LETTER NO. HL-49
DATE 4 Feb 1977
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HUGHES SERVICE INFORMATION LETTER

TO—All owners and operators of Hughes Helicopters

SUBJECT: POWER TURBINE (N2) RUB OR LOCKUP IN 250-C20 ENGINE

MODELS AFFECTED: All Hughes 500 Model 369H Series Helicopters

Reference

Detroit Diesel Allison Commercial Service Letter 250-C20/C20B No. CSL-1037, dated 12 March 1975
Detroit Diesel Allison Commercial Service Letter 250-C20/C-20B No. CSL-1056, dated 8 November 1976

In most cases, the cause for N2 rub or seizure is carbon buildup on the rotating labyrinth seal of the power turbine rotor. When this problem is experienced, owners and operators should refer to the above referenced DDA Commercial Service Letters reprinted as part of this Hughes Service Information Letter. As stated in CSL-1037, walking the main rotor backwards while the engine is cooling after shutdown will definitely help to eliminate this cause for seizure and will not harm the engine.

In the event binding due to carbon formation cannot be relieved by walking the main rotor backward, field disassembly and cleaning of the power turbine unit may be accomplished, per CSL-1056, and the engine returned to service.

If power turbine rub or lockup occurs, it is recommended that owners and operators refer to both of these DDA service letters to help resolve the problem.

Edward Koch

Edward Koch, Manager
Customer Service Department
Hughes Helicopters

FORM NO. 95788 HTC-AD REV. 11-67

COMMERCIAL SERVICE LETTER

Detroit Diesel Allison Division of General Motors Corporation
Indianapolis, Indiana 46206

March 12, 1975
FAA-DER Approved

SUBJECT: Power Turbine (N_2) Rub

PROBLEM:

1. The helicopter main rotor (NR) does not rotate by the time the gas producer rotor (N_1) has reached 25% during a start.

2. NR cannot be rotated backward.

CAUSE:

Assuming the binding or seizure is not in the helicopter transmission, tail rotor gearbox or associated shafting, there is one major cause for N_2 rub in the engine which is carbon formation.

1. Carbon formation in the labyrinth seal between the small diameter of the power turbine support sump cover and the knives on the rotating seal attached to the aft side of the third-stage turbine wheel. During operation, the knives clear their path in the carbon. At rest after cooldown, the axial movement of the knives into the carbon causes seizure.

A second relatively infrequent cause for N_2 rub in the engine is metal-to-metal contact.

1. Metal-to-metal contact can occur at either of two locations on the third-stage turbine wheel.

   a. The OD knives against the fourth-stage turbine nozzle shroud.

   b. The knives on the forward face of the third-stage wheel and the interstage seal on the ID of the fourth-stage turbine nozzle.

   Both of these metal-to-metal places of interference experience very minor contact as proven on disassembly of the turbine. Disassembly of many turbines at DDA shows few of them have made contact. When contact is made, the wear is .001-.002 inch.

DDA now believes that carbon formation in the labyrinth seal is the cause for N_2 rub in the majority of cases encountered.

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CORRECTIVE ACTION:
(Maintenance)

1. DDA recommends and some operators report success with a procedure to "wear in" the knives. This procedure entails walking the main rotor backwards while the engine is cooling after a shutdown. During the cooldown period, the relatively thin sections of the fourth-stage turbine nozzle at the third-stage wheel shroud and interstage seal cool rather quickly. The third-stage turbine wheel being heavier, cools more slowly. It is the differential cooling that causes seizure. When the temperature of the internal parts has stabilized, this type of rub disappears.

   Walking the main rotor backwards will definitely help to eliminate this cause for seizure and will not harm the engine.

2. Binding due to carbon formation may or may not be helped by walking the main rotor backwards. DDA recommends that it be tried. If the engine begins to "chatter" during this procedure, the action should be stopped until the next convenient shutdown when the main rotor can be walked backwards again until improvement is noted.

3. The best action an operator can take to combat the carbon formation problem is to use MIL-L-7808G oil or MIL-L-23699 oil as listed in the latest revision of 250-C20 CSL-1002.

4. Operators can also help the situation by strictly following the two minute dwell at idle prior to shutdown per the Operation and Maintenance Manual, Publication No. 10W2.

5. If binding persists, the operator should still keep the turbine in service provided N_2 will rotate after the second or third start attempt. The heat generated by a start attempt almost always frees the binding condition. Some operators have reported that the problem eventually clears itself.

L. O. Davidson
Service Manager
Aircraft Engines

RNB/bsc

COMMERCIAL SERVICE LETTER

Detroit Diesel Allison Division of General Motors Corporation
Indianapolis, Indiana 46206

FAA-DER Approved

SUBJECT: Field Cleaning Procedure Relative to Carbon Caused Turbine N_2 Lockup All Series I and II Model 250 Engines

November 8, 1976

There have been instances wherein N_2 Turbine lockup has been the result of carbon buildup on the Rotating Labyrinth Seal of the Power Turbine Rotor. As a result of this condition, several engines have reportedly been removed from service.

