CHAPTER

79

OIL

CHAPTER 79 - OIL
LIST OF EFFECTIVE PAGES

CHAPTER SECTION SUBJECT	PAGE	DATE
79-30-00	201	Dec. 15/09
	202	Dec. 15/09
	203	Dec. 15/09
	204	Dec. 15/09
	205	Dec. 15/09
	206	Dec. 15/09
	207	Dec. 15/09
	208	Dec. 15/09
	209	Dec. 15/09
	210	Dec. 15/09
	211	Dec. 15/09
	212	Dec. 15/09
	213	Dec. 15/09
	214	Dec. 15/09
	215	Dec. 15/09
	216	Dec. 15/09
	217	Dec. 15/09
	218	Dec. 15/09

CHAPTER 79 - OIL
TABLE OF CONTENTS

SPECIAL NOTE

WITHIN THIS MANUAL ALL REFERENCES TO LEFT AND RIGHT, CLOCKWISE AND COUNTERCLOCKWISE, FRONT AND REAR, ARE AS VIEWED FROM THE REAR OF THE AIRPLANE.

WITHIN THE ENGINE/PROPELLER MANUALS ALL SUCH REFERENCES ARE AS VIEWED FROM THE ACCESSORY GEARBOX/SPINNER BULKHEAD.

BECAUSE THE PIAGGIO P180 AVANTI IS CONFIGURED WITH "PUSHER" PROPELLERS, THE ENGINES ARE INSTALLED WITH THE ACCESSORY GEARBOX TOWARDS THE FRONT OF THE AIRPLANE; THEREFORE, IN THIS MANUAL ALL REFERENCES TO LEFT AND RIGHT, CLOCKWISE AND COUNTERCLOCKWISE, FRONT AND REAR (WHEN APPLIED TO ENGINE AND PROPELLER COMPONENTS) WILL BE THE OPPOSITE TO THE SAME REFERENCES IN THE ENGINE/PROPELLER MANUALS.

FOR EXAMPLE, ACCORDING TO THIS MANUAL, THE ENGINE ACCESSORY GEARBOX IS AT THE FRONT OF THE ENGINE; THE ENGINE MANUALS CONSIDER THE ACCESSORY GEARBOX TO BE THE REAR OF THE ENGINE.

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OIL - DESCRIPTION AND OPERATION

1. General

A. Each of the two power plants of the P.180 Avanti II has its own independent oil system. The two systems are identical so this chapter gives description, operation and maintenance practices information for one system and is valid for both systems.

B. The engine oil system provides a constant supply of clean oil for:

- lubrication and cooling of the engine bearings, gears and accessory drives
- operation of the propeller pitch control system
- operation of the engine torquemeter system.

The engine oil system comprises:

- a pressure oil subsystem
- a scavenge oil subsystem
- a breather subsystem.

C. The engine manufacturer specifies limits for engine oil temperature which require the airplane manufacturer to incorporate an oil cooler into the system.
All description, operation and maintenance practices information for the oil cooler is given in Section 79-20-00 of this chapter.

D. To complete the power plant oil system, the airplane manufacturer is also required to incorporate an oil temperature and pressure indication system.
All description, operation and maintenance practices information for the indication system components is given in Section 79-30-00 of this chapter.

NOTE: Only MOBIL JET OIL II, AEROSHELL TURBINE OIL 500, CASTROL 5000 and EXXON TURBO OIL 2380 engine oils have been tested and are approved for use on the P.180 airplane within the recommendations of the latest revision of P&WC Engine service Bulletin No. 14001.
The other oils listed in the above P&WC Engine Service Bulletin are not approved for use on the P.180 airplane.

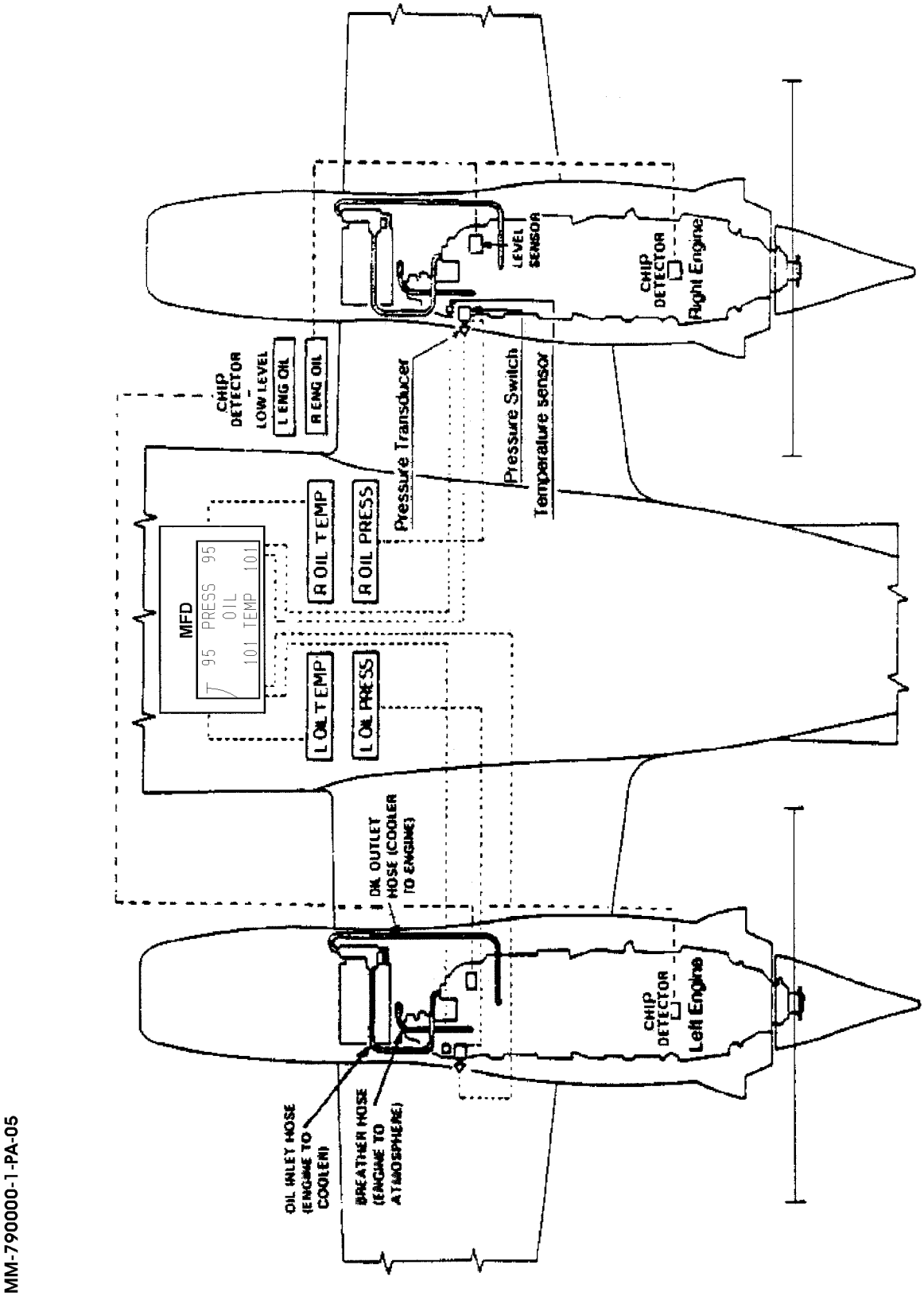

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Fig. 1 - Power Plant Oil System - General Details

OIL DISTRIBUTION - DESCRIPTION AND OPERATION

1. General

A. With the exception of the oil cooler, all components of the oil distribution system (pressure and scavenge subsystems) are dealt with in the engine maintenance manual.

B. This Section (79-20-00) gives the description, operation and maintenance practices information for the oil cooler, and maintenance practices for some of the oil distribution system components because of the interface with power plant components.

2. Description

A. The oil cooler is mounted centrally in the lower part of the nacelle. The rear (air outlet duct) of the cooler is bolted to the lower part of the engine mounting center frame; the weight of the cooler is supported by an integral bracket and a pair of lugs which are secured (by two bolts each side) to the wing ribs at WS1825 and WS2325.

B. The basic design of the cooler is that of a typical heat exchanger where the oil flows across integral finned passages and is cooled by ram air sweeping through the finned air passages which separate the oil passages. For maximum cooling efficiency a two-pass cross-contra flow arrangement is used; this arrangement causes the oil entering the cooler to flow across one set of passages, then turn round, flow across another set of passages and exit at the same side of the cooler as the entering oil.

C. The cooler incorporates a pressure relief-type bypass valve which is set to operate at a pressure differential of 30 psi; this is so that oil which does not require cooling can be directed back to the engine without flowing through the cooling passages. The valve will also bypass the oil should the matrix become blocked to an extent that will cause a pressure differential of 30 psi or more across the valve.

D. A thermal actuator, located adjacent to the bypass valve, operates an airflow control vane located in the air outlet duct of the cooler. The thermal actuator starts to operate the airflow control vane to the open position at an oil temperature of 120 ±5°F (49 ±3°C); the vane is fully open when the oil temperature is 140 ±5°F (60 ±3°C) or more. The purpose of the airflow control vane is:

- to allow rapid warm-up of the oil before cooling begins; this is to help the engine oil reach its normal (ideal) operating temperature as quickly as possible
- to reduce the ram airflow at altitude to the minimum required for maintaining oil cooling.

E. For maintenance purposes, a drain plug is installed each side of the cooler matrix housing towards the lower rear corner.

F. The flush-scoop type air inlet duct of the oil cooler is incorporated into the lower nacelle panel; the lip of the air inlet duct is anti-iced by hot air bled from the engine (refer to 30-23-00 for further details of the air inlet duct anti-icing system).

G. The air oulet duct of the oil cooler connects with a dual (bifurcated) air outlet duct which extends rearwards from the lower part of the engine mounting center frame to the left and right lower sides of the rear firewall. The outlet air flows into the hot section area of the engine (which is enclosed by the rear nacelle panels), and is exhausted to atmosphere through a louvered outlet at the top of the rear nacelle panels and through the gaps where items (exhaust stacks, etc.) protrude from the rear nacelle panels. Each of the two bifurcations of the oil cooler air outlet duct incorporates an ejector tube which, on a hot day and when the airplane is not moving forward, is used to provide a motive flow to induce an airflow through the cooler. The ejectors are supplied with air from a tapping off the engine bleed air system through a flow shutoff solenoid valve. The valve is controlled from a switch, marked OIL COOL, which is located on the control pedestal immediately behind the power control levers.

3. Operation

A. Oil is fed to the cooler by the scavenge pumps of the engine reduction and accessory gearboxes. The oil flows from the pumps to the cooler inlet through a flexible hose.

B. Immediately after engine start, the oil fed to the cooler is cool and viscous and does not flow easily through the cooling passages; this resistance to flow causes a buildup of oil pressure which, at 30 psi differential across the bypass valve, opens the bypass valve and allows the oil to flow back to the engine oil tank.

C. As oil temperature increases, the viscosity decreases and the oil flows more easily through the cooling passages; this causes a decrease in the pressure differential across the bypass valve which gradually closes until all oil entering the cooler flow through the cooling passages.

D. Oil from the cooler flows back to the engine oil tank through a flexible hose.

E. The airflow control vane remains closed until the oil reaches a temperature of 120 ±5°F (49 ±3°C) after which the vane gradually opens until, at 140 ±5°F (60 ±3°C), the fully open position is reached.

F. During flight, the forward motion of the airplane induces a ram airflow into the air inlet duct of the cooler; this ram air sweeps through the cooler air passage and outlet ducts, then exhausts to atmosphere. When there is little or no forward motion (as when the airplane is on the ground), the airflow through the cooler can be induced by operation of the ejectors installed in the outlet air passages.

