Manual: CSP–HMI–2, Handbook of Maintenance Instructions
Models: 369D/E/FF – 500/600N Helicopters
Issued: 31 October 1990
Revision 37: 13 December 2005

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

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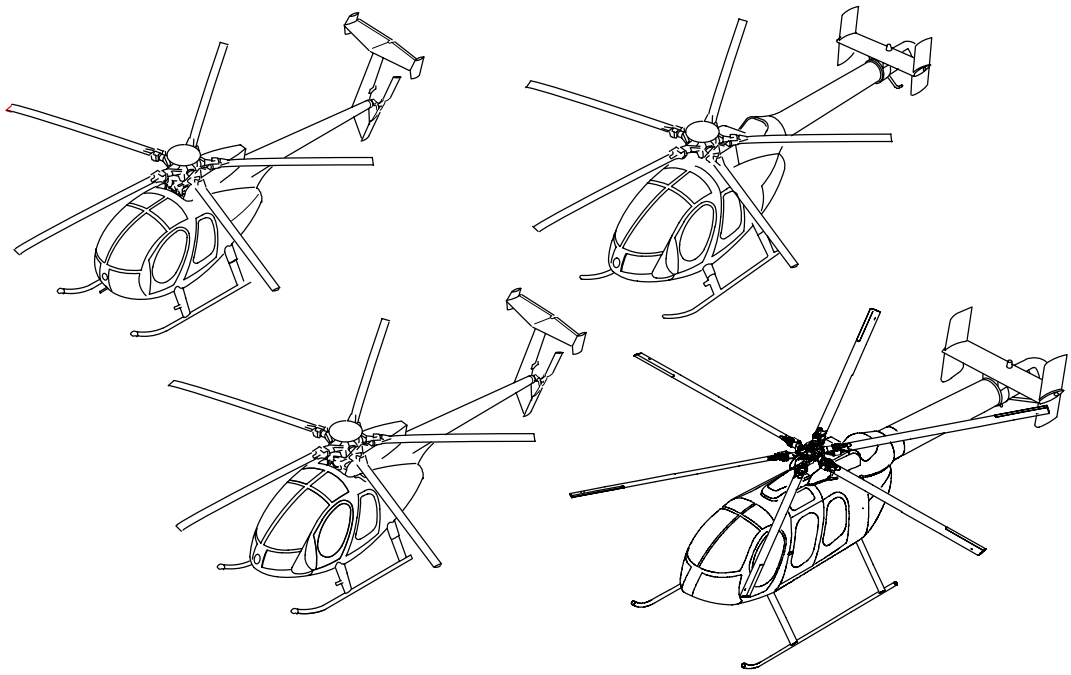
MDHI MODEL HELICOPTERS

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

Basic Handbook of Maintenance Instructions

(CSP-HMI-2)

SERVICING AND MAINTENANCE



MD Helicopters, Inc.
4555 East McDowell Road
Mesa, Arizona 85215-9734

Issued: 31 October 1990
Revision No. 37: 13 December 2005

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4555 East McDowell Road
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RECORD OF TEMPORARY REVISIONS

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420 . . . . . Revision 29
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401 thru 405 . . . . . Revision 22
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1 thru 3/(4 blank) . . . . . Revision 22
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1/(2 blank) . . . . . Revision 22
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402 thru 404 . . . . . Revision 29
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1/(2 blank) . . . . . Revision 22
401 . . . . . Revision 26
402 . . . . . Revision 22
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1 and 2 . . . . . Revision 22
101 thru 103/(104 blank) . . . . . Revision 22
401 thru 412 . . . . . Revision 22
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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)
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) Deleted

(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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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 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 6.25 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.

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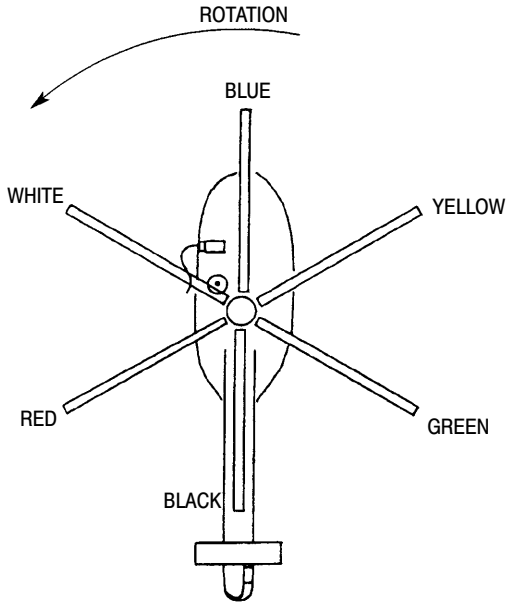
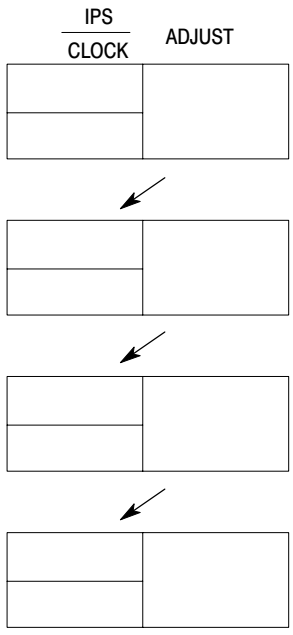


BLADE ORIENTATION WITH DRIVE LINK INTERRUPTER OVER MAGNETIC PICKUP

AIRCRAFT VIEWED FROM ABOVE

MD600N HOVER BALANCE CHART

1. TAKE READINGS AT IGE HOVER AFTER PCL TRACK.
2. USE WEIGHT, IN GRAMS, AT HUB LOCATION.
3. BLADE SEQUENCE IS SHOWN WITH SINGLE INTERRUPTER ATTACHED TO DRIVE LINK OF ROTATING SWASHPLATE.
4. LATERAL VELOCIMETER READINGS USING VELOCIMETER AT LEADING SIDE OF CONTROLS COVER POINTING TO LEFT OF AIRCRAFT.



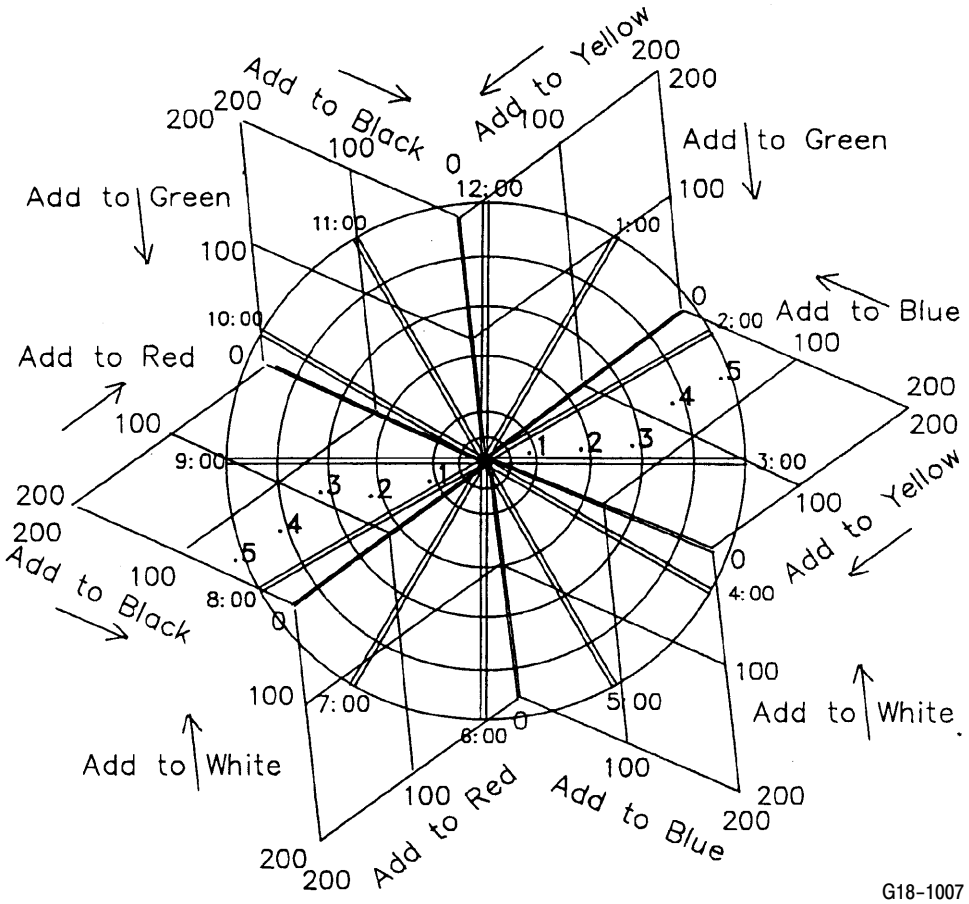
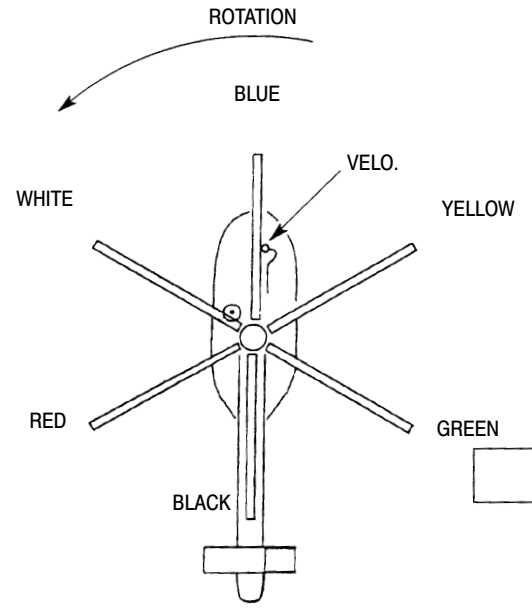


Figure 505. Main Rotor System Balance Chart

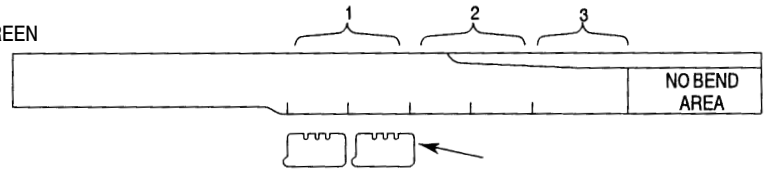


BLADE ORIENTATION WITH DRIVE LINK INTERRUPTER OVER MAGNETIC PICKUP

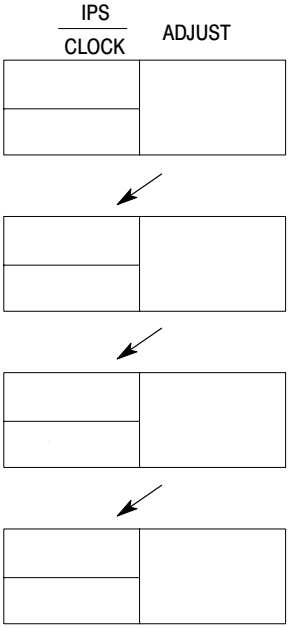
AIRCRAFT VIEWED FROM ABOVE

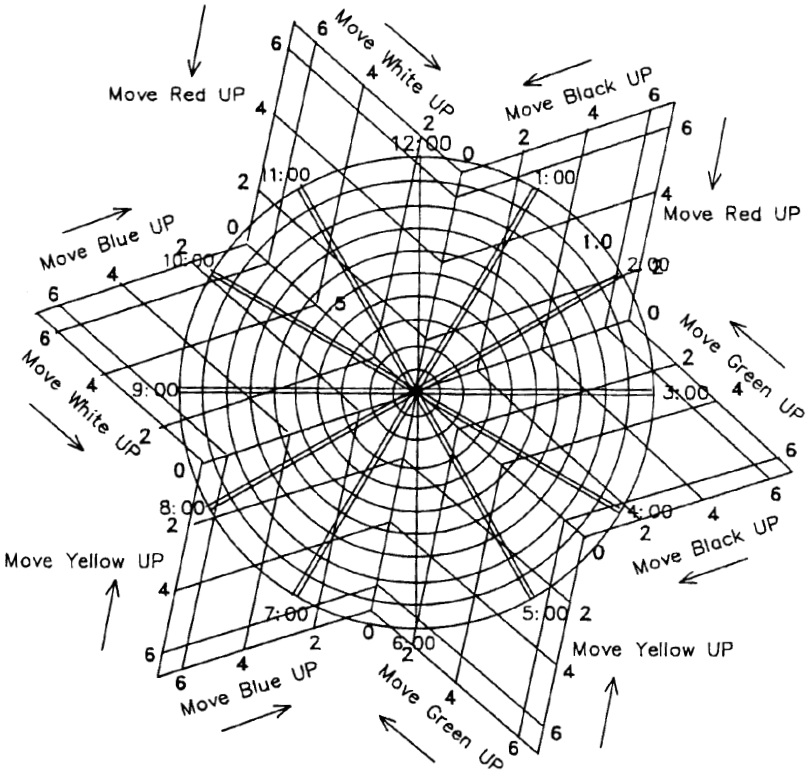
MD600N VERTICAL TAB CHART 100–130 KIAS

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 DOWN.



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)





NOTE:
ARROWS INDICATE DIRECTION POINT SHOULD GO WHEN ADJUSTMENT TO NOTED BLADE IS MADE.

G18-1006A

Figure 506. Main Rotor Tracking at 100 - 130 KIAS (Inner Tab Adjustment)

(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)

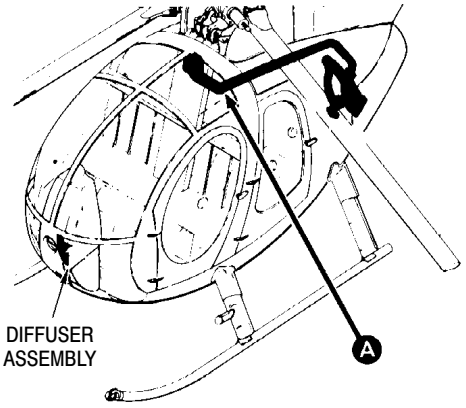
Item	Nomenclature
CM432	Dichloromethane
CM433	Ethylene chloride

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).

