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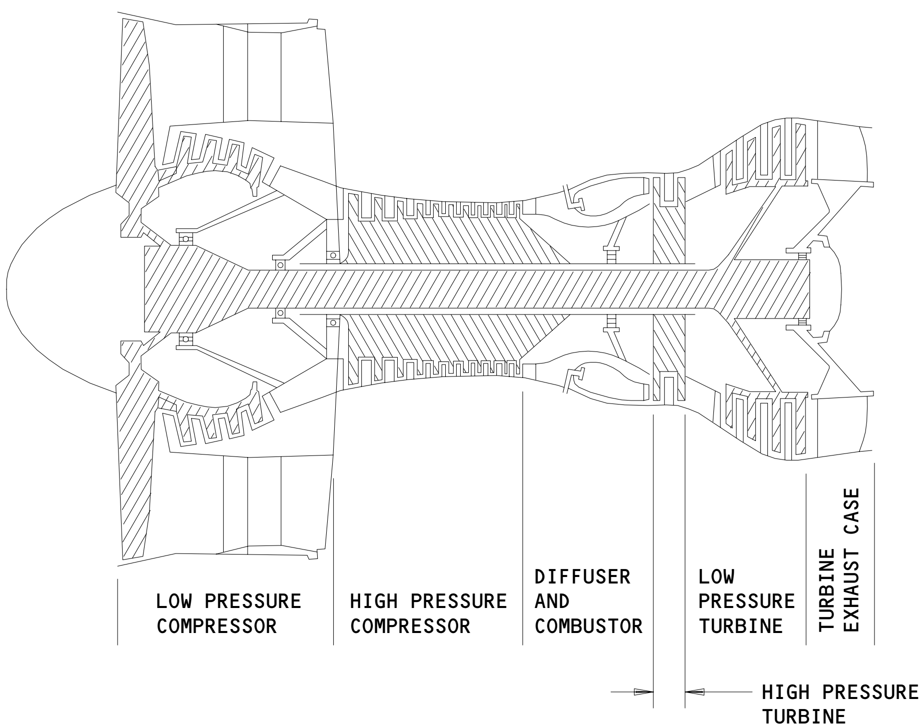
POWER PLANT - DESCRIPTION AND OPERATION

1. General
   A. The 767 airplane is powered by two PW4000 high-bypass turbofan engines mounted below the wings. The engines are individually supported in strut-mounted nacelles.
   B. The engine provides the airplane with propulsion, hydraulic power, pneumatic power and electrical power.
   C. Engine components are accessible for maintenance by opening fan cowl panels, core cowl panels and/or thrust reverser. Some engine components can be serviced through access doors without opening the cowling.
2. Component Details
   A. Power Plant (Fig. 1)
      (1) The engine is a two-spool, axial-flow turbofan engine with high compression ratio and high bypass ratio.



Split Compressor and Turbine Arrangement
Figure 1

(2) The engine incorporates two multi-stage turbine driven compressors. The compressors have concentric shafting. The low pressure (N1) compressor has five stages and is driven by a low pressure turbine that has four stages. The high pressure (N2) compressor has eleven stages and is driven by a high pressure turbine that has two stages. Refer to AMM 72-00-00, Engine, for description of engine and basic accessories.

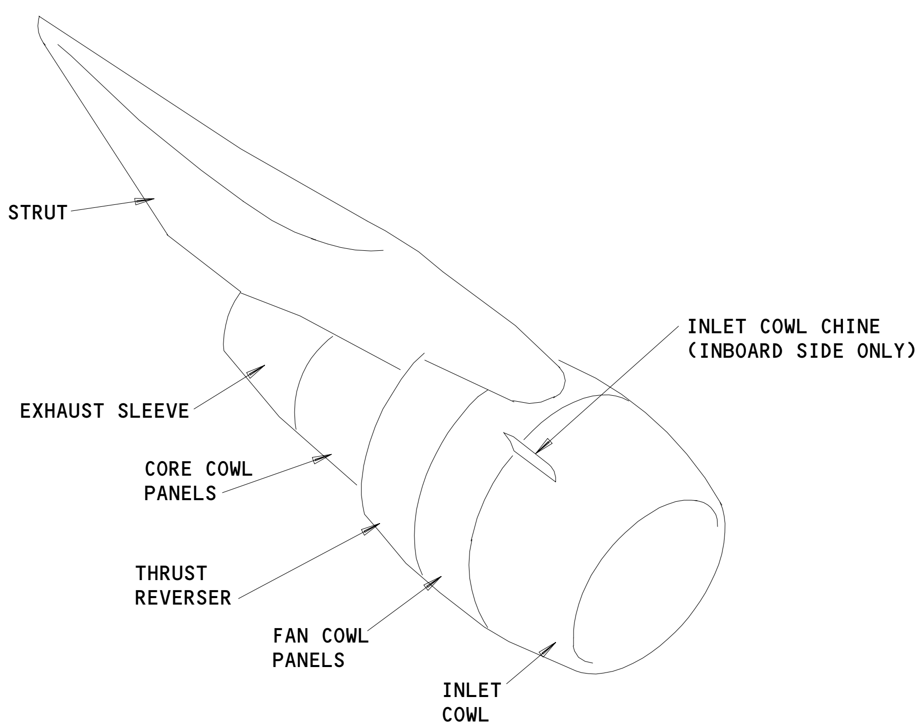
(3) The combustion section of the engine is a single annular-type combustion chamber. Refer to AMM 72-00-00, Engine, for description of engine and basic accessories.

(4) The exhaust section of the power plant is described in AMM 78-11-00 and AMM 78-31-00.

B. Cowling (Fig. 2)

(1) The engine cowling and exhaust system combine to form an aerodynamically smooth surface over the engine and provide a protective enclosure for engine mounted components.

(2) The cowling consists of the inlet cowl, right and left fan cowl panels, and right and left core cowl panels. The thrust reverser and the exhaust sleeve complete the nacelle. Refer to AMM 71-11-00, Engine Cowling, AMM 78-11-00, Turbine Exhaust and AMM 78-31-00, Thrust Reverser System, for description of individual components.



Cowling
Figure 2

C. Mounts

(1) Each engine is attached to the airplane wing struts by the forward and aft engine mounts.

(2) The mounts provide suspension of the engine and transmission of engine thrust loads. The mounts absorb vertical and side loads as well as allow axial and radial growth due to thermal expansion. Refer to AMM 71-21-00, Engine Mounts, for description of the engine mounts.

D. Drains

(1) The engine drain system collects and discharges drain fluids from the engine. The drain fluids are discharged through the lower left side of the thrust reverser and the core cowl panels. Refer to AMM 71-71-00, Engine Drains for description of engine drains.

POWER PLANT - MAINTENANCE PRACTICES (OPERATING PROCEDURE)

1. General
   A. This section contains the items that follow:
      - the safety precautions for an engine on the ground,
      - the limits of operation for the power plant,
      - the procedure to prepare for the engine start,
      - the procedure for the engine start,
      - the procedure to put the airplane back to the usual condition,
      - the procedure to motor the engine,
      - the procedure to operate the engine in cold weather.
   B. Many engine indications show on the Engine Indication and Crew Alerting System (EICAS) display when you operate the engine. You can look at more engine indications when you operate the lower EICAS display.

      NOTE: If the lower EICAS display does not show, push the ENGINE switch on the pilot's display select panel. Then the indications for the secondary engine parameter will show on the lower EICAS display. When you push the ENGINE switch again, the indication will not show on the lower EICAS display.

   C. The Start the Engine (Normal Operation) and Stop the Engine (Normal) is the regular procedure to operate the engine.
   D. The procedure to motor the engine is when you turn the engine with the starter but you do not supply the ignition. The Dry-Motor procedure supplies the fuel to the fuel pump as a lubricant, but not to the engine combustion chamber. The Wet-Motor procedure supplies the fuel to the fuel pump and lets the fuel go into the combustion chamber. Thus, you must only use the Wet-Motor procedure when it is necessary.
   E. The Power Plant Operation (Cold Weather) is the procedure for engine operation in the conditions of snow, ice and temperatures less than 32°F (0°C).

   TASK 71-00-00-802-062-N00
2. Engine Ground Safety Precautions
   A. Procedure

S 862-011-N00

<u>WARNING</u>: STAY AWAY FROM THE HAZARD AREAS IN THE FRONT AND THE REAR OF THE POWER PLANT. IF YOU USE THE ENGINE SAFETY BARRIER, YOU MUST STAY OUT OF THE ENGINE SAFETY BARRIER DURING THE GROUND OPERATIONS. THE ENGINE CAN CAUSE SUFFICIENT SUCTION AT THE INLET TO PULL A PERSON INTO THE INLET AND CAUSE INJURY. THUS, WHEN YOU GO NEAR A JET ENGINE, YOU MUST FOLLOW THE PRECAUTIONS TO STAY AWAY FROM THE INLET AIRFLOW. THE SUCTION NEAR THE INLET CAN ALSO PULL IN HATS, GLASSES, LOOSE CLOTHES AND WIPE-RAGS. YOU MUST ATTACH OR REMOVE LOOSE OBJECTS BEFORE YOU DO THE WORK AROUND THE ENGINE. IF YOU DO NOT FOLLOW THESE INSTRUCTIONS, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) You must be very careful during an operation of the airplane to prevent injury to persons and damage to property. The airplane is supplied with power by jet engines. You must stay away from the engine inlet and the exhaust nozzle. The hot exhaust gases go out of the exhaust nozzle at high speeds. Also, the speed of the air that goes out of the fan is sufficiently high to cause injury. When the thrust reverser is in the reverse thrust position, the fan air goes out in the forward direction and not the rearward direction.

S 162-012-N00

(2) Make sure to clean and examine the engine compartment, the air inlet, and the work area to make sure there are no unwanted materials before you operate the engine.

S 492-008-N00

(3) You must wear the protections for your eyes and ears when you do the work near the airplane while the engines are in operation.

S 492-009-N00

(4) Use the aerostands or platforms with the protection railings to prevent injury when you do the work on the engines.

S 492-010-N00

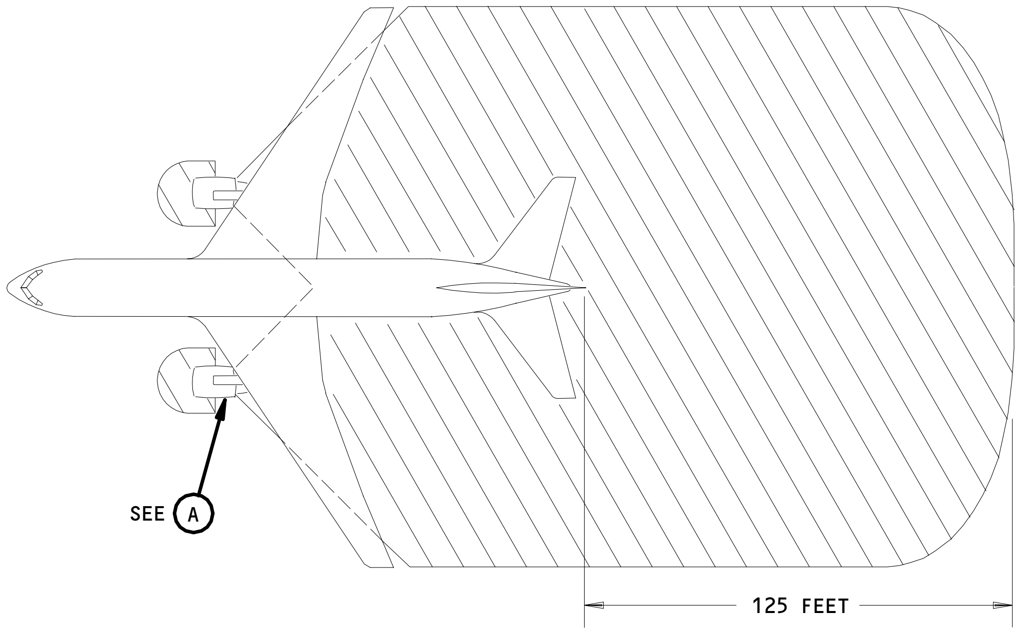
<u>CAUTION</u>: DO NOT INSTALL TIES OR STRAPS FROM THE FAN BLADES TO THE FAN EXIT GUIDE VANES TO HOLD THE ROTOR. IF YOU INSTALL THE TIES OR STRAPS, DAMAGE TO THE ENGINE CAN OCCUR.

(5) Use the general safety items when it is necessary for the task to prevent an accident.

B. Air Intake (Fig. 201 thru 204)

S 992-092-N00

(1) Refer to figures 201 to 204 for the air intake instructions.



EXHAUST HAZARD AREA

WARNING: KEEP ALL PERSONS OUT OF THE DANGEROUS AREA DURING ENGINE OPERATION. IF THE SURFACE WIND IS MORE THAN 25 KNOTS, INCREASE THE DANGEROUS AREA AT THE ENGINE INLET BY 20 PERCENT.

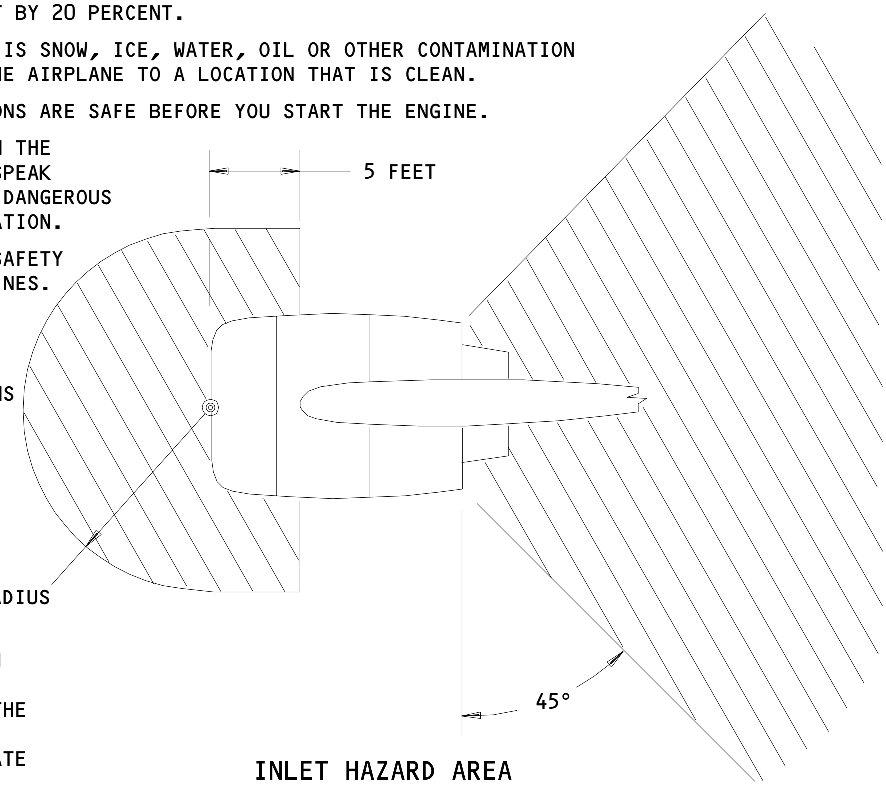
CLEAN THE RAMP IF THERE IS SNOW, ICE, WATER, OIL OR OTHER CONTAMINATION ON THE RAMP. OR MOVE THE AIRPLANE TO A LOCATION THAT IS CLEAN.

MAKE SURE THAT ALL PERSONS ARE SAFE BEFORE YOU START THE ENGINE.

MAKE SURE THE PERSONS IN THE FLIGHT COMPARTMENT CAN SPEAK TO ALL PERSONS NEAR THE DANGEROUS AREA DURING ENGINE OPERATION.

OBEY ALL OF THE GROUND SAFETY PRECAUTIONS FOR THE ENGINES.

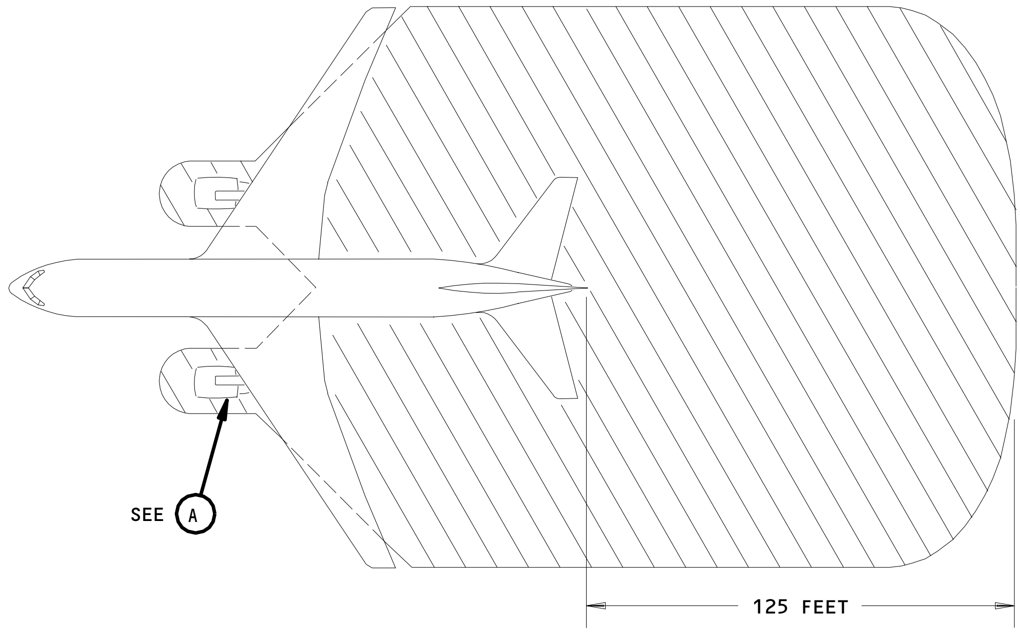
THE ENGINES CAN PULL PERSONS OR UNWANTED MATERIALS INTO THEM AND CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.



NOTE: THE DANGEROUS AREA IS SHOWN FOR THE LEFT ENGINE ONLY. THE DANGEROUS AREA AROUND THE RIGHT ENGINE HAS THE SAME DIMENSIONS. WHEN YOU OPERATE TWO ENGINES, THE DANGEROUS AREA IS THE SUM OF THE LEFT AND RIGHT DANGEROUS AREAS.

INLET HAZARD AREA
A

Minimum Idle-Power Hazard Area (Cowling Closed)
Figure 201 (Sheet 1)



EXHAUST HAZARD AREA

WARNING: KEEP ALL PERSONS OUT OF THE DANGEROUS AREA DURING ENGINE OPERATION. IF THE SURFACE WIND IS MORE THAN 25 KNOTS, INCREASE THE DANGEROUS AREA AT THE ENGINE INLET BY 20 PERCENT.

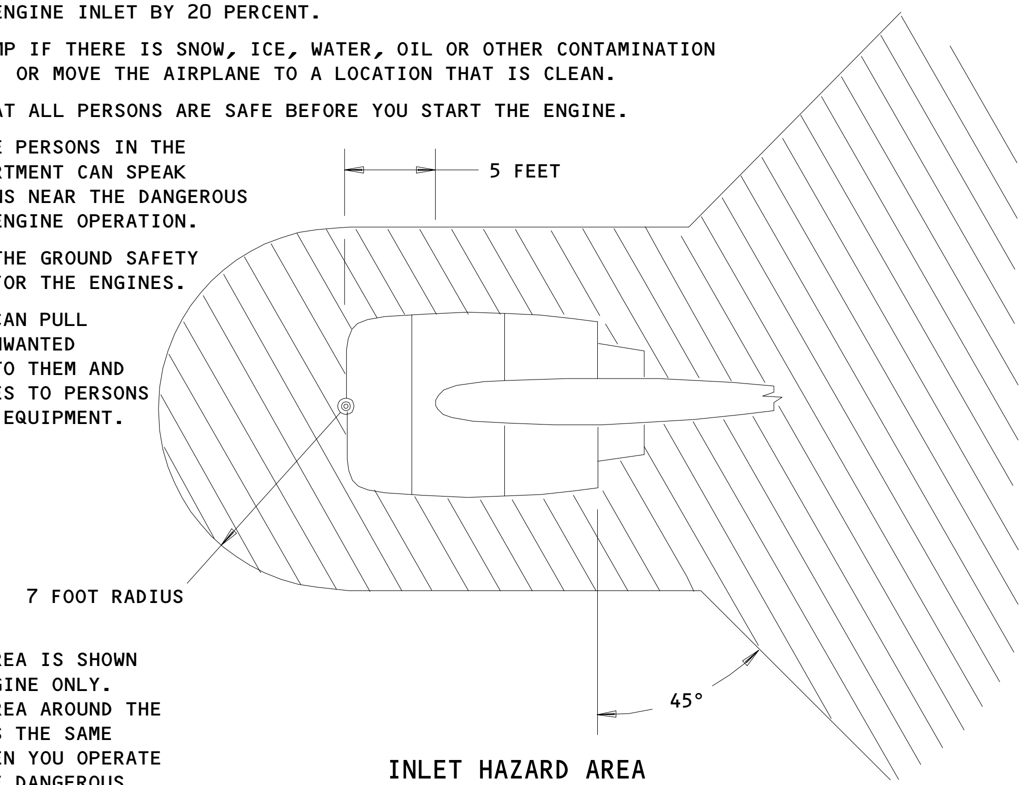
CLEAN THE RAMP IF THERE IS SNOW, ICE, WATER, OIL OR OTHER CONTAMINATION ON THE RAMP. OR MOVE THE AIRPLANE TO A LOCATION THAT IS CLEAN.

MAKE SURE THAT ALL PERSONS ARE SAFE BEFORE YOU START THE ENGINE.

MAKE SURE THE PERSONS IN THE FLIGHT COMPARTMENT CAN SPEAK TO ALL PERSONS NEAR THE DANGEROUS AREA DURING ENGINE OPERATION.

OBEY ALL OF THE GROUND SAFETY PRECAUTIONS FOR THE ENGINES.

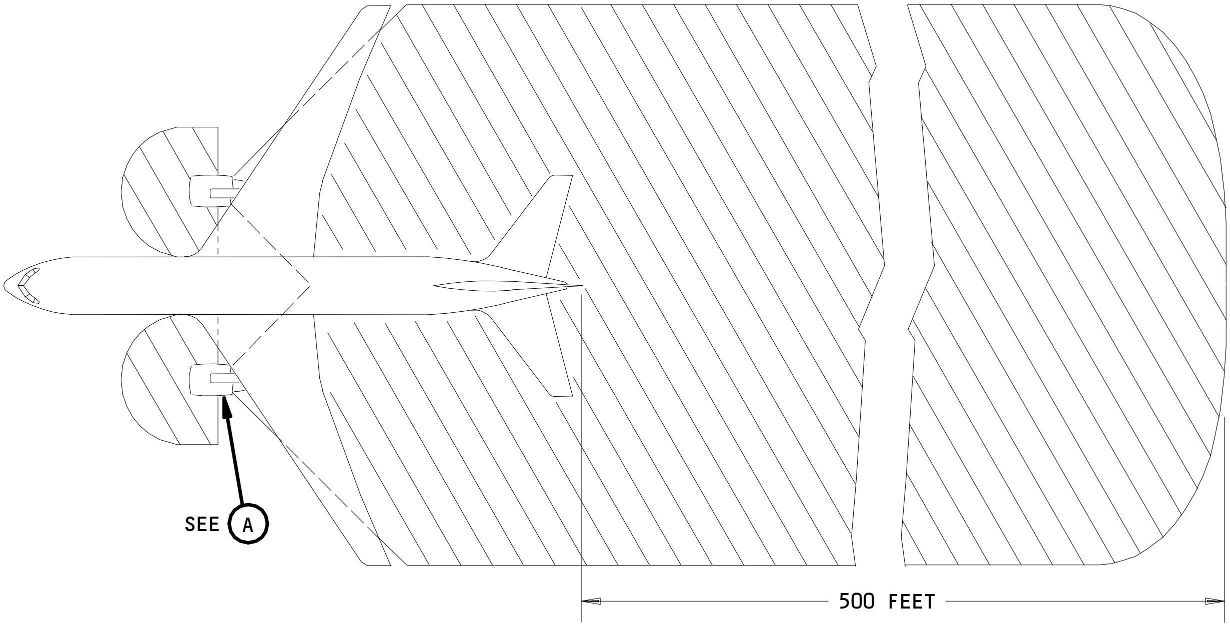
THE ENGINES CAN PULL PERSONS OR UNWANTED MATERIALS INTO THEM AND CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.



NOTE: THE DANGEROUS AREA IS SHOWN FOR THE LEFT ENGINE ONLY. THE DANGEROUS AREA AROUND THE RIGHT ENGINE HAS THE SAME DIMENSIONS. WHEN YOU OPERATE TWO ENGINES, THE DANGEROUS AREA IS THE SUM OF THE LEFT AND RIGHT DANGEROUS AREAS.

INLET HAZARD AREA
A

Minimum Idle-Power Hazard Area (Cowling Open)
Figure 201 (Sheet 2)



EXHAUST HAZARD AREA

WARNING: KEEP ALL PERSONS OUT OF THE DANGEROUS AREA DURING ENGINE OPERATION. IF THE SURFACE WIND IS MORE THAN 25 KNOTS, INCREASE THE DANGEROUS AREA AT THE ENGINE INLET BY 20 PERCENT.

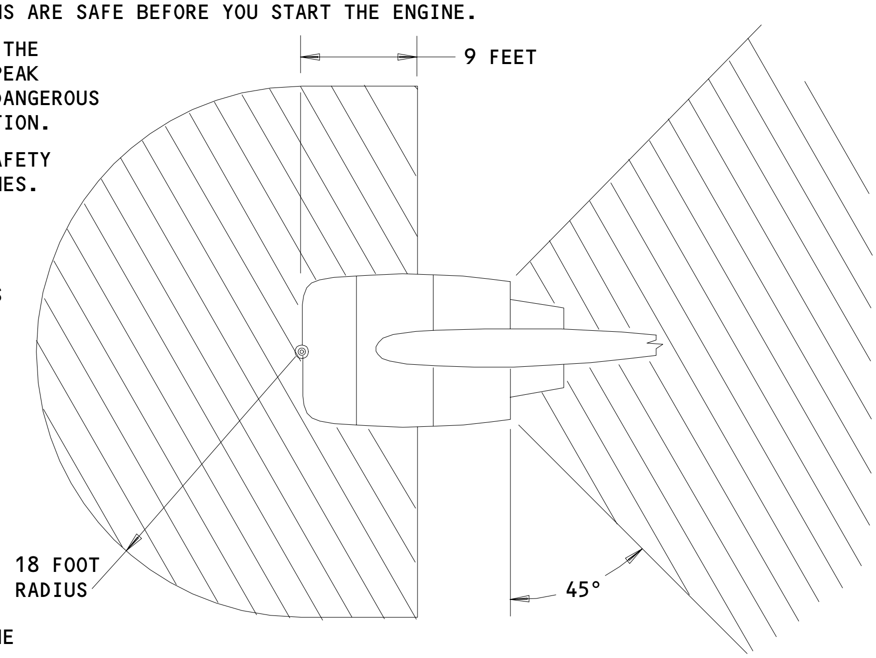
CLEAN THE RAMP IF THERE IS SNOW, ICE, WATER, OIL OR OTHER CONTAMINATION ON THE RAMP. OR MOVE THE AIRPLANE TO A LOCATION THAT IS CLEAN.

MAKE SURE THAT ALL PERSONS ARE SAFE BEFORE YOU START THE ENGINE.

MAKE SURE THE PERSONS IN THE FLIGHT COMPARTMENT CAN SPEAK TO ALL PERSONS NEAR THE DANGEROUS AREA DURING ENGINE OPERATION.

OBEY ALL OF THE GROUND SAFETY PRECAUTIONS FOR THE ENGINES.

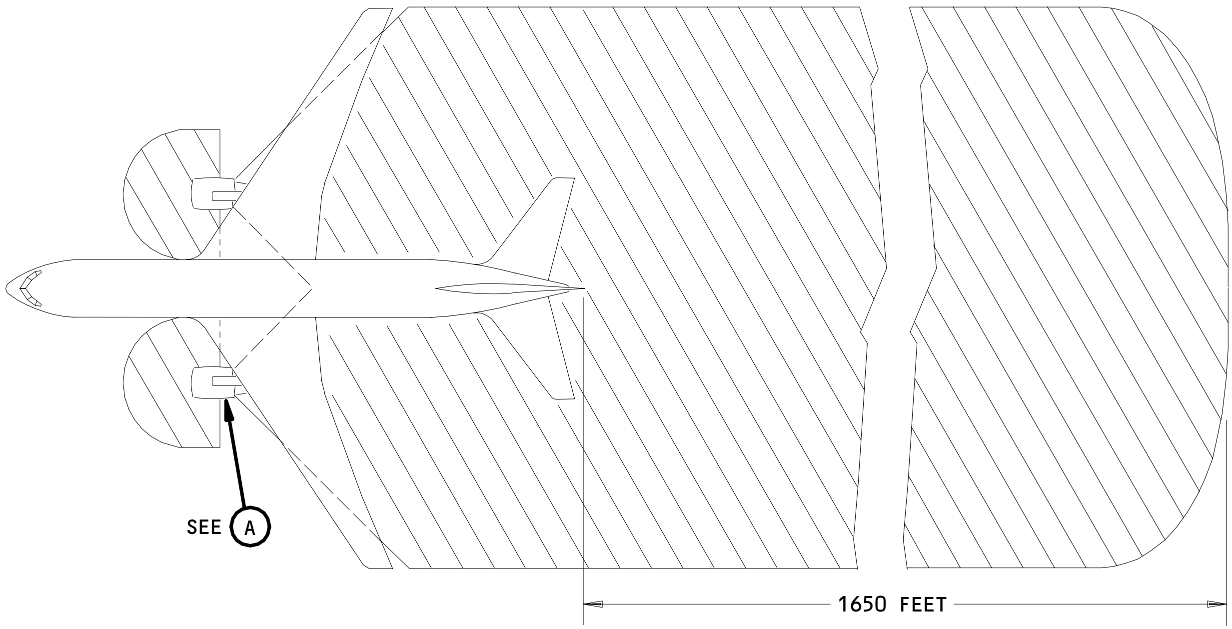
THE ENGINES CAN PULL PERSONS OR UNWANTED MATERIALS INTO THEM AND CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.



NOTE: THE DANGEROUS AREA IS SHOWN FOR THE LEFT ENGINE ONLY. THE DANGEROUS AREA AROUND THE RIGHT ENGINE HAS THE SAME DIMENSIONS. WHEN YOU OPERATE TWO ENGINES, THE DANGEROUS AREA IS THE SUM OF THE LEFT AND RIGHT DANGEROUS AREAS.

INLET HAZARD AREA
A

Breakaway Thrust-Power Hazard Area
Figure 202



EXHAUST HAZARD AREA

WARNING: KEEP ALL PERSONS OUT OF THE DANGEROUS AREA DURING ENGINE OPERATION. IF THE SURFACE WIND IS MORE THAN 25 KNOTS, INCREASE THE DANGEROUS AREA AT THE ENGINE INLET BY 20 PERCENT.

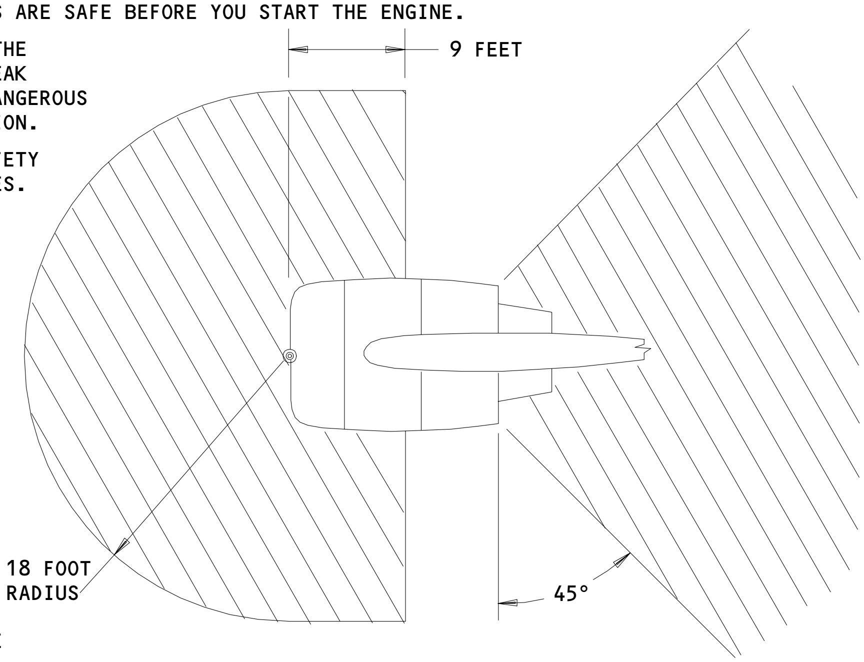
CLEAN THE RAMP IF THERE IS SNOW, ICE, WATER, OIL OR OTHER CONTAMINATION ON THE RAMP. OR MOVE THE AIRPLANE TO A LOCATION THAT IS CLEAN.

MAKE SURE THAT ALL PERSONS ARE SAFE BEFORE YOU START THE ENGINE.

MAKE SURE THE PERSONS IN THE FLIGHT COMPARTMENT CAN SPEAK TO ALL PERSONS NEAR THE DANGEROUS AREA DURING ENGINE OPERATION.

OBEY ALL OF THE GROUND SAFETY PRECAUTIONS FOR THE ENGINES.

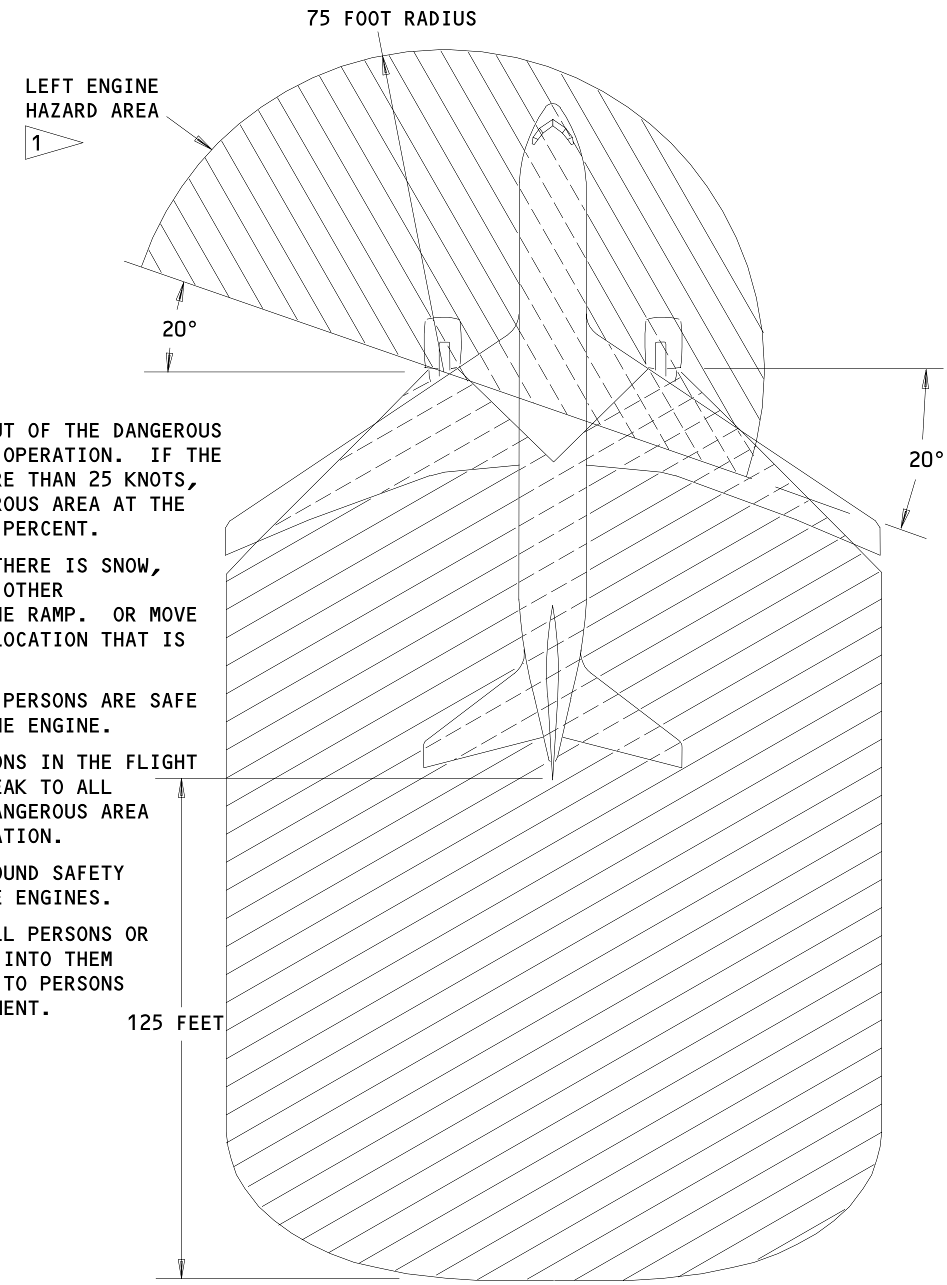
THE ENGINES CAN PULL PERSONS OR UNWANTED MATERIALS INTO THEM AND CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.



NOTE: THE DANGEROUS AREA IS SHOWN FOR THE LEFT ENGINE ONLY. THE DANGEROUS AREA AROUND THE RIGHT ENGINE HAS THE SAME DIMENSIONS. WHEN YOU OPERATE TWO ENGINES, THE DANGEROUS AREA IS THE SUM OF THE LEFT AND RIGHT DANGEROUS AREAS.

INLET HAZARD AREA
A

Takeoff Thrust-Power Hazard Area
Figure 203



WARNING: KEEP ALL PERSONS OUT OF THE DANGEROUS AREA DURING ENGINE OPERATION. IF THE SURFACE WIND IS MORE THAN 25 KNOTS, INCREASE THE DANGEROUS AREA AT THE ENGINE INLET BY 20 PERCENT.

CLEAN THE RAMP IF THERE IS SNOW, ICE, WATER, OIL OR OTHER CONTAMINATION ON THE RAMP. OR MOVE THE AIRPLANE TO A LOCATION THAT IS CLEAN.

MAKE SURE THAT ALL PERSONS ARE SAFE BEFORE YOU START THE ENGINE.

MAKE SURE THE PERSONS IN THE FLIGHT COMPARTMENT CAN SPEAK TO ALL PERSONS NEAR THE DANGEROUS AREA DURING ENGINE OPERATION.

OBEY ALL OF THE GROUND SAFETY PRECAUTIONS FOR THE ENGINES.

THE ENGINES CAN PULL PERSONS OR UNWANTED MATERIALS INTO THEM AND CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

EXHAUST HAZARD AREA

1 THE CONDITION FOR THE LEFT ENGINE IS SHOWN, THE RIGHT ENGINE IS EQUIVALENT

Reverse Minimum Idle-Power Hazard Area
Figure 204

C. Exhaust Properties

S 862-095-N00

(1) Velocity (Fig. 201 thru 204)

(a) At high engine speeds, the air (which flows out of the fan and the engine exhaust) can blow loose dirt, stones, sand and other material at a distance of more than one hundred feet. Thus, you must use caution when you park the aircraft for a high speed operation to prevent injury to persons or damage to property or other aircraft. You can use a blast fence if you will operate the engines at high power in an area where there is not sufficient space available. It is necessary to have a sufficient space to decrease the speed of the fan and exhaust blast.

S 862-096-N00

(2) Temperature (Fig. 201 thru 204)

(a) You can find high temperature more than one hundred feet from the exhaust nozzle in the correct wind conditions. By the engine, the exhaust temperature can cause sufficient deterioration of the bituminous pavement. Thus, concrete aprons are recommended for areas of a high speed operation. It is possible for a jet engine, when started, to set fire to the fuel in the turbine exhaust area. This will cause long flames to blow out of the exhaust nozzle. You must monitor this possible dangerous condition and keep all flammable materials away.

S 862-097-N00

(3) Toxicity

(a) The tests showed that the quantity of the carbon monoxide in the exhaust is small. But, other gases are also in the exhaust. These other gases smell bad and are dangerous to your body. If you are near these gases, they can cause injury to your eyes. But more important, they can cause you not to breathe correctly. Because of these two results, you must not get near the gases, specially in small spaces where the concentration is large.

D. Thrust Lever Movement

NOTE: A deterioration of the performance can occur if the gaspath seal clearance increases. The clearance will increase if the gaspath seal is worn from high temperature changes which occur during fast thrust changes. To decrease the area of the turbine seal which wears, slowly increase or slowly decrease the thrust with a smooth thrust lever movement if it is possible.

S 862-072-N00

(1) Snap accelerations and decelerations will not cause deterioration if the conditions that follow are used:
   (a) You must operate the engine at idle for a minimum of 5 minutes after the initial start and before the engine shutdown.
   (b) If the engine is operated at high power (more than 1.4 EPR) for more than 30 seconds, with the acceleration time included, and then put back to idle, you must operate the engine at idle for less than one minute or more than 10 minutes before a snap acceleration to high power is done again. You do not have to operate the engine at idle if the acceleration is done slowly (a minimum of 60 seconds).

E. Engine Cool Down

S 862-073-N00

WARNING: DO NOT TOUCH THE BUFFER AIR COOLER FOR THE NO. 3 BEARING OR THE RELATED TUBES AND TURBINE EXHAUST AREA FOR 3 HOURS AFTER THE ENGINE SHUTDOWN. THE BUFFER AIR COOLER CAN GET TO A TEMPERATURE OF 950°F (510°C) DURING THE ENGINE OPERATION. THIS CAN CAUSE INJURY TO PERSONS.

(1) After the engine operation, you must make sure that the turbine exhaust sleeve and plug and buffer air cooler are not hot before you do the work in these areas. You can do the work on most other parts without the risk of injury.

F. Compressor Bleed Valves

S 862-074-N00

WARNING: WHEN A BLEED VALVE OPENS, HIGH PRESSURE AIR AT HIGH VELOCITY IS RELEASED OUT OF THE ENGINE. THE FORCE OF THIS HIGH PRESSURE AIR, SPECIALLY WHEN THE BLEED VALVE FIRST OPENS DURING DECELERATION FROM HIGH RPM, IS SUFFICIENT TO CAUSE INJURY TO PERSONS.

(1) When you operate the engine, make sure persons stay away from the surge bleed ducts during the open operation of the bleed valve. If the side cowl panels are not installed, make sure the persons stay away from the compressor bleed valves.

G. Engine Noise (Fig. 205)

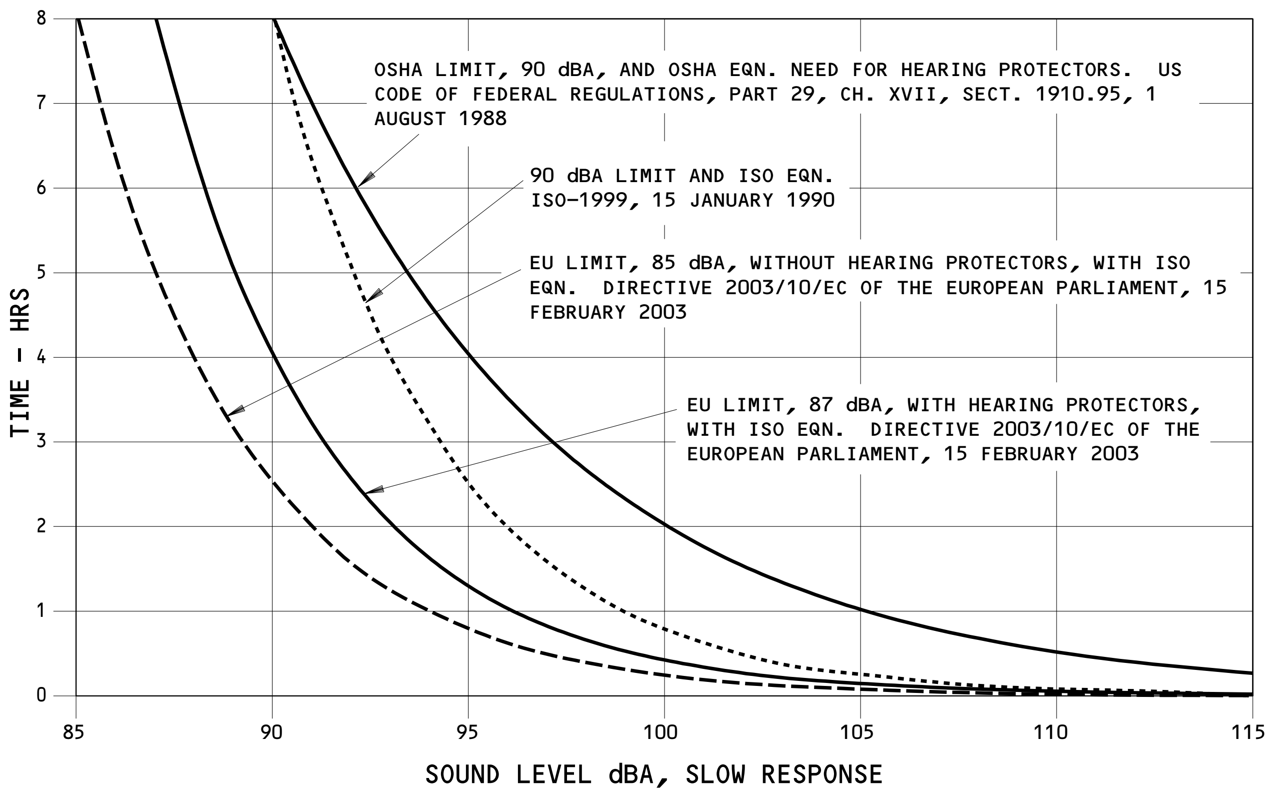
S 862-192-N00

WARNING: MAKE SURE ALL PERSONS USE THE APPROVED SAFETY EQUIPMENT FOR THEIR EARS WHEN THEY ARE NEAR NOISE THAT IS MORE THAN 84 DB. THIS WILL HELP PREVENT INJURY TO PERSONS.

(1) The jet engines make sufficient noise to cause damage to your ears.
   (a) See these noise graphs for the limits: Noise Time Limits (Fig 205), and One Engine Operation Noise Contours (Fig. 205A).
   (b) Noise can have an unwanted effect on your ears. It may cause your sense of balance to decrease.
   (c) If you listen to high quantities of noise for a short time, you can cause temporary dmamge to your ears. Your ears can become less sensitive to hear sound.
   (d) If you listen to high quantities of noise for a long time, you can cause permanent damage to your ears. You can not hear sound.
   (e) If you listen to very high quantities of noise for a short time, you can cause permanent damage to your ears. You can not hear sound.
   (f) When you are near an engine in operation, always use ear protection to decrease the quantity of sound to your ears.
      1) A cup-type, earmuff, hearing protection is recommended.

S 862-193-N00

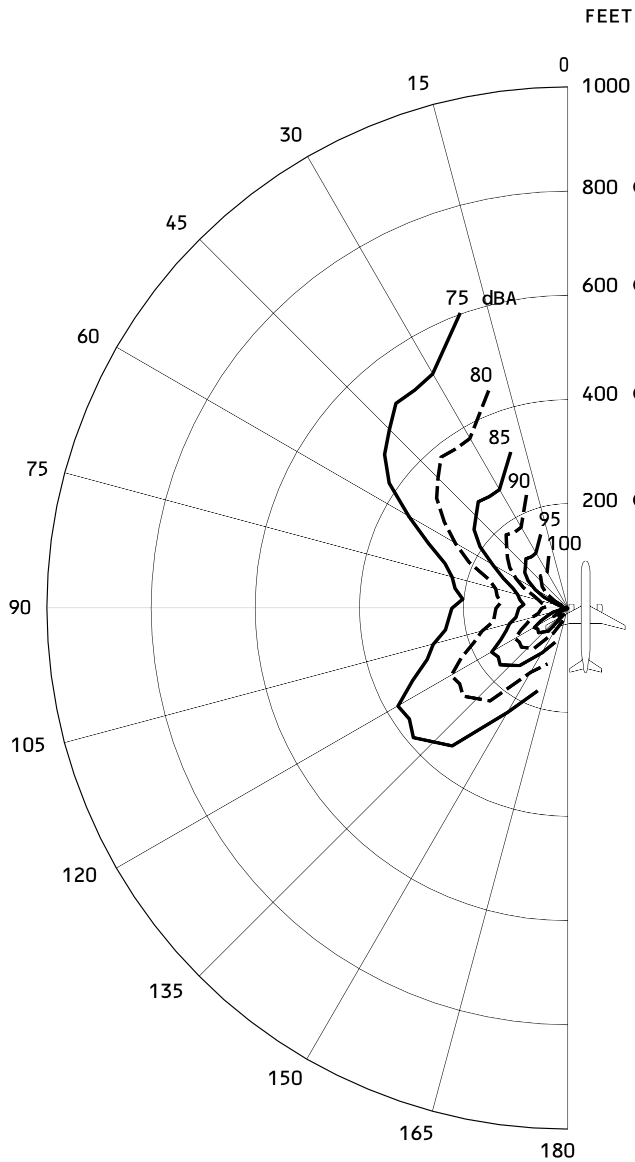
(2) There are two graphs, the noise time limits and one engine operation noise contours.
   (a) The noise contour graphs are guidelines for the amount of noise that is made by the engine at three defined power settings for the standard conditions shown in the graph.
   (b) When the data from the noise contour graphs are used with the noise time limit chart, this shows the need for hearing protection for certain conditions.
   (c) The noise time limits are from the standards of the Occupational Safety and Health Administration (OSHA), the international Organization for Standardization (ISO) and the European Union (EU).
      1) Refer to the figure, Noise Time Limits (Fig. 205).



Noise Time Limit
Figure 205

SINGLE ENGINE OPERATING AT:
(ADD 3 dBA FOR TWO ENGINES OPERATING OR ADD 6 dBA FOR FOUR ENGINES OPERATING)

BREAKAWAY THRUST
(4,944 LBS; N1C = 1,189 RPM; 412 KLB A/P)



- STATIC OPERATION, APU OFF, ECS PACKS OFF
- NOISE LEVELS OVER PAVED TERRAIN
  ACOUSTIC STANDARD DAY:
  TEMP. = 77 DEGREES F (25 DEGREES C);
  REL. HUMIDITY = 70%; 14.7 PSIA (760.2 mm Hg);
  ZERO WIND.
- ENGINE CENTERLINE HEIGHT = 9 FEET (2.7 METERS)
- RECEIVER HEIGHT = 5.25 FEET (1.60 METERS)
  (EAR HEIGHT)

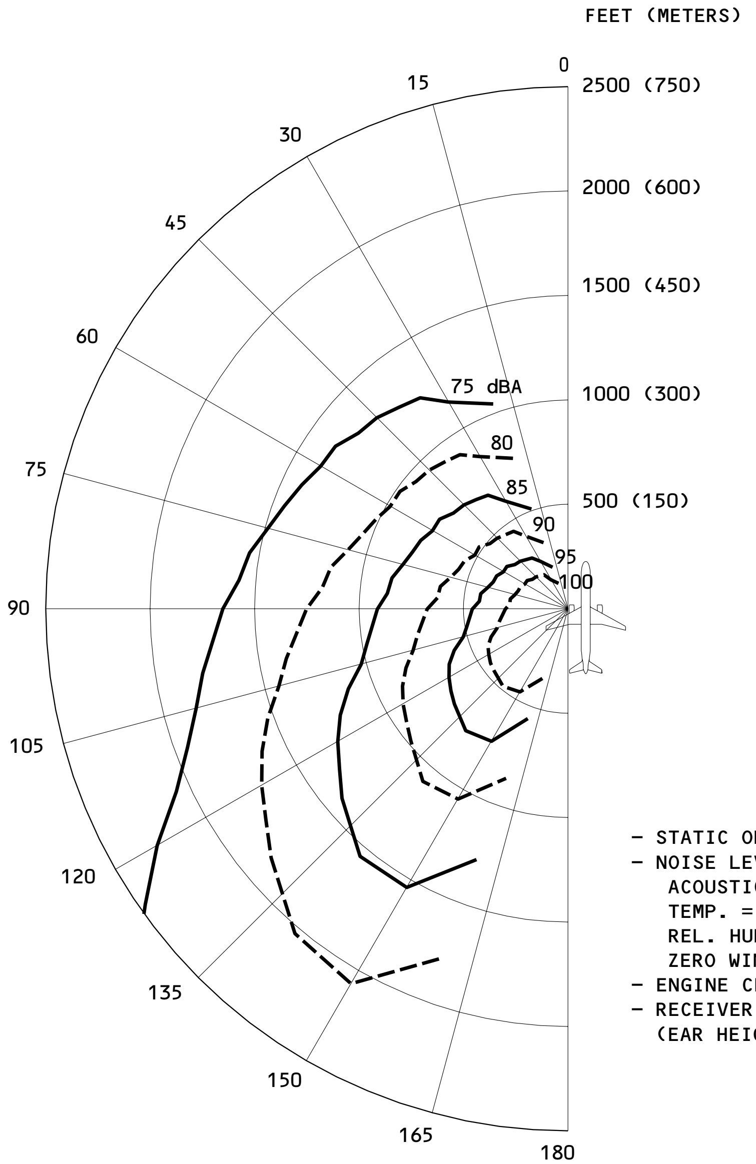
ACCURACY OF THE CONTOURS DECREASES AS THE DISTANCE FROM THE ENGINE INCREASES AND IS ABOUT ±5 dBA AT 2000 FEET (600 METERS) FROM THE ENGINE.
NON-IDEALIZED METEOROLOGICAL CONDITIONS WOULD INCREASE THE TOLERANCE. BLOCKAGE OR REFLECTION EFFECTS OF THE AIRPLANE BODY AND WING OR BUILDING WALLS ARE NOT INCLUDED.

N1C1189_DBA

One Engine Operation Noise Contours
Figure 205A (Sheet 1)

SINGLE ENGINE OPERATING AT: (ADD 3 dBA FOR TWO ENGINES OPERATING OR ADD 6 dBA FOR FOUR ENGINES OPERATING)

TAKEOFF THRUST (59,615 LBS; N1C = 3,659 RPM)



- STATIC OPERATION, APU OFF, ECS PACKS OFF
- NOISE LEVELS OVER PAVED TERRAIN
  ACOUSTIC STANDARD DAY:
  TEMP. = 77 DEGREES F (25 DEGREES C);
  REL. HUMIDITY = 70%; 14.7 PSIA (760.2 mm Hg);
  ZERO WIND.
- ENGINE CENTERLINE HEIGHT = 9 FEET (2.7 METERS)
- RECEIVER HEIGHT = 5.25 FEET (1.60 METERS)
  (EAR HEIGHT)

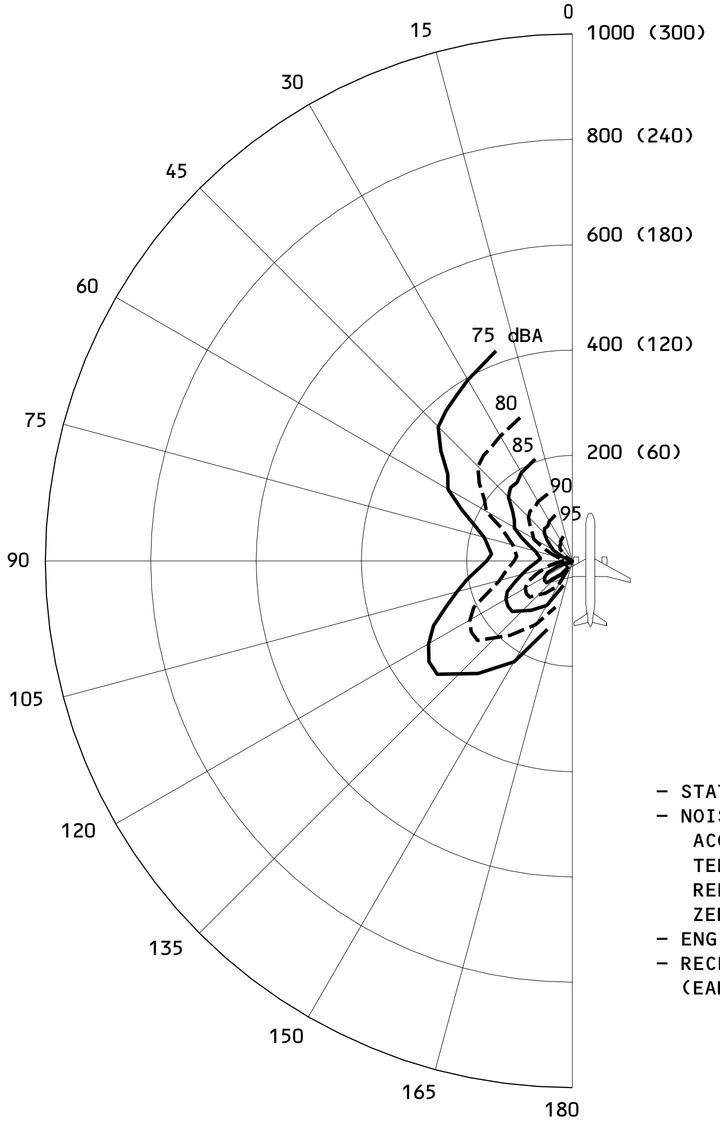
ACCURACY OF THE CONTOURS DECREASES AS THE DISTANCE FROM THE ENGINE INCREASES AND IS ABOUT ±5 dBA AT 2000 FEET (600 METERS) FROM THE ENGINE.
NON-IDEALIZED METEOROLOGICAL CONDITIONS WOULD INCREASE THE TOLERANCE. BLOCKAGE OR REFLECTION EFFECTS OF THE AIRPLANE BODY AND WING OR BUILDING WALLS ARE NOT INCLUDED.

N1C3659_DBA

One Engine Operation Noise Contours
Figure 205A (Sheet 2)

SINGLE ENGINE OPERATING AT: (ADD 3 dBA FOR TWO ENGINES OPERATING OR ADD 6 dBA FOR FOUR ENGINES OPERATING)

GROUND IDLE THRUST (2,137 LBS; N1C = 903 RPM)



- STATIC OPERATION, APU OFF, ECS PACKS OFF
- NOISE LEVELS OVER PAVED TERRAIN
  ACOUSTIC STANDARD DAY:
  TEMP. = 77 DEGREES F (25 DEGREES C);
  REL. HUMIDITY = 70%; 14.7 PSIA (760.2 mm Hg);
  ZERO WIND.
- ENGINE CENTERLINE HEIGHT = 9 FEET (2.7 METERS)
- RECEIVER HEIGHT = 5.25 FEET (1.60 METERS) (EAR HEIGHT)

ACCURACY OF THE CONTOURS DECREASES AS THE DISTANCE FROM THE ENGINE INCREASES AND IS ABOUT ±5 dBA AT 2000 FEET (600 METERS) FROM THE ENGINE.
NON-IDEALIZED METEOROLOGICAL CONDITIONS WOULD INCREASE THE TOLERANCE. BLOCKAGE OR REFLECTION EFFECTS OF THE AIRPLANE BODY AND WING OR BUILDING WALLS ARE NOT INCLUDED.

N1C903_DBA

One Engine Operation Noise Contours
Figure 205A (Sheet 3)

(d) For one engine operation, the noise contours are given for ground idle thrust, breakaway thrust, and takeoff thrust.
   1) Refer to figure, One Engine Operation Noise Contour (Fig. 205A).
   2) This figure also gives the values for the noise from the operation of more than one engine.

(e) To find the quantity of noise energy, use a sound level meter.

(f) For the distance and the circumferential position from the engine, find the maximum noise from the applicable noise contour graph. Compare this value with the noise limits graph.

(g) Speak to a noise safety person to help you make the decision about the risk of noise damage to your ears.

NOTE: These noise contour graphs should not be used as a reliable basis for the prediction of noise in the surrounding community. These graphs are given to show the noise environment and to give guidance for hearing safety practices. Decisions about the risks of noise exposure should be made by a qualified, noise safety expert with the aid of a sound exposure dosimeter.

H. Engine Starter Disintegration With Cowling Open

S 862-191-N00

WARNING: PERSONNEL MUST STAY OUTSIDE OF THE ENGINE HAZARD AREA DURING ENGINE OPERATION WHEN THE ENGINE COWLING IS OPEN. THE ENGINE STARTER COULD DISINTEGRATE DURING OPERATION. PIECES FROM THE STARTER CAN CAUSE INJURY.

(1) You must take precautions when you work near the engine while it operates with the engine cowling open.

I. Engine Ignition

S 862-018-N00

WARNING: OBEY THESE INSTRUCTIONS WHEN YOU DO WORK ON THE ENGINE. THE ENGINE IGNITION SYSTEM IS USUALLY HIGH IN ENERGY. THIS IS A DANGEROUS SOURCE OF THE ELECTRICAL SHOCK UNLESS YOU USE PRECAUTIONS. IF YOU DO NOT OBEY THESE INSTRUCTIONS, YOU CAN CAUSE INJURY TO PERSONS, OR POSSIBLY KILL.

(1) Do not disconnect the ignition system components unless you first remove the input leads from the ignition exciter.

J. Deicing Fluid

S 862-075-N00

CAUTION: DO NOT APPLY THE DEICING FLUID INTO AN ENGINE IN OPERATION. THE DEICING FLUID WILL CAUSE CONTAMINATION OF THE AIRFOILS AND DETERIORATION OF THE ENGINE PERFORMANCE CAN OCCUR.

(1) Do not apply deicing fluid into an engine in operation.

K. X-rays

S 862-076-N00

CAUTION: DO NOT LET THE SCU OR EEC GET NEAR X-RAYS. A LARGE QUANTITY OF X-RAYS CAN CAUSE DAMAGE TO THE SCU OR EEC.

(1) Remove the SCU and the EEC before the engine gets near the X-rays.

L. Fuel and Lubricant Oils

S 862-098-N00

(1) All fuel, oils and hydraulic fluids can dry the skin. You must use all precautions to not get these fluids on your skin.

TASK 71-00-00-802-063-N00

3. Power Plant Operation Limits

A. Starter Operation Limits

S 862-099-N00

(1) Each starter uses the low pressure air to start and motor the engine. This air is supplied through the pneumatic manifold from one of three sources. Three sources are as follows:
- an engine in operation,
- the ground supply units for the low pressure air,
- the auxiliary power unit (APU) which is attached on the airplane.

S 862-021-N00

(2) Starter cycle limits are in the steps that follow:

CAUTION: DO NOT OPERATE THE STARTER AT HIGHER SPEED THAN THE STARTER RE-ENGAGEMENT SPEED OF 15% N2. DAMAGE TO THE STARTER OR GEARBOX CAN OCCUR.

(a) The usual duty cycle is two starts, one after the other, which were tried followed by some time to continuously motor the engine to decrease the temperature. After the second time to decrease the temperature, you must disengage the starter and let the N2 decrease to zero before you engage the starter again.

NOTE: If you motor the engine before you do the starter duty cycle, it is not necessary to disengage the starter before you try to start the engine.

CAUTION: IF THE STARTER IS DISENGAGED, STOP THE AIR SUPPLY TO THE STARTER IMMEDIATELY. IF YOU DO NOT STOP THE AIR SUPPLY, YOU CAN CAUSE DAMAGE TO THE STARTER.

(b) If the starter is disengaged, put the applicable ENG START switch in the OFF position.
(c) If you stop the starter operation, you may engage the starter again below 15% N2.
(d) If an engine start is stopped (aborted) above 48% N2, you must let N2 decrease to below 5% N2 before you try the next start.

NOTE: This will remove power from the EEC and reset the EEC overspeed protection logic.

(e) Engage the starter again with the applicable ENG START switch in the GND position.
(f) After an extended duty cycle for the starter, with the fuel and ignition off, the necessary time to let the engine temperature decrease is as follows:
    1) Operate the starter for 5 minutes maximum, then disengage the starter and let the N2 speed decrease to zero before you engage the starter again.

2) Operate the starter for 5 minutes maximum, then wait for 20 minutes to let the starter decrease in temperature.
3) Operate the starter for 5 minutes maximum, then wait for 30 minutes to let the starter decrease in temperature.

B. Engine Operation Limits (Figs. 206 and 207)

S 862-022-N00

(1) The engine operation conditions and limits are shown in Fig. 206. You must do an applicable corrective procedure if the engine indications are more than the recommended limits.

S 862-129-N00

(2) The related wind data which is recommended for the engine maintenance operation is shown in Fig. 207. More data about the effect of the tailwinds on the engine ground operations are in the steps that follow.

S 862-024-N00

(3) Tailwinds or components of the wind, from the tail, have a bad effect on the ground operation of the engines.
   (a) During a start, and at idle or a low level of power, you can get a high EGT.
   (b) At a high level of power, a compressor surge can occur in high crosswinds, or tailwind conditions.
   (c) You must quickly (1-2 seconds) move the thrust lever rearward, from a high power to "IDLE", to prevent a compressor surge.
   (d) When a compressor stall occurs, you must quickly move the thrust lever rearward to let the engine operate (normal operation) after the stall.
   (e) When a compressor stall can possibly occur, you must move the thrust lever rearward quickly to prevent the engine stall.
   (f) Operate all engines which do not require bleeds-closed information at the power levels less than the closure of the 2.5 bleed valve. This decreases the possibility of the engine surge (stall) during the ground runs.

(g) Put the airplane at different location as it is necessary to get the correct related wind direction.

S 862-025-N00

(4) Do not operate the engine in forward thrust with these conditions:
(a) If there are more than three cascade vane segments gone in one thrust reverser half.
(b) If there are two adjacent cascade vane segments gone in one thrust reverser half.

C. N1/N2 rotor speed limits.

S 862-174-N00

(1) The speed limits for the N1/N2 rotor are shown in Fig. 206.

S 862-175-N00

(2) If the N1/N2 rotor speed is more than the limits (overspeed occurs), do the steps that follow:
(a) Use the Stop the Engine (Normal) procedure to do the engine shutdown as quickly as it is possible.
(b) Do an overspeed inspection (AMM 72-00-00/601) before you start the engine again.

S 972-031-N00

(3) When an overspeed occurs, the EICAS keeps the records of the event on the EICAS EXCD page. The EICAS will keep records of the maximum speed and the length of time N1 or N2 was more than the N1/N2 rotor speed limit. You can use this data for the overspeed inspection procedure to find the necessary inspections.

CONDITION OF THE OPERATION 1	TIME LIMIT (MINUTES)	EXHAUST GAS TEMP (EGT) LIMIT (°C)	MINIMUM OIL PRESSURE (PSID) 4	OIL TEMP LIMIT (°C) 5
START, OPERATION BELOW IDLE	2.0 2	535 3	N/A	N/A
MINIMUM IDLE	CONTINUOUS	450 6	70	163
TAKEOFF POWER	5 8	7 9	70	163
ACCEL/DECEL	-	650 7 10	70	163
MAX CONTINUOUS	CONTINUOUS	625	70	163
MAX REVERSE	-	650 10	70	163

1 ROTOR SPEED LIMITS:

	PW4056 PW4060/60A/60C/62
N1	111.4%
N2	105.5%

2 AN ENGINE IS NOT PERMITTED TO OPERATE MORE THAN 120 SECONDS TO INCREASE THE SPEED FROM FUEL ON (FUEL CONTROL SWITCH IS SET TO THE RUN POSITION) TO MINIMUM IDLE.

3 IF THE N2 ACCELERATION BECOMES SLOW BETWEEN 30 AND 40% N2 AND THE EGT INCREASES QUICKLY THRU 425°C, STOP THE START BEFORE THE EGT IS 535°C.

4 THE OIL PRESSURE DURING A SATISFACTORY ENGINE OPERATION IS 70 TO 325 PSID. IF THE OIL PRESSURE IS LESS THAN 70 PSID, ENGINE DAMAGE CAN OCCUR. THE PILOT'S WARNING LIGHT FOR THE LOW OIL PRESSURE GOES OFF BEFORE 83 PSID WHEN THE OIL PRESSURE INCREASES AND GOES ON BEFORE 67 PSID WHEN THE OIL PRESSURE DECREASES. WHEN THE DIFFERENTIAL PRESSURE OF AN OIL FILTER IS 35 PSID, AN EICAS MESSAGE "L/R OIL FILTER" WILL SHOW. THE FILTER BYPASS BEGINS AT 65 PSID.

IF HIGH DIFFERENTIAL PRESSURE ACROSS THE OIL FILTER OCCURS WITH COLD OIL, KEEP THE ENGINE AT THE IDLE SPEED UNTIL THE OIL TEMPERATURE INCREASES TO 35°C. IF THE INDICATION STAYS ON WITH THE OIL TEMPERATURE OF 35°C, REPLACE THE MAIN OIL FILTER (AMM 79-21-05/401).

DURING A COLD WEATHER START, YOU MUST OPERATE THE ENGINE AT THE IDLE SPEED UNTIL THE OIL TEMPERATURE INCREASES TO 50°C MINIMUM. THIS WILL MAKE SURE THAT THERE IS SUFFICIENT HEAT TO MELT THE ICE IN THE FUEL.

5 THE OIL TEMPERATURE LIMIT IS 163°C FOR THE CONTINUOUS OPERATION. DURING THE TRANSIENT OPERATION, THE OIL TEMPERATURE CAN BE MORE THAN 163°C FOR 20 MINUTES OR LESS, BUT THE OIL TEMPERATURE MUST NOT GO MORE THAN 177°C.

IF THE OIL TEMPERATURE IS MORE THAN 163°C FOR MORE THAN 20 MINUTES, OR MORE THAN 177°C, DO THE OIL OVERTEMPERATURE INSPECTION (AMM 72-00-00/601).

6 THE MIS-SCHEDULED STATOR VANES CAN CAUSE A MINIMUM IDLE EGT OF MORE THAN 450°C.

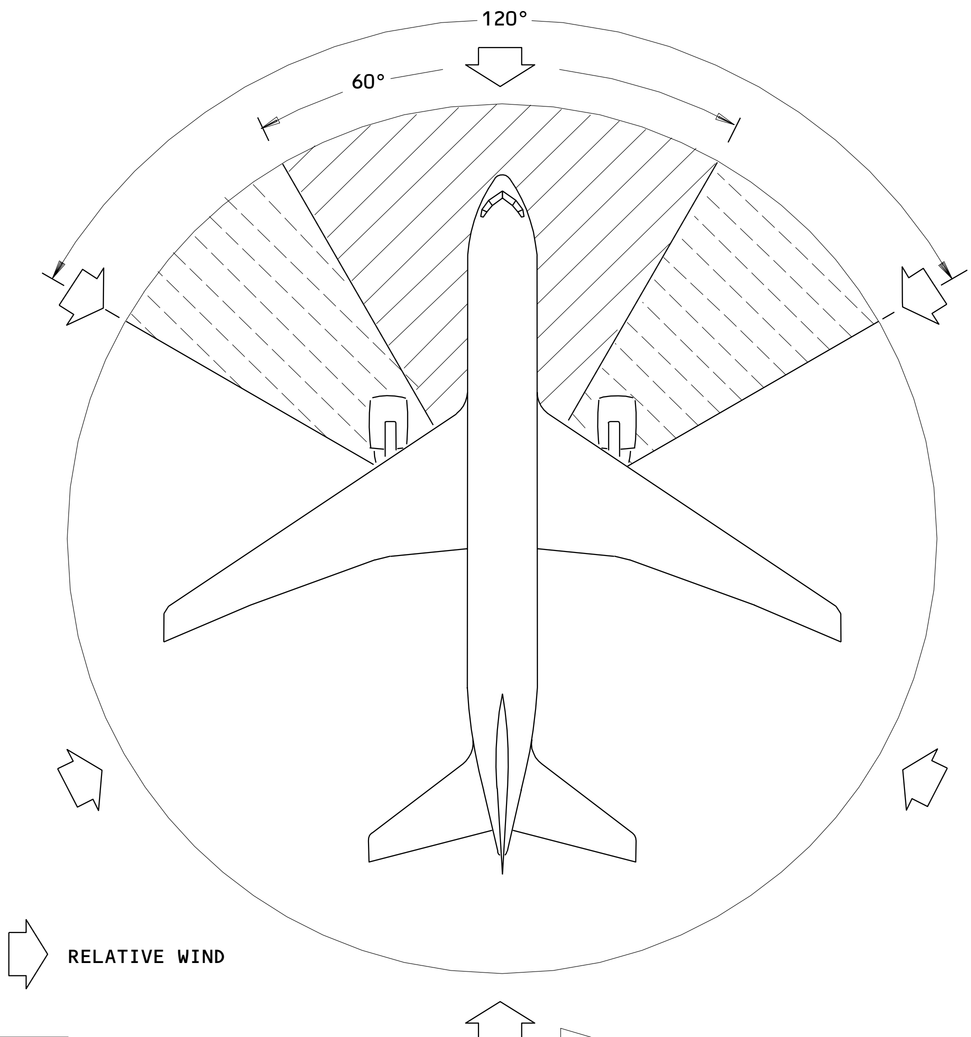
7 THE EICAS WILL KEEP A RECORD OF AN OVERTEMPERATURE EVENT WHEN THE EGT IS MORE THAN 625°C.

8 THE NORMAL 5 MINUTE TAKEOFF TIME LIMIT MAY BE EXTENDED TO 10 MINUTES FOR AN ENGINE OUT CONTINGENCY

9 SEE EXHAUST GAS TEMPERATURE (EGT) GUIDELINE, FIGURE 208

10 LIMIT INCLUDES EGT SHUNT OF -4°C FOR ENGINES POST-PW-SB 73-166 AND ALL SUBSEQUENT ENGINES.

Recommended Engine Starting and Operating Limitations
Figure 206



RECOMMENDED (25 KNOTS MAXIMUM WIND VELOCITY)

FOR POWER LEVELS UP TO 1.25 EPR.
FOR POWER LEVELS ABOVE 1.25 EPR, A MINIMUN WIND SPEED OF 10 KNOTS IS RECOMMENDED. (TESTING BELOW 10 KNOTS IS PERMITTED, OPERATION SHOULD BE WITH EXTRA HIGH ALERT FOR DESTABILIZING INDICATIONS AS DESCRIBED IN NOTE 1. A LOCAL WIND STATION IS RECOMMENDED IF AVAILABLE). [1]

PERMITTED (15 KNOTS MAXIMUM WIND VELOCITY)

FOR POWER LEVELS UP TO 1.25 EPR. [1]

LIMITED UP TO THE FLIGHT IDLE (5 KNOTS MAXIMUM WIND VELOCITY)

[1] THE WIND VELOCITY IS FOR STABLE WIND CONDITIONS. DECREASE THE MAXIMUM WIND LIMIT 5 KNOTS FOR GUSTY WIND CONDITIONS, OR UNTIL THE SVA INDICATION ON THE EICAS EPCAS PAGE BECOMES STABLE.

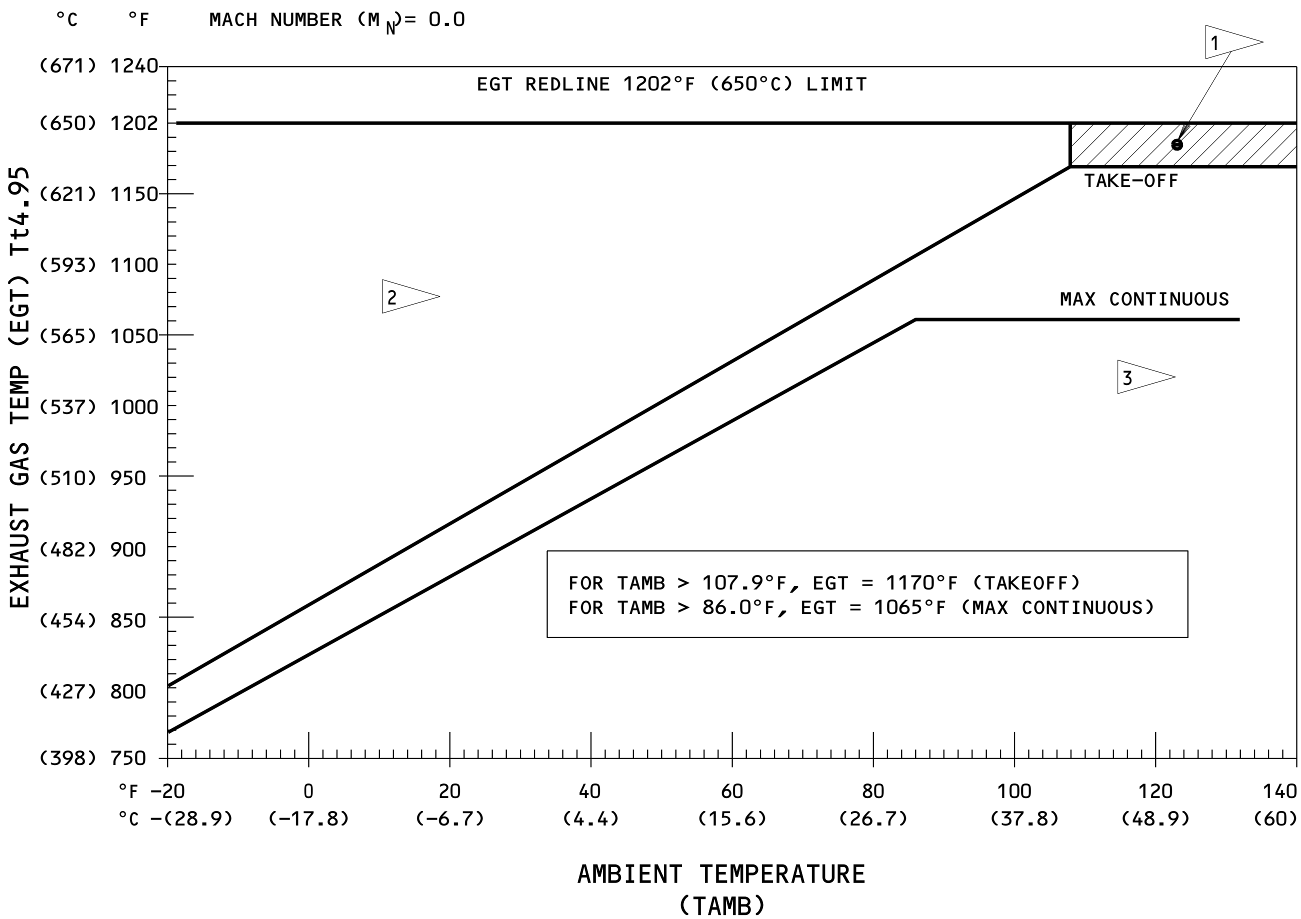
STOP THE TRIM RUN OF THE ENGINE IF THE SVA INDICATION ON THE EICAS EPCS PAGE IS NOT STABLE. ALSO STOP THE TRIM RUN IF THE INLET SOUND CHANGES TO A BLOWTORCH-TYPE SOUND. DECREASE THE POWER TO IDLE AND EXAMINE THE RELATIVE WIND DIRECTION AND SPEED. STOP THE ENGINE AND CHANGE THE POSITION OF THE AIRPLANE TO POINT IN THE DIRECTION OF THE WIND, IF IT IS NECESSARY, BEFORE YOU COMPLETE THE THE ENGINE TRIM RUN.

YOU CAN OPERATE THE APU DURING THE ENGINE OPERATION ON THE GROUND.

L-B8184 (0900)

Preferred Relative Wind Direction During an Engine Operation
Figure 207

STATION 4.95 EXHAUST GAS TEMPERATURE (EGT)



1. EGT IN THIS AREA AT ZERO M_N WOULD RESULT IN AN OVER TEMPERATURE AT INCREASED M_N.
2. EGT IN THIS AREA WOULD RESULT IN AN OVER TEMPERATURE WITH INCREASED AMBIENT TEMPERATURE.
3. MAXIMUM REVERSE EGT GUIDELINE IS SAME AS THE TAKEOFF EGT GUIDELINE.

L-A5173 (0493)

(PW4056, PW4060, PW4060A, PW4060C, PW4062)
Station 4.95 Exhaust Gas Temperature (EGT) Guidelines
Figure 208

S 972-030-N00

(4) Keep all overspeed records with the engine's permanent records.

(a) Parts that contain asbestos.

NOTE: At one time, some engine parts contained asbestos fibers, and it is possible that some of these parts continue in service. Refer to that commercial engine service bulletins for a listing of parts that once contained asbestos. In some parts, the material that contains asbestos may be within an adhesive. It is important to use correct precautions during work with these parts. Operators must obey all local regulations and employer work policies when parts that contain asbestos are handled or discarded.

NOTE: The asbestos used in Pratt & Whitney engine parts was usually encapsulated and will not release dust unless the parts are ground, sanded, drilled, scraped, cut, or broken. While it is our experience that these operations do not usually generate asbestos at levels in excess of permissible exposure limits, operators must use all applicable precautions when handling such parts.

D. Exhaust Gas Temperature (EGT), Station 4.95 Harness Average Limits.

S 862-181-N00

CAUTION: IF EGT STABILIZES ABOVE THE FIG. 206 VALUES, THEN ENGINE WILL BE EGT LIMITED DURING A HOT DAY TAKEOFF. APPROPRIATE MAINTENANCE ACTION SHOULD BE TAKEN TO DETERMINE AND CORRECT CAUSE OF HIGH LEVEL OF EGT.

(1) The maximum allowable observed Exhaust Gas Temperature (EGT) at Station 4.95, for the applicable operating condition, is listed in Figure 206 and Figure 208.

S 862-179-N00

(2) EGT (TT4.95) Redline Limits:

PW4056 . . . 650°C (during ground starting, 535°C)

PW4060 . . . 650°C (during ground starting, 535°C)

PW4060A. . . 650°C (during ground starting, 535°C)

PW4060C. . . 650°C (during ground starting, 535°C)

PW4062 . . . 650°C (during ground starting, 535°C)

S 862-180-N00

(3) If EGT (TT4.95) exceeds the redline limits given above or the values given in Figure 206, the engine has been subjected to an overtemperature condition. Remedial action which must be taken depends on temperature level reached, length of time at temperature and condition at which engine operated at time. Perform applicable inspection as given in FIM 71-05-00/101.

S 862-126-N00

CAUTION: DO NOT DO THE ENGINE SHUTDOWN PROCEDURE WHEN THE EGT (T4.95) IS TOO HIGH UNLESS OPERATION WHICH IS CONTINUED WILL CAUSE MORE DAMAGE.

CAUTION: YOU MUST LET THE ENGINE OPERATE FOR FIVE MINUTES TO DECREASE THE TEMPERATURE. DO THIS INSTRUCTION UNLESS OPERATION WHICH IS CONTINUED WILL CAUSE MORE DAMAGE.

CAUTION: DO NOT START THE ENGINE UNTIL THE INSPECTION SHOWS THE TWO ENGINE ROTORS TURN CORRECTLY AND THE APPLICABLE INSPECTION IS DONE. IF YOU DO NOT OBEY THESE INSTRUCTIONS, YOU CAN CAUSE DAMAGE TO THE ENGINE.

(4) During an engine operation, an overtemperature condition occurs when the fuel flow, high compressor rpm or the temperature increases in large quantities in a short time.
   (a) When you think an overtemperature condition will occur or has occurred, you must let the temperature decrease before you do the engine shutdown procedure.
   (b) Do not do an emergency engine shutdown unless you know (if you continue the engine operation), it will cause more damage to the engine.
   (c) If you did the engine shutdown and the engine overtemperature condition did not occur, you can start the engine as given for an engine start after an emergency engine shutdown.

S 862-128-N00

(5) After the engine shutdown from an overtemperature, do the steps that follow to do the engine start again:
   (a) If an overtemperature occurred during engine start or other engine operation below idle speed, do the trouble-shooting procedure for Hot Start Occurred (FIM 71-06-00/101, Fig. 103).
   (b) If the overtemperature occurred during the engine operation at or above idle speed, find and correct the cause for the EGT Exceeded Limits (FIM 71-05-00/101, Fig. 108).

S 972-036-N00

(6) When an overtemperature occurs, the EICAS keeps the records of the result on the EICAS EXCD page. The EICAS will keep a record of the maximum EGT and the length of time the EGT was above the maximum EGT limit. The length of time for the overtemperature must agree with the condition of the engine operation at the time of the overtemperature:

(a) The length of the overtemperature is the time the temperature is more than the redline, if the overtemperature occurs during one of two condition:
- an engine start
- an engine operation below idle speed.

(b) The length of the overtemperature is the time the temperature is more than the yellowline with the condition that follows.
1) The engine had the maximum EGT more than yellowline and less than redline during the engine operation at idle speed or more.

(c) The length of the overtemperature is the time above redline if the engine had the maximum EGT more than the redline during an at-or-above idle speed.

S 862-127-N00

(7) You can use the overtemperature data kept on the EICAS to find the necessary inspections (FIM 71-05-00/101, Fig. 109 and FIM 71-06-00/101, Fig. 104).

S 972-038-N00

(8) You must write all overtemperature conditions and keep them with the engine's permanent records.

E. Leakage Limits

S 862-039-N00

(1) The permitted leakage from the engine vents and drains, with the necessary correction, is given in AMM 71-71-00/601, Engine Vents and Drains - Inspection/Check. The given permitted leakage is for the time during an engine operation and after an engine shutdown.

S 862-040-N00

(2) The fuel leakage in the cowling is not permitted.

<u>WARNING</u>: STAY OUT OF ENGINE HAZARD AREAS SHOWN IN FIG. 201 THRU FIG. 204 WHEN YOU EXAMINE THE NACELLE. IF YOU DO NOT STAY OUT OF THE ENGINE HAZARD AREAS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(a) You can see the fuel leakage in the cowling during an engine start, in the light of the day and in artificial light.

(b) The fuel leakage is a fog-like spray off the bottom of the aft lip of the turbine exhaust sleeve.

(c) If you look at the aft part of the nacelle during an engine start, you can see the fuel leakage.
(d) If you see signs of a fuel leakage, you must stop the engine start, or do the engine shutdown procedure if you started the engine.
(e) Do not start or operate the engine until you find and correct the cause of the fuel leakage.

F. Ignition Ground Use Limits

S 862-041-N00

(1) Keep the ignition off during all ground maintenance operation after the engine is started. This will keep a possible overtemperature condition to a minimum if there is a compressor surge (stall).

G. Vibration Guidelines

NOTE: The vibration indication can have small changes when the engine is at a stable speed. This vibration guideline is for an average vibration value of an engine that is at a stable speed.

S 862-135-N00

CAUTION: USE THIS VIBRATION GUIDELINE ONLY FOR THE GROUND TEST OF THE ENGINES DURING MAINTENANCE. THE VIBRATION GUIDELINE IS NOT FOR FLIGHT OPERATIONS.

(1) The maximum vibration guideline of the engine for continuous operation is as follows for broadband and tracked vibrations:

NOTE: If you do the trim balance procedure (AMM 72-31-00/501), use the vibration limits in that procedure.

(a) N1 - 4.0 units (4.0 mils single amplitude)
(b) N2 - 2.5 units (1.25 inches/second)
(c) BB - 3.0 units (1.8 inches/second)

S 862-047-N00

(2) You must examine the sudden changes of 1.0 unit or more which occur.

H. Oil Consumption Limits

S 862-048-N00

(1) The maximum oil consumption for an engine in operation is 0.5 U.S. quart (0.47 liters) in one hour. If the oil consumption quickly or continuously increases, you must examine the oil system (FIM 71-05-00/101, Fig. 106).

NOTE: The oil quantity instrument in the control cabin shows the quantity of oil in the oil tank only. It does not include the quantity of oil in the engine. During the engine operation, as much as 12 quarts (11.36 liters) of oil can go from the oil tank to the engine. This causes the oil quantity indication to decrease by the same quantity. After the engine shutdown, the oil drains from the engine to the oil tank. While the oil goes back to the oil tank, the oil quantity indication in the control cabin shows an increase in the oil quantity.

I. Precautionary Procedures

S 862-049-N00

CAUTION: DO NOT MOVE THE THRUST LEVER FORWARD ON AN ENGINE THAT HAS A SURGE (STALL). YOU MUST ALWAYS MOVE THE THRUST LEVER REARWARD. IF YOU DO NOT DO THIS, YOU CAN CAUSE DAMAGE TO THE ENGINE.

CAUTION: DO NOT OPERATE THE ENGINE AT THE POWER LEVELS MORE THAN THE 2.5 BLEED CLOSURE (APPROXIMATELY 75% N1) IF THE "BLEEDS CLOSED DATA" IS NOT NECESSARY. IF YOU DO NOT FOLLOW THIS, YOU CAN INCREASE THE RISK OF A COMPRESSOR SURGE (STALL) AND THE ENGINE OVERTEMPERATURE.

(1) Compressor Surge (stall)

NOTE: During an engine operation, it is possible to have a compressor surge when you operate at high power in high speeds of crosswinds, or tailwind conditions. If a compressor surge occurs, keep one hand on the thrust lever and the other hand on the FUEL CONTROL switch. This makes it easier for a fast engine shutdown.

(a) If a compressor surge (stall) occurs, do these steps:
1) Quickly (in less than 1 second) move the thrust lever rearward to the idle speed.
2) Monitor the EGT and fuel flow.

NOTE: The EGT and fuel flow should decrease.

3) If the EGT is stable or if it decreases, do the procedure for the normal engine shutdown.

4) If the EGT increases, do the procedure for the emergency shutdown.
5) Do the surge (stall) inspection procedure (FIM 71-05-00/101, Fig. 103) to correct the problems.

CAUTION: WHEN YOU START AN ENGINE AFTER AN EMERGENCY SHUTDOWN, YOU MUST USE THE PROCEDURE FOR AN ENGINE START WHICH FOLLOWS AN EMERGENCY ENGINE SHUTDOWN. IF NOT, DAMAGE TO THE SEALS ON THE TURBINE BLADE TIP CAN OCCUR.

(b) Start the engine as follows:
1) If there was an emergency shutdown, use the procedure to start the engine after an emergency shutdown.
2) If there was a normal shutdown, use the procedure for a normal start.

S 862-050-N00
(2) Starting Precautions

CAUTION: IF THE ENGINE DOES NOT LIGHT UP IN 20 SECONDS OR LESS (30 TO 35 SECONDS IF IT IS THE INITIAL START AFTER AN ENGINE REPLACEMENT OR MAINTENANCE OF THE ENGINE FUEL SYSTEM) AFTER YOU MOVED THE FUEL CONTROL SWITCH TO THE RUN POSITION, IMMEDIATELY PUT THE FUEL CONTROL SWITCH TO THE CUTOFF POSITION. IF YOU DO NOT OBEY THESE INSTRUCTIONS, AN ENGINE GROUND FIRE OR A FLAME WHICH COMES OUT THE EXHAUST CAN OCCUR.

(a) Failure to Light Up
1) If the engine does not light up in 20 seconds or less (30 to 35 seconds if it is in the initial start after an engine replacement or maintenance on the engine fuel system) after you move the FUEL CONTROL switch to the RUN position, immediately put the FUEL CONTROL switch to the CUTOFF position.
2) Continue to motor the engine for a minimum of 30 seconds (engage the starter at 15% N2 rpm or less, if it is necessary) to remove the fuel from the engine.
3) Use the Stop the Engine (Normal) procedure to do the engine shutdown.
4) Examine the engine.
5) Correct the problem before you try to start the engine.

CAUTION: IF INSTANTANEOUS LIGHT UP OCCURS (LIGHT UP OCCURS IN 1 TO 2 SECONDS AFTER YOU PUT THE FUEL CONTROL SWITCH TO THE RUN POSITION), IMMEDIATELY PUT THE FUEL CONTROL SWITCH TO THE CUTOFF POSITION. IF YOU DO NOT OBEY THESE INSTRUCTIONS, YOU CAN CAUSE DAMAGE TO THE ENGINE.

(b) Instantaneous Light Up
1) If an instantaneous light up occurs, immediately put the FUEL CONTROL switch to the CUTOFF position.
2) Continue to motor the engine for a minimum of 30 seconds (engage the starter at 15% N2 or less, if it is necessary) to remove the fuel from the engine.
3) Use the Stop the Engine (Normal) procedure to do the engine shutdown.
4) Examine the engine.
5) Correct the problem before you try to start the engine again.

CAUTION: IF A COMPRESSOR STALL OCCURS AT THE CUTOUT SPEED OF THE STARTER CONTROL VALVE (50% N2) OR MORE, IMMEDIATELY PUT THE FUEL CONTROL SWITCH TO THE CUTOFF POSITION. IF YOU DO NOT OBEY THESE INSTRUCTIONS, YOU CAN CAUSE DAMAGE TO THE ENGINE.

(c) Compressor Stall
1) If a compressor stall occurs at the cutout speed of the starter control valve (50% N2) or more, immediatey put the FUEL CONTROL switch in the CUTOFF position.
2) Continue to motor the engine for a minimum of 30 seconds (engage the starter at 15% N2 or less).
3) Use the Stop the Engine (Normal) procedure to do the engine shutdown.
4) Examine the engine (FIM 71-05-00/101, Fig. 103, Surge Occurred Audible Stall).
5) If it is applicable, correct the problem before you start the engine again.

CAUTION: IF THE N2 ACCELERATION IS NOT STABLE AFTER LIGHT UP AND BEFORE 40% N2, AND THE EGT QUICKLY INCREASES MORE THAN 425 C, IMMEDIATELY PUT THE FUEL CONTROL SWITCH TO THE CUTOFF POSITION. IF YOU DO NOT OBEY THESE INSTRUCTIONS, YOU CAN CAUSE DAMAGE TO THE ENGINE.

(d) Sluggish N2 Acceleration
1) If the N2 acceleration is not stable after light up and before 40% N2 and the EGT quickly increases more than 425 C, immediately put the FUEL CONTROL switch to the CUTOFF position.
2) Continue to motor the engine until the EGT starts to decrease.

3) Put the FUEL CONTROL switch to RUN to start the engine again at maximum motor speed (approximately 28% N2).

CAUTION: IF THERE IS NO INDICATION THAT N1 STARTS TO TURN WHILE THE EGT STARTS TO INCREASE, IMMEDIATELY PUT THE FUEL CONTROL SWITCH TO THE CUTOFF POSITION. IF YOU DO NOT OBEY THESE INSTRUCTIONS, YOU CAN CAUSE DAMAGE TO THE ENGINE.

(e) No Indication that N1 starts to turn.
  1) If a person on the ground does not see an indication that the N1 turns as the EGT starts to increase, put the FUEL CONTROL switch to the CUTOFF position.
    a) Continue to motor the engine for a maximum of 3 minutes.
    b) If the N1 turns in the 3 minutes, put the FUEL CONTROL switch to the RUN position at the maximum motor speed (approximately 28% N2). This starts the engine again.
    c) If the N1 does not turn in 3 minutes, put the ENG START switch to the OFF position.
      1 Let the engine become cool until the rotor is free.
      2 If the rotor stays locked, examine the engine.
      3 Correct the problem (if it is necessary) before you try to start the engine again (FIM 71-05-00/101).

CAUTION: IF THE FUEL OR IGNITION IS STOPPED, IMMEDIATELY PUT THE FUEL CONTROL SWITCH TO THE CUTOFF POSITION. IF YOU DO NOT OBEY THIS INSTRUCTION, YOU CAN CAUSE DAMAGE TO THE ENGINE.

(f) Fuel or Ignition Interruption
  1) If the fuel or ignition is stopped, immediately put the FUEL CONTROL switch to the CUTOFF position.
  2) Continue to motor the engine (engage the starter at 15% N2 or less, if it is necessary) until the EGT starts to decrease.
  3) Use the Stop the Engine (Normal) procedure to do the engine shutdown.
  4) Examine the engine.
  5) Correct the problem before you try to start the engine again.

CAUTION: IF THE ENGINE ACCELERATION TO IDLE IS VERY SLOW, IMMEDIATELY PUT THE FUEL CONTROL SWITCH TO THE CUTOFF POSITION. IF YOU DO NOT OBEY THIS INSTRUCTION, YOU CAN CAUSE DAMAGE TO THE ENGINE.

(g) Slow Engine Acceleration
  1) If engine acceleration to idle is very slow (goes near 120 seconds from the time you put the FUEL CONTROL switch to the RUN position), put the FUEL CONTROL switch to the CUTOFF position.

2) If the engine acceleration to idle is very slow, with the maximum speed between 35 and 45% N2 and the starter still engaged, put the FUEL CONTROL switch to the CUTOFF position.
3) Continue to motor the engine (engage the starter at 15% N2 or less, if it is necessary) until the EGT starts to decrease.
4) Use the Stop the Engine (Normal) procedure to do the engine shutdown.
5) Examine the engine.
6) Correct the problem before you try to start the engine.

S 862-051-N00
(3) Thrust Lever Movement.
(a) Keep the deterioration to a minimum as follows:

NOTE: If the gaspath seal clearance increases, the deterioration of the performance can occur. The gaspath seal clearance increases from the wear related to the high thermal gradients which occur during the quick thrust changes.

1) Snap accelerations and decelerations will not cause deterioration if the conditions that follow are used:
a) You must operate the engine at idle for a minimum of 5 minutes after the initial start and before the engine shutdown.
b) If you operate the engine to high power (more than 1.40 EPR) for more than 30 seconds (with the acceleration included) and then put it back to idle, you must operate the engine at idle for less than one minute or more than 10 minutes before a snap acceleration to high power is done again.

NOTE: The temperature of the engine must be stable before you do a snap acceleration. If it is done within one minute of the high power run done before, or after 10 minutes, then the engine will be at the correct temperature inside and outside to prevent damage.

c) If you slowly do the acceleration again (60 seconds minimum), it is not necessary to do the above step.

J. Thrust Reverser Guidelines

S 862-052-N00

CAUTION: DO NOT OPERATE THE ENGINE IN THE REVERSE THRUST WITHOUT THE CASCADE VANE SEGMENTS. IF YOU DO NOT OBEY THIS INSTRUCTION, YOU CAN CAUSE DAMAGE TO THE ENGINE.

(1) You cannot operate the engine in reverse thrust without all of the cascade vane segments.

S 862-170-N00

(2) You must use caution during the static operation of the thrust reverser with the engine in operation.
   (a) Do a check of the area around the engine for unwanted material which can cause foreign object damage (FOD).
   (b) Keep the engine at or near idle speed when it is possible.

K. Cowling Limits

S 862-168-N00

(1) The engine operation is usually done with all cowling closed and latched. You can operate the engine with the cowling open only for the conditions that follow:
   (a) You can motor the engine to a maximum of 28% N2 with the cowls open and held on the hold-open rods.
   (b) When the wind gusts are less than 20 knots, you can operate the engine at minimum idle in the conditions that follow:
      1) The fan cowls removed, or open and held by the two hold-open rods.
      2) The thrust reversers open and held by the hold-open equipment (A78001).
      3) The core cowls are removed.

      NOTE: Only for the engine ground idle test, if hold open rod, PN A3409-2 or a new leak check test rod, PN A3409-3 are used, the core cowl panels do not have to be removed. For all other engine operation tests at thrust greater that idle, the core cowl panels must be removed.

L. Electronic Engine Control Limits

S 862-169-N00

(1) The indication for the EPR, N1, and N2 will not show on the EICAS display before you start the engine. When sufficient power becomes available from the EEC alternator (N2 transducer), the indications for the EPR and N2 will show on the EICAS display at approximately 8-10% N2. The indication for the N1 will show quickly at approximately 6% N1 or at approximately 28% N2.

M. Start Procedure After An Emergency Engine Shutdown

NOTE: An emergency engine shutdown is an engine shutdown from power levels more than the minimum idle because of a compressor surge or other emergency conditions.

This procedure is only for an engine, which is started after an emergency engine shutdown, for a ground test of the engine during maintenance.

S 862-136-N00

CAUTION: YOU MUST FOLLOW THE SPECIFIED START PROCEDURE AFTER AN EMERGENCY ENGINE SHUTDOWN. IF YOU DO NOT FOLLOW THIS PROCEDURE, DAMAGE TO THE SEALS ON THE TURBINE BLADE TIP CAN OCCUR.

CAUTION: DO NOT USE THIS PROCEDURE FOR THE FLIGHT OPERATIONS. THIS PROCEDURE IS FOR AN ENGINE START SUBSEQUENT TO AN EMERGENCY SHUTDOWN FOR THE GROUND TEST OF THE ENGINES DURING MAINTENANCE. IF YOU USE THIS PROCEDURE FOR THE FLIGHT OPERATIONS, YOU CAN CAUSE DAMAGE TO THE ENGINE.

(1) If the cause for the engine shutdown was not one of reasons shown below and the two rotors move freely, you can start the engine with the applicable steps that follows:
- a surge,
- a tailpipe fire,
- a cause which includes maintenance,
- the conditions are more than the limits.

(a) If you can start the engine in less than 15 minutes from the time of the engine shutdown:
1) Do the Start the Engine (Normal Operation) procedure.
2) Stay at the minimum idle for a minimum of 15 minutes before you increase the speed to a higher power.

(b) If you can not start the engine in 15 minutes from the time of the engine shutdown:
1) Stop for a minimum of 50 minutes from the time of the engine shutdown before you try to start the engine again.
2) After the 50-minutes, make sure the two rotors turn freely.
3) If the two rotors turn freely, do the Dry-Motor the Engine procedure for approximately two minutes to permit the engine to become cool.
4) After you dry-motor the engine, permit the engine to become cool for five minutes before you motor it again.
5) After the five minutes, do the steps that follow:
a) Do the Dry-motor the Engine procedure for two more minutes.

b) Try to start the engine again with the Start the Engine (Normal Operation) procedure and include the step that follows:
1 Put the FUEL CONTROL switch to RUN at the maximum motor speed (approximately 28% N2).
6) Stay at the minimum idle rpm for a minimum of 15 minutes before you increase the speed to a higher power.

N. Clean the engine gaspath.

S 112-090-N00
(1) Do this task: Engine Gaspath After Use of Fire Extinguishing Agents (AMM 72-00-00/701).

TASK 71-00-00-862-001-N00

4. Prepare for the Engine Operation

A. General
(1) This procedure contains the instructions necessary to operate the engine during the permitted conditions. You can use this procedure to examine the operation of the engine or the related systems when the engine operation is necessary.
(2) During cold weather, it is possible you must prepare the engine, increase the temperature for example, before you try to start it.
(a) Use the Power Plant Operation (Cold Weather) procedure to operate the engine in cold weather.
(3) It is important to have a clean engine compartment because a large quantity of mass airflow can pull unwanted material into the engine.
(a) You must fully clean and examine the area after you are done with the work.
(b) Make sure there is no dirt, oil, or grease in the inlet area.
(c) Remove all parts which are not used, for example, nuts, washers, and pieces of lockwire.
(4) To prevent corrosion in the compressor stages and damage to the fan, you are recommended to install the applicable covers on the engine inlet and exhaust when it is possible.
(5) When the temperature is less than 0°C (32°F) or there is sufficient wind to turn the engine, it is important to immediately install the covers on the engine.
(6) When the fan cowls and thrust reverser cowls are open, the engine fire extinguishing systems are not effective. You must have supplemental fire extinguishing equipment and a ground observer available when you do this test.

B. Equipment
(1) Service interphone equipment
(2) Engine Safety Barrier - A71042-29
(3) Thrust Reverser Hold-Open Equipment - A78001-31

C. References
(1) AMM 12-11-01/301, Fuel Tank
(2) AMM 12-12-01/301, Hydraulic Systems
(3) AMM 12-13-01/301, Engine
(4) AMM 12-13-03/301, Integrated Drive Generator
(5) AMM 24-22-00/201, Electrical Power - Control

(6) AMM 29-11-00/201, Main Hydraulic Systems
(7) AMM 36-00-00/201, Pneumatic - General
(8) AMM 54-52-01/601, Strut Forward Fairing
(9) AMM 71-11-04/201, Fan Cowl Panels
(10) AMM 71-11-06/201, Core Cowl Panels
(11) AMM 71-11-06/401, Core Cowl Panels
(12) AMM 78-31-00/201, Thrust Reverser System

D. Access

(1) Location Zone

211	Control Cabin
212	Control Cabin
411	Left Engine
421	Right Engine

E. Prepare for the Engine Operation

S 212-003-N00

(1) Examine the ramp area around and below the nose gear and the main landing gear.
(a) Make sure the ramp area and the tires are clean and free of contamination and possible FOD (Foreign Object Damage).
(b) Water, frost, ice, snow, oil, grease, sand or other contaminations are not permitted on the pavement and under the wheels.

S 862-004-N00

(2) Apply the parking brake.
(a) Make sure the indicator light of the PARK BRAKE, on the P10 panel, comes on.

S 862-005-N00

(3) Put the nose landing gear in the forward direction.

S 492-002-N00

(4) Install ground locks on the nose and main landing gear.

S 492-006-N00

(5) Put chocks 6 to 12 inches (15 to 30 cm) in front and aft of the nose and all main landing gear tires.

S 862-016-N00

(6) Supply the electrical power (AMM 24-22-00/201).

S 862-173-N00

CAUTION: DO NOT OPERATE THE AIRPLANE HYDRAULIC SYSTEMS UNLESS THE FUEL QUANTITY IS SUFFICIENT TO GO ABOVE THE HEAT EXCHANGERS FOR THE HYDRAULIC FLUID. IF YOU OPERATE THE AIRPLANE HYDRAULIC SYSTEMS WITHOUT SUFFICIENT FUEL, YOU CAN CAUSE DAMAGE TO THE AIRPLANE HYDRAULIC SYSTEMS.

(7) Make sure you keep a minimum of 4020 pounds (1827 Kg) of fuel in the main fuel tanks of the left and right wings.
(a) If it is necessary, do the servicing procedure for the fuel tanks (AMM 12-11-01/301).

S 992-067-N00
(8) For the engine operations more than the idle speed, use the table that follows to put the airplane in the correct configuration:
(a) Make sure the airplane weighs more than the minimum gross weight for the applicable power level.
(b) Make sure you operate the opposite engine at the specified power level for the CG (center of gravity) of the airplane.

NOTE: The CG of the airplane is given in %MAC (mean aerodynamic chord).

767-200 AIRPLANES			
Power Level	Minimum Gross Weight *[1] Pounds (KG)	CG %MAC	Power Level For The Opposite Engine *[2]
Up to 80% N2	MEW	11-36	0
80% N2 to 1.40 EPR	275,000 (124,850)	11-36	0

*[1] These values are the minimum gross weight that is necessary to operate the engine at the specified power level. The MEW is the manufacturer's empty weight. No additional weight is necessary on the airplane if the minimum gross weight shown in the table is MEW.
*[2] It is necessary to operate the opposite engine at this power level for the specified airplane CGs. If you do not know the %MAC, use the power level for the highest range of the %MAC that is shown in the table.

767-300 AIRPLANES			
Power Level	Minimum Gross Weight *[1] Pounds (KG)	CG %MAC	Power Level For The Opposite Engine *[2]
Up to 80% N2	MEW	7-25 26-37	0 1.06 EPR
80% N2 to 1.40 EPR	253,000 (114,860)	7-24 25-34 35-37	0 1.06 EPR 1.09 EPR

*[1] These values are the minimum gross weight that is necessary to operate the engine at the specified power level. The MEW is the manufacturer's empty weight. No additional weight is necessary on the airplane if the minimum gross weight shown in the table is MEW.

*[2] It is necessary to operate the opposite engine at this power level for the specified airplane CGs. If you do not know the %MAC, use the power level for the highest range of the %MAC that is shown in the table.

S 862-100-N00

(9) For each engine you will operate, do these steps:
   (a) Remove the engine inlet and exhaust covers, if it is installed.
   (b) Remove the covers for the pitot probes, if installed.
   (c) Put the engine safety barrier at the inlet area, if it is necessary.
   (d) Examine the areas around the engine for the unwanted materials. The areas consists of the air inlet, fan and turbine exhaust areas, wing leading edge immediately above the engine, and the ground area.
   (e) Examine the hydraulic fluid reservoir for sufficient servicing.

      NOTE: You can see the fluid in the sight gages on the reservoirs.

      1) If it is necessary, do the servicing procedure for the hydraulic fluid reservoirs (AMM 12-12-01/301).

CAUTION: DO NOT OPEN THE FILLER CAP ON THE OIL TANK IN LESS THAN FIVE MINUTES AFTER THE ENGINE SHUTDOWN. IF YOU OPEN THE FILLER CAP TOO FAST, A FAST FLOW OF THE HOT OIL CAN CAUSE INJURY TO YOU.

(f) Examine the engine oil tank for sufficient servicing (AMM 12-13-01/301).
  1) Before you install the oil tank cap, make sure that the packing does not have damage or deterioration.
  2) If it is necessary, do the servicing procedure for the engine oil tank (AMM 12-13-03/301).

(g) Examine the IDG for sufficient servicing.
  1) If it is necessary, do the servicing procedure for the IDG (AMM 12-13-03/301).

(h) Make sure the forward fairing is installed correctly (AMM 54-52-01/601).

S 012-005-N00

CAUTION: DO NOT OPERATE THE ENGINE WITH THE COWLS OPEN IF THE WIND GUSTS ARE MORE THAN 20 KNOTS. THE WIND GUSTS WITH HIGH SPEED CAN DAMAGE THE COWLS AND ENGINE.

(10) If you operate the engine with the cowls open, do the steps that follow:
  (a) Open the fan cowl panels (AMM 71-11-04/201).
    1) Make sure the two hold-open rods for one fan cowl pane are fully extended and locked in the position.

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

  (b) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).
  (c) Remove the core cowl panels (AMM 71-11-06/401).

NOTE: Only for the engine ground idle test, if hold open rod, PN A3409-2 or a new leak check test rod, PN A3409-3 are used, the core cowl does not have to be removed. For all other engine operation tests at thrust greater that idle, the core cowl panel must be removed.

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

  (d) Open the thrust reversers (AMM 78-31-00/201).

(e) Install the hold-open equipment for the two sides of the thrust reverser as follows (Fig. 209):
1) Put the actuator lock along the actuator rod.
2) Make sure the lock yoke is against the bolt that attaches the actuator rod.
3) Make sure the lock channel is against the actuator cylinder.
4) Tighten the screw to attach the channel clamp to the actuator rod.
5) Close the actuator a small distance.

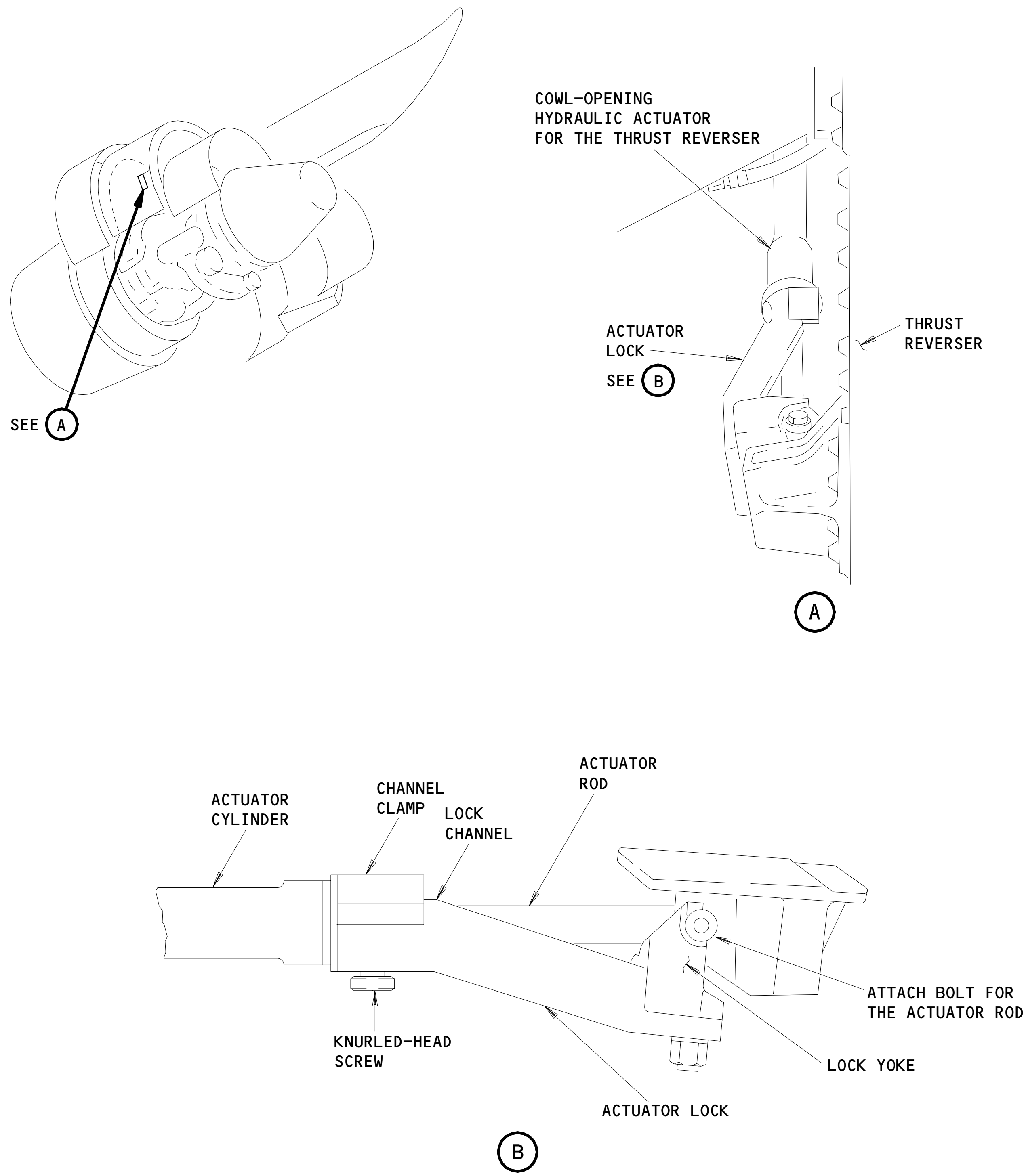
NOTE: When you close the actuator a small distance, the load moves from the actuator to the actuator lock.

6) Disengage the hold open rod for the thrust reverser from the support.
7) Install the hold open rod and the support to its stowage points.

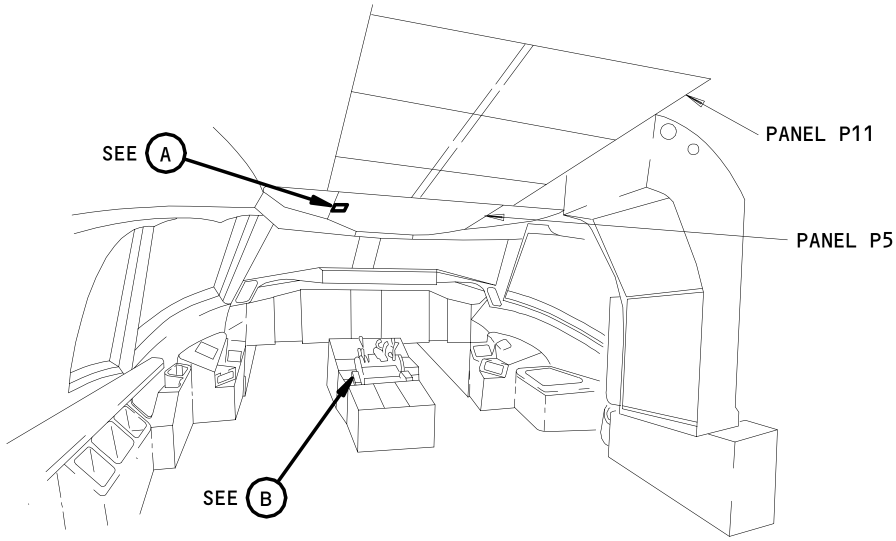
S 212-006-N00
(11) If you operate the engine with the cowls closed, make sure the cowls are latched:
(a) The thrust reversers (AMM 78-31-00/201).
(b) The fan cowl panels (AMM 71-11-04/201).
(c) The core cowl panels (AMM 71-11-06/201).

S 862-007-N00
(12) Make sure you have the conditions that follow (Fig. 210):
(a) The forward thrust lever is at idle.
(b) The reverse thrust lever is in the forward position.
(c) The FUEL CONTROL switch is in the CUTOFF position.
(d) On the aft electronic control panel, P8, make sure that the fire handles are fully in.

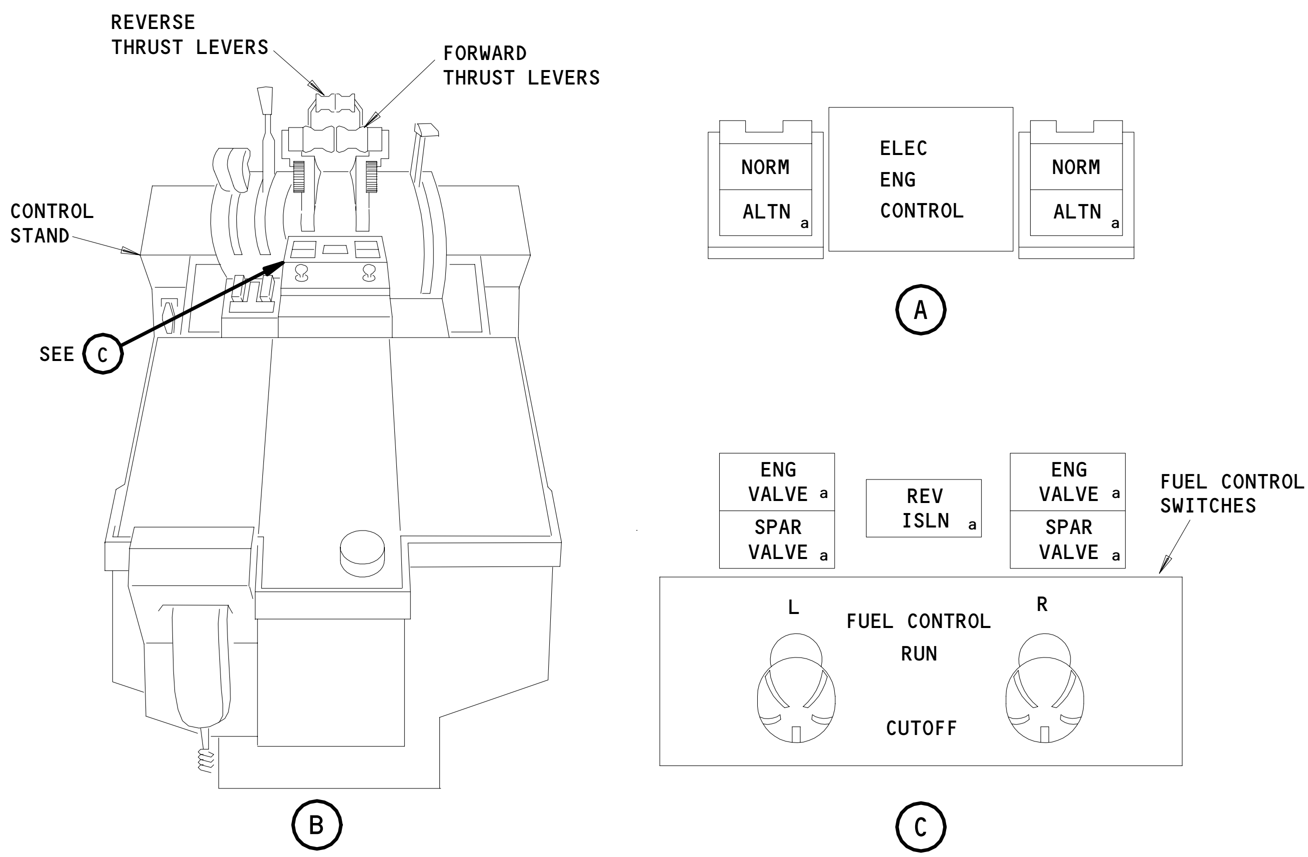
S 862-008-N00
(13) Make sure the control surfaces and the controls agree.



Thrust Reverser Hold Open Equipment Installation
Figure 209



FLIGHT COMPARTMENT



Flight Compartment
Figure 210

S 862-167-N00

CAUTION: KEEP THE CENTER AND RIGHT HYDRAULIC SYSTEMS PRESSURIZED DURING THE OPERATION OF THE TEST. IF YOU DO NOT KEEP THE HYDRAULIC SYSTEM PRESSURIZED, THE PERFORMANCE OF THE AIRPLANE CONTROL CAN DECREASE.

(14) Supply hydraulic power (AMM 29-11-00/201).

S 862-009-N00
(15) Make sure the towing lever on the steering metering valve is in the NORMAL position.

S 862-010-N00
(16) Put the parking brake ON.
(a) Make sure the brake pressure is a minimum of 2850 psi.

S 862-012-N00
(17) Make sure the EICAS circuit breakers (6 locations) on the overhead panel, P11, are closed.

S 862-171-N00
(18) For the left engine, make sure this circuit breaker on the P11 panel is closed:
(a) 11L9, LEFT ENGINE OIL PRESS EICAS REF

S 862-130-N00
(19) For the right engine, make sure this circuit breaker on the P11 panel is closed:
(a) 11L36, RIGHT ENGINE OIL PRESS EICAS REF

S 862-153-N00
(20) Supply pneumatic power (AMM 36-00-00/201).

S 862-182-N00

WARNING: MAKE SURE YOU OPEN THE CIRCUIT BREAKERS FOR THE WEATHER RADAR SYSTEM BEFORE YOU OPERATE THE ENGINE. IF YOU DO NOT, YOU CAN CAUSE SERIOUS INJURY OR DEATH TO PERSONS AND DAMAGE TO EQUIPMENT.

(21) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
(a) 11F2, LEFT WX RADAR
(b) 11F23, RIGHT WX RADAR

S 862-131-N00

CAUTION: BEFORE YOU START THE GROUND OPERATION OR THE TEST OF THE POWER PLANT, YOU MUST OPEN THE CIRCUIT BREAKERS FOR THE FLIGHT RECORDER. YOU MUST MAKE SURE THESE CIRCUIT BREAKERS ARE OPEN TO KEEP THE RECORD OF THE ENGINE DATA.

(22) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
 (a) 11B16, AURAL WARN SPKR L
 (b) 11H35, AURAL WARN SPLR R
 (c) 11J7, FLIGHT RECORDER AC
 (d) 11J8, FLIGHT RECORDER DC

S 842-018-N00

(23) Prepare a check sheet to keep a record of the engine data during the start and the ground operations.

F. Operate the Engine

S 842-017-N00

(1) Do the procedure for the Engine Ground Precautions.

S 862-132-N00

(2) Do the prestart procedure.
 (a) Make sure the EEC switch is in the NORM mode (ALTN switch light does not go on).
 (b) Make sure the EEC MAINT L(R) ENG POWER switch on the P61 panel is in the NORM position.
 (c) On the pilot's overhead panel, P5, make sure the components that follow are in the specified position:
  1) L ISLN valve - Open
  2) R ISLN valve - Open
  3) C ISLN valve - Open
  4) Applicable L (R) ENG (Bleed) Valve - Off
  5) Pack Valves - PACK OFF (2 locations)
  6) FUEL CROSSFEED valve - Closed
  7) Applicable Boost Pump switches - On
  8) WING ANTI-ICE - Off
  9) L ENGINE ANTI-ICE - Off
  10) R ENGINE ANTI-ICE - Off
 (d) Do a test of the fire system.
  1) Push the SQUIB TEST 1 switch on the P61 panel.
   a) Make sure all SQUIB TEST lights go on.
  2) Push the SQUIB TEST 2 switch on the P61 panel.
   a) Make sure all SQUIB TEST lights, but not the APU, go on.
  3) Make sure the DISCH lights are off.
  4) Push the ENG/APU/CARGO FIRE OVHT TEST switch on the aft electronic control panel, P8.
   a) Make sure the FAIL light does not come on.

5) Make sure all fire indications show during the test.

(e) For the left engine, make sure these circuit breakers on the P11 panel are closed:
1) 11D19, ENGINE START CONT L
2) 11M1, ENGINES L IGN 1
3) 11M28, ENGINES L IGN 2

(f) For the right engine, make sure these circuit breakers on the P11 panel are closed:
1) 11D20, ENGINE START CONT R
2) 11M2, ENGINES R IGN 1
3) 11M29, ENGINES R IGN 2

(g) For the left engine, make sure this circuit breaker on the P6 panel is closed:
1) 6L19, PROBE HEAT ENG L

(h) For the right engine, make sure this circuit breaker on the P6 panel is closed:
1) 6K25, PROBE HEAT ENG R

(i) Make sure these circuit breakers on the P6 panel are closed:
1) 6K14, PITOT HEAT CAPT ϕA
2) 6K15, PITOT HEAT CAPT ϕB
3) 6K16, PITOT HEAT R AUX ϕB
4) 6K17, PITOT HEAT R AUX ϕC

S 842-096-N00

(3) Make sure you can talk to the person on the ground.

TASK 71-00-00-712-021-N00

5. Start the Engine (Normal Operation - Air from an APU or Ground Cart)

A. General
(1) This is the usual procedure to start the engine.
(2) If the EGT is between 0°C and 180°C, you can use this procedure or the Start the Engine (Normal Operation - Engine Bleed Air).
(3) If the EGT is 0°C or less, you must use the procedure for the Start the Engine (Cold Weather Operation).
(4) If the EGT is more than 180°C, you must do the Dry-Motor the Engine procedure until the EGT decreases. Then use this or the Start the Engine (Normal Operation - Engine Bleed Air) procedure to continue the engine start.
(5) Look at the aft part of the nacelle during the start for signs of fuel leakage as shown in the Leakage Limits.

B. References
(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 29-11-00/201, Main Hydraulic Systems
(3) AMM 36-00-00/201, Pneumatic - General
(4) AMM 49-11-00/201, Auxiliary Power Unit
(5) FIM 71-05-00/101, Power Plant
(6) FIM 71-Fault Code Diagram

C. Access

(1) Location Zone

211 Control Cabin
212 Control Cabin
411 Left Engine
421 Right Engine

D. Procedure

S 912-184-N00

WARNING: DO NOT OPERATE ANY FUEL PUMP IF THE LOW PRESSURE LIGHT COMES ON AND STAYS ON. FUEL VAPORS IN THE TANK MAY IGNITE AND CAUSE A FIRE OR EXPLOSION.

(1) Continuously monitor the fuel quantity and the low pressure light indication for the applicable main fuel tank.
   (a) Immediately set the applicable fuel pump switch(es) to OFF if the LOW PRESSURE light comes on and stays on.

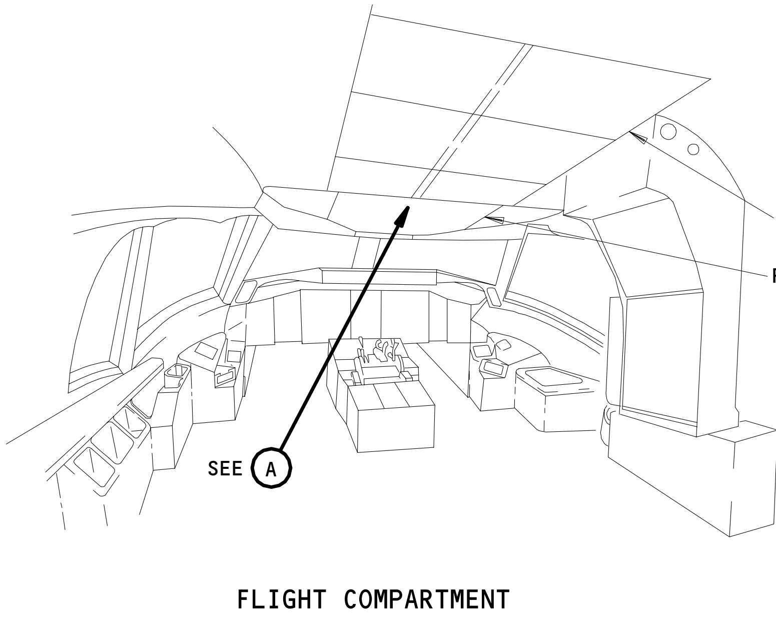
S 842-024-N00

(2) Do the Prepare for the Engine Operation procedure.

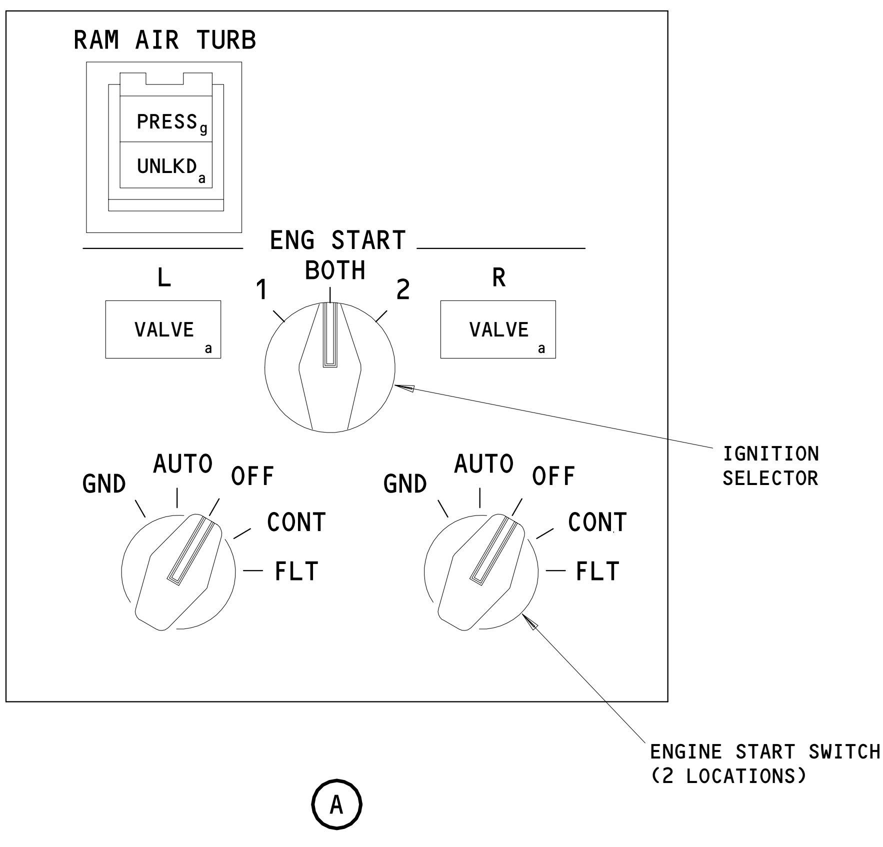
S 862-133-N00

(3) Do these steps before you put the ENG START switch in the GND position:
   (a) On the P5 panel, put all boost pump switches for the tank, on the same side as the engine you will start, to the ON position.
      1) Make sure all the applicable lights for the low fuel pressure go off.
   (b) If you will use the low pressure air from the ground source for the engine start, close the bleed air valve for the APU.
   (c) If you will use the air source from the APU, do these steps:
      1) Start the APU, if it is not in operation (Ref 49-11-00/201).
      2) Put the APU VALVE switch to the open position.
      3) Close the ISLN VALVE for the engine which you will not start.
   (d) Put the ignition switch to the 1 (or A) or 2 (or B) position for a single igniter start, or to the BOTH position for a two igniter start (Fig. 211).

      NOTE: You can use one or two igniters for the ground starts.



FLIGHT COMPARTMENT



Engine Start and Ignition Module
Figure 211

S 862-102-N00

CAUTION: MAKE SURE THE ENG START SWITCH DOES NOT RELEASE FROM GND UNTIL YOU GET 50% N2. FAILURE OF THE ENG START SWITCH TO STAY IN THE GND POSITION UNTIL 50% N2 CAN CAUSE A HOT START WITH SUBSEQUENT ENGINE DAMAGE. YOU MUST USE THE STARTER OPERATION LIMITS OR YOU CAN CAUSE DAMAGE TO THE STARTER.

(4) Put the applicable ENG START switch in the GND position (Fig. 211).
  (a) Make sure the engine start VALVE light goes on and then goes off.

S 862-154-N00

CAUTION: USE THE ENGINE STARTING PRECAUTIONS IN THE PRECAUTIONARY PROCEDURES IN THE POWER PLANT OPERATION LIMITS TASK. IF YOU DO NOT USE THESE PRECAUTIONS, YOU CAN CAUSE DAMAGE TO THE ENGINE.

(5) Put the FUEL CONTROL switch in the RUN position when the N2 speed is at the maximum motor speed.

NOTE: The minimum motor speed necessary for an engine start is 15% N2.

  (a) Monitor the N1, N2, and the EGT indications while the light up occurs.
  (b) If the person on the ground does not see the engine fan turn when the EGT increases, immediately do the task for No Indication that N1 starts to turn (Refer to the Starting Precautions in the Power Plant Operation Limits Task).

S 862-104-N00
(6) Look at the specified engine indications (on the EICAS) while the engine lights up and the speed increases to idle.
  (a) Lightup - the EGT increases in 20 seconds or less (30 to 35 seconds if it is the initial start after an engine replacement or the maintenance on the engine fuel system).
  (b) Engine Oil Pressure - increases
  (c) The Warning Light for the Low Oil Pressure of the engine goes off at approximately 83 psi with the pressure that increases.

(d) Fuel flow at light up - approximately 499 lb/hr (227 kg/hr)

NOTE: Airplanes PRE-SB 31-0114 may exhibit a fuel flow indication spike during an engine start, immediately after the Fuel Control Switch is moved to the RUN position. The high fuel flow indication will subside within 10 to 15 seconds.

Airplanes POST-SB 31-0114 will not exhibit any fuel flow indication spiking anomalies during engine start. When the Fuel Control Switch is moved to the RUN position, the fuel flow gage will indicate the correct fuel flow. A rapid increase in fuel flow with SB 31-0114 incorporated signals a failure of the Fuel Metering Unit.

CAUTION: DO NOT LET THE EGT INCREASE TO MORE THAN 650°C. IF THE EGT IS MORE THAN 650°C, DAMAGE TO THE ENGINE CAN OCCUR.

(e) EGT - less than 535°C

S 862-028-N00

(7) Make sure the ENG START switch moves to AUTO at approximately 50% N2.

(a) Make sure the start VALVE light goes on and then goes off.

(b) If the ENG START switch does not move to AUTO at 50% N2, manually turn the ENG START switch to the AUTO position.

NOTE: You can get the usual pneumatic duct pressure back quickly when the ENG START switch releases.

S 862-029-N00

(8) Put the ENG START switch in the OFF position.

S 862-030-N00

(9) Let the engine speed increase to the idle speed (approximately 65% N2).

NOTE: After you put the FUEL CONTROL switch to the RUN position, you are permitted no more than 120 seconds to increase the engine speed to the minimum idle.

(a) If a hung start occurs, stop the start procedure.

1) Find and correct the cause for no accelaration (FIM 71-Fault Code Diagram).

S 862-031-N00

(10) Let the engine become stable at the minimum idle.

(a) Make sure you have these approximate specified indications:

1) EPR - 1.007 to 1.022
2) N1 - 23%
3) N2 - 64%
4) Fuel Flow - 1400 lb/hr (635 kg/hr)
5) Oil Quantity - 17 quarts (16 liters), left engine
13 quarts (12 liters), right engine

NOTE: The oil quantity indication decreases when you start the engine. This condition occurs because the oil moves from the oil tank to the engine. During operation of the engine, as much as 12 quarts (11.36 liters) of oil can go from the oil tank to the engine. The oil quantity indication will go to the usual indication after the engine stops.

6) Oil Temperature - 50° C, minimum
7) Oil Pressure - 70 psid (482.6 kPad), minimum
8) Engine Vibration - 0.1

(b) Make sure the pressure of the hydraulic system becomes stable between 2800 and 3200 psi.

(c) When the wind conditions are not stable, monitor the SVA indication on the EICAS EPCS page.

1) Stop the trim run of the engine if the SVA indication is not stable (Ref Fig. 207).

S 862-155-N00

(11) Remove pneumatic power, if it is not necessary (AMM 36-00-00/201).

S 862-156-N00

(12) Remove electrical power, if it is not necessary (AMM 24-22-00/201).

S 862-166-N00

(13) Remove hydraulic power, if it is not necessary (AMM 29-11-00/201).

S 862-107-N00

(14) If you used the APU for the air source during the start, put the APU VALVE switch to the closed position.

S 712-049-N00

(15) Operate the engine and the related systems.

TASK 71-00-00-712-036-N00

6. Start the Engine (Normal Operation - Engine Bleed Air)

A. General

(1) This is an alternative procedure to start an engine when the other engine is in operation.

(2) If the EGT is at 0°C or less, you must use the Start the Engine (Cold Weather Operation) procedure.

(3) If the EGT is more than 180 °C, you must use the Dry-Motor the Engine procedure until the EGT decreases. Then use this or the Start the Engine (Normal Operation - Air from an APU or Ground Cart) procedure to continue the engine start.

(4) Look at the aft part of the nacelle during the start for signs of fuel leakage as shown in the Leakage Limits.

B. Access

(1) Location Zone

211	Control Cabin
212	Control Cabin
411	Left Engine
421	Right Engine

C. Procedure

S 912-185-N00

WARNING: DO NOT OPERATE ANY FUEL PUMP IF THE LOW PRESSURE LIGHT COMES ON AND STAYS ON. FUEL VAPORS IN THE TANK MAY IGNITE AND CAUSE A FIRE OR EXPLOSION.

(1) Continuously monitor the fuel quantity and the low pressure light indication for the applicable main fuel tank.

(a) Immediately set the applicable fuel pump switch(es) to OFF if the LOW PRESSURE light comes on and stays on.

S 712-038-N00

(2) Operate the engine that you will use for the air source at idle speed.

S 862-157-N00

(3) Make sure you do the steps shown in the Prepare for the Engine Operation procedure, but replace the steps that follow:

(a) On the pilot's overhead panel, P5, make sure the components that follow are in the specified position:

1) Operation engine; L(R) ENG Bleed Valve - ON
Start engine; L(R) ENG Bleed Valve - OFF

2) APU valve switch - Closed position

S 862-091-N00

(4) Increase the power on the engine in operation to 70-75% N2 (DUCT PRESSURE is approximately 40-50 psi).

S 712-092-N00

(5) Use the Start the Engine (Normal Operation - Air from an APU or Ground Cart) to continue the start procedure.

S 862-093-N00

(6) Decrease the engine speed to idle on the engine you used for the cross start after the ENG START switch for the engine you started goes to the AUTO position.

S 862-152-N00

(7) Put the switch for the L (R) ENG Bleed Valve on the engine in operation to the OFF position.

S 712-050-N00

(8) Operate the engine and the related systems.

TASK 71-00-00-712-059-N00

7. Manually Start the Engine

A. General

(1) This task gives steps to start an engine when the electrical circuit for the starter control valve does not operate.

(2) Before you manually start the engine, you must make sure the cowlings are closed.

(3) You can use most steps from the Start the Engine (Normal Operation - Air from an APU or Ground Cart) or the Start the Engine (Normal Operation - Engine Bleed Air) procedure. The differences are shown in this task.

B. Equipment

(1) Drive Extension - Starter Control Valve and PRSOV
G71021-6 (Recommended)
G71021-1 (Alternative)

C. Access

(1) Location Zone

211	Control Cabin
212	Control Cabin
411	Left Engine
421	Right Engine

D. Procedures

S 912-186-N00

WARNING: DO NOT OPERATE ANY FUEL PUMP IF THE LOW PRESSURE LIGHT COMES ON AND STAYS ON. FUEL VAPORS IN THE TANK MAY IGNITE AND CAUSE A FIRE OR EXPLOSION.

(1) Continuously monitor the fuel quantity and the low pressure light indication for the applicable main fuel tank.

(a) Immediately set the applicable fuel pump switch(es) to OFF if the LOW PRESSURE light comes on and stays on.

S 712-060-N00

<u>WARNING</u>: DO NOT START THE ENGINE MANUALLY WITH THE COWLINGS OPEN. IF YOU DO NOT OBEY THESE INSTRUCTIONS, INJURY TO PERSONS CAN OCCUR.

(2) Do the Start the Engine (Normal Operation) procedure to start the engine, but use the steps that follow when it is applicable:

(a) If the starter control valve does not operate when you put the ENG START switch to the GND position, tell the persons on the ground to manually open the starter control valve as follows:

<u>WARNING</u>: YOU MUST WEAR COVERS ON YOUR HANDS AND ARMS. THE HEAT AND AIR FLOW FROM THE STARTER CONTROL VALVE CAN CAUSE INJURY TO PERSONS.

<u>CAUTION</u>: YOU MUST HAVE AIR PRESSURE IN THE INLET DUCT IF YOU MANUALLY OPERATE THE STARTER CONTROL VALVE. IF YOU DO NOT HAVE AIR PRESSURE, YOU CAN CAUSE DAMAGE TO THE STARTER CONTROL VALVE.

<u>CAUTION</u>: DO NOT USE THE COMBINATION OF SHORT EXTENSIONS TO MAKE UP 40-INCH EXTENSION. IF YOU DO, YOU CAN CAUSE DAMAGE TO THE ENGINE.

1) Install the G71021-6 drive extension for the starter control valve through the access port in the left core cowl panel.

<u>NOTE</u>: Make sure the core cowl panels are closed.

2) Engage the drive extension in the override receptacle of the starter control valve.

a) When the person from the flight compartment permits, turn the drive extension (in the direction shown on the core cowl) 90° to open the starter control valve.

b) Hold the starter control valve in the OPEN position.

<u>CAUTION</u>: MAKE SURE THE STARTER CONTROL VALVE CLOSES AT APPROXIMATELY 50% N2. IF THE STARTER CONTROL VALVE DOES NOT CLOSE AT APPROXIMATELY 50% N2, DAMAGE TO THE STARTER CAN OCCUR.

(b) When you get the an indication of 50% N2, tell the persons on the ground to close the starter control valve.

1) You will close the starter control valve when you turn the drive extension in the direction (shown on the core cowl) 90° to the CLOSED position.

(c) Make sure the ENGINE START VALVE light goes off.

(d) Remove the drive extension from the access port on the core cowl.
(e) Look at the maintenance entry corridor for the engine (Fig. 212).

S 712-109-N00
(3) Operate the engine and the related systems.

TASK 71-00-00-712-041-N00
8. Stop the Engine
A. References
(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 36-00-00/201, Pressurize/Depressurize Pneumatic System
B. Access
(1) Location Zones

211	Control Cabin
212	Control Cabin
411	Left Engine
421	Right Engine

C. Procedure

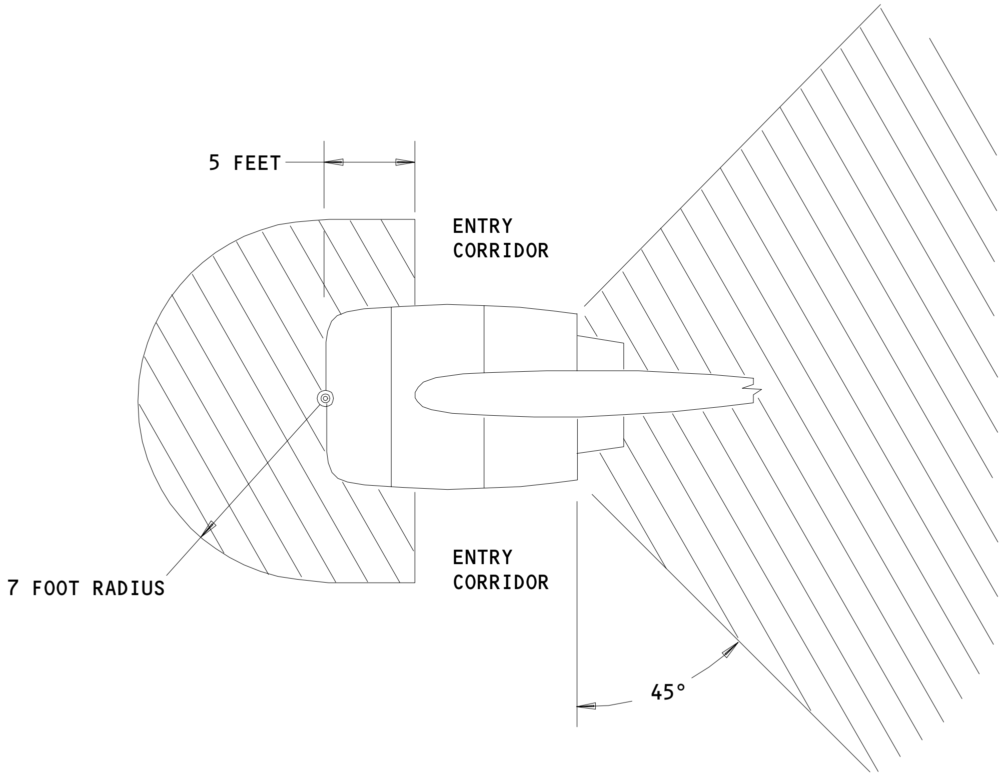
S 712-097-N00
(1) Stop the engine (normal operation) as follows:
(a) Move the forward thrust lever to operate the engine at minimum power.

CAUTION: DO NOT DO THE ENGINE SHUTDOWN BEFORE THE TEMPERATURE OF THE ENGINE DECREASES SUFFICIENTLY. IF YOU DO THE ENGINE SHUTDOWN TOO QUICKLY, YOU CAN CAUSE THERMAL DISTORTION OR OIL COKING IN THE TURBINE SECTION OF THE ENGINE.

(b) Let the engine become cool for a minimum of 5 minutes.
(c) Do these steps before you do the engine shutdown.

CAUTION: DO NOT DO THE ENGINE SHUTDOWN UNLESS YOU SUPPLY PNEUMATIC POWER TO MOTOR THE ENGINE WITH THE STARTER. IF YOU DO NOT SUPPLY PNEUMATIC POWER, YOU CAN CAUSE DAMAGE TO THE ENGINE WHEN THERE IS AN INTERNAL ENGINE FIRE.

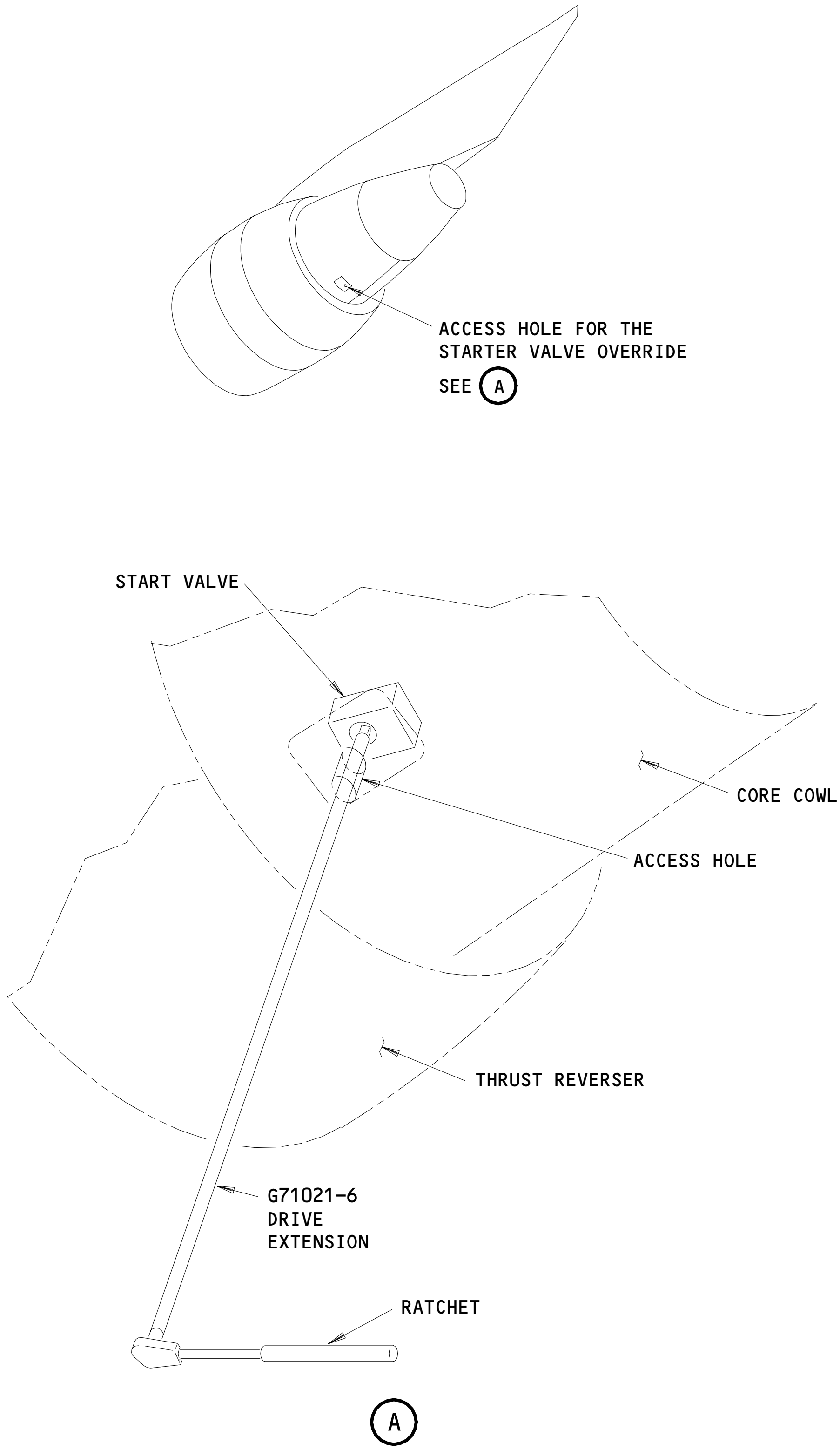
1) Supply pneumatic power (AMM 36-00-00/201).



WARNING: ENTRY CORRIDOR MUST BE USED ONLY UNDER THE CONDITIONS LISTED BELOW:

1. THE ENGINE OPERATION MUST BE LESS THAN THE MINIMUM IDLE (FORWARD THRUST ONLY) WHILE PERSONS ARE IN THE ENTRY CORRIDOR.
2. IF THE WIND IS MORE THAN 25 KNOTS, INCREASE DISTANCE OF THE INLET BOUNDARY BY 20%. IF THERE IS SNOW, ICE, WATER, OIL OR OTHER CONTAMINATION ON THE RAMP, IT IS NECESSARY TO CLEAN THE RAMP.
3. THE PERSONS ON THE ENTRY CORRIDOR MUST TELL THE PERSONS IN THE CONTROL CABIN WHEN PROBLEMS OCCUR.
4. WHEN THE ENGINE IS OPERATED, THE PERSONS IN THE ENTRY CORRIDOR MUST NOT STAND IN THE INLET AND EXHAUST HAZARD AREAS.
5. ALL ENGINE COWLS CLOSED.

Engine Maintenance Entry Corridor-Cowling Closed
Figure 212



Starter Control Valve Override
Figure 213

2) Make sure the PACK VALVES are closed.
3) Make sure the ISLN VALVES are open.
4) Supply electrical power from a source other than the engine you will do the shutdown (AMM 24-22-00/201).

(d) Put the FUEL CONTROL switch in the CUTOFF position.

CAUTION: IF YOU DO NOT IMMEDIATELY SEE THE INDICATIONS OF AN ENGINE SHUTDOWN, YOU MUST FIND THE CAUSE AND CORRECT IT BEFORE THE SUBSEQUENT START. FAILURE TO CORRECT THE INCORRECT ENGINE SHUTDOWN CAN CAUSE AN ENGINE OVERTEMPERATURE OR A FLAME OUT ON THE SUBSEQUENT START.

1) Examine the N2, EGT and fuel flow for an immediate indication of the engine shutdown.
2) Make sure the engine decreases in speed and none of the engine parts rub together.
3) When the speed of the engine decreases, monitor the engine for signs of an internal fire or tailpipe fire.
4) If an internal fire or tailpipe fire occurs, do the steps for an internal fire during an engine shutdown.

(e) Make sure the ENG START switch is in the OFF position.
(f) Put the FWD and AFT boost pump switches in the off position.
1) Make sure that the two low fuel PRESS warning lights go on.
(g) Put the hydraulic switches for the DEMAND pump to the OFF position.

S 712-098-N00

(2) If an internal engine fire occurs during the engine shutdown, do the steps that follow:
(a) Put the FUEL CONTROL switch to the CUTOFF position.
(b) Engage the starter at a speed of 15% N2 or less.

CAUTION: DO NOT USE THE FIRE EXTINGUISHING AGENTS ON A FIRE IN THE INTERNAL OR TURBINE EXHAUST AREAS UNLESS THE FIRE IS NOT CONTROLLED WHEN YOU MOTOR THE ENGINE. THE HOT SECTION OF THE ENGINE IS RESISTANT TO VERY HIGH TEMPERATURE. USUALLY, A FIRE IN THE INTERNAL OR TURBINE EXHAUST AREA IS PERMITTED TO BURN UNTIL YOU CAN MOTOR THE ENGINE. THE DAMAGE TO THE ENGINE FROM A FIRE IS USUALLY LESS THAN THE DAMAGE CAUSED BY THE FIRE EXTINGUISHING AGENTS.

(c) Motor the engine to remove all signs of the internal fire or exhaust sleeve fire without the starter time limits.
(d) After you remove the fire, complete the engine shutdown procedure.

S 712-099-N00

(3) Do the emergency engine shutdown (Engine Fire Warning) as follows:
(a) Move the forward thrust lever rearward to the idle position.
(b) Immediately put the FUEL CONTROL switch in the CUTOFF position.

(c) On the aft electronic control panel, P8, pull the applicable fire handle.
(d) Turn the applicable fire handle to release the fire extinguishing agents.
(e) Monitor the master caustion warning lights at the pilot's glare shield and the sound of the fire warning bells.
(f) Put the FWD and AFT boost pump switches to the off position.

TASK 71-00-00-862-100-N00

9. <u>Put the Airplane Back to the Usual Condition</u>

A. References
   (1) AMM 24-22-00/201, Electrical Power - Control
   (2) AMM 36-00-00/201, Pneumatic - General
   (3) AMM 71-11-04/201, Fan Cowl Panels
   (4) AMM 71-11-06/401, Core Cowl Panels
   (5) AMM 78-31-00/201, Thrust Reverser System

B. Access
   (1) Location Zone

211	Control Cabin
212	Control Cabin
411	Left Engine
421	Right Engine

C. Procedure

S 862-158-N00

(1) On pilot's overhead panel, P5, put the components that follow in the specified position:
   (a) L ISLN Valve - Open
   (b) R ISLN Valve - Open
   (c) C ISLN Valve - Open
   (d) L ENG bleed valve - OFF
   (e) R ENG bleed valve - OFF
   (f) Pack Valves - PACKOFF
   (g) Boost Pump Switches - Off
   (h) FUEL CROSSFEED valve - Closed
   (i) L ENGINE ANTI-ICE - Off
   (j) R ENGINE ANTI-ICE - Off
   (k) WING ANTI-ICE - Off

S 212-102-N00

(2) Examine the EICAS for auto events, which are on a record, during the engine operation.

S 862-172-N00

(3) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
   (a) 11B16, AURAL WARN SPKR L
   (b) 11F2, LEFT WX RADAR
   (c) 11F23, RIGHT WX RADAR
   (d) 11H35, AURAL WARN SPKR R

(e) 11J7, FLIGHT RECORDER AC
(f) 11J8, FLIGHT RECORDER DC

S 412-104-N00
(4) If you operated the engine with cowlings open, do the steps that follow:
(a) Remove the hold-open equipment for the thrust reverser as follows (Fig. 209):
1) Open the thrust reverser (to the maximum actuator extension) to remove the load on the hold-open equipment.
2) Loosen the knurled-head screws to release the channel clamp.
3) Move the channel clamp off the actuator rod.
4) Remove the actuator lock from the actuator.

WARNING: OBY THE INSTRUCTION IN AMM 78-31-00 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(b) Close the thrust reversers (AMM 78-31-00/201).
(c) Close the core cowl panels (AMM 71-11-06/401).
(d) Close the fan cowl panels (AMM 71-11-04/201).