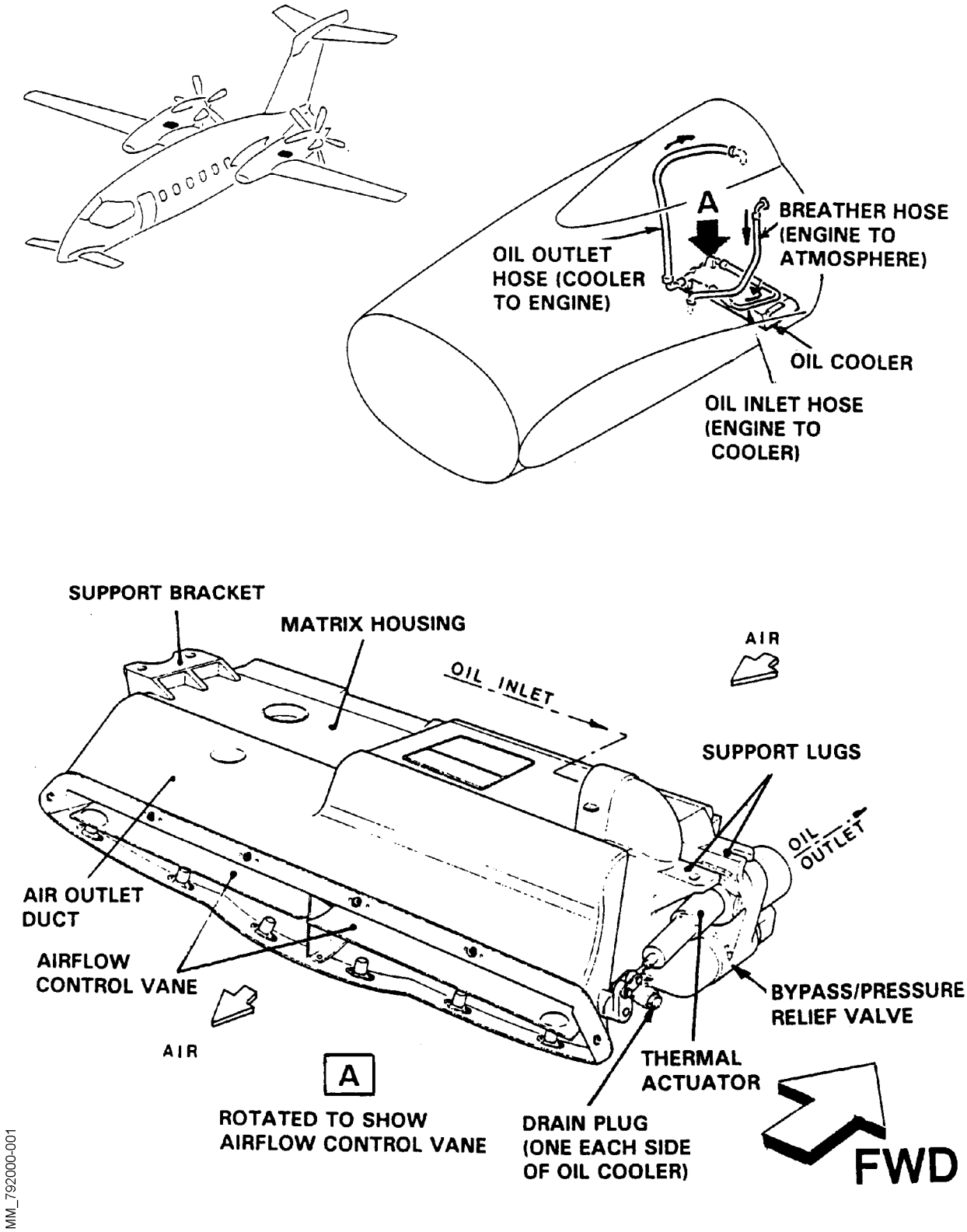

Fig. 1 - Oil Cooler and Hoses - General Details

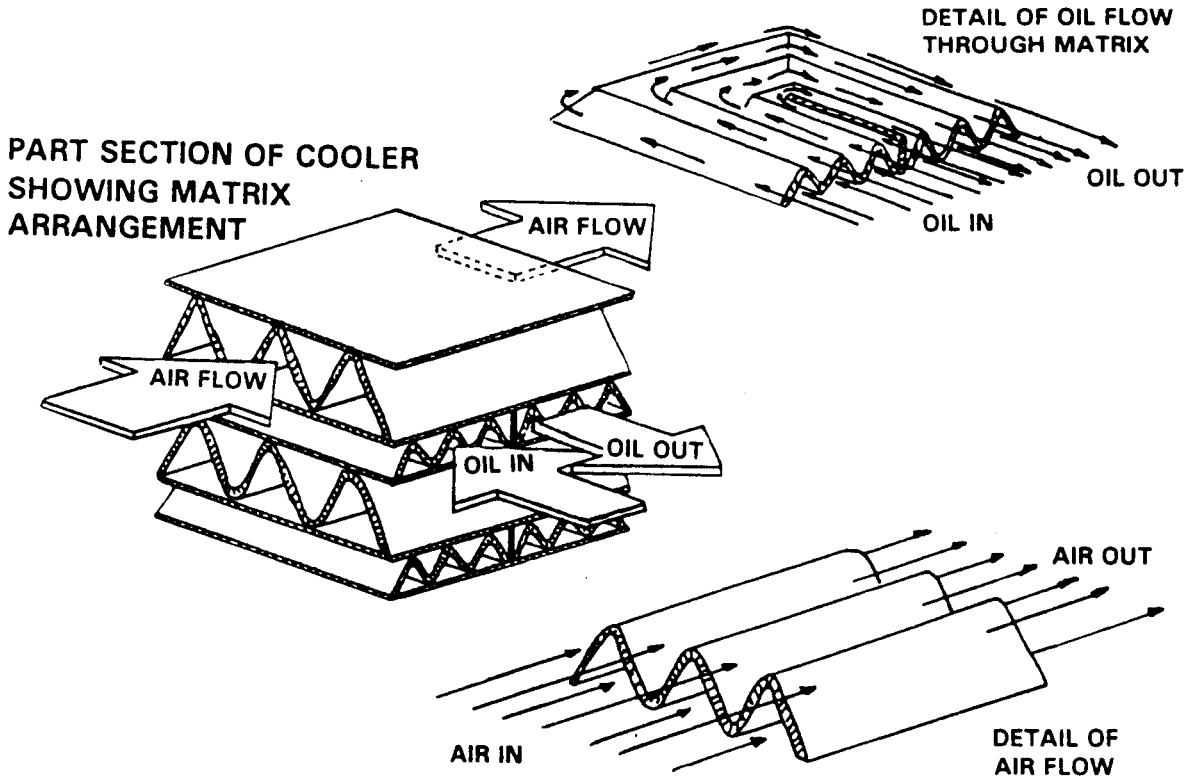

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Fig. 2 - Oil and Air Flow Arrangement - Schematic

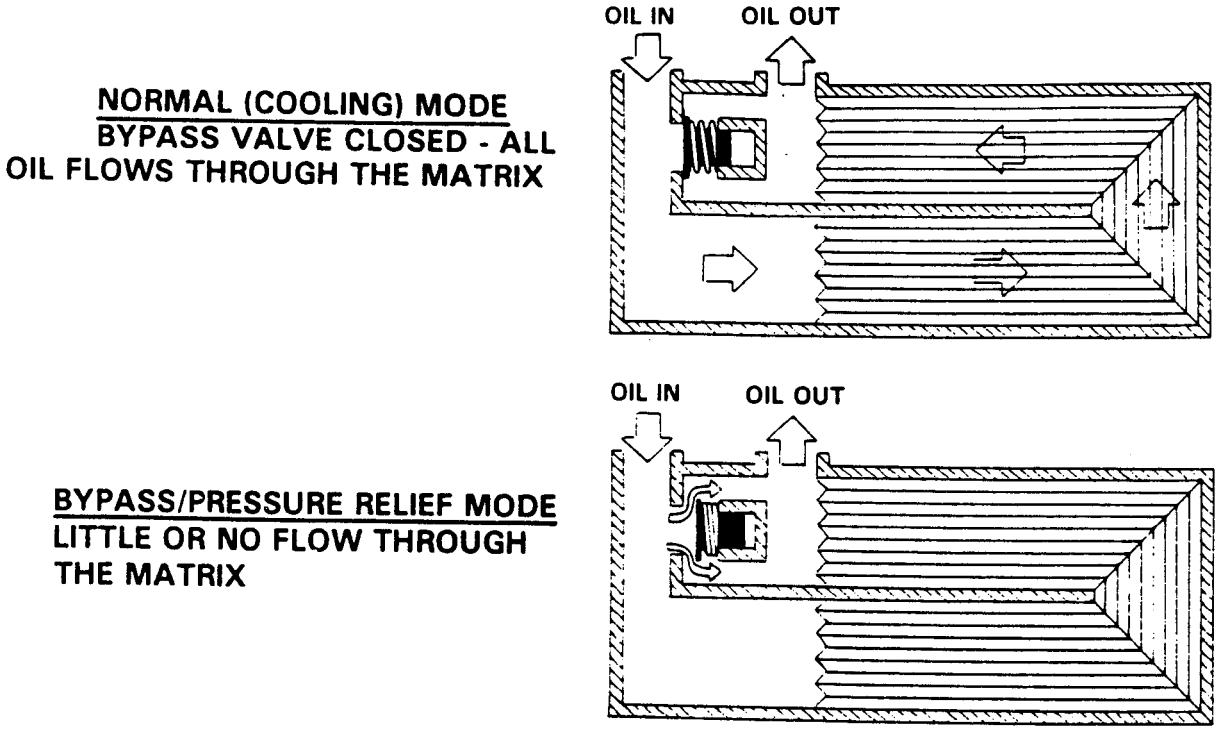

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Fig. 3 - Normal (Cooling) and Bypass/Pressure Relief Modes - Schematic

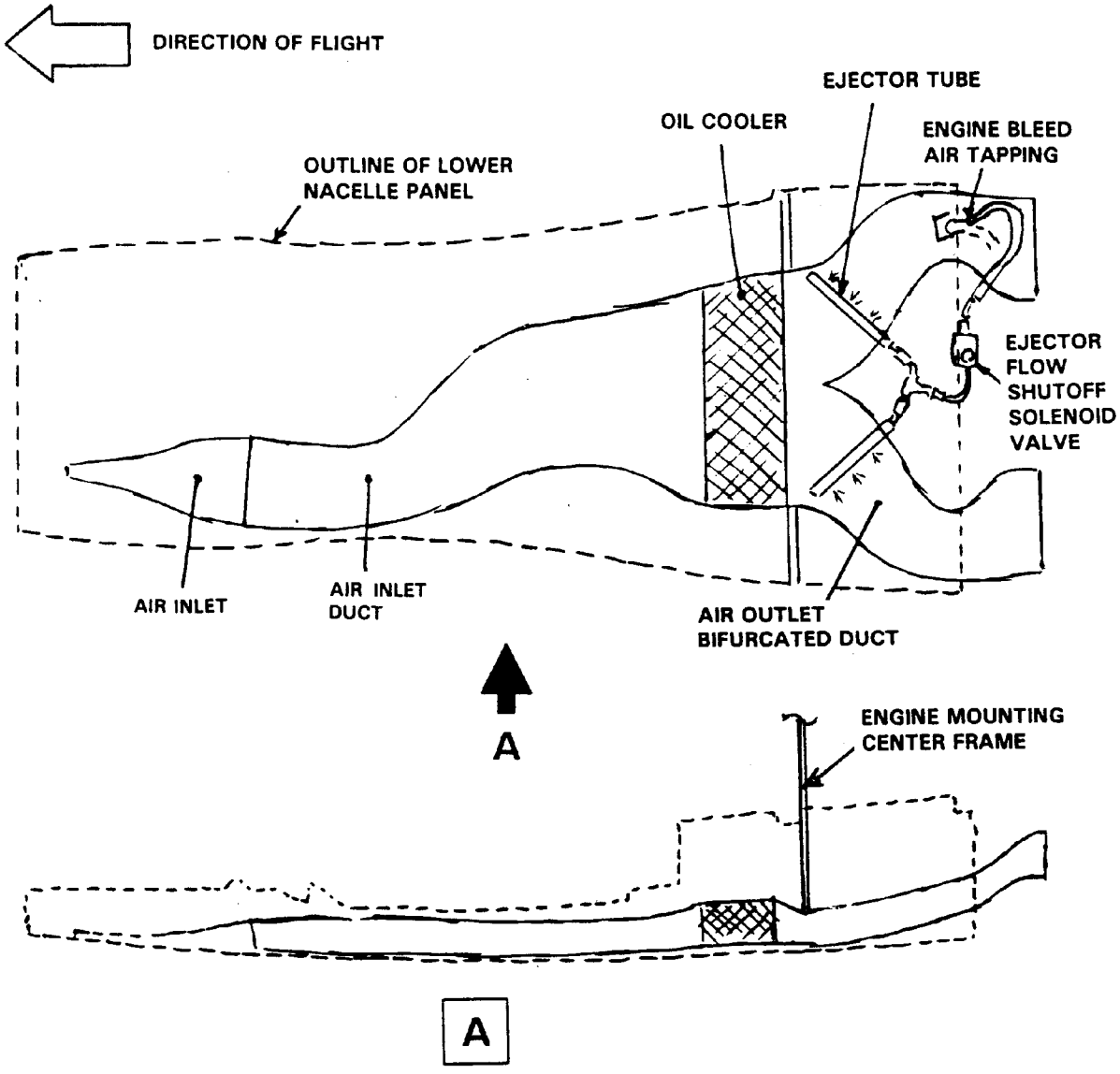

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Fig. 4 - Oil Cooler Air Inlet and Outlet Ducts

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OIL DISTRIBUTION - MAINTENANCE PRACTICES

1. General

WARNING: DO NOT TOUCH THE OIL SYSTEM COMPONENTS UNTIL THEY ARE COOL. THE TEMPERATURE STAYS HIGH AFTER THE ENGINE STOPS. HIGH TEMPERATURES CAN CAUSE INJURY TO PERSONS.

WARNING: DO NOT GET THE OIL ON YOUR SKIN OR IN YOUR EYES. PUT ON SAFETY GOGGLES AND PROTECTIVE CLOTHING. IF THE OIL GETS ON YOUR SKIN OR IN YOUR EYES, GET MEDICAL HELP.

A. This procedure gives the oil distribution - maintenance practices that follow:
- oil filter element and housing removal, installation, inspection and cleaning
- oil cooler removal, installation and inspection
- oil system draining
- oil system flushing
- oil change

2. Oil Filter Element and Housing - Removal

A. Fixtures, Test and Support Equipment

Covers/Caps/Plugs	Not specified
Container	Not specified
Access Platform	3.3 ft (1 m)

B. Referenced Information

Maintenance Manual Chapter 54-10-00
Engine Maintenance Manual Chapter 79-26-32

C. Procedure

NOTE: This procedure is applicable to both the left hand and right hand installation. Data for the right hand procedure is given between parentheses.

(1) Open, tag and safety this circuit breaker:

Pilot CB panel
L ENG START
R ENG START

(2) Remove nacelle panels 410AT and 410AB (420AT and 420AB) (Refer to 54-10-00).

(3) Remove the oil filter element and housing as detailed in the engine maintenance manual 79-26-32.

3. Oil Filter Element and Housing - Installation

A. Fixtures, Test and Support Equipment

Access Platform	3.3 ft (1 m)

B. Referenced Information

Maintenance Manual Chapter 54-10-00
Maintenance Manual Chapter 71-00-00
Engine Maintenance Manual Chapter 79-26-32

C. Procedure

NOTE: This procedure is applicable to both the left hand and right hand installation. Data for the right hand procedure is given between parentheses.

(1) Make sure, as necessary that:
- the applicable circuit breaker is open, tagged and safetied
- the system is safe
- access is available (Refer to the Removal Procedure).

(2) Install the filter housing and element as detailed in the engine maintenance manual 79-26-32.

(3) Install nacelle panels 410AT and 410AB (420AT and 420AB) (Refer to 54-10-00).

(4) Remove the safety tag and close this circuit breaker:

Pilot CB panel
L ENG START
R ENG START

(5) Remove all tools, materials and equipment from the work area. Make sure that the area is clean.

(6) Do a ground run of the engine (Refer to 71-00-00, Page Block 501).

4. Oil Filter Element and Housing - Inspection

WARNING: DO NOT TOUCH THE OIL SYSTEM COMPONENTS UNTIL THEY ARE COOL. THE TEMPERATURE STAYS HIGH AFTER THE ENGINE STOPS. HIGH TEMPERATURES CAN CAUSE INJURY TO PERSONS.

WARNING: DO NOT GET THE OIL ON YOUR SKIN OR IN YOUR EYES. PUT ON SAFETY GOGGLES AND PROTECTIVE CLOTHING. IF THE OIL GETS ON YOUR SKIN OR IN YOUR EYES, GET MEDICAL HELP.

A. Fixtures, Test and Support Equipment

Magnifying glass (x10 minimum)	Not specified
Access Platform	3.3 ft (1 m)

B. Referenced Information

Maintenance Manual Chapter 71-00-00

C. Procedure

(1) Remove the oil filter element and housing (Ref. Para. 2).

(2) If the oil filter shows signs of metal contamination you must make a note of the items that follow:

- the shape, size and quantity of contaminants
- the engine operating history.

NOTE: A newly installed engine or a recently overhauled engine can cause metal contamination in the oil filter.