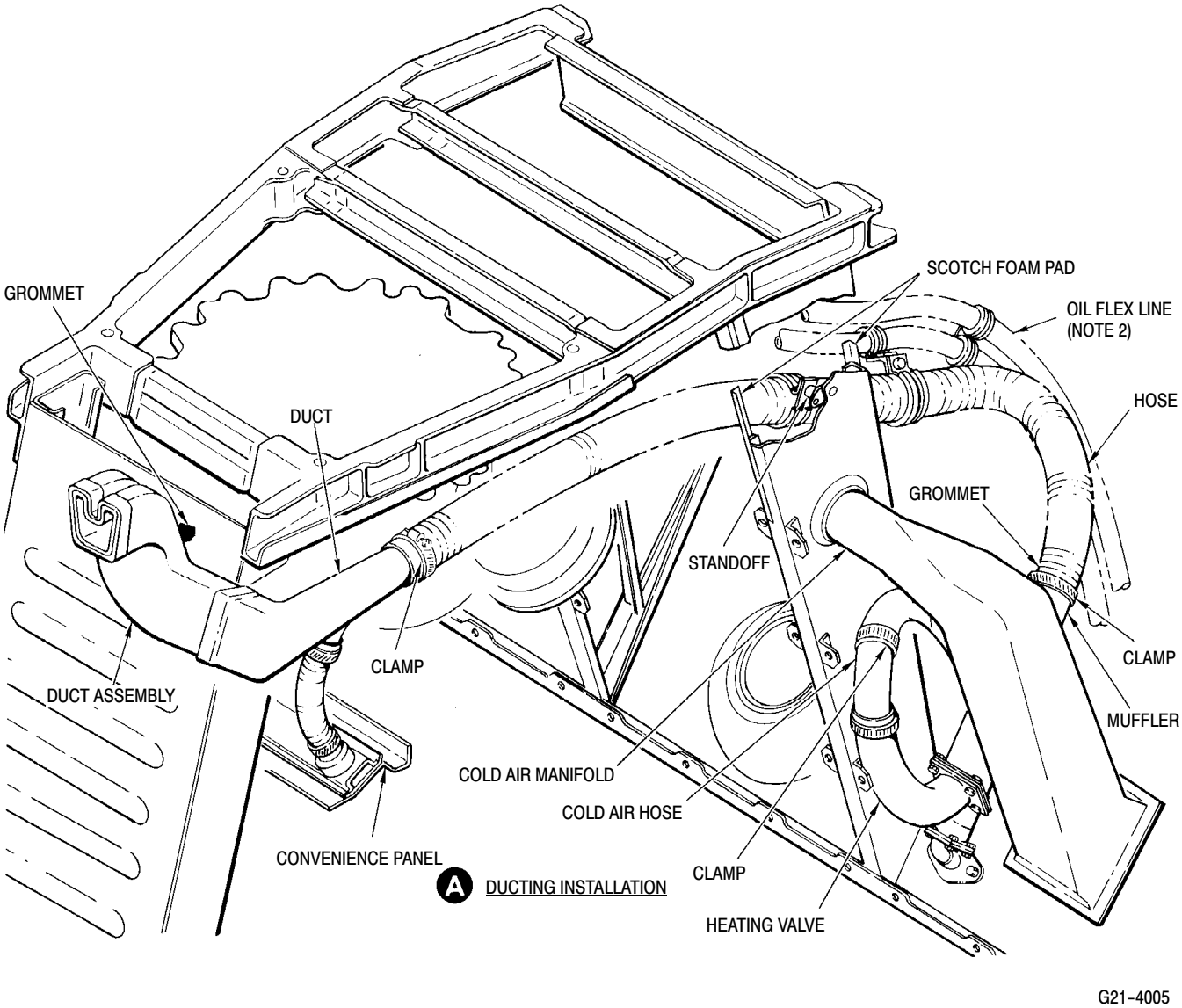
(1). Repair rigid fiberglass or muffler according to the fiberglass repair procedures outlined in the SRM, except use fire-retardant resin.

(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 (CM432) 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.



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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.

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-T richloroethane (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.

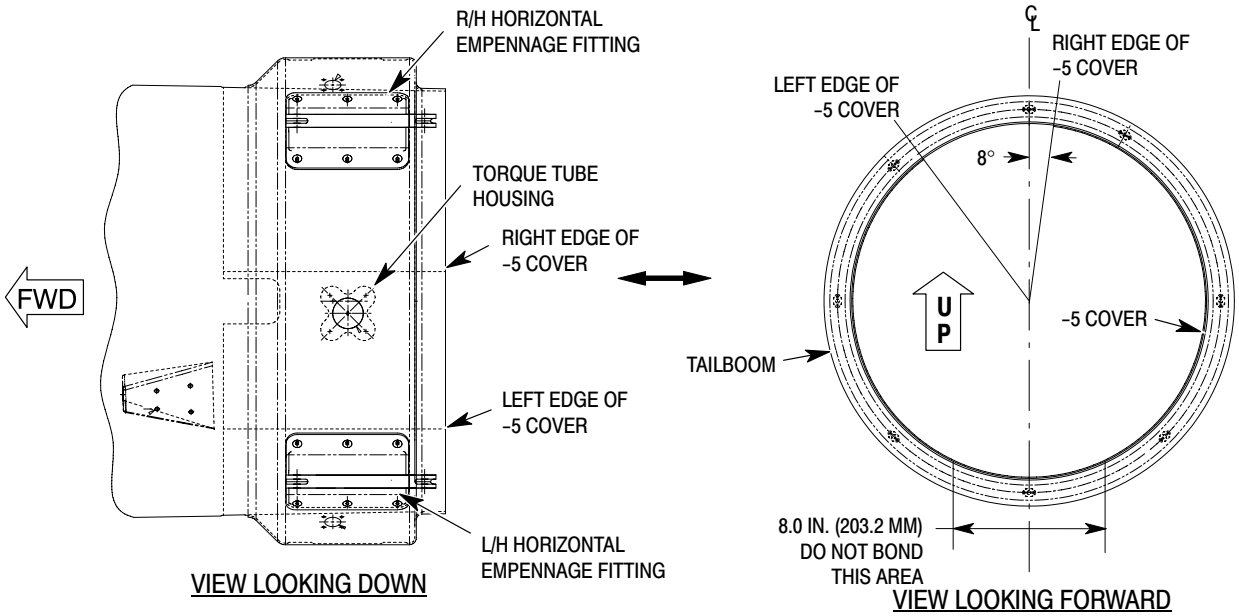


Figure 204. 500N3500-5 Cover Installation

14. Tail Skid Replacement

(Ref. Figure 205)

A. Tail Skid Removal

(1). Remove two bolts with washers from aft tail skid brace.

(2). Retain shims between base and brace if same tail skid is to be reinstalled.

(3). Slide tail skid from forward bracket assembly.

B. Tail Skid Installation

(1). Slide tail skid into forward bracket assembly.

(2). Install aft brace onto aft base.

(3). If reinstalling the same tail skid:

(a). Insert removed shims and install two bolts and washers.

(b). Torque bolts to **36 - 40 Inch-pounds (3.95 - 4.52 Nm) plus drag torque**.

(4). If installing a new tail skid:

(a). Install bolts finger tight, ensure gap is even on both sides.

(b). Measure gap between brace and base.

(c). Subtract 0.010 in. (0.254 mm) and peel shims to that thickness.

(d). Insert shims between brace and base and torque bolts to **36 - 40 Inch-pounds (3.95 - 4.52 Nm) plus drag torque**.

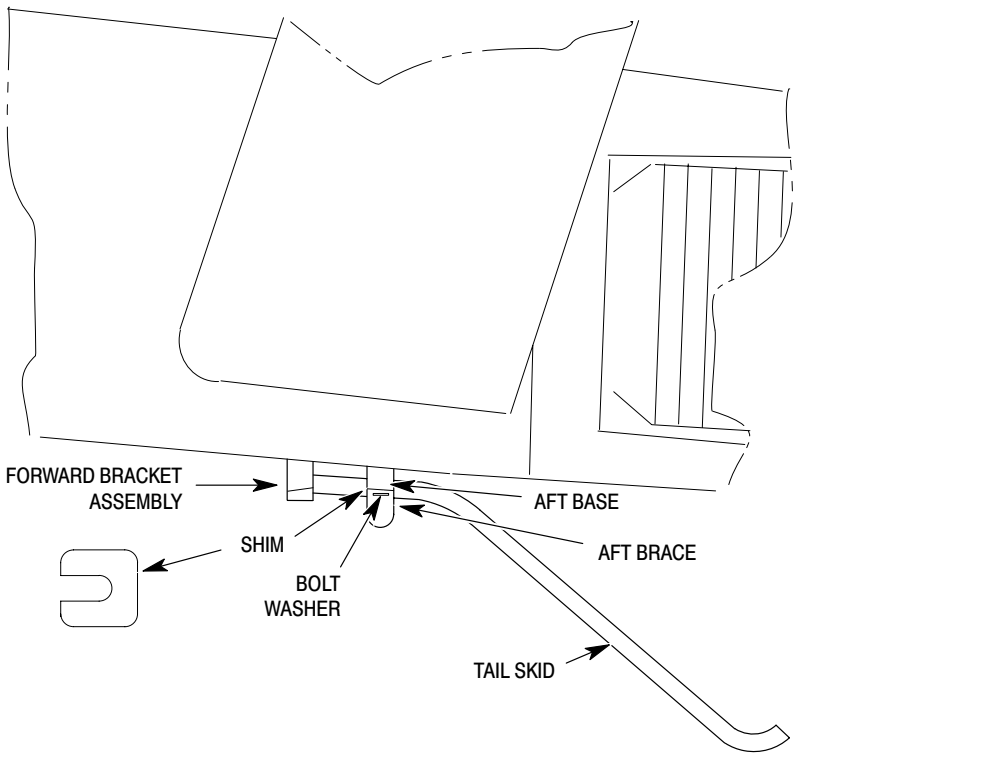
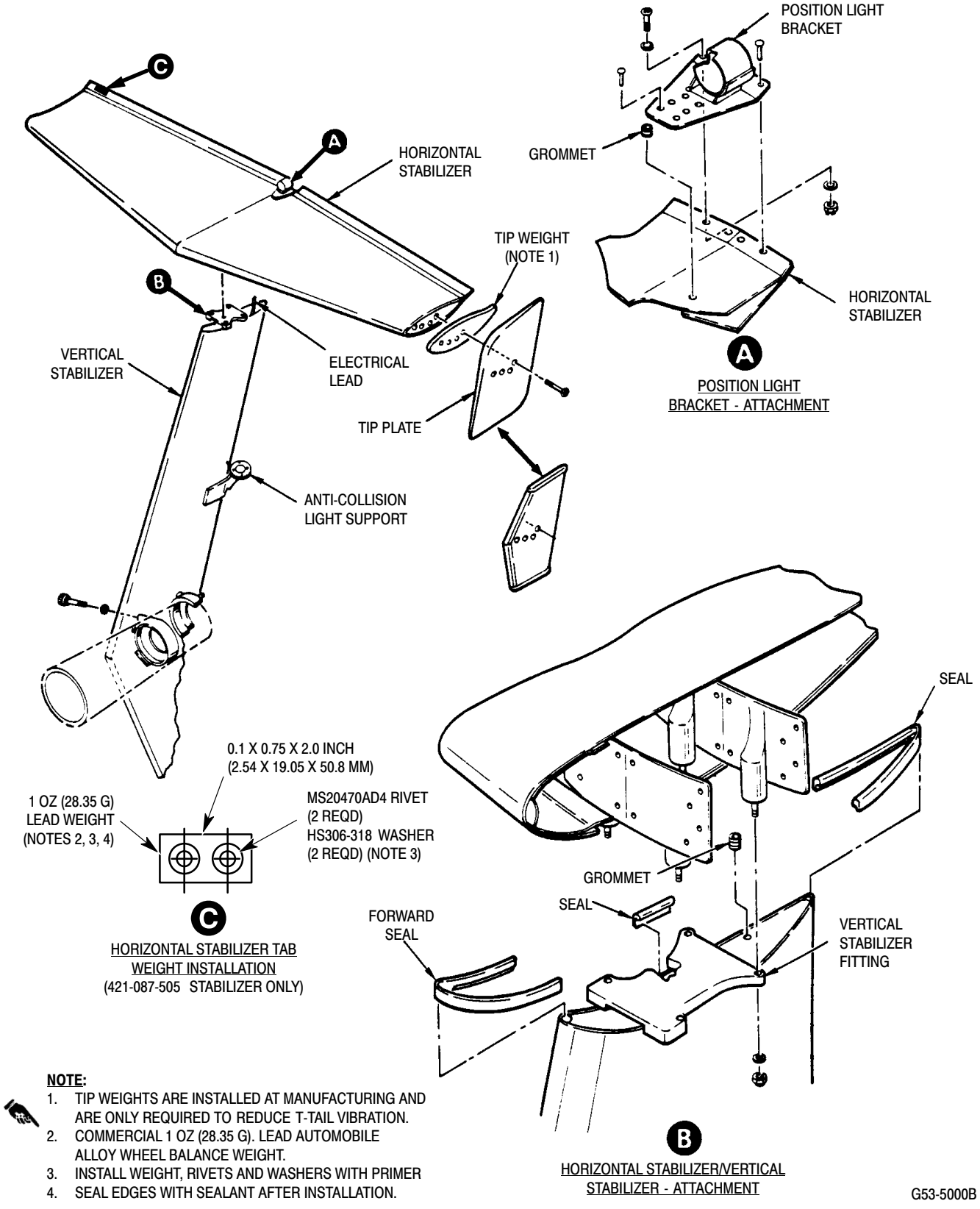


Figure 205. Tail Skid Installation



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.

- If the mast is tilted forward of 0°, add "H" to "S".
- If the mast is tilted aft of 0°, subtract "H" from "S".

(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).

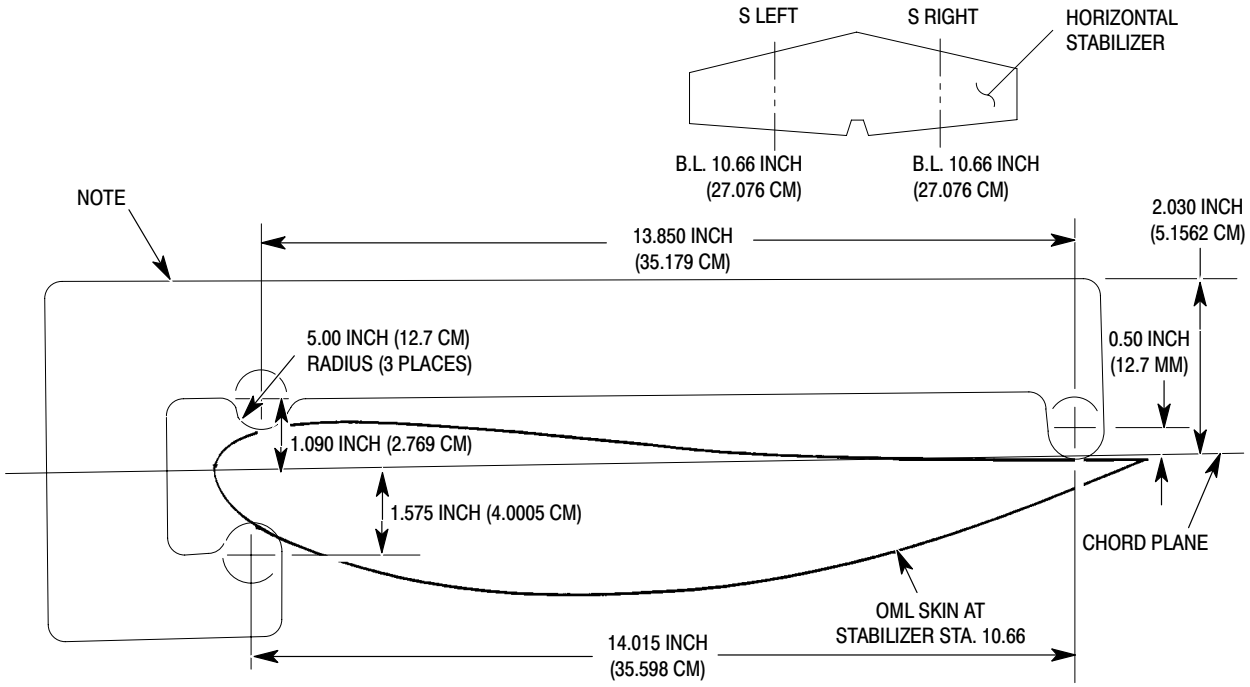
(d). Install weight, rivets and washers with wet primer.

