. (1.524 MM) ABOVE OUTSIDE SURFACE OF PART AFTER NUT IS TIGHTENED.
2. WASHERS ARRANGED TO ALIGN LINK WITH TORQUE TUBE, LOOSELY SPACED WITH FOUR WASHERS.
3. CONTROL RODS MUST NOT JAM THROUGHOUT FULL RANGE OF LONGITUDINAL TRAVEL (34°).
4. INSTALLED WITH LOCKING COMPOUND.

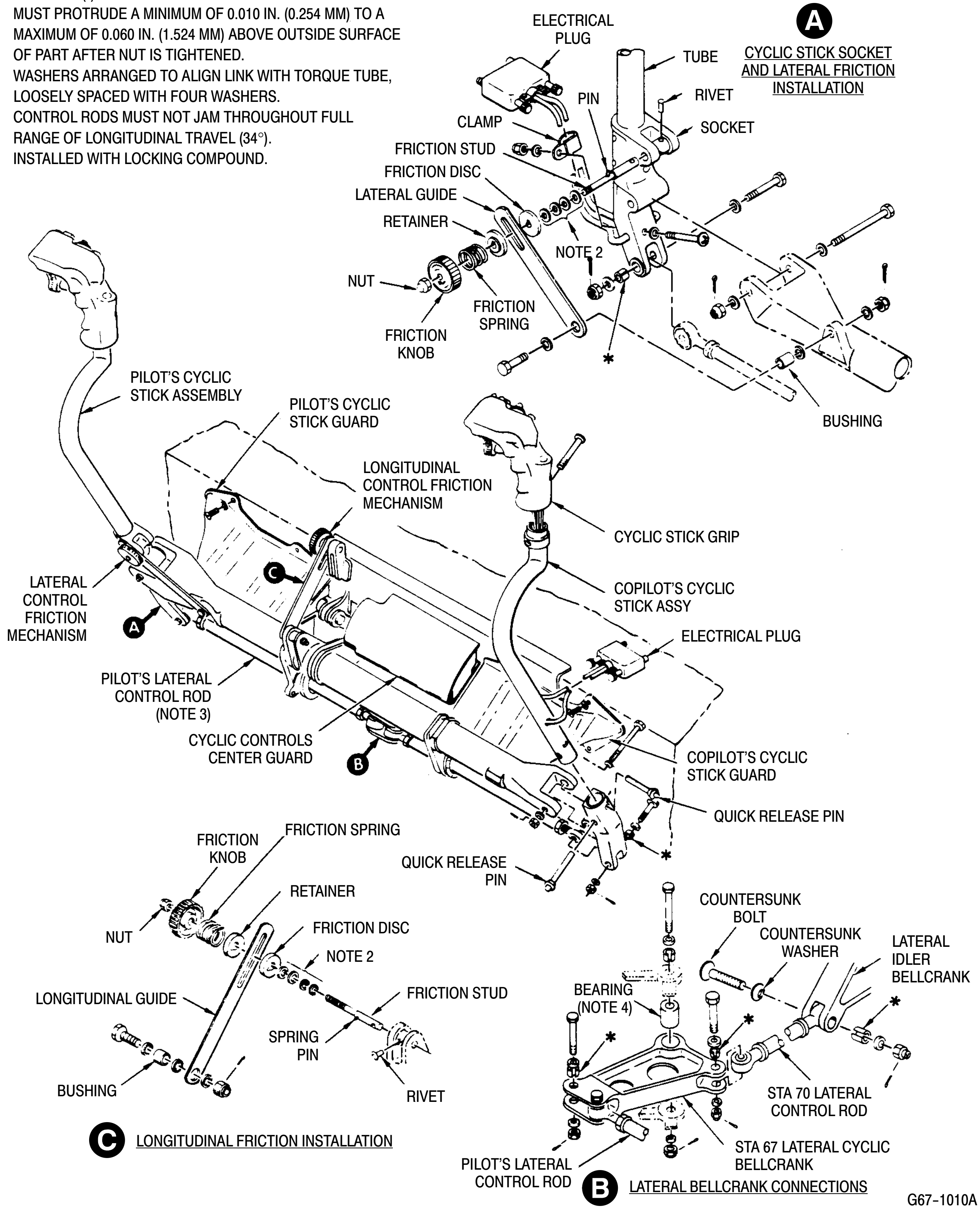


Figure 411. Cyclic Controls (R/H Command)

16. Lateral Control Rods and Sta. 67 Lateral Cyclic Bellcrank Replacement (R/H Command)

(Ref. Figure 411)

A. Lateral Control Rods and Sta. 67 Lateral Cyclic Bellcrank Removal (R/H Command)

(1). Remove cyclic stick guards.

(2). Install large (central) cyclic stick guard pilot's seat cover and controls access door.

(3). Remove pilot's collective pitch stick cover, and controls access door and left foot support fairing from Sta. 78.50 canted bulkhead.

(4). Remove cotter pin, two washers and bolt from each end of pilot's lateral control rod, copilot's lateral control rod, or Sta. 70 lateral control rod, as applicable; remove rod assembly.

(5). Remove cotter pin, nut, two washers and bolt securing Sta. 67 lateral cyclic bellcrank to seat structure fitting; remove bellcrank.

(6). If rod or rod ends require replacement, accurately measure and record distance between rod end bearing centers for future reference; use trammel method, or equivalent.

B. Lateral Control Rods and Sta. 67 Lateral Cyclic Bellcrank Installation (R/H Command)

(1). Check that slotted bushing is in upper web of seat structure fitting. Align Sta. 67 lateral cyclic bellcrank and install bolt, two washers, nut and new cotter pin.

(2). Check that slotted bushings are in place and install Sta. 70 lateral control rod. Install both lateral control rods at each end with a bolt, two washers, nut and new cotter pin.

(3). Move both cyclic sticks full forward, then full aft and set both lateral control rods so that rod end bearings do not jam at full throw positions; hold rod ends and tighten jam nuts.

(4). If control rod or rod ends were replaced, perform cyclic control rigging check.

(5). Install cyclic stick guards, pilot's collective pitch stick cover, controls access door, and foot fairing.

17. Cyclic Pitch Interconnecting Torque Tube Replacement (L/H Command)

(Ref. Figure 412)

A. Cyclic Pitch Interconnecting Torque Tube Removal (L/H Command)

(1). Remove pilot's seat cover.

(2). Position pilot's cyclic stick to align holes in one-way lock support links with bolt that attaches forward end of one-way lock to torque tube; tighten longitudinal friction. Disconnect rod end from torque tube arm.

(3). Remove pilot's cyclic stick.

(4). Remove all of cyclic stick guard installation except small guard next to pilot's cyclic stick.

(5). Remove longitudinal control friction mechanism.

(6). Remove pilot's lateral control rod from Sta. 67 lateral cyclic bellcrank.

(7). Cut lockwire and remove support nuts, support bolts and two wide (L/H) support spacers from seat structure fitting lugs and torque tube. Prevent torque tube from dropping as bolts are removed.

(8). Remove torque tube and two narrow (R/H) support spacers.

NOTES:

1. EDGE OF BUSHING MUST PROTRUDE A MINIMUM OF 0.010 IN. (0.254 MM) TO A MAXIMUM OF 0.080 IN. (2.032 MM) ABOVE OUTSIDE SURFACE OF PART AFTER NUT IS TIGHTENED.
2. MAY BE INSTALLED IN EITHER DIRECTION.
3. MAY BE INTERCHANGED TO ALIGN ONE-WAY LOCK.
4. INSTALLED WITH GREASE ON OUTSIDE CIRCUMFERENCE.
5. INSTALLED WITH LOCKING COMPOUND.
6. SHIM WASHERS AS REQUIRED TO ALIGN ONE-WAY LOCK (REMOVE SIDELOAD).

CAUTION:

DO NOT HAMMER RIVETS: SQUEEZE ONLY.

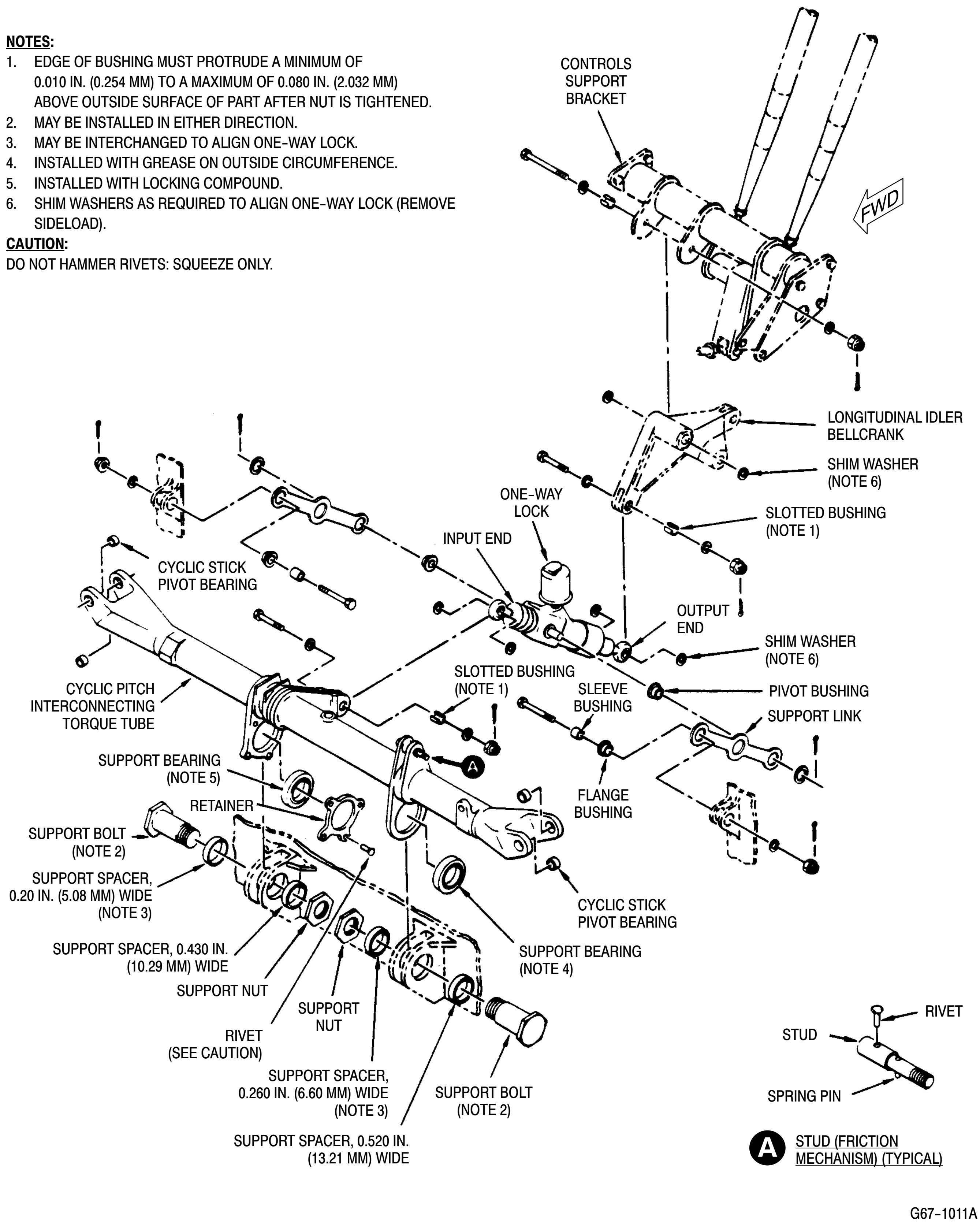


Figure 412. Cyclic Torque Tube and One-Way Lock Installation

B. Cyclic Pitch Interconnecting Torque Tube Installation (L/H Command)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM702	Lockwire CRES

(1). Align cyclic torque tube support bearings with holes in structure fitting lugs. Place narrow support spacer on right side of each support bearing, and install two wide support spacers and support bolts.

NOTE: Support bolts may be installed from either direction, and two narrowest (R/H) support spacers are to be interchanged for best alignment of torque tube with one-way lock.

(2). Check that slotted bushing is in torque tube arm, and fit one-way lock rod end against unbushed lug of arm. If tightening of attachment bolt will apply sideload on the rod end, interchange two narrowest (R/H) support spacers, and/or adjust lateral position shimming of longitudinal idler bellcrank or one-way lock rod ends until there is no sideload on one-way lock control system. Check that no structural interference results from spacer interchange.

(3). Without sideload on one-way lock, install and tighten support nuts. Using lockwire (CM702), safetywire each nut to hole in threaded end of mating bolt. When installing lockwire do not damage aluminum nut and bolt.

(4). Install pilot's lateral control rod (riveted rod) end to Sta. 67 lateral cyclic bellcrank.

(5). Install longitudinal control friction mechanism.

(6). Install cyclic stick guards.

(7). Install pilot's cyclic stick.

(8). Position pilot's cyclic stick to align bolt holes in torque tube arm with holes in one-way lock support links; install attaching hardware.

(9). Install pilot's seat cover.

18. Cyclic Pitch Interconnecting Torque Tube Replacement (R/H Command)

(Ref. Figure 411)

A. Cyclic Pitch Interconnecting Torque Tube Removal (R/H Command)

Removal of torque tube is essentially the same as L/H command except note the following:

(1). Remove pilot's collective pitch stick cover.

(2). Remove pilot's cyclic stick and copilot's cyclic stick.

(3). Remove cyclic stick guards.

(4). Remove longitudinal control friction mechanism.

(5). Remove both lateral control rods from Sta. 67 lateral cyclic bellcrank.

B. Cyclic Pitch Interconnecting Torque Tube Installation (R/H Command)

Installation of torque tube is essentially the same as L/H command except note the following:

(1). Install pilot's and copilot's lateral control rods (riveted rod ends) to Sta. 67 lateral cyclic bellcrank.

(2). Install longitudinal control friction mechanism.

(3). Install cyclic stick guards.

(4). Install pilot's cyclic stick and copilot's cyclic stick.

(5). Install pilot's collective pitch stick cover.

19. One-W ay Lock Replacement

(Ref. Figure 412)

A. One-W ay Lock Removal

(1). Remove pilot's seat cover or inboard collective pitch stick cover and controls access door from Sta. 78.50 canted bulkhead.

(2). Remove cyclic stick guard.

(3). Position pilot's cyclic stick to align holes in one-way lock support links with bolt that attaches forward end of one-way lock to cyclic torque tube; tighten longitudinal friction. Disconnect rod end from torque tube arm.

(4). Disconnect one-way lock lower rod end from longitudinal idler bellcrank.

(5). Disconnect upper end of each support link from seat structure and remove one-way lock with links attached.

(6). Remove two cotter pins, washers and links. Do not remove pivot bushings from links unless replacement is necessary.

B. One-W ay Lock Installation

(1). Check that rod end bearing center-to-center distance is correct.

(2). Attach lower ends of links to one-way lock with bushings, washers and cotter pins.

(3). Align upper ends of links with mating holes in seat structure fitting and attach each link with bolt, sleeve bushing, washer, nut and cotter pin.

(4). Check that slotted bushing is in place in longitudinal idler bellcrank; then fit lower rod end bearing against un-bushed lug of bellcrank to check if sideloading occurs when attachment bolt is tightened. There must be no sideloading of one-way lock mechanism. Arrange shim washers, as necessary, to position longitudinal idler bellcrank and/or lower rod end for alignment without sideload.

(5). Position pilot's cyclic stick to align holes in support links with hingeline for upper end of one-way lock and cyclic torque tube arm; tighten longitudinal friction.

(6). Repeat check for sideload on one-way lock, step (4)., and arrange shim washers, if necessary, to position upper rod end for alignment without sideload.

NOTE: Two narrowest (R/H) cyclic torque tube support spacers may also be interchanged to align one-way lock.

(7). Without sideload on one-way lock, secure each rod end bearing with attaching hardware.

(8). Check reservoir fluid level (Ref. Sec. 12-00-00).

(9). Install cyclic stick guard.

(10). Install pilot's seat cover or inboard collective pitch stick cover and control access door.

20. Cyclic Trim Actuator Replacement

(Ref. Figure 403)

A. Cyclic Trim Actuator Removal

(1). Jack helicopter (Ref. Sec. 07-00-00) until landing gear is fully extended and clears ground.

(2). Remove foot fairing, controls access door from Sta. 78.50 canted bulkhead and open pilot's compartment floor access door.

(3). Disconnect bonding jumper and electrical connector from actuator housing.

(4). Disconnect upper end of trim actuator. Keep pivot bushing with actuator unless actuator is being replaced.

(5). Disconnect lower end of trim actuator. Access to attaching nut is through hole in under-floor compartment aft bulkhead, near centerline beam.

(6). Remove trim actuator. Reinstall original lower end attaching hardware if actuator is being replaced; new actuator includes this hardware.

B. Cyclic Trim Actuator Installation

(1). Check trim actuator spring assembly for free play between spring and spring adapters. Adjust spring adapter screw until 0.010-0.050 inch (0.254-1.27 mm) is felt while pushing or pulling on spring assembly.

(2). Remove hardware supplied in housing end of new trim actuator.

(3). Check that slotted bushings are in place in actuator housing. Place one washer around each side of pivot bearing in center beam support lug and align actuator housing with bearing. Install bolt, two washers and nut (and cotter pin if old style).

(4). Align actuator with idler bellcrank. Check that slotted bushing is in bellcrank lug; install actuator pivot bushing if actuator is a replacement. Pivot bushing must rotate freely in actuator. Install bolt, two washers, nut and cotter pin. After bolt is tightened, pivot bushing must not rotate in idler bellcrank.

NOTE: Lateral actuator upper hingeline has 3/16 inch (4.7625 mm) bolt hole; longitudinal has 1/4 inch (6.35 mm) bolt hole.

(5). Connect bonding jumper. Connect electrical plug to actuator.

(6). With main rotor blades lifted off droop stops, perform power-on operational check of cyclic trim actuator. Actuator must not bind throughout travel range in either direction, and must maintain at least 0.015 inch (0.381 mm)minimum clearance with center beam structure.

(7). Lower helicopter and remove jacks.

MAIN ROTOR FLIGHT CONTROLS ADJUSTMENT/TEST

1. Cyclic and Collective Control System Rigging

Rigging of the main rotor control system must be accomplished immediately after replacement of linkage that cannot be accurately measured (by trameling, etc.) before it is installed in the main rotor control system, or if helicopter operation reveals rigging deficiency.

NOTE:

- Cyclic and collective controls must be rigged in sequence, starting with collective controls. Control rod end bearing adjustments are to be made to nearest half turn that produces correct rigging. When tightening jam nut at adjustable end of control rods, always hold rod end with wrench to prevent jamming of bearing.
- On the 600N helicopter, make all rigging adjustments using the roof-mounted control rods.
- On the 600N helicopter, tunnel- routed control rods should only be adjusted if a flight control component, forward of the roof- mounted bellcranks, has been replaced.

2. Collective Controls Rigging (L/H Command) (369D/E/FF - 500N)

(Ref. Figure 501)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST501	Collective rigging fixture (LH command)
ST503	Mixer rigging plate

(1). Remove main rotor blades, or manually raise blades off droop stops by simultaneously lifting blade tips. All five blades must be off stops during rigging. Padded supports should be used.

(2). Release friction and raise pilot's collective stick. Position collective rigging fixture (ST501) in outboard lower end of slot in collective friction guide link (view C).

(3). Lower collective stick on rigging fixture and tighten friction grip (drive gear).

(4). Position mixer rigging plate (ST503) on mast support fitting.

NOTE: When installing the mixer rigging plate on the 500N helicopter, removal of the splitter bungee and bracket is required. (Ref. Sec 67-20-30).

(5). Measure and record distance from horizontal centerline of mast support bracket hingeline bolt (attaching longitudinal idler bellcrank and collective pitch mixer bellcrank to mast support bracket) to surface of mixer plate (view A). This dimension shall be used as the basic dimension in rigging the mixer controls.

(6). Measure distance from horizontal centerline of bolt that attaches collective pitch mixer bellcrank to longitudinal pitch mixer bellcrank (view B) to surface of mixer rigging plate; it should be same as basic dimension recorded in step (5). above. If not, loosen checknut, disconnect upper end of collective control rod and adjust rod end (to nearest half-turn of rod end bearing) until dimensions are equal.

(7). Reconnect control rod, remove collective stick rigging fixture and check mixer travel. With stick at down stop, centerline of collective pitch mixer bellcrank bolt (view B) should move down so that dimension recorded in step (5). above decreases not less than 0.74 inch (18.796 mm).

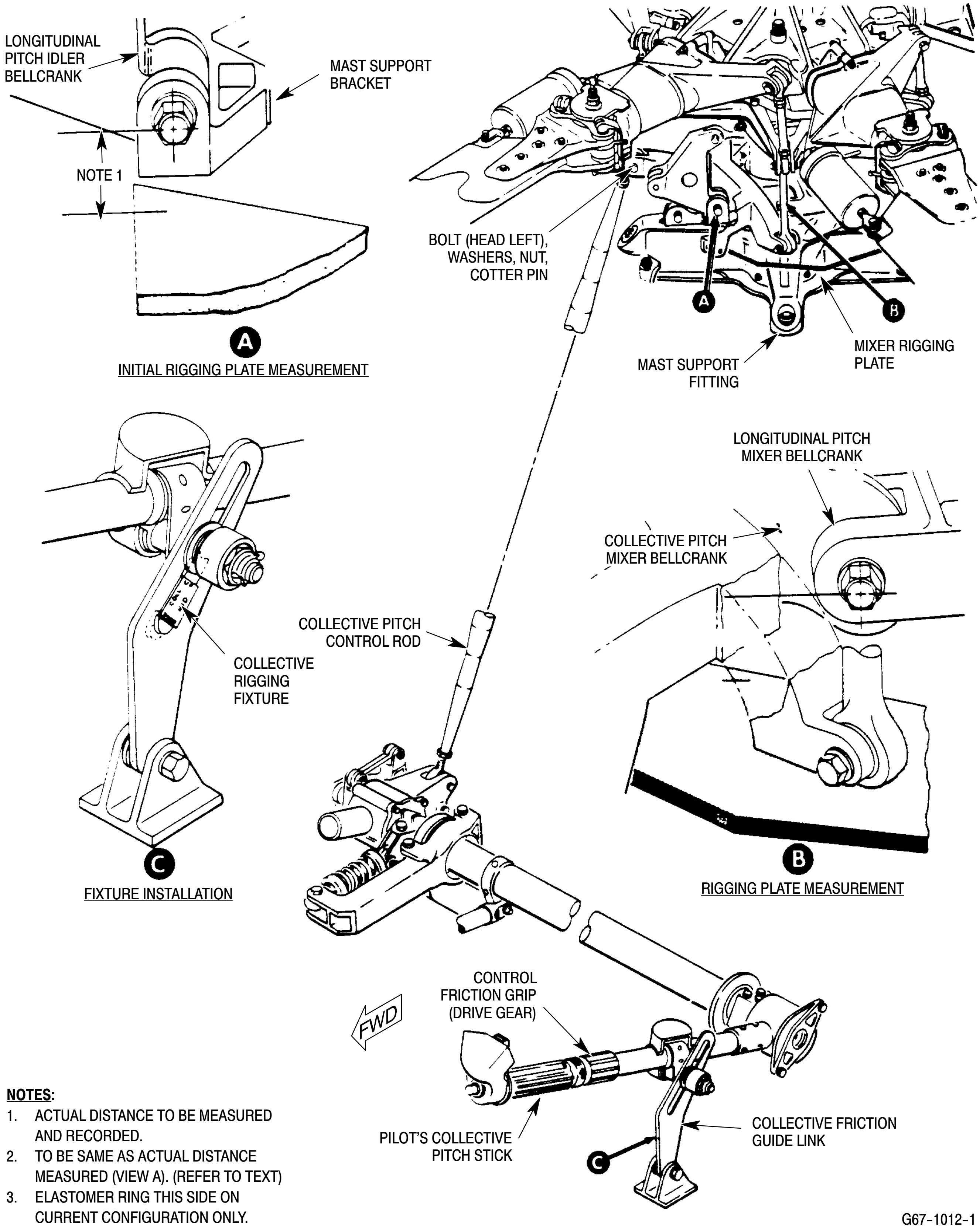


Figure 501. Main Rotor Control System Rigging (369D/E/FF - 500N) (Sheet 1 of 3)

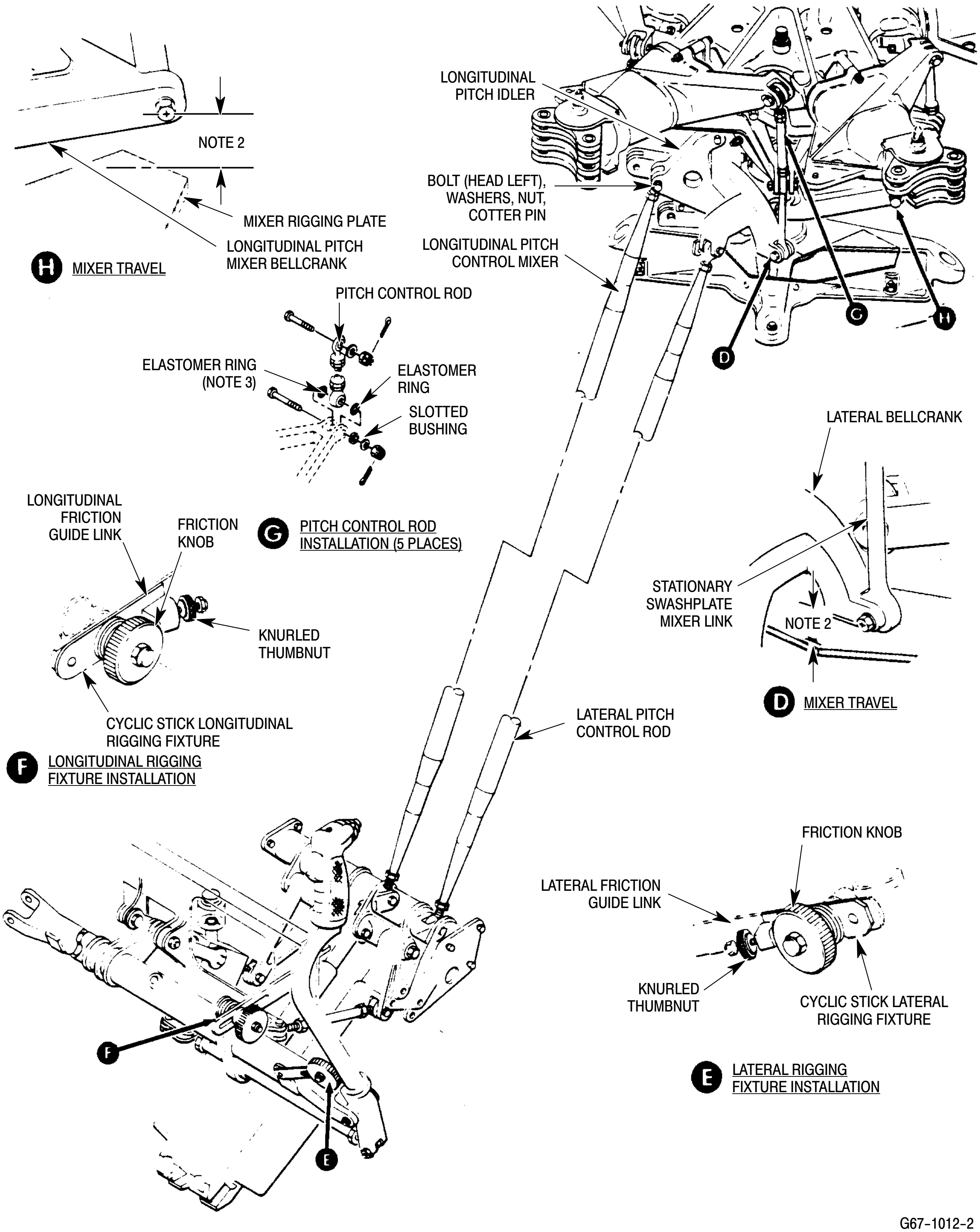
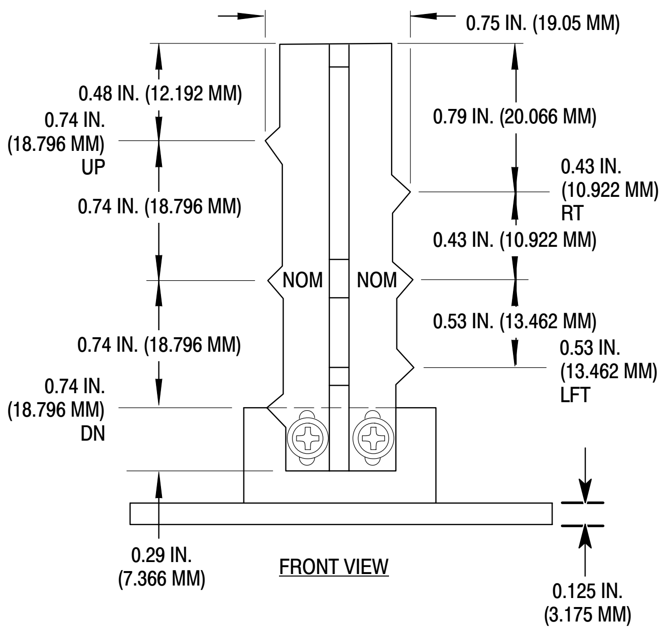
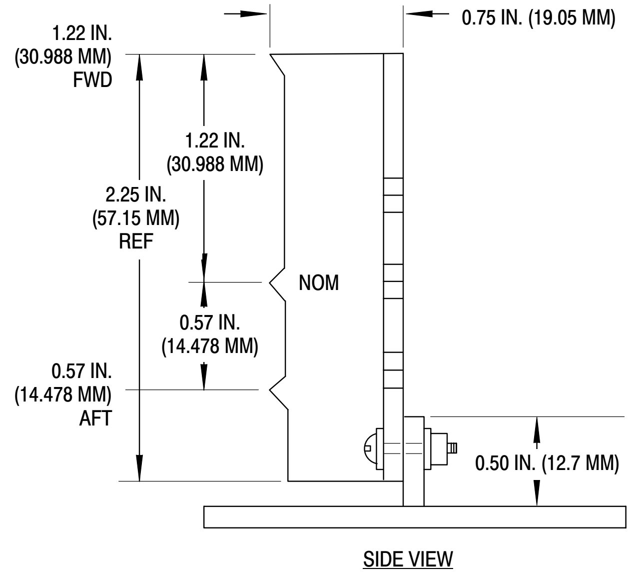
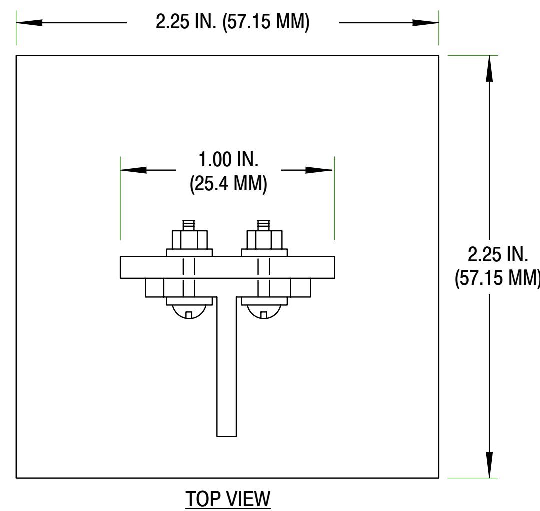


Figure 501. Main Rotor Control System Rigging (369D/E/FF - 500N) (Sheet 2 of 3)







GENERAL NOTES FOR BUILDING FIELD RIGGING AID:

1. MAKE FROM T-ANGLE STOCK TO DIMENSIONS SHOWN.
2. SCREWS, NUTS AND WASHERS AS REQUIRED.
3. HOLES IN VERTICAL T-ANGLE TO BE SLOTTED TO ADJUST TO MIXER SUPPORT BOLT NOMINAL DIMENSION.
4. SCRIBE MARKING ON VERTICAL T-ANGLE AS SHOWN.
5. MANUFACTURE FROM 2024-T4 AL ALY PLATE.
6. IMPRESSION STAMP PART NO. AND INSTRUCTIONS. SURFACE TO BE FLAT AFTER STAMPING.

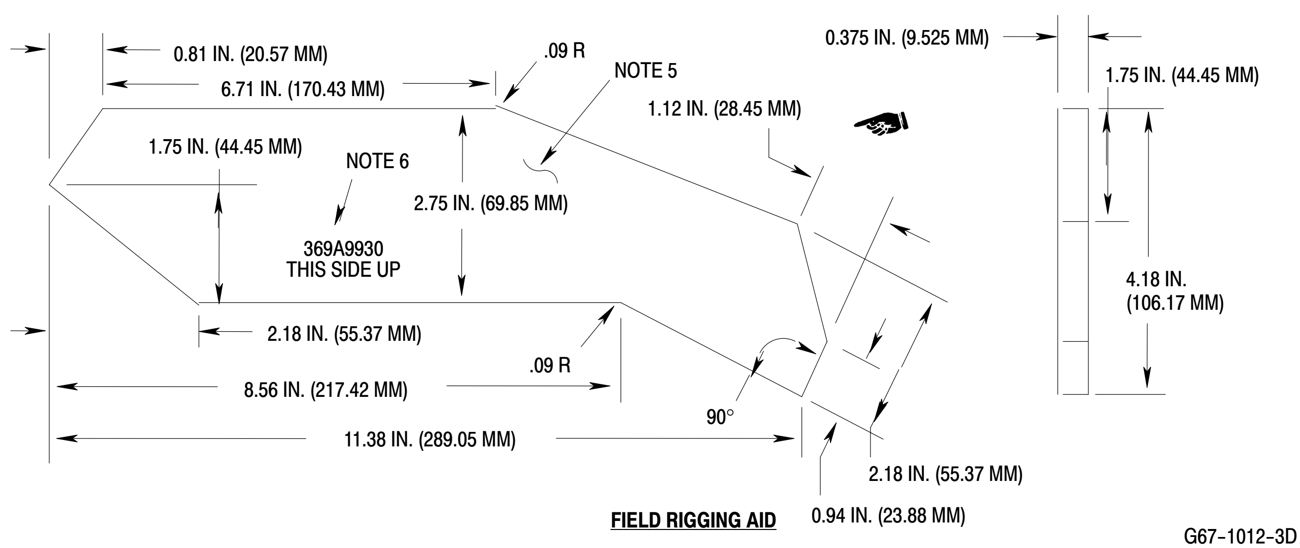


Figure 501. Main Rotor Control System Rigging (369D/E/FF - 500N) (Sheet 3 of 3)

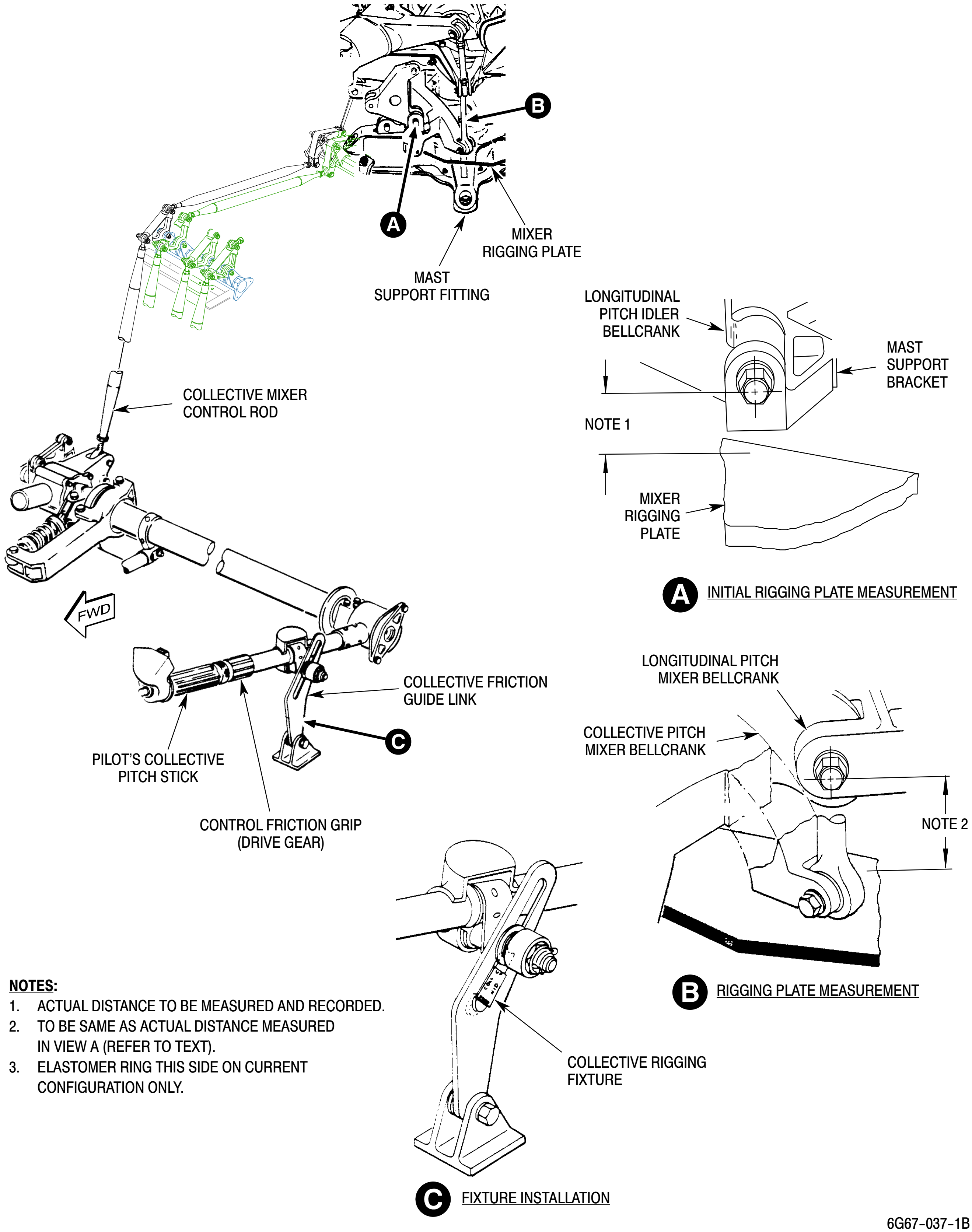


Figure 502. Rigging Main Rotor Control System (600N) (Sheet 1 of 3)

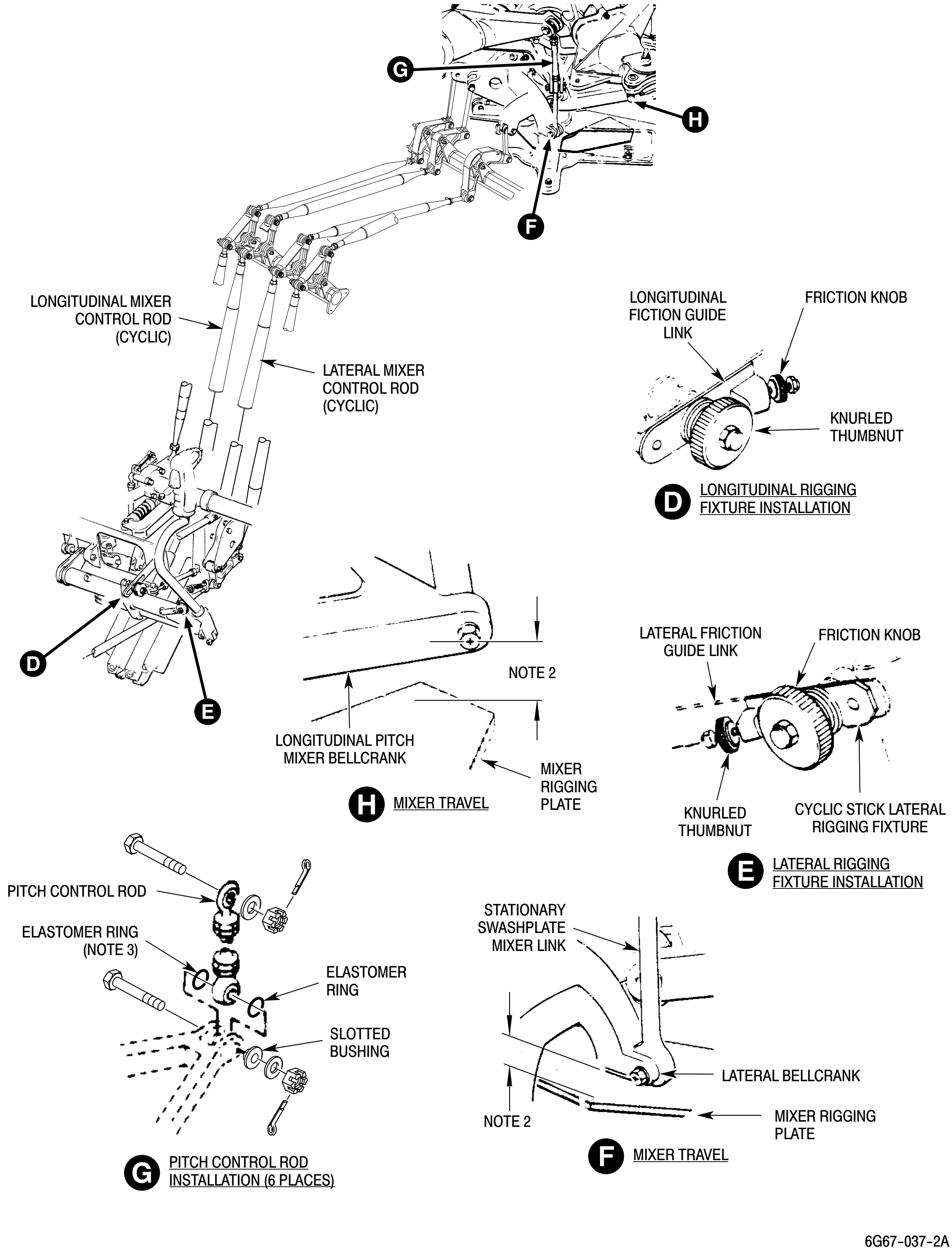
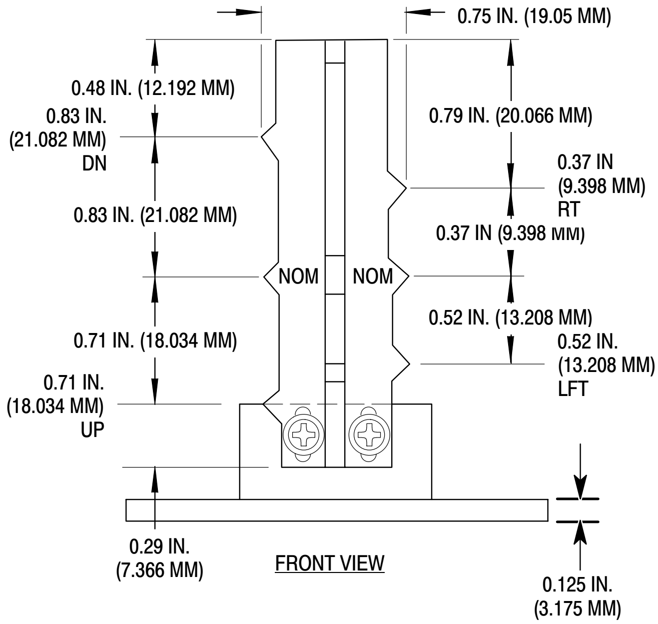
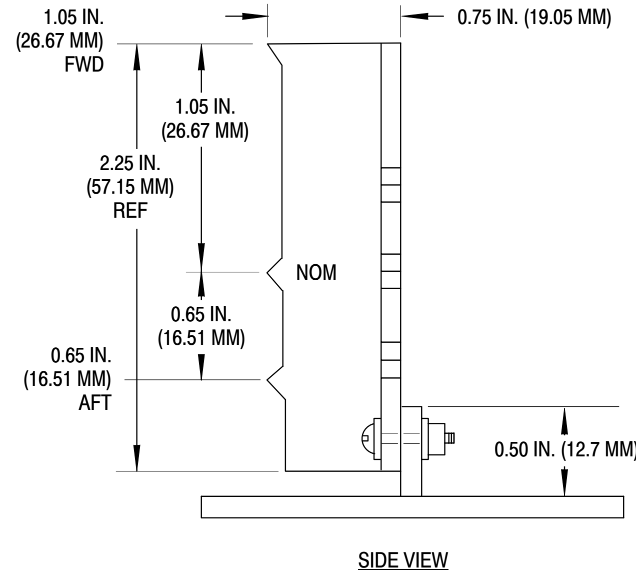
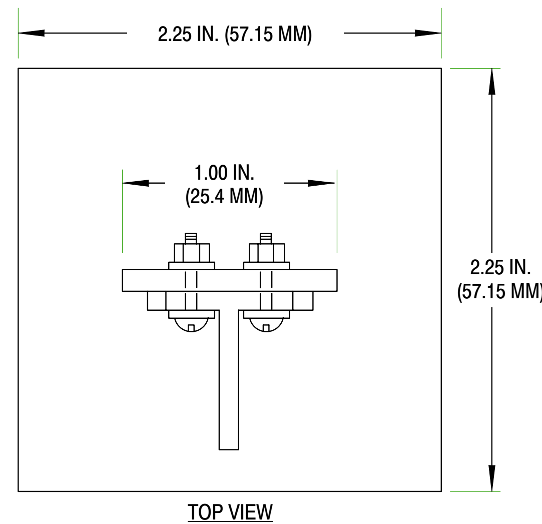


Figure 502. Rigging Main Rotor Control System (600N) (Sheet 2 of 3)







GENERAL NOTES FOR BUILDING FIELD RIGGING AID:

1. MAKE FROM T-ANGLE STOCK TO DIMENSIONS SHOWN.
2. SCREWS, NUTS AND WASHERS AS REQUIRED.
3. HOLES IN VERTICAL T-ANGLE TO BE SLOTTED TO ADJUST TO MIXER SUPPORT BOLT NOMINAL DIMENSION.
4. SCRIBE MARKING ON VERTICAL T-ANGLE AS SHOWN.
5. MANUFACTURE FROM 2024-T4 AL ALY PLATE.
6. IMPRESSION STAMP PART NO. AND INSTRUCTIONS. SURFACE TO BE FLAT AFTER STAMPING.

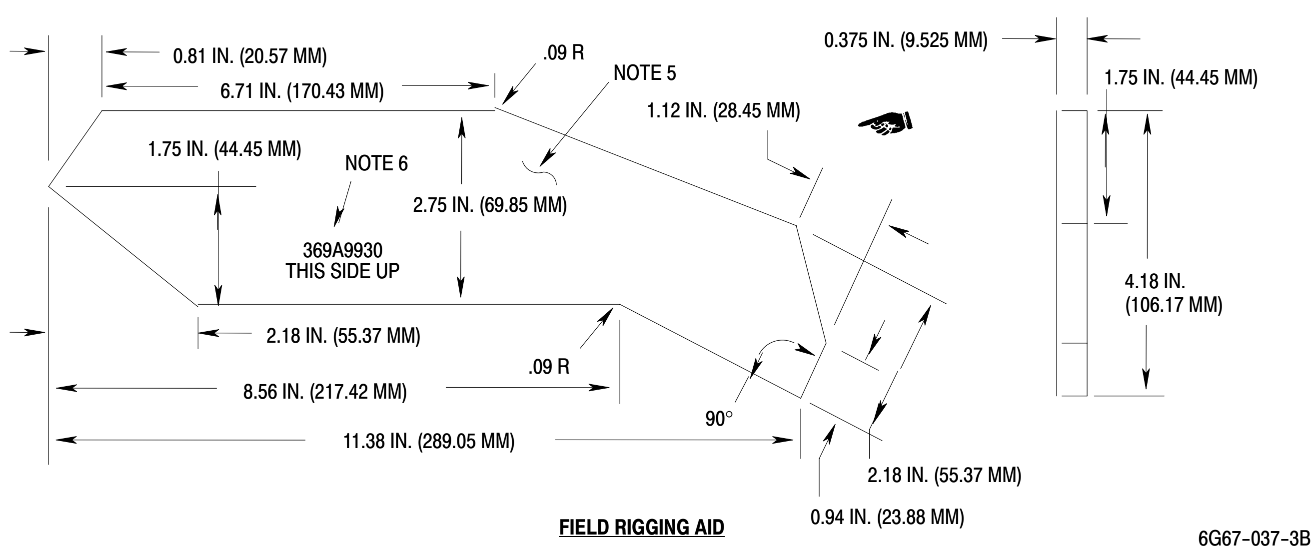


Figure 502. Rigging Main Rotor Control System (600N) (Sheet 3 of 3)

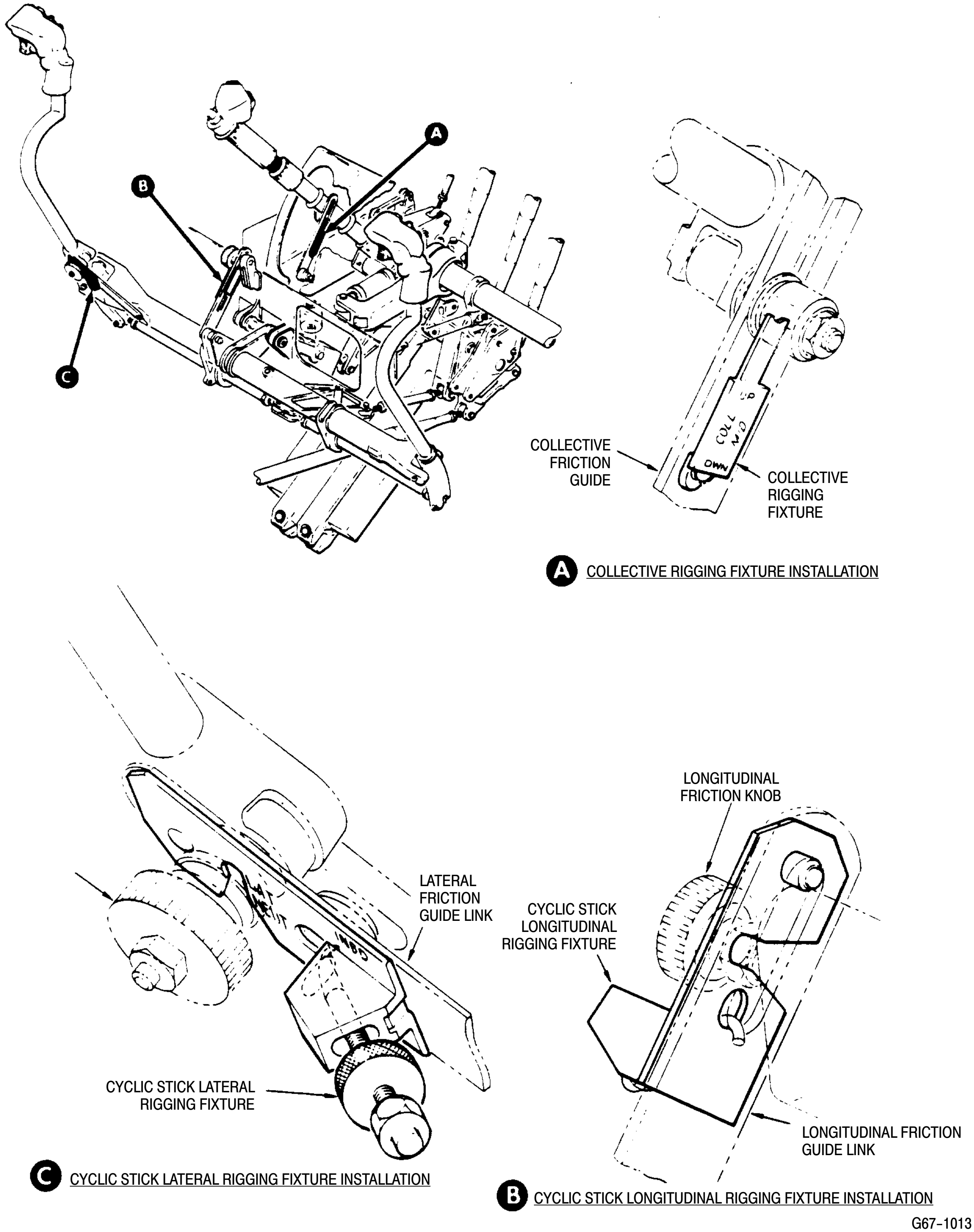


Figure 503. Cyclic and Collective Controls Rigging Tools (R/H Command)

NOTE: To facilitate field rigging of the collective control (up and down) and the cyclic control (both forward and aft, and right and left) a field rigging aid may be fabricated as illustrated (Ref. Figure 501, Sheet 3). If the mixer bellcranks are in dimension with reference to the mixer rigging plate (ST503) the collective and cyclic controls are properly rigged. The dimension attained in steps (7). and (8). shall correspond to the dimensions marked on the field rigging aid. If the dimensions attained do not correspond, full rigging procedures must be performed.

(8). With stick at up stop, centerline of collective pitch mixer bellcrank bolt should move up so that dimension recorded in step (5). above increases minimum of 0.74 inch (18.796 mm).

CAUTION Do not adjust control rod end beyond witness hole. Tighten jamnut after final adjustment. Failure to observe this precaution can result in parts damage and/or equipment failure.

(9). If necessary, adjust rod end of collective pitch control rod to meet limits specified in steps (7). and (8). above. When adjustment is complete, tighten jamnut and make certain that length of control rod does not change.

(10). Remove mixer rigging plate. On the 500N helicopter reinstall the spitter bungee and bracket. (Ref. Sec 67-20-30).

(11). Reconnect collective pitch control rod.

3. Collective Controls Rigging (R/H Command) (369D/E/FF - 500N)

(Ref. Figure 501 and Figure 503)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST502	Collective rigging fixture (RH command)

Collective control rigging for the R/H command helicopter is accomplished according to instructions for L/H command helicopters, except collective rigging fixture (ST502) is used in inboard lower end of collective friction guide slot.

4. Collective Control System Rigging (L/H Command) (600N)

(Ref. Figure 502)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST501	Collective rigging fixture (LH command)
ST503	Mixer rigging plate
ST504	Longitudinal rigging fixture (LH command)
ST506	Lateral rigging fixture (LH command)
ST511	Test fixture

(1). Remove main rotor blades, or manually raise blades off droop stops by simultaneously lifting blade tips. All six blades must be off stops during rigging. Padded supports should be used.

(2). Release friction and raise pilot's collective stick. Position collective rigging fixture (ST501) in outboard lower end of slot in collective friction guide link (view C).

NOTE: The collective bungee has very high over-center spring pressure. Ensure collective stick is fully seated on rigging fixture or rigging may not be correct.

(3). Lower collective stick on rigging fixture and tighten friction lock.

(4). Adjust longitudinal cyclic trim for no-load and install longitudinal cyclic rigging fixture (ST504) (Ref. View D).

(5). Adjust lateral cyclic trim for no-load and install lateral cyclic rigging fixture (ST506) (Ref. View E).

NOTE: For both longitudinal and lateral cyclic rigging fixtures, ensure that the bolt of the friction lock is engaged in the slot of the rigging fixture and that the hook of the fixture is properly engaged with the checknut tightened.

(6). Position mixer rigging plate (ST503) on mast support fitting.

NOTE: To facilitate field rigging of the collective control (up and down) and the cyclic control (both forward and aft and right and left) a field rigging aid may be fabricated as illustrated (Ref. Figure 502, Sheet 3). If the mixer bellcranks are in dimension with reference to the mixer rigging plate (ST503) the collective and cyclic controls are properly rigged. The dimension attained in the following paragraphs shall correspond to the dimensions marked on the field rigging aid. If the dimensions attained do not correspond, full rigging procedures must be performed.

(7). Using a six inch (16 cm) scale, measure and record distance from rigging plate-to-collective hinge bolt center, this is your nominal setting, or, position test fixture (ST511) on rigging plate and adjust NOM indicator to centerline of collective hinge bolt.

CAUTION Do not allow test fixture points to scribe or mark the bolts.

NOTE: Do not change the setting of the test fixture. This setting will be the basic NOMINAL for locating, to the nearest half turn of the respective control rod end fitting, the height of the bolts.

(a). Adjust collective control rod so centerline of bolt of the collective bellcrank (369N2664) is at NOM, to nearest half-turn on rod end bearing.

(b). Adjust longitudinal control rod so centerline of bolt of the longitudinal bellcrank (369N2666) is at NOM, to nearest half-turn on rod end bearing.

(c). Adjust lateral control rod so centerline of bolt of the lateral bellcrank (369N2670) is at NOM, to nearest half-turn on rod end bearing.

(8). Remove collective rigging fixture and check travel as follows:

NOTE: Adjust rod end, as required, to obtain the following limits.

(a). With collective stick at down-stop, centerline of bolt in collective bellcrank (369N2664) shall move down a minimum of 0.71 inch (18.0 mm) below nominal setting.

(b). With collective stick at up-stop, centerline of bolt in collective bellcrank (369N2664) shall move up a minimum of 0.83 inch (21.0 mm) above nominal setting.

5. Collective Controls Rigging (R/H Command) (600N)

(Ref. Figure 502 and Figure 503) Collective control rigging for the R/H command helicopter is accomplished according to instructions for L/H command helicopters, except the following rigging fixtures must be substituted.

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST502	Collective rigging fixture (RH command)
ST503	Mixer rigging plate
ST505	Longitudinal rigging fixture (RH command)
ST507	Lateral rigging fixture (RH command)
ST511	Test fixture

6. Cyclic Controls Rigging (L/H Command) (369D/E/FF - 500N)

(Ref. Figure 501)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST501	Collective rigging fixture (LH command)
ST503	Mixer rigging plate
ST504	Longitudinal rigging fixture (LH command)
ST506	Lateral rigging fixture (LH command)

NOTE: All cyclic control rigging is done with collective controls at mid-position.

(1). Remove main rotor blades, or manually raise blades off droop stops by simultaneously lifting blade tips. All five blades must be off stops during rigging. Padded supports should be used.

(2). Release friction and raise pilot's collective stick. Position collective rigging fixture (ST501) in outboard lower end of slot in collective friction guide link (view C).

(3). Lower collective stick on rigging fixture and tighten friction grip (drive gear).

(4). Position mixer rigging plate (ST503) on mast support fitting.

(5). Loosen longitudinal friction knob and set longitudinal cyclic trim for no load by neutralizing cyclic stick. Position cyclic stick so that longitudinal rigging fixture (ST504) fits in outboard side of slot in longitudinal friction guide link. (Index pin of fixture butts against forward end of slot, and friction knob stud fits in fixture detent - view F.)

(6). Secure fixture hook in aft end of slot. Tighten knurled thumbnut to seat bushing at forward end and tighten friction knob.

(7). Measure and record distance from horizontal centerline of bolt at aft end of longitudinal pitch mixer bellcrank (view H) to surface of mixer rigging plate. It should be same as distance from horizontal centerline of mast support bracket hingeline bolt to surface of mixer plate (Ref. Collective Controls Rigging (L/H Command), step (5).). If not, loosen jamnut, disconnect longitudinal pitch control rod and adjust rod end, to nearest half turn of rod end bearing, until dimensions are equal. This will be basic dimension for cyclic control rigging.

(8). Reconnect control rod, remove longitudinal stick rigging fixture and check mixer travel. With stick at forward stop, centerline of longitudinal pitch mixer bellcrank bolt (view B) should move up so that basic dimension recorded in step (3). above is increased minimum of 1.19 inches (3.0226 cm), or a maximum of 1.22 inches (3.0988 cm).

NOTE: Field rigging aid (Ref. Figure 501, Sheet 3) may be used to check dimensions attained in steps (4). and (5).. If dimensions attained do not correspond with dimensions shown on rigging aid, full rigging procedures must be performed.

(9). Reposition mixer rigging plate to clear longitudinal pitch mixer bellcrank. With stick at aft stop, centerline of longitudinal pitch mixer bellcrank bolt (view B) should move down so that basic dimension recorded in step (3). above decreases minimum of 0.570 inch (14.478 mm).

CAUTION Do not adjust control rod beyond witness hole. Tighten jamnut after final adjustment. Failure to observe this precaution can result in parts damage and/or equipment failure.

(10). If necessary, adjust rod end of longitudinal pitch control rod to meet limits specified in steps (4). and (5). above. Adjust carefully; tolerance is only 1/2 turn. When adjustment is complete, tighten jamnut and ensure that length of control rod does not change.

(11). Reconnect control rod to longitudinal pitch idler.

(12). Reinstall longitudinal rigging fixture; reposition and secure mixer rigging plate.

(13). Loosen friction knob and set lateral cyclic trim for no load by neutralizing cyclic stick. Position cyclic stick so that lateral rigging fixture (ST506) fits in forward side of slot in lateral friction guide link. (Index pin of fixture butts against outboard end of slot, and friction knob stud fits in fixture detent - view E.)

(14). Secure fixture hook in inboard end of slot, tighten knurled thumbnut to seat bushing at outboard end, and tighten friction knob.

(15). Measure distance from horizontal centerline of bolt connecting lateral bellcrank to stationary swashplate mixer link to (view D) surface of mixer rigging plate; it should be same as basic dimension recorded in step (3).. If not, loosen checknut, disconnect lateral pitch control rod and adjust rod end (to nearest half-turn on rod end bearing) until dimensions are equal.

(16). Reconnect control rod, remove lateral stick rigging fixture and check mixer travel. With stick at left stop, centerline of lateral bellcrank bolt (view D) should move down so that basic dimension recorded in step (3). decreases a minimum of 0.50 inch (12.70 mm) or a maximum of 0.53 inch (13.462 mm).

NOTE: The field rigging aid (Ref. Figure 501, sheet 3) may be used to check dimensions attained in steps (12). and (13).. If the dimensions attained do not correspond with dimensions shown on the rigging aid, full rigging procedures must be performed.

(17). With stick at right stop, centerline of lateral bellcrank bolt should move up so that basic dimension recorded in step (3). increases minimum of 0.43 inch (10.922 mm).

CAUTION Do not adjust control rod beyond witness hole. Tighten jamnut after final adjustment. Failure to observe this precaution can result in parts damage and/ or equipment failure.

(18). If necessary, adjust rod end of lateral pitch control rod to meet limits specified in steps (12). and (13). above. When adjustment is complete, tighten jamnut and make certain that length of control rod does not change.

(19). Reconnect control rod to lateral bellcrank.

(20). Loosen friction control, friction knob, knurled thumbnuts and hooks of rigging fixture and remove all three fixtures.

CAUTION Check for interference between rod end bearings and lugs of pitch control housing. Adjust bearings as required to provide clearance.

NOTE: Next step establishes initial adjustment of main rotor pitch controls links. Final adjustment is to be made by tracking and autorotation rpm setting (Ref. Sec. 18-10-00).

(21). Remove and adjust length of each pitch control link (view G) so that centerline-to-centerline distance between rod-end bearings is 6.25 inches (15.875 cm). Then install the pitch control links.

(22). With collective stick full down and cyclic stick full forward and full left, check clearance between the rotating swashplate and the longitudinal pitch idler bellcrank. Minimum clearance is 0.125 inch (3.175 mm). Adjust the collective control rod as required.

(23). With collective stick full up and cyclic stick full left (any position fore or aft), check clearance between lateral bellcrank and, collective pitch mixer bellcrank of the mixer controls. Minimum clearance is 0.030 inch (0.762 mm). Adjust lateral control rod as required.

(24). With collective stick full down and cyclic stick full aft, check clearance between the aft longitudinal bellcrank and the mast base. Minimum clearance is 0.030 inch (0.762 mm). Adjust longitudinal control rod (preferably) or collective control rod as required.

(25). With collective stick full up and cyclic stick full forward and full left, check clearance between rotating swashplate and scissors fitting. Also check clearance between scissors rotating link and lower hub shoe. Minimum clearance in both cases is 0.030 inch (0.762 mm). Rotate hub 360 degrees to determine location of minimum clearance. Adjust collective control rod as required.

(26). Repeat step (21). above with collective stick full up and cyclic stick full forward and full right.

(27). With collective stick full up and cyclic stick full aft and full left, check clearance between scissors link and edge of pocket in rotating swashplate. Minimum clearance is 0.006 inch (0.1524 mm). Rotate hub 360 degrees to determine location of minimum clearance. Repeat clearance check with cyclic stick full aft and full right.

(28). Repeat steps (17). thru (22). above to recheck all clearances.

(29). Repeat steps (7). of Collective Controls Rigging, step (4)., and steps (9). thru (15). of Cyclic Controls Rigging, to recheck mixer control motion travels and see that minimums are met.

(30). Install main rotor blades or remove supports and simultaneously lower all five blades to normal position.

(31). Track main rotor blades and adjust autorotation rpm (Ref. Sec. 18-10-00).

7. Cyclic Controls Rigging (R/H Command) (369D/E/FF - 500N)

(Ref. Figure 501 and Figure 503) Rigging of cyclic controls for the R/H command helicopter is accomplished according to instructions for L/H command helicopters except as follows:

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST505	Longitudinal rigging fixture (RH command)
ST507	Lateral rigging fixture (RH command)

(1). Use longitudinal rigging fixture (ST505) on outboard side of longitudinal friction guide, with fixture cutout positioned over friction knob stud. Bushing end of fixture butts against upper end of slot in guide (Ref. Figure 503, view B). Secure fixture hook in lower end of slot, tighten knurled thumbnut to seat bushing at upper end, and tighten friction knob.

(2). Use lateral rigging fixture (ST507) on forward side of lateral friction guide, with fixture cutout positioned over friction knob stud (view C). Secure fixture hook in lower inboard end of slot, tighten knurled thumbnut to seat bushing at upper outboard end and tighten lateral friction knob.

8. Cyclic Controls Rigging (L/H Command) (600N)

(Ref. Figure 502)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST501	Collective rigging fixture (LH command)
ST503	Mixer rigging plate
ST504	Longitudinal rigging fixture (LH command)
ST506	Lateral rigging fixture (LH command)

NOTE: All cyclic control rigging is done with collective stick on rigging fixture.

(1). Remove main rotor blades, or manually raise blades off droop stops by simultaneously lifting blade tips. All six blades must be off stops during rigging. Padded supports should be used.

(2). Release friction and raise pilot’s collective stick. Position collective rigging fixture (ST501) in outboard lower end of slot in collective friction guide link (view C).

(3). Lower collective stick on rigging fixture and tighten friction grip (drive gear).

(4). Adjust lateral cyclic trim for no-load and install lateral cyclic rigging fixture (ST506).

(5). Position mixer rigging plate (ST503) on mast support fitting.

(6). Check longitudinal travel as follows:

NOTE: Adjust rod end, as required, to obtain the following limits.

(a). With cyclic stick at forward stop, centerline of bolt in longitudinal bellcrank (369N2666) shall move up a minimum of 1.05 inches (26.67 mm) above centerline of collective hinge bolt. Reposition mixer plate to clear longitudinal bellcrank.

(b). With cyclic stick at aft stop, centerline of bolt in bellcrank (369N2666) shall move down a minimum of 0.65 inch (16.51 mm) below centerline of collective hinge bolt.

(7). Adjust longitudinal cyclic trim for no-load and install longitudinal cyclic rigging fixture (ST504).

(8). Remove lateral cyclic rigging fixture.

(9). Check lateral travel as follows:

NOTE: Adjust rod end, as required, to obtain the following limits.

(a). With cyclic stick at left stop, centerline of bolt head (fwd end) of bolt in lateral bellcrank (369N2670) shall move down a minimum of 0.52 inch (13.208 mm) below centerline of collective hinge bolt.

(b). With cyclic stick at right stop, centerline of bolthead in lateral bellcrank (369N2670) shall move up a minimum of 0.37 inch (9.398 mm) above centerline of collective hinge bolt.

CAUTION Do not adjust control rod beyond witness hole. Tighten jamnut after final adjustment. Failure to observe this precaution can result in parts damage and/ or equipment failure.

(10). Set pitch change links at nominal 6.25 inch (158.75 mm).

NOTE: Final adjustment of pitch change links will be accomplished during tracking and autorotation rpm settings.

(11). Remove all rigging fixtures.

(12). With collective stick full down and cyclic stick forward and full left, check clearance between rotating swashplate and longitudinal pitch idler bellcrank (369N2670). The minimum allowable clearance shall be 0.125 inch (3.175 mm). Adjust collective control rod as required.

(13). With collective stick full up and cyclic stick full left (any position fore and aft), check for interference between lateral bellcrank (369N2670) and collective bellcrank (369N2664) of mixer controls. When there is interference, lengthen lateral mixer control rod (369A7012) to maintain a minimum allowable clearance of 0.030 inch (0.762 mm).

(14). With collective stick full down and cyclic stick full aft, check clearance between aft longitudinal bellcrank (369N2668) and mast base. The minimum allowable clearance shall be 0.030 inch (0.762 mm). When clearance is less than 0.030 inch (0.762 mm), adjust longitudinal control rod (preferable) or collective control rod.

(15). With collective stick full up and cyclic stick full forward and full left, check clearance between rotating swashplate and scissors fitting. Also check clearance between scissors fitting and lower hub shoe. The minimum allowable clearance in both cases is 0.030 inch (0.762 mm). Rotate hub 360 degrees to determine location of minimum clearance. Adjust collective mixer control rod as required.

(16). Repeat above step with collective stick full up and cyclic stick full forward and full right.

(17). With collective stick full up and cyclic stick full aft and full left, check clearance between scissors link and edge of pocket in rotating swashplate. Rotate hub 360 degrees to determine location of minimum clearance. Minimum clearance is 0.006 inch (0.152 mm).

(18). Repeat clearance check with cyclic stick full aft and full right.

(19). Recheck all clearances from previous steps.

(20). Recheck control motion travels and check that minimum clearances are met.

(21). Install main rotor blades or remove supports and simultaneously lower all six blades to normal position.

(22). Track main rotor blades and adjust autorotation rpm (Ref. Sec. 18-10-00).

9. Cyclic Controls Rigging (R/H Command) (600N)

(Ref. Figure 502 and Figure 503) Rigging of cyclic controls for the R/H command helicopter is accomplished according to instructions for L/H command helicopters except as follows:

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST501	Collective rigging fixture (LH command)
ST503	Mixer rigging plate
ST505	Longitudinal rigging fixture (RH command)
ST507	Lateral rigging fixture (RH command)

(1). Use longitudinal rigging fixture (ST505) on outboard side of longitudinal friction guide, with fixture cutout positioned over friction knob stud. Bushing end of fixture butts against upper end of slot in guide). Secure fixture hook in lower end of slot, tighten knurled thumbnut to seat bushing at upper end, and tighten friction knob.

(2). Use lateral rigging fixture (ST507) on forward side of lateral friction guide, with fixture cutout positioned over friction knob stud. Secure fixture hook in lower inboard end of slot, tighten knurled thumbnut to seat bushing at upper outboard end and tighten lateral friction knob.

10. Gas Producer Linkage Adjustment

(Ref. Figure 504 and Figure 505) Adjust gas producer linkage in installed collective pitch stick(s) and/or inboard socket assembly as follows:

(1). Remove cap and outboard bearing from pilot's collective pitch stick housing.

(2). Remove backlash shims and gear shaft assembly from socket housing.

NOTE: Note locations, mark and measure removed shim thicknesses to ensure reassembly at same places.

(3). Ensure that inboard collective pitch stick socket internal gears are aligned and mated. If gears are correctly aligned and mated, do not perform steps (4). thru (6). and continue with step (7). If gears are misaligned, perform steps (4). thru (6).

(4). Disconnect link from idler and remove link and bellcrank as an assembly from gearshaft of inboard collective pitch stick socket by removing bolt, two washers and nut.

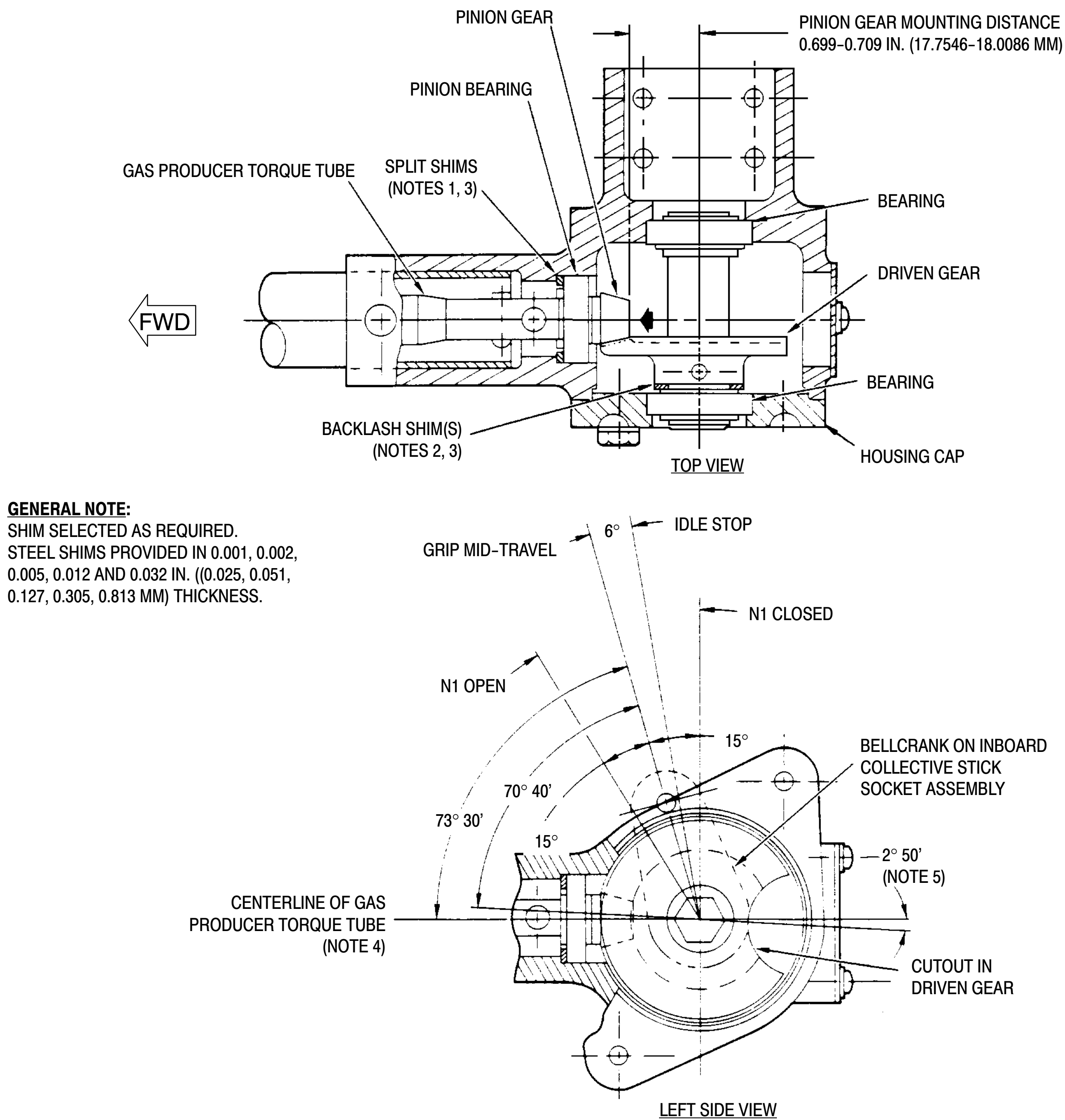
NOTE: During gear shaft rotation to establish correct mid-position for gearshaft and pinion in next step, gearshaft cutout is seen through hole in rear of socket assembly housing.

(5). Rotate end of gas producer interconnect torque tube in pilot's stick socket housing until gear shaft-to-N_1 pinion gearmesh is at mid-travel and N_1 pinion gear wide toothspace is positioned at approximately one o'clock. View pinion by looking aft into open end of collective stick socket.

(6). Attach inboard collective pitch stick socket bellcrank to gearshaft and link to idler. Bellcrank attachment bolt must be installed with head slightly down and forward.

NOTE: Inboard collective N_1 pinion gear must be held in correct position while steps (7). thru (9). below are performed. If available, optional copilot's collective pitch stick can be used to hold gear in position by setting copilot's throttle grip attachment bolts at approximately seven o'clock (looking aft) before engaging stick and socket.

(7). With inboard collective pitch stick socket N_1 pinion gear held at position described in step (5)., rotate pilot's collective pitch stick throttle grip to mid-travel position (grip attaching bolts approximately straight down).



NOTES:
1. DETERMINES GEAR MOUNTING DISTANCE.
2. DETERMINES GEAR BACKLASH MAXIMUM 0.003 IN. (0.0762 MM).
3. SELECTED AS REQUIRED; STEEL SHIMS AVAILABLE IN 0.001, 0.002, 0.005, 0.0012 AND 0.032 IN. (0.025, 0.051, 0.127, 0.305, 0.813 MM) THICKNESSES.
4. ALSO CENTERLINE OF PINION GEAR AND CUTOUT IN DRIVEN GEAR.
5. CENTERLINE OF CENTER TOOTH ON DRIVEN GEAR.

G67-1014B

Figure 504. Gas Producer Drive Backlash Adjustment (Outboard Collective Stick)

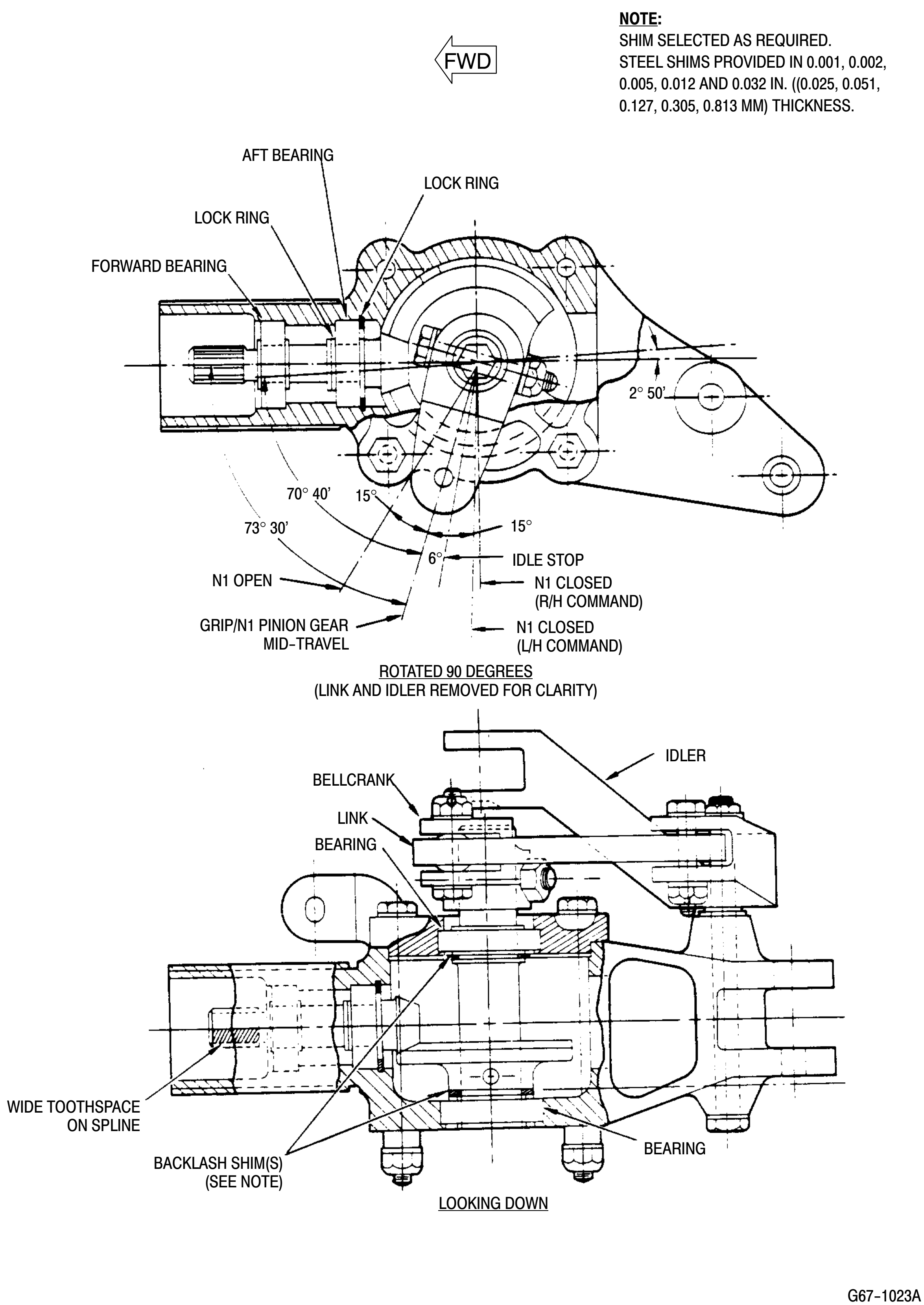


Figure 505. Gas Producer Drive Backlash Adjustment (Inboard Collective Stick)

(8). Install backlash shims and gear shaft in pilot's collective stick socket housing. Ensure that gearshaft and pinion are aligned and mated when pilot's throttle grip is at mid-travel.

NOTE: Make sure that shims are installed in original locations.

(9). Reinstall outboard bearing and cap on pilot's stick housing.

(10). Check that both pilot's throttle grip and inboard collective pitch stick socket N_1 pinion gear wide toothspace are correct at mid-travel.

(11). Remove snap plug from skin, rotate pilot's throttle grip and visually check for evidence of backlash between gas producer interconnect torque tube and hexagonal interior surfaces of gearshaft. If necessary, remove cover and gearshaft from torque tube and eliminate any backlash by tightening pipe plug in end of torque tube. Zero backlash is required at both ends of tube. Reinstall snap plug.

11. Pipe Plug Adjustment

(Ref. Figure 407)

(1). Remove pilot seat cover for access to under seat controls.

(2). Remove snap plug from exterior skin.

(3). Remove bolt securing bellcrank to inboard gearshaft.

(4). Position throttle midway between idle stop and full open.

(5). With assistant, tighten pipe plugs at each end of torque tube simultaneously; maintain throttle as set in step (4). Initial torque required to turn pipe plugs may be high because of dried zinc chromate primer used at installation.

NOTE: If the normally installed plug does not sufficiently expand tube, a 1/8-27 internal-wrenching pipe plug 0.380 inch (9.652 mm) long may be substituted. Whichever plug is used, it must not protrude more than 0.030 inch (0.762 mm) when tightened.

(6). Reinstall bolt to secure bellcrank to inboard gearshaft.

(7). Reinstall snap plug in exterior skin.

(8). Reinstall pilot seat cover.

NOTE: If optional dual controls are installed, perform following rigging and deceleration checks using copilot throttle.

(9). Check engine gas producer controls rigging (Ref. Chap. 76).

(10). Perform deceleration check (Ref. Pilot's Flight Manual).

12. Gas Producer Interconnecting Torque Tube Assembly Shimming (0003D thru 0929D)

(Ref. Figure 506)

(1). Remove pilot's seat cover and access door.

(2). Make an index mark on end of collective torque tube fitting flush with inboard end of pilot's collective stick assembly housing using a felt pen or pencil. **Do not scribe** index mark on fitting.

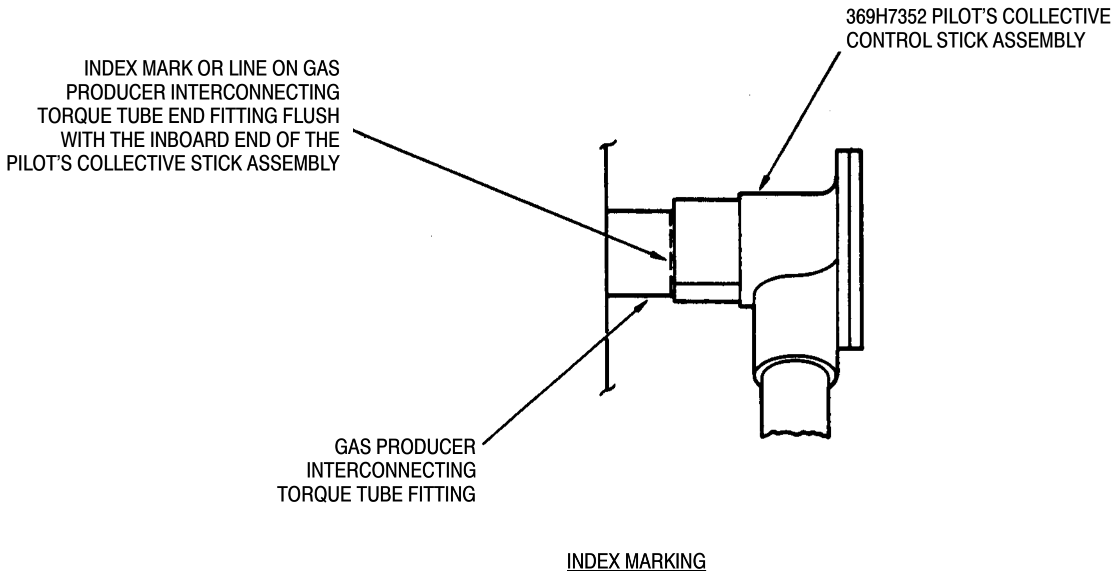
(3). Remove four bolts securing pilot's collective stick assembly to end of collective torque tube fitting.

(4). Loosen pipe plug in end of gas producer interconnecting torque tube which secures it to gas producer gearshaft in pilot's collective stick assembly.

(5). Remove pilot's collective stick assembly.

(6). Using rubber mallet or equivalent soft tool, tap gas producer interconnecting torque tube assembly toward copilot's collective socket assembly. Avoid damage to gas producer interconnecting torque tube hex end or pipe plug threads.

(7). Measure distance between index mark on collective torque tube fitting and hex end of gas producer interconnecting torque tube.



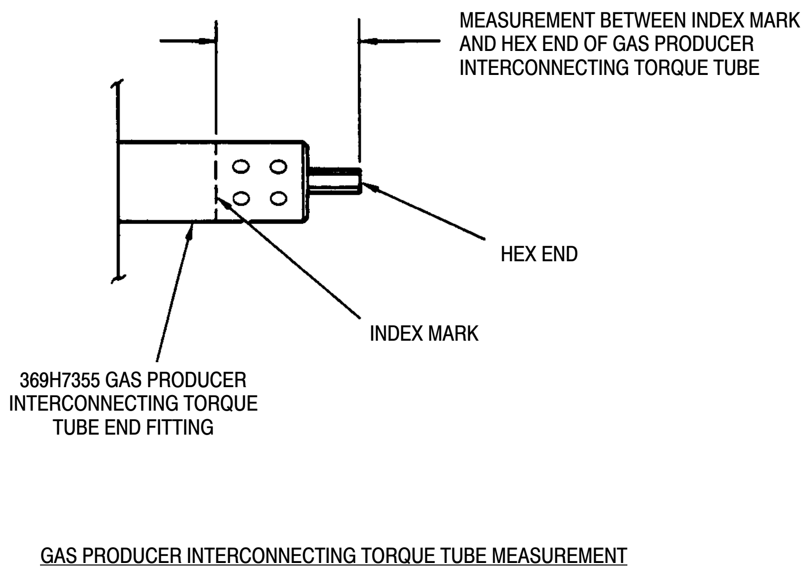


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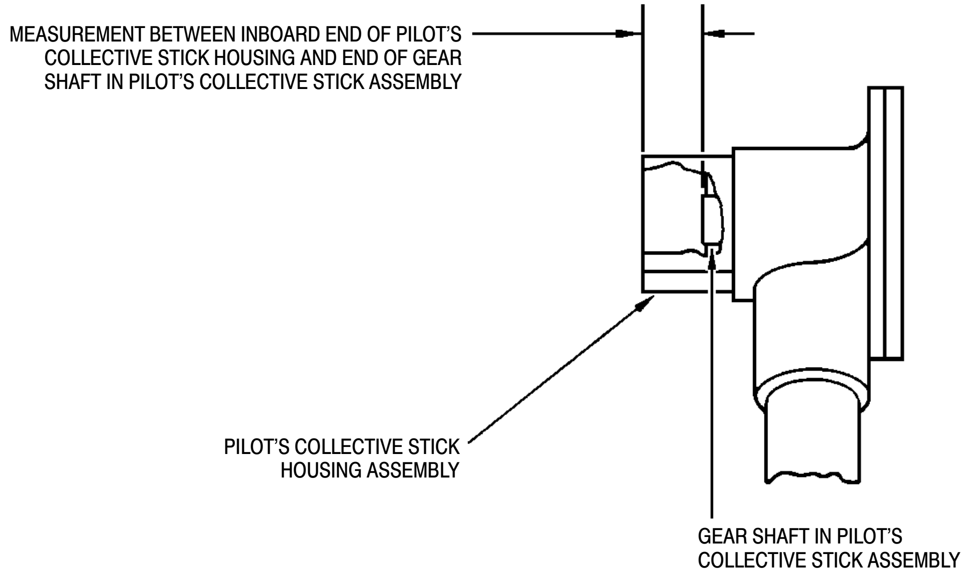
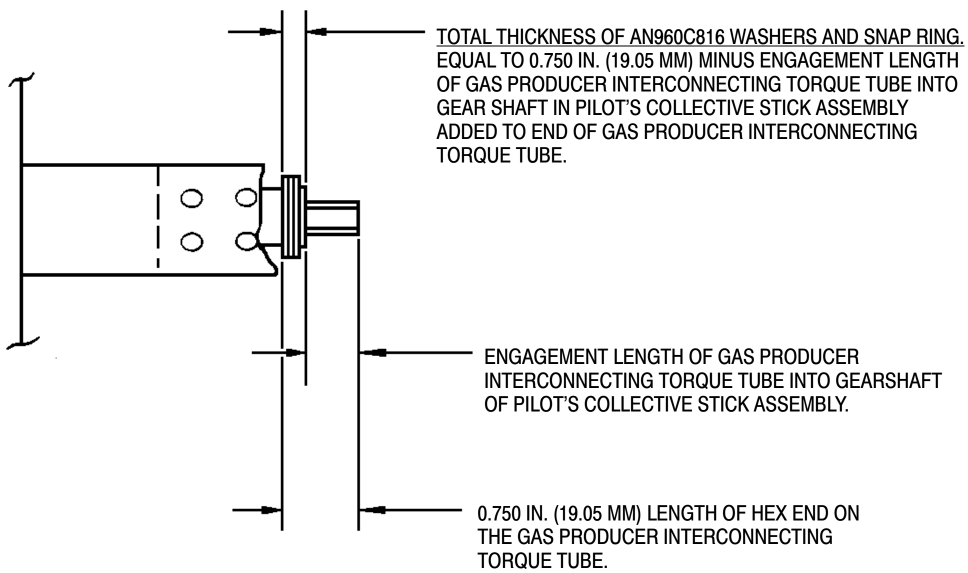
Figure 506. Gas Producer Interconnecting Torque Tube Shimming Procedure (0003D thru 0929D) (Sheet 1 of 2)



GEAR SHAFT RECESSION MEASUREMENT



TORQUE TUBE SHIMMING

G67-1015-2

Figure 506 Gas Producer Interconnecting Torque Tube Shimming Procedure (0003D thru 0929D) (Sheet 2 of 2)

(8). Measure distance between inboard end of pilot's collective stick assembly housing and inboard face of gas producer gearshaft in pilot's collective stick assembly.

(9). Subtract measurement taken in step (8). from measurement taken in step (7). Remainder is engagement of gas producer interconnecting torque tube with gearshaft in pilot's collective stick assembly.

(10). Subtract engagement (remainder) from 0.750 inch (19.05 mm). In addition to thickness of external snap ring, add PN AN960C816 washers to end of gas producer interconnecting torque tube to a total thickness equal to the remainder from 0.750 inch (19.05 mm) less engagement. Equivalent washers in varying thicknesses may be in combination with PN AN960C816 washers.

(11). Reinstall pilot's collective stick assembly.

(12). Tighten pipe plug of gas producer interconnecting torque tube to obtain zero backlash between torque tube and gearshaft in pilot's collective stick assembly.

(13). Reinstall pilot's seat cover and access door.

13. Collective Stick Friction Mechanism Adjustment

(Ref. Figure 507)

CAUTION For collective friction mechanism to be correctly adjusted for maximum friction, three actions must occur at same time: Drive gear must contact stick fitting fixed stop; spring retainer housing washer must contact retainer internal stop; and gear assembly pin must be at approximate peak of cam. Do not overtighten retainer nut so that retainer washer contacts retainer stop before friction drive gear reaches stick fitting stop. Adjustment that does not produce approximately simultaneous contact will allow excessive additional rotation of drive gear grip and cause nylon gears to be stripped.

(1). Remove friction mechanism guard.

(2). Rotate friction drive gear counterclockwise to maximum friction position.

(3). Remove cotter pin, nut, retainer assembly, teflon washer and one phenolic washer.

(4). Slide gear assembly out far enough to disengage it from idler gear. Use care to keep other washers and spacer from dropping.

(5). Remesh gear assembly with idler gear to position pin on peak of cam. Check that drive gear is still at maximum friction stop position.

(6). If gear assembly does not correctly position pin, reposition idler gear on drive gear.

NOTE: Ratio of idler gear to gear assembly is 3:1, which permits fine adjustment. When repositioning idler gear, be sure to reinstall same number of washers that were removed from between cotter pin and idler. These washers limit gear end play to maximum of 0.010 inch (0.254 mm). When reassembled, gear train must rotate freely.

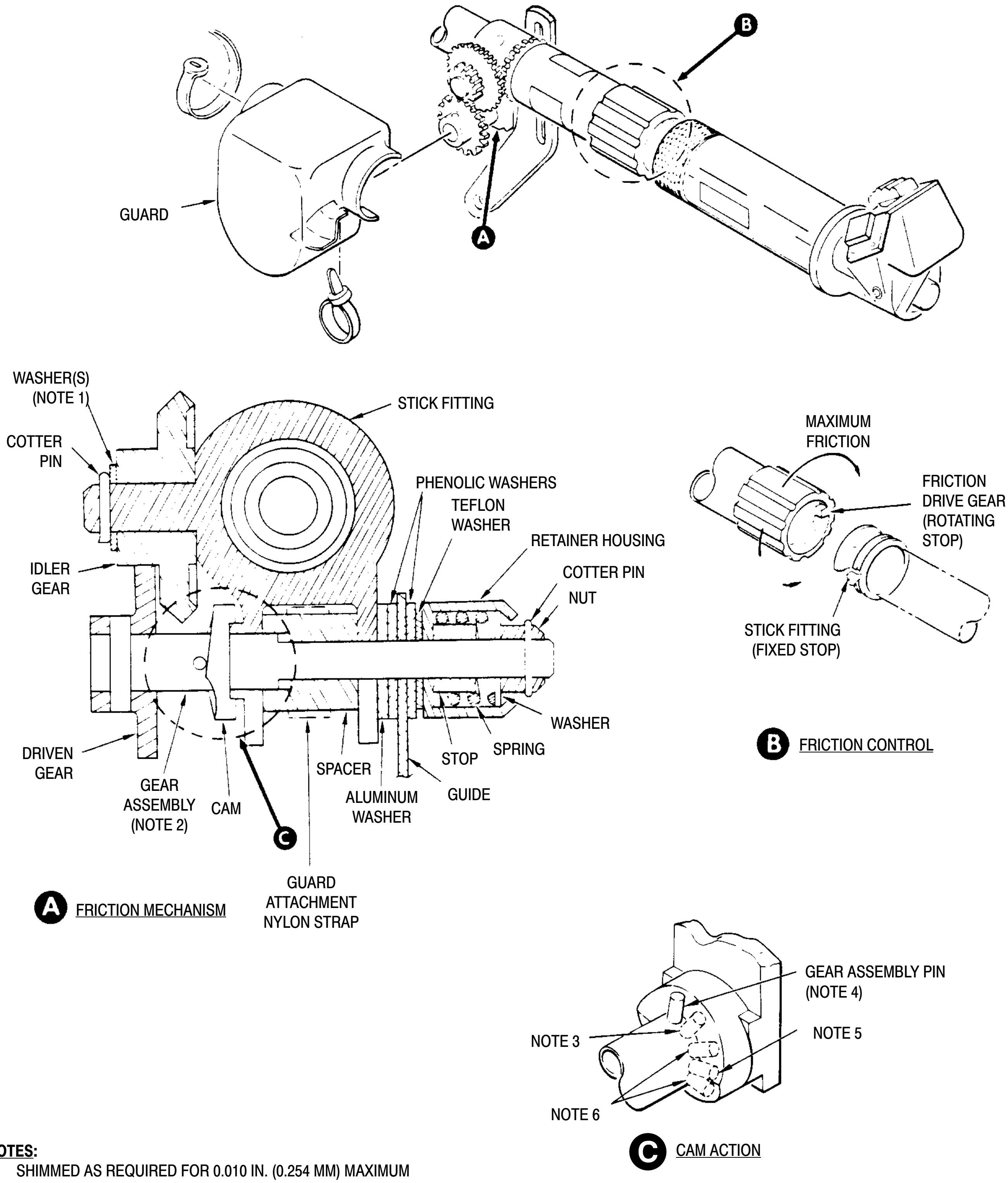
(7). Reinstall phenolic washer, teflon washer, retainer assembly and nut.

(8). With drive gear still at maximum friction position, tighten retainer nut until it just bottoms on retainer stop.

(9). Rotate friction drive gear clockwise to minimum friction stop position, release grip and perform checks in steps (10). and (11). below.

(10). If pin has overridden low point of cam (desired minimum friction position), and grip-to-stick friction prevents springback of pin to cam low point, turn grip and move pin to low point.

NOTE: A drive gear that does not rotate freely on collective stick tube should be replaced.



NOTES:
1. SHIMMED AS REQUIRED FOR 0.010 IN. (0.254 MM) MAXIMUM END PLAY. GEAR TRAIN MUST ROTATE FREELY.
2. GEAR ASSEMBLY MUST SLIDE AND ROTATE FREELY IN FITTING. GREASE APPLIED TO SHAFT.
3. ACCEPTABLE MINIMUM FRICTION POSITION.
4. DESIRED MINIMUM FRICTION POSITION (CAM LOW POINT).
5. CORRECT MAXIMUM FRICTION POSITION (CAM HIGH POINT).
6. UNACCEPTABLE MAXIMUM FRICTION POSITION.

G67-1016B

Figure 507. Collective Stick Friction Adjustment

(11). With pin on cam low point, rotate retainer assembly. It should turn freely on shaft of gear assembly with only light finger pressure. Adjust retainer nut to nearest castellation that produces zero friction (no drag on retainer assembly during rotation). Install cotter pin.

NOTE: If undesirable collective forces (”light”, ”heavy” or ”creeping”) are reported to exist in collective stick during flight, do not attempt to compensate by an increase in collective friction. Condition should be corrected elsewhere in control system (Ref. Collective Controls Rigging (L/H Command) and Collective Bungee Adjustment).

14. Collective Bungee Adjustment

(Ref. Figure 404) Adjustment of bungee system is only permissible when helicopter is on ground.

WARNING

- **Do not attempt bungee adjustment in flight, control jamming can result.**
- **Use all necessary precautions to prevent possible entry of any foreign objects into controls linkage exposed by removal of pilot's seat cover to make adjustment of bungee system. Do not attempt bungee adjustment in flight, control jamming could result.**

(1). Collective load forces are affected by any adjustment made in main rotor system. Comply with the following.

(a). Bungee adjustment should be made only when main rotor blades are in track and autorotation rpm is established.

(b). Ensure that collective stick friction is correctly adjusted.

(c). Perform flight evaluation of collective forces with helicopter takeoff weight at 2350 pounds (1066 kg), N_2 at 103 percent and zero collective stick friction.

(2). Prior to test flight, establish half-way point of collective friction adjustment grip (drive gear) as follows.

(a). Using soft, colored pencil; index collective friction adjustment grip at zero friction.

(b). Roll on maximum friction (approximately 275 degrees rotation). Note travel and reset friction grip halfway; hold in this position.

(c). Using dot of white paint or similar method, temporarily mark top of friction grip and adjacent exposed area of collective stick. Friction half-way index mark should be visible to pilot.

(3). While helicopter is on ground, adjust bungee to extent necessary to avoid any upload in flat pitch at normal rpm. This adjustment must also provide absence of an excessive download or upload while in hover and at 120 knots level cruise. Helicopter must be landed after each flight check, before making corrective adjustment.

CAUTION

- After each bungee adjustment is made, collective stick must be slowly moved through its full travel range to assure that there is no binding or restriction of stick motion, and that spring does not bottom at overcenter position.
- Do not turn female bearing assembly spring retainer while bungee installation tool is spring loaded.
- When making adjustments to the bungee over- center fitting, ensure nut turns when bolt adjustment is made. Cotter pin can be sheared if nut does not turn with bolt.

(a). If an upload exists on ground at flat pitch and normal rpm but a download prevails during hover and at 120 knot level cruise, turn bungee adjustment retainer nut clockwise to increase preload in bungee system.

(b). To correct a download on ground during flat pitch at normal rpm and an upload condition during hover and 120 knot level cruise, turn bungee adjustment retainer nut counterclockwise to decrease preload in bungee system.

(c). When a relatively constant upload condition prevails during flat pitch at normal rpm on the ground, at hover, and at 120 knot level cruise, decrease upload by turning bungee over-center adjustment bolt clockwise.

(d). When a relatively constant download condition prevails during flat pitch at normal rpm on the ground, at hover, and at 120 knot level cruise, decrease download by turning bungee over-center adjustment bolt counterclockwise.

NOTE: Rotation of adjustment bolt head is the only mechanical operation required to adjust over-center position of bungee fitting.

(e). After minimum and balanced collective forces are obtained, not more than one-half of available collective stick friction (friction grip at half-way index) must cancel collective forces during flight test at 140 knots level flight.

(f). If friction applied in step (e). above is insufficient to cancel collective forces, repeat adjustment procedure.

15. Cyclic Trim Actuator Bench Testing (369D/E/FF - 500N)

(Ref. Figure 508)

(1). Connect cyclic trim actuator to test harness and equipment.

(2). Mount actuator in suitable fixture that allows vertical extension and retraction.

(3). Turn on direct-current power and adjust output to 25.75 - 26.25 volts.

CAUTION During following tests, do not retract spring assembly (ram) so that actuator length is less than 13.50 inches (34.29 cm) between attach bolt centers.

(4). With actuator spring assembly (ram) approximately halfway between travel limits (actuator length at 14.46 inches (36.7284 cm) between attach bolt centers), set up test dial indicator and measure ram end play. End play must be within 0.010-0.050 inch (0.254-1.27 mm). While adjusting screw, check that there is thread-locking friction from self-locking threaded insert. If end play is excessive, replace actuator.

NOTE:

- When power is applied to the 8222M6 (369A7014) actuator, it will move in the commanded direction until it reaches the end of the stroke. If, during mid-travel, an opposite power is applied simultaneously, it will stop and remain stopped until one or the other input is removed.
- When power is applied to the 8222M7 (369D27001) actuator, it will move, as commanded, and like the M6, if power is applied simultaneously in the opposite direction, it will stop. Unlike the M6, when one of the inputs is removed, the M7 actuator may or may not start. If it does not restart, it has been latched into the off state by the current surge generated upon applying the second input. The M7 has a built-in current limit circuit that latches it off if the actuator current exceeds 2.7 amp. All power must be removed in order to unlatch it.

(5). Position test switch to RETRACT and allow actuator ram to retract to a length of 13.50 inches (34.29 cm) between attach bolt centers.

(6). Using stopwatch, check actuator ram travel time from fully retracted to fully extended. Check time interval for actuator motor tested.

NOTE: The times in the following charts are maximum times. Some actuators will travel at a greater speed than others. Intervals of less time are acceptable.

Actuator Motor Part number	Time Interval (Seconds)
369A7001	58.4
369A7014 (High Speed)	38.0
369D27001 (Super Fast)	17.5

(7). Measure length of extended ram. Subtract measured result of step (5). above from this value. Result must be 1.92 inches (4.8768 cm) minimum.

CAUTION Do not run actuator against extend limit stop with the 163-pound weight aiding actuation. Actuator thrust bearing may be damaged.

(8). Connect a 163 pound (74 kg) load to actuator. Set switch at RETRACT. Check time it takes ram to travel 1.72-1.78 inches (4.3688-4.5212 cm) to retract stop. Check retraction time for actuator motor tested.

Actuator Motor Part number	Time Interval (Seconds)
369A7001	30-50
369A7014 (High Speed)	15-25
369D27001 (Super Fast)	7-12

(9). Operating current under load conditions must not exceed 1.2 amperes running and 2.0 amperes stalled.

(10). Reduce voltage input to 21 volts. Actuator ram must retract and extend. Overtravel is limited to 0.020 inch (0.508 mm) with an overriding (aiding) load; otherwise there must be no overtravel.

NOTE: It is not necessary to extend or retract actuator ram more than 1/4 inch (6.35 mm) for test in steps (10). above or (11). below.

(11). Increase input voltage to 28 volts. Actuator arm must retract and extend. Overtravel is limited to 0.020 inch (0.508 mm) maximum with an overriding (aiding) load; otherwise there must be no overtravel.

(12). Remove 163 pound (74 kg) load and repeat step (4). above.

(13). Run actuator until arm is extended 1.75 inches (4.445 cm). Turn power off and disconnect cyclic trim actuator.

16. Cyclic Trim Actuator Bench Testing (600N)

(Ref. Figure 508)

(1). Connect cyclic trim actuator to test harness and equipment.

(2). Mount actuator in suitable fixture that allows vertical extension and retraction.

(3). Turn on direct-current power and adjust output to 25.75 - 26.25 volts.

CAUTION During following tests, do not retract spring assembly (ram) so that actuator length is less than 13.50 inches between attach bolt centers.

(4). With actuator spring assembly (ram) approximately halfway between travel limits (actuator length at 14.46 inches (36.7284 cm) between attach bolt centers), set up test dial indicator and measure ram end play. End play must be within 0.010-0.050 inch (0.254-1.27 mm). While adjusting screw, check that there is thread-locking friction from self-locking threaded insert. If end play is excessive, replace actuator.

NOTE: When power is applied to the 8222M21 (600N7001) actuator, it will move, as commanded, and if power is applied simultaneously in the opposite direction, it will stop. When one of the inputs is removed, the actuator may or may not start. If it does not restart, it has been latched into the off state by the current surge generated upon applying the second input. The actuator has a built-in current limit circuit that latches it off if the actuator current exceeds 3.1 amp. All power must be removed in order to unlatch it.

(5). Position test switch to RETRACT and allow actuator ram to retract to a length of 13.50 inches (34.29 cm) between attach bolt centers.

(6). Using stopwatch, check actuator ram travel time from fully retracted to fully extended. Check time interval for actuator motor tested.

NOTE: The time in the following chart is maximum time. Some actuators will travel at a greater speed than others. Intervals of less time are acceptable.

Actuator Motor Part number	Time Interval (Seconds)
600N7001-1 (longitudinal)	6.6
369D27001-3 (lateral)	11.0
600N7014-1 (lateral, with YSAS)	11.0

(7). Measure length of extended ram. Subtract measured result of step (5). above from this value. Result must be 1.92 inches (4.8768 cm).

CAUTION Do not run actuator against extend limit stop with the 163-pound weight aiding actuation. Actuator thrust bearing may be damaged.

(8). Connect a 163 pound (74 kg) load to actuator. Set switch at RETRACT. Check time it takes ram to travel 1.72-1.78 inches (4.3688-4.5212 cm) to retract stop. Check retraction time for actuator motor tested.

Actuator Motor Part number	Time Interval (Seconds)
600N7001-1 (longitudinal)	7-12
369D27001-3 (lateral)	7-12
600N7014-1 (lateral, with YSAS)	7-12

(9). Operating current under load conditions must not exceed 1.2 amperes running and 2.0 amperes stalled.

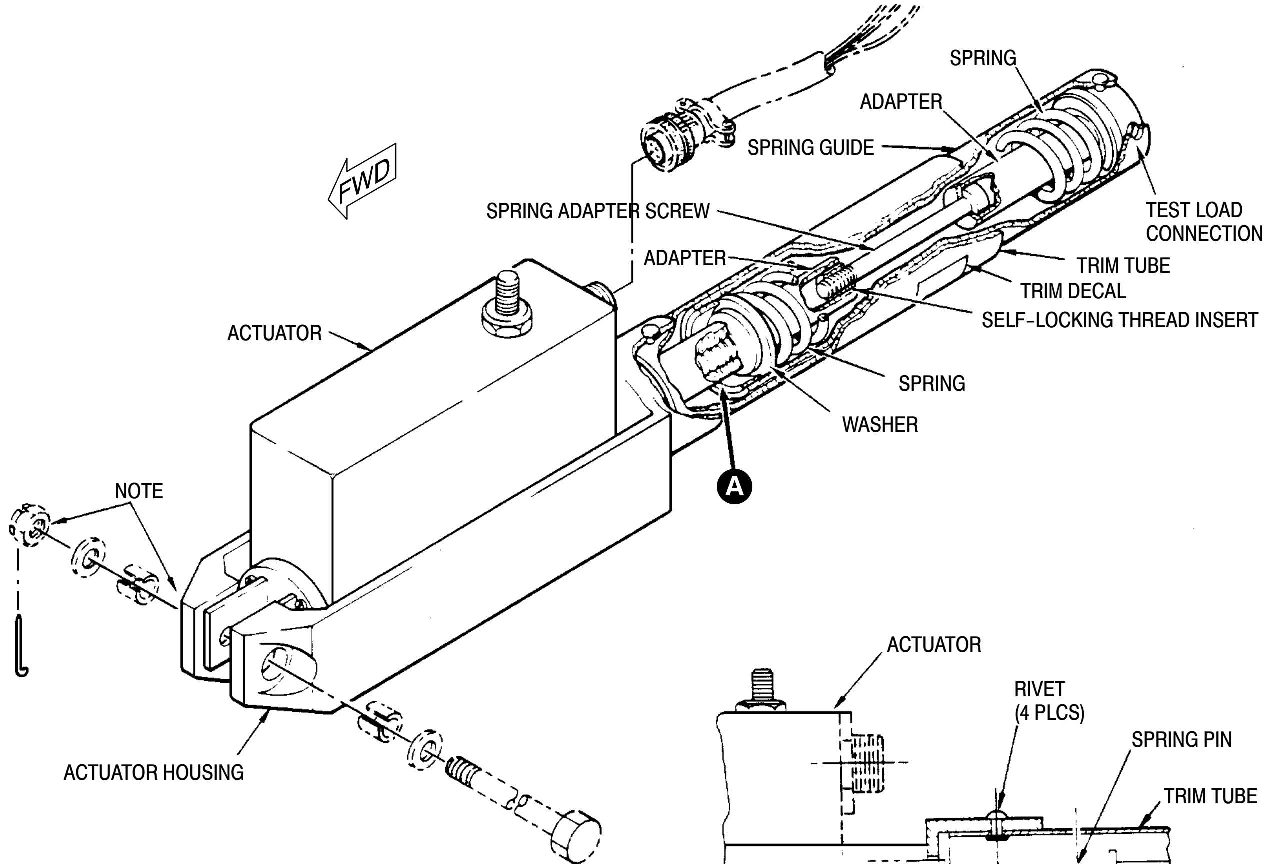
(10). Reduce voltage input to 21 volts. Actuator ram must retract and extend. Overtravel is limited to 0.020 inch (0.508 mm) with an overriding (aiding) load; otherwise there must be no overtravel.

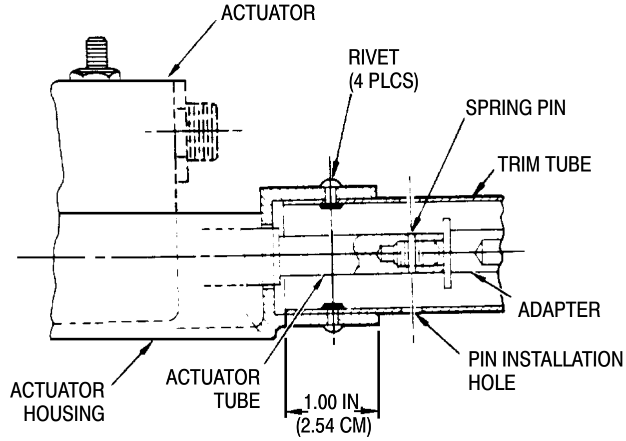
NOTE: It is not necessary to extend or retract actuator ram more than 1/4 inch (6.35 mm) for test in steps (10). above or (11). below.

(11). Increase input voltage to 28 volts. Actuator arm must retract and extend. Overtravel is limited to 0.020 inch (0.508 mm) maximum with an overriding (aiding) load; otherwise there must be no overtravel.

(12). Remove 163 pound (74 kg) load and repeat step (4). above.

(13). Run actuator until arm is extended 1.75 inches (4.445 cm). Turn power off and disconnect cyclic trim actuator.

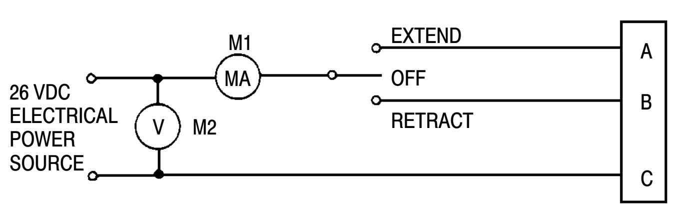




NOTE: REPLACEMENT PARTS HAVE NUTPLATE RIVETED IN PLACE. WASHER, NUT AND COTTER PIN NOT REQUIRED.

A TRIM TUBE - INSTALLATION

ITEM NO.	TEST EQUIPMENT
1	STOPWATCH, MARKED IN 1/10-SECOND INCREMENTS (MINERVA OR EQUIVALENT).
2	6 IN. (15.25 CM) SCALE.
3	DC VOLTMETER, 0-50 VOLTS (WESTON MODEL 931 OR EQUIVALENT).
4	DC MILLIAMMETER, 0-5 AMPERES (WESTON MODEL 931 OR EQUIVALENT).
5	VARIABLE DC POWER SUPPLY, 10-36 VOLTS (N.J.E. MODEL SY 36-10 OR EQUIVALENT).
6	DIAL INDICATOR GAGE (BROWN AND SHARP, MODEL 740 OR EQUIVALENT).
7	SWITCH, SPDT: CENTER OFF.



TEST HOOKUP

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Figure 508. Cyclic Trim Actuator Assembly

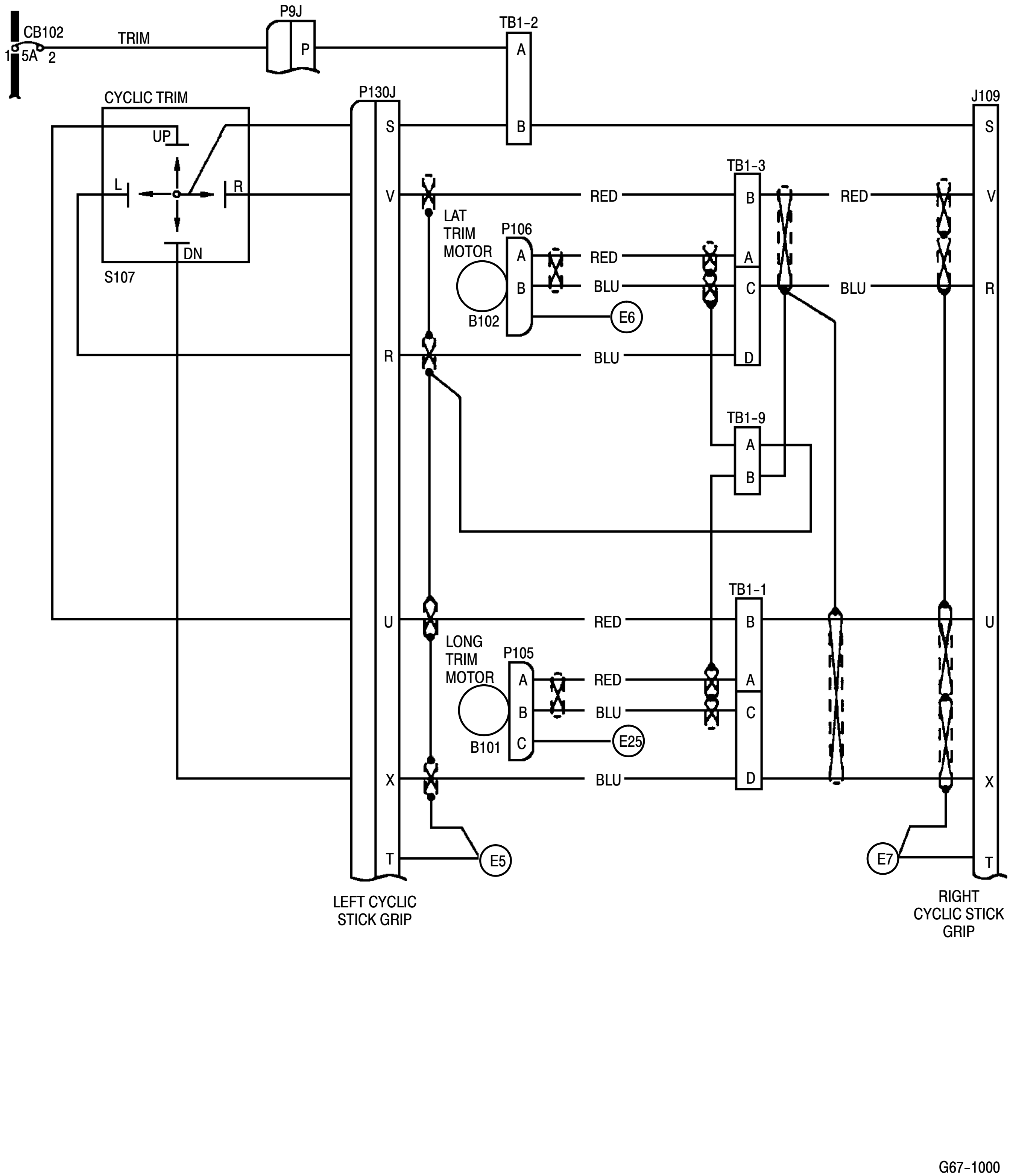
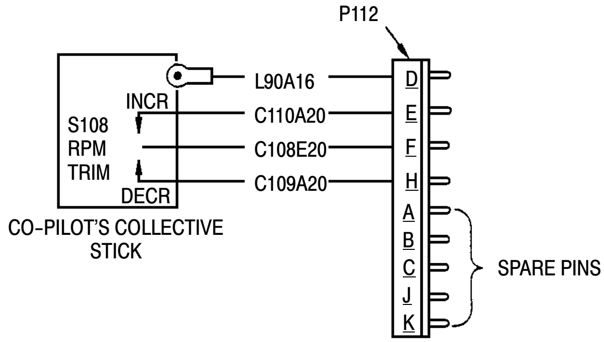
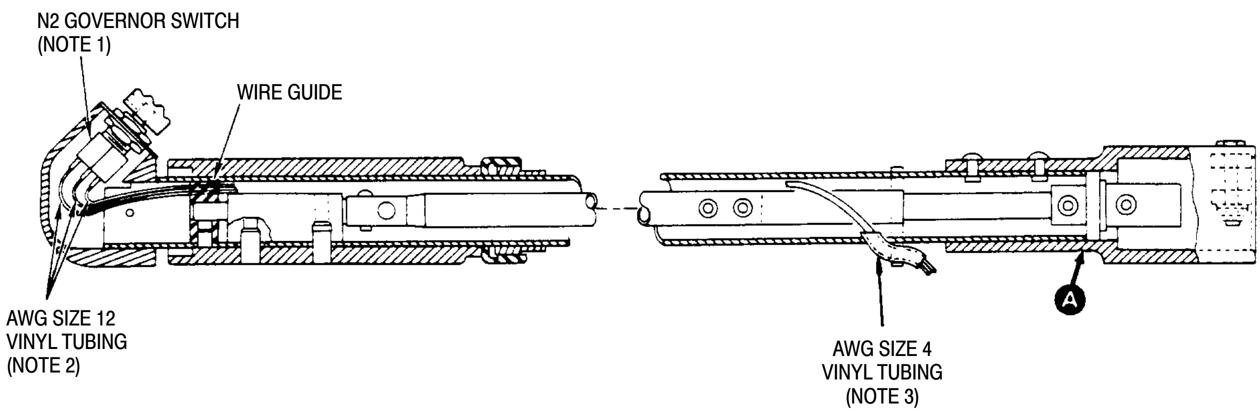
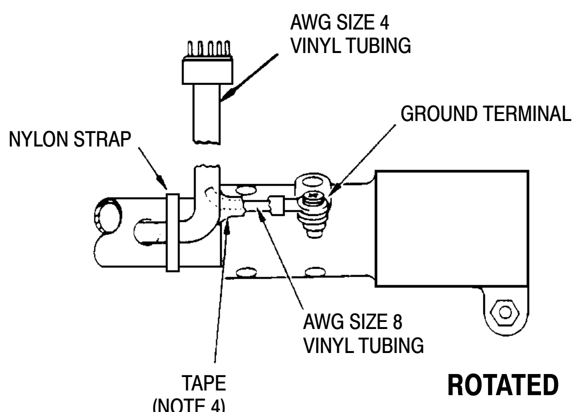


Figure 509. Cyclic Trim Wiring Diagram



WIRING DIAGRAM





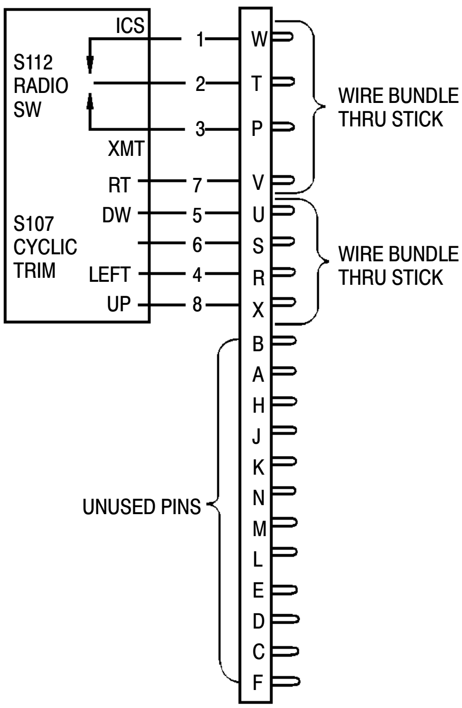
A CABLE ROUTING

NOTES:

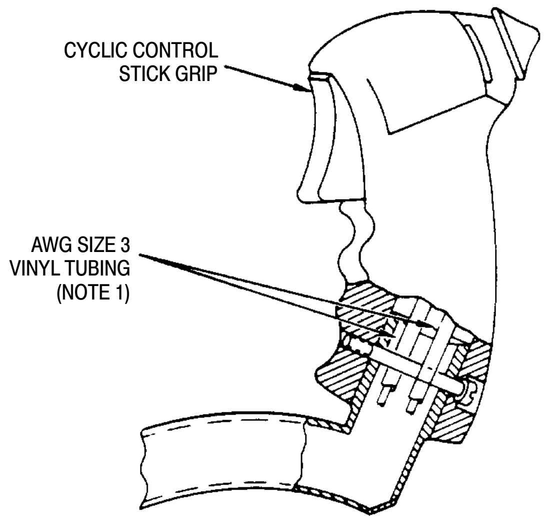
1. DISCARD 29-761 LOCKING RING BEFORE INSTALLING SWITCH.
2. ENCASE EACH WIRE FULL LENGTH WITH AWG SIZE 12 VINYL TUBING.
3. AWG SIZE 4 TUBING SHOULD NOT EXTEND INSIDE CONTROL STICK MORE THAN 0.060 IN. (1.524 MM).
4. WRAP WIRE BUNDLE WITH CT93C TAPE AS REQUIRED.

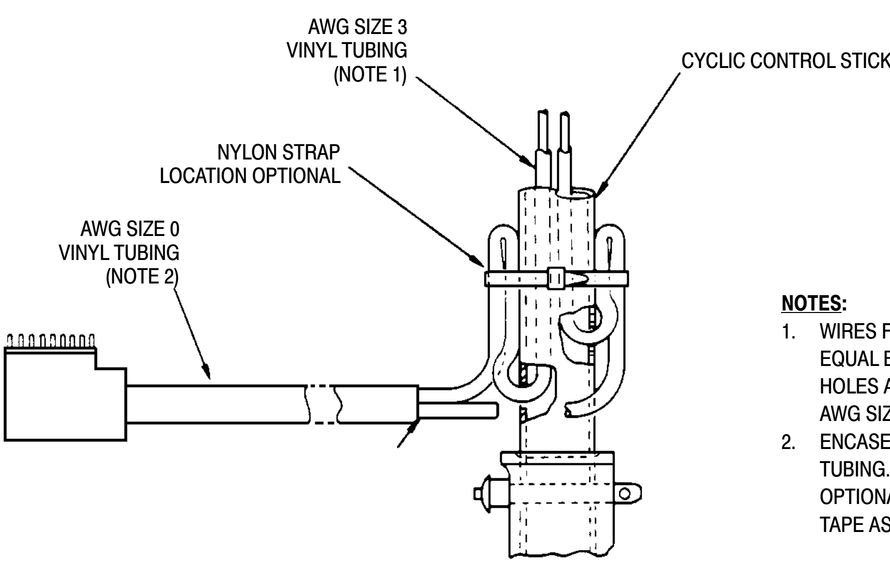
G67-1018A

Figure 510. Wiring Diagram and Cable Routing (Collective Stick)



WIRING DIAGRAM





CABLE ROUTING

NOTES:

1. WIRES FURNISHED WITH GRIP. SPLIT INTO TWO EQUAL BUNDLES AND RUN EACH BUNDLE THRU HOLES AS SHOWN. ENCASE EACH BUNDLE IN AWG SIZE 3 VINYL TUBING.
2. ENCASE TWO BUNDLES IN AWG SIZE 0 VINYL TUBING. END OF BUNDLE LOCATION IS OPTIONAL. TAPE END OF TUBING WITH CT93C TAPE AS REQUIRED.

G67-1019

Figure 511. Wiring Diagram and Cable Routing (Cyclic Stick)

MAIN ROTOR FLIGHT CONTROLS INSPECTION/CHECK

1. Tunnel-Routed Control Rod Inspection

(Ref. Figure 601)

(1). Inspect rod end bearings for binding and excessive wear, 0.040 inch (1.016 mm) maximum axial play.

(2). Inspect control rod for surface damage and evidence of bending.

(3). Inspect upper two inches (5.08 cm) of each tunnel routed control rod for wear. Replace rods with wear depth exceeding 0.020 inch (0.508 mm), or having outer diameter (OD) less than minimum which follow.

Control Rod	Minimum OD Inches (mm)
Collective mixer	0.470 (11.938)
Longitudinal mixer	0.520 (13.208)
Lateral mixer	0.530 (13.462)
Tail rotor	0.470 (11.938))

(4). Inspect for loose rivet at fixed rod end (lower end).

CAUTION

- When tightening loosened jam nuts on rod ends as in steps (5). and (6). or (7). below, always hold rod end with wrench.
- Do not disconnect rod ends from mixer assembly to perform this inspection except as instructed.

(5). Inspect upper end of tunnel-routed control rod assemblies for excessive rod end play.

(a). Loosen jam nut minimum of two threads.

(b). Preload rod end against either side of attaching clevis with light finger pressure to eliminate play other than in area being inspected and effect of bearing play.

(c). Lightly deflect tube laterally from one extreme to other (maintain preload).

(d). With dial indicator or 6 inch (15.25 cm) rule, measure total horizontal movement at top of tube where rod end enters.

(e). If total movement exceeds 1/16 inch (1.5875 mm) rod assembly must be replaced with serviceable parts.

(f). Movement less than 3/64 inch (1.190625 mm) is considered negligible.

(g). If movement is between 3/64 and 1/16 inch (1.5875 and 1.190625 mm), inspect rod threads, step (6)., or rod insert, step (7).

(6). For early control tubes without swaged inserts:

(a). If total lateral movement of upper end of tube is found to be between 3/64 and 1/16 inch (1.5875 and 1.190625 mm), check rod threads.

(b). Disconnect rod end from control system.

(c). Screw rod end completely out of control rod.

(d). Use 0.339 inch (8.6106 mm) diameter drill (size R), free of burrs, to check rod threads.

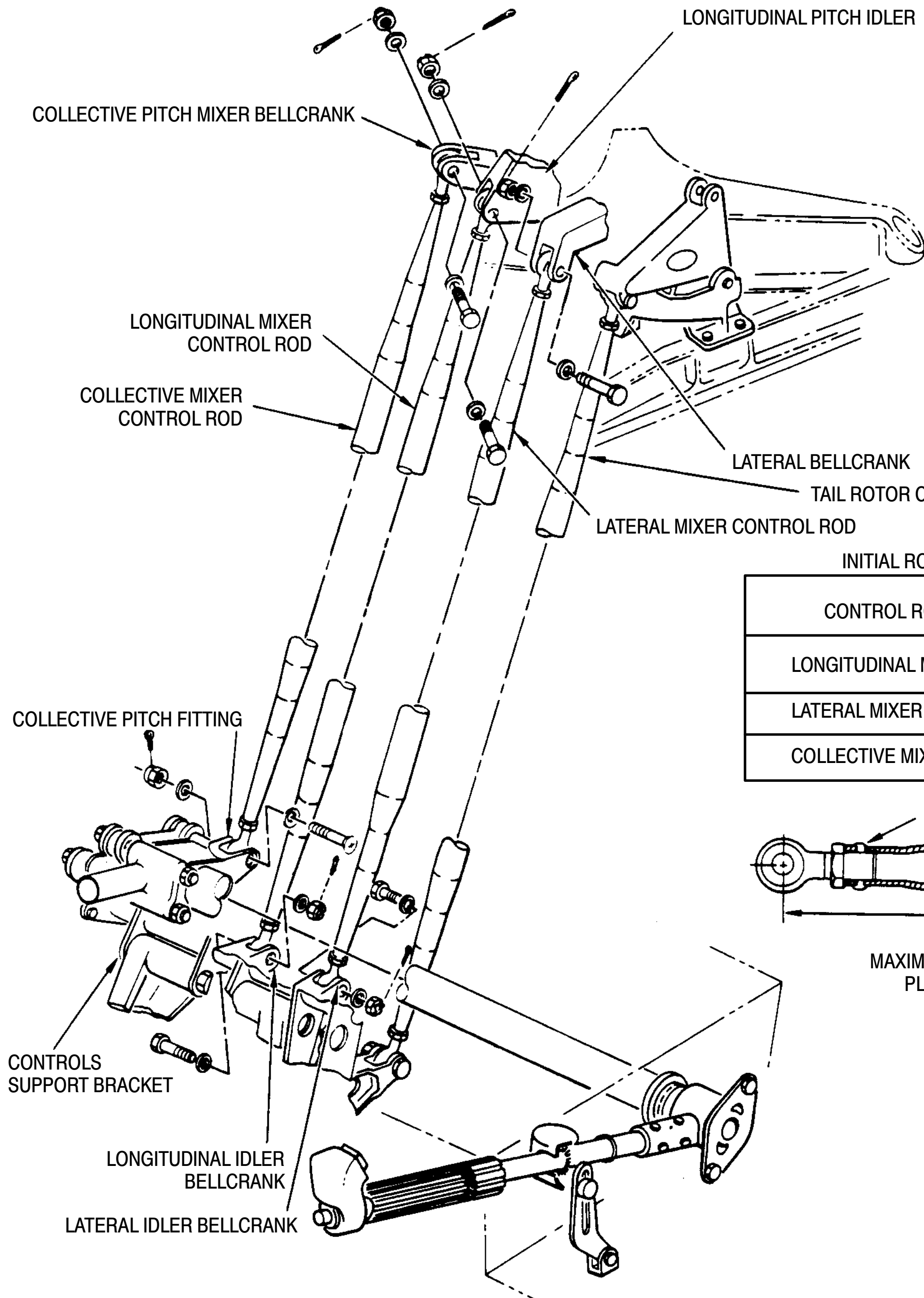
1). If drill can be inserted, rod assembly is unserviceable and must be replaced.

2). If drill cannot be inserted, rod is serviceable.

(e). Reinstall rod end, reconnect rod to control system and tighten jam nut.

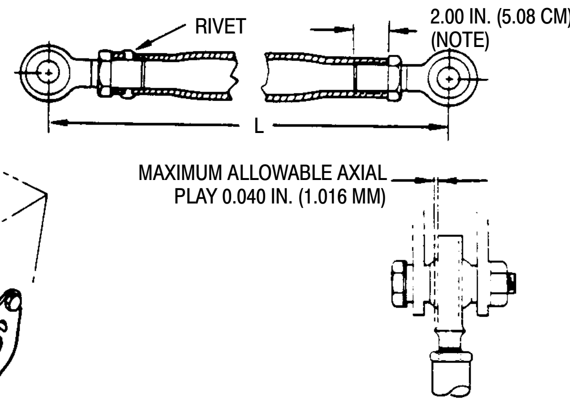
(7). For current control rods with swaged inserts:

(a). Disconnect rod end from control system.



INITIAL ROD LENGTH (BEFORE RIG)

CONTROL ROD	DIM L INCH (CM)
LONGITUDINAL MIXER	56.67 (143.9418) 56.51 (143.5354)
LATERAL MIXER	55.67 (141.4018)
COLLECTIVE MIXER	53.14 (134.9756)



NOTE:
INSPECT FOR WEAR. REPLACE RODS WITH WEAR DEPTH EXCEEDING 0.020 IN. (0.508 MM) OR HAVING OD LESS THAN ALLOWABLE MINIMUM.

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Figure 601. Tunnel-Routed Control Rod Inspection

(b). Back off jam nut sufficiently enough to inspect insert.

(c). Inspect insert for proper installation, flush to a maximum of 0.010 inch (0.254 mm) below the surface of the rod.

(d). Check that insert is tight inside of rod.

1). If insert is loose or protrudes above surface of rod, rod assembly is unserviceable and must be replaced.

2). If insert is tight and swaged flush to 0.010 inch (0.254 mm) below the surface of the rod, rod is serviceable.

(e). Reconnect rod to control system and tighten jam nut.

(8). Check rigging of re-connected control system.

2. Controls Support Bracket and Bellcrank Inspection

(Ref. Figure 403)

(1). Inspect bearings in bellcranks for binding.

(2). Perform fluorescent dye penetrant inspection on any suspected part.

NOTE: Parts identified with double asterisk (**) (Ref. Figure 403) may be either magnesium or aluminum alloy. (For corrosion control and identification of magnesium and aluminum alloys, Ref. Sec. 20-40-00.)

3. Pilot's Collective Pitch Stick Inspection

(Ref. Figure 602)

(1). Inspect bearings for binding or play.

(2). Inspect all gears for cracks, and chipped or broken teeth.

(3). Inspect stick tube and gas producer control tube for corrosion, deformation and loose rivets.

NOTE: Pitch stick housing and cap may be either magnesium or alloy casting. (For corrosion control and identification of magnesium or aluminum alloys, Ref. Sec. 20-40-00.)

4. Copilot's Collective Pitch Stick Inspection

(Ref. Figure 603)

(1). Inspect bearings for binding or play.

(2). Inspect all gears for cracks, and chipped or broken teeth.

(3). Inspect stick tube and gas producer control tube for corrosion, deformation and loose rivets.

5. Collective Stick Friction Mechanism Operational Check

(Ref. Figure 602)

(1). Remove guard from collective stick.

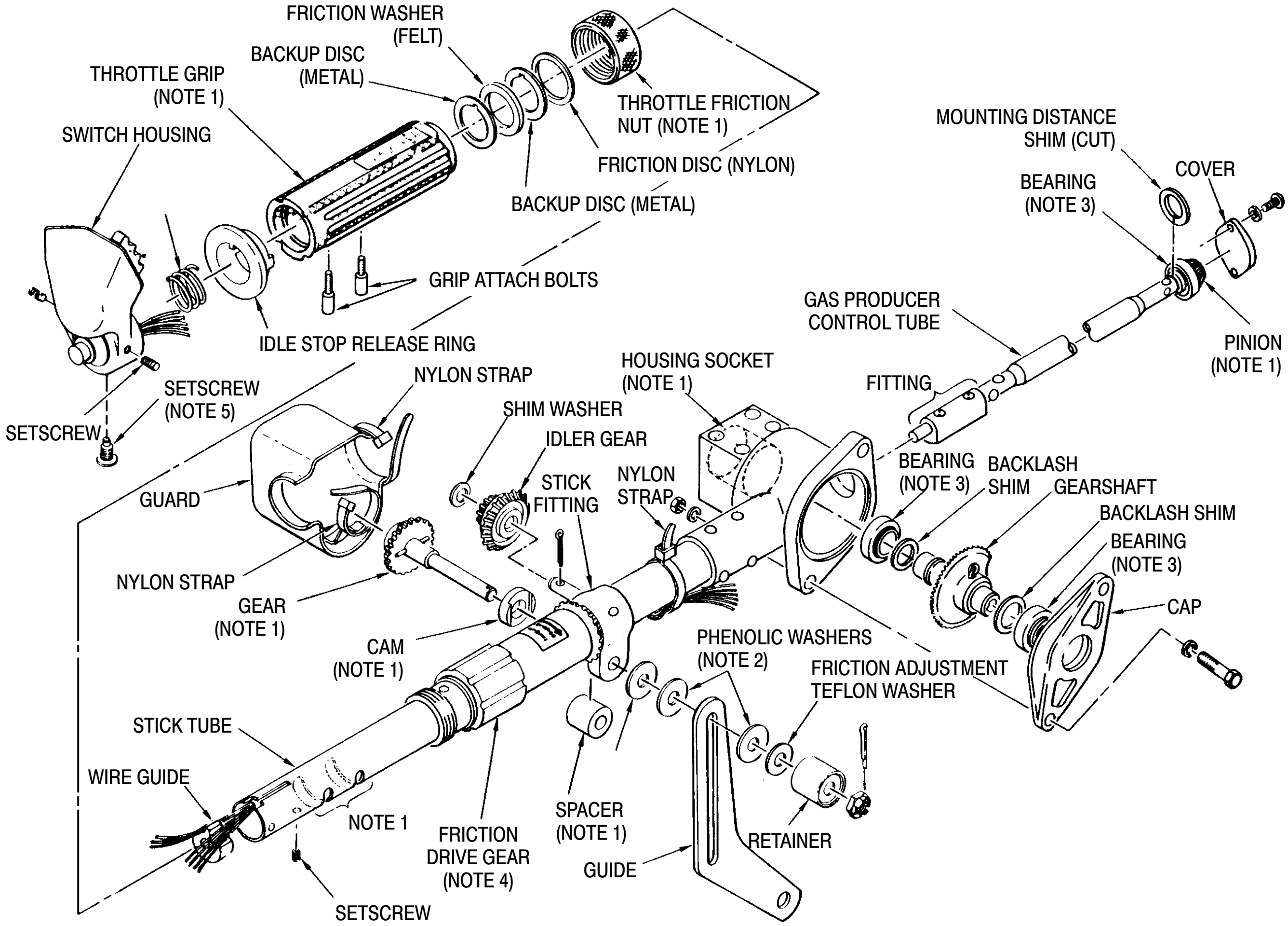
(2). Check that teeth of friction drive gear, idler gear, and driven gear are not stripped or otherwise damaged.

(3). Rotate friction drive gear grip counterclockwise to maximum friction stop; gear train must rotate freely. Check position of shaft assembly pin. Pin should be at highest point of cam.

(4). If pin is not at approximate peak of cam or has overridden peak, friction mechanism must be readjusted. If pin is in correct position, continue with step (5). below.

(5). Rotate drive gear grip clockwise to minimum friction position and release grip; gear train must rotate freely. Pin should be at approximate low point of cam.

(6). With pin on low point of cam, hand rotate spring release housing. If there is drag on retainer, there is friction on guide and collective friction must be readjusted. If retainer rotates freely, without obvious play, low point friction setting is correct.



NOTES:

1. SURFACES IN CONTACT DURING ROTATION, OR OTHERWISE NOTED, TO BE LUBRICATED WITH GREASE.
2. NEW PHENOLIC WASHERS ABRADED TO REMOVE GLAZE.
3. BEARINGS INSTALLED WITH GRADE A LOCKING COMPOUND AFTER SHIMMING.
4. DRIVE GEAR END PLAY 0.002-0.010 IN. (0.0508-0.254 MM).
5. USED ONLY WITH OPTIONAL EQUIPMENT.

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Figure 602. Outboard Collective Stick Inspection (L/H Command)

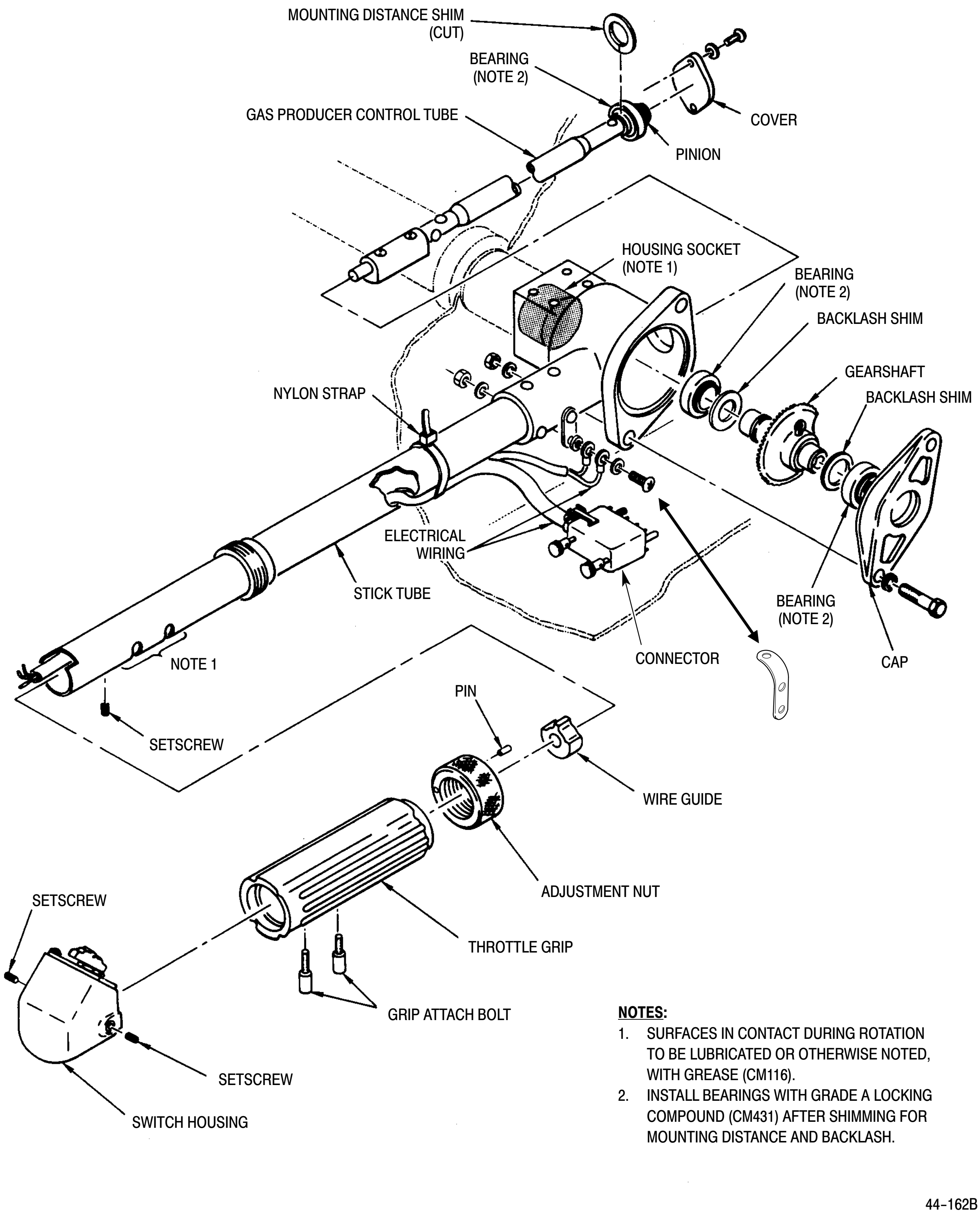


Figure 603. Outboard Collective Stick Inspection (R/H Command)

6. Collective Control Interconnecting Torque Tube Inspection

(Ref. Figure 404)

(1). Remove pilot's seat cover, control access door, and left side foot support fairing.

(2). Inspect collective interconnecting torque tube for cracks, bends or distortions.

(3). Inspect bungee bracket and bungee fitting for security and condition. Ensure cotter pin in over-center adjustment bolt is not sheared.

(4). Inspect all accessible rivets for play. inspect support bearings for security and evidence of binding.

(5). Reinstall pilot's seat cover, controls access door and foot support fairing.

7. Collective Bungee Inspection

(Ref. Figure 407)

NOTE: Replace any bungee parts in questionable condition.

(1). Inspect bearings in male and female bearing assemblies for evidence of binding, corrosion and galling.

(2). Inspect female bearing assembly threads for damage.

(3). Inspect spring for evidence of deformation. Free length of spring must be 3.64 ± 0.06 inches (92.456 ±1.524 mm).

(4). Inspect male bearing rod for cracks, evidence of binding, corrosion and deformation.

NOTE: Bungee support bracket may be either an aluminum or magnesium casting. (For corrosion control and identification of magnesium and aluminum alloys, Ref. Sec. 20-40-00.)

8. Inboard Collective Stick Socket Assembly Inspection

(Ref. Figure 408)

(1). Inspect all bearings for binding or play.

(2). Inspect gears for cracks, and chipped or broken teeth.

(3). Inspect all components for cracks, corrosion and deformation.

NOTE: Bellcrank and idler may be either an aluminum or magnesium casting. (For corrosion control and identification of magnesium and aluminum alloy parts, Ref. Sec. 20-40-00.)

9. Pilot's Cyclic Control Stick Inspection

(Ref. Figure 604)

NOTE:

- For this inspection, friction stop nut must be loosened.
- Socket may be either an aluminum or magnesium casting. (For corrosion control and identification of magnesium and aluminum alloys, Ref. Sec. 20-40-00.)

(1). Inspect stick tube attachment to socket for evidence of loose rivets, distortion and corrosion.

(2). Inspect parts of friction mechanism for physical damage. Free length of friction spring should be approximately 0.580 inch (14.732 mm).

(3). To check installation, loosen lateral and longitudinal friction knobs, move cyclic control stick and check for binding or unusual noises. Check that rod end bearings of pilot's lateral control rod do not jam when stick is full forward and full aft.

NOTE: Set minimum friction so that phenolic washers can be slightly turned by hand. If minimum friction is set too low, stick shake will occur.

10. Copilot's Cyclic Control Stick Inspection

(Ref. Figure 604)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM114	Petrolatum

(1). Inspect quick-release pins for secure fit, also stick tube and socket for security, distortion and corrosion. Check for presence of a light coating of grease in socket and on stick tube end. Apply thin coating of petrolatum (CM114), on contact surfaces.

(2). To check controls installation, loosen lateral and longitudinal friction knobs, move stick and check for binding or unusual noises. Check that rod end bearings of copilot's lateral control rod do not jam throughout full range of stick travel.

NOTE: Set minimum friction so that phenolic washers can be slightly turned by hand. If minimum friction is set too low, stick shake will occur.

11. One-Way Lock Inspection

(1). Replace reservoir if cracked, leaking or has loose or damaged filler cap (Ref. COM).

NOTE: It is normal for a thin hydraulic oil film to remain on piston as a result of wiping contact with the piston seal. This should not be considered leakage or cause for rejection.

(2). Replace forward input rod end bearing if bearing binds.

CAUTION Do not attempt to adjust larger (aft) of two rod ends and do not remove cotter pin; malfunction of lock will likely result. (For overhaul and replacement instructions, Ref. COM).

(3). Replace one-way lock if aft (output) end bearing binds.

(4). Replace protective boot if it is cracked, torn or deteriorated.

(5). Replace one-way lock if exposed portion of piston has nicks, scratches or wear penetrates chrome plating.

(6). Replace external mounting bushing if outside diameter is less than 0.4979 inch (12.64666 mm).

(7). One-way lock must be replaced if nicks, dents and scratches to body exceed 0.040 inch (1.016 mm) depth after repair.

(8). One-way lock must be replaced if end play between rod ends exceeds 0.010 inch (0.254 mm) measured at input (forward) end.

(9). One-way lock must be replaced if leaking, except as noted for reservoir in step (1). above.

12. Cyclic Trim Actuator Inspection

(Ref. Figure 508)

(1). Inspect electrical connector for evidence of damage, and broken or missing contacts.

(2). Inspect exterior of trim actuator for evidence of damage and deformation.

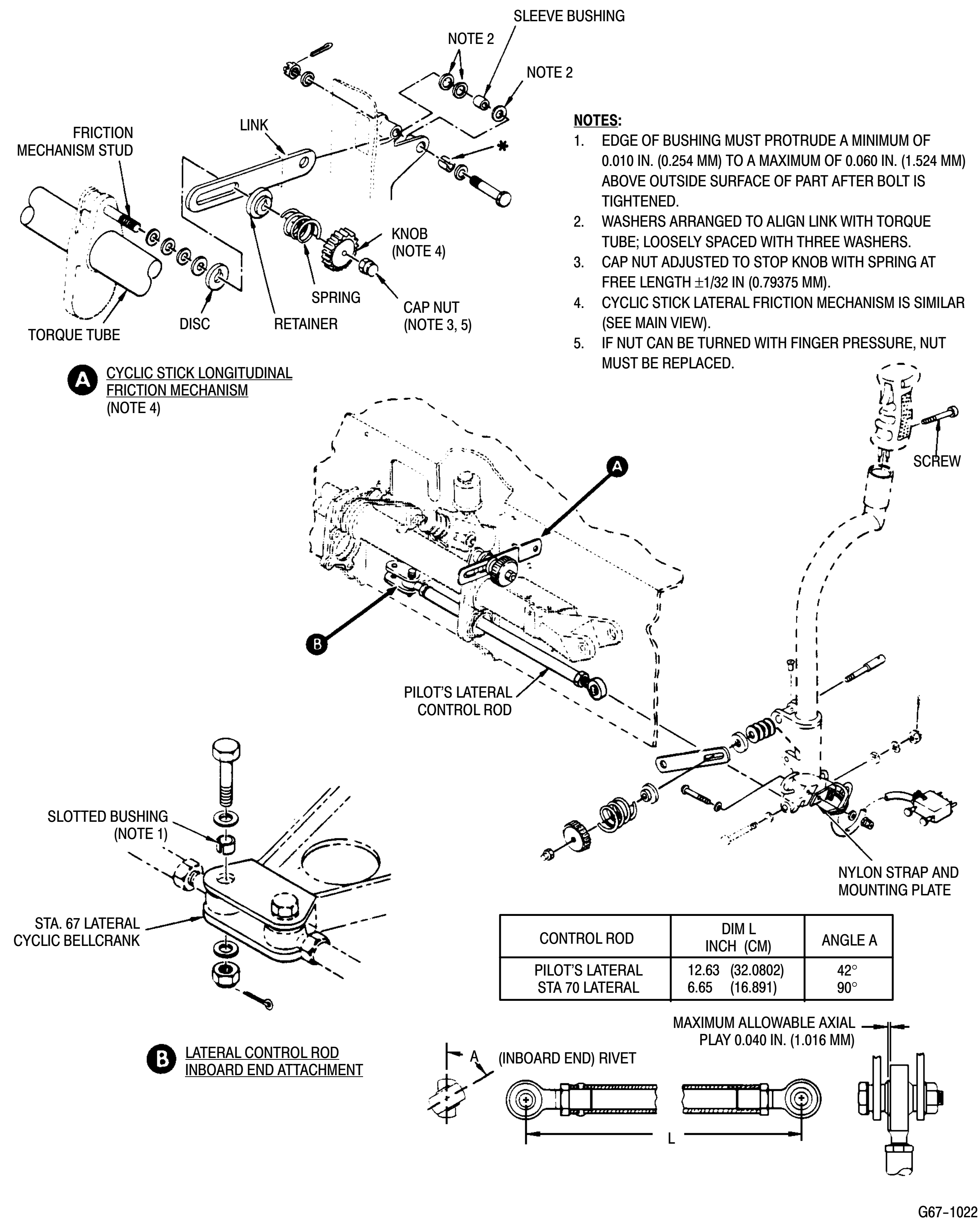
(3). When actuator speed (response and/or travel time) is questionable, perform bench test (Ref. Cyclic Trim Actuator Bench Test).

13. Cyclic Control System Operational Check

Excessive slack or free play in the cyclic control system may result in premature control stop contact or roughness of the helicopter and fanning out (out of track) of the main rotor tip path plane (Ref. Sec. 18-10-00/60). Areas to be checked include mixer linkages (Ref. Sec. 62-30-00/60) at the base of the main rotor mast, rotating controls above the swashplate, trim actuators, and cyclic control stick in the pilot's compartment. If total free play at the top of the cyclic grip exceeds 3/8 inch (9.525 mm) in either longitudinal or lateral direction, perform the following:

CAUTION When replacing control rod ends, measure length accurately to ensure that replacement rod is exactly the same length as the original. Control rods are factory adjusted at installation to provide necessary clearances.

(1). With the rotor stopped, check for free play at the cyclic stick grip. While moving cyclic stick through free play range, have assistant check controls mixer area for any free play motion.



NOTES:

1. EDGE OF BUSHING MUST PROTRUDE A MINIMUM OF 0.010 IN. (0.254 MM) TO A MAXIMUM OF 0.060 IN. (1.524 MM) ABOVE OUTSIDE SURFACE OF PART AFTER BOLT IS TIGHTENED.
2. WASHERS ARRANGED TO ALIGN LINK WITH TORQUE TUBE; LOOSELY SPACED WITH THREE WASHERS.
3. CAP NUT ADJUSTED TO STOP KNOB WITH SPRING AT FREE LENGTH ±1/32 IN (0.79375 MM).
4. CYCLIC STICK LATERAL FRICTION MECHANISM IS SIMILAR (SEE MAIN VIEW).
5. IF NUT CAN BE TURNED WITH FINGER PRESSURE, NUT MUST BE REPLACED.

CONTROL ROD	DIM L INCH (CM)	ANGLE A
PILOT'S LATERAL	12.63 (32.0802)	42°
STA 70 LATERAL	6.65 (16.891)	90°

Figure 604. Cyclic Stick and Friction Inspection

(a). Check pivot bolt areas where mixer bellcranks attach to control rod bellcranks. If free play is noted, remove pivot bolts and inspect for wear and/or play between bolts, bushings, and bellcranks. Replace parts as required.

(b). Check control rod assemblies by Pressing sidewards near the rod end bearing. Replace rod end as required.

(2). Check for free play in blade pitch links which connect rotating swashplate to blade pitch housings. Replace rod ends having free play in excess of 0.040 inch (1.016 mm) side motion.

NOTE: Rod ends on pitch links should be checked under a no-load condition which is best achieved by removing blades.

(3). While moving cyclic stick through free play range, check lower controls for free play motion; Remove controls tunnel access door.

(a). Check control rod assemblies by pressing sidewards near the rod end bearings. Looseness indicates axial play in rod end bearing. Replace rod end as required.

(b). Check pivot bolt areas of lateral and longitudinal bellcranks. If free play is noted, remove pivot bolts and inspect for wear and/or play between bolts, bushings, and bellcranks. Replace parts as required.

(c). Check lower end of cyclic stick and play at attachment of cyclic interconnecting torque tube. Replace bearings and bushings as required.

(4). Check for axial play in cyclic trim actuators.

(a). Disconnect lower end of cyclic control rods from aft ends of trim actuators and check for free play. Remove free play by adjusting spring adjustment screw located in center recess at aft end of actuator. If end play exceeds 0.0075 inch (0.1905 mm), replace actuator. Reconnect control rod.

(b). Check for free play in attachments and linkages between trim actuators and cyclic pitch interconnecting torque tube. Replace parts as required; Install controls tunnel access door.

14. Main Rotor Flight Control System 600-Hour Inspection

(Ref. Figure 508)

(1). With the rotor stopped, check for free play at the cyclic stick grip.

NOTE: If total free play at the top of the cyclic grip is 3/8 inch (9.525 mm) or less in either longitudinal or lateral direction inspection is not required. If total free play at the top of the cyclic grip exceeds 3/8 inch (9.525 mm) in either longitudinal or lateral direction, perform the following:

(2). While moving cyclic stick through free play range, have assistant check controls mixer area for any free play motion.

