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ENGINE, TURBOPROP - DESCRIPTION AND OPERATION

1. Description and Operation

The PT6A Series power plant is a lightweight free turbine engine. The engine utilizes two independent turbine sections: one driving the compressor in the gas generator section and the second driving the propeller shaft through a reduction gearbox. The engine is self-sufficient since its gas generator driven oil system provides lubrication for all areas of the engine, pressure for the torquemeter and power for propeller pitch control.

Refer to Figs. 1 and 2 for the main features of a typical engine, Fig. 3 for the engine cross-section and Fig. 4 for engine stations, flanges and bearings.

The inlet air enters the engine through an annular plenum chamber, formed by the compressor inlet case, where it is directed forward to the compressor. The compressor consists of three axial stages combined with a single centrifugal stage, assembled as an integral unit.

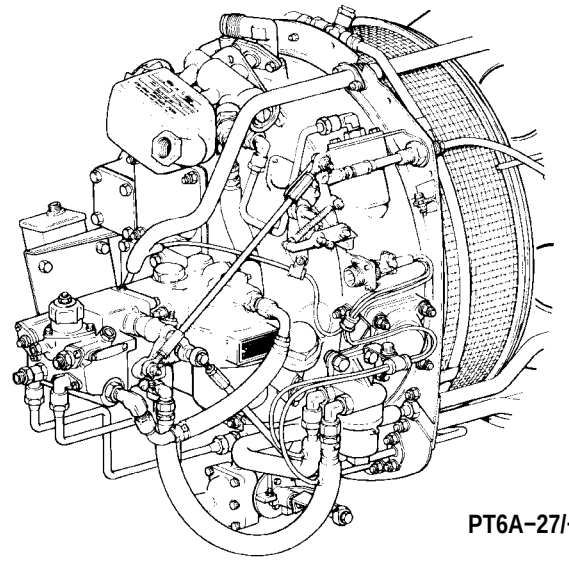
A row of stator vanes, located between each stage of compression, diffuses the air, raises its static pressure and directs it to the next stage of compression. The compressed air passes through diffuser tubes which turn the air through ninety degrees in direction and converts velocity to static pressure. The diffused air then passes through straightening vanes to the annulus surrounding the combustion chamber liner and the gas generator case.

The combustion chamber liner consists of an annular weldment having perforations of various sizes that allow entry of compressor delivery air. The flow of air changes direction 180 degrees as it enters and mixes with fuel. The fuel/air mixture is ignited and the resultant expanding gases are directed to the turbines. The location of the liner eliminates the need for a long shaft between the compressor and the compressor turbine, thus reducing the overall length and weight of the engine.

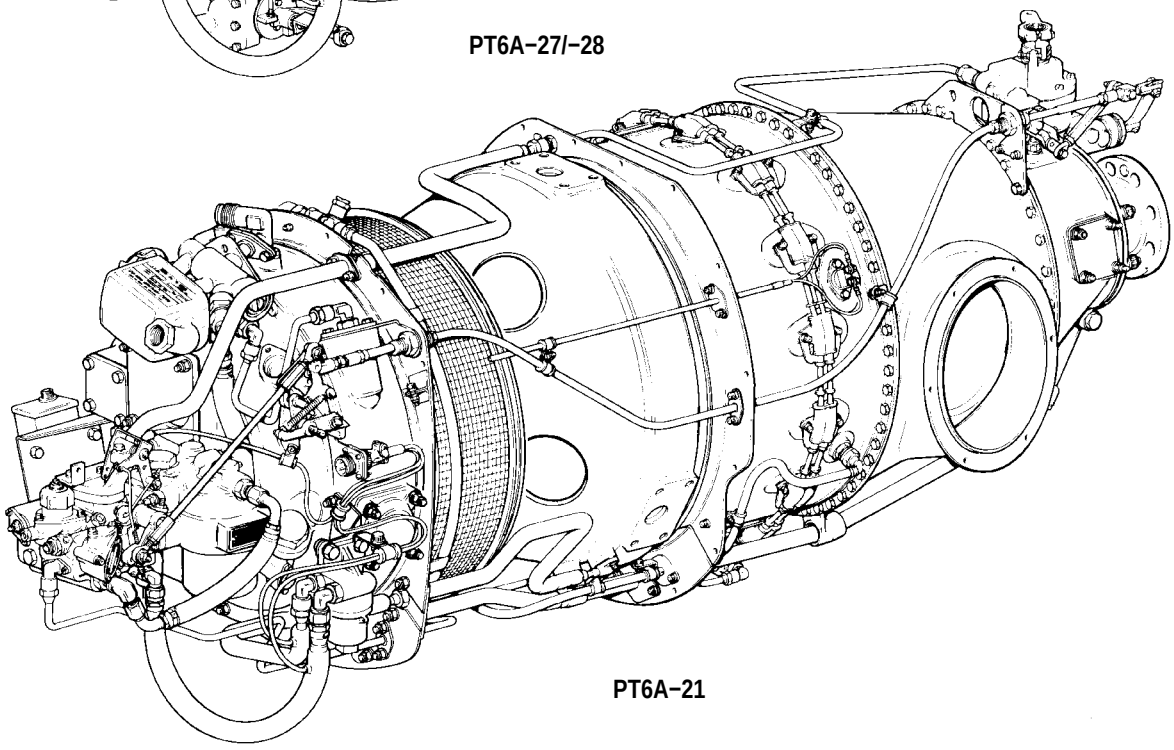
Fuel is injected into the combustion chamber liner through 14 simplex nozzles arranged for ease of starting. Fuel is supplied by a dual manifold consisting of primary and secondary transfer tubes and adapters. The fuel/air mixture is ignited by two spark igniters which protrude into the liner. The resultant gases expand from the liner, reverse direction in the exit duct zone and pass through the compressor turbine inlet guide vanes to the compressor turbine. The guide vanes ensure that the expanding gases impinge on the turbine blades at the correct angle, with minimum loss of energy. The still expanding gases are then directed forward to drive the power turbine.

The compressor and power turbines are located in the approximate center of the engine with their respective shafts extending in opposite directions. This feature provides for simplified installation and inspection procedures. The exhaust gas from the power turbine is directed through an annular exhaust plenum to atmosphere via twin opposed exhaust ports provided in the exhaust duct.

Interturbine temperature (T5) is monitored by a cold junction thermocouple system comprising a bus-bar, probes and harness assembly installed between the compressor and power turbines with the probes projecting into the gas path. A terminal block mounted in the gas generator case provides a connection point to cockpit instrumentation and to a T5 trim thermocouple mounted externally in the air inlet zone.



PT6A−27/−28



PT6A−21

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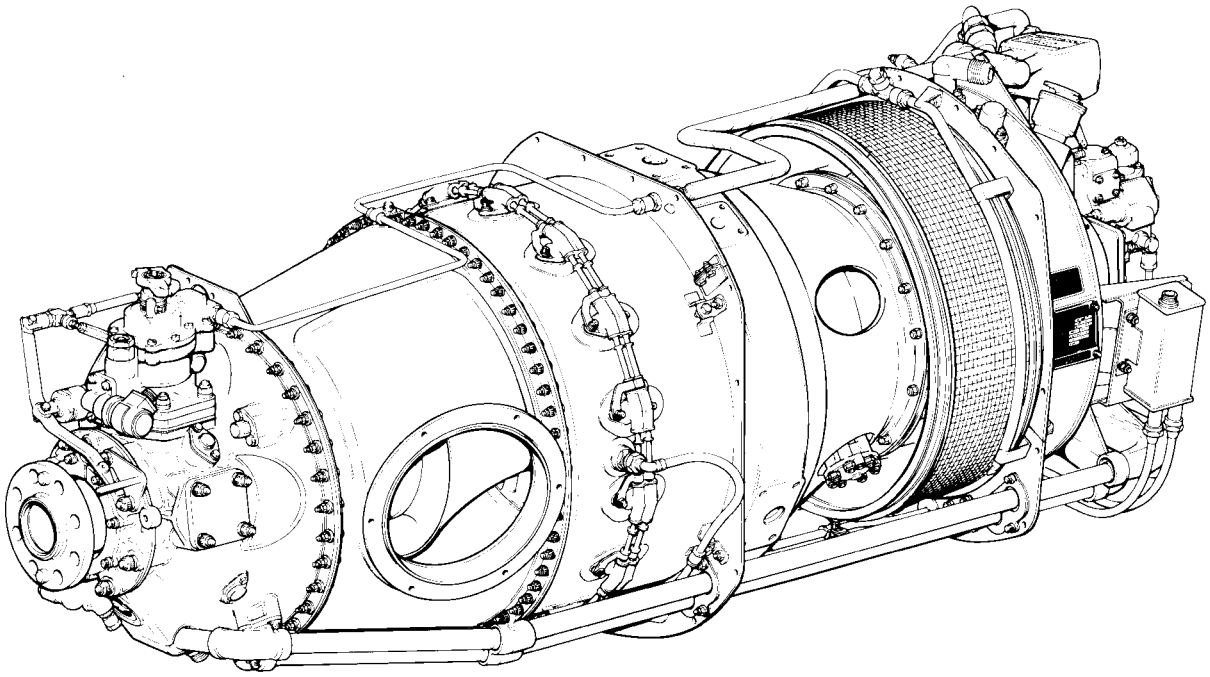
Right Rear View of Engine
Figure 1



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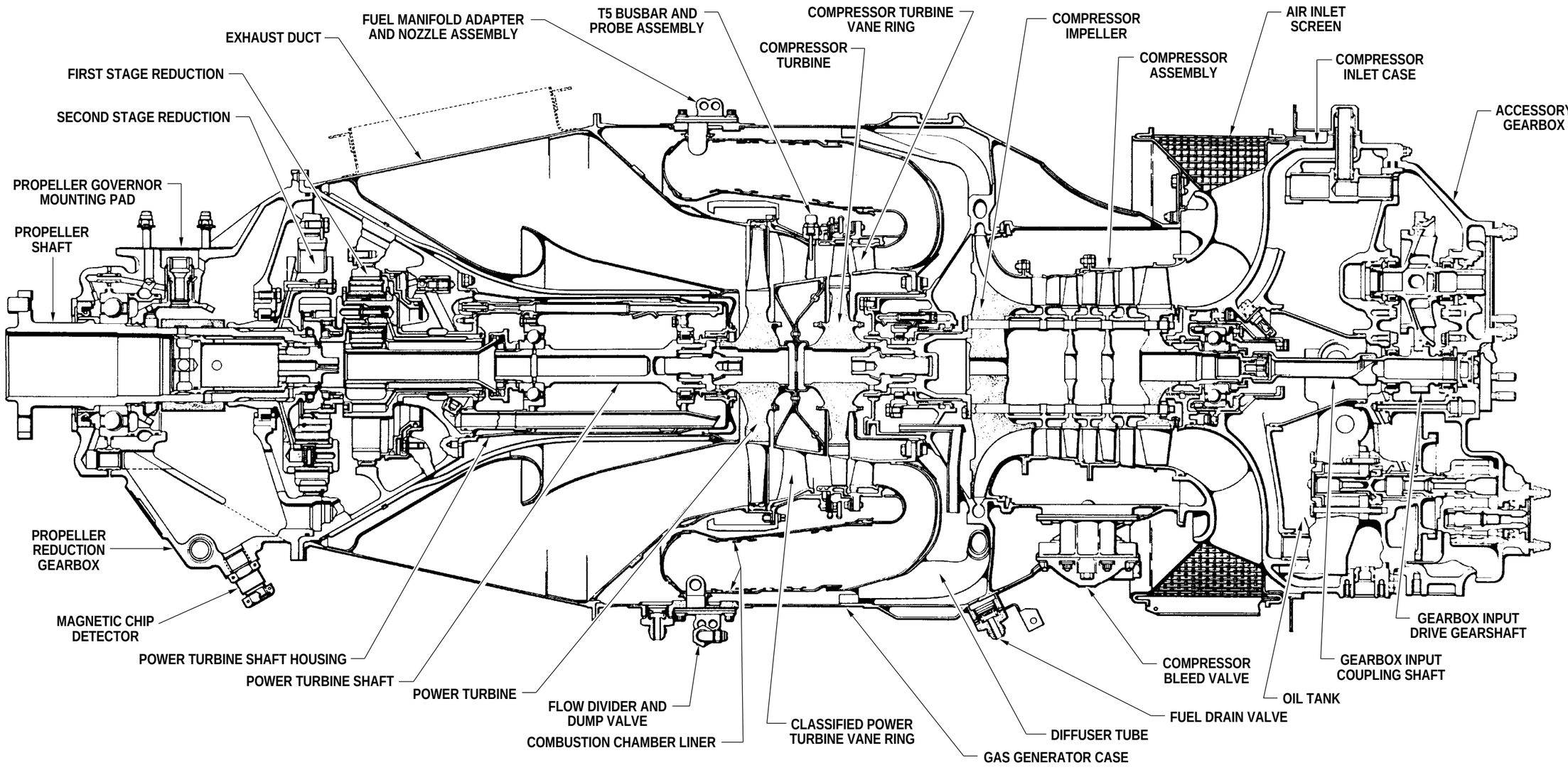
Left Front View of Engine
Figure 2



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Engine Cross Section
Figure 3

All engine-driven accessories, with the exception of the propeller governor, Nf overspeed governor and Nf tachometer-generator are mounted on the accessory gearbox at the rear of the engine. These components are driven by the compressor by means of a coupling shaft which extends the drive through a conical tube in the center section of the oil tank. The rear location of accessories provides for a clean engine and simplifies maintenance procedures.

The engine oil supply is contained in an integral oil tank which forms the rear section of the compressor inlet case. The tank has a total capacity of 2.3 U.S. gallons and is provided with a dipstick.

Fuel supplied to the engine from an external source is further pressurized by an engine-driven fuel pump and its flow to the fuel manifold is controlled by the fuel control unit (FCU) and a starting flow control unit or a flow divider and dump valve according to engine model requirements.

The power turbine drives a propeller through a two-stage planetary reduction gearbox located at the front of the engine. The gearbox embodies an integral torquemeter device which is instrumented to provide an accurate indication of engine power.

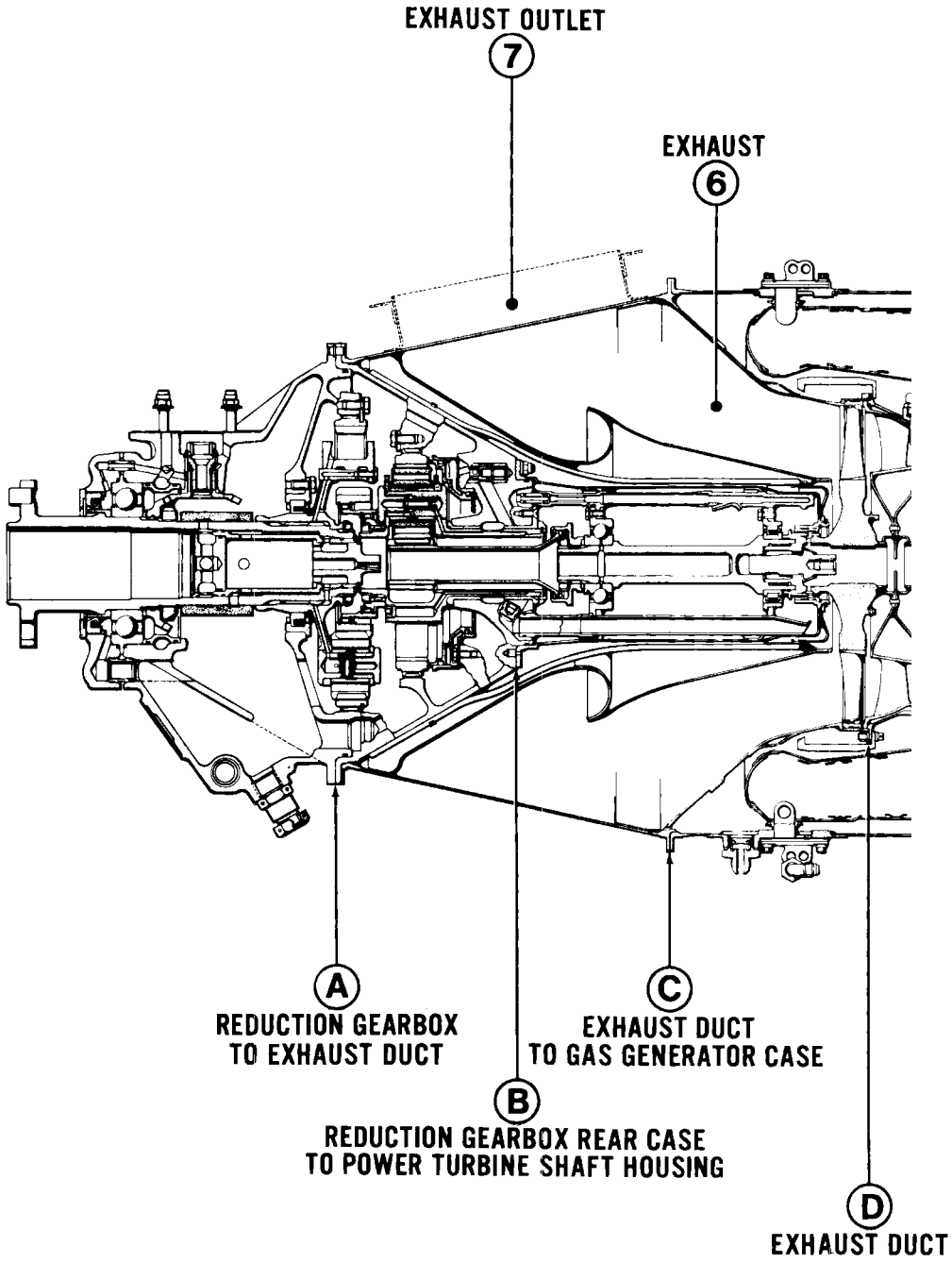
The propeller reversing installation consists of a single-acting hydraulic propeller controlled by a propeller governor, combining the functions of a normal constant speed unit (CSU), a reversing valve and a power turbine (Nf) governor. A mechanical linkage between the propeller governor Beta control valve and the air bleed link enables the FCU and the propeller governor to modify engine power to maintain power turbine speed at a speed slightly less than the selected rpm when operating in the Beta control range.

2. Engine Data

For engine specifications and leading particulars, refer to Tables 1, 3 and 5.

For the front and rear accessory drives-leading particulars, refer to Table 7.

For engine fuel and lubrication system specifications and leading particulars, refer to Table 8.



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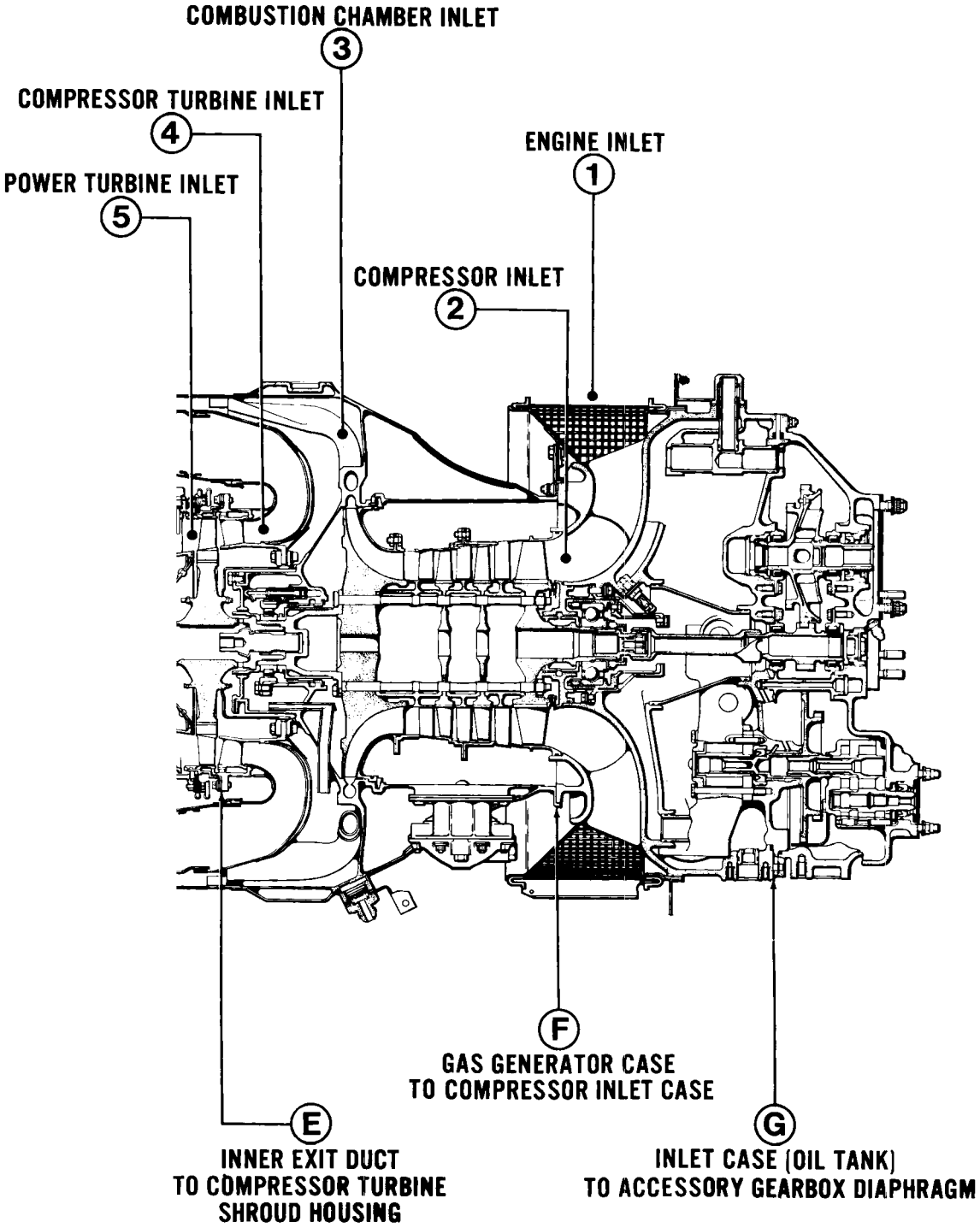
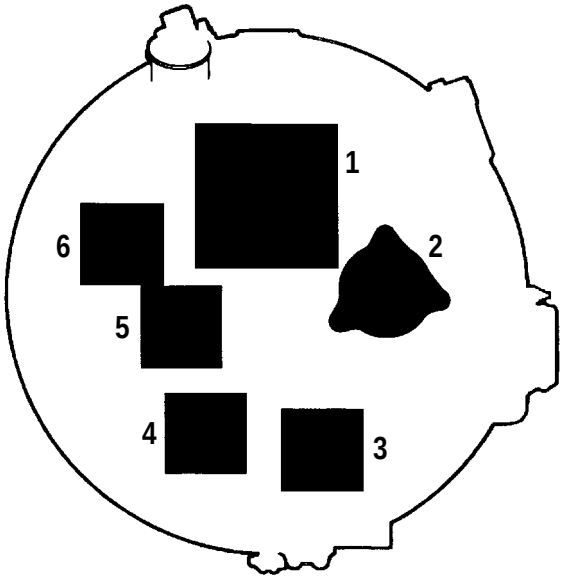
Engine Stations and Flanges (Typical)
Figure 4 (Sheet 1 of 2)

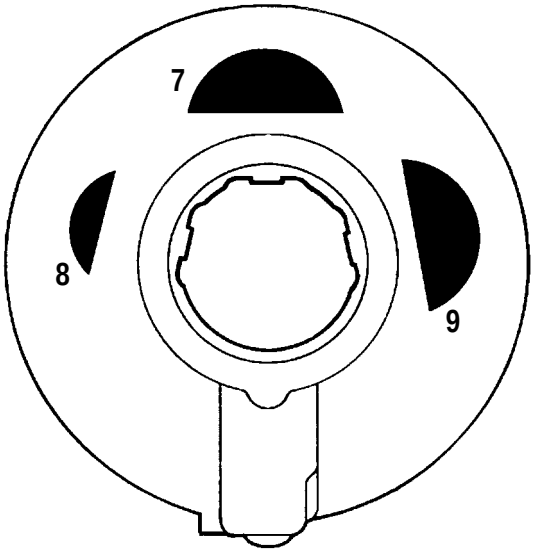


C435D-2

Engine Stations and Flanges (Typical)
Figure 4 (Sheet 2)



AS VIEWED FROM REAR



AS VIEWED FROM FRONT

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Engine Accessory Drives
Figure 5

TABLE 1, PT6A-21 Engine Specifications (Sea Level Static Output - Standard Day)

OPERATING CONDITION	ESHP	SHP	JP-4 FUEL CONSUMPTION (lb/eshp/hr) at 15°C (59°F)	JET THRUST (lb.)
Takeoff	580 (4)	550 (1)	0.630	75
Max. Continuous	580 (4)	550 (1)	0.630	75
Max. Climb (2)	580 (4)	550 (3)	0.630	75
Max. Cruise (2)	580 (4)	550 (3)	0.630	75

(1) Available to 32.8 °C (91 °F) ambient.

(2) No certification ratings.

(3) Available to 47.2 °C (117 °F) ambient.

(4) Ratings are for 2205 propeller rpm.

TABLE 2, PT6A-21 Engine Leading Particulars

LEADING PARTICULARS	
Engine type	Free turbine
Type of combustion chamber	Annular
Compression ratio	7.0:1
Propeller shaft rotation (looking FWD)	Clockwise
Propeller shaft configuration	Flanged
Propeller shaft gear ratio	0.0664:1
Engine diameter (combustion case approx. at room temp.)	19.0 in. (483 mm)
Engine length (approx. at room temp.)	62.0 in. (1575 mm)
Oil consumption, (Max. 10 hour period)	0.2 lb/hr. (0.091 kg/hr)
Dry weight (Incl. standard equip.)	328 lb. (148.8 kg)

TABLE 3, PT6A-27 Engine Specifications (Sea Level Static Output - Standard Day)

OPERATING CONDITION	ESHP	SHP	JP-4 FUEL CONSUMPTION (lb/eshp/hr) at 15°C (59°F)	JET THRUST (lb.)
Takeoff	715 (4)	680 (1)	0.602	87.5

TABLE 3, PT6A-27 Engine Specifications (Sea Level Static Output - Standard Day) (Cont'd)

OPERATING CONDITION	ESHP	SHP	JP-4 FUEL CONSUMPTION (lb/eshp/hr) at 15°C (59°F)	JET THRUST (lb.)
Max. Continuous	715 (4)	680 (1)	0.602	87.5
Max. Climb (2)	652 (4)	620 (3)	0.612	80
Max. Cruise (2)	652 (4)	620 (3)	0.612	80

(1) Available to 21.7 °C (71 °F) ambient.

(2) No certification ratings.

(3) Available to 20.6 °C (69 °F) ambient.

(4) Ratings are for 2205 propeller rpm.

TABLE 4, PT6A-27 Engine Leading Particulars

LEADING PARTICULARS	
Engine type	Free turbine
Type of combustion chamber	Annular
Compression ratio	7.0:1
Propeller shaft rotation (looking FWD)	Clockwise
Propeller shaft configuration	Flanged
Propeller shaft gear ratio	0.0664:1
Engine diameter (combustion case approx. at room temp.)	19.0 in. (483 mm)
Engine length (approx. at room temp.)	62.0 in. (1575 mm)
Oil consumption, (Max. 10 hour period)	0.2 lb/hr. (0.091 kg/hr)
Dry weight (Incl. standard equip.)	328 lb. (148.8 kg)

TABLE 5, PT6A-28 Engine Specifications (Sea Level Static Output - Standard Day)

OPERATING CONDITION	ESHP	SHP	JP-4 FUEL CONSUMPTION (lb/eshp/hr) at 15°C (59°F)	JET THRUST (lb.)
Takeoff	715 (3)	680 (1)	0.602	87.5
Max. Continuous	715 (3)	680 (1)	0.602	87.5

TABLE 5, PT6A-28 Engine Specifications (Sea Level Static Output - Standard Day) (Cont'd)

OPERATING CONDITION	ESHP	SHP	JP-4 FUEL CONSUMPTION (lb/eshp/hr) at 15°C (59°F)	JET THRUST (lb.)
Max. Climb (2)	652 (3)	620 (4)	0.612	80
Max. Cruise (2)	652 (3)	620 (5)	0.612	80

(1) Available to 21.7 °C (71 °F) ambient.

(2) No certification ratings.

(3) Ratings are for 2205 propeller rpm.

(4) Available to 20.6 °C (69 °F) ambient.

(5) Available to 33 °C (91 °F) ambient.

TABLE 6, PT6A-28 Engine Leading Particulars

LEADING PARTICULARS	
Engine type	Free turbine
Type of combustion chamber	Annular
Compression ratio	7.0:1
Propeller shaft rotation (looking FWD)	Clockwise
Propeller shaft configuration	Flanged
Propeller shaft gear ratio	0.0664:1
Engine diameter (combustion case approx. at room temp.)	19.0 in. (483 mm)
Engine length (approx. at room temp.)	62.0 in. (1575 mm)
Oil consumption, (Max. 10 hour period)	0.2 lb/hr. (0.091 kg/hr)
Dry weight (Incl. standard equip.)	328 lb. (148.8 kg)

TABLE 7, Accessory Drives - Leading Particulars

	Drive Pad	Rotation	Ratio	Max. Torque (in.lb.) Continuous	Max. Torque (in.lb.) Static	Max. Speed (RPM)
1	Starter-generator (1)	CW	0.2931:1	170	1600	10,982

TABLE 7, Accessory Drives - Leading Particulars (Cont'd)

	Drive Pad	Rotation	Ratio	Max. Torque (in.lb.) Continuous	Max. Torque (in.lb.) Static	Max. Speed (RPM)
2	Fuel Pump/FCU (1)	CCW	0.1670:1	-	-	6,257
3	Ng Tach Generator (1)	CCW	0.1121:1	7	100	4,200
4	Vacuum Air Pump (Optional) (1)	CCW	0.1019:1	60	800	3,818
5	Optional Accessory Drive (1)	CW	0.3208:1	135	800	12,027
6	Optional Accessory Drive (Hydraulic Pump) (1)	CCW	0.2041:1	150	800	7,643
7	Propeller Governor (2)	CW	0.1273:1 (PT6A-21) 0.1264 (PT6A-27/-28)	50	850	-
8	Nf Tach Generator (2)	CW	0.1273:1 (PT6A-21) 0.1264 (PT6A-27/-28)	7	100	-
9	Propeller OverspeedGovernor (2)	CW	0.1273:1 (PT6A-21) 0.1264 (PT6A-27/-28)	50	850	-

NOTE: 1. Rear Accessory Drives: 100% is 37,468 rpm Ng.

NOTE: 2. Front Accessory Drives: 100% is 33,235 rpm Nf.

TABLE 8, Fuel and Lubrication System Specifications

Nomenclature	Specification
Fuel Specification	Ref. P&WC SB1244 (Ref. NOTE 1)
Oil Specification	Ref. P&WC SB1001 (Ref. NOTE 1)

TABLE 8, Fuel and Lubrication System Specifications (Cont'd)

Nomenclature	Specification
Oil Tank - Total Capacity	2.8 US gallons (2.33 Imp. gallons, 10.6 liters)
Oil Tank - Expansion Space	0.7 US gallons (0.58 Imp. gallons, 2.65 liters)
Oil Tank - Usable Quantity	1.5 US gallons (1.25 Imp. gallons, 5.68 liters)
NOTE: 1. Ref. Service Bulletin List for further details.	

3. Approved Service Bulletins

The following Service Bulletins contain data recommended by Pratt & Whitney Canada and approved by the Canadian Minister of Transport.

SB1001: Approved Listing of Synthetic Oils.

SB1002: Rotor Components - Service Life.

SB1003: DELETED.

SB1803: Operating Time Between Overhauls and Hot Section Inspection Frequency

SB1244: Requirements and Approved Listing of Engine Fuel And Additives.

ENGINE, TURBOPROP - FAULT ISOLATION

1. General

   A. For details on recommended procedures for engine system fault isolation, reference should be made to the Fault Isolation Charts (Figures 101 through 105 and Table 101).

   B. The charts comprise a series of diagnostic tests and rectification sequences which will assist an operator in discovering, isolating and correcting various faults that may arise in the basic engine or any of its related systems during service.

   C. Engine faults can be either obvious or hidden. If hidden faults are not detected, serious and considerable damage may occur to the engine. Therefore, it is essential to have a thorough knowledge of correct turbine gas temperature and other important details of engine operation. Before attempting to locate a fault or difficulty, or to work on an engine which has been malfunctioning during flight, consult flight log and any other available data that could help in diagnosing the fault.

   D. To correctly isolate a fault, check all previous information of engine faults, if any, and work that has been performed on the engine. Check each probable source of fault by use of relevant diagnostic test sequences until defect has been isolated. Systematic checking, essential for thorough fault isolation, will save time and extend engine life.

2. Consumable Materials

   Not Applicable

3. Special Tools

   Not Applicable

4. Fixtures, Equipment and Supplier Tools

   Not Applicable

5. Engine Condition Trend Monitoring System

   A. General

      Gas turbine/turboprop engine maintenance practices frequently include in-flight engine performance monitoring as a means of detecting mechanical deterioration in engine gas paths. A simple system, requiring almost no arithmetic calculation, has been devised for the PT6A engine to aid in early planning of indicated rectifications, and thus reduce the potential costs of primary and secondary damage resulting from fully developed failures, or from the risks of in-flight shutdowns, and flight cancellations.

      The turbine engine characteristic of repeatedly producing its output at, or very close to, charted gas generator parameter values provides the basis for the engine condition trend monitoring system. Thus, under known conditions of pressure altitude (PA) and

indicated outside air temperature (IOAT), the gas generator parameter values of interturbine temperature (ITT), compressor speed (Ng), and fuel flow (Wf), for particular propeller shaft speeds (Np) and torques are predictable within reasonable limits.

New engines operate within a tolerance band, either above or below charted parameter values, and tend to deviate more from these values with time and deterioration of gas path components.

Abrupt changes, or gradual increased rate of change, of the normal deviations from charted parameter values are critical indicators of gas path component conditions. As such, changes are detectable before any drastic failure occurs.

The monitoring system should be introduced when engines are new or newly overhauled. This enables establishment of a performance base line before any deterioration takes place in the engine. For procedure refer to P&WC Publication SIL No. GEN-055 and No. PT6A-122.

6. Fault Isolation

A. Categories

To enable systematic fault isolation, engine faults are categorized into classes. Each class consists of common related engine problems with appropriate diagnostic tests and rectification sequences. The classes of engine fault and probable causes are detailed as follows:

(a) Engine Starting (Ref. Subpara. B.)

(b) Engine Operating (Ref. Subpara. C.)

(c) Engine Performance (Ref. Subpara. D.)

(d) Engine Condition Trend Monitoring Shift (Ref. Subpara. E.)

(e) Engine Lubrication (Ref. Subpara. F.)

(f) Engine Lubrication Oil Contamination (Ref. Subpara. G.)

B. Engine Starting

(1) To diagnose and rectify engine starting problems, refer to Engine Starting Fault Isolation Chart (Ref. Fig. 101).

C. Engine Operating

(1) To diagnose and rectify engine operating problems, refer to Engine Operating Fault Isolation Chart (Ref. Fig. 102).

D. Engine Performance

(1) To diagnose and rectify engine performance problems, refer to Engine Performance Fault Isolation Chart (Ref. Fig. 103).

E. Engine Condition Trend Monitoring Shift

(1) To diagnose and rectify engine condition trend monitoring shift, refer to ECTM Shift Fault Isolation Chart (Ref. Table 101) .

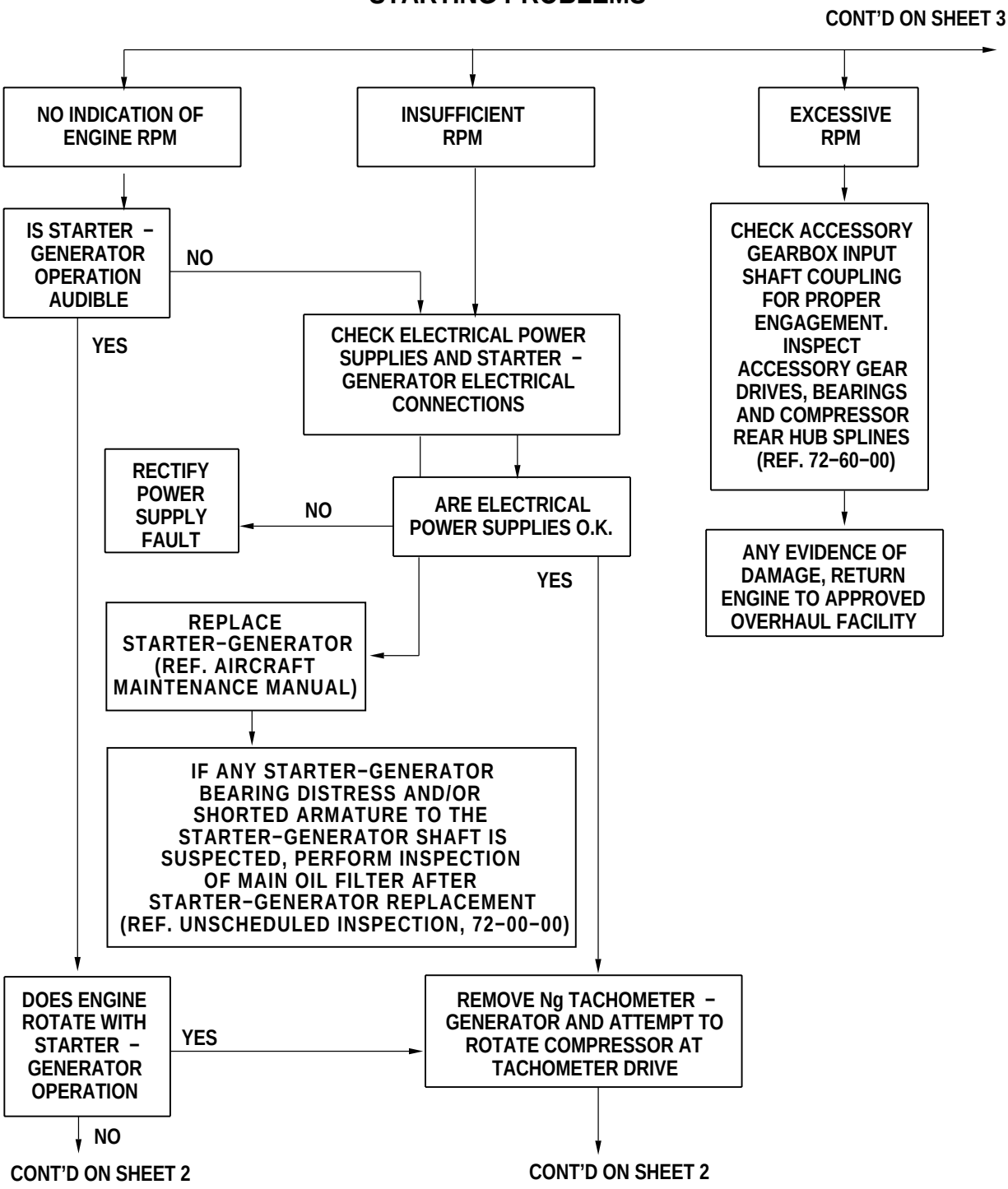
F. Engine Lubrication

(1) To diagnose and rectify engine lubrication problems, refer to Engine Lubrication Fault Isolation Chart (Ref. Fig. 104).

G. Lubricating Oil Contamination

(1) To diagnose and rectify engine lubricating oil contamination, refer to Engine Lubricating Oil Contamination Fault Isolation Chart (Ref. Fig. 105).

STARTING PROBLEMS



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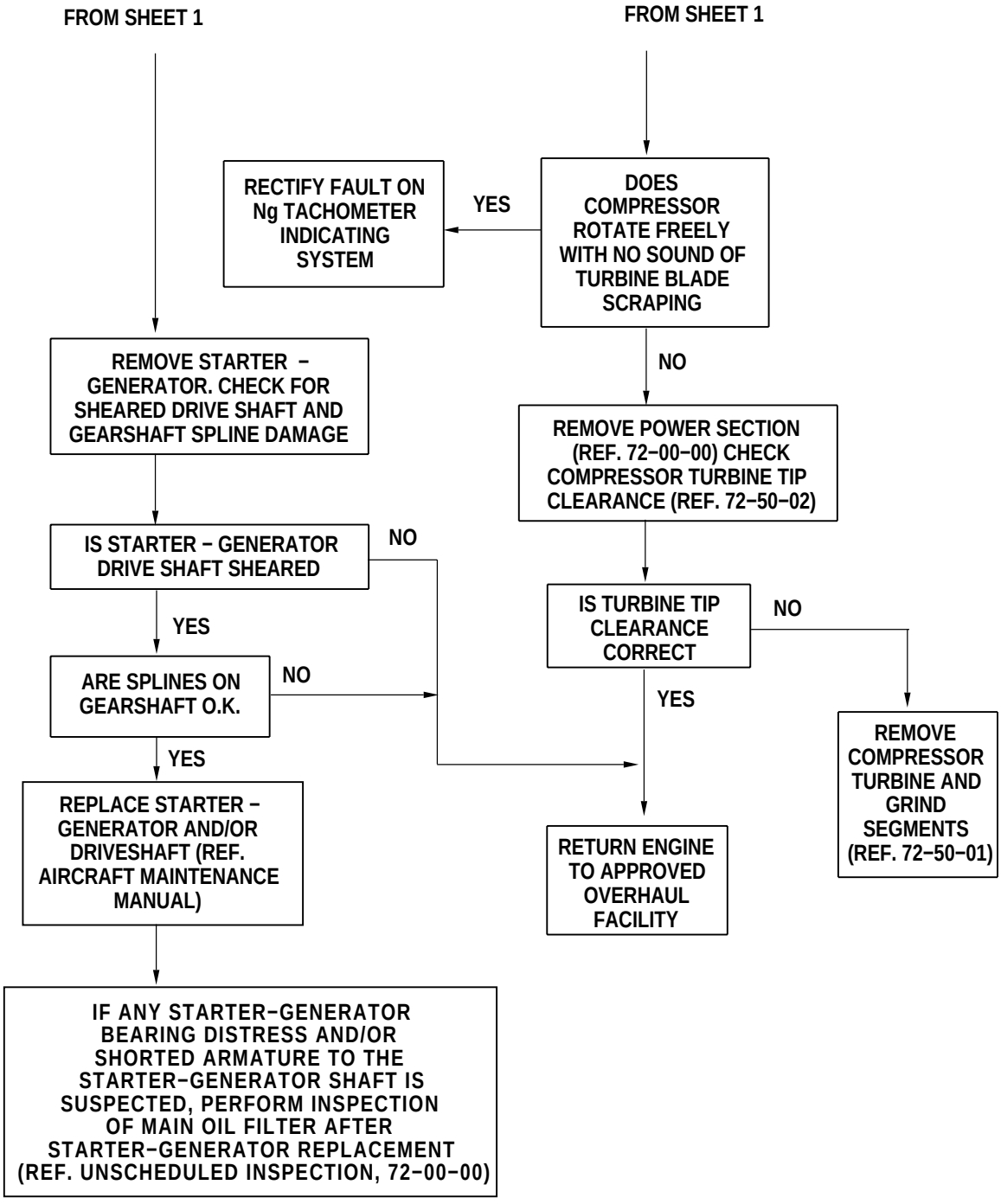
Engine Starting Fault Isolation Chart
Figure 101 (Sheet 1 of 8)

STARTING PROBLEMS



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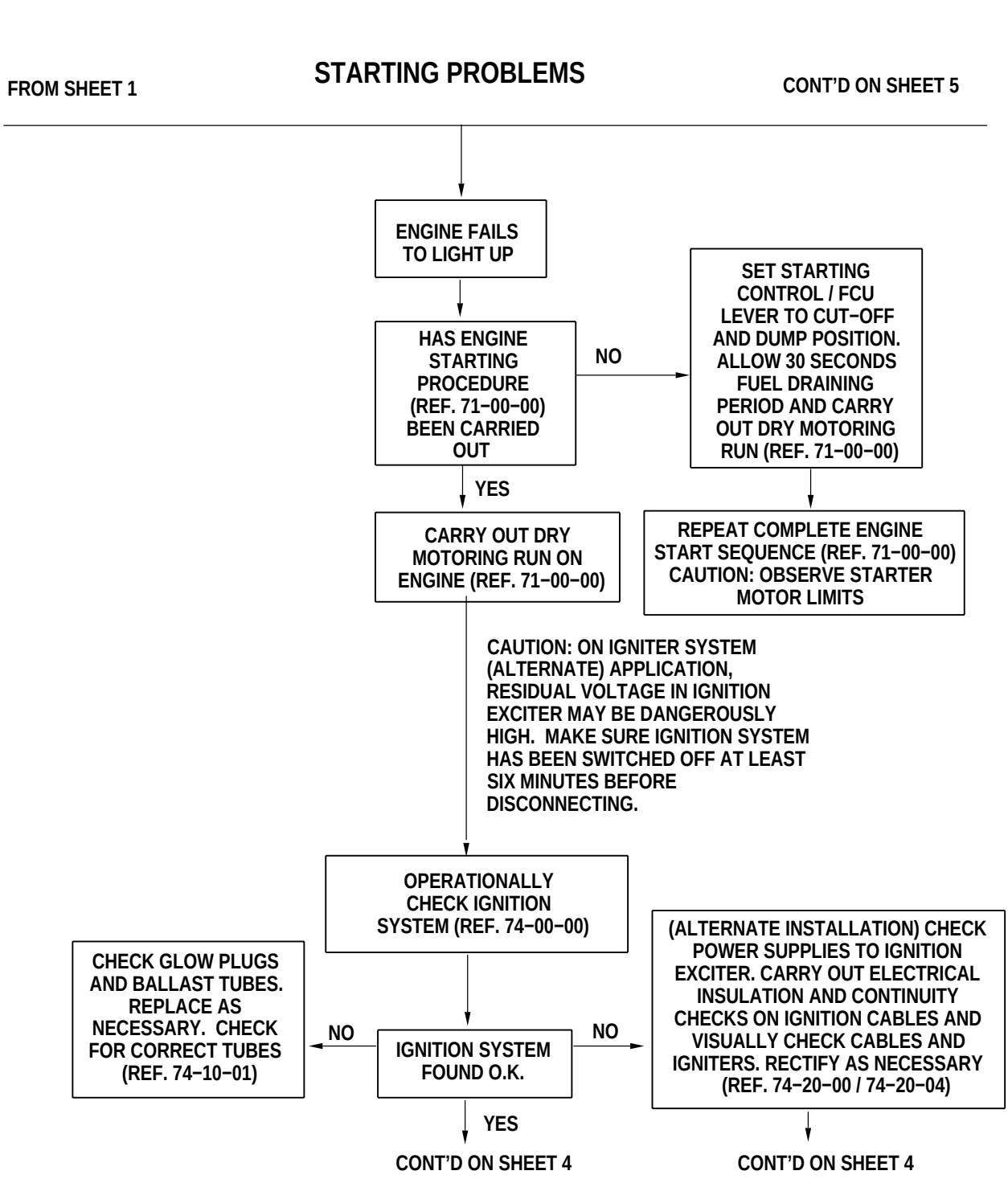
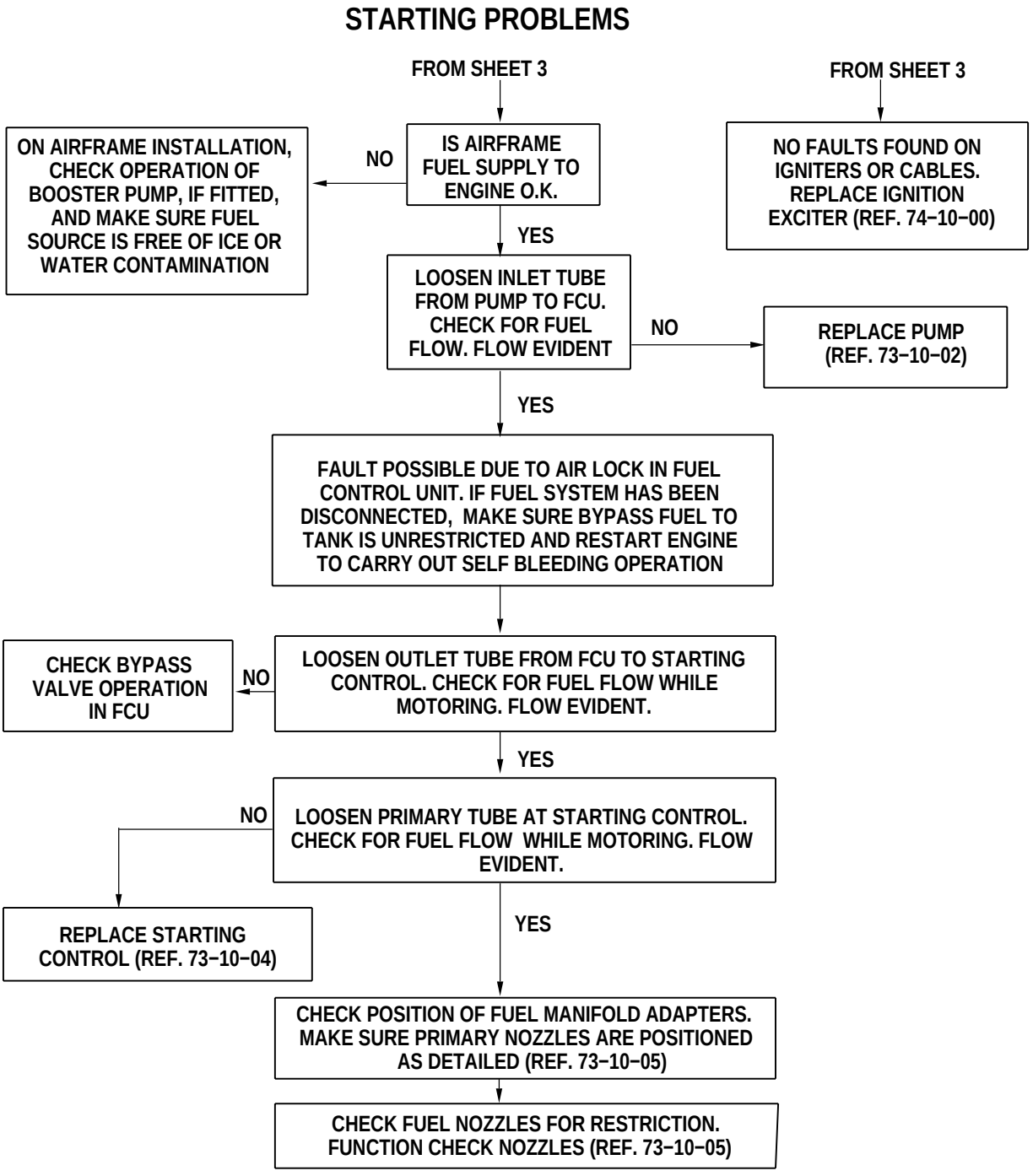
Engine Starting Fault Isolation Chart
Figure 101 (Sheet 2)