(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).



NOTE:
TOOL FUNCTION - TO CHECK STABILIZER INCIDENCE.

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Figure 202. Horizontal Stabilizer Incidence Angle Measuring Tool

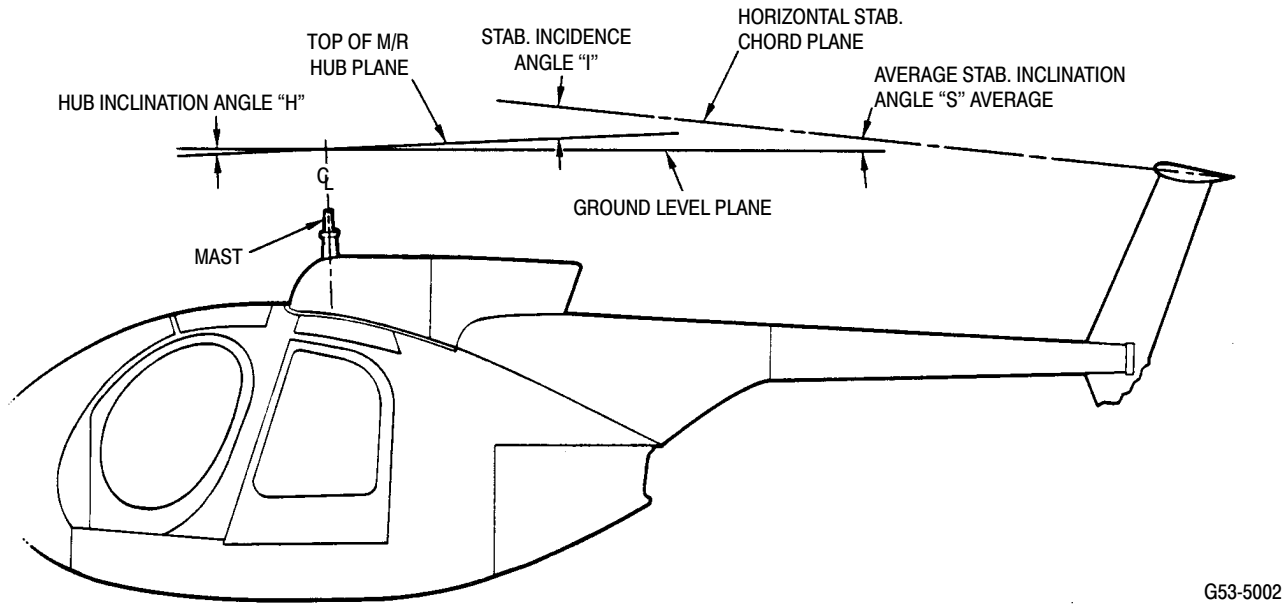

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Table 601. Strap Pack Inspection

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.

Special Tools
(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.

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.

CAUTION When installing droop stop ring, droop stop followers T- Heads must be offset away from lower shoe to prevent damage to lower shoe.

(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.

CAUTION Droop stop followers T- Heads must be offset away from lower shoe to prevent droop stop ring from damaging lower shoe.

(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.

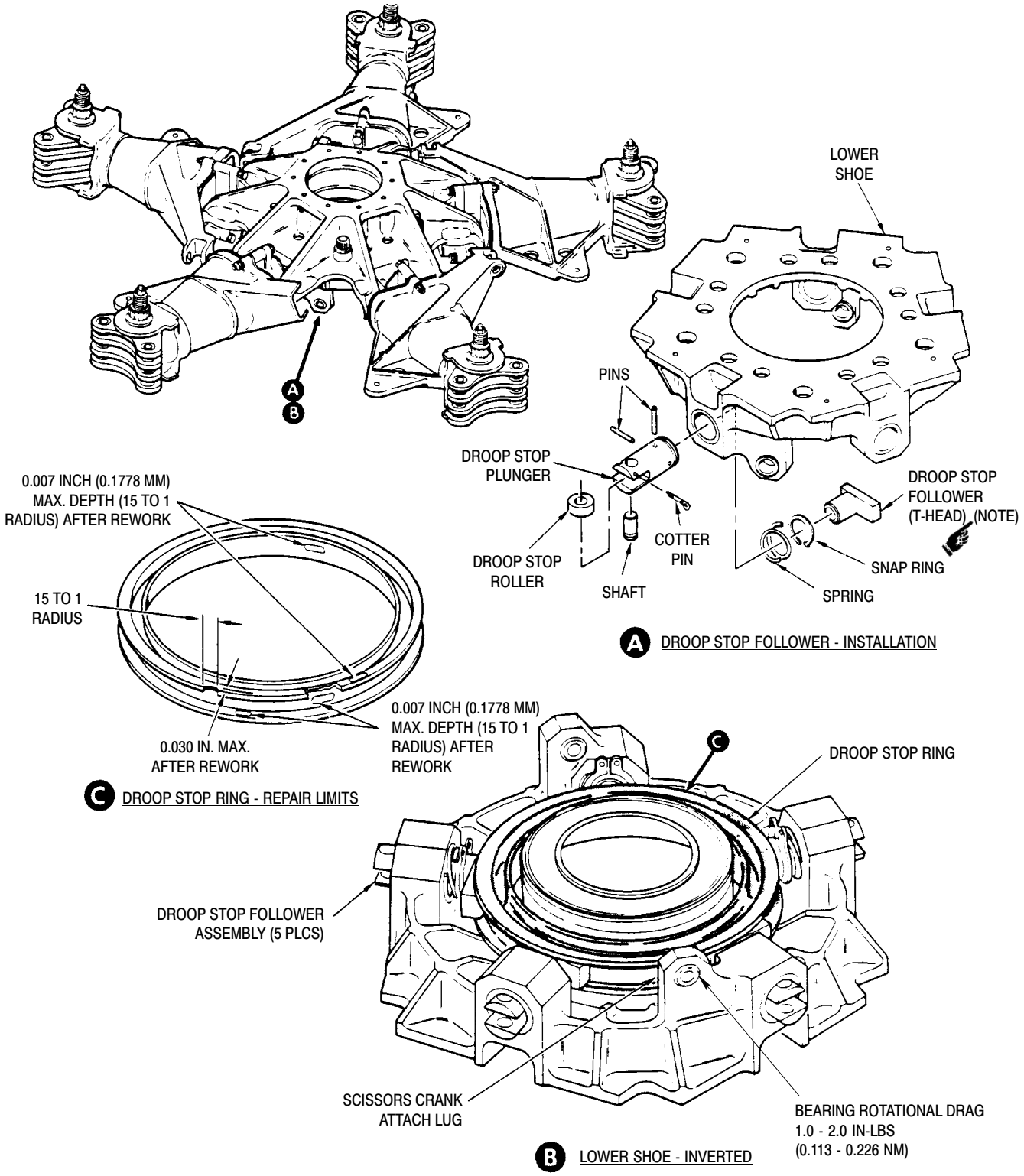
(4). If more than 0.063 inch (1.6002 mm) spacing is required (above factory spacing), inspect striker plate and droop stop roller or follower and droop stop ring for excessive wear. Replace as required.

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.



NOTE: DROOP STOP FOLLOWER T-HEADS TO BE OFFSET AWAY FROM LOWER SHOE.

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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.

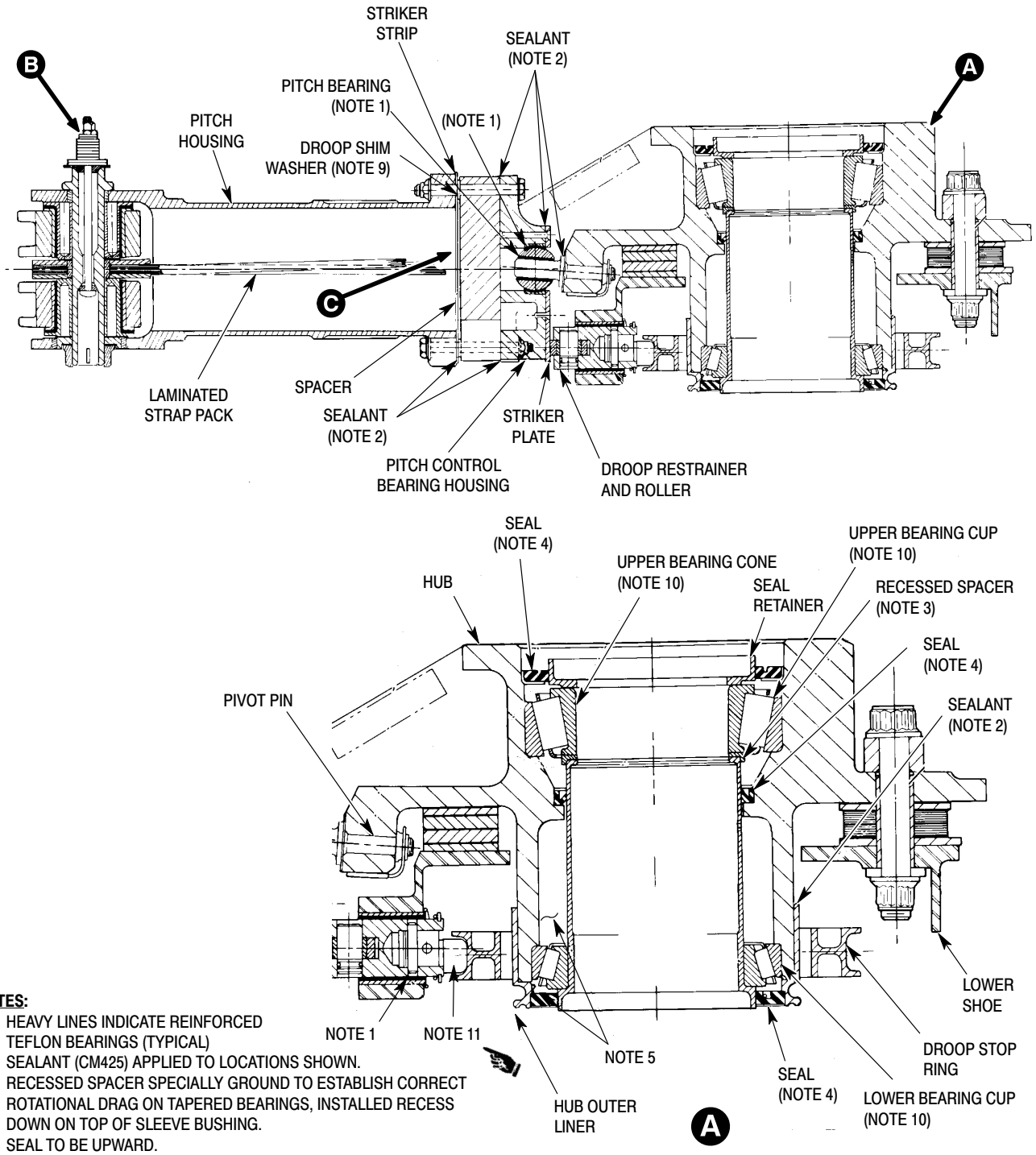
(8). Apply film of grease to sleeve bushing. Use pressing tool equivalent to tool C, and press bearing cone onto sleeve bushing.

(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



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.
11. DROOP STOP FOLLOWER T-HEAD TO BE OFFSET AWAY FROM LOWER SHOE.