S 862-159-N00
(5) Remove pneumatic power if it is not necessary (AMM 36-00-00/201).

S 862-160-N00
(6) Remove electrical power if it is not necessary (AMM 24-22-00/201).

S 942-107-N00
(7) Remove the engine safety barrier from the inlet area, if it was used and is not necessary.

TASK 71-00-00-862-051-N00

10. Power Plant Operation (Dry-Motor)

A. General
(1) Use the dry-motor procedure for all tests unless a wet motor procedure is necessary.

B. Equipment
(1) Service interphone equipment

C. References
(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 36-00-00/201, Pneumatic System

D. Access
(1) Location Zones

211	Control Cabin
212	Control Cabin
411	Left Engine
421	Right Engine

E. Prepare to Motor the Engine

S 492-052-N00

(1) Make sure the airplane will not move while you motor the engine as follows:
   (a) Install the wheel chocks on the wheels of the main landing gear.
   (b) Install the ground locks.

S 862-109-N00

(2) Before you motor the engine, do these steps:
   (a) Remove the engine inlet and exhaust covers, if they are installed.
   (b) Examine these areas for the unwanted materials:
      1) The areas around the air inlet
      2) The fan and turbine exhaust areas
      3) The wing leading edge immediately above the engine
      4) The ground area around engine.
   (c) Make sure you have the conditions that follow:
      1) The forward thrust lever is in the position for minimum power.
      2) The reverse thrust lever is in the forward thrust position.
      3) The FUEL CONTROL switch is in the CUTOFF position.
      4) On the aft electronic control panel, P8, make sure the fire handle is fully in.

S 862-110-N00

(3) Supply electrical power (AMM 24-22-00/201).

S 862-161-N00

(4) Supply pneumatic power (AMM 36-00-00/201).

S 862-056-N00

(5) Use the electric pump in the right hydraulic system for a pressure source to put the parking brake in the ON position.

F. Motor the Engine

S 862-162-N00

(1) Do the pre-motor procedure.
   (a) On the pilot's overhead panel, P5, make sure the components that follow are in the specified position:
      1) L ISLN valve - Open
      2) R ISLN valve - Open
      3) C ISLN valve - Open
      4) Applicable Engine (Bleed) Valve Light - OFF light is on
      5) Pack Valves - PACKOFF
      6) FUEL CROSSFEED Valves - Closed
      7) L ENGINE ANTI-ICE - Off
      8) R ENGINE ANTI-ICE - Off
      9) WING ANTI-ICE - Off

CAUTION: DO NOT KEEP THE CIRCUIT BREAKERS FOR THE IGNITION CLOSED. IF YOU KEEP THE CIRCUIT BREAKERS CLOSED, ACCIDENTAL LIGHT UP CAN OCCUR WHEN YOU WET MOTOR THE ENGINE.

(b) For the left engine, open these circuit breakers on the P11 panel and install DO-NOT-CLOSE tags:
   1) 11D7, ENGINE STBY IGN 1
   2) 11D8, ENGINE STBY IGN 2
   3) 11M1, ENGINES L IGN 1
   4) 11M28, ENGINES L IGN 2
(c) For the right engine, open these circuit breakers on the P11 panel and install DO-NOT-CLOSE tags:
   1) 11D7, ENGINE STBY IGN 1
   2) 11D8, ENGINE STBY IGN 2
   3) 11M2, ENGINES R IGN 1
   4) 11M29, ENGINES R IGN 2
(d) For the left engine, make sure this circuit breaker on the P11 panel is closed:
   1) 11D19, ENGINE START CONT L
(e) For the right engine, make sure this circuit breaker on the P11 panel is closed:
   1) 11D20, ENGINE START CONT R
(f) Make sure these circuit breakers on the P11 panel are closed:
   1) 11L9, LEFT ENGINE OIL PRESS EICAS REF
   2) 11L36, RIGHT ENGINE OIL PRESS EICAS REF
(g) Open the spar valve.

   NOTE: You must open the spar fuel valve when you motor the engine to supply a lubricant to the engine fuel pump.

   1) For left engine, make sure the circuit breaker on the P6 panel is closed:
      a) 6E1, FUEL VALVES L SPAR
   2) For the right engine, make sure this circuit breaker on the P6 panel is closed:
      a) 6E2, FUEL VALVES R SPAR
   3) If you will motor the left engine, make sure this circuit breaker on the P11 panel is closed:
      a) 11D25, ENGINE FUEL CONT VLV & EEC CHAN B RESET L
   4) If you will motor the right engine, make sure this circuit breaker on the P11 panel is closed:
      a) 11D26, ENGINE FUEL CONT VLV & EEC CHAN B RESET R
   5) Make sure the FUEL CONTROL switch is in the CUTOFF position.
   6) Make sure the two ENG VALVE and SPAR VALVE lights are off.
   7) For the left engine, open this circuit breaker on the P11 panel as follows:
      a) 11D25, ENGINE FUEL CONT VLV & EEC CHAN B RESET L

8) For the right engine, open this circuit breaker on the P11 panel as follows:
   a) 11D26, ENGINE FUEL CONT VLV & EEC CHAN B RESET R
9) Put the FUEL CONTROL switch to the RUN position.
   a) Make sure the SPAR VALVE light goes on then goes off.
10) For the left engine, open this circuit breaker on the P6 panel and install a DO-NOT-OPERATE tag:
   a) 6E1, FUEL VALVES L SPAR
11) For the right engine, open this circuit breaker on the P6 panel and install a DO-NOT-CLOSE tag:
   a) 6E2, FUEL VALVES R SPAR
12) Move the FUEL CONTROL switch to the CUTOFF position.
13) For the left engine, close this circuit breaker on the P11 panel as follows:
   a) 11D25, ENGINE FUEL CONT VLV & EEC CHAN B RESET L
14) For the right engine, closed this circuit breaker on the P11 panel as follows:
   a) 11D26, ENGINE FUEL CONT VLV & EEC CHAN B RESET R

(h) Supply the boost pump pressure.
1) Put the FWD and AFT boost pump switches for the tank on the applicable side in the ON position.
2) Make sure the two warning lights for the low fuel pressure go off.

S 862-163-N00

CAUTION: YOU MUST MAKE SURE TO USE THE STARTER OPERATION LIMITS. IF YOU DO NOT OBEY THE LIMITS, YOU CAN CAUSE DAMAGE TO THE STARTER.

(2) Put the applicable ENG START switch in the GND position (Fig. 211).

NOTE: When you put the engine start switch in the GND position, the start VALVE light on the P5 panel will go on then go off. Also, the DUCT PRESSURE indication on the panel P5 will show the pressure immediately decrease. The DUCT PRESSURE indication will also show that the pressure will slowly, but not fully, get back to the initial pressure.

S 862-059-N00

(3) Make sure the engine motors at a maximum motor speed of approximately 28% N2.
(a) Make sure the N1 turns.

S 862-060-N00

CAUTION: YOU MUST FIND AND CORRECT THE CAUSE FOR THE FLOW INDICATION OR THE FOG BEFORE THE SUBSEQUENT START. IF YOU DO NOT CORRECT THE CAUSE OF THE FLOW INDICATION OR THE FOG, YOU CAN CAUSE AN ENGINE OVERTEMPERATURE OR A FLAME OUT ON THE SUBSEQUENT START.

(4) If the fuel flow indication or a fuel fog occurs, do the steps that follow:
  (a) For the left engine, remove DO-NOT-CLOSE tag and close this circuit breaker on the P6 panel as follows:
    1) 6E1, FUEL VALVES L SPAR
  (b) For the right engine, remove DO-NOT-CLOSE tag and close this circuit breaker on the P6 panel as follows:
    1) 6E2, FUEL VALVES R SPAR
  (c) Continue to motor the engine until the fuel fog stops.

S 862-061-N00

(5) Continue to motor the engine in the starter operation limits.
  (a) Do the checks that are necessary.

S 862-062-N00

(6) Put the ENGINE START switch to the OFF position.
  (a) Make sure the VALVE light switch for the starter control valve goes on then goes off.

G. Put the Airplane to its Usual Condition

S 862-063-N00

(1) Put the FWD and AFT boost pump switches to the off position.

S 862-134-N00

(2) Make sure the circuit breakers and components are in the specified position as follows:
  (a) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P6 panel as follows:
    1) 6E1, FUEL VALVES L SPAR
  (b) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P6 panel as follows:
    1) 6E2, FUEL VALVES R SPAR
  (c) Make sure the SPAR VALVE light goes off.
  (d) On the pilot's overhead panel, P5, make sure the components that follow are in the specified position:
    1) L ISLN valve - Open
    2) R ISLN valve - Open
    3) C ISLN valve - Open
    4) Applicable Engine (Bleed) Valve Light - Switch in (OFF light is on)
    5) Pack Valves - PACKOFF
    6) Boost Pump Switches - Off
    7) FUEL CROSSFEED Valves - Closed

8) ENGINE ANTI-ICE - Off
9) WING ANTI-ICE - Off
(e) For the left engine, remove the DO-NOT-CLOSE tags and close this circuit breakers on the P11 panel as follows:
1) 11D7, ENGINE STBY IGN 1
2) 11D8, ENGINE STBY IGN 2
3) 11M1, ENGINES L IGN 1
(f) For the right engine, remove the DO-NOT-CLOSE tags and close this circuit breakers on the P11 panel as follows:
1) 11D7, ENGINE STBY IGN 1
2) 11D8, ENGINE STBY IGN 2
3) 11M2, ENGINES R IGN 1
4) 11M29, ENGINES R IGN 2

S 862-164-N00
(3) Remove pneumatic power, if it is not necessary (AMM 36-00-00/201).

S 862-165-N00
(4) Remove electrical power, if it is not necessary (AMM 24-22-00/201).

TASK 71-00-00-802-068-N00
11. <u>Wet Motor the Engine</u>
A. General
(1) When you do the wet-motor procedure, fuel goes in the engine combustion chamber.
(2) Use the Dry-Motor the Engine procedure to motor the engine unless the wet-motor procedure is necessary for a specific engine test.
B. Equipment
(1) Service interphone equipment
C. References
(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 36-00-00/201, Pneumatic System
D. Access
(1) Location Zones

211	Control Cabin
212	Control Cabin
411	Left Engine
421	Right Engine

E. Prepare to Motor the Engine

S 492-110-N00
(1) Make sure the airplane will not move while you motor the engine.
(a) Install the wheel chocks on the wheels of the main landing gear.
(b) Install the ground locks.

S 862-145-N00
(2) Before you motor the engine, do these steps:
(a) Remove the engine inlet and exhaust covers, if they are installed.

(b) Examine these areas for the unwanted materials:
  1) The areas around air inlet
  2) The fan and turbine exhaust areas
  3) The wing leading edge immediately above the engine
  4) The ground area around the engine.

(c) Make sure you have the conditions that follow:
  1) The forward thrust lever is in the position for minimum power.
  2) The reverse thrust lever is in the forward thrust position.
  3) The FUEL CONTROL switch is in the CUTOFF position.
  4) On the aft electronic control panel, P8, make sure the fire handle is fully in.

S 862-144-N00

(3) Supply electrical power (AMM 24-22-00/201).

S 862-143-N00

(4) Supply pneumatic power (AMM 36-00-00/201).

S 862-142-N00

(5) Use the electric pump in the right hydrualic system for a pressure source to put the parking brake in the ON position.

F. Motor the Engine

S 862-141-N00

(1) Do the pre-motor procedure.

(a) On the pilot's overhead panel, P5, make sure the components that follow are in the specified position:
  1) L ISLN valve - Open
  2) R ISLN valve - Open
  3) C ISLN valve - Open
  4) Applicable Engine (Bleed) Valve Light - OFF light is on
  5) Pack Valves - PACKOFF
  6) FUEL CROSSFEED Valves - Closed
  7) L ENGINE ANTI-ICE - Off
  8) R ENGINE ANTI-ICE - Off
  9) WING ANTI-ICE - Off

CAUTION: DO NOT KEEP THE CIRCUIT BREAKERS FOR THE IGNITION CLOSED. IF YOU KEEP THE CIRCUIT BREAKERS CLOSED, ACCIDENTAL LIGHT UP CAN OCCUR WHEN YOU WET MOTOR THE ENGINE.

(b) For the left engine, open these circuit breakers on the P11 panel and install DO-NOT-CLOSE tags:
   1) 11D7, ENGINE STBY IGN 1
   2) 11D8, ENGINE STBY IGN 2
   3) 11M1, ENGINES L IGN 1
   4) 11M28, ENGINES L IGN 2
(c) For the right engine, open these circuit breakers on the P11 panel and install DO-NOT-CLOSE tags:
   1) 11D7, ENGINE STBY IGN 1
   2) 11D8, ENGINE STBY IGN 2
   3) 11M2, ENGINES R IGN 1
   4) 11M29, ENGINES R IGN 2
(d) For the left engine, make sure this circuit breaker on the P11 panel is closed:
   1) 11D19, ENGINE START CONT L
(e) For the right engine, make sure this circuit breaker on the P11 panel is closed:
   1) 11D20, ENGINE START CONT R
(f) Make sure these circuit breakers on the P11 panel are closed:
   1) 11L9, LEFT ENGINE OIL PRESS EICAS REF
   2) 11L36, RIGHT ENGINE OIL PRESS EICAS REF
(g) Open the spar valve.

   NOTE: You must open the spar fuel valve when you motor the engine to supply a lubricant to the engine fuel pump.

   1) Supply electrical power (AMM 24-22-00/201).
   2) For left engine, make sure this circuit breaker on the P6 panel is closed:
      a) 6E1, FUEL VALVES L SPAR

3) For the right engine, make sure this circuit breaker on the P6 panel is closed:
   a) 6E2, FUEL VALVES R SPAR
4) If you will motor the left engine, make sure this circuit breaker on the P11 panel is closed:
   a) 11D25, ENGINE FUEL CONT VLV & EEC CHAN B RESET L
5) If you will motor the right engine, make sure this circuit breaker on the P11 panel is closed:
   a) 11D26, ENGINE FUEL CONT VLV & EEC CHAN B RESET R
6) Make sure the FUEL CONTROL switch is in the CUTOFF position.
7) Make sure the two ENG VALVE and SPAR VALVE lights are off.
8) For the left engine, open this circuit breaker on the P11 panel as follows:
   a) 11D25, ENGINE FUEL CONT VLV & EEC CHAN B RESET L
9) For the right engine, open this circuit breaker on the P11 panel as follows:
   a) 11D26, ENGINE FUEL CONT VLV & EEC CHAN B RESET R
10) Put the FUEL CONTROL switch to the RUN position.
   a) Make sure the SPAR VALVE light goes on then goes off.
11) For the left engine, open this circuit breaker on the P6 panel and install a DO-NOT-OPERATE tag:
   a) 6E1, FUEL VALVES L SPAR
12) For the right engine, open this circuit breaker on the P6 panel and install a DO-NOT-CLOSE tag:
   a) 6E2, FUEL VALVES R SPAR
13) Move the FUEL CONTROL switch to the CUTOFF position.
14) For the left engine, close this circuit breaker on the P11 panel as follows:
   a) 11D25, ENGINE FUEL CONT VLV & EEC CHAN B RESET L
15) For the right engine, closed this circuit breaker on the P11 panel as follows:
   a) 11D26, ENGINE FUEL CONT VLV & EEC CHAN B RESET R

(h) Apply the boost pump pressure.
   1) Put the FWD and AFT boost pump switches for the tank on the applicable side in the ON position.
   2) Make sure the two warning lights for the low fuel pressure go off.

S 862-140-N00

CAUTION: YOU MUST MAKE SURE TO USE THE STARTER OPERATION LIMITS. IF YOU DO NOT OBEY THE LIMITS, YOU CAN CAUSE DAMAGE TO THE STARTER.

(2) Put the applicable ENG START switch in the GND position (Fig. 211).

NOTE: When you put the engine start switch in the GND position, the start VALVE light on the P5 panel will go on then go off. Also, the DUCT PRESSURE indication on the panel P5 will show the pressure immediately decrease. The DUCT PRESSURE indication will also show that the pressure will slowly, but not fully, get back to the initial pressure.

S 862-139-N00
(3) Make sure the engine motors at a maximum motor speed of approximately 28% N2.
(a) Make sure the N1 turns.

S 862-151-N00
(4) Put the FUEL CONTROL switch to the RUN position.

S 862-150-N00
(5) Continue to motor the engine in the starter operation limits.
(a) Do the checks that are necessary.

S 862-070-N00
(6) Put the FUEL CONTROL switch to the CUTOFF position.

CAUTION: FIND AND CORRECT THE CAUSE FOR THE FUEL FOG, WHICH STAYS FOR A LONG TIME, BEFORE THE SUBSEQUENT START. IF YOU DO NOT CORRECT THE CAUSE OF THE FUEL FOG, YOU CAN CAUSE AN ENGINE OVERTEMPERATURE CONDITION OR A FLAME OUT OF THE EXHAUST DURING THE SUBSEQUENT START.

(a) Dry motor the engine with the FUEL CONTROL switch in the CUTOFF position to remove the fuel which has collected in the gaspath.
1) Continue to dry-motor the engine until the fuel fog goes out of view.
(b) Turn the ENG START switch to the OFF position.
1) Make sure the start VALVE light goes on then goes off.

G. Put the Airplane to its Usual Condition

S 862-149-N00
(1) Put the FWD and AFT boost pump switches to the off position.

S 862-148-N00

(2) Make sure these circuit breakers and components are in the specified position as follows:

   (a) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P6 panel as follows:
      1) 6E1, FUEL VALVES L SPAR
   (b) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P6 panel as follows:
      1) 6E2, FUEL VALVES R SPAR
   (c) Make sure the SPAR VALVE light goes off.
   (d) On the pilot's overhead panel, P5, make sure the components that follow are in the specified position:
      1) L ISLN valve - Open
      2) R ISLN valve - Open
      3) C ISLN valve - Open
      4) Applicable Engine (Bleed) Valve Light - Switch in (OFF light is on)
      5) Pack Valves - PACKOFF
      6) Boost Pump Switches - Off
      7) FUEL CROSSFEED Valves - Closed
      8) ENGINE ANTI-ICE - Off
      9) WING ANTI-ICE - Off
   (e) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel as follows:
      1) 11D7, ENGINE STBY IGN 1
      2) 11D8, ENGINE STBY IGN 2
      3) 11M1, ENGINES L IGN 1
      4) 11M28, ENGINES L IGN 2
   (f) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel as follows:
      1) 11D7, ENGINE STBY IGN 1
      2) 11D8, ENGINE STBY IGN 2
      3) 11M2, ENGINES R IGN 1
      4) 11M29, ENGINES R IGN 2

S 862-147-N00

(3) Remove pneumatic power, if it is not necessary (AMM 36-00-00/201).

S 862-146-N00

(4) Remove electrical power, if it is not necessary (AMM 24-22-00/201).

TASK 71-00-00-712-089-N00

12. Power Plant Operation During Cold Weather

A. General

(1) This procedure gives the instructions for engine operation during cold weather conditions.

(2) These instructions add the information, the techniques, and additional procedure to the normal engine operation procedure.

(3) Engine icing can occur during engine operation when there are two conditions:

(a) Outside air temperature is less than 10°C (50°F).

(b) Visible moisture can be seen.

NOTE: Visible moisture is defined as clouds or fog with less than one mile visibility, rain, snow, sleet, and ice crystals or; water, ice, or snow on the ground.

(4) During cold weather operation, you can prevent damage to the engine if you use the inlet covers, thrust reverser plugs, and exhaust covers.

(a) Before the engine is started, the rotors must not be locked.

(b) Snow and ice must not collect in the engine inlet and must be removed.

(c) During very cold weather operations, the covers will slow the heat loss from the engine and prevent the engine oil temperature from decreasing too fast.

(5) A quantity of ice that collects in the engine inlet is one of the dangerous conditions during cold weather engine operation.

(a) Snow blown into the engine can become ice if it melts and then freezes again.

(b) This ice can lock the rotor blades to the stator case.

(c) If the ice becomes a layer on the rotor blades, the engine rotors will not be balanced.

(6) Ice can collect on the engine parts (i.e. stators, guide vanes, fan blades, spinner, etc.) during the engine operation because of the large quantity of air that is moved by suction into the engine.

(a) This condition is dangerous when you operate the engine at high power and static conditions on the ground.

(b) The suction decreases the air pressure which decreases the air temperature.
(c) The ice can collect in the inlet when water droplets hit the fan blades, the guide vanes, and the spinner and become cool during evaporation.

(7) After the engine is shut down, you must immediately install the inlet cover and thrust reverser plugs to prevent windblown snow or rain in the engines, and in very cold conditions, to keep the heat in the engine.
(a) You must install the turbine exhaust cover as soon as the engine is cool enough to prevent damage to the cover.

(8) It is recommended that the airplane is pointed into the wind when parked for a long time.

(9) During heavy snowstorms, you must always shut down the engine in forward thrust.
(a) This will prevent ice layers on the cascade vanes, the blocker doors, and linkages of the thrust reverser.

(10) Usually, it is not necessary to heat the engine before you start the engine. Reliable starts can be done with the normal start procedures.
(a) You must heat the engine to free rotors locked with snow and ice.
(b) You must remove all the ice and snow from these areas:
1) The engine inlet panels.
2) The fan cowl panels.
3) The external surfaces and joints of the thrust reverser.
4) The acoustic panels of the inlet cowl.
5) The fan and turbine exhaust ducts.
(c) You must heat the engine if the engine oil temperature is colder than -40°C (-40°F).

(11) When it is very cold, the high viscosity oil in the thrust reverser opening system can cause the thrust reverser to close very slowly or cause a hydraulic lock in a check valve in the quick disconnect.
(a) If the thrust reverser closes slowly, apply hot air to the opening actuators and tubes and at the quick disconnect for the hand pump.

(b) To clear a hydraulic lock, pump the thrust reverser open a little, then try to close it again. Continue to apply hot air to warm the opening system and to open and close the thrust reverser a little until the thrust reverser is completely closed.

(12) Additional procedures are necessary for very cold weather operations which are less than -30°C (-22°F). Do the through-flight procedure or the cold soak procedure for overnight or extended periods.

(13) A modified turbine exhaust cover is needed when the engine is heated. It has two 250mm (10 inch) diameter holes for the heater hoses.

B. Equipment

(1) Heater, condition air cart

(2) Service interphone equipment

(3) LMC16M87 Engine inlet cover, or equivalent.

Weckworth Langdon
PO Box 3435
Wichita, Kansas 67201-3435

(4) LMC17M87 Turbine exhaust cover, or equivalent
Weckworth Langdon

(5) LMC17M87 Modified turbine exhaust cover (NOTE: This is a modified turbine exhaust cover with two 250 millimeter (10in) holes for the heater hoses.)
Weckworth Langdon

(6) LMC18M87 Thrust reverser plug, or equivalent
Weckworth Langdon

C. References

(1) AMM 12-11-03/301, Fuel Sump Draining

(2) AMM 12-33-01/301, Cold Weather Maintenance

(3) AMM 24-22-00/201, Manual Control (Apply Power)

(4) AMM 36-00-00/201, Pneumatic - General

(5) AMM 72-00-00/201, Engine

D. Prepare the power plant.

S 862-079-N00

(1) Prepare for normal engine operation and add the steps that follow:

<u>WARNING</u>: MAKE SURE THAT YOU FOLLOW THE PROCEDURES TO TURN THE LOW PRESSURE (N1) AND THE HIGH PRESSURE (N2) ROTOR SYSTEMS. FAILURE TO FOLLOW AMM 72-00-00/201 COULD RESULT IN INJURY TO PERSONS OR DAMAGE TO THE POWER PLANT.

(a) Make sure the N1 rotor can turn freely in the counterclockwise direction as seen from the front (AMM 72-00-00/201).
  1) Turn the fan blades with a wooden stick or a rod that is made of another material that will not damage the fan blades.
  2) Make sure the N2 rotor can turn freely (AMM 72-00-00/201).

(b) If the N1 or N2 rotors cannot turn, do these steps to heat the engine:
  1) Remove all snow and ice from the engine inlet and the acoustic panels of the inlet cowl, the thrust reverser exhaust, and turbine exhaust areas.
  2) Install the inlet cover.
  3) Install the plugs for the thrust reverser.
  4) Install the modified turbine exhaust cover.
  5) Attach two heating hoses to the heater.
  6) Install the two heater hoses through the modified turbine exhaust cover.
  7) Operate the hot air source heater to provide hot air.

     <u>NOTE</u>: The temperature of the hot air must not be more than 121°C (250°F).

  8) Apply hot air until the rotors turn freely.
  9) Stop the operation of the hot air source heater.
  10) Disconnect the heating hoses.
  11) Remove the modified turbine exhaust cover from the turbine exhaust.
  12) Install the turbine exhaust cover.

<u>CAUTION</u>: THE ENGINE INLET MUST BE COMPLETELY CLEAN OF ICE AND SNOW. THE ENGINE ANTI-ICE SYSTEM CAN MELT THE ICE AND SNOW AT THE HEATED AREA, BUT THE ICE CAN FREEZE AGAIN ON THE INLET ACOUSTIC PANELS AND ON THE ENGINE PARTS.

(c) If the N1 or N2 rotors can turn, do these steps:
   1) Remove all snow and ice from the engine inlet and the acoustic panels of the inlet cowl, the thrust reverser exhaust, and turbine exhaust areas.
   2) Install the inlet cover.
   3) Install the plugs for the thrust reverser.
   4) Install the turbine exhaust cover.

(d) If you find it is difficult to open the fan cowl panels or the thrust reverser because of the snow or ice, apply hot air to the external surfaces as necessary.
   1) Blow the melted snow or ice from the exterior joints of the cowl panels before the panels are opened.

(e) Drain the water from all fuel sumps in the fuel system (AMM 12-11-03/301).

   NOTE: If the fuel flows freely from the drains in the tank sumps, the fuel system has no ice.

   1) If there is ice in the fuel system, blow hot air from an explosion-proof hot air source (121°C or 250°F maximum) at the drain area (AMM 12-33-01/301).

S 862-080-N00

(2) Do these steps for a through-flight at temperatures colder than -30°C.

   NOTE: Through-flight conditions are given as follows:
   - the cabin temperatures are kept warmer than 0°C (32°F) and,
   - the engine oil temperatures are warmer than -40°C (-40°F), while the airplane is on the ground and,
   - the airplane is monitored during this time.

(a) If the EICAS engine oil temperature or cabin temperature indications have decreased below these values, do the steps to return the airplane to service after a cold soak (follow the through-flight steps).

(b) Make sure that you follow the procedure for airplane cold weather maintenance (AMM 12-33-01/301).

NOTE: To view oil temperature on EICAS with the engines not running, turn on the EEC Ground Test Power.

(c) Remove the inlet cover, thrust reverser plugs, and turbine exhaust cover from the engines.

WARNING: DO NOT GO NEAR THE INLET DURING THE OPERATION OF THE ENGINE. STAND AT THE NOSE LANDING GEAR AND TALK TO THE FLIGHT COMPARTMENT WITH THE INTERPHONE WHEN YOU MONITOR THE DANGEROUS AREAS OF THE INLET FOR ICE. INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

CAUTION: THE EICAS ENGINE OIL TEMPERATURE VALUE MUST BE WARMER THAN -40°C (-40°F) AT THE ENGINE START FOR THROUGH-FLIGHTS. IF THE ENGINE OIL TEMPERATURE IS COLDER THAN -40°C (-40°F) AND YOU START THE ENGINE, DAMAGE TO THE ENGINE BEARINGS MAY OCCUR.

(d) Start the engine with the cold weather procedure (follow the steps for the cold soak).

NOTE: During engine starts at cold temperatures, high oil pressure can occur, and the oil quantity indication can decrease. As the oil temperature increases with the engine operation at idle thrust, the oil pressure will decrease and the oil quantity indication will go to the usual condition.

(e) Operate the engine at idle until the oil temperature is equal to or warmer than 0°C (32°F) before you move the thrust levers forward and accelerate the engine from idle power.
1) Operate cold engines at idle power or taxi power until the oil temperature is more than 50°C (122°F) before you increase to takeoff power.
2) If you use this procedure to re-warm the engine, make sure the engine operates at idle power for a minimum of 10 minutes before the engine is shut down.

NOTE: Measure the 10 minutes from the time that the engine oil temperature is 0°C (32°F). These 10 minutes are the minimum time for the engine temperature to become stable. You can increase the time periods between engine operations to re-warm the engine if you increase the engine run time to more than 10 minutes or use a higher power level than idle power.

(f) Shut down the engine.
(g) Install the inlet cover.
(h) Install the thrust reverser plugs.
(i) Install the turbine exhaust cover when the engine exhaust is cool enough to prevent damage to the cover.

S 862-138-N00

(3) Do these steps to return the airplane to service after a cold soak.

NOTE: A cold soak is defined as follows:
- The outside temperature is less than -15°C (5°F).
- The airplane has remained overnight, or for an extended period, and is not monitored during this time.

(a) Make sure that you follow the procedure for airplane cold weather maintenance (AMM 12-33-01/301).
(b) If the engine oil temperature is colder than -40°C (-40°F), do these steps:

NOTE: At engine oil temperatures that are colder than -40°C (-40°F), you must warm the engine bearings and the engine oil to prevent engine damage. The process to warm the engine bearings is slow.

To look at the oil temperature on EICAS with the engines not in operation, turn on the EEC Ground Test Power. If the engine oil temperature is colder than -50°C (-58°F), the EICAS indication will be blank.

1) Warm the engine with a hot air source heater.
   a) Remove the turbine exhaust cover.
   b) Install a modified turbine exhaust cover on the turbine exhaust.
   c) Install two heater hoses through the modified exhaust cover holes.
   d) Install two heater hoses to the heater.

e) Operate the hot air source heater to supply hot air.

NOTE: The temperature of the hot air must not be more than 121°C (250°F).

f) Apply hot air to the engine core through the turbine exhaust.

2) As an alternate procedure, move the airplane to a warm airplane hangar to warm the engine oil temperature to 0°C or more.

(c) When the engine oil temperature is warmer than 0°C (32°F), do these steps:

1) If the engine is warmed with hot air from a heater:
   a) Stop the operation of the hot air source heater.
   b) Disconnect the heating hoses.
   c) Remove the modified turbine exhaust cover.
   d) Install the turbine exhaust cover.
2) If the airplane is in a hangar, move it to the outside ramp.
3) Supply electrical power (AMM 24-22-00/201).
4) Remove the inlet and exhaust covers and the thrust reverser plugs from the engines.
5) Start the engine with the cold weather procedure (follow these steps).

NOTE: During engine starts at cold temperatures, high oil pressure can occur, and the oil quantityindication can decrease. As the oil temperature increases with the engine operation at idle thrust, the oil pressure will decrease and the oil quantity indication will go to the usual condition.

6) Operate the engine at idle power until the oil temperature is equal to or more than 0°C (32°F) before you move the thrust levers forward and accelerate the engine from idle power.
   a) Operate cold engines at idle power or taxi power until the oil temperature is more than 50°C (122°F) before you go to takeoff power.

b) If you use this procedure to re-warm the engine, make sure the engine operates at idle power for a minimum of 10 minutes before the engine is shut down.

NOTE: Measure the 10 minutes from the time that the engine oil temperature is 0°C (32°F). These 10 minutes are the minimum time for the engine temperature to become stable. You can increase the time periods between engine operations to re-warm the engine if you increase the engine run time to more than 10 minutes or use a higher power level than idle power.

7) Shut down the engine.
8) Install the inlet cover.
9) Install the thrust reverser plugs.
10) Install the turbine exhaust cover when the engine exhaust is cool enough to prevent damage to the cover.

E. Start the Engine with the Cold Weather Procedure

S 862-081-N00

(1) Do the procedure to prepare the engine for normal engine operation.
(a) Make sure that you follow these procedures for temperatures colder than -30°C (-22°F).
1) Through-flight at temperatures colder than -30°C (-22°F).
2) Return the airplane to service after a cold soak.

S 712-093-N00

CAUTION: DO NOT OPERATE AN ENGINE, WHICH HAS BEEN AT LOW TEMPERATURES, IF THE ENGINE DOES NOT ACCELERATE CORRECTLY TO IDLE POWER. IMMEDIATELY SHUT DOWN THE ENGINE IF THE INDICATIONS ARE LESS THAN NORMAL. IF YOU DO NOT IMMEDIATELY SHUTDOWN THE ENGINE, DAMAGE TO THE ENGINE CAN OCCUR.

CAUTION: IF THE AIRPLANE IS PARKED ON ICE OR PACKED SNOW, START THE ENGINES WITH THE AUXILARY POWER UNIT (APU) OR SUPPLY AIR FROM THE GROUND CARTS. ENGINE THRUST IS NOT SYMMETRIC DURING CROSS BLEED STARTS AND CAN CAUSE THE AIRPLANE TO MOVE IN A CIRCLE. ICE CHOCKS AND A HIGH GROSS WEIGHT CAN MINIMIZE AIRPLANE MOVEMENT. IF YOU DO NOT OBEY THESE INSTRUCTIONS, DAMAGE TO THE AIRPLANE CAN OCCUR.

(2) Start the engine with the instructions for normal engine operation and add the steps that follow:
(a) Provide the pneumatic power from the APU or two or three ground air carts (AMM 36-00-00/201).
1) Do not use the cross bleed start procedure.

(b) If there is no drop in pressure on the DUCT PRESSURE indicator on the Pilot's overhead panel P5 during the start, examine the starter control valve for a frozen solenoid.
   1) Use the manual starter valve override handle on the starter control valve during the engine start to release the valve.
   2) Apply hot air from an explosion-proof hot air source to release the strut valve or the high pressure bleed valve (121°C or 250°F maximum).

(c) If an engine start with a single igniter causes a problem, use two igniters during the next start attempt.

(d) If an engine accelerates slowly after lightup and a hung start occurs, do the engine shut down procedure.
   1) Start the engine again with the procedure for normal engine operation.

(e) If the engine is slow to start, or will not accelerate to idle power (hung start), do the engine shut down and find the cause.

CAUTION: DO NOT TURN ON THE ENGINE ANTI-ICE SYSTEM IF THE ENGINE INLET IS NOT COMPLETELY CLEAN OF ICE. AT TEMPERATURES COLDER THAN FREEZING, THE ANTI-ICE SYSTEM HAS SUFFICIENT HEAT TO MELT THE ICE AT THE INLET, BUT THE ICE AND WATER WILL MOVE INTO THE ENGINE AND FREEZE AGAIN ON THE INLET ACOUSTIC PANELS AND ENGINE PARTS.

(f) While the engine operates at idle power during icing conditions, turn on the engine anti-ice system.
   1) Push the applicable engine anti-ice switch to the ON position at the Wing and Engine Anti-Ice Control Panel.
      a) L ENG ANTI-ICE switch.
      b) R ENG ANTI-ICE switch.

CAUTION: IF THERE IS NO OIL PRESSURE INDICATION (EICAS RED BAND) WHEN THE ENGINE HAS ACCELERATED TO MINIMUM IDLE OR THE OIL PRESSSURE DECREASES TO ZERO DURING ENGINE OPERATION, DO THE PROCEDURE TO SHUT DOWN THE ENGINE AND FIND THE CAUSE OF THE PROBLEM.

CAUTION: WHEN THE ENGINE IS STARTED DURING VERY COLD CONDITIONS, THE OIL PRESSURE INDICATION CAN GO HIGHER THAN NORMAL BECAUSE OF HIGH OIL VISCOSITY. THE OIL PRESSURE WILL DECREASE AS THE OIL TEMPERATURE INCREASES. IF THE OIL PRESSURE DOES NOT DECREASE AFTER THE OIL TEMPERATURE BECOMES STABLE, DO THE PROCEDURE TO SHUT DOWN THE ENGINE AND FIND THE CAUSE OF THE PROBLEM

(g) Operate the engine at idle until the oil temperature is equal to or warmer than 0°C (32°F) before you move the thrust levers forward and accelerate the engine from idle power.
   1) Operate cold engines at idle power or taxi power until the oil temperature is more than 50°C (122°F) before you go to takeoff power.

2) If you use this procedure to re-warm the engine, make sure the engine operates at idle power for a minimum of 10 minutes before the engine is shut down.

NOTE: Measure the 10 minutes from the time that the engine oil temperature reaches 0°C (32°F). These 10 minutes are the minimum time for the engine temperature to become stable. You can increase the time periods between engine operations to re-warm the engine if you increase the engine run time to more than 10 minutes or use a higher power level than idle power.

S 842-083-N00

(3) If you must do the Power Plant Tests in AMM 71-00-00/501, you must turn off the engine anti-ice system.

NOTE: Good data from the power plant tests requires engine operation with no electrical load on the IDG and no bleed air off-takes.

(a) Push the applicable engine anti-ice switch to the OFF position at the Wing and Engine Anti-Ice Control Panel.
1) L ENG ANTI-ICE switch.
2) R ENG ANTI-ICE switch.

S 712-084-N00

(4) Shut down the engine.
(a) Do the engine shutdown given for normal engine operation.
1) Make sure the thrust reverser is retracted (the forward thrust position).

F. Put the Airplane Back to Its Usual Condition

S 842-085-N00

(1) Do the steps to put the airplane back to the usual condition with the procedure for normal engine operation.

S 842-086-N00

(2) Install the inlet cover.

S 842-087-N00

(3) Install the thrust reverser plugs.

S 842-088-N00

(4) Install the turbine exhaust cover when engine is cool enough to prevent damage to the cover.

POWER PLANT - ADJUSTMENT/TEST

1. General
   A. These tests apply to the PW4000-series engines. The tests give the necessary steps to make sure the engine operates correctly after a component is replaced or repaired.
   B. The tests are given a number for positive identification. The table that follows shows the test numbers and titles.

Power Plant Tests List	
Test Number	Title of Test
1	Pneumatic Leak Test
2	Engine Motoring Test
3	Ground Test - Idle Power
4	Engine Power and Acceleration/Deceleration Test
5	Oil System Static Leak Test
6	Electronic Engine Control (EEC) Idle Test
7	Electronic Engine Control (EEC) Static Test
8	Vibration Survey
9	Performance Test
10	Replacement Engine Test (Pretested)
11	Replacement Engine Test (Untested)
12	Engine Vacuum Test
12A	No. 1 Bearing Vacuum Test (with LPC Removed)
13	Main Oil Pressure Test
14	PT2 System Leak Test
15	EEC Ground Test of Engine Control System Actuators {For ALL EECS WITHOUT THE EEC P/N 791100-4-035 (50D437), 791100-4-038 (50D821), 791100-4-044 (50D823), 791100-4-048 (51D011), or 791100-4-049 (51D012)}
16	Engine Rating Check

C. Engine Test Data Symbols

(1) For easy use, symbols have been given to some engine data at internal and external locations on the engine. These are shown below:

AMB	Ambient Temperature (T) or Pressure (P)
TT2	Compressor-Inlet Total Temperature
PT2	Compressor-Inlet Total Pressure
PS2	Compressor-Inlet Static Pressure
PT2.5	Low-Pressure Compressor-Discharge Total Pressure
PS3	Burner-Case Static Pressure
PS4I	Turbine-Cooling-Air Static Pressure
TT4.9	Turbine-Discharge Total Temperature
PT4.9	Turbine-Discharge Total Pressure
EPR	Engine Pressure Ratio
TLR	Thrust-Lever Resolver
FF	Fuel Flow
N1	Low-Pressure-Compressor-Rotor Angular-Speed
N2	High-Pressure-Compressor-Rotor Angular-Speed
N2C	High-Pressure-Compressor-Rotor Angular-Speed Corrected To Low-Pressure-Compressor Pressure
EGT	Exhaust Gas Temperature
OAT	Outside Air Temperature
BVA	Bleed-Valve Angle
SVA	Stator-Vane Angle

TASK 71-00-00-995-015-N00

2. Power-Plant Test-Reference Table

A. General

(1) The Power-Plant Test-Reference Table that follows shows the necessary tests after an engine, module or component is repaired or replaced. The tests are necessary to make sure that the engine operates satisfactorily after repair or replacement.

(2) If more than one test is listed (example: 2, 3, 4), all the tests are necessary and must be done in the sequence shown.

(3) The test for a complete engine replacement is for engines that were tested before in a test cell. It is also for engines that were removed for line maintenance tasks and not tested in a test cell. Line maintenance tasks are:

(a) The removal, installation or repair of engine externals (LRU's) with the engine removed.

(b) The replacement or repair of the LPC 1st stage (fan) blades with the engine removed.

(c) The replacement or repair of the fan (front) case with the engine removed.

(d) The replacement or repair of the main gearbox with the engine removed.

(4) The Power-Plant Test-Reference Table is shown below:

Power-Plant Test-Reference Table	
Component Repaired or Replaced	Necessary Test
BASIC ENGINE COMPONENTS LOW PRESSURE COMPRESSOR (LPC)	
Low Pressure Compressor (LPC) *[1] Test 12A is the No. 1 bearing leak check. This test is done only when the LPC is removed from the engine.	3, 9, 12, or 12A *[1], 13
FAN CASES	
Fan Case Assembly	8, 14
Fan Exit Case Assembly	8, 14
Fan Blades	8
Inlet Cone *[2] If repairs were done that changed the weight and balance of the initial rear segment of the inlet cone, do the vibration survey.	8 *[2]
INLET COWL	
Inlet Cowl	14
INTERMEDIATE CASE	
Intermediate Case	3, 9, 12, 13
HIGH PRESSURE COMPRESSOR (HPC)	
High Pressure Compresor (HPC)	9

Power-Plant Test-Reference Table	
Component Repaired or Replaced	Necessary Test
BASIC ENGINE COMPONENTS DIFFUSER AND COMBUSTOR	
Diffuser and Combustor	3, 9, 13
TURBINE NOZZLE	
Turbine Nozzle	9
HIGH PRESSURE TURBINE (HPT)	
High Pressure Turbine (HPT)	9
LOW PRESSURE TURBINE (LPT)	
Low Pressure Turbine (LPT)	9
TURBINE EXHAUST CASE	
Turbine Exhaust Case	8, 12, 13
MAIN GEARBOX	
Main Gearbox	3, 12, 13
Accessory Drive Seals	3
Gearbox Strainer-Element Assembly	2
Manual Crank Pad Cover	3 or 5

Power-Plant Test-Reference Table	
Component Repaired or Replaced	Necessary Test
BASIC ENGINE COMPONENTS ANGLE GEARBOX	
Angle Gearbox	3, 13
Angle-Gearbox Lower Cover	2
ELECTRICAL POWER (24-00-00)	
IDG Air/Oil Heat Exchanger	3
ENGINE FUEL AND CONTROL SYSTEM (73-00-00)	
Fuel Pump	2 or 3
Fuel Pump Filter	2 or 3
Fuel Distribution Valve	2 or 3
Fuel-Pump Interstage-Pressure Transmitter	2 or 3
Fuel Distribution-Valve Strainer	2 (wet motor) or 3
Fuel-Pump Filter Differential-Pressure Switch	2 (wet motor) or 3
Fuel Injector and Support	4
Electronic Engine Control (EEC)	6, 16

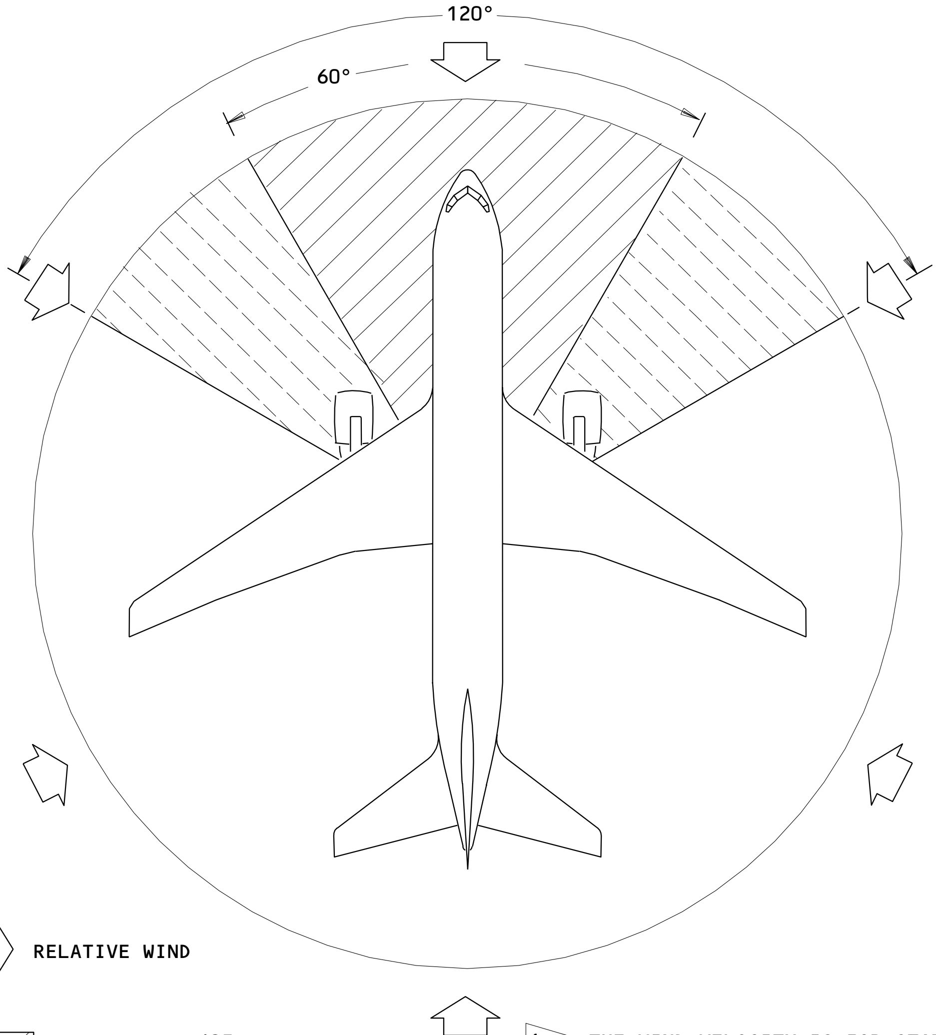
Power-Plant Test-Reference Table	
Component Repaired or Replaced	Necessary Test
BASIC ENGINE COMPONENTS EEC Inlet Total Pressure/Temperature (PT2/TT2) Probe	6 or 7 and 14
Fuel Metering Unit	3
EEC Fuel-Temperature Thermocouple Probe	3
EEC Oil-Temperature Thermocouple Probe	3
EEC Speed Transducer (N1)	3
EEC Wiring Harness	6
EEC Alternator (N2 Transducer)	6
EEC Programming Plug	7, 16
EEC Thermocouple Probe (TT3)	3
Fuel-Metering-Unit Bypass Valve	2 or 3
Fuel-Metering-Unit Filter	2 or 3
Fuel Manifolds and External Tubes	2 or 3
Fuel Flow Transmitter	3
IGNITION SYSTEM (74-00-00)	
Ignition Exciter	Audible Test
Exciter-To-Igniter Plug Cable Igniter Plug	Audible Test

Power-Plant Test-Reference Table	
Component Repaired or Replaced	Necessary Test
BASIC ENGINE COMPONENTS ENGINE AIR SYSTEM (75-00-00)	
Turbine-Case-Cooling (TCC) Air-Shutoff Valve (HPT)	3, 6
Turbine-Case-Cooling (TCC) Air-Valve Control Cable	6
Turbine-Case-Cooling (TCC) Air-Valve Actuator	6
Turbine-Case-Cooling (TCC) Air-Shutoff Valve (LPT)	3, 6
Variable Stator-Vane Actuator (SVA)	3 and 6, or 15
2.5 Bleed Valve Actuator	3 and 6, or 15
2.9 Bleed Valve	6
2.9 Bleed Valve Solenoid	6
HPC Secondary-Flow Control Valve	6
HPC Secondary-Flow Control Valve, IDG Air/Oil Heat-Exchanger Valve Override Solenoid	6
HPC Secondary-Flow Control Valve, Turbine Blade and Vane Cooling Air-Valve Solenoid	6
Turbine Vane and Blade Cooling Air-Valve Position Switch	6
External Air Tubes	2 or 3
No. 3 Bearing Buffer Air Cooler	2 or 3
PS3 Air Filter Assembly	6

Power-Plant Test-Reference Table	
Component Repaired or Replaced	Necessary Test
BASIC ENGINE COMPONENTS	
Turbine Vane and Blade Cooling Air Valve, IDG Air/Oil Heat-Exchanger Valve Override Solenoid	6
Turbine Vane Cooling Air Valve	6
Turbine Vane Cooling Air Valve, Turbine Vane and Blade Cooling Air-Valve Solenoid	6
ENGINE INDICATING SYSTEM (77-00-00)	
EGT (TT4.95) Thermocouple Box and Cable	3
EGT (TT4.95) Thermocouple Probes	3

Power-Plant Test-Reference Table	
Component Repaired or Replaced	Necessary Test
BASIC ENGINE COMPONENTS ENGINE OIL SYSTEM (79-00-00)	
Lubrication and Scavenge Oil Pumps	3, 13
Fuel/Oil Cooler (Engine and IDG)	3
Fuel/Oil Cooler Bypass Valve	3
Fuel/Oil Cooler Bypass Valve Solenoid	3
Engine Oil Tank	3
Main Oil Filter	3
Main Oil Filter Bypass Valve	3
Oil System Pressure (Regulator) Relief Valve	3
Air/Oil Heat Exchanger and Valve (Engine)	3
Last Chance Oil Strainers	3
Magnetic Chip Detector Housing	3
External Oil Tubes	3
Oil Filter Differential Pressure Switch	3
DIAGNOSTIC COMPONENTS (OPTIONAL)	
EEC Speed Transducer (N1)/Multiplexer Input Probe	6
Supplemental Control Unit (SCU)	6

Power-Plant Test-Reference Table	
Component Repaired or Replaced	Necessary Test
BASIC ENGINE COMPONENTS ELECTRICAL HARNESS	
Electrical Harness	6
STARTING SYSTEM (80-11-00)	
Starter Starter Control Valve	Dry motor engine (Ref 71-00-00/201)
POWER PLANT	
Engines Converted in Thrust	7, 16
Engine Replacement (Engine with a test in a test cell)	10, 16
Engine Replacement (Engine without a test in a test cell)	11, 16
MISCELLANEOUS AIRPLANE SYSTEM	
Integrated Drive Generator	3
Integrated-Drive-Generator Fuel/Oil Heat-Exchanger	See Engine Oil Syst Components
Integrated-Drive-Generator Air/Oil Heat-Exchanger	See Electrical Syst Components
Integrated-Drive-Generator Scavenge Filter	2
Engine-Driven Pump (EDP)	3



LEGEND

RELATIVE WIND

RECOMMENDED (25 KNOTS MAXIMUM
WIND VELOCITY)

FOR POWER LEVELS UP TO 1.25 EPR.
FOR POWER LEVELS ABOVE 1.25 EPR, A
MINIMUN WIND SPEED OF 10 KNOTS IS
RECOMMENDED. (TESTING BELOW 10
KNOTS IS PERMITTED, OPERATION SHOULD
BE WITH EXTRA HIGH ALERT FOR DESTABILIZING
INDICATIONS AS DESCRIBED IN NOTE 1.
A LOCAL WIND STATION IS RECOMMENDED
IF AVAILABLE). [1]

PERMITTED (15 KNOTS MAXIMUM
WIND VELOCITY)

FOR POWER LEVELS UP TO 1.25 EPR. [1]

LIMITED UP TO THE FLIGHT IDLE
(5 KNOTS MAXIMUM WIND VELOCITY)

[1] THE WIND VELOCITY IS FOR STABLE WIND CONDITIONS.
DECREASE THE MAXIMUM WIND LIMIT 5 KNOTS FOR
GUSTY WIND CONDITIONS, OR UNTIL THE SVA
INDICATION ON THE EICAS EPCAS PAGE BECOMES STABLE.

STOP THE TRIM RUN OF THE ENGINE IF THE SVA
INDICATION ON THE EICAS EPCS PAGE IS NOT STABLE.
ALSO STOP THE TRIM RUN IF THE INLET SOUND CHANGES
TO A BLOWTORCH-TYPE SOUND. DECREASE THE POWER TO
IDLE AND EXAMINE THE RELATIVE WIND DIRECTION AND
SPEED. STOP THE ENGINE AND CHANGE THE POSITION
OF THE AIRPLANE TO POINT IN THE DIRECTION OF THE
WIND, IF IT IS NECESSARY, BEFORE YOU COMPLETE THE
THE ENGINE TRIM RUN.

YOU CAN OPERATE THE APU DURING THE ENGINE
OPERATION ON THE GROUND.

L-B8184 (0900)

Preferred Relative Wind Direction During an Engine Operation
Figure 501

TEST NO. 1 - ENGINE PNEUMATIC LEAK TEST

TASK 71-00-00-795-001-N00

3. Test No. 1 - Engine Pneumatic Leak Test

A. General
   (1) This test motors the engine to test the engine flanges, ducts, and valves for pneumatic leaks.

B. References
   (1) AMM 24-22-00/201, Electrical Power - Control
   (2) AMM 36-00-00/201, Pneumatic - General
   (3) AMM 36-11-09/201, Air Supply Pressure Regulating and Shutoff Valve
   (4) AMM 49-11-00/201, Auxiliary Power Unit
   (5) AMM 71-11-04/201, Fan Cowl Panel
   (6) AMM 71-11-06/201, Core Cowl Panel
   (7) AMM 78-31-00/201, Thrust Reverser System

C. Access
   (1) Location Zones

411	Left Engine
421	Right Engine
434	Mid Torque Box, Left Strut
444	Mid Torque Box, Right Strut

   (2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine
434AL	Strut Pressure Relief Panel, Left Strut
434AR	Strut Pressure Relief Panel, Left Strut
444AL	Strut Pressure Relief Panel, Right Strut
444AR	Strut Pressure Relief Panel, Right Strut

D. Equipment
   (1) Ground Pneumatic Cart
   (2) Hot Film Anemometer - Range zero to 6000 ft/min

E. Test the engine for pneumatic leaks.

   S 865-017-N00
   (1) Supply electrical power (AMM 24-22-00/201).

TEST NO. 1 - ENGINE PNEUMATIC LEAK TEST

S 215-018-N00

(2) Make sure the DUCT PRESSURE PSI gage on the pilots' overhead panel, P5, shows zero.
   (a) If the duct pressure is more than zero, remove pneumatic power (AMM 36-00-00/201).

S 865-019-N00

(3) Put these switches on the pilots' overhead panel, P5, in the OFF position:
   (a) ENG valve switches
   (b) PACK CONTROL SELECTOR switch
   (c) ENGINE START switch.

S 865-020-N00

(4) Put these valve switches on the pilots' overhead panel, P5, in the CLOSED position:
   (a) C ISLN valve
   (b) WING ANTI-ICE valve
   (c) FWD CARGO HEAT valve
   (d) ENGINE ANTI-ICE valves.

S 015-021-N00

(5) Open the fan cowl panels (AMM 71-11-04/201).

S 045-022-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO YOU OR DAMAGE TO EQUIPMENT.

(6) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 015-023-N00

(7) Open the core cowl panels (AMM 71-11-06/201).

S 015-024-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(8) Open the thrust reversers (AMM 78-31-00/201).

TEST NO. 1 - ENGINE PNEUMATIC LEAK TEST

S 015-025-N00

(9) For the air leak test on the left engine, open the left strut pressure relief doors 434AL and 434AR.
   (a) Put a screwdriver into the latch and use force to release the latch on the pressure relief doors.

S 015-026-N00

(10) For the air leak test on the right engine, open the right strut pressure relief doors 444AL and 444AR.
   (a) Put a screwdriver into the latch and use force to release the latch on the pressure relief doors.

S 215-027-N00

(11) Examine the position indicator for the high pressure shutoff valve (HPSOV) to make sure the HPSOV is closed (Fig. 502).

S 035-028-N00

(12) Remove the rigid pressure-sense tube that is downstream from the pressure regulating and shutoff valve (PRSOV).
   (a) Disconnect the pressure-sense tube from the valve tee (Fig. 503).
   (b) Put a cap on the pressure-sense tube.
   (c) Put a plug in the PRSOV tee.

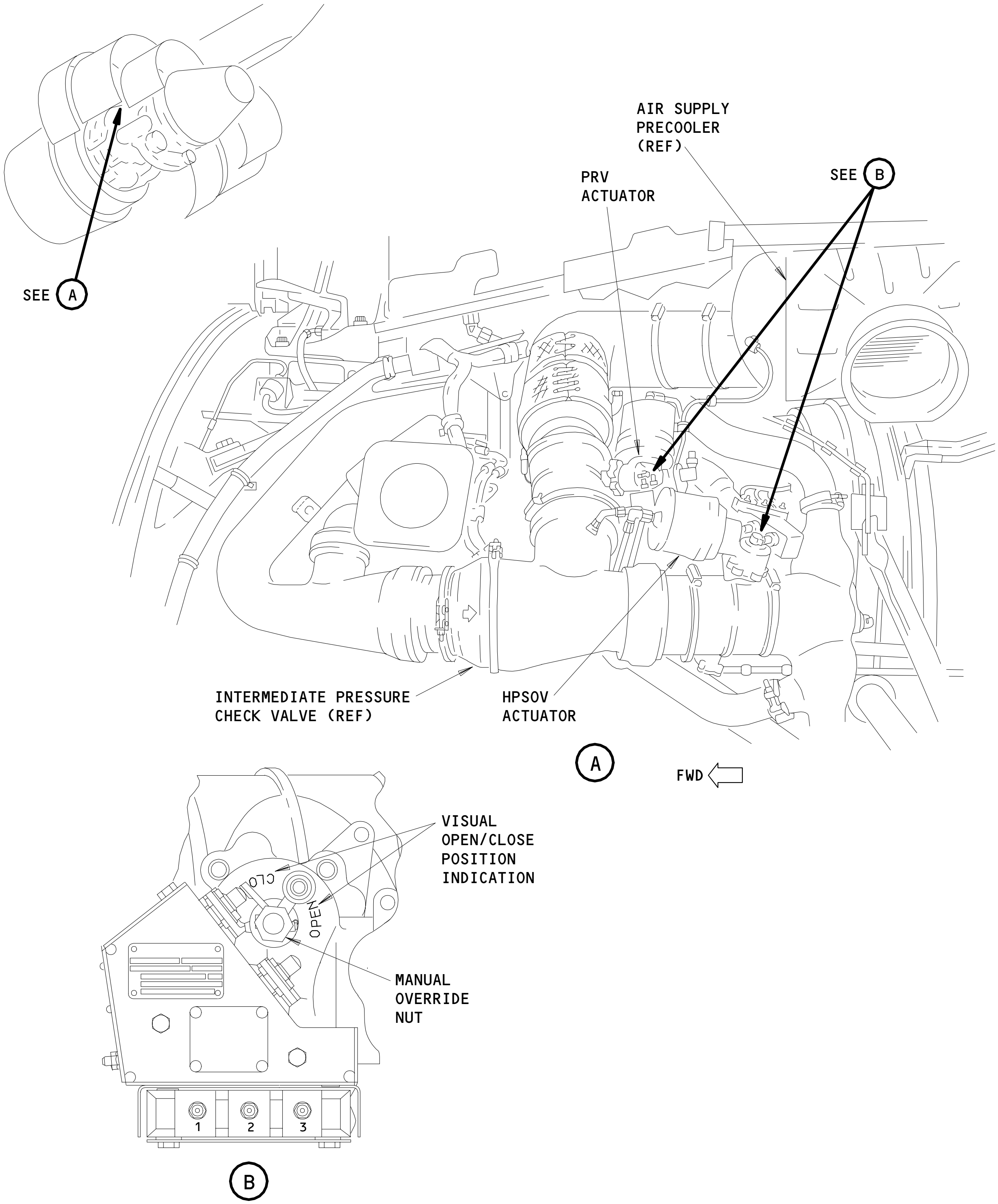
S 865-029-N00

(13) Pressurize the air supply system on the upstream side (the engine side) of the PRSOV (AMM 36-11-09/201).

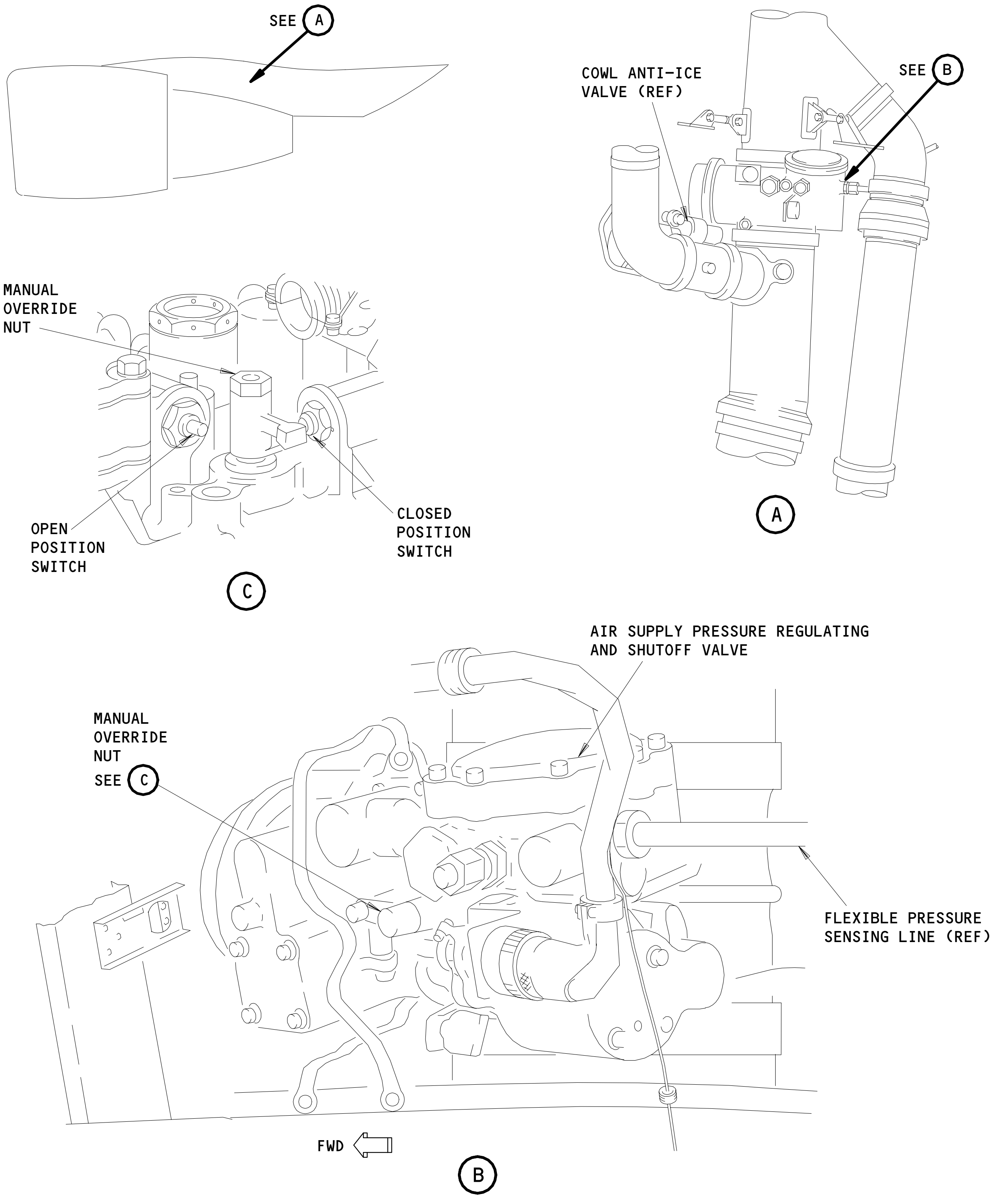
   NOTE: You can use a ground cart or the APU to pressurize the pneumatic system.

S 865-030-N00

(14) Pressurize the pneumatic system with the ground pneumatic cart.
   (a) For a leak test on the left engine, set these switches on the pilots' overhead panel, P5, as follows:
      1) Close the C ISLN valve.
      2) Close the L ISLN valve.
      3) Close the R ISLN valve.



PRV and HPSOV Actuators
Figure 502



Air Supply Pressure Regulating and Shutoff Valve
Figure 503

TEST NO. 1 - ENGINE PNEUMATIC LEAK TEST

(b) For a leak test on the right engine, set these switches on the pilots' overhead panel, P5, as follows:
1) Close the C ISLN valve.
2) Open the L ISLN valve.
3) Open the R ISLN valve.

(c) Supply 35 to 40 psig of pressure to the pneumatic system (AMM 36-00-00/201).

NOTE: After 8 to 10 psig pressure is supplied, the PRSOV and the PRV should stay open.

S 865-031-N00

(15) Start the APU (AMM 49-11-00/201) to pressurize the pneumatic system (optional procedure).

NOTE: You can pressurize the pneumatic system with the APU as an optional source if a ground cart is not available.

(a) For a leak test on left engine, set these switches on the pilots' overhead panel, P5, as follows:
1) Open the C ISLN valve.
2) Open the L ISLN valve.
3) Close the R ISLN valve.

(b) For a leak test on the right engine, set these switches on the pilots' overhead panel, P5, as follows:
1) Open the C ISLN valve.
2) Close the L ISLN valve.
3) Open the R ISLN valve.

(c) Supply pneumatic power from the APU.
1) Put the APU VALVE switch on the pilots' overhead panel, P5, in the OPEN position.
2) Make sure that the white light on the switch is on.
3) Make sure that the amber VALVE light comes on and then goes off.
4) Make sure that the duct pressure is 35 to 45 psi.

S 795-032-N00

(16) Examine all of the joints and connections for leaks in the part of the pneumatic system that is isolated.

NOTE: Air that leaks from one location around a duct coupling is not permitted. Air that leaks equally around a coupling is permitted.

(a) Put an anemometer 2.0 to 3.0 inches from the outside surface of the joints and connections to examine for leaks.

(b) Repair each joint or coupling (either by duct adjustment or duct replacement) that has a leak of more than 100 ft/min.

TEST NO. 1 - ENGINE PNEUMATIC LEAK TEST

S 795-695-N00

(17) Examine the nacelle anti-ice duct for leaks.

CAUTION: IF HOT AIR (APPROXIMATELY 350°F) IS USED, DO NOT OPEN THE ANTI-ICE VALVE OF THE ENGINE INLET FOR MORE THAN 30 SECONDS FOLLOWED BY A TIME TO BECOME COOL. DAMAGE TO THE INLET COWL CAN OCCUR.

(a) Open the anti-ice valve.
   1) Put the applicable ANTI-ICE, ENGINE L/R switch in the ON position.
   2) AIRPLANES WITHOUT THE ICE DETECTION SYSTEM;
      Make sure these components are in the condition that follows:
      a) The white ON light in the applicable switch shows.
      b) The amber VALVE light in the applicable switch comes on for approximately 2 seconds, then goes off.
   3) Make sure TAI shows in green above the applicable engine N1 indication on the main EICAS.

WARNING: YOU MUST BE VERY CAREFUL WHEN YOU FIND A LEAK. THE BLEED AIR LEAKAGE IS VERY HOT AND CAN CAUSE INJURY TO PERSONS.

(b) Examine the nacelle anti-ice duct for leaks.

   NOTE: Leakage of air is not permitted at the couplings.

(c) Close the anti-ice valve.
   1) Put the applicable ANTI-ICE, ENGINE L/R switch in the OFF position.
   2) AIRPLANES WITHOUT THE ICE DETECTION SYSTEM;
      Make sure these components are in the condition that follows:
      a) The white ON indication in the applicable switch goes off.
      b) The amber VALVE light in the applicable switch comes on for approximately 2 seconds, then goes off.
   3) Make sure TAI does not show in green above the applicable engine N1 indication on the main EICAS.

S 865-033-N00

(18) Remove pneumatic power (AMM 36-00-00/201).

S 215-034-N00

(19) Make sure the DUCT PRESSURE PSI gage on the pilots' overhead panel, P5, shows zero pressure.

TEST NO. 1 - ENGINE PNEUMATIC LEAK TEST

S 865-035-N00

(20) Stop the APU if it is in operation (AMM 49-11-00/201).

S 435-036-N00

(21) Connect the PRSOV downstream rigid pressure-sense line (Fig. 503).
- (a) Remove the cap from PRSOV downstream pressure-sense line.
- (b) Remove the plug from the valve tee.
- (c) Connect the downstream rigid pressure-sense line to the valve tee and tighten the nut.

S 415-037-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(22) Close the thrust reversers (AMM 78-31-00/201).

S 415-038-N00

(23) Close the core cowl panels (AMM 71-11-06/201).

S 415-628-N00

(24) Close the fan cowl panels (AMM 71-11-04/201).

S 445-039-N00

(25) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 415-041-N00

(26) For the left engine, close the strut pressure relief doors 434AL and 434AR.

S 415-042-N00

(27) For the right engine, close the strut pressure relief doors 444AL and 444AR.

S 865-043-N00

(28) Remove electrical power if it is not necessary (AMM 24-22-00/201).

TEST NO. 2 - ENGINE MOTORING TEST

TASK 71-00-00-715-002-N00

4. Test No. 2 - Engine Motoring Test

A. General

(1) This test examines the engine fuel system for leaks. This test also makes sure that N1, N2, oil pressure, and EPR are shown on EICAS without the engine started.

B. Special Tools and Equipment

(1) PWA 102757 Block, Wedge (2 Necessary - Optional)

C. References

(1) AMM 71-00-00/201, Power Plant (Operation Procedure)

(2) AMM 71-11-04/201, Fan Cowl Panel

(3) AMM 71-11-06/201, Core Cowl Panel

(4) AMM 78-31-00/201, Thrust Reverser System

D. Access

(1) Location Zones

211	Control Cabin
212	Control Cabin
411	Left Engine
421	Right Engine

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

TEST NO. 2 - ENGINE MOTORING TEST

E. Motor the engine and do the leak test.

NOTE: Refer to the Power-Plant Test-Reference Table for the correct motoring procedure (wet or dry).

S 865-698-N00

(1) If you do not want any N1 rotation, complete the following step (Optional).

(a) Carefully install two PWA 102757 Wedges between two fan blades and the fan case at approximately the 6 o'clock position (Fig. 503A).

NOTE: The thinnest edge of the wedge must be centered onto the leading edge of the fan blades and then tapped into position, along the blade chord line, until they fit tightly in the fan blade to case clearance gap.

S 015-044-N00

(2) Open the fan cowl panels (AMM 71-11-04/201).

S 045-045-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO YOU OR DAMAGE TO EQUIPMENT.

(3) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

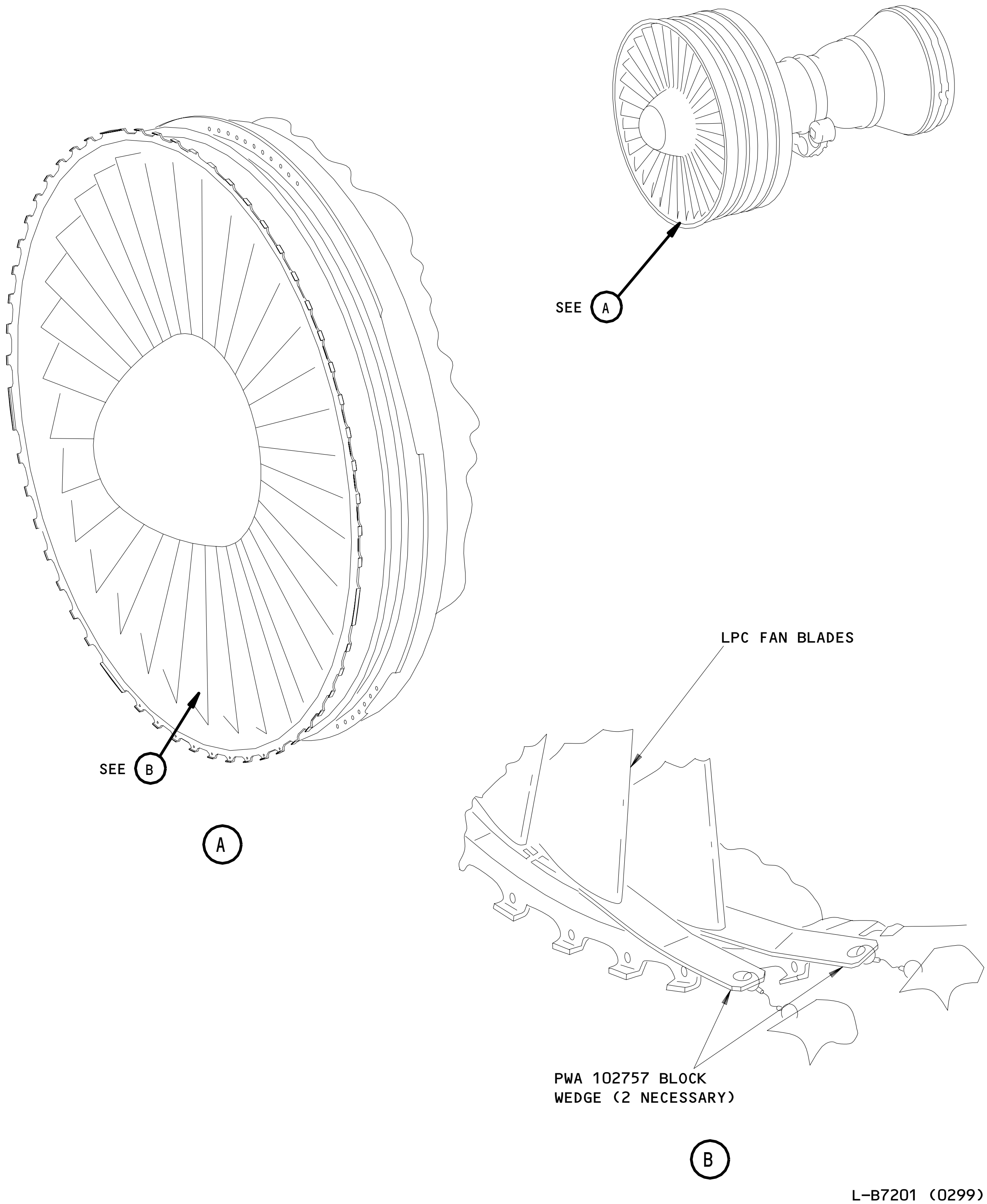
S 015-046-N00

(4) Open the core cowl panels (AMM 71-11-06/201).

S 015-047-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(5) Open the thrust reversers (AMM 78-31-00/201).



Installation of PWA 102757 Block Wedges
Figure 503A

TEST NO. 2 - ENGINE MOTORING TEST

S 795-048-N00

WARNING: USE AMM 71-00-00/201 TO OPERATE THE POWER PLANT. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE DAMAGE TO EQUIPMENT OR INJURY TO PERSONS.

(6) Use the Power Plant Dry-Motor procedure to motor the engine (AMM 71-00-00/201).
  (a) Make sure that the N1 and N2 digital indications are shown on the top EICAS display.
  (b) Make sure the oil pressure indication on the EICAS PERF/APU page is sufficient.

    NOTE: Do not continue to motor the engine if the oil pressure is not sufficient.

  (c) Make sure the EPR indication is shown on the top EICAS display as N2 increases.
  (d) Examine for leaks while you motor the engine.
  (e) If you see leaks, stop the engine motoring operation.
  (f) Repair the leaks.
  (g) Motor the engine again and examine for leaks.

S 795-049-N00

WARNING: USE AMM 71-00-00/201 TO OPERATE THE POWER PLANT. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE DAMAGE TO EQUIPMENT OR INJURY TO PERSONS.

(7) Use the Power Plant Wet-Motor procedure to motor the engine (AMM 71-00-00/201) (Optional).
  (a) Make sure that the N1 and N2 digital indications are shown on the top EICAS display.

TEST NO. 2 - ENGINE MOTORING TEST

(b) Make sure the oil pressure indication on the EICAS PERF/APU page is sufficient.

NOTE: Do not continue to motor the engine if the oil pressure is not sufficient.

(c) Make sure the EPR indication is shown on the top EICAS display as N2 increases.
(d) If you see leaks, stop the engine motoring operation.
(e) Repair the leaks.
(f) Motor the engine again and examine for leaks.

S 025-699-N00
(8) Remove Wedges (PWA 102757) from the fan blade to fan case clearance gap if used to prevent N1 rotation.

S 415-050-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(9) Close the thrust reversers (AMM 78-31-00/201).

S 415-051-N00
(10) Close the core cowl panels (AMM 71-11-06/201).

S 415-629-N00
(11) Close the fan cowl panels (AMM 71-11-04/201).

S 445-052-N00
(12) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

TEST NO. 3 - GROUND TEST AT IDLE POWER

TASK 71-00-00-795-003-N00

5. Test No. 3 - Ground Test at Idle Power

A. General

(1) This test makes sure that the EEC operates correctly. The test uses engine operation to supply electrical power to the EEC. The EEC does a test to find internal failures. All failures found are kept in the Propulsion Interface and Monitor Unit (PIMU).

(2) This test also pressurizes different systems at idle power to examine for leaks when a component was replaced.

(3) You can keep the engine cowls open when you do this test. Refer to the cowl limits in AMM 71-00-00/201 for the necessary steps to operate the engine with the cowls open.

(4) Only for the engine ground idle test, if hold open rod, P/N A3409-2 or leak check test rod, P/N A3409-3 are used, the core cowl does not have to be removed. For all other engine operation tests at thrust greater that idle, the core cowl panel must be removed.

B. References

(1) AMM 71-00-00/201, Power Plant (Operation Procedure)

(2) AMM 71-11-04/201, Fan Cowl Panel

(3) AMM 71-11-06/201, Core Cowl Panel

(4) AMM 78-31-00/201, Thrust Reverser System

C. Access

(1) Location Zones

211	Control Cabin
212	Control Cabin
411	Left Engine
421	Right Engine

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

D. Examine the engine for leaks with the engine at idle power.

TEST NO. 3 - GROUND TEST AT IDLE POWER

S 865-054-N00

WARNING: USE AMM 71-00-00/201 TO OPERATE THE POWER PLANT. IF YOU DO NOT USE THIS PROCEDURE , YOU CAN CAUSE DAMAGE TO EQUIPMENT OR INJURY TO PERSONS.

(1) Use the Power Plant Operation (Normal) procedure to start the engine (AMM 71-00-00/201).

S 865-613-N00

(2) Let the N2 rpm become stable at idle for five minutes.

S 715-056-N00

(3) Make sure the engine operates correctly.
   (a) Push the PERF/APU switch for the EICAS display on the right side panel, P61.
   (b) Make sure the N1, N2, EGT, and FF indications show on the bottom EICAS display.
   (c) Push the ECS/MSG switch for the EICAS display on the right side panel, P61.
      1) If there are maintenance messages on the bottom EICAS display, correct the failures as necessary.

S 865-057-N00

(4) Use the Power Plant Operation (Normal) procedure to do the engine shutdown (AMM 71-00-00/201).

S 015-058-N00

(5) Open the fan cowl panels (AMM 71-11-04/201).

S 045-059-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO YOU OR DAMAGE TO EQUIPMENT.

(6) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 015-060-N00

(7) Open the core cowl panels (AMM 71-11-06/201).

TEST NO. 3 - GROUND TEST AT IDLE POWER

S 015-061-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(8) Open the thrust reversers (AMM 78-31-00/201).

S 795-062-N00
(9) Examine the engine for leaks.

S 365-063-N00
(10) Repair the leaks as necessary.

NOTE: If an engine turns at speeds below idle, a small quantity of oil leakage can occur. It comes through one of the two sources, the NO. 1 bearing carbon seal assembly or the No. 2 bearing carbon seal assembly. This usually occurs when the engine turns at low speeds for an extended time (when an engine has an extended start/shutdown or when an engine turns freely in the wind). After engine shutdown, a small quantity of the oil leakage can be collected through the carbon seal assemblies, on the variable stator vane retention bolts at the bottom of the engine. It can also be on the bottom of the nose cone/spinner. This small quantity of oil leakage is permitted.

S 415-064-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(11) Close the thrust reversers (AMM 78-31-00/201).

S 415-065-N00
(12) Close the core cowl panels (AMM 71-11-06/201).

S 415-630-N00
(13) Close the fan cowl panels (AMM 71-11-04/201).

S 445-066-N00
(14) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 795-068-N00
(15) Do this test again if leaks were found.

TEST NO. 4 - ENGINE POWER AND ACCELERATION/DECELERATION TEST

TASK 71-00-00-725-004-N00

6. Test No. 4 - Engine Power and Acceleration/Deceleration Test

A. General

(1) This test makes sure these items are in the operation limits:

(a) Minimum Idle

(b) Approach Idle

(c) Minimum Idle Burner Pressure

(d) %N1 at 1.25 EPR

(e) Engine Acceleration/Deceleration Time

(2) Use the Trim Worksheet (Fig. 504) to write the engine data and the ambient conditions for this test. Keep the worksheets as a record to refer to in the future.

(3) The test tables are for engines with no bleed air. Thus, this test should not be done when the anti-ice systems are necessary. The anti-ice systems may be necessary in the rain, snow, or fog with the outside air temperature (OAT) less than 46 °F (8 °C).

(a) If the test must be done with the anti-ice on, keep the anti-ice system on during the operation. For the last 30 seconds at each power level, switch the anti-ice to off and get the necessary engine data.

B. Equipment

(1) Alcohol thermometer (or a mercury thermometer if it is not used inside the airplane) calibrated in degrees, -40 to +120°F (-40 to +49°C) range, ±1/2°F (±1/4°C)

C. References

(1) AMM 24-22-00/201, Electrical Power Control

(2) AMM 29-11-00/201, Main Hydraulic System

(3) AMM 36-00-00/201, Pneumatic - General

(4) AMM 49-11-00/201, Auxiliary Power Unit

(5) AMM 71-00-00/201, Power Plant (Operation Procedure)

(6) AMM 71-01-02/201, Power Plant (Trim Check Tables)

DATE ______________________ AIRPLANE NUMBER ______________________

ENGINE POSITION ______________________ ENGINE NUMBER ______________________

OAT ______________________ BAROMETRIC PRESSURE ______________________

MINIMUM IDLE (%N2):

TARGET	TOLERANCE	MINIMUM	MAXIMUM	ACTUAL

MINIMUM IDLE BURNER PRESSURE (PB) (PSIA):

TARGET	TOLERANCE	MINIMUM	MAXIMUM	ACTUAL

APPROACH IDLE (%N2):

TARGET	TOLERANCE	MINIMUM	MAXIMUM	ACTUAL

N1 AT 1.25 EPR (%N1):

TARGET	TOLERANCE	MINIMUM	MAXIMUM	ACTUAL

CORRECTED N2 AT 1.25 EPR (%N2C)______________________

Trim Worksheet
Figure 504 (Sheet 1)

ENGINE DATA AT MINIMUM IDLE:

EPR ____________ EGT ____________ VIB ____________ FUEL FLOW ____________

%N1 ____________ %N2 ____________ OIL TEMP ____________ OIL PRESS ____________

ENGINE DATA AT 1.25 EPR:

EPR ____________ EGT ____________ VIB ____________ FUEL FLOW ____________

%N1 ____________ %N2 ____________ OIL TEMP ____________ OIL PRESS ____________

ENGINE DATA AT APPROACH IDLE:

EPR ____________ EGT ____________ VIB ____________ FUEL FLOW ____________

%N1 ____________ %N2 ____________ OIL TEMP ____________ OIL PRESS ____________

ACCELERATION TO 1.25 EPR (SEC) ____________

DECELERATION TO 1.08 EPR (SEC) ____________

Trim Worksheet
Figure 504 (Sheet 2)

TEST NO. 4 - ENGINE POWER AND ACCELERATION/DECELERATION TEST

(7) AMM 71-11-04/201, Fan Cowl Panel
(8) AMM 71-11-06/201, Core Cowl Panel
(9) AMM 78-31-00/201, Thrust Reverser System
(10) FIM 71-PIMU MESSAGE INDEX

D. Access
(1) Location Zones

211	Control Cabin
212	Control Cabin
411	Left Engine
421	Right Engine

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

E. Prepare to do the Engine Power Test.

S 585-069-N00

(1) Put the airplane so that wind conditions permit the engine to be operated (Fig. 501).

S 975-070-N00

CAUTION: TO PREVENT ERRORS, DO NOT USE THE AIRPLANE TOTAL AIR TEMPERATURE FOR THE AMBIENT AIR TEMPERATURE. MAKE SURE TO GET THE LOCAL BAROMETRIC PRESSURE (NOT CORRECTED TO SEA LEVEL) FROM THE CONTROL TOWER.

CAUTION: DO NOT USE A MERCURY THERMOMETER ON THE AIRPLANE. IF THE THERMOMETER BREAKS, THE MERCURY CAN CAUSE DAMAGE TO EQUIPMENT.

(2) Get these ambient weather conditions:
   (a) Get the ambient temperature (outside air temperature, OAT) in the shade at the airplane nose gear.
      1) Write the OAT on the Trim Worksheet (Fig. 504).
   (b) Get the true local barometric pressure (PAMB).
      1) Write the PAMB on the Trim Worksheet (Fig. 504).

TEST NO. 4 - ENGINE POWER AND ACCELERATION/DECELERATION TEST

S 975-071-N00

(3) Use the Trim Check Tables (AMM 71-01-02/201) to find these trim targets and write the data on the Trim Worksheet (Fig. 504):

NOTE: Make sure you write the target values, the tolerances, and the limits (minimum/maximum).

MINIMUM IDLE (%N2)
MINIMUM IDLE BURNER PRESSURE (PB) (PSIA)
APPROACH IDLE (%N2)
N1 AT 1.25 EPR (%N1)

S 865-082-N00

CAUTION: MAKE SURE THE CENTER HYDRAULIC SYSTEM IS PRESSURIZED DURING ENGINE OPERATION. IF YOU DO NOT KEEP THE HYDRAULIC SYSTEM PRESSURIZED, YOU MAY NOT KEEP CONTROL OF THE AIRPLANE BRAKES AND STEERING.

(4) Pressurize the center hydraulic system (AMM 29-11-00/201).

NOTE: The center hydraulic system provides hydraulic pressure for control of the nose wheel steering and alternate and reserve brakes. The right hydraulic system may also be used at the same time to provide main brake pressure. Note that the right system does not provide control of the nose wheel steering. The use of both systems will not put too much load on the engine and affect the test.

S 865-083-N00

(5) Supply electrical power if it is not done (AMM 24-22-00/201).

S 215-084-N00

(6) Make sure the ECS valves are in the usual position for an engine start.

S 865-085-N00

(7) For the left engine, close these circuit breakers on the overhead circuit breaker panel, P11:
(a) 11A10, AIR DATA CMPTR L
(b) 11C27, L ENG EEC CHAN A RST
(c) 11D17, ENGINE EEC DISCRETES L
(d) 11D25, ENGINE FUEL CONT VLV & EEC CHAN B RESET L
(e) 11F30, AIR DATA CMPTR R
(f) 11L3, LEFT ENGINE PERF SOL CHAN A
(g) 11L4, LEFT ENGINE PERF SOL CHAN B
(h) 11M6, LEFT ENGINE IDLE CONT

TEST NO. 4 - ENGINE POWER AND ACCELERATION/DECELERATION TEST

S 865-086-N00

(8) For the right engine, close these circuit breakers on the overhead circuit breaker panel, P11:
- (a) 11A10, AIR DATA CMPTR L
- (b) 11C28, R ENG EEC CHAN A RST
- (c) 11D26, ENGINE FUEL CONT VLV & EEC CHAN B RESET R
- (d) 11F30, AIR DATA CMPTR R
- (e) 11L30, RIGHT ENGINE PERF SOL CHAN A
- (f) 11L31, RIGHT ENGINE PERF SOL CHAN B
- (g) 11M32, RIGHT ENGINE EEC DISCRETES
- (h) 11M33, RIGHT ENGINE IDLE CONT

S 865-087-N00

(9) For the left engine, close this circuit breaker on the main power distribution panel, P6:
- (a) 6L19, LEFT ENG PROBE HEAT

S 865-088-N00

(10) For the right engine, close this circuit breaker on the main power distribution panel, P6:
- (a) 6K25, RIGHT ENG PROBE HEAT

S 865-089-N00

WARNING: USE AMM 71-00-00/201 TO OPERATE THE POWER PLANT. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE DAMAGE TO EQUIPMENT OR INJURY TO PERSONS.

(11) Do the Power Plant Operation (Normal) procedure to start the engine (AMM 71-00-00/201).

S 865-090-N00

CAUTION: START THE OTHER ENGINE OR THE APU. TO PREPARE FOR AN EMERGENCY ENGINE SHUT-DOWN, THE OTHER ENGINE OR THE APU MUST BE OPERATED FOR PNEUMATIC POWER. IF PNEUMATIC POWER IS NOT AVAILABLE DURING AN EMERGENCY SHUT-DOWN, YOU CAN CAUSE DAMAGE TO THE ENGINE.

(12) Do the Power Plant Operation (Normal) procedure to start the other engine (AMM 71-00-00/201) or do the APU Operation (AMM 49-11-00/201) procedure.

S 865-091-N00

(13) Remove the ground pneumatic power, if it was supplied (AMM 36-00-00/201).

TEST NO. 4 - ENGINE POWER AND ACCELERATION/DECELERATION TEST

S 865-092-N00

(14) On the pilots' overhead panel, P5, make sure these components are in the conditions that follow:

NOTE: The test limits were found for an engine that does not have an electrical (IDG) or pneumatic (bleed air) load.

It is not necessary to remove power from the engine driven (hydraulic) pump. The hydraulic pump does not cause a large enough load on the engine.

(a) Applicable engine BLEED switch - OFF
(b) WING ANTI-ICE switch - OFF (unless required)
(c) Applicable ENGINE ANTI-ICE switch - OFF (unless it is necessary to use)
(d) Applicable GEN CONT switch - OFF

S 865-093-N00

(15) Let the engine become stable at idle for five minutes.

F. Do the Engine Power Test.

S 975-094-N00

(1) Write the engine data (EPR, EGT, %N1, %N2, fuel flow, vibration level, oil pressure, oil temperature) on the Trim Worksheet as the ENGINE DATA AT MINIMUM IDLE.
(a) Make sure that the engine indications are in the operation limits (AMM 71-00-00/201).

S 865-095-N00

(2) Push the PERF/APU switch for EICAS on the right side panel, P61.

S 975-096-N00

(3) Examine the minimum idle %N2 and BURNER PRESSURE as follows:
(a) Write the %N2 indication (shown on the EICAS PERF/APU page) on the Trim Worksheet as the MINIMUM IDLE (%N2) - ACTUAL.
(b) Write the BURN PR indication (shown on the EICAS PERF/APU page) on the Trim Worksheet as the MINIMUM IDLE BURNER PRESSURE (PB) (PSIA) - ACTUAL.

TEST NO. 4 - ENGINE POWER AND ACCELERATION/DECELERATION TEST

(c) Make sure the %N2 and the PB are in the specified limits.

NOTE: The EEC controls minimum idle speed on the gound by one of two schedules: A minimum N2 schedule or a minimum PB schedule. The EEC selects the schedule that gives the higher fuel flow. Ambient conditions and service bleed affect %N2, fuel flow, and PB. Thus, the EEC may control fuel flow based on %N2 on some conditions and PB on others. Engine idle operation is satisfactory if the %N2 is within the limits or the PB is within the limits. It is not necessary for both %N2 and PB to be within the limits at the same time (although they usually are).

S 215-097-N00

(4) On the overhead panel P5, make sure the ALTN light on the L(R) EEC switch is the OFF position.

S 865-639-N00

(5) Move the thrust lever forward until the engine is at 1.25 EPR.

S 865-106-N00

(6) Let the engine become stable for 15 to 20 seconds.

S 865-107-N00

(7) Push the EVENT RECORD switch on the forward electrical control stand, P9.

NOTE: This switch keeps a record of the engine data at 1.25 EPR.

S 975-716-N00

(8) Record position of thrust lever for use during the acceleration test.

S 985-108-N00

(9) Put the thrust lever back in the idle position.

S 975-109-N00

(10) Get the necessary data from the EICAS EPCS MAN EVENT page.

NOTE: This is the record of the EPCS page for the engine data at 1.25 EPR.

(a) Push the EPCS switch on the right side panel, P61.
(b) Push the EVENT READ-MAN switch on the right side panel, P61.

TEST NO. 4 - ENGINE POWER AND ACCELERATION/DECELERATION TEST

(c) Write the N2C indication (shown on the EICAS EPCS MAN EVENT page) on the Trim Worksheet as the CORRECTED N2 AT 1.25 EPR (%N2C).

S 975-111-N00

(11) Get the necessary data from the EICAS PERF/APU MAN EVENT page.
(a) Push the PERF/APU switch on the right side panel, P61.
(b) Push the EVENT READ-MAN switch on the right side panel, P61.
(c) Write the engine parameters (shown on the EICAS PERF/APU MAN EVENT page) on the Trim Worksheet as the ENGINE DATA AT 1.25 EPR.
(d) Write the %N1 indication on the Trim Worksheet as the N1 AT 1.25 EPR (%N1) - ACTUAL.
(e) Make sure the items at 1.25 EPR on the Trim Worksheet are in the specified limits.

S 865-112-N00

(12) Let the engine become stable at idle for five minutes.

S 715-114-N00

(13) Examine the engine data at approach idle.
(a) Set the engine at approach idle as follows:
1) Open this circuit breaker on the APU external power panel, P34:
a) 34L1, ENG IDLE CONT
2) For the left engine, open this circuit breaker on the overhead circuit breaker panel, P11:
a) 11M6, LEFT ENGINE IDLE CONT
3) For the right engine, open this circuit breaker on the overhead circuit breaker panel, P11:
a) 11M33, RIGHT ENGINE IDLE CONT
(b) Push the PERF/APU switch for EICAS on the right side panel, P61.
(c) Write the engine data (shown on the EICAS PERF/APU page) on the Trim Worksheet as the ENGINE DATA AT APPROACH IDLE.
1) Make sure the engine at approach idle on the Trim Worksheet is in the specified limits (Ref 71-00-00/201).
(d) Write the N2 indication (shown on the EICAS PERF/APU page) on the Trim Worksheet as APPROACH IDLE (%N2) - ACTUAL.
1) Make sure that the APPROACH IDLE (%N2) - ACTUAL is in the limits.

TEST NO. 4 - ENGINE POWER AND ACCELERATION/DECELERATION TEST

(e) Put the engine back to minimum idle as follows:
   1) For the left engine, close this circuit breaker on the overhead circuit breaker panel, P11:
      a) 11M6, LEFT ENGINE IDLE CONT
   2) For the right engine, close this circuit breaker on the overhead circuit breaker panel, P11:
      a) 11M33, RIGHT ENGINE IDLE CONT
   3) Close this circuit breaker on the APU external power panel, P34:
      a) 34L1, ENG IDLE CONT

S 715-715-N00

CAUTION: IF ENGINE SURGE IS ENCOUNTERED, RAPIDLY (IN LESS THAN ONE SECOND) MOVE THRUST LEVER TO MINIMUM IDLE. OPERATE THE ENGINE AT MINIMUM IDLE FOR FIVE MINUTES IF THE EGT IS AT THE NORMAL IDLE EGT LEVEL AND THE ENGINE OPERATES AT THE NORMAL IDLE SPEED. AFTER FIVE MINUTES AT MINIMUM IDLE, CONTINUE WITH THIS TEST.

(14) Do the Engine Acceleration/Deceleration Test.
   (a) Examine the engine acceleration in primary EPR mode as follows:
      1) Set engine speed to APPROACH IDLE %N2 speed with the thrust lever. Use the value recorded earlier as APPROACH IDLE (%N2) - ACTUAL.
      2) Operate the engine at APPROACH IDLE %N2 speed for 15 minutes. It is necessary to stabilize the engine at the APPROACH IDLE position prior to acceleration step.
      3) In less than one second, move the thrust lever from the APPROACH IDLE position to the 1.25 EPR position determined earlier.
      4) Measure the time of the engine acceleration from APPROACH IDLE to 1.23 EPR.
      5) Write the engine acceleration time on the Trim Worksheet.
      6) The engine acceleration time should be 5.7 seconds or less to the 1.23 EPR target.
      7) Stabilize the engine for 30 - 35 seconds. Make sure engine does not exceed 1.25 EPR.
   (b) Examine the engine deceleration as follows:
      1) In less than one second, move the thrust lever to the idle position.
      2) Measure the time of the engine deceleration from 1.25 EPR to 1.08 EPR.
      3) Write the deceleration time on the Trim Worksheet.
      4) The engine deceleration time should be 6.0 seconds or less to the 1.08 EPR target.
      5) Make sure engine stabilizes at minimum idle.

TEST NO. 4 - ENGINE POWER AND ACCELERATION/DECELERATION TEST

G. Put the airplane back to its usual condition.

S 865-117-N00

(1) Let the engine operate at minimum idle for five minutes to decrease the engine temperature.

S 865-118-N00

(2) Use the Power Plant Operation (Normal) procedure to do the engine shutdown (AMM 71-00-00/201).

S 865-119-N00

(3) If the other engine was operated, use the Power Plant Operation (Normal) procedure to do the engine shutdown (AMM 71-00-00/201).

S 865-120-N00

(4) If the APU was operated, use the APU Operation procedure to do the APU shutdown (AMM 49-11-00/201).

S 015-121-N00

(5) Open the fan cowl panels (AMM 71-11-04/201).

S 045-122-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO YOU OR DAMAGE TO EQUIPMENT.

(6) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 015-123-N00

(7) Open the core cowl panels (AMM 71-11-06/201).

S 015-124-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(8) Open the thrust reversers (AMM 78-31-00/201).

S 215-125-N00
(9) Examine the engine for leaks.

NOTE: If an engine turns at speeds below idle, oil can leak through the No. 2 bearing carbon seal assembly. This usually only occurs when the engine turns at low speeds for an extended time (when an engine has an extended start/shutdown or when an engine turns freely in the wind). After engine shutdown, this oil may drain on the variable stator vane retention bolts at the bottom of the engine. This small quantity of oil leakage is permitted.

S 365-126-N00
(10) Repair the leaks as necessary.

S 415-127-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(11) Close the thrust reversers (AMM 78-31-00/201).

S 415-128-N00
(12) Close the core cowl panels (AMM 71-11-06/201).

S 415-627-N00
(13) Close the fan cowl panels (AMM 71-11-04/201).

S 445-129-N00
(14) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 795-131-N00
(15) If leaks were found and repaired, do Test No. 3 - Ground Test at Idle Power.

S 745-560-N00
(16) Do a check of PIMU messages:
(a) Make sure these circuit breakers on the forward miscellaneous electrical equipment panel, P33, are closed:
1) 33D4, PIMU L ENG
2) 33D5, PIMU R ENG
3) 34P3, EEC GRD TEST - R ENG
(b) Make sure these circuit breakers on the overhead circuit breaker panel, P11, are closed:
1) 11L7, EEC/SCU PWR L ENG

TEST NO. 4 - ENGINE POWER AND ACCELERATION/DECELERATION TEST

2) 11K28, EEC/SCU PWR R ENG

(c) Put the EEC MAINT L (R) ENG POWER switches on the right side panel, P61, to the TEST position.

(d) Do these steps to put the EEC fault codes into the L(R) PIMU for the engine that was tested:

1) Push the RESET switch on the PIMU.
2) Put the PIMU GRD TEST switch to the CH A position.
3) Stop for ten seconds.
4) Put the PIMU GRD TEST switch to the CH B position.
5) Push the BIT switch on the PIMU and write the PIMU messages.

NOTE: The PIMU messages will show one at a time when you push the BIT switch. The channel A messages will show before the channel B messages. The message END will show after all the PIMU messages have shown. The message END will show for ten seconds and then the PIMU will go off.

(e) Put the EEC MAINT L (R) ENG POWER switches on the right side panel, P61, to the NORM position.

(f) If a PIMU message shows, correct the failures as necessary (FIM 71-PIMU MESSAGE INDEX).

TEST NO. 5 - OIL SYSTEM STATIC LEAK TEST

TASK 71-00-00-795-005-N00

7. Test No. 5 - Oil System Static Leak Test

A. General

(1) This test pressurizes the main gearbox to examine the gearbox seals for leaks.

B. Equipment

(1) Adapter - PWA 85700, Pratt & Whitney

(2) Air Supply - Pneumatic Unit

NOTE: The pneumatic unit should have a maximum pressure of 10 psig (69 KPA) and a maximum temperature of 325 °F (160 °C) (air at room temperature is best).

(3) Pint bottle of water

(4) Hose - 2-feet long, 3/8-inch diameter (to slip-fit on the drain tubes)

C. Consumable Materials

(1) Solution - Leak Check - PMC 9569 Fluid or PMC 2277 Fluid

(2) Portable Nitrogen

D. References

(1) AMM 71-11-04/201, Fan Cowl Panel

(2) AMM 71-11-06/201, Core Cowl Panel

(3) AMM 78-31-00/201, Thrust Reverser System

E. Access

(1) Location Zones

411	Left Engine
421	Right Engine

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

F. Do the Oil System Static Leak Test.

S 015-132-N00

(1) Open the fan cowl panels (AMM 71-11-04/201).

TEST NO. 5 - OIL SYSTEM STATIC LEAK TEST

S 045-133-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO YOU OR DAMAGE TO EQUIPMENT.

(2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 015-134-N00

(3) Open the core cowl panels (AMM 71-11-06/201).

S 015-135-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(4) Open the thrust reversers (AMM 78-31-00/201).

S 485-136-N00

(5) Install the tube end of PWA 85700 adapter into the deoiler vent duct (Fig. 505).

S 485-137-N00

(6) Connect the air supply or portable nitrogen to the plug end of the PW adapter.

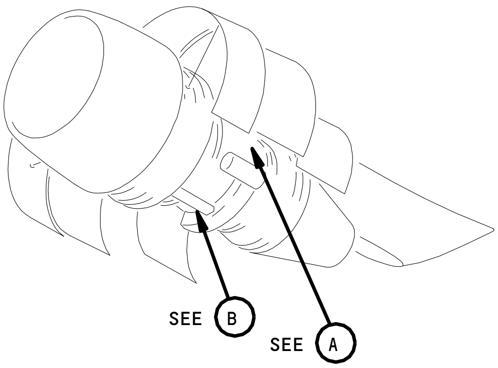
S 865-138-N00

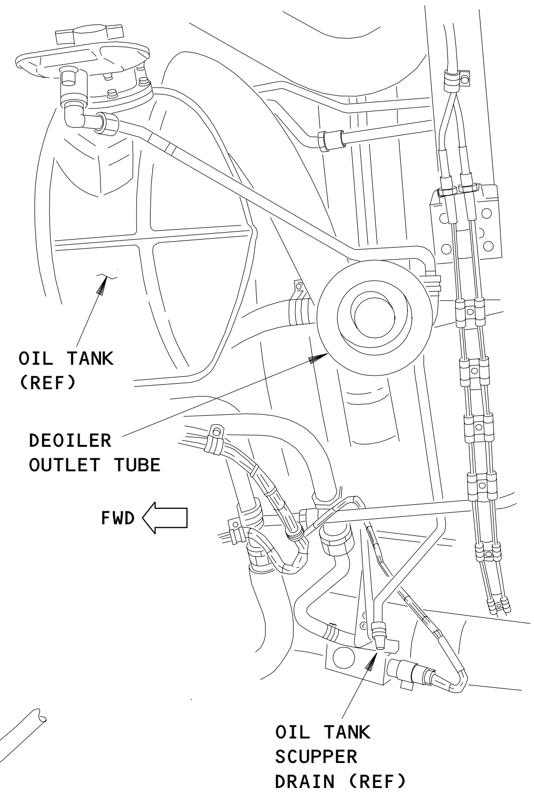
CAUTION: DO NOT SUPPLY MORE THAN 10 PSIG (68.9 KPA) PRESSURE OR 325 °F (163 °C) TEMPERATURE AIR TO THE GEARBOX. DO NOT MOTOR THE ENGINE DURING THIS TEST. IF YOU MOTOR THE ENGINE WHILE THE OIL SYSTEM IS PRESSURIZED, YOU CAN CAUSE OIL CONTAMINATION OF THE COMPRESSOR AND GAS PATH.

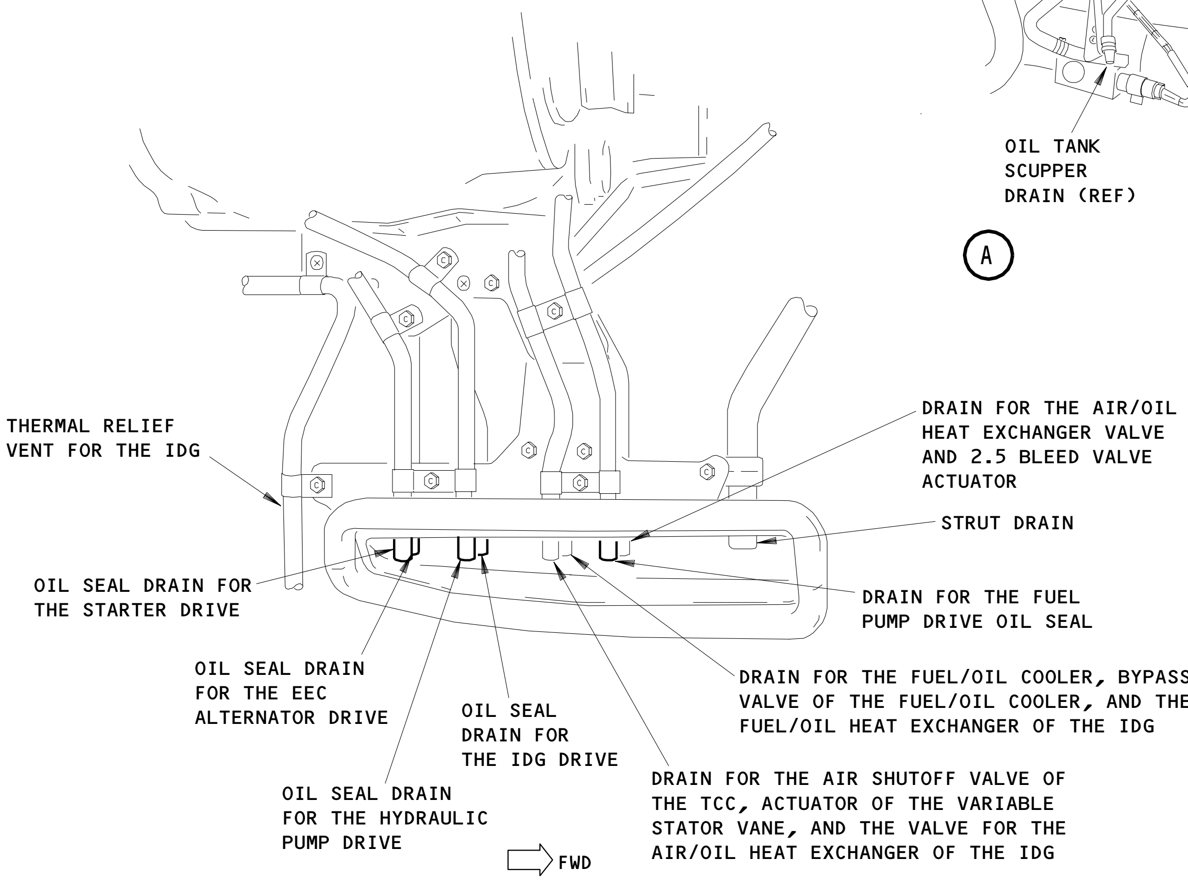
(7) Supply clean, dry air or portable nitrogen to the main gearbox.

NOTE: The pressure must be at least 7 psig (48 KPA) to give an accurate result, but do not supply more than 10 psig (68.9 KPA) of pressure.

(a) Make sure the air pressure is 7 to 10 psig (48 to 68.9 KPA).
(b) Make sure the air temperature is less than 325 °F (163 °C).







DRAIN COLLECTOR
B

Oil System Static Leak Test Port Locations
Figure 505

TEST NO. 5 - OIL SYSTEM STATIC LEAK TEST

S 795-139-N00

(8) Examine the gearbox seal drains for leaks.
  (a) Connect a hose to each gearbox seal drain at the drain collector (Fig. 505).
  (b) Put the hoses in the pint bottle of water one at a time.
    1) All seal leaks that cause steady air bubbles in the water are not permitted.

      NOTE: You should see some air bubbles that slowly come into view. Steady air bubbles show that the leakage is too much.

S 795-140-N00

(9) Use the leak check or a soap and water solution to examine for leaks at these locations:
  (a) All the oil lines from the oil pump to the main gearbox and to the bearings.
  (b) All the gearbox housing covers and connections.
  (c) All the connections to the deoiler.
  (d) All the gearbox pad seals that do not have overboard drains.
  (e) All the angle gearbox and the lay shaft connections.

S 865-141-N00

(10) Remove the air pressure from the main gearbox.

S 365-142-N00

(11) Repair all leaks and do the test again as necessary.

S 085-143-N00

(12) Remove the air supply lines.

S 085-144-N00

(13) Remove the PW adapter from the deoiler vent duct.

S 415-145-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(14) Close the thrust reversers (AMM 78-31-00/201).

S 415-146-N00

(15) Close the core cowl panels (AMM 71-11-06/201).

TEST NO. 5 - OIL SYSTEM STATIC LEAK TEST

S 415-631-N00
(16) Close the fan cowl panels (AMM 71-11-04/201).

S 445-147-N00
(17) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

TEST NO. 6 - ELECTRONIC ENGINE CONTROL (EEC) IDLE TEST

TASK 71-00-00-745-006-N00

8. Test No. 6 - Electronic Engine Control (EEC) Idle Test

A. General

(1) This task makes sure the three items that follow operate correctly during the engine operation.

(a) The EEC

(b) The interface between the EEC and the engine components

(c) The interface between the EEC and the airplane.

(2) The EEC does the self tests internally, and relays the test failure data with the fault codes to the Propulsion Interface and Monitor Unit (PIMU).

(3) This task does checks for the items that follow:

(a) A check of EICAS data with the engine at idle.

(b) And checks for EICAS maintenance messages and PIMU messages.

B. References

(1) AMM 24-22-00/201, Electrical Power

(2) AMM 71-00-00/201, Power Plant (Operating Procedures)

(3) FIM 71-EICAS MESSAGES

(4) FIM 71-PIMU MESSAGE INDEX

C. Access

(1) Location Zones

211 Control Cabin
212 Control Cabin

D. Prepare for the EEC idle test.

S 865-595-N00

(1) Make sure the applicable NACELLE ANTI-ICE and ENGINE BLEED switches are in the OFF position.

S 865-596-N00

(2) Make sure the EEC MAINT L (R) ENG POWER switch on the P61 panel is in the NORM position.

S 865-149-N00

WARNING: USE AMM 71-00-00/201 TO OPERATE THE POWER PLANT. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE DAMAGE TO EQUIPMENT OR INJURY TO PERSONS.

(3) Use the Power Plant Operation (Normal) procedure to start the engine (AMM 71-00-00/201).

TEST NO. 6 - ELECTRONIC ENGINE CONTROL (EEC) IDLE TEST

S 865-150-N00

(4) Operate the engine at minimum idle for five minutes.

NOTE: Do not do this step if the engine has operated at the minimum idle condition for five minutes as part of the engine start procedure.

S 715-151-N00

(5) Make sure the engine operates correctly.
- (a) Push the PERF/APU switch for the EICAS display on the right side panel, P61.
- (b) Make sure the N1, N2, EGT, and FF indications show on the bottom EICAS display.
- (c) Push the EPCS switch for the EICAS display on the right side panel, P61.
- (d) Make sure these indications show on the bottom EICAS display: TRA, SVA, BVA, N2C, T2, PS, P2, RP, SCAV, P5, AOC, and TCC.
- (e) Push the ECS/MSG switch for the EICAS display on the right side panel, P61.
  - 1) If there are maintenance messages on the bottom EICAS display, correct the failures as it is necessary (FIM 71-EICAS Messages).

E. Do a check for the maintenance messages.

S 975-152-N00

(1) Put the EEC fault codes into the PIMU as follows:
- (a) Push the RESET switch on the L(R) PIMU.
- (b) Put the L(R) PIMU GRD TEST switch to the CH A position.
- (c) Stop for ten seconds.
- (d) Put the L(R) PIMU GRD TEST switch to the CH B position.
- (e) Push the BIT switch on the PIMU and write the PIMU messages:

  NOTE: The PIMU messages will show one at a time when you push the BIT switch. The channel A messages will show before the channel B messages. The message END will show after all the PIMU messages have shown. The message END will show for ten seconds and then the PIMU will go off.

- (f) Push the RESET switch on the L(R) PIMU.

TEST NO. 6 - ELECTRONIC ENGINE CONTROL (EEC) IDLE TEST

S 865-153-N00

(2) Use the Power Plant Operation (Normal) procedure to do the engine shutdown (AMM 71-00-00/201).

S 815-598-N00

(3) If the PIMU messages show, correct the failures as they are necessary (FIM 71-PIMU MESSAGE INDEX).

S 865-154-N00

(4) Push the ECS/MSG switch for the EICAS display on right side panel, P61.
   (a) If there are maintenance messages on the bottom EICAS display, correct the failures as necessary.

TEST NO. 7 - ELECTRONIC ENGINE CONTROL (EEC) STATIC TEST

TASK 71-00-00-745-007-N00

9. Test No. 7 - Electronic Engine Control (EEC) Static Test

A. General

(1) This task makes sure the three items that follow operate correctly without the engine operation:

(a) The EEC

(b) The interface between the EEC and the engine components

(c) The interface between the EEC and the airplane.

(2) The EEC does the self tests internally, and relays the test failure data with the fault codes to the Propulsion Interface and Monitor Unit (PIMU).

(3) This procedure does checks on the four items in the list below:

(a) The circuit for the switch of the EEC mode select

(b) EEC/Auto-throttle arm discrete

(c) EEC/TLA at idle and full throttle

(d) EEC fault dump.

(4) When you do this task after the replacement of the component listed below, do a check for EICAS and PIMU messages only:

(a) The EEC inlet total pressure/temperature (PT2/TT2) probe

B. References

(1) AMM 24-22-00/201, Electrical Power - Control

(2) FIM 71-PIMU MESSAGE INDEX

C. Access

(1) Location Zones

211 Control Cabin

212 Control Cabin

D. Do the EEC Static Test.

S 865-155-N00

(1) Supply electrical power (AMM 24-22-00/201).

S 865-156-N00

(2) Prepare the airplane for the test as follows:

(a) Make sure this circuit breaker on the forward miscellaneous equipment panel, P33, is closed:

1) 33D4, PIMU L ENG

2) 33D5, PIMU R ENG

TEST NO. 7 - ELECTRONIC ENGINE CONTROL (EEC) STATIC TEST

(b) Make sure these circuit breakers on the overhead circuit breaker panel, P11, are closed:
1) 11L7, EEC/SCU PWR L ENG
2) 11K28, EEC/SCU PWR R ENG

S 865-588-N00

(3) If you replaced the EEC, programming plug, or power plant, prepare the airplane for the test as follows:

WARNING: MAKE SURE YOU OPEN THESE CIRCUIT BREAKERS BEFORE YOU CONTINUE THIS TEST. IF YOU DO NOT OPEN THESE CIRCUIT BREAKERS, THE THRUST REVERSER CAN RETRACT. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(a) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
1) 11D14 ENGINE T/R CONT L
2) 11S10 LEFT ENG BLEED IND
3) 11L33 RIGHT ENGINE T/R CONT
4) 11S19 RIGHT ENG BLEED IND

(b) Make sure these switches are at the position shown:
1) L(R) COW ANTI-ICE (M10397 panel) - OFF
2) L(R) PACK MODE SELECT (M10078 panel) - AUTO
3) WING ANTI-ICE WINDOW - PROBE HT TEST (M10398 panel) - OFF
4) STANDBY ENG. IND. (SEI) (P10016 panel) - AUTO
5) EICAS COMPUTER SELECT switch (M10195 panel) - AUTO
6) FLAP SELECTOR (P3 panel) - NORM
7) L(R) FUEL CONTROL (M73 panel) - CUTOFF
8) L(R) EEC MODE SELECT (P5 panel) - NORM
9) AUTO-THROTTLE ARM (P55 panel) - OFF

(c) Make sure the thrust lever is in the idle position.

S 865-159-N00

(4) Put the applicable EEC MAINT L (R) ENG POWER switch on the right side panel, P61, to the TEST position.

TEST NO. 7 - ELECTRONIC ENGINE CONTROL (EEC) STATIC TEST

E. Do the check after the EEC, programming plug, or power plant replacement.

S 725-599-N00

(1) If you replaced the EEC, programming plug, or power plant, do the check of the EEC Mode Select switch.
   (a) Move and hold the L(R) thrust lever to the fully forward position.
   (b) Make sure the EPR command selector aligns with or is greater than the maximum EPR limit (amber bar) on the EICAS display.
   (c) Put the L(R) EEC mode select switch on the P5 panel to the ALTN position while you hold the thrust lever for the applicable engine at the fully forward position.
   (d) Make sure the EPR command sector on the EICAS display does not show.
   (e) Make sure that the L(R) EEC "ALTN" mode light comes on.
   (f) Move the L(R) thrust lever slowly to the idle position.
   (g) Put the L(R) EEC mode select switch to the NORM position.
   (h) Make sure that the L(R) EEC "ALTN" mode light goes off.

S 725-600-N00

(2) If you replaced the EEC, programming plug, or power plant, and the EICAS had page 2 of the EPCS page, do the check of the auto-throttle arm discrete.
   (a) Push the EPCS switch on the EICAS Maintenance panel.
   (b) Push the EPCS switch again to get to the page 2.
   (c) Make sure the auto-throttle arm switch on the center glareshield, P55, is in the OFF position.
   (d) Make sure that the LABEL 275 bit 22 is set to zero for the two EEC channels (FIM 71-PIMU MESSAGE INDEX).
   (e) Put the auto-throttle arm switch to the A/T ARM position.
   (f) Make sure that the LABEL 275 bit 22 is now set to one (FIM 71-PIMU MESSAGE INDEX).
   (g) Put the auto-throttle arm switch to the OFF position.

S 725-601-N00

(3) If you replaced the EEC, programming plug, or power plant, do a check of the EEC thrust lever angle (TLA) at idle and full throttle.
   (a) Push the EPCS switch on the EICAS Maintenance panel, if you did not do this before.
   (b) Make sure that the L(R) TRA indication, on the EICAS EPCS page, is between 33.4 and 34.3 degrees.
   (c) Put the L(R) thrust lever to the fully forward position.
   (d) Make sure that the L(R) TRA indication, on the EICAS EPCS page, is between 82.5 and 87.5 degrees.
   (e) Put the thrust lever to the idle position.

TEST NO. 7 - ELECTRONIC ENGINE CONTROL (EEC) STATIC TEST

F. Do a check for maintenance messages.

S 975-602-N00

(1) Put the EEC fault codes into the L(R) PIMU as follows:
   (a) Put the RESET switch on the PIMU.
   (b) Put the L(R) PIMU GRD TEST switch to the CH A position.
   (c) Stop for ten seconds.
   (d) Put the L(R) PIMU GRD TEST switch to the CH B position.
   (e) Push the BIT switch on the L(R) PIMU and write the PIMU messages:

   NOTE: The PIMU messages will show one at a time when you push the BIT switch. The channel A messages will show before the channel B messages. The message END will show after all the PIMU messages have shown. The message END will show for ten seconds and then the PIMU will go off.

   (f) Push the RESET switch on the L(R) PIMU.

S 865-603-N00

(2) Put the applicable EEC MAINT L (R) ENG POWER switch on the right side panel, P61, to the NORM position.

S 815-604-N00

(3) If there are PIMU messages, correct the failures as it is necessary (FIM 71-PIMU MESSAGE INDEX).

G. Put the airplane back to its usual condition.

S 865-605-N00

(1) If you installed, remove the DO-NOT-CLOSE tags and close these circuit breakers as follow:

   (a) P11 Overhead Circuit Breaker Panel
      1) 11D14 ENGINE T/R CONT L
      2) 11L33 RIGHT ENGINE T/R CONT
      3) 11S10 LEFT ENG BLEED IND
      4) 11S19 RIGHT ENG BLEED IND

TEST NO. 8 - VIBRATION SURVEY

TASK 71-00-00-725-008-N00

10. Test No. 8 - Vibration Survey

A. General

(1) This procedure makes sure that the engine vibration is at a satisfactory value after a system repair, or component replacement.

NOTE: This procedure is for ground tests of the engines during maintenance, and does not apply to flight operation.

B. References

(1) AMM 49-11-00/201, Auxiliary Power Unit

(2) AMM 71-00-00/201, Power Plant (Operating Procedures)

(3) AMM 72-31-00/501, Low Pressure Compressor

C. Access

(1) Location Zones

211 Control Cabin

212 Control Cabin

D. Prepare to do the vibration survey.

S 865-163-N00

(1) Make sure this circuit breaker on the overhead circuit breaker panel, P11, is closed.

(a) 11K1, ENGINE VIB MONITOR

S 865-164-N00

WARNING: USE AMM 71-00-00/201 TO OPERATE THE POWER PLANT. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE DAMAGE TO EQUIPMENT OR INJURY TO PERSONS.

(2) Use the Power Plant Operation (Normal) procedure to start the engine (AMM 71-00-00/201).

S 865-165-N00

CAUTION: START THE OTHER ENGINE OR THE APU. TO PREPARE FOR AN EMERGENCY ENGINE SHUTDOWN, THE OTHER ENGINE OR THE APU MUST BE OPERATED FOR PNEUMATIC POWER. IF THE PNEUMATIC POWER IS NOT AVAILABLE DURING AN EMERGENCY SHUTDOWN, YOU CAN CAUSE DAMAGE TO THE ENGINE.

(3) Use the Power Plant Operation (Normal) procedure to start the other engine (AMM 71-00-00/201), or use the APU Operation (AMM 49-11-00/201) procedure.

S 865-166-N00

(4) Let the engine become stable at idle for five minutes.

TEST NO. 8 - VIBRATION SURVEY

S 715-167-N00

(5) Make sure that the engine indications are in the operation limits (AMM 71-00-00/201).

S 865-169-N00

(6) Slowly increase the speed of the engine to 1.3 EPR for 3 minutes to make sure the engine is stable.

S 865-170-N00

(7) Put the thrust lever in the idle position.

S 865-648-N00

(8) Let the engine become stable for 6 minutes.

NOTE: You can do the Vibration Survey only if the temperature of the engine is stable.

E. Do the Vibration Survey.

S 865-171-N00

(1) Push the PERF/APU select switch on the right side panel, P61, to monitor the engine vibration indications.

S 985-172-N00

(2) Use 90 seconds or more to increase the engine speed at a constant rate from idle to 1.40 EPR.

NOTE: The rate of acceleration must be sufficiently slow to find the high vibration indications.

(a) During the acceleration, monitor the N1 and the N2 VIB indications on the bottom EICAS display for high vibrations.

NOTE: The engine can have one or more high vibrations when the engine speed goes from idle to 1.40 EPR.

(b) Make a record of the N1 and N2 speed indications at which the high vibrations occur during the engine acceleration.

TEST NO. 8 - VIBRATION SURVEY

S 985-173-N00

(3) Use 90 seconds or more to decrease the engine speed at a constant rate from 1.40 EPR to idle.

NOTE: The rate of deceleration must be sufficiently slow to find the high vibration indications.

(a) During the deceleration, monitor the N1 and the N2 VIB indications on the EICAS bottom display for high vibrations.

NOTE: The engine can have one or more high vibrations when the engine speed goes from 1.40 EPR to idle.

(b) Make a record of the N1 and the N2 speed indications at which the high vibrations occur during the engine deceleration.

S 215-174-N00

(4) Do a check of the vibration at each of the engine speeds written in the steps before.

(a) Slowly increase the speed of the engine to each of the speed positions in the steps before and let the engine become stable for 30 seconds.

(b) After 30 seconds, make a record of these indications for each of the engine speeds: The average N1 VIB, the average N2 VIB, the N1 RPM, and the N2 RPM.

NOTE: The average vibration is used because the vibration indications can have small changes when the engine is stable. The average vibration is the middle value between the minimum and the maximum vibration indications with the engine stable.

TEST NO. 8 - VIBRATION SURVEY

S 215-653-N00

CAUTION: USE THIS VIBRATION GUIDELINE ONLY FOR THE GROUND TEST OF THE ENGINES DURING MAINTENANCE. THE VIBRATION GUIDELINE IS NOT FOR FLIGHT OPERATIONS.

(5) The engine must not have an average vibration indication more than the vibration guidelines shown below, after 30 seconds of stable engine operation.

NOTE: If you do the trim balance procedure (AMM 72-31-00/501), use the limits given for that procedure.

(a) N1 - 4.0 units (4.0 mils single amplitude)
(b) N2 - 2.5 units (1.25 inches/second)
(c) BB - 3.0 units (1.8 inches/second)
(d) If the average vibration indication is more than the vibration guideline, do the necessary corrections (FIM 71-FAULT CODE DIAGRAM, Vibration - Fault Codes).

F. Do the vibration survey with the Universal AVM P/N S362A001.

S 745-766-N00

(1) AIRPLANES WITH AVM P/N S362A001;
To get imbalance data, use this alternate acceleration procedure with the takeoff power speed for the current conditions:

CAUTION: DO NOT EXCEED THE TAKEOFF POWER SPEED FOR THE CURRENT CONDITIONS, ENGINE DAMAGE CAN OCCUR.

(a) Pause for 30 seconds at each of the ideal dwell fan speeds ±1% N1. Do not use fan speeds which exceeds the takeoff power speed.

NOTE: If conditions do no allow the engine to run 30 seconds at the ideal speed, then use a lower speed in the speed range. If conditions do not allow the engine to run 30 seconds in the speed range, then skip that particular speed range.

NOTE: The AVM gathers imbalance data when the engine runs at a constant speed within test ranges during ground runs and flights.

TEST NO. 8 - VIBRATION SURVEY

SPEED RANGE	IDEAL DWELL SPEED (% N1)	SPEED RANGE (% N1)
1	94.0	100.0 - 88.1
2	86.5	88.0 - 85.0
3	83.0	84.9 - 81.1
4	78.0	81.0 - 75.0
5	72.5	74.9 - 70.0
6	65.0	69.9 - 60.0

(b) During the acceleration, monitor the applicable engine vibration indications.
(c) Record the N1% and the N2% where the maximum vibrations occur (if more than one).
(d) Let the engine become stable at the takeoff power speed for a minimum of 15 seconds.
(e) If the average vibration indication is more than the following guidlines, do the Engine Trim Balance with the Universal Airborne Vibration Monitor (AMM 72-31-00/501).
1) N1 - 4.0 units
2) N2 - 2.5 units
3) BB - 3.0 units

G. Put the airplane back to its usual condition.

S 865-175-N00
(1) Put the thrust lever in the idle position and let the engine operate for five minutes to decrease the engine temperature.

S 865-176-N00
(2) Use the Power Plant Operation (Normal) procedure to do the engine shutdown (AMM 71-00-00/201).

S 865-177-N00
(3) If the other engine was operated, use the Power Plant Operation (Normal) procedure to do the engine shutdown (AMM 71-00-00/201).

TEST NO. 8 - VIBRATION SURVEY

S 865-178-N00

(4) If the APU was operated, use the APU Operation (AMM 49-11-00/201) procedure to do the APU shutdown.

TEST NO. 9 - ENGINE PERFORMANCE TEST

TASK 71-00-00-725-009-N00

11. Test No. 9 - Performance Test

A. General

(1) This test makes sure these items are in the operation limits:

(a) %N1 at 1.25 EPR

(b) Engine Acceleration/Deceleration Time

(c) Turbine Cooling Air Supply

(d) Corrected %N1, Corrected %N2, and Corrected EGT at 1.25 EPR

(e) HPC/LPC Compression Ratios.

(2) Use the Performance Worksheet (Fig. 507) to write the engine data and the ambient conditions for this test. Use the Performance Worksheet to calculate the engine performance at the end of this test. Keep the Worksheet as a record to refer to in the future.

(3) There are two configurations of the N1 speed probe in use on PW4000 engines. One configuration has the capability to record the condition monitoring parameters PT2.5 and TT2.5 while the other configuration does not. When an engine without the Station 2.5 pressure and temperature measurement capability on the N1 probe performs the AMM Test No 9, that portion of the test involving LPC pressure ratio and HPC pressure ratio will have to be skipped because the PT2.5 parameter is not available.

(4) Replacement of an engine module can cause an unsatisfactory effect on these: The engine performance, the engine EGT margin, the compressor surge margin, the rotor speeds, the turbine cooling, and the bearing thrust load. This test is necessary as shown in the Power-Plant Test-Reference Table to keep the engine performance and safety.

NOTE: The requirement to check the turbine cooling air ratio (TCAR) has been removed from all the PW4000 engine and maintenance manuals. The review from the field experience showed that the assembly instructions and TOBI flow checks are adequate to insure proper operation.

You must follow the the assembly procedure and check the procedures specified in the Engine Manual and Service Bulletins.

The removal of the requirement to check TCAR to limits supersedes any and all related Engine Manual and Service Bulletin requirements for TCAR limits check.

(5) This test uses EICAS to display the engine data. All of the engine indication systems must operate correctly to do this test.

(6) This test is done at 1.25 EPR to keep the power level and time at high power to a minimum. This is the only necessary engine test that examines engine component failures. Accurate instruments are necessary to measure the engine pressures.

TEST NO. 9 - ENGINE PERFORMANCE TEST

(7) A vibration check (Test No. 8) can be performed during the performance testing.
(8) A power acceleration/deceleration time check (Test No. 4) is required during the performance testing.
(9) Refer to AMM 71-00-00/201 for the engine ground safety precautions and operation limits.
(10) The test tables are for engines with no bleed air. Thus, you must not do this test when the anti-ice systems are necessary. The anti-ice systems may be necessary in the rain, snow, or fog with the outside air temperature (OAT) less than 46 °F (8 °C).
  (a) If you must do the test with the anti-ice on, keep the anti-ice system on during the operation. For the last 30 seconds at each power level, move the anti-ice switch to the off position and get the necessary engine data.

B. Equipment
  (1) Alcohol thermometer (or a mercury thermometer if it is not used inside the airplane) calibrated in degrees, -40 to +120°F (-40 to +49°C) range, ±1/2°F (±1/4°C)
  (2) PS3 (Optional), range from 0 - 400 psig and ±0.5 psi accuracy
  (3) PS4I (Optional), range from 0 - 400 psig with ±0.5 psi accuracy
  (4) Test Equipment - Pressure Monitoring - B71034-29

C. References
  (1) AMM 24-22-00/201, Electrical Power - Control
  (2) AMM 29-11-00/201, Main Hydraulic Systems
  (3) AMM 36-00-00/201, Pneumatic - General
  (4) AMM 49-11-00/201, Auxiliary Power Unit
  (5) AMM 71-00-00/201, Power Plant (Operation Procedure)
  (6) AMM 71-01-02/201, Engine Trim (Trim Tables)
  (7) AMM 71-11-04/201, Fan Cowl Panel
  (8) AMM 71-11-06/201, Core Cowl Panel
  (9) AMM 78-31-00/201, Thrust Reverser System

D. Access
  (1) Location Zones

211	Control Cabin
212	Control Cabin
411	Left Engine
421	Right Engine

TEST NO. 9 - ENGINE PERFORMANCE TEST

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

E. Prepare to do the Engine Performance Test.

S 015-179-N00

(1) Open the fan cowl panels (AMM 71-11-04/201).

S 045-180-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO YOU OR DAMAGE TO EQUIPMENT.

(2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 015-181-N00

(3) Open the core cowl panels (AMM 71-11-06/201).

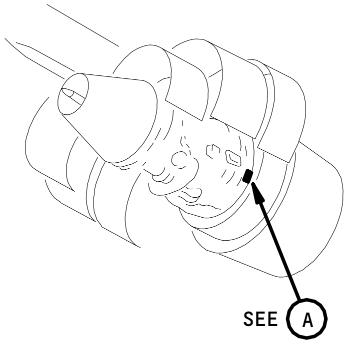
S 015-182-N00

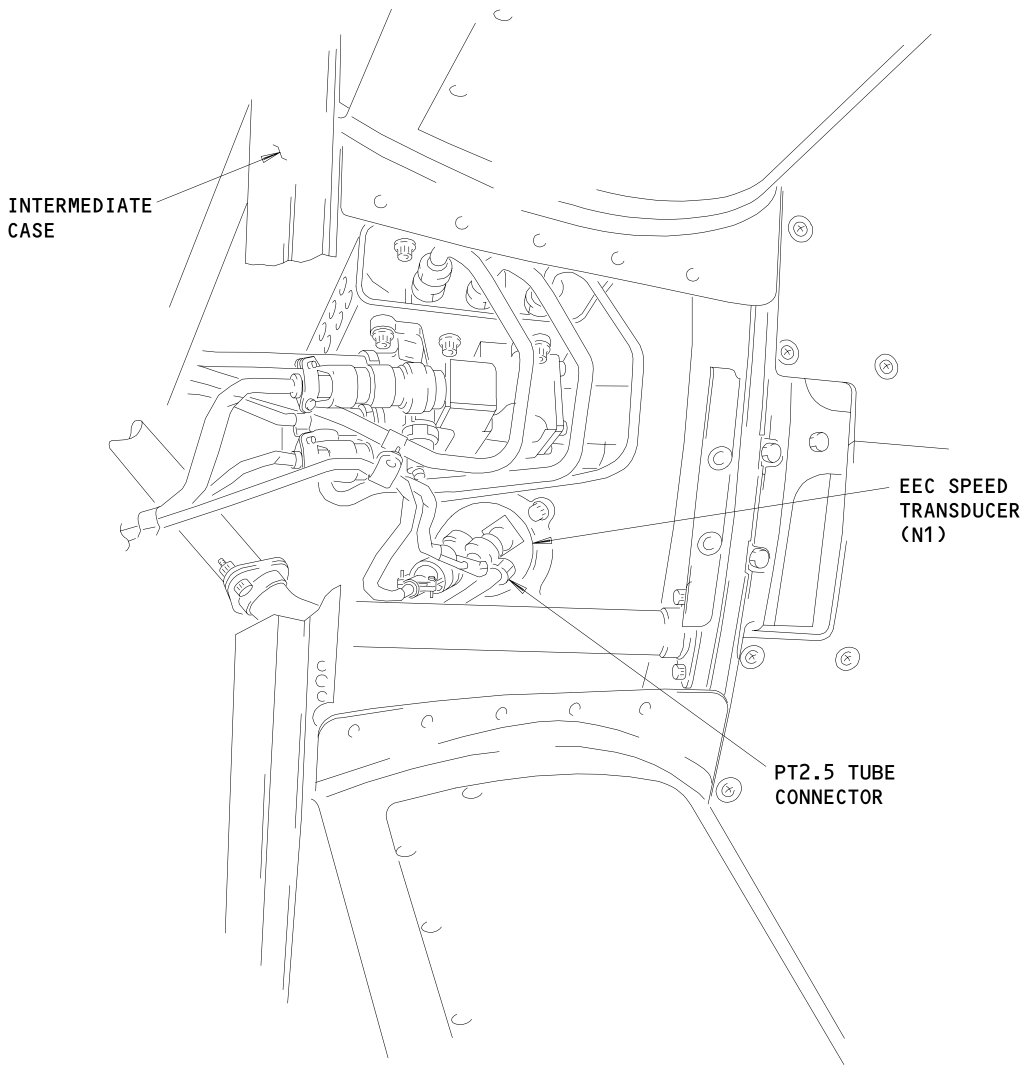
WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(4) Open the thrust reversers (AMM 78-31-00/201).

S 485-183-N00

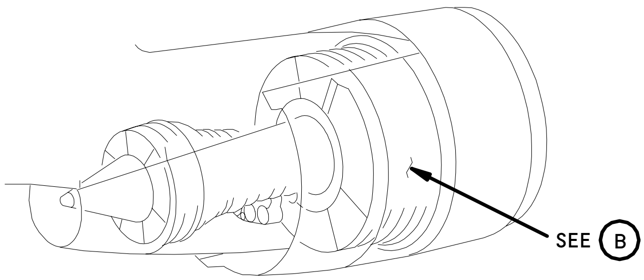
(5) Install the equipment to monitor pressure (Fig. 506).
  (a) Remove the tube nut from the PT2.5 tube connector (if present) on the EEC speed transducer.
  (b) Install the PT2.5 pressure probe to the PT2.5 tube connector (if present).
  (c) Remove the plug from the PS3 test port.
  (d) Remove the cap form the PS4I test port.

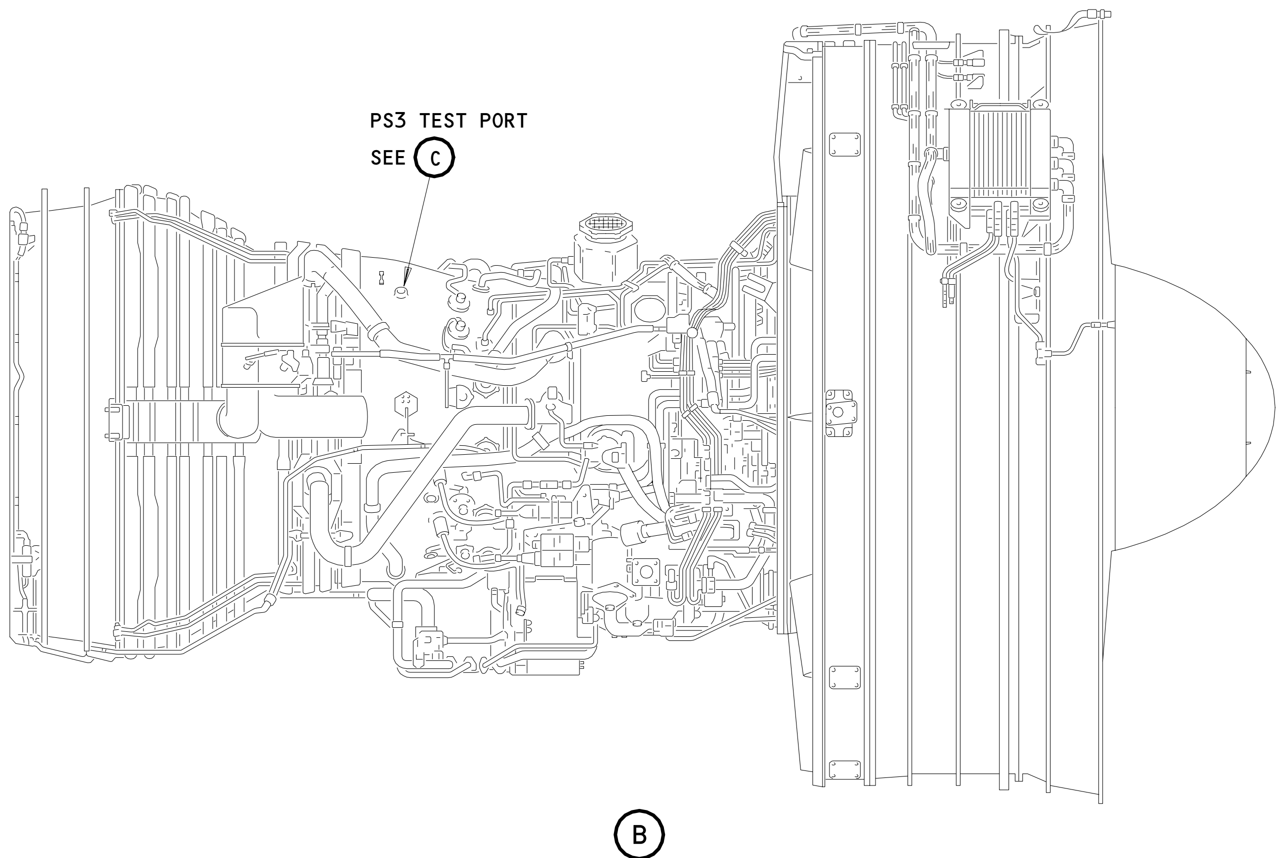


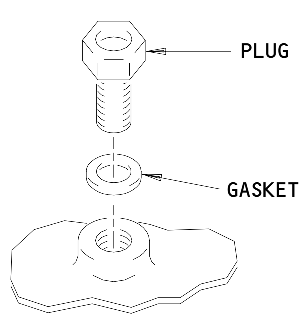


PT2.5 PORT
A

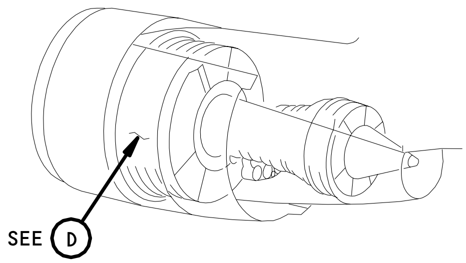
PT2.5, PS3, and PS4I Test Port Locations
Figure 506 (Sheet 1)

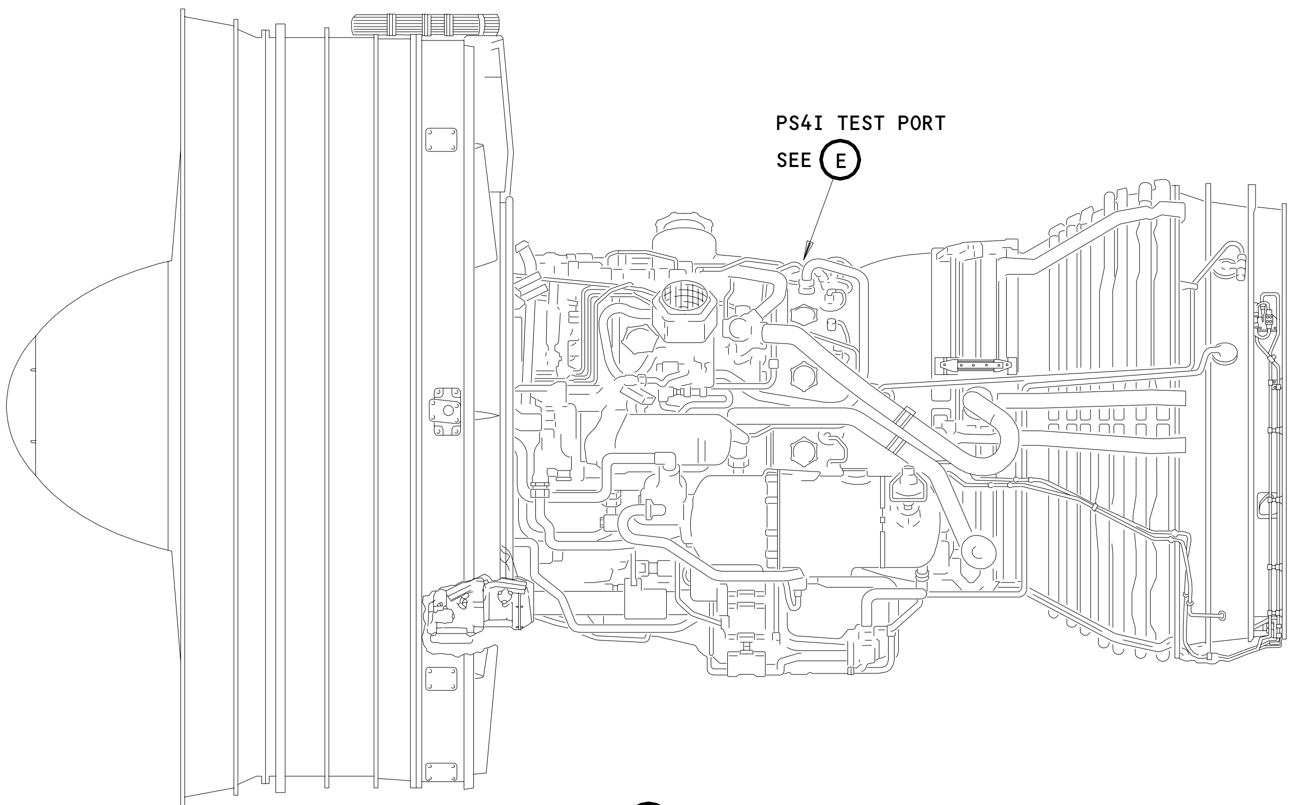






PT2.5, PS3, and PS4I Test Port Locations
Figure 506 (Sheet 2)





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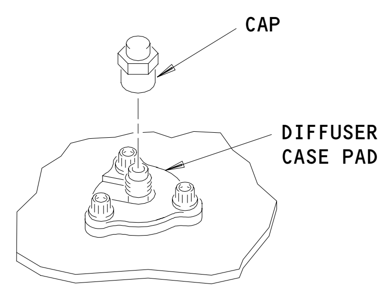


PS4I TEST PORT

E

L-A3032

PT2.5, PS3, and PS4I Test Port Locations
Figure 506 (Sheet 3)

TEST NO. 9 - ENGINE PERFORMANCE TEST

(e) Connect hoses to the PT2.5 pressure probe (if available), the PS3 test port, and the PS4I test port on the engine.

NOTE: PS4I/PS3 is optional, if you use TCAR check. PS3 EEC can be used for PS3/PT2.5 check.

(f) Connect the hoses together as necessary so the cowls can be closed.

(g) Connect the PT2.5 (if available), PS3 and PS4I pressure gauges in the control cabin.

S 665-783-N00

(6) The engine icing may take place when the visible moisture is present and outside temperature (AOT) is below 8 degreee C.

NOTE: The visible moisture is defined as rain, snow or fog (visibility of one mile (1.6 kilometer) or less).

S 975-184-N00

(7) Get the part number for the EEC programming plug.

(a) Write the part number of the EEC programming plug on the Performance Worksheet (Fig. 507) as part of the ENGINE NUMBER information.

S 415-185-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(8) Close the thrust reversers (AMM 78-31-00/201).

NOTE: Do not do the activation procedure for the thrust reverser at this time. This procedure will be done at the end of the performance test.

S 415-186-N00

(9) Close the core cowl panels (AMM 71-11-06/201).

S 415-187-N00

(10) Close the fan cowl panels (AMM 71-11-04/201).

S 585-188-N00

(11) Put the airplane so that the wind conditions permit the engine to be operated (Fig. 501).

TEST NO. 9 - ENGINE PERFORMANCE TEST

S 975-189-N00

CAUTION: TO PREVENT ERRORS, DO NOT USE THE AIRPLANE TOTAL AIR TEMPERATURE FOR THE AMBIENT AIR TEMPERATURE. MAKE SURE TO GET THE LOCAL BAROMETRIC PRESSURE (NOT CORRECTED TO SEA LEVEL) FROM THE CONTROL TOWER.

CAUTION: DO NOT USE A MERCURY THERMOMETER ON THE AIRPLANE. IF THE THERMOMETER BREAKS, THE MERCURY CAN CAUSE DAMAGE TO EQUIPMENT.

(12) Get these ambient weather conditions:
  (a) Get the true local barometric pressure (PAMB).
    1) Write the PAMB on the Performance Worksheet (Fig. 507).
  (b) Get the specific humidity.
    1) Write the specific humidity on the Performance Worksheet (Fig. 507).

S 865-198-N00

CAUTION: MAKE SURE THE CENTER HYDRAULIC SYSTEM IS PRESSURIZED DURING THE ENGINE OPERATION. IF YOU DO NOT KEEP THE HYDRAULIC SYSTEM PRESSURIZED, YOU MAY NOT KEEP CONTROL OF THE AIRPLANE.

(13) Pressurize the center hydraulic system (AMM 29-11-00/201).

S 865-199-N00

(14) Supply electrical power (AMM 24-22-00/201).

S 865-200-N00

(15) Make sure the ECS valves are in the usual position (not locked).

S 865-201-N00

(16) For the left engine, make sure these circuit breakers on the overhead circuit breaker panel, P11, are closed:
  (a) 11A10, AIR DATA CMPTR L

DATE ______________________ AIRPLANE NUMBER ______________________

ENGINE POSITION ______________ ENGINE NUMBER ______________________

BAROMETRIC PRESSURE (PAMB) ______________________

SPECIFIC HUMIDITY ______________________

ENGINE DATA AT 1.25 EPR:

PT2.5 (PSI) __________ PS3 (PSI) __________ PS4I (PSI) __________

TCA PRESSURE RATIO ______________________

EPR ______________ EGT ______________ PT2 ______________

%N1 ______________ %N2 ______________ TT2 ______________

N1 RPM ______________________ N2 RPM ______________________

θT2 ______________________ RθT2 ______________________

LPC PRESSURE RATIO ______________________

HPC PRESSURE RATIO ______________________

KHN1 ______________________ N1C ______________________

KHN2 ______________________ N2C ______________________

EGTC ______________________

Performance Worksheet
Figure 507

TEST NO. 9 - ENGINE PERFORMANCE TEST

(b) 11C27, L ENG EEC CHAN A RST
(c) 11D17, ENGINE EEC DISCRETES L
(d) 11D25, ENGINE FUEL CONT VLV & EEC CHAN B RESET L
(e) 11F30, AIR DATA CMPTR R
(f) 11L3, LEFT ENGINE PERF SOL CHAN A
(g) 11L4, LEFT ENGINE PERF SOL CHAN B
(h) 11M6, LEFT ENGINE IDLE CONT

S 865-202-N00

(17) For the right engine, make sure these circuit breakers on the overhead circuit breaker panel, P11, are closed:
(a) 11A10, AIR DATA CMPTR L
(b) 11C28, R ENG EEC CHAN A RST
(c) 11D26, ENGINE FUEL CONT VLV & EEC CHAN B RESET R
(d) 11F30, AIR DATA CMPTR R
(e) 11L30, RIGHT ENGINE PERF SOL CHAN A
(f) 11L31, RIGHT ENGINE PERF SOL CHAN B
(g) 11M32, RIGHT ENGINE EEC DISCRETES
(h) 11M33, RIGHT ENGINE IDLE CONT

S 865-203-N00

(18) For the left engine, make sure this circuit breaker on the main power distribution panel, P6, is closed:
(a) 6L19, LEFT ENG PROBE HEAT

S 865-204-N00

(19) For the right engine, make sure this circuit breaker on the main power distribution panel, P6, is closed:
(a) 6K25, RIGHT ENG PROBE HEAT

S 865-205-N00

WARNING: USE AMM 71-00-00/201 TO OPERATE THE POWER PLANT. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE DAMAGE TO EQUIPMENT OR INJURY TO PERSONS.

(20) Do the Power Plant Operation (Normal) procedure to start the left or right engine (AMM 71-00-00/201).

TEST NO. 9 - ENGINE PERFORMANCE TEST

S 865-206-N00

CAUTION: START THE OTHER ENGINE OR THE APU. TO PREPARE FOR AN EMERGENCY ENGINE SHUTDOWN, THE OTHER ENGINE OR THE APU MUST BE OPERATED FOR PNEUMATIC POWER. IF PNEUMATIC POWER IS NOT AVAILABLE DURING AN EMERGENCY SHUTDOWN, YOU CAN CAUSE DAMAGE TO THE ENGINE.

(21) Do the Power Plant Operation (Normal) procedure to start the other engine (AMM 71-00-00/201) or do the APU Operation (AMM 49-11-00/201) procedure.

S 095-207-N00

(22) Remove the ground pneumatic power, if it was supplied (AMM 36-00-00/201).

S 865-208-N00

(23) Make sure these systems are in the off position for the engine that gets this test:

NOTE: The test limits were found for an engine that does not have an electrical (IDG) or pneumatic (bleed air) load.

It is not necessary to remove power from the engine driven (hydraulic) pump. The hydraulic pump does not cause large enough load on the engine.

(a) Engine bleed air
(b) Engine and wing anti-ice unless it is necessary
(c) Integrated drive generator (IDG).

S 865-209-N00

(24) Let the engine become stable at idle for five minutes.

F. Do the Engine Performance Test

S 975-210-N00

(1) Examine the engine data (EPR, EGT, %N1, %N2, fuel flow, vibration level, oil pressure, oil temperature).
(a) Make sure that the engine indications are in the operation limits (AMM 71-00-00/201).

S 865-211-N00

(2) Push the PERF/APU switch for the EICAS on the right side panel, P61.

TEST NO. 9 - ENGINE PERFORMANCE TEST

S 865-212-N00

(3) Let the engine become stable at MINIMUM IDLE for five minutes, and then examine the minimum idle %N2 and the BURNER PRESSURE as follows:

(a) Make sure that %N2 and PB are in the specified limits.

NOTE: The %N2 and PB should be in the limits at the same time. If %N2 is in the limits, the PB can be more than the specified limit. IF PB is in the limits, the %N2 can be more than the specified limit.

S 725-213-N00

CAUTION: MONITOR THE TURBINE COOLING AIR PRESSURE RATIO WHEN THE ENGINE IS OPERATED ABOVE IDLE SPEED. THIS IS NECESSARY TO BE SURE THERE IS ENOUGH COOLING AIR SUPPLIED TO THE TURBINE. IF THE PRESSURE RATIO IS MORE THAN THE SPECIFIED LIMITS, THIS CAN CAUSE UNSATISFACTORY PERFORMANCE OF THE ENGINE. IF THE PRESSURE RATIO IS LESS THAN THE SPECIFIED LIMITS, THIS CAN CAUSE DAMAGE TO THE ENGINE.

(4) Monitor vibration indications during the five minute stabilization period and while accelerating and decelerating. If the vibration values are more than the limits, do Test No. 8 at this time.

S 865-784-N00

(5) Check that operating indications are within operating limits.

S 865-785-N00

(6) Make sure that the following systems are off when the engine is in test.

NOTE: These systems must be off during the test because the test limits are based on no load and no bleed air condition.

(a) Engine bleed air.

TEST NO. 9 - ENGINE PERFORMANCE TEST

(b) Engine and wing anti-ice, if it is required.
(c) Integrated drive generator (IDG).

S 865-787-N00
(7) If the Vibration Survey is required, perform the Test No. 8 at this time.

S 865-641-N00
(8) Do the 1.25 EPR power performance and turbine cooling air pressure check as follows:
(a) Move the thrust lever until the engine is at 1.25 EPR.
(b) Let the engine become stable for 60 seconds.
(c) Check and get the TARGET EPR parameter.
(d) Push the EVENT RECORD switch on the forward electrical control stand, P9.

NOTE: This switch puts the engine data at 1.25 EPR in the EICAS memory.

(e) Write the parameters listed below on the Performance Worksheet.
1) EPR value.
2) % N1 value.
3) % N2 value.
4) EGT value.
5) PT2.5 value (if available).
6) PS3 value (Optional).
7) PS4I value (Optional).
8) Specified Humidity value.
9) PT2 value.
10) TT2 value.

NOTE: If the PT2 and TT2 are not available true local barometric pressure (PAMB) and ambient temperature (outside air temperature (AOT)) can be substituted in all calculations. You need to find out the outside air temperature in shade of the airplane nose gear.

(f) Record the thrust lever position for later use.

NOTE: The thrust lever position will be necessary during the acceleration/deceleration Test No. 4.

TEST NO. 9 - ENGINE PERFORMANCE TEST

(g) Put the thrust lever back in the idle position.

S 975-230-N00

(9) Get the necessary data from the EICAS PERF/APU MAN EVENT page.
  (a) Push the PERF/APU switch on the right side panel, P61.
  (b) Push the EVENT READ-MAN switch on the right side panel, P61.
  (c) Write the EPR, EGT, %N1, %N2, PT2.5, PS3, Specified Humidity, PT2 and TT2, indications on the Performance Worksheet as the ENGINE DATA AT 1.25 EPR.
  (d) Make sure the data at 1.25 EPR on the Performance Worksheet is in the specified limits.