Engine Starting Fault Isolation Chart
Figure 101 (Sheet 3)



Engine Starting Fault Isolation Chart
Figure 101 (Sheet 4)

STARTING PROBLEMS

FROM SHEET 3

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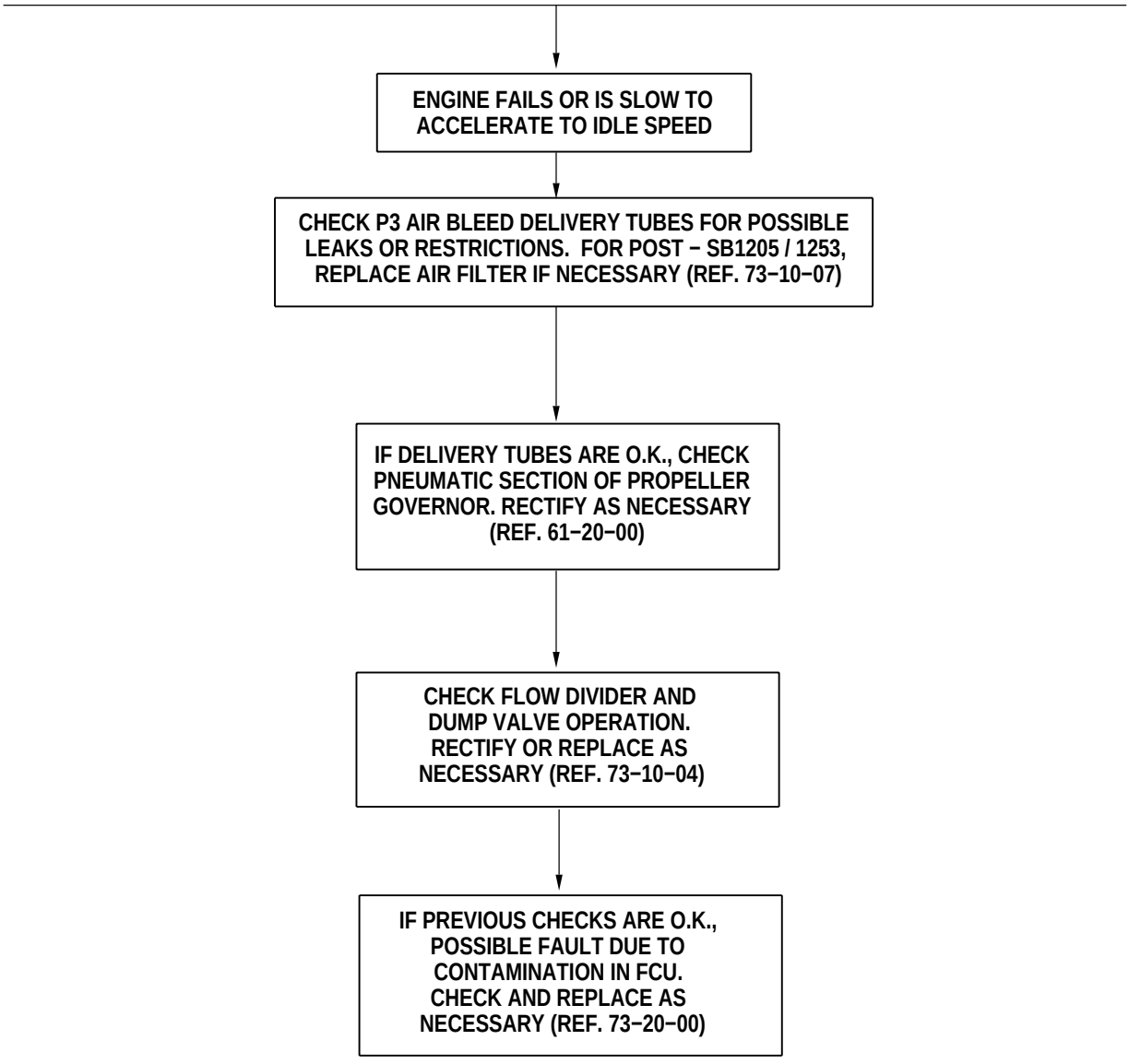

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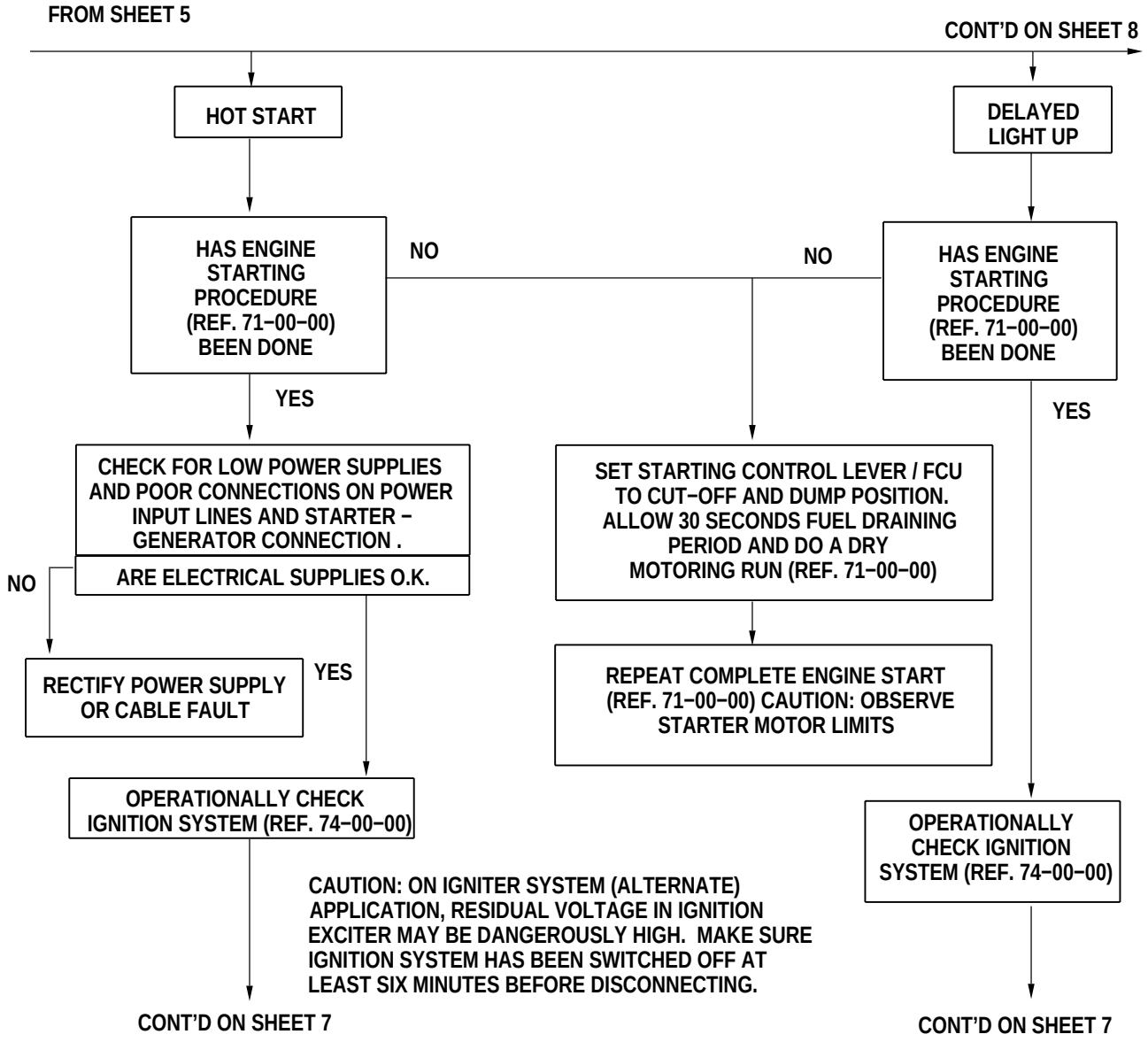
Engine Starting Fault Isolation Chart
Figure 101 (Sheet 5)

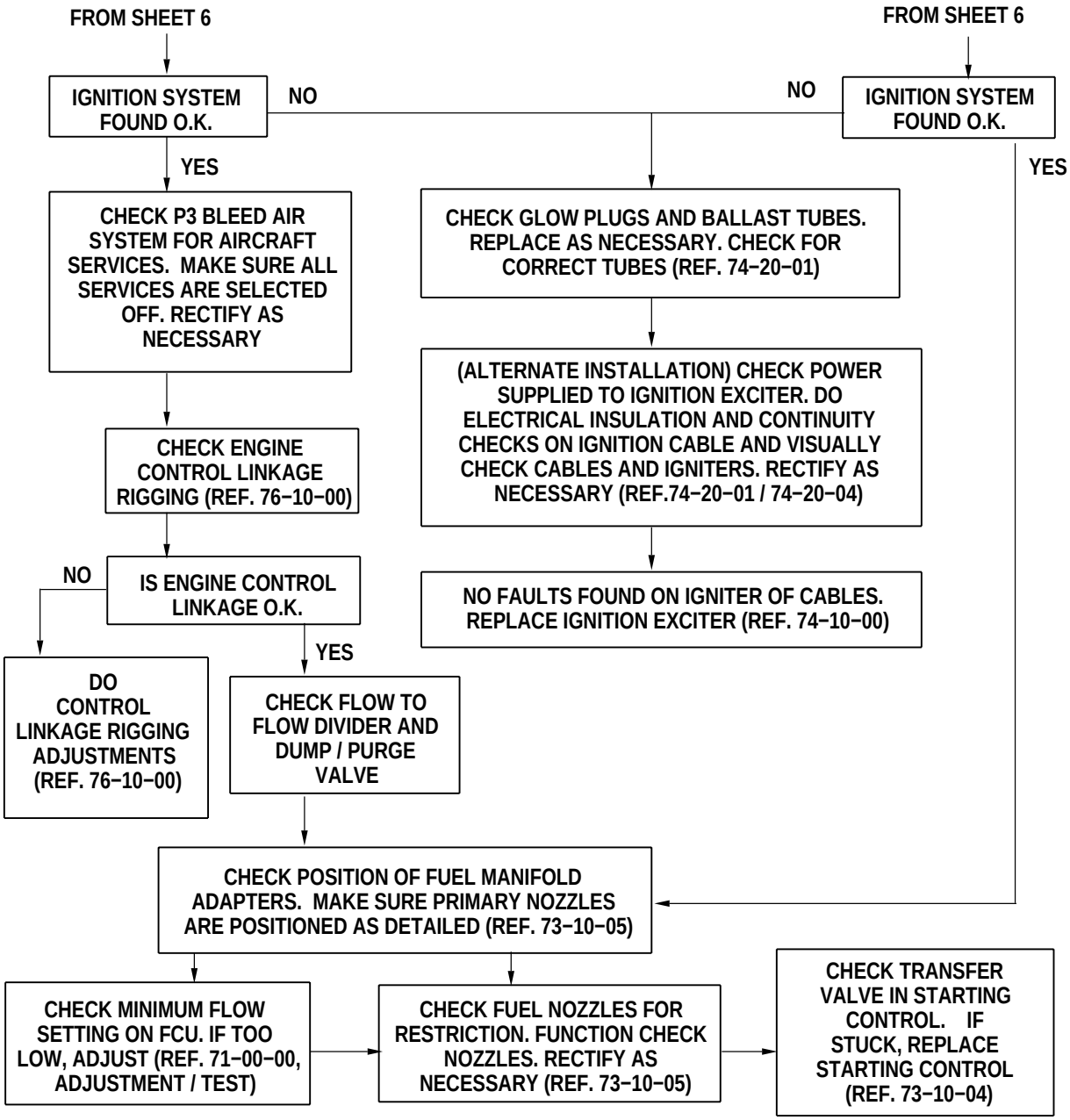
STARTING PROBLEMS



C70753

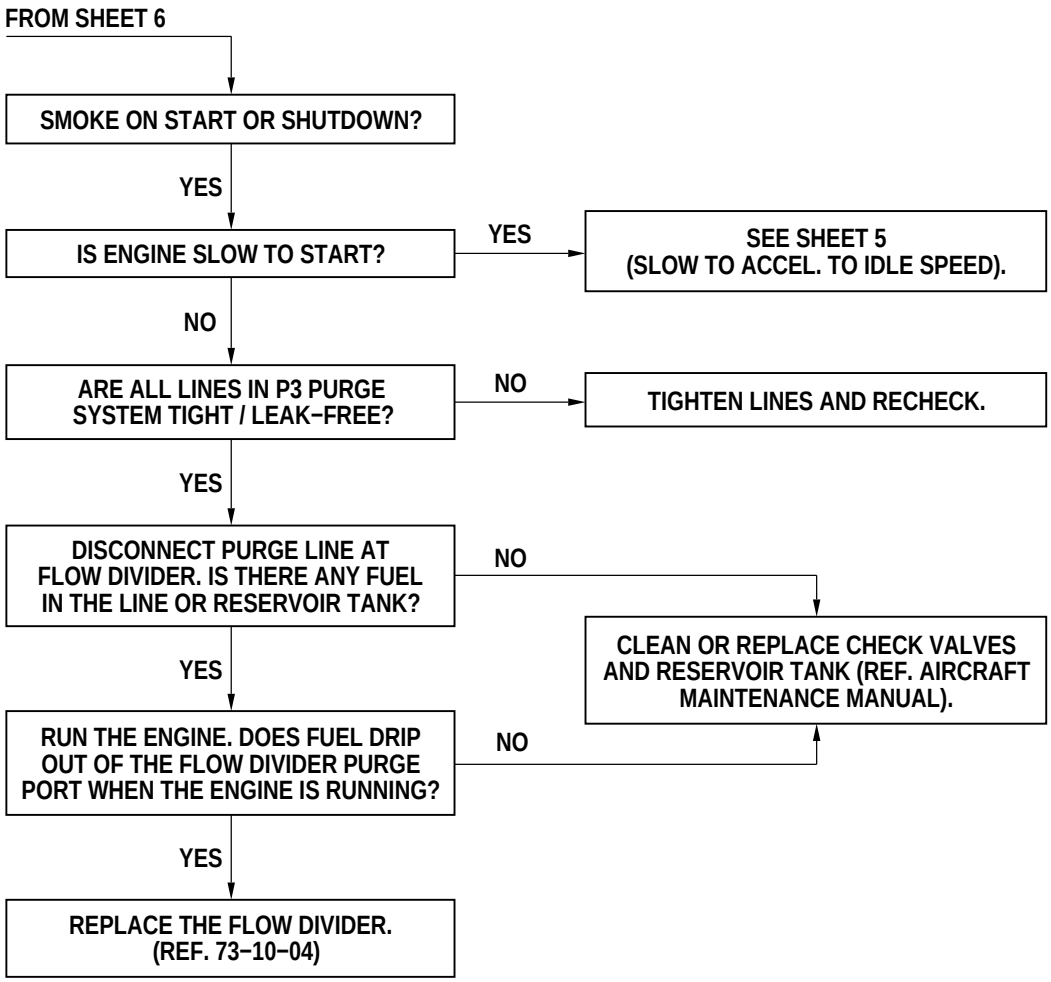
Engine Starting Fault Isolation Chart
Figure 101 (Sheet 6)

STARTING PROBLEMS



C29849A

Engine Starting Fault Isolation Chart
Figure 101 (Sheet 7)



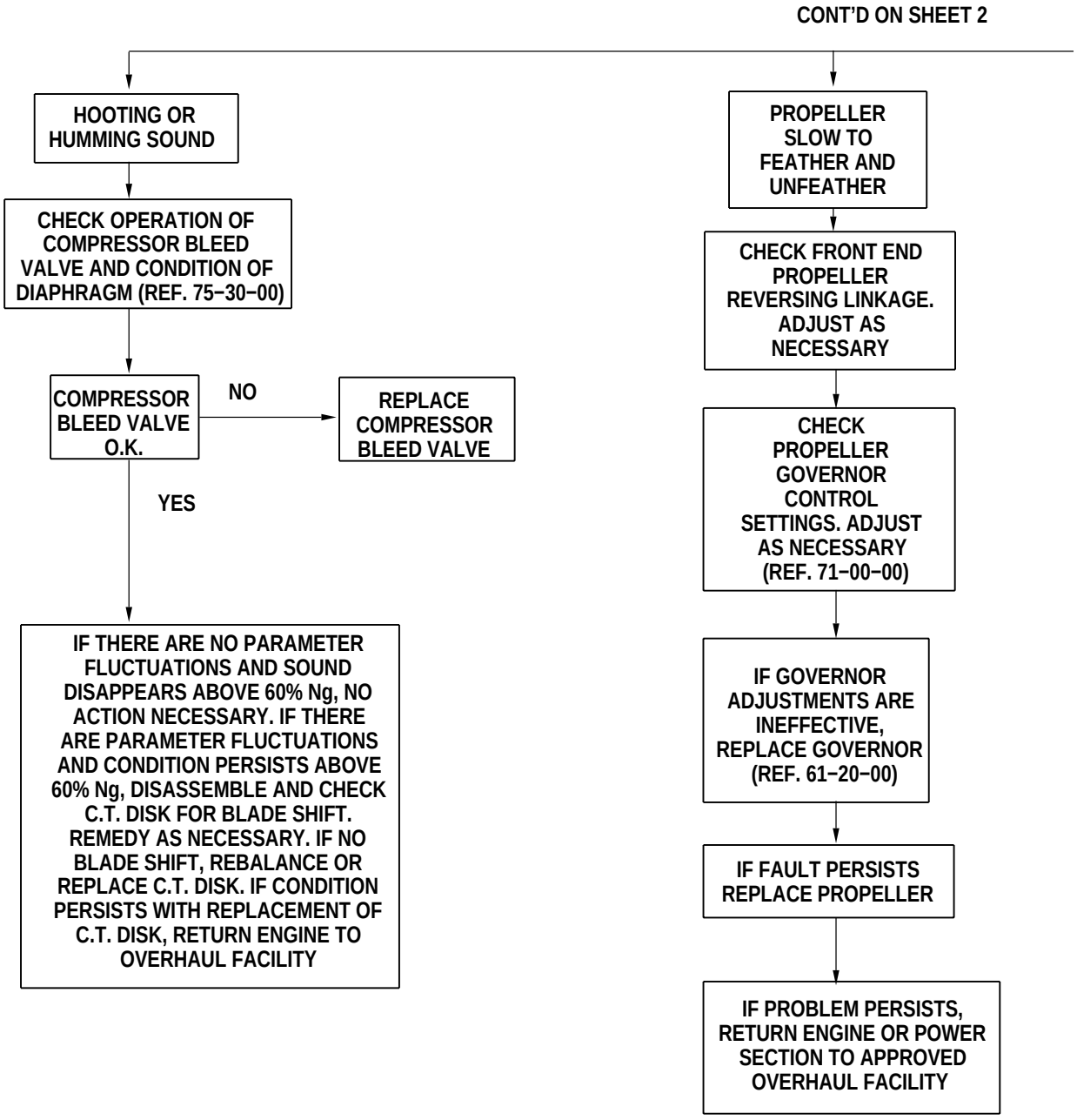
CAUTION:

A SHORT SECURED LINE TO A PLASTIC OR GLASS BOTTLE WILL AVOID DISCHARGE OF FUEL ONTO THE GROUND AND PROVIDE ADDED SAFETY.

C70754

Engine Starting Fault Isolation Chart
Figure 101 (Sheet 8)

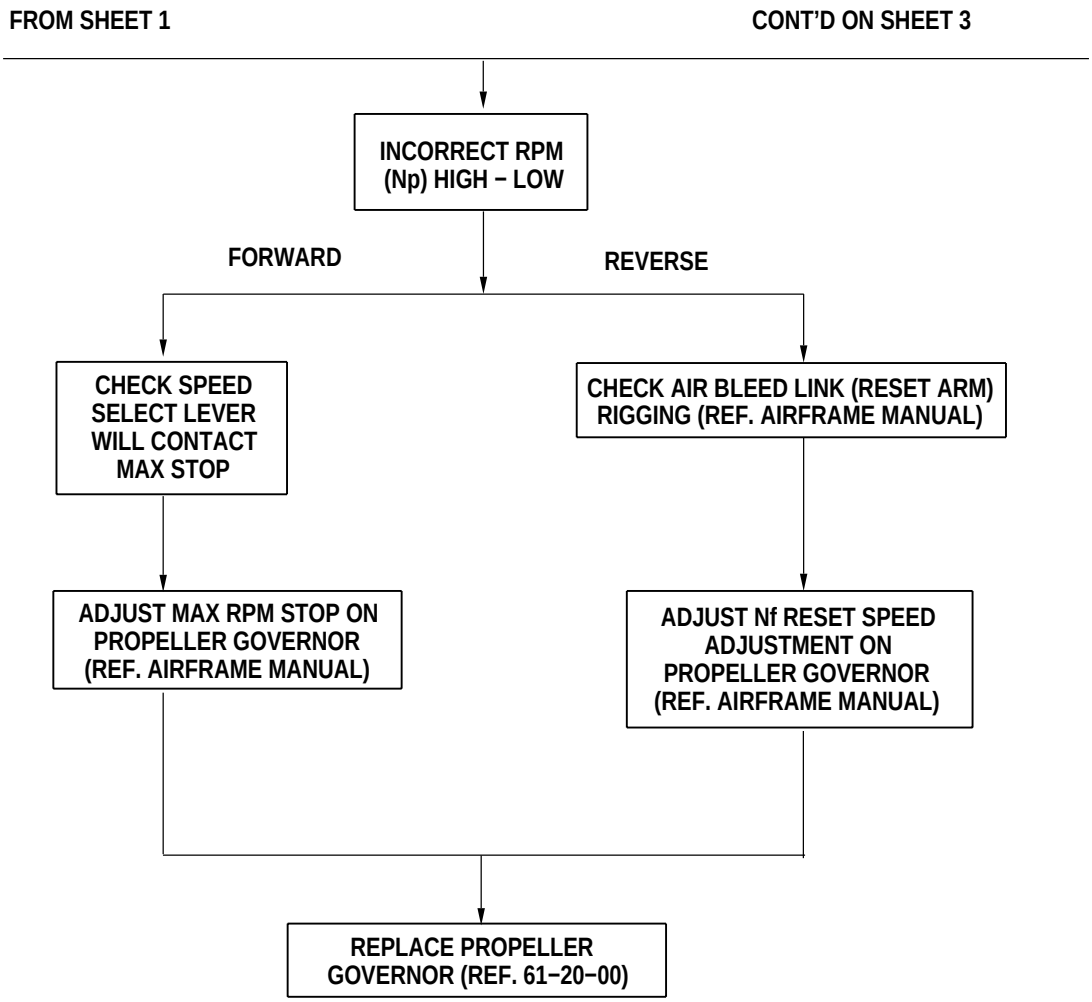
OPERATING PROBLEMS



C29850

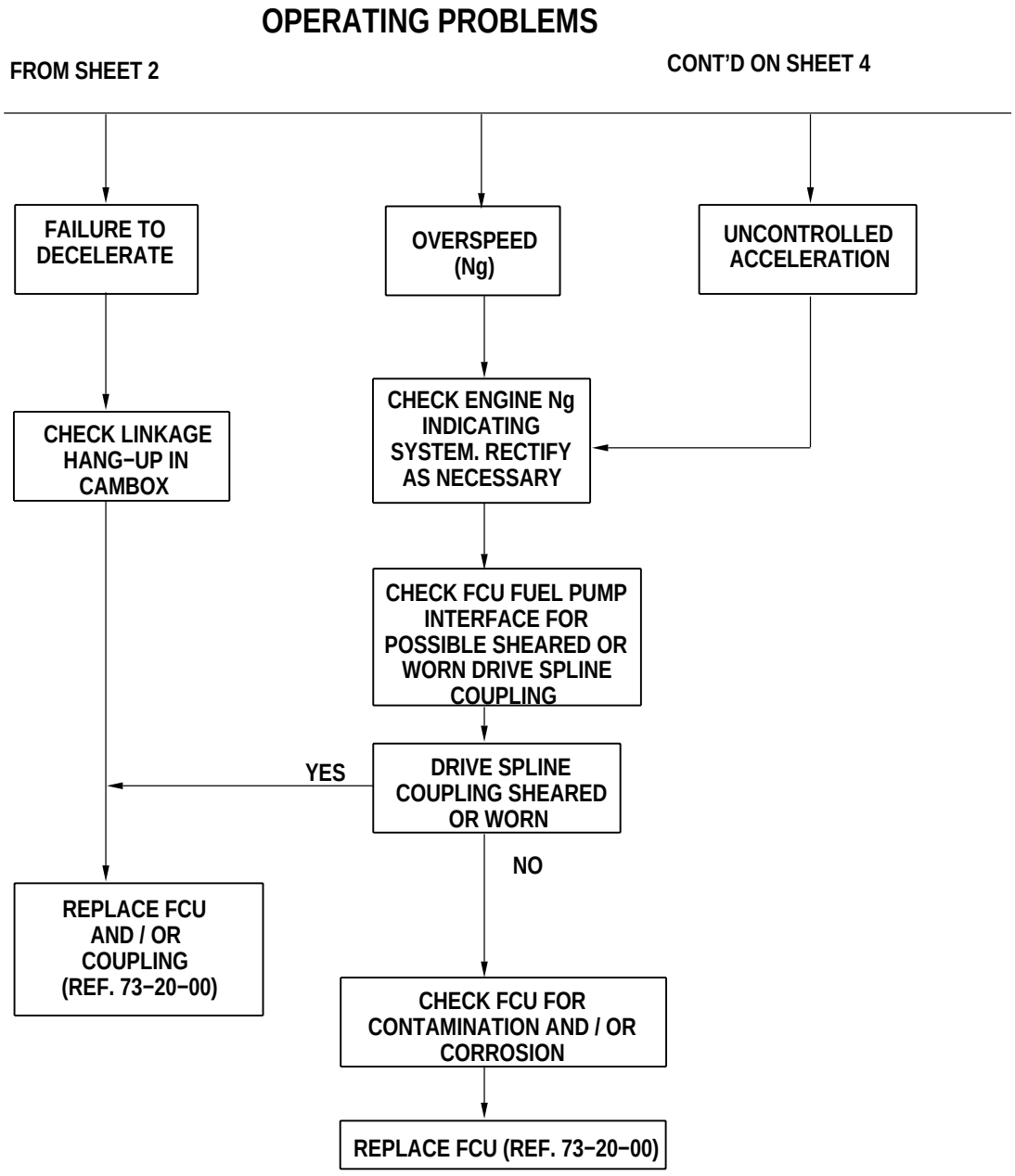
Engine Operating Fault Isolation Chart
Figure 102 (Sheet 1 of 11)

OPERATING PROBLEMS



C29851

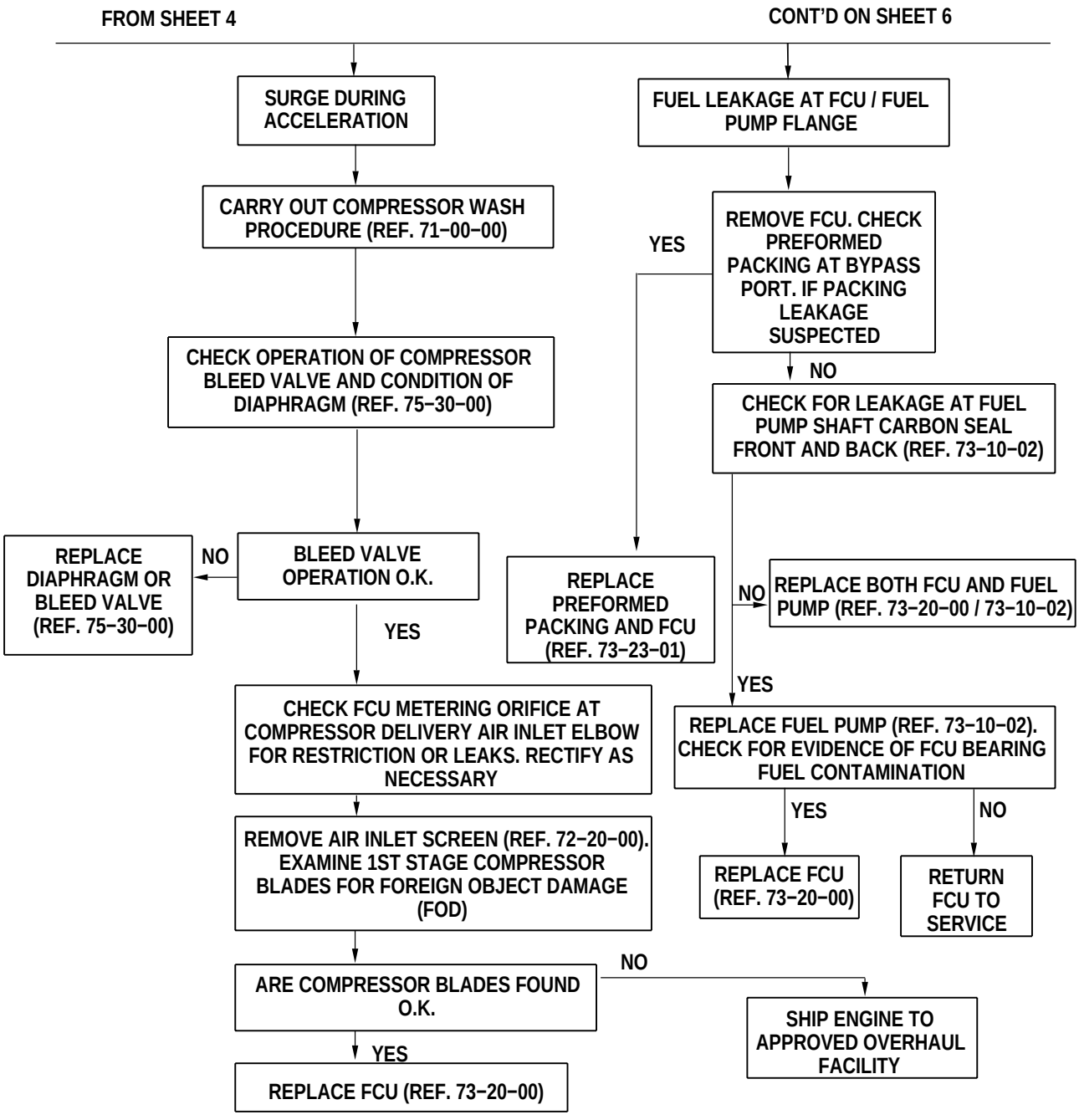
Engine Operating Fault Isolation Chart
Figure 102 (Sheet 2)



C29853

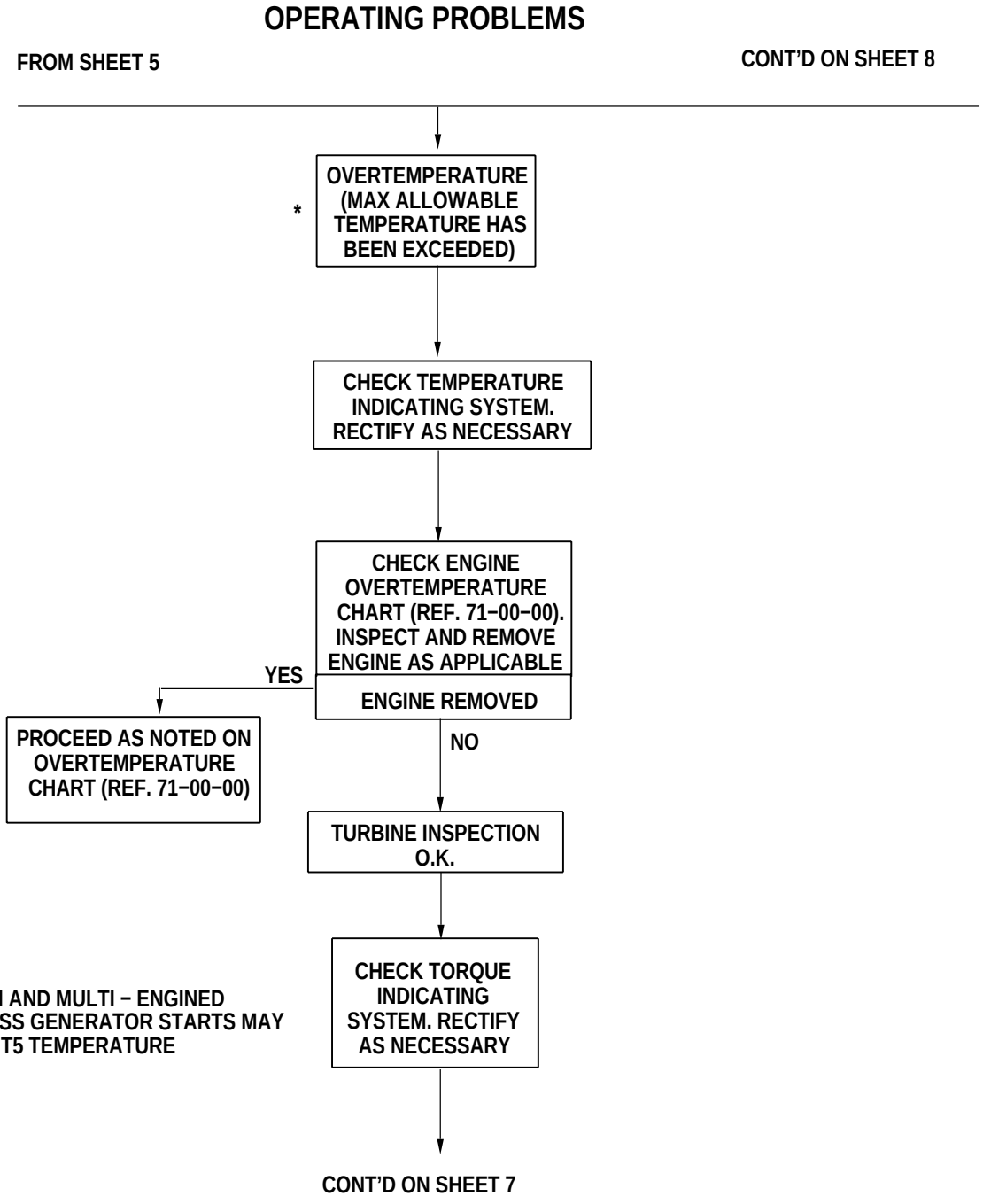
Engine Operating Fault Isolation Chart
Figure 102 (Sheet 3)

OPERATING PROBLEMS



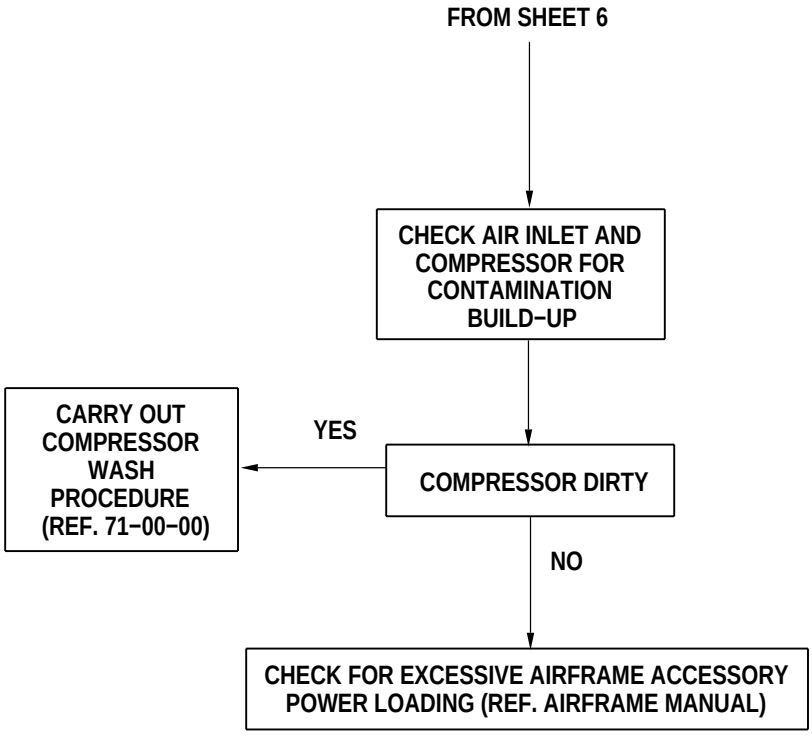
C29855

Engine Operating Fault Isolation Chart
Figure 102 (Sheet 4)



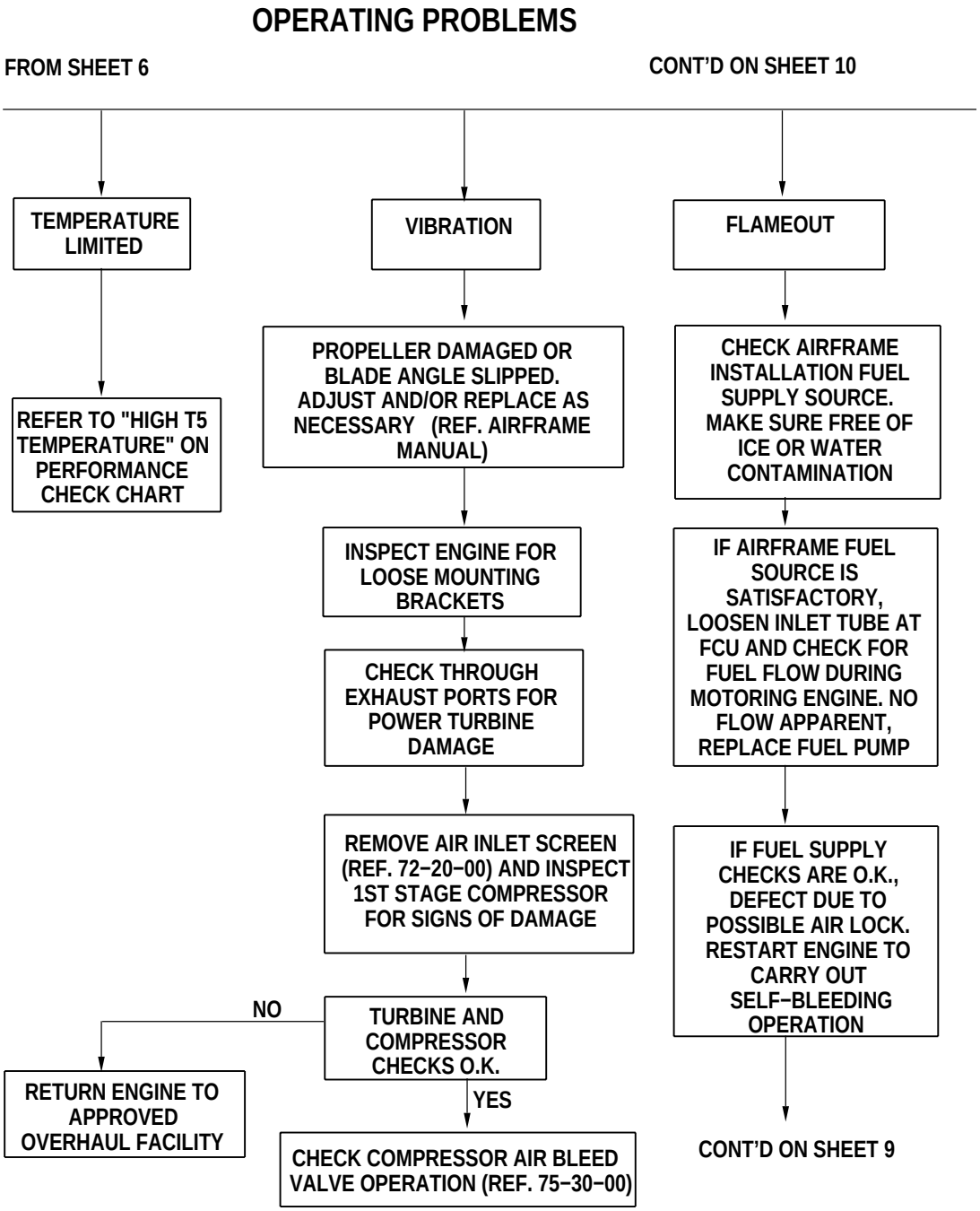
Engine Operating Fault Isolation Chart
Figure 102 (Sheet 5)

OPERATING PROBLEMS



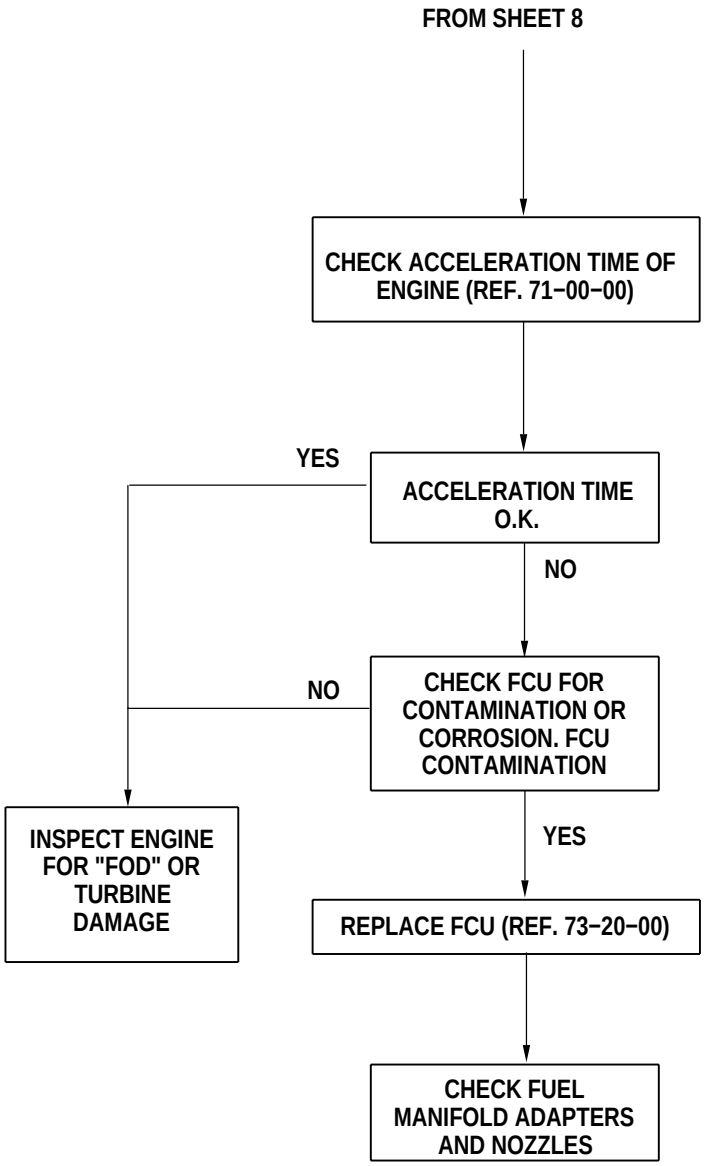
C29857

Engine Operating Fault Isolation Chart
Figure 102 (Sheet 6)



Engine Operating Fault Isolation Chart
Figure 102 (Sheet 7)

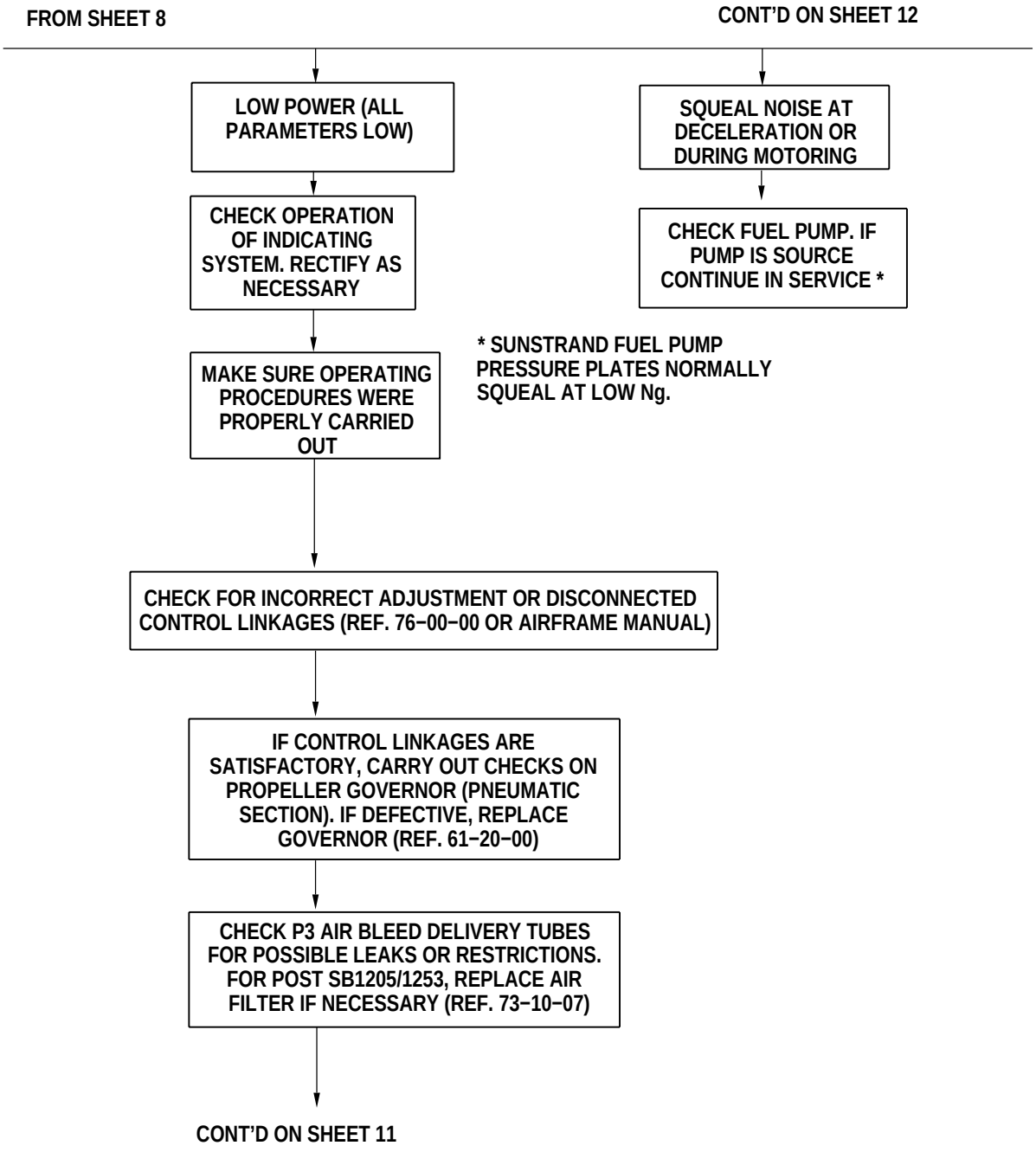
OPERATING PROBLEMS



C29859

Engine Operating Fault Isolation Chart
Figure 102 (Sheet 8)

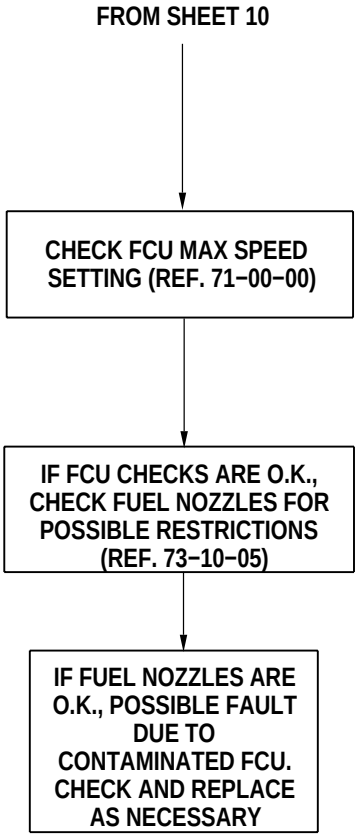
OPERATING PROBLEMS



C29860

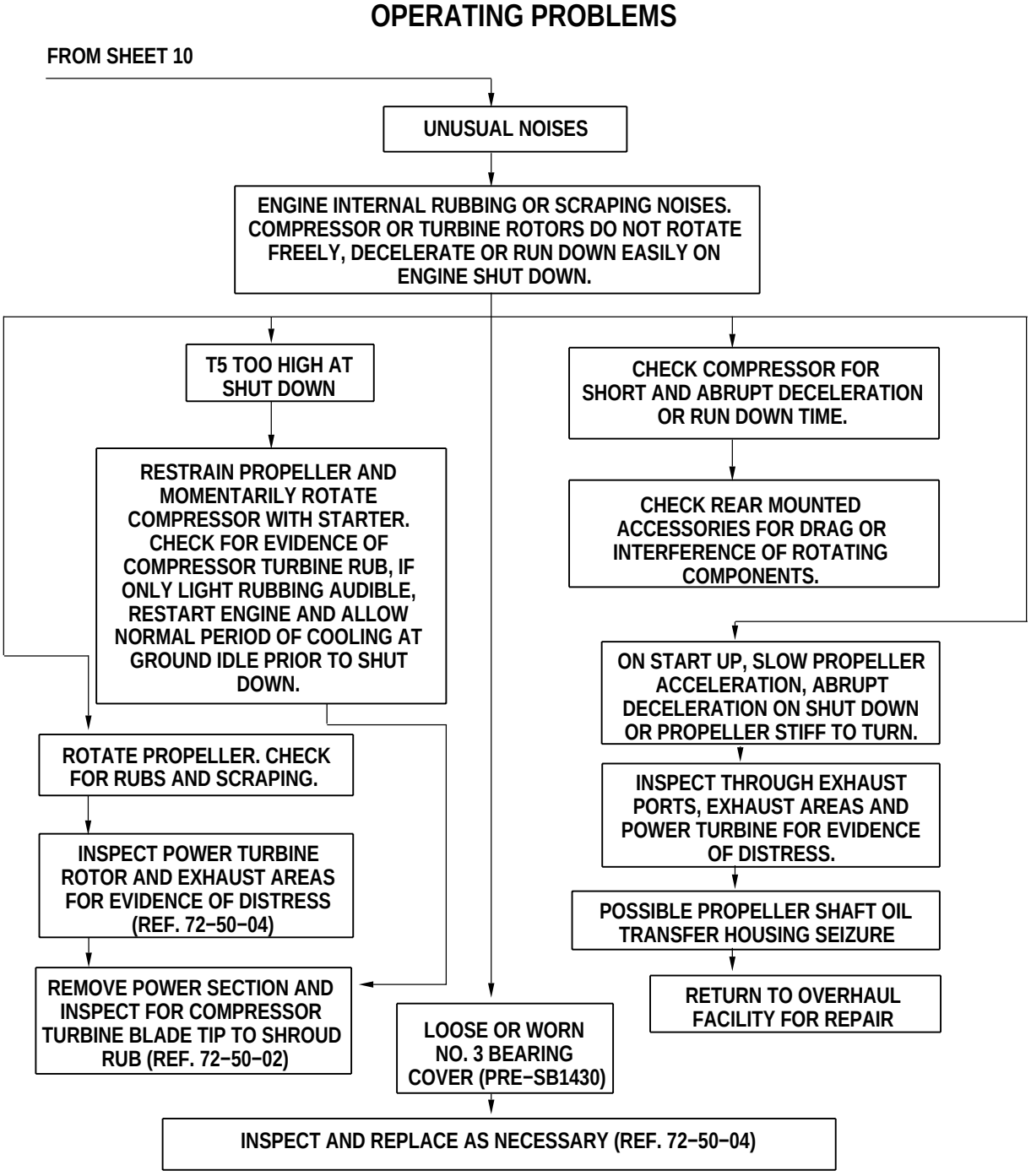
Engine Operating Fault Isolation Chart
Figure 102 (Sheet 9)