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Figure 805. Main Rotor Hub - Cross Section (Sheet 1 of 2)

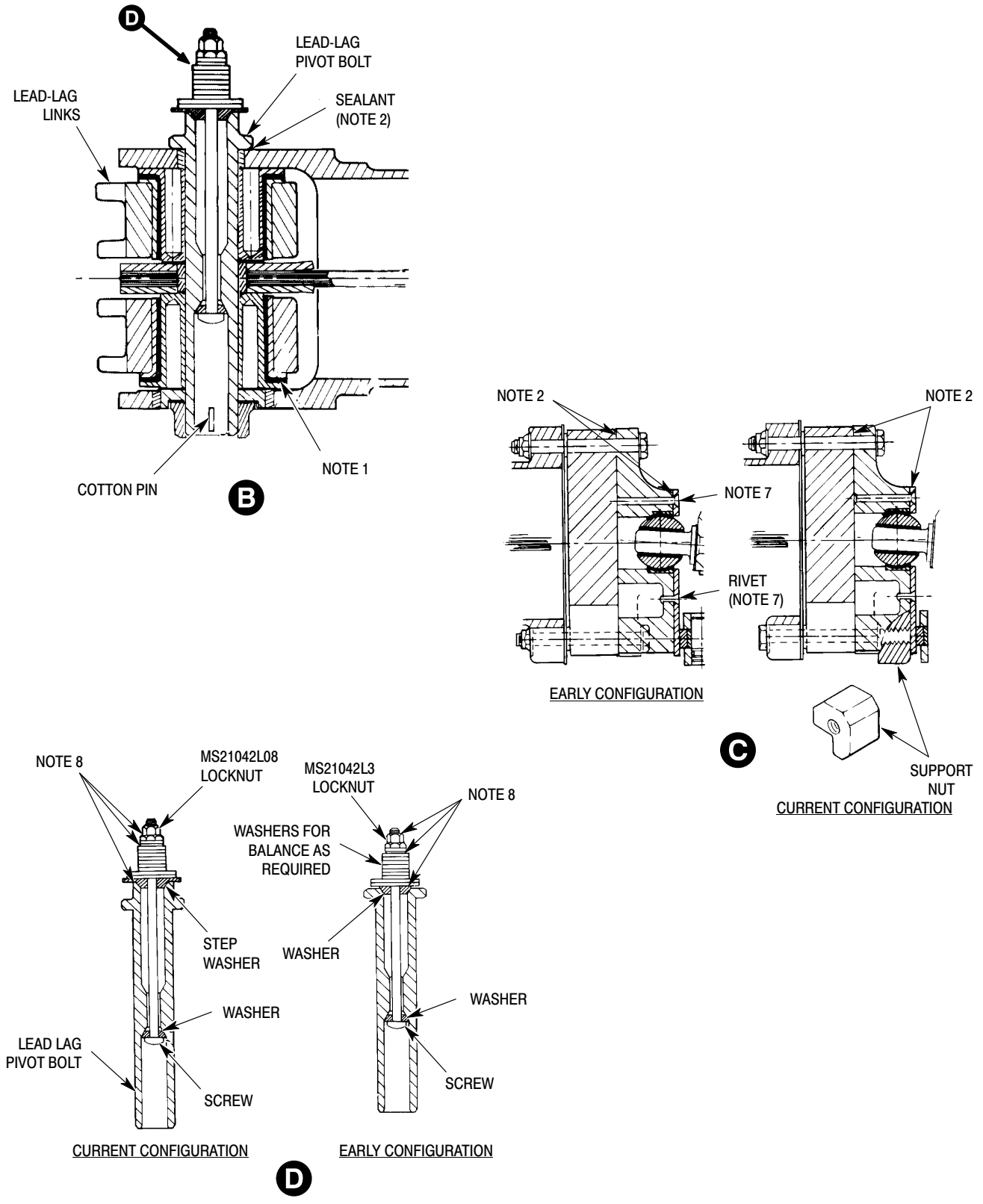
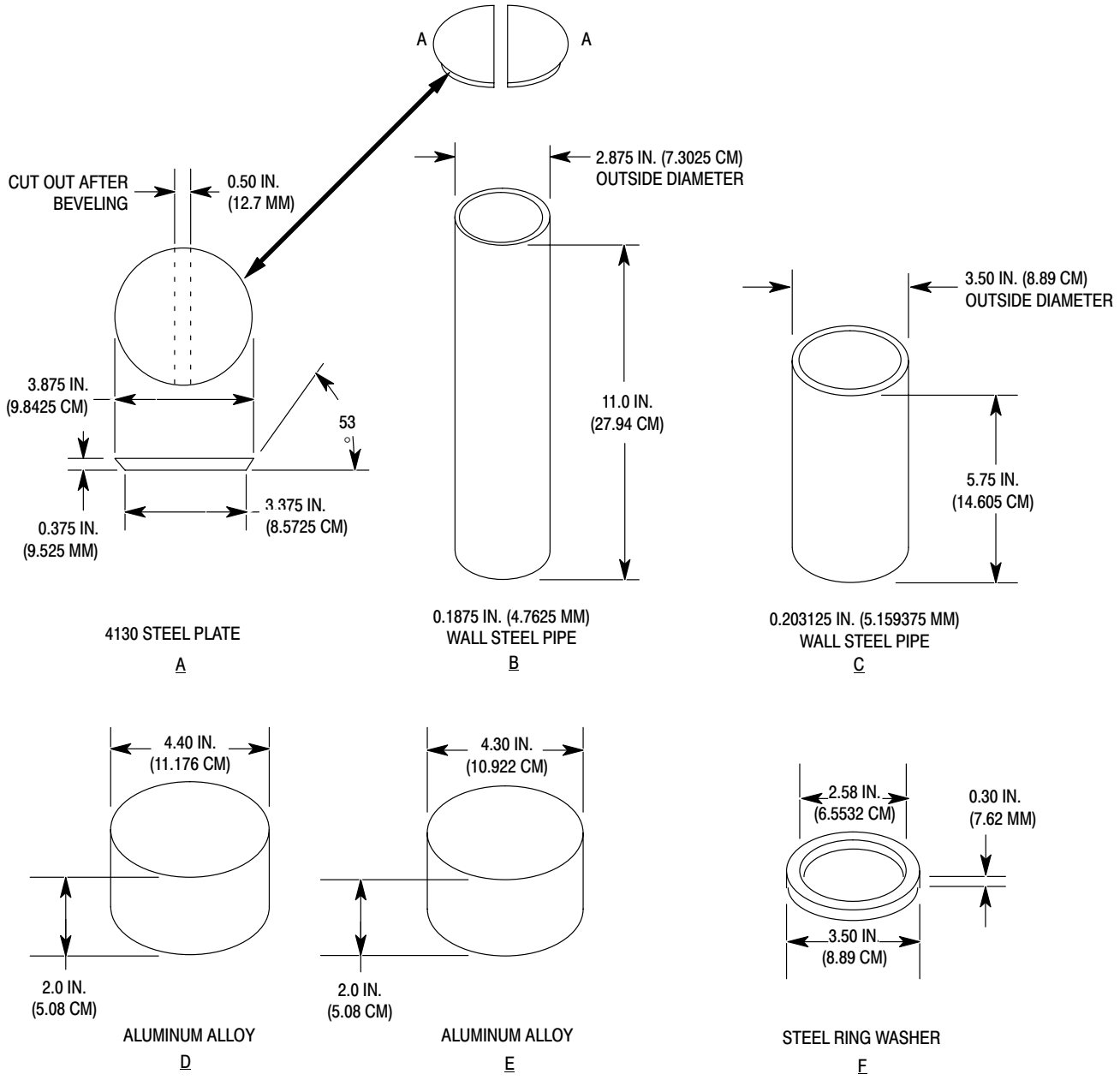


Figure 805. Main Rotor Hub - Cross Section (Sheet 2 of 2)



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

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Figure 806. Tapered Bearing Tools - Main Rotor Hub (Sheet 1 of 2)

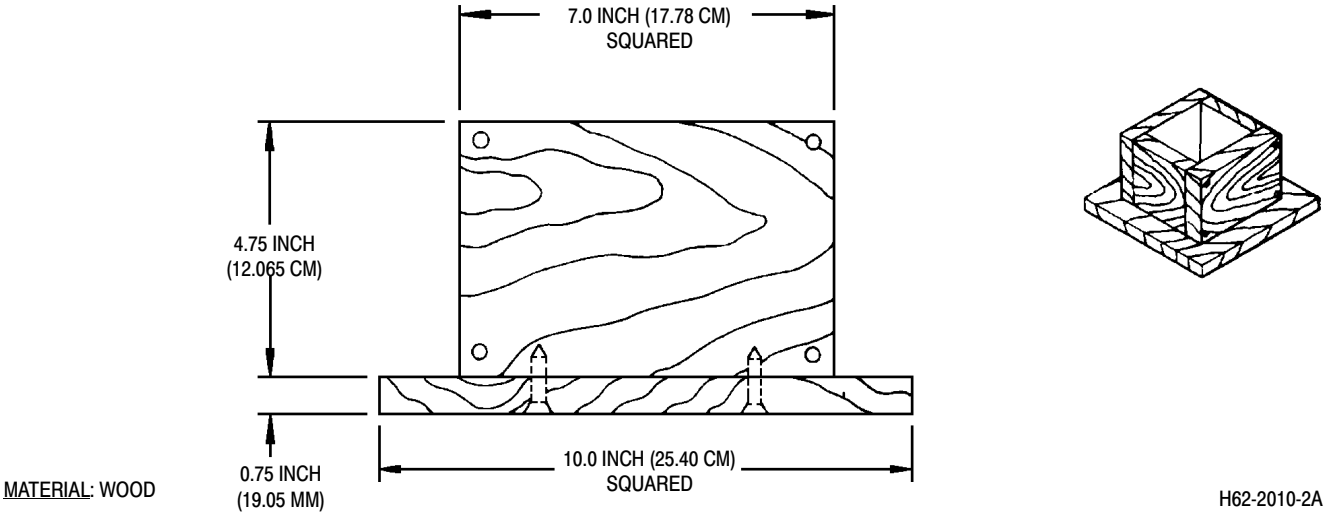


Figure 806. Tapered Bearing Tools - Main Rotor Hub (Sheet 2 of 2)

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.

CAUTION When installing droop stop ring, droop stop followers T- Heads must be offset away from lower shoe to prevent damage to lower shoe.

(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.

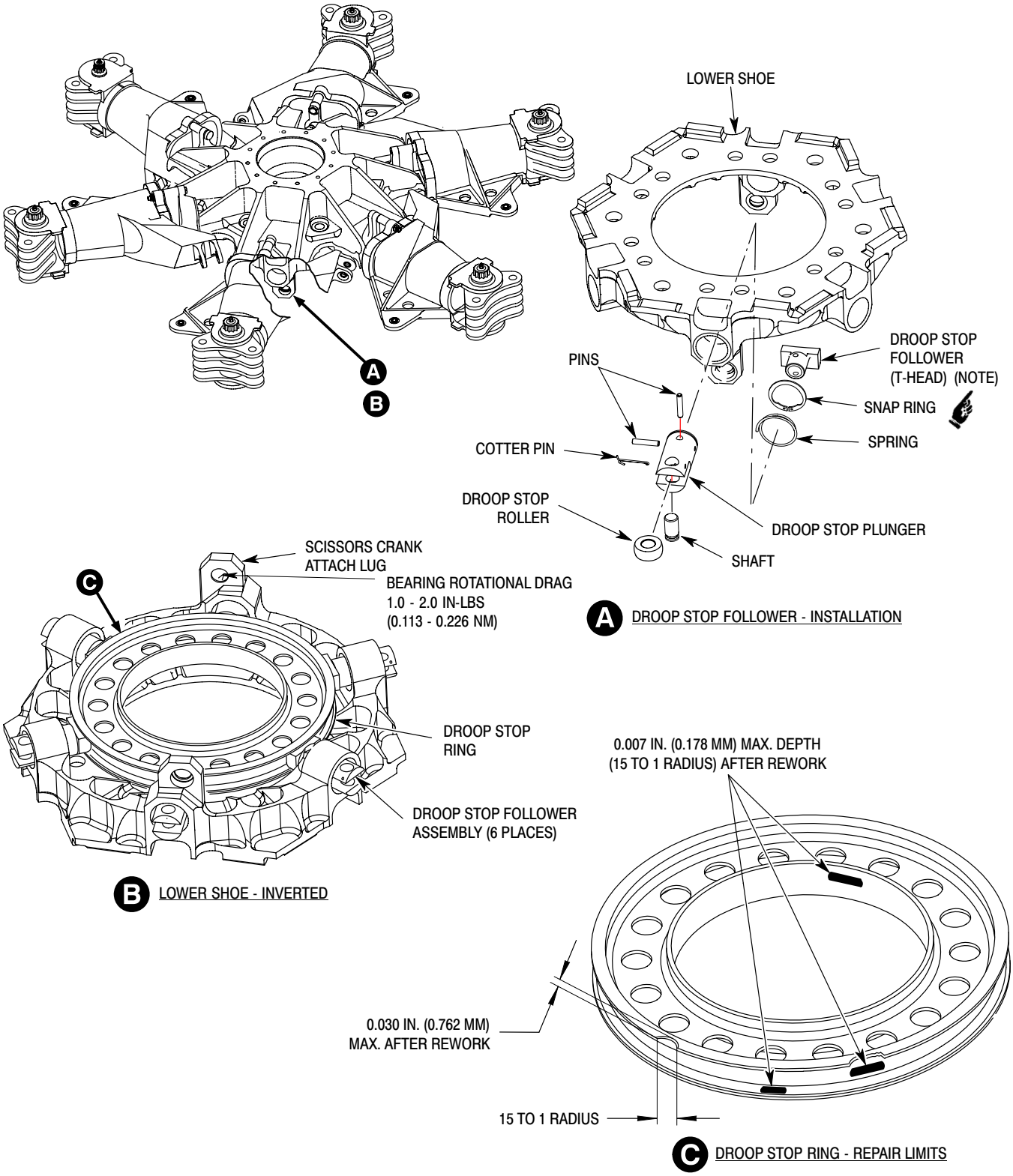


Figure 803. Droop Stop Ring Replacement and Repair

(2). Remove pins that secure follower to plunger.

CAUTION Droop stop followers T- Heads must be offset away from lower shoe to prevent droop stop ring from damaging lower shoe.

(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).

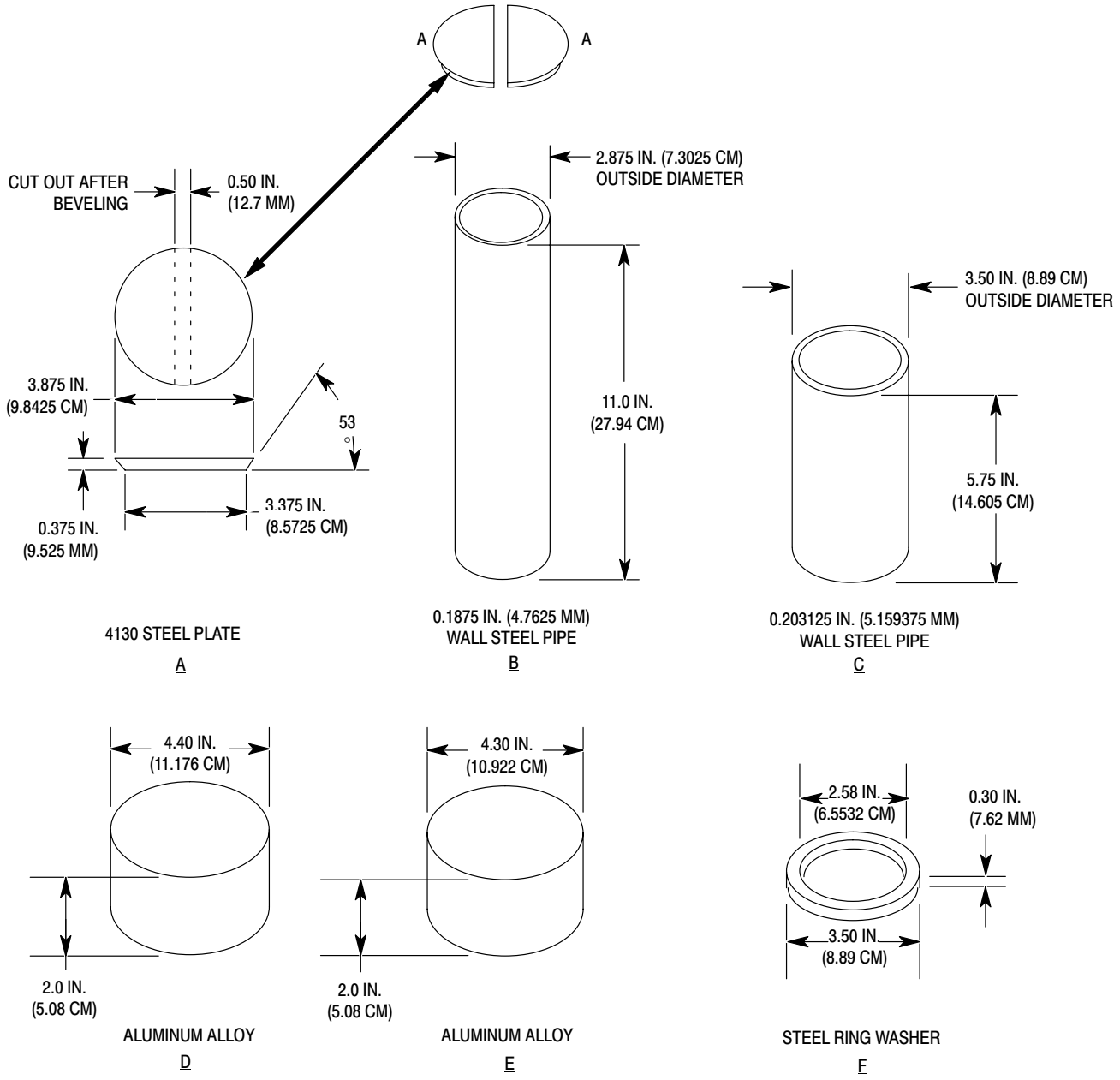
(7). Coat bores of hub with grease (CM111).