(a). Check each pivot bolt area where lateral mixer bellcranks attach to collective bellcranks. If free play is noted at the lateral bellcranks, remove pivot bolts and inspect for wear and/or looseness between bolt, bushings and bellcrank. Replace parts as required.

(b). Check control rod assemblies by pressing sidewards near the rod end bearings; motion here indicates axial play in rod end bearing. Replace rod end as required.

(3). Check for free play in blade pitch links which connect rotating swashplate to blade pitch housings.

NOTE: Both rod ends on each pitch link should be checked under a no load condition which is best achieved by removing blades. Replace rod ends having free play in excess of 0.040 inch (1.016 mm) side motion.

(4). Inspect lower controls for slack between cyclic stick and attachment of the longitudinal and lateral control rods to the mixer mechanisms, located just forward of the main rotor mast.

(5). Check lower end of cyclic stick for looseness at the attachment point to cyclic pitch interconnecting torque tube. Replace bearings and/or bushings as required.

(6). Check interconnecting torque tube bearings for free play; replace bearings if excessive free play is noted.

(7). Check for axial play in cyclic trim actuators (remove access door at lower end of pilot's bulkhead center tunnel in the cargo compartment).

(a). Disconnect lower end of longitudinal cyclic control rod from aft end of trim actuator and check for axial play. Remove free play by adjusting spring adapter screw located in center recess at aft end of actuator assembly.

(b). Check for looseness in longitudinal and lateral cyclic control rod ends, located in tunnel. Replace rod ends as required.

(c). Check for free play in attachments and linkages between trim actuators and cyclic pitch interconnecting torque tube. Replace parts as required. Reinstall access door.

CAUTION When replacing adjustable rod ends, measure length accurately to ensure that replacement rod is exactly same length as original. Mixer control rods are factory adjusted at original installation to provide necessary clearances.

(8). Recheck for free play at the top of the cyclic stick grip; as required, repeat steps (1). thru (3). until total free play at top of grip is 3/8 inch (9.525 mm) or less in either longitudinal or lateral direction.

(9). If replacement of parts is required perform rigging of main rotor controls (Ref. Collective Controls Rigging and Cyclic Controls Rigging).

MAIN ROTOR FLIGHT CONTROLS

REPAIRS

1. Tunnel-Routed Control Rod Repair

(Ref. Figure 401)

(1). Perform straightness check on control rod that appears bent or bowed. Total length of any tunnel-routed rod (excluding rod ends) must be straight within 0.050 inch (1.270 mm), with straightness variation limited to maximum of 0.010 inch (0.254 mm) in each foot of length.

WARNING **Dye-check for cracking must always be performed after cold-straightening. Replace cracked rod, or cracked or bent rod end.**

(2). Cold-straighten bent rod that is not within tolerance (step (1). above) provided there are no nicks or sharp dents in bent length. Do not use rod ends to support rod during straightening.

CAUTION Use care when drilling to remove or install riveted rod end; rod end is steel and rod is aluminum.

(3). Replace control rod end if bearing axial play is more than 0.040 inch (1.016 mm). Set initial control rod length (Ref. Figure 601).

2. Tunnel-Routed Control Tube Inspection and Sleeve Installation

(Ref. Figure 801) The following procedures are for inspection and installation of reinforcing sleeves to the tunnel-routed control tubes.

A. Control Tube End Sleeve Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM219	Methyl-ethyl-ketone
CM229	Paint remover
CM230	Paint remover
CM231	Plastic bead, spherical 20 - 30 mesh
CM318	Primer
CM409	Adhesive, epoxy

(1). Remove all four control rods (Ref. Tunnel-Routed Control Rod Replacement).

(2). Using paint remover (CM229, CM230 or CM231) remove paint approximately six inches back from end of each tube, tape and cover-rap remaining area of tube.

NOTE: Control tubes that are cracked must be removed from service.

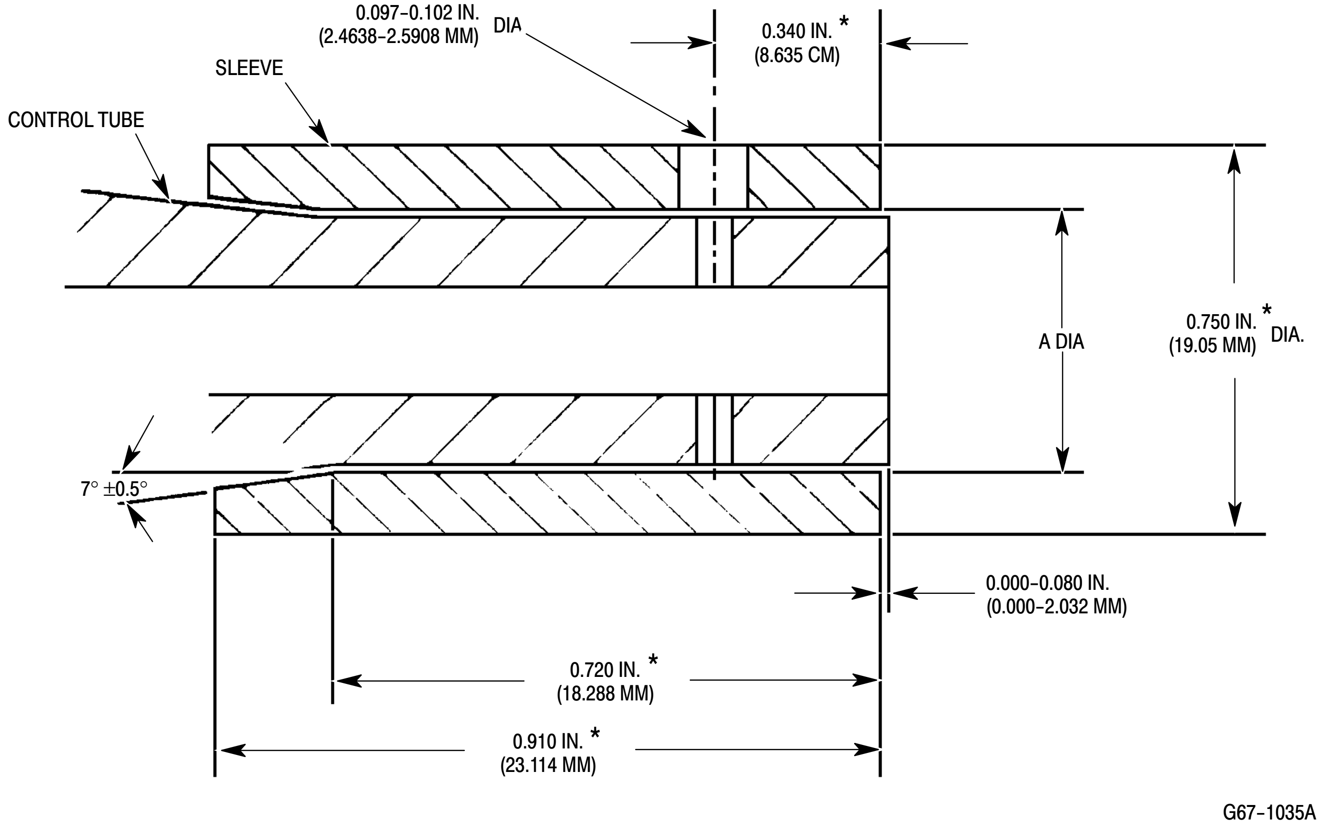
(3). Dye penetrant inspect external surface of stripped area for cracks.

(a). Cracked are indicated by heavy bleed out. It may be necessary to wipe off and reapply the developer to distinguish between surface defects caused during swaging operation.

(b). Light penetrant indications are not cause for rejection.

(4). If no cracks are found; inspected control tube can be reworked for sleeve installation. All four control tubes are to be reworked as follows:

(a). Measure and record length of control tubes for reinstalling rod ends and to prevent rerigging after tube reinstallation.



Dimensional Table

Rod No.	Sleeve No. 369D27013	Dim A inch (mm)		Tube O.D. inch (mm)	
369A7007 369A7009	-1	0.540-0.545	(13.716-13.843)	0.501-0.530	(12.7254-13.462)
	-2	0.510-0.515	(12.954-13.081)	0.470-0.500	(11.938-12.70)
369A7011	-3	0.590-0.595	(14.986-15.1 13)	0.551-0.580	(13.9954-14.732)
	-4	0.560-0.565	(14.224-14.351)	0.520-0.550	(13.208-13.970)
369A7012	-5	0.570-0.575	(14.478-14.605)	0.530-0.560	(13.462-14.224)

NOTES:

(1) Material; 2024-T351 or T4 (QQA 225/6) bar or round stock

(2) Break sharp edges 0.005-0.015 inch (0.127-0.381 mm).

(3) Surface finish 125 RMS.

(4) Chemical film per MIL-C-5541.

(5) Tolerance * ±0.010 inch (±0.254 mm).

Figure 801. Sleeve Fabrication and Installation

CAUTION Drilled out rivets may damage threads upon removal. Visually inspect control tube threads for damage from rivet and rod end removal. Replace damaged control tubes. Drilled rod ends are matched drilled to each control tube and must be reinstalled into control tube end from which removed.

(b). Remove rod ends, MS20470AD3 rivets must be removed from fixed end.

(c). Measure outside diameter of control tube end and select proper sleeve.

(d). Temporarily install sleeve onto control tubes. Align sleeve and control tube witness hole. If sleeve protrudes past end of control tube, trim end of sleeve flush to 0.000 inch (0.000 mm) or back 0.080 inch (2.032 mm) from end of tube.

NOTE: Bond integrity is dependent on clean surfaces.

(e). Thoroughly clean end of control tube and interior surface of sleeve with lint free cloth and MEK (CM219) or equivalent.

(f). Mix epoxy adhesive (CM409) per manufacturer's instructions.

(g). Remove excessive adhesive with lint free cloth moistened with MEK or equivalent. Do not saturate the cleaning cloth. Remove adhesive from witness holes.

(h). Plug end of control tube to prevent adhesive from entering threads. Bond sleeve to control tube. Apply adhesive to both surfaces and install sleeve. Align witness/rivet hole in sleeve and tube.

CAUTION Do not use heat gun. Use of heat lamp is acceptable.

(i). Allow to cure for 24 hours at minimum ambient temperature of 68°F (20°C) (alternate cure 4 hours at 115°-140 °F (47°-60 °C)).

(j). Repeat procedure for ends of each control tube.

(k). Using primer (CM318), touch-up repaired area(s) of control tube.

(l). Install rod ends into ends in which it was removed. On fixed rod end, align witness/rivet hole in sleeve and tube with rivet hole in rod end. Drill (#40) thru opposite end of sleeve. Rivet fixed end with MS20470AD3-15 rivet.

(m). Adjust each control tube to its previously measured length and paint the control tube ends with primer. Paint adjustable ends of control tube flat black.

(n). Reidentifiy, with permanent ink, the control tubes that have been reworked (Ref. Table 801).

Table 801. Control Tube Re-Identification

Old Part Number	New Reworked Part Number
369A7007	369A7007-5
369A7009	369A7009-5
369A7011	369A7011-5
369A7012	369A7012-5

(o). Rework control tube boot (Ref. Figure 802).

CAUTION If control rod is not accurately measured, flight controls will require rerigging.

(p). Reinstall control tubes. Reinstall trimmed boot with vertical seam facing aft. Check flight controls for interference or binding.

B. Control Tube Straight Area Sleeve Installation

This repair is permissible on the straight area of the tube only and increases the outside diameter.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM219	Methyl-ethyl-ketone
CM229	Paint remover
CM230	Paint remover
CM231	Plastic bead, spherical 20 - 30 mesh
CM318	Primer
CM409	Adhesive, epoxy

NOTE:

- Ensure adequate clearance exists prior to performing the repair. Determine and repair condition that caused damage.
- Maximum length of repair sleeve is 6 inches (15.24 cm). Two sleeve repairs permitted per control tube.

(1). Remove damaged control rod(s) (Ref. Tunnel-Routed Control Rod Replacement).

(2). Tape around area to be repaired.

(3). Using paint remover (CM229, CM230 or CM231), strip paint 1.0 inch (2.54 cm) beyond area of repair.

(4). Polish out burrs and sharp edges. Ensure defects do not exceed allowable limits (Ref. Table 801). Dye penetrant inspect area per MIL-I-25135; no cracks allowed.

NOTE: Bond integrity is dependent on clean surfaces.

(a). Thoroughly clean repair area of control tube and interior surface of sleeve with lint free cloth and MEK (CM219) or equivalent.

(b). Mix epoxy adhesive (CM409) per manufacturer's instructions.

(c). Apply adhesive to both surfaces and install sleeve.

(d). Remove excessive adhesive with lint free cloth moistened with MEK or equivalent. Do not saturate the cleaning cloth.

Table 802. Control Tube Straight Area Repair Limits

Tube 369A	Nicks and Gouges (2)		Dents and Depressions (2)		Repair Sleeve (3)	
	Max. Depth W/O Repair (4) Inch (mm)	Max. Depth With Repair (1) inch (mm)	Max. Depth W/O Repair (4) inch (mm)	Max. Depth With Repair (1) inch (mm)	O.D. inch (cm)	Wall Thickness inch (mm)
7007	0.006 (0.152)	0.015 (0.381)	0.010 (0.254)	0.025 (0.635)	1.375 (3.4925)	0.049 (1.2446)
7009	0.008 (0.203)	0.020 (0.508)	0.010 (0.254)	0.025 (0.635)	1.50 (3.81)	0.049 (1.2446)
7011 7012	0.010 (0.254)	0.025 (0.635)	0.010 (0.254)	0.025 (0.635)	1.625 4.1275)	0.049 (1.2446)

NOTES:

(1) Sleeve repair not permitted in tapered area. Two sleeve repairs per control tube. Maximum defect area 0.375 in^2 (2.41935 cm^2) per sleeve.

(2) Must be free of burrs and sharp areas.

(3) Aluminum tube 6061-T6 WW-T-700/6 or 2024-T3 WW-T-700/3. Alternate: field fabricate from 2024-T351 or 2024-T4 (QQ-A-225/6 or QQ-A-200/3). Inside diameter to be 0.010-0.025 inch (0.254-0.635 mm) larger than outside diameter of tube to be repaired. Outside diameter as listed in table, ±0.010 inch (±0.254 mm) and concentric to inside diameter 0.005 inch (0.127 mm). Maximum length of repair sleeve 6 inches (15.24 cm). Break sharp edges 0.005-0.015 inch (0.127-0.381 mm).

(4) Maximum defect area without repair 0.10 in^2 (0.64516 cm^2) total. For threaded area, last 2 inches (5.08 cm) of both ends, maximum depth of defect 0.020 inch (0.508 mm).

CAUTION Do not use heat gun. Use of heat lamp is acceptable.

(e). Allow to cure for 24 hours at minimum ambient temperature of 68°F (20°C) (alternate cure 4 hours at 115°-140 °F (47°-60 °C)).

(f). Using primer (CM318), touch-up repaired area(s) of control tube.

3. Controls Support Bracket and Bellcrank Disassembly

(Ref. Figure 403)

NOTE: In following steps, do not remove slotted bushings unless replacement is necessary.

(1). Remove lateral idler bellcrank.

(2). Remove tail rotor bellcrank.

(3). Remove longitudinal idler bellcrank.

NOTE: Shim washers between longitudinal idler bellcrank and support brackets align one- way lock for no sideload. Keep shim washers with bracket for use during reassembly.

4. Controls Support Bracket and Bellcrank Repair

(Ref. Figure 403)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM321	Surface primer locking compound
CM431	Sealing, locking and retaining compound

(1). Replace unserviceable bearings. Install new bearing with surface primer (CM321) and grade A locking compound (CM431).

NOTE: When idler bellcrank bearings are replaced, make sure that idler bellcrank spacers are reinstalled between bearings.

(2). Replace bellcranks or controls support bracket that has distortion, cracks or elongated holes.

5. Controls Support Bracket and Bellcrank Reassembly

(Ref. Figure 403)

(1). Install longitudinal idler bellcrank. Check that slotted bushing is in place in support bracket lug, and reinstall shim washers between bellcrank and bracket for no sideload of one-way lock.

NOTE: When performing following steps, ensure that slotted bushing is in support bracket lug.

(2). Install lateral idler bellcrank.

(3). Install tail rotor bellcrank.

6. Pilot's Collective Pitch Stick Disassembly (L/H Command)

(Ref. Figure 602)

(1). Cut two nylon straps, and remove stick friction mechanism guard.

(2). Remove setscrews that secure switch housing.

NOTE: Removal of additional setscrew is also required on helicopters equipped with cargo release mechanism.

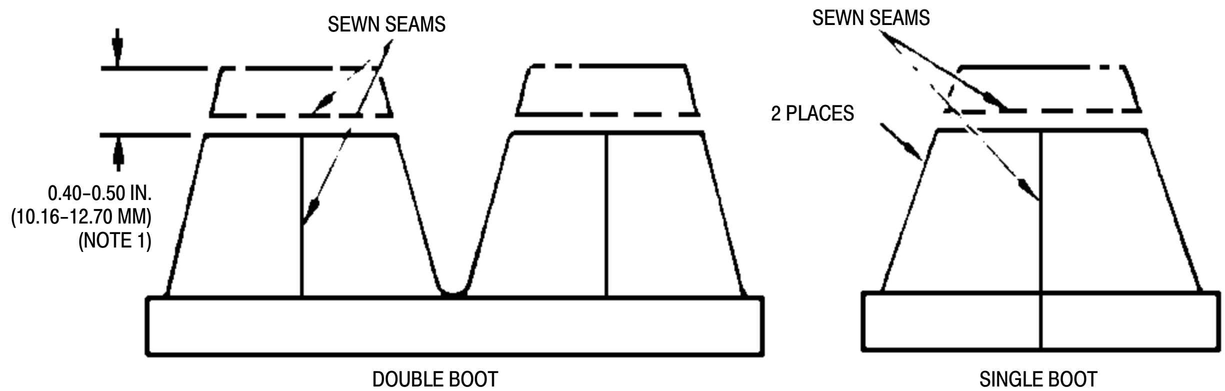
(3). Cut nylon strap or twine that secures electrical wiring to stick tube. Push wire slack into stick, carefully pull housing and wiring from end of stick tube and disconnect wiring from switches.

(4). Remove setscrew and wire guide from forward end of stick. Tie string on each wire bundle to aid reassembly and remove wiring.

(5). Remove spring and idle stop release ring.

(6). Remove grip attach bolts. Slide throttle grip friction washer and discs, and friction nut from stick tube.

(7). Remove friction mechanism and guide from stick fitting.



NOTES:

1. TRIM BOOTS BELOW HORIZONTAL SEAM.

CAUTION: DO NOT USE SOLVENTS OR PETROLEUM BASED CLEANING FLUIDS ON VINYL BOOTS.

2. CLEAN INSIDE AND OUTSIDE OF VERTICAL SEAM AND TOP OF BOOT WITH CLEAN CLOTH DAMPENED WITH ISOPROPYL ALCOHOL.
3. COAT BOTH SIDES OF VERTICAL SEAM WITH CONTACT CEMENT.
4. APPLY THIN COAT OF CONTACT CEMENT ALONG TRIMMED EDGE AND 0.125–0.250 INCH (3.175–6.350 MM) DOWN INSIDE AND OUTSIDE SURFACES OF BOOTS TO PREVENT FRAYING.

G67–1036A

Figure 802. Control Tube Boot Rework

(8). Remove idler gear from stick fitting.

NOTE: In following steps, do not remove bearings or pinion unless replacement is necessary.

(9). Remove cap from stick housing.

(10). Remove gear shaft assembly. Keep backlash shims with gear shaft.

(11). Remove cover from back of stick housing.

(12). Remove gas producer control tube through access hole at back of stick housing. Remove mounting distance shim only if necessary to adjust pinion gear mounting distance.

7. Pilot's Collective Pitch Stick Repair (L/H Command)

(Ref. Figure 602)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM116	Grease, aircraft and instrument

(1). Replace bearings if corroded, excessively worn, or if outer or inner races of bearings rotate on mating surfaces and locking compound is inadequate to prevent rotation.

(2). Replace loose rivets in gas producer control tube.

(3). Replace friction drive gear or idler gear with cracked, chipped or broken teeth.

(4). Replace friction drive gear if it does not rotate freely on stick tube, or if rotating stop is damaged. To remove gear, drill out rivets that attach throttle friction nut fitting to stick.

NOTE: Before replacing drive gear for binding, clean and relubricate bore with grease (CM116). Reinstall gear on stick tube and recheck for free rotation. If gear still binds it must be replaced.

(5). Replace phenolic friction washers against guide if worn to less than 1/32 inch thickness.

(6). Replace friction gear assembly if driven gear has cracked, chipped or broken teeth or if cam pin is bent.

(7). Replace damaged idle stop release ring. Ring must slide freely on tube and in throttle grip.

8. Pilot's Collective Pitch Stick Reassembly (L/H Command)

(Ref. Figure 602)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM116	Grease, aircraft and instrument
CM431	Sealing, locking and retaining compound
CM807	Twine, nylon
CM815	Solder

(1). Check gearshaft bearings in housing cap a housing for security of outer races. Use grade A locking compound (CM431) to install replacement bearings. Use care to prevent compound from entering bearings, and make sure that each bearing is seated against its bore shoulder.

(2). Using grease (CM116), lubricate stick tube interior where gas producer control tube fitting makes contact.

(3). Attach strings routed through stick tube during disassembly, and thread electrical wire bundles from plug through exit hole, throttle friction nut, friction washers and discs, throttle grip, idle stop release ring and spring. Pull wiring out through front end of stick tube.

(4). Install wire guide so that it divides switch wiring: three wires in one cutout and four in the other. Align guide with matching hole in stick tube and install setscrew. When tightened, setscrew must be flush or not recessed more than 0.010 inch (0.254 mm) below outer tube surface.

NOTE: Ensure gas producer control tube is installed into stick housing with elongated area of fitting facing down.

(5). Install gas producer control tube through access hole in back of stick housing, and through stick tube until control tube fitting engages wire guide bore. Reinstall mounting distance shims forward side of pinion bearing if removed during disassembly. (One edge of shim must be cut for installation.)

NOTE: Steps (6). thru (8). below are used to determine gas producer control tube pinion mounting distance.

(6). Install approximate required thickness of split shims between pinion bearing and housing to establish gas producer control tube pinion mounting distance.

(7). Use throttle friction nut to pull gas producer torque tube forward until not less than 10 pounds (44.48 N) of force is applied to compress shims.

(8). Add or subtract shims to provide 0.699-0.709 inch (17.7546-18.0086 mm) dimension (Ref. Figure 504). Repeat step (7). during each measurement.

(9). After mounting distance shimming is correct, remove gas producer control tube and apply grade A locking compound (CM431) to outside diameter pinion bearing outer race and stick housing bore. Reinstall control tube, and check that compound does not enter bearing and that bearing outer race and shims are firmly seated against housing bore.

(10). Install throttle friction nut, friction discs and washers.

(11). Using grease (CM116), lubricate interior of throttle grip and install grip on stick tube. Align grip and gas producer control tube fitting and install grip attach bolts. When tightened, bolts must be flush or not more than 0.010 inch (0.254 mm) below outer face of grip.

(12). Establish gas producer control tube pinion and shaft assembly bevel gear backlash by temporarily installing driven gear, shaft, and two bearings, plus approximate required thickness of backlash shims in housing. Temporarily install housing cap. Add or subtract shims to provide maximum backlash of 0.003 inch (0.076 mm) without bind in gears. Make certain that bearings are completely seated in bores while establishing this backlash adjustment.

(13). After backlash shimming is correct, remove housing cap and gear shaft.

(14). Lubricate teeth of pinion gear and shaft assembly bevel gear with grease (CM116).

(15). Apply grade A locking compound (CM431) to secure gearshaft to bearings. Do not allow compound to enter bearings. With throttle grip at mid-travel, install driven gear. Note that at throttle-grip mid-travel, cut out portion of the driven gear is to be opposite pinion gear. (Centerline of center tooth of driven gear is two degrees and fifty minutes from center of driven gear cutout.)

NOTE: With throttle grip at mid- travel, two grip attach bolts are positioned approximately straight down.

(16). Install housing cap on shaft assembly and seat with hand pressure while slowly rotating grip back and forth. Secure cap to side of housing and cover to back of housing.

(17). Using solder (CM815), connect wiring to stick switches. Pull electrical wiring slack out through exit holes in stick tube, position release ring and. spring and install switch housing with setscrews. Using nylon strap, or twine (CM807), secure electrical wiring to stick tube approximately one inch aft of exit holes.

(18). Install friction cam and driven gear assembly on stick fitting. Temporarily mesh idler gear and driven gear, and rotate friction drive gear counterclockwise to maximum stop.

(19). Hold drive gear at stop and remesh idler gear and driven gear so that gear assembly pin is at high point of cam.

(20). Use shim washers sufficient to limit gear end play to maximum of 0.010 inch (0.254 mm), and secure idler gear with cotter pin.

(21). Assemble remainder of friction mechanism.

(22). Adjust collective friction mechanism.

9. Pilot's Collective Pitch Stick Disassembly (R/H Command)

(Ref. Figure 603)

(1). Disassemble collective stick to extent of removing friction mechanism idler gear from stick fitting, except also remove screw and nut to disconnect electrical terminals from stick housing.

(2). Detach link and idler.

(3). Remove idler from socket housing. Do not remove idler bearing unless replacement is necessary.

(4). Remove four bolts and washers that attach housing cap to socket housing. Rotate shaft assembly until gear tooth cutout clears pinion (bellcrank ears at approximately 195 degrees);, then separate bellcrank, housing cap and shaft assembly from housing.

(5). Remove bellcrank from shaft assembly to separate housing cap from shaft. Do not press bearings from cap or housing unless replacement is necessary. Keep backlash shims with shaft assembly.

(6). Remove link from bellcrank.

(7). Remove gas producer control tube through access hole at back of pilot's collective stick housing.

(8). Remove mounting distance shim only if necessary to adjust pinion gear mounting distance.

(9). Remove pinion and bearing from control tube only if replacement is necessary.

10. Pilot's Collective Pitch Stick Reassembly (R/H Command)

(Ref. Figure 603)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM431	Sealing, locking and retaining compound

(1). Check gearshaft bearings in housing cap and housing for security of outer races. Use grade A locking compound (CM431) to install replacement bearings. Use care to prevent compound from entering bearings, and make sure that each bearing is seated against its bore shoulder.

(2). Completely reassemble pilot's collective stick to the extent of assembling friction mechanism.

(3). Connect two electrical terminals to stick housing.

(4). Shim and adjust pinion mounting distance and backlash.

(5). After backlash shimming is correct, install bellcrank on shaft assembly and link to bellcrank; then install, seat and secure housing cap on stick housing. Do not adjust collective friction mechanism at this point of assembly.

(6). Install idler to the stick housing, and link to the idler.

(7). Adjust the collective friction mechanism (Ref. Collective Stick Friction Mechanism Adjustment).

11. Copilot's Collective Pitch Stick Disassembly (L/H and R/H Command)

(1). Cut nylon strap or twine securing wiring to stick tube.

(2). Remove setscrews that secure the switch housing.

(3). Push wire slack into stick and carefully pull switch housing from end of stick tube; disconnect wiring from N_2 switch (Ref Chap. 96).

(4). Remove grip attach bolts and grip.

(5). Remove adjusting nut pin and throttle end play adjusting nut only if stick tube replacement is necessary, or if end play must be adjusted.

(6). Remove setscrew and wire guide. Tie a "fish" string on end of wire bundle to aid reassembly, and then remove the wiring.

(7). Remove cap from stick housing. Do not remove bearing from cap unless replacement is necessary.

(8). Remove gearshaft assembly. Keep backlash shims with gearshaft and do not remove bearing from stick housing unless replacement is necessary.

(9). Remove cover from back of stick housing.

(10). Remove gas producer control tube through access hole in back of stick housing. Remove mounting distance shim only if necessary to adjust pinion gear mounting distance. Remove pinion and bearing from control tube only if replacement is necessary.

12. Copilot's Collective Pitch Stick Repair

(1). Replace bearings if locking compound does not prevent outer or inner races from rotating on mating surfaces, if corroded, or if excessively worn.

(2). Replace loose rivets in gas producer control tube, or damaged pinion gear.

13. Copilot's Collective Pitch Stick Reassembly

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM116	Grease, aircraft and instrument
CM431	Sealing, locking and retaining compound
CM807	Twine, nylon
CM815	Solder

(1). Check gearshaft bearings in housing cap and housing for security of outer races. Use grade A locking compound (CM431) to install replacement bearing. Use care to prevent compound from entering bearings, and make sure each bearing is seated against its bore shoulder.

(2). Using grease (CM116), lubricate stick tube interior where gas producer control tube fitting makes contact.

(3). Attach "fish" string (routed through stick during disassembly) and thread electrical wire bundle from electrical plug through exit hole in stick tube and out front end of tube.

(4). Install wire guide in stick tube so it positions wire bundle in right cutout of guide. Align guide with matching hole in stick tube, and install setscrew. When tightened, setscrew must be at least flush and not recessed more than 0.010 inch (0.254 mm) below outer surface of tube.

(5). Install gas producer control tube through access hole in back of stick housing, and through stick tube until control tube fitting engages wire guide bore. Reinstall mounting distance shims at forward side of pinion bearing if removed during disassembly. (One edge of shims must lie cut for installation.)

(6). Establish gas producer control tube pinion mounting distance (Ref. Gas Producer Linkage Adjustment).

(7). After mounting distance shimming is correct, remove gas producer control tube and apply grade A locking compound (CM431) to OD of pinion bearing outer race, and stick housing bore. Reinstall control tube and check that compound does not enter bearing and that bearing outer race and shims are firmly seated against housing bore.

(8). Using grease (CM116), lubricate ID of throttle grip and install grip on stick tube. Align grip and gas producer control tube fitting and install grip attach bolts. When tightened, bolts must be at least flush and not recessed more than 0.010 inch (0.254 mm) below outer surface of grip.

(9). Establish gas producer control tube pinion and gearshaft bevel gear backlash.

(10). After backlash shimming is correct, remove housing cap and gearshaft.

(11). Lubricate teeth of pinion gear and gearshaft bevel gear with grease (CM116).

(12). Apply grade A locking compound (CM431) to gearshaft and ID of bearings. With throttle grip at mid-travel, install shaft assembly gear.

(13). Install housing cap on gearshaft and seat with hand pressure while slowly rotating grip back and forth. Secure cap on side of housing and cover on back of housing.

(14). Check throttle grip for zero end play on stick tube and that not more than 1 pound torque is required to rotate the grip. If these conditions exist, proceed with step (18). below. If there is end play, or too much torque is required to rotate the grip, perform steps (15)., (16). and (17).

(15). Remove grip attach bolts and grip.

(16). Insert 3/64 inch (1.190625 mm) diameter drift punch into access hole on forward face of adjusting nut and drive grooved taper pin from adjusting nut and threaded fitting of stick tube.

(17). Reinstall grip with grip attach bolts and establish zero end play and correct rotational friction, 1 pound (4.448 N) maximum, between nut and grip. The match-drill 3/64 inch (1.190625 mm) maximum diameter stick tube fitting threads to existing pin groove in nut, and install pin.

(18). Using solder (CM815), connect wiring to N_2 switch. Pull electrical wiring slack out through exit hole in stick tube and install switch housing with setscrews. Using nylon strap or twine (CM807), secure electrical wiring to stick tube, approximately one inch (2.54 cm) aft of exit hole.

14. Collective Control Interconnecting Torque Tube Repair

(Ref. Figure 407)

(1). Replace loose or binding torque tube sup- port bearings. Drill out rivets securing retainer and doubler to seat structure to replace left support bearing. Drill out three rivets securing right end fitting to torque tube to replace right support bearing. Install new bearings and rivets at existing holes.

(2). Replace torque tube if it is cracked or has elongated holes.

NOTE: Torque tube droop control bracket may be either an aluminum or magnesium casting. (For corrosion control and identification of magnesium and aluminum alloy parts, Ref. Sec. 20-40-00.)

(3). Replace bent or stripped bungee adjusting bolt. Torque nut to **30 - 40 inch-pounds (3.39 - 4.52 Nm)**.

(4). Replace scratched, nicked or otherwise damaged reinforcement strap.

15. Collective Bungee Disassembly

(Ref. Figure 407)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST510	Bungee spring compression tool rod and channel

(1). Remove male bearing from bungee clamped in compression by installation tool.

(2). Install bungee compression tool rod and channel (ST510) on compressed bungee. Insert 1/4 inch (6.35 mm) bolt through channel and female bearing rod end.

(3). Place compression tool and bungee in vise so that vise jaws make contact with tool rod and channel. Compress vise and remove bungee clamp.

(4). Slowly open vise and remove bungee components.

NOTE: Do not disassemble female bearing assembly; if defective, replace as a unit.

16. Collective Bungee Reassembly

(Ref. Figure 407)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM116	Grease, aircraft and instrument

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST508	Collective bungee installation tool
ST509	Not used at this time
ST510	Bungee spring compression tool rod and channel

(1). Lubricate cups of spring retainers and threads and bore of female bearing assembly with grease (CM116).

(2). Assemble retainer, spring and female bearing assembly. Install compression tool rod and channel (ST510). Insert a 1/4 inch (6.35 mm) bolt through channel and female bearing rod end.

(3). Position assembly in bench vise. Compress bungee spring until bungee installation tool (ST508 or ST509) fits over retainers. Secure tool halves in place with clamp.

(4). Open vise slowly and remove bungee compression tool rod and channel.

(5). Install male bearing in compressed bungee.

17. Inboard Collective Stick Socket Assembly Disassembly

(Ref. Figure 408)

(1). Disconnect link from idler.

(2). Remove idler from socket housing. Do not remove idler bearing unless replacement is necessary.

(3). Remove four bolts and washers that attach housing cap to socket housing. Rotate shaft assembly until gear tooth cutout clears pinion (bellcrank ears at approximately 195 degrees); then separate bellcrank, housing cap and shaft assembly from housing.

(4). Remove bellcrank from shaft assembly to separate housing cap from shaft. Do not press bearings from cap or housing unless replacement is necessary. Keep backlash shims with shaft assembly.

(5). Remove link from bellcrank.

(6). Remove snap ring that retains N_1 pinion gear aft bearing in housing. Press pinion gear and aft bearing, as an assembly, out through access hole at the back of housing. Disassemble pinion bearings from pinion and housing only if replacement is necessary.

18. Inboard Collective Stick Socket Assembly Repair

(Ref. Figure 408)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM116	Grease, aircraft and instrument

(1). Replace bearings if corroded, excessively worn, or if outer or inner races of bearings rotate on mating surfaces and locking compound does not prevent rotation. Install new bearings with grade A locking compound (CM116). Check that replacement bearing is properly seated in mounting bore.

(2). Replace any cracked part.

(3). Replace entire link if bearings are defective; link bearings are not replaceable.

(4). Replace pinion gear or shaft assembly bevel gear when correct backlash cannot be maintained because of tooth irregularities caused by wear or deformation.

19. Inboard Collective Stick Socket Assembly Reassembly

(Ref. Figure 408)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM116	Grease, aircraft and instrument
CM431	Sealing, locking and retaining compound

(1). Check gearshaft bearings in housing cap and housing for security of outer races. Use grade A locking compound (CM431) to install replacement bearings. Use care to prevent compound from entering bearings, and make sure that each bearing is seated against bore shoulder.

(2). Apply grade A locking compound (CM431) to pinion gear aft bearing outer circumference and matching bore in socket housing. Install assembled N_1 pinion gear and aft bearing; seat bearing firmly against bore shoulder.

(3). Install snap ring that retains aft-bearing in housing bore. Apply locking compound to bond pinion shaft to forward bearing and to bond forward bearing to housing bore. Press bearing firmly against housing shoulder. (Housing is machined to provide a light press-fit.)

(4). Establish N_1 pinion and shaft assembly bevel gear backlash by rotating N_1 pinion gear assembly so that wide toothspace on spline is at about one o'clock when viewed from socket (looking aft). Install backlash shims to obtain maximum backlash of 0.003 inch (0.076 mm) with bearings firmly seated in bores.

(5). After backlash shimming is correct, remove housing cap and gearshaft.

(6). Install bellcrank on shaft assembly, and link to bellcrank.

NOTE: Bellcrank attachment bolt must be installed with head slightly down and forward.

(7). Lubricate teeth of pinion gear and shaft assembly bevel gear with grease (CM116).

(8). Apply grade A locking compound (CM431) to bond bevel gearshaft and bearings. With centerline of wide toothspace of N_1 pinion gear spline up (on top), install shaft assembly gear at midtravel position.

NOTE: N_1 pinion shaft spline wide toothspace should be positioned up at approximately one o'clock position, as viewed looking aft into open end of socket.

(9). Install four bolts, eight washers, four spacers and nuts to secure cap to housing.

(10). Install idler to housing, and link to idler.

NOTE: When installed, idler to gas producer control rod bolt holes should be in line with centerline of stick assembly housing cap when gearshaft and pinion gears are positioned as outlined in step (8). above.

20. Cyclic Control Stick Repair

(Ref. Figure 411) Disassemble cyclic control stick only as necessary to replace damaged or faulty parts. Pilot's stick tube should not be removed from stick socket; the assembly should only be replaced as a unit.

21. Cyclic Friction Mechanism Repair

(Ref. Figure 603)

(1). Remove cap nut from friction stud and disassemble friction mechanism from stick socket or torque tube.

(2). Replace bent or stripped friction stud. Drill out rivet and press stud from socket; install new stud and rivet in place. Press replacement spring pin into friction stud until one end of pin is flush with surface of stud.

(3). Assemble friction mechanism to stick socket or torque tube.

(4). Adjust friction knob cap nut to stop knob when spring extends to free length, no compression ±1/32 inch (±0.79375 mm).

22. Lateral Control Rods and Sta. 67 Bellcrank Repair

(Ref. Figure 411)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM431	Sealing, locking and retaining compound

(1). Replace Sta. 67 lateral bellcrank if it has elongated holes or is cracked. Replace pivot bearing if it binds or is excessively worn; install with grade A locking compound (CM431). Check free play of bellcrank with newly installed pivot bearing by applying light up and down pressure at forward end of bellcrank with bearing secured. For bearing to be acceptable, bellcrank total play measured at centerline of bolt that attaches pilot's lateral control rod end must not exceed ±0.024 inch (±0.6096 mm).

NOTE: Sta. 67 lateral bellcrank may be either an aluminum or magnesium machined forging. (For corrosion control and identification of magnesium and aluminum alloys, Ref. Sec. 20-40-00.)

(2). Perform straightness check on control rod(s) that appear bent or bowed. Total length of rod (excluding rod ends) must be straight within 0.010 inch (0.254 mm). Cold-straightening of rod is permissible if no nicks or sharp dents exist in bend length, and rod ends are not used to support rod during straightening process. Dye-check for cracking is to be performed after cold-straightening. Replace cracked rod, or cracked or bent rod end.

CAUTION Use care when drilling to remove or install riveted rod end; rod end is steel and rod is aluminum. Do not tighten adjustable rod end jam nut on pilot's lateral control rod until rod is installed and cyclic stick longitudinal travel is checked.

(3). Replace control rod end if bearing axial play is more than 0.040 inch (1.016 mm). Set initial control rod length and bearing angularity.

23. Cyclic Pitch Interconnecting Torque Tube Repair

(Ref. Figure 412)

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM116	Grease, aircraft and instrument
CM431	Sealing, locking and retaining compound

NOTE: Cyclic torque tube may be either a machined magnesium or aluminum casting. (For corrosion control and identification of magnesium and aluminum alloys, Ref. Sec. 20-40-00.)

(1). Replace torque tube if it is cracked, has elongated holes or deformed bearing supports.

(2). Replace main support bearings or cyclic stick pivot bearings if they bind or are excessively worn. Drill out four rivets and remove bearing retainer to replace right support bearing. Install cyclic stick pivot bearing and right support bearing with grade A locking compound (CM431).

NOTE: Left support bearing is a slip- fit in torque tube lug; coat outer circumference of bearing with grease (CM116) prior to insertion in lug.

(3). Replace bent or stripped friction stud. Drill out rivet; install and rivet new stud in place. Insert spring pin with one end flush with stud.

24. One-W ay Lock Repair

For overhaul information, Ref. COM.

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM206	Chemical coating
CM801	Abrasive paper, silicon carbide
CM803	Crocus cloth

(1). Remove dents, nicks and scratches by using grade 400 abrasive paper (CM801) to remove rough edges. Finish by polishing with crocus cloth (CM803); maintain smooth transition into surrounding area. After repair treat area with chemical film (CM206).

(2). When replacing input (forward) shaft rod end bearing, with piston at mid stroke ensure bearing center-to-center distance is 8.58 ±0.030 inches (217.932 ±0.762 mm). Adjust as required. After correct length is set, tighten and safety lock nut with lockwire.

NOTE: Support links may be either forged aluminum or magnesium castings. (For corrosion control and identification of magnesium and aluminum parts, Ref. Sec. 20-40-00.)

25. Cyclic Trim Actuator Spring Assembly Replacement

(Ref. Figure 508)

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM116	Grease, aircraft and instrument
CM234	Solvent, dry-cleaning

(1). Insert screwdriver into open end of spring guide and remove screw that connects two spring adapters.

NOTE: Identify screw for lateral or longitudinal trim; screws are not interchangeable. Lateral actuator screw is 2- 7/8 inches (73.025 mm) long; longitudinal screw is 2-5/8 inches (66.675 mm) long.

(2). Slide spring assembly out of trim tube.

(3). Clean inside of trim tube with solvent (CM234).

(4). Coat outside of replacement spring assembly tube lightly with grease (CM116).

(5). Slide replacement spring assembly into trim tube.

(6). Install spring adapter screw in open end of spring assembly and tighten screw until 0.010-0.050 inch (0.254-1.27 mm) play is felt while pushing or pulling on spring assembly. While tightening screw, check that friction exists from self-locking threaded insert.

(7). Wipe off all excess grease.

(8). Perform bench test to check actuator operation.

26. Cyclic Trim Actuator Housing or Trim Tube Replacement

(Ref. Figure 508)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

(1). Remove actuator spring assembly.

(2). Carefully drill out four rivets attaching trim tube. Remove trim tube.

(3). Remove actuator from actuator housing. Check housing for condition and evidence of corrosion.

NOTE: Housing may be either aluminum or magnesium casting. (For corrosion control and identification of magnesium and aluminum alloys, Ref. Sec. 20-40-00.)

(4). Use dimensions to assemble replacement actuator housing and trim tube. If replacement part is undrilled, drill #40 - 0.098 inch (2.4892 mm) four attaching rivet holes.

(5). Coat mating surfaces of trim tube and actuator housing with primer (CM318). Assemble while primer is still wet.

(6). Install four mechanically expanding rivets.

(7). Reinstall actuator.

(8). Reinstall actuator spring assembly.

(9). Perform bench test.

27. Cyclic Trim Actuator (Motor/Gear Drive Mechanism) Replacement

(Ref. Figure 508)

(1). Remove actuator spring assembly.

(2). Remove trim tube.

(3). Support actuator tube and press out spring pin.

(4). Unscrew adapter from actuator and remove actuator from housing.

(5). Screw adapter into replacement actuator shaft until it bottoms. If spring pin hole drilled in adapter does not align with guide hole in adapter, adapter must be replaced; otherwise adapter may be reused.

(6). Use 1/16 inch (0.0625) drill to drill spring pin hole through adapter and actuator; deburr hole.

(7). Reassemble actuator housing and trim tube.

(8). Install actuator in housing. Screw adapter on actuator.

(9). Support actuator shaft; press in spring pin. Ensure that pin is flush with shaft.

(10). Install actuator spring assembly.

(11). Bench test actuator.

28. Cyclic Trim Actuator Rework (Calco P/N 8222M6 and 8222M7)

The following procedure is for tightening the trim actuator drive gear retention nut and also testing stalled actuators.

NOTE: Rework is NOT applicable to actuators having letter ”R” following vendor part number on actuator housing.

(1). Remove cyclic trim actuator from helicopter.

(2). If actuator is inoperative, bench test unit to determine whether mechanical (stalled), electrical or other mechanical failures exists.

(a). A reading of 0.0 - 0.1 amperes indicates electrical failure; replace actuator.

(b). The motor runs, but the output shaft does not move, indicates a mechanical failure; replace actuator.

(c). A reading of 0.7 amperes (approximately), or actuator extends part way and stalls, indicates stalled failure; rework actuator per steps (3). thru (9). below.

(3). Remove lockwire and six screws securing actuator cover to housing.

CAUTION When removing housing, note the location and number of shims on each gear for reassembly in proper location.

NOTE: Step (4). not applicable if actuator is operative. Perform steps (5). thru (9). below.

(4). Using fingers only, check gear drive retention (hex) nut for looseness. If nut is loose, rework per instructions below. If nut is NOT loose, replace actuator assembly.

(5). Remove nut and clean threads. Reinstall nut using Locktight #290 on threads. Torque nut to **30 - 40 inch-pounds (3.39 - 4.52 Nm)**.

(6). Reinstall actuator cover with existing screws; lockwire screws.

(7). Add letter ”R” at end of vendor part number on actuator housing.

(8). As applicable, reinstall trim actuator.

(9). Record rework of trim actuator in Components Record of helicopter Log Book.

Section

67-10-20

Collective and Cyclic Stick Grips (369D/E/FF - 500/600N)

COLLECTIVE AND CYCLIC STICK GRIPS MAINTENANCE PRACTICES

1. Collective Pitch Stick Switches

(Ref. Figure 201) The START, N2 GOV and LDG LT switches are on the collective stick assembly. Wiring for the switches is routed down through the collective stick tube and interconnects with electrical system wiring through a connector at the base of the stick.

2. Collective Pitch Stick Switches Replacement

(Ref. Figure 201)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM703	Tie strap
CM807	Twine, nylon

CAUTION Ensure all electrical power is OFF.

(1). Disconnect grounding terminals.

(2). Remove attaching hardware securing stick grip switch housing. Remove housing and switchplate.

(3). Disconnect wiring and remove affected switch.

(4). Install replacement switch in reverse order of removal. If nylon strap (CM703) is not available, use twine (CM807) to secure wiring to collective pitch stick.

(5). Perform operational check of switch and associated system or equipment (Ref. appropriate PFM).

3. Cyclic Stick Grip Switches

(Ref. Figure 202) The pilot's cyclic stick grip contains a toggle switch for cyclic trim control and a trigger switch for radio/interphone communications. A blank switch socket is provided at the left of the trim switch for optional equipment. Coiled, insulated and open-ended wiring is provided in the grip for connection to an optional switch.

NOTE: Cyclic stick grip configurations vary and may have additional switches. Switch functions are described in appropriate sections.

4. Cyclic Control Stick Grip Replacement

A. Cyclic Control Stick Grip Removal

(Ref. Figure 203)

(1). Disconnect removable contacts from electrical plug.

(2). Remove nylon strap that secure wiring to stick socket. Remove strap mounting plate only if it is unserviceable.

(3). Remove screw from grip and separate grip from tube.

(4). Tie a string to each wire bundle to aid reassembly. Push wire slack into wiring exit holes in stick socket while pulling grip wiring from stick tube. Remove grip and wiring; leave strings in tube.

B. Cyclic Control Stick Grip Installation

(Ref. Figure 203)

(1). Separate grip wiring into approximately equal size color-coded bundles, according to wiring diagram.

(2). Install an eight inch (20.32 cm) length of AWG Size No. 3 electrical insulation sleeving on each bundle and push sleeving up into grip.

(3). Route wiring through stick tube and out wiring exit holes with aid of strings inserted at stick removal. Push wires at grip end while pulling slack out of socket.

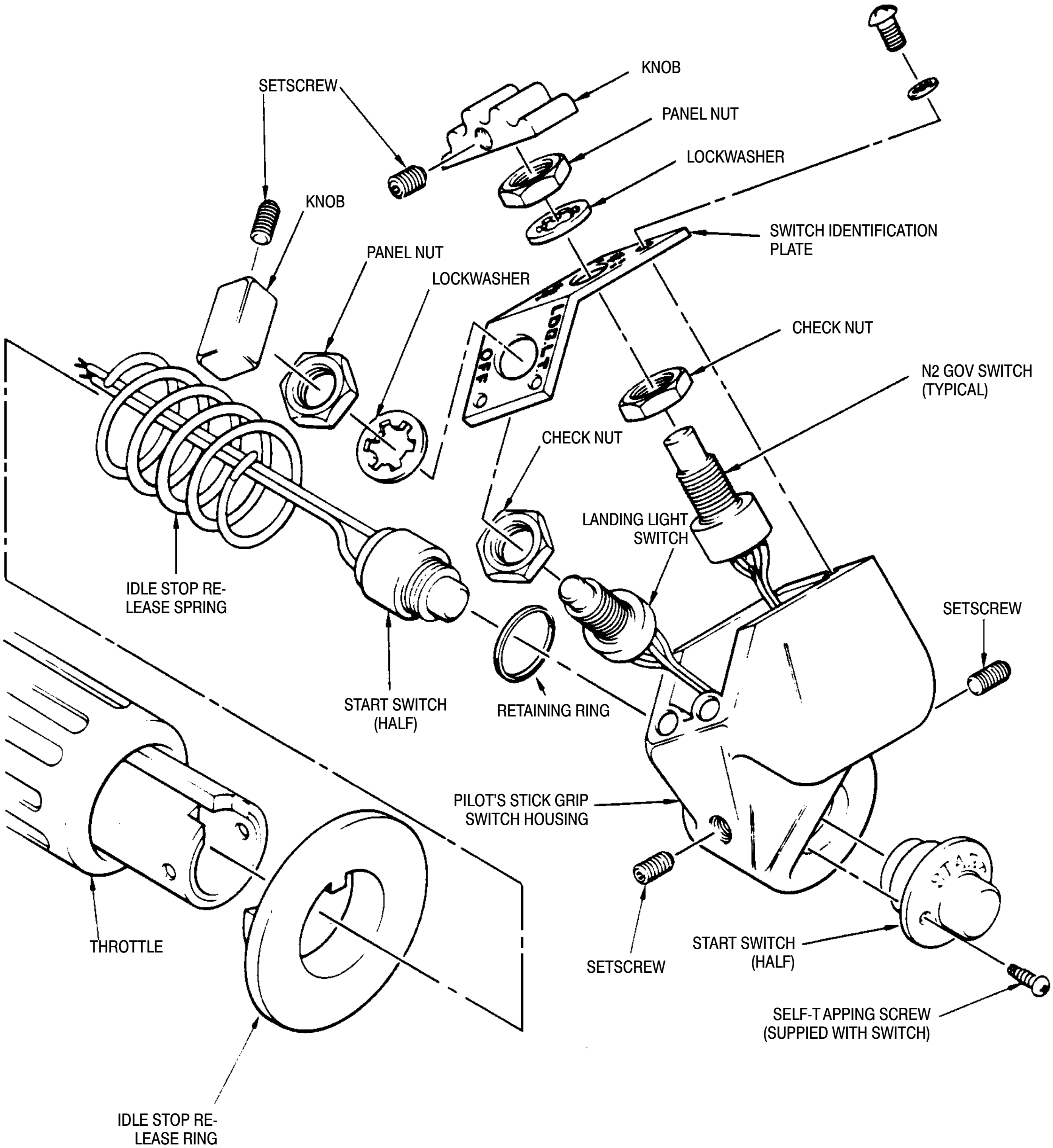


Figure 201. Collective Pitch Stick Switch Replacement

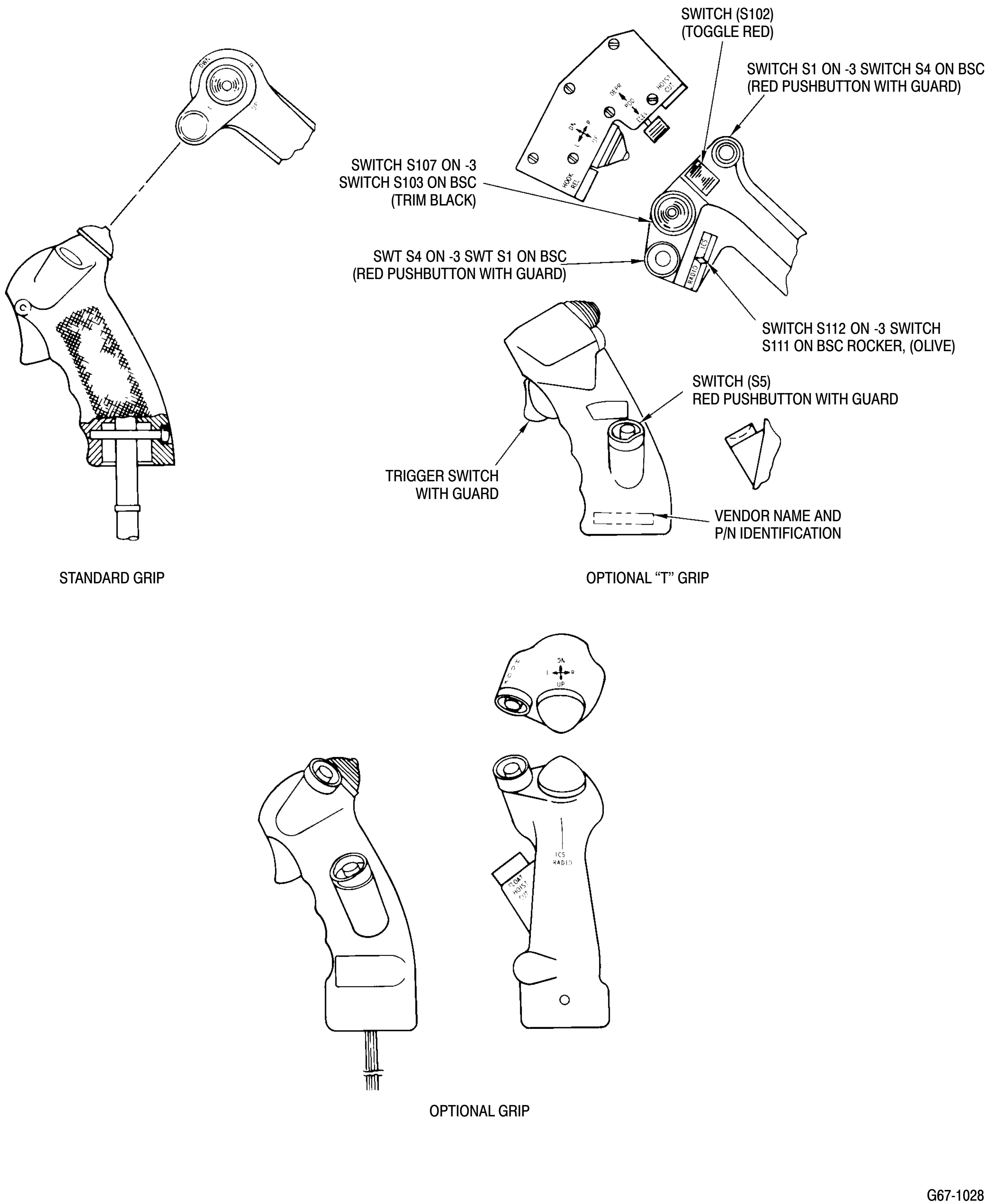


Figure 202. Cyclic Stick Grips

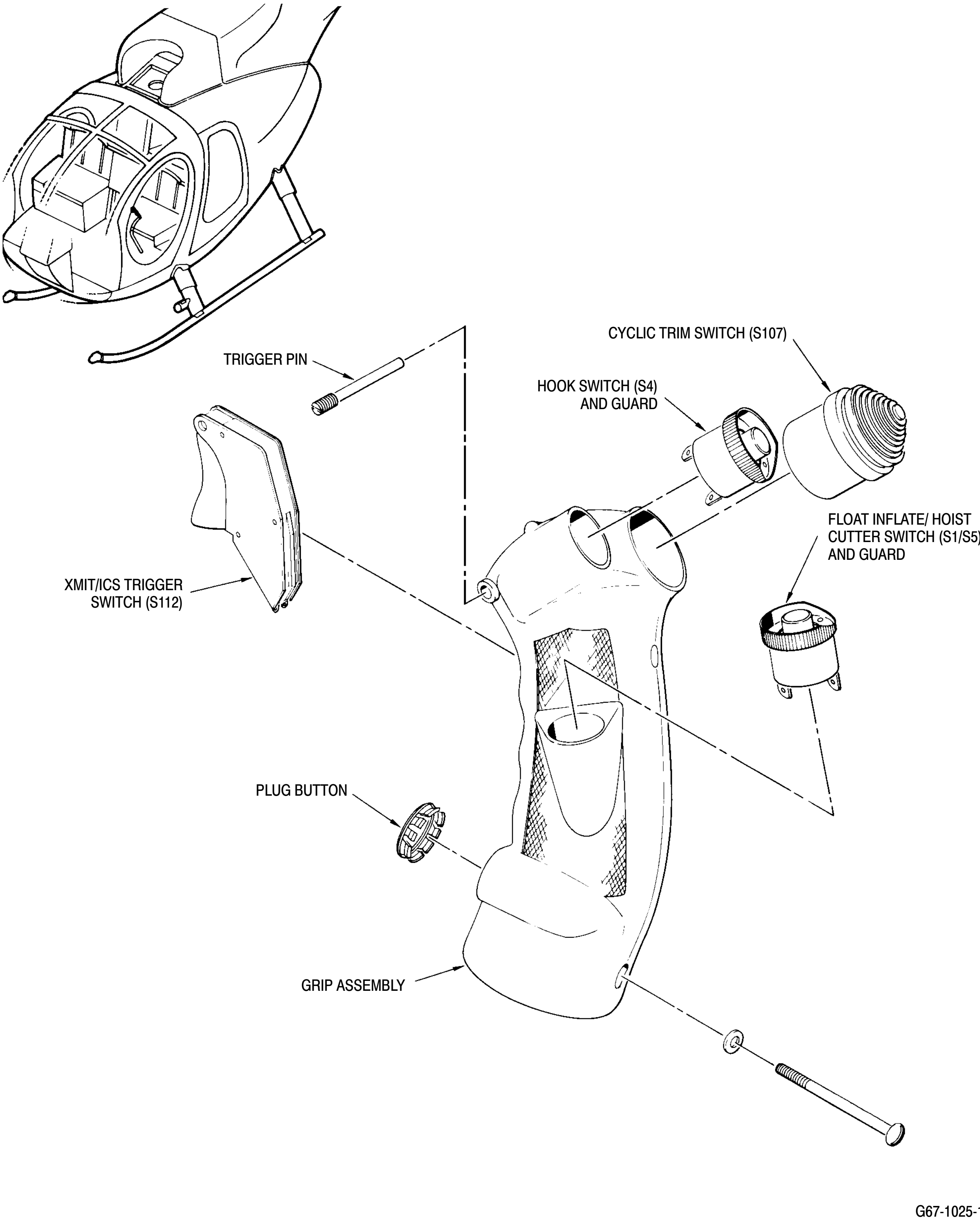


Figure 203. Cyclic Stick Grip Disassembly (Sheet 1 of 2)

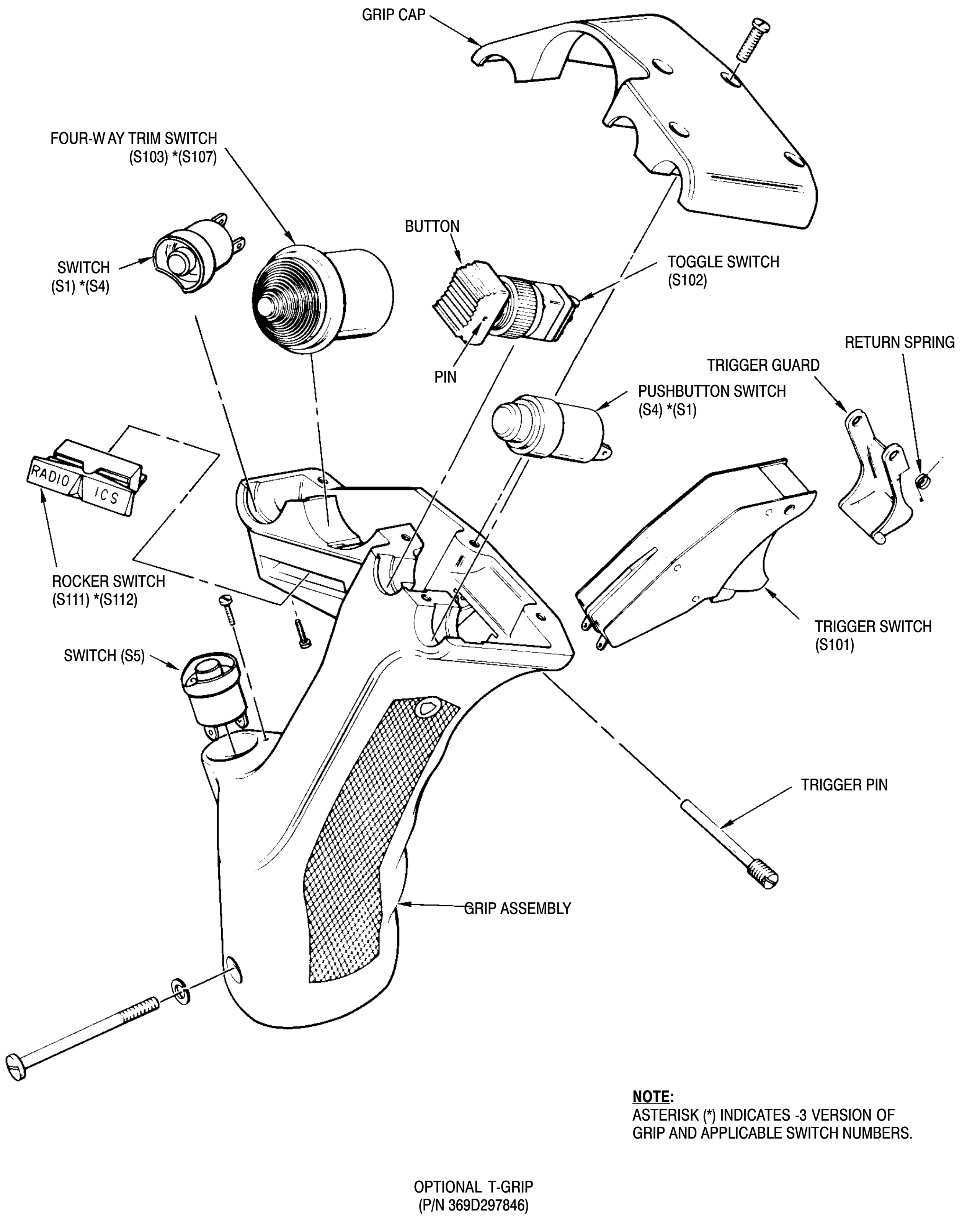


Figure 203. Cyclic Stick Grip Disassembly (Sheet 2 of 2)

(4). Install an additional eight inch 20.32 cm) length of insulation sleeving to protect each wire bundle where routed through exit holes in socket.

(5). Position grip on stick tube and install screw.

(6). Push as much wire slack as possible back into stick. Secure wiring to socket with new nylon strap, or equivalent.

(7). Cut wiring to correct length and reinstall replaceable contacts and electrical plug and wiring diagram.

5. Cyclic Stick Grip Switch Replacement (Standard Grip)

(Ref. Figure 203)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM217	Isopropyl alcohol
CM425	Sealing compound
CM703	Tie strap
CM815	Solder

WARNING **Ensure that all electrical power is OFF.**

(1). Disconnect cyclic grip wiring connector from plug at lower end of cyclic stick.

(2). Remove strap securing wiring to stick socket; remove strap mounting plate if it is unserviceable.

(3). Remove exterior sealant from grip assembly covering switch mounting hardware and attaching screws.

(4). Drive trigger pivot pin from grip to release trigger. Pin is removed from right to left while holding grip in normal position. Remove trigger.

(5). Remove screw from grip and separate grip from stick tube.

(6). Push slack wiring into wiring exit holes in stick socket while pulling grip wiring from stick tube.

(7). Remove trim switch cap by carefully pulling cap off.

(8). Remove all attaching hardware securing switches to grip, carefully remove switches and attached harness from grip assembly.

(9). Tag, identify and un-solder wires of switch to be disconnected.

(10). Clean grip, wiring and switches with alcohol (CM217).

(11). Reconnect all electrical wires using solder (CM815), remove identification tags from wires.

(12). Carefully position switches to their approximate location within the grip.

NOTE: Ensure that switches are correctly positioned with any applicable keyway, pin hole, etc, for proper alignment of mating parts.

(13). Install attaching hardware securing switches onto grip.

(14). Install trigger and trigger attach pin.

(15). Install cyclic trim switch cap.

(16). Reinstall grip on stick tube, route grip wiring through stick tube and attach connector.

(17). Check switch operation and wiring continuity.

(18). Apply sealing compound (CM425) to all screw holes and insert holes.

(19). Secure wiring to stick with nylon straps (CM703).

CAUTION Cyclic trim actuators should be operated only momentarily to prevent damage to equipment.

(20). Check operation of switch by momentarily cycling in all modes ensuring that the associated system operates correctly.

6. Cyclic Stick Grip Disassembly (Optional T-Grip, PN 369D297846 Only)

(Ref. Figure 203)

WARNING **Ensure that all electrical power is OFF.**

(1). Remove the grip cap by removing six screws.

NOTE: The grip is to be disassembled only to the extent required for replacement of the switches. The wiring through the grip assembly is tied with nylon twine and covered with a two inch (5.08 cm) insulating sleeve. Do not remove the twine and sleeves unless wire replacement is required.

(2). Detach the rocker switch (S111) by removing two screws.

(3). Unscrew the trigger pin and carefully withdraw it while holding the trigger guard and trigger switch (S101) in place. Then remove the trigger guard and switch and separate them with care to prevent distorting or losing the return spring.

(4). Remove toggle switch (S102). Switch button is separated from housing by pressing out the pin.

(5). Unsolder wiring connected to terminals on the switch to be disconnected. Tag and identify wires to facilitate correct reconnection.

7. Cyclic Stick Grip Reassembly and Modification

(Ref. Figure 203 and Figure 204)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM217	Isopropyl alcohol
CM314	Varnish, moisture resistant
CM425	Sealing compound
CM703	Tie strap
CM815	Solder

(1). Clean grip, wiring and switches with alcohol (CM217). Reconnect all electrical wires using solder (CM815) and reinstall switches as applicable.

NOTE: Ensure that switch is correctly positioned with any applicable keyway, pin hole, etc, for proper alignment of matching parts.

(2). Insert replacement switch at the approximate mounting position on the grip subassembly.

(3). Using solder (CM815), connect wiring to terminals of the replacement switch. Remove identification tags from wires.

NOTE:

- Helicopters (369D) S/N 003 thru 480 may require trigger switch rework to accommodate replacement switch (Ref. Figure 204).
- Rework is not necessary for the following cyclic grip assemblies; PN 369D27133 or A218-964401-00.

(4). If rework is required, perform steps (a). thru (c). before continuing.

(a). Press or pull insert from top of grip.

(b). Make template of profile of new A218-158698-05 trigger switch.

(c). Using file, blade or equivalent routing tool, remove material from lower inside edge of hole for trigger switch to permit installation of new switch. Use template to determine amount and location of material to be removed.

(5). As applicable, secure or attach the trigger switch, (trigger guard and return spring for 369D297846 cyclic grips) to the grip housing using the original attaching hardware.

(6). Apply sealing compound (CM425) to all open screw holes and insert hole.

(7). Secure the grip cap (for 369D297846 cyclic grips) to the grip subassembly with six screws; coat the screws with varnish (CM314) before installation into grip.

(8). Reinstall grip on stick tube. Using attached strings, route grip wiring through stick tube and reconnect at electrical plug.

(9). Check switch operation and wiring continuity.

(10). Secure wiring to stick socket with nylon strap (CM703).

(11). Energize the electrical system.

CAUTION Cyclic trim actuators should be operated only momentarily to prevent damage to equipment.

(12). Check operation of the switch by momentarily activating it and ensuring that the associated system operates correctly.

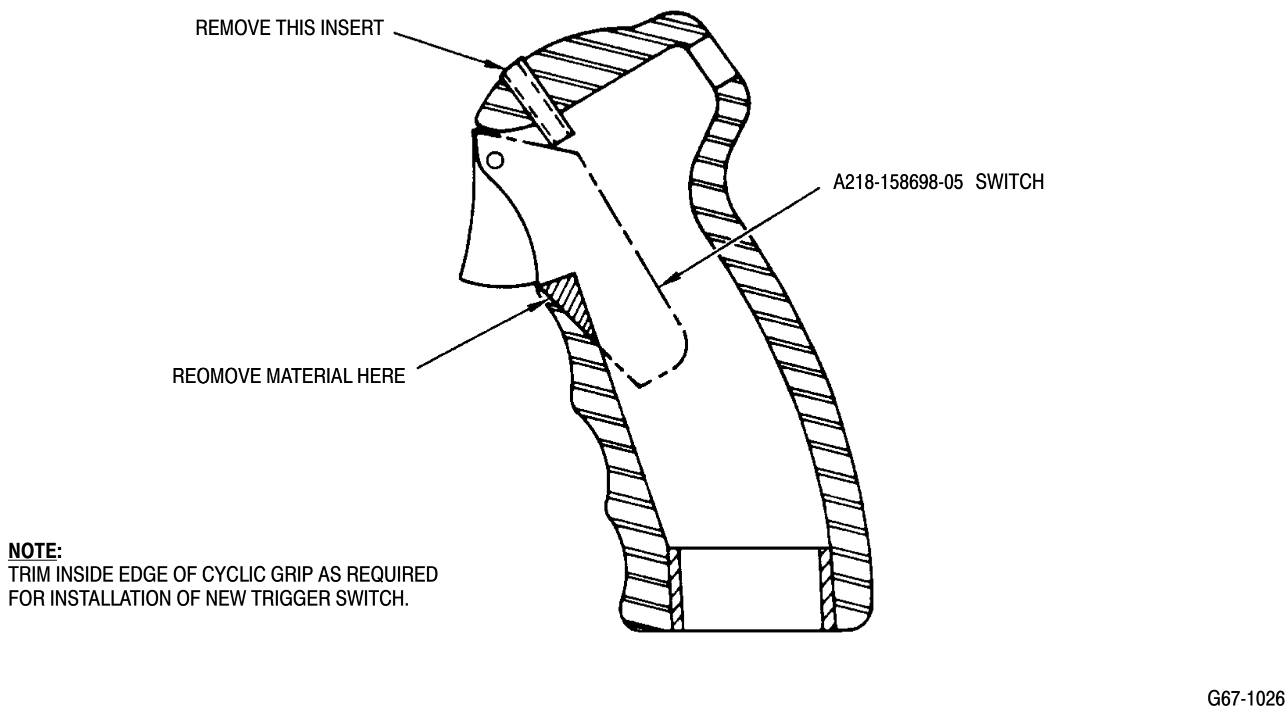


Figure 204. Rework of Cyclic Stick Grip

Section

67-20-10

Anti-Torque Flight Controls (Two and Four Blade) (369D/E/FF)

ANTI-T ORQUE FLIGHT CONTROLS (TWO AND FOUR BLADE) DESCRIPTION AND OPERATION

1. Tail Rotor Control Configuration

The helicopter may be equipped with either of two basic pilot's tail rotor foot pedal control configurations. The tail rotor and control linkage to the foot pedals are identical on either basic configuration.

(1). Basic Left-Hand Command Tail Rotor Controls. Single left position pilot's tail rotor control pedals. Foot rest can be installed at right side of crew compartment in place of right-hand foot pedals.

(2). Basic Right-Hand Command Tail Rotor Controls. Right position pilot's tail rotor control pedals with left copilot's dual controls. Foot rest not installed.

2. Upper Fuselage and Tailboom Control Linkage

Upper fuselage tail rotor controls consist of Sta. 95 bellcrank and support at the front of the main rotor mast base, Sta. 120 control rod and Sta. 142 bellcrank inside the boom fairing. Boom linkage consists of tailboom control rod, supported by seven bushings (grommets), and Sta. 284 Bellcrank mounted on the tail rotor transmission.

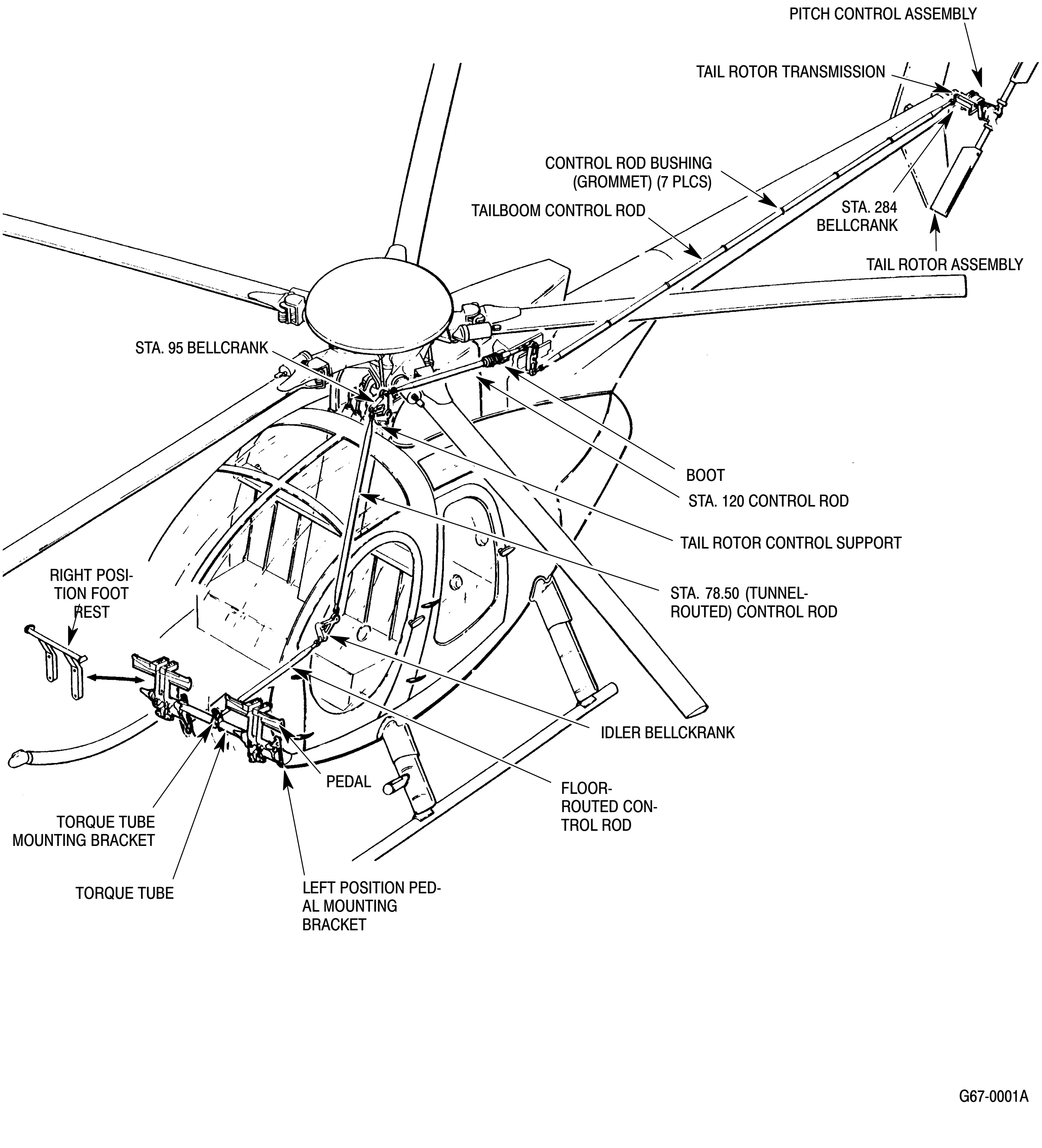


Figure 101. Tail Rotor and Control System

ANTI-T ORQUE FLIGHT CONTROLS (TWO AND FOUR BLADE)

REMOVAL/INSTALLATION

1. Sta. 120 Control Rod or Sta. 142 Bellcrank Replacement

A. Sta. 120 Control Rod or Sta. 142 Bellcrank Removal

(Ref. Figure 401) The Sta. 142 bellcrank and Sta. 120 control rod must be removed as an assembled unit.

(1). Remove tail rotor control bellcrank access door from left side of boom fairing.

(2). Disconnect tailboom control rod from lower end of Sta. 142 bellcrank.

(3). Remove hardware that secures Sta. 142 bellcrank to boom fairing brackets.

(4). Open hinge-mounted access door on engine air inlet aft fairing. Remove clamp on boot support tube at Sta. 137.50.

(5). Disconnect forward end of Sta. 120 control rod from Sta. 95 bellcrank.

NOTE: Sta. 95 bellcrank must also be detached from its support for clearance from air inlet fairing for rod-end bolt removal.

(6). Carefully pull forward end of control rod and withdraw assembled rod and bellcrank out through boot support tube at plenum chamber Sta. 137.50.

(7). Disconnect control rod from upper end of bellcrank.

B. Sta. 120 Control Rod or Sta. 142 Bellcrank Installation

(Ref. Figure 401) Sta. 142 bellcrank and Sta. 120 control rod must be installed as a unit by routing assembled end of bellcrank and control rod through boot support tube at plenum chamber station (Sta. 137.50).

(1). For access to bellcrank support bracket, use access door in boom fairing.

(2). Ensure that slotted bushings are in place at each end of bellcrank; then position riveted rod end in bellcrank and install bolt, two washers, nut and cotter pin. Make sure that hump of bellcrank faces forward.

(3). Carefully feed assembled control rod and bellcrank through forward air intake at left side of control mixer installation while an assistant guides the assembly through boot support tube to bellcrank support bracket.

(4). Position rubber boot in place at Sta. 137.50.

(5). Position Sta. 142 bellcrank in support bracket and install bolt, two washers, nut and cotter pin.

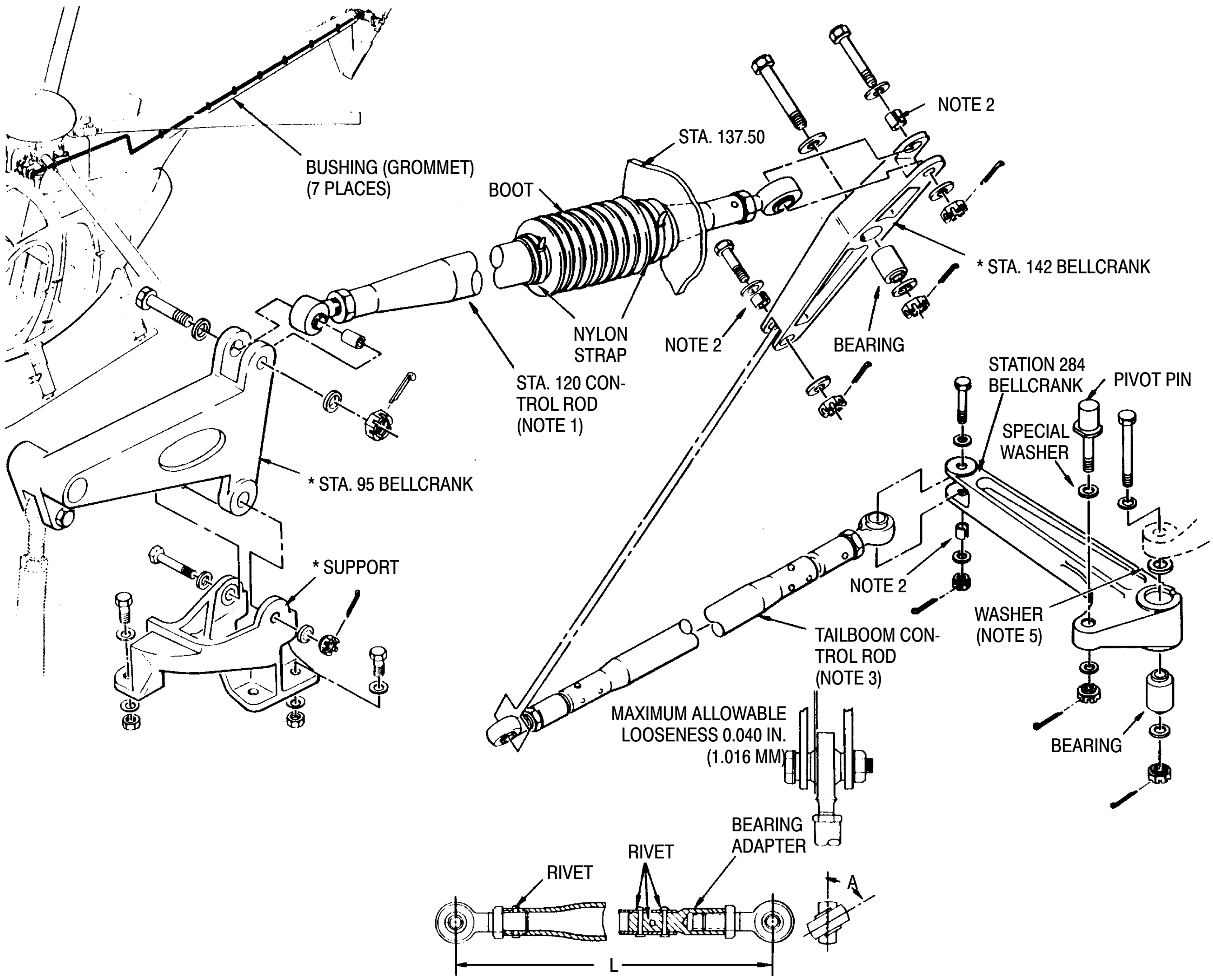
CAUTION Check Sta. 142 bellcrank for clearance with support structure. Pay particular attention to area above 369A7951-23 bearing when top of bellcrank is in forward position. If contact is noted, machine surface of bellcrank (machine surface with interference only) (Ref. Figure 801).

(6). Check that slotted bushing is in place in Sta. 95 bellcrank; then install forward rod end in bellcrank with bolt (head to left), two washers, nut and cotter pin.

(7). Reinstall Sta. 95 bellcrank in its support with bolt, two washers, nut and cotter pin.

(8). Secure rubber boot at support tube with nylon strap. Then clamp tail rotor pedals in neutral, set free length of bellows portion of boot at approximately 5.5 inches and secure end to control rod with nylon strap.

(9). Check rigging of tail rotor controls.



ROD LENGTH AND BEARING
ANGULARITY - BEFORE RIG

CONTROL ROD	DIMENSION L INCHES (CM)	ANGLE A
STA. 120	45.88 (116.5352)	IN LINE
TAILBOOM	143.80 (365.252)	63°

NOTES:
1. MINIMUM OF 0.060 IN. (1.524 MM) CLEARANCE FOR FULL RANGE OF TRAVEL THRU STA. 137.50 BULKHEADS.
2. EDGE OF BUSHING MUST PROTRUDE A MINIMUM OF 0.010 IN. (0.254 MM) TO A MAXIMUM OF 0.060 IN. (1.524 MM) ABOVE OUTSIDE SURFACE OF PART AFTER NUT IS TIGHTENED.
3. MINIMUM OF 0.010 IN. (0.254 MM) CLEARANCE FOR FULL RANGE OF TRAVEL BETWEEN BOOM AND TAIL ROTOR TRANSMISSION.
4. ASTERISK (*) INDICATES PARTS THAT MAY BE EITHER ALUMINUM OR MAGNESIUM ALLOY. FOR ALLOY IDENTIFICATION AND CORROSION CONTROL (REF. SEC. 20-40-00).
5. ADD ONE OR TWO AN960KD516 WASHERS AS REQUIRED FOR CLEARANCE AT PEDAL FULL STROKE.

G67-2000B

Figure 401. Upper Fuselage and Boom Tail Rotor Control Linkage

2. Sta. 284 Bellcrank Replacement

A. Sta. 284 Bellcrank Removal

(Ref. Figure 401)

(1). Disconnect bellcrank from tailboom control rod.

(2). Disconnect bellcrank from tail rotor transmission. Disengage bellcrank pitch control pin from pitch control housing and remove bellcrank.

B. Sta. 284 Bellcrank Installation

(Ref. Figure 401)

(1). Insert bellcrank pivot pin into pitch control housing self-aligning bearing.

(2). Position bellcrank to align with mating hole in tail rotor transmission arm and install bolt.

(3). Check that slotted bushing is in place in lower lug of bellcrank; then attach tailboom control rod to bellcrank with bolt, two washers, nut and cotter pin.

(4). Check rigging of tail rotor controls (Ref. Tail Rotor Controls Rigging).

3. Tailboom Control Rod Replacement

A. Tailboom Control Rod Removal

(Ref. Figure 401)

(1). Disconnect control rod from Sta. 284 bellcrank.

(2). Remove tail rotor control bellcrank access door from left side of boom fairing.

(3). Accurately measure and record distance between unchamfered edge of forward rod end bearing jam nut and center of bearing attach bolt hole. Hold forward rod end, loosen jam nut and unthread control rod from rod end by turning aft end of rod.

(4). Slowly pull aft end of control rod and withdraw rod through opening in tail rotor transmission mounting frame.

B. Tailboom Control Rod Installation

(Ref. Figure 401)

NOTE: Tailboom control rod is routed through boom with forward rod end removed.

(1). Deleted

(2). Guide control rod through boom aft frame opening and carefully route through seven bushings (grommets). Rotate rod slightly to start it through each grommet.

(3). Check that slotted bushing is in place in lower lug of Sta. 284 bellcrank; then attach aft rod to bellcrank.

(4). Using measurement recorded at time of rod removal, install forward rod end bearing. Align rod ends so that bearings have equal space for angular throw; hold rod end and tighten jam nut.

(5). Check that slotted bushing is in place in lower end of Sta. 142 bellcrank; then attach forward rod end to bellcrank.

(6). Check rigging of tail rotor controls (Ref. Tail Rotor Controls Rigging).

(7). Close plenum chamber access door.

4. Sta. 95 Bellcrank and Support Replacement

A. Sta. 95 Bellcrank and Support Removal

(Ref. Figure 401)

(1). Disconnect tunnel-routed control rod from bellcrank.

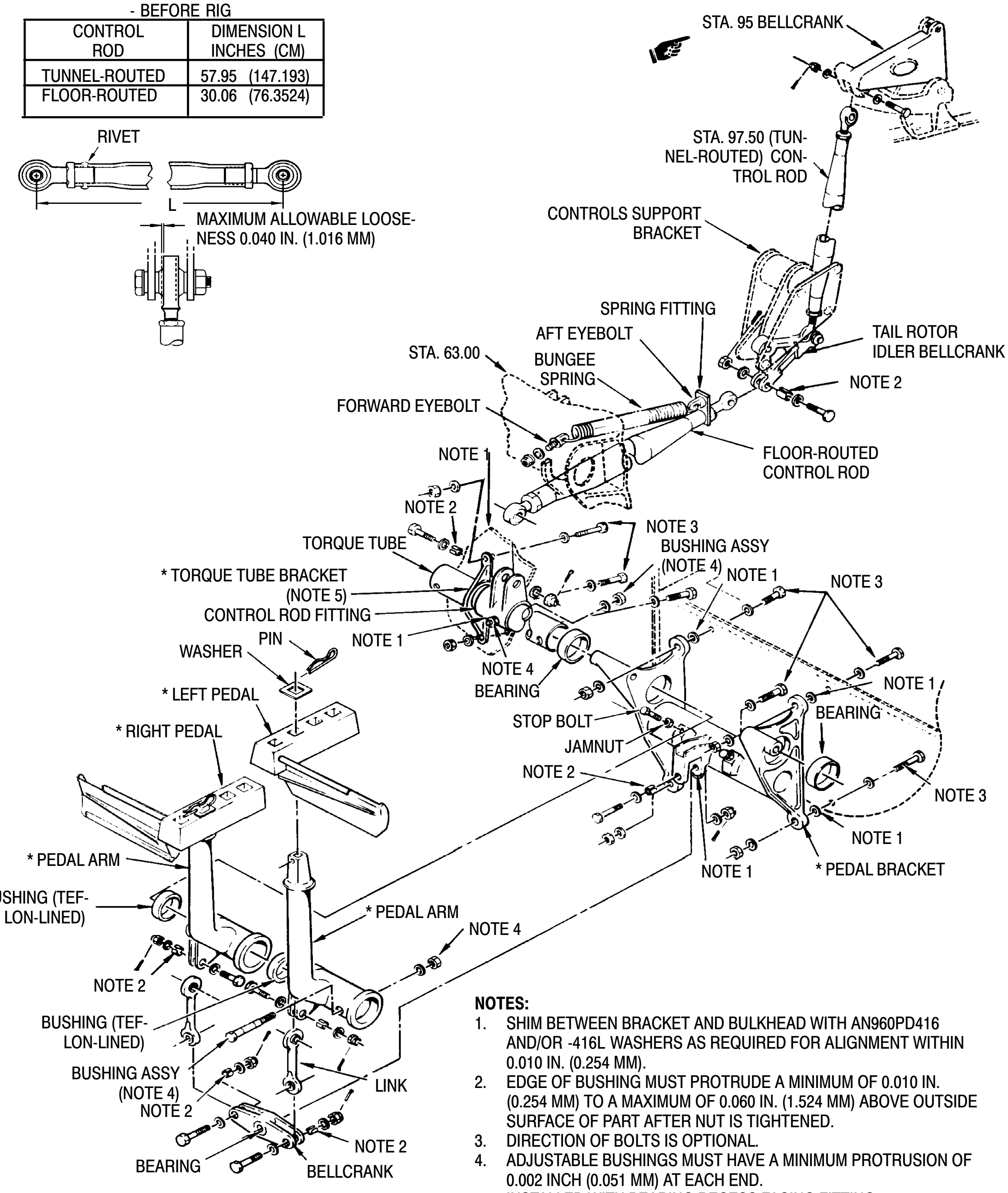
(2). Disconnect bellcrank from support.

(3). Disconnect bellcrank from Sta. 120 control rod and remove bellcrank.

(4). Remove hardware that secures support to mast structure; remove support.

INITIAL CONTROL ROD LENGTH - BEFORE RIG

CONTROL ROD	DIMENSION L INCHES (CM)
TUNNEL-ROUTED	57.95 (147.193)
FLOOR-ROUTED	30.06 (76.3524)



NOTES:

1. SHIM BETWEEN BRACKET AND BULKHEAD WITH AN960PD416 AND/OR -416L WASHERS AS REQUIRED FOR ALIGNMENT WITHIN 0.010 IN. (0.254 MM).
2. EDGE OF BUSHING MUST PROTRUDE A MINIMUM OF 0.010 IN. (0.254 MM) TO A MAXIMUM OF 0.060 IN. (1.524 MM) ABOVE OUTSIDE SURFACE OF PART AFTER NUT IS TIGHTENED.
3. DIRECTION OF BOLTS IS OPTIONAL.
4. ADJUSTABLE BUSHINGS MUST HAVE A MINIMUM PROTRUSION OF 0.002 INCH (0.051 MM) AT EACH END.
5. INSTALLED WITH BEARING RECESS FACING FITTING.
6. ASTERISK (*) INDICATES PART THAT MAY BE EITHER MAGNESIUM OR ALUMINUM ALLOY. FOR ALLOY IDENTIFICATION AND CORROSION CONTROL (REF. SEC. 20-40-00).

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Figure 402. Tail Rotor Pedal Installation (Sheet 1 of 2)

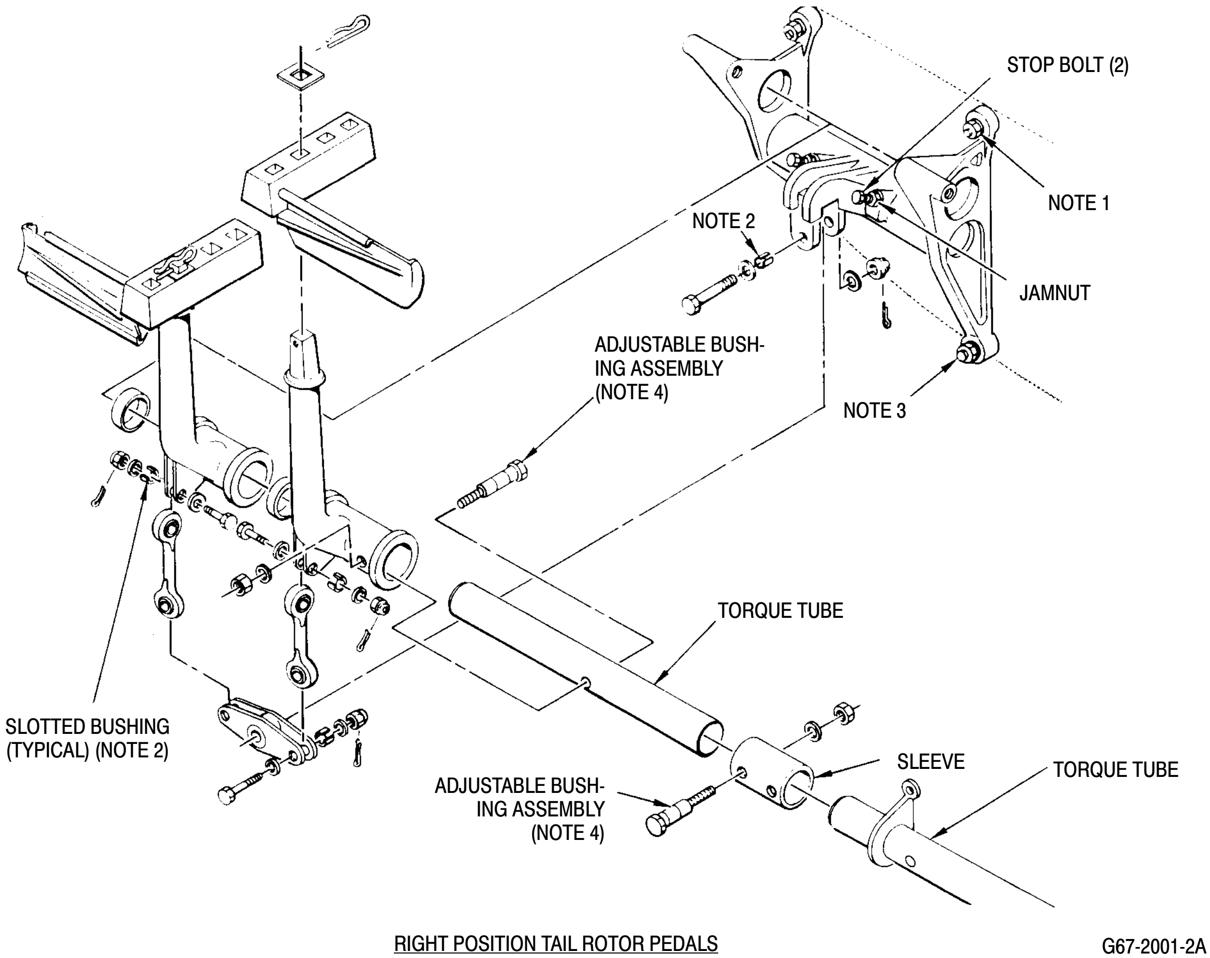


Figure 402. Tail Rotor Pedal Installation (Sheet 2 of 2)

B. Sta. 95 Bellcrank and Support Installation

(Ref. (Ref. Figure 401)

(1). Install bellcrank support to mast structure with three bolts, seven washers and three nuts. Forward bolt requires an extra washer under bolthead; two thin washers are used at all three locations. Torque nuts to **80 - 100 inch-pounds (9.04 - 11.30 Nm)**.

(2). Check that slotted bushings are in place in bellcrank; then attach Sta. 120 control rod to bellcrank with bolt (head to left).

(3). Install bellcrank in support.

(4). Attach tunnel-routed control rod to bellcrank.

C. Tail Rotor Pedal Assembly - General

(Ref. (Ref. Figure 402) Tail rotor pedal installation consists of a pair of adjustable pedals, pedal arms with interconnecting linkage, pedal mounting bracket for left control position, torque tube with control rod fitting and torque tube mounting bracket. Forward pressure on right pedal rotates torque tube, moving control system linkage to increase tail rotor blade pitch. Pressure on left pedal decreases tail rotor blade pitch. A bungee spring is installed at aft end of floor-routed control rod in underseat tail rotor control linkage. This spring relieves left pedal forces during flight and causes left pedal to remain at forward position when helicopter is on ground and not operating.

NOTE: Parts identified with an asterisk (*) may be either magnesium or aluminum alloy. (Ref. Sec. 20-40-00 for corrosion control and identification of magnesium and aluminum alloys).

D. Co-Pilot' s Pedal Installation

(Ref. Figure 402) The copilot's pedal installation is essentially the same as the pilot's. A sleeve couples a torque tube extension to the pilot's torque tube. Dual pedal installation is also equipped with pedal stop nuts, heel strips, retaining springs and attachment hardware.

5. Tail Rotor Pedal Assembly Replacement

A. Tail Rotor Pedal Assembly Removal

(Ref. Figure 402)

(1). Pull two hinge pins from pilot's compartment floor access door hinges and remove door. Remove access panel from each side of instrument panel lower support structure.

(2). Remove battery (Ref. Chap. 96).

(3). Remove pins securing pedals to pedal arms and remove pedals.

(4). For access to bungee, remove access cover between pilot's seats and/or by removing left passenger's footwell on aft side of canted bulkhead.

(5). Block left tail rotor control pedal at full forward position to relieve tension on bungee.

(6). Remove eyebolt and washers at Sta. 63 with bungee attached. Keep washers with eyebolt for reinstallation.

(7). Disconnect bungee from eyebolt and fitting at aft end of floor-routed control rod by using spring tension removal tool (75, Table 203, 91-00).

(8). Remove cotter pin, nut, two washers and bolt that connect floor-routed control rod to torque tube fitting.

(9). Remove two nuts, four washers, any shim washers and two bolts that secure torque tube bracket to bulkhead. Keep shim washer selection with bracket to simplify torque tube alignment during reinstallation.

(10). Remove four nuts, eight washers, any shim washers and four bolts that secure pedal bracket to bulkhead. Remove control pedal installation. Keep shim washer selection with bracket.

B. Tail Rotor Pedal Assembly Installation

(Ref. Figure 402)

NOTE: Install both left and right pedal brackets for right-hand command helicopters.

(1). Install pedal bracket with four bolts, eight washers and four nuts. Add shim washers as required at pedal bracket attachment points to keep centerline alignment of pedal bracket bearings within 0.010 inch (0.254 mm). Correct alignment is indicated by free rotational movement of torque tube after nuts are tightened.

(2). Position torque tube bracket over mating holes in bulkhead and check alignment with bulkhead. Add shim washers as required at bracket attachment points to maintain bearing alignment established in step a above. Install two bolts, four washers and two nuts.

(3). Install forward eyebolt, using same number of washers removed, on bungee and then hook aft end of bungee into eyebolt on floor-routed control rod fitting.

NOTE: If tail rotor pedal forces are not zero during level flight at 130 to 140 knots, tail rotor force adjustment may be accomplished by removing washers as required from the eyebolt at Sta. 63 bracket.

(4). Using spring tension tool install bungee into position at Sta. 63 bracket; install washer and nut on eyebolt.

(5). Check that slotted bushing is in place; then install floor-routed control rod in torque tube fitting and install bolt, two washers, nut and cotter pin.

(6). Check rigging of tail rotor controls and pedal-to-canopy clearance (Ref. Tail Rotor Controls Rigging). Pedals should clear windows by a minimum of 0.20 inch (5.08 mm) with 20 pounds (88.96 N) of force applied.

6. Dual Tail Rotor Pedal Initial Installation

(Ref. Figure 402)

NOTE: Before pedal installation, remove the bushing assembly that secures pilot's left pedal arm to the torque tube. This will allow the tube to rotate far enough to install the bushing assemblies.

(1). Thread a stop nut on each of the two stop-bolts and install bolts into threaded inserts of pedal bracket.

(2). Locate pedal bracket and pedal arms for correct position on torque tube.

(3). Fasten left pedal arm to torque tube with adjustable bushing assembly; install bushing bolt so that shank of the bolt head end protrudes at least 0.002 inch. Install nut and torque to **80 inch-pounds (9.04 Nm) plus drag torque**, do not allow bolt to turn.

(4). Check that each end of bushing protrudes at least 0.002 inch (0.051 mm). If not, loosen nut and repeat prior step.

(5). Check that spherical bearings are in place; then attach bellcrank to pedal bracket with bolt, two washers, nut and cotter pin.

(6). Check that slotted bushings are in place; then fasten each link to bellcrank with bolt, two washers, nut and cotter pin.

(7). Check that slotted bushings are in place; then fasten each link in pedal arm lugs with bolt, two washers, nut and cotter pin.

(8). Install pedal bracket assembly with four bolts, eight washers and four nuts. Add shim washers as required at pedal bracket attachment points to keep centerline alignment of pedal bracket bearings within 0.10 inch (2.54 mm). Correct alignment is indicated by free rotational movement of torque tube after nuts are tightened.

(9). Reinstall bushing assembly previously removed from the pilot's left pedal arm.

(10). Install pedals on pedal arms and secure with pins provided.

(11). Install heel strips with pins, washers and cotter pins. Direction of pin head is optional.

ANTI-T ORQUE FLIGHT CONTROLS (TWO AND FOUR BLADE) ADJUSTMENT/TEST

1. Tail Rotor Controls Rigging

(Ref. Figure 501) The tail rotor control system must be re-rigged immediately after replacement of linkage that cannot be accurately measured (by trammeling, etc) before it is installed in the tail rotor control system, or if helicopter operation reveals a rigging deficiency.

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST606	T/R swashplate rigging tool

CAUTION Remove pilot's pedals and copilot's (if installed) to prevent possible contact with lower windshield during rigging sequence.

NOTE: Control rod end bearing adjustments are to be made to nearest half turn that produces correct rigging. When tightening jam nut at adjustable end of a control rod, always hold rod end with a wrench to prevent jamming of bearing. Never reinstall a used cotter pin; always install a new one.

(1). Disconnect bungee spring at aft end of floor-routed control rod (Ref. Figure 402).

(2). Using two pieces of wood and C-clamp or rope, secure pilot's foot pedal arms so they are aligned (A, Figure 501). With pilot's foot pedals clamped in neutral and control rod lengths adjusted (Ref. Figure 401 and Figure 402), control system bellcrank positions may be checked as follows:

(a). Tail rotor idler bellcrank (pilot's compartment): Centerline of aft arm should be 90 ±2 degrees to Sta. 78.50 bulkhead.

(b). Sta. 95 bellcrank: Centerline of tunnel-routed control rod attach bolt should be 4.30 ±0.090 inches (109.22 ±2.286 mm) above mast base structure.

(c). Sta. 142 bellcrank: Centerline of tailboom control rod attach bolt should be 4.75-5.09 inches (120.65-129.286 mm) from aft face of Sta. 137.50 bulkhead. For access to bellcrank, remove tail rotor control bellcrank access door.

(3). Loosen rod end jam nut at forward end of tailboom control rod.

(4). On tail rotor transmission, remove hardware attaching tailboom control rod to inboard end of Sta. 284 bellcrank.

(5). Tie back tail rotor rotating boot. Place midtravel portion of swashplate rigging tool (ST606) between swashplate and tail rotor fork split-ring retainer (B, Figure 501). Make sure that rigging tool contacts ring and not fork.

(6). Turn tailboom control rod at aft end. Adjust rod length to nearest half turn of rod end that allows swashplate rigging tool to just slide between split-ring retainer and swashplate.

(7). Recheck that centerline of tailboom control rod forward attach bolt remains 4.75-5.09 inches (120.65-129.286 mm) from aft face of Sta. 137.50 bulkhead. Also check forward rod end for not less than one and one-half exposed threads with jam nut snug against rod. If either condition does not exist, disconnect forward end of Sta. 120 control rod and readjust both control rods until Sta. 142 bellcrank position and exposed threads of both control rods are within tolerance.

(8). Ensure that slotted bushing is in place in bottom ear of Sta. 284 bellcrank and inboard ear of Sta. 95 bellcrank. Connect control rods (Ref. Figure 401).

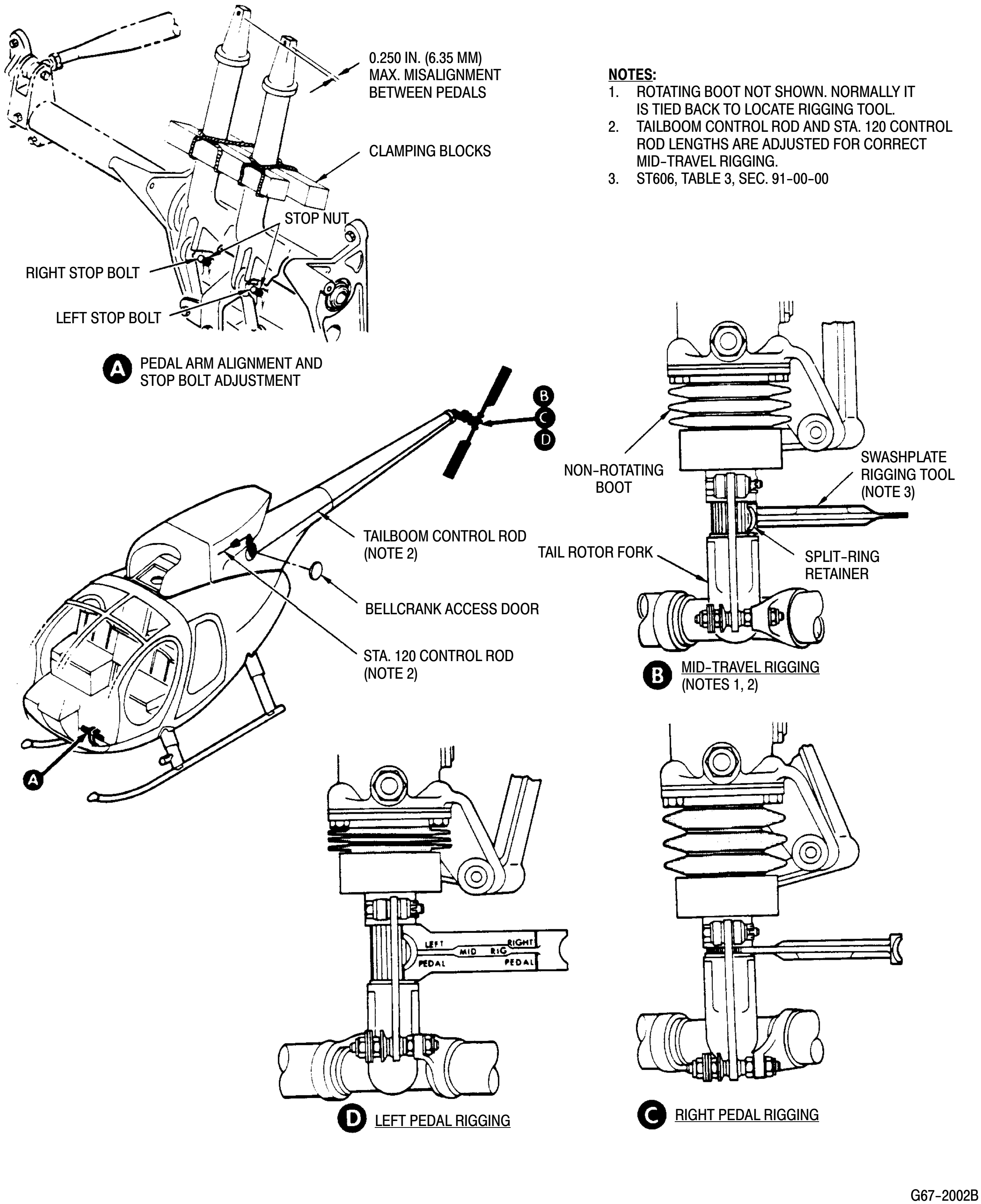


Figure 501. Rigging - Tail Rotor Control System

(9). Check witness holes for proper thread engagement. Align rod ends to get approximately equal angular throw in bellcranks; tighten jam nuts.

(10). Remove clamping device from foot pedal arms.

(11). Loosen jam nuts on pedal stop bolts (A, Figure 501). Screw in pedal stop bolts approximately 0.50 inch (12.70 mm).

CAUTION Use care when actuating pedals to avoid possibility of damaging tool or windshield.

NOTE: Adjust copilot's pedal stop bolts to match pilot's pedal travel, 0.001-0.003 inch (0.025- 0.076 mm) gap between stop bolts and pedals.

(12). Adjust right pedal stop bolt (A, Figure 501) so that when pedal arm is held against stop, right pedal portion of swashplate rigging tool just slides between split-ring retainer and swashplate (view C). Fit should be tight enough to support weight of tool. Without changing adjustment of bolt or tool fit, tighten jam nut on stop bolt.

(13). Adjust left pedal stop bolt (A, Figure 501) so that when pedal arm is held against stop with 20 - 25 pounds (88.96 - 111.20 N) pressure (or pull on right pedal), left pedal portion of swashplate rigging tool just slides between split-ring retainer and swashplate (view D). Fit should be tight enough to support weight of tool. Without changing adjustment of bolt or tool fit, tighten jam nut on stop bolt. Remove swashplate rigging tool and restore rotating boot to normal installed position.

(14). Reinstall pedals. Slowly press outboard pedal to its full forward travel position against stop bolt. With not more than 20 pounds pressure applied, upper and lower edges of pedal must clear canopy glass by not less than 0.20 inch (0.508 mm).

(15). Operate pedals through full range of travel. While controls are being moved, check that there is never less than 0.060 inch (1.524 mm) clearance around Sta. 120 control rod where it passes through structure at Sta. 137.50 and that there is never less than 0.010 inch (0.254 mm) clearance around tailboom control rod where it exits between boom and tail rotor transmission.

(16). Connect bungee spring between aft end of floor-routed control rod and Sta. 63 bracket (Ref. Figure 402) and check that pilot's left pedal moves to its normal forward position.

(17). Install Sta. 142 bellcrank access door.

2. Tail Rotor Bungee Adjustment

(Ref. (Ref. Figure 502)

(1). 2-Bladed bungee adjustment:

(a). Increase pedal force by removing washers from under bungee spring eyebolt.

(b). If tail rotor pedal forces are not zero during level flight at 130 - 140 knots, tail rotor force adjustment may be accomplished by removing a desired number of AN970-3 washers.

(2). 4-bladed bungee adjustment:

(a). Adjust tail rotor pedal force by tightening or loosening the 0.120 inch (3.048 mm) thread adjustment on bungee female bearing assembly.

(b). Tighten to maximum 0.120 inch (3.048 mm) thread adjustment on bungee female bearing assembly increases pedal force approximately five pounds; loosening decreases pedal force.

(c). Bungee spring may be attached to any of four holes in fitting. If excessive left pedal force is required, position spring at lower hole.

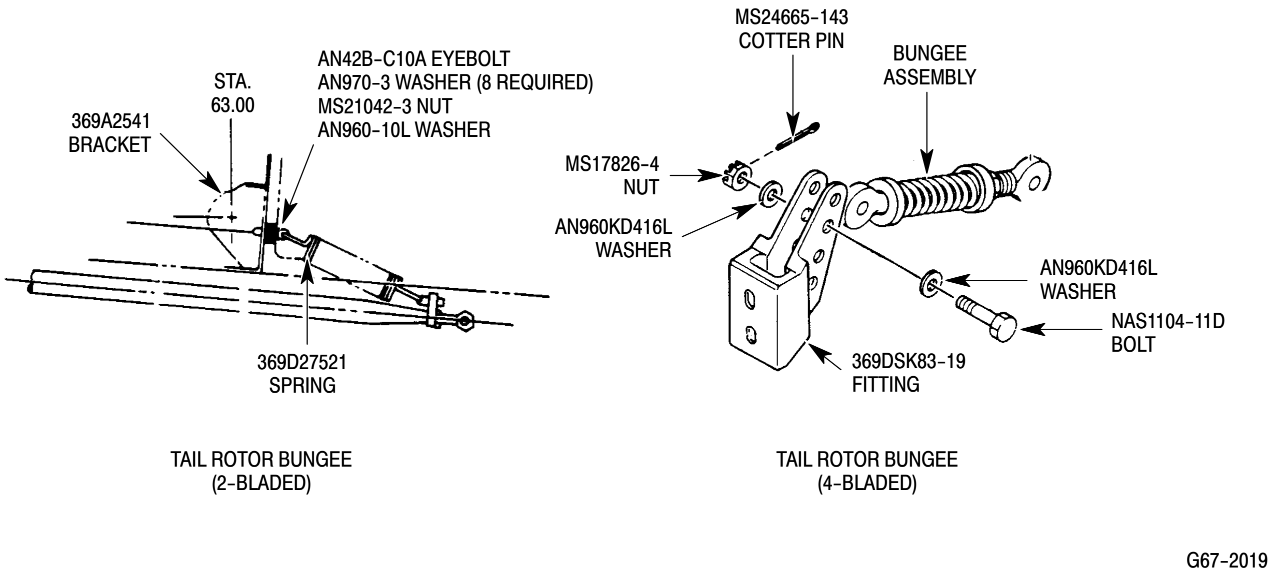


Figure 502. Tail Rotor Bungee Adjustment

ANTI-T ORQUE FLIGHT CONTROLS (TWO AND FOUR BLADE) INSPECTION/CHECK

1. Upper Fuselage and Tailboom Control Linkage Inspection

(Ref. Figure 401)

(1). Inspect rod end bearings for binding and excessive wear, 0.040 inch (1.016 mm) maximum axial play. Inspect rivet at fixed rod end.

(2). Inspect control rod for surface damage and evidence of bending.

(3). Inspect rubber boot just forward of Sta. 137.50 bulkhead for condition.

(4). Inspect tailboom control rod surfaces that pass through all grommets. Serviceable wear is limited to thickness of hard anodic coating. Check that all bushings are secure.

(5). Inspect bellcranks for scratches, cracks, corrosion and similar surface defects.

(6). Inspect bellcrank bearings for looseness and binding.

(7). Inspect for obstructions in drain slot of Sta. 284 bellcrank.

(8). Inspect for corrosion or excessive wear on Sta. 284 bellcrank pivot pin.

(9). Visually inspect doublers on Sta. 142 bellcrank supports for cracking/damage.

NOTE: MDHC Notice DN- 49 contains information relative to repair of damaged doublers on bellcrank supports. MDHC Notice DN- 102 contains information required to modify the particle separator fairing and cover assemblies to prevent possible chafing of the Sta. 120 tail rotor control rod.

2. Tail Rotor Pedal Assembly Inspection

(Ref. Figure 402)

NOTE: Inspect components at left and right position on the right-hand command models. Check that corresponding pedals contact stops simultaneously.

(1). Inspect pedals and pedal arms for cracks, elongated pedal attach holes and open drain holes. Inspect teflon-reinforced bushing liners for deterioration.

(2). Inspect pedal-to-arm quick-release locking pin for condition and positive spring action.

(3). Inspect links and bellcrank for cracks and bends, and bearings for excessive play.

(4). Inspect control rod fitting, torque tube mounting bracket and pedal mounting bracket for cracks and corrosion. Using an 8-power magnifying glass, mirror and flashlight, closely inspect pedal link bellcrank fitting of pedal bracket in center forward area where fitting (fork piece) joins tubular section. If any cracks are detected, replace bracket assembly. Inspect bracket bearings for excessive looseness.

(5). Inspect torque tube for cracks, scratches, nicks, dents and similar surface defects.

(6). Inspect pedal brackets for corrosion.

Table 601. Isolating Control System Troubles

Symptom	Isolating Step	Corrective Action
Binding, locking-up and erratic action of foot pedals (Do not force controls).	Disconnect pitch control links from pitch control assembly.	If symptom is gone, replace tail rotor assembly. Repair (Ref. COM).
Symptom remains.	Disconnect Sta. 284 aft boom bellcrank from pitch control assembly.	If symptom is gone, clean swashplate bore and output shaft splines. Lubricate splines. Replace swashplate if necessary. Check for elongation of bolt hole in support arm portion of main housing assembly of tail rotor gearbox, caused by looseness of bellcrank fulcrum bolt and nut. Repair (Ref. COM).
Symptom remains.	Disconnect floor-routed tail rotor control rod from foot pedal torque tube fitting.	If symptom is gone, inspect tail rotor control rods and bellcranks until defective part is located.
Symptom remains.	Loosen foot pedal torque tube brackets mounted on front of floor structure.	If symptom is gone, pedal torque tube misaligned; shim for correct alignment. If symptom remains, disassemble and inspect tail rotor control foot pedal installation until defective part is located.
Trouble corrected.		

ANTI-T ORQUE FLIGHT CONTROLS (TWO AND FOUR BLADE) REPAIRS

1. Floor- and Tunnel-Routed Control Rods

(Ref. Figure 401 and Figure 402) The floor- and tunnel-routed control rods connect the tail rotor pedal installation with the upper fuselage and tailboom control linkage. The two control rods are linked by a tail rotor idler bellcrank mounted on the underseat controls support bracket.

2. Floor-Routed Tail Rotor Control Rod Repair

(Ref. Figure 401) Replace rod end if bearing axial play is more than 0.040 inch (1.016 mm). Riveted rod end bearing is replaceable without rod removal if located at forward end of rod. If riveted rod end is aft, rod removal is required to replace rod end bearing.

NOTE: Floor-routed control rod normally does not require replacement unless helicopter receives extensive impact or crash damage. Remove control rod forward through landing light wiring grommet hole after landing light (if installed) is removed (Ref. Chap. 96).

(1). Disconnect control rod from pedal torque tube fitting or from tail rotor idler bellcrank (Ref. Figure 402). Remove bungee spring (Ref. Sec. 67-10-00).

(2). Accurately measure and record distance between unchamfered edge of rod end jam nut and center of rod end bearing hole.

CAUTION Use care when drilling to remove or install riveted rod end; rod end is steel and rod is aluminum.

(3). If necessary, drill out rivet. Loosen jam nut and unscrew rod end.

(4). Screw another rod end into rod to obtain same measurement made in step (2). above. Align control rod ends so that bearings have equal space for angular throw; tighten jam nut.

(5). If removed, install rivet to secure rod end.

(6). Check that slotted bushing is in place; then secure control rod in torque tube fitting or idler bellcrank with bolt, two washers, nut and cotter pin.

(7). Install bungee spring.

(8). Install access doors.

(9). Check rigging of tail rotor controls (Ref. Tail Rotor Controls Rigging).

3. Upper Fuselage and Tailboom Control Linkage Repair

(Ref. Figure 401)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer
CM431	Sealing, locking and retaining compound
CM802	Abrasive cloth, aluminum oxide

(1). Perform straightness check on control rod that appears bent or bowed. Total length of Sta. 120 control rod, excluding rod ends, must be straight within 0.040 inch (1.016 mm), with straightness variation limited to maximum of 0.010 inch (0.254 mm) in each foot of length. Total length of tailboom control rod, excluding rod ends, must be straight within 0.120 inch (3.048 mm), with straightness variation limited to maximum of 0.010 inch (0.254 mm) in each foot of length.

WARNING **A dye check for cracking must always be performed after cold-straightening. Replace cracked rod, or cracked or bent rod end.**

(2). Cold-straighten bent rod that is not within tolerance (step (1). above) provided there are no nicks or sharp dents in bend length. Do not use rod ends to support rod during straightening process.

CAUTION Use care when drilling to remove or install riveted rod end; rod end is steel and rod and bearing adapter are aluminum.

(3). Replace control rod end if bearing axial play is more than 0.040 inch (1.016 mm). Set initial control rod length and bearing angularity.

(4). Replace unserviceable control rod bearing adapter. Trammel method (or equivalent) may be used to establish rod length when replacing an adapter.

(a). Measure length and record position of rod end in adapter; then remove affected rod end.

(b). Comply with precaution above and drill out rivets securing adapter to rod and aft rod end.

(c). Install rod end in replacement adapter and position at recorded measurement.

(d). Fit adapter into rod and position to fit trammel point spacing; pick up and drill through existing rivet holes in rod and install rivets to secure adapter to rod; at aft end, drill and rivet rod end to adapter.

(5). Replace unserviceable bellcrank and support pivot bearings. Install bearing with grade A locking compound (CM431). Make sure that bearing seats against bore shoulder.

NOTE:

- Installation direction of Sta. 142 bellcrank bearing may be from either side, depending on location of bearing shoulder. There must not be less than 0.010 inch (0.254 mm) protrusion of bearing inner race beyond sides of bellcrank after bearing is installed.
- If contact is noted between Sta. 142 bellcrank and mount bracket, rework bellcrank to clear bracket (Ref. Figure 801).

(6). Repair minor surface defects such as scratches, nicks and corrosion on bellcranks and support bracket. Use abrasive cloth, grade 400 - 600 (CM802), to smooth out and blend in such defects. Following rework limits represent total limits, including effects of all previous repairs to any given area.

NOTE: Parts identified (Ref. Figure 401) with an asterisk (*) may be either magnesium or aluminum alloy. For corrosion control and identification of magnesium and aluminum alloys, refer to Section 20-40-00.

(a). Cast surfaces may be reworked to depth of 0.020 inch (0.508 mm).

(b). Flat machined surfaces, except clevis inner ears, may be reworked to depth of 0.015 inch (0.381 mm). Clevis inner ear surfaces may be reworked to depth of 0.020 inch (0.508 mm).

(c). Machined holes may have 0.003 inch (0.076 mm) removed from bore wall in an area no greater than 15 percent of circumference and 50 percent of depth.

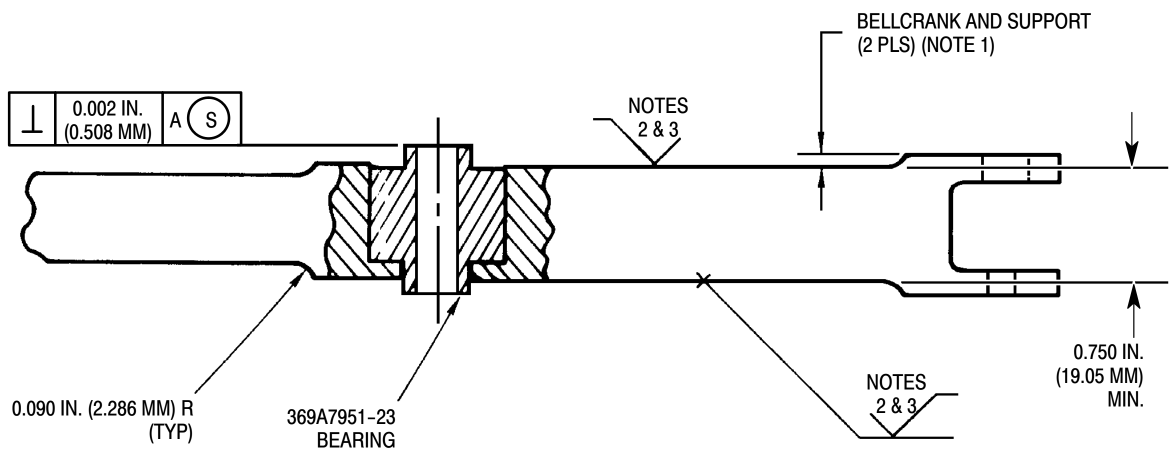
(d). All edges may have 0.030 inch (0.762 mm) removed except around machined holes, which are limited to 0.010 inch (0.254 mm) chamfer.

(e). All rework must be smoothly blended into adjacent surfaces and finish must be restored (Ref. preceding **NOTE**).

(7). Repair surface abrasion on Sta. 120 control rod by smoothing area with grade 400 abrasive cloth (CM802) and restoring protective finish with primer (CM318). Replace rod if wear or depth of repair exceeds 0.004 inch (0.102 mm).

(8). Replace tailboom control rod if hard anodic coating is worn through and aluminum base metal is visible.

(9). Replace split or torn boot. Remove Sta. 120 control rod. Replace boot and reinstall Sta. 120 control rod.



NOTES:
1. 0.010 MINIMUM CLEARANCE REQUIRED IN THIS AREA.
2. TREAT MACHINED AREA WITH CHROMIC ACID SOLUTION (CM207).
3. TOUCH UP COLOR 34151 GREEN (CM304).

G67-2003A

Figure 801. Rework of Sta. 142 Bellcrank Assembly

4. Station 78.50 Tail Rotor (Tunnel-Routed) Control Rod

All tunnel-routed control rods are removed, inspected, repaired and installed in same manner. For initial length and rod end angularity, Ref. Figure 402. For maintenance information, Ref. Sec. 67-10-00.

A. Tail Rotor Idler Bellcrank

(Ref. Controls Support Bracket and Bellcrank, Sec. 67-10-00)

5. Tail Rotor Pedal Disassembly

(Ref. Figure 402)

(1). Before disassembly of tail rotor pedal installation, matchmark mating pedal arms, links and bellcranks with pedal brackets to avoid intermixing components between locations at reassembly.

(2). Disconnect links from pedal arms and bellcrank; remove links.

(3). Remove bellcrank from pedal bracket.

(4). Remove nut and washer of two bushing assemblies that secure left pedal arm and control rod fitting to torque tube. Carefully remove bushing bolt and temporarily reinstall washer and nut on bolt.

(5). Slide pedal bracket and pedal arms off end of torque tube.

(6). Do not remove two teflon-lined bushings from right pedal arm, unless replacement is required.

(7). Do not remove two stop bolts, jam nuts on stop bolts or bearings from pedal bracket unless replacement is required.

(8). Slide torque tube bracket and control rod fitting off torque tube.

6. Tail Rotor Pedal Repair

(Ref. Figure 402)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM425	Sealing compound
CM431	Sealing, locking and retaining compound

(1). Replace parts that are cracked or have elongated attachment holes. Do not attempt to straighten bent torque tube or pedal link.

(2). Replace unserviceable pedal covers. Apply sealing compound (CM425) to approximately 30 percent of upper and lower edge surfaces that contact pedal. Cure according to container instructions.

(3). Replace complete pedal link if it is cracked or contains unserviceable bearings; bearings are not replaceable.

(4). Replace unserviceable bearings in mounting brackets or pedal link bellcrank. Install replacement with grade A locking compound (CM431).

CAUTION Right pedal arm bushings are glass-filled phenolic. Make certain that bushing does not cock during replacement, and that it is fully seated in arm bore. Keep tools from contact with bushing liners to avoid fraying.

(5). Replace bearings in right pedal arm when teflon-reinforced liner is galled or frayed. Pull bushing to remove; press to install.

(6). Remove corrosion from pedal brackets (Ref. Sec. 20-40-00 and CSP-A-3, Corrosion Control Manual).

7. Tail Rotor Pedal Reassembly

(Ref. Figure 402)

(1). When reassembling components, check for correct matchmark identification.

(2). If previously removed, thread jam nut on each of two stop bolts and install two stop bolts into threaded inserts of pedal brackets.

(3). Slide torque tube bracket and control rod fitting onto torque tube.

(4). Locate pedal bracket and pedal arms for correct position on torque tube; slide bracket and arms onto torque tube.

(5). Fasten left pedal arm and control rod fitting to torque tube with adjustable bushing assemblies. Install bushing bolt so that shank at bolt-head end protrudes at least 0.002 inch (0.051 mm). Torque nut to **50 - 80 inch-pounds (5.65 - 9.04 Nm) plus drag torque**. Do not allow bolt to turn.

(6). Check that each end of bushing assembly shank protrudes at least 0.002 inch (0.051 mm). If not, loosen and repeat step (4). above.

(7). Check that slotted bushing is in place; then attach bellcrank to pedal bracket with bolt, two washers, nut and cotter pin.

(8). Check that slotted bushings are in place; then fasten each link to bellcrank with bolt, two washers, nut and cotter pin.

(9). Check that slotted bushings are in place; then fasten each link in pedal arm lugs with bolt, two washers, nut and cotter pin.

(10). Ensure outboard pedals clear windows by a minimum of 0.20 inch (0.508 mm) with 20 pounds (88.96 N) of force applied.

8. Tail Rotor Bungee Spring Forward Attachment Relocation

(Ref. Figure 802) The information given in this procedure is for the relocation of the tail rotor bungee spring forward attachment on 369D helicopters, Serial No. 003D - 0467D. This rework allows for the installation of washers, for bungee adjustment, to adjust for minimum pedal loads in cruise.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM207	Chromic acid solution
CM318	Primer
CM411	Adhesive, epoxy

(1). Remove access cover between pilot's seats and/or passenger's footwell on aft side of canted bulkhead.

(2). Block left tail rotor control pedal at full forward position to relieve tension on bungee.

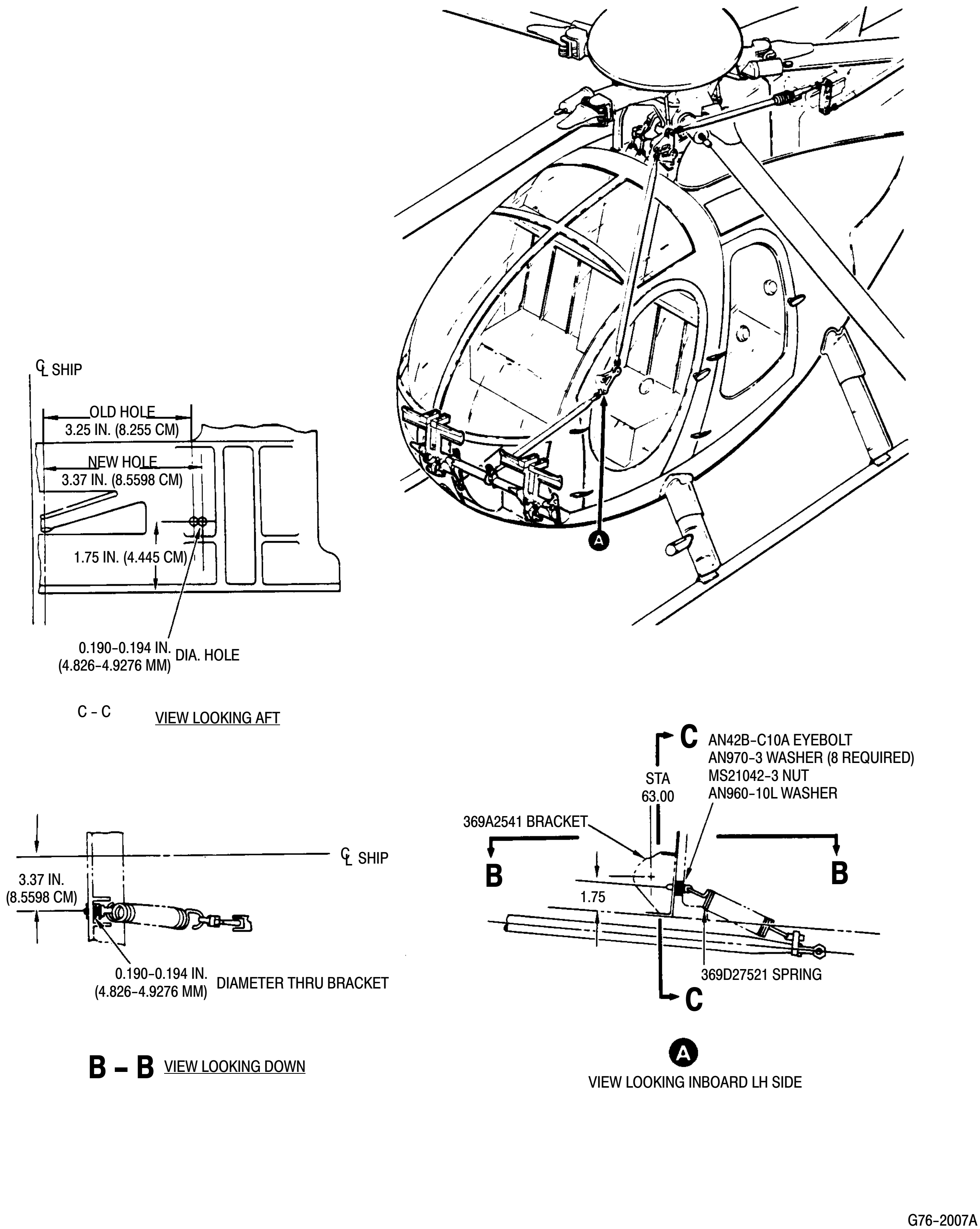


Figure 802. Relocation of Tail Rotor Bungee Spring Forward Attachment

(3). Disconnect bungee spring from eyebolt and remove and retain nut and washer attaching eyebolt to bracket at Sta. 63, discard eyebolt.

(4). Locate position and drill new hole using No. 10 drill, deburr as required.

(5). Seal old eyebolt hole with adhesive (CM411). Allow to dry per manufacturer's instructions.

(6). Treat edge of new hole with chromic acid solution (CM207) and touch up with zinc chromate primer (CM318).

(7). Install eight AN970-3 washers on one AN42B-C10A eyebolt and hook forward end of 369D27521 bungee spring to eyebolt. Insert eyebolt in new hole in 369A2541 bracket and secure with washer and nut retained from prior step. Torque nut to **20 - 25 inch-pounds (2.26 - 2.82 Nm)**.

NOTE: If tail rotor pedal forces are not zero during level flight at 130 - 140 knots, tail rotor force adjustment may be accomplished by removing a desired number of AN970-3 washers.

(8). Remove block from left tail rotor control pedal.

(9). Reinstall access cover between pilot's seats and/or passenger's footwell.

Section

67-20-30

NOTAR®
Anti-Torque System Flight Controls (500/600N)

NOTAR® ANTI-TORQUE SYSTEM FLIGHT CONTROLS DESCRIPTION AND OPERATION

1. NOTAR Anti-Torque System Control Linkages Configuration and Description

(1). The helicopter may be equipped with either of two basic configurations, single left-hand command or right-hand command, (dual control are optional).

NOTE:

- The 600N helicopter does not have a spring on the splitter assembly like the 500N helicopter.
- Some 600N helicopters are not equipped with a YSAS system.
- The 600N helicopter has a Sta. 95 bellcrank instead of a Sta. 97.50 Bellcrank.

(2). The control linkages for the foot pedals installation are identical to the basic helicopter, with the exception of a pedal friction mechanism with a preset friction tension. The pedal friction mechanism (500N only) offers the pilot an artificial feel or workload of a conventional tail rotor system.

(3). A splitter bungee spring (500N only) which is incorporated in the flight control system at the mast base between the 97.50 bellcrank support bracket and splitter pinion gear dampens control feedback.

(4). Fuselage controls linkages consist of Sta. 97.50 bellcrank and a support at the front of the main rotor mast base, fwd control tube, splitter bungee spring, splitter assembly, intermediate control tube, Sta. 137.50 support bracket and a bellcrank at the fan transmission support assembly, aft control tube and a two piece cable assembly to the thruster.

(5). Empennage controls consist of a thruster installation, four piece cable and drum assembly, a control rod, vertical stabilizer control tubes and bellcranks and, in the case of the 500N, a stability augmentation system (S.A.S.).

2. Stability Augmentation System Description and Operation

NOTE: Aircraft equipped with YSAS cannot be flown with any component of the system removed.

(1). The Yaw Stability Augmentation System provides increased directional stability and allows for a lower pilot workload in the directional axis.

(2). The YSAS adds an actuator that is located inside the right side of the horizontal stabilizer and is mechanically bolted to the horizontal stabilizer on the outboard side.

(3). Two access panels on the horizontal stabilizer allows access to the actuator, bellcranks, control rod and electrical connectors.

(4). A yaw rate gyro is located under the pilot's seat structure on the foreword bulkhead. Access to the gyro is through the rear access panel (footwell) Sta. 78.50 canted bulked.

The yaw rate gyro provides short term rate signals to the computer, proportional to the rate of angular displacement about the axis perpendicular to the gyro's mounting surface damping in the directional axis signal electronically.

(5). A YSAS electronic control box (computer) is installed below the rate gyro. It is equipped with an internally-mounted lateral accelerometer.

The lateral accelerometer enhances direction stability by feeding back to the YSAS computer signals measured during flight. The computer processes the signals received and sends them to the actuator.

(6). The 600N helicopters come equipped with an indicator mounted in the console to alert the pilot in case of a YSAS failure.

3. 500NM7301 YSAS Fin Position Indicator (U.K. Only)

(Ref. Table 1) The 500N helicopters sold in the United Kingdom come equipped with an indicating system to alert the pilot in case of a YSAS failure. Because this is a very limited option, the parts are not listed in CSP-IPC-4. The following table is for ordering the major components of this system.

Table 1. 500NM7301 YSAS Fin Position Indicator Components

Component	Part Number
Edge light panel	369D26454-27
Indicator	500N7305-3
Vne card set	500N6530-31
369D24506-9	Indicator
PFM Flight Manual Supplement	CSP-520N-1C
369D26454-17	Decal

NOTAR® ANTI-TORQUE SYSTEM FLIGHT CONTROLS REMOVAL/INSTALLATION

1. Anti-T orque Flight Controls

NOTE:

- The NOTAR anti-torque control system must be re- rigged after removal or replacement of control rods, linkages and components or if helicopter operation reveals a rigging deficiency.
- Refer to adjustment and test control rigging, during flight control installation.

2. Upper Fuselage Sta. 97.50 (500N) or Sta. 95 (600N) Bellcrank and Support Bracket Replacement

(Ref. Figure 401)

A. Sta. 97.50 (500N) or Sta. 95 (600N) Bellcrank and Support Bracket Removal

(1). Disconnect anti-torque control tube (Sta. 87.50) and Fwd directional control tube from Sta. 97.50 (Sta. 95) bellcrank.

(2). Remove nuts, washers and bolts from main rotor mast base support bracket. Remove bellcrank and support bracket as an assembly.

B. Sta. 97.50 (500N) or Sta. 95 (600N) Bellcrank and Support Bracket Installation

(1). Position bellcrank and support bracket on mast base structure,and install three bolts, seven washers and three nuts. Most forward bolt requires extra thick washer under head of bolt. Torque bolt to **80 - 100 inch-pounds (9.04 - 11.30 Nm) plus drag torque**.

(2). Ensure slotted bushings are in place and connect anti-torque control tube and fwd rod end of Fwd directional control tube to bellcrank and cotter pin. Split bushings must protrude 0.010 - 0.060 inch (0.254 - 1.524 mm) above surface of bellcrank.

3. Forward Directional Control Tube Replacement

(Ref. Figure 401)

A. Forward Directional Control Tube Removal

(1). Remove fairings, access covers and doors necessary to facilitate maintenance (Ref. Sec. 53-30-30, Upper Aft Section Fuselage).

(2). Disconnect forward directional control tube from Sta. 97.50 (Sta. 95) bellcrank.

(3). Disconnect forward directional control tube from the lever assembly gear pinion rack Sta. 113.00 splitter and remove control tube.

B. Forward Directional Control Tube Installation

(1). Forward directional control rod initial length is 15.42 inches (39.17 cm), measured center of rod end to center of rod end. Install forward directional control tube on pinion gear rack lever assembly Sta. 113.00 splitter and on Sta. 97.50 (Sta. 95) bellcrank.

(2). Ensure slotted bushings are in place. Split bushings must protrude 0.010 - 0.060 inch (0.254 - 1.524 mm) above surface of bellcranks.

(3). Install washers, bolts and nuts. install cotter pins and safety wire jamnuts as required.

(4). Install fairings and panels.

4. Splitter Bungee Spring Replacement (500N)

(Ref. Figure 401)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST601	Rigging pin
ST602	Spring tension removal tool

A. Splitter Bungee Spring Removal

(1). Using two pieces of wood and C-clamp or rope, secure pilots pedals in mid position so they are aligned.

(2). Insert rigging pin (ST601) into the upper hole of bracket assembly and through the the slot marked **"M"** in the gear pinion rack. (View B).

WARNING **Bungee spring is under tension, use care to prevent personal injuries or damage to aircraft.**

(3). Disconnect spring from links, either aft or fwd., using a spring expansion tool (ST602).

B. Splitter Bungee Spring Installation

(1). Insert rigging pin (ST601) into the upper hole of bracket assembly and through the the slot marked **"M"** in the gear pinion rack Sta. 113.00 splitter.

(2). With a spring expansion tool (ST602), expand the spring the amount necessary to secure the spring to the forward and aft links.

(3). Remove rigging pin.

5. Upper Fuselage Station 113.00 Splitter Assembly and Bellcrank Replacement

(Ref. Figure 402)

A. Station 113.00 Splitter Assembly and Bellcrank Removal

(1). <u>500N Only</u>: Remove splitter bungee spring from Sta. 113.00 splitter assembly pinion gear (Ref. Splitter Bungee Spring Replacement (500N)).

(2). Disconnect forward cable assembly rodend and rodend of forward directional control tube from walking lever.

NOTE: Note relationship of index marks on splitter assembly.

(3). Align index marks on gear teeth. Remove walking lever from splitter bracket by removing nut, pivot bolt, washers and spacer.

(4). Remove nut, washer, link assy. and spacer and disconnect intermediate control tube from gear pinion stud.

(5). Remove four bolts and washers, and remove splitter assembly.

B. Station 113.00 Splitter Assembly and Bellcrank Installation

(1). Position splitter bracket on structure and install four bolts and washers.

(2). Position intermediate control tube on gear pinion stud. Install link, spacer, washer and nut; install cotter pin.

(3). During installation of walking lever and bracket, align the index marks together and install pivot bolt, spacer, washers and nut and torque to **50 - 60 inch-pounds (5.65 - 6.78 Nm)**. Ensure bushings and bearings are in place; install cotter pin.

(4). Install forward cable assembly rodend and fwd directional control tube rodend. Ensure bushings are in place. Torque nuts and install cotter pin.

(5). <u>500N Only</u>: Install splitter bungee spring.

6. Intermediate Control Tube Replacement

(Ref. Figure 402)

A. Intermediate Control Tube Removal

(1). <u>500N Only</u>: Remove splitter bungee spring from Sta. 113.00 splitter assembly pinion gear (Ref. Splitter Bungee Spring Replacement (500N)).

(2). Disconnect intermediate control tube from gear pinion stud by removing nut, washer, link and spacer.

(3). Disconnect aft end of intermediate control tube at Sta. 137.50 bellcrank by depressing pin in head of bolt to release locking ball while removing nut. With pin still depressed, remove bolt.

(4). Remove control tube boot ty-strap, and move control tube carefully forward through boot, support tube at plenum chamber inlet.

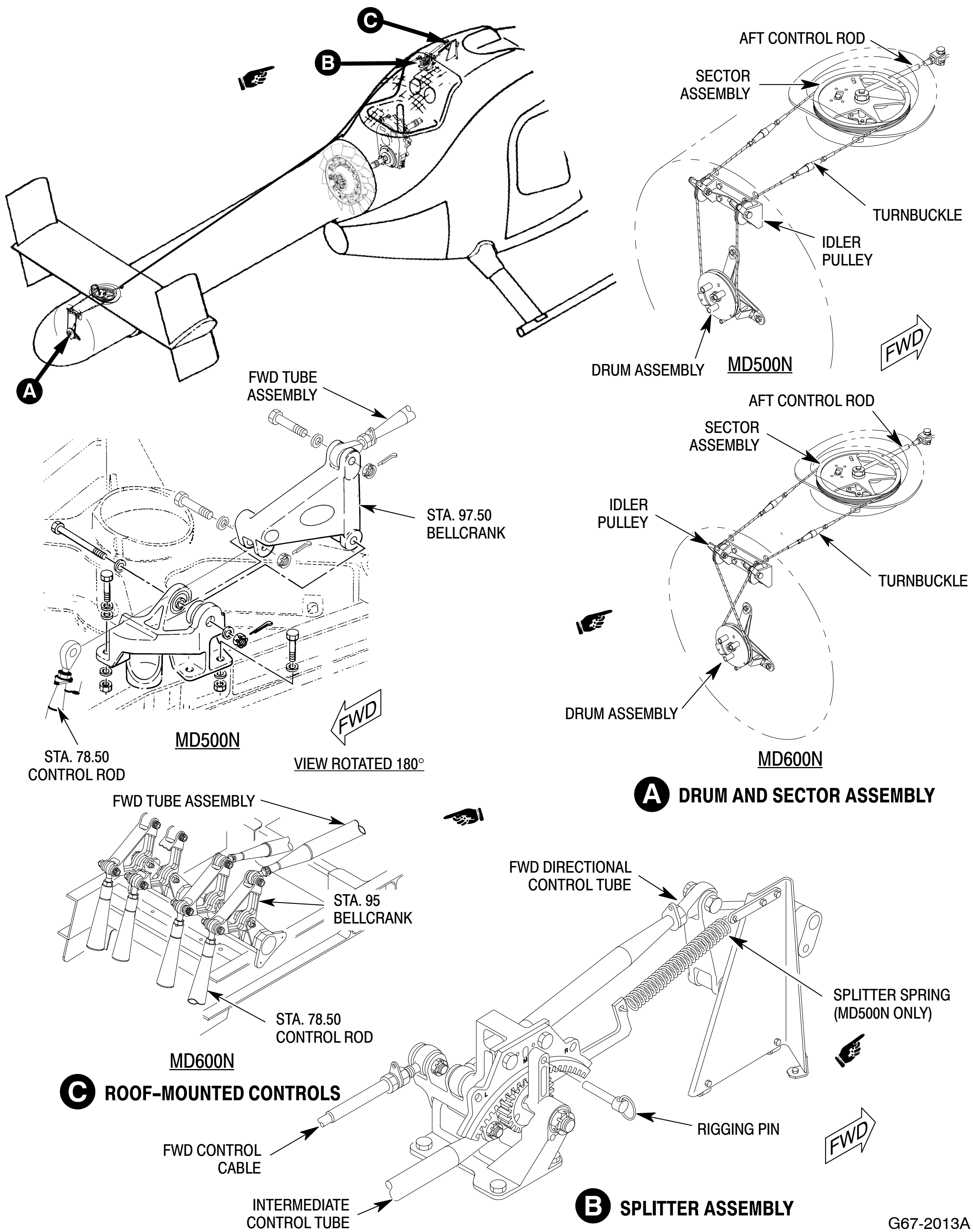


Figure 401. Anti-Torque Control System

B. Intermediate Control Tube Installation

(1). Carefully feed intermediate control tube through boot if installed and forward air inlet to bellcrank at Sta. 137.50.

(2). Connect control tube and check that bushings are in place.

(3). Install impedance bolt as follows:

NOTE: Install bolt-head up, nut facing down.

(a). Depress pin in head of bolt to install bolt though clevis assembly.

NOTE: In the following step, pin is to remain depressed while nut is torqued.

(b). While pin is depressed, install nut and torque to **40 - 50 inch-pounds (4.52 - 5.65 Nm)**.

(c). Release pin and retorque nut to **75 - 90 inch-pounds (8.47 - 10.17 Nm)** to ensure engagement of locking balls with nut.

NOTE: Pin must be in the released position (flush with bolt head) and bolt must protrude past the nut for proper installation.

(d). Apply torque stripe.

(4). Install alternate NAS6204-11D bolt and MS17826-4 nut as follows:

(a). Install bolt, with one AN960KD416L washer through clevis assembly.

(b). Install AN960KD416L washer and nut and torque to **20 - 40 inch-pounds (2.26 - 4.52 Nm)**; install MS24665-134 cotter pin.

(5). Position rubber boot in place. Secure boot at support tube with nylon strap, then clamp directional control pedals in neutral, set free length of bellows portion of boot at approximately 5.5 inches (13.97 cm) and secure end to control tube with nylon strap.

(6). <u>500N Only</u>: Install splitter bungee spring.

7. Station 137.50 Support Bracket and Bellcrank Replacement

(Ref. Figure 402)

A. Station 137.50 Support Bracket and Bellcrank Removal

(1). Disconnect intermediate control tube from upper end of Sta. 137.50 bellcrank by depressing pin in head of bolt to disengage and release locking ball and removing nut. With pin still depressed, remove bolt.

(2). Disconnect link assembly at clevis, remove bolt in same manner as in previous step.

(3). Remove four support bracket assembly bolts from fan transmission support.

(4). Bellcrank and bracket assembly may be separated by removing bolt.

B. Station 137.50 Support Bracket and Bellcrank Installation

NOTE: It is recommended to assemble link and bracket assembly to bellcrank before installing bracket assembly on fan transmission support bracket.

(1). Reassemble bellcrank and bracket assembly if necessary.

(2). Install impedance bolt as follows:

(a). Depress pin in head of bolt to install bolt through bracket and bellcrank.

NOTE: In the following step, pin is to remain depressed while nut is torqued.

(b). Install nut and torque to **100 - 120 inch-pounds (11.30 - 13.56 Nm)**.

(c). Release pin and torque nut to **200 - 225 inch-pounds (22.60 - 25.42 Nm)** to insure engagement of locking ball with nut.

NOTE: Pin must be in the released position (flush with bolt head) and bolt must protrude past the nut for proper installation.

(d). Apply torque stripe.

(3). Install alternate NAS6206-29D bolt and MS17826-6 nut as follows:

(a). Install bolt, with one AN960KD616L washer through clevis assembly.

(b). Install AN960KD616L washer and nut and torque to **95 - 110 inch-pounds (10.73 - 12.43 Nm)**; install MS24665-285 cotter pin.

(4). Install lower bolt at link assembly and bellcrank clevis, and upper bolt intermediate control tube Sta. 137.50 bellcrank bolts as follows:

NOTE: Install bolt-head up, nut facing down.

(a). Depress pin in head of bolt to install bolt through clevis end of bellcrank.

NOTE: In the following step, pin is to remain depressed while nut is torqued.

(b). While pin is depressed, install nut and torque to **40 - 50 inch-pounds (4.52 - 5.65 Nm)**.

(c). Release pin and retorque nut to **75 - 90 inch-pounds (8.47 - 10.17 Nm)** to ensure engagement of locking balls with nut.

NOTE: Pin must be in the released position (flush with bolt head) and bolt must protrude past the nut for proper installation.

(d). Apply torque stripe.

(5). Install alternate NAS6204-11D bolt and MS17826-4 nut as follows:

(a). Install bolt, with one AN960KD416L washer through clevis assembly.

(b). Install AN960KD416L washer and nut and torque to **20 - 40 inch-pounds (2.26 - 4.52 Nm)**; install MS24665-134 cotter pin.

(6). Install four support bracket assembly bolts and washers to fan transmission support. Torque bolts to **70 - 90 inch-pounds (7.91 - 10.17 Nm)**; safety wire bolts.

8. Fan Pitch Control Tube Replacement

A. Fan Pitch Control Tube Removal

(1). Remove tail boom fairing and tail boom.

(2). Remove bolt and clevis assembly at Sta. 137.50 bellcrank. Remove convoluted boot from fan gearbox.

NOTE:

- The Fan Pitch Control Tube can be removed in one of the following steps. The fan assembly pitch bearing slider, pitch bearing retainer, pitch plate bearings and bearing retainer nut with aft control tube can be removed as a unit or individually. Use extreme care do not damage parts.
- 1. Remove locking wire and remove nut and lock washer from fan pitch control tube. Remove locking wire and remove three bolts and washers from pitch bearing retainer housing. Pitch bearing slider, pitch plate bearings and, bearing retainer nut with aft control tube can be removed as a unit.
- 2. Remove locking wire and remove six pitch bearing housing assembly bolts. Remove pitch bearing retainer housing assembly as a unit.

B. Fan Pitch Control Tube Installation

NOTE:

- Refer to Fan Pitch Control Rigging during installation.
- Before installing fan pitch control tube, perform Fan Pitch Control Tube Inspection.

(1). Install the aft control tube.

(2). Install convoluted boot on fan gearbox or clevis.

(3). Install clevis assembly on aft control tube. Ensure that clevis has full thread engagement on control tube. Ensure locking washer tang tip is in slot. Tighten jam nut against locking washer and safety wire.

(4). Install floating bushing in clevis.

(5). Install bolt, bolthead on floating bushing side of clevis, through clevis and link assembly as follows:

(a). Depress pin in head of bolt to install bolt through clevis end of bellcrank.

NOTE: In the following step, pin is to remain depressed while nut is torqued.

(b). While pin is depressed, install nut and torque to **40 - 50 inch-pounds (4.52 - 5.65 Nm)**.

(c). Release pin and retorque nut to **75 - 90 inch-pounds (8.47 - 10.17 Nm)** to ensure engagement of locking balls with nut.

NOTE: Pin must be in the released position (flush with bolt head) and bolt must protrude past the nut for proper installation.

(d). Apply torque stripe.

(6). Install alternate NAS6204-11D bolt and MS17826-4 nut as follows:

(a). Install bolt, with one AN960KD416L washer through clevis assembly.

(b). Install AN960KD416L washer and nut and torque to **20 - 40 inch-pounds (2.26 - 4.52 Nm)**; install MS24665-134 cotter pin.

NOTE: Before installing fan pitch slider, perform Fan Pitch Slider Inspection.

(7). Install pitch bearing slider and bearing retainer per rigging instructions.

(8). Install pitch bearing and pitch bearing retainer housing using three bolts and washers. Torque bolts to **70 - 80 inch-pounds (7.91 - 9.04 Nm)**; safety wire bolts.

(9). Install lockwasher so that the face of the tang aligns with the tube assembly keyway, and the lockwasher aligns with one of the six slots in the face of the bearing retainer.

(10). Install jamnut on aft control tube.

(11). Torque nut to **95 -110 inch-pounds (10.73 - 12.43 Nm)** leaving a minimum of three threads protruding beyond the face of the jam nut.

(12). Install two lockwires on jamnut and lockwasher.

NOTE: After safety wiring nut and bolts, rotate fan and ensure that safety wires do not have interference with each other on rotation.

(13). Install tail boom (Ref. Sec. 53-40-30).

9. Forward Cable Assembly Replacement

(Ref. Figure 402)

A. Forward Cable Assembly Removal

CAUTION To prevent damage to the engine install F.O.D. cover over engine air inlet.

(1). Remove fairings, access doors and panels necessary to facilitate maintenance (Ref. Sec. 53-30-30).

(2). Remove tailboom fairing.

(3). Disconnect the aft end of the anti-torque control cable by turning outside collar sleeve counter-clockwise and back to expose the inner cable.

(4). Apply sufficient right pedal to expose inner cables.

(5). Without bending cable, slide male connector out of female connector.

(6). Disconnect cable assembly forward rodend from Sta. 113.00 splitter assembly outboard bellcrank clevis.

(7). Loosen jam nut at rodend and remove rodend from cable; remove jam nut.

(8). Remove safety wire, jam nuts and washers from cable assembly support bracket, remove by pulling or sliding cable assy. thru conduit and support bracket.