OPERATING PROBLEMS

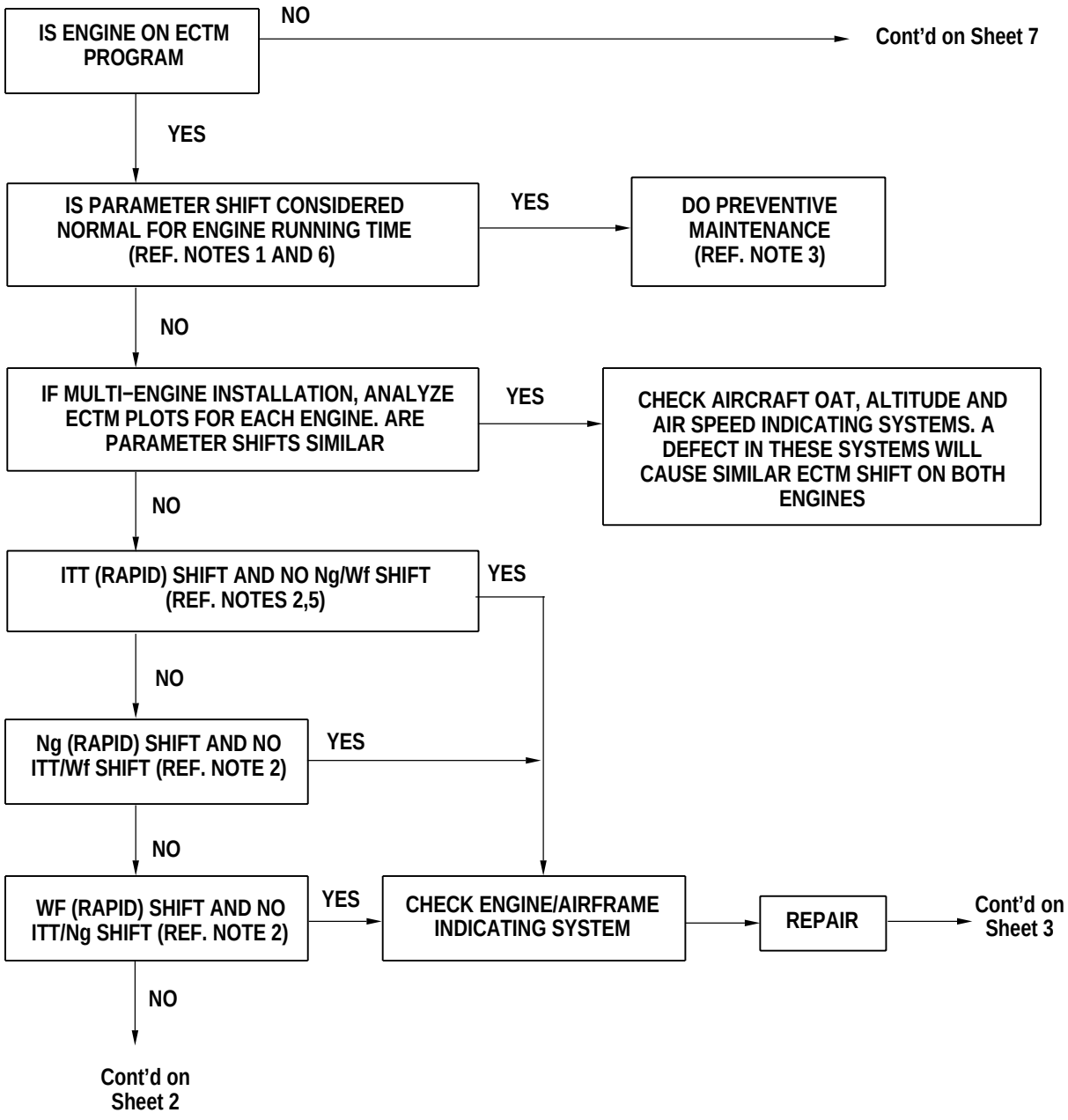


C29862

Engine Operating Fault Isolation Chart
Figure 102 (Sheet 10)

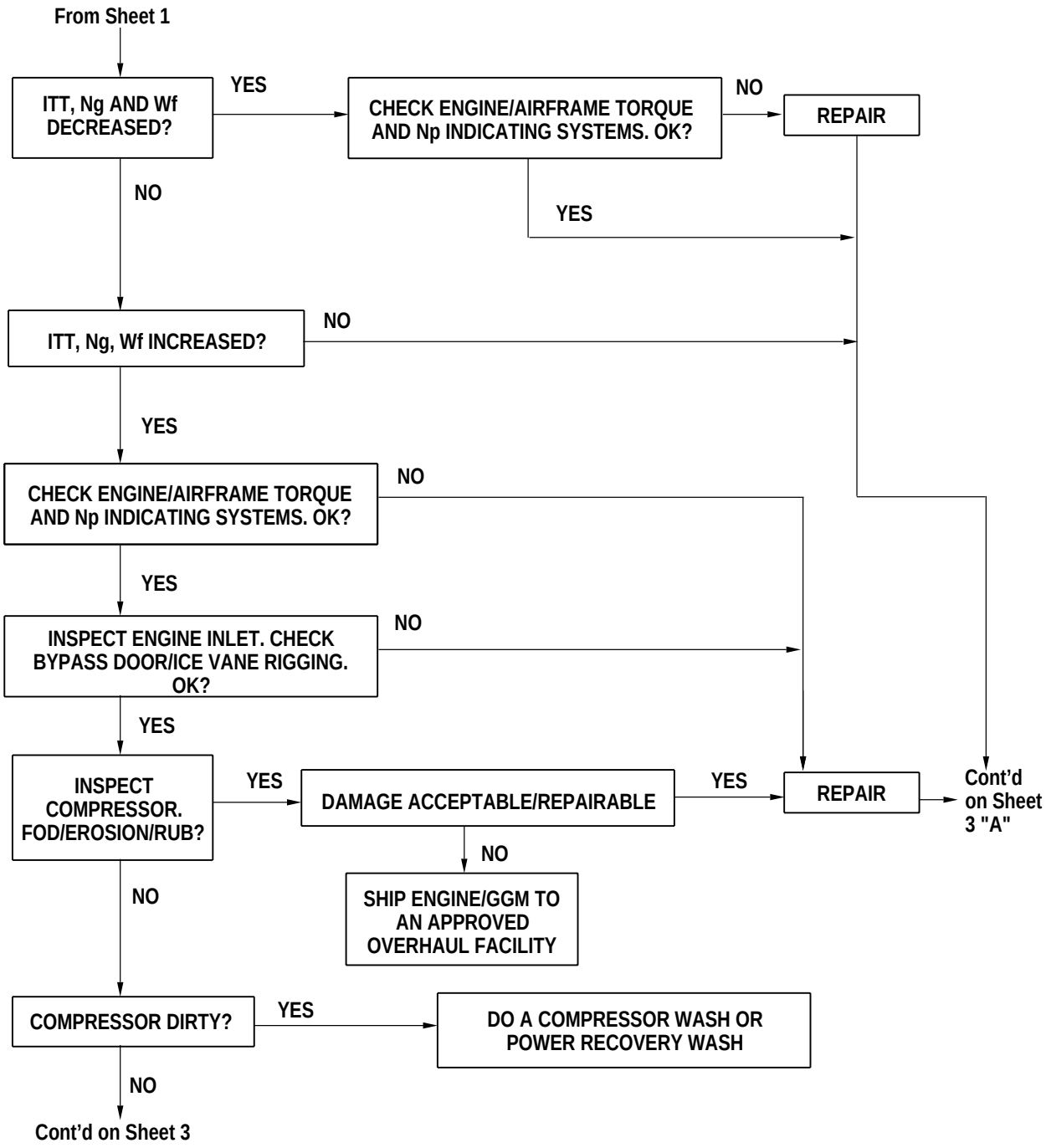


Engine Operating Fault Isolation Chart
Figure 102 (Sheet 11)



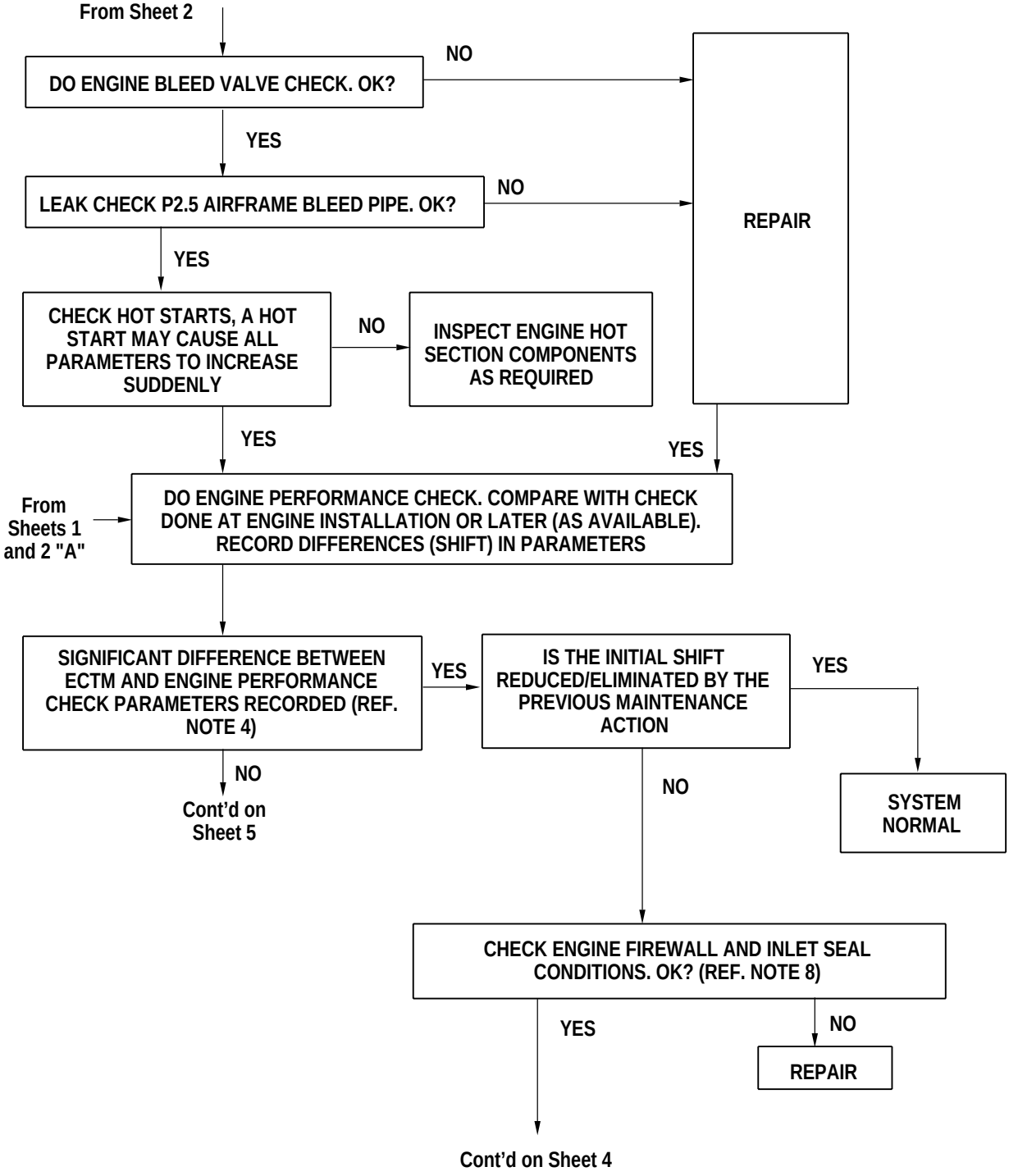
C36844A

Engine Performance Fault Isolation Chart
Figure 103 (Sheet 1 of 10)



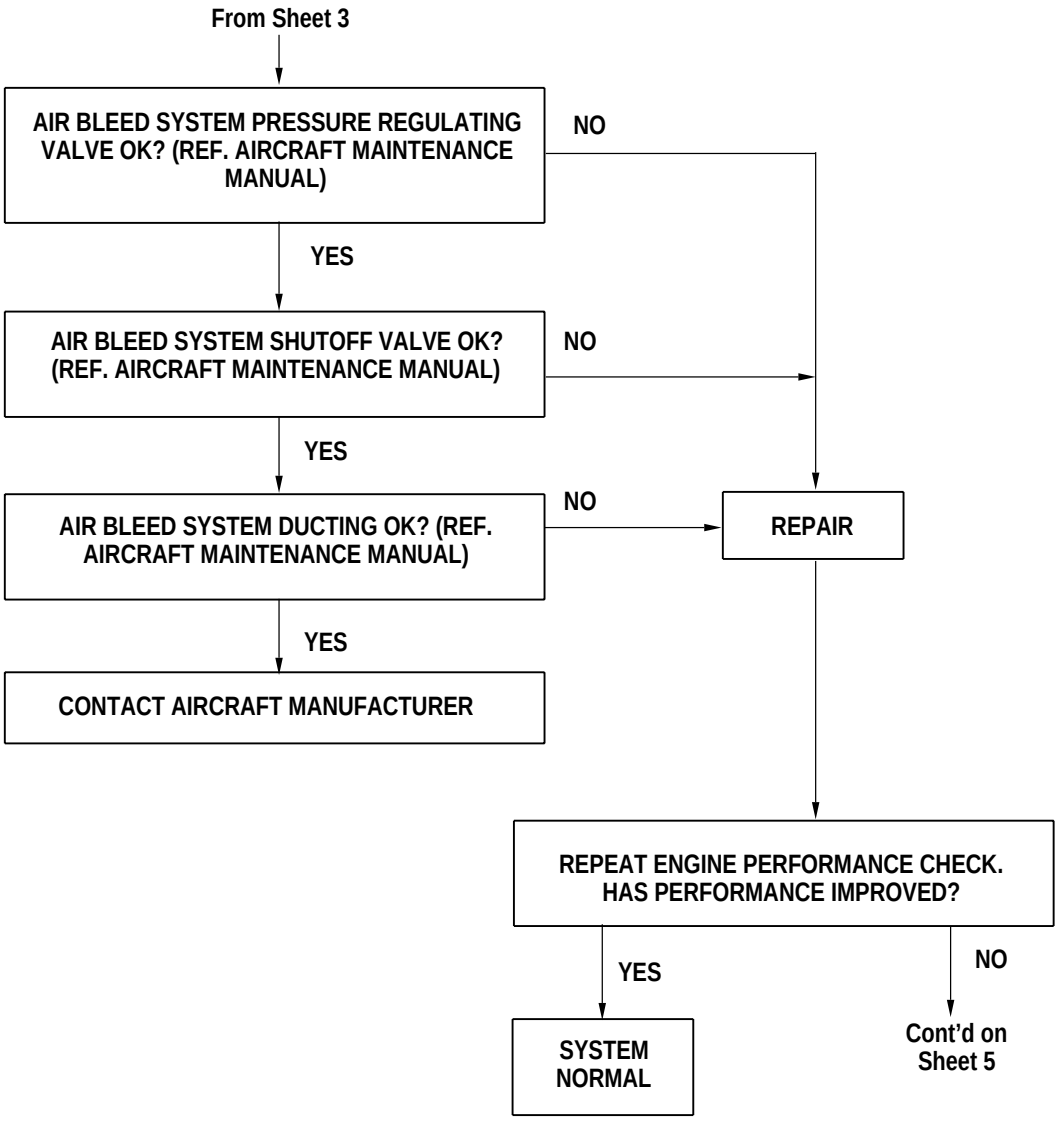
C36845

Engine Performance Fault Isolation Chart
Figure 103 (Sheet 2)



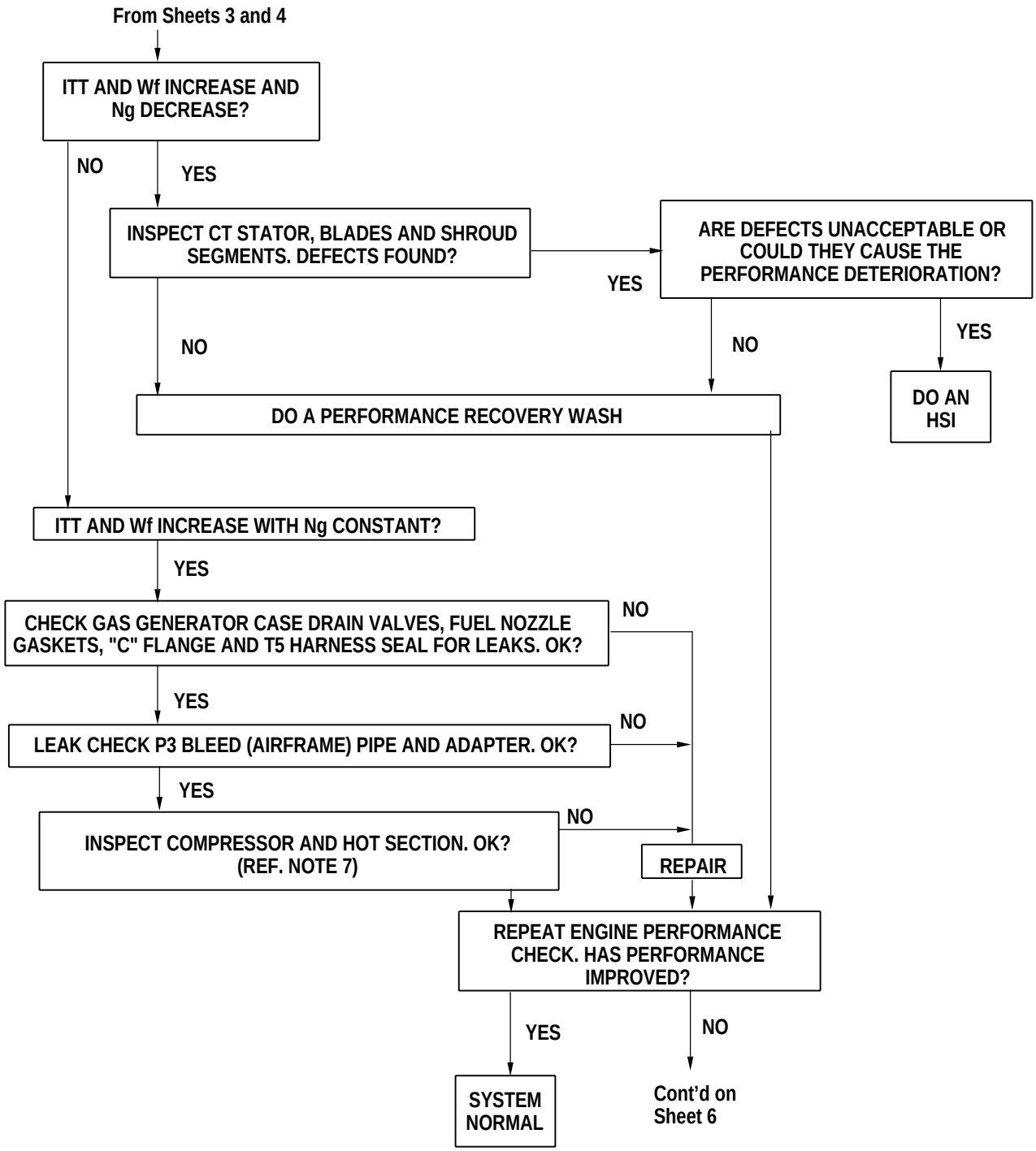
C36846A

Engine Performance Fault Isolation Chart
Figure 103 (Sheet 3)



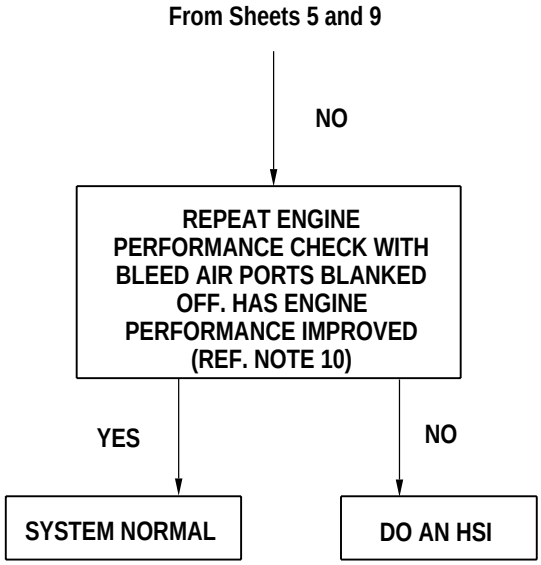
C36847

Engine Performance Fault Isolation Chart
Figure 103 (Sheet 4)



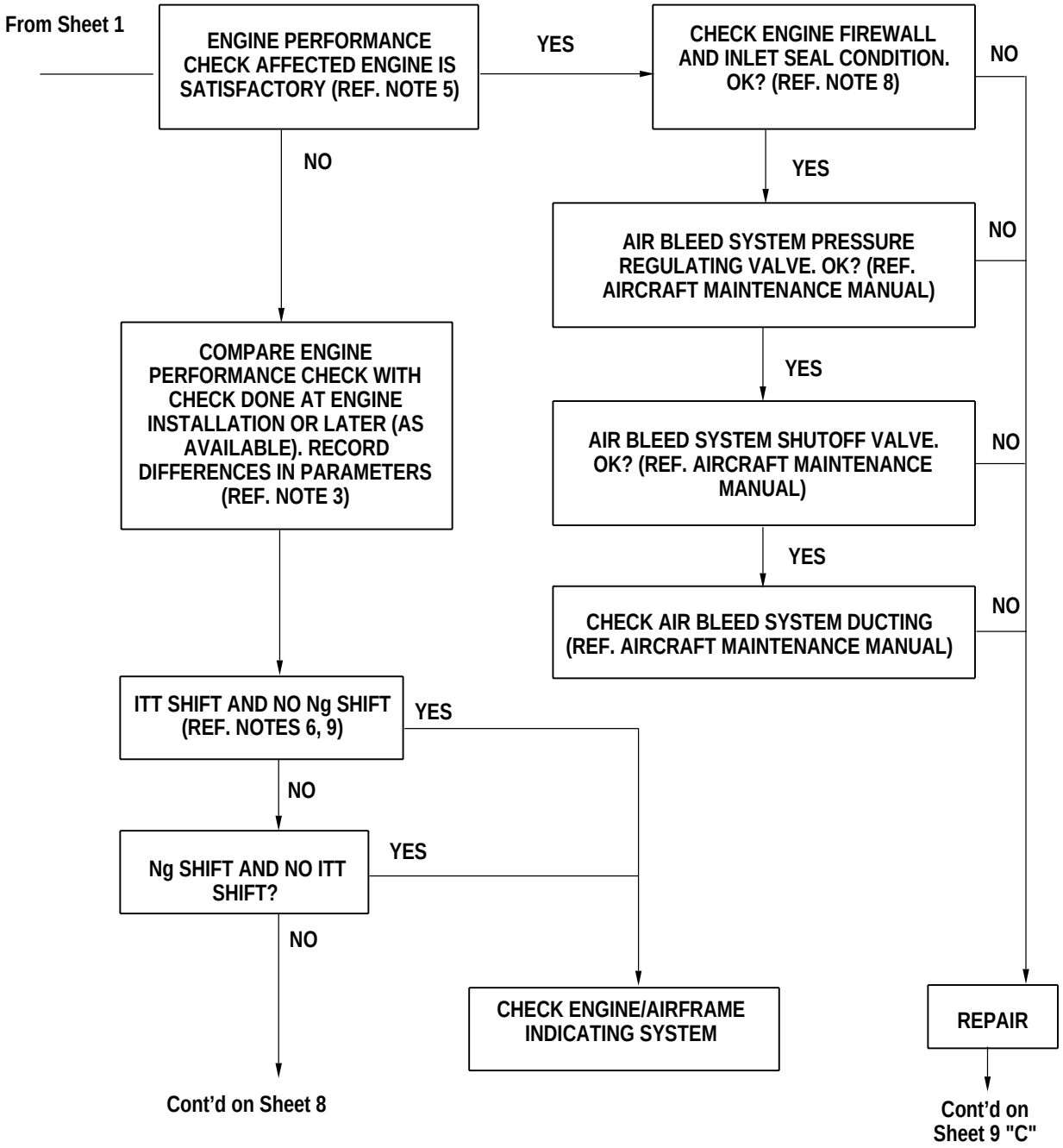
C36848

Engine Performance Fault Isolation Chart
Figure 103 (Sheet 5)



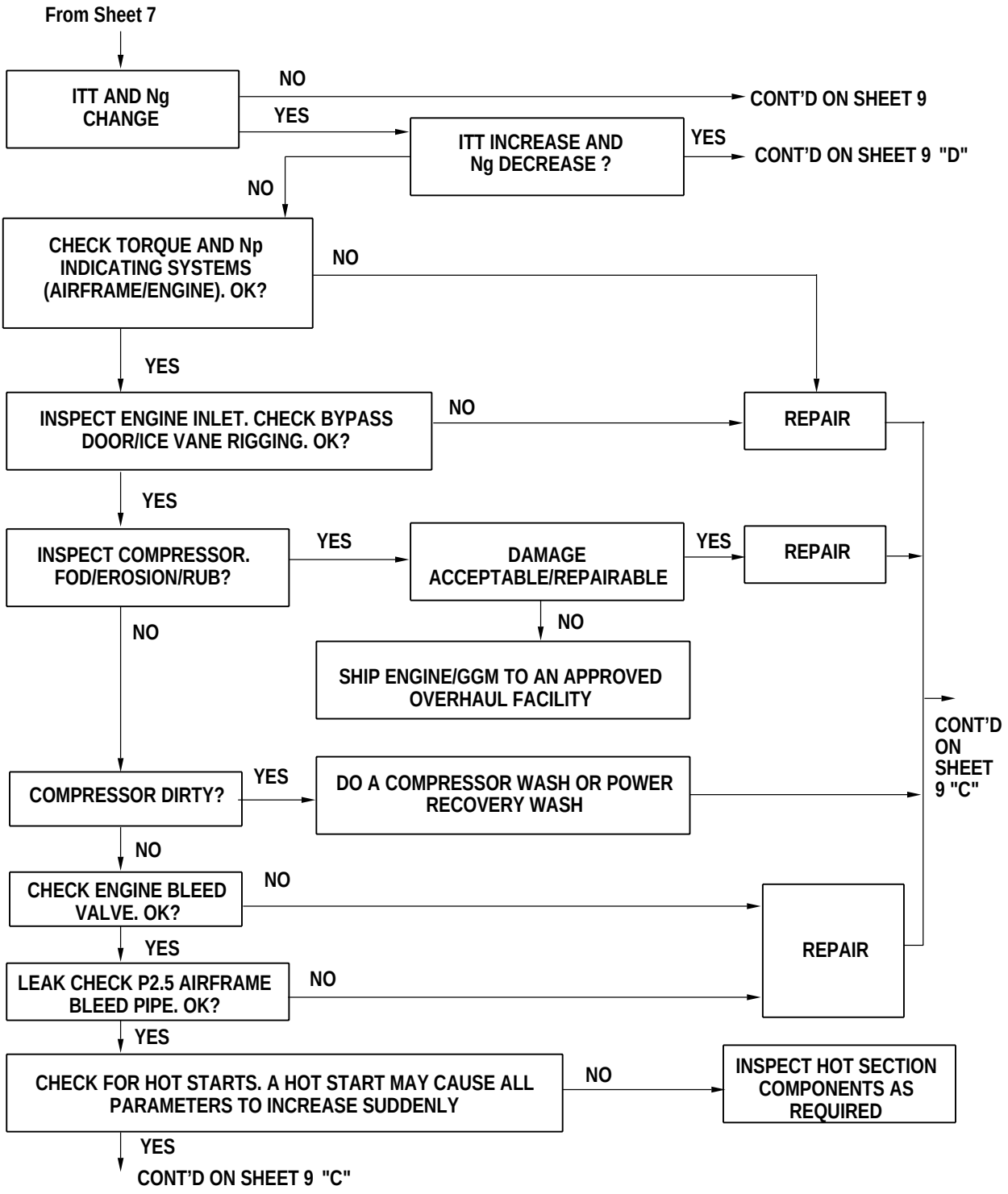
C36849

Engine Performance Fault Isolation Chart
Figure 103 (Sheet 6)



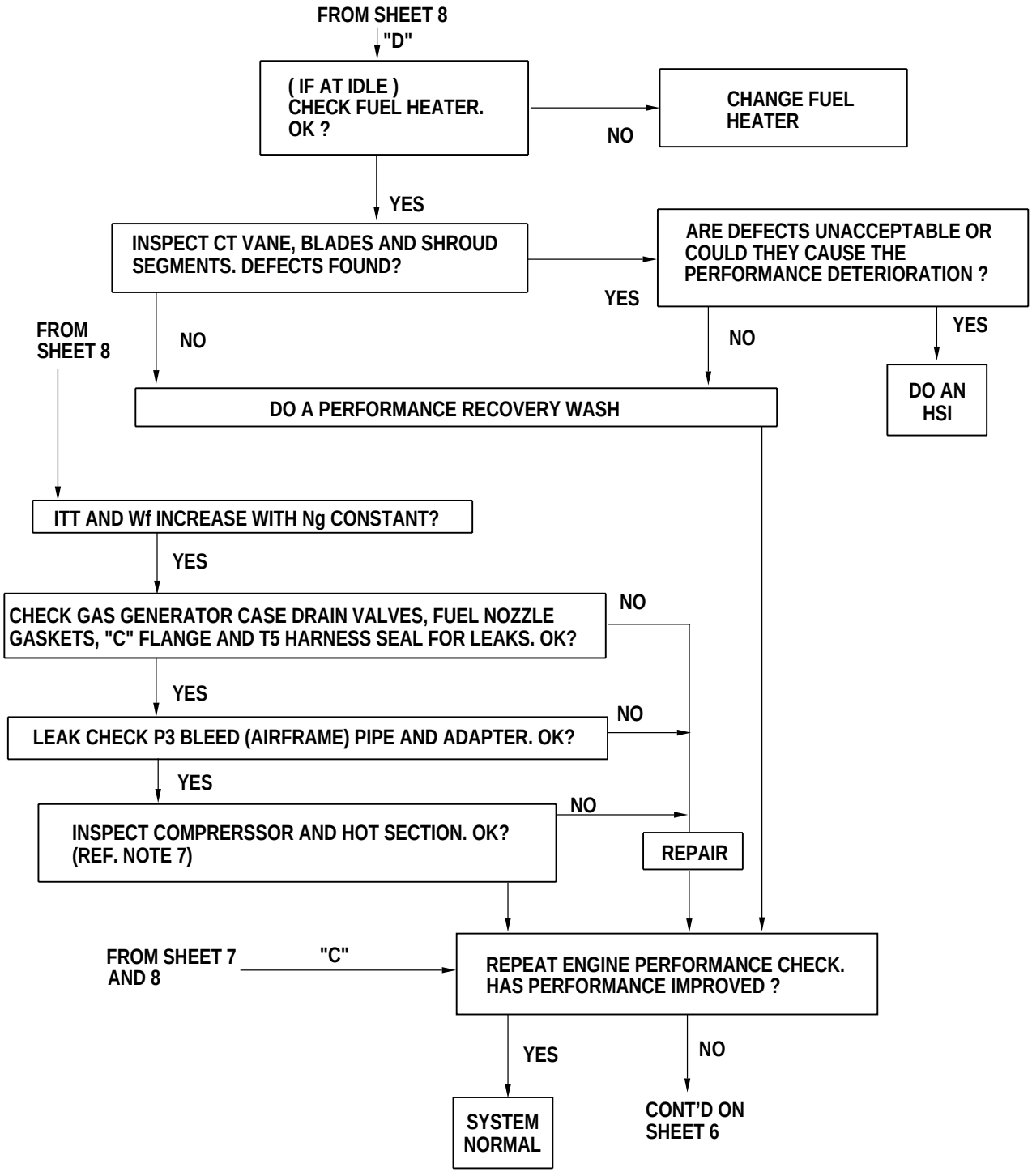
C36850

Engine Performance Fault Isolation Chart
Figure 103 (Sheet 7)



C36851B

Engine Performance Fault Isolation Chart
Figure 103 (Sheet 8)



C36852A

Engine Performance Fault Isolation Chart
Figure 103 (Sheet 9)

NOTE: 1. Review ECTM data, pilot reports and maintenance log book entries and troubleshooting for the last 6 months. Hot section components and performance gradually deteriorate as running time accumulates. The deterioration rate varies according to operating conditions (environment and type of operation) and for different engine modification standards. If engine performance apparently improves T5 decrease without maintenance action, check indicating systems (usually T5 system is at fault).

NOTE: 2. A rapid shift in engine parameters is usually the result of an indicating system defect.

NOTE: 3. To extend hot section life, the following preventive maintenance, based on the increase in T5 from the values established at engine installation (engine performance/ground power check or ECTM), is recommended: For a 10°C (20°F) increase in T5, do a performance recovery wash. In addition, indicating system and engine performance/ground power checks are recommended to ensure reliable engine performance data. Also, test spray pattern or refurbish fuel nozzles.
For a 15°C (27°F) increase in T5 or a 1 to 1.5% decrease in Ng, do a borescope inspection of the combustion chamber, small exit duct, CT stator vanes and CT blades. In addition, do the maintenance recommended above.

NOTE: 4. A significant difference between ECTM and engine performance/ground power check parameters indicate that the defect is within the aircraft air bleed system on the affected engine (air bleed is off during an engine performance/ground power check). An alternative method is to do an engine performance/ground power check with air bleed ON then OFF. Compare the shift parameters for the engines on the same aircraft. A significant difference indicates bleed sharing problems. For single engine installations, contact P&WC for typical parameter shift recommendations.

NOTE: 5. When an engine is temperature limited on climb or cruise and the engine performance/ground power check is satisfactory, the defect is within the aircraft bleed system of the affected engine.

NOTE: 6. An increase in temperature without other parameter shifts may be the result of defective fuel nozzles or a deteriorated combustion liner altering combustion profile and changing the temperature distribution.

NOTE: 7. Compressor deterioration (which increases Ng) and hot section normal deterioration (which reduces Ng) may balance each other and the effect deterioration has on Ng will be very small or zero (i.e. Ng will remain constant).

NOTE: 8. When the engine is running on the ground, inlet plenum air pressure is lower than ambient air pressure. Therefore, if the inlet or firewall seals are damaged, hot air from around the engine may be ingested causing a temperature increase. Similarly, if the wind direction is from the rear, exhaust gas may be ingested and temperature increased.

NOTE: 9. The relationship between T5 and the temperature in front of CT stator may change due to hot section component deterioration altering combustion profile and/or gas path temperature distribution. This may affect the T5 trim and the indicated T5 and the relationship between T5 and the temperature in front of the CT vane used for engine certification. A T5 trim verification on the wing or in the test cell will confirm a shift in the indicated temperature.

NOTE: 10. To remove doubts, a T5 system check (including individual thermocouple checks) is recommended before doing a complete HSI.

C65318

Engine Performance Fault Isolation Chart
Figure 103 (Sheet 10)

TABLE 101, ECTM Shift Fault Isolation Chart

ENGINE PARAMETERS	PROBABLE CAUSE	ACTION REQ'D	REMARKS
All parameters UP	AC/ engine indicating systems	Inspect	Repair as req'd
	Air inlet door blocked	Inspect	Repair as req'd
	Bypass door or ice vane mis-rigged.	Inspect	Repair as req'd
	Compressor FOD, rub, erosion	Inspect and/or repair	Remove engine if limits are exceeded
	Compressor contaminated/dirty	Wash compressor	
	Bleed valve open	Inspect	Repair as req'd
	P2.5 air leaks from engine/airframe system	Inspect	Repair as req'd
	PT stator vanes burned/flow area increased. PT blade tip oxidation/rub.	Inspect	Repair as req'd
	Hot start	Inspect hot section and check log book	Do applicable overtemperature inspection
All parameters DOWN	AC/engine indicating system	Inspect	Repair as req'd
Fuel nozzle deterioration	Inspect	Clean as req'd	
Ng UP or DOWN, T5, WF Constant.	AC/engine indicating system	Inspect	Repair as req'd.
Wf UP or DOWN, T5, Ng, constant.	AC/engine indicating system	Inspect	Repair as req'd.
Wf, T5 UP, Ng down	CT stator vanes burned/flow area increased. CT blade tip oxidation/rub.	Inspect CT stator, and CT blades.	If limits exceeded, do an HSI.
	Normal hot section deterioration	Do an HSI if T5 limit exceeded.	

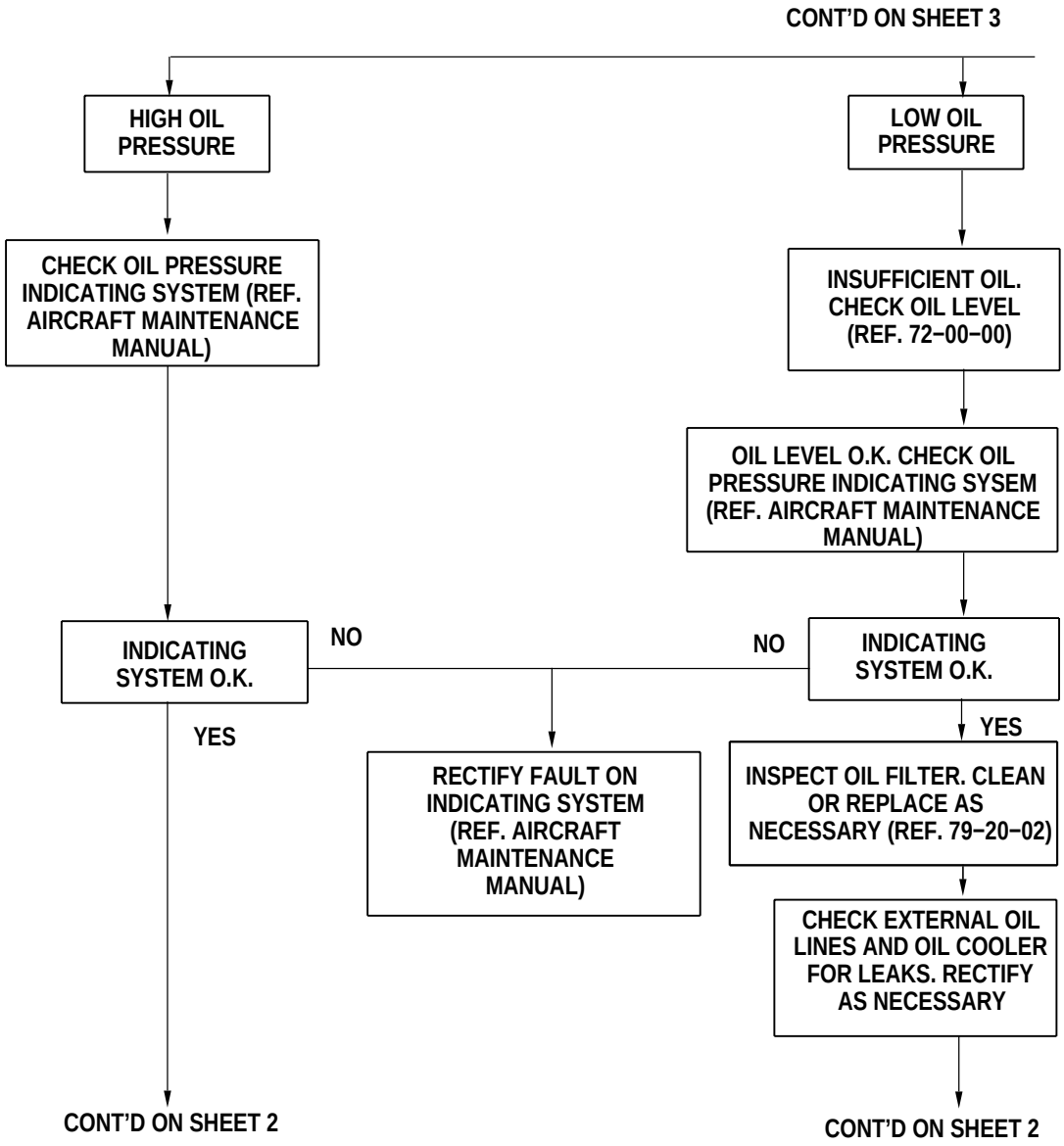
TABLE 101, ECTM Shift Fault Isolation Chart (Cont'd)

ENGINE PARAMETERS	PROBABLE CAUSE	ACTION REQ'D	REMARKS
Wf, T5 UP, Ng constant	P3 leaks from AC/engine system	Inspect	Repair as req'd
	Gas generator case cracked at fuel nozzle or P3 bleed pads. Diffuser exit ducts cracked or loose.	Inspect	Replace engine if defect confirmed.
	Leaking gas generator drain valves, C flange, fuel nozzle gasket, or T5 harness seal.	Inspect	Replace engine if defect confirmed.
	Concurrent hot section and compressor deterioration	Inspect CT stator and CT blades, and compressor.	Do an HSI or send engine for overhaul.

NOTE: 1. An increase in T5 without other parameter shifts may be the result of defective fuel nozzles or a deteriorating combustion chamber liner altering combustion profile and gas path temperature distribution.

NOTE: 2. The relationship between T5 and the temperature in front of the CT stator may change due to hot section component deterioration altering combustion profile and/or gas path temperature distribution. This may affect the T5 trim and the indicated T5, and the relationship between T5 and the temperature in front of the CT stator used for engine certification. A T5 trim verification on-wing or in a test cell will confirm a shift in the indicated temperature.

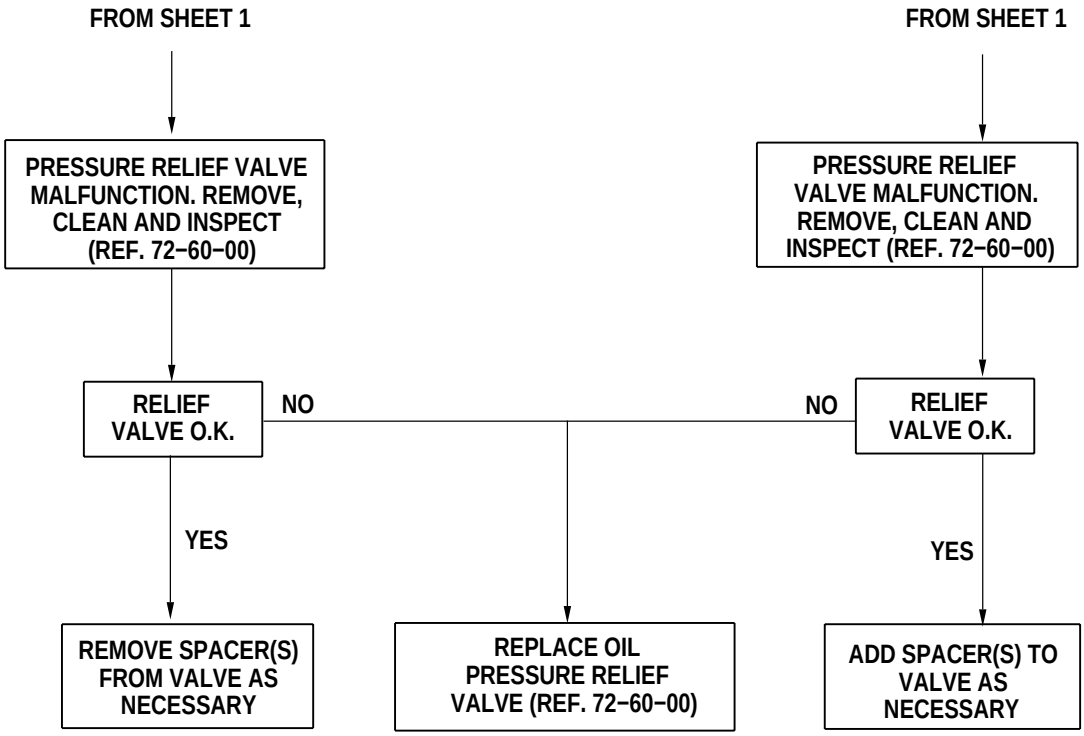
LUBRICATION PROBLEMS



C29872

Engine Lubrication Fault Isolation Chart
Figure 104 (Sheet 1 of 8)

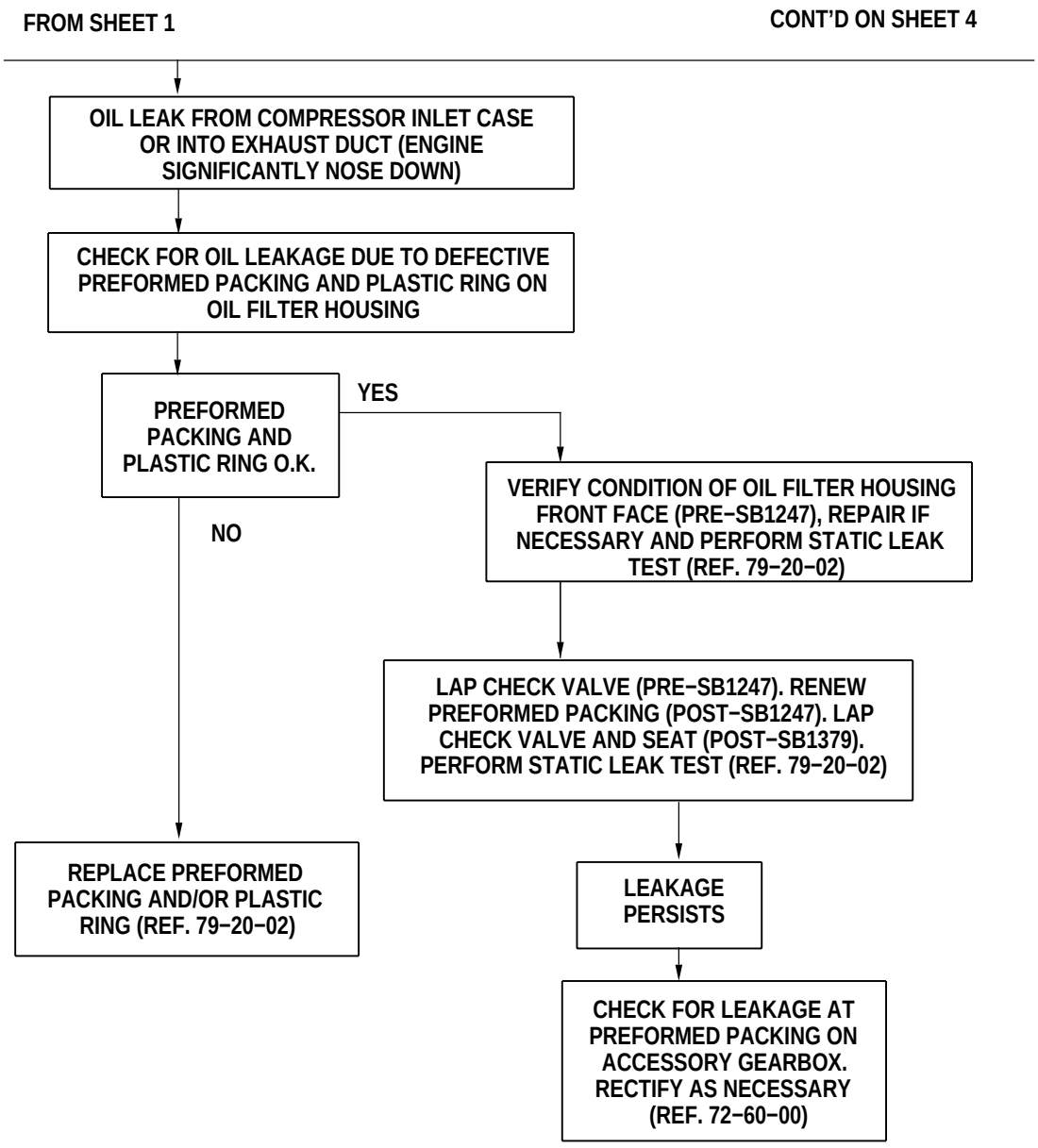
LUBRICATION PROBLEMS



C29873

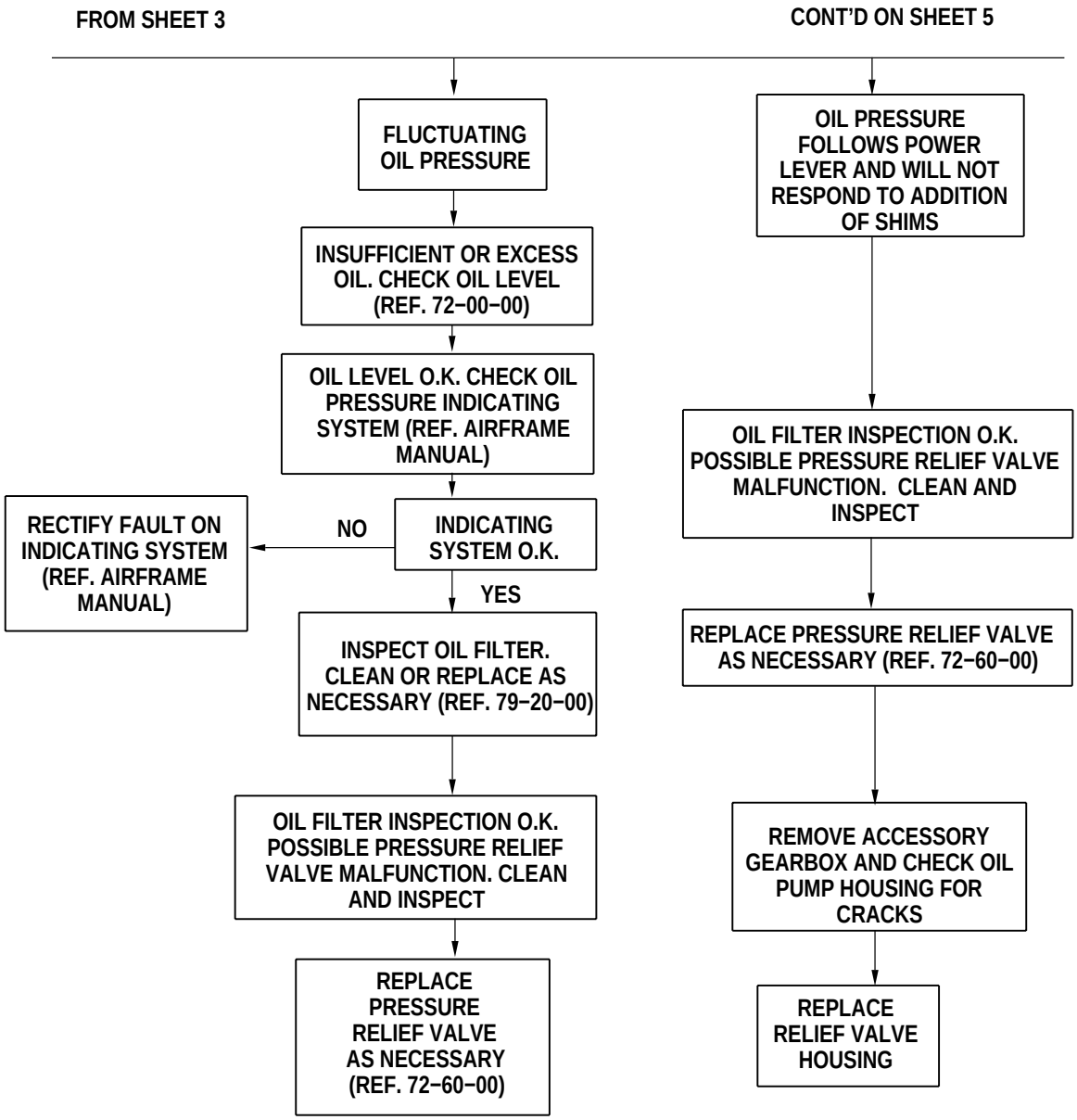
Engine Lubrication Fault Isolation Chart
Figure 104 (Sheet 2)