S 975-227-N00

(10) OPTION;
Make sure the turbine cooling air pressure ratio is within the limits as follows:
  (a) Calculate OBSERVED N2 SPEED:

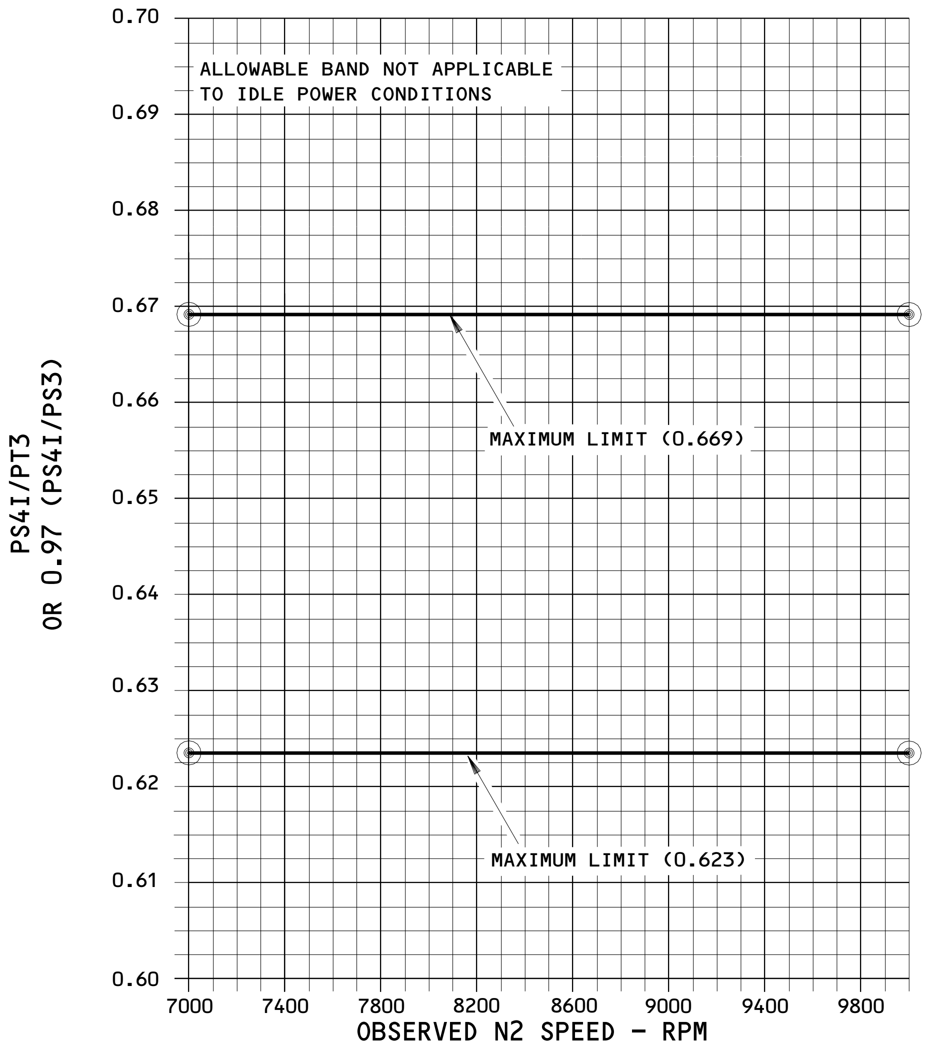
  OBSERVED N2 SPEED = N2 X 99.00

  (b) Calculate the turbine cooling air (TCA) pressure ratio:

  $$\text{TCA PRESSURE RATIO} = \frac{\text{PS4I}}{\text{PT3}} = \frac{\text{PS4I X 0.97}}{\text{PS3}}$$

  (c) If optional PS4I and PS3 instrumentation is installed, check that the PS4I/PS3 is as expected based on the operators experience.
  (d) Write the TCA pressure ratio on the Performance Worksheet.
  (e) Make sure this value is in the permitted limits of the TCA Pressure Ratio curve (Fig. 508).

  NOTE: If the pressure ratio is less than the minimum limit, then there is not a sufficient flow of turbine cooling air. If the pressure ratio is more than the maximum limit, then there is too much flow of the turbine cooling air. Too much flow can cause the engine performance to decrease and a possible bearing skid can occur from a change in the bearing thrust loads.



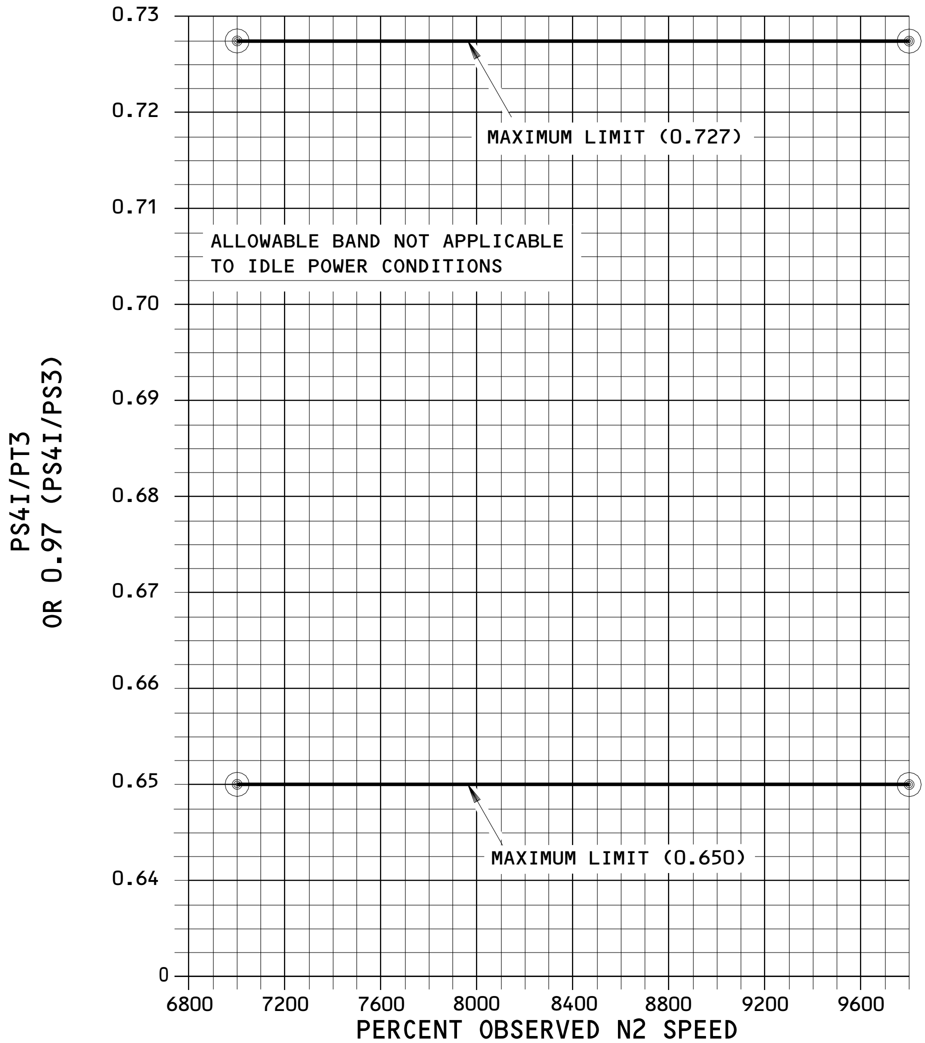
NOTES: THE PERMITTED BAND IS NOT APPLICABLE TO THE IDLE POWER CONDITIONS.

THIS CURVE IS FOR ENGINES PRE-PW-SB 72-514 AND ENGINES PRE-PW-SB 72-662 WITH TOBI DUCT PN's 50K120, 50K178-01 OR 50K363-01.

(PW4052, PW4056, PW4060, PW4060C AND ALL
(-1C) INTERMIX MODELS WHICH INCLUDES PW4062-1C)

L-A5162
0302

Turbine Cooling Air Ratio Check Limits
Figure 508 (Sheet 1)



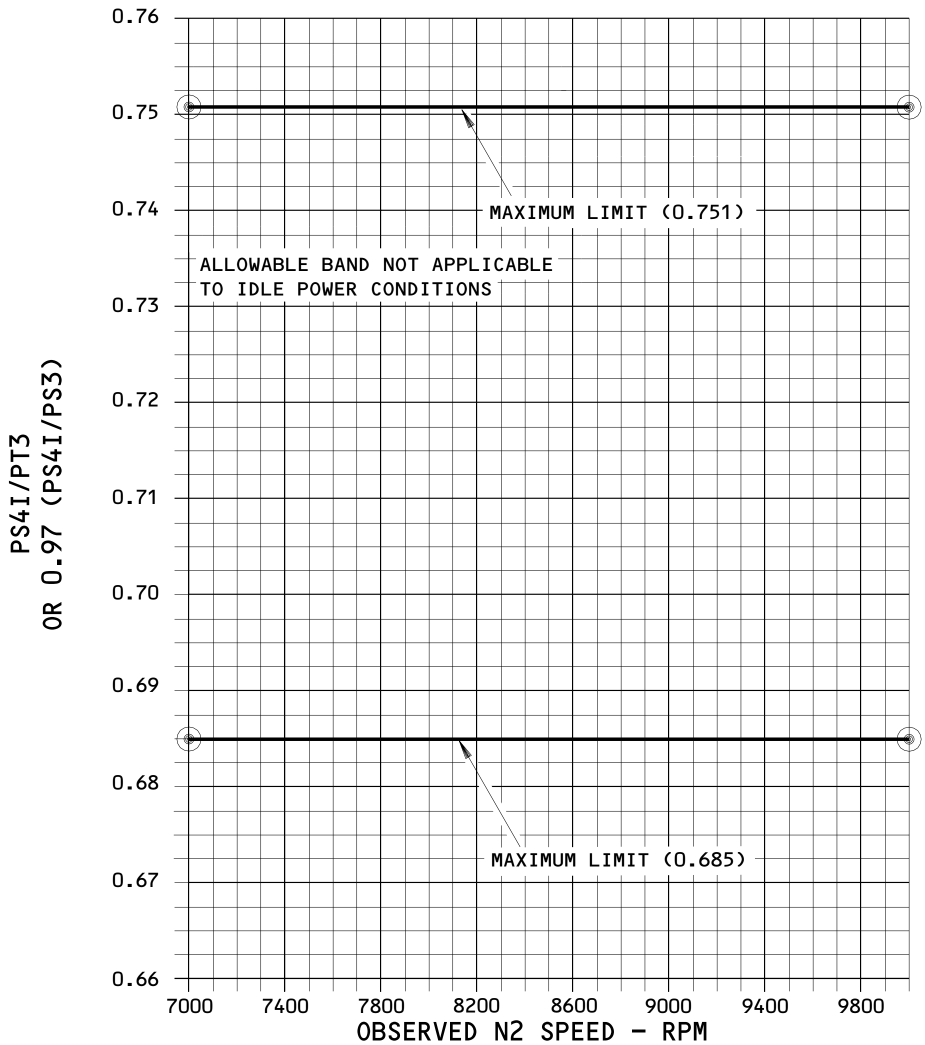
NOTES: THE PERMITTED BAND IS NOT APPLICABLE TO THE IDLE POWER CONDITIONS.

THIS CURVE IS FOR ENGINES POST-PW-SB 72-514 AND ENGINES PRE-PW-SB 72-662 WITH TOBI DUCT PN's 50K178-001, 50K363-001, OR 50K542-01, OR 50K542-001.

(PW4052, PW4056, PW4060, PW4060C AND ALL
(-1C) INTERMIX MODELS WHICH INCLUDES PW4062-1C)

L-B4510
0302

Turbine Cooling Air Ratio Check Limits
Figure 508 (Sheet 2)



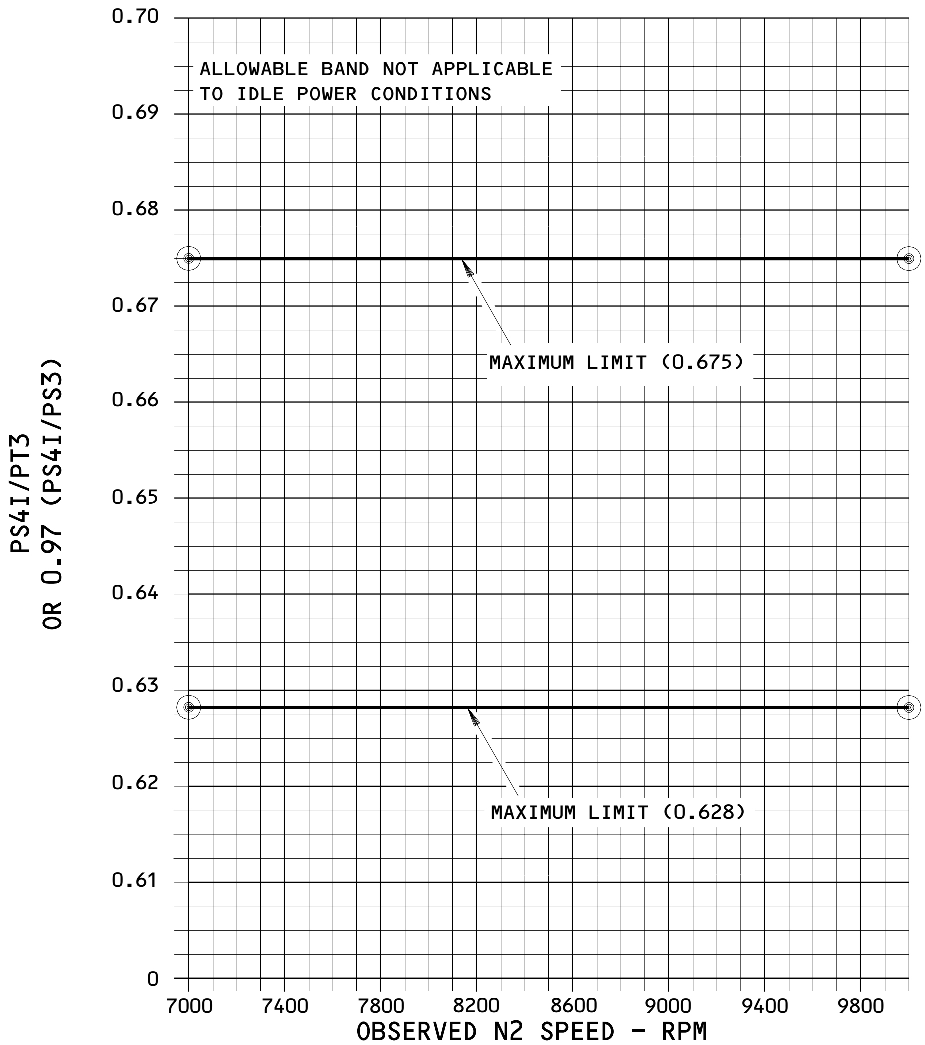
<u>NOTES</u>: THE PERMITTED BAND IS NOT APPLICABLE TO THE IDLE POWER CONDITIONS.

THIS CURVE IS FOR ENGINES POST-PW-SB 72-514 AND ENGINES POST-PW-SB 72-662 WITH TOBI DUCT PN 50K136-01, OR 50K136-001.

(PW4052, PW4056, PW4060, PW4060C AND ALL (-1C) INTERMIX MODELS WHICH INCLUDES PW4062-1C)

L-B6932
0302

Turbine Cooling Air Ratio Check Limits
Figure 508 (Sheet 3)



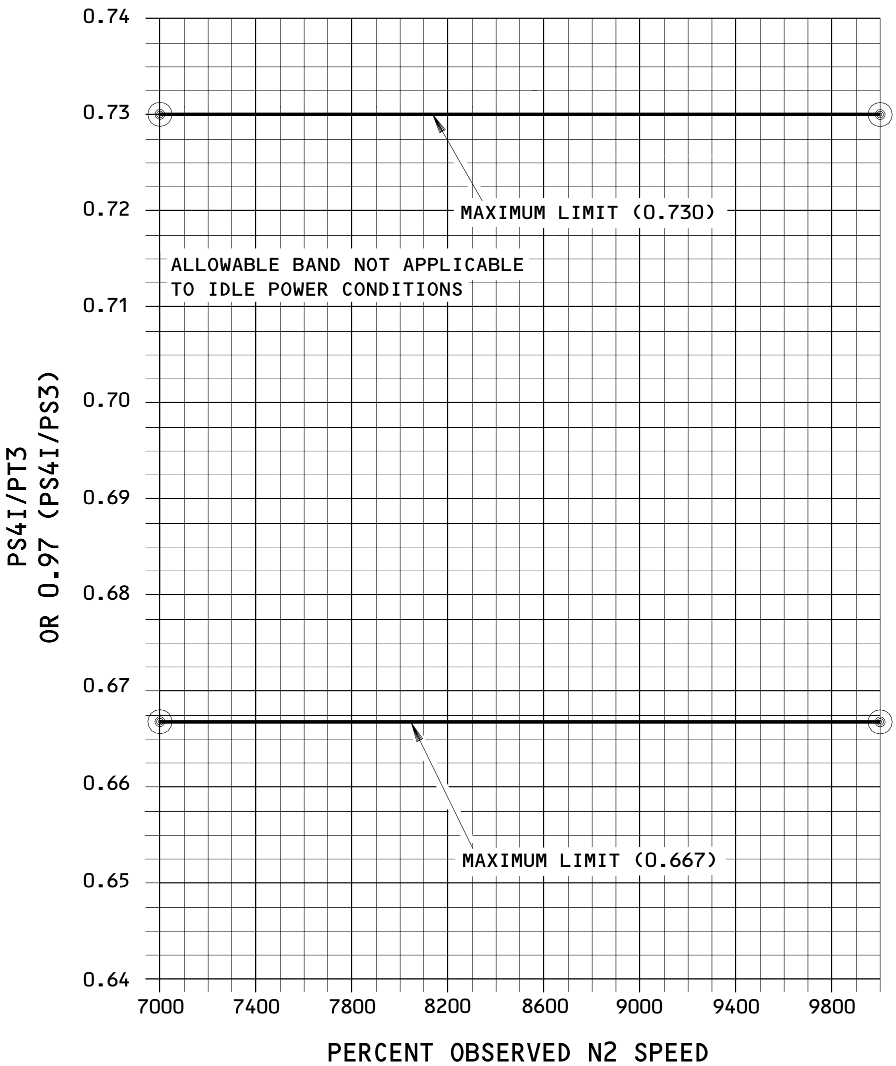
NOTES: THE PERMITTED BAND IS NOT APPLICABLE TO THE IDLE POWER CONDITIONS.

THIS CURVE IS FOR ENGINES PRE-PW-SB 72-662 WITH TOBI DUCT PN's 50K362-01, 50K362-001, 50K362-002, 50K372-01, OR 50K372-001.

(PW4052-3, PW4056-3, PW4060-3, PW4062-3, AND
ALL (-3B) INTERMIX MODELS)

L-B0049
0302

Turbine Cooling Air Ratio Check Limits
Figure 508 (Sheet 4)



NOTES: THE PERMITTED BAND IS NOT APPLICABLE TO THE IDLE POWER CONDITIONS.

THIS CURVE IS FOR ENGINES POST-PW-SB 72-662 WITH TOBI DUCT PN's 50K137-01, 50K137-001, 50K362-002, OR 50K362-004.

(PW4052-3, PW4056-3, PW4060-3, PW4062-3, AND ALL (-3B) INTERMIX MODELS)

L-B6933
0302

Turbine Cooling Air Ratio Check Limits
Figure 508 (Sheet 5)

TEST NO. 9 - ENGINE PERFORMANCE TEST

S 715-782-N00

CAUTION: IF ENGINE SURGE OCCURS, QUICKLY PULL (IN LESS THAN ONE SECOND) BACK THE THRUST LEVER TO MINIMUM IDLE. IF YOU DO NOT PULL THE THRUST LEVER BACK, DAMAGE TO THE ENGINE CAN OCCUR.

(11) Operate the engine at minimum idle for five minutes.
  (a) Make sure that these conditions occur before you continue:
    1) The EGT is at the usual EGT idle levels.
    2) The engine operates at the usual idle speeds.

S 715-792-N00
(12) Do the Engine Acceleration/Deceleration Test.
  (a) Do Test No. 4, Engine Power and Acceleration/Deceleration.
    1) Record the ambient weather information and Trim Table data identified in the "Prepare to do the Engine Power Test" step.
    2) Do the step "Do the Engine Power Test"
    3) Complete the Test No. 4 - Power Acceleration/Deceleration procedure.
  (b) Let the engine operate at minimum idle for five minutes to decrease the engine temperature.
  (c) Push the ECS/MSG switch on the right side panel, P61, and look for maintenance messages on the bottom EICAS display.
  (d) Correct the maintenance messages as necessary.
  (e) Use the Power Plant Operation (Normal) procedure to do the engine shutdown (AMM 71-00-00/201).
  (f) If the other engine was operated, use the Power Plant Operation (Normal) procedure to do the engine shutdown (AMM 71-00-00/201).
  (g) If the APU was operated, use the APU Operation procedure to do the APU shutdown (AMM 49-11-00/201).

S 975-241-N00
(13) Use the ENGINE DATA AT 1.25 EPR on the Performance Worksheet to examine the performance data as follows:
  (a) Calculate the Actual N1 as follows:

    N1 (RPM) (All models except PW4062) = %N1 X 36.00 rpm

    NI (RPM) (PW4062) = %N1 X 36.29 rpm

    NOTE: If the engine rating is PW4062, 100%N1 = 3629 rpm

    1) Write the N1 (RPM) on the Performance Worksheet.

TEST NO. 9 - ENGINE PERFORMANCE TEST

(b) Calculate the Actual N2 as follows:

N2 (RPM) = %N2 X 99.00 rpm

1) Write the N2 (RPM) on the Performance Worksheet.

(c) Calculate the θT2 as follows:

$$\theta T2 = \frac{TT2 + 273.16}{288.16}$$

1) Write the θT2 on the Performance Worksheet.

(d) Calculate the RθT2 as follows:

$$R\theta T2 = \left[\frac{TT2 + 273.16}{288.16}\right]^{0.5}$$

1) Write the RθT2 on the Performance Worksheet.

(e) Calculate the LPC pressure ratio (if available) as follows:

$$\text{LPC PRESSURE RATIO} = \frac{PT2.5}{PT2 \times (\theta T2)^{-0.08}}$$

1) Write the LPC pressure ratio on the Performance Worksheet.

(f) Calculate the HPC pressure ratio (if available) as follows:

$$\text{HPC PRESSURE RATIO} = \frac{PS3}{PT2.5 \times (\theta T2)^{0.08}}$$

1) Write the HPC pressure ratio on the Performance Worksheet.

TEST NO. 9 - ENGINE PERFORMANCE TEST

(g) Calculate the Corrected N1 (N1C) as follows:
1) Get the KHN1 for the ambient specific humidity on the Humidity Correction Factor graph (Fig. 509).
2) Write the KHN1 on the Performance Worksheet.
3) Calculate the N1C as follows:

$$N1C = \frac{N1\ (RPM)}{R\theta T2 \times KHN1}$$

4) Write the N1C on the Performance Worksheet.

(h) Calculate the Corrected N2 (N2C) as follows:
1) Get the KHN2 for the ambient specific humidity on the Humidity Correction Factors graph (Fig. 509).
2) Write the KHN2 on the Performance Worksheet.
3) Calculate the N2C as follows:

$$N2C = \frac{N2\ (RPM)}{R\theta T2 \times KHN2}$$

4) Write the N2C on the Performance Worksheet.

(i) Calculate the Corrected EGT (EGTC) as follows:
1) Calculate the EGTC:

$$EGTC = \left[\frac{EGT + 273.16}{(\theta T2)^{1.057}}\right] - 273.16$$

2) Write the EGTC on the Performance Worksheet.

TEST NO. 9 - ENGINE PERFORMANCE TEST

(j) Find the N1C, N2C, and EGTC LIMITS for the engine model tested shown in the N1, N2, And EGT Acceptance Limits table (Fig. 510).

(k) Compare the N1C value recorded on the Performance Worksheet to the N1C limit values shown in the N1, N2 and EGT Acceptance Limits table (Fig. 510).

1) The N1C value must be between the N1C MIN LIMIT and N1C MAX LIMIT values.

(l) Compare the N2C value recorded on the Performance Worksheet to the N2C LIMIT value shown in the N1, N2 and EGT Acceptance Limits table (Fig. 510).

1) The N2C value must be lower than the N2C Limit value.

(m) Compare the EGTC value recorded on the Performance Worksheet to the EGTC LIMIT value shown in the N1, N2 and EGT Acceptance Limits table (Fig. 510).

1) The EGTC value must be lower than the EGTC LIMIT value.

S 975-713-N00

(14) Do a LPC and a HPC pressure ratio check.

(a) Review the LPC Pressure Ratio recorded on the Performance Worksheet. This value can be between 1.9 and 2.1. This is a guideline only.

NOTE: The ratio values are guidelines only and not acceptance limits. If the calculated ratios are more than the guidelines, check for instrumentation errors or pressure leaks.

(b) Review the HPC Pressure Ratio recorded on the Performance Worksheet. This value can be between 8.9 and 9.7. This is a guideline only.

NOTE: The ratio values are guidelines only and not acceptance limits. If the calculated ratios are more than the guidelines, check for instrumentation errors or pressure leaks.

TEST NO. 9 - ENGINE PERFORMANCE TEST

S 355-714-N00

(15) Repair and retest as necessary.

G. Put the airplane back to its usual condition.

S 015-701-N00

(1) Open the fan cowl panels (AMM 71-11-04/201).

S 045-702-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO YOU OR DAMAGE TO EQUIPMENT.

(2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 015-703-N00

(3) Open the core cowl panels (AMM 71-11-06/201).

S 015-704-N00

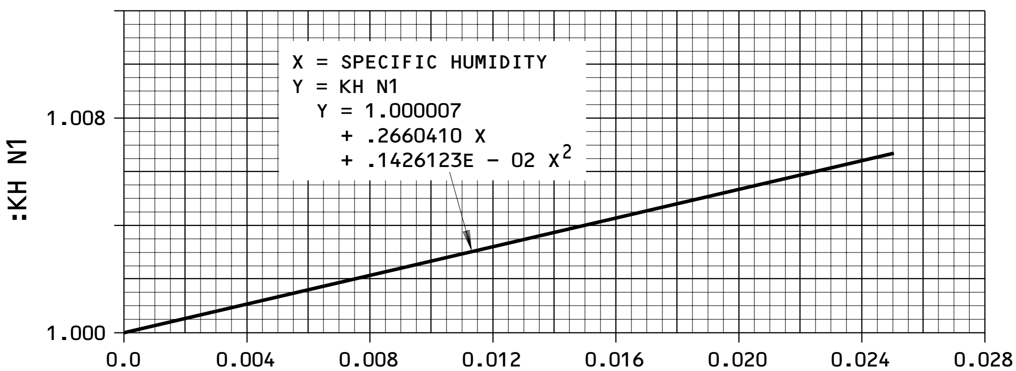
WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

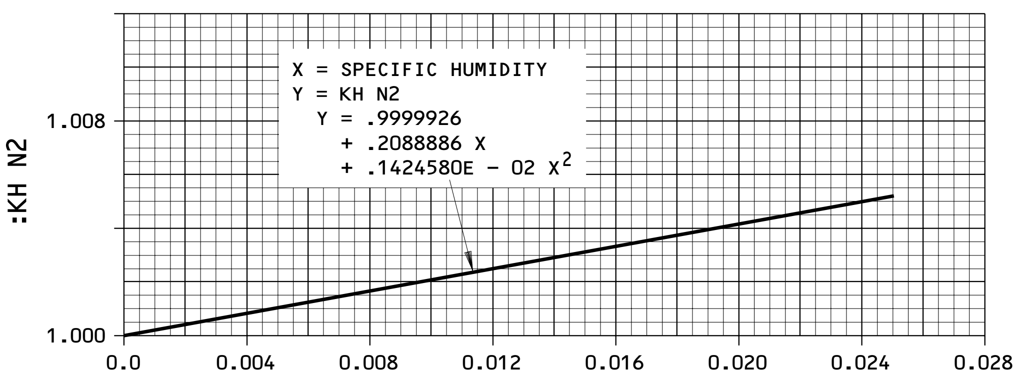
(4) Open the thrust reversers (AMM 78-31-00/201).

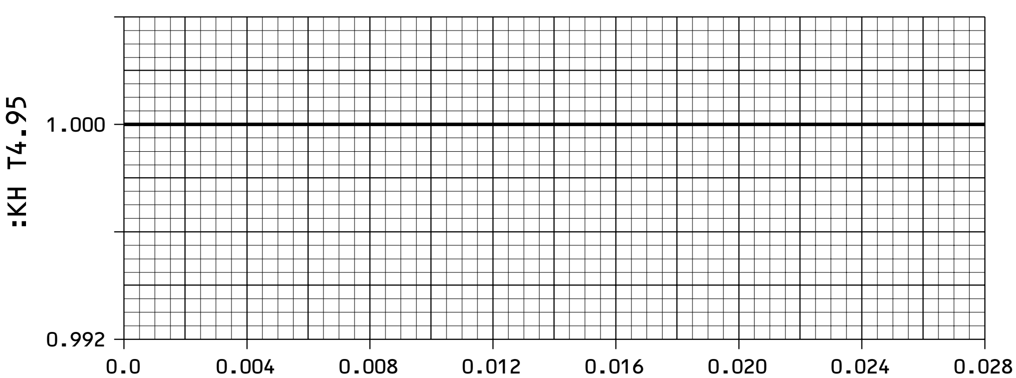
S 215-705-N00

(5) Examine the engine for leaks.

NOTE: If an engine turns at speeds below idle, oil can leak through the No. 2 bearing carbon seal assembly. This usually only occurs when the engine turns at low speeds for an extended time (when an engine has an extended start/shutdown or when an engine turns freely in the wind). After engine shutdown, this oil may drain on the variable stator vane retention bolts at the bottom of the engine. This small quantity of oil leakage is permitted.







SPECIFIC HUMIDITY
LB MOISTURE/LB DRY AIR

L-A0668
(0293)

Humidity Correction Factors
Figure 509

1.25 EPR LIMITS (INCLUDES SEGMENTED AND RCC HPC CONFIGURATION 1)					
MODEL IDENT.	EEC PP P/N INSTALLED 2	N1C MAXIMUM LIMIT RPM 4	N1C MINIMUM LIMIT RPM 4	N2C LIMIT RPM 4	EGTC LIMIT DEGREES C 3 4
PW4052	P/N 51D402/51D403	2943	2723	9146	476
PW4052	P/N 54D330	2943	2723	9047	476
PW4056	P/N 51D418/51D419	2953	2726	9078	472
PW4056	P/N 54D334	2953	2726	8961	472
PW4060	P/N 51D434/51D435	2938	2759	9037	466
PW4060	P/N 54D338	2938	2759	8945	466
PW4060A (MODEL NOT AVAILABLE)	---	---	---	---	---
PW4060C	P/N 51D444/51D445	2938	2759	9037	463
PW4060C	P/N 54D342	2938	2759	8945	463

ABBREVIATIONS: EEC = ELECTRONIC ENGINE CONTROL
PP = PROGRAMMING PLUG
P/N = PART NUMBER
IDENT. = IDENTIFICATION

1 RING CASE COMPRESSOR (RCC) HPC CONFIGURATION UPGRADE PER PW4ENG 72-755, REQUIRES EPP 54D3XX SERIES PART NUMBER.

2 EEC EPP P/N INSTALLED, SEE DATA PLATE INFORMATION FOR EPP PART NUMBER, IF EPP PART NUMBER LOOK-UP IS REQUIRED, SEE SB PW4ENG 73-202.

3 SUBTRACT 11 DEGREES C FROM TABLE VALUE IF HPT CLEARANCE HAS BEEN RESTORED.

4 PROCEDURE FOR CORRECTING N1, N2 AND EGT STABILIZED DATA. SEE TABLE 508.

N1, N2 and EGT Acceptance Limits
Figure 510 (Sheet 1)

1.25 EPR LIMITS (INCLUDES SEGMENTED AND RCC HPC CONFIGURATION 1)					
MODEL IDENT.	EEC PP P/N INSTALLED 2	N1C MAXIMUM LIMIT RPM 4	N1C MINIMUM LIMIT RPM 4	N2C LIMIT RPM 4	EGTC LIMIT DEGREES C 3 4
PW4052 (-3)	P/N 51D410/51D411	3035	2864	9316	480
PW4052 (-3)	P/N 54D332	3035	2864	9276	480
PW4056 (-3)	P/N 51D414/51D415	2979	2864	9406	484
PW4056 (-3)	P/N 54D336	2979	2864	9317	484
PW4060 (-3)	P/N 51D432/51D433	2933	2864	9238	463
PW4060 (-3)	P/N 54D340	2933	2864	9152	463
PW4060A (-3) (MODEL NOT AVAILABLE)	---	---	---	---	---
PW4060C (-3)	P/N 51D456/51D457	2933	2864	9184	463
PW4060C (-3)	P/N 54D344	2933	2864	9102	463
PW4062 (-3)	P/N 51D452/51D453	2944	2771	9176	463
PW4062 (-3)	P/N 54D346	2944	2771	9082	463

ABBREVIATIONS: EEC = ELECTRONIC ENGINE CONTROL
PP = PROGRAMMING PLUG
P/N = PART NUMBER
IDENT. = IDENTIFICATION

1 RING CASE COMPRESSOR (RCC) HPC CONFIGURATION UPGRADE PER PW4ENG 72-755, REQUIRES EPP 54D3XX SERIES PART NUMBER.

2 EEC EPP P/N INSTALLED, SEE DATA PLATE INFORMATION FOR EPP PART NUMBER, IF EPP PART NUMBER LOOK-UP IS REQUIRED, SEE SB PW4ENG 73-202.

3 SUBTRACT 11 DEGREES C FROM TABLE VALUE IF HPT CLEARANCE HAS BEEN RESTORED.

4 PROCEDURE FOR CORRECTING N1, N2 AND EGT STABILIZED DATA. SEE TABLE 508.

N1, N2 and EGT Acceptance Limits
Figure 510 (Sheet 2)

1.25 EPR LIMITS (INCLUDES SEGMENTED AND RCC HPC CONFIGURATION [1])					
MODEL IDENT.	EEC PP P/N INSTALLED [2]	N1C MAXIMUM LIMIT RPM [4]	N1C MINIMUM LIMIT RPM [4]	N2C LIMIT RPM [4]	EGTC LIMIT DEGREES C [3] [4]
PW4052 (-1C)	P/N 51D404/51D405	3004	2759	9263	456
PW4052 (-1C)	P/N 54D331	3004	2759	9171	456
PW4056 (-1C)	P/N 51D412/51D413	2951	2759	9169	455
PW4056 (-1C)	P/N 54D335	2951	2759	9063	455
PW4060 (-1C)	P/N 51D426/51D427	2913	2759	9107	460
PW4060 (-1C)	P/N 54D339	2913	2759	9014	460
PW4060A (-1C) (MODEL NOT AVAILABLE)	---	---	---	---	---
PW4060C (-1C)	P/N 51D458/51D459	2913	2759	8991	460
PW4060C (-1C)	P/N 54D343	2913	2759	8887	460

ABBREVIATIONS: EEC = ELECTRONIC ENGINE CONTROL
PP = PROGRAMMING PLUG
P/N = PART NUMBER
IDENT. = IDENTIFICATION

[1] RING CASE COMPRESSOR (RCC) HPC CONFIGURATION UPGRADE PER PW4ENG 72-755, REQUIRES EPP 54D3XX SERIES PART NUMBER.

[2] EEC EPP P/N INSTALLED, SEE DATA PLATE INFORMATION FOR EPP PART NUMBER, IF EPP PART NUMBER LOOK-UP IS REQUIRED, SEE SB PW4ENG 73-202.

[3] SUBTRACT 11 DEGREES C FROM TABLE VALUE IF HPT CLEARANCE HAS BEEN RESTORED.

[4] PROCEDURE FOR CORRECTING N1, N2 AND EGT STABILIZED DATA. SEE TABLE 508.

N1, N2 and EGT Acceptance Limits
Figure 510 (Sheet 3)

1.25 EPR LIMITS (INCLUDES SEGMENTED AND RCC HPC CONFIGURATION 1)					
MODEL IDENT.	EEC PP P/N INSTALLED 2	N1C MAXIMUM LIMIT RPM 4	N1C MINIMUM LIMIT RPM 4	N2C LIMIT RPM 4	EGTC LIMIT DEGREES C 3 4
PW4052 (-3B)	P/N 51D406/51D407	3062	2759	9292	479
PW4052 (-3B)	P/N 54D333	3062	2759	9252	479
PW4056 (-3B)	P/N 51D420/51D421	2999	2759	9351	481
PW4056 (-3B)	P/N 54D337	2999	2759	9275	481
PW4060 (-3B)	P/N 51D428/51D429	2958	2759	9210	466
PW4060 (-3B)	P/N 54D341	2958	2759	9134	466
PW4060A (-3B) (MODEL NOT AVAILABLE)	---	---	---	---	---
PW4060C (-3B)	P/N 51D460/51D461	2958	2759	9131	466
PW4060C (-3B)	P/N 54D345	2958	2759	9048	466

ABBREVIATIONS: EEC = ELECTRONIC ENGINE CONTROL
PP = PROGRAMMING PLUG
P/N = PART NUMBER
IDENT. = IDENTIFICATION

1 RING CASE COMPRESSOR (RCC) HPC CONFIGURATION UPGRADE PER PW4ENG 72-755, REQUIRES EPP 54D3XX SERIES PART NUMBER.

2 EEC EPP P/N INSTALLED, SEE DATA PLATE INFORMATION FOR EPP PART NUMBER, IF EPP PART NUMBER LOOK-UP IS REQUIRED, SEE SB PW4ENG 73-202.

3 SUBTRACT 11 DEGREES C FROM TABLE VALUE IF HPT CLEARANCE HAS BEEN RESTORED.

4 PROCEDURE FOR CORRECTING N1, N2 AND EGT STABILIZED DATA. SEE TABLE 508.

N1, N2 and EGT Acceptance Limits
Figure 510 (Sheet 4)

Not Used
Figure 511

Not Used
Figure 512

Not Used
Figure 513

Not Used
Figure 514

TEST NO. 9 - ENGINE PERFORMANCE TEST

S 365-706-N00

(6) Repair the leaks as necessary.

S 085-707-N00

(7) Remove the pressure monitoring equipment, if it is not necessary (Fig. 506).
   - (a) Remove the gauges and the hoses from the PT2.5, PS3, and PS4I test ports.
   - (b) Install the PS3 port plug.
   - (c) Install the PS4I port cap.
   - (d) Remove the PT2.5 probe (if present) from the EEC speed transducer.
   - (e) Install the tube nut on the PT2.5 tube connector (if present).

S 415-248-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(8) Close the thrust reversers (AMM 78-31-00/201).

S 415-249-N00

(9) Close the core cowl panels (AMM 71-11-06/201).

S 415-632-N00

(10) Close the fan cowl panels (AMM 71-11-04/201).

S 445-250-N00

(11) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 795-252-N00

(12) If leaks were found and repaired, do Test No. 3 - Ground Test at Idle Power.

TEST NO. 10 - REPLACEMENT ENGINE TEST (PRETESTED)

TASK 71-00-00-725-010-N00

12. Test No. 10 - Replacement Engine Test (Pretested)

A. General

(1) This test examines a pretested engine after it is installed. A pretested engine is an engine that has a test in a test cell or on-wing after it is refurbished.

(2) If the replacement engine is not a pretested engine, you must use Test No. 11 - Replacement Engine Test (Untested) after the new engine is installed.

B. Equipment

(1) Alcohol thermometer (or a mercury thermometer if it is not taken inside the airplane) calibrated in degrees, -40 to +120°F (-40 to +49°C) range, ±1/2°F (±1/4°C)

(2) Hot Film Anemometer - Range 0 to 6000 ft/min

(3) Ground Pneumatic Cart

C. References

(1) AMM 12-11-01/301, Fuel Tank - Pressure Fueling (Replenishing)
(2) AMM 12-12-01/301, Hydraulic Systems (Replenishing)
(3) AMM 12-13-01/301, Engine (Oil Servicing)
(4) AMM 12-13-02/301, Engine Starter (Oil Servicing)
(5) AMM 12-13-03/301, Integrated Drive Generator (Oil Servicing)
(6) AMM 24-22-00/201, Electrical Power - Control
(7) AMM 29-11-00/201, Main Hydraulic System
(8) AMM 36-00-00/201, Pneumatic - General
(9) AMM 49-11-00/201, Auxiliary Power Unit
(10) AMM 71-00-00/201, Power Plant (Operation Procedure)
(11) AMM 71-01-02/201, Engine Trim (Trim Check Tables)
(12) AMM 71-11-04/201, Fan Cowl Panels
(13) AMM 71-11-06/201, Core Cowl Panels
(14) AMM 71-71-00/601, Engine Vents and Drains
(15) AMM 78-31-00/201, Thrust Reverser System
(16) AMM 78-31-17/401, Thrust Reverser Hydraulic Actuators
(17) AMM 78-36-00/501, Thrust Reverser Indication System
(18) FIM 71-PIMU MESSAGE INDEX

D. Access

(1) Location Zones

211	Control Cabin
212	Control Cabin
411	Left Engine
421	Right Engine

TEST NO. 10 - REPLACEMENT ENGINE TEST (PRETESTED)

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine
434AL	Strut Pressure Relief Panel, Left Strut
434AR	Strut Pressure Relief Panel, Left Strut
444AL	Strut Pressure Relief Panel, Right Strut
444AR	Strut Pressure Relief Panel, Right Strut

E. Prepare for the Replacement Engine Test.

S 585-253-N00

(1) Put the airplane in a position so that wind conditions permit the engine to be operated (Fig. 501).

S 215-254-N00

(2) Make sure the fuel tank sumps do not have water in them.

S 655-255-N00

CAUTION: DO NOT OPERATE THE AIRPLANE HYDRAULIC SYSTEM IF THERE IS NOT ENOUGH FUEL FOR THE HYDRAULIC FLUID HEAT EXCHANGERS. THE HYDRAULIC SYSTEM CAN BECOME TOO HOT AND CAUSE DAMAGE TO EQUIPMENT.

(3) Make sure you keep a minimum of 4020 pounds (1827 Kg) of fuel in the main fuel tanks of the left and right wings (AMM 12-11-01/301).

S 015-256-N00

(4) Open the fan cowl panels (AMM 71-11-04/201).

S 045-257-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO YOU OR DAMAGE TO EQUIPMENT.

(5) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

TEST NO. 10 - REPLACEMENT ENGINE TEST (PRETESTED)

S 015-258-N00

(6) Open the core cowl panels (AMM 71-11-06/201).

S 015-259-N00

WARNING: DO THE PROCEDURE IN AMM 78-31-00/201 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(7) Open the thrust reversers (AMM 78-31-00/201).

S 635-261-N00

(8) If you operate the replacement engine for the first time, do these steps:
   (a) Make sure that these items related to the engine preservation are removed: storage plugs, seals on vents and drains, all seals on engine openings, humidity indicators, and dessicants.
   (b) Make sure that there are no foreign objects in these areas: the fan turbine exhaust areas, the wing leading-edge above the engine, and the area around the airplane.

S 215-262-N00

(9) Make sure the hydraulic reservoir is full (AMM 12-12-01/301).

NOTE: You can examine the hydraulic reservoirs in the sight gage or on the EICAS STATUS page.

S 615-263-N00

(10) Do the Engine - Oil Servicing procedure (AMM 12-13-01/301).

S 615-264-N00

(11) Do the Integrated Drive Generator (IDG) - Servicing procedure (AMM 12-13-03/301).

S 615-265-N00

(12) Do the Pneumatic Starter - Servicing procedure (AMM 12-13-02/301).

S 215-266-N00

(13) Make sure that the thrust lever is in the idle, forward thrust position.

S 215-267-N00

(14) Make sure the FUEL CONTROL switch is in the CUTOFF position.

TEST NO. 10 - REPLACEMENT ENGINE TEST (PRETESTED)

S 215-268-N00

(15) Make sure the LEFT (RIGHT) DISCH fire switch on the aft electronics panel, P10, is in the usual position.

S 865-269-N00

(16) Supply electrical power (AMM 24-22-00/201).

S 865-270-N00

(17) Put the parking brake in the ON position.

S 715-606-N00

(18) Do these steps to do a static test for the electronic engine control (EEC):
- (a) Prepare the airplane for the test as follows:
  - 1) Make sure this circuit breaker on the forward miscellaneous electric equipment, P33, is closed:
    - a) 33D4, PIMU L ENG
    - b) 33D5, PIMU R ENG
  - 2) Make sure these circuit breakers on the overhead circuit breaker panel, P11, are closed:
    - a) 11L7, EEC/SCU PWR L ENG
    - b) 11K28, EEC/SCU PWR R ENG
  - 3) Open these circuit breakers on the main power distribution panel, P6, and attach the DO-NOT-CLOSE tags:
    - a) 6D14 PITOT HEAT CAPT PHASE A
    - b) 6K15 PITOT HEAT CAPT PHASE B
    - c) 6K16 PITOT HEAT R AUX PHASE B
    - d) 6K17 PITOT HEAT R AUX PHASE C
    - e) 6L19 LEFT ENG PROBE HEAT
    - f) 6K25 RIGHT ENG PROBE HEAT

  WARNING: MAKE SURE YOU OPEN THESE CIRCUIT BREAKERS BEFORE YOU CONTINUE THIS TEST. IF YOU DO NOT OPEN THESE CIRCUIT BREAKERS, THE THRUST REVERSER CAN RETRACT. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

  - 4) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
    - a) 11D14 ENGINE T/R CONT L

TEST NO. 10 - REPLACEMENT ENGINE TEST (PRETESTED)

b) 11S10 LEFT ENG BLEED IND
c) 11L33 RIGHT ENGINE T/R CONT
d) 11S19 RIGHT ENG BLEED IND

5) Make sure these switches are at the position shown:
a) L(R) COW ANTI-ICE (M10397 panel) - OFF
b) L(R) PACK MODE SELECT (M10078 panel) - AUTO
c) WING ANTI-ICE WINDOW - PROBE HT TEST (M10398 panel) - OFF
d) STANDBY ENG. IND. (SEI) (P10016 panel) - AUTO
e) EICAS COMPUTER SELECT switch (M10195 panel) - AUTO
f) FLAP SELECTOR (P3 panel) - NORM
g) L(R) FUEL CONTROL (M73 panel) - CUTOFF
h) L(R) EEC MODE SELECT (P5 panel) - NORM
i) AUTO-THROTTLE ARM (P55 panel) - OFF

6) Make sure the thrust lever is in the idle position.

(b) Put the applicable EEC MAINT L (R) ENG POWER switch on the right side panel, P61, to the TEST position.

(c) Do the check of the EEC Mode Select switch.
1) Move and hold the L(R) thrust lever to the fully forward position.
2) Make sure the EPR command selector aligns with or is more than the maximum EPR limit (amber bar) on the EICAS display.
3) Put the L(R) EEC mode select switch on the P5 panel to the ALTN position while you hold the thrust lever for the applicable engine at the fully forward position.
4) Make sure the EPR command selector on the EICAS display does not show.
5) Make sure that the L(R) EEC "ALTN" mode light comes on.
6) Move the L(R) thrust lever slowly to the idle position.
7) Put the L(R) EEC mode select switch to the NORM position.
8) Make sure that the L(R) EEC "ALTN" mode light goes off.

(d) If the EICAS has page 2 of the EPCS page, do the check of the auto-throttle arm discrete.
1) Push the EPCS switch on the EICAS Maintenance panel.
2) Push the EPCS switch again to get to page 2.
3) Make sure the auto-throttle arm switch on the center glareshield, P55, is in the OFF position.
4) Make sure that the LABEL 275 bit 22 is set to zero for the two EEC channels (FIM 71-PIMU MESSAGE INDEX).
5) Put the auto-throttle arm switch to the A/T ARM position.

TEST NO. 10 - REPLACEMENT ENGINE TEST (PRETESTED)

6) Make sure that the LABEL 275 bit 22 is now set to one (FIM 71-PIMU MESSAGE INDEX).
7) Put the auto-throttle arm switch to the OFF position.

(e) Do a check of the EEC thrust lever angle (TLA) at idle and full throttle.
1) Push the EPCS switch on the EICAS Maintenance panel, if you did not do this before.
2) Make sure that the L(R) TRA indication, on the EICAS EPCS page, is between 33.4 and 34.4 degrees.
3) Put the L(R) thrust lever to the fully forward position.
4) Make sure that the L(R) TRA indication, on the EICAS EPCS page, is between 82.5 and 87.5 degrees.
5) Put the thrust lever to the idle position.

(f) Put the EEC fault codes into the L(R) PIMU as follows:
1) Put the RESET switch on the PIMU.
2) Put the L(R) PIMU GRD TEST switch to the CH A position.
3) Stop for ten seconds.
4) Put the L(R) PIMU GRD TEST switch to the CH B position.
5) Push the BIT switch on the L(R) PIMU and write the PIMU messages:

NOTE: The PIMU messages will show one at a time when you push the BIT switch. The channel A messages will show before the channel B messages. The message END will show after all the PIMU messages have shown. The message END will show for ten seconds and then the PIMU will go off.

6) Push the RESET switch on the L(R) PIMU.

(g) Put the applicable EEC MAINT L (R) ENG POWER switch on the right side panel, P61, to the NORM position.

(h) If there are PIMU messages, correct the failures as it is necessary (FIM 71-PIMU MESSAGE INDEX).

(i) If you installed them, remove the DO-NOT-CLOSE tags and close these circuit breakers as follow:
1) P6 Main Power Distribution Panel
   a) 6D14 PITOT HEAT CAPT PHASE A
   b) 6K15 PITOT HEAT CAPT PHASE B
   c) 6K16 PITOT HEAT R AUX PHASE B
   d) 6K17 PITOT HEAT R AUX PHASE C
   e) 6K25 RIGHT ENG PROBE HEAT
   f) 6L19 LEFT ENG PROBE HEAT
2) P11 Overhead Circuit Breaker Panel
   a) 11D14 ENGINE T/R CONT L
   b) 11L33 RIGHT ENGINE T/R CONT
   c) 11S10 LEFT ENG BLEED IND
   d) 11S19 RIGHT ENG BLEED IND

TEST NO. 10 - REPLACEMENT ENGINE TEST (PRETESTED)

S 715-287-N00

(19) Do a test of the fire system.
   (a) Push the SQUIB TEST 1 switch on the right side panel, P61.
      1) Make sure all the SQUIB TEST lights come on.
   (b) Push the SQUIB TEST 2 switch on the right side panel, P61.
      1) Make sure all the SQUIB lights (except the APU) come on.
   (c) Make sure the DISCH lights are off.
   (d) Push the ENG/APU/CARGO FIRE OVHT TEST switch on the aft electronic control panel, P8.
      1) Make sure the FAIL light does not come on.
   (e) Make sure all the fire indications are shown during this test.

F. Do the Engine Leak Tests.

S 215-271-N00

(1) Make sure the DUCT PRESSURE PSI gage on the pilots' overhead panel, P5, shows zero.
   (a) If the duct pressure is more than zero, remove pneumatic power (AMM 36-00-00/201).

S 865-272-N00

(2) Put these switches on the overhead circuit breaker panel, P5, in the OFF position:
   (a) ENG valve switches
   (b) Pack valve switches
   (c) ENGINE START switches.

S 865-273-N00

(3) Put these valve switches on the pilots' overhead panel, P5, in the CLOSED position:
   (a) C ISLN valve
   (b) WING ANTI-ICE valve
   (c) FWD CARGO HEAT valve
   (d) ENGINE ANTI-ICE valves.

TEST NO. 10 - REPLACEMENT ENGINE TEST (PRETESTED)

S 015-274-N00

(4) For the air leak test on the left engine, open the left strut pressure relief doors 434AL and 434AL.

NOTE: Put a screwdriver into the latch and use force to release the latch on the pressure relief doors.

S 015-275-N00

(5) For a leak test on the right engine, open the right strut pressure relief doors 444AL and 444AR.

NOTE: Put a screwdriver into the latch and use force to release the latch on the pressure relief doors.

S 215-276-N00

(6) Examine the high pressure shut-off valve (HPSOV) position indication to make sure the HPSOV is closed (Fig. 502).

S 035-277-N00

(7) Remove the rigid pressure-sense tube that is downstream of the pressure regulating and shutoff valve (PRSOV).
   (a) Disconnect the pressure-sense tube from the valve tee (Fig. 503).
   (b) Put a cap on the pressure-sense tube.
   (c) Put a plug in the PRSOV tee.

S 865-278-N00

(8) Pressurize the air supply system on the upstream side (the engine side) of the PRSOV (AMM 36-11-09/201).

NOTE: You can use a ground cart or the APU to pressurize the pneumatic system.

TEST NO. 10 - REPLACEMENT ENGINE TEST (PRETESTED)

S 865-279-N00

(9) Pressurize the pneumatic system with the ground source power.
   (a) For a leak test on the left engine, set these switches on the pilots' overhead panel, P5, as follows:
      1) Close the C ISLN valve.
      2) Close the L ISLN valve.
      3) Close the R ISLN valve.
   (b) For a leak test on the right engine, set these switches on the pilots' overhead panel, P5, as follows:
      1) Close the C ISLN valve.
      2) Open the L ISLN valve.
      3) Open the R ISLN valve.
   (c) Supply 35 to 40 psig of pressure to the pneumatic system (AMM 36-00-00/201).

      NOTE: After 8 to 10 psig pressure is supplied, the PRSOV and the PRV should stay open.

S 865-607-N00

(10) Start the APU (AMM 49-11-00/201) to pressurize the pneumatic system (optional procedure).

   NOTE: The pneumatic system can be pressurized with the APU as an optional source if a ground cart is not available.

   (a) For a leak test on the left engine, set these switches on the pilots' overhead panel, P5, as follows:
      1) Open the C ISLN valve.
      2) Open the L ISLN valve.
      3) Close the R ISLN valve.
   (b) For a leak test on the right engine, set these swithces on the pilots' overhead panel, P5, as follows:
      1) Open the C ISLN valve.

TEST NO. 10 - REPLACEMENT ENGINE TEST (PRETESTED)

2) Close the L ISLN valve.
3) Open the R ISLN valve.

(c) Supply pneumatic power from the APU.
1) Put the APU VALVE switch on the pilots' overhead panel, P5, in the OPEN position.
2) Make sure the white light on the switch is on.
3) Make sure the yellow VALVE light comes on and then goes off.
4) Make sure the duct pressure is 35 to 45 psig.

S 795-280-N00

(11) Examine all of the joints and connections for leaks in the part of the pneumatic system that is isolated.

NOTE: Air that leaks from one location around a duct coupling is not permitted. Air that leaks equally around a coupling is permitted.

(a) Put an anemometer 2 to 3 inches from the outer surface of the joints and connections to examine for leaks.
(b) Repair each joint or coupling (either by duct adjustment or by duct replacement) that has a leak of more than 100 feet/minute.

S 795-696-N00

(12) Examine the nacelle anti-ice duct for leaks.

CAUTION: IF HOT AIR (APPROXIMATELY 350°F) IS USED, DO NOT OPEN THE ANTI-ICE VALVE OF THE ENGINE INLET FOR MORE THAN 30 SECONDS FOLLOWED BY A TIME TO BECOME COOL. DAMAGE TO THE INLET COWL CAN OCCUR.

(a) Open the anti-ice valve.
1) Put the applicable ANTI-ICE, ENGINE L/R switch in the ON position.
2) On all airplanes without the ice detection system, make sure these components are in the condition that follows:
a) The white ON light in the applicable switch shows.
b) The amber VALVE light in the applicable switch comes on for approximately 2 seconds, then goes off.
3) Make sure TAI shows in green above the applicable engine N1 indication on the main EICAS.

TEST NO. 10 - REPLACEMENT ENGINE TEST (PRETESTED)

WARNING: YOU MUST BE VERY CAREFUL WHEN YOU FIND A LEAK. THE BLEED AIR LEAKAGE IS VERY HOT AND CAN CAUSE INJURY TO PERSONS.

(b) Examine the nacelle anti-ice duct for leaks.

NOTE: Leakage of air is not permitted at the couplings.

(c) Close the anti-ice valve.
1) Put the applicable ANTI-ICE, ENGINE L/R switch in the OFF position.
2) AIRPLANES WITHOUT THE ICE DETECTION SYSTEM;
Make sure these components are in the condition that follows:
a) The white ON indication in the applicable switch goes off.
b) The amber VALVE light in the applicable switch comes on for approximately 2 seconds, then goes off.
3) Make sure TAI does not show in green above the applicable engine N1 indication on the main EICAS.

S 865-281-N00
(13) Remove pneumatic power (AMM 36-00-00/201).

S 215-282-N00
(14) Make sure the DUCT PRESSURE PSI gage on pilots' overhead panel, P5, shows zero pressure.

S 865-283-N00
(15) Use the APU Operation procedure to do the APU shutdown (AMM 49-11-00/201).

S 435-284-N00
(16) Connect the PRSOV downstream rigid pressure-sense line (Fig. 503).
(a) Remove the cap form the PRSOV downstream rigid pressure-sense line.
(b) Remove the plug from the valve tee.
(c) Connect the downstream rigid pressure-sense line to the valve tee and tighten the nut.

S 865-285-N00
(17) For the left engine, close the strut pressure relief doors 434AL and 434AR.

S 865-286-N00
(18) For the right engine, close the strut pressure relief doors 444AL and 444ARL.

TEST NO. 10 - REPLACEMENT ENGINE TEST (PRETESTED)

S 795-288-N00

WARNING: USE AMM 71-00-00/201 TO OPERATE THE POWER PLANT. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE DAMAGE TO EQUIPMENT OR INJURY TO PERSONS.

(19) Use the Power Plant Wet-Motor procedure to motor the engine (AMM 71-00-00/201).

NOTE: Keep the fan cowl panels, the thrust reversers, and core cowl panels open. This will permit you to examine the engine for leaks while you motor the engine.

(a) Examine the engine for leaks while you motor the engine.
(b) If leaks are found, do as follows:
1) Repair the leaks as necessary.
2) Motor the engine again to examine the engine for leaks.

S 415-289-N00

WARNING: DO THE PROCEDURE IN AMM 78-31-00/201 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(20) Close the thrust reversers (AMM 78-31-00/201).

S 415-290-N00
(21) Close the core cowl panels (AMM 71-11-06/201).

S 415-633-N00
(22) Close the fan cowl panels (AMM 71-11-04/201).

S 445-291-N00
(23) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

G. Prepare to operate the engine.

S 865-302-N00

CAUTION: MAKE SURE THE CENTER HYDRAULIC SYSTEM IS PRESSURIZED DURING ENGINE OPERATION. IF YOU DO NOT KEEP THE HYDRAULINC SYSTEM PRESSURIZED YOU MAY NOT KEEP CONTROL OF THE AIRPLANE.

(1) Pressurize the center hydraulic system (AMM 29-11-00/201).

S 865-303-N00
(2) Supply electrical power if it was not done before (AMM 24-22-00/201).

TEST NO. 10 - REPLACEMENT ENGINE TEST (PRETESTED)

S 865-304-N00

(3) Make sure the ECS valves are in the usual position for an engine start.

S 865-305-N00

(4) For the left engine, close these circuit breakers on the overhead circuit breaker panel, P11:
- (a) 11A10, AIR DATA CMPTR L
- (b) 11C27, L ENG EEC CHAN A RST
- (c) 11D17, ENGINE EEC DISCRETES L
- (d) 11D25, ENGINE FUEL CONT VLV & EEC CHAN B RESET L
- (e) 11F30, AIR DATA CMPTR R
- (f) 11L3, LEFT ENGINE PERF SOL CHAN A
- (g) 11L4, LEFT ENGINE PERF SOL CHAN B
- (h) 11M6, LEFT ENGINE IDLE CONT

S 865-306-N00

(5) For the right engine, close these circuit breakers on the overhead circuit breaker panel, P11:
- (a) 11A10, AIR DATA CMPTR L
- (b) 11C28, R ENG EEC CHAN A RST
- (c) 11D26, ENGINE FUEL CONT VLV & EEC CHAN B RESET R
- (d) 11F30, AIR DATA CMPTR R
- (e) 11L30, RIGHT ENGINE PERF SOL CHAN A
- (f) 11L31, RIGHT ENGINE PERF SOL CHAN B
- (g) 11M32, RIGHT ENGINE EEC DISCRETES
- (h) 11M33, RIGHT ENGINE IDLE CONT

S 865-307-N00

(6) For the left engine, close this circuit breaker on the main power distribution panel, P6:
- (a) 6L19, LEFT ENG PROBE HEAT

S 865-308-N00

(7) For the right engine, close this circuit breaker on the main power distribution panel, P6:
- (a) 6K25, RIGHT ENG PROBE HEAT

TEST NO. 10 - REPLACEMENT ENGINE TEST (PRETESTED)

S 865-309-N00

WARNING: USE AMM 71-00-00/201 TO OPERATE THE POWER PLANT. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE DAMAGE TO EQUIPMENT OR INJURY TO PERSONS.

(8) Use the Power Plant Operation (Normal) procedure to start the engine (AMM 71-00-00/201).
   (a) Let the N2 rpm become stable at idle for five minutes.

S 715-557-N00

(9) Make sure the engine operates correctly.
   (a) Push the PERF/APU switch for the EICAS display on the right side panel, P61.
   (b) Make sure the N1, N2, EGT, and FF indications show on the bottom EICAS display.
   (c) Push the EPCS switch for the EICAS display on the right side panel, P61.
   (d) Make sure these indications show on the bottom EICAS display: TRA, SVA, BVA, N2C, T2, PS, P2, RP, SCAV, P5, AOC, and TCC.

S 865-310-N00

CAUTION: START THE OTHER ENGINE OR THE APU. TO PREPARE FOR AN EMERGENCY ENGINE SHUTDOWN, THE OTHER ENGINE OR THE APU MUST BE OPERATED FOR PNEUMATIC POWER. IF PNEUMATIC POWER IS NOT AVAILABLE DURING AN EMERGENCY SHUTDOWN, YOU CAN CAUSE DAMAGE TO THE ENGINE.

(10) Do the Power Plant Operation (Normal) procedure to start the other engine (AMM 71-00-00/201) or do the APU Operation (AMM 49-11-00/201) procedure.

S 865-311-N00

(11) Remove the ground pneumatic power, if it was supplied (AMM 36-00-00/201).

S 715-312-N00

(12) Do a check of the engine-driven (hydraulic) pump.
   (a) Push the ELEC/HYD switch for EICAS on the right side panel, P61.
   (b) Put the ENG pump switch on the hydraulic control panel in the ON position.
   (c) Make sure the hydraulic pressure (shown on the EICAS ELEC/HYD page) is stable at 2900 to 3200 psi.

TEST NO. 10 - REPLACEMENT ENGINE TEST (PRETESTED)

(d) Put the ENG pump switch on the hydraulic control panel in the OFF position.

S 715-313-N00

(13) Do a check of the Integrated Drive Generator (IDG).

(a) Put the applicable L(R) GEN CONT switch on the pilots' overhead panel, P5, in the ON position.

(b) Make sure the LOAD comes from the two APU GEN and the applicable L(R) IDG.

(c) Put the applicable L(R) GEN CONT switch on the pilots' overhead panel, P5, in the OFF position.

S 715-338-N00

(14) Do the thrust reverser check.

CAUTION: MAKE SURE THAT THE HINGED COWLS ARE CLOSED AND LATCHED BEFORE YOU OPERATE THE THRUST REVERSER DURING THE ENGINE OPERATION. IF YOU DO NOT FOLLOW THIS INSTRUCTION, YOU CAN DAMAGE THE EQUIPMENT.

(a) Quickly pull and hold the applicable L(R) thrust reverser lever against the interlock.

1) Measure the time that the REV indication on the top EICAS display is yellow.

2) An amber REV light will show on the top EICAS display above the applicable EPR indication to show that the thrust reverser is in translation.

3) A green REV light will replace the amber REV light when the thrust reverser has successfully deployed.

(b) Make sure the REV indication is not yellow for more than 3.0 seconds.

(c) Make sure the RP indication on the EICAS EPCS page is between 98 and 102.

(d) If the RP indication is not between 98 and 102, replace the center locking hydraulic actuators for the thrust reverser (AMM 78-31-17/401).

CAUTION: DO NOT OPERATE THE ENGINE ABOVE 90 PERCENT N1 IN THE REVERSE THRUST MODE. DO NOT OPERATE THE ENGINE IN REVERSE IDLE FOR MORE THAN FIVE MINUTES. IF YOU DO NOT FOLLOW THIS INSTRUCTIONS, YOU CAN DAMAGE THE ENGINE.

(e) Slowly move the thrust reverse lever to increase the engine speed to approximately 30 percent N1.

TEST NO. 10 - REPLACEMENT ENGINE TEST (PRETESTED)

(f) Slowly move the reverse thrust lever to the REVERSE IDLE position.

NOTE: This makes sure the interlock for the reverse thrust lever has cleared.

1) Put the applicable L(R) thrust reverser through the interlock to the forward thrust position.
   a) Measure the time the REV light changes to amber while the thrust reverser is in translation.
2) Make sure the REV light goes off when the thrust reverser is in fully stowed position.

(g) Make sure that the REV indication is not yellow for more than 3.0 seconds.

(h) Make sure that the RP indication on the EICAS EPCS page is between -2 and +2.

(i) If the RP indication is not between -2 and +2, set the thrust reverser position indicator (AMM 78-36-00/501).
   1) If you can not set the position indicator for the thrust reverser, replace the center locking hydraulic actuator for the thrust reverser (AMM 78-31-17/401).

S 795-558-N00

(15) Do the steps that follow to operate the engine at 80% N2:
   (a) Slowly move the thrust lever forward until the engine is at 80% N2.
   (b) Let the engine become stable for 15-20 seconds.
   (c) Slowly move the thrust levers to the rear until the engine is at idle.

S 865-339-N00

(16) Push the ECS/MSG switch on the right side panel, P61, and look for maintenance messages on the lower EICAS display.
   (a) Correct the maintenance messages as necessary.

TEST NO. 10 - REPLACEMENT ENGINE TEST (PRETESTED)

S 865-559-N00

(17) Put the EEC fault codes into the PIMU as follows:
   (a) Push the RESET switch on the PIMU.
   (b) Put the PIMU GRD TEST switch to the CH A position.
   (c) Stop for ten seconds.
   (d) Put the PIMU GRD TEST switch to the CH B position.
   (e) Push the BIT switch on the PIMU and write the PIMU messages.

NOTE: The PIMU messages will show one at a time when you push the BIT switch. The channel A messages will show before the channel B messages. The message END will show for ten seconds after all of the messages have shown.

S 715-340-N00

(18) Do the IDG disconnect check.

CAUTION: DO NOT PUSH THE GEN DRIVE DISC SWITCH FOR MORE THAN THREE SECONDS. AFTER YOU PUSH THE GEN DRIVE DISC SWITCH, DO NOT PUSH THE SWITCH AGAIN FOR AT LEAST 60 SECONDS.

CAUTION: DO NOT PUSH THE GEN DRIVE DISC SWITCH IF THE ENGINE IS LESS THAN THE IDLE N2 LIMIT. IF YOU DISCONNECT THE IDG WITH THE ENGINE LESS THAN THE IDLE SPEED, YOU CAN CAUSE DAMAGE TO THE DISCONNECT DOG TEETH.

   (a) Push the applicable L(R) GEN DRIVE DISC switch on the pilots' overhead panel, P5.
   (b) Make sure the applicable the L(R) DRIVE light and the L(R) GEN CONT OFF lights are on.

NOTE: This lets you know the IDG is disconnected.

TEST NO. 10 - REPLACEMENT ENGINE TEST (PRETESTED)

H. Put the airplane back to its usual condition.

S 865-341-N00

(1) Operate the engine at idle for five minutes to decrease the engine temperature.

S 865-342-N00

(2) Use the Power Plant Operation (Normal) procedure to do the engine shutdown (AMM 71-00-00/201).

S 865-343-N00

(3) If the other engine was operated, use the Power Plant Operation (Normal) procedure to do the engine shutdown (AMM 71-00-00/201).

S 865-344-N00

(4) If the APU was operated, use the APU Operation procedure to do the APU shutdown (AMM 49-11-00/201).

S 015-345-N00

(5) Open the fan cowl panels (AMM 71-11-04/201).

S 045-346-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO YOU OR DAMAGE TO EQUIPMENT.

(6) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 015-347-N00

(7) Open the core cowl panels (AMM 71-11-06/201).

S 015-348-N00

WARNING: DO THE PROCEDURE IN AMM 78-31-00/201 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(8) Open the thrust reversers (AMM 78-31-00/201).

TEST NO. 10 - REPLACEMENT ENGINE TEST (PRETESTED)

S 215-609-N00

(9) Make sure there are no leaks at the fuel, oil, or hydraulic connections.

NOTE: If an engine turns at speeds below idle, a small quantity of oil leakage can occur. It comes through the carbon seal assembly for the No. 2 bearing. This usually occurs when the engine turns at low speeds for an extended time (when an engine has an extended start/shutdown or when an engine turns freely in the wind). After engine shutdown, this oil leakage can be on the variable stator vane retention bolts at the bottom of the engine. It can also be on the bottom of the nose cone/spinner. This small quantity of oil leakage is permitted.

S 865-349-N00

(10) Make sure the N2 rotor is stopped.

S 985-350-N00

(11) Pull the IDG disconnect reset ring until the solenoid pin will go back into its usual position (Fig. 515).

S 415-351-N00

WARNING: DO THE PROCEDURE IN AMM 78-31-00/201 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(12) Close the thrust reversers (AMM 78-31-00/201).

S 415-352-N00

(13) Close the core cowl panels (AMM 71-11-06/201).

S 415-634-N00

(14) Close the fan cowl panels (AMM 71-11-04/201).

S 445-353-N00

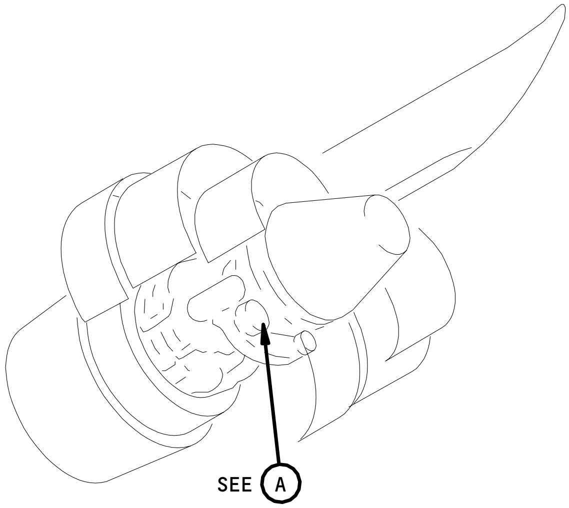
(15) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

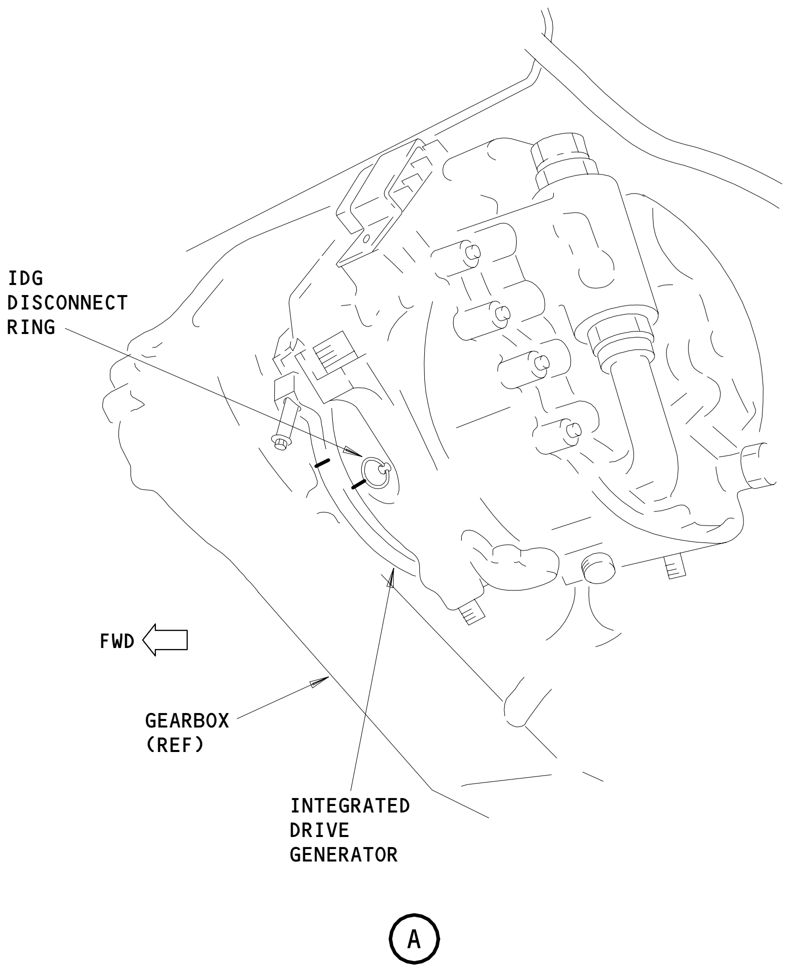
S 815-610-N00

(16) If there are PIMU messages shown, correct the failures as necessary (FIM 71-PIMU MESSAGE INDEX).

S 865-355-N00

(17) Remove electrical power, if it is not necessary (AMM 24-22-00/201).





IDG Disconnect
Figure 515

TEST NO. 11 - REPLACEMENT ENGINE TEST (UNTESTED)

TASK 71-00-00-725-011-N00

13. Test No. 11 - Replacement Engine Test (Untested)

A. General

(1) This procedure is used to prepare a replacement engine for operation. This procedure is used for an engine that has not had a test in a test cell before it was installed. If the engine had a test in a test cell, use Test No. 10 - Replacement Engine Test (Pretested).

(2) Use the Trim Worksheet (Fig. 504) and the Performance Worksheet (Fig. 507) to write the engine data and the ambient conditions for this test. Keep the worksheets as a record to refer to in the future.

(3) The test graphs are for engines with no bleed air. Thus, you should not do this test when the anti-ice systems are necessary. The anti-ice systems may be necessary in the rain, snow, or fog with the outside air temperature (OAT) less than 46 °F (8 °C).

(a) If you must do the test with the anti-ice on, keep the anti-ice system on during the operation. For the last 30 seconds at each power level, switch the anti-ice to off and get the necessary engine data.

B. Equipment

(1) Alcohol thermometer (or a mercury thermometer if it is not used in the airplane) calibrated in degrees, -40 to +120°F (-40 to +49°C) range, ±1/2°F (±1/4°C)

(2) Hot Film Anemometer - Range zero to 6000 ft/min

(3) Ground Pneumatic Cart

C. References

(1) AMM 12-11-01/301, Fuel Tank - Pressure Fueling (Replenishing)

(2) AMM 12-12-01/301, Hydraulic Systems (Replenishing)

(3) AMM 12-13-01/301, Engine (Oil Servicing)

(4) AMM 12-13-02/301, Engine Starter (Oil Servicing)

(5) AMM 12-13-03/301, Integrated Drive Generator (Oil Servicing)

(6) AMM 24-22-00/201, Electrical Power - Control

TEST NO. 11 - REPLACEMENT ENGINE TEST (UNTESTED)

(7) AMM 27-81-00/201, Leading Edge Slat System
(8) AMM 36-00-00/201, Pneumatic - General
(9) AMM 36-11-09/201, Air Supply Pressure Regulating and Shutoff Valve
(10) AMM 49-11-00/201, Auxiliary Power Unit
(11) AMM 71-00-00/201, Power Plant (Operation Procedure)
(12) AMM 71-11-04/201, Fan Cowl Panel
(13) AMM 71-11-06/201, Core Cowl Panel
(14) AMM 71-71-00/601, Engine Vents and Drains
(15) AMM 73-11-02/401, Fuel Pump Filter
(16) AMM 73-11-04/701, Fuel Distribution Valve Strainer
(17) AMM 78-31-00/201, Thrust Reverser System
(18) AMM 78-31-17/401, Thrust Reverser Hydraulic Actuators
(19) AMM 78-36-00/501, Thrust Reverser Indication System
(20) AMM 79-21-05/401, Main Oil Filter
(21) AMM 79-21-10/601, Magnetic Chip Detectors
(22) FIM 71-PIMU MESSAGE INDEX

D. Access

(1) Location Zones

211	Control Cabin
212	Control Cabin
411	Left Engine
421	Right Engine

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine
434AL	Strut Pressure Relief Panel, Left Strut
434AR	Strut Pressure Relief Panel, Left Strut
444AL	Strut Pressure Relief Panel, Right Strut
444AR	Strut Pressure Relief Panel, Right Strut

E. Prepare to operate the engine.

S 585-356-N00

(1) Put the airplane so that wind conditions permit the engine to be operated (Fig. 501).

TEST NO. 11 - REPLACEMENT ENGINE TEST (UNTESTED)

S 215-357-N00

(2) Make sure the fuel tank sumps do not have water in them.

S 655-358-N00

CAUTION: DO NOT OPERATE THE AIRPLANE HYDRAULIC SYSTEM IF THERE IS NOT ENOUGH FUEL FOR THE HYDRAULIC FLUID HEAT EXCHANGERS. THE HYDRAULIC SYSTEM CAN BECOME TOO HOT AND CAUSE DAMAGE TO EQUIPMENT.

(3) Make sure you keep a minimum of 4020 pounds (1827 Kg) of fuel in the main fuel tanks of the left and right wings (AMM 12-11-01/301).

S 015-359-N00

(4) Open the fan cowl panels (AMM 71-11-04/201).

S 045-360-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO YOU OR DAMAGE TO EQUIPMENT.

(5) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 015-361-N00

(6) Open the core cowl panels (AMM 71-11-06/201).

S 015-362-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(7) Open the thrust reversers (AMM 78-31-00/201).

S 635-364-N00

(8) If you operate the replacement engine for the first time, do these steps:
   (a) Make sure that these items related to the engine preservation are removed: storage plugs, seals on vents and drains, all seals on engine openings, humidity indicators, and dessicants.
   (b) Make sure that there are no foreign objects in these areas: the fan turbine exhaust areas, the wing leading-edge above the engine, and the area around the airplane.

TEST NO. 11 - REPLACEMENT ENGINE TEST (UNTESTED)

S 215-365-N00

(9) Make sure the hydraulic reservoir is full (AMM 12-12-01/301).

NOTE: You can examine the hydraulic reservoirs in the sight gage or on the EICAS STATUS page.

S 615-366-N00

(10) Do the Engine - Oil Servicing procedure (AMM 12-13-01/301).

S 615-367-N00

(11) Do the Integrated Drive Generator (IDG) - Servicing procedure (AMM 12-13-03/301).

S 615-368-N00

(12) Do the Pneumatic Starter - Servicing procedure (AMM 12-13-02/301).

S 215-369-N00

(13) Make sure that the thrust lever is in the idle, forward thrust position.

S 215-370-N00

(14) Make sure the FUEL CONTROL switch is in the CUTOFF position.

S 865-371-N00

(15) Make sure the LEFT (RIGHT) DISCH fire switch on the aft electronics panel, P10, is in the normal position.

S 865-372-N00

(16) Supply electrical power (AMM 24-22-00/201).

S 865-373-N00

(17) Put the parking brake in the ON position.

TEST NO. 11 - REPLACEMENT ENGINE TEST (UNTESTED)

S 715-611-N00

(18) Do these steps to do a static test for the electronic engine control (EEC):

(a) Prepare the airplane for the test as follows:

1) Make sure this circuit breaker on the P33 panel is closed:
   a) 33D4, PIMU L ENG
   b) 33D5, PIMU R ENG
2) Make sure these circuit breakers on the overhead circuit breaker panel, P11, are closed:
   a) 11L7, EEC/SCU PWR L ENG
   b) 11K28, EEC/SCU PWR R ENG
3) Open these circuit breakers on the P6 panel and attach DO-NOT-CLOSE tags:
   a) 6D14 PITOT HEAT CAPT PHASE A
   b) 6K15 PITOT HEAT CAPT PHASE B
   c) 6K16 PITOT HEAT R AUX PHASE B
   d) 6K17 PITOT HEAT R AUX PHASE C
   e) 6L19 LEFT ENG PROBE HEAT
   f) 6K25 RIGHT ENG PROBE HEAT

WARNING: MAKE SURE YOU OPEN THESE CIRCUIT BREAKERS BEFORE YOU CONTINUE THIS TEST. IF YOU DO NOT OPEN THESE CIRCUIT BREAKERS, THE THRUST REVERSER CAN RETRACT. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

4) Open these circuit breakers on the P11 panel and attach DO-NOT-CLOSE tags:
   a) 11D14 ENGINE T/R CONT L
   b) 11S10 LEFT ENG BLEED IND
   c) 11L33 RIGHT ENGINE T/R CONT
   d) 11S19 RIGHT ENG BLEED IND
5) Make sure these switches are at the position shown:
   a) L(R) COW ANTI-ICE (M10397 panel) - OFF
   b) L(R) PACK MODE SELECT (M10078 panel) - AUTO
   c) WING ANTI-ICE WINDOW - PROBE HT TEST (M10398 panel) - OFF
   d) STANDBY ENG. IND. (SEI) (P10016 panel) - AUTO
   e) EICAS COMPUTER SELECT switch (M10195 panel) - AUTO
   f) FLAP SELECTOR (P3 panel) - NORM

TEST NO. 11 - REPLACEMENT ENGINE TEST (UNTESTED)

g) L(R) FUEL CONTROL (M73 panel) - CUTOFF
h) L(R) EEC MODE SELECT (P5 panel) - NORM
i) AUTO-THROTTLE ARM (P55 panel) - OFF

6) Make sure the thrust lever is in the idle position.

(b) Put the applicable L(R) EEC MAINT POWER switch on the P61 panel to the TEST position.

(c) Do the check of the EEC Mode Select switch.

1) Move and hold the L(R) thrust lever to the fully forward position.
2) Make sure the EPR command selector aligns with or is more than the maximum EPR limit (amber bar) on the EICAS display.
3) Put the L(R) EEC mode select switch on the P5 panel to the ALTN position while you hold the thrust lever for the applicable engine at the fully forward position.
4) Make sure the EPR command sector on the EICAS display does not show.
5) Make sure that the L(R) EEC "ALTN" mode light comes on.
6) Move the L(R) thrust lever slowly to the idle position.
7) Put the L(R) EEC mode select switch to the NORM position.
8) Make sure that the L(R) EEC "ALTN" mode light goes off.

(d) If the EICAS has page 2 of the EPCS page, do the check of the auto-throttle arm discrete.

1) Push the EPCS switch on the EICAS Maintenance panel.
2) Push the EPCS switch again to get to the page 2.
3) Make sure the auto-throttle arm switch on the P55 panel is in the OFF position.
4) Make sure that the LABEL 275 bit 22 is set to zero for the two EEC channels (FIM 71-PIMU MESSAGE INDEX).
5) Put the auto-throttle arm switch to the A/T ARM position.
6) Make sure that the LABEL 275 bit 22 is now set to one (FIM 71-PIMU MESSAGE INDEX).
7) Put the auto-throttle arm switch to the OFF position.

(e) Do a check of the EEC thrust lever angle (TLA) at idle and full throttle.

1) Push the EPCS switch on the EICAS Maintenance panel, if you did not do this before.
2) Make sure that the L(R) TRA indication, on the EICAS EPCS page, is between 33.4 and 34.4 degrees.
3) Put the L(R) thrust lever to the fully forward position.
4) Make sure that the L(R) TRA indication, on the EICAS EPCS page, is between 82.5 and 87.5 degrees.
5) Put the thrust lever to the idle position.

(f) Put the EEC fault codes into the L(R) PIMU as follows:

1) Put the RESET switch on the PIMU.
2) Put the L(R) PIMU GRD TEST switch to the CH A position.

TEST NO. 11 - REPLACEMENT ENGINE TEST (UNTESTED)

3) Stop for ten seconds.
4) Put the L(R) PIMU GRD TEST switch to the CH B position.
5) Push the BIT switch on the L(R) PIMU and write the PIMU messages:

NOTE: The PIMU messages will show one at a time when you push the BIT switch. The channel A messages will show before the channel B messages. The message END will show after all the PIMU messages have shown. The message END will show for ten seconds and then the PIMU will go off.

6) Push the RESET switch on the L(R) PIMU.

(g) Put the applicable EEC MAINT L (R) ENG POWER switch on the P61 panel to the NORM position.
(h) If there are PIMU messages, correct the failures as it is necessary (FIM 77-35-00/101).
(i) If you installed, remove the DO-NOT-CLOSE tags and close the circuit breakers as follow:
1) P6 Main Power Distribution Panel
a) 6D14 PITOT HEAT CAPT PHASE A
b) 6K15 PITOT HEAT CAPT PHASE B
c) 6K16 PITOT HEAT R AUX PHASE B
d) 6K17 PITOT HEAT R AUX PHASE C
e) 6K25 RIGHT ENG PROBE HEAT
f) 6L19 LEFT ENG PROBE HEAT
2) P11 Overhead Circuit Breaker Panel
a) 11D14 ENGINE T/R CONT L
b) 11L33 RIGHT ENGINE T/R CONT
c) 11S10 LEFT ENG BLEED IND
d) 11S19 RIGHT ENG BLEED IND

F. Do the Engine Leak Tests.

S 215-374-N00

(1) Make sure that the DUCT PRESSURE PSI on the pilots' overhead panel, P5, shows zero.
(a) If duct pressure is more than zero, remove pneumatic power (AMM 36-00-00/201).

TEST NO. 11 - REPLACEMENT ENGINE TEST (UNTESTED)

S 865-375-N00

(2) Put these switches on the pilots' overhead panel, P5, in the OFF position:
- (a) ENG valve switches
- (b) Pack valve switches
- (c) ENGINE START switches.

S 865-376-N00

(3) Put these valve switches on the pilots' overhead panel, P5, in the CLOSED position:
- (a) C ISLN valve
- (b) WING ANTI-ICE valve
- (c) FWD CARGO HEAT valve
- (d) ENGINE ANTI-ICE valves.

S 865-377-N00

(4) For the air leak test on the left engine, open the left strut pressure relief doors 434AL and 434AL.

NOTE: Put a screwdriver into the latch and use force to release the latch on the pressure relief doors.

S 865-378-N00

(5) For a leak test on the right engine, open the right strut pressure relief doors 444AL and 444AR.

NOTE: Put a screwdriver into the latch and use force to release the latch on the pressure relief doors.

S 865-379-N00

(6) Examine the position indicator for the high pressure shutoff valve (HPSOV) to make sure the HPSOV is closed (Fig. 502).

TEST NO. 11 - REPLACEMENT ENGINE TEST (UNTESTED)

S 035-380-N00

(7) Remove the rigid pressure-sense tube that is downstream of the pressure regulating and shutoff valve (PRSOV).
  (a) Disconnect the pressure-sense tube from the valve tee (Fig. 503).
  (b) Put a cap on the pressure-sense tube.
  (c) Put a plug in the PRSOV tee.

S 865-381-N00

(8) Pressurize the air supply system on the upstream side (the engine side) of the PRSOV (AMM 36-11-09/201).

NOTE: You can use a ground cart or the APU to pressurize the pneumatic system.

S 865-382-N00

(9) Pressurize the pneumatic system with the ground source power.
  (a) For a leak test on the left engine, set these switches on the pilots' overhead panel, P5, as follows:
    1) Close the C ISLN valve.
    2) Close the L ISLN valve.
    3) Close the R ISLN valve.
  (b) For a leak test on the right engine, set these switches on the pilots' overhead panel, P5, as follows:
    1) Close the C ISLN valve.
    2) Open the L ISLN valve.
    3) Open the R ISLN valve.
  (c) Supply 35 to 40 psig of pressure to the pneumatic system (AMM 36-00-00/201).

  NOTE: After 8 to 10 psig pressure is supplied, the PRSOV and the PRV should stay open.

TEST NO. 11 - REPLACEMENT ENGINE TEST (UNTESTED)

S 865-383-N00

(10) Start the APU (AMM 49-11-00/201) to pressurize the pneumatic system (optional).

NOTE: The pneumatic system can be pressurized with the APU as an optional source if a ground cart is not available.

(a) For a leak test on the left engine, set these switches on the pilots' overhead panel, P5, as follows:
  1) Open the C ISLN valve.
  2) Open the L ISLN valve.
  3) Close the R ISLN valve.

(b) For a leak test on the right engine, set these swithces on the pilots' overhead panel, P5, as follows:
  1) Open the C ISLN valve.
  2) Close the L ISLN valve.
  3) Open the R ISLN valve.

(c) Supply pneumatic power from the APU.
  1) Put the APU VALVE switch on the pilots' overhead panel, P5, in the OPEN position.
  2) Make sure the white light on the switch is on.
  3) Make sure the yellow VALVE light comes on and then goes off.
  4) Make sure the duct pressure is 35 to 45 psig.

S 795-384-N00

(11) Examine all of the joints and connections for leaks in the part of the pneumatic system that is isolated.

NOTE: Air that leaks from one location around a duct coupling is not permitted. Air that leaks equally around a coupling is permitted.

(a) Put an anemometer 2 to 3 inches from the outer surface of the joints and connections to examine for leaks.

TEST NO. 11 - REPLACEMENT ENGINE TEST (UNTESTED)

(b) Repair each joint or coupling (either by duct adjustment or by duct replacement) that has a leak of more than 100 feet/minute.

S 795-697-N00

(12) Examine the nacelle anti-ice duct for leaks.

CAUTION: IF HOT AIR (APPROXIMATELY 350°F) IS USED, DO NOT OPEN THE ANTI-ICE VALVE OF THE ENGINE INLET FOR MORE THAN 30 SECONDS FOLLOWED BY A TIME TO BECOME COOL. DAMAGE TO THE INLET COWL CAN OCCUR.

(a) Open the anti-ice valve.
 1) Put the applicable ANTI-ICE, ENGINE L/R switch in the ON position.
 2) AIRPLANES WITHOUT THE ICE DETECTION SYSTEM;
 Make sure these components are in the condition that follows:
  a) The white ON light in the applicable switch shows.
  b) The amber VALVE light in the applicable switch comes on for approximately 2 seconds, then goes off.
 3) Make sure TAI shows in green above the applicable engine N1 indication on the main EICAS.

WARNING: YOU MUST BE VERY CAREFUL WHEN YOU FIND A LEAK. THE BLEED AIR LEAKAGE IS VERY HOT AND CAN CAUSE INJURY TO PERSONS.

(b) Examine the nacelle anti-ice duct for leaks.

NOTE: Leakage of air is not permitted at the couplings.

(c) Close the anti-ice valve.
 1) Put the applicable ANTI-ICE, ENGINE L/R switch in the OFF position.
 2) AIRPLANES WITHOUT THE ICE DETECTION SYSTEM;
 Make sure these components are in the condition that follows:
  a) The white ON indication in the applicable switch goes off.
  b) The amber VALVE light in the applicable switch comes on for approximately 2 seconds, then goes off.
 3) Make sure TAI does not show in green above the applicable engine N1 indication on the main EICAS.

S 865-385-N00

(13) Remove pneumatic power (AMM 36-00-00/201).

S 215-386-N00

(14) Make sure the DUCT PRESSURE PSI on pilots' overhead panel, P5, is zero.

TEST NO. 11 - REPLACEMENT ENGINE TEST (UNTESTED)

S 865-387-N00

(15) Use the APU Operation procedure to do the APU shutdown (AMM 49-11-00/201).

S 435-388-N00

(16) Connect the PRSOV downstream rigid pressure-sense line (Fig. 503).
  (a) Remove the cap from the PRSOV downstream rigid pressure-sense line.
  (b) Remove the plug from the valve tee.
  (c) Connect the downstream rigid pressure-sense line to the valve tee and tighten the nut.

S 415-389-N00

(17) For the left engine, close the strut pressure relief doors 434AL and 434AR.

S 415-390-N00

(18) For the right engine, close the strut pressure relief doors 444AL and 444ARL.

S 715-391-N00

(19) Do a test of the fire system.
  (a) Push the SQUIB TEST 1 switch on the right side panel, P61.
    1) Make sure all the SQUIB TEST lights come on.
  (b) Push the SQUIB TEST 2 switch on the right side panel, P61.
    1) Make sure all the SQUIB lights (except the APU) come on.
  (c) Make sure the DISCH lights are off.
  (d) Push the ENG/APU/CARGO FIRE OVHT TEST switch on the aft electronic control panel, P8.
    1) Make sure the FAIL light does not come on.
  (e) Make sure all the fire indications are shown during this test.

S 795-392-N00

WARNING: USE AMM 71-00-00/201 TO OPERATE THE POWER PLANT. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE DAMAGE TO EQUIPMENT OR INJURY TO PERSONS.

(20) Use the Power Plant Wet-Motor procedure to motor the engine (AMM 71-00-00/201).

NOTE: Keep the fan cowl panels, the thrust reversers, and core cowl panels open. This will permit you to examine the engine for leaks while you motor the engine.

  (a) Examine the engine for leaks while you motor the engine.
  (b) If leaks are found, do as follows:
    1) Repair the leaks as necessary.

TEST NO. 11 - REPLACEMENT ENGINE TEST (UNTESTED)

2) Motor the engine again to examine the engine for leaks.

S 865-393-N00

(21) Use the Wet-Motor Procedure to do the engine shutdown (AMM 71-00-00/201).

S 865-394-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO OPERATE THE POWER PLANT. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

CAUTION: BEFORE YOU DO THE IGNITION SYSTEM TEST, DO THE DRY-MOTOR PROCEDURE TO REMOVE ALL THE FUEL FROM THE ENGINE. FUEL IN THE ENGINE FROM THE WET-MOTOR PROCEDURE CAN CAUSE AN ENGINE FIRE OR A TURBINE EXHAUST AREA FIRE.

(22) Use the Power Plant Dry-Motor procedure to motor the engine (AMM 71-00-00/201).

S 755-395-N00

(23) Do the Ignition System Audible Test.

CAUTION: OPEN THE START CONT AND THE FUEL CONTROL VLV CIRCUIT BREAKERS. IF THESE ARE NOT OPEN, THE ENGINE WILL MOTOR WITH THE PNEUMATIC PRESSURE AND THE START SWITCH IN THE GND POSITION.

(a) For the left engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
   1) 11D19, ENGINE START CONT LEFT
   2) 11D25, ENGINE FUEL CONT VLV & EEC CHAN B RESET L
(b) For the right engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
   1) 11D20, ENGINE START CONT RIGHT
   2) 11D26, ENGINE FUEL CONT VLV & EEC CHAN B RESET R
(c) For the left engine, close these circuit breakers on the overhead circuit breaker panel, P11:
   1) 11M1, ENGINES L IGNITION 1
   2) 11M9, LEFT ENG BUS POWER SENSE
   3) 11M28, ENGINES L IGNITION 2
(d) For the right engine, close these circuit breakers on the overhead circuit breaker panel, P11:
   1) 11M2, ENGINES R IGNITION 1
   2) 11M29, ENGINES R IGNITION 2
   3) 11M36, RIGHT ENG BUS POWER SENSE

TEST NO. 11 - REPLACEMENT ENGINE TEST (UNTESTED)

(e) Put the ignition select switch on the pilots' overhead panel, P5, to 1.

CAUTION: DO NOT DO THE IGNITION SYSTEM TEST WHEN THE N2 ROTOR TURNS. IF THE N2 ROTOR TURNS, FUEL CAN GET INTO THE COMBUSTION CHAMBER WITH THE FUEL CONTROL IN THE RUN POSITION. WHEN THIS OCCURS, THE FUEL WILL BURN AND CAUSE DAMAGE TO THE ENGINE.

1) Put the ENG START switch on the pilots' overhead panel, P5, to the GND position.
2) Listen to the igniter to make sure it fires.

NOTE: If you hear the ignitor fire, it is not an indication that the igniter operates correctly. The igniter could make a spark in an area other than the igniter point.

3) Put the ENG START switch on the pilots' overhead panel, P5, to the OFF position.

(f) Put the ignition select switch on the pilots' overhead panel, P5, to 2.

CAUTION: DO NOT DO THE IGNITION SYSTEM TEST WHEN THE N2 ROTOR TURNS. IF THE N2 ROTOR TURNS, FUEL CAN GET INTO THE COMBUSTION CHAMBER WITH THE FUEL CONTROL IN THE RUN POSITION. WHEN THIS OCCURS, THE FUEL WILL BURN AND CAUSE DAMAGE TO THE ENGINE.

1) Put the ENG START switch on the pilots' overhead panel, P5, to the GND position.
2) Listen to the igniter to make sure it fires.

NOTE: If you hear the ignitor fire, it is not an indication that the igniter operates correctly. The igniter could make a spark in an area other than the igniter point.

3) Put the ENG START switch on the pilots' overhead panel, P5, to the OFF position.

(g) For the left engine, open this circuit breaker on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tag:
1) 11M9, LEFT ENG BUS POWER SENSE

(h) For the right engine, open this circuit breaker on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tag:
1) 11M36, RIGHT ENG BUS POWER SENSE

TEST NO. 11 - REPLACEMENT ENGINE TEST (UNTESTED)

(i) Close these circuit breakers on the overhead circuit breaker panel, P11:
   1) 11D7, STANDBY IGNITION 1
   2) 11D8, STANDBY IGNITION 2
(j) Put the ENG START switch on the pilots' overhead panel, P5, to the GND position.
(k) Put the FUEL CONTROL switch to the RUN position.
(l) Put the ignition select switch to the BOTH position.
(m) Make sure the two igniters fire.
(n) Push the ECS/MSG switch for EICAS on the right side panel P61.
   1) Make sure the IGN 1 STBY BUS and IGN 2 STBY BUS messages show on the bottom EICAS display.
(o) Put the ignition select switch on the pilots' overhead panel, P5, to 1.
   1) Make sure that igniter plug 1 fires.
(p) Put the ignition select switch on the pilots' overhead panel, P5, to 2.
   1) Make sure that igniter plug 2 fires.
(q) Put the ignition select switch on the pilots' overhead panel, P5, to the BOTH position.
(r) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the overhead circuit breaker panel, P11:
   1) 1M9, LEFT ENG BUS POWER SENSE
(s) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the overhead circuit breaker panel, P11:
   1) 11M36, RIGHT ENG BUS POWER SENSE
(t) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
   1) 11D7, STANDBY IGNITION 1
   2) 11D8, STANDBY IGNITION 2
(u) Make sure the IGN 1 STBY BUS and IGN 2 STBY BUS messages are not shown on the EICAS ECS/MSG page.
(v) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the overhead circuit breaker panel, P11:
   1) 11D19, ENGINE START CONT LEFT
(w) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the overhead circuit brealer panel, P11:
   1) 11D20, ENGINE START CONT RIGHT

TEST NO. 11 - REPLACEMENT ENGINE TEST (UNTESTED)

(x) Make sure the leading edge slats are in the retracted position (Ref 27-81-00/201).
(y) Put the ignition select switch to 1.
(z) Put the FUEL CONTROL switch to the RUN position.
(aa) For the left engine, close this circuit breaker on the overhead circuit breaker panel, P11:
   1) 11A16, ANTI-ICE ENG L
(ab) For the right engine, close this circuit breaker on the overhead circuit breaker panel, P11:
   1) 11T19, ANTI-ICE ENG R
(ac) Do a check of the ignition control system.
   1) Put the applicable engine ANTI-ICE switch-light to the ON position.
   2) Put the applicable ENG START switch to the AUTO position.
      a) Make sure the igniter fires.
   3) Put the ANTI-ICE switch-light to the OFF position.
      a) Make sure the igniter does not fire.
   4) Put the ENG START switch to the CONT position.
      a) Make sure the igniter fires.
   5) Put the ENG START switch to the FLT position.
      a) Make sure the two igniters fire.
(ad) Put the ignition select switch to 2 and do the check of the ignition control system again.
(ae) Put the ignition select switch to the BOTH position and do the check of the ignition control system again.
(af) Put the ENG START switch to the AUTO position.
(ag) Open this circuit breaker on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tag:
   1) 11C10, SLAT POS IND
(ah) Make sure the two igniters fire.
(ai) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the overhead circuit breaker panel, P11:
   1) 11C10, SLAT POS IND
(aj) Make sure the two igniters do not fire.
(ak) Put the ENG START switch to the OFF position.

TEST NO. 11 - REPLACEMENT ENGINE TEST (UNTESTED)

(al) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the overhead circuit breaker panel, P11:
1) 11D25, ENGINE FUEL CONT VLV & EEC CHAN B RESET L

(am) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the overhead circuit breaker panel, P11:
1) 11D26, ENGINE FUEL CONT VLV & EEC CHAN B RESET R

S 415-396-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(24) Close the thrust reversers (AMM 78-31-00/201).

S 415-397-N00

(25) Close the core cowl panels (AMM 71-11-06/201).

S 415-635-N00

(26) Close the fan cowl panels (AMM 71-11-04/201).

S 445-398-N00

(27) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 735-565-N00

(28) Do the necessary test in the Power Plant Test Reference Table as the result of the maintenance which was done.

S 735-566-N00

(29) If you did not do Test No. 9 - Performance Test, do Test No. 4 - Power Acceleration/Deceleration Test.

S 715-419-N00

(30) Do a check of the engine-driven (hydraulic) pump.
(a) Push the ELEC/HYD switch for EICAS on the right side panel, P61.

TEST NO. 11 - REPLACEMENT ENGINE TEST (UNTESTED)

(b) Put the ENG pump switch on the hydraulic control panel in the ON position.
(c) Make sure the hydraulic pressure (shown on the EICAS ELEC/HYD page) is stable at 2900 to 3200 psi.
(d) Put the ENG pump switch on the hydraulic control panel in the OFF position.

S 715-420-N00

(31) Do a check of the Integrated Drive Generator (IDG).
(a) Put the applicable L(R) GEN CONT switch on the pilots' overhead panel, P5, in the ON position.
(b) Make sure the LOAD comes from the two APU GEN and the applicable L(R) IDG.
(c) Put the applicable L(R) GEN CONT switch on the pilots' overhead panel, P5, in the OFF position.

S 715-445-N00

(32) Do the thrust reverser check.

CAUTION: MAKE SURE THAT THE HINGED COWLS ARE CLOSED AND LATCHED BEFORE YOU OPERATE THE THRUST REVERSER DURING THE ENGINE OPERATION. IF YOU DO NOT FOLLOW THIS INSTRUCTION, YOU CAN DAMAGE THE EQUIPMENT.

(a) Quickly pull and hold the applicable L(R) reverse thrust lever against the interlock.
1) Measure the time the REV indication on the top EICAS display is yellow.
2) An amber REV light will show on the top EICAS display above the applicable EPR indication to show that the thrust reverser is in translation.
3) A green REV light will replace the amber REV light when the thrust reverser has successfully deployed.
(b) Make sure the REV indication is not yellow for more than 3.0 seconds.
(c) Make sure the RP indication on the EICAS EPCS page is between 98 and 102.
(d) If the RP indication is not between 98 and 102, replace the center locking hydraulic actuators for the thrust reverser (AMM 78-31-17/401).

TEST NO. 11 - REPLACEMENT ENGINE TEST (UNTESTED)

CAUTION: DO NOT OPERATE THE ENGINE MORE THAN 90 PERCENT N1 IN THE REVERSE THRUST MODE. DO NOT OPERATE THE ENGINE IN REVERSE IDLE FOR MORE THAN FIVE MINUTES. IF YOU DO NOT FOLLOW THIS INSTRUCTIONS, YOU CAN DAMAGE THE ENGINE.

(e) Slowly move the reverse thrust lever to increase the engine speed to approximately 30 percent N1.
(f) Slowly move the reverse thrust lever to the REVERSE IDLE position.

NOTE: This makes sure the interlock for the reverse thrust lever has cleared.

1) Put the applicable L(R) reverse thrust lever through the interlock to the forward thrust position.
2) Measure the time the REV light changes to amber while the thrust reverser is in translation.
3) Make sure the REV light goes off when the thrust reverser is in the fully stowed position.

(g) Make sure that the REV indication is not yellow for more than 3.0 seconds.
(h) Make sure that the RP indication on the EICAS EPCS page is between -2 and +2.
(i) If the RP indication is not between -2 and +2, adjust the thrust reverser position indicator (AMM 78-36-00/501).
1) If you cannot adjust the position indicator for the thrust reverser, replace the center locking hydraulic actuator for the thrust reverser (AMM 78-31-17/401).

S 865-446-N00

(33) Push the ECS/MSG switch on the right side panel, P61, and look for maintenance messages on the bottom EICAS display.
(a) Correct the maintenance messages as necessary.

TEST NO. 11 - REPLACEMENT ENGINE TEST (UNTESTED)

S 715-447-N00

(34) Do the IDG disconnect check.

CAUTION: DO NOT PUSH THE GEN DRIVE DISC SWITCH FOR MORE THAN THREE SECONDS. AFTER YOU PUSH THE GEN DRIVE DISC SWITCH, DO NOT PUSH THE SWITCH AGAIN FOR AT LEAST 60 SECONDS.

CAUTION: DO NOT PUSH THE GEN DRIVE DISC SWITCH IF THE ENGINE IS BELOW THE IDLE N2 LIMIT. IF YOU DISCONNECT THE IDG WITH ENGINE BELOW THE IDLE SPEED, YOU CAN CAUSE DAMAGE TO THE DISCONNECT DOG TEETH.

(a) Push the applicable L(R) GEN DRIVE DISC switch on the pilots' overhead panel, P5.

(b) Make sure the applicable the L(R) DRIVE light and the L(R) GEN CONT OFF lights are on.

NOTE: This lets you know the IDG is disconnected.

G. Put the airplane back to its usual condition.

S 865-448-N00

(1) Operate the engine at idle for five minutes to decrease the engine temperature.

S 865-449-N00

(2) Use the Power Plant Operation (Normal) procedure to do the engine shutdown (AMM 71-00-00/201).

S 865-450-N00

(3) If the other engine was operated, use the Power Plant Operation (Normal) procedure to do the engine shutdown (AMM 71-00-00/201).

TEST NO. 11 - REPLACEMENT ENGINE TEST (UNTESTED)

S 865-451-N00

(4) If the APU was operated, use the APU Operation procedure to do the APU shutdown (AMM 49-11-00/201).

S 015-452-N00

(5) Open the fan cowl panels (AMM 71-11-04/201).

S 045-453-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO YOU OR DAMAGE TO EQUIPMENT.

(6) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 015-454-N00

(7) Open the core cowl panels (AMM 71-11-06/201).

S 015-455-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(8) Open the thrust reversers (AMM 78-31-00/201).

S 215-456-N00

(9) Make sure the N2 rotor is stopped.

S 985-457-N00

(10) Pull the IDG disconnect reset ring until the solenoid pin will go back into its usual position (Fig. 515).

TEST NO. 11 - REPLACEMENT ENGINE TEST (UNTESTED)

S 215-458-N00

(11) Make sure no fuel, oil, or hydraulic connections have leakage.

NOTE: The only fuel, oil, or hydraulic fluid that is permitted is the leakage from the vents and drains. The leakage from the vents must also be in the specified limits (AMM 71-71-00/601).

S 115-459-N00

(12) Clean the fuel distribution valve strainer (AMM 73-11-04/701).

S 905-460-N00

(13) Replace the fuel pump filter (AMM 73-11-02/401).

S 905-461-N00

(14) Replace the main oil filter element (AMM 79-21-05/401).

S 215-462-N00

(15) Clean the magnetic chip detectors (AMM 79-21-10/701).

S 615-463-N00

WARNING: DO NOT OPEN THE OIL TANK CAP FOR FIVE MINUTES AFTER SHUTDOWN OF THE ENGINE. A MINIMUM OF FIVE MINUTES IS NECESSARY TO LET THE PRESSURE IN THE OIL TANK BLEED OFF. IF YOU DO NOT DO THIS, A FAST FLOW OF HOT OIL CAN OCCUR AND CAUSE INJURY TO YOU.

(16) Do the Engine - Oil Servicing procedure (AMM 12-13-01/301).

S 615-464-N00

(17) Do the Integrated Drive Generator (IDG) - Oil Servicing procedure (AMM 12-13-03/301).

TEST NO. 11 - REPLACEMENT ENGINE TEST (UNTESTED)

S 415-465-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(18) Close the thrust reversers (AMM 78-31-00/201).

S 415-466-N00

(19) Close the core cowl panels (AMM 71-11-06/401).

S 415-636-N00

(20) Close the fan cowl panels (AMM 71-11-04/201).

S 445-467-N00

(21) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 865-469-N00

(22) Remove electrical power, if it is not necessary (AMM 24-22-00/201).

TEST NO. 12 - ENGINE VACUUM TEST

TASK 71-00-00-785-012-N00

14. Test No. 12 - Engine Vacuum Test

A. General

(1) This test measures the rate of air leakage into the engine bearing compartments (No. 1, 1.5, 2, 3, 4, angle gearbox, and main gearbox).

(a) The maximum airflow leakage for the No. 1, 1.5, 2, 3 and angle gearbox bearing compartments is 44 pounds/hour.

(b) The maximum airflow leakage for the No. 4 bearing compartment is 10 pounds/hour.

B. Equipment

(1) Adapter - PWA 85498, Pratt & Whitney

(2) Adapter - PWA 85843, Pratt & Whitney

(3) Adapter - PWA 85863, Pratt & Whitney

(4) Plug - PWA 85978, Pratt & Whitney

(5) Vacuum Cart - CTE 6075 or equivalent

(6) M303, M305, or M307 Bergen Mechanical Crimper
Bergen Cable Technologies Inc
170 Gregg St
P.O. Box 1300
Lodi, NJ 07644-9982

C. Consumable Materials

(1) A00637 Compound - Antigalling, Hi-T 650 or
A00665 Compound - Antigalling, Lubri-Bond HT

(2) D00390 Oil - Engine

(3) D50124 Anti-Seize Paste (P06-054)

(4) G02332 Ferrule, Safety Cable (P05-292)

(5) G02334 Lockwire, (P05-289) 0.032 inch (0.813 mm) - AS3214-02

(6) G02335 Cable, Safety (P05-291)

D. References

(1) AMM 71-11-04/201, Fan Cowl Panels

(2) AMM 71-11-06/201, Core Cowl Panels

(3) AMM 78-31-00/201, Thrust Reverser System

E. Access

(1) Location Zones

411	Left Engine
421	Right Engine

TEST NO. 12 - ENGINE VACUUM TEST

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

F. Do the Engine Vacuum Test.

S 015-470-N00

(1) Open the fan cowl panels (AMM 71-11-04/201).

S 045-666-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 015-667-N00

(3) Open the core cowl panels (AMM 71-11-06/201).

S 015-668-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the thrust reversers (AMM 78-31-00/201).

TEST NO. 12 - ENGINE VACUUM TEST

S 035-669-N00

(5) Remove the oil pressure tube (LP34) for the No. 4 bearing:
   (a) Remove the two hose clamps which hold the top spray shield at the rear tube connection on the exhaust case at the 10:30 o'clock position (Fig. 516, View B).
      1) Remove the spray shield from the engine.
   (b) Remove the two bolts and nuts from the rear tube connection.
   (c) Disconnect the tube elbow on the oil pressure tube from the internal tube nut on the exhaust case at the 10:30 o'clock position (Fig. 516, View A).
   (d) Remove the oil pressure tube (LP34) from the engine.
   (e) Remove the last chance strainer element from the oil pressure tube (LP34) (Fig. 516, View B).
   (f) Install the protection covers on the openings on the oil pressure tube.

S 495-670-N00

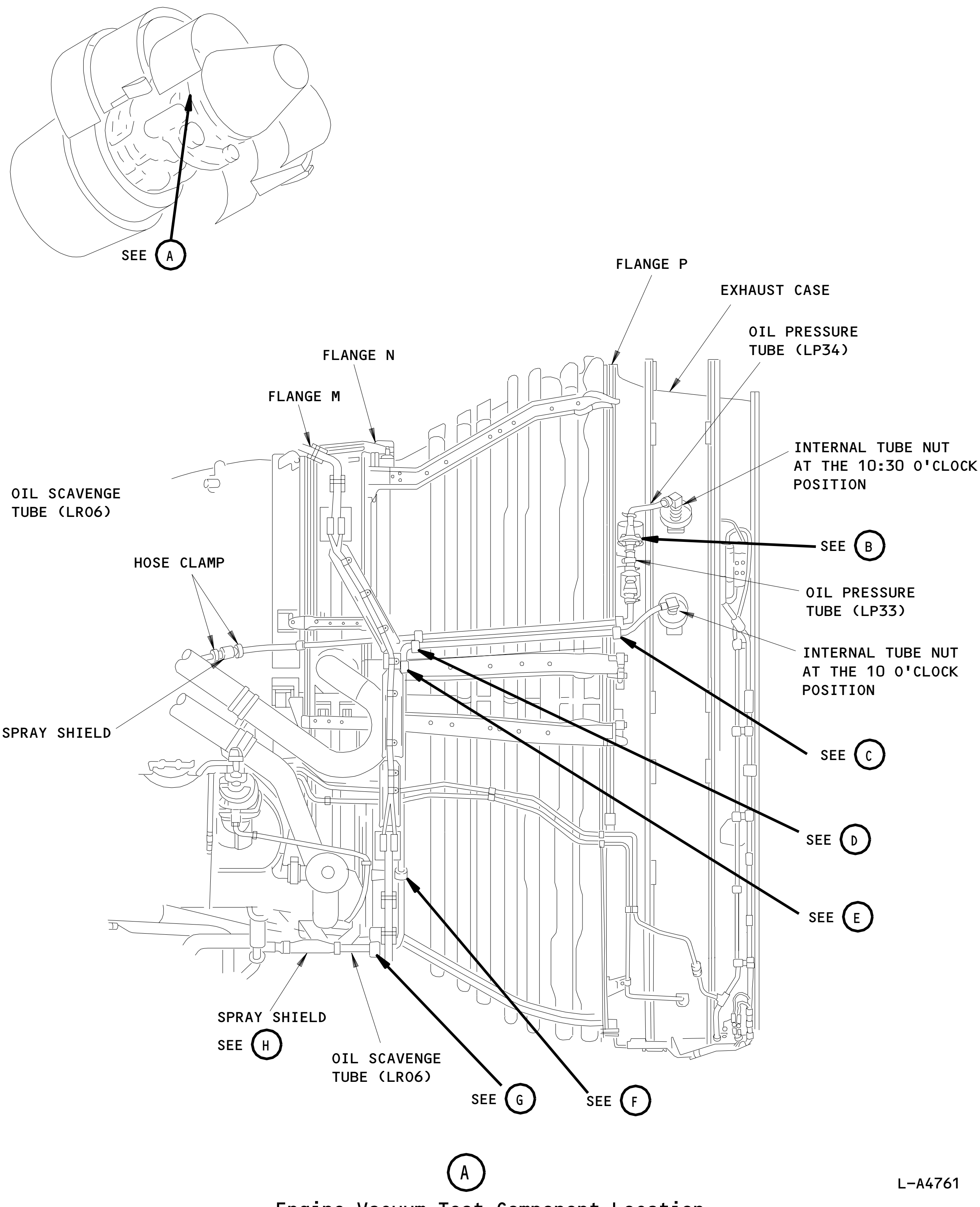
(6) Install the PWA 85978 plug in the internal tube nut for the oil pressure tube on the exhaust case at the 10:30 o'clock position.

S 035-671-N00

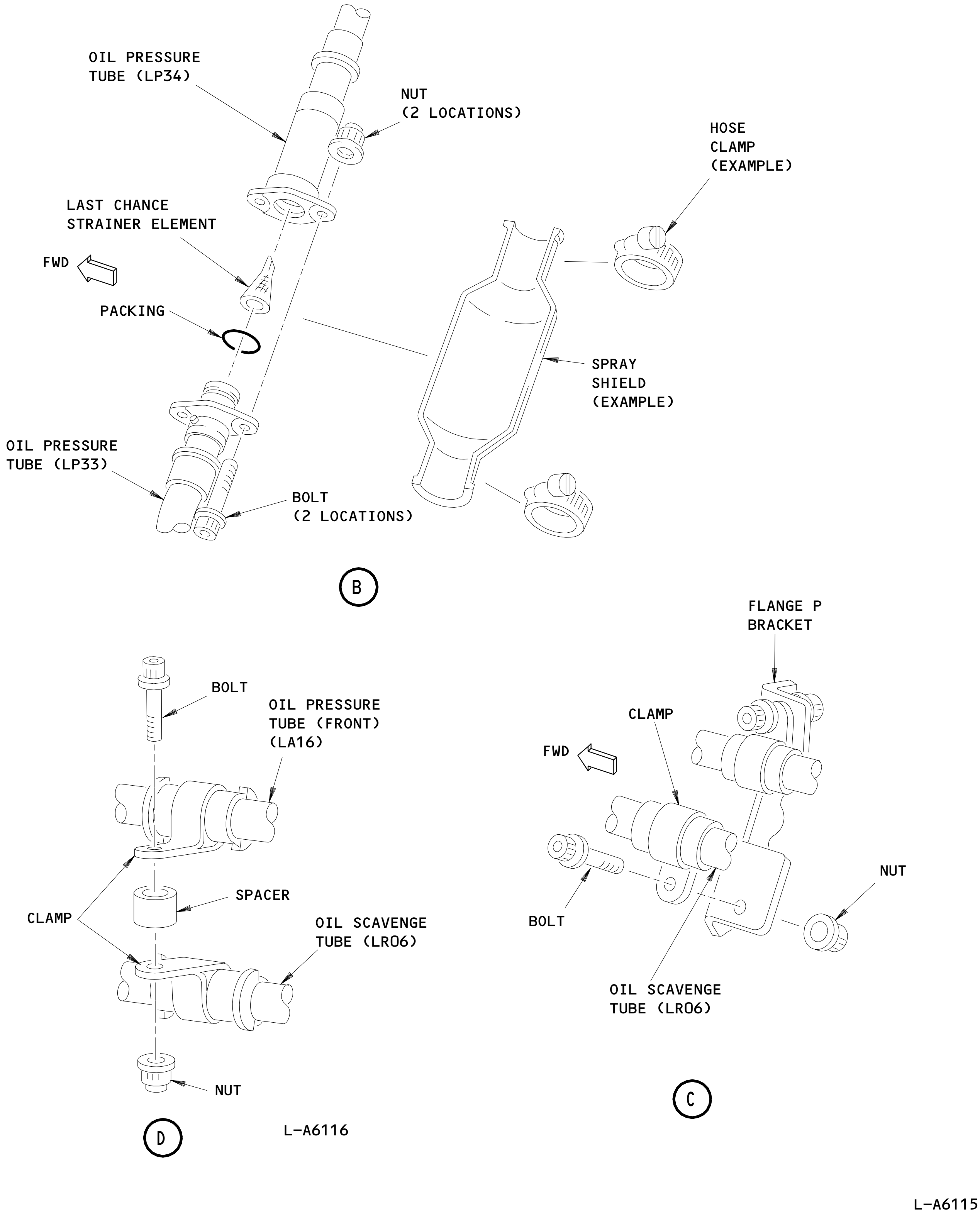
(7) ENGINES PRE-PW-SB 79-75;
Disconnect and loosen the oil scavenge tube assembly (LR06) for the No. 4 bearing:
   (a) Remove the lockwire and disconnect the rear scavenge tube elbow from the internal tube nut on the exhaust case at the 10 o'clock position (Fig. 516, View A).
   (b) Remove the bolt, nut, and clamp which attach the spray shield to the flange M bracket at the 7 o'clock position (Fig. 516, View H).
   (c) Remove the hose clamp which attaches the forward end of the spray shield to the oil scavenge tube and remove the spray shield.
   (d) Disconnect the tube nut at Flange M from the tube adapter.
   (e) Remove the bolts, nuts and clamps which attach the oil scavenge tube (LR06) (Fig. 516, Views C, D, E, F and G).
   (f) Install the protection covers on the open ends of the oil scavenge tube.

S 035-672-N00

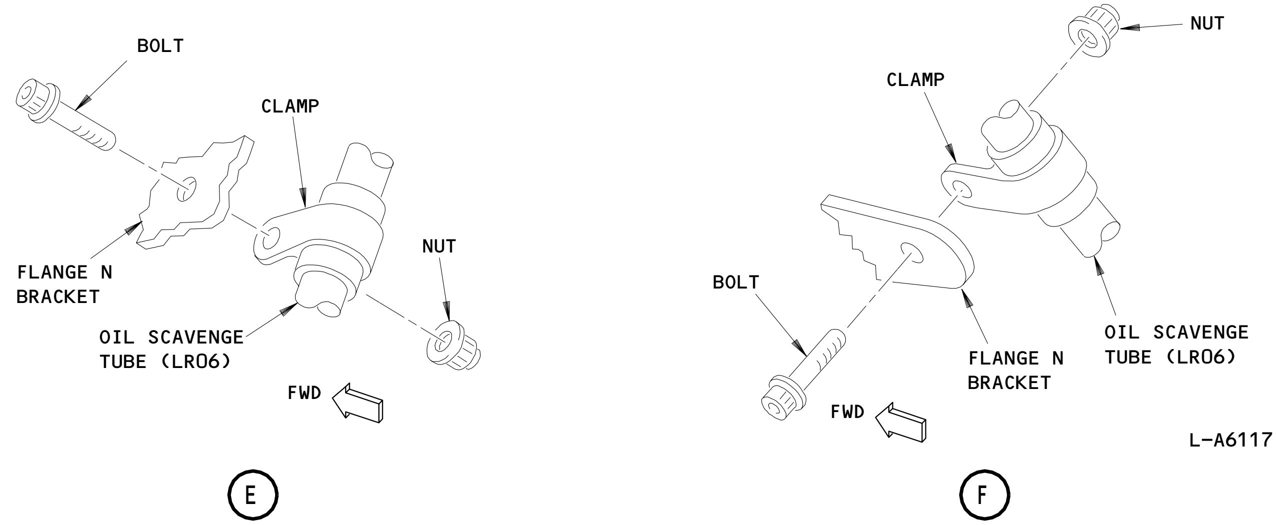
(8) ENGINES POST-PW-SB 79-75 AND PRE-PW-SB 79-76;
Disconnect and loosen the oil scavenge tube assembly (LR06) for the No. 4 bearing:
   (a) Remove the hose clamp which attaches the tube shield to the bracket on the inboard side of Flange M at approximately the 7 o'clock position (Fig. 516A).

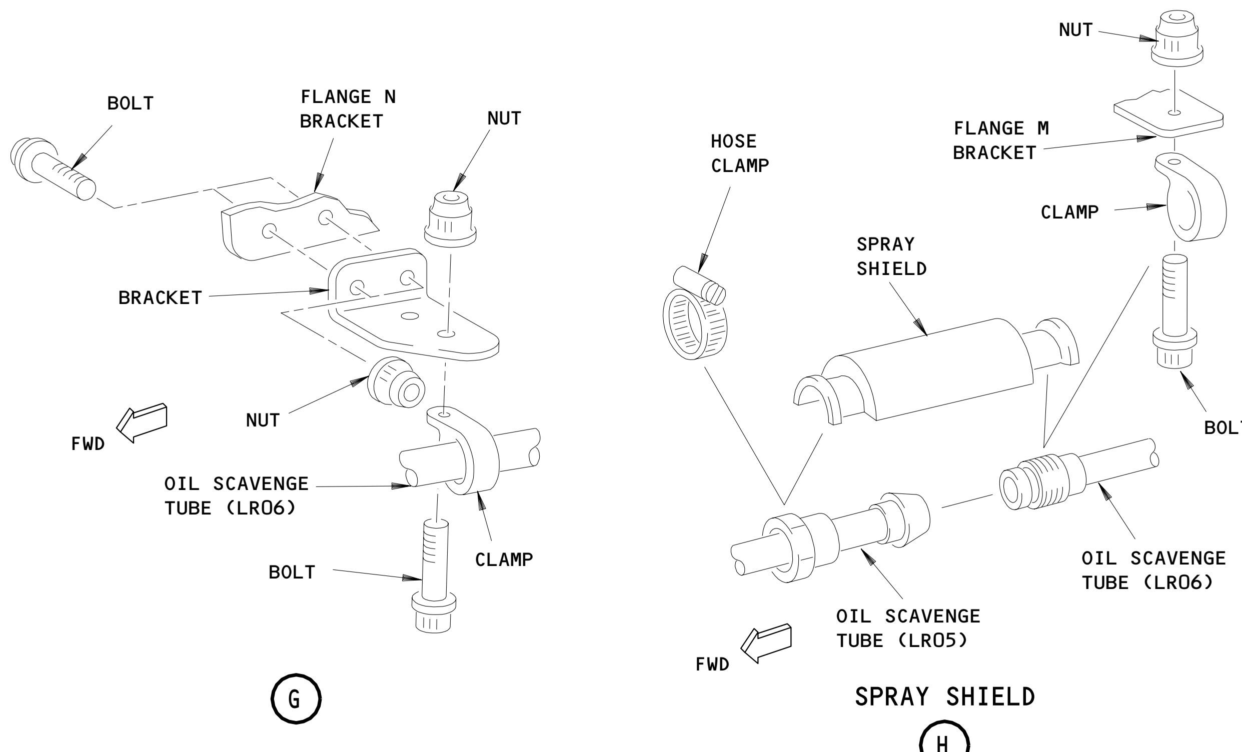


Engine Vacuum Test Component Location
Figure 516 (Sheet 1)

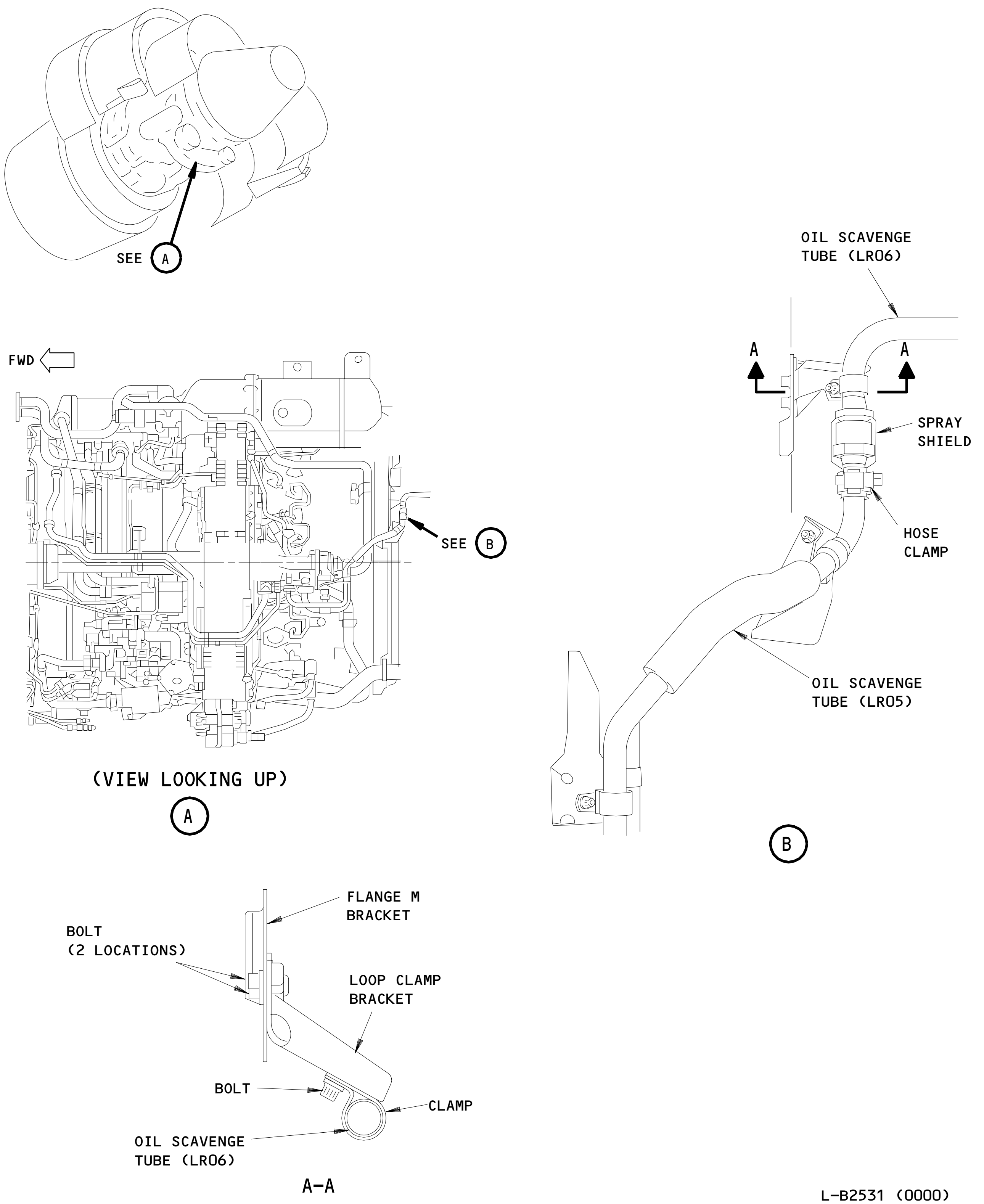


Engine Vacuum Test Component Location
Figure 516 (Sheet 2)





Engine Vacuum Test Component Location
Figure 516 (Sheet 3)



Test 12 - Engines with PW SB 79-75 and without PW SB 79-76
Figure 516A

TEST NO. 12 - ENGINE VACUUM TEST

(b) Remove the lockwire and disconnect the tube nut for the oil scavenge hose and tube assembly (LR05) from the tube coupling on the oil scavenge tube (LR06).
(c) Remove the lockwire and disconnect the tube elbow from the internal tube nut on the exhaust case at approximately the 10 o'clock position (Fig. 516, View A).
(d) Remove the bolts, nuts and clamps which attach the oil scavenge tube (LR06) to the Flange N and P brackets (Fig. 516, Views C, D, E, F and G).
(e) Remove the oil scavenge tube (LR06) from the engine.
(f) Install the protection covers on all openings.
(g) Remove the bolts, nuts and clamp bracket attached to the Flange M and N brackets at approximately the 7 o'clock position.

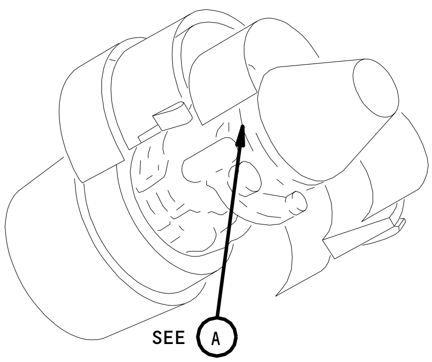
S 035-673-N00
(9) ENGINES POST-PW-SB 79-76;
Disconnect and loosen the oil scavenge tube assemblies (LR21) and (LR22) for the No. 4 bearing:
(a) Remove the clamps and the spray shields at the connection for the oil scavenge tubes (LR21) and (LR22), and at the connection for the oil scavenge tubes (LR05) and (LR21) (Fig. 516B, Views B and I).
(b) Remove the clamps on the oil scavenge tube (LR22) (Fig. 516B, Views C, D, E and F).
(c) Remove the oil scavenge tube (LR22) from the oil scavenge tube (LR21) and the port for the internal tube on the exhaust case (Fig. 516B, Views B and G).
(d) Remove the clamps, nuts and bolts that attach the oil scavenge tube (LR21) (Fig. 516B, Views H, J, K and L).
(e) Remove the oil scavenge tube (LR21) from the oil scavenge tube (LR05) (Fig. 516B, View I).

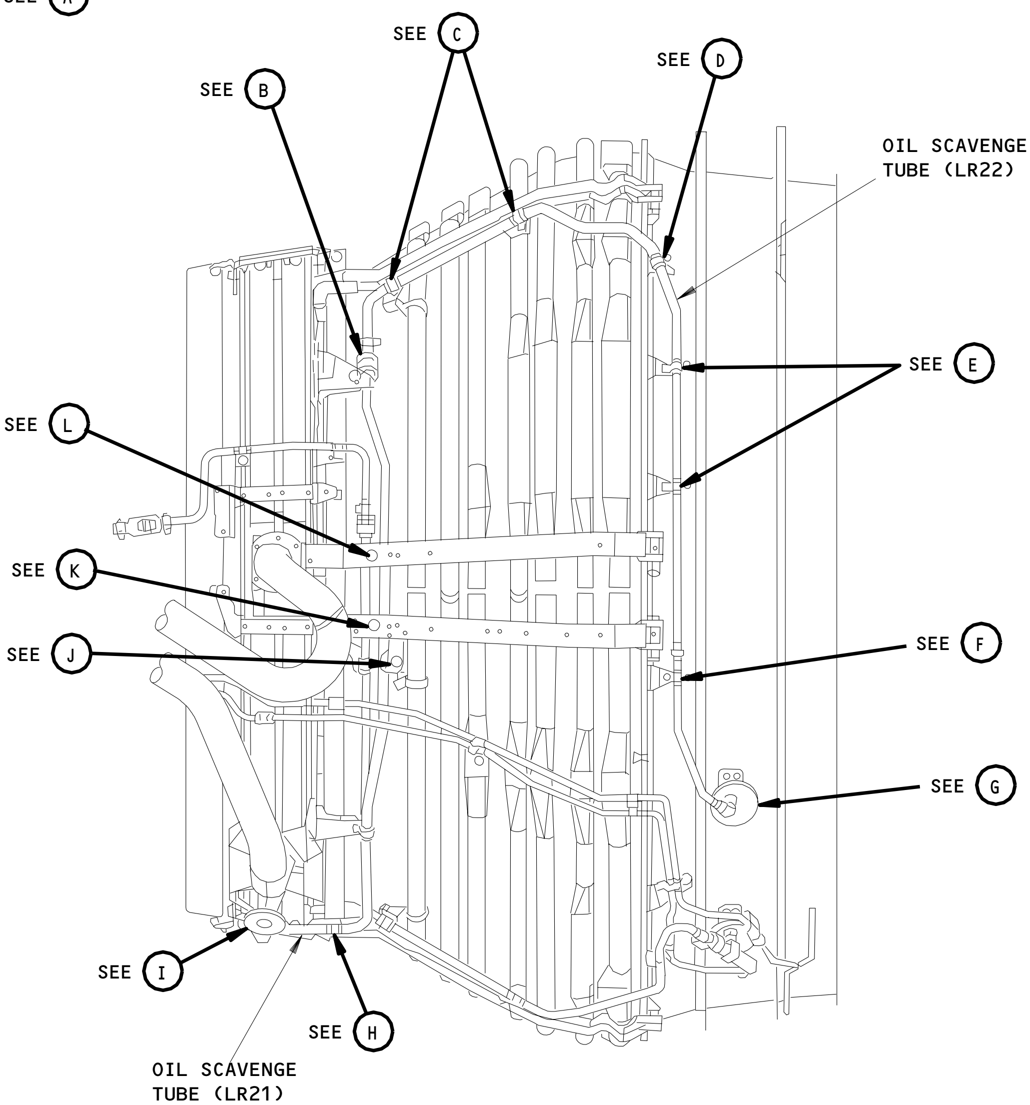
S 495-674-N00
(10) Install the PWA 85843 adapter to the internal tube nut on the exhaust case at the 10 o'clock position.

S 435-675-N00
(11) Install caps on all oil supply tubes, breather tubes, and scavenge tubes.

NOTE: During the vacuum test, all of the oil supply tubes, breather tubes, and scavenge tubes must be installed unless specified.

S 435-676-N00
(12) If the integrated drive generator (IDG) or the hydraulic pump are removed, install the protection cover(s) on the gearbox pad(s).

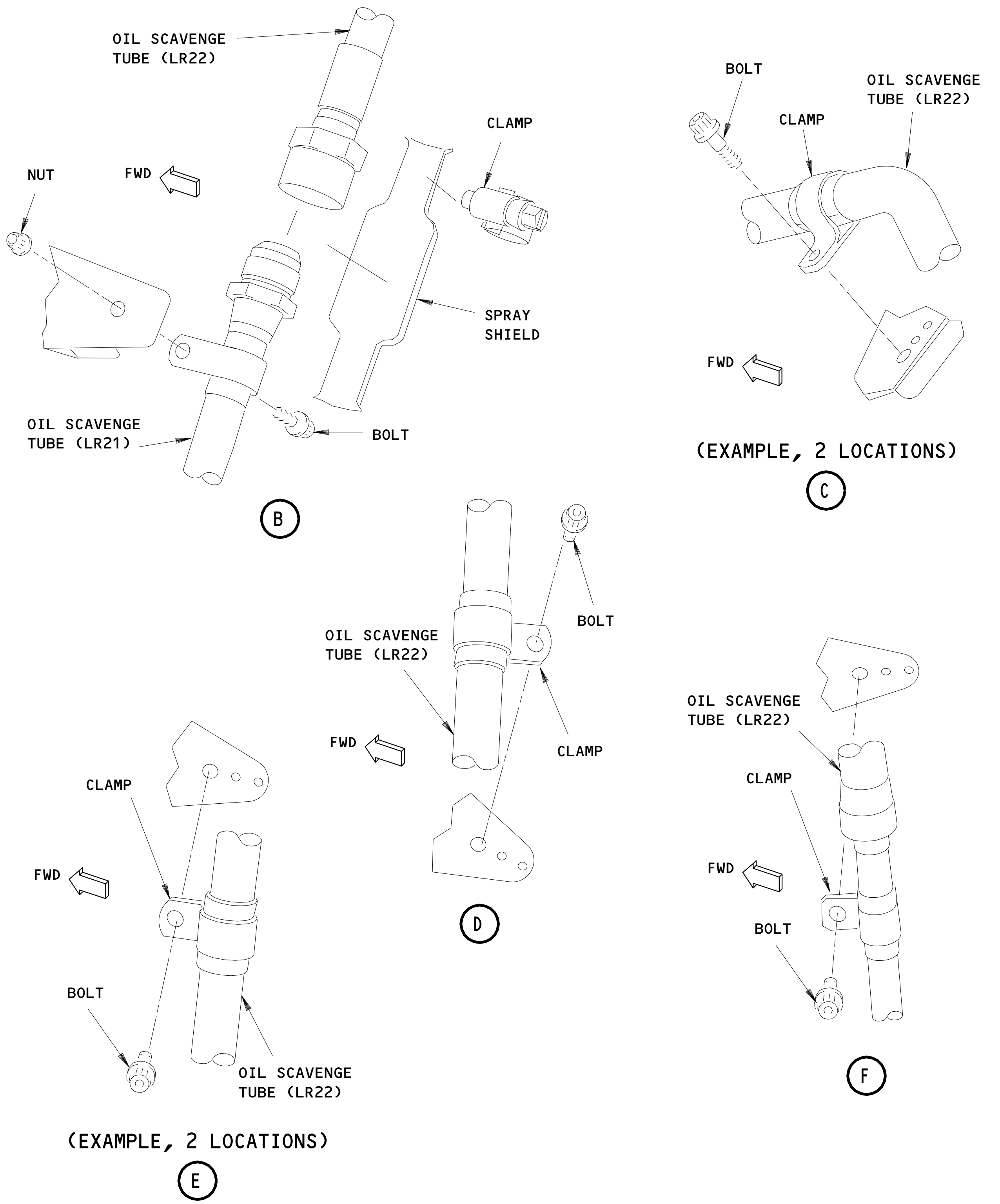




A

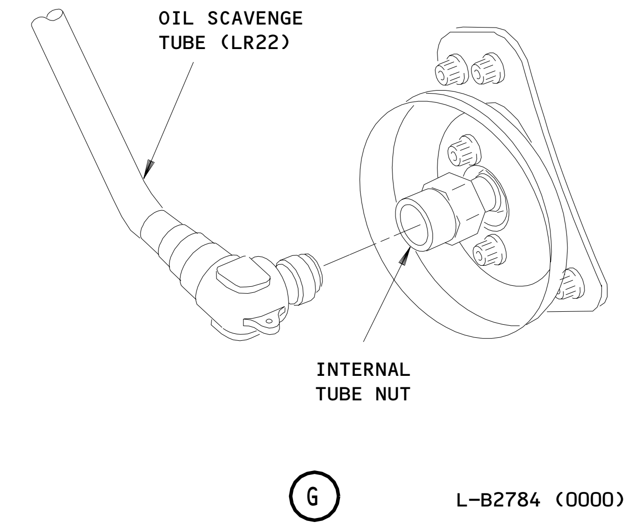
L-B2783 (0000)

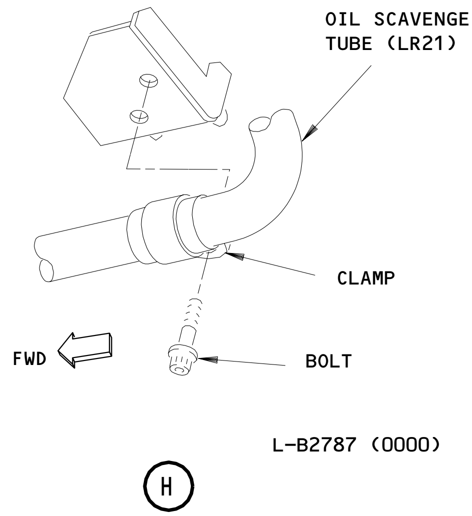
Test 12 - Engine with PW SB 79-76
Figure 516B (Sheet 1)

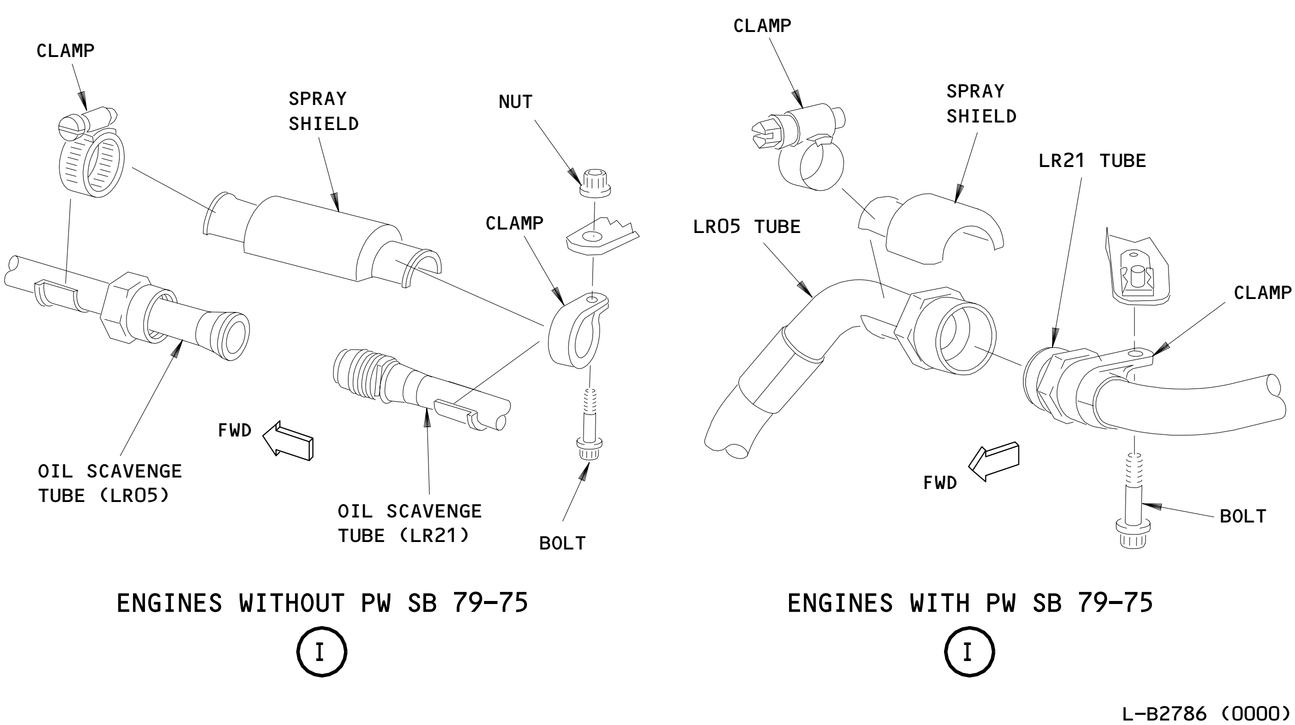


L-B2784 (0000)
L-B2785 (0000)

Test 12 - Engines with PW SB 79-76
Figure 516B (Sheet 2)

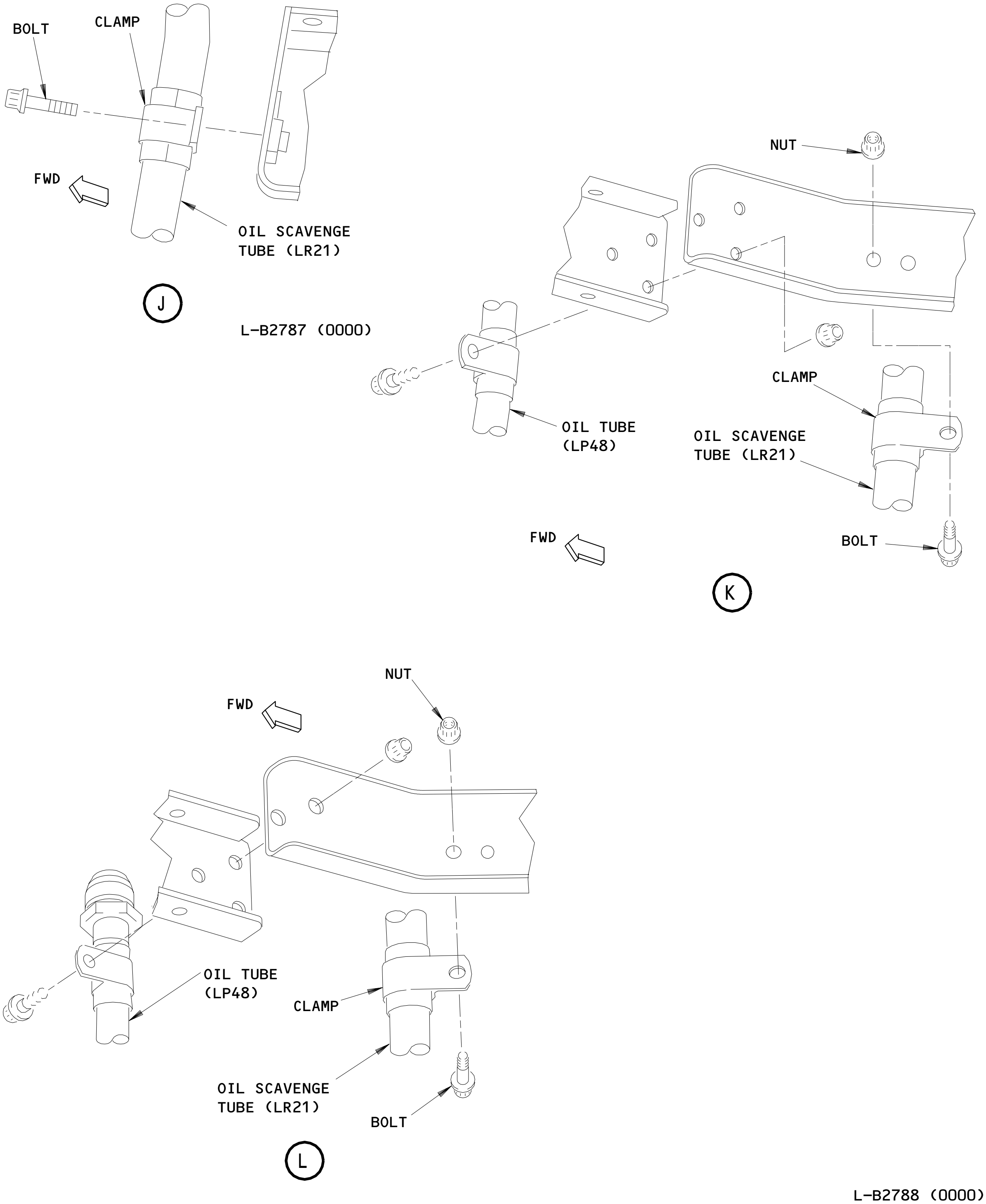






Test 12 - Engines with PW SB 79-76
Figure 516B (Sheet 3)

G93470



Test 12 - Engines with PW SB 79-76
Figure 516B (Sheet 4)

TEST NO. 12 - ENGINE VACUUM TEST

S 495-677-N00

(13) Attach the vacuum hose and the pressure line hose from the CTE 6075 Vaccum Cart to the PWA 85843 (Tee) Adapter.

S 795-678-N00

(14) For this test, set the vacuum cart pressure at the ambient pressure (PAMB) minus 10 psi (69 kPa) or PAMB minus 20 inches (508 mm) Hg.

NOTE: At sea level, this is 5.0 psia (34.5 kPa ABSOLUTE).

S 795-679-N00

(15) Find the airflow leakage rate in the No. 4 bearing compartment.
(a) Make sure the airflow leakage rate in the No. 4 bearing compartment is not more than a maximum of 10 pounds/hour (4.5 kg/hour).

S 095-680-N00

(16) Disconnect the vacuum cart hoses and remove the PWA 85843 Adapter from the internal tube nut.

S 495-681-N00

(17) Install the PWA 85498 Adapter to the mounting pad on the deoiler outlet tube on the main gearbox with the detail bolts.
(a) Install the PWA 85498 Adapter so the larger threaded opening points away from the engine.
(b) If the deoiler outlet tube (LB05) is still attached, use the PWA 85863 Adapter.

S 495-682-N00

(18) Attach the hoses from the CTE 6075 Vacuum Cart to the PWA 85498 or PWA 85863 adapter (Fig. 516C).

S 795-683-N00

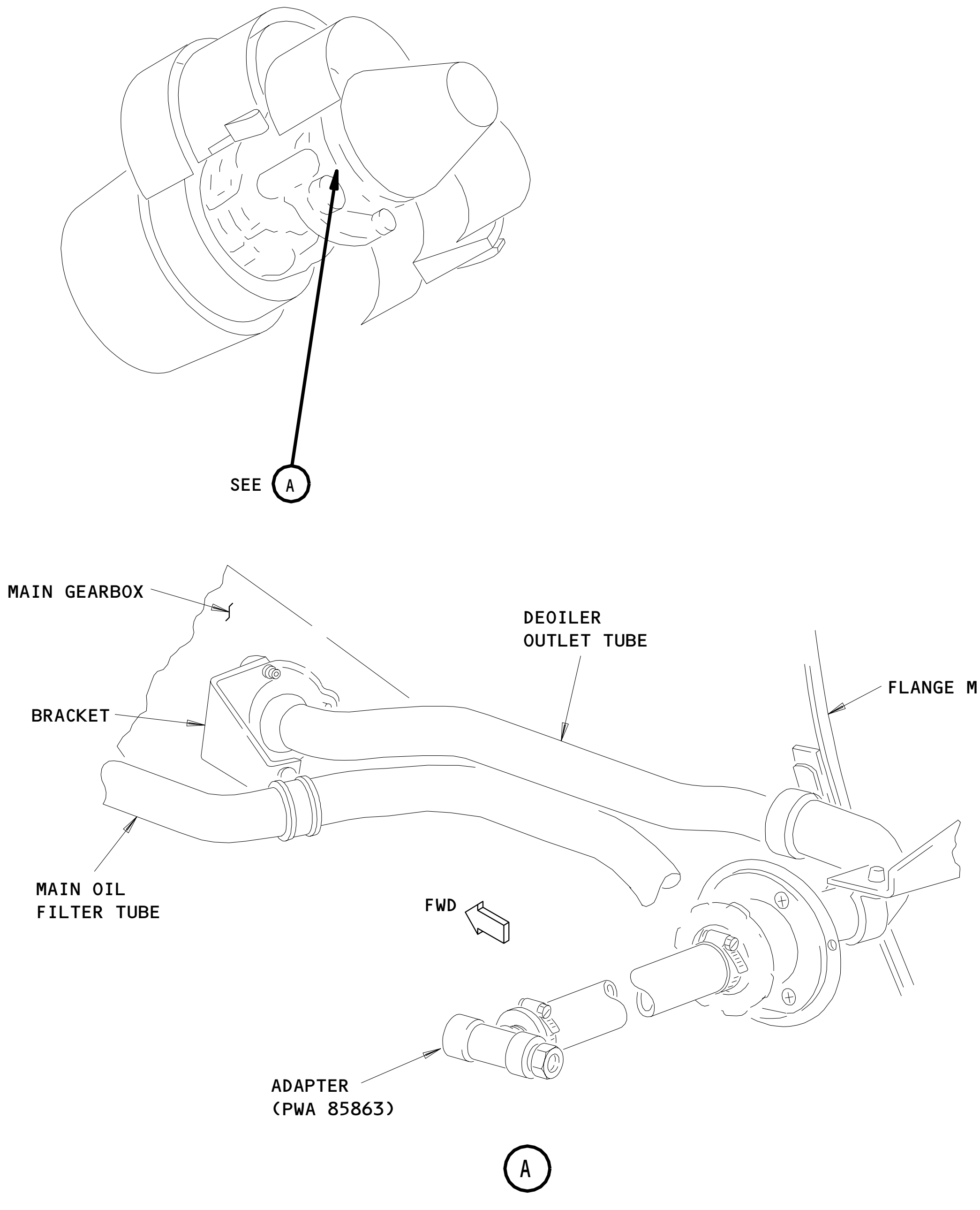
(19) Set the gage reading on the CTE 6075 Vacuum Cart at PAMB minus 10 psi (69 kPa) or PAMB minus 20 inches (-508 mm) Hg.
(a) Make sure the airflow leakage rate in the No. 1, 1.5, 2, 3 bearing compartment and the angle gearbox is not more than a maximum of 44 pounds/hour (20 kgs/hour).

S 095-684-N00

(20) Remove the vacuum hose, pressure line and CTE 6075 vacuum cart from the engine.

S 095-685-N00

(21) Remove the PWA 85863 or the PWA 85498 adapter from the deoiler outlet tube, and the PWA 85978 plug from the internal tube nut on the exhaust case at the 10:30 o'clock position.



L-A4761

Engine Vacuum Test Adapter
Figure 516C

TEST NO. 12 - ENGINE VACUUM TEST

S 435-686-N00

(22) Install the oil pressure tube (LP34) for the No. 4 bearing:
 (a) Remove the protection covers from the oil pressure tube (LP34).
 (b) Lubricate the threads of the tube nut on the oil pressure tube (LP34) with the Hi-t 650 or the Lubribont HT antigalling compound.
 (c) Install the oil pressure tube (LP34) to the internal tube nut on the exhaust case at the 10:30 o'clock position (Fig. 516, View A).
  1) Tighten the tube nut with your hand.
 (d) Install the last chance strainer element in the oil pressure tube (LP34) (Fig. 516, View B).
 (e) Remove the protection cover from the oil pressure tube (LP33).
 (f) Lubricate the coupling end of the oil pressure tube (LP33) and the packing with engine oil.
 (g) Install the packing to the flanged end of the oil pressure tube (LP33) (Fig. 516, View B).
 (h) Lubricate the threads of the two bolts, which attach the oil pressure tubes, with engine oil.
 (i) Install the oil pressure tube (LP33) with the two bolts and nuts (Fig. 516, View B).
  1) Tighten the nuts with your hand.
 (j) Tighten the two bolts to 36-40 pound-inches (4.1-4.5 newton-meters).
 (k) Tighten the internal tube nut on the exhaust case at the 11 o'clock position to 270-300 pound-inches (30.5-33.9 newton-meters).
  1) Install the lockwire or safety cable and safety cable ferrule to the internal tube nut.
 (l) Install the spray shield to the inboard side of the connection for the oil pressure tube at the 10:30 o'clock position at the Flange P (Fig. 516, View B).
  1) Attach the spray shield with the hose clamps.
  2) Tighten the hose clamps to 15-18 pound-inches (1.7-2.0 newton-meters).