(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.



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)

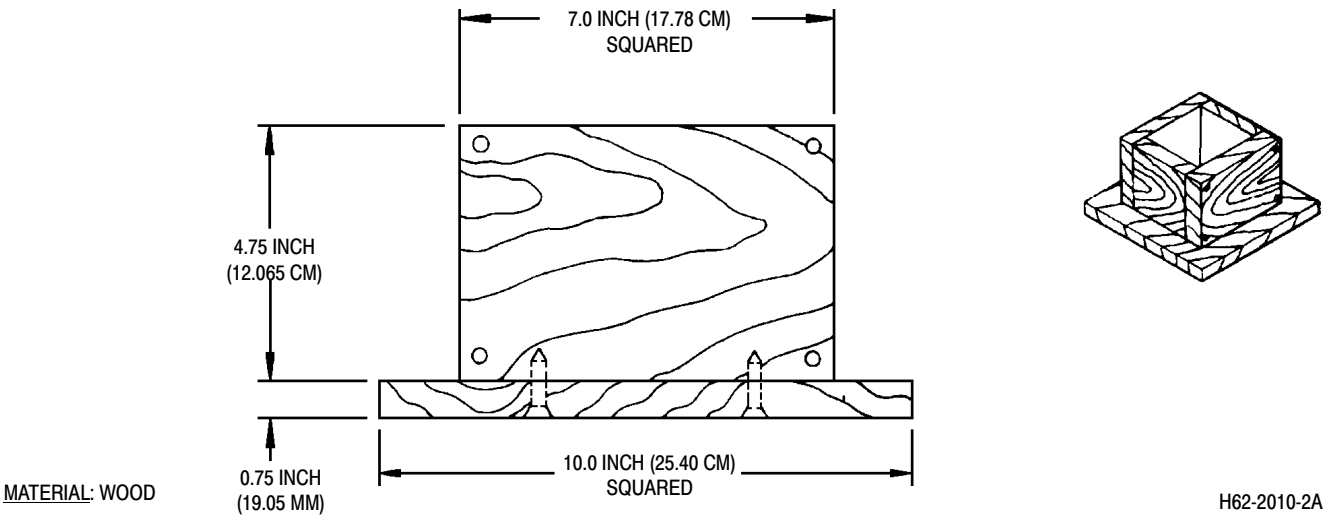


Figure 804. Tapered Bearing Tools - Main Rotor Hub (Sheet 2 of 2)

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)

(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.

(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 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.

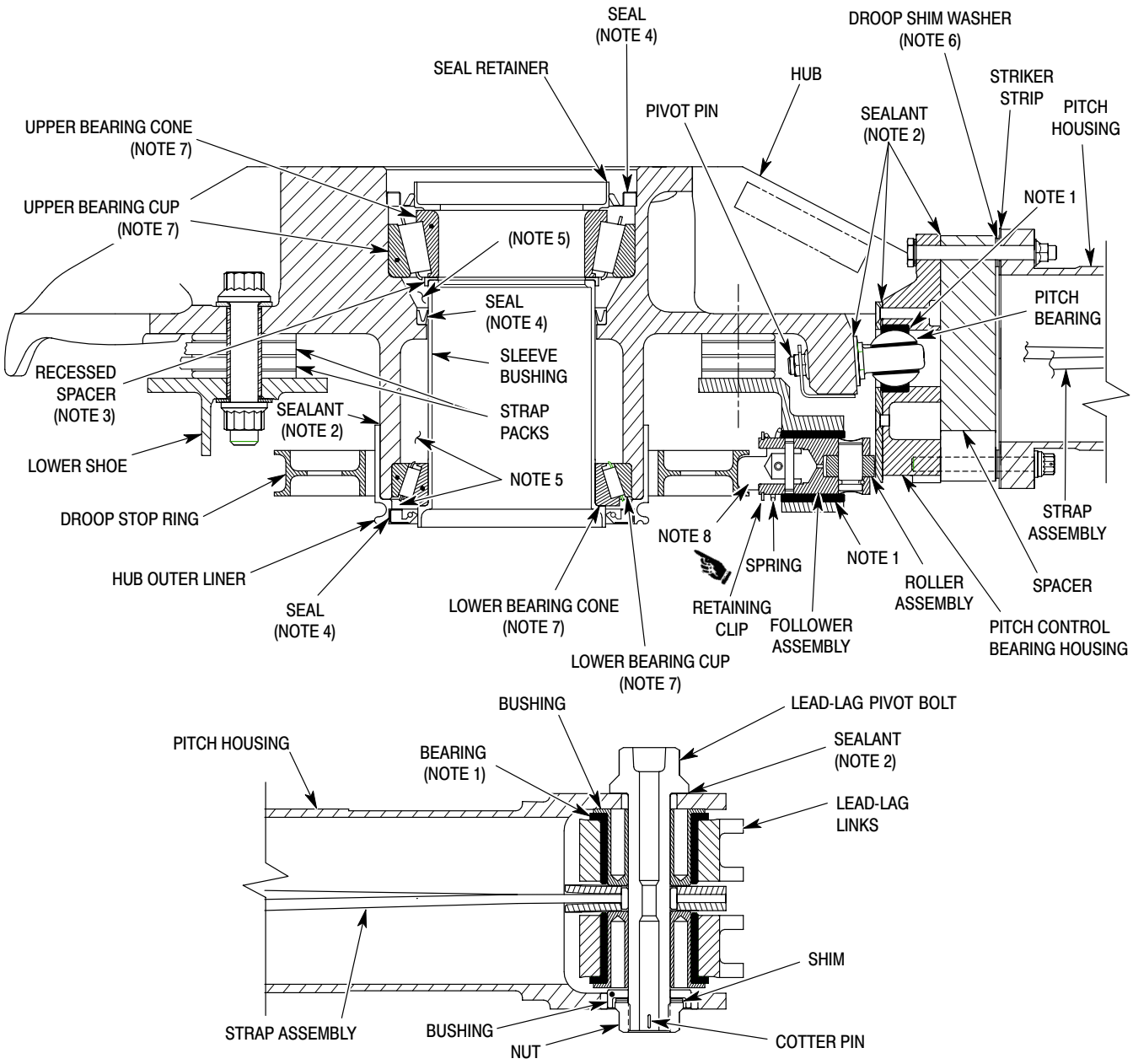
(12). Apply a small fillet of sealant around bearing and allow to dry for 24 hours at room temperature or heat to 140° - 160°F (60° - 72°C) for one hour.

(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 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.
8. DROOP STOP FOLLOWER T-HEAD TO BE OFFSET AWAY FROM LOWER SHOE.

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Figure 805. Main Rotor Hub - Cross Section

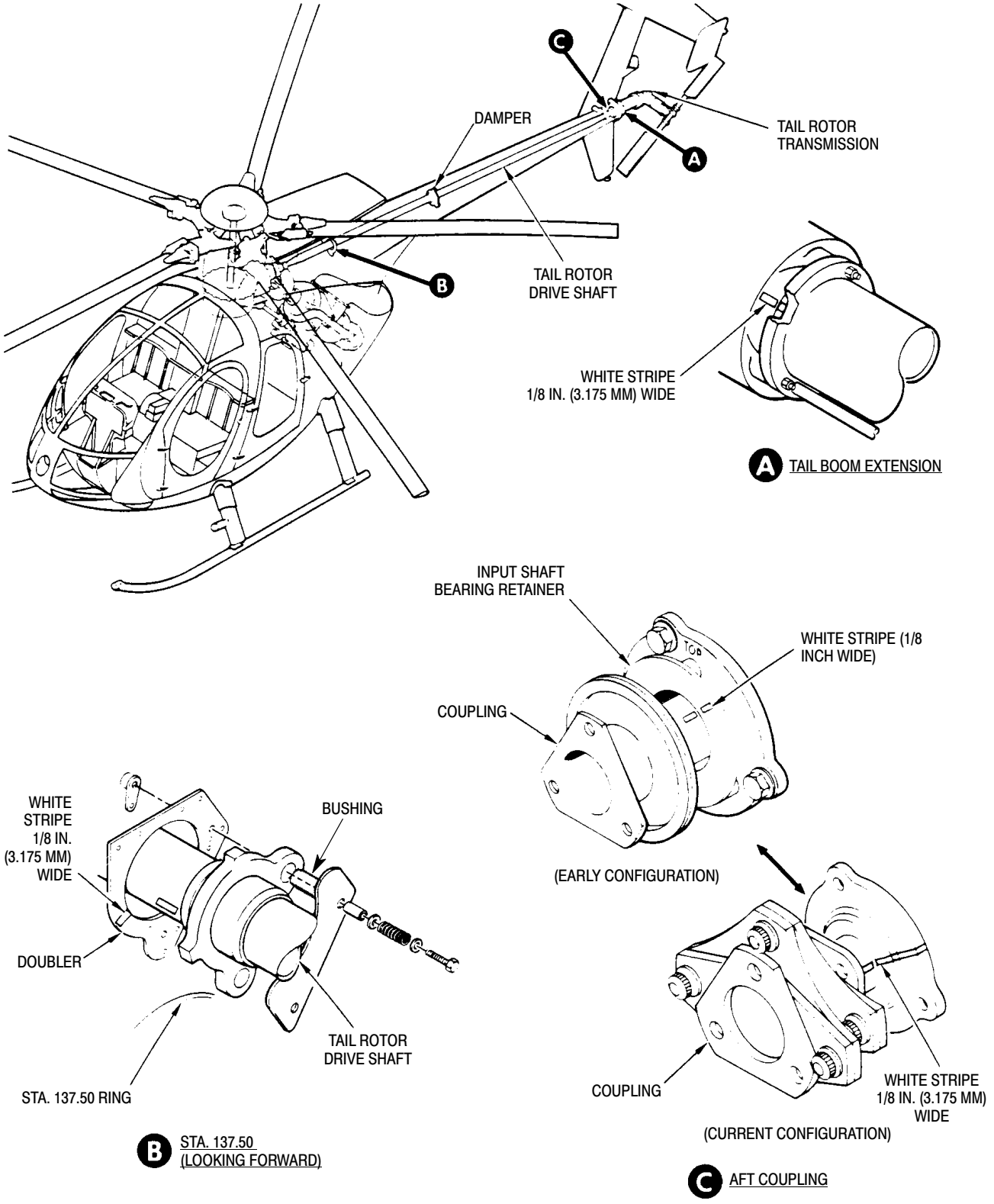


Figure 602. Tail Rotor Drive Shaft - Inspection Markings (Extended Tailboom)

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 ±0.25 pounds (0.91 ±0.11 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.)

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.

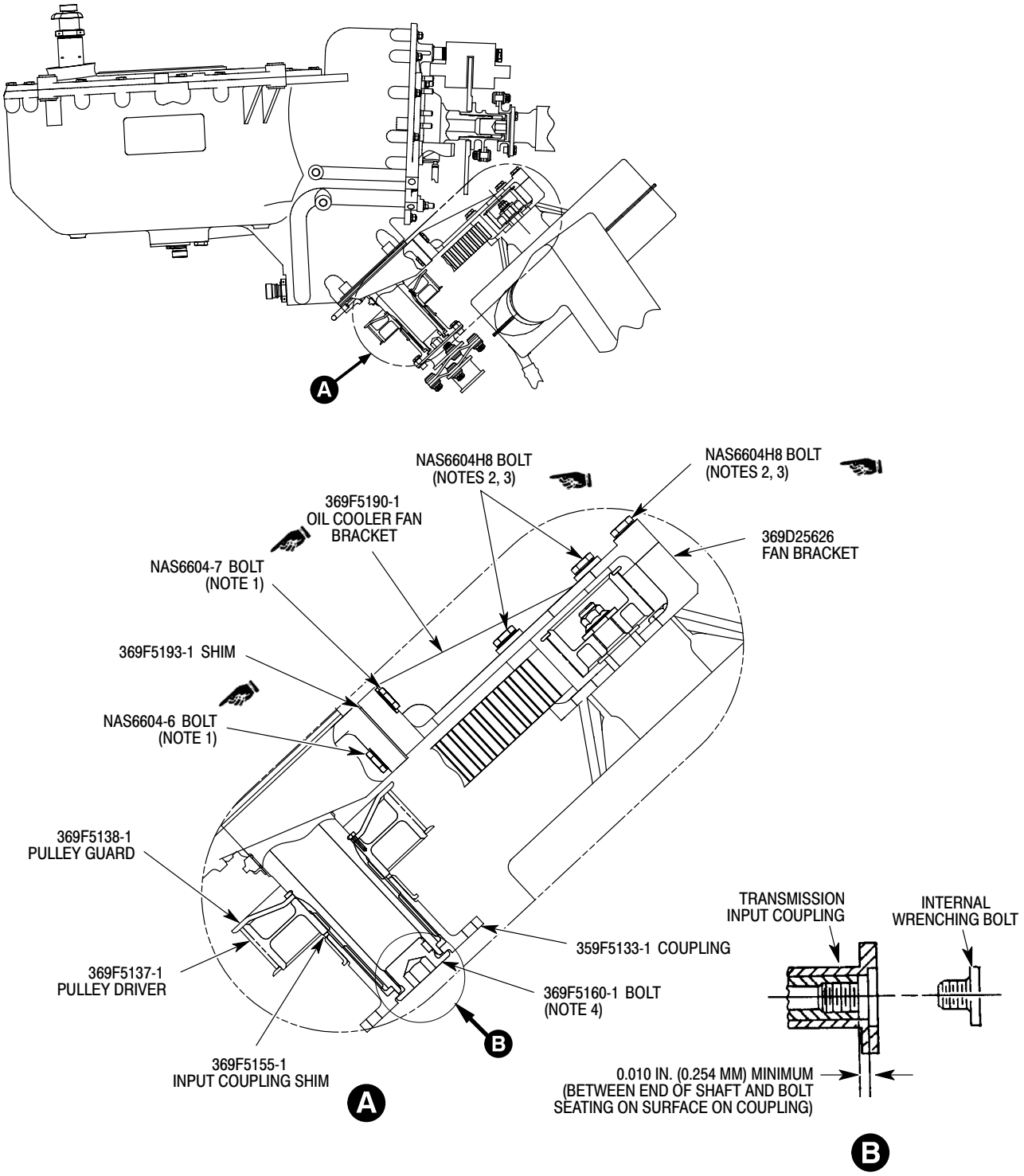
(11). Adjust belt tension (Ref. Sec. 63-21-00, Cooling Blower Belt Tension Check and Adjustment).