(3) The examples that follow must be used as a guide and not as a specification of the engine serviceability:

- small flakes of non-ferrous metal usually come from bearings or bushes made of babbit, tin, bronze or silver.
- small flakes of ferrous metal usually come from spalled anti-friction bearings, gear teeth or from fretting.
- slivers of steel usually come from interference between steel parts or from heavy scoring.
- powdered metal is cast iron and comes from the propeller-shaft oil-transfer sleeve.
- less than 40 small particles of metal is acceptable. In such a case, clean and install the oil filter element.

(4) Examine the oil filter element for metal contamination.

(a) If light traces of sediment are found on the main filter-screen, clean the element (Ref. Para 5). All other contamination, replace the element. The filter element must be replaced every 1000 hours.

(5) If there is no visible metallic contamination, continue as follows:

(a) Clean the oil filter element (Ref. Para. 5).

(b) Use a 10-power (minimum) magnifying glass to examine the filter element for blocked passages, broken wires and dents.

(c) If dents or broken wires are found, discard the filter element.

(d) Do the cleaning procedure again.

(e) If the passages stay blocked more than 5%, discard the filter element.

(6) If the inspection shows less than 40 particles of bronze or steel, clean the filter element. Do the inspection again after 5 to 10 hours of engine operation.

(7) If the inspection shows more than 40 particles of bronze or steel, continue as follows:

(a) Clean the oil filter element (Ref. Para. 5).

(b) Change the engine oil (Ref. Para. 11).

(c) Start the engine (Refer to 71-00-00) and do a ground run at idle speed for one hour. Shut down the engine (Refer to 71-00-00).

(d) Examine the filter element for contamination. If the quantity of the particles is greater, send the engine to an approved overhaul facility. If less particles are found, clean the filter element (Ref. Para. 5) and examine again after 5 to 10 hours of engine operation.

(e) If the examination after 5 to 10 hours shows similar quantities of steel or bronze particles, send the engine to an approved overhaul facility for inspection.

(8) If the inspection shows white metal particles, continue as follows:

(a) When you first find white metal particles, clean the filter element (Ref. Para. 5). Examine again after 10 hours of engine operation.

(b) The second time you find an equivalent quantity of white metal, clean the filter element (Ref. Para. 5). Change the engine oil (Ref. Para. 11). Examine the filter element again after 10 hours of engine operation.

(c) The third time you find an equivalent quantity of white metal, send the engine to an approved overhaul facility for inspection.

(9) Examine the oil filter housing

(a) Examine the sealing surfaces of the housing for scoring, scratches, nicks, burrs and foreign matter. No damage is permitted.

(10) Install the oil filter housing and element (Ref. Para. 3).

(11) Examine the oil filter and housing for general condition and security of installation. Repair or replace defective parts as necessary.

5. Oil Filter Element and Housing - Cleaning

NOTE: Two cleaning procedures are given - one requires the use of an electrosonic cleaner, the other is a basic agitation method. Use either of the procedures given; ultrasonic or other methods of cleaning are not permitted.

A. Fixtures, Test and Support Equipment

Covers/Caps/Plugs	Not specified
Electrosonic Cleaner	Sonac S-2

B. Materials

Lint Free Gloves	Not specified
Solvent (Agitation Method)	02-012
Solvent (Electrosonic Method)	02-015

C. Procedure - Agitation Method

(1) Remove the oil filter housing and element (Ref. Para. 2).

WARNING: BE CAREFUL WHEN YOU USE THE PETROLEUM SOLVENT:
– PUT ON SAFETY GOGGLES AND PROTECTIVE CLOTHING
IF YOU GET THE SOLVENT IN YOUR EYES OR ON YOUR SKIN:

– FLUSH YOUR EYES WITH WATER FOR AT LEAST 15 MINUTES
– CLEAN YOUR SKIN WITH SOAP AND WATER.
– GET MEDICAL HELP.

THE SOLVENT IS DANGEROUS. IT CAN CAUSE DAMAGE TO YOUR EYES AND SKIN.

(2) Clean the element with solvent 02-012, as follows:
(a) Put rubber caps on the apertures at both ends of the oil filter-element central-tube.
(b) Shake the element for five minutes in clean, new solvent 02-012.
(c) Let the element stay in a clean environment until dry.
(d) Do an inspection of the oil filter element (Ref. Para. 4).

NOTE: Use clean, new solvent 02-012 for each cleaning procedure.

(e) Do the cleaning and the inspection procedures again until the oil filter element is in a serviceable condition.
(3) Install the filter element and housing (Ref. Para. 3).

D. Procedure - Electrosonic Method

(1) Remove the oil filter housing and element (Ref. Para. 2).
(2) Clean the element electrosonically, as follows:
(a) Put rubber caps on the apertures at both ends of the oil filter element.
(b) Put the element in the cleaning tank of the electrosonic cleaner.
(c) Put a sufficient quantity of solvent 02-015 in to the tank. Fill until approximately 0.25 in. (6.35 mm) from the top.
(d) Operate the unit for 10 minutes.
(e) Turn the oil filter element 180 degrees (end to end) in the tank. Operate the unit again for 10 minutes.
(f) Continue to clean until the oil filter element is in a satisfactory condition.

NOTE: For best results, change the solvent 02-015 every 20 minutes.

(g) Use clean, lint free gloves and remove the oil filter element from the electrosonic cleaning tank.
(h) Remove the rubber caps from the ends of the filter element.
(i) Let the element stay in a clean environment until dry.
(j) Use a vibropen and put the cleaning date on the end of the cap.
(k) Do an inspection of the oil filter element (Ref. Para. 4).
(3) Install the filter element and housing (Ref. Para. 3).

6. Oil Cooler - Removal (Ref. Fig. 201)

WARNING: DO NOT TOUCH THE OIL SYSTEM COMPONENTS UNTIL THEY ARE COOL. THE TEMPERATURE STAYS HIGH AFTER THE ENGINE STOPS. HIGH TEMPERATURES CAN CAUSE INJURY TO PERSONS.

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A. Fixtures, Test and Support Equipment

Covers/Caps/Plugs	Not specified
Container/drip pan	Not specified
Access Platform	3.3 ft (1 m)

B. Referenced Information

Maintenance Manual Chapter 54-10-00

C. Procedures

NOTE: This procedure is applicable to both the left hand and right hand installation. Data for the right hand procedure is given between parentheses.

(1) Open, tag and safety these circuit breakers:

Pilot CB panel:	Copilot CB panel:
L ENG START	(R OIL COOLER)
(R ENG START)	
L OIL COOLER	

(2) Remove nacelle panels 410AT, 410AB, 430AL and 430AR (420AT, 420AB, 440AL and 440AR) (Refer to 54-10-00).

(3) Drain the oil system (Refer to Para. 9).

(4) Put a container below the outlet hose (11) of the oil cooler (10).

(5) Disconnect the hose (11) from the oil cooler outlet and drain any residual oil from the hose into the container.

(6) Disconnect the inlet hose (4) from the adapter on the scavenge pumps of the oil tank assembly.

(7) Remove the four bolts (2), washers (3) and the two nuts (5), washers (6) and bolts (7) that attach the oil cooler to the lower part of the center frame.

WARNING: BE CAREFUL WHEN YOU MOVE THE COMPONENT. THIS COMPONENT IS HEAVY. INCORRECT MOVEMENT CAN CAUSE INJURY TO PERSONS AND/OR DAMAGE TO EQUIPMENT.

(8) Remove the two bolts (9) and washers (8), and the two bolts (12) and washers (13) that attach the oil cooler to the two support brackets.

(9) Carefully remove the oil cooler (10) complete with the oil inlet hose.

(10) If the oil cooler is to be replaced, do the steps that follow:

(a) Remove the nut, washer and screw that secures the inlet hose clamp to the oil cooler.

(b) Disconnect the oil inlet hose (4) from the adapter at the oil cooler inlet.

(c) Remove the inlet and outlet adapters from the oil cooler and discard the O-rings.

(11) Put caps on all line ends and openings, and wipe up any spilled oil.

7. Oil Cooler - Installation (Ref. Fig. 201)

A. Fixtures, Test and Support Equipment

Access Platform	3.3 ft (1 m)

B. Referenced Information

Maintenance Manual Chapter 12-00-00
Maintenance Manual Chapter 54-10-00

C. Materials

Lockwire	04-008

D. Procedure

NOTE: This procedure is applicable to both the left hand and right hand installation. Data for the right hand procedure is given between parentheses.

(1) Make sure as necessary that:
- the applicable circuit breakers are open, tagged and safetied.
- the system is safe
- access is available. (Refer to the Removal Procedure).

(2) Remove the caps from all line ends and apertures.

(3) If the oil cooler to be installed is a replacement item do the steps that follow:

(a) Install a new O-ring (IPC CSN 792100 01-050) on the inlet and outlet adapters; install and tighten the adapters.

(b) Connnet the straight end of the oil inlet hose to the oil cooler inlet adapter in such a way that the center part can be clamped to the inlet lip of the cooler.

(c) Attach the hose clamp to the cooler inlet lip with the screw, washer and nut; the washer and nut are installed on the clamp side of the attachment.

WARNING: BE CAREFUL WHEN YOU MOVE THE COMPONENT. THIS COMPONENT IS HEAVY. INCORRECT MOVEMENT CAN CAUSE INJURY TO PERSONS AND/ OR DAMAGE TO EQUIPMENT.

(4) Put the oil cooler into position and attach the cooler to the support brackets with the four bolts and the washers.

CAUTION: CHECK THAT THE CLEARANCE BETWEEN THE OIL COOLER INLET DUCT AND THE OIL-TO-FUEL-HEATER IS NOT LESS THAN 12.5 MILLIMETERS.
CHECK THAT THE CLEARANCE BETWEEN THE FLEXIBLE HOSE AND ENGINE FUEL TUBE IS 15MM MINIMUM.
FOR AIRCRAFT INSTALLING HOSE P/N 80-337276-001 REFER TO SB-80-0175 LATEST ISSUE FOR ALLOWED CLEARANCES

(5) Attach the oil cooler to the lower part of the center frame with the four bolts (2) and washers (4) and the two bolts (7), washers (6) and nuts (5).

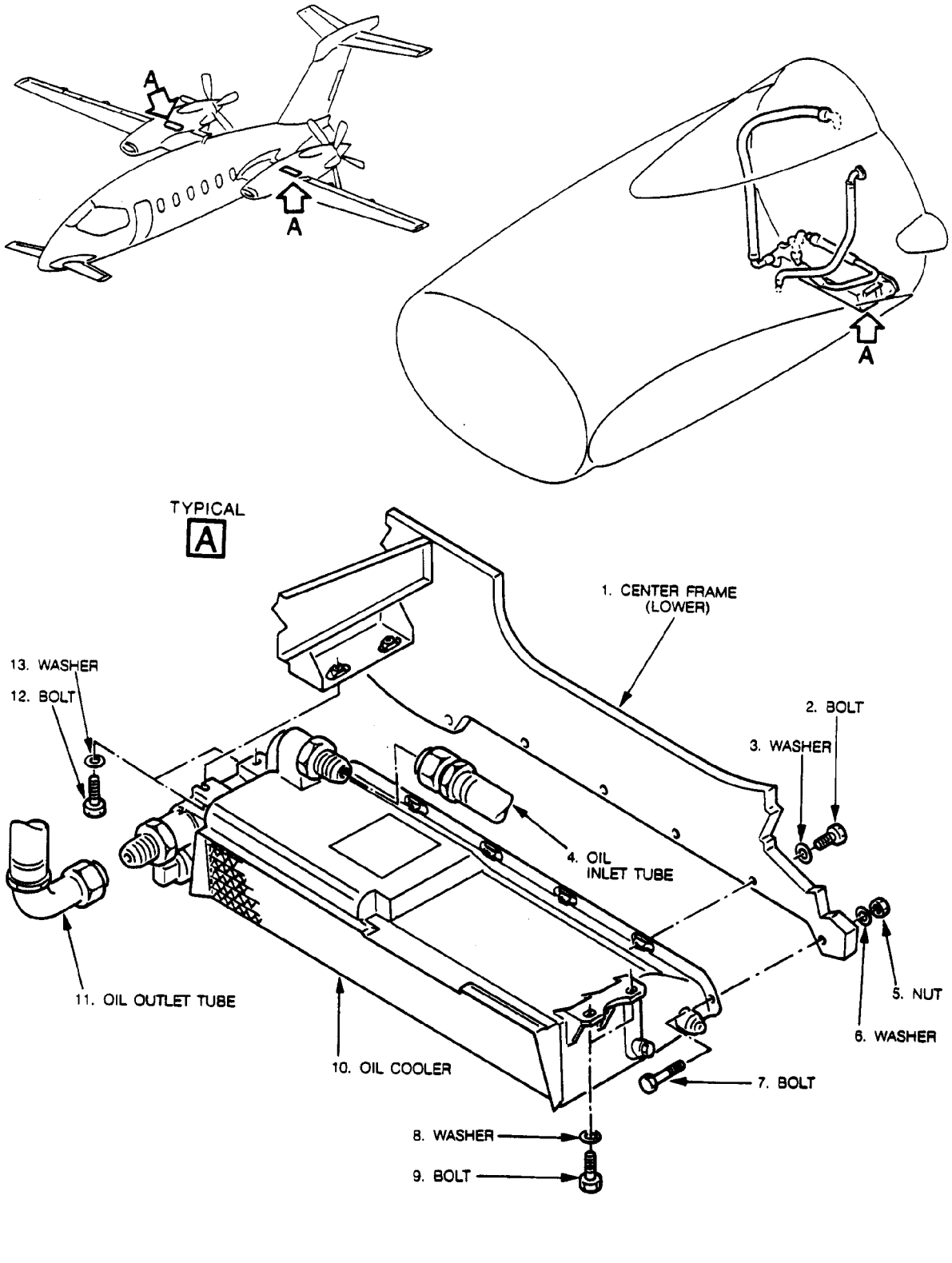

Fig. 201 - Oil Cooler - Removal/Installation

(6) Connect the inlet hose to the adapter on the scavenge pumps of the oil tank assembly. Tighten the coupling and safety with lockwire.

(7) Connect the hose to the oil cooler outlet. Tighten the coupling and safety with lockwire.

(8) Remove all tools, materials and equipment from the work area. Make sure that the area is clean.

(9) Fill the oil system (Refer to 12-00-00). Check for oil leaks at hose and adapter connections.

(10) Install nacelle panels 410AT, 410AB, 430AL and 430AR (420AT, 420AB, 440AL and 440AR) (Refer to 54-10-00).

(11) Remove the safety tags and close these circuit breakers:

Pilot CB panel:	Copilot CB panel:
L ENG START	(R OIL COOLER)
(R ENG START)	
L OIL COOLER	

(12) Remove all tools, materials and equipment from the work area. Make sure that the area is clean.