S 435-687-N00

(23) ENGINES PRE-PW-SB 79-75;
Install the oil scavenge tube assembly (LR06) for the No. 4 bearing:
 (a) Remove the protection covers from the oil scavenge tube (LR06).
 (b) Lubricate the threads of the oil scavenge tube (LR06) with the anti-seize paste (P06-054).
 (c) Install the oil scavenge tube (LR06) to the internal tube nut on the exhaust case at the 10 o'clock position (Fig. 516, View A).
  1) Tighten the tube nut with your hand.

TEST NO. 12 - ENGINE VACUUM TEST

(d) Connect the tube nut for the oil scavenge tube (LR06) to the oil scavenge tube (LR05) at Flange M at approximately the 7 o'clock position (Fig. 516, View H).
   1) Tighten the tube nut with your hand.
(e) Lubricate the threads of the bolts, which attach the clamps for the oil scavenge tube (LR06), with engine oil.
(f) Install the clamps, bolts, and nuts on the oil scavenge tube (LR06) to the brackets at Flange N and P (Fig. 516, Views C, D, E, F and G).
   1) Tighten the bolts to 36-40 pound-inches (4.1-4.5 newton-meters).
(g) Tighten the tube nut at the exhaust case connection to 200-225 pound-inches (22.6-25.4 newton-meters).
   1) Install the lockwire or safety cable and safety cable ferrule to the tube nut.
(h) Tighten the tube nut at the Flange M connection to 475-525 pound-inches (53.7-59.3 newton-meters).
   1) Install the lockwire or safety cable and safety cable ferrule to the tube nut.
(i) Install the spray shield to the inboard side of the Flange M connection, and attach the forward end with the hose clamp (Fig. 516, View H).
   1) Tighten the hose clamp to 15-18 pound-inches (1.7-2.0 newton-meters).
(j) Lubricate the threads of the bolt, which attaches the clamp for the aft end of the spray shield, with engine oil.
(k) Install the clamp to the aft end of the spray shield and the Flange M bracket with the bolt and nut.
   1) Tighten the bolt to 36-40 pound-inches (4.1-4.5 newton-meters).

S 425-688-N00
(24) ENGINES POST-PW-SB 79-75 AND PRE-PW-SB 79-76;
Install the oil scavenge tube (LR06) for the No. 4 bearing:
(a) Remove the protection covers from the oil scavenge tube (LR06).
(b) Lubricate the threads of the oil scavenge tube (LR06) with the anti-seize paste (P06-054).
(c) Install the oil scavenge tube (LR06) to the internal tube nut on the exhaust case at the 10 o'clock position (Fig. 516, View A).
   1) Tighten the tube nut with your hand.
(d) Connect the tube nut for the oil scavenge tube (LR06) to the oil scavenge tube (LR05) at Flange M at approximately the 7 o'clock position (Fig. 516A).
   1) Tighten the tube nut with your hand.
(e) Lubricate the threads of the bolts, which attach the loop clamp bracket to Flange M, with engine oil.

TEST NO. 12 - ENGINE VACUUM TEST

(f) Attach the oil scavenge tube (LR06) to the loop clamp bracket on the Flange M bracket at approximately the 7 o'clock position with the bolts.
   1) Tighten the bolts to 36-40 pound-inches (4.1-4.5 newton-meters).
(g) Lubricate the threads of the bolts, which attach the clamps for the oil scavenge tube (LR06), with engine oil.
(h) Install the clamps to the oil scavenge tube (LR06) and attach to the brackets on Flanges N and P with the bolts and nuts (Fig. 516, Views C, D, E, F and G).
   1) Tighten the bolts to 36-40 pound-inches (4.1-4.5 newton-meters).
(i) Tighten the tube nut at the exhaust case connection to 200-225 pound-inches (22.6-25.4 newton-meters).
   1) Install the lockwire or safety cable and safety cable ferrule to the tube nut.
(j) Tighten the tube nut at the Flange M connection to 475-525 pound-inches (53.7-59.3 newton-meters).
   1) Install the lockwire or safety cable and safety cable ferrule to the tube nut.
(k) Install the spray shield to the inboard side of the Flange M connection and attach the forward end with the hose clamp (Fig. 516A).
   1) Tighten the hose clamp to 15-18 pound-inches (1.7-2.0 newton-meters).
(l) Lubricate the threads of the bolt, which attaches the clamp at the Flange M bracket, with engine oil.
(m) Install the clamp to the aft end of the spray shield on the oil scavenge tube (LR06) and attach to the Flange M bracket with the bolt and nut (Fig. 516A).
   1) Tighten the bolt to 36-40 pound-inches (4.1-4.5 newton-meters).

S 425-689-N00

(25) ENGINES POST-PW-SB 79-76;
Install the oil scavenge tube assemblies (LR21) and (LR22) for the No. 4 bearing:
(a) Attach the oil scavenge tube (LR21) to the oil scavenge tube (LR05) (Fig. 516B, View I).
   1) Tighten the tube nut with your hand.
(b) Install the clamps and attach with the bolts and nuts (Fig. 516B, Views H, J, K and L).
   1) Tighten the bolts with your hand.
(c) Lubricate the threads of the internal tube with engine oil.
(d) Attach the oil scavenge tube (LR22) to the oil scavenge tube (LR21) tube and the port for the internal tube on the exhaust case (Fig. 516B, Views B and G).
   1) Tighten the tube nut with your hand.

TEST NO. 12 - ENGINE VACUUM TEST

(e) Install the clamps on the oil scavenge tube (LR22) and attach with the bolts (Fig. 516B, Views C, D, E and F).
 1) Tighten the bolts with your hands.
(f) Tighten the tube connection for the oil scavenge tubes (LR21) and (LR05) to 475-525 pound-inches (56.7-59.3 newton-meters).
 1) Install the lockwire or safety cable and safety cable ferrule to the tube nut.
(g) Tighten the tube connection between the oil scavenge tubes (LR21) and (LR22) to 475-525 pound-inches (56.7-59.3 newton-meters).
 1) Install the lockwire or safety cable and safety cable ferrule to the tube nut.
(h) Tighten the internal tube nut to the oil scavenge tube (LR22) to 270-300 pound-inches (30.5-33.9 newton-meters).
 1) Install the lockwire or safety cable and safety cable ferrule to the tube nut.

S 425-690-N00
(26) ENGINES POST-PW-SB 79-76;
Install the spray shields for the oil scavenge lines for the No. 4 bearing:
(a) Install the spray shield at the tube connection between the oil scavenge tubes (LR05) and (LR21) (Fig. 516B, View I).
(b) Attach the spray shield with the clamp or bolt as applicable.
(c) Install the spray shield at the tube connection between the oil scavenge tubes (LR21) and (LR22) (Fig. 516B, View B).
(d) Attach the spray shield with the clamp or bolt as applicable.
(e) Tighten the clamps to 15-18 pound-inches (1.7-2.0 newton-meters).
(f) Tighten the nut and bolt to 36-40 pound-inches (4.1-4.5 newton-meters).

S 415-691-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(27) Close the thrust reversers (AMM 78-31-00/201).

S 415-692-N00
(28) Close the core cowl panels (AMM 71-11-06/201).

S 415-693-N00
(29) Close the fan cowl panels (AMM 71-11-04/201).

S 445-694-N00
(30) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

TEST NO. 12A - LOW PRESSURE COMPRESSOR (LPC) BEARING COMPARTMENT VACUUM TEST

TASK 71-00-00-715-773-N00

15. Test No. 12A - LOW PRESSURE COMPRESSOR (LPC) BEARING COMPARTMENT VACUUM TEST

A. General

(1) This test measures the rate of air leakage into the Low Pressure Compressor (LPC) bearing compartment when the LPC is removed from the engine and mounted in a holding fixture.

B. Equipment

(1) Adapter - PWA 85478, Pratt & Whitney
(2) Portector - PWA 85584, Pratt & Whitney
(3) Vacuum Cart - CTE 6075 or equivalent

C. Do the Engine Vacuum Test.

S 845-767-N00

(1) Ensure the packing is installed in the OD groove of the seal assembly and in OD groove of the PW 85478 adapter (Fig. 516D).

S 945-768-N00

(2) Attach hoist to eye bolt on PWA 85478 Adapter and lift the Adapter to position it over the LPC hub and NO. 1 bearing.

S 945-769-N00

(3) Attach the vacuum hose and the pressure line hose from the CTE 6075 Vacuum Cart to the PWA 85843 (Tee) Adapter.

S 725-770-N00

(4) For this test, set the vacuum cart pressure at the ambient pressure (PAMB) minus 10 psi (69 kPa) or PAMB minus 20 inches (508 mm) Hg.

NOTE: At sea level, this is 5.0 psia (34.5 kPa ABSOLUTE).

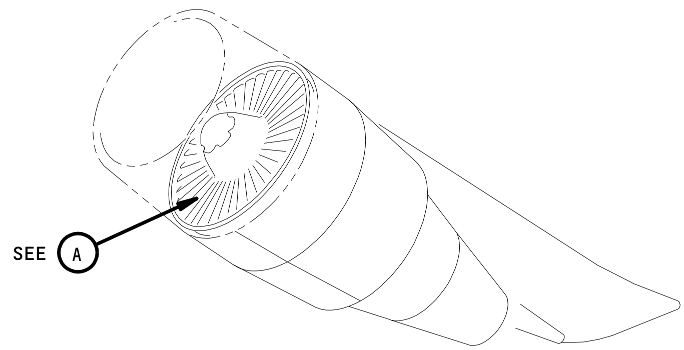
(a) PRE PW SB72-245;
Airflow leakage rate must not exceed 14 lbs. (6.36kg) per hour.
(b) POST PW SB72-245;
Airflow leakage rate must not exceed 5 lbs. (2.27kg) per hour.

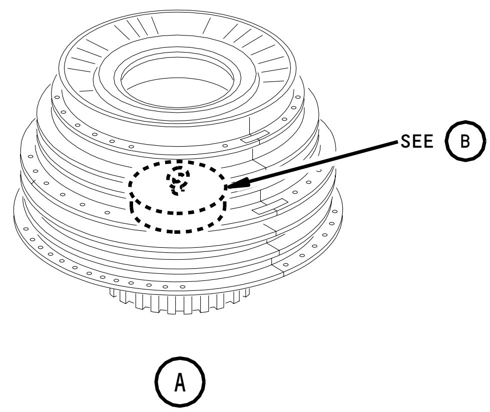
S 945-771-N00

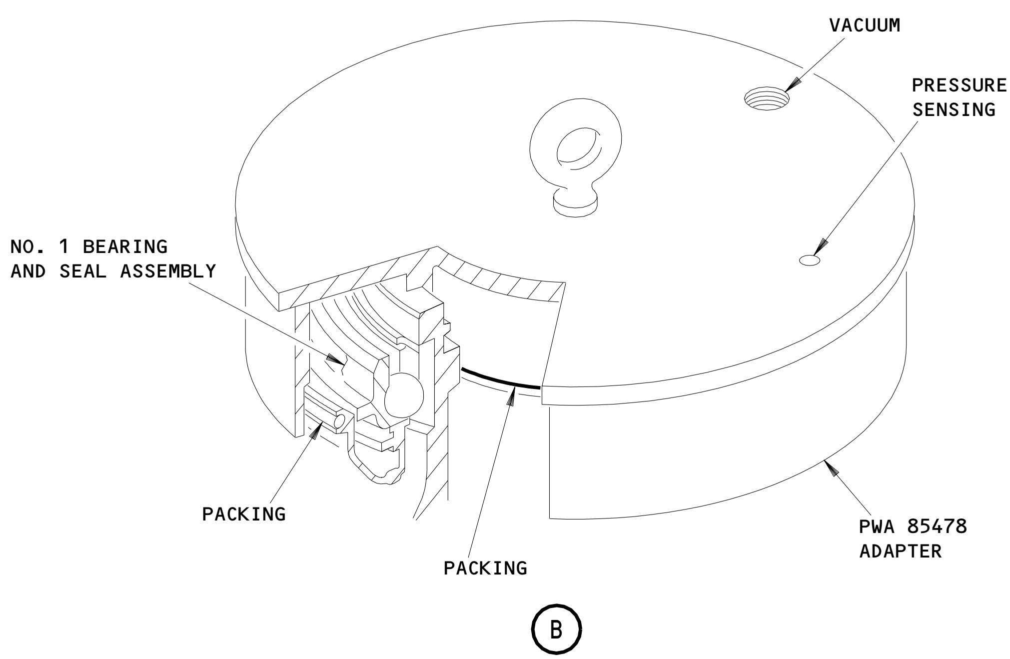
(5) Disconnect the vacuum cart hoses and remove the PWA 85478 Adapter from the No. 1 bearing.

S 945-772-N00

(6) Install the PWA 85584 Protector over the No. 1 bearing assembly.







L-A2276

LPC Bearing Compartment Vacuum Test
Figure 516D

TEST NO. 13 - MAIN OIL PRESSURE TEST

TASK 71-00-00-785-013-N00

16. Test No. 13 - Main Oil Pressure Test

A. General

(1) This test is used to monitor and to adjust the engine main oil pressure.

(2) The main oil pressure limits that are permitted are given in this procedure. If the pressure is not in the limits, you must replace the external oil tube metering nipple. A table of the available metering nipples is shown in this test.

B. General

(1) M303, M305, or M307 Bergen Mechanical Crimper
Bergen Cable Technologies Inc
170 Gregg St
P.O. Box 1300
Lodi, NJ 07644-9982

C. Consumable Materials

(1) A00456 Compound - Antigalling (PWA 550)
(2) D00453 Compound - Antigalling (PWA 36035)
(3) G02332 Ferrule, Safety Cable (P05-292)
(4) G02334 Lockwire, (P05-289) 0.032 inch (0.813 mm) - AS3214-02
(5) G02335 Cable, Safety (P05-291)

D. References

(1) AMM 36-00-00/201, Pneumatic - General
(2) AMM 49-11-00/201, Auxilary Power Unit
(3) AMM 71-00-00/201, Maintenance Practices (Operation Procedure)
(4) AMM 71-11-04/201, Fan Cowl Panel
(5) AMM 71-11-06/201, Core Cowl Panel
(6) AMM 78-31-00/201, Thrust Reverser System

E. Access

(1) Location Zones

211	Control Cabin
212	Control Cabin
411	Left Engine
421	Right Engine

TEST NO. 13 - MAIN OIL PRESSURE TEST

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

F. Do a Test of the Main Oil Pressure.

S 795-486-N00

(1) Do Test No. 3 - Ground Test at Idle Power to make sure that there are no leaks.

NOTE: If an engine turns at speeds below idle, a small quantity of oil leakage can occur. It comes through the carbon seal assembly for the No. 2 bearing. This usually occurs when the engine turns at low speeds for an extended time (when an engine has an extended start/shutdown or when an engine turns freely in the wind). After engine shutdown, this oil leakage can be on the variable stator vane retention bolts at the bottom of the engine. It can also be on the bottom of the nose cone/spinner. This small quantity of oil leakage is permitted.

S 865-487-N00

WARNING: USE AMM 71-00-00/201 TO OPERATE THE POWER PLANT. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE DAMAGE TO EQUIPMENT OR INJURY TO PERSONS.

(2) Do the Power Plant Operation (Normal) procedure to start the engine (AMM 71-00-00/201).

TEST NO. 13 - MAIN OIL PRESSURE TEST

S 865-488-N00

CAUTION: START THE OTHER ENGINE OR THE APU. TO PREPARE FOR AN EMERGENCY ENGINE SHUTDOWN, YOU MUST OPERATE THE OTHER ENGINE OR THE APU FOR PNEUMATIC POWER. IF PNEUMATIC POWER IS NOT AVAILABLE DURING AN EMERGENCY ENGINE SHUTDOWN, YOU CAN CAUSE DAMAGE TO THE ENGINE.

(3) Do the Power Plant Operation (Normal) procedure to start the other engine (AMM 71-00-00/201) or do the APU Operation procedure (AMM 49-11-00/201).

S 865-489-N00

(4) Remove the ground pneumatic power, if it was supplied (AMM 36-00-00/201).

S 865-490-N00

(5) Push the PERF/APU switch for the EICAS on the right side panel, P61.

S 865-491-N00

(6) Let the N2 speed become stable at minimum idle N2 for five minutes.

S 715-492-N00

(7) Make sure the engine indications are in the operation limits (AMM 71-00-00/201).
   (a) Make a record of the N2 and OIL PRESS indications from the EICAS display.

S 985-493-N00

(8) Move the thrust lever forward to the 1.3 EPR position.
   (a) Let the engine become stable.
   (b) Make a record of the N2 and the OIL PRESS indications from the EICAS display.

TEST NO. 13 - MAIN OIL PRESSURE TEST

S 865-640-N00
(9) Move the thrust lever forward to the 1.40 EPR position.
  (a) Let the engine become stable for 15 to 20 seconds.
  (b) Make a record of the N2 and the OIL PRESS indications from the EICAS display.

S 985-497-N00
(10) Slowly move the thrust lever to the idle position.

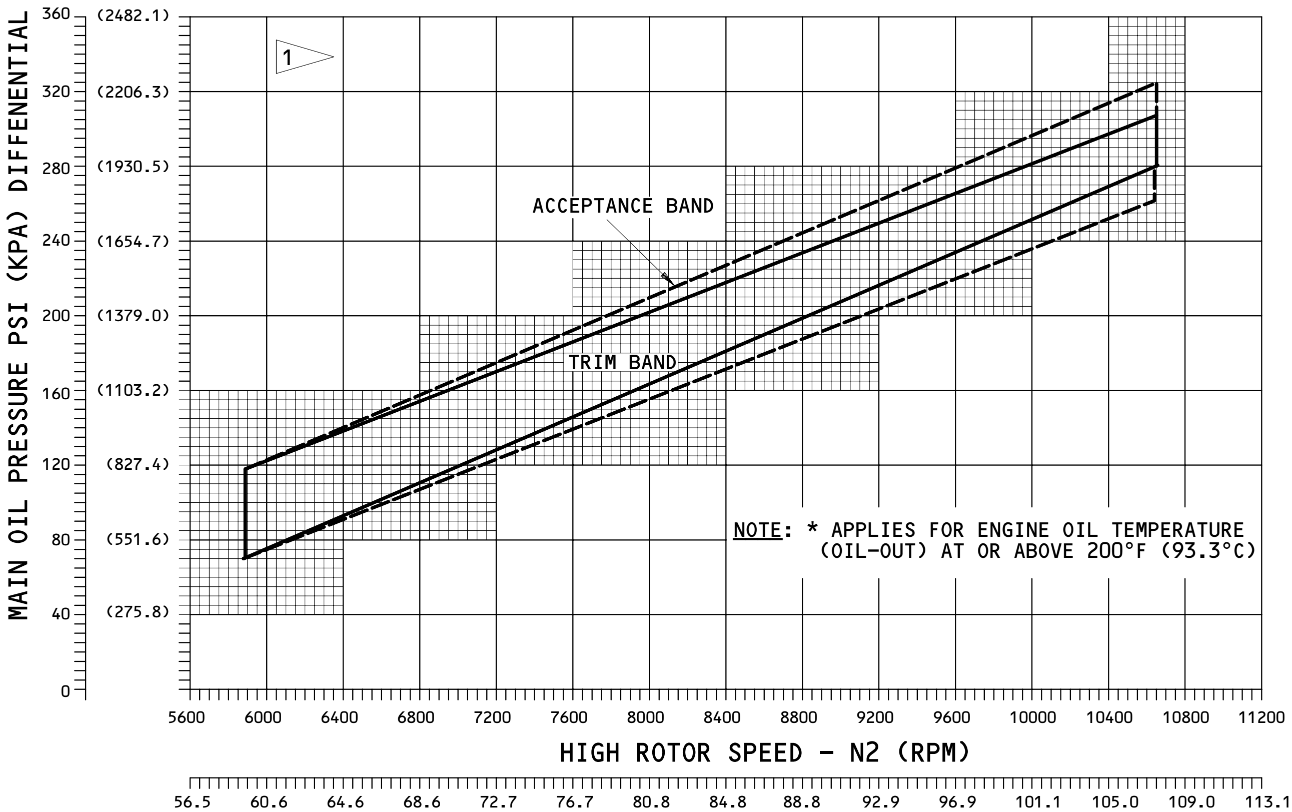
S 865-498-N00
(11) Operate the engine at idle for five minutes to decrease the engine temperature.

S 865-499-N00
(12) Use the Power Plant Operation (Normal) procedure to do the engine shutdown (AMM 71-00-00/201).

S 975-500-N00
(13) Make sure the OIL PRESS indications are in the limits shown on Fig. 517.

S 825-501-N00
(14) If the OIL PRESS indications are not in the limits, do the steps that follow:
  (a) Find the class (part number) of the metering tube nipple that you removed.
  (b) ENGINES PRE-PW-SB 72-114;
  Refer to Fig. 519 and the Class Selection Table that follows to get a new metering tube nipple.
  (c) ENGINES POST-PW-SB 72-114;
  Refer to Fig. 520 and the Class Selection Table that follows to get a new metering tube nipple.

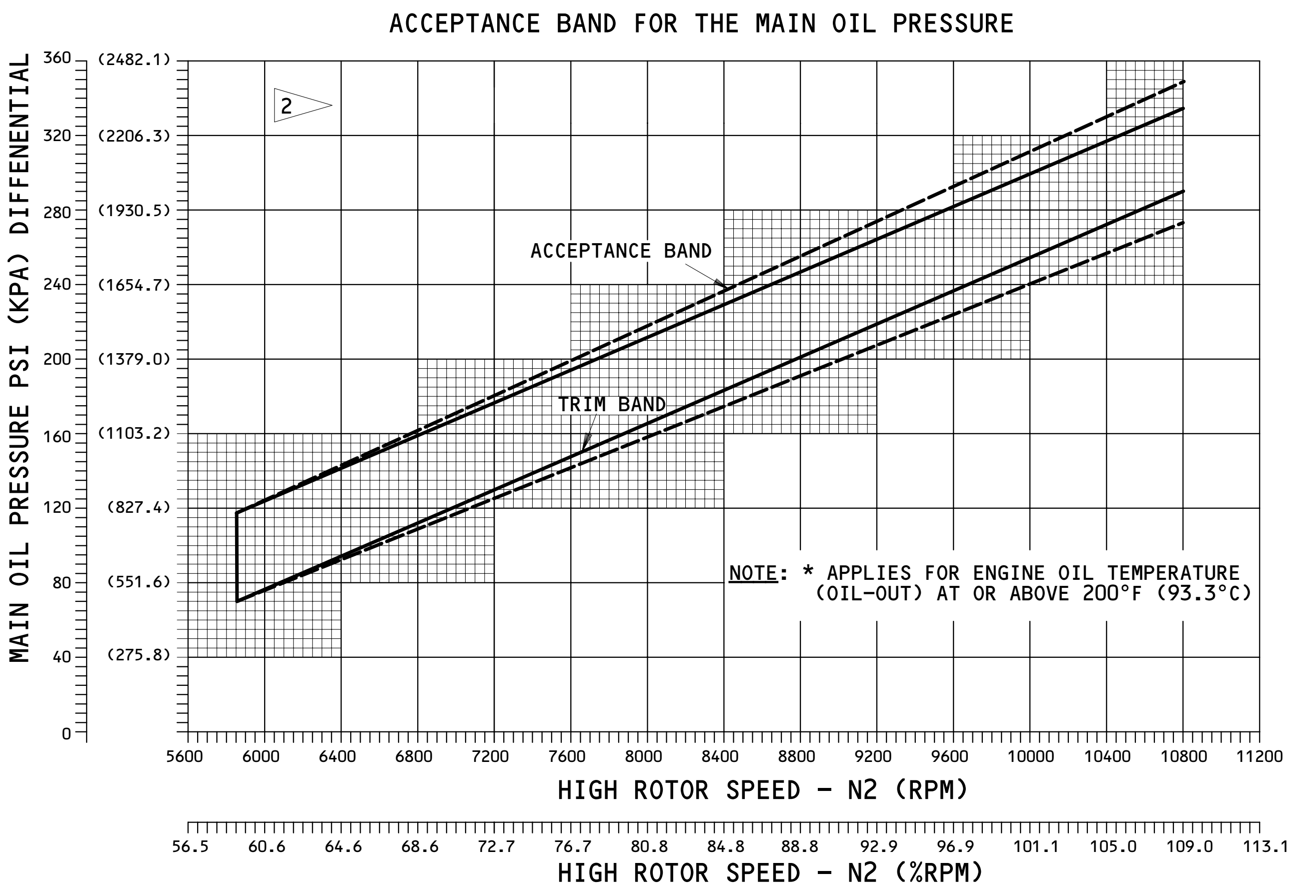
ACCEPTANCE BAND FOR THE MAIN OIL PRESSURE



1 ENGINES WITHOUT PW SB 75-95

L-A4357(1091)

Main Oil Pressure Limits
Figure 517 (Sheet 1)



L-A7737(0000)V

2 ENGINES WITH PW SB 75-95

Main Oil Pressure Limits
figure 517 (Sheet 2)

Class Selection Table		
METERING TUBE NIPPLE PART NUMBER	ORIFICE DIAMETER	
	INCHES	MM
52T955CL1	0.099-0.101	2.515-2.565
52T955CL2	0.104-0.106	2.642-2.692
52T955CL3	0.109-0.111	2.769-2.819
52T955CL4	0.114-0.116	2.896-2.946
52T955CL5	0.119-0.121	3.023-3.073
52T955CL7	0.123-0.125	3.124-3.175
52T955CL8	0.125-0.127	3.175-3.226
52T955CL9	0.127-0.129	3.226-3.277
52T955CL10	0.129-0.131	3.276-3.327
52T955CL11	0.131-0.133	3.328-3.378
52T955CL13	0.135-0.137	3.429-3.480
52T955CL17	0.143-0.145	3.632-3.683
52T955CL20	0.149-0.151	3.785-3.835
52T955CL24	0.157-0.159	3.988-4.039
52T955CL27	0.163-0.165	4.140-4.191
52T955CL30	0.169-0.171	4.293-4.343
52T955CL33	0.175-0.177	4.445-4.496
52T955CL36	0.181-0.183	4.597-4.648
52T955CL39	0.187-0.189	4.750-4.801

Class Selection Table		
METERING TUBE NIPPLE PART NUMBER	ORIFICE DIAMETER	
	INCHES	MM
52T955CL42	0.193-0.195	4.902-4.953
52T955CL45	0.199-0.201	5.055-5.105
52T955CL48	0.205-0.207	5.207-5.258

(d) Open the fan cowl panels (AMM 71-11-04/201).

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO YOU OR DAMAGE TO EQUIPMENT.

(e) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

(f) Open the core cowl panels (AMM 71-11-06/201).

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(g) Open the thrust reversers (AMM 78-31-00/201).

WARNING: USE CAUTION WHEN YOU TOUCH THE METERING TUBE NIPPLE. THE OIL IN THE SYSTEM CAN BE HOT AND CAUSE INJURY TO YOU.

(h) Replace the metering tube nipple with the steps that follow:

WARNING: DO NOT KEEP THE OIL ON YOUR SKIN FOR A LONG TIME. IF YOU DO NOT CLEAN THE OIL OFF, THE OIL CAN CAUSE THE INJURY.

CAUTION: YOU MUST USE THE WRENCHING FLATS ON THE METERING TUBE NIPPLE WHEN YOU LOOSEN THE TUBE NUTS. IF YOU DO NOT DO THIS, YOU CAN TWIST THE TUBE AND CAUSE DAMAGE TO THE TUBES.

1) Use the wrenching flats to disconnect the tube nuts from the metering tube nipple (Fig. 518).
2) Remove the metering tube nipple from the engine.

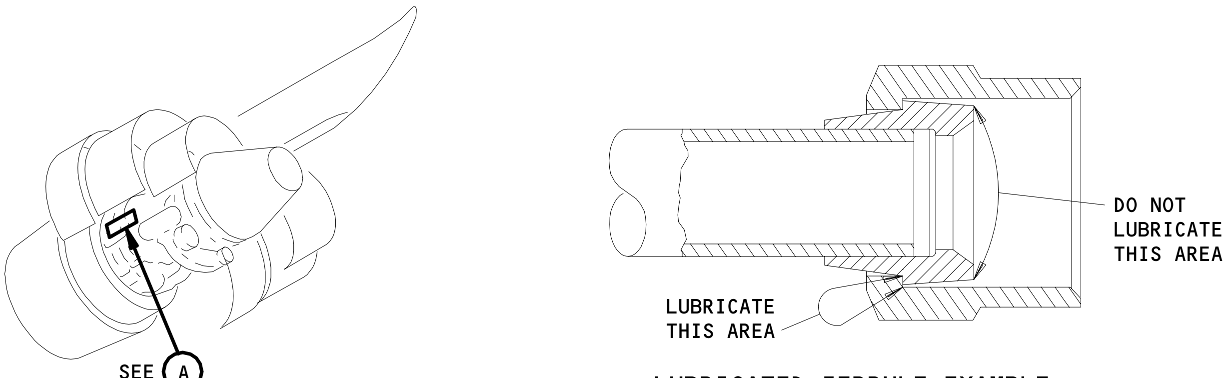
CAUTION: YOU MUST USE THE WRENCHING FLATS ON THE METERING TUBE NIPPLE WHEN YOU TIGHTEN THE TUBE NUTS. IF YOU DO NOT DO THIS, YOU CAN TWIST THE OIL TUBE AND CAUSE DAMAGE TO THE OIL TUBES.

3) Lubricate the back of the ferrules on the tube nuts with the antigalling compound D00453 (Fig. 518).
4) Lubricate the threads of the new metering tube nipple with the antigalling compound A00637.
5) Install the metering tube nipple between the two tube nuts.
   a) Tighten the tube nuts with your hand.
6) While you hold the metering tube nipple with a wrench, tighten the tube nuts to 675-750 pound-inches (76.3-84.7 newton-meters).
7) Install the lockwire or safety cable and safety cable ferrule to the tube nuts.

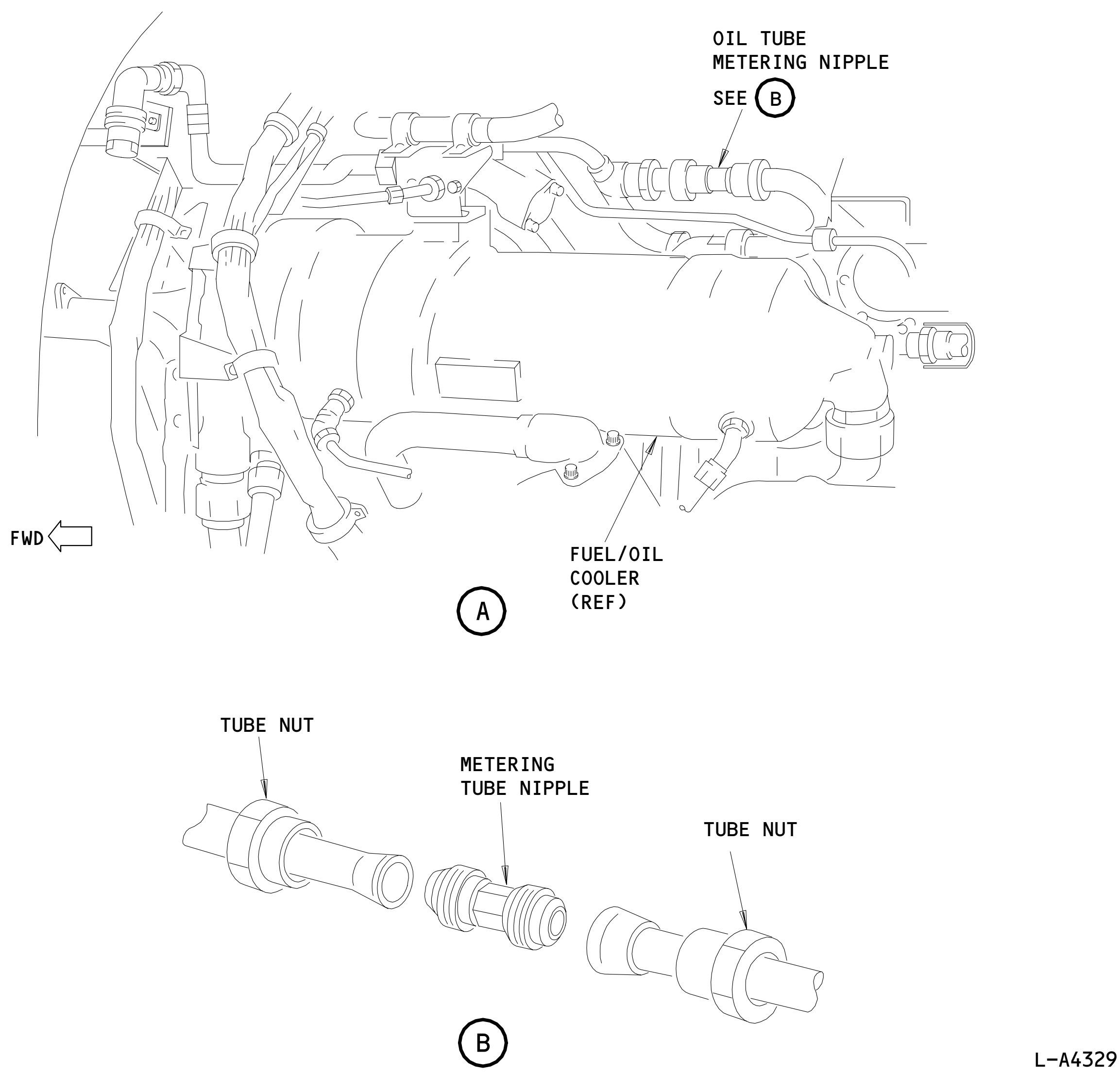
WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(i) Close the thrust reversers (AMM 78-31-00/201).
(j) Close the core cowl panels (AMM 71-11-06/201).
(k) Close the fan cowl panels (AMM 71-11-04/201).
(l) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).
(m) Do the test of the main oil pressure again to make sure the OIL PRESS indication is in the limits.

NOTE: Each engine can have a different main oil pressure, but the oil pressure must be in the specified limits.



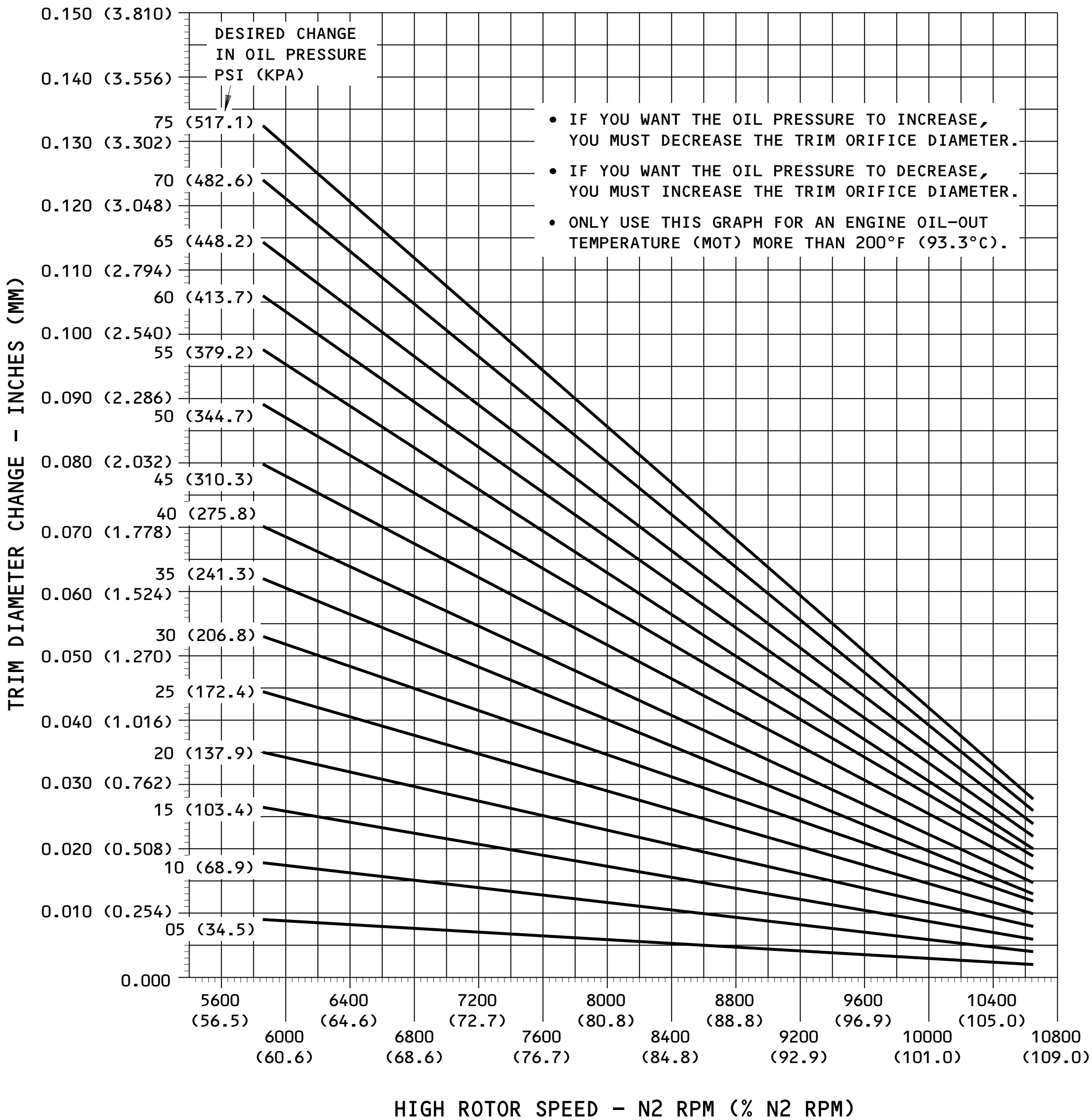
LUBRICATED FERRULE EXAMPLE



L-A4329

Oil Tube Metering Nipple Installation
Figure 518

CHANGE IN THE MAIN OIL PRESSURE CAUSED FROM A TRIM CHANGE
(ENGINES WITHOUT PW SB 72-114)

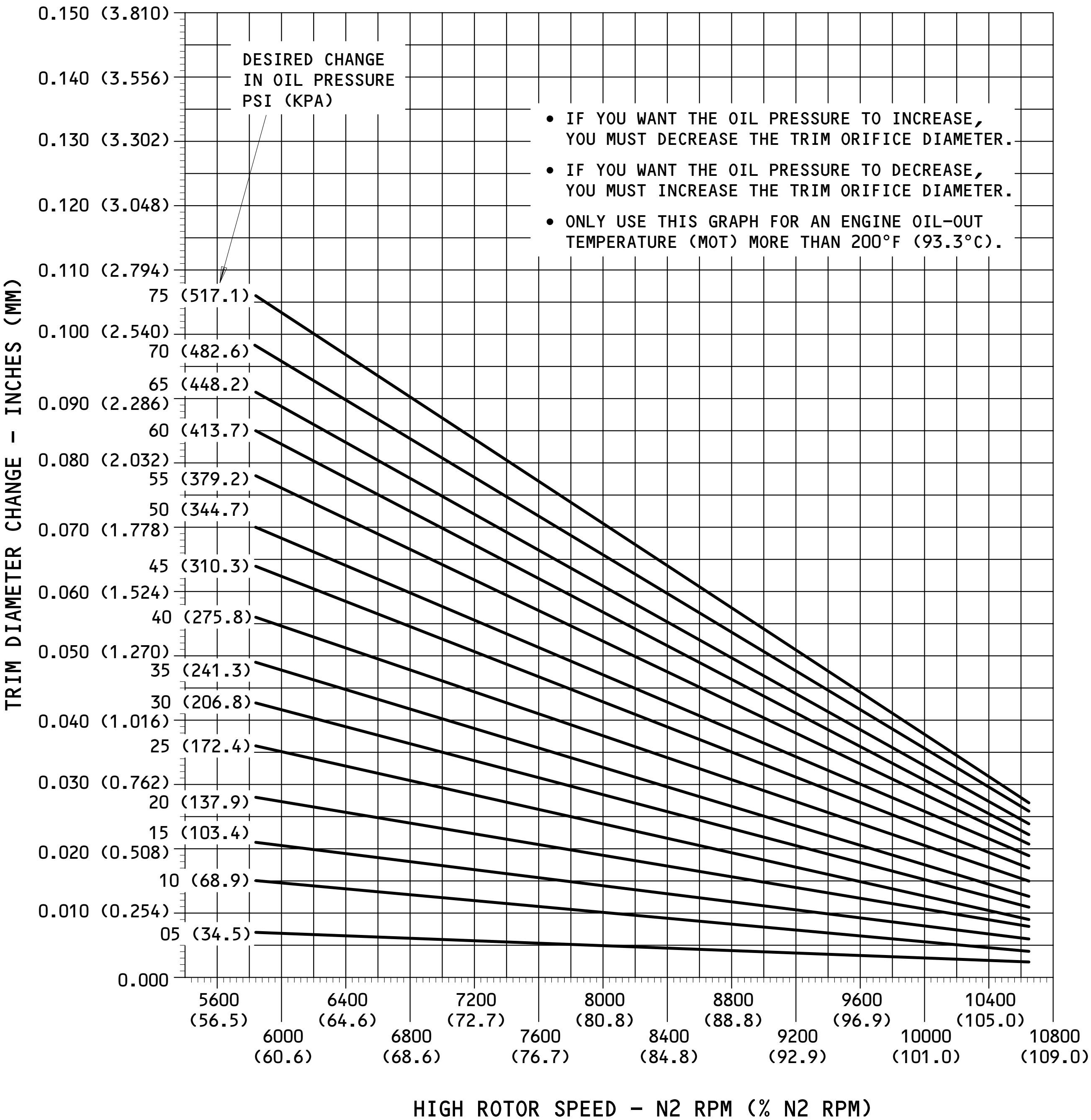


ENGINES WITHOUT PW SB 72-114

L-A4347
(1091)

Orifice Diameter Selection
Figure 519

CHANGE IN THE MAIN OIL PRESSURE CAUSED FROM A TRIM CHANGE
(ENGINES WITH PW SB 72-114)



L-A4346
(1091)

ENGINES WITH PW SB 72-114
Orifice Diameter Selection
Figure 520

TEST NO. 14 - PT2 SYSTEM LEAK TEST

TASK 71-00-00-795-014-N00

17. Test No. 14 - PT2 System Leak Test

A. General
   (1) This procedure does a pressurization and leak check for the PT2 system. The PT2 system is pressurized from the EEC PT2/TT2 probe found in the inlet cowl, thru the EEC.
   (2) Leaks in the system are not permitted, and must be corrected.

B. Equipment
   (1) Regulator (air pressure), with isolation shutoff valve
   (2) Pressure Gage, with a range of 10 PSIG (68.9 KPa), and a precision of ±10 percent
   (3) A71049-1 - Adapter, PT2 Probe
   (4) Tygon Flexible Tubing, 0.250 inch (6.350 mm) ID or the equivalent
   (5) Ground Pneumatic Cart, to supply clean dry air at 10 PSIG (68.9 KPa)
   (6) Protective Mats, Rubber Manufacturers Association Grade SC43, Neoprene Sponge, 1 inch (25 mm) thick, approximately 3 X 4 feet (90 X 120 cm) with the warning streamers attached (three are necessary)

C. Consumable Materials
   (1) G02151 Fluid, Leak Check (bubble type) PMC 9569

D. References
   (1) AMM 71-11-04/201, Fan Cowl Panels

E. Access
   (1) Location Zones

211	Control Cabin
212	Control Cabin
411	Left Engine
412	Right Engine

   (2) Access Panels

414AR	Fan Cowl Panel, Left Engine
424AR	Fan Cowl Panel, Right Engine

F. Prepare for the PT2 system leak test.

S 865-515-N00

   (1) Attach the DO-NOT-OPERATE-ENGINE tag to the L(R) ENG START switch on the pilots' overhead panel, P5.

S 865-516-N00

   (2) For the left engine, open this circuit breaker on the main power distribution panel, P6, and attach the DO-NOT-CLOSE tag:
      (a) 6L19, L ENG PROBE HT

TEST NO. 14 - PT2 SYSTEM LEAK TEST

S 865-517-N00

(3) For the right engine, open this circuit breaker on the main power distribution panel, P6, and attach the DO-NOT-CLOSE tag:
(a) 6K25, R ENG PROBE HT

S 015-518-N00

(4) Open the right fan cowl panel (AMM 71-11-04/201).

G. Do the PT2 System Leak Test

S 865-657-N00

(1) Put the protection mats in the inlet cowl.

S 865-658-N00

(2) Assemble the compressed air source, pressure gauge, vent valve, shutoff valve, flexible tube, and PT2 Probe Adapter (Fig. 521).

NOTE: Make sure the round gasket on the PT2 Probe Adapter fits correctly over the pressure inlet port.

S 865-659-N00

CAUTION: DO NOT APPLY A PRESSURE OF MORE THAN 15 PSIG (103.4 KPA) TO THE PT2 SYSTEM. MAKE SURE THE AIR REGULATOR IS SET LOW BEFORE YOU SUPPLY AIR TO THE PT2 SYSTEM. A HIGH PRESSURE CAN CAUSE DAMAGE TO THE EEC.

(3) Pressurize the PT2 system to a maximum pressure of 10 psig (66.9 kPag).

NOTE: Apply the pressure at a rate of 2.0 psig (13.8 kPag) in one minute.

S 415-520-N00

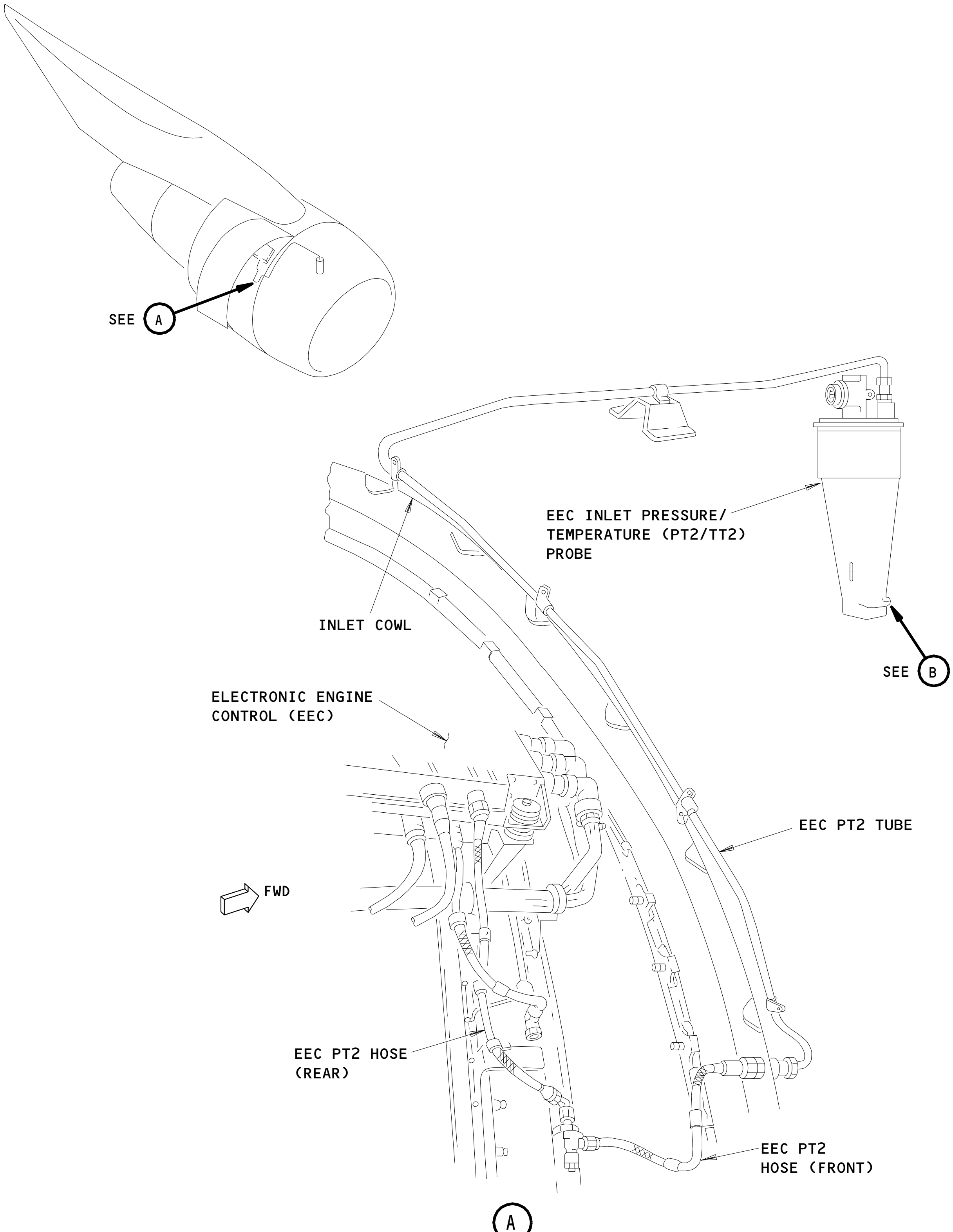
(4) Close the shutoff valve to isolate the PT2 system.

S 865-664-N00

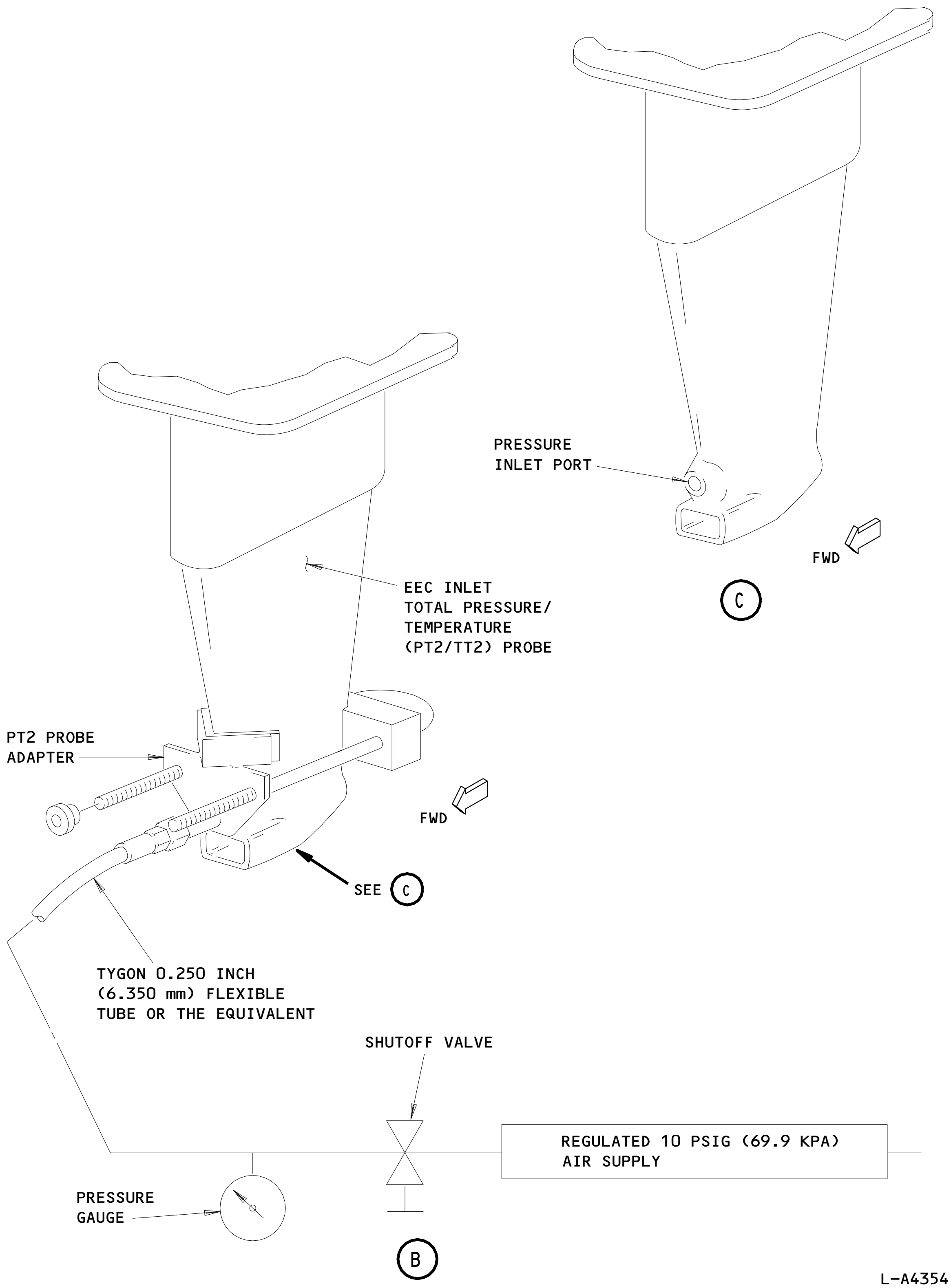
(5) Make sure the pressure does not decrease more than 0.1 psia (0.7 kPa) in five minutes.

S 865-660-N00

(6) If the pressure decreases, do the steps that follow:
(a) Keep a pressure of 10 psig (68.8 kPag) on the PT2 system.
(b) Apply the leak check fluid to the PT2 line to find the leak.
(c) If a leak is not found, do the steps that follow:
(d) Remove the screws which attach the access door for the PT2/TT2 probe to the inlet cowl.



PT2 System Leak Test
Figure 521 (Sheet 1)



PT2 System Leak Test
Figure 521 (Sheet 2)

TEST NO. 14 - PT2 SYSTEM LEAK TEST

(e) Remove the access door.
(f) Apply the leak check fluid to the PT2 line connection at the PT2/TT2 probe to find the leak.
(g) Repair or replace the PT2 tube as it is necessary.
(h) Do the test again to make sure the repair has corrected all the leaks in the PT2 system.
(i) Install the access door for the PT2/TT2 probe if it was removed.

H. Put the airplane back to its usual condition.

S 085-524-N00

(1) Remove the air source from the inlet of the PT2/TT2 probe.

S 415-525-N00

(2) Close the right fan cowl panel (AMM 71-11-04/201).

S 865-661-N00

(3) Remove the protection mats from the inlet cowl.

S 865-526-N00

(4) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the main power distribution panel, P6:
(a) 6L19, L ENG PROBE HT

S 865-527-N00

(5) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the main power distribution panel, P6:
(a) 6K25, R ENG PROBE HT

S 865-528-N00

(6) Remove the DO-NOT-OPERATE-ENGINE tag from the L(R) ENG START switch on the pilots' overhead panel, P5.

TEST NO. 15 - EEC GROUND TEST OF ENGINE CONTROL SYSTEM ACTUATORS

TASK 71-00-00-865-585-N00

18. Test NO. 15 - EEC Ground Test of Engine Control System Actuators

A. General

(1) You can use this test to make sure the engine components in the list below operate correctly.
   (a) The electronic engine control (EEC)
   (b) The fuel metering unit (FMU)
   (c) The stator vane actuator (SVA)
   (d) The 2.5 bleed valve actuator (BVA)
   (e) The turbine case cooling (TCC)
   (f) The engine air/oil heat exchanger (AOC)

(2) You can start the actuator test through the inputs from the flight deck, while you do the dry-motor procedure on the engine. After you start the test, the EEC does the steps that follow:
   (a) Move the actuators of the FMU, SVA, TCC and AOC to the fully closed position.
   (b) Move the actuator of the BVA to the fully open position.
   (c) Move the actuators of the FMU, SVA, TCC, AOC, and BVA to the opposite position.
   (d) Move the actuators of the FMU, SVA, TCC, AOC, and BVA to the first position.

(3) After you start the actuator test, the EEC will do the actuator test for the channel A and for the channel B.

(4) You can monitor the transitions of the SVA, TCC, AOC, and BVA valve position on the EICAS EPCS screen. The transitions of the valve position will show twice on the EICAS EPCS screen.

(5) After the actuator test, do the PIMU Ground Test to make sure the actuator test is done satisfactorily.

B. References

(1) AMM 71-00-00/201, Power Plant
(2) AMM 71-11-04/201, Fan Cowl Panels
(3) AMM 71-11-06/201, Core Cowl Panels
(4) AMM 78-31-00/201, Thrust Reverser System
(5) FIM 71-PIMU MESSAGE INDEX

C. Access

(1) Location Zones

221 and 222	Control Cabin
411	Left Engine
421	Right Engine

TEST NO. 15 - EEC GROUND TEST OF ENGINE CONTROL SYSTEM ACTUATORS

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

D. Prepare for the ground test

S 865-570-N00

(1) Put the EEC MAINT L (R) ENG POWER switch on the P61 panel to the TEST position.

S 865-571-N00

(2) Push the switch for the EPCS DISPLAY SELECT on the P61 panel to get the EPCS page on the bottom EICAS display.

S 865-572-N00

(3) Push the thrust lever on the pilot's aisle stand until the TRA value on the EPCS page is between 40 to 60 degrees.

E. Do the ground test

S 845-662-N00

WARNING: USE THE POWER PLANT OPERATING PROCEDURE TO MOTOR THE ENGINE. IF YOU DO NOT DO THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) If a fuel line was opened, do the Power Plant Wet-motor procedure to motor the engine (AMM 71-00-00/201).

NOTE: This will remove air from the engine fuel lines before you do the test. This will make sure the actuators operate correctly and will prevent fault messages that are not necessary.

TEST NO. 15 - EEC GROUND TEST OF ENGINE CONTROL SYSTEM ACTUATORS

S 845-652-N00

(2) If it is not done, use the Power Plant Dry-motor procedure to motor the engine (AMM 71-00-00/201).

S 865-573-N00

(3) When the engine motors between 21 %N2 and 32 %N2, put the L(R) EEC switch on the P5 panel to the ALTN mode.
- (a) Make sure the ALTN light on the L(R) EEC switch comes on.
- (b) If it is necessary to stop the actuator test, do one of the two steps that follow:
  - 1) Pull the thrust lever back to make the TRA less than 40 degrees.
  - 2) Put the ENG START switch in the OFF position.
- (c) Continue to dry-motor the engine and monitor the changes in the valve position for the SVA, BVA, TCC, and AOC on the EPCS page.

NOTE: The valve positions will change two times.

S 865-574-N00

(4) When you see no changes in the valve position for the SVA, BVA, TCC, and AOC on the EPCS page, use the Power Plant Dry-Motor procedure to do the engine shutdown (AMM 71-00-00/201).

S 865-575-N00

(5) Let the engine fully decrease in speed.

S 865-576-N00

(6) Put the L(R) EEC switch on the P5 panel in the NORM mode.
- (a) Make sure the ALTN light on the L(R) EEC switch goes off.

S 865-577-N00

(7) Make sure the thrust lever is at the idle position.

S 865-578-N00

(8) Make sure that the actuator test is completed without a failure.
- (a) Move the GND TEST switch on the front of the PIMU to the CH A position.
  - 1) Release the GND TEST switch.
  - 2) Make sure the message CH A TEST IN PROGRESS shows on the PIMU display while the PIMU receives and keeps the data from the EEC.

    CH A
    TEST IN
    PROGRESS

TEST NO. 15 - EEC GROUND TEST OF ENGINE CONTROL SYSTEM ACTUATORS

(b) When the message CH A TEST IN PROGRESS does not show on the PIMU display, move the GND TEST swith to the CH B position.

1) Release the GND TEST switch.

2) Make sure the message CH B TEST IN PROGRESS shows on the PIMU display while the PIMU receives and keeps the data from the EEC.

CH B
TEST IN
PROGRESS

(c) When the message CH B TEST IN PROGRESS does not show on the PIMU display, push the BIT switch on the front of the PIMU.

NOTE: Each time you push the BIT switch, a different PIMU message will show until the message END shows.

(d) If one of the two PIMU messages EEC CH-A LBL 354 BIT 19 and EEC CH-B LBL 354 BIT 19 does not show, continue to push the BIT switch and write the PIMU message(s).

NOTE: If one of the two PIMU messages do not show, the actuator test has failed. When the actuator test fails, one or more of the PIMU messages in the list below will show.

EEC CH-A(B) FMU T/M W/A FAIL
EEC CH-A(B) SVA T/M W/A FAIL
EEC CH-A(B) B25 T/M W/A FAIL
EEC CH-A(B) TCC T/M W/A FAIL
EEC CH-A(B) AOC T/M W/A FAIL
EEC CH-A(B) FMU TR-CK FAIL
EEC CH-A(B) SVA TR-CK FAIL
EEC CH-A(B) B25 TR-CK FAIL
EEC CH-A(B) TCC TR-CK FAIL
EEC CH-A(B) AOC TR-CK FAIL
EEC CH-A(B) FMU FD-BK FAIL
EEC CH-A(B) SVA FD-BK FAIL
EEC CH-A(B) B25 FD-BK FAIL
EEC CH-A(B) TCC FD-BK FAIL
EEC CH-A(B) AOC FD-BK FAIL
EEC CH-A(B) LOST POWER
EEC CH-A(B) FMU CR-CK FAIL

1) Do the procedure to correct the failure for the PIMU message(s) shown (FIM 71-PIMU MESSAGE INDEX).

S 015-614-N00

(9) Open the fan cowl panel (AMM 71-11-04/201).

TEST NO. 15 - EEC GROUND TEST OF ENGINE CONTROL SYSTEM ACTUATORS

S 045-615-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(10) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 015-616-N00

(11) Open the core cowl panel (AMM 71-11-06/201).

S 015-617-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(12) Open the thrust reverser (AMM 78-31-00/201).

S 215-580-N00

(13) Look at the fuel tube connection for leakages on the component you replaced.
   (a) If you find a leak, repair or replace the fuel tube, fitting, or the component as necessary.
   (b) Do a check for the leakage again.

S 415-618-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(14) Close the thrust reverser (AMM 78-31-00/201).

S 415-619-N00

(15) Close the core cowl panel (AMM 71-11-06/201).

S 415-620-N00

(16) Close the fan cowl panel (AMM 71-11-04/201).

S 045-621-N00

(17) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 865-582-N00

(18) Let the engine cool to the starter operation limits (AMM 71-00-00/201).

F. Put the airplane back to its usual condition.

S 865-583-N00

(1) Put the EEC MAINT L (R) ENG POWER switch on the P61 panel to the NORM position.

TEST NO. 16 - ENGINE RATING CHECK

TASK 71-00-00-715-717-N00

19. Test No. 16 - Engine Rating Check

A. General

(1) This test checks the Engine Rating to verify it is correct for the airplane and that it is the same as the other engine.

B. References

(1) AMM 31-41-00/201 EICAS Maintenance Displays

(2) AMM 24-22-00/201, Electrical Power

C. Access

(1) 211 Control Cabin

(2) 212 Control Cabin

D. Do the Engine check

S 845-718-N00

(1) Supply electrical power (AMM 24-22-00/201).

S 845-719-N00

(2) Make sure the fuel control switch is in the CUTOFF position.

S 985-724-N00

(3) Make sure the applicable EEC mode select switch on the P5 panel is in the NORM position.

S 985-725-N00

(4) Make sure the thrust lever is in the idle position.

S 845-720-N00

(5) Put the applicable EEC MAINT L(R) ENG POWER switch on the P61 panel to the TEST position.

S 755-721-N00

(6) Do a check of the eingine thrust rating.

(a) Go to the EICAS Maintenance Displays page, and select Engine CONF/MCDP switch on the right side panel, P61 (AMM 31-41-00/201).

TEST NO. 16 - ENGINE RATING CHECK

(b) Make sure all the engine (EPCS) rating are:

EICAS CONF/MCDP page display Model Number	Engine Data Plate
PW4052	PW4052
PW4056	PW4056
PW4060	PW4060
PW4060-B4	PW4060C
PW4062	PW4062

NOTE: PW4062.1 on the EICAS display is for a 747-400 and is an incorrect rating for a 767. Any display other than listed above is an incorrect rating.

S 855-722-N00

(7) Set the applicable EEC MAINT L(R) ENG POWER switch on the P61 panel to the NORM position.

S 845-723-N00

(8) If it is not necessary, remove electrical power (AMM 24-22-00/201).

POWER PLANT - INSPECTION/CHECK

1. General
   A. This procedure gives five tasks. Five tasks are the strut drains inspection, the engine cowls inspection, the engine mounts inspection, the inspection of the engine drain system and the flexible tubes visual inspection.
   B. Before you do each task, you must open the fan cowl panels, the core cowl panels, and the thrust reversers.

TASK 71-00-00-206-001-N00

2. Strut Drains Inspection
   A. References
      (1) AMM 54-53-01/401, Strut Pressure Relief and Access Doors
      (2) AMM 71-11-04/201, Fan Cowl Panels
      (3) AMM 71-11-06/201, Core Cowl Panels
      (4) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones

411	Left Engine
421	Right Engine

      (2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
416BR	Push-Pull Cable Access Panel, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
426BR	Push-Pull Cable Access Panel, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine
436BL	Strut Access Panel, Left Engine
446BL	Strut Access Panel, Right Engine

   C. Procedure

S 046-002-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE THRUST REVERSER TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

      (1) Do the deactivation procedure for the thrust reverser for ground Maintenance (AMM 78-31-00/201).

S 016-003-N00

(2) Remove the 436BL access panel for the left engine and the 446BL access panel for the right engine (AMM 54-53-01/401).

S 216-004-N00

(3) Make sure the inlet to the strut drain line does not have a blockage.

<u>NOTE</u>: The strut drain line goes through the skirt fairing on the core cowl.

S 416-005-N00

(4) Install the 436BL and the 446BL access panels (AMM 54-53-01/401).

S 016-006-N00

(5) Open the fan cowl panels (AMM 71-11-04/201).

S 016-007-N00

(6) Open the core cowl panels (AMM 71-11-06/201).

S 016-008-N00

<u>WARNING</u>: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS WHEN YOU OPEN THE THRUST REVERSERS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(7) Open the thrust reversers (AMM 78-31-00/201).

S 016-009-N00

(8) Remove the 416BR access panel for the left engine and the 426BR access panel for the right engine (AMM 54-53-01/401).

<u>NOTE</u>: These access panels are on the strut behind the thrust reversers.

S 216-010-N00

(9) Make sure the inlet of the drain line does not have a blockage.

S 416-011-N00

(10) Install the 416BR and the 426BR access panels (AMM 54-53-01/401).

S 216-012-N00

(11) Make sure the drain inlets on the left side and the right side of the forward engine mount do not have a blockage.

S 416-041-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS WHEN YOU CLOSE THE THRUST REVERSERS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(12) Close the thrust reversers (AMM 78-31-00/201).

S 416-042-N00

(13) Close the core cowl panels (AMM 71-11-06/201).

S 416-043-N00

(14) Close the fan cowl panels (AMM 71-11-04/201).

S 446-044-N00

(15) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

TASK 71-00-00-206-025-N00

3. The Engine Cowls Inspection

A. References

(1) AMM 71-11-04/201, Fan Cowl Panels

(2) AMM 71-11-06/201, Core Cowl Panels

(3) AMM 78-31-00/201, Thrust Reverser System

B. Access

(1) Location Zones

411	Left Engine
421	Right Engine

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

C. Procedure

S 046-038-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE THRUST REVERSER TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Do the deactivation procedure for the thrust reverser for ground Maintenance (AMM 78-31-00/201).

S 016-053-N00
(2) Open the fan cowl panel (AMM 71-11-04/201).

S 016-039-N00
(3) Open the core cowl panels (AMM 71-11-06/201).

S 016-040-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS WHEN YOU OPEN THE THRUST REVERSERS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the thrust reversers (AMM 78-31-00/201).

S 416-013-N00
(5) Make sure the pressure relief doors on the inlet cowl, the fan cowl, and the core cowl are closed.

S 216-014-N00
(6) Examine these parts for damage and the correct installation:
  (a) The external side of the inlet cowl
  (b) The flanges on the inlet cowl and on the fan case

(c) The mount bolts for the inlet cowl
(d) The pressure relief vent on the inlet cowl
(e) The fan cowl latches
(f) The pressure relief door on the fan cowl panel
(g) The fan cowl hinges
(h) The core cowl latches
(i) The core cowl hinges
(j) The internal side of the core cowl panels
(k) The pressure relief doors for the core cowl panels.

S 416-045-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS WHEN YOU CLOSE THE THRUST REVERSERS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(7) Close the thrust reversers (AMM 78-31-00/201).

S 416-046-N00

(8) Close the core cowl panels (AMM 71-11-06/201).

S 416-047-N00

(9) Close the fan cowl panels (AMM 71-11-04/201).

S 446-048-N00

(10) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

TASK 71-00-00-206-031-N00

4. Engine Mounts Inspection

A. References
(1) AMM 71-11-04/201, Fan Cowl Panels
(2) AMM 71-11-06/201, Core Cowl Panels
(3) AMM 78-31-00/201, Thrust Reverser System

B. Access
(1) Location Zones

411	Left Engine
421	Right Engine

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

C. Procedure

S 046-054-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE THRUST REVERSER TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Do the deactivation procedure for the thrust reverser for ground Maintenance (AMM 78-31-00/201).

S 016-055-N00

(2) Open the fan cowl panel (AMM 71-11-04/201).

S 016-056-N00

(3) Open the core cowl panels (AMM 71-11-06/201).

S 016-057-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS WHEN YOU OPEN THE THRUST REVERSERS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the thrust reversers (AMM 78-31-00/201).

S 216-015-N00

(5) Do a visual inspection of these parts on the forward mount for damage and the correct installation:
- (a) The thrust links
- (b) The evener bar
- (c) The mount bolts
- (d) The center connection to the compressor case
- (e) The platform fitting.

S 216-016-N00

(6) Do a visual inspection of these parts on the aft mount for damage and the correct installation:
 (a) The mount bolts
 (b) The hanger on the aft mount
 (c) The tangential links and the center link.

S 416-049-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS WHEN YOU CLOSE THE THRUST REVERSER, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(7) Close the thrust reversers (AMM 78-31-00/201).

S 416-050-N00

(8) Close the core cowl panels (AMM 71-11-06/201).

S 416-051-N00

(9) Close the fan cowl panels (AMM 71-11-04/201).

S 446-052-N00

(10) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

TASK 71-00-00-206-032-N00

5. Drain System Inspection

A. References
 (1) AMM 71-11-04/201, Fan Cowl Panels
 (2) AMM 71-11-06/201, Core Cowl Panels
 (3) AMM 71-71-00/601, Engine Vents and Drains
 (4) AMM 78-31-00/201, Thrust Reverser System

B. Access
 (1) Location Zones

411	Left Engine
421	Right Engine

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

C. Procedure

S 046-058-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE THRUST REVERSER TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Do the deactivation procedure for the thrust reverser for ground Maintenance (AMM 78-31-00/201).

S 016-059-N00

(2) Open the fan cowl panel (AMM 71-11-04/201).

S 016-060-N00

(3) Open the core cowl panels (AMM 71-11-06/201).

S 016-061-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS WHEN YOU OPEN THE THRUST REVERSERS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the thrust reversers (AMM 78-31-00/201).

S 216-017-N00

(5) Examine the drain tubes for damage and the correct installation.

S 216-018-N00

(6) Examine the overboard drain seal for damage.

S 216-019-N00

(7) Make sure the overboard drain seal is attached correctly.

S 216-020-N00

(8) Examine the fluid traps on the drain tubes for leakage (AMM 71-71-00/601).

S 416-037-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS WHEN YOU CLOSE THE THRUST REVERSERS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(9) Close the thrust reversers (AMM 78-31-00/201).

S 416-036-N00

(10) Close the core cowl panels (AMM 71-11-06/201).

S 416-035-N00

(11) Close the fan cowl panels (AMM 71-11-04/201).

S 446-034-N00

(12) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

TASK 71-00-00-206-063-N00

6. Flexible Tubes Visual Inspection

A. References
(1) AMM 71-11-04/201, Fan Cowl Panels
(2) AMM 71-11-06/201, Core Cowl Panels
(3) AMM 71-71-00/601, Engine Vents and Drains
(4) AMM 78-31-00/201, Thrust Reverser System

B. Access
(1) Location Zones
411 Left Engine
421 Right Engine

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

C. Procedure

S 046-072-N00

<u>WARNING</u>: DO THE DEACTIVATION PROCEDURE FOR THE THRUST REVERSER TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Do the deactivation procedure for the thrust reverser for ground Maintenance (AMM 78-31-00/201).

S 016-073-N00
(2) Open the fan cowl panel (AMM 71-11-04/201).

S 016-074-N00
(3) Open the core cowl panels (AMM 71-11-06/201).

S 016-075-N00

<u>WARNING</u>: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS WHEN YOU OPEN THE THRUST REVERSERS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the thrust reversers (AMM 78-31-00/201).

S 216-064-N00

CAUTION: BE CAREFUL WHEN YOU HANDLE, REMOVE OR INSTALL ALL TUBES WHICH CONTAIN A FLEX DESIGN SEGMENT. REMOVE AND INSTALL A TUBE WITH A FLEX SEGMENT WITH THE SAME PRECAUTIONS USED FOR A TUBE WITHOUT A FLEX SEGMENT. DO NOT BEND THE FLEXHOSE OF A TUBE TO HELP WITH THE INSTALLATION OR REMOVAL OF AN ATTACHED COMPONENT. IF A FLEX SEGMENT IS BENT TOO MUCH, THIS CAN CAUSE A KINK IN THE EXTERNAL WIRE BRAID AND IN THE INNER POLYTETRAFLUORETHYLENE (PTFE) TUBE AND LEAKS OR TUBE RUPTURE CAN BE THE RESULT.

(5) Visually examine the flexible tube outer fire sleeve for cuts, tears, gouges and abrasions that go through the thickness of the outer silicone fire sleeve.
  (a) Flexible tubes with cuts or tears to 0.750 inch (19.050 mm) maximum length must be repaired.
  (b) Flexible tubes with gouges or abrasions to 0.250 sq-in (161. sq-mm) maximum area must be repaired.
  (c) Flexible tubes with damage that are more than the above limiits are not repairable and must not be installed on an engine.

S 216-065-N00

(6) If the outer fire sleeve is damaged, visually examine the stainless steel metal braid under the silicone fire sleeve.
  (a) Visually examine the stainless steel metal braid for cuts, fraying or punctures.
  (b) For tube assemblies with fire sleeves that are not integral to the flexible section, the wire braid must not be repaired. The tube assembly must not be installed on an engine.
  (c) For tube assemblies with fire sleeves that are integral to the flexible section, the metal braid is not repairable. The tube assembly must not be installed on an engine.

S 216-066-N00

(7) Visually examine the flexible tube assemblies without fire sleeves or assemblies on which the fire sleeve has been removed.
  (a) Visually examine the stainless steel braid for kinks, broken wires, frayed areas or corrosion. Use 5X magnification or greater.

(b) Flexible tube assemblies with damage specified above must not be installed on an engine.

S 216-067-N00

(8) Visually examine the flexible tube assemblies with fire sleeves in place.

(a) Visually examine the fire sleeve for wires that come out of the braid or distortion that shows the braid damage under the fire sleeve.

(b) Visually examine the tube assemblies with integral fire sleeves for flat or discolored areas. This will show a kinked tube.

(c) Use care when you feel for wires that come out of the braid. Use your fingers to feel the fire sleeve for necking under the stainless braid. This will show a kinked tube.

(d) Flexible tube assemblies with the damage specified above must not be installed on an engine.

(e) Flexible tubes with a slip-on fire sleeve that has a loose metal strap on each end of the tube must not be installed on an engine.

S 286-076-N00

(9) Do the following tests if needed to get more information about the tube.

S 216-068-N00

(10) Visually examine the flexible tube inner diameter for kinks.

(a) Get a round ball that has an 80 percent minimum diameter of the inner diameter of the flexible tube.

(b) Put the ball through one end of the tube. The ball must come out the other end.

(c) Flexible tube assemblies with the damage specified above must not be installed on an engine.

S 786-069-N00

(11) For fuel hydraulic fluid flexible hoses do a pressure test of not installed or removed lines with water or equivalent fluid at 1150 - 1200 psi (7929.0 - 8273.7 kPa) for three minutes and check for leaks.

(a) If you find a leak, do not install on an engine.

S 786-070-N00

(12) For oil and air flexible hoses do a pressure test of not intalled or removed lines with water or equivalent fluid at 195-200 psi (1344.5 - 1379.0 kPa) for three minuets and check for leaks.

(a) If you find a leak, do not install on an engine.

S 416-077-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS WHEN YOU CLOSE THE THRUST REVERSERS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(13) Close the thrust reversers (AMM 78-31-00/201).

S 416-078-N00

(14) Close the core cowl panels (AMM 71-11-06/201).

S 416-079-N00

(15) Close the fan cowl panels (AMM 71-11-04/201).

S 446-080-N00

(16) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

POWER PLANT - REMOVAL/INSTALLATION

1. General
   A. This procedure includes the six tasks that follow:
      - Prepare for the Power Plant Removal
      - Remove the Power Plant with the Bootstrap Equipment (Recommended)
      - Remove the Power Plant with the PT90-E (Optional)
      - Install the Power Plant with the Bootstrap Equipment (Recommended)
      - Install the Power Plant with the PT90-E (Optional)
      - Put the Airplane Back to Its Usual Configuration.
   B. The platforms and stands are necessary to get access to the points where you will disconnect specified parts. These points are approximately 13 feet (4 meters) above the ground.
   C. The power plant weighs approximately 11,000 pounds when you remove it from the airplane. You must add the weight of the ground support equipment and persons (that you will lift) to the weight of the power plant when you calculate the load.
   D. For the removal and installation of the power plant, you must do the steps as follows:
      (1) Install the hold-open equipment for the thrust reversers.
      (2) Remove the fan cowl panels.
      (3) Remove the core cowl panels.
         (a) You can install the hold-open equipment on the fan and core cowl panels as an alternative.
      (4) You can do this procedure with the inlet cowl removed or installed. The load distribution will be different with the inlet cowl off. You must make sure you do not exceed the load limits for the forward and aft load cells.
   E. The ground, where you will remove and install the power plant, must be very clean. When you operate the power plant, the mass airflow causes the unwanted objects to go into the power plant.
      (1) Before you operate the power plant, you must make sure these are free of the unwanted objects.
         - the power plant compartment
         - the air inlet
         - the work area.
   F. Before the power plant removal, you must make sure the center of gravity (C.G.) for the airplane stays in the safe limits. You must calculate the weight and balance the airplane.
      (1) After you disconnect the fuel and hydraulic lines and the electrical connectors, you can supply electrical power to the airplane to do the maintenance. You must remove electrical power when you connect the lines and the connectors after you install the engine.

TASK 71-00-02-844-002-N00

2. Prepare for the Power Plant Removal
   A. General
      (1) During the power plant removal, you must seal all openings with the approved caps. You must seal all the tube ends, ducts and electrical connectors with a cap as quickly as possible. You must use the external caps.

B. Equipment
  (1) A71030-32 Fan Cowl Hold-Open Equipment - (40 knots) (optional)
  (2) A71032-14 Core Cowl Hold-Open Equipment - (40 knots) (optional)
  (3) A78001-31 Thrust Reverser Hold-Open Equipment - (40 knots)
  (4) G78005-1 Adapter for the Thrust Reverser Hold Open Rod
  (5) G71023-52 Hold Open Equipment - Fan and Core Cowls - (20 knots) (optional)
  (6) G24006-1 Support Hook, Power Feeder Wire Bundle
  (7) Container - 5-gallon capacity, approved for fuel
  (8) Container - 1-gallon capacity, approved for hydraulic fluid

C. References
  (1) AMM 07-11-05/201, Jacking for Airplane Support with Engines Removed
  (2) AMM 08-21-00/201, Leveling
  (3) AMM 20-41-00/201, Static Grounding
  (4) AMM 24-22-00/201, Electrical Power - Control
  (5) AMM 27-81-00/201, Leading Edge Slat System
  (6) AMM 29-11-00/201, Main Hydraulic Systems
  (7) AMM 71-11-04/201, Fan Cowl Panels
  (8) AMM 71-11-04/401, Fan Cowl Panels
  (9) AMM 71-11-06/201, Core Cowl Panels
  (10) AMM 71-11-06/401, Core Cowl Panels
  (11) AMM 78-31-00/201, Thrust Reverser System

D. Access
  (1) Location Zone

411	Left Engine
421	Right Engine

  (2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

E. Prepare the Airplane for the Power Plant Removal

S 944-003-N00

(1) Ground the airplane to an approved ground lug (AMM 20-41-00/201).

S 864-004-N00

(2) Make the airplane level to the zero ± 1/4 degree in the pitch and roll directions (AMM 08-21-00/201).

S 824-005-N00

(3) Install a tail jack if it is necessary (AMM 07-11-05/201).

NOTE: The airplane C.G. will move aft when you remove the engine. If the airplane C.G. is too far aft when you start to remove the engine, the airplane can fall on its tail.

S 044-001-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(4) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 864-006-N00

(5) Make sure the forward thrust levers are in the fully aft position and attach the DO-NOT-OPERATE tag.

S 864-008-N00

WARNING: DO NOT KEEP THE FUEL SPAR VALVE OPEN. THE ACCIDENTAL LEAKAGE OF THE FUEL DURING THE ENGINE CHANGE CAN CAUSE INJURY TO PERSONS.

(6) Make sure the applicable engine and spar valves are closed as follows:
    (a) For the left engine, make sure this circuit breaker on the overhead circuit breaker panel, P11, is closed:
        1) 11D25, ENGINE FUEL CONT VLV & EEC CHAN B RESET L

(b) For the right engine, make sure this circuit breaker on the overhead circuit breaker panel, P11, is closed:
1) 11D26, ENGINE FUEL CONT VLV & EEC CHAN B RESET R
(c) For the left engine, make sure this circuit breaker on the main power distribution panel, P6, is closed:
1) 6E1, FUEL VALVES L SPAR
(d) For the right engine, make sure this circuit breaker on the main power distribution panel, P6, is closed:
1) 6E2, FUEL VALVES R SPAR
(e) Move the FUEL CONTROL switch on the control stand to the CUTOFF position.
1) Attach the DO-NOT-OPERATE tag.
(f) Make sure the ENG VALVE and SPAR VALVE lights on the control stand are off.
(g) For the left engine, open this circuit breaker on the main power distribution panel, P6, and attach the DO-NOT-CLOSE tag:
1) 6E1, FUEL VALVES L SPAR
(h) For the right engine, open this circuit breaker on the main power distribution panel, P6, and attach the DO-NOT-CLOSE tag:
1) 6E2, FUEL VALVES R SPAR
(i) For the left engine, open this circuit breaker on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tag:
1) 11D25, ENGINE FUEL CONT VLV & EEC CHAN B RESET L
(j) For the right engine, open this circuit breaker on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tag:
1) 11D26, ENGINE FUEL CONT VLV & EEC CHAN B RESET R

S 434-009-N00
(7) Close the supply shutoff valve for the engine driven pump (EDP) as follows:
(a) For the left engine, make sure this circuit breaker on the overhead circuit breaker panel, P11, is closed:
1) 11D29, HYDRAULIC L ENG PUMP SUPPLY
(b) For the right engine, make sure this circuit breaker on the overhead circuit breaker panel, P11, is closed:
1) 11D30, HYDRAULIC R ENG PUMP SUPPLY
(c) Make sure the fire handle for the applicable engine on the aft pilots' control stand, P8, is in the usual position.

(d) Push the manual override switch below the fire handle.
(e) Pull the fire handle on the aft pilots' control stand, P8, to the FIRE position but do not turn it.
1) Make sure the position indicator for the supply shutoff valve of the EDP moves to the CLOSE position.

S 864-021-N00
(8) Retract the leading edge slats (AMM 27-81-00/201).
(a) Attach the DO-NOT-OPERATE tag on the flap control lever.

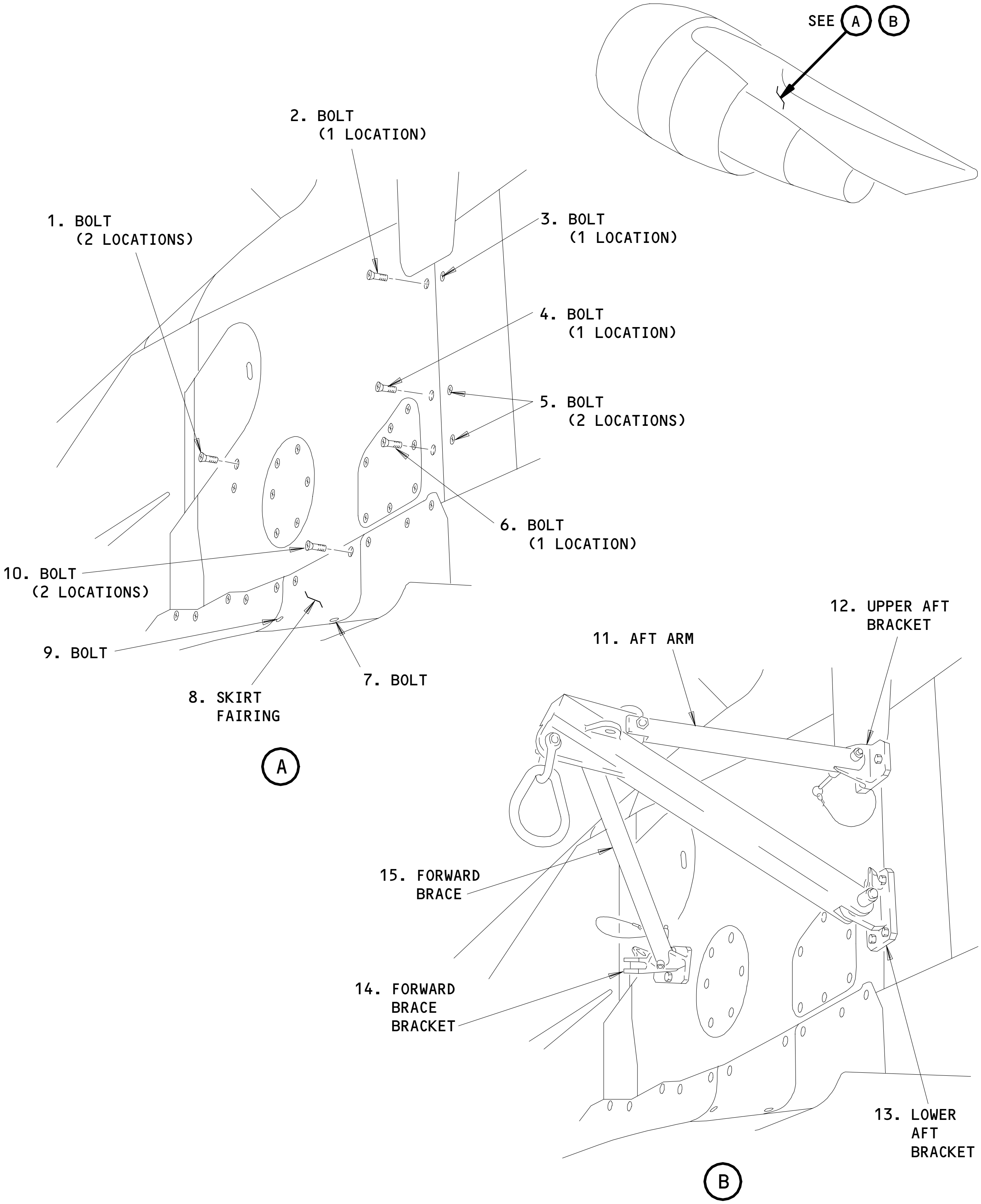
S 864-010-N00
(9) Release the pressure from the left or right hydraulic system and reservoir (AMM 29-11-00/201).

S 034-011-N00
(10) Remove the bolts (7, 9, 10) and the skirt fairing (8) from the two sides of the strut (Fig. 401).

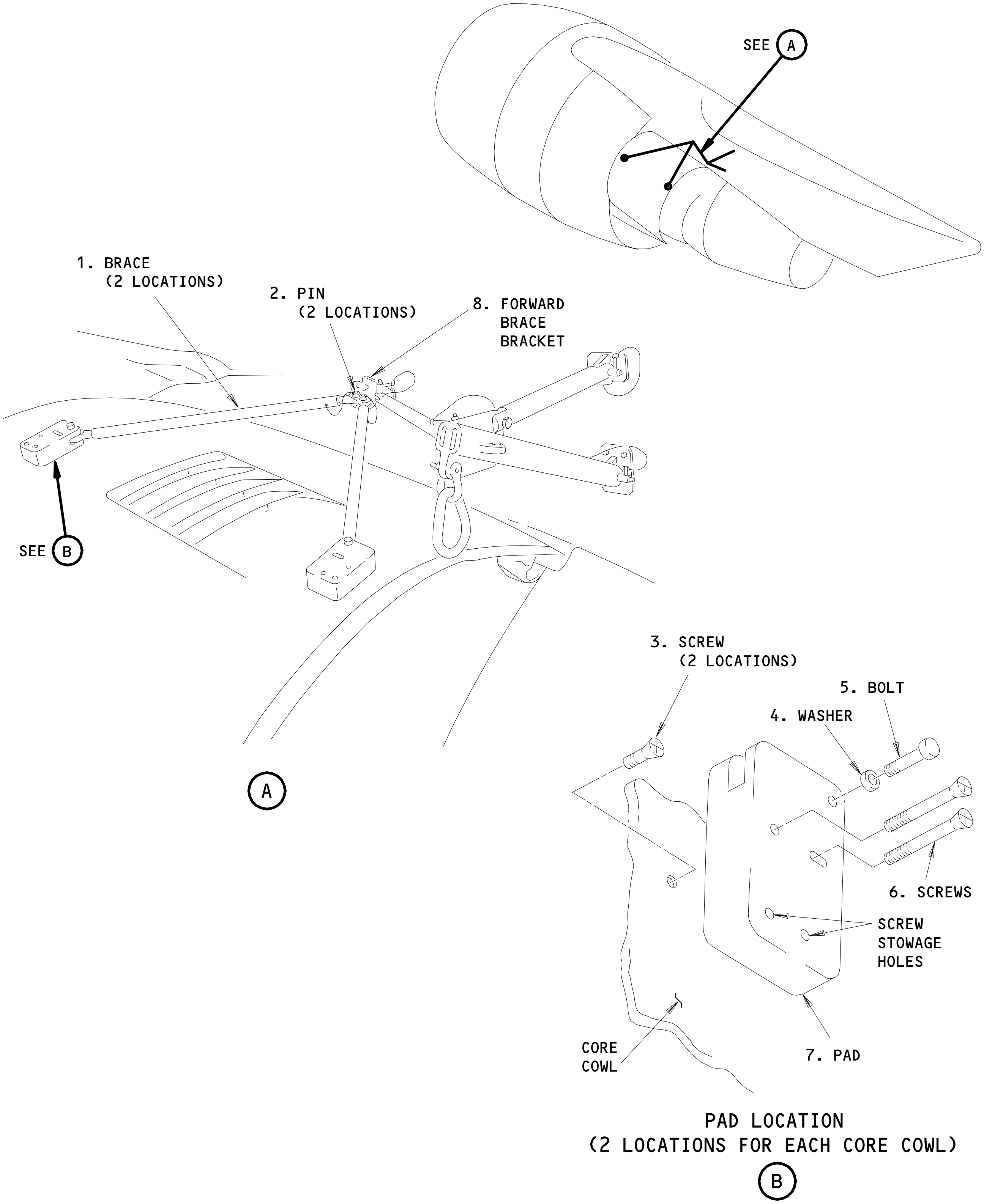
S 864-007-N00
(11) If electrical power is necessary for other maintenance, supply electrical power (AMM 24-22-00/201).

F. Prepare for the Power Plant Removal

S 014-012-N00
(1) Remove the core cowl panels or install the hold-open equipment (A71032-14) for the core cowl as follows:
(a) Open the core cowl panels (AMM 71-11-06/201).
(b) If you use the bootstrap equipment (Fig. 402), do as follows:
1) Install the aft bootstrap components (Fig. 401) as follows:
a) Put the protection pads on the turbine exhaust sleeve (one on each side).
b) Remove the bolts (1, 2, 3, 4, 5, 6) from the two sides of the strut.
c) Install the top and lower aft brackets (12, 13) on the two sides of the strut.
d) Install the forward bracket (14) on the two sides of the strut.
e) Install the aft inboard arm (11) on the top and lower aft brackets (12, 13).



Aft Bootstrap Equipment Installation
Figure 401



Core Cowl Panel Hold-Open Equipment Installation
Figure 402

WARNING: INSTALL THE LONGER OUTBOARD ARM ON THE OUTBOARD BRACKETS ONLY. IF YOU INSTALL THE BOOTSTRAP ARMS INCORRECTLY, THE BOOTSTRAP WILL NOT OPERATE. THIS CAN CAUSE INJURY TO PERSONS.

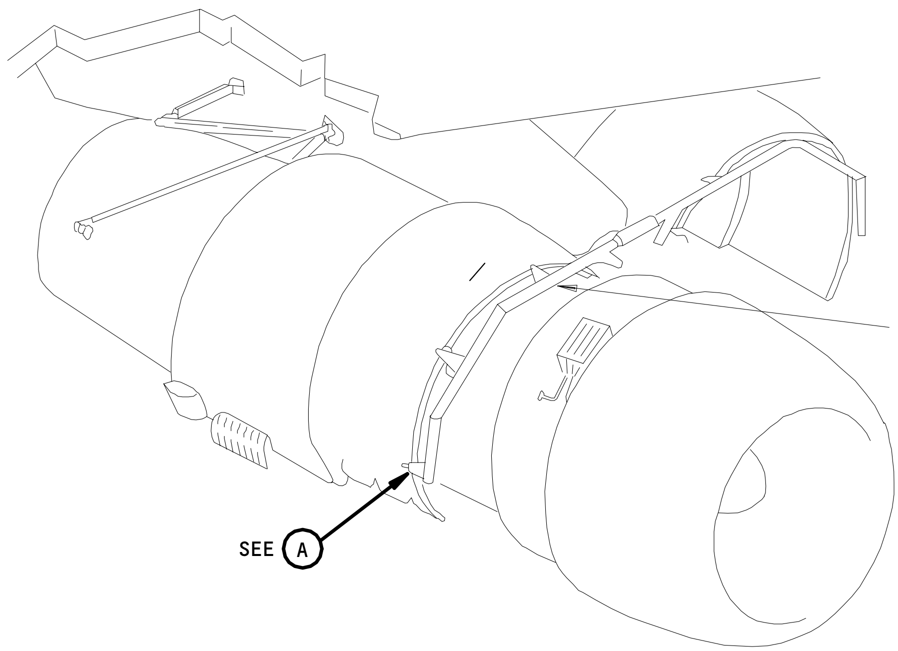
f) Install the aft outboard arm (11) on the top and lower aft brackets (12, 13).
g) Install the inboard forward brace (15) on the forward bracket (14) and the aft inboard arm (11).
h) Install the outboard brace (15) on the forward bracket (14) and the aft outboard arm (11).

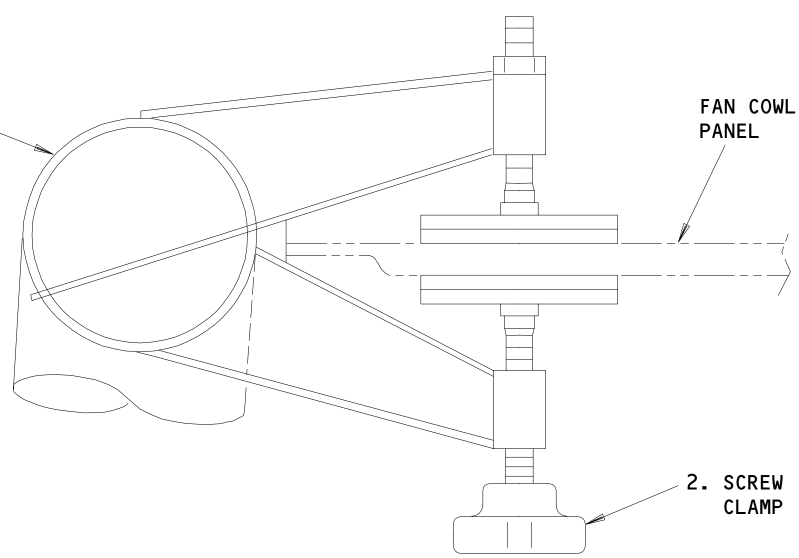
2) Remove the screws (3) from the core cowl panels.
3) Attach the pads (7) to the core cowl with the screws (6).
4) Attach the braces (1) to the pads (7) with the bolts (5) and washers (4).
5) Attach the braces (1) with the pins (2) to the forward bracket (14, Fig. 401).
6) Install the hold-open rods to the stow bracket on the core cowl panel.

(c) If you use the hold-open equipment (G71023) for the fan and core cowl panels, go to the step that follows which installs the hold-open equipment (G71023).

S 014-013-N00

(2) Remove the fan cowl panels or install the hold-open equipment (A71030-32) for the fan cowl panels as follows:
(a) Open the fan cowl panels (AMM 71-11-04/201).
(b) If you use the hold-open equipment (A71030-32) for the fan cowl (Fig. 403), do as follows:
1) Assemble the hold-open equipment (1) on the ground.
2) Put the hold-open equipment (1) on the forward edge of the fan cowl panels.
3) Tighten the screw clamps (2).
4) Make sure the hold-open equipment does not touch the support structure for the fan cowl.
5) Install the hold-open rods to the stow bracket on the fan cowl panels.
(c) If you use the hold-open equipment (G71023) for the fan and core cowl panels, go to the step that follows which installs the hold-open equipment (G71023).





Fan Cowl Panel Hold-Open Equipment Installation
Figure 403

S 014-139-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(3) Open the thrust reversers (AMM 78-31-00/201).
(a) Install the adapter for the hold-open rod for the thrust reverser (G78005).

NOTE: This will hold the thrust reverser in an extended open postion. This will let you install the hold-open equipment (A78001) more easily.

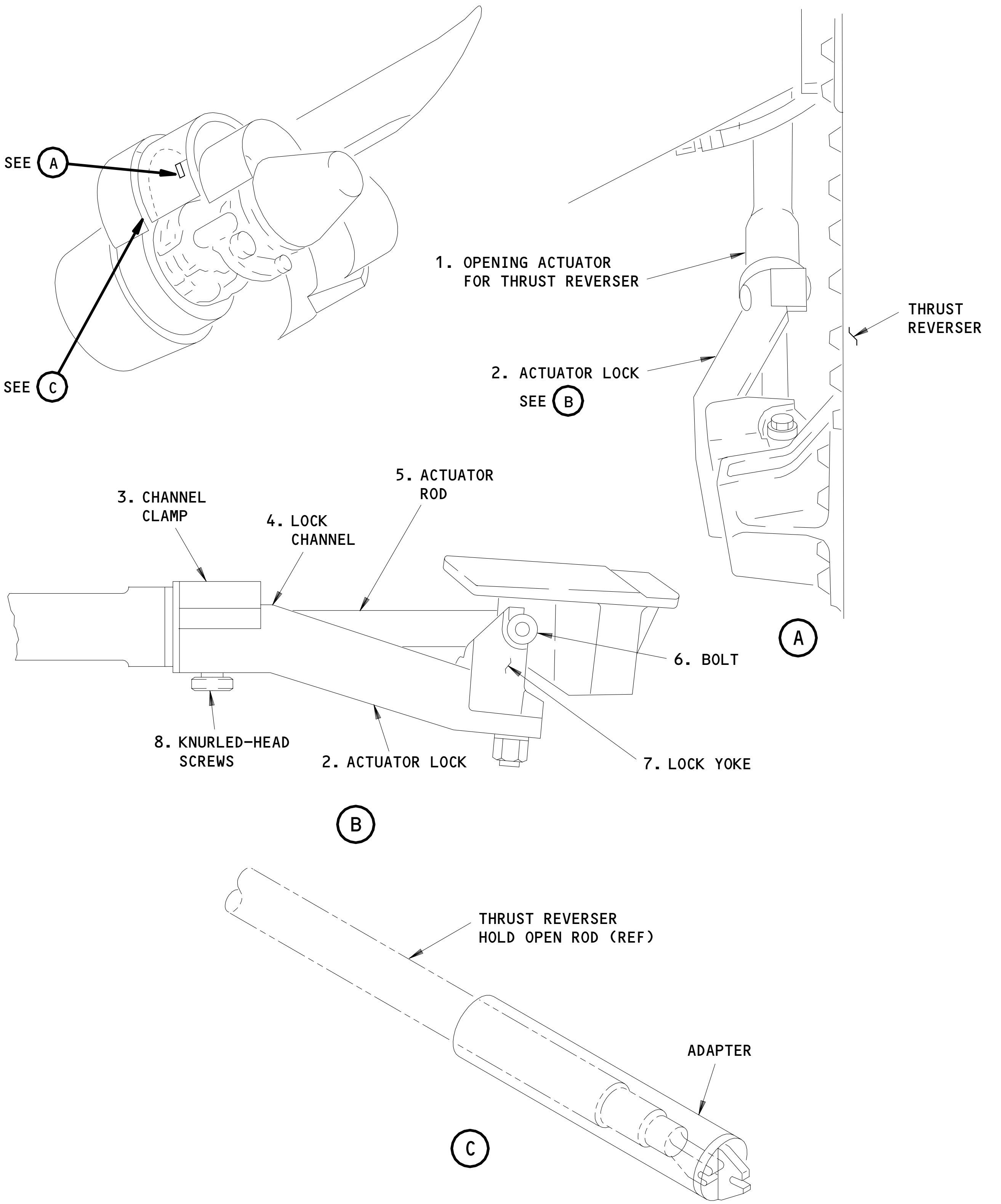
S 494-015-N00
(4) Install the hold-open equipment (A78001) for the thrust reverser (Fig. 404) as follows:
(a) Put the actuator lock (2) along the actuator rod (5).
(b) Make sure the lock yoke (7) is against the bolt (6) that attaches the actuator rod (5).
(c) Make sure the lock channel (4) is against the actuator cylinder.
(d) Put the channel clamp (3) around the actuator rod (5).
(e) Tighten the screw (8) to attach the channel clamp (3) to the actuator rod (5).
(f) Lightly close the actuator (1).

NOTE: When you lightly close the actuator, the load moves from the actuator to the actuator lock (2).

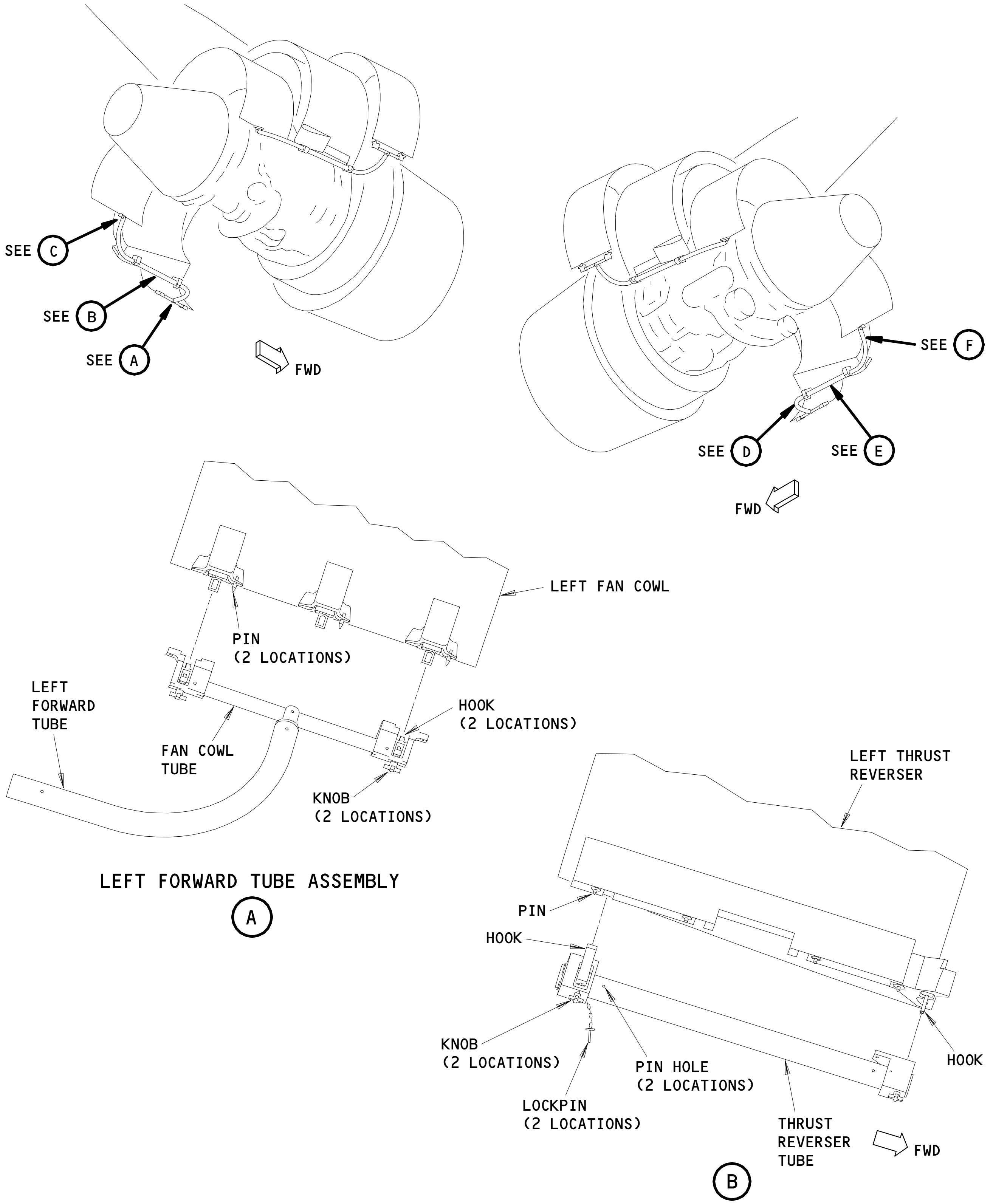
(g) Disengage the hold-open rod for the thrust reverser from the support.
(h) Install the hold-open rod and the support to its stowage points.

S 494-016-N00
(5) If you use the hold-equipment equipment (G71023) to hold the fan and the core cowl panel open (Fig. 405), do as follows:
(a) Install the thrust reverser tube and attached parts on the thrust reversers (View B or E).
1) Engage the hook on the thrust reverser tube to the loop on the thrust reverser.

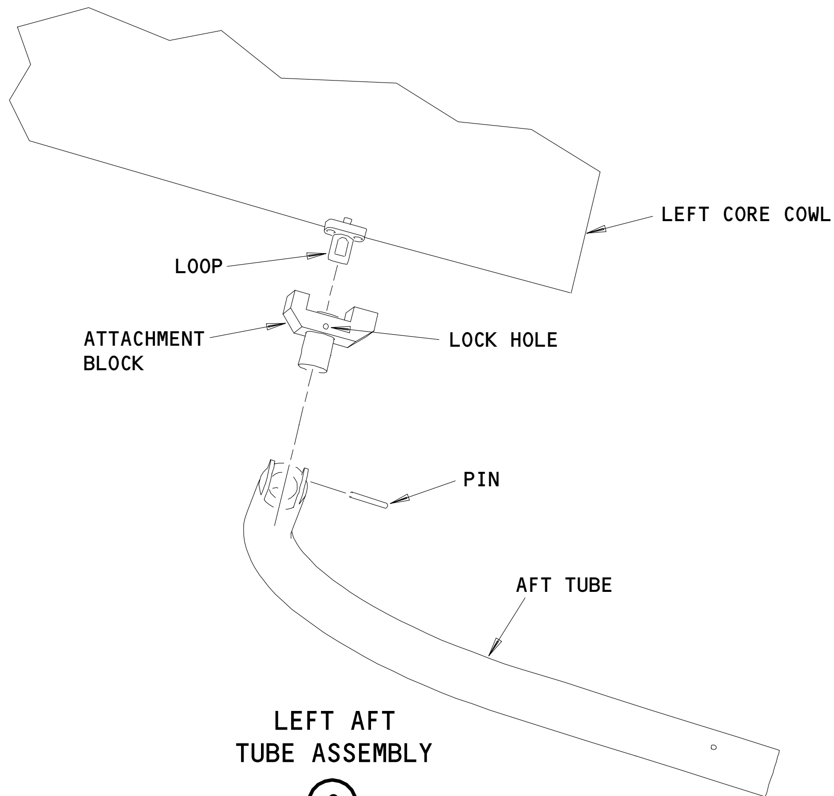
NOTE: Make sure the pin on the thrust reverser engages the hole on the thrust reverser tube. Or make sure the pin on the thrust reverser tube engages the hole on the thrust reverser.



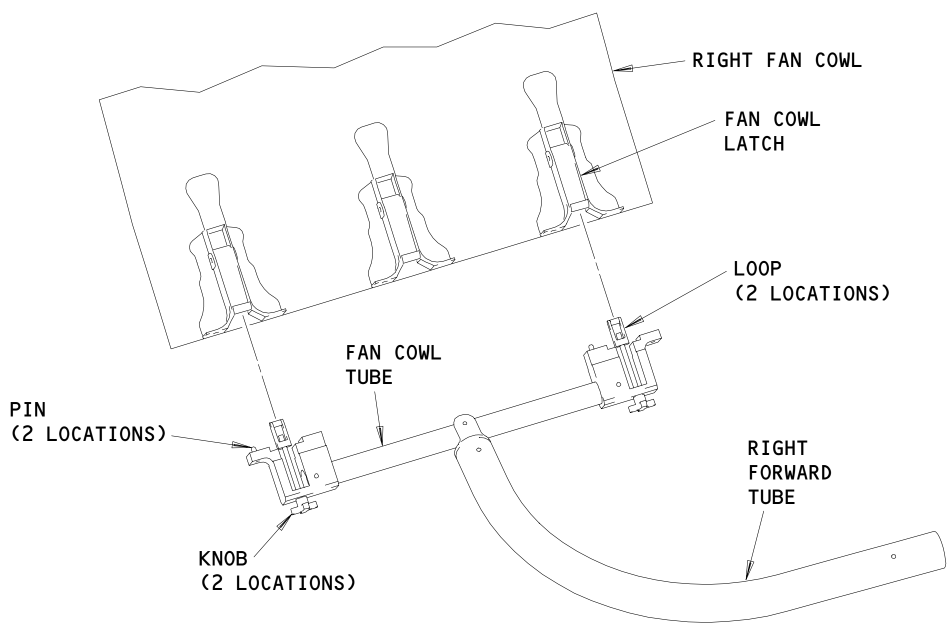
Thrust Reverser Hold-Open Equipment Installation
Figure 404



Fan and Core Cowl Hold-Open Equipment Installation
Figure 405 (Sheet 1)

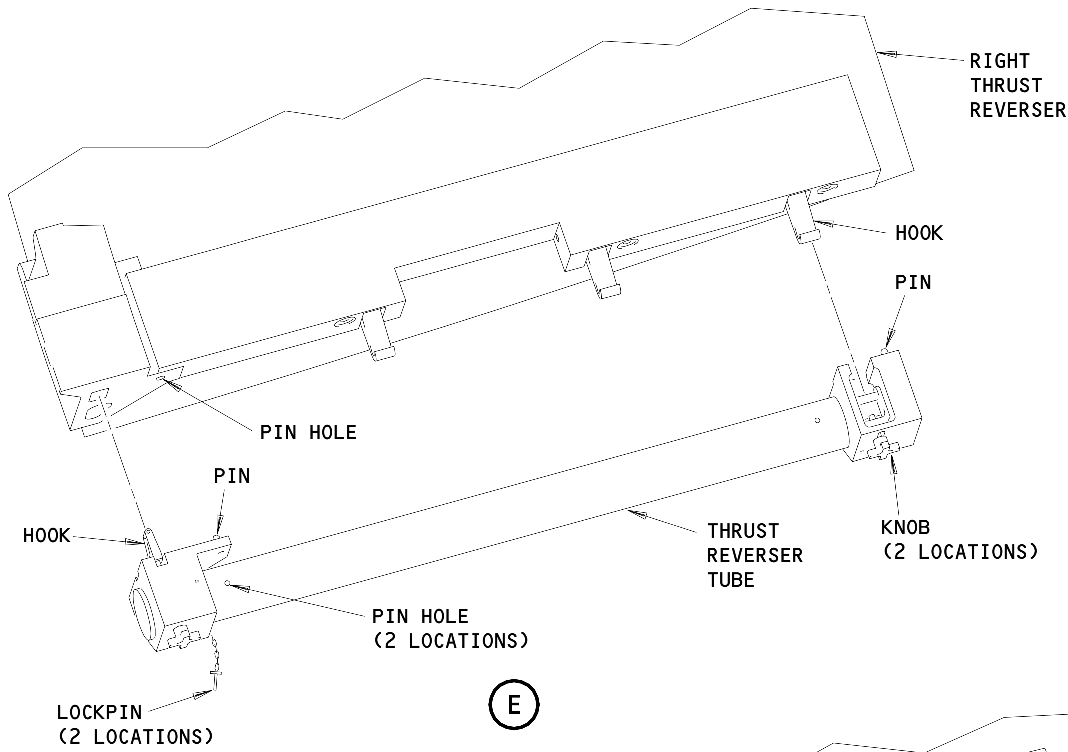


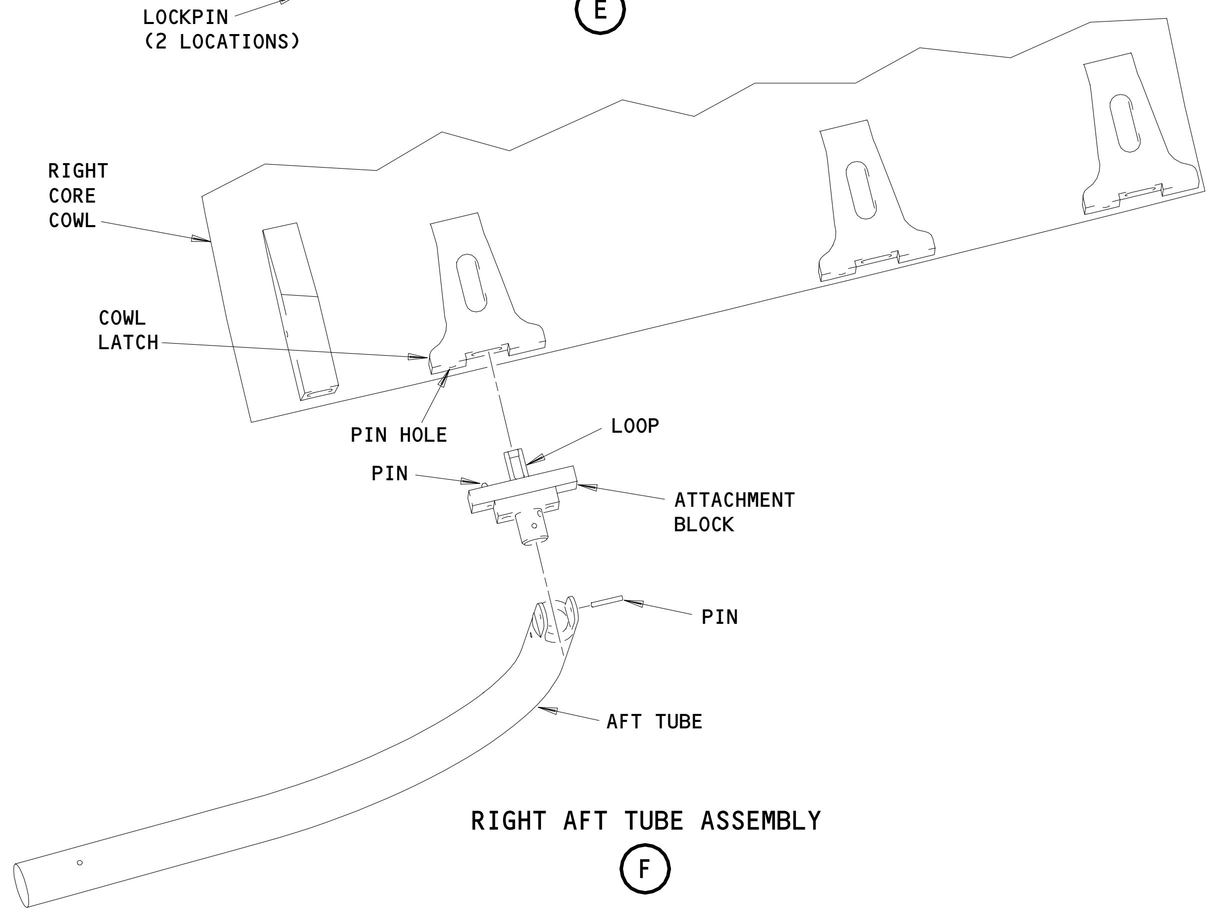
LEFT AFT TUBE ASSEMBLY
C



RIGHT FORWARD TUBE ASSEMBLY
D

Fan and Core Cowl Hold-Open Equipment Installation
Figure 405 (Sheet 2)





Fan and Core Cowl Hold-Open Equipment Installation
Figure 405 (Sheet 3)

2) Engage the loop on the thrust reverser tube to the hook on the thrust reverser.

NOTE: Make sure the pin on the thrust reverser engages the hole on the thrust reverser tube. Or make sure the pin on the thrust reverser tube engages the hole on the thrust reverser.

3) Tighten the knobs on the thrust reverser tube to attach the tube to the thrust reverser.

(b) Install the forward tube assembly on the fan cowl panel (View A or D).
  1) Turn the forward tube to engage the tube end to the thrust reverser tube.
  2) For the left fan cowl panel, do as follows:
    a) Engage the hook on the left fan cowl tube to the loops on the fan cowl panel.

    NOTE: Make sure the pins on the fan cowl panel engage the pinholes on the fan cowl tube.

    b) Tighten the knobs on the fan cowl tube to attach the tube to the fan cowl panel.
  3) For the right fan cowl panel, do as follows:
    a) Engage the hooks on the fan cowl panel to the loops on the right fan cowl panel.

    NOTE: Make sure the pins on the fan cowl tube engage the pinholes on the fan cowl panel.

    b) Close the fan cowl latch.
    c) Tighten the knobs on the fan cowl tube to attach the tube to the fan cowl panel.
  4) Put the lockpin into the pin hole on the thrust reverser tube.
  5) Install the hold-open rods on the fan cowl panel to the stow bracket on the panel.

(c) Install the aft tube assembly on the core cowl panel (View C and F).
  1) For the left core cowl, put the attachment block into the loop of the core cowl panel.

  NOTE: Make sure the pins on the attachment block engage the pin holes on the core cowl panel.

    a) Put a pin into the lockhole on the attachment block to attach the core cowl attachment to the core cowl panel.

2) For the right core cowl, install the attachment block on the cowl latch as follows:
   a) Put the loop of the attachment block into the core cowl latch.

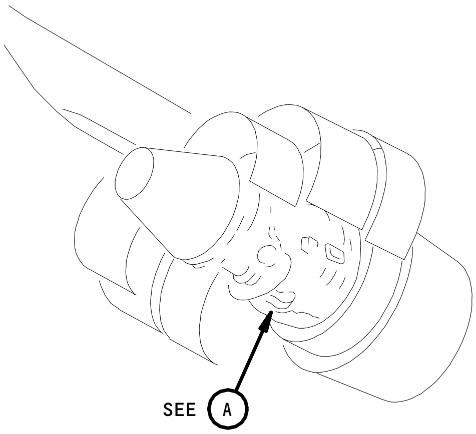
      NOTE: Make sure the pins on the attachment block engage the pin holes on the core cowl panel.

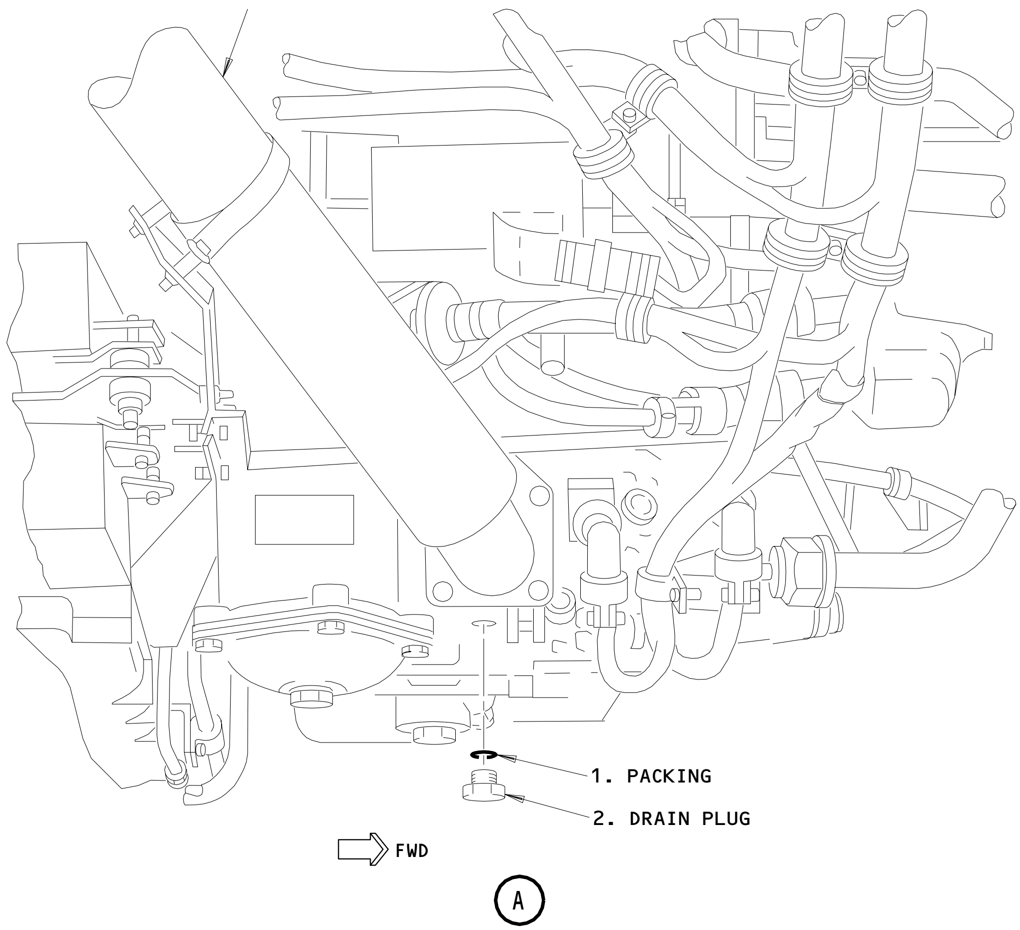
   b) Close the core cowl latch.
3) Put the aft tube into the thrust reverser tube.
4) Turn the aft tube to install the other end of the tube on the attachment block.
5) Put the lockpin into the pin hole on the thrust reverser tube.
6) Put the pin into the aft tube and the attachment block.
7) Install the hold-open rods on the core cowl panel to the stow bracket on the panel.

S 434-228-N00

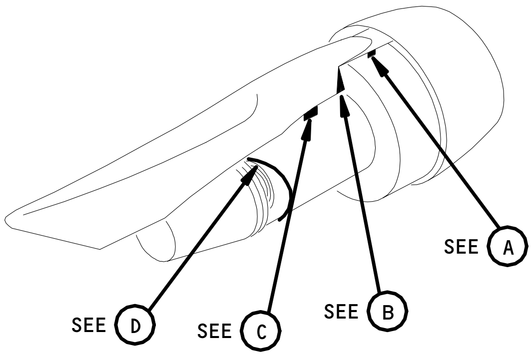
WARNING: KEEP THE ELECTRICAL POWER OFF WHILE YOU DISCONNECT THE FUEL, HYDRAULIC, AND ELECTRICAL LINES. IF YOU APPLY THE PRESSURIZED FLUIDS OR THE ELECTRICAL POWER ACCIDENTALLY, INJURY TO PERSONS AND DAMAGE TO THE ENGINE CAN OCCUR.

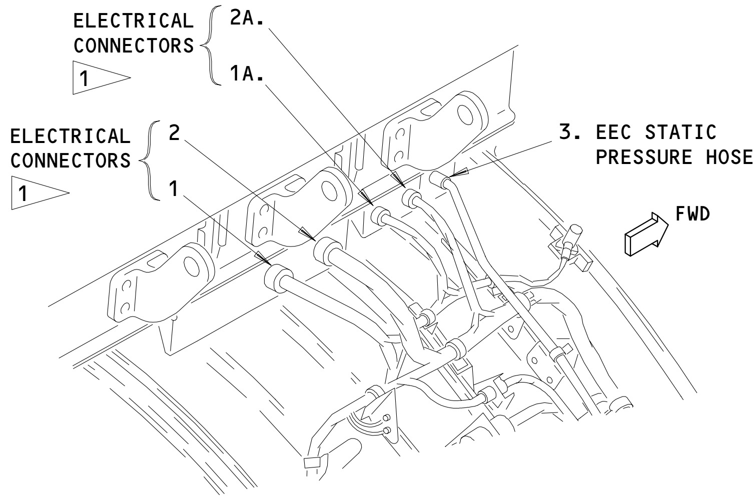
(6) Disconnect the primary supply line for the engine fuel as follows:
(a) Drain the fuel from the supply line (Fig. 406).
   1) Put a container below the drain plug (2).
   2) Remove the drain plug (2).
      a) Drain the fuel.
      b) Discard the packing (1).
   3) Install a new packing (1) and the drain plug (2) in the fuel pump.
   4) Tighten the drain plug (2) to 45-55 pound-inches (5.1-6.2 newton-meters).
      a) Install a lockwire on the drain plug (2).
(b) Remove the top lockwires from the spray shield to get access to the raceway connection of the fuel supply line.
(c) Pull the coupling to the rear and turn counterclockwise to disconnect the fuel supply line (2, Fig. 407) from the raceway connector.





Fuel System Drain
Figure 406





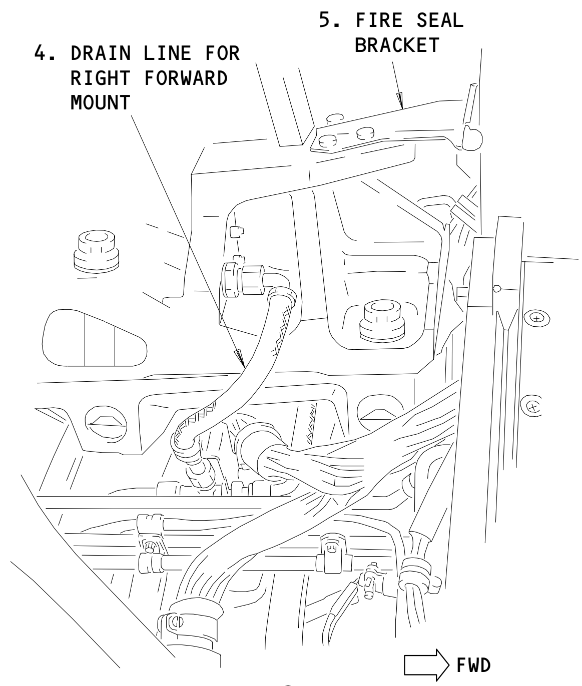
ENGINES WITH SCU

A

1

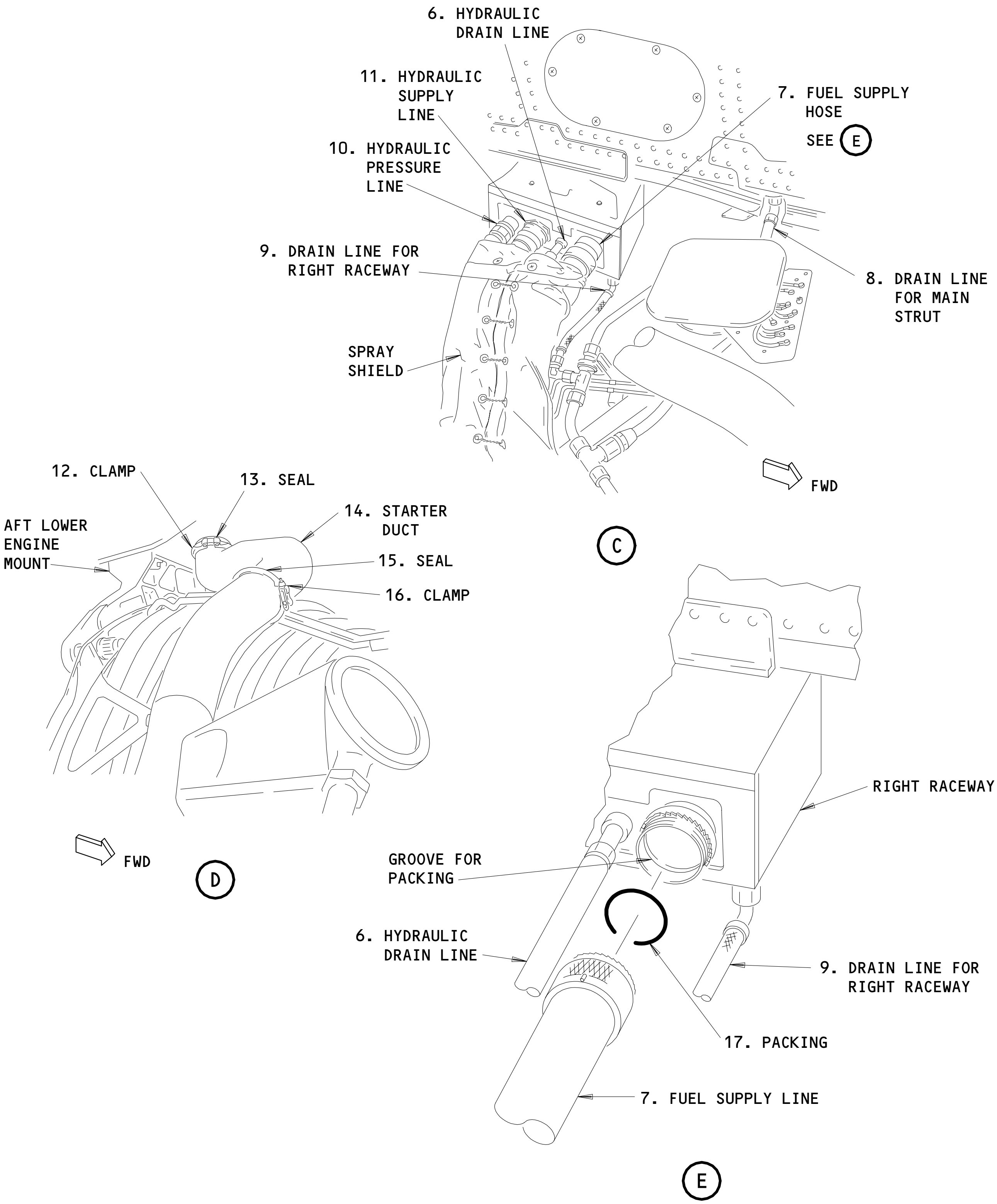
ELECTRICAL CONNECTORS IDENTIFICATION

INDEX NO.	CONNECTOR PLUG	MATING RECEPTACLES STRUT LEFT	 RIGHT
1	D8320P	D8320J	D8334J
2	D4224P	D4224J	D4246J
1A	D8360P	DUMMY RECEPTACLES	
2A	D8350P		



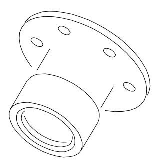
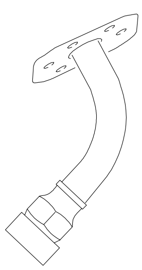
B

Power Plant Disconnect Locations (Right Side)
Figure 407 (Sheet 1)



Power Plant Disconnect Locations (Right Side)
Figure 407 (Sheet 2)

767 PW4000 ENGINE/STRUT DRAIN INSTALLATION INTERCHANGEABILITY

STRUT/ENGINE COMBINATION	PROP NO. VP832 AND PRIOR	PROP NO. RQ538 AND AFTER [1]
PRIOR TO L/N 802 OR STRUT DRAIN FITTING 311T4631-1 (INCLUDES UNION MS21902J8 AND O-RING M83248-2-908) 	HOSE P/N: AS138-08N0095L	HOSE P/N: AS138-08N0095L
L/N 802 AND AFTER OR STRUT DRAIN FITTING 311T4631-2 	HOSE P/N: AS138-08N0086	HOSE P/N: AS136-08N0077

[1] CORRESPONDS TO ENGINE SERIAL NUMBERS P727991-P727992, P727997-P727998, P727999-P728000, P729001-P729002, P729014-P729015, P729021-P729022, P729023-P719024, P729033-P719034, P729039-P729040, P729045-P729046.

Power Plant Disconnect Locations (Right Side)
Figure 407 (Sheet 3)

1) Discard the packing (17, Fig. 407) from the inner diameter groove of the raceway connector.

CAUTION: INSTALL THE CAPS ON THE FUEL SUPPLY LINE AND RACEWAY CONNECTOR. IF YOU DO NOT INSTALL THE CAPS, THE CONTAMINATION CAN GO INTO THE FUEL.

(d) Install the caps on the fuel supply line (7, Fig. 407) and the raceway connector.

S 034-018-N00

(7) Remove the thermal anti-ice (TAI) duct of the inlet cowl (Fig. 408) as follows:
(a) Remove the bolt (22).
(b) Remove the clamps (17, 20) and seals (16, 21).
(c) Remove the TAI duct (24).

CAUTION: INSTALL THE CAPS ON THE PNEUMATIC DUCTS. IF YOU DO NOT INSTALL THE CAPS, THE CONTAMINATION CAN GO INTO THE DUCTS.

(d) Install the caps on the two ends of the openings of the TAI duct.

S 864-019-N00

WARNING: KEEP THE ELECTRICAL POWER OFF WHILE YOU DISCONNECT THE FUEL, HYDRAULIC, AND ELECTRICAL LINES. IF YOU ACCIDENTALLY APPLY THE PRESSURIZED FLUIDS OR THE ELECTRICAL POWER, INJURY TO PERSONS AND DAMAGE TO THE ENGINE CAN OCCUR.

(8) Remove electrical power (AMM 24-22-00/201).

S 034-020-N00

CAUTION: BE CAREFUL WITH THE HYDRAULIC SUPPLY LINE. DO NOT MAKE THE HYDRAULIC SUPPLY LINE INTO A TIGHTLY COIL. IF THE HOSE CLOSES AND HAS KINKS, IT WILL DECREASE THE FLUID SUPPLY. IF THE FLUID SUPPLY DECREASES, FAILURE IN THE ENGINE DRIVEN PUMP CAN OCCUR.

CAUTION: INSTALL THE CAPS ON THE HYDRAULIC LINES AND FITTINGS. IF YOU DO NOT INSTALL THE CAPS, THE CONTAMINATION OF THE HYDRAULIC LINES AND THE LEAKAGE OF THE HYDRAULIC FLUID CAN OCCUR.

CAUTION: CLEAN THE HYDRAULIC FLUID LEAKAGE. IF THE LEAKAGE COLLECTS, THE HYDRAULIC FLUID CAN CAUSE CORROSION TO THE PART.

(9) Disconnect the hydraulic lines (Fig. 407) as follows:
(a) Put a container below the hydraulic supply line (11).
(b) Disconnect the hydraulic supply line (11).
1) Drain the fluid into the container.

2) Install the caps on the hydraulic supply line (11) and the connector.

(c) Disconnect the hydraulic pressure line (10).

1) Install the caps on the hydraulic pressure line (10) and connector.

(d) Disconnect the hydraulic drain line (6).

1) Install the caps on the hydraulic drain line (6) and connector.

S 034-022-N00

CAUTION: INSTALL THE CAPS ON THE ELECTRICAL PLUGS AND RECEPTACLES. IF YOU DO NOT, THE ELECTRICAL PLUGS AND RECEPTACLES CAN GET CONTAMINATION FROM THE DIRT AND MOISTURE, OR DAMAGE FROM THE HANDLE.

(10) Disconnect the electrical connector (1, 2, 1A and 2A, Fig. 407) (6 thru 12, and 25, Fig. 408).

(a) Install the caps on the plugs and receptacles.

S 034-031-N00

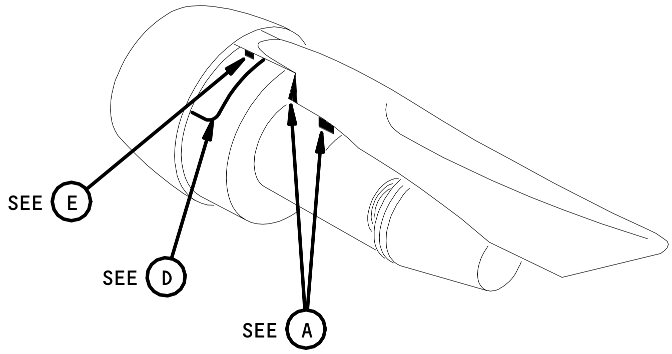
(11) Disconnect the power feeder cable of the IDG from the engine as follows (Fig. 409):

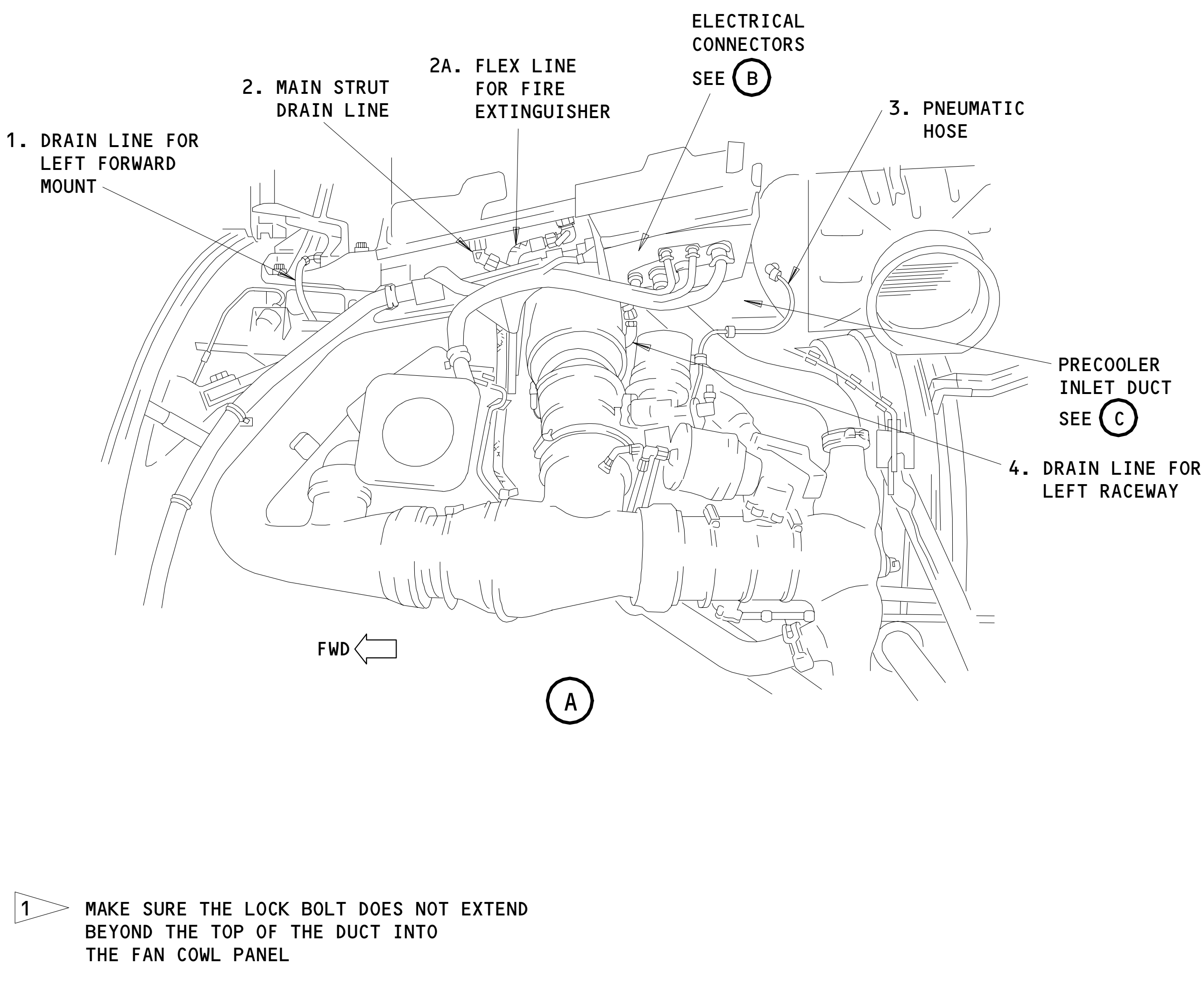
CAUTION: DO NOT REMOVE THE CLAMPS ON THE POWER FEEDER CABLE FROM THE ENGINE. THE CLAMPS ARE A QUICK-RELEASE TYPE CLAMP THAT YOU CAN OPEN TO REMOVE THE POWER FEEDER CABLE FROM THE ENGINE. IF YOU REMOVE THE CLAMPS FROM THE ENGINE, YOU CAN INCORRECTLY INSTALL THE CLAMPS. INCORRECT INSTALLATION OF THE CLAMPS CAN CAUSE DAMAGE TO THE CABLE.

(a) Open the clamps (1) to remove the power feeder cable from the engine.

(b) Remove the screws (6).

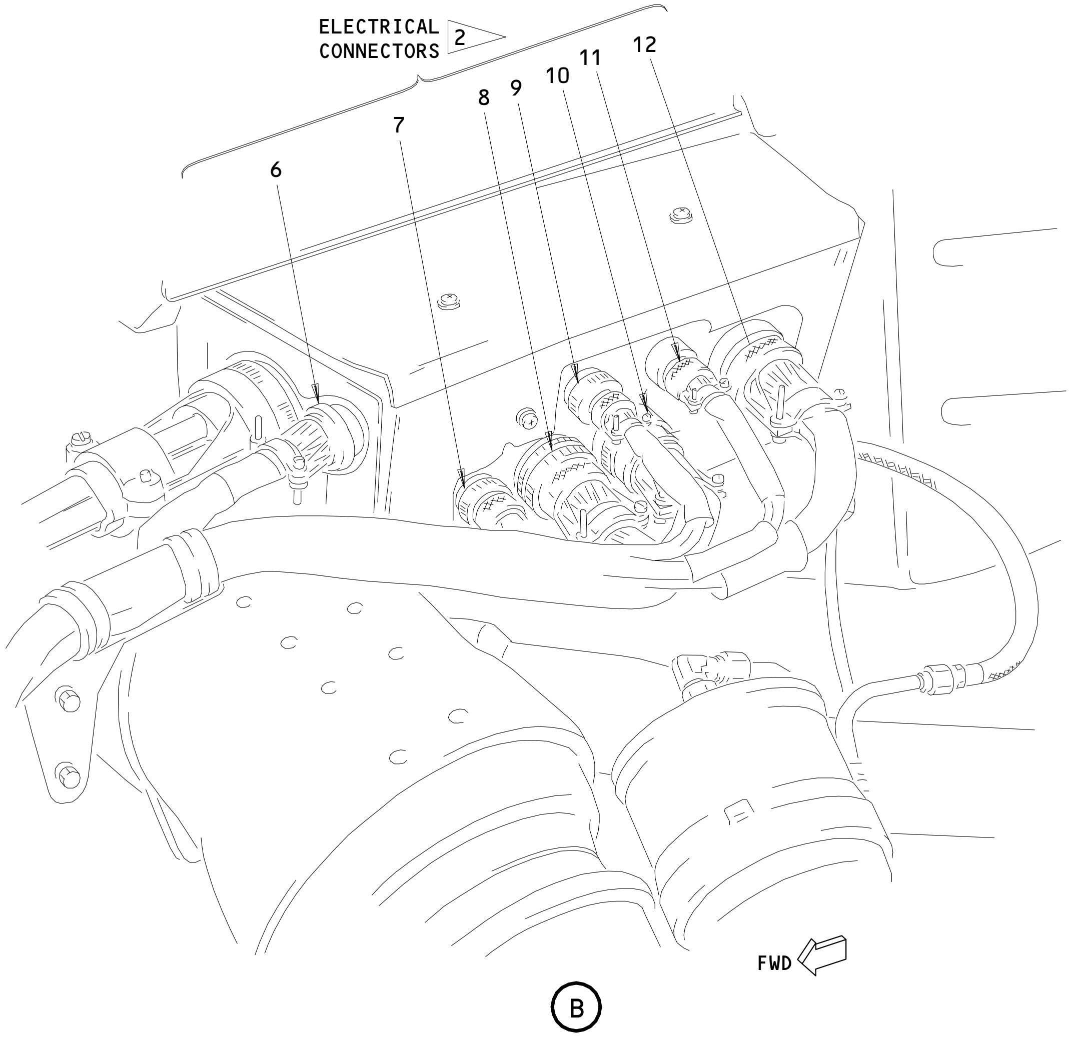
(c) Remove the terminal block cover (5).





1 MAKE SURE THE LOCK BOLT DOES NOT EXTEND BEYOND THE TOP OF THE DUCT INTO THE FAN COWL PANEL

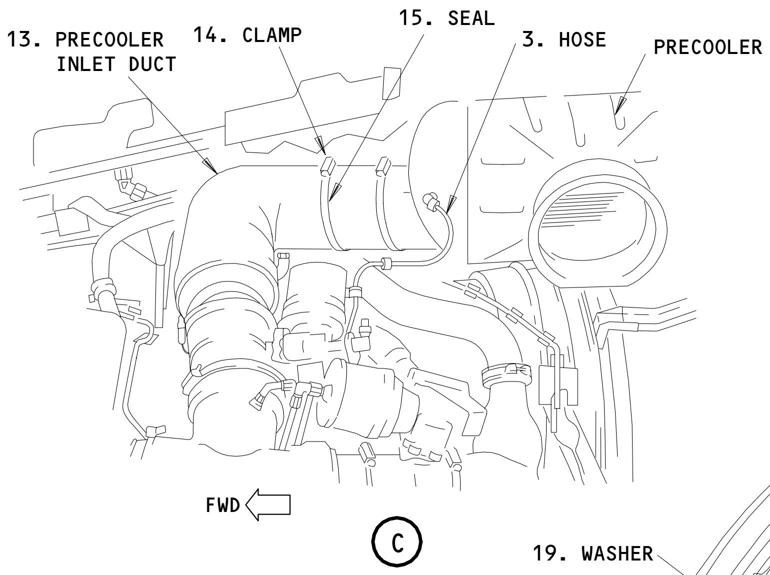
Power Plant Disconnect Locations (Left Side)
Figure 408 (Sheet 1)

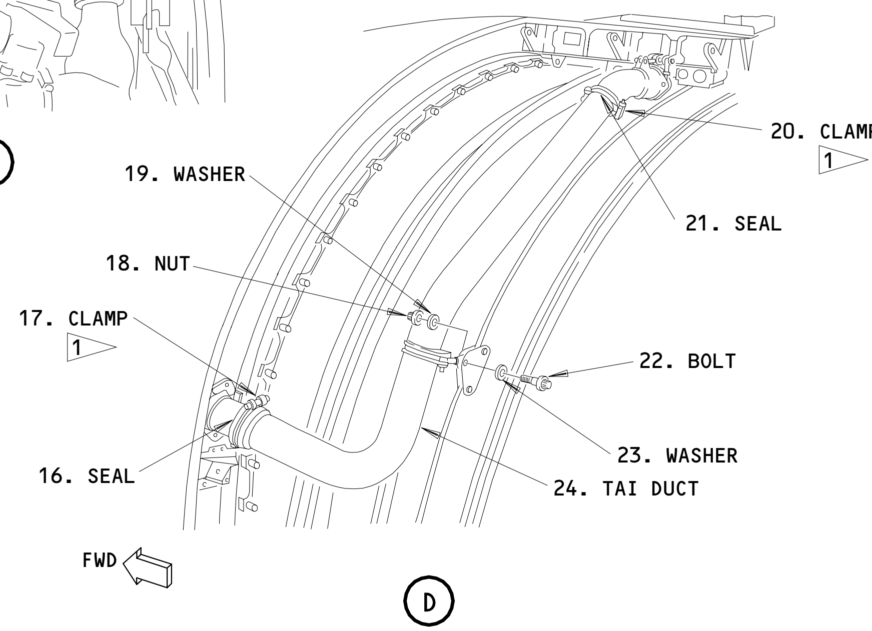


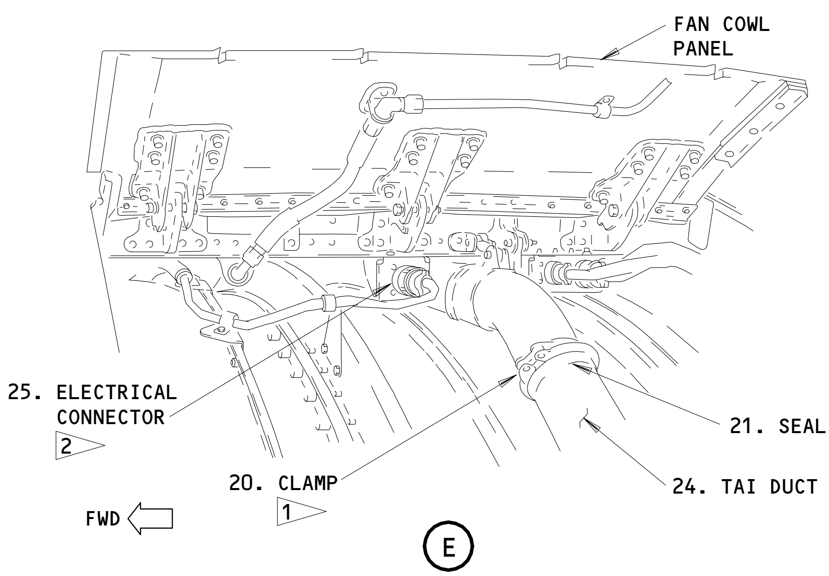
2

ELECTRICAL CONNECTORS IDENTIFICATION			
INDEX NO.	CONNECTOR PLUG	MATING RECEPTACLES STRUT LEFT	MATING RECEPTACLES STRUT RIGHT
6	D4230P	D4230J	D4220J
7	D4154P	D4154J	D4148J
8	D4208P	D4208J	D4258J
9	D4228P	D4228J	D4256J
10	D4216P	D4216J	D4266J
11	D4200P	D4200J	D4236J
12	D4232P	D4232J	D4240J
25	D8336P	D6420J	D6442J

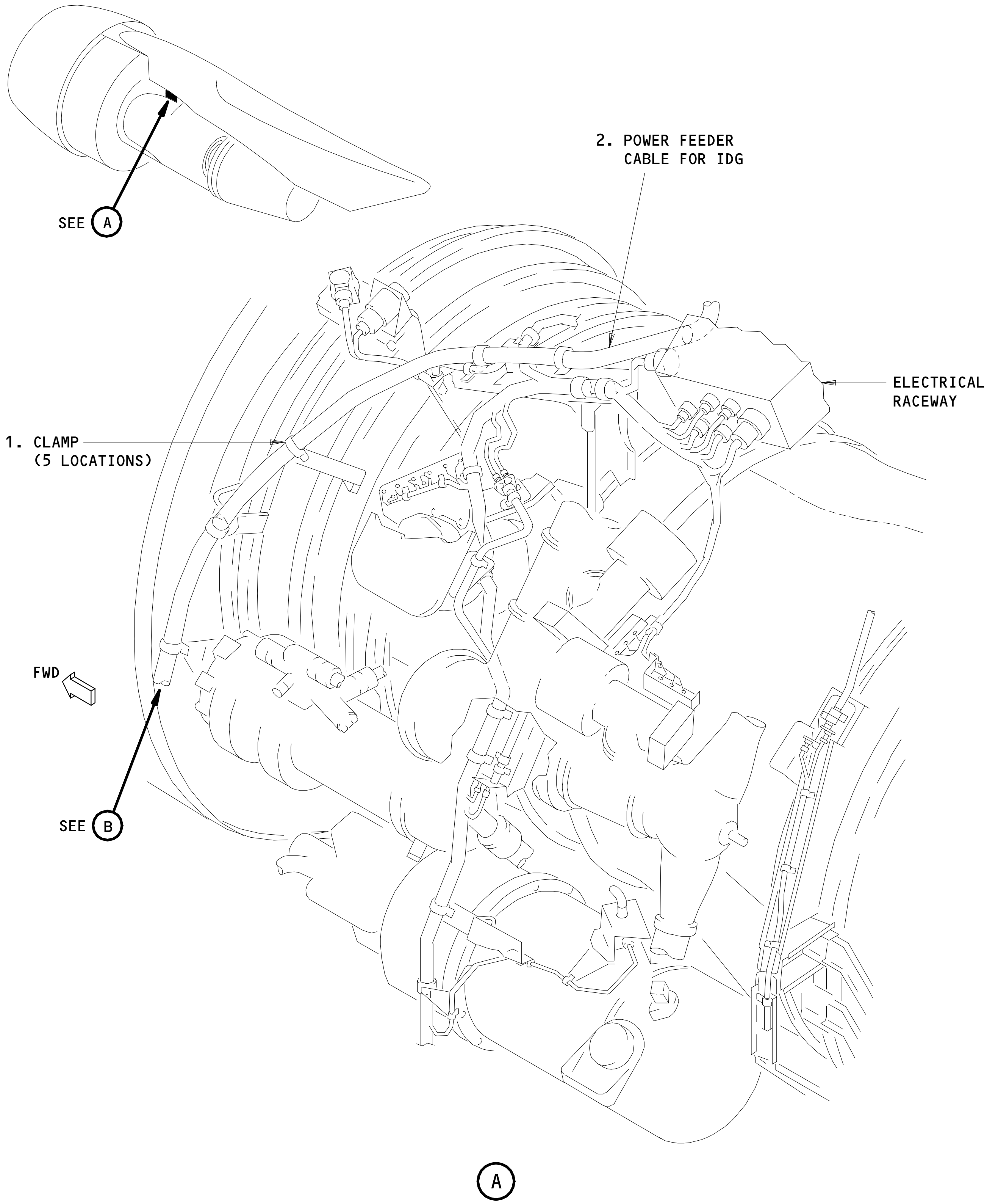
Power Plant Disconnect Locations (Left Side)
Figure 408 (Sheet 2)



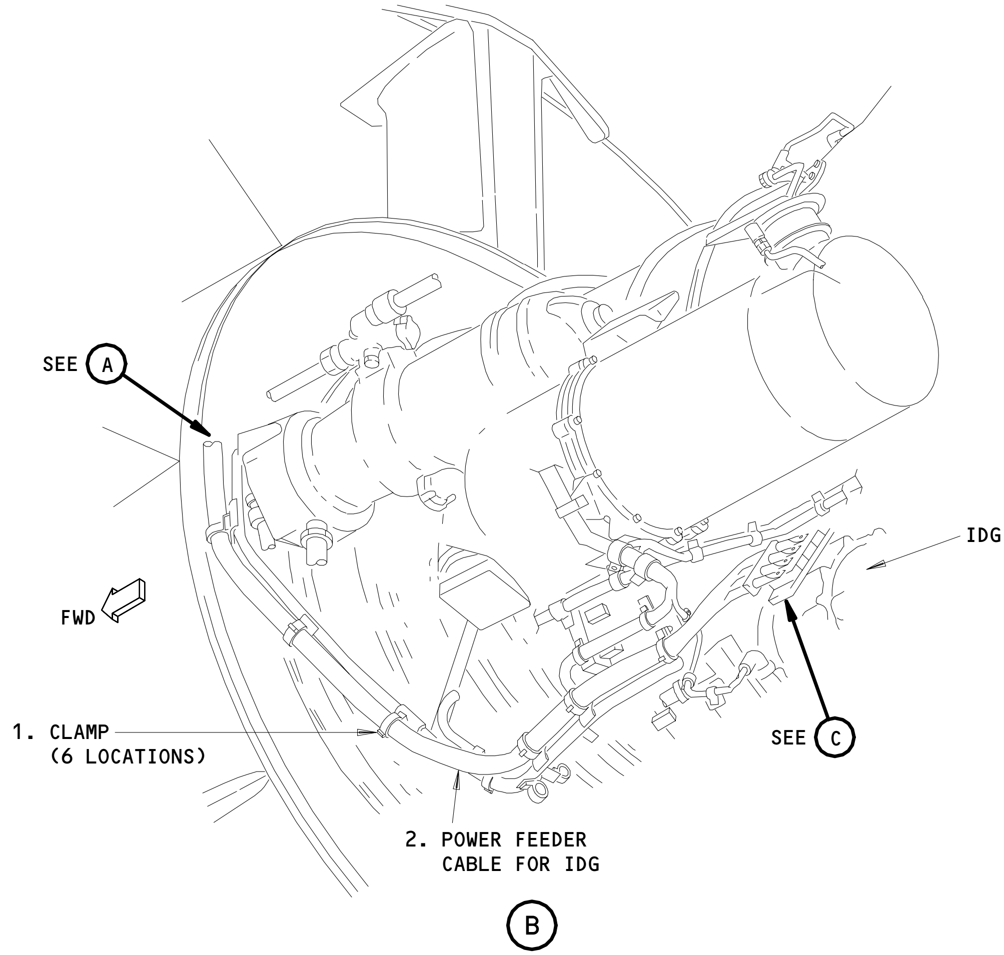


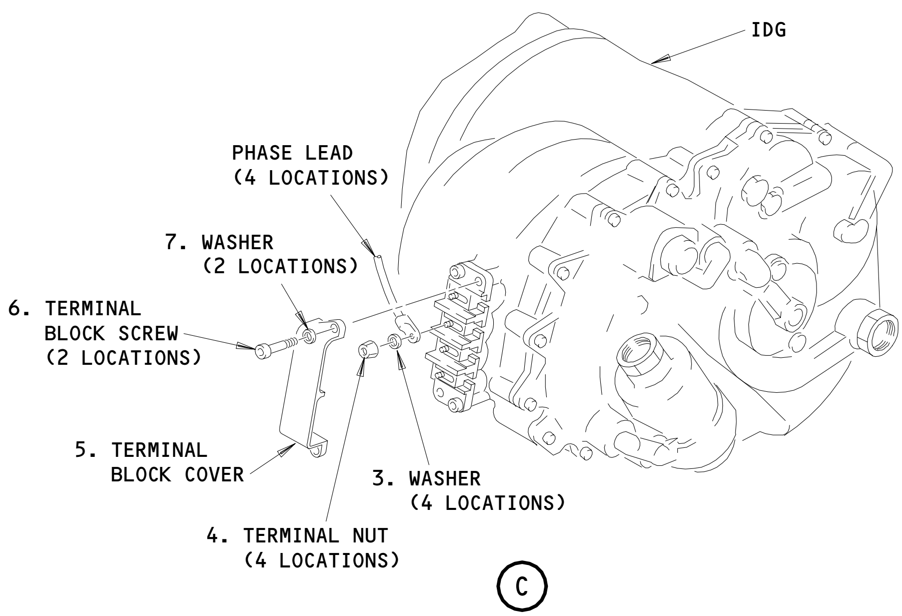


Power Plant Disconnect Locations (Left Side)
Figure 408 (Sheet 3)



Power Feeder Wire Bundle Installation
Figure 409 (Sheet 1)





Power Feeder Wire Bundle Installation
Figure 409 (Sheet 2)

S 034-032-N00

(12) Remove the nuts (4) and the phase leads of the power feeder cable from the IDG.
  (a) Install the support hook on the thrust reverser.
  (b) Install the wire bundle for the power feeder on the support hook (Fig. 410).