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)).

CSP102-012C

Figure 406. Oil Cooler Blower Installation (369F5100 Transmission)

(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:

For 369D25100 transmission installation, **65 - 75 inch-pounds (7.34 - 8.47 Nm)**, and then lockwire drilled heads.

For 369F5100 transmission installation, **70 - 90 inch-pounds (7.91 - 10.17 Nm)**.

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2. 369D25630 Cooling Blower Reassembly

(Ref. Figure 801)

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

Item	Nomenclature
CM116	Grease, aircraft and instrument
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 (CM116) 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 (CM116) 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 (CM116) 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).

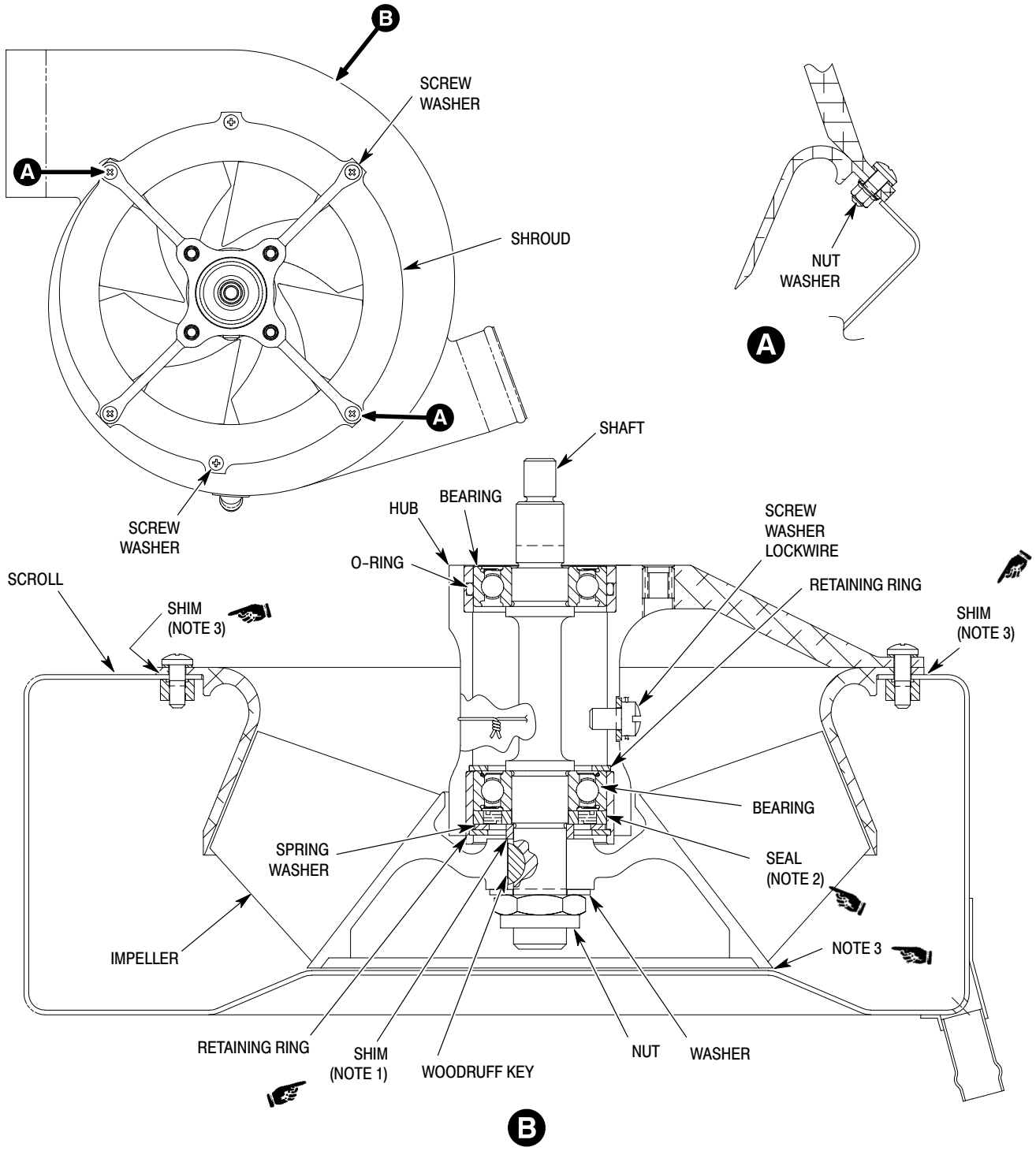
(2). Hold impeller retaining nut with socket wrench and remove driven-pulley retaining nut and washer.

(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
CM116	Grease, aircraft and instrument
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 (CM116) 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 (CM116) 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 (CM116) 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.

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

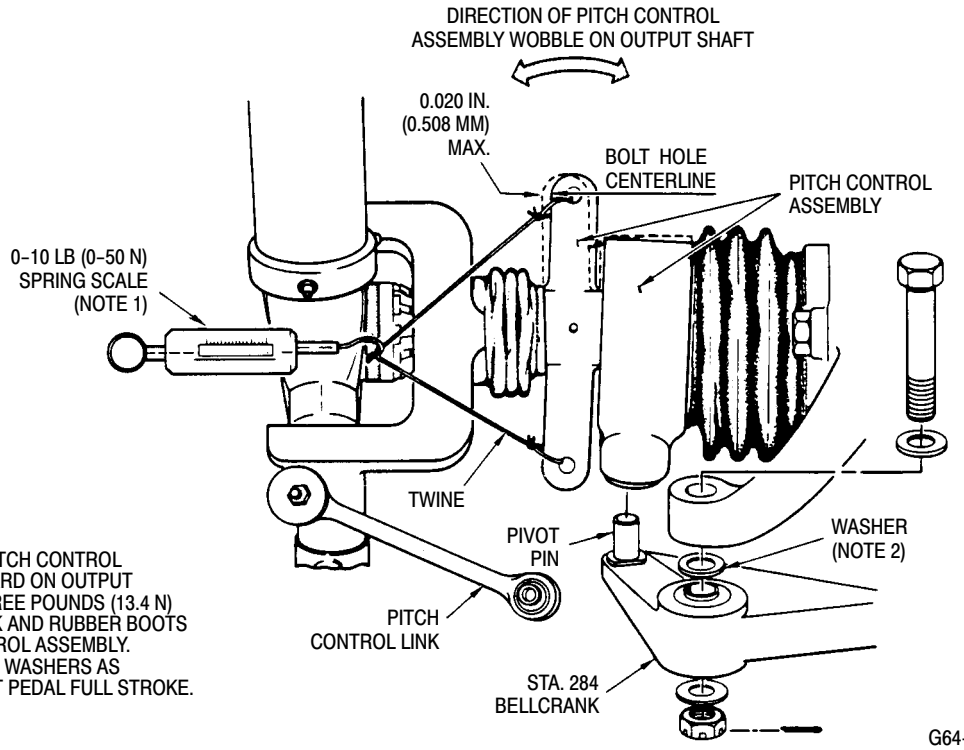
A. Tail Rotor Pitch Control Assembly Removal

(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

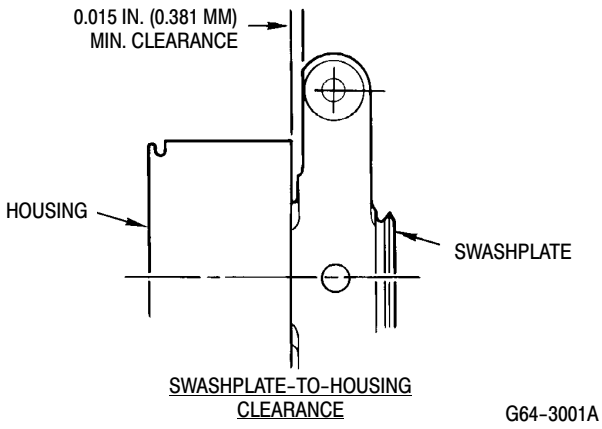


Figure 202. Swashplate-to-Pitch Control Housing Clearance

(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.

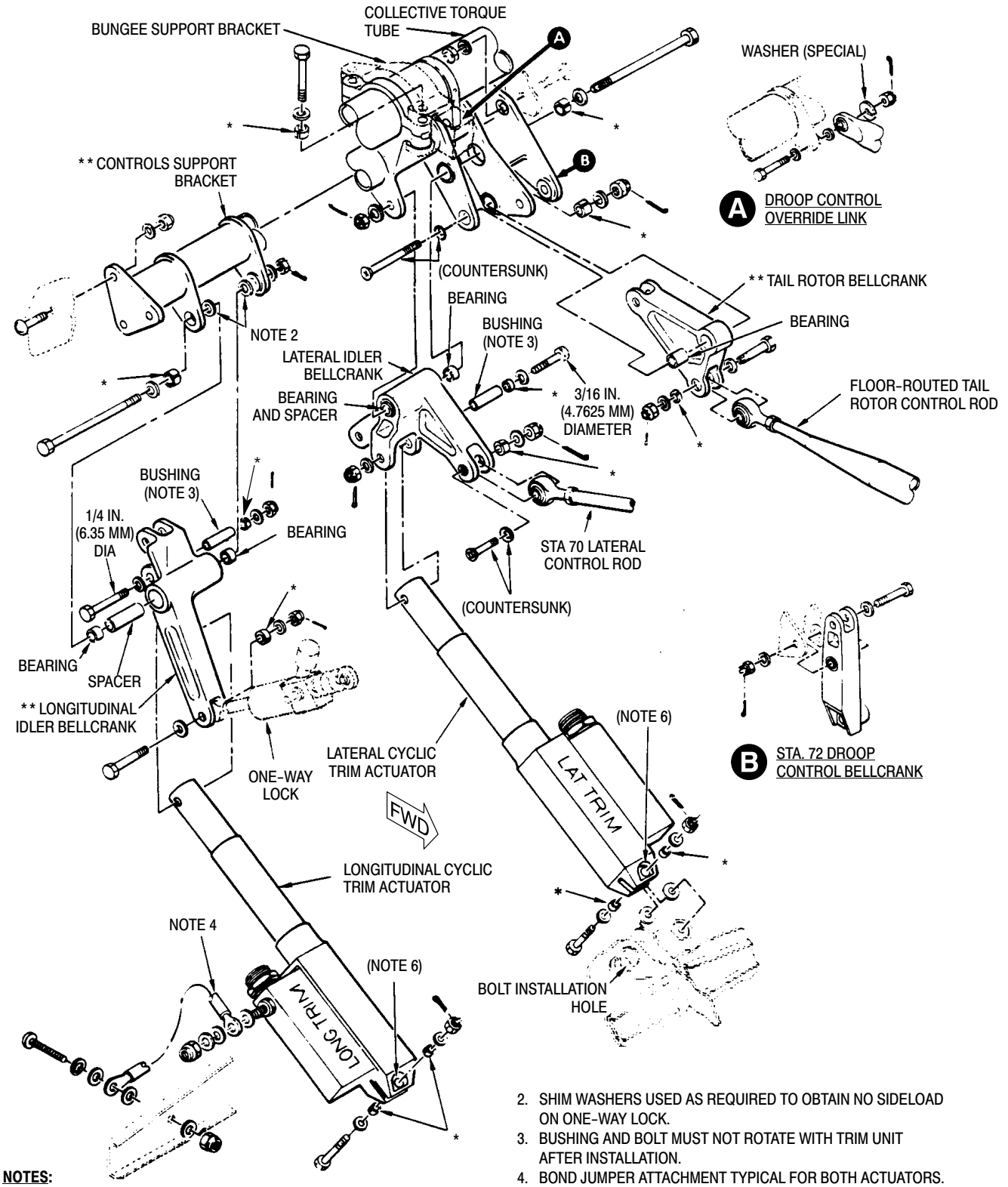
(1). Disconnect ends of pitch control link from clevis ear of swashplate and from blade pitch control arm.

(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.



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.

"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 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.