LUBRICATION PROBLEMS



Engine Lubrication Fault Isolation Chart
Figure 104 (Sheet 3)

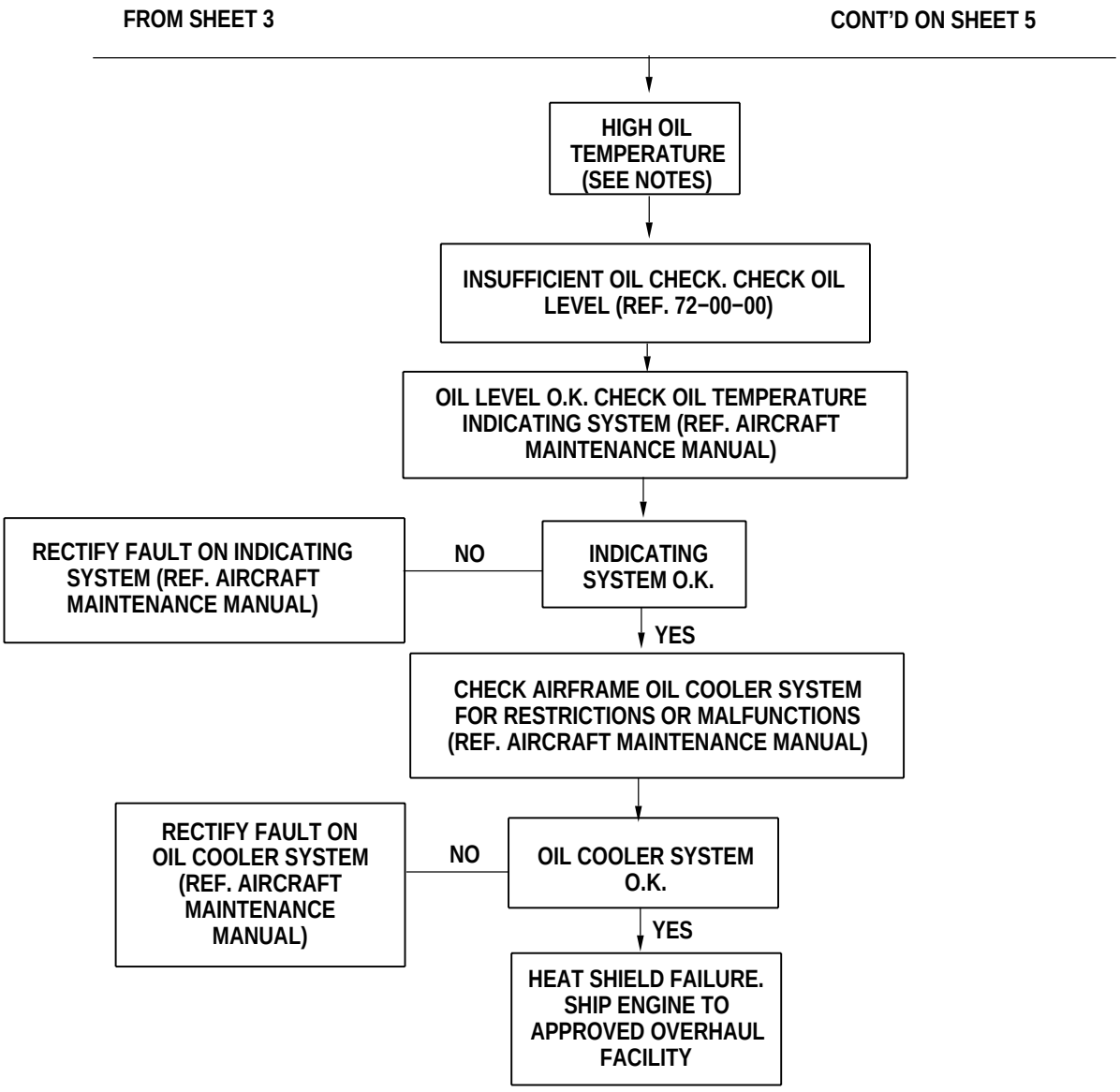
LUBRICATION PROBLEMS



C29876

Engine Lubrication Fault Isolation Chart
Figure 104 (Sheet 4)

LUBRICATION PROBLEMS



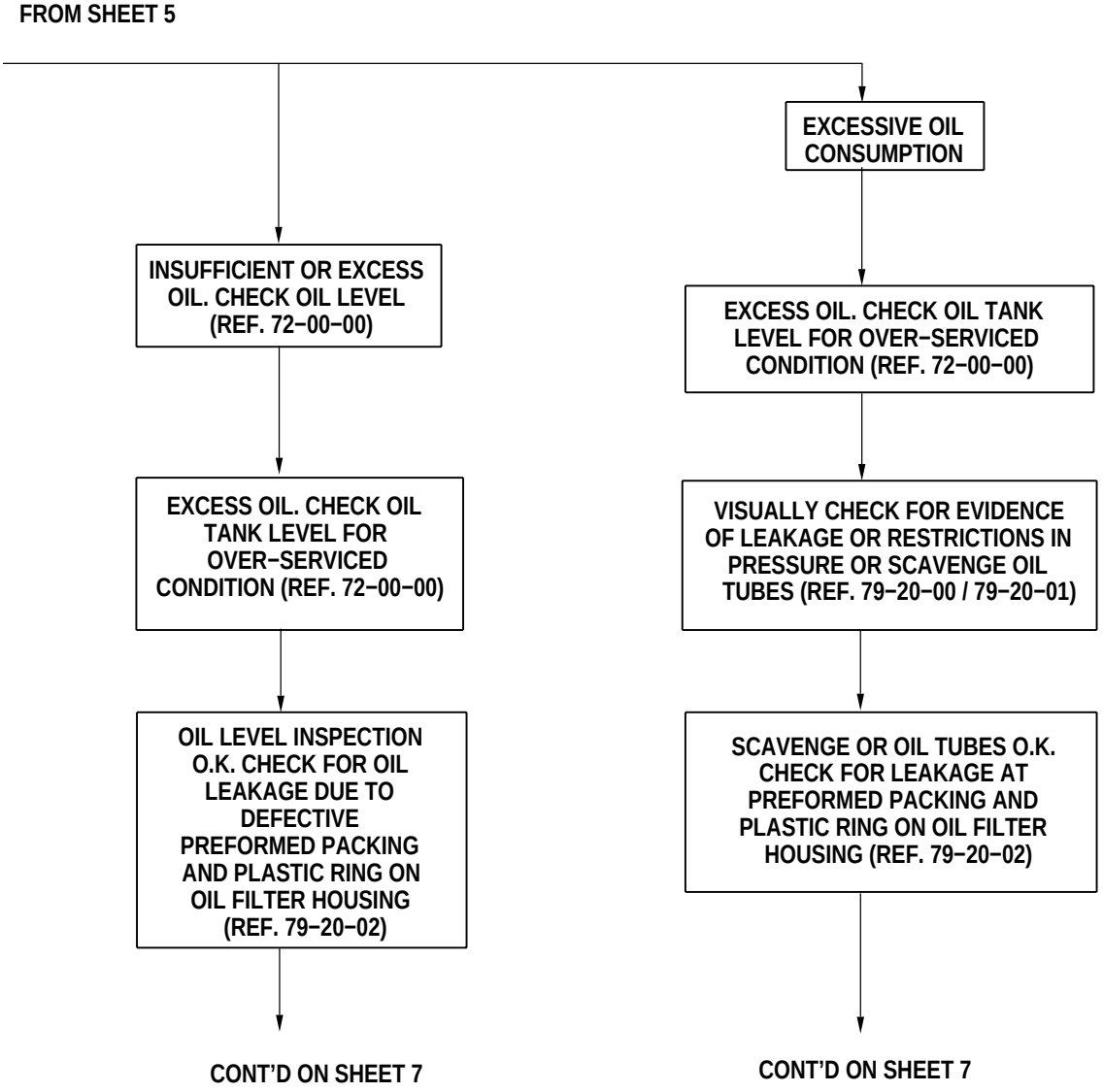
NOTE:

1. FOR GROUND OPERATION RESTRICT IDLING IN FEATHER.
2. VERIFY PROPELLER RIGGING (CHECK PRIMARY BLADE ANGLE, REF. AIRCRAFT MAINTENANCE MANUAL).

C29877

Engine Lubrication Fault Isolation Chart
Figure 104 (Sheet 5)

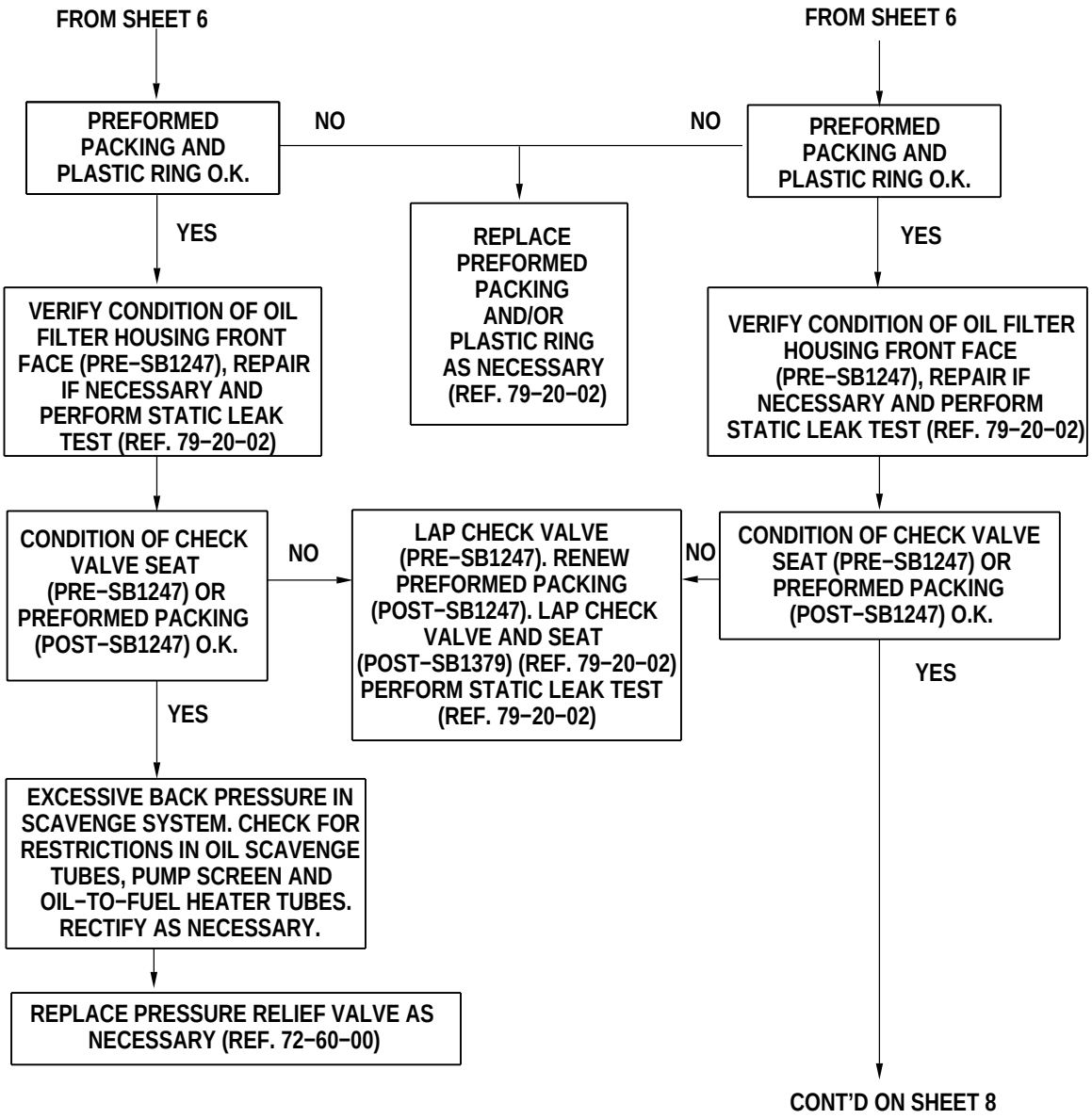
LUBRICATION PROBLEMS



C29878

Engine Lubrication Fault Isolation Chart
Figure 104 (Sheet 6)

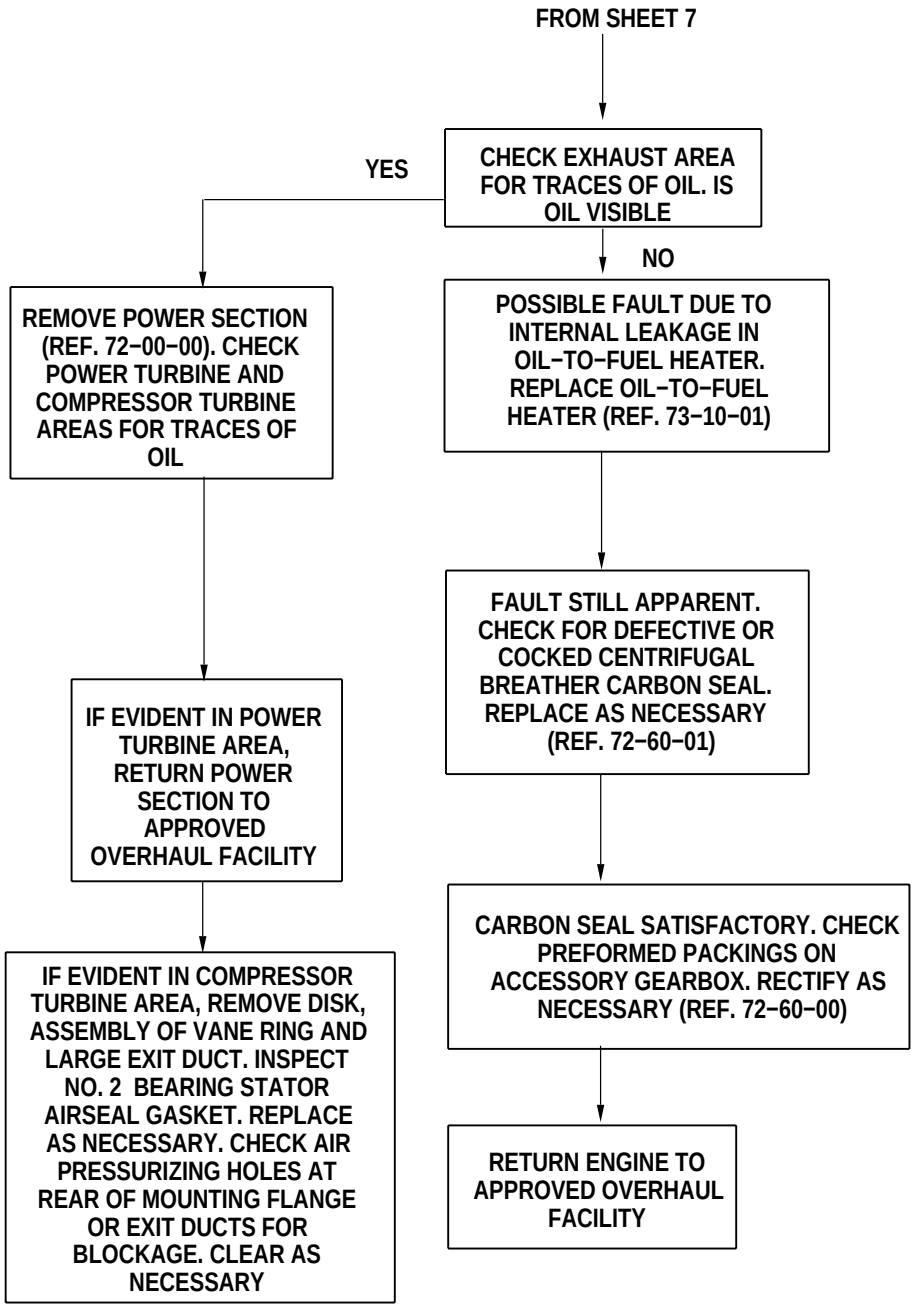
LUBRICATION PROBLEMS



C29879

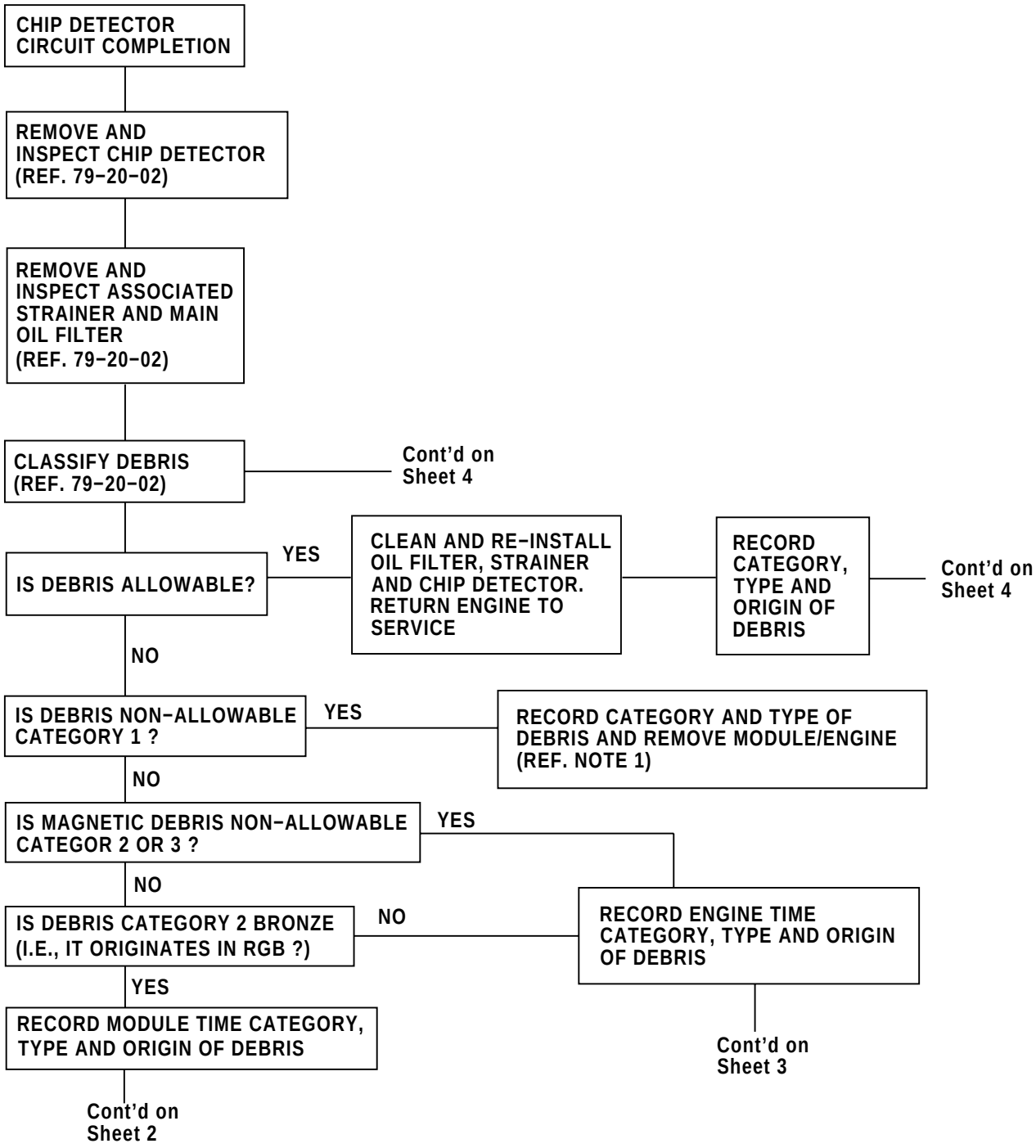
Engine Lubrication Fault Isolation Chart
Figure 104 (Sheet 7)

LUBRICATION PROBLEMS



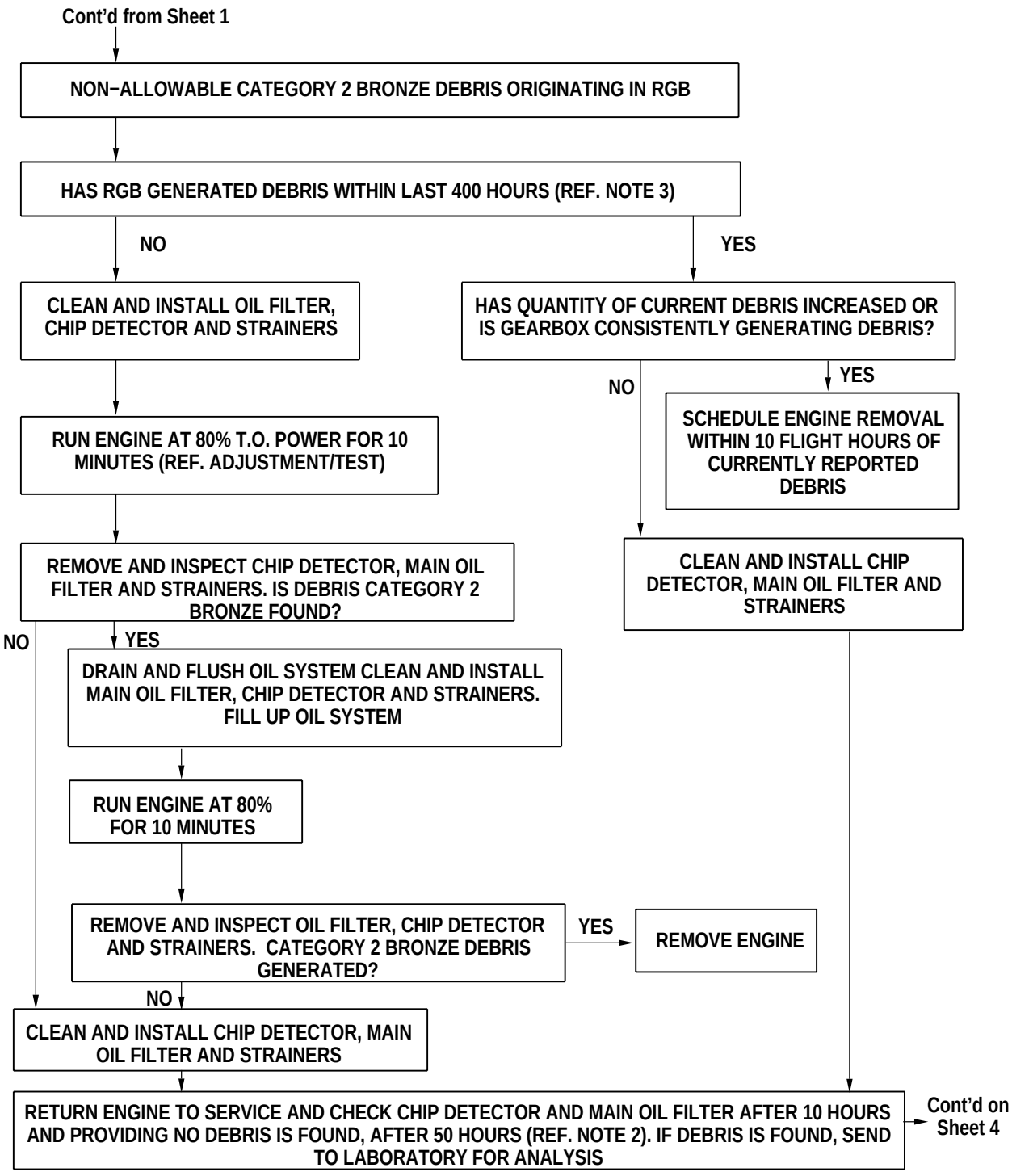
C29881

Engine Lubrication Fault Isolation Chart
Figure 104 (Sheet 8)

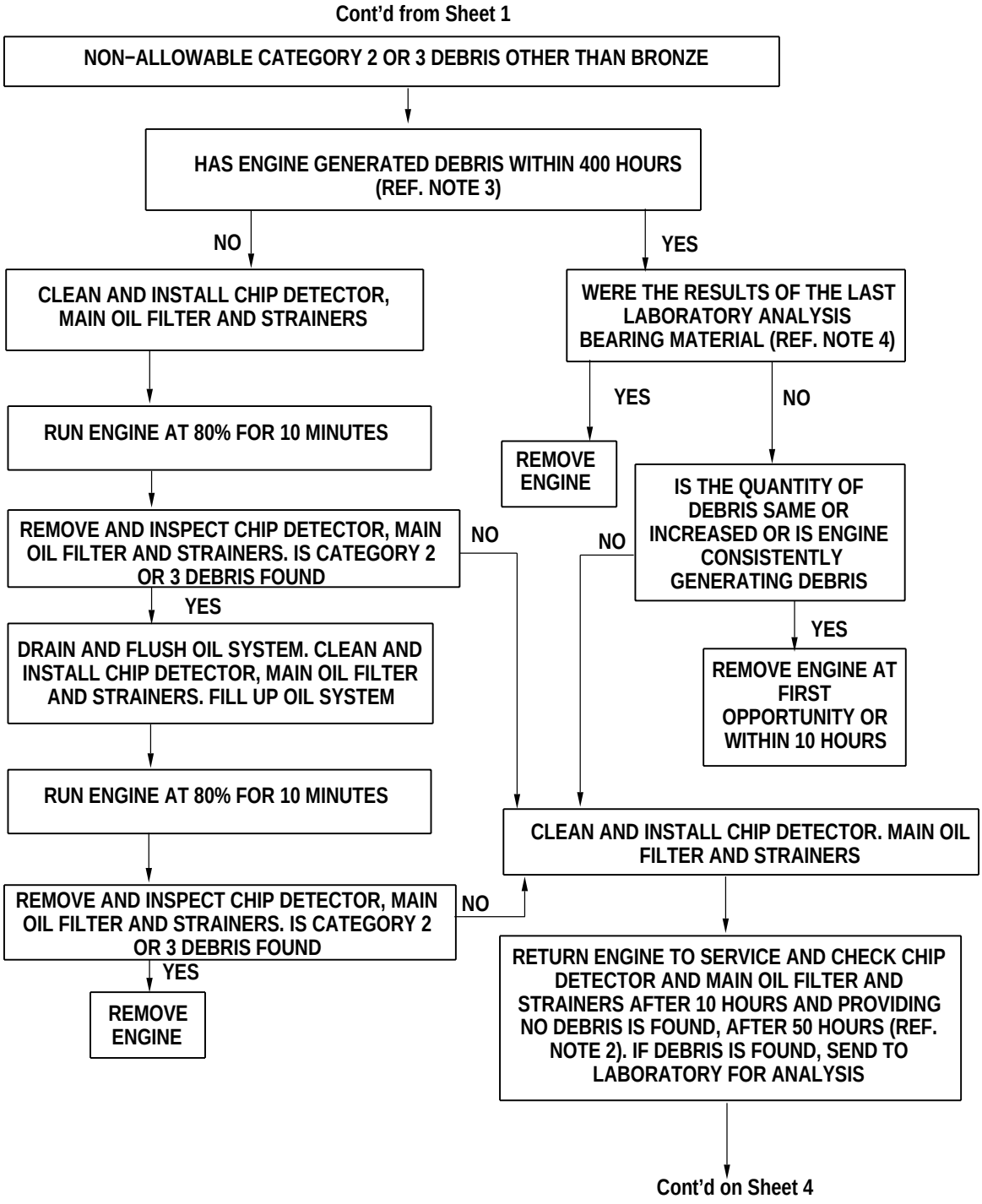


C23263C

Engine Lubricating Oil Contamination
Fault Isolation Chart
Figure 105 (Sheet 1 of 4)

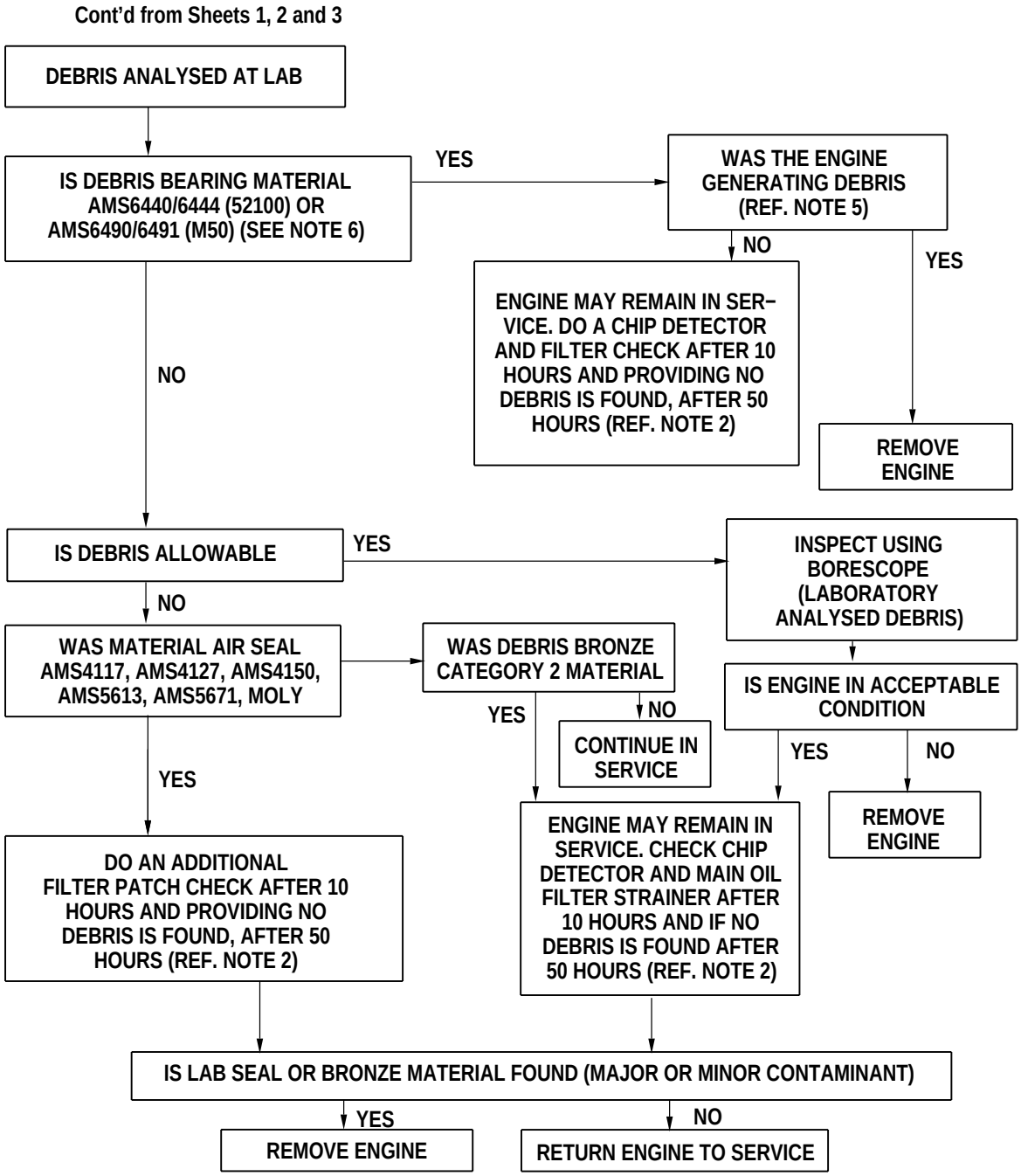


Engine Lubricating Oil Contamination
Fault Isolation Chart
Figure 105 (Sheet 2)



C36864B

Engine Lubricating Oil Contamination
Fault Isolation Chart
Figure 105 (Sheet 3)



C36865B

Engine Lubricating Oil Contamination
Fault Isolation Chart
Figure 105 (Sheet 4)

(2) The following NOTES are referred to in Figure 105:

NOTE: 1. Depending where the debris was found (i.e., strainer, main oil filter or chip detector) and the shape (i.e., tooth part, locking washer part etc.) a decision could be made concerning the removal of the affected module. Alternatively, remove engine.

NOTE: 2. If no debris is found at the 50-hour check, return the oil filter and chip detector inspections to operator's standard maintenance program intervals.

NOTE: 3. Results of previous laboratory analysis and origin of debris should be determined within 50 hours of original detection of debris.

NOTE: 4. Results of last sample must be known prior to continuing.

NOTE: 5. It should have already been determined that the engine and not RGB mounted accessories are generating the debris. If propeller governor or O/S governor failure occurred prior to original debris detection and the material could be identified as a propeller or O/S governor material then the engine may not be generating the debris.

NOTE: 6. Bearing inner and outer rings as well as rolling elements are made of steel AMS 6440/6444 (52100) or AMS 6490/6491 (M50). Bearing cages are made of steel AMS 6414/6415 (4340) or bronze AMS 4616, silver plated per AMS 2412. When only bearing cage material is generated (major or minor filter contaminant), this may indicate cage wear due to lack of lubrication and/or bearing damage causing rolling element instability.

ENGINE, TURBOPROP - MAINTENANCE PRACTICES

1. General

   DELETED.

2. Special Tools

   Information moved to TOOLS/FIX/EQUIP section.

3. Special Equipment

   Information moved to TOOLS/FIX/EQUIP section.

4. Consumable Materials

   Information moved to CONSUMABLE MATERIALS section.

5. Suppliers and Supplier Services

   Information moved to CONSUMABLE MATERIALS section.

ENGINE, TURBOPROP - SERVICING

1. General

   A. The following information and procedures are necessary for storage, preservation and depreservation of an engine or power section, and removal and installation in an appropriate fiberboard/reinforced fiberboard container, metal container or stand.

   CAUTION: TO AVOID POSSIBLE BEARING DAMAGE SUCH AS BRINELLING, THE USE OF A SHIPPING CONTAINER/SKID WITH SHOCK MOUNTS IS REQUIRED FOR ALL TRANSPORTATION OF AN ENGINE.

   NOTE: For engine installation in airframe, refer to REMOVAL/INSTALLATION.

2. Consumable Materials

   The consumable materials listed below are used in the following procedures.

Item No.	Name
PWC03-001	Oil, Engine Lubricating
PWC05-063	DELETED
PWC05-070	Tape, Pressure Sensitive
PWC05-077	Oil, Preservative
PWC06-012	Compound, Preservative
PWC09-003	Compound, Sealing

3. Special Tools

   The special tools listed below are used in the following procedures.

Tool No.	Name	Application
PWC30077	Puller	
PWC32420	Sling, Engine	Replaced by PWC51861
PWC51861	Sling, Engine	

4. Fixtures, Equipment and Supplier Tools

   Not Applicable

5. Lubricating Oil System

   A. Lubricating Oil

      The lubricating oils specified for use in PT6A turboprop engines are detailed in Pratt & Whitney Canada, (P&WC) Service Bulletin 1001 and will be revised periodically to include recently approved oils. All oils listed in the bulletin are for use in commercially operated engines, and are approved for flight operation.

In cases when oils approved by P&WC are not available and other oils have to be substituted, an operator must obtain prior approval or recommendations for use of such oil from:

Pratt & Whitney Canada Corp.
Att. Customer Support Services
1000 Marie-Victorin
Longueuil, Quebec
Canada J4G 1A1

B. Oil Level Check

To avoid overfilling of oil tank, and high oil consumption, an oil level check is recommended within 30 minutes after engine shutdown. Ideal interval is 15 to 20 minutes. If more than 30 minutes has passed, and the dipstick indicates that oil is needed, start the engine and run at ground-idle for five minutes, and recheck oil level as follows:

C. Procedure

(1) Unlock filler cap and dipstick from filler neck at 11 o'clock position on accessory gearbox and remove filler cap.

(2) Wipe the dipstick with clean lint free cloth.

CAUTION: WHEN THE FILLER CAP AND DIPSTICK/GAGE ASSEMBLY IS INSTALLED AND LOCKED, NO MOVEMENT IS ALLOWED.

(3) Install the cap/dipstick and lock.

(4) Remove the cap/dipstick.

CAUTION: DELETED.

(5) Check the oil tank contents against the markings on dipstick (markings correspond to U.S. quarts) and service as required.

NOTE: 1. Normal oil level is one U.S. quart (0.83 Imp. quart, 0.95 liter) below maximum level with engine in horizontal altitude.

NOTE: 2. Filling the oil to the maximum level may result in high consumption rate, with the oil exiting through the AGB breather. On some engines, this may also occur with the oil level at one or two US quarts below the maximum level. In such cases, operators are advised to service the oil to the level that results in acceptable consumption, down to 3 quarts below the maximum, if necessary. For engines with an oil sight gauge, keep the level within the green band. This practice is acceptable, due to the large usable oil quantity, and providing the oil level is monitored using the engine maintenance manual, making sure the consumption allowance and operation are within the recommended oil temperature and pressure.

(6) If oil level is too low to register on dipstick due to possible excessive consumption, or if low or fluctuating pressures have been recorded, refer to Fault Isolation, Engine Lubrication, for action to be taken, then proceed as follows:

(a) Fill oil tank to normal level and record quantity of oil added.

CAUTION: WHEN FILLER CAP ASSEMBLY IS INSTALLED AND LOCKED, NO MOVEMENT IS ALLOWED.

(b) Install filler cap/dipstick, make sure cap is locked.

(c) Run engine at ground-idle for approximately five minutes (Ref. 71-00-00, ADJUSTMENT/TEST).

(d) Check oil level (Ref. Steps (1) through (6) preceding).

(e) Check main oil filter (Ref. 79-20-02).

D. Oil Servicing (Ref. Fig. 301)

NOTE: For oil change recommendations, refer to SB1001.

(1) Oil System Draining

(a) Place large drip pan below engine and suitable oil container under each drain point.

(b) Remove lead from chip detector (3) (Ref. Aircraft Maintenance Manual).

(c) Remove drain plug (1) (Pre-SB1217) or chip detector (3) (Post-SB1217) from propeller reduction gearbox and discard preformed packings (Ref. 72-10-00).

(d) Remove drain plug from accessory gearbox and discard preformed packing (Ref. 72-60-00).

(e) Remove cotterpin (9) and flat head pin (6) from compressor inlet case. Extract drain plug (8) from inlet case with puller (PWC30077) and discard preformed packing.

NOTE: Refer to the Aircraft Maintenance Manual for procedure on draining airframe side of oil system.

(2) Oil System Filling

(a) Install preformed packing on drain plug (Pre-SB1217) or chip detector (Post-SB1217) and screw into propeller reduction gearbox. Torque plug or chip detector 45 to 55 lb.in. and safety wire (Ref. 72-10-00).

(b) Install preformed packing on drain plug and screw into accessory gearbox. Torque plug 200 to 225 lb.in. and safety wire (Ref. 72-60-00).

(c) Install preformed packing on oil tank drain plug. Press drain plug into inlet case. Fasten with flat head pin and lock with cotterpin.

(d) Refill oil tank with specified oil (Ref. SB1001).

NOTE: Refer to Subparagraph B. for checking oil tank levels

(e) Install filler cap and dipstick (Ref. 72-60-00, Removal/ Installation).

(f) Replace aircraft lead on chip detector, torque lead connector and lockwire (Ref. Aircraft Maintenance Manual).

E. Oil System Flushing

CAUTION: IF AN ENGINE IS TO BE OPERATED WITH AN OIL BRAND OR TYPE THAT DIFFERS FROM THAT ON WHICH IT PREVIOUSLY OPERATED, OR IF THE OIL SYSTEM HAS BEEN CONTAMINATED BY OTHER THAN METALLIC MATTER, THE SYSTEM MUST BE FLUSHED.

(1) Place suitable containers or drip pan under engine.

CAUTION: LIMIT ENGINE ROTATION TO THE MINIMUM TIME REQUIRED TO DO COMPLETE DRAINING. ALSO, OBSERVE STARTER OPERATING LIMITATIONS.

(2) With drains open, place the starting control lever to CUT-OFF and the IGNITION switch to OFF. Motor the engine with the starter only and allow the scavenge pumps to clear all lubricating oil.

(3) Reinstall all the drain plugs and chip detector (Ref. Subpara. D.).

(4) Refill the engine oil tank (Ref. Subpara. C.).

(5) Start the engine and run at idle speed (Ref. 71-00-00, ADJUSTMENT/TEST) for a minimum of two minutes.

(6) Feather the propeller.

(7) Shut down the engine (Ref. 71-00-00, ADJUSTMENT/TEST).

(8) Repeat steps (1) through (2), preceding.

(9) Remove the main oil filter and clean or replace with a new filter (Ref. 79-20-04), according to type. Reinstall the oil filter.

(10) Remove the reduction gearbox scavenge oil strainer and clean (Ref. 72-10-00). Reinstall the strainer.

(11) Reinstall all engine drain plugs and chip detector. Tighten and lockwire (Ref. Subpara. D.).

(12) Repeat steps (4) through (7), preceding.

(13) Check the oil level and replenish, as necessary (Ref. Subpara. C.).

CAUTION: WHEN THE FILLER CAP AND DIPSTICK/GAGE ASSEMBLY IS INSTALLED AND LOCKED INTO POSITION, NO MOVEMENT IS ALLOWED.

(14) Install the filler cap and dipstick/gage assembly in filler tube. Make sure the cap is correctly installed and locked securely.

F. Procedure After Oil System Flushing

CAUTION: DIFFERENT FORMULATIONS OF VARIOUS OIL BRANDS MAY HAVE DIFFERENT DETERGENT ACTION. AFTER AN OIL BRAND CHANGE, THIS MAY CAUSE RELEASE OF CARBON PARTICLES INTO THE OIL SYSTEM RESULTING IN BLOCKAGE OF THE SCAVENGE SCREEN.

(1) After a change of oil brand, the main oil filter should be inspected for carbon particles at 10 hour intervals up to a total of 50 hours (5 inspections) and at routine oil filter checks thereafter, up to 500 hours.

(2) When carbon in excess of normal amount is noted:

(a) Place a suitable drip pan under the accessory gearbox or engine.

(b) Remove the oil drain plug from the 6 o'clock position on the accessory gearbox rear housing.

(c) Inspect the scavenge pump screen through the drain hole using a suitable mirror and light.

(d) If carbon is present, attempt to remove using a small stiff brush.

(e) Flush out any particles of removed carbon.

(f) If carbon cannot be removed by this method, remove the accessory gearbox (Ref. 72-60-00) and clean the screen.

6. Preservation and Depreservation

A. General

Preservation of engines in service depends on the period of inactivity and whether or not the engine may be rotated during the inactive period. An engine is considered inactive when it has not been operated either on the ground, or in flight for a minimum of ten minutes after the oil temperature has stabilized. The expected period of inactivity should be established and reference made to the Engine Preservation Procedures following (Ref. Para. C.).

The preservation done should be recorded in the engine log book and on tags fastened to the engine.

For an engine inactive in a severe environment such as extreme temperature changes, high humidity, dusty, polluted or salt laden atmosphere, it is recommended that the engine be preserved to the next higher schedule or the engine started and run more frequently, for a minimum of ten minutes each time.

If an engine has been preserved for a certain schedule (91 days to 1 year), and now the engine will be inactive for a longer period of time (more than 1 year), the engine should be depreserved, inspected and tested according to the 91 days to 1 year depreserving instructions. Then, remove the engine, preserve according to schedule and store in an engine container.

B. Fuel Control Unit Preservation and Depreservation

(1) Preservation of a fuel control unit depends on the period of inactivity and whether or not the FCU is operated during the inactive period.

(a) A FCU is considered active if an engine is involved in normal flight operations or if an engine is wet motored or run during preservation periods.

(b) A FCU is not considered active if an engine is not wet motored or run during aircraft inactive periods.

(2) For fuel control units that remain on inactive engines in long term container storage (off wing), the time accumulated in the container begins at the time of packaging.

(3) For units that have been removed from the engine and are in storage three years or more, refer to 73-20-00, Maintenance Practice, Storage, Three Year Requirement.

(4) For units that have been removed from the engine and are in storage more than six years, refer to 73-20-00, Maintenance Practice, Storage, Six Year Requirement.

(5) For units on engines that are inactive for more than six months and that are not preserved, refer to 73-20-00, Maintenance Practice, Storage, Six Year Requirement.

C. Engine Preservation

CAUTION: DO NOT SPRAY PRESERVATIVE OIL INTO COMPRESSOR OR EXHAUST PORTS OF ENGINES. DIRT PARTICLES DEPOSITED ON BLADES AND VANES COULD ADHERE AND ALTER AIRFOIL SHAPE, ADVERSELY AFFECTIVE COMPRESSOR EFFICIENCY.

(1) Engines inactive 0 to 7 days.

(a) If the engine was operated in a salt laden environment, do a compressor and turbine desalination wash.

(b) Engine may remain inactive with no preservation protection provided engine is sheltered, humidity is not excessively high and there is not extreme temperature changes that may produce condensation.

(c) Install inlet and exhaust covers.

(2) Engines inactive 8 to 28 days.

(a) Do 0 to 7 days procedures.

(b) Place desiccant bags and humidity indicator on wooden racks in engine exhaust duct only.

(c) Seal off all engine openings. Make sure exhaust cover has suitable window to monitor humidity indicators.

(d) Check relative humidity every two weeks if engine is stored outside, and every 28 days if engine is stored inside. Relative humidity should be maintained at 40%. If humidity indicator turns pink, replace desiccant bags and indicator.

(3) Engines inactive 29 to 90 days.

(a) Do 0 to 7 days, and 8 to 28 days procedures.

(b) Wash engine externally.

(c) Do a compressor performance recovery/desalination wash and a turbine rinse (Ref. 71-00-00, CLEANING).

(d) Examine all engine external protective coating, and touch-up/repair as necessary.

(e) Lubricate all linkages.

(f) Place a suitable container under the engine.

(g) Disconnect fuel inlet to oil-to-fuel heater and connect suitable oil supply line to oil-to-fuel heater fuel inlet. Blank off disconnected fuel supply line.

(h) Disconnect fuel line at flow divider and dump valve (PT6A-21) or from inlet of manifold adapter (PT6A-27 and PT6A-28) to prevent preservation oil from entering fuel manifold. Blank off elbow on adapter or valve, as applicable.

CAUTION: UNDER NO CIRCUMSTANCES PERMIT PRESERVATIVE OIL TO ENTER ENGINE WHERE IT MAY COME INTO CONTACT WITH THERMOCOUPLE PROBE ASSEMBLY. OIL CONTAMINATION OF PROBES MAY CAUSE COMPLETE FAILURE OF THERMOCOUPLE SYSTEM.

(i) Supply preserving oil (PWC05-077) at 5 to 25 psig at least 16°C (60°F) to fuel supply line on oil-to-fuel heater.

CAUTION: OBSERVE STARTER MOTOR OPERATING LIMITS (REF. STARTER MANUFACTURER'S MANUAL).

(j) With ignition system OFF, fuel condition lever to GROUND-IDLE and power control lever to TAKE-OFF, carry out normal motoring run until all preservative oil is displaced. During motoring run, move power control lever from TAKE-OFF to GROUND-IDLE and back to TAKE-OFF and fuel condition lever from GROUND-IDLE to OFF and back to GROUND-IDLE to displace fuel from system.

(k) After motoring run, check to see if preservative oil is coming from opened fuel line. If not, repeat motoring cycle until preservative oil flows from opened fuel line.

(l) Return power control lever to GROUND-IDLE and fuel condition lever to OFF. Reconnect fuel supply to oil-to-fuel heater and fuel line to flow divider inlet.

(m) Install caps, covers and plugs as necessary to prevent entry of foreign material and accumulation of moisture .

(4) Engines inactive for periods exceeding 90 days.

(a) Do 0 to 7, 8 to 28 and 29 to 90 days procedures.

CAUTION: OBSERVE STARTER MOTOR OPERATING LIMITS (REF. STARTER MANUFACTURER'S MANUAL).

(b) Close normal fuel supply shutoff valve and motor engine with starter until oil pressure and Ng are indicated. Disengage starter.

(c) Place suitable container under the engine.

(d) Drain engine oil.

(e) With drains open, motor engine (Ref. 71-00-00, ADJUSTMENT/TEST) to permit scavenge pumps to clear engine, indicated by cessation of steady stream of oil from drains. To prevent excessive operation with limited lubrication, limit rotation to shortest possible time to do complete draining.

(f) Remove oil filter element (Ref. 79-20-02) and allow to drain.

(g) Let oil to drain to a slow drip, approximately one drip per half hour, then install oil filter and close drains.

(h) Remove covers from accessory drive pads and spray exposed surfaces and gearshafts with engine oil (PWC03-001). Replace cover plates.

CAUTION: COMPOUND MUST NOT TO BE APPLIED TO ANY BOLT THREADS USED TO RETAIN ACCESSORIES. THESE THREADS MUST BE COATED WITH REGULAR ENGINE OIL AS REQUIRED BY NORMAL TIGHTENING PROCEDURES. UNDER NO CIRCUMSTANCES MUST THE COMPOUND BE USED IN, OR PERMITTED TO ENTER ANY AREA WHERE IT COULD CONTAMINATE THE ENGINE LUBRICATION SYSTEM.

(i) Coat all external flanges, bolts, and studs with compound (PWC09-003). In particular, pay special attention to the RGB and compressor inlet case flanges.

(j) Install caps, covers and plugs, as necessary to prevent entry of foreign material and accumulation of moisture .

(k) Tag oil filler cap with date of preservation and enter date and type of preservation in engine log book.

(l) Install humidity indicator in air inlet and exhaust of engine compartment. Cover with suitable airtight moisture barrier. Provide inspection windows at each end for observation of humidity indicators.

NOTE: Inspection of a preserved unit should be carried out every two weeks if aircraft is stored outside, or every 30 days if aircraft is stored inside. If relative humidity, as indicated on humidity indicator, is less than 40 percent, no further action is required. If humidity indicated exceeds 40 percent, desiccant bags must be replaced or reactivated (Ref. Para. 7. D.).

(5) Engines inactive for periods exceeding one year:

(a) Do 0 to 7, 8 to 28, 29 to 90, and 91 days and over procedures.

(b) Remove the engine, and store in storage container.

(6) Fuel System Preservation

(a) Fuel supply and ignition switches OFF.

(b) Place a suitable container under the engine.