S 034-033-N00

(13) Disconnect the pneumatic hose (3, Fig. 408) from the precooler.
  (a) Install the caps on the pneumatic hose (3) and the connector.

S 034-034-N00

(14) Disconnect the static pressure hose (3, Fig. 407) for the EEC.
  (a) Install the caps on the static pressure hose (3) and the connector.

S 034-035-N00

CAUTION: INSTALL THE CAPS ON THE LINES AND CONNECTORS. IF YOU DO NOT INSTALL THE CAPS, CONTAMINATION CAN GO IN THE LINES AND CONNECTORS. THIS CAN CAUSE DAMAGE TO THE LINES AND CONNECTORS.

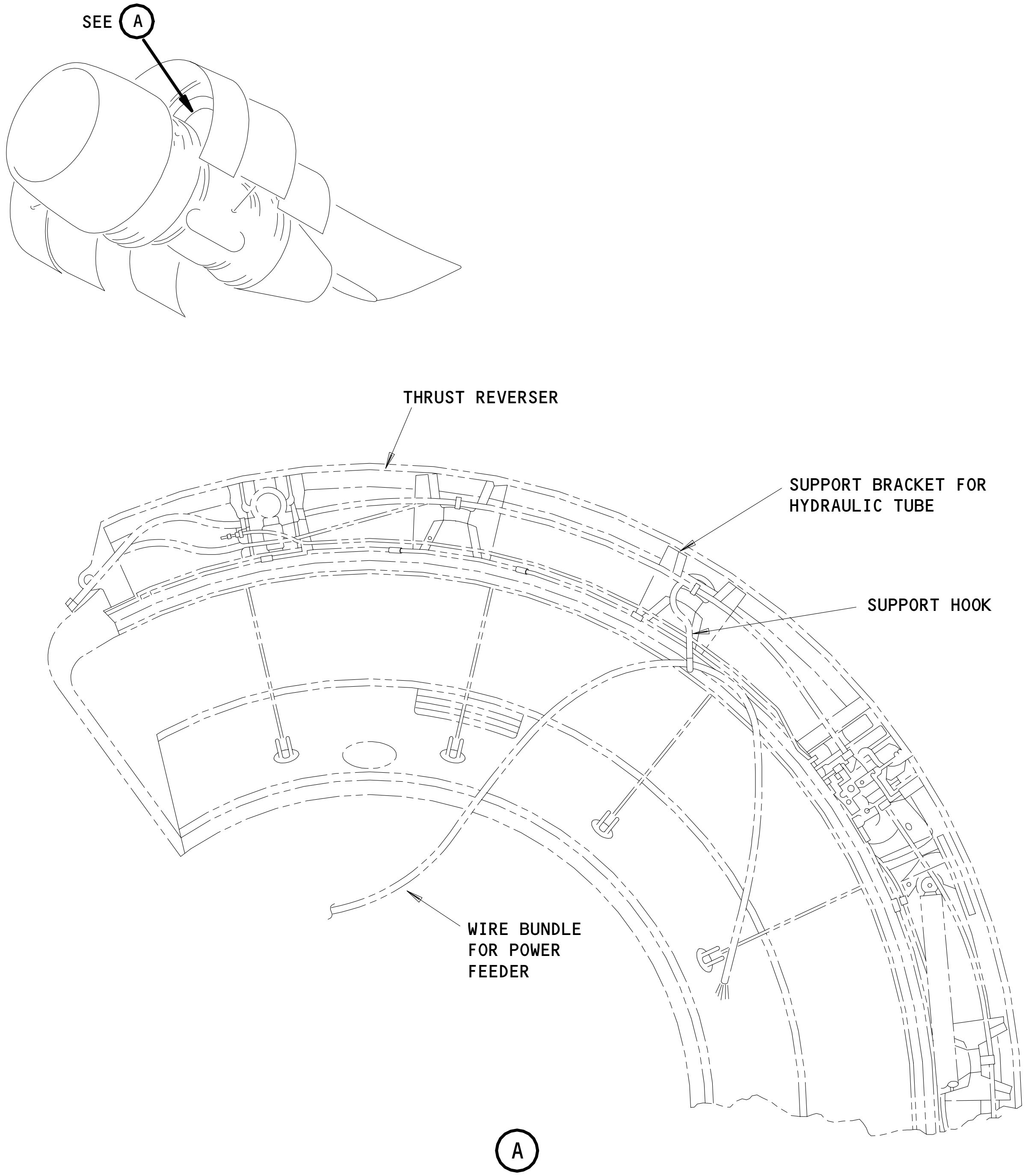
(15) Disconnect the strut drain lines.
  (a) Disconnect the drain line (4, Fig. 407) for the right forward mount.
  (b) Disconnect the drain line (1, Fig. 408) of the left forward mount.
  (c) Disconnect the drain line (8, Fig. 407) for the main strut.
  (d) Disconnect the drain line (9, Fig. 407) for the right raceway.
  (e) Disconnect the drain line (4, Fig. 408) for the left raceway.

S 034-036-N00

(16) Disconnect the flexible line (2A, Fig. 408) for the fire extinguisher.
  (a) Install the caps on the flexible line (2A) and receptacle.

S 034-037-N00

(17) Remove the top section of the starter duct (Fig. 407) as follows:
  (a) Remove the clamps (12, 16) and seals (13, 15).



Power Feeder Wire Bundle Support Hook Installation
Figure 410

(b) Remove the starter duct (14).

S 034-038-N00

(18) Remove the precooler inlet duct (Fig. 408) as follows:
  (a) Remove the clamp (14) and seal (15).
  (b) Remove the precooler inlet duct (13) from the engine.
  (c) Install the caps on the openings of the duct and connection.

TASK 71-00-02-004-039-N00

3. Remove the Power Plant With the Bootstrap Equipment

NOTE: The bootstrap procedure is the recommended procedure, but you can do the optional procedure which uses the PT90-E Universal Engine Change System.

A. Equipment
  (1) A71001-185 Bootstrap Equipment
  (2) A71003-25 Torque Equipment (all rigid engine mounts)
  (3) A71003-41 Torque Equipment (used only on the aft engine mounts with the vibration isolators)
  (4) A71006-79 Cradle
  (5) 140059-5 Stand - Shipping, engine, air/truck transportation, Stanley Aviation (Recommended). 110059-501 Transportation Stand, Stanley Aviation (Alternative)

  (6) Protection pads - commercially available

B. References
  (1) AMM 71-11-04/201, Fan Cowl Panels
  (2) AMM 71-11-06/201, Core Cowl Panels
  (3) AMM 78-31-00/201, Thrust Reverser System

C. Access
  (1) Location Zone

411	Left Engine
421	Right Engine

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

D. Procedure

S 494-040-N00

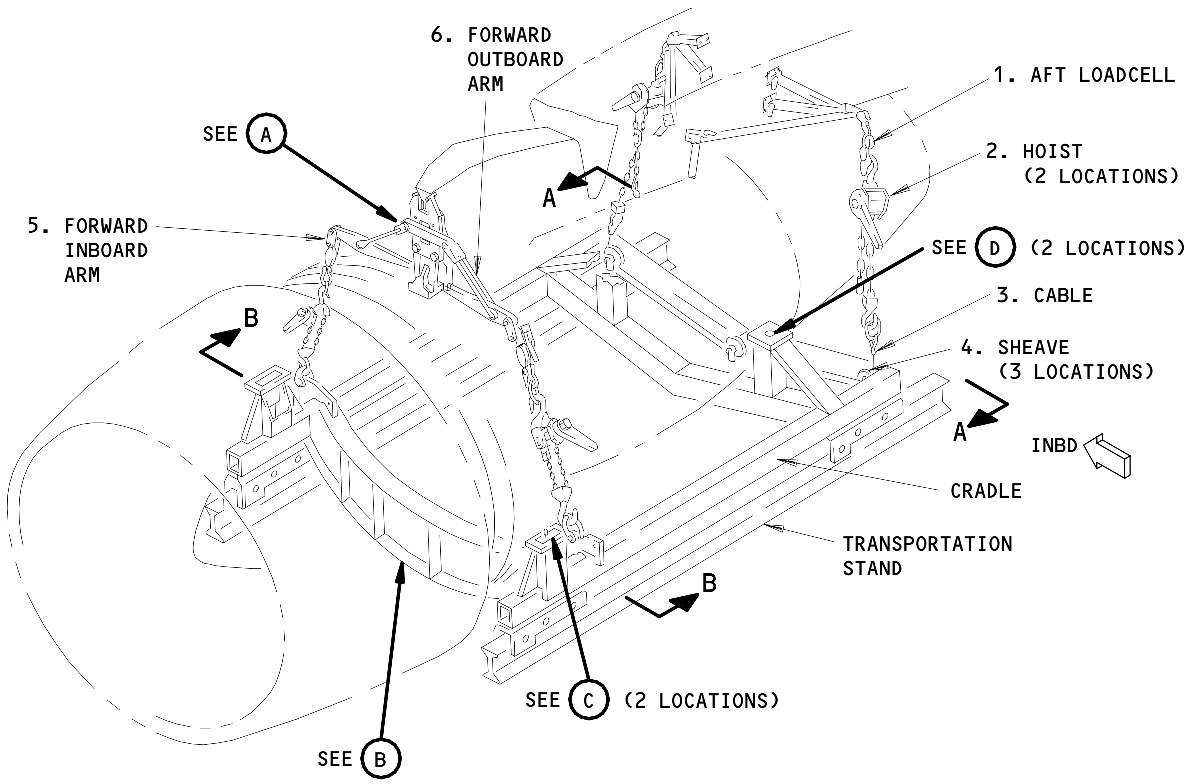
(1) If you did not do this, install the aft bootstrap components (Fig. 401) as follows:
   (a) Put the protection pads on the turbine exhaust sleeve (one on each side).
   (b) Remove the bolts (1, 2, 3, 4, 5, 6) from the two sides of the strut.
   (c) Install the top and lower aft brackets (12, 13) on the two sides of the strut.
   (d) Install the forward bracket (14) on the two sides of the strut.
   (e) Install the aft inboard arm (11) on the top and lower aft brackets (12, 13).

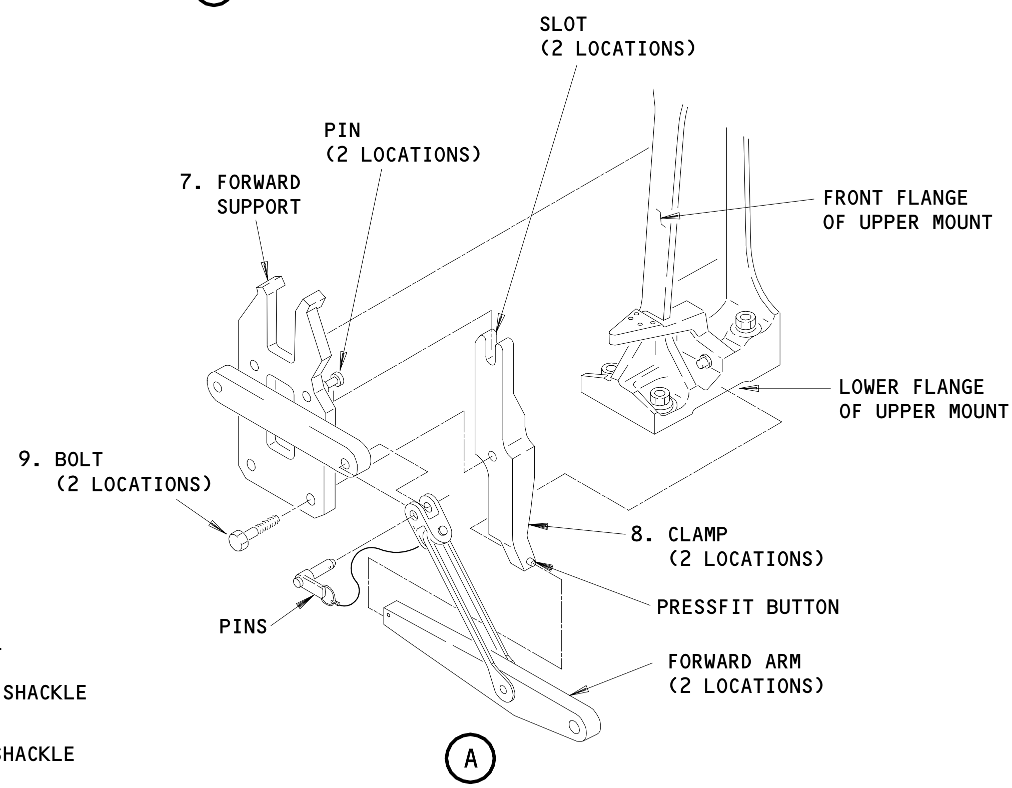
<u>WARNING</u>: INSTALL THE LONGER OUTBOARD ARM ON THE OUTBOARD BRACKETS ONLY. INCORRECT INSTALLATION OF THE BOOTSTRAP ARMS CAN CAUSE INJURY TO PERSONS AND FAILURE OF THE BOOTSTRAP.

   (f) Install the aft outboard arm (11) on the top and lower aft brackets (12, 13).
   (g) Install the inboard forward brace (15) on the forward bracket (14) and the aft inboard arm (11).
   (h) Install the outboard brace (15) on the forward bracket (14) and the aft outboard arm (11).

S 494-041-N00

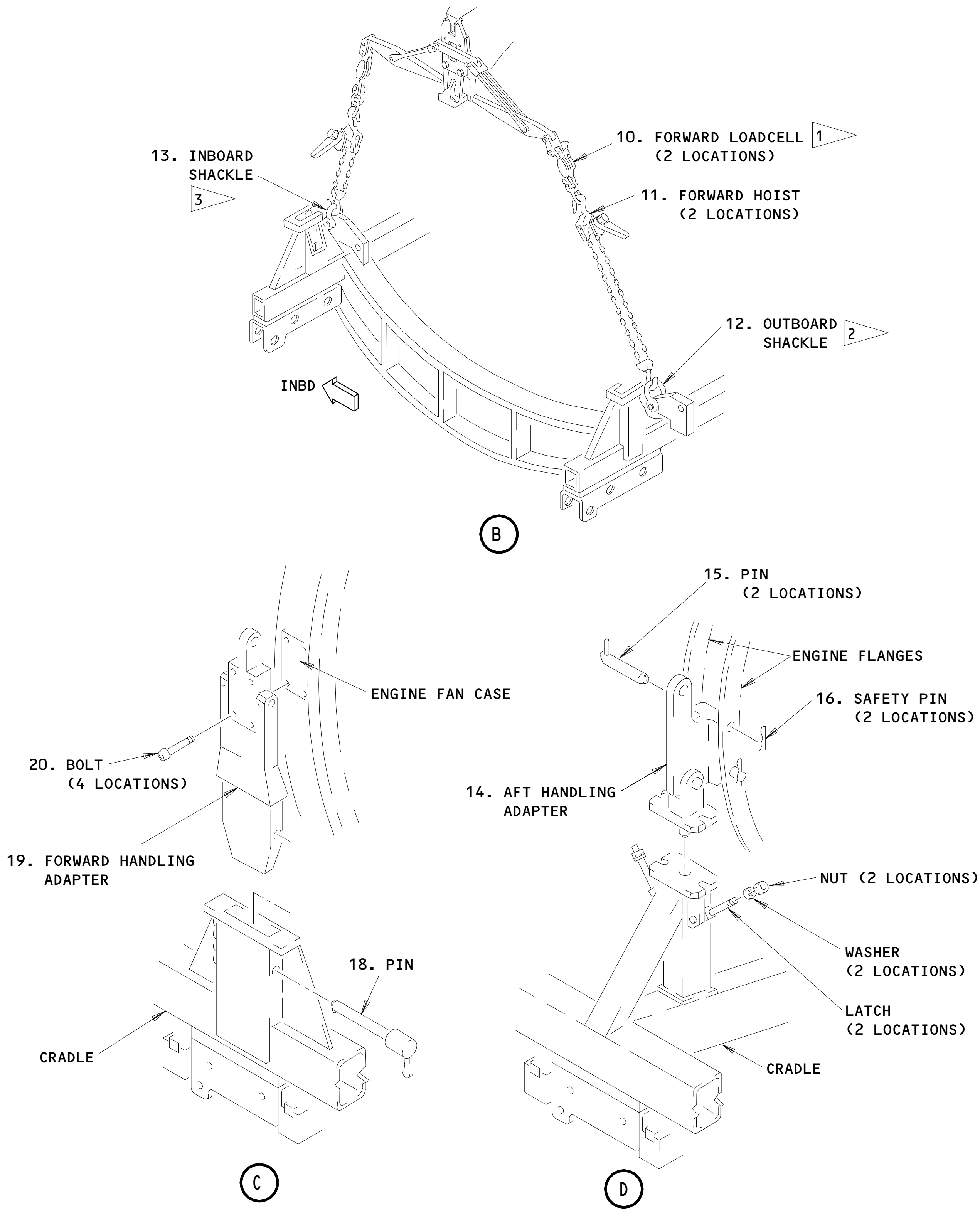
(2) Install the forward bootstrap components (Fig. 411) as follows:
   (a) Remove the bolts (9) from the clamps (8).
   (b) Put the forward support (7) against the forward side of the front flange of the top mount.
   (c) Engage the clamp (8) slots with the pins on the aft side of the forward support (7).
   (d) Move the clamps (8) down to touch the lower flange of the top mount.



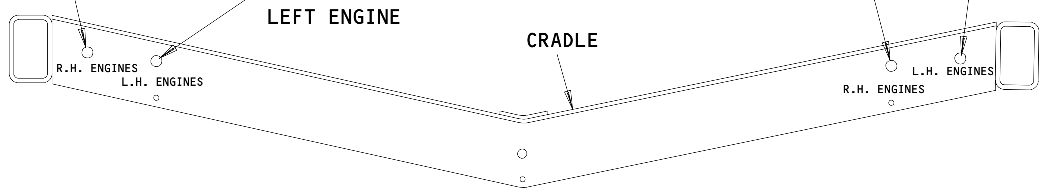


1 GAUGE FACING AFT
2 ATTACH OUTBOARD SHACKLE TO INSIDE HOLE
3 ATTACH INBOARD SHACKLE TO OUTSIDE HOLE

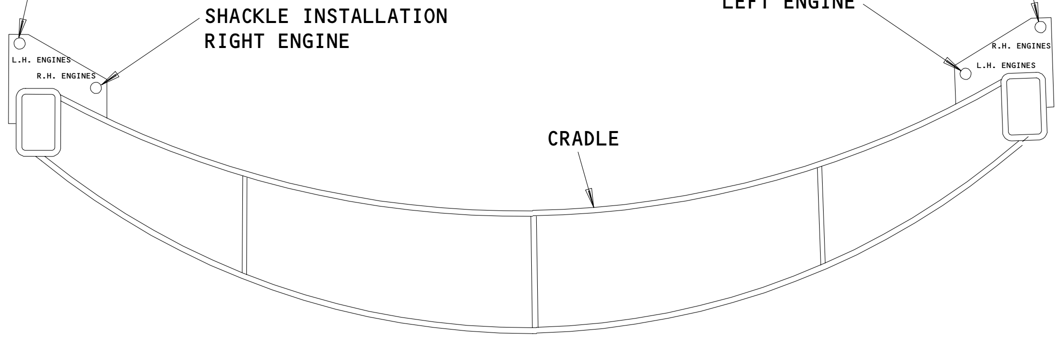
Bootstrap Equipment and Cradle Installation
Figure 411 (Sheet 1)



Bootstrap to Cradle Installation
Figure 411 (Sheet 2)



(VIEW IN THE FORWARD DIRECTION)
A-A



(VIEW IN THE AFT DIRECTION)
B-B

Bootstrap Equipment and Cradle Installation
Figure 411 (Sheet 3)

(e) Put the bolts (9) through the forward support holes and loosely turn the bolts into the clamps.
(f) Make sure the bottoms of the clamps (8) touch the top of the lower flange on the top mount.
(g) Tighten the bolts (9).
(h) Install the forward outboard and inboard arms (6, 5) to the forward support and the clamp assembly (7, 8).
1) Allign the ends of the forward outboard and inboard arms (6, 5) with the pressfit buttons on the clamps (8).
(i) Attach the forward load cell (10) to the forward inboard arm (5).

NOTE: Point the load cell in the aft direction.

(j) Attach the forward load cell (10) to the forward outboard arm (6).

NOTE: Point the load cell in the aft direction.

(k) Attach the forward hoists (11) to the forward load cells (10).

NOTE: Put the handle on the forward hoist in the direction of the forward load cells.

S 494-042-N00
(3) Install the handling adapters (Fig. 411).
(a) Install the forward handling adapters (19) to the fan case of the engine with the bolts (20).
(b) Install the aft handling adapters (14) between the engine flanges with the pins (15) and safety pins (16).

S 494-044-N00
(4) Install the bootstrap equipment on the cradle (Fig. 411) as follows:
(a) Install the protection pads on the engine to prevent damage from the hoists.
(b) Put the transportation stand and the cradle below the power plant from the aft side.
(c) Attach the aft load cell (1) to the aft outboard arm.
(d) Attach the end of the aft hoists (2) with the handle to the aft load cell (1) and the aft inboard arm.
(e) Put the aft cable (3) on the transportation stand and install the sheaves (4).

NOTE: Make sure you attach the outboard sheave to the inner hole and inboard sheave to the outer hole.

(f) Attach the aft hoists (2) to the cable (3).

(g) Attach the forward hoists (11) to the outboard and inboard shackles (12, 13).

<u>NOTE</u>: Make sure you attach the outboard shackle (12) to the inner hole and inboard shackle (13) to the outer hole.

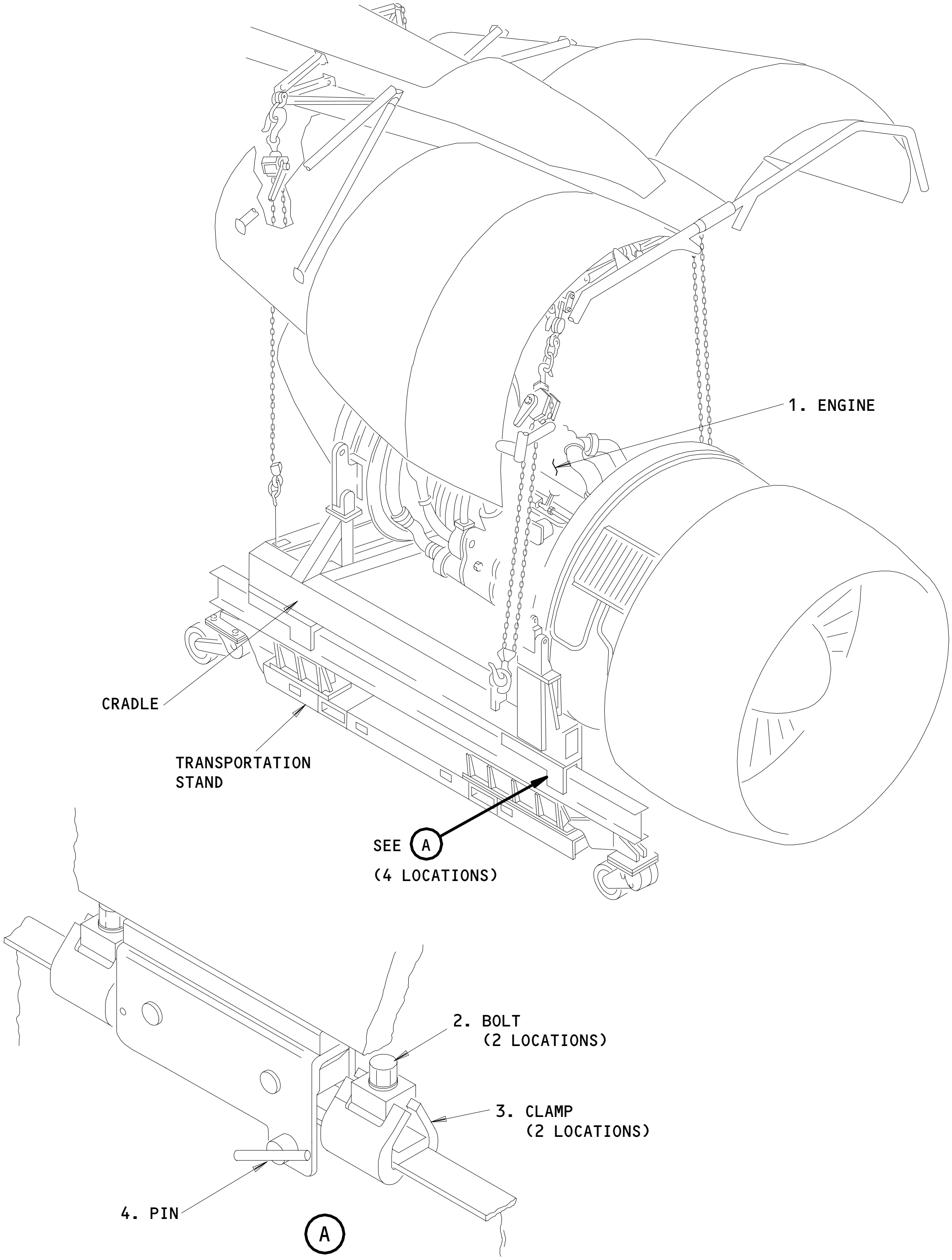
S 584-045-N00

<u>WARNING</u>: ONLY THE PERSONS, WHO CAN USE THE HOIST LEVER CORRECTLY, MUST OPERATE THE HOIST. THE HOISTS CAN RELEASE THE LOAD IF YOU ACCIDENTALLY SET THE CONTROL LEVER OR THE KNOB INTO THE NEUTRAL OR THE FREE CHAIN POSITION. IF THE LOAD FALLS, INJURY TO PERSONS OR DAMAGE TO THE ENGINE CAN OCCUR.

<u>WARNING</u>: DO NOT LET THE LOAD BE MORE THAN 2500 POUNDS (1136 KG) IN THE AFT LOAD CELL. DO NOT LET THE FRONT WHEELS OF THE TRANSPORTATION STAND TOUCH THE GROUND WHEN THE AFT BOOTSTRAPS HAVE THE LOAD. IF THE LOAD IS MORE THAN 2500 POUNDS (1136 KG) OR THE FRONT WHEELS TOUCH THE GROUND, THE LOAD CAN FALL AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

<u>WARNING</u>: ADD THE LOAD ON THE FORWARD BOOTSTRAPS SLOWLY AND CONTINUOUSLY. MAKE SURE THE LOAD DIFFERENCE BETWEEN THE INBOARD AND OUTBOARD BOOTSTRAPS IS LESS THAN 2000 POUNDS (909 KG) WHEN YOU LIFT THE CRADLE AND TRANSPORTATION STAND. IF THE LOAD DIFFERENCE IS MORE THAN 2000 POUNDS (909 KG), THE LOAD CAN FALL AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(5) Lift the cradle to the power plant (Fig. 412) as follows:
   (a) Lift the cradle and transportation stand approximately two inches (50 mm) from the ground.
      1) Let the cradle and transportation stand become level and aligned below the power plant.
   (b) Put the cradle and transportation stand on the ground.
   (c) Loosen the bolts (2) until the clamps are free of the transportation stand.
   (d) Remove the pins (4) from the cradle and the transportation stand.



Engine to Cradle
Figure 412

(e) Lift the cradle from the transportation stand to the power plant.

NOTE: You can use the forward and aft hoists to align the cradle with the power plant. You can use the forward hoists to move the cradle in the roll direction, and the forward or aft hoists to move the cradle in the pitch direction.

S 494-046-N00

(6) Attach the cradle to the engine adapters (Fig. 411) as follows:
(a) Align the forward and aft adapters (19, 14) to the cradle.
(b) Attach the forward adapters (19) to the cradle with the pins (18).
(c) Attach the aft adapters (14) to the cradle.

S 494-047-N00

WARNING: MONITOR THE LOAD CELLS ON THE FORWARD AND AFT HOISTS. DO NOT LET THE LOAD BE MORE THAN 8000 POUNDS (3636 kg) IN EACH FORWARD LOAD CELL. DO NOT LET THE LOAD BE MORE THAN 2500 POUNDS (1136 kg) IN THE AFT LOAD CELL. IF THE LOAD IS MORE THAN THE LIMITS, THE POWER PLANT CAN FALL AND CAUSE INJURY TO PERSONS OR DAMAGE TO THE POWER PLANT.

(7) Increase the hoist loads equally to move the weight of the power plant on the bootstrap equipment.
(a) Increase the aft hoist load until the load cell reads 2000 pounds (909 kg).
(b) Increase the forward hoist loads until each load cell reads 6000 pounds (2727 kg).

S 024-048-N00

(8) Disconnect the engine mounts (Fig. 413) as follows:
(a) ENGINES WITH RIGID ENGINE MOUNTS;
Use the A71003-25 torque equipment to loosen the forward and aft vertical tension bolts (1, 2, 10) one-half turn.
(b) ENGINES WITH THE VIBRATION ISOLATORS ON THE AFT ENGINE MOUNTS;
Use the A71003-41 torque equipment to loosen the forward and aft vertical tension bolts (1, 2, 13) one-half turn.
(c) Monitor the load cell indications and the engine mount-to-strut interface.

NOTE: The load cell indications must not change. Make sure there is no gap between the engine mounts and the strut.

1) If the load cell indications increase, make sure the indications are less than the maximum permitted value.
2) If a gap shows between the engine mount and strut, slowly lift the forward or aft hoists to remove the gap.

(d) Loosen the vertical tension bolts (1, 2, and 10 or 13) another one-half turn.

(e) Monitor the load cell indications and the engine strut interface.

NOTE: The load cell indications must not change. Make sure there is no gap between the engine mounts and the strut.

CAUTION: INSTALL THE TAG ON THE BOLT. WRITE THE LOCATION OF THE BOLT ON THE TAG. FAILURE TO IDENTIFY THE BOLT LOCATION CAN CAUSE INCORRECT INSTALLATION OF THE BOLT.

(f) Remove the vertical tension bolts (1, 2, and 10 or 13).

1) Install the tag on the bolt (1, 2, and 10 or 13).

2) Identify the location of the bolt (1, 2, and 10 or 13) on the tag.

S 424-049-N00

(9) Lower the power plant and attach the power plant to the transportation stand as follows:

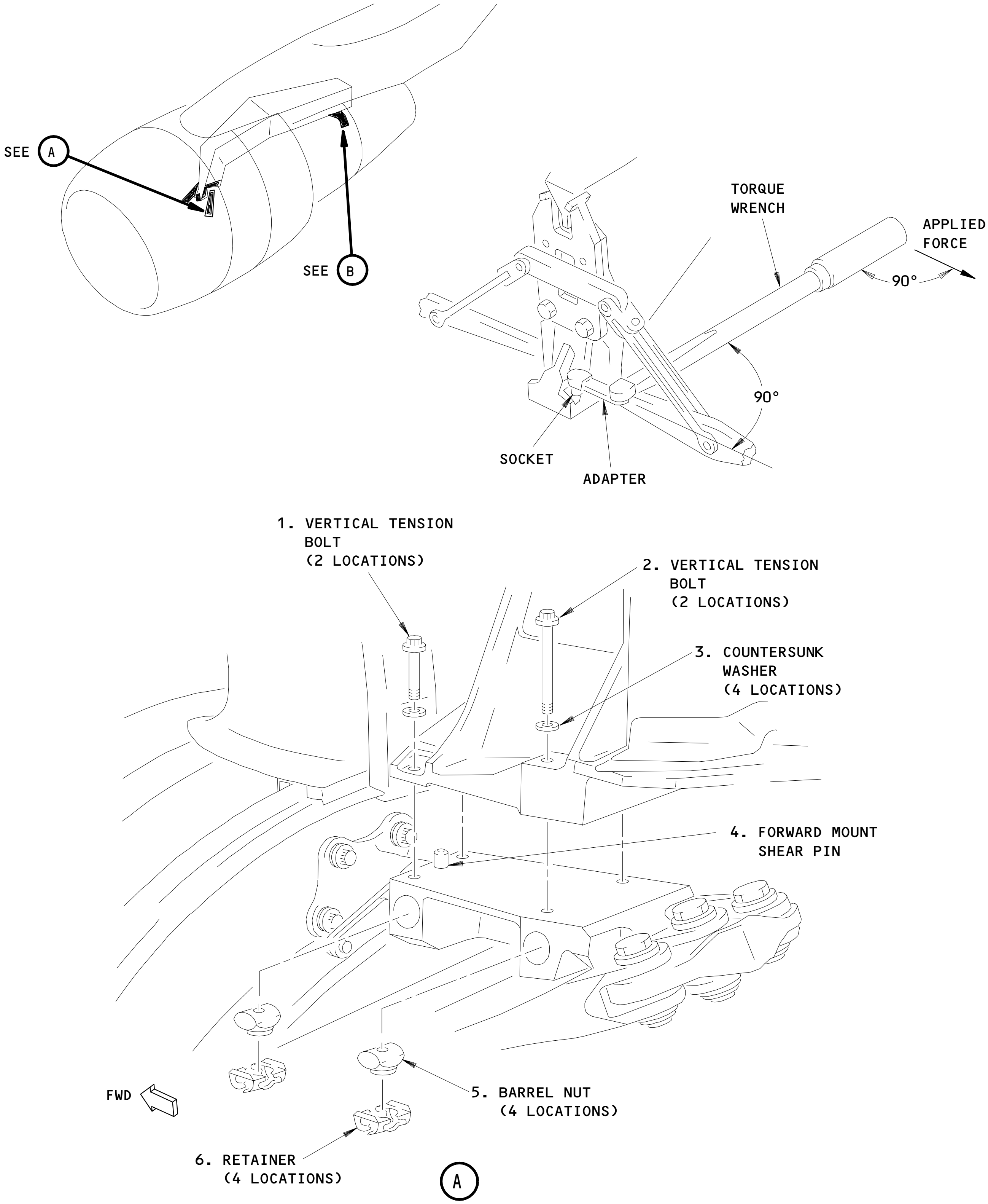
WARNING: KEEP THE WORK STANDS AND PERSONS CLEAR OF THE STRUT. THE POWER PLANT CAN MOVE WITH RELATION TO THE STRUT WHEN THE SHEAR PINS ARE CLEAR FROM THE STRUT. IF THE PERSONS AND WORK STANDS ARE NOT CLEAR OF THE STRUT, INJURY TO THE PERSONS AND DAMAGE TO THE EQUIPMENT CAN OCCUR.

WARNING: MONITOR THE LOAD CELLS ON THE FORWARD AND AFT HOISTS. DO NOT LET THE LOAD BE MORE THAN 8000 POUNDS (3636 kg) IN EACH FORWARD LOAD CELL. DO NOT LET THE LOAD BE MORE THAN 2500 POUNDS (1136 kg) IN THE AFT LOAD CELL. IF THE LOAD IS MORE THAN THE LIMITS, THE POWER PLANT CAN FALL AND CAUSE INJURY TO PERSONS OR DAMAGE TO THE POWER PLANT.

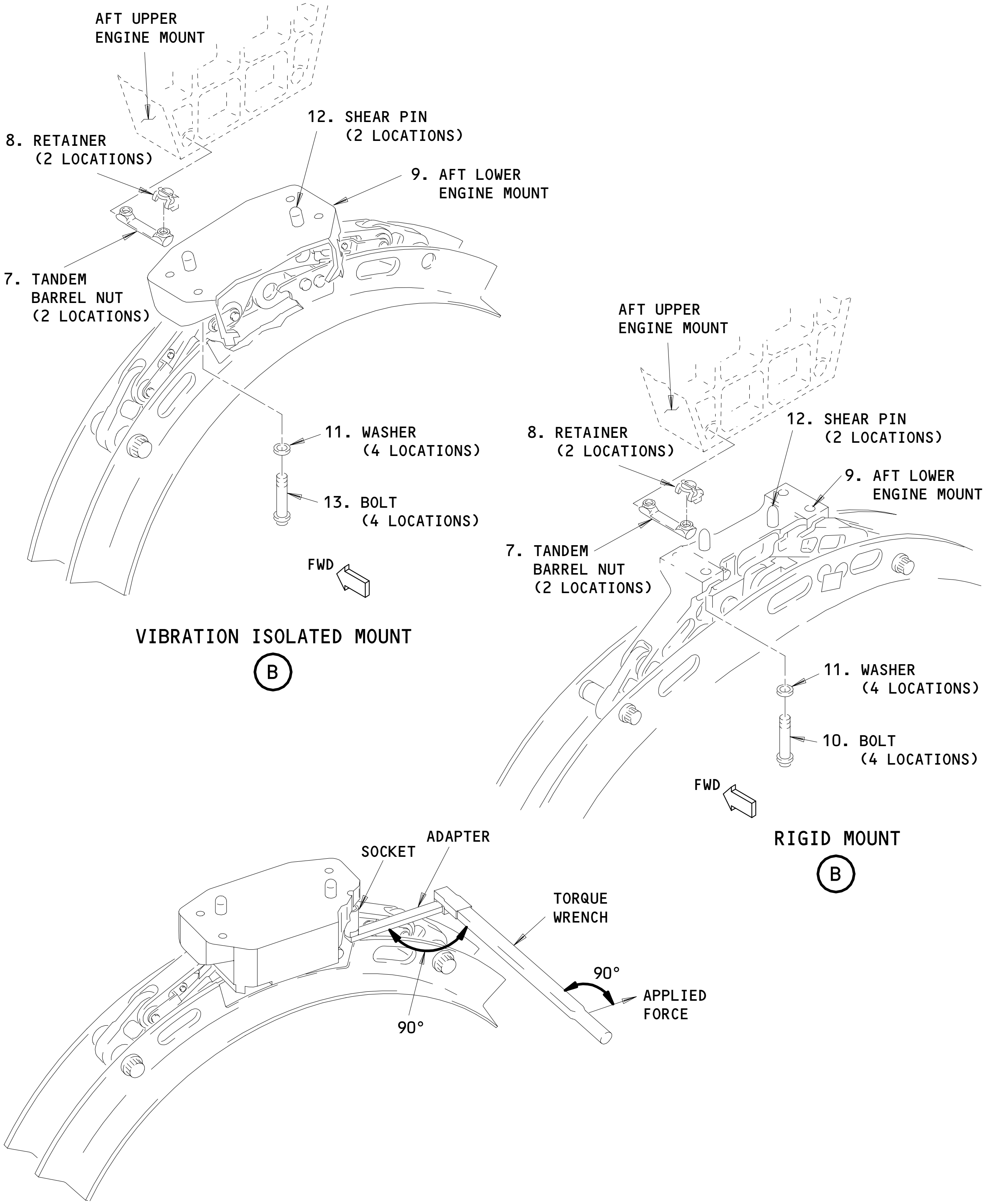
WARNING: ADD THE LOAD ON THE FORWARD BOOTSTRAPS SLOWLY AND CONTINUOUSLY. THIS MAKES SURE THE LOAD DIFFERENCE BETWEEN THE INBOARD AND OUTBOARD BOOTSTRAPS IS LESS THAN 2000 POUNDS WHEN YOU LIFT THE CRADLE AND TRANSPORTATION STAND. IF THE LOAD DIFFERENCE IS MORE THAN 2000 POUNDS (909 KG), THE LOAD CAN FALL AND CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(a) Lower the aft hoists slowly and equally until the shear pins (12, Fig. 413) on the aft engine mount are clear from the top engine mount.

(b) Lower the forward hoists slowly and equally until the shear pin (4, Fig. 413) on the forward engine mount is clear from the top engine mount.



Forward and Aft Engine Mount Installation
Figure 413 (Sheet 1)



Forward and Aft Engine Mount Installation
Figure 413 (Sheet 2)

(c) Lower the engine.
(d) Turn the engine to align with the transportation stand.

CAUTION: DO NOT LET THE FRONT OF THE CRADLE AND ENGINE TOUCH THE TRANSPORTATION STAND WHEN THE AFT BOOTSTRAP HAS THE LOAD. IF THE LOAD IN THE AFT LOAD CELL IS MORE THAN 2500 POUNDS (1136 KG), THE LOAD CAN FALL AND CAUSE DAMAGE TO THE POWER PLANT, CRADLE, OR TRANSPORTATION STAND.

(e) Attach the engine and the cradle to the transportation stand as follows (Fig. 412):
1) Align the cradle and the transportation stand.
2) Lower the cradle with the engine to the transportation stand.

NOTE: Make sure you lower the forward and aft ends equally, or the aft end just before the forward end. This will make sure the load in the aft bootstrap is not more than the limits.

3) Align the clamps (3).
4) Tighten the bolts (2).
5) Install the pins (4).

(f) Disconnect the hoists (2, 11, Fig. 411) from the cradle and the bootstrap equipment.
(g) Pull the transportation stand with the cradle and the power plant forward until they are clear of the strut.

S 494-050-N00
(10) Remove the bootstrap equipment (Fig. 411) as follows:

NOTE: You must remove the bootstrap components if you have one of the two conditions that follow:
- you will not install the power plant on the strut in less than one day
- the winds will be more than the limit for the hold-open equipment.

If one of two conditions does not occur, you can let the load cells, aft arms, and the forward arms stay on the strut. You can use those during the installation of the replacement power plant.

(a) Remove the aft load cell (1).
(b) Remove the forward braces (15, Fig. 401).
(c) Remove the aft arm (11, Fig. 401).
(d) Remove the forward load cells (10)
(e) Remove the forward inboard and outboard arms (5, 6).
(f) Remove the forward support and the clamp assembly as follows:
1) Remove the bolts (9) which attach the clamps (8) to the forward support (7).

2) While you hold the forward support (7), do these steps:
   a) Move the bottom of the clamps (8) out of the forward support pins.
   b) Disengage the clamp slots from the forward support pins.
3) Remove the forward support (7).

S 094-051-N00

(11) If you removed the core and fan cowl panels, remove the hold-open equipment (A78001) for the thrust reverser as follows:

NOTE: You must close the cowls if you have one of the two conditions that follow:
- you will not install the replacement engine in less than one day,
- the speed of the winds is more than the limit for the hold-open equipment.

(a) Open the thrust reverser to release the load on the hold-open equipment (AMM 78-31-00/201).
(b) Loosen the screw (8) to release the channel clamp (3).
(c) Move the channel clamp (3) off the actuator rod (5).
(d) Remove the actuator lock (2) from the actuator (1).

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(e) Close the thrust reverser (AMM 78-31-00/201).
(f) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 094-052-N00

(12) If you installed the hold-open equipment (A71032-14 and bootstrap) for the fan and core cowl panels, remove the hold-open equipment (A78001) as follows:

NOTE: You must close the cowls if you have one of the two conditions that follow:
- you will not install the replacement engine on the strut in less than one day,
- the speed of the wind is more than the limit for the hold-open equipment.

(a) Remove the hold-open equipment for the thrust reverser (Fig. 404) as follows:
   1) Open the thrust reverser to remove the load on the hold-open equipment (AMM 78-31-00/201).
   2) Loosen the screw (8) to release the channel clamp (3).
   3) Move the channel clamp (3) off the actuator rod (5).
   4) Remove the actuator lock (2) from the actuator (1).

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(b) Close the thrust reverser (AMM 78-31-00/201).

WARNING: HOLD THE CORE COWL PANELS BEFORE YOU REMOVE THE HOLD-OPEN EQUIPMENT. IF YOU DO NOT HOLD THE CORE COWL PANELS, THE COWL CAN MOVE FREELY AND CAUSE INJURY TO PERSONS.

(c) Remove the hold-open braces for the core cowl (1, Fig. 402).
(d) Close the core cowl panels (AMM 71-11-06/201).

WARNING: HOLD THE FAN COWL PANELS BEFORE YOU REMOVE THE HOLD-OPEN EQUIPMENT. IF YOU DO NOT HOLD THE FAN COWL PANELS, THE PANELS CAN MOVE FREELY AND CAUSE INJURY TO PERSONS.

(e) Remove the hold-open equipment (A71030-32) for the fan cowl (1, Fig. 403).
(f) Close the fan cowl panels (Ref 71-11-04/201).
(g) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 094-084-N00

(13) If you installed the hold-open equipment (G71023) for the fan and core cowl panels, remove the hold-open equipment (Fig. 405) as follows:

NOTE: You must close the cowls if you have one of the two conditions that follow:
- you will not install the replacement engine on the strut in less than one day,
- the speed of the wind is more than the limit for the hold-open equipment.

(a) Open the thrust reverser to remove the load on the hold-open equipment (AMM 78-31-00/201).
(b) Remove the forward tube assembly from the fan cowl panel (View A or D) as follows:
    1) Open the fan cowl panel to remove the load on the hold-open equipment (AMM 71-11-04/201).
    2) Remove the lockpin from the pin hole on the thrust reverser tube.
    3) Loosen the knobs on the fan cowl tube to disconnect the tube from the fan cowl panel.
    4) For the right fan cowl panel, open the fan cowl latch.
    5) Disengage the hooks from the loops.
    6) Turn the forward tube and remove the forward tube assembly from the fan cowl panel and the thrust reverser tube.

(c) Remove the aft tube assembly from the core cowl panel (View C or F) as follows:
  1) Open the core cowl panel to remove the load on the hold-open equipment (AMM 71-11-06/201).
  2) Remove the pin from the aft tube and the attachment block.
  3) Remove the lockpin from the pin hole on the thrust reverser tube.
  4) Turn and remove the aft tube.
  5) For the right core cowl, open the core cowl latch.
  6) For the left core cowl panel, remove the pin from the lockhole on the attachment block.
  7) Remove the attachment block from the core cowl panel.

(d) Remove the thrust reverser tube from the thrust reversers (View B or E) as follows:
  1) Loosen the knobs on the thrust reverser tube.
  2) Remove the thrust reverser tube from the thrust reverser half.

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(e) Close the thrust reverser (AMM 78-31-00/201).
(f) Close the core cowl panels (AMM 71-11-06/201).
(g) Close the fan cowl panels (AMM 71-11-04/201).
(h) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

TASK 71-00-02-004-149-N00

4. Remove the Power Plant With the PT90-E

NOTE: The PT90-E procedure is an optional procedure to the bootstrap procedure which is the recommended procedure.

You must use the tool manufacturers' instructions with the steps that follow to remove or install an engine correctly.

A. Equipment
  (1) PT90-E - Universal Engine Change System; Dendro Maskin Lift AB Lovholmsgrand 12, S-117 43 Stockholm, Sweden; or NORDEQUIP, INC., 7315 Courthouse Boulevard, Hastings, MN USA 55033
  (2) A71006-79 Cradle
  (3) A71003-25 Torque Equipment (all rigid engine mounts)
  (4) A71003-41 Torque Equipment (used only on the aft engine mounts with the vibration isolators)

B. References
  (1) AMM 71-11-04/201, Fan Cowl Panels

(2) AMM 71-11-06/201, Core Cowl Panels
(3) AMM 78-31-00/201, Thrust Reverser Systems

C. Access

(1) Location Zone

411	Left Engine
421	Right Engine

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

D. Procedure (Fig. 414)

S 494-170-N00

(1) Make sure the PT90-E is on.
   (a) Make sure the batteries are fully charged.
   (b) Make sure the master circuit breaker is in the ON position.
   (c) Push the START button on the aft horizontal support until you see the green light come on.

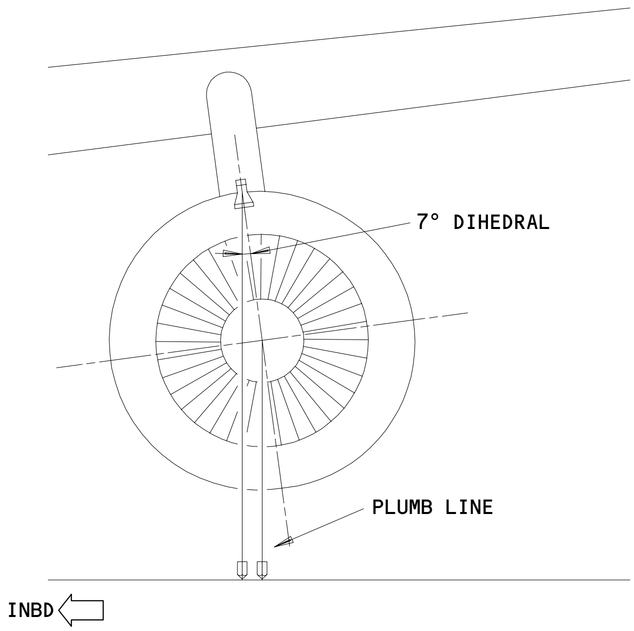
S 494-171-N00

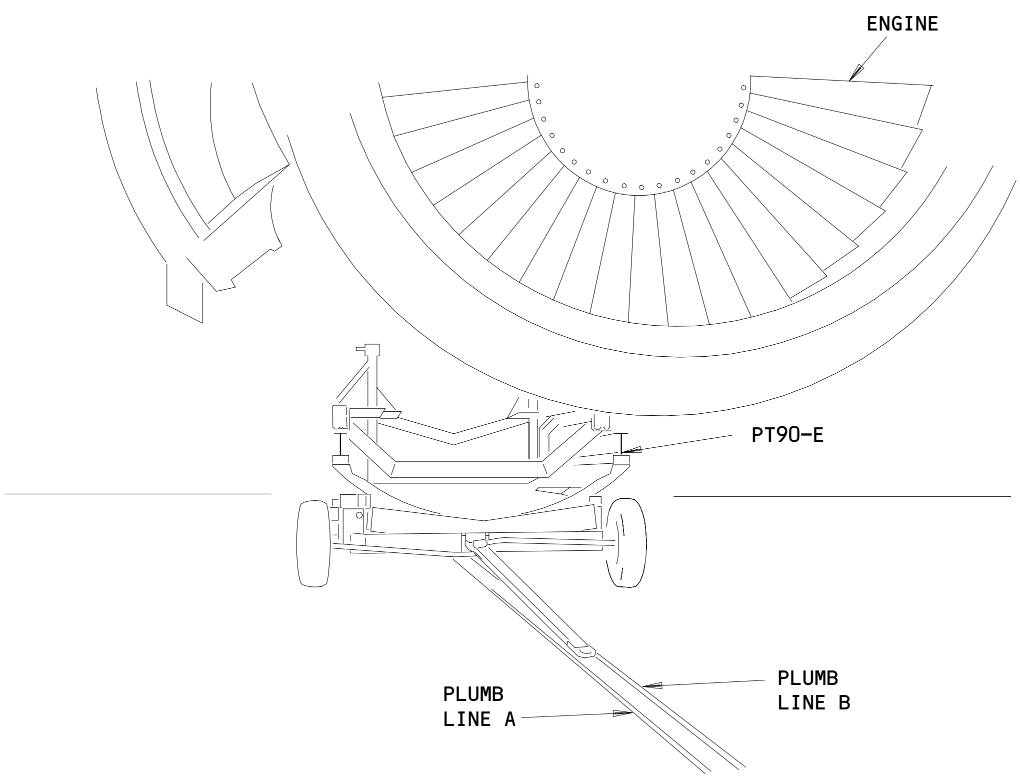
(2) Put the PT90-E into the correct position below the engine.
   (a) Put a plumb line on the center of the engine and make a mark on the floor (plumb line A).
   (b) Make a second mark (plumb line B) that is approximately 7 inches inboard of the first mark (plumb line A).
   (c) Put the center of the PT90-E engine hoist in position above the plumb line B.
      1) The forward tow bar and the aft tow bar can control the engine hoist.
   (d) Make sure the engine hoist and cradle is approximately 4-6 inches farther forward than necessary.

   NOTE: The cradle and the engine hoist will slightly move to the rear while it is lifted.

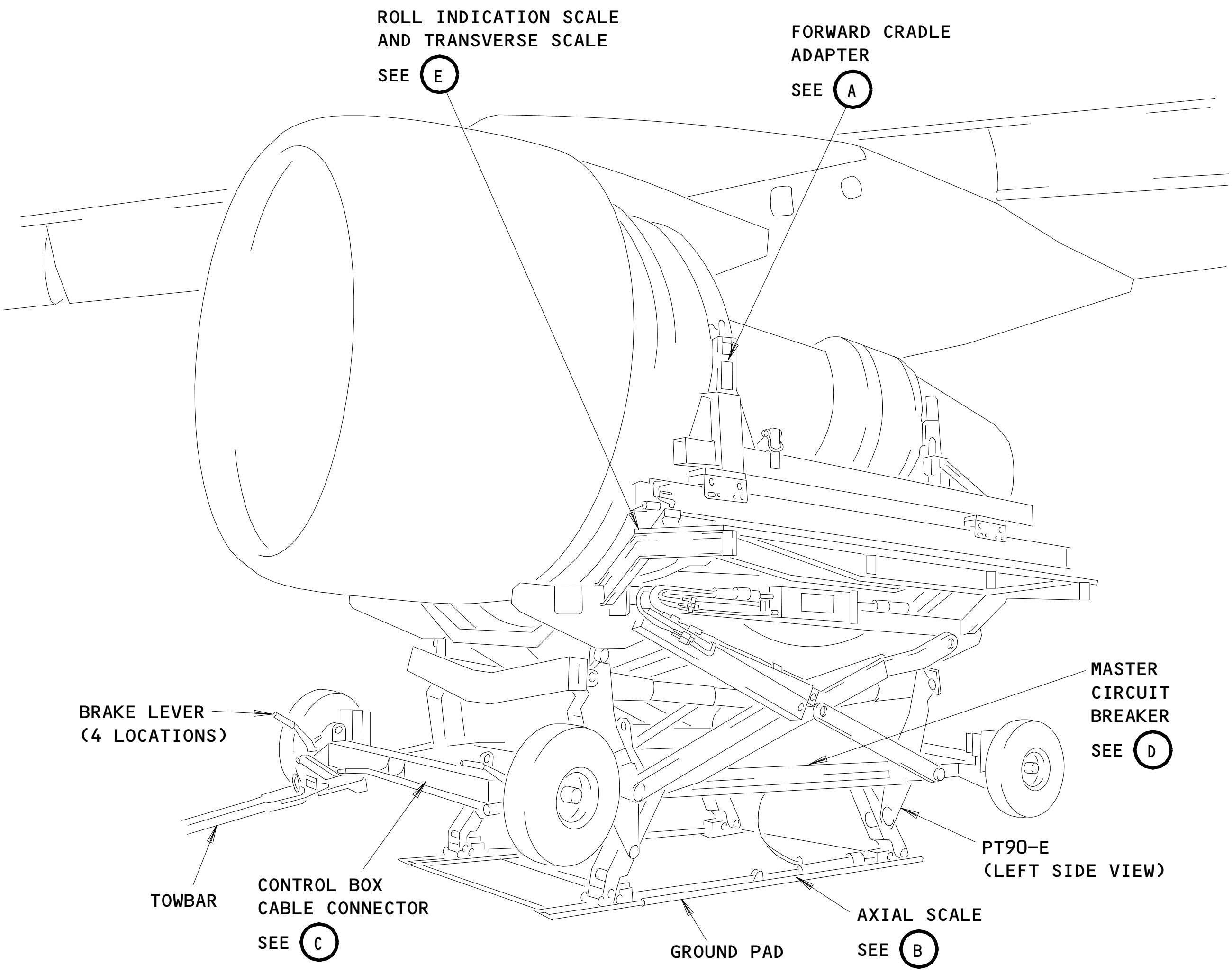
S 494-172-N00

(3) Install the forward engine adapters on the engine fan case.

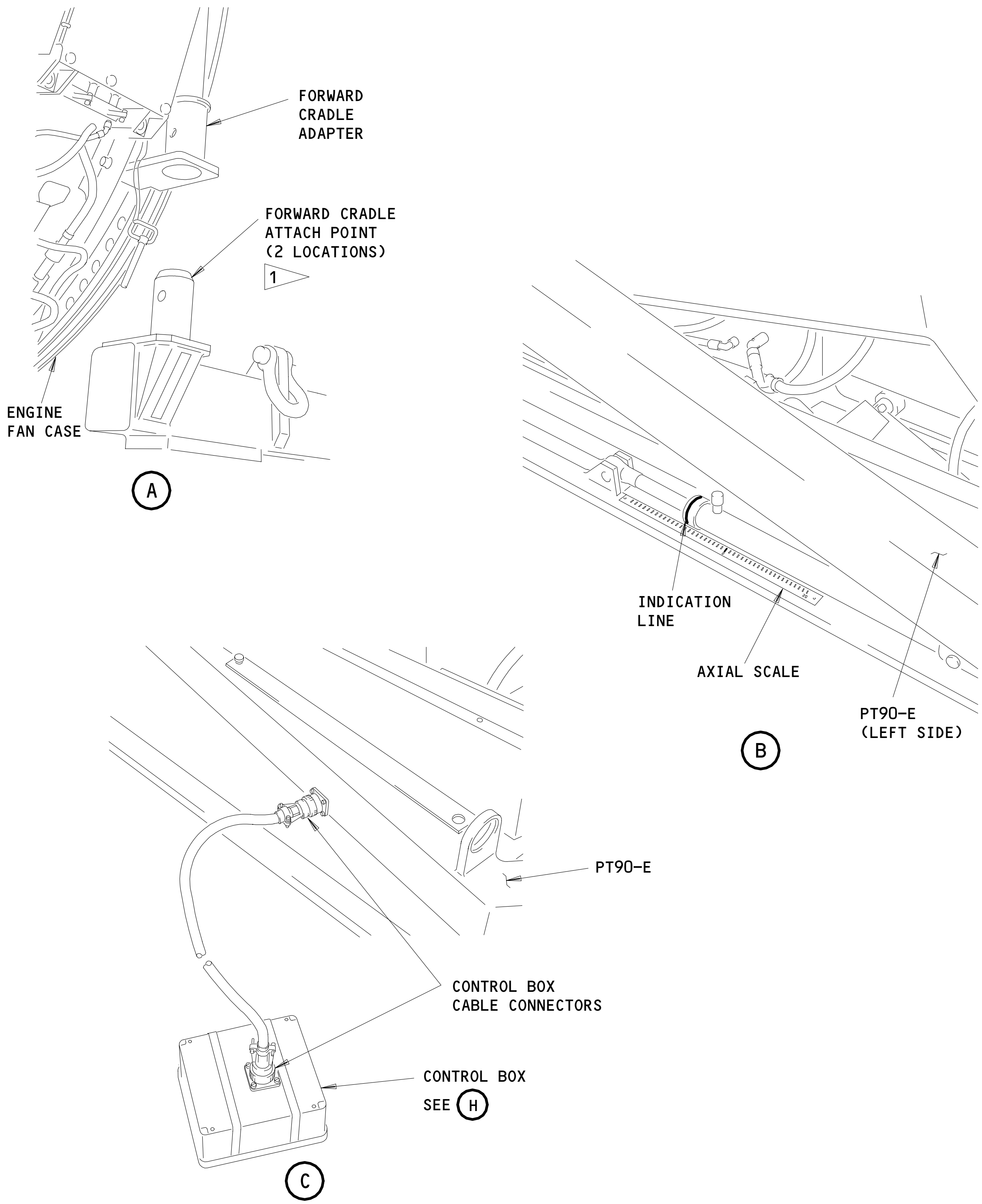




PT90-E Universal Engine Changer
Figure 414 (Sheet 1)

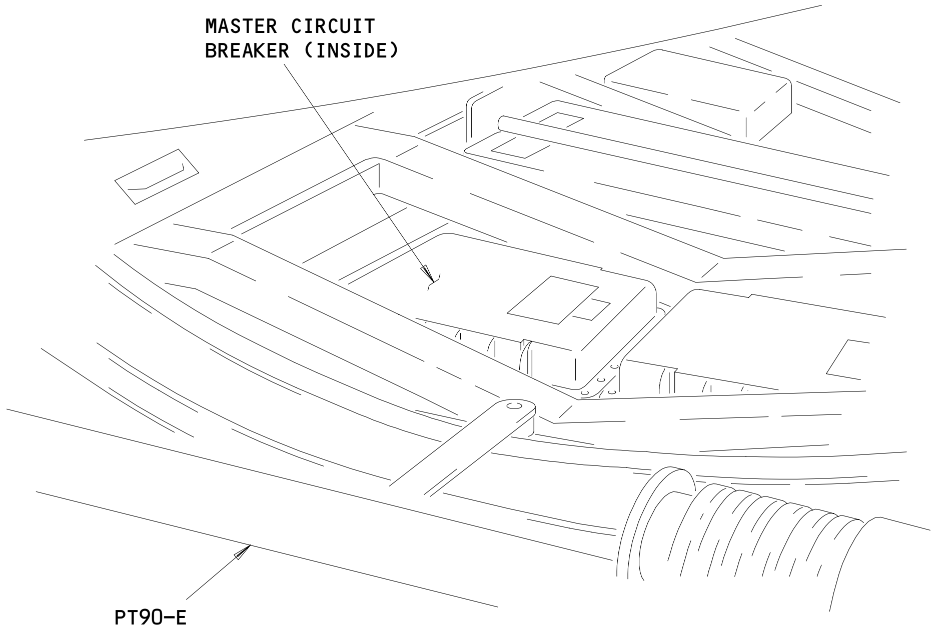


PT90-E Universal Engine Changer
Figure 414 (Sheet 2)



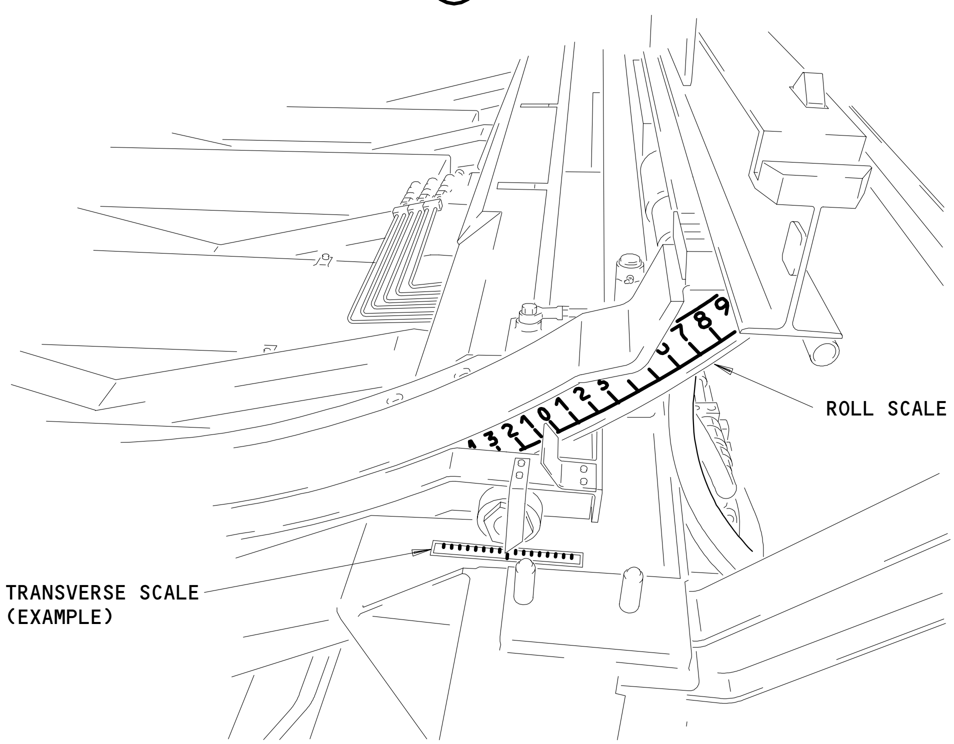
1 PT90-E NOT SHOWN

PT90-E Universal Engine Changer
Figure 414 (Sheet 3)



VIEW IN THE FORWARD DIRECTION

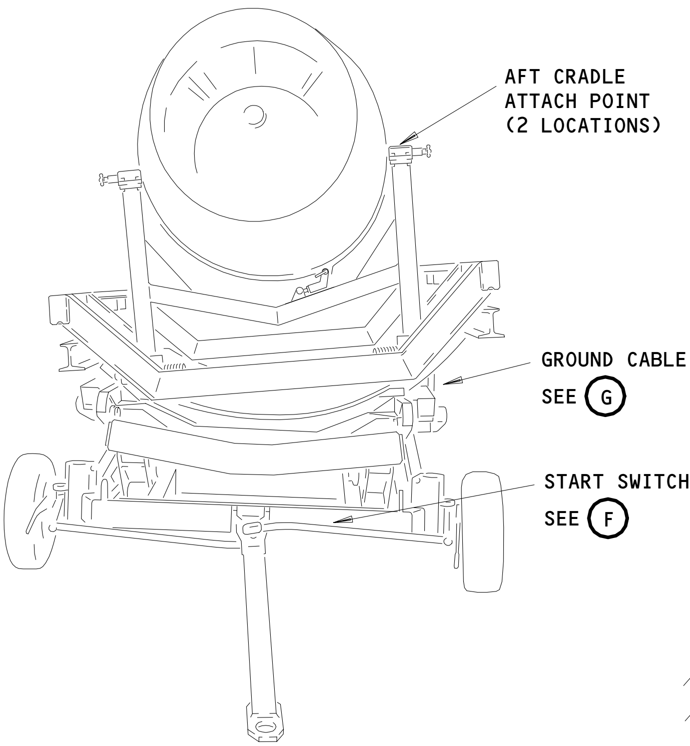
D



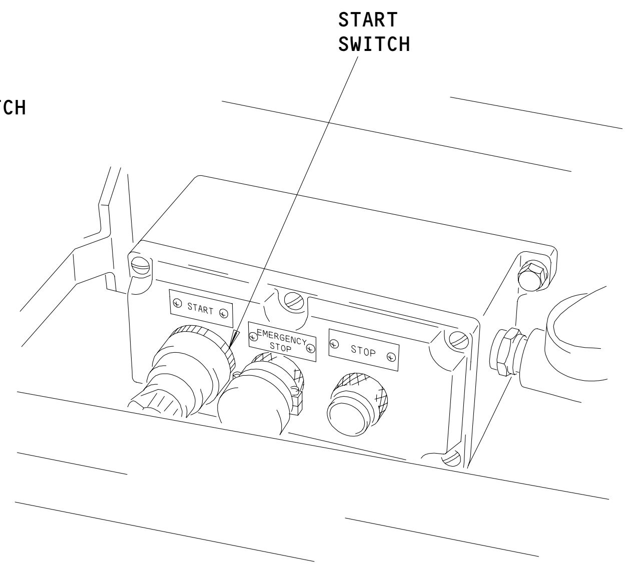
VIEW IN THE AFT DIRECTION

E

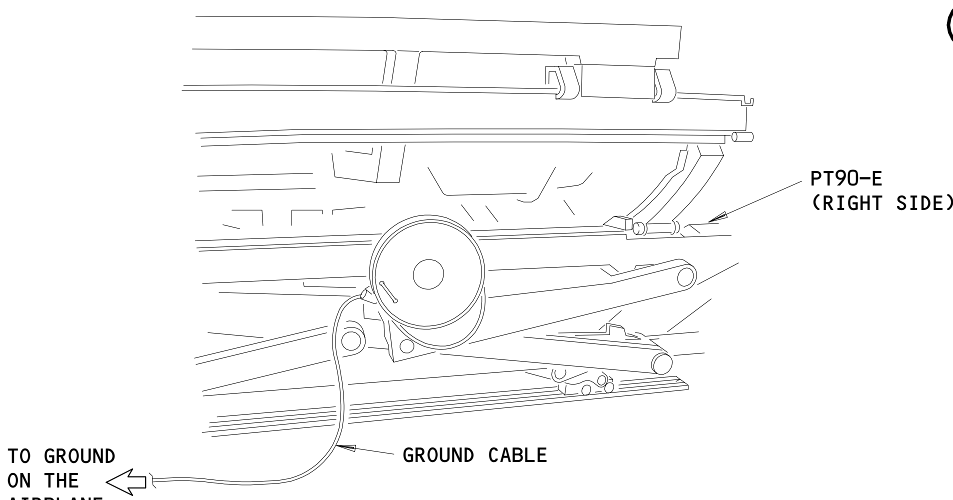
PT90-E Universal Engine Changer
Figure 414 (Sheet 4)



PT90-E
(VIEW IN THE FORWARD DIRECTION)

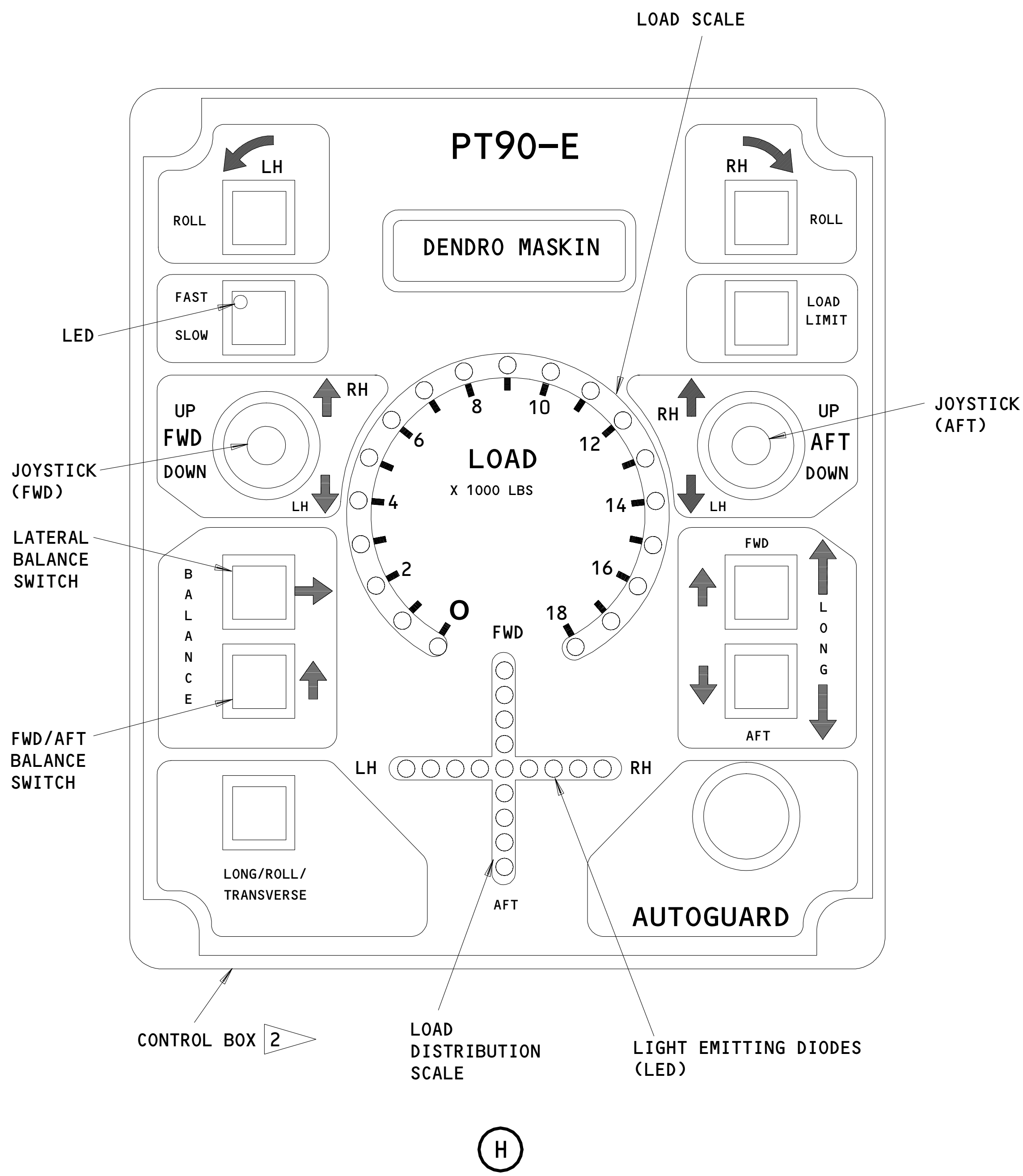


F



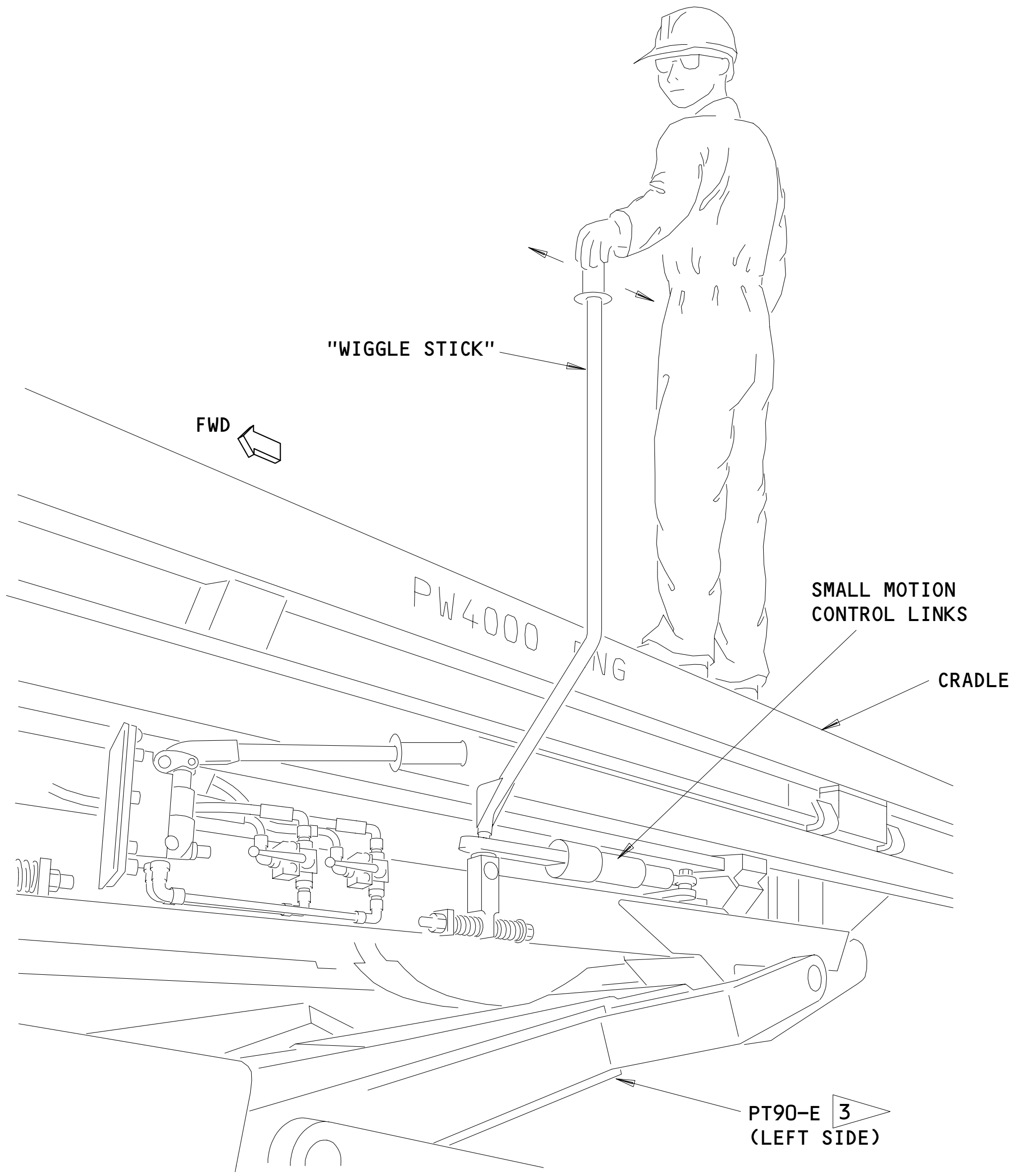
G

PT90-E Universal Engine Changer
Figure 414 (Sheet 5)



2 REFER TO THE DENDRO MASKIN PT90-E OPERATION AND MAINTENANCE MANUAL FOR DIRECTIONS ON HOW TO USE THE CONTROL BOX TO OPERATE THE HOIST CORRECTLY.

PT90-E Universal Engine Changer
Figure 414 (Sheet 6)



3 ENGINE NOT SHOWN FOR CLARITY

PT90-E Universal Engine Changer
Figure 414 (Sheet 7)

S 494-173-N00
(4) Connect the control box to the PT90-E.
(a) Connect the control box cable to the connection on the forward end of the PT90-E.
(b) Connect the control box cable to the control box.

S 214-174-N00
(5) Look at the transverse, axial and roll scales on the PT90-E.

S 214-175-N00
(6) Make sure the pointer is at zero (center) for each scale.
(a) If the pointer is not at zero (center) for one of the scales, operate the control box to put the pointer(s) at zero.

S 494-176-N00
(7) Put the parking brake at each wheel in the locked position.

S 494-177-N00
(8) Use the control box to lower the ground pad support and lift the PT90-E and the cradle until the wheels do not touch the ground.

S 494-178-N00
(9) Use the control box to move the cradle in the roll direction 6 degrees.

S 494-179-N00
(10) Use the control box to lift the PT90-E until the cradle attach points are approximately 1 inch from the engine attach points.

S 494-180-N00
(11) Make sure all the tools and the mechanics that are necessary to remove the engine are on the cradle.

S 494-181-N00
(12) Make sure you set the load distribution display on the control box to zero.

S 494-182-N00
(13) Use the control box to set the load limit at 11,500 pounds.

S 494-183-N00
(14) Use the control box to (slowly) lift the PT90-E and cradle until you can connect the cradle to the engine.
(a) Make sure you use the control box to keep the space between the cradle attach points and the engine at the same distance.

S 494-184-N00
(15) When the cradle is in the correct position, do the steps that follow:
(a) Install the aft attach pins into the engine.

(b) Install the quick-release pins through the cradle and the forward engine adapters.

S 494-185-N00

(16) Use the control box to lift the PT90-E, cradle, and engine.

(a) Make sure the AUTOGUARD button is in the out (on) position.

CAUTION: MAKE SURE YOU OPERATE THE CONTROL BOX CORRECTLY SO YOU SEE THE LED IS IN THE CENTER OF THE DISPLAY. IF YOU DO NOT, YOU CAN CAUSE SIDE LOADS ON THE ENGINE MOUNT AND STRUT AND CAUSE DAMAGE TO EQUIPMENT AND INJURY TO PERSONS.

(b) Make sure you keep the light emitting diode (LED) for the load distribution display on the control box in the center of the display.

(c) Make sure you do not lift the engine too much.

S 034-186-N00

(17) Disconnect the engine mounts (Fig. 413) with the steps that follow:

(a) ENGINES WITH RIGID ENGINE MOUNTS;
Use the A71003-25 torque equipment to loosen the forward and aft vertical tension bolts (1, 2, 10) one-half turn.

(b) ENGINES WITH THE VIBRATION ISOLATORS ON THE AFT ENGINE MOUNTS;
Use the A71003-41 torque equipment to loosen the vertical tension bolts (13) one-half turn.

(c) Make sure you monitor the load distribution display and the engine-to-strut interface.

1) Make sure the load distribution display does not change.
2) Make sure you do not see a small distance between the engine mounts and the strut.
3) If you see a small distance between the engine mount and the strut, use the control box to slowly lift the engine until you cannot see the small distance.

NOTE: If you see the load distribution display increase, make sure the load does not increase more than the maximum load limts.

4) Carefully loosen the vertical tension bolts (1, 2 and 10 or 13) one-half turn again.
5) Make sure you monitor the load distribution display and the engine-to-strut interface.
6) Make sure the load distribution display does not change and you do not see a small distance between the forward and the aft engine mounts and the strut.

NOTE: The weight of the engine is held by the PT90-E engine lift equipment.

(d) Remove the vertical tension bolts (1, 2, and 10 or 13) from the engine mounts.

S 024-187-N00

CAUTION: MAKE SURE YOU ARE VERY CAREFUL WHEN YOU LOWER THE POWER PLANT. THE POWER PLANT CAN MOVE IN RELATION TO THE STRUT WHEN THE SHEAR PINS ARE AWAY FROM THE STRUT. THIS CAN CAUSE INJURY TO PERSONS.

(18) Use the control box to slowly and equally lower the forward end and the aft end of the power plant until the shear pins (4 and 12) on the forward and aft engine mounts are away from the strut.

S 024-188-N00

CAUTION: MAKE SURE YOU LOWER THE POWER PLANT WITH THE FORWARD END LOWER THAN THE AFT END. IF YOU DO NOT, THE TOP OF THE ENGINE FAN CASE CAN TOUCH THE THRUST REVERSER AND CAUSE DAMAGE TO EQUIPMENT.

(19) Carefully lower the power plant 3-4 inches (75-100 mm) with the forward end lower than the aft end.

S 024-189-N00

(20) Use the control box to move the engine in the roll direction to the 0 mark on the roll indication.

S 024-190-N00

(21) Use the control box to lower the power plant until the ground pad lifts off the ground and is in the stored position.

S 024-191-N00

(22) Put the brake levers to the not locked position.

S 024-192-N00

(23) Push the power plant forward until it is away from the strut and remove the power plant from the area.

S 944-148-N00

(24) Remove the protection pads.

TASK 71-00-02-404-053-N00

5. Install the Power Plant With the Bootstrap Equipment

A. General

(1) You must not remove the caps from the tube ends, ducts and the electrical connectors until you connect each connection.

(2) You must not apply the forces more than necessary to lift the power plant, when the power plant is engaged with the strut. You can use the load cell to monitor the loads applied.

(3) You can attach the bootstrap components on the strut. The bootstrap components use a lever hoist in each of the four support legs. The adjustment of the lever hoists permits the power plant to turn in the pitch and roll directions while the power plant hangs. You can get the Pitch when you lift or lower the forward or aft hoists together. You can get the Roll when you use the forward hoists only.

(4) When you use the bootstrap components, the level of the airplane must be zero ± 1/4 degree in the pitch and roll directions.

B. Equipment

(1) A71030-32 Fan Cowl Hold-Open Equipment - (40 knots) (optional)

(2) A71032-14 Core Cowl Hold-Open Equipment - (40 knots) (optional)

(3) A78001-31 Thrust Reverser Hold-Open Equipment - (40 knots)

(4) G71023-52 Hold Open Equipment - Fan and Core Cowls - (20 knots) (optional)

(5) A71001-185 Bootstrap Equipment

(6) A71003-25 Torque Equipment - (all rigid engine mounts)

(7) A71003-41 Torque Equipment - (used only on the aft engine mounts with the vibration isolators)

(8) A71006-79 Cradle

(9) 140059-5 Stand - Shipping, engine, air/truck transportation, Stanley Aviation (Recommended).
110059-501 Transportation Stand,
Stanley Avaiation (Alternative)

(10) Protection pads - commercially available

C. Consumable Materials

(1) D00010 Antiseize Compound - Bostick Never-Seez Pure Nickel Special

D. References
   (1) AMM 26-11-02/201, Engine Fire and Overheat Detector Element
   (2) AMM 70-50-00/201, Standard Torque Values
   (3) AMM 71-11-04/201, Fan Cowl Panels
   (4) AMM 71-11-06/201, Core Cowl Panels
   (5) AMM 71-21-00/601, Engine Mounts
   (6) AMM 70-11-06/201, Fluorescent Penetrant Inspection
   (7) AMM 78-31-00/201, Thrust Reverser System

E. Access
   (1) Location Zone

411	Left Engine
421	Right Engine

   (2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

F. Prepare the Airplane for the Power Plant Installation

S 404-230-N00

WARNING: INSTALLATION OF A RING CASE CONFIGURATION ENGINE IS NOT ALLOWED ON AN AIRPLANE THAT HAS A SEGMENTED CASE ENGINE WITH A P/N 791100-14-102 EEC INSTALLED. IF YOU DO YOU CAN CAUSE INJURY TO PERSONNEL OR DAMAGE TO THE AIRPLANE.

(1) If the engine being installed is a ring case configuration (post P&W SB PW4ENG 72-755 or production equivalent) engine, you must ensure that the other engine installed on the airplane does not have a P/N 791100-14-102 (P&W P/N 54D043) EEC. If the other engine has a P/N 791100-14-102 (P&W P/N 54D043) EEC, the EEC must be replaced and a non-SCN 11 EEC installed before the airplane can be returned to service.

S 404-231-N00

(2) If the engine being installed is a segmented case configuration engine (pre SB PW4ENG 72-755 or production equivalent) check the P/N of the EEC installed on this engine. If the EEC P/N is 791100-14-102 (P&W P/N 54D043), you must ensure that the other engine installed on the airplane is not a ring case configuration engine (post P&W SB PW4ENG 72-755 or production equivalent).

S 214-054-N00

CAUTION: DO NOT INSTALL AN ENGINE WITH A VIBRATION-ISOLATED MOUNT UNLESS YOU VERIFY THE AIRPLANE MOUNT CONFIGURATION. YOU CANNOT ALWAYS INSTALL A VIBRATION-ISOLATED ENGINE MOUNT ON AN AIRPLANE THAT HAS A CONFIGURATION FOR A RIGID ENGINE MOUNT. YOU CAN INSTALL AN ENGINE WITH A RIGID ENGINE MOUNT ON AN AIRPLANE THAT HAS THE CONFIGURATION FOR A VIBRATION-ISOLATED MOUNT. IF YOU INSTALL THE INCORRECT ENGINE MOUNT, THE ENGINE MOUNT CAN CAUSE DAMAGE TO THE ENGINE, THE CORE COWL, OR THE STRUT.

(3) SAS 050, 051, 150-154;
MTH 275, 276;
Make sure the correct aft engine mount is on the engine (AMM 71-21-02/401).

NOTE: You can install an engine with a vibration-isolated mount on an airplane with the configuration for a rigid mount if: The airplane is not in the group above or the airplane is in the group above and was reworked to SB 71-48. You can install an engine with a rigid mount on an airplane with a configuration for a vibration-isolated mount.

S 864-055-N00

(4) Make sure the airplane is in the same configuration as the power plant removal (Refer to the Prepare the Power Plant Removal).

S 214-056-N00

(5) Make sure the card for the engine fire/overheat detection agrees with the fire detector elements on the replacement power plant (AMM 26-11-02/201).

G. Prepare the Power Plant for Installation

S 234-225-N00

(1) Get new or examined vertical tension bolts (1, 2, 10, 13, Fig. 413) or make an inspection of the used bolts with the fluorescent penetrant (AMM 70-11-06/201).
   (a) Make sure you can apply sufficient torque on the threads of the bolts (1, 2, 10, 13) to lock them when you use a satisfactory nut.

(b) Discard all bolts with damage that you can feel with a fingernail.
(c) Discard all bolts with damage that you can see the damage.

S 224-059-N00
(2) Make sure the self-locking (run-on) torque of the tandem barrel nuts (7) is a minimum of 70 pound-inches (7.9 newton-meters) and a maximum of 600 pound-inches (67.8 newton-meters) (Fig. 413).

NOTE: These torque values are for barrel nuts that are previously used or bench-tested. New barrel nuts must be bench-tested to a minimum torque value of 135 pound-inches

(a) If the torque value for the tandem barrel nut is not in the minimum value, replace the tandem barrel nut.
1) Examine the torque value for the tandem barrel nuts again.

S 224-060-N00
(3) Make sure the self-locking (run-on) torque of the barrel nuts (5) is a minimum of 70 pound-inches (7.9 newton-meters) and a maximum of 600 pound-inches (67.8 newton-meters) (Fig. 413).

NOTE: These torque values are for barrel nuts that are previously used or bench-tested. New barrel nuts must be bench-tested to a minimum torque value of 135 pound-inches

(a) If the torque value for the barrel nut is not in the minimum value, replace the tandem barrel nut.
1) Examine the torque value for the barrel nuts again.

S 214-061-N00
(4) Examine the engine mounts (AMM 71-21-00/601).

S 114-062-N00
(5) Make sure the surfaces of the forward and aft engine mounts are free of the oil, grease, and other unwanted material.

S 644-063-N00

(6) Apply the antiseize compound to the shear pins (4, 12, Fig. 413).

S 214-064-N00

(7) Do a check on the wire bundles in the support beam on the fan cowl.
   (a) Make sure the wire bundle did not wear in a large area.
   (b) Make sure the wire bundle is attached correctly.

S 494-065-N00

(8) Remove the core cowl panels or install the hold-open equipment (A71032-14) for the core cowl panels as follows:

   NOTE: The installation of the hold-open equipment is optional to the removal of the core cowl panels.

   (a) If you use the bootstrap equipment (Fig. 402), do as follows:
      1) Install the aft bootstrap components (Fig. 401) as follows:
         a) Put the protection pads on the turbine exhaust sleeve (one on each side).
         b) Remove the bolts (1, 2, 3, 4, 5, 6) from the two sides of the strut.
         c) Install the top and lower aft brackets (12, 13) on the two sides of the strut.
         d) Install the forward bracket (14) on the two sides of the strut.
         e) Install the aft inboard arm (11) on the top and lower aft brackets (12, 13).

         WARNING: INSTALL THE LONGER OUTBOARD ARM ON THE OUTBOARD BRACKETS. IF YOU INSTALL THE BOOTSTRAP ARMS INCORRECTLY, THE BOOTSTRAP CAN FAIL. THIS CAN CAUSE INJURY TO PERSONS.

         f) Install the aft outboard arm (11) on the top and lower aft brackets (12, 13).
         g) Install the inboard forward brace (15) on the forward bracket (14) and the aft inboard arm (11).
         h) Install the outboard brace (15) on the forward bracket (14) and the aft outboard arm (11).
      2) Remove the screws (3) from the core cowl panels.
      3) Attach the pads (7) to the core cowl with the screws (6).
      4) Attach the braces (1) to the pads (7) with the bolts (5) and washers (4).
      5) Open the core cowl panels (Ref 71-11-06/201) and attach the braces (1) with the pins (2) to the forward bracket (14, Fig. 401).

6) Install the hold-open rods to the bracket on the core cowl panel.

(b) If you use the hold-open equipment (G71023) for the fan and core cowl, go to the step that follows which installs the hold-open equipment (G71023).

S 494-066-N00

(9) If you did not remove the fan cowl panels, install the hold-open equipment (A71030-32) for the fan cowl panels as follows:

(a) If you use the hold-open equipment for the fan cowl panels (Fig. 403), do as follows:

1) Open the fan cowl panels (AMM 71-11-04/201).
2) Assemble the hold-open equipment (1) on the ground.
3) Put the hold-open equipment (1) on the forward edge of the fan cowl panels.
4) Tighten the screw clamps (2).
5) Make sure the hold-open equipment (A71030-32) does not touch the support structure for the fan cowl.
6) Install the hold-open rods to the stow bracket on the fan cowl panels.

(b) If you use the hold-open equipment (G71023) for the fan and core cowl panels, go to the step that follow which installs the hold-open equipment (G71023).

S 014-140-N00

<u>WARNING</u>: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(10) Open the thrust reversers (AMM 78-31-00/201).

S 494-068-N00

(11) Install the hold-open equipment (A78001) for the thrust reversers (Fig. 404) as follows:

(a) Put the actuator lock (2) along the actuator rod (5).
(b) Make sure the lock yoke (7) is against the bolt (6) that attaches the actuator rod (5).
(c) Make sure the lock channel (4) is against the actuator cylinder.
(d) Put the channel clamp (3) around the actuator rod (5).
(e) Tighten the screw (8) to attach the channel clamp (3) to the actuator rod (5).
(f) Lightly close the actuator (1).

<u>NOTE</u>: When you lightly close the actuator, the load moves from the actuator to the actuator lock (2).

(g) Disengage the hold-open rod for the thrust reverser from the support.

(h) Install the hold-open rod and the support to its stowage points.

S 494-069-N00

(12) If you use the hold-open equipment (G71023) for the fan and core cowl (Fig. 405), do as follows:

(a) Install the thrust reverser tube and attached parts on the thrust reversers (View B or E).

1) Engage the hook on the thrust reverser tube to the loop on the thrust reverser.

<u>NOTE</u>: Make sure the pin on the thrust reverser engages the pin hole on the thrust reverser tube. Or make sure the pin on the thrust reverser tube engages the pin hole on the thrust reverser.

2) Engage the loop on the thrust reverser tube to the hook on the thrust reverser.

<u>NOTE</u>: Make sure the pin on the thrust reverser or on the thrust reverser tube engages the pin hole on its mate.

3) Tighten the knobs on the thrust reverser tube to attach the tube to the thrust reverser.

(b) Install the forward tube assembly on the fan cowl panel (View A or D).

1) Turn the forward tube to engage the tube end to the thrust reverser tube.

2) For the left fan cowl panel, do as follows:

a) Engage the hook on the left fan cowl tube to the loops on the fan cowl panel.

<u>NOTE</u>: Make sure the pins on the fan cowl panel engage the pin holes on the fan cowl tube.

b) Tighten the knobs on the fan cowl tube to attach the tube to the fan cowl panel.

3) For the right fan cowl panel, do as follows:

a) Engage the hooks on the fan cowl panel to the loops on the right fan cowl panel.

<u>NOTE</u>: Make sure the pins on the fan cowl tube engage the pin holes on the fan cowl panel.

b) Close the fan cowl latch.

c) Tighten the knobs on the fan cowl tube to attach the tube to the fan cowl panel.

4) Put the lockpin into the pin hole on the thrust reverser tube.

5) Install the hold-open rods on the fan cowl panel to the stow bracket on the fan cowl panel.

(c) Install the aft tube assembly on the core cowl panel (View C and F).

1) For the left core cowl, put the attachment block into the loop of the core cowl panel.

<u>NOTE</u>: Make sure the pins on the attachment block engage the pin holes on the core cowl panel.

a) Put a pin in the lockhole into the attachment block to attach the core cowl attachment to the core cowl panel.

2) For the right core cowl, install the attachment block on the cowl latch as follows:

a) Put the loop of the attachment block into the core cowl latch.

<u>NOTE</u>: Make sure the pins on the attachment block engage the pin holes on the core cowl panel.

b) Close the core cowl latch.

3) Put the aft tube into the thrust reverser tube.

4) Turn the aft tube to install the other end of the tube on the attachment block.

5) Put the lockpin into the pin hole on the thrust reverser tube.

6) Put the pin into the aft tube and the attachment block.

7) Install the hold-open rods on the core cowl panel to the stow bracket on the core cowl panel.

H. Install the Power Plant

S 494-226-N00

<u>CAUTION</u>: MAKE SURE THAT THE ENGINE CONFIGURATION AND THE ENGINE DESIGNATION ON THE ENGINE IDENTIFICATION PLATE, INSTALLED ON FLANGE C ON THE FAN CASE, AGREE WITH EACH OTHER.

(1) Install the aft bootstrap components (Fig. 401) as follows:

(a) Put the protection pads on the turbine exhaust sleeve (one on each side).

(b) Remove the bolts (1, 2, 3, 4, 5, 6) from the two sides of the strut.

(c) Install the top and lower aft brackets (12, 13) on the two sides of the strut.

(d) Install the forward bracket (14) on the two sides of the strut.

(e) Install the aft inboard arm (11) on the top and lower aft brackets (12, 13).

WARNING: INSTALL THE LONGER OUTBOARD ARM ON THE OUTBOARD BRACKETS ONLY. INCORRECT INSTALLATION OF THE BOOTSTRAP ARMS CAN CAUSE INJURY TO PERSONS AND FAILURE OF THE BOOTSTRAP.

(f) Install the aft outboard arm (11) on the top and lower aft brackets (12, 13).
(g) Install the inboard forward brace (15) on the forward bracket (14) and the aft inboard arm (11).
(h) Install the outboard brace (15) on the forward bracket (14) and the aft outboard arm (11).

S 494-071-N00
(2) Install the forward bootstrap components (Fig. 411) as follows:
(a) Remove the bolts (9) from the clamps (8).
(b) Put the forward support (7) against the forward side of the front flange of the top mount.
(c) Engage the clamp slots with the pins on the aft side of the forward support.
(d) Move the clamps (8) down to touch the lower flange of the top mount.
(e) Put the bolts (9) through the forward support holes and loosely turn the bolts into the clamps.
(f) Make sure the bottoms of the clamps (8) touch the top of the lower flange on the top mount.
(g) Tighten the bolts (9).
(h) Install the forward outboard and the inboard arms (6, 5) to the forward support and the clamp assembly (7, 8).
(i) Attach the forward load cell (10) to the forward inboard arm (5).

NOTE: Point the load cell in the aft direction.

(j) Attach the forward load cell (10) to the forward outboard arm (6).

NOTE: Point the load cell in the aft direction.

(k) Attach the forward hoists (11) to the forward load cells (10).

NOTE: Put the handle on the forward hoist in the direction of the forward load cells.

S 824-072-N00
(3) Align the transportation stand with the cradle and the power plant below the strut as follows:
(a) Put the transportation stand with the cradle and the power plant below the strut.
(b) Attach the hoists to the bootstrap equipment and cradle.

WARNING: MONITOR THE LOAD CELLS ON THE FORWARD AND AFT HOISTS. DO NOT LET THE LOAD BE MORE THAN 8000 POUNDS (3636 kg) IN EACH FORWARD LOAD CELL. DO NOT LET THE LOAD BE MORE THAN 2500 POUNDS (1136 KG) IN THE AFT LOAD CELL. DO NOT LET THE FRONT WHEELS OF THE TRANSPORTATION STAND TOUCH THE GROUND WHEN THE AFT WHEELS ARE OFF THE GROUND. IF THE LOAD IS MORE THAN THE LIMITS, OR IF ONLY THE FRONT WHEELS TOUCH THE GROUND, THE LOAD CAN FALL. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO THE POWER PLANT.

WARNING: ADD THE LOAD ON THE FORWARD BOOTSTRAPS SLOWLY AND CONTINUOUSLY. MAKE SURE THE LOAD DIFFERENCE BETWEEN THE INBOARD AND OUTBOARD BOOTSTRAPS IS LESS THAN 2000 POUNDS (909 KG) WHEN YOU LIFT THE POWER PLANT. IF THE LOAD DIFFERENCE IS MORE THAN 2000 POUNDS (909 KG), THE LOAD CAN FALL AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(c) Tighten all hoists to correct the tension on the hoists.
(d) Do these at the same time:
  1) Put a load on the forward hoists.
  2) Lift the front wheels of the transportation stand 2-3 inches off the ground.
  3) Monitor the loadcells to make sure the difference in the inboard and outboard loads is less than 2000 pounds (909 KG).
(e) Operate the aft hoists to lift the aft wheels of the transportation stand 2-3 inches off the ground.
(f) Let the position of the power plant become level and aligned below the strut.
(g) Lower the aft end of the assembly of the transportation stand, the cradle, and the power plant.
(h) Release the load from the aft hoists.
  1) At the same time, lower the forward end of the assembly of the transportation stand, the cradle, and the power plant.
(i) Release the loads from the forward hoists.

S 034-073-N00
(4) Move the cradle away from the transportation stand (Fig. 412) as follows:
(a) Loosen the bolts (2).
(b) Remove the pins (4) from the transportation stand and the cradle.

S 824-074-N00

WARNING: MONITOR THE LOAD CELLS ON THE FORWARD AND AFT HOISTS. DO NOT LET THE LOAD BE MORE THAN 8000 POUNDS (3636 kg) IN EACH FORWARD LOAD CELL. DO NOT LET THE LOAD BE MORE THAN 2500 POUNDS (1136 KG) IN THE AFT LOAD CELL. DO NOT LET THE FRONT WHEELS OF THE TRANSPORTATION STAND TOUCH THE GROUND WHEN THE AFT WHEELS ARE OFF THE GROUND. IF THE LOAD IS MORE THAN THE LIMITS OR IF ONLY THE FRONT WHEELS TOUCH THE GROUND, THE LOAD CAN FALL AND CAUSE INJURY TO PERSONS AND DAMAGE TO THE POWER PLANT.

WARNING: ADD THE LOAD ON THE FORWARD BOOTSTRAPS SLOWLY AND CONTINUOUSLY. MAKE SURE THE LOAD DIFFERENCE BETWEEN THE INBOARD AND OUTBOARD BOOTSTRAPS IS LESS THAN 2000 POUNDS (909 KG) WHEN YOU LIFT THE POWER PLANT. IF THE LOAD DIFFERENCE IS MORE THAN 2000 POUNDS (909 KG), THE LOAD CAN FALL AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

CAUTION: DO NOT LET THE POWER PLANT MOVE FORWARD, AFT, LEFT OR RIGHT WHEN YOU LIFT THE POWER PLANT FROM THE TRANSPORTATION STAND. YOU MUST KEEP AN EVEN LOAD ON THE HOISTS TO MAKE SURE THE CONNECTIONS BETWEEN THE CRADLE AND THE TRANSPORTATION STAND ARE FREE TO MOVE. FAILURE TO DO SO CAN CAUSE DAMAGE TO THE CRADLE OR TRANSPORTATION STAND.

(5) Lift the power plant until you can see the mount is aligned with the strut (approximately six inches below the strut).

NOTE: It will be necessary to move the power plant about its longitudinal axis approximately 5 to 7 degrees. You can use the forward and aft hoists to align the cradle with the power plant. You can use the forward hoists to move the cradle in the roll direction, and the forward or aft hoists to move the cradle in the pitch direction.

S 424-075-N00

(6) Connect the engine mounts (Fig. 413) as follows:

NOTE: If you will use the torque adapters (A71003-25 and -26), make sure you correct the torque wrench indication before you tighten the vertical tension bolts (AMM 20-11-00/201).

CAUTION: MAKE SURE THE FORWARD AND AFT SHEAR PINS ENGAGE AT THE SAME TIME, OR THE FORWARD PIN ENGAGES 0.10 INCH (2.5 mm) BEFORE THE AFT PIN. IF YOU DO NOT DO THIS, YOU CAN DAMAGE THE ENGINE MOUNTS.

(a) Lift the forward and aft ends of the power plant equally until the shear pins engage.

NOTE: Make sure the forward and aft shear pins engage at the same time, or the forward pin engages 0.10 inch (2.5 mm) before the aft pin.

(b) Lift the power plant until the mount surfaces are 1.00 inch or less apart.
1) Move the power plant forward, rearward, left or right if it is necessary.

CAUTION: INSTALL ONLY NEW OR EXAMINED VERTICAL TENSION BOLTS. IF YOU USE DAMAGED VERTICAL TENSION BOLTS, YOU CANNOT TIGHTEN THE VERTICAL TENSION BOLTS CORRECTLY.

CAUTION: MAKE SURE THE VERTICAL TENSION BOLTS ARE THE CORRECT LENGTH BEFORE YOU INSTALL THEM. IF YOU USE THE INCORRECT VERTICAL TENSION BOLT, DAMAGE TO THE VERTICAL TENSION BOLT AND NUT CAN OCCUR.

CAUTION: TO TIGHTEN THE VERTICAL TENSION BOLTS, YOU MUST USE A TORQUE ADAPTER ON THE TORQUE WRENCH. WHEN YOU USE THE TORQUE ADAPTER, YOU MUST CALCULATE THE VALUE TO BE SET ON THE TORQUE WRENCH. USE THE LENGTHS OF THE TORQUE WRENCH AND THE TORQUE ADAPTER, AND THE SPECIFIED TORQUE VALUE FOR THE VERTICAL TENSION BOLTS. REFER TO "TIGHTENING TECHNIQUES AND TORQUE VALUES" (AMM 70-50-00/201) TO CORRECTLY USE THE TORQUE ADAPTER. YOU MUST INSTALL THE TORQUE WRENCH ON THE TORQUE ADAPTER AT A 90 DEGREE ANGLE. YOU MUST APPLY THE FORCE ON THE TORQUE WRENCH AT A 90 DEGREE ANGLE. IF YOU DO NOT TIGHTEN THE VERTICAL TENSION BOLTS CORRECTLY, DAMAGE CAN OCCUR.

(c) Install the vertical tension bolts (1, 2 and 10 and 13) in the forward and the aft mount fitting as follows:
1) Lubricate the vertical tension bolts (1, 2 and 10 or 13) with the antiseize compound.
2) Install the vertical tension bolts (10 or 13) and countersunk washers (11) in the aft mount fitting.

3) Install the vertical tension bolts (1 and 2) and countersunk washers (3) in the forward mount fitting.
   a) Torque the bolt a small amount more than the run-on torque.

      NOTE: Let the bootstrap hold and show the load while the bolts keep the mount surfaces parallel to each other. The dynamometer indications should not change since the bootstrap holds the power plant/cradle load.

4) Lift the power plant a small amount while you monitor the dynamometer values.
   a) Initially, lift the power plant 0.25 inch (6 mm).
   b) Tighten the bolts the same amount.

      NOTE: The vertical tension bolts are a guide for the mounts, but they do not hold the power plant loads.

5) Continue to lift the power plant until the mount surfaces are 0.000 to 0.060 inch (0.00 to 1.52 mm) apart.
6) ENGINES WITH THE RIGID ENGINE MOUNTS;
   Use the A71003-25 torque equipment to tighten the vertical tension bolts (10) to 3060-3740 pound-inches (346-423 newton-meters).
7) ENGINES WITH THE VIBRATION ISOLATORS ON THE AFT ENGINE MOUNTS;
   Use the A71003-41 torque equipment to tighten the vertical tension bolts (13) to 3060-3740 pound-inches (346-423 newton-meters).
8) Use the forward adapter assembly, found in the above torque equipment set, to tighten the vertical tension bolts (1, 2) for the forward engine mounts to 4050-4950 pound-inches (458-559 newton-meters).
   a) Make sure all of the threads in the nut are engaged.
   b) Make sure all of the chamfer on the end of the bolt comes out of the nut.

S 094-076-N00
(7) Remove the cradle as follows:
   (a) Remove the quick-release pins (18, Fig. 411) from the forward supports of the power plant.
   (b) Disengage the aft handling adapters (14) from the cradle.
   (c) Lower the cradle to the transportation stand.
   (d) Install the cradle to the transportation stand with the pins (4, Fig. 412) and clamps (3).
   (e) Disconnect the hoists (2, 11) from the cradle, the aft load cells (1), the forward inboard arm (5), and the forward outboard arm (6) (Fig. 411).

(f) Remove the forward handling adapters (19) and aft handling adapters (14) from the engine.

TASK 71-00-02-404-150-N00

6. Install the Power Plant With the PT90-E

NOTE: The PT90-E installation procedure is an optional procedure to the bootstrap installation procedure, which is recommended.

A. Equipment
(1) PT90-E - Universal Engine Change System; Dendro Maskin Lift AB Lovholmsgrand 12, S-117 43 Stockholm, Sweden; or NORDEQUIP, INC., 7315 Courthouse Boulevard, Hastings, MN USA 55033
(2) A71006-79 Cradle
(3) A71030-32 Fan Cowl Hold-Open Equipment - (40 knots) (optional)
(4) A71032-14 Core Cowl Hold-Open Equipment - (40 knots) (optional)
(5) A78001-31 Thrust Reverser Hold-Open Equipment - (40 knots)
(6) G71023-52 Hold-Open Equipment - Fan and Core Cowls (20 knots) (optional)
(7) A71003-25 Torque Equipment (all rigid engine mounts)
(8) A71003-41 Torque Equipment (used only on the aft engine mounts with the vibration isolators)
(9) Protection pads - commercially available

B. Consumable Materials
(1) D00010 Antiseize Compound - Bostik Never-Seez Pure Nickel Special

C. References
(1) AMM 26-11-02/201, Engine Fire and Overheat Detector Element

(2) AMM 70-50-00/201, Standard Torque Values
(3) AMM 71-11-04/201, Fan Cowl Panels
(4) AMM 71-11-06/201, Core Cowl Panels
(5) AMM 71-21-00/601, Engine Mounts
(6) AMM 71-21-02/401, Aft Engine Mounts
(7) AMM 70-11-06/201, Fluorescent Penetrant Inspection
(8) AMM 78-31-00/201, Thrust Reverser Systems

D. Access

(1) Location Zone

411	Left Engine
421	Right Engine

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

E. Prepare the Airplane for the Power Plant Installation

S 404-232-N00

WARNING: INSTALLATION OF A RING CASE CONFIGURATION ENGINE IS NOT ALLOWED ON AN AIRPLANE THAT HAS A SEGMENTED CASE ENGINE WITH A P/N 791100-14-102 EEC INSTALLED. IF YOU DO YOU CAN CAUSE INJURY TO PERSONNEL OR DAMAGE TO THE AIRPLANE.

(1) If the engine being installed is a ring case configuration (post P&W SB PW4ENG 72-755 or production equivalent) engine, you must ensure that the other engine installed on the airplane does not have a P/N 791100-14-102 (P&W P/N 54D043) EEC. If the other engine has a P/N 791100-14-102 (P&W P/N 54D043) EEC, the EEC must be replaced and a non-SCN 11 EEC installed before the airplane can be returned to service.

S 404-233-N00

(2) If the engine being installed is a segmented case configuration engine (pre SB PW4ENG 72-755 or production equivalent) check the P/N of the EEC installed on this engine. If the EEC P/N is 791100-14-102 (P&W P/N 54D043), you must ensure that the other engine installed on the airplane is not a ring case configuration engine (post P&W SB PW4ENG 72-755 or production equivalent).

S 214-216-N00

CAUTION: DO NOT INSTALL AN ENGINE WITH A VIBRATION-ISOLATED MOUNT UNLESS YOU VERIFY THE AIRPLANE MOUNT CONFIGURATION. YOU CANNOT ALWAYS INSTALL A VIBRATION-ISOLATED ENGINE MOUNT ON AN AIRPLANE THAT HAS A CONFIGURATION FOR A RIGID ENGINE MOUNT. YOU CAN INSTALL AN ENGINE WITH A RIGID ENGINE MOUNT ON AN AIRPLANE THAT HAS THE CONFIGURATION FOR A VIBRATION-ISOLATED MOUNT. IF YOU INSTALL THE INCORRECT ENGINE MOUNT, THE ENGINE MOUNT CAN CAUSE DAMAGE TO THE ENGINE, THE CORE COWL, OR THE STRUT.

(3) SAS 050, 051, 150-154;
MTH 275, 276;
Make sure the correct aft engine mount is on the engine (AMM 71-21-02/401).

NOTE: You can install an engine with a vibration-isolated mount on an airplane with the configuration for a rigid mount if: The airplane is not in the group above or the airplane is in the group above and was reworked to SB 71-48. You can install an engine with a rigid mount on an airplane with a configuration for a vibration-isolated mount.

S 864-151-N00

(4) Make sure the airplane is in the same configuration as the power plant removal (Refer to the Prepare for the Power Plant Removal).

S 214-153-N00

(5) Make sure the card for the engine fire/overheat detection agrees with the fire detector elements on the replacement power plant (AMM 26-11-02/201).

F. Prepare the Power Plant for Installation

S 234-193-N00

(1) Get new vertical tension bolts (1, 2, and 10 or 13), or satisfactorily examined ones, or make an inspection of the old vertical tension bolts with the fluorescent penetrant (AMM 70-11-06/201).
    (a) Make sure you can apply sufficient torque on the threads of the vertical tension bolts (1, 2, and 10 or 13) to lock them when you use a satisfactory nut.

(b) Discard all vertical tension bolts with damage that you can see.

(c) Discard all vertical tension bolts with damage that you can feel with your fingernail.

S 644-154-N00

(2) Apply the antiseize compound to the threads and shanks of the vertical tension bolts (1, 2, and 10 or 13)(Fig. 413).

S 224-156-N00

(3) Make sure the self-locking (run-on) torque of the tandem barrel nuts (7) is a minimum of 70 pound-inches (7.9 newton-meters) and a maximum of 600 pound-inches (67.8 newton-meters) (Fig. 413).

NOTE: These torque values are for barrel nuts that are previously used or bench-tested. New barrel nuts must be bench-tested to a minimum torque value of 135 pound-inches

(a) If the torque value for the barrel nut is not the necessary minimum value, replace the tandem barrel nut (7).

1) Examine the self-locking torque value for the barrel nuts (7) again.

S 224-220-N00

(4) Make sure the self-locking (run-on) torque of the barrel nuts (5) is a minimum of 70 pound-inches (7.9 newton-meters) and a maximum of 600 pound-inches (67.8 newton-meters) (Fig. 413).

NOTE: These torque values are for barrel nuts that are previously used or bench-tested. New barrel nuts must be bench-tested to a minimum torque value of 135 pound-inches

(a) If the torque value for the barrel nut is not in the limits, replace the tandem barrel nut.

1) Examine the torque value for the barrel nuts again.

S 214-159-N00
(5) Examine the engine mounts (AMM 71-21-00/601).

S 114-158-N00
(6) Make sure the surfaces of the forward and aft engine mounts are free of oil, grease, and other unwanted material.

S 644-157-N00
(7) Apply the antiseize compound to the shear pins (4, 12)(Fig. 413).

S 214-160-N00
(8) Do a check on the wire bundles in the support beam on the fan cowl.
    (a) Make sure the wire bundle did not wear in a large area.
    (b) Make sure the wire bundle is attached correctly.

S 494-161-N00
(9) Remove the core cowl panels (AMM 71-11-06/201) or install the hold-open equipment (A71032-14) for the core cowl panels as follows:

NOTE: The installation of the hold-open equipment is optional to the removal of the core cowl panels.

(a) If you use the hold-open equipment (G71023) for the fan and core cowl, go to the step that follows which installs the hold-open equipment (G71023).

S 494-195-N00
(10) Remove the fan cowl panels (AMM 71-11-04/201) or install the hold-open equipment (A71030-32) for the fan cowl panels as follows:

NOTE: The installation of the hold-open equipment is optional to the removal of the fan cowl panels.

(a) If you use the hold-open equipment (Fig. 403), do the steps that follow:
    1) Open the fan cowl panels (AMM 71-11-04/201).

2) Assemble the hold-open equipment (1) on the ground.
3) Put the hold-open equipment (1) on the forward edge of the fan cowl panels.
4) Tighten the screw clamps (2).
5) Make sure the hold-open equipment does not touch the support structure for the fan cowl panel.
6) Install the hold-open rods to the stow bracket on the fan cowl panels.

(b) If you use the hold-open equipment (G71023) for the fan and core cowl panels, go to the step that follow which installs the hold-open equipment (G71023).

S 494-196-N00

(11) Install the hold-open equipment (A78001) for the thrust reversers (Fig. 404) as follows:

(a) Put the actuator lock (2) along the actuator rod (5).
(b) Make sure the lock yoke (7) is against the bolt (6) that attaches the actuator rod (5).
(c) Put the channel clamp (3) around the actuator rod (5).
(d) Tighten the screw (8) to attach the channel clamp (3) to the actuator rod (5).
(e) Lightly close the actuator (1).

<u>NOTE</u>: When you lightly close the actuator, the load moves from the actuator to the actuator lock (2).

(f) Disengage the hold-open rod for the thrust reverser from the support.
(g) Install the hold-open rod and the support to its stowage points.

S 494-197-N00

(12) If you use the hold-open equipment (G71023) for the fan and core cowl (Fig. 405), do as follows:

(a) Install the thrust reverser tube and attached parts on the thrust reversers (View B or E).

1) Engage the hook on the thrust reverser tube to the loop on the thrust reverser.

<u>NOTE</u>: Make sure the pin on the thrust reverser engages the pin hole on the thrust reverser tube. Or make sure the pin on the thrust reverser tube engages the pin hole on the thrust reverser.

2) Engage the loop on the thrust reverser tube to the hook on the thrust reverser.

<u>NOTE</u>: Make sure the pin on the thrust reverser or on the thrust reverser tube engages the pin hole on its mate.

3) Tighten the knobs on the thrust reverser tube to attach the tube to the thrust reverser.

(b) Install the forward tube assembly on the fan cowl panel (View A or D).

1) Turn the forward tube to engage the tube end to the thrust reverser tube.
2) For the left fan cowl panel, do as follows:
   a) Engage the hook on the left fan cowl tube to the loops on the fan cowl panel.

      NOTE: Make sure the pins on the fan cowl panel engage the pin holes on the fan cowl tube.

   b) Tighten the knobs on the fan cowl tube to attach the tube to the fan cowl panel.
3) For the right fan cowl panel, do as follows:
   a) Engage the hooks on the fan cowl panel to the loops on the right fan cowl panel.

      NOTE: Make sure the pins on the fan cowl tube engage the pin holes on the fan cowl panel.

   b) Close the fan cowl latch.
   c) Tighten the knobs on the fan cowl tube to attach the tube to the fan cowl panel.
4) Put the lockpin into the pin hole on the thrust reverser tube.
5) Install the hold-open rods on the fan cowl panel to the stow bracket on the fan cowl panel.

(c) Install the aft tube assembly on the core cowl panel (View C and F).

1) For the left core cowl, put the attachment block into the loop of the core cowl panel.

   NOTE: Make sure the pins on the attachment block engage the pin holes on the core cowl panel.

   a) Put a pin in the lockhole into the attachment block to attach the core cowl attachment to the core cowl panel.
2) For the right core cowl, install the attachment block on the cowl latch as follows:
   a) Put the loop of the attachment block into the core cowl latch.

      NOTE: Make sure the pins on the attachment block engage the pin holes on the core cowl panel.

   b) Close the core cowl latch.
3) Put the aft tube into the thrust reverser tube.
4) Turn the aft tube to install the other end of the tube on the attachment block.

5) Put the lockpin into the pin hole on the thrust reverser tube.
6) Put the pin into the aft tube and the attachment block.
7) Install the hold-open rods on the core cowl panel to the stow bracket on the core cowl panel.

G. Install the Power Plant with the PT90-E

S 944-227-N00

CAUTION: MAKE SURE THAT THE ENGINE CONFIGURATION AND THE ENGINE DESIGNATION ON THE ENGINE IDENTIFICATION PLATE, INSTALLED ON FLANGE C ON THE FAN CASE, AGREE WITH EACH OTHER.

(1) Put the protection pad in position on each side of the turbine exhaust sleeve.

S 424-163-N00

(2) Put the PT90-E and the power plant in the correct position below the strut.

NOTE: Move the assembly below the strut from the front end.

(a) If it is necessary, use plumb lines from the center of the engine mounts to put a mark (plumb line A) on the ground.
(b) Make a second mark (plumb line B) approximately 7 inches inboard of plumb line A.
(c) Move the hoist and the power plant into position at the front end.
(d) Use the forward and aft tow bars to control the PT90-E and the power plant into position above plumb line B while you move the hoist and the power plant.
(e) Move the hoist and the power plant until the engine mounts are approximately 4 inches forward of the engine mounts on the strut.

NOTE: The power plant and hoist will slightly move to the rear as it is lifted.

S 424-164-N00

(3) Use the control box to lift the power plant and the cradle (Fig. 414).
(a) Make sure that all the tools and mechanics necessary to install the power plant are on the PT90-E.
(b) Set the load distribution display to zero.
(c) Set the load limit to 500 pounds.
(d) Make sure the AUTOGUARD button is in the out (on) position.

CAUTION: MAKE SURE YOU LIFT THE POWER PLANT WITH THE FORWARD END LOWER THAN THE AFT END. IF YOU DO NOT DO THIS, THE TOP OF THE ENGINE FAN CASE CAN TOUCH THE THRUST REVERSER AND CAUSE DAMAGE TO EQUIPMENT.

(e) Use the control box to lift the power plant until the forward and aft engine mounts are approximately 6 inches (150 mm) from the strut interfaces.

NOTE: Make sure the aft engine mount (9) is a little higher than the forward engine mount while you lift the power plant.

(f) Use the control box to adjust the power plant in the roll (6 degrees) and pitch directions to align the engine mount-to-strut interfaces.

NOTE: Engine mounts are free to move until attached to the strut to help in alignment.

(g) Slowly operate the hoist to lift the power plant until the mount surfaces are 1.00 inch or less apart.
1) Lift the power plant very slowly and equally.
2) If it is necessary, use the control box to adjust the position of the power plant in the transverse, axial, roll, or pitch directions.

NOTE: The operator must monitor the load distribution display, and must have used the control box before, to prevent side loads on the engine mounts.

(h) Let the shear pins (4, 12) on the forward and aft engine mounts start to engage the strut.

S 424-200-N00
(4) Connect the engine mounts with the steps that follow (Fig. 413):

NOTE: If you will use the torque adapter, make sure you correct the torque wrench indication before you tighten the vertical tension bolts (Ref 70-50-00/201).

CAUTION: INSTALL ONLY NEW OR EXAMINED VERTICAL TENSION BOLTS. IF YOU USE DAMAGED VERTICAL TENSION BOLTS, YOU CANNOT TIGHTEN THE VERTICAL TENSION BOLTS CORRECTLY.

CAUTION: MAKE SURE THE VERTICAL TENSION BOLTS ARE THE CORRECT LENGTH BEFORE YOU INSTALL THEM. IF YOU USE THE INCORRECT VERTICAL TENSION BOLT, DAMAGE TO THE VERTICAL TENSION BOLT AND NUT CAN OCCUR.

CAUTION: TO TIGHTEN THE VERTICAL TENSION BOLTS, YOU MUST USE A TORQUE ADAPTER ON THE TORQUE WRENCH. WHEN YOU USE THE TORQUE ADAPTER, YOU MUST CALCULATE THE VALUE TO BE SET ON THE TORQUE WRENCH. USE THE LENGTHS OF THE TORQUE WRENCH AND THE TORQUE ADAPTER, AND THE SPECIFIED TORQUE VALUE FOR THE VERTICAL TENSION BOLTS. REFER TO "TIGHTENING TECHNIQUES AND TORQUE VALUES" (AMM 70-50-00/201) TO CORRECTLY USE THE TORQUE ADAPTER. YOU MUST INSTALL THE TORQUE WRENCH ON THE TORQUE ADAPTER AT A 90 DEGREE ANGLE. YOU MUST APPLY THE FORCE ON THE TORQUE WRENCH AT A 90 DEGREE ANGLE. IF YOU DO NOT TIGHTEN THE VERTICAL TENSION BOLTS CORRECTLY, DAMAGE CAN OCCUR.

(a) Install the vertical tension bolts (1, 2 and 10 and 13) in the forward and the aft mount fitting as follows:
 1) Lubricate the vertical tension bolts (1, 2 and 10 or 13) with the antiseize compound.
 2) Install the vertical tension bolts (10 or 13) and countersunk washers (11) in the aft mount fitting.
 3) Install the vertical tension bolts (1 and 2) and countersunk washers (3) in the forward mount fitting.
  a) Torque the bolt a small amount more than the run-on torque.

   NOTE: Let the hoist hold and show the load while the bolts keep the mount surfaces parallel to each other. The load distribution display should not change since the hoist holds the power plant/cradle load.

 4) Lift the power plant a small amount while you monitor the load distribution display.
  a) Initially, lift the power plant 0.25 inch.
  b) Tighten the bolts the same amount.

   NOTE: The vertical tension bolts are a guide for the mounts, but they do not hold the power plant loads.

5) Continue to lift the power plant until the mount surfaces are 0.000 to 0.060 inch (0.00 to 1.52 mm) apart.
6) ENGINES WITH THE RIGID ENGINE MOUNTS;
Use the A71003-25 torque equipment to tighten the vertical tension bolts (10) to 3060-3740 pound-inches.
7) ENGINES WITH THE VIBRATION ISOLATORS ON THE AFT ENGINE MOUNTS;
Use the A71003-41 torque equipment to tighten the vertical tension bolts (13) to 3060-3740 pound-inches.
8) Tighten the vertical tension bolts (1, 2) for the forward engine mounts to 4050-4950 pound-inches.
    a) Make sure all of the threads in the nut are engaged.
    b) Make sure all of the chamfer on the end of the bolt comes out of the nut.

S 024-199-N00
(5) Use the control box to lower the PT90-E and the power plant until the load distribution display is almost zero.

<u>NOTE</u>: When the wing and strut holds the weight of the power plant, you can pull the attach pins from the power plant.

S 094-165-N00
(6) Remove the aft top pins at the aft top attach points on the cradle.

S 094-198-N00
(7) Remove the pin at the aft lower attach point.

S 094-166-N00
(8) Use the control box to lower the hoist and the cradle and lift the ground pad.
    (a) Lower the hoist and cradle and adjust the transverse, axial, and roll directions to zero.

S 094-167-N00
(9) Put the brake lever in the not locked position.

S 094-168-N00
(10) Carefully move the hoist and the cradle to the rear and remove them from the area.

S 094-169-N00
(11) Remove the forward cradle adapters from the power plant.

TASK 71-00-02-844-077-N00
7. <u>Put the Airplane Back to Its Usual Configuration</u>

A. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
406	1	Packing	73-11-02	10	10
407	13	Seal	36-11-01	06	10
	15	Seal			10
	17	Packing	73-11-07	07	45
408	15	Seal	36-11-01	05	55
	16	Seal	71-11-09	01	10
	21	Seal			10

B. References
(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 31-41-00/201, Engine Indication and Crew Alerting System
(3) AMM 71-00-00/501, Power Plant
(4) AMM 71-00-03/201, Engine Preservation/Depreservation
(5) AMM 71-11-02/401, Inlet Cowl Chine
(6) AMM 71-11-04/201, Fan Cowl Panels
(7) AMM 71-11-04/401, Fan Cowl Panels
(8) AMM 71-11-06/201, Core Cowl Panels
(9) AMM 71-11-06/401, Core Cowl Panels
(10) AMM 71-11-07/501, Core Cowl Panel Latch
(11) AMM 76-11-00/501, Engine Control System
(12) AMM 78-31-00/201, Thrust Reverser System
(13) AMM 78-31-01/601, Thrust Reverser
(14) AMM 78-31-02/501, Latch Bands
(15) AMM 78-31-04/501, Tension Latches

C. Access
(1) Location Zone
411 Left Engine
421 Right Engine

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

D. Procedure

S 864-147-N00

WARNING: DO NOT KEEP ELECTRICAL POWER ON THE AIRPLANE WHEN YOU CONNECT THE FUEL AND HYDRAULIC LINES, AND THE ELECTRICAL CONNECTORS. POSSIBLE ELECTRICAL SHOCK OR IGNITION OF FLAMMABLE FLUIDS OR FUMES CAN OCCUR. THIS CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) If electrical power is on the airplane, remove electrical power (AMM 24-22-00/201).

S 434-078-N00

(2) Install the thermal anti-ice (TAI) duct (Fig. 408) as follows:
   (a) Remove the caps from the TAI duct (24).
   (b) Put the TAI duct (24) on the fan case.
   (c) Install the clamps (17, 20) with new seals (16, 21) on the TAI duct (24).
   (d) Install the bolt (22), washers (23, 19) and nut (18) in the TAI duct bracket.
   (e) Tighten the clamps (17, 20) to 85-100 pound-inches.

   NOTE: Make sure the lock bolt on the clamp does not extend more than the top of the duct.

S 434-079-N00

(3) Install the strut drain lines as follows:

NOTE: See Fig. 407 for the correct drain hose part number to install on your strut/engine combination

(a) Remove the caps from the strut drain lines.
(b) Connect the right forward mount drain (4, Fig. 407) and the left forward mount drain (1, Fig. 408).
(c) Connect the drain line (8, Fig. 407) for the main strut.
(d) Connect the right raceway drain (9, Fig. 407) and the left raceway drain (4, Fig. 408).

S 434-080-N00

(4) Install the flexible line for the fire extinguisher (Fig. 408) as follows:
(a) Remove the caps from the flexible line (2A).
(b) Attach the flexible line (2A) for the fire extinguisher.

S 434-081-N00

(5) Install the starter duct (14) on the turbine case (Fig. 407) as follows:
(a) Attach the starter duct (14) with the seals (13, 15) and the clamps (12, 16).
(b) Tighten the clamps (12, 16) to 110-115 pound-inches.

S 434-082-N00

(6) Connect the precooler inlet duct (Fig. 408) as follows:
(a) Connect the precooler inlet duct (13) with the seal (15) and the clamp (14).
(b) Tighten the clamp (14) to 115-125 pound-inches.

S 434-083-N00

(7) Connect the pneumatic hose and the static pressure hose as follows:
(a) Remove the caps from the pneumatic hose (3, Fig. 408) and the static pressure hose (3, Fig. 407).
(b) Connect the pneumatic hose (3, Fig. 408) to the precooler.
(c) Connect the static pressure hose (3, Fig. 407) for the EEC to its receptacle.

S 434-086-N00

(8) Connect the electrical connectors (Fig. 407 and 408) as follows:
(a) Remove the caps from the electrical connectors (1 and 2 on Fig. 407; 6 thru 12, and 25 on Fig. 408).
(b) Connect the electrical connectors (1 and 2 on Fig. 407; 6 thru 12, and 25 on Fig. 408) on the receptacles.

S 434-101-N00

(9) Connect the power feeder cable for the IDG to the power plant as follows (Fig. 409):
   (a) Remove the wire bundle and the hook for the power feeder from the thrust reverser.
   (b) Install the phase leads for the IDG power feeder to the terminal block with the washers and nuts (3, 4).
   (c) Tighten the nuts (3, 4) to 144-168 pound-inches (16.3-19.0 newton-meters).
   (d) Install the terminal block cover (5) with the washers and screws (7, 6).
   (e) Attach the power feeder cable (2) for the IDG to the power plant with the clamps (1).

S 434-102-N00

<u>CAUTION</u>: BE CAREFUL WITH THE HYDRAULIC SUPPLY LINE. DO NOT MAKE THE HYDRAULIC SUPPLY LINE INTO A TIGHT COIL. IF THE HOSE CLOSES AND HAS KINKS, IT WILL DECREASE THE FLUID SUPPLY. IF THE FLUID SUPPLY DECREASES, FAILURE IN THE ENGINE DRIVEN PUMP CAN OCCUR.

<u>CAUTION</u>: CLEAN THE HYDRAULIC FLUID LEAKAGE. IF THE LEAKAGE COLLECTS, THE HYDRAULIC FLUID CAN CAUSE CORROSION TO THE PART.

(10) Connect the hydraulic lines (Fig. 407) as follows:
   (a) Remove caps from the hydraulic drain line (6), the pressure line (10), and the supply line (11).

      <u>NOTE</u>: A small quantity of the fluid leakage can occur when you remove the caps.

   (b) Connect the hydraulic drain line (6).
   (c) Connect the hydraulic pressure line (10).
   (d) Connect the hydraulic supply line (11).

S 434-103-N00

(11) Connect the supply line (Fig. 407) for the primary fuel of the power plant as follows:
   (a) Remove the caps from the fuel supply line (7) and the raceway connector.
   (b) Lubricate new packing (17).
   (c) Install the packing (17) in the inner diameter groove of the raceway connector.

   <u>CAUTION</u>: DO NOT USE THE TOOLS TO TIGHTEN THE COUPLING. IF YOU TIGHTEN THE COUPLING TOO MUCH, IT CAN CAUSE DAMAGE TO THE COUPLING.

   (d) Connect the fuel supply line (32) to the raceway connector.
   (e) Tighten the coupling clockwise with your hand.

(f) Make sure the coupling teeth are locked with the receway connector teeth.
(g) Install the spray shield around the fuel supply line and the hydraulic lines with the velcro.
(h) Install the lockwire on the spray shield.

E. Put the Airplane Back to Its Usual Condition.

S 864-104-N00

(1) Supply the electrical power (AMM 24-22-00/201).

S 864-141-N00

(2) Make sure these circuit breakers on the overhead circuit breaker panel, P11, are closed:

<u>NOTE</u>: You must close these circuit breakers to supply power to the SCU. It is also necessary to close these circuit breakers to supply the ground test power to the Electronic Engine Control (EEC).

(a) 11L7 EEC/SCU PWR L ENG
(b) 11K28, EEC/SCU PWR R ENG

S 284-113-N00

(3) Make sure the fuel system does not have leakage as follows:
(a) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P6 panel:
1) 6E1, FUEL VALVES L SPAR
(b) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P6 panel:
1) 6E2, FUEL VALVES R SPAR
(c) Move the FUEL CONTROL switch to the RUN position.
(d) Put the BOOST PUMP switches to the ON position.
(e) Make sure the fuel system does not have leakage.
(f) Put the BOOST PUMP switches in the OFF position.
(g) Move the FUEL CONTROL switch to the CUTOFF position.
(h) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
1) 11D25, ENGINE FUEL CONT VLV & EEC CHAN B RESET L
(i) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
1) 11D26, ENGINE FUEL CONT VLV & EEC CHAN B RESET R

S 864-114-N00

(4) Open the supply shutoff valve for the engine driven pump (EDP) as follows:
(a) Remove the DO-NOT-OPERATE identifier and push the fire handle down to put the system back to its usual condition.

(b) Make sure the position indicator on the supply shutoff valve for the EDP moves to the OPEN position.

S 634-115-N00

(5) Do the depreservation procedure for the power plant if it is necessary (AMM 71-00-03/201).

S 864-116-N00

(6) Remove electrical power (AMM 24-22-00/201).

S 094-117-N00

(7) To remove the bootstrap equipment, refer to the Remove the Power Plant With the Bootstrap Equipment.

S 094-118-N00

(8) To remove the hold-open equipment (A78001) for the thrust reverser, refer to the Remove the Power Plant With the Bootstrap Equipment.

S 414-119-N00

(9) If you removed the fan cowl and core cowl panels, do the steps as follows:
(a) Install the core cowl panels (AMM 71-11-06/401).
(b) Install the fan cowl panels (AMM 71-11-04/401).

S 094-120-N00

(10) If you installed the hold-open equipment (G71023) for the fan cowl and core panel, refer to the Remove the Power Plant With the Bootstrap Equipment.

S 034-121-N00

(11) Remove the protection pads.

S 414-122-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(12) Close the thrust reverser (AMM 78-31-00/201).

S 414-124-N00

(13) Close the core cowl panels (AMM 71-11-06/201).

S 434-125-N00
(14) Install the core cowl fairing (8, Fig. 401) with the bolts (7, 9, 10).

S 414-126-N00
(15) Close the fan cowl panels (AMM 71-11-04/201).

S 424-206-N00

CAUTION: YOU MUST INSTALL THE INLET CHINE ON THE INBOARD SIDE OF THE INLET COWL. THE INCORRECT INSTALLATION OF THE INLET CHINE CAN INCREASE THE AERODYNAMIC DRAG.

(16) Make sure you install the inlet cowl chine on the inboard side of the inlet cowl (AMM 71-11-02/401).

S 224-128-N00
(17) Adjust the core cowl panel latches (AMM 71-11-07/501), the fan duct tension latches (AMM 78-31-04/501), and the latch bands (AMM 78-31-02/501).

S 224-129-N00
(18) Do a check of the thrust reverser to find if adjustment is necessary after the engine change (AMM 78-31-01/601).

S 444-130-N00
(19) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 034-131-N00
(20) Remove DO-NOT-OPERATE tag from the flap control lever.

S 094-132-N00
(21) Remove the tail jack.

S 714-134-N00
(22) Do the test for the engine that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

POWER PLANT - MAINTENANCE PRACTICES (PRESERVATION AND DEPRESERVATION)

1. General
   A. There are three tasks in this procedure.
      (1) The engine preservation procedure.
      (2) The depreservation procedure.
      (3) Dry the engine bearing compartment procedure.
   B. There are four different time intervals for the engine preservation:
      (1) Engine preserve for 7 days or less method.

         NOTE: The instructions for engine preservation of 7 days or less are included at the beginning of the Method I procedure.

      (2) Engine preserve for less than 60 days (Method I).
      (3) Engine preserve for more than 60 days (Method II).
      (4) New engine deliver from Pratt & Whitney engine manufacture.
   C. There are two different time intervals for the engine depreservation:
      (1) Depreservation engine that preserved for 60 days or less.
      (2) Depreservation engine that preserved for more than 60 days.
   D. For general preservation procedures.
      (1) Refer to the method shown for "New Delivered Engines" for a new engine received from Pratt and Whitney.
      (2) To preserve engines for 60 days or less, refer to "In Service Engine Going Into Storage For 60 Days Or Less (Method I)" for in service engines.
      (3) The procedure that follows are Pratt & Whitney guidelines for the protection of out-of-service engines against damage from excessive exposure to moisure and debris, and other environmental conditions during extend periods of no activity and/or storage.
      (4) This preservation procedure (SPOP 428) is a guideline for each operator to use as a baseline to determine what precautions should be exercised to give sufficient protection for the engines out-of-service for the extended periods of time. It is important that the engines should not be preserved and put into storage and forgotten.

(5) For those engines with an expired tag, transport the engine to a test cell or to an aircraft for a test run. When you transport the engine, use an approved method only to prevent damage to the engine.
(6) Use the applicable preservation procedure (Method I or Method II) that is necessary for the time that the engine is in the storage.
(7) If you are not sure how long the engine will be in storage, use more than 60 days preservation procedure (Method II).

E. Do the task to dry the engine bearing compartment for engines that are ferried and not operated for more than six (6) hours. Do this task on engines which were shutdown in flight where the engine subsequently did not turn freely.

TASK 71-00-03-622-001-N00

2. Power Plant Preservation

A. General
(1) There are three different time intervals for engine preservation: 7 days or less, less than 60 days (Method I) or more than 60 days (Method II). To determine the correct method of preservation see Fig. 201.
(a) If you do not know how long the engine will be in storage use Method II (more than 60 days).
(b) To determine the correct method of preservation see Fig. 201.

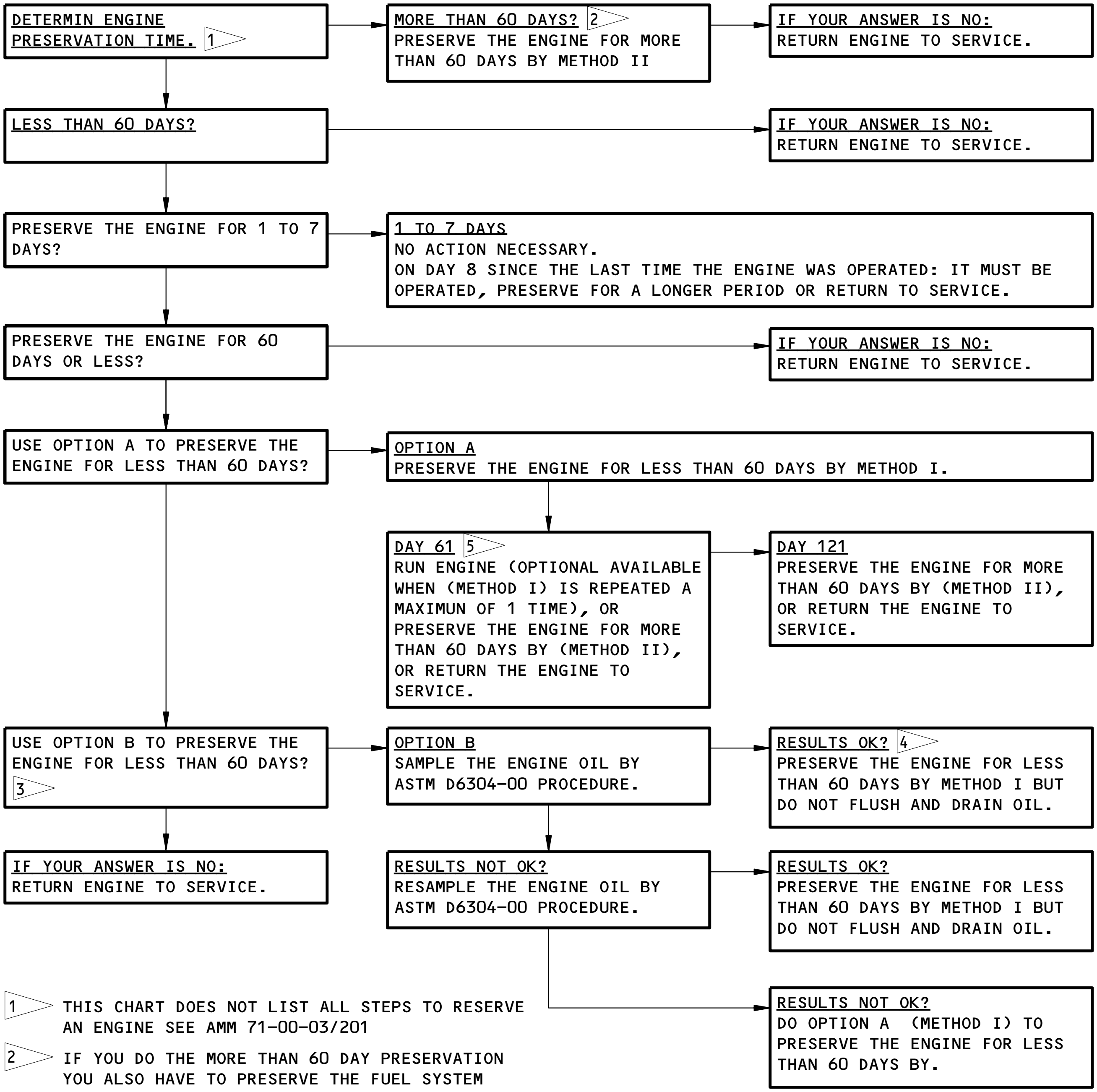
B. References
(1) AMM 12-13-01/301, Engine (Servicing)
(2) AMM 12-22-01/301, Engine (Oil Change)
(3) AMM 70-11-12/201, Degreasing Of The Engine Externals (SPOP 1)
(4) AMM 70-11-13/201, Degreasing Of Parts By Solvent Wiping (SPOP 208)
(5) AMM 71-00-00/201, Power Plant
(6) AMM 73-11-02/401, Fuel Pump Filter
(7) AMM 78-31-00/201, Thrust Reverser System
(8) AMM 79-21-05/401, Main Oil Filter
(9) AMM 79-21-10/401, Magnetic Chip Detectors

C. Access
(1) Location Zones

411	Left Engine
421	Right Engine

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine



1 THIS CHART DOES NOT LIST ALL STEPS TO RESERVE AN ENGINE SEE AMM 71-00-03/201

2 IF YOU DO THE MORE THAN 60 DAY PRESERVATION YOU ALSO HAVE TO PRESERVE THE FUEL SYSTEM (AMM 71-00-03/201)

3 THE SAMPLING OPTION IN OPTION B CAN BE DONE FOR ONLY ONE 60 DAY PERIOD.

4 IN OPTION B, OIL SYSTEM FLUSH IS NOT NECESSARY (REF. METHOD I) IF SAMPLE TEST RESULTS ARE OK.

5 IF THE ENGINE WILL STAY IN STORAGE AFTER 60 DAYS (METHOD I), YOU CAN PRESERVE THE ENGINE AGAIN AFTER THE INITIAL 60-DAY PERIOD. SEE TEXT FOR INSTRUCTIONS.

Chart to Determine Engine Preservation Time
Figure 201

D. Preservation of the Engine For Less Than 60 Days (Method I)

S 622-127-N00

(1) General

(a) This task gives instructions to preserve the engine for 60 days or less.

(b) If the engine is to be stored for more than 60 days, refer to Preservation For More Than 60 Days (Method II).

(c) If you are not sure how much time the engine will not be used, use the preservation procedure that is necessary for the longer time.

(d) It will be necessary to air motor or run the engine in a test cell to preserve the engine for more than 60 days.

S 622-128-N00

(2) Engines can be left in storage (not active) with no preservation under the following conditions.

CAUTION: AFTER A MAXIMUM OF SEVEN DAYS AND THEN AT SEVEN-DAY INTERVALS, OPERATE THE ENGIEN TO REMOVE AND CONDESATION IN THE OIL. COUNT THE TIME FROM THE FIRST DAY OF NO ENGINE ACTIVITY. IF YOU DO NOT DO THIS CONDENSAION CAN CAUSE CONTAMINATION OF THE OIL AND CAUSE DAMAGE TO PARTS IN THE OIL SYSTEM.

(a) At 7-day intervals, you must operate the engine (on wing or in a test cell) to get the main oil temperature high enough to remove any moisture or condensation.

(b) You must keep the engine inside or under cover as follows:

1) Install a tarp or PVC plastic sheet over the inlet cowl.

2) Install a tarp or PVC plastic sheet over the fan exhaust area.

3) Install a tarp or PVC plastic sheet over the engine exhaust area.

(c) The humidity must be at 60 percent or less.

(d) There are no extreme temperature changes to caues condensation on or in the engine.

S 622-129-N00

(3) Preservation of the Engine for 60 Days or Less (Method I)

(a) Determine if you must flush and drain, sample or do nothing to the engine oil system (Fig. 201).

1) If the engine was operated within the last 7-days, it is not necessary to flush and drain or sample the engine oil system.

2) If you sample the engine oil by the ASTM D6304-00 procedure and the result are OK, it is not necessary to preserve the oil system. This is for one 60-day peoiod only.

3) If you sample the engine oil by the ASTM D6304-00 procedure and the result are NOT OK, do a re-sample.
   a) If the results of the re-sample are OK, then it is not necessary to flush and drain the oil system.
   b) If the results of the re-sample are NOT OK, then it IS necessary to flush and drain the oil system.

(b) Flush and drain the oil system as follows:

<u>CAUTION</u>: IT IS RECOMMENDED THAT THIS PROCEDURE BE ACCOMPLISHED IN A TEST CELL OR SIMILARLY CLEAN AND PROTECTED AREA TO MINIMIZE NOISE, SAFETY HAZARDS AND POTENTIAL DAMAGE TO ROTATING, AIR FLOWING MACHINERY. CHOCKS OR SIMILAR RESTRAINT OF TRANSPORT STANDS ARE ALSO RECOMMENDED.

1) Drain the engine oil as follows:
   a) Remove the magnetic chip detector assemblies and valve assemblies from the main gearbox and the oil tank (AMM 79-21-10/401). Let the oil drain into containers.
   b) Remove the main oil filter (AMM 79-21-05/401). Let the oil drain into containers for approximately 1/2 hour.
   c) Install a new oil filter (AMM 79-21-05/401).
   d) Install the magnetic chip detector assemblies and valve assemblies (AMM 79-21-10/401).
2) Fill and service the oil tank (AMM 12-13-01/301).
3) Install the starter (if not previously installed). Be sure the starter is serviced.
4) For engines that cannot be started and operated, motor the engine with the starter at a starter inlet air pressure of 15 psig (103.4 kPa) minimum. Make sure that the fan (LPC) is turning during motoring. If necessary, increase the starter inlet air pressure to turn the fan (LPC). The maximum starter inlet air pressure is 50 psig (344.7 kPa). Continue to motor the engine for 5 minutes. This will flow the oil through the engine. Be sure not to run more than the starter operation time limits.
5) For engines that can be started and operated, ground run the engine (AMM 71-00-00/201).
6) Remove the drain plugs from the bottom of the oil tank and bottom of the gearbox. Allow the engine oil to drain to a slow drip (approximately 1/2 hour). Reinstall the drain plugs.
7) Remove any accessory drive pad covers from the main gearbox. Spray the drive pads with engine oil (P03-001). Install any removed covers.
8) Write the date of preservation on a tag and attach it to the oil filler cap.

(c) Change the starter oil (AMM 12-13-02/301).

(d) Preserve the main gearbox as follows:

CAUTION: DO NOT SPRAY PRESERVATIVE OIL (P03-002) IN THE ENGINE GAS PATH AS POSSIBLE DIRT DEPOSITION ON THE BLADES AND VANES WILL REDUCE ENGINE EFFICIENCY.

CAUTION: HYDRAULIC FLUID CAN SERIOUSLY CORRODE THE MAIN GEARBOX HOUSING DURING PROLONGED PERIODS OF INOPERATION. ANY HYDRAULIC FLUID SPILLED ON THE MAIN GEARBOX HOUSING SHOULD BE IMMEDIATELY CLEANED OFF WITH A TRICHLORETHYLENE SOAKED CLOTH.

1) Examine the gearbox for hydraulic fluid on the gearbox housing. If you see the hydraulc fluid, you must remove it from the housing.
2) If necessary, use a rag and clean the housing by Degreasing of Engine Externals (SPOP 1) or Degreasing of Parts by Solvent Wiping (SPOP 208).
3) If any of the accessories are removed from the main gearbox housing, spray engine oil (P03-001) on the gearbox drive pads.
4) Install accessory gearbox covers on the gearbox.

(e) Seal the engine for storage as follows:
1) Install a cover, tarp of PVC plastic sheet over the engine intake area.
2) Install a cover, tarp of PVC plastic sheet over the engine exhaust area.
3) If possible, store the engine inside a building.

(f) If the engine will stay in storage for more than the 60 day limit, do the above steps again to store the engine another 60 days.

(g) Make a record for each engine as follows:
1) Record the method of the preservation.
2) Record the date of the preservation.
3) Record that the oil system is drained.

E. Preservation of the Engine For More Than 60 Days (Method II)

S 622-130-N00

(1) General
(a) This task gives instructions to preserve the engine when it is stored for more than 60 days.
(b) This task gives the instructions to preserve in-service engines (on-wing or off-wing) for a storage period more than 60 days.
(c) It will be necessary to air motor or run the engine in a test cell to preserve the engine for more than 60 days.

S 622-142-N00

(2) Equipment
(a) Special Tools
1) CTE 3160 Cart, Preservation or Equipment
2) PWA 85433 Adapter, Fuel Preserve, Fuel Pump Inlet
3) PWA 85451 Adapter, Fuel Preserve, Fuel Flowmeter Outlet

S 622-143-N00
(3) Consumable Materials
(a) PWA 521B Oil, Engine (P03-001)
(b) PWA 586 Antigalling, Compound (P06-003)
(c) PMC 9852 Lubricating, Oil (P03-002)
(d) PMC 9609 White, Patrolatum (P06-002)
(e) SPMC 214 Agent, Dehydrating (Desiccant) (P15-001)

S 622-144-N00
(4) Expendable Parts
(a) Oil Filter Element
(b) Fuel Filter Element
(c) Packings

S 622-131-N00
(5) Procedure
(a) Preserve the engine oil system as follows:
1) Drain the engine oil as follows:
a) Remove the magnetic chip detector assemblies and valve assemblies from the main gearbox and the oil tank (AMM 79-21-10/401). Let the oil drain into containers.
b) Remove the main oil filter (AMM 79-21-05/401). Let the oil drain into containers for approximately 1/2 hour.
c) Install a new oil filter (AMM 79-21-05/401).
d) Install the magnetic chip detector assemblies and valve assemblies (AMM 79-21-10/401).
2) Fill and service the oil tank (AMM 12-13-01/301).
3) Ground run the engine (optional to motor procedure).
a) Start the engine (AMM 71-00-00/201). Engine Starting, Procedure (Normal). Set minimum idle and hold for 5 minutes.
b) Set power at 1.13 - 1.14 EPR and hold for 5 minutes after main oil temerature has reached 220°F (104°C) or more. Continue to operate the engine for 5 minutes.
c) Decrease power setting to minimum idle and hold for 5 more minutes.
d) Do an engine shutdown by the Normal Engine Shutdown Procedure (AMM 71-00-00/201).
e) For engines that cannot be started and operated, motor the engine with the starter inlet air pressure of 15 psig (103.4 kPa) minimum. Make sure that the fan (LPC) is turning during motoring. If necessary increase the starter inlet air pressure to turn the fan (LPC). The maximum starter inlet air pressure is 50 psig (344.7 kPa). Continue to motor that engine for five minutes. This will flow the oil through the engine. Be sure not to run more than the starter operation time limits.

4) Motor the engine by on-wing or test cell (Method A , an optional to engine operation):

a) Dry motor the engine with the starter for three minutes or start the engine and run at idle.

NOTE: When you dry motor the engine, the fan (LPC) must turn, This is necessary to get oil through all of the engine oil system.

b) Do not drain the engine oil until after you preserve the fuel system.

5) Dry motor the engine in the Transportation Stand or off-wing (Method B, an optional to engine operation).

NOTE: You can use this method for engine off-wing motoring when a test cell is not available to test the engine.

CAUTION: MAKE SURE THAT THE ENGINE IS CORRECTLY INSTALLED IN THE DOLLY STAND AND THE WHEELS OF THE STAND ARE LOCKED.

CAUTION: TO PREVENT DAMAGE TO THE STARTER, DO NOT OPERATE THE STARTER FOR MORE THAN THE STARTER TIME LIMIT.

a) Remove the engine hydraulic pump (AMM 72-61-07/401)

b) Connect the external supply pressure source to the starter air valve. A standard aircraft pneumatic start cart can be used.

NOTE: You can use a locally manufactured coupling to

connect the external supply pressure source to the starter air valve.

c) If you remove the main gearbox accessories, make sure the pad covers and gaskets are installed.

d) Put a cap on the pad cavity drains to prevent the loss of the engine oil.

e) Make sure that the fuel and oil system lines are not disconnected.

f) If necessary, connect the fuel and oil system lines.

g) Use a wrench and extension to manually open the starter air valve.