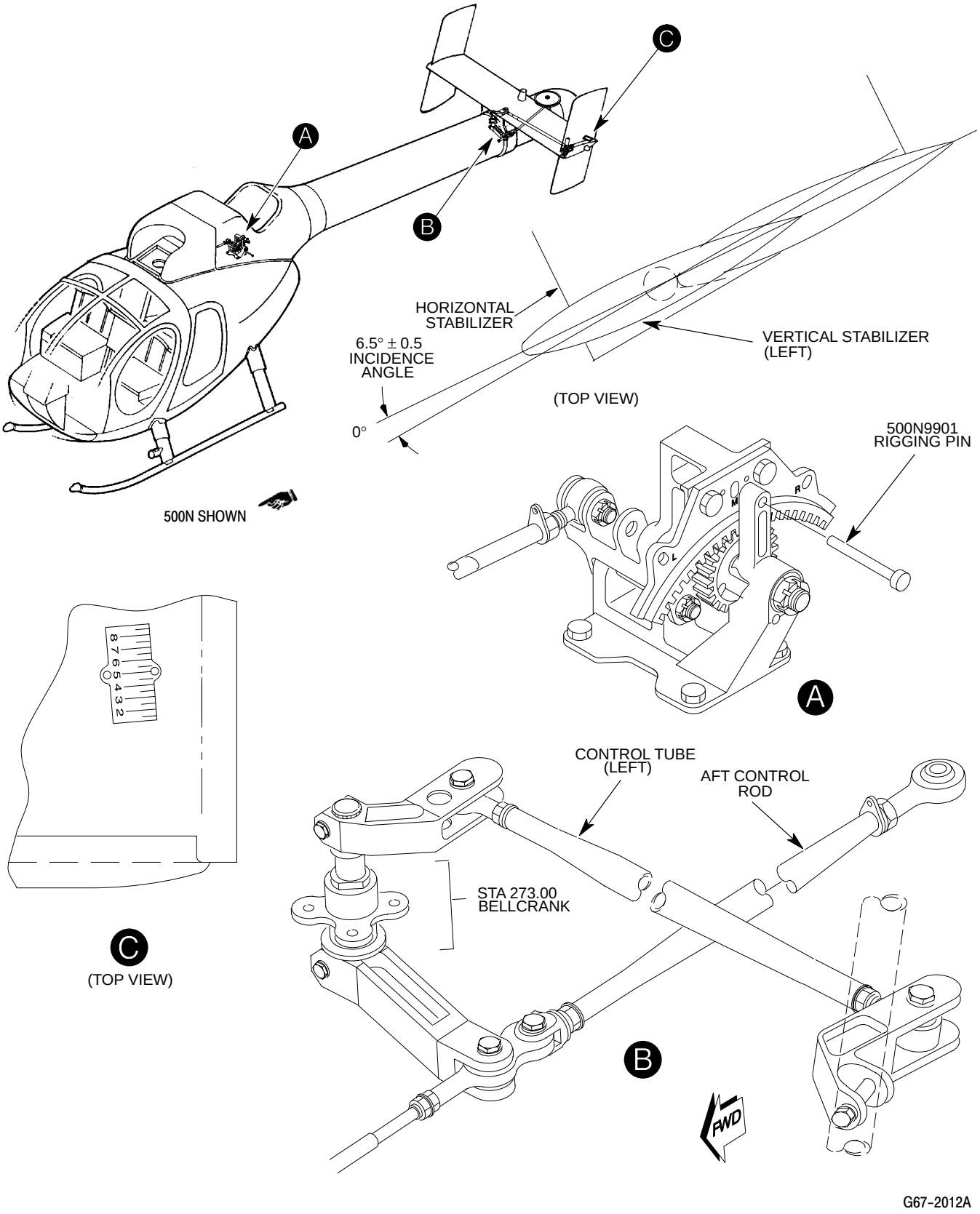

Figure 504. Left Vertical Stabilizer Rigging (500N, and 600N with YSAS)

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 (5).

(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.

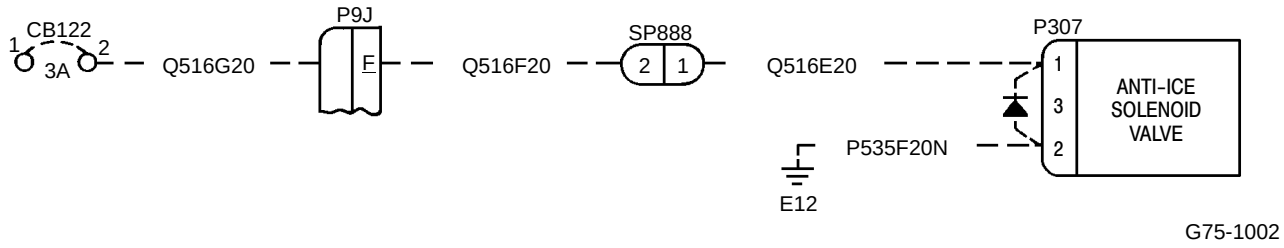

Figure 201. 250-C20/R2, 250-C30 and 250-C47 Engine Anti-Icing System Wiring

(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). Perform anti-icing system test per the appropriate Pilot's Flight Manual (Ref. Sec. 01-00-00).

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.

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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.

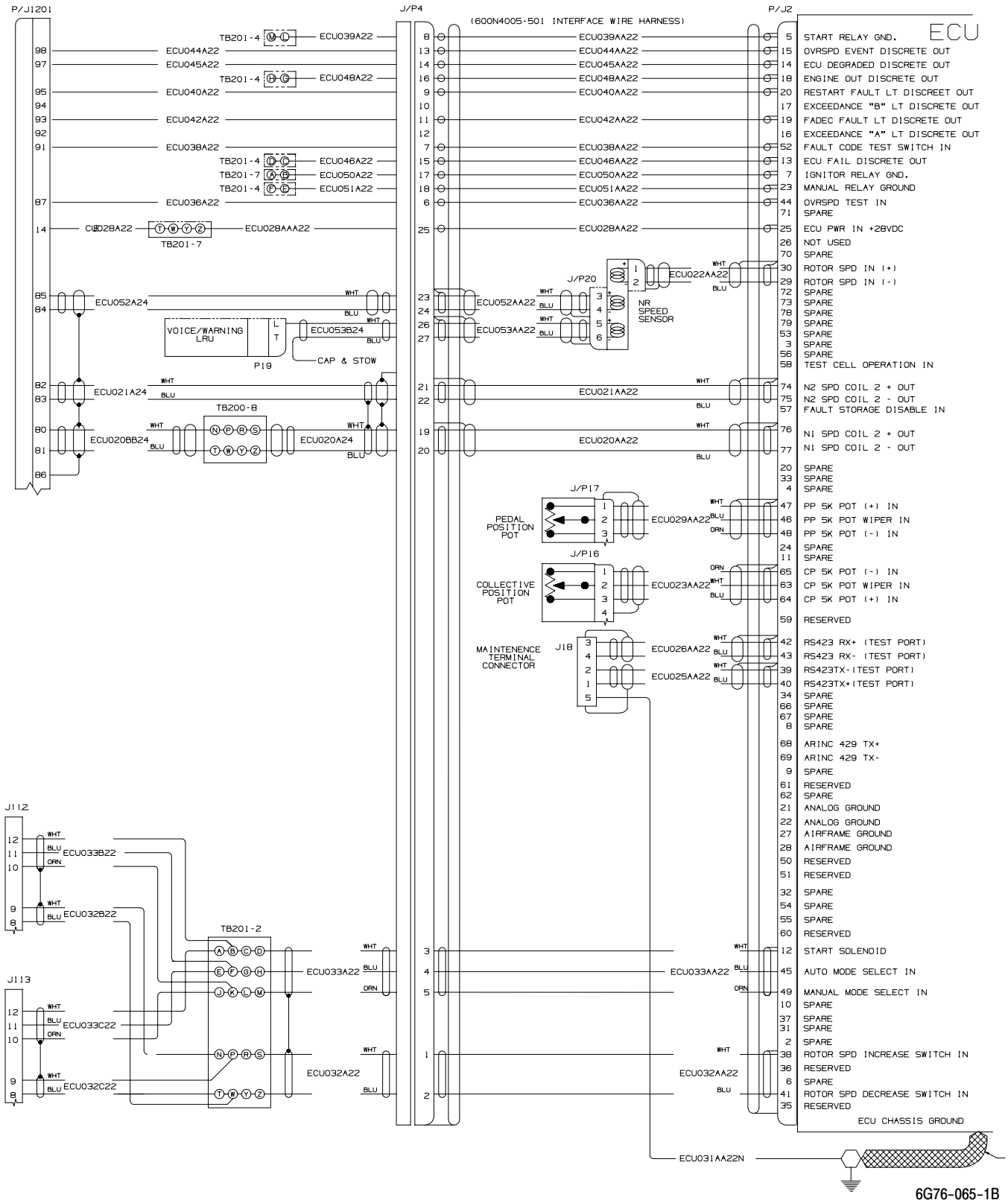

Figure 201. Engine Control Unit Wiring Diagram (Sheet 1 of 2)

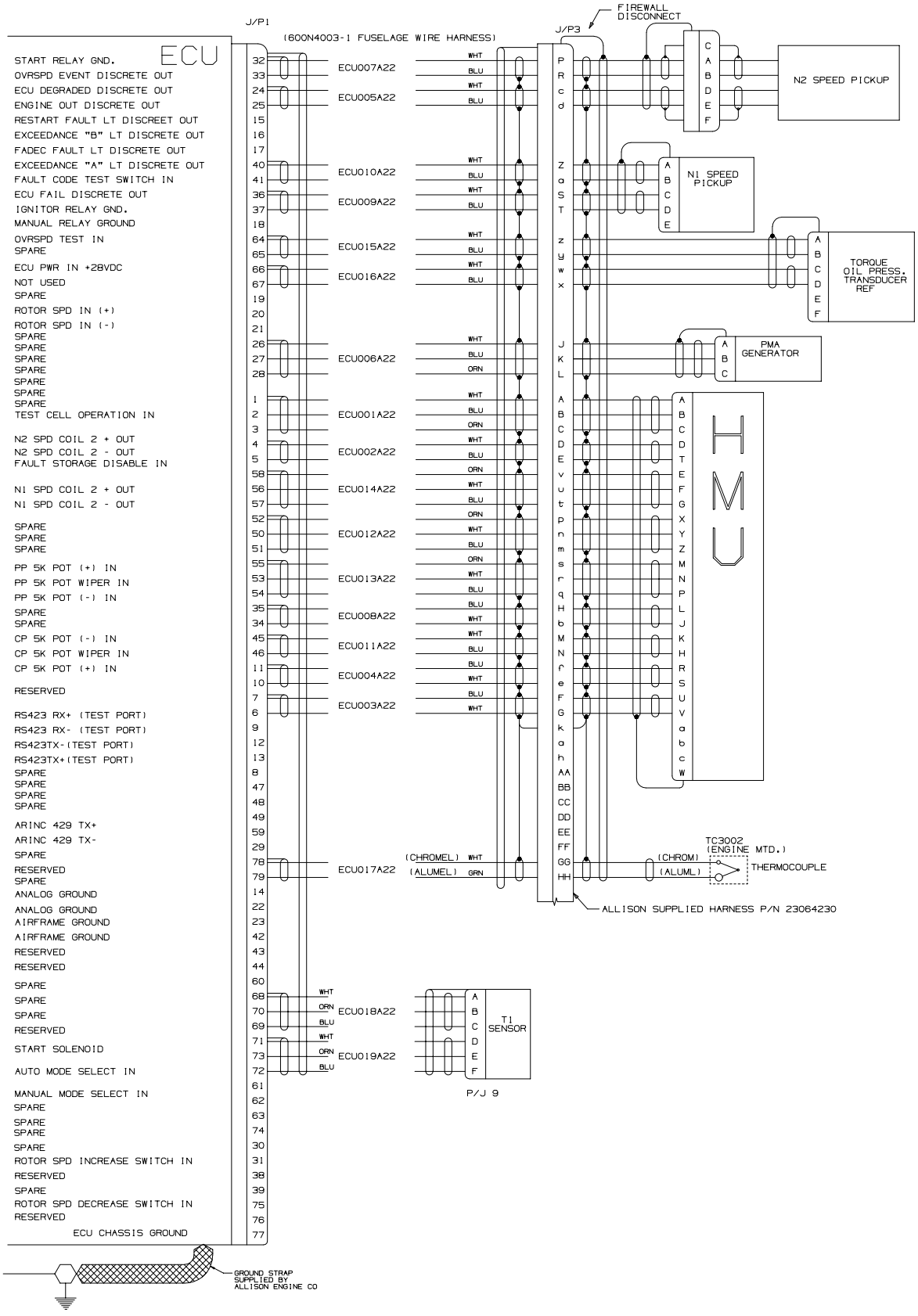

Figure 201. Engine Control Unit Wiring Diagram (Sheet 2 of 2)

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

NOTE: A 0.1540 in. (3.9116 mm) rig pin or standard #23 drill must be inserted in rig hole during installation of the engine control box to the engine hydromechanical control unit to maintain proper alignment.

(1). Install engine control box to engine hydromechanical control unit with 600N7717-1 nut. Torque nut to **60 - 85 inch-pounds (6.78 - 9.60 Nm) plus**

drag torque. Minimum drag torque is **15 inch-pounds (1.69 Nm)**.

(2). Measure gap between engine control box and HMU.

(3). Peel MHS5079-2346 shim washer for gap in step (2). and ensure alignment to maintain full engagements of the serrations without binding the controls.

(4). Install bolt, washer and shim washer. Torque bolt to **36 - 46 inch pounds (4.06 - 5.19 Nm)**. A slip fit of the rig pin through the control box, HMU lever and HMU rig pin hole must be maintained after final torque of bolt.

(5). Install control cable end into engine control box coupling and connect cable nut. Torque nut to **50 inch pounds (5.64 Nm)**.

(6). 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.

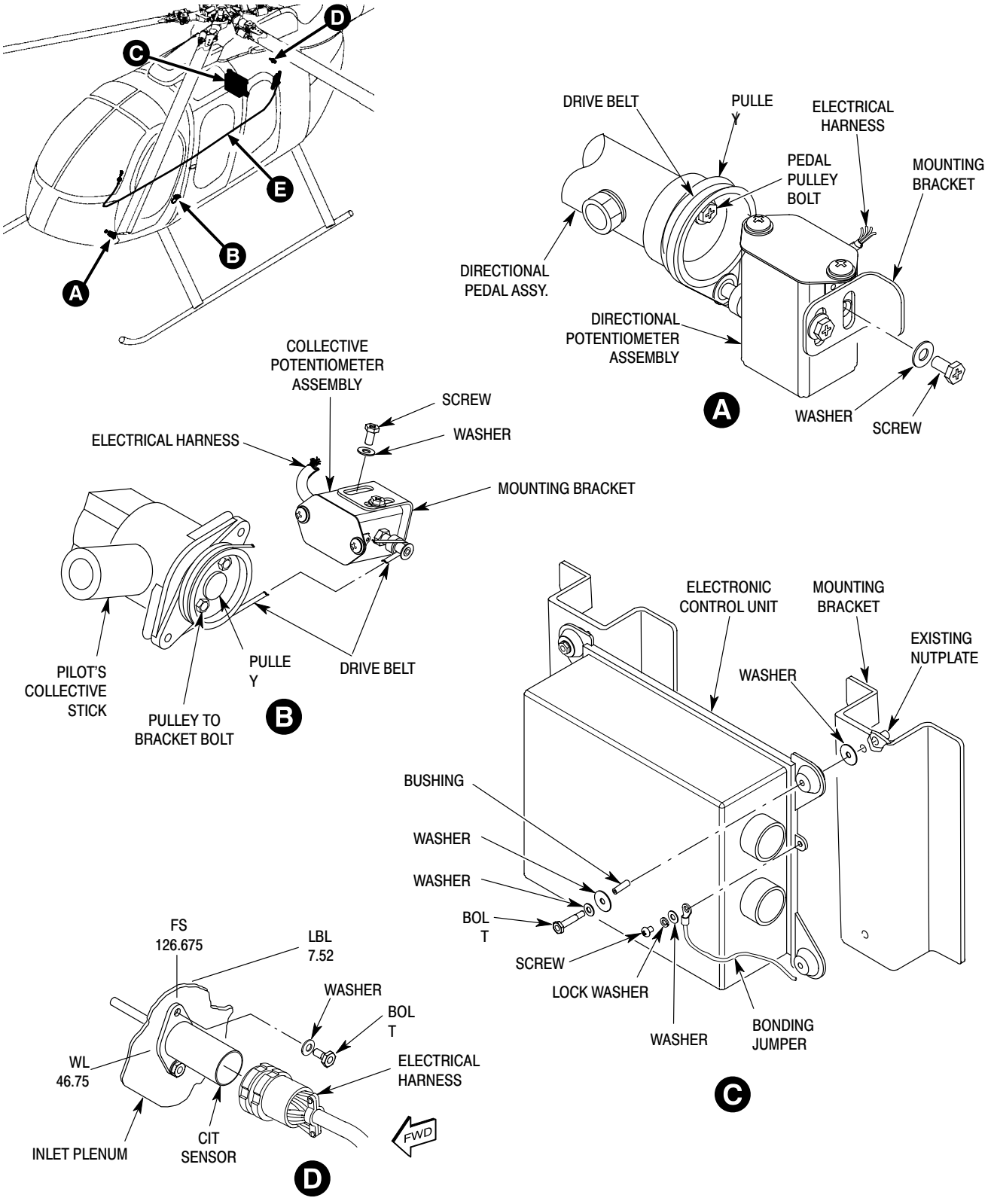

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Figure 202. Engine Controls Installation (Sheet 1 of 2)