8. Oil Cooler - Inspection

WARNING: DO NOT TOUCH THE OIL SYSTEM COMPONENTS UNTIL THEY ARE COOL. THE TEMPERATURE STAYS HIGH AFTER THE ENGINE STOPS. HIGH TEMPERATURES CAN CAUSE INJURY TO PERSONS.

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A. Fixtures, Test and Support Equipment

Access Platform	3.3 ft (1 m)

B. Referenced Information

Maintenance Manual Chapter 54-10-00

C. Procedure

NOTE: This procedure is applicable to both the left hand and right hand installation. Data for the right hand procedure is given between parentheses.

(1) Open, tag and safety these circuit breakers:

Pilot CB panel:	Copilot CB panel:
L ENG START	(R OIL COOLER)
(R ENG START)	

Pilot CB panel:	Copilot CB panel:
L OIL COOLER	

(2) Remove nacelle panels 410AT and 410AB (420AT and 420AB) (Refer to 54-10-00).
(3) Examine the oil cooler and the inlet and outlet hoses.
  (a) Make sure that there is no damage, deterioration or corrosion to the matrix of the oil cooler.
  (b) Examine the hoses for surface cracks or deterioration. Carefully flex the hoses (to the maximum extent possible without removal) to see if they are cracked. If they are cracked, replace as necessary.
  (c) Examine the oil cooler and the hoses for general condition and security of installation.
(4) Install nacelle panels 410AT and 410AB (420AT and 420AB) (Refer to 54-10-00).
(5) Remove the safety tags and close these circuit breakers:

Pilot CB panel:	Copilot CB panel:
L ENG START	(R OIL COOLER)
(R ENG START)	
L OIL COOLER	

(6) Remove all tools, materials and equipment from the work area. Make sure that the area is clean.

9. Oil System - Draining (Ref. Fig. 202)

WARNING: DO NOT TOUCH THE OIL SYSTEM COMPONENTS UNTIL THEY ARE COOL. THE TEMPERATURE STAYS HIGH AFTER THE ENGINE STOPS. HIGH TEMPERATURES CAN CAUSE INJURY TO PERSONS.

WARNING: DO NOT GET THE OIL ON YOUR SKIN OR IN YOUR EYES. PUT ON SAFETY GOGGLES AND PROTECTIVE CLOTHING. IF THE OIL GETS ON YOUR SKIN OR IN YOUR EYES, GET MEDICAL HELP.

A. General

This topic gives the oil-system maintenance practices that are not included in Chapter 12-00-00. When it is necessary to drain all or part of the oil system, use all or the applicable part of the procedure that follows.

B. Fixtures, Test and Support Equipment

Access Platform	3.3 ft (1 m)
Drain hose	Not specified
Funnel	Not specified
Container/drip pan	Not specified

C. Materials

Lockwire	04-008

D. Expendable Parts

ITEM	NOMENCLATURE	ENGINE IPC-CSN
-	O-ring	72-16-31, 1-360
-	O-ring	72-26-31, 2-330
-	O-ring	72-66-31, 1-330
-	O-ring	73-16-31, 1-50

E. Referenced Information

Maintenance Manual Chapter 12-00-00
Maintenance Manual Chapter 54-10-00
Engine Maintenance Manual Chapter 72-16-31

F. Procedure

NOTE: This procedure is applicable to both the left hand and right hand installation. Data for the right hand installation is given between parentheses.

(1) Open, tag and safety these circuit breakers:

Pilot CB panel:	Copilot CB panel:
L ENG START	(R OIL COOLER)
(R ENG START)	
L OIL COOLER	

(2) Remove nacelle panels 410AT, 410AB, 430AL and 430AR (420AT, 420AB, 440AL and 440AR) (Refer to 54-10-00):

(3) Drain the oil system.

(a) Put a clean container or drip pan below the compressor inlet case.

(b) Cut and remove the lockwire from the drain plug at the bottom of the compressor inlet case.

(c) Remove the drain plug from the compressor inlet case. Use the drain hose and the funnel to drain the oil into the container. Discard the O-ring.

(d) Put a clean container or drip pan below the reduction gearbox.

(e) Cut and remove the lockwire from the chip detector at the bottom of the reduction gearbox.

(f) Remove the chip detector from the reduction gearbox. Use the drain hose and the funnel to drain the oil into the container. Discard the O-ring.

(g) Put a clean container or drip pan below the accessory gearbox.

(h) Cut and remove the lockwire from the drain plug at the bottom of the accessory gearbox.

(i) Remove the drain plug from the accessory gearbox. Use the drain hose and

the funnel to drain the oil into the container. Discard the O-ring.

(j) Put a clean container or drip pan below the oil-to-fuel heater.

(k) Cut and remove the lockwire from the drain plug on the oil to fuel heater.

(l) Remove the drain plug from the oil to fuel heater. Use the drain hose and the funnel to drain the oil into the container. Discard the O-ring.

(m) Put a clean container or drip pan below the oil cooler.

(n) Cut and remove the lockwire from the drain plugs (3, 5) on the oil cooler (1).

(o) Remove one of the plugs from the oil cooler. Use the drain hose and the funnel to drain the oil into the container. Discard the bonded seal.

(p) Remove the other drain plug from the cooler. Use the drain hose and the funnel to drain the oil into the container. Discard the bonded seal.

(4) When the oil system has been drained, do the steps that follow:

(a) Put a new O-ring on the drain plug and install on the compressor inlet case. Torque the drain plug to between 215 and 240 lbf.in. (24.4 and 27.1 Nm). Safety the drain plug with lockwire.

(b) Do a continuity check of the chip detector (Refer to P&WC 72-16-31).

(c) Put a new O-ring on the chip detector. Lubricate the threads with engine oil and install on the reduction gearbox. Torque the chip detector to between 45 and 55 lbf. in. (5.1 and 6.2 Nm). Safety the chip detector with lockwire.

(d) Put a new O-ring on the drain plug and install on the accessory gearbox.Torque the drain plug to between 215 and 240 lbf.in. (24.4 and 27.1 Nm). Safety the drain plug with lockwire.

(e) Put a new O-ring on the drain plug (2) and install on the oil to fuel heater. Torque the drain plug to between 65 amd 75 lbf.in. (7.3 and 8.5 Nm). Safety the drain plug with lockwire.

(f) Put new bonded seals on the drain plugs (3, 5) and install on the oil cooler (5). Tighten the drain plugs and safety with lockwire.

(5) Fill the oil system (Refer to 12-00-00).

(6) Install nacelle panels 410AT, 410AB, 430AL and 430AR (420AT, 420AB, 440AL and 440AR) (Refer to 54-10-00).

(7) Remove the safety tags and close these circuit breakers:

Pilot CB panel:	Copilot CB panel:
L ENG START	(R OIL COOLER)
(R ENG START)	
L OIL COOLER	

(8) Remove all tools, materials and equipment from the work area. Make sure that the area is clean.

10. Oil System - Flushing

WARNING: DO NOT TOUCH THE OIL SYSTEM COMPONENTS UNTIL THEY ARE COOL. THE TEMPERATURE STAYS HIGH AFTER THE ENGINE STOPS. HIGH TEMPERATURES CAN CAUSE INJURY TO PERSONS.

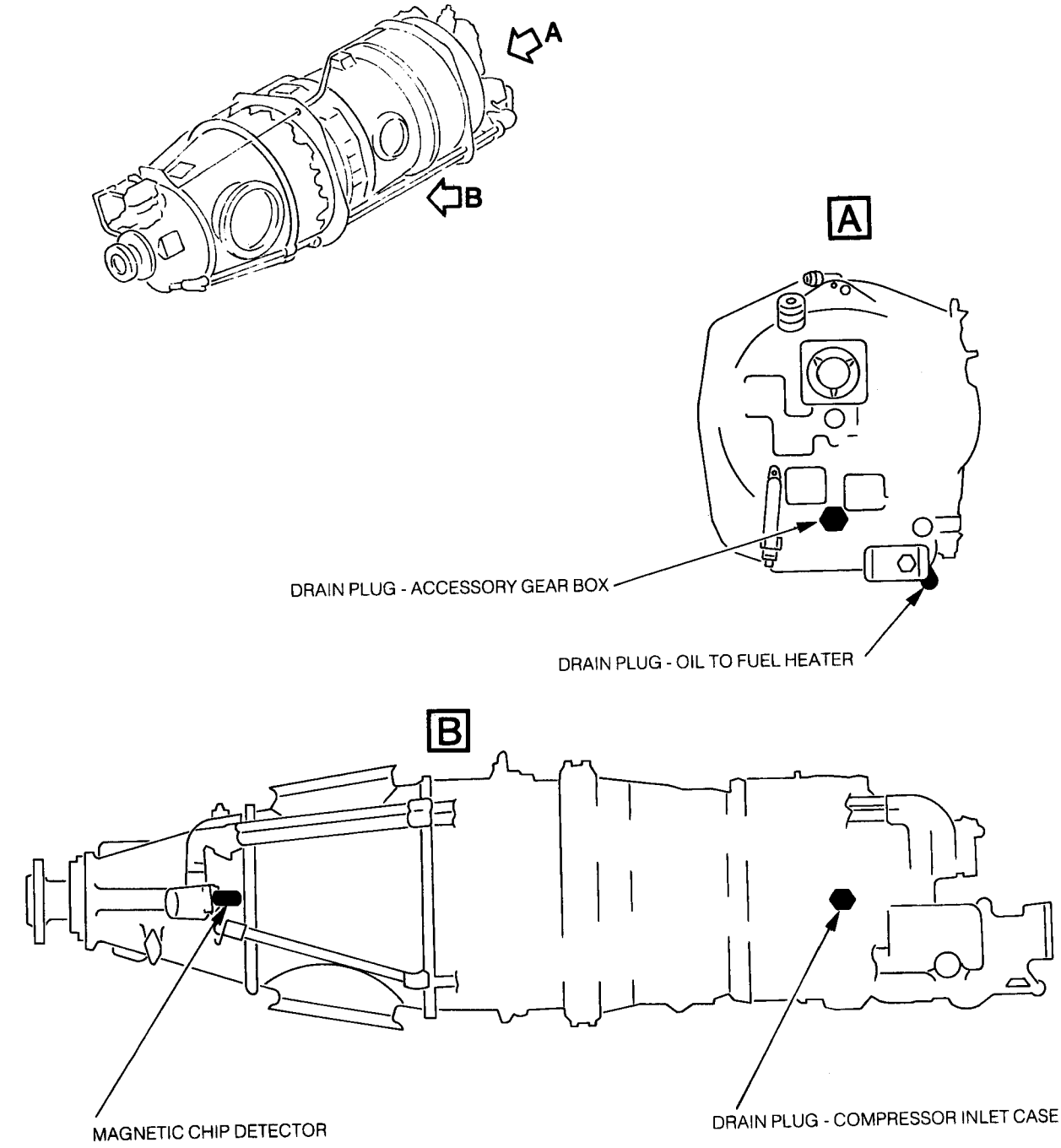

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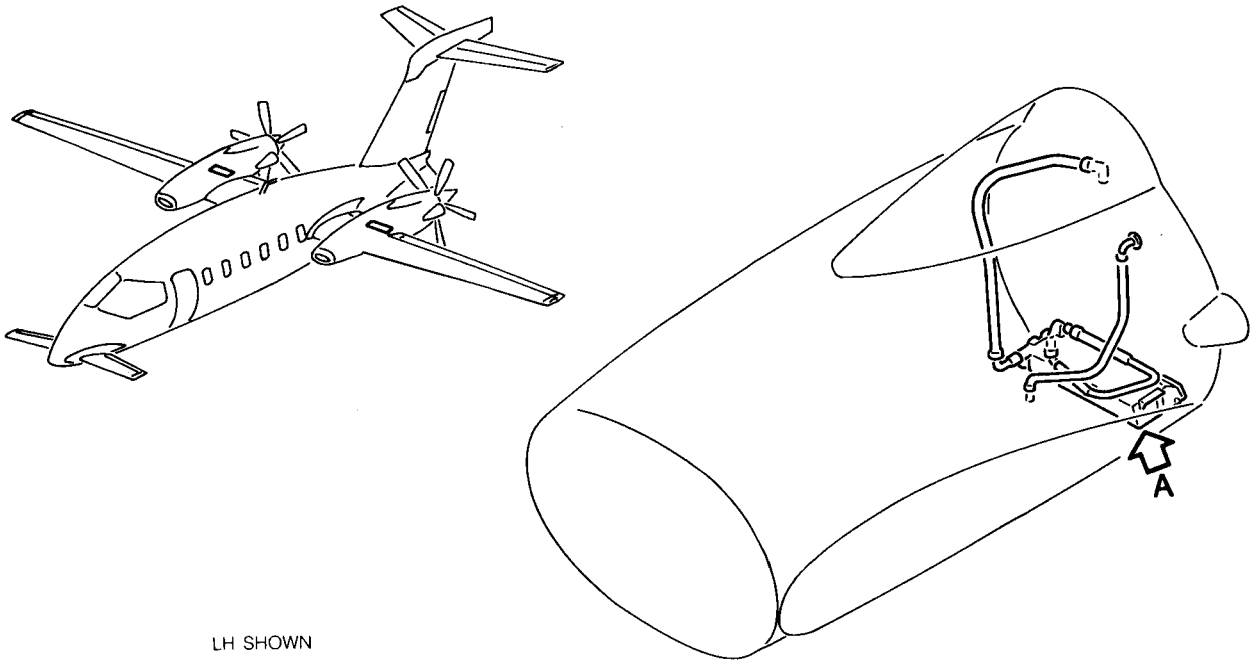
Fig. 202 - Oil System - Draining (Sheet 1 of 2)



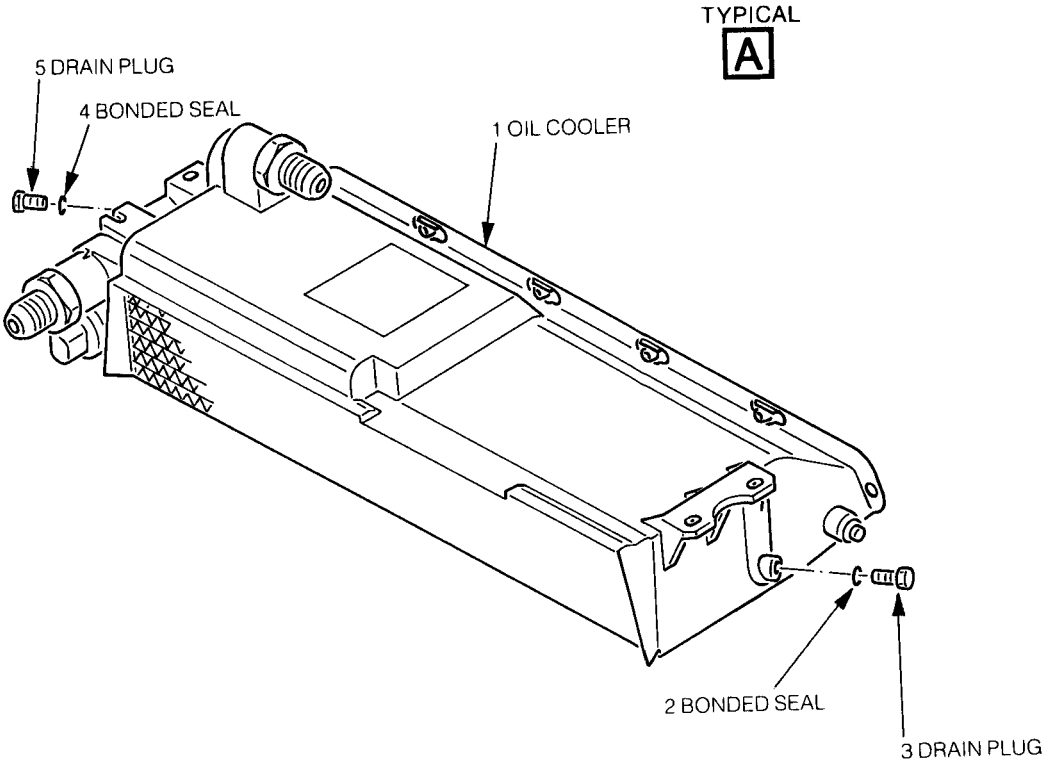


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Fig. 202 - Oil System - Draining (Sheet 2 of 2)

WARNING: DO NOT GET THE OIL ON YOUR SKIN OR IN YOUR EYES. PUT ON SAFETY GOGGLES AND PROTECTIVE CLOTHING. IF THE OIL GETS ON YOUR SKIN OR IN YOUR EYES, GET MEDICAL HELP.