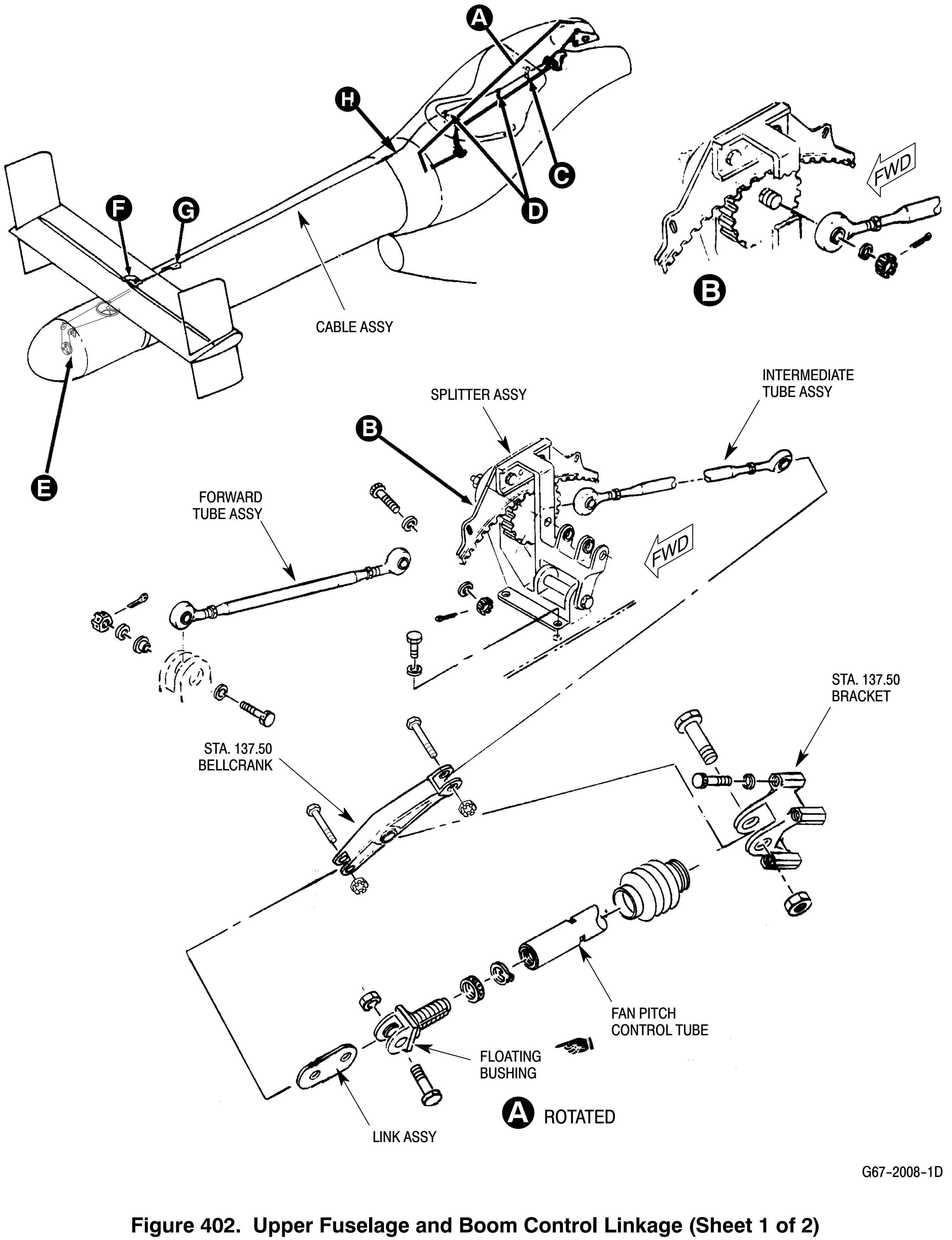


Figure 402. Upper Fuselage and Boom Control Linkage (Sheet 1 of 2)

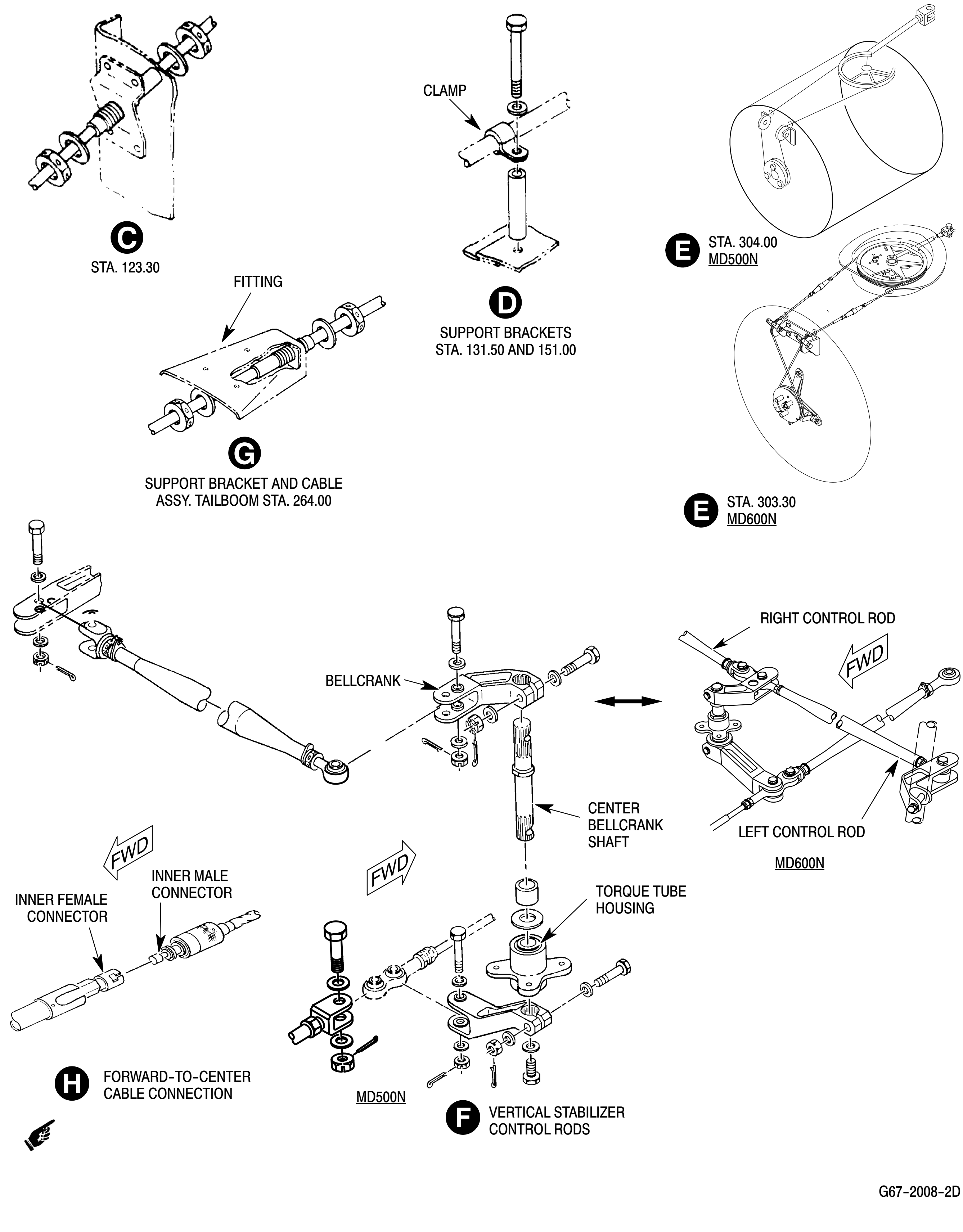


Figure 402. Upper Fuselage and Boom Control Linkage (Sheet 2 of 2)

B. Forward Cable Assembly Installation

Consumable Materials (Ref. Section 91-00-00)	
Item	Nomenclature
CM702	Lockwire CRES

CAUTION Before installation of cable, inspect cable (Ref. Forward and Center Cable Assembly Inspection).

(1). Install one jam nut and washer on cable and insert cable assembly through support bracket and conduit.

(2). Install washer and one jam nut on cable forward side of support bracket.

(3). Ensure that the threaded portion is centered in the support bracket.

NOTE: When tightening cable jamnuts, ensure smooth action of cable and alignment of cable hex end into cable socket.

(4). Ensure cable hex end and cable socket are aligned to ensure smooth action.

(5). Slide cable in and out to ensure there is no binding and tighten jamnuts.

(6). Slide cable in and out again to ensure there is no binding. If cable slides smoothly, safety jamnuts (CM702).

(7). Install rodend bearing with locking device and jamnut.

(8). Ensure that threads protrude past witness hole. Tighten jamnut and safety wire nuts.

(9). Connect cable assembly forward rodend to Sta. 113.00 splitter assembly outboard bellcrank clevis.

(10). Torque nut and install cotter pin.

(11). Reconnect forward and center control cable couplings.

WARNING **Failure to properly connect thruster cables could result in uncoupling during flight and loss of anti-torque authority.**

(a). Apply sufficient right pedal to expose inner cable female connector.

(b). Without bending cable, insert inner male connector into inner female connector and ensure they are properly engaged together.

(c). Slide outside cable collar over forward cable to engage locking device and turn clockwise until fully locked.

(12). Verify rigging of cable assembly from Sta. 113.00 splitter assembly (Ref. Adjustment/Test).

(13). Install fairings, access doors and panels removed for installation.

10. Center Cable Assembly Replacement

(Ref. Figure 402)

A. Center Cable Assembly Removal

(1). Remove rotating thruster cone (Ref. Sec. 53-40-30).

(2). Remove stationary thruster cone (Ref. Sec. 53-40-30).

(3). Remove cotter pin, nut, washers and bolt from clevis end of control rod double rodend.

(4). Disconnect cable assembly double rod end bearing from center tailboom bellcrank.

(5). Remove double rod end from cable assembly.

(6). Remove tailboom fairing.

(7). Disconnect the forward end of the anti-torque control cable by turning forward cable outside collar sleeve counter-clockwise and back to expose the inner cable.

(8). Apply sufficient right pedal to expose inner cables.

(9). Without bending cable, slide male connector out of female connector.

(10). Disconnect cable assembly forward rodend from Sta. 113.00 splitter assembly outboard bellcrank clevis.

(11). Remove safety wire and aft jamnut from cable assembly support bracket. Cable assembly can be removed by sliding or pulling cable assembly through support bracket and conduit and through grommet.

B. Center Cable Assembly Installation

CAUTION Before installation of cable, inspect cable (Ref. Forward and Center Cable Assembly Inspection).

(1). Install one jam nut and washer on cable and route cable assembly thru conduit of tailboom and thru support bracket.

(2). Install washer and jamnut on cable aft side of support bracket.

(3). Ensure that the threaded portion is centered in the support bracket.

NOTE: When tightening cable jamnuts, ensure smooth action of cable and alignment of cable hex end into cable socket.

(4). Ensure cable hex end and cable socket are aligned to ensure smooth action.

(5). Slide cable in and out to ensure there is no binding and tighten jamnuts.

(6). Slide cable in and out again to ensure there is no binding. If cable slides smoothly, safety jamnuts (CM702).

(7). Install double rodend bearing with locking device and jamnut.

(8). Ensure that threads protrude past witness hole. Tighten jamnut and safety wire nuts.

NOTE: The split bushing is installed at the top of bellcrank. A minimum of 0.010 inch (0.254 mm) and a maximum of 0.060 inch (1.524 mm) split bushing protrusion required above surface.

(9). Install double rodend bearing and forward bearing to bellcrank with bolt, washers and nut. Tighten nut and install cotter pin.

(10). Reconnect forward and center control cable couplings.

WARNING **Failure to properly connect thruster cables could result in uncoupling during flight and loss of anti-torque authority.**

(a). Apply sufficient right pedal to expose inner cable female connector.

(b). Without bending cable, insert inner male connector into inner female connector and ensure they are properly engaged together.

(c). Slide outside cable collar over forward cable to engage locking device and turn clockwise until fully locked.

(11). Verify rigging of cable assembly from Sta. 113.00 splitter assembly to vertical stabilizers is correct.

(12). Install stationary thruster cone.

(13). Install rotating thruster cone.

11. Aft Control Rod Assembly Replacement

(Ref. Figure 402)

A. Aft Control Rod Assembly Removal

(1). Remove thruster cone (Ref. Sec. 53-40-30).

(2). Remove stationary thruster cone (Ref. Sec. 53-40-30).

(3). Remove cotter pin, nut and washer from sector input shaft.

(4). Remove pan cover.

(5). Remove cotter pin, nut, washers and bolt from clevis end of control rod at double rodend bearing of tailboom center cable assembly.

(6). Remove and discard lockwire and then remove control rod bolt from sector assembly.

(7). Remove control rod.

B. Aft Control Rod Assembly Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM702	Lockwire CRES

NOTE: Split bushing is installed at the top, shoulder bushing is installed at bottom. A minimum of 0.010 inch (0.254 mm) and maximum of 0.060 inch (1.524 mm) split bushing protrusion required above surface.

(1). Connect thruster control rod clevis end to double rod end aft bearing of center cable assembly.

(2). Install washer and bushing on bolt and then insert through rod end into sector assembly.

(3). Torque bolt to **30 - 40 inch-pounds (3.39 - 4.52 Nm)** and install safety wire (CM702).

(4). Install bushings, bolt, washer and nut; Torque nut to **30 - 40 inch-pounds (3.39 - 4.52 Nm)** and install cotter pin.

(5). Install pan cover.

(6). Install washer and nut on sector input shaft; torque nut to **95 - 110 inch-pounds (10.73 - 12.43 Nm)** and install cotter pin.

(7). Install stationary thruster cone.

(8). Install rotating thruster cone.

12. Sector Assembly and Control Cable Replacement

(Ref. Figure 401)

A. Sector Assembly and Control Cable Removal

(1). Remove rotating thruster cone (Ref. Sec. 53-40-30).

NOTE: Removed safety clips from turnbuckles are not to be reused.

(2). Disconnect cables from turnbuckles in access hole provided (top of stationary cone).

(3). Remove cotter pin, nut and washers from sector input shaft.

(4). Remove pan cover.

(5). Remove washer and bushing under pan cover from sector bellcrank input shaft.

(6). Remove control rod bolt from sector assembly and lift sector assembly from shaft.

(7). Remove clevis pins from sector assembly and remove cables.

B. Sector Assembly and Control Cable Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM702	Lockwire CRES

(1). Position the cable assembly around thruster sector bellcrank, install cable clevis pins and cotter pins.

(2). Install sector bellcrank on input shaft.

(3). Connect sector assembly aft control rod to clevis.

(a). Install washer and bushing on bolt and then insert through rod end into sector assembly.

(b). Torque bolt to **30 - 40 inch-pounds (3.39 - 4.52 Nm)** and install safety wire (CM702).

(4). Install bushing, washer on sector input shaft.

(5). Install pan cover.

(6). Install washer and nut on sector input shaft; torque nut to **95 - 110 inch-pounds (10.73 - 12.43 Nm)** and install cotter pin.

(7). Install rotating thruster cone.

(8). Perform a rigging check.

13. Drum Assembly and Idler Pulley Replacement

(Ref. Figure 401)

A. Drum Assembly and Idler Pulley Removal

(1). Remove rotating thruster cone (Ref. Sec. 53-40-30).

NOTE: Removed safety clips from turnbuckles are not to be reused.

(2). Disconnect cables from turnbuckles in access hole provided (top of stationary cone).

(3). Remove cotter pin, nut and two washers, remove drum assembly from shaft.

(4). Remove guard pins to remove cable assemblies.

B. Drum Assembly and Idler Pulley Installation (500N)

NOTE: The long cable is 23.07 inches (58.60 cm) and is installed on the aft cable guide of the drum, or right side, up and around the right idler pulley. The short cable is 22.82 inches (57.96 cm) long and is installed on the fwd cable guide of the drum, or left side, up and round the left idler pulley.

(1). Install cables on drum assembly.

(2). Install drum assembly on shaft and install guard pins.

(3). Install HS306-233H flat washer against the bearing.

(4). Install washer and nut; torque nut to **160 - 190 inch-pounds (18.08 - 21.47 Nm)** and install cotter pin.

(5). Install turnbuckles and cables.

(6). Perform a rigging check.

(7). Install rotating thruster cone.

C. Drum Assembly and Idler Pulley Installation (600N)

NOTE: The long cable is 23.76 inches (60.35 cm) long and is installed on the aft cable guide of the drum, or right side, over and around the left idler pulley. The short cable is 23.51 inches (59.72 cm) long and is installed on the fwd cable guide of the drum, or left side, over and round the right idler pulley.

(1). Install cables on drum assembly as follows:

(a). Install left cable on forward groove of drum and cross over to right pulley.

(b). Install right cable on aft groove of drum and cross over to left pulley.

(2). Install drum assembly on shaft and install guard pins.

(3). Install HS306-233H flat washer against the bearing.

(4). Install washer and nut; torque nut to **160 - 190 inch-pounds (18.08 - 21.47 Nm)** and install cotter pin.

(5). Install turnbuckles and cables.

(6). Perform a rigging check.

(7). Install rotating thruster cone.

14. Anti-Torque Pedal Friction Replacement

(Ref. Figure 403)

A. Anti-Torque Pedal Friction Removal

(1). Remove bolt, washer and bushing from console support bracket.

(2). Remove nut and washers, remove spring, retainer, spring and friction disc, and link.

(3). Remove brace and clamp arm assembly from anti-torque tube assembly.

B. Anti-Torque Pedal Friction Installation

(1). Using two pieces of wood and C-clamp or rope, secure pilot's pedals in mid position so they are aligned within 0.50 inch (1.27 cm) of each other.

(2). Install washer, bolt, bushing, and link assembly to bracket assembly on instrument console.

(3). Install brace and clamp arm assembly to anti-torque tube assembly.

(4). Install friction disc, link, retainer and spring, install washer (shim washers if required) and nut.

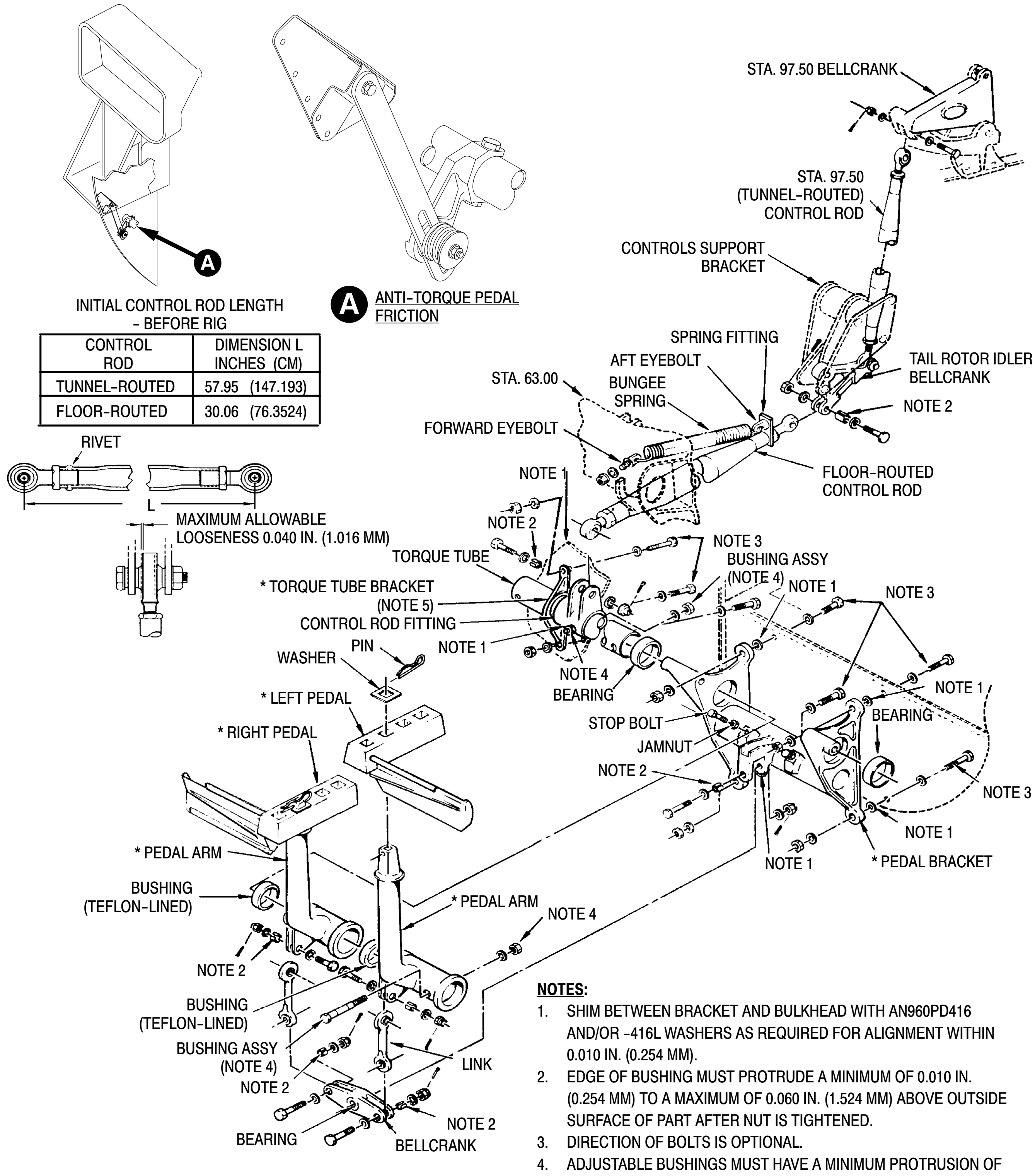
(5). Torque brace and arm assembly bolts **30 - 35 inch-pounds (3.39 - 3.95 Nm)**. Torque nut against washer to obtain a pedal friction of **5 - 8 pounds (2.27 - 3.63 kg)**.

15. Anti-Torque Pedal Assembly Replacement

(Ref. Figure 403)

A. Anti-Torque Pedal Assembly Removal

(1). Pull two hinge pins from pilot's compartment floor access door hinges and remove door.



INITIAL CONTROL ROD LENGTH - BEFORE RIG

CONTROL ROD	DIMENSION L INCHES (CM)
TUNNEL-ROUTED	57.95 (147.193)
FLOOR-ROUTED	30.06 (76.3524)

NOTES:

1. SHIM BETWEEN BRACKET AND BULKHEAD WITH AN960PD416 AND/OR -416L WASHERS AS REQUIRED FOR ALIGNMENT WITHIN 0.010 IN. (0.254 MM).
2. EDGE OF BUSHING MUST PROTRUDE A MINIMUM OF 0.010 IN. (0.254 MM) TO A MAXIMUM OF 0.060 IN. (1.524 MM) ABOVE OUTSIDE SURFACE OF PART AFTER NUT IS TIGHTENED.
3. DIRECTION OF BOLTS IS OPTIONAL.
4. ADJUSTABLE BUSHINGS MUST HAVE A MINIMUM PROTRUSION OF 0.002 IN. (0.051 MM) AT EACH END.
5. INSTALLED WITH BEARING RECESS FACING FITTING.
6. ASTERISK (*) INDICATES PART THAT MAY BE EITHER MAGNESIUM OR ALUMINUM ALLOY. FOR ALLOY IDENTIFICATION AND CORROSION CONTROL REF. SEC. 20-40-00.

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Figure 403. Pedal Installation (Sheet 1 of 2)

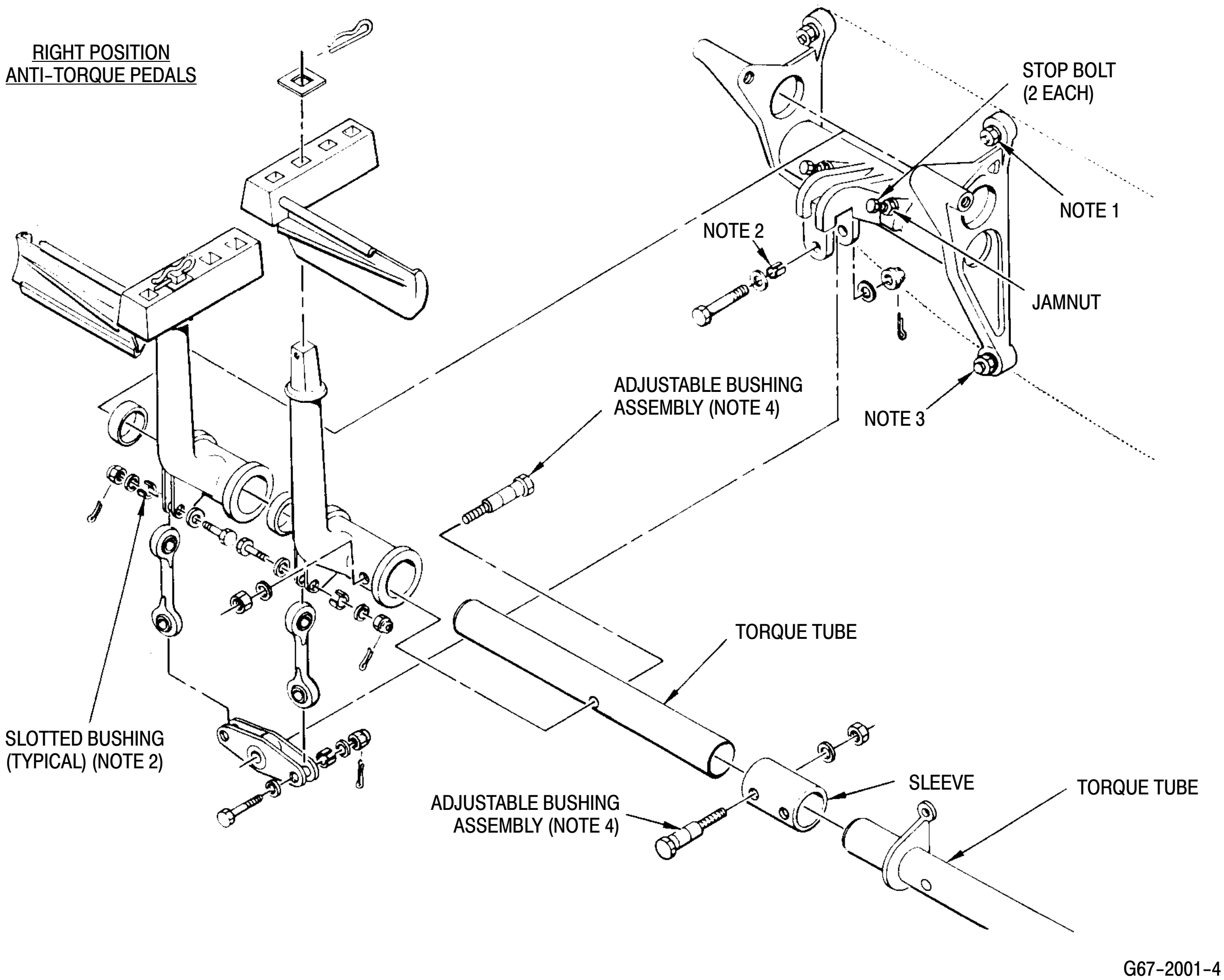

Figure 403. Pedal Installation (Sheet 2 of 2)

(2). Remove access panel from each side of instruction panel lower support structure.

(3). Remove battery (Ref. Sec. 96-00-00).

(4). Remove pins securing pedals to pedal arms and remove pedals.

(5). Remove pedal friction mechanism.

(6). Remove cotter pin, nut, two washers and bolt that connect floor-routed control rod to torque tube fitting.

(7). Remove two nuts, four washers, any shim washers and two bolts that secure torque tube bracket to bulkhead. Keep shim washer selection with bracket to simplify torque tube alignment during reinstallation.

(8). Remove four nuts, eight washers, any shims washers and four bolts that secure pedal bracket to bulkhead.

(9). Remove control pedal installation. Keep shim washer selection with bracket for reinstallation.

B. Anti-Torque Pedal Assembly Installation

(1). Install pedal bracket with four bolts, eight washers and four nuts.

(2). Add shim washers as required at pedal bracket attachment points to keep centerline alignment of pedal bracket bearings within 0.010 inch. Correct alignment is indicated by free rotational movement of torque tube after nuts are torqued with no evidence of binding.

(3). Position torque tube bracket over mating holes in bulkhead and check alignment with bulkhead.

(4). Add shim washers as required at bracket attachment points to maintain bearing alignment established in step (2). above. Install two bolts, four washers and two nuts.

(5). Check that slotted bushing is in place, install floor-routed control rod in torque tube fitting and install bolt, two washers and nut; install cotter pin. A minimum of 0.010 inch (0.254 mm) and a maximum of 0.060 inch (1.524 mm) split bushing protrusion required above surface.

(6). Install anti-toque pedal friction mechanism.

(7). Check rigging of pedal assembly controls and pedal-to-canopy clearance. Pedals should clear windows by a minimum of 0.020 inch (0.508 mm) with 20 pounds (9.0718 Kg) of force applied.

16. Stability Augmentation System (S.A.S.) Actuator Replacement

(Ref. Figure 505)

A. S.A.S. Actuator Removal

(1). Disconnect electrical power from aircraft. Ensure that battery power is disconnect.

(2). Remove horizontal stabilizer center access panels and R/H end cap access cover.

(3). Remove upper and lower R/H vertical stabilizers (Ref. Sec. 53-50-30, Vertical Stabilizer Replacement).

(4). Disconnect actuator control tube from vertical stabilizer torque tube bellcrank.

(5). Remove R/H vertical stabilizer torque tube bellcrank.

NOTE: Observed and note position of vertical stabilizer bellcrank for reinstallation purposes.

(6). Remove vertical stabilizer torque tube (Ref. Sec. 53-50-30, Vertical Stabilizer Torque Tube and/or Bushing Replacement).

(7). Disconnect electrical connector from actuator.

(8). Disconnect S.A.S. actuator from control rod.

(9). Remove bolts from actuator support bracket and carefully slide actuator out of access hole.

B. S.A.S. Actuator Installation

NOTE: Whenever S.A.S. actuator or control tube is replaced, S.A.S. rigging must be performed.

(1). Slide actuator through access panel and attach actuator to support bracket.

(2). Install vertical stabilizer torque tube (Ref. Sec. 53-50-30, Vertical Stabilizer Torque Tube Replacement).

(3). Connect actuator control tube to vertical stabilizer torque tube bellcrank. Torque nut to **30 - 40 inch-pounds (3.39 - 4.52 Nm)** and install cotter pin.

NOTE: Care should be observed to position vertical stabilizer bellcrank in the same position as removed.

(4). Reinstall upper and lower R/H vertical stabilizers (Ref. Sec. 53-50-30, Vertical Stabilizer Replacement).

(5). Reconnect electrical connector to actuator.

(6). Perform S.A.S. actuator rigging check (Ref. Stability Augmentation System Rigging Instructions).

(7). Install access panels.

17. S.A.S. Rate Gyro and Electronic Control Box (Computer) Replacement

Access to the rate gyro and electronic control box (computer) is through the passenger compartment footwell access panels.

The units are mounted on a rack under the pilot's seat structure against the seat structure forward panel.

The 500N has the components mounted approximately 12 inches (30.48 cm) to the right of centerline.

The 600N has the components mounted approximately 12 inches (30.48 cm) to the left of centerline.

A. S.A.S. Rate Gyro and Electronic Control Box (Computer) Removal

(1). Remove appropriate passenger compartment footwell fairing (Ref. Sec. 52-50-00).

(2). Disconnect and remove electrical plug.

(3). Remove mounting hardware.

(4). Carefully remove component from rack.

B. S.A.S. Rate Gyro and Electronic Control Box (Computer) Installation

(1). Install component on rack.

(2). Reinstall mounting hardware. Torque screws to **12 - 15 inch-pounds (1.36 - 1.69 Nm) plus drag torque**.

(3). Connect electrical plug.

(4). Reinstall passenger compartment footwell fairing (Ref. Sec. 52-50-00).

NOTAR® ANTI-TORQUE SYSTEM FLIGHT CONTROLS ADJUSTMENT/TEST

1. Directional Controls Rigging

NOTE:

- On the 500N, directional control rigging is to be accomplished with the (Sta. 113.00) spring on the splitter assembly disconnected.
- The NOTAR control system must be re-rigged after replacement of control rods, linkages, and components or if helicopter operation reveals a rigging deficiency.

2. Fan Pitch Control Rigging

(Ref. Figure 501)

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM702	Lockwire CRES

Special Tools (Ref. Section 91-00-00)

Item	Nomenclature
ST601	Rigging pin

NOTE: Fan Pitch Control Rigging shall be accomplished with the tailboom and engine air inlet fairings removed.

(1). Position Sta. 113.00 splitter assembly pinion gear so the rigging slot aligns with lower rigging hole in the bracket assembly; Insert the rigging pin (ST601) (View A).

(2). Adjust the bearing retainer so the flange of bearing retainer is screwed in on the tube assembly until it just touches the shoulder of the fan pitch-aft control tube (View B).

NOTE: A gap of 0.015-0.025 inch (0.381-0.635 mm) between pitch bearing housing and bearing retainer plate must exist to ensure proper clamp-up.

(3). Assemble the pitch plate control bearing into slider and attach the bearing retainer plate using three bolts and three washers.

(4). Torque bolts to **70 - 80 inch-pounds (7.91 - 9.04 Nm)** and safety (CM702).

NOTE: Every 60° turn on bearing retainer is equivalent to 0.6 degree change in fan pitch angle.

(5). Using the TICK marks on the fan blade assembly and on hub housing to determine blade pitch angle, adjust bearing retainer to obtain a fan blade pitch angle of 26 ±1° (View D).

NOTE:

- The aft control tube keyway should be installed at the 12 O'clock position for ease of installation.
- Ensure that one of the six slots in the face of the bearing retainer aligns with fan pitch-aft control tube key way (View C).

(6). Install lockwasher so that the face of the lockwasher aligns with one of six slots of the bearing retainer.

(7). Install jam nut, torque nut to **95 - 110 inch-pounds (10.73 - 12.43 Nm)** leaving a minimum of three threads protruding beyond the face of the jam nut.

(8). Check tick marks on fan blade assembly and hub housing, ensure that fan pitch angle is 26 ±1°. If blade pitch is 26 ±1°, proceed to step (9). If not, remove jamnut and lockwasher and return to steps (5).

(9). Safety wire (CM702) nut and lockwasher (2 places required).

(10). Rotate fan to ensure the safety wire does not interfere.

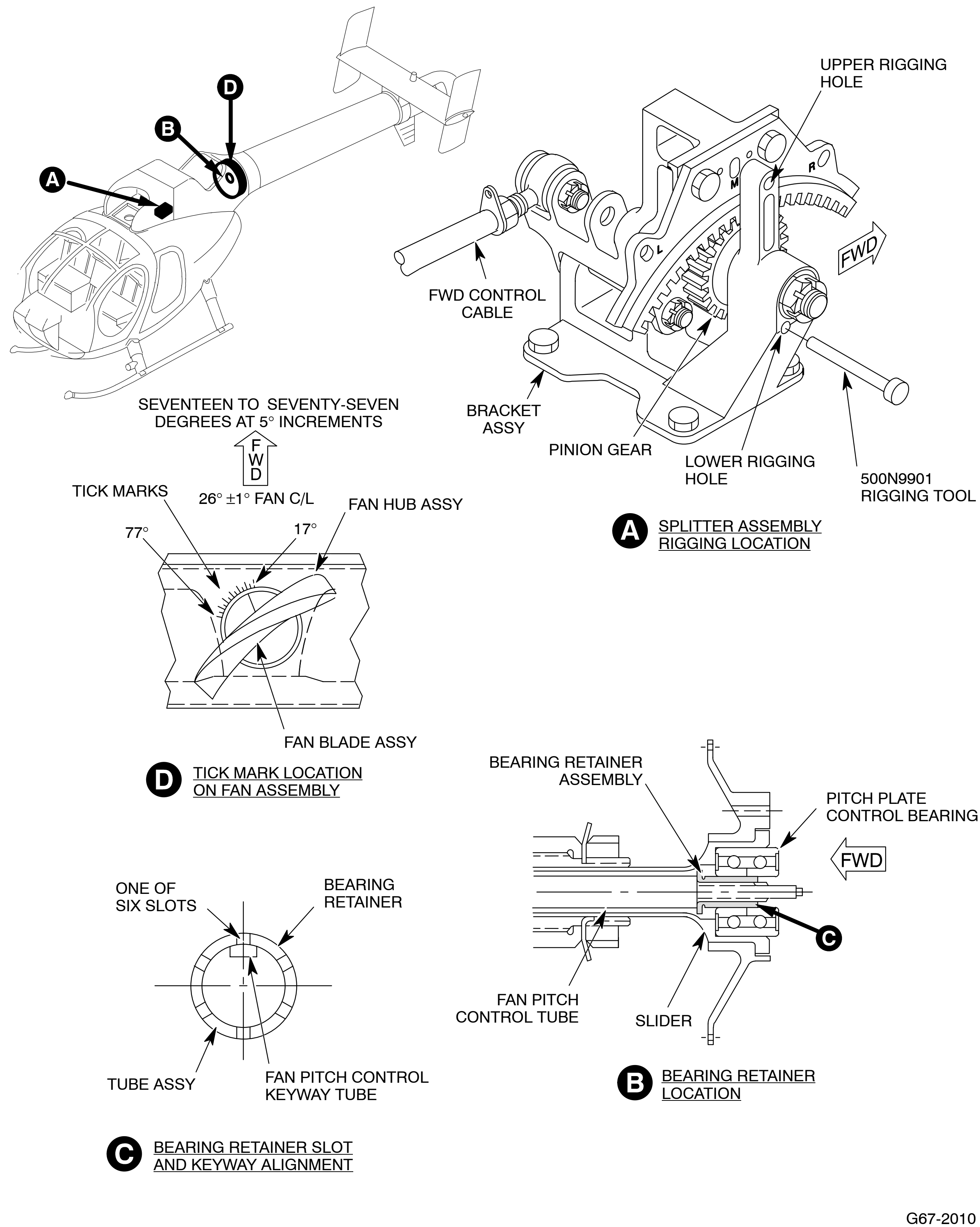

Figure 501. Fan Pitch Control Rigging

NOTE:

- If the required adjustment of bearing retainer, lockwasher and jamnut cannot be achieved, adjust the intermediate control tube to meet requirements of specifications in steps (5). thru (10).
- Do not adjust the control rodend beyond the witness hole. Do not tighten jam nut until after final adjustment.

(11). Remove rigging pin.

(12). Fan Pitch Control Rigging shall produce the following results:

(a). 500N:

1). Full left pedal, 69 - 73 degrees.

2). Full right pedal, 50 - 54 degrees.

(b). 600N;

1). Full left pedal, 71 - 75 degrees.

2). Full right pedal, 52 - 56 degrees.

NOTE: On the 600N helicopter, the pedal potentiometer rigging must be checked any time the anti-torque system has been adjusted.

3. Pilot Pedal Rigging

(Ref. Figure 502)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM702	Lockwire CRES

NOTE: Directional control rigging shall be accomplished with the (Sta.113) splitter spring assembly disconnected (500N) and the fan pitch control rigging complete.

(1). Remove left-hand air inlet fairing to facilitate pedal rigging (Ref. Sec. 53-30-30).

CAUTION Remove pilot's pedals and copilot's (if installed) to prevent possible contact with lower windshield during rigging sequence.

(2). Using two pieces of wood and C-clamp or rope, secure pilot's foot pedal arms so they are aligned (View A). Maximum misalignment between pedals shall be 0.50 inch (1.27 mm).

NOTE: Do not adjust the control rod beyond the witness hole. Do not tighten the locking jamnut until after final adjustment.

(3). Anti-torque idler bellcrank position to be checked as follows:

(a). Position pilot's foot pedals in neutral and floor-routed control rod length (initial control rod length is 30.06 inches (76.35 cm) before rigging).

(b). Adjust floor-routed control rod so that centerline of bellcrank arm is 90° ±2 degrees to Sta. 78.50 canted bulkhead (View B).

(c). Sta. 97.50 bellcrank: Adjust the tunnel-routed control rod so the centerline of the tunnel-routed control rod attach bolt in the transfer bellcrank is 4.21 - 4.39 inches (10.69 - 11.15 cm) above mast base structure (View C).

(4). Check witness holes for proper thread engagement.

(5). Tighten jamnuts and safetywire (CM702) as required.

(6). Adjust rodends on the forward control tube so the rigging pin can be inserted into the bracket assembly upper hole and through the slot marked **"M"** in the gear pinion rack Sta. 113.00 splitter assembly (View D).

(7). Remove rigging pin and remove clamping device from foot pedal arms.

CAUTION Use care when actuating pedals to avoid damaging tool or windshield.

(8). Loosen jamnuts on pedal stop-bolts (View A).

(9). Screw in pedal stop-bolts approximately one-half inch (12.7 mm).

(10). Adjust left-hand stop-bolt in the pilot's pedal support.

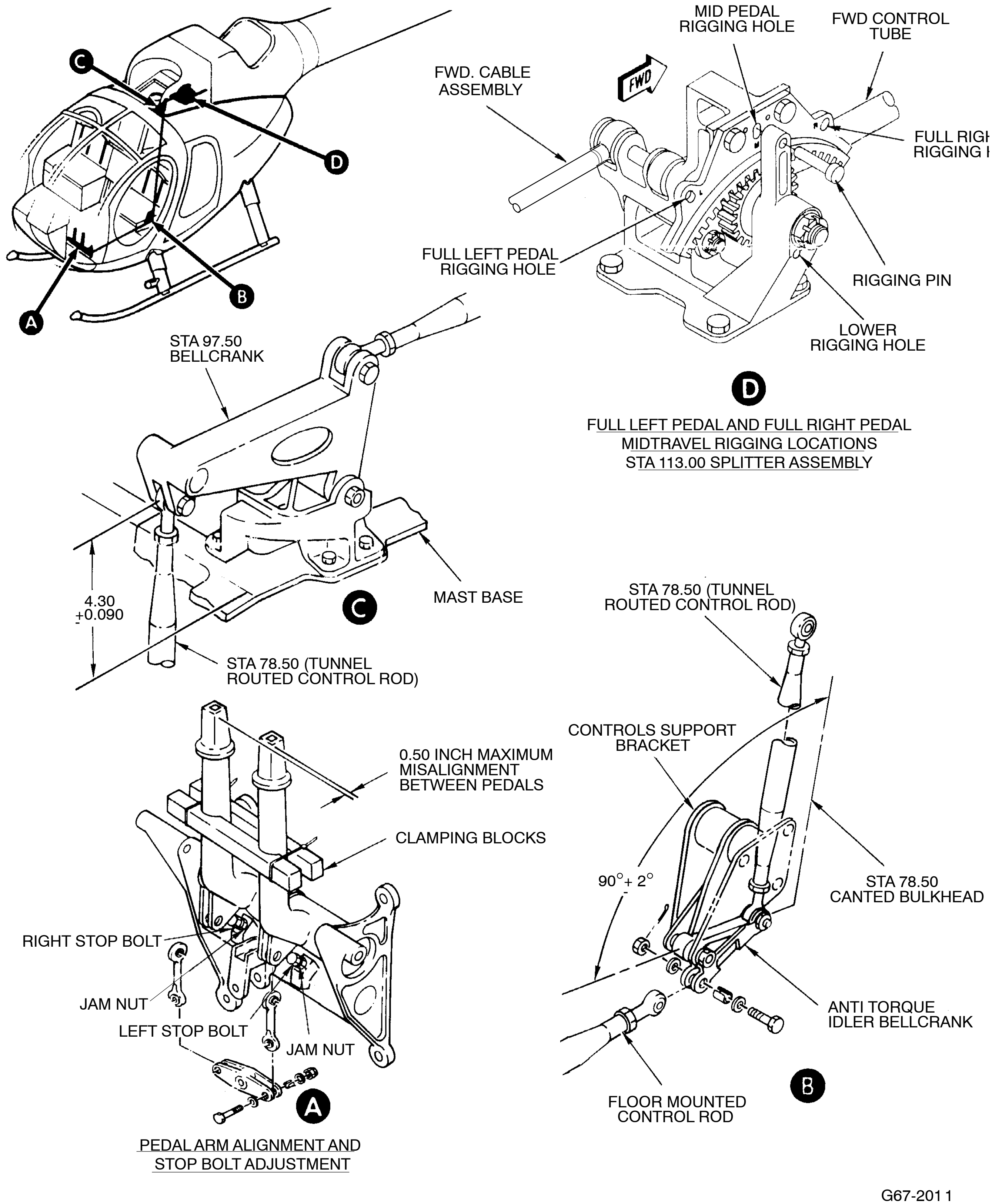

Figure 502. Pilot Pedal Rigging

(11). Apply full left pedal until the rigging pin can be inserted through the bracket assembly upper hole and into the slot marked **"L"** in the gear pinion rack Sta. 113.00 splitter assembly (View D).

(12). Adjust the left-hand stop-bolt in the pilot's pedal support so that the stop just comes in contact with the link assembly (View A).

(13). Remove the rigging pin assembly and adjust right-hand stop-bolt in the pilot's pedal support.

(14). Apply full right pedal until the rigging pin assembly can be inserted through the bracket assembly upper hole and into the slot marked **"R"** in the gear pinion rack Sta. 113.00 splitter assembly (View D).

(15). Adjust the right-hand stop-bolt in the pilot's pedal support so that the stop just comes in contact with the link assembly (View A).

NOTE: For dual installation, adjust the stop-bolts in the co- pilot's support bracket to match the pilot's pedal travel. Repeat steps (11). thru (13).

4. Anti-Torque Pedal Friction Installation and Adjustment

(Ref. Figure 403)

(1). Using two pieces of wood and C-clamp or rope, secure pilot's pedals in mid position so they are aligned within 0.50 inch (1.27 cm) of each other.

(2). Install washer, bolt, bushing, and link assembly to bracket assembly on instrument console.

(3). Install brace and clamp arm assembly to anti-torque tube assembly.

(4). Install friction disc, link, retainer and spring, install washer (shim washers if required) and nut.

(5). Torque brace and arm assembly bolts **30 - 35 inch-pounds (3.39 - 3.95 Nm)**. Torque nut against washer to obtain a pedal friction of 5 - 8 pounds (2.27 - 3.63 kg).

5. Thruster Control Rigging (500N)

(Ref. Figure 503)

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM702	Lockwire CRES

Special Tools (Ref. Section 91-00-00)

Item	Nomenclature
ST601	Rigging pin

NOTE:
- Thruster control rigging to be accomplished with the splitter spring installed, the fan pitch control rigging completed, the tailboom sector control rod assembly and stationary thruster cone installed.
- Do not adjust the control rodend beyond the witness hole, do not tighten jamnuts until after final adjustment.

(1). Insert rigging pin (ST601) into the bracket assembly lower rigging hole and through the slot on the pinion gear rack Sta. 113.00 splitter assembly (View D).

(2). Removed pan cover.

(3). Adjust rodend until it can be attached to input clevis of sector assembly (View C).

(4). Connect sector clevis control rod.

(5). Install bushing, washer and bolt. Torque bolt **30 - 40 inch-pounds (3.39 - 4.52 Nm)**. Safety wire (CM702) bolt (Ref. Anti-Torque Flight Control Installation).

(6). Remove rigging pin from splitter assembly.

NOTE: Removed safety clips from turnbuckles are not to be reused.

(7). Remove safety clips and adjust the two turnbuckles until a second rigging pin (ST601) can be inserted through a slot in the output drum assembly and through holes in drum output support (View A and B).

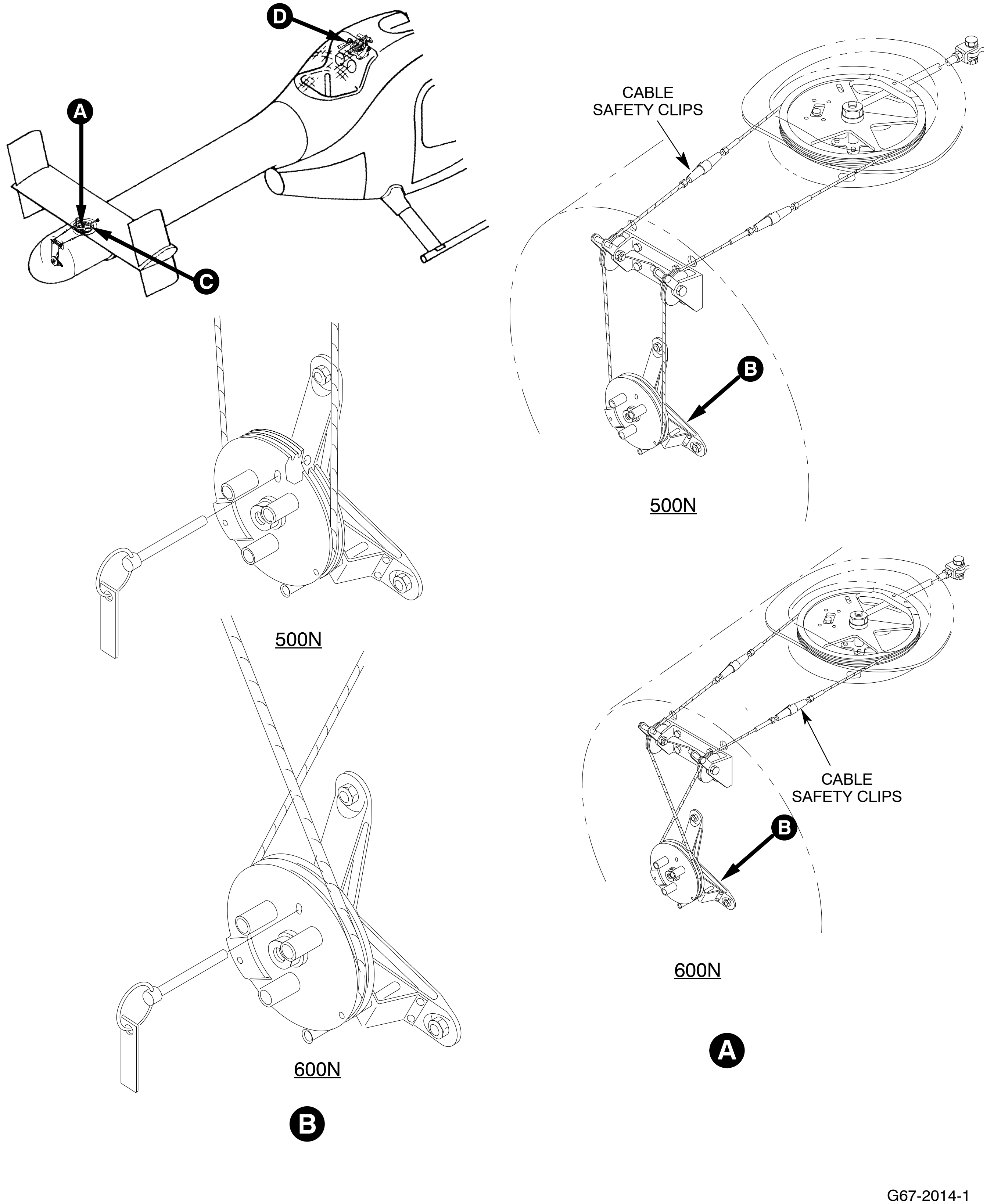

Figure 503. Thruster Control Rigging (Sheet 1 of 2)

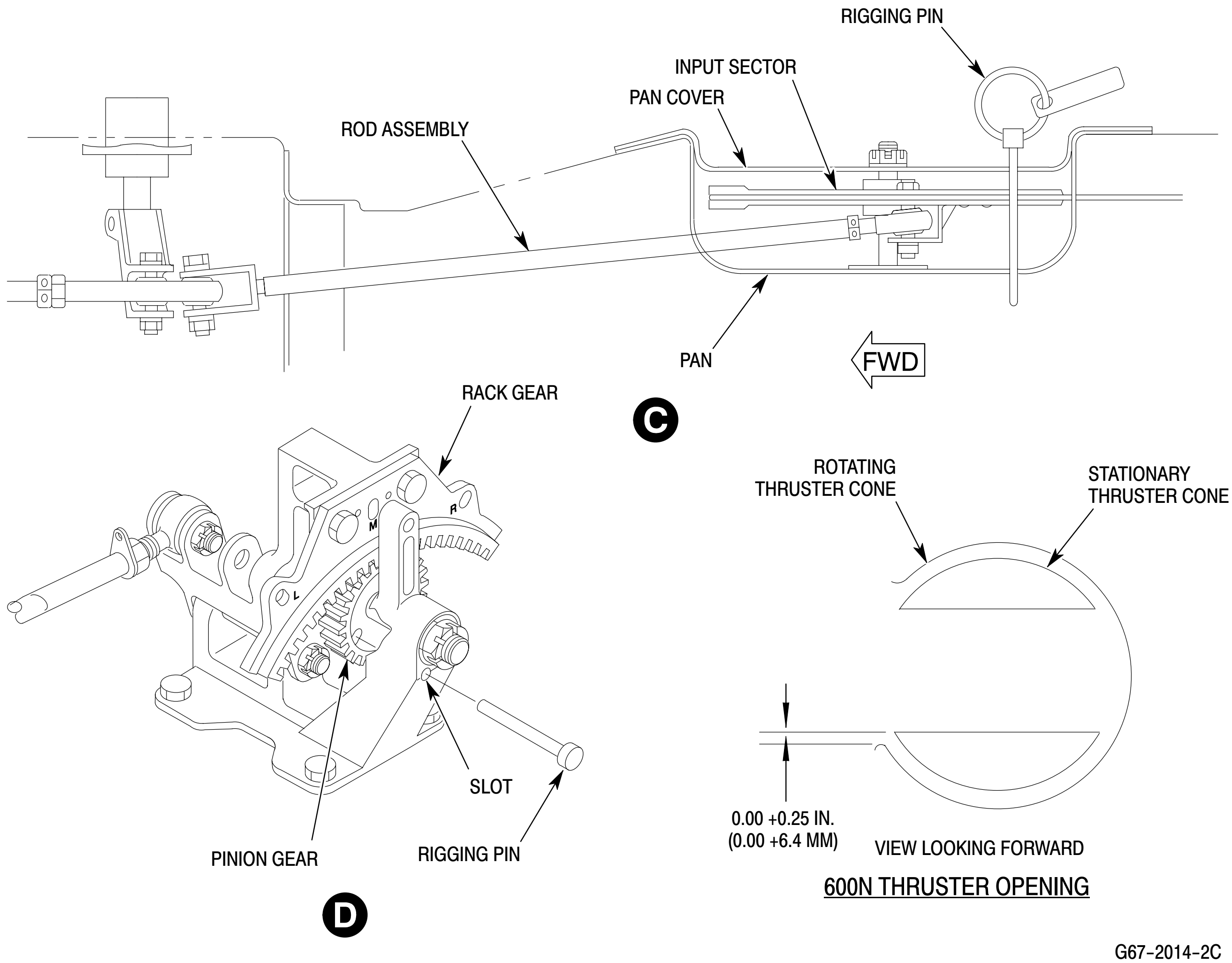

Figure 503. Thruster Control Rigging (Sheet 2 of 2)

(8). Using a cable tensiometer, adjust cable tension to **20 - 40 pounds (9.07 - 18.14 kg)**.

NOTE: Removed safety clips from turnbuckles are not to be reused.

(9). Install safety clips in turnbuckles.

(10). Remove rigging pins.

(11). Install rotating thruster cone using three bolts and washers. Torque bolts **70 - 90 inch-pounds (7.91 - 10.17 Nm)**.

(12). Safety wire (CM702) bolts.

(13). Thruster Control Rigging shall produce the following results:

(a). Full left pedal; rotating thruster cone to be fully open to the left side of the tailboom.

(b). Full right pedal; rotating thruster cone to be open a minimum of 11.80 inches (29.97 cm) when measured from the lower edge of the right opening to the upper lip of the rotating cone.

6. Thruster Control Rigging (600N)

(Ref. Figure 503)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM701	Lockwire CRES

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST601	Rigging pin

NOTE: Do not adjust the control rodend beyond the witness hole, do not tighten jamnuts until after final adjustment.

(1). Insert rigging pin (ST601) into bracket assembly lower rigging hole and through slot on the pinion gear Sta. 113.00 splitter assembly (Ref. Figure 503).

(2). Removed pan cover.

(3). Adjust rodend until it can be attached to input clevis of sector assembly and the rigging slot in input sector assembly aligns with the rigging hole in pan.

(4). Connect sector clevis control rod.

(5). Install bushing, washer and bolt. Torque bolt **70 - 90 inch-pounds (7.91 - 10.17 Nm)**. Safety bolt with lockwire (CM701) (Ref. Anti-Torque Flight Control Installation).

(6). Reinstall pan cover ensuring rigging pin hole in pan cover aligns with rigging hole in sector assembly. If pin cannot be inserted through fan cover, sector assembly and pan, repeat above steps.

(7). Adjust the two turnbuckles until a second rigging pin can be inserted through a slot in the output drum assembly and through holes in drum output support.

(8). Using a cable tensiometer, adjust cable tension to **20 - 40 pounds (9.07 - 18.14 Kg)** by adjusting the two turnbuckles.

(9). Remove rigging pins.

(10). Install rotating thruster cone using three bolts and washers.

(11). Push full left pedal and verify bottom edge of rotating thruster opening is within 0.00 ±0.25 inch (0.0 ±6.4 mm) of edge of stationary thruster cone (Ref. Figure 503); adjust turnbuckles as necessary.

(12). Remove rotating thruster cone.

(13). Verify cable tension.

(14). Reinstall rotating thruster cone; Torque rotating thruster cone bolts to **70 - 90 inch-pounds (7.91 - 10.17 Nm)**.

NOTE: On the 600N helicopter, the pedal potentiometer rigging must be checked any time the anti-torque system has been adjusted.

(15). Safety bolts with lockwire (CM701).

(16). Safety turnbuckles with clips.

7. Left Vertical Stabilizer Assembly Rigging (500N, and 600N with YSAS)

(Ref. Figure 504)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST601	Rigging pin

NOTE:

- Rigging to be accomplished with the tailboom and vertical stabilizers, splitter assembly bungee spring and engine air inlet fairings installed.
- Do not adjust the control rodend beyond the witness hole, do not tighten jamnuts until after final adjustment.

(1). <u>500N helicopters</u>: Insert rigging pin (ST601) into the bracket assembly upper hole and into the slot marked

"R" in the gear pinion rack Sta. 113.00 splitter assembly **(**View A**)** splitter assembly upper hole.

(a). Adjust the left vertical stabilizer to 6.5 ±0.5 degrees on the horizontal stabilizer degree plate (View C).

(b). Remove rigging pin.

(2). 600N helicopters: With pedals set to full right position, adjust tip of the left vertical stabilizer trailing edge to 12 degrees.

(3). Check witness holes for proper thread engagement. Rodends are to be installed equal distance on torque tube to within 0.020 inch (0.508 mm) of each other.

8. Stability Augmentation System Rigging Instructions (500N, and 600N with YSAS)

(Ref. Figure 505)

Special Tools (Ref. Section 91-00-00)

Item	Nomenclature
ST1013	Yaw S.A.S. test box

(1). Turn OFF power supply, turn S.A.S. switch on the instrument panel to the OFF position.

(2). Install the Yaw S.A.S (ST1013). Test Box to the computer located and mounted on the co-pilot's seat structure forward bulkhead, the test box is now in series with the computer and actuator.

(3). Using the aircraft power supply or an external power source, activate S.A.S. switch.

(4). Adjust actuator to the fully extended position using the Yaw S.A.S. test box.

(5). Turn aircraft power OFF, actuator should remain in fully extended position.

NOTE: The actuator and control tube can be slid out the horizontal stabilizer end panel far enough to remove safety wire and loosen the jamnuts. The control tube can be rotated and adjusted similar to a turnbuckle.

(6). 500N helicopters: Using the top rig plate, adjust right vertical stabilizer to 4.0 ±0.5 degrees.

(7). 600N helicopters: Using the top rig plate, adjust top right vertical stabilizer to -1.75 ±0.25 degrees.

(8). After adjustment, slide actuator and control tube out far enough to tighten and safety jamnuts.

(9). Reinstall actuator and control tube.

NOTE: On the 600N helicopter, the pedal potentiometer rigging must be checked any time the anti-torque system has been adjusted.

9. Vertical Stabilizer Assembly Rigging (600N without YSAS System)

(Ref. Figure 506)

Special Tools (Ref. Section 91-00-00)

Item	Nomenclature
ST601	Rigging pin

NOTE:

- Rigging to be accomplished with the tailboom and vertical stabilizers, and engine air inlet fairings installed.
- Do not adjust the control rodend beyond the witness hole, do not tighten jamnuts until after final adjustment.

(1). Insert rigging pin (ST601) into the bracket assembly upper hole and into the slot marked **"R"** in the gear pinion rack Sta. 113.00 splitter assembly.

(2). Push trailing edge of left vertical stabilizer to the right using only enough force to eliminate freeplay (5-lb (0.3 Kg) max).

(3). Adjust control rod for the left vertical stabilizer to 10.5 ±0.5 degrees on the horizontal stabilizer degree plate.

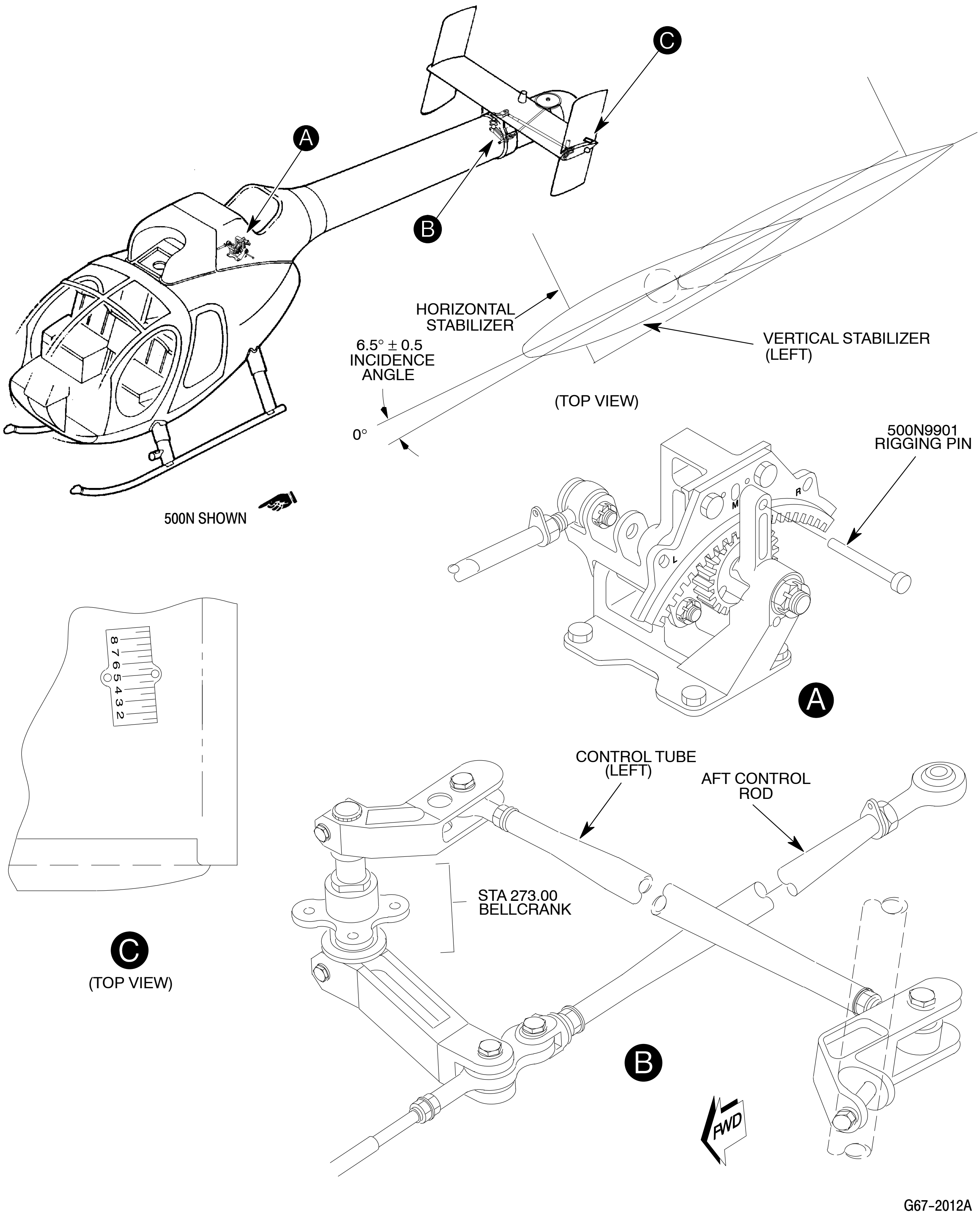

Figure 504. Left Vertical Stabilizer Rigging (500N, and 600N with YSAS)

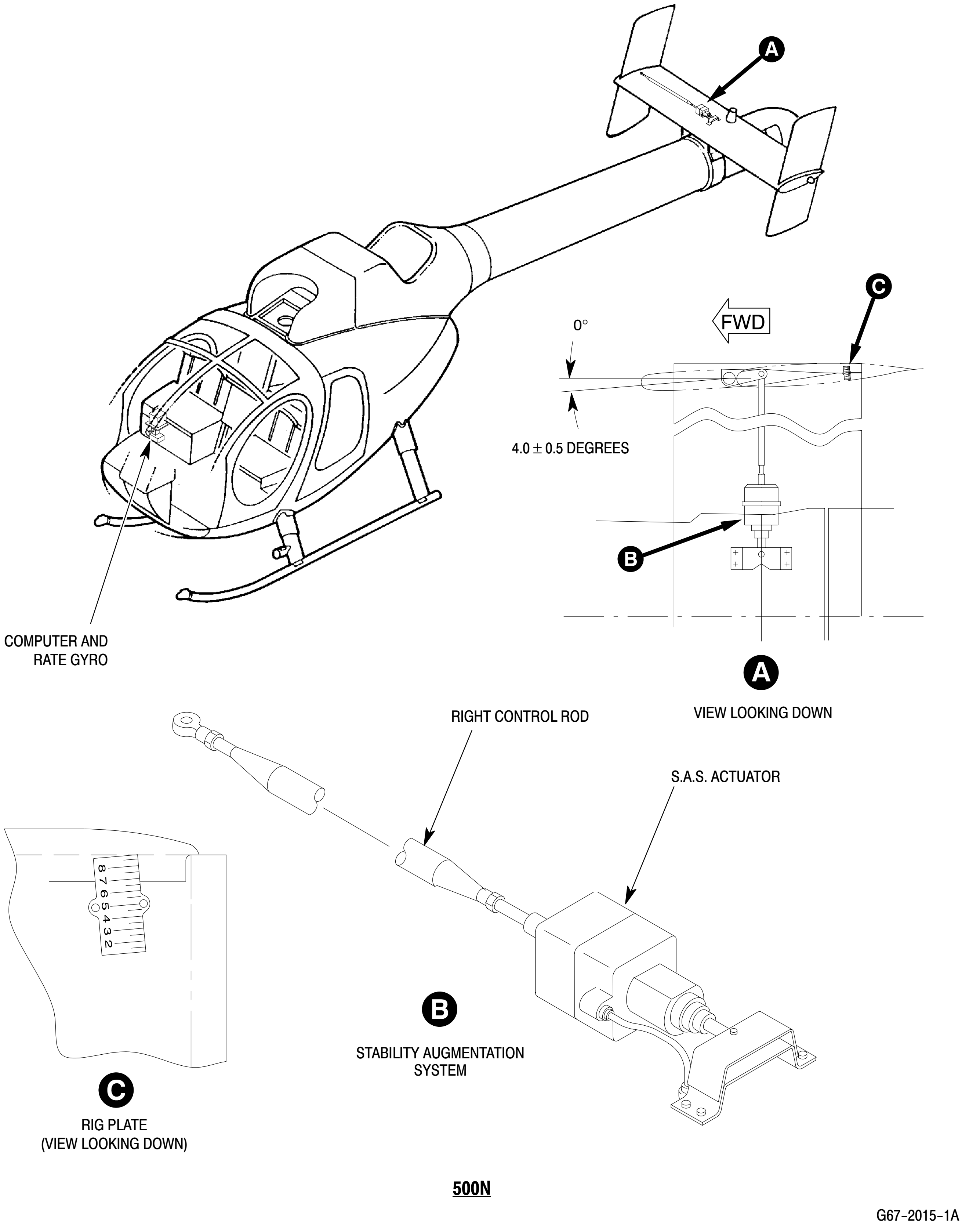

Figure 505. Stability Augmentation System S.A.S. (Sheet 1 of 2)

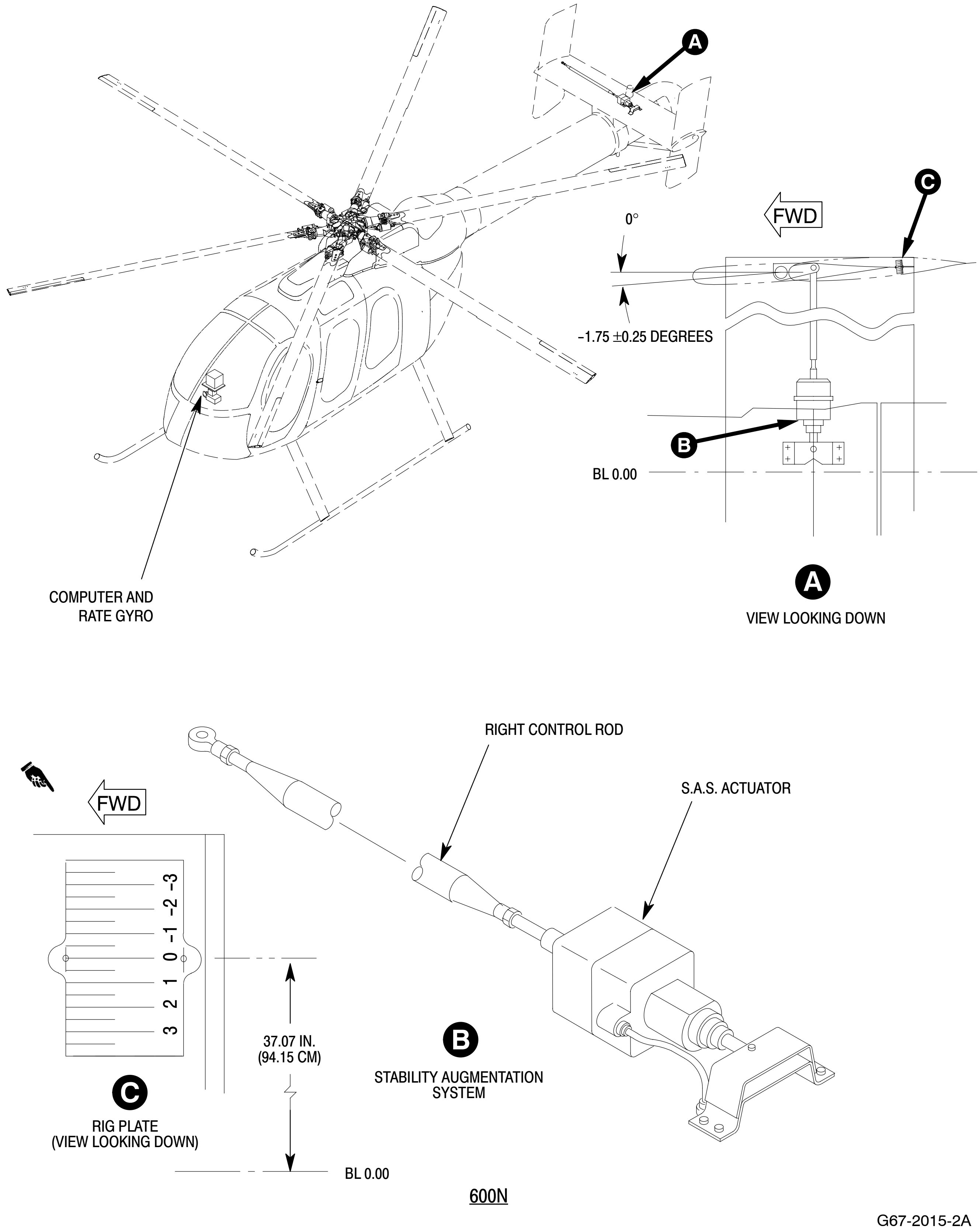

Figure 505. Stability Augmentation System S.A.S. (Sheet 2 of 2)

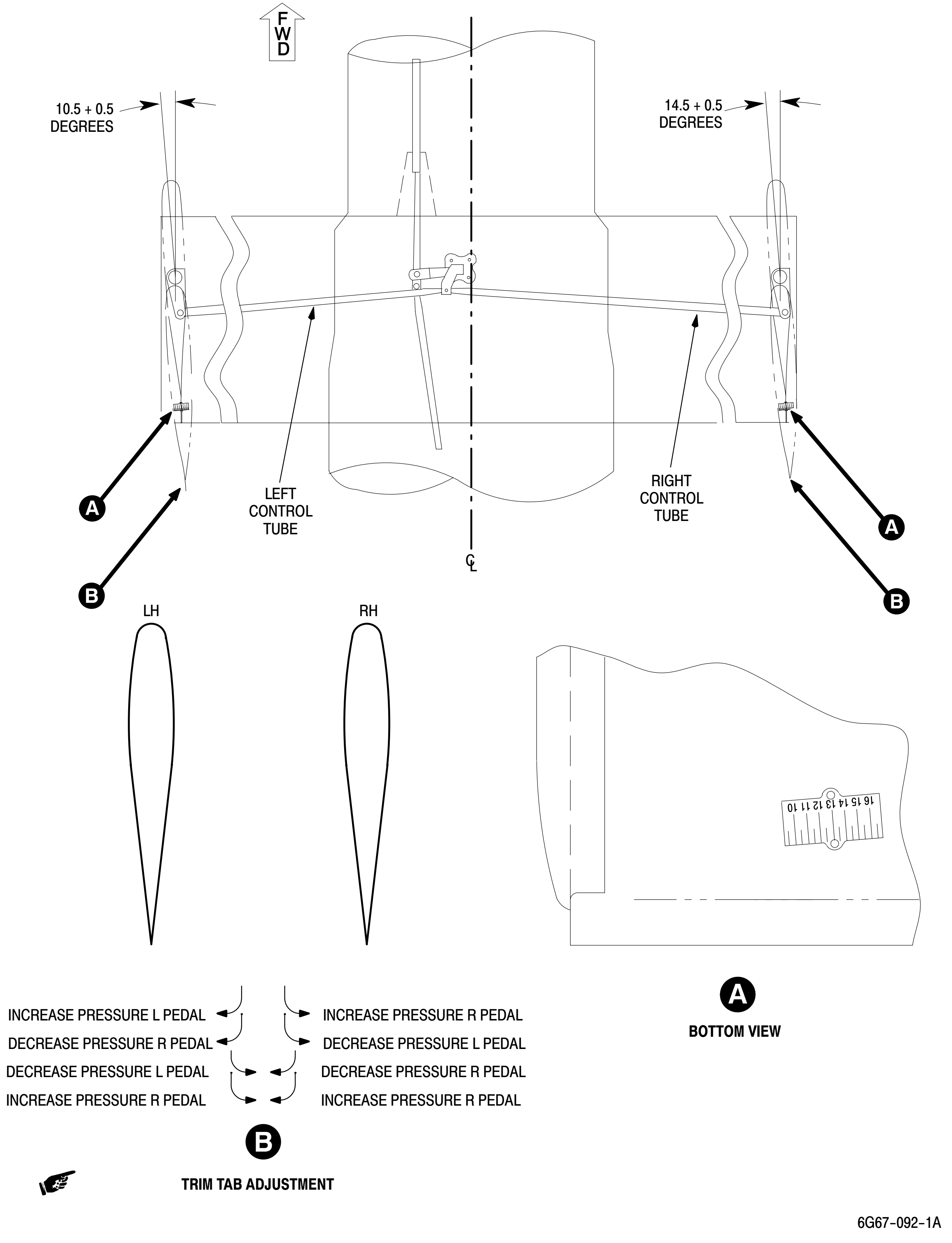

Figure 506. Vertical Stabilizer Rigging (600N without YSAS)

(4). Push trailing edge of right vertical stabilizer to the right using only enough force to eliminate freeplay, 5 lbs (0.3 Kg) maximum.

(5). Adjust control rod for the right vertical stabilizer to 14.5 ±0.5 degrees on the horizontal stabilizer degree plate.

(6). Remove rigging pin.

NOTE: On the 600N helicopter, the pedal potentiometer rigging must be checked any time the anti-torque system has been adjusted.

10. Vertical Stabilizer Trim Tab Adjustment and Tool Manufacturing (600N without YSAS)

A. Trim Tab Tool Manufacturing

(Ref. Figure 507)

(1). Manufacture guide as follows:

(a). Cut guide from 0.130 inch (3.30 mm) 2024-T3 aluminum sheet 7.00 inch (17.78 cm) x 4.50 inch (11.43 cm).

(b). Measuring 1.73 inch (4.39 cm) from bottom, make V-cut in guide 1.030 inch (2.62 cm) wide and 3.79 inch (9.63 cm) deep.

(c). File 0.070 inch (1.78 mm) wide x 0.260 inch (6.60 mm) deep slot in aft end of V-cut.

(d). File smooth all surfaces of guide.

NOTE: Note the difference in the degree markings between the top and bottom of the guide.

(e). Etch degree marks in guide as indicated in Figure 507.

(2). Manufacture angle tool as follows:

(a). Cut two plates from 0.130 inch (3.30 mm) 2024-T3 aluminum sheet 9.00 inch (22.86 cm) x 2.00 inch (5.08 cm).

(b). Cut a spacer from 0.040 inch (1.016 mm) 2024-T3 aluminum sheet 9.00 inch (22.86 cm) x 1.00 inch (2.54 cm).

(c). File smooth all surfaces of spacer and plates.

(d). Chamfer one 9.00 inch (22.86 cm) edge of each plate, 0.060 x 0.100 inch (1.524 x 2.54 mm) (this will be the front of the tool) as indicated in Figure 507.

(e). Stack plates, chamfered edges facing each other with spacer between plates and flush with aft side of plates (un-chamfered edge).

(f). Drill and rivet angle tool together, size and type of rivets optional.

B. Trim Tab Adjustment

(Ref. Figure 506) Adjust vertical stabilizer trim tabs to improve directional handling characteristics and to minimize pedal forces in forward flight.

For best results, aircraft should be weighted down to normal operating weight during test flights while doing tab adjustments.

NOTE:

- Ensure vertical stabilizers are rigged correctly (Ref. Vertical Stabilizer Assembly Rigging (600N)).
- Ensure there is no play between the 500N7213-5 bellcrank assembly and the 500N7212-3 shaft.
- Ensure there is minimal play between the upper and lower vertical stabilizers.
- When installing new upper vertical stabilizers, if previous tab settings were not recorded, left trim tab should be set to zero degrees and right trim tab should be set to 10° right (viewed looking forward from the rear).
- The right vertical stabilizer tends to affect pedal pressure more than the left. The left vertical stabilizer tends to affect flight characteristics more than the right.

Left Vertical Tab	Right Vertical Tab
0°	10° Right

(1). Determine which pedal requires excess pressure to attain proper trim during straight flight.

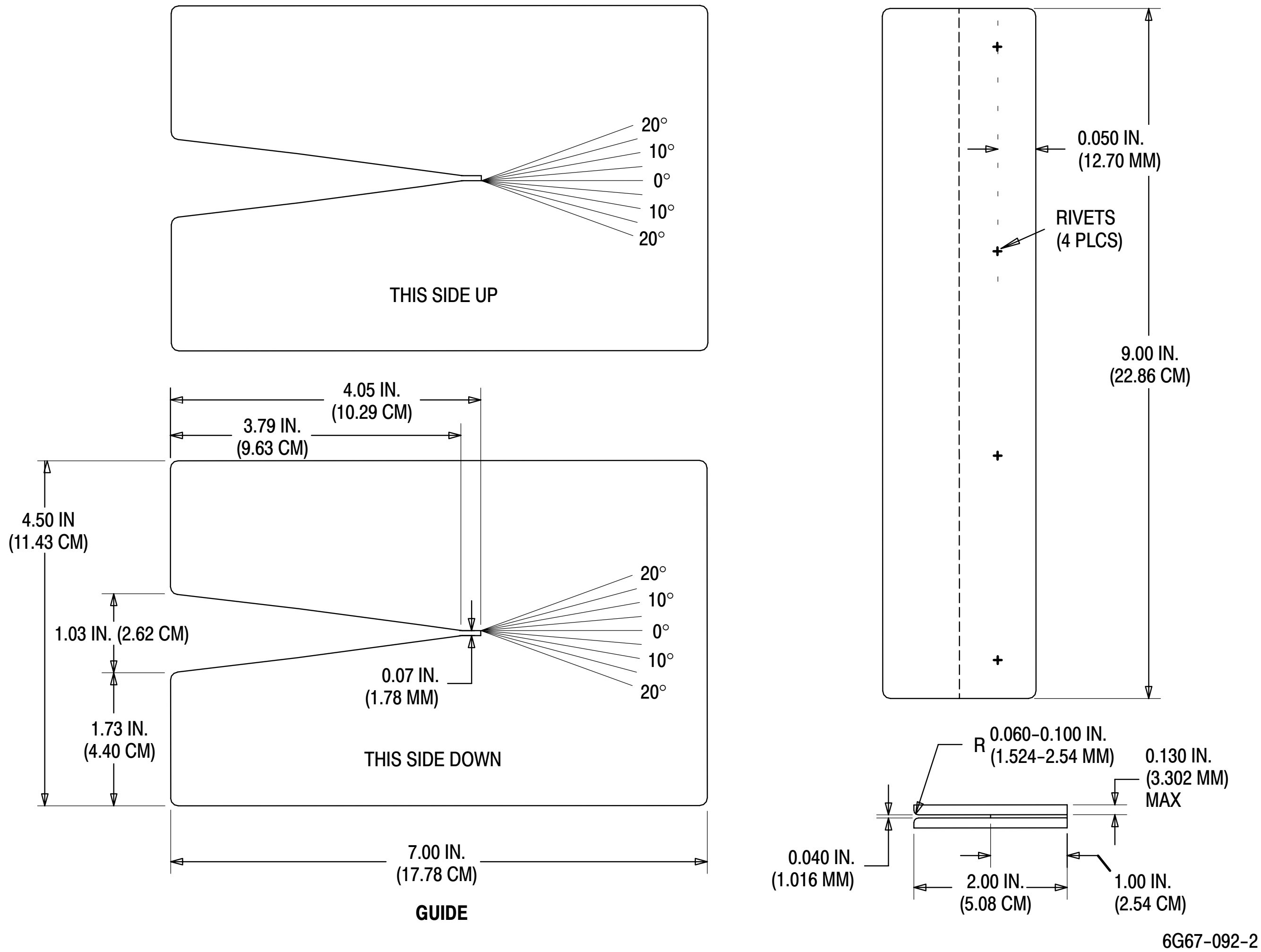

Figure 507. Vertical Stabilizer Trim Tab Bending Tool

NOTE:

- Always adjust right vertical stabilizer trim tab first. If tab is bent to a maximum of 20° before correct pedal pressure can be achieved, go to left tab and continue adjustments.
- Limit tab adjustments to 5° increments between flights.
- Exceeding 20° tab adjustments may cause a ”tail wag” condition.

(2). Position guide on right vertical stabilizer over trim tab.

(3). Position angle tool on trim tab.

CAUTION Do not bend tabs beyond 20° in either positive or negative direction. Tabs and/or vertical stabilizer skin can be damaged.

NOTE:

- Bending tabs to the right will decrease left pedal pressure.
- Tab angles are acceptable when left pedal forces are between 2 and 5 lbs. (0.91 and 2.27 Kg) in stabilized flight and the flight characteristics are acceptable.

(4). Bend tab in direction needed to relieve pedal pressure and improve flight characteristics.

(5). Remove tab tools and fly aircraft, see chart below, to determine if pedal pressure was relieved.

(6). Repeat above steps until pedal pressure and handling characteristic are corrected.

NOTE: After trim tab adjustments, position guide on both the top and bottom of trim tab to ensure tab is straight.

(7). Log trim tab setting in log book.

	Pedal Position	Pedal Force
Hover	________	________
*60 KIAS	________	________
*80 KIAS	________	________
*100 KIAS	________	________
*120 KIAS	________	________
*130 KIAS	________	________

NOTE: *Level flight

Handling: Low pedal forces might require bending tabs in opposite directions.

Table 501. Flight Controls Troubleshooting

Pedal Kick-Thru or Binding				
Noticeable hump in pedals (kick-thru) in flight.				
yes ⇓				
Are control cables Binding?	no ⇒	Is there binding in control rod at fan transmission?	no ⇒	Is there pedal binding in flight?
yes ⇓		yes ⇓		yes ⇓
Replace worn or binding control cable(s).		Adjust control rod for proper clearance.		Check for dry roller bearings at rotating cone.
Dutch Roll				
Is there relative movement between upper and lower verticals?	no ⇒	Is there play when holding cone and moving the vertical stabilizers?	no ⇒	Bend left tab to the left, starting with 5° left.
yes ⇓		yes ⇓		
Check for loose attaching hardware for the upper and lower verticals (NOTE).		Check for loose bellcrank at control shaft.		
NOTE: When tightening hardware, do not torque fasteners beyond specified torque limits.				

NOTAR® ANTI-TORQUE SYSTEM FLIGHT CONTROLS INSPECTION/CHECK

1. Upper Fuselage and Tailboom Control Linkage Inspection

(Ref. Figure 401)

(1). Inspect rod end bearings for binding and excessive wear (0.040 inch (1.016 mm) maximum axial play). Inspect rivet at fixed rod end.

(2). Inspect control rod for surface damage and evidence of bending.

(3). Inspect rubber boot just forward of Sta. 137.50 bulkhead for condition.

(4). Inspect control rod surfaces serviceability, wear is limited to thickness of hard anodic coating.

(5). Inspect bellcranks for scratches, cracks, corrosion and similar surface defects. Check that all bushings are secure.

(6). Inspect bellcrank bearings for looseness and binding.

(7). Visually inspect bellcrank supports for cracking/damage.

2. Anti-Torque Pedal Assembly Inspection

(Ref. Figure 502)

NOTE: Inspect components at left and right position on the right-hand command models. Check that corresponding pedals contact stops simultaneously.

(1). Inspect pedals and pedal arms for cracks, elongated pedal attach holes and open drain holes. Inspect teflon-reinforced bushing liners for deterioration.

(2). Inspect pedal-to-arm quick-release locking pin for condition and positive spring action.

(3). Inspect links and bellcrank for cracks and bends, and bearings for excessive play.

(4). Inspect control rod fitting, torque tube mounting bracket and pedal mounting bracket for cracks and corrosion. Using an 8X magnifying glass, mirror and flashlight, closely inspect pedal link bellcrank fitting of pedal bracket in center forward area where fitting (fork piece) joins tubular section. If any cracks are detected, replace bracket assembly. Inspect bracket bearings for excessive looseness.

(5). Inspect torque tube for cracks, scratches, nicks, dents and similar surface defects.

(6). Inspect pedal brackets for corrosion.

3. Sta. 97.50 (500N) or Sta. 95 (600N) Bellcrank and Support Bracket Inspection

(1). Inspect bellcrank and support bracket for cracks, corrosion and other similar surface defects.

(2). Check that all bushings are secure. Check bellcrank bearings for looseness and binding.

(3). Inspect rod ends bearings for binding and excessive wear (0.040 inch (1.016 mm) maximum axial play). Inspect control rod surface serviceability, wear is limited to thickness of hard anodic coating. Inspect for safety wire at rodends and lockwasher as required. Bolts for cotter pins as required.

4. Forward and Intermediate Directional Control Tube, and Link Inspection

(1). Inspect rodend and link bearings for binding and excessive wear (0.040 inch (1.016 mm) maximum axial play).

(2). Inspect control tubes and link for surface damage and wear. Inspect control tubes surface serviceability, wear is limited to thickness of hard anodic coating.

(3). Inspect for safety wire at rodends and lockwasher as required. Bolts for cotter pins as required.

5. Splitter Bungee Spring Inspection (500N)

(1). Inspect spring support bracket for loose rivets, loose screws, corrosion and cracks and general condition.

(2). Check link assemblies for cracks, bends and dents.

(3). Inspect spring for condition and a positive spring action.

6. Sta. 113.00 Splitter Assembly and Bellcrank Inspection

(1). Visually inspect bellcrank and support bracket for cracks and damage using 5X power magnifying glass.

(2). Inspect for cracks, corrosion and other similar surface defects.

(3). Check that all bushings and bearings are secure.

(4). Inspect rodend bearings for binding and excessive wear (0.040 inch (1.016 mm) maximum axial play). Inspect control rod surface serviceability, wear is limited to thickness of hard anodic coating. Inspect for safety wire at rodends and lockwasher as required. Bolts for cotter pins as required.

7. Forward and Center Cable Assembly Inspection

(1). Inspect for freedom of movement and no binding.

(2). Check rodend bearings for corrosion, and wear.

(3). Cable housing for fraying, and security.

(4). Inspect cable couplings for wear, deformation or damage (Ref. Figure 602).

(5). Inspect inner cable coupling hex for proper alignment with outer cable coupling.

(6). Inspect cable inner couplings for deformation or obvious damage.

(7). Using a bright light and 10X magnifying glass, inspect inner coupling male and female connectors for corrosion pitting or cracks; none allowed.

(8). Inspect center cable hex end for wear beyond allowable tolerance (Ref. Figure 601).

(9). Inspect collar for wear in locking groove.

(10). Inspect relieved area, at Sta. 123.30, between threads and swage for crack or evidence of corrosion.

(11). Inspect relieved area, at Sta. 164.00 (500N) or Sta. 292.00 (600N), between threads and swage for crack or evidence of corrosion.

(12). Inspect forward cable coupling opening for proper dimension (Ref. Figure 601).

(13). Using a bright light and 10x magnifying glass, inspect the swaged area of the telescopic swivel end for cracks (Ref. Figure 603).

(14). Inspect for any evidence of swivel ball separation.

8. YSAS Actuator, Rate Gyro and Electronic Control Box Inspection

(1). Inspect YSAS actuator for damage, no damage allowed.

(2). Inspect mounting hardware for proper installation and general condition.

(3). Inspect wiring for condition, no fraying, cracking of insulation or chafing allowed.

(4). Inspect grommet for proper installation and deterioration, replace if deteriorated.

(5). Inspect mounting bracket for cracks (pay particular attention to area around four rivet attach holes) no cracks allowed.

(6). Inspect rate gyro and electronic control box for damage, security in mount and ensure electrical plugs are secure.

(7). Inspect mounting bracket for cracks, no cracks allowed.

9. Fan Pitch Control Tube Inspection

(1). Inspect tube for dents, scratches, nicks, gouges and corrosion, none allowed.

(2). Inspect for visible step in splined area.

(3). If step is evident:

(a). Measure across splines using 0.096 in. (2.4384 mm) diameter pins.

(b). Minimum measurement across pins is 0.640 in. (16.256 mm).

10. Fan Pitch Slider Inspection

(1). Inspect slider for dents, scratches, nicks, gouges and corrosion, none allowed.

(2). Inspect Karon coating on slider for condition.

(3). Measure across slider, minimum diameter is 0.805 in. (20.447 mm).

Table 601. Isolating Control System Troubles

Symptom	Isolating Step	Corrective Action
Binding, locking-up and erratic action of foot pedals (Do not force controls).	Disconnect fwd control tube from Sta. 113.00 splitter assembly.	If symptom is gone, check from splitter assembly aft.

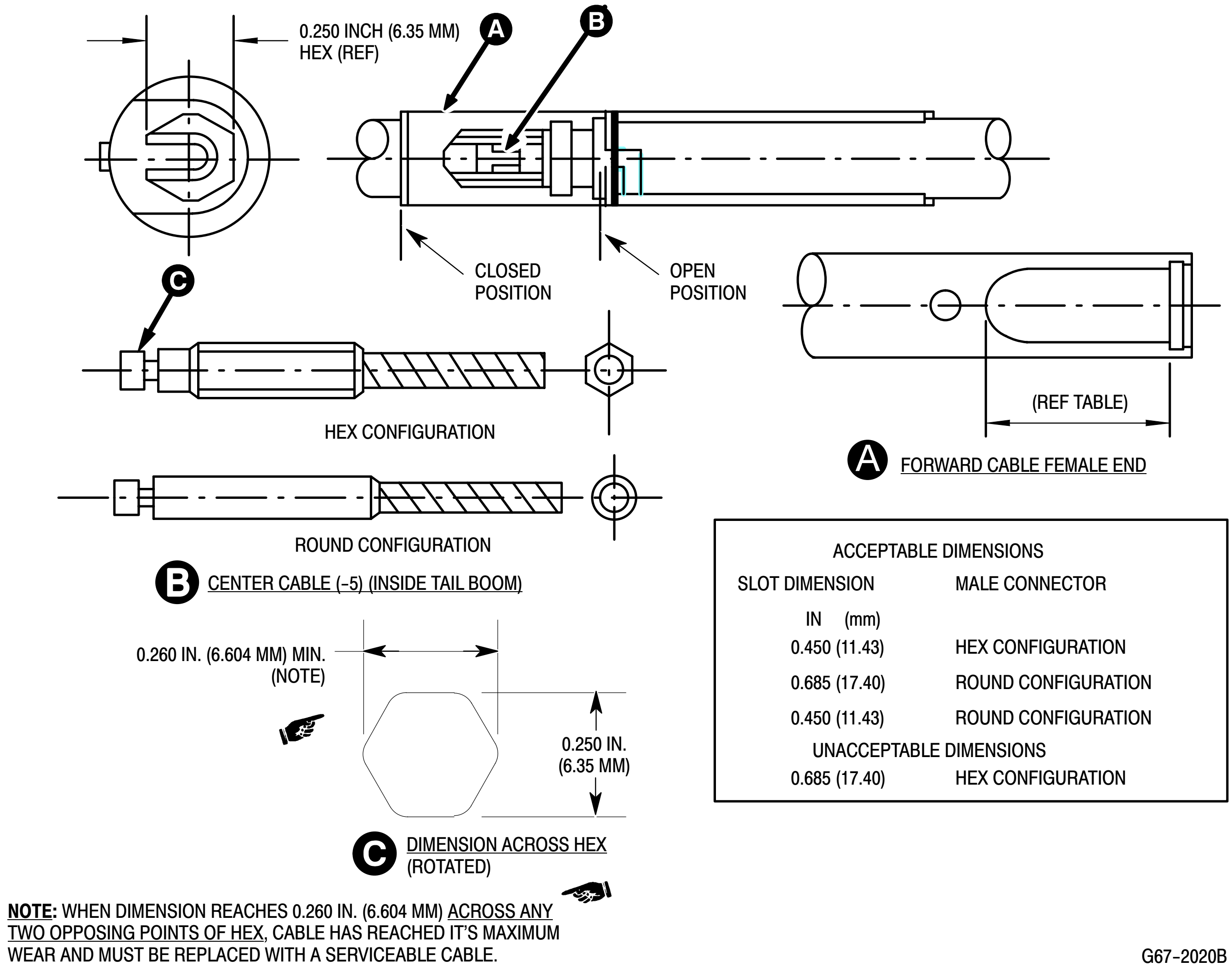

Figure 601. Control Cable Coupling Inspection

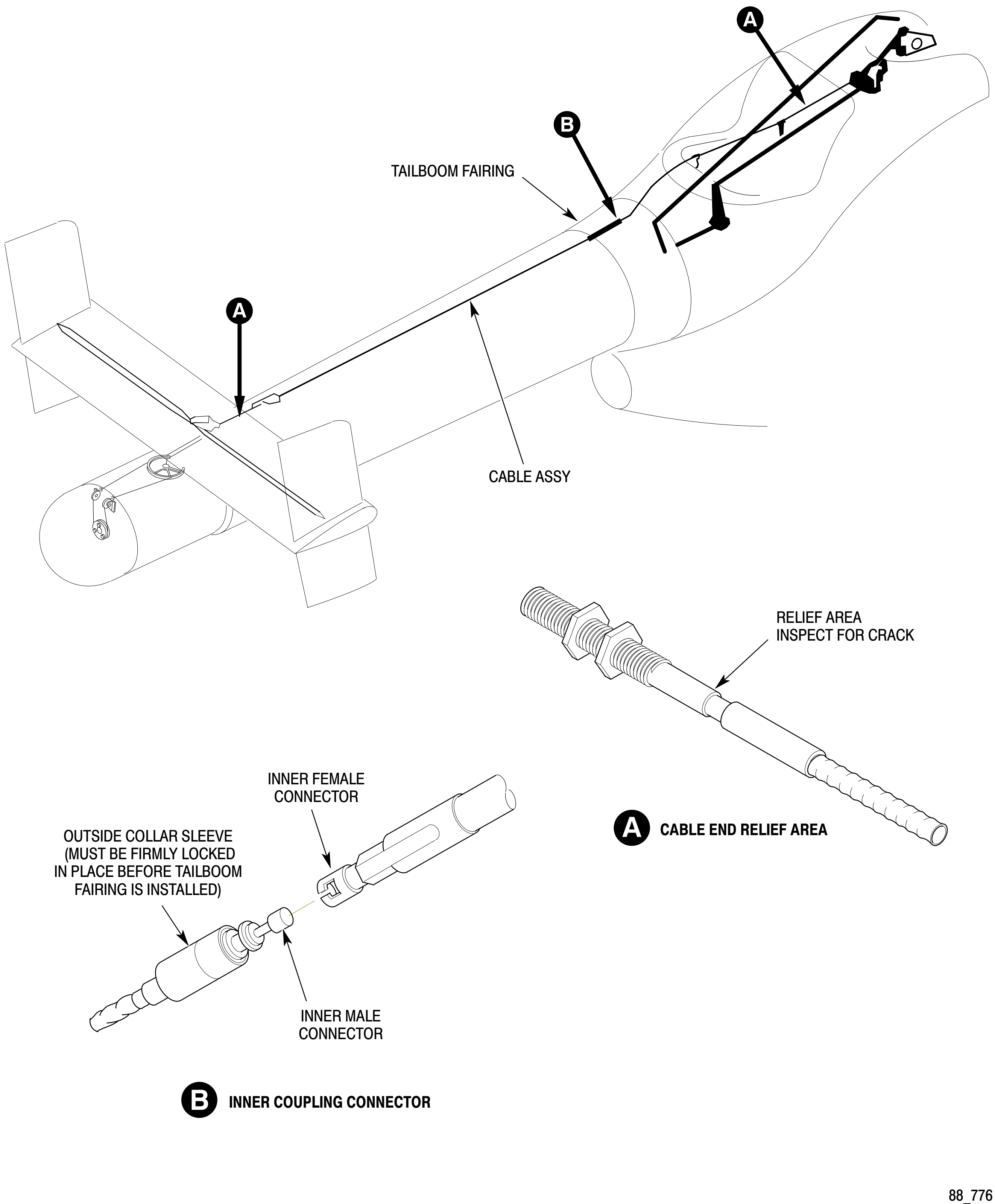

Figure 602. Forward and Center Cable Relief Area Inspection

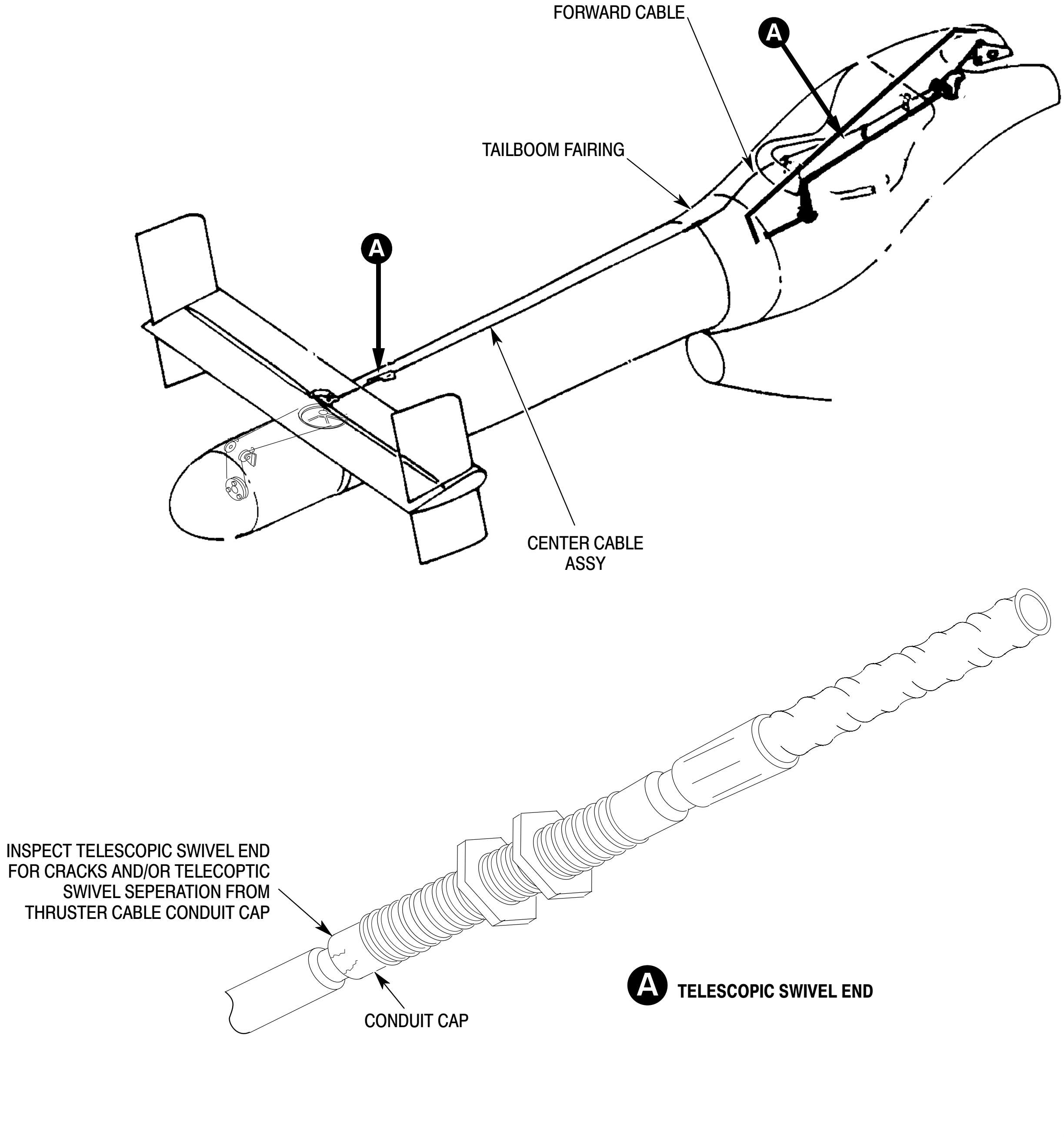

Figure 603. Control Cable Telescopic Swivel End Inspection

11. Sector Assembly, Control Cables and Drum Assembly Inspection

(Ref. Figure 402)

(1). Inspect sector assembly for:

(a). Proper installation of mounting hardware.

(b). Remove access cover from pan assembly.

(c). Center cable mounting bolt for security and proper installation of safety wire.

WARNING In the following step, ensure the anti-torque pedals are not moved, personal injury can occur.

(d). Check sector assembly for excess up-and-down play.

(e). Damage, cracks or corrosion; no damage, cracks or corrosion allowed.

(f). Reinstall access cover on pan assembly.

(2). Remove tip cap (500N).

(3). Remove rotating cone assembly.

(4). Remove access cover from top of stationary thruster assembly (600N).

(5). Inspect control cables for:

(a). Fraying or corrosion; no fraying or corrosion allowed.

(b). Proper installation of turnbuckle safety clips.

(c). Corrosion or cracking on turnbuckles; no corrosion or cracking allowed.

(d). Proper cable tension.

(6). Reinstall access cover on top of stationary thruster assembly (600N).

(7). Inspect control cable pulleys for:

(a). Proper installation of mounting hardware.

(b). Guard pins installed.

(c). Excessive groove in pulleys; evident in out-of-round pulley.

(8). Inspect drum assembly for:

(a). Proper installation of mounting hardware.

(b). Damage, cracks or corrosion; no damage, cracks or corrosion allowed.

(c). Guard pins installed.

(9). Reinstall rotating cone assembly.

(10). Reinstall tip cap (500N).

NOTAR® ANTI-TORQUE SYSTEM FLIGHT CONTROLS REPAIRS

1. Anti-Torque Flight Control Repair - General

CAUTION Use care when drilling to remove or install riveted rod end; rod end is steel and rod and bearing adapter are aluminum.

2. Sta. 97.50 (500N) or Sta. 95 (600N) Bellcrank and Support Bracket Repair

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM321	Surface primer locking compound
CM431	Sealing, locking and retaining compound

(1). Replace unserviceable bearings.

(2). Install new bearings with surface primer (CM321) and grade A locking compound (CM431).

NOTE: When idler bellcrank bearing are replaced, ensure idler bellcrank spacers are reinstalled between bearings.

(3). Replace bellcranks or control support brackets that have cracks or enlongated holes.

3. Forward Directional Control Tube Repair

(1). Replace control rod end if bearing axial play is more than 0.040 inch (1.016 mm). Set initial control rod length and bearing angularity.

(2). Initial length forward directional control tube is 15.42 inches (39.17 cm). Rod end angularity is 0 degrees straight line within ±2 degrees.

(3). Perform straightness check on control rods that appear bent or bowed.

(4). Drill out rivet. Loosen jamnut and unscrew rodend.

(5). Screw replacement rodend into rod to obtain same measurement made in step b. Align control rodends so bearings have equal space for angular throw; tighten jamnut.

(6). If removed, install rivet to secure rodend.

(7). Ensure slotted bushing is in place.

(8). Secure control rod in torque tube fitting or idler bellcrank with bolt, two washers, nut and cotter pin.

4. Upper Fuselage Sta. 113.00 Splitter Assembly Repair

Refer to Field Service Department for repairs.

5. Intermediate Control Tube Repair

(1). Perform straightness check on intermediate control rod that appears bent or bowed. Total length of control rod (excluding rod ends) must be straight within 0.040 inch (1.016 mm), with straightness variation limited to maximum of 0.010 inch (0.254 mm) in each foot of length.

NOTE:

- A dye check for cracking must always be performed after cold-straightening. Replace cracked rod, or cracked or bent rod end.
- Do not use rod ends to support rod during straightening process.

(2). Cold-straighten bent rod that is not within tolerance provided there are no nicks or sharp dents in bend length.

(3). Replace control rod end if bearing axial play is more than 0.040 inch (1.016 mm). Set initial control rod length and bearing angularity.

(4). Replace unserviceable control rod bearing adapter if installed.

(a). Measure length and record position of rod end in adapter.

(b). Remove affected rod end. Initial installation length of intermediate control rod is 23.68 inches (60.15 cm). Rod end angularity is 40 ±2 degrees.

(c). Drill out rivets securing adapter to rod and aft rod end.

(d). Install rod end in replacement adapter and position at recorded measurement.

6. Sta. 137.50 Support Bracket and Bellcrank Repair

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer
CM321	Surface primer locking compound
CM431	Sealing, locking and retaining compound
CM802	Abrasive cloth, aluminum oxide

(1). Replace unserviceable bearings.

(2). Install new bearings with surface primer (CM321) and grade A locking compound (CM431).

(3). Flat machined surfaces, except clevis inner ears, may be reworked to depth of 0.015 inch (0.381 mm).

(4). Clevis inner ear surfaces may be reworked to depth of 0.020 inch (0.508 mm).

(5). Machined holes may have 0.003 inch (0.076 mm) removed from bore wall in an area no greater than 15 percent of circumference and 50 percent of depth.

(6). All edges may have 0.030 inch (0.762 mm) removed except around machined holes, which are limited to 0.010 inch (0.254 mm) chamfer.

(7). All rework must be smoothly blended into adjacent surfaces and finish must be restored.

NOTE: Installation direction of Sta. 137.50 bellcrank bearing may be from either side, depending on location of bearing shoulder. There must not be less than 0.010 inch (0.254 mm) protrusion of bearing inner race beyond sides of bellcrank after bearing is installed.

(8). Repair minor surface defects such as scratches, nicks and corrosion on bellcranks and support bracket.

(9). Use abrasive cloth (CM802), grade 400 - 600, to smooth out and blend in such defects.

(10). Cast surfaces may be reworked to depth of 0.020 inch (0.508 mm).

(11). Repair surface abrasion on control rod by smoothing area with grade 400 abrasive cloth (CM802) and restoring protective finish with primer (CM318).

(12). Replace rod if wear or depth of repair exceeds 0.004 inch (0.102 mm).

(13). Replace tailboom control rod if hard anodic coating is worn through and aluminum base metal is visible.

(14). Replace split or torn boot.

7. Fan Pitch Control Tube Repair

Refer to Field Service Department for repairs.

8. Forward Cable Assembly Repair

Refer to Field Service Department for repairs.

9. Center Cable Assembly Repair

Refer to Field Service Department for repairs.

10. Aft Control Rod Repair

Refer to Field Service Department for repairs.

11. Thruster Sector Assembly Repair

Refer to Field Service Department for repairs.

12. Drum Assembly and Idler Pulleys Repair

Refer to Field Service Department for repairs.

13. Anti-Torque Pedal Disassembly

(Ref. Figure 403)

NOTE: Before disassembly of pedal installation, matchmark mating pedal arms, links and bellcranks with pedal brackets to avoid intermixing components between locations at reassembly.

(1). Disconnect links from pedal arms and bellcrank; remove links.

(2). Remove bellcrank from pedal bracket.

(3). Remove nut and washer of two bushing assemblies that secure left pedal arm and control rod fitting to torque tube.

(4). Carefully remove bushing bolt and temporarily reinstall washer and nut on bolt.

(5). Slide pedal bracket and pedal arms off end of torque tube.

NOTE:

- Do not remove two teflon-lined bushings from right pedal arm unless replacement is required.
- Do not remove two stop bolts, jam nuts on stop bolts or bearings from pedal bracket unless replacement is required.

(6). Slide torque tube bracket and control rod fitting off torque tube.

14. Anti-Torque Pedal Repair

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM425	Sealing compound
CM431	Sealing, locking and retaining compound

(1). Replace parts that are cracked or have elongated attachment holes.

CAUTION Do not attempt to straighten bent torque tube or pedal link.

(2). Replace unserviceable pedal covers. Apply sealing compound (CM425) to approximately 30 percent of upper and lower edge surfaces that contact pedal. Cure according to container instructions.

(3). Replace complete pedal link if cracked or contains unserviceable bearings; bearings are not replaceable.

(4). Replace unserviceable bearings in mounting brackets or pedal link bellcrank.

(5). Install replacement with grade A locking compound (CM431).

CAUTION Right pedal arm bushings are glass- filled phenolic. Do not cock bushings during replacement; ensure bushing is fully seated in arm bore. Keep tools from contact with bushing liners to avoid fraying.

(6). Replace bearings in right pedal arm when teflon-reinforced liner is galled or frayed. Pull bushing to remove; press to install.

(7). Remove corrosion from pedal brackets (Ref. Sec. 20-40-00 and CSP-A-3, Corrosion Control Manual).

15. Anti-Torque Pedal Reassembly

(Ref. Figure 403)

(1). When reassembling components, check for correct matchmark identification.

(2). If previously removed, thread jamnut on each of two stop bolts and install two stop bolts into threaded inserts of pedal brackets.

(3). Slide torque tube bracket and control rod fitting onto torque tube.

(4). Locate pedal bracket and pedal arms for correct position on torque tube; slide bracket and arms onto torque tube.

(5). Fasten left pedal arm and control rod fitting to torque tube with adjustable bushing assemblies.

(6). Install bushing bolt so shank at bolt-head end protrudes at least 0.002 inch (0.051 mm).

(7). Torque nut to **50 - 80 inch-pounds (5.65 - 9.04 Nm) plus drag torque**; do not allow bolt to turn.

(8). Ensure each end of bushing assembly shank protrudes a minimum of 0.002 inch (0.051 mm). If not, loosen and repeat above steps.

(9). Ensure slotted bushing is in place; then attach bellcrank to pedal bracket with bolt, two washers, nut and cotter pin.

(10). Ensure slotted bushings are in place; then fasten each link to bellcrank with bolt, two washers, nut and cotter pin.

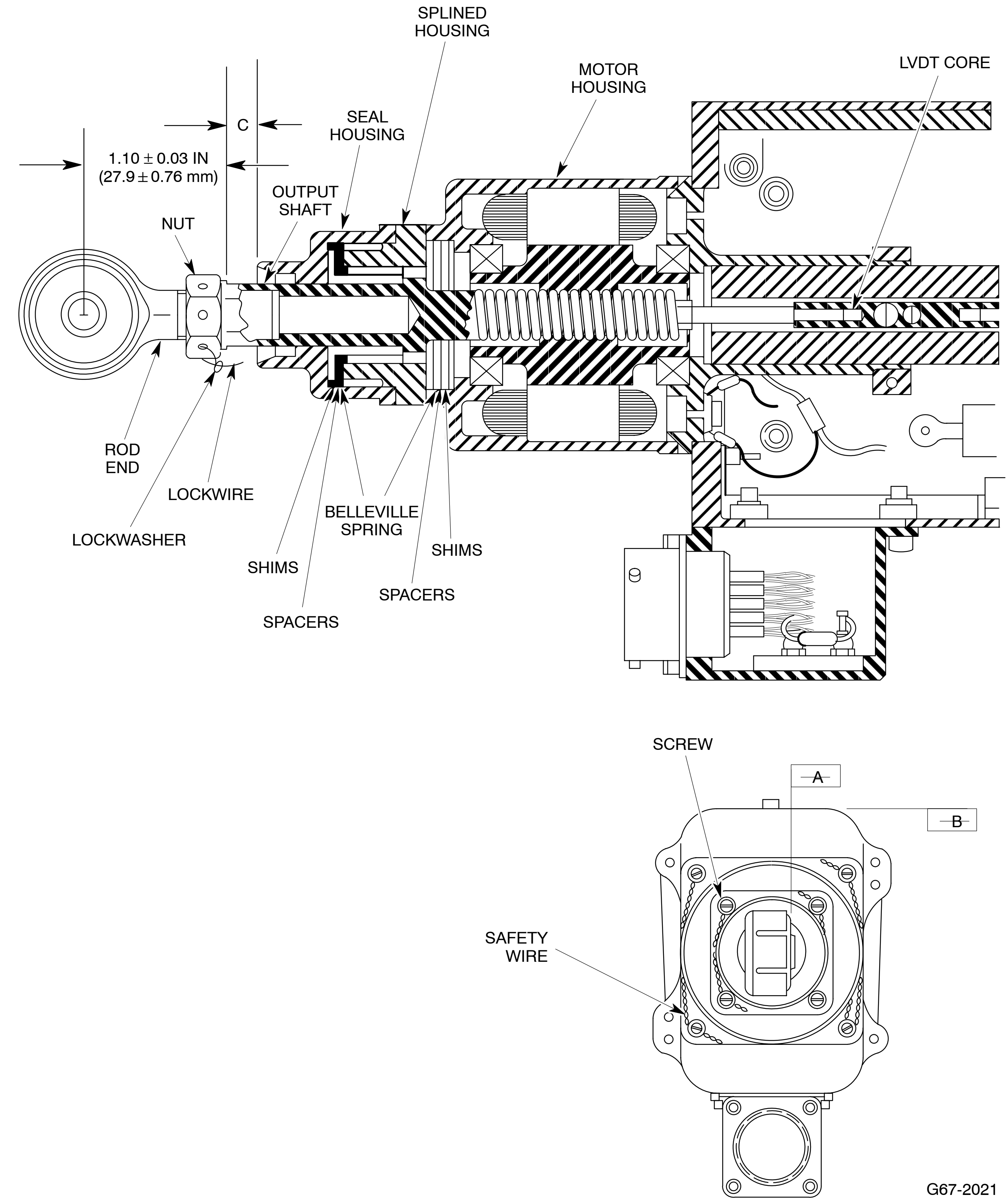

Figure 801. YSAS Actuator (Cross-Section View)

(11). Ensure slotted bushings are in place; then fasten each link in pedal arm lugs with bolt, two washers, nut and cotter pin.

(12). Ensure outboard pedals clear windows by a minimum of 0.20 inch (5.08 mm) with 20 pounds (9.07 kg) of force applied.

16. YSAS Actuator Regrease Procedure

A. YSAS Actuator Disassembly

(Ref. Figure 801)

CAUTION Do not attempt to loosen or tighten nut by grasping actuator shaft, damage to spline housing can occur.

(1). Cut and remove lockwire from nut; Loosen nut.

(2). Remove rod end, nut and lockwasher.

(3). Record output shaft orientation by marking the notch on the connector side of the shaft with a pencil.

(4). Measure endplay of the actuator as follows:

(a). Push the output shaft in towards the actuator housing by applying a load of 20 -100 lbs (9.07 - 45.36 kg).

(b). Using a depth gage, measure and record dimension “C”.

(c). Screw the rod end into the output shaft a few turns.

(d). Pull on the output shaft by applying a load of 20 -100 lbs (9.07 - 45.36 kg).

(e). Unscrew and remove the rod end without changing dimension “C”.

NOTE: If the variation in dimension “C” exceeds 0.013 inch (0.3302 mm), the actuator should be returned to the manufacturer for repair rather than regrease.

(f). Remeasure and record dimension “C”.

(5). Cut lockwire and remove the four screws that hold the seal housing and splined housing.

NOTE: It may be necessary to grasp the cylindrical portion of the seal housing or splined housing with a rubber-tipped clamping tool to loosen the housing because of primer applied to the screws at assembly.

(6). If there is an inspection seal at the housing joint, remove enough of the label so that it cannot get pinched between the housings when the actuator is re-assembled. Leave some of the label on the actuator to aid in re-assembly. If there is no inspection seal, use pieces of tape.

NOTE: Belleville spring, spacer and shims (if installed) are installed between the seal housing and splined housing.

(7). Remove seal housing and splined housing.

(8). Note the order of assembly of these parts.

(9). Measure and record the thickness of the spacer and the total thickness of the shims (if installed) to avoid confusion with the spacer and shims on the other side of the splined housing.

NOTE: The teflon washer attached to the end of the LVDT core is a close fit to the bore through the LVDT housing, it may be necessary to carefully tug a little to fully remove the shaft.

(10). Unscrew and remove the output shaft. This shaft has the LVDT core and associated hardware attached to it; Do not unscrew the nylon screw or the LVDT core.

(11). Note the orientation of the belleville spring, spacer and shims (if installed). Measure and record the thickness of the spacer and shims.

CAUTION Do not use any cleaning solvents. Damage to the motor bearings and the molybdenum disulfide finish on the acme nut and spline surfaces may occur.

(12). Wipe off old grease from all parts using lint-free cloth.

(13). Using cotton swabs, remove grease from acme nut area. Be sure to reach into the cavity just beyond the acme nut threads to remove grease deposits.

(14). Use the acme screw to remove grease from the acme nut threads.

(a). Run screw in and out, then wipe threads clean.

(b). Repeat above step until no more grease appears on screw threads.

B. YSAS Actuator Regrease and Reassembly

(Ref. Figure 801)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM111	Grease, aircraft
CM127	Grease, YSAS Actuator
CM318	Primer
CM731	Lockwire CRES

(1). Prior to applying new grease, re-assemble the output shaft with attached hardware (splined housing, belleville spring, spacer and shims (if installed)) to the actuator to avoid confusion at re-assembly.

(2). Remove and weigh output shaft with LVDT core and associated hardware attached; Record weight.

(3). Adjust scale up 2.5 grams.

(4). Apply special grease (CM127) to acme screw threads until scale is balanced again.

(5). Evenly distribute grease around the acme screw threads to form a fairly even cylinder in order to fit through the belleville spring without scraping off too much grease.

(6). With belleville spring, spacer and shims (if installed) in place within end bore in motor housing, carefully assemble greased output shaft to actuator.

(a). Screw in the shaft until the leading edge of the spline on the shaft is about flush with the end of the motor housing and oriented so that the splined housing can be put on in it's proper orientation.

(7). Apply grease (CM111) to splined surfaces of splined housing until grooves are completely full. Install splined housing as originally oriented.

(8). Apply film of grease (CM111) to smallest inside diameter of seal housing.

(9). With belleville spring, spacer and shims (if installed) in place within end bore of seal housing, slide seal housing into position over output shaft as originally oriented.

(10). Replace four screws which hold down seal housing; Use only NAS1352-04H8P screws.

(a). Install screws with wet primer (CM318).

(b). Torque screws to **9 inch-pounds (1.02 Nm)**.

(c). Using lockwire (CM731), safety screws.

(11). Re-install rod end, washer and nut with rod end face (surface "A") oriented at 90° ±2° with respect to surface "B". Torque nut to **170 - 200 inch-pounds (19.21 - 22.60 Nm)**.

(12). Using lockwire (CM731), safety nut to washer, washer may be oriented with lockwire end up or down.

Chapter

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Power Plant

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Section

71-00-00

Power Plant
(250-C20)

POWER PLANT
DESCRIPTION AND OPERATION

1. Power Plant Description

(1). MDHI 369D/E helicopters may be powered by either a 250-C20B or 250-C20R/2 turboshaft engine manufactured by the Allison Engine Company Inc.

(2). MDHI 500N helicopter is powered by a 250-C20R/2 turboshaft engine manufactured by the Allison Engine Company Inc.

(3). The engine is secured in the helicopter by three mount assemblies and accessed through two hinged, air-sealed doors.

(4). A belt-driven blower provides external cooling air through strategically positioned ducts that direct air onto engine exterior surfaces and through the engine and transmission oil cooler heat exchangers. Spent blower air is exhausted aft through an annular opening between the engine exhaust pipes and fuselage.

(5). Engine intake air may be filtered through a standard screen or optional air particle separator/mist eliminator assembly. Intake air is drawn through a plenum chamber and into the engine intake bell-mouth by the compressor. Engine compartment air is separated from compressor intake air by a seal ring.

2. Power Plant Operation

(1). Allison turboshaft engines installed in 369D/E - 500N model helicopters consist of a combined four stage axial and single stage centrifugal flow compressor, an annular combustion chamber and a four stage turbine system to extract power from the gas. A two-stage gas producer turbine drives the compressor, gas producer fuel control, accessory gear train and N_1 tachometer-generator. A two-stage power turbine drives the helicopter rotor system, governor control and N_2 tachometer-generator. A start counter is standard and part of the engine ignition system

(2). Allison Engine Operation and Maintenance Manuals are the primary information source for engine fault isolation and maintenance data (Ref. Sec. 01-00-00). Refer to these manuals for specific engine maintenance procedures.

(3). Starter operational limitations are in the applicable Pilot's Flight Manual.

3. Models 250-C20B and 250-C20R/2 Power Plant Fault Isolation

(Ref. Table 1)

(1). Check engine support systems, i.e.; chip detectors, instruments, fuel supply, electrical systems, etc., to ensure that helicopter equipment is functioning correctly before disassembling engine systems for an indicated fault.

(2). Inspect and isolate engine problems per the applicable Allison Engine Operation and Maintenance Manual.

Table 1. Power Plant Fault Isolation

Symptom	Probable Trouble	Corrective Action
High frequency vibration (1)	Loose engine mount bolts.	Retorque engine mount bolts to **100 - 140 inch-pounds (11.30 - 15.82 Nm)**.

NOTES:

(1) High frequency vibrations may be caused by other drive and rotor system components.

POWER PLANT
REMOVAL/INSTALLATION

1. Engine Removal

A. Engine Disconnecting for Removal

(Ref. Figure 401 and Figure 402)

WARNING **After each opening, removal or replacement of any part of the engine and/or aircraft fuel system between the aircraft fuel tank and the engine fuel nozzle, the fuel system must be bled to remove trapped air. Failure to comply with this procedure can result in engine flameout or power loss.**

CAUTION Cap fluid lines and fittings with approved devices. Do not use tape to cover fuel and oil openings. Tape adhesives loosened by fuel or oil can contaminate systems.

(1). Set all switches **OFF**. Disconnect external power. Disconnect battery.

NOTE: Tag all hardware, wire terminals, fuel and oil lines before removal to expedite engine installation. Identify and bag loose parts to prevent loss or damage.

(2). Remove main transmission drive shaft (Ref. Sec. 63-10-00).

(3). Remove engine exhaust pipes (Ref. Sec. 78-20-00). Cover engine exhaust outlet.

(4). Disconnect electrical wiring from engine;

(a). Disconnect engine electrical harness ground lead and plug from receptacle.

(b). Disconnect thermocouple wire leads from terminal studs on engine compartment door frame (Ref. Figure 401, view C).

(c). Remove thermocouple lead clamps from door frame and exhaust pipe clamp.

(d). Disconnect terminals E, C, and B from starter-generator.

(e). Disconnect ground jumper at center firewall stud.

(f). Unclamp and remove electrical harness from right engine mount (369D only).

(5). Remove combustion chamber drain line from burner drain valve.

(6). Disconnect fuel inlet line from engine.

(7). Disconnect fuel pump seal drain line.

(8). Disconnect compressor cabin air bleed outlet tube from tee fitting on engine compressor scroll.

(9). Loosen compressor cooling air ducts at firewall coupling and engine oil cooler deflector coupling (Ref. Sec. 71-60-00).

(10). Disconnect duct support bracket at hoisting eye. Remove ducts from engine compartment (Ref. Figure 401, view B).

(11). Disconnect torque-meter oil line from firewall.

(12). Disconnect oil pressure indicator line from firewall.

(13). Disconnect N_2 control rod from idler bellcrank. Secure control rod to firewall.

(14). Disconnect anti-icing system as follows:

(a). <u>Model 250-C20B</u>;
Disconnect anti-ice control valve lever (Ref. Figure 401, view A).

(b). <u>Model 250-C20R/2</u>:
Remove electrical connector from anti-ice solenoid valve. Unclamp and remove wiring harness from horizontal firewall shield.

(15). Disconnect N_1 control rod from gas producer lever. Secure control rod to firewall.

(16). Disconnect accessory drive vent tube.

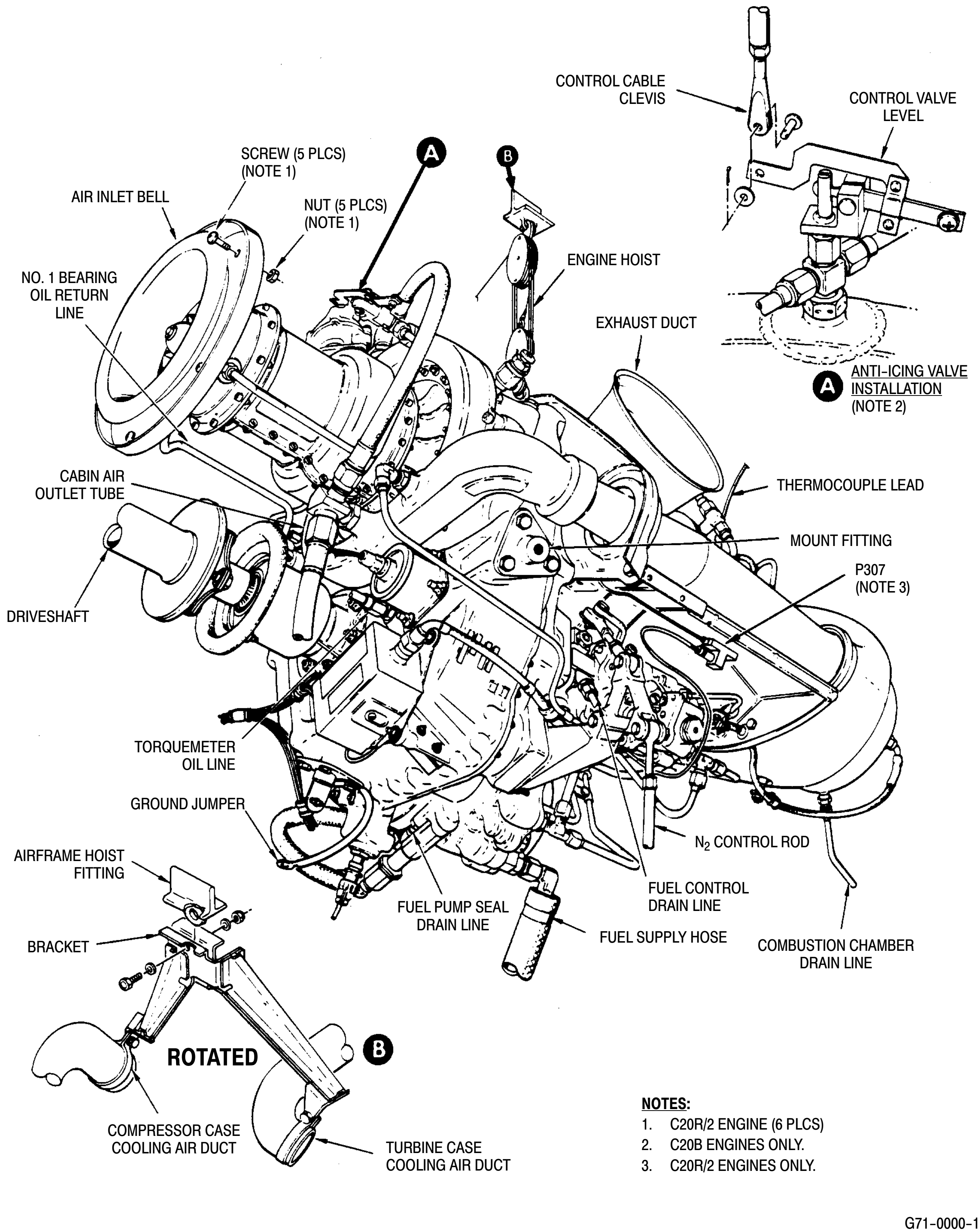
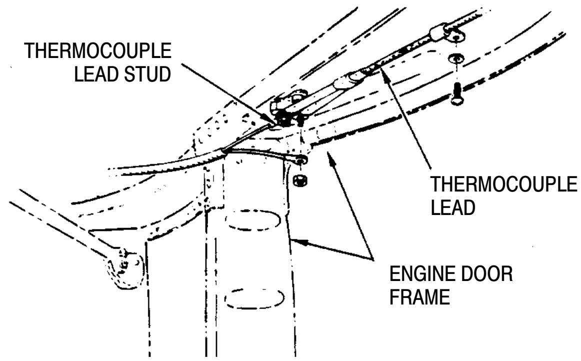


Figure 401. Allison 250-C20B and 250-C20R/2 Engine Removal and Installation (Sheet 1 of 2)



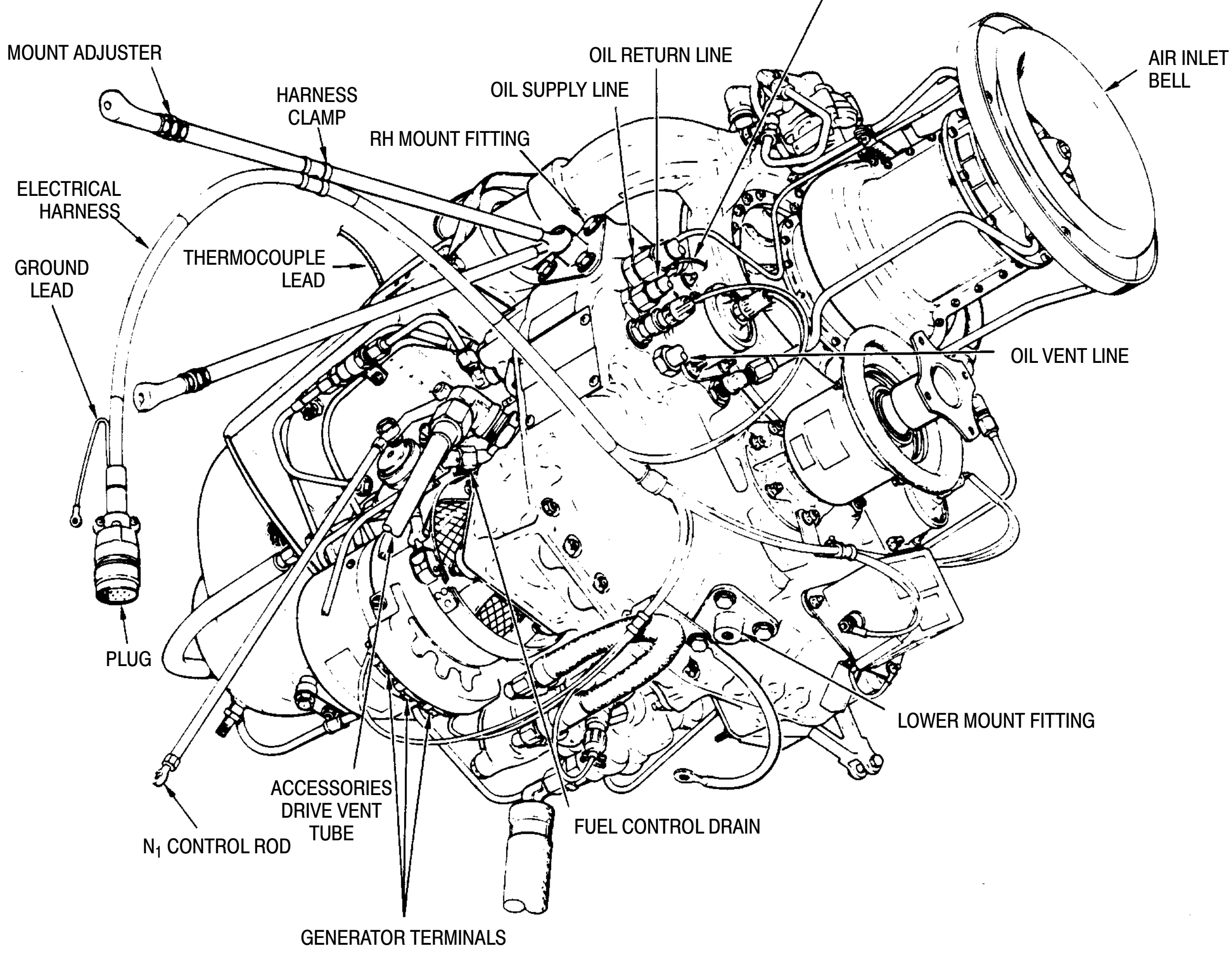


Figure 401. Model 250-C20B and 250-C20R/2 Engine Removal and Installation (Sheet 2 of 2)

(17). Disconnect fuel control drain line.

CAUTION The oil cooler is fragile. Unless otherwise required, disconnect oil supply and return lines only at engine. Support oil cooler port boss with a backup wrench when oil line removal is required. Do not strain or bend unsupported tubes.

(18). Disconnect and cap engine oil inlet, outlet and vent lines.

B. Removal of Disconnected Engine

(Ref. Figure 401 and Figure 402)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST401	Engine stand
ST402	Engine hoist

CAUTION

- Do not remove engine mounts or disturb engine mount adjustments to remove the engine (Ref. CSP-SRM-6).
- Engine-transmission alignment must be inspected and realigned whenever one or more engine mount assemblies is replaced or the existing engine- transmission alignment adjustment is disturbed. Do not disturb adjustable engine mount fittings unless an engine- transmission alignment check is planned.

(1). Install engine hoist apparatus (ST402) between airframe hoist fitting and engine hoist eye.

(2). Have an assistant apply tension to engine with hoist.

(3). Maintain downward pressure on rear of engine during mount bolt removal. Unbolt lower engine mount assembly from engine fitting.

(4). Unbolt left and right engine mount assemblies from engine fittings.

CAUTION Do not use fuel or oil lines as hand holds. Do not allow engine to strike airframe while maneuvering it out of the helicopter.

(5). Align engine stand (ST401) under engine with adjustable support shaft on left side (Ref. Figure 402).

(6). Slowly lower engine out of helicopter. Align engine side mount fittings between fixed and adjustable support shafts.

(7). Screw in adjustable support shaft until engine mount fittings are securely engaged with support shaft sockets.

(8). Insert detent pin through adjustable support shaft.

(9). Remove hoist from engine lift fitting.

(10). If engine is to be stored or transported, secure upper end of engine stand transport and storage bar to engine lifting eye fitting.

2. Engine Installation

A. Engine Installation in Mounts

(Ref. Figure 401 and Figure 402)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM702	Lockwire CRES

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST402	Engine hoist

(1). Open engine access doors.

(2). Position engine to line up engine lifting eye under airframe lift fitting.

(3). Remove detent pin from adjustable support shaft on engine stand. Detach transport and storage bar from engine lift fitting.

(4). Install engine hoist (ST402) between airframe fitting and engine hoist fitting.

(5). Have an assistant tension hoist to support engine. Unscrew engine stand adjustable support shaft.

(6). Move engine to disengage fixed shaft. Roll stand away from engine.

CAUTION

- Do not use tubes or hoses as hand holds. Do not allow engine to strike airframe. Avoid damaging engine intake bell.
- Prevent FOD, ensure that no foreign objects are trapped in firewall seal ring.

(7). Have hoist operator raise engine while while pushing down to maintain correct helicopter and engine alignment.

(8). Align left and right engine mount assemblies with engine mount fittings and install bolts and washers (Ref. Figure 403). Torque bolts to **100 - 140 inch-pounds (11.30 - 15.82 Nm)**. Safety bolts to engine mounts using lockwire (CM702).

(9). Align hole in lower engine mount assembly with engine mount fitting and install bolt and washer. Torque bolt to **100 - 140 inch-pounds (11.30 - 15.82 Nm)**. Safety bolt to engine mount using lockwire (CM702).

(10). Ensure engine air inlet firewall seal ring contacts firewall seal around its entire circumference.

(11). Remove hoist from helicopter.

B. Connecting an Installed Engine

(Ref. Figure 401 and Figure 402)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM702	Lockwire CRES

WARNING **Proper tightening of engine tubing connections is critical to flight safety. Correct torque values must be used at all times. Excessive torque on fuel or pneumatic sensing system connections can result in cracking of the flare causing an air leak which can cause flameout, power loss, or overspeed.**

(1). Connect torque-meter oil line to firewall.

(2). Connect oil pressure gauge line to firewall.

(3). Connect engine oil vent line. Torque line nut to **120 - 140 inch-pounds (13.56 - 15.82 Nm)** (Ref. Figure 401).

CAUTION Do not bend oil return line. Bending loads are transferred to oil cooler port and may fracture cooler.

(4). Connect engine oil inlet and outlet lines. Hand-tighten until snug. Wrench-tighten approximately 1/4 turn or until definite resistance is felt.

(5). Position accessory drive vent elbow and connect with vent tube. Torque elbow jamnut to **150 - 250 inch-pounds (16.95 - 28.25 Nm)**. Torque tube nut to **20 - 30 inch-pounds (2.26 - 3.39 Nm)** (Ref. Figure 402, detail B).

(6). Connect N_1 control rod to lever with bolt, two washers and nut. Install bolt with head outboard, one standard OD washer under nut and one large 0.80 inch (20.32 mm) diameter washer under bolt head. Torque nut to **40 - 45 inch-pounds (4.52 - 5.08 Nm)**. Install a new cotter pin.

(7). Connect short N_2 control rod to governor lever with bolt head up, one standard OD washer under head and one large 0.80 inch (20.32 mm) OD washer under nut. Install a new cotter pin. Connect long N_2 control rod with bolt head forward, two washers and nut. Install a new cotter pin.

(8). Connect engine fuel pump seal drain line. Torque tube nut to **20 - 30 inch-pounds (2.26 - 3.39 Nm)**.

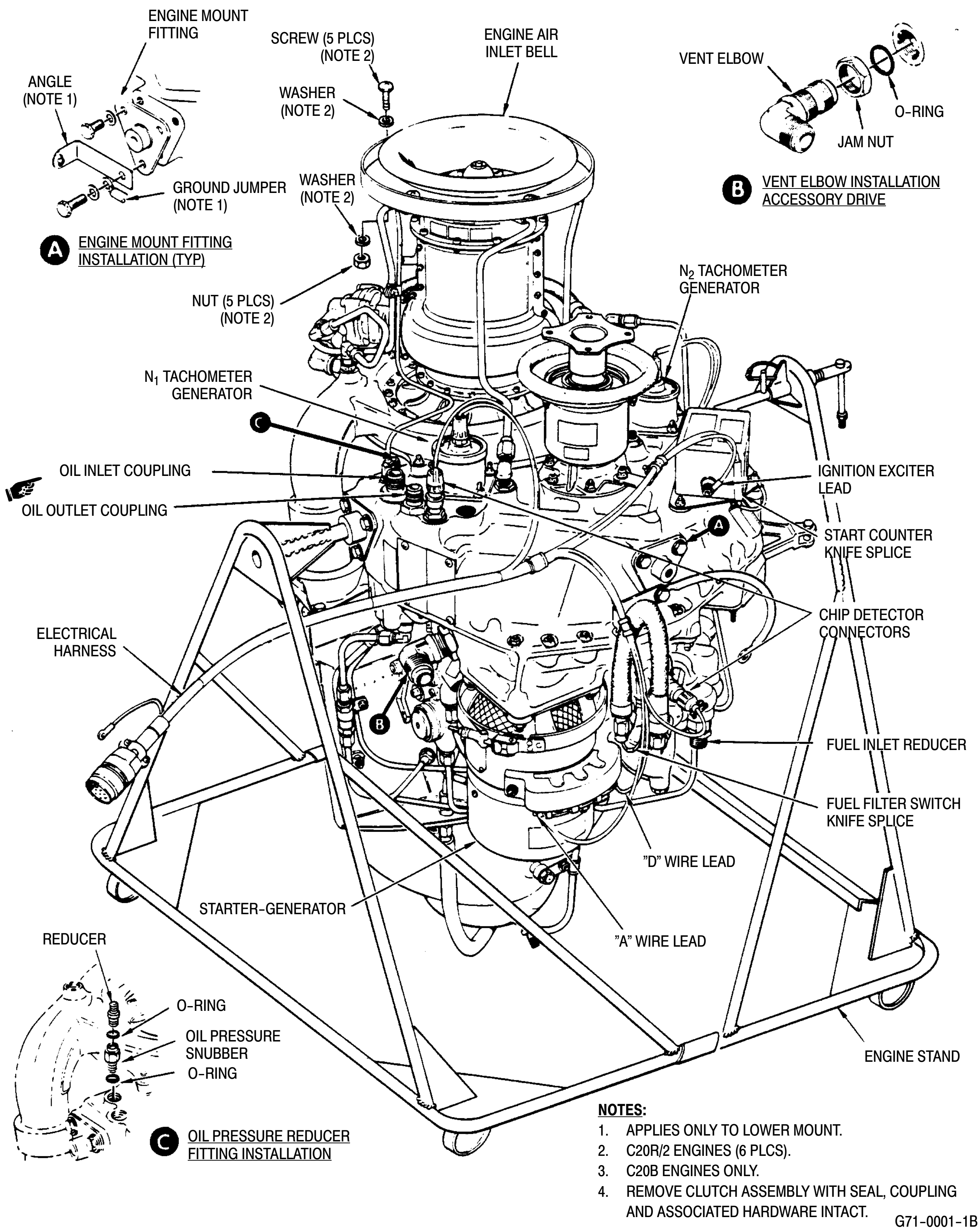


Figure 402. Model 250-C20B and 250-C20R/2 Engine Stripping and Buildup (Sheet 1 of 2)

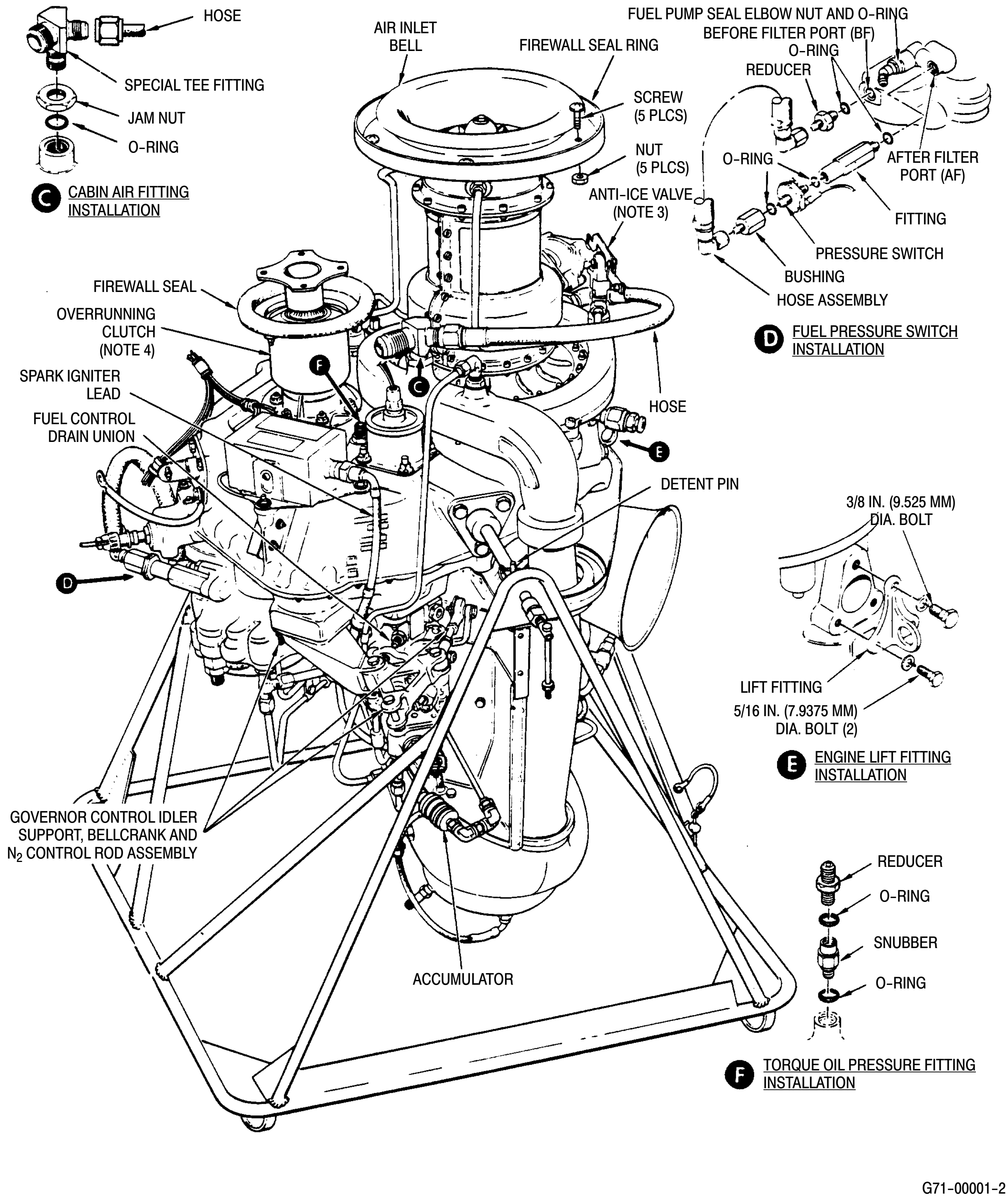


Figure 402. Model 250-C20B and 250-C20R/2 Engine Stripping and Buildup (Sheet 2 of 2)

(9). Connect fuel inlet line to fuel pump. Torque hose nut to **230 - 260 inch-pounds (25.99 - 29.38 Nm)**.

NOTE: Ensure burner drain valve and plug are installed in combustion chamber with an O-ring on each part. Ensure drain valve is in the aft (lowest) position.

(10). Install combustion chamber drain line on drain valve.

(11). Connect fuel control drain line. Torque drain line nut to **20 - 30 inch-pounds (2.26 - 3.39 Nm)** (Ref. Figure 401).

(12). Connect anti-ice system as follows:

(a). Model 250-C20B:
Connect anti-icing control cable to anti-icing control valve lever with clevis pin and washer. Secure with cotter pin (Ref. Figure 401, detail A).

(b). Model 250-C20R/2:
Install connector P307 to anti-ice solenoid valve and secure anti-icing wiring harness with clamps.

(13). Install cooling air ducts and air duct support bracket on hoisting eye above engine. Connect and tighten ducts on firewall coupling and oil cooler deflector.

(14). Secure engine electrical harness to engine mount with cushioned loop clamp. Connect harness plug to receptacle and safety with lockwire (CM702).

(a). Install engine harness ground lead.

(b). Install E, C, and B generator leads on starter-generator terminal block with washers and nuts.

(c). At lower engine mount fitting; install bonding jumper on engine compartment firewall stud. Torque bolt to **100 - 140 inch-pounds (11.30 - 15.82 Nm)**. Safety bolt to engine mount using lockwire (CM702).

(15). Install engine exhaust pipes and thermocouple clamp support.

(16). Attach thermocouple clamps in frame and leads to terminal block studs located on right upper engine door frame with chromel and alumel nuts.

(17). Install main transmission drive shaft (Ref. Sec. 63-10-00).

(18). Remove all identifying tags from wires and hardware.

CAUTION Misrigging of throttle controls can cause inadvertent flameout when throttle is rapidly closed to the idle position.

(19). Rig gas producer (N_1) and power turbine (N_2) controls (Ref. Chap. 76).

WARNING **After each opening, removal or replacement of any part of the engine and/or aircraft fuel system between the aircraft fuel tank and the engine fuel nozzle, the fuel system must be bled to remove trapped air. Failure to comply with this procedure can result in engine flameout or power loss.**

(20). Perform fuel system bleed.

(21). Perform an engine deceleration check per the Pilot's Flight Manual.

NOTE: Make engine adjustments per the Allison Engine Operation and Maintenance Manual.

(22). Perform an anti-icing system operational check (Ref. Sec. 75-10-00).

(23). Inspect engine installation and connections for proper routing and security.

3. Engine Stripping

(Ref. Figure 402)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST401	Engine stand
ST402	Engine hoist

(1). Install engine in engine stand (ST401).

(2). Disconnect wire leads from generator A and D terminals.

(a). Loosen mounting clamp and remove starter-generator.

(b). Remove mounting flange and gasket.

(c). Install cover on generator mounting pad.

(3). Disconnect electrical connectors from:

(a). Chip detectors.

(b). Tachometer generators.

(c). Ignition exciter.

(d). Start counter.

(e). Fuel filter pressure switch.

(f). Unclamp and remove electrical harness from overrunning clutch and lower engine mount fitting.

(g). Remove entire engine electrical harness.

NOTE: Discard all used O-ring packings.

(4). Remove fuel supply and return reducers/unions.

(5). Remove oil supply and return reducers/unions.

(6). Remove accessories drive vent elbow and jamnut.

(7). Remove compressor bleed air hose, tee and jamnut (Ref. Figure 402. view C).

(8). Remove oil pressure reducer/snubber.

(9). Remove torque-meter reducer/snubber.

(10). Remove N_1 and N_2 tachometer generators and gaskets.

(11). Remove fuel pressure switch installation as follows:

(a). Remove hose, reducer and O-ring from before filter (BF) port (Ref. Figure 402, view D).

(b). Remove bushing, fuel pressure switch, fitting and O-rings from after filter (AF) port.

(12). Remove engine air inlet bell and firewall seal.

(13). Model 250-C20B Only:
Remove anti-icing valve lever assembly from poppet guide (Ref. Figure 401, view A).

(14). Remove fuel pump seal drain port elbow and jamnut.

(15). Remove governor control idler support, bellcrank and short N_2 control rod as an assembly. Install vacuum/hydraulic pump pad cover.

(16). Remove overrunning clutch and firewall seal. Install cover on engine pad.

(17). Remove fuel control drain fitting.

(18). Remove pneumatic line accumulator per Allison installation bulletin (Ref. Sec. 01-00-00).

(19). Hoist (ST402) engine out of engine stand.

(20). Unbolt and remove engine mount fittings.

(21). Install engine in shipping container.

(22). Remove engine hoist fitting.

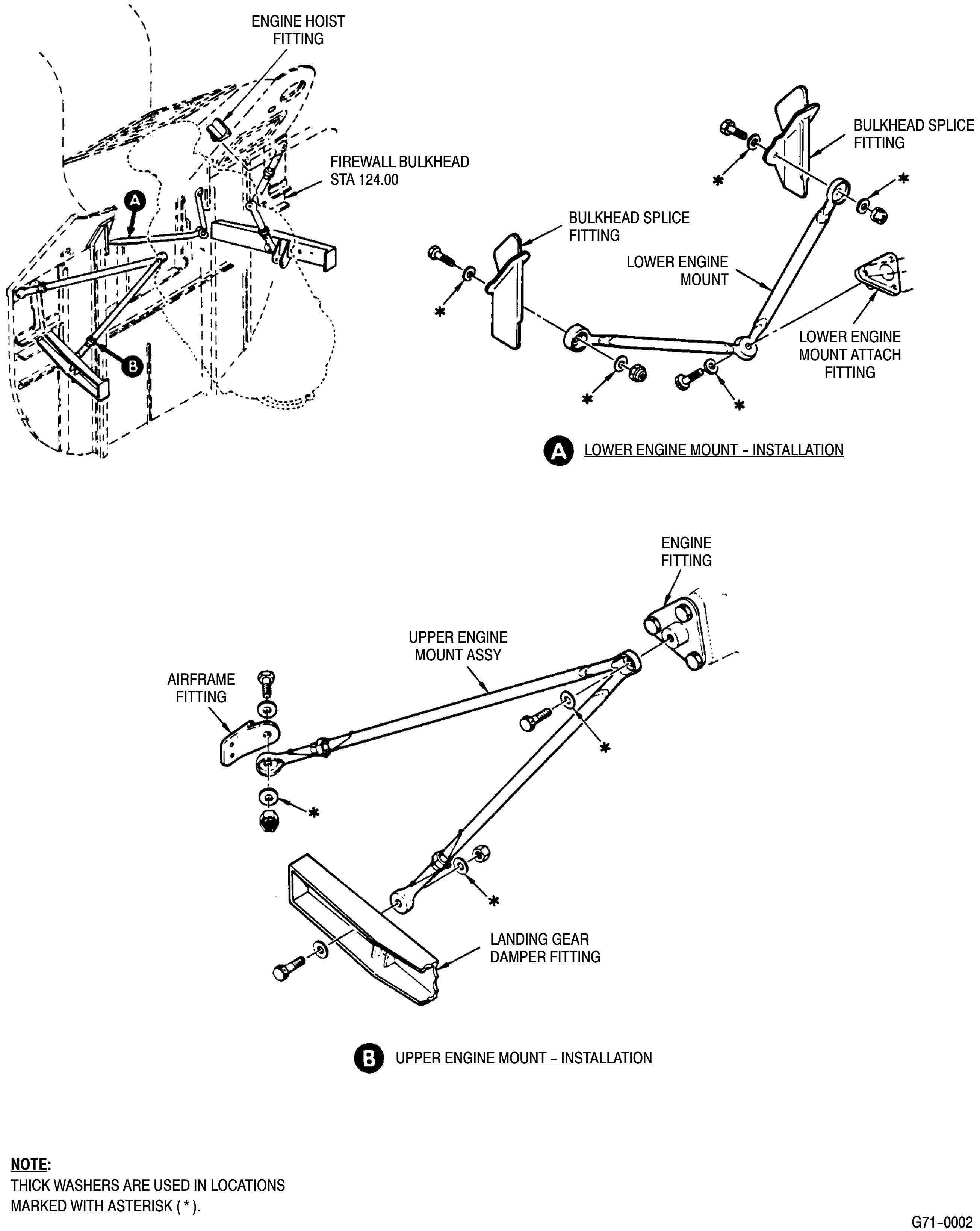


Figure 403. Model 250-C20B and 250-C20R/2 Engine Mounts and Airframe Fittings

4. Engine Buildup

(Ref. Figure 402 and Figure 403)

WARNING **Proper tightening of engine tubing connections is critical to flight safety. Correct torque values must be used at all times. Excessive torque on fuel or pneumatic sensing system connections can result in cracking of the flare causing an air leak which can cause flameout, power loss, or overspeed.**

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM113	Anti-seize compound low temperature
CM114	Petrolatum
CM118	Grease
CM502	Sleeving, fiberglass
CM702	Lockwire CRES
CM808	Lacing cord

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST401	Engine stand

(1). Review Allison instructions for removing engine from shipping container in Allison Operation and Maintenance Manual.

CAUTION Prevent FOD Inspect and clean all accessories and hardware prior to installing parts on engine.

NOTE: Replace O-rings and gaskets with new parts. Lubricate fuel line packings with clean jet fuel or petrolatum (CM114) prior to installation. Lubricate oil line packings with clean engine oil prior to installation. Apply a thin coating of anti- seize compound (CM113) to the male threads of unions and fittings before torquing.

(2). Install engine hoist lift fitting and bolts. Torque 3/8 inch-diameter bolt to **160 - 190 inch-pounds (18.08 - 21.47 Nm)**. Torque 5/16 inch-diameter bolts to **140 - 160 inch-pounds (15.82 - 18.08 Nm)**.

(3). Hoist engine clear of shipping container.

(4). Inspect engine as follows:

(a). If shipping container moisture indicator was other than a light blue color, examine engine for corrosion. Perform corrosion corrective maintenance per Allison Operation and Maintenance Manual as required.

(b). Inspect inlet guide vanes for damage.

(c). Exhaust and inlet openings for FOD.

(d). Turbine blades for damage.

(e). Install covers over intake and exhaust ports.

(f). All fasteners for security, slippage marks for alignment, potting compound and, or correctly installed lockwire where applicable.

(g). Tubes and hoses for damage.

(5). Record engine serial number and start-counter reading in appropriate log.

CAUTION Prevent damage to machined surfaces and contamination. Remove covers from engine one at a time as required by the installation sequence.

(6). Install lower engine mount fitting with angle and ground wire under aft bolt head. Install side engine mount fittings, bolts and washers. Torque bolts to **140 - 160 inch-pounds (15.82 - 18.08 Nm)**. Install lockwire (CM702).

(7). Install engine in engine stand (ST401).

(8). Install accumulator in pneumatic line per Allison installation bulletin (Ref. Sec. 01-00-00).

(9). Install fuel control drain fitting and O-ring.

(10). Remove overrunning clutch pad cover. Install overrunning clutch, firewall seal and engine electrical harness angle and clamp (Ref. Sec. 63-10-00).

(11). Install oil pressure gauge reducer/snubber and O-ring.

(12). Install torque-meter reducer/snubber and O-ring.

CAUTION Engine spark igniter wire lead may obstruct governor arm on a new or overhauled engine.

(13). Reroute engine spark igniter lead below governor as shown (Ref. Figure 402). Support igniter lead only with cushioned clamps and existing fasteners. Replace and, or add clamps as required.

(14). Remove vacuum/hydraulic pump pad cover from gear case.

(15). Install governor control idler support, bellcrank and short N_2 control rod as an assembly. Do not connect control rod to governor lever.