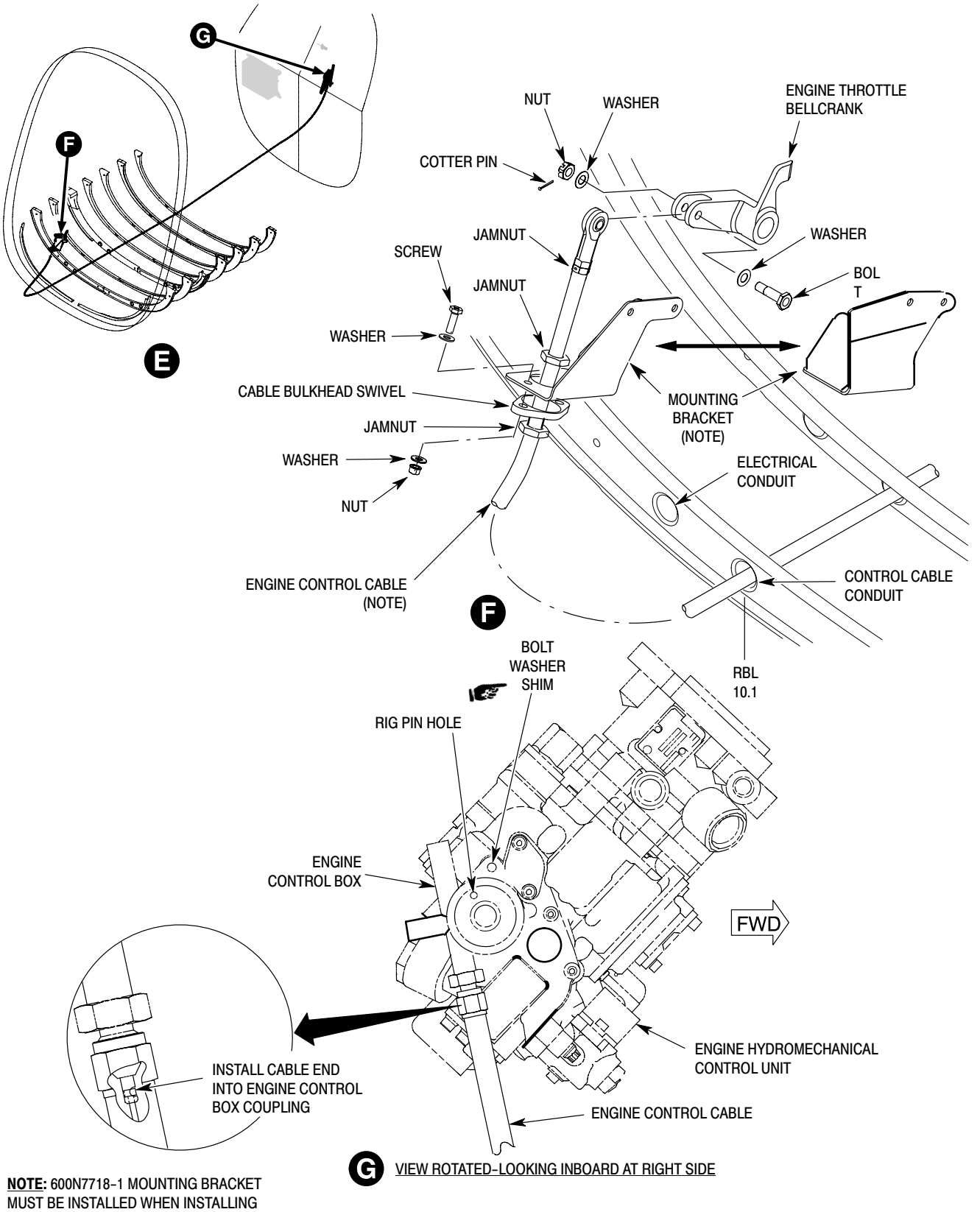

Figure 202. Engine Controls Installation (Sheet 2 of 2)

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).

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.

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.

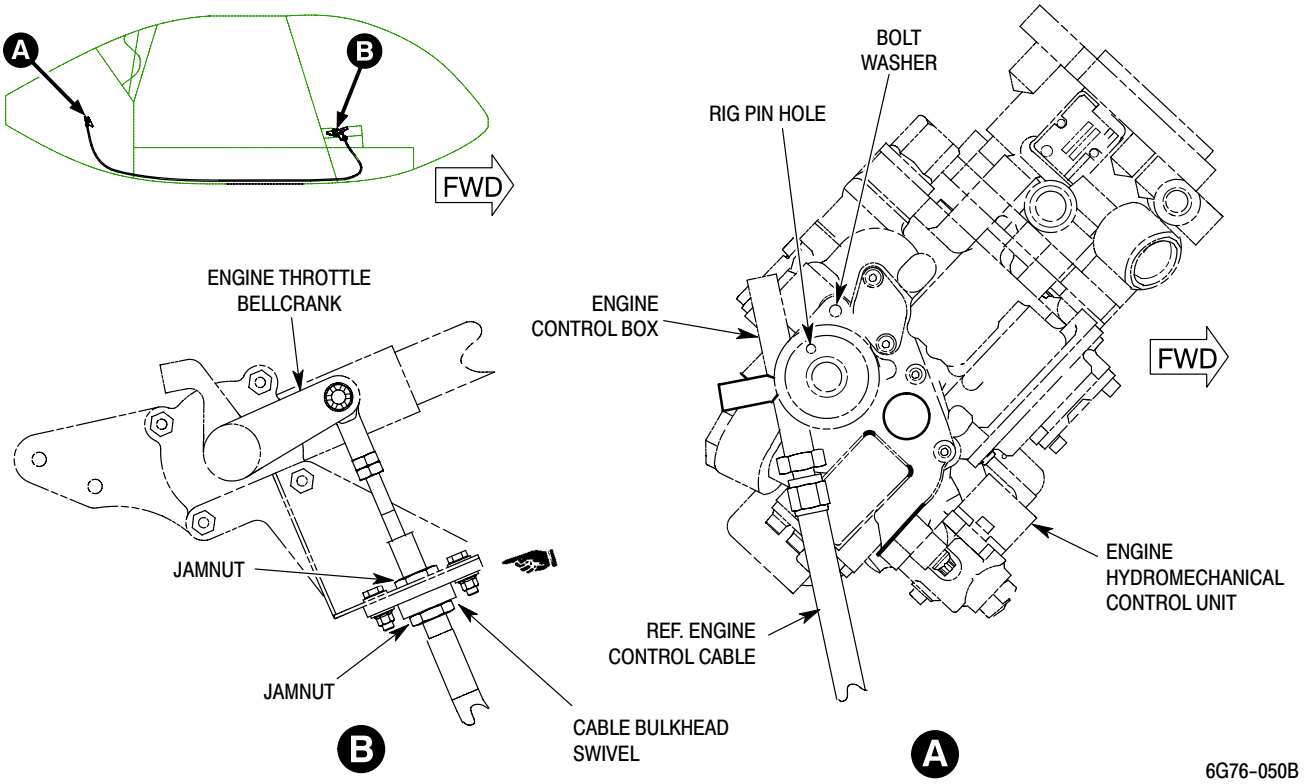

Figure 203. Engine Control Cable Rigging

(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.

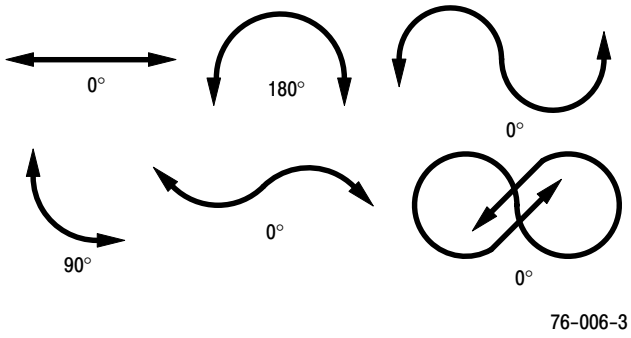

Figure 204. Effective Bend Angle

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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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

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

Item	Nomenclature
CM423	Sealant

(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). Inject sealant (CM423) into cavity around spring attach points. Allow sealant to cure per manufacturers instructions.

(7). Attach lower spring hook to clip bushing between support link and thin washer (Ref. View D).

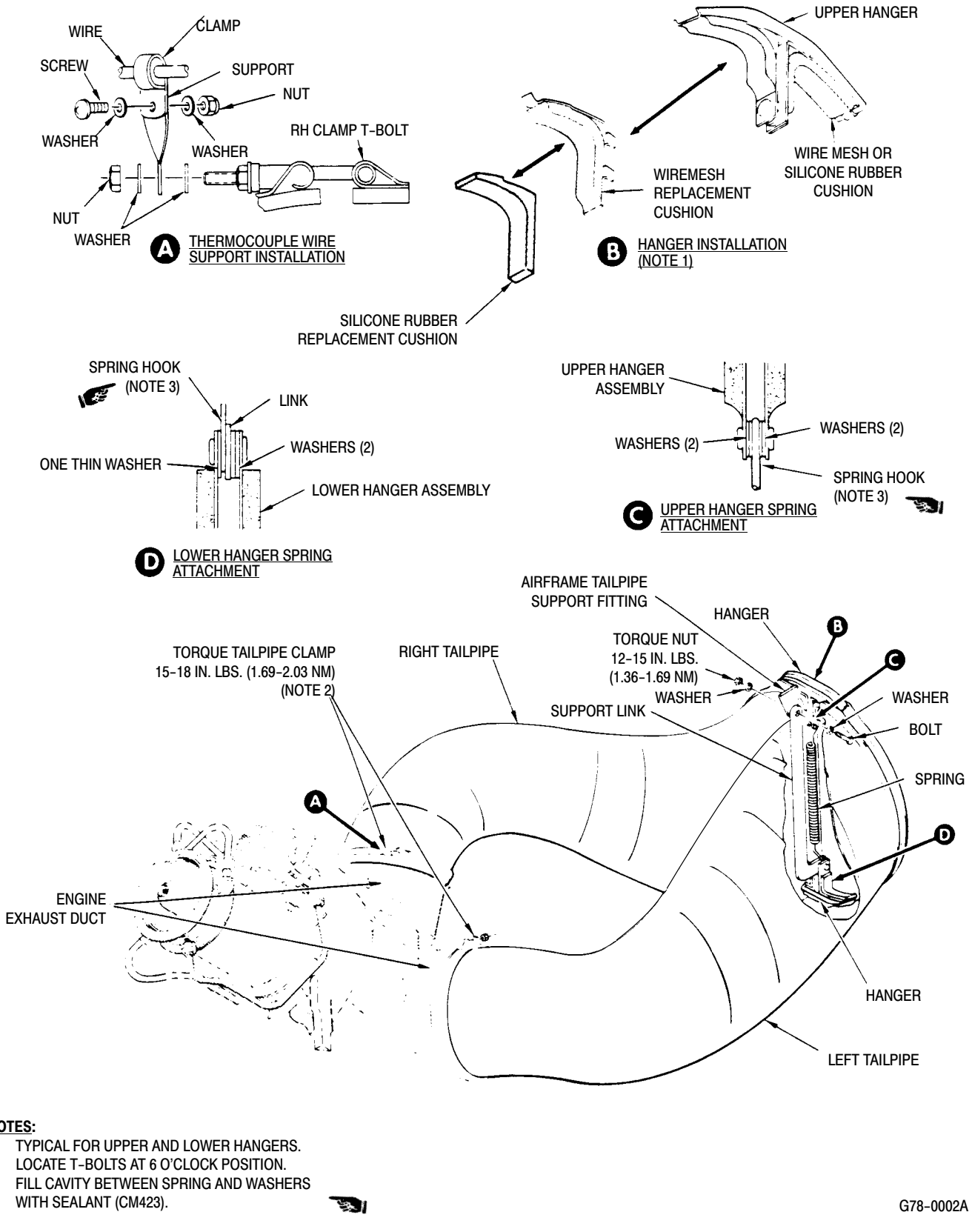
(8). Torque engine/tailpipe clamp nuts to **15 - 18 inch-pounds (1.69 - 2.03 Nm)**.

(9). 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)**.

(10). Continue tapping around clamp and retorquing clamp nut until nut no longer turns when specified torque is applied.

(11). 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.

(12). 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.
3. FILL CAVITY BETWEEN SPRING AND WASHERS WITH SEALANT (CM423).

Figure 201. Exhaust System Installation

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	(3)
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-Weld 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)
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		DX-296	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 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 old KS 5549 new	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	369H9925 369H9925-3	Collective rigging fixture (LH command) (369D/E/FF - 500N) (600N)	Rigging of main rotor collective controls.	
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	369D29929-9 600N9929-5	Longitudinal rigging fixture (LH command) (369D/E/FF - 500N) (600N)	Rigging of main rotor cyclic controls.	
ST505	369A9929-5 369D29929-5	Longitudinal rigging fixture (RH command) (369D/E/FF - 500N) (600N)	Rigging of main rotor cyclic controls.	
ST506	369A9928-9 369A9928-19	Lateral rigging fixture (LH command) (369D/E/FF - 500N) (600N)	Rigging of main rotor cyclic controls.	
ST507	369A9928-5	Lateral rigging fixture (RH command)	Rigging of main rotor cyclic controls.	
ST508	369D29936 369A7300-ATP-1	Collective bungee installation tool (369D/E/FF - 500N) (600N)	Compress collective bungee.	
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-Torque		
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 old FRDH101 new	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