A. General

CAUTION: YOU MUST REPLACE THE ENGINE AND THE OIL COOLER IF YOU FIND METALLIC CONTAMINATION IN THE OIL SYSTEM.

The oil system must be fully flushed if:

- the engine is to be operated with a different brand or type of oil
- different brands of oil have been mixed within the system
- the oil system has been contaminated with non-metallic matter.

B. Fixtures, Test and Support Equipment

Access Platform	3.3 ft (1 m)
Container/drip pan	Not specified

C. Referenced Information

Maintenance Manual Chapter 12-00-00
Maintenance Manual Chapter 54-10-00
Maintenance Manual Chapter 71-00-00
Engine Maintenance Manual Chapter 72-16-31

D. Procedure

NOTE: This procedure is applicable to both the left hand and right hand installation. Data for the right hand installation is given between parentheses.

(1) Remove nacelle panels 410AT, 410AB, 430AL and 430AR (420AT, 420AB, 440AL and 440AR) (Refer to 54-10-00).

(2) Put a clean container or drip pan below the engine.

(3) Remove the chip detector and the oil drain plugs from the engine and the oil cooler (Ref. Para. 9). Note that during oil system flushing the drain plugs and chip detector are removed and installed twice; retain the existing O-rings and bonded seals for the installation following the first removal and use the new O-rings and bonded seals for the second installation.

(4) On the control pedestal, set the propeller control lever to the CUT-OFF position.

(5) Open, tag and safety this circuit breaker:

Pilot CB panel:
IGN SYS

(6) Prepare to collect oil drainage from all drain points.

CAUTION: DO NOT MOTOR THE ENGINE FOR MORE THAN A FEW SECONDS. TAKE THE MINIMUM TIME TO DRAIN THE COMPLETE OIL SYSTEM. MAKE A NOTE OF THE STARTER OPERATING LIMITATIONS (REFER TO 71-00-00).

(7) Motor the engine with the starter only and allow the scavenge pumps to clear the engine of oil.
(8) Install the chip detector and the oil drain plugs in the engine and the oil cooler. Tighten the plugs and the chip detector but do not safety with lockwire at this stage (Ref. Para. 9).
(9) Fill the engine oil tank (Refer to 12-00-00).
(10) Remove the safety tag and close this circuit breaker:

Pilot CB panel:
IGN SYS

(11) Start the engine and operate at idle speed for a minimum of two minutes (Refer to 71-00-00).
(12) Feather the propeller twice to allow oil to circulate through the propeller circuit.
(13) Shut down the engine (Refer to 71-00-00).
(14) Do steps (2) thru (7) again.
(15) Remove the oil filter (Ref. Para. 2).
(16) Clean the oil filter (Ref. Para. 5). Replace the filter if necessary (Ref. Para. 3).
(17) Remove, clean and install the reduction gearbox oil-strainer (Refer to 72-16-31).
(18) Install the chip detector and the oil drain plugs in the engine and the oil cooler. Torque the plugs and the chip detector and safety with lockwire (Ref. Para. 9).
(19) Do steps (9) thru (13) again.
(20) Check the oil level and fill as necessary (Refer to 12-00-00).
(21) Install nacelle panels 410AB, 410AT, 430AL and 430AR (420AB, 420AT, 440AL and 440AR) (Refer to 54-10-00).
(22) Remove all tools, materials and equipment from the work area. Make sure that the area is clean.

11. Oil Change

WARNING: DO NOT TOUCH THE OIL SYSTEM COMPONENTS UNTIL THEY ARE COOL. THE TEMPERATURE STAYS HIGH AFTER THE ENGINE STOPS. HIGH TEMPERATURES CAN CAUSE INJURY TO PERSONS.

WARNING: DO NOT GET THE OIL ON YOUR SKIN OR IN YOUR EYES. PUT ON SAFETY GOGGLES AND PROTECTIVE CLOTHING. IF THE OIL GETS ON YOUR SKIN OR IN YOUR EYES, GET MEDICAL HELP.

A. General Refer to P & WC Service Bulletin No. 14001 latest revision for the approved listing of oil brands which may be used in the engines.

B. Procedure

(1) If the oil specification/type/brand are the same, drain the oil system (Ref. Para. 9) to change the oil. Fill the oil system (Refer to 12-00-00).
(2) If the oil specification/type/brand are different, flush the oil system (Ref. Para. 10).

OIL INDICATION - DESCRIPTION AND OPERATION

1. General

Oil system indication for each of the two power plants comprises:

- temperature and pressure indication
- low pressure warning
- low level warning
- indication that selection of oil cooler motive air flow has been made.

2. Description

A. Temperature and Pressure Indication

Each engine oil temperature and pressure indication system comprises a temperature sensistive bulb, a pressure transducer, temperature and pressure indication displayed on the MFD (Multi Function Display) System Page.
Power for the left engine system is supplied from the left dual feed bus and power for the right engine system is supplied from the right dual feed bus.
The temperature bulb contains a heat sensitive winding which acts as a variable resistance. The bulb is installed in the engine accessory gearbox at approximately the 8 o'clock position (viewed from the propeller) where it is affected by temperature changes from the oil passing over it.
The pressure transducer is installed on a manifold which is mounted on the engine accessory gearbox immediately above the temperature bulb. The pressure transducer produces a signal proportional to the oil pressure acting upon it.
The pressure and temperature oil value are displayed on the MFD (Multi Function Display) System Page.
A grey OIL PRESS Legend, with OIL placed below Press, is displayed betwen the left and right digital readouts.
A grey TEMP Legend, placed below the PRESS OIL Legend is displayed between the left and right digital readouts.
Normal operating temperature is between 60 and 80°C.

B. Oil Low Pressure / High Temperature Indications (Warning)

Each engine oil low pressure indication system comprises a pressure switch, a warning annunciator (captioned L OIL PRESS for the left engine and R OIL PRESS for the right engine), and associated electrical circuitry. Power for the systems is supplied from the L and R Dual Feed Busses respectively..
The pressure switch is installed on the same manifold as the pressure transducer and operates to the open or closed position according to the engine oil pressure acting upon it. When closed, the switch completes the circuit to the L OIL PRESS/ R OIL PRESS warning annunciator to give indication that the oil pressure in the corresponding engine is below the minimum required for safe operation of the engine. The warning annunciators are located in the upper part of the annunciator panel on the center instrument panel.
Each engine oil high temperature indication system comprises a sensing bulb, a warning annunciator (captioned L OIL TEMP for the left engine and R OIL TEMP for the right engine), and associated electrical circuitry. Power for the systems is

supplied from the essential bus.

C. Oil Low Level Indication (Warning)

Each engine oil low level warning system comprises a sensor, a warning annunciator (captioned L ENG OIL for the left engine and R ENG OIL for the right engine) and associated electrical circuitry. Power for the systems is supplied from the hot battery bus.
The sensor is installed within the dipstick of the engine oil tank and operates to the open or closed position according to the level (quantity) of oil in the tank. When closed, the sensor completes the circuit to the L ENG OIL/R ENG OIL warning annunciator to give indication that the oil level in the corresponding engine is below the minimum required for safe operation of the engine.
The warning annunciators are located on the ground test/refuel panel which is located at the right side of the fuselage below the wing root.

D. Oil Cooler Motive Airflow Indication

Each power plant oil cooler has a motive airflow system which includes a caution annunciator (captioned OIL COOLING). Both systems share the same annunciator so that when one or both of the systems is operating (L OIL COOL/R OIL COOL selected), the system shutoff valve completes the circuit to the annunciator from the right single feed bus to give indication that one/both motive airflow systems is/ are operating.
The caution annunciator is located in the central part of the annunciator panel on the center instrument panel.

E. Magnetic Chip Detector

A magnetic chip detector is installed in the base of the front housing of the engine to provide an indication of metal particle contamination of the engine oil system.
Access to the chip detector can be obtained by removing the nacelle panels (440AR, 430AL).

3. Operation

A. Oil Temperature Indication

The temperature of the oil around the sensing bulb determines the resistance of its internal winding, and the bulb sends a corresponding signal to the DCU (Data Concentration Unit). The indication device within the instrument converts the signal to a digital display which represents oil temperature in degrees Celsius (°C).
The transducer send an electrical signal to the DCU (Data Concentration Unit), then displayed on the MFD (Multi Function Display).

– Annunciations
Oil Teperature Digital Display:

- A grey TEMP Legend, placed below the PRESS OIL Legend is displayed between the left and right digital readouts.
- Oil Temperature is an up 3 digit readout with lading zeros suppressed.
- Left engine readout is left justified.
- Right engine readout is right justified.
- Three yellow dashed are displayed if Oil Temperature from all sources has data SSM of Fail, missing, or NCD (See Table 1).
- Digital Readout flashes for 5 seconds when it first turns yellow, it stops flashing if it turns green in less than the 5 second time period.
- Digital Readout flashes for 5 seconds when it first turns red, it continues to flash if it turns yellow within the 5 second time period, but stops flashing if it turns green in less than the 5 second time period.
- Automatic source selection between data sources is provided.
- L DCU is priority source for left engine.
- R DCU is priority source for right engine.
- Cross-side DCU is the secondary source.
- Onside EDC is the third priority source.

NOTE: Inputs from the cross-side DCU are not independently calculated. These inputs represent the onside DCU's Oil Temperature calculation via a different path to the ADF.

- Limit

  AFD display Range is 50 to 150°C.

  - Resolution is 1 degree C.
  - Hysteresis is 0.7 x 1.0 degrees C.
  - Oil Temperature is have a 1.0 second low pass filter.
  - All AFD Oil Temperature Limit values, Redlines, Yellowlines, and associated timers, are with respect to Oil Temperature as it is Displayed to the Pilot. All Oil Temperature Limita are listed in Table 1.
  - TheOil Temperature Digital Readout is green within the Normal Limit region.
  - The Digital readout is yellow within the Transient Limit Region when the Transient Limit conditions have not been exceeded.
  - The Digital Readout is red if in the Transient Limit Region after the Lmit condition is exceeded, or if within the Redline Limit region.
  - If Oil Temperature is > 104°C at AFD power up, it is displayed as a red limit.
  - If valid input < -50°C, Oil Temperature is processed as -50°C.
  - If valid input < 150°C, Oil Temperature is processed as 150°C.
  - Oil Temperature Normal Limit, Transient Limit and Redline Limit is stored in the ADF (See Table1).
- DCU Oil Temperature input is s RTD type with exitacion supplied by the DCU, with a non -linear output of 68.27 to 177.95 ohms for -70 to 200°C

- The DCU is account for wire resistance between the DCU and the sensor when calculating the Oil Teperature.
- If RTD input indicates that temperature is < -65°C, Oil Temperature is set to last valid value with SSM = Fail.
- If RTD input indicates that temperature is > 165°C, Oil Temperature is set to last valid value with SSM = Fail.
- The DCU set the L Oil Temp Red discrete output to GND when the Left Oil Temperature digital readout is red.
- The DCU set the R Oil Temp Red discrete output to GND when the Right Oil Temperature digital readout is red..

Table 1:

Parameter	Condition	Normal Limit	Transient Limit Cautionary (Yellow)	Redline Limit (Red)
Oil Temp (OT) Degrees C	All	20<= OT <=104 (Green)	-40<= OT <20 or (OT)> 104 for 10 mintes or less And OT <= 110	OT <-40 or (OT)> 104 for more than 10 min-utes or OT > 110

B. Oil Pressure Indication

The pressure of the oil at the transducer is converted within the transducer to an electrical signal which is transmitted to the DCU (Data Concentration Unit), then displayed on the MFD (Multi Function Display).

– Annunciations

Oil Teperature Digital Display:

- A grey OIL PRESS Legend, with OIL below PRESS is displayed between the left and right digital readouts.
- The Oil Pressure is an up 3 digit readout with lading zeros suppressed.
- Left engine readout is left justified.
- Right engine readout is right justified.
- Three yellow dashed are displayed if Oil Pressure from all sources has data SSM of Fail, missing, or NCD (See Table 1).
- Digital Readout flashes for 5 seconds when it first turns yellow, it stops flashing if it turns green in less than the 5 second time period.
- Digital Readout flashes for 5 seconds when it first turns red, it continues to flash if it turns yellow within the 5 second time period, but stops flashing if it turns green or white in less than the 5 second time period.
- Automatic source selection between data sources is provided.
- L DCU is priority source for left engine.
- R DCU is priority source for right engine.
- Cross-side DCU is the secondary source.

– Onside EDC is the third priority source.

AFD display Range is 50 to 210 PSIG.

– Resolution is 1 PSIG.
– Hysteresis is 0.7 x 1.0.
– Oil Pressure have a 1.0 second low pass filter.
– All AFD Oil Pressure Limit values, Redlines, Yellowlines, and associated timers, are with respect to Oil Pressure as it is Displayed to the Pilot. All Oil Temperature Limita are listed in Table 2.
– Ol Pressure Readout is green or white within the Normal Limit region as indicated in Table 2.
– The Readout is yellow within the Transient Limit region.
– The Readout is red within the Redline Limit region.
– If valid input < 0 PSIG, it is processed as Failed.
– If valid input > 210 PSIG, it is processed as valid 210 PSIG.
– Oil pressure Normal Limit, Transient Limit and Redline Limit are stored in the ADF. (See Table 2).