The intent of this Commercial Service Letter is to provide a procedure by which the operator, if he chooses, may disassemble the Turbine Unit and clean the affected area shown in Figure 1 as required.

Procedure:

1. Remove the Turbine Section from the Gearbox as outlined in the applicable Operations and Maintenance Manual.

2. Remove the No. 6 and 7 External Oil Sump (Ref. Figure 1), and the No. 8 Bearing Scavenge Oil fitting and discard the metallic crush type seal rings.

3. Remove the two nuts and bolts and separate the firewall from the Turbine assembly.

4. Remove the retaining rings which lock the Air Discharge Tubes in the Outer Combustion Case and remove the tubes.

5. Remove the twenty-four (24) split line bolts between the Exhaust Collector Support and the Power Turbine Support, (Ref. Figure 1).

6. Separate the Power Turbine Support from the Exhaust Collector, being careful the Third Stage Turbine Nozzle does not come out of the Power Turbine Support.

7. Using a stiff wire brush or equivalent and No. 26 City Service Carbon Solvent or equivalent, clean the carbon and/or varnish deposits from the Rotating Labyrinth Seal at the rear face of the Third Stage Turbine Wheel, (Ref. Figure 2).

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CAUTION: Do not use carbon solvent on the stationary member seal surface.

8. After the cleaning has been accomplished, assemble the Turbine using the reversal of the procedure outlined above.

CAUTION: Use care in assembling #6 Bearing inner race to #6 Bearing (Ref. Figure 1).

9. Important Reassembly Torques:

24 Splitline bolts, 20-30 in. lbs.

#8 Bearing Scavenge Oil Fitting, 40 in. lbs.

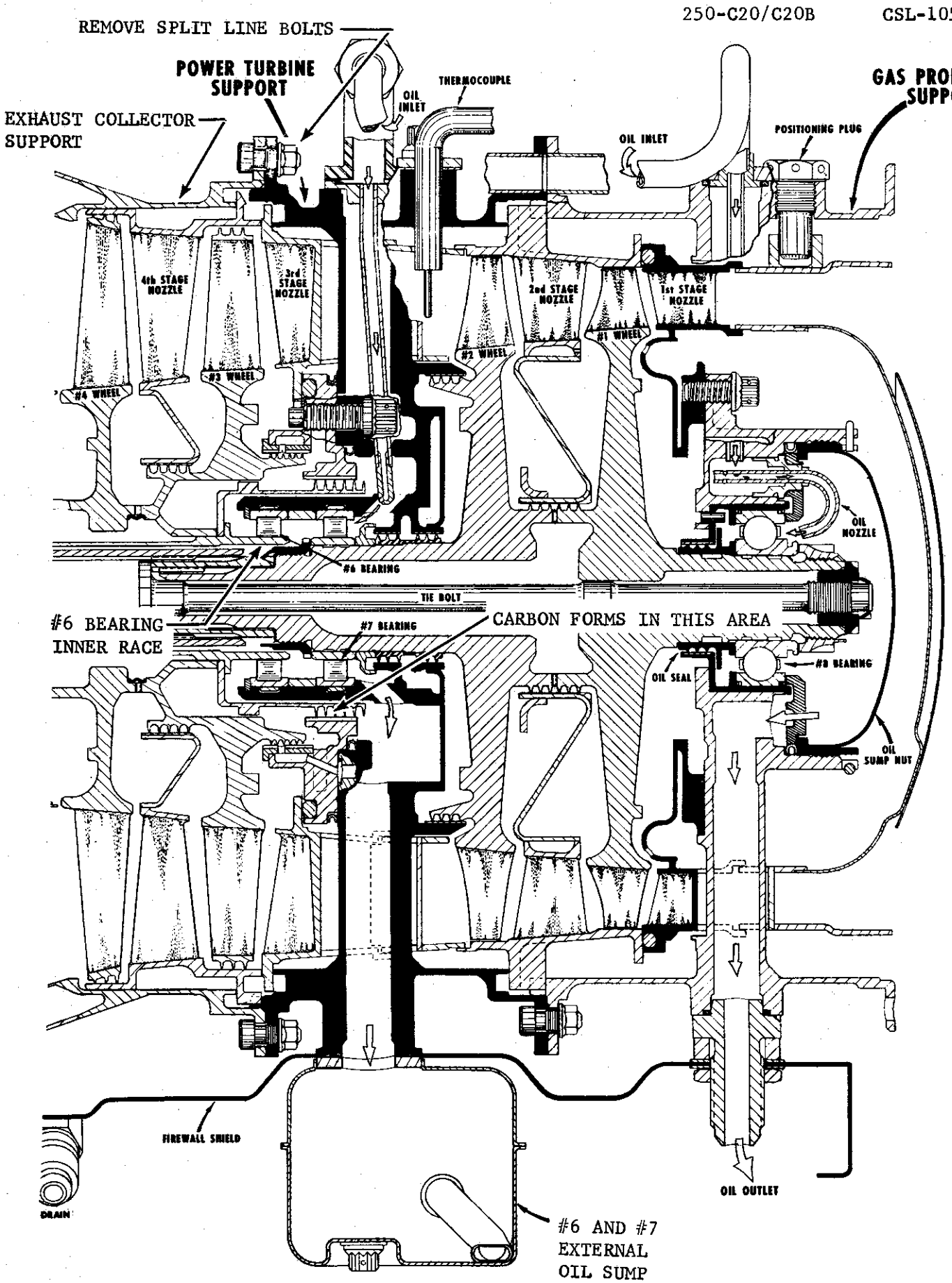
#6 and 7 External Oil Sump Bolts, 35-45 in. lbs.