WARNING: DO NOT TRY TO TURN THE FAN ROTOR BY HAND WITHOUT THE USE OF HEAVY PROTECTIVE GLOVES. MAKE SURE YOU HAVE SAFE, FIRM FOOTING. USE CARE TO PREVENT PERSONAL INJURY.

h) Dry motor the engine with the starter for 3 minutes (optional to engine operation). If necessary, increase the starter inlet air pressure to turn the fan (LPC). The maximum starter inlet air pressure is 50 psi (344.7 kPa).
i) When you dry motor the engine, the fan (LPC) must turn. This is necessary to get oil through all of the engine oil system. Be careful not to run more than the starter operation time limits.
j) Stop motoring the engine and permit the engine to come to a full stop.
k) Do not drain the engine oil until after you preserve the fuel system.

6) Analyze engine oil for water content as follows:
a) Take 4 oz or 100 ml sample of engine oil.
b) Conduct Karl Fisher ASTM D1744 Water Analysis to determine water content in oil.
c) If water content is above 800 parts per million (ppm) either by weight or volume, replace engine oil with new uncontaminated oil (AMM 12-13-01/301).

NOTE: Maximum allowable amount of water in new and used PWA-521B Type 2 synthetic oils in engine is 800 ppm.

7) Analyze engine oil for acid content as follows:
a) Take 4 oz or 100 ml sample of engine oil.
b) Use ASTM D664 Total Acid Number (TAN) (titrated to PH 11.0) analysis to compare acid content of oil.
c) Determine TAN for batch of new oil of type being used to service engines.

NOTE: PWA-521B Type 2 synthetic oils vary in TAN by brand and manufacturer.

d) Determine TAN for engine oil sample.
e) If TAN for engine oil sample is more than 0.2 above TAN determined for a batch of new oil, then engine oil is considered to have degraded and should be replaced with new oil having an acceptable TAN.

8) If either water or acid content was over limits, replace oil (AMM 12-13-01/301). Then motor the engine to distribute oil throughout the system (AMM 71-00-00/201).
   a) Dry motor the engine with the starter for 3 minutes (optional to engine operation). If necessary, increase the starter inlet air pressure to turn the fan (LPC). The maximum starter inlet air pressure is 50 psi (344.7 kPa).
   b) When you dry motor the engine, the fan (LPC) must turn. This is necessary to get oil through all of the engine oil system. Be careful not to run more than the starter operation time limits.
   c) Stop motoring the engine and permit the engine to come to a full stop.
9) Do not drain the engine oil until after you preserve the fuel system.

(b) Fuel System Preservation - Pressure Feed Method to Preserve the Engine Fuel System (Optional to Gravity Feed Method)
1) Drain the fuel system as follows:
   a) Remove the lockwire and drain plugs for the FP1 and FP3 ports of the fuel pump. Let the fuel drain into a 5-U.S. gallon (19 liters) fluid drain container (Fig. 202).
2) If installed, disconnect the main fuel supply line as follows:
   a) Remove the four bolts and washers that attach the line to the pump (Fig. 202).
   b) Disengage the line and remove the gasket.
3) Remove the fuel pump filter (AMM 73-11-02/401).
4) Install the new fuel pump filter (AMM 73-11-02/401).
5) Install the PWA 85451 adapter to the fuel flowmeter as follows:
   a) Remove the lockwire and eight bolts that attach the rear fuel flowmeter support. Remove the support (Fig. 202).
   b) Move the transfer tube rearward into the fuel distribution valve strainer cover. Remove the four bolts and washers that attach the cover to the valve. Remove the cover and transfer tube together as a unit.
   c) Install the PWA 85451 adapter with the packing removed from the transfer tube and the four bolts to the fuel flowmeter outlet. Tighten bolts (Fig. 202).
   d) Attach a hose to the adapter. Put the other end in a container with a minimum capacity of 5 U.S. gallons (19 liters).
6) Install the PWA 85433 adapter with the gasket and remove from the main fuel line and the four bolts to the fuel pump inlet. Tighten bolts (Fig. 202).

7) Install the two drain plugs with new packings, lubricated with white petrolatum (P06-002). Torque the plugs to 45 - 55 lb-in. (5.084 - 6.214 N.m). Safety the plugs with lockwire.

CAUTION: BE SURE THE PRESERVATION CART HAS FILTERS OR STRAINERS OF NO COARSER MESH THAN USED IN THE ENGINE FUEL SYSTEM.

DO NOT SPRAY PRESERVATION OIL (P03-002) INTO THE ENGINE GASPATH. THE OIL CAN CAUSE UNWANTED MATERIAL TO STICK TO THE BLADES AND VANES. REDUCED ENGINE PERFORMANCE CAN RESULT.

MAKE SURE THE ENGINE OIL SYSTEM HAS THE CORRECT AMOUNT OF OIL IN THE SYSTEM OR DAMAGE TO THE ENGINE CAN OCCUR.

8) Attach the pressure hose of the CTE 1160 fuel accessory preservation cart assembly, or equivalent, to the PWA 85433 adapter on the fuel pump inlet port.
9) Make sure the preservation cart is away from the engine inlet, exhaust and fan discharge area(s).

CAUTION: MAKE SURE THE AIRCRAFT MAIN FUEL SUPPLY LINE VALVE IS CLOSED BEFORE YOU WET MOTOR THE ENGINE. IF YOU DO NOT CLOSE THE VALVE, FUEL WILL FLOW FROM THE DISCONNECTED MAIN FUEL SUPPLY LINE.

10) Make sure the fuel spar valve is closed.
11) Use the cart and flush lubricating oil (P03-002), at a pressure of 5 - 25 psig (34.5 - 172.4 kPa) and at 60°F (16°C) minimum, and wet motor the engine (AMM 71-00-00/201) until approximately 2 U.S. gallons (8 liters) are discharged into the fluid drain container.
12) Stop the wet motor and the pump on the fuel accessory preservation cart and disconnect the cart and let the system drain.
13) Remove the adapters and gasket from the rear of the fuel flowmeter and the fuel pump inlet port.
14) Connect the main fuel supply line as follows:
    a) Install a new gasket and the main fuel supply line flange to the fuel pump port.
    b) Install the four bolts and washers. Torque the bolts to 180 - 220 lb-in. (20.338 - 24.856 N.m).
15) Install the fuel flowmeter transfer tube and rear support as follows:
    a) Install two new packings lubricated with white petrolatum (P06-002), to the transfer tube. Install the transfer tube to the fuel distribution valve strainer cover.

b) Install a new packing, lubricated with white petrolatum (P06-002), to the strainer cover. Install the cover and transfer tube to the fuel distribution valve and attach with the four bolts, lubricated with engine oil (P03-001), and washers. Torque the bolts to 30 - 33 lb-in. (3.390 - 3.728 N.m).

c) Slide the transfer tube forward and engage the fuel flowmeter and dowel pin. Place the support in position and align the brackets. Install the eight bolts, lubricated with engine oil (P03-001).

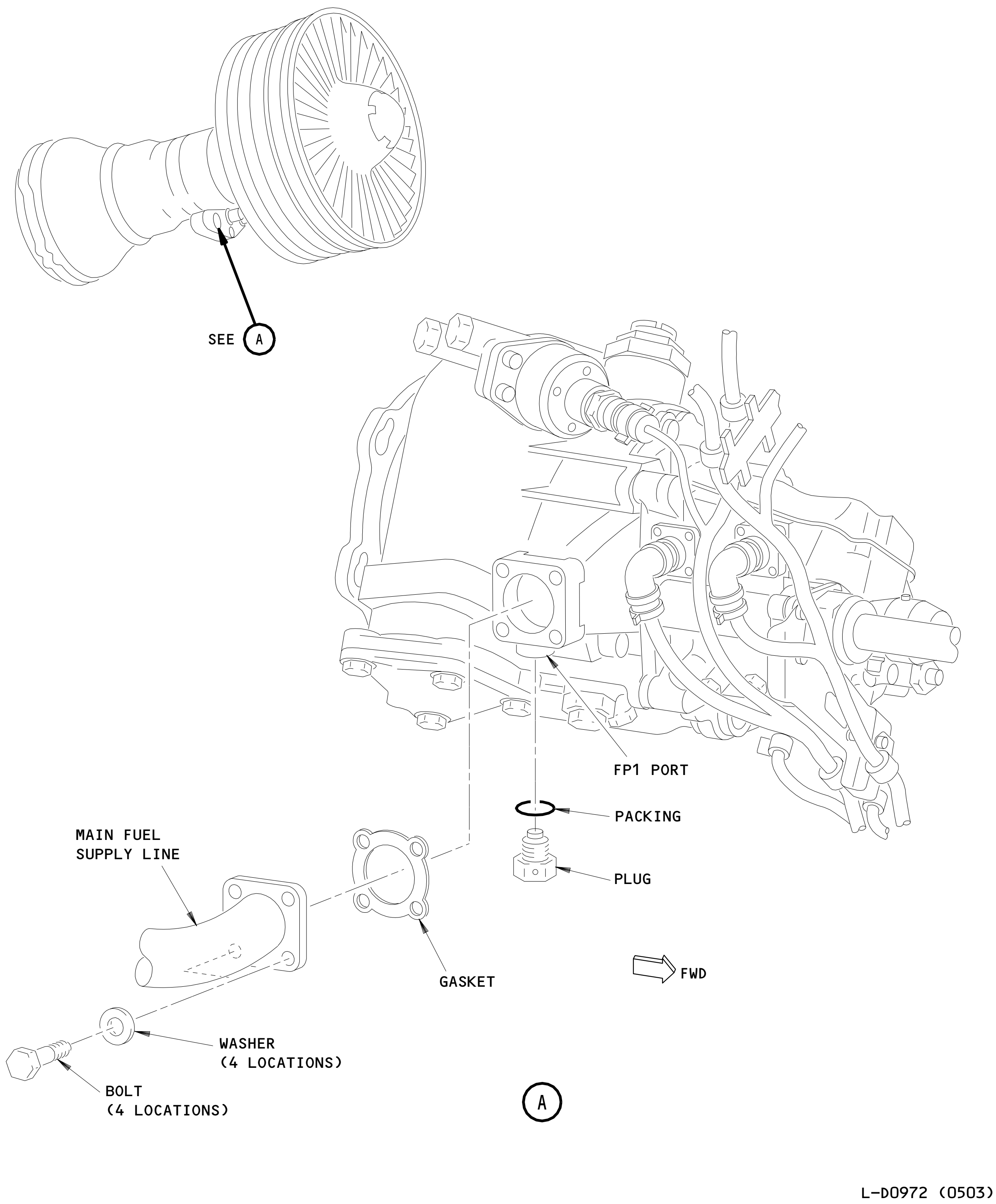
NOTE: Install the drilled head bolts to the front.

d) Torque the eight bolts to 85 - 95 lb-in. (9.604 - 10.734 N.m). Safety the four bolts with lockwire to the front four bolts.

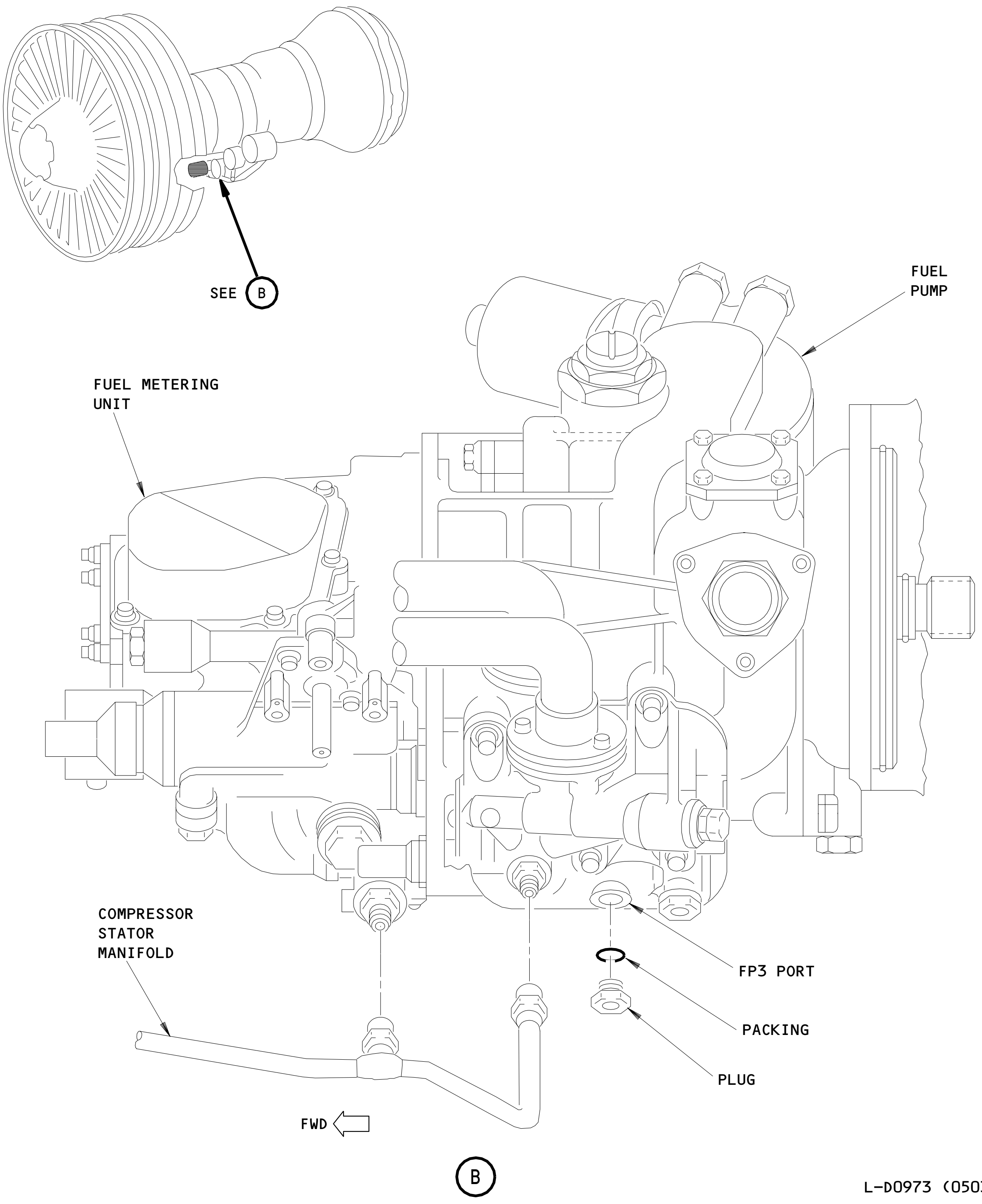
16) Write the date and the method of preservation on a tag and attach it to the fuel metering unit.

(c) Fuel System Preservation - Gravity Feed Method to Preserve the Engine Fuel system (Optional to Pressure Feed Method)

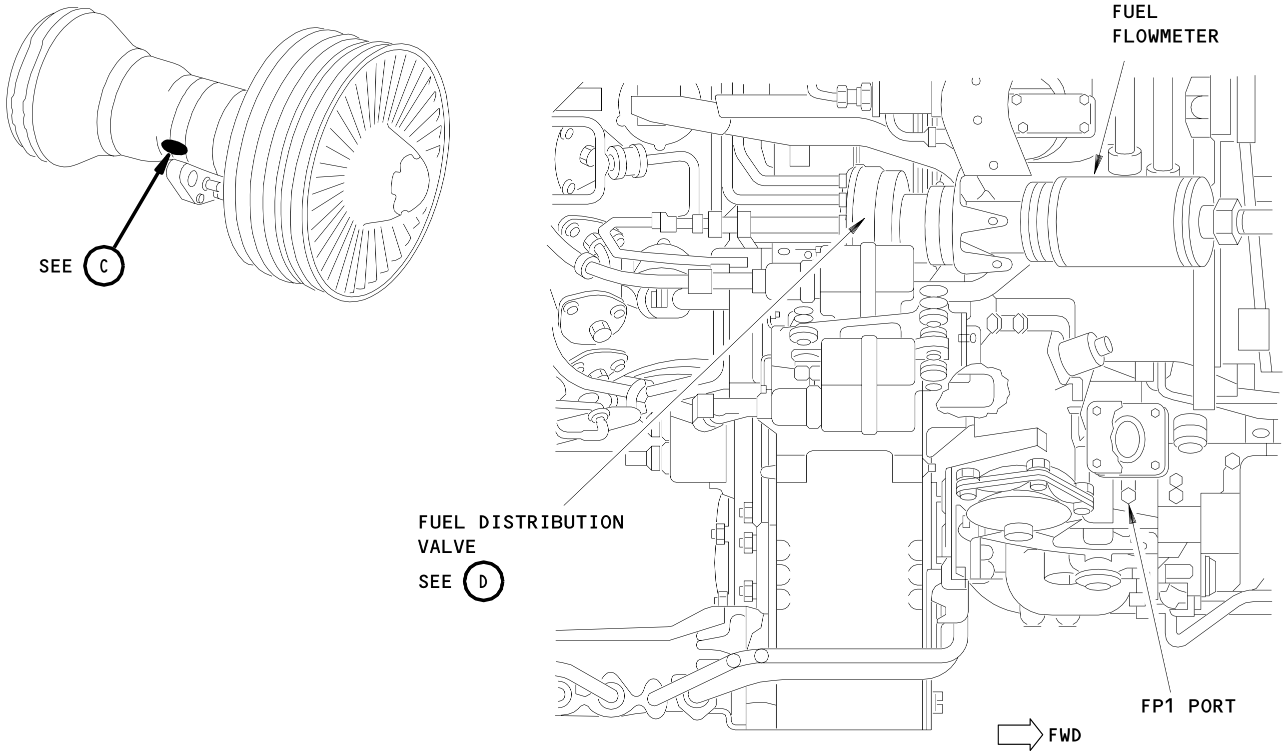
1) Drain the fuel system as follows:
   a) Remove the lockwire and drain plugs for the FP1 and FP3 ports of the fuel pump. Let the fuel drain into a 5-U.S. gallon (19 liters) fluid drain container (Fig. 202).
2) If installed, disconnect the main fuel supply line as follows:
   a) Remove the four bolts and washers that attach the line to the pump (Fig. 202).
   b) Disengage the line and remove the gasket.
3) Remove the fuel pump filter (AMM 73-11-02/401).
4) Install the new fuel pump filter (AMM 73-11-02/401).
5) Install the PWA 85451 adapter to the fuel flowmeter as follows:
   a) Remove the lockwire and eight bolts that attach the rear fuel flowmeter support. Remove the support (Fig. 202).
   b) Move the transfer tube rearward into the fuel distribution valve strainer cover. Remove the four bolts and washers that attach the cover to the valve. Remove the cover and transfer tube together as a unit.

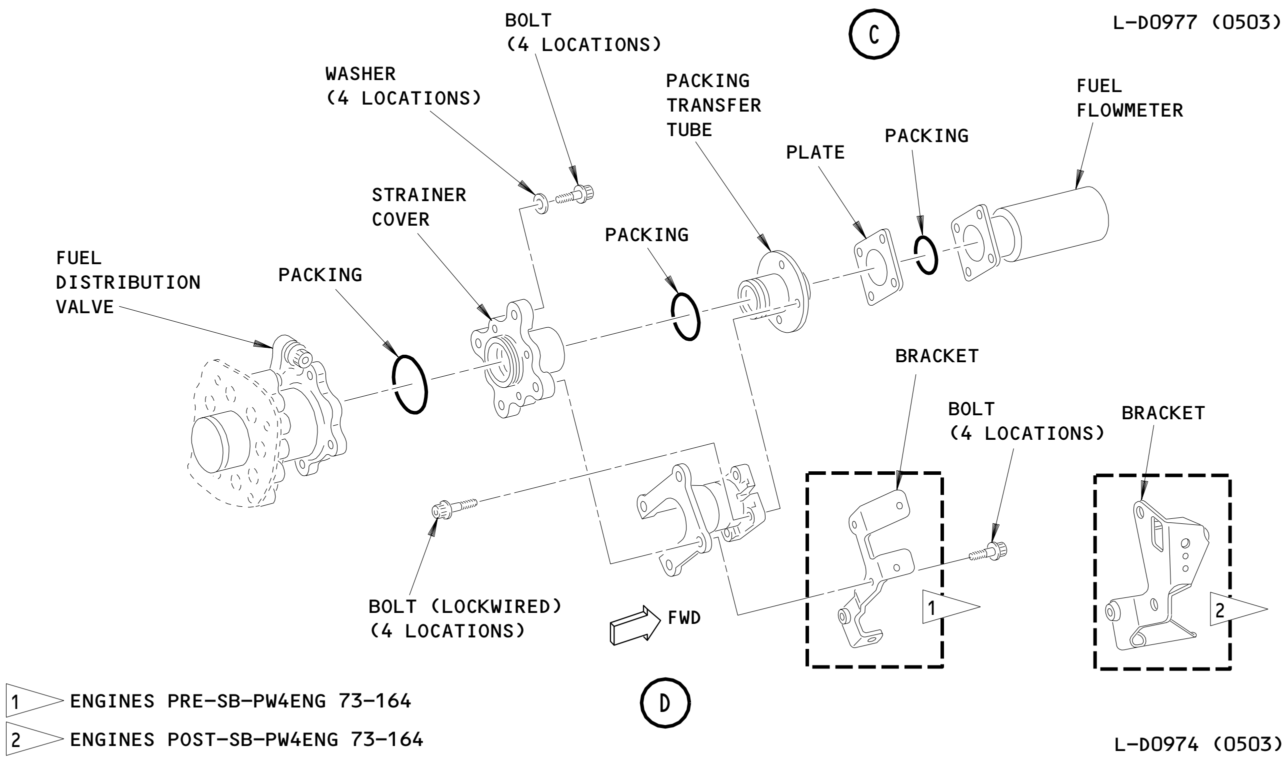


Fuel System Preservation
Figure 202 (Sheet 1)

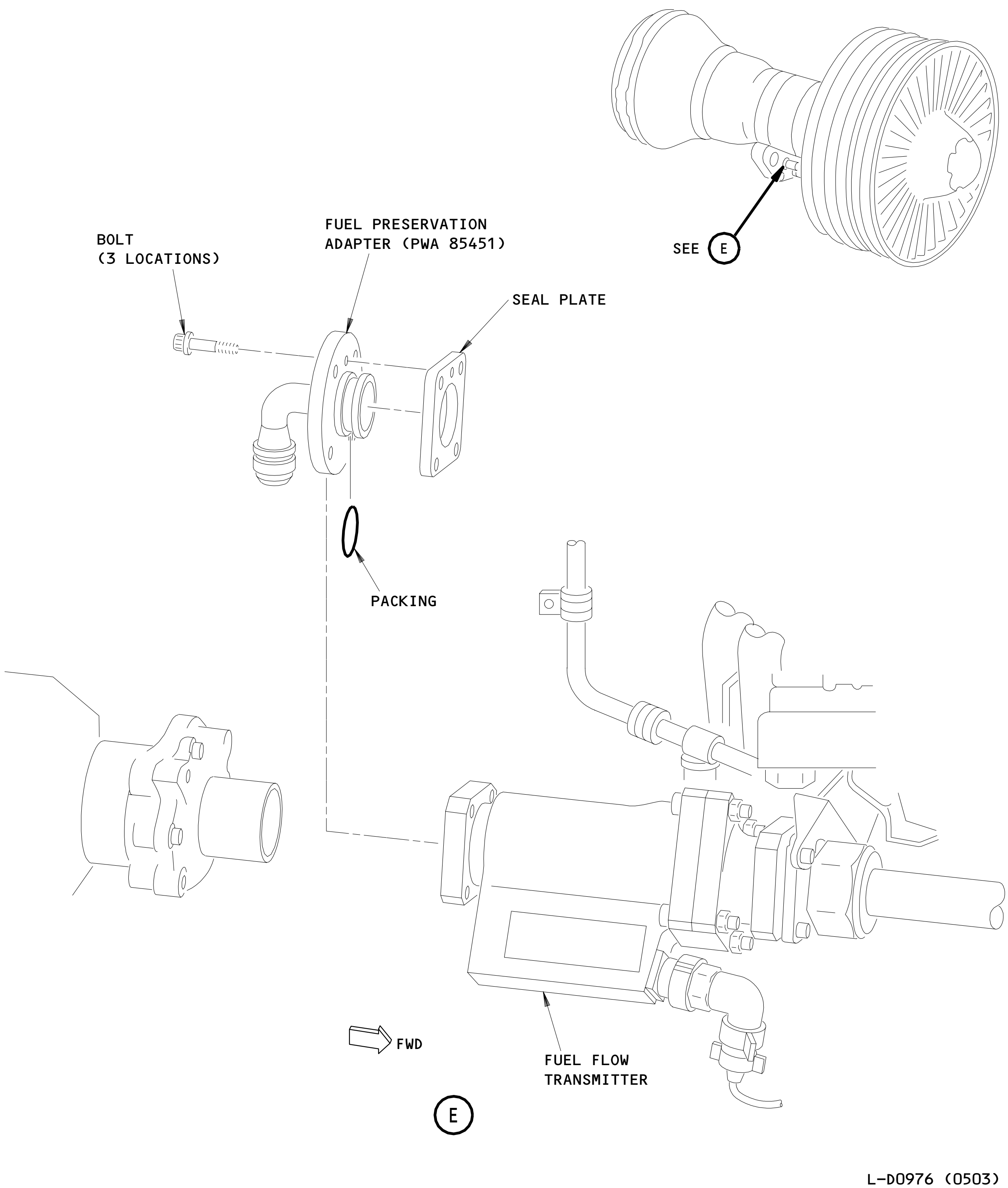


Fuel System Preservation
Figure 202 (Sheet 2)

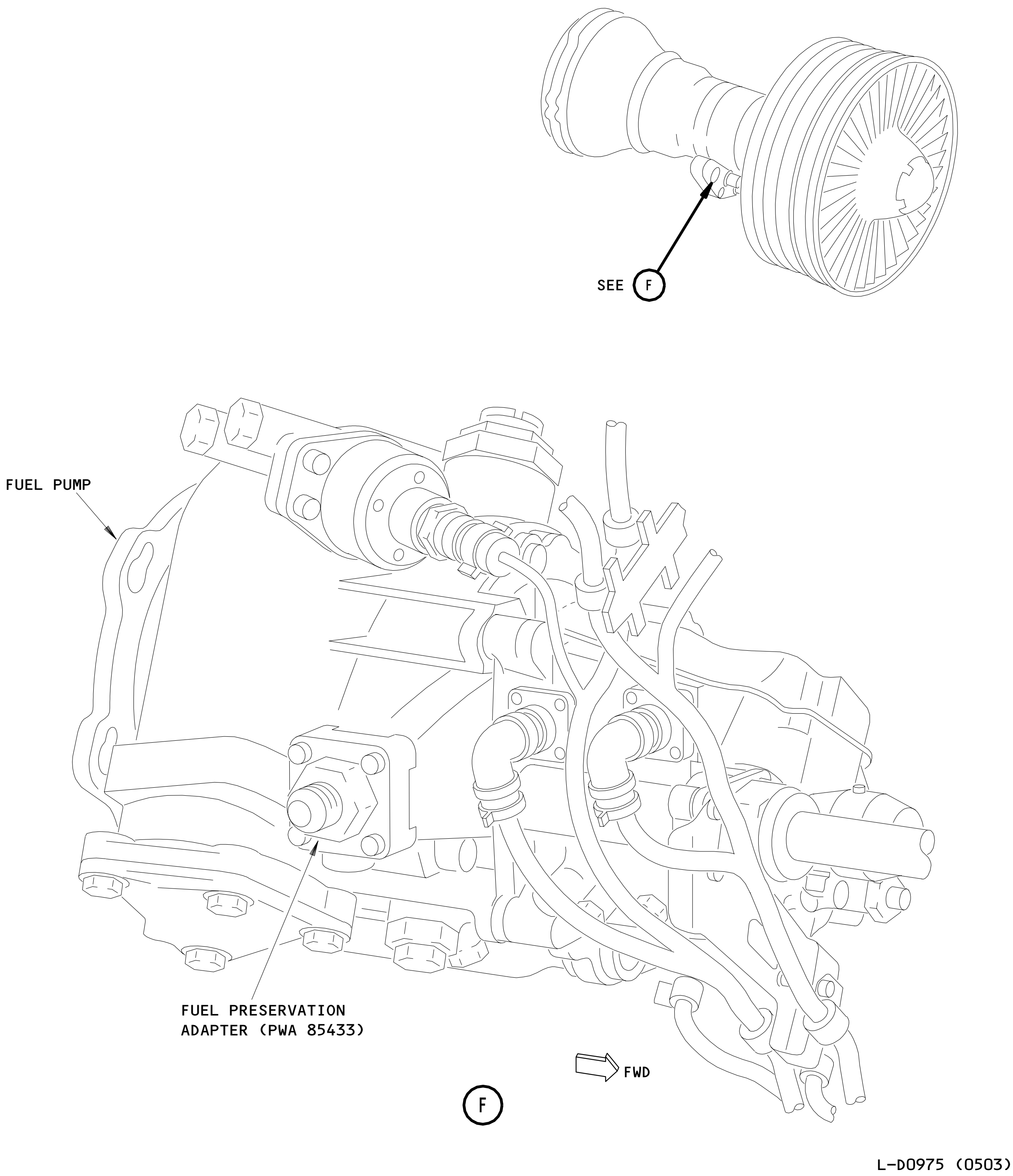




Fuel System Preservation
Figure 202 (Sheet 3)



Fuel System Preservation
Figure 202 (Sheet 4)



Fuel System Preservation
Figure 202 (Sheet 5)

6) Install the PWA 85451 adapter with the packing removed from the transfer tube and the four bolts to the fuel flowmeter outlet. Tighten bolts (Fig. 202).
7) Attach a hose to the adapter. Put the other end in a container with a minimum capacity of 5 U.S. gallons (19 liters).
8) Install the PWA 85433 adapter with the gasket removed from the main fuel line and the four bolts to the fuel pump inlet. Tighten bolts (Fig. 202).
9) Install the two drain plugs with new packings, lubricated with white petrolatum (P06-002). Torque the plugs to 45 - 55 lb-in. (5.084 - 6.214 N.m). Safety the plugs with lockwire.

CAUTION: DO NOT SPRAY LUBRICATING OIL (P03-002) INTO THE ENGINE GASPATH. THE OIL CAN CAUSE UNWANTED MATERIAL TO STICK TO THE BLADES AND VANES. REDUCED ENGINE PERFORMANCE CAN RESULT.

MAKE SURE THE ENGINE OIL SYSTEM HAS THE CORRECT AMOUNT OF OIL IN THE SYSTEM OR DAMAGE TO THE ENGINE CAN OCCUR.

10) Use a clean dry tank with a capacity of 5 - 10 U.S. gallons (19 - 38 liters) and assemble a gravity feed preservation tank as follows:
    a) The tank must be vented and have a fitting at the bottom to attach a valve and hose.

    NOTE: The hose must be 0.5 inch (12.70 mm) inside diameter (ID) minimum, approximately 20 feet (6.10 m) in length, and must not collapse under negative pressure.

    b) Install a shutoff valve to the bottom of the tank with an in-line 40-micron filter.
    c) Attach the hose to the PWA 85433 adapter on the fuel pump inlet port.
    d) Position the tank away from the engine fan discharge air and 5 feet (1.52 m) minimum above the fuel pump inlet.
    e) Shut the valve at the bottom of the tank.
    f) Fill the tank with 5 U.S. gallons (19 liters) minimum of lubricating oil (P03-002).

CAUTION: MAKE SURE THE AIRCRAFT MAIN FUEL SUPPLY LINE VALVE IS CLOSED BEFORE YOU WET MOTOR THE ENGINE. IF YOU DO NOT CLOSE THE VALVE, FUEL WILL FLOW FROM THE DISCONNECTED MAIN FUEL SUPPLY LINE.

11) Open the valve at the bottom of the tank and wet motor the engine (AMM 71-00-00/201), until approximately 2 U.S. gallons (8 literws) of flushing oil comes out of the drain adapter and into the fluid drain container.
12) Stop the wet motor and close the valve at the bottom of the tank.
13) Disconnect the hose and let the fuel system drain.
14) Remove the adapters and gasket from the rear of the fuel flowmeter and the fuel pump inlet port.
15) Connect the main fuel supply line as follows:
    a) Install a new gasket and the main fuel supply line flange to the fuel pump port.
    b) Install the four bolts and washers. Torque the bolts to 180 - 220 lb-in. (20.338 - 24.856 N.m).
16) Install the fuel flowmeter transfer tube and rear support as follows:
    a) Install two new packings, lubricated with white petrolatum (P06-002), to the transfer tube. Install the transfer tube to the fuel distribution valve strainer cover.
    b) Install a new packing, lubricated with white petrolatum (P06-002), to the strainer cover. Install the cover and transfer tube to the fuel distribution valve and attach with the four bolts, lubricated with engine oil (P03-001), and washers. Torque the bolts to 30 - 33 lb-in. (3.390 - 3.728 N.m).
    c) Slide the transfer tube forward and engage the fuel flowmeter and dowel pin. Place the support in position and align the brackets. Install the eight bolts, lubricated with engine oil (P03-001).

       NOTE: Install the drilled head bolts to the front.

    d) Torque the eight bolts to 85 - 95 lb-in. (9.604 - 10.734 N.m). Safety the eight bolts with lockwire to the front four bolts.
17) Write the date and the method of preservation on a tag and attach it to the fuel metering unit.

18) If engine is on the wing, use Method II.

NOTE: Every 60 days, examine the humidity indicators of preserved engine whether the engine is stored outside or inside. If relative humidity is more than 40 percent, engine should be depreserved and represerved by Preserve the Engine for Relative Humidity method.

(d) Preserve the gearboxes as follows:

CAUTION: DO NOT PERMIT HYDRAULIC FLUID TO STAY ON THE MAIN GEARBOX DURING THE PRESERVATION TIME. THE HYDRAULIC FLUID CAN CAUSE CORROSION AND DAMAGE TO THE BEARBOX HOUSING.

1) Examine the gearbox for hydraulic fluid on the gearbox housing. If you see the hydraulic fluid, you must remove it from the housing.
2) If necessary, use a rag and clean the housing by degreasing of engine externals (SPOP 1) (AMM 70-11-12/201), or by degreasing of parts by solvent wiping (SPOP 208) (AMM 70-11-13/201).
3) If any of the accessories are removed from the main gearbox housing, spray engine oil (P03-001) on the gearbox drive pads.
4) Install accessory gearbox covers on the gearbox.

(e) Preserve the engine for relative humidity, as follows:

NOTE: The relative humidity must be 40 percent or less inside the engine during the preservation time for optional corrosion prevention.

1) Make sure that all of the above steps are completed.
2) Install the dehydrating agent (Desiccant) as follows:

CAUTION: DO NOT PUT THE DEHYDRATING AGENT (DESICCANT) NEAR FAN OR TURBINE BLADES BECAUSE THE ROTATION OF THE BLADES CAN CAUSE THE DESICCANT BAGS TO TEAR.

a) Open the engine covers.
b) Put 25 - 125 lbs (11.34 - 56.70 kg) of dehydrating agent in the bottom of the engine bag or shipping container.

NOTE: The bags of Dehydrating Agent (Dessicant) in the engine must be in a position that will not cause the bags to tear if the fan or turbine blades rotate.

NOTE: It is important to maximize the surface area of each bag exposed to the air, therefore, to get the best absorption of moisture, do not put the bags on top of each other.

c) Put relative humidity indicators inside the inlet and exhaust areas.

3) Seal the engine for storage as follows:
   a) Seal all the engine openings. Install a tarp or PVC plastic sheet over the intake cowl, fan exhaust area and the engine exhaust area.
   b) The protective covers must have windows so that you can see the relative humidity indicators inside the engine.
4) Make a record of the engine preservation method and the date for each engine. Include the procedures used for the oil (oil drained) and the fuel systems (lubricating oil).
5) Examine the engine during preservation as follows:
   a) Every 15 days or less, examine the humidity indicators.
   b) If the relative humidity is less than 40 percent, change the dehydrating agent, if necessary, and permit the engine to continue in storage for 15 days more.
   c) If the relative humidity is more than 40 percent, but less than 60 percent, replace the dehydrating agent and continue in storage for 15 days more.
   d) If the relative humidity is more than 60 percent, replace the dehydrating agent and do the following:
      1 If no lines in the fuel system were disconnected during the preservation period, re-preserve the oil system only (AMM 71-00-03/201).
      2 If lines in the fuel system were disconnected during the preservation period, re-preserve both the fuel and oil system (AMM 71-00-03/201).

(f) New engine deliver from Pratt & Whitney engine manufacture.

1) When a new engine is delivered from Pratt & Whitney manufacture, make sure that you operate the engine before the expiration of the 60 days limit (Method I), and do one of the steps that follow.
2) If you plan to operate the engine within 60 days limit of Mothod I, then additional preservation is not necessary.
3) If you do not plan to operate the engine within the 60 days limit (Method I), do as follows before the expiration of the current preservation period.
   a) Install the dehydrating agent (Desiccant).
   b) Open the engine bag and covers.

   CAUTION: DO NOT PUT THE DEHYDRATING AGENT (DESICCANT) NEAR FAN OR TURBINE BLADES BECAUSE THE ROTATION OF THE BLADES CAN CAUSE THE DESICCANT BAGS TO TEAR.

   c) Put 23 - 125 lbs (11.34 - 56.70 kg) of the dehydrating agent in the bottom of the engine bag or shipping container.
4) Put the Relative Humidity Indicators inside the inlet and exhaust areas.
5) Seal the engine for storage as follows.
   a) Install the tarp or PVC plastic sheet over the inlet cowl.
   b) Install a tarp or PVC plastic sheet over the fan exhaust area.
   c) Install a tarp or PVC plastic sheet over the engine exhaust area.
   d) The protective covers must have windows so that you can see the Ralative Humidity Indicators inside the engine.
6) Make a record of the engine preservation method and the date for each engine.
7) Inspect the engine during preservation as follows.
   a) For every 15 days or less, examine the Relative Humidity Indicators.
   b) If the relative humidity is less than 40 percent, change the dehydrating agent, if necessary.
   c) Allow the engine to continue in storage for 15 more days.
   d) If the relative humidity is more than 40 percent but less than 60 percent, replace the dehydrating agent.
   e) Allow the engine to continue in storage for 15 more days.
   f) If the relative humidity is more than 60 percent, replace the dehydrating agent.
   g) If the fuel system lines are not disconnected during the preservation period, re-preserve the oil system only.

h) If the fuel system lines are disconnected during the preservation period, re-preserve both the fuel and oil system (Refer to engine preserve for more than 60 days (Method II)).

TASK 71-00-03-632-138-N00

3. Power Plant Depreservation

A. References

(1) AMM 12-13-01/301, Engine (Oil Servicing)
(2) AMM 29-11-05/401, Engine Driven Pump
(3) AMM 71-00-00/201, Power Plant (Operation Procedure)
(4) AMM 72-61-07/401, Hydraulic Pump Rear Drive Oil Seal
(5) AMM 78-31-00/201, Thrust Reverser System

B. Access

(1) Location Zones

411	Left Engine
421	Right Engine

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

C. Depreservation Of The Engine That Preserved For 60 Days Or Less

S 022-148-N00

(1) Remove all the covers, tarps or PVC plastic sheets from the engine intake and exhaust area.

S 632-147-N00

(2) Depreserve the main gearbox as follows:

(a) Examine the main gearbox for corrosion damage from the hydraulic fluid.

(b) If necessary, repair any hydraulic fluid leaks.
(c) If necessary, remove the hydraulic pump and check for hydraulic fluid in gearbox cavity. If an indication of fluid is found, replace gearbox carbon seal.
(d) If one or more of the gearbox accessories have been removed, do the steps that follows:
1) Remove the covers on the gearbox drive pads.
2) Install the gearbox accessories.
(e) Fill and service the oil system with new oil (AMM 12-13-03/301).

D. Depreservation For Engine That Preserved For More Than 60 Days

S 022-149-N00
(1) Remove all covers, tarps or PVC plastic sheets from the engine intake and exhaust area.

S 632-151-N00
(2) Remove all dehydrating agents from inside the engine.

S 632-150-N00
(3) Depreserve the main gearbox as follows:
(a) Examine the main gearbox for corrosion damage from the hydraulic fluid.
(b) If necessary, repair any hydraulic fluid leaks.
(c) If necessary, remove the hydraulic pump and check for hydraulic fluid in gearbox cavity. If an indication of fluid is found, replace gearbox carbon seal.
(d) If one or more gearbox accessaries have been removed, do the steps that follows:
1) Remove the covers on the gearbox drive pads.
2) Install the gearbox accessories.
(e) Fill and service the oil system with new oil (AMM 12-13-03/301).
(f) Do the prime engine oil and fuel system as follows:
1) Do the engine oil servicing.

2) Put the engine ignition to OFF position or ground idle position, test cell fuel system to ON position, fuel metering unit condition lever in CUTOFF position, and the thrust reverser lever in IDLE mode. Motor the engine at the speed sufficiently high to make sure the oil system is fully primed and oil pump pressure is stable.

CAUTION: LET THE OIL TANK PRESSURE BLEED OFF FOR A MINIMUM OF FIVE MINUTES AFTER THE ENGINE IS STOPPED, AND BEFORE YOU REMOVE THE OIL TANK FILLER CAP.

3) Move condition lever to RUN position at approximately 1500 rpm N2 and monitor for 30 seconds, then return condition lever to CUTOFF position. Dry engine by motoring with condition lever at CUTOFF position. Check that no fuel or oil system is leaking to outside or into the fan ducts.
4) After engine oil prime is completed, check oil tank again. An oil system that has been completely drained requires approximately 15 quarts of oil to fill plumbing, coolers, pumps and other oil systems.

(g) Do an engine normal start procedure (AMM 71-00-00/201).
1) Operate the engine at idle power to burn off the remaining flushing oil in the fuel system.
2) Check the fuel and oil system for leaks.

(h) Do an engine shutdown by the Normal Engine Shutdown Procedure (AMM 71-00-00/201).

(i) Do all the other depreservation steps for engines preserved for more than 60 days.

E. Depreservation of the Engine After Storage.

S 632-132-N00

(1) Remove the protective covers, if installed, from all the engine and gearbox openings.

S 632-133-N00

(2) Remove the dehydrating agents and relative humidity indicators if installed.

S 632-134-N00

(3) Examine and clean any hydraulic fluid on the gearbox housing as follows:
   (a) Examine the gearbox housing for hydraulic fluid on the gearbox housing.
   (b) If you see any hydraulic fluid on the gearbox housing or drive pad:
      1) Remove it by wiping with solvent soaked rag.
   (c) Repair any hydraulic fluid leaks to prevent any further contamination.

S 632-135-N00

(4) Install the engine to the test cell or on an aircraft.

S 632-136-N00

(5) Fill and service the oil system, as necessary, with new oil (AMM 12-13-03/301).

S 632-139-N00

(6) For engines preserved more than 60 days (Method II), change the starter oil (AMM 12-13-02/301).

S 632-137-N00

(7) For engines preserved for more than 60 days (Method II), depreserve the fuel system as follows:
   (a) Wet motor the engine with the starter until fuel comes out of the exhaust (AMM 71-00-00/201).
   (b) Start the engine and burn off the remaining flushing oil in the fuel system (AMM 71-00-00/201).
   (c) Do the Idle Power Test (AMM 71-00-00/501).
   (d) Shut down the engine (AMM 71-00-00/201).

S 712-140-N00

(8) For on-wing de-preservation, do the Replacement Engine Test (AMM 71-00-00/501).

TASK 71-00-03-102-069-N00

4. Dry the Engine Bearing Compartment

A. Equipment
   (1) Fitting and Adapter (not necessary if a regulator tool is used).
   (2) Air supply - a unit to start pneumatic engines which can supply air at 800 to 1000 pounds per hour flow, 9 psi (maximum) controlled pressure, and 325°F (163°C) maximum controlled temperature.
   (3) PWA 85525 Adapter, Pratt and Whitney Commercial Products Division, 400 Main Street, East Hartford, CT 06108
   (4) PWA 85526 Adapter, Pratt and Whitney
   (5) CTE 9060 Oil Heating Cart, Pratt and Whitney

B. Consumable Materials
   (1) G00964 Compound - Antigalling, Fel-Pro C-200
   (2) D00390 Oil - Engine

C. References
   (1) AMM 12-22-02/301, Engine (Oil Change)
   (2) AMM 71-00-00/201, Power Plant

D. Prepare to dry the engine bearing compartment.

S 612-070-N00

   (1) Clean and fill the Oil Heating Cart (referred to as the cart):
      (a) Drain water or contamination from the reservoir, lines, and the hydraulic system.
      (b) Close the outlet valve from the reservoir:

         NOTE: You can fill the reservoir through the inlet line.

         1) Remove the cap from the oil supply connection.
         2) Connect the oil supply to the oil supply connection.
      (c) Open the outlet valve and the inlet valve.

      CAUTION: DO NOT MIX OILS OF DIFFERENT TYPES OR MANUFACTURERS. THE OILS CAN CHANGE CHEMICALLY AND CAUSE DAMAGE TO THE EQUIPMENT.

      (d) Fill the reservoir with approximately 50 gallons (189 liters) of jet engine oil or until leakage comes out of the opening.

         NOTE: Use the same type of oil from same manufacturer in the cart as is in the engine.

(e) Close the inlet valve.
(f) Put a cap on the oil supply connection.
(g) Set the temperature controller in the control cabinet to the initial temperature.

NOTE: To increase the oil temperature in the cart, set the temperature controller to 225°F (107°C) for one hour (or until steam from the opening stops). After that, set the temperature controller to 300°F (149°C).

S 882-071-N00
(2) Increase the temperature of the oil in the cart:

WARNING: REMOVE THE ELECTRICAL POWER BEFORE YOU CONNECT OR DISCONNECT THE ELECTRICAL CONNECTIONS TO THE CART. REMOVE THE ELECTRICAL POWER BEFORE YOU OPEN THE CONTROL CABINET. INJURY TO PERSONS CAN OCCUR IF YOU DO NOT REMOVE ELECTRICAL POWER.

(a) Connect the electrical connections to the cart and to the electrical power supply.
(b) Energize these electrical circuits on the cart in this sequence:
1) The Power Supply
2) The Circulating Pump
3) The Heating Elements.

NOTE: The temperature controller will not make the oil temperature hotter than 310°F (154°C). If the oil temperature is hotter than 310°F (154°C), the oil can put the coke on the heating elements.

(c) Keep the oil at the set temperature until the engine is serviceable.

NOTE: Examine the opening for leakage when the oil is at the set temperature. Add oil if it is necessary to fill the reservoir.

S 022-072-N00

(3) Remove the tube assembly for the main oil filter (Fig. 203):

(a) Remove the bolts that hold the forward end of the tube to the main oil filter.

(b) Remove the bolts that hold the rear end of the tube to the top of the oil pump.

(c) Remove the bolts, nuts, and clamps that hold the tube to the two gearbox brackets.

(d) Remove the bolts, nuts, and clamps that hold the tube to the diffuser case bracket.

(e) Remove the bolts, nuts, and clamps that hold the tube to the oil scavenge tube for No. 4 bearing.

(f) Remove the tube assembly.

(g) Discard the packings.

(h) Install the caps on the tube and the two end connections.

S 492-073-N00

(4) Use the bolts to install a PWA 85525 Adapter to the flange on the housing for the main oil filter.

NOTE: Make sure that the packing is installed on the PWA 85525 adapter before you install the PWA 85525 adapter.

S 492-074-N00

(5) Use the bolts to install a PWA 85526 adapter on the top rear flange of the oil pump.

NOTE: Make sure that the packing is installed on the PWA 85526 adapter before you install the PWA 85526 adapter.

S 612-075-N00

(6) Do this task: "Engine - Servicing (Oil Change)" (AMM 12-22-02/301).

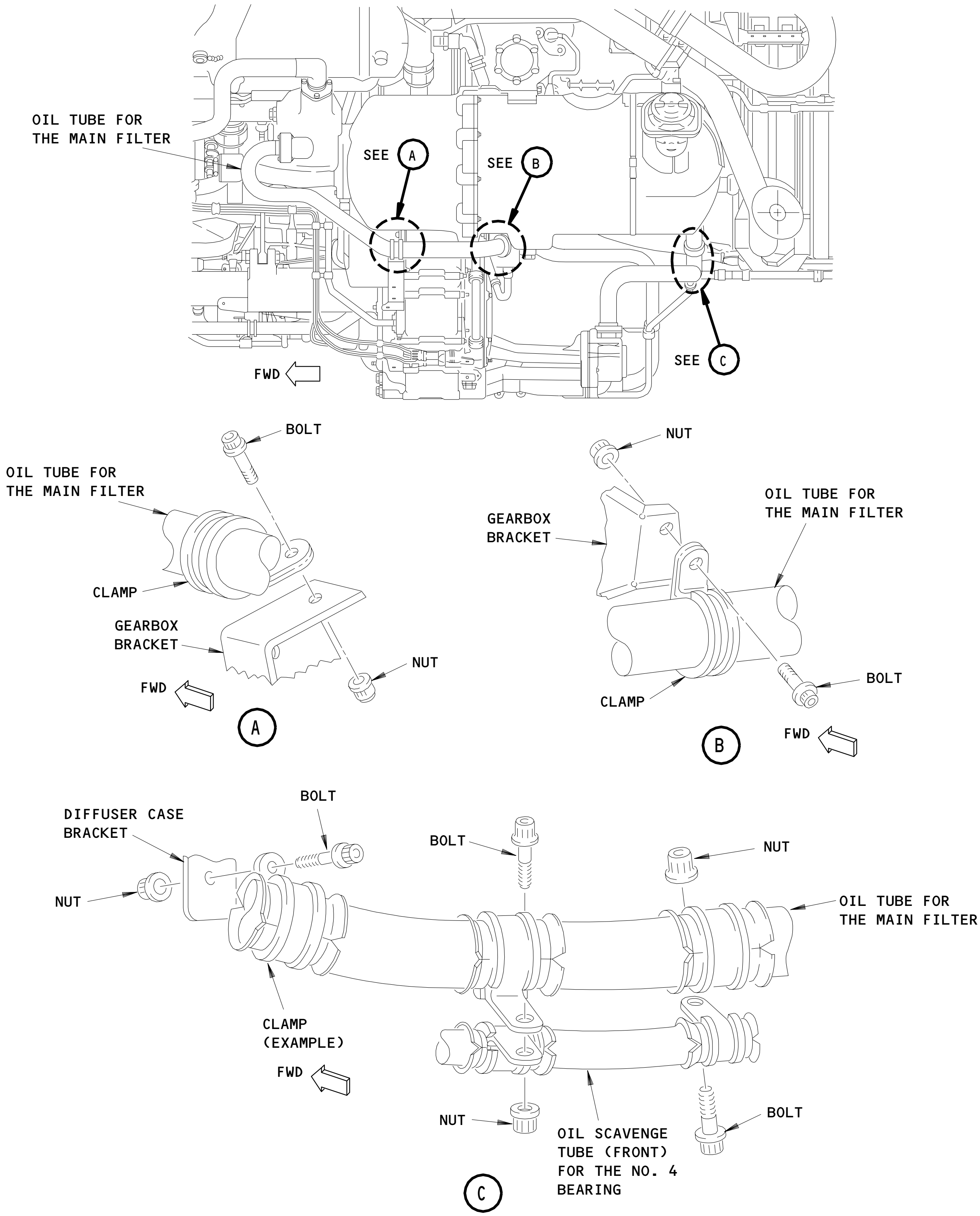
S 882-076-N00

(7) Stop the heat cycle on the cart:

WARNING: REMOVE THE ELECTRICAL POWER BEFORE YOU CONNECT OR DISCONNECT THE ELECTRICAL CONNECTIONS TO THE CART. REMOVE THE ELECTRICAL POWER BEFORE YOU OPEN THE CONTROL CABINET. INJURY TO PERSONS CAN OCCUR IF YOU DO NOT REMOVE ELECTRICAL POWER.

(a) Disconnect the electrical connections.

(b) Move the cart to the servicing area.



Engine Bearing Compartment Drying
Figure 203

951112

E. Dry the engine bearing compartment

S 492-077-N00

(1) Connect the inlet and outlet hoses:
   (a) Connect the outlet hose from the cart to the adapter on the housing for the main oil filter.
   (b) Connect the inlet hose from the cart to the adapter on the top rear side of the oil pump.

S 862-078-N00

(2) Close the outlet valve on the reservoir.

S 862-079-N00

(3) Open the inlet and the outlet valve to the reservoir.

S 862-080-N00

CAUTION: FILL THE RESERVOIR, OPEN THE INLET VALVE, AND CLOSE THE OUTLET VALVE BEFORE YOU MOTOR THE ENGINE. THE BEARINGS CAN BE DAMAGED IF YOU DO NOT PREPARE THE CART.

(4) Do this task to dry motor the engine for a minimum of three minutes: "Power Plant Operation (Engine Motoring)" (AMM 71-00-00/201).
   (a) Monitor the pressure in the reservoir while it increases and when it is stable while you motor the engine.

S 092-081-N00

WARNING: BE CAREFUL WHEN YOU TOUCH THE FITTINGS AND LINES AFTER YOU MOTOR THE ENGINE. THE HOT OIL IN THE SYSTEM CAN BURN YOU.

(5) Disconnect the inlet and outlet lines:
   (a) Disconnect the outlet line from the adapter on the housing for the main oil filter.
   (b) Disconnect the inlet line from the adapter on the top of the rear side of the oil pump.

F. Put the engine back to its usual condition.

S 092-082-N00

(1) Remove the bolts to disconnect the adapter from the flange on the housing for the main oil filter.

S 092-083-N00

(2) Remove the bolts to disconnect the adapter from the flange on the top rear side of the oil pump.

S 422-084-N00

(3) Install the tube assembly for the main oil filter (Fig. 201):
   (a) Remove the caps from the tube and the connections.
   (b) Install the packings lubricated with engine oil in the grooves on the two ends of the tube.
   (c) Put the forward end of the tube (with the flange) on the opening on the housing for the main oil filter.
   (d) Put the other end of the tube (with the bracket) on the opening on the top rear side of the oil pump.
   (e) Use bolts to install the flange on the tube forward end to the housing for the main oil filter:
      1) Lubricate the bolt threads with engine oil.
      2) Tighten the bolts with your hand.
   (f) Use bolts to install the rear end of the tube (with bracket) to the oil pump:
      1) Lubricate the bolt threads with the antiseize compound.
      2) Tighten the bolts with your hand.
   (g) Install the tube to the two gearbox brackets with clamps, bolts and nuts:
      1) Lubricate bolt threads with engine oil.
      2) Tighten the bolts with your hand.
   (h) Use the clamps, bolts, and nuts to install the tube to the diffuser case bracket and the oil scavenge tube:
      1) Lubricate bolt threads with engine oil.
      2) Tighten the bolts with your hand.

(i) Tighten all clamp bolts to 36-40 pound-inches (4.1-4.5 newton-meters).

(j) Tighten the bolts that attach the tube to the housing for the main oil filter to 85-95 pound-inches (9.6-10.7 newton-meters).

(k) Tighten the bolts that attach the tube to the main oil pump to 62-72 pound-inches (7.0-8.1 newton-meters).

S 432-085-N00

(4) Install caps on all the connection lines and hydraulic systems of the cart.

S 842-086-N00

(5) Prepare the engine for an installation or do a preservation procedure.

NOTE: For the best results, you can use the initial oil quantity to motor the engine for a second time. You must increase the temperature of the oil again before you motor the engine a second time. You must remove the water from the oil kept in the cart before you use the oil again. You must examine the oil kept in the cart to make sure that the oil is in a good condition.

POWER PLANT - MAINTENANCE PRACTICES (ENGINE INTERMIX)

1. General
   A. The same engine thrust rating must be used on both the No. 1 and No. 2 engines. Otherwise, asymmetric thrust will occur on the airplane at take-off (and other) power settings.
   B. You must do these steps to complete the procedure.
      (1) Do the Service Bulletin to change the engine to the thrust rating appropriated for the airplane.
      (2) Make sure the engine thrust rating is correct.

TASK 71-00-07-942-001-N00

2. Interchange Engines with Different Ratings
   A. References
      (1) 12-13-01/301, ENGINE - OIL SERVICING
      (2) 34-61-00/201, Flight Management Computer
      (3) 71-00-00/501, POWER PLANT - ADJUSTMENT/TEST
      (4) 71-00-00/501, POWER PLANT - ADJUSTMENT/TEST
      (5) 71-01-02/201, ENGINE TRIM - MAINTENANCE PRACTICES (TRIM TABLES)
      (6) 73-21-14/401, T2/TT2 PROBE RESISTOR HARNESS - REMOVAL/INSTALLATION
      (7) 79-11-00/301, ENGINE OIL STORAGE - SERVICING
      (8) 26-10-01/401, FIRE DETECTION CARD FILE - PRINTED CIRCUIT CARD - REMOVAL/INSTALLATION
   B. Procedure

      S 942-002-N00
      (1) To change the engine thrust rating contact your Boeing representative to obtain the correct Service Bulletin.

      NOTE: This procedure can only be performed in accordance a Boeing approved Service Bulletin. To obtain these bulletins contact your local field service representative.

      S 912-020-N00
      (2) AIRPLANES PRE SB 767-72-0037;
      Do the Service Bulletin SB 767-72-0037 to change the engine to the correct thrust rating for the airplane.

S 862-023-N00

CAUTION: DO NOT MOVE THE THRUST LEVER FORWARD, OR DO NOT KEEP IT IN THE SAME POSITION, ON AN ENGINE THAT HAD A SURGE (STALL). IF YOU DO NOT MOVE THE THRUST LEVER REARWARD, YOU CAN CAUSE DAMAGE TO THE ENGINE.

(3) Make sure the engine has the correct thrust rating.

S 862-006-N00

(4) If you install the TT2 resistor harness on the opposite engine because the changed JT9D-7R4E had a TT2 resistor harness, remove it (AMM 73-21-14/401).

S 862-007-N00

(5) Make sure that the control cards for fire detection are installed at the applicable positions in the P54 card file found in the main E/E Equipment Center (AMM 26-10-01/401).

S 862-008-N00

(6) Do the procedure for engine oil servicing with the oil type shown on the oil tank placard (AMM 12-13-01/301), or change the oil (AMM 79-11-00/301).

S 722-009-N00

(7) Do the EEC System Test No. 6 or No. 7 (AMM 71-00-00/501).

S 722-010-N00

(8) Do the applicable Power Plant Test No. 13 or 14, (AMM 71-00-00/501).

S 722-011-N00

(9) Do the Engine Power and Acceleration/Deceleration Test No. 4 (AMM 71-00-00/501).

S 722-012-N00

(10) If the TT2 resistor harness was removed from the opposite engine, do the engine trim on the opposite engine (AMM 71-00-00/501) Test No. 4 with the trim data for engines without TT2 resistor harnesses (AMM 71-01-02/201).

POWER PLANT (ENGINE CONVERSION) - MAINTENANCE PRACTICES

1. General
   A. This procedure gives the task to prepare an engine which is assembled for one airline's 767 or 747-400. It can then be used on a different airline's 767. This procedure can apply to leased pool engines from Pratt & Whitney (P&W). This procedure also gives tasks to change the airplane for the engine and to put the airplane back to the initial configuration.
      (1) This 767 Maintenance Manual has data for a specified operator. This procedure only addresses engine conversion requirements. It does not address all possible engine configuration differences. Examples of engine configuration differences are AVM, Service Interphone, Hydraulic System Ripple Damper, ETOPS, IDG Power Feeder Cables, Hydraulic Pump, Fuel Flow Meter and Fuel Pressure Indicator. If the configuration of another operator's engine that is leased or a leased pool engine from PW is not the same as the Lessee's, you must verify this AMM provides maintenance instructions for the alternate configuration.
   B. The power plant configuration for the 767 is almost the same as the 747-400. These are the parts that are different:
      (1) The aft engine mount
      (2) The high pressure controller
      (3) The wire harness with the two extra connectors for the fire detection and overheat system.
   C. The 767 engines have a different EEC programming plug and name plate than the 747-400 engines.
   D. The 767 and the 747-400 inlet cowl, fan cowl panels, and thrust reversers are not directly interchangeable and must stay with the airplane.
   E. The wire harness connectors on the 767 engine have different numbers than the wire harness connectors on the 747-400 engine.
   F. Intermix of all certified engine configurations/models (Phase I, Phase III(-3), -3B, -1C) on the same airplane is permitted.

TASK 71-00-09-802-001-N00

2. Engine Conversion
   A. References
      (1) 747-400 AMM 36-11-06/401, High Pressure Controller
      (2) 767 AMM 36-11-08/401, High Pressure Controller
      (3) AMM 71-21-02/401, Aft Lower Engine Mount
      (4) AMM 73-21-08/401, EEC Programming Plug

   B. Access
      (1) Location Zone

412	No. 1 Engine
422	No. 2 Engine

C. Procedure

S 862-029-N00

CAUTION: DO NOT CHANGE THE SPECIFIED THRUST OF AN ENGINE WITHOUT THE APPROVAL OF PRATT & WHITNEY. THE ENGINES WITH A LOWER SPECIFIED THRUST CAN BE DAMAGED IF YOU OPERATE THEM AT A HIGHER THRUST.

(1) Make sure the engine has the correct specified thrust.
  (a) Look at the part number of the EEC programming plug.
  (b) Make sure the part number is the same as the one shown on the engine name plate.
  (c) Replace the EEC programming plug if the part number is different than the number on the engine name plate (AMM 73-21-08/401).

  NOTE: You can only get an EEC programming plug from a P&W representative.

S 962-025-N00

(2) If the aft lower engine mount is for a 747-400, do the steps that follow:
  (a) Remove the aft lower engine mount for the 747-400 (AMM 71-21-02/401).
  (b) Install the aft lower engine mount for the 767 (AMM 71-21-02/401).

S 962-026-N00

(3) If the high pressure controller for the 747-400 is installed, do the steps that follow:
  (a) Remove the high pressure controller for the 747-400 (AMM 36-11-06/401).
  (b) Install the high pressure controller for the 767 (AMM 36-11-08/401).

TASK 71-00-09-802-030-N00

3. Prepare the Airplane for the Installation of a Converted Engine

A. Equipment

(1) G57NB-5 Collar - Circuit Breaker, Nylon Molding Corp., Garwood NJ (Recommended), or Commercially Available (Alternative)

B. References

(1) AMM 26-10-01/401, Fire Warning and Detection Cards

C. Access

(1) Location Zone

411	No. 1 Engine
421	No. 2 Engine

D. Procedure

S 022-008-N00

(1) Make sure the engine to be installed has the fire detection and overheat system by Kidde.

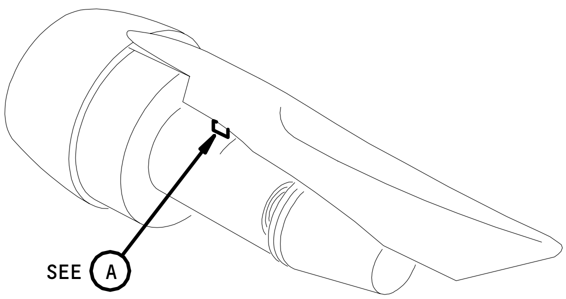
(a) If the engine has a fire detection and overheat system by Systron Donner, install the caps on the plugs for the electrical connector, D4200J and D4228J (Fig. 201).

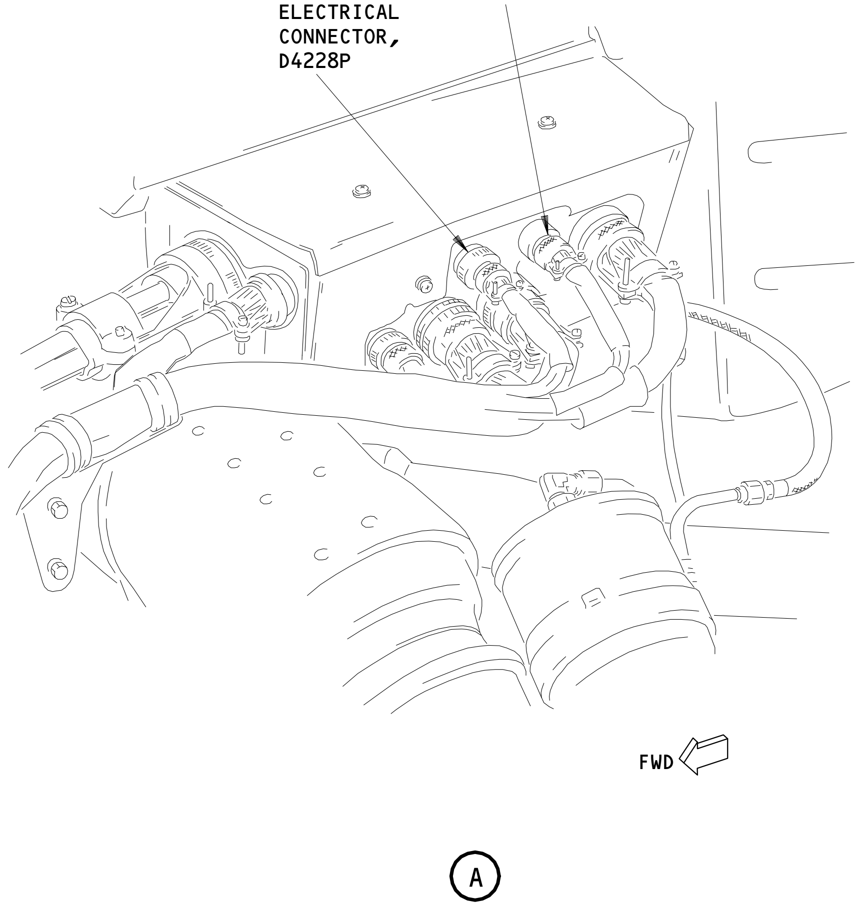
(b) If the engine has a fire detection and overheat system by Systron Donner, replace the fire detection and overheat cards for the engine (AMM 26-10-01/401).

NOTE: The fire detection and overheat cards are specified for the system that is installed on the engine.

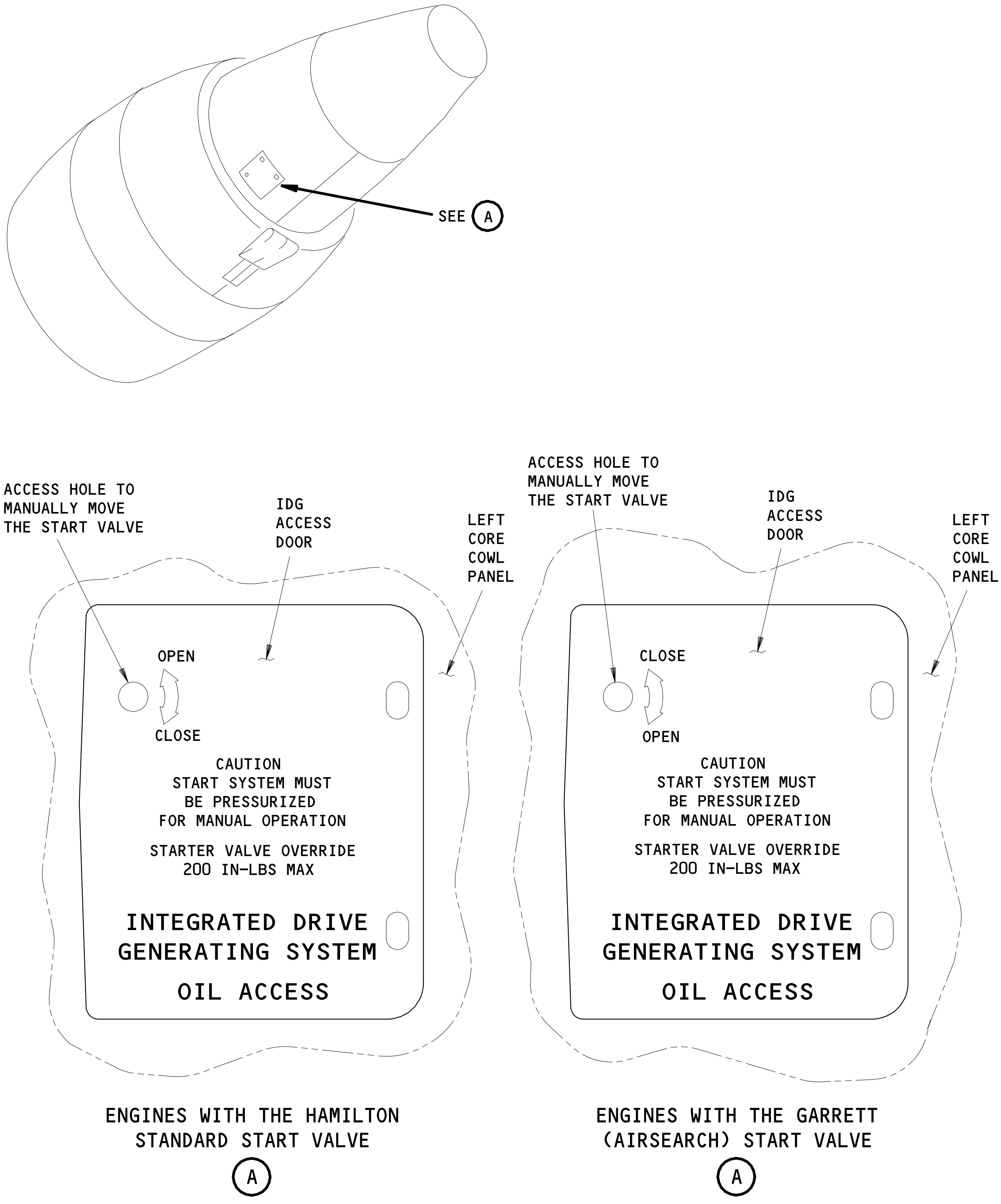
1) The fire and overheat cards are as follows:

L ENG FIRE DET, M681
L ENG FIRE DET, M682
L ENG OVHT, M687
L ENG OVHT, M688
R ENG FIRE DET, M683
R ENG FIRE DET, M684
R ENG OVHT, M689
R ENG OVHT, M690





Fire Detection System Electrical Connector Location
Figure 201



Start Valve Manual Override Direction
Figure 202

S 932-039-N00

(2) ENGINES WITH THE HAMILTON STANDARD STARTER VALVE;
Change the stencil for the starter valve on the IDG access door of the left core cowl panel (Fig. 202).

S 042-016-N00

(3) If the engine to be installed does not have a supplemental control unit (SCU), disconnect the SCU functions with the steps that follow:

(a) For the applicable engine, open this circuit breaker on the overhead circuit breaker panel, P11, and install a collar:

NOTE: With the circuit breakers closed, the airplane will continuously supply power for the EEC ground test to channel B.

1) 11L7, EEC/SCU PWR L ENG
2) 11K28, EEC/SCU PWR R ENG

(b) Install the replacement plug on the receptacle for the connectors, D8350P and D8360P (Fig. 203).

TASK 71-00-09-802-037-N00

4. Put the Airplane Back to Its Usual Configuration After the Removal of a Converted Engine

A. Access

(1) Location Zone

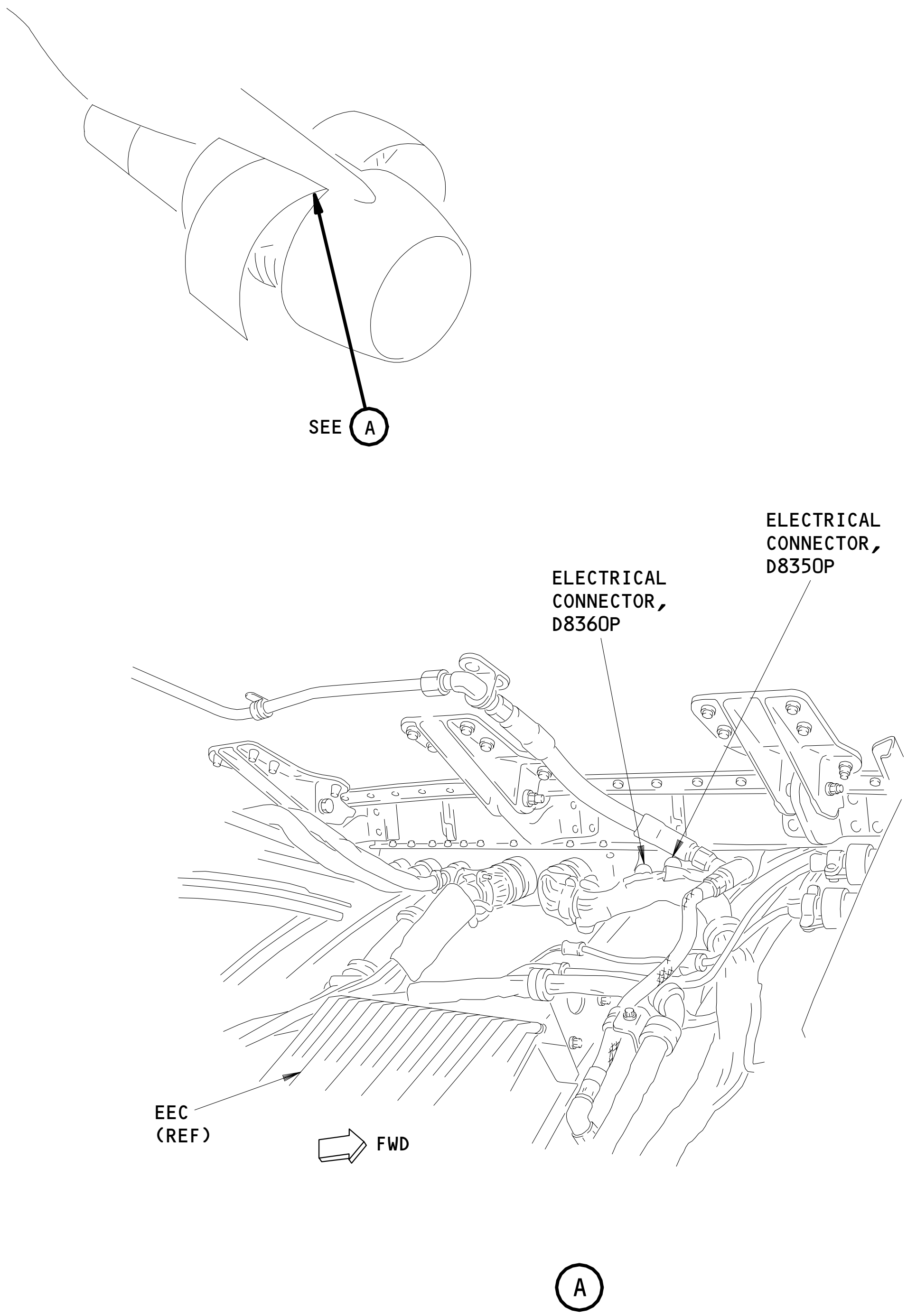
411 No. 1 Engine
421 No. 2 Engine

B. Procedure

S 422-033-N00

(1) If the engine had a fire detection and overheat system by Systron Donner, and the airplane is configured for the Kidde system, do these steps:

(a) Remove the caps and install the connectors D4200P and D4228P (Fig. 201).



Supplemental Control Unit (SCU) Electrical Connector Location
Figure 203

(b) Replace the fire detection and overheat cards for the engine (AMM 26-10-01/401).

S 932-040-N00

(2) If the engine has a Hamilton Standard starter valve installed, remove the label from the stencil on the IDG access door of the left core cowl panel (Fig. 202).
   (a) Make sure the stencil shows OPEN in the bottom position (clockwise).

S 442-027-N00

(3) For the applicable engine, remove the collar and close this circuit breaker on the P11 panel:
   (a) 11L7, EEC/SCU PWR L ENG
   (b) 11K28, EEC/SCU PWR R ENG

S 442-041-N00

(4) If there are replacement plugs installed, remove the plugs from the receptacles for the connectors, D8350P and D8360P (Fig. 203).

POWER PLANT - MAINTENANCE PRACTICES (TRIM CHECK TABLES)

1. General
   A. This procedure has the necessary data for the tests that do a check of the engine trim (AMM 71-00-00/501).
   B. There is an example to show you how to use the Trim Tables on Fig. 201. Do not use the values on Fig. 201 for the trim data. The correct values for the trim data are shown on Fig. 202.

TASK 71-01-02-972-001-N00

2. Use the Trim Table to Find the Trim Targets (Fig. 202)
   A. Procedure

      S 972-002-N00

      (1) Use the ambient temperature and the barometric pressure to find the trim targets on Fig. 202.

         NOTE: If the ambient temperature and the barometric pressure are not shown on the tables, find the data by interpolation.

         (a) MIN IDLE (%N2)
         (b) MIN PB (PSIA)
         (c) APP IDLE (%N2)
         (d) N1 @ 1.25 EPR (%N1).

EXAMPLE: TRIM TABLE USAGE

ASSUME:

1. AMBIENT TEMPERATURE: OAT = 0°F
2. BAROMETRIC PRESSURE: = 29.0 INCHES OF MERCURY

SELECT TRIM TARGETS AS FOLLOWS:

1. MINIMUM IDLE (%N2) IS 62.1 (+1.5/-1.5) %N2
2. MINIMUM IDLE BURNER PRESSURE (PSIA) IS 47.5 (+3.0/-3.0) PSIA
3. APPROACH IDLE (%N2) IS 64.7 (+1.5/-1.5) %N2
4. N1 @1.40 EPR (%N1) IS 85.0 (+1.5/-1.5) %N1

OAT °F (°C)	TRIM TARGETS	BAROMETER, INCHES OF MERCURY									
		31.0	30.0	29.0	28.0	27.0	26.0	25.0	24.0	23.0	22.0
0 (-18)	MIN IDLE (%N2)	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1
	MIN PB (PSIA)	48.6	48.0	47.5	46.9	46.2	45.4	44.7	44.0	43.2	42.4
	APP IDLE (%N2)	64.4	64.4	64.7	65.1	65.4	65.8	66.1	66.6	67.0	67.4
	N1 @1.40 EPR (%N1)	85.0	85.0	85.0	85.0	85.0	85.0	85.0	85.0	85.0	85.0
4 (-16)	MIN IDLE (%N2)	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1
	MIN PB (PSIA)	48.6	48.0	47.5	46.9	46.2	45.4	44.7	44.0	43.2	42.4
	APP IDLE (%N2)	64.6	64.6	65.0	65.3	65.7	66.0	66.4	66.8	67.3	67.7
	N1 @1.40 EPR (%N1)	85.4	85.4	85.4	85.4	85.4	85.4	85.4	85.4	85.4	85.4
8 (-13)	MIN IDLE (%N2)	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1
	MIN PB (PSIA)	48.6	48.0	47.5	46.9	46.2	45.4	44.7	44.0	43.2	42.4
	APP IDLE (%N2)	64.9	64.9	65.2	65.6	66.0	66.3	66.7	67.1	67.6	68.0
	N1 @1.40 EPR (%N1)	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7
12 (-11)	MIN IDLE (%N2)	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1
	MIN PB (PSIA)	48.6	48.0	47.5	46.9	46.2	45.4	44.7	44.0	43.2	42.4
	APP IDLE (%N2)	65.2	65.2	65.5	65.9	66.2	66.6	67.0	67.4	67.9	68.3
	N1 @1.40 EPR (%N1)	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1
16 (-9)	MIN IDLE (%N2)	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1
	MIN PB (PSIA)	48.6	48.0	47.5	46.9	46.2	45.4	44.7	44.0	43.2	42.4
	APP IDLE (%N2)	65.4	65.4	65.8	66.1	66.5	66.9	67.3	67.7	68.1	68.6
	N1 @1.40 EPR (%N1)	86.5	86.5	86.5	86.5	86.5	86.5	86.5	86.5	86.5	86.5

NOTE: THE EEC CONTROLS MINIMUM IDLE SPEED ON THE GROUND BY ONE OF TWO SCHEDULES: A MINIMUM N2 SCHEDULE OR A MINIMUM PB SCHEDULE. THE EEC SELECTS THE SCHEDULE THAT GIVES THE HIGHER FUEL FLOW. AMBIENT CONDITIONS AND SERVICE BLEED AFFECT %N2, FUEL FLOW, AND PB. THUS, THE EEC MAY CONTROL FUEL FLOW BASED ON %N2 ON SOME CONDITIONS AND PB ON OTHERS. ENGINE IDLE OPERATION IS SATISFACTORY IF THE %N2 IS WITHIN THE LIMITS OR THE PB IS WITHIN THE LIMITS. IT IS NOT NECESSARY FOR BOTH %N2 AND PB TO BE WITHIN THE LIMITS AT THE SAME TIME (ALTHOUGH THEY USUALLY ARE).

Trim Table Usage
Figure 201

F86214

OAT °F (°C)	TRIM TARGETS	BAROMETER, INCHES OF MERCURY									
		31.0	30.0	29.0	28.0	27.0	26.0	25.0	24.0	23.0	22.0
-40 (-40)	MIN IDLE (%N2)	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	62.1	62.6	63.0	63.3	63.7	64.0	64.4	64.7	65.1	65.4
	N1 @1.25 EPR (%N1)	72.1	72.1	72.1	72.1	72.1	72.1	72.1	72.1	72.1	72.1
-36 (-38)	MIN IDLE (%N2)	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	62.4	62.9	63.3	63.6	64.0	64.3	64.7	65.0	65.4	65.7
	N1 @1.25 EPR (%N1)	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
-32 (-36)	MIN IDLE (%N2)	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	62.7	63.2	63.6	63.9	64.3	64.6	65.0	65.3	65.7	66.1
	N1 @1.25 EPR (%N1)	72.8	72.8	72.8	72.8	72.8	72.8	72.8	72.8	72.8	72.8
-28 (-33)	MIN IDLE (%N2)	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	63.0	63.5	63.9	64.2	64.6	64.9	65.3	65.6	66.0	66.4
	N1 @1.25 EPR (%N1)	73.2	73.2	73.2	73.2	73.2	73.2	73.2	73.2	73.2	73.2
-24 (-31)	MIN IDLE (%N2)	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	63.3	63.8	64.2	64.5	64.9	65.2	65.6	65.9	66.3	66.7
	N1 @1.25 EPR (%N1)	73.5	73.5	73.5	73.5	73.5	73.5	73.5	73.5	73.5	73.5
-20 (-29)	MIN IDLE (%N2)	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	63.5	64.1	64.5	64.8	65.2	65.5	65.9	66.2	66.6	67.0
	N1 @1.25 EPR (%N1)	73.8	73.8	73.8	73.8	73.8	73.8	73.8	73.8	73.8	73.8
-16 (-27)	MIN IDLE (%N2)	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	63.8	64.4	64.7	65.1	65.5	65.8	66.2	66.5	66.9	67.3
	N1 @1.25 EPR (%N1)	74.2	74.2	74.2	74.2	74.2	74.2	74.2	74.2	74.2	74.2
-12 (-24)	MIN IDLE (%N2)	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	64.1	64.7	65.0	65.4	65.8	66.1	66.5	66.8	67.2	67.6
	N1 @1.25 EPR (%N1)	74.5	74.5	74.5	74.5	74.5	74.5	74.5	74.5	74.5	74.5

TOLERANCES: MIN IDLE (%N2) - ±1.5
MIN PB (PSIA) - ±3.0
APP IDLE (%N2) - ±1.5
N1 @1.25 EPR (%N1) - ±1.5

Trim Table
Figure 202 (Sheet 1)

OAT °F (°C)	TRIM TARGETS	BAROMETER, INCHES OF MERCURY									
		31.0	30.0	29.0	28.0	27.0	26.0	25.0	24.0	23.0	22.0
-8 (-22)	MIN IDLE (%N2)	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	64.4	64.9	65.3	65.7	66.1	66.4	66.8	67.1	67.5	67.9
	N1 @1.25 EPR (%N1)	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8
-4 (-20)	MIN IDLE (%N2)	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	64.7	65.2	65.6	66.0	66.3	66.7	67.1	67.4	67.8	68.2
	N1 @1.25 EPR (%N1)	75.2	75.2	75.2	75.2	75.2	75.2	75.2	75.2	75.2	75.2
0 (-18)	MIN IDLE (%N2)	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	65.0	65.5	65.9	66.3	66.6	67.0	67.3	67.7	68.1	68.5
	N1 @1.25 EPR (%N1)	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5
4 (-16)	MIN IDLE (%N2)	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	65.3	65.8	66.2	66.6	66.9	67.3	67.6	68.0	68.4	68.8
	N1 @1.25 EPR (%N1)	75.8	75.8	75.8	75.8	75.8	75.8	75.8	75.8	75.8	75.8
8 (-13)	MIN IDLE (%N2)	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	65.5	66.1	66.5	66.8	67.2	67.6	67.9	68.3	68.7	69.1
	N1 @1.25 EPR (%N1)	76.1	76.1	76.1	76.1	76.1	76.1	76.1	76.1	76.1	76.1
12 (-11)	MIN IDLE (%N2)	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	65.8	66.4	66.8	67.1	67.5	67.9	68.2	68.6	69.0	69.4
	N1 @1.25 EPR (%N1)	76.5	76.5	76.5	76.5	76.5	76.5	76.5	76.5	76.5	76.5
16 (-9)	MIN IDLE (%N2)	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	65.1	66.6	67.0	67.4	67.8	68.1	68.5	68.9	69.3	69.7
	N1 @1.25 EPR (%N1)	76.8	76.8	76.8	76.8	76.8	76.8	76.8	76.8	76.8	76.8
20 (-7)	MIN IDLE (%N2)	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	66.4	66.9	67.3	67.7	68.1	68.4	68.8	69.2	69.5	70.0
	N1 @1.25 EPR (%N1)	77.1	77.1	77.1	77.1	77.1	77.1	77.1	77.1	77.1	77.1

TOLERANCES: MIN IDLE (%N2) - ±1.5
MIN PB (PSIA) - ±3.0
APP IDLE (%N2) - ±1.5
N1 @1.25 EPR (%N1) - ±1.5

Trim Table
Figure 202 (Sheet 2)

OAT °F (°C)	TRIM TARGETS	BAROMETER, INCHES OF MERCURY									
		31.0	30.0	29.0	28.0	27.0	26.0	25.0	24.0	23.0	22.0
24 (-4)	MIN IDLE (%N2)	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	66.6	67.2	67.6	68.0	68.4	68.7	69.1	69.5	69.8	70.3
	N1 @1.25 EPR (%N1)	77.4	77.4	77.4	77.4	77.4	77.4	77.4	77.4	77.4	77.4
28 (-2)	MIN IDLE (%N2)	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	66.9	67.5	67.9	68.3	68.6	69.0	69.4	69.7	70.1	70.5
	N1 @1.25 EPR (%N1)	77.8	77.8	77.8	77.8	77.8	77.8	77.8	77.8	77.8	77.8
32 (0)	MIN IDLE (%N2)	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	67.2	67.8	68.2	68.5	68.9	69.3	69.7	70.0	70.4	70.8
	N1 @1.25 EPR (%N1)	78.1	78.1	78.1	78.1	78.1	78.1	78.1	78.1	78.1	78.1
36 (2)	MIN IDLE (%N2)	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	67.5	68.0	68.4	68.8	69.2	69.6	69.9	70.3	70.7	71.1
	N1 @1.25 EPR (%N1)	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4
40 (4)	MIN IDLE (%N2)	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	67.7	68.3	68.7	69.1	69.5	69.8	70.2	70.6	71.0	71.4
	N1 @1.25 EPR (%N1)	78.7	78.7	78.7	78.7	78.7	78.7	78.7	78.7	78.7	78.7
44 (7)	MIN IDLE (%N2)	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	68.0	68.6	69.0	69.4	69.8	70.1	70.5	70.9	71.3	71.7
	N1 @1.25 EPR (%N1)	79.0	79.0	79.0	79.0	79.0	79.0	79.0	79.0	79.0	79.0
48 (9)	MIN IDLE (%N2)	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	68.3	68.9	69.3	69.7	70.0	70.4	70.8	71.2	71.5	72.0
	N1 @1.25 EPR (%N1)	79.3	79.3	79.3	79.3	79.3	79.3	79.3	79.3	79.3	79.3
52 (11)	MIN IDLE (%N2)	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	68.5	69.1	69.5	69.9	70.3	70.7	71.1	71.4	71.8	72.3
	N1 @1.25 EPR (%N1)	79.6	79.6	79.6	79.6	79.6	79.6	79.6	79.6	79.6	79.6

TOLERANCES: MIN IDLE (%N2) - ±1.5
MIN PB (PSIA) - ±3.0
APP IDLE (%N2) - ±1.5
N1 @1.25 EPR (%N1) - ±1.5

Trim Table
Figure 202 (Sheet 3)

OAT °F (°C)	TRIM TARGETS	BAROMETER, INCHES OF MERCURY									
		31.0	30.0	29.0	28.0	27.0	26.0	25.0	24.0	23.0	22.0
56 (13)	MIN IDLE (%N2) MIN PB (PSIA) APP IDLE (%N2) N1 @1.25 EPR (%N1)	60.4 48.0 68.8 80.0	60.4 48.0 69.4 80.0	60.4 47.4 69.8 80.0	60.4 46.7 70.2 80.0	60.4 46.1 70.6 80.0	60.4 45.4 71.0 80.0	60.4 44.6 71.3 80.0	60.4 43.9 71.7 80.0	60.4 43.1 72.1 80.0	60.4 42.3 72.5 80.0
60 (16)	MIN IDLE (%N2) MIN PB (PSIA) APP IDLE (%N2) N1 @1.25 EPR (%N1)	60.7 48.0 69.1 80.3	60.7 48.0 69.7 80.3	60.7 47.4 70.1 80.3	60.7 46.7 70.5 80.3	60.7 46.1 70.9 80.3	60.7 45.4 71.2 80.3	60.7 44.6 71.6 80.3	60.7 43.9 72.0 80.3	60.7 43.1 72.4 80.3	60.7 42.3 72.8 80.3
64 (18)	MIN IDLE (%N2) MIN PB (PSIA) APP IDLE (%N2) N1 @1.25 EPR (%N1)	60.9 48.0 69.3 80.6	60.9 48.0 69.9 80.6	60.9 47.4 70.3 80.6	60.9 46.7 70.7 80.6	60.9 46.1 71.1 80.6	60.9 45.4 71.5 80.6	60.9 44.6 71.9 80.6	60.9 43.9 72.3 80.6	60.9 43.1 72.7 80.6	60.9 42.3 73.1 80.6
68 (20)	MIN IDLE (%N2) MIN PB (PSIA) APP IDLE (%N2) N1 @1.25 EPR (%N1)	61.1 48.0 69.6 80.9	61.1 48.0 70.2 80.9	61.1 47.4 70.6 80.9	61.1 46.7 71.0 80.9	61.1 46.1 71.4 80.9	61.1 45.4 71.8 80.9	61.1 44.6 72.2 80.9	61.1 43.9 72.5 80.9	61.1 43.1 72.9 80.9	61.1 42.3 73.4 80.9
72 (22)	MIN IDLE (%N2) MIN PB (PSIA) APP IDLE (%N2) N1 @1.25 EPR (%N1)	61.4 48.0 69.9 81.2	61.4 48.0 70.5 81.2	61.4 47.4 70.9 81.2	61.4 46.7 71.3 81.2	61.4 46.1 71.7 81.2	61.4 45.4 72.0 81.2	61.4 44.6 72.4 81.2	61.4 43.9 72.8 81.2	61.4 43.1 73.2 81.2	61.4 42.3 73.7 81.2
76 (24)	MIN IDLE (%N2) MIN PB (PSIA) APP IDLE (%N2) N1 @1.25 EPR (%N1)	61.6 48.0 70.1 81.5	61.6 48.0 70.7 81.5	61.6 47.4 71.1 81.5	61.6 46.7 71.5 81.5	61.6 46.1 71.9 81.5	61.6 45.4 72.3 81.5	61.6 44.6 72.7 81.5	61.6 43.9 73.1 81.5	61.6 43.1 73.5 81.5	61.6 42.3 73.9 81.5
80 (27)	MIN IDLE (%N2) MIN PB (PSIA) APP IDLE (%N2) N1 @1.25 EPR (%N1)	61.8 48.0 70.4 81.8	61.8 48.0 71.0 81.8	61.8 47.4 71.4 81.8	61.8 46.7 71.8 81.8	61.8 46.1 72.2 81.8	61.8 45.4 72.6 81.8	61.8 44.6 73.0 81.8	61.8 43.9 73.4 81.8	61.8 43.1 73.8 81.8	61.8 42.3 74.2 81.8
84 (29)	MIN IDLE (%N2) MIN PB (PSIA) APP IDLE (%N2) N1 @1.25 EPR (%N1)	62.0 48.0 70.7 82.1	62.0 48.0 71.3 82.1	62.0 47.4 71.7 82.1	62.0 46.7 72.1 82.1	62.0 46.1 72.5 82.1	62.0 45.4 72.9 82.1	62.0 44.6 73.2 82.1	62.0 43.9 73.6 82.1	62.0 43.1 74.0 82.1	62.0 42.3 74.5 82.1

TOLERANCES: MIN IDLE (%N2) - ±1.5
MIN PB (PSIA) - ±3.0
APP IDLE (%N2) - ±1.5
N1 @1.25 EPR (%N1) - ±1.5

Trim Table
Figure 202 (Sheet 4)

OAT °F (°C)	TRIM TARGETS	BAROMETER, INCHES OF MERCURY									
		31.0	30.0	29.0	28.0	27.0	26.0	25.0	24.0	23.0	22.0
88 (31)	MIN IDLE (%N2)	62.3	62.3	62.3	62.3	62.3	62.3	62.3	62.3	62.3	62.3
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	70.9	71.5	71.9	72.3	72.7	73.1	73.5	73.9	74.3	74.8
	N1 @1.25 EPR (%N1)	82.4	82.4	82.4	82.4	82.4	82.4	82.4	82.4	82.4	82.4
92 (33)	MIN IDLE (%N2)	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	71.2	71.8	72.2	72.6	73.0	73.4	73.8	74.2	74.6	75.0
	N1 @1.25 EPR (%N1)	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7
96 (36)	MIN IDLE (%N2)	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	71.4	72.0	72.5	72.9	73.3	73.7	74.0	74.4	74.9	75.3
	N1 @1.25 EPR (%N1)	83.0	83.0	83.0	83.0	83.0	83.0	83.0	83.0	83.0	83.0
100 (38)	MIN IDLE (%N2)	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	71.7	72.3	72.7	73.1	73.5	73.9	74.3	74.7	75.1	75.6
	N1 @1.25 EPR (%N1)	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3
104 (40)	MIN IDLE (%N2)	63.2	63.2	63.2	63.2	63.2	63.2	63.2	63.2	63.2	63.2
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	71.9	72.5	73.0	73.4	73.8	74.2	74.6	75.0	75.4	75.8
	N1 @1.25 EPR (%N1)	83.6	83.6	83.6	83.6	83.6	83.6	83.6	83.6	83.6	83.6
108 (42)	MIN IDLE (%N2)	63.4	63.4	63.4	63.4	63.4	63.4	63.4	63.4	63.4	63.4
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	72.2	72.8	73.2	73.7	74.1	74.4	74.8	75.2	75.7	76.1
	N1 @1.25 EPR (%N1)	83.9	83.9	83.9	83.9	83.9	83.9	83.9	83.9	83.9	83.9
112 (44)	MIN IDLE (%N2)	63.6	63.6	63.6	63.6	63.6	63.6	63.6	63.6	63.6	63.6
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	72.5	73.1	73.5	73.9	74.3	74.7	75.1	75.5	75.9	76.4
	N1 @1.25 EPR (%N1)	84.2	84.2	84.2	84.2	84.2	84.2	84.2	84.2	84.2	84.2
116 (47)	MIN IDLE (%N2)	63.8	63.8	63.8	63.8	63.8	63.8	63.8	63.8	63.8	63.8
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	72.7	73.3	73.8	74.2	74.6	75.0	75.4	75.8	76.2	76.6
	N1 @1.25 EPR (%N1)	84.5	84.5	84.5	84.5	84.5	84.5	84.5	84.5	84.5	84.5

TOLERANCES: MIN IDLE (%N2) - ±1.5
MIN PB (PSIA) - ±3.0
APP IDLE (%N2) - ±1.5
N1 @1.25 EPR (%N1) - ±1.5

Trim Table
Figure 202 (Sheet 5)

OAT °F (°C)	TRIM TARGETS	BAROMETER, INCHES OF MERCURY									
		31.0	30.0	29.0	28.0	27.0	26.0	25.0	24.0	23.0	22.0
120 (49)	MIN IDLE (%N2)	64.1	64.1	64.1	64.1	64.1	64.1	64.1	64.1	64.1	64.1
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	73.0	73.6	74.0	74.4	74.8	75.2	75.6	76.0	76.5	76.9
	N1 @1.25 EPR (%N1)	84.8	84.8	84.8	84.8	84.8	84.8	84.8	84.8	84.8	84.8
124 (51)	MIN IDLE (%N2)	64.3	64.3	64.3	64.3	64.3	64.3	64.3	64.3	64.3	64.3
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	73.2	73.8	74.3	74.7	75.1	75.5	75.9	76.3	76.7	77.2
	N1 @1.25 EPR (%N1)	85.1	85.1	85.1	85.1	85.1	85.1	85.1	85.1	85.1	85.1
128 (53)	MIN IDLE (%N2)	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	73.5	74.1	74.5	74.9	75.3	75.7	76.2	76.6	77.0	77.4
	N1 @1.25 EPR (%N1)	85.4	85.4	85.4	85.4	85.4	85.4	85.4	85.4	85.4	85.4
130 (54)	MIN IDLE (%N2)	64.6	64.6	64.6	64.6	64.6	64.6	64.6	64.6	64.6	64.6
	MIN PB (PSIA)	48.0	48.0	47.4	46.7	46.1	45.4	44.6	43.9	43.1	42.3
	APP IDLE (%N2)	73.6	74.2	74.6	75.1	75.5	75.9	76.3	76.7	77.1	77.6
	N1 @1.25 EPR (%N1)	85.5	85.5	85.5	85.5	85.5	85.5	85.5	85.5	85.5	85.5

TOLERANCES: MIN IDLE (%N2) - ±1.5
MIN PB (PSIA) - ±3.0
APP IDLE (%N2) - ±1.5
N1 @1.25 EPR (%N1) - ±1.5

Trim Table
Figure 202 (Sheet 6)

POWER PLANT SCHEDULED MAINTENANCE - MAINTENANCE PRACTICES

TASK 71-05-03-212-001-N00

1. No. 1 Power Plant
   A. General
      (1) This procedure is a scheduled maintenance task.
   B. Inspection

      S 212-002-N00
      (1) Do the inspection.

TASK 71-05-03-212-003-N00

2. No. 1 Power Plant
   A. General
      (1) This procedure is a scheduled maintenance task.
   B. Inspection

      S 212-004-N00
      (1) Do the inspection.

TASK 71-05-03-212-005-N00

3. No. 2 Power Plant
   A. General
      (1) This procedure is a scheduled maintenance task.
   B. Inspection

      S 212-006-N00
      (1) Do the inspection.

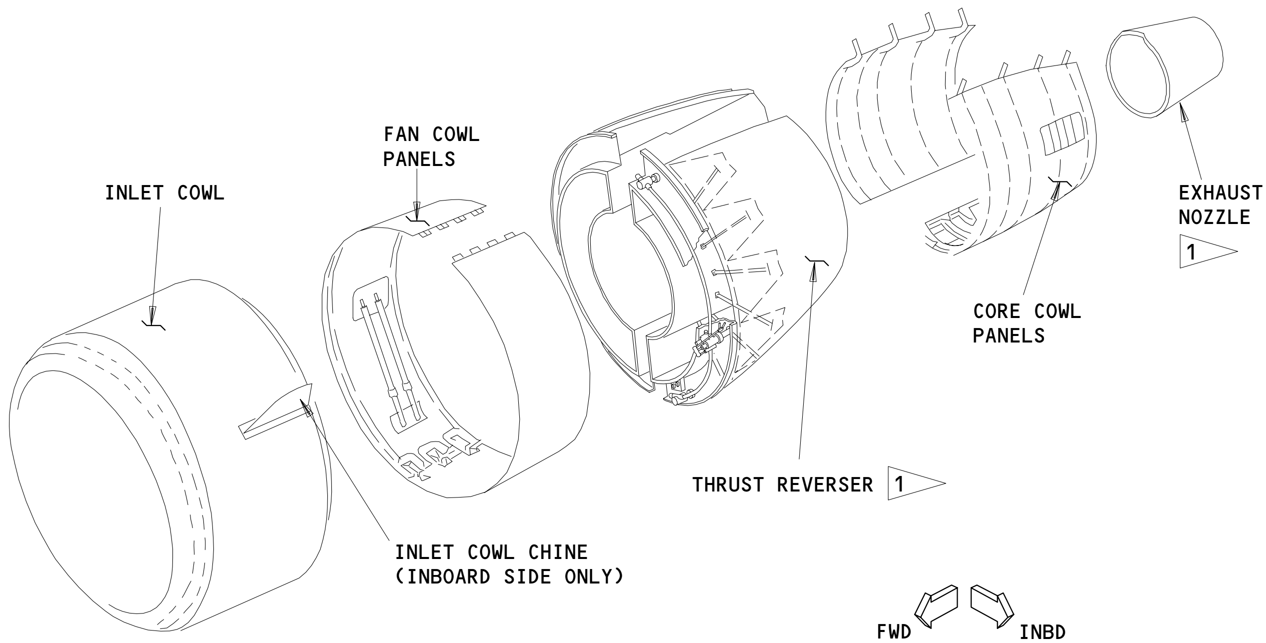
TASK 71-05-03-212-007-N00

4. No. 2 Power Plant
   A. General
      (1) This procedure is a scheduled maintenance task.
   B. Inspection

      S 212-008-N00
      (1) Do the inspection.

ENGINE COWLING - DESCRIPTION AND OPERATION

1. General (Fig. 1)
   A. The engine nacelle protects the engine components in flight and provides a smooth entry for the airstream to reduce drag. The engine cowling components are described in this section. The exhaust system components are illustrated for reference only. For further information on the exhaust system components, see Turbine Exhaust System (AMM 78-11-00) and Thrust Reverser System (AMM 78-31-00).
   B. The cowling is composed of the inlet cowl, fan cowl panels and core cowl panels.
   C. A chine is mounted on the inboard side of the inlet cowl.
   D. The thrust reverser, exhaust nozzle and plug are shown for reference only. For further information on the exhaust system components, see Chapter 78.
2. Component Details
   A. Inlet Cowl (Fig. 2)
      (1) The inlet cowl provides a passage for entry of the airstream to the engine with minimum drag.



1 EXHAUST SYSTEM COMPONENTS SHOWN FOR REFERENCE ONLY

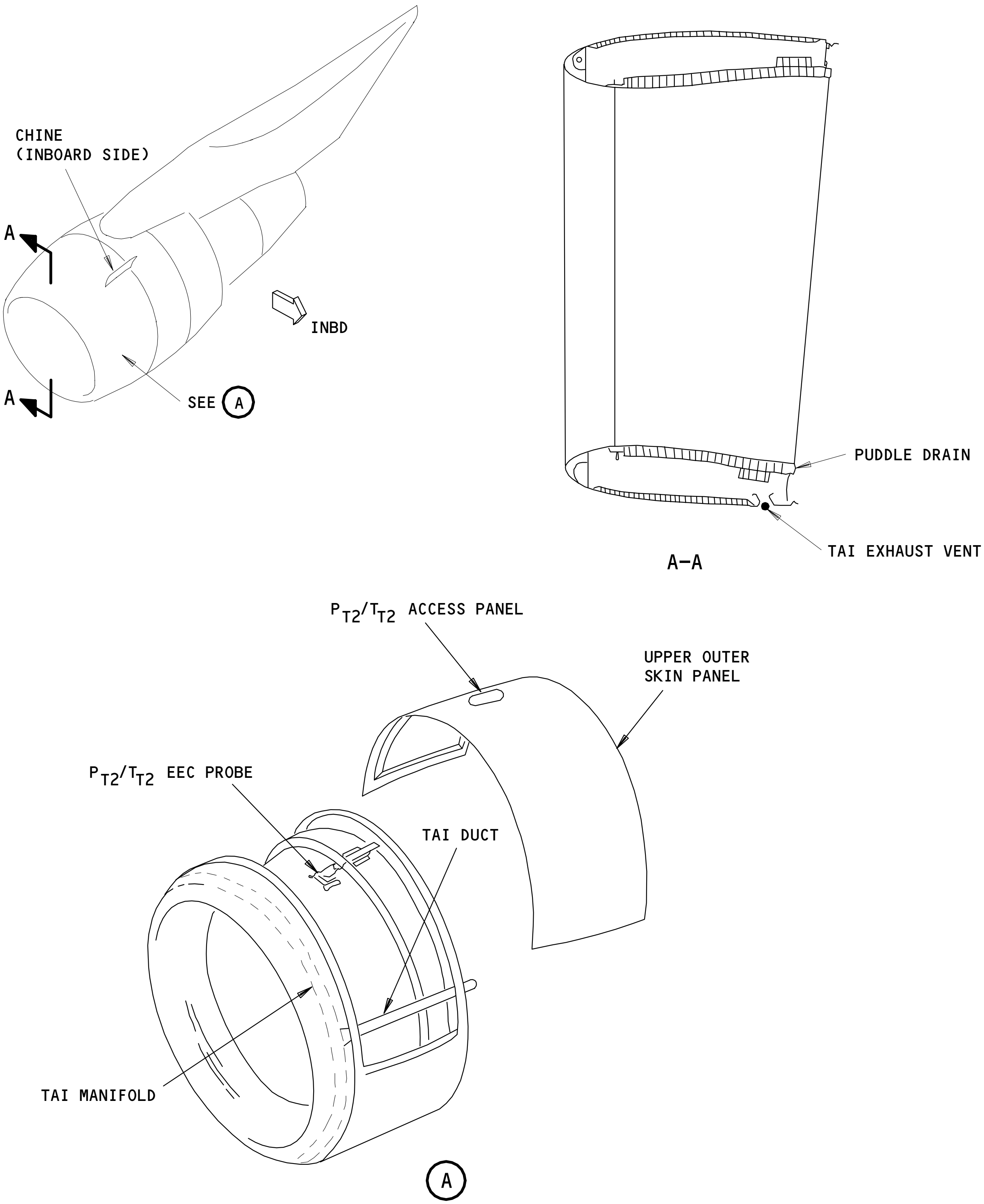
Engine Cowling
Figure 1

(2) The inlet cowl is an aluminum structure with acoustical lining that has a honeycomb core and kevlar-graphite external panels. The approximate dimensions and weight of the inlet cowl are: 110 inches in diameter, 54 inches long and weight of 536 lbs.
(3) The thermal anti-icing (TAI) duct routes warm engine bleed air to a spray duct manifold to prevent icing of the inlet cowl. The manifold completely encircles the lip of the inlet cowl.
(4) The puddle drain in the lower section of the inlet cowl drains accumulated liquids.
(5) The outer skin panel on the upper side is attached to the inlet structure with screws and nutplates. The panel is removable to allow access to the TAI duct and PT2/TT2 probe (Fig. 3).

B. Inlet Cowl Chine (Fig. 1)
(1) The inlet cowl chine is a small fin mounted on the inboard side of the inlet cowl.
(2) The inlet cowl chine causes air separation at a fixed point which results in a more stable airflow around the engine nacelle.
(3) The inlet cowl has mounting provisions to allow chine to be installed on either side to maintain inlet cowl interchangeability.

C. Fan Cowl Panels (Fig. 3)
(1) The fan cowl panels are mounted to the strut with three hinges on each panel and latch together at the bottom with three tension latches.
(2) The fan cowl panels are a composite structure of nomex honeycomb and kevlar-graphite panels with an aluminum frame. The approximate dimensions and weight of the fan cowl panels are: 108 inches in diameter, 35 inches long and a weight of 55 lbs.
(3) The cowl panels are made of fire-resistant material to prevent fire from spreading to other areas. The components mounted internally are explosion proof and require no additional fire protection.
(4) A pressure relief door on the left fan cowl panel opens automatically to relieve excessive pressure in case of failure of the thermal anti-icing (TAI) duct.
(5) Two hold-open rods, stowed on the inside of each cowl panel, support the panel in the open position. The lower end of each rod is released from the stowed position and attached to a receiver bracket. Both rods must be fully extended to remain locked in the open position.

D. Core Cowl Panels (Fig. 4)
(1) The core cowl panels are mounted to the strut with four hinges, and latch together at the bottom with four tension latches.
(2) The core cowl panels are made of aluminum. The approximate dimensions and weight of the core cowl panels are: 70 inches in diameter, 55 inches long, and weight of 110 pounds for left and 90 pounds for right.

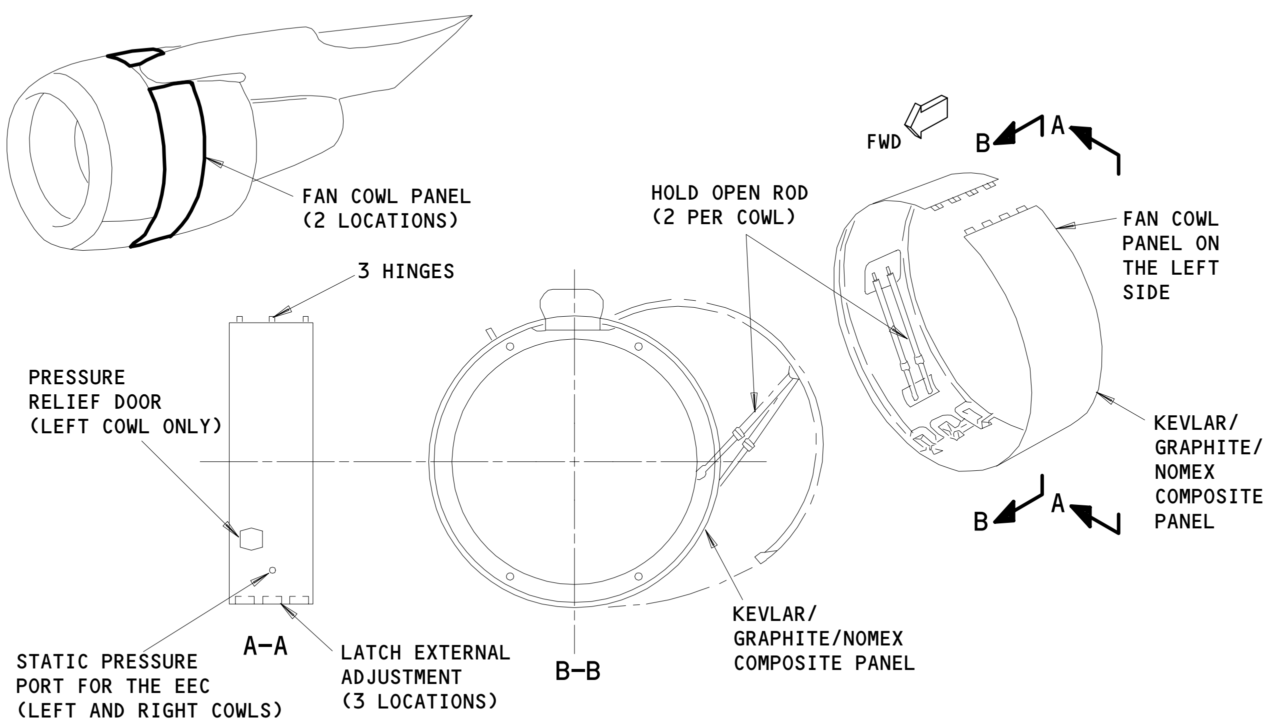


Inlet Cowl
Figure 2

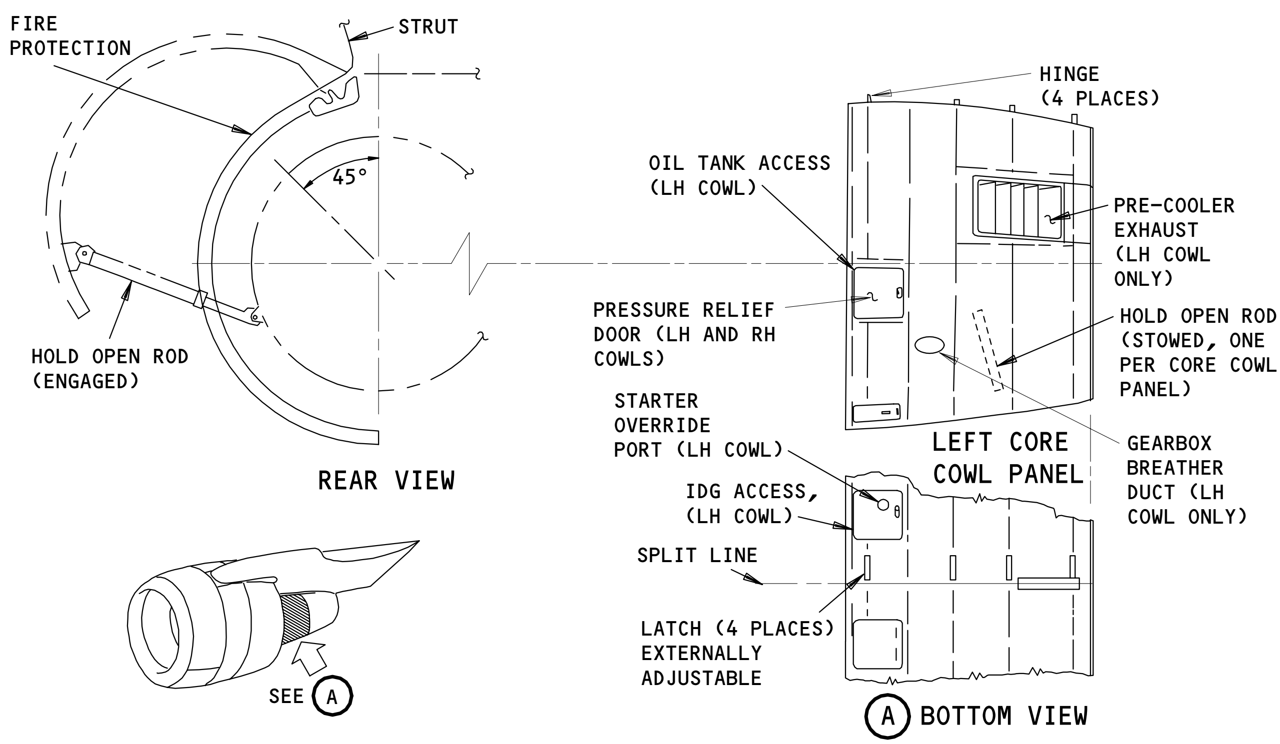
(3) There are two pressure relief doors on each core cowl panel that relieve high pressure in the event of a duct failure. The upper door of the left core cowl panel provides access to the oil tank and the lower door provides access to the system for the integrated drive generator (IDG).

(4) A hold-open rod stowed on the inside of each cowl panel supports the panel in the open position. The rod is released from the stowed position and the upper end is rotated down to attach to a bracket on the engine flange. The rod must be fully extended to remain locked in the open position.

(5) A port through the lower access door on the left core cowl panel provides access to the manual override for the starter control valve without opening any cowling or access doors.



Fan Cowl Panels
Figure 3

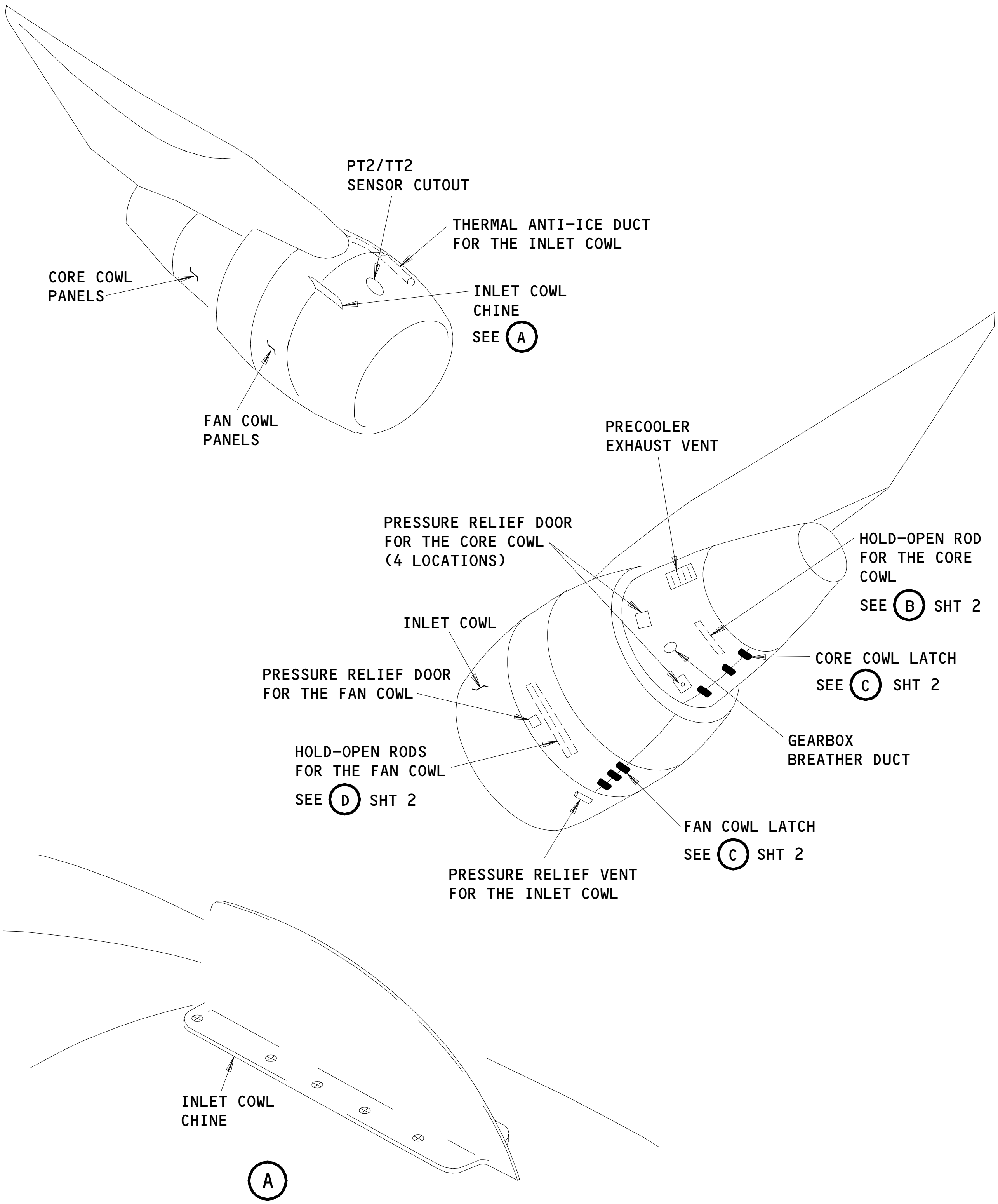


Core Cowl Panels
Figure 4

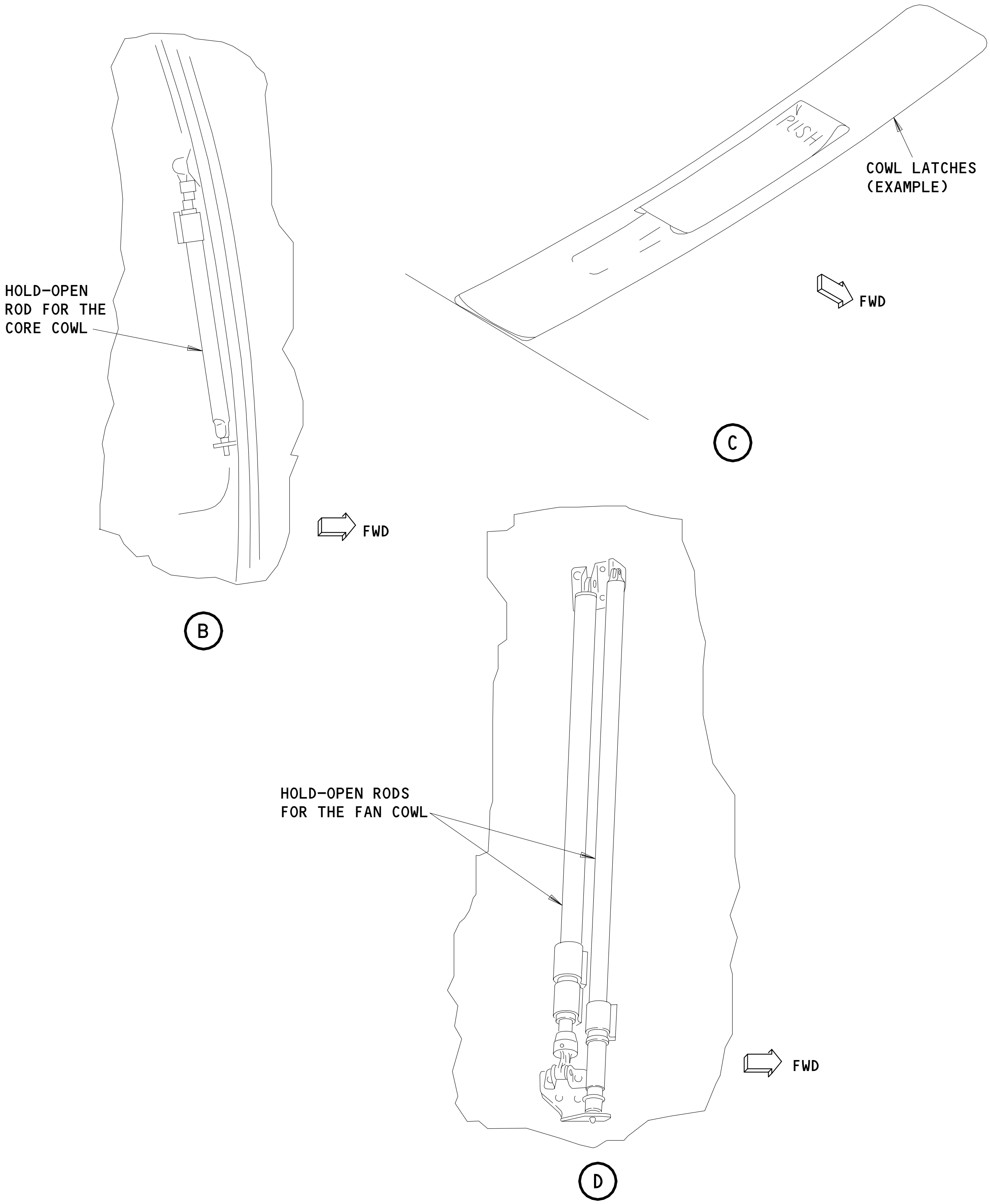
ENGINE COWLING

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
CHINE - LEFT ENGINE INLET COWL	1	1	INLET COWL	71-11-02
CHINE - RIGHT ENGINE INLET COWL	1	1	INLET COWL	71-11-02
COWL - LEFT ENGINE INLET	1	1		71-11-01
COWL - RIGHT ENGINE INLET	1	1		71-11-01
CUTOUT - LEFT ENGINE PT2/TT2 SENSOR	1	1	413AL, FAN COWL	71-11-00
CUTOUT - RIGHT ENGINE PT2/TT2 SENSOR	1	1	423AL, FAN COWL	71-11-00
DOOR - LEFT ENGINE CORE COWL PRESSURE RELIEF	1	4	417AL, CORE COWL	71-11-08
DOOR - LEFT ENGINE FAN COWL PRESSURE RELIEF	1	1	413AL, FAN COWL	71-11-08
DOOR - RIGHT ENGINE CORE COWL PRESSURE RELIEF	1	4	427AL, CORE COWL	71-11-08
DOOR - RIGHT ENGINE FAN COWL PRESSURE RELIEF	1	1	423AL, FAN COWL	71-11-08
DUCT - LEFT ENGINE GEARBOX BREATHER	1	1	417AL, CORE COWL	71-11-00
DUCT - LEFT ENGINE INLET COWL THERMAL ANTI-ICE	1	1	413AL, FAN COWL	71-11-09
DUCT - RIGHT ENGINE GEARBOX BREATHER	1	1	427AL, CORE COWL	71-11-00
DUCT - RIGHT ENGINE INLET COWL THERMAL ANTI-ICE	1	1	423AL, FAN COWL	71-11-09
LATCH - LEFT ENGINE CORE COWL	2	4	417AL,418AR, CORE COWL	71-11-07
LATCH - LEFT ENGINE FAN COWL	2	3	413AL,414AR, FAN COWL	71-11-05
LATCH - RIGHT ENGINE CORE COWL	2	4	427AL,428AR, CORE COWL	71-11-07
LATCH - RIGHT ENGINE FAN COWL	2	3	423AL,424AR, FAN COWL	71-11-05
PANEL - LEFT ENGINE CORE COWL	1	2	417AL,418AR, CORE COWL	71-11-06
PANEL - LEFT ENGINE FAN COWL	1	2	413AL,414AR, FAN COWL	71-11-04
PANEL - RIGHT ENGINE CORE COWL	1	2	427AL,428AR, CORE COWL	71-11-06
PANEL - RIGHT ENGINE FAN COWL	1	2	423AL,424AR, FAN COWL	71-11-04
ROD - LEFT ENGINE CORE COWL HOLD OPEN	2	2	417AL,418AR, CORE COWL	71-11-10
ROD - LEFT ENGINE FAN COWL HOLD OPEN	2	4	413AL,414AR, FAN COWL	71-11-10
ROD - RIGHT ENGINE CORE COWL HOLD OPEN	2	2	427AL,428AR, CORE COWL	71-11-10
ROD - RIGHT ENGINE FAN COWL HOLD OPEN	2	4	423AL,424AR, FAN COWL	71-11-10
VENT - LEFT ENGINE INLET COWL PRESSURE RELIEF	1	1	INLET COWL	71-11-00
VENT - LEFT ENGINE PRECOOLER EXHAUST	1	1	417AL, CORE COWL	71-11-00
VENT - RIGHT ENGINE INLET COWL PRESSURE RELIEF	1	1	INLET COWL	71-11-00
VENT - RIGHT ENGINE PRECOOLER EXHAUST	1	1	427AL, CORE COWL	71-11-00

Engine Cowling - Component Index
Figure 101



Engine Cowling - Component Location
Figure 102 (Sheet 1)



Engine Cowling - Component Location (Details from Sht 1)
Figure 102 (Sheet 2)

ENGINE COWLING - MAINTENANCE PRACTICES (AERODYNAMIC SMOOTHNESS)

1. General
   A. This procedure gives the task to adjust the cowl panel to the given tolerances.
   B. The access doors and panels on the cowls are in very important areas for aerodynamic smoothness. After a removal or an installation, you must adjust the access panels and doors to the given tolerances.

TASK 71-11-00-822-001-N00

2. Adjust the Cowl Panel
   A. Access
      (1) Location Zones

411	Left Engine
421	Right Engine

      (2) Access Panels

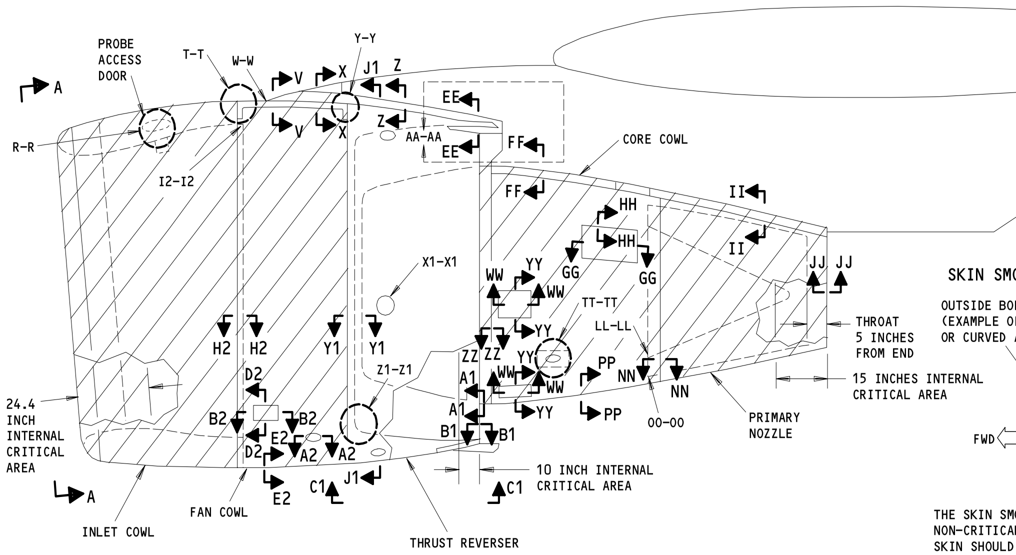
413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan REverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

   B. Procedure

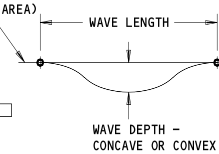
      S 822-002-N00
      (1) Adjust for aerodynamic smoothness (Fig. 201):
         (a) Make sure that the tolerances agree with the limits (Fig. 201).

            NOTE: All dimensions are shown in inches.

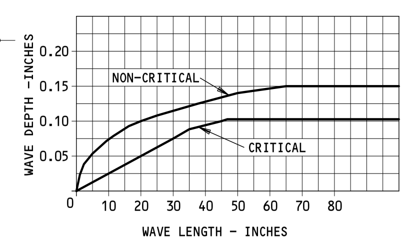
            1) If it is necessary, cut or bend the surfaces, or install shims to adjust the access doors and panels for aerodynamic smoothness.
         (b) Make sure that the outer surfaces are free from dents, scratches or other damage. Damage of this type can cause the cowl to come loose during a flight.



SKIN SMOOTHNESS



THE SKIN SMOOTHNESS IN CRITICAL AND NON-CRITICAL AREAS ALONG THE CONTINUOUS SKIN SHOULD AGREE WITH THE LIMITS SHOWN AT RIGHT. (EXAMPLE OF STRAIGHT OR CURVED AREAS).



REQUIRES HIGH DEGREE OF AERODYNAMIC SMOOTHNESS — CRITICAL — NON-CRITICAL

	REQUIRED AERODYNAMIC SMOOTHNESS TOLERANCES (EXCEPTIONS ARE SHOWN IN SECTION VIEWS)			
	CONDITION	LOCATION	CRITICAL	NON-CRITICAL
1	WAVE DEPTH TO LENGTH RATIO	ALL SKINS	0.0025	SEE GRAPH
	WAVE DEPTH TO LENGTH RATIO 1.0 MAX DIA. DISHING AT FASTENERS	AT FASTENERS	0.0050	0.0100
	CLEARANCES			
2	LONGITUDINAL (STREAMWISE) BUTT JOINT-MAXIMUM CLEARANCE	REMOVABLE PANELS	0.060	0.060
		HINGED PANELS	0.080	0.080
		FIXED SKINS	0.040	0.040
3	TRANSVERSE (NORMAL TO AIRSTREAM) BUTT JOINT CLEARANCES	FIXED SKINS	0.00 TO 0.03	0.00 TO +0.06
		REMOVABLE & HINGED PANELS	0.01 TO 0.07	+0.01 TO +0.07
	FLUSHNESS			
4	LONGITUDINAL JOINT FLUSHNESS	FIXED SKINS	0.00 TO 0.03	0.00 TO +0.03
		REMOVABLE & HINGED PANELS	0.00 TO 0.03	0.00 TO +0.03
5	TRANSVERSE JOINT FLUSHNESS	FIXED SKINS	-0.02 TO 0.00	-0.03 TO +0.02
		REMOVABLE & HINGED PANELS	-0.035 TO +0.025	-0.04 TO +0.02

NOTE: ALL DIMENSIONS ARE IN INCHES.

[1] AIRFLOW (+) POSITIVE STEP — AIRFLOW (-) NEGATIVE STEP

[2] TOLERANCE CAN BE $^{+0.05}_{-0.09}$ ALONG 15% OF THE EDGE

[3] ±0.120 STEP IS PERMITTED FOR A MAXIMUM OF 25% OF THE LENGTH

[4] $^{0.30}_{0.08}$ IS PERMITTED ALONG 10% OF THE EDGE

[5] $^{0.42}_{0.18}$ IS PERMITTED ALONG 10% OF THE EDGE

[6] $^{0.24}_{0.06}$ IS PERMITTED ALONG 10% OF THE FORE AND AFT LENGTH

[7] ±0.080 STEP IS PERMITTED AT THE LEADING EDGE OF THE SKIRT FAIRING. THE STEP CAN CHANGE AFT OF THE LEADING EDGE BY ±0.120. THE WAVE LENGTH OF THIS CHANGE MUST AGREE WITH THE LIMITS SHOWN IN THE GRAPH.

[8] $^{0.24}_{0.02}$ IS PERMITTED ALONG 10% OF THE EDGE

[9] $^{+0.05}_{-0.12}$ IS PERMITTED ALONG 10% OF THE EDGE

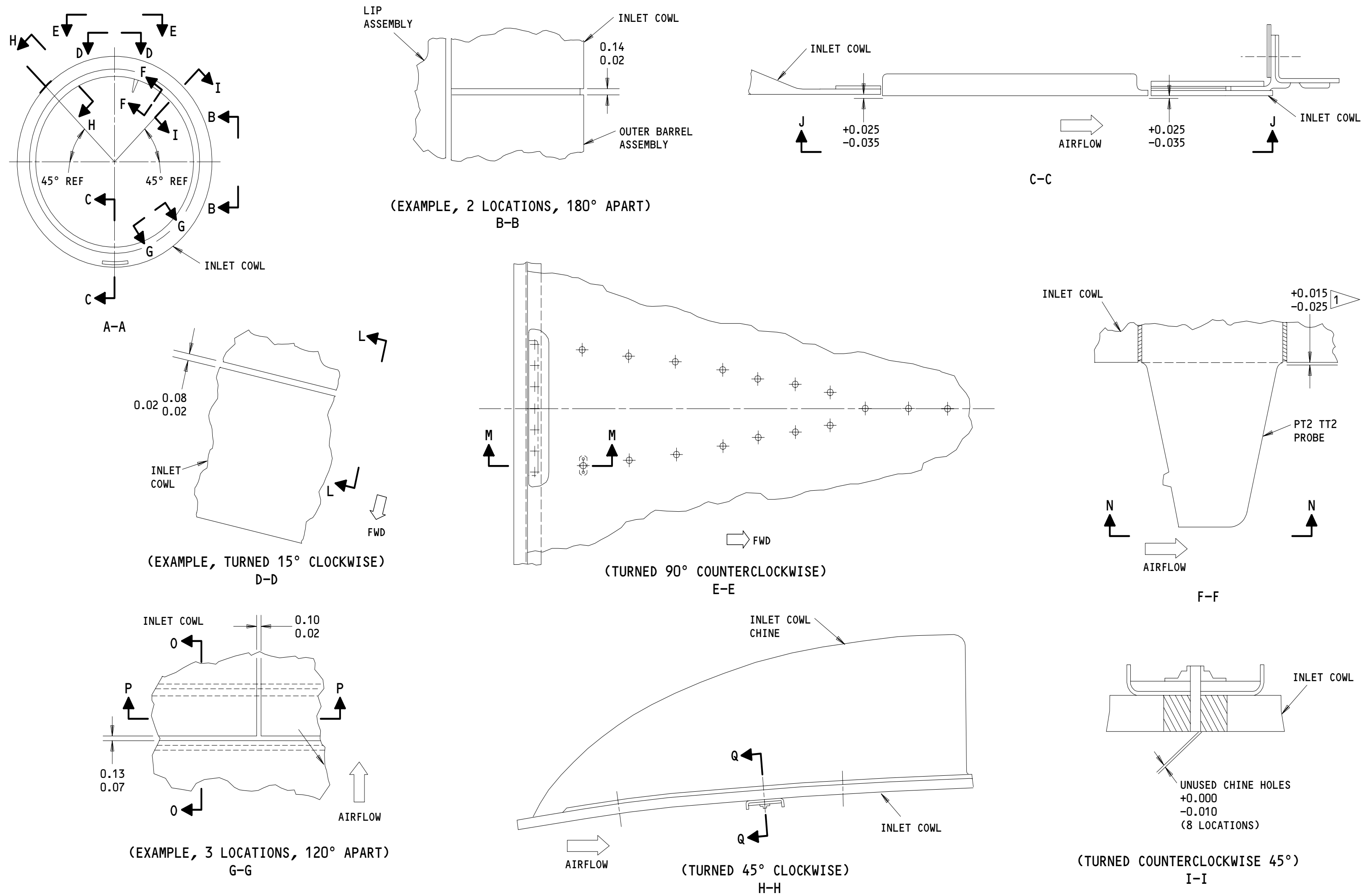
[10] $^{0.24}_{0.08}$ IS PERMITTED ALONG 10% OF THE FORE AND AFT LENGTH

[A] SAS 50,150-154; ALL MTH AIRPLANES

[B] SAS 51-149, 155-999

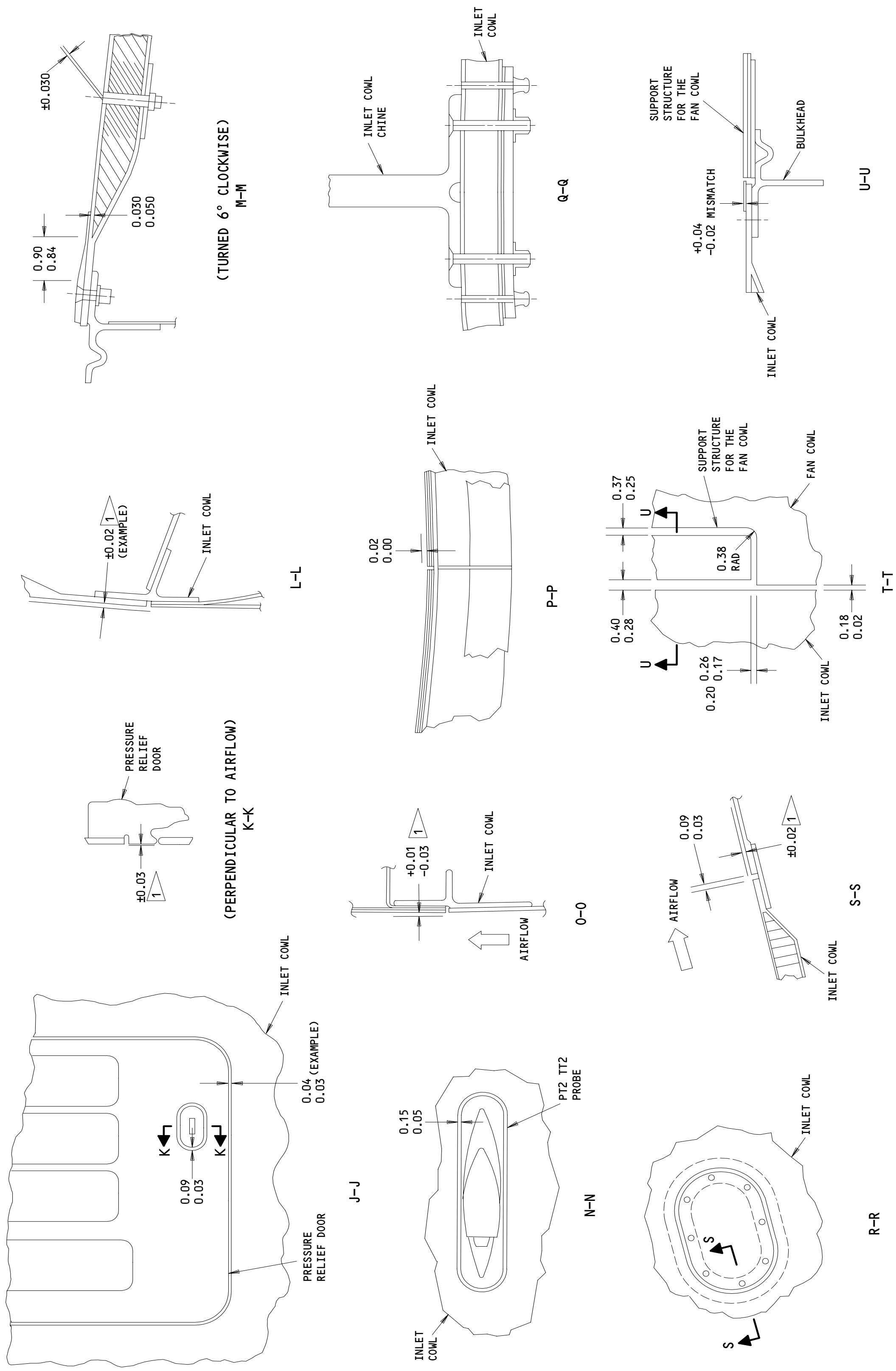
Aerodynamic Smoothness
Figure 201 (Sheet 1)

772112



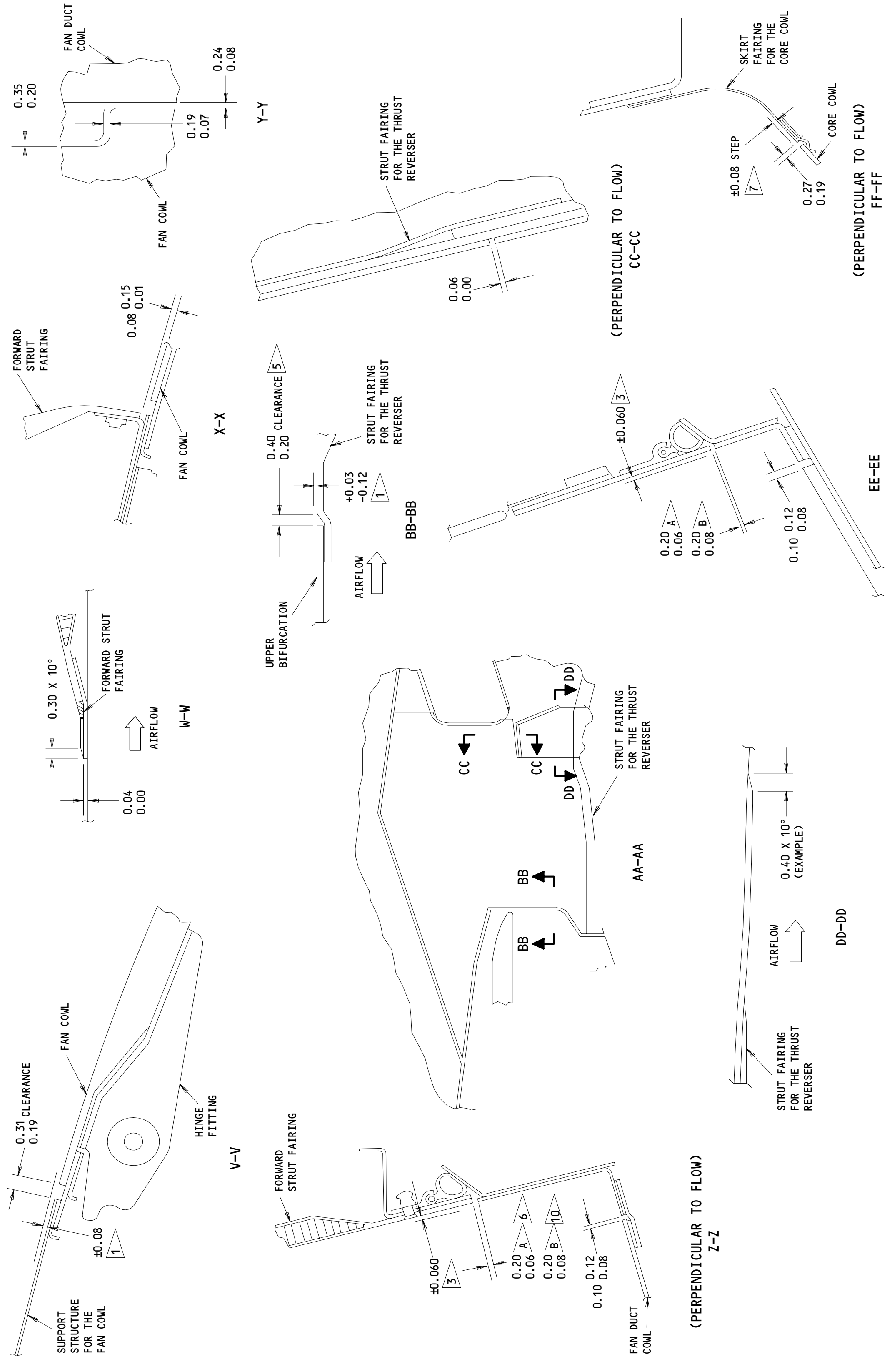
Aerodynamic Smoothness
Figure 201 (Sheet 2)

271972



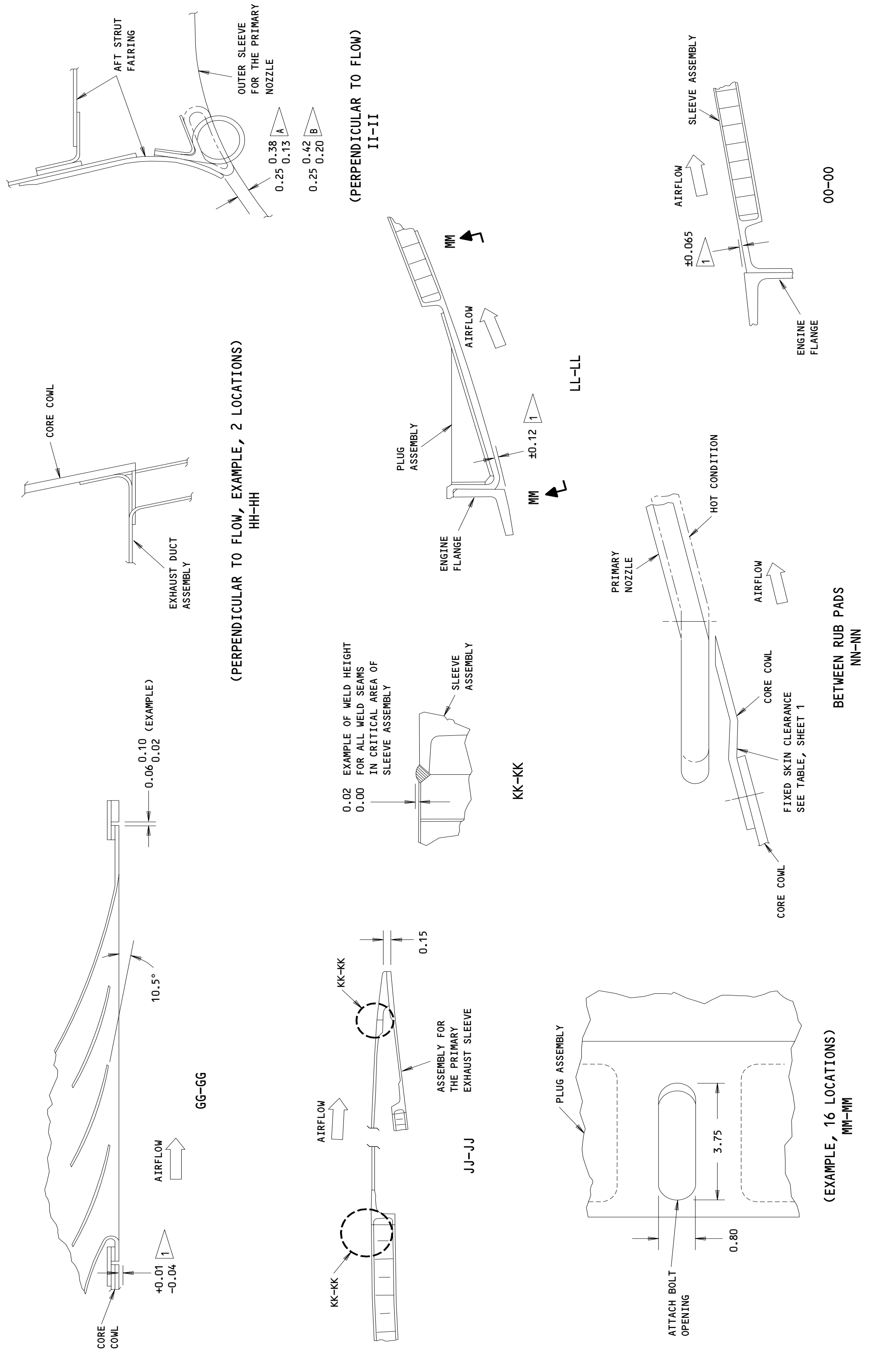
Aerodynamic Smoothness
Figure 201 (Sheet 3)

272123

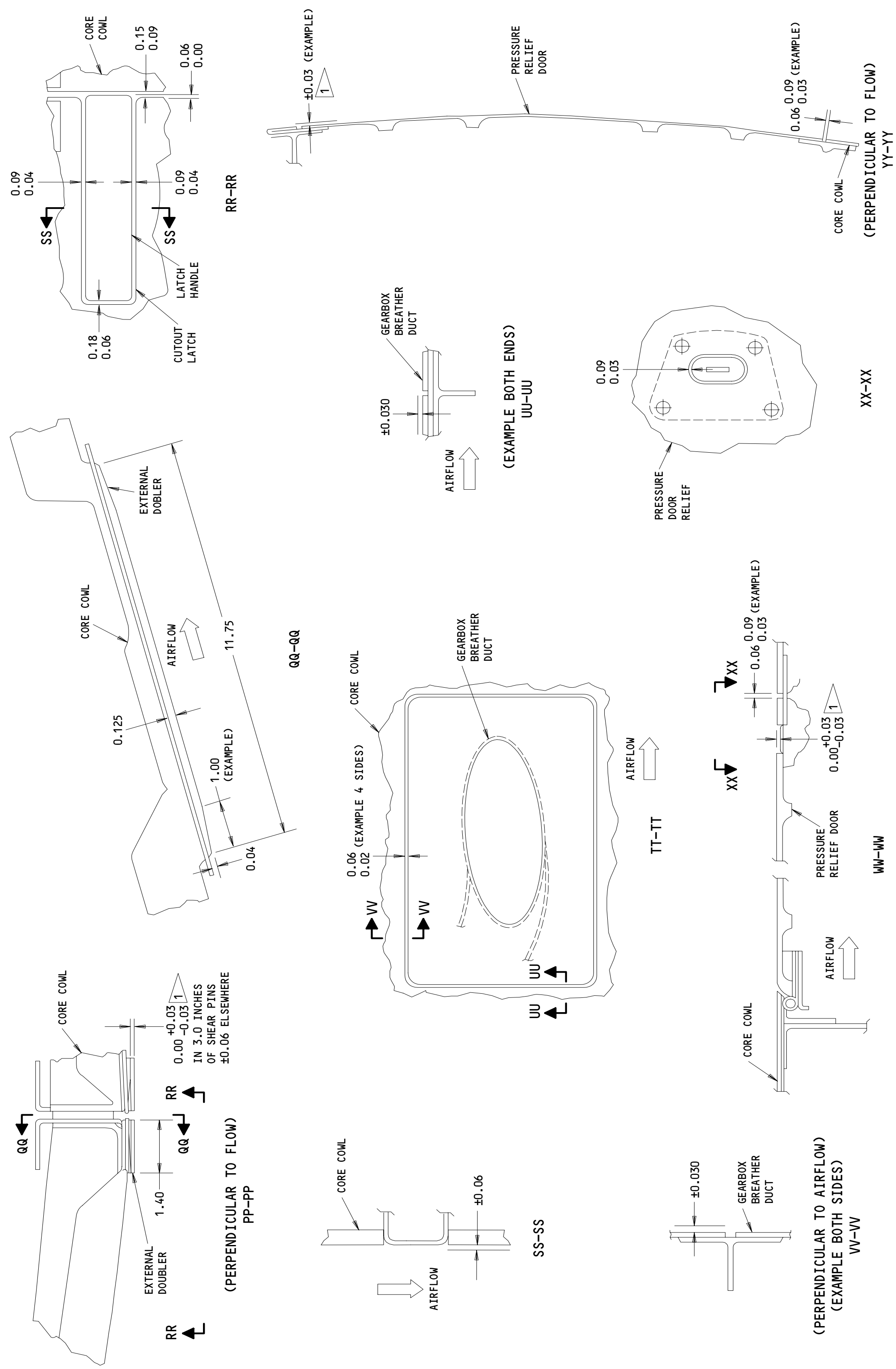


Aerodynamic Smoothness
Figure 201 (Sheet 4)

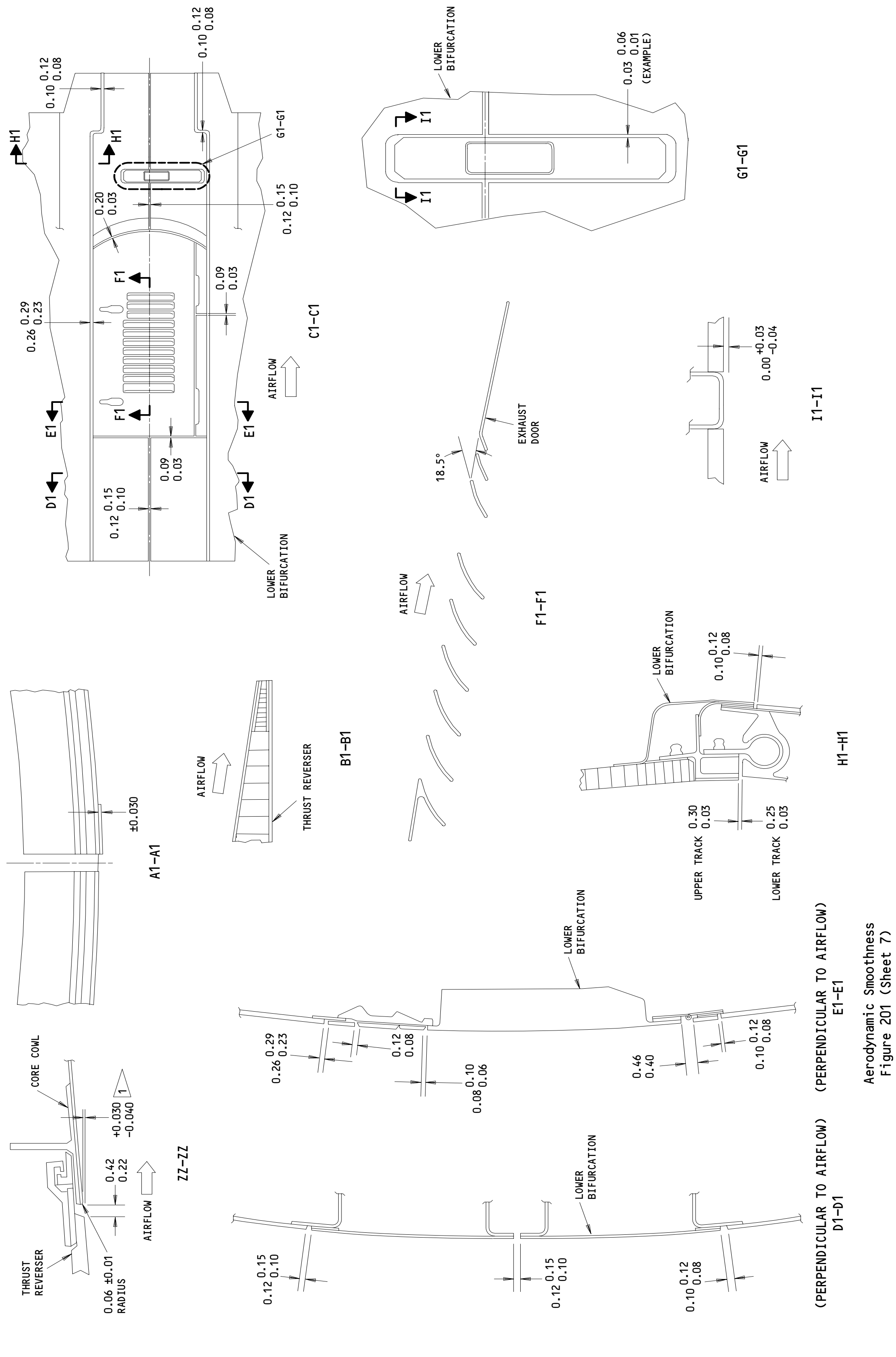
772207



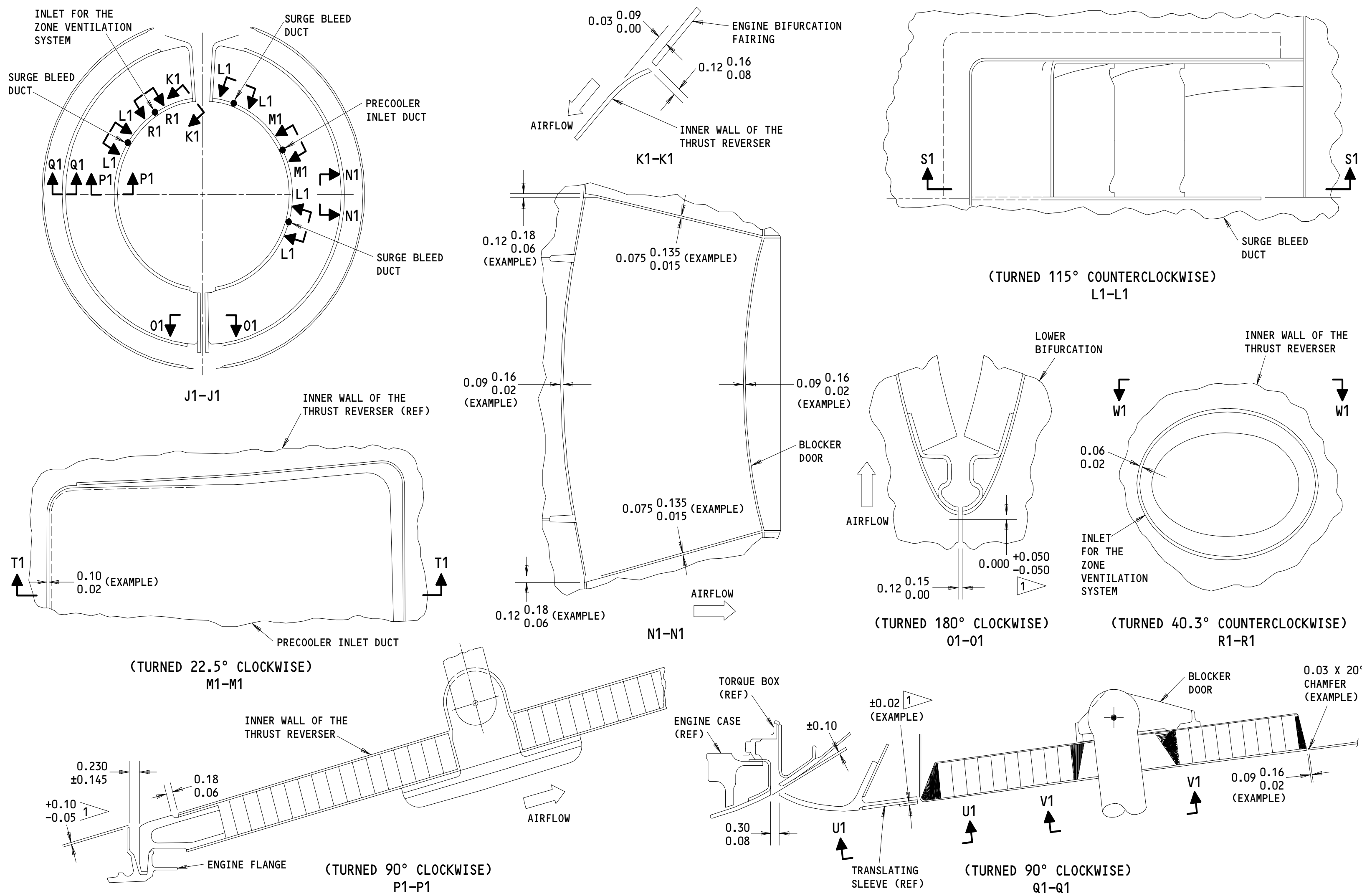
Aerodynamic Smoothness
Figure 201 (Sheet 5)



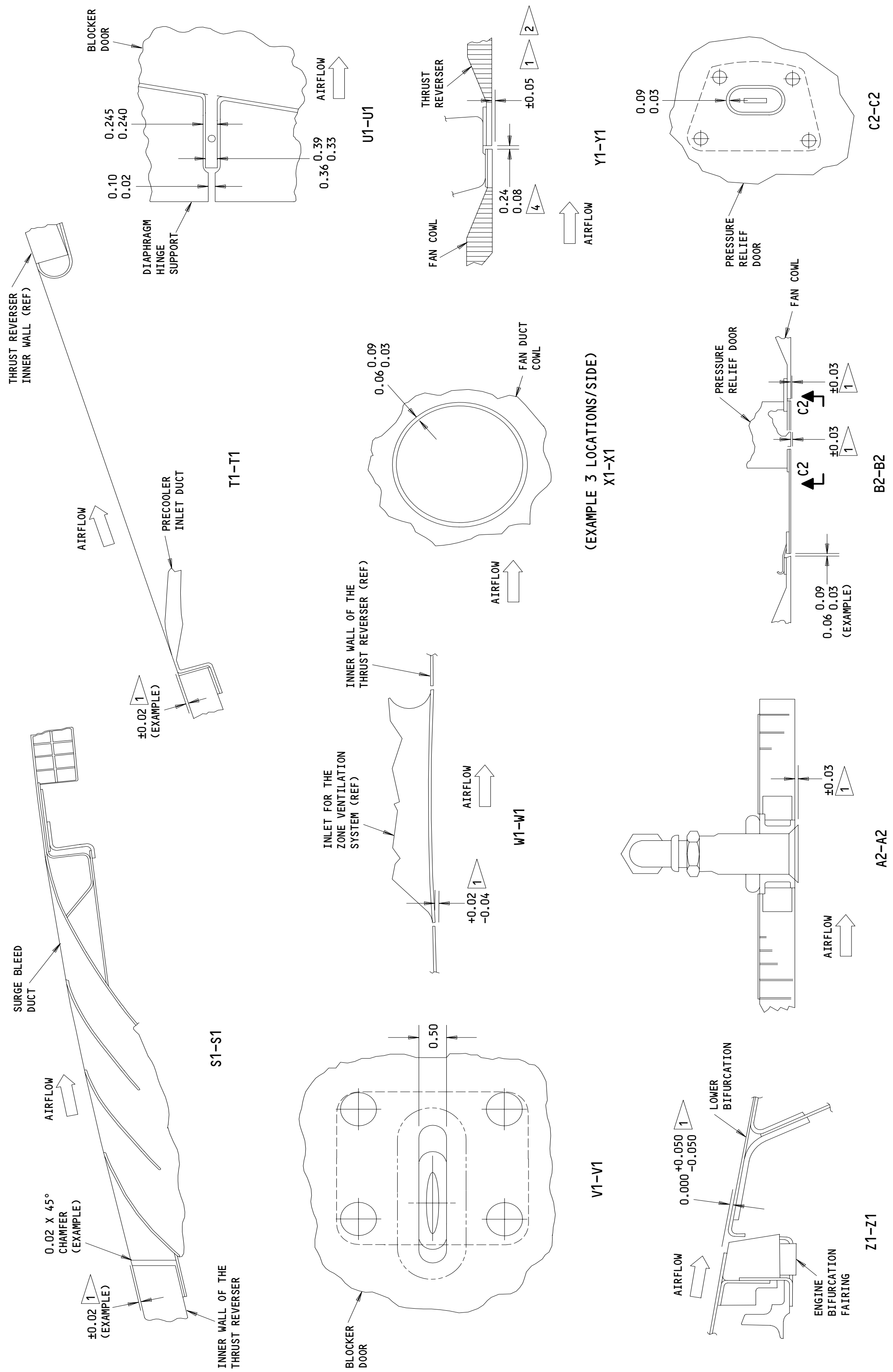
Aerodynamic Smoothness
Figure 201 (Sheet 6)



Aerodynamic Smoothness
Figure 201 (Sheet 7)

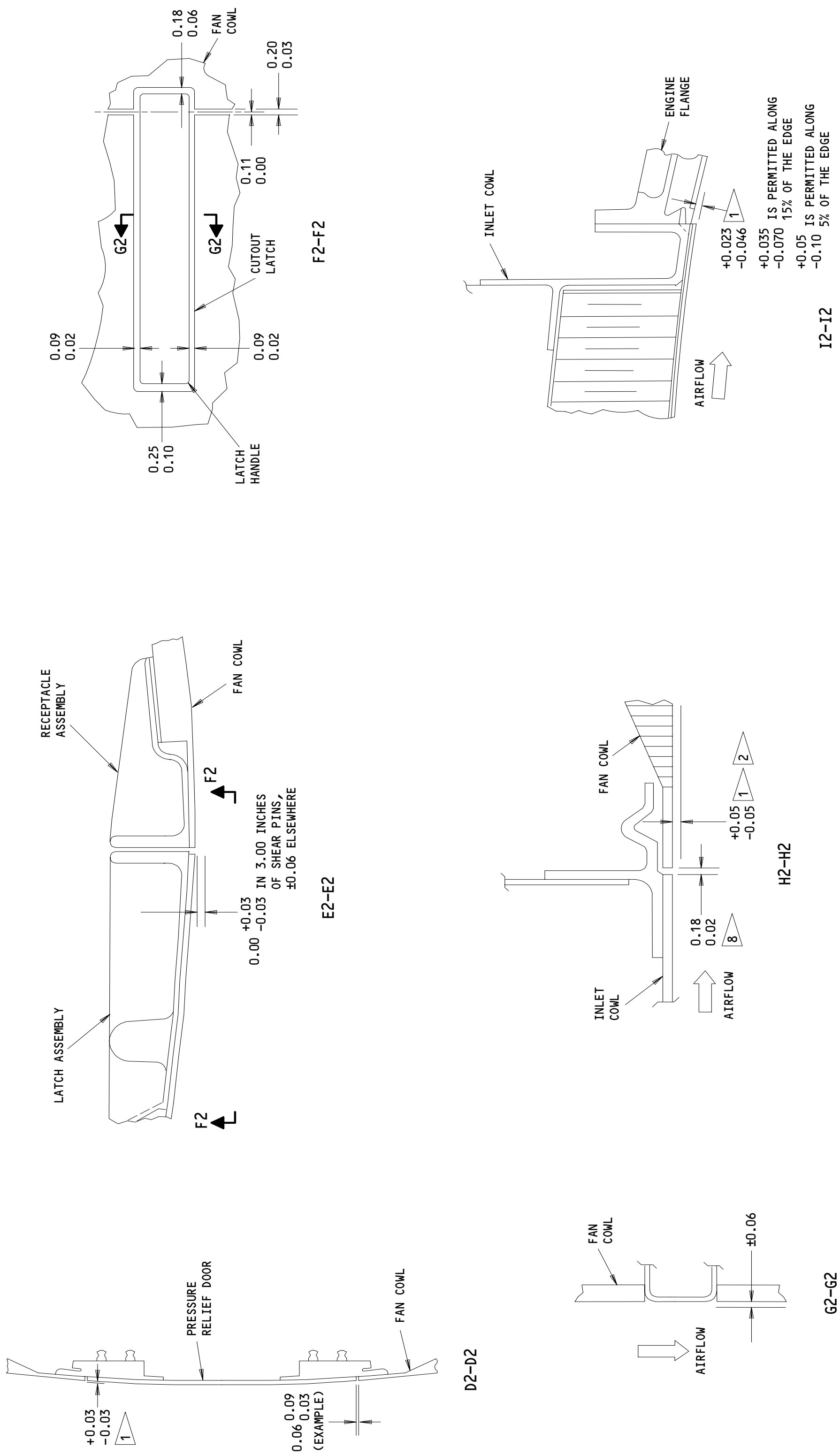


Aerodynamic Smoothness
Figure 201 (Sheet 8)



Aerodynamic Smoothness
Figure 201 (Sheet 9)

272335



Aerodynamic Smoothness
Figure 201 (Sheet 10)

INLET COWL - REMOVAL/INSTALLATION

1. General
   A. There are two tasks in this procedure. The first task is the removal of the inlet cowl. The second task is the installation of the inlet cowl.
   B. It is necessary to have a crane that can lift a minimum of 900 pounds (409.09 Kg) to do this procedure. A dynamometer is also necessary unless the crane has an adjustable load limit. The dynamometer is necessary to prevent damage to the cowl by large loads that lift the cowl when it is attached to the engine.
   C. The inlet cowls are interchangeable between the left and right engines. Make sure the inlet cowl chine is only installed on the inboard side of the engine.
   D. The inlet cowl sling has three hoists, one strap, and a sling link. These parts permit the cowl to be moved vertically, and to be moved about the longitudinal and lateral axes.
   E. When the inlet cowl is removed, it can be put on a platform or on sandbags. The cowl can be put with the front side up or down. If the inlet cowl is put with the front side up, use caution to prevent damage to the thermal anti-ice (TAI) duct.