– DCU Oil Pressure input is from an airframe powered transducer, with a linear output 0-5 VDC for 0 to 150 PSIG.
  – If Transducer input is < -0.5 V or > 7.0 V, it is set to last valid value with SSM = Fail.
  – If Transducer input is >= -0.5 V and <= 0.0 V, it is processed as valid 0.0 V.
  – If Transducer input is >= 6.83 V and <= 7.0 V, it is processed as valid 6.83 V.
  –

Table 2:

Parameter	Condition	Normal Limit	Transient Limit Cautionary (Yellow)	Redline Limit (Red)
Oil Press (OP) PSIG	Starting (Engine Running = False	0<= OP <=200 (White)	---	OP > 200
Oil Press (OP) PSIG	Not Starting (Engine Running = Truee	90<= OP <=135 (Green)	60<= OP < 90 Or 135 < OP <= 150	OP < 60 Or OP > 150

C. Oil Low Pressure Warning

The pressure of the oil at the pressure switch determines the open or closed condition of the switch. The switch is set to operate to the open position when the oil pressure acting on it reaches 60 psi or more, and to close when the oil pressure falls to 53 ±3 psi.
When closed, the switch completes the circuit to the L OIL PRESS/R OIL PRESS warning annunciator to give indication that the oil pressure in the corresponding engine is below the minimum required for safe operation of the engine. The warning annunciators are located in the upper part of the annunciator panel on the

center instrument panel.

D. Oil High Temperature Warning

Each engine oil high temperature indication system comprises a sensing bulb, a warning annunciator captioned L OIL TEMP for the left engine and R OIL TEMP for the right engine. The annunciators are located on the annunciator panel.

E. Oil Low Level Warning

The level of the oil in the engine integral tank determines the open or closed condition of the sensor which is installed in the tank dipstick. The sensor is set to operate (close) when the oil level is two US quarts low.

F. Oil Cooler Motive Airflow Indication

The open or shut condition of the shutoff valve in the oil cooler motive airflow system is determined by the position of the OIL COOL switch. When the switch is set to the OIL COOL poisiton, the shutoff valve is open and this open condition is indicated by the caution annunciator OIL COOLING.

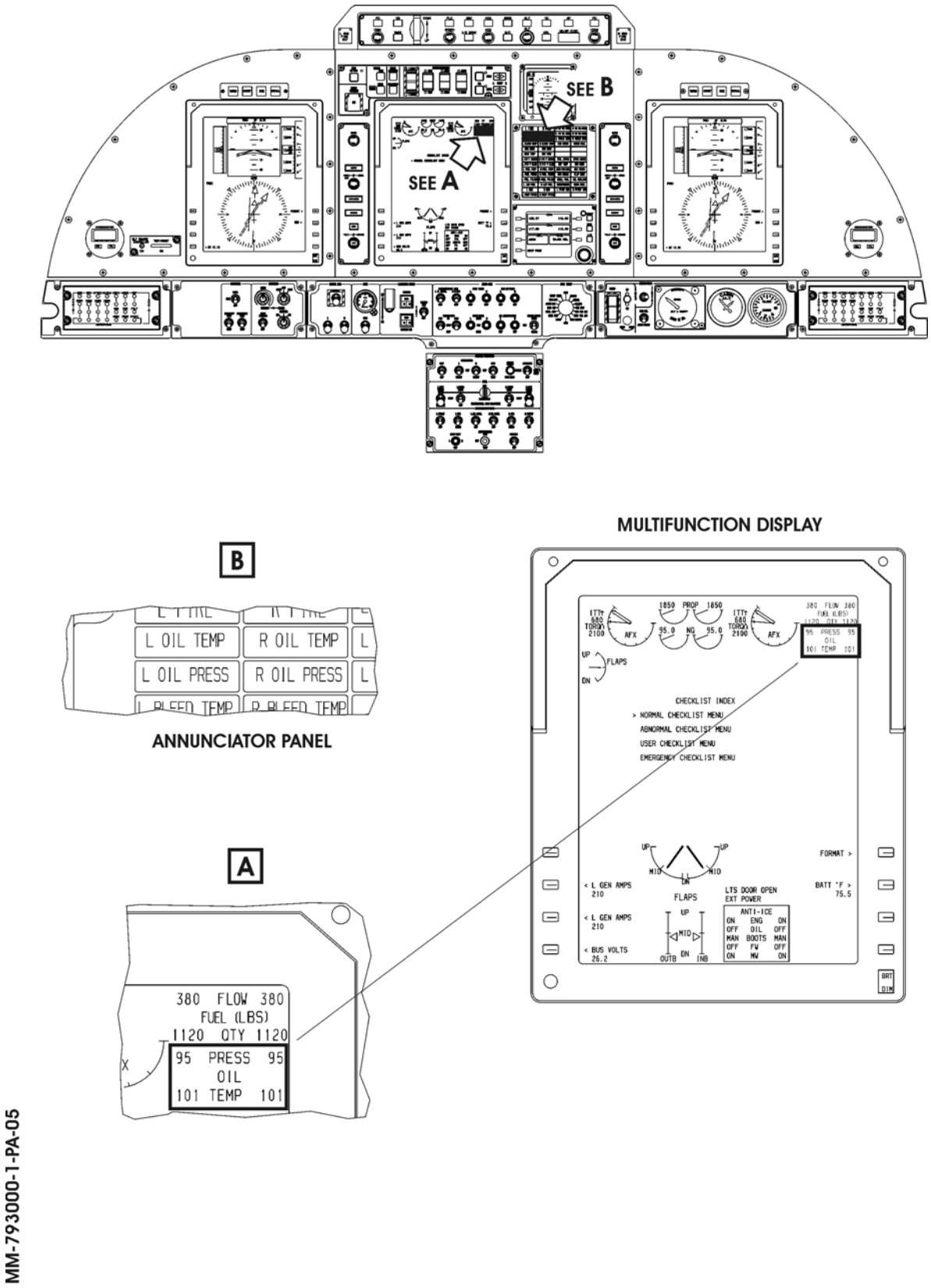

Fig. 1 - Oil System Indicating - Components Location

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OIL INDICATION - MAINTENANCE PRACTICES

1. General

WARNING: DO NOT TOUCH THE OIL SYSTEM COMPONENTS UNTIL THEY ARE COOL. THE TEMPERATURE STAYS HIGH AFTER THE ENGINE STOPS. HIGH TEMPERATURES CAN CAUSE INJURY TO PERSONS.

WARNING: DO NOT GET THE OIL ON YOUR SKIN OR IN YOUR EYES. PUT ON SAFETY GOGGLES AND PROTECTIVE CLOTHING. IF THE OIL GETS ON YOUR SKIN OR IN YOUR EYES, GET MEDICAL HELP.

A. This procedure gives the oil indication maintenance practices that follow:

- oil pressure transducer removal, installation and inspection
- oil pressure switch removal, installation and inspection
- oil temperature bulb removal, installation and inspection
- oil temperature and pressure indicator removal, installation, inspection and operational test.

NOTE: The maintenance practices for the magnetic chip detector are given in 72-16-32 of the engine maintenance manual.

2. Oil Pressure Transducer - Removal (Ref. Fig. 201)

A. Fixtures, Test and Support Equipment

Covers/Caps/Plugs	Not specified
Access Platform	3.3 ft (1 m)

B. Referenced Information

Maintenance Manual Chapter 54-10-00

C. Procedures

NOTE: This procedure is applicable to both the left hand and right hand installation. Data for the right hand procedure is given between parentheses.

(1) Open, tag and safety these circuit breakers:

Pilot CB panel:	Copilot CB panel:
L ENG START	(R OIL PRESS)
(R ENG START)	
L OIL PRESS	

(2) Remove nacelle panel 410AT (420AT) (Refer to 54-10-00):

(3) Cut and remove the lockwire from the oil pressure transducer (2) and the electrical connector (1).
(4) Disconnect and remove the electrical connector (1) from the oil pressure transducer (2). Put caps on the electrical connectors.
(5) Remove the oil pressure transducer from the support bracket (4). Immediately put a plastic cap in the opening of the support bracket.
(6) Discard the O-ring (3) from the oil pressure transducer and put caps on all openings.
(7) Put the transducer in a clean environment.

3. Oil Pressure Transducer - Installation (Ref. Fig. 201)

A. Fixtures, Test and Support Equipment

Access Platform	3.3 ft (1m)

B. Expendable Parts

ITEM	NOMENCLATURE	IPC-CSN
3	O-ring	792100 02-040

C. Materials

Lockwire	04-008

D. Referenced Information

Maintenance Manual Chapter 54-10-00
Maintenance Manual Chapter 71-00-00

E. Procedures

NOTE: This procedure is applicable to both the left hand and right hand installation. Data for the right hand procedure is given between parentheses.

(1) Make sure as necessary that:
- the applicable circuit breakers are open, tagged and safetied
- the system is safe
- access is available (Refer to the Removal Procedure).

(2) Install a new O-ring (3) on the oil pressure transducer (2).
(3) Remove the caps from all line ends and electrical connectors.
(4) Install the oil pressure transducer on to the support bracket (4).
(5) Torque the transducer to between 18 and 20 lbf.in. (2.0 and 2.3 Nm) and safety with lockwire.
(6) Connect the electrical connector (1) to the pressure transducer (2).
(7) Safety the connector with lockwire.
(8) Install nacelle panel 410AT (420AT) (Refer to 54-10-00).

(9) Remove the safety tags and close these circuit breakers:

Pilot CB panel:	Copilot CB panel:
L ENG START	(R OIL PRESS)
(R ENG START)	
L OIL PRESS	

(10) Remove all tools, materials and equipment from the work area. Make sure that the area is clean.

(11) Do an engine ground run, as detailed in Page Block 501 of 71-00-00, for the replacement of the oil pressure transducer.

4. Oil Pressure Transducer - Inspection

A. Fixtures, Test and Support Equipment

Access Platform	3.3 ft (1m)

B. Referenced Information

Maintenance Manual Chapter 54-10-00

C. Procedures

NOTE: This procedure is applicable to both the left hand and right hand installation. Data for the right hand procedure is given between parentheses.

(1) Open, tag and safety these circuit breakers:

Pilot CB panel:	Copilot CB panel:
L ENG START	(R OIL PRESS)
(R ENG START)	
L OIL PRESS	

(2) Remove nacelle panel 410AT (420AT) (Refer to 54-10-00):

(3) Examine the area around the oil pressure tranducer. Make sure there are no leaks.

(4) Examine the oil pressure transducer for security of installation. Make sure that the lockwire is secure.

(5) Examine the electrical connector for security of installation. Make sure that the lockwire is secure.

(6) Install nacelle panel 410AT (420AT) (Refer to 54-10-00).

(7) Remove the safety tags and close these circuit breakers:

Pilot CB panel:	Copilot CB panel:
L ENG START	(R OIL PRESS)
(R ENG START)	
L OIL PRESS	

(8) Remove all tools, materials and equipment from the work area. Make sure that the area is clean.

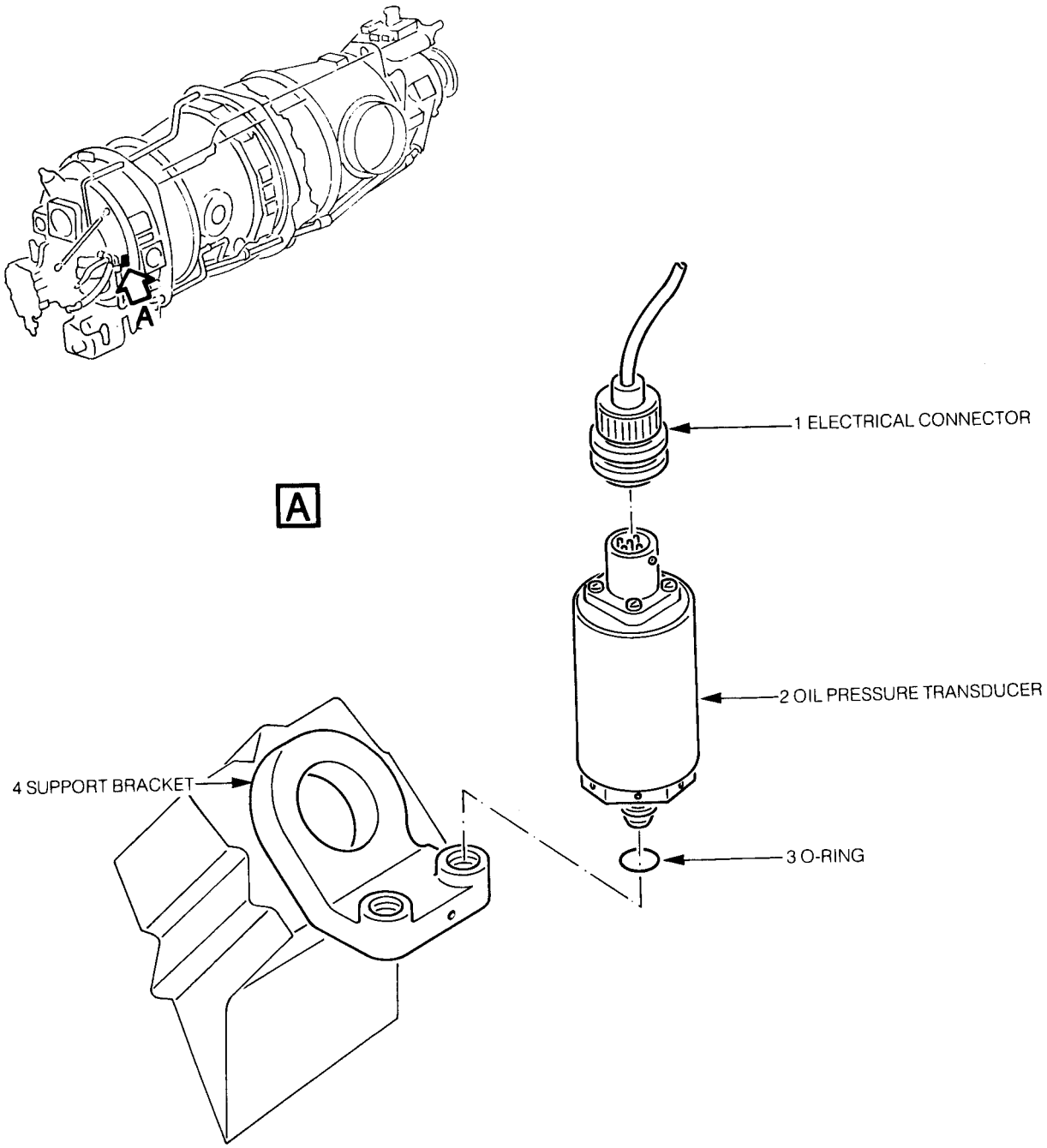

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Fig. 201 - Oil Pressure Tranducer - Removal/Installation

5. Oil Pressure Switch - Removal (Ref. Fig. 202)

A. Fixtures, Test and Support Equipment

Covers/Caps/Plugs	Not specified
Access Platform	3.3 ft (1m)

B. Referenced Information

Maintenance Manual Chapter 54-10-00

C. Procedures

NOTE: This procedure is applicable to both the left hand and right hand installation. Data for the right hand procedure is given between parentheses.