Nut, Firewall Shield to #8 Sump Fitting, 55-80 in. lbs.

Apply anti-seize to the threads on all of the above items.

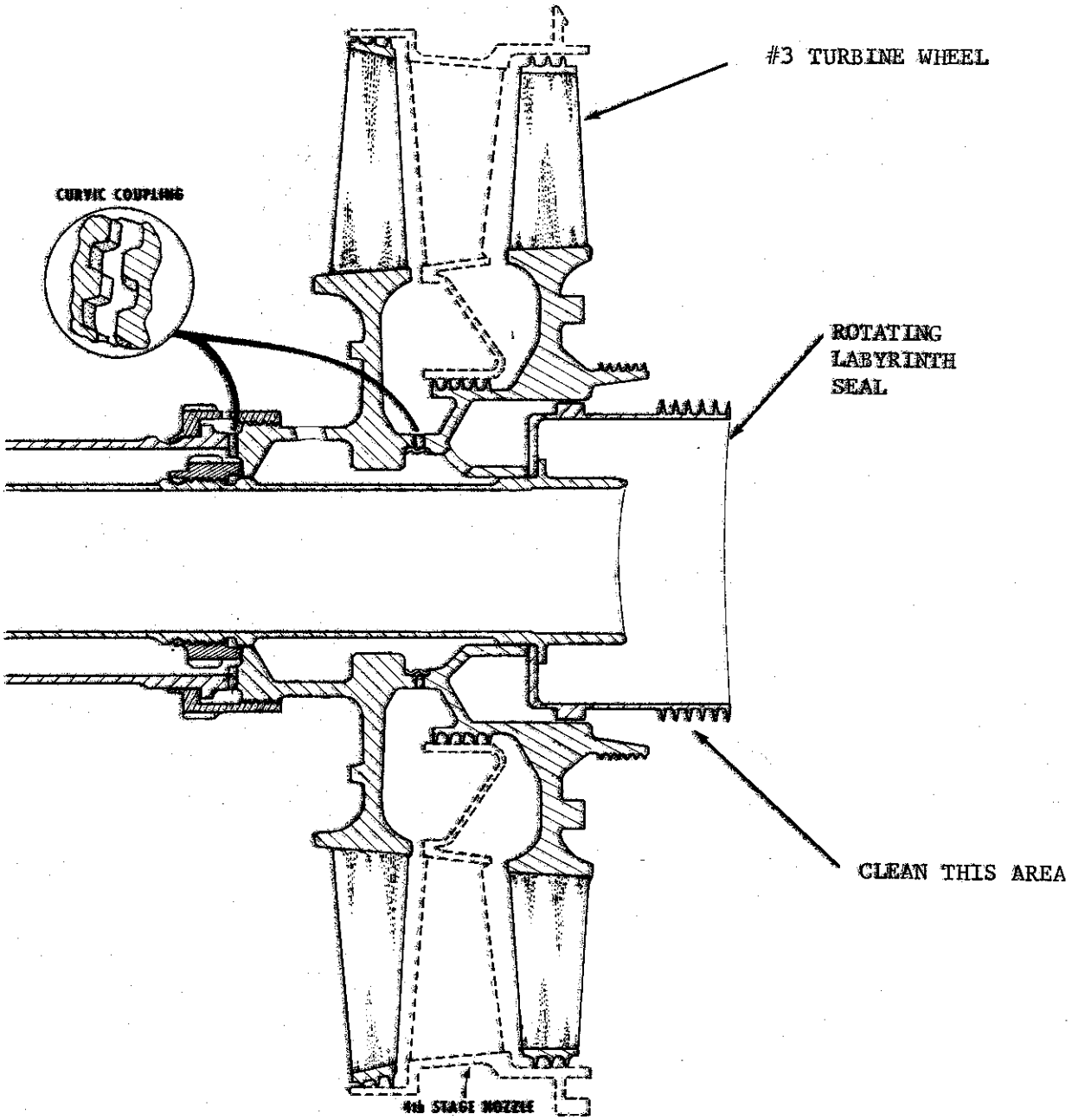
L. O. Davidson
Service Manager
Gas Turbine Engines

RFR/jt



TYPICAL TURBINE
FIGURE 1

250-C18	CSL-86
250-B15G TP	CSL-23
250-B17/B17B TP	CSL-1028
250-C20/C20B	CSL-1056



TYPICAL POWER TURBINE ROTOR
FIGURE 2