TASK 71-11-01-004-001-N00

2. Remove the Inlet Cowl
   A. Equipment
      (1) Inlet Cowl Sling - A71005-33
      (2) Single Cable Ratchet Hoist -
          1500-pound capacity with safety hooks,
          Model L4H150, Ingersall Rand, Shippensberg, PA
      (3) Dynamometer - 0-1000 pound capacity
          (± 2% accuracy) (Commercially Available)
   B. References
      (1) AMM 71-11-04/401, Fan Cowl Panels
      (2) AMM 71-11-09/401, Inlet Cowl Thermal Anti-Ice (TAI) Duct
   C. Access
      (1) Location Zones
          412 Inlet Cowl, Left Engine
          422 Inlet Cowl, Right Engine

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine

D. Procedure

S 864-002-N00

(1) For the left engine, open this circuit breaker on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
    (a) 6L19, PROBE HEAT ENG L

S 864-003-N00

(2) For the right engine, open this circuit breaker on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
    (a) 6K25, PROBE HEAT ENG R

S 014-004-N00

(3) Remove the fan cowl panels (AMM 71-11-04/401).

S 034-005-N00

(4) Disconnect the thermal anti-ice (TAI) duct (4) from the inlet cowl (Fig. 401).
    (a) Remove the coupling (2) from the end of the TAI duct (4).
    (b) Remove and discard the gasket (3).

<u>CAUTION</u>: PUT PROTECTION CAPS ON ALL OF THE OPEN ENDS OF THE TAI DUCT IMMEDIATELY AFTER YOU DISCONNECT THE DUCT. IF DIRT GETS INTO THE TAI DUCT, A BLOCKAGE CAN OCCUR.

    (c) Put protection caps on the open ends of the TAI duct (1 and 4).
    (d) It the inlet cowl will be put on a pallet with the front side up, remove the TAI duct (1) (AMM 71-11-09/401).

S 034-006-N00

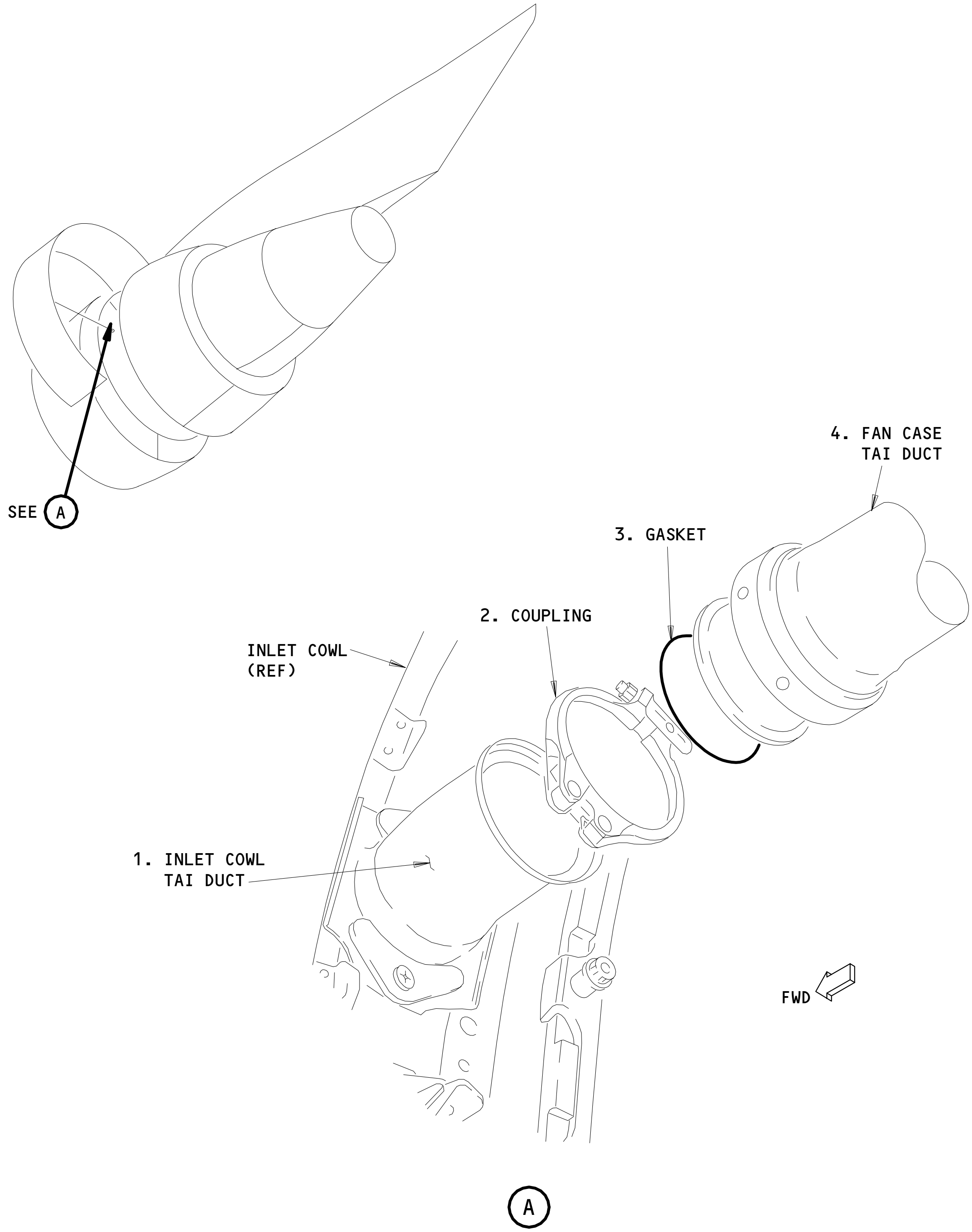
(5) Disconnect the PT2/TT2 tube from the inlet cowl (Fig. 402).
    (a) Put protection caps on the PT2/TT2 tube and on the inlet cowl.

S 034-007-N00

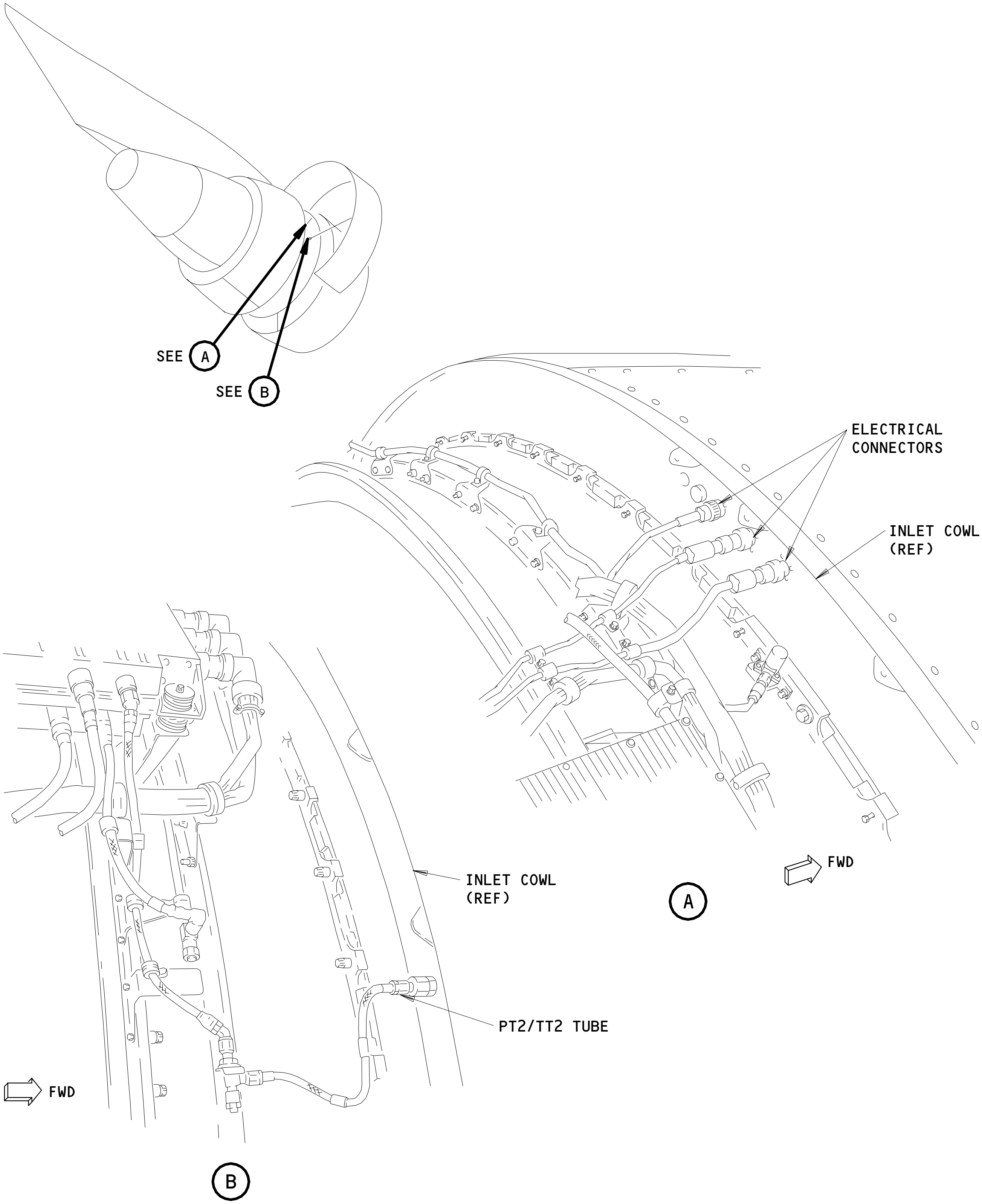
(6) Disconnect the electrical connectors from the inlet cowl (Fig. 402).
    (a) Install protection caps on all of the electrical connectors.

S 494-008-N00

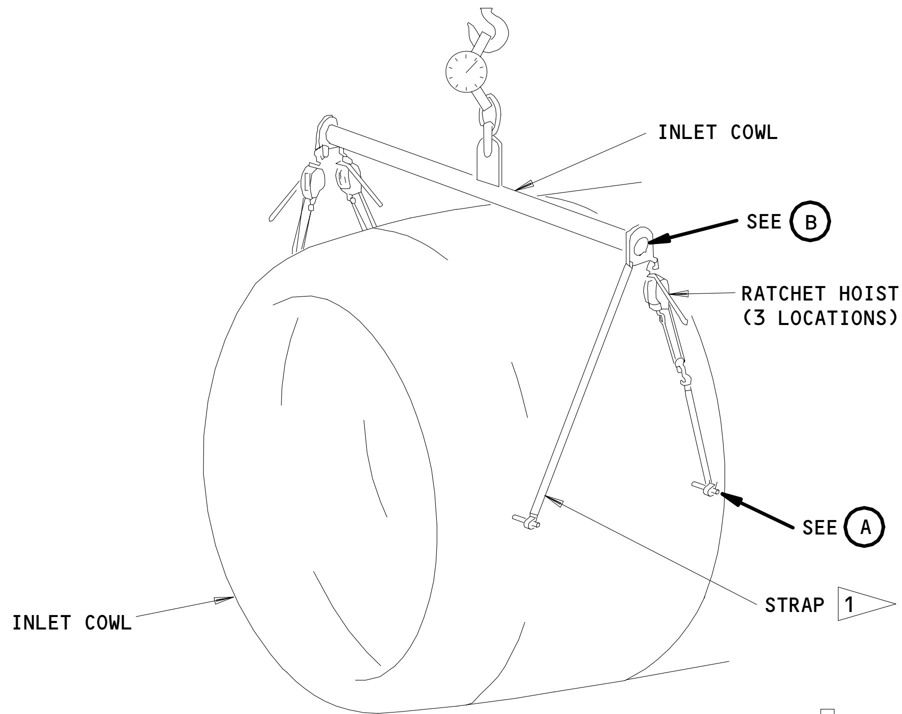
(7) Install the inlet cowl sling (Fig. 403).

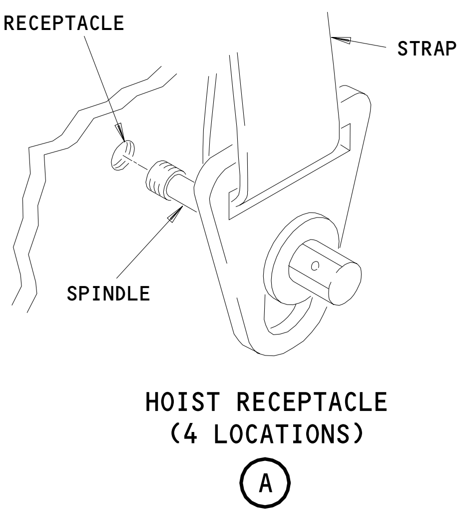


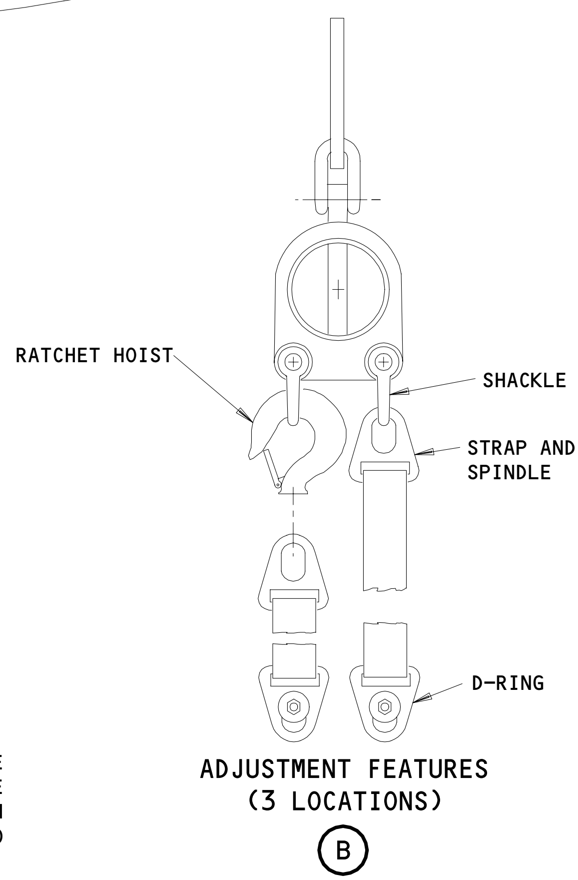
Inlet Cowl Thermal Anti-Ice (TAI) Duct
Figure 401



Inlet Cowl Probe Connections
Figure 402







1 CONNECT THE STRAP TO THE FORWARD RECEPTACLE TO PUT THE NOSE COWL ON THE GROUND WITH THE FORWARD SIDE UP. TO PUT THE NOSE COWL WITH THE FORWARD SIDE DOWN, CONNECT THE STRAP TO THE AFT RECEPTACLE.

Inlet Cowl Sling Installation
Figure 403

WARNING: MAKE SURE YOU KNOW HOW TO USE A RATCHET HOIST BEFORE YOU APPLY A LOAD TO IT. A RATCHET HOIST WITH A LIGHT LOAD ON IT CAN RELEASE IF IT IS PUT INTO A NEUTRAL (OR FREE) POSITION. IF THE RATCHET HOIST RELEASES, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(a) You can install a ratchet hoist between the hoist and the sling to lift the cowl by smaller quantities.
(b) If the hoist has an adjustable load limit, use the load limits on the placard of the sling to adjust the load.
(c) If the hoist does not have an adjustable load limit, install a dynamometer on the sling link.
(d) Attach the hoist hook to the sling link.
(e) Put the sling above the inlet cowl.
(f) Install the spindles in the receptacles on the inlet cowl at the three and the nine o'clock positions.
  1) If the inlet cowl will be put on a platform with the front side up, attach the strap to the front receptacle.
  2) Attach the three spindles with the ratchet hoists to the inlet cowl.

WARNING: MAKE SURE THE SPINDLES ARE TIGHT. IF THE SPINDLES BECOME LOOSE WHILE YOU LIFT THE COWL, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

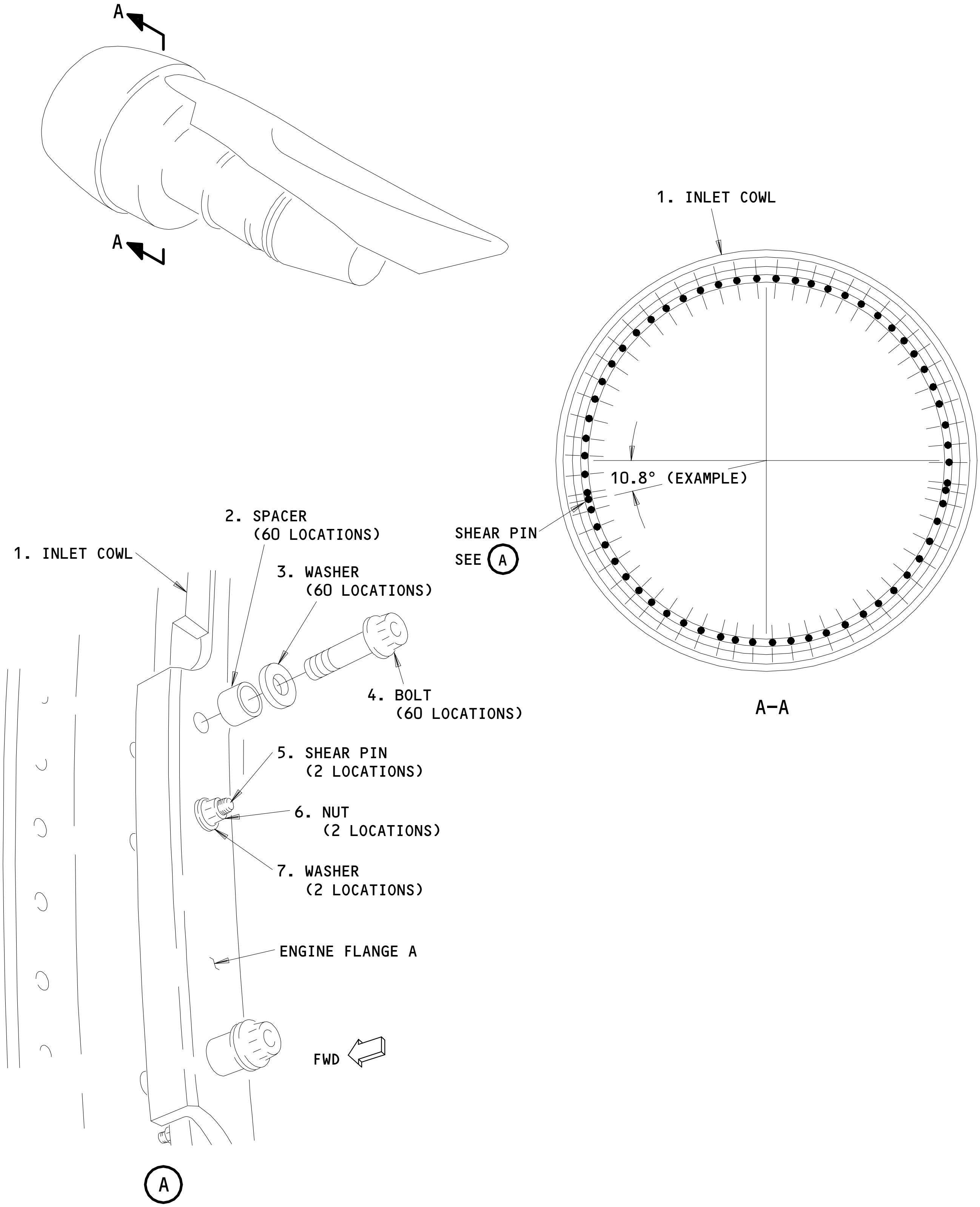
(g) Tighten the spindles to 120 pound-inches (13.56 newton-meters).

CAUTION: ADJUST THE CRANE TO BALANCE THE WEIGHT OF THE INLET COWL AND THE SLING EQUIPMENT. IF THE WEIGHT IS NOT BALANCED, THE COWL CAN MOVE SUFFICIENTLY TO CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT WHEN THE COWL IS RELEASED FROM THE SHEAR PINS.

(h) Adjust the hoist and the sling straps until the straps are tight.
(i) Make sure the load on the inlet cowl is not more than the weight of the inlet cowl and the sling equipment.

  NOTE: Use the placard on the sling to find the weight of the inlet cowl. The sling equipment weighs approximately 130 pounds (59.1 Kg).

S 024-009-N00
(8) Remove the inlet cowl (1) (Fig. 404).
  (a) Remove the bolts (4), the washers (3), and the spacers (2) that attach the inlet cowl to the engine flange A.



Inlet Cowl Installation
Figure 404

CAUTION: HOLD THE INLET COWL STABLE WHILE YOU DISENGAGE THE SHEAR PINS. THE INLET COWL CAN TURN WHEN THE SHEAR PINS DISENGAGE AND CAN CAUSE DAMAGE TO THE COWL OR TO THE ENGINE.

(b) Move the inlet cowl forward to disengage the shear pins (5).

S 024-010-N00

(9) Put the inlet cowl on a platform or on the sandbags.
  (a) Put the inlet cowl above a platform or above the sandbags.
  (b) Adjust the ratchet hoists to turn the inlet cowl until the front side is up or down.

CAUTION: WHEN YOU LOWER THE INLET COWL, MAKE SURE THE TAI DUCT GOES INTO AN OPENING IN THE PLATFORM (OR SANDBAGS). IF YOU DO NOT OBEY THESE INSTRUCTIONS, YOU CAN CAUSE DAMAGE TO THE INLET COWL.

  (c) Make sure the TAI duct goes into an opening in the platform (sandbags) when you lower the inlet cowl.

S 094-011-N00

(10) If you will not install the same inlet cowl, remove the sling (Fig. 403).
  (a) Remove the spindles from the inlet cowl.
  (b) Lower the sling to the ground away from the inlet cowl.
  (c) Remove the sling from the crane hook.

TASK 71-11-01-404-012-N00

3. Install the Inlet Cowl
  A. Equipment
    (1) Inlet Cowl Sling - A71005-33
    (2) Single Cable Ratchet Hoist -
        1500-pound capacity with safety hooks,
        Model L4H150, Ingersall Rand, Shippensberg, PA
    (3) Dynamometer - 0-1000 pound capacity
        (± 2% accuracy) (Commercially Available)
  B. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	3	Gasket	71-11-09	01	10
404	1	Inlet Assembly (Inlet Cowl)	71-11-01	10	70

C. References
  (1) AMM 71-00-00/501, Power Plant
  (2) AMM 71-11-02/401, Inlet Cowl Chine
  (3) AMM 71-11-04/401, Fan Cowl Panels
  (4) AMM 71-11-09/401, Inlet Cowl Thermal Anti-Ice (TAI) Duct

D. Access
  (1) Location Zones
    412 Inlet Cowl, Left Engine
    422 Inlet Cowl, Right Engine

  (2) Access Panels
    413AL Fan Cowl Panel, Left Engine
    414AR Fan Cowl Panel, Left Engine
    423AL Fan Cowl Panel, Right Engine
    424AR Fan Cowl Panel, Right Engine

E. Procedure

  S 434-013-N00
  (1) Install the shear pins (5), the washers (7), and the nuts (6) to the engine flange A if necessary (Fig. 404).
    (a) Tighten the nuts (6) to 50-75 pound-inches (5.65-8.48 newton-meters).

  S 494-014-N00
  (2) Install the sling to the inlet cowl if it was removed (Fig. 403).

WARNING: MAKE SURE YOU KNOW HOW TO USE THE RATCHET HOIST BEFORE YOU APPLY A LOAD ON IT. A RATCHET HOIST WITH A LIGHT LOAD ON IT CAN RELEASE IF THE CONTROL LEVER IS PUT INTO A NEUTRAL (OR FREE) POSITION. IF THE HOIST RELEASES, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(a) You can install a ratchet hoist between the crane and the sling to lift the cowl by smaller quantities.
(b) If the crane has an adjustable load limit, adjust the crane for 806±10 pounds (366.4±4.5 Kg).
(c) If the crane does not have an adjustable load limit, install a dynamometer on the sling link.
(d) Attach the crane hook to the sling link.
(e) Put the sling above the inlet cowl to be installed.
(f) Install the spindles in the receptacles on the inlet cowl.
(g) If the inlet cowl has the front side up, connect the strap without the ratchet hoist to the forward receptacle.
(h) If the inlet cowl has the front side down, connect the strap without the ratchet hoist to the aft receptacle.
(i) Install the other three spindles to the inlet cowl.

WARNING: MAKE SURE THE SPINDLES ARE TIGHT. IF THE SPINDLES BECOME LOOSE WHILE YOU LIFT THE COWL, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(j) Tighten the spindles to 120 pound-inches (13.56 newton-meters).

S 024-015-N00

(3) Install the inlet cowl on the engine flange A (Fig. 404).
(a) Remove the straps that attach the inlet cowl to the platform.
(b) Lift the crane to tighten the straps.
(c) Lift the inlet cowl until it is of sufficient height to turn.
(d) Adjust the ratchet hoists to turn the inlet cowl until it is vertical.
(e) Align the inlet cowl (1) with the shear pins (5) on the engine flange A.
(f) Move the inlet cowl (1) aft to engage the shear pins (5).
(g) Attach the inlet cowl (1) to the engine flange A with the bolts (4), the washers (3), and the spacers (2).
1) Tighten the bolts (4) to 300-360 pound-inches (33.90-40.68 newton-meters).

S 094-016-N00

(4) Disconnect the sling from the inlet cowl (Fig. 403).
(a) Lower the crane to make the straps loose.
(b) Remove the spindles from the inlet cowl.
(c) Move the crane until the sling is clear of the inlet cowl.
(d) Remove the sling from the crane hook.

S 034-017-N00

(5) Install the PT2/TT2 tube to the inlet cowl (Fig. 402).
  (a) Remove the protection caps from the PT2/TT2 tubes.
  (b) Connect the PT2/TT2 tube.

S 034-018-N00

(6) Install the electrical connectors (Fig. 402).
  (a) Remove the caps from the electrical connectors.
  (b) Connect the electrical connectors.

S 034-019-N00

(7) Connect the TAI duct (4) to the inlet cowl (Fig. 401).
  (a) Install the TAI duct (1) on the inlet cowl (AMM 71-11-09/401) if it was removed.
  (b) Remove the protection caps from the TAI duct (1 and 4).
  (c) Install the gasket (3) to the TAI duct (4) on the fan case.
  (d) Attach the TAI ducts (1 and 4) with the coupling (2).
    1) Tighten the coupling (2) to 85-100 pound-inches (9.61-11.30 newton-meters).

S 214-020-N00

CAUTION: KEEP TOOLS AND OTHER OBJECTS OUT OF THE INLET COWL. IF OBJECTS ARE IN THE INLET COWL WHEN THE ENGINE STARTS, DAMAGE TO THE ENGINE WILL OCCUR.

(8) Make sure that no tools or other objects are in the inlet cowl.

S 414-021-N00

(9) Install the fan cowl panels (AMM 71-11-04/401).

S 214-022-N00

CAUTION: MAKE SURE THE INLET COWL CHINE IS INSTALLED ON THE INBOARD SIDE OF THE INLET COWL. IF THE INLET COWL CHINE IS NOT INSTALLED CORRECTLY, THE AIRPLANE WILL HAVE UNSATISFACTORY PERFORMANCE.

(10) Make sure the inlet cowl chine is installed on the inboard side of the inlet cowl (AMM 71-11-02/401).

S 864-023-N00

(11) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the main power distribution panel, P6:
  (a) 6L19, PROBE HEAT ENG L

S 864-024-N00

(12) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the main power distribution panel, P6:
  (a) 6K25, PROBE HEAT ENG R

S 794-025-N00
(13) Do the PT2 System Leak Test (Test 14) that is shown in the Power-Plant Test-Reference Table (AMM 71-00-00/501).

INLET COWL CHINE - REMOVAL/INSTALLATION

1. General
   A. There are two tasks in this procedure. The first task is the removal of the inlet cowl chine. The second task is the installation of the inlet cowl chine.
   B. This procedure has the necessary steps to install an inlet cowl chine on an inlet cowl for the left or the right engine.
   C. The inlet cowl chine must be installed on the inboard side of the inlet cowl. To make the left and right inlet cowls interchangeable, the cowls have two positions to install an inlet cowl chine.
   D. The left and right inlet cowl chines are not interhcangeable. An inlet cowl chine for the right engine cannot be installed on the inboard side of the left engine.

TASK 71-11-02-004-001-N00

2. Remove the Inlet Cowl Chine (Fig. 401)
   A. Access
      (1) Location Zones
         412 Inlet Cowl, Left Engine
         422 Inlet Cowl, Right Engine

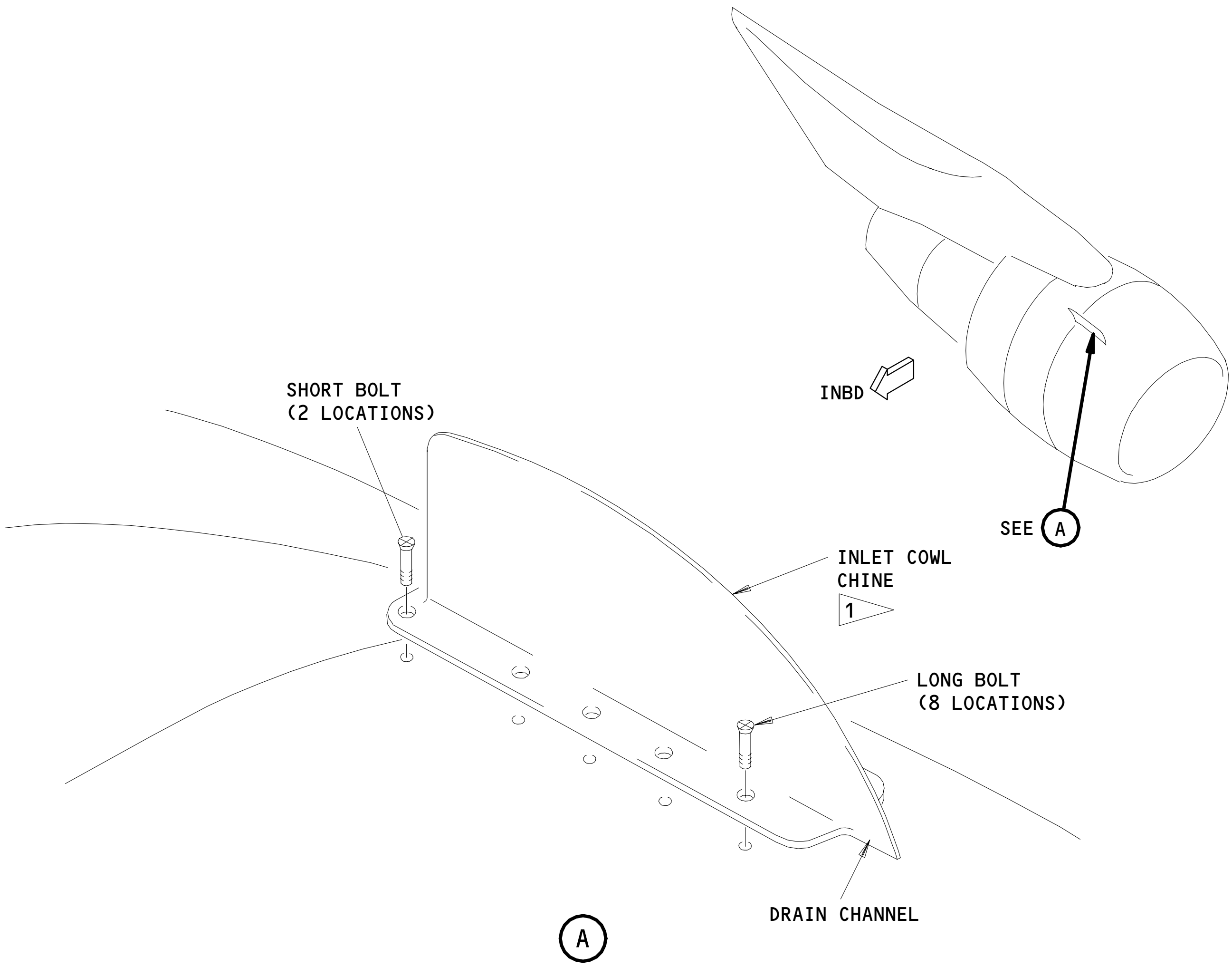
   B. Procedure

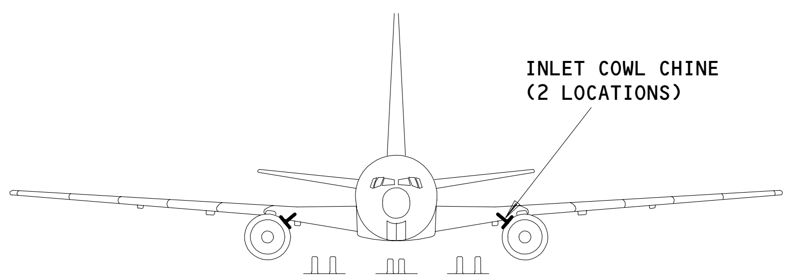
      S 034-002-N00
      (1) Remove the bolts that attach the inlet cowl chine to the inlet cowl.

      S 024-003-N00
      (2) Remove the inlet cowl chine.

TASK 71-11-02-404-004-N00

3. Install the Inlet Cowl Chine (Fig. 401)
   A. Consumable Materials
      (1) A00247 Sealant - BMS 5-95
   B. References
      (1) AMM 51-31-01/201, Seals and Sealing
   C. Access
      (1) Access Zones
         412 Inlet Cowl, Left Engine
         422 Inlet Cowl, Right Engine





CHINE LOCATION

1 INSTALL THE INLET COWL ON THE INBOARD SIDE ONLY (SEE THE CHINE LOCATION).

Inlet Cowl Chine Installation
Figure 401

D. Procedure

S 034-005-N00

(1) If an inlet cowl chine is to be installed on the other side of the inlet cowl, do these steps:

NOTE: These steps will prepare an inlet cowl for installation on either engine.

(a) Remove the sealant from the bolt locations for the inlet cowl chine.
(b) Remove the bolts for the inlet cowl chine from the inlet cowl.

S 024-006-N00

(2) Remove the peel ply from the bottom of the chine, if it is necessary.

S 394-007-N00

(3) Apply a fay seal with the sealant (AMM 51-31-01/201).

S 394-008-N00

(4) Apply the sealant to the inner side of the heads of the bolts.

S 424-009-N00

CAUTION: THE INLET COWL CHINES ARE NOT INTERCHANGEABLE. INSTALL THE INLET COWL CHINE ON THE INBOARD SIDE ONLY. IF THE CHINE IS NOT INSTALLED CORRECTLY, IT CAN HAVE AN EFFECT ON THE PERFORMANCE OF THE AIRPLANE.

(5) Put the chine in its position on the inboard side of the inlet cowl.

NOTE: When the inlet cowl chine is correctly installed, the front of the chine is higher than the aft end.

(a) Install the short bolts in the two aft locations.
(b) Install the long bolts in the forward eight locations.

S 394-010-N00

CAUTION: DO NOT APPLY THE SEALANT TO THE DRAIN CHANNEL. THE SEALANT CAN CAUSE A BLOCKAGE OF THE DRAIN CHANNEL AND FLUID CAN COLLECT.

CAUTION: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO APPLY THE SEALANT. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO THE AIRPLANE SURFACE CAN OCCUR.

(6) Apply a fillet seal with the sealant around the chine but not on the drain channel (AMM 51-31-01/201).

S 434-011-N00

(7) If the bolts for a chine on the opposite side of the inlet cowl are not installed, do these steps:

(a) Install the short bolts in the two aft locations.

(b) Install the long bolts in the forward eight locations.

1) Make sure the bolts are 0.03 to 0.04 inches below the surface of the inlet cowl.

(c) Apply the sealant to the bolts (AMM 51-31-01/201).

INLET COWL PRESSURE RELIEF VENT - REMOVAL/INSTALLATION

1. General
   A. There are two tasks in this procedure. The first task is the removal of the pressure relief vent on the inlet cowl. The second task is the installation of the pressure relief vent on the inlet cowl.
   B. The pressure relief vent on the inlet cowl is on the bottom aft edge of the inlet cowl.

TASK 71-11-03-004-001-N00

2. Remove the Inlet Cowl Pressure Relief Vent (Fig. 401)
   A. Access
      (1) Location Zones

412	Inlet Cowl, Left Engine
422	Inlet Cowl, Right Engine

   B. Procedure

S 034-002-N00

(1) Put a screwdriver in the latch tool slots.

S 034-003-N00

(2) Apply a force to the screwdriver to release the latches.

S 034-004-N00

(3) Remove the bolts from the hinge assemblies on the vent.

S 024-005-N00

(4) Use a drift punch on the outer side of the vent to push the roll pin until the vent is free.

S 034-006-N00

(5) Remove the hinge assemblies and the washers.

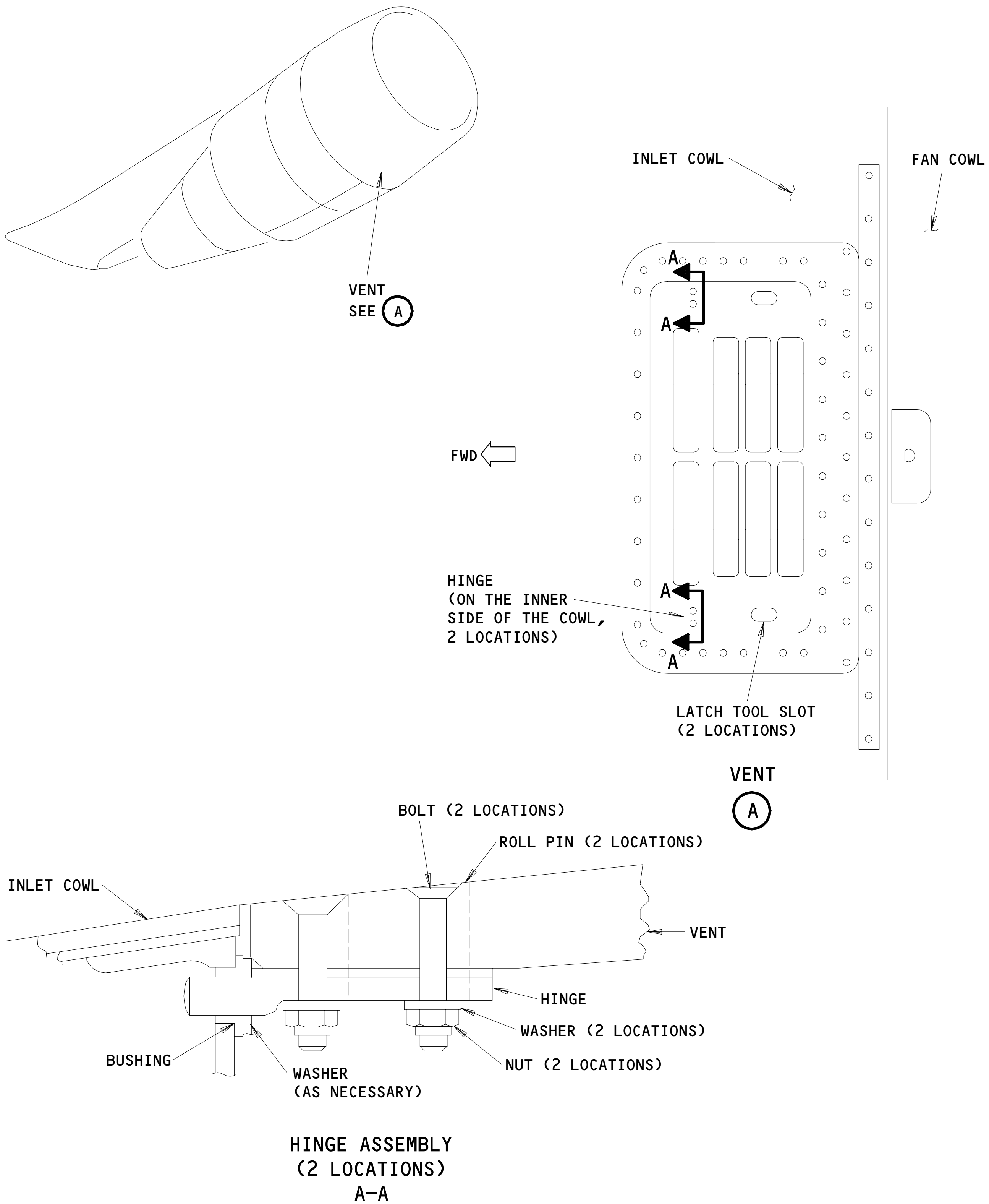
S 034-007-N00

(6) Remove the bushings if they are worn.

TASK 71-11-03-404-008-N00

3. Install the Inlet Cowl Pressure Relief Vent (Fig. 401)
   A. Consumable Materials
      (1) A00247 Sealant - BMS 5-95
   B. References
      (1) AMM 71-11-03/501, Cowl Panel Pressure Relief Vent
   C. Access
      (1) Location Zones

412	Inlet Cowl, Left Engine
422	Inlet Cowl, Right Engine



Inlet Cowl Pressure Relief Vent Installation
Figure 401

D. Procedure

S 434-009-N00

(1) If it is necessary, install the bushings.

NOTE: Use the sealant to apply a fillet seal around the bushing.

S 424-010-N00

(2) Install the hinge assemblies in the bushings.

NOTE: Use the washers as necessary to get the correct tolerance on the surface of the inlet cowl.

S 434-011-N00

(3) Align the vent with the roll pins in the hinge assemblies.

S 434-012-N00

(4) Use a drift punch on the inner side of the vent to push the roll pins until they are smooth with the outer surface of the vent.

S 394-013-N00

(5) Apply the sealant to the bolts.

S 434-014-N00

(6) Install the bolts, the nuts, and the washers that attach the hinge assemblies to the vent.

S 824-015-N00

(7) Adjust the latches and the hinges on the vent (AMM 71-11-03/501).

S 414-016-N00

(8) Close the vent.

INLET COWL PRESSURE RELIEF VENT - ADJUSTMENT/TEST

1. General
   A. There are two tasks in this procedure. The first task is used to do a latch test for the pressure relief vent on the inlet cowl. The second task is used to do an adjustment of the aerodynamic smoothness for the pressure relief vent.
      (1) The latch test is used to make sure the latches release at the correct pressure. To do this test, you apply a load to the latches.
      (2) The adjustment of aerodynamic smoothness is used to make sure the pressure relief vent is in the correct tolerances.
   B. The pressure relief vent on the inlet cowl is a vent for the thermal anti-icing air. This vent is also a pressure relief vent for the inlet cowl.

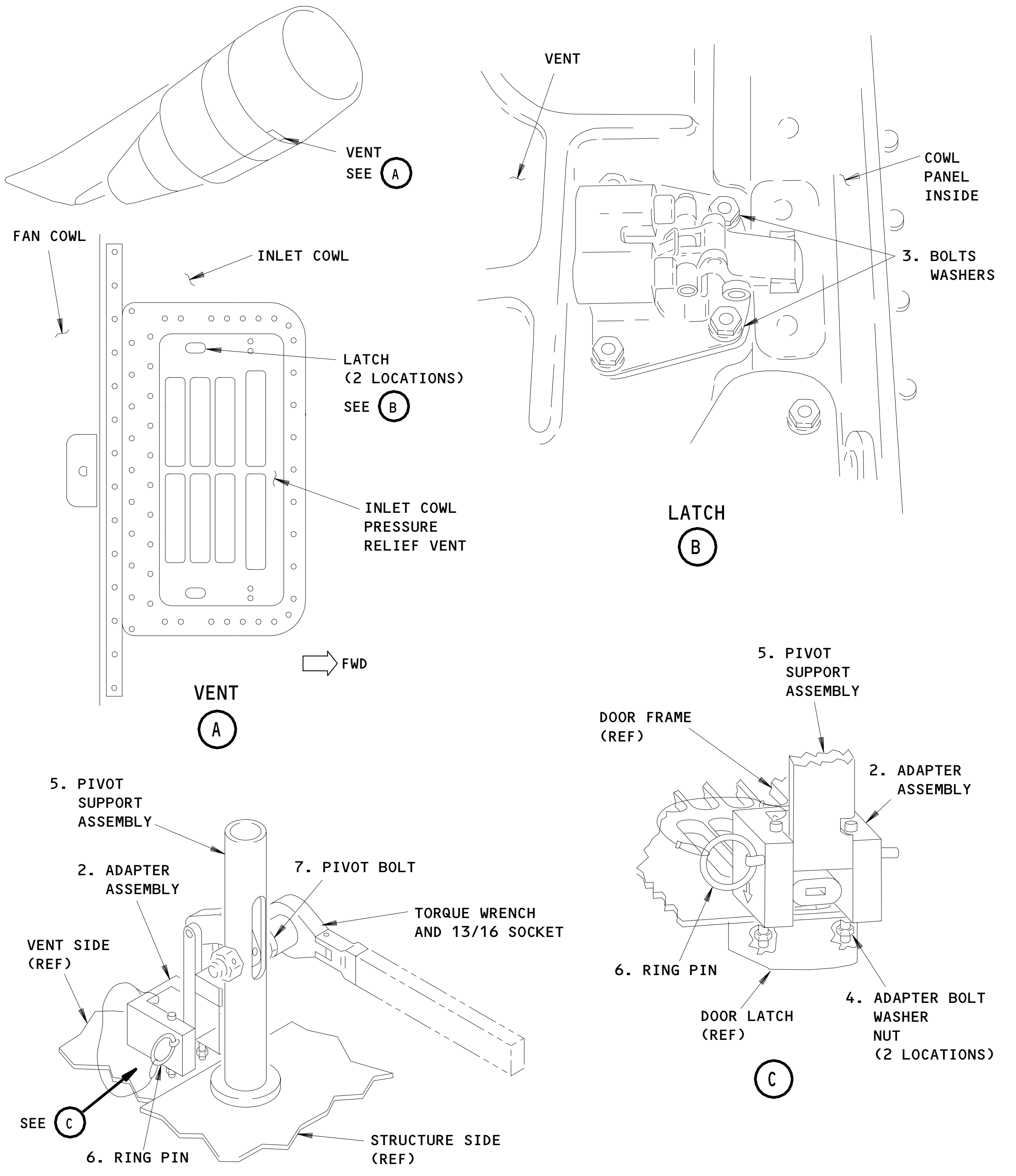
TASK 71-11-03-225-001-N00

2. Latch Test for the Inlet Cowl Pressure Relief Vent
   A. Equipment
      (1) Adapter - Load Test - Pressure Relief Vent
          Latch
          B71044-28 (Recommended)
          B71044-10 (Alternative)
   B. Access
      (1) Location Zones
          412 Inlet Cowl, Left Engine
          422 Inlet Cowl, Right Engine

   C. Do the Test of the Latches on the Pressure Relief Vent (Fig. 501).

      S 015-010-N00
      (1) Open the latches on the pressure relief vent.
          (a) Put the blade of a straight-slot screwdriver into the latch slot (1).
          (b) Move the screwdriver handle to the side to turn the latch (1) to the open position.

      S 485-011-N00
      (2) Install the load-test-adapter-tool for the latch on the pressure relief vent.
          (a) Remove the two latch mounting bolts (3) that are nearest to the edge of the pressure relief vent.



B71044-10 LOAD TEST TOOL INSTALLATION

Inlet Cowl Pressure Relief Vent Latch Test
Figure 501

(b) Temporarily fasten the adapter assembly (2) to the vent with the bolts (4) that are supplied with the adapter assembly.
   1) Put the adapter bolts (4) into the bolt holes that the latch bolts (3) were removed from.
   2) Tighten the nuts on the bolts (4) with your fingers.

(c) Attach the arm of the pivot support assembly (5) to the adapter assembly (2) with the ring pin (6).

(d) Put the base of the pivot support assembly (5) flush on the surface of the pressure relief vent.

NOTE: The axis of the main tube of the pivot support assembly (5) must be vertical, or 90-degrees, to the surface of the pressure relief vent. The arm of the pivot support assembly (5), that connects to the adapter assembly (2), also must be 90-degrees to the surface of the pressure relief vent. When you put the tool in this correct position and turn the torque wrench, force will be applied correctly at the centerline of the latch.

S 485-012-N00

(3) Attach the torque wrench to the pivot bolt (7) of the pivot support assembly (5).

NOTE: Make sure that the handle of the torque wrench is parallel with the surface of the pressure relief vent.

S 415-013-N00

(4) Close the latch (1) that you will examine on the pressure relief vent.
   (a) Put the blade of a straight-slot screwdriver into the slot on the latch (1) that you will examine.
   (b) Move the screwdriver handle until the latch (1) is in the fully open position, and close the pressure relief vent.
   (c) Move the screwdriver in the opposite direction to lock the latch (1).
   (d) Do not lock the opposite latch.

   NOTE: The opposite latch must stay unlocked during the test.

S 725-014-N00

(5) Do the test of the latches on the pressure relief vent.

CAUTION: PUT A FOLDED SHOP CLOTH OR RUBBER MAT BETWEEN THE TORQUE WRENCH HANDLE AND THE PRESSURE RELIEF VENT (BEFORE YOU TURN THE HANDLE TO OPEN THE LATCH). THIS WILL PREVENT INJURY TO YOUR HAND WHEN YOU SUDDENLY RELEASE THE LATCH. ALSO, IT WILL PREVENT SCRATCHES TO THE SURFACE OF THE PRESSURE RELIEF VENT CAUSED BY THE TORQUE WRENCH HANDLE. IF YOU DO NOT DO THIS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(a) Put a folded shop cloth or rubber mat between the torque wrench handle and the pressure relief vent.
(b) With the handle of the torque wrench parallel to the surface of the pressure relief vent, turn the handle down smoothly.
(c) As you turn the handle down, make a record of the torque when the latch on the pressure relief vent opens.
(d) The latch is serviceable if the torque used to open it is 100-130 pound-inches (11.3-14.7 newton-meters).

NOTE: The force necessary to open the latch is 50-65 pounds. (22.7-29.5 kilograms) But, the arm of the pivot support assembly which pulls up on the latch decreases the applied force by a factor of two. This makes it necessary to increase the force you apply by a factor of two. Thus, the latch must unlock when the torque wrench shows 100-130 pound-inches (11.3-14.7 newton-meters).

S 025-015-N00
(6) If the force to release the latch (1) is not in the specified limits, replace the latch.

S 085-016-N00
(7) Remove the load-test-adapter-tool from the pressure relief vent.
(a) Remove the pivot support assembly (5) from the pressure relief vent.
(b) Remove the adapter assembly (2) from the pressure relief vent.
(c) Install the mounting bolts, washers and nuts (3) on the latch, and tighten the nuts (3).

S 725-017-N00
(8) Do these steps again to do a test of the other latch on the pressure relief vent.

S 415-018-N00
(9) When you have completed the tests for the two latches on the pressure relief vent, do these steps:
(a) Put the blade of a straight-slot screwdriver into the slot of one of the latches (1) on the pressure relief vent.
(b) Move the screwdriver handle until the latch (1) is in the fully open position, and close the pressure relief vent.

(c) Move the screwdriver in the opposite direction to lock the latch (1).
(d) Do these steps again to close the opposite latch (1) on the pressure relief vent.

TASK 71-11-03-715-019-N00

3. Aerodynamic Smoothness Check of the Inlet Cowl Pressure Relief Vent

A. References
(1) AMM 71-11-00/201, Aerodynamic Smoothness
(2) AMM 71-11-03/401, Inlet Cowl Pressure Relief Vent

B. Access
(1) Location Zones

412	Inlet Cowl, Left Engine
422	Inlet Cowl, Right Engine

C. Procedure

S 215-007-N00

(1) Make sure the pressure relief vent is in the limits for aerodynamic smoothness (AMM 71-11-00/201).

S 825-008-N00

(2) If the vent is not in the limits for the aerodynamic smoothness, do these steps to adjust the vent:
(a) Adjust the vent left and right (side tolerance).
1) Add or remove the washers installed between the hinge assemblies and the bushings (AMM 71-11-03/401).
(b) Adjust the vent forward and aft.
1) Use a drift punch to remove the roll pins from the hinge assemblies.
2) Loosen the bolts that attach the vent to the hinge assemblies.
3) Adjust the vent until it is in the tolerances for the aerodynamic smoothness.

4) Drill two new holes on the opposite side of the bolts for the roll pins with a 0.062-0.065 inch bit.
5) Use a drift punch to install the roll pins until they are smooth with the external surface of the vent.

(c) Adjust the step height of the vent.
1) Remove the pressure relief vent (AMM 71-11-03/401).
2) Remove the roll pins from the hinge assembly.
3) Remove the laminations of the shim or replace the shim with a thicker shim if it is necessary.

NOTE: It is necessary to drill holes in a new shim for the bolts and the roll pins.

4) Install the pressure relief vent (AMM 71-11-03/401).

FAN COWL PANEL - MAINTENANCE PRACTICES (OPEN AND CLOSE)

1. General
   A. There are two tasks in this procedure. The first task opens the fan cowl panels, and the second task closes the fan cowl panels. These two tasks are for the inboard and the outboard fan cowl panels.
   B. The hold-open rod and the stabilizer rod hold the fan cowl panel open. The top of the rods attache to the fan cowl panel with a bolt. The bottom of the rods attach to a stow bracket on the fan cowl panel when the panel is closed. When the fan cowl panel is open, the rods attach to brackets on the fan case. The rods extend when the fan cowl panel opens.
   C. When the rods are fully extended, it is necessary to lock the rods. If the rods are not locked, an injury can occur.

TASK 71-11-04-402-001-N00

2. Open the Fan Cowl Panels (Fig. 201)
   A. Access
      (1) Location Zones

413	Fan Cowl Panel, Left Engine
414	Fan Cowl Panel, Left Engine
423	Fan Cowl Panel, Right Engine
424	Fan Cowl Panel, Right Engine

      (2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine

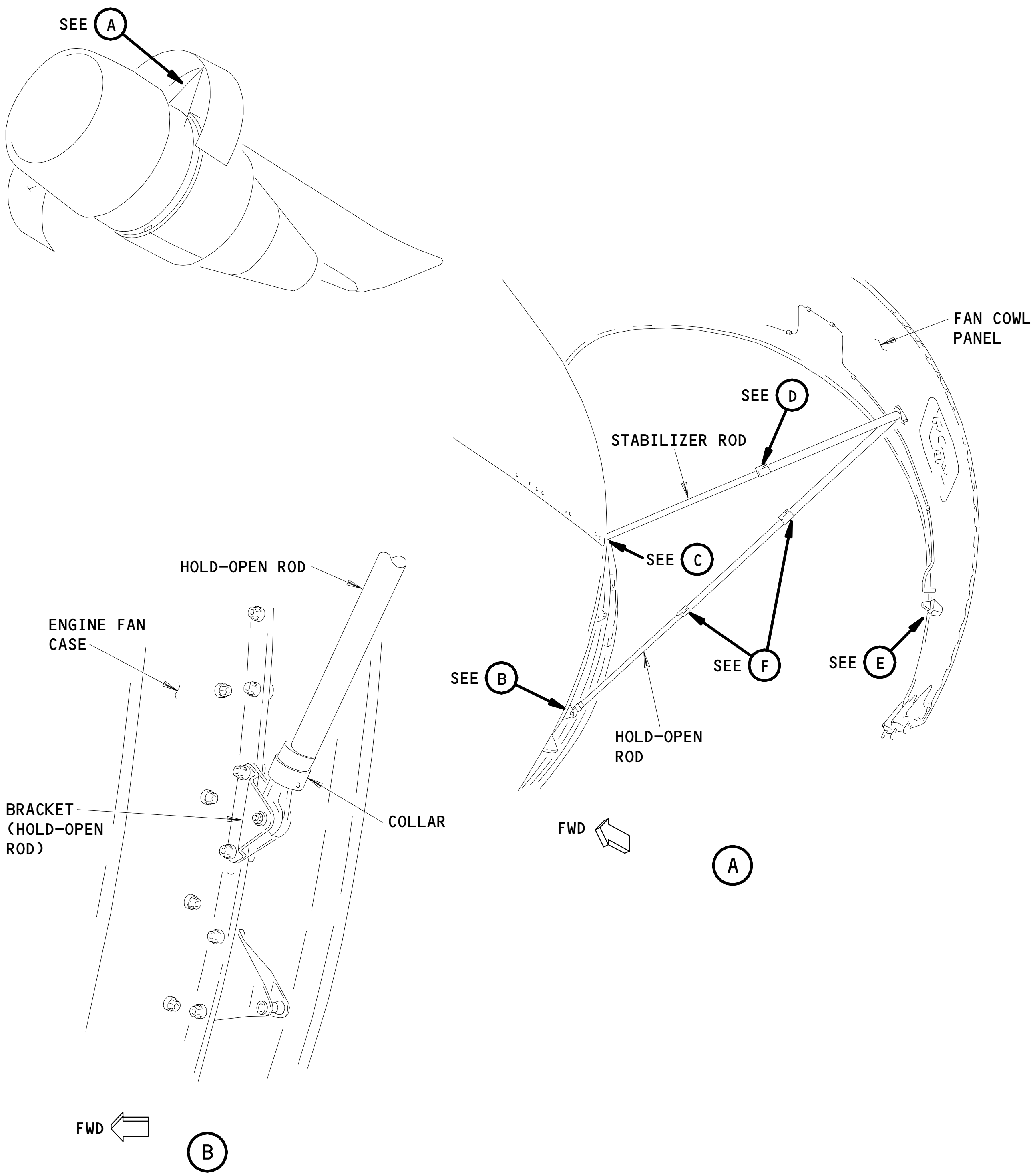
   B. Procedure

S 012-000-N00

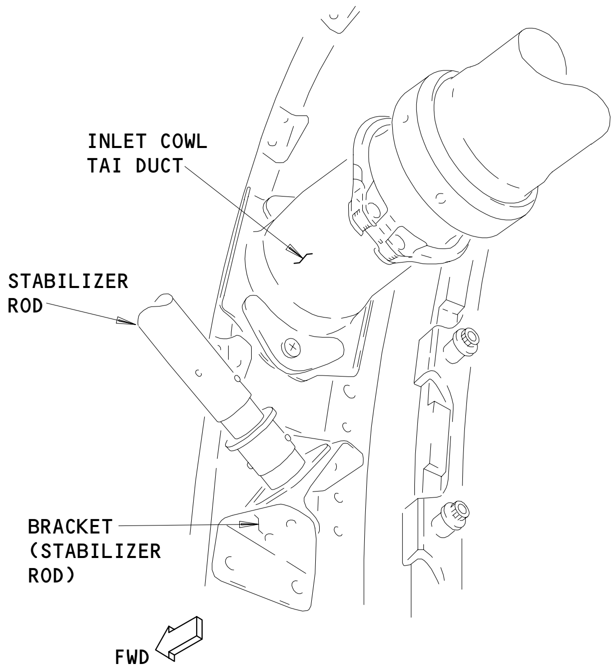
WARNING: USE CAUTION WHEN YOU OPEN THE FAN COWL PANELS IN HIGH WINDS OR IN WIND GUSTS. IF YOU DO NOT USE CAUTION, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

WARNING: DO NOT HOLD THE FAN COWL PANELS OPEN WITH THE HOLD-OPEN RODS IF THE WIND VELOCITY IS MORE THAN 60 KNOTS. THE HOLD-OPEN RODS CAN HAVE A FAILURE IN LARGE WINDS WHICH CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

      (1) Do these steps to open the latches on the fan cowl panels:
         (a) Open the forward latch.
            1) Push the trigger to release the handle.



Fan Cowl Panel Opening
Figure 201 (Sheet 1)



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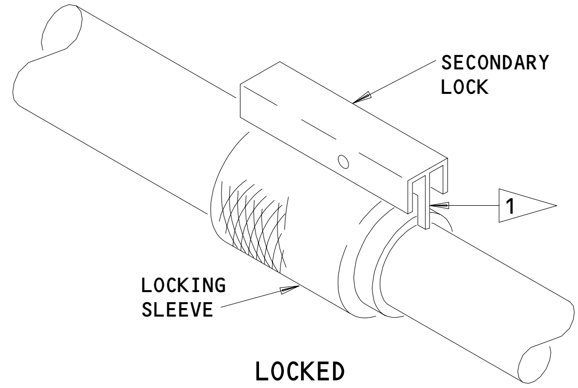
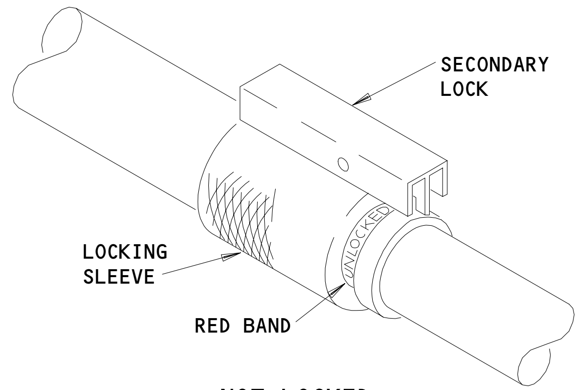


LOCKED
D



NOT LOCKED
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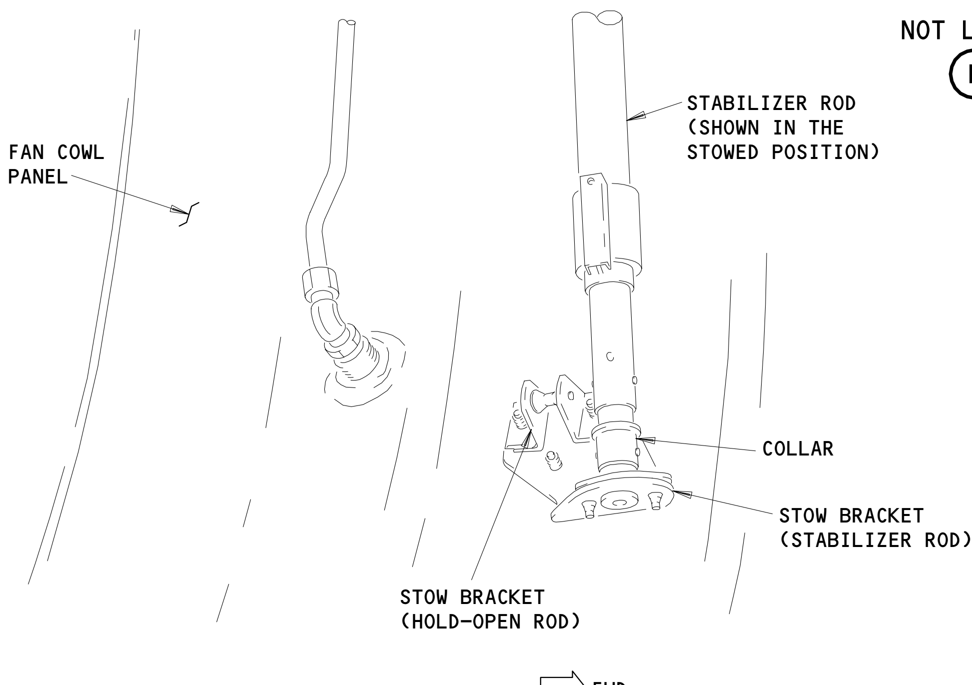
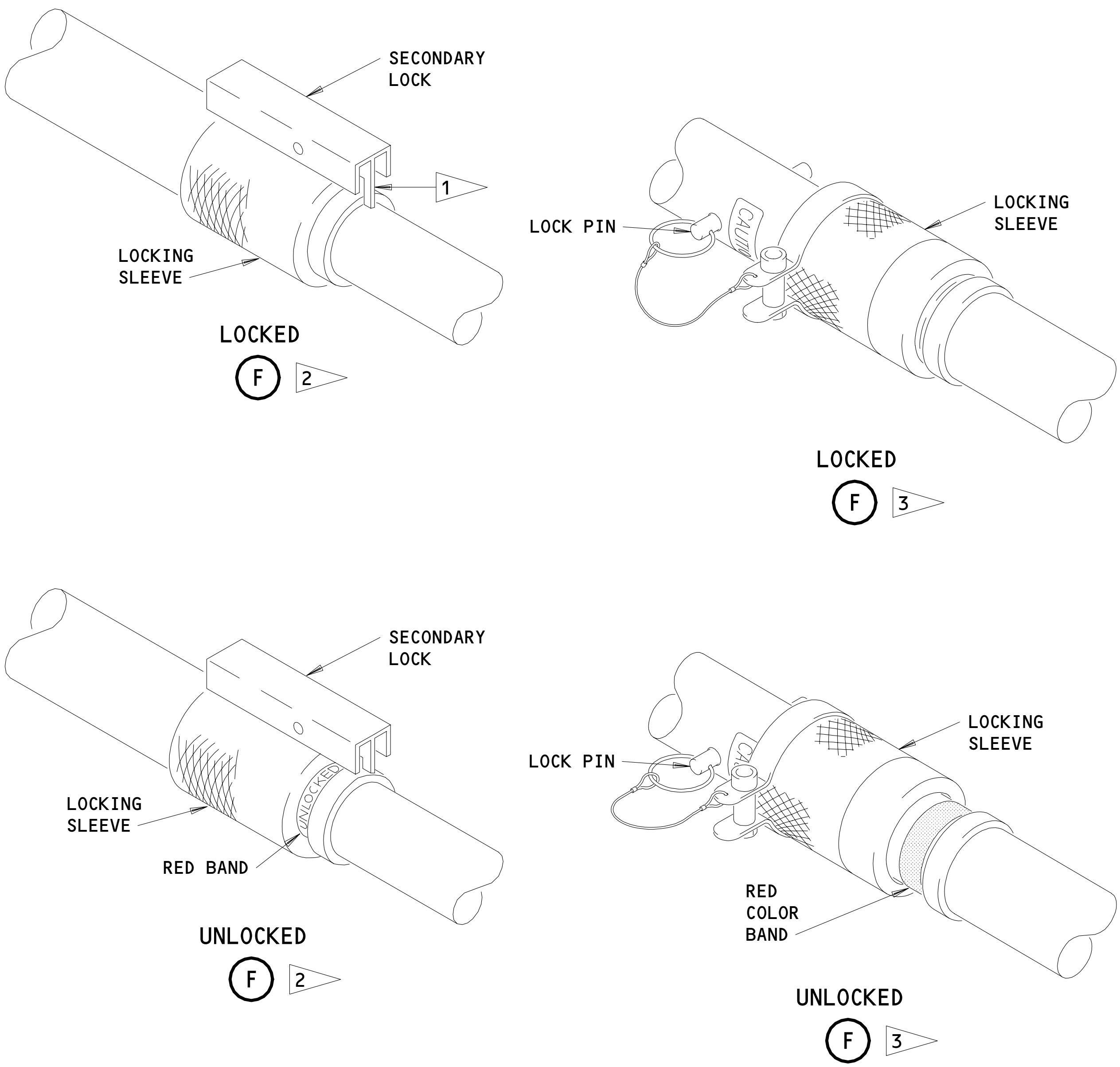


E

1 MAKE SURE THE SECONDARY LOCK IS ENGAGED.

Fan Cowl Panel Opening
Figure 201 (Sheet 2)



1 MAKE SURE THE SECONDARY LOCK IS LATCHED.
2 HOLD-OPEN RODS WITHOUT THE DETENT PIN
3 HOLD-OPEN RODS WITH THE DETENT PIN

Fan Cowl Panel Opening
Figure 201 (Sheet 3)

2) Pull the handle down to release the latch.

(b) Use the same steps to open the other latches from the front of the fan cowl to the rear.

S 012-003-N00

(2) Move the collar up to remove the bottom end of the rods from the stow brackets on the fan cowl panel.

S 012-004-N00

(3) Attach the free end of the rods to the brackets on the fan case.

NOTE: The hold-open rod attaches to the middle bracket on the fan case. The stabilizer rod attaches to the top bracket on the fan case.

S 012-005-N00

WARNING: MAKE SURE THE HOLD-OPEN RODS ARE FULLY EXTENDED AND LOCKED WHEN THE FAN COWL IS OPEN. THE RODS ARE NOT LOCKED WHEN YOU CAN SEE THE RED BAND WITH THE WORD "UNLOCKED" ON THE SLEEVE. IF THE RODS ARE NOT CORRECTLY LOCKED, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) HOLD-OPEN RODS WITHOUT A PIN THAT LOCKS THE ROD OPEN;
Open the fan cowl panel to fully extend the rods.

(a) Move the lock sleeve to the locked position.

(b) Make sure you cannot see the red band and the word UNLOCKED on the lock sleeve.

S 032-006-N00

(5) HOLD-OPEN RODS WITH A PIN THAT LOCKS THE ROD OPEN;
Put the pin in the hold-open rod and make sure the pin goes through the rod.

TASK 71-11-04-402-002-N00

3. Close the Fan Cowl Panel (Fig. 201)

A. References

(1) AMM 71-11-05/501, Fan Cowl Panel Latches

B. Access

(1) Location Zones

413	Fan Cowl Panel, Left Engine
414	Fan Cowl Panel, Left Engine
423	Fan Cowl Panel, Right Engine
424	Fan Cowl Panel, Right Engine

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine

C. Procedure

S 412-000-N00

WARNING: USE CAUTION WHEN YOU CLOSE THE FAN COWL PANELS IN HIGH WINDS OR IN WIND GUSTS. IF YOU DO NOT USE CAUTION, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

WARNING: DO NOT HOLD THE FAN COWL PANELS OPEN WITH THE HOLD-OPEN RODS IF THE WIND VELOCITY IS MORE THAN 60 KNOTS. THE HOLD-OPEN RODS CAN HAVE A FAILURE IN LARGE WINDS WHICH CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

WARNING: HOLD THE FAN COWL PANELS OPEN WHEN YOU REMOVE THE HOLD-OPEN RODS. EACH FAN COWL PANEL WEIGHS APPROXIMATELY 55 POUNDS (25 kg). IF THE FAN COWL PANEL FALLS, AN INJURY CAN OCCUR.

(1) Hold the fan cowl panel and do the steps that follow to close the cowl:
  (a) HOLD-OPEN RODS WITH A PIN THAT LOCKS THE ROD OPEN;
  Remove the pin from the hold-open rod and put the pin in the bolt that holds the attached cable.
  (b) Do these steps to remove the stabilizer rod from the bracket on the fan case:
    1) Push the secondary lock and move the lock sleeve up to retract the stabilizer rod.
    2) Remove the stabilizer rod from the bracket on the fan case.
    3) Put the free end of the stabilizer rod in the stow bracket on the fan cowl panel.

(c) Do these steps to remove the hold-open rod from the bracket on the fan case:
1) HOLD-OPEN RODS WITHOUT A PIN THAT LOCKS THE ROD OPEN; Push the secondary lock and move the lock sleeve up to retract the hold-open rod.
2) Remove the hold-open rod from the bracket on the fan case.
3) Put the free end of the hold-open rod in the stow bracket on the fan cowl panel.

S 412-009-N00
(2) Close the fan cowl panel.

S 412-010-N00
(3) Close the latches on the fan cowl panel.
(a) If the latch handles are not smooth with the outer surface of the fan cowl panels, adjust the latches (AMM 71-11-05/501).

FAN COWL PANEL - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task is the removal of the fan cowl panels. The second task is the installation of the fan cowl panels. This procedure is used for the inboard and the outboard fan cowl panels.

TASK 71-11-04-004-001-N00

2. Remove the Fan Cowl Panel (Fig. 401)
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panel
   B. Access
      (1) Location Zones

413	Fan Cowl Panel, Left Engine
414	Fan Cowl Panel, Left Engine
423	Fan Cowl Panel, Right Engine
424	Fan Cowl Panel, Right Engine

      (2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine

   C. Procedure

S 014-016-N00

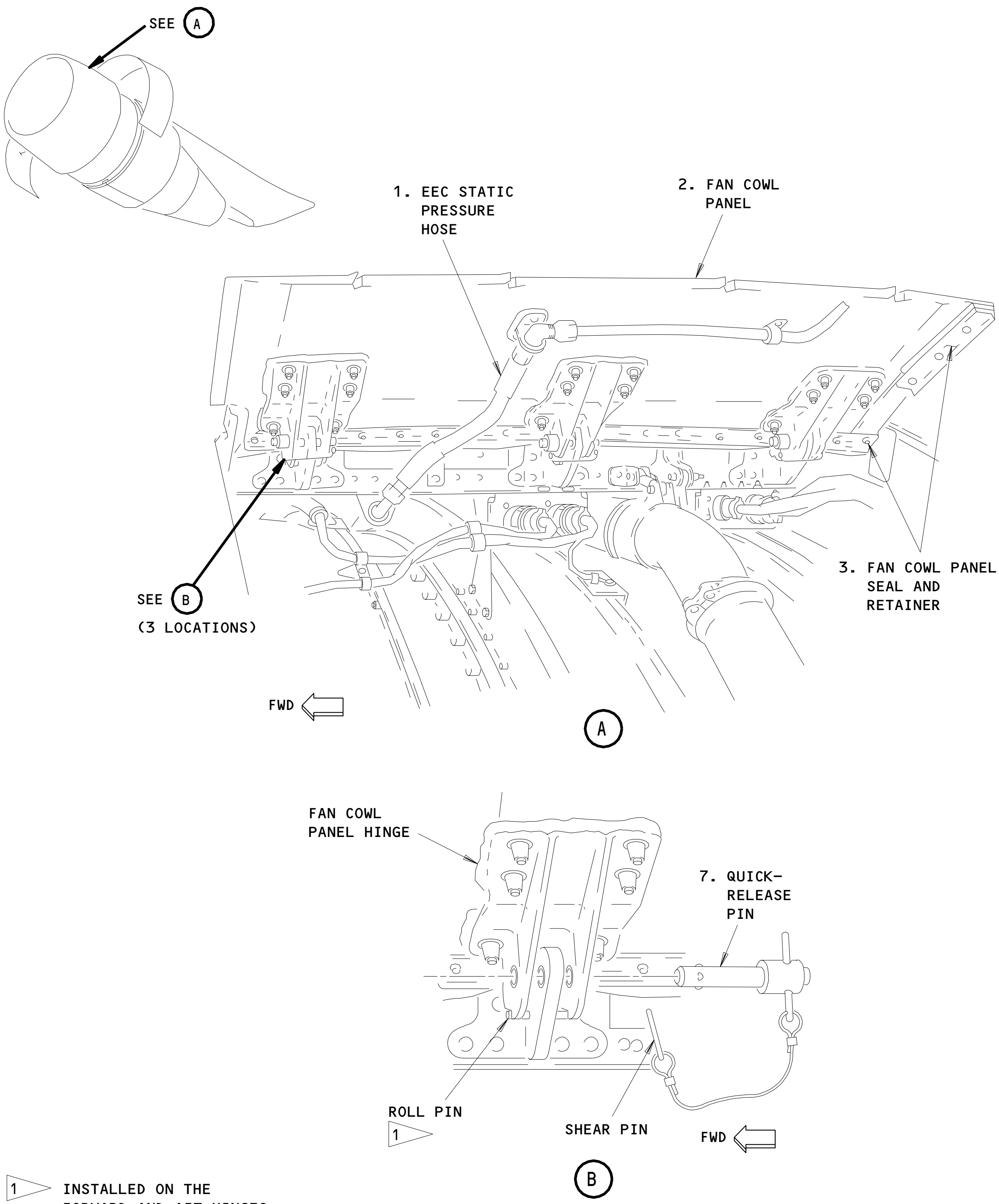
WARNING: USE CAUTION WHEN YOU REMOVE THE FAN COWL PANELS IN HIGH WINDS OR IN WIND GUSTS. IF YOU DO NOT USE CAUTION, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

WARNING: DO NOT HOLD THE FAN COWL PANELS OPEN WITH THE HOLD-OPEN RODS IF THE WIND VELOCITY IS MORE THAN 60 KNOTS. THE HOLD-OPEN RODS CAN HAVE A FAILURE IN LARGE WINDS WHICH CAN CAUSE AN INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

      (1) Open the fan cowl panels (AMM 71-11-04/201).

S 034-003-N00

      (2) Disconnect the EEC static pressure hose (1).



1 INSTALLED ON THE FORWARD AND AFT HINGES.

Fan Cowl Panel Installation
Figure 401

S 024-004-N00

WARNING: HOLD THE FAN COWL PANEL OPEN WHEN YOU REMOVE THE COWL. EACH FAN COWL PANEL WEIGHS APPROXIMATELY 55 POUNDS (25 kg). IF THE FAN COWL PANEL FALLS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(3) Hold the fan cowl panel (2) open while you do the steps that follow to remove the cowl:
  (a) Disengage the hold-open rods.
  (b) Put the hold-open rods in the stow brackets on the fan cowl panel.

WARNING: DO NOT PUT YOUR WEIGHT AGAINST THE THRUST REVERSER WHEN YOU REMOVE THE FAN COWL PANEL. AN INJURY CAN OCCUR IF THE THRUST REVERSER OPERATES.

  (c) Remove the shear pin from the quick-release pins (7).
  (d) Remove the quick-release pins (7) from the hinges on the fan cowl panel.
  (e) Lift the fan cowl panel (2) from the roll pins to remove the cowls.

TASK 71-11-04-404-017-N00

3. Install the Fan Cowl Panels (Fig. 401)
  A. Consumable Materials
    (1) D00014 Grease - MIL-G-21164 Molybdenum disulphide
  B. Parts

AMM			AIPC		
FIG	ITEM	NOMENCLATURE	SUBJECT	FIG	ITEM
401	2	Cowl Assy (Cowling Only) (LH) Cowl Assy (Cowling Only) (RH)	71-11-04	05	25 30

C. References
   (1) AMM 71-11-04/201, Fan Cowl Panel
   (2) AMM 71-11-05/501, Fan Cowl Panel Latch
D. Access
   (1) Location Zones

413	Fan Cowl Panel, Left Engine
414	Fan Cowl Panel, Left Engine
423	Fan Cowl Panel, Right Engine
424	Fan Cowl Panel, Right Engine

   (2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine

E. Procedure

S 644-000-N00

WARNING: USE CAUTION WHEN YOU INSTALL THE FAN COWL PANELS IN HIGH WINDS OR IN WIND GUSTS. IF YOU DO NOT USE CAUTION, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

WARNING: DO NOT HOLD THE FAN COWL PANELS OPEN WITH THE HOLD-OPEN RODS IF THE WIND VELOCITY IS MORE THAN 60 KNOTS. THE HOLD-OPEN RODS CAN HAVE A FAILURE IN LARGE WINDS WHICH CAN CAUSE AN INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Apply the grease to the quick-release pins (7).

S 424-009-N00

WARNING: HOLD THE FAN COWL PANELS OPEN WHEN YOU INSTALL THE COWL. EACH FAN COWL PANEL WEIGHS APPROXIMATELY 55 POUNDS (25 kg). IF THE FAN COWL PANEL FALLS, AN INJURY CAN OCCUR.

(2) Put the hinges of the fan cowl panel on the roll pins.

S 424-010-N00

(3) Hold the fan cowl panel while you do the steps that follow to install the cowl:

(a) Open the fan cowl panel (2) until it is at approximately 55 degrees.

(b) Install the quick-release pins (7) in the hinges of the fan cowl panel (2).

(c) Install the shear pins in the quick-release pins (7).

S 424-011-N00

(4) Connect the EEC static pressure hose (1).

S 414-012-N00

(5) Close the fan cowl panels (AMM 71-11-04/201).

S 824-013-N00

(6) Adjust the latches on the fan cowl panel (AMM 71-11-05/501).

S 824-014-N00

(7) Do the steps that follow to adjust the seal on the fan cowl panel:

(a) Loosen the screws that hold the seal and the retainer to the fan cowl panel.

(b) Adjust the seal until you get a 10-20% compression of the seal when the fan cowl panel is closed.

(c) Tighten the screws that hold the retainer and the seal.

FAN COWL PANEL LATCH - REMOVAL/INSTALLATION

1. General
   A. There are two tasks in this procedure. The first task is the removal of the latches on the fan cowl panels. The second task is the installation of the latches on the fan cowl panels.

TASK 71-11-05-004-001-N00

2. Remove the Fan Cowl Panel Latch (Fig. 401)
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panel
   B. Access
      (1) Location Zones

413	Fan Cowl Panel, Left Engine
414	Fan Cowl Panel, Left Engine
423	Fan Cowl Panel, Right Engine
424	Fan Cowl Panel, Right Engine

      (2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine

   C. Procedure

      S 014-002-N00
      (1) Open the fan cowl panels (AMM 71-11-04/201).

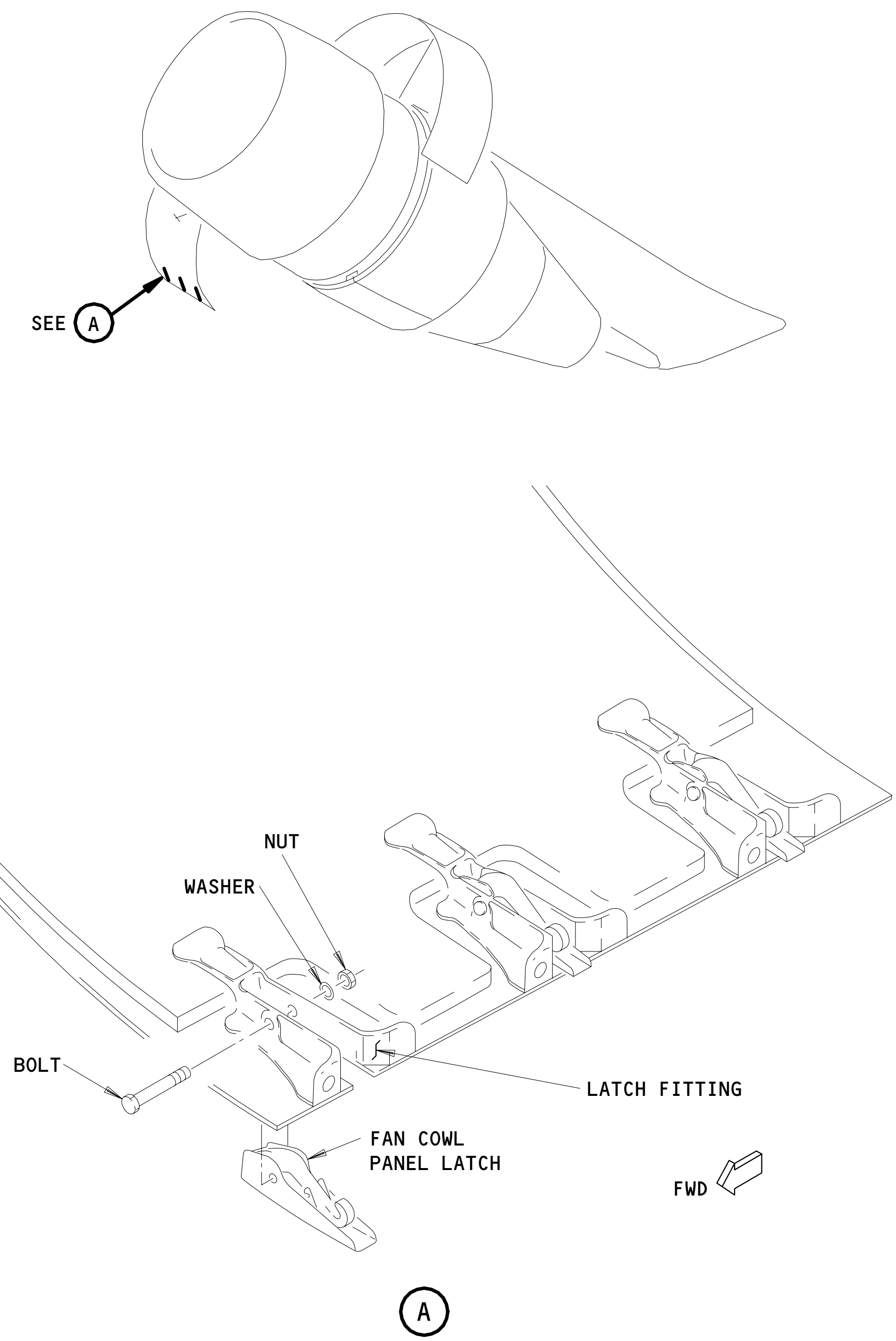
      S 034-003-N00
      (2) Remove the bolt, the washer, the nut, and the cotter pin that attach the latch to the latch fitting.

      S 024-004-N00
      (3) Remove the latch from the latch fitting.

TASK 71-11-05-404-005-N00

3. Install the Fan Cowl Panel Latch (Fig. 401)
   A. Consumable Materials
      (1) A00247 Sealant - BMS 5-95
   B. References
      (1) AMM 71-11-04/201, Fan Cowl Panel
      (2) AMM 71-11-05/501, Fan Cowl Panel Latch
   C. Access
      (1) Location Zones

413	Fan Cowl Panel, Left Engine
414	Fan Cowl Panel, Left Engine
423	Fan Cowl Panel, Right Engine
424	Fan Cowl Panel, Right Engine



Fan Cowl Panel Latch Installation
Figure 401

(2) Access Panels
- 413AL Fan Cowl Panel, Left Engine
- 414AR Fan Cowl Panel, Left Engine
- 423AL Fan Cowl Panel, Right Engine
- 424AR Fan Cowl Panel, Right Engine

D. Procedure

S 424-006-N00

(1) Put the latch in its position on the latch fitting.

S 034-007-N00

(2) Install the bolt, the washer, and the nut that attach the latch to the latch fitting.
   (a) Tighten the nut to 60-90 pound-inches (6.78-10.17 newton-meters).
   (b) Loosen the nut until you can install the cotter pin in the bolt.
   (c) Install the cotter pin in the bolt.

S 394-008-N00

(3) Apply approximately 0.06 inch (0.15 cm) of the sealant to the washer, the nut, and the cotter pin.

S 824-009-N00

CAUTION: MAKE SURE THE LATCHES ARE CORRECTLY ADJUSTED. THE ENGINE MOVES IN THE FAN COWL PANELS WHEN IT OPERATES. HEAT ALSO CAUSES THE ENGINE TO BECOME LARGER WHEN IT OPERATES. IF YOU DO NOT ADJUST THE LATCHES, DAMAGE CAN OCCUR TO THE ENGINE OR TO THE COWLS.

(4) Adjust the latches on the fan cowl panels (AMM 71-11-05/501).

S 414-010-N00

(5) Close the fan cowl panels (AMM 71-11-04/201).

FAN COWL PANEL LATCH - ADJUSTMENT/TEST

1. General
   A. This procedure has a task to adjust the latches on the fan cowl panels.
   B. You adjust the latches on the fan cowl panels to get the correct tension on the latches. You also adjust the latches to get the correct aerodynamic smoothness.
   C. It is necessary to install and adjust the thrust reversers before you adjust the latches on the fan cowl panels.
   D. It is necessary to adjust the latches on the fan cowl panels when one of these parts is replaced: The engine, the fan cowl panel, a latch on the fan cowl panel, or the thrust reverser.

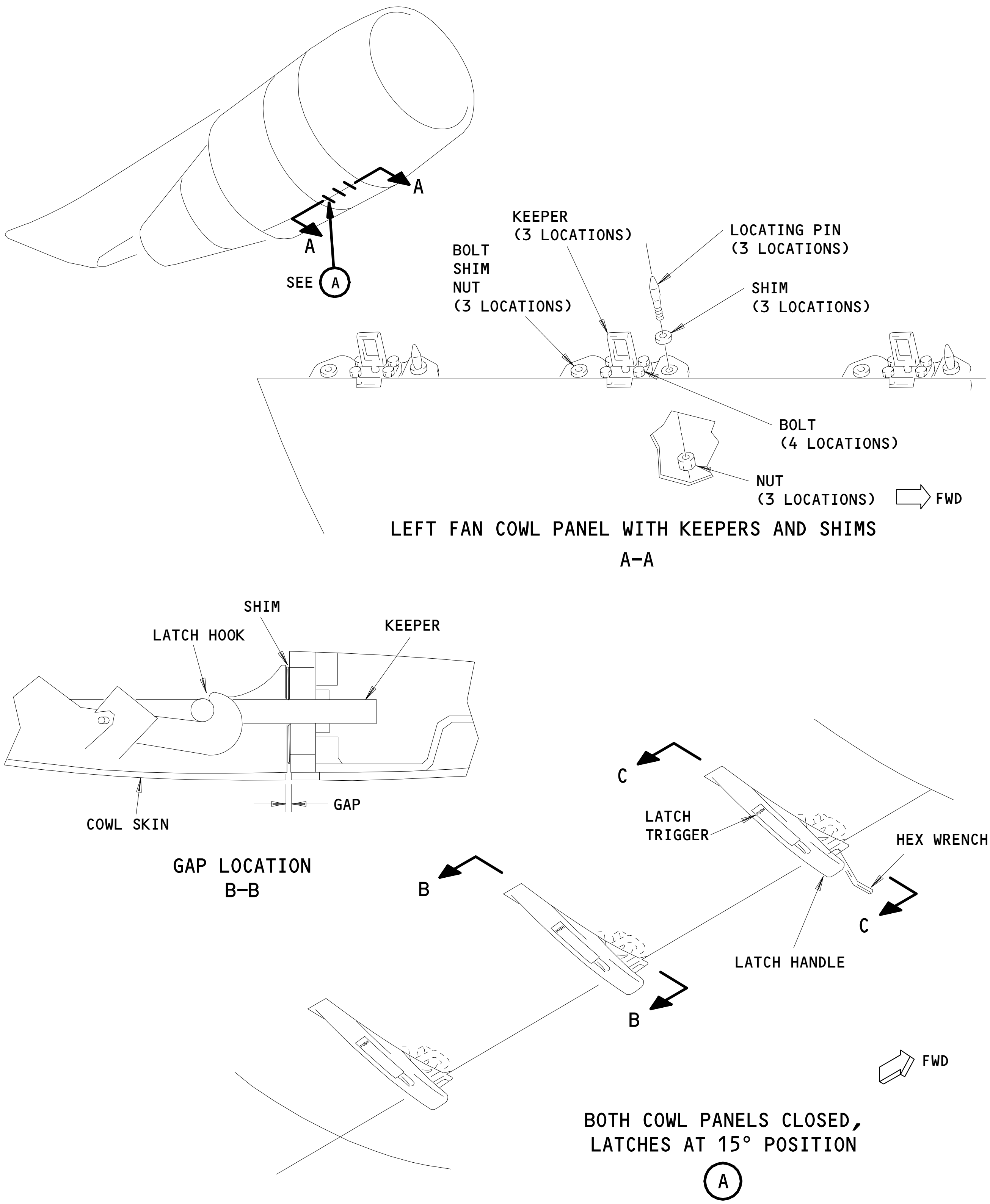
TASK 71-11-05-825-001-N00

2. Adjust the Fan Cowl Panel Latches (Fig. 501)
   A. Equipment
      (1) Scale - with a 0 to 60 pound range
   B. Consumable Materials
      (1) G02020 Clay, Modeling
      (2) D00139 Lubricant, Silicone spray - WD-40
      (3) C00812 Primer - BMS 10-11, Type I
   C. References
      (1) AMM 71-11-00/201, Aerodynamic Smoothness
      (2) AMM 71-11-04/201, Fan Cowl Panel
      (3) AMM 78-31-00/201, Thrust Reverser System
   D. Access
      (1) Location Zones

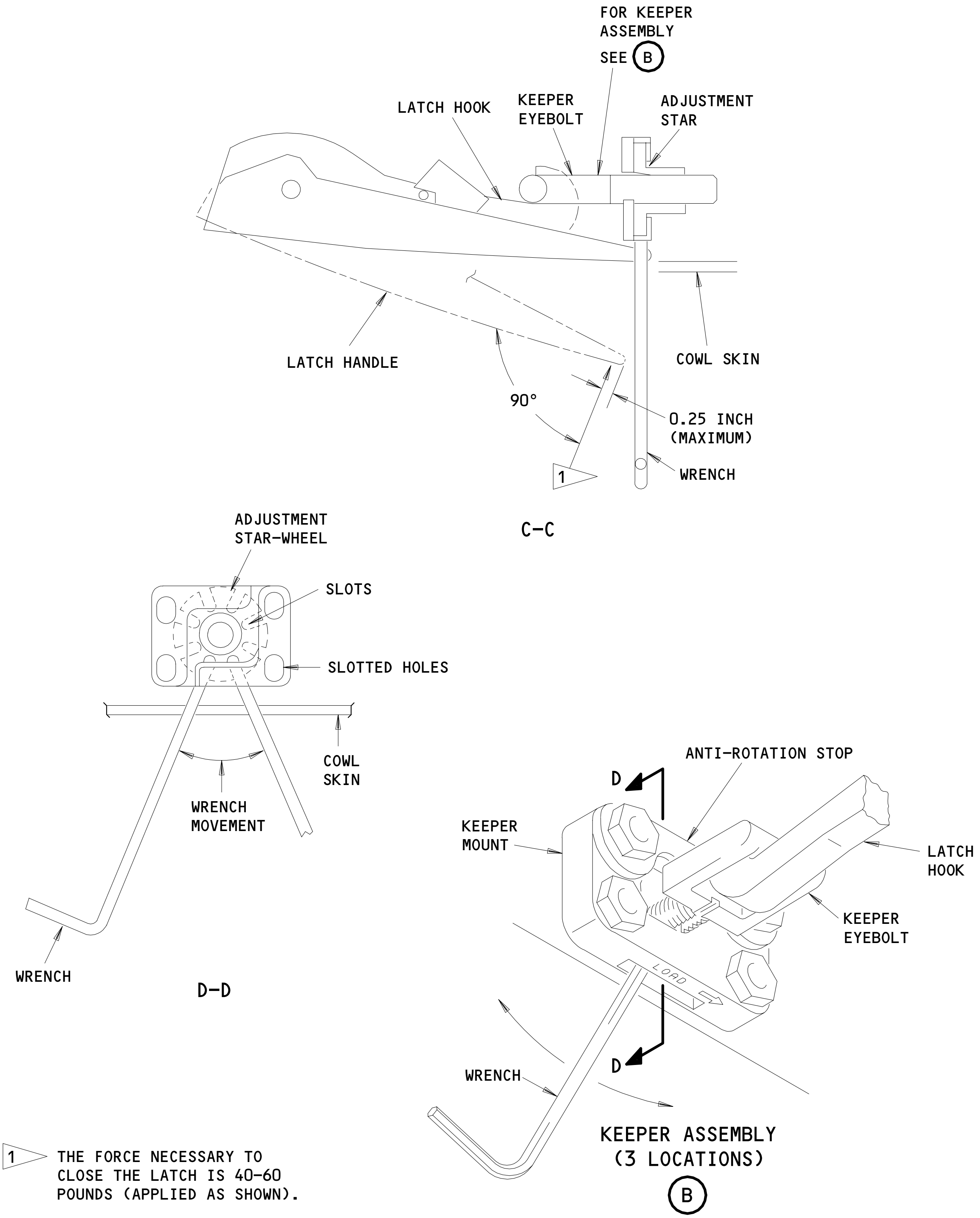
413	Fan Cowl Panel, Left Engine
414	Fan Cowl Panel, Left Engine
423	Fan Cowl Panel, Right Engine
424	Fan Cowl Panel, Right Engine

      (2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine



Fan Cowl Panel Latch Adjustment
Figure 501 (Sheet 1)



1 THE FORCE NECESSARY TO CLOSE THE LATCH IS 40-60 POUNDS (APPLIED AS SHOWN).

Fan Cowl Panel Latch Adjustment
Figure 501 (Sheet 2)

E. Procedure

S 015-002-N00

(1) Open the left fan cowl panel (AMM 71-11-04/201).

S 215-003-N00

(2) Make sure the keeper eyebolt cannot turn.
    (a) If the keeper eyebolt turns, replace the anti-rotation stops and the keepers that have damage.

S 215-004-N00

(3) Make sure the thrust reversers are closed and latched (AMM 78-31-00/201).

S 415-005-N00

(4) Close and latch the fan cowl panels (AMM 71-11-04/201).

S 225-006-N00

(5) Make sure the distance between the fan cowl panels is in the limits for the aerodynamic smoothness (AMM 71-11-00/201).

S 225-007-N00

(6) If the fan cowl panels are not in the limit for aerodynamic smoothness, do the steps that follow:
    (a) Open the left fan cowl panel (AMM 71-11-04/201).
    (b) Remove the shims (6 locations) from the left fan cowl panel.
        1) Remove the location pins and the shims on the forward side of the keepers (3 locations).
        2) Install the location pins with the nuts.
        3) Remove the bolts and the shims on the aft side of the keepers (3 locations).
    (c) Close and latch the fan cowl panels (AMM 71-11-04/201).
    (d) Do the steps that follow to adjust the distance between the fan cowl panels:
        1) Push the latch trigger to open latch handles.

        <u>NOTE</u>: The latch handles open to approximately 15 degrees.

CAUTION: DO NOT APPLY MORE THAN A 60 POUND (27 KG) FORCE TO THE LATCH HANDLE. IF YOU APPLY A LARGE FORCE, YOU CAN CAUSE DAMAGE TO THE LATCH.

2) Turn the adjustment star with a hex wrench to adjust the distance between the fan cowl panels.

NOTE: The direction to turn the adjustment star is shown on the keeper mount. Increase the load to decrease the distance between the cowls.

Do not turn the adjustment start if the force necessary to close the latch is more than 60 pounds (27 kg).

(e) Open the fan cowl panels (AMM 71-11-04/201).
(f) Do the steps that follow to find the necessary thickness of the shims:
1) Apply 0.25 inches (0.64 cm) of the modeling clay to the shim locations on the left fan cowl panel.
2) Apply the lubricant to the surface that the shim touches on the right fan cowl panel.
3) Close and latch the fan cowl panels (AMM 71-11-04/201).
4) Open the left fan cowl panel (AMM 71-11-04/201).
5) Measure the thickness of the modeling clay at all of the shim locations.
6) Remove the modeling clay.
(g) Do the steps that follow to install new shims:
1) Remove the laminations until the shims are the thickness of the modeling clay at each shim location.
2) Apply the primer to the shims.
3) Remove the location pins (3 locations) on the forward side of the keepers.
4) Install the shims, the location pins, and the nuts.
5) Install the shims on the aft side of the keepers (3 locations) with the bolts and the nuts.
(h) Close the left fan cowl panel, but do not latch the cowl.

S 825-008-N00

CAUTION: DO NOT APPLY A FORCE OF MORE THAN 60 POUNDS (27 KG) TO THE LATCH HANDLE. IF YOU APPLY A LARGE FORCE, YOU CAN CAUSE DAMAGE TO THE LATCH.

(7) Use the scale on the latch handle to do a check of the force necessary to close the latch.

S 825-009-N00
(8) If the force necessary to close the latch is not 40-60 pounds (18-27 kg), do these steps to adjust the latch:
  (a) Turn the adjustment star with a hex wrench to adjust the latch until the tension is in the limits above.

    NOTE: The direction to increase the load on the latch is shown on the keeper mount.

S 415-010-N00
(9) Close all of the latches on the fan cowl panels.

S 215-011-N00
(10) Make sure the latch handles are smooth with the outer surface of the fan cowl panels.

S 825-012-N00
(11) If the latch handles are not smooth with the surface of the fan cowl panels, adjust the keeper mount.
  (a) Open the left fan cowl panel (AMM 71-11-04/201).
  (b) Loosen the bolts that attach the keeper mount to the left fan cowl panel.
  (c) Move the keeper mount up if the latch was higher than the surface of the fan cowl panel.
  (d) Move the keeper mount down if the latch was in a recess.
  (e) Tighten the bolts that attach the keeper mount to the left fan cowl panel.

S 415-013-N00
(12) Close and latch the fan cowl panels (AMM 71-11-04/201).

S 215-014-N00
(13) Make sure all of the latch handles are smooth with the outer surface of the core cowl panels.

S 225-015-N00
(14) Make sure the force necessary to close the latches is 40-60 pounds (18-27 kg).

CORE COWL PANEL - MAINTENANCE PRACTICES (OPEN AND CLOSE)

1. General
   A. There are two tasks is this procedure. The first task opens the core cowls panels, and the second task closes the core cowl panels. These two tasks are for the inboard and the outboard core cowl panels.
   B. The core cowl panel is held open by the hold-open rod. The bottom end of the rod is attached to the core cowl panel with a bolt. The top end of the rod attaches to a stow bracket on the core cowl panel when the panel is closed. When the panel is open, the rod attaches to a bracket on the engine.
   C. The rod extends when the core cowl opens. When the rod is fully extended, the latch holds the cowl open. Make sure the rod is locked when the cowl is open or an injury can occur.

TASK 71-11-06-002-001-N00

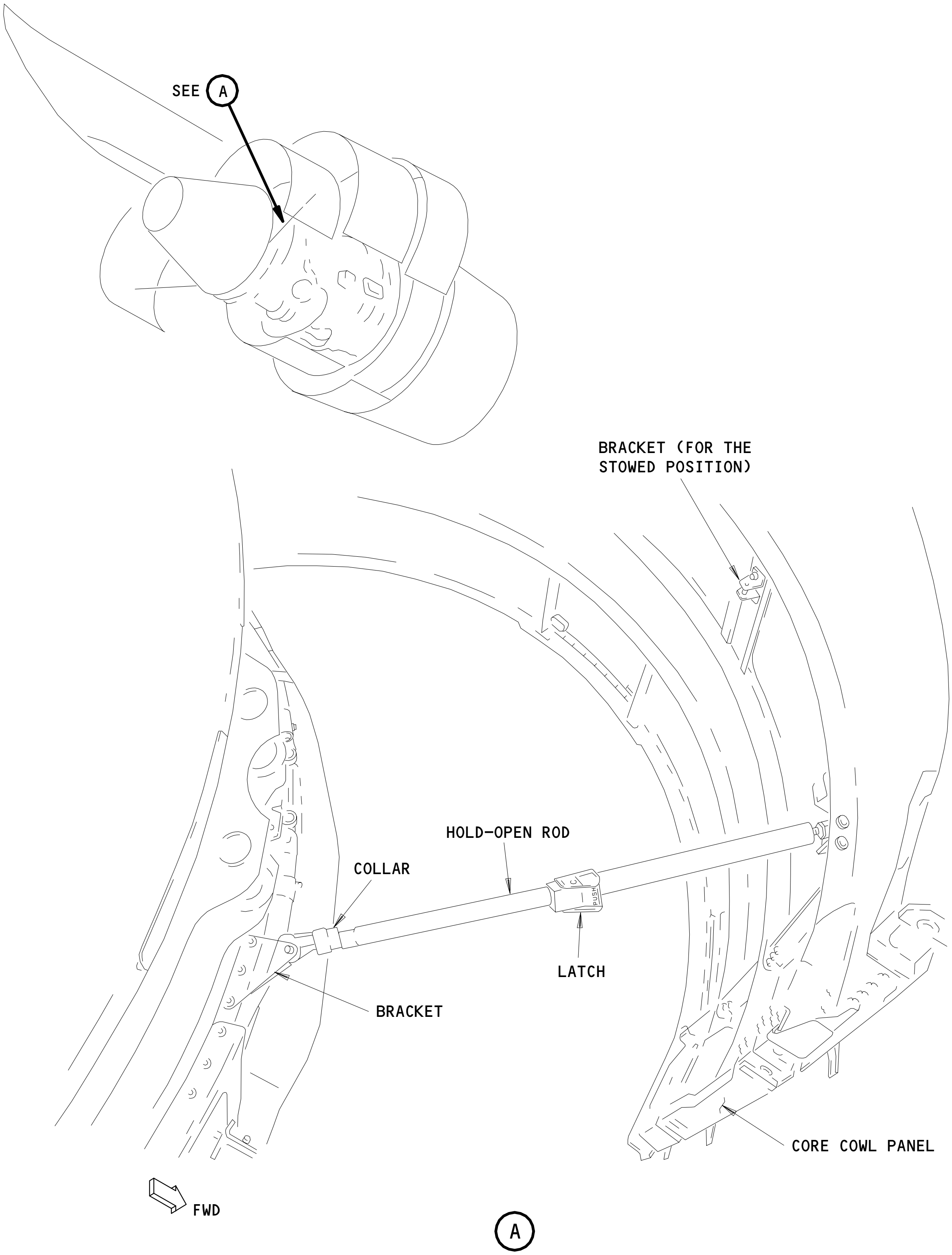
2. Open the Core Cowl Panels (Fig. 201)
   A. References
      (1) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones

411	Left Engine
421	Right Engine

      (2) Access Panels

415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

   C. Procedure



Core Cowl Opening
Figure 201

S 042-002-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 012-000-N00

WARNING: USE CAUTION WHEN YOU OPEN THE CORE COWL PANELS IN HIGH WINDS OR IN WIND GUSTS. IF YOU DO NOT USE CAUTION, AN INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

WARNING: DO NOT HOLD THE CORE COWL PANELS OPEN WITH THE HOLD-OPEN ROD IF THE WIND VELOCITY IS MORE THAN 60 KNOTS. THE HOLD-OPEN ROD CAN HAVE A FAILURE IN LARGE WINDS WHICH CAN CAUSE AN INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Do the steps that follow to open the latches on the core cowl panels:
   (a) Open the forward latch.
      1) Push the trigger to release the handle.
      2) Pull the handle down to release the latch.
   (b) Use the same steps to open the other latches from front to aft.

S 012-004-N00
(3) Move the collar down to remove the top end of the rod from the stow bracket.

S 012-005-N00
(4) Attach the rod to the bracket on the engine.

S 012-006-N00

WARNING: MAKE SURE THE HOLD-OPEN IS FULLY EXTENDED AND LOCKED WHEN THE CORE COWL IS OPEN. IF THE ROD IS NOT CORRECTLY LOCKED, THE CORE COWL PANEL CAN FALL. THIS CAN CAUSE AN INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(5) Open the cowl panel to fully extend the rod.
   (a) Make sure the rod is locked.

TASK 71-11-06-402-002-N00
3. Close the Core Cowl Panels (Fig. 201)
   A. References
      (1) AMM 71-11-07/501, Core Cowl Panel Latches

(2) AMM 78-31-00/201, Thrust Reverser System

B. Access

(1) Location Zones

411	Left Engine
421	Right Engine

(2) Access Panels

415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

C. Procedure

S 412-000-N00

WARNING: USE CAUTION WHEN YOU CLOSE THE CORE COWL PANELS IN HIGH WINDS OR IN WIND GUSTS. IF YOU DO NOT USE CAUTION, AN INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

WARNING: DO NOT HOLD THE CORE COWL PANELS OPEN WITH THE HOLD-OPEN ROD IF THE WIND VELOCITY IS MORE THAN 60 KNOTS. THE HOLD-OPEN ROD CAN HAVE A FAILURE IN LARGE WINDS WHICH CAN CAUSE AN INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

WARNING: HOLD THE CORE COWL PANEL OPEN WHEN YOU REMOVE THE HOLD-OPEN ROD FROM THE ENGINE. THE RIGHT CORE COWL PANEL WEIGHS APPROXIMATELY 90 POUNDS (41 kg). THE LEFT CORE COWL PANEL WEIGHS APPROXIMATELY 110 POUNDS (50 kg). IF THE CORE COWL PANEL FALLS, AN INJURY CAN OCCUR.

(1) Hold the core cowl panel and do the steps that follow to close the cowl:
   (a) Remove the hold-open rod from the bracket on the engine.
   (b) Push on the latch to retract the hold-open rod.
   (c) Put the free end of the hold-open rod on the stow bracket.
   (d) Close the core cowl panel.
   (e) Close the latches on the core cowl panel.

S 212-009-N00

(2) Make sure the latch handles are smooth with the outer surface of the core cowl panel.
   (a) If the latch handles are not smooth with the cowl panel, adjust the latches (AMM 71-11-07/501).

S 442-010-N00

(3) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

CORE COWL PANEL - REMOVAL/INSTALLATION

1. General
   A. There are two tasks in this procedure. The first task is the removal of the core cowl panel. The second task is the installation of the core cowl panel. These two tasks are for the inboard and the outboard core cowl panels.
   B. There is more than one part number for the left and the right core cowl panels. These core cowls are not interchangeable on all airplanes. Use the IPC to find the correct core cowls.

TASK 71-11-06-004-037-N00

2. Remove the Core Cowl Panel
   A. Equipment
      (1) A71016-1 Sling - Core Cowl
      (2) A20001-79 Hoist - Boom (with an 8 foot height and a 400 pound capacity)
      (3) A20001-55 Hoist Arm - Extension
   B. References
      (1) AMM 71-11-06/201, Core Cowl Panel
      (2) AMM 78-31-00/201, Thrust Reverser System
   C. Access
      (1) Location Zones

411	Left Engine
421	Right Engine

      (2) Access Panels

415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

D. Procedure

S 044-002-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 024-000-N00

WARNING: USE CAUTION WHEN YOU REMOVE THE CORE COWL IN HIGH WINDS OR IN WIND GUSTS. IF YOU DO NOT USE CAUTION, YOU CAN CAUSE AN INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

WARNING: DO NOT HOLD THE CORE COWL PANEL OPEN WITH THE HOLD-OPEN ROD IF THE WIND VELOCITY IS MORE THAN 60 KNOTS. THE HOLD-OPEN ROD CAN HAVE A FAILURE IN LARGE WINDS, WHICH CAN CAUSE AN INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Remove the bolts (7 and 10) from the core cowl panel (4) (Fig. 402).

S 494-004-N00

(3) Remove the bolts (5 and 8) from the bolt storage holes that attach the lift pads (6 and 9) to the core cowl panel (Fig. 401).

S 494-005-N00

WARNING: MAKE SURE THE BOLTS THAT ATTACH THE SLING TO THE CORE COWL PANEL ARE TIGHT. THE LEFT CORE COWL PANEL WEIGHS APPROXIMATELY 110 POUNDS (50 kg). THE RIGHT CORE COWL PANEL WEIGHS APPROXIMATELY 90 POUNDS (41 kg). IF THE CORE COWL PANEL FALLS, AN INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Attach the lift pads (6 and 9) to the core cowl panel with the bolts (5 and 8).

S 414-006-N00

(5) Open the core cowl panel (AMM 71-11-06/201).

S 494-007-N00

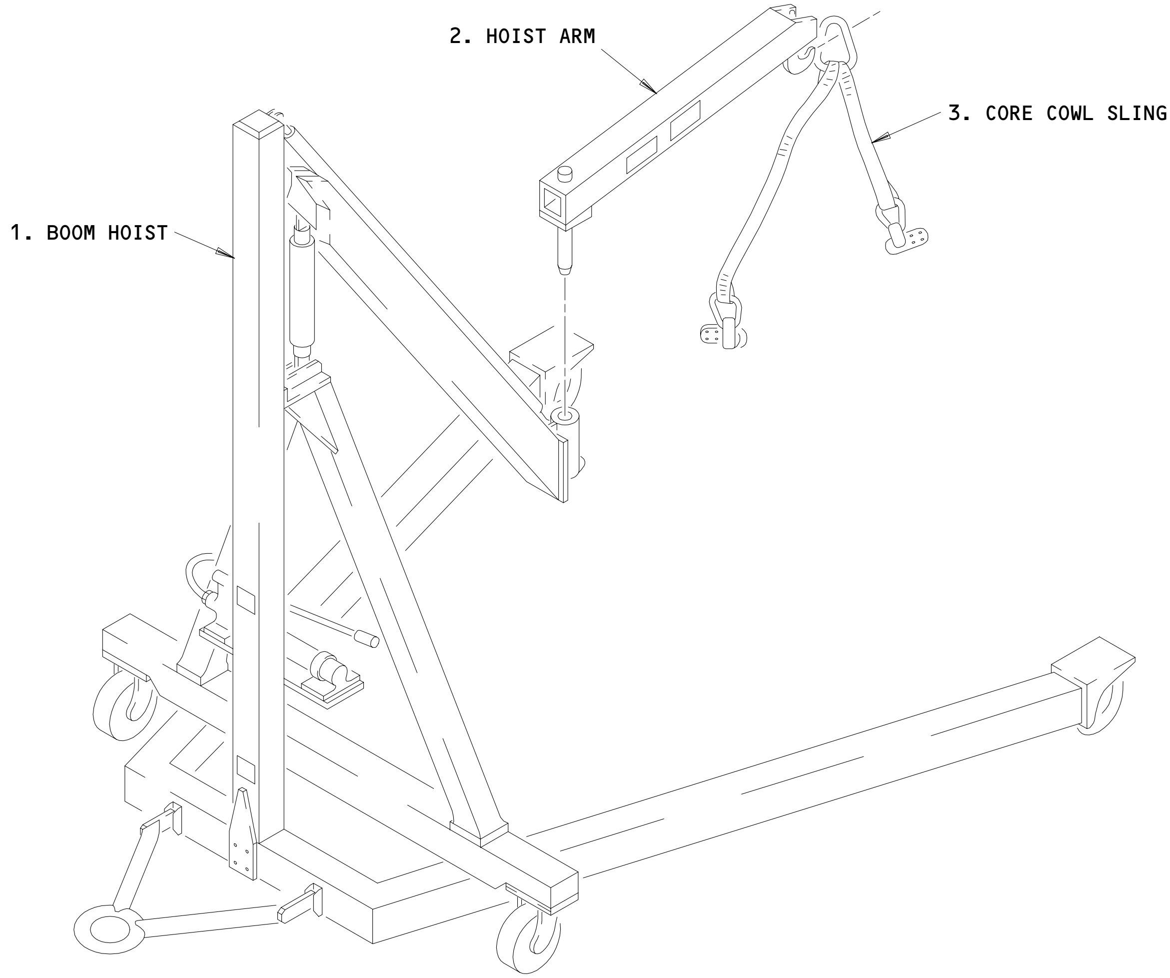
(6) Attach the arm (2) to the hoist boom (1).

S 494-008-N00

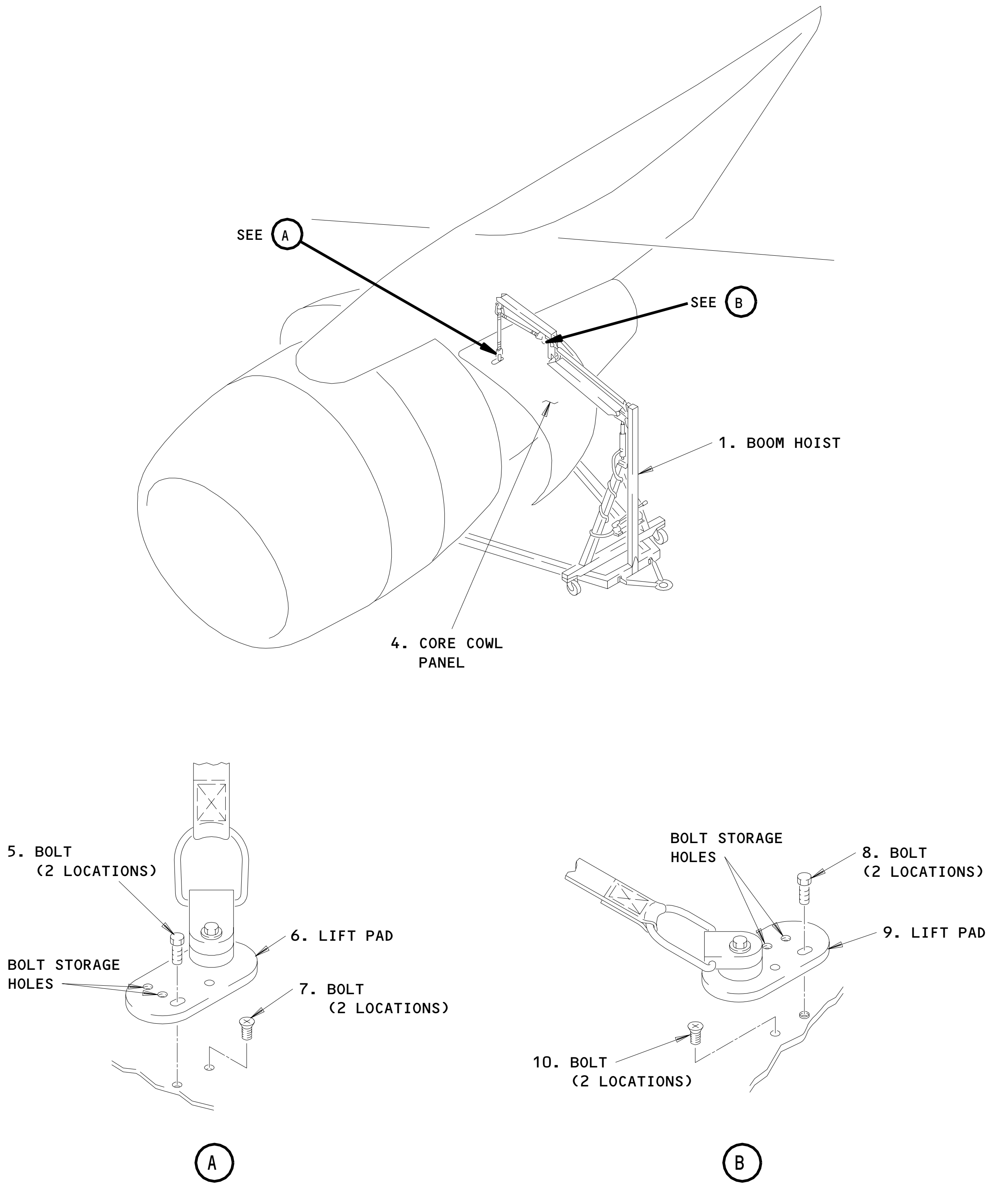
(7) Attach the core cowl sling (3) to the arm (2) of the hoist boom.

S 024-009-N00

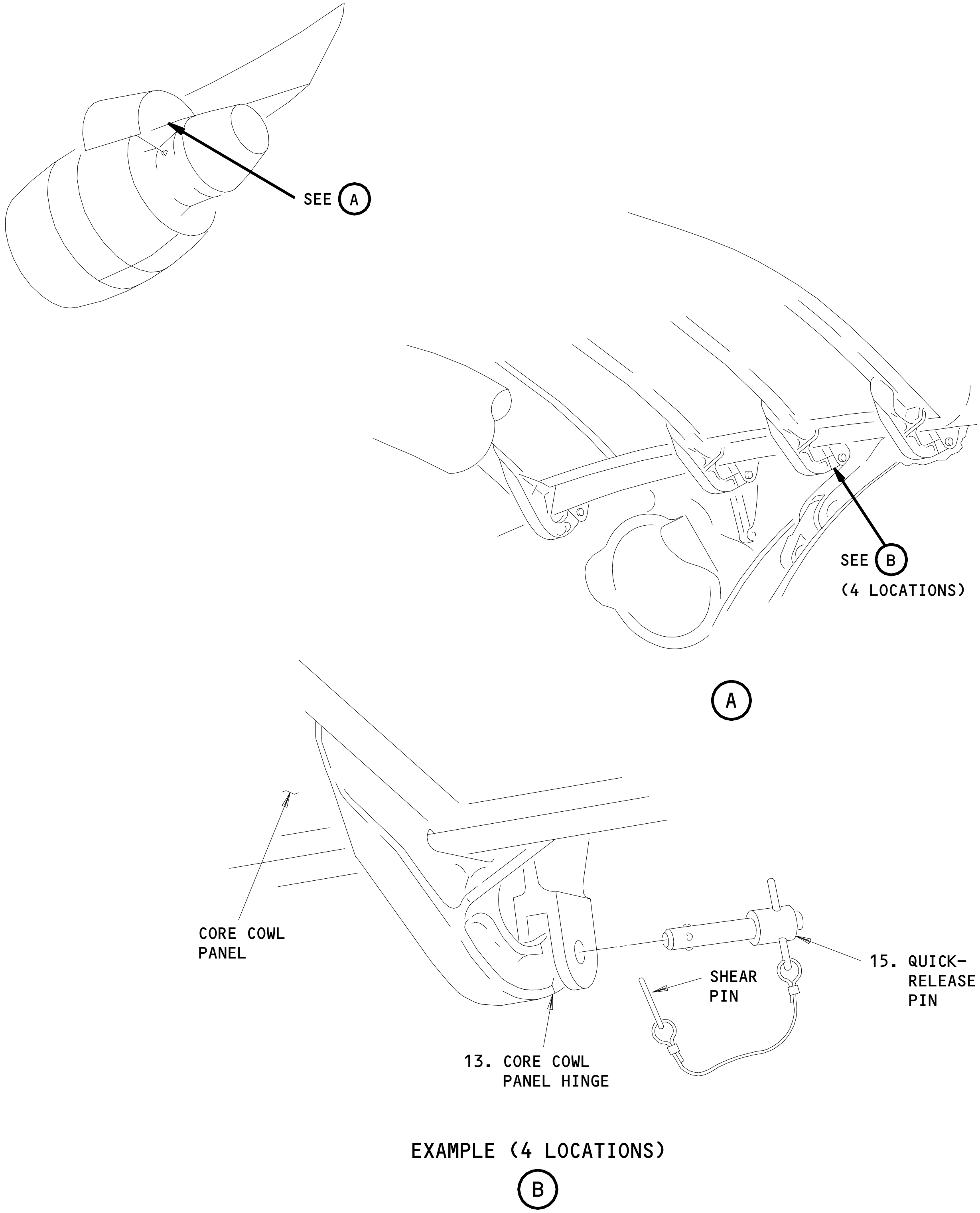
(8) Lift the hoist boom to make the core cowl sling tight.



Equipment Installation
Figure 401 (Sheet 1)



Equipment Installation
Figure 401 (Sheet 2)



Core Cowl Panel Installation
Figure 402

S 024-010-N00

(9) Do the steps that follow to put the hold-open rods in the stow brackets on the core cowl panel:
   (a) Remove the hold-open rod from the bracket on the engine.
   (b) Push the latch to retract the hold-open rod.
   (c) Attach the free end of the hold-open rod to the stow bracket on the core cowl panel.

S 034-013-N00

(10) Remove the shear pins from the quick-release pins (15) on the hinges of the core cowl panel.

S 034-014-N00

(11) Remove the quick-release pins (15) from the hinges of the core cowl panel.

S 024-015-N00

(12) Remove the core cowl panel (4).

S 024-016-N00

(13) Put the core cowl panel (4) on a platform that is clear of the airplane.

S 094-017-N00

(14) If the same core cowl panel will not be installed on the airplane, do the steps that follow:
   (a) Remove the core cowl sling (3) from the core cowl panel (4).
   (b) Install the bolts (7 and 10) in the core cowl panel (4).

TASK 71-11-06-404-001-N00

3. Install the Core Cowl Panel

A. Equipment
   (1) A71016-1 Sling - Core Cowl
   (2) A20001-79 Hoist - Boom (with an 8 foot height and a 400 pound capacity)

(3) A20001-55 Hoist Arm - Extension

B. Consumable Materials

(1) D00014 Grease - MIL-G-21164 Molybdenum disulphide

C. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	4	Cowl Assy - Core Panel (LH) Cowl Assy - Core Panel (RH)	71-11-06	05	55 60

D. References

(1) AMM 71-11-06/201, Core Cowl Panel

(2) AMM 71-11-07/501, Core Cowl Panel Latch

(3) AMM 78-31-00/201, Thrust Reverser System

E. Access

(1) Location Zones

411 Left Engine
421 Right Engine

(2) Access Panels

415AL Fan Reverser, Left Engine
416AR Fan Reverser, Left Engine
417AL Core Cowl, Left Engine
418AR Core Cowl, Left Engine
425AL Fan Reverser, Right Engine
426AR Fan Reverser, Right Engine
427AL Core Cowl, Right Engine
428AR Core Cowl, Right Engine

F. Procedure

S 214-019-N00

(1) Make sure the thrust reverser is installed, adjusted, and closed.

S 484-000-N00

WARNING: USE CAUTION WHEN YOU INSTALL THE CORE COWL IN HIGH WINDS OR IN WIND GUSTS. IF YOU DO NOT USE CAUTION, YOU CAN CAUSE AN INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

WARNING: DO NOT HOLD THE CORE COWL PANEL OPEN WITH THE HOLD-OPEN ROD IF THE WIND VELOCITY IS MORE THAN 60 KNOTS. THE HOLD-OPEN ROD CAN HAVE A FAILURE IN LARGE WINDS, WHICH CAN CAUSE AN INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

CAUTION: THE CORE COWLS ARE NOT INTERCHANGEABLE. REFER TO THE IPC TO GET THE CORRECT CORE COWL. IF YOU DO NOT INSTALL THE CORRECT CORE COWL, YOU CAN CAUSE DAMAGE TO THE ENGINE OR TO THE CORE COWL.

(2) Attach the core cowl sling (3) to the core cowl that you will install (Fig. 401).
   (a) Remove the bolts (7 and 10) from the core cowl panel (4).
   (b) Attach the lift pads (6 and 9) and the core cowl sling (3) to the core cowl panel with the bolts (5 and 8).

   WARNING: MAKE SURE THE BOLTS THAT ATTACH THE SLING TO THE CORE COWL PANEL ARE TIGHT. THE LEFT CORE COWL PANEL WEIGHS APPROXIMATELY 110 POUNDS (50 kg). THE RIGHT CORE COWL PANEL WEIGHS APPROXIMATELY 90 POUNDS (41 kg). IF THE CORE COWL PANEL FALLS, AN INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

   (c) Tighten the bolts (5 and 8) that attach the core cowl sling to the core cowl panel.

S 494-022-N00

(3) Attach the arm (2) to the hoist boom (1).

S 494-023-N00

(4) Attach the core cowl sling (3) to the hoist boom (1).

S 424-024-N00

(5) Put the core cowl panel (4) in its position on the strut.

S 034-027-N00

(6) Do these steps to install the quick-release pins (15) in the hinges of the core cowl panel:
   (a) Apply the grease to the quick-release pins (15).

(b) Install the quick-release pins (15) in the hinges of the core cowl panel.
(c) Install the shear pins in the quick-release pins (15).

S 424-028-N00
(7) Attach the hold-open rod to the bracket on the engine (AMM 71-11-06/201).

S 424-029-N00
(8) Lower the hoist boom (1) to make the core cowl sling (3) loose.

S 094-030-N00
(9) Remove the core cowl sling (3) from the arm (2) of the hoist boom (1).

S 094-031-N00
(10) Move the hoist boom (1) away from the engine.

S 414-032-N00
(11) Close the core cowl panel (AMM 71-11-06/201).

S 094-033-N00
(12) Remove the bolts (5 and 8), the lift pads (6 and 9), and the core cowl sling from the core cowl panel.
(a) Install the bolts (5 and 8) in the bolt storage holes on the lift pads (6 and 9).

S 424-034-N00
(13) Install the bolts (7 and 10) in the core cowl panel (4).

S 824-035-N00
(14) Adjust the latches on the core cowl panel (AMM 71-11-07/501).

S 444-036-N00
(15) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

CORE COWL PANEL LATCH - REMOVAL/INSTALLATION

1. General
   A. There are two tasks in this procedure. The first task is the removal of the latches on the core cowl panels. The second task is the installation of the latches on the core cowl panels.

TASK 71-11-07-004-001-N00

2. Remove the Core Cowl Panel Latch (Fig. 401)
   A. References
      (1) AMM 71-11-06/201, Core Cowl Panel
      (2) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones

411	Left Engine
421	Right Engine

      (2) Access Panels

415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

   C. Procedure

S 044-002-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

      (1) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 014-003-N00

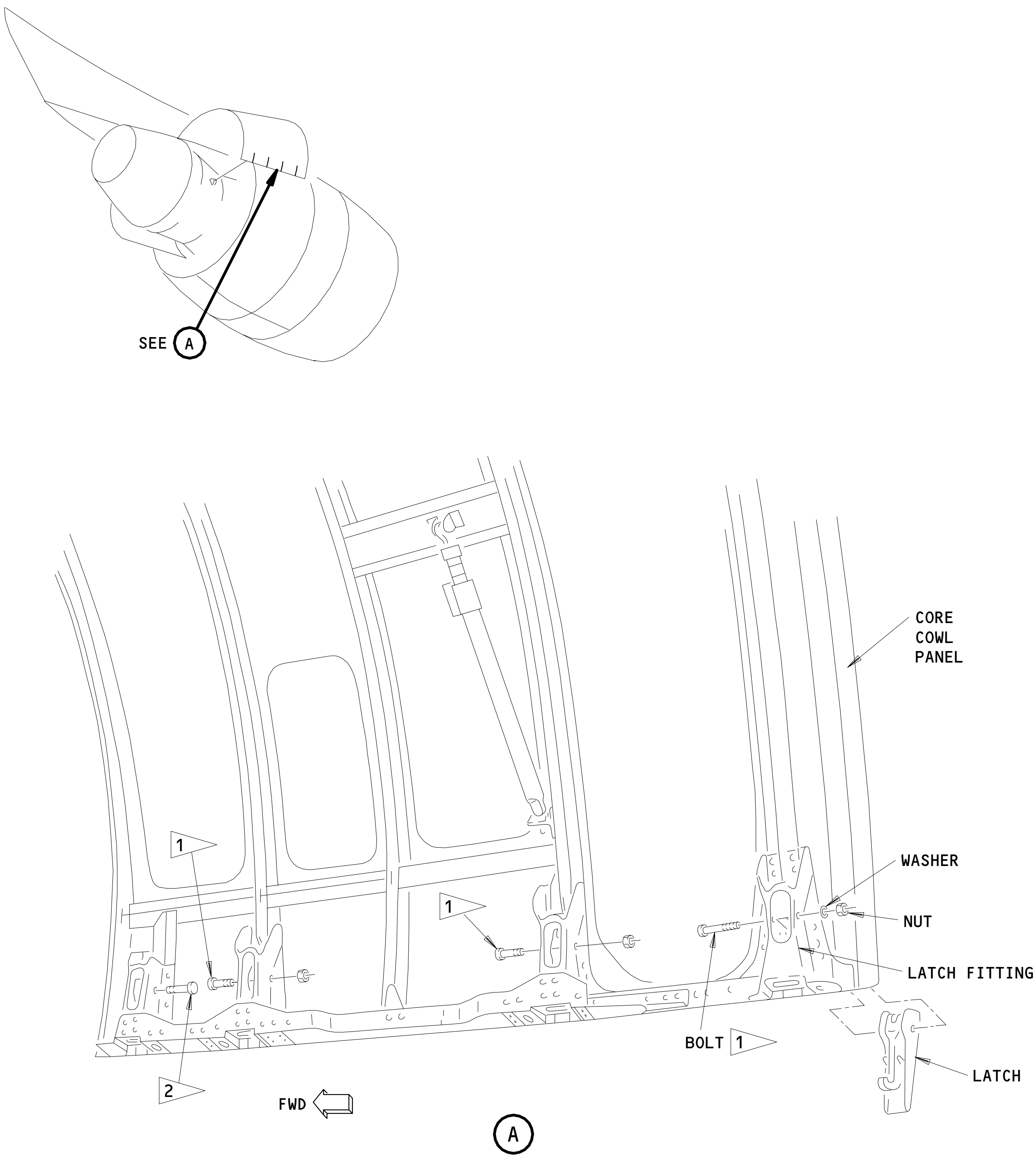
      (2) Open the core cowl panels (AMM 71-11-06/201).

S 034-004-N00

      (3) Remove the bolt that attaches the latch to the latch fitting.

S 024-005-N00

      (4) Remove the latch from the core cowl panel.



1 THE HEAD OF THE BOLT IS FORWARD
2 THE HEAD OF THE BOLT IS AFT

Core Cowl Panel Latch Installation
Figure 401

TASK 71-11-07-404-006-N00

3. Install the Core Cowl Panel Latch (Fig. 401)

A. References
   (1) AMM 71-11-06/201, Core Cowl Panel
   (2) AMM 71-11-07/501, Core Cowl Panel Latch
   (3) AMM 78-31-00/201, Thrust Reverser System

B. Access
   (1) Location Zones

411	Left Engine
421	Right Engine

   (2) Access Panels

415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

C. Procedure

S 024-007-N00

(1) Attach the latch to the latch fitting with the bolt, the washer, and the nut.

NOTE: Install the bolt from the forward side for the front latch. Install the bolts from the aft side for the three aft latches.

S 824-008-N00

CAUTION: MAKE SURE THE LATCHES ON THE CORE COWL PANEL ARE ADJUSTED CORRECTLY. WHEN THE ENGINE IS IN OPERATION, IT MOVES AND BECOMES LARGER. IF THE LATCHES ARE NOT CORRECTLY ADJUSTED, DAMAGE TO THE ENGINE OR TO THE COWL CAN OCCUR.

(2) Adjust the latches on the core cowl panel (AMM 71-11-07/501).

S 414-009-N00

(3) Close the core cowl panels (AMM 71-11-06/201).

S 444-010-N00

(4) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

CORE COWL PANEL LATCH - ADJUSTMENT/TEST

1. General
   A. This procedure is a task to adjust the latches on the core cowl panels. You adjust the latches to make sure the latches are in the limits for the aerodynamic smoothness. You also adjust the latches to make sure the latches have the correct tension.
   B. It is necessary to adjust the latches on the core cowl panels when one of these parts is replaced: The engine, the core cowl panel, the thrust reverser, or a latch on the core cowl panels.
   C. It is necessary for the thrust reverser to be installed, adjusted, and closed before you can adjust the latches on the core cowl panel.

TASK 71-11-07-825-020-N00

2. Adjust the Core Cowl Panel Latches
   A. Equipment
      (1) Scale - with a 60 pound capacity
   B. Consumable Materials
      (1) G02020 Clay - Modeling
      (2) D00139 Lubricant - Silicone Spray, WD-40
      (3) C00812 Primer - BMS 10-11, Type I
   C. References
      (1) AMM 71-11-06/201, Core Cowl Panel
      (2) AMM 78-31-00/201, Thrust Reverser System
      (3) AMM 78-31-04/501, Fan Duct Tension Latches
   D. Access
      (1) Location Zones

411	Left Engine
421	Right Engine

      (2) Access Panels

415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

E. Procedure

S 045-002-N00

<u>WARNING</u>: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 015-001-N00

(2) Open the core cowl panels (AMM 71-11-06/201).

S 215-004-N00

(3) Make sure the keeper does not turn.
    (a) If the keeper turns, replace the anti-rotation stops and the keepers that have damage.

S 215-005-N00

(4) Make sure the thrust reversers are closed and latched (AMM 78-31-00/201).

S 415-006-N00

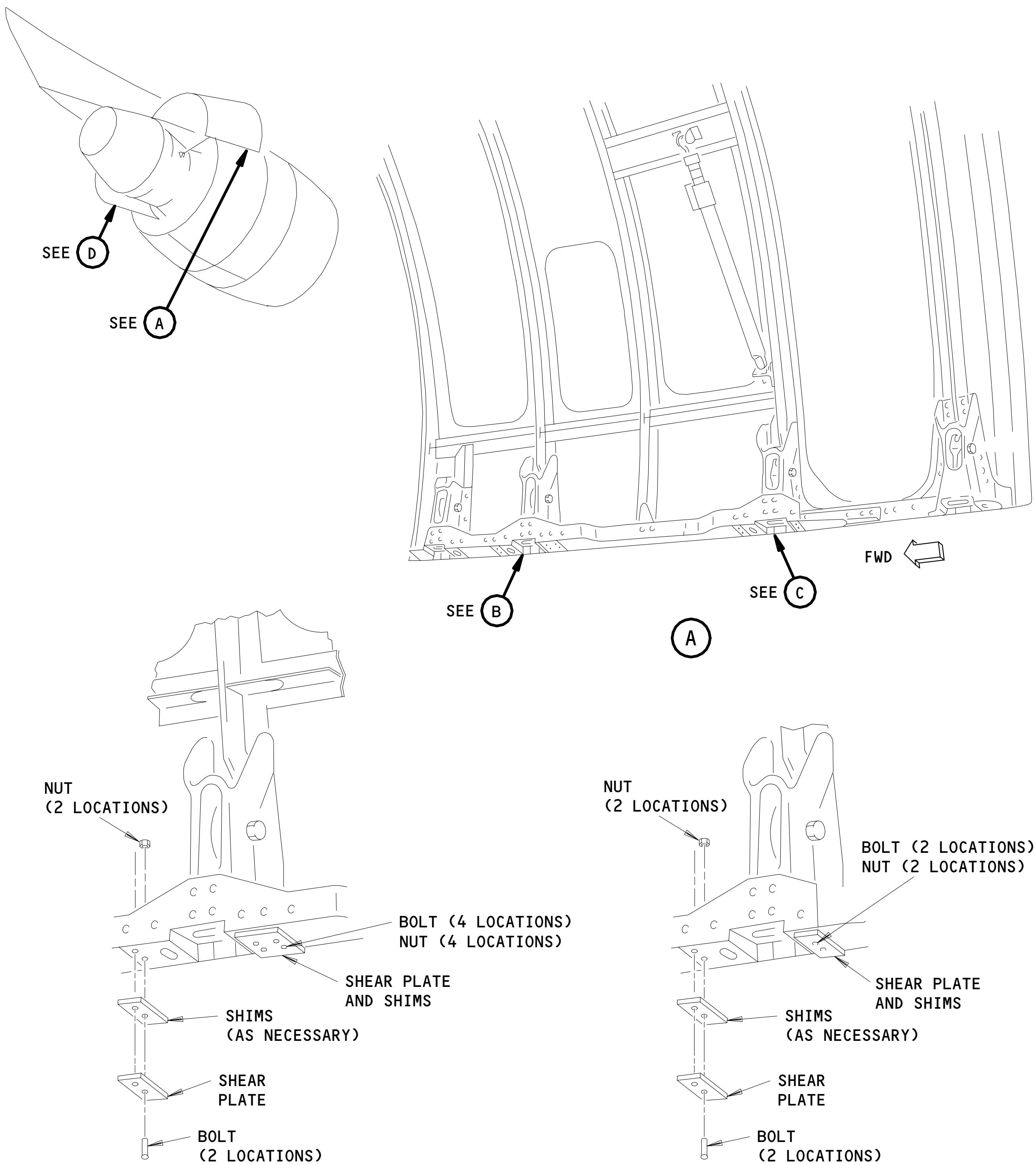
(5) Close and latch the core cowl panels (AMM 71-11-06/201).

S 225-007-N00

(6) Measure the distance between the core cowl panels at each of the latches.

S 825-008-N00

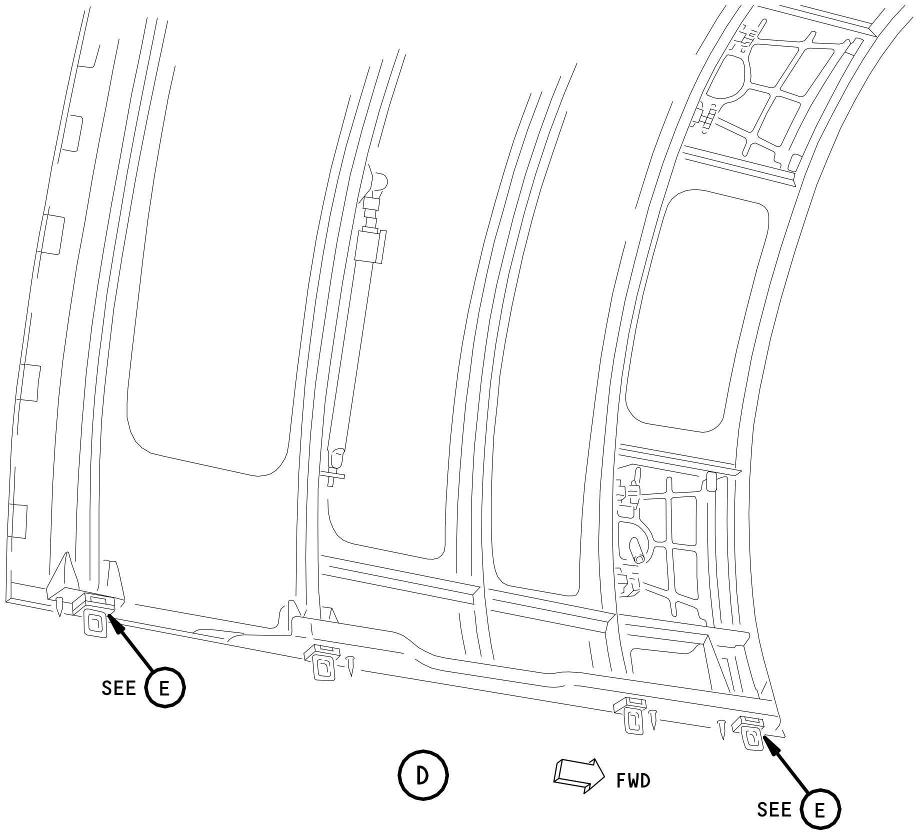
(7) If the distance between the core cowl panels is not 0.125 inches, do these steps to adjust the latches:
    (a) Open the core cowl panels (AMM 71-11-06/201).
    (b) Do the steps that follow to remove the shims from the two middle latches of the right core cowl:
        1) Remove the bolts (10 locations) that attach the shear plates and the shims to the right core cowl.
        2) Remove the shims from the right core cowl.
        3) Install the shear plates with the bolts and the nuts.

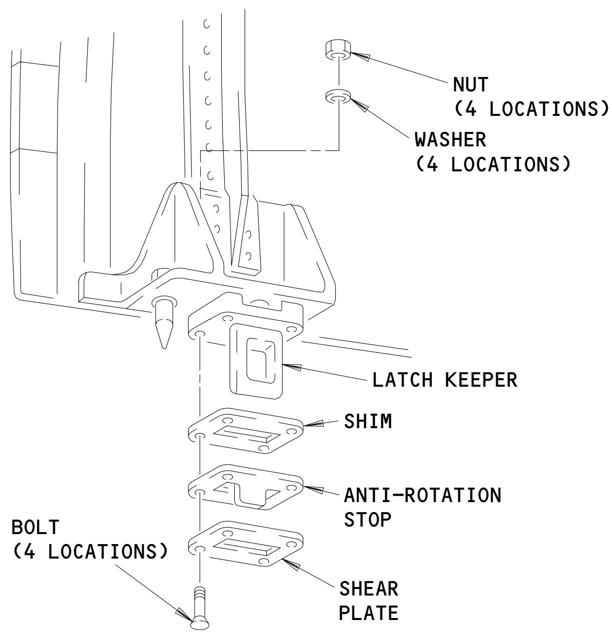


THE LOCATION OF THE FORWARD MIDDLE LATCH
B

THE LOCATION OF THE AFT MIDDLE LATCH
C

Core Cowl Panel Latch Shim Installation
Figure 501 (Sheet 1)





THE LOCATION OF THE AFT LATCH
(ALMOST THE SAME AS THE FORWARD LATCH)
E

Core Cowl Panel Latch Shim Installation
Figure 501 (Sheet 2)

(c) Do the steps that follow to remove the shims from the forward and the aft latches on the left core cowl:
   1) Remove the bolts (8 locations) that attach the keepers, the shear plates, the anti-rotation stops, and the shims to the cowl.
   2) Remove the shims from the forward and aft latches.
   3) Install the keepers, the shear plates, and the anti-rotation stops to the forward and the aft latches.