(1) Open, tag and safety these circuit breakers:

Pilot CB panel:	Copilot CB panel:
L ENG START	(R OIL PRESS)
(R ENG START)	
L OIL PRESS	

(2) Remove the nacelle panel 410AT (420AT) (Refer to 54-10-00).
(3) Cut and remove the lockwire from the oil pressure switch (2) and the electrical connector (1).
(4) Disconnect and remove the electrical connector (1) from the oil pressure switch (2). Put caps on the electrical connectors.
(5) Remove the oil pressure switch from the support bracket (4). Immediately put a plastic cap in the opening of the support.
(6) Discard the O-ring (3) from the oil pressure switch and put caps on all openings.
(7) Put the switch in a clean environment.

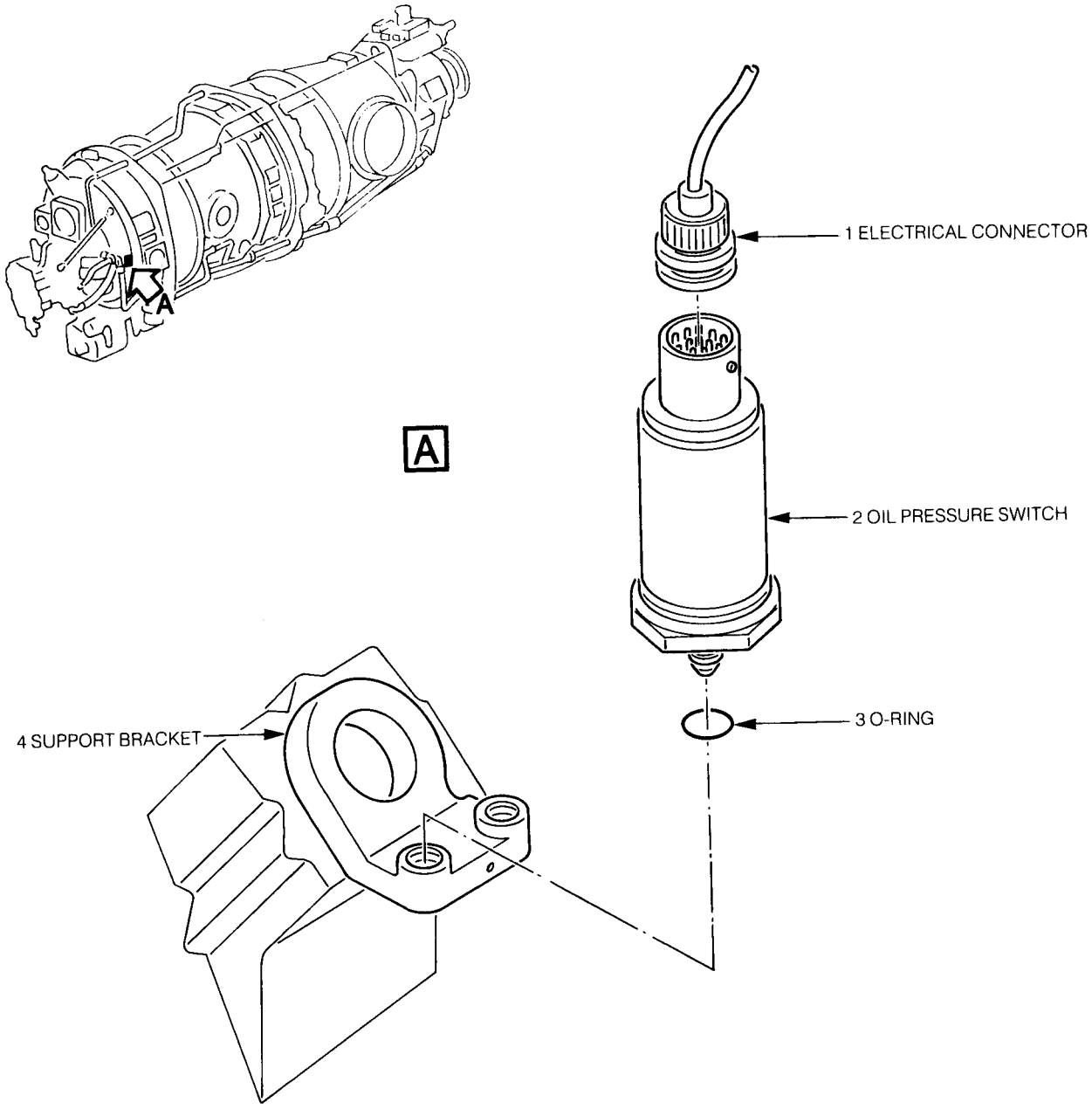

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Fig. 202 - Oil Pressure Switch - Removal/Installation

6. Oil Pressure Switch - Installation (Ref. Fig. 202)

A. Fixtures, Test and Support Equipment

Access Platform	3.3 ft (1m)

B. Expendable Parts

ITEM	NOMENCLATURE	IPC-CSN
3	O-ring	792100 02-040

C. Materials

Lockwire	04-008

D. Referenced Information

Maintenance Manual Chapter 54-10-00
Maintenance Manual Chapter 71-00-00

E. Procedures

NOTE: This procedure is applicable to both the left hand and right hand installation. Data for the right hand procedure is given between parentheses.

(1) Make sure as necessary that:
- the applicable circuit breakers are open, tagged and safetied
- the system is safe
- access is available (Refer to the Removal Procedure).

(2) Remove the caps from all line ends and electrical connectors.
(3) Install a new O-ring (3) on the oil pressure switch (2).
(4) Install the oil pressure switch on to the support bracket (4).
(5) Tighten the transducer and safety with lockwire.
(6) Connect the electrical connector (1) to the oil pressure switch (2).
(7) Safety the connector with lockwire.
(8) Install nacelle panel 410AT (420AT) (Refer to 54-10-00):
(9) Remove the safety tags and close these circuit breakers:

Pilot CB panel:	Copilot CB panel:
L ENG START	(R OIL PRESS)
(R ENG START)	
L OIL PRESS	

(10) Remove all tools, materials and equipment from the work area. Make sure that the area is clean.
(11) Do an engine ground run detailed in Page Block 501 of 71-00-00 for the replacement of the oil pressure switch.

7. Oil Pressure Switch - Inspection

A. Fixtures, Test and Support Equipment

Access Platform	3.3 ft (1m)

B. Referenced Information

Maintenance Manual Chapter 54-10-00

C. Procedures

NOTE: This procedure is applicable to both the left hand and right hand installation. Data for the right hand procedure is given between parentheses.

(1) Open, tag and safety these circuit breakers:

Pilot CB panel:	Copilot CB panel:
L ENG START	(R OIL PRESS)
(R ENG START)	
L OIL PRESS	

(2) Remove nacelle panel 410AT (420AT) (Refer to 54-10-00):
(3) Examine the area around the oil pressure switch. Make sure there are no leaks.
(4) Examine the oil pressure switch for security of installation. Make sure that the lockwire is secure.
(5) Examine the electrical connector for security of installation. Make sure that the lockwire is secure.
(6) Install nacelle panel 410AT (420AT) (Refer to 54-10-00):
(7) Remove the safety tags and close these circuit breakers:

Pilot CB panel:	Copilot CB panel:
L ENG START	(R OIL PRESS)
(R ENG START)	
L OIL PRESS	

(8) Remove all tools, materials and equipment from the work area. Make sure that the area is clean.

8. Oil Temperature Bulb - Removal (Ref. Fig. 203)

A. Fixtures, Test and Support Equipment

Covers/Caps/Plugs	Not specified
Access Platform	3.3 ft (1m)

B. Referenced Information

Maintenance Manual Chapter 54-10-00
Maintenance Manual Chapter 79-20-00

C. Procedure

NOTE: This procedure is applicable to both the left hand and right hand installation. Data for the right hand procedure is given between parentheses.

(1) Drain the oil tank (Refer to 79-20-00).
(2) Open, tag and safety these circuit breakers:

Pilot CB panel:	Copilot CB panel:
L ENG START	(R OIL TEMP)
(R ENG START)	
L OIL TEMP	

(3) Remove nacelle panel 410AT (420AT) (Refer to 54-10-00).
(4) Cut and remove the lockwire from the electrical connector (1) on the oil temperature bulb (2).
(5) Disconnect the electrical connector (1) from the oil temperature bulb (2).
(6) Remove the oil temperature bulb (2).
(7) Put caps on all line ends and electrical connectors.

9. Oil Temperature Bulb - Installation (Ref. Fig. 203)

A. Fixtures, Test and Support Equipment

Access Platform	3.3 ft (1m)

B. Expendable Parts

NOTE: The copper/absestos gasket is supplied with the temperature bulb. If the bulb that was removed is the same one to be installed, examine the gasket for general condition. Re-use the gasket if satisfactory, otherwise use a new gasket MS35769-11.

C. Referenced Information

Maintenance Manual Chapter 12-00-00
Maintenance Manual Chapter 54-10-00
Maintenance Manual Chapter 71-00-00

D. Procedures

NOTE: This procedure is applicable to both the left hand and right hand installation. Data for the right hand procedure is given between parentheses.

(1) Make sure as necessary that:
- the applicable circuit breakers are open, tagged and safetied
- the system is safe
- access is available (Refer to the Removal Procedure).

(2) Remove the caps from all line ends and electrical connectors.

(3) Install a gasket (3) on the oil temperature bulb (2). Refer to the note above.

(4) Install the oil temperature bulb (2) and tighten.

(5) Connect the electrical connector (1) to the oil temperature bulb (2). Tighten the electrical connector by hand and safety with lockwire.

(6) Install nacelle panel 410AT (420AT) (Refer to 54-10-00).

(7) Remove the safety tags and close these circuit breakers:

Pilot CB panel:	Copilot CB panel:
L ENG START	(R OIL TEMP)
(R ENG START)	
L OIL TEMP	

(8) Fill the oil tank (Refer to 12-00-00).

(9) Do a ground run of the engine (Refer to 71-00-00). Do a check of the oil-temperature indication-system for correct operation (Ref. Para 14).

(10) After you do the ground run, examine the area around the oil temperature bulb for leaks.

(11) Remove all tools, materials and equipment from the work area. Make sure that the area is clean.

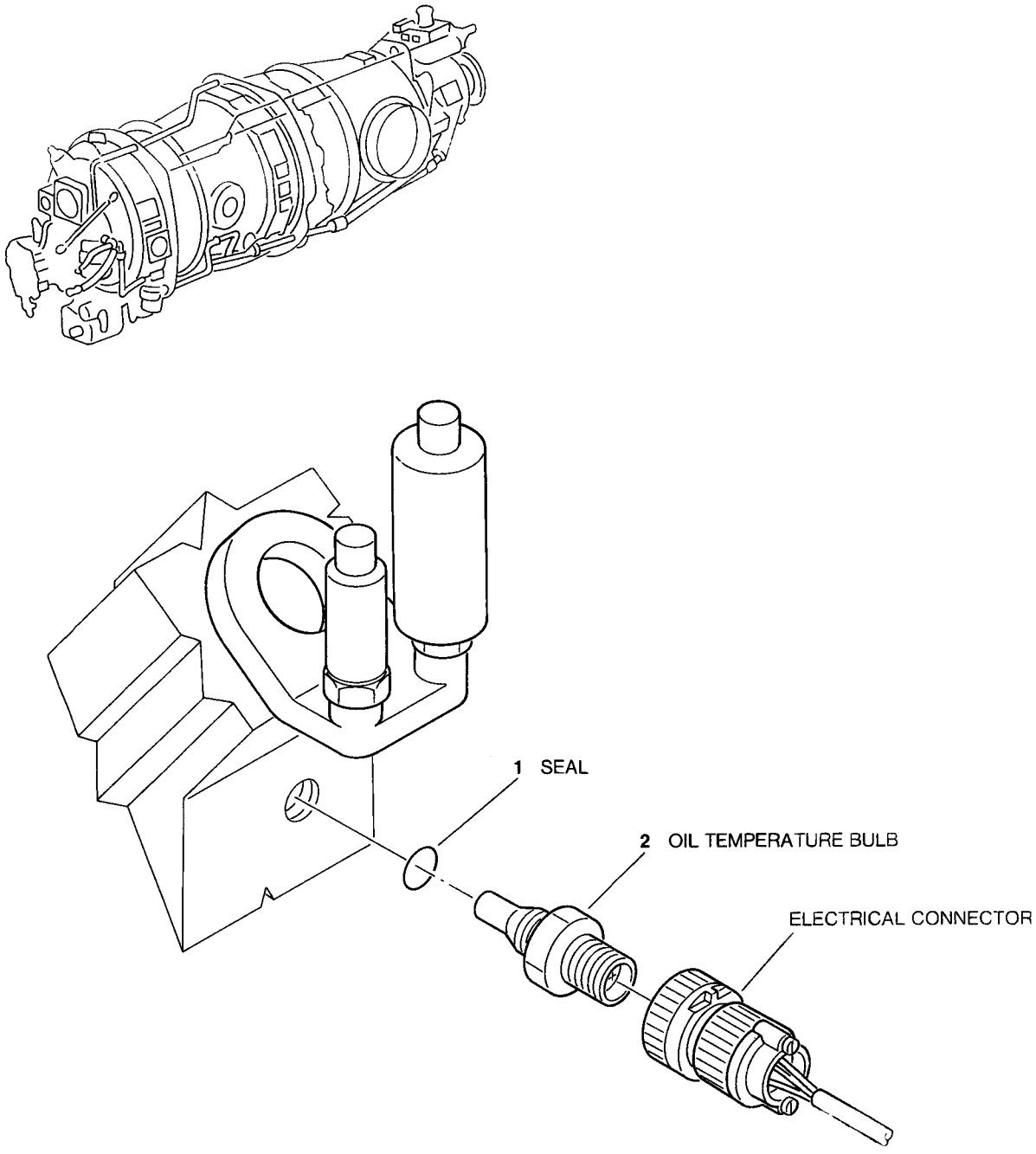

Fig. 203 - Oil Temperature Bulb - Removal/Installation

10. Oil Temperature Bulb - Inspection

A. Fixtures, Test and Support Equipment

Access Platform	3.3 ft (1m)

B. Referenced Information

C. Maintenance Manual Chapter 54-10-00

D. Procedures

NOTE: This procedure is applicable to both the left hand and right hand installation. Data for the right hand procedure is given between parentheses.