CAUTION Only high temperature all metal self locking nuts shall be used to fasten governor control idler support bracket to engine accessory pad.

(16). Install elbow with O-ring and jamnut in fuel pump seal drain port.

(17). Model 250-C20B Only:
Install anti-icing valve lever with attaching hardware on poppet guide. Position poppet guide so that lever is parallel with top of engine.

(18). Install engine air inlet bell and firewall seal.

(19). Install fuel pressure switch fitting and O-ring in fuel pump AF port (Ref. Sec. 28-00-00).

CAUTION Ensure both halves of the fuel filter pressure switch are gripped by wrench when torquing the installation. An asymmetrical wrench grip may cause shearing motion between assembly halves. Such damage may result in leakage or failure to operate **FUEL FILTER** caution/warning light, or both.

(a). Install fuel filter pressure switch and O-ring.

(b). Install bushing and O-ring on switch.

(c). Install reducer and O-ring in BF port.

(d). Install hose assembly between AF and BF fittings.

(20). Lubricate splines with grease (CM118) and install N_1 and N_2 tachometer generators. Install washers and nuts. Torque nuts to **70 - 90 inch-pounds (7.91 - 10.17 Nm)**.

(21). Install special tee, jamnut and O-ring in compressor scroll bleed air port. Do not torque at this time.

(22). Install hose between special tee and compressor bleed air elbow. Torque tee jamnut. Torque hose nuts to **150 - 250 inch-pounds (16.95 - 28.25 Nm)**.

(23). Install accessory gear case vent elbow, jamnut and O-ring. Do not torque at this time.

(24). Install oil inlet and outlet couplings and O-rings.

(25). Install fuel inlet reducer and O-ring.

(26). Install starter/generator.

CAUTION Always support the weight of the starter/generator during removal/installation. Damage can occur if weight is supported by the shear shaft.

(a). Remove starter/generator pad cover. Install starter/generator mount with gasket, washers and nuts. Torque nuts to **100 - 140 inch-pounds (11.29 - 15.81 Nm)**.

(b). Install starter/generator with V-clamp. Torque clamp nut to **50 inch-pounds (5.64 Nm)**.

(c). Tap around clamp with a rawhide mallet to seat clamp on flange. Retorque clamp nut to **50 inch-pounds (5.64 Nm)**.

(d). Continue tapping around clamp and retorquing clamp nut until nut no longer turns when specified torque is applied.

(27). Clamp engine electrical harness to lower engine mount and starter-generator.

(28). Connect ignition exciter wire lead and starter-generator A and D wire leads.

(29). Attach electrical connectors to both chip detectors and safety with lockwire (CM702).

(30). Connect N_1 and N_2 tachometer generators connectors.

(31). Connect start counter lead and fuel pressure switch wire lead splices. Install fiberglass sleeving (CM502) over splices and secure with high temperature lacing cord (CM808).

5. Modification of Accessory Drive Gearbox Overboard Vent Tube (SN 0004D - 0519D)

(Ref. Figure 404) The following procedure adds a four inch extension tube to the existing engine accessory drive gearbox vent tube to reduce oil spattering onto the lower fuselage.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM425	Sealing compound

(1). Disconnect accessory drive overboard vent tube from elbow on engine accessory case; remove vent tube from helicopter.

(2). Install extension tube to existing vent tube as follows:

(a). Position extension tube over vent tube. Drill rivet holes in line thru tubing.

(b). Apply sealant (CM425) between tubes. Install two NAS1738B4-2 rivets. Fillet seal around circumference of tubes.

(3). Remove existing grommet at lower fuselage Sta. 127.00 and install new MS35489-22 grommet.

(4). Insert extension tube thru grommet and connect vent tube to elbow on engine accessory case. Torque line nut to **120 - 140 inch-pounds (13.56 - 15.82 Nm).**

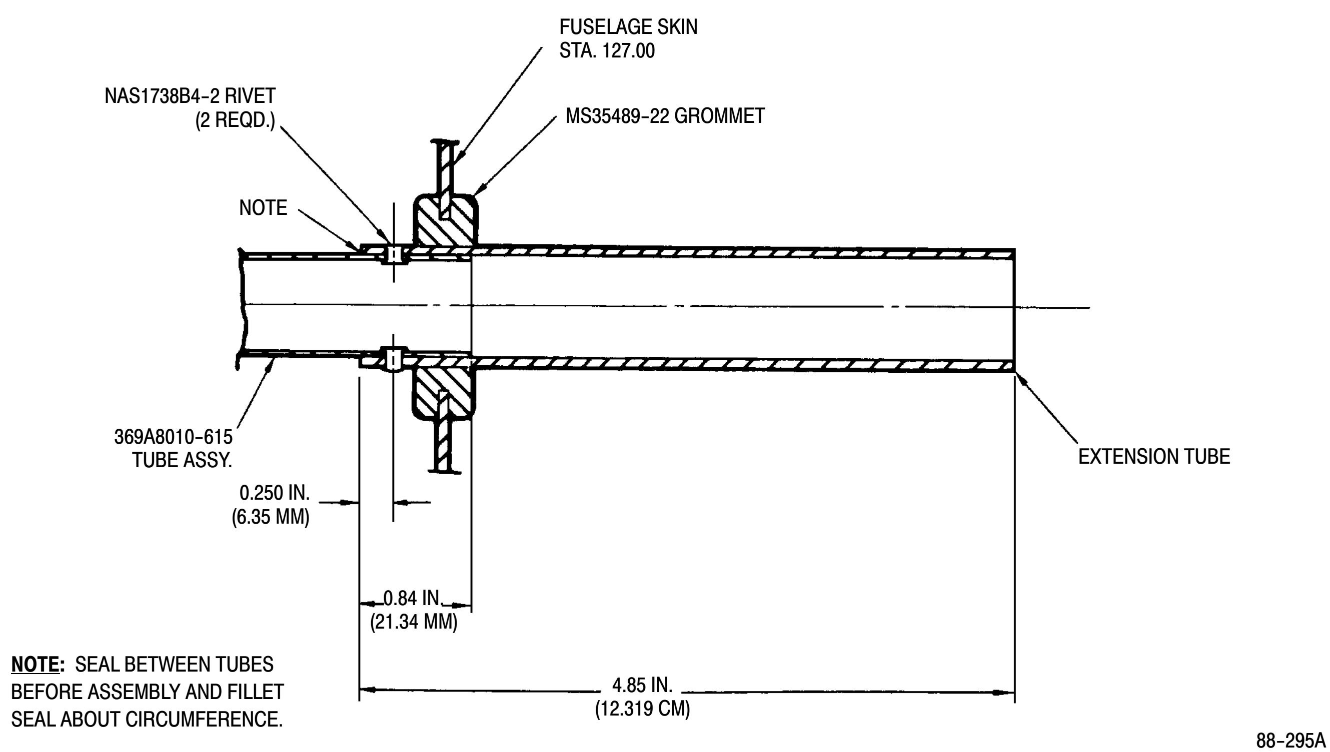


Figure 404. Extension of Engine Accessory Drive Overboard Vent Tube

Section

71-00-30

Power Plant (250-C30)

POWER PLANT
DESCRIPTION AND OPERATION

1. Power Plant Description

(1). MDHI 369FF helicopter is powered by a 250-C30 turboshaft engine manufactured by the Allison Engine Company Inc.

(2). The engine is secured in the helicopter by three mount assemblies and accessed through two hinged, air-sealed doors.

(3). A belt-driven blower forces external cooling air through strategically positioned ducts that direct the air onto engine exterior surfaces and through the engine and transmission oil cooler heat exchangers. Spent cooling air is exhausted aft through an annular opening between the engine exhaust duct and fuselage.

(4). Engine intake air may be filtered through a standard screen or optional air particle separator/mist eliminator assembly. Intake air is drawn through a plenum chamber and into the engine intake bell-mouth by the compressor. Engine compartment air is separated from compressor intake air by a seal ring.

2. Power Plant Operation

(1). The Allison 250-C30 turboshaft engine consists of a single stage centrifugal flow compressor, a can-annular combustion chamber, a two-stage gas producer turbine driving the compressor, N_1 tachometer-generator and accessory gear train, and a two-stage power turbine driving the spare accessory pad, governor, N_2 tachometer-generator and helicopter rotor system. An overrunning clutch, drive shaft, starter generator, fuel, oil, drain and bleed air lines, exhaust ducting, mounting and hoist fittings and control levers adapt the engine to the helicopter.

(2). Allison Engine Operation and Maintenance Manuals are the primary information source for engine fault isolation and maintenance data (Ref. Sec. 01-00-00). Refer to these manuals for specific engine maintenance procedures.

(3). Starter operational limitations are in the applicable Pilot's Flight Manual.

3. Model 250-C30 Power Plant Fault Isolation

(Ref. Table 1)

(1). Check engine support systems, i.e.; chip detectors, instruments, fuel supply, electrical systems, etc., to ensure that helicopter equipment is functioning correctly before disassembling engine systems for an indicated fault.

(2). Inspect and isolate engine problems per the applicable Allison Engine Operation and Maintenance Manual.

Table 1. Power Plant Fault Isolation

Symptom	Probable trouble	Corrective action
High frequency vibration (1)	Loose engine mount bolts	Retorque engine mount bolts to **100 - 140 inch-pounds (11.30 - 15.82 Nm)**.

NOTES:

(1) High frequency vibrations may be caused by other drive and rotor system components.

POWER PLANT REMOVAL/INSTALLATION

1. Engine Removal

A. Engine Disconnecting for Removal

(Ref. Figure 401 and Figure 402)

WARNING **After each opening, removal or replacement of any part of the engine and/or aircraft fuel system between the aircraft fuel tank and the engine fuel nozzle, the fuel system must be bled to remove trapped air. Failure to comply with this procedure can result in engine flameout or power loss.**

CAUTION Cap fluid lines and fittings with approved devices. Do not use tape to cover fuel and oil openings. Tape adhesives loosened by fuel or oil can contaminate systems.

(1). Set all switches OFF. Disconnect external power. Disconnect battery.

NOTE: Tag all hardware, wire terminals, fuel and oil lines before removal to expedite installation. Identify and bag loose parts to prevent loss or damage.

(2). Remove main transmission drive shaft (Ref. Sec. 63-10-00).

(3). Remove engine exhaust duct (Ref. Sec. 78-30-00). Cover engine exhaust outlet.

(4). On left engine compartment door frame; unclamp and disconnect thermocouple wire leads from terminal studs (Ref. Figure 401, view B).

(5). Unplug engine-airframe electrical harness connector from engine receptacle.

(6). Disconnect thermal switch plug from firewall.

(7). Loosen and remove remaining engine cooling air ducts from engine compartment (Ref. Figure 402, views A and D).

(8). Remove combustion chamber drain line from burner drain valve.

(9). Disconnect fuel inlet line at engine-mounted fuel pump and cap line.

(10). Disconnect and remove fuel pump seal drain line.

(11). Disconnect and remove fireshield drain line.

(12). Disconnect fuel control vent line and cap line.

(13). Disconnect customer bleed line at firewall.

(14). Disconnect torque-meter oil line from firewall.

(15). Disconnect oil pressure indicator line from firewall.

(16). Disconnect N_2 control rod from idler bellcrank. Secure control rod to firewall.

(17). Disconnect N_1 control rod from gas producer lever. Secure control rod to firewall.

(18). Disconnect and remove starter-generator cooling air duct from starter and fuselage bracket.

CAUTION The oil cooler is fragile. Unless otherwise required, disconnect oil supply and return lines only at engine. Support oil cooler port boss with a backup wrench when oil line removal is required. Do not strain or bend unsupported tubes.

(19). Disconnect and cap engine oil inlet, outlet and vent lines.

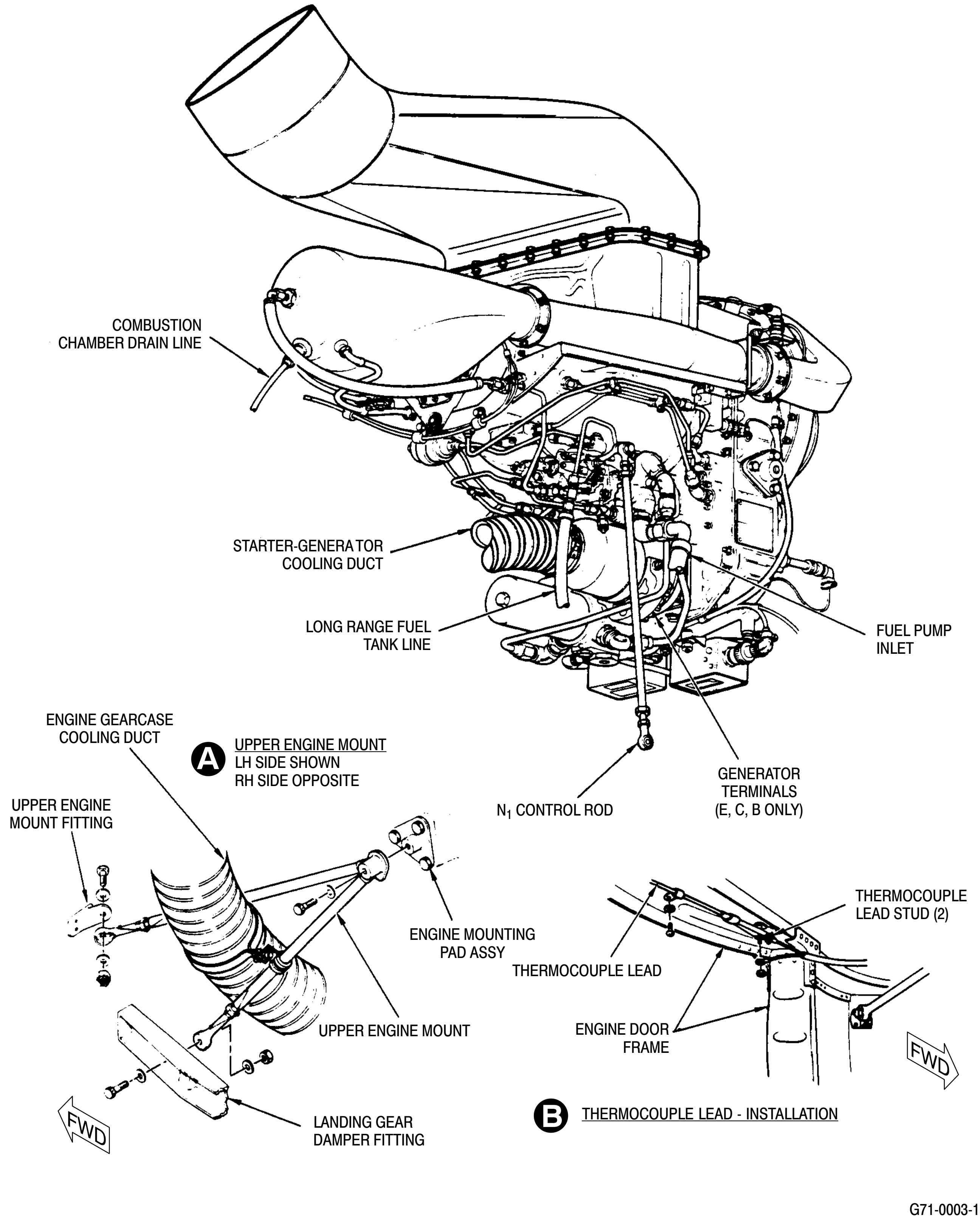


Figure 401. Model 250-C30 Engine Removal and Installation (Sheet 1 of 2)

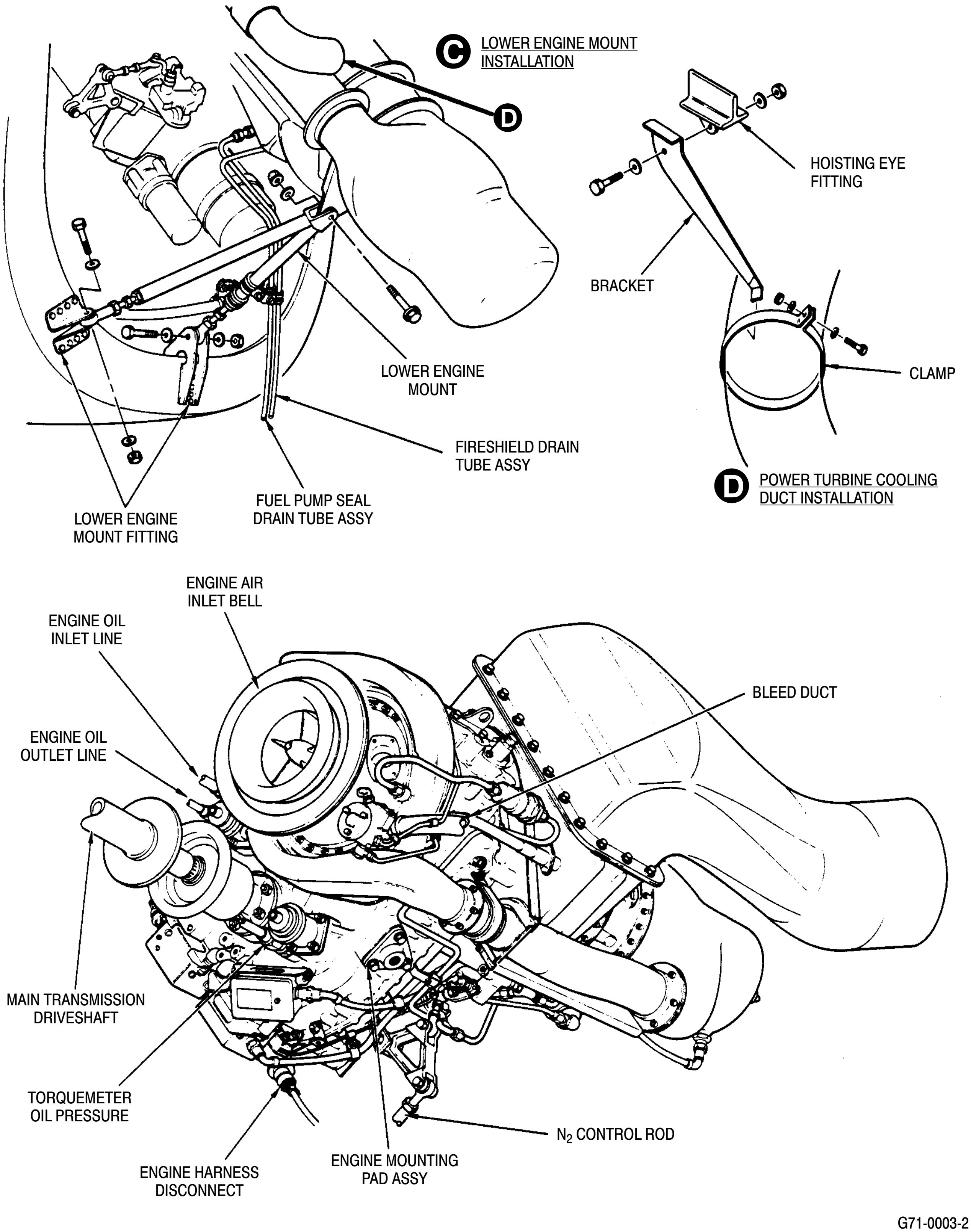


Figure 401. Model 250-C30 Engine Removal and Installation (Sheet 2 of 2)

B. Removal of Disconnected Engine

(Ref. Figure 401 and Figure 402)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST401	Engine stand
ST402	Engine hoist

CAUTION

- Do not remove engine mounts or disturb engine mount adjustments to remove engine.
- Engine-transmission alignment shall be inspected whenever one or more engine mount assemblies is replaced or the existing alignment is disturbed. Do not disturb adjustable engine mount fittings unless an engine-transmission alignment check is planned.

(1). Install engine hoist apparatus (ST402) between engine hoist eye and airframe hoist fitting.

(2). Have an assistant apply tension to engine with hoist.

(3). Maintain downward pressure on rear of engine during mount bolt removal. Unbolt engine at lower engine mount fitting. Take care not to damage rod end bearings.

(4). Unbolt left and right engine mount assemblies from engine fittings.

CAUTION Do not use fuel or oil lines as hand holds. Do not allow engine to strike airframe while maneuvering it out of the helicopter.

(5). Align engine stand (ST401) under engine with adjustable support shaft on left side.

(6). Slowly lower engine out of helicopter. Align engine side mount fittings between fixed and adjustable support shafts.

(7). Screw in adjustable support shaft until engine mount fittings are securely engaged with support shaft sockets.

(8). Insert detent pin through adjustable support shaft.

(9). Remove hoist from engine lift fitting.

(10). If engine is to be stored or transported, secure upper end of engine stand transport and storage bar to engine lifting eye fitting.

2. Engine Installation

A. Engine Installation in Mounts

(Ref. Figure 401 and Figure 402)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM702	Lockwire CRES

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST402	Engine hoist

(1). Open engine access doors.

(2). Position engine to line up engine lifting eye under airframe lift fitting.

(3). Remove detent pin from adjustable support shaft on engine stand. Detach transport and storage bar from engine lift fitting.

(4). Install engine hoist (ST402) between airframe fitting and engine hoist fitting.

(5). Have an assistant tension hoist to support engine. Unscrew engine stand adjustable support shaft.

(6). Move engine to disengage fixed shaft. Roll stand away from engine.

CAUTION

- Do not use tubes or hoses as hand holds. Do not allow engine to strike airframe or components. Avoid damaging engine intake bell.
- Prevent FOD ensure that no foreign objects are trapped in firewall seal ring.

(7). Have hoist operator slowly raise engine while pushing engine down to maintain correct engine and transmission alignment.

(8). Align left and right engine mount assemblies with engine fittings. Install bolts and washers (Ref. Figure 403). Torque bolts to **220 - 360 inch-pounds (24.86 - 40.67 Nm)**; Safety bolts to engine mounts using lockwire (CM702).

(9). Align hole in lower engine mount assembly with engine fitting. Install bolt, washers and nut. Torque nut to **95 - 110 inch-pounds (10.73 - 12.43 Nm)**; install cotter pin as required.

(10). Ensure engine air inlet firewall seal ring contacts firewall seal around its entire circumference.

(11). Remove hoist from helicopter.

B. Connecting an Installed Engine

(Ref. Figure 401 and Figure 402)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM702	Lockwire CRES

WARNING **Proper tightening of engine tubing connections is critical to flight safety. Correct torque values must be used at all times. Excessive torque on fuel or pneumatic sensing system connections can result in cracking of the flare causing an air leak which can cause flameout, power loss, or overspeed.**

(1). Connect torque-meter oil line to firewall.

(2). Connect oil pressure gauge line to firewall.

(3). Connect engine oil vent line. Torque line nut to **120 - 140 inch-pounds (13.56 - 15.82 Nm)**.

CAUTION Do not bend oil return line. Bending loads are transferred to oil cooler port and may fracture cooler.

(4). Connect engine oil outlet and inlet lines. Hand-tighten until snug. Wrench-tighten approximately 1/4 turn or until definite resistance is felt.

(5). Position accessory drive vent elbow and connect with vent tube. Torque elbow jamnut to **150 - 250 inch-pounds (16.95 -** 28.25 Nm). Torque tube nut to **20 - 30 inch-pounds (2.26 - 3.39 Nm)**.

(6). Connect N_1 control rod to lever with bolt, two washers and nut. Install bolt with head outboard, one standard OD washer under nut and one large 0.8 inch diameter washer under head. Torque nut to **40 - 45 inch-pounds (4.52 - 5.08 Nm)**. Install a new cotter pin.

(7). Connect short N_2 control rod to governor lever with bolt head up, one standard OD washer under head, one large 0.80 inch (20.32 mm) OD washer under nut and a new cotter pin. Connect long N_2 control rod with bolt head forward, two washers, nut and a new cotter pin.

(8). Connect engine fuel pump seal drain line. Torque tube nut to **50 - 65 inch-pounds (5.65 - 7.34 Nm)**.

(9). Connect fuel inlet line to fuel pump. Torque hose nut to **230 - 260 inch-pounds (25.99 - 29.38 Nm)**.

NOTE: Ensure burner drain valve and plug are installed in combustion chamber with an O-ring on each part. Ensure drain valve is in the aft (lowest) position.

(10). Install combustion chamber drain line on drain valve.

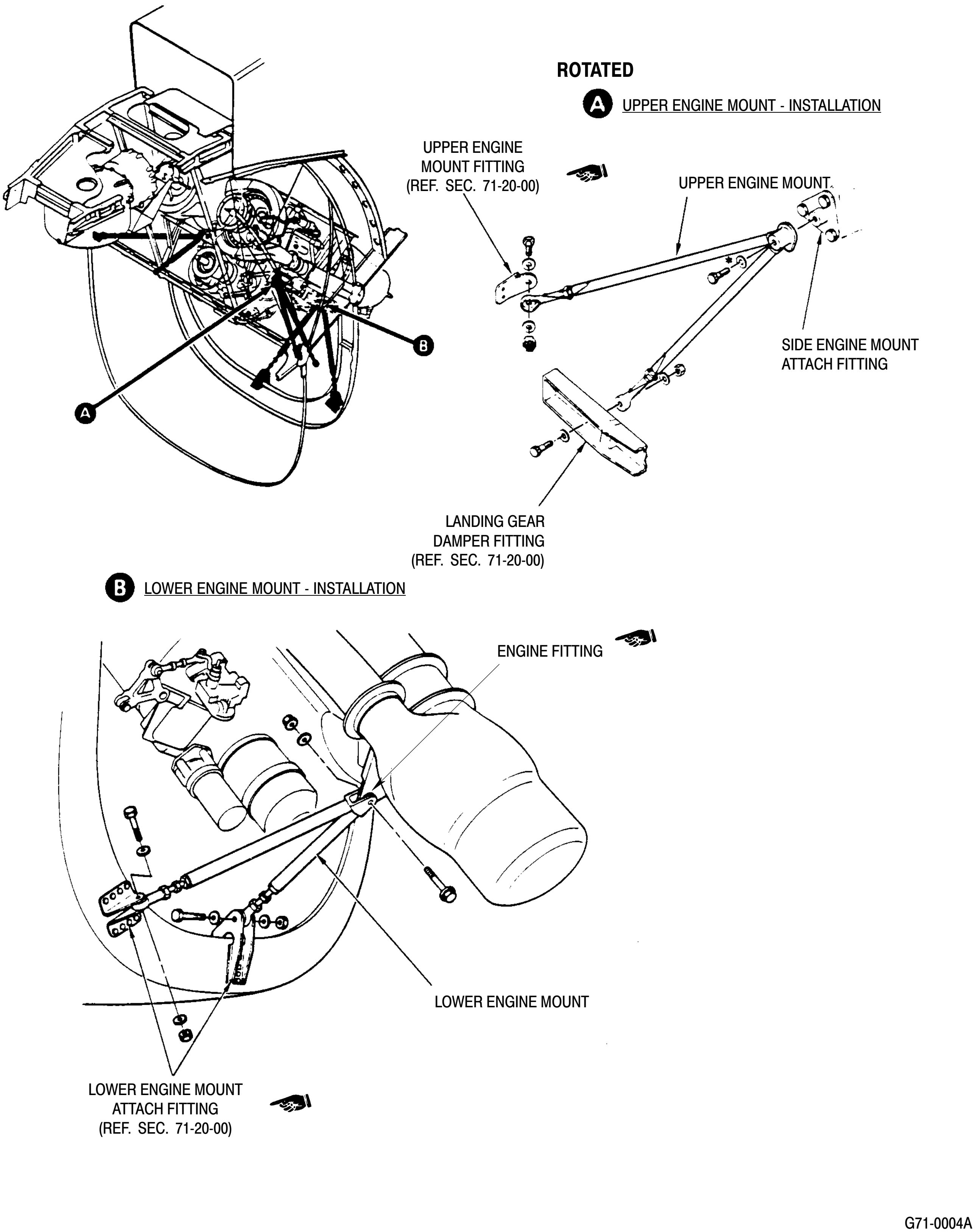


Figure 402. Engine Mounts and Structural Fittings

(11). Secure engine electrical harness to engine mount with cushioned loop clamp. Connect harness plug to receptacle and safety with lockwire (CM702).

(a). Install engine harness ground lead.

(b). Install E, C, and B generator leads on starter-generator terminal block with washers and nuts.

(c). Attach thermocouple leads to terminal block studs located on right upper engine door frame with chromel and alumel nuts.

(12). Install cooling air ducts and air duct support bracket on airframe hoist fitting. Connect and tighten ducts on firewall coupling and oil cooler deflector.

(13). Install main transmission drive shaft (Ref. Sec. 63-10-00).

(14). Install exhaust duct (Ref. Sec. 78-30-00).

(15). Remove all identifying tags from wires and hardware.

CAUTION Improper rigging of throttle controls can cause inadvertent flameout when throttle is rapidly closed to the idle position.

(16). Rig gas producer (N_1) and power turbine (N_2) controls (Ref. Chap. 76).

WARNING **After each opening, removal or replacement of any part of the engine and/or aircraft fuel system between the aircraft fuel tank and the engine fuel nozzle, the fuel system must be bled to remove trapped air. Failure to comply with this procedure can result in engine flameout or power loss.**

(17). Perform fuel system bleed.

(18). Perform an engine deceleration check per the Pilot's Flight Manual.

NOTE: Make engine adjustments per the Allison Engine Operation and Maintenance Manual.

(19). Perform an anti-icing system operational check (Ref. Sec. 75-10-00).

(20). Inspect engine installation and connections for proper routing and security.

3. Engine Stripping

(Ref. Figure 403)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST401	Engine stand
ST402	Engine hoist

(1). Install engine in engine stand (ST401).

(2). Disconnect wire leads from generator A, E and D terminals.

(3). Loosen mounting clamp and remove starter-generator.

(4). Remove mounting flange and gasket.

(5). Install cover on generator mounting pad.

(6). Disconnect electrical connectors from:

(a). Chip detectors.

(b). Tachometer generators.

(c). Fuel filter pressure switch.

(d). Unplug electrical harness connector from front of engine.

(e). Unclamp and remove engine electrical harness.

NOTE: Discard all used O-ring packings.

(7). Remove oil vent line and associated hardware.

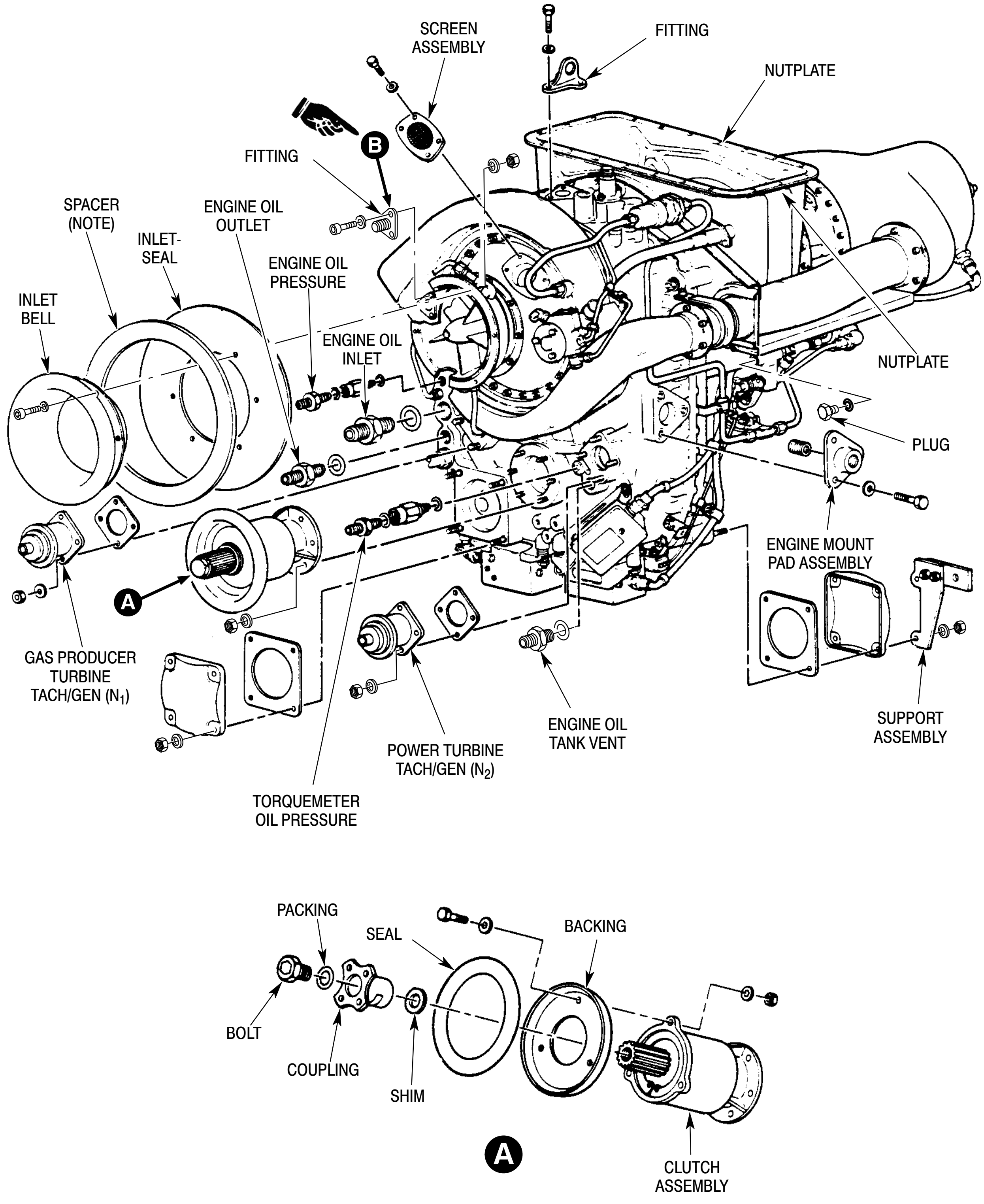
(8). Remove fuel inlet fitting.

(9). Remove oil supply, return and vent reducers/unions.

(10). Remove oil pressure reducer/snubber.

(11). Remove torquemeter reducer/snubber.

(12). Unclamp and remove compressor bleed service line, fitting and associated clamps.



NOTE:
SPACER BONDED TO INLET SEAL.

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Figure 403. Model 250-C30 Engine Build-Up (Sheet 1 of 2)

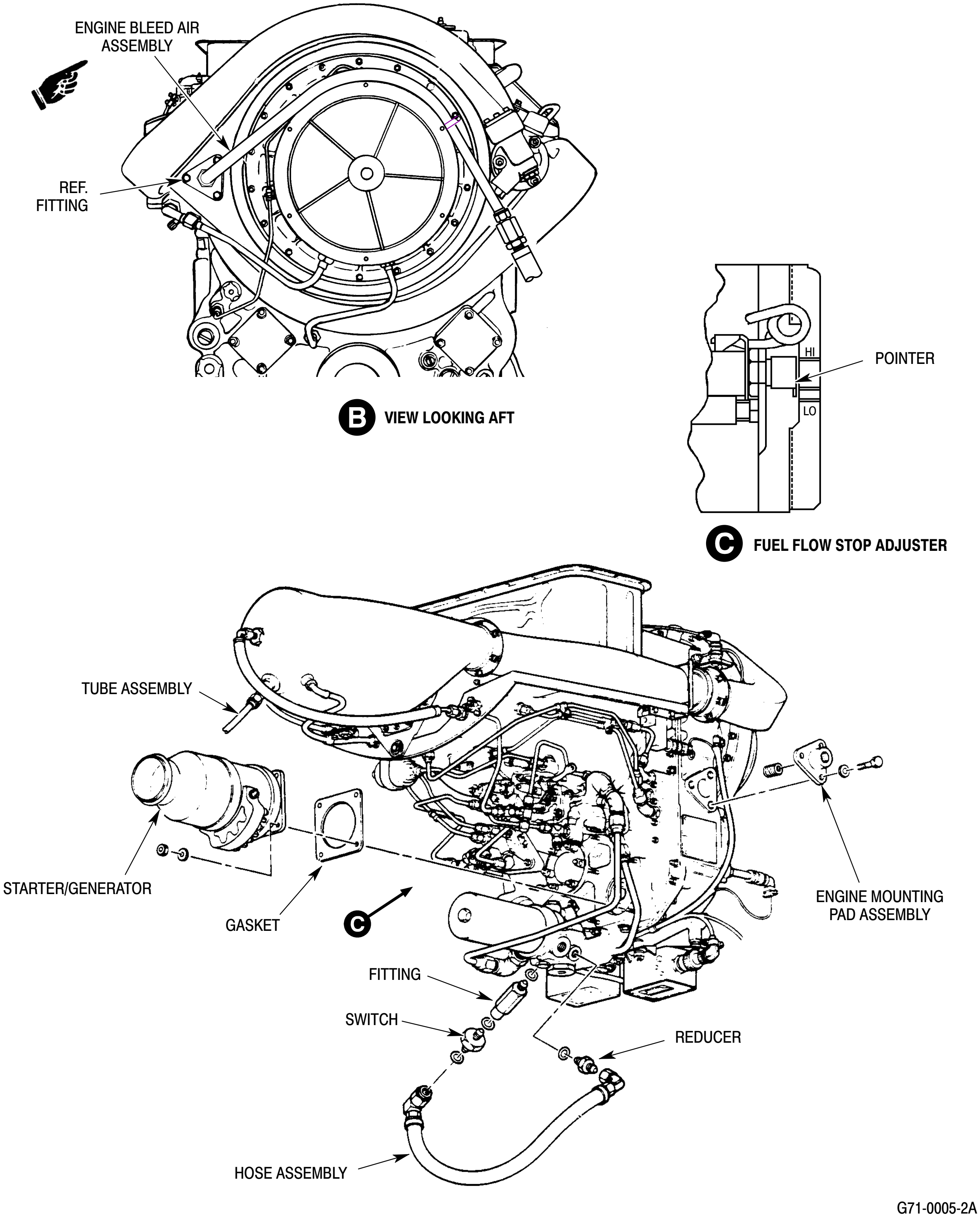


Figure 403. Model 250-C30 Engine Build-Up (Sheet 2 of 2)

(13). Remove compressor bleed duct from bleed valve.

(14). Unfasten and remove N_1 and N_2 tachometer generators and gaskets.

(15). Remove hose and reducer from fuel pump after filter (AF) port.

(16). Remove fuel pressure switch and fitting from fuel pump before filter (BF) port (Ref. Figure 403).

(17). Remove engine air inlet bell and firewall seal. Cover engine inlet.

(18). Remove fuel pump seal drain port union/reducer.

(19). Remove governor control idler support complete with bellcrank, short N_2 control rod and lever. Do not dismantle assembly.

(20). Remove overrunning clutch and clutch firewall seal. Install cover on gear case.

(21). Hoist (ST402) engine out of engine stand.

(22). Unbolt and remove engine mount fittings.

(23). Install engine in shipping container.

(24). Unbolt and remove hoist fitting.

4. Engine Buildup

(Ref. Figure 403)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM113	Anti-seize compound low temperature
CM114	Petrolatum
CM118	Grease
CM502	Sleeving, fiberglass
CM702	Lockwire CRES
CM808	Lacing cord

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST401	Engine stand

(1). Review Allison instructions for removing engine from shipping container in Allison Operation and Maintenance Manual.

CAUTION Prevent FOD Inspect and clean all accessories and hardware prior to installing parts on engine.

NOTE: Replace O-rings and gaskets with new parts. Lubricate fuel line packings with clean jet fuel or petrolatum (CM114) prior to installation. Lubricate oil line packings with clean engine oil prior to installation. Apply a thin coating of anti- seize compound (CM113) to the male threads of unions and fittings before torquing.

(2). Install engine hoist fitting and bolts. Torque 3/8 inch diameter bolt to **160 - 190 inch-pounds (18.08 - 21.47 Nm)**. Torque 5/16 inch-diameter bolts to **140 - 160 inch-pounds (15.82 - 18.08 Nm)**.

(3). Hoist engine clear of shipping container.

(4). Inspect engine as follows:

(a). If shipping container moisture indicator was other than a light blue color, examine engine for corrosion. Perform corrosion corrective maintenance per Allison Operation and Maintenance Manual as required.

(b). Inspect inlet guide vanes for damage.

(c). Exhaust and inlet openings for FOD.

(d). Turbine blades for damage.

(e). Install covers over intake and exhaust ports.

(f). All fasteners for security, slippage marks for alignment, potting compound and, or correctly installed lockwire where applicable.

(g). Tubes and hoses for damage.

(5). Record engine serial number and start-counter reading in appropriate log.

CAUTION Prevent damage to machined surfaces and contamination. Remove covers from engine one at a time as required by the installation sequence.

(6). Install side engine mount fittings with bolts and washers. Torque bolts to **140 - 160 inch-pounds (15.82 - 18.08 Nm)**; lockwire bolts.

(7). Install engine in engine stand (ST401).

(8). Set fuel flow stop adjuster as follows:

(a). For Bendix P/N 2524944-5 or 2524922-7 and subsequent, set pointer at LO position.

(b). For Bendix P/N 2524944-1, -2, -3, -4 or 2524922-3, -4, -5, -6, set pointer midway between LO stamped mark and the middle scribed mark.

(c). Torque jam nut to **20 - 25 inch-pounds (2.26 - 2.82 Nm)**; lockwire nut.

(9). Remove cover from gearcase clutch mounting pad.

(10). Install overrunning clutch on gearcase mount pad with wire harness support angle between 4 and 5 o'clock position looking aft (Ref. Sec. 63-10-00).

(11). Loosely attach wire harness clamp to support angle with screw, washer and nut.

(12). Attach clutch firewall seal to clutch flange with one washer under each bolt head and nut. Torque nuts to **25 - 35 inch-pounds (2.82 - 3.95 Nm)**.

NOTE: Use new O-ring packings and gaskets on all installations where the parts are required. Lubricate O- rings with clean system fluids prior to installation.

(13). Remove tachometer-generator cover plates from gearcase mount pads.

(14). Install a gasket under each tachometer-generator .

(15). Lubricate splines with grease (CM118) and install N_1 and N_2 tachometer generators. Install washers and nuts. Torque nuts to **70 - 90 inch-pounds (7.91 - 10.17 Nm)**.

WARNING **Proper tightening of engine tubing connections is critical to flight safety. Correct torque values must be used at all times. Excessive torque on fuel or pneumatic sensing system connections can result in cracking of the flare causing an air leak which can cause flameout, power loss, or overspeed.**

(16). Inspect torquemeter and engine oil pressure snubber and reducer bores for metal shavings and debris. Clean hardware as required. Preassemble both snubbers as follows:

(a). Thread torquemeter snubber onto reducer and O-ring. Torque assembly to **65 - 75 inch-pounds (7.34 - 8.47 Nm)**.

(b). Thread oil pressure snubber onto reducer and O-ring. Torque assembly to **95 - 105 inch-pounds (10.73 - 11.86 Nm)**.

(c). Apply a thin coat of engine oil to snubber threads and O-rings and install in gearcase ports (Ref. Figure 403)

CAUTION The gear case is magnesium alloy. Using relatively high torque values applicable to threaded fittings and fasteners in metals other than magnesium may result in stripped threads. Refer to Allison Engine Maintenance Manual for additional fastener torque information.

(d). Torque oil pressure snubber assembly to **50 - 65 inch-pounds (5.65 - 7.34 Nm)**.

(e). Torque torquemeter snubber assembly to **25 - 35 inch-pounds (2.82 - 3.95 Nm)**.

(f). Install union and O-ring in gearcase oil supply (inlet) port. Torque union to **450 - 500 inch-pounds (50.84 - 56.49 Nm)**.

(g). Install union and O-ring in gearcase oil return port. Torque union to **180 - 200 inch-pounds (20.34 - 22.60 Nm)**.

(17). Install compressor bleed air duct with screws washers and clamp (Ref. Figure 401).

(18). Install inlet bell with one washer under each bolt head and nut. Install service bleed air tube support bracket on aft surface of engine inlet bell mounting flange at the 2 o'clock position looking aft. Torque nuts to **5 - 7 inch-pounds (0.56 - 0.79 Nm)**.

CAUTION Only high- temperature self locking all metal nuts shall be used to fasten governor control idler support bracket to engine accessory pad.

(19). Install governor control idler support complete with bellcrank, short N_2 control rod and lever.

(20). Attach short control rod to N_2 governor lever. Stack hardware with bolt head on top, large washer under bolt head and washer under castellated nut; Install cotter pin.

(21). Install compressor bleed air service fitting on compressor case with engine supplied washers and bolts. Lockwire bolts.

(22). Attach bleed air tube to service fitting.

(23). Install clamp on bleed air tube and secure to support bracket with bolt, washer and nut. Torque bleed air tube nut on compressor case fitting to **450 - 500 inch-pounds (50.84 - 56.49 Nm)**. Install a protective cap on tube end.

(24). Install union and O-ring in engine oil tank vent gearcase boss. Torque union to **180 - 200 inch-pounds (20.34 - 22.60 Nm)**.

(25). Preassemble oil tank vent tube, clamp, union and hose. Torque union, hose and tube end nuts to **450 - 500 inch pounds (50.84 - 56.49 Nm)**.

(26). Attach vent tube assembly to oil tank vent gearcase union. Install tube clamp with screw, washer and nut. Using a backup wrench to hold union, torque tube nut to **450 - 500 inch-pounds (50.84 - 56.49 Nm)**.

(27). Assemble differential pressure switch.

(28). Install elbow with O-ring and jamnut in fuel pump seal drain port.

(29). Install oil inlet and outlet couplings and O-rings.

(30). Install fuel inlet reducer and O-ring.

(31). Install starter/generator.

CAUTION Always support the weight of the starter/generator during removal/installation. Damage can occur if weight is supported by the shear shaft.

(a). Remove starter/generator pad cover. Install starter/generator mount with gasket, washers and nuts. Torque nuts to **100 - 140 inch-pounds (11.29 - 15.81 Nm)**.

(b). Install starter/generator with V-clamp. Torque clamp nut to **50 inch-pounds (5.64 Nm)**.

(c). Tap around clamp with a rawhide mallet to seat clamp on flange. Retorque clamp nut to **50 inch-pounds (5.64 Nm)**.

(d). Continue tapping around clamp and retorquing clamp nut until nut no longer turns when specified torque is applied.

(32). Clamp engine electrical harness to lower engine mount and starter-generator.

(33). Connect ignition exciter wire lead and starter-generator A and D wire leads.

(34). Attach electrical connectors to both chip detectors and safety with lockwire (CM702).

(35). Connect N_1 and N_2 tachometer generators.

(36). Connect start counter lead and fuel pressure switch wire lead splices. Install fiberglass sleeving (CM502) over splices and secure with high temperature lacing cord (CM808).

(37). Inspect engine connections for security and proper routing.

Section

71-00-47

Power Plant (250-C47)

POWER PLANT
DESCRIPTION AND OPERATION

1. Power Plant Description

(1). MDHI 600N helicopter is powered by a 250-C47M turboshaft engine manufactured by the Allison Engine Company Inc.

(2). The engine is secured in the helicopter by three mount assemblies and accessed through two hinged air-sealed doors.

(3). A belt-driven blower forces external cooling air through strategically positioned ducts that direct the air onto engine exterior surfaces and through the engine and transmission oil cooler heat exchangers. Spent cooling air is exhausted aft through an annular opening between the engine exhaust duct and fuselage.

(4). Engine intake air may be filtered through a standard screen or optional air particle separator assembly. Intake air is drawn through a plenum chamber and into the engine intake bell-mouth by the compressor. Engine compartment air is separated from compressor intake air by a seal ring.

(5). The engine is equipped with a full authority digital engine control (FADEC) system. A hydromechanical control manual system is provided for backup if the electronic system fails.

2. Power Plant Operation

(1). The Allison 250-C47M turboshaft engine consists of a single stage centrifugal flow compressor section, a can-annular combustion section, a two-stage gas producer turbine section and power and accessory gearbox. The gas producer geartrain drives the compressor, hydromechanical control unit, fuel pump and internal pressure and scavenge oil pumps. An overrunning clutch, drive shaft, starter generator, fuel, oil, drain and bleed air lines, exhaust ducting, mounting and hoist fittings and control levers adapt the engine to the helicopter.

(2). Allison Engine Operation and Maintenance Manuals are the primary information source for engine fault isolation and maintenance data (Ref. Sec. 01-00-00). Refer to these manuals for specific engine maintenance procedures.

(3). Starter operational limitations are in the applicable Pilot's Flight Manual.

3. Model 250-C47 Power Plant Fault Isolation

(Ref. Table 1)

(1). Check engine support systems, i.e.; chip detectors, instruments, fuel supply, electrical systems, etc., to ensure that helicopter equipment is functioning correctly before disassembling engine systems for an indicated fault.

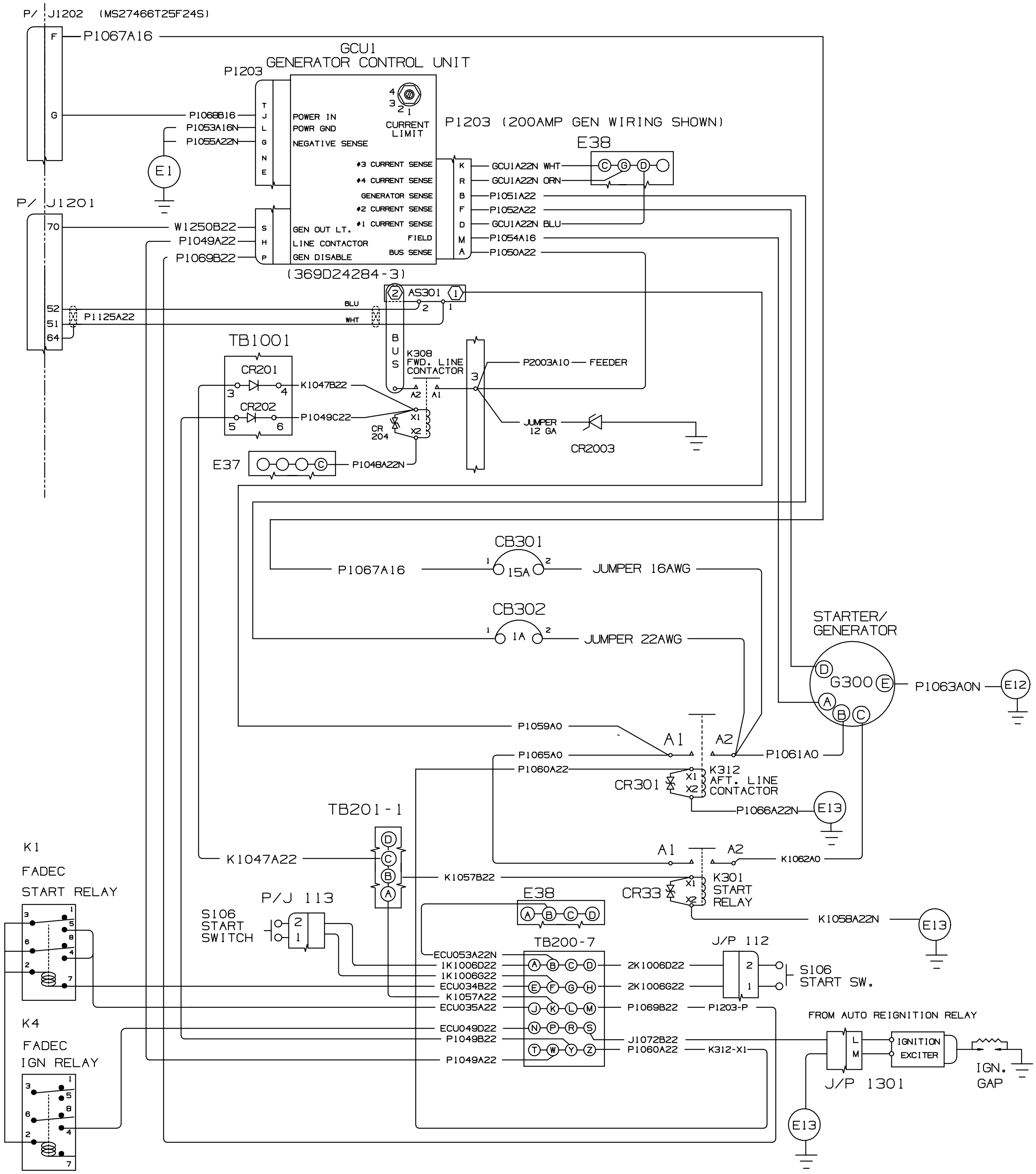
(2). Inspect and isolate engine problems per the applicable Allison Engine Operation and Maintenance Manual.

Table 1. Power Plant Fault Isolation

Symptom	Probable trouble	Corrective action
High frequency vibration (1)	Loose engine mount bolts	Retorque engine mount bolts to **100 - 140 inch-pounds (11.30 - 15.82 Nm)**.

NOTES:

(1) High frequency vibrations may be caused by other drive and rotor system components.



GENERATOR / STARTER CIRCUIT

6G71-064-1

Figure 1. Starter/Generator System Wiring Diagram (Sheet 1 of 2)

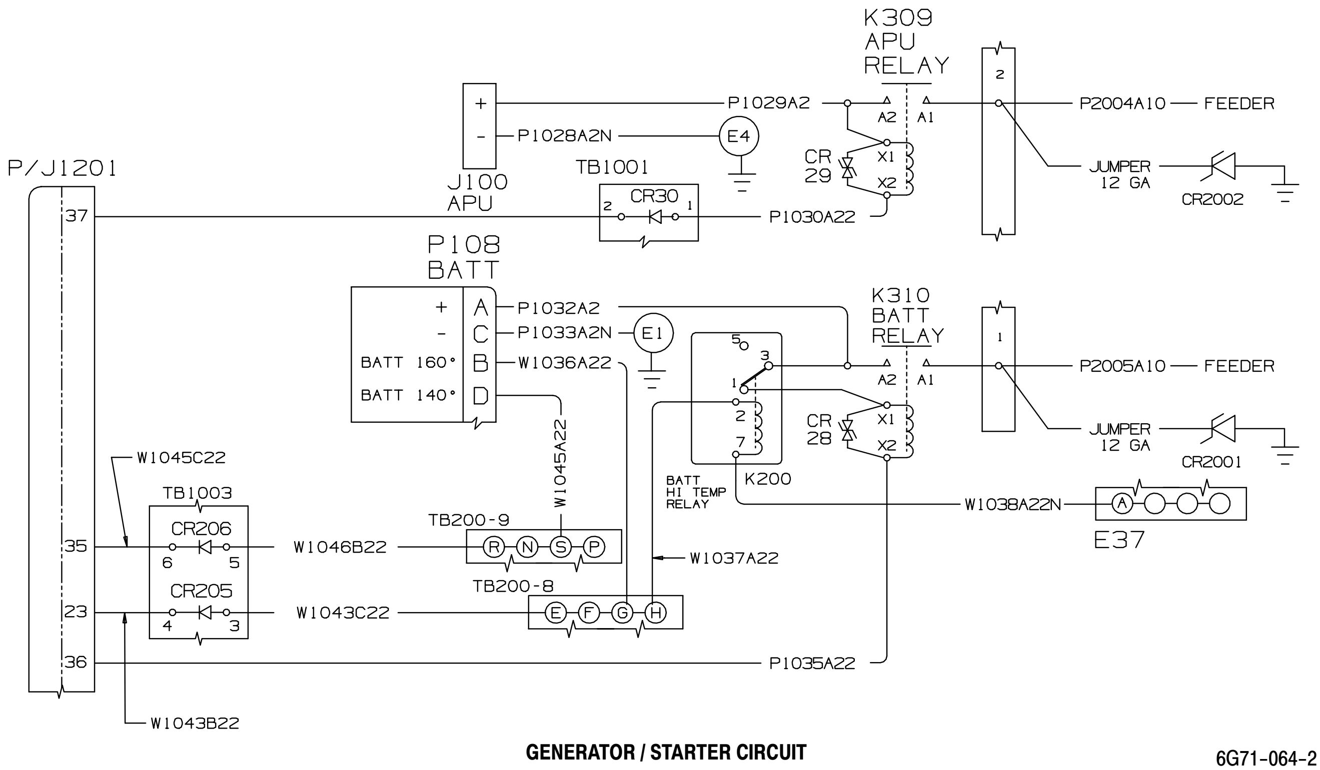


Figure 1. Starter/Generator System Wiring Diagram (Sheet 2 of 2)

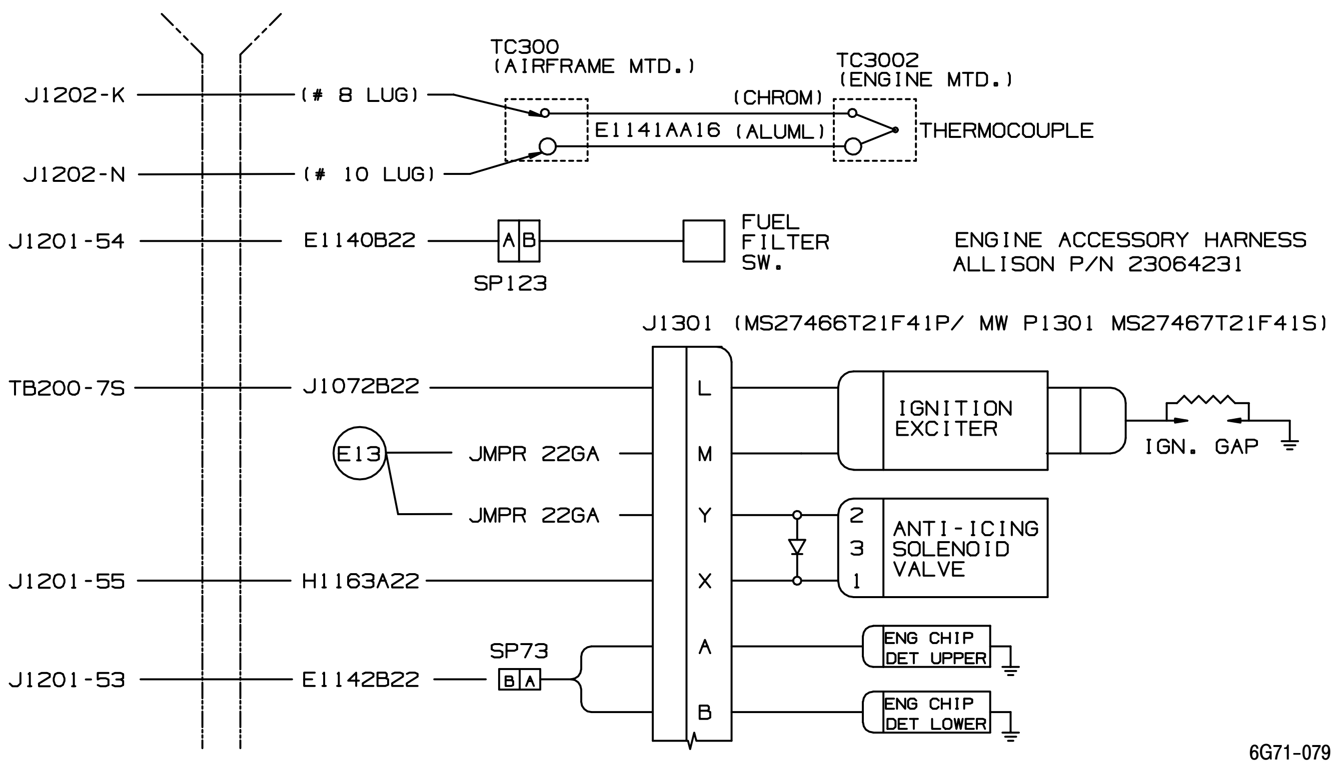


Figure 2. Engine Wire Harness Wiring Diagram

POWER PLANT
REMOVAL/INSTALLATION

1. Model 250-C47 Engine Replacement

A. Engine Disconnecting for Removal

(Ref. Figure 401 and Figure 402)

WARNING **After each opening, removal or replacement of any part of the engine and/or aircraft fuel system between the aircraft fuel tank and the engine fuel nozzle, the fuel system must be bled to remove trapped air. Failure to comply with this procedure can result in engine flameout or power loss.**

CAUTION Cap fluid lines and fittings with approved devices. Do not use tape to cover fuel and oil openings. Tape adhesives loosened by fuel or oil can contaminate systems.

(1). Set all switches **OFF**. Disconnect external power. Disconnect battery (Ref. Sec. 96-05-00).

NOTE: Tag all hardware, wire terminals, fuel and oil lines before removal to expedite installation. Identify and bag loose parts to prevent loss or damage.

(2). Remove main transmission drive shaft (Ref. Sec. 63-10-00).

(3). Remove engine exhaust duct (Ref. Sec. 78-30-00). Cover engine exhaust outlet.

(4). Loosen clamps and remove starter cooling air duct from engine compartment.

(5). Loosen clamps and remove engine cooling air ducts from engine compartment.

(6). Loosen clamps and remove compressor bleed hose from engine compartment.

(7). Detach engine electrical connections.

(a). Detach engine electrical harness connector.

(b). Detach electrical connections from starter/generator.

(c). Detach splice connector from fuel filter bypass switch.

(8). Disconnect fuel inlet line at engine mounted fuel pump.

(9). Disconnect hydromechanical unit (HMU) vent line and drain line.

(10). Disconnect customer bleed air line at firewall elbow.

(11). Disconnect torquemeter oil line at firewall.

(12). Disconnect oil pressure indicator line at firewall.

(13). Disconnect engine control cable from engine control box on HMU.

CAUTION The oil cooler is fragile. Unless otherwise required, disconnect oil supply and return lines only at engine. Support oil cooler port boss with a backup wrench when oil line removal is required. Do not strain or bend unsupported tubes.

(14). Disconnect engine oil inlet, outlet and vent lines.

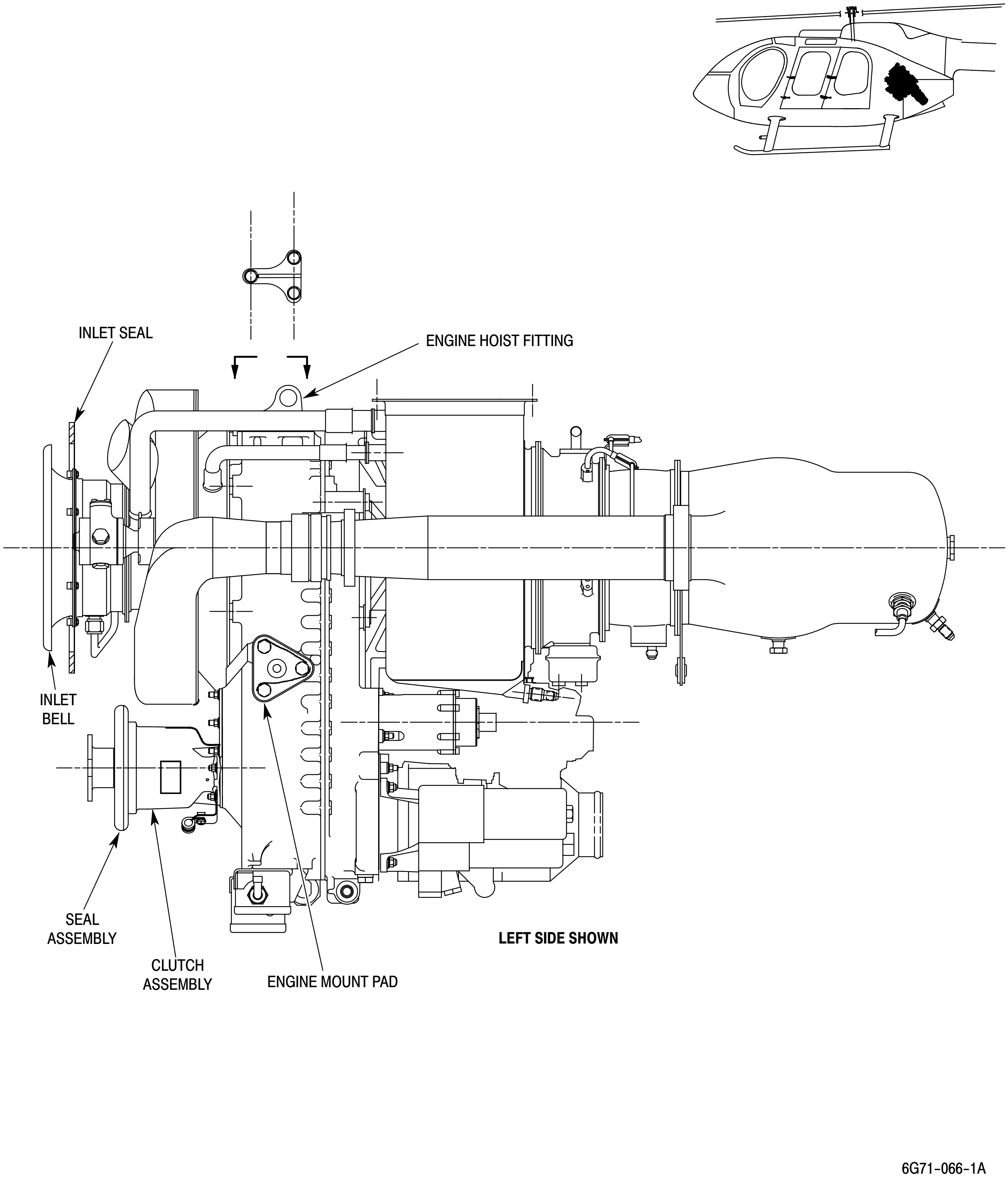


Figure 401. Engine Build-up Assembly (Sheet 1 of 2)

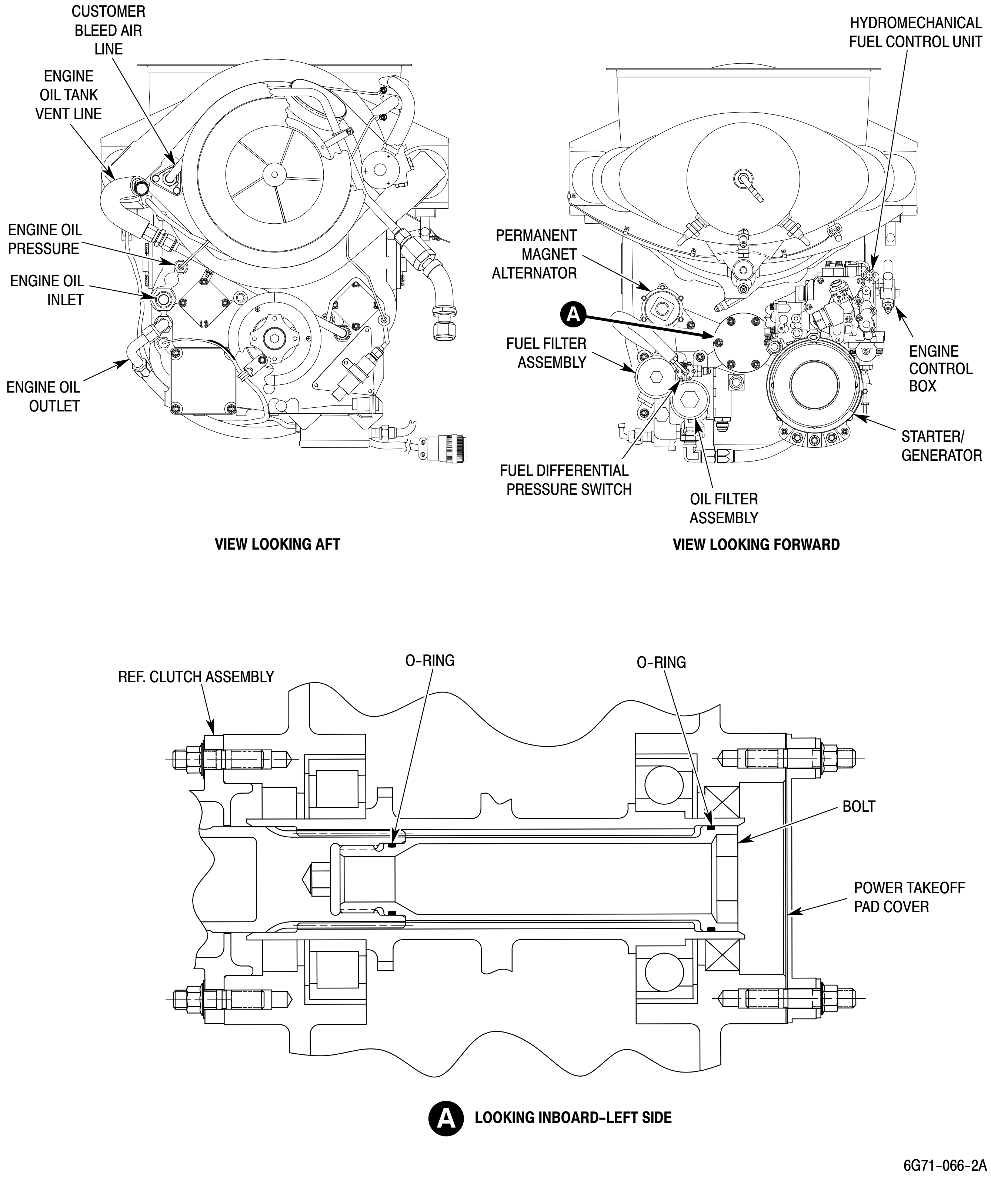


Figure 401. Engine Build-up Assembly (Sheet 2 of 2)

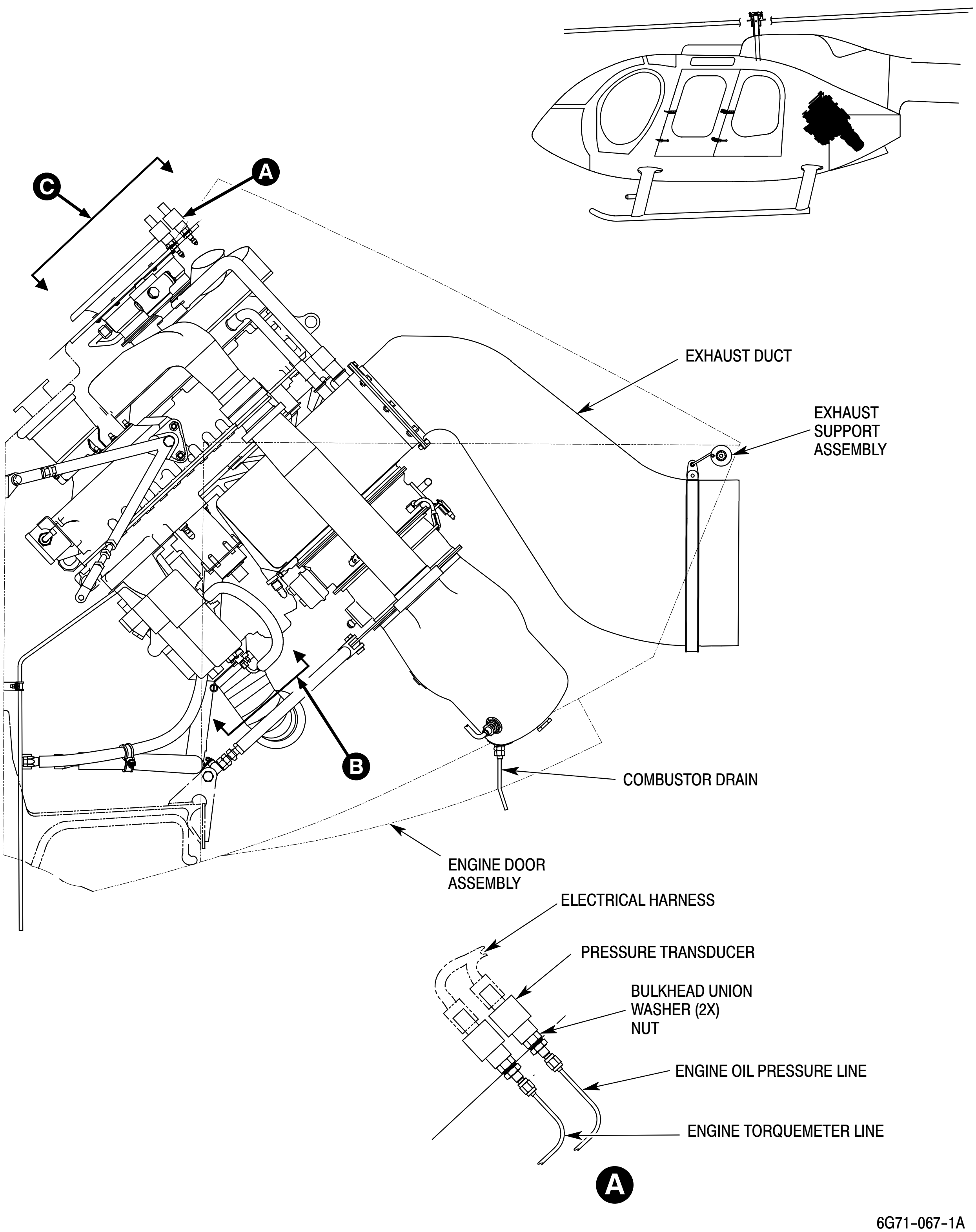


Figure 402. Engine Installation (Sheet 1 of 2)

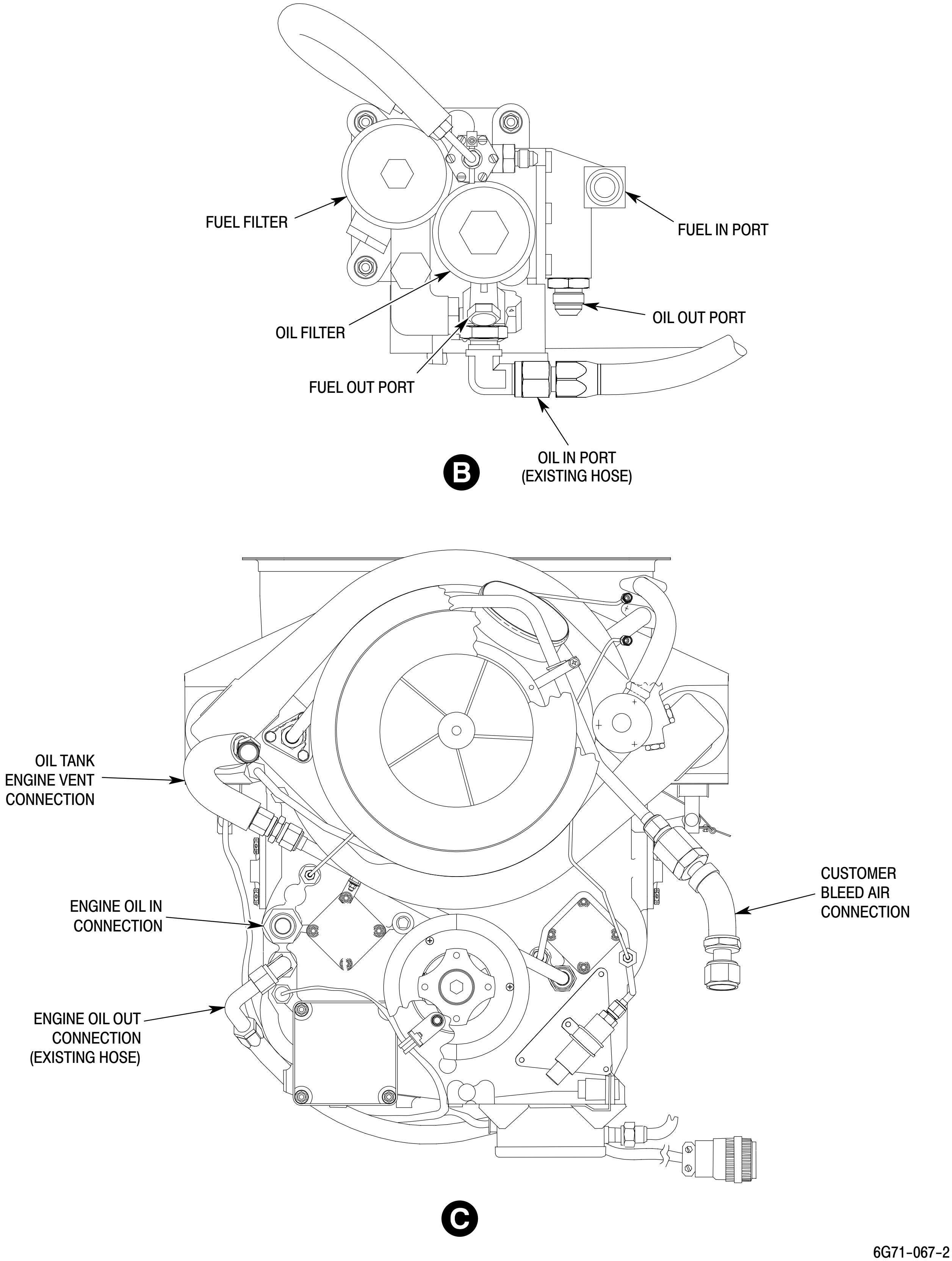


Figure 402. Engine Installation (Sheet 2 of 2)

B. Removal of Disconnected Engine

(Ref. Figure 401 and Figure 402)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST401	Engine stand
ST402	Engine hoist

CAUTION

- Do not remove engine mounts or disturb engine mount adjustments to remove engine.
- Engine to transmission alignment shall be inspected whenever one or more engine mount assemblies is replaced or the existing alignment is disturbed. Do not disturb adjustable engine mount fittings unless an engine- transmission alignment check is planned.

(1). Install engine hoist tool (ST402) between engine hoist fitting and airframe hoist fitting.

(2). Apply tension to engine with hoist and remove engine mount bolts.

CAUTION Do not use fuel or oil lines as hand holds. Do not allow engine to strike airframe while maneuvering it out of the helicopter.

(3). Align engine stand (ST401) under engine with adjustable support shaft on left side.

(4). Slowly lower engine out of helicopter. Align engine side mount fittings between fixed and adjustable support shafts.

(5). Screw in adjustable support shaft until engine mount fittings are securely engaged with support shaft sockets.

(6). Insert detent pin through adjustable support shaft.

(7). Remove hoist from engine hoist fitting.

(8). If engine is to be stored or transported, secure upper end of engine stand transport and storage bar to engine hoist fitting.

C. Engine Installation in Mounts

(Ref. Figure 401 and Figure 402)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM702	Lockwire CRES

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST401	Engine stand
ST402	Engine hoist

(1). Open engine access doors.

(2). Position engine to line up engine hoist fitting under airframe hoist fitting.

(3). Remove detent pin from adjustable support shaft on engine stand. Detach transport and storage bar from engine hoist fitting.

(4). Install engine hoist (ST401) between airframe fitting and engine hoist fitting.

(5). Apply tension to engine hoist to support engine. Unscrew engine stand adjustable support shaft.

(6). Move engine to disengage fixed shaft. Roll stand away from engine.

CAUTION

- Do not use tubes or hoses as hand holds. Do not allow engine to strike airframe or components. Avoid damaging engine intake bell.
- Prevent FOD. Ensure that no foreign objects are in the engine plenum area.

(7). Slowly raise engine while pushing back of engine down to maintain correct engine and transmission alignment.

(8). Align left and right engine mount assemblies with engine mount fittings. Install bolts and washers (Ref. Figure 403). Torque bolts to **220 - 360**

inch-pounds (24.85 - 40.66 Nm). Safety bolts with lockwire (CM702).

(9). Align hole in lower engine mount assembly with engine fitting. Install bolt, washers and nut. Torque nut to **95 - 110 inch-pounds (10.73 - 12.43 Nm)**.

(10). Ensure inlet seal assembly contacts firewall around its entire circumference.

(11). Remove hoist from helicopter.

(12). Perform engine to transmission alignment if applicable (Ref. CSP-SRM-6, Section 53-30-00).

(13). Using a mirror and light, check for clearance between airframe and bleed valve, any clearance is acceptable.

(14). If bleed valve contacts firewall, readjust engine mounts for clearance.

(a). Move engine back by adjusting the left and right mounts, increasing the top and decreasing the bottom.

(b). Only make adjustments one flat at a time until bleed valve clears firewall.

NOTE: One flat will move the engine approximately 0.020 inch (0.508 mm) aft.

(c). Adjust lower mount to insure no preload exists.

(d). Perform engine to transmission alignment if applicable (Ref. CSP-SRM-6, Section 53-30-00).

D. Connecting an Installed Engine

(Ref. Figure 401 and Figure 402)

WARNING **Proper tightening of engine tubing connections is critical to flight safety. Correct torque values must be used at all times. Excessive torque on fuel or pneumatic sensing system connections can result in cracking of the flare causing an air leak which can cause flameout, power loss, or overspeed.**

(1). Connect torquemeter indicator oil line to bulkhead union on firewall. Torque tube nut to **75 - 85 inch-pounds (8.47 - 9.60 Nm)**.

(2). Connect oil pressure gauge line to bulkhead union on firewall. Torque tube nut to **75 - 85 inch-pounds (8.47 - 9.60 Nm)**.

(3). Connect engine oil vent line. Torque hose nut to **230 - 260 inch-pounds (25.98 - 29.36 Nm)**.

CAUTION Do not bend oil return line. Bending loads are transferred to oil cooler port and may fracture cooler.

(4). Connect engine oil out line to elbow. Torque hose nut to **230 - 260 inch-pounds (25.98 - 29.36 Nm)**.

(5). Connect engine oil in line to union. Torque hose nut to **460 - 500 inch-pounds (51.96 - 56.48 Nm)**.

(6). Connect customer bleed air line to elbow. Torque hose nut to **460 - 500 inch-pounds (51.96 - 56.48 Nm)**.

(7). Connect engine fuel pump seal drain line. Torque tube nut to **50 - 65 inch-pounds (5.64 - 7.34 Nm)**.

(8). Connect fuel inlet line to fuel pump. Torque hose nut to **230 - 260 inch-pounds (25.98 - 29.36 Nm)**.

NOTE: Ensure burner drain valve and plug are installed in combustion chamber with an O-ring on each part. Ensure drain valve is in the aft (lowest) position.

(9). Install combustion chamber drain line on drain valve. Torque tube nut to **50 - 65 inch-pounds (5.64 - 7.34 Nm)**.

(10). Attach engine electrical connectors.

(a). Attach engine electrical wire harness to to airframe connector at firewall.

(b). Attach fuel pressure bypass switch splice connector.

(c). Attach starter/generator electrical connections (Ref. Figure 403).

(11). Install main transmission drive shaft (Ref. Sec. 63-10-00).

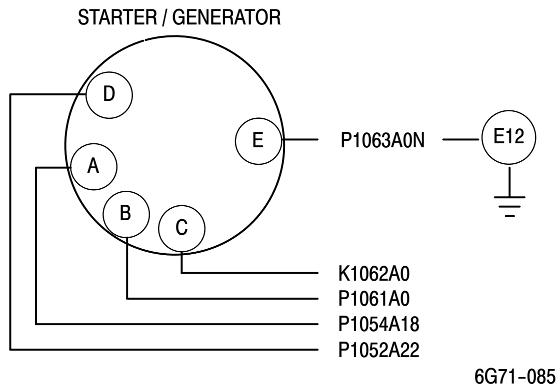


Figure 403. Starter/Generator Electrical Connections

(12). Install cooling air ducts and air duct support bracket on airframe hoist fitting. Connect ducts and tighten clamps on firewall coupling and oil cooler deflector.

(13). Install compressor bleed hose and tighten clamps.

(14). Install starter cooling air duct and tighten clamps.

(15). Install exhaust duct (Ref. Sec. 78-00).

(16). Connect and rig engine control cable (Ref. Chap. 76).

WARNING **After each opening, removal or replacement of any part of the engine and/or aircraft fuel system between the aircraft fuel tank and the engine fuel nozzle, the fuel system must be bled to remove trapped air. Failure to comply with this procedure can result in engine flameout or power loss.**

(17). Perform fuel system bleed (Ref. Chap. 28).

(18). Perform an engine deceleration check per the Pilot's Flight Manual.

NOTE: Make engine adjustments per the Allison Engine Operation and Maintenance Manual.

(19). Perform an anti-icing system operational check (Ref. Chap. 75).

(20). Inspect engine installation and connections for proper routing and security.

2. Model 250-C47 Engine Stripping

(Ref. Figure 401)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST401	Engine stand
ST402	Engine hoist

CAUTION Cap fluid lines and fittings with approved devices. Do not use tape to cover fuel and oil openings. Tape adhesives loosened by fuel or oil can contaminate systems.

NOTE: Discard all used O-ring packings.

(1). Remove engine control box from HMU.

(2). Remove reducers from HMU.

(3). Remove starter/generator.

CAUTION Always support the weight of the starter/generator during removal/installation. Damage can occur if weight is supported by the shear shaft.

(a). Loosen V-clamp and remove starter/generator.

(b). Remove bolts, washers, mounting flange and gasket.

(4). Remove oil vent line and associated hardware.

(5). Remove fuel inlet fitting.

(6). Remove unions from oil in port and oil tank vent unions from gearcase.

(7). Remove oil pressure tube, clamps and attaching hardware and reducer/snubber.

(8). Remove torquemeter tube, clamps and attaching hardware and expander.

(9). Remove customer bleed air line, associated clamps and hardware and fitting.

(10). Remove N_1 and N_2 tachometer generators and gaskets.

(11). Remove hose, fuel pressure switch, reducers, tee fitting and union from fuel filter assembly.

(12). Remove engine air inlet bell and firewall inlet seal. Cover engine inlet.

(13). Remove overrunning clutch and clutch firewall seal. Install cover on gear case.

(14). Hoist engine and remove engine stand.

(15). Unbolt and remove engine mount fittings.

(16). Install engine in shipping container.

(17). Unbolt and remove hoist fitting.

3. Model 250-C47 Engine Buildup

(Ref. Figure 401)

WARNING **Proper tightening of engine tubing connections is critical to flight safety. Correct torque values must be used at all times. Excessive torque on fuel or pneumatic sensing system connections can result in cracking of the flare causing an air leak which can cause flameout, power loss, or overspeed.**

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM111	Grease, aircraft
CM126	Oil, turbine
CM702	Lockwire CRES

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST401	Engine stand
ST402	Engine hoist

(1). Prepare engine for buildup as follows:

(a). Review Allison instructions for removing engine from shipping container in Allison Operation and Maintenance Manual.

CAUTION

- Prevent FOD. Inspect and clean all accessories and hardware prior to installing parts on engine.
- The gear case is magnesium alloy. Using relatively high torque values applicable to threaded fittings and fasteners in metals other than magnesium may result in stripped threads. Refer to Allison Engine Maintenance Manual for additional fastener torque information.

(b). Install engine hoist fitting and bolts. Torque bolts to **140 - 160 inch-pounds (15.81 - 18.07 Nm)**.

(c). Install engine hoist tool (ST402) between engine hoist fitting and airframe hoist fitting.

(d). Raise engine off shipping container base.

(2). Inspect engine as follows:

(a). If shipping container moisture indicator was other than a light blue color, examine engine for corrosion. Perform corrosion corrective maintenance per Allison Operation and Maintenance Manual as required.

(b). Inlet guide vanes for damage.

(c). Exhaust and inlet openings for FOD.

(d). Install covers over intake and exhaust ports.

(e). All fasteners for security, slippage marks for alignment, potting compound and, or correctly installed lockwire where applicable.

(f). Tubes and hoses for damage.

(3). Record engine serial number and start-counter reading in appropriate log.

CAUTION Prevent damage to machined surfaces and contamination. Remove covers from engine one at a time as required by the installation sequence.

(4). Install engine mount fittings with bolts and washers. Torque bolts to **140 - 160 inch-pounds (15.81 - 18.07 Nm)**. Safety bolts with lockwire (CM702).

(5). Install engine in engine stand (ST401).

(6). Install clutch assembly.

(a). Remove engine power take off pad cover from aft side of engine gearbox and protective cover from forward side of engine gearbox.

(b). Lubricate clutch assembly and engine power output shaft splines before assembly. Pack all voids and gaps with grease (CM111).

(c). Install clutch assembly with angle, washers and nuts. Torque nuts to **50 - 70 inch-pounds (5.64 - 7.90 Nm)**.

CAUTION Use caution when installing bolt to avoid cutting O-ring. Liberally coat O-ring with grease and install with twisting motion.

NOTE: Use new O-ring packings and gaskets on all installations where the parts are required. Lubricate O- rings with clean system fluids prior to installation.

(d). Lubricate O-rings with grease (CM111) and install on bolt. Install bolt in aft end of engine power output shaft. Thread bolt into clutch shaft and torque bolt to **250 - 300 inch-pounds (28.24 - 33.88 Nm)**.

(e). Reinstall engine power take off pad cover. Torque nuts to **50 - 70 inch-pounds (5.64 - 7.90 Nm)**.

NOTE: Install firewall seal with split at 6 O'clock position.

(f). Install seal at end of clutch assembly with washers and screws. Torque screws to **15 - 20 inch pounds (1.69 - 2.25 Nm)**.

CAUTION To avoid contamination of engine oil system, inspect reducer and snubber bores for metal shavings and debris.

(7). Install engine oil pressure snubber, reducer and O-ring on engine gearbox. Connect oil pressure tube to snubber. Torque tube nut to **20 - 30 inch-pounds (2.25 - 3.38 Nm)**. Clamp tube to existing engine line.

(8). Install expander with O-ring on existing engine torquemeter line fitting. Torque expander to **50 - 70 inch-pounds (5.64 - 7.90 Nm)**.

(9). Install engine oil tank vent line.

(a). Install union with O-ring in engine gearcase oil tank vent port. Torque union to **280 - 305 inch-pounds (31.62 - 34.45 Nm)**.

(b). Install oil tank vent tube on union. Torque tube nut to **230 - 260 inch-pounds (25.98 - 29.36 Nm)**.

(c). Install union on oil tank vent tube. Torque union to **230 - 260 inch-pounds (25.98 - 29.36 Nm)**.

(d). Install vent hose on union. Torque hose nut to **230 - 260 inch-pounds (25.98 - 29.36 Nm)**.

(10). Install union with O-ring in engine gearcase oil inlet port. Torque union to **550 - 600 inch-pounds (62.12 - 67.77 Nm)**.

(11). Install customer bleed air line.

(a). Install customer bleed air fitting with engine supplied gasket, washers and engine supplied bolts. Torque bolts to **20 - 25 inch-pounds (2.25 - 2.82 Nm)**. Safety bolts with lockwire (CM702).

(b). Install bleed hose assembly on bleed air fitting. Torque hose assembly to **230 - 260 inch-pounds (25.98 - 29.36 Nm)**. Clamp line to strap attached to inlet bell mount bolt.

(12). Install fuel switch.

(a). Install union with O-ring in fuel filter housing. Torque union to **95 - 105 inch-pounds (10.73 - 11.86 Nm)**.

(b). Install tee on union with O-ring and jam nut. Torque jam nut to **38 - 42 inch-pounds (4.29 - 4.74 Nm)**.

(c). Install reducer with O-ring on end of tee. Torque reducer to **95 - 105 inch-pounds (10.73 - 11.86 Nm)**.

(d). Install union with O-ring on 90 degree fitting of tee. Torque restrictor to **95 - 105 inch-pounds (10.73 - 11.86 Nm)**.

(e). Install fuel switch with O-ring on reducer. Torque switch to **65 - 75 inch-pounds (7.34 - 8.47 Nm)**.

(f). Install reducer with O-ring in fuel filter housing. Torque reducer to **95 - 105 inch-pounds (10.73 - 11.86 Nm)**.

(g). Install hose between fuel switch and reducer. Torque hose nuts to **20 - 30 inch-pounds (2.25 - 3.38 Nm)**.

(13). Install inlet bell and inlet seal with bolts, washers and nuts. Torque nuts to **60 - 85 inch-pounds (6.77 - 9.60 Nm)**.

(14). Install starter/generator.

CAUTION Always support the weight of the starter/generator during removal/installation. Damage can occur if weight is supported by the shear shaft.

(a). Remove starter/generator pad cover. Install starter/generator mount with gasket, washers and nuts. Torque nuts to **100 - 140 inch-pounds (11.29 - 15.81 Nm)**.

(b). Install starter/generator with V-clamp. Torque clamp nut to **50 inch-pounds (5.64 Nm)**.

(c). Tap around clamp with a rawhide mallet to seat clamp on flange. Retorque clamp nut to **50 inch-pounds (5.64 Nm)**.

(d). Continue tapping around clamp and retorquing clamp nut until nut no longer turns when specified torque is applied.

(15). Install engine control box on HMU.

(a). Hold engine control box in position against HMU.

(b). Insert 0.1535-0.1545 inch (3.8989-3.9243 mm) rig pin (#23 drill blank) through engine control box, indexed HMU pointer and into HMU.

(c). Rotate serrated washer on shaft for micro-adjustment until rig pin inserts without interference.

(d). Install mounting bolts, washers and use shim washers as required between engine control box and HMU to prevent binding on rig pin. Torque bolts to **36 - 46 inch-pounds (4.06 - 5.19 Nm)**.

(e). Check rig pin fit again and repeat previous steps as required.

(16). Install reducers with O-rings on HMU. Torque reducers to **550 - 600 inch-pounds (62.12 - 67.77 Nm)** and **50 - 55 inch-pounds (5.64 - 6.21 Nm)**.

Section

71-10-00

Engine Air Intake System (369D/E/FF - 500/600N)

ENGINE AIR INTAKE SYSTEM
MAINTENANCE PRACTICES

1. Description and Operation

(1). The engine air intake system consists of an air inlet screen, plenum chamber, engine inlet bell, engine inlet firewall seal, and engine firewall seal ring.

(2). Air enters the inlet fairing, passes through the inlet screen, plenum chamber and air inlet bell into the engine compressor.

(3). The engine inlet screen assembly is made of a lightweight 1/4 inch (6.35 mm) mesh metal screen material secured to a metal frame along its outer edge. The engine air particle separator option, when installed, replaces the inlet screen.

(4). The inlet screen edge is 1-1/2 inches (3.81 cm) from the top of air inlet fairing to provide an intake air-bypass area in the event that debris clogs the screen. The firewall seal separates plenum chamber intake air from engine compartment air.

(5). A differential pressure switch is mounted with a reference to both sides of the engine inlet screen. Blockage of the inlet screen will cause a pressure decrease on the engine plenum side and the switch will activate a warning light in the cockpit.

(6). A cable from the cockpit is manually operated to open a bypass door which allows unfiltered air into the engine inlet plenum if the engine inlet screen is blocked.

(7). The molded nylon air inlet bell is retained on its mounting flange with three flat springs and is required to smooth air flow into the compressor.

(8). A plenum chamber drain system prevents water condensed out of engine intake air from accumulating in the plenum chamber cavity.

2. Air Inlet Screen Replacement

A. Air Inlet Screen Removal (369D/E/FF - 500N)

(Ref. Figure 201)

NOTE: The following procedures are to be used for all MDHI model helicopters. The different steps are noted for the 500N installation.

(1). Remove engine air inlet forward fairings (Ref. Sec. 53-30-00/30).

(2). Open plenum chamber bypass door.

(3). Install a suitable cover over engine air inlet bell though bypass door opening.

(4). On 500N installation, remove the engine plenum fairing attachment hardware, open bypass door and remove fairing assembly.

CAUTION Avoid FOD. Cover compressor inlet prior to working in plenum chamber. Vacuum all FOD debris out of plenum chamber before removing protective cover from engine inlet bell. Severe damage to engine may result from entry of foreign objects.

(5). Remove clamps or tie-down straps securing tail rotor control rod boot to inlet screen fairing.

(6). Disconnect Sta. 120.00 tail rotor control rod forward end. (Ref. Chap. 67).

(7). On 500N disconnect the intermediate anti torque tube forward end. (Ref. Sec. 67-20-30).

(8). Remove blower air inlet screen (Ref. Figure 201).

(9). Remove attaching hardware and engine air inlet screen.

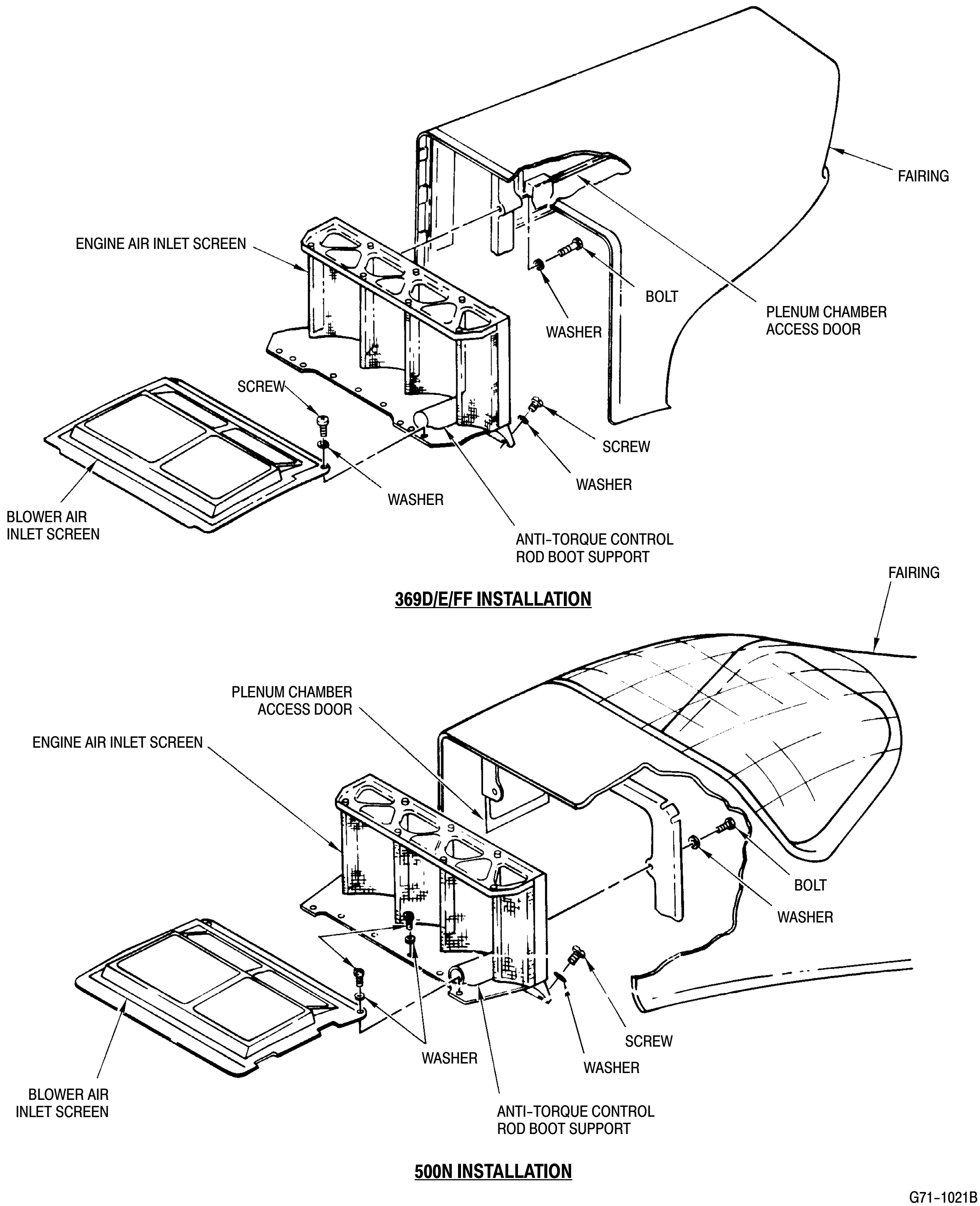


Figure 201. Engine Air Inlet Screen Installation (Sheet 1 of 2)

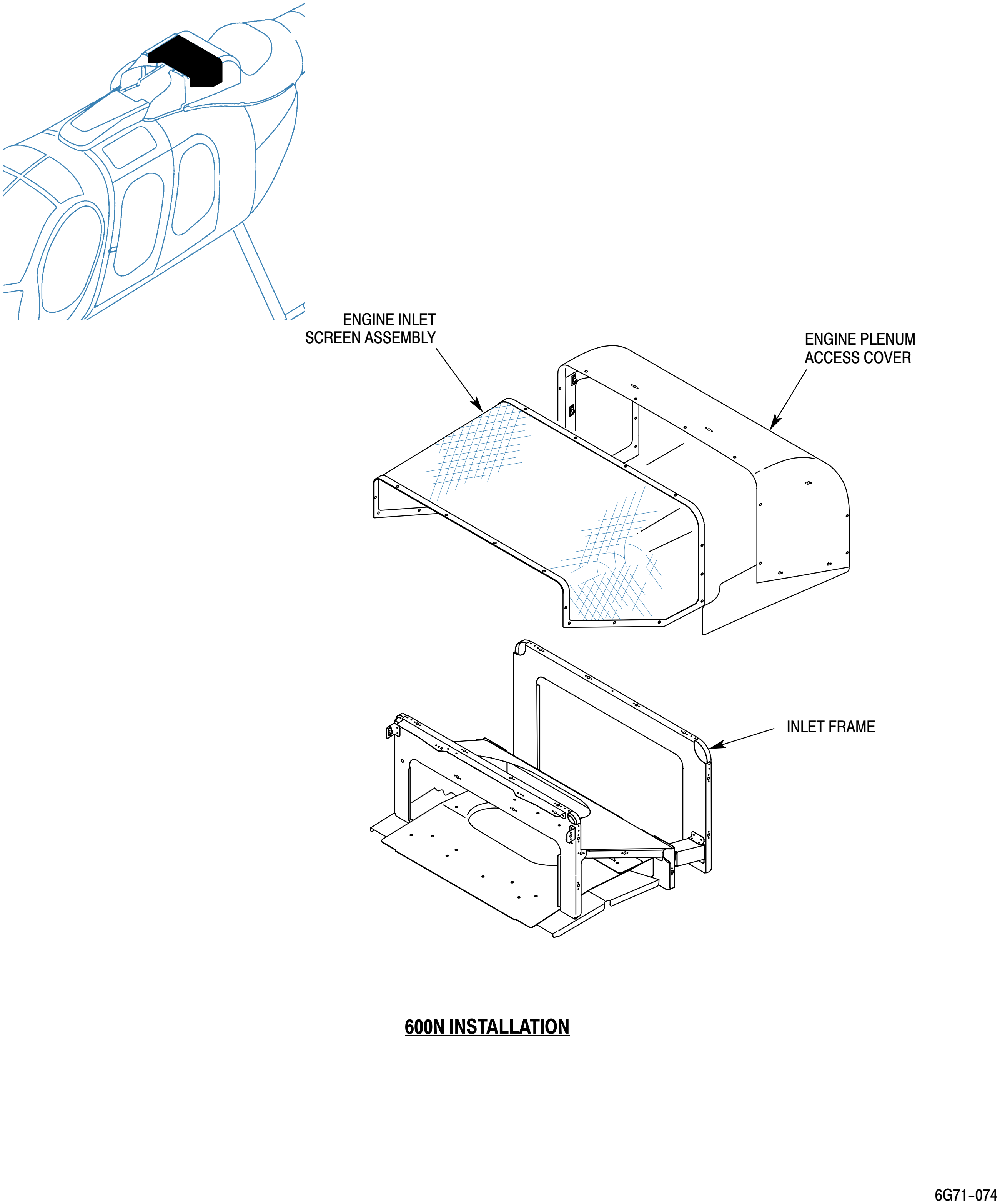


Figure 201. Engine Inlet Screen Installation (Sheet 2 of 2)

B. Engine Inlet Screen Removal (600N)

(Ref. Figure 201)

(1). Remove screws, washers and inlet screen from inlet frame.

C. Air Inlet Screen Installation (369D/E/FF - 500N)

(Ref. Figure 201)

CAUTION Vacuum all FOD debris out of plenum chamber before removing protective cover from engine inlet bell. Severe damage to engine may result from entry of foreign objects.

(1). Install engine air inlet screen in reverse order of removal.

D. Engine Inlet Screen Installation (600N)

(Ref. Figure 201)

(1). Install inlet screen on inlet frame with washers and screws. Torque screws to **20 - 25 inch-pounds (2.25 - 2.82 Nm)**.

3. Air Inlet Bell Replacement

A. Air Inlet Bell Removal

(Ref. Figure 202)

(1). Remove engine.

(2). Remove attaching hardware, air inlet bell and firewall seal ring.

(3). Remove firewall seal ring from inlet bell.

B. Air Inlet Bell Installation

(Ref. Figure 202)

(1). <u>Model 250-C20B Only</u>:
On early installations; attach firewall seal ring to inlet bell by lifting and positioning leaf springs over bell flange.

(2). Position engine air inlet bell and seal assembly on compressor inlet mounting flange and secure.

(3). Install engine.

4. Firewall Seal Removal

(Ref. Figure 202)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM219	Methyl-ethyl-ketone
CM411	Adhesive, epoxy

(1). Remove engine.

(2). Pull seal from firewall.

WARNING **Use Methyl ethyl ketone (MEK) in a well ventilated area and away from heat and flame.**

(3). Remove seal debris from firewall with a wooden or plastic scraper.

(4). Remove residue from firewall with MEK (CM219).

(5). Apply adhesive (CM411) to installation per manufacturers instructions. Center seal over firewall opening and bond in place.

(6). Install engine.

5. Air Intake System Inspection

(1). Inspect air inlet screen for security, deformation,inspect screen for cleanliness, clogged areas and foreign particle accumulation. (Cleaning of engine air inlet screens Ref. Sec. 20-20-00).

(2). Inspect screen for tears, cuts, breaks and missing pieces.

(3). Inspect anti-torque control rod boot for condition and secure attachment (Ref. Chap. 67).

(4). Inspect air inlet bell for cracks, breaks and missing pieces. No cracks or missing pieces allowed.

(5). <u>Model 250-C20B Only</u>:
On early installations; inspect engine firewall seal ring for cracked or weak springs.

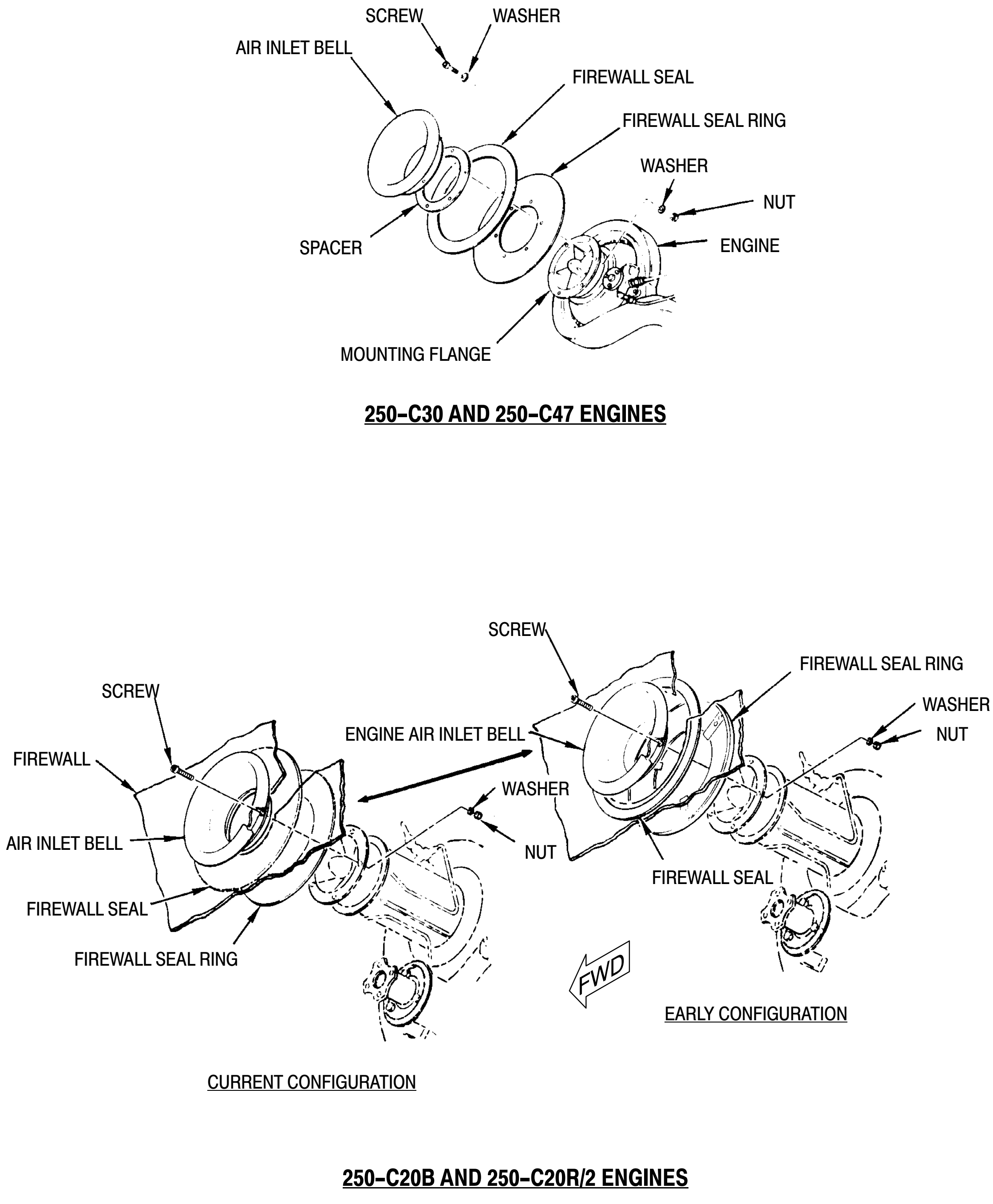


Figure 202. Firewall Seal Installation

(6). Inspect engine-to-firewall seal ring at the firewall for cracks, corrosion or damage preventing a positive and complete seal. Repair or replace seal installation as required.

(7). Inspect air inlet-to-firewall seal for cracks, corrosion or damage preventing a positive and complete seal. Repair or replace seal installation as required.

(8). Inspect plenum chamber drain tubing for deformation and corrosion. Ensure drain is open.

6. Firewall Seal Ring Repair

Replace damaged or broken springs on early installations.

7. Air Inlet Bell Repair

Engine air inlet bell repairs are not authorized; replace a defective bell.

8. Plenum Chamber Drain Tube Replacement

(Ref. Figure 203)

(1). Replace drain tubing using standard practices and procedures.

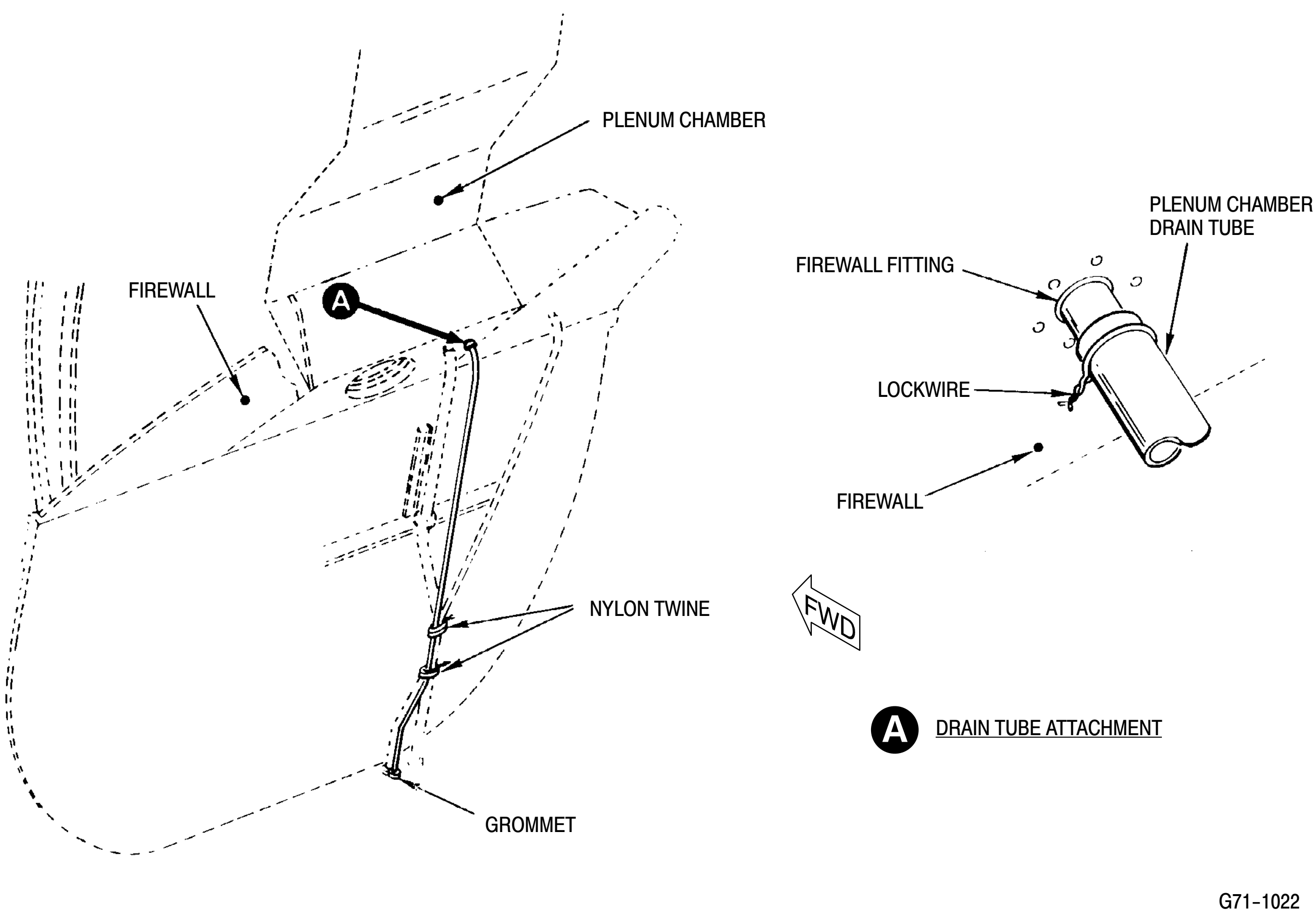


Figure 203. Drain System

Section

71-10-05

Engine Compressor Water Wash Kit (369D/E/FF - 500/600N)

ENGINE COMPRESSOR WATER WASH KIT MAINTENANCE PRACTICES

1. Engine Compressor Water Wash Kit Maintenance

Replace hoses, clamps and other hardware only when necessary.

CAUTION Whenever working in the engine plenum area, cover engine with cardboard or other suitable object to prevent foreign objects from entering engine.

(1). Remove appropriate access panels to gain access to area of water wash kit to be worked on.

2. Engine Compressor Water Wash Kit Inspection

(1). Inspect hoses for chafing, damage and deterioration.

(2). Inspect all clamps for damage and security.

(3). Inspect elbow for damage and security.

(4). Inspect spray assembly for loose rivets, secure hose and clamp, no damage to grommet and silicone sealant around tube intact.

(5). Inspect all mounting brackets for loose rivets.

(6). Inspect lanyard for security and damage; cap installed.

ENGINE COMPRESSOR WATER WASH KIT INITIAL INSTALLATION

1. Engine Compressor Water Wash Kit Initial Installation

A. Gaining Access to Work Area

(1). In aft compartment, remove seat assemblies, L/H bulkhead trim, access cover and insulation; gearbox access cover.

(2). Remove engine air inlet forward fairing; open plenum chamber access door.

CAUTION Install temporary cover of cardboard or suitable material over engine air intake.

(3). Remove engine air shield screen or engine air inlet screen, as applicable; remove access cover from mast support structure panel.

(4). Open L/H engine compartment door.

B. Airframe Modification and Installation

(Ref. Figure 901)

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer
CM430	Sealant, solvent resistant

(1). Position 369H3047 support on Sta. 137.50 lower section ring at dimensions shown in view E-E. Mark and drill rivet holes and install support with six NAS1398B4-2 rivets. Install rivets with Primer (CM318).

(2). Drill No. 8 hole in ring assembly; locate from existing hole in support.

(3). Install AN807-4D hose adapter in support with hardware as shown; install lanyard clip in hole with hardware as shown. Install 369H3046 cap on hose adapter.

(4). Drill or cut 0.4531 inch (11.50874 mm) hole in firewall assembly at dimension shown in view A-A. Position and install AN848-4D hose elbow in firewall with hardware as shown.

(5). Cut hole for MS35489-11 grommet in forward wall of plenum chamber per dimensions shown; install grommet with sealant (CM430).

(6). Position 369H3042 spray assembly on inner side of plenum chamber forward wall, view B-B, with tube inserted forward through grommet. Mark and drill rivet holes and install spray assembly with eight NAS1738M4-2 rivets. Install rivets with primer.

(7). Install 369H3048-5 hose on spray assembly tube and on hose elbow at firewall; secure hose at each end with AN737TW22 clamps.

(8). Mark and drill No. 8 hole in 369H3024 channel and install MS25281-4 clamp and hardware as shown. Secure -5 hose with clamp.

(9). Install 369H3048-3 hose on elbow at left side of firewall and on hose adapter at forward side of lower section ring. Secure hose at each end with AN737TW22 clamps.

2. Installation Inspection

(1). Carefully check and/or vacuum the plenum chamber for any foreign objects or debris. Remove protective cover from engine air intake.

NOTE: Spray kit using 369H3042 nozzle requires 60 PSI (414 kPa) to establish water flow rate of one quart (0.946 L) in 9-10 seconds. A bypass valve or equivalent installed at source hose connection is recommended in order to relieve pressure and facilitate disconnection at hose adapter.

(2). Perform operational check of water wash kit installation.

(3). Reinstall removed components and assemblies; install and secure access covers and doors.

(4). Record installation of 369H92537 engine compressor water wash kit in helicopter Log Book.

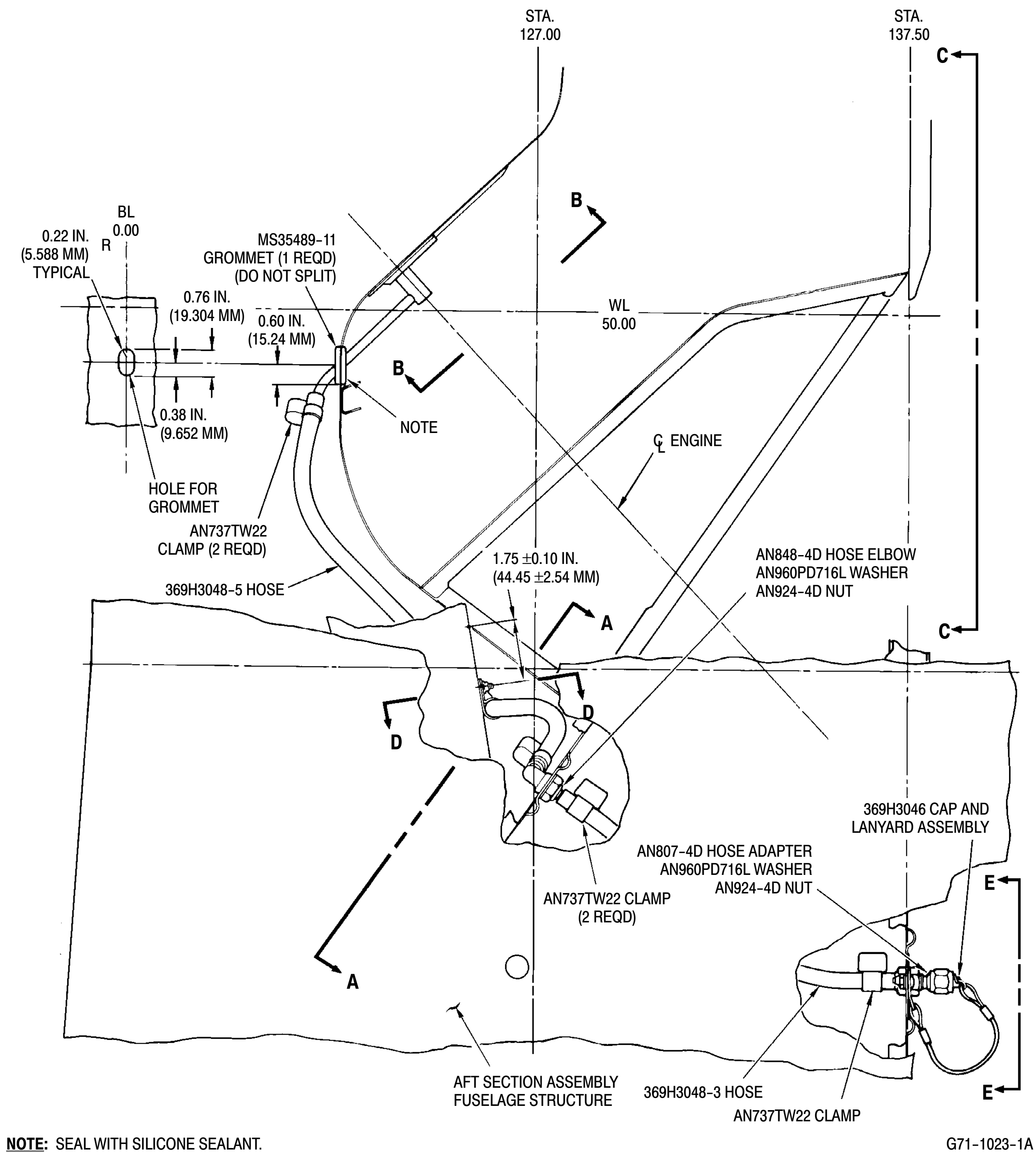


Figure 901. Engine Compressor Water Wash Kit Installation (Sheet 1 of 3)

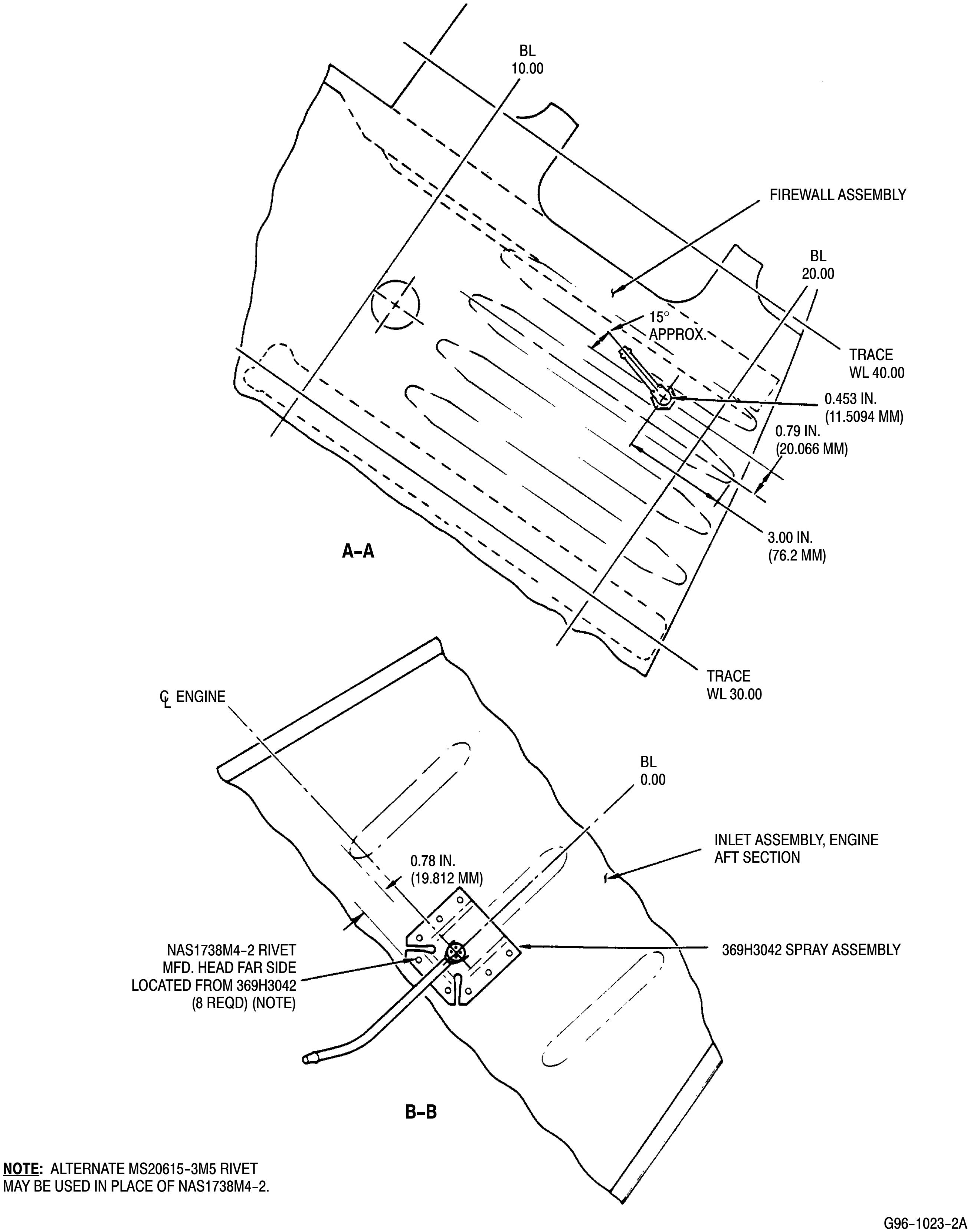


Figure 901. Engine Compressor Water Wash Kit Installation (Sheet 2 of 3)

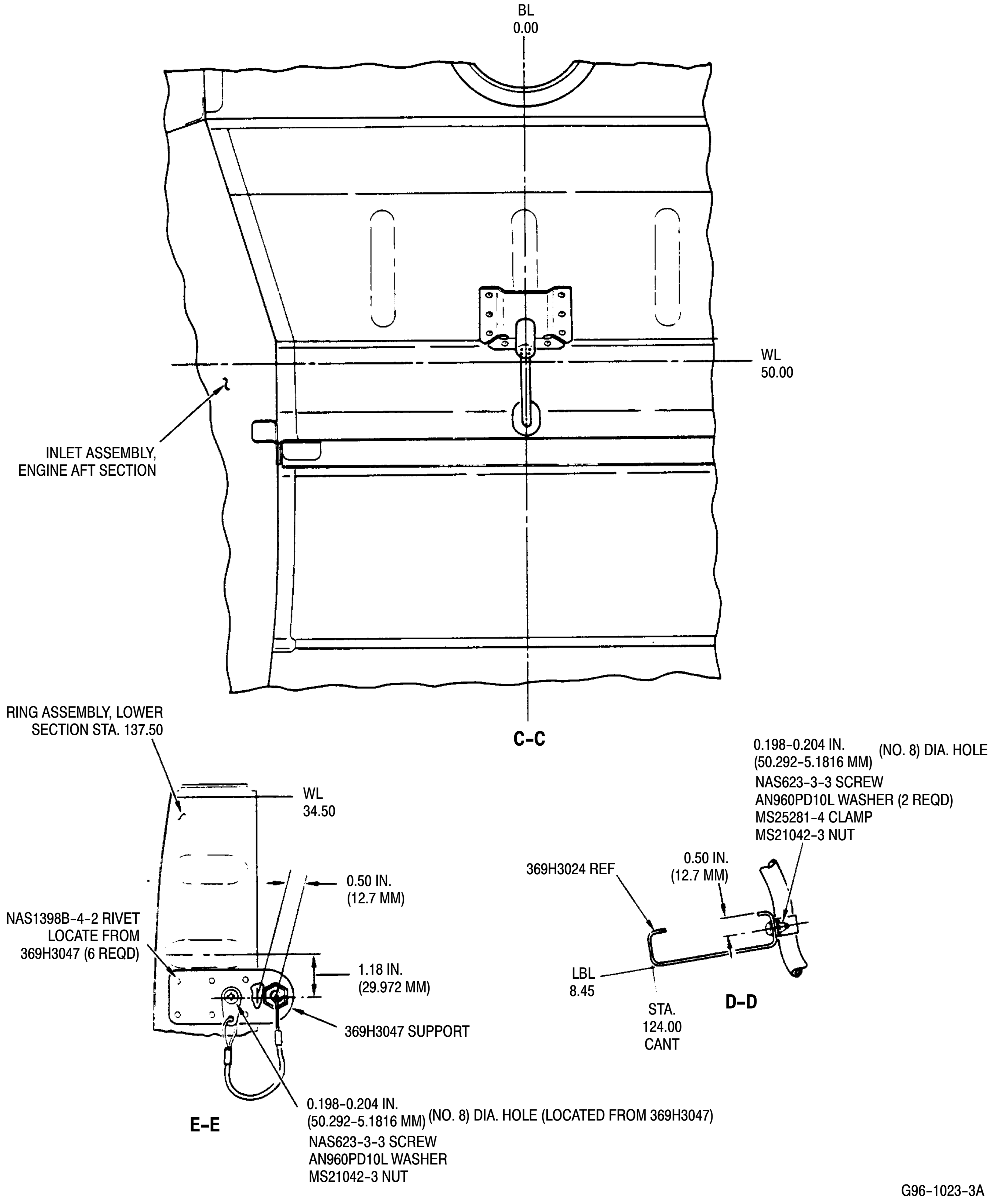


Figure 901. Engine Compressor Water Wash Kit Installation (Sheet 3 of 3)

Section

71-10-10

Engine Air Particle Separator (369D/E/FF - 500N)

ENGINE AIR PARTICLE SEPARATOR DESCRIPTION AND OPERATION

1. Description and Operation

(Ref. Figure 1)

(1). MDHI 369/500 helicopters may be equipped with an optional engine inlet air particle separator filter installation in place of the standard engine air inlet screen.

(2). Later model helicopters are equipped with a Aircraft Porous Media (APM) filter. Earlier 500D helicopters were fitted with a Donaldson particle separator. The APM unit is equipped with provisions for an optional mist eliminator installation.

(3). Both the APM and Donaldson particle separators are installed inside the front of the aft intake fairing above the plenum chamber and utilize the same operating principle. The particle separator installation consists of vortex tubes, a collection chamber, a nozzle manifold, ejectors, flapper valve, seals and attaching hardware. A scavenge air system is used to remove trapped particles from the collection chamber with engine bleed air. The scavenge air system consists of a solenoid air valve, tubes, an air pressure switch, SCAV AIR circuit breaker switch, AIR FILTER CLOGGED caution light, wiring, and attaching hardware. An air bypass door system is included to allow the particle separator to be bypassed in the event the unit becomes clogged. The air bypass door system includes a hinged plenum chamber door, door latches, door actuating forward and aft cables, cable return spring, two retainers, three cable pulleys, adjustable cable stop, handle and attaching hardware.

(4). An optional mist eliminator may be fitted to the back of APM separators to filter liquid sprays out of engine inlet air. Nine self retaining bolts secure early mist eliminator installations to the aft face of the particle separator. Later installations feature a system of clips that retain the mist eliminator in sealed contact with the particle separator. The mist eliminator consists of a welded stainless steel frame and wire mesh screens on the fore and aft faces.

(5). Air drawn through the particle separator by the engine passes through the parallel vortex tubes. Each tube is fitted with vanes and an opening to the particle collection chamber. The vanes spin the incoming air so that centrifugal force separates heavier solid bits from the air flow. A smaller diameter tube directs particle free center vortex tube air through the collection chamber rear plate into the plenum chamber. When the scavenge air system is switched ON, trapped particles are drawn out of the collection chamber by scavenge air vacuum and discharged overboard through an opening in the right side of the aft inlet fairing of APM equipped helicopters and the left side on Donaldson equipped machines. The nozzle manifold is fitted with an engine bleed air inlet port and air jets to discharge contaminants. The ejector assembly consists of a mounting flange with tubes, duct assembly and flapper valve.

(6). The scavenge air system is supplied compressor bleed air controlled by the solenoid air valve. Bleed air is delivered to a duct-mounted nozzle-manifold that ejects contaminants from the particle separator. The electrically actuated solenoid air valve is mounted on the left forward side of the Station 124.00 bulkhead. The valve is controlled by the SCAV AIR circuit breaker switch on the instrument panel.

(7). An increase in plenum chamber vacuum (reduced plenum chamber pressure) caused by reduced airflow through a clogged filter/mist eliminator is sensed by a differential pressure switch ported to the plenum chamber and particle separator inlet. Sufficient pressure differential causes the switch to close. Switch closure lights an AIR FILTER CLOGGED caution indicator on the instrument panel. A cable actuated filter bypass door on the plenum chamber wall may be opened by the pilot to allow the engine to operate on unfiltered air.

(8). Pulling the FILTER BYPASS CONTROL handle in the crew compartment disengages two door latches inside the engine air inlet aft fairing and opens the door inward. A spring and two retainers on the aft end of the forward cable returns the handle to the stowed position. An adjustable stop provides for cable travel adjustment and air bypass door rigging.

On 500N installation, the FILTER BYPASS CONTROL handle in the crew compartment disengages one door latch inside the air inlet aft fairing and opens the door inward. Adjustment of this cable installation is limited by repositioning the cable assembly.

Table 1. Engine Air Particle Separator Configurations

Model	Part Number	Cabin Heat	Principal Features
500N	500N90148-3	No	APM filter with new pressure switch and T-pedestal electrical
	500N90148-1	Yes	installation.
530FF	369H90148-543	No	APM filter with generic wire harness and no cabin heat
	369H90148-541	Yes	APM filter with generic wire harness and cabin heat
	369H90148-529	No	APM filter with new pressure switch and T-pedestal electrical
	369H90148-527	Yes	installation.
500E	369H90148-545	Yes	APM filter for C20R engine with generic wire harness
	369H90148-539	No	APM filter for C20R engine with generic wire harness
	369H90148-537	No	APM filter for C20B engine with generic wire harness
	369H90148-535	Yes	APM filter for C20B engine with generic wire harness
	369H90148-521	No	APM filter with T-pedestal electrical installation.
	369H90148-519	Yes	
500D	369H90148-509	No	APM filter with electrical controls bracket on side of slimline pedestal.
	369H90148-507	Yes	
	369H90148-505	No	Donaldson filter with electrical controls bracket on side of slimline
	369H90148-503	Yes	pedestal. No mist eliminator option.

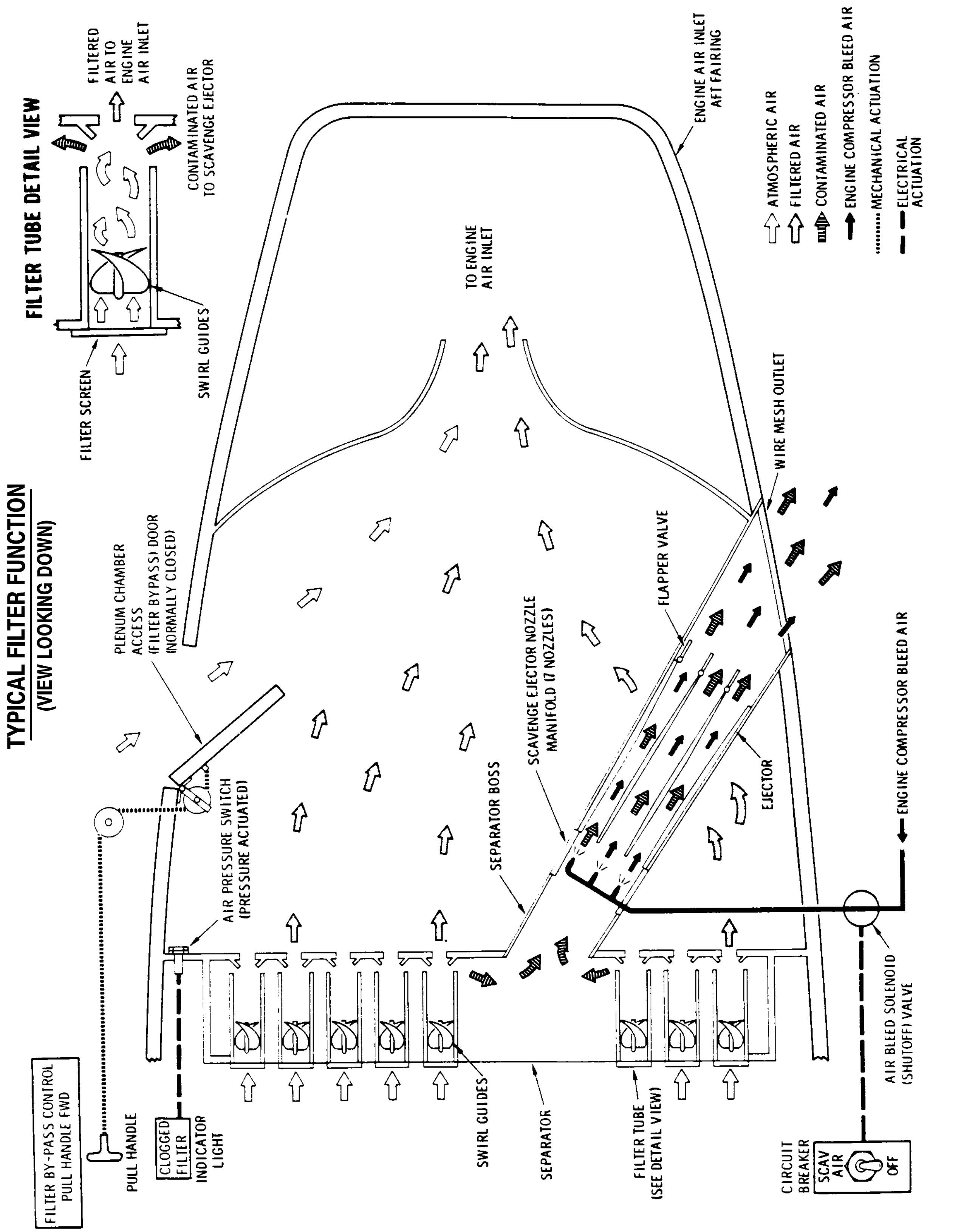


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Figure 1. Particle Separator Operating Principle - Early Type (Donaldson Unit)

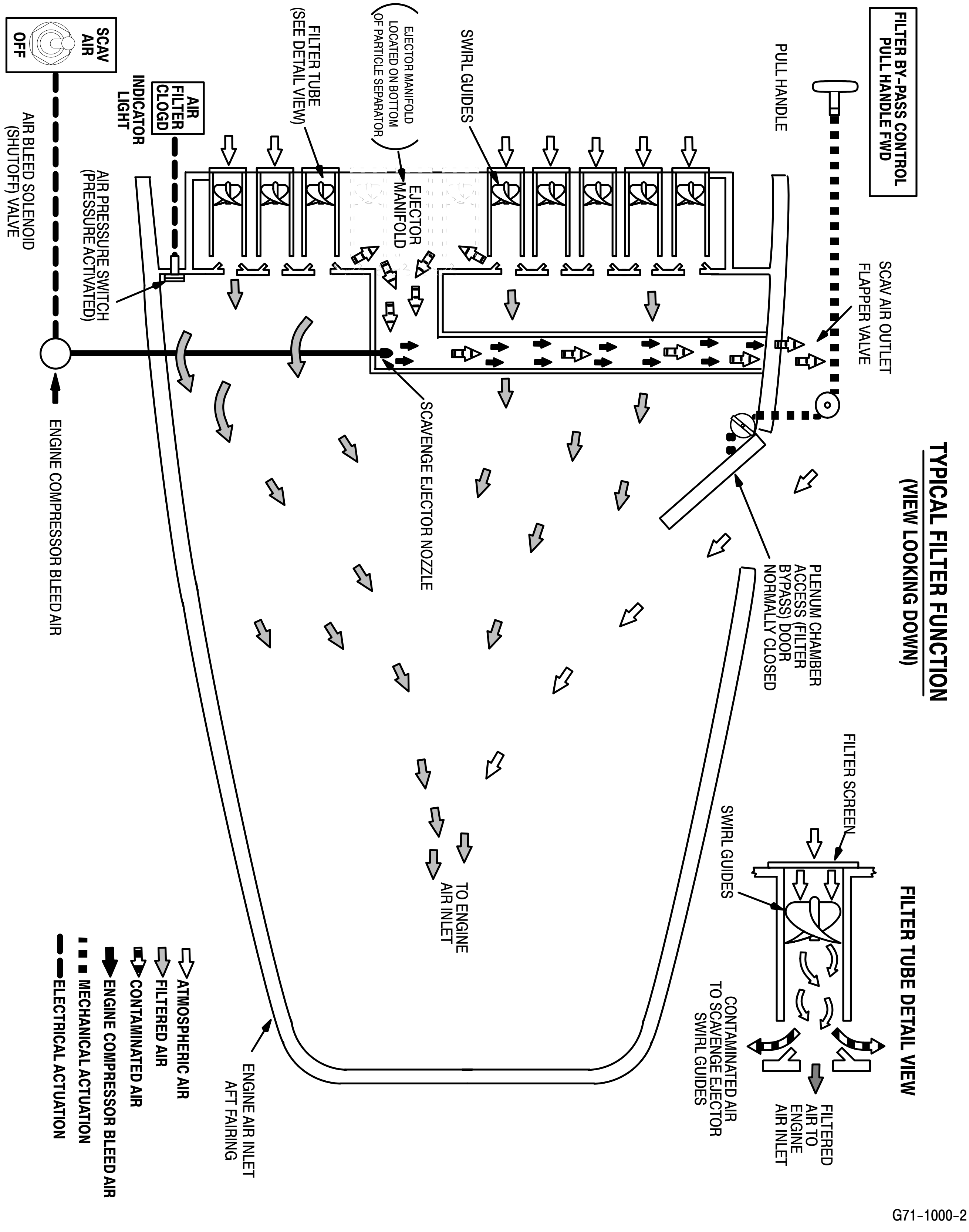


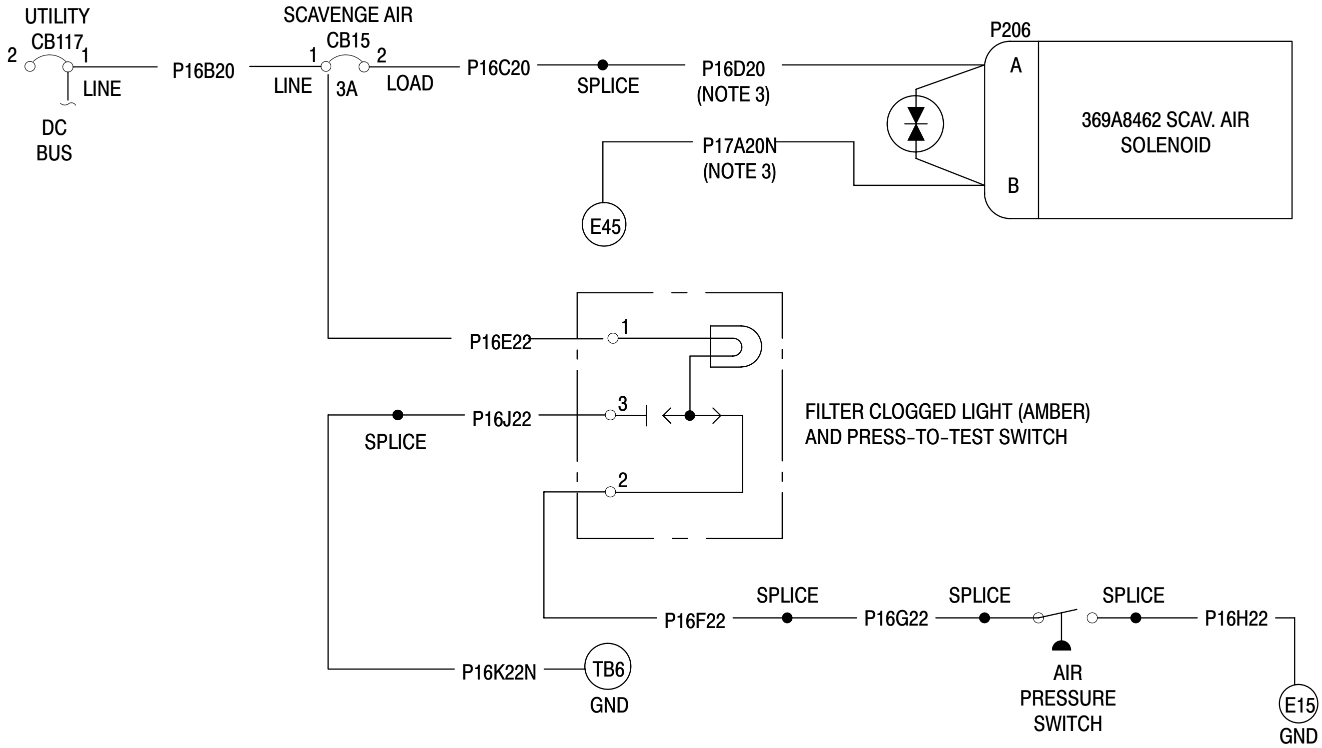
Figure 2. Particle Separator Operating Principle - Current Type (APM Unit)

ENGINE AIR PARTICLE SEPARATOR FAULT ISOLATION

1. Engine Air Particle Separator Fault Isolation

Table 101. Engine Air Particle Separator Fault Isolation

Symptom	Probable Trouble	Corrective Action
Turbine outlet temperature (TOT) gage indicates a moderate temperature increase with all other indications normal.	Partially blocked particle separator and, or mist eliminator.	Clean and service particle separator installation.
FILTER CLOGGED caution light on. Light goes out when air bypass door is opened.	Clogged filter.	Clean and service particle separator installation.
Filter requires frequent cleaning. Loads up with SCAV AIR, ON and functioning.	Inadequate scavenge air flow; leaking scavenge air bleed air lines.	Inspect scavenge air system for leakage. Repair system as required.
	Solenoid air valve blocked.	Clean solenoid air valve.
FILTER CLOGGED caution light fails to come on when filter is clogged.	Lamp failed.	Replace lamp.
	Disconnected, open or loose wiring.	Check continuity, repair or replace wiring.
	Faulty air pressure switch.	Replace pressure switch.
FILTER CLOGGED caution light stays on regardless of bypass door position.	Defective light assembly.	Replace light assembly.
	Defective air pressure switch.	Replace air pressure switch.
	Wiring problem.	Repair wiring.
FILTER CLOGGED caution light fails to come on when air filter is clogged but works when tested.	Defective wiring.	Repair wiring.
	Defective air pressure switch.	Replace air pressure switch.
FILTER BYPASS CONTROL handle is pulled but bypass door fails to open.	Disconnected or broken cable.	Repair or replace cables.
Air bypass door does not open all the way when FILTER BYPASS CONTROL handle is pulled to forward limit.	Cable stop out of adjustment.	Adjust cable stop.
FILTER BYPASS CONTROL handle fails to return to full aft position after control actuation.	Defective return spring.	Replace return spring.
	Cable kinked, worn or binding.	Repair or replace cable assembly.
No air is exhausted through outlet duct with SCAV AIR circuit breaker ON and engine running.	Defective wiring.	Repair wiring.
	Disconnected or damaged scavenge air line.	Connect or replace scavenge air line.
	Defective solenoid air valve.	Replace solenoid air valve.



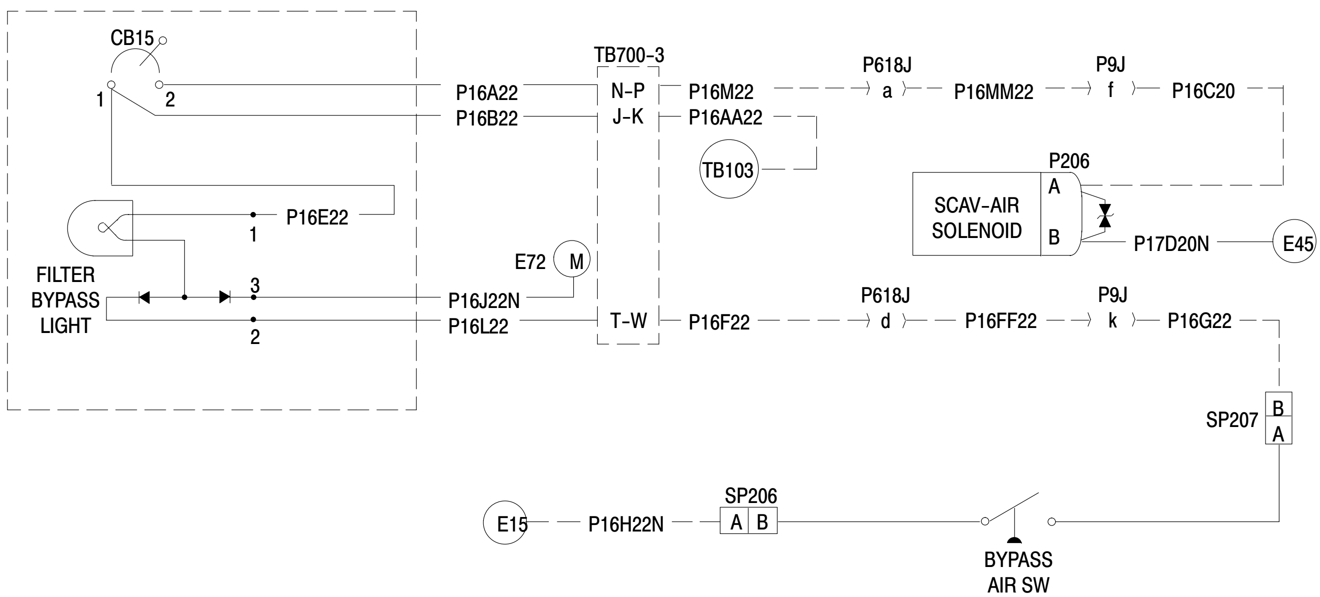
NOTES:
1. THIS WIRING DIAGRAM SHOULD BE USED WITH THE ELECTRICAL SYSTEM WIRING DIAGRAM IN CSP-HMI-3 FOR COMPLETE CIRCUIT INTERCONNECT AT INSTALLATION.
2. ASTERISK (*) INDICATES WIRE IS CUT TO LENGTH AT INSTALLATION.
3. PART OF WIRE HARNESS 369D24163.

G71-1002-1A

WIRE LIST

WIRE NO.	LENGTH	FROM	TERMINATION	TO	TERMINATION
P17A20N	-	P206-B	-	E45	-
P16K22N	72.0*	SPLICE	32445	TB6	MS25036-101
P16J22	10.0	LIGHT - 3	SOLDER	SPLICE	32445
P16H22	72.0*	SPLICE	32445	E15	MS25036-103
P16G22	204.0*	SPLICE	32445	SPLICE	32445
P16F22	12.0	LIGHT - 2	SOLDER	SPLICE	32445
P16E22	3.0	CB15 - LINE	MS25036-149	LIGHT - 1	SOLDER
P16D20	-	SPLICE	-	P206-A	-
P16C20	240.0*	CB15 - LOAD	MS25036-149	SPLICE	32445
P16B20	72.0*	CB117 - LINE	MS25036-149	CB15 - LINE	MS25036-149

Figure 101. 369H90148-503, -505, -507, -509 Particle Separator Installation Wiring Diagram (Slim-Line Panel)

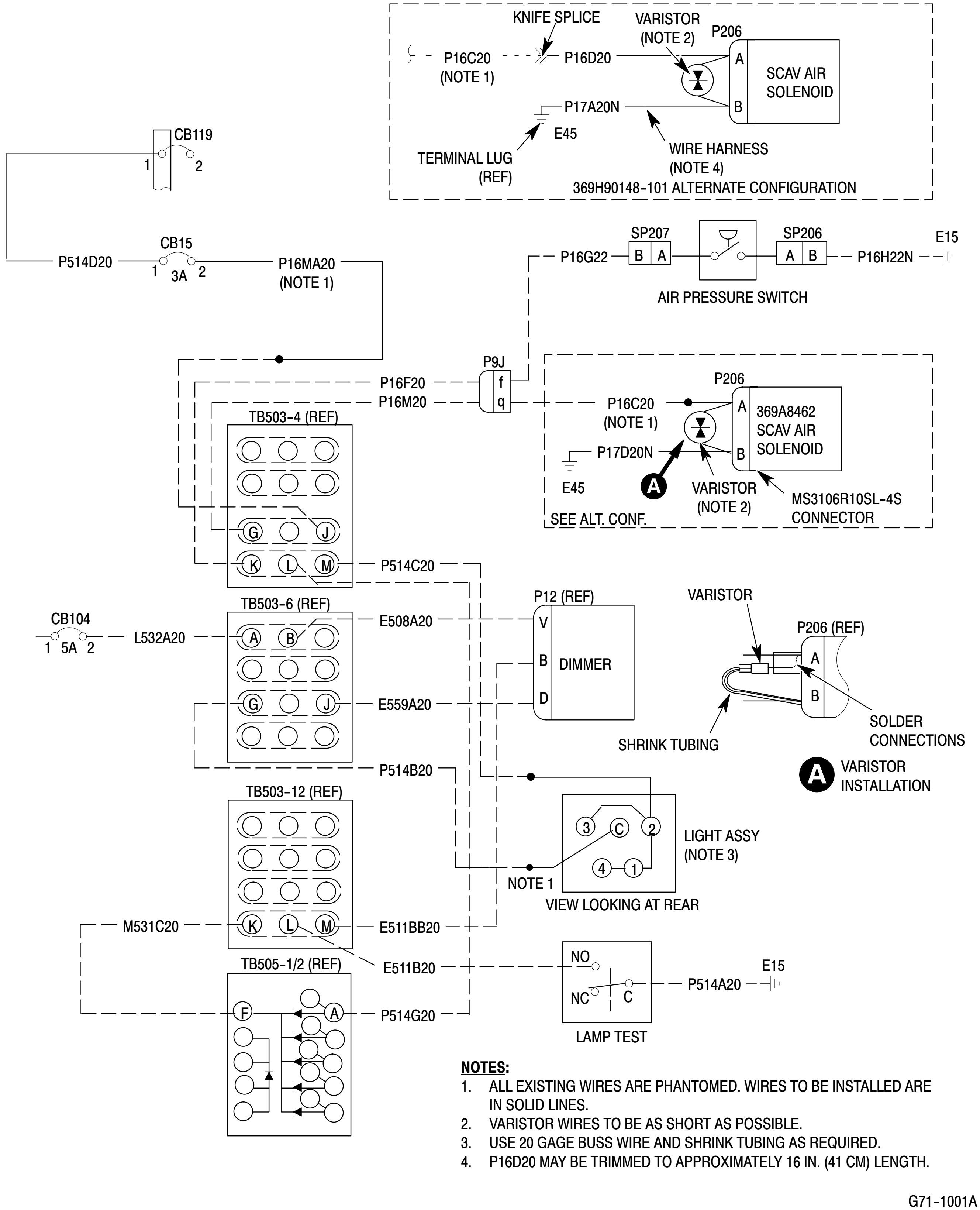


NOTES:

1. APPLICABLE TO 369D MODEL, S/N 1222 AND SUBS. WITH T-PANEL AND CENTER ELECTRICAL CONSOLE.
2. EXISTING WIRING IS SHOWN PHANTOMED. WIRE TO BE INSTALLED IS SOLID.