(c) Disconnect fuel inlet line at oil-to-fuel heater and blank off line.

CAUTION: THE FOLLOWING EQUIPMENT MUST BE SUPPLIED WITH A SUITABLE FILTER NO COARSER THAN 10-MICRON RATING, TO PREVENT FOREIGN MATERIAL FROM BEING DRAWN INTO ENGINE FUEL SYSTEM.

(d) Connect suitable oil supply line to oil-to-fuel heater fuel inlet.

(e) Disconnect fuel line from inlet manifold adapter (PT6A-27 and PT6A-28) (Ref. 73-10-04) or flow divider and dump valve (PT6A-21). Blank off elbow on adapter or valve, as applicable.

CAUTION: DO NOT ALLOW PRESERVATIVE OIL TO ENTER ENGINE WHERE IT MAY COME IN CONTACT WITH THERMOCOUPLE PROBES. OIL CONTAMINATION OF PROBES MAY CAUSE COMPLETE FAILURE OF THERMOCOUPLE SYSTEM.

(f) Connect a supply of preservative oil (PWC05-077) at 5 to 25 psig, 16 °C (60 °F) to fuel supply line on oil-to-fuel heater (Ref. Step (d) preceding).

CAUTION: TO PREVENT EXCESSIVE OPERATION WITH LIMITED LUBRICATION, MAINTAIN MOTORING TO THE SHORTEST POSSIBLE TIME. OBSERVE STARTER MOTOR OPERATING LIMITS (REF. TO STARTER MANUFACTURER'S MANUAL).

(g) Motor engine with starter and advance Condition Lever (PT6A-21) or Starting Flow Control Lever (PT6A-27 and PT6A-28) to OPEN and Power Lever to IDLE.

(h) After motoring run, return levers to the OFF or CLOSED position.

(i) If no oil is flowing from open fuel line, refer to starter manufacturer's manual for time interval before repeating procedure.

(j) Remove blanking plug from fuel line, and oil supply line from oil-to-fuel heater fuel inlet. Connect fuel supply line to oil-to-fuel heater. Torque coupling nut (Ref. Airframe Manufacturer's Maintenance Manual) and lockwire.

(k) Remove blanking cap from flow divider and dump valve elbow (PT6A-21) or from inlet manifold adapter (PT6A-27 and PT6A-28) and connect fuel line. Torque coupling nut 90 to 100 lb.in. and lockwire.

(l) Complete preservation.

(7) Oil System Preservation

(a) Make sure fuel supply and ignition are OFF.

CAUTION: TO PREVENT EXCESSIVE OPERATION WITH LIMITED LUBRICATION, MAINTAIN MOTORING TO SHORTEST POSSIBLE TIME. OBSERVE STARTER MOTOR OPERATING LIMITS (REF. STARTER MANUFACTURER'S MANUAL).

(b) Motor engine until oil pressure and compressor speed (Ng) is indicated; stop motoring.

(c) Place large drip pan below engine and suitable oil container under each drain point.

(d) Remove lead from chip detector (Ref. Aircraft Maintenance Manual).

(e) Remove drain plug (1, Fig. 301, Pre-SB1217) or chip detector (3, Post-SB1217) from propeller reduction gearbox and discard preformed packings (2) and (4).

(f) Remove drain plug (10) from accessory gearbox and discard preformed packing (11).

(g) Remove cotterpin (9) and flat head pin (6) from compressor inlet case; extract drain plug (8) from inlet case with puller (PWC30077) and discard preformed packing (7).

(h) Motor engine to allow scavenge pumps to clear oil, this will be indicated by slowing down, then stopping of the steady stream of oil from each drain point; stop motoring.

(i) Remove oil tank filter element from inlet case (Ref. 79-20-04,MAINTENANCE PRACTICES).

(j) Allow oil to drain for one-half hour, then reinstall filter (Ref. 79-20-04, MAINTENANCE PRACTICES).

(k) Install new preformed packing (2) on drain plug (1, Fig. 301, Pre-SB1217) or new preformed packings (2 and 4) on chip detector (3, Post-SB1217) and install in propeller reduction gearbox.

(l) Install new preformed packing (11) on drain plug (10) and install in accessory gearbox.

(m) Install new preformed packing (7) on drain plug (8) and install in compressor inlet case. Install flat head pin (6) and cotterpin (9).

D. Engine Depreservation

CAUTION: UNDER NO CIRCUMSTANCES PERMIT PRESERVATIVE OIL TO ENTER ENGINE WHERE IT MAY COME INTO CONTACT WITH THERMOCOUPLE PROBE ASSEMBLY. OIL CONTAMINATION OF PROBES MAY CAUSE COMPLETE FAILURE OF INDICATING SYSTEM.

(1) 0 to 7 days:

(a) No depreservation required. Remove covers from inlet and exhaust and check for obstructions.

(2) 8 to 28 days:

(a) Remove desiccant bags, humidity indicator and moisture barrier.

(b) Make sure previously sealed engine openings are reopened and are unobstructed.

(3) 29 to 90 days:

(a) Remove engine intake and exhaust covers, moisture barriers, desiccant bags and humidity indicators. Depreserve engine fuel system.

(4) 91 days to one year:

(a) Remove all moisture barriers, desiccant bags and humidity indicators.

(b) Open previously sealed openings.

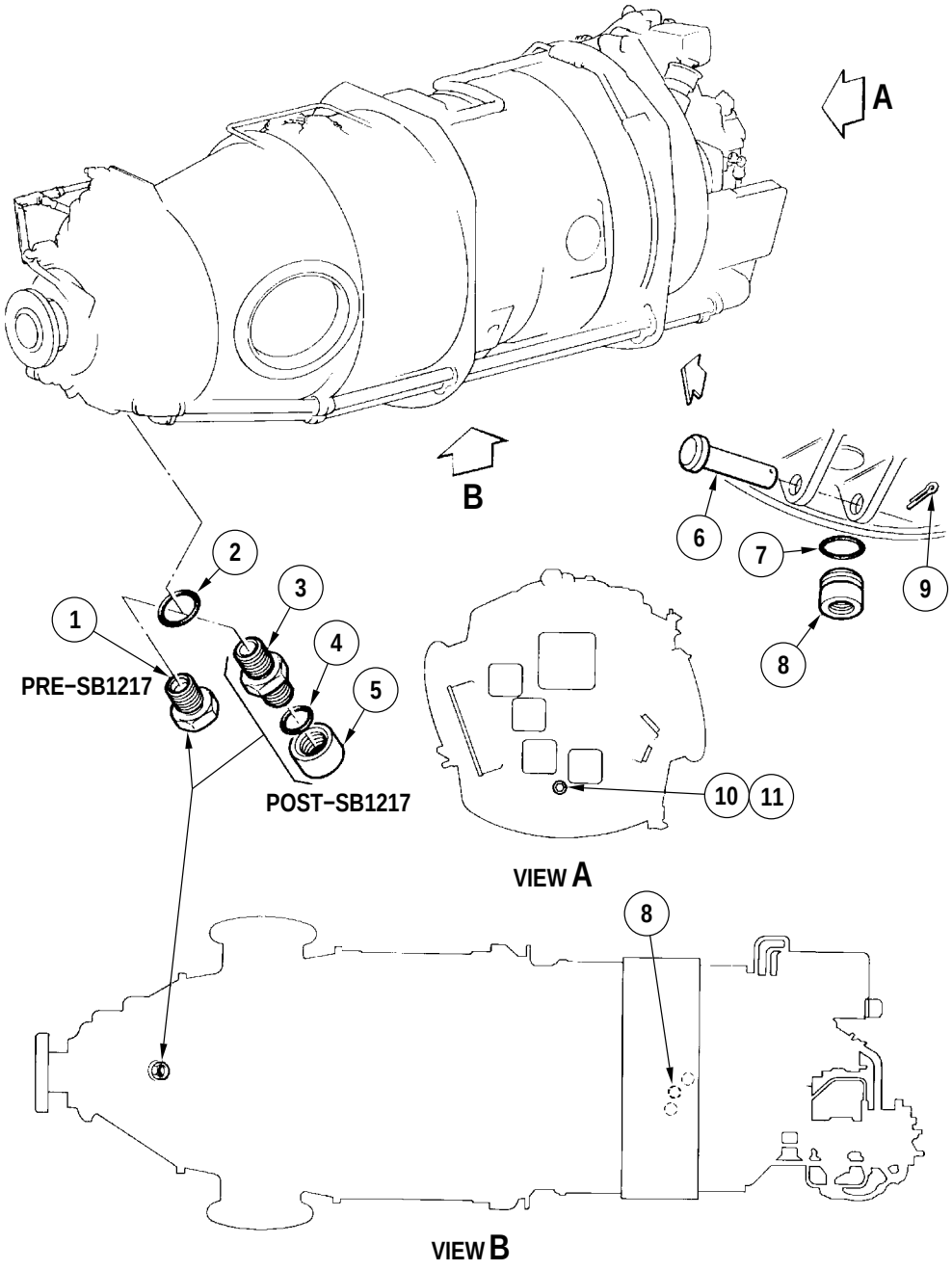
(c) Check for any obstructions

(d) Inspect all external engine cases, flanges, accessories and hardware for evidence of corrosion.

(e) Remove the compressor inlet screen and inspect the inlet case and visible flanges internally for evidence of corrosion. If corrosion is found, inspect the accessory gearbox and the reduction gearbox internally for corrosion with a borescope.

(f) If corrosion is outside limits, remove the engine and overhaul for inspection after storage. Slowly rotate the propeller by hand and check for any stiffness, audible scraping, binding or rubbing.

(g) Service the engine oil system (Ref. Para. 5.).



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Location of Oil Drain Plugs
Figure 301

Key to Figure 301

1. Propeller Reduction Gearbox Drain Plug (Pre-SB1217)
2. Preformed Packing
3. Chip Detector (Post-SB1217)
4. Preformed Packing (used for storage and shipping)
5. Cover (Post-SB1217) (used for storage and shipping)
6. Flat Head Pin
7. Preformed Packing
8. Oil Tank Drain Plug
9. Cotterpin
10. Accessory Gearbox Drain Plug
11. Preformed Packing

(h) Depreserve the fuel system (Ref. Para. 6.E.).

NOTE: During motoring, check for stiffness, audible scraping, binding or rubbing.

(i) After the engine run, inspect all gas generator and exhaust case drain valves for presence of oil. If oil is evident, overhaul the engine for inspection after storage.

(j) Inspect all fuel filters. Clean or replace as necessary.

(k) Inspect the oil filter, reduction gearbox strainer and chip detector(s) for contamination. If contamination is evident, and the engine has no previous recent contamination history, remove and overhaul the engine. Otherwise refer to Chapter 79-20-04.

(5) One year and over:

(a) Engine must be completely depreserved and lubrication system serviced.

E. Fuel System Depreservation

(1) Overhauled engines and fuel control units are subjected to preservation procedure to protect them during shipping and storage. When the engine is installed in the aircraft, or the fuel control unit installed on the engine, the fuel system is depreserved:

(a) Disconnect fuel lines from inlet manifold adapter (PT6A-27 and PT6A-28) or flow divider and dump valve (PT6A-21). Blank off elbow on adapter or valve, as applicable.

(b) Place FCU Condition Lever (PT6A-21) or Starting Flow Control Lever (PT6A-27 and PT6A-28 engines) to OFF or CLOSED.

(c) Fuel ON.

(d) Boost pump ON.

(e) Fuel pressure 5 psig minimum.

(f) Power Control Lever CLOSED.

(g) Ignition OFF.

CAUTION: MAINTAIN MOTORING PERIOD TO SHORTEST POSSIBLE TIME. OBSERVE STARTER MOTOR OPERATING LIMITS (REFER TO AIRCRAFT OR STARTER MANUFACTURER'S MANUAL).

CAUTION: DO NOT ALLOW PRESERVATIVE OIL TO CONTACT THERMOCOUPLE PROBES. OIL CONTAMINATION OF PROBES MAY CAUSE COMPLETE FAILURE OF INDICATING SYSTEM.

(h) Motor engine with starter and advance Condition Lever or Starting Flow Control Lever to OPEN position and Power Lever to IDLE.

(i) When clean fuel, free of oil flows from open line, return power lever to OFF or CLOSED, and stop motoring.

(j) Remove blanking cap from elbow and connect fuel lines. Torque line coupling nut 90 to 100 lb.in. and lockwire.

(k) Fuel OFF, boost pump OFF.

7. Storage and Shipping

A. General

CAUTION: TO AVOID POSSIBLE BEARING DAMAGE SUCH AS BRINELLING, USE OF A SHIPPING CONTAINER/SKID WITH SHOCK MOUNTS IS REQUIRED FOR ALL TRANSPORTATION.

The following information and procedures are necessary for storage, preservation and depreservation of an engine . Refer to Removal/Installation for engine installation in the airframe.

NOTE: For engine installation in airframe, refer to REMOVAL/INSTALLATION.

B. Shipping Container

The shipping container is constructed of fiberboard, and comprises a wooden skid base, to which is fastened a metal cradle, with a fiberboard inner and outer sleeve forming the sides of the containers, and a fiberboard cover. Plywood sheeting provides additional support to the container sides and cover. The base, plywood supports, cradle and associated hardware are reusable; the fiberboard sleeve and cover are disposable. The container is intended for shipment in a closed conveyance on the North American continent, or overseas shipment by air and is not intended for shipment by sea. To avoid possible bearing damage such as brinnelling, use of shipping container/skid with shock mounts is required for all transportation.

The fiberboard container is weather resistant only and should not be exposed to climatic conditions for more than seven days and must not be used for outdoor storage. It also offers protection against corrosion for a period of up to six months, provided that the container is correctly sealed and sheltered indoors in relatively dry areas and the color of humidity indicator is monitored every 15 days (Ref. Subpara. D.).

For fiberboard and reinforce fiberboard engine shipping container data, refer to Table 301, and Figs. 303 and 304.

TABLE 301, Fiberboard and Reinforced Fiberboard Engine Shipping Container Data

Description	Fiberboard Container Data	Reinforced Fiberboard Container Data
Length	69 in. (1752 mm)	71 in. (1803 mm)
Width	27 in. (686 mm)	35.4 in. (899 mm)
Height	30 in. (762 mm)	37 in. (940 mm)
Weight Empty (approximate)	280 lb. (127 kg)	332 lb. (150.6 kg)

C. Humidity Control

Twelve bags of desiccant material are placed in the protective envelope to maintain internal humidity at a safe level for storage. Each desiccant bag contains eight one-ounce units.

A humidity indicator is installed within the protective envelope and is visible through a window in the fiberboard casing. The moisture level can thus be checked without disturbing the container or its contents.

At a safe humidity level (up to 40 percent relative humidity) the indicator color is blue. As humidity increases the color gradually changes to pink. An all pink color indicates that an unsafe moisture condition has been reached; the desiccant must then be replaced with freshly activated bags (Ref. Subpara. D. following).

D. Reactivation of Desiccant and Humidity Indicator

(1) Place bags of desiccant (Ref. IPC) and humidity indicator in a suitable oven controlled at 121°C (250°F). The humidity indicator may be removed when an all blue color has been attained. The desiccant bags should remain in the oven for two hours minimum.

(2) Allow the oven to cool to room temperature (approximately 22°C (72°F)), and then remove the bags and indicator.

(3) Immediately place the desiccant bags in airtight polyethylene envelopes. Exclude all air and heat seal envelopes.

NOTE: Desiccant bags must be removed from the polyethylene envelopes prior to installation in the shipping/storage container.

E. Precautions

(1) Before an engine is to be removed from or installed in a fiberboard shipping container, observe the following precautions:

(a) Make sure a hoist of sufficient lifting capacity, plus safety factor, is available to lift loads as follows:

1 A load of 350 lbs. (159 kg) when lifting the engine only.

2 A load of 800 lb. (363 kg) when lifting the engine loaded in a fiberboard container.

3 A load of 860 lb. (400 kg) when lifting the engine loaded in a reinforced fiberboard container.

(b) Place the container or engine correctly on floor, directly beneath the hoist.

(c) Allow free overhead space of at least 6 feet (2 meters), exclusive of distance from the top of the container or engine to the hook.

F. Metal Storage and Shipping Container

The metal storage and shipping container is of steel construction, manufactured in two halves and joined at the horizontal centerline with a gasket between upper and lower halves to form a hermetic seal. The container is reusable and may be used for long term indoor and outdoor storage, provided humidity within is frequently checked, desiccant replenished as required and the engine preserved in accordance with the applicable preservation schedule.

The metal container is pressurized through an air fill valve located in the service receptacle, to maintain the pressure within the container at or above ambient pressure. The service receptacle can be removed (Ref. Fig. 302) to provide access to the desiccant cage to facilitate desiccant replenishment. A cylindrical receptacle, located adjacent to the service receptacle, is provided for storage of the engine log book, shipping instructions and other documents.

For metal storage and shipping container data, refer to Table 302.

TABLE 302, Metal Storage and Shipping Container Data

DESCRIPTION	DATA
Length	79 in. (2007 mm)
Width	34 in. (864 mm)
Height	38 in. (965 mm)
Weight	400 lb. (181.4 kg)
Pressure Tested at	10 psig
Material Specification (Skin)	SAE 1010-1020
Paint Primer (One Coat as per)	TT-P-636 or TT-P-664
Paint (Two Coats Enamel as per)	MIL-E-7729

G. Humidity and Pressure Control (Ref. Table 303)

To maintain humidity within the metal container at a safe level for storage, twelve bags of desiccant are tied to the engine, evenly placed over the engine length, 6 on each side. Each desiccant bag contains eight one-ounce units.

A humidity indicator is installed in the service end of the cover, enabling the humidity level to be checked without disturbing the cover. Two viewing windows are provided adjacent to the humidity indicator.

A drain plug is located in the container base just below the service receptacle cover.

At a safe humidity level (up to 40 percent humidity), indicator color is blue. As humidity increases, the color gradually changes to pink. An all pink color indicates that an unsafe humidity level exists. Replace the desiccant bags with freshly activated bags (Ref. Subpara. 7. D.). Retain the desiccant bags for reactivation.

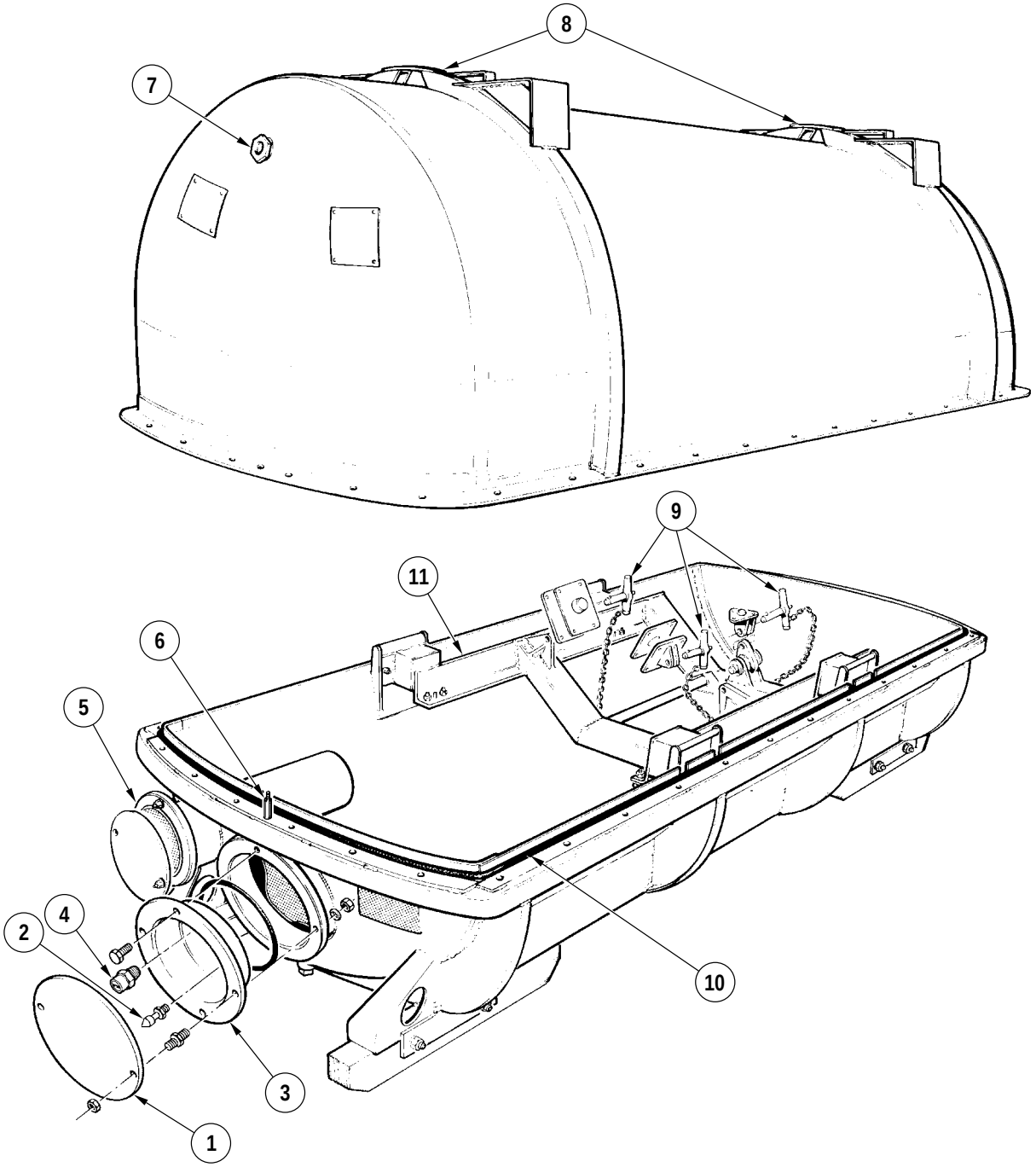
TABLE 303, Temperature/Pressure Gradient

Description	Data							
Ambient Temperature	-28.9°C (-20°F)	-23.3°C (-10°F)	-17.8°C (0°F)	-6.7°C (20°F)	4.4°C (40°F)	15.6°C (60°F)	26.7°C (80°F)	37.8°C (100°F)
Required psi gage pressure	2.000	2.375	2.750	3.500	4.250	5.000	5.750	6.500
NOTE: Five psig is established at a standard working temperature of 15.6°C (60°F).								

H. Precautions

(1) Before an engine is removed from or installed in a metal container, observe the following precautions:

(a) Before removing an engine from a metal container, loosen relief valve (4, Fig. 302) in the service receptacle to relieve the pressure inside container.



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Metal Storage and Shipping Container Components
Figure 302

Key to Figure 302

1. Service Receptacle Cover
2. Air Fill Valve
3. Service Receptacle
4. Pressure Relief Valve
5. Record Receptacle
6. Container Locating Pin
7. Humidity Indicator
8. Container Lifting Points
9. Quick-release Pins
10. Container Gasket
11. Mounting Cradle

(b) Make sure a hoist of sufficient lifting capacity, plus safety factor, is available to lift loads as follows:

1 A load of 350 lbs. (159 kg) when lifting the engine only.

2 A load of 800 lb. (363 kg) when lifting the engine loaded in a metal container.

(c) Position the container or engine correctly on the floor, directly beneath the hoist.

(d) Allow free overhead space of at least six feet (two meters) exclusive of the distance from top of the container or engine to the hook.

I. Engine Storage in Metal Container (Ref. Fig. 302 and Table 304)

TABLE 304, Preservation Schedule for Engine in Metal Container

CONTAINER INTERNAL PRESSURE (psi)	CONTAINER INTERNAL RELATIVE HUMIDITY (%)	ACTION REQUIRED
Normal for prevailing ambient temperature in Table	Below 20 (Indicator all blue)	No action required.
Less than normal for prevailing ambient temperature in Table	Below 20	Repressurize container (Ref. Para. F.). If pressure has dropped after lapse of seven days, remove engine (Ref. Para. E.), and reinstall in a serviceable container (Ref. Para. F.).
	20 to 40 (Indicator partially pink)	Replace desiccant. Repressurize container and check for leakage using a soapy water solution.

TABLE 304, Preservation Schedule for Engine in Metal Container (Cont'd)

CONTAINER INTERNAL PRESSURE (psi)	CONTAINER INTERNAL RELATIVE HUMIDITY (%)	ACTION REQUIRED
	Above 40 (Indicator all pink)	Remover engine from container (Ref. Para. E.). Inspect for corrosion; if condition is satisfactory, reinstall unit with shipping covers, freshly activated desiccant and repressurize container. Check for leakage using soapy water solution. If necessary, rectify faulty container and repeat leakage check. If severe corrosion is present, engine should be shipped to an overhaul facility.

(1) Check the color of humidity indicator at least once every 30 days, dependent upon ambient relative humidity. If humidity indicator color is turning to pink, continue inspection (Refer to Schedule, Table 304).

(2) Remove two nuts, washers and bolts securing the service the receptacle cover (1) to the container base. Remove the cover.

(3) Loosen the air fill valve (2) to depressurize the container.

(4) Remove two lockwashers and nuts securing the service receptacle (3) to the container base. Remove the service receptacle and discard the preformed packing.

(5) Remove eight desiccant bags from the cage using the service receptacle port and retain for reactivation (Ref. Subpara. 7. D.) and reuse. Install eight freshly activated desiccant bags of the same size (8 units per bag) in desiccant cage.

(6) Install a new preformed packing on the service receptacle and insert the receptacle in the port in the container base. Secure the receptacle to the container with two lockwashers and nuts.

(7) Install the service receptacle cover and secure the cover with two bolts, lockwashers and nuts.

(8) Reuse of the humidity indicator should be satisfactory since the color of element is reversible. Replace only if necessary and retain pink indicator for reactivation (Ref. Subpara. 7. D.).

J. Stacking Containers for Storage

(1) Instructions outlined in Table 305 must be followed when stacking empty containers or containers with engines.

TABLE 305, Stacking Limitations - Engine/Power Section
Shipping Container

METAL CONTAINER		FIBERBOARD CONTAINER	
Engine in Container Three high max.	Make sure that containers are sound and in undamaged condition.	Engine in container Two high Max. (Static Storage) One high Max. (Shipping/ Transporting)	Replace used sleeve with new sleeve and cover.
Empty Container Four high Max.	Only static (no impact) and superimposed stacking recommended. Avoid dropping containers over each other.	Empty container Four high Max.	Make sure the wooden side stiffeners (where fitted) are sound and undamaged. Only static (no impact) and superimposed stacking is recommended. Avoid dropping containers over each other.

8. Removal/Installation of Engine from/in Fiberboard Container

CAUTION: IF THE ENGINE IS DROPPED, IN THE CONTAINER OR OTHERWISE, RETURN THE ENGINE TO AN OVERHAUL FACILITY FOR LIGHT OVERHAUL. INDICATE ‘‘DROPPED ENGINE’’.

A. Removal

(1) Remove strapping (3) from the fiberboard container. Retain the reinforcing corners (2). Remove the cover (1) and sleeve (5) from the base (14).

(2) Cut the protective envelope (7) and expose the top of the engine.

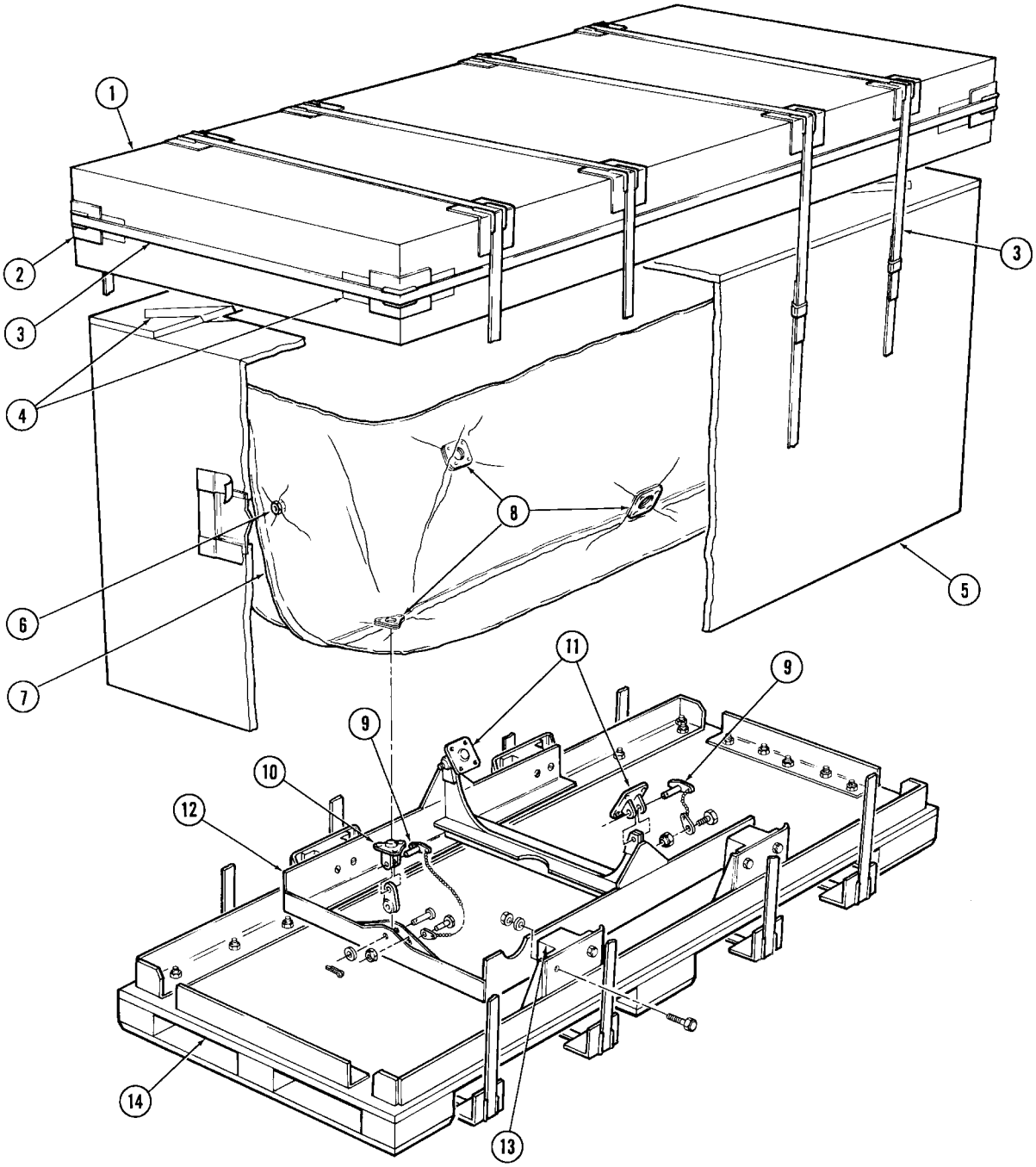
CAUTION: NEVER USE THE SLING AND LIFTING BRACKETS TO LIFT THE ENGINE ATTACHED TO THE SKID BASE.

(3) Install the sling on hoist; adjust the sling lifting eye for horizontal lift.

(4) Attach the sling to the engine lifting brackets at flanges A and G.

(5) Take the engine weight on the sling; remove the quick-release pins (9) securing engine to the cradle (12).

(6) Maintain the engine in a horizontal position and raise until clear of the cradle. Remove the engine front mount brackets (11) and rear mount bracket (10), together with the associated hardware, from the engine.



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Engine Shipping Container
Figure 303

Key to Figure 303

1. Cover
2. Reinforcing Corners
3. Strap
4. Pressure-sensitive Tape
5. Sleeve
6. Humidity Indicator
7. Protective Envelope
8. Gaskets
9. Quick-release Pin
10. Rear Mount Bracket
11. Front Mount Bracket
12. Cradle
13. Shear Mount
14. Skid Base

(7) Replace the engine front mount brackets (11) and engine rear mount bracket (10) on the cradle and secure with engine mount pins (9).

NOTE: Retain all other hardware in a bag and secure to the cradle for reuse.

(8) Remove the ignition exciter, if applicable, complete in protective envelope from cradle and retain with the engine.

(9) Remove 12 desiccant bags from the engine and retain for reactivation and reuse (Ref. Subpara. 7. D.).

NOTE: Retain a desiccant bag in the ignition exciter protective envelope until the unit is required for use. When the unit is removed, the desiccant bag should be reactivated for reuse.

(10) Remove the envelopes containing shipping data and the engine log book from the box glued to the skid base.

(11) Remove all shipping caps, plugs, covers and the T5 trim lead tiedown strap from the engine .

(12) Retain moisture barrier/protective wrapping on the engine air inlet screen until the engine is installed in the airframe.

B. Installation (Ref. Fig. 303)

CAUTION: MAKE SURE OIL HAS BEEN COMPLETELY DRAINED FROM THE ENGINE.

(1) With the engine mounted in the stand (Ref. Para. 9.) and the engine preservation procedure implemented (Ref. Para. 6. C.), fit all blanking plates, plugs, caps and the T5 trim lead tiedown strap (Ref. IPC).

(2) Position moisture barrier/protective cover on air-inlet screen with pressure-sensitive tape (PWC05-070).

NOTE: The cover may be made of polyethylene sheet, aluminized cotton-backed material or waxed paper.

(3) Make sure the cradle and skid base are serviceable and new or serviceable fiberboard sleeve and cover are available.

(4) Remove the engine from the stand (Ref. Para. A.).

(5) Remove the ignition exciter, if applicable, from the engine and secure the ignition cables with adjustable tie down straps to the engine. Install protective caps to cable ends and secure with pressure-sensitive tape (PWC05-070).

CAUTION: DO NOT USE STANDARD COMMERCIAL HARDWARE TO SECURE ENGINE SUPPORT BRACKETS TO THE ENGINE OR CONTAINER. USE OF HARDWARE OF LOWER STRENGTH THAN SPECIFIED COULD CAUSE SERIOUS ENGINE DAMAGE DURING SHIPPING.

(6) Check that the interior of the protective envelope is free of dirt, oil, water or other contaminants.

(7) Lower the engine into the new protective envelope (7) with gaskets (8) aligned with the lower engine mounting pads each side of the engine and accessory gearbox mounting pad.

(8) Attach the engine front mount brackets (11) to the lower engine mounting pads each side of the gas generator case with eight bolts. Tighten the bolts 225 to 250 lb.in.

(9) Attach the engine rear mount bracket (10) to the mounting pad at the 6 o'clock position on the accessory gearbox with three bolts. Tighten the bolts 50 to 70 lb.in.

(10) Lower the engine into the cradle (12) and install the front and rear mount brackets to the cradle with quick-release pins (9).

(11) Secure the humidity indicator (6) to the protective envelope, so it is visible through the fiberboard sleeve window.

(12) Place the engine log book, log sheets and relevant documents for shipping with engine in a waterproof envelope and seal with pressure-sensitive tape (PWC05-070). Place the envelope in box secured to the skid base and seal the box.

(13) Remove the sling and hoist from the engine.

CAUTION: REMOVE THE DESICCANT BAGS FROM THE PROTECTIVE ENVELOPES BEFORE INSTALLATION.

(14) Tie 12 freshly activated eight-unit desiccant bags (Ref. IPC) to the engine, evenly spaced over the engine length, six on each side.

(15) Heat seal along the top of the envelope using a suitable hand sealing iron, leaving one corner open. Evacuate the air, fold the corner and heat seal.

(16) Place the ignition exciter (Ref. Step (5)), in a protective envelope. Insert one four-unit desiccant bag in the envelope. Heat seal the envelope leaving one corner open. Secure the envelope to the bottom of the shipping container in the forward left-hand position, using pressure-sensitive tape. Evacuate the air from the envelope, fold the corner and heat seal.

(17) Install the fiberboard sleeve (5) over the engine and fit in position on the skid base (14).

(18) Fold the engine envelope and make sure that the humidity indicator (6) aligns with the window in the sleeve. Tape the envelope folds with pressure-sensitive tape (4).

(19) Close the flaps of sleeve and seal with pressure-sensitive tape (4).

(20) Place the cover (1) on the sleeve, fold the flaps down and seal at each corner with pressure-sensitive tape (4).

(21) Secure the cover horizontally with strap (3) and four reinforcing corners (2).

(22) Secure the cover and sleeve to the skid base with four straps (3) and 16 reinforcing corners (2).

C. Engine Removal from Reinforced Fiberboard Container (Ref. Fig. 304)

CAUTION: IF THE ENGINE IS DROPPED, IN THE CONTAINER OR OTHERWISE, RETURN THE ENGINE TO AN OVERHAUL FACILITY FOR LIGHT OVERHAUL. INDICATE ‘‘DROPPED ENGINE’’.

(1) Cut and remove strapping (5) from around the fiberboard container. Retain the reinforcing corners (2). Remove the cover (1) and sleeve (6), panels (4) and sleeve (7) from the base (18).

(2) Cut the protective envelope (8) and expose the top of the engine.

CAUTION: DO NOT USE THE ENGINE SLING AND LIFTING BRACKETS TO LIFT THE ENGINE ATTACHED TO THE SKID BASE.

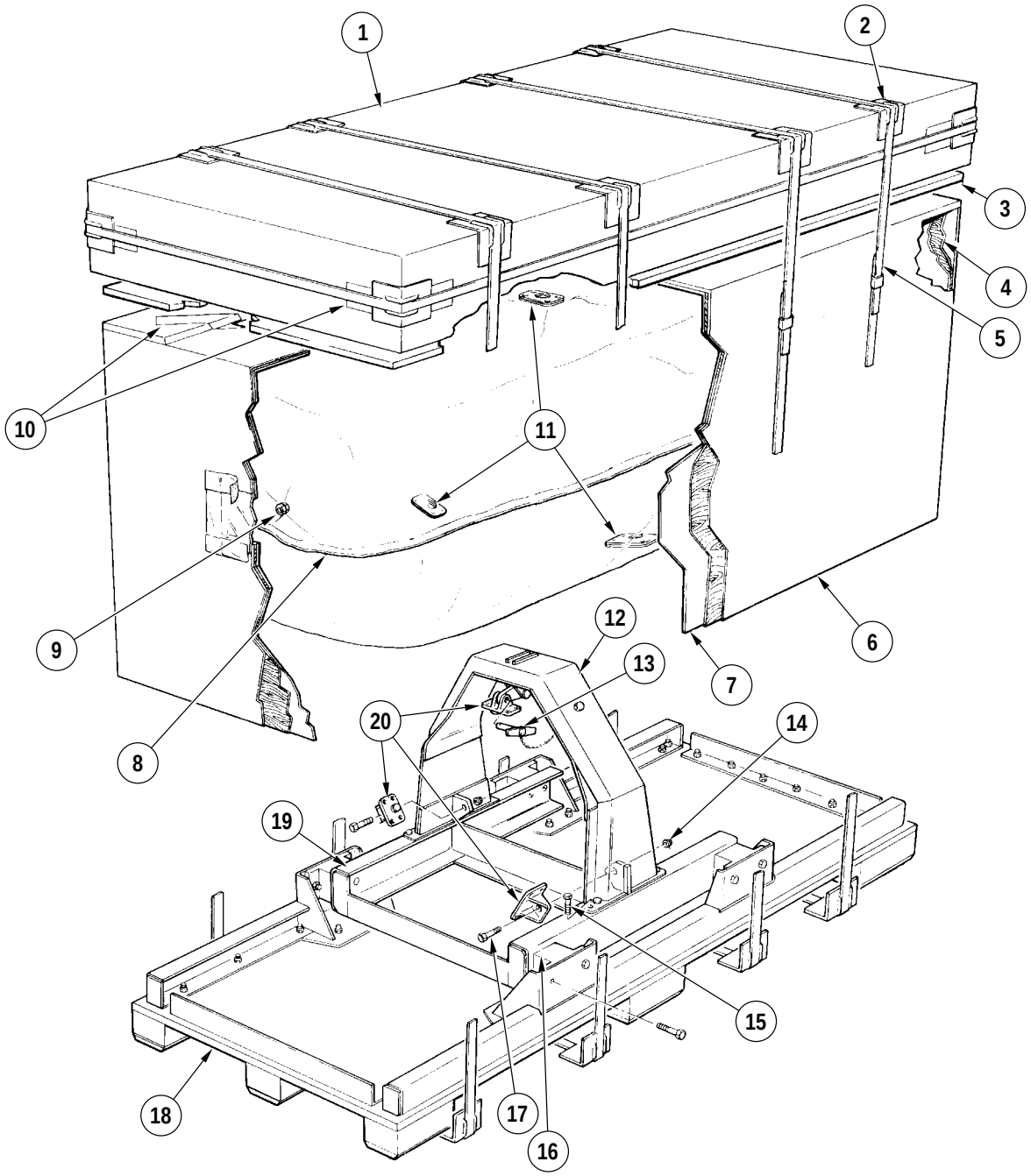
(3) Install the sling on the hoist; adjust the sling lifting eye for horizontal lift.

(4) Attach the sling to the engine lifting brackets at flanges A and G.

(5) Take the engine weight on the sling; remove the quick-release pin (13), nuts (14) and bolts (17) that secure the support (12) to the engine mounts.

(6) Remove nuts and bolts (15) that secure the support (12) to the cradle (19). Withdraw the support from the engine, taking care not to strike the support against the engine. Remove the engine mounts (20) from the gas generator case.

(7) Maintain engine horizontal and raise until clear of the cradle.



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Reinforced Fiberboard Container Components
Figure 304

Key to Figure 304

1. Cover
2. Reinforcing Corners
3. Panel
4. Panel
5. Strap
6. Sleeve
7. Sleeve
8. Protective Envelope
9. Humidity Indicator
10. Pressure-sensitive Tape
11. Gaskets
12. Support
13. Quick-release Pin
14. Locknut
15. Bolt
16. Shear Mounts
17. Bolt
18. Skid Base
19. Cradle
20. Mount Brackets

(8) Reinstall the engine mount brackets (20) and engine support (12) on the cradle and secure with the pin (13), bolts (17) and nuts (14).

NOTE: Retain all other hardware in a bag and secure to the cradle.

(9) Remove the ignition exciter, if applicable, complete in protective envelope from the cradle and retain with the engine.

(10) Remove 12 desiccant bags from the engine and retain for reactivation and reuse (Ref. Subpara. 7. D.).

NOTE: Retain a desiccant bag in the ignition exciter protective envelope until the unit is required for use. When the unit is removed, the desiccant bag should be reactivated for reuse.

(11) Remove the envelopes containing shipping data and the engine log book from the box glued to the skid base.

(12) Remove all shipping caps, plugs, covers and the T5 trim lead tiedown strap from the engine .

(13) Retain the moisture barrier/protective wrapping on the engine air-inlet screen until the engine is installed in the airframe.

D. Engine Installation in Reinforced Fiberboard Container (Ref. Fig. 304)

CAUTION: MAKE SURE OIL HAS BEEN COMPLETELY DRAINED FROM THE ENGINE.

(1) With the engine mounted in the stand (Ref. Para. 9.) and engine preservation procedure implemented (Ref. Para. 6. C.), fit all blanking plates, plugs, caps and the T5 trim lead tiedown strap (Ref. IPC).

(2) Position the moisture barrier/protective cover on the air inlet screen and install with pressure-sensitive tape (PWC05-070).

NOTE: The cover may be made of polyethylene sheet, aluminized cotton-backed material or waxed paper.

(3) Make sure the cradle (19), plywood panels (3 and 4) and skid base (18) are serviceable and new or serviceable fiberboard sleeves (6 and 7) and cover (1) are available.

(4) Remove the engine from the stand (Ref. Para. A.).

(5) Remove the ignition exciter, if applicable, from the engine and fasten the ignition cables with adjustable tiedown straps. Install protective caps to the cable ends and fasten with pressure-sensitive tape.

CAUTION: DO NOT USE STANDARD COMMERCIAL HARDWARE TO INSTALL THE ENGINE SUPPORT BRACKETS TO THE ENGINE OR CONTAINER. USE OF HARDWARE OF LOWER STRENGTH THAN SPECIFIED COULD CAUSE SERIOUS ENGINE DAMAGE DURING SHIPPING.

(6) Check that the interior of the new protective envelope (8) is free of dirt, oil, water or other contaminants.

(7) Lower the engine into the protective envelope (8) with the gaskets (11) aligned with the engine mounting pads.

(8) Attach the engine mount brackets (20) to the engine mounting pads with bolts. Tighten bolts 225 to 250 lb.in. fasten with lockwire.

(9) Position the support (12) over the engine, taking care not to strike the engine. Install the support on the engine with quick-release pin (13), bolts (17) and nuts (14). Tighten the nuts 515 to 575 lb.in.

(10) Install a humidity indicator (9) to the protective envelope so it is visible through the fiberboard sleeve window.

(11) Lower the engine and support (12) onto the cradle (19); align flanges of the support with the cradle taking care not to strike the engine against the cradle. Secure the support to the cradle with eight bolts (15) and nuts. Tighten the nuts 190 to 210 lb.in.

(12) Remove the sling and hoist from the engine.

(13) Place the engine log book, log sheets and relevant papers for shipping with the engine in a waterproof envelope and seal with pressure-sensitive tape (PWC05-070). Place the envelope in the box secured to the skid base and seal the box.

CAUTION: REMOVE DESICCANT BAGS FROM THE PROTECTIVE ENVELOPES BEFORE INSTALLATION.

(14) Tie 12 freshly activated eight-unit desiccant bags (Ref. IPC) to the engine, evenly spaced over the engine length, six on each side.

(15) Heat-seal along the top of the envelope using a suitable hand sealing iron, leaving one corner open. Evacuate the air, fold the corner and heat-seal.

(16) Place the ignition exciter (Ref. Step (5)) in a protective envelope. Insert one four-unit desiccant bag in the envelope. Heat-seal the envelope leaving one corner open. Secure to the bottom of the shipping container in the forward left-hand position, using pressure-sensitive tape. Evacuate the air from the envelope, fold the corner and heat-seal.

(17) Install the fiberboard sleeves (6) and (7) and plywood panels (4) over the engine and fit in position on the skid base (18).

(18) Fold the engine envelope and make sure that the humidity indicator (9) aligns with the window in the sleeve. Tape the envelope folds with pressure-sensitive tape (10).

(19) Close the flaps of the sleeve and seal with pressure-sensitive tape (10).

(20) Place the plywood panel (3) and cover (1) on the sleeve, fold the flaps down and seal at each corner with pressure-sensitive tape (10).

(21) Secure the cover horizontally with strap (5) and four reinforcing corners.

(22) Secure the cover and sleeve to the skid base with four straps (5) and 16 reinforcing corners (2).

E. Engine Removal from Metal Container (Ref. Fig. 302)

CAUTION: IF THE ENGINE IS DROPPED, IN THE CONTAINER OR OTHERWISE, RETURN THE ENGINE TO AN OVERHAUL FACILITY FOR LIGHT OVERHAUL. INDICATE ‘‘DROPPED ENGINE’’.

(1) Remove two nuts, lockwashers and bolts securing the service receptacle cover (1) to the receptacle and remove the cover.

(2) Loosen the air fill valve (2) to equalize the air pressure before proceeding.

(3) Remove 36 nuts, lockwashers and bolts securing the container top cover to the container base.

(4) Lift the container top vertically to clear the locating pin (6) using the hoist attached to the lifting points (8). Rest the container top on clean wooden blocks.

(5) Attach the sling to the engine lifting brackets at flanges A and G.

CAUTION: DO NOT USE THE ENGINE SLING AND HOIST FITTINGS TO LIFT THE ENGINE SECURED TO THE METAL CONTAINER BASE.

(6) Take the engine weight on the sling and remove the quick-release pins (9) from the engine mounting brackets.

(7) Raise the engine slowly from the container; make sure the engine remains horizontal and is not permitted to swing.

(8) Remove the two engine front mount brackets, rear mount bracket, bolts and washers from the engine mount pads. Retain the brackets and bolts in a suitable cloth or polyethylene envelope and secure to the cradle.

(9) Remove eight desiccant bags from the desiccant cage and retain for reactivation and reuse.

(10) Remove the self-locking nuts, washers and bolts, and remove the cover from the receptacle (5). Withdraw the engine log book and documents from the receptacle. Replace the cover, bolts, washers and nuts.

(11) Remove all shipping covers, caps, plugs and the T5 trim lead tiedown strap from the engine. Retain the covers, caps, plugs and the T5 trim tiedown strap in a suitable cloth or polyethylene envelope and secure to the cradle .

(12) Clean the interior of the container.

(13) Replace the container top and secure with 36 nuts, lockwashers and bolts.

(14) Coat all exposed hardware with preservative compound (PWC06-012).

(15) Retain the moisture barrier/protective wrapping on the engine air inlet screen until the engine is installed in the airframe.

F. Engine Installation in Metal Container (Ref. Fig. 302)

(1) With the engine mounted in the stand (Ref. Para. 9.) and engine preservation procedure implemented (Ref. Para. 6. C.), fit all shipping covers, plugs and the T5 trim lead tiedown strap.

(2) Locate the moisture barrier/protective cover around the air-inlet screen, making sure there is adequate overlap and full coverage of the screen. Secure the cover with pressure-sensitive tape (PWC05-070).

NOTE: The moisture barrier/protective cover may be made of polyethylene sheet, aluminized cotton-backed material or waxed paper.

(3) Make sure the interior and exterior of the metal container top and bottom halves are clean, dry and free of damage. Make sure a new gasket (10) is available.

CAUTION: MAKE SURE THE OIL HAS BEEN COMPLETELY DRAINED FROM THE ENGINE.

(4) Remove the engine from the stand (Ref. Para. A.).

CAUTION: DO NOT USE STANDARD COMMERCIAL HARDWARE TO SECURE THE ENGINE SUPPORT BRACKETS TO THE ENGINE OR CONTAINER. USE OF HARDWARE OF LOWER STRENGTH THAN SPECIFIED COULD CAUSE SERIOUS DAMAGE DURING SHIPPING.

(5) Remove the two engine front mount brackets from the container and secure the brackets to the engine front lower mount pads on each side of the engine with eight bolts and washers. Tighten the bolts 225 to 250 lb.in.

(6) Remove the engine rear mount bracketfrom the cradle and secure the bracket to the engine rear mount pad with three bolts and washers. Tighten the bolts 50 to 70 lb.in.

(7) Carefully lower the engine onto the cradle (11); secure the front and rear mount brackets to the cradle with quick-release pins (9).

CAUTION: WHEN REACTIVATED DESICCANT BAGS ARE USED, REMOVE THE BAGS FROM THE PROTECTIVE ENVELOPES.

(8) Insert eight bags of desiccant (64 units total) into the desiccant cage. Install the cover and secure. Reuse of the humidity indicator (7) should be satisfactory since the element is reversible. Replace only if necessary.

(9) Liberally coat the new gasket (10) with anti-sticking compound (PWC09-003) and install the gasket in position on the mating flange of lower half of the container.

(10) Lift the top cover of the container into position using the hoist and sling from the lifting points (8). Lower the top cover over the locating pin (6).

(11) Secure the top cover to the container base using 36 bolts, lockwashers and nuts. Tighten the bolts 270 to 300 lb.in.

(12) Coat all exposed hardware with preservative compound (PWC06-012).

(13) Place the engine log book and relevant shipping documents in the receptacle (5). Install the cover and secure with two bolts, washers and self- locking nuts.