(1) Open, tag and safety these circuit breakers:

Pilot CB panel:	Copilot CB panel:
L ENG START	(R OIL TEMP)
(R ENG START)	
L OIL TEMP	

(2) Remove nacelle panel 410AT (420AT) (Refer to 54-10-00).
(3) Examine the area around the oil temperature bulb. Make sure there are no leaks. Make sure that the lockwire is secure.
(4) Examine the oil temperature bulb for security of installation. Make sure that the lockwire is secure.
(5) Examine the electrical connector for security of installation. Make sure that the lockwire is secure.
(6) Install nacelle panel 410AT (420AT) (Refer to 54-10-00).
(7) Remove the safety tags and close these circuit breakers:

Pilot CB panel:	Copilot CB panel:
L ENG START	(R OIL TEMP)
(R ENG START)	
L OIL TEMP	

(8) Remove all tools, materials and equipment from the work area. Make sure that the area is clean.

11. Magnetic Chip Detector - Removal

A. Referenced Information

Maintenance Manual Chapter 54-10-00
P&WC Maintenance Manual Chapter 72-16-30

B. Procedure

(1) Open, tag and safety these circuit breakers:

Pilot CB panel:
L ENG START
R ENG START.

(2) Remove the nacelle panels (440AR, 430AL) (Refer to 54-10-00).
(3) Remove the magnetic chip detector (Refer to P&WC Maintenance Manual, Chapter 72-16-30).

12. Magnetic Chip Detector - Installation

A. Referenced Information

Maintenance Manual Chapter 54-10-00
P&WC Maintenance Manual Chapter 72-16-30

B. Procedure

(1) Make sure as necessary that:
- The applicable circuit breakers are open, tagged and safetied
- The system is safe
- Access is available (Refer to the Removal Procedure).

(2) Install the magnetic chip detector (Refer to P&WC Maintenance Manual, Chapter 72-16-30).
(3) Install the nacelle panels (440AR, 430AL) (Refer to 54-10-00).
(4) Remove the safety tags and close these circuit breakers:

L ENG START
R ENG START.

13. Chip Detection Monitoring

A. A chip detector is mounted in the reduction gearbox. The chip detection condition can be checked by either removing the two nacelle panels, as decribed in this section, or, if the upgraded ground test/refuel panel is installed, moving and holding the GROUND TEST switch to the SYS position: in the event of a L or R ENG OIL light flashing, with a rate of 3Hz (40% on and 60% off), a real chip detection condition is shown in the corresponding engine oil.

B. The ground test/refuel panel performs the following indications, tests and operations:

– display of the low oil level condition in the left and the right engine and annunciators driving circuitry test
– controlled display of the metallic chip detection condition, if any, in the left and right engine oil.

All of the annunciator lights are dual-bulb, word readout type. The following list illustrate the function associated with each light:

L ENG OIL	Red	Low oil level in the left engine
		Chip detection condition in the left engine oil (upgraded configuration only)
R ENG OIL		Low oil level in the right engine
		Chip detection condition in the right engine oil (upgraded configuration only)

When the upgraded configuration of the ground test/refuel panel is installed, a dual engine oil condition monitoring function is associated with the L and R ENG OIL annunciator lights:

– level condition of the engine oil (automatic display)
– chip detection condition in the engine oil (controlled display)

With the upgraded configuration, when the GROUND TEST switch is moved and held to the LAMP position, the L and R ENG OIL lights should flash with a rate of 3 Hz. (60% on and 40% off) showing the proper operation of the chip detection monitoring circuitry, while all the other annunciator lights should steady illuminate for just a bulb check.

When the GROUND TEST switch is moved and held to the SYS position, all the red-warning lights should steady illuminate in a few seconds then should go off releasing the switch.

WARNING: ON THE GROUND TEST/REFUEL PANEL), IF THE L OR R ENG OIL ANNUNCIATOR LIGHT IS FLASHING WHILE THE GROUND TEST SWITCH IS HELD IN THE SYS POSITION, A REAL CHIP DETECTION CONDITION OCCURS IN THE RELATED ENGINE OIL. HAVE AN IMMEDIATE ENGINE MAINTENANCE CHECK AS PER THE APPLICABLE ENGINE MANUAL. FOR MORE INFORMATIONS REFER TO CHAPTER 12-10-08.

14. Magnetic Chip Detector - Check

A. Materials

Multimeter	Not Specified

B. Referenced Information

Maintenance Manual Chapter 54-10-00
P&WC Maintenance Manual Chapter 72-00-00

C. Procedure

(1) Open, tag and safety these circuit breakers:

Pilot CB panel:
L ENG START
R ENG START

(2) Remove the nacelle panels (440AR, 430AL) (Refer to 54-10-00).

(3) Using a multimeter check an open circuit as described in the P&WC Maintenance Manual Chapter 72-06-00.

(4) Install the nacelle panels (440AR, 430AL) (Refer to 54-10-00).

(5) Remove the safety tags and close these circuit breakers:

L ENG START
R ENG START.

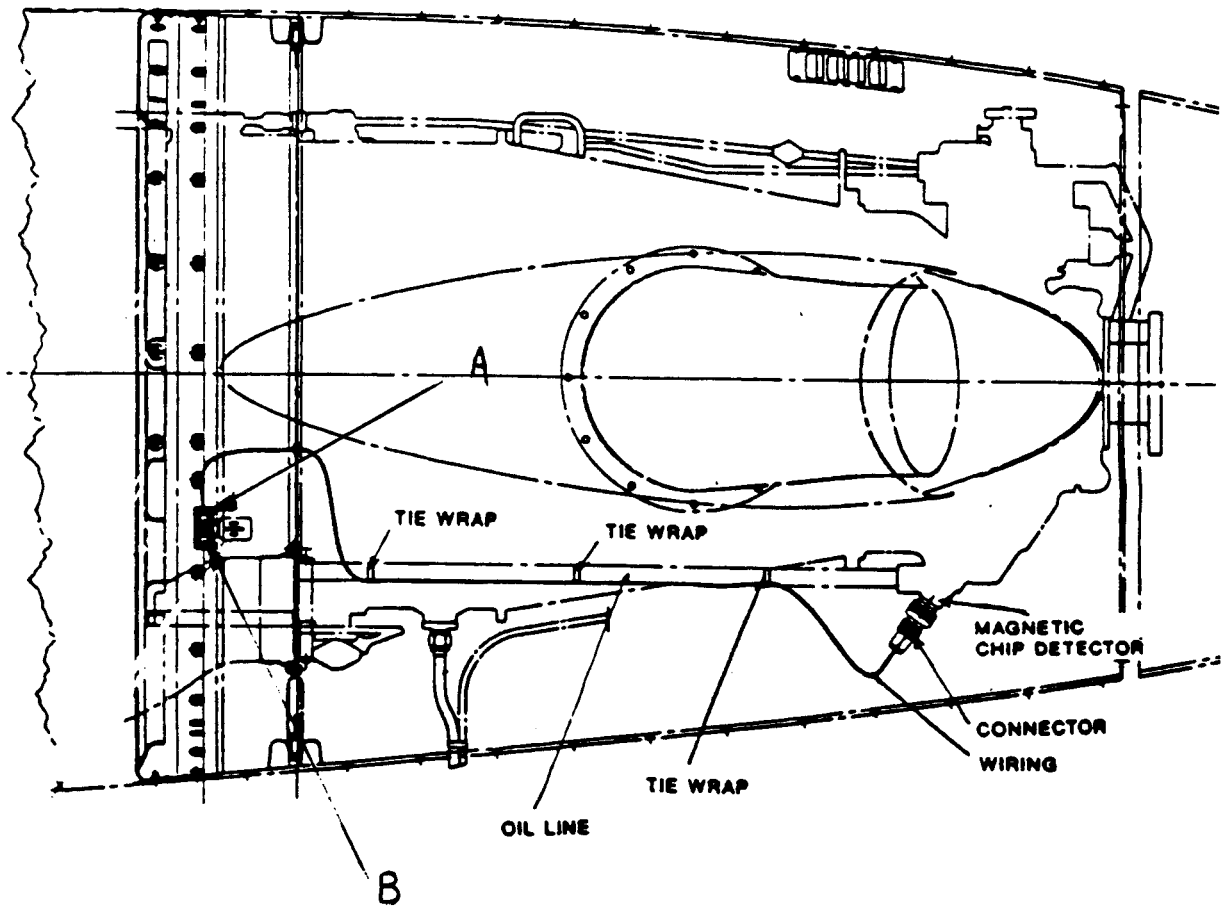

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Fig. 204 - Magnetic Chip Detector (Optional) - Check

15. Chip Detection Monitoring Circuitry - Check (Ref. Fig. 205)

A. Materials

Precision Resistor Box	Not Specified
Variable Resistor	Not Specified

B. Referenced Information

Maintenance Manual Chapter 24-00-00
Maintenance Manual Chapter 54-10-00

C. Procedure

NOTE: The procedures for Left and Right Magnetic Chip are identical.

(1) Open, tag and safety these circuit breakers:

Pilot CB panel:
L ENG START
R ENG START

(2) Remove the electrical power (Refer to 24-00-00)
(3) Remove the nacelle panels (Refer to 54-10-00).
(4) Disconnect the Magnetic Chip Detector Connector (2).
(5) Open the Ground Test/Refuel panel door.
(6) The magnetic chip detector circuitry control can be done in two different way:
- using a Precision Resistor Box
- using a Variable Resistor

(a) Using a Precision Resistor Box:
- Connect the Precision Resistor Box to the Electrical Connector Pins (female)(3).
- Starting with a value over 306 Ohm, set and hold the GROUND TEST Switch to the SYS position.
- Decrease the value of the Precision Resistor Box (by steps of 1 Ohm) until the L or R ENG OIL flash. Note the resistence value when the L or R ENG OIL lamp start to flash. The noted value must be within 306 and 294 Ohm.

(b) Using a Variable Resistor
- Set the variable resistor to a resistence value over to 306 Ohm.
- Set and hold the GROUND TEST Switch to the SYS position.
- Decrease slowly the Variable Resistor until the L or R ENG OIL flashes.
- Make and note the variable resistor value, using a suitable Ohm-meter, when the L or R ENG OIL lamp start to flash.
- The noted value must be within 306 and 294 Ohm.
- If the L or R ENG OIL lamp start to flash over 306 Ohm or Lower 294 Ohm check the wiring cables continuity from the Magnetic Chip Detector Connector (2) to the connector located to the

Ground Test/Refuel Panel back side.
If there is continuity The Ground Test/Refuel Panel must be replaced.
In this case repeat the procedure starting from step 1.

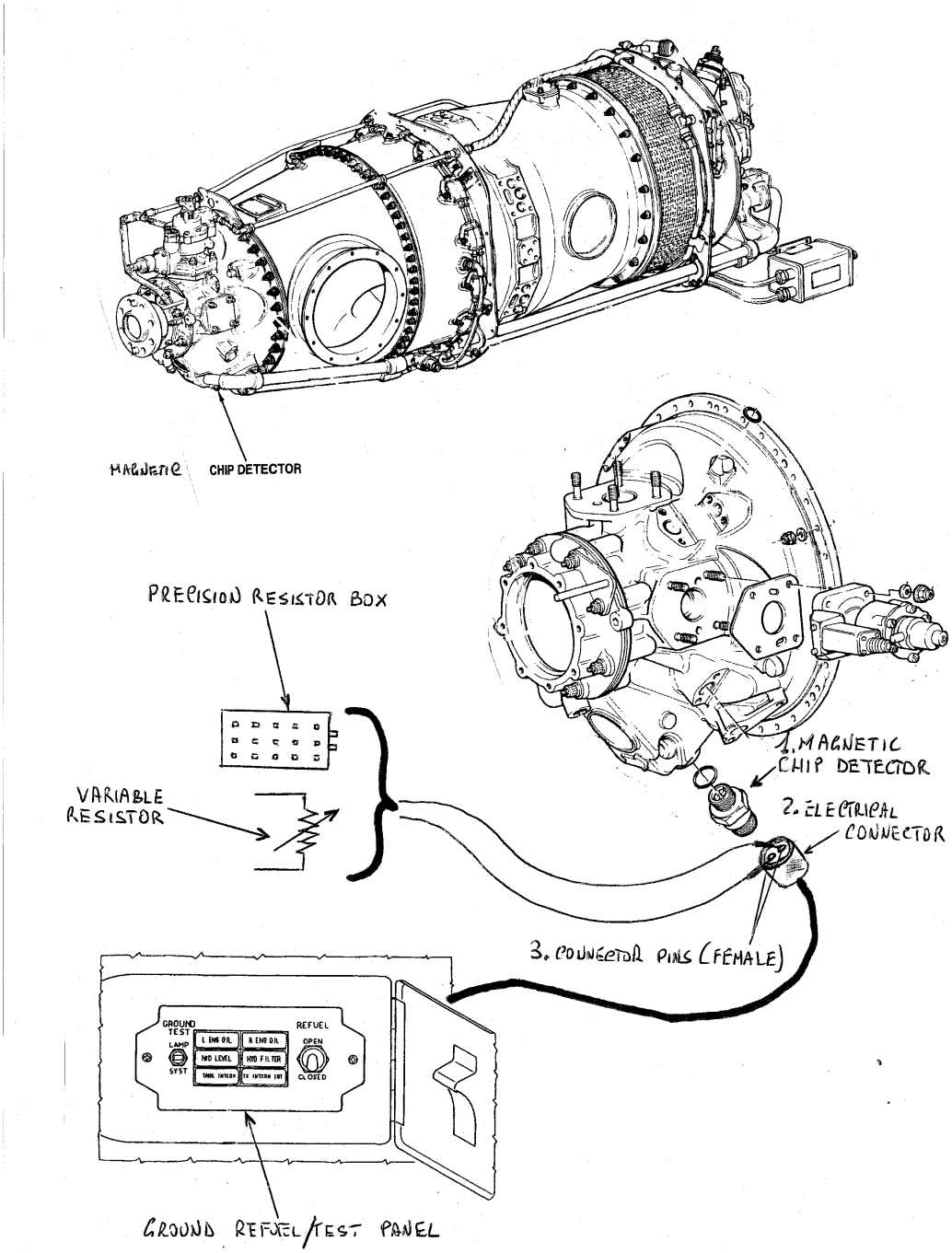

Fig. 205 - Chip Detection Monitoring Circuitry