G71-1002-2

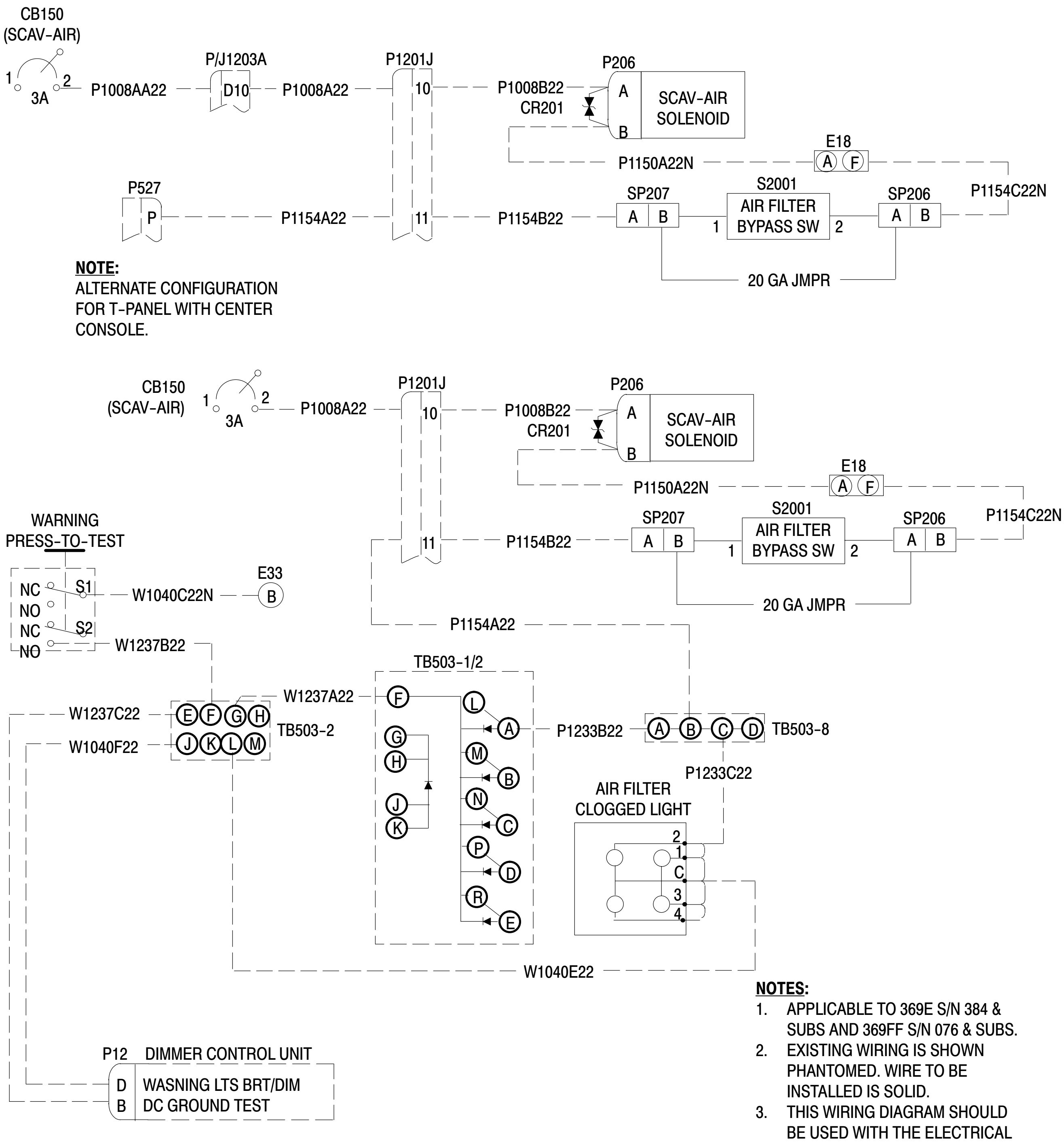
Figure 102. 369H90148-503, -505, -507, -509 Particle Separator Installation Wiring Diagram (T-Panel with Center Console)



NOTES:

1. ALL EXISTING WIRES ARE PHANTOMED. WIRES TO BE INSTALLED ARE IN SOLID LINES.
2. VARISTOR WIRES TO BE AS SHORT AS POSSIBLE.
3. USE 20 GAGE BUSS WIRE AND SHRINK TUBING AS REQUIRED.
4. P16D20 MAY BE TRIMMED TO APPROXIMATELY 16 IN. (41 CM) LENGTH.

Figure 103. 369H90148-519, -521, -527, -529 Particle Separator Installation Wiring Diagram



NOTES:

1. APPLICABLE TO 369E S/N 384 & SUBS AND 369FF S/N 076 & SUBS.
2. EXISTING WIRING IS SHOWN PHANTOMED. WIRE TO BE INSTALLED IS SOLID.
3. THIS WIRING DIAGRAM SHOULD BE USED WITH THE ELECTRICAL SYSTEM WIRING DIAGRAM IN CSP-HMI-3 FOR COMPLETE IDENTIFICATION.

G71-1002-3

Figure 104. 369H90148-535,-537, -539, -541, -543, -545 and 500N90148-1, -3 Particle Separator Installation Wiring Diagram

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ENGINE AIR PARTICLE SEPARATOR MAINTENANCE PRACTICES

1. Air Bypass Door System Maintenance

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM106	Fluorocarbon dry lubricant

CAUTION

- Prevent engine FOD. Secure a cover over the engine intake prior to working inside plenum chamber. Remove cover after completing work.
- Loose, missing or improperly installed air bypass door hardware may cause engine damage.

NOTE: Maintain door system equipment per FAA publication, EA-AC43.13-1A and 2A.

(1). Disconnect cable from door.

(2). Inspect and replace loose or worn door hinge pins with 0.091 inch (2.3114 mm) diameter corrosion resistant wire.

(3). Inspect all door hardware for wear, corrosion, correct installation, secure attachment and proper operation.

(4). Connect cable to door.

(5). Close door. Check for positive latching and correct alignment. Peel or add latch clip shims to align door flush with fairing surface.

(6). Rig air bypass door (Ref. Air Bypass Door Rigging) after replacing either forward or aft cable, or changing cable travel.

(7). Spray gasket and door edge with S-122 fluorocarbon dry lubricant (CM106) if operating in temperatures below 40°F (4.5°C).

(8). Remove engine intake cover.

2. Solenoid Air Valve Cleaning

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM112	Anti-seize compound high temperature

NOTE: Maintain scavenge air equipment per FAA publication, EA-AC43.13-1A and 2A.

CAUTION Use anti-seize compound (CM112) on all male threaded fittings prior to installation.

(1). To access solenoid air valve; remove lower and center air duct trim from forward left side of aft passenger compartment bulkhead.

NOTE: Solenoid air valve water flush procedure may be accomplished with valve installed or removed from helicopter. In either case, a 28 Vdc power supply is required to actuate valve for cleaning.

(2). Connect a low pressure, clean water source to valve inlet fitting. Connect a hose to the outlet fitting to route discharged water to a drain. Connect a 28 Vdc external power source to helicopter or the valve, as required.

(3). Turn on water. Alternately open and close valve with SCAV AIR circuit breaker switch to flush valve poppet seat.

(4). Reverse air valve water connections. Repeat flushing procedure.

CAUTION Compressor bleed air is hot enough to char tube identification tapes that may cause FOD. Remove identification tapes from compressor bleed air tubes prior to installation.

(5). Install solenoid air valve. Torque valve mounting bolts to **22 - 27 inch-pounds (2.49 - 3.05 Nm)**. Torque tube nuts to **110 - 130 inch-pounds (12.43 - 14.69 Nm)**.

3. Air Pressure Sensing Switch Maintenance

Air pressure switch and AIR FILTER CLOGGED caution light circuit function may be quick-checked as follows:

(1). Open air bypass door.

CAUTION Prevent engine FOD. Secure a cover over the engine intake prior to working inside plenum chamber. Remove cover after completing work.

(2). Attach a suitable length of 3/16 inch (4.76 mm) ID hose to pressure switch nipple. Connect a vacuum source to the hose.

(3). Connect 28 Vdc power to the helicopter.

(4). Apply vacuum to pressure switch. The AIR FILTER CLOGGED caution light should come on. Release the vacuum and the light should go out.

4. Air Bypass Door Rigging (369D/E/FF)

Rig air bypass door installation after replacing forward or aft cables or when door operation or opening angle is incorrect. Rig door as follows:

CAUTION Prevent engine FOD. Secure a cover over the engine intake prior to working inside plenum chamber. Remove cover after completing work.

(1). Cycle air bypass door control handle and door mechanism several times to be certain system does not bind at any point. Isolate problem and repair a binding cable or door latch system before continuing.

(2). With door open, make sure FILTER BYPASS CONTROL handle is returned full aft against cable housing and spring resistance is immediately felt as handle is started forward.

(3). Determine if there is excess slack in the cable system as follows:

(a). Close air bypass door. Try door to make sure latch-bolts are bottomed in latch-clips.

(b). Have an assistant press hard against the air bypass door in an attempt to keep the latch-bolts from moving up out of their clips.

(c). Grasp FILTER BYPASS CONTROL handle and slowly move it forward. The distance the handle travels before meeting the solid resistance of the latch-bolts gives an indication of cable slack and lost motion due to wear.

(4). Remove cable slack as follows:

(a). Break lockwire between door latch center crank threaded swivel fitting and cable end fitting (Ref. Figure 201, detail D). Remove attaching hardware and swivel fitting from door latch center crank. Thread swivel fitting up swaged cable terminal end 2 - 3 turns. Reassemble all door hardware except lockwire.

(b). Repeat previous steps as required until slack is removed. Do not preload cable.

(c). Lockwire cable end fitting to door latch center crank swivel fitting.

(5). Adjust door opening angle as follows:

(a). Thread cable-stop in or out of stop sleeve until top of cable-stop is 1.65 inches (4.19 cm) below cable swaged ball.

(b). Pull FILTER BYPASS CONTROL handle forward until aft cable swaged ball bottoms in cable stop. Maintain cable tension to keep cable ball against stop.

(c). Pull air bypass door outboard to maintain cable tension.

CAUTION Avoid an erroneous cable adjustment. Maintain a constant cable ball contact with cable stop as stop is adjusted.

(d). Adjust cable stop until air bypass door opens to a minimum 45° angle relative to fairing exterior surface. Measure angle between door and fairing exterior surface at Sta. 136.00 (Ref. Figure 201, details G and H).

(e). Release FILTER BYPASS CONTROL handle. Inspect handle for freedom of movement, full retraction and contact with forward fitting.

(f). Close air bypass door.

(g). Check that aft cable is tight and cable swaged ball rests against top of cable-stop.

(h). Inspect pulley alignment. All pulleys must line up within 0.13 inch (3.302 mm).

(i). Inspect cable for correct routing around pulleys. Rotate each pulley 90° to distribute wear.

(j). Peel cable-stop support bracket laminated shim as required to center cable inside cable-stop to within 0.060 inch (1.524 mm).

(k). Torque cable-stop jam-nut to **10 - 30 inch-pounds (1.13 - 3.39 Nm)**.

(6). Check all components of FILTER BYPASS CONTROL system for correct operation. Inspect all fasteners for security.

5. Air Bypass Door Rigging (500N)

(Ref. Figure 202)

CAUTION Prevent engine FOD. Secure a cover over the engine intake prior to working inside plenum chamber. Remove cover after completing work.

(1). The bypass door cable length is determined on the initial installation.

NOTE: The control cable assembly shall actuate with one pound pull.

(2). Cycle air bypass door control handle and door mechanism several times to be certain system does not bind at any point. Isolate problem and repair a binding cable or door latch system before continuing.

(3). Minor repositioning of the cable assembly can be performed by loosening the installation hardware to reposition the cable.

6. Particle Separator Cleaning

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM226	Cleaning compound, alkaline waterbase

(1). Submerge separator in a solution of detergent soap (CM226) and water for at least 15 minutes. Clean screens and vortex tubes with a soft, long-bristle brush.

(2). Flush with clean water. Drain and blow out ejector nozzle with dry, low pressure compressed air.

7. Mist Eliminator Maintenance

(1). Remove mist eliminator and clean with solvent or steam.

NOTE: Mist eliminator is all stainless steel. The assembly will not be harmed by conventional metal cleaning solutions.

(2). Examine plenum chamber. A dust accumulation indicates leakage which must be identified and eliminated.

(3). Spray 15 milliliters of engine oil on each face of the mist eliminator prior to installation.

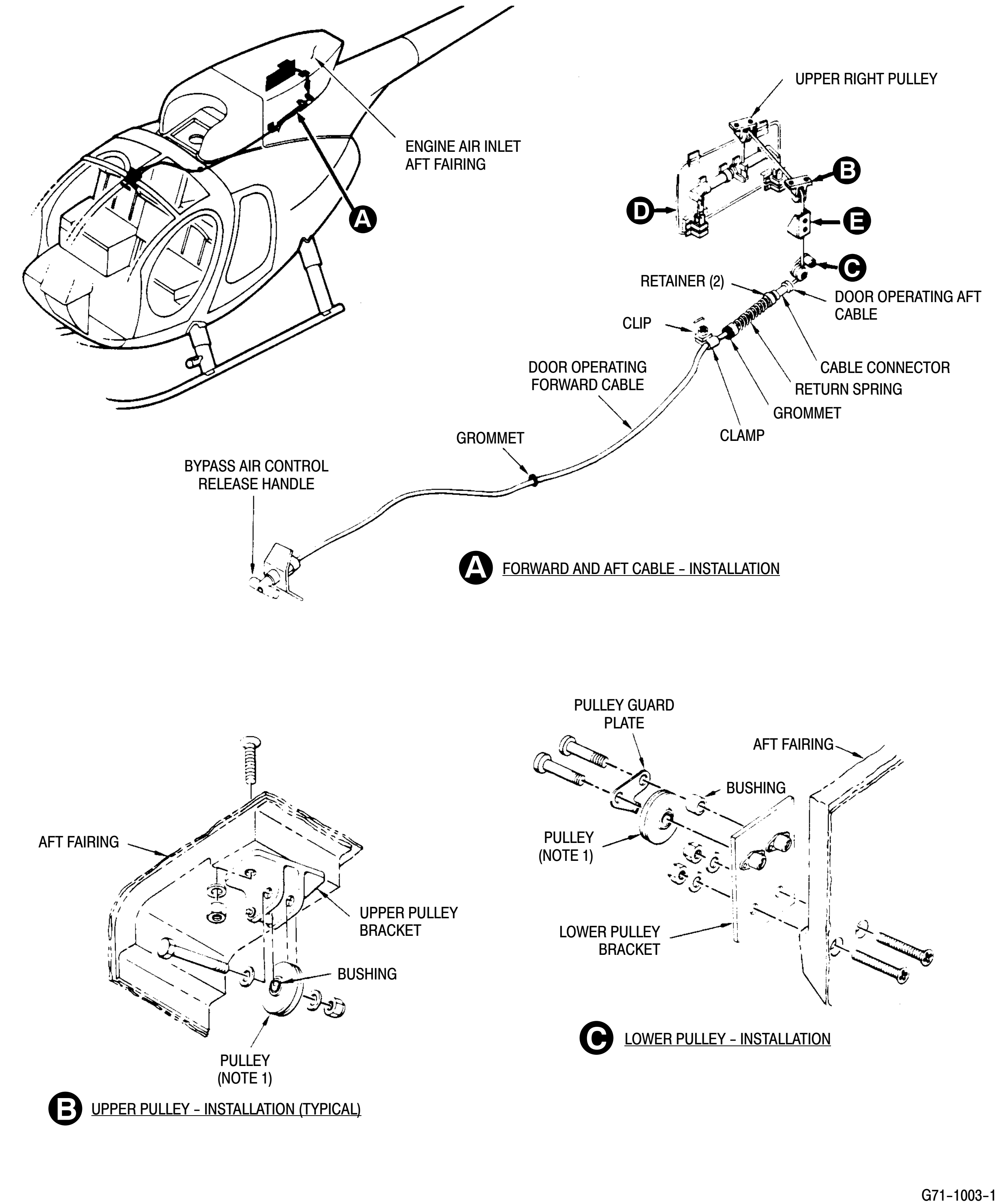
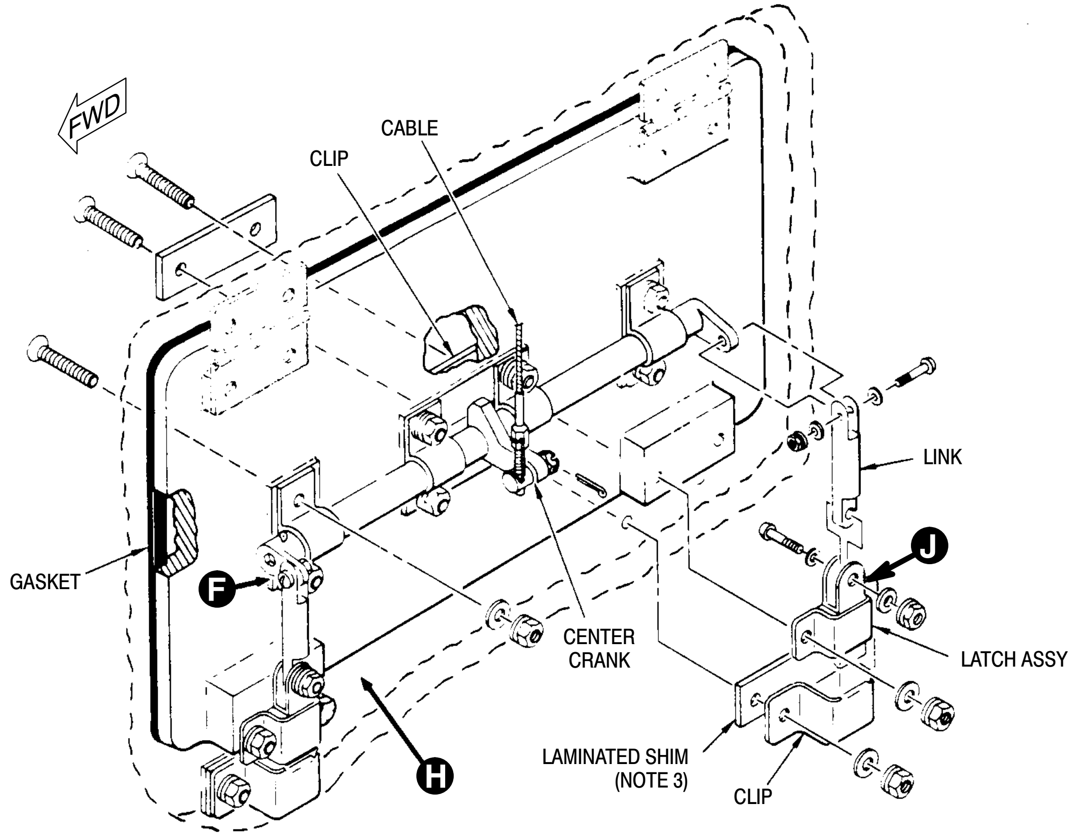
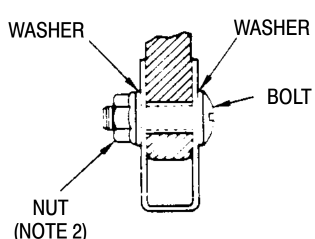


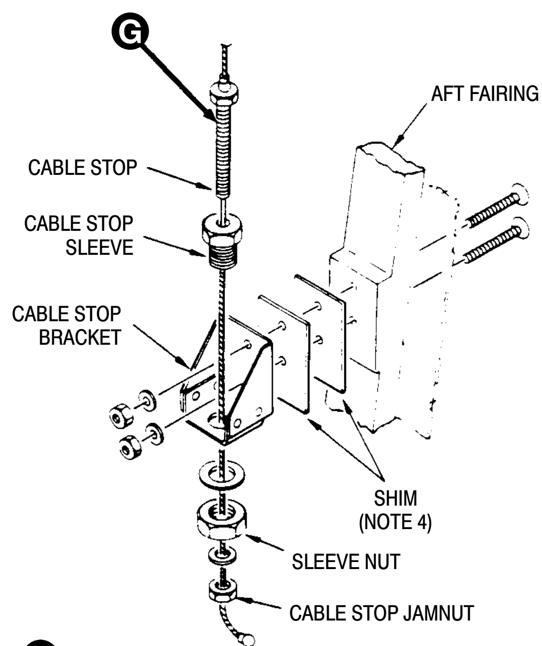
Figure 201. Air Bypass Door System (369D/E/FF) (Sheet 1 of 3)



D FILTER BYPASS DOOR - INSTALLATION



F TYPICAL LINKAGE - INSTALLATION
(4 PLACES)



E CABLE STOP - INSTALLATION

G71-1003-2B

NOTES:

1. PULLEYS TO BE IN ALIGNMENT WITHIN 0.13 IN. (3.302 MM).
2. TIGHTEN NUT TO GET 0.005-0.015 IN. (0.127-0.381 MM) GAP BETWEEN BOLT HEAD AND WASHER; 4 PLACES.
3. ADJUST LAMINATED SHIM THICKNESS TO GET CORRECT DOOR LATCHING AND ALIGNMENT.
4. SHIM TO ALIGN CABLE WITH CABLE STOP WITHIN 0.060 IN. (1.524 MM).

Figure 201. Air Bypass Door System (369D/E/FF) (Sheet 2 of 3)

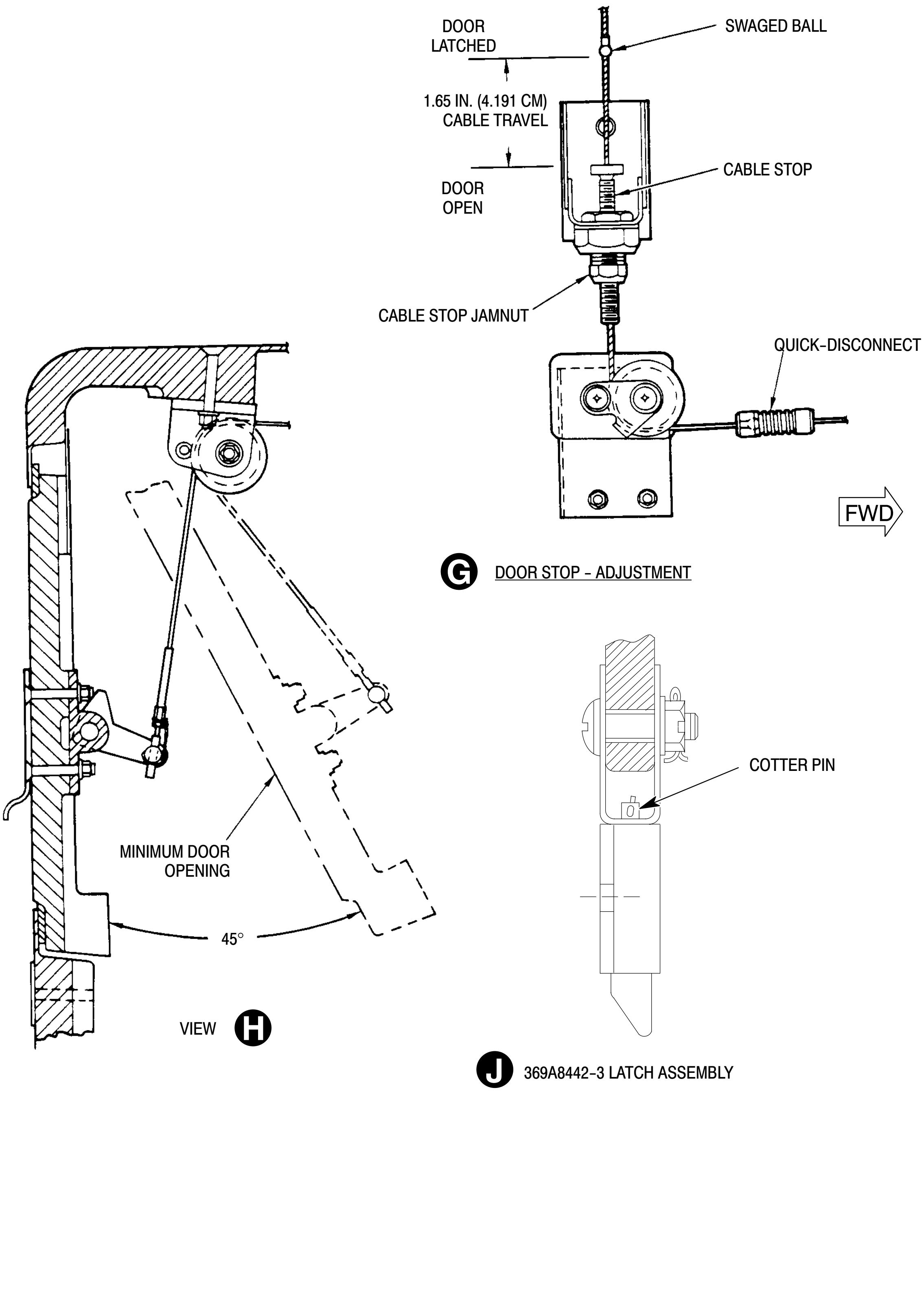


Figure 201. Air Bypass Door System (369D/E/FF) (Sheet 3 of 3)

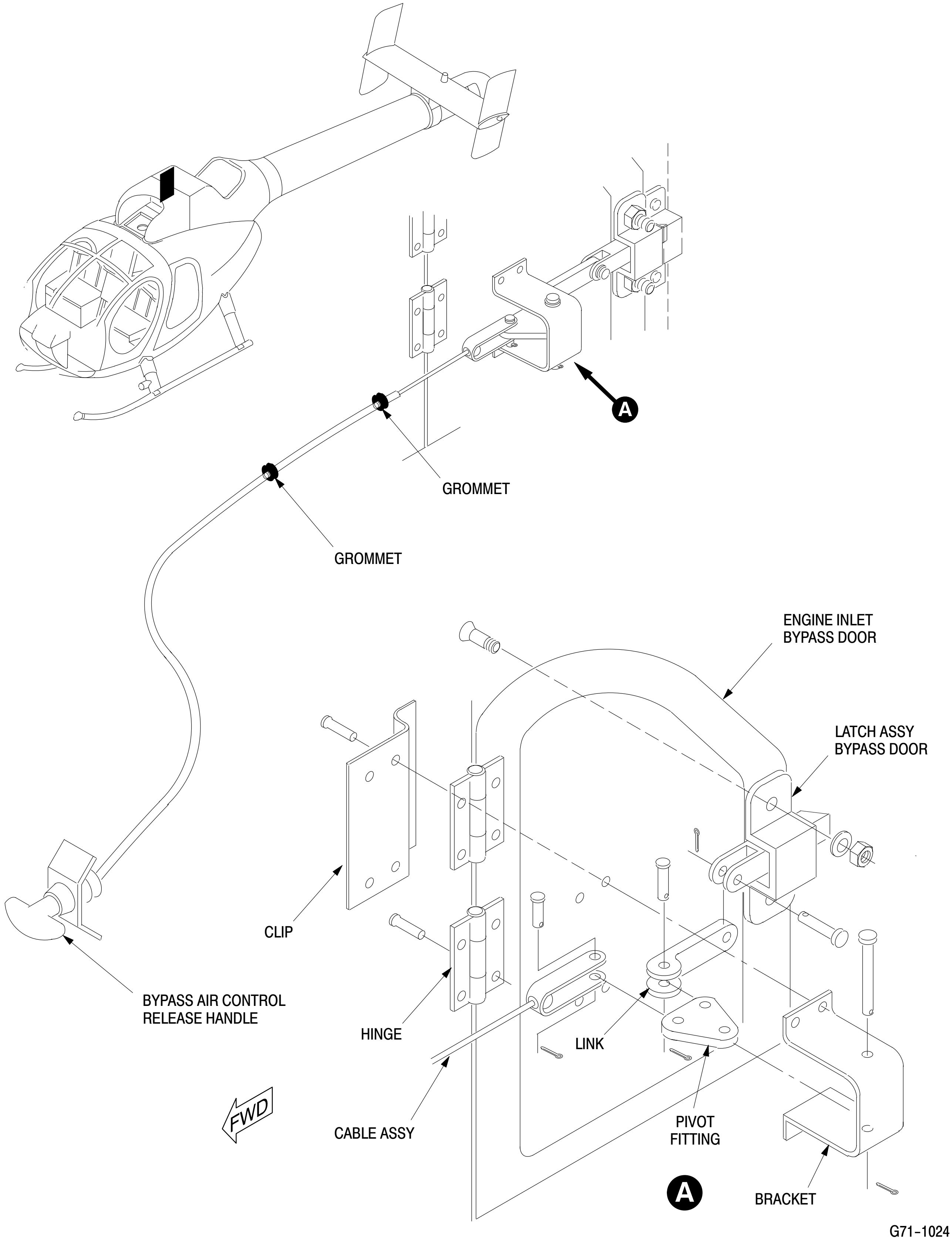


Figure 202. Air Bypass Door System (500N)

ENGINE AIR PARTICLE SEPARATOR REMOVAL/INSTALLATION

1. PLM Particle Separator Replacement

A. PLM Particle Separator Removal

(1). Remove forward engine air inlet fairings.

(2). Pull FILTER BYPASS CONTROL handle to open filter bypass door.

CAUTION Prevent engine FOD. Secure a cover over the engine intake prior to working inside plenum chamber. Remove cover after completing work.

(3). Remove engine air cooling inlet screen.

(4). In crew compartment; remove map case trim panel from control channel (Ref. Chap. 25).

(5). Disconnect forward cable from aft cable at quick-disconnect fitting. Remove spring retainers and spring.

(6). Remove handle plug button. Separate retainers and remove handle.

(7). Remove attaching hardware and cable retaining clamps. Remove cable forward fitting nut and washers.

(8). Pull cable assembly forward into crew compartment far enough to clear particle separator.

(9). Disconnect and remove pressure switch tubes, jam-nut, washers and union.

(10). Remove particle separator fairing retaining screws and washers.

NOTE: Left fairing installations without removable lower cover require the tail rotor control rod be disconnected at Sta. 95.00 bellcrank to remove fairing from helicopter.

(11). Remove tail rotor control rod boot forward clamp.

(12). Slide boot and left fairing forward and clear of particle separator.

(13). Unfasten and remove ejector duct assembly.

(14). Disconnect and remove ejector scavenge air line between particle separator and bracket mounted elbow.

(15). If installed, remove mist eliminator.

(16). Unbolt, then tilt top of particle separator forward and remove from fairing.

B. PLM Particle Separator Installation

Install particle separator in reverse order of removal and per the following procedures:

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM112	Anti-seize compound high temperature

(1). Center and clamp tail rotor control pedals in neutral position. Install forward boot on tail rotor pitch control rod. Adjust boot free length between 7.13 and 7.22 inches (18.1102 and 18.3388 cm). Install ty-rap.

(2). Use the same number of washers under forward cable fitting as were removed. Washer stack height variances will affect door rigging.

CAUTION Use anti-seize compound on all male threaded fittings prior to installation.

(3). Apply anti-seize compound (CM112) to fitting threads and particle separator attaching hardware.

(4). Check air bypass door rig (Ref. Air Bypass Door Rigging).

(5). Perform an operational check of air bypass door and scavenge air systems (Ref. Scavenge Air Operational Check).

2. PLM Scavenge Ejector Replacement

A. PLM Scavenge Ejector Removal

(1). Remove lockwire and unbolt ejector assembly support bracket.

(2). Remove lockwire and bolts attaching ejector assembly hold down plates to particle separator ejector box.

(3). Remove ejector assembly.

B. PLM Scavenge Ejector Installation

(1). Install ejector in reverse order of removal.

3. PLM Ejector Nozzle and Manifold Replacement

(1). Remove ejector assembly (Ref. PLM Scavenge Ejector - Removal).

(2). Remove lockwire and two nuts securing nozzle and manifold assembly to particle separator ejector box.

(3). Remove nozzle and manifold assembly.

(4). Clean mating surfaces between ejector box and nozzle and manifold assembly.

(5). Install nozzle and manifold assembly in reverse order of removal.

(6). Install ejector assembly.

4. Mist Eliminator Replacement

A. Helicopters With Mist Eliminator Access Panel

CAUTION

- Prevent engine FOD. Secure a cover over the engine intake prior to working inside plenum chamber. Remove cover after completing work.
- If mist eliminator is NOT to be reinstalled, remove 4504 tape from particle separator. If not removed, tape may come loose and be ingested by the engine.

NOTE: Mist eliminator access panel installation replaces nine mist eliminator mount bolts with a system of permanently installed clips to secure mist eliminator.

(1). On top of aft inlet fairing; unfasten two 1/4-turn panel fasteners. Lift panel trailing edge, then entire panel clear of access opening.

(2). Lift mist eliminator out of access panel opening.

B. Helicopters Without Mist Eliminator Access Panel

CAUTION Prevent engine FOD. Secure a cover over the engine intake prior to working inside plenum chamber. Remove cover after completing work.

(1). Pull FILTER BYPASS CONTROL handle to open air bypass door.

(2). On 500N installation, remove the fan inlet screen and engine plenum access fairing attachment hardware. Proceed with step E.

(3). Remove four screws securing door hinge upper halves to inlet fairing (Ref. Figure 201, detail D).

NOTE: Do not disturb established cable length.

(4). Remove cotter pin, nut and washer from cable end-fitting. Remove cable from door. Remove door.

CAUTION Nine mount bolts are retained in mist eliminator frame. Do not attempt to remove bolts from frame.

(5). Unbolt mist eliminator from particle separator.

(6). Pull mist eliminator aft to clear particle separator frame. Tilt mist eliminator lower edge up and remove unit through bypass door opening.

C. Mist Eliminator Installation

(1). Install mist eliminator in reverse order of removal.

5. Donaldson Particle Separator Replacement

A. Donaldson Particle Separator Removal

(1). Remove engine air inlet forward fairings.

(2). Pull FILTER BYPASS CONTROL handle to open the air bypass door (Ref. Figure 201, detail A).

CAUTION Prevent engine FOD. Secure a cover over the engine intake prior to working inside plenum chamber. Remove cover after completing work.

(3). Remove engine air cooling inlet screen.

(4). In crew compartment; remove map case trim panel from control channel (Ref. Chap. 25).

(5). Disconnect forward cable from aft cable at quick-disconnect fitting. Remove handle plug button. Separate retainers and remove handle.

(6). Remove spring retainers and spring.

(7). Remove attaching hardware and cable retaining clamps. Remove cable forward fitting nut and washers. Pull cable assembly into crew compartment.

(8). Remove pressure switch tubes and union.

NOTE: It is not necessary to disconnect tail rotor control rod to remove left fairing if fairing is equipped with a removable cover.

(9). Disconnect forward end of tail rotor control rod at Sta. 95.00 bellcrank.

(10). Remove fairing retaining screws and washers. Remove tail rotor control rod boot forward.

clamp. Slide left fairing forward on tail rotor control rod to clear particle separator.

NOTE: Paint an alignment mark across ejector and nozzle manifold flanges prior to disassembly as a reference for later assembly.

(11). Remove bolts and washers securing nozzle manifold to particle separator.

(12). Unbolt particle separator. Tilt top of particle separator forward and remove from fairing.

(13). Disconnect upper air tube assembly from nozzle manifold. Move forward O-ring from ejector to rubber sleeve. Remove nozzle manifold and ejector from aft fairing.

(14). Remove sleeve and O-rings from duct.

(15). Remove exit port screen attaching hardware and duct.

B. Donaldson Particle Separator Installation

Install particle separator assembly in reverse order of removal and as follows:

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM112	Anti-seize compound high temperature

NOTE: Apply antiseize compound (CM112) to male threads of fittings, nozzle manifold bolts and particle separator attaching hardware before installation.

(1). Bench assemble rubber sleeve and O-ring on grooved end of ejector.

(2). Align nozzle manifold and ejector inside aft fairing.

(3). Position ejector so that top flapper valve vertical hinge line angle is 10 to 20 degrees counterclockwise from ejector vertical centerline.

(4). Torque ejector and nozzle manifold bolts to **12 - 15 inch-pounds (1.36 - 1.69 Nm)**.

(5). Install tail rotor control rod forward boot with a free length of 7.13 to 7.22 inches (18.1102 and 18.3388 cm) with tail rotor pedals centered.

(6). Use the same number of washers under forward cable fitting as were removed. Hardware position changes or washer stack height variances will affect door rigging.

(7). Rig air bypass door (Ref. Air Bypass Door Rigging).

(8). Perform air bypass door and scavenge air system operational checks (Ref. Scavenge Air Operational Check).

ENGINE AIR PARTICLE SEPARATOR INSPECTION/CHECK

1. Engine Air Inlet Bypass Door 300-Hour Inspection

(Ref. Figure 201)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM425	Sealing compound

CAUTION Prevent engine FOD. Secure a cover over the engine intake prior to working inside plenum chamber. Use extreme care when working around engine inlet to prevent any foreign object from entering engine. Remove cover after completing work.

(1). Remove engine inlet bypass door and inspect air bypass door gasket seal for condition and secure attachment. No gasket seal deterioration or debonding allowed. Replace door gasket as required.

(2). Inspect door surfaces for cracking, chaffing or damage. Repair door per Structural Repair Manual (CSP-SRM-6).

(3). Inspect cable for fraying and chaffing.

(4). Remove and replace the latch retention cotter pin (located inside the attach cable “U” clamp). Seal cotter pin with sealant (CM425).

(5). Replace latch assembly if:

(a). The cotter pin hole in the latch stem is elongated more than 0.080 inch (2.032 mm).

(b). The cotter pin has worn into the surface of the cable attach “U” clip, more than 1/2 the thickness of the clip, 0.025 inch (0.635 mm) deep.

(c). The latch engagement faying surface, where it contacts the plenum, is worn more than 0.050 inch (1.270 mm) below the original surface.

(6). Inspect door hinges for wear and hinge fastening hardware for security. Repair or replace hinges as required.

(7). Inspect door for worn or damaged latching and attachment hardware.

(8). Check insert assembly and latch linkages for wear and lost motion. Repair or replace latch hardware as required.

(9). Inspect door system cable, cable connections, pulleys, pulley bushings and brackets for wear, damage, freedom of movement and security.

(10). Reinstall engine inlet bypass door. Seal all cotter pins with sealant (CM425).

(11). Inspect door for proper alignment when closed. Door must fit snug against seal with obvious seal compression.

(12). Inspect latches for positive latching.

(13). Pull FILTER BYPASS CONTROL handle. Action to be a smooth, positive door opening with no binding. Release handle. Handle should snap back to stowed position.

2. PLM Particle Separator Inspection

(1). Inspect vortex generator tubes for broken, loose or missing vanes and center pins.

(2). Inspect outlet tube for security and damage.

(3). Inspect inlet plate for dents punctures and cracks.

(4). Inspect vortex tube particle discharge openings for clogging.

(5). Inspect separator and mist eliminator mounting seals for secure attachment and damage. Replace damaged seals.

CAUTION Left fairing inspection and rework or replacement is mandatory for particle separator installations, part numbers 369H90148-507, and -509. Early installations were fitted with left forward fairings, PN 369D290128-11 equipped with a single screw and nutplate securing a removable fairing section, PN 369D290128-31 over the tail rotor control rod.

(6). Inspect tail rotor control rod for abrasion or gouging caused by contact with particle separator fairing or fairing hardware. Modify, repair or replace fairing (Ref Fairing Modification (369D Only)). Inspect, repair or replace control rod if damaged beyond limits (Ref. Sec. 67-20-10).

(7). Inspect ejector flapper valve and hinge for wear and corrosion. Repair or replace valve parts as required.

(8). Inspect ejector tubes for cuts, breaks and distortion. Inspect flange condition.

(9). Inspect tube nuts and fittings for crossed or stripped threads.

(10). Inspect scavenge air discharge duct for damage.

(11). Inspect entire assembly for cracks, holes and distortion. Cracks may indicate that assembly is subject to distortion loads when installed.

3. Donaldson Particle Separator Inspection

(1). Inspect filter inlet screens for damage and secure attachment. Remove damaged inlet screens.

NOTE: Particle separator may be operated without inlet screens.

(2). Inspect vortex tubes for for security and broken or missing vanes.

NOTE: Up to five damaged vortex tubes may be blocked off with patches.

(3). Inspect vortex tube particle separator openings for clogging.

(4). Inspect gasket tapes for deterioration and security. Replace damaged gasket tapes.

(5). Inspect entire particle separator assembly for cracks, holes and distortion. Cracks may indicate filter preload, misalignment or distortion when installed. Align filter (Ref. Particle Separator Alignment and Joint Surface Repair).

(6). Inspect rubber sleeves for cuts, holes or deterioration.

(7). Inspect O-rings for nicks, cuts, wear or deterioration.

(8). Inspect ejector tube for cuts, breaks or distortion.

(9). Inspect flapper valve for condition and free movement.

NOTE: Ejectors with a missing flapper valve may be continued in operation until a replacement is installed.

(10). Inspect nozzle manifold for cracks and distortion.

(11). Inspect fitting for crossed or stripped threads. See that the seven nozzle air passages are open, clean and undamaged.

(12). Inspect ejector exhaust duct screen for damage or clogging.

4. Scavenge Air Operational Check

WARNING **Engine operation or helicopter flight must be accomplished in accordance with requirements and limitations specified in the Pilot's Flight Manual and applicable supplements.**

(1). Ensure air bypass door is closed.

(2). Ground run engine per Pilot's Flight Manual.

(3). Switch SCAV AIR circuit breaker ON.

NOTE: A slight increase in turbine outlet temperature (TOT) is normal when SCAV AIR circuit breaker is switched ON.

(4). Have an assistant check for scavenge air exhaust from outlet duct. Airflow from duct indicates that solenoid air valve has opened.

(5). Switch SCAV AIR circuit breaker OFF.

(6). Check that no scavenge air flows from outlet duct.

(7). Shut down engine per Pilot's Flight Manual.

5. Air Pressure Sensing Switch Calibration Check

(1). Assemble test equipment (Ref. Figure 601).

(2). Attach pressure switch to test equipment. Connect a suitable vacuum source to pressure switch nipple and u-tube.

(3). Connect an ohmmeter or continuity tester to pressure switch electrical leads.

(4). Cycle switch from open to close several times with vacuum. Watch meter for indication of switch closure. Release vacuum.

(5). Slowly apply vacuum. Note u-tube water height differential in both legs of the tube relative to the switch closing point. The total of the differential heights of both legs of the u-tube is equal to switch actuation pressure.

(6). Switch closing pressures shall be per the applicable particle separator installation dash number shown (Ref. Figure 601).

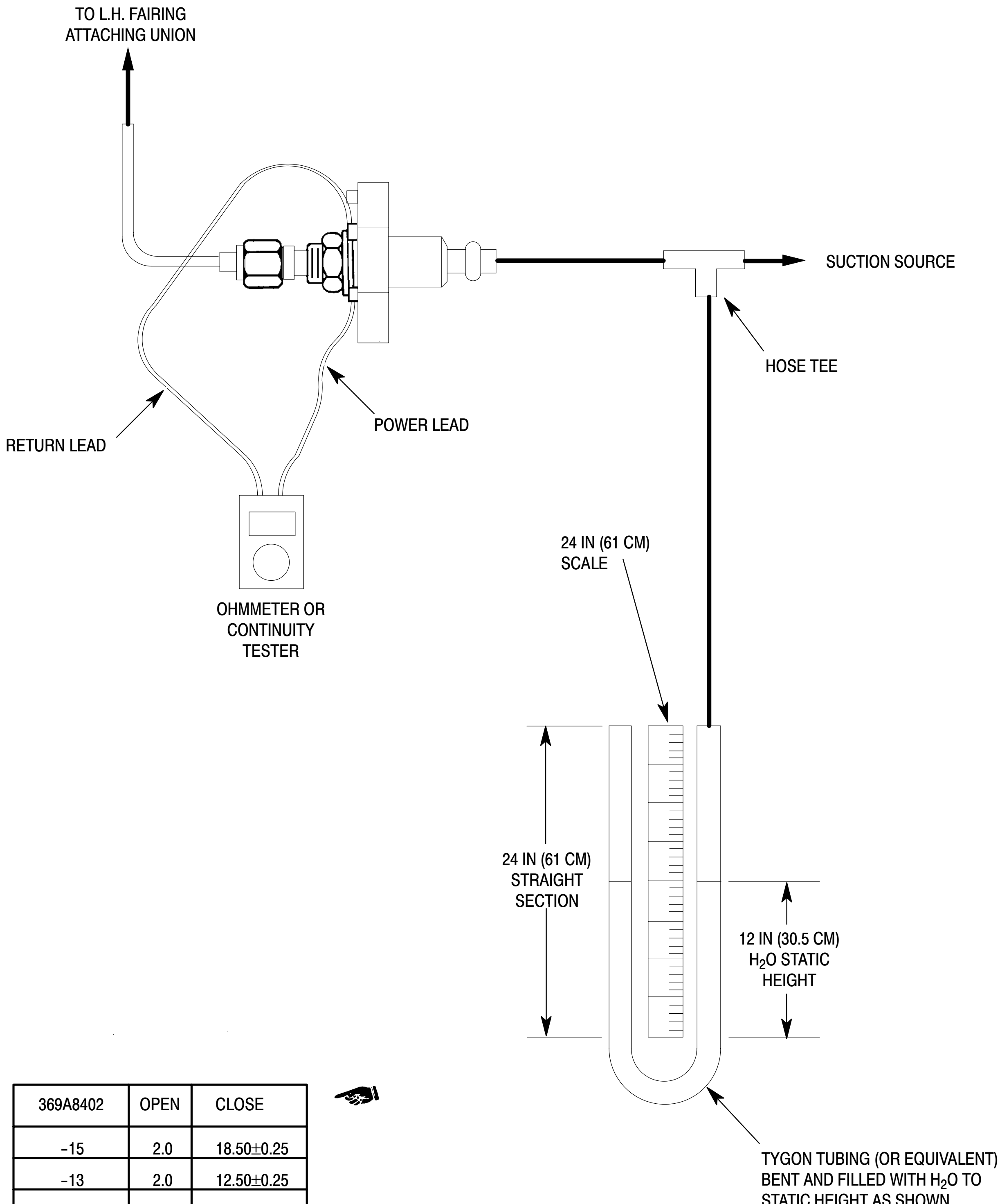
6. Mist Eliminator Inspection

(1). Check mist eliminator serial number for APM serial numbers 005 thru 069. Remove the wire staples from a mist eliminator so identified.

(2). Inspect frame and screens for security and condition. Replace mist eliminator if screens are partially detached, or assembly distortion prevents joint seal contact with the particle separator.

(3). Inspect all nine bolts, where installed, for security in mist eliminator frame. Repair or replace bolts as required (Ref. Page 803).

(4). Examine outlet side of mist eliminator. Surface should be slightly oily but clean. Dirt on the outlet side signals the need to clean the assembly.



369A8402	OPEN	CLOSE
−15	2.0	18.50±0.25
−13	2.0	12.50±0.25
−7	2.0	10.50±0.25
−3	2.0	4.8±0.4

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Figure 601. Air Pressure Sensing Switch Calibration Check

ENGINE AIR PARTICLE SEPARATOR REPAIRS

1. PLM Particle Separator Repairs

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM234	Solvent, dry-cleaning
CM728	Tape, pressure sensitive

NOTE:

- The following particle separator repair/ replacement items and, or kits are available from Pall Land Marine (PLM) or through your local distributor (Ref. Sec. 01-00-00).
- AA-A224-1D1KF1 Repair kit, Centrisep scavenge ejector Assy. (Ejector, two plate halves, four bolts).
- AA-224A-1D1KF2 Repair kit, Centrisep nozzle and manifold Assy.

CAUTION The following procedures are for Pall Land Marine (PLM) particle separators only.

A. Vortex Tube Plug Installation

NOTE: Procedures are per Pall Land Marine Corporation publication, PLM- TM- 80- 1. Contact PLM direct for additional information. A vortex generator tube replacement kit may be available that will supersede use of Tube Repair Kit AA-8101-1KF1 required to accomplish the following temporary repairs.

(1). The AA-8101-1KF1 repair kit contain parts required to plug holes created by displacement of, or damage to, the vortex generator and outlet tubes.

CAUTION Permanent repairs or particle separator replacement should be accomplished as soon as possible. Do not use repair kit if mounting plate holes are enlarged or distorted so as to prevent the repair plug snap-lock lip from fully engaging plate hole edge.

(a). Repair plugs, AA-9500-D929 are used to seal pushed-in but otherwise undamaged vortex generator tubes.

(b). Stems, AA-9500-D930 are used with repair plugs to seal the vortex generator tube hole when the the tube is missing or removed.

(c). Stems, AA-9500-D931 are used with repair plugs when both the vortex generator tube and outlet tube are missing or removed.

WARNING **No more than 30 of the 292 vortex generator tubes may be plugged. Plugged tubes shall be widely distributed over particle separator. Not more than 15 plugged tubes may be concentrated in any one area.**

B. Displaced Vortex Generator Tube

(Ref. Figure 801)

(1). Inspect displaced vortex generator tube for missing center pin and extensive rim damage. Should either condition exist, refer to Damaged Or Missing Vortex Generator Tube.

(2). Position particle separator on a table with front surface of vortex tube plate up.

(3). Press damaged tube assembly all the way in. Ensure that vortex tube bottoms on outlet tube per illustration (Ref. Figure 801, view B).

(4). Insert repair plug AA-9500-D929 in the hole. Align plug with vortex generator center pin.

(5). Press plug into inlet tube plate until plug snaps in place.

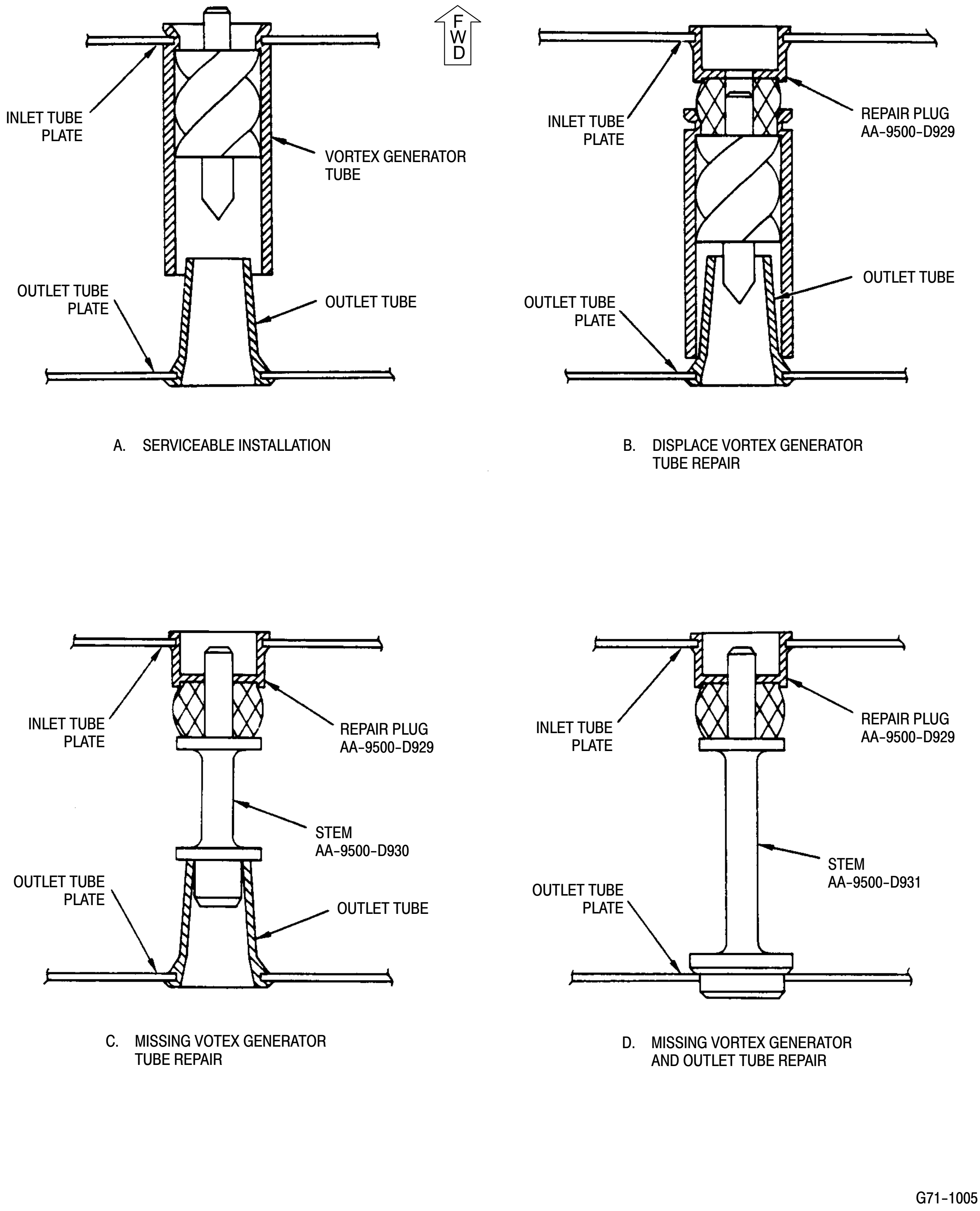


Figure 801. Vortex Generator Repairs

C. Damaged Or Missing Vortex Generator Tube

(1). Remove remaining vortex generator tube material without damaging plate hole.

(2). Insert center pin of stem AA-9500-D930 into plug AA-9500-D929 and install in hole per illustration (Ref. Figure 801, view C). Ensure stem free end is inside outlet tube.

(3). Press plug into hole until it snaps in place.

D. Damaged Or Missing Vortex Generator and Outlet Tubes

(1). Remove remaining vortex generator and outlet tube material. Do not damage either plate hole.

(2). Insert center pin of stem AA-9500-D931 into plug AA-9500-D929 and install in hole per illustration (Ref. Figure 801, view D). Ensure stem free end protrudes from outlet tube plate.

(3). Press plug into hole until it snaps in place.

E. PLM Particle Separator Gasket Replacement

(1). Remove old gasket and clean joint surfaces with P-D-680 dry cleaning solvent (CM234) on a clean cloth.

(2). Cut 1/8 inch (3.175 mm) thick pressure sensitive tape (CM728) to 3/8 inch (9.525 mm) width.

NOTE:

- Note that the particle separator/aft inlet fairing seal tape is not installed on the bottom.
- The inner seal tape is the mist eliminator joint seal.

(3). Cut tape to length, peel off backing and apply to surface.

(4). Ensure gasket tape is firmly attached to surface.

F. Fairing Modifications (369D Only)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM501	Fiberglass cloth
CM505	Polyester laminating resin

NOTE: Modification procedures apply to 500D series helicopters equipped with 369H90148-507 or -509 particle separator installations and APM (now PLM) particle separators. Early installations were fitted with left forward fairings, PN 369D290128- 11 equipped with a single screw and nutplate securing a removable fairing section, PN 369D290128-31 over the tail rotor control rod. Modify the -11 and -31 fairing components as follows.

(1). Remove fairings (Ref. PLM Particle Separator Removal).

(2). Drill out rivets and remove nutplate from 369D290128-11 left fairing assembly (Ref. Figure 802, detail A).

(3). Patch nutplate rivet and screw holes with fiberglass cloth (CM501) and resin (CM505) per structural repair manual (SRM).

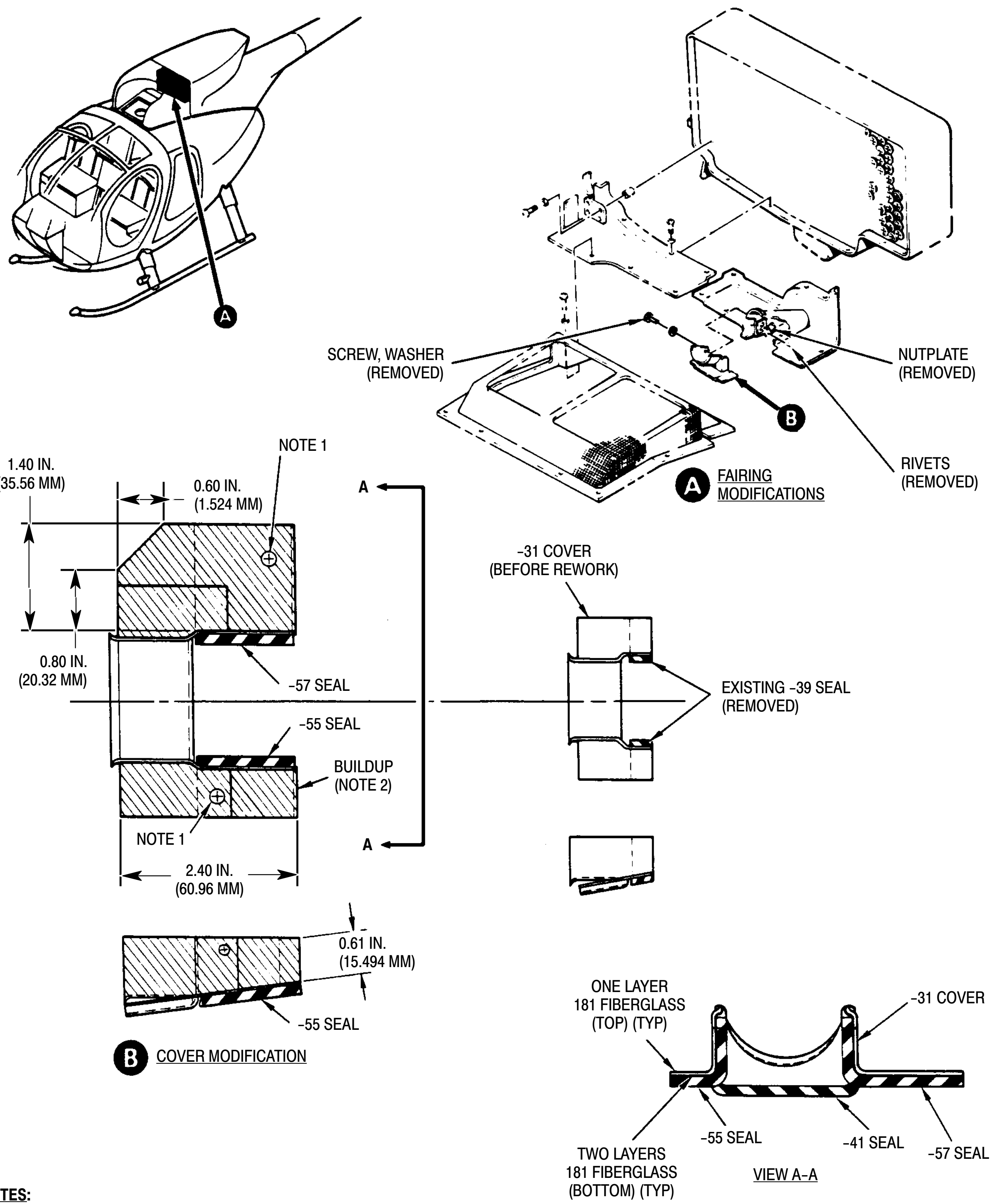
NOTE: A replacement cover, PN 369D290128-51 may be installed in lieu of reworking 369D290128-31 cover assembly.

(4). Rework cover, PN 369D290128-31 per illustration using fiberglass cloth and resin. Laminate one layer of fiberglass cloth on top of cover and two layers on bottom surface (Ref. Figure 802, detail B).

(5). Drill two 0.250 inch (6.35 mm) diameter screw holes through cover to match holes in PN 369D290128-11 fairing assembly.

(6). Install 369D290128-55 and -57 seals on cover.

(7). Install reworked fairings (Ref. PLM Particle Separator Installation).



NOTES:

1. DRILL 0.250 IN (6.35 MM) DIAMETER HOLES IN COVER TO MATCH -11 FAIRING.
2. SHADED AREA DENOTES FIBERGLASS BUILDUP.

G71-1019A

Figure 802. Fairing Modifications

2. Mist Eliminator Repair

(1). The mist eliminator is a non-repairable all welded assembly except for the mounting bolts required for some installations. Repairs are limited to bolt repair or replacement.

NOTE:

- The following mist eliminator repair/replacement items and, or kits are available from Pall Land Marine (PLM) or through your local distributor.
- AE- A224- 1D2 Mist eliminator Assy., complete.
- AA-A224-1D2KF1 Repair kit, mist eliminator (nine mounting bolts).

(2). Remove mist eliminator assembly per 'Mist Eliminator Replacement'.

(3). Chase mounting bolt threads with a 10-32 die, as required.

(4). Remove mounting bolts from mist eliminator frame by pulling bolt aft while unscrewing.

(5). Replace mounting bolts.

(6). Flatten an area 0.160-0.170 inch (4.064-4.318 mm) wide by 0.125 inch (3.175 mm) long, maximum, across the first three to four threads adjacent to the bolt shank to inhibit removal.

3. Particle Separator Alignment and Joint Surface Repair (369D/E/FF)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM504	Epoxy resin with catalyst

(1). Draw an outline of the particle separator on smooth, parallel surfaced, 1/2 inch (12.7 mm) thick phenolic or close grained plywood. Cut template from material. Drill mounting bolt holes.

(2). Position template against engine air inlet fairing-to-filter mounting surface and install three bolts and nuts finger tight. Ensure template is secure and undistorted.

(3). Using a 0.030 inch (0.762 mm) feeler gage, check for gaps at the three mounting bolt attach points. Install shims in areas where gaps exceed 0.030 inch (0.762 mm) width per the next step.

(4). Bond an aluminum or fiberglass shim thickness to the fairing that is equivalent to the gap.

(a). Bond aluminum shims to the fairing with epoxy resin (CM504).

(b). Laminate and bond fiberglass cloth per Structural Repair Manual procedures (CSP-DEF-6).

4. Donaldson Particle Separator Repair (369D Only)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM234	Solvent, dry-cleaning
CM503	Fiberglass repair kit
CM728	Tape, pressure sensitive

NOTE: Particle separator repairs are accomplished per standard fiberglass repair methods using fiberglass repair kit (CM503). Ensure that no potential for engine foreign object damage occurs as a result of filter repair.

(1). Rebond loose or missing fiberglass attachment spacers.

(2). Rebond front and back wall to center section seams as required.

(3). Rebond manifold nozzle attachment tube.

(4). Patch repair or fill any other damaged or cracked areas.

(5). Replace damaged vortex tubes.

NOTE: Up to five damaged vortex tubes may be temporarily blocked.

(6). Install not more than five aluminum patches over vortex tube outlet holes. Install patches with at least three mechanically expanded rivets.

(7). Replace worn or loose gasket tapes as follows:

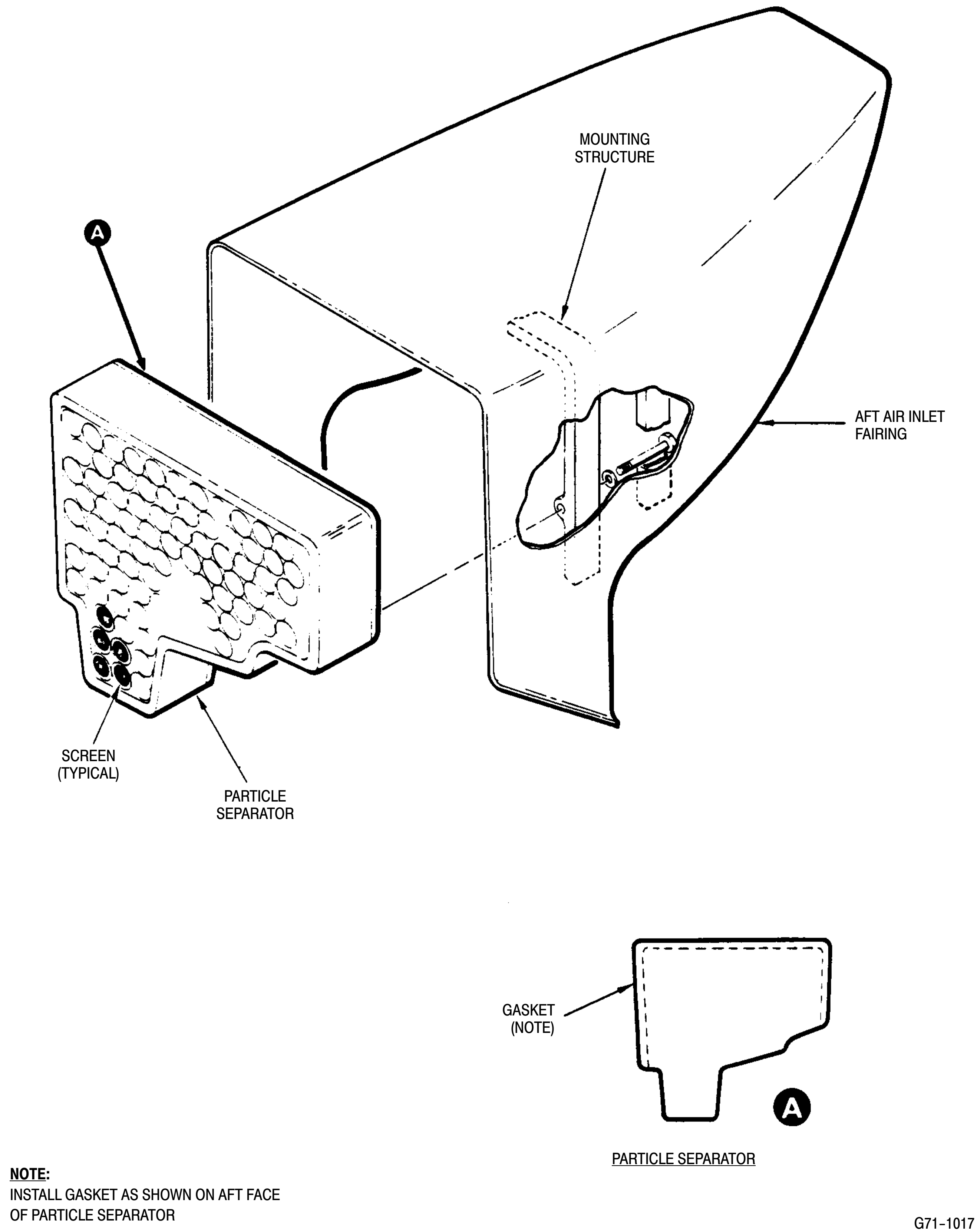


Figure 803. Donaldson Particle Separator Gasket Replacement

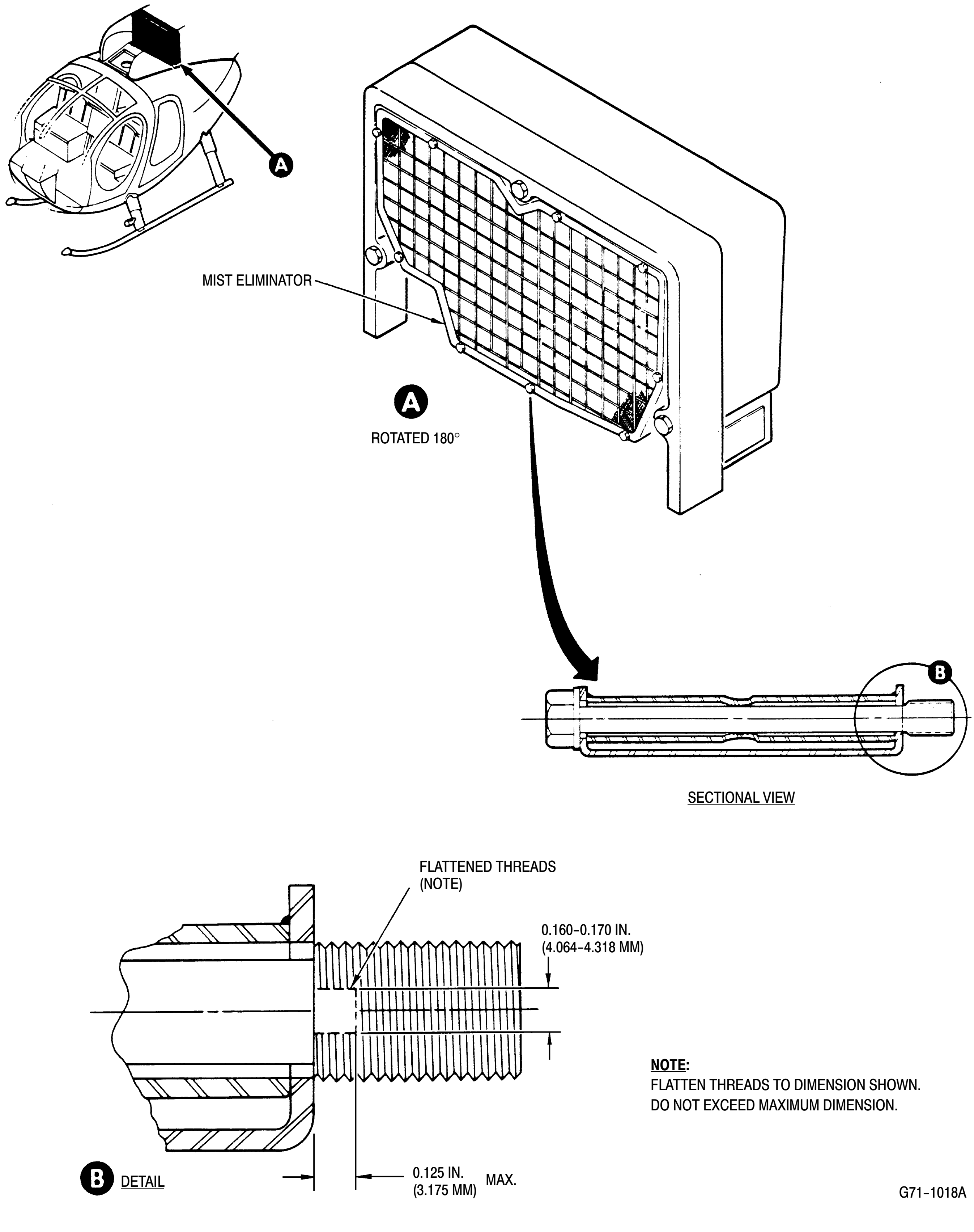


Figure 804. Mist Eliminator Bolt Repair

(a). Remove tape debris. Wipe tape contact surfaces with a clean cloth and P-D-680 dry-cleaning solvent (CM234).

(b). Cut tape 0.380 inch (9.652 mm) wide from 0.125 inch (3.175 mm) thick Y-3192-B material (CM728).

(c). Install tape across the top and down right and left sides of the fairing contact area. Do not apply seal tape across the bottom (Ref. Figure 803). Install particle separator.

(8). Perform particle separator alignment procedures and the following steps.

(a). Remove ejector-to-outlet duct rubber sleeve. Use a straight edge to check for misalignment between the ejector and outlet duct. Maximum allowed misalignment is 1/4 inch (6.35 mm).

(b). Install tapered shims between duct and screen rubber rim to repair ejector-to-outlet duct misalignment. Use at least two attachment screws to retain shim.

NOTE: Existing screen and duct attachment screws are long enough to allow addition of 1/4 inch (6.35 mm) thick shim.

(9). Install particle separator.

5. Donaldson Particle Separator Auxiliary Fairings and Seals Installation

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM234	Solvent, dry-cleaning
CM318	Primer
CM430	Sealant, solvent resistant

NOTE:

- Installation of sealed fairings around the particle separator to protect the engine from FOD is required for early Donaldson particle separator installations 369H90148-503 and -505 used on some 369D series helicopters.
- Donaldson particle separator installations are identified by the scavenge air exhaust port on the left side of the aft inlet fairing.
- Procedures cover fairing kit, PN 369D290140 and pressure switch, PN 369A8402-7 installation.
- PN 369A8402-3 pressure switch modifications to -7 specifications using a Jensen #800-174 kit are provided. Modification of a -3 switch to a -7, or procurement and installation of a -7 switch is mandatory when auxiliary fairings are installed.

(1). Remove air inlet forward fairings.

(2). Remove particle separator (Ref. Donaldson Particle Separator Removal).

(3). Clean particle separator (Ref. Particle Separator Cleaning).

(4). Inspect particle separator (Ref. Donaldson Particle Separator Inspection).

(5). Repair unit (Ref. Donaldson Particle Separator Repair).

NOTE: 369D290140-5 and -7 supports and 369D290140-11 and -12 fairing assemblies may be manufactured using drawings provided (Ref. Figure 806). Apply a coat of primer (CM318) after making the parts.

(6). Install LH fairings and seals as follows:

(a). Locate 369D290140-5 seal support forward of aft fairing filter mounting frame as indicated (Ref. Figure 805, detail A and section B-B).

(b). Use -5 support as a guide and drill two rivet holes through fairing.

(c). Install support with two NAS1738B4-2 rivets.

(d). Install 369D290140-13 and -25 seals on support (Ref. Figure 805, view A-A and section B-B).

(e). Position and mark 369D290140-11 fairing (Ref. Figure 805, view E-E). Drill 0.250 inch (6.35 mm) diameter hole through -11 to match inlet fairing existing nutplate.

(f). Split grommet and install on wire and controls bundle (Ref. Figure 805, view E-E). Slip -11 fairing into grommet groove.

(g). Trial fit 369D290140-11 fairing on aft inlet fairing with washer and screw. Remove fairing assembly.

(h). Install 369D290140-17, -19 and -23 seals on underside of 369H90151-31 fairing. Trim -19 and -23 seals to match fairing contour (Ref. Figure 805, view A-A).

(7). Install RH fairings and seals as follows:

(a). Locate 369D290140-7 seal support forward of aft fairing filter mounting frame as indicated (Ref. Figure 805, view A-A and section C-C).

(b). Use -5 support as a guide and drill three rivet holes through fairing.

(c). Install support with three NAS1738B4-2 rivets.

(d). Install 369D290140-15 seal on support (Ref. Figure 805, view A-A and section C-C).

(e). Position and mark 369D290140-12 fairing (Ref. Figure 805, view E-E). Drill 0.250 inch (6.35 mm) diameter hole through -11 to match inlet fairing existing nutplate.

(f). Split grommet and install on wire and controls bundle (Ref. Figure 805, view E-E). Slip -12 fairing into grommet groove.

(g). Trial fit 369D290140-12 fairing on aft inlet fairing with washer and screw. Remove fairing assembly.

(h). Install 369D290140-17 and -23 seals on underside of 369H90151-41 fairing. Trim -23 seal to match fairing contour (Ref. Figure 805, view A-A).

(8). Disconnect and remove 369A8402-3 pressure switch.

(a). Remove screws and separate switch halves. Remove diaphragm-magnet and return spring (Ref. Figure 807).

(b). Clean parts with P-D-680 dry cleaning solvent (CM234).

(c). Reassemble switch with new diaphragm-magnet and return spring per illustration.

(d). Align screw holes, magnet-diaphragm, spring and switch halves and assemble unit with screws. Lockwire screws.

(e). Install new name plate over existing name plate.

(9). Check pressure switch operation (Ref. Air Pressure Sensing Switch Calibration Check). Switch closing should occur between 10.25-10.75 inches (26.035-27.305 cm) of water.

(10). Install pressure switch.

(11). Install particle separator (Ref. Donaldson Particle Separator Installation).

(a). Install 369H90151-31 and -41 fairing halves with washers and screws (Ref. Figure 805, view A-A).

(b). Install 369D290140-11 and -12 fairings with washers and screws (Ref. Figure 805, view E-E).

(c). Apply sealing compound, RTV732 (CM430) around all gaps between -11 and -12 fairings, grommets, wire bundles, aft fairing and mast fitting (Ref. Figure 805, detail A).

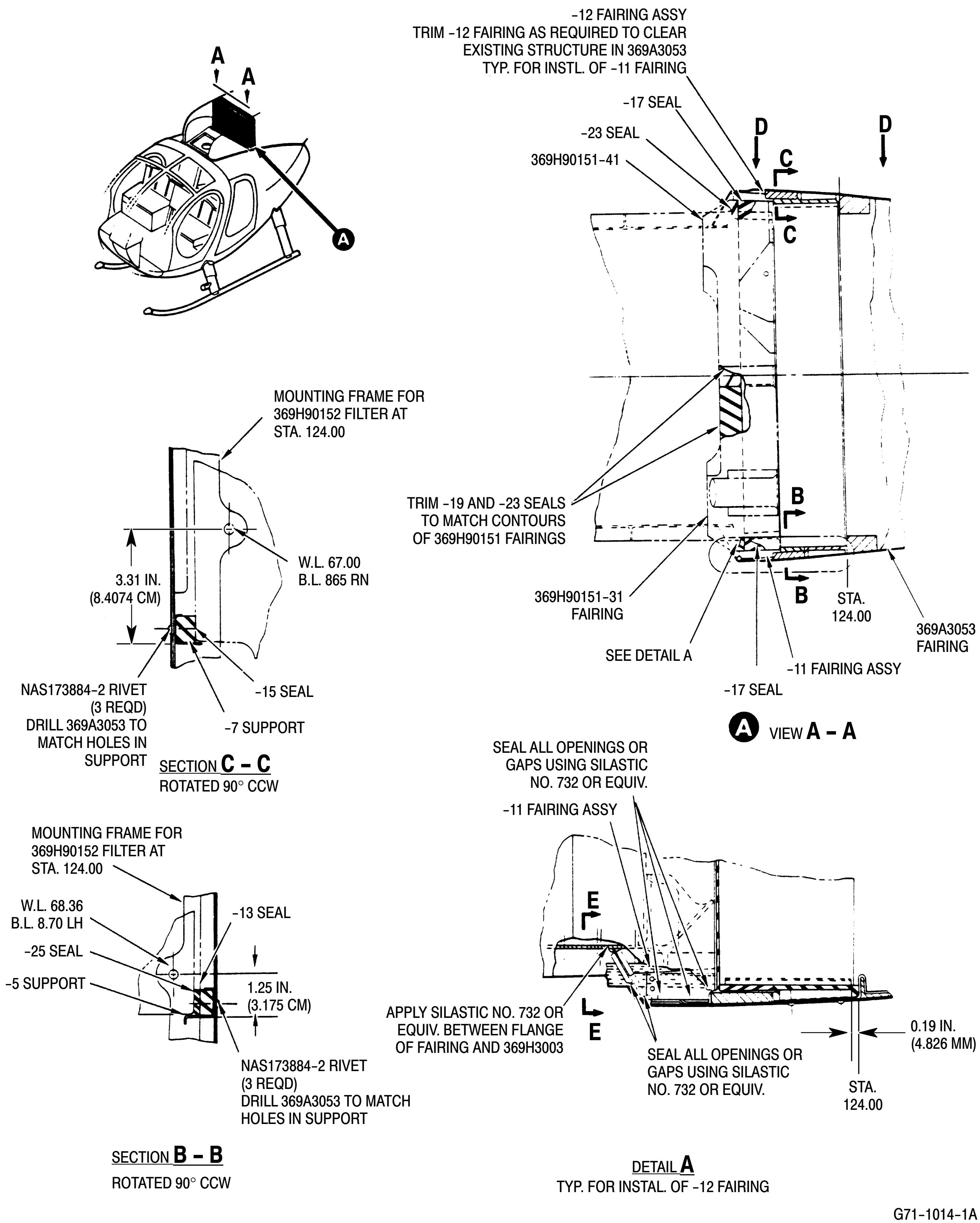
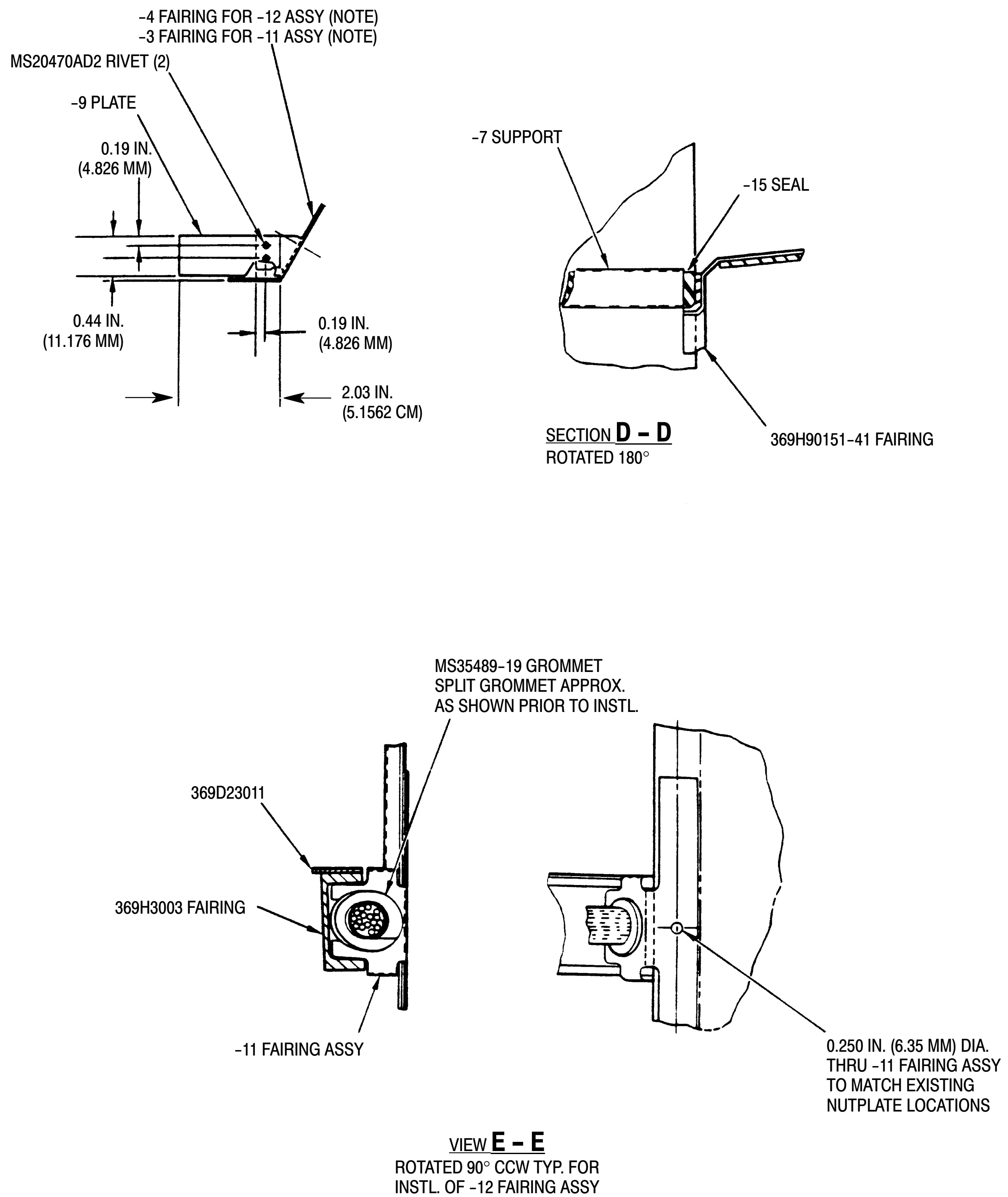


Figure 805. Auxiliary Fairings and Seals Installation (Sheet 1 of 2)



NOTE:
DRILL 0.063 IN. (1.6002 MM) DIA. HOLES IN
-3 AND -4 FAIRINGS TO MATCH HOLES IN
-9 PLATE (2 PLCS)

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Figure 805. Auxiliary Fairings and Seals Installation (Sheet 2 of 2)

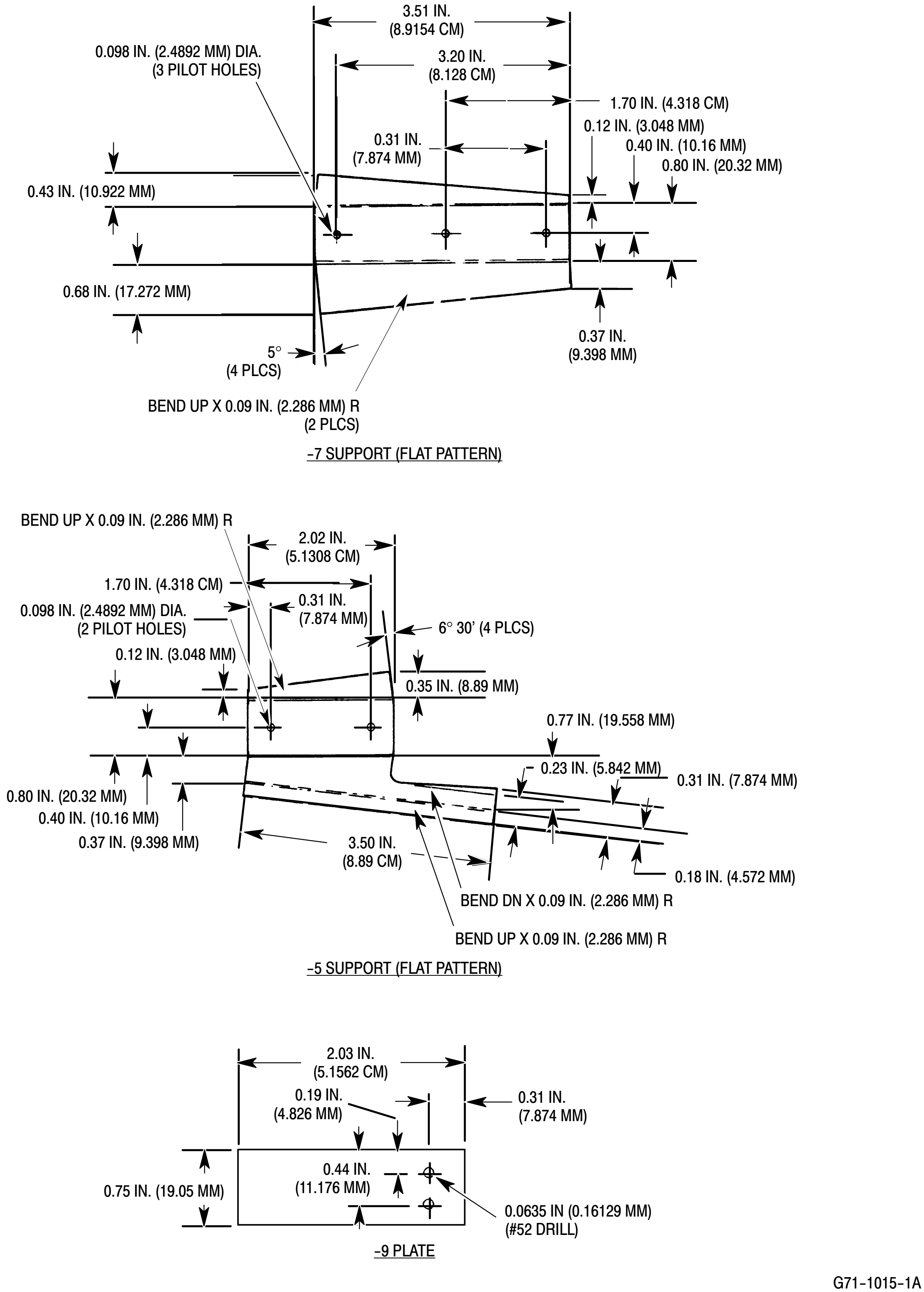


Figure 806. Auxiliary Fairings and Supports Fabrication (Sheet 1 of 2)

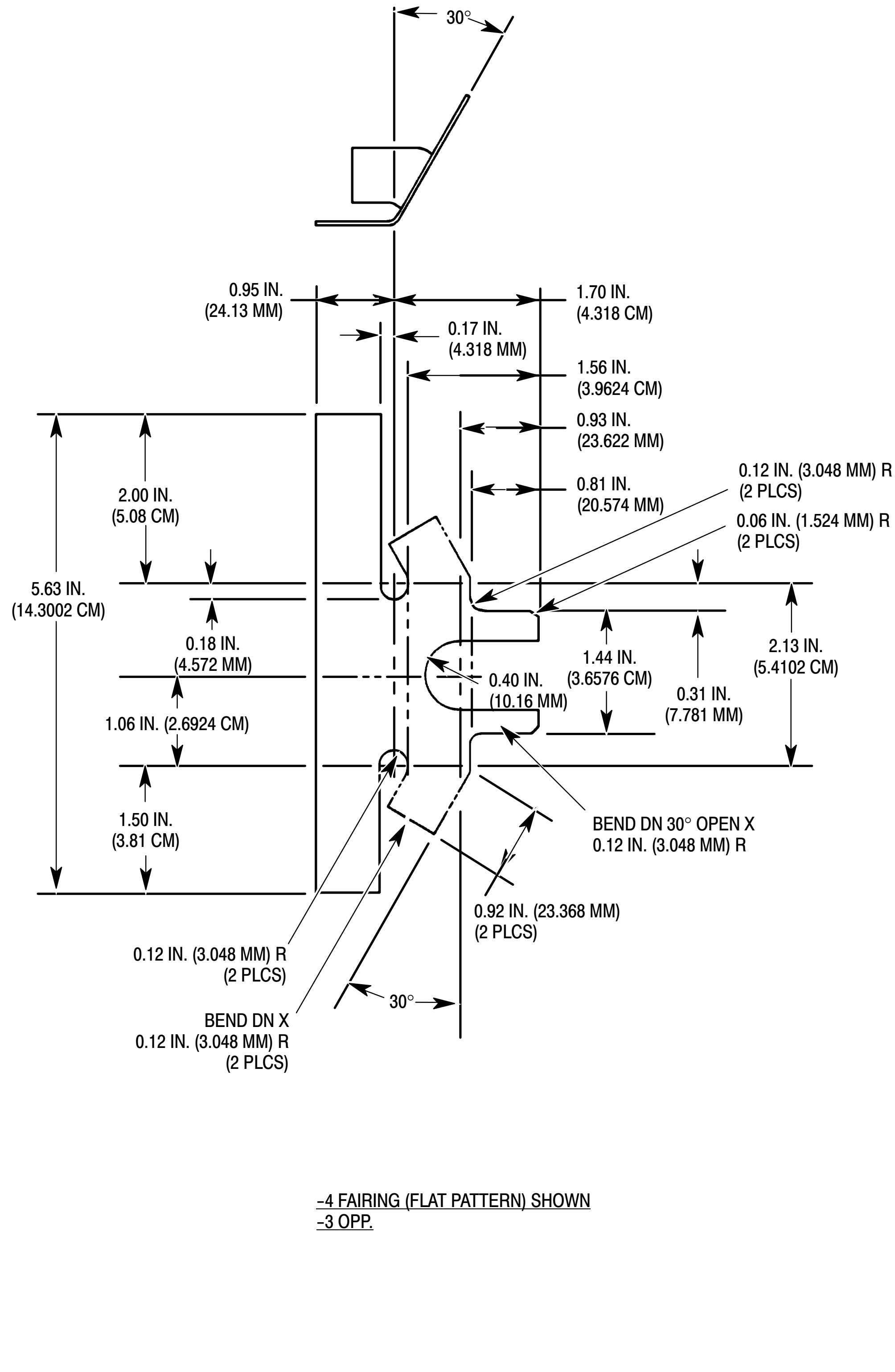


Figure 806. Auxiliary Fairings and Supports Fabrication (Sheet 2 of 2)

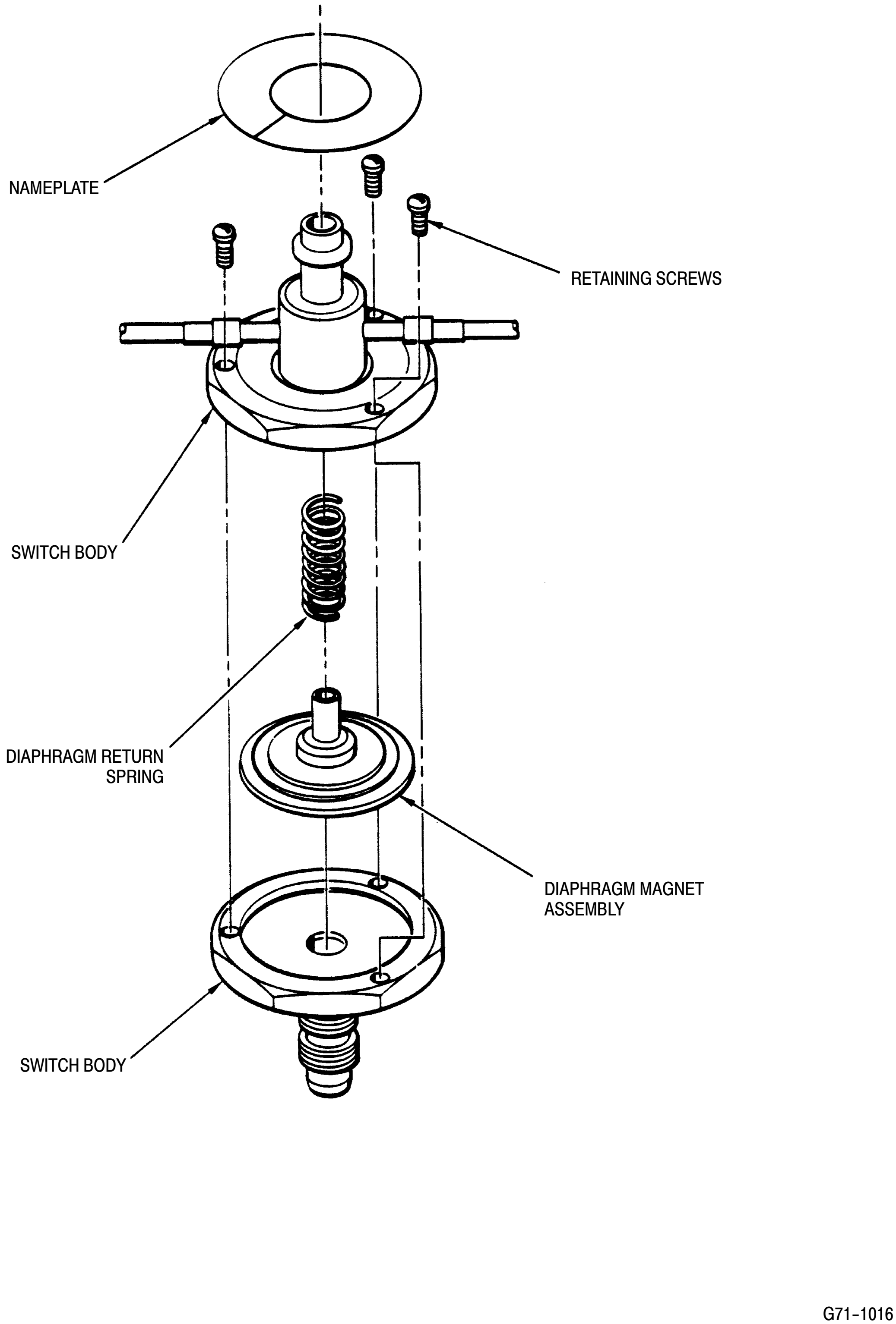


Figure 807. Pressure Switch

ENGINE AIR PARTICLE SEPARATOR INITIAL INSTALLATION

1. Engine Air Particle Separator Initial Installation

**Consumable Materials
(Ref. Section 91-00-00)**

Item	Nomenclature
CM206	Chemical coating
CM318	Primer

(1). 369H90148-519, -521, -527 and -529 particle separator installations are covered by procedures in this section.

NOTE: Tag components as they are removed, including attaching hardware. Protect loose parts from damage, dirt or loss.

(2). Ensure that battery switch and all other helicopter switches are OFF.

(3). Open crew compartment left floor access door and disconnect battery connector J108.

(4). Remove fairings from instrument panel (Ref. Chap. 95).

(5). Remove rotor brake cover, where installed.

(6). Remove map case and interior trim panel (Ref. Sec. 25-30-00).

(7). Remove map case cover upper left support bracket.

(8). Remove transmission oil cooler inlet duct (Ref. Sec. 63-21-00).

NOTE: Installation of bleed air extraction elbow, tee and hose with the engine in the helicopter can be done; however, clearance is minimal.

(9). On helicopters without cabin heat, remove engine to ease bleed air extraction hardware installation prior to installing part numbers 369H90148-509, -521, or -529 particle separators.

(10). On helicopters with cabin heat, remove cabin heat control valve to facilitate installing part number 369H90148-507, -519, or -527 particle separators.

CAUTION Prevent engine FOD. Secure a cover over the engine intake before working in or around plenum chamber.

(11). Remove engine air inlet forward fairing and aft fairing access cover.

(12). Remove plenum chamber access door.

(13). Disconnect forward end of tail rotor control rod at Sta. 95.00 bellcrank (Ref. Sec. 67-20-10). Remove forward boot.

(14). Remove engine air cooling inlet screen.

(15). Modify engine air cooling inlet screen (Ref. Figure 903, view B).

(16). Remove engine intake air inlet screen (Ref. Sec. 71-10-00).

(17). Prepare airframe electrical ground points per FAA publication, EA-AC43.13-1A and 2A.

(18). Using chemical film (CM206) treat reworked areas as required and apply primer (CM318) except on electrical ground or bonding points.

A. Filter Bypass Door and Aft Cable

(Ref. Figure 901)

**Consumable Materials
(Ref. Section 91-00-00)**

Item	Nomenclature
CM410	Adhesive, epoxy (parts A & B)

(1). Modify the plenum chamber access door as follows:

(2). Install clip and insert assembly on door with screws, washers and nuts.

(3). Install latch assemblies on door with screws, washers and nuts.

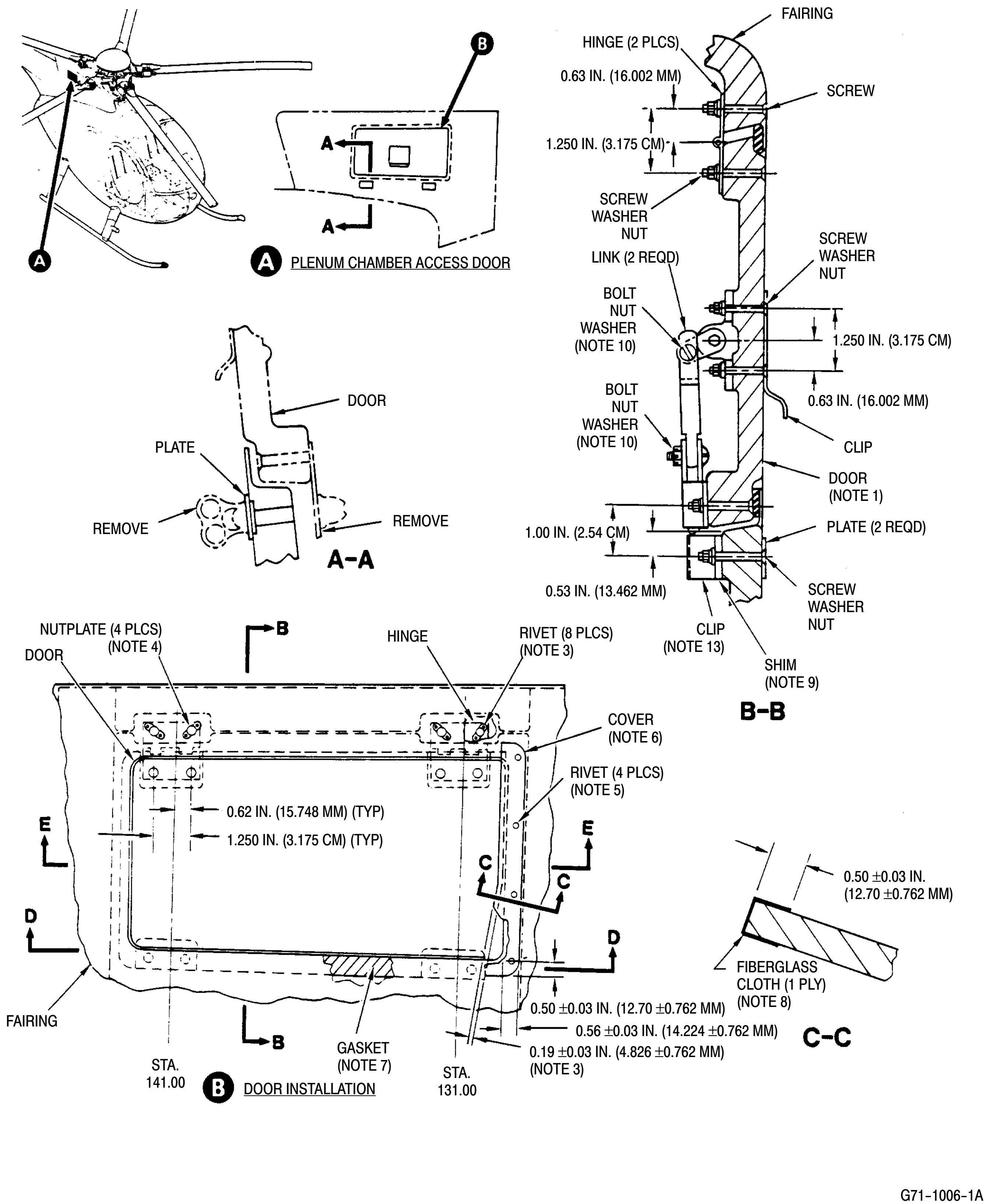
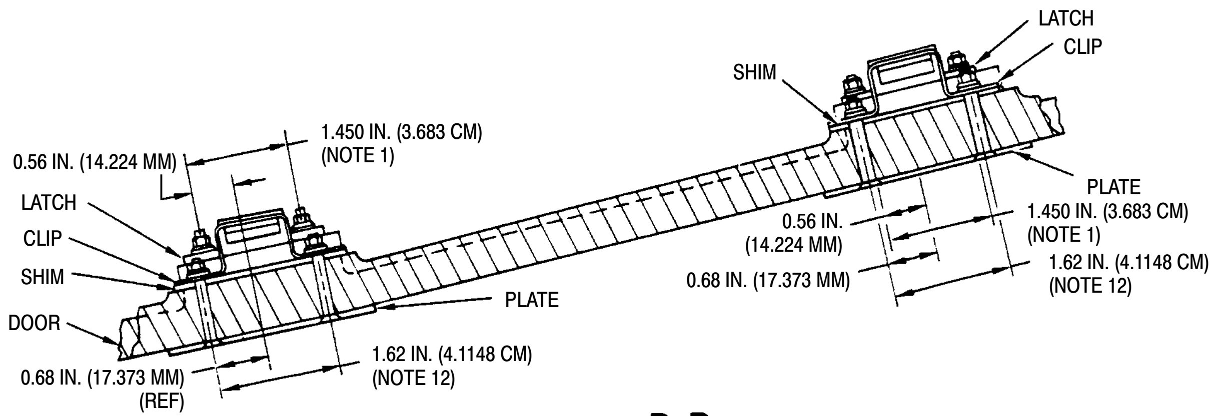
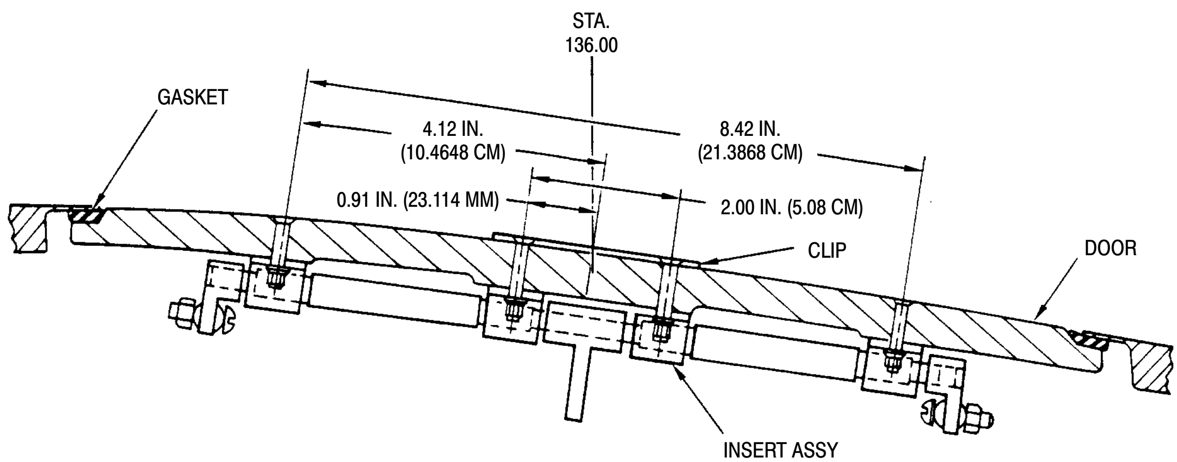


Figure 901. Air Bypass Door Installation (Sheet 1 of 2)



D–D



E–E

NOTES:

1. DOOR PN 369A2099, 369H2087 AND 369D22087.
2. INSTALL COVER. TRIM DOOR TO MATCH CONTOUR OF COVER SO AFT EDGE OF COVER OVERLAPS DOOR BY 0.19 IN. (4.826 MM) NOMINAL. REWORK NOT REQUIRED ON 369D290134 DOOR.
3. INSTALL MS20426A03-5 RIVETS FLUSH ON HINGE NEAR SIDE.
4. CENTER NUTPLATES ON EXISTING 0.196–0.210 IN. (4.9784–5.334 MM) DIA. HOLES IN HINGE. POSITION NUTPLATES AS SHOWN ON FAR SIDE IF HINGE.
5. DRILL FAIRING TO MATCH HOLE PATTERN IN COVER. INSTALL FOUR MS20470AD-3 RIVETS.
6. BOND COVER TO AFT FAIRING (REF. CSP-DEF-6).
7. MAKE GASKET FROM DE41 CLOSED CELL NEOPRENE RUBBER. BOND TO DOOR WITH ADHESIVE (CM418).
8. APPLY ONE PLY OF FIBERGLASS TO COVER-TRIMMED DOOR EDGE PER DIMENSION SHOWN.
9. PEEL SHIM, AS REQUIRED, TO ALIGN DOOR AND FAIRING EXTERNAL SURFACES FLUSH WHEN DOOR IS LATCHED.
10. TIGHTEN NUT TO GET 0.005–0.015 IN. (0.127–0.381 MM) GAP BETWEEN BOLT HEAD AND WASHER.
11. DIMENSION TO MATCH LATCH AND BE CENTERED WITHIN 0.060 IN. (1.524 MM) WITH CLIP.
12. DIMENSION TO MATCH CLIP AND BE CENTERED WITHIN 0.060 IN. (1.824 MM) WITH LATCH.
13. CHAMFER UPPER EDGE TO EASE DOOR LATCH ENGAGEMENT.

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Figure 901. Air Bypass Door Installation (Sheet 2 of 2)

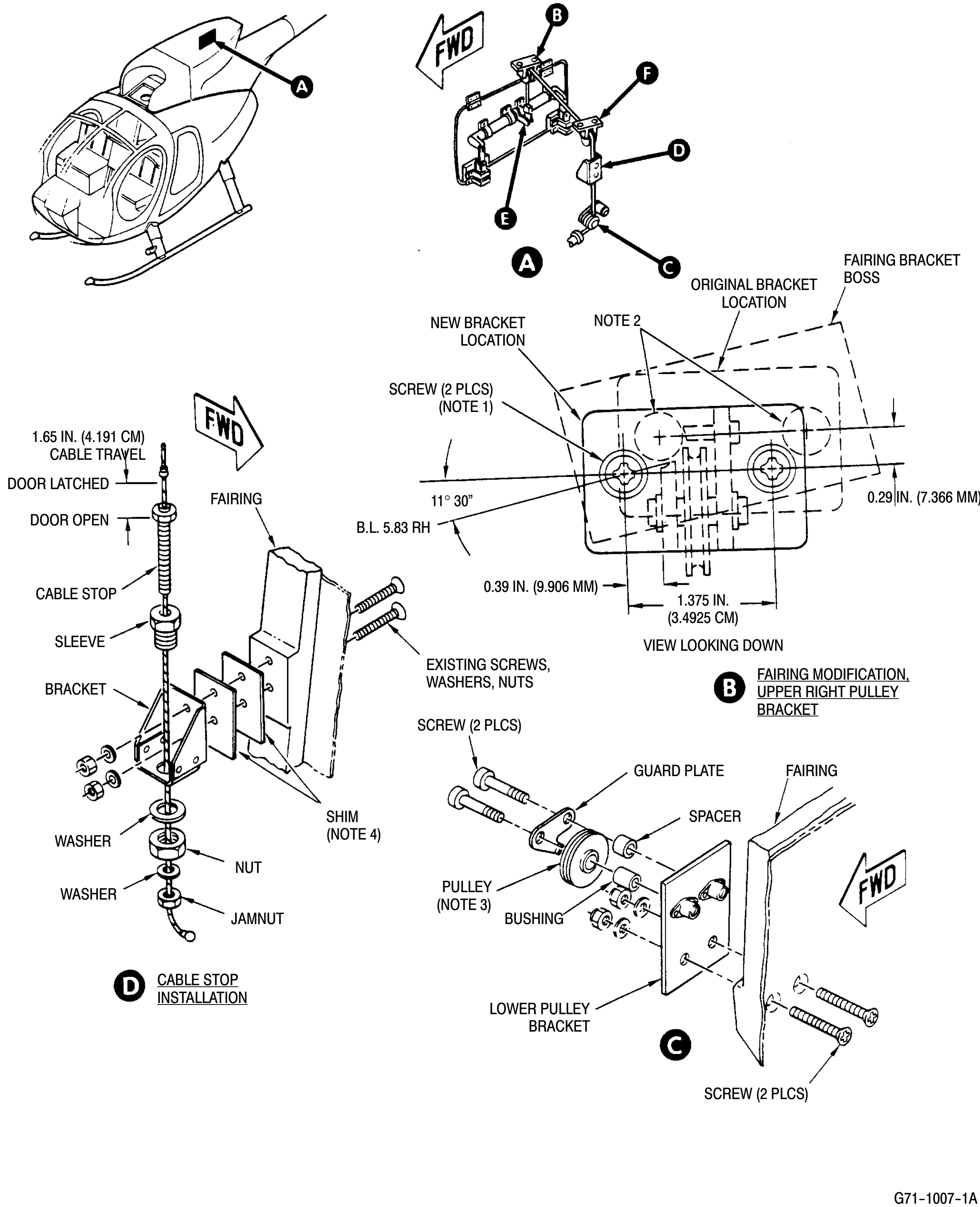
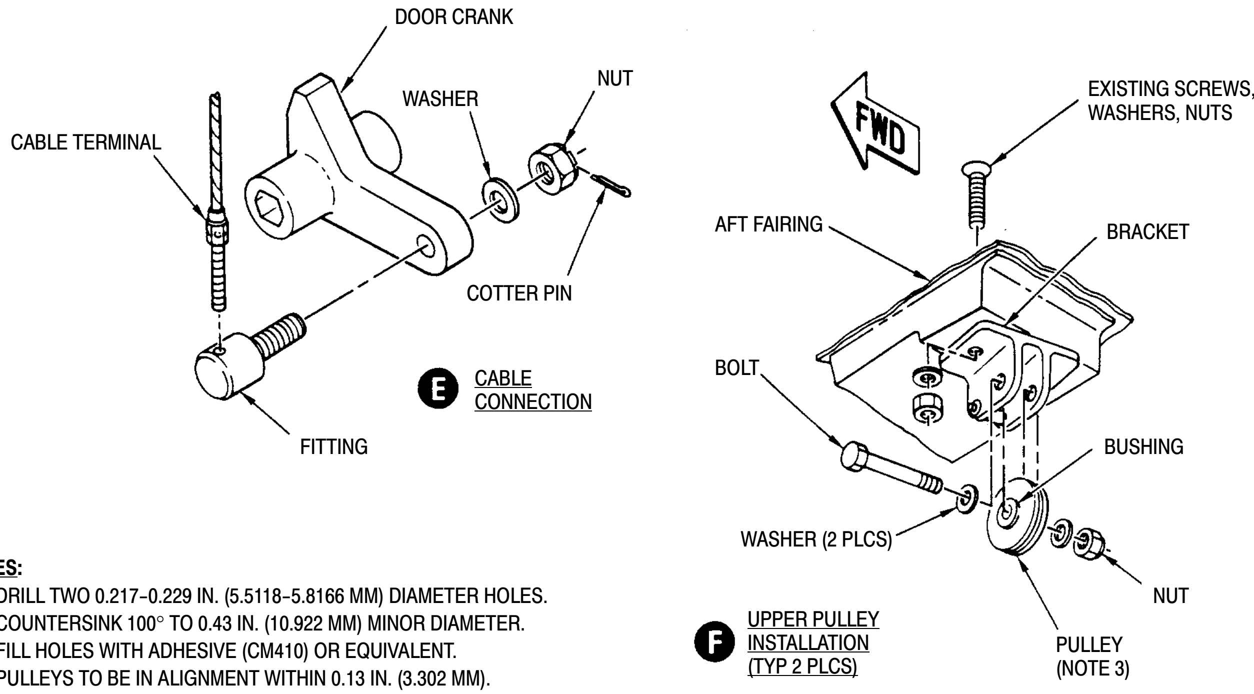


Figure 902. Aft Cable Installation (Sheet 1 of 2)



NOTES:
1. DRILL TWO 0.217–0.229 IN. (5.5118–5.8166 MM) DIAMETER HOLES. COUNTERSINK 100° TO 0.43 IN. (10.922 MM) MINOR DIAMETER.
2. FILL HOLES WITH ADHESIVE (CM410) OR EQUIVALENT.
3. PULLEYS TO BE IN ALIGNMENT WITHIN 0.13 IN. (3.302 MM).
4. SHIM TO ALIGN CABLE WITH CABLE STOP WITHIN 0.060 IN. (1.524 MM).

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Figure 902. Aft Cable Installation (Sheet 2 of 2)

(4). Attach links to latch and insert assembly with bolts, washers and nuts. Tighten nuts to get a 0.005-0.015 inch (0.127-0.381 mm) clearance between bolt-heads and washers.

(5). Install door hinge nut-plates with rivets.

(6). Relocate upper right pulley bracket mount holes (Ref. Figure 902, view B). Drill 0.217-0.229 inch (5.5118-5.8166 mm) diameter holes. Countersink 100° to 0.430 inch (10.922 mm) diameter. Fill original holes with EA9314 epoxy adhesive (CM410) mixed per manufacturers instructions.

(7). Install upper pulley brackets using existing fasteners. Insert bushings in two upper pulleys. Route cable assembly over pulleys.

(8). Install pulleys and cable assembly in brackets; install pulley bracket bolts, washers and nuts.

(9). Install cable-stop bracket and shim using existing fasteners. Thread cable stop into sleeve. Install washer and cable-stop jamnut.

(10). Install sleeve assembly in bracket. Secure with washer and nut.

(11). Install door latch shims, clips, plates, screws, washers and nuts (Ref. Figure 901, view D-D).

(12). Install bushing in lower pulley. Attach pulley assembly to bracket with shim between pulley and bracket. Install guard plate, spacer, screws and washers over pulley. Attach the assembled pulley bracket to fairing with screws, washers and existing nuts (Ref. Figure 902 detail C).

(13). Install air bypass door on aft fairing with screws, washers and nuts.

(14). Screw fitting (Ref. Figure 902, detail E) onto cable terminal. Install fitting in insert assembly crank arm with washer and nut. Tighten nut to get a 0.005-0.015 inch (0.127-0.381 mm) gap between crank and fitting head. Install cotter pin. Bend cotter pin only enough to keep it in place. Door rigging adjustments will be required later to complete the installation.

(15). Add or peel latch clip shims to align door and fairing external surfaces flush with door closed and latched (Ref. Figure 901).

(16). Check pulley alignment. Pulleys shall line up within 0.130 inch (3.302 mm) of each other.

(17). Locate seal supports on fairing. Drill fairing to match holes in supports. Install rivets (Ref. Figure 904, detail A).

(18). Install seals on supports. Align LH seals (Ref. Figure 904, detail A, sections A-A and C-C).

(19). Remove coax, anti-ice and wire harness cable support hardware, including clip (Ref. Figure 904, views H-H and J-J).

(20). Locate and rivet ty-rap base in position. Tie coax, anti-ice and wire harness in one bundle. Secure bundle to base with ty-raps.

B. Cover Installation

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM418	Cement, epoxy

NOTE: 369D series helicopters equipped with engine inlet fairings other than part numbers 369A3053-505, -507 and -509 require modification of the air bypass door to clear particle separator and the installation of a cover on the fairing (Ref. Figure 901, detail B).

(1). Use cover as a template and drill a 0.098 inch (2.4892 mm) diameter hole in four places. Bond cover to fairing using bonding adhesive (CM418). Install rivets.

(2). Trace aft edge of cover onto bypass door. Remove door and cut away material 0.190 inch (4.826 mm) forward of trace line.

(3). Cover saw cut with a single ply of glass cloth (Ref. Figure 901, detail C-C) and per Structural Repair Manual, CSP-DEF-6.

C. Handle and Forward Cable Installation

(Ref. Figure 903)

Consumable Materials (Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer

Special Tools (Ref. Section 91-00-00)

Item	Nomenclature
ST2007	Rivnut installation speed header
ST2008	Rivnut keyway cutter

(1). Remove 369H6524-835 bracket (Ref. Figure 903).

(2). Remove oil pressure sender tube assembly from frame hole at canted Sta. 78.50.

(3). Enlarge oil pressure sender tube bulkhead hole to 0.042 inch (1.0668 mm) diameter. Install grommet.

(4). Modify map case or rotor brake cover (Ref. Figure 903, Sheet 3). Use fly-cutter as required.

(5). Attach control handle identification decal to map case.

(6). Drill and deburr rivet holes in angle, brackets and mount. Install brackets and mount.

(7). Insert cable end into handle. Fit two retainer halves over swaged ball. Pull assembly back into handle to secure. Install button plug.

(8). Route cable assembly through bracket and secure with nut and washers. Stack washers as required to adjust handle protrusion into cabin.

(9). Trim fairing to get a 0.120 inch (3.048 mm) diameter gap between main rotor mast and fairing (Ref. Figure 903, view F).

(10). Locate rivnut installation point (Ref. Figure 903, view A). Drill one 0.250-0.256 inch (6.35-6.5024 mm) diameter hole through pan. Use a C-3576 key cutting tool (ST2008) to make a 0.062-0.065 inch (1.5748-1.651 mm) wide by 0.056-0.058 inch (1.4224-1.4732 mm) deep rivnut keyway. Apply primer (CM318) to hole. Install rivnut with a C-6000 speed header (ST2007) while primer is wet.

(11). Inspect rivnut installation. Rivnut length measured from upper surface of head to blind end shall be between 0.365-0.415 inch (9.271-10.541 mm). Rivnut shall be tight.

(12). Secure cable to rivnut with a clamp, washer and screw.

(13). Install grommet in fairing (Ref. Figure 903, view D). Route cable through grommet.

(14). Locate and drill 0.390 inch (9.906 mm) diameter hole through left fairing for pressure switch tube union (Ref. Figure 904, Sheet 1). Do not install union at this time.

(15). Locate pressure switch support angle position (Ref. Figure 904, Sheet 1). Drill and deburr rivet holes. Install angle with rivets. Do not install pressure switch at this time.

NOTE: Ground connection (E45) requires minimum resistance to current flow for reliable solenoid air valve operation.

(16). Prepare electrical ground (E45) stud installation per FAA publication, EA-AC43.13-1A and 2A.

(17). Install ground stud screw through existing tool hole in stringer with washers, jamnut and nut. Install decal (Ref. Figure 907, detail B).

D. Bleed Air System Installation (Helicopters Without Cabin Heat)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM112	Anti-seize compound high temperature

CAUTION Compressor bleed air is hot enough to char tube identification tapes that may cause FOD. Remove identification tapes from compressor bleed air tubes prior to installation.

NOTE:

- Helicopters without Cabin Heating require the installation of compressor bleed air hardware on the engine for the particle separator scavenge air system.
- Installation of bleed air extraction elbow, tee and hose with the engine installed in the helicopter can be done; however, clearance is minimal.
- Apply high temperature anti-seize compound (CM112) to male threads of all fittings prior to installation.

(1). Remove engine (Ref. Sec. 71-00).

(2). Continue with ‘Scavenge Air System Installation’.

E. Bleed Air System Installation (Helicopters With Cabin Heat)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM112	Anti-seize compound high temperature

CAUTION Compressor bleed air is hot enough to char tube identification tapes that may cause FOD. Remove identification tapes from compressor bleed air tubes prior to installation.

NOTE: Apply high temperature anti- seize compound (CM112) to male threads of all fittings prior to installation.

(1). Remove cabin heat control valve. Remove existing control valve elbow and O-ring.

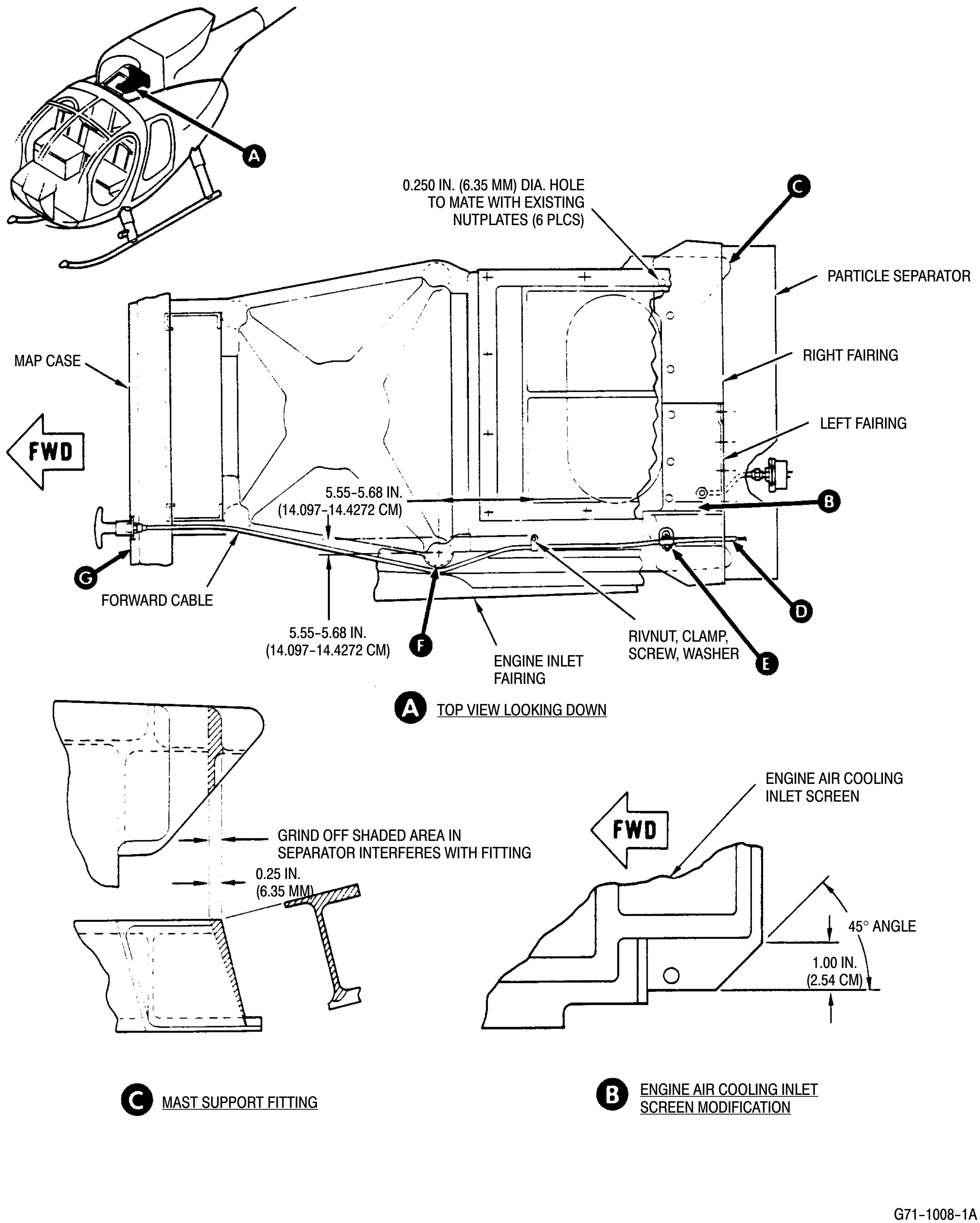

Figure 903. Handle and Forward Cable Installation (Sheet 1 of 3)

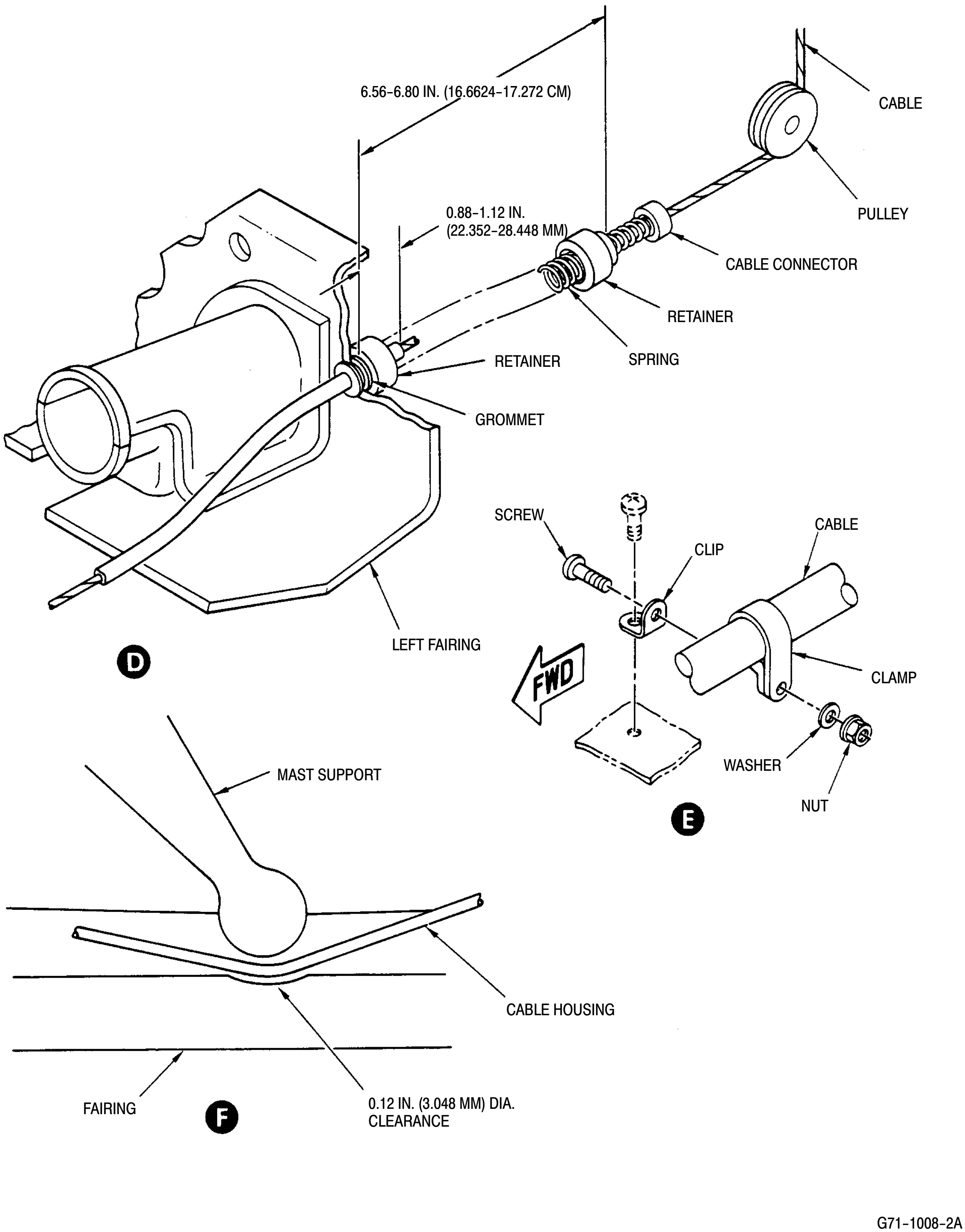

Figure 903. Handle and Forward Cable Installation (Sheet 2 of 3)

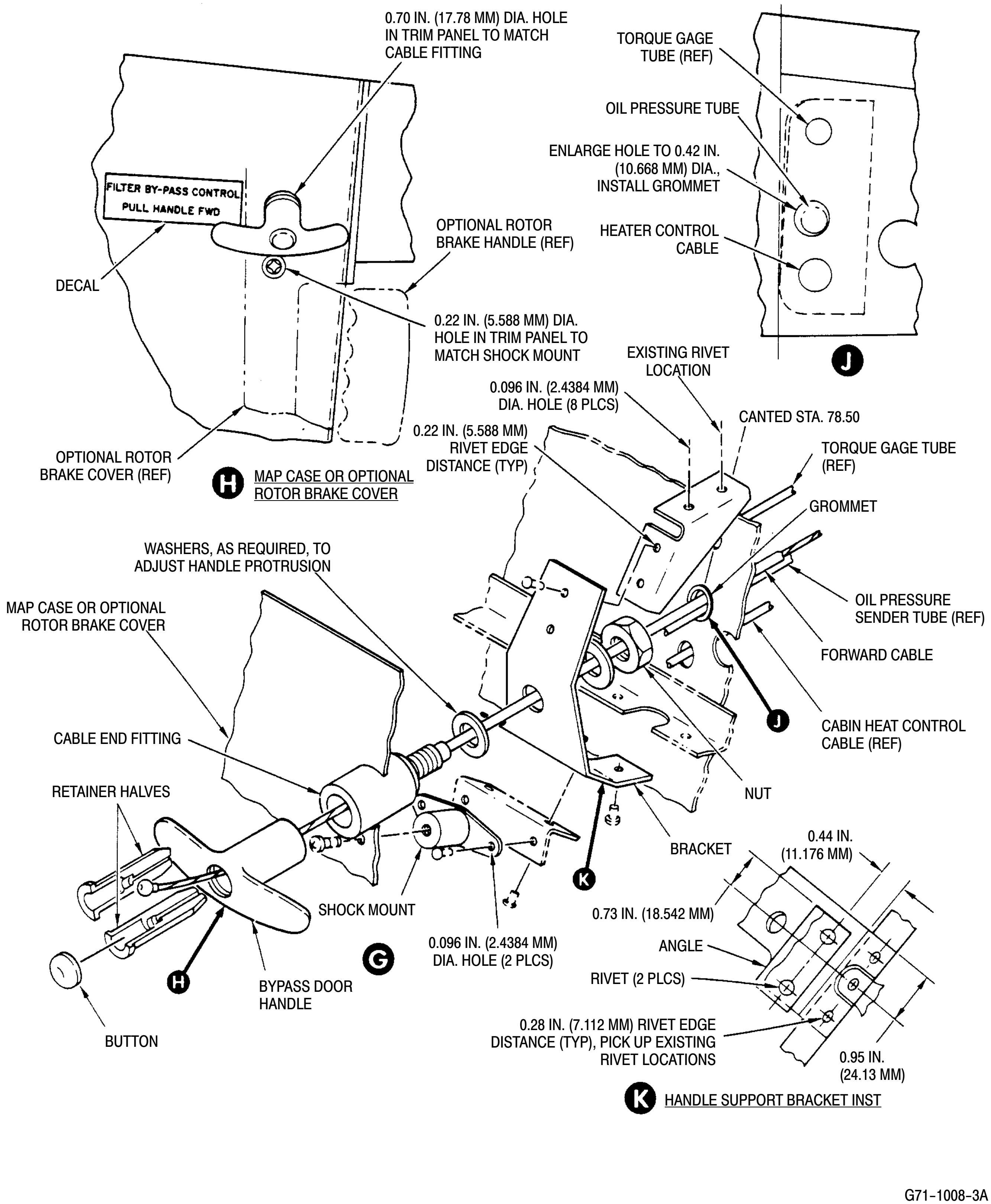

Figure 903. Handle and Forward Cable Installation (Sheet 3 of 3)

(2). Install special three-port elbow and O-rings with existing fasteners. Torque three-port elbow flange self-locking nuts up to **18 inch-pounds (2.03 Nm)**. Install cabin heat control valve. Torque nuts to **20 - 25 inch-pounds (2.26 - 2.82 Nm)**.

(3). Install universal elbow, O-ring and jamnut on engine compressor scroll. Torque jamnut to **145 - 155 inch-pounds (16.38 - 17.51 Nm)** (Ref. Figure 905).

(4). Install tee, jamnut and O-ring on compressor diffuser duct. Torque tee jamnut to **285 - 315 inch-pounds (32.20 - 35.59 Nm)**.

(5). Install hose assembly between elbow and tee. Torque hose nuts to **150 - 250 inch-pounds (16.95 - 28.25 Nm)**.

(6). Install cover, spacer and gaskets on special three-port elbow with bolts, washers and nuts.

(7). Loosely install special three-port elbow on canted firewall with bolts, washers and nuts.

(8). Install nut and O-ring on 0.750 inch (19.05 mm) universal elbow and install in three-port elbow. Torque three-port elbow flange self-locking nuts up to **18 inch-pounds (2.03 Nm)**. Torque universal elbow jamnut **285 - 315 inch-pounds (32.20 - 35.59 Nm)**.

(9). Install engine (Ref. Sec. 71-00).

(10). Install tube assembly between firewall mounted universal elbow and tee-fitting. Torque tube nuts to **460 - 500 inch-pounds (51.97 - 56.49 Nm)**.

F. Scavenge Air System Installation

(Ref. Figure 905)

(1). The scavenge air system consists of a solenoid air valve, tubes, air pressure switch, SCAV AIR circuit breaker switch, AIR FILTER CLOGGED caution light, wiring, and attaching hardware.

(2). Attach one end of compressor bleed air tube to special three-port elbow. Torque tube nut to **110 - 130 inch-pounds (12.43 - 14.69 Nm)**.

(3). Bolt solenoid valve to bracket. Attach free end of bleed air tube assembly to solenoid valve. Torque tube nut to **110 - 130 inch-pounds (12.43 - 14.69 Nm)**.

CAUTION Do not scratch or gouge firewall surface when trimming heat shield.

(4). Mark solenoid valve bracket position on firewall heat shield pad. Remove bracket, valve and tube. Cut an 0.125 inch (3.175 mm) oversize opening through heat shield pad for the valve mounting bracket.

(5). Drill and deburr valve bracket rivet holes.

(6). Install bracket on firewall with six rivets.

(7). Mount solenoid valve on bracket. Torque valve mounting bolts to **20 - 25 inch-pounds (2.26 - 2.82 Nm)**.

(8). Install scavenge air tube between the valve and elbow. Torque tube nuts **110 - 130 inch-pounds (12.43 - 14.69 Nm)**.

(9). Install elbow on scavenge air line support bracket (Ref. Figure 904, view G-G) with one washer on each side. Install and torque jamnut to **120 - 150 inch-pounds (13.56 - 16.95 Nm)**.

(10). Trim away up to 0.050 inch (1.270 mm) of bracket outboard edge to clear intersecting angle and rivet heads. Install support assembly on shelf with washers and screws.

(11). Locate scavenge air line elbow doubler on plenum chamber bulkhead. Fasten doubler to structure with rivets.

(12). Install elbow, washer and nut on doubler. Torque elbow jamnut to **120 - 150 inch-pounds (13.56 - 16.95 Nm)**.

(13). Install upper scavenge air tube between elbows. Torque tube nuts **110 - 130 inch-pounds (12.43 - 14.69 Nm)**.

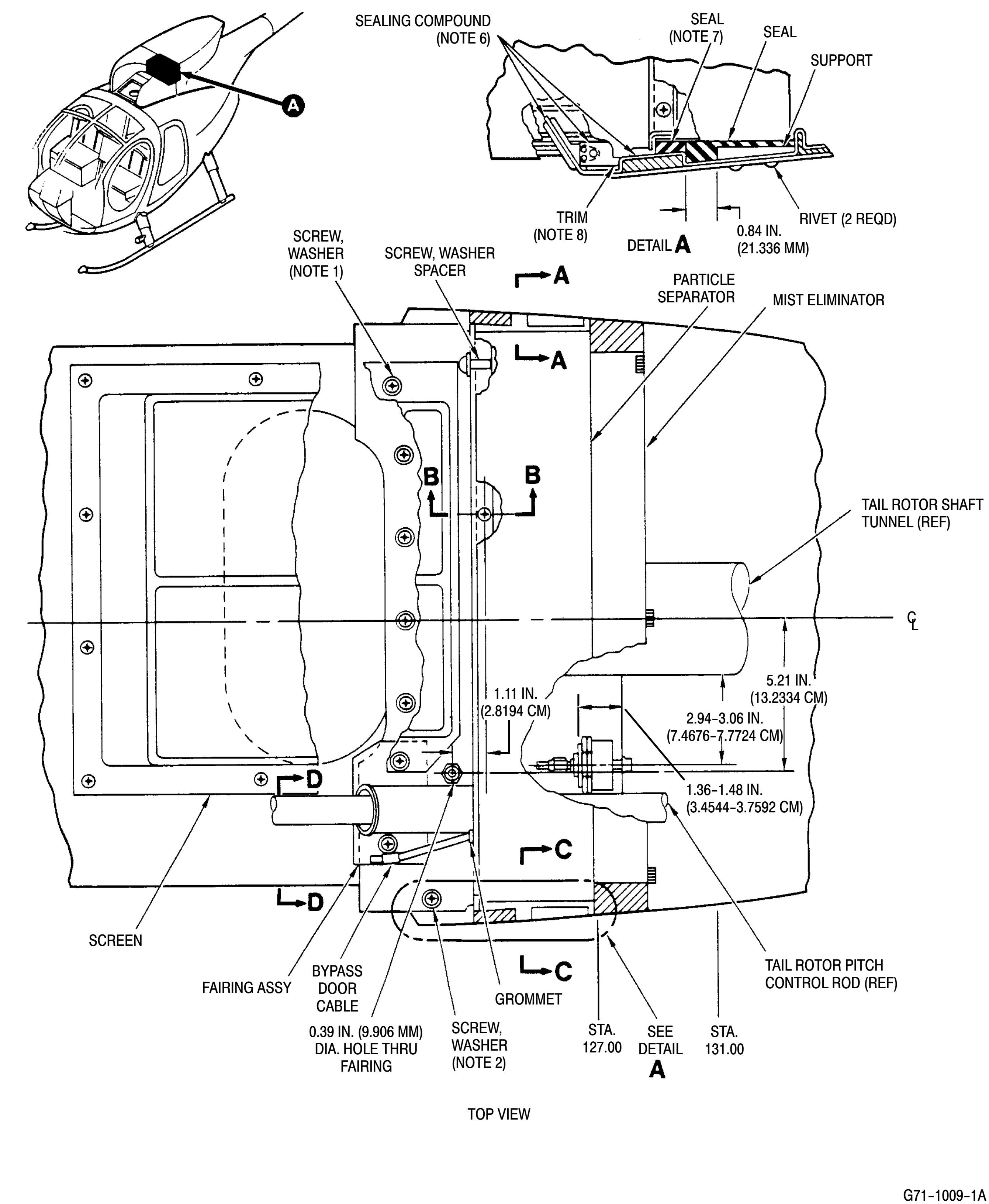

Figure 904. Modifications and Installation (Sheet 1 of 4)

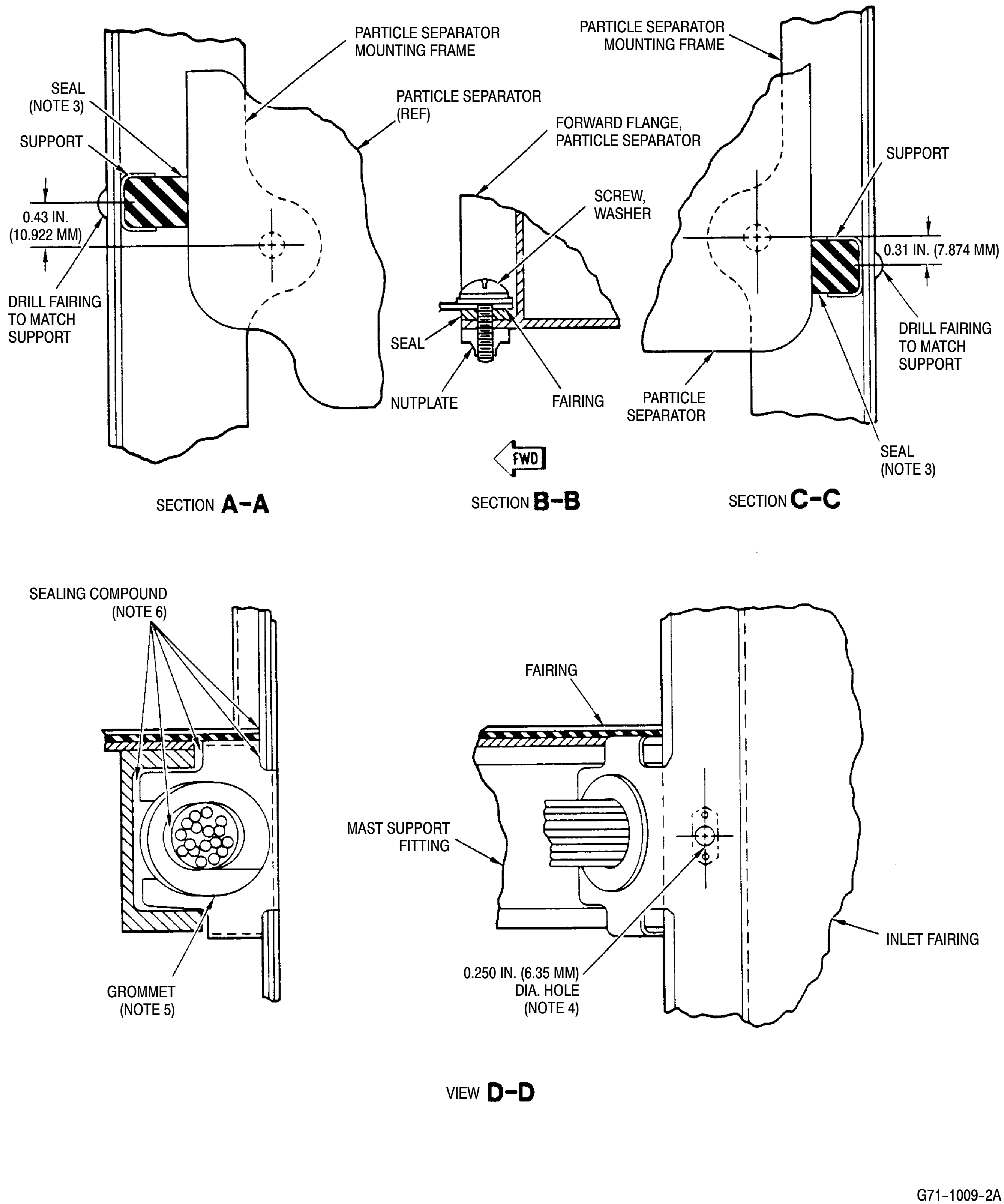

Figure 904. Modifications and Installation (Sheet 2 of 4)

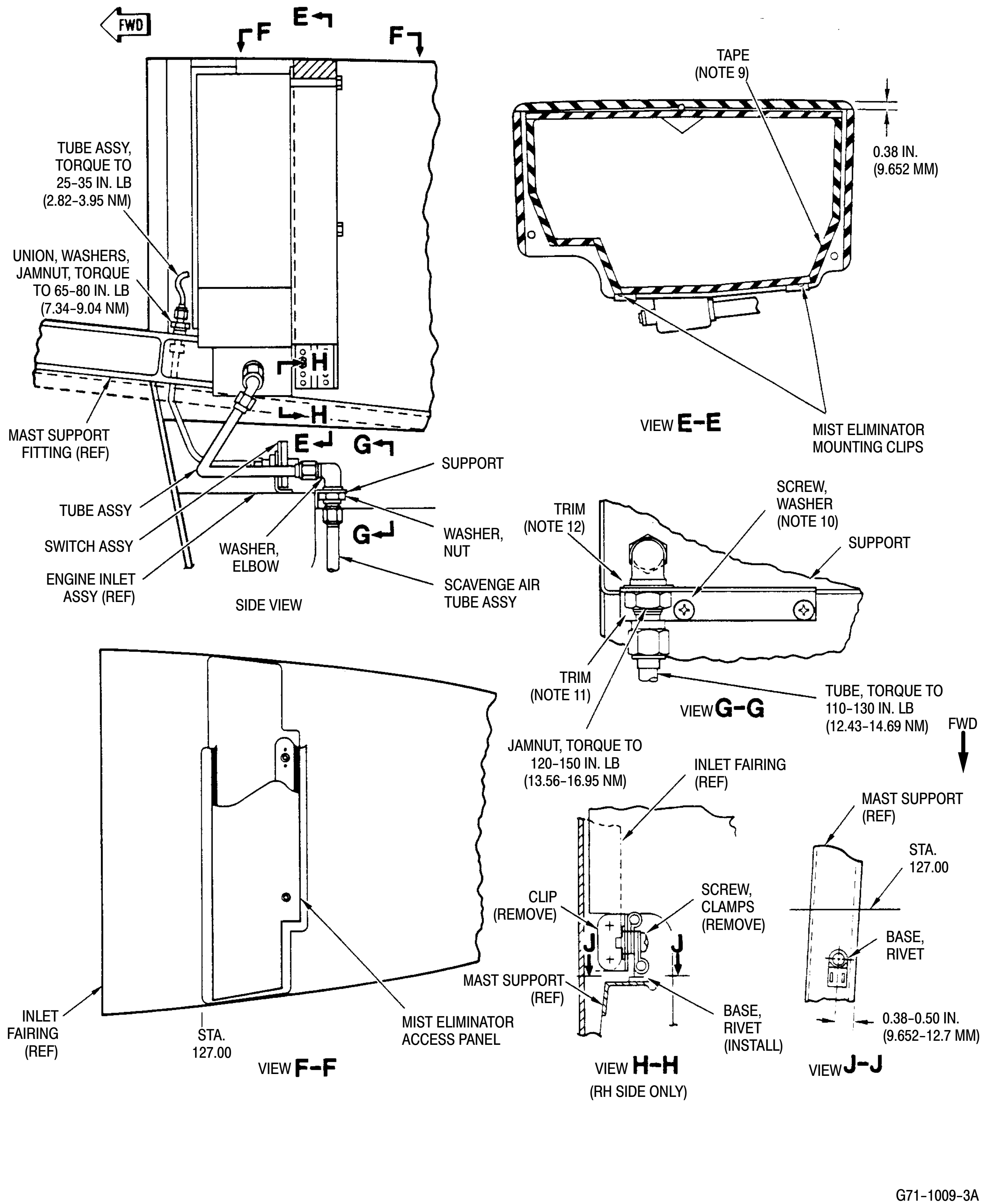

Figure 904. Modifications and Installation (Sheet 3 of 4)

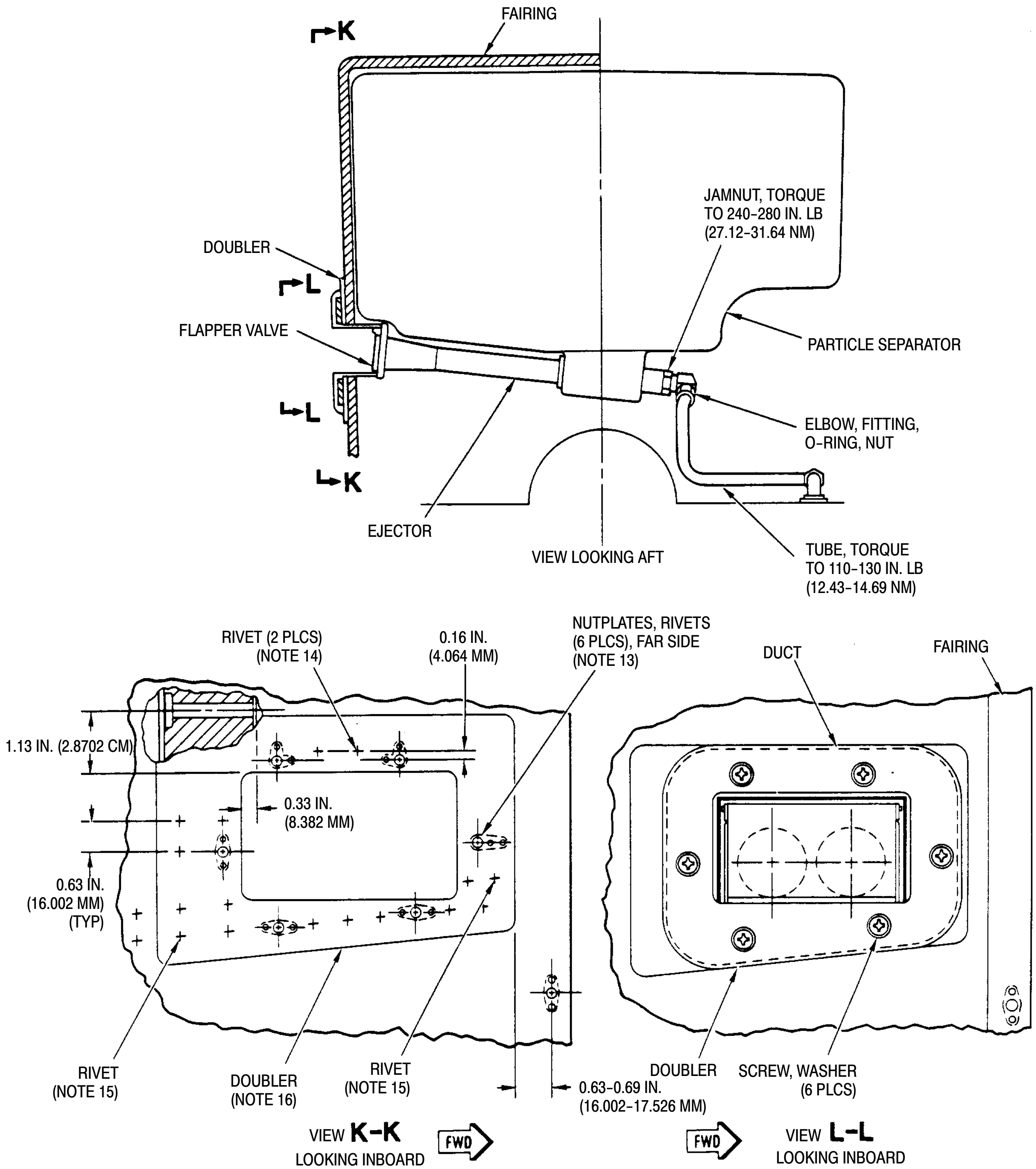

Figure 904. Modifications and Installation (Sheet 4 of 4)

Legend (Ref. Figure 904)

1. 0.250 IN. (6.35 MM) DIAMETER HOLE THROUGH FAIRINGS TO MATCH EXISTING NUT-PLATE LOCATION.
2. 0.250 IN. (6.35 MM) DIAMETER HOLE THROUGH FAIRING TO MATCH LOWER FAIRING ASSEMBLY NUT-PLATE LOCATION; LEFT AND RIGHT SIDES.
3. INSTALL SEAL AFTER SUPPORT INSTALLATION.
4. DRILL 0.250 IN. (6.35 MM) DIAMETER HOLE THROUGH FAIRING ASSEMBLY TO MATCH EXISTING NUT-PLATE LOCATION.
5. SPLIT GROMMET ON TANGENT SHOWN PRIOR TO INSTALLATION.
6. APPLY SEALING COMPOUND (CM430) TO ALL OPENINGS AND GAPS.
7. ALIGN BOTTOM EDGES OF SEALS.
8. TRIM LOWER FAIRING AS REQUIRED TO CLEAR AFT FAIRING STRUCTURE.
9. IF INSTALLING MIST ELIMINATOR; APPLY 0.125 IN. (3.175 MM) THICK BY 0.380 IN. (9.652 MM) WIDE PRESSURE SENSITIVE TAPE (CM728) OR EQUIVALENT TO PARTICLE SEPARATOR PRIOR TO INSTALLATION.
10. USE EXISTING NUT-PLATES.
11. TRIM SUPPORT AS REQUIRED TO CLEAR RIVET HEADS.
12. TRIM OUTBOARD EDGE OF SUPPORT 0.050 IN. (1.270 MM), MAXIMUM, TO CLEAR ANGLE.
13. DRILL 0.217-0.229 IN. (5.5118-5.8166 MM) DIAMETER SCREW HOLES TO MATCH DOUBLER HOLES.
14. EQUALLY SPACE RIVETS BETWEEN NUT-PLATES.
15. PICK UP EXISTING RIVET LOCATIONS.
16. CUT HOLE THROUGH AFT FAIRING TO MATCH DOUBLER. BOND DOUBLER TO EXTERIOR FAIRING SURFACE WITH ADHESIVE (CM410) PER MANUFACTURERS INSTRUCTIONS.

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(14). Install tee on solenoid air valve. Install cap on tee.

(15). Install tube assembly between solenoid valve tee and elbow. Torque tube nuts **110 - 130 inch-pounds (12.43 - 14.69 Nm)**.

(16). Install scavenge air tube clamp support bracket, spacer, clamp, screws, washers, and nuts (Ref. Figure 905, detail C).

(17). Clamp tube assembly to air duct with clamps, screw, washers and nut (Ref. Figure 905, detail B).

G. Solenoid Valve and Pressure Switch Wire Harness Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM815	Solder

NOTE: If using prefabricated wire harness, part number 369A4163, go to step (6). If not using prefabricated wire harness, proceed as follows:

(1). Do not clamp wiring until routing and connections are complete. Install wires per FAA publication, EA-AC43.13-1A and 2A. Where possible, route added wiring along existing wire harness.

(2). Install varistor across connector P206 pins A and B (Ref. Figure 103, detail A). Solder (CM815) connections per standard shop practices.

(3). Connect wire P17D20N to solenoid valve connector P206 pin B and ground lug E45 with washers and nut.

(4). Solder wire P16C20 to connector P206, pin A.

(5). Route solenoid air valve wire harness through airframe (Ref. Figure 907).

(6). Install wire harness, part number 369A4163 as follows:

(7). Solder varistor between pins A and B of connector P206 (Ref. Figure 103, detail A).

(8). Route wire harness through airframe (Ref. Figure 907).

(9). Connect wire P17A20N to ground lug E45.

(10). Splice solenoid valve wire P16D20 to airframe wire P16C20.

(11). Determine correct pressure switch wire length. Trim wires as required.

(12). Install knife splice halves on pressure switch pigtails. Install knife splice halves on airframe wires P16G22 and P16H22N.

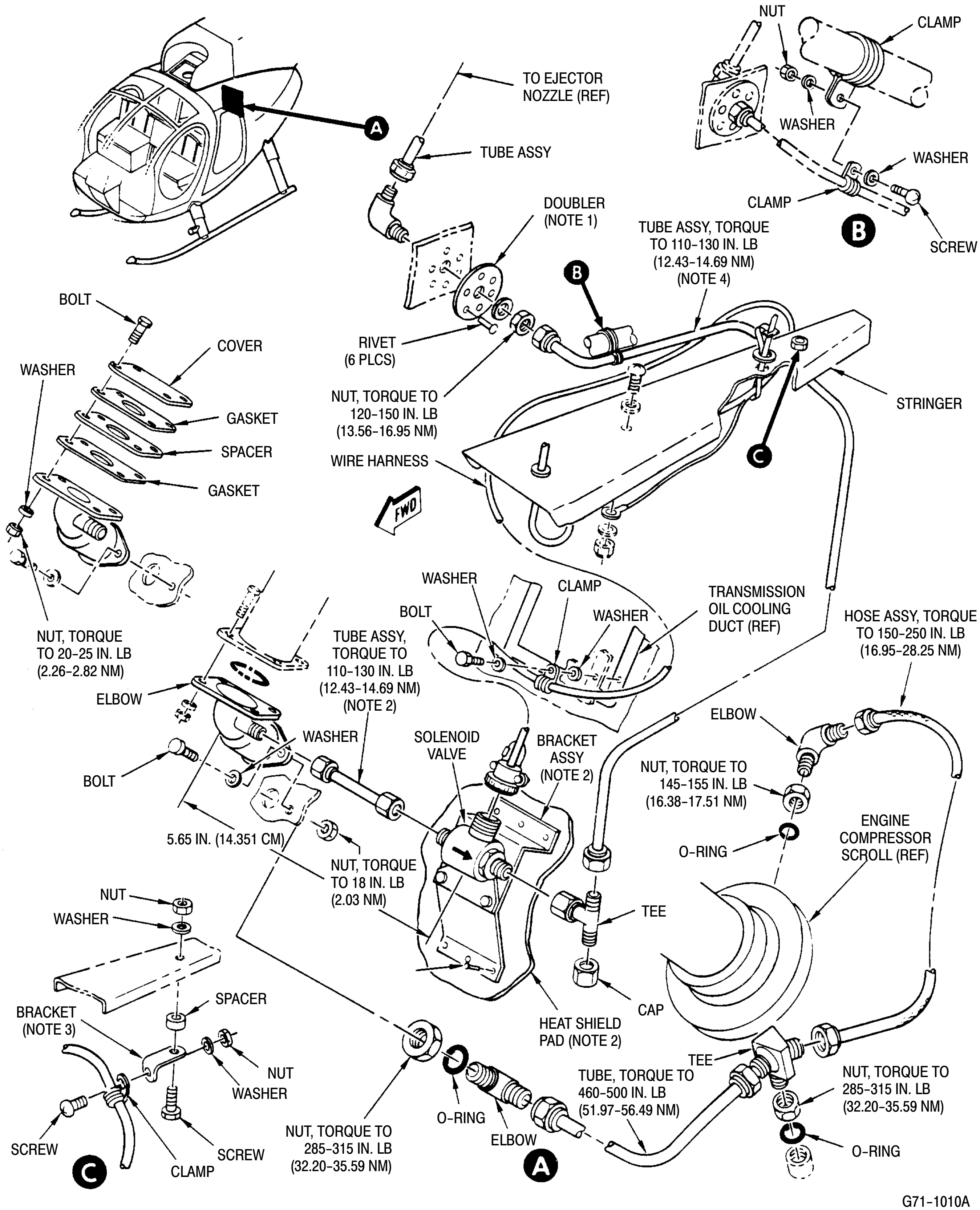


Figure 905. Scavenge Air Equipment Installation

Legend (Ref. Figure 905)

1. LOCATE DOUBLER ON PLENUM CHAMBER WALL AT THE INTERSECTIONS OF STA. 126.25 AND W/L 52.50. CENTER DOUBLER ON A POINT 1.50 IN. (3.81 CM) BELOW PLENUM CHAMBER ANGLED FLOOR PAN. DRILL ONE 0.578 IN. (14.6812 MM) DIAMETER HOLE THROUGH CENTER. DRILL SIX EQUALLY SPACED RIVET HOLES AROUND DOUBLER. MAINTAIN A 0.220 IN. (5.588 MM) MINIMUM RIVET EDGE DISTANCE.
2. BOLT SOLENOID VALVE TO MOUNTING BRACKET. ATTACH TUBE BETWEEN VALVE AND ELBOW TO LOCATE VALVE ASSEMBLY ON FIREWALL. TRIM AWAY HEAT SHIELD PAD BENEATH BRACKET PRIOR TO RIVETING BRACKET TO FIREWALL.
3. USE EXISTING STRINGER TOOLING HOLE.
4. HAND FORM AS REQUIRED TO CLEAR STRUCTURES.