(14) Stencil the engine model, serial number, rubber cure date and pertinent preservation and inspection dates on the white panel adjacent to the humidity indicator.

(15) Make sure the service receptacle cover (1) is secure, lockwired and lead sealed.

(16) Introduce clean, dry air through the air fill valve (2) to provide internal pressure equal to value for ambient temperature (Ref. Table 303). Install the valve cap securely.

(17) Check the container for pressure drop after twenty minutes. No leaks are permissible. If leaks occur, depressurize if necessary and repeat the sealing procedure until no leaks are detected.

9. Removal/Installation of Engine from/in Maintenance Stand

A. Removal

(1) Attach the sling (8, Fig. 305) to the engine lifting brackets (9 and 10) and take up slack on the hoist.

NOTE: Adjust lifting eye on sling to maintain engine horizontal during lifting operations.

(2) Remove the bolts (7) and engine mount ring (11) adapter (3) from the stand.

(3) Carefully lift the engine clear of the stand.

(4) Remove the bolts and lockplates (15) securing the segments of the engine mount ring.

(5) Remove nuts, washers and bolts, and segments of the mount ring from the engine mount brackets (12).

(6) Remove the bolts (13) and mount brackets (12) from respective the pad on the engine.

(7) Stow the brackets, adapters and bolts on the stand.

B. Installation

(1) Secure the engine mount brackets (12, Fig. 305) to the engine mount pads using four bolts (13) lubricated with engine oil (PWC03-001). Tighten the bolts 225 to 250 lb.in., and lockwire with a single strand of wire at each location.

(2) Secure one engine mount adapter (3) to the face of each mounting disk (16) on the engine stand (18) using three bolts (4), washers (2) and nuts (1) so extension on the adapter lies in a horizontal plane. Tighten the nuts securely.

(3) Locate the large segment of the mount ring (11) on the right side of the engine and secure the pads (14) of the ring to the mount brackets at the 8 and 12 o'clock positions with bolts, washers and castellated nuts. Tighten the nuts fingertight.

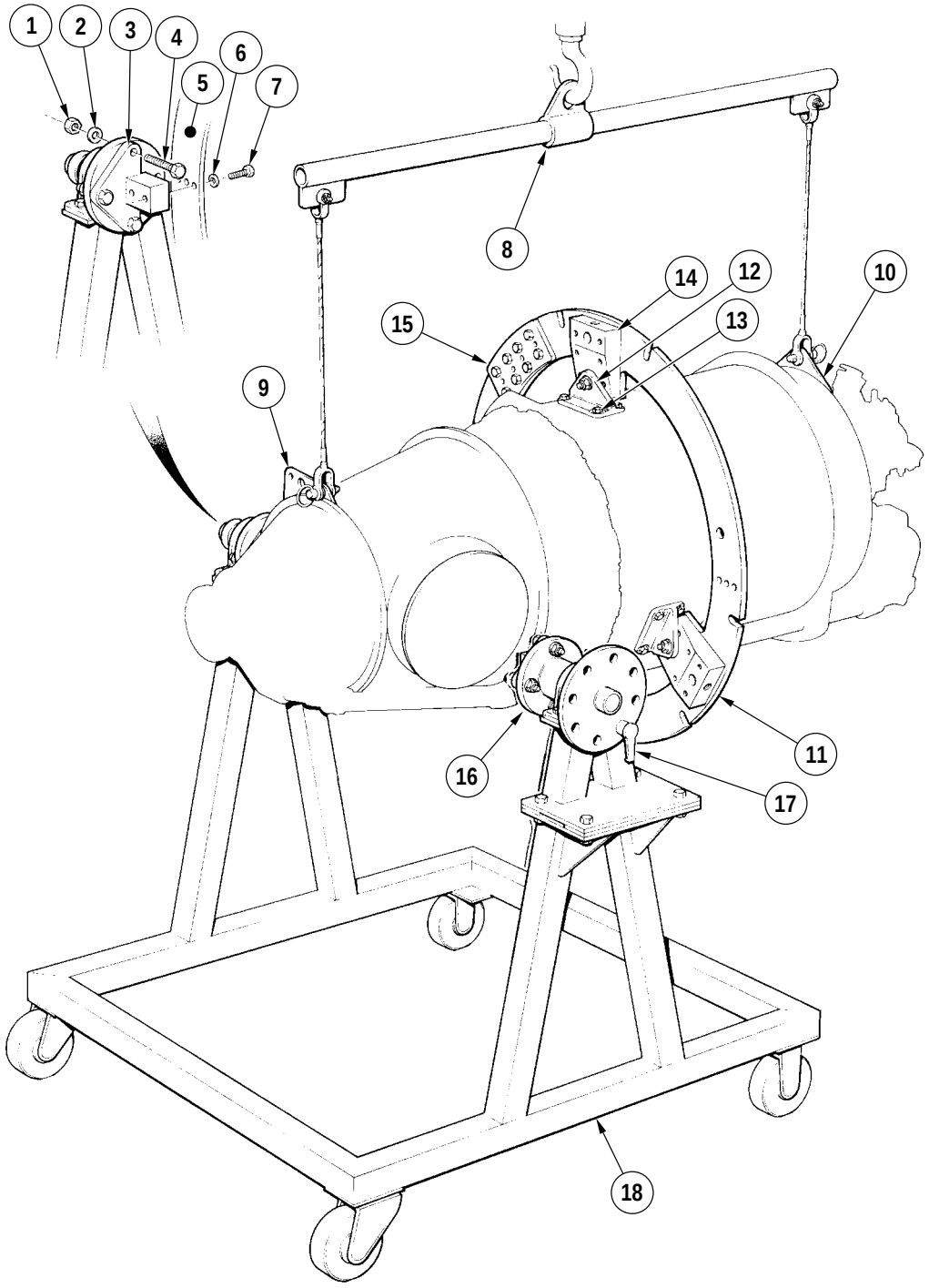
(4) Locate the small segment of the mount ring (11) on the left side of the engine and secure the pad of the ring to the mount bracket at the 4 o'clock position with bolt, washer and castellated nut. Tighten the nut fingertight.

(5) Secure the mount ring segments with lockplates (15) and bolts. Tighten the bolts firmly. Tighten the nuts at each mount ring pad firmly and secure with cotterpins.

(6) Position the stand directly below the engine and carefully lower the engine into the stand. Secure the first and third holes in the engine mounting brackets to the two holes in the engine mount adapters with bolts (7) and washers (6). Tighten the bolts and secure.

(7) Check that the hub locking lever (17) is engaged to prevent the engine from tilting.

(8) Remove the sling (8) and hoist from the engine.



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Engine in Stand
Figure 305

Key to Figure 305

1. Nut
2. Washer
3. Adapter
4. Bolt
5. Mount Ring (Ref.)
6. Washer
7. Bolt
8. Engine Sling (PWC32420) or (PWC51861)
9. Front Lifting Bracket
10. Rear Lifting Bracket
11. Mount Ring
12. Bracket
13. Bolts
14. Mount Ring Pads
15. Lockplates
16. Engine Mount Disk
17. Hub Locking Lever
18. Engine Stand

ENGINE, TURBOPROP - REMOVAL/INSTALLATION

1. General

   A. Maintenance personnel should make reference to the INTRODUCTION section and Chapter 70-00-00 STANDARD PRACTICES of this manual to familiarize themselves with general procedures.

   B. Install suitable protective caps/covers over all disconnected tubes/lines and component openings.

   C. Lockwire, unless otherwise specified, shall comply with specification AMS5687, heat and corrosion resistant steel wire MS9226-03, which is 0.025 inch diameter, and will not be specified in instructions.

2. Consumable Materials

   The consumable materials listed below are used in the following procedures.

Item No.	Name
PWC09-005	Compound, Universal
PWC09-006	Compound, Universal

3. Special Tools

   The special tools listed below are used in the following procedures.

Tool No.	Name	Application
PWC30037	Sling, Power Section	Replaced by PWC70099
PWC30269	Mount Ring	
PWC30338	Sling, Power Section	Replaced by PWC70652 and PWC70653
PWC30712	Adapter	
PWC32420	Sling, Engine	Replaced by PWC51861
PWC34300	Stand, Engine	Replaced by PWC51140
PWC51140	Stand, Engine	
PWC51861	Sling Assembly, Engine	
PWC70099	Sling, Power Section	(without propeller)
PWC70652	Sling, Power Section	(with propeller)
PWC70653	Sling Adapter	(used with PWC70652)

4. Fixtures, Equipment and Supplier Tools

   Not Applicable

5. Removal/Installation of Engine

A. Removal of Engine from Airframe

CAUTION: IF ENGINE IS DROPPED, IN CONTAINER OR OTHERWISE, SEND THE ENGINE TO AN APPROVED OVERHAUL FACILITY FOR LIGHT OVERHAUL. INDICATE ''DROPPED ENGINE''.

(1) Remove propeller and engine-mounted airframe-supplied accessories from engine (Ref. Aircraft Maintenance Manual).

CAUTION: THE AIRFRAME MOUNTED IGNITION EXCITER MUST BE REMOVED WITH THE ENGINE AND NOT LEFT CONNECTED TO AIRFRAME INPUT LEADS.

(2) Use sling (PWC32420) or (PWC51861) and suitable hoist to remove engine from airframe (Ref. Aircraft Maintenance Manual).

NOTE: After removal of engine from airframe, install correctly in shipping container if engine is to be shipped to an overhaul facility, or in engine stand if heavy maintenance is to be done (Ref. SERVICING).

B. Installation of Engine in Airframe

(1) Install engine-mounted airframe-supplied accessories (Ref. Aircraft Maintenance Manual).

(2) Use sling (PWC32420) or (PWC51861) and suitable hoist to install engine on airframe (Ref. Aircraft Maintenance Manual).

NOTE: Where ignition exciter is airframe mounted, install unit in accordance with Aircraft Maintenance Manual.

(3) Install propeller and other airframe-supplied, engine-mounted accessories on engine (Ref. Aircraft Maintenance Manual).

6. Removal/Installation of Power Section (P/S) from Gas Generator Assembly

CAUTION: IF P/S IS DROPPED, IN CONTAINER OR OTHERWISE, SEND THE PS/ENGINE TO AN APPROVED OVERHAUL FACILITY FOR LIGHT OVERHAUL. INDICATE ''DROPPED ENGINE''.

A. Removal

CAUTION: P/S MUST NOT BE LEFT IN SLING OVERNIGHT OR FOR LONGER PERIOD. REMOVE PROPELLER AND INSTALL P/S IN STAND (REF. SERVICING).

NOTE: Removal of power section from airframe mounted engine may be done with propeller installed or removed.

(1) Place suitable container under reduction gearbox and remove chip detector (22, Fig. 401) from boss at 6 o'clock position on front case of reduction gearbox. Allow oil to drain (Ref. SERVICING).

(2) Disconnect coupling nut (1) of governor pneumatic (Py) line (3) from center fireseal bulkhead coupling tube. Cap line and coupling tube.

(3) Disconnect electrical connections from airframe and engine accessories mounted on reduction gearbox, as necessary.

(4) For engines equipped for propeller reversing:

(a) Remove cotterpin, nut, bolt and washer securing clevis end (6) of push-pull terminal to propeller reversing lever (7).

(b) Remove cotterpin, nut, washers, spacer and bolt securing propeller governor interconnecting rod end (9) to airbleed link reset arm (4) on propeller governor (Ref. 76-10-00).

(c) Release locknut (17) securing front swivel joint of propeller reversing linkage to front lifting bracket (10) (Ref. 76-10-00).

(d) Remove inner nut and bolt (16) and slacken outer nut and bolt (19) securing swivel joint retaining plate (18) to front lifting bracket (10). Swing away retaining plate and lift forward end of propeller reversing linkage clear of front lifting bracket. Suitably support linkage (Ref. 76-10-00).

(5) Remove alumel and chromel bolts (15) that secure T5 trim wiring harness (14) to T5 thermocouple terminal (12) on gas generator case. Move wiring harness lugs away from terminal. Temporarily secure T5 trim harness, and airframe leads if applicable, to gasgenerator case. Reinstall alumel and chromel bolts in terminal and tighten fingertight.

(6) Remove two bolts (13) that secure T5 wiring harness terminal (12) to gas generator case, then push terminal and gasket inside case.

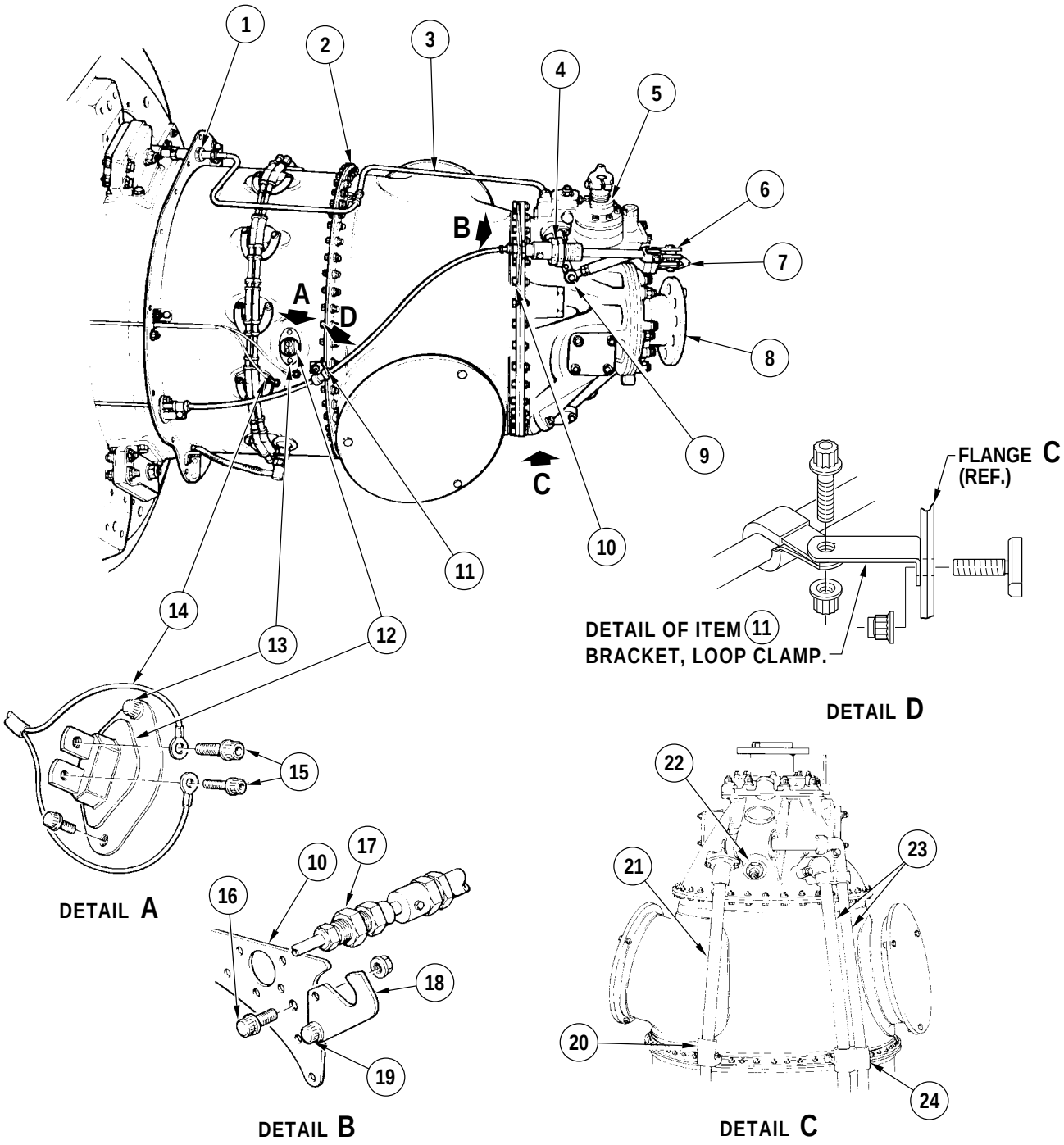
CAUTION: WHEN POWER SECTION IS REMOVED FROM AIRFRAME MOUNTED ENGINE FOR OVERNIGHT, OR LONGER PERIODS OF TIME, THE PROPELLER MUST BE REMOVED (REF. AIRCRAFT MAINTENANCE MANUAL) AND POWER SECTION INSTALLED IN MAINTENANCE STAND (REF. SERVICING).

(7) Attach appropriate sling to power section:

(a) When propeller is not installed, position sling (1, PWC30037 or PWC70099, Fig. 402), engage with dowels on propeller mounting flange and secure using four socket head screws. Tighten screws securely.

(b) When propeller is installed, position sling (20) (PWC30338) or (PWC70652) and (PWC70653) and secure to front lifting bracket (19) using pin (21).

(8) Position hoist hook into sling (1 or 20) eye and take up slack on hoist.



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Removal/Installation of Power Section
Figure 401

Key to Figure 401

1. Coupling Nut
2. Flange C
3. Propeller Governor Pnuematic (Py) Line
4. Propeller Governor Reset Arm
5. Propeller Governor
6. Clevis
7. Propeller Reversing Lever
8. Propeller Shaft Flange
9. Interconnect Rod
10. Front Lifting Bracket
11. Support Bracket
12. T5 Terminal Block
13. Retaining Bolt
14. Trim Harness Leads
15. Alumel and Chromel Bolts
16. Bolt
17. Locknut
18. Swivel Joint Retaining Plate
19. Bolt
20 Pressure Oil Tube Coupling
21. Pressure Oil Tube
22. Chip Detector
23. Scavenge Oil Tubes
24. Scavenge Oil Tube Coupling

CAUTION: DO NOT ROTATE OR DISTURB THE INTERSTAGE SEALING RING(S) ON THE POWER TURBINE SHROUD HOUSING, UNLESS THEY ARE TO BE REMOVED FOR INSPECTION (REF. 72-50-03).

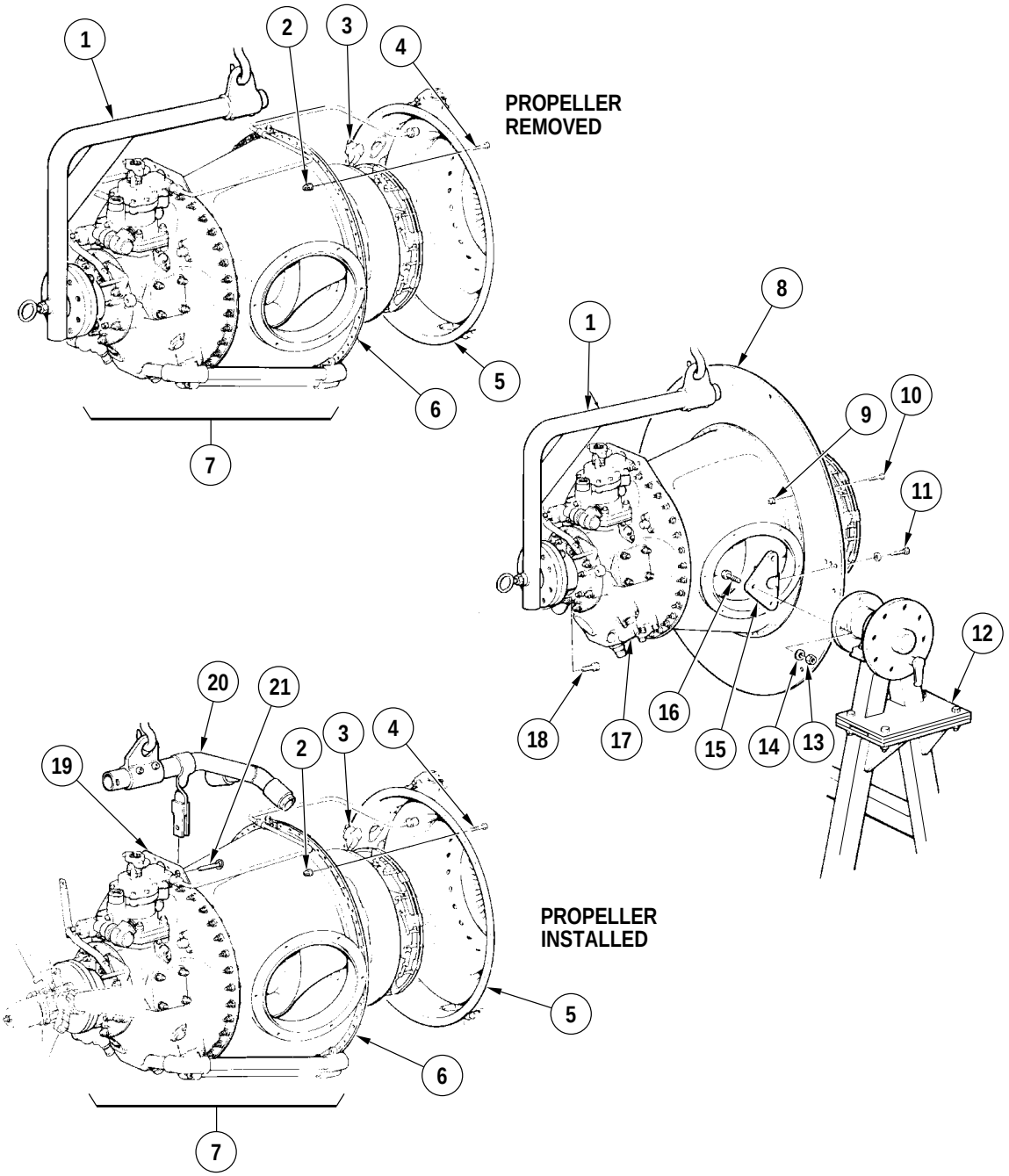
(9) Remove nuts and bolts at Flange C (2, Fig. 401) and separate power section from gas generator section. Using sling, partially withdraw power section. Retrieve and discard T5 wiring harness terminal gasket. Reinstall terminal securing bolts (13) in terminal (12) and tighten fingertight.

(10) Cap tubes (21 and 23, Fig. 402) and install plugs on couplings (20 and 24).

(11) Withdraw power section (6) from gas generator case.

B. Installation

NOTE: Whenever a replacement power section is installed on an engine at maintenance, the original power turbine stator assembly should be retained and installed on new power section whenever possible. This is to maintain vane throat area match between compressor turbine and power turbine vane rings, which can affect operating parameters of the engine if altered.



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Power Section Removal from Engine Gas Generator/Stand
Figure 402

Key to Figure 402

1. Sling Assembly (propeller not installed) (PWC30037) or (PWC70099)
2. Nut
3. T5 Terminal Block
4. Bolt, Tee Head
5. Gas Generator Assembly
6. Flange C
7. Reduction Gearbox
8. Mount Ring
9. Nut
10. Bolt
11. Screw
12. Stand
13. Nu
14. Washer
15. Adapter
16. Bolt
17. Propeller Reduction Gearbox
18. Cap Screws
19. Front Lifting Bracket
20. Sling Assembly (propeller installed) (PWC30338) or (PWC70652) and (PWC70653)
21. Ball Lock Detent Pin

(1) Remove caps from pressure and scavenge oil transfer tubes on gas generator case and install new preformed packing on tubes.

(2) Remove plugs from coupling at Flange C on power section.

(3) Inspect mating areas of gas generator case and power section for cleanliness and security of parts; remove any protective covers installed during maintenance period.

NOTE: If required, a light coating of sealant (PWC09-005) or (PWC09-006) may be applied to mating faces of Flange C and to T5 terminal block and boss prior to assembly.

(4) Attach new gasket to T5 terminal block (3, Fig. 402) and insert through gas generator case. Secure terminal block with two bolts (13, Fig. 401); tighten bolts to snug fit. Do not torque at this time.

(5) Prior to mating gas generator case to the power section, centralize the interstage sealing ring(s) (Ref. 72-50-03).

CAUTION: MAKE SURE FLANGE C OF GAS GENERATOR CASE AND EXHAUST DUCT ARE PARALLEL AND AXIALLY ALIGNED. IF ASSEMBLIES DO NOT MATE FREELY, DO NOT USE FORCE. WITHDRAW POWER SECTION AND CHECK FOR CAUSE OF INTERFERENCE.

(6) Move power section carefully into position, align pressure and scavenge oil transfer couplings (Ref. Fig. 403) with tubes at gas generator case, and mate power section with gas generator.

(7) Install bolts (4, Fig. 402) through Flange C, with bolt heads at rear and secure self-locking nuts (2). Tighten nuts in diametric sequence 36 to 40 lb.in.

(8) Remove sling (1 or 20) from power section.

(9) Tighten terminal block mounting bolts (12, Fig. 401) 32 to 36 lb.in. Do not lockwire until engine ground checks are completed.

(10) Connect leads (14) of T5 trim harness and airframe leads to terminal block (12). Secure alumel terminal leads with large bolt, tighten 10 to 15 lb.in. Secure chromel terminal leads with small bolt, tighten 8 to 12 lb.in. (Ref. 77-20-01).

(11) Install new preformed packing on chip detector (20) and install detector in reduction gearbox drain boss. Tighten detector, torque 45 to 55 lb.in. Locate cover on chip detector and torque fingertight only. Secure cover and detector to reduction gearbox with lockwire .

(12) Install, tighten and lockwire airframe electrical fittings, as appropriate (Ref. Aircraft Maintenance Manual).

(13) Connect propeller governor pneumatic (Py) line coupling nut (1) to nipple fitting on propeller governor. Torque nut 90 to 100 lb.in., and safety wire.

(14) For engines equipped with propeller reversing mechanism:

(a) Install front swivel joint of propeller reversing linkage in slot of front lifting bracket (10). Swing retaining plate (18) over swivel joint and install inner nut and bolt (16). Tighten inner and outer nuts of plate and torque 36 to 40 lb.in. Tighten front swivel joint locknut (17), torque 200 to 225 lb.in., and lockwire.

(b) Install spacer sleeve in upper hole of propeller reversing lever (7). Locate clevis end (6) of push-pull terminal over upper end of lever, align holes and insert bolt. Secure with castellated nut and washers, tighten nut, torque 24 to 36 lb.in., and install cotterpin.

(c) Locate lower end of governor interconnecting rod (9) on propeller governor reset arm and secure with bolt, washer and castellated nut. Tighten nut, torque 24 to 36 lb.in., and install cotterpin.

(15) Do engine ground run checks (Ref. 71-00-00, ADJUSTMENT/TEST).

7. Removal/Installation of Power Section (P/S) from Maintenance Stand

A. Removal

(1) Position sling (1, PWC30037 or PWC70099) on propeller shaft flange, engage with dowels and secure using four cap screws (18, Fig. 402). Tighten screws securely.

(2) With power section directly beneath hoist, engage hoist hook in sling eye and take up slack on hoist.

(3) Remove 12 nuts (9) and bolts (10) securing power section (7) to mount ring (8).

(4) Carefully withdraw power section from mount ring.

(5) Install propeller governor pneumatic (Py) line (3, Fig. 401) to propeller governor. Torque coupling nut 90 to 100 lb.in.

(6) Install new preformed packings on pressure oil tube (21) and scavenge oil tubes (23). Install tubes in respective bosses on reduction gearbox and install couplings (20 and 24) on rear ends of tubes.

B. Installation

(1) Assemble adapters (15, PWC30712, Fig. 402) to stand (12) (PWC34300) or (PWC51140) using three bolts (16), washers (14) and nuts (13). Tighten nuts securely.

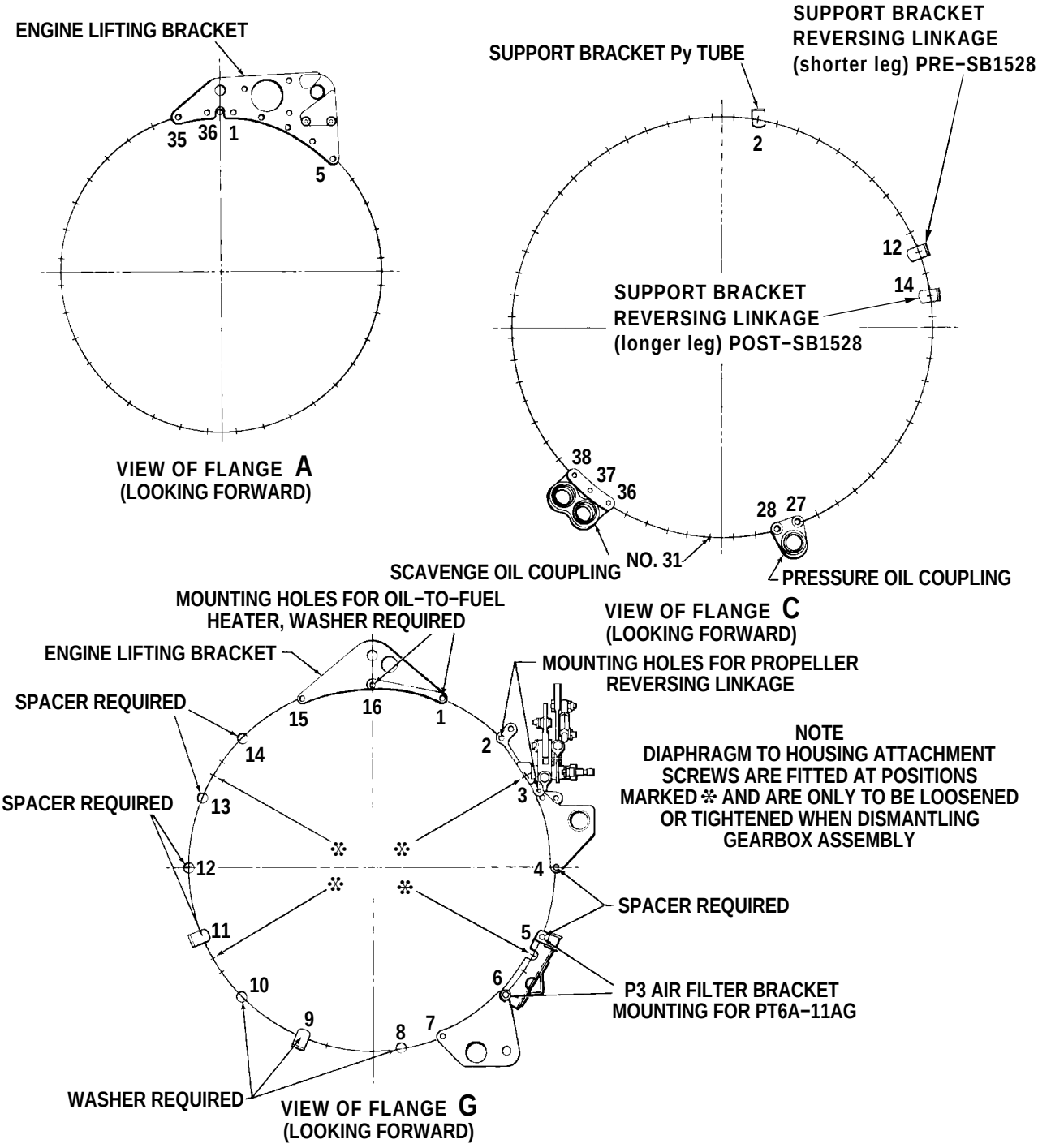
(2) Position mount ring (8) (PWC30269) in stand with front face against rear face of adapters. Align and secure mount ring to each adapter using two screws (11) and washers. Tighten screws securely.

(3) Remove propeller governor pneumatic (Py) line (3, Fig. 401), scavenge oil tubes (23) and pressure oil tube (21) from power section.

(4) Lower power section to align Flange C (6, Fig. 402) with cutout in mount ring. Carefully position power section so that Flange C is in contact with mount ring.

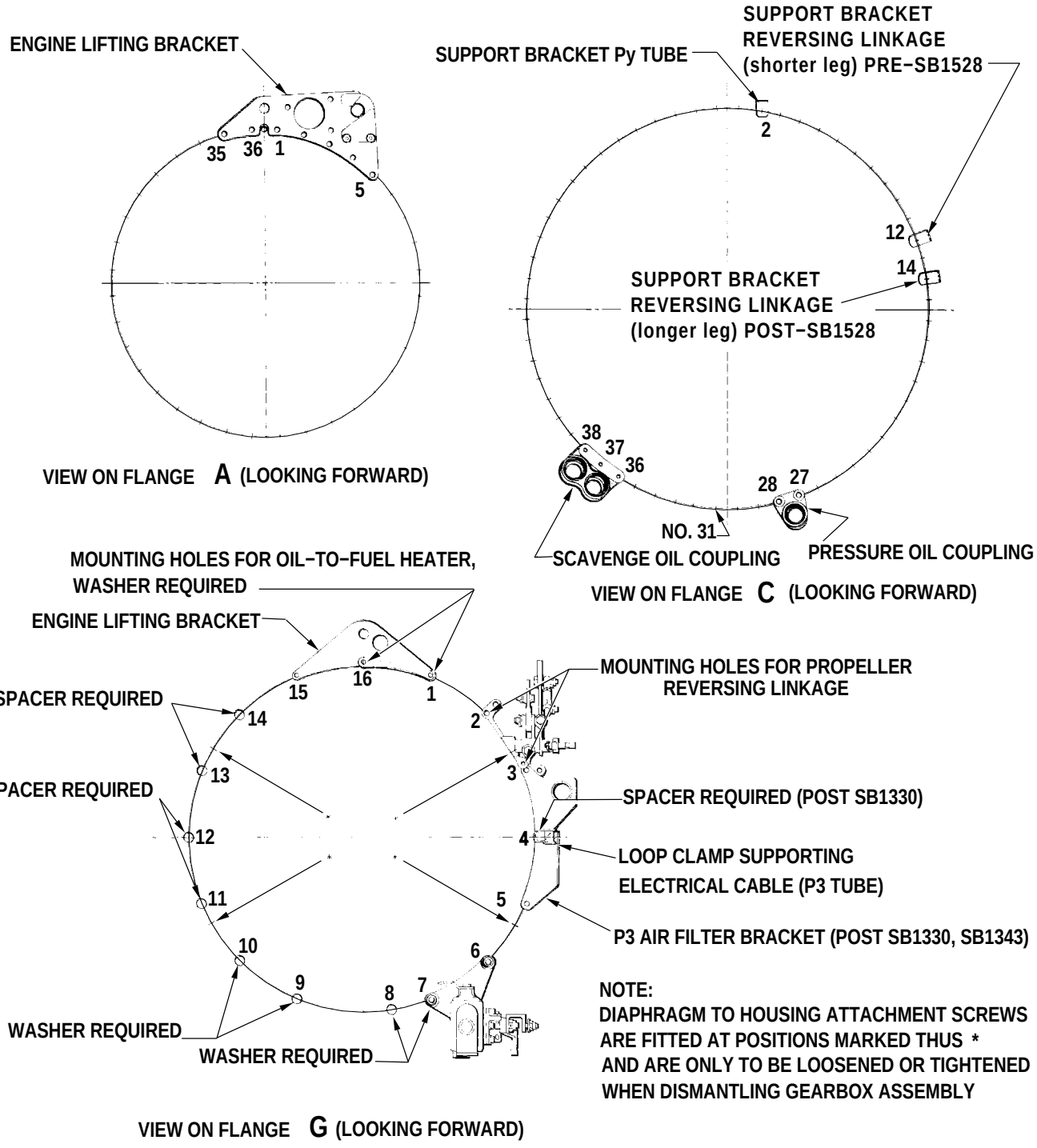
(5) Secure power section to mount ring using 12 bolts (10) and nuts (9). Tighten nuts securely.

(6) Lower hoist to transfer power section weight to stand. Remove sling (1) from propeller shaft flange.



PT6A-21 C7164C

Bolting and Component Configuration
Figure 403 (Sheet 1 of 2)



PT6A-27 and PT6A-28 C7927B

Bolting and Component Configuration
Figure 403 (Sheet 2)

ENGINE - INSPECTION

1. General

   A. The inspection criteria for the various sections of the engine are summarized in Table 601. Detailed inspection procedures are provided, where applicable, in the relevant INSPECTION/CHECK sections of subject chapters in this manual.

   B. The inspection procedures detailed are considered a normal function of operating organizations and are intended as a guide for minimum inspection and maintenance requirements.

   C. ROUTINE inspection coincides with the daily or preflight airframe inspection. MINOR inspection is coincidental with a typical airframe zone inspection. The intervals at which these inspections are performed may be altered by the aircraft manufacturers maintenance program and approved by the operators local airworthiness authority.

   D. Engines maintained in compliance with the aircraft manufacturer's approved maintenance program shall be inspected as required by Condition Monitoring in accordance with the Operator/Local Authority agreed plan. Engines operating in sandy or dusty environments or in smog or salt-laden atmospheres should be subjected to additional inspections for corrosion and compressor erosion.

   E. Hot section inspection frequencies are outlined in the applicable service bulletin (Ref. DESCRIPTION AND OPERATION, Approved Service Bulletins) and will be updated periodically as dictated by service experience and time-between-overhauls (TBO). If, in the light of experience, it becomes necessary to modify procedures, these will be included in subsequent revisions to this manual.

   F. Retaining rings (spirolox, etc.) used throughout the engine are to be inspected for distortion and general condition. Distorted rings are not acceptable and must be replaced (Ref. 70-00-00, MAINTENANCE PRACTICES).

2. Consumable Materials

   The consumable materials listed below are used in the following procedures.

Item No.	Name
PWC04-001	Grease
PWC11-027	Solvent, Petroleum
PWC11-031	Cleaner, Engine

3. Special Tools

   The special tools listed below are used in the following procedures.

Tool No.	Name
PWC34910-101	Borescope Assembly
PWC34910-200	Guide Tube
PWC34913	Holding Fixture

Tool No.	Name
PWC34941	Wrench

4. Fixtures, Equipment and Supplier Tools

Not Applicable

5. Corrosion

A. High Temperature Alloy Corrosion

High temperature alloy corrosion may be identified as metal loss or pitting, but more usually appears as local swelling or buildup due to greater volume occupied by nickel oxides. These corrosion products vary in color from black to green and in the advanced state there will be cracking and flaking, referred to as exfoliation.

Care should be taken to distinguish between corrosion buildup and possible light brown or rust colored deposits which are essentially harmless combustion by-products. The latter are usually more widespread over hot section components and while possibly affecting performance will not directly affect compressor turbine mechanical integrity.

B. Sulphidation

Sulphidation is a common name for a type of hot corrosion which can affect turbine area components of gas turbine engines.

Sulphates form at engine operating temperatures with sodium and sulphur present. Most aviation turbine fuels contain sulphur in sufficient amounts for sulphidation. Common sources of sodium are seawater, atmospheric pollutants and volcanic discharges.

Sulphidation attack most often affects the compressor turbine blades, but sulphidation of power turbine blades and of non-rotating parts such as shroud segments is not uncommon. Turbine blades are coated with a protective layer. Sulphidation will first degrade this coating and eventually lead to some loss of base alloy material. Post coating strip inspection of attacked blades may reveal that they are not suitable for repair by recoating.

In-service sulphidation may be characterized through the following four stages:

Stage 1 - Light Sulphidation (Initial Coating Deterioration): Slight roughening of the surface and localized breakdown of the protective surface layer. Substrate is not yet affected.

Stage 2 - Failure of the protective layer (Initial substrate corrosion): Roughness of surface is more marked as protective layer breakdown exposes the substrate to attack. Mechanical integrity is not yet affected.

Stage 3 - Severe sulphidation: Base material is attacked to significant depth, as evidenced by obvious buildup scale and some blistering. Progression to Stage 4 would accelerate. Integrity is now affected and parts are no longer serviceable.

Stage 4 - Catastrophic attack: Deep penetration of attack with large blisters of scale. Loss of structural material will lead to eventual component failure.

All stages of attack may be encountered, although stages 3 and 4 will normally be limited to those engines which are directly exposed to salt water.

Desalination wash using plain water with an antifreeze agent, if required, minimizes attack. During stages 1 and 2 the wash will dissolve and carry away sulfates on component surface.

Water used for washing must be free from contamination, in most cases drinking water is acceptable. Otherwise demineralized water should be used.

Wash frequency depends on the amount of contamination. Washing weekly is probably the minimum acceptable. Maritime areas may require washing daily or before each flight.

Recommended wash frequency is based on operators estimate of corrosion environment or refer to Chapter 71-00-00, CLEANING.

An alternative method of establishing wash frequency is to monitor blade condition using a borescope assembly (PWC34910-101). Wash schedule should be adjusted according to results.

If sulphidated blades continue in service, a borescope inspection program should be started. This program should continue until a reliable progression rate for the particular circumstances can be established and a blade life limit determined. The recommended inspection interval is 200 hours. Blade lives established this way should be reviewed periodically to account for possible changes in the factors affecting sulphidation.

Two points are important to consider when evaluating sulphidated blades:

Stage of corrosion attack.

Estimate of progression rate to stage 3.

At stage 3 mechanical integrity is jeopardized and blades should be removed from service. When estimating progression beyond stage 1 or 2 exposure to contamination and improvements in wash programs should be taken into account.

6. Control Linkage

Inspect all engine controls for correct operation. Make sure the linkage from the cockpit controls to the engine control levers are connected to permit full and free movement. Make sure controls are adjusted to permit over-travel of power control lever to ensure full operation of engine and that the linkage can be operated without interference. Also, investigate and eliminate any slack in the control system. Lubricate and adjust all controls (Ref. Aircraft Maintenance Manual).

7. Periodic Inspection

For inspection items and intervals, refer to Table 601. Refer to Inspection/Check in the referenced CHAP/SEC/SUB for limits and disposition of items.

TABLE 601, Periodic Inspection

	Component		Inspection	Interval
1.	Engine Externals			
	A. Tubing, Wiring, Control linkages, Hose Assemblies	(1)	All accessible connections, clamps and brackets for attachment.	MINOR
		(2)	Wear, chafing, cracks and corrosion.	MINOR
		(3)	Fuel and oil lines for leaks.	ROUTINE
		(4)	Depending on operating conditions and environment, examine linkages at regular intervals. Pay particular attention to rear linkage cam box, fuel control unit arm, telescopic rod and rod end fittings. Disconnect rod ends and clean using solvent (PWC11-027) or (PWC11-031). Lubricate with light grease (PWC04-001)after engine external wash. Examine rod end for corrosion, roughness in rotation, side play and radial play. After lubrication reinstall rod ends and torque to specified value (Ref. 76-10-00). Check free movement of linkage.	MINOR (See NOTE)
			NOTE: Inspect initially at 100 hours with extension to relevant airframe zone inspection based on inspection results but not to exceed 200 hours.	
			NOTE: With the exception of rod end fittings, linkages generally will operate satisfactorily without lubrication. While lubrication will be effective in some instances, it must be realized that grease and oil attracts dirt and foreign matter. Depending on local conditions, operators should take these facts into consideration before deciding to lubricate components.	
	B. Air Inlet Screen		Cleanliness (Ref. 72-20-00).	MINOR
	C. Gas Generator Case		External surfaces, and fire seal mount ring brackets for cracks, distortion and corrosion (Ref. 72-30-04)	Minor
	D. Fireseal Mount Rings		Cracks and attachment of brackets and seals. (Ref. 72-30-01/-02)	MINOR
	E. Exhaust Duct	(1)	Cracks and distortion (Ref. 72-50-05, MAINTENANCE PRACTICES).	MINOR

TABLE 601, Periodic Inspection (Cont'd)

Component			Inspection		Interval
			(2)	Engines that exhibit inferior welds (Ref. 72-50-05, MAINTENANCE PRACTICES) (Ref. SB1610)	MINOR not to exceed 150 hours.
			(3)	Engines that exhibit cracks (Ref. 72-50-05, MAINTENANCE PRACTICES) (Ref. SB1610)	25 hours
	F.	Propeller Shaft Seal		Check for oil leaks (Ref. 72-10-00)	ROUTINE
	G.	Accessories	(1)	Attachment of accesories and linkages, air, oil and fuel lines (Ref. 73-10-07/-08) .	MINOR
			(2)	Security of pneumatic lines (Ref. 73-10-07/-08).	MINOR
			(3)	Oil and fuel leaks as applicable.	ROUTINE
			(4)	Starter-generator gearshaft splines for wear (At starter-generator removal/replacement only) (Ref. 72-60-00).	MINOR
2.	Engine Internals				
	A.	Compressor Turbine Disk Assembly		Overhaul. Remove assembly and ship to an approved overhaul facility.	Refer to SB1803.
	B.	Hot Section		Examine with borescope (Ref. Para. 8.).	In conjunction with periodic fuel nozzle leak and function tests (Ref. 3.B.(11)).
3.	Systems				
	A.	Oil System		**CAUTION:** DELETED.	
			(1)	Check oil level (Ref. SERVICING, Lubricating Oil System).	ROUTINE
			(2)	Check condition and locking of oil filler cap (Ref. 72-60-00).	ROUTINE

TABLE 601, Periodic Inspection (Cont'd)

Component	Inspection	Interval
	(3) Oil Filter Elements Elements must be inspected and cleaned (Ref. 79-20-02). Light traces of sediment only may be removed from the main filter screen. All other contamination requires replacement of filter element. Any foreign material found in main oil filter or on chip detector, should be identified before further inspection/operation (Ref. 70-00-00, MAINTENANCE PRACTICES).	MINOR (See NOTE)
	NOTE: Inspect initially at 100 hours with extension to relevant airframe zone inspection based on inspection results but not to exceed 200 hours.	
	NOTE: If carbon like deposits are found, drain accessory gearbox oil into a clean container and examine debris. Varnish flakes are non metallic and are usually dark on one side and shiny, similar to bronze, on the other side. They are hard and will not form into paste when rubbed between fingers (Ref. step (7)).	
	(4) Use approved equipment to clean permanent filter element at an overhaul facility prior to further use. Do not clean ultrasonically. Filter element must be discarded after 1000 hours or after heavy contamination.	
	NOTE: While the chip detector is removed, inspect with both poles bridged (Ref. Step 5). With poles unbridged, inspect for continuity. If continuity exists, replace the chip detector.	
	(5) Check magnetic chip detector(s) for continuity; open circuit must exist indicating no contamination at pole tips. If continuity exists, remove and inspect for contamination. Any foreign material found on the chip detector or in the main oil filter should be identified before further inspection/operation (Ref. 79-20-02, Inspection/Check).	Every 100 hours
	NOTE: For aircraft equipped with a cockpit indicating system, use a suitable ohmmeter to check completely as stated in Step (6) below.	Every 100 hours, with extension to 400 hours maximum, based on inspection results.

TABLE 601, Periodic Inspection (Cont'd)

Component		Inspection		Interval
		(6)	Remove magnetic chip detector (Ref. 72-10-00). Bridge chip detector magnetic poles with suitable metallic jumper and use a suitable ohmmeter to check for continuity between connector pin. Any foreign material found on either chip detector or in main oil filter should be identified before further inspection/operation (Ref. 70-00-00, MAINTENANCE PRACTICES). Replace chip detector if continuity does not exist.	Every 600 hours or 12 months (whichever comes first)
		(7)	Check scavenge oil pump housing for leaks.	ROUTINE
		(8)	Check the AGB internal scavenge oil pump inlet screen (Ref. Chapter 72-60-00 CLEANING/ INSPECTION). Collect drained oil. Using a mirror and a flashlight inspect the scavenge oil pump inlet screen. Any foreign material found blocking the screen or contained in the oil should be identified before further operation (Ref. Unscheduled Inspection).	200 hours or 6 months (at operator's option) for engines operating in high relative humidity/ tropical environ-ment (above 70% for most of the year).
				1000 hours for engines NOT operating in high relative humidity/ tropical environ-ment.
B.	Fuel System	(1)	Check fuel for water contamination.	ROUTINE
		(2)	Check fuel pump for installation and leaks (Ref. 73-10-02)	MINOR

TABLE 601, Periodic Inspection (Cont'd)

Component	Inspection	Interval
	NOTE: If airframe fuel boost pump fails or is inadvertently left off for an accumulative time in excess of 10 hours, the engine driven fuel pump must be removed and replaced. The removed pump should be sent to an approved overhaul facility.	
	(3) Check inlet screen for foreign matter or distortion, clean and reinstall, or install new screen. (Ref. 73-10-02).	Every 600 hours
	CAUTION: ON NEW AIRCRAFT, CHECK FILTER AFTER EACH FLIGHT UNTIL NO CONTAMINATION IS EVIDENT. CHECK AFTER FIRST FLIGHT OR GROUND RUN WHENEVER ANY COMPONENT UPSTREAM OF FILTER IS REPLACED.	
	(4) Check outlet filter for foreign matter or distortion (Ref. 73-10-02). Install new filter every 600 hours or as service conditions dictate and when fuel system contamination is suspected.	MINOR
	(5) If Sundstrand fuel pump is installed, check fuel pump coupling in-situ for fretting corrosion, coincident with scheduled outlet filter replacement (Ref. 73-10-02).	Not to exceed 600 hours
	(6) Check drain valve for installation and leaks (Ref. 73-10-06).	MINOR
	(7) Check flow divider and dump valve for installation and leaks (Ref. 73-10-04).	MINOR
	(8) Check FCU for installation, linkages and pneumatic tubes (Ref. 73-20-00). Evidence of FCU bearing washout indicated by traces of blue dye effluent is caused by a mixture of bearing grease and fuel.	MINOR
	(9) For Post-SB1472 engines fitted with a manual override on the fuel control, check FCU Manual Override System for static operation (Ref. 71-00-00, ADJUSTMENT/TEST).	MINOR
	(10) FCU Drivebody Inspection/Driveshaft Bearing Replacement.	See NOTE

TABLE 601, Periodic Inspection (Cont'd)

Component	Inspection	Interval
	NOTE: Fuel control preventive maintenance is suggested for the following conditions: 1. Severe operating environment (temperature, humidity, dust or other contaminants). 2. Very low or irregular utilization over a period of time. **Definition of regular/irregular utilization:** Regular utilization: A unit which accumulates 500 hours a year with a monthly utilization of 30 hours minimum. Irregular utilization: A unit which accumulates 500 hours in the first two months of a year, is inactive for extended periods of time, and is used again several months later. 3. The interval for a Drivebody Inspection/Driveshaft Bearing Replacement is to be at mid-TBO, not exceeding 3000 hours or 6 years.	
	(11) Leak test and function test fuel manifold adapter and nozzle assemblies. Clean as necessary (Ref. 73-10-05).	See NOTES
	NOTE 1: Do the periodic borescope inspection of the hot section components in conjunction with these tests (Ref. 2.B.).	
	NOTE 2: If one or more unacceptable nozzle(s) is (are) found during the leak and function tests, it is highly recommended that the hot section be inspected for damage by a direct visual inspection or borescope inspection.	
	NOTE 3: Regular fuel nozzle maintenance is important for hot section durability. Inspection is recommended at routine intervals according to either of the following:	
	NOTE 4: Engines ON fuel nozzle in-situ cleaning program (Ref. 71-00-00, CLEANING). Test fuel nozzles and refurbish as necessary. Where fuel quality may be questionable, and for operators new to PT6A operation, inspection is recommended at 400 hr. initially, with extension of 200 hr. based on inspection results.For other operators, inspection is recommended at 600 hr. initially, with extension, of 200 hr. based on inspection results.	
	NOTE 5: Engine NOT ON fuel nozzle in-situ cleaning program. Test fuel manifold adapter (Ref. 73-10-05). Where fuel quality may be questionable, and for operators new to PT6A operation, cleaning/inspection is recommended at 200 hr. initially, with extension, if applicable, based on inspection results. For other operators, inspection is recommended at 400 hr. initially, with extension, based on inspection results.	
	(12) Check oil-to-fuel heater installation (Ref. 71-00-00).	MINOR

TABLE 601, Periodic Inspection (Cont'd)

Component		Inspection		Interval
C.	Ignition System	(1)	Check ignition exciter/current regulator for installation and condition (Ref. 74-10-01 and 74-10-02).	MINOR
		(2)	Check ignition cables for chafing, wear and installation (Ref. 74-20-01).	MINOR
		(3)	Check spark igniters/glow plugs for cleanliness and erosion. Check function (Ref. 74-20-02 and 72-20-00).	MINOR (See NOTE)
		NOTE: Inspect initially at 100 hours with extension to relevant airframe zone inspection based on inspection results but not to exceed 200 hours.		
D.	Pneumatic System	(1)	Check P3 filter for installation (Ref. 73-10-07).	MINOR
		(2)	Clean or replace filter, dependent on condition, service experience or environment (Ref. 73-10-07).	Every 100 hours
		(3)	Clean and inspect Post-SB1495 P3 filter drain valve housing assembly (Ref. 73-10-07).	Every 100 hours
		NOTE: Filter contamination is greatly influenced by particular operating conditions and environment, inspection intervals may be modified accordingly.		
		(4)	Replace disposable filter based on condition, service experience or environment.	Every 1000 hours.
		(5)	Clean or replace permanent filter based on condition, service experience or environment. Ship to an approved overhaul facility for ultrasonic cleaning.	Every 1000 hours.
		NOTE: Send filter to an approved facility for ultrasonic cleaning and testing in accordance with the engine overhaul manual every 1000 hours.		
		(6)	Check the bleed valve (Ref. 75-30-00, Inspection/Check).	
			(a) For engines operating in dusty, industrial/smog, salt laden environments or high cyclic conditions.	Every 600 hours. Extension may be based on operators experience.