NOTE: Ensure electrical continuity and minimum resistance between ground wire P16H22N and airframe.

(13). Connect either switch pigtail to airframe wire P16G22. Connect remaining lead to airframe ground wire P16H22N.

(14). Install clamps and ty-raps.

(15). Refer to Instrument Panel Modifications; T-Pedestal or Slimline Panel Modification for crew compartment wiring information.

(16). Vacuum all debris from work area.

(17). Inspect all tube connections for correct torque values. Inspect all components and attaching hardware for correct installation and security.

H. Ejector Duct Doubler and Rib Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM418	Cement, epoxy

NOTE: Doubler is required for all installations. Rib installation is required for helicopters not equipped with 369A3053-505, -507, or -509 engine inlet fairing assemblies.

(1). Drill out required rivets (Ref. Figure 904, view K-K and Figure 906).

(2). Locate and bond doubler to fairing exterior with adhesive (CM418).

(3). Install rivets through doubler and fairing.

(4). Back-drill from inside of engine inlet fairing through existing rivet holes and doubler.

(5). Cut hole in aft engine inlet fairing to match hole in doubler.

(6). Bond rib in position (Ref. Figure 906).

(7). Drill six holes through fairing to match holes in doubler, Install nut-plates and rivets (Ref. Figure 904, view K-K).

(8). Install ejector duct (Ref. Figure 904, view L-L) with screws and washers.

I. Particle Separator Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM106	Fluorocarbon dry lubricant
CM112	Anti-seize compound high temperature
CM234	Solvent, dry-cleaning
CM405	Adhesive
CM425	Sealing compound
CM430	Sealant, solvent resistant

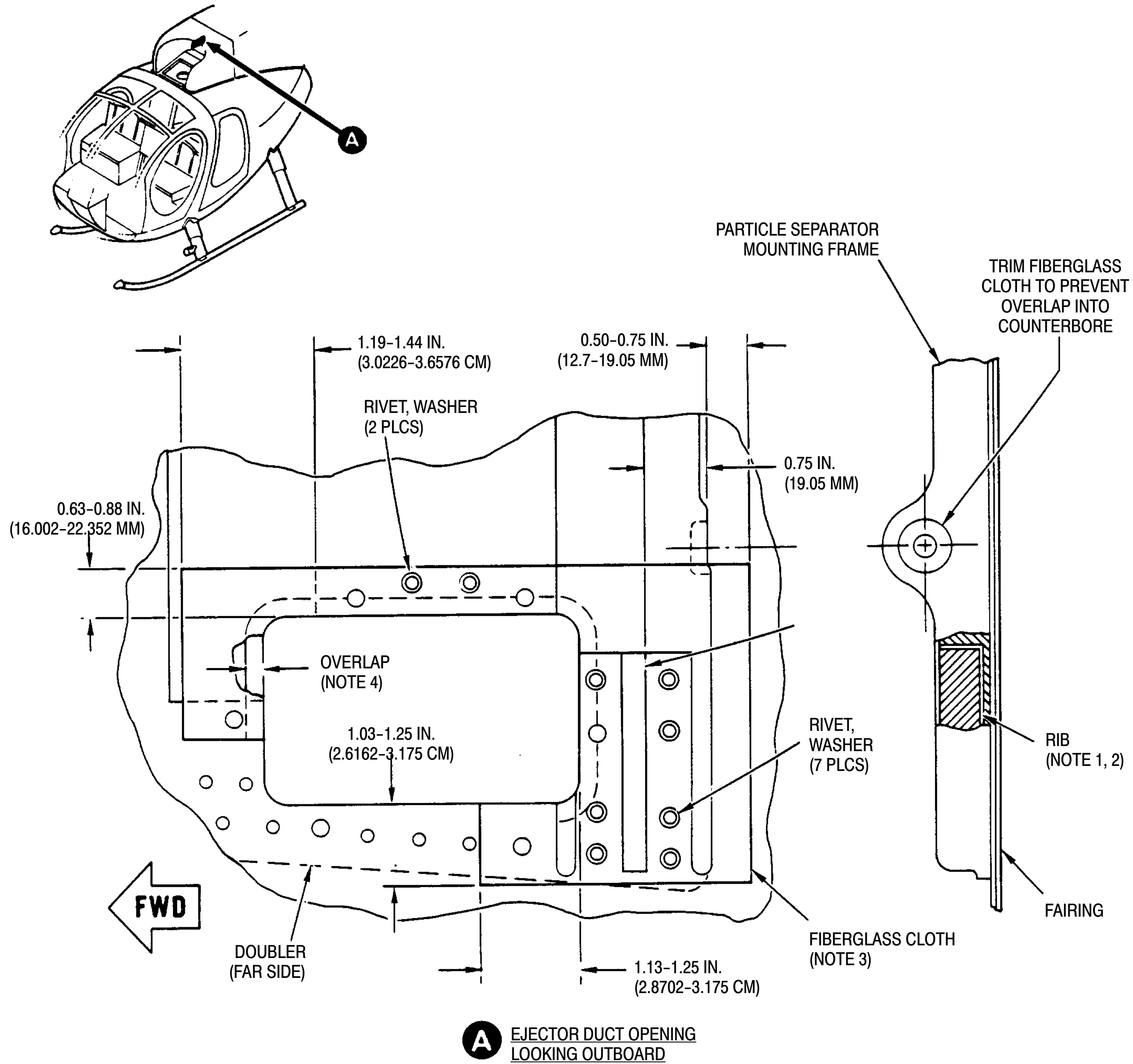
(1). Position particle separator inside engine air inlet aft fairing. Coat mounting bolt threads with anti-seize compound (CM112).

(a). Temporarily attach separator to mount boss with bolts and washers. Stack washers under right bolt head as necessary. Check fit.

NOTE: Do not grind mast support fitting unless particle separator cannot be installed due to interference with fitting.

(2). Remove particle separator and grind material from corner of mast support fitting (Ref. Figure 903, detail C).

(3). Drill 0.250 inch (6.35 mm) diameter holes through horizontal fairings to match auxiliary fairing nut-plates (Ref. Figure 904, Sheet 1).



NOTES:

1. RIB INSTALLATION ONLY REQUIRED FOR HELICOPTERS NOT EQUIPPED WITH 369A3053-505, -507 OR -509 ENGINE INLET FAIRING ASSEMBLY. INSTALL RIB AND FIBERGLASS CLOTH PRIOR TO INSTALLING NUTPLATES AND NUTPLATE RIVETS.
2. BOND RIB TO FAIRING WITH ADHESIVE (CM410) PER MANUFACTURERS INSTRUCTIONS.
3. APPLY A MINIMUM OF TWO PLIES OF FIBERGLASS CLOTH (CM501) WITH RESIN (CM506) OR EQUIVALENT PER MANUFACTURERS INSTRUCTIONS.
4. FIBERGLASS CLOTH TO OVERLAP HOLE EDGE 0.09-0.19 IN. (2.286-4.826 MM) ON FAR SIDE.

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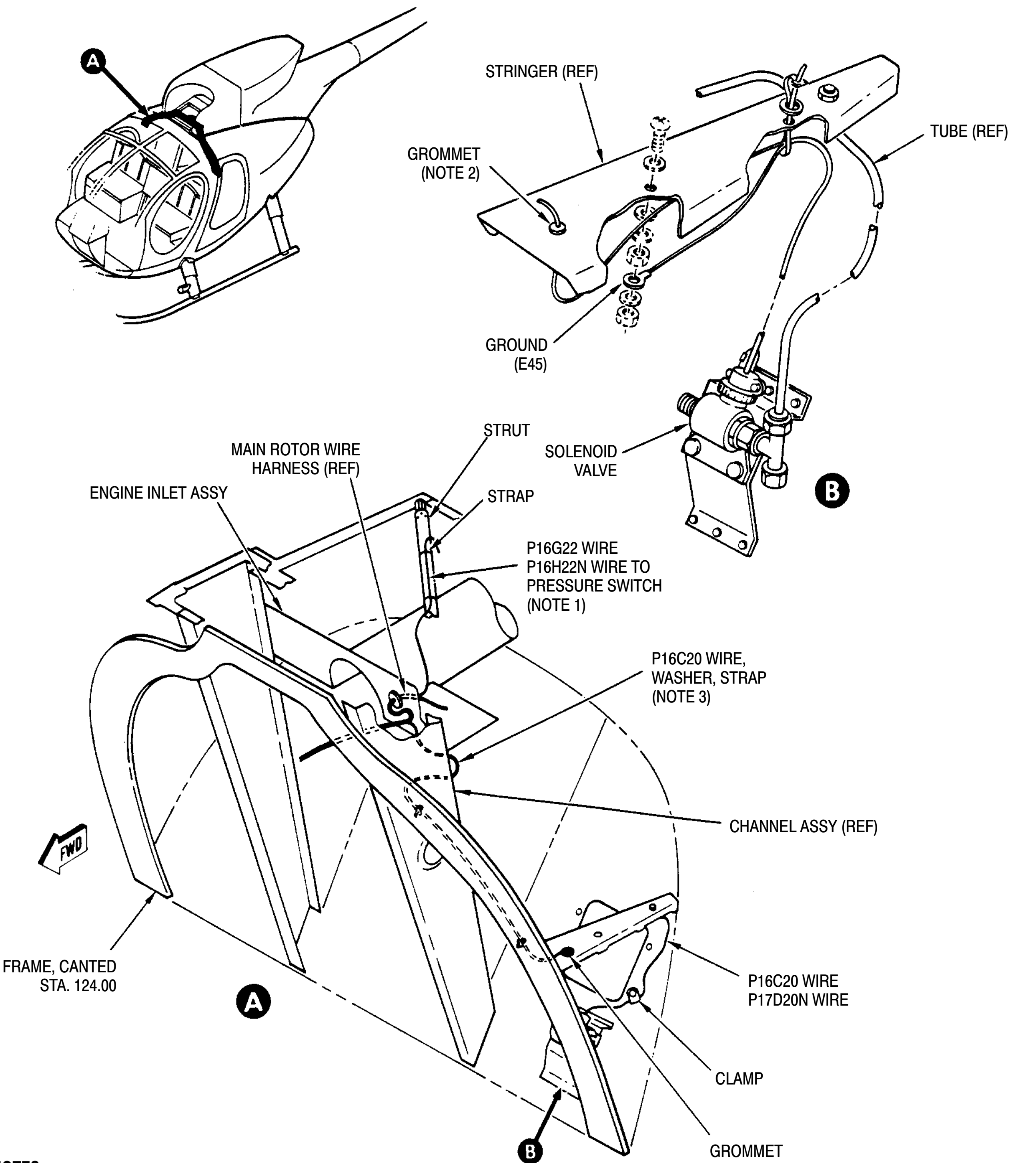
Figure 906. Ejector Duct Doubler Installation



NOTES:

1. P16H22N WIRE FROM PRESSURE SWITCH TO GROUND E15.
2. INSTALL GROMMET IN EXISTING TOOLING HOLE.
3. SECURE WIRE TO FRAME USING WASHERS AND STRAPS THROUGH EXISTING TOOLING HOLES (2 PLCS).

G71-1012

Figure 907. Wiring Harness Installation

(4). Drill 0.250 inch (6.35 mm) diameter holes through auxiliary fairing vertical plates to match aft inlet fairing nutplates (Ref. Figure 904, view D-D).

NOTE: Do not install auxiliary fairings at this time.

(5). If installation does not include mist eliminator, install bolts and washers in the three lowest particle separator mist eliminator attachment holes. Torque bolts **20 - 25 inch-pounds (2.26 - 2.82 Nm)**.

(6). If installation includes mist eliminator, wipe rear surfaces of particle separator clean with dry cleaning solvent (CM234) on a clean cloth. Wipe dry.

(7). Attach 0.125 inch (3.175 mm) thick by 0.380 inch (9.652 mm) wide pressure sensitive seal tape to particle separator aft surface around mist eliminator frame and fairing frame contact areas (Ref. Figure 904, view E-E).

(8). Install rubber seal (Ref. Figure 904, section B-B) on the forward lower shelf edge of the particle separator as follows:

(a). Apply one heavy brush coat of adhesive (CM405) to seal and particle separator joint surfaces. Let surfaces dry 15 minutes.

(b). Apply a second coat of adhesive. Immediately press seal in place. Allow assembly to air dry a minimum of eight hours.

NOTE: Do not install mist eliminator support channels if helicopter is not equipped with a mist eliminator access panel on top of the aft fairing (Ref. Figure 904, view F-F).

(9). Install mist eliminator support channels on particle separator lower aft face with screws (Ref. Figure 904, view E-E).

(10). Install scavenge air line special elbow, O-ring and nut on particle separator ejector assembly. Do not torque elbow jamnut at this time (Ref. Figure 904, Sheet 4).

(11). Install particle separator with washers and bolts.

(12). Install scavenge air supply tube between ejector nozzle and shelf mounted elbows. Torque ejector nozzle elbow jamnut **240 - 280 inch-pounds (27.12 - 31.64 Nm)**. Torque tube nuts **110 - 130 inch-pounds (12.43 - 14.69 Nm)**.

(13). Modify two grommets as shown (Ref. Figure 904, view D-D). Install grommets over left and right wire bundles. Insert left and right auxiliary fairing assemblies into grommet grooves. Install screws and washers through auxiliary fairing vertical plates.

(14). Install pressure switch sensing tube union on left fairing with one washer on each side of fairing. Torque union jamnut **65 - 80 inch- pounds (7.34 - 9.04 Nm)**.

(15). Attach tail rotor control rod cover, if so equipped, to left fairing with existing fasteners. Complete all fairing installations.

(16). Install pressure switch. Torque pressure switch jamnut **65 - 80 inch-pounds (7.34 - 9.04 Nm)**.

(17). Install upper and lower pressure switch tubes. Torque tube nuts to **25 - 35 inch-pounds (2.82 - 3.95 Nm)**.

(18). Seal all gaps around auxiliary fairing installations with sealant (CM430) (Ref. Figure 904, view D-D).

(19). Use existing screw to attach clip to structure (Ref. Figure 903, detail E). Install clamp on cable with clip, screw, washer and nut.

(20). Install cable return spring and retainers (Ref. Figure 903, detail D). Secure spring assembly with cable connector.

(21). Close and latch air bypass door. Connect forward and aft cable sections. Distance between center of forward cable swaged ball terminal and aft face of fairing should be between 6.56 and 6.80 inches (16.662 and 17.272 cm) with no cable slack (Ref. Figure 903 detail D).

(22). On helicopters without mist eliminator access panel, remove air bypass door. Spray 15 milliliters, total, of engine oil on mist eliminator front and rear surfaces. Insert mist eliminator, forward face up, through bypass door opening and move to engage nine mist eliminator mount bolts with particle separator. Start all bolts by hand. Torque bolts to **20 - 25 inch-pounds (2.82 - 3.95 Nm)**.

(23). Install door gasket on aft fairing with adhesive (CM405) per manufacturers instructions.

(24). For operation below 40°F (4.5°C), spray door gasket and door edge with fluorocarbon dry lubricant (CM106).

(25). Install air bypass door.

(26). Rig bypass door (Ref. Air Bypass Door Rigging).

(27). Apply sealing compound (CM425) to door cable fitting cotter pin (Ref. Figure 902, detail E).

(28). On helicopters equipped with mist eliminator access panel disengage two 1/4-turn fasteners and remove access panel (Ref. Figure 904, view F-F).

(29). Use locking pliers to pull while turning nine mounting bolts, if so equipped, out of mist eliminator frame. Discard bolts.

(30). Pass mist eliminator through access opening into engagement with lower support channels. Hold mist eliminator against particle separator and install access panel. Lock panel fasteners.

(31). Inspect mist eliminator installation through bypass door opening. Check that mist eliminator is firmly in position against particle separator. Adjust as required.

(32). Remove mist eliminator and spray a total of 15 milliliters of clean engine oil on front and rear surfaces. Reinstall mist eliminator.

(33). Clamp tail rotor control pedals in mid-position. Adjust tail rotor control rod forward boot free length to between 7.130 and 7.250 inches (18.1102 and 18.4150 cm). Secure with ty-raps.

J. Instrument Panel Modifications; T-Pedestal

(1). Do not install clamps or ty-raps on wiring until wiring installation is complete. Install wires per FAA publication, EA-AC43.13-1A and 2A. Where possible, route added wiring along existing wire bundles.

(2). Remove plug button from SCAV AIR switch panel hole.

(3). Connect wire P514D20 between pin 1 of SCAV AIR (CB15) circuit breaker switch and pin 1 of POS LT circuit breaker switch CB119 (Ref. Figure 103).

(4). Connect wire P16MA20 (stowed inside console) to pin 2 of CB15.

(5). Install SCAV AIR circuit breaker switch in panel.

(6). Remove third from right dummy block from caution and warning light panel.

(7). Connect stowed wires P514C20 to pin 2 of light assembly and wire P514B20 to pin C.

(8). Install AIR FILTER CLOGGED caution light assembly.

K. Slimline Panel Modification

(1). Use switch and light subpanel bracket as a template. Locate and drill a 0.219 inch (5.5626 mm) diameter hole through instrument panel hood and left fairing above existing hole.

(2). Cut a 0.50 inch (12.70 mm) wide slot, 2.98 inches (7.5692 cm) long with full radius at forward end in instrument panel left fairing.

(3). On helicopters equipped with 369H90022 anti-ice fuel filter (airframe filter) installation; remove plug buttons from AIR FILTER CLOGGED and SCAV AIR subpanel positions. Wire and install switch and light (Ref. Figure 103).

L. Post-Installation Inspection

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM209	Zinc chromate putty

(1). Inspect all installation brackets, clamps and fasteners for security.

(2). Check electrical wiring connectors, clamps and attaching hardware for proper installation and security.

CAUTION Failure to inspect and thoroughly clean debris from engine inlet areas will result in engine FOD.

(3). Inspect plenum chamber for cleanliness. Remove all traces of debris with a vacuum cleaner.

(4). Remove engine inlet covers.

(5). Clean all debris from mast area.

(6). Install modified engine cooling air inlet screen (Ref. Figure 903, detail B).

(7). Install engine air inlet forward fairings. Seal gap between reworked area of left fairing and door cable with zinc chromate putty (CM209) as required.

(8). Install all interior trim.

(9). Check bypass door rigging (Ref. Air Bypass Door Rigging).

(10). Perform a particle separator operational check (Ref. Scavenge Air Operational Check).

(11). Revise weight and balance records.

M. Weight and Balance

Weight and balance changes resulting from installation of the particle separator are listed in Table 901. Incorporate changes in helicopter weight and balance records.

Table 901. Weight and Balance Data

Configuration	Weight Pounds (kg)		Arm inches (cm)		Moment in-lb (kg cm)	
369H90148-503	10.8	(4.8987968)	124.2	(315.468)	13.4	(154.38408)
369H90148-505	13.5	(6.123496)	125.1	(317.754)	16.9	(194.70828)
369H90148-507	10.8	(4.8987968)	122.6	(311.404)	13.2	(152.07984)
369H90148-509	12.3	(5.5791852)	122.8	(311.912)	15.2	(175.12224)
369H90148-519	17.0	(7.7110691)	124.8	(316.992)	21.3	(245.40156)
369H90148-521	18.6	(8.4368167)	125.4	(318.516)	23.3	(268.44396)
369H90148-527	17.0	(7.7110691)	124.8	(316.992)	21.3	(245.40156)
369H90148-529	18.6	(8.4368167)	125.4	(318.516)	23.3	(268.44396)
500N90148-1 /-3	18.6	(8.4368167)	125.4	(318.516)	23.3	(268.44396)

Section

71-10-60

Engine Air Particle Separator (600N)

ENGINE AIR PARTICLE SEPARATOR DESCRIPTION AND OPERATION

1. Description and Operation

(1). The optional engine air particle separator is mounted above the engine air inlet plenum. Intake air is cleaned by the particle separator to prevent dirt or foreign objects from entering the engine.

(2). Dirt is separated from the intake air by centrifugal force created by the particle separator vortex tubes. Clean air passes through the tubes to the engine inlet plenum.

(3). The separated dirt is removed from the inside of the particle separator with pressurized engine compressor bleed air. A solenoid shutoff valve is activated from a switch in the cockpit and bleed air comes from the cabin heat system. Pressure from the bleed air draws the dirt out of the particle separator and exhausts it through the ejectors.

(4). A differential pressure switch is mounted with a reference to inside and outside of the particle separator. Blockage of the particle separator will cause a pressure decrease on the engine plenum side and the switch will activate a warning light in the cockpit.

(5). A cable from the cockpit is manually operated to open an engine bypass door which allows unfiltered air into the engine inlet plenum if the particle separator is blocked.

ENGINE AIR PARTICLE SEPARATOR FAULT ISOLATION

1. Engine Air Particle Separator Fault Isolation

Table 101. Engine Air Particle Separator Fault Isolation

Symptom	Probable Trouble	Corrective Action
Air Filter Clogged warning light.	Inlet screen or air particle separator obstructed.	Clear obstruction from screen or panel.
		Replace panel (Ref. Sec. 76-00-00).
Decrease in performance with scavenge air activated.	Faulty scavenge air solenoid valve.	Replace scavenge air solenoid.
	Faulty wiring.	Test and repair wiring (Ref. Sec. 96-00-00).

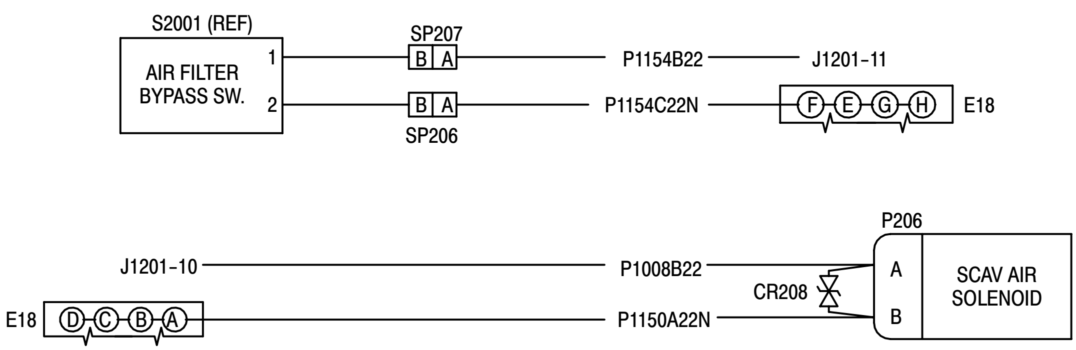


Figure 101. Air Intake and Particle Separator Circuits Wiring Diagram

6G71-078

ENGINE AIR PARTICLE SEPARATOR REMOVAL/INSTALLATION

1. Particle Separator Replacement

(Ref. Figure 401)

A. Particle Separator Removal

(1). Remove left and right particle separator access panels.

(2). Disconnect left and right bleed air tubes from particle separator.

(3). Remove screws and washers attaching left and right ejectors to particle separator.

(4). Remove screws and washers and lift particle separator from top of engine inlet frame.

B. Particle Separator Installation

(1). Install particle separator on top of engine inlet frame with screws and washers. Torque screws to **20 - 25 inch-pounds (2.25 - 2.82 Nm)**.

(2). Attach left and right ejectors with screws and washers. Torque screws to **20 - 25 inch-pounds (2.25 - 2.82 Nm)**.

(3). Connect left and right bleed air tubes to particle separator. Torque particle separator tube nuts to **460 - 500 inch-pounds (51.96 - 56.48 Nm)**.

(4). Install left and right particle separator access panels. Torque screws to

2. Scavenge Air Solenoid Valve Replacement

(Ref. Figure 401)

A. Scavenge Air Solenoid Valve Removal

(1). Detach electrical connector from solenoid valve.

(2). Disconnect tube nuts from solenoid valve.

(3). Remove bolts, washers and solenoid valve.

B. Scavenge Air Solenoid Valve Installation

(1). Install solenoid valve with bolts and washers. Torque bolts to **20 - 25 inch-pounds (2.25 - 2.82 Nm)**.

(2). Connect tube nuts to solenoid valve. Torque tube nuts to **110 - 130 inch-pounds (12.42 - 14.68 Nm)**.

(3). Attach electrical connector to solenoid valve.

3. Air Filter Bypass Switch Replacement

A. Air Filter Bypass Switch Removal

(1). Detach electrical wires at splices.

(2). Disconnect tube nut from switch.

(3). Remove jam nut, washer and switch.

B. Air Filter Bypass Switch Installation

(1). Install switch with jam nut and washer. Torque jam nut to **65 - 80 inch-pounds (7.34 - 9.03 Nm)**.

(2). Connect tube nut to switch. Torque nut to **25 - 35 inch-pounds (2.82 - 3.95 Nm)**.

(3). Attach electrical wires with splices.

4. Bypass Door Assembly Replacement

A. Bypass Door Assembly Removal

(1). Remove cotter pin and clevis pin and disconnect bypass door linkage.

(2). Drill out rivets and remove bypass door assembly.

B. Bypass Door Assembly Installation

(1). Install bypass door assembly with rivets.

(2). Connect linkage with clevis pin and cotter pin.

5. Bypass Door Cable Assembly Replacement

A. Bypass Door Cable Assembly Removal

(1). Remove cotter pin and clevis pin from bellcrank and cable end.

(2). Disconnect mounting clamps and remove cable assembly.

B. Bypass Door Cable Assembly Installation

(1). Install cable assembly and connect mounting clamps.

(2). Install clevis pin through cable end and bellcrank. Safety clevis pin with cotter pin.

6. Bypass Door Seal Repair

(1). Drill out rivets attaching door stop and seal to frame. Remove door stop with seal.

(2). Remove damaged seal.

(3). Clean faying surfaces.

(4). Install new seal on door stop.

(5). Install door stop and seal with rivets.

7. Particle Separator Manifold Replacement

(Ref. PA CD-01062-1D8L/R)

(Ref. Figure 401) The following procedure is for field replacement of the Pall Aerospace particle separator manifold.

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM234	Solvent, dry-cleaning
CM318	Primer
CM425	Sealing compound

CAUTION Prevent engine FOD. Secure a cover over the engine intake prior to working inside plenum chamber. Remove cover after completing work.

(1). Remove particle separator (Ref. Particle Separator Replacement).

(2). Remove access door from side of particle separator.

NOTE: There area eight rivets securing the manifold in place. Four rivets secure the flange and four rivets, two per side, secure the tubes.

(3). Remove rivets securing manifold and remove from particle separator.

CAUTION Debris left in particle separator must be removed to prevent damage to engine.

(4). Clean area thoroughly of any metal shavings.

(5). Thoroughly wipe rework area with clean cloth dampened with solvent (CM234) and allow to air dry.

(6). Install new manifold is particle separator.

(a). Secure with eight CR3212-4-2 (or equivalent) rivets wet with primer (CM318).

CAUTION Ensure rivets are properly installed to prevent damage to engine.

(b). Thoroughly clean heads of rivets and surrounding area with solvent (CM234) and allow to air dry.

(c). Apply a small amount of sealing compound (CM425) to seal rivet head to particle separator.

(d). Allow sealing compound to cure before reinstalling particle separator on helicopter.

(7). Reinstall access door on side of particle separator.

(8). Remove cover from engine inlet.

(9). Reinstall particle separator (Ref. Particle Separator Replacement).

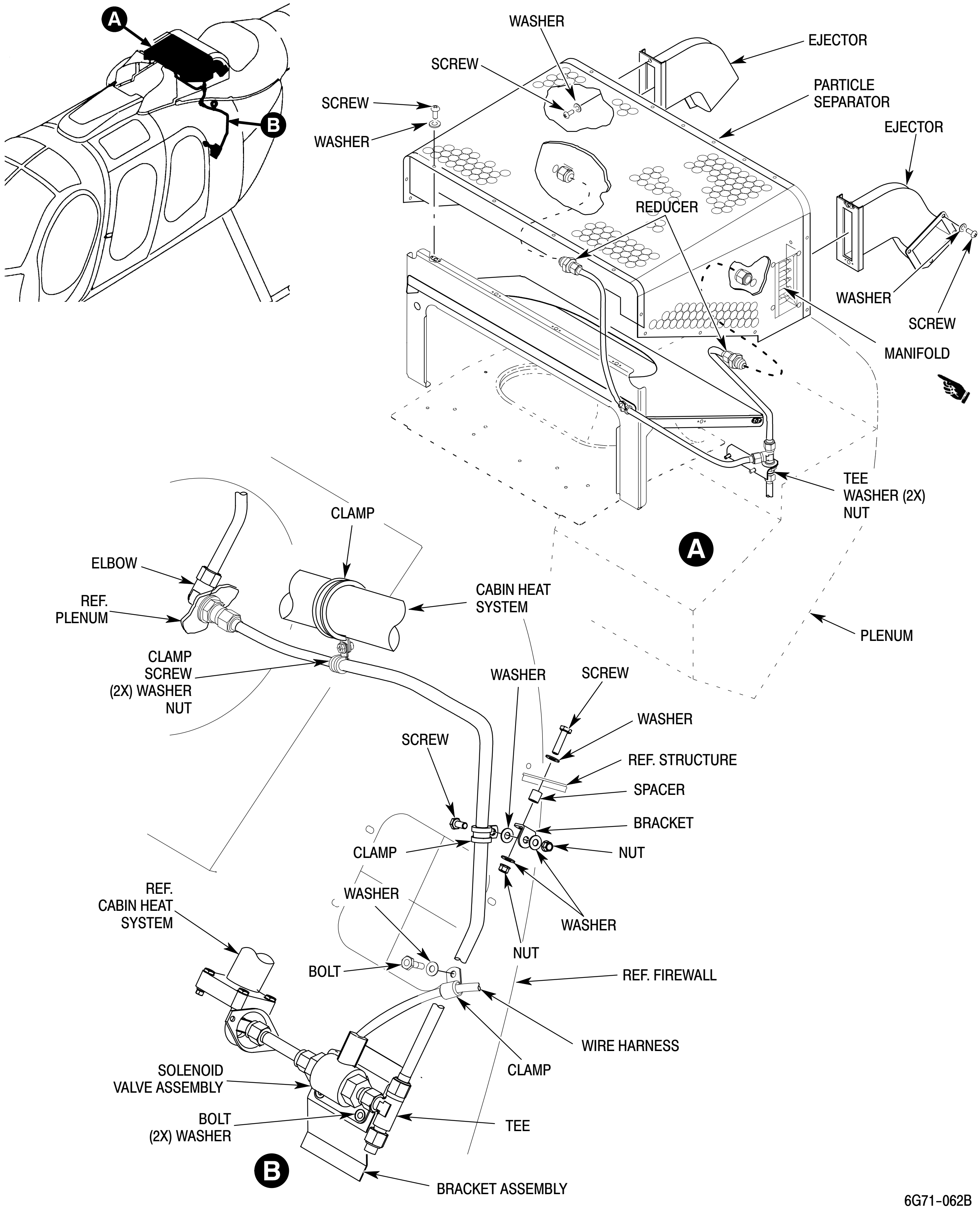


Figure 401. Engine Air Particle Separator Installation

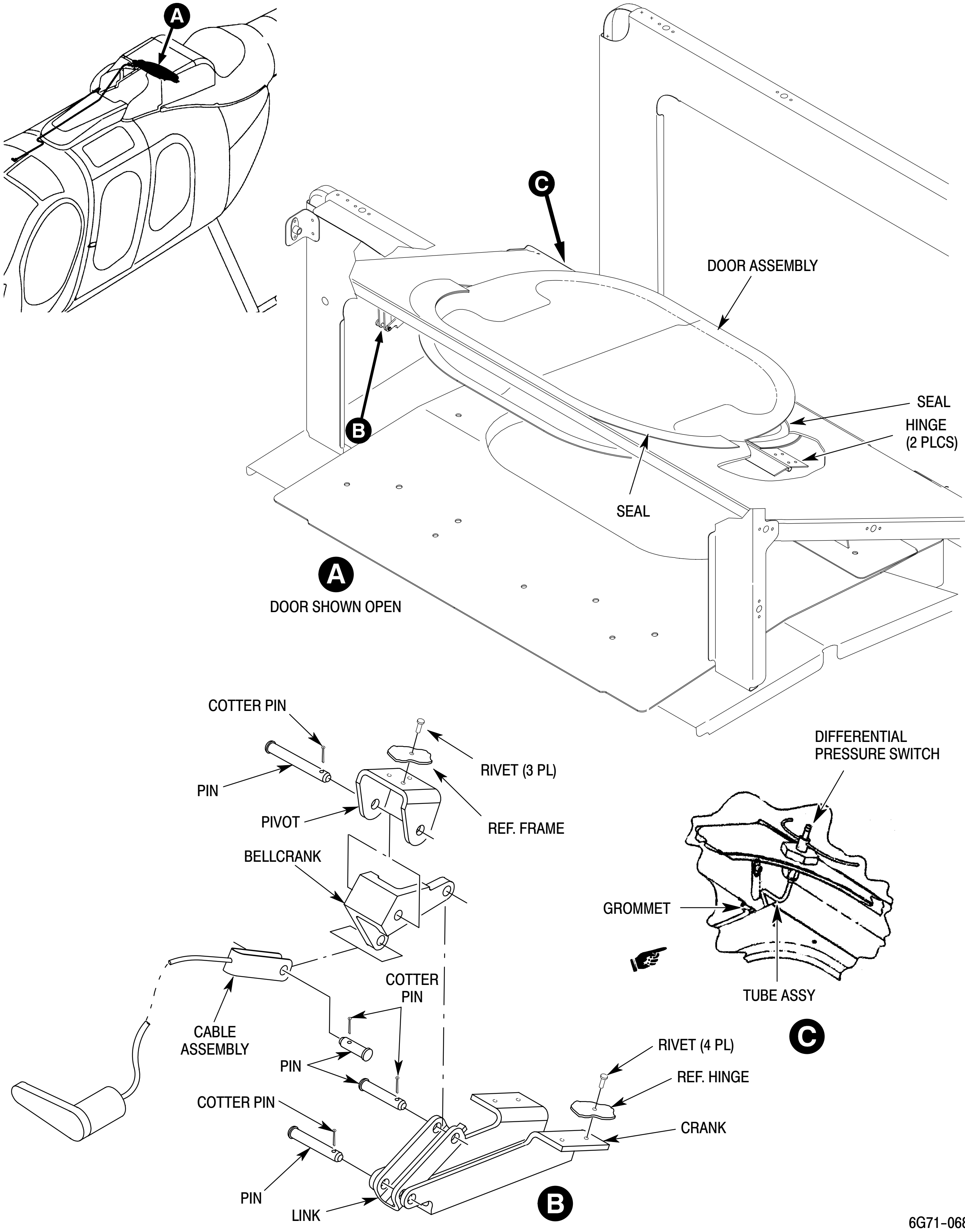


Figure 402. Bypass Door Installation

ENGINE AIR PARTICLE SEPARATOR INSPECTION/CHECK

1. Engine Air Particle Separator Inspection

(1). Visually inspect particle separator for damage and security of installation.

(a). Inspect particle separator panel for damage to axial flow dust separator tubes. No damage allowed.

(b). Inspect particle separator for security of installation. Torque or replace loose or missing hardware.

(c). Open access panels and inspect bleed air tubes for security. Torque tube nuts.

(d). Inspect ejectors for security. Torque or replace loose or missing hardware.

(2). Visually inspect bypass door for damage and security of installation.

(a). Open bypass door and inspect seal for damage or leakage. None allowed.

(b). Inspect bypass door for security of installation. Torque or replace loose or missing hardware.

(3). Visually inspect air filter bypass switch for damage and security of installation.

(a). Inspect switch for security. Torque loose hardware.

(b). Inspect electrical wiring for chafing or cuts. None allowed. Ensure connections are secure.

(4). Visually inspect scavenge air solenoid valve for damage and security of installation.

(a). Inspect solenoid valve for security of installation. Torque or replace loose or missing hardware.

(b). Inspect electrical wiring for chafing or cuts. None allowed. Ensure connections are secure.

2. Bypass Door Inspection

(1). Visually inspect bypass door stop for damage to seals. Replace damaged seals.

(2). Inspect bypass door hinges for operation and security. Replace or repair as required.

3. Bypass Door Cable Inspection

(1). Visually inspect bypass door cable for operation and security. Replace inoperable cable. Torque or replace loose or missing hardware.

(2). Visually inspect linkage for cracks, deformation and security of hardware. Replace damaged linkage. Replace missing hardware.

4. Air Pressure Sensing Switch Calibration Check

(1). Assemble test equipment (Ref. Figure 601).

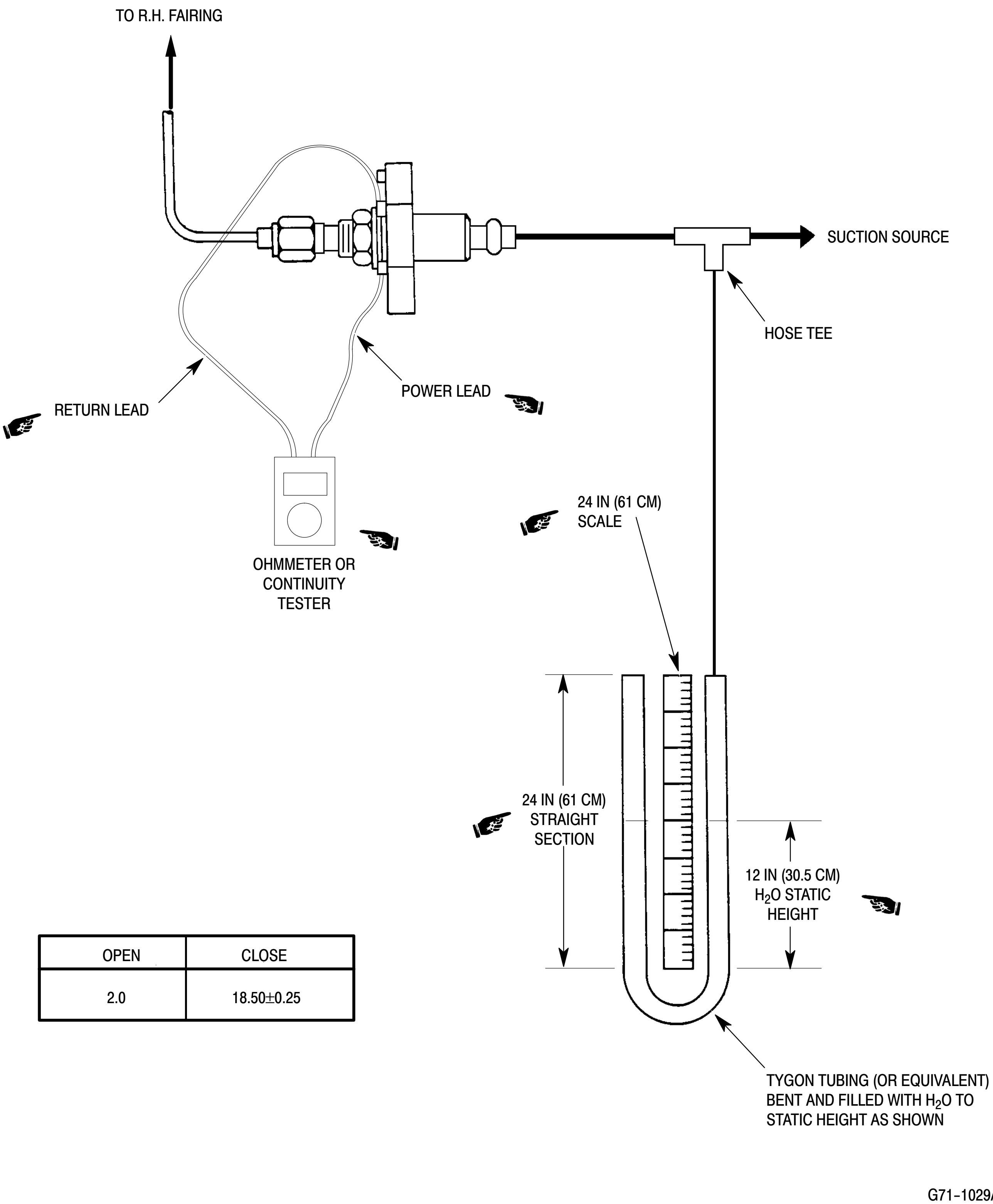
(2). Attach pressure switch to test equipment. Connect a suitable vacuum source to pressure switch nipple and u-tube.

(3). Connect an ohmmeter or continuity tester to pressure switch electrical leads.

(4). Cycle switch from open to close several times with vacuum. Watch meter for indication of switch closure. Release vacuum.

(5). Slowly apply vacuum. Note u-tube water height differential in both legs of the tube relative to the switch closing point. The total of the differential heights of both legs of the u-tube is equal to switch actuation pressure.

(6). Switch closing pressures shall be per the applicable particle separator installation dash number shown (Ref. Figure 601).



OPEN	CLOSE
2.0	18.50±0.25

Figure 601. Air Pressure Sensing Switch Calibration Check

Section

71-20-00

Engine Mounts (250-C20B, 250-C20R/2, 250-C30 and 250-C47)

ENGINE MOUNTS DESCRIPTION AND OPERATION

1. Description

(1). The engine is bolted to the helicopter airframe with one lower and two upper tubular steel, welded mount assemblies. Engine loads are transferred through the mounting system into the airframe through six fittings and special attaching fasteners. Left and right upper engine mount assemblies effect engine-transmission alignment and may be adjusted by means of threaded fittings that are a part of each mount leg.

CAUTION

- Engine-transmission alignment shall be inspected and adjusted whenever one or more of the engine mount assemblies is replaced or the existing adjustment is disturbed.
- Do not remove engine mounts to remove the engine.
- Unless otherwise required, remove and replace only one engine mount at a time.
- Do not disturb adjustable engine mount fittings unless an engine- transmission alignment check is planned.
- Use box- end and socket wrenches on mounting system hardware. Do not nick or scratch any of the mounting system fasteners.

2. Airframe Fittings

(1). Airframe-engine mount structural attach fittings and hoist fitting are removed or replaced per the Structural Repair Manual (SRM).

NOTE: Structural attach fittings shall not be removed unless structural damage is evident or engine-transmission misalignment is suspected as a result of a damaged structural fitting. Prior to attempting fitting replacement perform an engine-transmission alignment check per the SRM.

ENGINE MOUNTS REMOVAL/INSTALLATION

1. Airframe Fittings Replacement

Remove/install airframe structural attach fittings only if structural damage is present per the Structural Repair Manual (SRM).

2. Lower Engine Mount Replacement (250-C20/-C20R/2)

A. Lower Engine Mount Removal (250-C20/-C20R/2)

(Ref. Figure 401)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST402	Engine hoist

(1). Remove hardware attaching air duct support bracket to overhead engine hoist fitting.

(2). Install engine hoist (ST402). Back off mount nuts 1/2 turn. Tension hoist to relieve engine weight on lower mount until bolts will turn freely.

(3). Release cargo compartment trim and upholstery to gain access to bolt-heads at bulkhead fitting.

(4). Disconnect left and right forward ends of lower engine mount. Discard both nuts.

(5). Detach lower engine mount from engine fitting.

B. Lower Engine Mount Installation (250-C20/-C20R/2)

(Ref. Figure 401)

CAUTION

- Do not tighten airframe-mount bolts until engine fitting-mount bolt is torqued.
- If a new engine-mount fitting has been installed; retorque engine-mount attach bolt after 3 to 5 hours of flight time.

NOTE: All engine mount fitting bolts, washers and nuts are corrosion resistant steel.

(1). Install lower engine mount on bulkhead fittings with two bolts, four washers and two new nuts.

(2). Install engine-mount attach bolt and washer. Torque bolt to **100 - 140 inch-pounds (11.30 - 15.82 Nm)**; Lockwire installation.

(3). Torque airframe fitting hardware at firewall to **50 - 70 inch-pounds (5.56 - 7.91 Nm) plus drag torque**.

3. Upper Engine Mounts Replacement (250-C20/-C20R/2)

A. Upper Engine Mounts Removal (250-C20/-C20R/2)

(Ref. Figure 401)

(1). On upper right engine mount; unclamp and move wire harness.

(2). Remove gear case cooling duct clamp from left engine mount.

(3). Disconnect upper mount forward attach points from airframe fittings. Discard nuts.

(4). Disconnect aft ends of mounts from engine fittings.

B. Upper Engine Mounts Installation (250-C20/-C20R/2)

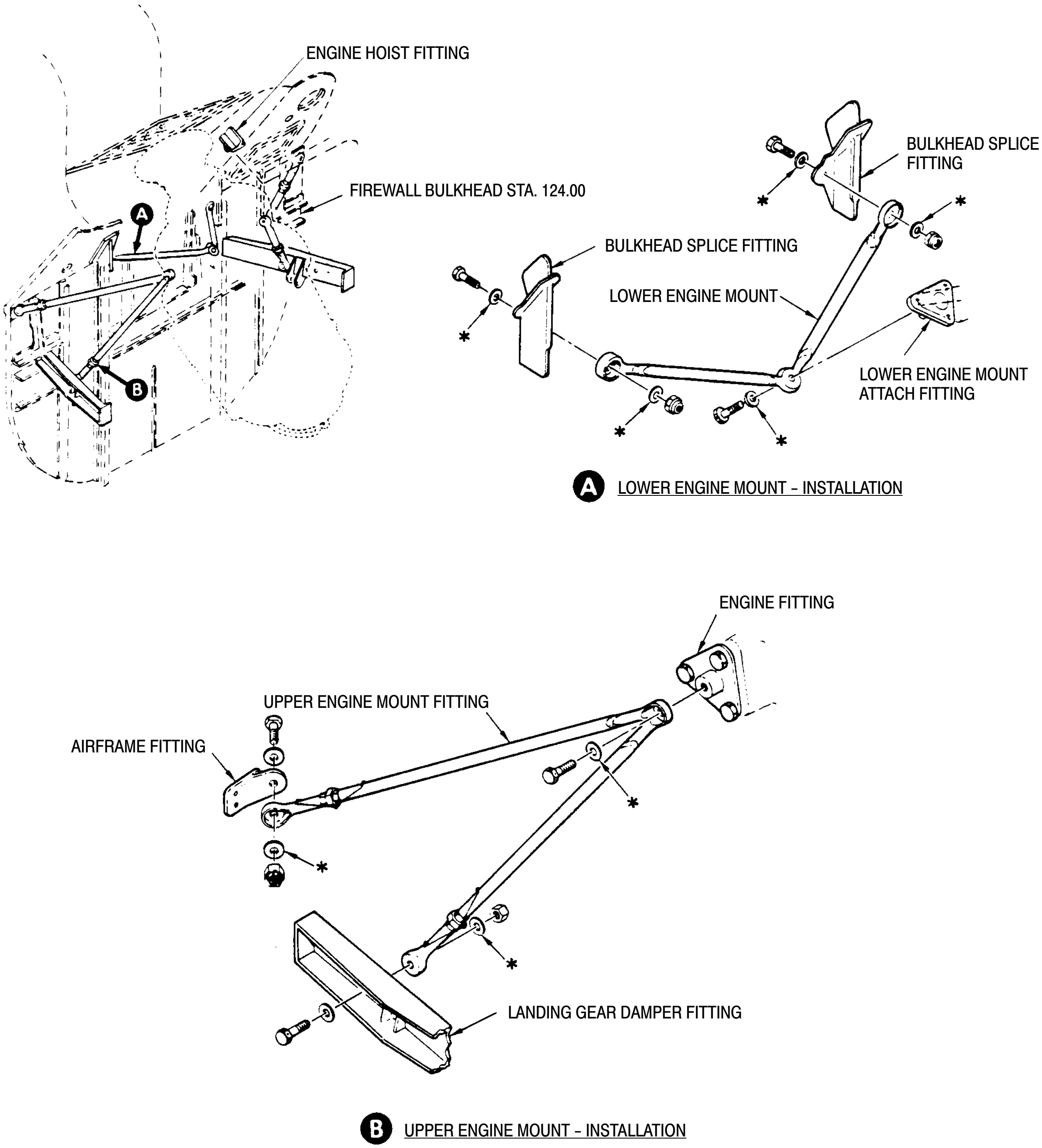
(Ref. Figure 401)

CAUTION Do not tighten airframe-mount bolts until engine fitting-mount bolt is tightened.

NOTE: All engine mount fitting bolts, washers and nuts are corrosion resistant steel.

(1). Install two bolts, four washers and two new nuts to fasten mounts to airframe fittings.

NOTE: Retorque engine attach bolt after 3 to 5 hours flight time following a new engine mount fitting installation.



NOTE:
THICK WASHERS ARE USED IN LOCATIONS MARKED WITH ASTERISK (*)

G71-2000

Figure 401. 250-C20/-C20R/2 Engine Mounts and Airframe Fittings

(2). Install engine-mount washer and bolt. Torque bolt to **100 - 140 inch-pounds (11.30 - 15.82 Nm)**.

(3). Torque upper engine mount fitting hardware at firewall and landing gear damper support to **30 - 40 inch-pounds (3.39 - 4.52 Nm) plus drag torque**.

(4). Repeat the appropriate steps to install the remaining upper engine mount.

(5). Remove engine hoist.

(6). Install wire harness clamp on right engine mount.

(7). Install compressor air duct support bracket on airframe hoist fitting. Install gear case cooling duct clamp on left engine mount (Ref. Sec. 71-60-00).

4. Lower-Aft Engine Mount Replacement (250-C30/-C47)

A. Lower-Aft Engine Mount Removal (250-C30/-C47)

(Ref. Figure 402)

Special Tools (Ref. Section 91-00-00)

Item	Nomenclature
ST402	Engine hoist

(1). Remove hardware attaching upper cooling air duct support bracket to overhead engine hoist fitting.

(2). Install engine hoist (ST402). Back off mount nuts 1/2 turn. Tension hoist to relieve engine weight on aft mount until bolts will turn freely.

(3). Detach aft engine mount from engine fitting.

(4). Disconnect left and right forward ends of aft engine mount. Discard nuts.

B. Lower-Aft Engine Mount Installation (250-C30/-C47)

(Ref. Figure 402)

CAUTION

- Do not tighten airframe-mount bolts until engine fitting-mount bolt is torqued.
- If a new engine-mount fitting has been installed; retorque engine-mount attach bolt after 3 to 5 hours of flight time.

NOTE: All engine mount fitting bolts, washers and nuts are corrosion resistant steel.

(1). Place ends of lower engine mount against bulkhead fittings.

(2). Install aft engine mount as shown; use two bolts, four washers and two new nuts at bulkhead attach fittings.

(3). Install engine-mount attach bolt washers and new nut. Torque nut to **95 - 110 inch-pounds (10.73 - 12.43 Nm) plus drag torque**. Install cotter pin as required.

(4). Torque airframe fitting hardware at Sta. 137.50 to **95 - 110 inch-pounds (10.73 - 12.43 Nm) plus drag torque**.

5. Upper Engine Mounts Replacement (250-C30/-C47)

A. Upper Engine Mounts Removal (250-C30/-C47)

(Ref. Figure 402)

(1). Remove gear case cooling duct clamp from left side engine mount.

(2). Disconnect upper mount forward attach points from airframe fittings. Discard nuts.

(3). Disconnect aft ends of mounts from engine fittings.

B. Upper Engine Mounts Installation (250-C30/-C47)

(Ref. Figure 402)

CAUTION

- Do not tighten airframe-mount bolts until engine fitting-mount bolt is torqued.
- If a new engine-mount fitting has been installed; retorque engine-mount attach bolt after 3 to 5 hours of flight time.

NOTE: All engine mount fitting bolts, washers and nuts are corrosion resistant steel.

(1). Install two bolts, four washers and two new nuts to fasten mounts to airframe fittings.

(2). Install engine-mount washer and bolt. Torque bolt to **220 - 360 inch-pounds (24.86 - 40.67 Nm)**; lockwire bolt.

(3). Torque upper engine mount fitting hardware at firewall and landing gear damper to **60 - 85 inch-pounds (6.78 - 9.60 Nm) plus drag torque**.

(4). Repeat the appropriate steps to install the remaining upper engine mount.

(5). Remove engine hoist.

(6). Install gear case cooling duct clamp on left engine mount.

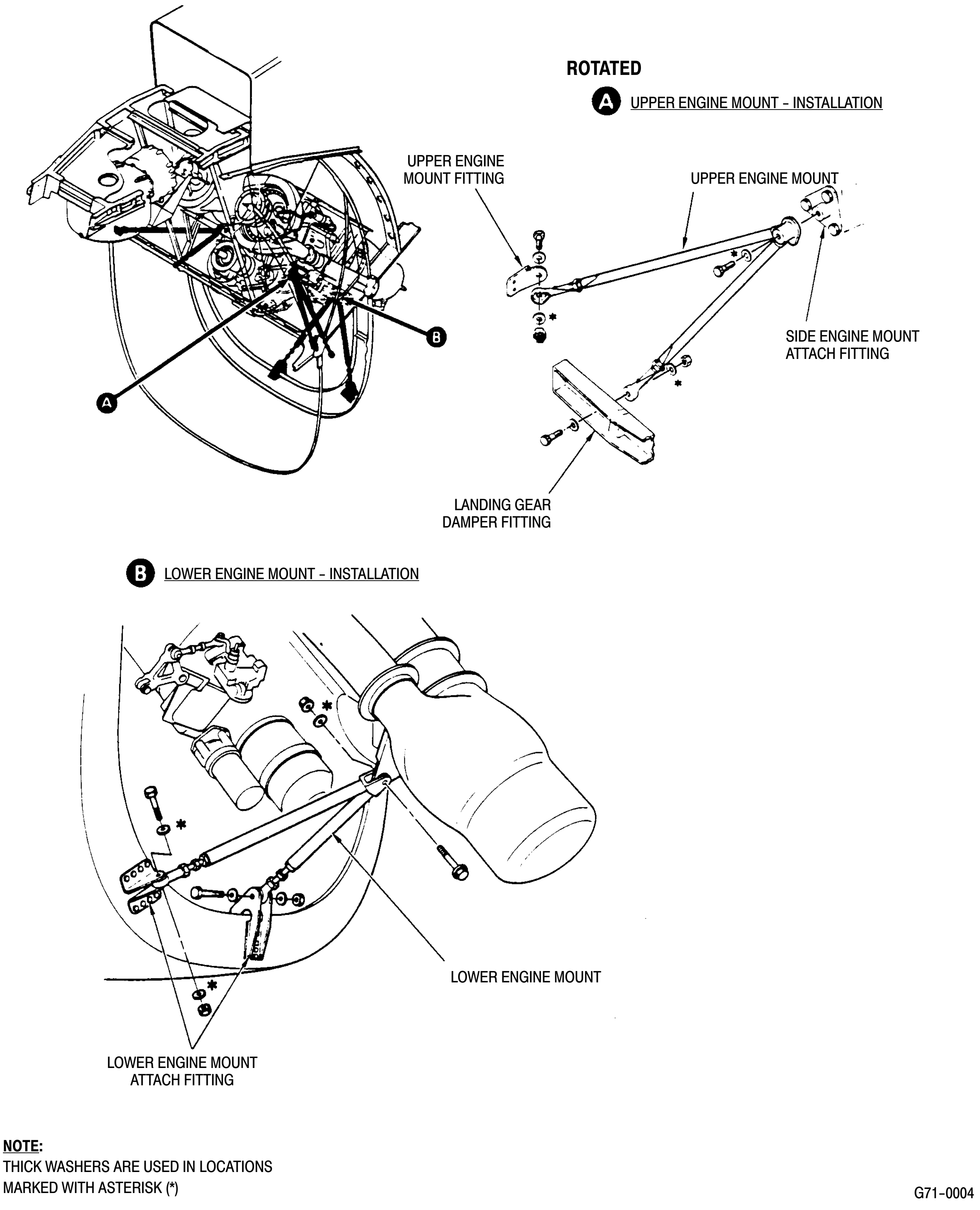


Figure 402. Model 250-C30/-C47 Engine Mounts and Airframe Fittings

ENGINE MOUNTS INSPECTION/CHECK

1. Engine Mounts and Fittings Inspection

(1). Inspect painted surfaces of engine mounts for condition.

(2). Inspect all engine mount tubes for straightness. Hold steel straight edge against tubes to reveal any warps or bends in tubes.

(3). Check that jam nuts and lockwire on mounts with adjustable fittings are secure and not disturbed. If not secure or adjustment is disturbed, a check of engine-to-transmission alignment is required per the Structural Repair Manual (SRM).

(4). Visually inspect all tubes and welded joints for cracks and evidence of corrosion. Magnetic-particle inspect suspected engine mount assemblies. If crack(s) are evident, mount is unserviceable.

(5). Inspect flanges and bosses of engine mount fittings and lifting eye for flatness, cracks and corrosion. Replace defective fittings.

(6). Inspect threaded steel insert for damaged threads, corrosion and for full bottoming to seat of insert hole.

2. Upper Engine Mounts Adjustment

NOTE: Do not disassemble upper engine mounts except for spares replacement or magniflux inspection.

(1). Engine realignment is required when:

(a). Mount assembly is from another helicopter.

(b). One upper mount has been replaced.

(c). One upper mount adjustment has been disturbed.

(2). Check engine-transmission alignment per the Structural Repair Manual (SRM) and realign a reassembled or cannibalized mount assembly.

(3). Engine transmission realignment is accomplished by adjusting the upper engine mounts using the tool specified by SRM instructions and as follows:

(a). Adjust mounts to align engine with transmission. Tighten jamnuts and recheck alignment.

(b). Lockwire jamnuts.

(c). Paint a slippage mark across both jamnuts on each leg.

ENGINE MOUNTS
REPAIRS

1. Engine Mount Repairs

Accomplish minor repairs as instructed below; otherwise, replace defective engine mounts that are cracked, twisted, bent or exceed acceptable attach hole tolerances.

2. Mount Hole Repair (250-C20/-20R/2)

Upper engine mounts incorporate close tolerance holes. Hole tolerances must be maintained within limits to get correct engine-transmission alignment.

(1). Engine attachment hole diameter normally is 0.3122-0.3132 inch (7.92988-7.95528 mm).

(2). Ream a damaged hole to 0.3170 inch (8.0518 mm) diameter maximum.

(3). Perform an engine-transmission alignment check per the Structural Repair Manual (CSP-SRM-6).

(4). A repaired mount shall be replaced when engine-transmission misalignment occurs as a result of repair.

NOTE:

- Drilling one mount hole to the maximum 0.3170 inch diameter does not normally cause misalignment beyond tolerance.
- If both mounts are reworked, engine-transmission alignment must be checked.

3. Painted Surfaces Repair

(1). Repaint otherwise undamaged surfaces as necessary (Ref. Sec. 20-30-00).

Section

71-30-00

Engine Ignition Control System (250-C20B, 250-C20R/2 and 250-C30)

ENGINE IGNITION CONTROL SYSTEM DESCRIPTION AND OPERATION

1. Engine Ignition System Description and Operation

(1). The engine ignition system consists of switches, wiring, ignition exciter and an igniter plug.

(2). Engine ignition power may be provided by the helicopter battery or external auxiliary power as selected by battery switch position. Later helicopters are equipped with a standard start circuit breaker that may be installed on earlier machines.

CAUTION Refer to the Pilot's Flight Manual for specific engine start procedures.

(3). Placing the battery switch in either EXT PWR or BAT with the key switch on, arms the start system. Pressing the START switch on the collective stick applies 24 Vdc to the starter/generator and ignition exciter. The starter/generator motors the engine gas producer to start speed while the exciter simultaneously provides a high voltage spark across the igniter plug gap. At about 15% rpm, fuel is added to the sequence by moving the throttle out of cutoff to idle. START button release de-energizes the ignition exciter and starter/generator.

(4). See the Allison Engine Operation and Maintenance manual for specific ignition system maintenance information.

(5). Refer to Auto Re-ignition for wiring data on the standard and automatic ignition system option.

WARNING **Secondary ignition circuit voltage is lethal. Set battery switch OFF, disconnect battery and external power before working on system. Insulate all bare wires and cable as required.**

2. Automatic Re-ignition System Description and Operation

(Ref. Figure 401) Engine automatic re-ignition equipment is installed on all Model 369D helicopters subsequent to S/N 1149 and all 369E/FF and 500N helicopters. The equipment consists of a two-switch, four-lamp, indicating latching cluster (XDS9), and a toggle switch (S11) for operational testing of the re-ignition system, mounted on the lower left side of the instrument panel face. Relays K104 and K304, and a diode isolator assembly (CR1 and CR2) is located in the engine bay on the aft oleo support fitting.

NOTE:

- For information relative to optional automatic re-ignition equipment installed on 369D helicopters prior to S/N 1150, refer to Auto Re-ignition Initial Installation.
- For Instructions on modification to re-ignition equipment for full time operation (Applicable to 369D helicopters, S/N 003 - 949 only), refer to Auto Re-ignition Modification.
- On 369E helicopters 384 and subs, and 369FF helicopters 076 and subs auto re-ignition system has new design and operational differences.
- On 369E helicopter S/N 384 - 508, 369FF helicopter S/N 076 - 091, and 500N helicopters S/N 001 - 044 addition of air/ground switch S522 and terminal boards TB1001 and TB1003 are used. Relay K304 and diodes CR1 and CR2 (located in the engine bay on the oleo panel) isolators are not used.
- On 369E helicopters 509 & subs, 369FF helicopters 092 & subs, and 500N helicopters 045 & subs the air/ground switch has been removed.

(1). The Automatic re-ignition is initiated when the Engine Power Out Warning (EPO) Unit senses an N_1 speed of less than 55 percent or an N_R speed of less than 98 percent (369D/E model helicopters) or 95 percent (369FF and 500N model helicopter).

(2). When the EPO unit senses one or both, re-ignition relay (K104) closes, which completes a 28 volt circuit to the ignition exciter (SQ300), generating high voltage across the igniter. In addition, audible and visual warning circuits are energized.

(3). The auto re-ignition relay is de-energized when the EPO unit senses the appropriate N_1 and N_R speeds.

(4). Pressing a reset button resets the warning light circuit (relay K304 opens).

(5). Automatic re-ignition is prevented during normal start-up and shutdown by an N_R disable switch which senses throttle position.

(6). Rotor/oil pressure switch S203 automatically arms the audio circuitry with pressure.

(7). As the throttle is increased to the flight idle position, the N_R sensing function is enabled after a time delay of 3.5 seconds. The N_R sensing function remains enabled until the throttle is decreased through the ground idle position.

(8). A re-ignition test switch, S11, provides a ground test of the auto re-ignition circuit. RE-IGN TEST switch S11 provides ground test of the auto re-ignition circuit by bypassing the main transmission pressure switch, closing relay K104 to energize the igniter.

(9). ENG OUT audio alarm only is disabled when the generator switch is OFF (On 369E helicopter S/N 384 - 508, 369FF helicopter S/N 076 - 091, and 500N helicopters S/N 001 - 044 audio warning is disabled by air/ground switch S522).

ENGINE IGNITION CONTROL SYSTEM FAULT ISOLATION

1. Engine Ignition System Fault Isolation

(Ref. Table 101)

WARNING **Before removing or installing components of the electrical system, ensure all electrical power is OFF. Serious injury or death can result from voltage potentials in the ignition exciter. Voltages in other electrical system components can injure personnel.**

NOTE: All troubleshooting presumes wire segment continuity checks for OPEN or SHORT circuit conditions have been completed and indicator lamps are known to be good.

Table 101. Ignition System Fault Isolation

Symptom	Probable Trouble	Corrective Action
Engine will not start (starter operation normal)	Oil fouled igniter plug	Attempt a second start.
	Faulty ignition circuitry	Listen for spark igniter operation. Check for fuel vapor from exhaust.
	No power to ignition exciter due to faulty key switch, start switch or wiring	Replace defective switch or wiring.
	Spark igniter fouled, grounded or open	Clean or replace igniter plug.
	Faulty high tension lead	Replace lead.
	Igniter plug firing intermittently	Check exciter input voltage. Install an operational exciter and test ignition system.
Starter/generator does not motor engine when START switch is pressed	Circuit breaker open	Reset/replace circuit breaker.
	Low battery voltage	Crank engine with an APU or charge battery.
	Defective start relay	Replace relay.

2. Automatic Re-ignition System Fault Isolation

(Ref. Table 102 and Table 103)

WARNING **Before removing or installing components of the electrical system, ensure all electrical power is OFF. Serious injury or death can result from voltage potentials in the ignition exciter. Voltages in other electrical system components can injure personnel.**

NOTE: All troubleshooting presumes wire segment continuity checks for OPEN or SHORT circuit conditions have been completed and indicator lamps known to be good.

Table 102. Automatic Re-ignition System Fault Isolation (369D)

Symptom	Probable Trouble	Corrective Action
System functions normally, but RE-IGN lamps do not illuminate	Defective lamp	Replace lamp XDS9.
	Defective switch XDS9	Replace indicator switch XDS9.
	Defective relay K304	Replace relay K304.
Start relay (K301) is energized during automatic re-ignition	Diode CR2 defective, or START switch (S106) closed	Replace diode CR2 or diode isolator assembly or check **START** switch and wiring for short circuit.
Equipment fails to function with 28 Vdc present at terminals D and E of terminal board TB503-3 and ARMED lamps illuminated	Relay K104 defective	Replace relay K104.
ARMED lamps not illuminated and equipment fails to function with 28 Vdc at terminals D and E of terminal board TB503-3	Switch S11 defective	Replace switch S11.
ARMED lamps not illuminated, but equipment functions	Relay K304 and/ or lamps defective	Replace lamps and/or relay K304.
ARMED and RE-IGN lamps illuminated, 28 Vdc present at terminal 1 of diode CR1, but less than 26 Vdc at terminal 2 of diode CR1 and automatic re-ignition fails	Diode CR1 defective	Replace diode CR1 or diode isolator assembly.

Table 103. Automatic Re-ignition System Fault Isolation (369E/FF - 500N)

Symptom	Probable Trouble	Corrective Action
RE-IGN TEST switch ON, RE-IGN P RST indicator lit, 28 Vdc present at pin 1 of CR1 (diode isolator assembly) but less than 28 Vdc present at pin 2 of CR1. Automatic re-ignition does not occur	Faulty diode CR1	Replace diode or diode isolator assembly.
RE-IGN TEST switch ON, 28 Vdc present at pin L of TB503-9. Automatic re-ignition does not occur	Faulty re-ignition relay K104	Replace re-ignition relay K104.
RE-IGN TEST switch ON, 28 Vdc present at pin 6 of TB503-10. Automatic re-ignition does not occur and RE-IGN P RST indicator does not light	Faulty RE-IGN TEST switch S11	Replace RE-IGN TEST switch S11.
Auto re-ignition system functions normally but RE-IGN P RST indicator does not light	Defective lamp	Replace lamp XDS9.
	Defective switch XDS9-S2	Replace indicator switch XDS9.
	Defective relay K304	Replace relay K304.

ENGINE IGNITION CONTROL SYSTEM REMOVAL/INSTALLATION

1. Automatic Re-ignition System Component Replacement

(Ref. Figure 401 thru Figure 403) Replace affected components of the automatic re-ignition system as indicated in the following procedures.

WARNING **Ensure all electrical power is OFF during removal and replacement of electrical components.**

A. Automatic Re-ignition Test Switch (S11) Replacement

Replace switch per Control Switches Replacement (Ref. Sec. 96-30-00).

B. Armed Light/Switch (XDS9) Assembly Replacement

(1). Remove four screws and washers securing adapter plate to instrument panel.

(2). Pull entire assembly away from panel.

(3). Remove nut, washer and screw securing clamp to switch and push housing through adapter plate.

(4). Hold switch with one hand and housing with other hand and apply breakaway pressure to force two spring fingers on housing to release switch.

(5). Remove wires from defective components and reconnect to replacement component as required.

(6). Reassemble components in reverse order of disassembly.

C. Armed Light/Switch (XDS9) Lamps Replacement

(1). Pull display screen and lampholder assembly out of housing.

(2). Slide defective lamp out of lampholder.

(3). Remove filter from defective lamp and slip it over glass envelope of new lamp.

CAUTION Lampholder assembly has a polarizing key, and can only be installed one way. Do not attempt to force it to seat.

(4). Insert new lamp into lampholder and reinstall lampholder assembly into housing.

D. Armed Lights/Switch (XDS9) Display Screen Replacement

(1). Pull screen and lampholder assembly out of housing.

(2). Remove screen by sliding it to left or right.

(3). Slide replacement screen into position.

CAUTION Lampholder assembly has a polarizing key, and can only be installed one way. Do not attempt to force it to seat.

(4). Re-insert screen and lampholder assembly into housing.

E. K104/K304 Relay Replacement

Replace relays K104 and/or K304 as follows:

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM815	Solder

(1). Remove nuts, four washers and two screws attaching relay to mounting bracket.

(2). Pull relay forward until wiring at back of relay is accessible.

(3). Note location of each wire and remove from back of relay.

(4). Using solder (CM815) connect wires to new relay.

(5). Reinsert wiring and relay, and attach to bracket with screws, washers and nuts.

F. CR1/CR2 Diode Replacement

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM313	Insulation varnish

(1). Open engine access doors.

(2). Remove lead wire from diode to be replaced by removing nut, two washers and screw.

(3). Remove nut, lockwasher and terminal (CR1) from diode. Holding flat washer, mica washer, and insulating ring under bus, remove diode and mica washer from opposite side of bracket. Remove washers and ring from under bus.

(4). Install mica washer on threaded end of replacement diode and hold insulating ring, mica washer and flat washer in place between bus and bracket.

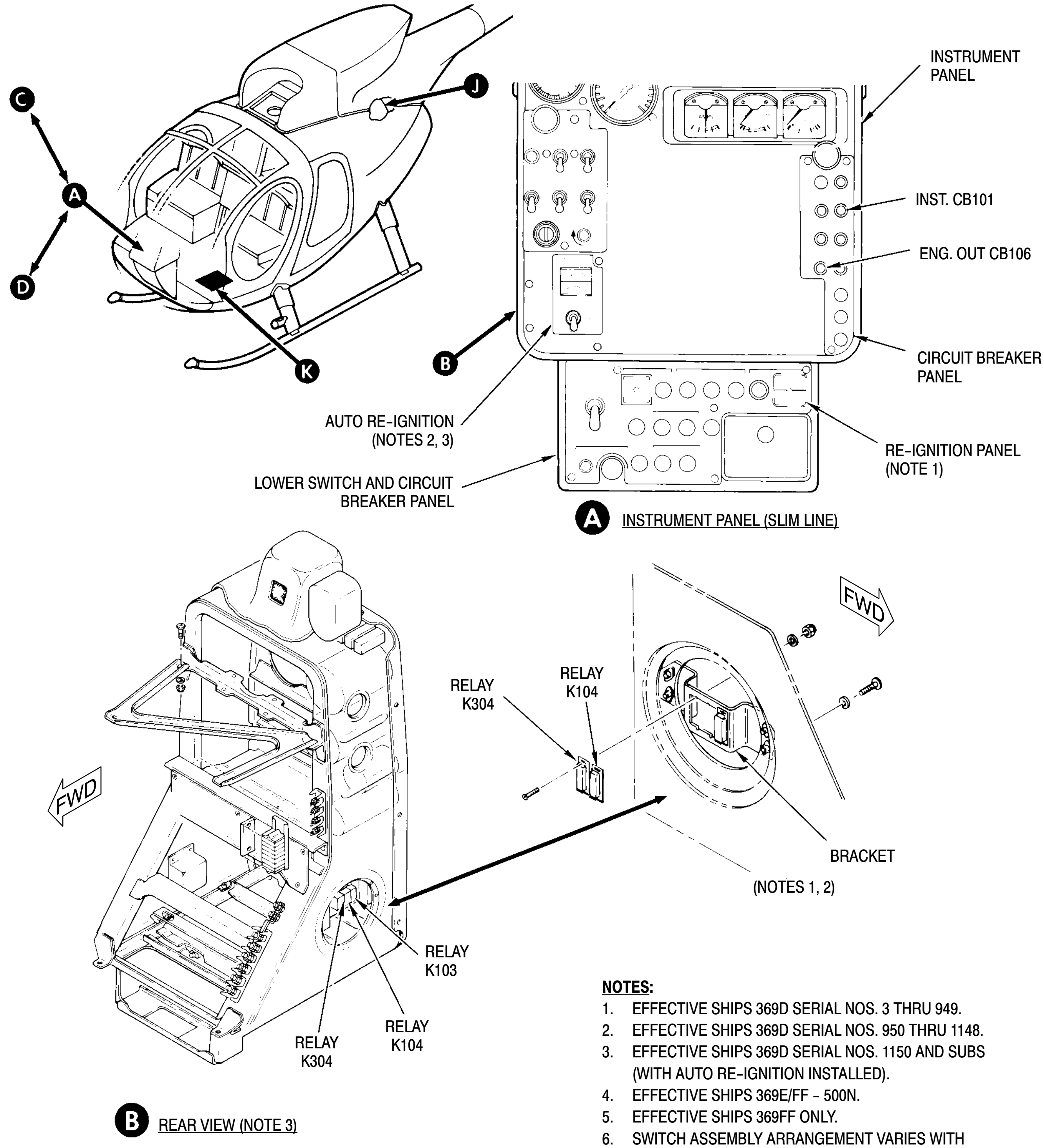
(5). Insert threaded end of diode through bracket, ring, washers and bus. Install terminal (CR1 only) and lockwasher on threaded end of diode and secure with AN316-4 nut. Do not use nut supplied with diode.

(6). Reinstall terminal on diode with screw, two washers and nut.

(7). Perform operational test of system (refer to applicable Pilot's Flight Manual.

(8). After successful test, apply glyptol (CM313) to exposed threads and tip of new diode.

(9). Close and secure engine access doors.



NOTES:
1. EFFECTIVE SHIPS 369D SERIAL NOS. 3 THRU 949.
2. EFFECTIVE SHIPS 369D SERIAL NOS. 950 THRU 1148.
3. EFFECTIVE SHIPS 369D SERIAL NOS. 1150 AND SUBS (WITH AUTO RE-IGNITION INSTALLED).
4. EFFECTIVE SHIPS 369E/FF - 500N.
5. EFFECTIVE SHIPS 369FF ONLY.
6. SWITCH ASSEMBLY ARRANGEMENT VARIES WITH HELICOPTER MODEL.
7. EFFECTIVE 369E, 001 THRU 383; 369FF, 001 THRU 075.
8. EFFECTIVE 369E, 384 AND SUBS; 369FF, 076 AND SUBS; 500N, 001 AND SUBS.
9. NOT USED ON 369E, 384 AND SUBS; 369FF, 076 AND SUBS; 500N, 001 AND SUBS.

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Figure 401. Auto Re-ignition System Equipment (Sheet 1 of 3)

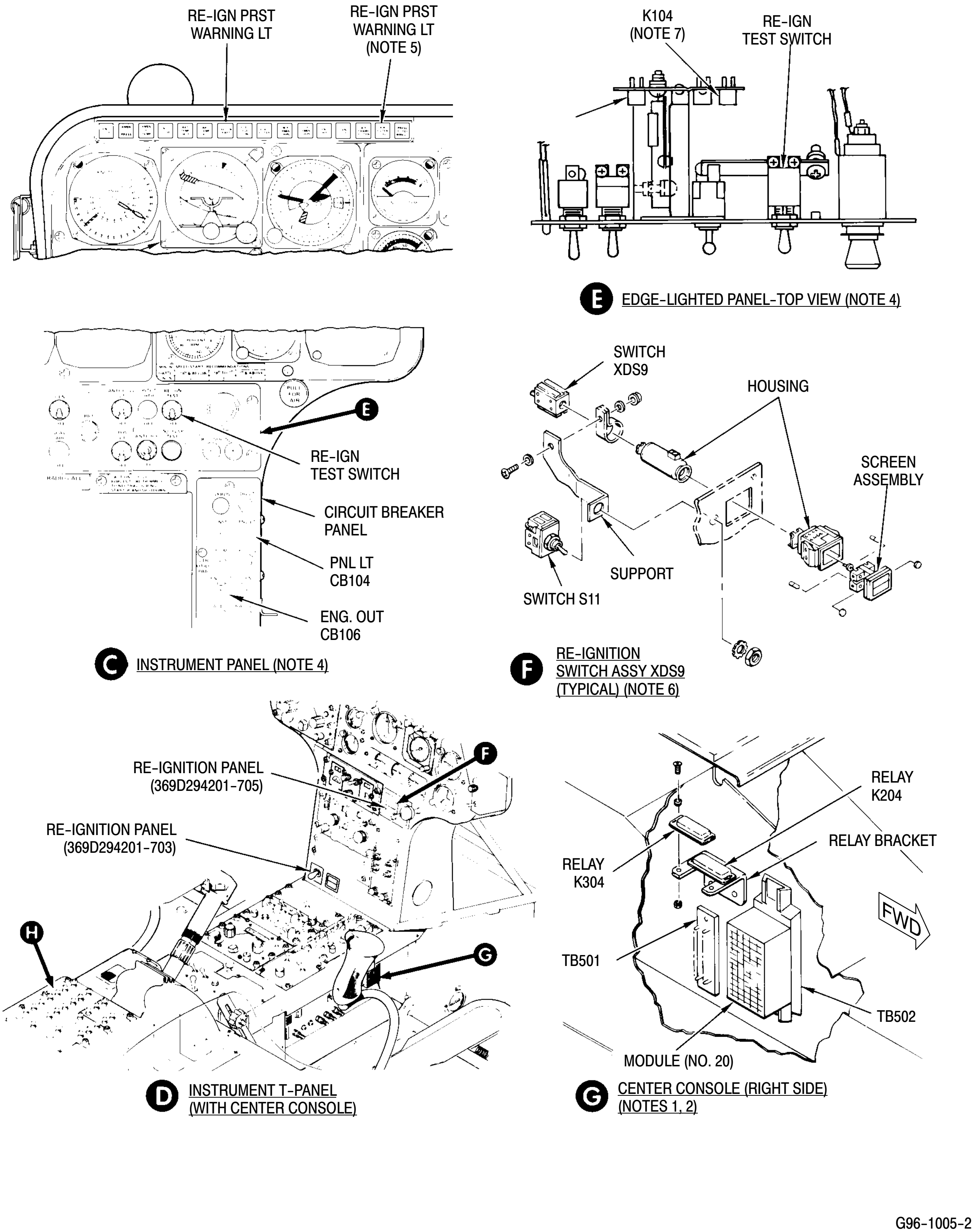


Figure 401. Auto Re-ignition System Equipment (Sheet 2 of 3)

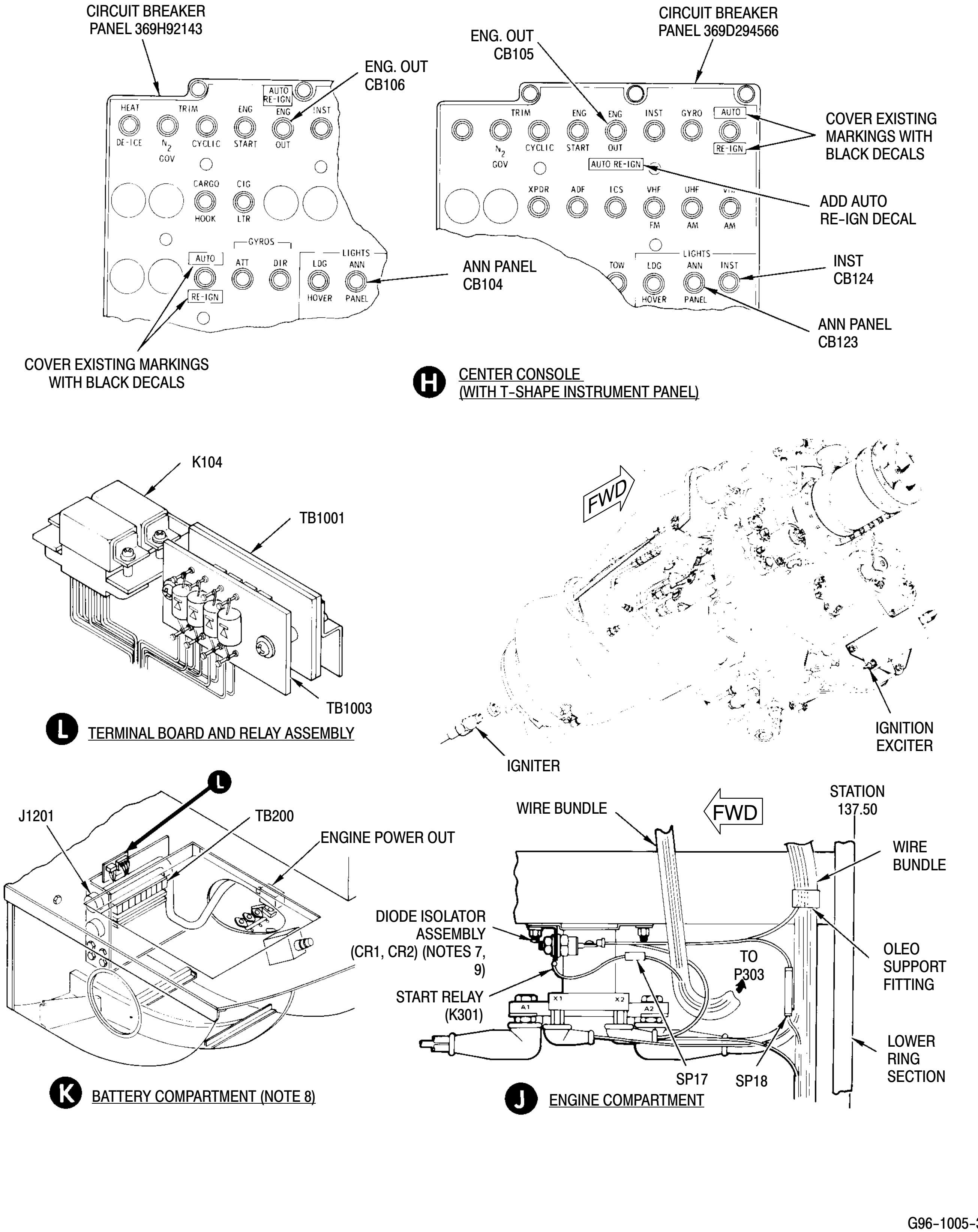
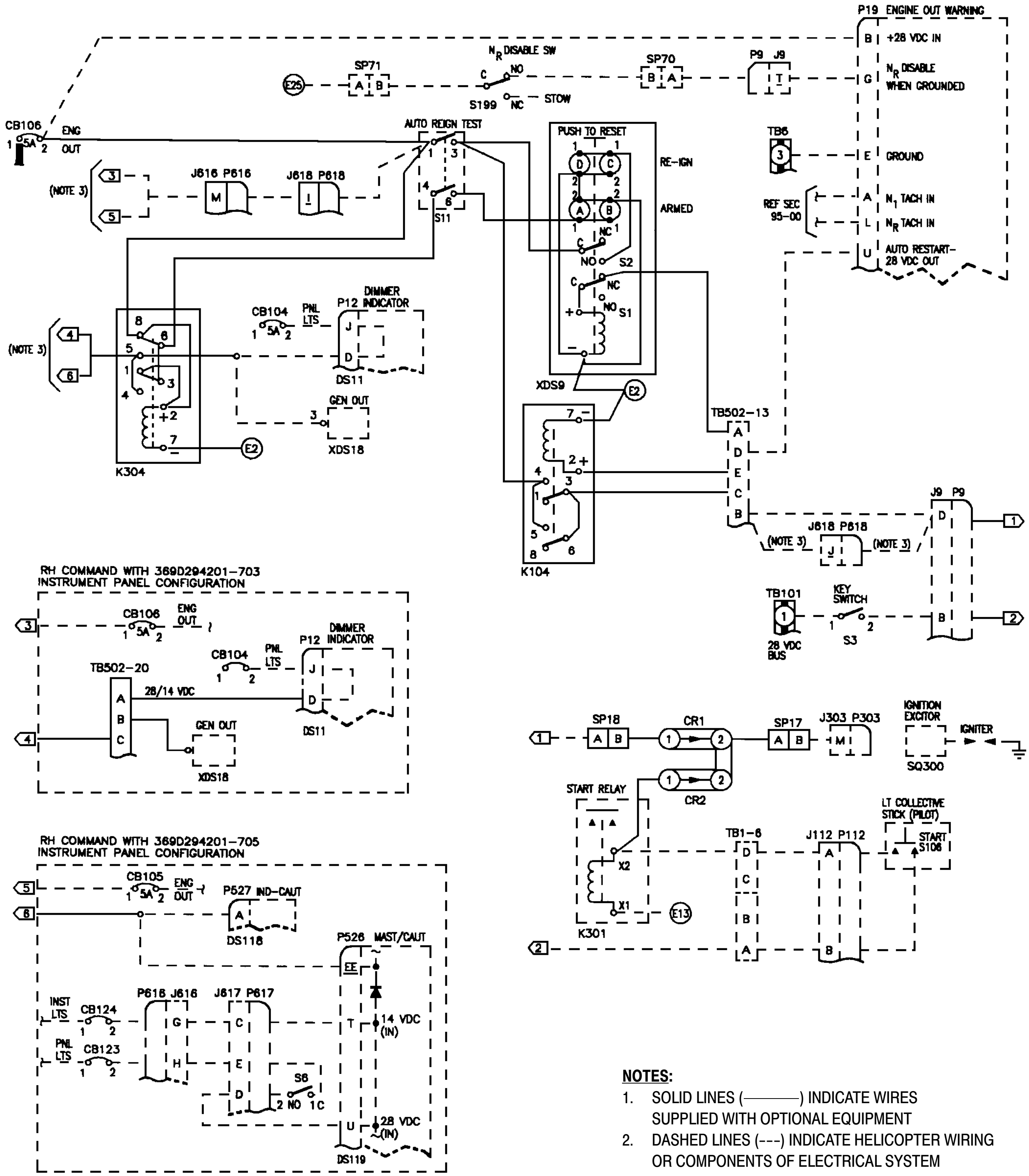


Figure 401. Auto Re-ignition System Equipment (Sheet 3 of 3)



NOTES:

1. SOLID LINES (————) INDICATE WIRES SUPPLIED WITH OPTIONAL EQUIPMENT
2. DASHED LINES (---) INDICATE HELICOPTER WIRING OR COMPONENTS OF ELECTRICAL SYSTEM
3. RIGHT HAND COMMAND HELICOPTERS ONLY

EFFECTIVITY: 369D; 003-949, 956, 965, 977 AND 989

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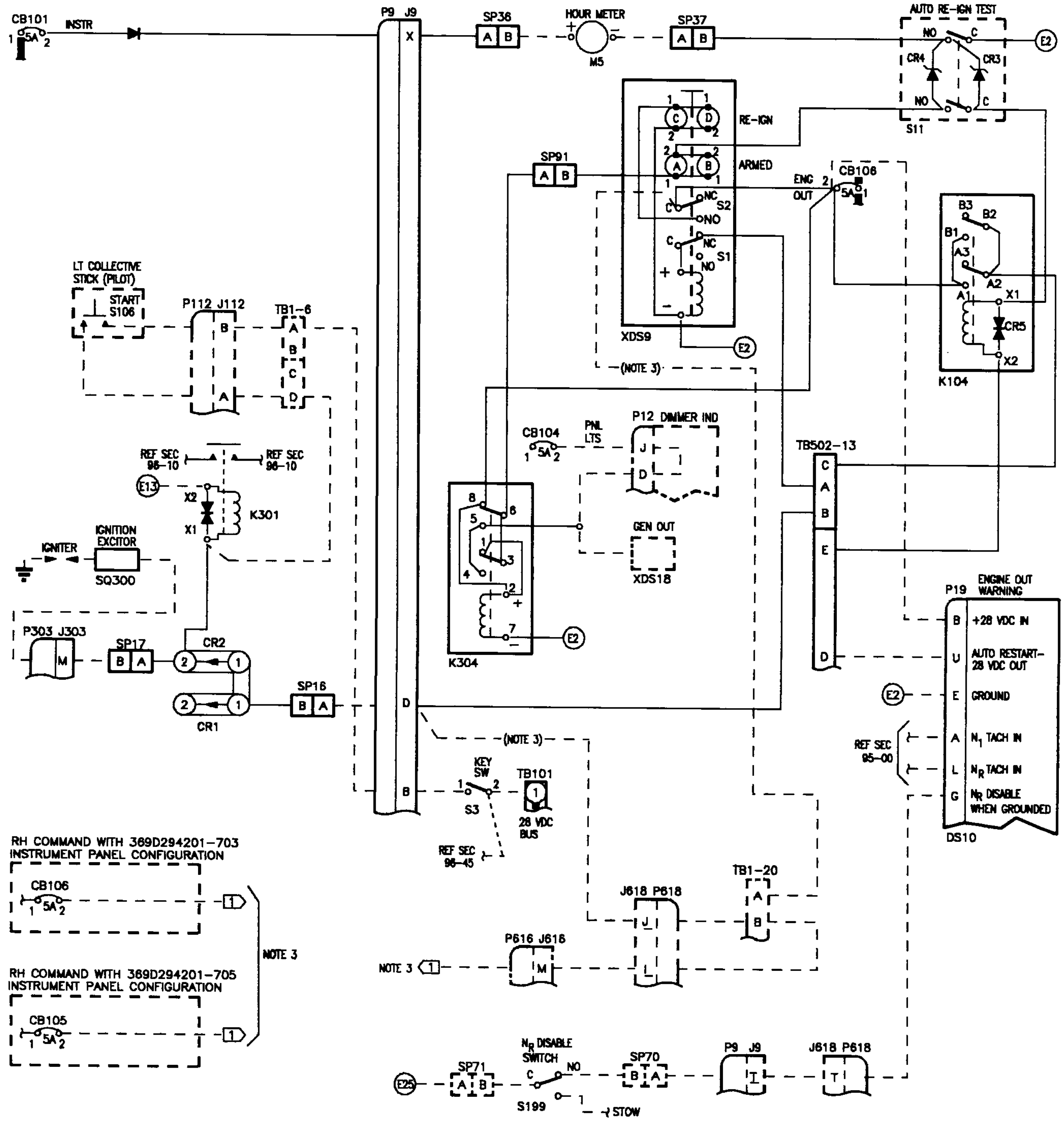
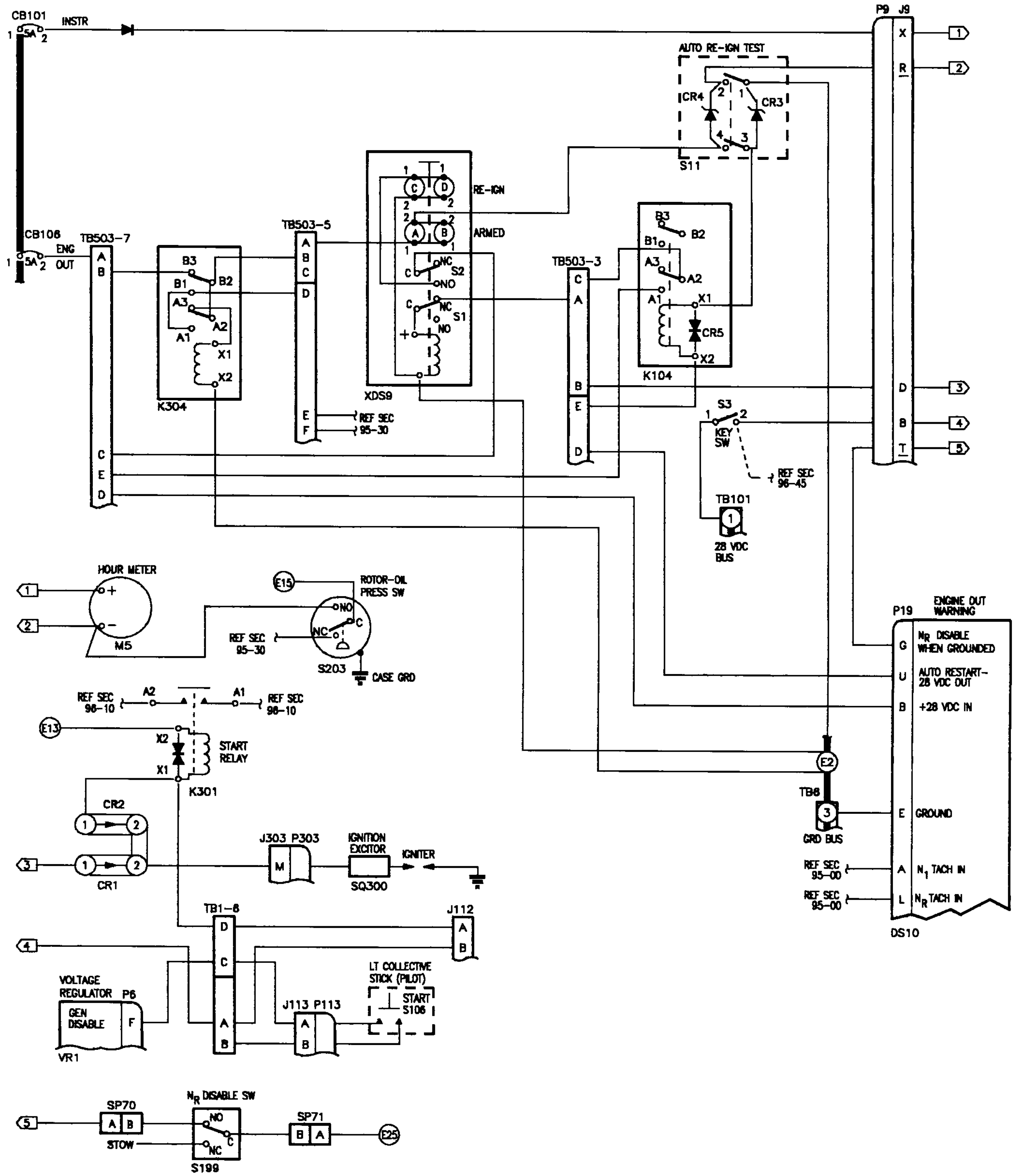
Figure 402. Auto Re-ignition Wiring Diagram (Sheet 1 of 6)



EFFECTIVITY: 369D; 950-955, 957-964, 966-976, 978-988, 990-1149, 1151-1184

G96-1006-2

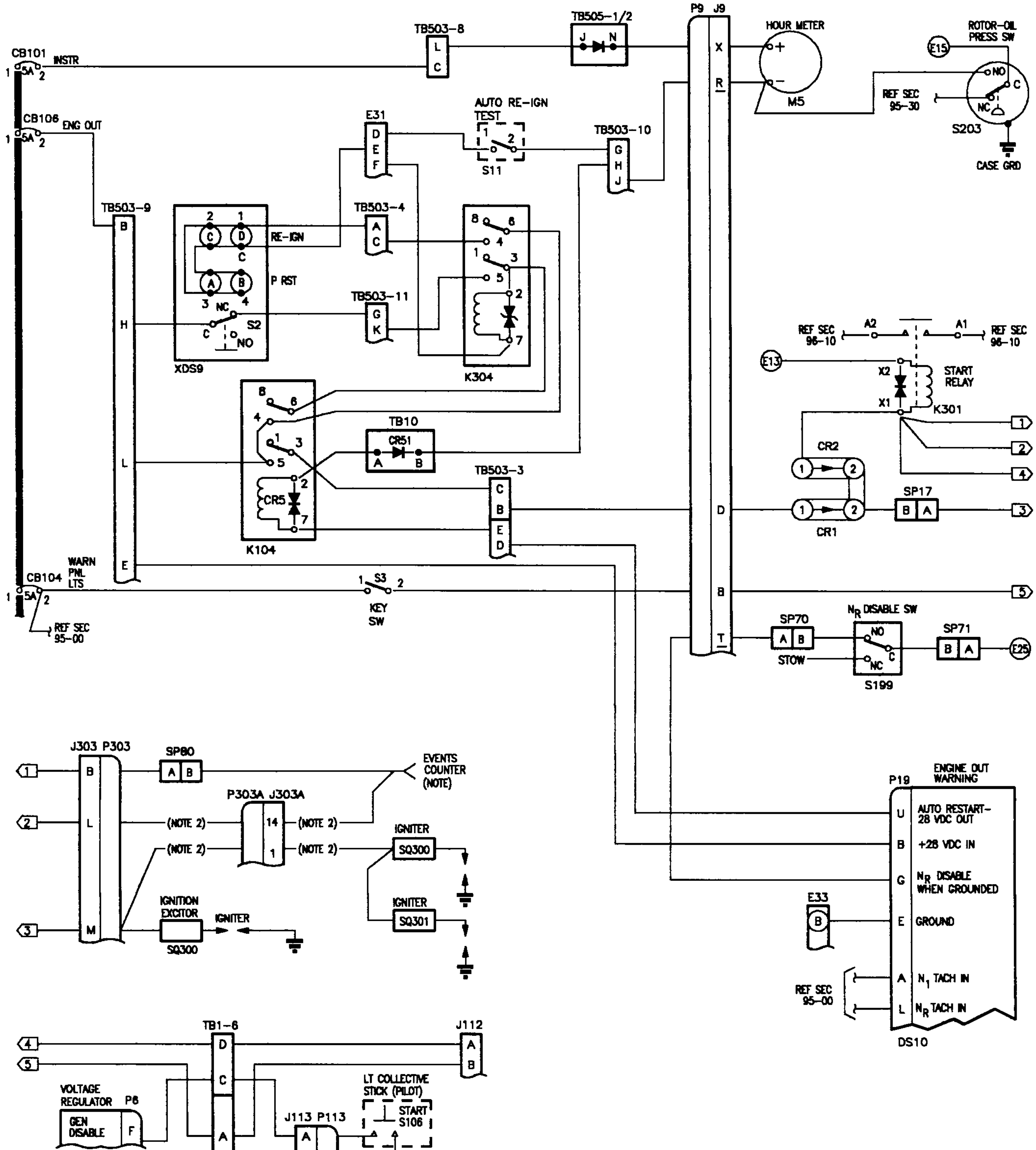
Figure 402. Auto Re-ignition Wiring Diagram (Sheet 2 of 6)



EFFECTIVITY: 369D; 1150, 1185 & SUBS

G96-1006-3

Figure 402. Auto Re-ignition Wiring Diagram (Sheet 3 of 6)



EFFECTIVITY: 369E; 001-383
369FF 001-075

NOTES:

1. REFER TO MANUFACTURER'S INSTRUCTION MANUAL, TABLE 201, SEC. 01-00
2. 369FF MODEL HELICOPTERS ONLY

G96-1006-4

Figure 402. Auto Re-ignition Wiring Diagram (Sheet 4 of 6)

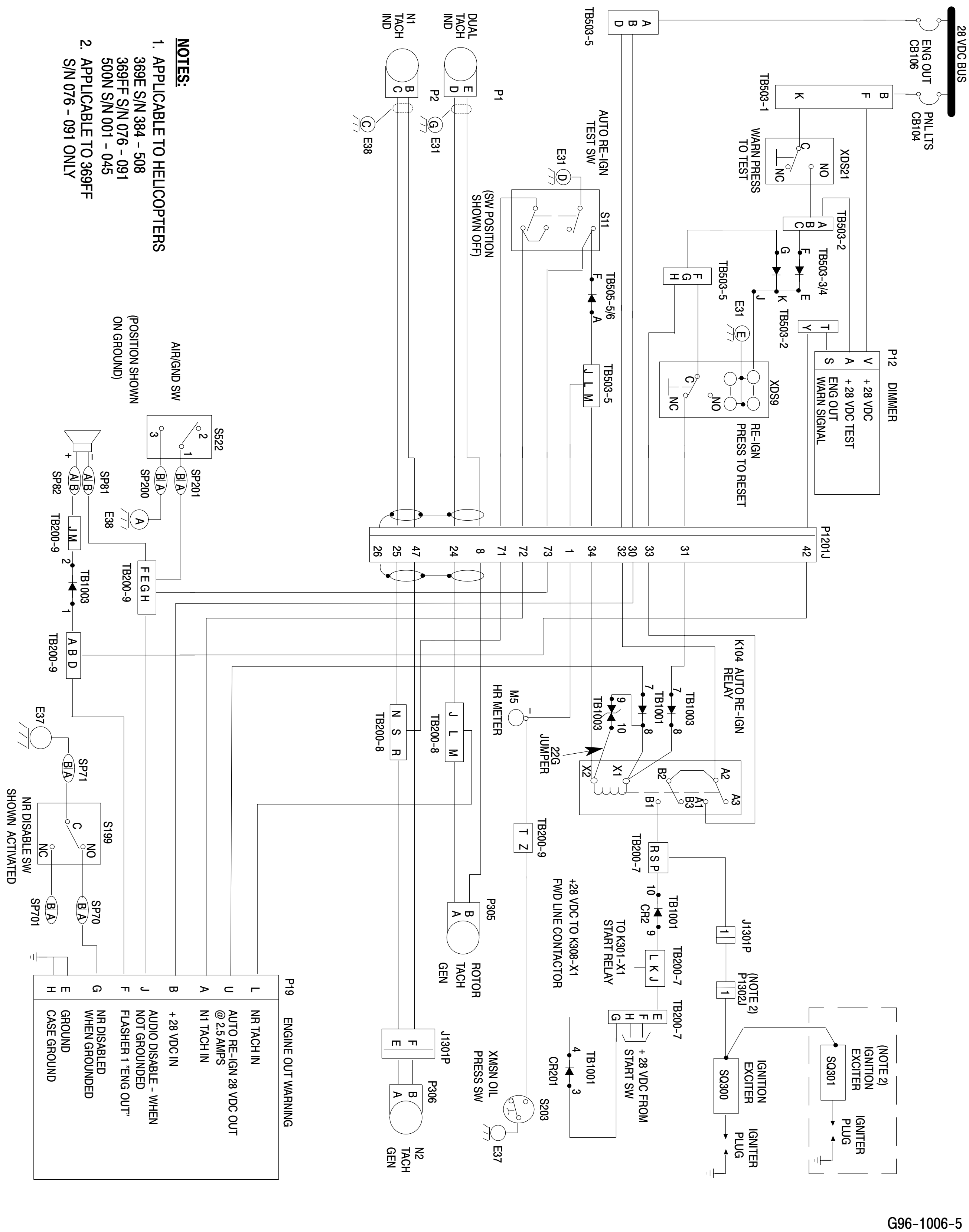


Figure 402. Auto Re-ignition Wiring Diagram (Sheet 5 of 6)

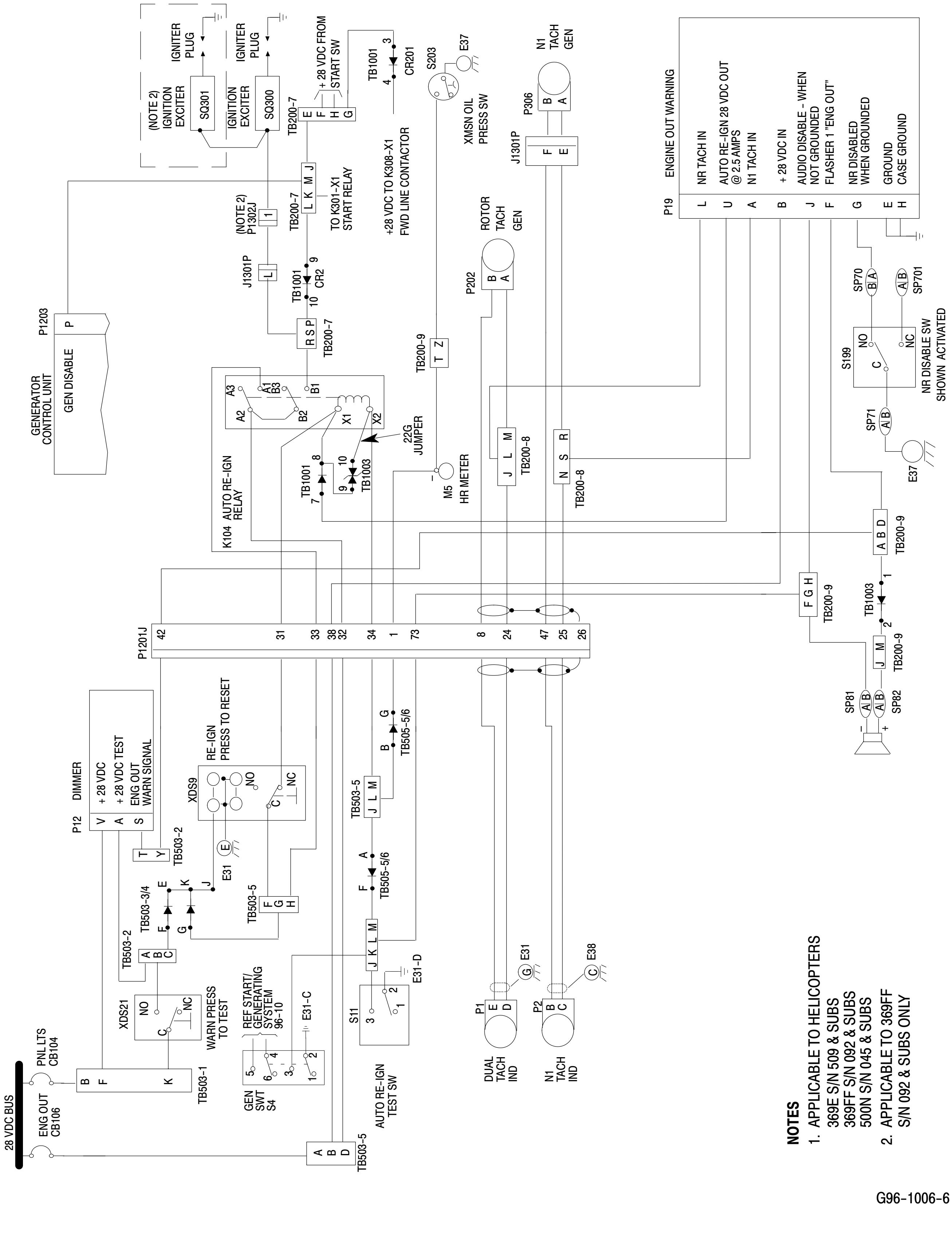
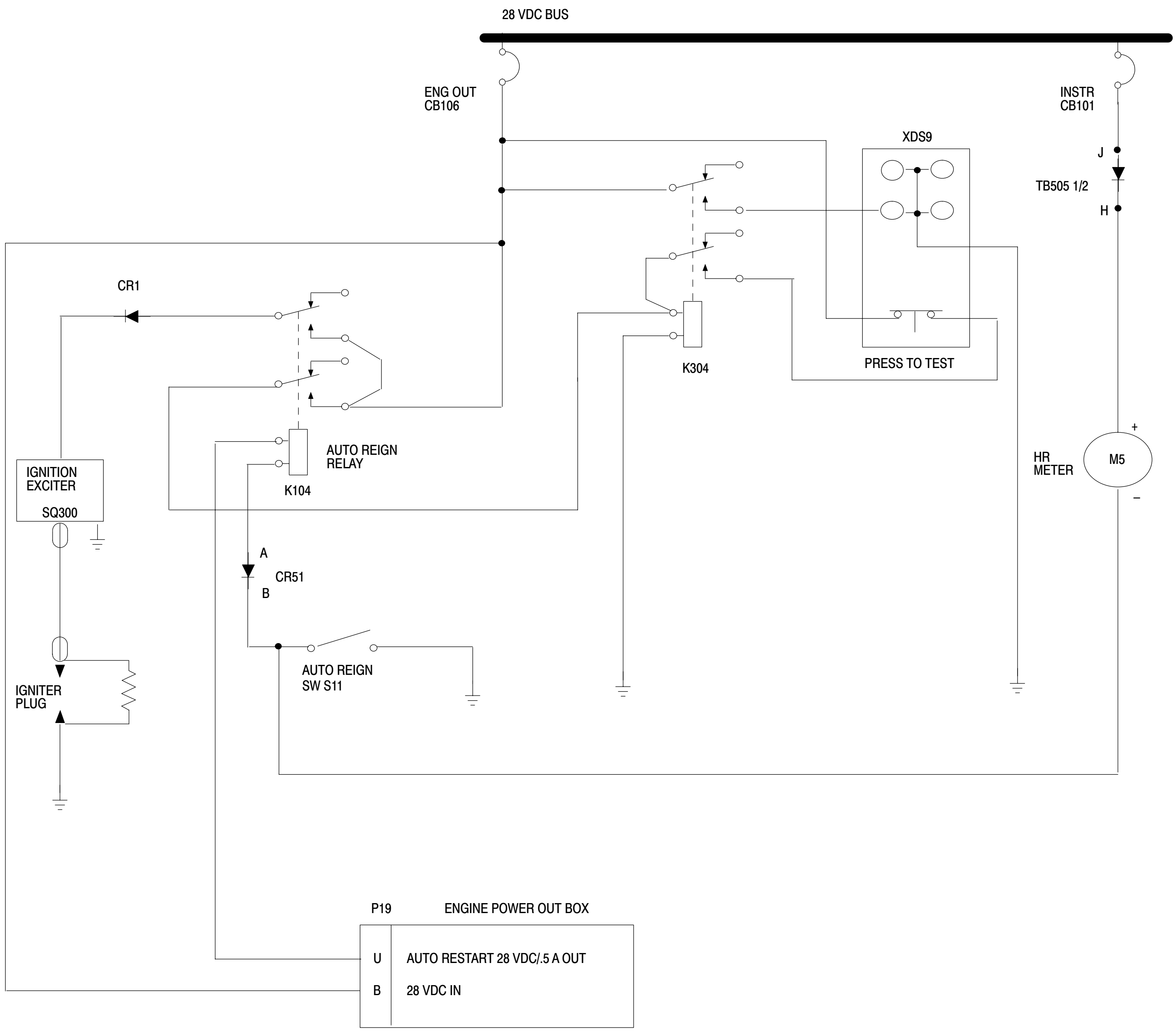


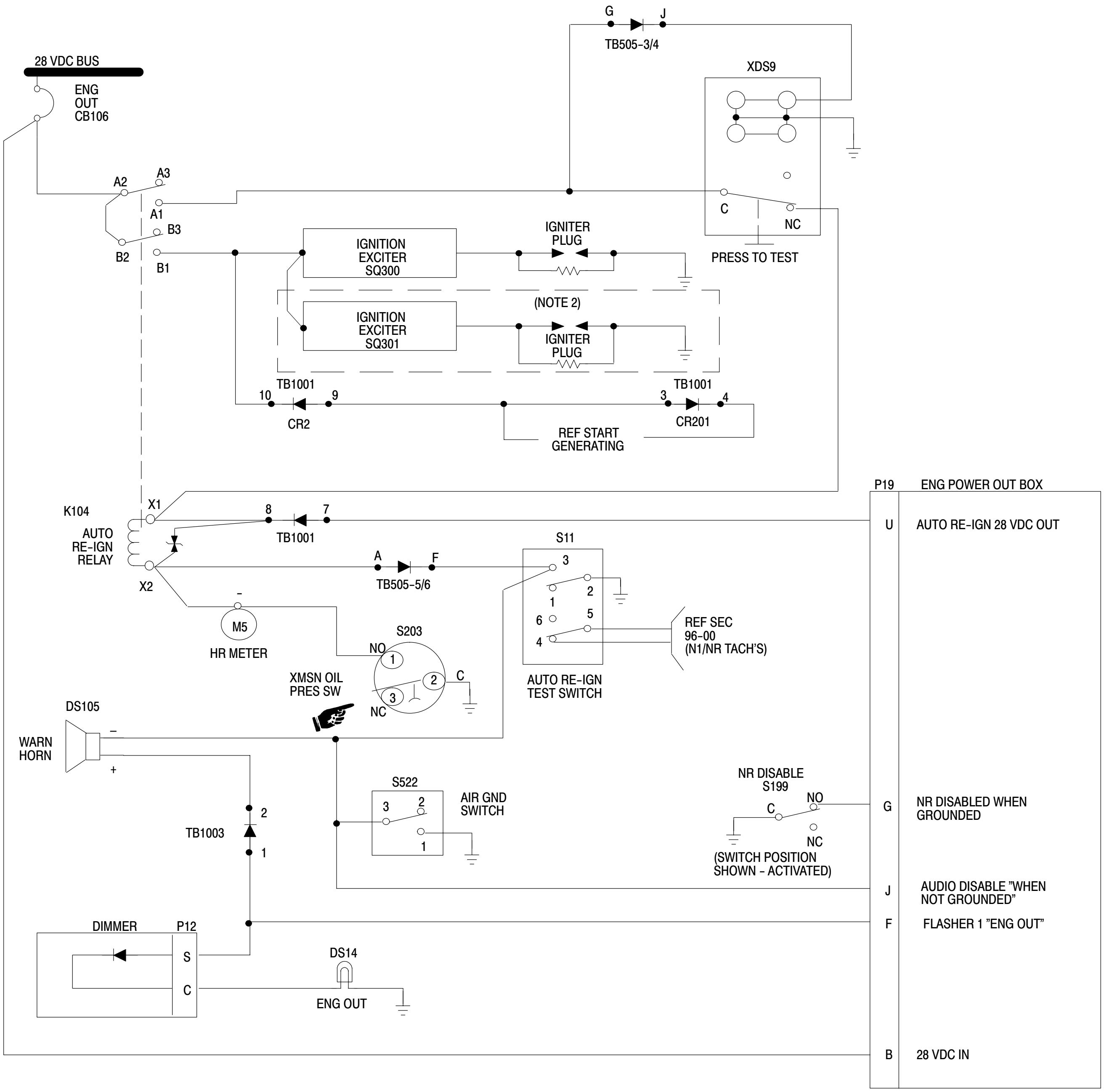
Figure 402. Auto Re-ignition Wiring Diagram (Sheet 6 of 6)



EFFECTIVITY: 369D; ALL
369E; 001-383
369FF; 001-075

G96-1009-1

Figure 403. Auto Re-ignition Schematic (Sheet 1 of 3)

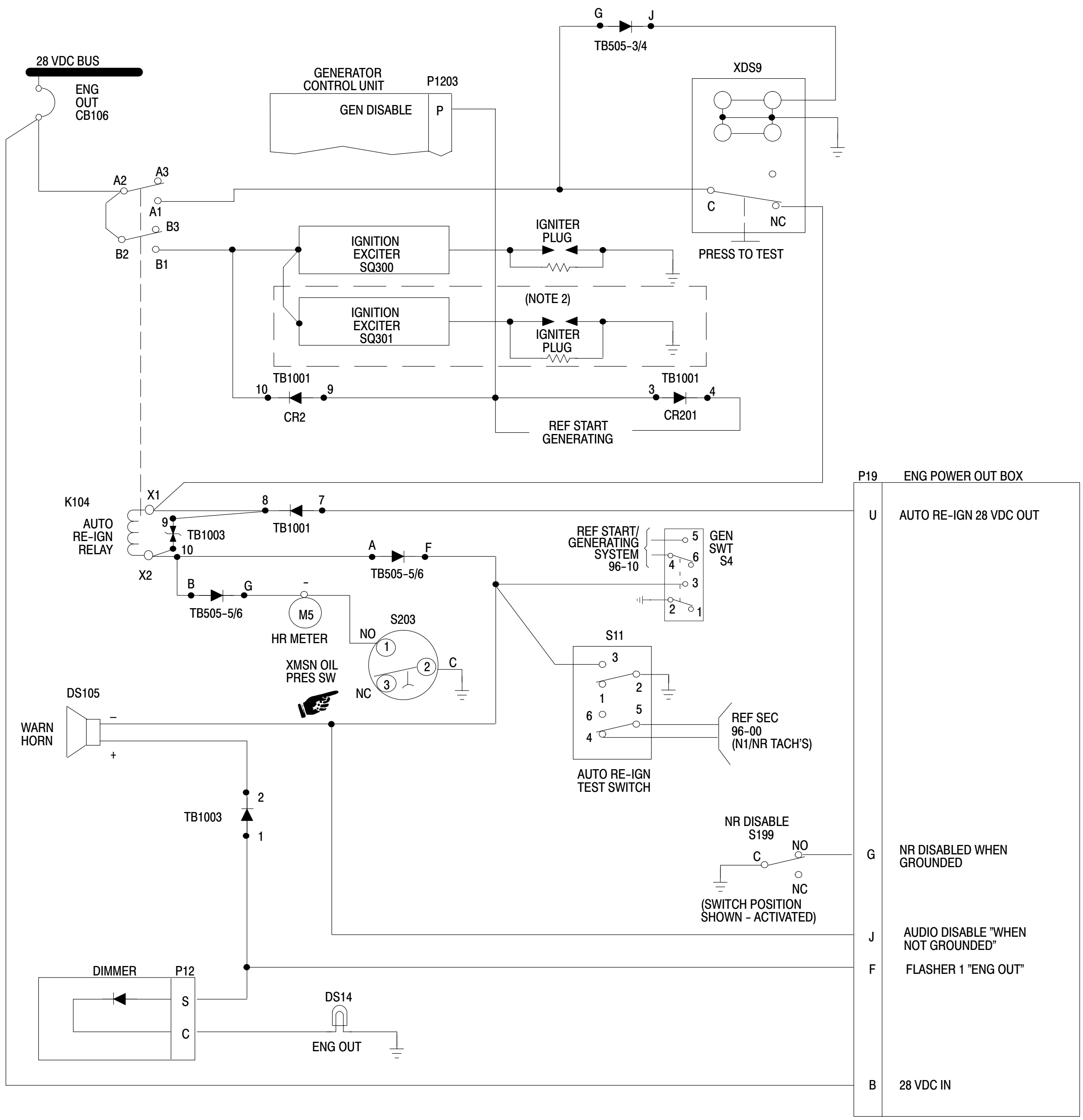


NOTES:

1. EFFECTIVITY; 369E; 384-508
   369FF; 076-091
   500N; 001-044
2. EFFECTIVITY: 369FF; 076-091 ONLY

G96-1009-2C

Figure 403. Auto Re-ignition Schematic (Sheet 2 of 3)



NOTES:

1. EFFECTIVITY 369E; 509 AND SUBS
   369FF; 092 AND SUBS
   500N; 045 AND SUBS
2. EFFECTIVITY 369FF; 092 AND SUBS ONLY

G96-1009-3A

Figure 403. Auto Re-ignition Schematic (Sheet 3 of 3)

ENGINE IGNITION CONTROL SYSTEM INSPECTION/CHECK

1. Automatic Re-ignition System Check (with Ground/Air Switch)

369E	384 - 508
369FF	076 - 091
500N	001 - 044

NOTE: Helicopters equipped with the ground/air switch can be modified to eliminate the switch (Ref. Sec. 96-10-00, Generator Control Unit Upgrade to Eliminate Squat Switch).

(1). The RE-IGN TEST switch (S11) provides for an OFF and two test positions; GND (up) and FLT (center).

(2). Both horn and audible warnings are disabled by ground/air switch (S522) when the helicopter is on the ground, except when RE-IGN TEST switch is placed in the GND position.

(3). The FLT position provides a complete in-flight systems test by simulating a fault of the N_1 input to the EPO.

(4). Both on-ground and in-flight tests can be accomplished by selecting GND position.

(5). On-ground test requires RE-IGN TEST switch in the GND position.

(a). With power applied, the ENG OUT indicator should be flashing.

(b). Press the press-to-test button and all warning lights should illuminate momentarily.

(c). Set RE-IGN TEST switch to GND.

(d). Verify horn, audio warning, RE-IGN P RST indicator is illuminated and engine igniter firing.

(e). Return switch to OFF, the system should reset.

NOTE: Conducting test with engine motoring will require pushing the RE-IGN P RST indicator to reset the system (Refer to appropriate PFM for in-flight test of system).

A. Normal Start

Verify system operation of normal starting circuit by performing a normal start as described in appropriate Pilot's Flight Manual.

2. Automatic Re-ignition System Check (without Ground/Air Switch)

369E	509 & subs
369FF	092 & subs
500N	045 & subs

Verify system operation of automatic re-ignition circuit as follows:

(1). Set BATTERY/OFF/EXT PWR (master) switch to OFF.

(2). Connect external 28 Vdc power.

(3). Set master switch to EXT PWR.

(4). Close ENG OUT circuit breaker.

NOTE: Closing ENG OUT circuit breaker provides power at re-ignition relay K104.

(5). Set RE-IGN TEST switch to ON.

(6). Verify audible spark across engine igniter gap.

(7). Verify Re-ignition indicator lights.

(8). Set RE-IGN TEST switch to OFF.

(9). Press Re-ignition indicator. Verify indicator lamps go out.

(10). Open ENG OUT circuit breaker.

(11). Set master switch to OFF.

(12). Disconnect external power.

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ENGINE IGNITION CONTROL SYSTEM
REPAIRS

1. Auto Re-ignition System Modification

This section provides for modification instructions of the 369H900118-513 and -515 engine automatic re-ignition equipment (369D helicopters S/N 003 - 949 only). These instructions cover relocation of re-ignition controls on the instrument panel and necessary rewiring to provide full-time operation of the system.

A. Preparation for Modification

Preparing for modification of installed engine automatic re-ignition equipment includes the following:

(1). Place BATTERY-OFF-EXT PWR (master) switch in OFF position.

(2). Disconnect wires from auto re-ignition switches as follows:

(a). Remove J501A20 from circuit breaker (CB106-2) and ARM-OFF switch (S11-1) and discard wire.

(b). Disconnect J501AE20, J502E20, J501B20, J502A20 and J502D20 at switch (S11).

(c). Remove ARM-OFF switch (S11) from instrument panel.

(d). Remove J503D20 and J503EE20 from terminal board (TB502-13A and 13C).

(e). Remove J505A20N and J508A20N from stud (E2).

(f). Remove J507AA20 from terminal board (TB502-13E).

(g). Remove E559AC22 from splice (MS25181-1).

(3). Remove relays (K304 and K104) and switch (XDS9). Remove all wires from relays and switch and retain relays and switch for reuse.

2. Instrument Panel Modification

(Ref. Figure 801)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM302	Epoxy primer / Catalyst reducer
CM305	Lacquer, acrylic

(1). Fabricate cover, as required, for hole vacated by switch XDS9.

(2). Install cover on instrument panel.

(3). Install plug button on instrument panel.

(4). Paint out lettering at previous auto re-ignition switch location with acrylic lacquer (CM305).

(5). Fabricate plate as follows:

(a). Make plate from 0.062 inch (1.5748 mm) thick aluminum alloy sheet as shown in Figure 801.

(b). Apply one coat primer (CM302) and dry for 1 to 2 hours.

(c). Apply topcoat of acrylic lacquer (CM305) and air dry 4 hours minimum.

(6). Install plate and auto re-ignition switches (XDS9) and (S11, PN 882GK15 - Cutler Hammer or equivalent) at new location on instrument panel.

(7). Fabricate and install decal on instrument panel.

3. Electrical System Modification

(Ref. Figure 802)

(1). Revise wiring as follows:

(a). Install diode at circuit breaker CB101.

(b). Install diodes CR3 and CR4 on switch S11.

(c). Install transzorb CR5 on relay K104.

(d). Rewire switches (S11 and XDS9) and relays (K104 and K304) as shown.

(e). Reinstall relays K104 and K304 in original position.

(2). Perform check of modified auto re-ignition system (refer to the appropriate PFM).

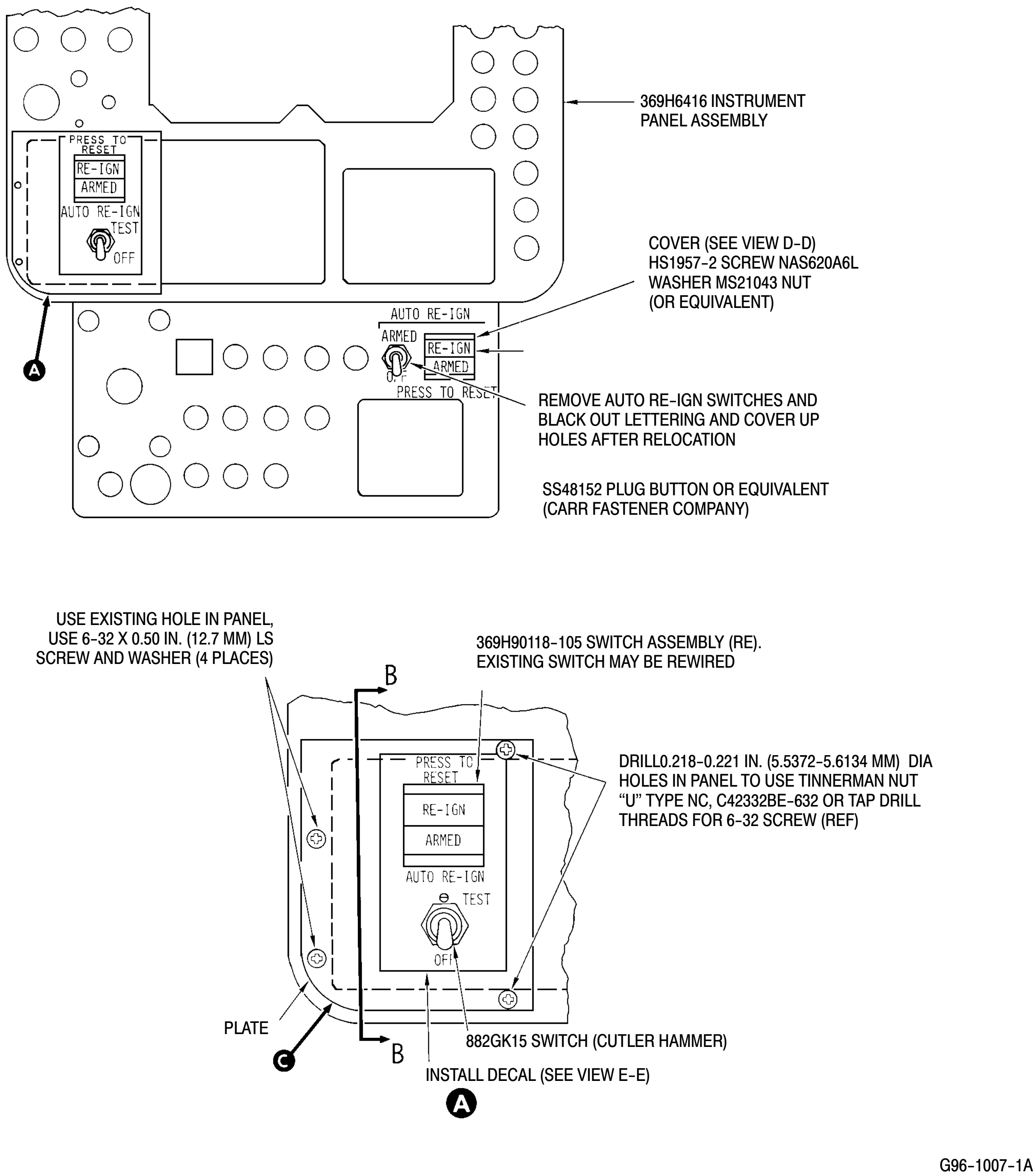


Figure 801. Relocation of Auto Re-ignition Controls (Sheet 1 of 2)

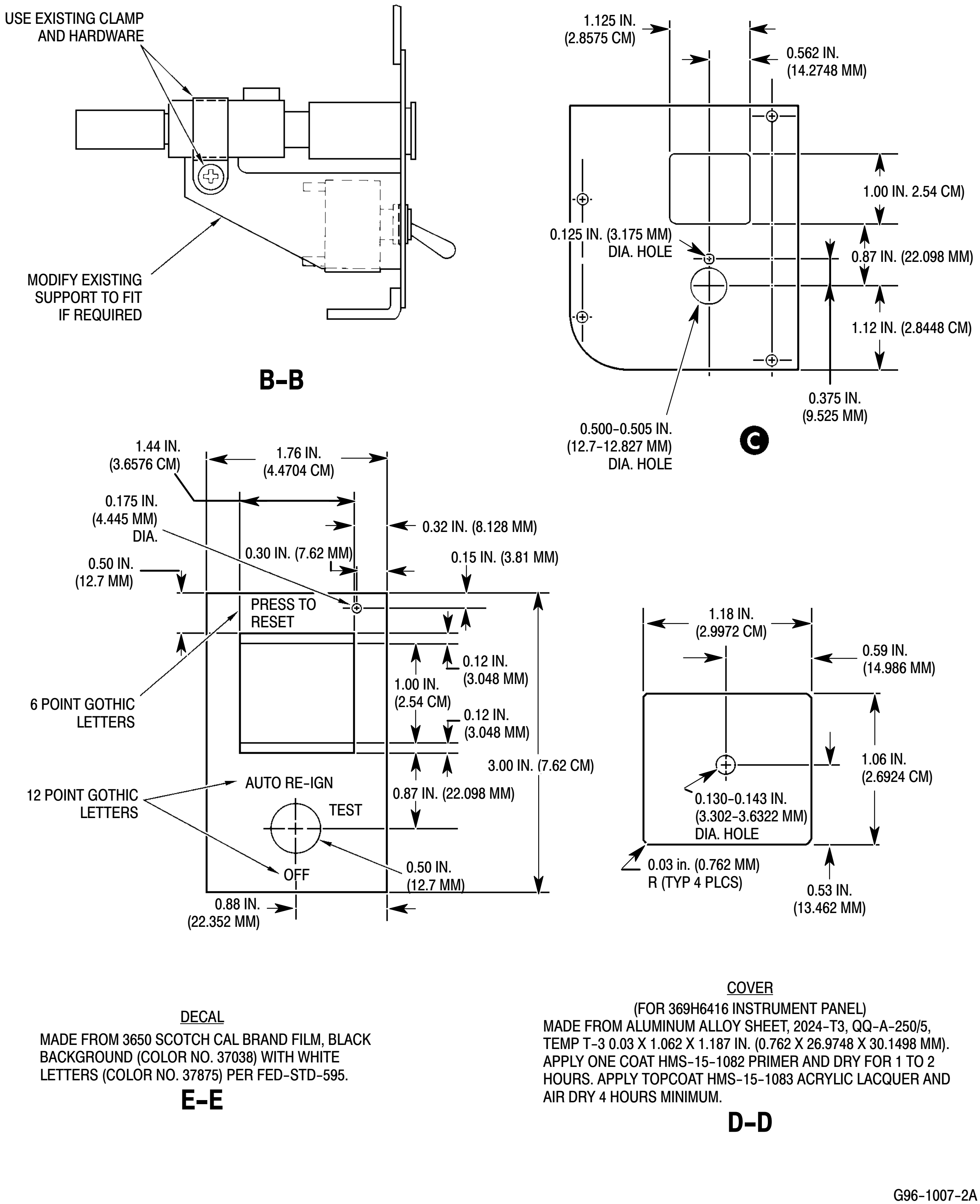
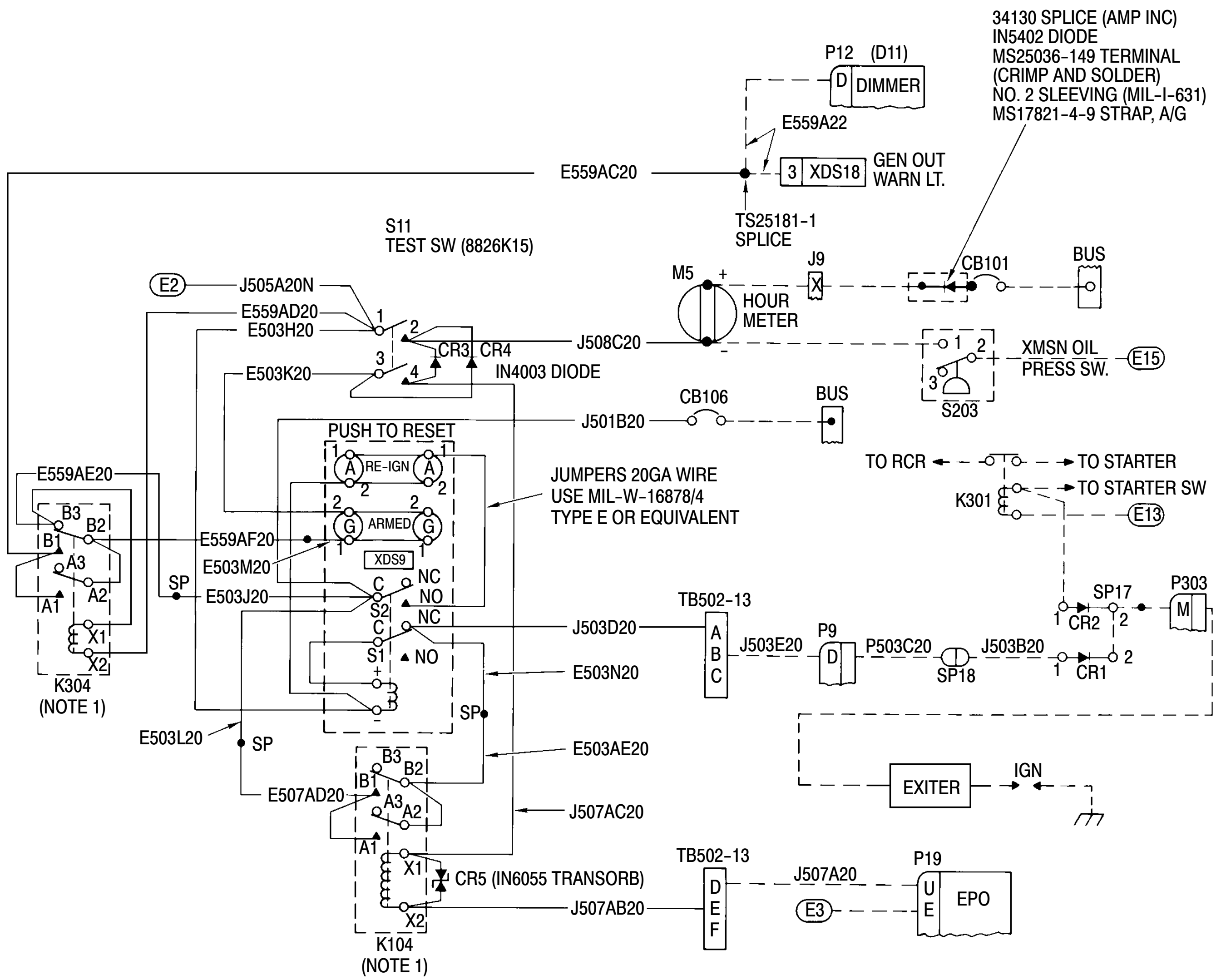


Figure 801. Relocation of Auto Re-ignition Controls (Sheet 2 of 2)



NOTES:

1. DO NOT RELOCATE RELAYS, EXISTING RELAYS MAY BE USED (REWIRED).
2. DASHED LINES (- - -) INDICATE EXISTING HELICOPTER WIRING.

Figure 802. Auto Re-ignition Rewiring Diagram

ENGINE IGNITION CONTROL SYSTEM
INITIAL INSTALLATION

1. Auto Re-ignition Initial Installation

(Ref. Figure 401, Figure 402 and Figure 403) This section provides instructions for installation of the 369H900118-513 and -515 engine automatic re-ignition equipment. These instructions cover removal or modification of existing equipment to accommodate re-ignition equipment.

NOTE: 369D helicopters S/N 003 - 949 did not provide full time operation. Refer to Auto Re- ignition Rework for converting system to full time operation.

A. Reference Data

The consumable and expendable materials listed are of a commercial nature that could be procurable locally. Alternate, but equivalent, items might be available, but consultation with MDHI Customer Service Department is recommended.

B. Preparation for Installation

Preparing for installation of engine automatic re-ignition equipment includes the following:

(1). Place BATTERY-OFF-EXT PWR (master) switch in OFF position.

(2). Open engine right access door.

(3). Identify all components, including attaching hardware removed to gain access to work areas. Protect components from damage and contamination until installed.

C. Automatic Re-ignition System Installation

NOTE: The engine automatic re-ignition kits are supplied with as many parts assembled as practical, however. some parts may require assembly at installation. The following procedures provide complete assembly instructions. The operator should omit those steps which may have already been accomplished.

D. Diode Isolator Assembly Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM313	Insulation varnish
CM612	Tube, silicone
CM703	Tie strap
CM808	Lacing cord

NOTE: When providing ground for electrical components, clean contacting surfaces to bare metal per Maintenance of Electrical Bonding Connections (Ref. Chap. 96). Do not tighten electrical clamps or secure electrical wiring to existing harnesses until all electrical wiring and components are installed.

(1). Remove nut and washer securing forward end of K301 start relay to 369A2537 oleo support.

(2). Clean area for electrical bonding around large hole in bracket and that portion of K301 start relay bracket exposed by removal of nut and washer in step (1). above.

(3). Using nut and washer removed in step (1). above, install diode isolator assembly so that lug type diode connectors are aft.

(4). Locate wire J503C20 (open end) in harness running vertically, just forward of Sta. 135.50 bulkhead and approximately 6 inches (15.24 cm) aft of diode isolator assembly. Place a 2.50 inch (6.35 cm) length of silicone tubing (CM612) on wire for use in step (6). below.

(5). Connect wire J503B20 from diode CR1 of diode isolator assembly to the B-end of knife splice SPl8. Connect A-end of same splice to wire J503C20 located in step (4). above.

(6). Slide silicone tubing over SPl8 splice and secure with tie-strap (CM703) at each end of splice.

(7). Remove existing wire K502D20 from terminal X2 of K301 start relay. Cut off existing terminal, remove and save existing terminal protector, slip 2.50 inch (6.35 cm) length of silicone tubing on wire, and connect wire to B-end of knife splice SPl7.

(8). Connect A-end of SP17 splice to K502CB20 wire from common connector 2 of CR1 and CR2 diodes of diode isolator assembly.

(9). Slide silicone tubing over splice and secure with tie-strap at each end of SP17 splice.

(10). Place terminal protector removed in step (7). above, on wire K502CA20 of diode isolator assembly. Connect wire to X2 terminal of K301 start relay and slide terminal protector into place.

(11). Secure wiring with lacing cord (CM808) as required. making certain that sufficient wire slack remains so that connectors are not stressed.

(12). After assembly and test apply insulation varnish (CM313) to exposed threads and tips.

(13). Close engine access door.

E. Relay and Switch Assembly Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM703	Tie strap
CM812	Splice, knife

(1). Remove instrument panel left and right side covers to expose lightening holes.

(2). Remove ash tray and edge lighted panel from lower switch and circuit breaker panel.

(3). Remove screws and loosen lower switch and circuit breaker panel.

(4). Remove and discard square cutout and adjacent round hole button covers located above PRESS TO RESET placard.

(5). On left side of instrument panel structure, install relay K104 in center position and relay K304 in aft position, on bracket with screws, washers and nuts.

NOTE: Bracket is installed in upper half of largest lightening hole in left side structure of instrument panel.

(6). Clean area around ARM-OFF switch (S11) mounting hole in lower switch and circuit breaker panel, to prepare bonding surface for switch support; clean all surfaces around holes in support.

(7). Insert threaded shank of ARM-OFF switch through half-inch (12.7 mm) hole in support followed by key washer with washer tang toward switch actuator arm.

(8). Insert ARM-OFF switch through half inch (12.7 mm) mounting hole in lower switch and circuit breaker panel; install washer and nut making certain tang is positioned in small hole adjacent to half-inch (12.7 mm) hole in panel.

(9). Clean portion of cylindrical (coil) housing to contact clamp; insert switch assembly (XDS9), from front side of panel. into square cut out mounting hole in lower switch and circuit breaker panel.

(10). Secure housing of switch (XDS9) to support with clamp, screw, washers and nut.

(11). Install electrical wiring as follows:

(a). Route wire J502A20 from relay K104 to ARM-OFF switch and connect to contact 3 of switch (S11).

(b). Route wire J503EE20 from relay K104 and insert pin in contact C of terminal block 502, module 13 (TB502-13).

(c). Route wire J508A20N from relay K104 and connect to ground stud E2.

(d). Route wire J507AA20 from relay K104 and insert pin in contact E of TB502-13.

(e). Route wire E559AC22 from relay K304 to closest proximity of GEN OUT wire E559A22; connect wires E559AC22 and E559A22 with splice (CM812).

(f). Route wire J501AE2O from relay K304 to contact 1 of ARM-OFF switch (S11); install terminal (MS25036-102) on wire J501A20; connect terminals of wires J501AE20 and J501A20 to contact 1 of ARM-OFF switch (S11). Route wire J501A20, install terminal (MS25036-149) and connect to contact 2 of circuit breaker CB106.

(g). Route wire J502E20 from relay, K304 and connect to contact 4 of ARM-OFF switch (S11).

(h). Arrange relay wires to form smooth flow integrating with existing wire bundles; use tie-straps (CM703) as required to secure wire bundles. Ensure sufficient wire slack to avoid stress on solder joints.

(i). If bracket has been removed for installation ease, clean bracket panel contact areas to ensure positive ground; install bracket with screws and washers.

(j). Route ground wire J505A20N from switch (XDS9) coil housing and connect to ground stud E2.

(k). Route wire J502D20 from RE-IGN ARMED switch (XDS9) and connect to contact 6 of ARM-OFF switch (S11).

(l). Route wire J503D20 from switch (XDS9) and insert pin in contact A of TB502-13.

(m). Route wire J501B20 from switch (XDS9) and insert pin in contact A of ARM-OFF switch (S11).

(12). Install instrument panel left side cover.

(13). Clean screw attach areas of lower switch and circuit breaker panel to ensure positive grounding bond; install panel.

(14). Install edge-lighted panel and ash tray on lower switch and circuit breaker panel.

(15). Perform Operational Check of engine automatic re-ignition electrical system.

F. Relay and Switch Assembly Installation (T-Panel with Center Console)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM612	Tube, silicone
CM703	Tie strap
CM812	Splice, knife
CM815	Solder

NOTE: T-panels (-703 and -705) with center console are identical except the -705 is equipped with 14 caution indicators.

(1). Remove console right side cover.

(2). Remove additional panels as required to facilitate installation of engine automatic re-ignition switches and wiring.

(3). Remove ARM-OFF and RE-IGN ARMED switch hole covers from instrument panel.

(4). Locate relay bracket (for relays K104 and K304) on right side of console inner panel.

(5). Install relays K104 and K304 as follows:

(a). Install relay K104 in outboard position, and relay K304 in inboard position on relay bracket, with screws, washers and nuts.

(b). Arrange relay wires to form a smooth flow, integrating with existing wire bundles; use tie-straps (CM703) as required to secure wire bundles. Ensure sufficient wire slack to avoid stress on solder joints.

(6). Install ARM-OFF switch (S11) and RE-IGN/ARMED switch assembly as follows:

(a). Clean area around ARM-OFF (S11) switch-hole in instrument panel to prepare bonding surface for switch (XDS9) support; install AUTO RE-IGNITION decal (369H90118-27). Clean all surfaces around holes in support.

(b). Insert threaded shank of ARM-OFF switch (S11) through half-inch mounting hole in support followed by key washer with washer tang toward switch actuator arm.

(c). Insert ARM-OFF switch (S11) through half-inch mounting hole in instrument panel; install washer and nut making certain key washer tang is in small hole adjacent to half-inch (12.7 mm) hole in panel.

(d). Clean portion of cylindrical (coil) housing to contact clamp; insert switch assembly (XDS9) into square cutout mounting hole in instrument panel.

(e). Secure housing of switch (XDS9) to support with clamp, screw, washers and nut.

(7). Install electrical wiring as follows:

(a). Route wire J502A20 from relay K104 to ARM-OFF switch (S11) and connect to contact 3 of ARM-OFF switch (S11).

(b). Route wire J503EE20 from relay K104 and insert pin in contact C of terminal block 502, module 13 (TB502-13).

(c). Route wire J508A20N from relay K104 and connect to ground stud E31.

(d). Route wire J507AA20 and insert pin in contact E of TB502-13.

(e). On aircraft equipped with 369D294201-703 instrument panel face, install wire E559AC22 as follows:

1). Install module No. 20 on TB502.

2). Route wire E559AC22 from relay K304 to TB502 and insert pin in contact C of TB502-20.

3). Install pin (MPCM20M-H2) on wire E559AB22; insert pin in contact A of TB502-20 and route wire to plug P12. Crimp pin on opposite end of wire E559AB22 and insert pin in contact D of P12.

4). Install pin (MPCM20M-H2) on wire E559AA22; insert pin in contact B of TB502-20. Route opposite end of wire E559AA22 to GEN OUT (XDS18) warning light and solder (CM815) to contact 3.

(f). On aircraft equipped with 369D294201-705 instrument panel face; install wire E559AC22 as follows:

1). Route wire E559AC22 to closest proximity of wire E17A22 (routed between P526-EE and P527-A).

2). Cut wire E17A22; install 2.50 inch (6.35 cm) length of silicone tubing (CM612) and splice (CM812) wires E559AC22 and E17A22. Slide tubing over splice and secure with tie-straps (CM703).

(g). Route wire J5017E20 from relay K304 and connect to contact 1 of ARM-OFF switch (S11).

(h). Route wire J502E20 and connect to contact 4 of ARM-OFF switch (S11).

(i). Route ground wire J505A20N from switch (XDS9) and connect terminal to ground stud E31.

(j). Route wire J502D20 from switch (XDS9) and connect terminal to contact 6 of ARM-OFF switch (S11).

(k). Route wire J503D20 from switch (XDS9) and insert pin in contact A of TB502-13.

(l). Route wire J501B20 from switch (XDS9) and connect to contact 3 of ARM-OFF switch (S11).

(m). Relocate wire J501A20 as follows:

1). On aircraft equipped with 369D 294201-703 instrument panel face, disconnect wire J501A20 from CB124 on circuit breaker panel, and connect to contact 2 of CB106.

2). On aircraft equipped with 369D 294201-705 instrument panel face, disconnect wire J501A20 from CB119 on circuit breaker panel, and connect to contact 2 of CB105.

(8). Install black cover decals (369H90118-35 and -37) over AUTO RE-IGN markings of previously used circuit breaker position on edge lighted circuit breaker panel; install new AUTO RE-IGN decal (369H90118-33).

(9). Install console right cover.

(10). Secure all panels loosened or removed for access.

(11). Perform Operational Check of engine automatic re-ignition system (refer to appropriate PFM).

G. Weight and Balance

Weight and balance changes resulting from installation of engine automatic re-ignition equipment are listed in Table 901. After installation of the engine automatic re-ignition system equipment, incorporate changes in helicopter weight and balance record.

Table 901. Weight and Balance Data

	Weight Pounds (kg)		Arm inches (cm)		Moment in.-lb (kg cm)	
Added	1.5	(0.6803884)	91.5	(232.41)	1.4	(16.12968)
Removed		0.0		0.0		0.0
Change	1.5	(0.6803884)	91.5	(232.41)	1.4	(16.12968)

Section

71-60-00

Engine Cooling System (250-C20B, 250-C20R/2, 250-C30 and 250-C47)

ENGINE COOLING SYSTEM MAINTENANCE PRACTICES

1. Engine Cooling System Description and Operation

(Ref. Figure 201 and Figure 202) Helicopter engine and transmission oil cooler blower air is used to cool engine exterior surfaces. After passing through the oil coolers, the relatively temperate air is redirected by a system of supports, clamps, and ducts onto the ignition exciter, engine gearcase, and compressor and turbine section external surfaces. Exhaust air is discharged overboard through a gap between the engine exhaust pipe and engine access doors.

2. Engine Cooling System Inspection

(Ref. Figure 201 and Figure 202)

(1). Inspect ducts for holes, tears, cracks, fraying and security. Repair duct damage as required.

(2). Inspect duct supports and clamps for condition and security. Repair support system as required.

3. Engine Cooling System Repair and Replacement

(Ref. Figure 201 and Figure 202)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM107	Fluorocarbon release agent
CM712	Tape, pressure sensitive

(1). Unclamp and remove ducts.

(2). Patch duct damage with tape (CM712).

NOTE: Apply dry film lubricant (CM107) to duct and seal mating surfaces prior to assembly.

(3). Assemble duct, seals, clamps and attaching hardware.

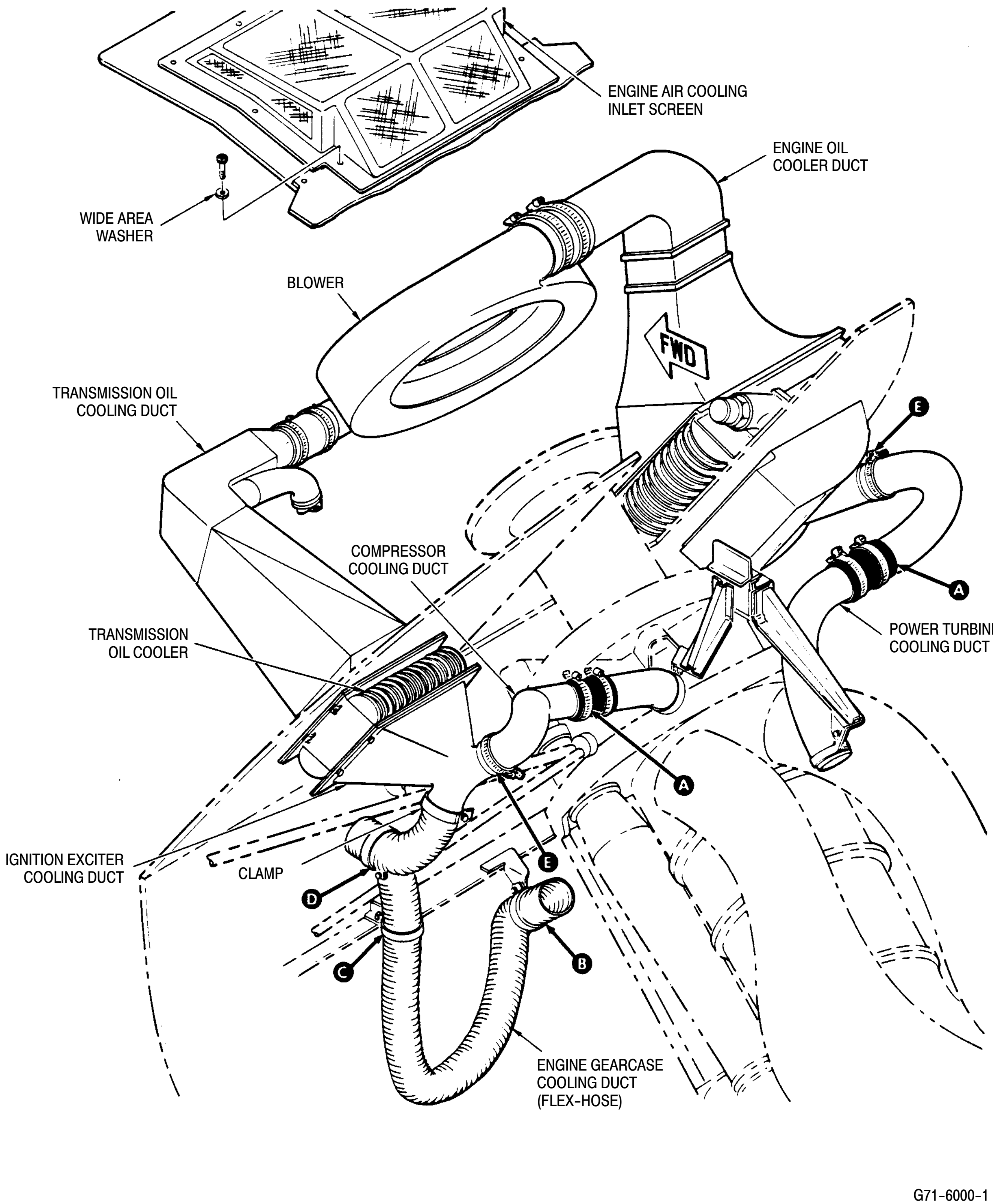


Figure 201. Engine Air Cooling System - 250-C20B and 250-C20R/2 (Sheet 1 of 2)

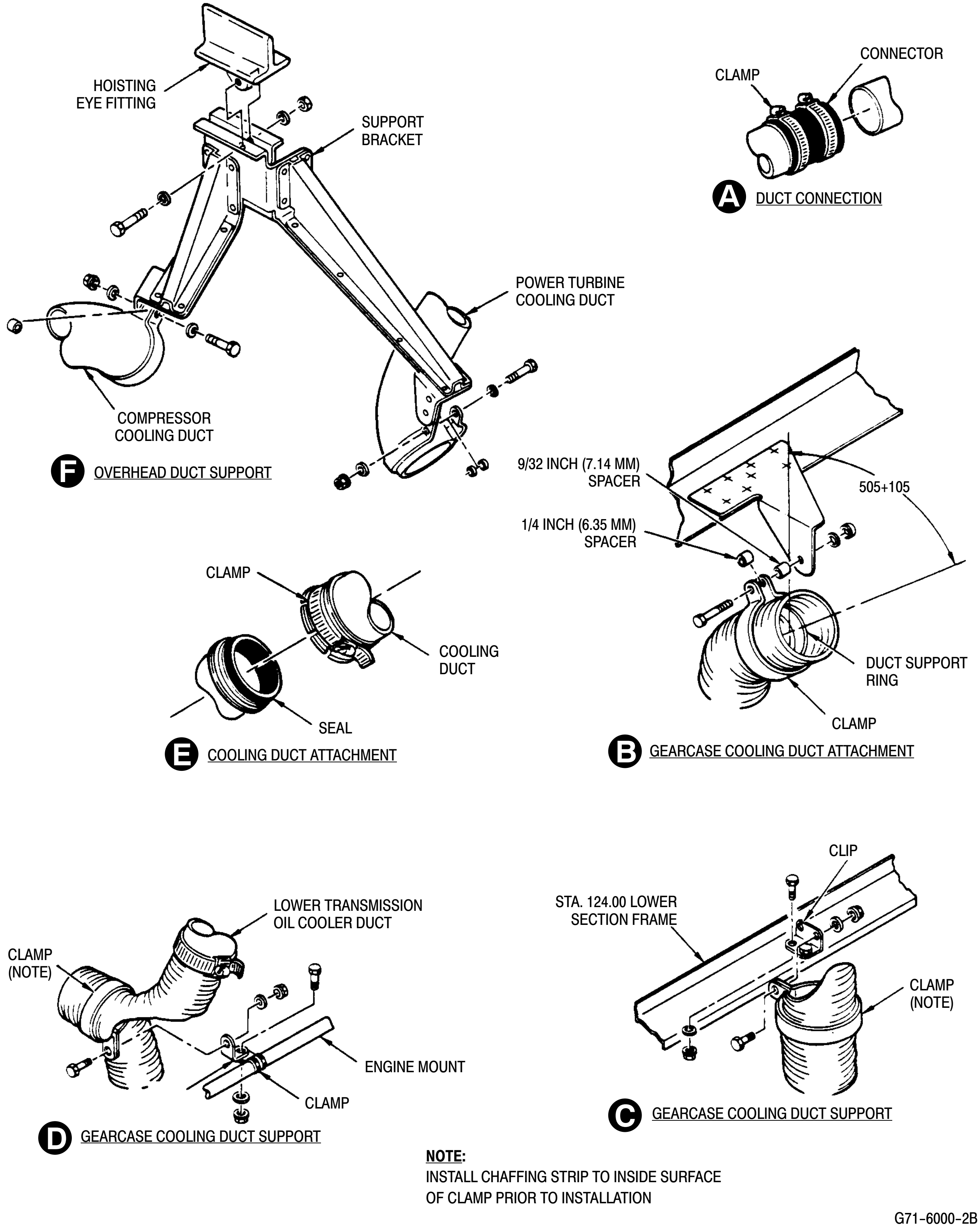


Figure 201. Engine Air Cooling System - 250-C20B and 250-C20R/2 (Sheet 2 of 2)

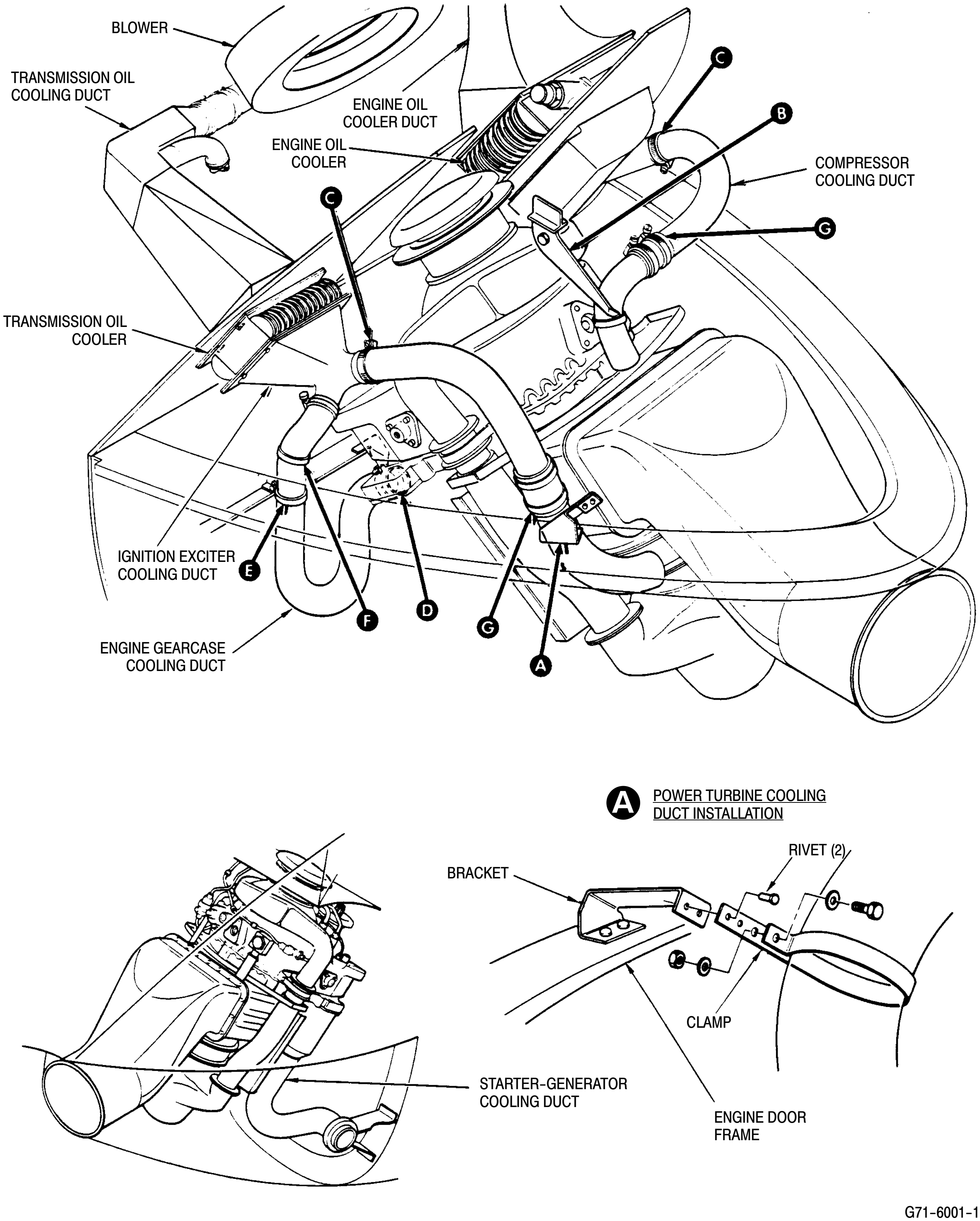


Figure 202. Engine Air Cooling System - 250-C30 and 250-C47 (Sheet 1 of 2)

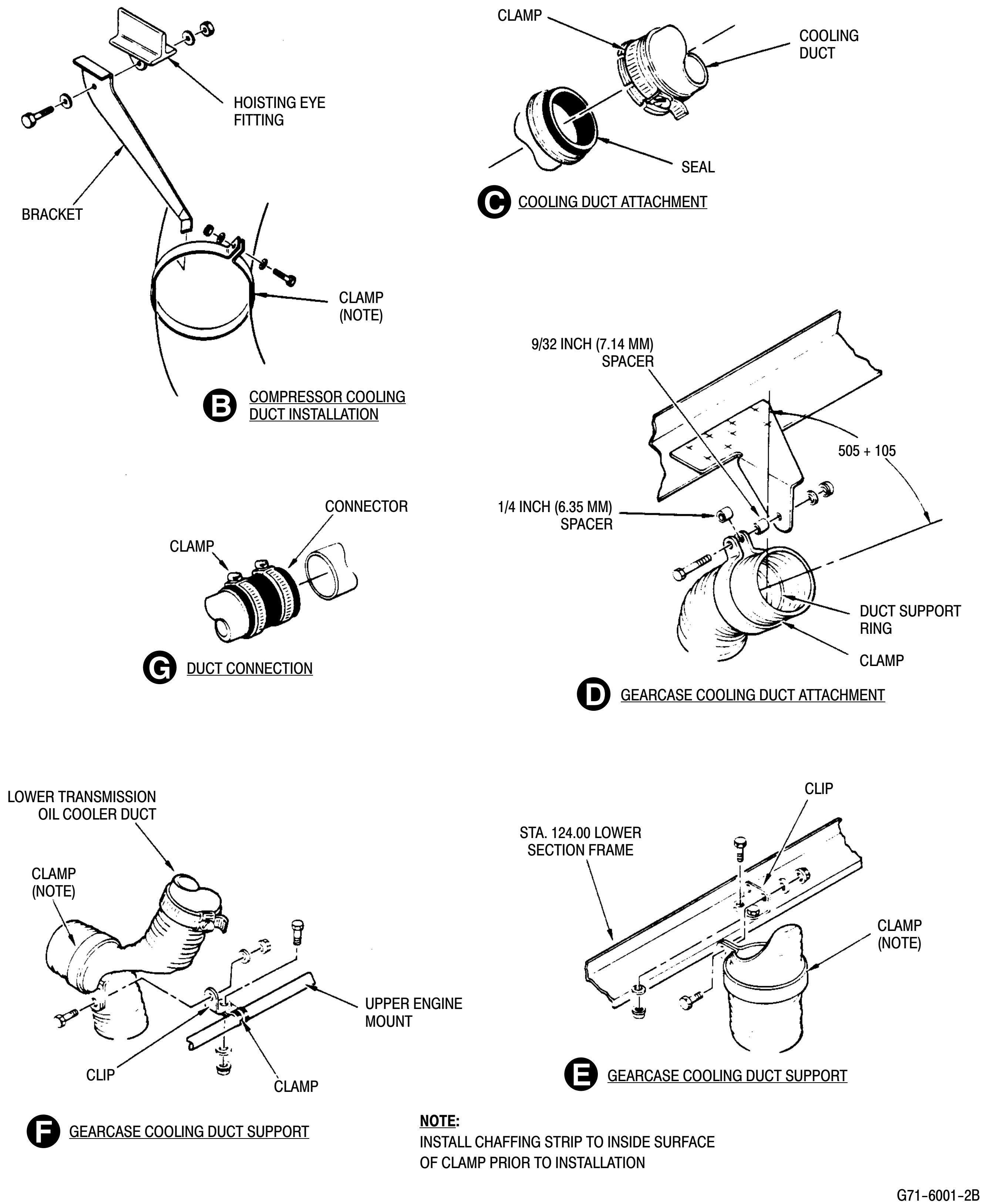


Figure 202. Engine Air Cooling System - 250-C30 and 250-C47 (Sheet 2 of 2)

Chapter

75

Engine Anti-Ice System

TABLE OF CONTENTS

Section

75-10-00

Engine Anti-Icing System (250-C20B, 250-C20R/2, 250-C30 and 250-C47)

ENGINE ANTI-ICING SYSTEM
MAINTENANCE PRACTICES

1. Engine Anti-Icing System Description and Operation

(1). Compressor inlet guide vanes and the front bearing hub are the only components supplied anti-icing air on the helicopter engines.