TABLE 601, Periodic Inspection (Cont'd)

Component	Inspection	Interval
	(b) For other engines NOT operating in conditions in Step (5)(a).	Inspect in conjunction with a Hot Section inspection.

8. Borescope

NOTE: The borescope inspection is not intended to replace or diminish the importance of doing an HSI, but is intended to monitor the internal components of the engine to help reduce the cost of future repairs/refurbishments.

A. General

The borescope is an optical device which lets an operator inspect hot section areas of the engine without removal or disassembly of the engine. Access is through ports or openings created by removal of engine components. Personnel that do the inspection should be qualified to use the borescope and analyze results. The borescope is a delicate device vulnerable to shocks, twisting and pinching. Use care and attention when handling/using tool. Examine the borescope assembly, it's accessories (Ref. Fig. 601), and the following procedures.

B. Description

The borescope assembly comprises a pattern-controlled rigid guide tube, a direct viewing flexible 5 mm fibrescope, a light source, a side viewing adapter, and other accessories. If required, a camera may be used to record engine areas being inspected.

An operator can do on-wing inspections of the CT stator assembly, combustion chamber liners, including cooling rings and dome, and AGB and RGB gears.

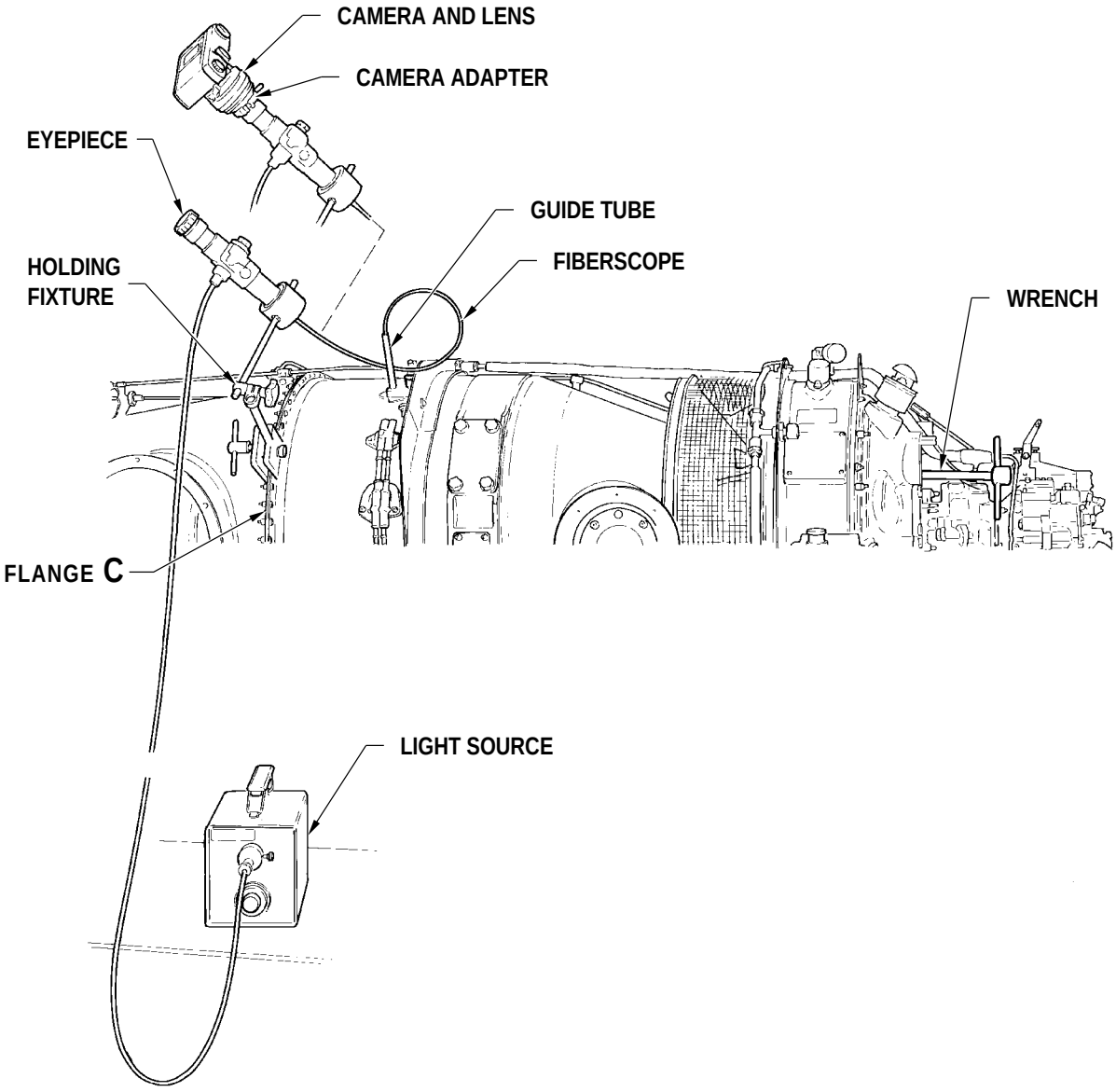
C. Removal/Installation of Borescope and Accessories

(1) Side viewing adapter (Ref. Fig. 602).

NOTE: An adapter (SL-4TP) is used to inspect components located at a nominal 90 degree angle to fiberscope distal tip. The use of side viewing adapter will introduce a reduction in the field of view as compared to the direct viewing field. A ring is installed to protect distal end when side viewing adapter is not fitted.

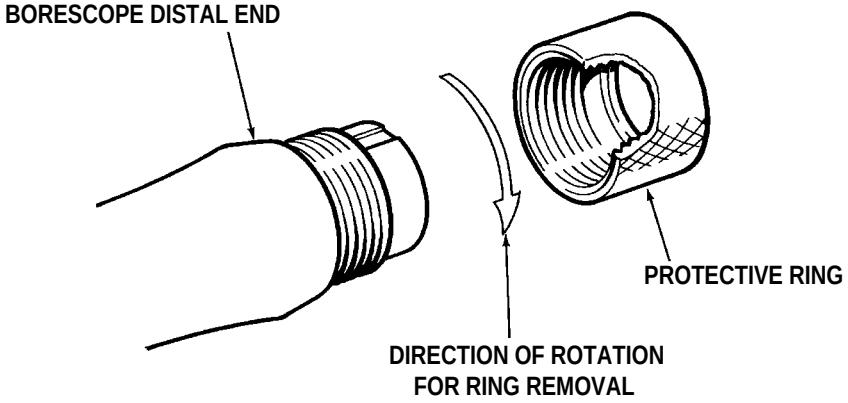
(a) Installation

1 Hold fiberscope as close as possible to distal end, and remove protective ring.

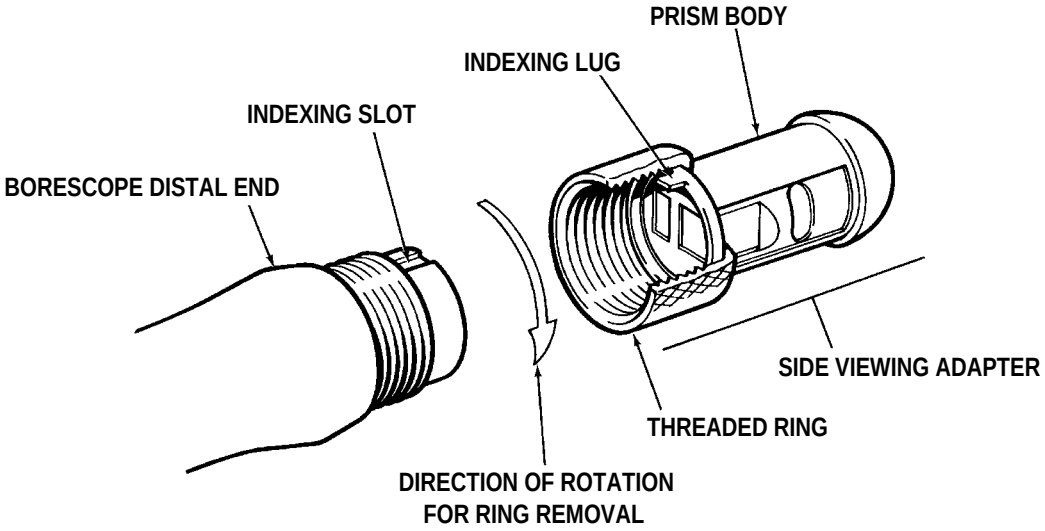


C41524

Borescope and Accessories Installed
Figure 601



RING REMOVAL



ADAPTER INSTALLATION

C12191

Removal/Installation of Side Viewing Adapter
Figure 602

CAUTION: INSTALL SIDE VIEWING ADAPTER CAREFULLY. IF NOT INSTALLED AND TIGHTENED CORRECTLY, ADAPTER COULD FALL INTO ENGINE. OVERTIGHTENING COULD DAMAGE DISTAL END.

2 Hold fiberscope as close as possible to distal end, and install adapter with indexing slot and lug aligned. Tighten adapter fingertight.

(b) Removal

1 Hold fiberscope as close as possible to distal, and remove side viewing adapter.

CAUTION: INSTALL PROTECTIVE RING CAREFULLY. IF NOT INSTALLED AND TIGHTENED CORRECTLY, RING COULD FALL INTO ENGINE. OVERTIGHTENING RING COULD DAMAGE DISTAL END.

2 Hold fiberscope as close as possible to distal end and install protective ring. Tighten ring fingertight.

(2) Light source

NOTE: Specify power requirement when purchasing borescope.

(a) A halogen lamp, with either 110 V 60 Hz, or a 220V 50 Hz power supply.

(b) Remove top cover from light source to replace lamp.

(c) Set intensity knob at maximum for best results.

(d) Before installing light source, refer to manufacturer's instructions.

(3) Camera

(a) A camera may be used to record internal engine components. It must be equipped with a 50 mm F1.8 lens (Ref. Camera Handbook).

(b) Installation

CAUTION: DO NOT USE COMPRESSED AIR TO CLEAN CAMERA, BORESCOPE, OR ASSOCIATED EQUIPMENT

1 Clean camera viewfinder, reflex mirror, focusing screen, and lens with lens cleaning tissue and cleaner.

2 Install endoscopic focusing screen in camera.

3 Install lens.

4 Install adapter (CAII) on lens.

5 Install film in camera (Ref. Camera Handbook).

6 Set camera film speed to suit film, and set exposure to −2 (Ref. Camera Handbook).

7 Align bayonet slots of adapter and install camera on borescope eyepiece pins.

NOTE: Make sure distal end is not moved while taking photographs.

(c) Removal

1 Turn outer ring of camera adapter to disengage locking mechanism and remove camera from borescope eyepiece.

2 Remove camera adapter from lens.

3 Remove film from camera and add following data:

Engine S/N

Date and area photographed

Engine TSN/TSO or cycles since last overhaul

Reason for borescope inspection (suspected foreign object damage, low power, etc.)

(4) Guide Tube (Ref. Fig. 603)

(a) Installation

1 Remove appropriate fuel manifold adapter(s) (Ref. 73-10-05).

2 Ease the guide tube (PWC34910-200) through the manifold adapter opening into the combustion chamber and exit duct area turning the guide tube three-quarters of a turn CCW.

NOTE: The rigid, pattern controlled guide tube must be inserted freely with NO force.

3 The guide tube end locates between vane of CT stator, while the supporting flange is attached to the adapter boss.

(b) Removal

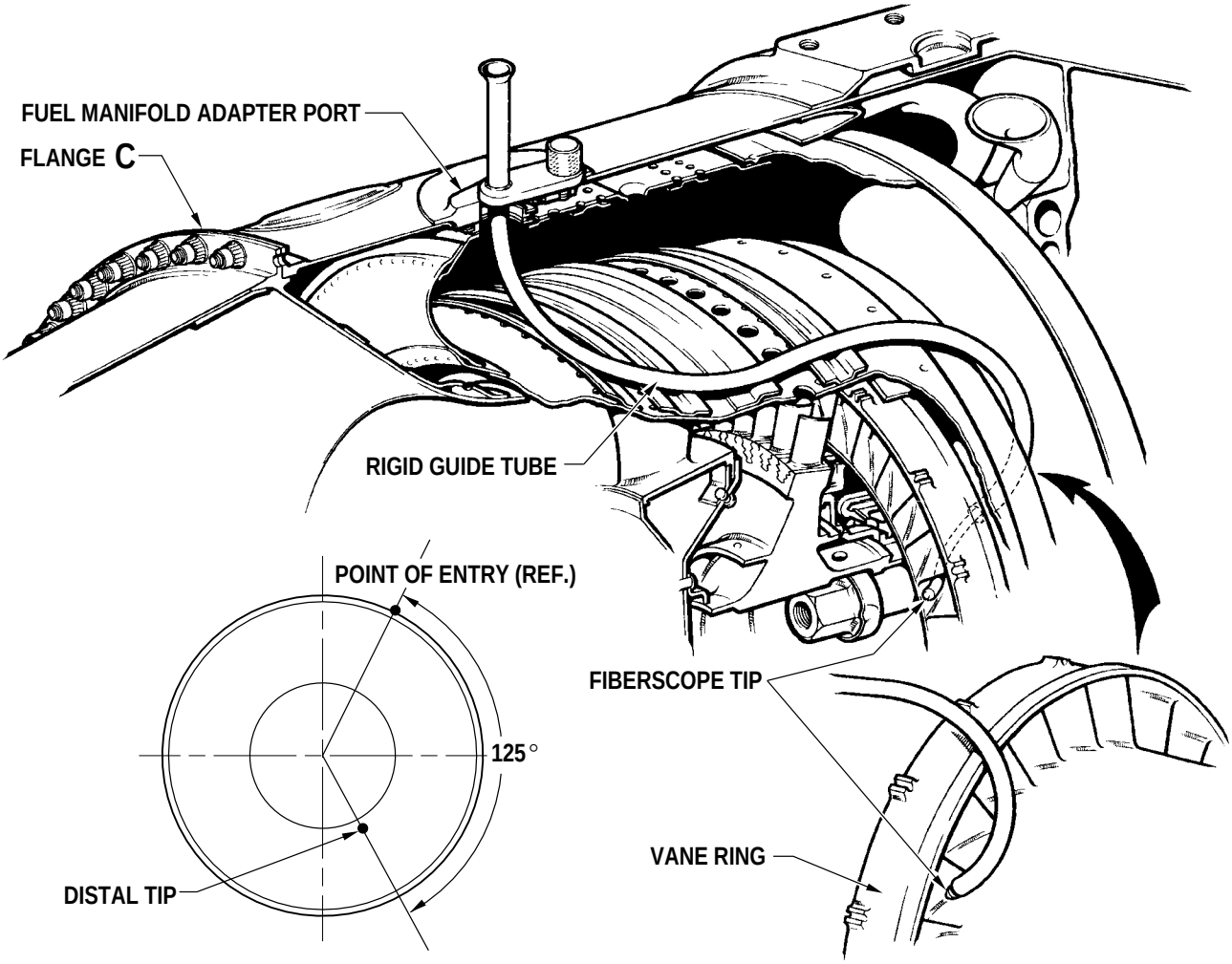
1 Loosen knurled screw to release guide tube supporting flange.

2 Withdraw guide tube, turning clockwise.

3 Install fuel manifold adapter(s) (Ref. 73-10-05).

D. Inspection

(1) Combustion Chamber Liner Assembly



C41525

Guide Tube Orientation
Figure 603

CAUTION: MAKE SURE ENGINE TEMPERATURE IS BELOW 60°C (140°F).

(a) Remove fuel manifold adapter as necessary (Ref. 73-10-05).

(b) Fasten holding fixture (PWC34913) to Flange C, insert fiberscope into fuel manifold adapter port, fasten eyepiece to fixture, and connect light source.

(c) Inspect combustion chamber liner (Ref. View E, Fig. 604 and 72-40-00, MAINTENANCE PRACTICES, Inspection/Check for limits).

(d) Remove fiberscope, light source, and holding fixture.

(e) Install fuel manifold adapter (Ref. 73-10-05).

(2) CT Stator Assembly

(a) Install guide tube (Ref. Para. C. step (4)).

(b) Fasten holding fixture (PWC34913) to Flange C, install borescope, and attach light source (Ref. Fig. 601).

CAUTION: MAKE SURE ENGINE TEMPERATURE IS BELOW 60°C (140°F).

(c) Insert fiberscope into guide tube.

NOTE: The side viewing adapter will add to inspection capability (Ref. Para. C. step (1)).

(d) Examine CT stator assembly.

(e) Remove light source, borescope and holding fixture.

(f) Remove guide tube (Ref. Para.C. step (4)).

(3) CT blades and shroud segments

(a) Install guide tube (Ref. Para. C. step (4)).

(b) Fasten holding fixture (PWC34913) to Flange C (Ref. Fig. 601).

(c) Install borescope on holding fixture and connect light source.

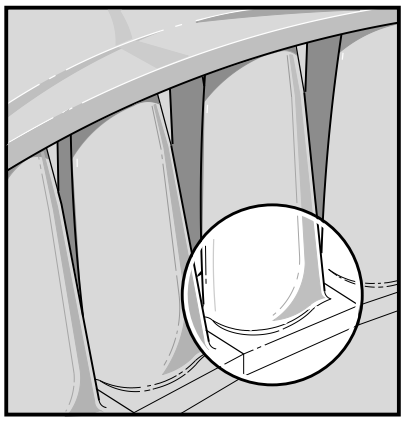
CAUTION: MAKE SURE ENGINE TEMPERATURE IS BELOW 60°C (140°F).

(d) Insert fiberscope into guide tube while looking through eyepiece. Stop inserting when distal tip reaches end of guide tube.

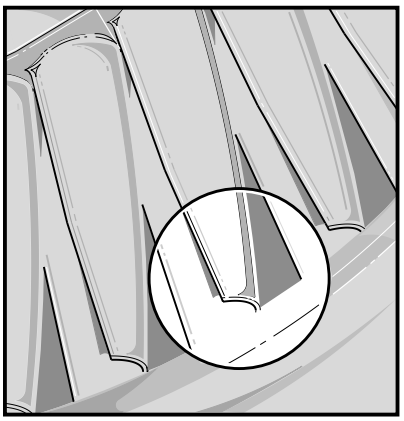
NOTE: Make sure distal tip actuating lever is in neutral position when installing/removing fiberscope.

(e) Remove starter-generator (Ref. Aircraft Maintenance Manual).

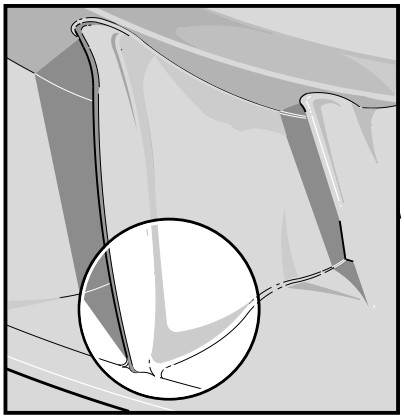
(f) Install wrench (PWC34941) on AGB splined gearshaft.



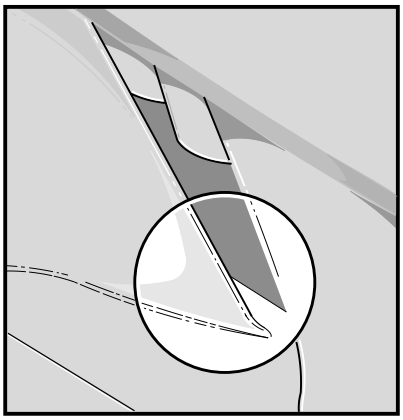
COMPRESSOR TURBINE BLADE ROOT
VIEW **A**



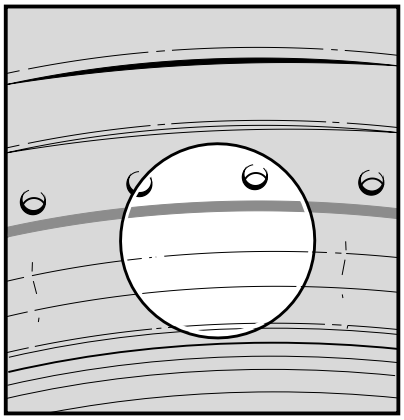
COMPRESSOR TURBINE BLADE TIP
VIEW **B**



VANE LEADING EDGE
VIEW **C**



VANE TRAILING EDGE
VIEW **D**



COMBUSTION CHAMBER LINER COOLING RING
VIEW **E**

C27489

Borescope Views
Figure 604

(g) Loosen knurled knob on holding fixture.

CAUTION: MAKE SURE DISTAL TIP IS NOT BETWEEN CT BLADES BEFORE TURNING COMPRESSOR.

(h) Examine CT blades and shroud segments while a second operator, using the wrench, rotates compressor.

(i) Retract fiberscope into guide tube.

(j) DELETED

(k) Remove fiberscope from guide tube.

(l) Remove borescope and holding fixture.

(m) Remove guide tube (Ref. Para. C. step (4)).

(n) Insert fiberscope through the exhaust duct port.

CAUTION: MAKE SURE THE PROPELLER AND THE POWER TURBINE DO NOT ROTATE WHILE FIBRESCOPE IS INSERTED THROUGH THE PT BLADES.

(o) Carefully insert fiberscope through the PT blades and the PT vane rings using the distal tip actuating lever.

CAUTION: MAKE SURE THE DISTAL TIP IS NOT INSERTED BETWEEN THE CT BLADES BEFORE TURNING COMPRESSOR.

(p) Examine the trailing edge of the CT blades while a second operator, using the wrench, rotates compressor.

(q) Carefully remove the fiberscope from the exhaust duct.

(r) Remove wrench from splined gearshaft, and install starter generator (Ref. Aircraft Maintenance Manual).

(4) Accessory Gearbox Gears

(a) Remove oil filler cap/ gage assembly and filler tube from accessory gearbox housing (Ref. 72-60-00).

(b) Remove starter-generator (Ref. Aircraft Maintenance Manual).

NOTE: When the AGB inspection is done at the same time as the first stage compressor rotor inspection, the AGB gears can be turned by rotating the first stage rotor. Do not use bare hands.

(c) Insert wrench (PWC34941) into splined gearshaft.

(d) Clamp holding fixture (PWC34913) to engine rear lifting bracket, fasten eyepiece to holding fixture, and connect light source.

CAUTION: MAKE SURE END OF FIBERSCOPE DOES NOT TOUCH GEARS.

(e) Insert fiberscope into oil filler hole and examine gear teeth, while a second operator rotates geartrain using the wrench.

(f) Inspect gearbox internally for corrosion.

(g) Remove wrench, light source, fiberscope, eyepiece and holding fixture.

(h) Install starter-generator (Ref. Aircraft Maintenance Manual).

(i) Install oil filler tube, filler cap and gage assembly (Ref. 72-60-00).

(5) Reduction Gearbox

(a) Remove scavenge oil strainer assembly (Ref. 72-10-00).

(b) Fasten holding fixture (PWC34913) to Flange A, attach eyepiece to fixture, and connect light source.

CAUTION: MAKE SURE END OF FIBERSCOPE DOES NOT TOUCH GEARS.

(c) Insert fiberscope into the oil strainer access along the lower passage until the first stage planet gears can be seen. To view the second stage gears, insert fiberscope in an upward direction. Examine gears.

(d) Manipulate fiberscope while second operator rotates geartrain by turning the propeller by hand.

(e) Inspect gearbox casing internally for corrosion. Pay particular attention to flange area at six o'clock position.

(f) Remove wrench, light source, fiberscope, eyepiece and holding fixture.

(g) Install scavenge oil strainer assembly (Ref. 72-10-00).

E. Fault Isolation

(1) The possible sources of, and remedies for problems encountered when using borescope are shown in Table 602.

TABLE 602, Fault Isolation

PROBLEM	SOURCE	REMEDY
Poor illumination	Oil or dirt on distal tip, or side viewing adapter prism	Clean using lens cleaner and tissue.
	Light source intensity switch set at LOW	Set switch to HIGH.
	Defective lamp	Replace lamp

TABLE 602, Fault Isolation (Cont'd)

PROBLEM	SOURCE	REMEDY
	Damaged borescope light tube	Return to manufacturer for repair.
	Defective transformer	Return to manufacturer for repair.
Poor definition	Poor illumination	Return to manufacturer for repair.
	Diopter ring not adjusted correctly	Adjust to suit eyes.
	Damaged fibers in fiberscope, (seen as black dots through viewer)	Return to manufacturer for repair.
Fiberscope distal end does not move when control knob is turned	Damaged control wires	Return to manufacturer for repair.
NOTE: Repairs should be done only by the manufacturer.		

9. In-service Inspection

A. Hot Section Components

In-service inspection is used to determine performance deterioration. Parts can be inspected using a borescope (Ref. Para. 8.) or by removing the power section (Ref. Subpara. B.) following. Refer to FAULT ISOLATION for areas to be inspected.

Using a borescope is more practical for this inspection. Removal and installation of the power section, components/assemblies may result in damage to parts and/or distortion of sealing surfaces causing gas leaks and performance loss.

Acceptable damage must be documented and progression monitored. Record engine/module TSN/TSO and cycles, fuel nozzle ports used, if found by borescope, component, description, location and dimensions of defect.

If rotating components are found with unacceptable damage during inspection, an HSI must be done before next flight. If damaged non-rotating components are found, except when holes are burnt through the combustion chamber or the CT stator airfoil trailing edge defects are beyond limits (Ref. Inspection), the HSI may be delayed, providing an engine performance/ground power check is done.

An additional engine performance/ground power check and inspection of the affected area must be done after 50 hours. Subsequent inspections and engine performance/ground power check intervals will depend on the progression and level of deterioration. Keeping an engine in service after components have deteriorated may substantially increase the cost of future repairs/refurbishments.

Gas path components downstream of components having material missing must be inspected for secondary damage. Pay special attention to rotating components. CT stator vanes burned through at trailing edge (pressure and suction sides) may mean replacement of the complete set of CT blades, depending on the area of the surface burned through.

The ability of an engine to produce the TO power required by the flight manual for the actual Tam/PA is the only engine airworthiness requirement. However, on some installations the aircraft maintenance manual provides an engine ground power test. This test may be used to confirm TO power is produced within operating limits over the complete range of Tam and PA for which the engine/aircraft is certified. If, at an anticipated high ambient temperature and/or altitude, T5 and Ng will approach or exceed the maximum limits, an HSI is recommended before the actual conditions occur. When T5 and Ng approach, or are anticipated to approach or exceed the maximum limits, troubleshoot the engine/installation before doing an HSI.

Carbon accumulation inside fuel nozzle passages is the principle cause of spray pattern degradation resulting in non-uniform combustion and local high temperature peaks. Exposure to these peaks contributes to premature hot section deterioration. Carbon accumulation is progressive and can affect all nozzles. Therefore, inspect all nozzles (Ref. 73-10-05, Inspection/Check), to minimize premature deterioration occurring at other locations.

If component deterioration exceeds limits, either replace the individual component or do an HSI, depending on the general condition of the hot section and engine performance.

The inspections are recommended concurrent with scheduled engine maintenance checks applicable to individual aircraft installations.

B. Removal/Installation of Power Section (Heavy Maintenance Only)

NOTE: This is an alternative to using borescope.

(1) Removal

(a) Remove power section (Ref. SERVICING).

(b) Remove CT disk assembly (Ref. 72-50-02, Removal/Installation).

(c) Remove combustion chamber inner liner (Ref. 72-40-00, Removal/Installation).

(d) Remove CT stator assembly, shroud housing and small exit duct (Ref. 72-50-01, Removal/Installation).

NOTE: Do not separate parts unless CT stator damage exceeds limits.

(e) Inspect hot section components (Ref. Para. C., D., E., F., G. and H. following).

(2) Installation

(a) Install CT stator assembly, shroud housing and small exit duct (Ref. 72-50-01, Removal/Installation).

(b) Install CT disk assembly (Ref. 72-50-02, Removal/Installation).

(c) Install combustion chamber inner liner (Ref. 72-40-01, Removal/Installation).

(d) Install power section (Ref. SERVICING).

C. Inspection of Combustion Chamber

NOTE: Combustion chamber includes small exit duct, inner and outer combustion chamber liner assemblies.

(1) Combustion chamber liner cracks may be repairable, and an HSI is recommended before component replacement is required. Converging cracks in the inner and outer combustion chamber liner walls which do not meet are acceptable. Inspect affected area at 100 hours. Subsequent inspections must not exceed 400 hours.

(2) Plasma top coating (ceramic) loss revealing undercoat (diffused aluminide) on outer and inner liners is acceptable, providing base metal is not burnt or eroded.

(3) Small areas (approximately 1 sq.in.) bulging and/or hot spots on inner or outer liner walls may be repairable and an HSI is recommended. Bulging and/or burning in the dome area, associated or not with axial cracks, are acceptable provided the axial cracks (circumferential cracks are unacceptable) do not exceed 1.0 inch in length or 0.030 inch in width. Engine may remain in service, providing the associated fuel nozzle(s) is/are inspected (Ref. 73-10-05, Inspection/Check) and replaced if not within limits. Subsequent inspections are at operators discretion, but must not exceed 400 hours.

(4) Holes in the inner and outer liner walls are unacceptable. An HSI must be done to replace or repair the affected component, and the associated fuel nozzle(s) inspected (Ref. 73-10-05, Inspection/Check) and replaced if not within limits.

(5) Cracked or distorted cooling rings on liners may be repairable. An HSI is recommended before cooling rings are burned through and pieces enter the gas stream. Engine may remain in service if it is understood that cooling air flow is changed, and the rate at which the combustion chamber deteriorates may increase. Therefore, if an HSI is not done, combustion chamber liner with distorted cooling rings or converging cracks must have the associated fuel nozzle(s) inspected (Ref. 73-10-05, Inspection/Check) and replaced if not within limits. Inspect damage at 100 hours. Subsequent inspections are at operators discretion, but must not exceed 400 hours.

(6) Excessive carbon deposits inside combustion chamber could be result of poor fuel atomization by the fuel nozzles (indicated by deposits around fuel nozzle bosses). Distortion of combustion chamber liner cooling rings may produce carbon deposits in the dome area downstream of the affected cooling ring. If excessive carbon deposits are found, flow check fuel nozzles (Ref. 73-10-05). If CT blades are eroded, refer to Inspection of CT Blades.

(a) If the nozzles are serviceable, the combustion chamber liner is the probable cause of the deposits. Inspect the CT blades, as erosion by carbon particles (some carbon particles remain in the gas stream and are not deposited in the combustion area) may damage and cause CT blade replacement.

(b) If CT blades are not eroded, engine may remain in service and the CT blades and combustion chamber liners inspected within 100 hours. Subsequent inspections are at operators discretion, but must not exceed 400 hours.

(7) As the structural integrity of the small exit duct is not affected, cracks and open radial cracks extending from the inner to the outer diameter are acceptable (length not limited), and an unlimited amount of coating loss is acceptable.

(a) Holes less than 0.500 in. in diameter in the outer wall are acceptable.

(b) If holes or open cracks are found, an HSI is recommended.

NOTE: The engine may remain in service, and HSI delayed, providing it is understood that the CT stator cooling air flow is affected, increasing the rate of deterioration.

(c) When damage is found, inspect the CT stator (Ref. 72-50-01, Inspection/Check) and associated fuel nozzle (Ref. 73-10-05, Inspection/Check).

(d) Inspect damage at 100 hours. Subsequent inspections are at the discretion of the operator, but must not exceed 400 hours. If deterioration exceeds the above limits, an HSI is recommended.

(8) Cracks along, or across, the dome to outer liner seam weld are acceptable provided the cracks do not intersect the fuel manifold support bracket. Inspect damage at 100 hours. Subsequent inspections are at the operators discretion but must not exceed 400 hours.

D. Inspection of Compressor Turbine (CT) Stator Assembly

CAUTION: IF ANY CT STATOR VANE HAS TRAILING EDGE BURN THROUGH EXCEEDING THE FOLLOWING LIMITS; THE CT BLADES MUST BE DISCARDED.

(1) Measure trailing edge burn through (Ref. Fig. 605).

NOTE: Burned areas on vanes increase flow area which accelerates downstream component deterioration, decreases Ng and increases T5.

(2) Cracks (Ref. Fig. 606) are repairable. Keep the engine in service and monitor deterioration progression. Do an HSI before defects progress to such an extent that the CT stator becomes unrepairable. This will increase the cost of the subsequent HSI. Inspect CT stator having the defects shown within 100 hours. Subsequent inspections must not exceed 400 hours.

(3) If defects have progressed beyond repair limits shown, engine may remain in service, providing an engine ground power check (Ref. Aircraft Maintenance Manual) is done, and the airfoil trailing edge damage does not exceed limits shown (Ref. Fig. 605). An HSI is recommended if the vane trailing edge defects are beyond the limits shown or downstream components are affected by the CT vane distress or engine performance is unacceptable.

NOTE: Refer to Subpara. A. for additional recommendations.

E. Inspection of CT Blades (Ref. Figs. 607, 608 and 609)

(1) While performing compression turbine blade inspection, operators might notice surface anomalies that could be mistaken for sulphidation. In fact, these surface anomalies are a result of the blade manufacturing process and do not affect turbine performance. The following points of inspection will help operators determine if the blades are serviceable:

- No loss of coating.
- No change in color.
- No evidence of sulphidation on adjacent blades.
- Geometrical deviations do not exceed 0.005 inches deep or 0.005 inches high. There is no width limitation (Ref. Fig. 609).

(2) The condition of blades and tips is critical to obtain rated power. Most significant blade tip defects (rubs and oxidation) increase interturbine temperature (T5). Even if T5 is below maximum, an HSI may be recommended if damage is beyond the limits shown (Ref. Fig. 608).

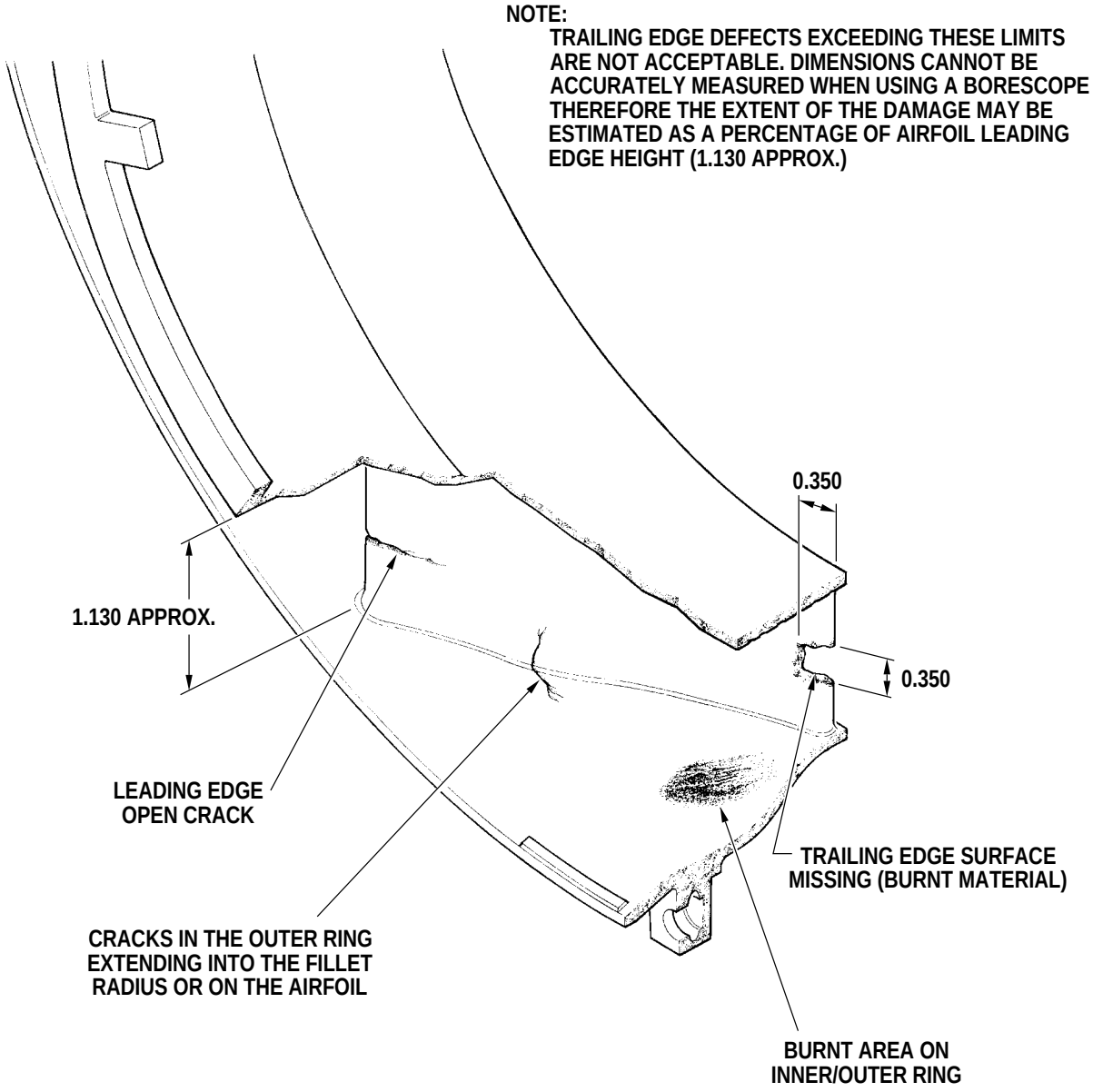
NOTE: Refer to Subpara. A. for additional HSI recommendations.

(a) Defects shown are acceptable, providing their condition is monitored by further inspections and engine performance checks.

(b) Subsequent inspections are at the discretion of the operator, but must not exceed 400 hours.

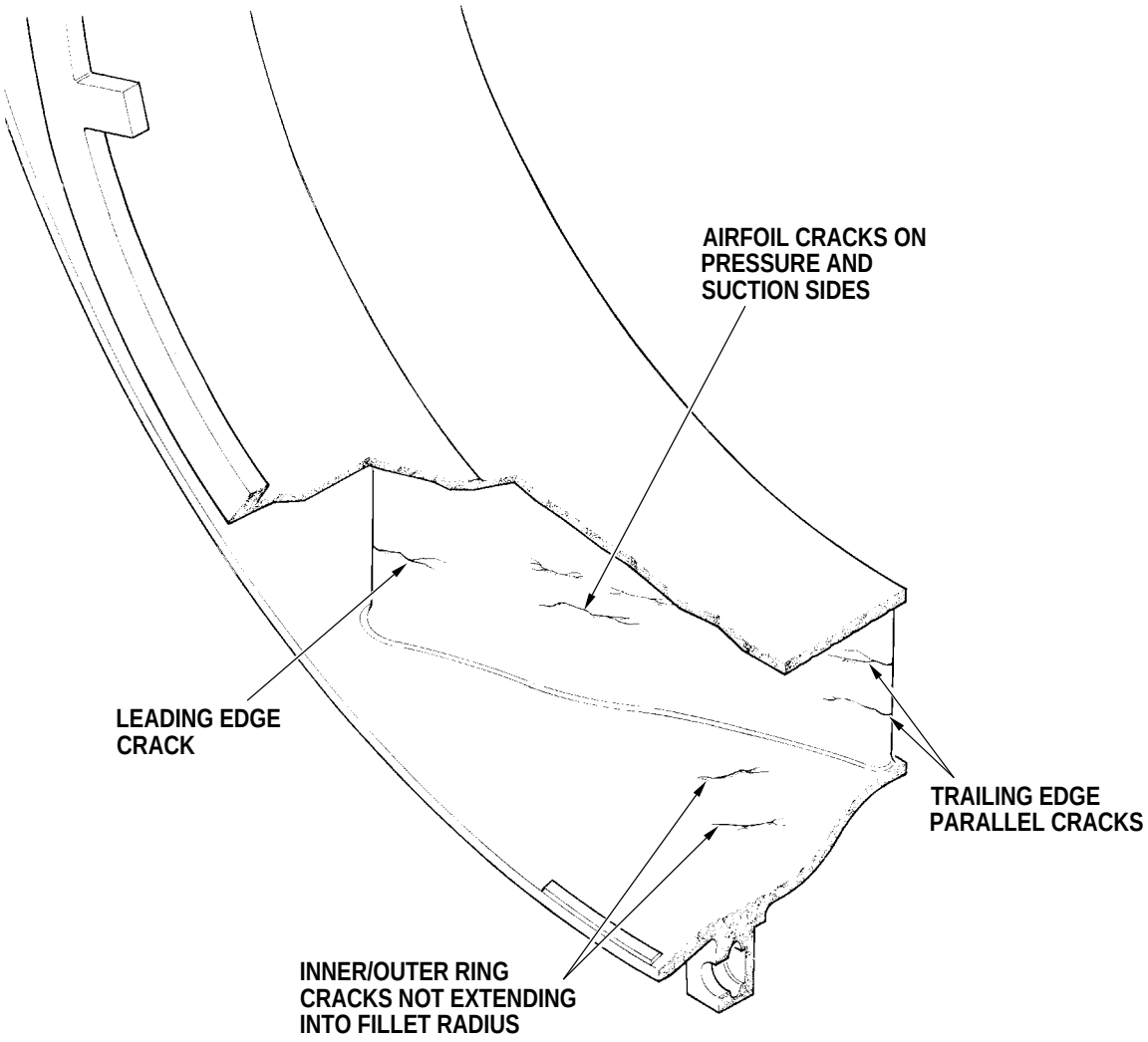
(c) Blades with cracks 0.050 in. long in the upper 1/3 of the trailing edge may remain in service for 100 hours.

(d) If defects are beyond those shown (Ref. Fig. 607), an HSI is recommended.



C23013A

CT Stator Damage - HSI Recommended
Figure 605

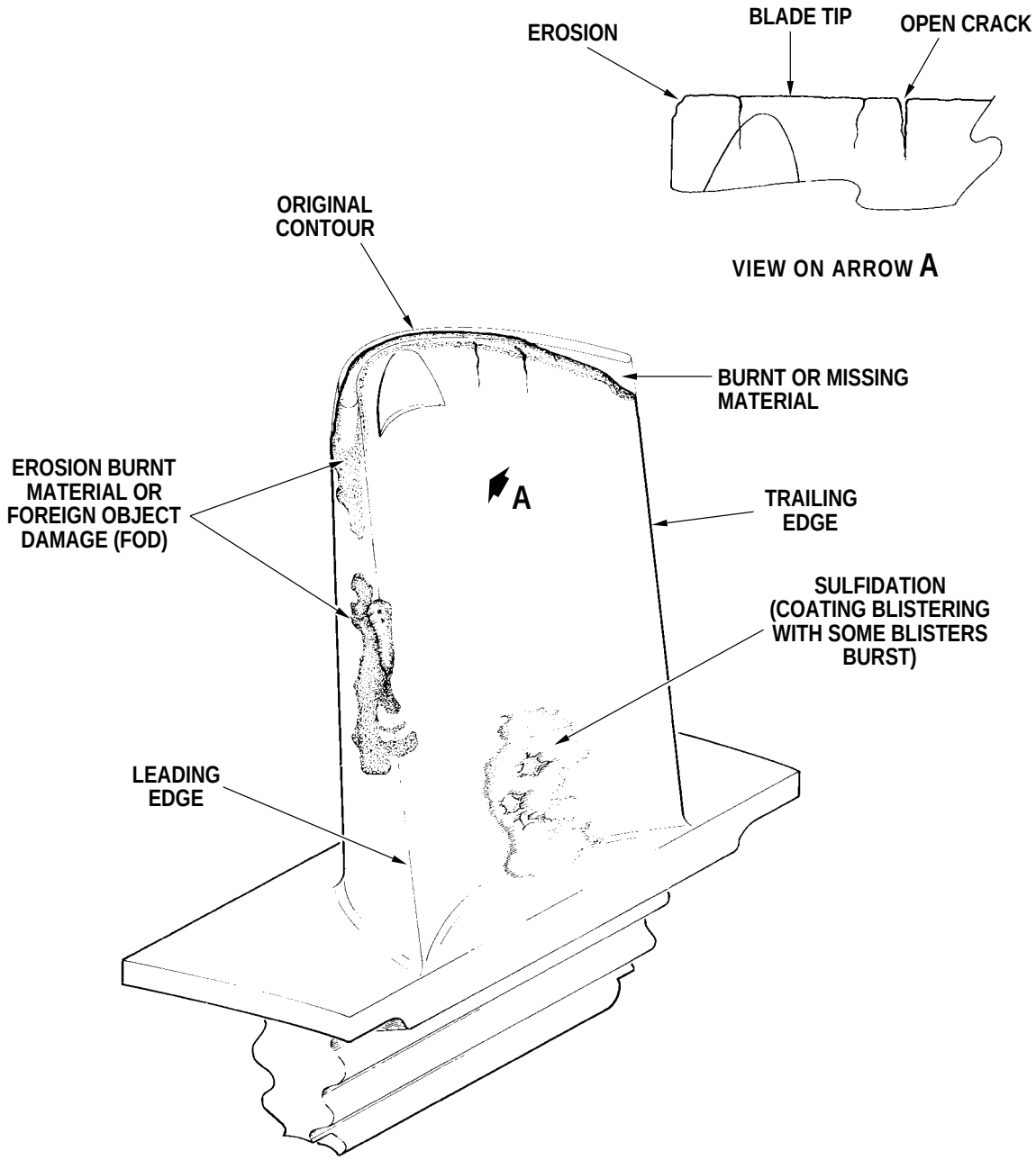


NOTE:

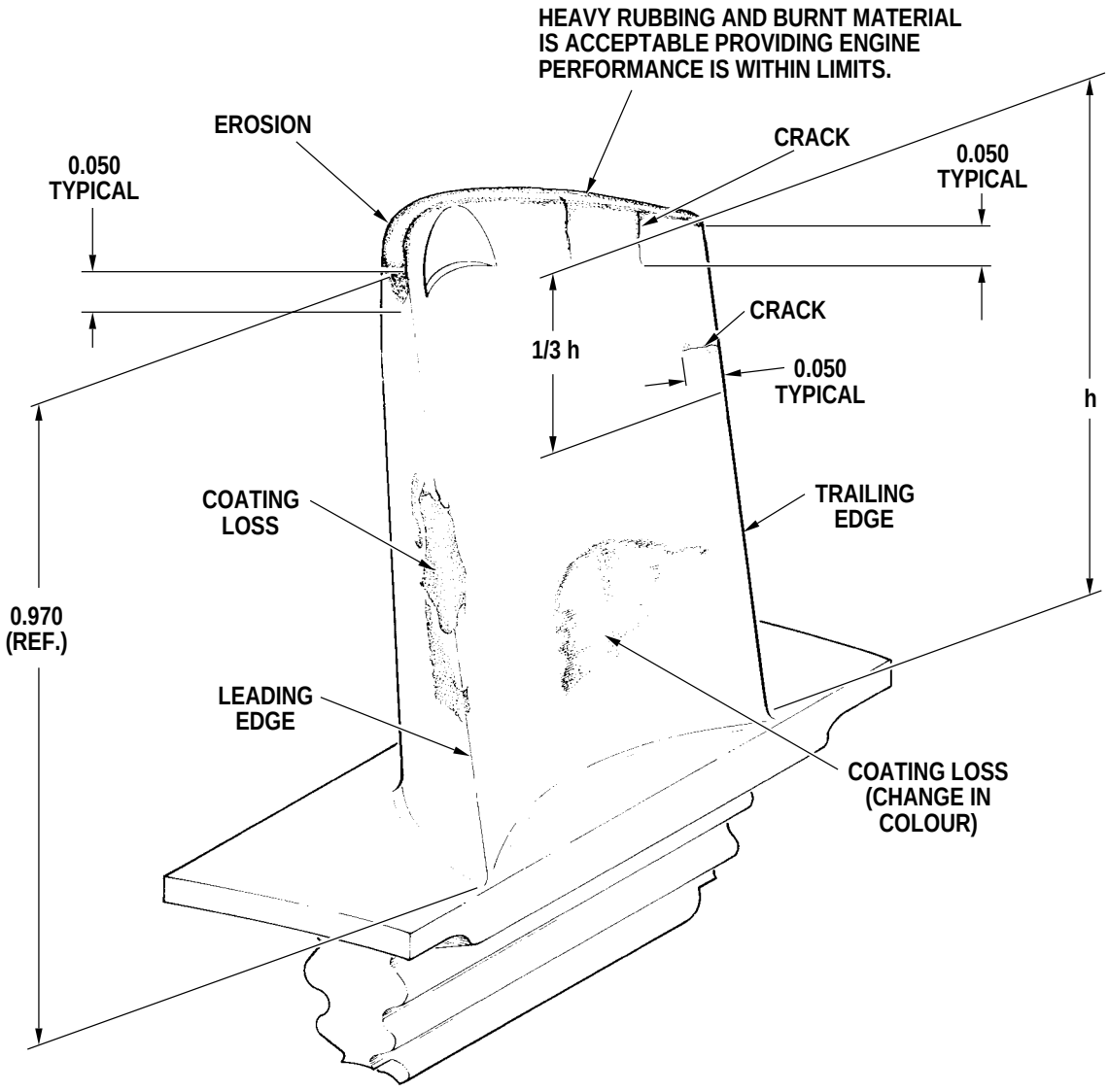
THE ABOVE DEFECTS ARE ACCEPTABLE FOR FURTHER SERVICE. THE EXTENT OF THE DEFECT(S) MUST BE RECORDED AND MONITORED BY ADDITIONAL INSPECTIONS. THE ASSOCIATED FUEL NOZZLE MUST BE INSPECTED AND REPLACED IF NOT WITHIN SPECIFIED LIMITS.

C23014

CT Stator - Acceptable/Repairable Damage
Figure 606



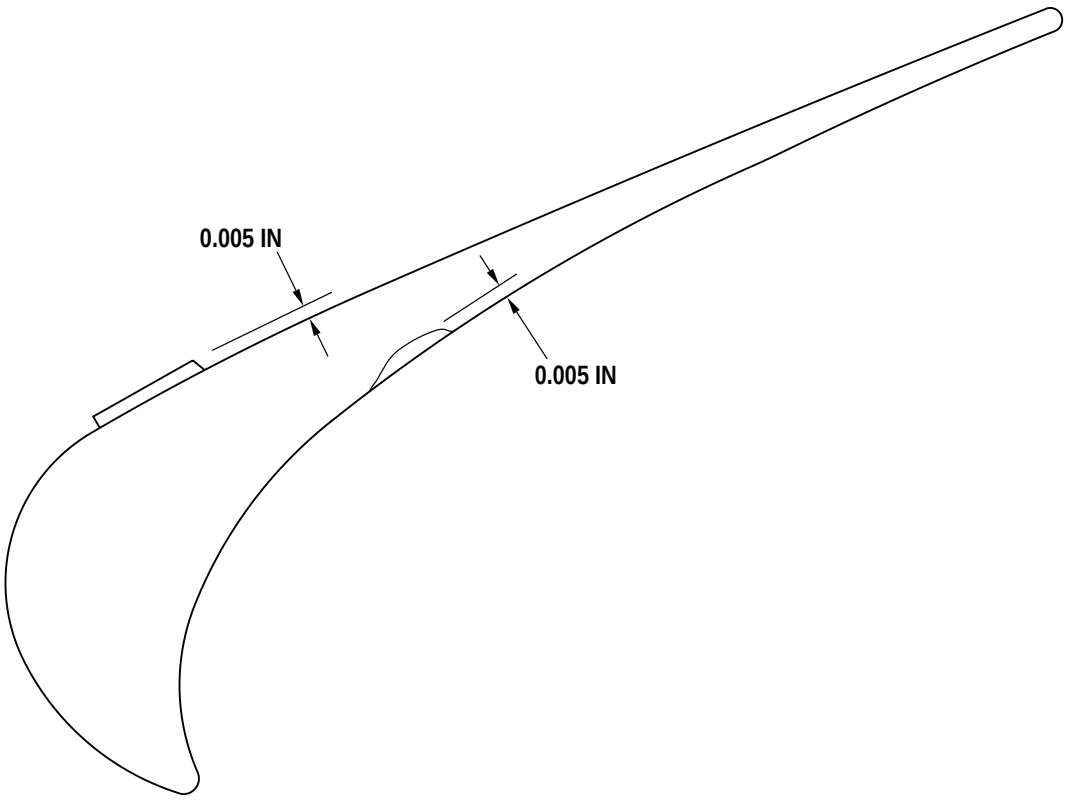
CT Blade Damage - Unacceptable Damage
Figure 607



THE ABOVE DEFECTS ARE ACCEPTABLE FOR FURTHER SERVICE. THE EXTENT OF THE DEFECT(S) MUST BE RECORDED AND MONITORED BY ADDITIONAL INSPECTIONS.

C23004

CT Blade Damage - Acceptable Damage
Figure 608



C77352

CT Blade - Manufacturing Anomalies
Figure 609

(3) Check blades for axial shift. Normally, with components within assembly tolerances, the blade platforms are approximately in line. When a blade shifts, the blade moves axially and can be seen as having moved in relation to the adjacent platform.

NOTE: 1. Checking each CT blade TE platform alignment with a borescope is quite difficult. The recommended method is to look at the leading edge (LE) mismatch while rotating the CT disk. When a mismatch is observed (one of the airfoil LE is shifted), check blade trailing edge platform. Maximum shift is 0.020 inch.

NOTE: 2. The amount of blade shift may be estimated by using a 0.020 in. thick wire wrapped tightly around the tip of borescope and held by tape. The free end should be positioned within the field of view of the borescope. When estimating the amount of shift, position the free end of the wire adjacent to the platform being checked.

(4) If blade shift in excess of the limit is observed, an HSI is recommended.

F. Inspection of CT Shroud Segments

(1) Heavy rubbing and oxidation are acceptable, providing T5 is within limits. Operating the engine with the shroud segments burned may cause damage to the CT shroud housing (cracking and burning of the attachment rim), and an HSI is recommended. A damaged shroud housing must be replaced at the next HSI or refurbishment.

NOTE: Refer to Subpara. A. for additional HSI recommendation.

G. Inspection of Power Turbine (PT) Stator

NOTE: Inspection of the PT stator is recommended when upstream component damage does not explain performance loss or when secondary damage is suspected.

(1) Damage on the vanes may produce an increase in flow area which will increase Ng and T5.

(2) Cracks on the inner and outer rings and vanes are repairable. Keeping the engine in service, the defects will progress until the stator becomes unrepairable. This will increase the cost of the subsequent HSI. Inspect the damaged area within 100 hours. Subsequent inspections must not exceed 400 hours.

(3) An HSI is recommended when the defects are still repairable.

(4) If the defects are not repairable, replace PT stator at the next power section repair. Providing Ng and T5 are within limits, there is no need for power section repair and PT stator change, regardless of the amount of damage, unless structural integrity of the vanes are affected (e.g. wide open cracks, excessive foreign object damage (FOD) and missing or burnt material are unacceptable).

H. Inspection of PT Blades

(1) Increased tip clearance of PT blades increases T5. If T5 is within limits, there is no need to change the PT assembly, regardless of the amount of damage, providing structural integrity of the components is not affected.

(a) Cracks, missing material, excessive FOD, heavy sulphidation or blade distortion are unacceptable.

I. Inspection of Accessory Gearbox (AGB) and Reduction Gearbox (RGB) Gears

(1) The following inspection criteria should be used when inspecting the accessory and the reduction gearboxes with a borescope.

(2) This inspection may be done at operator's discretion if gearbox distress is suspected or as a troubleshooting aid as required.

(3) Acceptable Damage on Tooth Contact Faces

(a) Small clusters of spalling at one extremity of the tooth width or in a narrow band on less than 1/2 tooth length.

(b) Light shallow scoring where the scratches cannot be detected with a 0.040 in. radius scriber. Scoring usually indicates poor lubrication and the associated oil nozzle is recommended to be overhauled.

(c) Heat discoloration usually indicates poor lubrication which may lead to scoring, then spalling. The associated oil nozzle is recommended to be overhauled

(d) Ideal tooth contact is a centrally-located strip on face of tooth. Any deviation indicates incorrect tooth contact.

(e) Wear pattern starting at the end of the tooth denotes end loading. A minor amount of end loading is not considered detrimental.

(f) Incorrect tooth contact may result in spalling because the torque transmitted by the gear is transmitted by a smaller tooth surface resulting in increased contact pressure and local overloading.

(g) Components having acceptable damage may remain in service providing an inspection of the affected area is done at an interval not exceeding 400 hours. Subsequent inspections should be done at intervals depending upon the rate of progression and level of deterioration seen. In addition, special attention must be paid to the scheduled oil filter and chip detector inspections required by the regular maintenance program.

(4) Non-acceptable Damage

NOTE: Replace affected module or component if any of the following non-acceptable conditions are evident.

(a) Spalling in a narrow band along whole width of tooth or dispersed throughout contact area.

(b) Deep scoring (root/tip direction) across tooth contact surface.

NOTE: Deep scoring is defined as scoring where the scratches can be felt with 0.040 in. radius scriber.

(c) Rough tooth contact surface due to excessive wear, with raised material at tooth extremities.

10. Hot Section Inspection

A. General

Engine performance check (Ref. 71-00-00, ADJUSTMENT/TEST) before and after inspection is recommended and is important in determining status of hot section parts, and ascertain performance recovery.

Hot section parts can be inspected using a borescope (Ref. Para. 8.).

The following information is offered as a guide to improved engine performance/handling.

B. Gas Generator Module

(1) Maintain CT blade radial tip clearance within prescribed limits (Ref. 72-50-01).

(2) Improve compressor turbine blade tip clearance by maintaining lug and slot joint geometry (Ref. 72-50-01, Removal/Installation) and minimizing side clearance of lugs.

(3) Maintain same CT and PT vane ring classes as installed in engine initial build or at last overhaul; that is, classes determined at engine test.

(4) Be sure the following conditions apply:

(a) Interstage sealing rings must be in satisfactory condition (Ref. 72-50-03, Inspection/Check) .

(b) Compressor bleed valve must be functioning correctly.

(c) No air leaks are permitted in gas generator assembly area (e.g., cabin bleed air adapter, fuel nozzle adapter, igniter plug, P3 air lines, filter cover and adjoining lines).

(d) Heatshield (Pre-SB1305) must be a snug fit in shroud housing.

(e) Cracks in the compressor turbine vane ring are acceptable provided they:

1 Do not exceed acceptable limits (Ref. 72-50-01).

2 Do not destroy lug and slot joint free movement and flat surface sealing.

(5) The following requirements should be maintained by rework on affected components. Rework should be accomplished by hand stoning and lapping on locally manufactured lapping plates (Ref. Chapter 72-50-01, Approved Repairs):

(a) A sliding fit must exist between the combustion chamber liner and small exit duct (Ref. Fig. 610). Rework by hand.

(b) Flatness and sealing must exist on flat sealing land between small exit duct and leading edge of compressor turbine vane ring outer ring. Lap using lapping plates to obtain good sliding fit.

(c) Flatness and sealing must exist on flat sealing land between compressor turbine vane ring and lock plate. Lap as required.

(d) A free sliding fit must exist between lugs of compressor turbine vane ring and grooves in No. 2 bearing cover. Stone lugs if necessary.

NOTE: Excessive clearance between lugs and slots will cause play and destroy blade tip clearances. Replace components or return to overhaul facility for rework.

(e) Make sure compressor stator does not hang-up on CT shroud housing. Stone lugs and/or slots as necessary (Ref. Fig. 610).

C. Power Section

(1) Remove power section (Ref. REMOVAL/INSTALLATION).

(2) Remove compressor turbine disk and blade assembly (Ref. 72-50-02, Removal/Installation).

(3) Remove fuel manifold adapter assembly (Ref. 73-10-05, Removal/Installation).

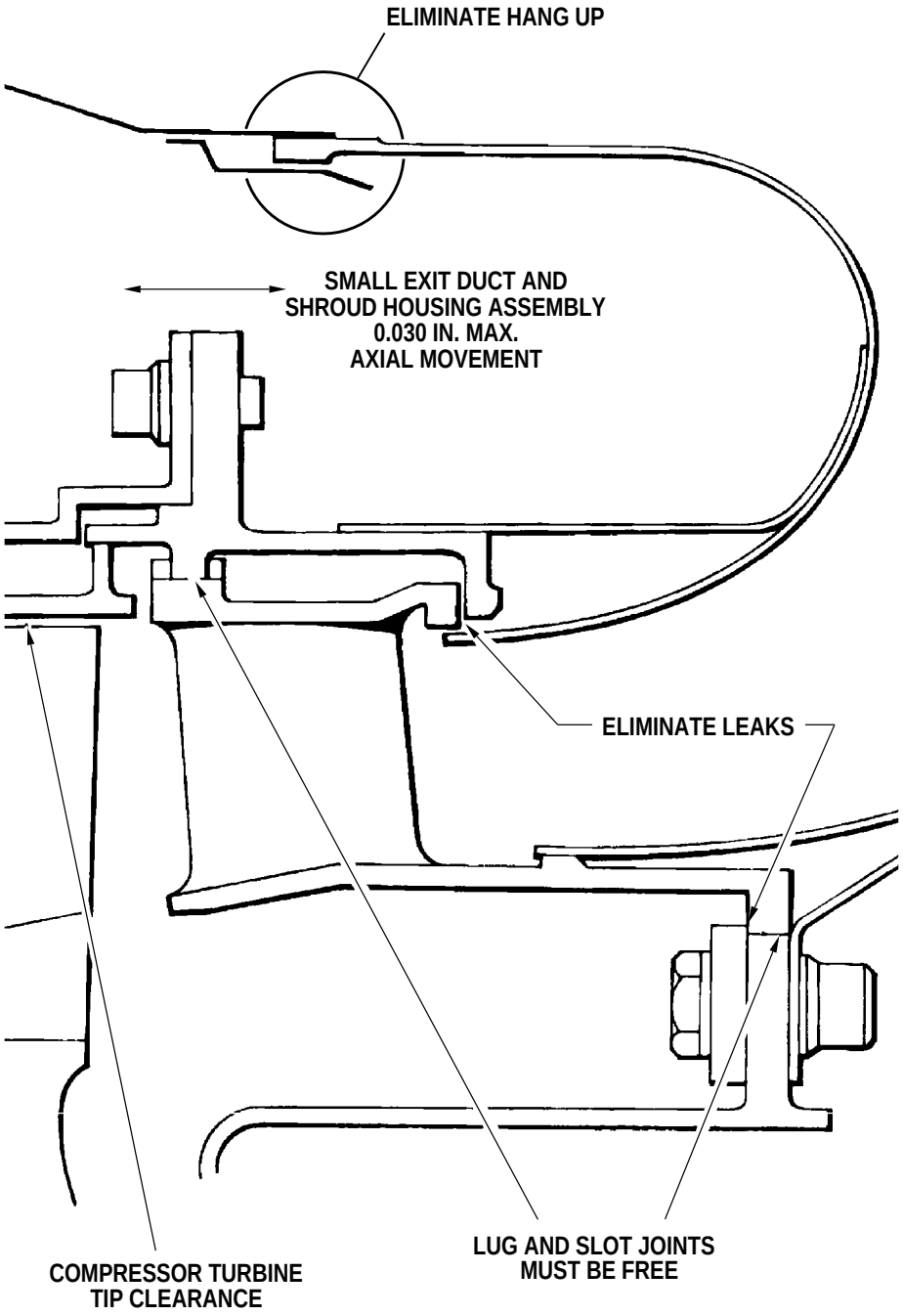
(4) Remove ignition spark igniters/glow plugs (Ref. 74-20-04 or 74-20-00, Removal/Installation).

(5) Remove combustion chamber liner (Ref. 72-40-01, Removal/Installation).

NOTE: During HSI, some components listed in Table 603, remain installed. If further inspection is necessary, remove components as detailed in 72-50-01.

D. Criteria

(1) Inspection criteria is found in Table 603.



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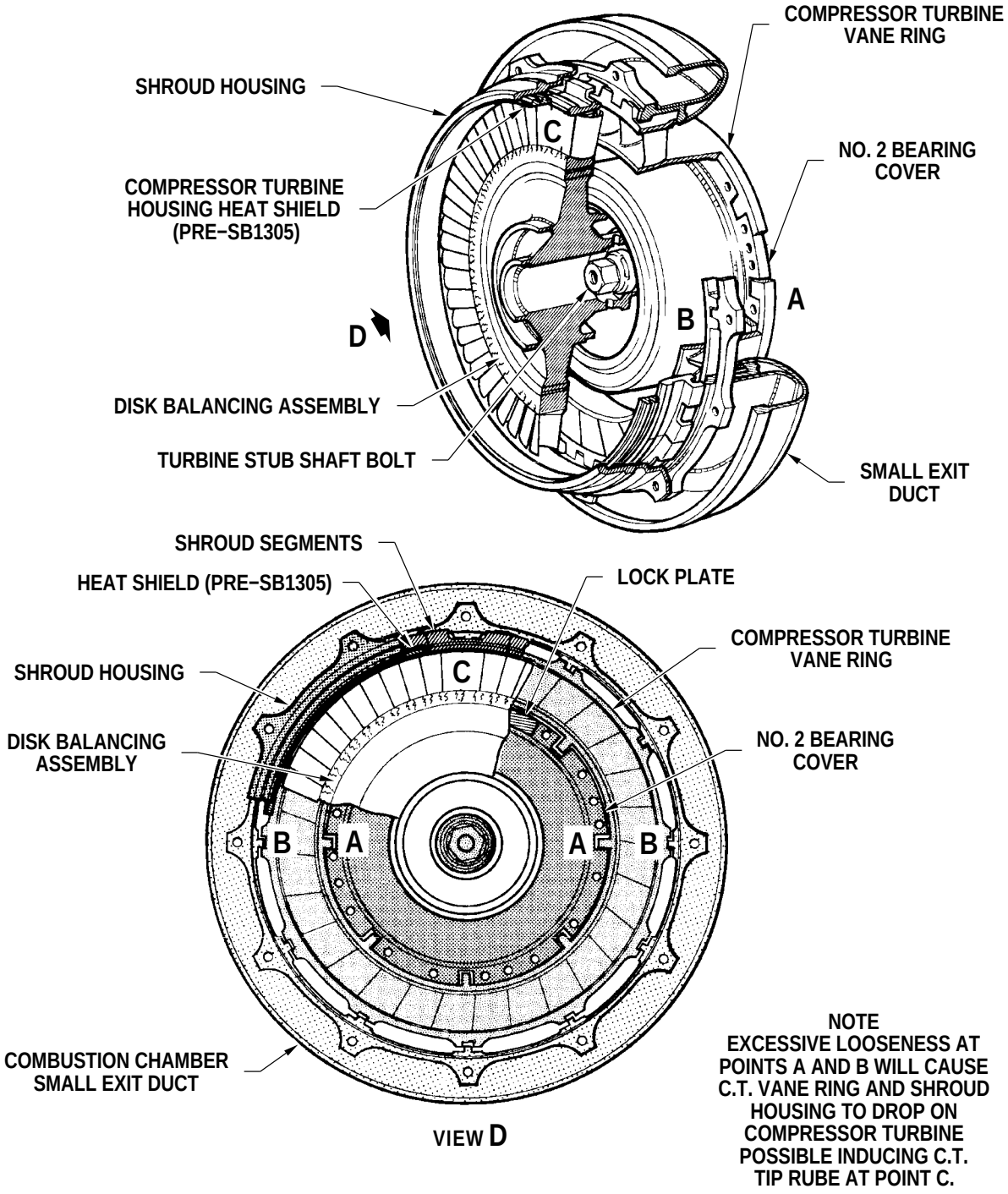
Hot Section Inspection
Figure 610 (Sheet 1 of 3)



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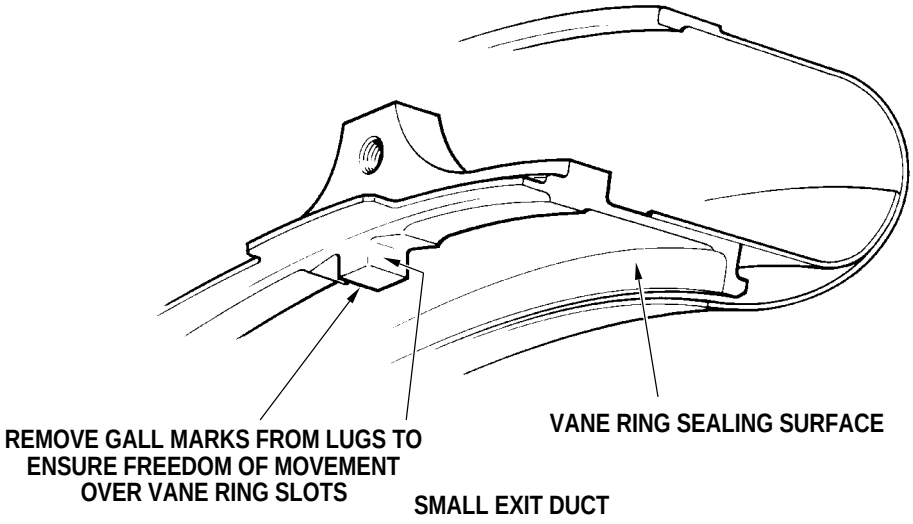
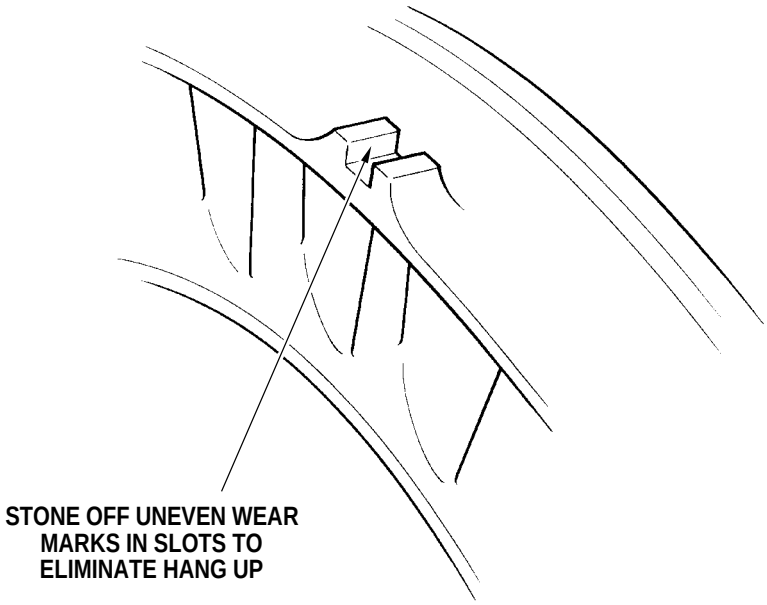
Hot Section Inspection
Figure 610 (Sheet 2)





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Hot Section Inspection
Figure 610 (Sheet 3)

TABLE 603, Hot Section Inspection

Component	Nature of Inspection
Gas Generator Case	Cracks, distortion, overheating and corrosion (Ref. 72-30-04).
Combustion Chamber Liners, Large and Small Exit Ducts	Cracks, distortion, burning, blockage of cooling holes due to repair and coating loss. Any amount of coating loss is acceptable provided burning of parent metal has not occurred (Ref. 72-40-01).
Compressor Vane Ring Assembly, Shroud Housing	Cracks, coating loss, erosion of parent metal or impact damage. Examine vane ring cooling air inlet and outlet ports for blockage (Ref. 72-50-01).
Compressor Turbine Shroud Segments	Cracks, distortion, erosion and metal build-up (Ref. 72-50-01).
Compressor Turbine Disk Assembly	Measure radial tip clearance (Ref. 72-50-02).
	Examine CT blades for tip rub, erosion, impact damage, coating loss, cracks, shift and circumferential movement. If a crack is found on any blade, ship the CT disk assembly to an approved overhaul facility. The complete set of blades must be discarded and replaced withCT blades (Ref. 72-50-02 and, for PT6A-28, Post-SB1265).
	Examine blade retaining rivets for condition.
Interstage Sealing Rings	Wear, fretting and distortion (Ref. 72-50-01).
Fuel Nozzles	Dissimilarity of carbon build-up. Do functional test (Ref. 73-10-05).
Fuel Nozzle Sheaths	Fretting wear, erosion and carbon build-up (Ref. 73-10-05).
Compressor Inlet	Remove air inlet screen, examine inlet area and struts, first-stage blades and vanes for dirt deposits, corrosion and cracks (Ref. 72-20-00).
T5 Temperature Sensing System	Attachment, wiring harness and lugs. Check operation (Ref. 77-20-01).
Power Section Module	
Power Turbine Stator Housing	Cracks, none permitted. Check for proper sealing with interstage sealing rings (Ref. 72-50-03).

TABLE 603, Hot Section Inspection (Cont'd)

Component	Nature of Inspection
Power Turbine Disk Assembly *	Blades for impact damage, erosion and cracks (Ref. 72-50-04).
Power Turbine Stator Assembly *	Cracks, erosion and impact damage (Ref. 72-50-03).
Exhaust Duct	Cracks and distortion (Ref. 72-50-05).
Reduction Gearbox Oil Strainer	Remove and examine assembly for foreign matter (Ref. 72-10-00).
Chip Detector	Remove and inspect chip detector for metal deposits (Ref. 72-10-00).

* Examine in-situ.

11. Unscheduled Inspection

NOTE: If complete engine or accessory gearbox assembly is sent to an overhaul shop for repair, it is recommended to incorporate SB1564 at this time if not previously incorporated.

A. General

(1) Unscheduled inspection is done when the engine is subjected to unusual stress or operating conditions, or exceeds operating limitations or gives unsatisfactory performance/handling.

(2) If as a result of the inspection, engine removal is required, a written report stating cause of removal in detail (e.g., overspeed, overtemperature, etc.) must be sent with the engine to an approved overhaul facility.

(3) Refer to the applicable accessories manual for disposition of external components or, if applicable, send component along with the removed engine or module to an approved overhaul facility.

(4) Several types of events call for rotating the propeller by hand as part of the inspection of the power section. On some engines, the power turbine may rub immediately after shutdown. This is not an indication of distress providing the rubbing/noise disappears after engine cool down.

B. Performance Deterioration

(1) Refer to FAULT ISOLATION.

C. Overspeed

(1) Check engine/aircraft indicating system. If satisfactory, do the following:

(a) If Ng exceeded 102.6 % or Np exceeded 110%, determine and rectify cause of overspeed. Send gas generator or power section to an approved overhaul facility for Light Overhaul, Engine Overspeed, indicating Ng or Np observed.

(b) If Np exceeded 100% for more than 20 seconds, but did not exceed 110%:

1 Inspect PT blades and check for rubs.

2 Remove and inspect RGB chip detector, oil strainer, and main oil filter (Ref. 72-10-00, 79-20-02). If metallic debris is found, refer to FAULT ISOLATION.

3 Turn the propeller by hand and listen for unusual noises coming from the reduction gearbox or PT bearings (Ref. Para. A.(4)). For unusual noises, slow propeller acceleration on start or abrupt deceleration on shutdown, send power section to an approved overhaul facility for Light Overhaul. Indicate the maximum speed attained, the duration, and any inspection discrepancy.

4 Run at 80 % TO power for ten minutes. Remove and inspect RGB chip detector, oil strainer, and main oil filter (Ref. 72-10-00, 79-20-02). If no metallic debris is found, return engine to service and check RGB chip detector daily for one week (25 hours minimum).

5 Inspect main oil filter after one week (25 hours minimum, 65 hours maximum) (Ref. 79-20-02). If no metallic debris is found, return to standard inspection intervals.

D. Inadvertent Cut-off and Relight During Taxi

NOTE: An inadvertent cut-off and relight happens when the operator moves the fuel condition lever from Low Idle to Cut-off and immediately back to Low Idle. This may result in a short-term sub-idle overtemperature.

(1) **For operators WITH an engine monitor and have obtained a detailed recording of the overtemperature event:** Refer to Chap. 71-00-00, ADJUSTMENT/TEST, Inadvertent Cut-off and Relight During Taxi figure.

(2) **For operators WITHOUT an engine monitor:** Return the compressor turbine blade and disk assembly to an overhaul shop facility for stretch check, fluorescent penetrant inspection and a metallurgical analysis (cut-up) of two blades.

E. Overtemperature

(1) Check engine/aircraft indicating system. If satisfactory, refer to Chapter 71-00-00, ADJUSTMENT/TEST for required action.

(2) When an overtemperature has occurred, and the maximum temperature reached and/or its duration cannot be established, or whenever an overtemperature is suspected to have occurred, send the engine to an overhaul facility for Light Overhaul. Indicate ‘‘Unknown Overtemperature’’.

NOTE: Two compressor turbine blades must be sent for metallurgical analysis (cut-up) to determine the extent of any damage to the engine.

(3) If engine was subject to an inadvertent cut-off and relight during taxi, refer to Para. D.

F. Overtorque

(1) Check engine/aircraft indicating system. If satisfactory, refer to Chapter 71-00-00, ADJUSTMENT/TEST and do the following .

(2) If the overtorque is in Area B:

(a) Remove and inspect RGB chip detector, oil strainer and main oil filter (Ref. 72-10-00, 79-20-02). If metallic debris is found, refer to FAULT ISOLATION.

(b) Turn the propeller by hand and listen for unusual noises coming from the reduction gearbox or PT bearings (Ref. Para. A.(4)). For unusual noises, slow propeller acceleration on start or abrupt deceleration on shutdown, send power section to an approved overhaul facility for Light Overhaul. Indicate torque observed and duration.

(c) Run at 80 % TO power for ten minutes. Remove and inspect RGB chip detector, oil strainer, and main oil filter (Ref. 72-10-00, 79-20-02). If no metallic debris is found, return engine to service and check RGB chip detector daily for one week (25 hours minimum).

(d) Inspect main oil filter after one week (25 hours minimum, 65 hours maximum) (Ref. 79-20-02). If no metallic debris is found, return to standard inspection intervals.

(3) If the overtorque is in Area C, send PSM to an approved overhaul facility for Light Overhaul. Indicate torque observed and duration.

(4) Refer to Aircraft Maintenance Manual for related aircraft checks.

G. Immersion in Water

(1) Send engine to an approved overhaul facility for Light Overhaul. Indicate immersion in water.

H. Dropped Engine or Component

(1) Send engine or component to an approved overhaul facility for Light Overhaul. Indicate dropped engine or component; the type of surface the engine struck and from what height.

I. Material Ingestion (e.g., ice, stones, etc.)

(1) Check compressor first-stage blades for damage (Ref. 72-30-05, Inspection/Check).

(2) Do an engine performance (Ref. 71-00-00, ADJUSTMENT/TEST, Engine Performance Check) or ground power check (Ref. 71-00-00, ADJUSTMENT/TEST, Ground Power Check).

J. Bird Strike/Soft Material Ingestion (e.g., rags, plastic bags, etc.)

(1) Remains on compressor first stage blades confirm if bird or soft material has passed through the engine and possibly contaminated the gas path and CT vane cooling passages. If contamination occurred, remove the power section and inspect hot section components (Ref. In-service Inspection). Evidence of possible contamination of the compressor turbine vane cooling passages necessitates an approved overhaul level inspection of the vane.

(2) If the engine remains in service, do a performance recovery wash (Ref. 71-00-00, POWER PLANT - CLEANING, Internal Washing) and a performance (Ref. 71-00-00, ADJUSTMENT/TEST, Engine Performance Check) or ground power check as applicable (Ref. 71-00-00, ADJUSTMENT/TEST, Ground Power Check).

K. Chip Detector Circuit Completion and/or Debris in Oil Filter

(1) Refer to FAULT ISOLATION.

L. Propeller Sudden Stoppage or Strike

NOTE: 1. Propeller sudden stoppage occurs when propeller rotation stops due to contact (propeller strike) with a hard object (e.g. ground, ground service equipment, etc).

NOTE: 2. The term propeller strike is used when either a rotating propeller hits an object which causes a speed variation (no stoppage) and blade damage or a stationary propeller is hit by a moving object which causes blade damage.

(1) For propeller sudden stoppage, propeller strike causing blade structural damage (eg. bent blade, or blade tip missing or bent over 1 in. (over 5 in. for composite blade)), propeller strike on a power line, or propeller strike at power above FLIGHT-IDLE (Ng above 82 %), do the following:

(a) Send power section to an approved overhaul facility for Light Overhaul. Indicate propeller strike, sudden stoppage as applicable, propeller speed and power at event, and extent of propeller damage.

(b) Inspect remainder of engine:

1 Remove and inspect the main oil filter (Ref. 79-20-02). If metallic debris if found, refer to FAULT ISOLATION.

2 Inspect for cracks or distortion at all engine casings and housings, especially at or near the flanges. Remove the starter-generator and check all AGB pads and AGB mounted engine and airframe components. Look for shearing, cracks, distortion or mis-alignment, and loose/pulled fasteners. Similarly, inspect all engine mounts.

3 Inspect fireseals for warping or buckling, and all external tubes for damage and/or fluid leaks.

4 Check all airframe/engine connections, including fuel inlet and oil cooler lines, air system, electrical, ignition and indicating systems, control linkages, and drains.

5 For propeller strike on a power line (power utility line - does not include guide/support wires, telephone or telecommunications lines), check for evidence of electrical discharge (localized burn marks) at the C-flange or at the compressor turbine.

6 Rotate the compressor by hand and listen for rubbing, scraping, interference of rotating components with stationary parts, or rapid/abrupt deceleration. Check for rear accessory case mounted accessory drag. Check for compressor turbine tip rub (Ref. 72-50-02, Inspection/Check).

7 For casing or accessories damage, evidence of electrical discharge, unusual noises that could indicate damage to the gears, bearings, seals or rotors, slow compressor acceleration on start or abrupt deceleration on shutdown, send the complete engine to an approved overhaul facility for Light Overhaul. Indicate propeller strike/sudden stoppage as applicable, propeller speed and power at event, and extent of propeller damage.

8 After installation of a repaired/replacement power section on the serviceable gas generator, run at 80% TO power for ten minutes. Remove and inspect the main oil filter (Ref. 79-20-02). If no metallic debris is found, return the engine to service.

9 Inspect main oil filter after one week (25 hours minimum, 65 hours maximum). If no metallic debris is found, return to standard inspection schedule.

(2) For propeller strike causing minor blade damage (eg. delamination, indentation, blade tip bent slightly, etc.) with engine at or below FLIGHT-IDLE power or while engine was shut down, do the following:

(a) Remove and inspect RGB chip detector, oil strainer, and main oil filter (Ref. 72-10-00, 79-20-02). If metallic debris is found, refer to FAULT ISOLATION.

(b) Turn the propeller by hand and listen for unusual noises coming from the reduction gearbox or PT bearings (Ref. Para. A.(4)). For unusual noises, slow propeller acceleration on start or abrupt deceleration on shutdown, send power section to an approved overhaul facility for Light Overhaul. Indicate what the propeller hit and at what speed and power, and extent of damage.

(c) Run engine at 80% TO power for ten minutes. Remove and inspect RGB chip detector, oil strainer, and main oil filter (Ref. 72-10-00, 79-20-02). If no metallic debris is found, return engine to service and check RGB chip detector daily for one week (25 hours minimum).

(d) Inspect main oil filter after one week (25 hours minimum, 65 hours maximum) (Ref. 79-20-02). If no metallic debris is found, return to standard inspection intervals.

M. Propeller Lightning Strike

(1) If signs of arcing are found on the propeller blades, the propeller shaft and flange must be checked for magnetism. Check for magnetism using one of the following methods:

(a) Check propeller shaft, especially flange, using a magnetometer to make sure residual magnetism is within ± 3 gauss or 3 oersted of 2.38 A/cm. If reading is above limits, replace power section.

(2) If propeller shaft or flange is magnetized:

(a) Ship power section to an approved overhaul facility for Light Overhaul. Indicate Lightning Strike.

(b) On the gas generator, check for evidence of electrical discharge (localized burn marks) at the C-flange or at the compressor turbine. Evidence of discharge requires sending the complete engine to an approved overhaul facility.

(c) Inspect the main oil filter (Ref. 79-20-02). If metallic debris is found, refer to FAULT ISOLATION.

(3) If the propeller shaft or flange is not magnetized:

(a) Remove and inspect RGB chip detector, oil strainer, and main oil filter (Ref. 72-10-00, 79-20-02). If metallic debris is found, refer to FAULT ISOLATION.

(b) Turn the propeller by hand and listen for unusual noises from the reduction gearbox or PT bearings (Ref. Para. A.(4)). For unusual noises, slow propeller acceleration on start or abrupt deceleration on shutdown, send power section to an approved overhaul facility for Light Overhaul and indicate lightning strike.

(c) Run engine at 80% TO power for ten minutes. Remove and inspect RGB chip detector, oil strainer, and main oil filter (Ref. 72-10-00, 79-20-02). If no metallic debris is found, return the engine to service and check RGB chip detector daily for one week (25 hours minimum).

(d) Inspect main oil filter after one week (25 hours minimum, 65 hours maximum) (Ref. 79-20-02). If no metallic debris is found, return to standard inspection intervals.

N. Propeller Electrical Leads Shorting

(1) If signs of arcing between de-icer leads and the propeller spinner, bulkhead or hub assembly have been found, check propeller de-icing system (Ref. Aircraft Maintenance Manual) and rectify.

(2) Inspect engine:

(a) Remove and inspect RGB chip detector, oil strainer, and main oil filter (Ref. 72-10-00, 79-20-02). If metallic debris is found, refer to FAULT ISOLATION.

(b) Turn the propeller by hand and listen for unusual noises coming from the reduction gearbox or PT bearings (Ref. Para. A.(4)). For unusual noises, slow propeller acceleration on start or abrupt deceleration on shutdown, send power section to an approved overhaul facility for Light Overhaul. Indicate propeller electrical leads short and any discrepancy noted. Otherwise, run engine at 80% TO power for ten minutes.

(c) Remove and inspect RGB chip detector, oil strainer, and main oil filter (Ref. 72-10-00, 79-20-02). If no metallic debris is found, return engine to service and check RGB chip detector daily for one week (25 hours minimum).

(d) Inspect main oil filter after one week (25 hours minimum, 65 hours maximum) (Ref. 79-20-02). If no metallic debris is found, return to standard inspection intervals.

O. Heavy/Hard Landing

NOTE: 1. Do the following checks in the event of a suspected heavy or hard landing. A landing must be considered hard if the aircraft incurred any airframe or landing gear damage.

NOTE: 2. If the heavy/hard landing involved a windmilling (inoperative) engine, send the complete engine to an approved overhaul facility for Light Overhaul. Indicate heavy/hard landing of inoperative engine. Otherwise, proceed as follows:

(1) Inspect for cracks or distortion at all engine casings and housings, especially at or near the flanges.

(2) Remove the starter-generator and check all AGB pads and AGB mounted engine and airframe components. Look for shearing, cracks, distortion or mis-alignment, and loose/pulled fasteners. Similarly, inspect all other accessories and engine mounts.

(3) Inspect fireseals for warping or buckling, and all external tubes for damage and/or fluid leaks.

(4) Check all airframe/engine connections, including fuel inlet and oil cooler lines, air system, electrical, ignition and indicating systems, control linkages, and drains.

(5) Remove and inspect RGB chip detector, oil strainer, and main oil filter (Ref. 72-10-00, 79-20-02). If metallic debris is found, refer to FAULT ISOLATION.

(6) Rotate the compressor by hand and listen for rubbing, scraping, interference of rotating components with stationary parts, or rapid/abrupt deceleration. Check for rear accessory case mounted accessory drag. Check for compressor turbine tip rub (Ref. 72-50-02, Inspection/Check). Rotate the propeller by hand and listen for any interference of rotating components with stationary parts or any other unusual noises coming from the gearbox or turbines (Ref. Para. A.(4)). Examine PT disk assembly and exhaust area through exhaust ports for evidence of distress. If damage is found, inspect (Ref. 72-50-04, Inspection/Check).

(7) For casing or accessories damage, unusual noises that could indicate damage to the gears, bearings, seals or rotors, slow propeller acceleration on start or abrupt deceleration of compressor or power section on shutdown, send the complete engine to an approved overhaul facility for Light Overhaul. Indicate heavy landing and discrepancies observed.

(8) Run engine at 80% TO power for ten minutes. Remove and inspect RGB chip detector, oil strainer, and main oil filter (Ref. 72-10-00, 79-20-02). If no metallic debris is found, return engine to service and check RGB chip detector daily for one week (25 hours minimum).

(9) Inspect main oil filter after one week (25 hours minimum, 65 hours maximum). If no metallic debris is found, return to standard inspection schedule.

P. Aircraft Flown Through Volcanic Ash or Smoke

(1) Wash compressor and turbine (Ref. 71-00-00, POWER PLANT - CLEANING, Internal Washing).

(2) Drain and refill oil system with new oil (Ref. SERVICING, Lubricating Oil System).

(3) Clean or change main oil filter (Ref. 79-20-02, Cleaning).

(4) Examine compressor (Ref. INSPECTION/CHECK, Borescope).

(5) Return engine to service if no defects are found.

(6) Drain and refill oil system with new oil (Ref. SERVICING, Lubricating Oil System) 50 ± 10 flight hours after original oil change done in step (2).

Q. Sustained Running at Oil Temperature Outside Limits

(1) Check aircraft/engine indicating system and correct cause of high oil temperature (Ref. FAULT ISOLATION).

(2) Rotate the compressor rotor and check for indications of AGB or bearing distress.

(3) Turn the propeller by hand and listen for unusual noises coming from the reduction gearbox or PT bearings (Ref. Para. A.(4)).

(4) For any presence of unusual noise, send the complete engine to an approved overhaul facility for Light Overhaul. Indicate the oil temperature that the engine was operated at, the engine power and the duration.

(5) Drain and discard oil (Ref. SERVICING, Lubricating Oil System).

(6) Remove and inspect RGB chip detector, oil strainer, and main oil filter (Ref. 72-10-00, 79-20-02). If metallic debris is found, refer to FAULT ISOLATION.

(7) Fill oil system (Ref. SERVICING, Lubricating Oil System).

(8) Run engine at 80% TO power for ten minutes. Remove and inspect RGB chip detector, oil strainer, and main oil filter (Ref. 72-10-00, 79-20-02). If no metallic debris is found, return engine to service and check RGB chip detector daily for one week (25 hours minimum).

(9) Inspect main oil filter after one week (25 hours minimum, 65 hours maximum) (Ref. 79-20-02). If no metallic debris is found, return to standard inspection intervals.

R. Loss of Oil/Oil Pressure or Low Oil Pressure

CAUTION: IF AIRCRAFT OIL SYSTEM CONTAMINATION IS SUSPECTED, REVERSE FLUSH ENGINE OIL SYSTEM, INCLUDING OIL-TO-FUEL HEATER. AIRCRAFT OIL COOLER MUST BE REJECTED.

NOTE: Low oil pressure is defined as running the engine with the oil pressure below limits (Ref. 71-00-00, Table 503).

(1) If the loss of oil is 6 qt. or more, resulting in fluctuation of oil pressure or torque indication or oil pressure dropped below minimum value.

(a) Check oil pressure and torque indicating system. If correct, and the engine did not run above 1315 lb.ft. (PT6A-21), 1628 lb.ft. (PT6A-27/28) torque with oil pressure below 80 psig (minimum time running is permitted to allow flight crew to follow the emergency procedure), remove main filters, strainer and chip detector. If metallic debris is found refer to 79-20-04, Inspection.

NOTE: 1. Oil pressures below 40 psig are unsafe and require either the engine to be shut down or an emergency landing made as soon as possible, using minimum power to sustain flight.

NOTE: 2. If oil pressure fluctuates or drops below 80 psig, reduce the engine power from the maximum of 1315 lb.ft. (PT6A-21), 1628 lb.ft. (PT6A-27/28) torque. The engine may be kept running provided that the oil pressure does not fall lower than 40 psig; however the torque indicating system will be unreliable at this low pressure. Minimum time running is permitted to allow the flight crew to follow emergency procedure.

(b) Turn the propeller by hand and listen for unusual noises coming from the reduction gearbox or PT bearings. If unusual noises are heard, send power section to an approved overhaul facility for Light Overhaul. Indicate unusual oil conditions.

NOTE: PT blades may rub, immediately after engine shutdown which is not an indication of distress, providing the rubbing/noise disappears after engine cool down.

(c) Turn the compressor rotor. Listen for unusual noises coming from bearings, seals, gears, compressor and/or CT.

(d) If unusual noises are heard, send gas generator to an approved overhaul facility for Light Overhaul. Indicate unusual oil conditions.

(e) Remove main oil filter, strainer and chip detector and inspect for metallic debris. If metallic debris is found, refer to FAULT ISOLATION. If no metallic debris is found, reinstall main oil filter, strainer and chip detector. Run the engine at 80% TO power for 10 minutes; recheck RGB chip detector, oil strainer and main oil filter. If no metallic debris is found return engine to service. Inspect chip detector daily for one week (approx. 65 flight hours)and main oil filter after seven days (approx. 15 flight hours). If no metallic debris is found, return to standard inspection intervals. If metallic debris is found, refer to FAULT ISOLATION.

(2) If the engine was kept running above 1315 lb.ft. (PT6A-21), 1628 lb.ft. (PT6A-27/28) torque with oil pressure below 80 psig (Ref. 71-00-00, Table 503), check oil pressure and torque indicating systems; and if correct, remove the engine and send it to an overhaul facility for Light Overhaul. Indicate low oil pressure.

(3) If the loss of oil is 6 qt. or more, and the engine oil pressure or torquemeter indication have fluctuated or oil pressure dropped below 40 psig:

NOTE: If the oil pressure drops below 40 psig, an engine shut down is required. In single engine installations or in emergency, use minimum power to sustain flight and prepare for an emergency landing.

(a) Check oil pressure and torque indicating system. If correct, and the engine was kept running with oil pressure below 40 psig in excess of the time required to carry out the emergency engine shutdown procedure, ship the engine to an overhaul facility for Light Overhaul. Indicate unusual oil conditions.

(b) Remove and ship propeller governor for overhaul. Indicate loss of oil.

S. Oil Pressure Follows Throttle

(1) Under normal operating conditions, oil pressure indication is stable. Malfunction of the pressure relief valve or oil leakage will cause indication to increase as throttle is advanced, or drop when throttle is retarded.

(a) Check external lines for breaks and leakage. Remove pressure relief valve and check for sticking, scoring, etc.

(b) Remove accessory gearbox. Check oil pump housing for cracks.

(c) Remove relief valve and housing. Examine housing for wear resulting from relief valve rotation. Replace housing if necessary.

T. Contamination by Fire Extinguishing Agents

(1) Foam, powder or other chemical extinguishers:

(a) If only engine externals are exposed, then wash (Ref. 71-00-00, CLEANING, Engine External Wash) using drinkable quality water only and monitor for corrosion.

(b) In the event of internal contamination, return engine to an approved overhaul facility for Light Overhaul. Indicate the agent ingested by the engine. Depending on the agent, and at the option of the operator, an attempt may be made at cleaning the contaminating agent prior to shipping:

1 Do a dry motoring run (Ref. 71-00-00, ADJUSTMENT/TEST, Dry Motoring Run) to blow out any residual deposits.

2 Wash engine externally (Ref. 71-00-00, CLEANING) using drinkable quality water only.

3 Do an engine performance recovery wash (Ref. 71-00-00, CLEANING) followed by two dry motoring runs.

(2) Halon:

(a) No engine maintenance required.

U. Audible Rubbing, Binding or Scraping

NOTE: Any unusual engine noise requires immediate investigation.

(1) Rotate compressor rotor and listen for any interference of rotating components with stationary parts and/or check for rapid deceleration on shutdown.

(a) Check for rear accessory case mounted accessory drag.

(b) Check for compressor turbine tip rub (Ref. 72-50-02, Inspection/Check).

(c) Indications of compressor rub or bearing or AGB distress. Send engine to an approved overhaul facility for Light Overhaul.

(2) Rotate the propeller and listen for any interference of rotating components with stationary parts (Ref. Para. A.(4)). If power turbine rotor rattles, or if there is rubbing or scraping, slow propeller acceleration on start or abrupt deceleration on shutdown:

(a) Examine PT disk assembly and exhaust area through exhaust ports for evidence of distress.

(b) If damage is found, inspect (Ref. 72-50-04, Inspection/Check).

(c) Slow or stiff propeller rotation. Send power section to an approved overhaul facility for Light Overhaul. Indicate rubbing.

(3) If the suspected problem cannot be repeated or confirmed:

(a) Remove and inspect RGB chip detector, oil strainer, and main oil filter (Ref. 72-10-00, 79-20-02). If metallic debris is found, refer to FAULT ISOLATION.

(b) Run engine at 80% TO power for ten minutes. Remove and inspect RGB chip detector, oil strainer, and main oil filter (Ref. 72-10-00, 79-20-02). If no metallic debris is found, return engine to service and check RGB chip detector daily for one week (25 hours minimum).

(c) Inspect main oil filter after one week (25 hours minimum, 65 hours maximum) (Ref. 79-20-02). If no metallic debris is found, return to standard inspection intervals.

V. Propeller Windmilling after In-flight Shutdown

(1) Investigate cause of shutdown. If suspected of being attributed to an engine or accessory problem, send engine or accessory to an approved overhaul facility for Light Overhaul. Indicate engine shutdown and the events and conditions at the time.

(2) With shutdown not related to an engine problem (serviceable engine):

(a) With stabilized windmilling Np not more than 20 rpm and less than 6 qt. of oil required to bring oil level to MAX on dipstick, no further action is necessary.

(b) With an unknown (not recorded) Np or stabilized windmilling Np greater than 20 rpm or if 6 qt. or more of oil is required to bring oil level to MAX on dipstick:

1 Remove and inspect RGB chip detector, oil strainer, and main oil filter (Ref. 72-10-00, 79-20-02). If metallic debris is found, refer to FAULT ISOLATION.

2 Rotate the compressor rotor and check for indications of AGB or bearing distress.

W. Contamination of Oil with Non-metallic Foreign Material

NOTE: 1. AGB/RGB internal protective coatings may be released within the engine and appear as flakes 1/64 inch to 3/8 inch in diameter, usually shiny, yellow, brown or green in color, and may or may not be transparent.

NOTE: 2. Inspect chip detector, main oil filter and AGB scavenge pump screen after approximately 10 hours. If no debris is found, inspect at 50 hours.

NOTE: 3. If no debris is found at 50 hours, refer to the standard periodic inspection interval for oil fitler and chip detector (Ref. Table 601).

NOTE: 4. If these flakes are found, immediately contact your local P&WC customer support representative. Send engine to an approved overhaul facility for Light Overhaul. Indicate oil contamination from released AGB/RGB internal protective coatings.

(1) Remove chip detector from reduction gearbox front housing (Ref. SERVICING,Oil Change) and scrub scavenge oil strainer sleeve with a brush to remove any foreign material blocking the screen.

(2) Remove accessory gearbox drain plug(s).

(3) Flush oil system (Ref. SERVICING, Oil System Flushing).

(4) Reinstall chip detector and plug(s) and tighten. Refill engine oil tank.

NOTE: Do not lockwire chip detector and drain plug(s) at this time.

(5) Remove chip detector and inspect scavenge oil strainer sleeve for residual foreign material accumulated after system flush (Ref. NOTE 1).

(6) Repeat steps (2) thru (5), if required.

(7) Reinstall chip detector. Tighten all plugs and chip detector and lockwire.

X. Starter-Generator Replacement

(1) If the starter-generator is replaced in order to rectify a reported engine starting or electrical generation defect, that is suspected as an electrical fault or bearing distress of the starter-generator, inspect the main oil filter as follows:

(a) Do a main oil filter patch check (Ref. Chapter 79-20-02). The results of the filter patch analysis should be reviewed within the next 25 flight hours. If non allowable debris is found, follow the recommended maintenance actions (Ref. Chapter 79-20-02).

(b) Regardless of the results of the patch analysis, repeat step (a) every 100 hours, for the next 700 flight hours.

(c) If bearing material (AMS 6440/6444 or AMS 6490/6491, Ref. Chapter 79-20-02) is found, remove the engine/gas generator module and send to an approved overhaul facility for repair.