(2). Model 250-C20B Engines: The anti-ice system consist of a manually operated push-pull control cable, mechanical anti-icing valve, air distribution tubing and, attaching hardware. The poppet-type anti-icing valve is mounted on the engine compressor scroll and controls compressor bleed air used for engine anti-icing. The control cable is assembled of rigid and flexible sections clamped along the right side of the overhead cabin heat duct. Moving the control handle forward opens the anti-icing valve. Control handle travel is approximately 1.44 inches (3.66 cm) from OFF to ON. A detent holds the handle in both ON and OFF positions. There is no intermediate heat position.

(3). Model 250-C20/R2, 250-C30 and 250-C47 Engines: The engine installations use an electrically controlled anti-ice system. Compressor bleed air, supplied to the inlet guide vanes and the number one bearing housing, is controlled by the ANTI-ICE circuit breaker/switch, CB143 on the 369FF - 500/600N, and CB122 on 369D/E helicopters fitted with a 250-C20/R2 engine. Moving the console mounted switch to ANTI-ICE de-energizes a solenoid fastened to the engine heat shield that controls the anti-icing system.

(4). Refer to the applicable Allison engine manual for additional engine anti-ice information.

2. Engine Anti-Icing System Fault Isolation

Table 201. 250-C20B Engine Anti-icing System Fault Isolation

Symptom	Probable Trouble	Corrective Action
Anti-ice ON does not restore normal engine operation when compressor icing occurs.	System not rigged correctly.	Check rigging.
Lack of anti-icing air.	Defective anti-ice air lines.	Check engine air lines for leaks.
	Anti-icing air valve stuck closed.	Replace valve.
	Cable wire sheared.	Replace cable.
	Cable clevis pin sheared or missing.	Replace clevis pin.
Anti-ice OFF has no effect. Inflight symptom is continuation of approximately 10% reduction in available power or torque.	Anti-icing air valve stuck open.	Replace valve.
	Corroded, pinched or crushed cable.	Replace cable.
	Cable clevis pin sheared or missing.	Replace clevis pin.
	Cable wire sheared.	Replace cable.
	Anti-ice air valve compressor scroll adapter nut over-tightened.	Loosen adapter nut. Torque nut to **10 inch-pounds (1.13 Nm).**

Table 201. 250-C20B Engine Anti-icing System Fault Isolation

Symptom	Probable Trouble	Corrective Action
Anti-icing control drags or binds.	Control cable rigid sleeve kinked. One or more flexible cable section bend radii less than 3 inch (7.62 cm) minimum.	Check operation with cable clevis disconnected from anti-ice valve lever. Replace kinked or corroded cable. Increase flexible cable bend radius.
Control handle creeps open or closed.	ON-OFF detent-spring weak or broken.	Replace detent-spring assembly.
	Handle detent grooves worn or dirty.	Clean, repair or replace cable.

Table 202. 250-C20/R2, 250-C30 and 250-C47 Engine Anti-icing System Fault Isolation

Symptom	Probable Trouble	Corrective Action
System ON fails to restore normal engine operation in compressor icing conditions.	Lack of anti-icing air.	Inspect air lines for leaks.
	Inoperative/defective anti-icing valve.	Replace valve.
	Faulty switch or wiring.	Repair or replace switch/wiring as required.
Switching anti-ice OFF has no effect. Inflight symptom is continuation of approximately 10% reduction in available power or torque.	Anti-icing air valve stuck open.	Replace valve.

3. 250-C20B Engine Anti-Icing Valve Control Cable Replacement

A. 250-C20B Engine Anti-Icing Valve Control Cable Removal

(1). Open engine access doors.

(2). Remove right half of engine air inlet forward fairing.

(3). Remove heater duct outer box attaching hardware.

(4). Remove clamps and straps attaching the control cable to structure.

(5). Remove valve lever cable clevis attaching hardware.

(6). Remove the heater duct box, and control cable.

B. 250-C20B Engine Anti-Icing Valve Control Cable Installation

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM430	Sealant, solvent resistant
CM707	Tape, fastener

CAUTION Do not kink cable rigid sleeve section.

(1). Position bulkhead hole grommet on rigid sleeve section.

(2). Install Velcro tape (CM707) on mating surfaces of forward clamp, and block.

(3). Route cable assembly through bulkhead, flexible cable bend radius shall be, not less than 3.00 inches (7.62 cm), minimum.

NOTE: Check valve lever travel before tightening clamp nearest anti-icing valve.

(4). Install cable clamps, straps, and attaching hardware.

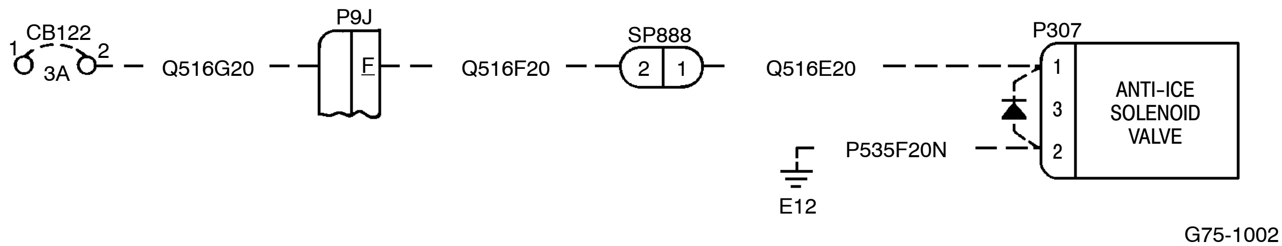


Figure 201. 250-C20/R2, 250-C30 and 250-C47 Engine Anti-Icing System Wiring

(5). Perform an anti-icing system operational check.

(a). Determine that control operates valve through full range of travel from ON to OFF.

(6). Secure clamp nearest anti-icing valve.

(7). Apply sealant (CM430) around engine side of air inlet pan cable hole (Ref. Figure 202).

(8). Move anti-ice handle to OFF. Ensure handle is locked in OFF position by detent.

(9). Move engine anti-ice valve lever to the closed position (poppet plunger down).

(10). Loosen cable clevis jamnut.

NOTE: Do not push, or pull actuator cable to get lever- arm and clevis- pin hole alignment.

(a). Screw clevis up or down cable end-fitting threads to align cable clevis with valve lever-arm pin holes.

(b). Check hole alignment by inserting clevis pin. Remove pin.

(c). Extend cable length by 1 to 2 full counterclockwise turns of clevis.

(11). Install clevis-pin, washer, and cotter-pin.

(12). Tighten clevis jamnut.

(13). Install heat duct outer box.

(14). Adjust handle position parallel to windshield glass using handle set screw, as required.

(15). Install right half of engine air inlet forward fairing.

(16). Close and latch engine access doors.

4. 250-C20/R2, 250-C30 and 250-C47 Engine Anti-Icing System Controls Replacement

(1). Refer to the applicable Allison Maintenance and Operation Manual for anti-ice system maintenance instructions (Ref. Sec. 01-00-00).

(2). Refer to Figure 201 for airframe wiring.

5. 250-C20B Engine Anti-Icing System Inspection

(1). Inspect anti-ice system controls as follows:

(a). Controls for freedom of movement, and control handle detent-spring for positive lock.

(2). Isolate stiff control operation problems as follows:

(a). Disconnect cable clevis from valve lever. Check for binding as control lever is moved from ON to OFF.

1). If control binds, inspect flexible cable length for bend radii less than the three inch minimum. Look for kinks, a crushed outer sleeve, and corrosion.

2). Inspect rigid cable section for corrosion, kinks, and dents.

3). Repair or replace damaged cable.

(3). Inspect anti-icing valve lever assembly for wear, lost motion, and freedom of movement.

(4). Repair or replace system components as required.

6. 250-C20/R2, 250-C30 and 250-C47 Engine Anti-Icing System Inspection

(1). Inspect solenoid valve for secure attachment.

(2). Check wire insulation for abrasion, and connections for security. Repair as required.

(3). Inspect tubes for cracks, and connections for security.

7. 250-C20B Engine Anti-Icing System Test

(1). Test system operation as follows:

(a). Pull control handle ON.

(b). Check control detent locks handle in ON position and does not creep toward OFF.

(c). In engine compartment, check anti-icing air valve as follows:

1). Valve lever is at aft travel limit (valve open), and cable is not distorted by overdrive.

(2). Return control handle to OFF position.

(a). Check control detent locks handle in OFF position and does not creep toward ON.

(b). In engine compartment, check anti-icing valve position:

1). Valve lever is at forward travel limit (valve closed).

(3). Adjust cable to correct insufficient anti-icing valve lever travel or cable distortion.

NOTE: Check that poppet guide, and lever assembly are parallel with top of engine (Ref. Figure 202, view B).

8. 250-C20/R2, 250-C30 and 250-C47 Engines Anti-Icing System Test

(1). Apply external electrical power to the helicopter.

(a). Set battery switch to EXT PWR.

(b). Cycle the engine ANTI ICE switch ON and OFF several times while listening for the clicking sound of the operating poppet valve.

(2). Perform an operational test of the engine anti-icing system as follows.

(a). Start and operate engine per Pilot's Flight Manual.

(b). Increase speed to 103% N_2 rpm.

(c). Watch turbine outlet temperature (TOT) gauge and set anti-ice switch to ANTI ICE position.

1). TOT should increase between 30 to 40°C when anti-icing valve opens. Anything less indicates that the valve is not full open.

(d). Set anti-ice switch OFF.

1). TOT should decrease 30 to 40°C to its original anti-ice OFF value. TOT temperatures higher than the original value indicate that the valve may be stuck open.

(3). Shut down engine per PFM.

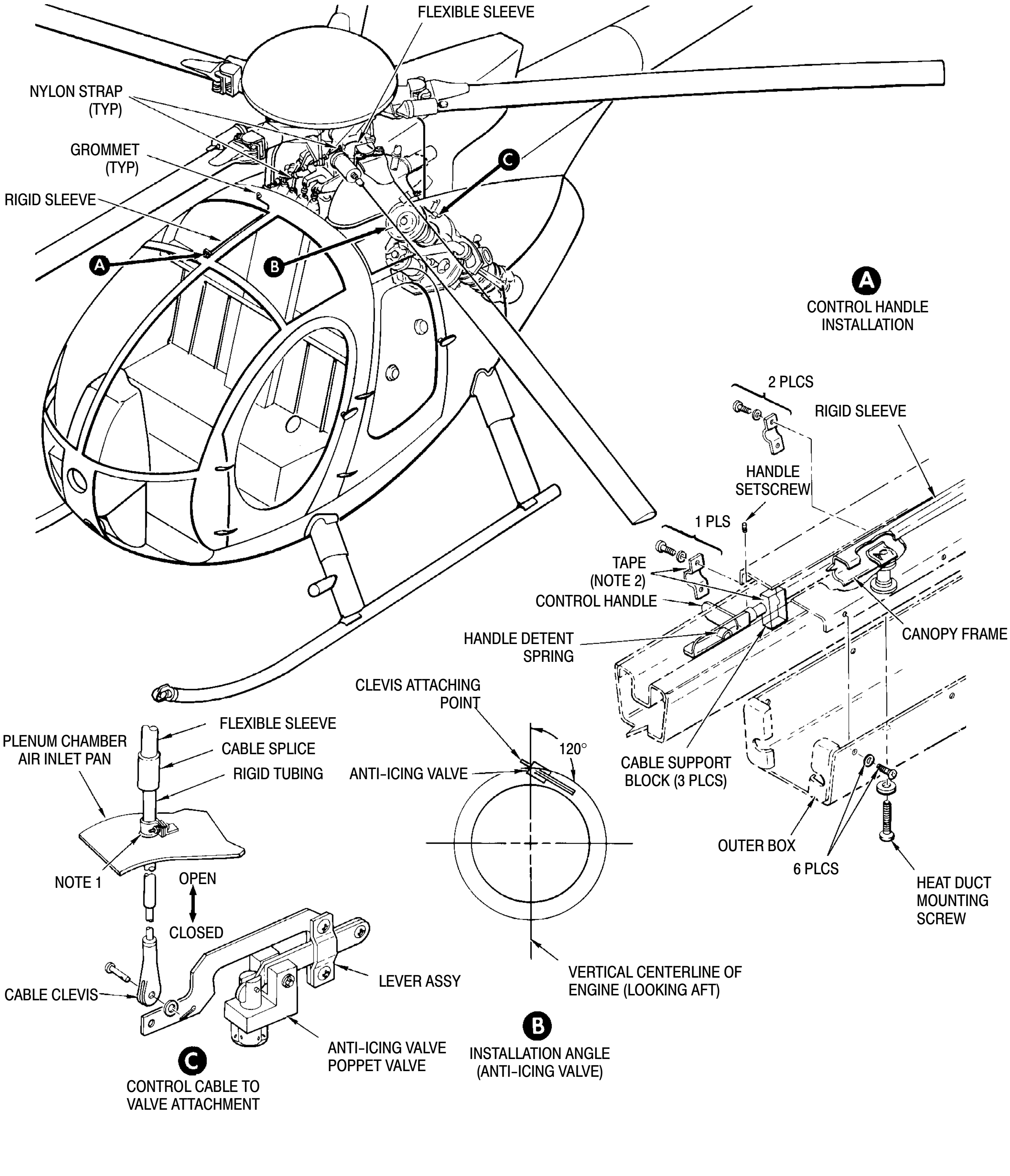
9. 250-C20B Engine Anti-Icing System Control Cable Repair

(1). The control cable assembly is normally replaced as a unit. However, disassembly to the extent shown in the illustrations can be accomplished for inspection purposes (Ref. Figure 202). No repairs are recommended except for replacement of lever mechanism parts.

10. 250-C20/R2, 250-C30 and 250-C47 Engine Anti-Icing Valve Repair

(Ref. Figure 203)

(1). Repair or replace engine anti-icing valve per Allison Engine Operation and Maintenance Manual.



NOTE:

1. SEAL HOLE ON ENGINE SIDE OF PAN WITH ADHESIVE.
2. APPLY VELCRO TAPE TO FORWARD BLOCK AND CLAMP MATING SURFACES.

G75-1000

Figure 202. 250-C20B Engine Anti-Icing System

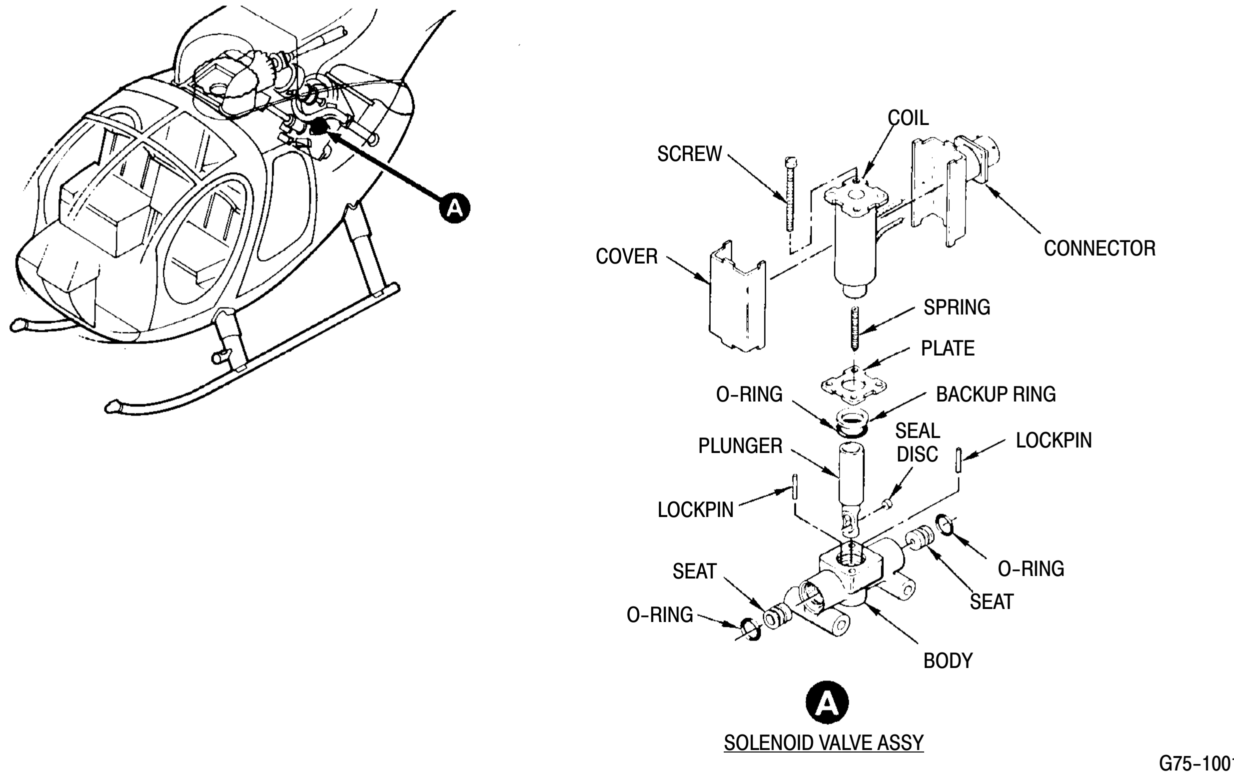


Figure 203. 250-C20/R2, 250-C30 and 250-C47 Engine Anti-Icing Control Valve

Chapter

76

Engine Power Controls

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Section

76-00-00

Engine Power Controls (250-C20B, 250-C20R/2 and 250-C30)

ENGINE POWER CONTROLS DESCRIPTION AND OPERATION

1. Engine Power Controls Description and Operation

(1). The engine control system consists of gas producer (N_1) throttle controls and power turbine (N_2) governor controls. The throttle twist grip mechanically actuates a lever on the gas producer fuel control that establishes a base line from which the unit schedules metered fuel to the gas producer portion of the engine. An electrically operated trim actuator and mechanical rpm droop compensator in the main rotor collective pitch control mechanism changes power turbine governor lever position when collective is increased or reduced and when N_2 speed increase or decrease is commanded with the beep switch on the collective stick. Either, or both actions regulate power output by biassing the gas producer fuel control to increase or decrease fuel flow to compensate for rotor system torque requirements.

(2). Refer to the applicable Allison Engine Operation and Maintenance Manual for additional engine fuel system theory, operation and maintenance data.

A. Power Turbine Governor Controls

(1). Power turbine governor (N_2) controls include the N_2 trim actuator controlled by the beep switch on the pilot's collective stick. Governor trim droop control override components and linkages are installed within the pilot's seat structure. A fuselage routed control rod assembly, engine compartment linkages, bellcranks and supports transfer motion to the power turbine governor. A droop control override spring compensates for over-travel in maximum collective pitch/speed conditions.

B. Power Turbine Governor Trim Actuator

(1). The actuator consists of a reversible continuous duty 26Vdc motor and gear train driving a ram equipped with an adjustable rod-end. The actuator, operated by an N_2 trim (beep) switch on the collective pitch stick, moves governor linkage that varies engine N_2 speed from 94 to 105% rpm. Operating stroke of the actuator ram is approximately 1.00 inch (2.54 cm); speed is 0.15 inch (3.81 mm) per second; travel time from full retraction to full extension is approximately 7 seconds. The actuator is lubricated when manufactured and requires no further lubrication service.

C. Gas Producer Controls

(1). The gas producer portion of the engine is controlled by the pilot's throttle twist grip which effects gas producer fuel control lever position through a system of torque tubes, gears, push-rods, bellcranks, bellcrank support fittings, levers and attaching hardware (Ref. Figure 1).

(2). Refer to Allison Engine Operation and Maintenance Manual for engine fuel system theory, operation and maintenance data.

D. Rigging

(1). Rig engine control system prior to the next flight when engine operation reveals a rigging problem, or after replacing any system component.

NOTE: Perform a deceleration time check per pilot's flight manual after rigging and testing power turbine controls. Refer to Allison Operation and Maintenance Manual for adjustment procedures if deceleration time is less than allowable minimum.

(2). Rig gas producer controls per (Ref. Sec. 76-20-00).

(3). Rig power turbine governor controls per (Ref. Sec. 76-10-00).

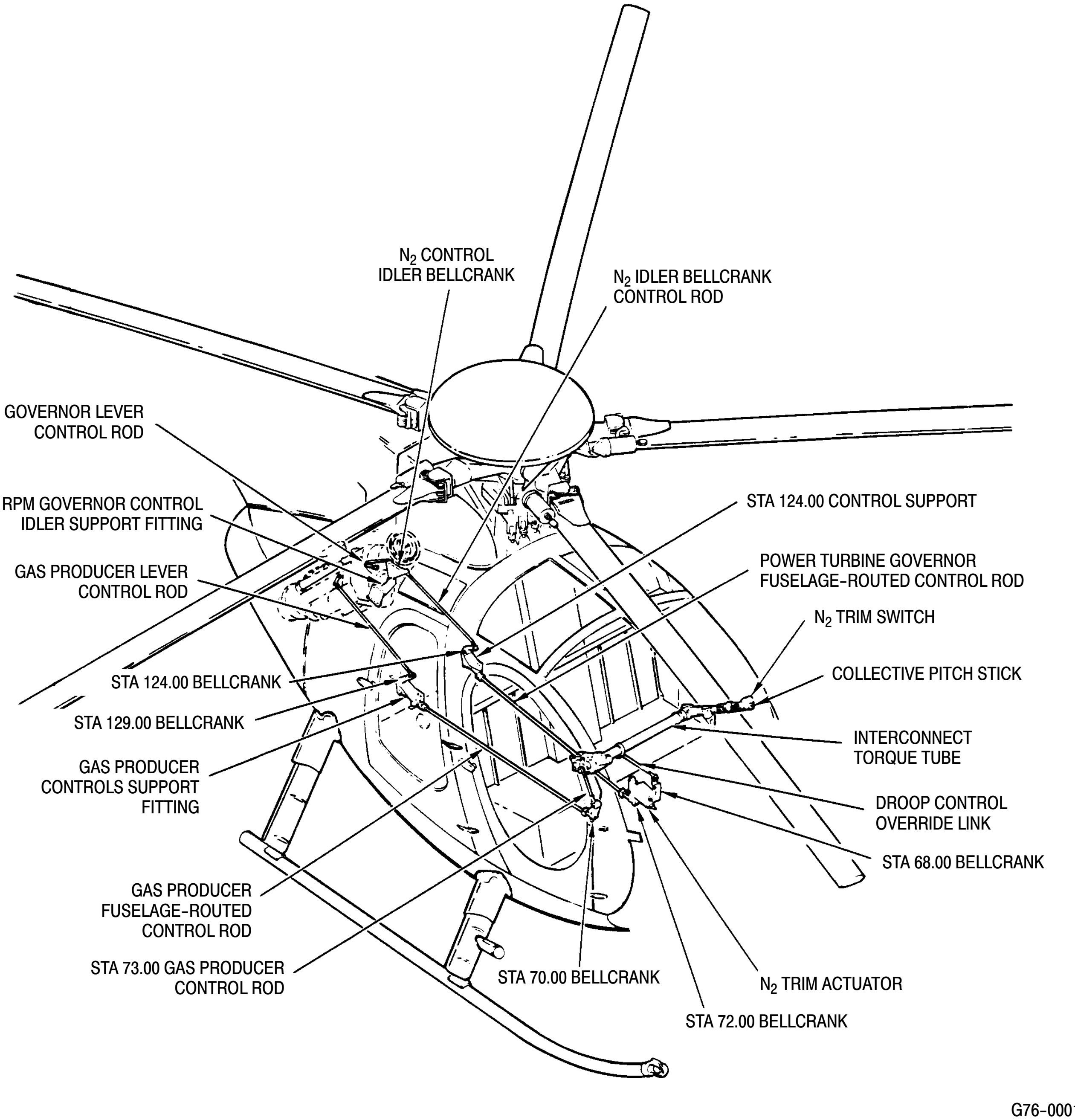


Figure 1. Engine Control Systems

ENGINE POWER CONTROLS FAULT ISOLATION

1. Engine Power Controls Fault Isolation

Table 101. Engine Control Fault Isolation

Symptom	Probable Trouble	Corrective Action
Throttle movement springy; response lags behind control movement.	Lost motion; gas producer interconnect torque tube loose in collective stick gear shafts.	Tighten torque tube pipe plug for zero backlash.
	Worn rod-ends; worn bellcrank bearings.	Replace worn parts.
Stiff control action.	Rod-ends binding/jammed.	Realign rod-end bearings to eliminate jamming.
Low power; improper idling speed; improper acceleration; variable power output at constant setting.	Incorrectly adjusted gas producer or power turbine governor controls.	Adjust gas producer or power turbine governor controls for correct operation.
	Defective gas producer or power turbine governor assembly.	Replace faulty unit per Allison Engine Operation and Maintenance Manual.
Stagnated or hot engine starts.	Fuel control derichment valve out of adjustment.	Adjust derichment valve.
Excessive TOT readings during engine shutdown.	Engine controls out of adjustment.	Adjust engine controls per the applicable Allison manual.
	Fuel cut-off valve not closing.	Adjust, repair or replace gas producer control per Allison manual.

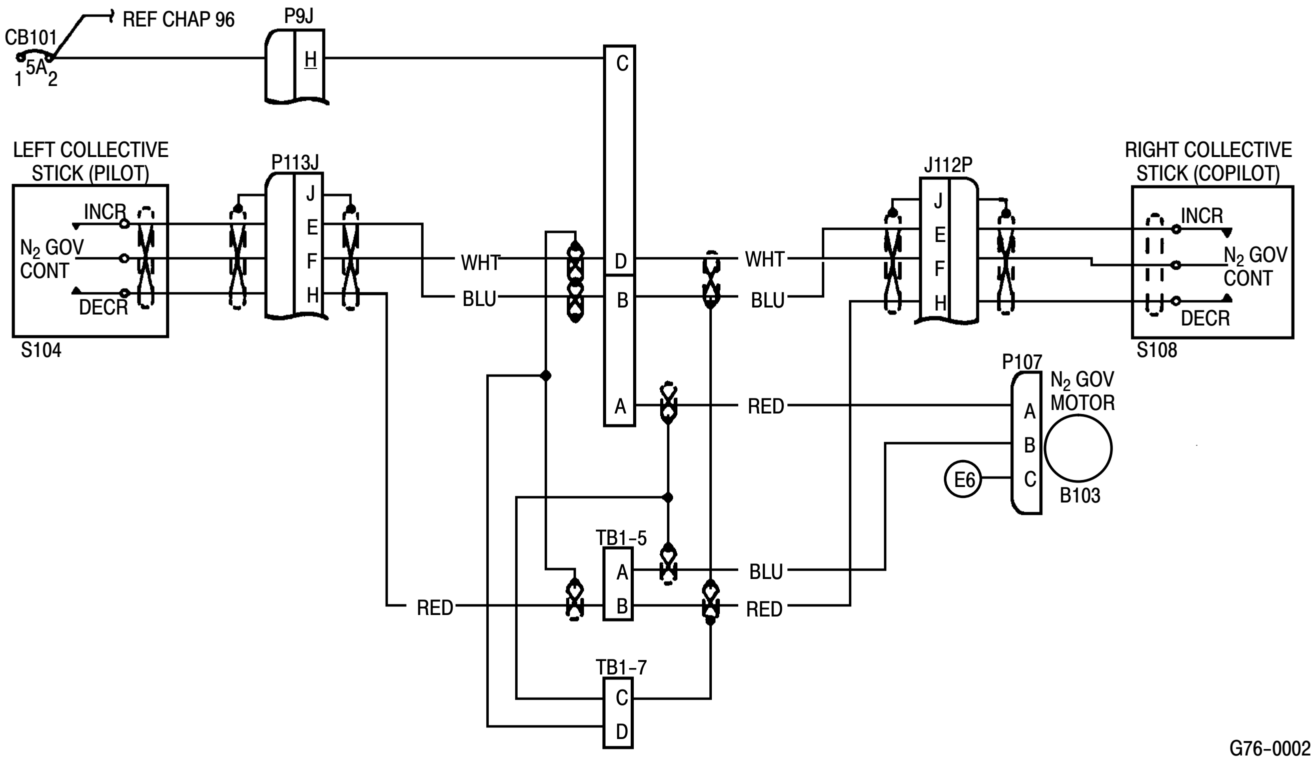


Figure 101. N_2 Trim Actuator Wiring Schematic

Section

76-10-00

Power Turbine Governor Controls (250-C20B, 250-C20R/2 and 250-C30)

POWER TURBINE GOVERNOR CONTROLS MAINTENANCE PRACTICES

1. Engine Governor Control Rigging

(Ref. Figure 201)

NOTE: The rigging procedures for the C20B, C20R/2 and C30 engine controls are similar, differing mostly in adjustments.

CAUTION

- Do not make any adjustments to governor stops, adjustment screws or nut positions.
- Replace worn linkage components prior to rigging engine controls or adjusting engine fuel controls. Several worn rod-end, fitting and bellcrank bearings in the governor control system compound otherwise minimal lost motion. Loose control systems will not hold rigging adjustments, and if continued in service may result in engine power creep, hunting or flame out.

NOTE: Gas producer throttle control tube, interconnect torque tube, collective pitch stick, interconnecting collective pitch torque tube and linkage maintenance practices are covered under ‘Main Rotor Flight Controls’ (Ref. Sec. 67-10-00) and ‘Gas Producer Controls’ (Ref. Sec. 76-20-00).

(1). Disconnect control rod between idler bellcrank and governor lever at idler bellcrank. Secure rod to avoid damage.

CAUTION

- 250- C20R/2 engines equipped with a 2524667-13 engine governor require removal of the 369A7717-5 droop compensation adjustment fork and installation of the longer 369A7717- 3 fork to achieve the necessary 1/2% to 1% droop compensation (approximately 2% for 500N).
- 250- C30 engine installations may require replacement of the 369A7717- 3 droop compensation adjustment fork to the longer 369A7717- 7 fork to achieve the necessary 1/2% to 1% droop compensation. Upon installation of the longer 369A7717- 7 fork assembly, ensure that no interference occurs between the collective torque tube and the 369A7712 link assembly. Also check between the protruding end of the droop fork and N_2 actuator.
- To identify forks with obscured part numbers, measure distance between threaded shank end-flat to clevis bolt hole center:
  <u>369A7717-3 fork</u>:
  3.00 inches (76.20 mm)
  <u>369A7717-5 fork</u>:
  2.63 inches (66.802 mm)
  <u>369A7717-7 fork</u>:
  3.87 inches (98.298 mm).

(2). Set the initial reference dimension between center of Sta. 68.00 bellcrank pivot bolt and droop compensation fork clevis bolt-center.

Droop Fork Settings		
Engine Installation	Length In.	(mm)
250-C20B	2.20 ±0.03	(55.880 ±0.762)
250-C20R/2	2.20 ±0.03	(55.880 ±0.762)
250-C20R/2 (1)	2.50 ±0.03	(63.500 ±0.762)
250-C30	(2)	

(1) With 2524667-13 governor

(2) 3.40 ±0.03 inches (86.360 ±0.762 mm) with 369A7717-7 ext. fork and 369A7704 bellcrank
2.60 ±0.03 inches (66.040 ±0.762 mm) with 369A7717-3 ext. fork and 369A7704-7 bellcrank

NOTE:

- Make control rod-end adjustments to the nearest half turn that produces correct rigging.
- Stabilize rod-end with a backup wrench when torquing rod-end jamnut.
- Inspect rod- end thread engagement through witness hole to ensure a safe, secure installation.

(3). Connect 28Vdc external power. Reset N_2 GOV circuit breaker. Set battery switch to EXT PWR.

(4). With pilot's collective stick the FULL DOWN position, beep N_2 actuator to maximum extension. Adjust actuator ram as required to get 5.47 ±0.03 inches (138.938 ±0.762 mm) measured between pivot bolt-centers.

(5). Adjust fuselage-routed governor control rod length to move Sta. 124.00 bellcrank. The lower arm pivot bolt-center measurement from the firewall should be set to the applicable engine installation as indicated below.

Station 124 Bellcrank Setting		
Engine Installation	Setting In.	(mm)
250-C20B, R/2 (Multi-Engine)	3.63 ±0.03	(92.20 ±0.762)
250-C30 (Current)	3.34 ±0.03	(84.84 ±0.762)
250-C30 (Early)	3.75 ±0.03	(95.25 ±0.762)

(6). In engine compartment; set idler bellcrank control rod length to the proper engine installation as indicated below.

Idler Bellcrank Control Rod Setting		
Engine Installation	Length In.	(mm)
250-C20B, R/2	14.38 ±0.03	(365.252 ±0.762)
250-C30	13.70 ±0.03	(347.980 ±0.762)

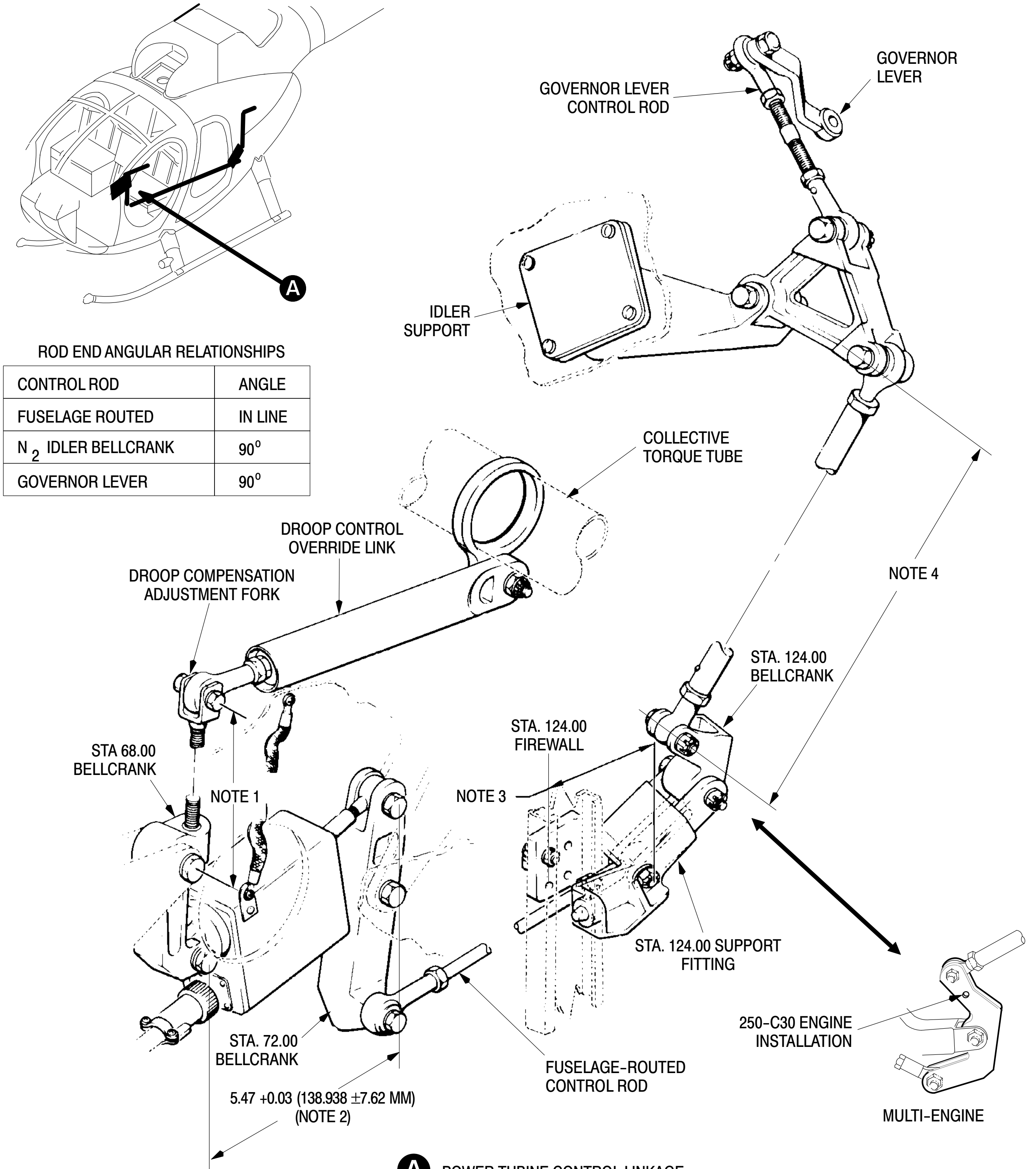
(7). Verify that collective is FULL DOWN and governor trim actuator is at maximum extension.

(8). Check governor lever and pointer position, as follows.

CAUTION Governor and fuel control levers can be installed on the wrong fuel system component shaft. Governor lever is relatively short with an offset angle of about 65°. Fuel control lever offset angle is a more moderate 38°.

NOTE:

- Specified pointer/lever angular relationships are standard production settings. Slight variations in position may be required to obtain proper travel and satisfactory engine operation. Such variation is acceptable provided all other rigging and engine performance requirements are met.
- Governor lever travel produced by trim actuator operation, from forward travel point (trim actuator retracted and collective stick down) to aft travel point (trim actuator extended and collective stick down), is 31° to 32°. Approximately 36° to 38° of governor lever travel from minimum N_2 stop is unused.



ROD END ANGULAR RELATIONSHIPS

CONTROL ROD	ANGLE
FUSELAGE ROUTED	IN LINE
N_2 IDLER BELLCRANK	90°
GOVERNOR LEVER	90°

NOTES:

INITIAL SETTINGS.
1. DROOP FORK.
2. N_2 ACTUATOR RAM.
3. STA. 124.00 BELLCRANK.
4. IDLER BELLCRANK CONTROL ROD.

G76-1002B

Figure 201. Power Turbine Governor Controls Rigging

2. Governor Lever Pointer Rigging for 250-C20B (P/N 2524769-10 and Prior)

(Ref. Figure 202)

(1). Reposition the lever arm only, not the pointer, one serration (15°) counterclockwise from pointer centerline.

CAUTION Do not overtorque governor control lever nut. Exceeding nut torque limit may cause binding.

(2). Torque lever nut to **40 - 50 inch-pounds (4.52 - 5.65 Nm)** while holding lever center screw with a hex wrench. Apply a torque stripe.

(3). Verify collective stick is FULL DOWN and governor actuator is at maximum extension.

(4). Connect short control rod between idler bellcrank and governor control arm. Adjust the rod to locate the N_2 pointer between the letters P and E of the word SPEED embossed on the governor.

(5). Raise the pilot's collective stick until the Sta. 124.00 bellcrank bottoms on support and ensure the governor pointer shifts to between the letters E and D of the word SPEED on the governor.

NOTE:

- The pointer control arm shall not hit the mechanical stops.
- As stick is raised, the Sta. 124.00 bellcrank will bottom out on the support and until it reaches FULL UP travel, the droop control override spring will compress.

(6). Bottom collective stick and beep N_2 trim to minimum; The governor pointer shifts back to approximately the first vertical leg of the letter **N** of N_2 on the governor.

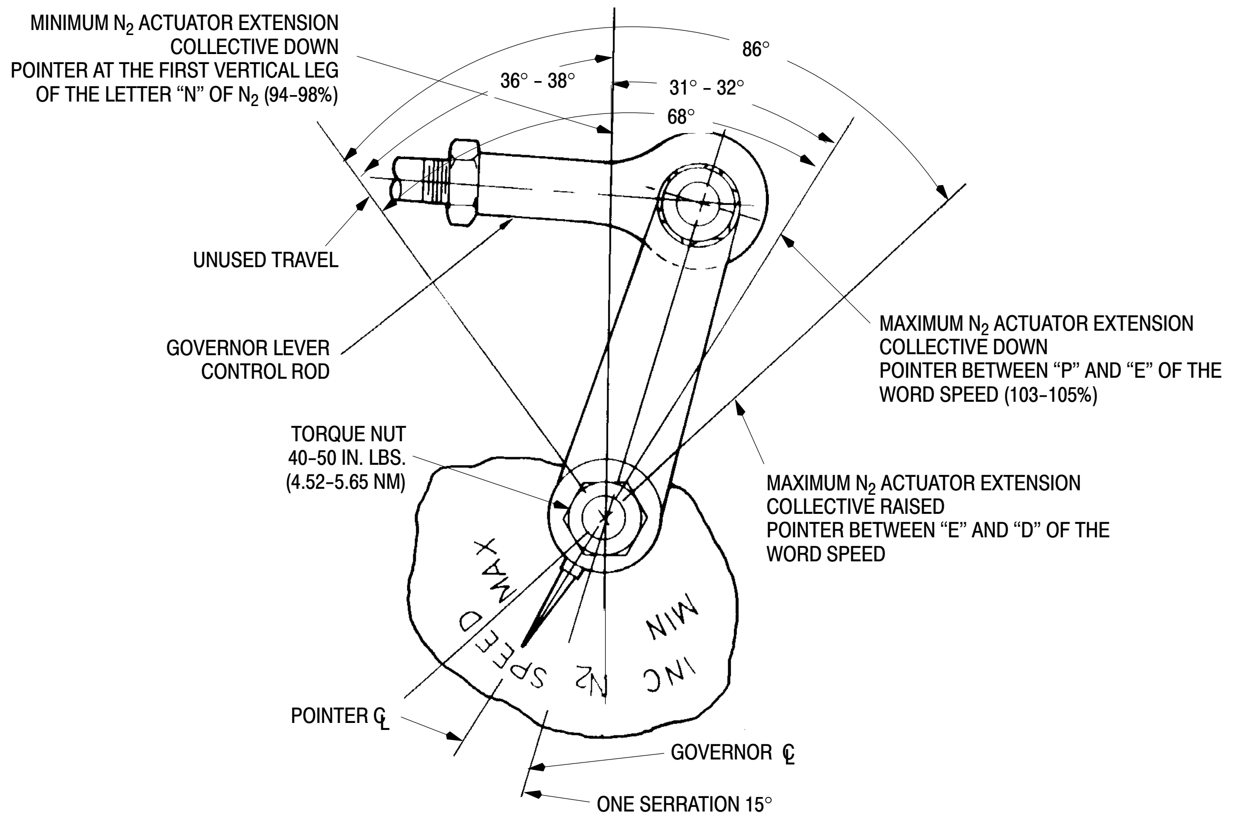
CAUTION If any interference exists at governor lever, check that correct lever is installed.

(7). Verify that all jamnuts, bolts, nuts, lockwire and cotter pins are properly installed and secured.

(8). Pull the N_2 GOV circuit breaker reset button, as required.

(9). Set the battery switch OFF.

(10). Shut down and disconnect external power.



NOTE:
DROOP CONTROL OVERRIDE LINK SPRING STARTS TO COMPRESS; ARM IS NOT REQUIRED TO HIT MAXIMUM STOP WITH FULL COLLECTIVE AND ACTUATOR EXTENDED.

G76–1004A

Figure 202. Power Turbine Governor Adjustments (P/N 2524769-10 and Prior)

3. Governor Lever Pointer Rigging for 250-C20B / -C20R2 (P/N 2524769-11, -12)

(Ref. Figure 203)

(1). Position the governor lever arm in line with the pointer.

CAUTION Do not overtorque governor control lever nut. Exceeding nut torque limit may cause binding.

(2). Torque lever nut to **40 - 50 inch-pounds (4.52 - 5.65 Nm)** while holding lever center screw with a hex wrench. Apply a torque stripe.

(3). Verify collective stick is FULL DOWN and governor actuator is at maximum extension.

(4). Connect short control rod between idler bellcrank and governor control arm. Adjust the rod to locate the N_2 pointer between the letters S and P of the word SPEED embossed on the governor.

(5). Raise the pilot's collective stick until the Sta. 124.00 bellcrank bottoms on support and ensure the governor pointer shifts to a position approximately aligning with the vertical leg in the first letter E in the word SPEED on the governor.

NOTE:

- The pointer control arm shall not hit the mechanical stops.
- As stick is raised, the Sta. 124.00 bellcrank will bottom out on the support and until it reaches FULL UP travel, the droop control override spring will compress.

(6). Bottom collective stick and beep N_2 trim to minimum; The governor pointer shifts back to approximately the first vertical leg of the letter R of INCR on the governor.

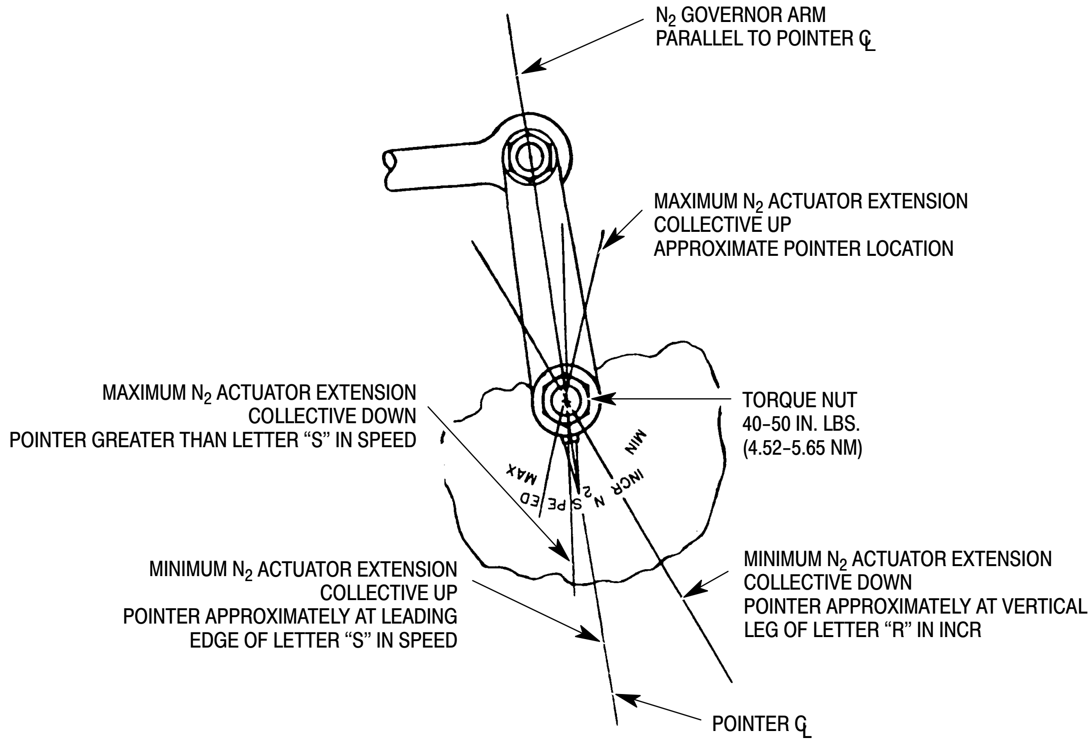
CAUTION If any interference exists at governor lever, check that correct lever is installed.

(7). Verify that all jamnuts, bolts, nuts, lockwire and cotter pins are properly installed and secured.

(8). Pull the N_2 GOV circuit breaker reset button, as required.

(9). Set the battery switch OFF.

(10). Shut down and disconnect external power.



NOTE:
DROOP CONTROL OVERRIDE LINK SPRING STARTS TO COMPRESS; ARM IS NOT REQUIRED TO HIT MAXIMUM STOP WITH FULL COLLECTIVE AND ACTUATOR EXTENDED.

ACCORDING TO STA. 124.00 BELLCRANK INSTALLATION, POINTER LOCATIONS ARE APPROXIMATE.

G76–1005B

Figure 203. Power Turbine Governor Adjustments (P/N 2524769-11, -12)

4. Governor Lever Pointer Rigging for 250-C20B / -C20R/2 (P/N 2524667-13)

(Ref. Figure 204)

(1). Position the governor lever arm in line with the pointer.

CAUTION Do not overtorque governor control lever nut. Exceeding nut torque limit may cause binding.

(2). Torque lever nut to **40 - 50 inch-pounds (4.52 - 5.65 Nm)** while holding lever center screw with a hex wrench. Apply a torque stripe.

(3). Verify collective stick is FULL DOWN and governor actuator is at maximum extension.

(4). Connect short control rod between idler bellcrank and governor control arm. Adjust the rod to locate the N_2 pointer greater than the letter P in the word SPEED embossed on the governor.

(5). Raise the pilot's collective stick until the Sta. 124.00 bellcrank bottoms on support and ensure the governor pointer is greater than the second letter E in the word SPEED on the governor.

NOTE:

- The pointer control arm shall not hit the mechanical stops.
- As stick is raised, the Sta. 124.00 bellcrank will bottom out on the support and until it reaches FULL UP travel, the droop control override spring will compress.

(6). Bottom collective stick and beep N_2 trim to minimum; The governor pointer shifts back to approximately the aft end of the letter R of INCR on the governor.

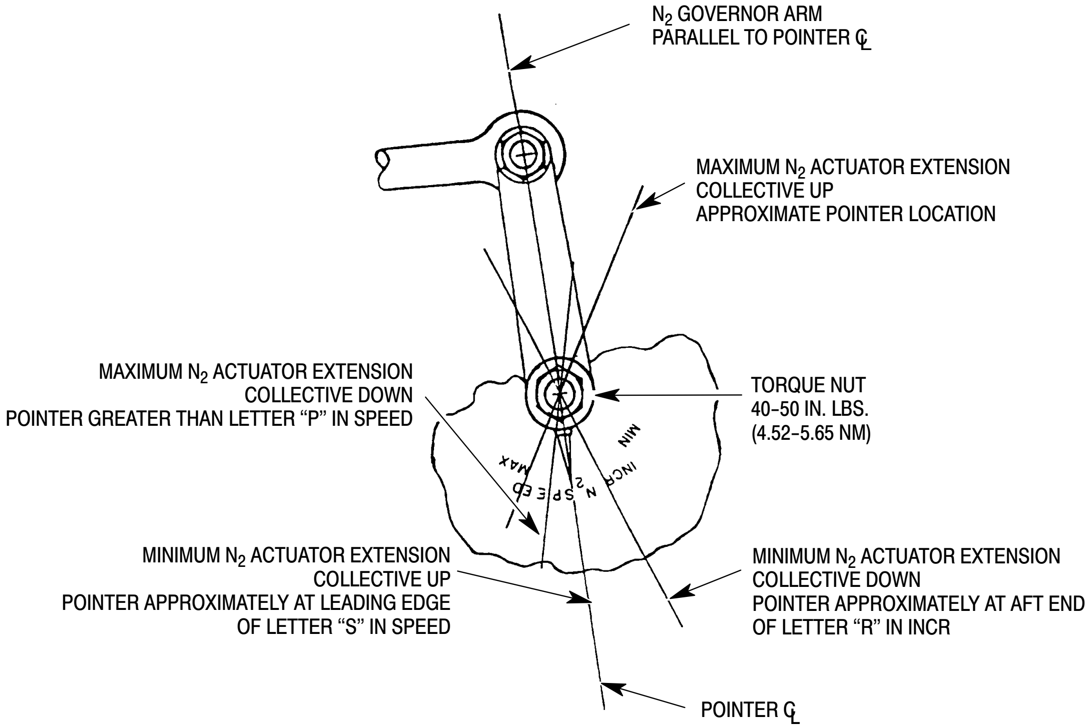
CAUTION If any interference exists at governor lever, check that correct lever is installed.

(7). Verify that all jamnuts, bolts, nuts, lockwire and cotter pins are properly installed and secured.

(8). Pull the N_2 GOV circuit breaker reset button, as required.

(9). Set the battery switch OFF.

(10). Shut down and disconnect external power.



NOTE:
DROOP CONTROL OVERRIDE LINK SPRING STARTS TO COMPRESS; ARM IS NOT REQUIRED TO HIT MAXIMUM STOP WITH FULL COLLECTIVE AND ACTUATOR EXTENDED.

ACCORDING TO STA. 124.00 BELLCRANK INSTALLATION, POINTER LOCATIONS ARE APPROXIMATE.

G76-1010B

Figure 204. Power Turbine Governor Adjustments (P/N 2524667-13)

5. Governor Lever Pointer Rigging for 250-C20B (P/N 2524667-14 and Higher, and P/N 2524769-13 and Higher)

(Ref. Figure 205)

(1). Position the governor lever arm, not the pointer, to the first serration counterclockwise from pointer centerline.

CAUTION Do not overtorque governor control lever nut. Exceeding nut torque limit may cause binding.

(2). Torque lever nut to **40 - 50 inch-pounds (4.52 - 5.65 Nm)** while holding lever center screw with a hex wrench. Apply a torque stripe.

(3). Verify collective stick is FULL DOWN and governor actuator is at maximum extension.

(4). Connect short control rod between idler bellcrank and governor control arm. Adjust the rod to locate the N_2 pointer at 69° ±3°.

(5). Raise the pilot's collective stick until the Sta. 124.00 bellcrank bottoms on support and ensure the governor pointer is approximately at 81°.

NOTE:

- The pointer control arm shall not hit the mechanical stops.
- As stick is raised, the Sta. 124.00 bellcrank will bottom out on the support and until it reaches FULL UP travel, the droop control override spring will compress.

(6). Bottom collective stick and beep N_2 trim to minimum; The governor pointer shifts back to 38° ±3°.

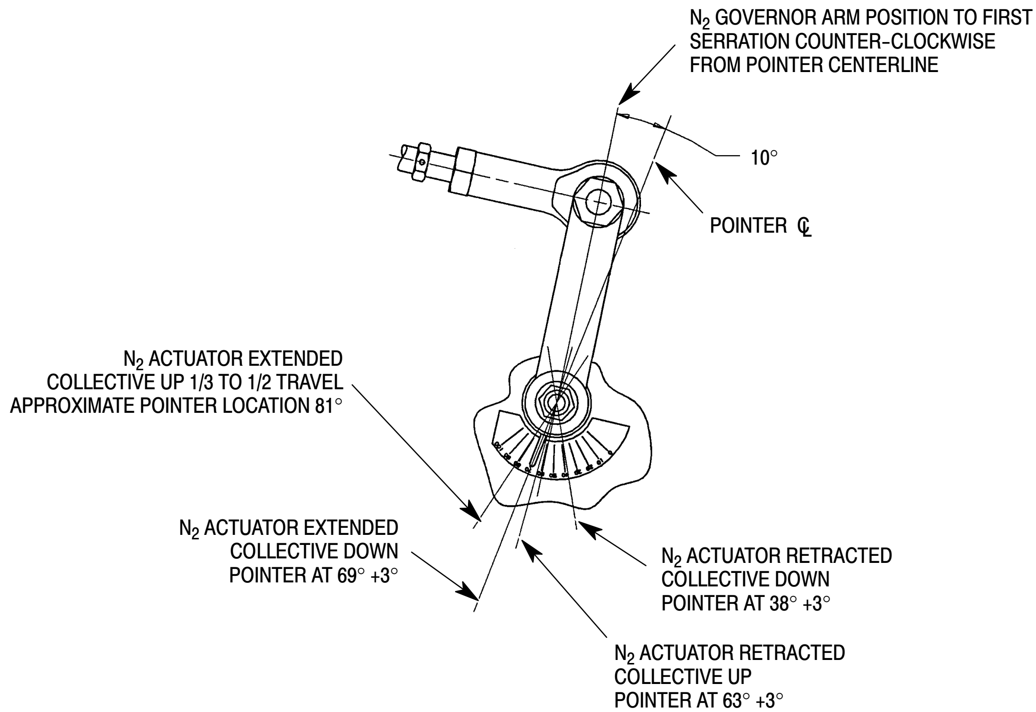
CAUTION If any interference exists at governor lever, check that correct lever is installed.

(7). Verify that all jamnuts, bolts, nuts, lockwire and cotter pins are properly installed and secured.

(8). Pull the N_2 GOV circuit breaker reset button, as required.

(9). Set the battery switch OFF.

(10). Shut down and disconnect external power.



NOTE:
DROOP CONTROL OVERRIDE LINK SPRING STARTS TO COMPRESS; ARM IS NOT REQUIRED TO HIT MAXIMUM STOP WITH FULL COLLECTIVE AND ACTUATOR EXTENDED.

ACCORDING TO STA. 124.00 BELLCRANK INSTALLATION, POINTER LOCATIONS ARE APPROXIMATE.

-14GOV - C20B

Figure 205. Power Turbine Governor Adjustments (P/N 2524667-14 and Higher, and P/N 2524769-13 and Higher on 250-C20B Engine)

6. Governor Lever Pointer Rigging for 250-C20R/2 (P/N 2524667-14 and Higher, and P/N 2524769-13 and Higher)

(Ref. Figure 206)

(1). Position the governor lever arm, not the pointer, to the first serration counterclockwise from pointer centerline.

CAUTION Do not overtorque governor control lever nut. Exceeding nut torque limit may cause binding.

(2). Torque lever nut to **40 - 50 inch-pounds (4.52 - 5.65 Nm)** while holding lever center screw with a hex wrench. Apply a torque stripe.

(3). Verify collective stick is FULL DOWN and governor actuator is at maximum extension.

(4). Connect short control rod between idler bellcrank and governor control arm. Adjust the rod to locate the N_2 pointer at 77° ±3°.

(5). Raise the pilot's collective stick until the Sta. 124.00 bellcrank bottoms on support and ensure the governor pointer is approximately at 94°.

NOTE:

- The pointer control arm shall not hit the mechanical stops.
- As stick is raised, the Sta. 124.00 bellcrank will bottom out on the support and until it reaches FULL UP travel, the droop control override spring will compress.

(6). Bottom collective stick and beep N_2 trim to minimum; The governor pointer shifts back to 44° ±3°.

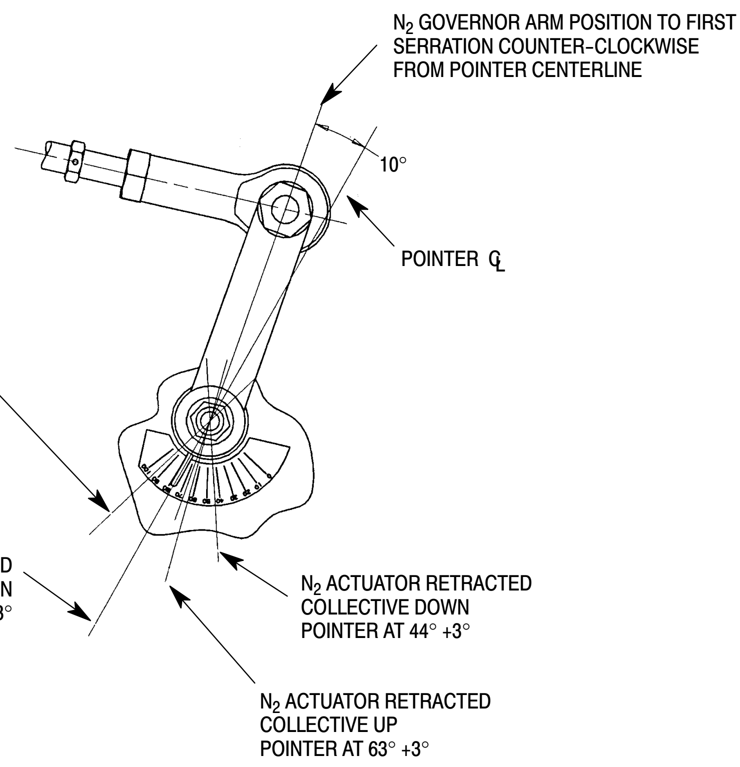
CAUTION If any interference exists at governor lever, check that correct lever is installed.

(7). Verify that all jamnuts, bolts, nuts, lockwire and cotter pins are properly installed and secured.

(8). Pull the N_2 GOV circuit breaker reset button, as required.

(9). Set the battery switch OFF.

(10). Shut down and disconnect external power.



NOTE:

DROOP CONTROL OVERRIDE LINK SPRING STARTS TO COMPRESS; ARM IS NOT REQUIRED TO HIT MAXIMUM STOP WITH FULL COLLECTIVE AND ACTUATOR EXTENDED.

ACCORDING TO STA. 124.00 BELLCRANK INSTALLATION, POINTER LOCATIONS ARE APPROXIMATE.

–14GOV – C20R2

Figure 206. Power Turbine Governor Adjustments (P/N 2524667-14 and Higher, and P/N 2524769-13 and Higher on 250-C20R/2 Engine)

7. Governor Lever Pointer Rigging for 250-C30

(Ref. Figure 207)

(1). At the governor unit position the governor lever to within 10 degrees parallel with the pointer arm.

CAUTION Do not overtorque governor control lever nut. Exceeding nut torque limit may cause binding.

(2). Torque lever nut to **40 - 50 inch-pounds (4.52 - Nm)** while holding lever center screw with a hex wrench. Apply a torque stripe.

(3). Verify that collective is FULL DOWN and governor trim actuator is at minimum extension.

(4). Adjust governor lever control rod link so that the governor pointer points to 20° mark on the N_2 governor plate.

(5). Raise the pilot's collective stick, minimum beep, and check that pointer is at is at the 35° mark on the in the N_2 governor plate.

NOTE:

- If pointer is above 35° mark, lengthen the 369A7706 rod. If the pointer is below the 35° mark, shorten the rod. After adjusting rod, repeat steps (3). and (4)..
- Specified pointer/lever angular relationships are standard production settings. Slight variations may be required to obtain proper travel and satisfactory engine operation. Variations are acceptable provided all engine performance requirements are met.

(6). Move collective stick FULL DOWN. Beep governor trim actuator to maximum extension. The pointer will point to approximately the 50° mark.

(7). Raise the collective stick until Sta. 124.00 bellcrank bottoms on support, the pointer will point approximately the 58° mark.

NOTE: The control arm of the pointer should not hit the mechanical stops.

(8). Continue raising the pilot's collective stick; droop control override spring compression continues to increase until the stick reaches FULL UP. The governor pointer should remain approximately stationary on the 58° mark.

(9). Verify that all jamnuts are torqued to **25 - 30 inch-pounds (2.82 - 3.39 Nm)**. Check all bolts, nuts and cotter pins for proper installation and security.

(10). Pull the N_2 GOV circuit breaker reset button, as required.

(11). Set the battery switch OFF.

(12). Shut down and disconnect external power.

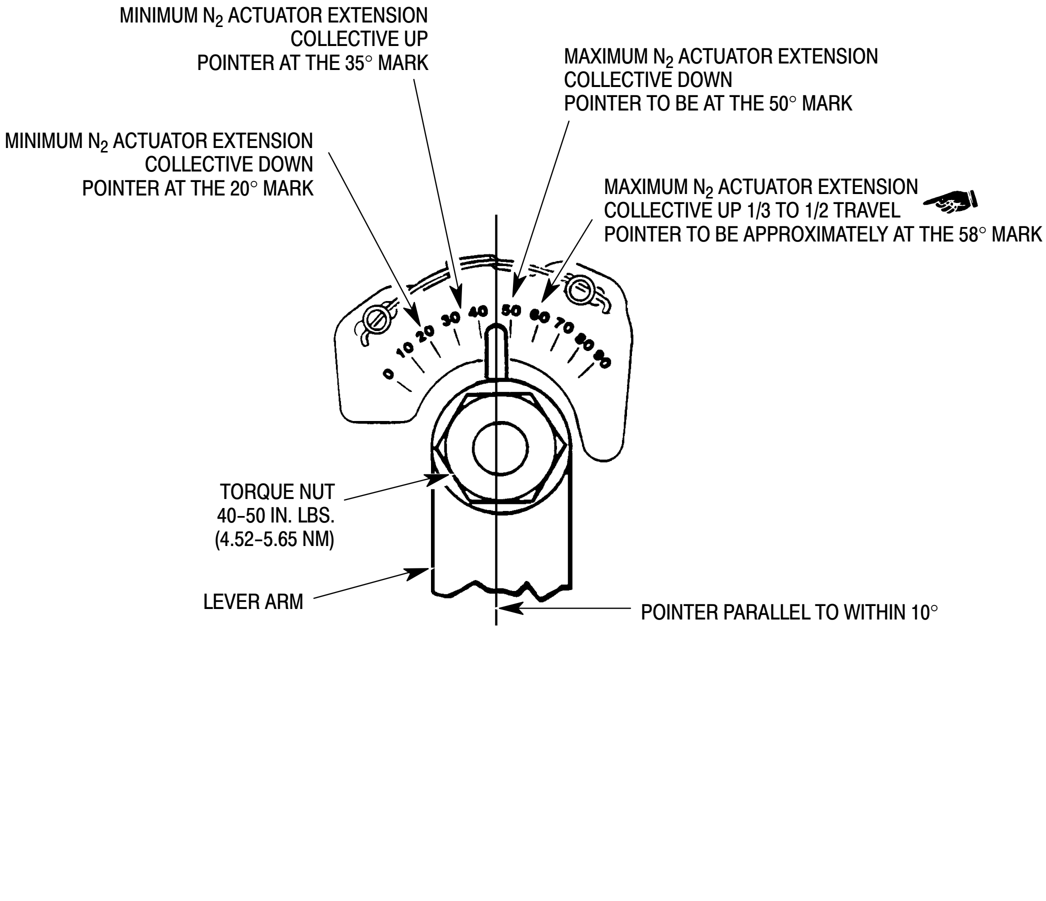


Figure 207. Power Turbine Governor Adjustments (250-C30 Engine)

8. Governor Controls Final Check and Adjustment (250-C20B, -C20R/2)

(1). Have an assistant move collective through full range of travel while inspecting all movable linkage for clearance with adjacent parts. Check that control rod, N_2 actuator and override link bearings are not jammed when linkage is at extreme control positions.

(2). Start and operate engine at idle with main rotor blades in flat pitch per Pilot's Flight Manual.

(3). Decrease N_2 trim to minimum.

(4). Throttle up to maximum rpm.

(5). Observe N_2 tachometer pointer for (94% - 98% rpm: 369D/E) (94% or less: 500N) when rotor rpm pointer is superimposed on N_2 pointer and N_1 tachometer pointer is stabilized.

(6). Check for the following engine power out (EPO) indications:

(a). Engine-out flashing light.

(b). Audio signal in headset.

(c). Horn; sounds when N_2 pointer on dual indicator is stable.

(7). With collective stick down, increase N_2 trim to (104% rpm, 105% maximum: 369D/E) (103% rpm, 104% maximum: 500N). Observe N_2 tachometer pointer when rotor rpm pointer is superimposed on N_2 pointer and N_1 tachometer pointer is stabilized.

(8). Without decreasing N_2 trim, rotate pilot's throttle to ground idle.

NOTE: Perform a deceleration time check per PFM after rigging and testing power turbine controls. Refer to Allison Operation and Maintenance Manual for adjustment procedures if deceleration time is less than allowable minimum.

(9). Shut down engine per Pilot's Flight Manual.

WARNING **Make all engine compartment control rod adjustments with engine shut down.**

(10). Mark N_2 lever position on governor quadrant.

(11). Connect external electric power.

(12). With collective at bottom stop, beep N_2 trim to maximum rpm.

(13). Adjust governor lever control rod (105% N_2 maximum: 369D/E) (104% N_2 maximum: 500N).

(14). Start engine. With main rotor blades in flat pitch, beep N_2 trim to (102% rpm: 369D/E) (100% rpm: 500N). Lift off and hover.

(15). Observe N_2 tachometer pointer when pointer of N_1 tachometer is stabilized. N_2 pointer indication, that is, droop compensation, should be 1/2 to 1% rpm above indication in previous step.

(16). Land and shut down engine.

(17). If droop compensation occurred as required, no further adjustments are required.

(18). If droop compensation did not occur per step (15)., check and re-rig power turbine and gas producer linkage systems as required.

(19). Where N_1 and N_2 linkage are correctly adjusted, additional adjustment may be made to droop compensation adjustment fork; as follows:

NOTE: Three to five turns of droop compensation fork may be necessary to change droop compensation approximately 0.5% rpm.

(a). Shorten droop compensation adjustment fork to increase compensation.

(b). Lengthen fork extension to decrease compensation.

(c). Align fork with override link rod-end before tightening fork jamnut.

(20). Move collective through full travel after adjustment and check for clearance between movable linkage and adjacent parts.

(21). When full power is demanded in flight and high N_1 and TOT operating range cannot be reached, gas producer fuel control maximum throttle stop may require adjustment. Refer to Allison Operation and Maintenance Manual for adjustment procedure.

9. Governor Controls Final Check and Adjustment (250-C30)

(1). Have an assistant move collective through full range of travel while inspecting all movable linkage for clearance with adjacent parts. Check that control rod, N_2 actuator and override link bearings are not jammed when linkage is at extreme control positions.

(2). Start and operate engine at idle with main rotor blades in flat pitch per Pilot's Flight Manual.

(3). Rotate pilots throttle counterclockwise up to maximum rpm.

(4). Decrease N_2 trim to minimum.

(5). Observe N_2 tachometer pointer for 94 percent or less and N_1 tachometer is stabilized.

(6). With collective stick down, increase N_2 trim to maximum.

(7). Observe N_2 tachometer pointer for 103 percent minimum and N_1 tachometer pointer is stabilized.

WARNING **Make all engine compartment control rod adjustments with engine shut down.**

(8). Stop engine. Adjust length of governor control lever rod until N_2 trim is within limits specified in steps (6). and (4). above. Adjust one rod end not more than one turn at a time.

(9). Restart engine. With main rotor blades in flat pitch, actuate N_2 trim for 100 percent, lift-off and hover.

(10). Observe N_2 tachometer pointer when pointer of N_1 tachometer is stabilized. N_2 pointer indication (droop compensation) should be 1 to 2 percent above N_2 setting in step (9)..

(11). Land and shut down engine.

NOTE: If droop compensation occurs as required in (10). above, skip steps (12). and (13). below.

(12). If droop compensation does not occur as required in step (10). above, recheck entire power turbine governor (N_2 RPM) control linkage rigging and gas producer (N_1 fuel control) linkage adjustment.

CAUTION Any change to initial droop compensation fork length may result in interference between N_2 trim actuator case and fork threaded end. Move collective through full travel after adjustment and check for clearance between movable linkage and adjacent parts.

(13). If N_1 and N_2 linkage are correctly installed, an additional adjustment may be made at droop compensation adjustment fork. Shorten droop compensation adjustment fork to increase compensation. Lengthen fork extension to decrease compensation. Align fork with override link rod end before tightening fork jam nut. Three to five turns of droop compensation fork may be necessary to change droop compensation fork approximately 0.5 percent.

NOTE: Perform a deceleration time check per PFM after rigging and testing power turbine controls. Refer to Allison Operation and Maintenance Manual for adjustment procedures if deceleration time is less than allowable minimum.

10. Governor Controls Replacement

(Ref. Figure 208)

(1). Remove and replace control rods, bellcranks and supports as required, except as follows:

WARNING **Only high temperature all metal self-locking nuts are to be used for attaching control idler support to engine gearcase accessory pad.**

NOTE: Remove droop control override link, N_2 trim actuator, and Sta. 72.00 bellcrank from airframe as a unit.

(2). Leave Sta. 72.00 bellcrank attached to N_2 trim actuator and remove as a unit.

(3). Disconnect the bonding jumper and electrical connector from the actuator.

(4). Disconnect the actuator from Sta. 68 bellcrank.

(5). Disconnect Sta. 72 bellcrank from the fuselage-routed control rod end.

(6). Remove the pivot bolt that attaches Sta. 72 bellcrank to structure rib and controls support bracket; remove actuator and bellcrank.

(7). Disconnect the trim actuator from Sta. 72 bellcrank. Use care to keep sleeve bushings with bellcrank.

(8). Check replacement actuator for a maximum extended length of 5.44-5.50 inches (13.82-13.97 cm) measured between bolt hole centers. Test actuator for proper operation (Ref. N_2 Trim Actuator Test).

(9). Assemble original or replacement trim actuator to original or replacement Sta. 72 bellcrank with a bolt, two washers, nut and new cotter pin.

(10). Check that both sleeve bushings are in place in Sta. 68 bellcrank arm before connecting the actuator; then install assembled unit in controls support bracket and connect linkage as shown in Figure 208.

(11). The sleeve bushings in Sta. 68 bellcrank arm must rotate freely, without any binding, after the actuator is attached and the connecting hardware is tightened.

(12). Connect replacement droop control override link to collective torque tube.

(13). Push on rod end and check that the link assembly plunger head is free to slide back and forth in the link housing end fitting.

(14). Connect rod end to droop compensation fork; the rod end should align with the fork.

(15). Connect the bonding jumper and electrical connector to the actuator.

NOTE: Replacement trim actuator may have a tab or use a bonding strap/clamp for connection of the bonding jumper.

(16). Rig power turbine governor controls if any linkage components have been removed and replaced.

NOTE: Perform a deceleration time check per PFM after rigging and testing power turbine controls. Refer to Allison Operation and Maintenance Manual for adjustment procedures if deceleration time is less than allowable minimum.

11. Control Rod Inspection

(Ref. Figure 208)

(1). Inspect rod end bearings for binding and excessive wear, 0.040 inch (1.013 mm) maximum axial play).

(2). Inspect control rod for surface damage and evidence of bending.

(3). When necessary, perform straightness check on control rods that appear bent or bowed. Total length of gas producer control rods (excluding rod ends) must be straight within the following tolerances, with straightness variation limited to maximum of 0.010 inch (0.254 mm) in each foot of length.

(a). Fuselage-routed control rods: 0.050 inch (1.27 mm).

(b). Governor lever control rod: 0.020 inch (0.508 mm).

(c). Idler bellcrank control rod: 0.020 inch (0.508 mm).

(4). Inspect for loose rivet at fixed rod ends.

(5). Inspect bearings in bellcranks for binding.

(6). Perform fluorescent dye penetrant inspection of any suspect part.

CAUTION Control rods, part number 369A7706-3, between the idler bellcrank and governor control lever were made of aluminum and must be replaced with a steel part, P/N 369A7706-5, or the complete assembly, P/N 369A7706-11.

NOTE: After replacement and inspection of the power turbine governor controls linkage, perform a deceleration check in accordance with procedures found in the PFM. If confirmed deceleration time is less than the allowable minimum, refer to the appropriate Allison Operation and Maintenance Manual.

12. Bellcrank Inspection

(Ref. Figure 208)

(1). 369D Only: Inspect droop compensation bellcrank for installation of a spacer between fork extension jamnut and bellcrank threaded insert.
As required, install spacer.

(2). Perform a fluorescent penetrant crack inspection on all suspected parts.

13. Droop Compensation Link Inspection

(Ref. Figure 208)

(1). Inspect droop compensation spring cartridge for condition and wear. Cartridge total end play is not to exceed 0.015 inch (0.381 mm).

NOTE: Perform a deceleration time check per PFM after rigging and testing power turbine controls. Refer to Allison Operation and Maintenance Manual for adjustment procedures if deceleration time is less than allowable minimum.

14. Droop Control Override Link Repair

(Ref. Figure 208)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM117	Grease
CM321	Surface primer locking compound
CM431	Sealing, locking and retaining compound

(1). Install link end-fitting bearing (detail B) using surface primer (CM321) and locking compound (CM431) per container instructions.

(2). Replace rod-end or spring as follows:

(a). Remove four retaining rivets from housing rod-end.

(b). Drill out rod-end rivet and dismantle spring assembly. Discard rod-end and plunger.

(c). Assemble plunger, retainers, spring and jam nut. Thread jamnut onto plunger until there is minimum spring free-play.

(d). Thread rod-end onto plunger until it contacts jamnut.

CAUTION Plunger must be free to travel to bottom of end-fitting oblong slot without binding.

(e). Align plunger-head hex-flats so that two parallel flats are at a right angle (90°) to rod-end bearing. Tighten jam nut.

(f). Using No. 50 drill, drill through rod-end and plunger at witness hole. Install rivet.

(g). Lubricate interior of housing, spring retainers and plunger with grease (CM117). Install spring assembly in housing so that plunger hex enters end fitting slot and rod-end aligns vertically with housing bearing.

(h). Install four plunger retaining rivets.

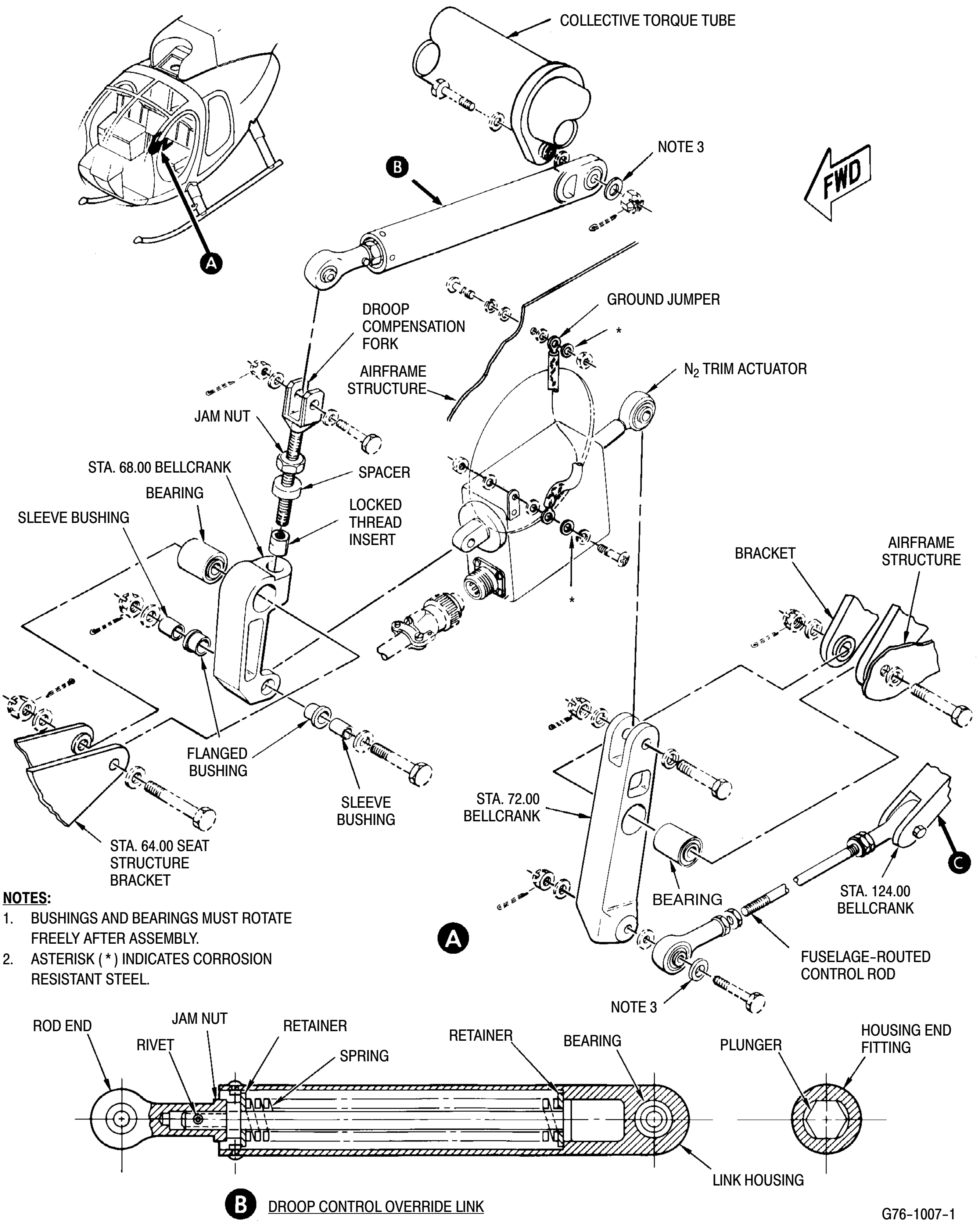


Figure 208. Power Turbine Governor Controls (Sheet 1 of 2)

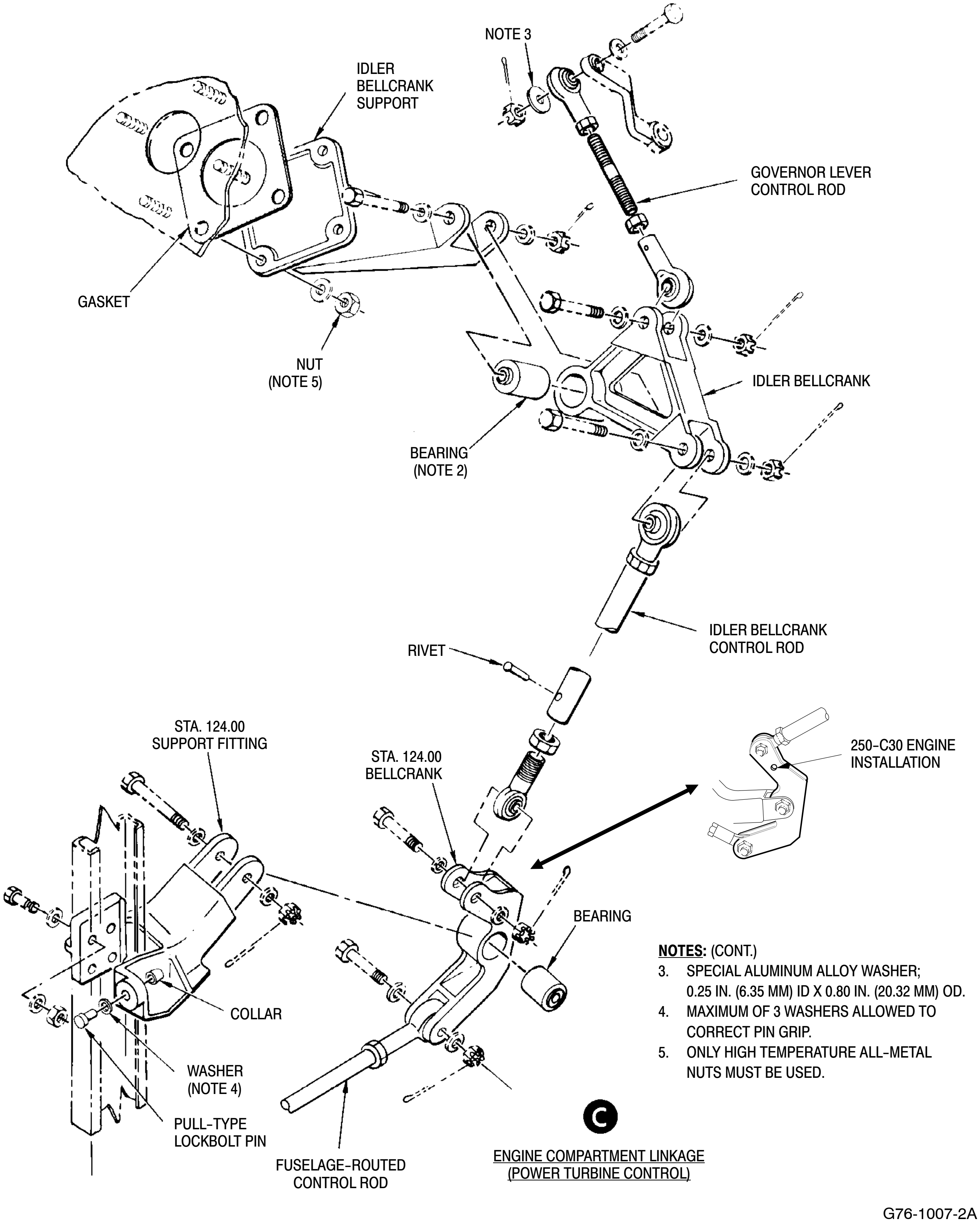


Figure 208. Power Turbine Governor Controls (Sheet 2 of 2)

15. Control Rod Repair

(Ref. Figure 208)

(1). Repair rod assemblies as follows:

CAUTION Fluorescent penetrant crack inspection shall be performed after cold-straightening control rods. Replace a cracked rod. Replace a cracked or bent rod-end.

(2). Cold-straighten bent rods provided there are no nicks or sharp dents in bend length. Do not use rod-ends to support rod during straightening process.

CAUTION Use care when drilling to remove or install riveted rod-end. Tighten jam nut before drilling or riveting.

(3). Replace control rod end if bearing axial play is more than 0.040 inch (1.016 mm).

16. Bellcrank and Support Fitting Repair

(Ref. Figure 208)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM321	Surface primer locking compound
CM431	Sealing, locking and retaining compound

(1). Install replacement bearings using surface primer (CM321) and grade A locking compound (CM431) per container instructions.

(2). Replace distorted or cracked bellcranks and support fittings. Replace parts that have elongated holes.

17. N_2 Trim Actuator Test

(Ref. Figure 209)

(1). Connect N_2 trim actuator to test equipment.

(2). Turn on dc power and adjust output to 25.75 to 26.25 volts.

(3). With actuator ram approximately halfway between stops, measure ram end-play with dial indicator. End-play must not exceed 0.005 inch (0.127 mm) total indicator reading when measured under 10 pound (4.5 kg) reversing load.

(4). Set test switch to RETRACT and allow actuator ram to fully retract. Using end of ram sleeve as reference point, measure portion of ram that remains out of sleeve to nearest 1/64 inch (0.3968 mm). Record this measurement for use in the following step.

(5). Set test switch to EXTEND and run ram to extend stop. Measure length of extended ram. Subtract result of step (4). from extended ram value. Result should be 0.97-1.03 inches (24.638-26.162 mm).

(6). Actuator current draw at 26.0Vdc shall be:

(a). Under no-load; 0.60-1.25 amperes.

(b). Stalled; 2.0 amperes, maximum.

(7). Operate actuator motor in both extend and retract directions. Over-travel must not exceed 0.020 inch (0.508 mm) maximum when power is switched off.

(8). Reduce voltage input to 21 volts. Actuator ram must retract and extend to stops without binding on or between stops.

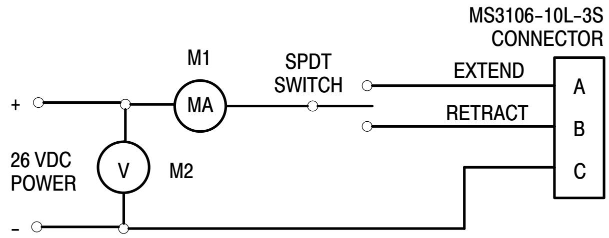
(9). Increase input voltage to 28 volts. Actuator ram must retract and extend to stops without binding on stops or between stops.

(10). Run actuator to full extended position. Extended actuator overall length shall be 5.47-5.50 inches (13.894-13.970 cm) between pivot bolt centers.

(11). Torque rod-end jamnut to **30 - 40 inch-pounds (3.39 - 4.52 Nm)**.

(12). Turn off power.

(13). Disconnect actuator.



ITEM NO.	EQUIPMENT DESCRIPTION
1	6-INCH SCALE
2	DC VOLTMETER, CLAIBRATED 0-50 VOLTS (WESTON MODEL 931 OR EQUIVALENT)
3	DC MILLIAMMETER, CALIBRATED 0-5 AMPERES (WESTON MODEL 931 OR EQUIVALENT)
4	VARIABLE DC POWER SUPPLY, 10-36 VOLTS, (N.J.E. MODEL SY36-10 OR EQUIVALENT)
5	DIAL INDICATOR GAGE (BROWN AND SHARP MODEL 740 OR EQUIVALENT)
7	SWITCH, SPDT, CENTER OFF

G76-1008

Figure 209. N_2 Trim Actuator Test Hookup

18. N_2 Trim Actuator Repair

(1). N_2 actuator repairs are limited to actuator ram rod-end replacement. Set distance between pivot-bolt centers to 5.44-5.50 inches (13.818-13.970 cm) with ram fully extended. Torque rod-end jamnut to **30 - 40 inch-pounds (3.39 - 4.52 Nm)**.

CAUTION All other actuator repairs are to be performed by an authorized overhaul station or the actuator manufacturer.

19. Sta. 68.00 Bellcrank Rework, P/N 369A7717-3 and 369N2606 Only

(Ref. Figure 210)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM318	Primer
N/A	Dichromate
N/A	Anodizing compound

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
N/A	Spotface cutter, 0.687 inch (17450 mm) dia., 0.030 inch (0.762 mm) corner radius
N/A	Spotface cutter pilot, 5/16-24 UNF-3A thread

(1). Remove panels required to get at power turbine governor controls linkage.

(2). Unbolt and remove Sta. 68.00 bellcrank assembly.

(3). To expedite reassembly, measure and note distance between the center of droop compensation fork clevis bolt hole and bellcrank pivot bolt hole. Remove droop compensation fork from bellcrank.

(4). Screw spotface cutter pilot into bellcrank. Cut away only enough material to provide a 360° flat surface around hole. Do not cut into thread insert.

(5). Coat bare metal surface with Dow #7 or #17 chemical treatment per manufacturers instructions.

(6). Apply primer (CM318) over reworked surfaces. Allow primer to dry.

(7). Assemble locknut, spacer and droop compensation fork on bellcrank. Get as close to previously noted dimension as possible.

(8). Rig power turbine governor controls.

(9). Note compliance in helicopter log book.

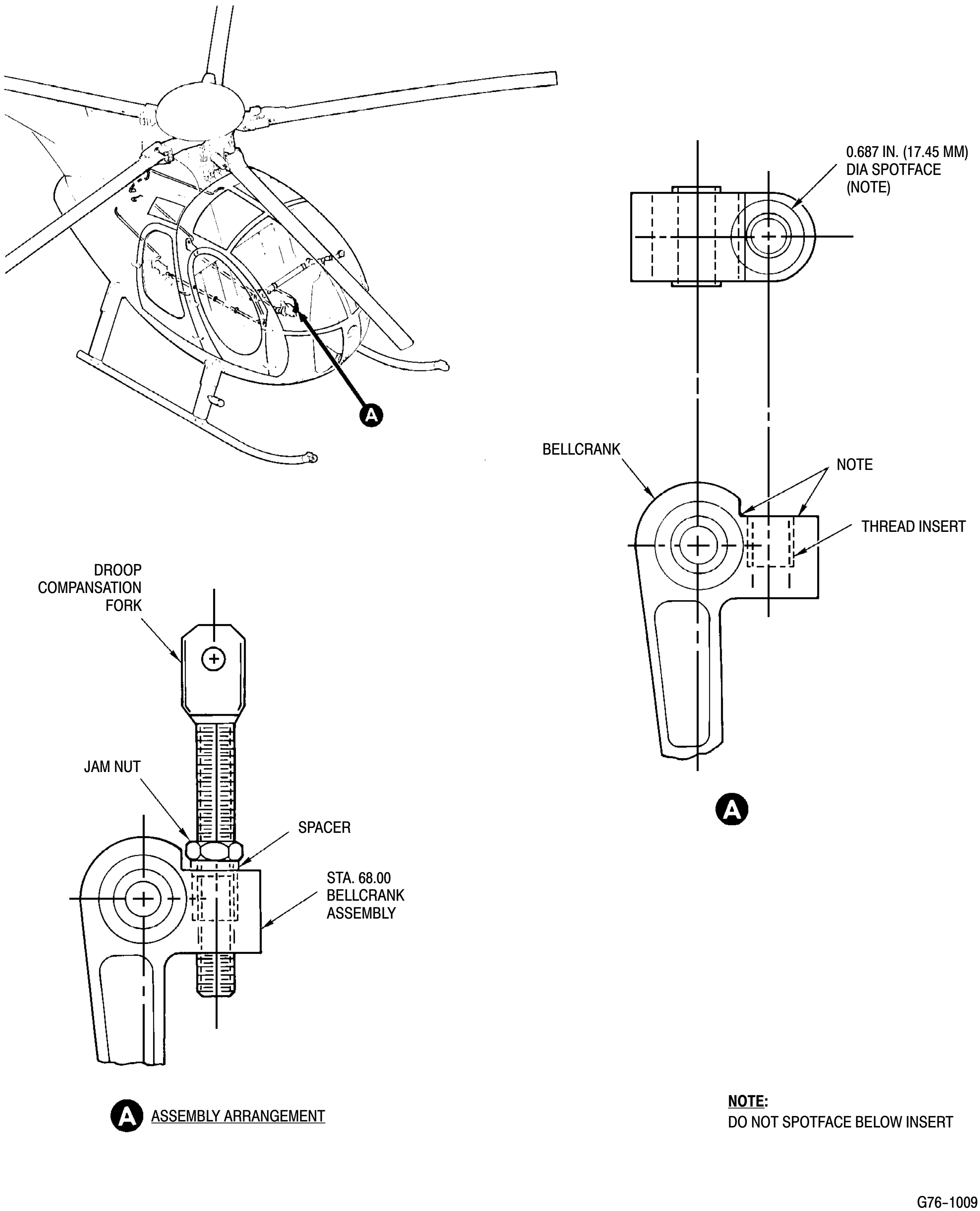


Figure 210. Station 68.00 Bellcrank Rework

Section

76-20-00

Gas Producer Controls (250-C20B, 250-C20R/2 and 250-C30)

GAS PRODUCER CONTROLS MAINTENANCE PRACTICES

1. Gas Producer Controls Rigging (250-C20B and 250-C20R/2)

(Ref. Figure 201)

Special Tools (Ref. Section 91-00-00)

Item	Nomenclature
ST404	Wrench, ground idle adjusting
ST501	Collective rigging fixture (LH command)
ST502	Collective rigging fixture (RH command)

NOTE:

- The following throttle control rigging procedures are applicable to Allison 250-C20B and 250-C20R/2 engines equipped with Bendix or Chandler Evans (CECO) fuel control systems.
- Make fuel flow metering adjustments per Allison Engine Operation and Maintenance Manual except for 369/500 series helicopter specific idle speed variances explained in the following steps.

WARNING **Failure to bleed fuel supply system after opening system to atmosphere can result in power loss or engine flameout. Bleed trapped air after opening any fuel lines between fuel tank and combustion chamber nozzle. Bleed fuel system following removal and replacement of any part of the engine or aircraft fuel system (Ref. Sec. 28-00-00).**

CAUTION Do not exceed adjustable rod-end maximum extension/thread engagement. Inspect rod-end thread engagement through witness hole.

NOTE:

- Refer to Collective Controls (Ref. Sec. 67-10-00) for information on rigging throttle gas producer control tube, interconnect torque tube and associated linkage.
- Rigging check/adjustments are required when pilot's compartment linkage, or control rod lengths have been disturbed, or when there is less than a 0.010 inch (0.254 mm) gap between Sta. 129.00 firewall bellcrank upper arm and its support fitting with the throttle in CUT-OFF.

(1). Remove gas producer lever control rod (Detail B).

(2). Position pilot's collective stick at mid-travel. Insert rigging fixture (ST501) or (ST502) in collective friction guide link slot. Rest collective stick on fixture (Detail A).

(3). On dual control installations; check for asynchronous motion between collective stick throttle assemblies with the throttle wide open and in CUT-OFF. Dual control throttle movement should be synchronized, but with the pilot's (command position) throttle dominating the copilot's throttle at idle.

(4). Position pilot's throttle twist grip so that twist grip set-screws are at six o'clock.

(5). Remove gearbox inspection plate on the bottom of the collective stick. Ensure that the centerline of the cutaway on the large bevel gear is aligned on the collective stick lengthwise centerline. If gear is not properly positioned, remove gearbox side plate and reposition the gear.

NOTE: When a ring adjustment is made, check engagement of ring gear and pinion. Cutout in ring gear should face aft with throttle in CLOSED position. When dual controls are in installed, check for override or interference between collective stick assemblies with with the throttle grip in the CLOSED and FULL OPEN position. Return throttle grip to MID travel position.

(6). Find and remove all lost motion in the throttle system before making rigging adjustments.

NOTE: It is important that all assembly tolerances between the gas producer interconnects and torque tube assemblies are correct and all backlash removed to assure accurate rigging of the fuel control system.

(7). Check idler for interference with its support.

(8). Adjust Sta. 73.00 control rod length so that lower arm of Sta. 70.00 bellcrank is parallel to seat structure (Detail B).

(9). Adjust fuselage-routed control rod length so that bolt center in lower arm of Sta. 129.00 bellcrank is 4.97-5.03 inches (12.624-12.776 cm) from Sta. 124.00 firewall bulkhead.

(10). Move throttle to CUT-OFF.

(11). Adjust the fuselage routed control rod to provide a gap of 0.010-0.050 inch (0.254-1.270 mm) between Sta. 129.00 bellcrank upper arm and support fitting. Push the rod and bellcrank toward the firewall bulkhead to remove all friction errors before checking gap.

NOTE:

- Bendix Fuel Control: Pointer position may range from 0° to 10° when contacting the CUT-OFF stop, depending on calibration settings peculiar to the fuel control.
- Bendix fuel control lever and shaft serrations are at 15° intervals.

(12). Set fuel control lever against CUT-OFF stop. Pointer position should range between the 0° and 10° quadrant marks. Set the fuel control throttle shaft lever, without moving the pointer, 15° counterclockwise from parallel with the engine compartment door frame while keeping the pointer at CUT-OFF and inboard lever half in contact with stop.

(13). Torque fuel control lever nut to **40 - 50 inch-pounds (4.52 - 5.65 Nm)**. Do not over-tighten nut. Apply a torque stripe.

CAUTION Governor and fuel control levers can be erroneously installed on the wrong fuel system component shaft. Governor lever is relatively short with an offset angle of about 65°. Fuel control lever offset angle is a more moderate 38°.

(14). Move throttle twist grip from wide open to CUT-OFF to ensure that the throttle lever is contacting open and closed fuel control mechanical stops. Adjust gas producer lever control rod as required to cause lever contact. Do not adjust stops.

(15). Turn pilot's throttle to maximum rpm, then to idle.

(16). Bendix Fuel Control: With pilot's throttle held at idle, adjust gas producer lever control rod until gas producer pointer is at 30° (View C).

(17). CECO Fuel Control: With pilot's throttle held at idle, adjust gas producer lever rod until gas producer pointer is at 30° to 32°.

CAUTION

- Do not alter gas producer lever position or control linkage to adjust idle speed. Idle speed is to be checked during engine operational test and adjusted with fuel control idle screw, not with the linkage.
- Check linkage at extreme travel positions. Ensure gas producer lever hits fuel control mechanical stops before throttle twist grip stops are contacted.
- Interference or binding anywhere in linkage is not allowed.
- Be sure that linkage movement is clear of wires, tubes and hoses.

(18). Rotate pilot's throttle counterclockwise to maximum rpm.

(19). Make sure gas producer lever strikes maximum speed stop.

(20). Raise collective stick to up stop.

(21). Gas producer lever must remain in contact with maximum speed stop; if lever comes off stop, check gas producer controls for binding.

(22). Release idle detent and roll pilot's throttle to CUT-OFF. Make sure that gas producer lever strikes CUT-OFF stop.

(23). Lower collective stick. Ensure gas producer lever does not move off CUT-OFF stop.

(24). When dual controls are installed, move copilot's throttle twist grip to its idle stop. Fuel control pointer shall not be more than 5/64 inch (1.9844 mm) below the idle degree mark specified for a Bendix fuel control (30°) or a CECO fuel control (30 to 32°) as applicable.

(25). Have an assistant cycle the throttle from CUT-OFF to wide open. Ensure control rods do not roll over or jam when linkage is at extreme travel positions.

NOTE: Refer to your Allison Operation and Maintenance Manual for complete gas producer fuel control rigging procedures to make the following adjustments.

(26). Start and operate engine at idle with main rotor in flat pitch per Pilot's Flight Manual (PFM).

CAUTION Operating requirements demand that idle rpm be adjusted within minus 1% of the Allison specified upper limit of 65% rpm. Achieving required idle rpm is particularly important for helicopters equipped with dual controls.

(27). With pilot's throttle at idle, observe N_1 tachometer indicator. Ensure N_1 speed stabilizes between 64 - 65 %. To adjust idle rpm, proceed as follows:

(a). Bendix: Adjust idle speed with adjusting tool (ST404) per the applicable Allison Operation and Maintenance Manual.

(b). CECO: Adjust idle speed with a 5/32 hex-wrench per the 250-C20 Allison Operation and Maintenance Manual.

(28). Accelerate engine to 100%, stabilize, then decelerate to idle after each adjustment. If idle adjustments do not consistently stabilize rpm within 64% - 65% limit, follow engine fuel control fault isolation procedures per Allison Manual.

(29). Accelerate and decelerate engine three times to ensure repeatability.

WARNING **Throttle snap to idle must be performed to ensure that engine will not flame out.**

(30). Accelerate engine to to normal operating rpm with pilot's throttle; then snap clockwise to idle. Repeat this check using copilot's throttle where installed. If flameout occurs, adjust engine idle speed per the applicable Allison Operation and Maintenance Manual.

CAUTION Perform a deceleration time check per PFM following gas producer or linkage replacement or adjustment. Refer to Allison Engine Operation and Maintenance Manual for adjustment procedures when deceleration time is less than allowable minimum.

(31). Shut down engine.

2. Gas Producer Controls Rigging (250-C30)

(Ref. Figure 201)

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST404	Wrench, ground idle adjusting
ST405	Rigging fixture, collective stick
ST406	Alignment fixture
ST407	Rigging pin
ST501	Collective rigging fixture (LH command)
ST502	Collective rigging fixture (RH command)

NOTE:

- The following throttle control rigging procedures are applicable to Allison 250-C30 engines equipped with Bendix fuel control systems.
- Make fuel flow metering adjustments per Allison Engine Operation and Maintenance Manual except for 369/500 series helicopter specific idle speed variances explained in the following steps.

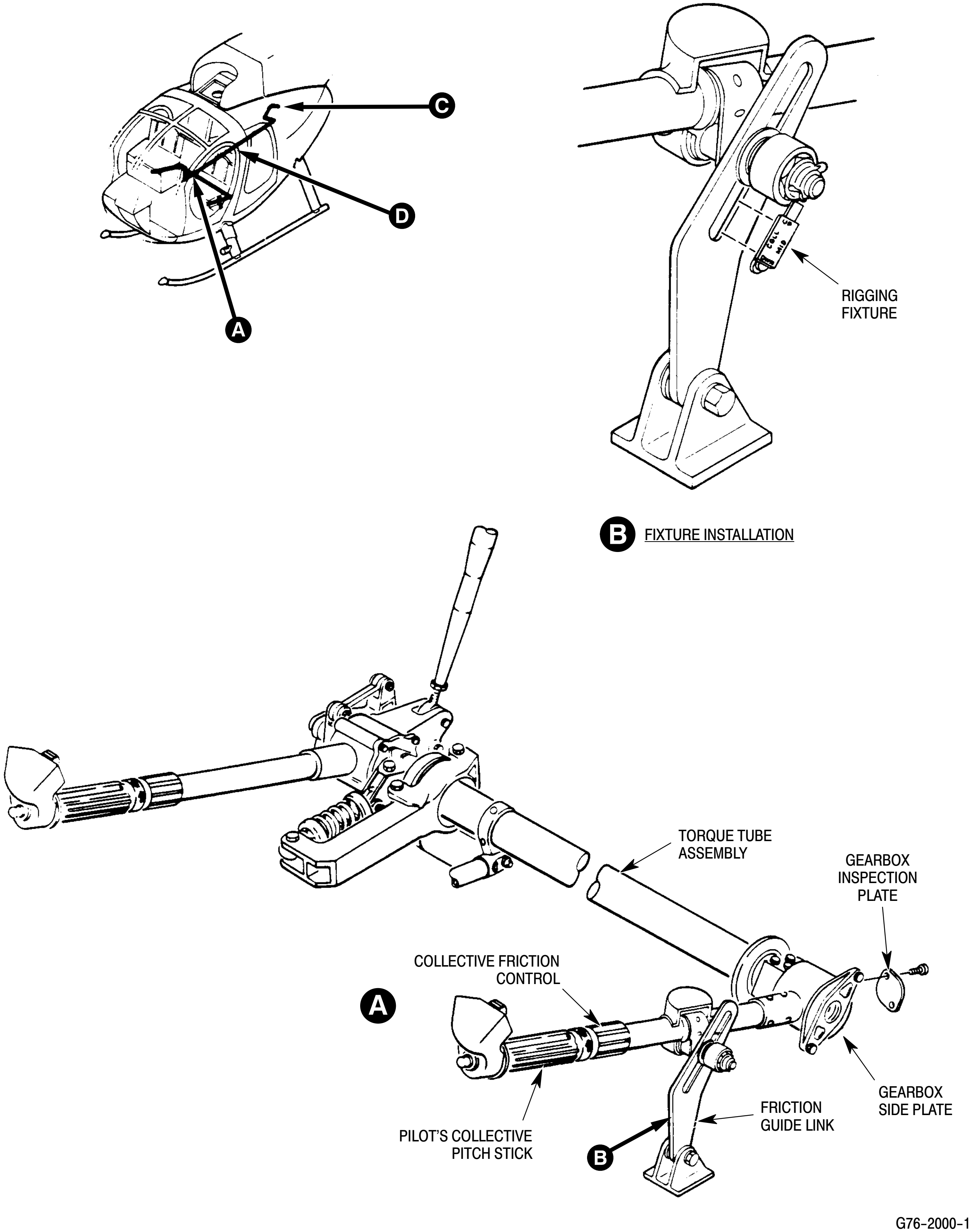
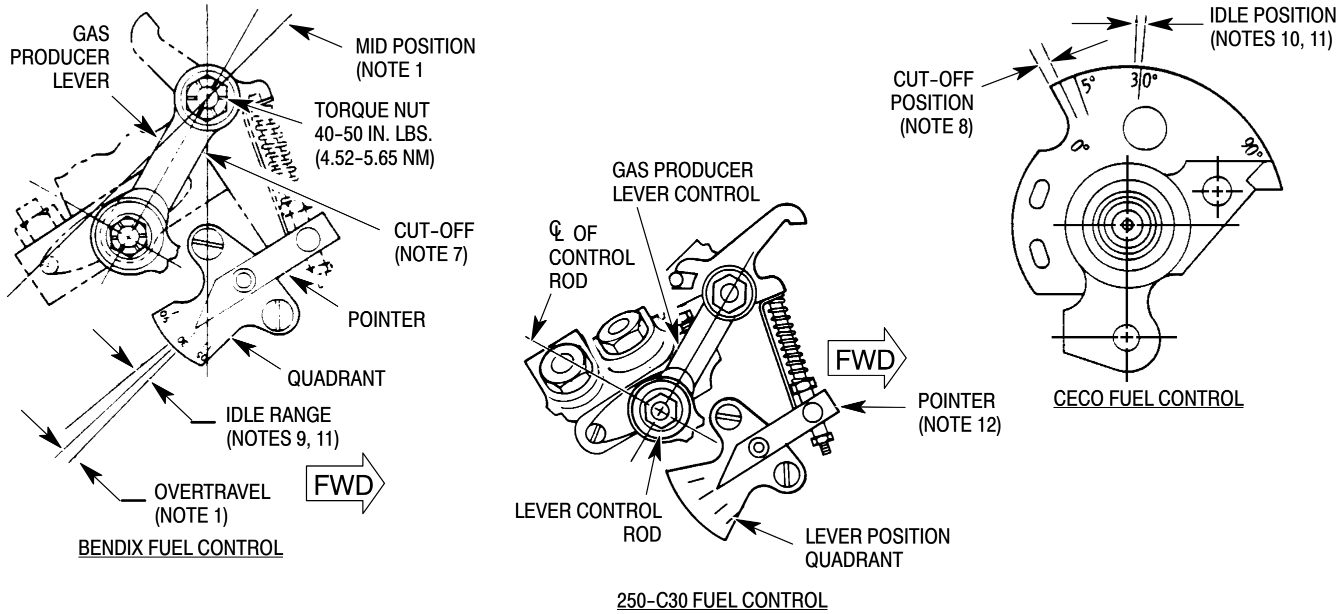
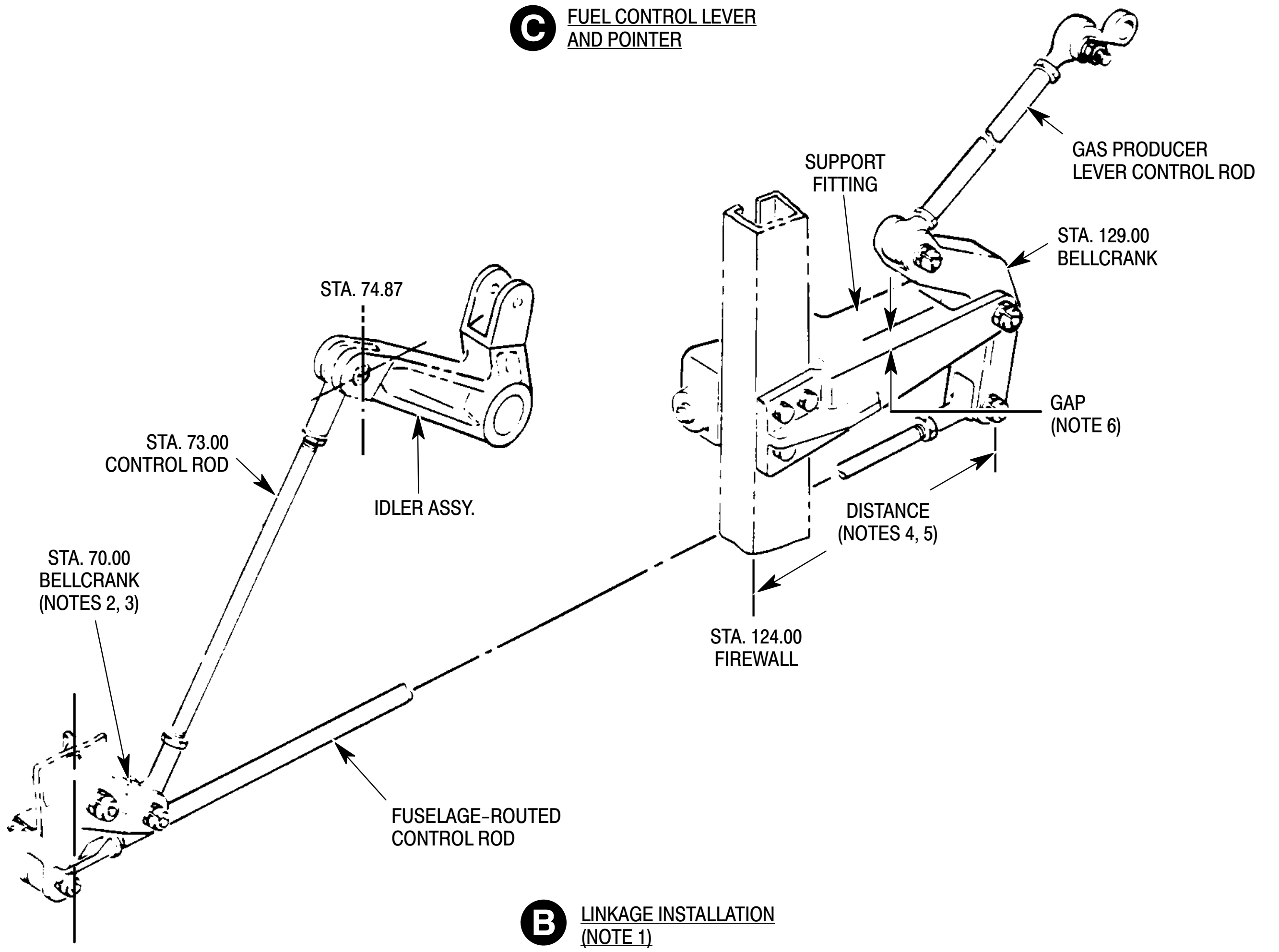


Figure 201. Gas Producer Controls Rigging (Sheet 1 of 3)



C FUEL CONTROL LEVER AND POINTER



B LINKAGE INSTALLATION (NOTE 1)

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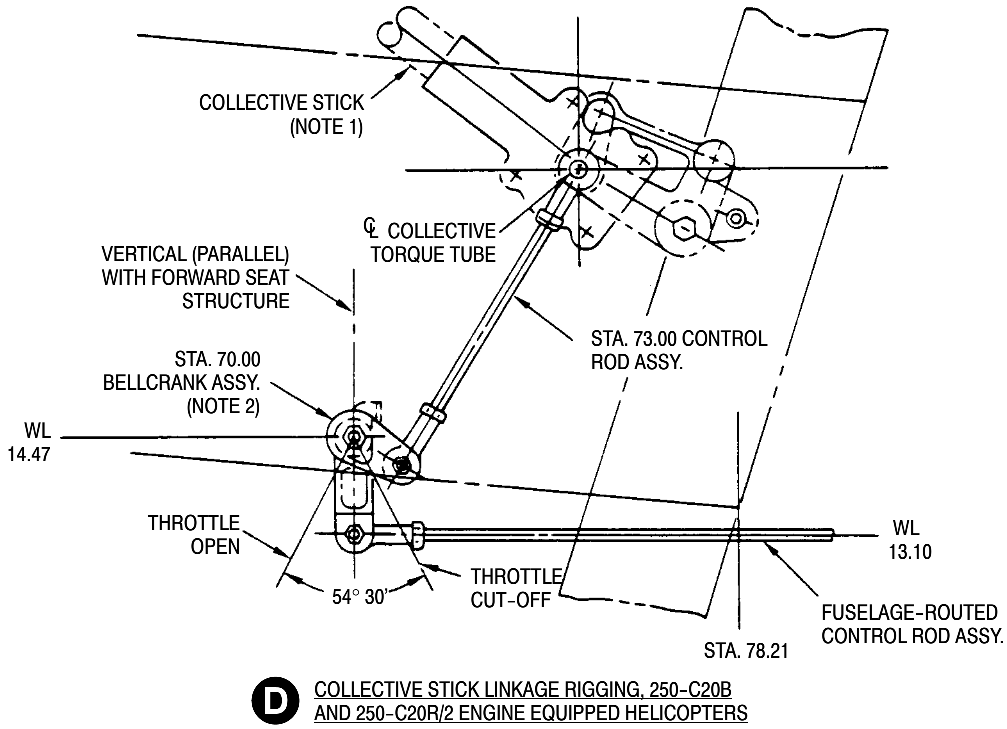
Figure 201. Gas Producer Controls Rigging (Sheet 2 of 3)



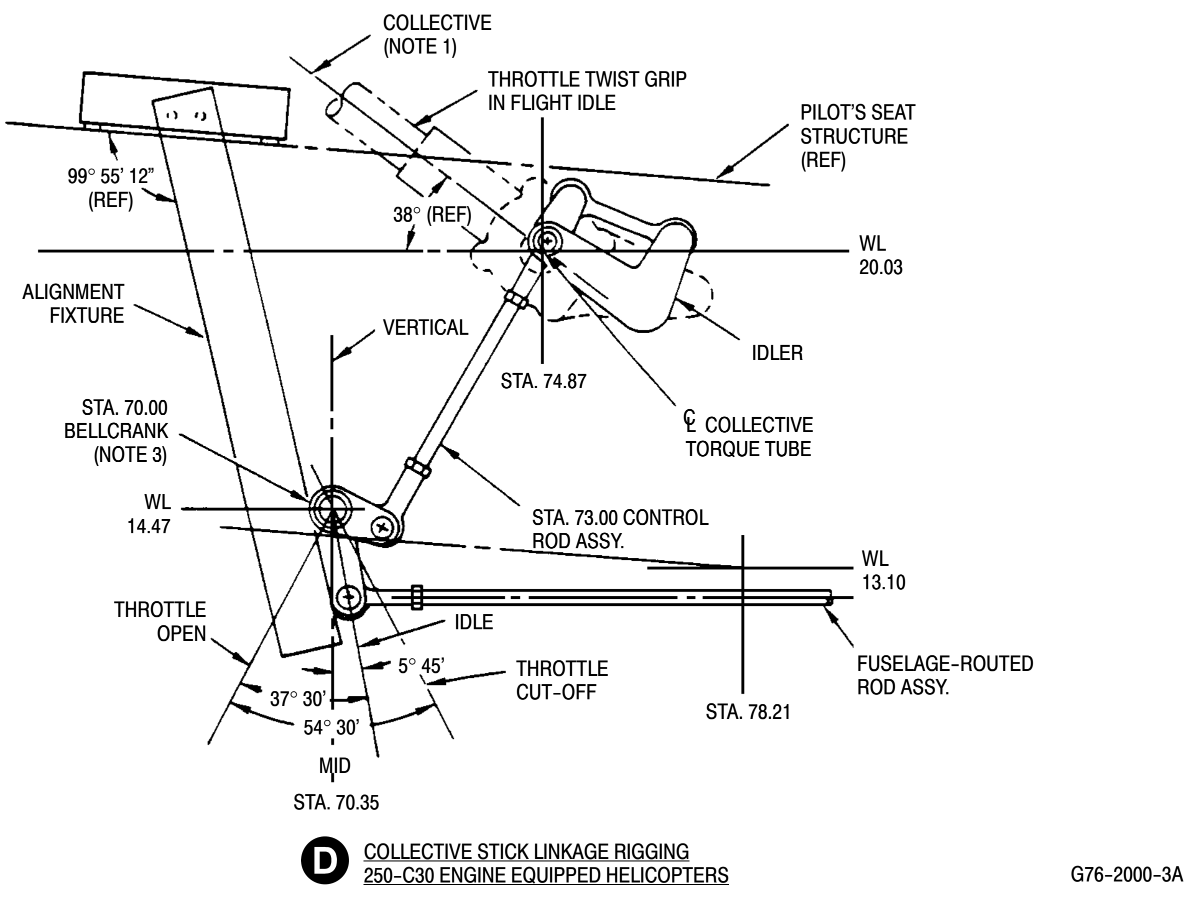


Figure 201. Gas Producer Controls Rigging (Sheet 3 of 3)

Legend (Ref. Figure 201)

1. EXCEPT AS NOTED, GAS PRODUCER AIRFRAME CONTROL LINKAGE RIGGING ADJUSTMENTS AND MEASUREMENTS ON ALL 369/500 SERIES HELICOPTER MODELS ARE NORMALLY STARTED WITH FUEL CONTROL LEVER CONTROL ROD DISCONNECTED, COLLECTIVE STICK AT MID-TRAVEL; I.E., RIGGING FIXTURE (ST501) OR (ST502) INSTALLED, AND THE PILOT'S THROTTLE TWIST GRIP ROTATED TO MID-POSITION; I.E., TWIST GRIP SET-SCREWS AT SIX O'CLOCK.
2. ON 250-C20B AND 250-C20R/2 ENGINE EQUIPPED HELICOPTERS; ADJUST STA. 73.00 CONTROL ROD SO LOWER ARM OF STA. 70.00 BELLCRANK IS VERTICAL WHEN THROTTLE TWIST GRIP IS AT IDLE POSITION.
3. FOR 250-C30 ENGINE EQUIPPED HELICOPTERS; ALIGN FORWARD FACE OF STA. 70.00 BELLCRANK WITH AFT EDGE OF FIXTURE (ST406).
4. FOR 250-C20B AND 250-C20R/2 ENGINE EQUIPPED HELICOPTERS; WITH THROTTLE AND COLLECTIVE IN MID-POSITION, ADJUST FUSELAGE ROUTED CONTROL ROD SO CENTER OF STA. 129.00 BELLCRANK LOWER ARM PIVOT BOLT IS 4.97-5.03 INCHES (12.624-12.776 CM) FROM FIREWALL BULKHEAD.
5. FOR 250-C30 ENGINE EQUIPPED HELICOPTERS; WITH THROTTLE AND COLLECTIVE IN MID-POSITION, ADJUST FUSELAGE ROUTED CONTROL ROD SO CENTER OF STA. 129.00 BELLCRANK LOWER ARM PIVOT BOLT IS 5.47 - 5.50 INCHES (13.894-13.970 CM) FROM FIREWALL BULKHEAD.
6. ON ALL ENGINE INSTALLATIONS: ROLL THROTTLE TO CUT-OFF AND PUSH CONTROL ROD AND BELLCRANK TOWARD FIREWALL TO ELIMINATE PLAY. ADJUST FUSELAGE ROUTED CONTROL ROD TO GET A GAP OF 0.010-0.050 INCH (0.254-1.270 MM) BETWEEN UPPER BELLCRANK ARM AND SUPPORT FITTING.
7. BENDIX FUEL CONTROL CUT-OFF POINTER POSITION NORMALLY RANGES BETWEEN 0 - 10° WITH FUEL CONTROL LEVER AGAINST CUT-OFF STOP. CUT-OFF RANGE IS DUE TO FACTORY SET CALIBRATION VARIATIONS BETWEEN FUEL CONTROL UNITS.
8. CECO FUEL CONTROL CUT-OFF POINTER POSITION IS 2° TO MINUS, 1/32 INCH (0.7938 MM) FROM QUADRANT EDGE, WITH FUEL CONTROL LEVER AGAINST CUT-OFF STOP.
9. WITH PILOT'S THROTTLE TWIST GRIP HELD AT IDLE: BENDIX FUEL CONTROL IDLE POINTER POSITION IS 30°.
10. CECO FUEL CONTROL IDLE POINTER POSITION IS 30 - 32°.
11. MAXIMUM ALLOWABLE POINTER MOVEMENT BELOW THE OPTIMAL IDLE POSITION ON ALL ENGINE INSTALLATIONS FROM ALL CAUSES IS, 5/64 INCH (1.9844 MM).
12. NORMAL SETTING IS 40° WITH PILOT'S THROTTLE AT IDLE.

WARNING **Failure to bleed fuel supply system after opening system to atmosphere can result in power loss or engine flameout. Bleed trapped air after opening any fuel lines between fuel tank and combustion chamber nozzle. Bleed fuel system following removal and replacement of any part of the engine or aircraft fuel system (Ref. Sec. 28-00-00).**

CAUTION Do not exceed adjustable rod-end maximum extension/thread engagement. Inspect rod-end thread engagement through witness hole.

NOTE:

- Refer to Collective Controls (Ref. Sec. 67-10-00) for information on rigging throttle gas producer control tube, interconnect torque tube and associated linkage.
- Rigging check/adjustments are required when pilot's compartment linkage or fuselage-routed control rod length adjustments have been disturbed, or when there is less than a 0.010 inch (0.254 mm) gap between Sta. 129.00 firewall bellcrank upper arm and its support fitting with the throttle in CUT-OFF position.

(1). Remove gas producer lever control rod (Detail B).

(2). Position pilot's collective stick at mid-travel. Insert rigging fixture (ST501) or (ST502) in collective friction guide link slot. Rest collective stick on fixture.

(3). On dual control installations; check for a synchronous motion between collective stick throttle assemblies with the throttle wide open and in CUT-OFF. Dual control throttle movement should be synchronized, but with the pilot's (command position) throttle dominating the copilot's throttle at idle.

(4). Position plot's throttle twist grip so that twist grip set screws are at six o'clock.

(5). Remove gearbox inspection plate on the bottom of the collective stick. Ensure that the centerline of the cutaway on the large bevel gear is aligned on the collective stick lengthwise centerline. If gear is not properly positioned, remove gearbox side plate and reposition the gear.

(6). Find and remove all lost motion in the throttle system before making rigging adjustments.

(7). Put throttle in idle position and secure with friction lock.

(8). Locate and secure alignment fixture (ST406) on the pilot's seat structure. The forward face of the Sta. 70.00 bellcrank should align with the aft edge of the fixture. Adjust Sta. 73.00 control rod as required to align bellcrank with fixture. Remove the rigging fixture.

(9). Bottom the collective stick and check the idler assembly for clearance with support.

(10). Set collective and throttle at mid-travel.

(11). Adjust fuselage-routed control rod length so bolt center through lower arm of Sta. 129.00 bellcrank is 5.50 ±0.03 inches (139.7 ±0.762 mm) from Sta. 124.00 firewall bulkhead.

(12). Rotate throttle twist grip to CUT-OFF.

(13). Adjust the fuselage routed control rod to provide a gap of 0.010-0.050 inch (0.254-1.270 mm) between Sta. 129.00 bellcrank upper arm and support fitting. Push the rod and bellcrank toward the firewall bulkhead to remove all friction errors before adjusting gap.

NOTE: It will be necessary, during the rigging procedure to remove and reinstall the rigging fixtures as required.

(14). Move collective through full range of travel. Ensure throttle movement is unrestricted in all collective stick positions.

(15). Torque control rod jamnuts to **25 - 30 inch-pounds (2.82 - 3.39 Nm)**.

CAUTION

- Adjusting fuel control mechanical stop settings for any reason is not allowed.
- Governor and fuel control levers can be erroneously installed on the wrong fuel system component shaft. Governor lever is relatively short with an offset angle of about 65°. Fuel control lever offset angle is a more moderate 38°.

NOTE:

- Pointer position may range from 0° to 10° when contacting the idle CUT-OFF stop, depending on calibration settings peculiar to the fuel control unit.
- The Bendix fuel control features a double serrated washer between the lever and fuel control input shaft. There are 24 (15° each) serrations on the lever side and 25 (14.4° each) serrations on the fuel control side that allow coarse or fine lever position adjustments to be made. Make 0.6° incremental adjustments by moving the washer one serration in one direction and the lever one serration in the opposite direction. Fifteen degree adjustments are made by moving the lever against the washer; 14.4° adjustments by moving the washer and lever together against the fuel control shaft.

(16). Rotate the throttle twist grip to idle.

(17). Insert rigging pin (ST407) through fuel control lever. Position the lever on the fuel control throttle shaft so that lever is close to parallel to, or a maximum of 5° forward of the Sta. 137.50 engine compartment bulkhead. Torque lever nut to **40 - 50 inch-pounds (4.52 - 5.65 Nm)**. Do not over-tighten the nut. Apply a torque stripe.

(18). Set gas producer lever control rod to a preliminary length of 16.4 inches (41.66 cm) measured between rod-end bolt hole centers.

(19). Set throttle twist grip in the idle position. Connect gas producer lever control rod. Adjust rod length as required to align it with the fuel control lever.

CAUTION To prevent flameout, the fuel control pointer should not move more than 5/64 inch (1.9844 mm) below the fuel control quadrant 40° mark with throttle at idle and commanded by either the pilot's or copilot's twist grip.

NOTE:

- When dual controls are installed, move copilot's throttle twist grip to its idle stop. Fuel control pointer shall not be more than 5/64 inch (1.9844 mm) below the idle degree mark.
- Throttle twist grip stopped at idle setting must produce a 40° pointer/quadrant alignment on the fuel control with the rigging pin inserted.

(20). Remove rigging pin and operate pilot's throttle twist grip from CUT-OFF to wide open while an assistant determines that the fuel control lever contacts the max open and CUT-OFF mechanical stops and the following pointer positions are indicated.

(a). With pilot's throttle wide open, fuel control pointer shall align with quadrant 100° mark and fuel control max stop shall be in contact with lever.

(b). With pilot's throttle in CUT-OFF; fuel control pointer shall be between 0° and 10° quadrant marks with lever in contact with fuel control minimum stop.

(21). Adjust the gas producer lever control rod length as required to move lever into stop contact. If the Sta. 124.00 bellcrank bottoms on its support fitting, adjust fuselage routed control rod one turn away from the bellcrank bottoming problem.

(22). Return pilot's throttle twist grip to idle detent. Ensure fuel control pointer aligns with 40° mark.

(23). Bottom the pilot's collective stick. Rotate throttle to wide open. Check for stop/lever contact.

(24). Move and hold throttle at idle. Check; gas producer pointer is at 40° quadrant position.

CAUTION

- Do not alter gas producer lever position or control linkage to adjust idle speed. Idle speed shall be adjusted by the fuel control idle screw, not the linkage.
- Check linkage at travel extremes to ensure that the linkage does not bind at any point and the gas producer lever hits the fuel control mechanical stops before the throttle twist grip stops make contact.

(25). Set pilot's throttle wide open. Raise collective stick to upper stop. Check that fuel control lever remains on max speed stop. Inspect the fuel control linkage for binding if the fuel control lever comes off the max speed stop.

(26). Leave throttle wide open and bottom pilot's collective stick. Check that fuel control lever remains in contact with the max stop.

(27). Have an assistant move throttle and collective stick through entire range of travel while inspecting installation for operating clearances, control rod bearing jamming and rod roll-over.

(28). Check that the copilot's throttle operates N_1 fuel control the same as the pilot's with the following exception:

(a). When the copilot's throttle twist grip is rotated to its idle stop, the fuel control pointer shall move no more than 5/64 inch (1.9844 mm) below the quadrant 40° mark (Detail C).

(29). Inspect all bolts, nuts, control rod jamnuts, cotter pins and lockwire installations for security.

NOTE: Refer to your Allison Operation and Maintenance Manual for complete gas producer fuel control rigging procedures to make the following adjustments.

(30). Start and operate engine at idle with main rotor in flat pitch per Pilot's Flight Manual.

CAUTION Operating requirements demand that idle rpm be adjusted within minus 1% of the Allison specified upper limit of 65% rpm. Achieving required idle rpm is particularly important for helicopters equipped with dual controls.

(31). With pilot's throttle at idle, observe N_1 tachometer indicator. Ensure N_1 speed stabilizes between 64% - 65%.

(a). Adjust idle speed with adjusting tool (ST404) per the applicable Allison Operation and Maintenance Manual.

(32). Accelerate engine to 100%, stabilize, then decelerate to idle after each adjustment. If idle adjustments do not consistently stabilize rpm within 64% - 65% limit, follow engine fuel control fault isolation procedures per Allison Manual.

(33). Accelerate and decelerate engine three times to ensure repeatability.

WARNING **Throttle snap to idle must be performed to ensure that engine will not flame out.**

(34). Accelerate engine to to normal operating rpm with pilot's throttle, then snap to idle. Repeat this check using copilot's throttle where installed. If flameout occurs, adjust engine idle speed per the applicable Allison Operation and Maintenance Manual.

CAUTION Perform a deceleration time check per PFM following gas producer or linkage replacement or adjustment. Refer to Allison Engine Operation and Maintenance Manual for adjustment procedures when deceleration time is less than allowable minimum.

(35). Shut down engine.

A. Gas Producer Fuel Control De-richment Valve Adjustment

(1). Refer to Allison Engine Operation and Maintenance Manual.

B. Power Controls Operational Test/Final Adjustments

(Ref. Sec. 76-10-00)

3. Gas Producer Controls Linkage Replacement

(Ref. Figure 202)

(1). Disassemble linkage only to point required to make repairs.

(2). Measure and note control rod length before removing rod-ends to expedite reassembly and rigging.

4. Sta. 124.00 Support Fitting Replacement

(Ref. Figure 202)

A. Sta. 124.00 Support Fitting Removal

(1). Remove lockbolt from Sta. 124.00 support fitting as follows:

(2). Split collar axially with a sharp chisel. Have an assistant support opposite side with a bucking bar to prevent hole deformation or breakout. Drive pin out with a drift.

NOTE: Lockbolt hole enlargement beyond 0.1870 inch (4.7498 mm) diameter requires an oversize lockbolt pin installation.

B. Sta. 124.00 Support Fitting Installation

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST2009	Inspection gauge

(1). Position support fitting on Sta. 124.00 lower frame. Install standard bolts, washers and nuts. Do not tighten.

NOTE: A standard size pin may be used where pin hole does not exceed 0.1870 inch (4.7498 mm) diameter; otherwise, proceed as follows:

(2). Use a No.7 drill to enlarge a damaged hole to 0.2015 inch (5.1181 mm) maximum diameter. Use a 3/16 inch (4.7625 mm) diameter replacement pin.

NOTE: Up to three washers may be used under pin head to establish correct lockbolt grip.

(3). Install lockbolt pin and collar; best fit results when pulling gun air pressure is 90-125 psi (621-862 kPa).

(4). Inspect lockbolt installation with gauge (ST2009) or equivalent.

(a). No gap is allowed under either pin head or collar. If pin grip length or collar swage quality is questionable, replace lockbolt.

(5). Torque control support fitting/Sta. 124.00 attaching hardware.

CAUTION Do not jam bearing against fitting. Hold rod- end with a wrench when tightening adjustable end jam nut. Ensure bearing misalignment is divided equally between each control rod bearing assembly.

(6). Rig gas producer controls (Ref. Model 250-C20B and 250-C20R/2 Gas Producer Controls Rigging).

5. Gas Producer Controls Inspection

(Ref. Figure 202)

(1). Check gas producer linkage for lost motion due to wear as follows:

(a). Open throttle to maximum speed stop, then slowly back to to idle stop.

(b). Mark pointer position on gas producer fuel control quadrant.

(c). Use light finger pressure to move gas producer lever toward CUT-OFF. Mark pointer position on quadrant. Relax pressure.

(d). Measure distance between lever position marks. Measurement exceeding 5/64 inch (1.9844 mm) indicates unacceptable wear in throttle control linkage. Inspect individual linkage components for loose fasteners and wear.

(2). Inspect control rods for:

(a). Worn or binding end bearings.

1). Bearing wear is limited to 0.040 inch (1.016 mm) maximum axial looseness.

(b). Surface damage.

(c). Cracks

(d). Gouges

(e). Nicks

(f). Loose end rivets

(g). Misalignment, bent or bowed

CAUTION Control rod variation from a straight line is limited to 0.010 inch (0.254 mm), maximum, in each foot.

(3). Bent or bowed gas producer control rods, excluding rod-ends, must fall within the following tolerances:

(a). Fuselage-routed control rods: Not more than 0.050 inch (1.270 mm), total variation.

(b). Sta. 73.00 control rod: Not more than 0.010 inch (0.254 mm), total variation.

(c). Gas producer lever control rod: Not more than 0.020 inch (0.508 mm), total variation.

(4). Inspect bellcrank and support fitting bearings for binding.

(5). Fluorescent penetrant inspect suspected parts for cracks.

WARNING **Check control system rig and engine operation following any repair that required gas producer control or linkage disassembly or replacement; prior to releasing helicopter for flight.**

CAUTION Perform a deceleration time check per pilot's flight manual after adjusting or replacing gas producer fuel control or linkage parts. Make adjustments per Allison Operation and Maintenance Manual if deceleration time is less than allowable minimum.

6. Gas Producer Control Rod Repair

(Ref. Figure 201)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM321	Surface primer locking compound
CM431	Sealing, locking and retaining compound

CAUTION Fluorescent penetrant crack inspection shall be performed after cold-straightening. Replace a cracked or bent rod, or rod-end.

(1). Cold-straighten a bent rod provided there are no nicks or sharp dents in bend length. Do not use rod-ends to support rod during straightening process.

CAUTION Use care when drilling to remove or install riveted rod-end. Tighten jam nut before drilling and riveting to prevent hole enlargement.

(2). Replace control rod-end if bearing axial play is more than 0.040 inch (1.016 mm). Set initial control rod length and bearing angularity as shown.

7. Bellcrank Repair

(Ref. Figure 202)

(1). Replace bellcranks or control supports that are distorted, cracked or have elongated holes.

(2). Replace unserviceable bellcrank bearings.

CAUTION Do not get primer or locking compound on bearing surfaces.

(a). Apply surface primer and grade A locking compound (CM321 and CM431) to bearing outer race and installation hole per manufacturers instructions. Install bearing.

WARNING **Check control system rig and engine operation following any repair that required gas producer control or linkage disassembly or replacement; prior to releasing helicopter for flight.**

CAUTION Perform a deceleration time check per pilot's flight manual after replacing or adjusting gas producer fuel control or linkage parts. Make adjustments per Allison Operation and Maintenance Manual if deceleration time is less than allowable minimum.

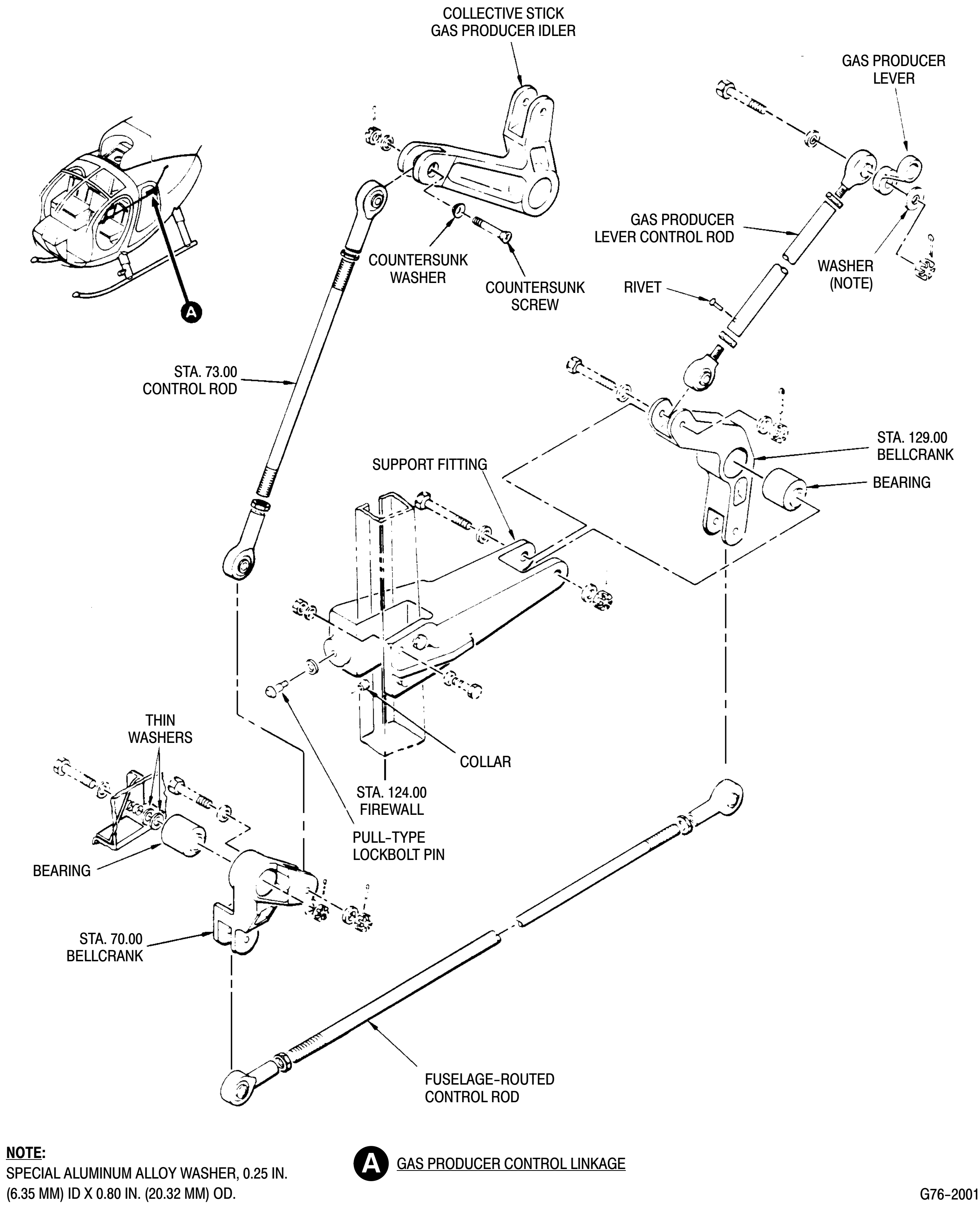


Figure 202. Gas Producer Controls Replacement

Section

76-47-00

Engine Power Controls (250-C47)

ENGINE CONTROLS
MAINTENANCE PRACTICES

1. Engine Controls Description

(1). The 250-C47 engine control system consists of a full authority digital engine control (FADEC) system for automatic operation and a hydromechanical backup system for emergencies or manual operation.

(2). Refer to the 250-C47M Allison Engine Operation and Maintenance Manual for additional engine fuel system theory, operation and maintenance data.

2. Engine Controls Operation

(1). Engine control mode is selected by the Auto/Manual Switch. In the Auto Mode, the Electronic Control Unit (ECU) modulates fuel flow to the engine in conjunction with the position of the power lever angle (PLA) which is connected to the throttle grip on the collective stick by a control cable. The PLA will be set with the throttle grip to either the Cutoff, Ground Idle or Flight Idle position. The ECU provides hot start and overspeed protection, overspeed test function and auto-reignition and rotor speed trim capability.

(2). In the Manual Mode, the fuel flow is modulated by the PLA on the Hydromechanical Control Unit with the throttle grip and control cable. The ignition exciter operates continuously in this mode.

3. Engine Controls Fault Isolation

Table 201. Engine Controls Fault Isolation

Symptom	Probable Trouble	Corrective Action
ECU FAIL on Warning/Caution panel.	Faulty ECU.	Replace ECU.
	Faulty wiring.	Test and repair wiring.
Flight controls unresponsive.	Faulty ECU.	Replace ECU.
	Faulty collective potentiometer.	Replace Collective Potentiometer.
	Faulty directional potentiometer.	Replace Directional Potentiometer.
	Faulty wiring.	Test and repair wiring.

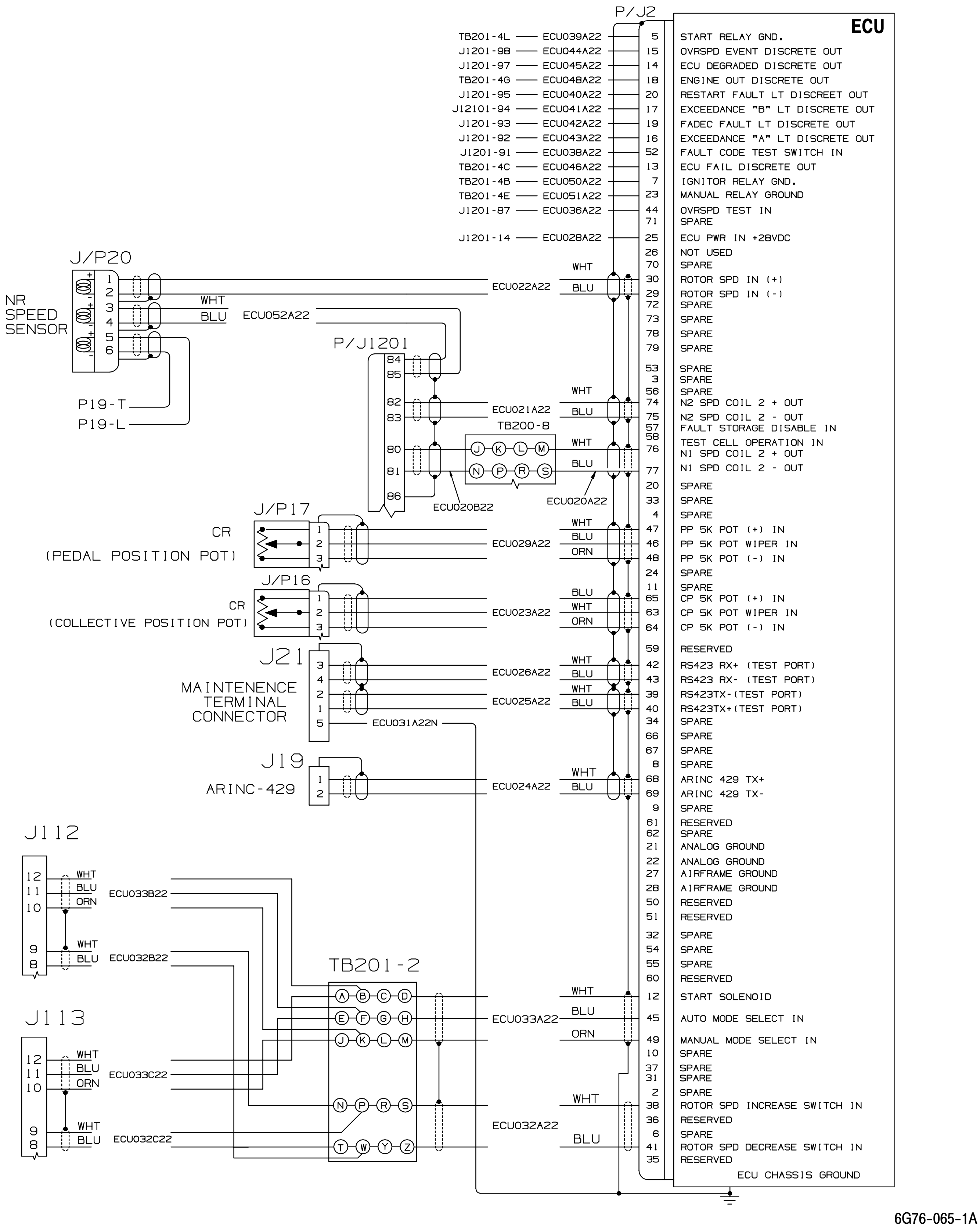


Figure 201. Engine Control Unit Wiring Diagram (Sheet 1 of 2)

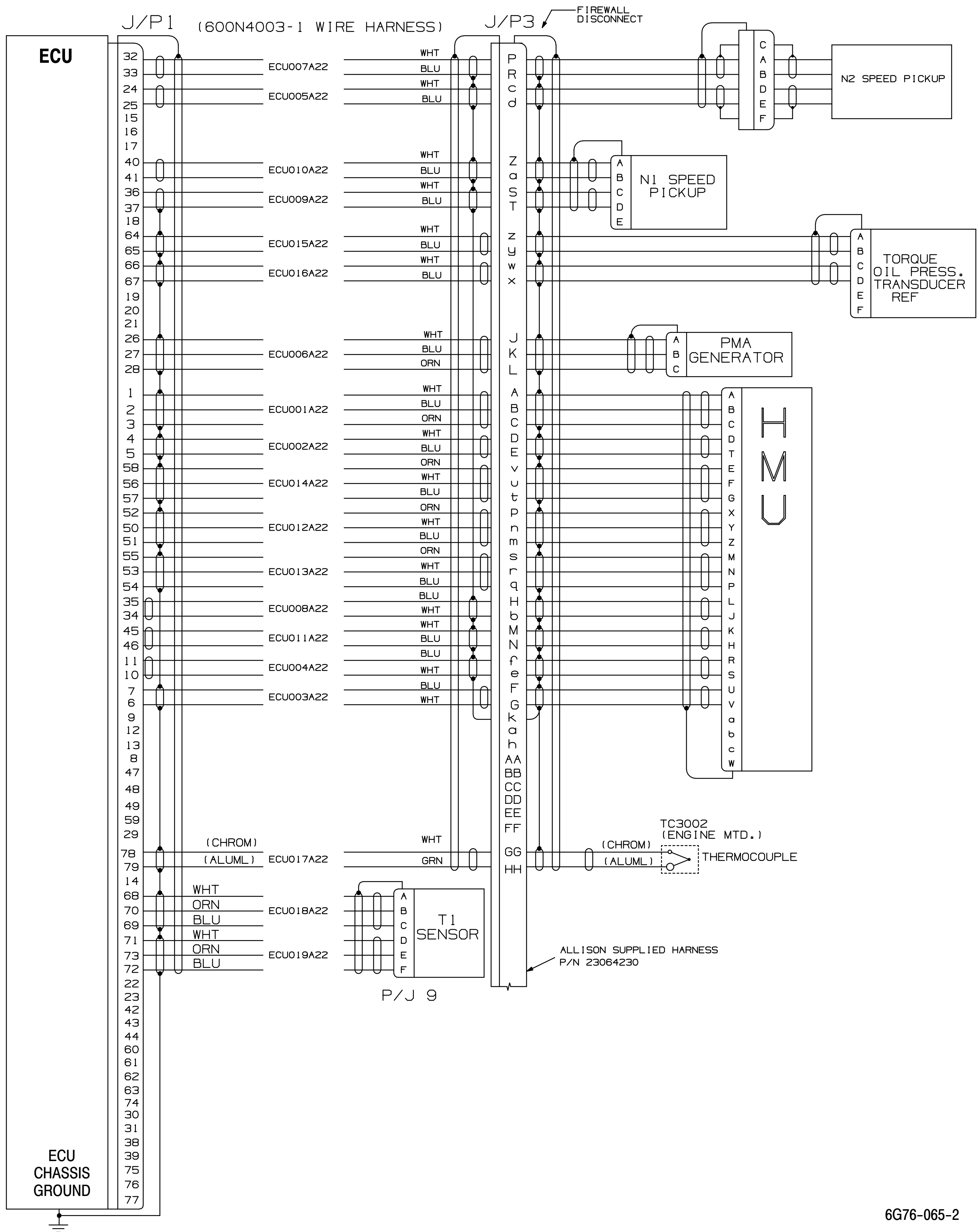


Figure 201. Engine Control Unit Wiring Diagram (Sheet 2 of 2)

4. ECU (Electronic Control Unit) Replacement

(Ref. Figure 202)

A. ECU Removal

(1). Detach engine harness and airframe harness connectors from ECU.

(2). Remove screw, lockwasher and washer and disconnect bonding jumper from ECU.

(3). Remove bolts, washers, large area washers and bushings and remove ECU from mounting bracket.

B. ECU Installation

(1). Install ECU on mounting bracket with bushings, large area washers, bolts and washers. Torque bolts to **36 - 46 inch pounds (4.06 - 5.19 Nm)**.

(2). Connect bonding jumper to ECU with screw, lockwasher and washer. Torque screw to **20 - 25 inch-pounds (2.25 - 2.82 Nm)**.

(3). Attach engine harness and airframe harness connectors to ECU.

5. Engine Control Potentiometer Replacement

(Ref. Figure 202)

A. Collective Potentiometer Removal

(1). Detach electrical connector from collective potentiometer.

(2). Loosen potentiometer mounting screws and remove drive belt.

(3). Remove screws and washers and remove potentiometer assembly from mounting bracket.

B. Collective Potentiometer Installation

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST1010	Volt-ohmmeter
N/A	Laptop computer with MT35 program

(1). Prepare potentiometer mounting surfaces for electrical bonding (Ref. CSP-HMI-3, Section 96-00-00).

(2). Install potentiometer with screws and washers. Torque screws to **20 - 25 inch-pounds (2.25 - 2.82 Nm)**.

(3). Rig potentiometer to collective stick.

(a). Place collective stick in full down position and connect an ohmmeter (ST1010) between pins 1 and 2. Turn potentiometer gear until resistance is between 1000 and 1175 ohms.
or
Attach electrical connector to potentiometer. Connect MT35 to the ECU and apply power to aircraft. Reading on MT35 should be 0.0% - 5.0%.

CAUTION Excessive tension on drive belt may damage potentiometer.

(b). Install drive belt over both pulleys with teeth fully engaged. Tension belt with potentiometer mounting screws so that the belt does not noticeably sag over the span. Retorque screws to **20 - 25 inch-pounds (2.25 - 2.82 Nm)**.

(c). Place collective in full up position and verify that potentiometer resistance is between 4500 and 4675 ohms.
or
With electrical connector attached to potentiometer and MT35 connected apply power to aircraft, reading should be 98.6% - 105.0%.

(d). If necessary, belt may be adjusted one tooth on either pulley (one tooth equals 450 ohms).

(e). If more adjustment is required, loosen pulley to bracket bolts on collective (view B) and rotate pulley to obtain desired resistance. Retorque bolts to **20 - 25 inch-pounds (2.25 - 2.82 Nm)**.

(4). If not already connected, attach electrical connector to potentiometer.

C. Directional Potentiometer Removal

(1). Detach electrical connector from directional potentiometer.

(2). Loosen potentiometer mounting screws and remove drive belt.

(3). Remove screws and washers and remove potentiometer assembly from mounting bracket.

D. Directional Potentiometer Installation

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST1010	Volt-ohmmeter
N/A	Laptop computer with MT35 program

(1). Prepare potentiometer mounting surfaces for electrical bonding (Ref. CSP-HMI-3, Chap. 96).

(2). Install potentiometer with screws and washers. Torque screws to **20 - 25 inch-pounds (2.25 - 2.82 Nm)**.

(3). Rig potentiometer to directional controls.

(a). Place directional control pedals to full left pedal position and connect ohmmeter (ST1010) between pins 2 and 3. Turn potentiometer gear until resistance is between 1000 and 1250 ohms.
or
Attach electrical connector to potentiometer. Connect MT35 to the ECU and apply power to aircraft. Reading on MT35 should be 0.0% - 7.1%.

CAUTION Excessive tension on drive belt may damage potentiometer.

(b). Install drive belt over both pulleys with teeth fully engaged. Tension belt with potentiometer mounting screws so that the belt does not noticeably sag over the span. Retorque screws to **20 - 25 inch-pounds (2.25 - 2.82 Nm)**.

(c). Place directional control pedals to full right pedal position and verify that potentiometer resistance is between 4500 and 4675 ohms.
or
With electrical connector attached to potentiometer and MT35 connected apply power to aircraft, reading should be 98.6% - 105.0%.

(d). If necessary, belt may be adjusted one tooth on either pulley (one tooth equals 400 ohms).

(e). If more adjustment is required, loosen pedal pulley bolt and rotate pulley to obtain desired resistance. Retorque bolt to **20 - 25 inch-pounds (2.25 - 2.82 Nm)**.

(4). If not already connected, attach electrical connector to potentiometer.

6. CIT (Compressor Inlet Temperature) Sensor Replacement

(Ref. Figure 202)

A. CIT Sensor Removal

(1). Detach electrical connector from CIT sensor.

(2). Remove bolts, washers and CIT sensor.

B. CIT Sensor Installation

(1). Install CIT sensor with bolts and washers. Torque bolts to **36 - 46 inch pounds (4.06 - 5.19 Nm)**.

(2). Attach electrical connector to CIT sensor.

7. Engine Control Box Replacement

A. Engine Control Box Removal

(1). Disconnect engine control cable nut from engine control box and remove cable end from control box coupling.

(2). Remove bolts, washers and engine control box from the engine hydromechanical control unit.

B. Engine Control Box Installation

(1). Install engine control box on the engine hydromechanical control unit with bolt and washer. Torque bolts to **36 - 46 inch pounds (4.06 - 5.19 Nm)**.

(2). Install control cable end into engine control box coupling and connect cable nut. Torque nut to **50 inch pounds (5.64 Nm)**.

(3). Rig engine control cable (Ref. Section 76-00-00).

8. Engine Control Cable Replacement

(Ref. Figure 202)

A. Engine Control Cable Removal

(1). Disconnect control cable nut from engine control box and remove cable end from control box coupling.

(2). Remove screw, washers, spacer, clamp and nut from control cable in engine compartment.

(3). Remove cotter pin, nut, bolt and washers and disconnect control cable from engine throttle bellcrank.

(4). Remove screws, nuts and washers attaching control cable bulkhead swivel to bracket.

(5). Pull engine control cable forward through bracket and control cable conduit and remove from cockpit.

(6). After cable is removed helicopter, refer to Engine Control Cable Shipping and Handling.

B. Engine Control Cable Installation

(1). Before installing a new cable;

(a). Lay the cable straight.

(b). Grasp one end and shake.

(c). This procedure aligns races and removes any twisting.

(2). Push engine control cable through control cable conduit from cockpit aft into engine compartment.

(3). Install control cable bulkhead swivel in bracket with screws, washers and nuts. Torque nuts to **12 - 15 inch pounds (1.35 - 1.69 Nm)**.

NOTE: When installing a 600N7714-3 throttle cable, the 600N7718-1 control cable bracket must be installed for proper control cable alignment.

(4). Connect engine control cable to engine throttle bellcrank with bolt, washers, nut and cotter pin. Torque nut to **30 - 40 inch pounds (3.38 - 4.51 Nm)**.

NOTE: Ensure there are no sharp bends in cable when clamping into position.

(5). Install clamp, screw, washers, spacer and nut attaching control cable to bracket in engine compartment. Torque nut to **12 - 15 inch pounds (1.35 - 1.69 Nm)**.

(6). Run cable through full range of travel to ensure smooth operation.

CAUTION Do not lubricate cable if cable action is not smooth. Lubricant attracts dirt which will damage the cable.

(7). Install control cable end into engine control box coupling and connect cable nut. Torque nut to **50 inch pounds (5.64 Nm)**.

(8). Rig engine control cable.

9. Engine Throttle Control Cable Mounting Bracket Replacement

(Ref. Figure 202)

A. Engine Throttle Control Cable Mounting Bracket Removal

(1). Disconnect throttle cable at collective stick (Ref. Engine Control Cable Replacement).

(2). Disconnect throttle cable from bracket (Ref. Engine Control Cable Replacement).

(3). Remove two nuts, four washers, two spacers and two bolts securing bracket to socket assembly.

(4). Slide bracket over end of throttle cable.

B. Engine Throttle Control Cable Mounting Bracket Installation

(1). Slide bracket over end of throttle cable and align with bolts holes in socket assembly.

(2). Install bolts with washers through bracket and socket assembly.

(3). Install spacers, washers and nuts on bolts (spacers are installed before washers).

(4). Torque nuts to **12 - 15 inch-pounds (1.36 - 1.69 Nm) plus drag torque**.

(5). Connect throttle cable (Ref. Engine Control Cable Replacement).

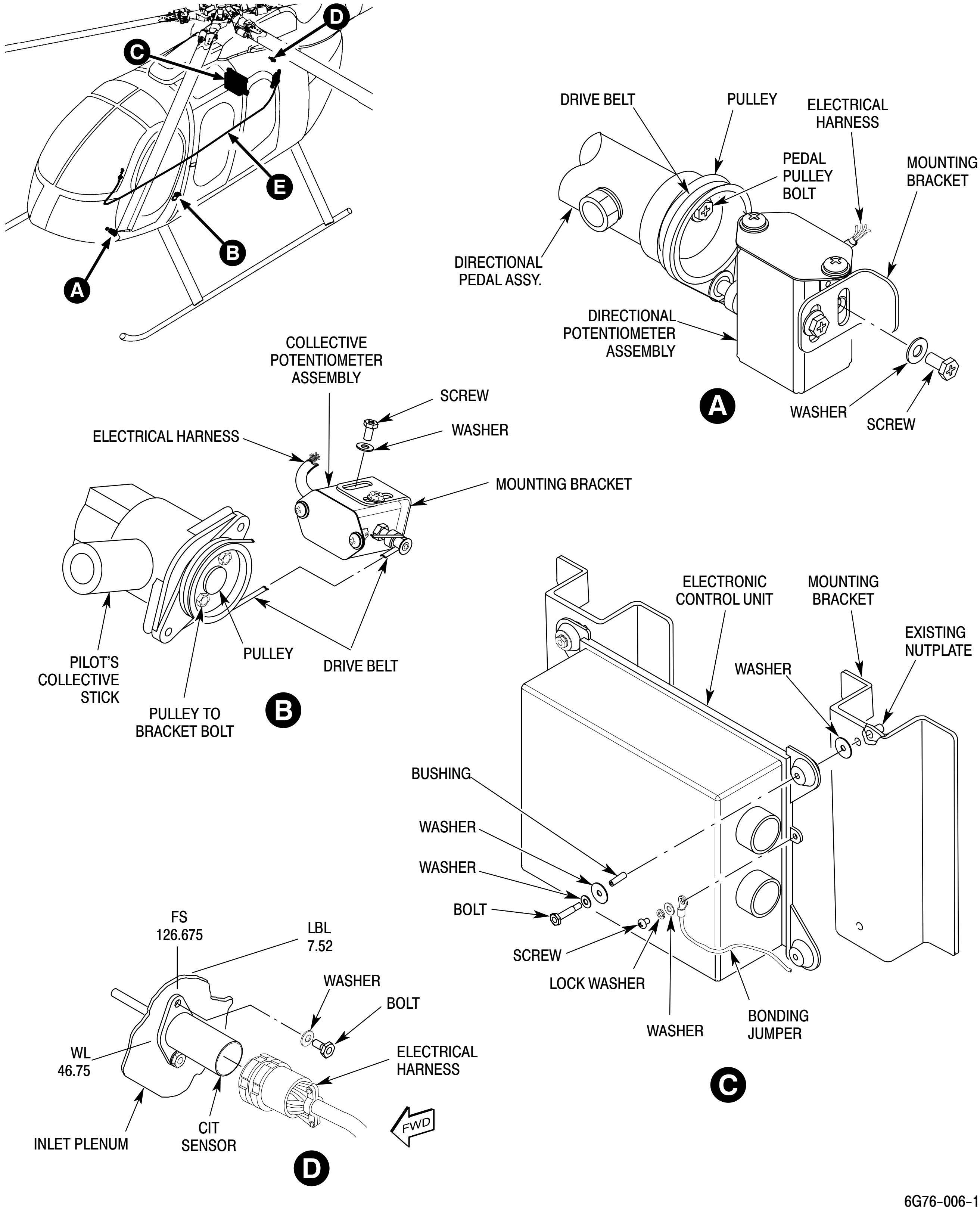


Figure 202. Engine Controls Installation (Sheet 1 of 2)

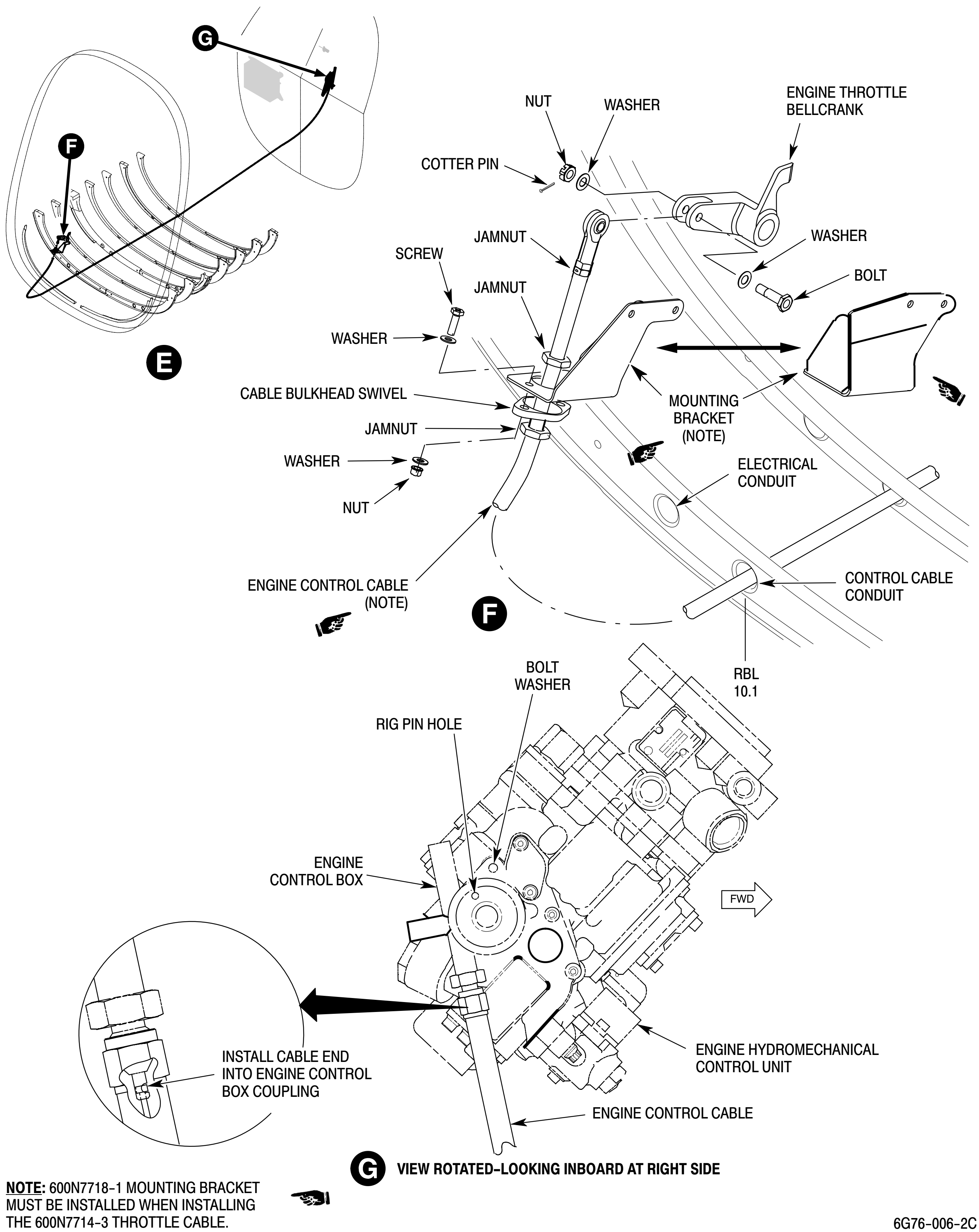


Figure 202. Engine Controls Installation (Sheet 2 of 2)

10. Engine Control Cable Rigging

(Ref. Figure 203)

(1). Loosen control cable jam nuts at cable bulkhead swivel.

(2). Set lever on engine hydromechanical control unit to idle and insert 0.1535-0.1545 inch (3.8989-3.9243 mm) rig pin (or #23 drill blank) in rig pin hole (ensure that rig pin engages the fuel control gearbox, gear, pointer arm and casting.

(3). Set collective twist grip at idle detent position.

(4). Position the cable in the bulkhead swivel so that the cable is not binding and tighten the jam nuts. Torque jam nuts to **40 inch-pounds (4.51 Nm)**.

(5). Remove rig pin (or drill blank).

(6). Rotate the throttle twist grip to full and shutoff positions and verify that the hydromechanical control unit lever contacts the stops at both settings.

(7). Rotate the throttle twist grip from full to idle positions and verify that the pointer on the hydromechanical control unit is between 30-40 degrees.

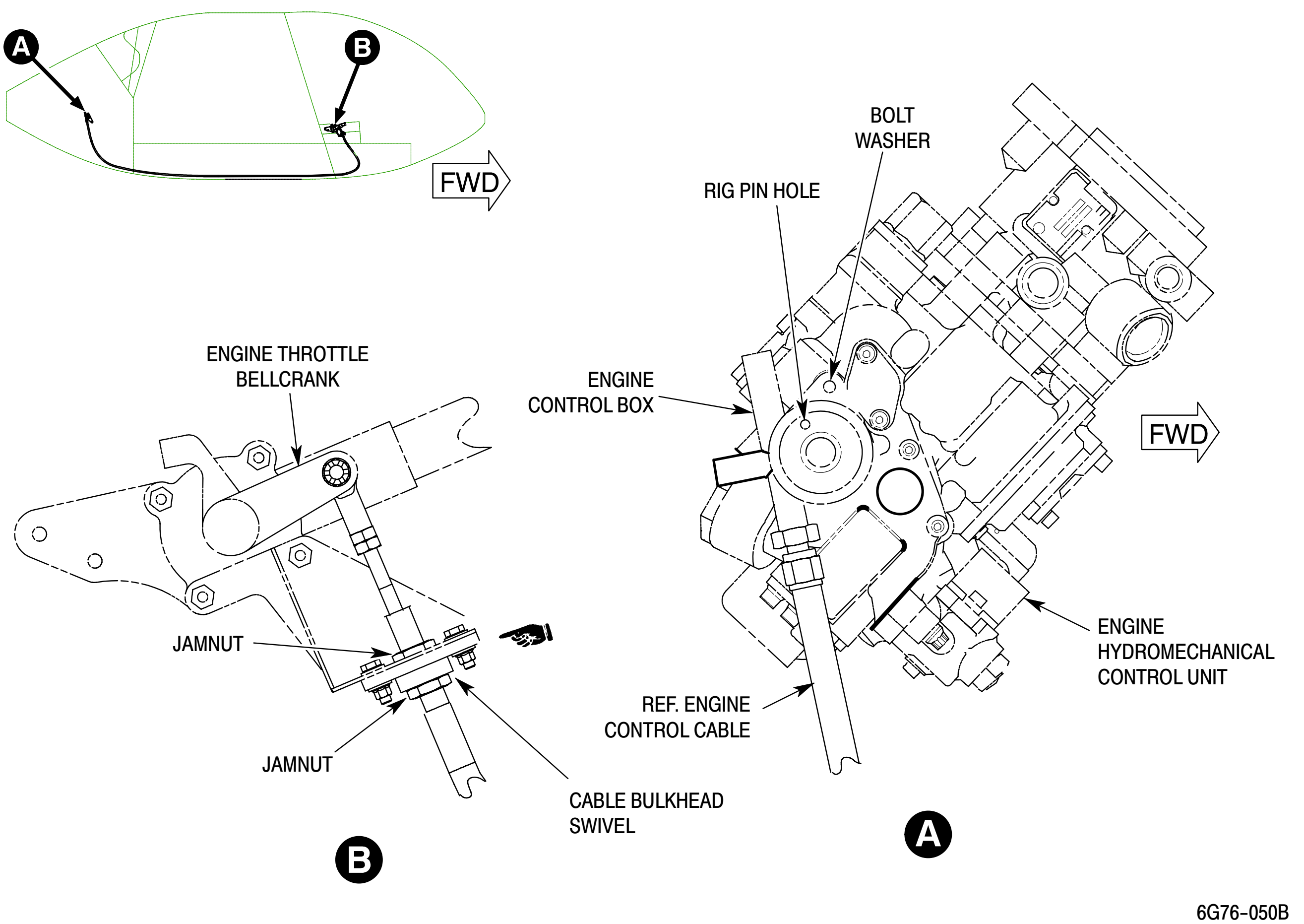


Figure 203. Engine Control Cable Rigging

11. Engine Controls Inspection

(1). Visually inspect ECU for damage and security of installation.

(a). Inspect ECU for security of hardware. Torque or replace loose or missing hardware.

(b). Inspect electrical connectors, wire harnesses and bonding jumper for chafing or cuts. None allowed. Ensure connectors are securely attached.

(2). Visually inspect collective and directional potentiometers for damage and security of installation.

(a). Inspect potentiometers for security of hardware. Torque or replace loose or missing hardware.

(b). Inspect drive belts for cuts and excessive tension. None allowed.

(c). Inspect electrical connectors and wire harnesses for chafing or cuts. None allowed. Ensure connectors are securely attached.

(3). Visually inspect CIT sensor for damage and security of installation.

(a). Inspect CIT sensor for security of hardware. Torque or replace loose or missing hardware.

(b). Inspect electrical connector and wire harness for chafing or cuts. None allowed. Ensure connector is securely attached.

(4). Visually inspect engine control box and control cable for damage and security of installation.

(a). Inspect engine control cable for sharp bends, chafing, binding (smooth operation through full range of travel), corrosion and dents. None allowed.

CAUTION Do not lubricate cable if cable action is not smooth. Lubricant attracts dirt which will damage the cable.

(b). Inspect engine control box and control cable for security of hardware. Torque or replace loose or missing hardware.

(c). Inspect control cable to control box connection for security. Torque control cable nut.

12. Engine Control Cable Shipping and Handling

(Ref. Figure 204) The following procedures should always be used when handling the engine control cable. This cable can be damaged if handled incorrectly.

A. Control Cable Removal From Shipping Box

The control cable is shipped in a “lazy figure 8” configuration.

(1). Lift control cable from box.

(2). Hold the cable upright in both hands.

(3). Remove the shipping wire.

(4). Starting with the nearest end fitting, pay out the loops of the cable, one at a time.

(5). Lay the cable straight.

(6). Grasp one end fitting and shake the cable to align the races.

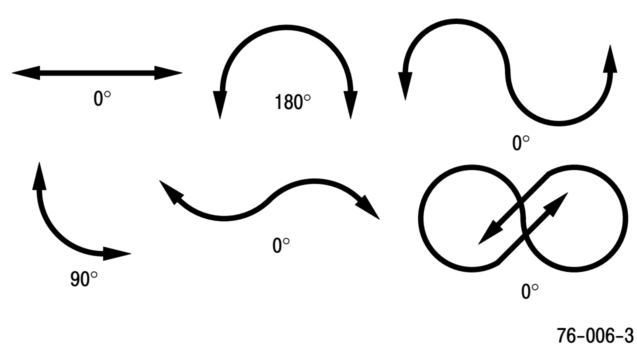


Figure 204. Effective Bend Angle

B. Control Cable Installation into Shipping Box

(Ref. Figure 204) The cable is to be folded into a “lazy figure 8” position whenever it is shipped.

CAUTION Never allow cable to be bent more than 180 degrees effective bend angle, this will damage cable.

NOTE: The following procedure may require more than one person to perform.

(1). Lay cable flat.

(2). Grasp both ends of cable and gently bend in opposite directions.

(3). Continue bending until you have a “figure 8”.

(4). To fit the cable into a shipping box, the cable may have to be bent into a double “figure 8”.

(5). Gently wire the cable together in the center of the “figure 8” to prevent damage in shipping or storage.

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Chapter

78

Engine Exhaust System

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Section

78-20-00

Engine Exhaust System (250-C20B and 250-C20R/2)

EXHAUST SYSTEM
MAINTENANCE PRACTICES

1. Description and Operation

The engine exhaust system consists of left and right tailpipes attached to the engine by two clamps and a flexible suspension system. Suspension hardware allows exhaust system thermal expansion and contraction. Movement is absorbed by a spring, upper and lower cushioned hanger assemblies and a pivoted link. The link suspends the tailpipes from an airframe fitting above the exhaust outlet.

2. Exhaust System Replacement

(Ref. Figure 201)

A. Exhaust System Removal

(1). Remove right side thermocouple hardware (Ref. View A).

(2). Remove tailpipe clamps.

(3). Remove airframe link attaching hardware.

(4). Remove two tailpipes as an assembly.

CAUTION Cover engine exhaust ducts to keep FOD out of turbine section.

(5). Install covers on engine exhaust outlets.

(6). Remove spring and hangers. Separate tailpipes.

B. Exhaust System Installation

(1). Remove exhaust duct covers.

CAUTION Support tailpipes during installation. Unsupported tailpipes could damage mounting flanges or result in clamp joint misalignment and subsequent exhaust gas leakage.

(2). Butt tailpipe flanges up to engine exhaust duct flanges and install clamps. Locate clamp T-bolts at 6 o'clock position. Install washers and nuts. Finger tighten clamp nuts.

NOTE: Use only corrosion resistant fasteners.

(3). Install lower hanger between tailpipe aft flanges. Attach tailpipe support link to airframe fitting. Install bolt, washers and nut. Finger tighten nut.

(4). Install upper hanger between tailpipe flanges.

(5). Attach spring hook to upper clip bushing with two captive washers on each side (Ref. View C).

(6). Attach lower spring hook to clip bushing between support link and thin washer (Ref. View D).

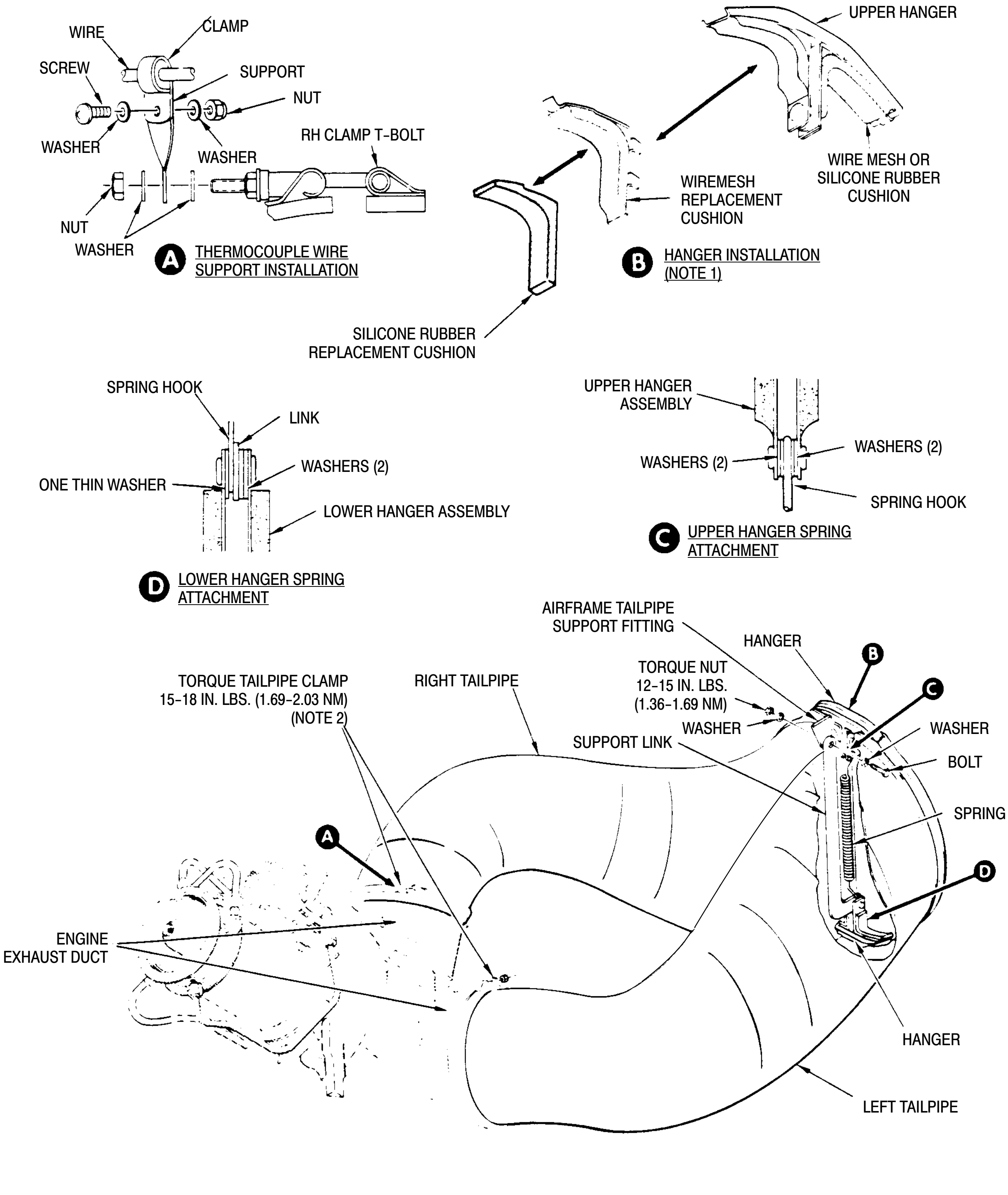
(7). Torque engine/tailpipe clamp nuts to **15 - 18 inch-pounds (1.69 - 2.03 Nm)**.

(8). Tap around both clamps with a rawhide mallet to seat clamps on flanges. Retorque clamp nuts **15 - 18 inch-pounds (1.69 - 2.03 Nm)**.

(9). Continue tapping around clamp and retorquing clamp nut until nut no longer turns when specified torque is applied.

(10). Install thermocouple wire support on right tailpipe clamp T-bolt with one washer on each side of support. Install nut (Ref. View A). Install thermocouple wire, clamp, screw, washers and nut on support.

(11). Torque tailpipe support link nut to **12 - 15 inch-pounds (1.36 - 1.69 Nm)**. Install cotter pin.



NOTES:

1. TYPICAL FOR UPPER AND LOWER HANGERS.
2. LOCATE T-BOLTS AT 6 O'CLOCK POSITION.

G78-0002

Figure 201. Exhaust System Installation

3. Exhaust System Inspection

(Ref. Figure 202)

A. Tailpipe Inspection

(1). Inspect tailpipe flanges and duct interior/exterior surfaces for cracks and broken weld seams.

(a). No cracks allowed across flange. Replace tailpipe.

(b). Weld seams may be repaired provided cracks meet limits in the following steps.

(c). Fluorescent penetrant inspect suspected cracks to determine crack ends and length.

(d). Nonintersecting single line cracks up to 2.00 inches (5.08 cm) long may be repaired if they do not affect the forward flange.

(e). Intersecting cracks of any length forming an acute angle and an unsupported section may not be repaired.

(2). Repair cracks or separations.

(3). Replace an unrepairable tail pipe.

(4). Inspect engine and tailpipe flanges for evidence of gas leakage.

(a). Gas leakage may be caused by flange misalignment, loose or improperly installed flange clamp, cracked, warped, nicked, dented, gouged or distorted flange areas or a combination of causes.

(5). Straighten flange distortions.

(6). Replace a tailpipe having a cracked forward flange.

(7). Inspect entire duct for dents, crimps, creases, wrinkles, sags and bulges.

(8). Repair distortions.

B. Supports and Fasteners Inspection

(1). Inspect hanger cushions for wear, tears and security.

(a). Inspect braided metal cushions for spotweld security.

(2). Replace damaged hanger cushions.

(3). Check spring for cracks, pits, nicks, kinks, gouges, evidence of overheating, wear and corrosion. Replace a spring showing such damage.

(a). Measure spring free length from hook center to hook center. Spring free length shall be 6.28 inches (15.951 cm). Replace a stretched spring.

(b). Anchor one end of spring. Attach an accurate weight scale to the other end. Stretch spring to 7.10 inches (18.034 cm), hook center to center. Spring tension at specified length must be 8-12 pounds (35.6-53.4 N). Replace a spring failing tension requirement.

(4). Inspect hanger/clip rivets and washers for security. Inspect spring hook bushings, washers and rivets for wear and security. Replace worn parts. Repair loose rivets.

(5). Inspect support link for cracks, corrosion and hole wear exceeding specifications (Ref. Figure 202).

C. Clamp Inspection

CAUTION A failed exhaust duct clamp may present a serious inflight problem. Replace any clamp you think is in marginal condition.

(1). Inspect T-bolt threads for condition. Repair damaged threads.

(2). Check self locking nut for run-on torque resistance. Replace a worn nut.

(3). Inspect strap/channel spotwelds for security.

(4). Check strap for cracks, creases, bends, joggles and other evidence of fatigue. Replace clamps showing metal crystallization or cracks anywhere on the strap.

(5). Inspect clamp channels for cracks, spread or crimp (Ref. Figure 202).

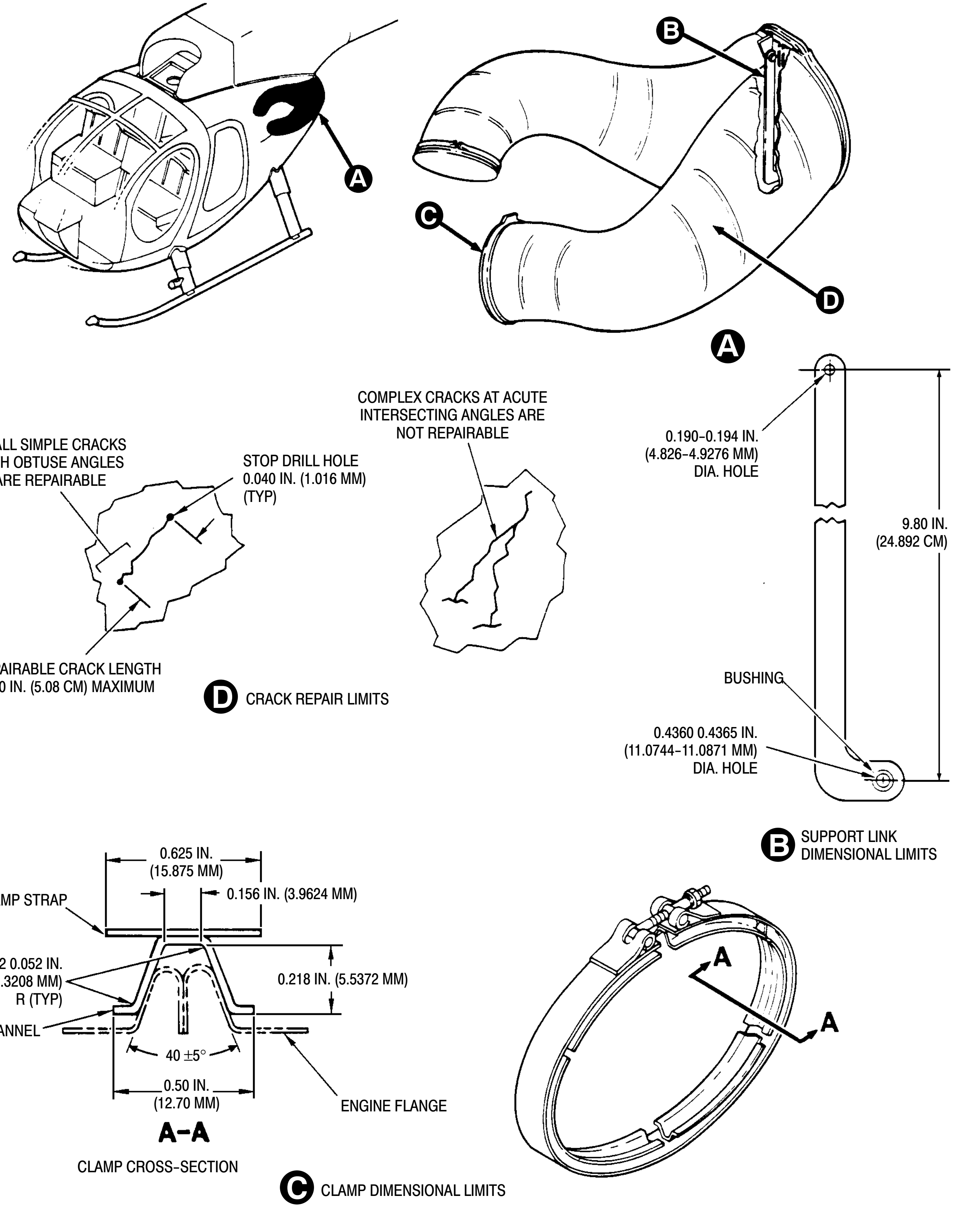


Figure 202. Exhaust System Inspection

4. Exhaust System Repairs

(Ref. Figure 203)

A. Tailpipe Repair

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM824	Welding rod

(1). Remove dents and distortions with a suitably shaped form-block and mallet.

(2). Repair cracks meeting repair limits as follows:

(a). Stop-drill crack ends with a 0.040 inch (1.016 mm) diameter drill.

(b). Remove all carbon and debris from a one inch area bordering crack with a stainless steel brush. Clean inside and outside surfaces.

(c). Route out crack a minimum width from end to end to expose bare metal.

(d). Flood back side of weld area with inert gas or shield with a suitable stainless steel flux.

(e). Tungsten inert gas weld crack with 21-6-9 CRES rod or wire (CM824).

(f). Fluorescent penetrant inspect repairs for cracks. Weld cracks as required.

B. Hanger Cushion Repair

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM423	Sealant

NOTE: Either bonded silicone rubber or welded all metal original equipment cushions may be installed. Replacement parts may be tab attached metal or bonded silicone rubber cushions.

(1). Replace original equipment metal cushions with tabbed metal cushions as follows:

(a). Cut away cushion debris.

(b). Grind spot welds smooth and level with hanger surfaces.

NOTE: Avoid weakening replacement cushion tabs. Ensure cushions are correctly located prior to bending tabs.

(c). Position cushion assembly on hanger. Bend cushion tabs to grip hanger (Ref. View B).

(2). Replace original equipment metal cushions with silicone rubber cushions as follows:

(a). Cut away cushion debris.

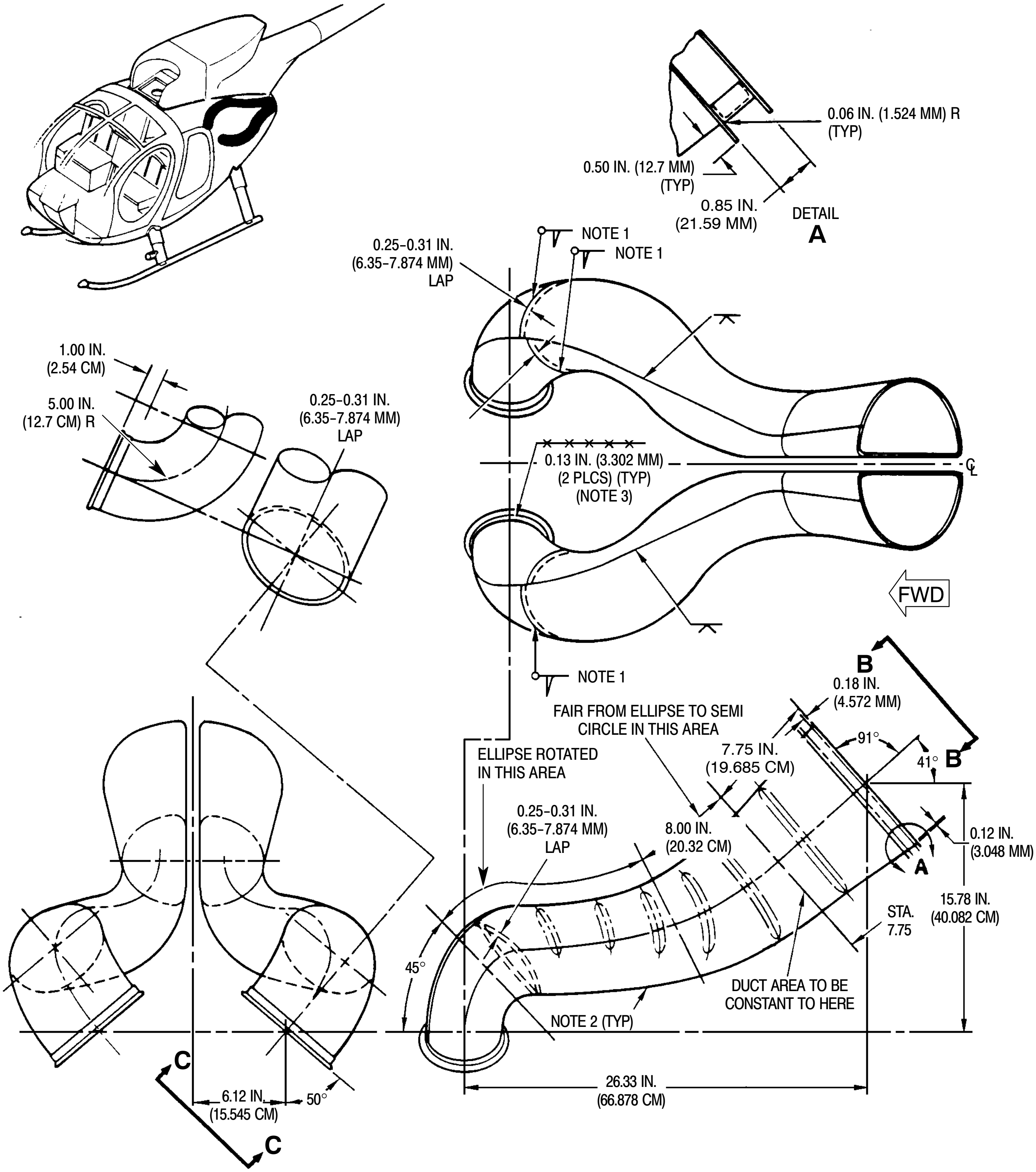
(b). Grind spot welds smooth and level with hanger surfaces.

(c). Clean hanger components and cushion bond joint-surfaces per sealant manufacturers instructions.

(d). Bond cushion to hanger with RTV 106 sealant (CM423). Inject sealant into cavity around spring attach points. Allow sealant to cure per manufacturers instructions.

C. Tailpipe Clamp Repair

(1). Chase clamp T-bolt threads with a 10-32NF-38 die or replace clamp, as required.



NOTES:

1. FILLET WELD ALL AROUND, NEAR SIDE.
2. BUTTWELD.
3. STITCHWELD. x x x x

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Figure 203. Exhaust System Repairs (Sheet 1 of 3)

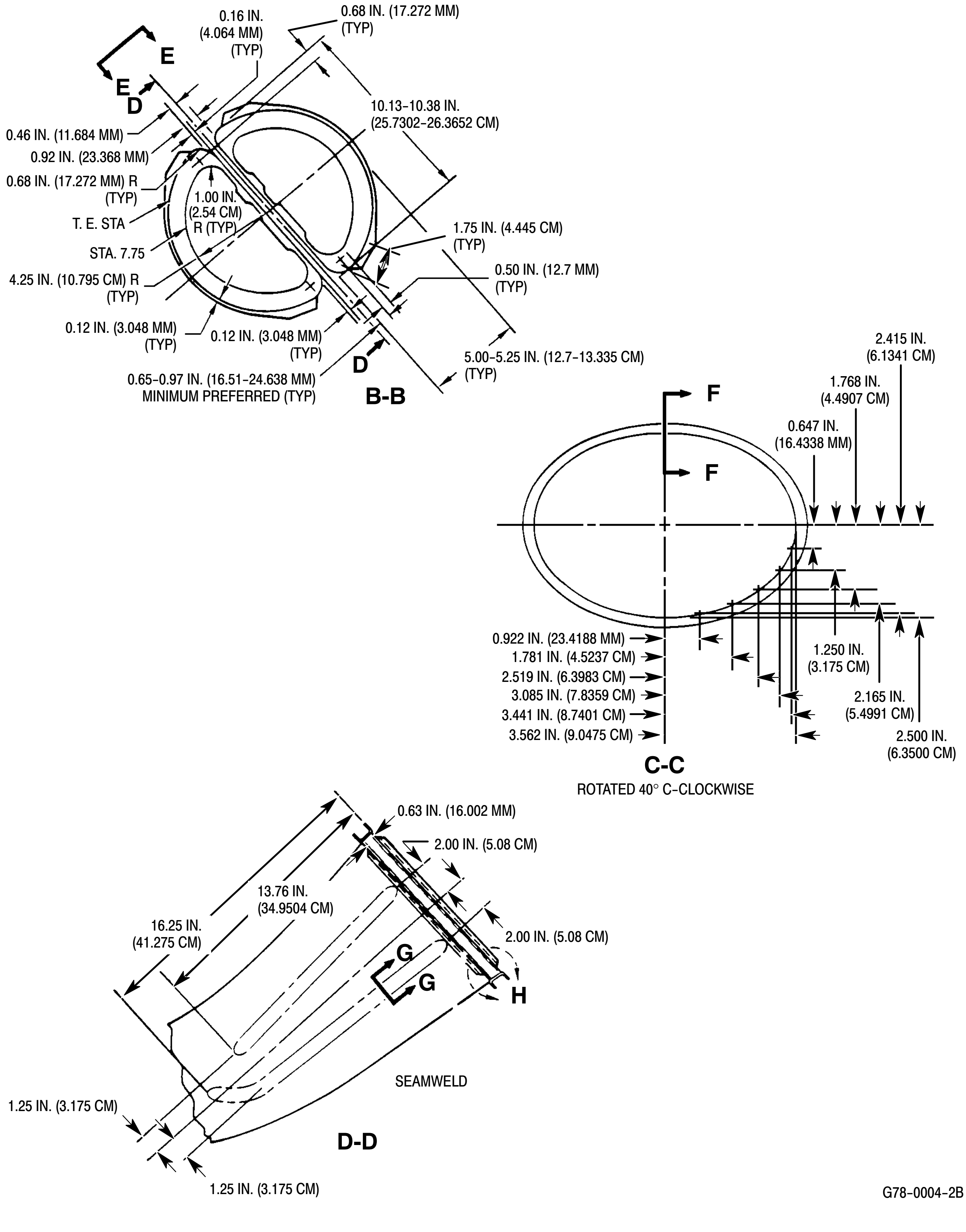

Figure 203. Exhaust System Repairs (Sheet 2 of 3)

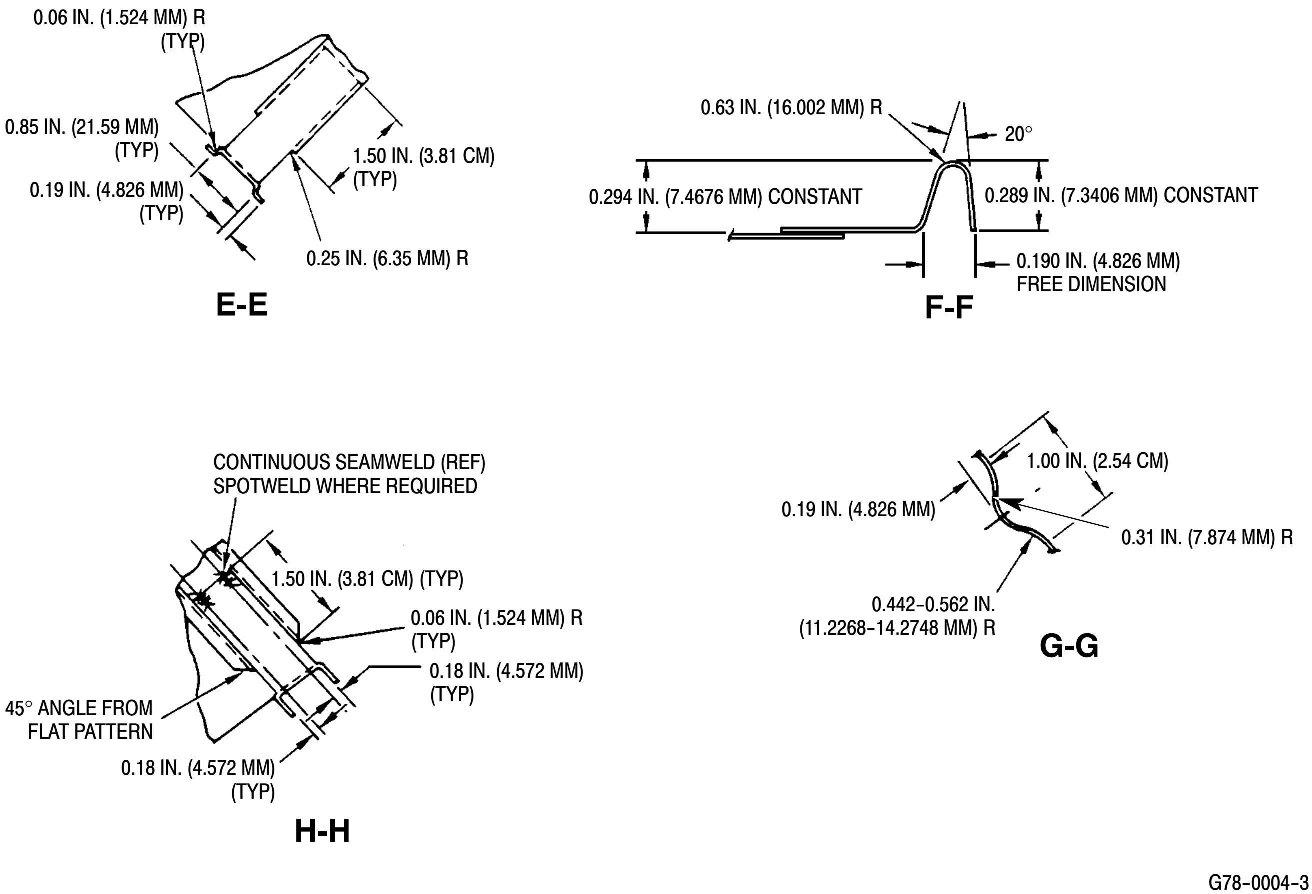

Figure 203. Exhaust System Repairs (Sheet 3 of 3)

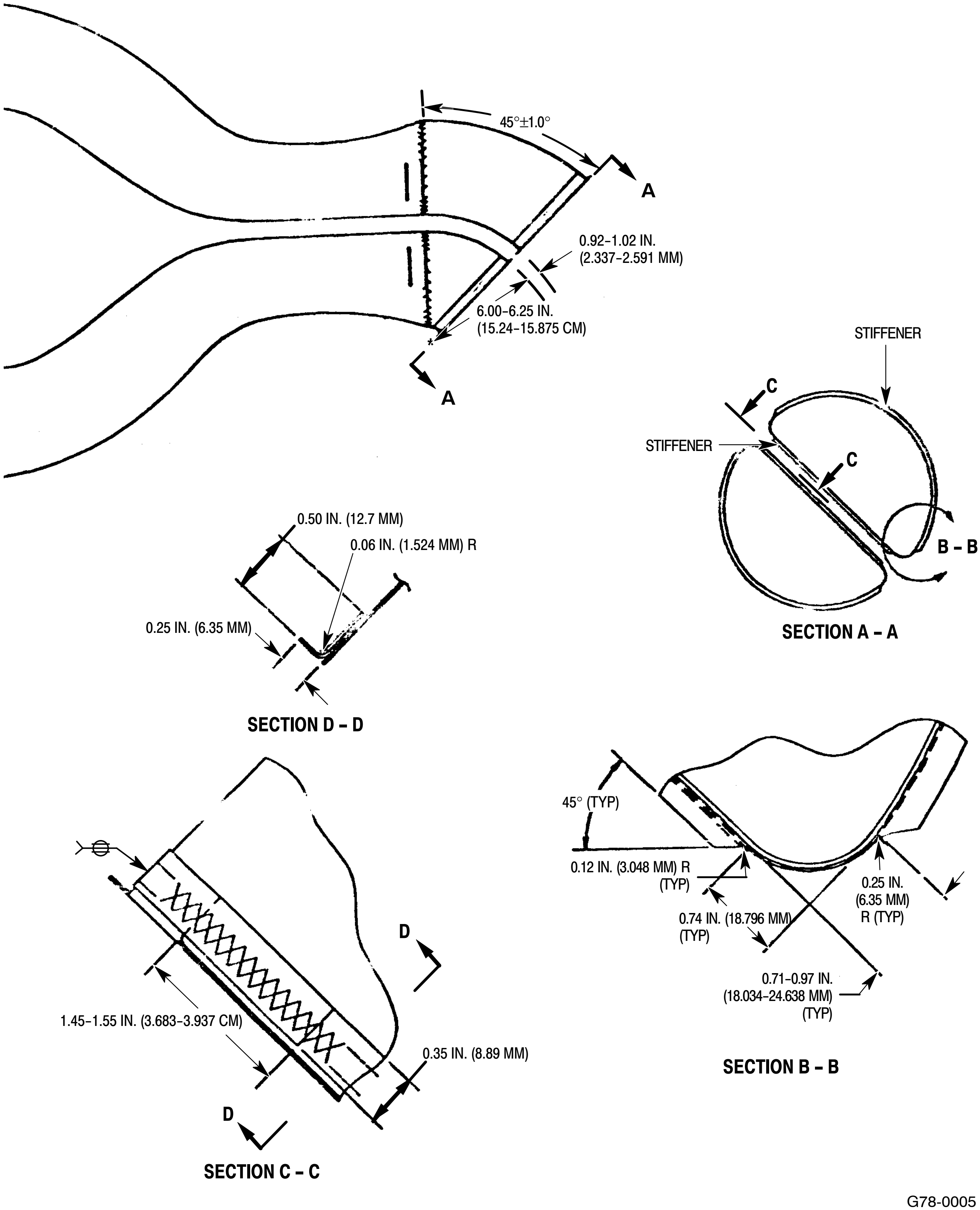

Figure 204. Engine Exhaust Extension (500N)

Section

78-30-00

Engine Exhaust System (250-C30 and 250-C47)

EXHAUST SYSTEM
MAINTENANCE PRACTICES

1. Description and Operation

Engine exhaust is ducted through a tailpipe bolted to the engine exhaust duct flange and supported by a flexible link mounting attached to the aft fuselage. Figure 201 shows the exhaust system and mounting details.

2. Exhaust System Replacement

(Ref. Figure 201)

A. Exhaust System Removal

(1). Detach tailpipe from engine exhaust duct by removing:

(a). Six nuts, bolts, and 12 washers from exhaust pipe side flanges.

(b). Two nutplate strips, 14 bolts and washers from exhaust pipe fore and aft flanges.

(2). Loosen the tensioning bolt passing through the hanger torsion spring mandrel.

(3). Disengage the adjuster from the spring pin.

CAUTION Whenever tailpipes are removed, cover engine exhaust ducts with clean covers to prevent entry of foreign materials into turbine section of engine.

(4). Remove tailpipe and gasket.

(5). Visually inspect bottom of upper aft section firewall for contact marks with discoloration, holes or tears. Pay particular attention to firewall blanket retainer clips at Sta. 155.75 fuselage ring.

B. Exhaust System Installation

(1). Remove protective cover from engine exhaust duct.

(2). Install gasket onto engine exhaust flange.

CAUTION Support aft ends of tailpipe during installation. Displacement from proper mounting position may damage forward mounting flanges.

(3). Place tailpipe over engine exhaust duct and secure with nuts, nutplate strips, bolts and washers; torque bolts to **36 - 46 inch-pounds (4.07 - 5.20 Nm) plus drag torque.**

(4). Install duct with duct clamp link standing vertical.

(5). When viewed from left side of helicopter. turn torsion spring adjuster 150 ±15 degrees clockwise and engage spring pin in nearest hole in adjuster.

(6). Tighten tensioning bolt to adjust spring.

(7). Inspect for no contact between top of exhaust and firewall retainer clips at Sta. 155.75 fuselage ring.

3. Exhaust System Inspection

(Ref. Figure 201)

(1). Inspect for cracks and broken weld seams.

(2). Inspect for dents and bends.

(3). Using flashlight and mirror, look in engine bay through engine access doors and look through engine oil filter access cutout.

(a). Inspect top of engine exhaust duct for contact marks and bottom of upper aft section firewall for contact marks with discoloration, holes or tears. Pay particular attention to firewall blanket retainer clips at Sta. 155.75 fuselage ring.

4. Exhaust System Repair

(Ref. Figure 201)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM824	Welding rod

(1). Repair dents and bends using a form block and suitable mallet.

(2). Repair cracks and breaks in tailpipes as follows:

(a). Using stainless steel brush, thoroughly clean at least 1 inch (2.54 cm) on all sides of cracked area. Cleaning should remove all carbon from both inner and outer surfaces and from crack itself.

(b). Weld, using inert arc method, with rod (CM824). Shield back side of weld with inert gas or suitable stainless steel flux.

(c). Repair single cracks less than 2 inches (5.08 cm) in length by stop-drilling 0.040 inch (1.016 mm) diameter hole at termination of each end of crack. This method of repair does not apply to intersecting cracks that form an acute angle leaving an unsupported section.

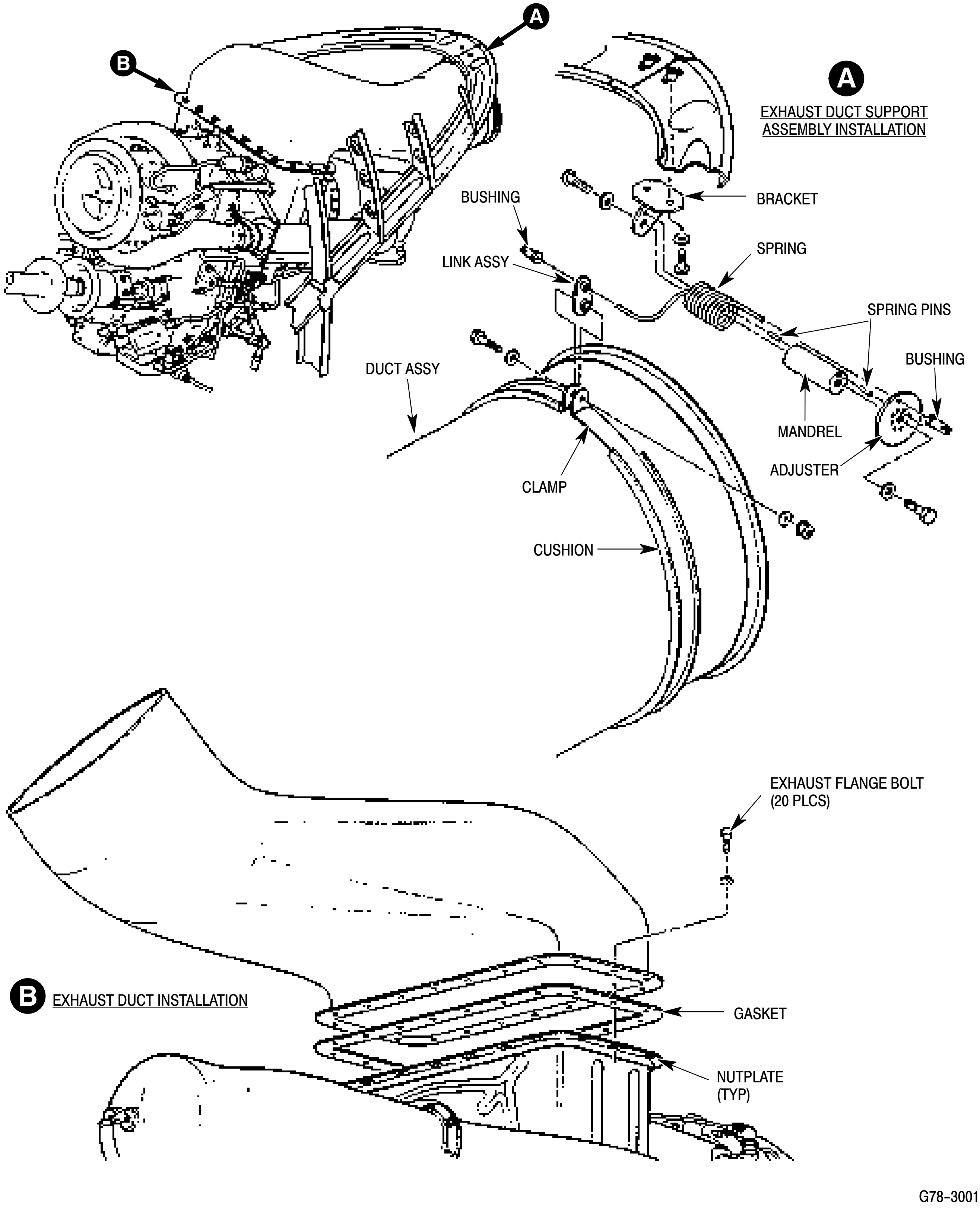

Figure 201. Engine Exhaust System Installation

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Chapter

79

Engine Oil Supply System

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79-00-00

Engine Oil Supply System (369D/E/FF - 500/600N)

ENGINE OIL SUPPLY SYSTEM DESCRIPTION AND OPERATION

1. Engine Oil Supply System Description and Operation

A. Oil Supply System Description

(1). MDHI helicopters feature a dry sump, air cooled, recirculating engine oil system consisting of an oil tank, oil temperature sender, oil cooler/heat exchanger and air duct, thermostat, drain valve, check valve, hoses, tubes, fittings and attaching hardware.

B. Oil Supply System Operation

(1). Hot oil scavenged from the engine is pumped through a one way check valve into the oil cooler. Oil cooler blower air at ambient temperature is ducted through the cooler/heat exchanger. The oil cooler reduces oil temperature to approximately 185°F (86°C). Cooled oil is returned to the oil tank. Oil drawn from the tank by the suction side of the engine driven pump is then distributed through the engine under pressure to cool and lubricate moving parts. The heated oil drains into various engine sumps, and the cycle is repeated.

(2). An all welded, spherical aluminum alloy oil tank is fitted with a filler neck, optional filler neck strainer, locking cap, vent tube, oil inlet and outlet fittings, temperature sender, sight plug and mounting support bosses. A replaceable sight plug provides oil quantity information at a glance.

(3). The oil cooler is an all aluminum, radiator-type heat exchanger. A thermostat in the oil cooler set at 140 - 180°F (60 - 82°C) returns cold oil directly to the tank, bypassing the cooler until the oil has reached operating temperature. The oil cooler also features a pressure-relief bypass valve that opens at 25-30 psi (172-207 kPa) and a one way ball type check valve mounted on the oil cooler inlet fitting that prevents oil from flowing back into the engine after shut down.

(4). A fiberglass duct guides cooling air from the oil cooler blower to the oil cooler.

(5). The oil supply system drain valve is mounted on a bracket below the oil cooler. Tubes from the oil tank, oil cooler and overboard drain are connected to the drain valve which is spring-loaded closed.

NOTE: DN- 72.1 discloses installation procedures modifying early 369D helicopter oil tank and cooler drains for easier access.

(6). All oil supply system hoses and tubes are lightweight assemblies incorporating permanent fittings. Hoses installed near the engine are equipped with fire shields.

(7). Refer to the applicable Allison Engine Operation and Maintenance Manual for specific engine oil system information (Ref. Sec. 01-00-00).

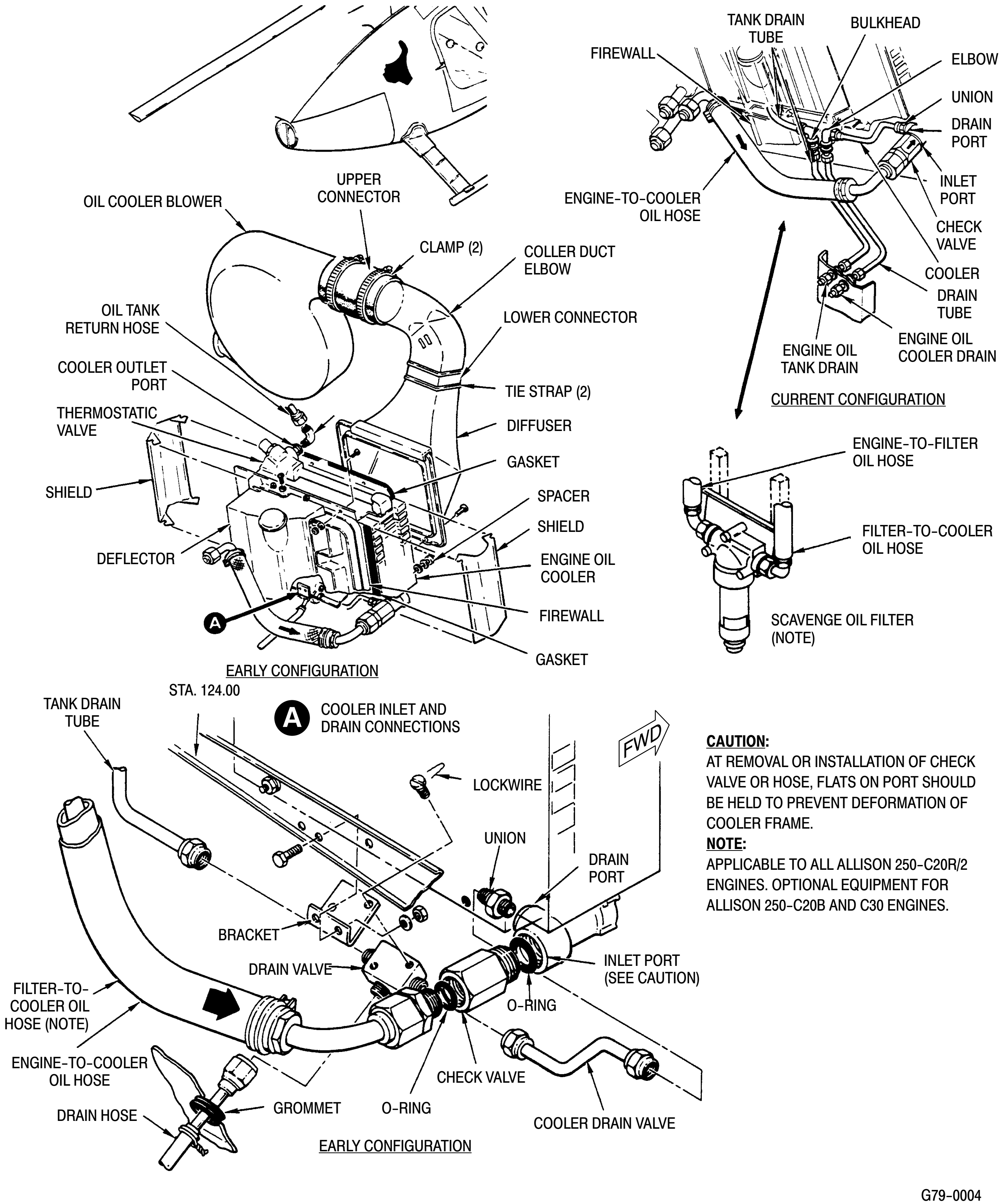


Figure 201. Engine Oil Supply System Schematic Diagram

2. Engine Oil Supply System Fault Isolation

Table 201. Engine Oil Supply System Fault Isolation

Symptom	Probable Trouble	Corrective Action
Low or zero oil pressure.	Oil tank empty.	Top off oil supply tank (Ref. Sec. 12-00-00).
	Oil line restriction.	Inspect, clean or replace plumbing.
	Restricted oil filter element.	Clean oil filter per Allison Operation and Maintenance Manual.
	Defective sensor or indicator.	Replace sensor and, or indicator.
	Oil pressure regulator valve improperly adjusted.	Adjust regulator per Allison Operation and Maintenance Manual.
	Contaminated oil.	Inspect filter and chip detectors. Drain and flush oil system. Refill system (Ref. Sec. 12-00-00).
Sudden oil pressure reduction or pressure fluctuations.	Low oil quantity.	Check oil level and service system (Ref. Sec. 12-00-00).
	Oil contamination.	Inspect filter and chip detectors. Drain and flush system. Replace oil (Ref. Sec. 12-00-00).
	Oil leak.	Repair or replace hoses, tubes or engine components as required.
	Defective sensor or indicator.	Replace sensor and, or indicator.
	Oil filter or pressure regulator valve restriction.	Clean oil filter; adjust pressure regulator valve. Replace valve if oil pressure can not be adjusted (refer to applicable Allison Operation and Maintenance Manual).
	Defective oil pump.	Replace oil pump per applicable Allison Operation and Maintenance Manual.
High oil pressure.	Defective indicator.	Replace indicator.
	Pressure regulator valve out of adjustment.	Adjust pressure regulator valve per Allison Operation and Maintenance Manual.
Abnormally high oil temperature indication.	Defective temperature sensor or indicator.	Replace temperature sensor and/or indicator.
	Oil cooler bypass valve stuck closed.	Repair or replace oil cooler.
	Oil cooler air passages blocked or damaged.	Repair or replace oil cooler.
	Oil cooler oil passages blocked or damaged.	Inspect oil filter and chip detectors. Repair or replace oil cooler.
	Oil cooler blower intake air blockage.	Open intake airway.
	Oil cooler blower failed or impeller damaged.	Repair or replace blower.

Table 201. Engine Oil Supply System Fault Isolation

Symptom	Probable Trouble	Corrective Action
Abnormally low oil temperature indication.	Defective temperature sensor or indicator.	Replace temperature sensor and/or indicator.
	Oil cooler bypass valve stuck open.	Repair or replace oil cooler.
Oil consumption exceeds 6.5 oz. (192.21 cc) per hour.	Leakage; loose fittings or connections.	Repair or replace fittings and connections.
	Restricted vent lines.	Inspect and clean as necessary.
	Defective engine bearing oil seals.	Repair or replace engine.
Chip detector warning light on.	Contaminated oil.	Inspect engine chip detectors per Allison Operation and Maintenance Manual.

3. Oil Cooler Flushing

(Ref. Figure 202)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM226	Cleaning compound, alkaline waterbase
CM234	Solvent, dry-cleaning

NOTE: Maintain the engine oil cooler per the following steps. For additional information, refer to manufacturer's publications (Ref. Sec. 01-00-00). Where a conflict exists between this manual and manufacturer's publication, information in this manual supersedes manufactures data.

(1). Remove thermostat, elbows, unions and O-rings. Plug all openings.

CAUTION Use only oil cooler manufacturer's recommended cleaning solutions or a substitute that is stated as safe for use on aluminum. Copper or copper nickel cleaning compounds or solutions may corrode the oil cooler. Cleaning equipment that has been used with an unknown material, or a known corrosive cleaning solution must be thoroughly flushed with the recommended solution prior to use on the oil cooler.

(2). Steam clean oil cooler exterior surfaces.

(3). Attach oil cooler to flushing setup shown. Flush oil cooler as follows:

(a). Start with solvent (CM234) to flush oil cooler interior. Initially reverse solvent flow through cooler by Connecting hose from pump discharge port to oil cooler outlet port.

(b). Connect hose from storage tank to inlet port of oil cooler.

(c). Start cleaning equipment pump. Flush cooler for 30 minutes, or until solution appears clean after passing through unit.

(d). Shut down equipment and drain oil cooler.

NOTE: If metal particles are found, clean screens with solvent (CM234) and blow dry with clean, dry, filtered, low pressure compressed air.

(4). Examine filter screens for metal or other foreign particles after flushing the unit per the following steps.

(a). Flush oil cooler with compound (CM226) in direction opposite to normal flow for 30 minutes.

(b). Reverse hoses and flush oil cooler for 10-15 minutes in normal flow direction.

(c). Rinse oil cooler with solvent (CM234) for 10 minutes.

(5). Check filter screens. Replace oil cooler if additional metal particles are found.

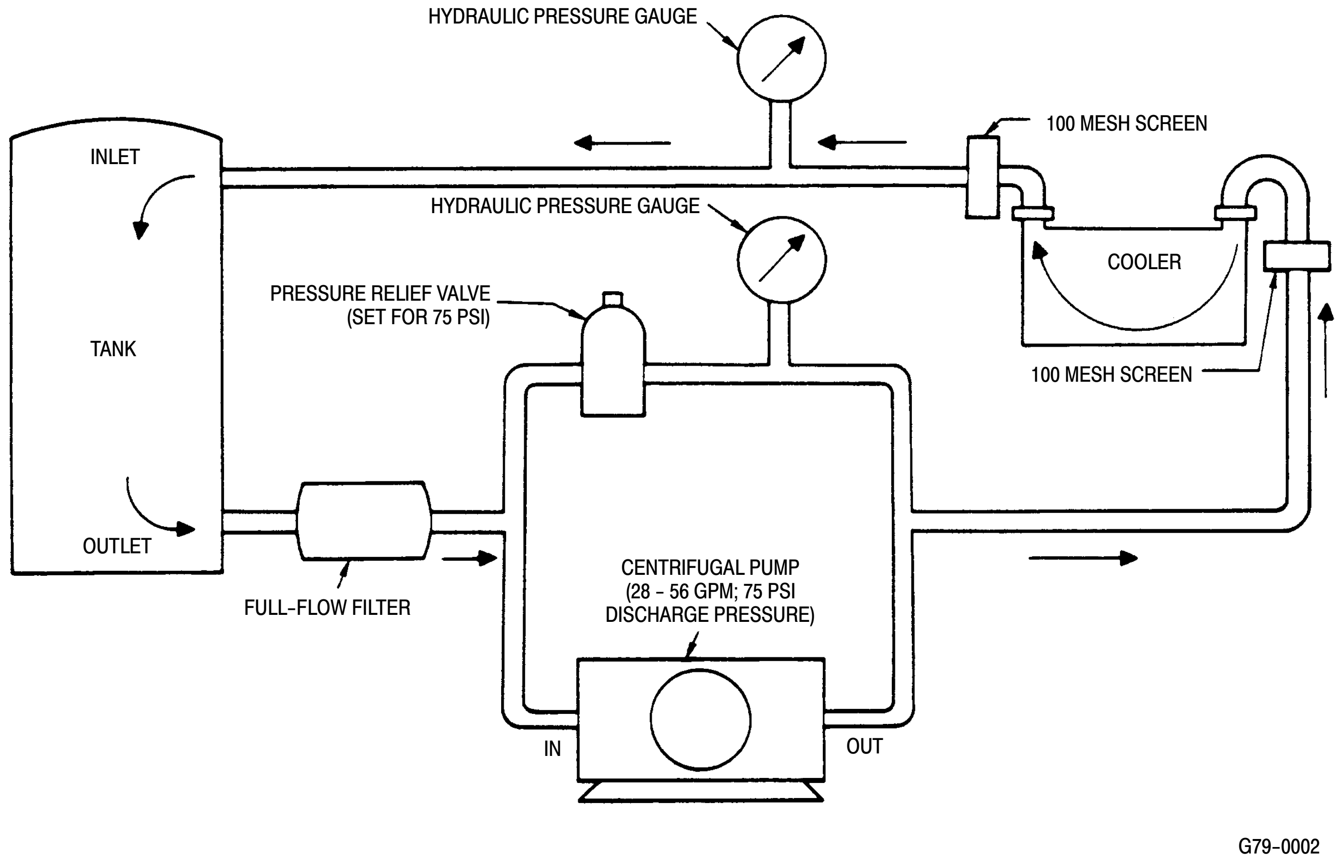


Figure 202. Oil Cooler Flush Equipment and Arrangement

4. Oil Tank Replacement

(Ref. Figure 203)

A. Oil Tank Removal

(1). Drain oil system (Ref. Sec. 12-00-00).

(a). Remove engine oil cooler duct.

(b). Disconnect hose between tank and vent. Disconnect supply, return and tank drain lines from oil tank fittings. Allow tank to drain dry.

(c). Disconnect oil temperature sender wires and remove sender.

(d). Remove oil filler seal, oil tank cap retaining plate and oil tank.

(e). Unfasten and remove oil tank.

B. Oil Tank Installation

(1). Assemble tank as follows:

(a). Install vent hose on tank.

(b). Install unions and O-rings on oil return and supply hoses and tank drain tube fittings.

(c). Install oil temperature sender and gasket. Torque sender body to **100 - 150 inch-pounds (11.30 - 16.95 Nm)**. Install lockwire. Torque wire terminal nut to **12 - 25 inch-pounds (1.36 - 2.82 Nm)**.

(d). Install sight plug (Ref. Oil Tank Sight Plug Replacement).

(2). Position engine oil tank on Sta. 124.00 firewall and secure with bolts and washers.

(a). Install oil tank filler seal and retaining plate. Ensure filler seal fits over oil tank filler neck and is secure with attaching hardware (Ref. Figure 203, Detail B).

(b). Install oil tank filler seal clamp.

(3). Connect the following oil lines and torque (Ref. Table 202, Oil System Hardware Torque Values).

(a). Connect return hose between engine and cooler.

(b). Connect supply hose between tank and engine.

(c). Connect drain tubes to oil tank fittings.

(d). Install O-ring and connect vent hose between tank and engine.

(e). Install oil cooler duct.

5. Oil Tank Sight Plug Replacement

(Ref. Figure 203)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM125	Oil
CM126	Oil, turbine

A. Oil Tank Sight Plug Removal

(1). Drain oil system.

(2). Remove oil tank (Ref. Oil Tank Replacement).

(3). Break lockwire and remove sight plug.

B. Oil Tank Sight Plug Installation

NOTE: Liquid level decal is applied <u>after</u> plug is installed and torqued.

(1). Install a new O-ring on sight plug. Coat O-ring and sight plug threads with clean engine oil (CM125) or (CM126). Torque sight plug to **80 - 90 inch-pounds (9.04 - 10.17 Nm)**; lockwire.

(2). Project a pencil line from the oil tank upper mount through the centers of nutplate and sight plug (Ref. Figure 203, view A).

(3). Install sight plug decal on plug face with decal water line (WL) marks aligned with pencil line.

(4). Install oil tank (Ref. Oil Tank Replacement).

6. Oil Temperature Sender Replacement

NOTE: 369A4533- BSC sensor is compatible with the 369D296305- 21, -23 and -31 instrument clusters only. 369A4533-3 sensor is compatible with the 369D296305-33, -35 and -37 instrument clusters only.

(1). Switch off and disconnect all electrical power.

(2). Drain oil tank.

(3). Disconnect electrical wire from oil temperature sender, break lockwire and remove sender from oil tank fitting.

(a). Install oil temperature sender and gasket. Torque sender body to **100 - 150 inch-pounds (11.30 - 16.95 Nm)**. Install lockwire. Torque wire terminal nut to **12 - 25 inch-pounds (1.36 - 2.82 Nm)**.

(4). Fill oil tank (Ref. Sec. 12-00-00).

(5). Start engine (Ref. Pilot's Flight Manual). Check for oil leakage and temperature gauge operation.

(6). Install aft bulkhead access cover.

7. Oil Cooler Replacement

(Ref. Figure 204)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM125	Oil
CM126	Oil, turbine

A. Oil Cooler Removal

CAUTION Avoid oil cooler damage. Use a backup wrench to support oil cooler port bosses when unfastening or torquing threaded fittings.

(1). Drain oil system (Ref. Sec. 12-00-00).

(a). Remove oil cooler duct.

(b). Disconnect oil return hose from elbow at cooler outlet fitting. Remove elbow.

(c). Remove cooler drain tube. Remove drain union and O-ring from cooler inlet port.

(d). Remove check valve.

(e). Disconnect engine power turbine cooling air duct from oil cooler deflector. Remove deflector from cooler mounting flange.

(f). Remove oil cooler.

(g). Remove lockwire and separate shields from cooler, if installed.

B. Oil Cooler Installation

CAUTION Avoid oil cooler damage. Use a backup wrench to support oil cooler port bosses when unfastening or torquing threaded fittings.

(1). Install oil cooler per the following steps. Refer to manufacturer's publications for additional information as required (Ref. Sec. 01-00-00). This information supersedes cooler manufacturer's data wherever conflicting information exists.

(a). On Harrison coolers only, position shields on sides of oil cooler so that outboard shield without tab is adjacent to oil inlet port. Secure shields with one lockwire wrap around cooler.

(b). Position oil cooler on firewall and secure with attaching hardware.

(c). Position deflector on cooler mounting flange and secure with screws and washers. Connect engine power turbine cooling duct to oil cooler deflector.

(d). Coat check valve threads with oil (CM125) or (CM126); Install check valve.

NOTE: Torque all oil cooler hardware per Oil System Hardware Torque Values (Ref. Table 202).

(e). Install union and O-ring in cooler drain port.

(f). Connect cooler drain tube.

(g). Install tank return hose elbow in cooler outlet port. Connect oil tank return hose.

(h). Install oil cooler duct (Ref. Oil Cooler Duct Installation).

(i). Service tank with oil (CM125) or (CM126) (Ref. Sec. 12-00-00).

(2). Operate engine per Pilot's Flight Manual. Inspect oil system for leaks.

8. Oil Tank Return Hose Replacement

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM125	Oil
CM126	Oil, turbine

A. Oil Tank Return Hose Removal

(1). Remove trim and R/H bulkhead access panel.

(2). Drain oil supply system.

CAUTION Avoid oil cooler damage. Use a backup wrench on oil cooler port boss when removing or installing oil line fittings.

(3). Disconnect hose from oil cooler OUT port elbow.

(4). Remove oil cooler OUT port elbow.

(5). Disconnect hose from oil tank IN port union. Remove union.

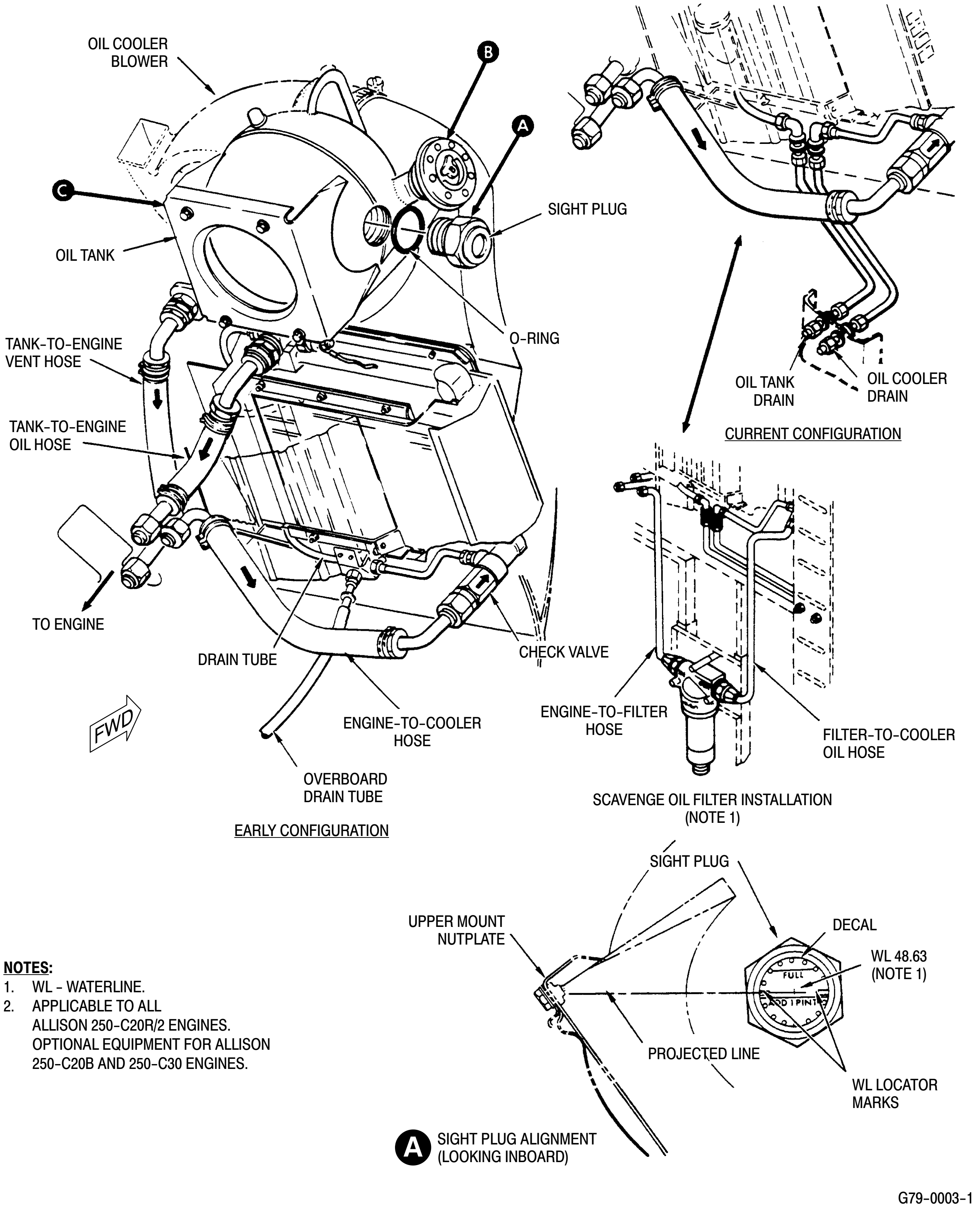
B. Oil Tank Return Hose Installation

(1). Lubricate male threads with clean engine oil (CM125) or (CM126) prior to installation. Thread hose straight end fitting into oil tank. Attach opposite end to oil cooler.

(2). Torque hose ends per Oil System Hardware Torque Values (Ref. Table 202).

(3). Install bulkhead panel and trim.

(4). Enter compliance in helicopter records.



NOTES:

1. WL - WATERLINE.
2. APPLICABLE TO ALL ALLISON 250-C20R/2 ENGINES. OPTIONAL EQUIPMENT FOR ALLISON 250-C20B AND 250-C30 ENGINES.

Figure 203. Engine Oil Supply System (Sheet 1 of 2)

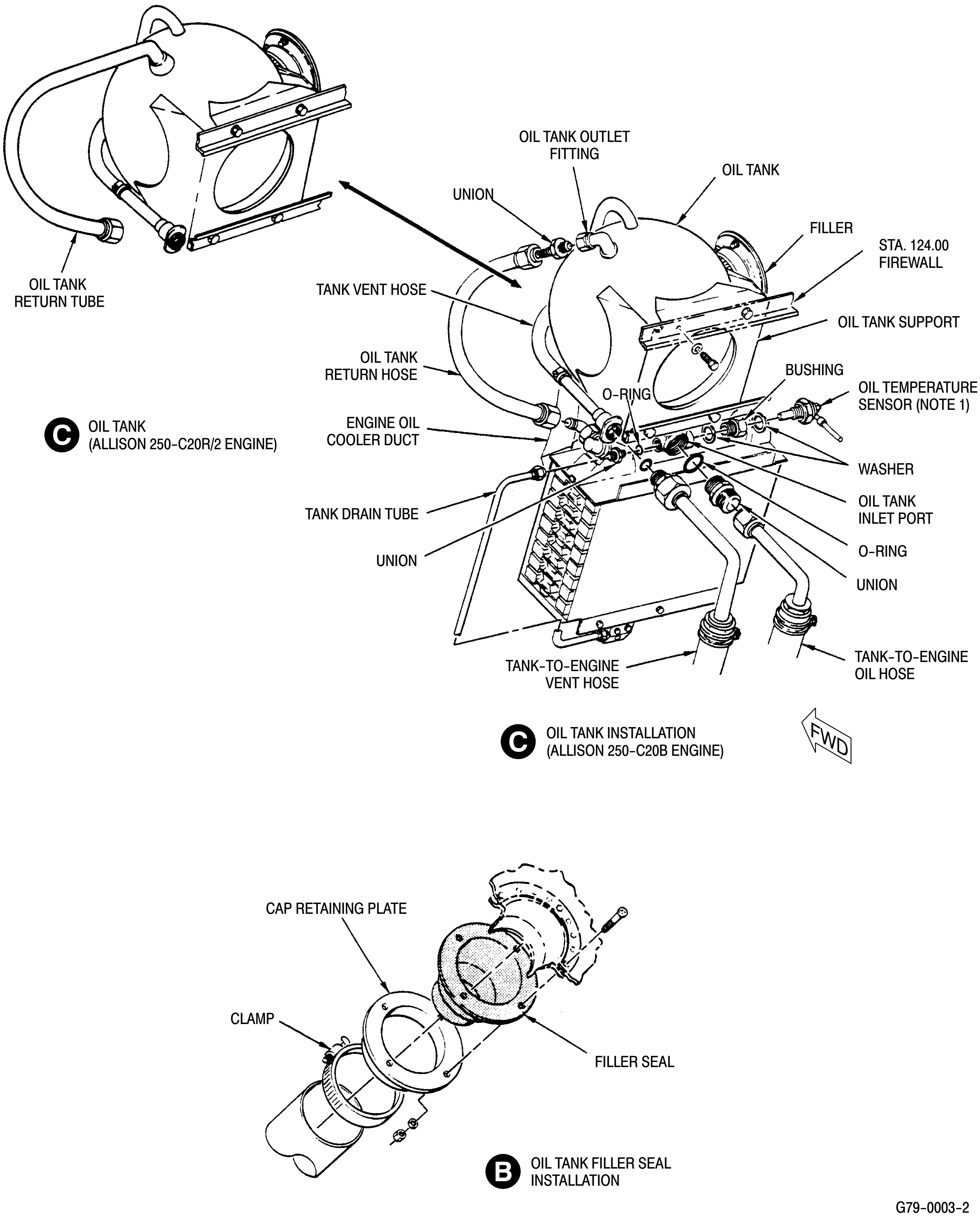


Figure 203. Engine Oil Supply System (Sheet 2 of 2)

9. Oil Supply Lines and Fittings Replacement

(Ref. Figure 203)

Consumable Materials (Ref. Section 91-00-00)	
Item	Nomenclature
CM125	Oil
CM126	Oil, turbine

(1). Drain system before removing oil lines.

NOTE:

- Lubricate all fitting threads with oil (CM125) or (CM126) prior to installation.
- Torque hardware per Oil System Hardware Torque Values (Ref. Table 202).

CAUTION Avoid oil system damage. Use a backup wrench to support bosses, fittings and subassemblies when unfastening or torquing all threaded components.

(2). Install oil lines and fittings.

10. Oil Cooler Duct Replacement

(Ref. Figure 203)

A. Oil Cooler Duct Removal

(1). Remove clamps and separate cooler duct elbow from oil cooler blower. Remove upper connector.

(2). Remove tie straps and separate cooler duct elbow from diffuser. Remove lower connector.

(3). Remove attaching hardware from diffuser. Lift diffuser to separate from cooler flange. Retain spacers.

B. Oil Cooler Duct Installation

CAUTION Over tightening bolts can crack duct flange.

(1). Align diffuser on oil cooler flange with spacers and gasket. Secure with attaching hardware.

(a). Place lower connector on cooler duct elbow, then slide connector over diffuser. Secure lower connector to cooler duct elbow and diffuser with tie-straps.

(b). Place upper connector on cooler duct elbow, then install elbow over oil cooler blower scroll. Slide upper connector over scroll; secure with clamps.

11. Oil Tank Inspection

(1). Check oil tank for obvious damage, corrosion, evidence of leakage and security.

(2). Repair or replace oil tank as required.

12. Oil Cooler Inspection

(1). Inspect engine oil cooler for cracks, corrosion, damaged or bulged plates, broken welds, clogged airways, oil leaks and security. Inspect all hoses and fittings for oil leaks and security.

(2). Repair or replace oil cooler and components as required.

Table 202. Oil System Hardware Torque Values

Item	Torque	
1/4 inch (6.35 mm) OD tube nuts	40 - 65 inch-pounds	(4.52 - 7.34 Nm)
5/16 inch (7.94 mm) OD tube nuts	60 - 80 inch-pounds	(6.78 - 9.04 Nm)
1/2 inch (12.70 mm) OD tube nuts	150 - 200 inch-pounds	(16.95 - 22.60 Nm)
1/4 inch (6.35 mm) OD hose nuts	70 - 120 inch-pounds	(7.91 - 13.56 Nm)
5/16 inch (7.94 mm) OD hose nuts	85 - 180 inch-pounds	(9.60 - 20.34 Nm)
1/2 inch (12.70 mm) OD hose nuts	210 - 420 inch-pounds	(23.73 - 47.45 Nm)

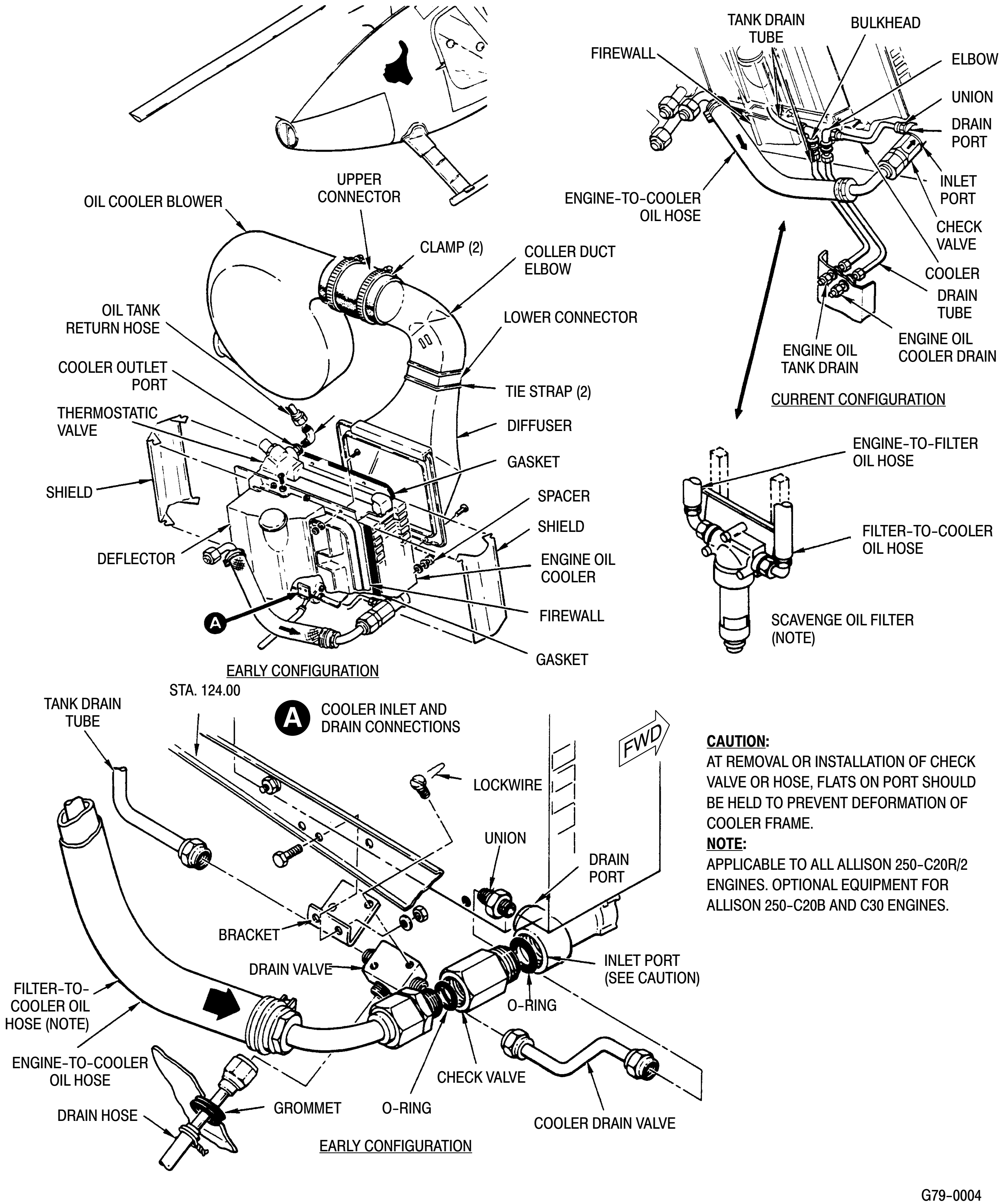


Figure 204. Engine Oil Cooler Installation

13. One Time Mandatory Hose Inspection (369D Serial Numbers 0003D thru 0374D, Only)

(1). Remove trim and aft R/H bulkhead access panel.

(2). Locate return hose between oil cooler and tank. Check part number. Part number 369D28309 hose must be replaced with a part number 369D28311-3 hose assembly per instructions in 'Removal and Installation'.

14. Oil Lines and Fittings Inspection

(1). Inspect tubes and hoses for uniform diameter, interference with adjoining structure and the following:

(a). Inspect tubes for kinks or dents which could obstruct oil flow. Dents may not exceed 0.015 inch (0.381 mm) deep.

(b). Look for cracks. No tubing cracks are allowed.

(c). Inspect coupling nut threads for Cross-thread damage. No thread damage allowed.

(d). Inspect tubing for chafe damage in excess of 0.010 inch (0.254 mm) deep. No chafe damage allowed on or near flared tubing end.

(e). Look for nicks in excess of 0.010 inch (0.254 mm) depth.

(f). Replace any tubes exceeding damage limits.

15. Oil Tank Repair

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM206	Chemical coating
CM234	Solvent, dry-cleaning
CM802	Abrasive cloth, aluminum oxide
CM825	Welding rod

(1). Remove sight plug, oil temperature sender, unions and hoses.

(2). Flush tank with solvent (CM234).

(3). Oxy-acetylene weld all cracks, loose fittings, open seams, and tubes with welding rod (CM825).

(4). Blend scratches and nicks with fine grit aluminum oxide abrasive cloth (CM802).

(5). Touch up reworked surfaces with chemical film (CM206).

(6). Install sight plug, oil temperature sender, unions and hoses.

16. Oil Cooler Repair

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM206	Chemical coating
CM802	Abrasive cloth, aluminum oxide
CM825	Welding rod

(1). Replace a defective thermostatic valve.

(2). Straighten bent cooling fins with a pair of duckbill pliers ground to fit between cooling tubes.

(3). Weld all small holes, cracked seams or loose fittings with welding rod (CM825).

(4). Smooth scratches and nicks with fine grit aluminum oxide abrasive cloth (CM802). Touch up surface with chemical film (CM206).

17. Oil Cooler Duct Repair

NOTE: Repairs must not restrict airflow, prevent proper mating or interfere with installation.

(1). Repair cooler duct per standard fiberglass repair procedures in the structural repair manual (CSP-SRM-6).

Section

79-10-10

Airframe-Mounted Engine Scavenge Oil Filter (369D/E/FF - 500N)

AIRFRAME-MOUNTED ENGINE SCAVENGE OIL FILTER MAINTENANCE PRACTICES

1. Description and Operation

(1). The optional scavenge oil filter is installed in the return line between the engine and oil cooler. The scavenge filter supplements the engine oil filter and provides the capacity to keep the oil clean enough to operate extended hours (Ref. applicable Allison Maintenance Manual, Sec. 01-00-00) between changes.

(2). The 10 micron filter element keeps otherwise recirculated microscopic carbon and metal particles from accumulating in the cooler, supply tank, engine or on magnetic plugs.

(3). The filter body is equipped with a bypass valve and red impending bypass warning indicator that extends when differential pressure across the filter element reaches 6-8 psid (41-55 kPa). The indicator is inoperative until the oil temperature exceeds 85-115°F (30-46 °C). The filter bypass valve opens at 9-11 psid (62-76 kPa).

2. Scavenge Oil Filter Check

(Ref. Figure 201)

(1). Open engine access doors.

(2). Inspect red bypass indicator button on bottom of filter bowl. Button extension indicates a filter element impending bypass condition.

(3). Press and turn indicator button 90° to reset.

(4). Operate engine per Pilot's Flight Manual until engine oil reaches normal operating temperature.

(5). Shut down engine. Check indicator button.

(6). If button has reappeared, investigate cause of filter bypass condition per the applicable Allison Operation and Maintenance Manual.

(7). Install a new oil filter element.

3. Scavenge Oil Filter Element Replacement

(Ref. Figure 201)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM701	Lockwire CRES

(1). Open engine access doors.

(2). Break lockwire and remove bowl and filter element. Inspect element, bowl seal and inside of bowl. Clean bowl as required. Replace seal as required.

(3). Install a new filter element.

(4). Hand tighten bowl snug into filter body. Lockwire (CM701) bowl.

(5). Motor engine until oil pressure is indicated. Check oil quantity and top off oil tank as required.

(6). Start and operate engine at idle for five minutes per Pilot's Flight Manual. Shut down engine and check for oil leaks.

(7). Enter filter element change in helicopter records.

4. Scavenge Oil Filter Bypass Indicator Test

(Ref. Figure 201)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM701	Lockwire CRES

Special Tools
(Ref. Section 91-00-00)

Item	Nomenclature
ST408	Test tool

(1). Open engine access doors.

(2). Break lockwire and remove filter bowl and element. Inspect element and inside of bowl per the applicable Allison Operation and Maintenance Manual.

(3). Install Facet test tool (ST408) and reinstall bowl without lockwire.

NOTE: Bypass indicator remains inoperative until oil temperature exceeds 85- 115°F (30-46 °C).

(4). Operate engine per Pilot's Flight Manual until engine oil reaches normal operating temperature and filter bypass indicator extends (about 10 minutes).

CAUTION Bypass indicator and bowl are matched assemblies and factory set. Do not attempt to adjust or replace bypass indicator assembly.

(5). If bypass indicator fails to extend or will not reset, contact Facet Enterprises, Inc., or your authorized Facet distributor (Ref. Sec. 01-00-00).

NOTE: The bypass indicator is functioning properly if it extends.

(6). Shut down engine per Pilot's Flight Manual. Remove filter bowl and test tool. Clean filter bowl as required.

(7). Install a new seal kit and filter element. Hand tighten bowl snug into filter body. Lockwire (CM701) bowl.

(8). Press and turn indicator button 90° to reset.

(9). Drain and service engine oil system.

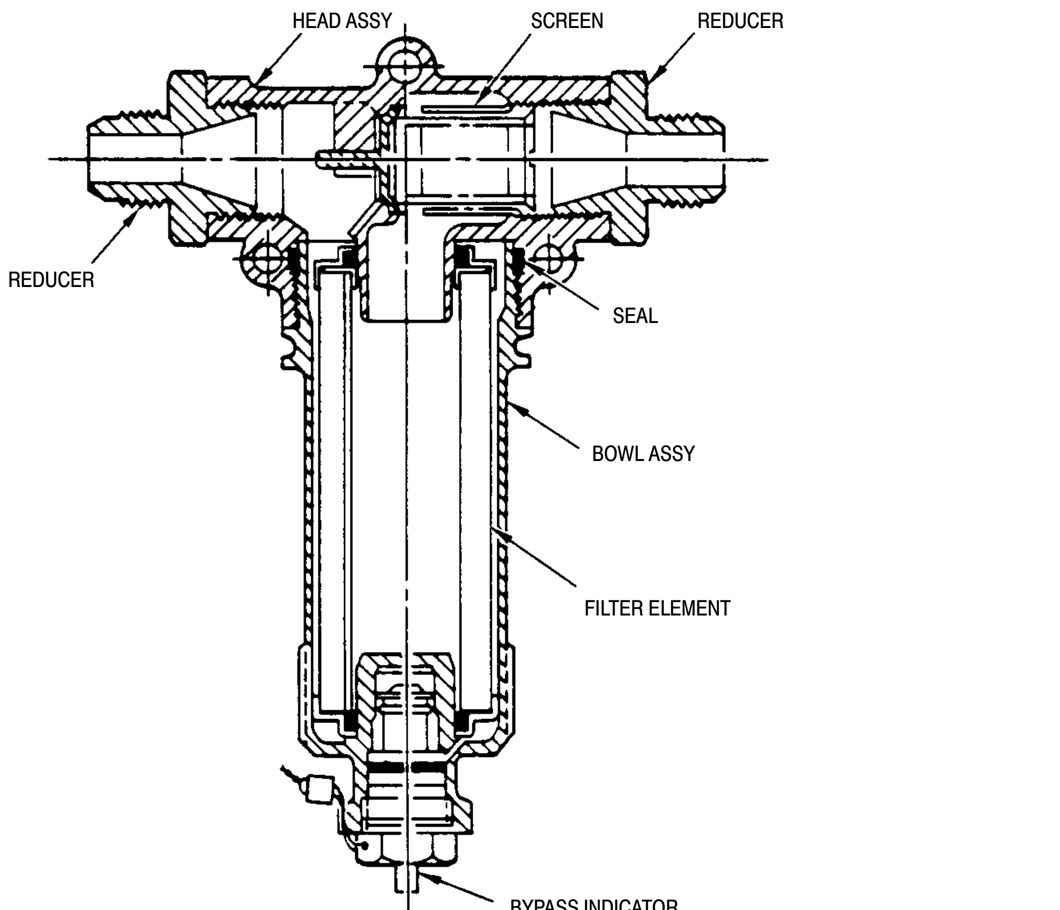


Figure 201. Facet Scavenge Oil Filter Assembly

AIRFRAME-MOUNTED ENGINE SCAVENGE OIL FILTER INITIAL INSTALLATION

1. Scavenge Oil Filter Initial Installation

(Ref. Figure 901)

Consumable Materials
(Ref. Section 91-00-00)

Item	Nomenclature
CM219	Methyl-ethyl-ketone
CM318	Primer
CM721	Tape, aluminum foil

CAUTION Prevent installation errors and equipment damage. Study installation instructions before beginning work. Contact Facet Enterprises, Inc. for additional information (Ref. Sec. 01-00-00).

(1). Disconnect external electric power. Set all switches OFF. Disconnect battery.

(2). Open engine access doors.

(3). Drain engine oil tank, lines and cooler (Ref. Sec. 12-00-00).

(4). Disconnect electrical plug from engine gear case chip detector. Remove chip detector from gear case. Bag parts for reinstallation.

(5). Disconnect scavenge oil line from gear case OUT port union (Ref. Sec. 79-00-00). Remove and discard union.

CAUTION Avoid oil cooler damage. Use a backup wrench on oil cooler port boss when removing or installing oil line fittings.

(6). Disconnect scavenge oil hose from oil cooler IN port check valve union. Remove union from oil cooler check valve. Discard union and hose.

(7). Unclamp wire bundle on BL 15.250 vertical stiffener. Bag clamp hardware for reuse.

(8). Locate airframe centerline on firewall bulkhead in engine compartment.

(9). Locate two vertical stiffeners located on RBL 8.500 and RBL 15.250.

(10). Locate flanged horizontal stiffener on WL 24.750. Stiffener is installed across helicopter centerline between left and right BL 8.500 vertical stiffeners.

CAUTION Avoid fatigue concentrations. Do not scratch, score or gouge firewall when removing insulation.

(11). Remove insulation between RBL 8.500 and RBL 15.250 vertical stiffeners beginning at WL 24.750 and down about 6 inches (15.24 cm). Retain insulation.

CAUTION Do not position mounting brackets and filter lower than the hoses will reach. Install filter so that line connections can be made without straining hoses.

(12). Locate and clamp LH mounting bracket within 0.1250-0.3125 inch (3.1750-7.9375 mm) of WL 24.75 horizontal stiffener with bracket flange facing inboard.

(13). Locate and clamp RH mounting bracket level with LH bracket and flange facing inboard.

(14). Locate and clamp filter mounting plate to brackets with plate flanges facing aft and triangular hole pattern pointing up.

(15). Position filter on its mounting plate and loosely install spacers, bolts, washers and nuts.

(16). Install O-ring on engine oil OUT port reducer. Install and torque reducer per requirements of the applicable Allison Operation and Maintenance Manual.

CAUTION Prevent oil cooler damage. Use a backup wrench on oil cooler check valve while torquing reducer.

(17). Install O-ring on oil cooler IN port reducer. Relieve lightening hole for additional clearance as required. Install reducer in oil cooler check valve and torque to **280 - 305 inch-pounds (31.64 - 34.46 Nm)**.

(18). Loosely install hose between engine gear case OUT port and filter IN port with 90° hose fitting attached to filter.

(19). Loosely install hose between filter OUT port and oil cooler IN check valve with 90° fitting attached to filter.

NOTE: Reposition brackets and filter as required to relieve any strain on hoses before drilling mounting bracket holes through stiffeners. Relocate and drill three new filter mounting bracket bolt holes when additional hose strain relief is required.

(20). Unclamp and move filter and mounting plate assembly out of the way.

CAUTION Avoid fatigue concentrations. Do not scratch, score or gouge firewall while drilling stiffeners.

(21). Ensure bracket upper edges are lined up and level. Drill three 0.189 inch (4.8006 mm) diameter bolt holes through left and right brackets and airframe stiffeners.

(22). Unclamp brackets and deburr holes. Coat holes with primer (CM318).

(23). Install brackets with bolts, washers and nuts. Install wire harness clamp under upper right bolt.

(24). Attach insulation to firewall with aluminum foil tape (CM721).

(25). Torque three filter mounting nuts to **50 - 55 inch-pounds (5.65 - 6.21 Nm)**.

(26). Attach filter mounting plate to airframe brackets with bolts, washers and nuts.

(27). Torque hose nuts to **280 - 305 inch-pounds (31.64 - 34.46 Nm)**.

(28). Install chip detector and torque to **60 - 80 inch-pounds (6.78 - 9.04 Nm)**.

(29). Attach chip detector electrical connector to chip detector.

(30). Select a location for filter bypass indicator reset label in plain view on upper LH corner of RH engine access door. Activate label adhesive with MEK (CM219).

2. Post Installation Inspection

WARNING **It is possible to install the filter with its IN and OUT ports reversed. This condition renders both the impending bypass indicator and filter bypass valve inoperative. Subsequent clogging of the outlet port screen will not provide any visual indication. If allowed to continue, the oil flow reduction could have a disastrous effect on the engine and oil system components.**

(1). Ensure that the engine gear case oil OUT port hose is connected to the scavenge oil filter IN port. Ensure that the filter OUT port hose is connected to the oil cooler IN port.

(2). Check for adequate hose clearances near structure and engine.

(3). Inspect attaching hardware for security and line connections for correct torque values.

(4). Service engine oil system (Ref. Sec. 12-00-00).

(5). Connect battery.

(6). Pick up tools and debris before closing engine access doors.

(7). Operate engine per Pilot's Flight Manual and inspect installation for oil leaks prior to releasing helicopter for flight.

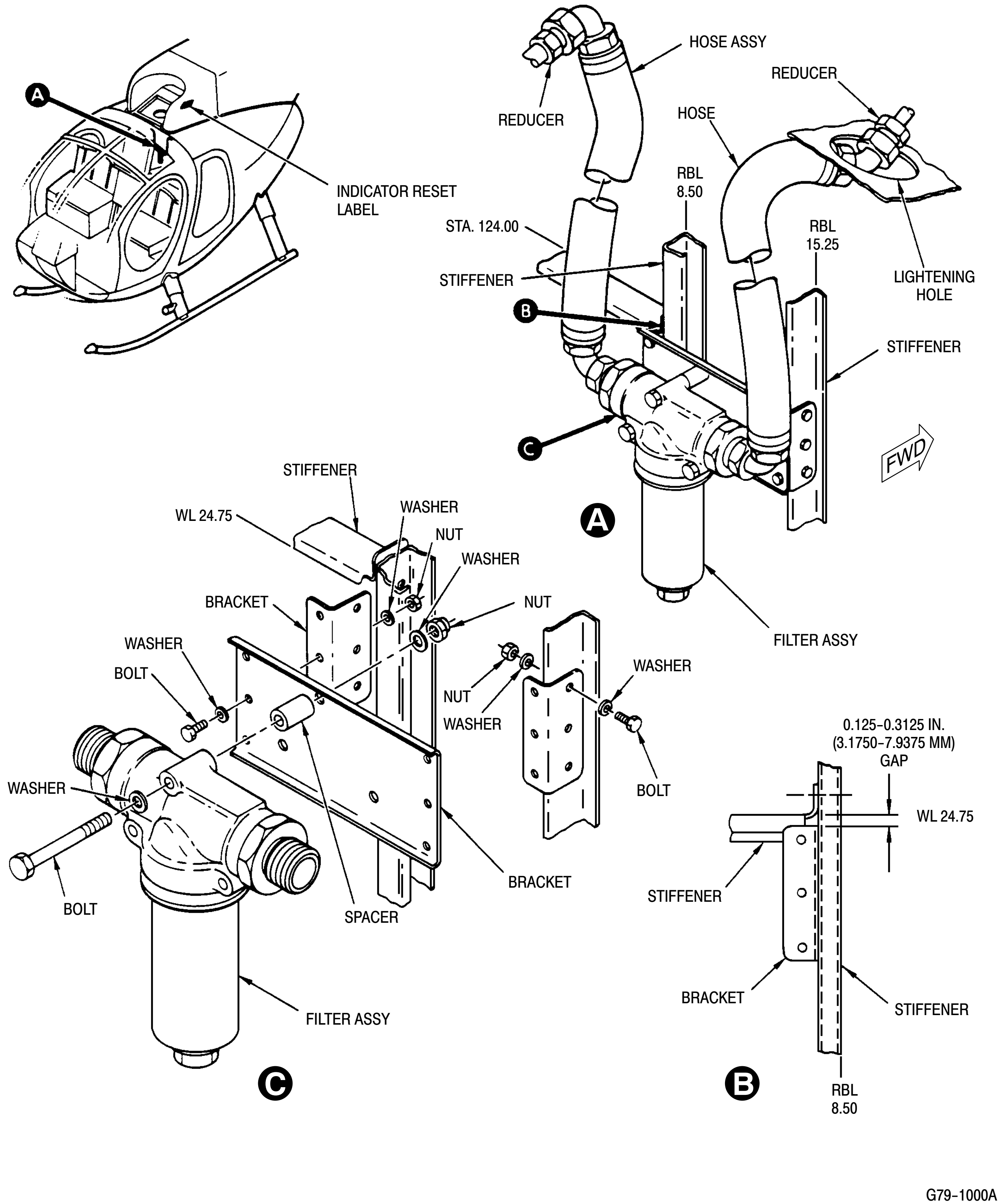


Figure 901. Scavenge Oil Filter Installation

Chapter

91

Charts

TABLE OF CONTENTS

Section

91-00-00

Charts

CHARTS
CONSUMABLE MATERIALS AND SPECIAL TOOLS

1. General

This chapter provides a table of Consumable Materials and a table of Special Tools used on the MD500/600 Series Helicopter.

The information in each table is divided into groups. Within each group, materials or tools are identified by a number. Numbers have a prefix of CM identifying a consumable material, or a ST identifying a special tool. CM and ST numbers are used throughout the maintenance manual, allowing quick reference for Consumable Materials and Special Tools.

2. Consumable Materials

Table 1 lists Consumable Materials, such as fuels and oils used to support repair or servicing procedures.

Consumable materials are assigned a CM number, with associated material name, specification number and commercial name.

The following consumable materials are approved for use on the MD500/600 Series. Do not use replacement materials unless equal in quality and grade. Refer to notes at the end of Table 1.

For additional servicing information, such as capacities Refer to Section 12-00-00.

- CM101 - Lubricants
- CM201 - Solvents, Cleaners and Corrosion Preventative Compounds
- CM301 - Paints, Primers and Coating Compounds
- CM401 - Adhesives, Cements and Sealants
- CM501 - Composite Materials
- CM601 - Rubber Material
- CM701 - Lockwire, Fasteners and Tape
- CM801 - Miscellaneous Materials

3. Special Tools

Table 3 identifies special tools, necessary for maintenance operations.

Each tool is assigned an ST number, with an associated part number, descriptive title and function.

4. Manufacturer/Supplier Number

Table 2 lists Manufacturer/Supplier (Vendor) Number with address. Table 2 is used with Table 1, Consumable Materials.

Table 4 lists Tool Manufacturer/Supplier (Vendor) Number with address. Table 4 is used with Table 3, Special Tools.

- ST101 - Ground Handling
- ST201 - Jacking and Leveling
- ST301 - Main Transmission
- ST401 - Engine
- ST501 - Flight Controls
- ST601 - Anti-Torque
- ST701 - Main Rotor
- ST801 - Fuel
- ST901 - Track and Balance
- ST1001 - Electrical/Instrument/Avionic
- ST2001 - Miscellaneous

Table 1. Consumable Materials

Item No.	Material	Specification No. (1) Type Class Grade	Commercial Name/No. (2)	Vendor (Table 2)
		Lubricants		
CM101	Solid film lubricant	MIL-L-46010		(3)
CM102	Solid film lubricant	MIL-L-46010A	Ecoalube No. 642	MS27
CM103	Solid film lubricant	MIL-L-8937 MIL-L-23398 HMS 4-1078 1	Lubribond A Molyspray Type PT-101	MS25 MS63
CM104	Lubricant, spray		Tri-Flow Break-Free	MS37 MS43
CM105	Lubricant, spray		Moly-Dee	MS9
CM106	Fluorocarbon dry lubricant		S-122	MS53
CM107	Fluorocarbon release agent (dry film lubricant)		6611N	MS24
CM108	Graphite, powdered			(3)
CM109	Molybdenum disulfide powder lubricant	MIL-L-7866		(3)
CM110	Grease		GD568-S	MS35
CM111	Grease, aircraft	MIL-G-81322	Mobil Grease 28 Aero Shell 22 Braycote 622	MS54 MS73 MS13
CM112	Anti-seize compound high temperature	MIL-PRF-907E	(3)	
CM113	Anti-seize compound low temperature	MIL-T-5544	Thread Lube	MS59
CM114	Petrolatum (petrolatum jelly)	MIL-G-6032 VV-P-236		MS22 MS70 MS81
CM115	Grease, oscillating bearing	MIL-G-25537 MIL-A-8623	Aero Shell 14 A-1 177-B	MS73 MS12
CM116	Grease, aircraft and instrument	MIL-G-23827	Braycoat 627 Exxon 5114EP Aero Shell 7	MS13 MS28 MS73
CM117	Grease	MIL-G-23872		(3)
CM118	Grease		930A	MS47
CM119	Grease		130A	MS47
CM120	Oil, corrosion preventive		Steelgard 1301	MS36
CM121	Preservation oil (general purpose)	VV-L-800		MS13
CM122	Preservative oil, hydraulic	MIL-H-6083		(3)
CM123	Hydraulic fluid	MIL-H-5606		(3)
CM124	Kerosene	VV-K-21 1		(3)
CM125	Oil (4) (7)		Mobil SHC 626 (6)	MS54

Table 1. Consumable Materials (Cont.)

Item No.	Material	Specification No. (1) Type Class Grade	Commercial Name/No. (2)	Vendor (Table 2)
CM126	Oil, turbine (4) (5)	MIL-L (PRF)-23699		(3)
CM127	Grease, YSAS Actuator		168043	MS90
	Solvents, Cleaners and Corrosion Preventative Compounds			
CM201	Protective coating	MIL-C (PRF)-6799 1		(3)
CM202	Metal protector, aerosol		Molykote	MS22
CM203	Potting compound	MIL-S (PRF)-8516G		MS77
CM204	Compound, corrosion preventa-tive	MIL-C (PRF)-16173E 3 4	Braycote	MS10 MS13 MS88
CM205	Dielectric compound		DC-4	MS22
CM206	Chemical coating	MIL-C-5541	Iridite 14-2 Al-Coat Alodine 1201	MS67 MS85
CM207	Chromic acid solution (pH 2.6 to 3.4, magnesium touchup)		Dow #19 or equivalent	MS22
CM208	Barrier material (grease-proof)	MIL-B (PRF)-121G 1 . . . . . 2 . . . . . A MIL-B (PRF)-131L 1		(3)
CM209	Putty, general purpose	MIL-P (PRF)-8116	Compound 3998	MS32
CM210	Corrosive preventive (aircraft gas turbine, synthetic base)	MIL-C (PRF)-8188		(3)
CM211	Solvent		3339	MS82
CM212	Releasing agent		TC7-527	MS26
CM213	Releasing agent		225	MS64
CM214	Releasing agent	MIL-P (PRF)-23377 HMS 20-1245		MS14 MS17
CM215	Parting agent		Slip-Spray Fre-Kote 33	MS24 MS31
CM216	Loctite remover (for disas-sembled parts)		Oakite 156	MS17 MS57 MS74
CM217	Isopropyl alcohol	TT-I-735		(3)
CM218	Alcohol, denatured	O-E-760 1		(3)
CM219	Methyl-ethyl-ketone	TT-M-261		(3)
CM220	Naphtha aliphatic	TT-N-95 2		(3)
CM221	Xylene			(3)
CM222	1,1,1-T richloroethane	O-T-620		(3)
CM223	Acetone	O-A-51		(3)

Table 1. Consumable Materials (Cont.)

Item No.	Material	Specification No. (1) Type Class Grade	Commercial Name/No. (2)	Vendor (Table 2)
CM224	Soap paste	P-S-560		(3)
CM225	Detergent, general purpose	MIL-O-16791		(3)
CM226	Cleaning compound, alkaline waterbase	MIL-C-25769		(3)
CM227	Washing compound with wax			(3)
CM228	Surface cleaner (pre-paint solution with phosphoric acid base)	TT-C-490 MIL-C-10578 2	WO#1	MS79
CM229	Paint remover (acid-type for epoxy)	TT-R-25134		MS79
CM230	Paint remover (solvent-type)	MIL-R-25314		(3)
CM231	Plastic bead, spherical 20 - 30 mesh		Poly Plus 20/30 (8)	MS1 MS2 MS61
CM232	Rust inhibitor spray		WD-40	MS68
CM233	Rust inhibitor spray		LPS3	MS46
CM234	Solvent, dry-cleaning		P-D-680	(3)
CM235	Cleaner		Desoclean 45	MS17
	Paints (9), Primers and Coating Compounds			
CM301	Pre-treatment	MIL-P-15328		(3)
CM302	Epoxy primer / Catalyst reducer		1-1G-69 / 1-1H-75	MS3
CM303	Wash primer	MIL-C-8514		(3)
CM304	Enamel, epoxy (Fed-Std-595)	MDM 15-1100 2	Black #37038 White #37769 Tan #20318 Parchment #20371 Red #11958 Green #34151 Gray #36231 Yellow #13655	(3)
CM305	Lacquer, acrylic (Fed-Std-595)	MDM 15-1083	Black #17038 Black #37038 Parchment #20371 Green #34151 Blue #15102 Blue #35044 Brown #30140	(3)
CM306	Lacquer, clear (aluminum clad alloy surfaces)	MIL-L-6066		(3)
CM307	Lacquer, acrylic semi-gloss	HMS 15-1083		(3)
CM308	Lacquer, blue	FED-STD-15102		(3)
CM309	Lacquer, green	TT-L-32		(3)

Table 1. Consumable Materials (Cont.)

Item No.	Material	Specification No. (1) Type Class Grade	Commercial Name/No. (2)	Vendor (Table 2)
CM310	Enamel, lusterless	TT-E-527		(3)
CM311	Coating, logo white / Thinner		Q-881 (Color No. 484) / T-80695	MS11
CM312	Ink stamp, permanent	MIL-M-43719 TT-I-558		(3)
CM313	Insulation varnish		Glyptal 1201	MS33
CM314	Varnish, moisture resistant	MIL-V-173 2		(3)
CM315	Adhesive primer (liquid primer)	HMS 16-1069 1		MS50
CM316	Epoxy coating / Thinner		Poly-EP	MS19
CM317	Resin primer / Thinner (paint base for polycarbonate plastic)		Q-881 / T-80679	MS11
CM318	Primer	MIL-P-85582 1 . . . . . C2		(3)
CM319	Barrier material, grease-proof	MIL-B-121 1 . . . . . 2 . . . . . A MIL-B-131 1		(3)
CM320	Thinner, lacquer (acrylin-nitrocellulose)	MIL-T-19544	Prepsol (DuPont 3919)	MS24
CM321	Surface primer locking compound (single component, grade as noted)	MIL-S-22473	Locquic	MS45
CM322	Primer, Silicone, Red		Dow Corning 1200	MS43
CM323	Primer	MIL-P-23377 1 C		(3)
Adhesives, Cements and Sealants				
CM401	Adhesive		Stabond G-304	MS75
CM402	Adhesive	MDM 16-1068 11	EA9323 EA956	MS21
CM403	Adhesive		Epon 919	MS72
CM404	Adhesive, epoxy (non-structural)	HMS 16-1147 2	EC2216B/A Scotch Weld	MS86
CM405	Adhesive	HMS 16-1149	C-1 11	MS75
CM406	Adhesive		U-136 (AC-AAAA)	MS75
CM407	Adhesive / Primer / Catalyst		A-4000 / A-4004 / xy22	MS22
CM408	Adhesive, silicone rubber		Silastic 140	MS22

Table 1. Consumable Materials (Cont.)

Item No.	Material	Specification No. (1) Type Class Grade	Commercial Name/No. (2)	Vendor (Table 2)
CM409	Adhesive, epoxy	MDM 16-1068 1	EA9330.3	MS21
CM410	Adhesive, epoxy	MDM 16-1068 7	EA9309.3	MS21
CM411	Adhesive, epoxy (non-structural)	MIL-A-52194 MDM 16-1068 2	Scotch-W eld EC1838 A1177B	MS86 MS12
CM412	Adhesive, bonding, vulcanized (synthetic rubber-to-steel)	MIL-A-1 154		MS86
CM413	Not used at this time			
CM414	Adhesive, cyanoacrylic / Accelerator	MIL-A-46050	3CI-1000 / Super Drop Accelerator	MS21
CM415	Cement	MIL-A-8576B	PS-18 S147	MS69
CM416	Cement		#2210	MS86
CM417	Cement	HMS 16-1149 2 1	Grip	MS38
CM418	Cement, epoxy	HMS 16-1149 2 2	EC1300L	MS86
CM419	Sealer	MDM 16-1068 2	A1177B	MS12
CM420	Sealant	MIL-S-81733	PR-1431 Type IV PR1436G Type II PR1436GB-2	MS62
CM421	Sealant		Anchor Weld #220	MS58
CM422	Sealant		#5220	MS30
CM423	Sealant		RTV106 **(2)**	MS34
CM424	Sealing compound		HT-4	MS75
CM425	Sealing compound (fuel resistant)	HMS 16-1097 1 . . . . . B2 MIL-S-8802	Pro-Seal 890	MS62
CM426	Sealing compound	MIL-S-8516 2	3C-3007	MS14
CM427	Sealing compound	MIL-S-8516 1 . . . . . 2 . . . . . A1/2	PR1422	MS62
CM428	Sealing compound	MIL-S-8516 1 2	RTV730 Silastic 730	MS22 MS34
CM429	Sealing compound, silicone		RTV11	MS34
CM430	Sealant, solvent resistant	MIL-S-8660B	RTV732 Silastic 732 RTV 157	MS22 MS34

Table 1. Consumable Materials (Cont.)

Item No.	Material	Specification No. (1) Type Class Grade	Commercial Name/No. (2)	Vendor (Table 2)
CM431	Sealing, locking and retaining compound (single component, grade as noted)	MIL-S-22473 MIL-R-46082	Loctite #85 or RC/609	MS45 MS60
CM432	Dichloromethane (methylene chloride)	MIL-D-6998		(3)
CM433	Ethylene chloride (ethylene dichloride, EDC)	MIL-E-10662		(3)
CM434	Thread sealant		P412	MS60
CM435	Tetrahydrofuran (THF)			MS51
CM436	Plastic steel		Devcon A	MS20
CM437	Sealing compound		Permabond 102 Loctite 414	MS43 MS60 MS45 MS87
CM438	Adhesive, Epoxy	HMS16-1068 12	EA9321	MS21
CM439	Adhesive	HMS16-1 149 5		MS75
CM440	Sealant, electrically conductive	MDM16-1261	Cho-bond 2165	MS91
		Composite Materials		
CM501	Fiberglass cloth (0.022, 2 ply)	SAE-AMS-C-9084 No. 181		(3)
CM502	Sleeving, fiberglass (No. 4, 0.214 in. ID x 4.0 in.)	MIL-I-3190 . . . . HA-1		(3)
CM503	Fiberglass repair kit		Cordokit RK-10	MS29
CM504	Epoxy resin with catalyst (low pressure laminating)	MIL-R-9300 1		(3)
CM505	Polyester laminating resin	MIL-R-7575		(3)
CM506	Resin, fiberglass		Epon 828	MS72
CM507	Resin, filler		Epon 960F	MS72
CM508	Resin, filler		#RP1257-3	MS66
		Rubber Material		
CM601	Insulation sleeving, electrical (vinyl tubing; size as notes)	MIL-I-631 F . . . . . 1 . . . . . A Form U, Category 1		(3)
CM602	Insulation sleeving, electrical, fiberglass (size as notes)	MIL-I-3190		(3)
CM603	Patching material (inside/outside)		#5200/5187/5194	MS82
CM604	Patching material (outside only)		#5218 or #5241/5241	MS82
CM605	Fuel cell repair kit		RK3CL	MS82

Table 1. Consumable Materials (Cont.)

Item No.	Material	Specification No. (1) Type Class Grade	Commercial Name/No. (2)	Vendor (Table 2)
CM606	Rubber cement	MIL-A-5092		(3)
CM607	Cement	MIL-S-91 17	EC-678	MS82
CM608	Cement		Uniroyal #3230	MS80
CM609	Repair kit (non-self- sealing cell)		Uniroyal #RK-10-34	MS80
CM610	Patch material (self- sealing cell, exterior)		Uniroyal #5241/5241 sand-wich	MS80
CM611	Tubing, vinyl clear		PVC tubing, 2 GA, clear 105C	MS71
CM612	Tube, silicone		No. 4 (H.A.I.)	MS83
CM613	Sleeve, vinyl		No. 2 Resinite	MS13
CM614	Sleeving, heat-shrink (class, type or diameter as noted)	MIL-I-23053	RNF100X3/8 RNF100X1/2 RNF100 .125 ID	MS65
	Lockwire, Fasteners and Tape			
CM701	Lockwire CRES	MS20995C20		(3)
CM702	Lockwire CRES	MS20995C32		(3)
CM703	Tie strap (size as noted)	MS3367-*-*		MS78
CM704	Tie strap, nylon	MS17821-1-9	TY-RAP	(3)
CM705	Tie, cable		SST2	MS18
CM706	Tie strap base		TC112	MS78
CM707	Tape, fastener (nylon hook and pile)		Velcro	(3)
CM708	Tape		#850	MS86
CM709	Tape		CT93C	MS42
CM710	Tape, high temperature (thick-ness as noted)		Temp-R	MS16 MS39
CM711	Tape, pressure sensitive (water-proof for packaging and sealing, width and thickness as noted)	PPP-T-60 1 1		MS60 MS86
CM712	Tape, pressure sensitive (width as noted)		#41	MS86
CM713	Tape, pressure sensitive		#471	MS86
CM714	Tape, pressure sensitive (width as noted)		#4104	MS86
CM715	Tape, pressure sensitive (width as noted)		#4508	MS86
CM716	Tape, pressure sensitive (adhe-sive, filament reinforced)	PPP-T-97		(3)
CM717	Tape, pressure sensitive, (poly-urethane, width as noted)		#Y8560	MS86
CM718	Tape, double-faced		E-706	MS8

Table 1. Consumable Materials (Cont.)

Item No.	Material	Specification No. (1) Type Class Grade	Commercial Name/No. (2)	Vendor (Table 2)
CM719	Tape, vinyl plastic		#330	MS76
CM720	Tape and activator, vinyl		Scotch Cal #45 Scotch Tite A-2	MS86
CM721	Tape, aluminum foil		#425	MS86
CM722	Tape, polyethylene		#483	MS86
CM723	Tape, nitrile rubber		NE-71-A	MS7
CM724	Tape, non-slip (pressure sensitive, medium grade, black)	P-D-00455		(3)
CM725	Tape, electrical, plastic	MIL-I-7798	#33	MS86
CM726	Tape teflon		#520 #48	MS60 MS86
CM727	Tape, foam (adhesive backing)		4104Y 92772	MS86
CM728	Tape, pressure sensitive (sponge rubber)		4504 Scotchfoam tape	MS86
CM729	Tape, masking, pressure sensitive	UU-T-106	#216 (High Temp)	MS86
CM730	Tape, duct			(3)
CM731	Lockwire CRES	MS20995C15		(3)
	Miscellaneous Materials			
CM801	Abrasive paper, silicon carbide (grade as noted)	P-P-101		(3)
CM802	Abrasive cloth, aluminum oxide (grade as noted)	P-C-451		(3)
CM803	Crocus cloth	P-C-458		(3)
CM804	Emery cloth, fine			(3)
CM805	Dye penetrant kit	MIL-I-25135		MS6 MS48
CM806	Micro-Mesh plastic restoration kit	5350-01-290-4002	Micro-Mesh Kit KR-70	MS52
CM807	Twine, nylon	MIL-T-713		(3)
CM808	Lacing cord (high temperature)	Type T-3333		MS84
CM809	Nylon cord (lacing)	MIL-C-5040		(3)
CM810	Leak detector, liquid	MIL-L-25567C	Leak-Tec	MS4
CM811	Leak detector, liquid		Snoop	MS56
CM812	Splice, knife		32445	MS5
CM813	Wire	MS22759/34-22-9		(3)
CM814	Dykem, red or blue		SP1100	MS23 MS40 MS49
CM815	Solder (tin alloy, rosin core)	QQ-S-571 SN60WRP2		(3)

Table 1. Consumable Materials (Cont.)

Item No.	Material	Specification No. (1) Type Class Grade	Commercial Name/No. (2)	Vendor (Table 2)
CM816	Solder (tin alloy, acid core)	QQ-S-571		(3)
CM817	Brazing flux (paste)	O-F-499		(3)
CM818	Brazing alloy (silver base)			MS86
CM819	Kimwipe			(3)
CM820	Cheesecloth			(3)
CM821	Gasket material (adhesive one side only)		Scotchfoam #4304	MS86
CM822	Acetylene, technical grade	BB-A-106		(3)
CM823	Oxygen, industrial grade	BB-O-925 1 . . . . B		(3)
CM824	Welding rod (corrosion and heat resistant alloys, class or type as noted)	AMS 5656, AWS A5.9, ER219	21-6-9 (Nitronic 40)	(3)
CM825	Welding rod	QQ-R-566 CLFS RA12 or RA143 (04043) 5% silicon		(3)

NOTES:

(1) Numbers are U.S. Specifications and Standards. Prefix symbols are specified as follows:
AMS - American Materials Standards;
MS - Military Standards;
MIL - Military Specification; Single, Double or Triple alpha prefix of the same letter - Federal Specification;
AN - Air Force/Navy Aeronautical Standard;
NAS - National Aerospace Standard.

(2) Primary selection. All equivalent material can be used as a different selection. Time increments on manufacturers instructions must be adhered to, unless given differently in a specific task.

(3) Use the best comparable grade material when conformity of available materials of same type with given Specification Number cannot be found.

(4) Oils approved for use in MD500/600 Series Helicopter main and fan transmission are synthetic compounds having Ryder Gear Value in excess of 2500 pounds.

(5) For Model 250 Series engine oil change requirements and restrictions on mixing oils, refer to Allison Operation and Maintenance Manual.
CAUTION: Mixing of oils within an oil series not in the same group is permitted only in an emergency. Use of mixed oils (oils not in the same group) in an engine is limited to five hours total running time. Adequate maintenance records must be maintained to ensure that the five hour limit is not exceeded. Mixing of oils from different series is not permitted.

(6) Mobil oil SHC 626 can be formulated such that it may have two different colors. The oil can still be mixed with no adverse affects.

(7) Use only Mobil SHC 626 oil in the 369F5450 overrunning clutch and 369F5100 main transmission.

(8) Do not use over 50 psig air pressure for abrasive cleaning method. Mask or shield threaded areas or critical surfaces where damage may result from abrasive blasting.

(9) When ordering paint, give each paint by type (i.e. acrylic, epoxy, polyurethane); by color and AC part number. Also include compatible HS or federal standard (FED-STD) number to make sure correct type and color paint is supplied. The color code numbers for finish paints used on MD500/600 Series Helicopters are entered in helicopter log books before delivery of aircraft. When ordering paints, ensure AC Number and SA Number are compatible.

Table 2. Manufacturer/Supplier Number

Number	Name
MS1	Abrasive Cleaning Equipment 20122 State Rd. Cerritos, CA 92701
MS2	Abrasives Unlimited 4653 S. 33rd St. Phoenix, AZ 85040 (602) 276-0077
MS3	Advanced Coating and Chemicals 2213 N. Tyler S. El Monte, CA 91733
MS4	American Gas and Chemical Co. 220A Pegasus Ave. Northvale, NJ 07647 1904 (201) 767-7300 (800) 526-1008
MS5	AMP Co. P.O. Box 55 Winston Salem, NC 27102 (336) 725-9222 (800) 522-6752
MS6	Ardrox Inc. 19 Woodburn Ave. P.O. Box 814 St. Catherines, Ontario Canada L2R 6Y3 (416) 684-1800
MS7	Armstrong Cork Co. Lancaster, PA 17604
MS8	Arno Adhesive Tapes Inc. Los Angeles, CA
MS9	Arthur Withrow 5511 District Blvd. Los Angeles, CA 90040
MS10	Tectyl Industrial Products A Div. Of Ashland Inc. 3499 Dabney Dr. Lexington, KY 40509 (859) 357-7534
MS11	Bee Chemical Co. 2700-T E. 170th St. Lansing, IL 60438 (708) 474-7000
MS12	B.F. Goodrich Co. 500 S. Main St. Akron, OH 44318
MS13	Castrol Industrial North America Inc. 1001- W. 31st St. Downers Grove, IL 60515 (630) 241-4000 (800) 621-2661
MS14	Churchill Chemical Corp. Los Angeles, CA
MS15	PRC-Desoto International, Inc. 5454 San Fernando Rd. Glendale, CA 91203 (818) 240 2060
MS16	Connecticut Hard Rubber Co. New Haven, CT
MS17	Crown Metro Inc P.O. Box 5857 Greenville, SC 29606 (864) 299-1331
MS18	Danquit Corp. Tinley Park, IL
MS19	Detroit Graphite Co. Detroit, MI
MS20	Devcon 30 Endicott St. Danvers, MA 01923 (978) 777-1100
MS21	Dexter Adhesive & Coating Systems 2850 Willow Pass Rd., P.O. Box 312 Bay Point, CA 94565-0031 (925) 458-8000 (800) 424-9300
MS22	Dow Corning Corporation P.O. Box 0994, South Saginaw Road Midland, MI 48686 (800) 634-9660
MS23	ITW/Dykem 805 E. Old 56 Hwy. Olathe, KS 6606 (800) 443-9536
MS24	Du Pont Wilmington, DE 19898 (302) 774-1000 (800) 441-7515

Number	Name
MS25	E/M Corp. 100-T Cooper Circle Peachtree City, GA 30269 (770) 261-4800
MS26	EPD Industries 2055 E. 223 St. Long Beach, CA 90810
MS27	Everlube Corp. North Hollywood, CA
MS28	Exxon Co. P.O. Box 2380 Houston, TX 77001
MS29	Ferro Corp. Composites Division 34 Smith St. Norwalk, CT 06852
MS30	Fiber-Resin Corp 170 W Providencia Ave Burbank, CA 91502 (800) 624-9487
MS31	Fre-Kote Inc.
MS32	Fuller O'Brien Co. S. San Francisco, CA
MS33	General Electric Insulation Dept. Schenectady, NY
MS34	General Electric Company Silicone Products Business Division 260 Hudson River Rd. Waterford, NY 12188 (518) 233-3330
MS35	GC Electronics Los Angeles, CA
MS36	Harry Miller Corp. 4th & Bristol Sts. Philadelphia, PA 19140 (215) 324-4000
MS37	IKS American Corp. Szumoto Seiko Division 1555 W. Rosecrans Ave. Gardena, CA 90249 (800) 421-2761
MS38	Columbia Aluminum Products 7020 E. Slauson Ave. Commerce, California 90040 (323) 728-7361

Number	Name
MS39	Insulectro Co. 1410 W. Olympic Blvd. Los Angeles, CA
MS40	Irwin-Hobson Co. Ninth and S.E. Woodward Portland, OR 97202
MS41	Deleted - Not used at this time.
MS42	Jones Industrial Supply Culver City, CA
MS43	K.R. Anderson 4316 E. University Dr. Phoenix, AZ 85034 (602) 437-0030
MS44	Not used at this time
MS45	Loctite Inc. 1001 Trout Brook Crossing Rocky Hill, CT 06067-3910 Phone: (860) 571-5100 FAX: (860) 571-5465
MS46	LPS Laboratories Inc. 4647 Hugh Howell Rd., Dept. M Tucker, GA 30084 (800) 241-8334
MS47	Lubriplate Div., Fiske Bros. Refining Co. 129-T Lockwood St. Newark, NJ 07105 (973) 589-9150
MS48	Magna Flux 11898-T Burnside Lane Roscoe, IL 61073 (815) 623-7634
MS49	Markall Products Co. 4772-T W. 139 St. Cleveland, OH 44135 (216) 267-3235
MS50	MD Helicopters Inc. 4555 E. McDowell Mesa, AZ 85215-9734 (480) 346-6377 (800) 388-3378
MS51	McKesson and Robbins Chemical Dept. Los Angeles, CA

Number	Name
MS52	Micro-Surface Finishing Products Inc. 1217 W. Third Street P.O. Box 818 Wilton, IA 52778 (319) 732-3240
MS53	Miller-Stevenson Chemical Co. 1001 E. first St. Los Angeles, CA
MS54	Mobil Oil Corp. International Aviation Division 150 E. 42nd St. New York, NY 10017
MS55	Rohm and Haas Company 100 Independence Mall West Philadelphia, PA 19106-2399 (215) 592-3000 (215) 592-3377
MS56	Nupro Company 4800 East 345th Street Willoughby, OH 44094 4460 (440) 951-7100
MS57	Chemetall Oakite Products, Inc. 50 Valley Rd. Berkeley Heights, NJ 07922 2712 (908) 464-6900
MS58	Pacific Upholstery Gardena, CA
MS59	Parker-Hannifin 711 Taylor Street P.O. Box 4032 Elyria, OH 44036 (440) 284-6300
MS60	Permabond International Corp. 480 S. Dean St. Englewood, NJ 07631 (201) 567-9494
MS61	Polyrock Co. 4763 Murrita Ave. Chino, CA 91710
MS62	Product Research and Chemical Co. 5426 San Fernando Rd. Glendale, CA 91209
MS63	Product Techniques, Inc. 511 East 8th Pl. Los Angeles, CA
MS64	Ram Chemical Co. Gardena, CA

Number	Name
MS65	Raychem Corp. 305 Constitution Dr., Mailstop 103/2A Menlo Park, CA 94025-1164 (800) 926-2425 (650) 361-3860
MS66	Ren Plastics Inc. Lansing, MI 48910
MS67	Richardson Company Allied-Kelite Products Division 2400 E. Devon Ave. Des Plains, IL
MS68	Rocket Chemical Co. Inc. San Diego, CA
MS69	Rohm and Haas Company 100 Independence Mall West Philadelphia, PA 19106-2399 (215) 592-3000 (215) 592-3377
MS70	Royal Lubricants, Inc. 215 Merry Lane, P.O. Box 518 East Hanover, NJ 07936 0518 (800) 989-7692
MS71	Sea Wire and Cable Inc. P.O. Box 647 Madison, AL 35758 1-800-633-7210
MS72	Shell Chemical Co. 910 Louisiana St. Houston, TX 77002 713-241-6161
MS73	Shell Oil Company 50 W. 50th. St. New York, NY 10020
MS74	Sherwin Williams
MS75	Stabond Corp. 14010-T S. Western Ave. Gardena, CA 90249 (310) 380-6168
MS76	Technical Tape Co. 363 Woodycrest Ave. Nashville, TN 37210 (800) 714-8806
MS77	Thiokol
MS78	Thomas and Betts Co. Elizabeth, NJ

Number	Name
MS79	Turco Products, Inc Division of Atochem North America 2700 Temple Ave Suite B Long Beach, CA 90806 (562) 981-8307
MS80	Uniroyal Inc. Engineered Systems Dept. Mishawaka, IN 46544
MS81	United-Erie Incorporated 438 Huron St. Erie, PA 16502 (800) 377-7561
MS82	U.S. Rubber Co. Fuel Container Dept. Mishawaka, IN
MS83	Varflex Corp. 512 W. Court St. Rome, NY 13440 (315) 336-4400
MS84	Warren Wire Co.
MS85	Witco Allied-Kelite Division 29111 Milford Rd. New Hudson, MI 48165 (313) 437-8161
MS86	3M Co. Bldg. 223-N 3M Center St. Paul, MN 55144-1000 (612) 733-1110 (800) 362-3550
MS87	R.S, Hughes 2107 E. Magnolia Phoenix, AZ 85034 (602) 275-5565 (602) 275-5025
MS88	Esgard Corrosion Coatings, PO Drawer 2698, Lafayette, LA 70502 (800) 888-2511
MS89	Hernon Mfg., Inc. 121-T Tech Dr. Sanford, FL 32771 USA (800) 527-0004 (407) 322-4000
MS90	Astronautics Corporation of America 4115 N. Teutonia Ave. Milwaukee, WI, 53209 www.astronautics.com Tel: (414) 449-4000 Fax: (414) 447-8231
MS91	Chomerics, Inc. 77 Dragon Court Woburn, MA 01801 (781) 935-4850

Table 3. Special Tools

Item No.	Part No.	Nomenclature	Function	Vendor (Table 4)
		Ground Handling		
ST101	369A9905 BDW-DHH	Ground handling wheels (369D/E/FF - 500N) (600N)	Ground handling of helicopter.	
ST102	369H9801	Handle-jack assembly, ground handling (straight) (369D/E/FF - 500N)	Raising or lowering helicopter with ground handling wheels.	
ST103	369A9906	Handle-jack assembly, ground handling (offset) (369D/E/FF - 500N)	Raising or lowering helicopter with ground handling wheels when additional clearance is required.	
ST104	369H90126	Ground handling wheels (one side)	Ground handling of helicopter equipped with utility or emergency floats.	
ST105	HM-7M (S/N 121)	Tow bar (600N)	Towing of helicopter.	
		Jacking and Leveling		
ST201	369D29904 600N9904	Hoisting adapter (5-bladed) (6-bladed)	Hoisting entire helicopter or removing main rotor.	
ST202	369A2010-5	Jack fittings	Jacking, leveling or tiedown of helicopter.	
ST203	02-0520-0100	Hydraulic jack: 1-5 ton (900-4500 kg)	Jacking and leveling at Sta. 90.61.	
ST204	02-0234-0100	Hydraulic jack: 80-inch (203 cm) leg	Jacking and leveling at Sta. 197.78.	TS15
ST205	KS 5490	Inclinometer	Angle of incidence tool, flight control rigging.	TS9
ST206	36-D-2844	Prop protractor	Measure angle of incident.	
		Main Transmission		
ST301	369H9807	Main transmission drain hose	Drain main transmission oil.	
		Engine		
ST401	369A9948 369D28602-80903-1	Engine stand (250-C20B / 250-C20R/2) (250-C30 / 250-C47)	Engine support and transport dolly.	
ST402	369A8009 369D29905 369DSK410	Engine hoist (250-C20B) (250-C20R/2) (250-C30 / 250-C47)	Engine removal and installation.	
ST403	369H92537 369H92537-501	Engine compressor wash kit (369D/E - 500N) (369FF - 600N)	Clean engine compressor.	

Table 3. Special Tools (Cont.)

Item No.	Part No.	Nomenclature	Function	Vendor (Table 4)
ST404	6798292	Wrench, ground idle adjusting	Bendix fuel control idle speed adjustment.	
ST405	369H9925	Rigging fixture, collective stick	Gas producer rigging.	
ST406	369A7368-80901	Alignment fixture	Gas producer rigging.	
ST407	MS17990-315	Rigging pin	Gas producer rigging.	
ST408	#1741145	Test tool	Oil filter bypass indicator test.	TS6
		Flight Controls		
ST501		Collective rigging fixture (LH command)	Rigging of main rotor collective controls.	
	369H9925	(369D/E/FF - 500N)		
	369H9925-3	(600N)		
ST502	369A9927	Collective rigging fixture (RH command)	Rigging of main rotor collective controls.	
ST503	369A9930	Mixer rigging plate	Rigging of main rotor collective and cyclic controls.	
ST504		Longitudinal rigging fixture (LH command)	Rigging of main rotor cyclic controls.	
	369D29929-9	(369D/E/FF - 500N)		
	600N9929-5	(600N)		
ST505		Longitudinal rigging fixture (RH command)	Rigging of main rotor cyclic controls.	
	369A9929-5	(369D/E/FF - 500N)		
	369D29929-5	(600N)		
ST506		Lateral rigging fixture (LH command)	Rigging of main rotor cyclic controls.	
	369A9928-9	(369D/E/FF - 500N)		
	369A9928-19	(600N)		
ST507	369A9928-5	Lateral rigging fixture (RH command)	Rigging of main rotor cyclic controls.	
ST508		Collective bungee installation tool	Compress collective bungee.	
	369D29936	(369D/E/FF - 500N)		
	369A7300-A TP-1	(600N)		
ST509	Not used at this time.			
ST510	369D29985	Bungee spring compression tool rod and channel (369D/E/FF - 500N)	Remove bungee installation tool. Dismantle bungee assembly.	
ST511	369D29910-32501	Test fixture	Shop aid for rigging main rotor controls.	

Table 3. Special Tools (Cont.)

Item No.	Part No.	Nomenclature	Function	Vendor (Table 4)
		Anti-T orque		
ST601	500N9901-3	Rigging pin	Rigging of NOTAR® anti-torque flight controls.	
ST602	830006-809-00653	Spring tension removal tool	Removal of anti-torque bungee spring & splitter spring.	
ST603	500N9502-1 or ATP1-500N5365-1	Tip seal cutter	Anti-torque tip seal felt metal cutting tool.	
ST604	500N9505-1	Coupling socket	Fan & gearbox coupling socket.	
ST605	500N9506-1	Fan nut socket	Anti-torque fan removal.	
ST606	 369D29931 369D29907	T/R swashplate rigging tool (2-bladed tail rotor) (4-bladed tail rotor)	Rig tail rotor controls.	
ST607	 369D29823 369D29826	Adapter, torque wrench (2-bladed tail rotor) (4-bladed tail rotor)	Install tail rotor nut.	
ST608	369D29822-3	Pitch control assembly holding block	Secure tail rotor swashplate block to remove/install nut.	
ST609	369D29822-5	Adapter, torque wrench	Remove/install tail rotor swashplate housing bearing nut.	
ST610	369A1600-80902	Bushing wrench	Install and torque tail rotor hub threaded bushing.	
ST611	83006-809-00090 -1	Arbor press fixture, 369A7951-5 bearing	Install tail rotor pitch control link bearings.	
ST612	83006-809-00090 -15	Staking tool, 369A7951-5 bearing	Stake tail rotor pitch control link bearings.	
ST613	269A9232	Plug, bearing removal	Remove tail rotor pitch control housing bearings.	
		Main Rotor		
ST701	369A9829	Main rotor wrench assembly	Loosening/torquing of main rotor mast nut.	
ST702	 369D29932 600N9932	Hub puller (369D/E/FF - 500N) (600N)	Separate main rotor hub from mast.	
ST703	369A9933 *369A9933-5	Main rotor hub driver	Seat main rotor hub.	
ST704	369D29957	Adapter, torque wrench	Install main rotor drive shaft fasteners.	
ST705	369A9825	Pitch bearing stud wrench	Remove main rotor hub pitch bearing pivot pin.	
ST706	83006-809-00090 -1	Arbor press fixture (369A7951-5 bearing)	Install main rotor pitch housing bearings.	

Table 3. Special Tools (Cont.)

Item No.	Part No.	Nomenclature	Function	Vendor (Table 4)
ST707	83006-809-00090 -15	Staking tool (369A7951-5 bearing)	Staking main rotor pitch housing bearings.	
ST708	83006-809-00088	Staking tool (pilot and punch) (369A7951-45 bearing)	Install pitch control housing bearings and swage rings.	
ST709	3006-809-00090 -1/-8	Arbor press fixture (369A7951-15 bearing)	Install main rotor blade bearings.	
ST710	3006-809-00090 -15/-20	Staking tool (369A7951-15 bearing)	Stake main rotor blade bearings.	
Fuel				
ST801	MITYVACR #4000	Hand operated vacuum pump kit	Pump down airframe and engine fuel systems for vacuum leak check.	TS13
ST801-1	AN840-D	Nipple, hose	Vacuum pump adaptive hardware.	
ST801-2	AN910-1D	Coupling		
ST801-3	AN816-4D	Nipple		
ST801-4	AS3084-04	O-ring		
ST802	369A8100-80902	Spanner wrench	Fuel cross-over fitting torquing.	
Track and Balance				
ST901	369D29942	Tip cap assembly	Tracking main rotor blades.	
ST902	369H9928	Main rotor blade fixture and tab bending tool	Adjusting main rotor blade tab angle/blade track.	
ST903		Balancer/analyzer instrument kit	Track and balance of dynamic components.	TS5
Electrical / Instruments / Avionics				
ST1001	RXT20-5 (extract) RTM20-9 (insert)	HYTIP insertion/extraction tool.	Install/remove HYTIP electrical contacts in terminal block modules.	TS4
ST1002	M8ND N14HCT2	HYTOOL M8ND and N14HCT	Crimp MINILOK and MODULOK terminal block contact tips on electrical wire.	TS4
ST1003	107-0970	Hand operated crimping tool (with positioners 107-0976 and 107-0977)	Crimp removable contacts in rectangular connectors.	TS18
ST1004	107R1001 107-1015	Contact removal tool / Contact insertion tool	Remove and insert removable contacts in rectangular connectors.	TS18
ST1005	CEIT 20	Insertion/extraction tool (20 Wire Mate connector)	Connect/disconnect No. 20 Wire Mate electrical connectors.	TS8

Table 3. Special Tools (Cont.)

Item No.	Part No.	Nomenclature	Function	Vendor (Table 4)
ST1006	CEIT 16	Insertion/extraction tool (16 Wire Mate connector)	Connect/disconnect No. 16 Wire Mate electrical connectors.	TS8
ST1007	CTJ-RO6	Deutsche module removal tool	Remove terminal block modules from instrument panel terminal block frames.	
ST1008	46673	Crimping tool	Thermocouple harness terminal lugs.	TS1
ST1009	^931	Voltmeter	Measure voltage.	TS17
ST1010	^260-7	Volt-ohmmeter	Measure resistance and voltage.	TS14
ST1011	**2312-G-8	Turbine temperature indicating system test set	Test and calibrate TOT indicating system.	TS2
ST1012	**BH112JA-36	Jetcal tester	Test and calibrate TOT indicating system.	TS7
ST1013	500N9701	Yaw S.A.S. test box	Anti-Torque stability augmentation system control rigging.	TS10
ST1014	DPI 603	Pressure calibrator	Test and calibrate torque indicating system (600N).	TS20
Miscellaneous				
ST2001	369H4009	Pitot tube cover	Pitot Tube protection.	
ST2002	369H6661-1	Blade socks	Main rotor blade tiedown.	
ST2003	369D29913-37	Main rotor blade storage rack (369D/E/FF - 500N)	Store main rotor blades. Blade folding pole included.	
ST2004	369H9803-503	Air inlet fairing cover	Air inlet cover.	
ST2005	369H9804-101	Engine exhaust cover	Engine exhaust duct cover.	
ST2006	51-C-887	Sleeve swage, oval C-type	Particle separator installation.	TS12
ST2007	C-6000	Rivnut installation speed header	Particle separator installation.	TS3
ST2008	C-3576	Rivnut keyway cutter	Particle separator installation.	TS3
ST2009	HG85-10	Inspection gauge	Lockbolt installation inspection.	
ST2010	369D29983	Adapter, torque wrench (369D/E/FF)	Torque tailboom attachment bolts.	
ST2011	369A6001-50506 -1	Left landing gear foot drill jig	Enlarge holes in lockbolt fastened landing gear strut to install machine-bolt-attached skids.	
ST2012	369A6001-50506 -2	Right landing gear foot drill jig	Enlarge holes in lockbolt fastened landing gear strut to install machine-bolt-attached skids.	

Table 3. Special Tools (Cont.)

Item No.	Part No.	Nomenclature	Function	Vendor (Table 4)
ST2013	WSI-HT-12AS	Bushing installation tool (WSI-B-12AS grommet)	Install tail rotor control rod grommets.	TS16
ST2014	369D23601-80910	Angle measuring tool	Check horizontal stabilizer angle of incidence.	

^ Primary selection. Any equivalent meter with an accuracy capable of measuring voltage within 0.25% full scale range may be used.

* Hammer and handle same as 369A9933; -7 driver replaces -3 driver.

** Either tester may be used.

Table 4. Tool Manufacturer/Supplier Number

Number	Name
TS1	AMP Inc. 441 Friendship Rd. Harrisgurg, PA 17111 Phone: (717) 564-0100 FAX: (717) 986-7575
TS2	Barfield Instrument Corporation 4101 NW 29th Street P.O. Box 02567 Miami, FL 33102
TS3	B.F. Goodrich Co. Aerospace Products Akron, OH
TS4	Burndy Corp. Norwalk, CT
TS5	Chadwich-Helmuth 4601 N. Arden Drive El Monte, CA 91731-1299
TS6	Facet Enterprises Inc. 8439 Traid Dr. Greensboro, NC 27409
TS7	Howell Instrument Inc.
TS8	I.T.T. Cannon Electric 3208 Humboldt St. Los Angeles, CA 90031
TS9	Kell-Strom Tool Company 214 Church Street Wethersfield, CT
TS10	MD Helicopters Inc. 5000 E. McDowell Road Mesa, AZ 85215-9797
TS11	MD Helicopters Inc. Field Fabricated
TS12	National Telegraph Supply Co. Cleveland, OH
TS13	Neward Enterprises Inc. P.O. Box 725 Cucamonge, CA 91730 714-987-8975
TS14	Simpson
TS15	Tronair South 1740 Eber Road Holland, OH 43528
TS16	Western Sky Industries 21300 Cloud Way Hayward, CA 94545
TS17	Weston
TS18	Winchester Electronics, Division of Litton Industries Main St. and Hillside Ave. Oakville, CT 06779
TS19	Daniels Manufacturing Corp. 526 Thorpe Road Orlando, FL 32824 Phone: (407) 855-6161 FAX: (407) 855-6884
TS20	Druck Incorporated 4 Dunham Drive New Fairfield CT 06812 Phone: (203) 746-0400 FAX: (203) 746-2494 E-mail: druck.inc@druck.com