<u>CAUTION</u>: DO NOT APPLY MORE THAN A 60 POUND (27 KG) FORCE TO THE LATCH HANDLE. IF YOU APPLY A LARGE FORCE, YOU CAN CAUSE DAMAGE TO THE LATCH.

(d) Close the core cowl panels with shims that are 0.125-inch thick between the cowls at each latch location.
   1) If you could not close the latches, decrease the tension in the latches.
      a) Turn the adjustment star with a hex wrench to decrease the tension of the latch.

         <u>NOTE</u>: The direction to turn the adjustment star is shown on the keeper mount.

   2) If the latches will not hold the 0.125-inch thick shim between the cowls, increase the latch tension.
      a) Push the latch trigger to open the latch handle.

         <u>NOTE</u>: The latch handles open to approximately 15 degrees.

      b) Turn the adjustment star with a hex wrench to increase the latch tension.

         <u>NOTE</u>: The direction to turn the adjustment star is shown on the keeper mount.

         Do not turn the adjustment star if the force necessary to close the latch is more than 60 pounds (27kg).

(e) Open the core cowl panels.
(f) Put 0.25-inches (0.64 cm) of the modeling clay on all of the shear plates.

   <u>NOTE</u>: There are 4 shear plates on the right cowl and 2 shear plates on the left cowl.

(g) Apply the lubricant to the cowl locations opposite all of the shear plates.
(h) Close the core cowl panels with a 0.125-inch thick shim at each of the latch locations.

(i) Open the core cowl panels.
(j) Measure the thickness of the modeling clay at all of the latch locations.
(k) Remove the modeling clay.
(l) Remove the laminations until the shims are the thickness of the modeling clay at each shim location.
(m) Apply the primer to the shims.
(n) Remove the bolts that attach the shims to the core cowl panels.
(o) Install the shims with the bolts at each of the latches.

S 415-009-N00

(8) Close the core cowl panels, but do not close the latches.

S 825-010-N00

CAUTION: DO NOT APPLY A FORCE OF MORE THAN 60 POUNDS (27 KG) TO THE LATCH HANDLE. IF YOU APPLY A LARGE FORCE, YOU CAN CAUSE DAMAGE TO THE LATCH.

(9) Use the scale on the latch handles to do a check of the force necessary to close the latches (Fig. 502).

S 825-011-N00

CAUTION: DO NOT TURN THE KEEPER TO ADJUST THE LATCH TENSION. IF YOU TURN THE KEEPER, YOU CAN CAUSE DAMAGE TO THE LATCH.

(10) If the load necessary to close the latch is not 40-60 pounds (18-27 kg), do these steps to adjust the latch:
(a) Turn the adjustment star with a hex wrench to adjust the latch until the tension is in the correct limits.

NOTE: The direction to increase the load on the latch is shown on the keeper mount.

S 415-012-N00

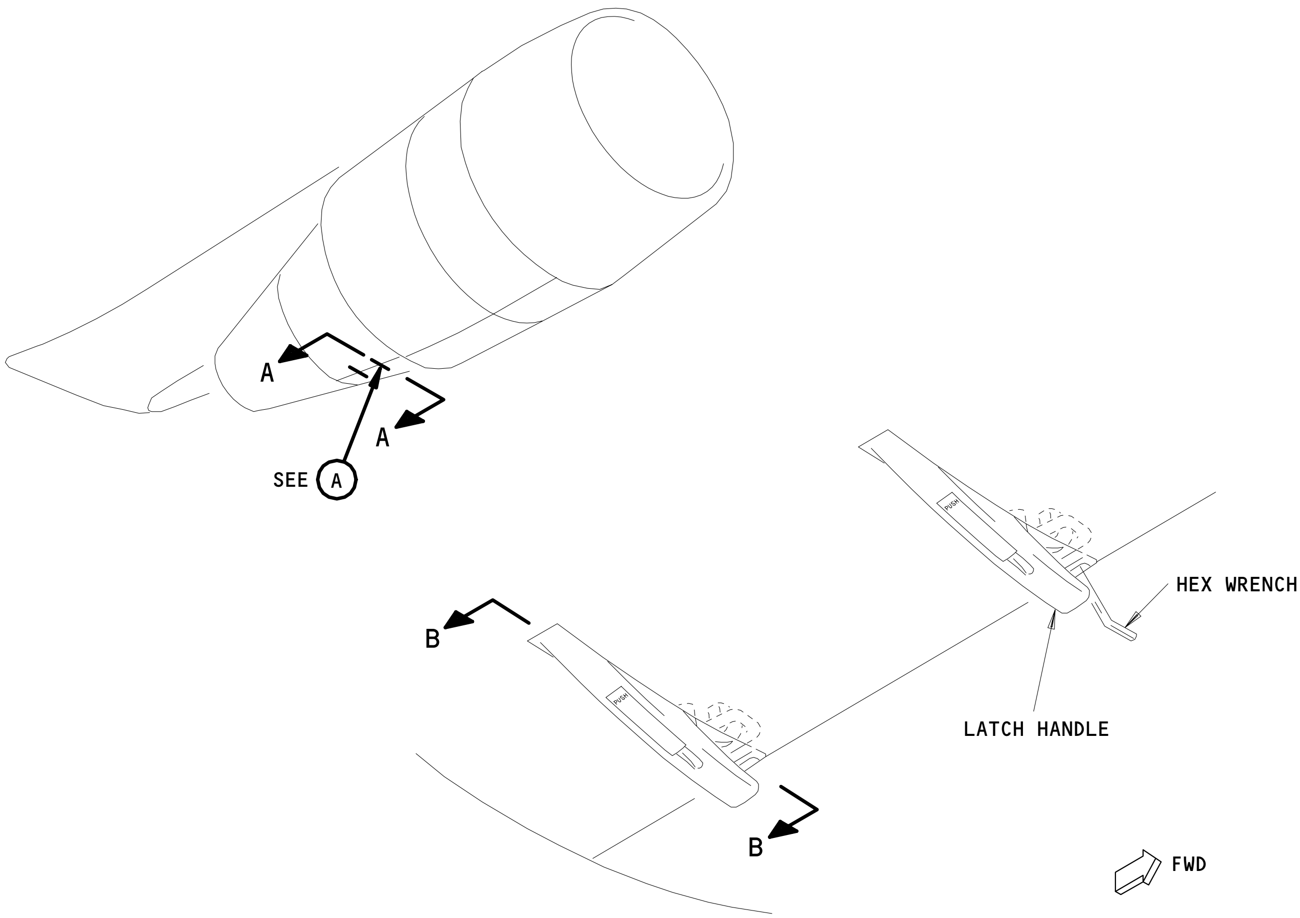
(11) Close all of the latches on the core cowl panels.

S 215-013-N00

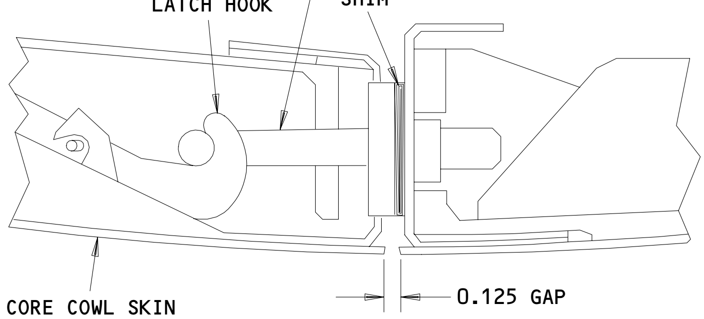
(12) Make sure all of the latch handles are smooth with the outer surface of the core cowl panels.

S 825-014-N00

(13) If the latch handles are not smooth with the surface of the core cowl panels, adjust the keeper mount.
(a) Open the core cowl panels.
(b) Loosen the bolts that attach the keeper mount to the core cowl panels.
(c) Move the keeper mount up if the latch was higher than the surface of the core cowl panel.

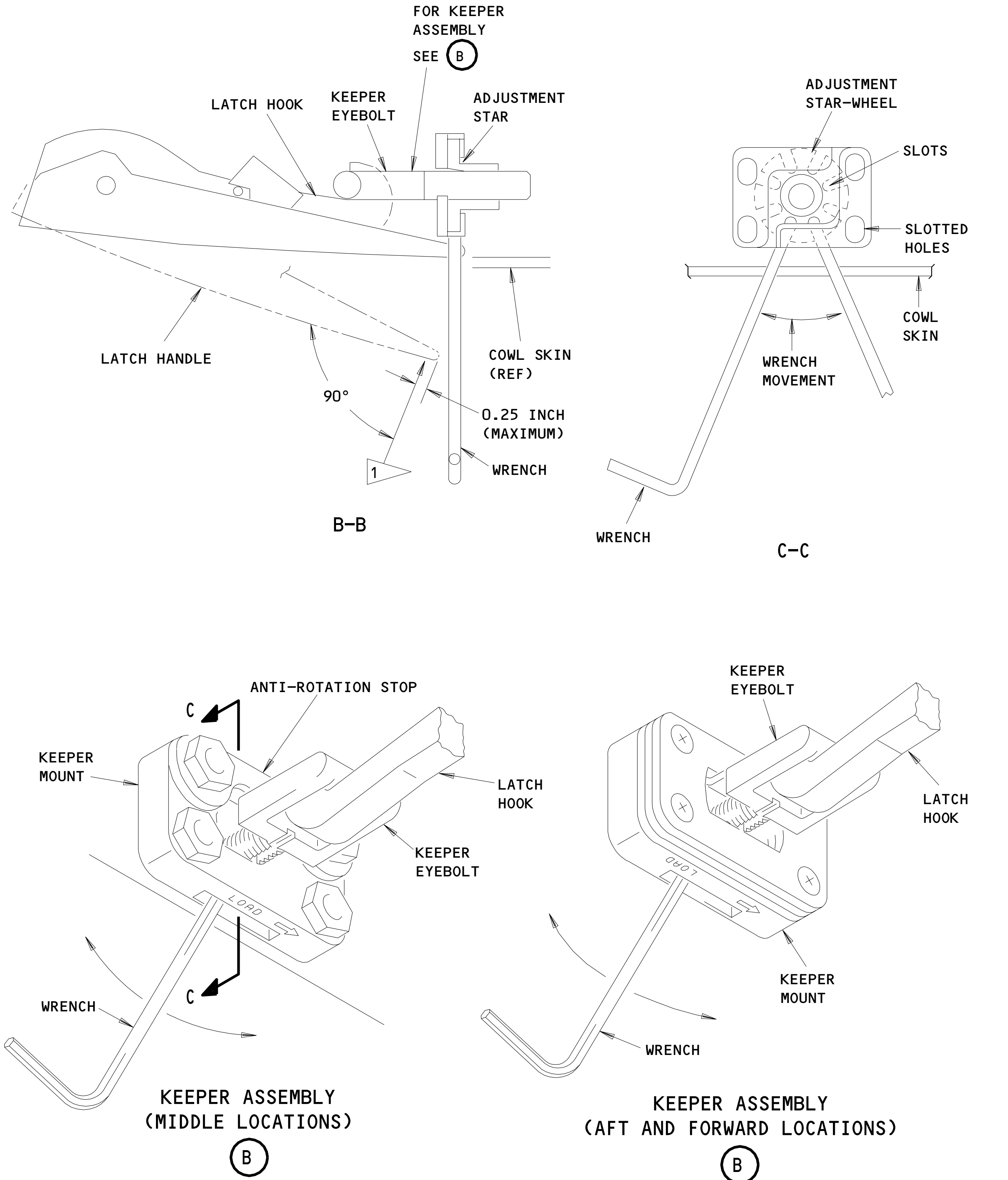


CORE COWL PANELS CLOSED,
LATCH HANDLE IN 15° (FREE-TRAVEL) POSITION
A



GAP LOCATION
(LATCH CLOSED)
A-A

Core Cowl Panel Latch Adjustment
Figure 502 (Sheet 1)



1 THE FORCE NECESSARY TO CLOSE THE LATCH IS 40-60 POUNDS (APPLIED AS SHOWN).

Core Cowl Panel Latch Adjustment
Figure 502 (Sheet 2)

(d) Move the keeper mount down if the handle was in a recess.
(e) Tighten the bolts that attach the keeper mount to the core cowl panels.

S 415-015-N00
(14) Close and latch the core cowl panels.

S 215-016-N00
(15) Make sure all of the latch handles are smooth with the outer surface of the core cowl panels.

S 825-017-N00
(16) Make sure the force necessary to close the latches is 40-60 pounds (18-27 kg).

S 825-018-N00
(17) Do a check of the force necessary to close the aft latch on the thrust reversers.
(a) Make sure all of the latches on the core cowl panel are closed.
(b) Make sure the force necessary to close the aft latch on the thrust reverser is 40-60 pounds (18-27 kg) (AMM 78-31-04/501).

S 445-019-N00
(18) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

COWL PANEL PRESSURE RELIEF DOORS - REMOVAL/INSTALLATION

1. General
   A. There are two tasks in this procedure. The first task is the removal of the pressure relief doors on the engine cowls. The second task is the installation of the pressure relief doors on the engine cowls.
   B. There are five pressure relief doors on each engine. There is one door on the left fan cowl at the 7:30 o'clock position. There are four doors on the core cowls at the 3:30, the 5:00, the 7:00, and the 8:30 o'clock positions. This procedure is used for the removal and the installation of all of the pressure relief doors.

TASK 71-11-08-004-001-N00

2. Remove the Pressure Relief Door (Fig. 401)
   A. References
      (1) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones

411	Left Engine
421	Right Engine

      (2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

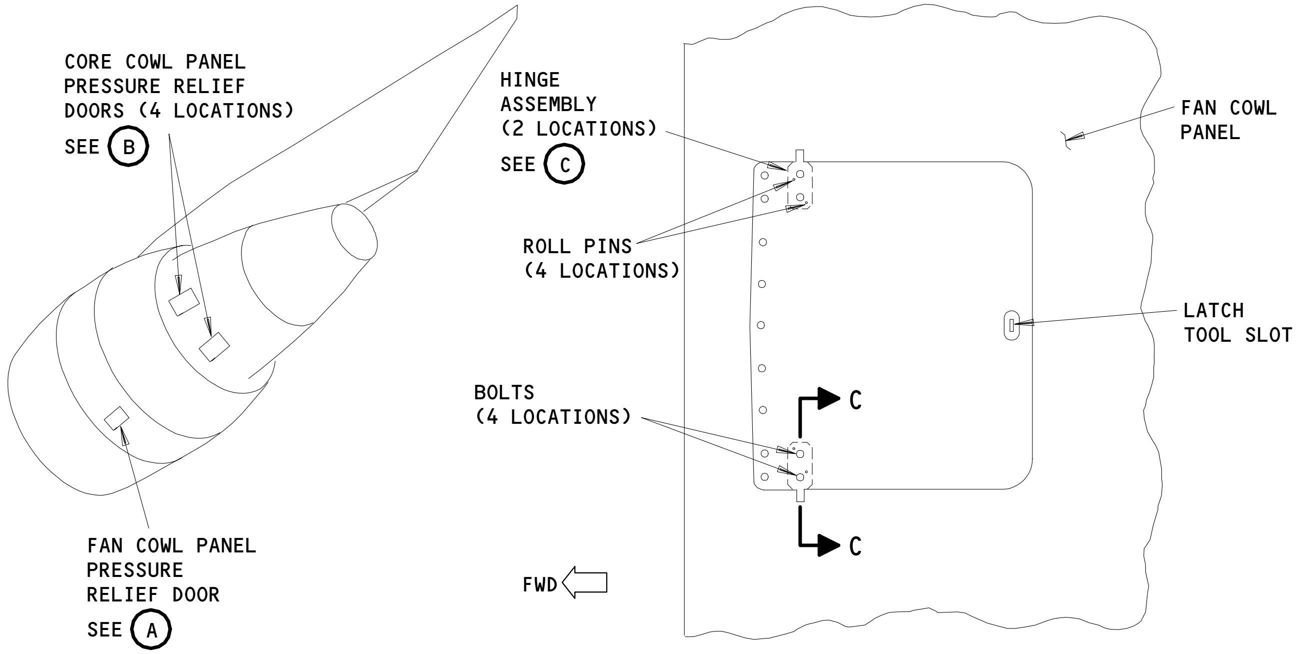
   C. Procedure

      S 044-002-N00

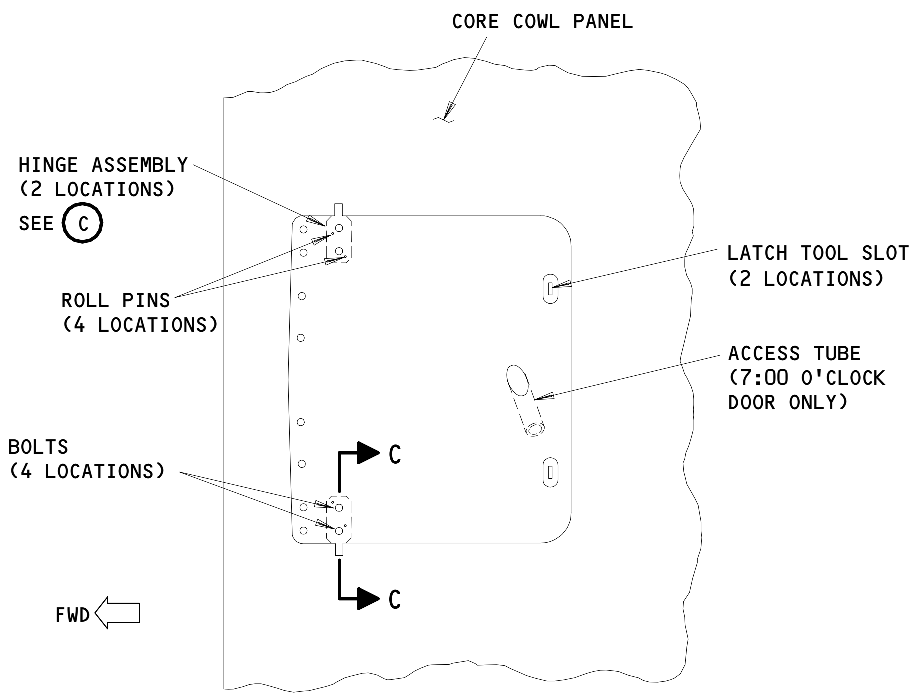
   WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

   (1) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

      S 034-003-N00
   (2) Release the latches on the pressure relief door.
      (a) Put a screwdriver in the latch slot.



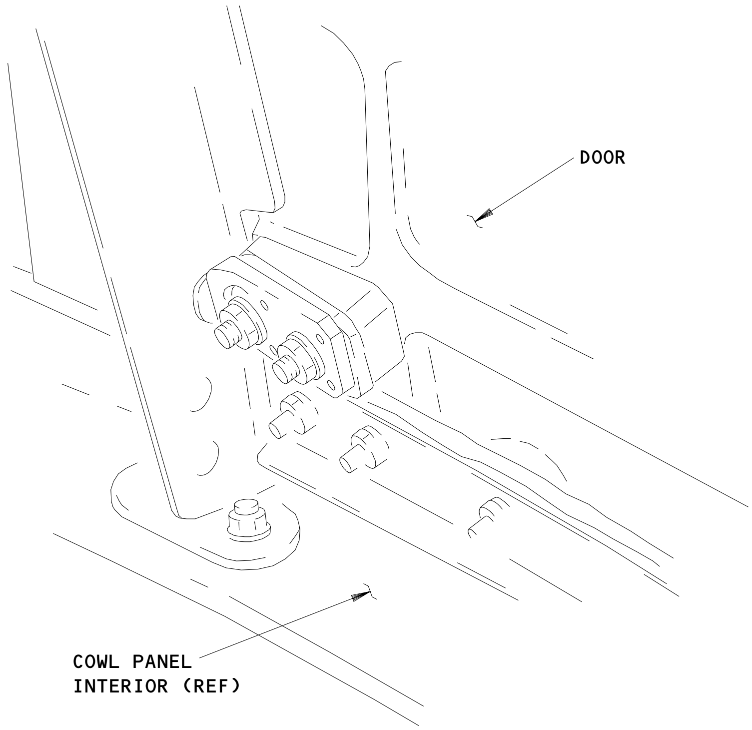
FAN COWL PANEL PRESSURE RELIEF DOOR
A



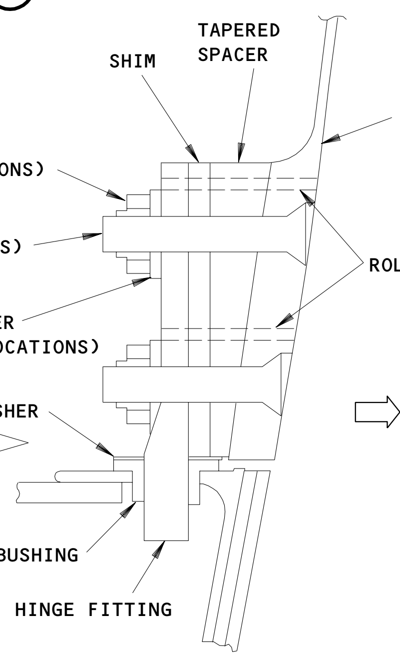
CORE COWL PANEL PRESSURE RELIEF DOOR (4 LOCATIONS)
B

Cowl Panel Pressure Relief Door Installation
Figure 401 (Sheet 1)

266196



HINGE ASSEMBLY
C



1 INSTALL AS NECESSARY TO KEEP THE CORRECT CLEARANCE.

HINGE ASSEMBLY CROSS SECTION
C-C

Cowl Panel Pressure Relief Door Installation
Figure 401 (Sheet 2)

(b) Apply a force on the screwdriver until the latch releases.

S 034-004-N00
(3) Remove the bolts from the hinge assemblies on the door.

S 024-005-N00
(4) Push the roll pins with a drift punch on the outer side of the door until the door is free.

S 034-006-N00
(5) Remove the hinge assemblies and the washers.

S 034-007-N00
(6) Remove the bushings that are worn.

TASK 71-11-08-404-008-N00
3. Install the Pressure Relief Door (Fig. 401)
A. Consumable Materials
(1) D00015 Grease - Corrosion Preventive BMS 3-24
B. References
(1) AMM 71-11-08/501, Cowl Panel Pressure Relief Doors
(2) AMM 78-31-00/201, Thrust Reverser System
C. Access
(1) Location Zones

411	Left Engine
421	Right Engine

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

D. Procedure

S 434-009-N00
(1) Install the bushings that were removed.

S 434-010-N00
(2) Install the hinge assemblies in the bushings.

NOTE: Use washers, if it is necessary, to make sure the door is in the limits for the aerodynamic smoothness.

S 424-011-N00
(3) Align the door with the holes for the roll pins in the hinge assemblies.

S 434-012-N00
(4) Use a drift punch on the inner side of the door to install the roll pins smooth with the outer surface of the cowl.

S 644-013-N00
(5) Apply the grease to the bolts that attach the hinge assemblies to the door.

S 434-014-N00
(6) Install the bolts, the nuts, and the washers that attach the hinge assemblies to the door.

S 824-015-N00
(7) Adjust the latches and the hinges on the door (AMM 71-11-08/501).

S 414-016-N00
(8) Close the door.

S 444-017-N00
(9) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

COWL PANEL PRESSURE RELIEF DOORS - ADJUSTMENT/TEST

1. General
   A. There are two tasks in this procedure. The first task is used to do a latch test for the pressure relief doors. The second task is used to do an adjustment of the aerodynamic smoothness for the pressure relief doors.
      (1) The latch test is used to make sure the latches release at the correct pressure. To do this test, you apply a load to the latches.
      (2) The adjustment of the aerodynamic smoothness is used to make sure the pressure relief door is in the correct tolerances.

TASK 71-11-08-825-001-N00

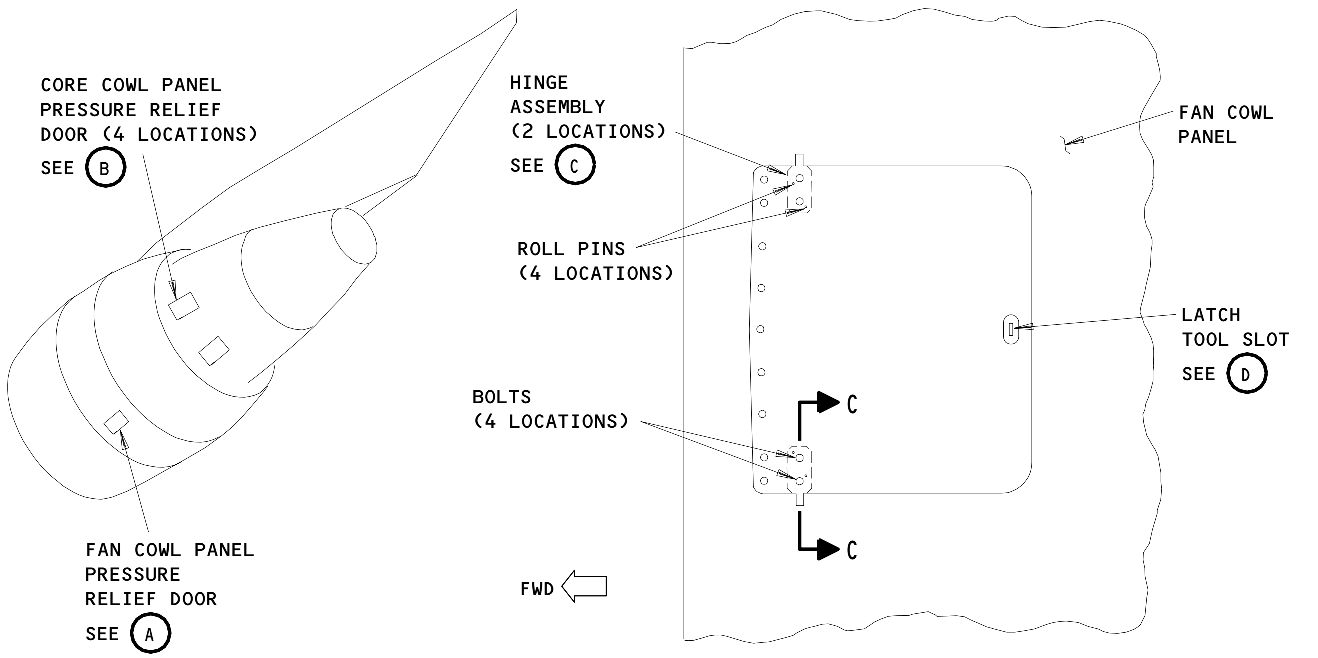
2. Latch Test for the Cowl Panel Pressure Relief Doors
   A. Equipment
      (1) Adapter - Load Test - Pressure Relief Door Latch
          B71044-28 (Recommended)
          B71044-10 (Alternative)
   B. References
      (1) AMM 78-31-00/201, Thrust Reverser System
   C. Access
      (1) Location Zones

411	Left Engine
421	Right Engine

      (2) Access Panels

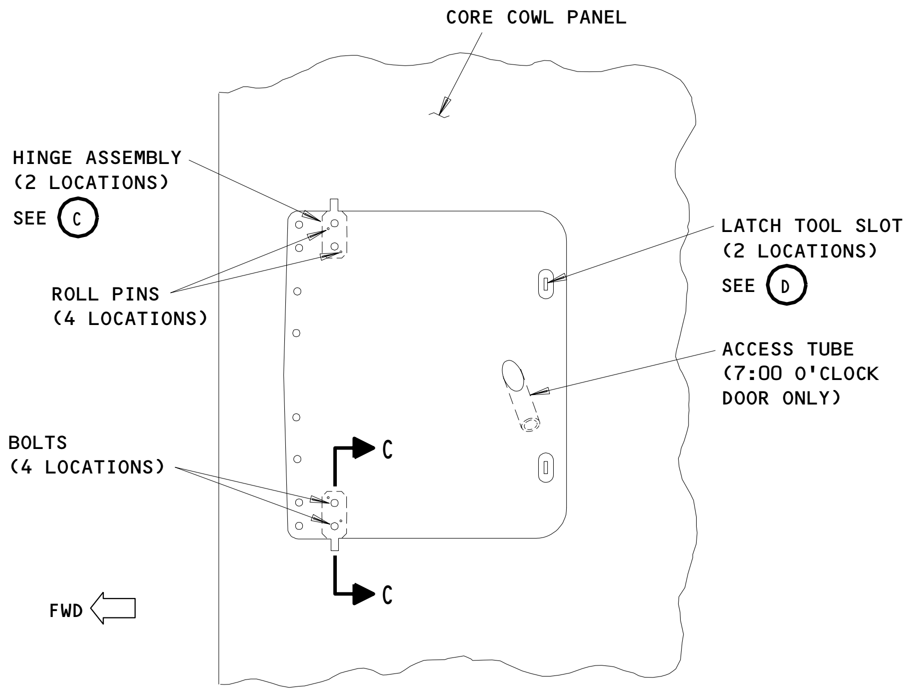
413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

   D. Do the Test of the Latches on the Pressure Relief Doors (Fig. 501).



FAN COWL PANEL PRESSURE RELIEF DOOR

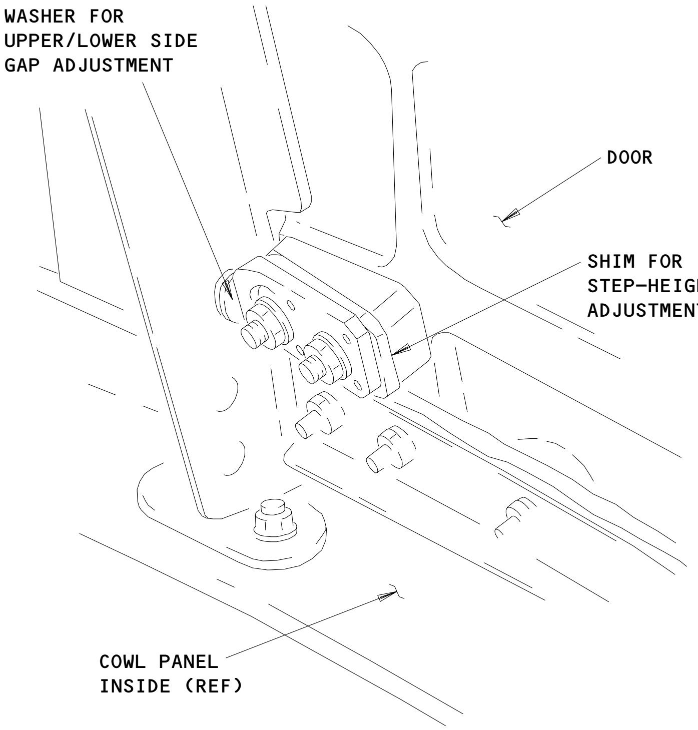
A



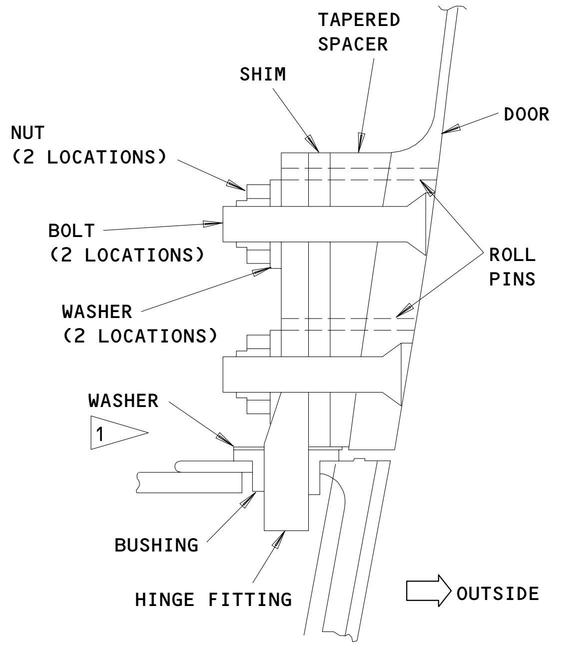
CORE COWL PANEL PRESSURE RELIEF DOOR (4 LOCATIONS)

B

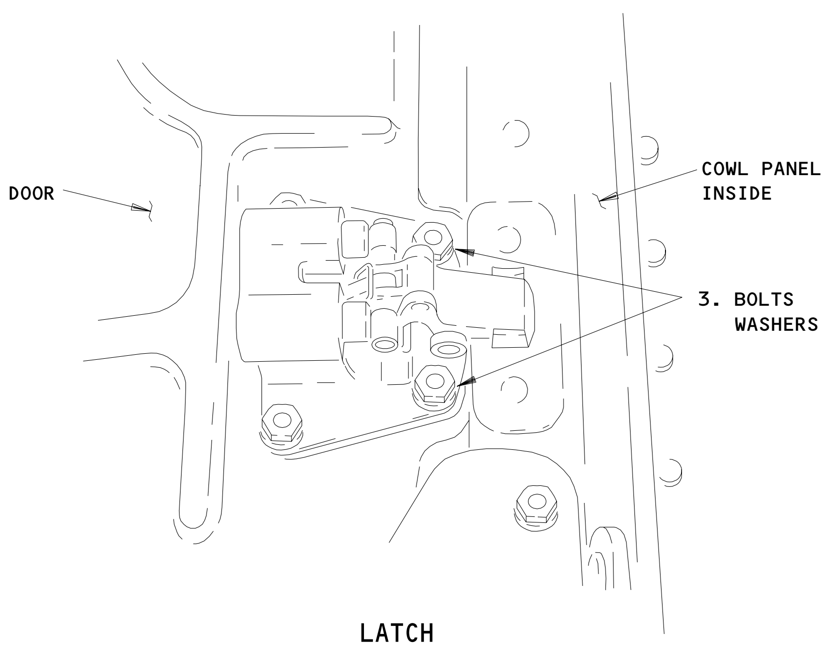
Cowl Panel Pressure Relief Doors
Figure 501 (Sheet 1)



HINGE ASSEMBLY
C



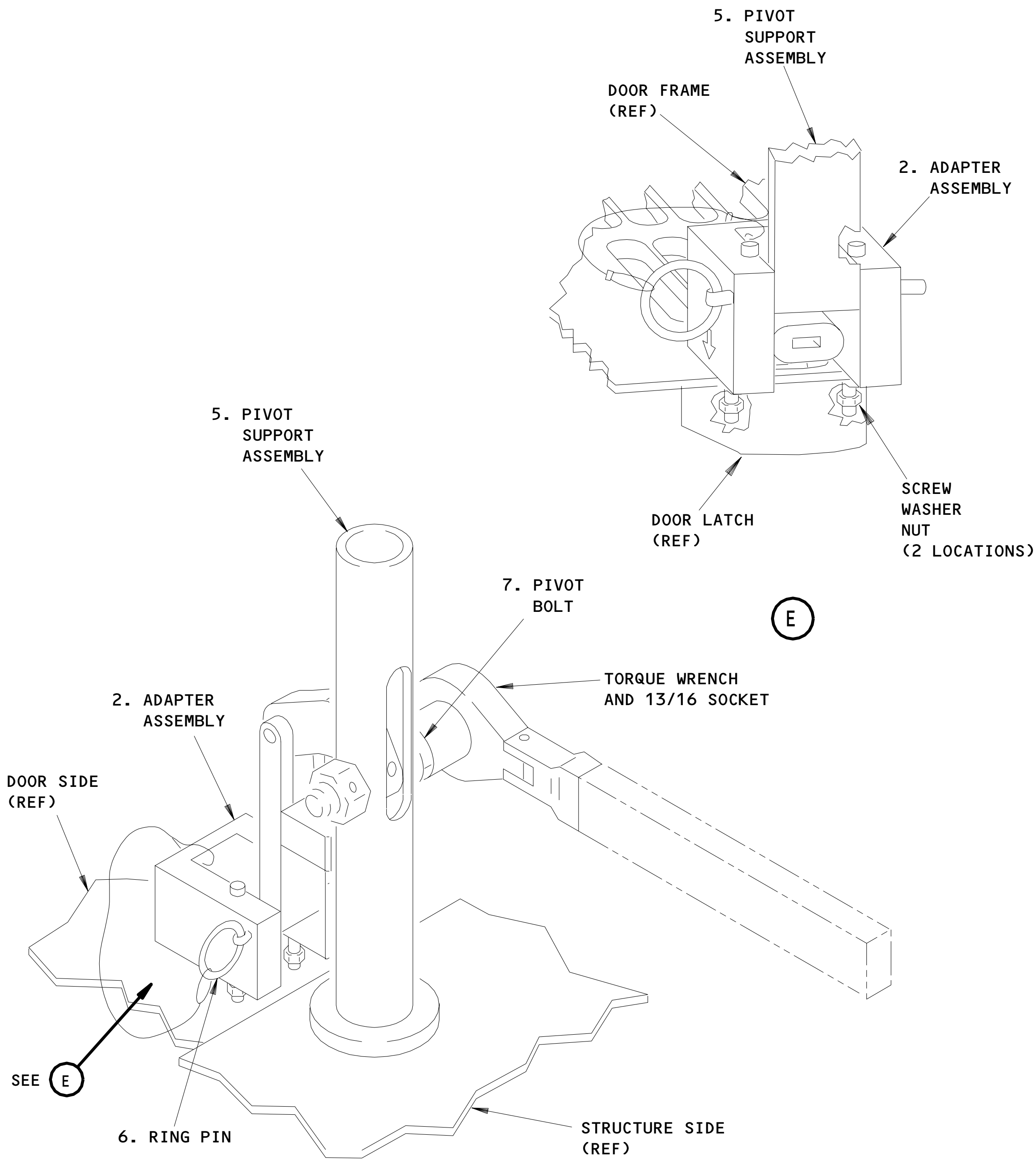
HINGE ASSEMBLY CROSS SECTION
C-C



1 INSTALL AS NECESSARY TO KEEP THE CORRECT CLEARANCE.

LATCH
D

Cowl Panel Pressure Relief Door Details
Figure 501 (Sheet 2)



B71044-10 LOAD TEST TOOL INSTALLATION

Cowl Panel Pressure Relief Door Latch Test
Figure 501 (Sheet 3)

S 045-002-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

NOTE: This is only necessary if you will use this procedure for the pressure relief doors on the core cowl panels.

S 015-013-N00

(2) Open the latches on the pressure relief door.
  (a) Put the blade of a straight-slot screwdriver into the latch slot (1).
  (b) Move the screwdriver handle to the side to turn the latch (1) to the open position.

S 485-014-N00

(3) Install the load-test-adapter-tool for the latch on the pressure relief door.
  (a) Remove the two latch mounting bolts (3) that are nearest to the edge of the pressure relief door.
  (b) Temporarily fasten the adapter assembly (2) to the door with the bolts (4) that are supplied with the adapter assembly.
    1) Put the adapter bolts (4) into the bolt holes that the latch bolts (3) were removed from.
    2) Tighten the nuts on the bolts (4) with your fingers.
  (c) Attach the arm of the pivot support assembly (5) to the adapter assembly (2) with the ring pin (6).
  (d) Put the base of the pivot support assembly (5) flush on the surface of the cowl structure.

  NOTE: The axis of the main tube of the pivot support assembly (5) must be vertical, or 90-degrees, to the surface of the cowl structure. The arm of the pivot support assembly (5), that connects to the adapter assembly (2), also must be 90-degrees to the surface of the cowl structure. When you put the tool in this correct position and turn the torque wrench, force will be applied correctly at the centerline of the latch.

S 485-015-N00

(4) Attach the torque wrench to the pivot bolt (7) of the pivot support assembly (5).

NOTE: Make sure that the handle of the torque wrench is parallel with the surface of the pressure relief door.

S 415-016-N00

(5) Close the latch (1) that you will examine on the pressure relief door.
- (a) Put the blade of a straight-slot screwdriver into the slot on the latch (1) that you will examine.
- (b) Move the screwdriver handle until the latch (1) is in the fully open position, and close the pressure relief door.
- (c) Move the screwdriver in the opposite direction to lock the latch (1).
- (d) If the pressure relief panel has more than one latch, do not lock the opposite latch.

NOTE: The opposite latch must stay unlocked during the test.

S 725-017-N00

(6) Do the test of the latches on the pressure relief door.

CAUTION: PUT A FOLDED SHOP CLOTH OR RUBBER MAT BETWEEN THE TORQUE WRENCH HANDLE AND THE PRESSURE RELIEF DOOR (BEFORE YOU TURN THE HANDLE TO OPEN THE LATCH). THIS WILL PREVENT INJURY TO YOUR HAND WHEN YOU SUDDENLY RELEASE THE LATCH. ALSO, IT WILL PREVENT SCRATCHES TO THE SURFACE OF THE PRESSURE RELIEF DOOR CAUSED BY THE TORQUE WRENCH HANDLE. IF YOU DO NOT DO THIS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

- (a) Put a folded shop cloth or rubber mat between the torque wrench handle and the pressure relief door.
- (b) With the handle of the torque wrench parallel to the surface of the pressure relief door, turn the handle down smoothly.
- (c) As you turn the handle down, make a record of the torque when the latch on the pressure relief door opens.

(d) For the fan cowl panel, the latch on the pressure relief door is serviceable if the torque used to open it is 100-130 pound-inches (11.3-14.7 newton-meters).

NOTE: The force necessary to open the latch is 50-65 pounds (22.7-29.5 kilograms) But, the arm of the pivot support assembly which pulls up on the latch decreases the applied force by a factor of two. This makes it necessary to increase the force you apply by a factor of two. Thus, the latch must unlock when the torque wrench shows 100-130 pound-inches (11.3-14.7 newton-meters).

(e) For the core cowl panel, the latch on the pressure relief door is serviceable if the torque used to open it is 160-190 pound-inches (18.0-21.5 newton-meters).

NOTE: The force necessary to open the latch is 80-95 pounds (36.3-43.1 kilograms) But, the arm of the pivot support assembly which pulls up on the latch decreases the applied force by a factor of two. This makes it necessary to increase the force you apply by a factor of two. Thus, the latch must unlock when the torque wrench shows 160-190 pound-inches (18.0-21.5 newton-meters).

S 025-018-N00

(7) If the force to release the latch (1) is not in the specified limits, replace the latch.

S 085-019-N00

(8) Remove the load-test-adapter-tool from the pressure relief door.
   (a) Remove the pivot support assembly (5) from the cowl structure.
   (b) Remove the adapter assembly (2) from the pressure relief door.
   (c) Install the mounting bolts, washers and nuts (3) on the latch, and tighten the nuts (3).

S 725-020-N00

(9) If there is more than one latch on the pressure relief door, do these steps again to do a test of the other latch.

S 415-021-N00

(10) When you have completed the tests for all the latches on the pressure relief door, do these steps:
   (a) Put the blade of a straight-slot screwdriver into the slot of one of the latches (1) on the pressure relief door.
   (b) Move the screwdriver handle until the latch (1) is in the fully open position, and close the pressure relief door.
   (c) Move the screwdriver in the opposite direction to lock the latch (1).

(d) If there is more than one latch on the pressure relief door, do these steps again to close the opposite latch (1).

S 445-006-N00

(11) If it is necessary, do this procedure: Thrust Reverser Activation After Ground Maintenance (AMM 78-31-00/201).

TASK 71-11-08-225-007-N00

3. Aerodynamic Smoothness Adjustment for the Pressure Relief Doors

A. Consumable Materials

(1) C00259 Primer - BMS 10-11, type 1

B. References

(1) AMM 71-11-00/201, Aerodynamic Smoothness

(2) AMM 71-11-08/401, Cowl Panel Pressure Relief Doors

(3) AMM 78-31-00/201, Thrust Reverser System

C. Access

(1) Location Zones

411	Left Engine
421	Right Engine

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

D. Procedure

S 045-008-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 225-009-N00

(2) Make sure the pressure relief doors are in the limits for the aerodynamic smoothness (AMM 71-11-00/201).

S 825-010-N00

(3) If the doors are not in the limits for the aerodynamic smoothness, do these steps to adjust the door:
- (a) Adjust the door up and down.
  - 1) Add or remove the washers installed between the hinge assemblies and the bushings (AMM 71-11-08/401).
- (b) Adjust the door forward and aft.
  - 1) Use a drift punch to remove the roll pins from the hinge assemblies.
  - 2) Loosen the bolts that attach the door to the hinge assemblies.
  - 3) Adjust the door until it is in the limits for the aerodynamic smoothness.
  - 4) Tighten the bolts that attach the door to the hinge assemblies.
  - 5) Drill two new holes on the opposite side of the bolts for the roll pins with a 0.062-0.065 inch bit.
  - 6) Use a drift punch to install the roll pins until they are smooth with the external surface of the door.
- (c) Adjust the step height of the door.
  - 1) Remove the pressure relief door (AMM 71-11-08/401).
  - 2) Remove the roll pins from the hinge assemblies.
  - 3) Remove the laminations of the shim or, if it is necessary, replace the shim with a thicker shim.

    NOTE: It is necessary to drill holes in a new shim for the bolts and the roll pins.

  - 4) Apply the primer to the shim.
  - 5) Install the pressure relief door (AMM 71-11-08/401).

S 445-011-N00

(4) Do this procedure: Thrust Reverser Activation (AMM 78-31-00/201).

INLET COWL THERMAL ANTI-ICE (TAI) DUCT - REMOVAL/INSTALLATION

1. General
   A. There are two tasks in this procedure. The first task is the removal of the inlet cowl TAI duct. The second task is the installation of the inlet cowl TAI duct.
   B. The TAI duct is removed in two pieces. The TAI duct on the fan case attaches to the left side of the strut. The other end of the TAI duct on the fan case attaches to the cowl TAI duct. The cowl TAI duct is immediately aft of the inlet cowl bulkhead.

TASK 71-11-09-004-001-N00

2. Remove the Inlet Cowl TAI Duct (Fig. 401)
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panel
   B. Access
      (1) Location Zones
         413 Fan Cowl Panel, Left Engine
         423 Fan Cowl Panel, Right Engine

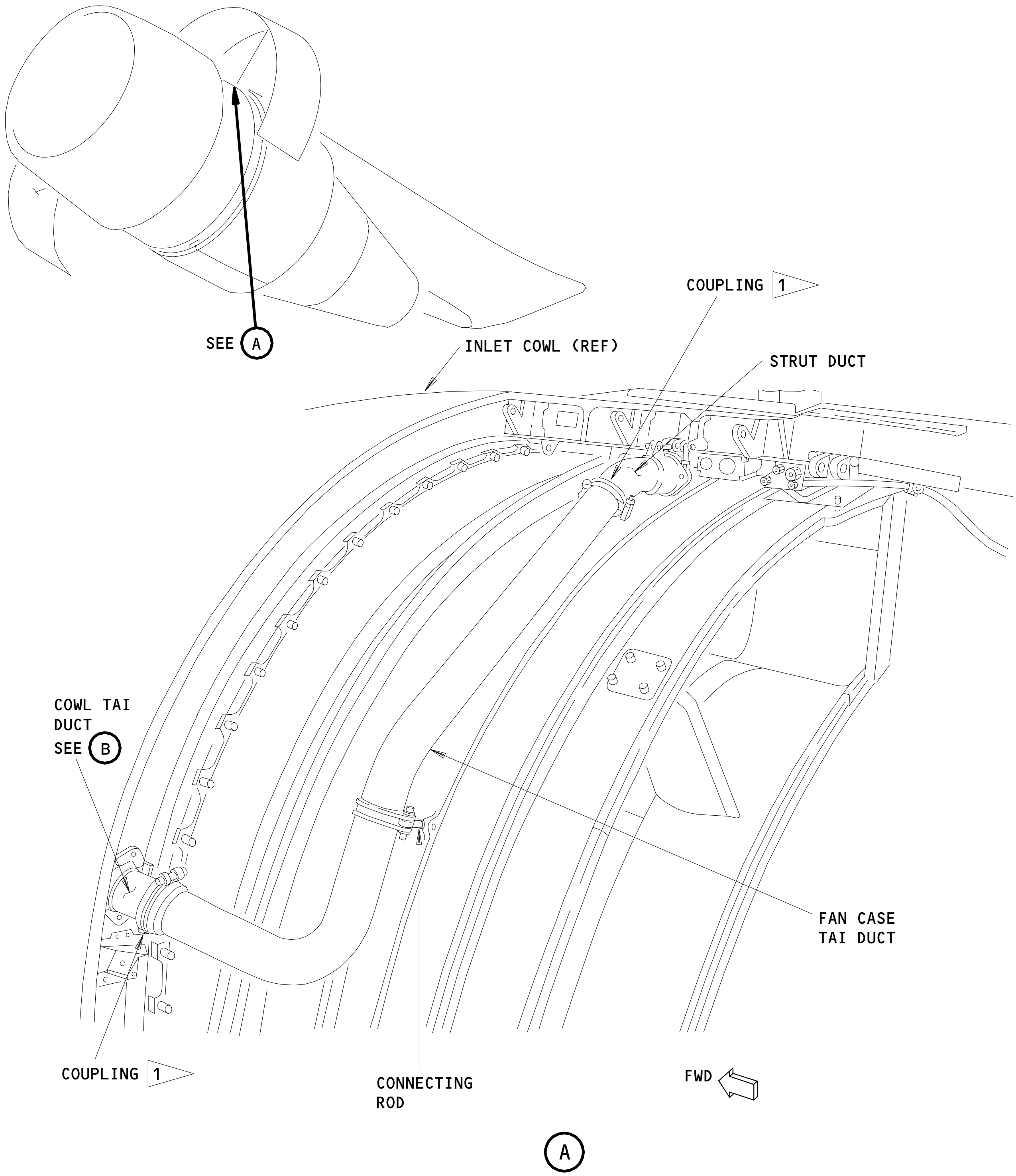
      (2) Access Panels
         413AL Fan Cowl Panel, Left Engine
         423AL Fan Cowl Panel, Right Engine

   C. Procedure

      S 014-002-N00
      (1) Open the fan cowl panel on the left side of the engine (AMM 71-11-04/201).

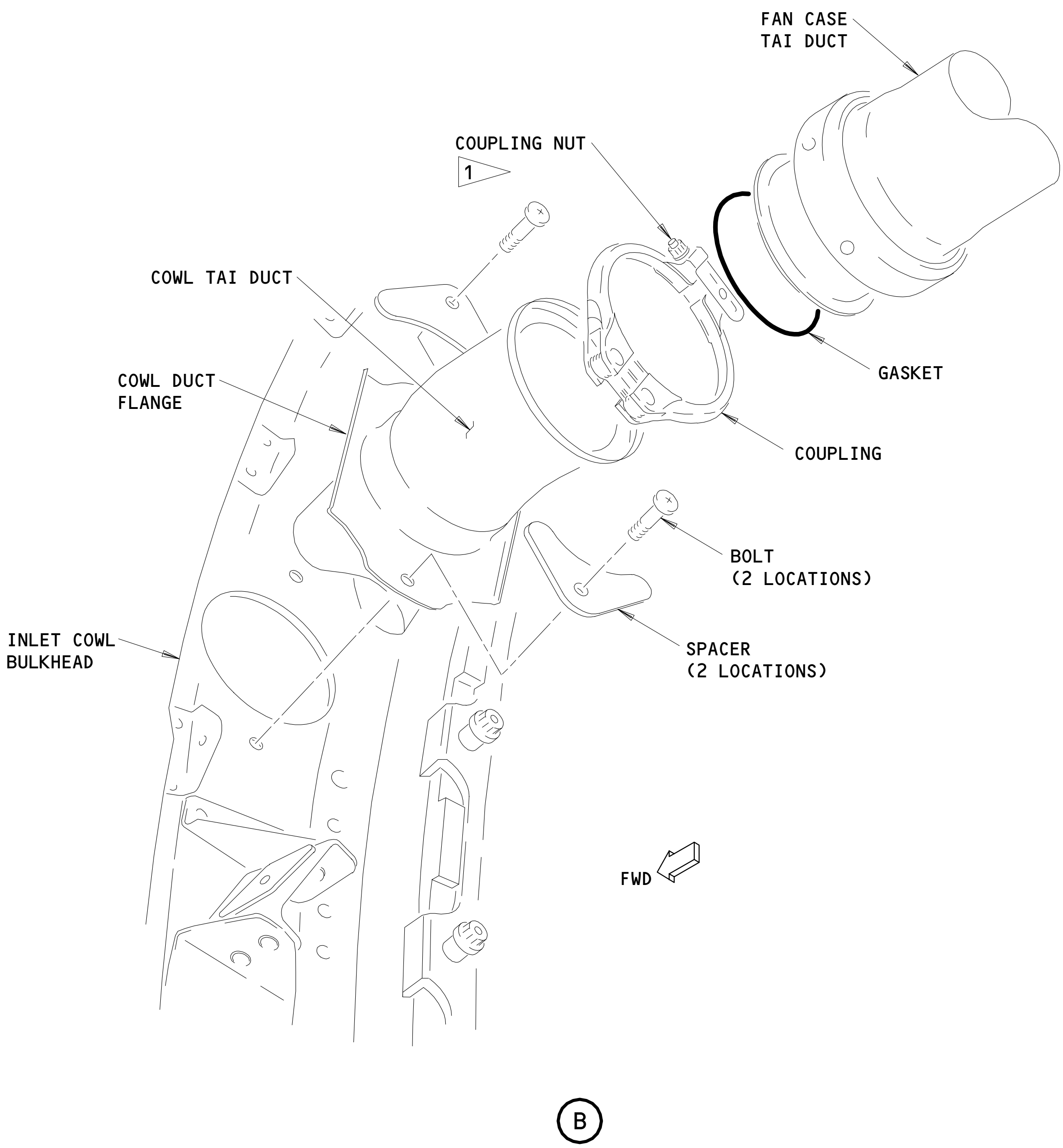
      S 024-003-N00
      (2) Do the steps that follow to remove the TAI duct on the fan case (Fig. 401):
         (a) Remove the bolt that attaches the connecting rod to the TAI duct.
         (b) Remove the couplings at the two ends of the TAI duct.
         (c) Remove the TAI duct.
         (d) Remove and discard the gaskets from the two ends of the TAI duct.
         (e) Install a protection cap on the strut duct.

      S 024-004-N00
      (3) Do the steps that follow to remove the cowl TAI duct:
         (a) Remove the bolts and the spacers that attach the cowl duct flange to the inlet cowl bulkhead.
         (b) Move the cowl TAI duct aft to remove the duct.



1 MAKE SURE THE LOCK-BOLT DOES NOT EXTEND BEYOND THE TOP OF DUCT INTO THE FAN COWL PANELS.

Inlet Cowl TAI Duct Installation
Figure 401 (Sheet 1)



Inlet Cowl TAI Duct Installation
Figure 401 (Sheet 2)

TASK 71-11-09-404-005-N00

3. Install the Inlet Cowl TAI Duct (Fig. 401)

A. Consumable Materials

(1) A00160 Sealant - BMS 5-63

B. References

(1) AMM 51-31-01/201, Specifications and Materials

(2) AMM 71-11-04/201, Fan Cowl Panel

C. Access

(1) Location Zones

413	Fan Cowl Panel, Left Engine
423	Fan Cowl Panel, Right Engine

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
423AL	Fan Cowl Panel, Right Engine

D. Procedure

S 424-006-N00

(1) Do the steps that follow to install the cowl TAI duct:

(a) Apply a fay surface seal between the cowl duct flange and the inlet cowl bulkhead (AMM 51-31-01/201).

(b) Install the cowl TAI duct on the inlet cowl bulkhead.

NOTE: The forward end of the duct must go into a housing in the inlet cowl. The housing is immediately aft of the leading of the inlet cowl). The duct will go approximately 1/2-inch into the housing.

(c) Install the bolts and the spacers that attach the cowl TAI duct to the inlet cowl bulkhead.

S 424-007-N00

(2) Do the steps that follow to install the TAI duct on the fan case:

(a) Remove the protection cap from the strut duct.

(b) Install a gasket to the strut duct.

(c) Install a gasket to the TAI duct on the fan case at the inlet cowl bulkhead.

(d) Put the TAI duct in its position on the fan case.

(e) Install the couplings on the two ends of the TAI duct.

(f) Tighten the couplings to 85-100 pound-inches (9.61-11.30 newton-meters).

(g) Install the bolt, the nut, the bushing, and the two washers that attach the connecting rod to the TAI duct.

S 414-008-N00

(3) Close the fan cowl panel (AMM 71-11-04/201).

COWL PANEL HOLD-OPEN ROD - MAINTENANCE PRACTICES

1. General
   A. There are two tasks in this procedure. The first task does an inspection of the hold-open rods for the fan cowls, the thrust reversers, and the core cowls. The second task is used to clean the hold-open rods.
   B. The hold-open rods hold the cowl panels in the open position. One end of the rods is attached to the cowl panel with a bolt. The other end of the rods attaches to a stow bracket on the cowl panel when the cowl is closed. When the cowl panel is open, one end of the rods attach to a bracket on the engine.
   C. The hold-open rods must lock when they are fully extended. It is important to make sure the hold-open rods and the lock mechanisms operate correctly.

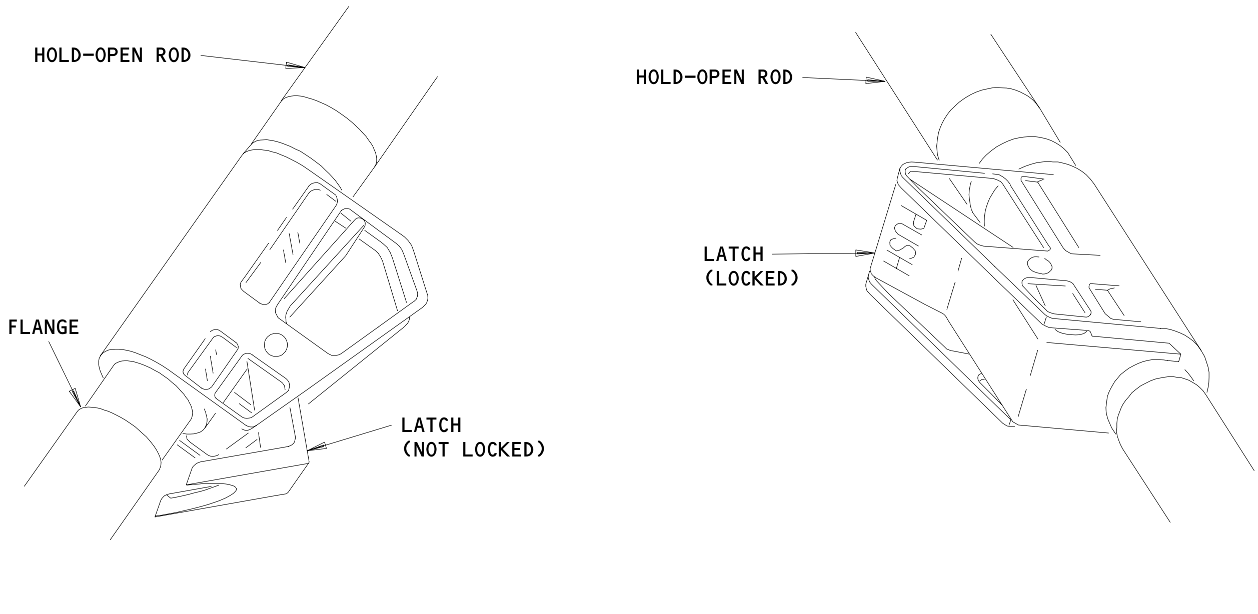
TASK 71-11-10-212-001-N00

2. Cowl Panel Hold-Open Rod - Inspection/Check (Fig. 201)
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panel
      (2) AMM 71-11-06/201, Core Cowl Panel
      (3) AMM 78-31-00/201, Thrust Reversers
   B. Access
      (1) Location Zones

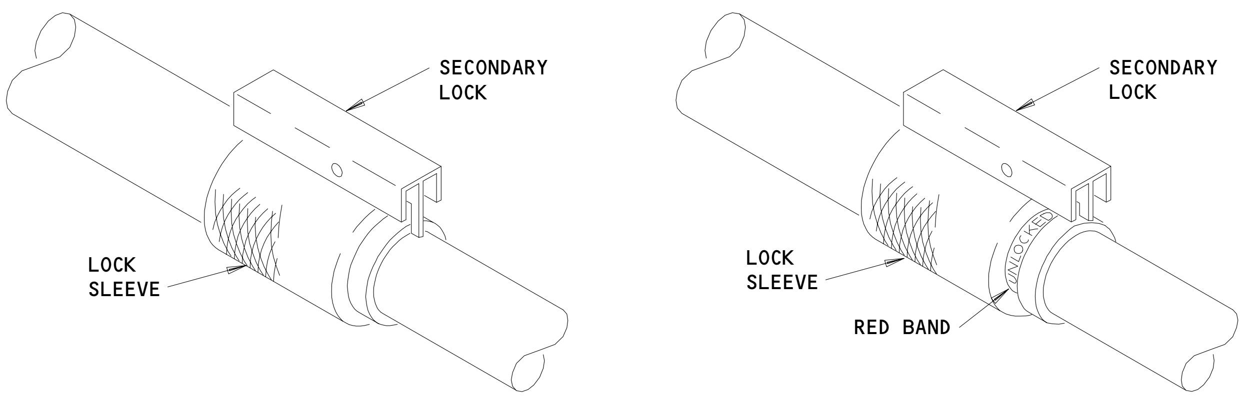
411	Left Engine
421	Right Engine

      (2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine



HOLD-OPEN ROD FOR THE CORE COWL PANEL AND THRUST REVERSER



LOCKED NOT LOCKED

HOLD-OPEN ROD FOR THE FAN COWL PANEL

Hold-Open Rod Lock
Figure 201

C. Procedure

S 412-002-N00

(1) Open the fan cowl panels (AMM 71-11-04/201).

NOTE: You open the fan cowl panels for access to the hold-open rods on the thrust reversers. It is not necessary to open the thrust reversers to examine the hold-open rods.

S 042-012-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 212-003-N00

(3) Do the steps that follow to examine the hold-open rods on the thrust reversers:
   (a) Disconnect and connect the rods to the stow bracket to make sure they operate correctly.
   (b) Make sure the end of the rods that attach to the cowls with the bolts move freely.
   (c) Visually examine the hold open rod attach bracket assembly for wear and damage.
      1) Make sure there is no crack in the hold open rod attach bracket.
      2) Make sure the minimum remaining thickness for the hold open rod attach bracket eye bolt flange is 0.110 inch (2.794 mm).
      3) Make sure the torque for the hold open rod attach bracket eye bolt nut is 160 - 240 inch-pounds (18.1 - 27.1 newton-meters).
   (d) Visually examine the rods for damage.
   (e) Extend the rods to make sure the rods operate smoothly.
   (f) Make sure the latches lock into the flanges of the rods.
   (g) Push the latches to release the rods three times to make sure there is not contamination in the latches.
   (h) If there is contamination on the rods or on the latches, clean the rods.

S 212-004-N00

(4) Do the steps that follow to examine the hold-open rods on the fan cowl panels:
   (a) Hold the fan cowls open from the external side.
   (b) Disconnect the hold-open rods from the brackets on the engine.

(c) Connect and disconnect the rods from the stow brackets to make sure they operate correctly.
(d) Make sure the end of the rods that attach to the fan cowls with the bolts move freely.
(e) Visually examine the rods for damage.
(f) Extend the rods to make sure the rods operate smoothly.
(g) Make sure you cannot see the red bands with the word "unlocked" when the rods are fully extended.
(h) Push on the secondary locks and move the lock sleeves three times to make sure there is not contamination in the lock devices.
(i) If there is contamination on the rods or on the latches, clean the rods.

S 012-006-N00
(5) Open the core cowl panels (AMM 71-11-06/201).

S 212-007-N00
(6) Do the steps that follow to examine the hold-open rods on the core cowl panels:
(a) Hold the core cowl panels open from the external side.
(b) Disconnect the hold-open rods on the core cowl panels from the brackets on the engine.
(c) Connect and disconnect the rods from the stow brackets to make sure they operate correctly.
(d) Make sure the end of the rods that attach to the core cowls with the bolts move freely.
(e) Visually examine the rods for damage.
(f) Extend the rods to make sure they operate smoothly.
(g) Make sure the latches go into the flanges when the rods are fully extended.
(h) Push the latches to release the rods three times to make sure there is not contamination in the latches.
(i) If there is contamination on the rods or on the latches, clean the rods.

S 412-008-N00
(7) Close the core cowl panels (AMM 71-11-06/201).

S 442-013-N00
(8) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 412-005-N00
(9) Close the fan cowl panels (AMM 71-11-04/201).

TASK 71-11-10-112-009-N00
3. <u>Cowl Panel Hold-Open Rod - Cleaning/Painting</u> (Fig. 201)
A. Consumable Materials
(1) B00069 Solvent - Triclorethane

B. Access

(1) Location Zones

411	Left Engine
421	Right Engine

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

C. Procedure

S 112-010-N00

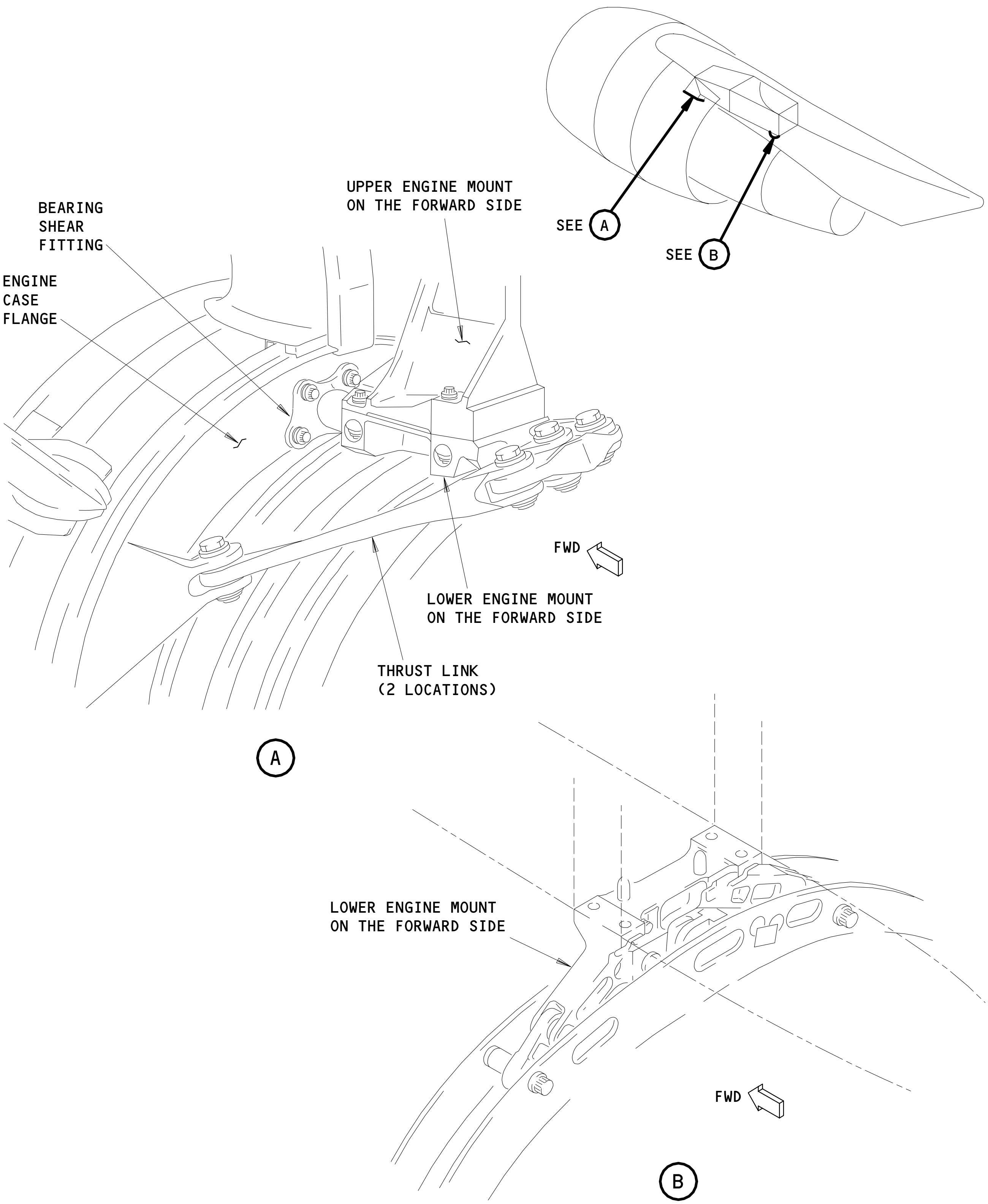
(1) Do the steps that follow to clean the hold-open rods on the fan cowl panels:
   (a) Make sure the rods are extended and locked.
   (b) Apply a large quantity of the solvent below the lock sleeves.
   (c) Operate the rods (extend and retract the rods) to flush the dirt, the oil, or the grease from the rods and the lock devices.
   (d) Dry the rods and the lock devices with a clean cloth.
   (e) Make sure the rods and the lock sleeves operate correctly.
   (f) Do not lubricate the rods or the lock devices.

S 112-011-N00

(2) Do these steps to clean the hold-open rods on the core cowl panels and on the thrust reversers:
   (a) Make sure the rods are extended and locked.
   (b) Apply a large quantity of the solvent to the rods and to the latches.
   (c) Operate the rods and the latches (extend and retract the rods) to flush the dirt, the oil, or the grease from the rods.
   (d) Dry the latches and the rods with a clean cloth.
   (e) Make sure the rods and the latches operate correctly.
   (f) Do not lubricate the rods or the latches.

ENGINE MOUNTS - DESCRIPTION AND OPERATION

1. General
   A. The lower engine mounts on the forward and aft sides support the engine and are attached at six points. The forward mount is attached to the rear flange of the intermediate case at three points. The aft mount is attached to the top of the double flange of the turbine exhaust case and at points approximately 35 degrees either side of the centerline. The mounts are designed to transfer engine thrust and absorb vertical and side loads. The mounts allow axial and radial growth due to thermal expansion.
2. Component Details (Fig. 1)
   A. Lower Engine Mount on the Forward Side
      (1) The lower engine mount on the forward side provides suspension of the engine at three points; a bearing shear fitting and two thrust links. The bearing shear fitting is inserted into a mating hole in the rear flange of the intermediate case and retained by four bolts. The two thrust links are attached to the rear flange of the intermediate case on either side of the bearing shear fitting and to the aft end of the mount assembly. The lower engine mount on the forward side attaches to the strut with four vertical tension bolts.
   B. Lower Engine Mounts on the Aft Side
      (1) The lower engine mount on the aft side provides suspension of the engine at three points on the double flange of the turbine exhaust case. The mount consists of two tangential links and a center link which attach to a common mount fitting. The fitting attaches to the strut with four vertical bolts.

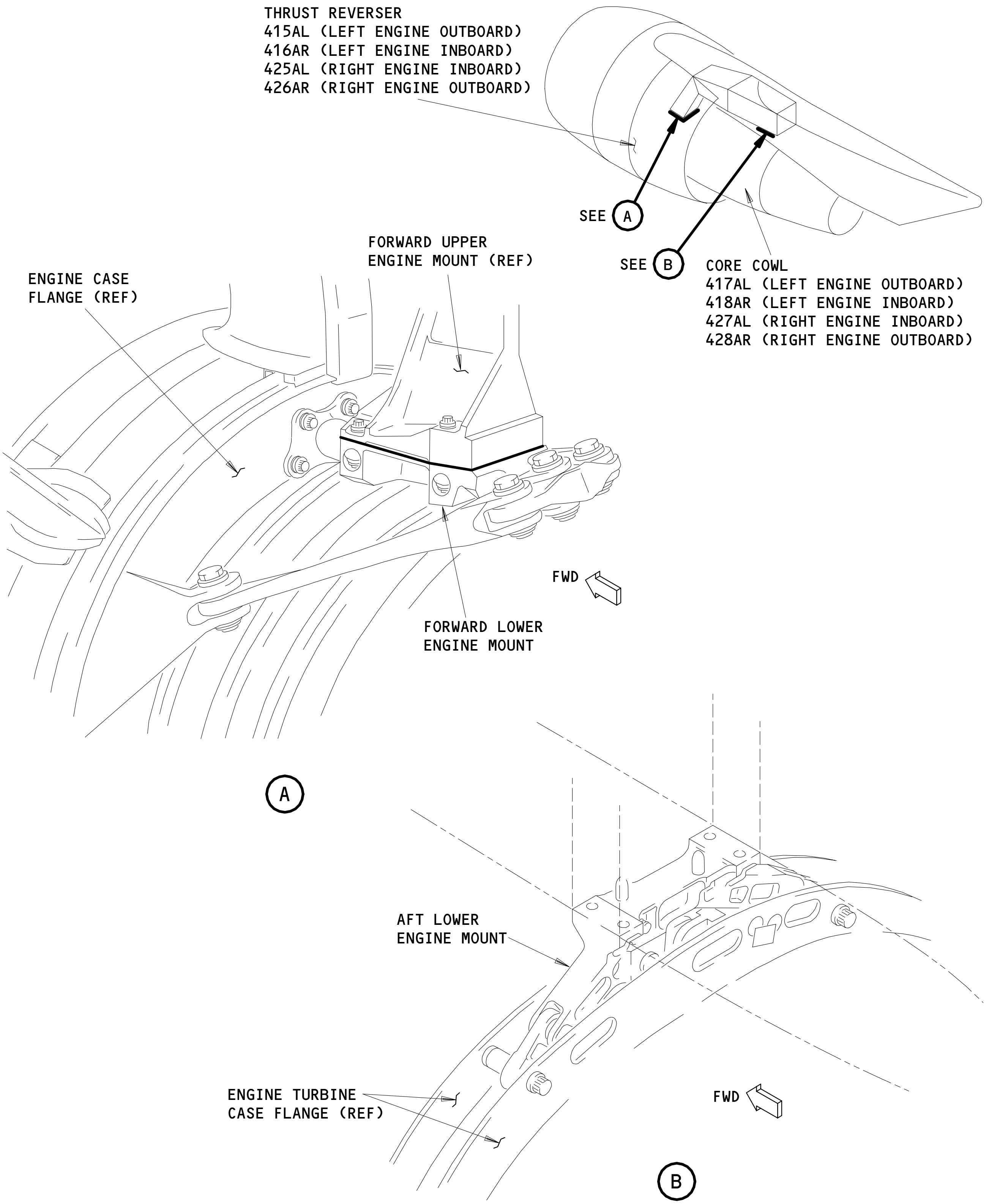


Engine Mounts
Figure 1

ENGINE MOUNTS

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
MOUNT - LEFT ENGINE AFT LOWER ENGINE	--	1	417AL,418AR, CORE COWL	71-21-02
MOUNT - LEFT ENGINE FORWARD LOWER ENGINE	--	1	415AL,416AR, THRUST REVERSER	71-21-01
MOUNT - RIGHT ENGINE AFT LOWER ENGINE	--	1	427AL,428AR, CORE COWL	71-21-02
MOUNT - RIGHT ENGINE FORWARD LOWER ENGINE	--	1	425AL,426AR, THRUST REVERSER	71-21-01

Engine Mounts - Component Index
Figure 101



Engine Mounts - Component Location
Figure 102

ENGINE MOUNTS - INSPECTION/CHECK

1. General
   A. This procedure examines the engine mounts. The first part checks the lower engine mounts for damage. The second part checks the lower engine mount and the shear pins for worn areas. These checks are done with the engine removed.
   B. The final task examines the vibration isolator clearance for the aft engine mount with the engines installed on the airplane.

TASK 71-21-00-206-001-N00

2. Examine the Lower Engine Mounts
   A. References
      (1) AMM 71-00-02/401, Power Plant
      (2) AMM 71-21-01/401, Forward Lower Engine Mount
      (3) AMM 71-21-02/401, Aft Lower Engine Mount
   B. Access
      (1) Location Zones

411	Left Engine
421	Right Engine

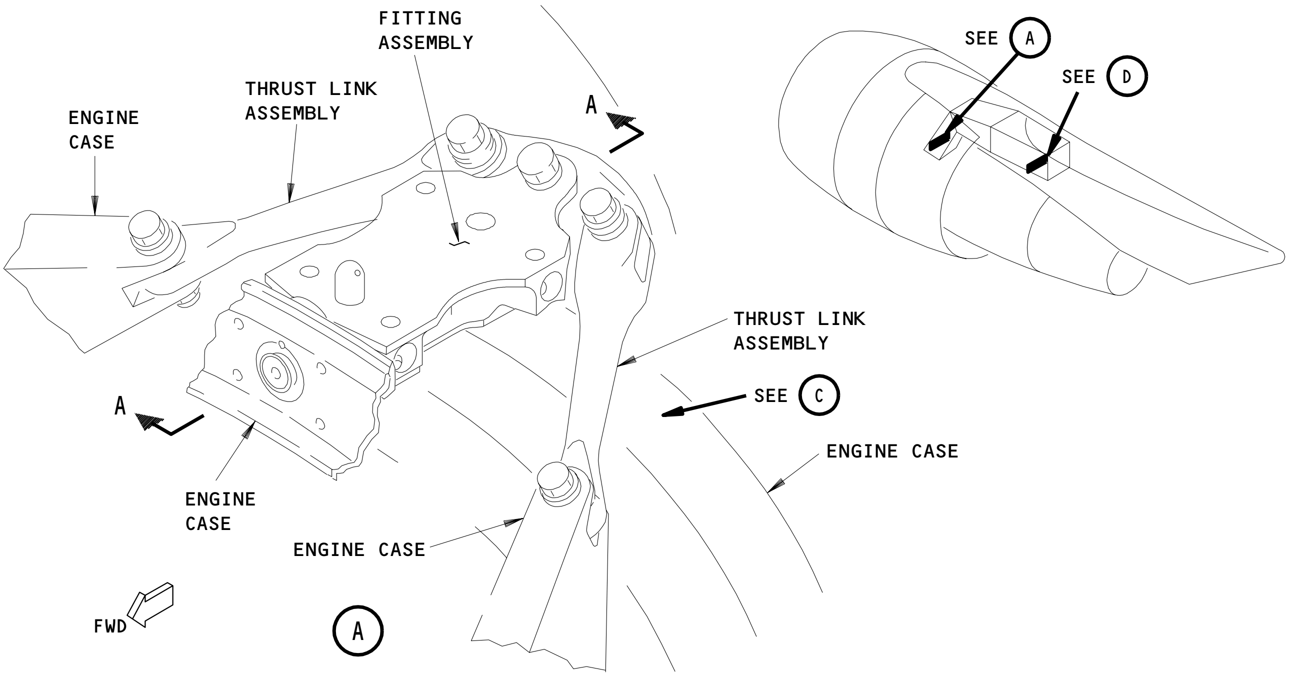
   C. Procedure

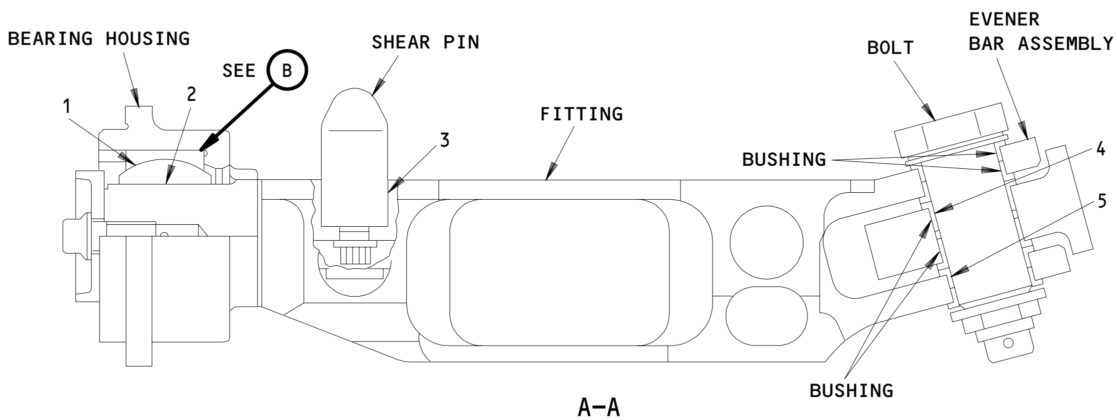
      S 016-002-N00
      (1) Remove the power plant (AMM 71-00-02/401).

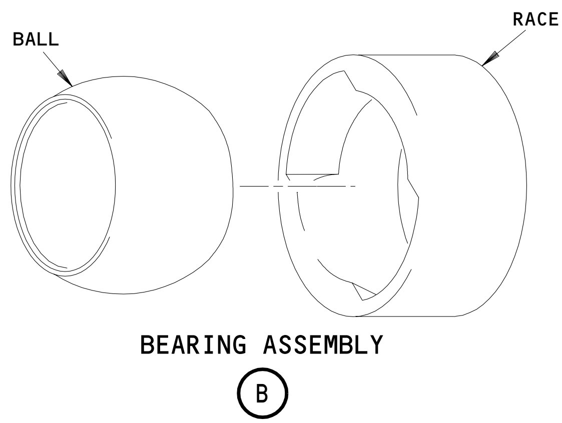
      S 226-012-N00
      (2) Examine the lower engine mounts for these signs of damage:

         NOTE: Rust color on the lower engine mount is a sign of corrosion. Rust color is also a sign that the lower engine mount has a crack.

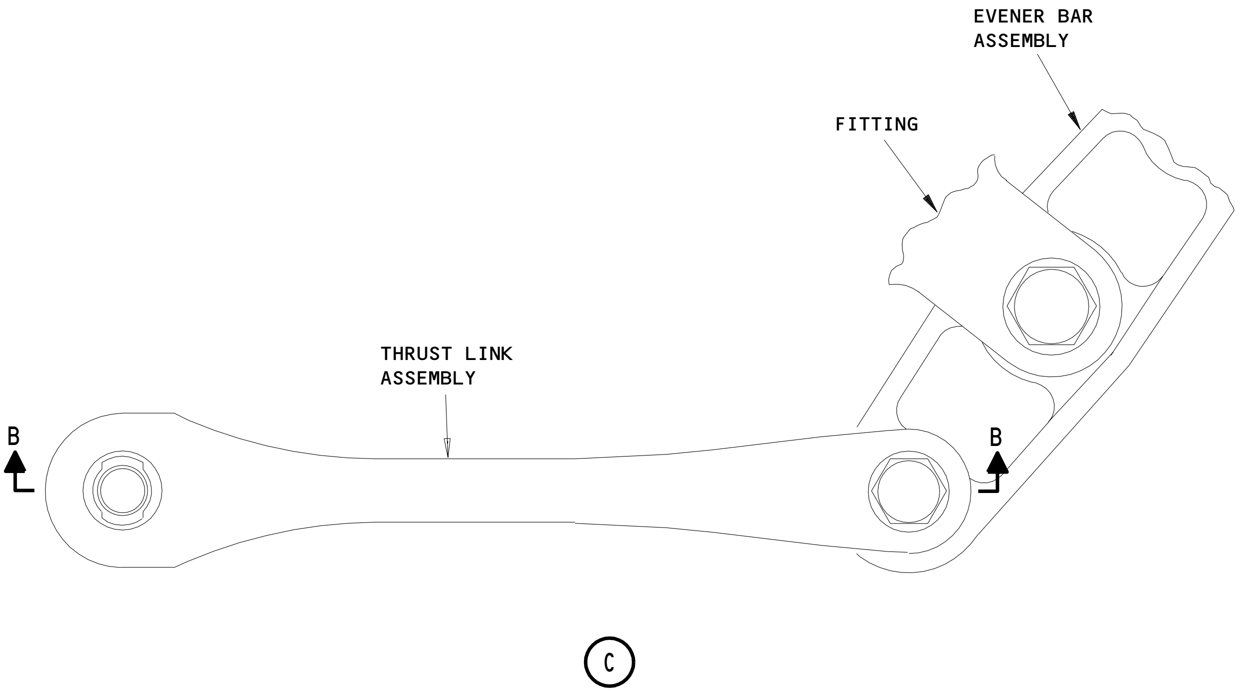
         (a) Corrosion is not permitted.
         (b) Cracks are not permitted.
         (c) Nicks are not permitted.
         (d) Dents are not permitted.

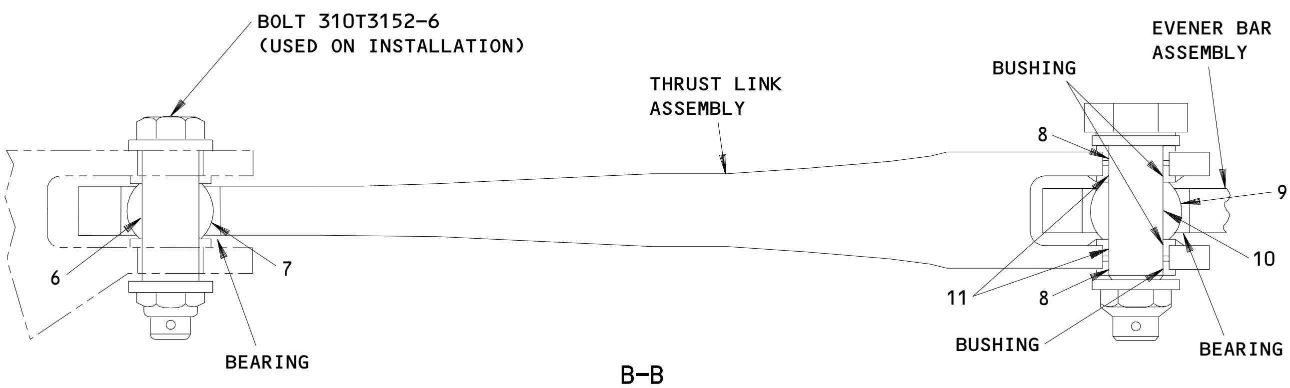






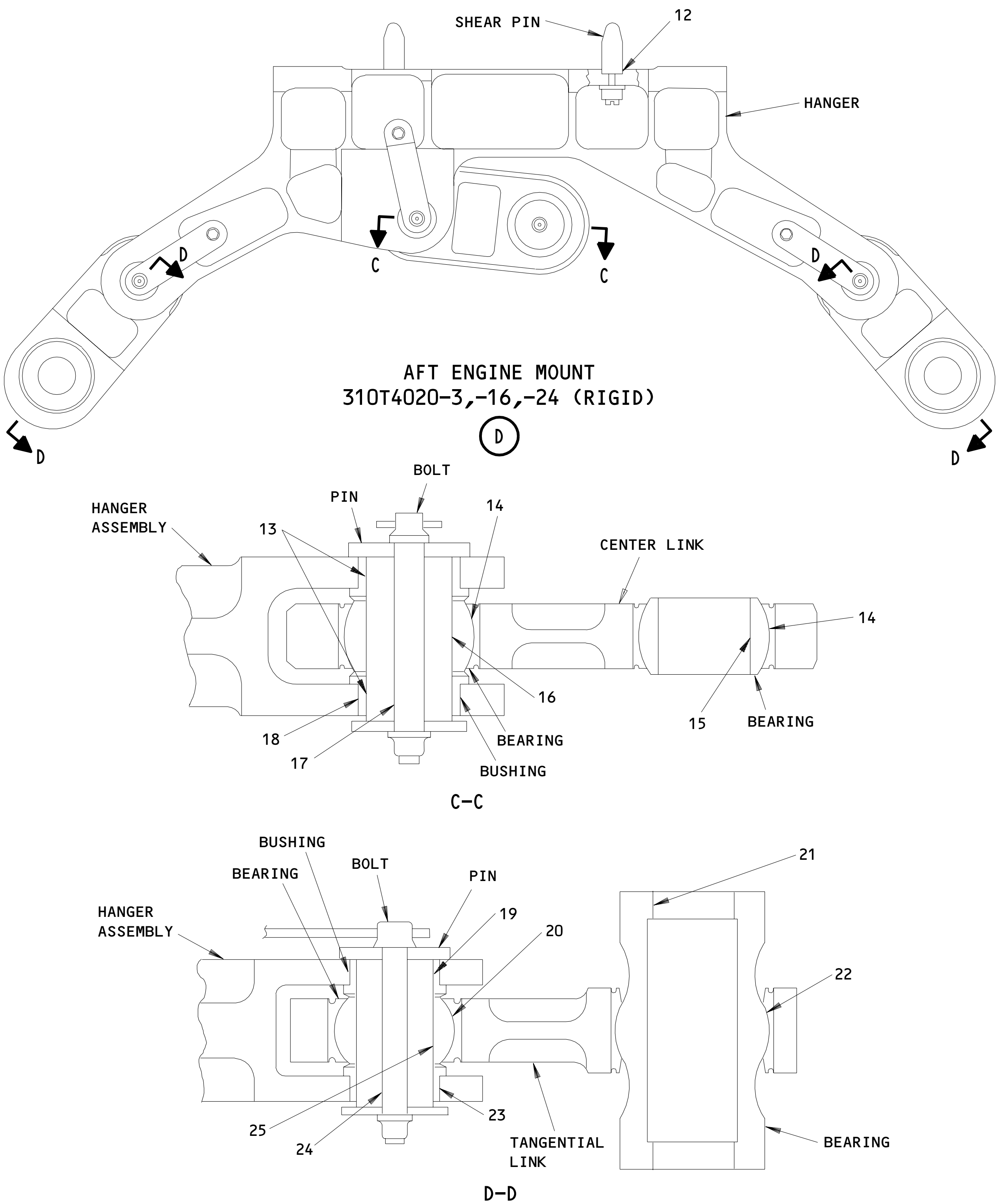
Engine Mount Inspection
Figure 601 (Sheet 1)



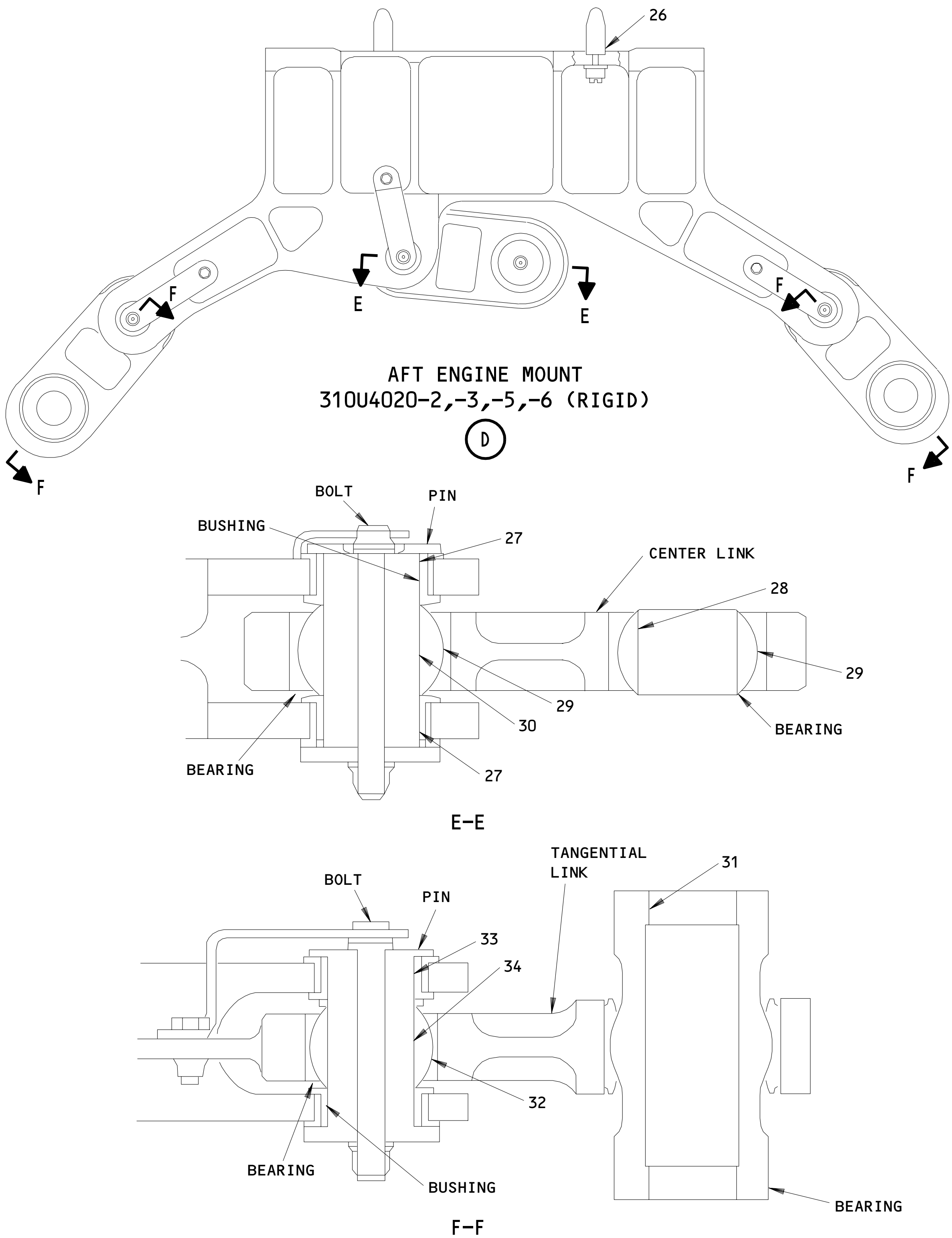


Engine Mount Inspection
Figure 601 (Sheet 2)

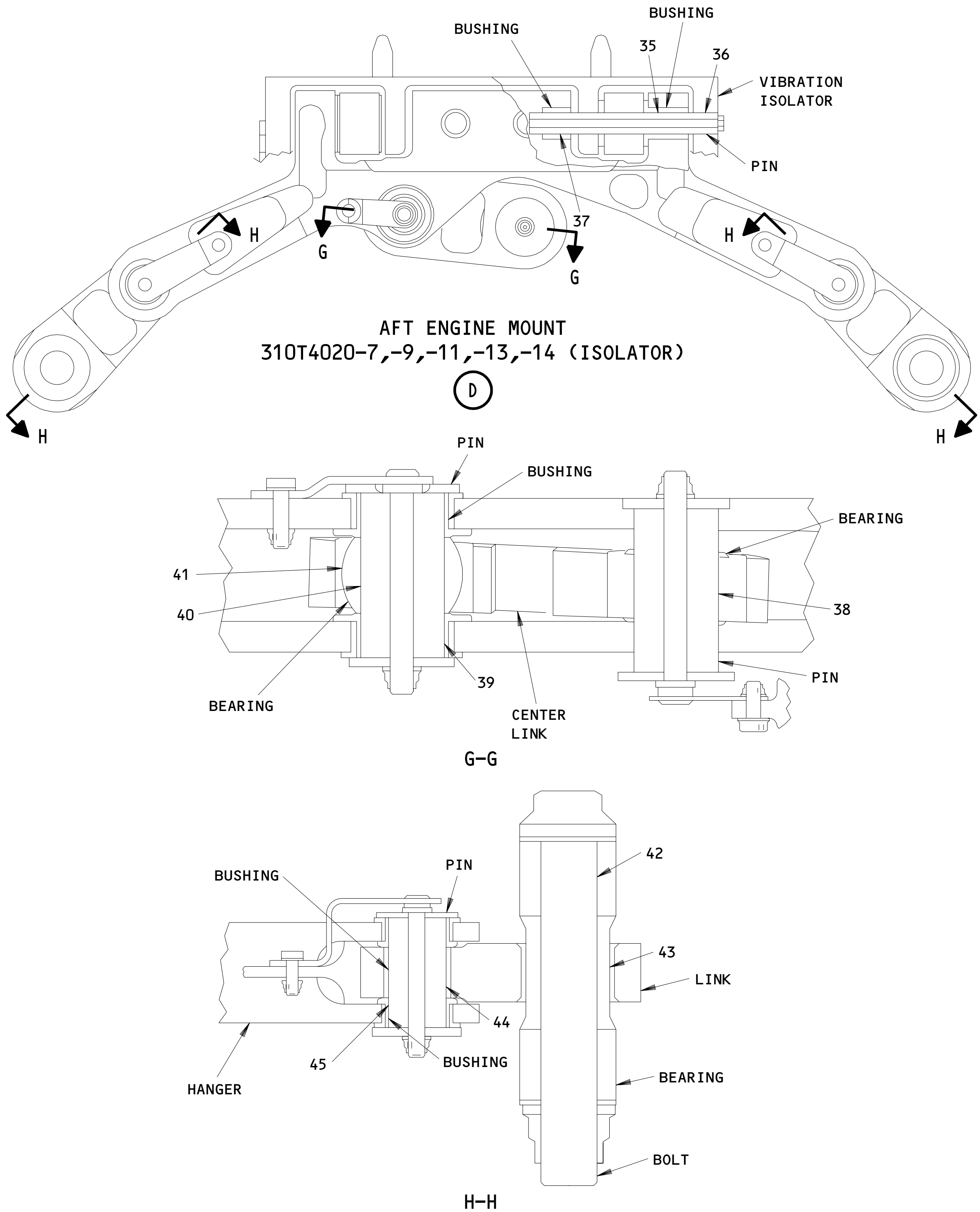
1420985



Engine Mount Inspection
Figure 601 (Sheet 3)



Engine Mount Inspection
Figure 601 (Sheet 4)



Engine Mount Inspection
Figure 601 (Sheet 5)

INDEX NO.	PART NAME	DIM.	WEAR LIMITS: PERMITTED WEAR DIA. MAX (MIN)	WEAR LIMITS: MAX DIA. CLEARANCE
1	BEARING RACE	ID	2.8795	[2]
	BEARING BALL	OD	(2.8715)	
2	BEARING BALL	ID	2.0017	0.005
	FITTING	OD	(1.9950)	
3	FITTING	ID	1.2515	0.0035
	SHEAR PIN	OD	(1.2470)	
4	BUSHING	ID	1.3778	0.0053
	BOLT	OD	(1.3702)	
5	BUSHING	ID	1.3778	0.0053
	BOLT	OD	(1.3702)	
6	BEARING BALL	ID	1.0020	[2] [3]
	[1]	OD	(0.9960)	
7	BEARING RACE	ID	1.5040	0.0045 [2]
	BEARING BALL	OD	(1.4970)	
8	BUSHING	ID	1.0023	0.0043
	BOLT	OD	(0.9960)	
9	BEARING RACE	ID	1.5040	0.0045 [2]
	BEARING BALL	OD	(1.4970)	
10	BEARING BALL	ID	1.0020	[2] [3]
	BOLT	OD	(0.9960)	
11	BUSHING	ID	1.0023	0.0043
	BOLT	OD	(0.9960)	
12	HANGER	ID	0.7527	0.0072
	SHEAR PIN	OD	(0.7438)	
13	BUSHING	ID	1.3778	0.0048
	PIN	OD	(1.3707)	
14	BEARING RACE	ID	2.0043	0.0048 [2]
	BEARING BALL	OD	(1.9967)	
15	BEARING	ID	1.3773	[2] [4]
	PIN	OD	(1.3707)	

NOTE: ALL DIMENSIONS ARE IN INCHES

Engine Mount Inspection
Figure 601 (Sheet 6)

1421282

INDEX NO.	PART NAME	DIM.	WEAR LIMITS: PERMITTED WEAR DIA. MAX (MIN)	WEAR LIMITS: MAX DIA. CLEARANCE
16	BEARING BALL	ID	1.3773	[2] [4]
	PIN	OD	(1.3707)	
17	PIN	ID	0.4000	--
	BOLT	OD	(0.3740)	
18	HANGER	ID	1.5643	0.0000
	BUSHING	OD	(1.5633)	
19	BUSHING	ID	1.2527	0.0047
	PIN	OD	(1.2458)	
20	BEARING RACE	ID	1.7852	0.0047 [2]
	BEARING BALL	OD	(1.7778)	
21	BEARING BALL	ID	1.2522	[2] [4]
	BOLT	OD	(1.2458)	
22	BEARING RACE	ID	--	[7]
	BEARING BALL	OD	--	
23	HANGER	ID	1.4392	0.0000
	BUSHING	OD	(1.4383)	
24	PIN	ID	0.4000	--
	BOLT	OD	(0.3740)	
25	BEARING BALL	ID	1.2522	[2] [4]
	PIN	OD	(1.2458)	
26	HANGER	ID	0.7522	0.0067
	SHEAR PIN	OD	(0.7443)	
27	BUSHING	ID	1.3790	0.0060
	PIN	OD	(1.3695)	
28	BEARING BALL	ID	1.3773	[2] [4]
	PIN	OD	(1.3707)	
29	BEARING RACE	ID	2.0043	0.0048 [2]
	BEARING BALL	OD	(1.9967)	
30	BEARING BALL	ID	1.3773	[2] [4]
	PIN	OD	(1.3707)	

NOTE: ALL DIMENSIONS ARE IN INCHES

Engine Mount Inspection
Figure 601 (Sheet 7)

INDEX NO.	PART NAME	DIM.	WEAR LIMITS: PERMITTED WEAR DIA. MAX (MIN)	WEAR LIMITS: MAX DIA. CLEARANCE
31	BEARING BALL	ID	1.2522	2 5
	BOLT	OD	(1.2458)	
32	BEARING RACE	ID	1.7852	
	BEARING BALL	OD	(--)	0.0047 2
33	BUSHING	ID	1.2540	
	PIN	OD	(1.2440)	0.0060
34	BEARING BALL	ID	1.2522	2 5
	PIN	OD	(1.2458)	
35	BUSHING	ID	1.4600	
	PIN	OD	(1.4440)	0.0110
36	ISOLATOR	ID	1.6490	
	PIN	OD	(1.4200)	0.2000
37	BUSHING	ID	1.4600	
	PIN	OD	(1.4440)	0.0110
38	BEARING	ID	1.3773	
	PIN	OD	(1.3707)	0.0043 2
39	BUSHING	ID	1.3790	
	PIN	OD	(1.3695)	0.0060
40	BEARING	ID	1.3773	
	PIN	OD	(1.3707)	0.0043 2
41	BEARING	ID	2.0043	
	BEARING	OD	(1.9967)	0.0048 2
42	BEARING	ID	1.2522	
	BOLT	OD	(1.2458)	0.0042 2
43	BEARING RACE	ID	--	6
	BEARING BALL	OD	(--)	
44	BUSHING	ID	1.2513	
	PIN	OD	(1.2473)	0.0033
45	BUSHING	ID	1.2513	
	PIN	OD	(1.2473)	0.0033

NOTE: ALL DIMENSIONS ARE IN INCHES

1 BOLT 310T3152-6 (USED ON INSTALLATION)

2 PIN OR BOLT-TO-BALL AND BALL-TO-RACE COMBINED MAXIMUM CLEARANCE 0.006 RADIAL AND 0.008 AXIAL

3 PIN OR BOLT-TO-BALL MAXIMUM CLEARANCE 0.0040 RADIAL

4 PIN-TO-BALL MAXIMUM CLEARANCE 0.0043 RADIAL

5 PIN-TO-BALL MAXIMUM CLEARANCE 0.0042 RADIAL

6 BALL-TO-RACE MAXIMUM CLEARANCE 0.0050 RADIAL AND 0.025 AXIAL

7 BALL-TO-RACE MAXIMUM CLEARANCE 0.0050 RADIAL AND 0.0350 AXIAL

Engine Mount Inspection
Figure 601 (Sheet 8)

(e) Scratches are not permitted.
(f) Pitting is not permitted.
(g) Fretting is not permitted.

NOTE: Fretting is when two adjacent metal pieces rub against one another.

(h) Pickup is not permitted.

NOTE: Pickup is when material is moved from one surface to another surface.

(i) High metal is not permitted.

NOTE: High metal is when metal causes damage as it is pushed above the adjacent surface.

(j) Bushing movement is not permitted (Bushing migration).
(k) Damage to the tangential link assembly is not permitted.
(l) Damage to the bearing in the tangential link assembly is not permitted.
1) Seized bearing is not permitted.
2) Cracks in bearing is not permitted.
3) Bearing migration is not permitted.
4) All other types of damage to bearing is not permitted.
(m) ENGINES WITH VIBRATION-ISOLATED MOUNTS;
Elastomer-to-metal bond separation is not permitted.
(n) ENGINES WITH VIBRATION-ISOLATED MOUNTS;
Elastomer which has expanded, bulged, discolored, or is mechanically damaged is not allowed.

S 216-013-N00
(3) If damage is found on the lower engine mount, please contact Boeing.

S 226-004-N00
(4) Examine the lower engine mount and the shear pins for worn areas.
(a) Do the procedure to get access to the inspection area (AMM 71-21-01/401, 71-21-02/401).
(b) Make sure the barrel nuts which are installed front of the lower engine mount are free from damage.
(c) Make sure the tandem barrel nuts in the aft side of the higher engine mounts are free from damage.
(d) Replace all the damaged barrel nuts.
(e) Make sure the part of the front mount brackets which you can see is solid and is in good condition.
(f) Look for damage at the areas where the front mounting brackets attach.
(g) Examine the shear pins on the lower engine mount for the worn areas.

S 216-016-N00

(5) If worn areas are found on the lower engine mount, replace the engine mount for component repair.
   (a) Remove engine mount (AMM 71-21-01/401 or 71-21-02/401).
   (b) Install engine mount (AMM 71-21-01/401 or AMM 71-21-02-/401)

S 416-005-N00

(6) Install the power plant (AMM 71-00-02/401).

TASK 71-21-00-206-006-N00

3. Vibration Isolator Clearance for the Aft Engine Mount (Fig. 602)

A. General
   (1) This task does a check of the vibration isolator clearance for the aft engine mount. This task is done with the engine installed on the airplane.

B. References
   (1) AMM 71-21-02/401, Aft Lower Engine Mount
   (2) AMM 78-31-00/201, Thrust Reverser System

C. Access
   (1) Location Zones
      410 Left Engine Nacelle
      420 Right Engine Nacelle

   (2) Access Panels
      436CL Aft Core Cowl Skirt Fairing (Left Engine)
      446CR Aft Core Cowl Skirt Fairing (Right Engine)

D. Prepare for the Vibration Isolator Clearance check.

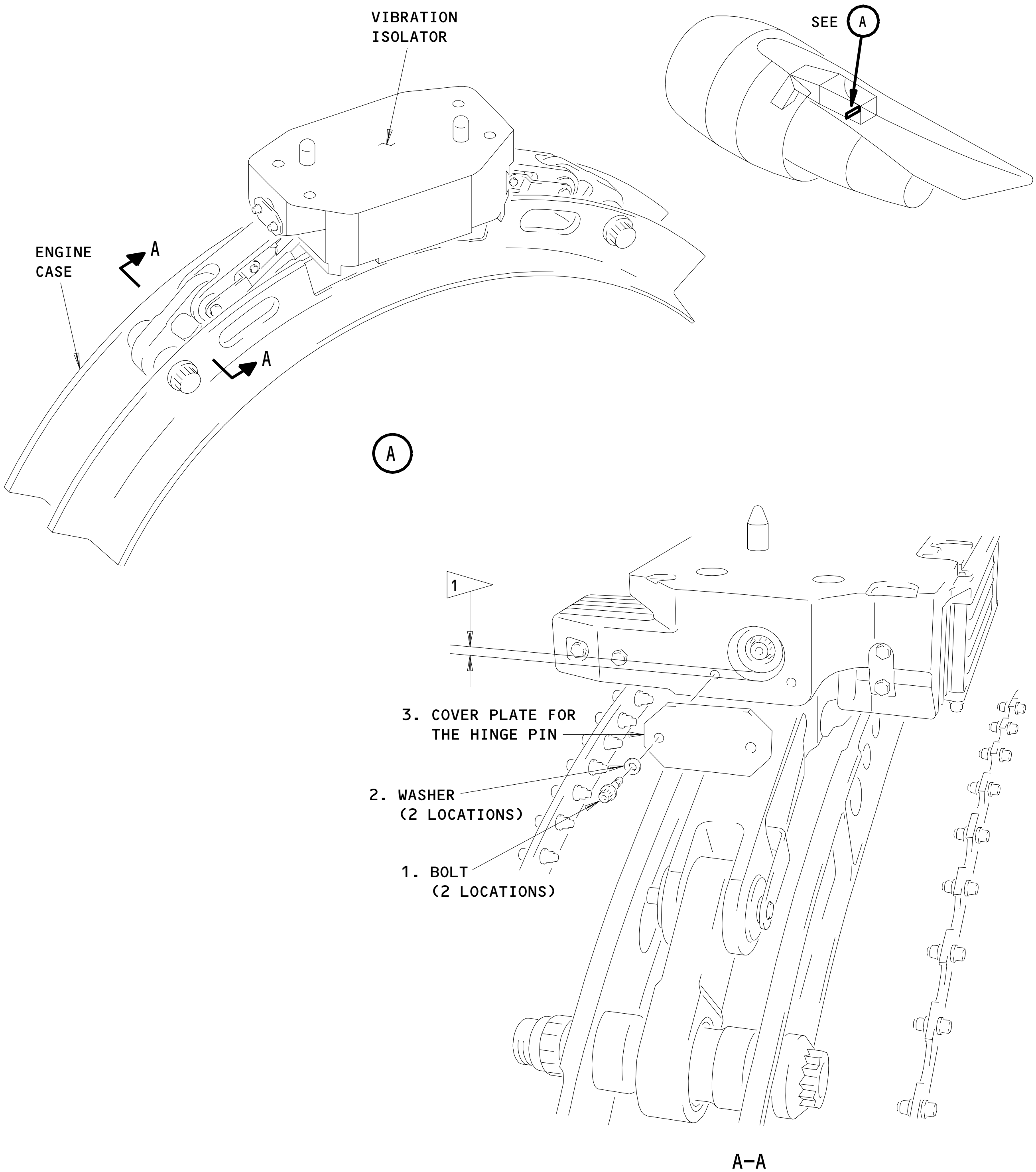
S 046-007-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION TO PREVENT THE OPERATION OF THE THRUST REVERSERS. THE ACCIDENTAL OPERATION OF THE THRUST REVERSERS CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 016-008-N00

(2) Remove the aft skirt fairing above the outboard core cowl panel.



1 THE CLEARANCE BETWEEN THE HINGE PIN AND THE DOWNSTOP MUST BE AT LEAST 0.015 INCH (0.38 mm)

Aft Engine Mount Inspection
Figure 602

S 036-009-N00

(3) Remove the two bolts (1), washers (2), and cover plate (3) for the hinge pin.

S 226-010-N00

(4) Measure the clearance between the hinge pin and the top plate downstop on the outboard side of the aft mount.

(a) If the clearance is less than 0.038 inch (0.97 mm), but more than 0.015 inch (0.38 mm), then visually inspect the hinge pin and downstop for damage immediately and replace the aft mount during the next possible scheduled maintenance operation.

NOTE: The gap is near the limit for removal of the aft mount. Replace the aft mount during the next possible scheduled maintenance operation.

1) Use the bootstrap to remove the load from the mount (AMM 71-00-02/401).

2) If the damage is minor, return the airplane to service.

NOTE: Signs of minor damage are surface polishing, a small quantity of missing material, and small pits caused by galling.

a) Inspect the components for damage again after 500 hours or 300 cycles, whichever comes first.

3) If the damage is major, replace the engine mount (AMM 71-21-02/401).

NOTE: Signs of major damage are missing chrome on the hinge pin, significant smearing of surface material, edge roll-over on the down stop, and surface cracks.

(b) If the clearance is less than 0.015 inch (0.38mm), replace the aft engine mount (AMM 71-21-02/401).
(c) Install the cover plate for the hinge pin.
(d) Install the aft skirt fairing on the outboard side of the engine.
(e) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

FORWARD LOWER ENGINE MOUNT - REMOVAL/INSTALLATION

1. General
   A. This procedure gives the instruction for the removal and installation of the forward lower engine mount.
   B. The engine mount is attached to the engine case flange by a bearing housing and two thrust links.
   C. You can get an access to the engine mount after you remove the engine.

TASK 71-21-01-004-001-N00

2. Remove the Forward Lower Engine Mount (Fig. 401)
   A. References
      (1) AMM 71-00-02/401, Power Plant
   B. Access
      (1) Location Zones
         411 Left Engine
         421 Right Engine

   C. Procedure

      S 014-002-N00
      (1) Remove the power plant (AMM 71-00-02/401).

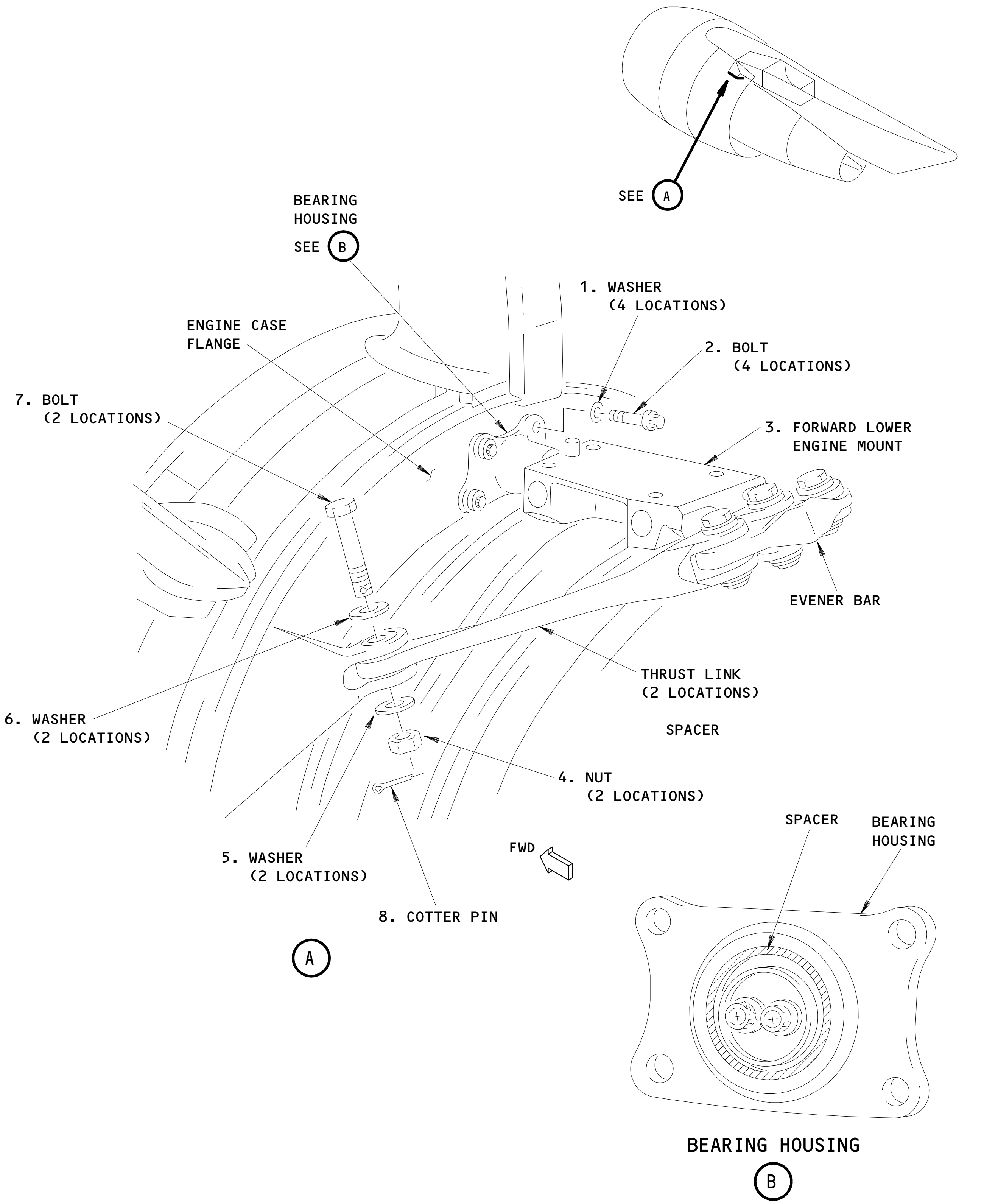
      S 034-003-N00
      (2) Remove the bolts (7), washers (5 and 6), and nuts (4) from the thrust links and the engine case flange.

      S 034-004-N00
      (3) Remove the bolts (2) and washers (1) from the bearing housing and the engine case flange.

      S 024-005-N00
      (4) Remove the engine mount (3) from the engine.

TASK 71-21-01-404-006-N00

3. Install the Forward Lower Engine Mount (Fig. 401)
   A. Consumable Materials
      (1) A00779 Sealant - BMS 5-26, Type 2, Class 1/2



Forward Lower Engine Mount Installation
Figure 401

235067

B. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	3	Mount Assy (Forward Lower Engine Mount)	71-21-01	02	220
	8	Pin (Cotter Pin)			195

C. References
   (1) AMM 70-41-03/201, Cotter Pins
   (2) AMM 70-50-00/201, Standard Torque Values
   (3) AMM 71-00-02/401, Power Plant

D. Access
   (1) Location Zones
      411 Left Engine
      421 Right Engine

E. Procedure

S 214-011-N00

CAUTION: MAKE SURE THE SPACER IS IN THE CORRECT POSITION IN THE BEARING HOUSING BEFORE YOU INSTALL THE ENGINE MOUNT ASSEMBLY ON THE ENGINE. IF THE SPACER IS NOT THERE, DAMAGE TO THE ENGINE MOUNT CAN OCCUR.

(1) Make sure the spacer is in the correct position in the bearing housing before you install the engine mount on the engine.

S 824-007-N00

(2) Align the engine mount (3) on the engine.

S 424-008-N00

(3) Attach the bearing housing to the engine case flange with the bolts (2) and washers (1).
   (a) With the torque wrench (AMM 70-50-00/201), tighten the bolts (2) to 1710-2090 pound-inches (192.3-235.1 newton-meters).
   (b) Install the lockwire on the bolts (2).

S 414-010-N00

(4) Install the thrust links to the engine case flange with the bolts (7), washers (5 and 6), and nuts (4).

(a) Make sure the run-on torque of the nut (4) is 50-400 pound-inches (5.6-45.0 newton-meters).

1) If the run-on torque of the nuts (4) is not 50-400 pound-inches (5.6-45.0 newton-meters), replace the nuts.

(b) While you hold the bolts (2), tighten the nuts (4) to 650-750 pound-inches (73.1-84.4 newton-meters).

(c) Install the cotter pin (AMM 70-41-03/201).

(d) Apply the sealant to the two ends of the cotter pin to prevent the movement.

S 414-009-N00

(5) Install the power plant (AMM 71-00-02/401).

AFT LOWER ENGINE MOUNT - REMOVAL/INSTALLATION

1. General
   A. This procedure gives the instruction for the removal and installation of the aft lower engine mount.
   B. The aft lower engine mount is attached to the two flanges on the aft turbine case of the engine. You can get an access to the engine mount after you remove the engine.
   C. There are two different aft engine mounts. One engine mount is a rigid engine mount and the other engine mount is a vibration-isolated engine mount. The two aft engine mounts are not always interchangeable.
      (1) You can install a rigid engine mount on an airplane with the configuration for a vibration-isolated engine mount.
      (2) You cannot always install a vibration-isolated engine mount on an airplane with the configuration for a rigid engine mount. You must first check the airplane configuration and follow the steps in this procedure. The vibration-isolated engine mount is larger than the rigid engine mount and there may not be sufficient clearance. You can also have a clearance problem with the core cowl because an engine moves more with a vibration-isolated engine mount.

TASK 71-21-02-004-001-N00

2. Remove the Aft Lower Engine Mount (Fig. 401)
   A. Equipment
      (1) SWE4803A Torque Adapter - Aft Engine Mount
   B. References
      (1) AMM 71-00-02/401, Power Plant
      (2) AMM 78-11-01/401, Turbine Exhaust Sleeve
   C. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine

   D. Procedure

      S 014-002-N00
      (1) Remove the power plant (AMM 71-00-02/401).

      S 034-014-N00
      (2) Remove the turbine exhaust sleeve (AMM 78-11-01/401).

      S 034-003-N00
      (3) Remove the bolt (1), washer (2) and bolt retainer (12) from the engine mount (5).

      S 034-004-N00
      (4) Remove the bolt (11), washer (9), nut (8), and link pivot pin (10) from the engine mount (5) and the clevis boss.

S 034-006-N00

(5) Remove the bolts (6), washers (4), washers (7), and nuts (3) from the engine mount (5) and the turbine flange.

NOTE: Use a torque adapter (if necessary) to remove the bolts (6).

S 024-005-N00

(6) Remove the engine mount (5) from the engine case.

TASK 71-21-02-404-007-N00

3. Install the Aft Lower Engine Mount (Fig. 401)

A. Consumable Materials

(1) D00010 Compound - Antiseize, Bostick Never-Seez

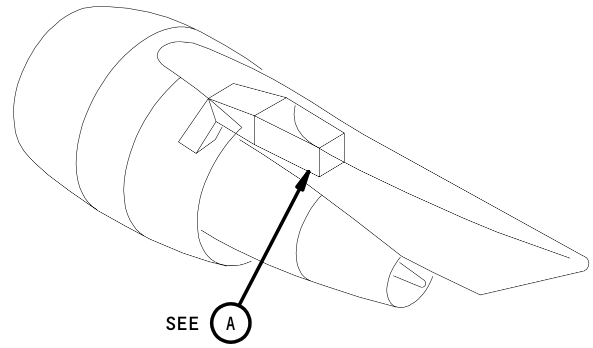
B. Equipment

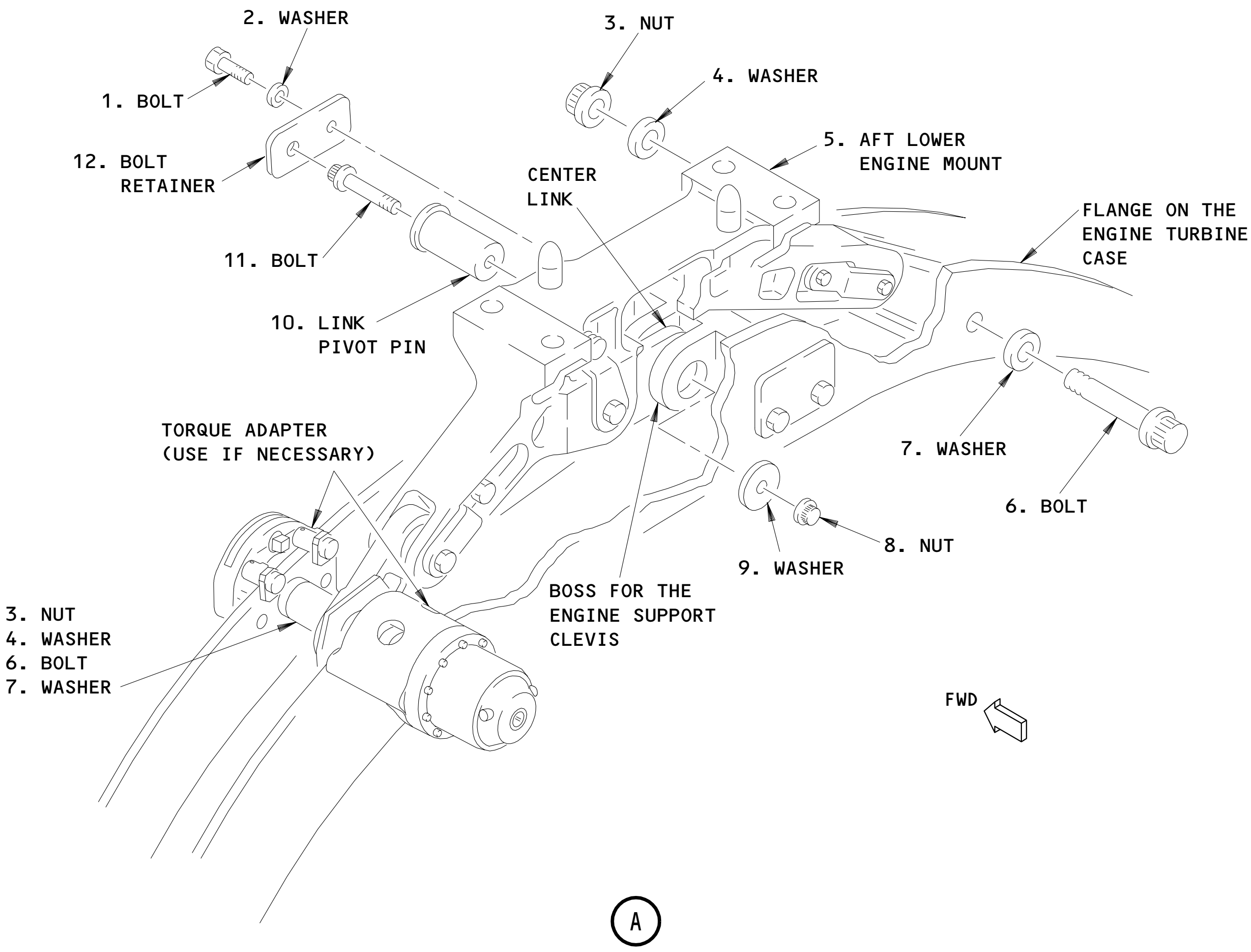
(1) A71034-1 Wrench - Aft Engine Mount

C. Parts

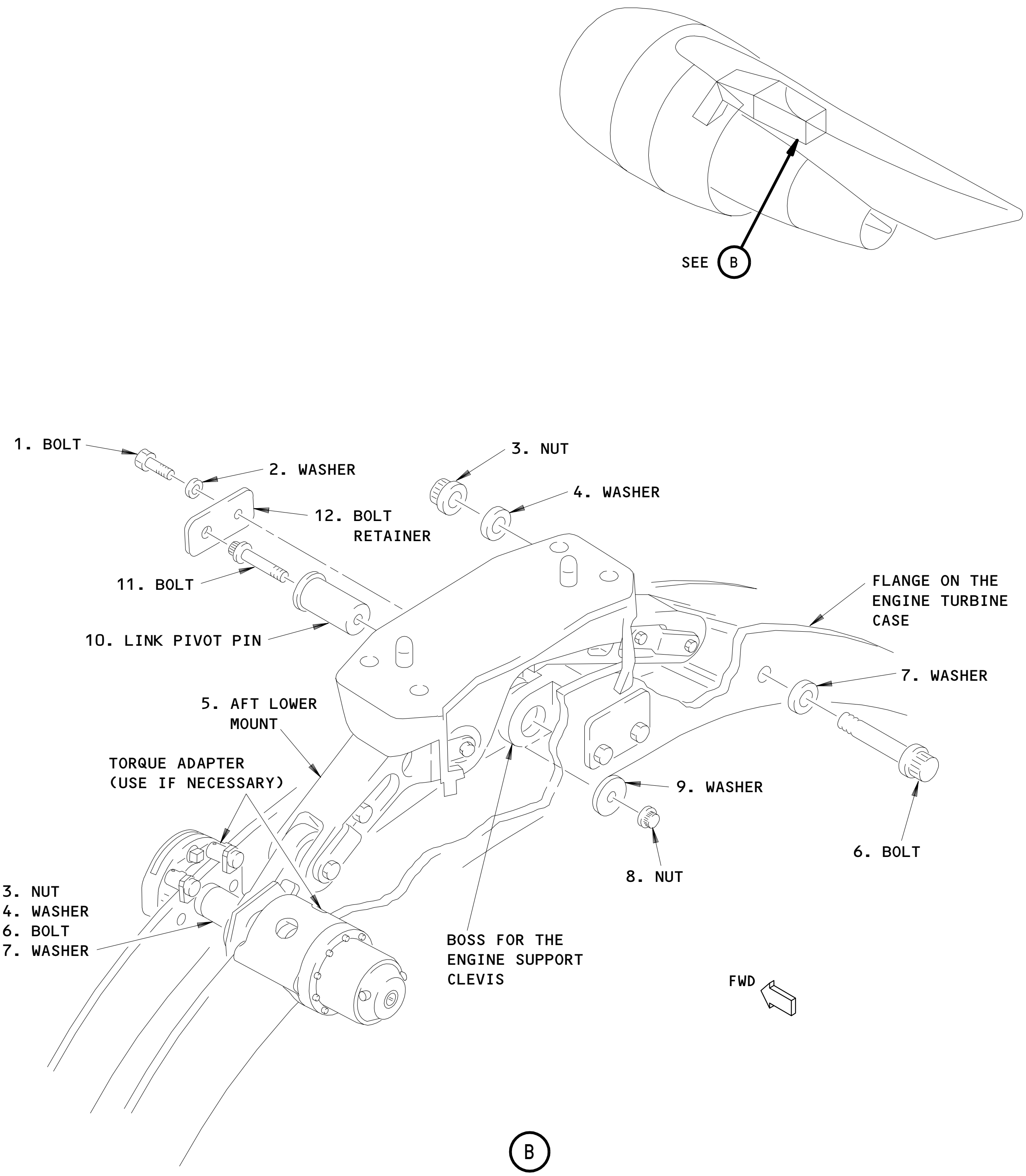
(1) ENGINES WITH AN AFT ENGINE MOUNT THAT IS A RIGID MOUNT; Use this table:

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Bolt	71-21-01	02	25
	2	Washer			30
	3	Nut			20
	4	Washer			15
	5	Mount Assy - Aft			60
	6	Bolt			5
	7	Washer			10
	8	Nut			50
	9	Washer			40
	10	Pin-Link Pivot			45
	11	Bolt			35
	12	Retainer-Bolt			55





Aft Lower Engine Mount Installation
Figure 401 (Sheet 1)



Aft Lower Engine Mount Installation
Figure 401 (Sheet 2)

(2) ENGINES WITH AN AFT ENGINE MOUNT THAT IS A VIBRATION-ISOLATED MOUNT;
Use this table:

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Bolt	71-21-01	02	25
	2	Washer			122
	3	Nut			20
	4	Washer			15
	5	Mount Assy - Aft			60
	6	Bolt			5
	7	Washer			10
	8	Nut			155
	9	Washer			150
	10	Pin-Link Pivot			145
	11	Bolt			135
	12	Retainer-Bolt			142

D. References
   (1) AMM 70-50-00/201, Standard Torque Values
   (2) AMM 71-00-02/401, Power Plant
   (3) AMM 78-11-01/401, Turbine Exhaust Sleeve

E. Access
   (1) Location Zones
       411 Left Engine
       421 Right Engine

F. Procedure

S 644-008-N00

(1) Lubricate the shank and the threads of the bolt (6) with the antiseize compound.

S 424-011-N00

CAUTION: DO NOT INSTALL AN ENGINE WITH A VIBRATION-ISOLATED MOUNT UNLESS YOU VERIFY THE AIRPLANE MOUNT CONFIGURATION. YOU CANNOT ALWAYS INSTALL A VIBRATION-ISOLATED ENGINE MOUNT ON AN AIRPLANE THAT HAS A CONFIGURATION FOR A RIGID ENGINE MOUNT. YOU CAN INSTALL AN ENGINE WITH A RIGID ENGINE MOUNT ON AN AIRPLANE THAT HAS THE CONFIGURATION FOR A VIBRATION-ISOLATED MOUNT. IF YOU INSTALL THE INCORRECT ENGINE MOUNT, THE ENGINE MOUNT CAN CAUSE DAMAGE TO THE ENGINE, THE CORE COWL, OR THE STRUT.

(2) SAS 050, 051, 150-154;
MTH 275, 276;
Make sure you have the correct engine mount for the engine.

NOTE: You can install an engine with a vibration-isolated mount on an airplane with the configuration for a rigid mount if: The airplane is not in the group above or the airplane is in the group above and was reworked to SB 71-48. You can install an engine with a rigid mount on an airplane with a configuration for a vibration-isolated mount.

S 424-016-N00

(3) Install the engine mount (5):
  (a) Put the links of the engine mount (5) between the aft turbine flanges.
  (b) Install the bolts (6) and washers (7) on the aft side of the engine flange and the mount links.
  (c) Install the washers (4) and nuts (3) on the bolts (6).
  (d) While you hold the nut (3) with the wrench A71034, tighten the bolt (6) to 7500-9700 pound-inches (847.4-1075.9 newton-meters).

  NOTE: It is recommended that you torque the bolt (6) to 9700 pound-inches (1075.9 newton-meters).

  (e) Align the link and install the link pivot pin (10) through the link and the clevis boss for the engine support.
  (f) Install the bolt (11), nut (8) and washer (9) with the bolt head on the forward side of the engine mount.
  (g) Tighten the nut (8) to 220-410 pound-inches (24.9-46.3 newton-meters).
  (h) Install the bolt retainer (12) with the bolt (1) and the washer (2).

S 434-013-N00

(4) Install the turbine exhaust sleeve (AMM 78-11-01/401).

S 414-010-N00

(5) Install the power plant (AMM 71-00-02/401).

ENGINE MOUNT BOLTS - INSPECTION/CHECK

1. General
   A. This procedure gives the instruction to do a dye penetrant inspection of the engine mount bolts. You can also use the other industry standard procedure of the penetrant inspection.

TASK 71-21-03-206-001-N00

2. Do a Dye Penetrant Inspection of the Engine Mount Bolts
   A. Consumable Materials
      (1) B00113 Solvent - Stoddard, ASTM D484-52
      (2) G00713 Cloth - Lint-free, dry
      (3) Dye penetrant materials (use from one of two groups of materials):
         (a) The materials from Magaflux Corp,
            1) G02490 Cleaner - Emulsifier, SKC-S
            2) G02491 Oil - Penetrant, SKL-SP
            3) G02489 Developer, SKD-S2
         (b) The materials from Turco Products, Inc.,Westminster, CA
            1) G02492 Penetrant, WWIA
            2) G02493 Developer, NAD
   B. Access
      (1) Location Zones
         411 Left Engine
         421 Right Engine

   C. Procedure

      S 116-002-N00
      (1) Clean the bolts of the dirt, oil and grease with the solvent.
         (a) Blow the air to dry the bolts.

      S 116-003-N00
      (2) If you will use the SKL-SP penetrant, apply the SKC-S emulsifier to the bolts.
         (a) Clean the bolts with water.

S 236-004-N00

(3) Do the dye penetrant inspection as follows:
   (a) Apply the dye penetrant on the bolts.
   (b) Let the penetrant stay for 5 to 6 minutes.
   (c) If you use the SKL-SP penetrant, apply the SKC-S emulsifier to the bolts again.
   (d) Apply the clean water for 30-45 seconds to clean the bolts.
   (e) Blow the air to dry the bolts for 2 to 3 minutes.
   (f) Apply the developer to the bolts.

   NOTE: Use the developer SKD-S2 with the penetrant SKL-SP. Use the developer NAD with the penetrant WWIA.

      1) Let the air flow continuously to dry the developer slowly.
   (g) Do a check of the bolts for cracks.
   (h) If you can not find signs of the cracks, clean the bolts as follows:
      1) Let the clean water to flow on the bolts for 2 to 3 minutes.

      NOTE: This will make sure the dye and developer are removed from the bolts.

      2) Dry the bolts with one of two steps:
         a) Blow air
         b) Wipe the bolt with a clean cloth until it is dry.

ENGINE WIRE HARNESS - ADJUSTMENT/TEST

1. General
   A. This procedure gives the steps to do two tests. These tests are for the electrical harnesses on the power plant which do not have cables with the external braid. One test is the circuit continuity test. The other test is the wire insulation test. This follows with steps to connect the connectors.
   B. If the engine wire harness is damaged, repair the harness (AMM 71-51-00/801).

TASK 71-51-00-845-001-N00

2. Engine Wire Harness - Adjustment/Test
   A. Equipment
      (1) Ohmmeter - Simpson 260 (or equivalent); Simpson Electric Co., 853 Dundee Ave., Elgin, IL 60120-3090, USA
      (2) Wrench - Glenair TG-70 (or equivalent); Glenair Inc., 1211 Air Way, Glendale, CA 91201, USA
      (3) Wrench, Strap - Daniels BT-BS-611 (or equivalent); Daniels Manufacturing Corp., 6103 Anno Ave., Orlando, FL 32809-5033, USA
      (4) Pliers, Connector Soft Jaw - Glenair TG-69 (or equivalent); Glenair Inc., 1211 Air Way, Glendale, CA 91201, USA
   B. Consumable Materials
      (1) G50177 Lockwire, Nickel-Chromium-Iron alloy (Inconel) - (0.020 inch diameter) NASM20995N20
   C. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 71-11-04/201, Fan Cowl Panels
      (3) AMM 71-11-06/201, Core Cowl Panels
      (4) AMM 71-51-00/801, Wire Harness Repair
      (5) AMM 78-31-00/201, Thrust Reverser System
   D. Access
      (1) Location Zones

411	Left Engine
421	Right Engine

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

E. Prepare to Do the Engine Wire Harness - Adjustment/Test

S 015-002-N00

(1) Open the fan cowl panels (AMM 71-11-04/201).

S 045-003-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 015-004-N00

(3) Open the core cowl panels (AMM 71-11-06/201).

S 015-005-N00

WARNING: DO THE PROCEDURE IN AMM 78-31-00 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(4) Open the thrust reversers (AMM 78-31-00/201).

S 865-006-N00

(5) Remove the electrical power (AMM 24-22-00/201).

S 845-007-N00

(6) Make sure that the engine shutdown was more than five minutes.

F. Do the Wire Harness Circuit Continuity Test

S 035-009-N00

(1) Disconnect the two wire harness connectors which attach to the ends of the circuit where you will do a check.

<u>NOTE</u>: Use a TG-70 or BT-BS-611 strap wrench, or equivalent (Fig. 501). The rubber strap on the strap wrench will not hold the backshell if you apply too much force.

S 485-010-N00

(2) Attach an ohmmeter lead to the connector contacts at the ends of the circuit.

S 765-011-N00

(3) Measure the resistance.

<u>NOTE</u>: If the shield resistance value is necessary, attach the ohmmeter leads to the connectors.

(a) The circuits must have continuity.

S 085-012-N00

(4) Remove the ohmmeter leads from the harness connectors.

G. Do the Wire Harness Wire Insulation Check

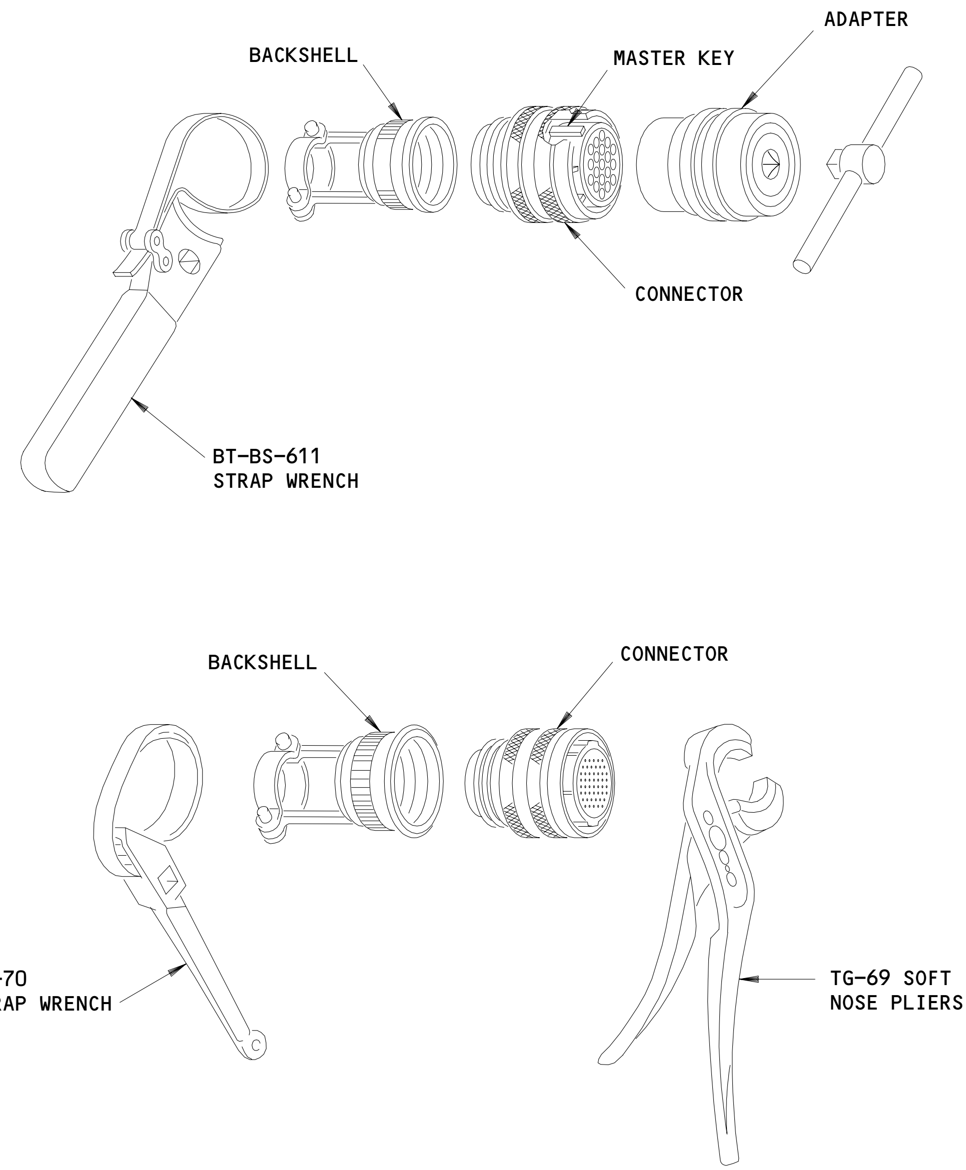
S 035-020-N00

<u>WARNING</u>: DO NOT USE A MEGOHMMETER FOR THE INSULATION RESISTANCE TEST OF THE ON-WING WIRE REPAIR. THIS COULD RESULT IN INJURY TO PERSONS OR DAMAGE TO THE AIRPLANE.

<u>CAUTION</u>: YOU MUST DISCONNECT ALL THE CONNECTORS ON THE CIRCUIT WHICH YOU WILL DO A CHECK. IF YOU DO NOT DO THIS, IT CAN CAUSE UNSATISFACTORY RESISTANCE INDICATIONS AND POSSIBLE DAMAGE TO THE CIRCUITS.

(1) Disconnect the wire harness connectors which attach to the ends of the circuits that you will do a test of.

<u>NOTE</u>: Use a TG-70 or BT-BS-611 strap wrench, or equivalent (Fig. 501).



Backshell and Connector Tools
Figure 501

S 765-016-N00

(2) Do these steps for a test of the insulation resistance:

(a) Put the ohmmeter at the 100K ohms scale.

(b) Attach one ohmmeter test lead to a connector contact (pin or socket) of the wire which you will test.

(c) Connect the other test lead to the braided shield.

(d) Measure the resistance.

NOTE: The circuit resistance must be infinity.

(e) Do the procedure again for the other wires you will do a test of.

(f) Remove the ohmmeter leads.

H. Connector/Receptacle Connection

S 435-021-N00

(1) Connect the connectors to the receptacles.

(a) Align the master key on the connector with the master key-way for the receptacle.

(b) Engage the connector to the receptacle with light hand pressure.

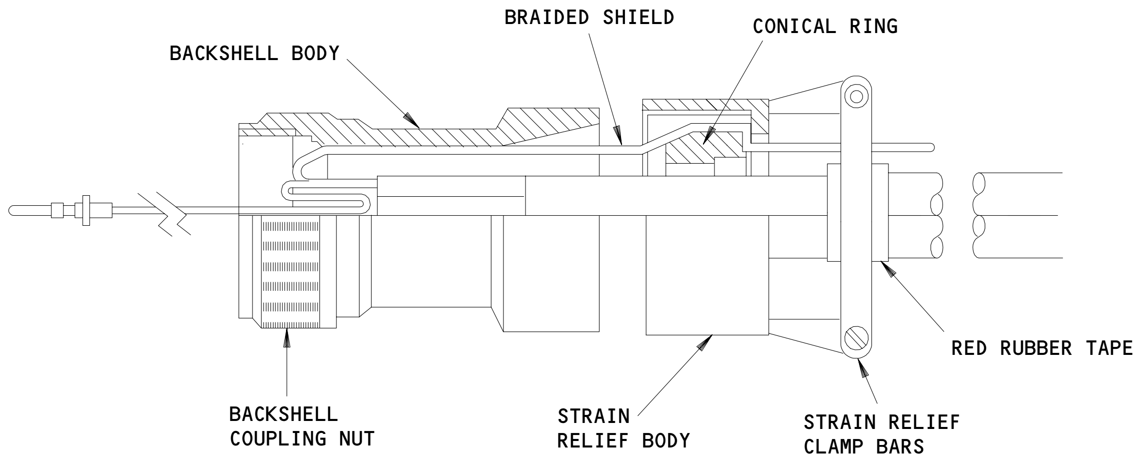
(c) Connect and tighten the connector coupling nut in a clockwise direction on the receptacle (Fig. 502 or 503).

NOTE: Make sure the threads and contacts are correctly engaged.

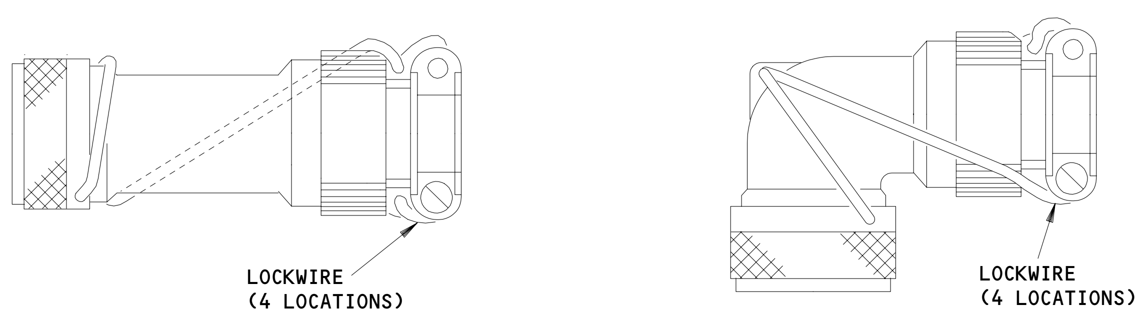
(d) Push the connector into the receptacle while you move the connector from one side to the other side.

CAUTION: DO NOT USE A METAL TOOL TO TIGHTEN OR TORQUE THE ALUMINUM CONNECTORS. THIS MAY DAMAGE THE CONNECTORS.

(e) Continue to tighten the coupling nut by hand until it is tight.

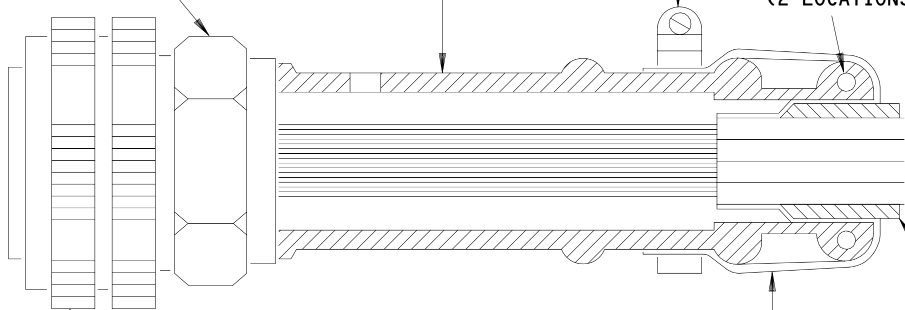


ALUMINUM BACKSHELL ASSEMBLY



LOCKWIRE INSTALLATION

Aluminum Backshell Assembly and Lockwire
Figure 502



Stainless Steel Backshell Assembly
Figure 503

(f) For connectors that have a self-locking coupling nut, make sure the visual indicator band does not show (Fig. 503).

NOTE: The visual indicator band on the receptacle is not a stop line. The leading edge of the connector knurled nut must go over the top of the indicator band. If you see the band, the connector is not installed correctly. If access to the receptacle is not easy, use a TG-70 or BT-BS-611 strap wrench, or equivalent (Fig. 501).

(g) For connectors that do not have a self-locking coupling nut, do as follows:
1) Tighten the connector coupling nut to the receptacle until the metal of the coupling nut touches the metal of the connector.

NOTE: Use a TG-70 or BT-BS-611 strap wrench, or equivalent (Fig. 501). The rubber strap on the strap wrench will not hold the backshell if you apply too much force.

2) For the connectors with the aluminum backshells, lockwire the backshell, the strain-relief clamp assembly, and the screws, as necessary (Fig. 502).

NOTE: Lockwire is not required for the stainless steel backshells and connector coupling nuts that are self-locking.

3) Lockwire all the connector coupling nuts that are not self-locking.

TASK 71-51-00-845-019-N00
3. Put the Airplane to the Usual Configuration
A. References
(1) AMM 71-11-04/201, Fan Cowl Panel

(2) AMM 71-11-06/201, Core Cowl Panel

(3) AMM 78-31-00/201, Thrust Reverser System

B. Access

(1) Location Zones

411	Left Engine
421	Right Engine

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

C. Procedure

S 415-022-N00

WARNING: DO THE PROCEDURE IN AMM 78-31-00 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Close the thrust reversers (AMM 78-31-00/201).

S 415-023-N00

(2) Close the core cowl panels (AMM 71-11-06/201).

S 445-024-N00

(3) Do this procedure: Thrust Reverser Activation (AMM 78-31-00/201).

S 415-025-N00

(4) Close the fan cowl panels (AMM 71-11-04/201).

ENGINE WIRE HARNESS - INSPECTION/CHECK

1. General
   A. This procedure gives the visual checks for all electrical harnesses on the power plant without the cables which have the external braid.
   B. If the engine wire harness is damaged, repair the harness with the procedure in AMM 71-51-00/801, Wire Harness Repair.

TASK 71-51-00-206-001-N00

2. Engine Wire Harness Visual Check
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 71-11-04/201, Fan Cowl Panel
      (3) AMM 71-11-06/201, Core Cowl Panels
      (4) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
         411 Left Engine
         421 Right Engine

   C. Prepare to do a check of the engine wire harness

      S 046-003-N00

      WARNING: DO THE DEACTIVATION PROCEDURE FOR THE THRUST REVERSER TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

      (1) Do the deactivation procedure for the thrust reverser for ground Maintenance (AMM 78-31-00/201).

      S 016-015-N00
      (2) Open the fan cowl panels (AMM 71-11-04/201).

      S 016-004-N00
      (3) Open the core cowl panels (AMM 71-11-06/201).

      S 016-005-N00

      WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS WHEN YOU OPEN THE THRUST REVERSERS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

      (4) Open the thrust reversers (AMM 78-31-00/201).

      S 866-006-N00
      (5) Remove the electrical power (AMM 24-22-00/201).

S 716-017-N00

(6) Make sure that the engine shutdown was more than five minutes.

D. Do the wire harness visual check

S 216-008-N00

(1) Do these steps to do a check on the harness cables and wires:
   (a) Examine all the cables in the harness for damage to the outer layer and the braid.
   (b) Examine all the wires which are open in the harness for damage.

S 216-009-N00

(2) Do these steps to do a check of the harness connectors:
   (a) Examine the position of the connector coupling nut.
   (b) If the coupling nut is not installed fully into the receptacle, do these steps to do a check on the harness touches (pins or sockets):
      1) Disconnect the harness connectors.
      2) Make sure that the contacts are straight, not damaged, and correctly engaged in the connector face.
      3) Connect the harness connectors.

E. Put the airplane to the usual configuration

S 416-011-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS WHEN YOU CLOSE THE THRUST REVERSERS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Close the thrust reversers (AMM 78-31-00/201).

S 416-012-N00

(2) Close the core cowl panels (AMM 71-11-06/201).

S 416-016-N00

(3) Close the fan cowl panels (AMM 71-11-04/201).

S 446-013-N00

(4) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

ENGINE WIRE HARNESS - APPROVED REPAIRS

1. General
   A. This procedure has three tasks for temporary repairs of the electrical harnesses on the power plant. These tasks are shown below in the sequence that they occur in this procedure:
      (1) A cable splice
      (2) A cable external jacket or braid repair
      (3) A cable replacement.
   B. These are the wire harness parts:
      (1) Wire - A single electrical conductor with insulation around it.
      (2) Cable - A group of wires in a metal shield and an insulation jacket.
      (3) Bundle - A group of cables attached together with lacing tape.
      (4) Harness - A single bundle or two or more bundles with connectors or terminal lugs attached to the ends of the bundles.
   C. Repair the connectors and connector contacts with the procedures in Chapter 20 of the Standard Wiring Practices Manual.

TASK 71-51-00-358-001-N00

2. Cable Splice Repair
   A. General
      (1) This procedure repairs broken wires or wires with damage. These are the limits for the wire repairs:
         (a) Replace the repaired cables when the harness is removed or during the engine's next shop visit.
         (b) Do not put a splice in a wire less than 6 inches (150 mm) from the clamp on the connector backshell.
         (c) Do not put a splice where it changes the position of the harness clamps or changes the location of the wire harness.
         (d) Do not put a splice in a cable with a steel outer braid.
         (e) Do not put a splice under a clamp or a drip loop.
         (f) Do not put a splice in a fire detection circuit.

            NOTE: You can put a temporary splice in the circuit, however, this must be replaced at the next scheduled maintenance check (SWPM 20-10-13).
         (g) You can put a splice in a generator feeder cable as a temporary repair. Use the procedures in the Standard Wiring Practices Manual. You must repair the cable permanently or replace it during the next schedule maintenance.
         (h) Splices must be moisture and abrasion resistant. Use a moisture-resistant tape wrap covered with an abrasion-resistant sleeve or tape when you do the repair.

(2) This procedure is for a 2-wire cable with a braided shield. If you put a splice in a 3-wire cable, put the third splice in the cable so the insulation edges of the splices are all at least 1.3 inches (32 mm) away from each other. If you put a splice in a 1-wire cable without a braided shield, ignore the steps about the shield.

B. Equipment
(1) Wire stripper, 16 to 20 gauge - Strip Master 45092 (or equivalent), Ideal Industries, Inc., 1008 Becker Pl., Sycamore, IL 60178, USA
(2) Wire splice crimp tool (use as necessary for all types of wire) - 46673, AMPS Inc., 2800 Fulling Mill, P.O. Box 3608, Harrisburg, PA 17105, USA
(3) Cable ferrule crimp tools (use the tools shown in this table as necessary), Thomas and Betts Corp., 920 Route 202, Raritan, NJ 08869-1420, USA

OUTER FERRULE PART NUMBER	TOOL
ALL	CRIMP TOOL MS22520/5-01
BACS13S261CNP	TOOL DIE MS22520/5-19
BACS13S312CNP	TOOL DIE MS22520/5-39
BACS13S327CNP	TOOL DIE MS22520/5-37

C. Consumable Materials
(1) Braid, tubular, silver-plated copper, 0.25 inch, (or an equivalent); NEQ241636SP, New England Electric Wire Corp., 365 Main St., Lisbon, New Hampshire 03585, USA

(2) Tape, red rubber, self-bonding - Moxness 620-3/4, Moxness Products Inc., 1914 Indiana St., Racine, WI 53405-3649, USA
(3) Tape, Lacing - BMS13-54 Grade D, Type 3p; or Gudebrod 718Z
(4) Tape, electrical silicone - Scotch 62, Minnesota Mining and Mfg. Co., 6801 River Place Blvd, Austin, TX 94023, USA
(5) Tape, electrical silicone - Scotch 92, Minnesota Mining and Mfg. Co., 6801 River Place Blvd, Austin, TX 94023, USA
(6) Lockwire, Corrosion Resistant Steel (0.020 inch diameter) - NASM20995C20

D. Parts
(1) Wire splices (use the splices that follow as necessary)
(a) FOR STANDARD WIRES; BACT12C-20 (nickel plated copper)
(b) FOR ALUMEL THERMOCOUPLE WIRES; 1-322325-0 (Alumel); AMPS Inc., 2800 Fulling Mill, P.O. Box 3608, Harrisburg, PA 17105, USA
(c) FOR CHROMEL THERMOCOUPLE WIRES; 1-322325-1 (Chromel); AMPS Inc., 2800 Fulling Mill, P.O. Box 3608, Harrisburg, PA 17105, USA
(2) Cable ferrules (use the ferrules shown in these tables as necessary):

INNER FERRULE	
APPLICATION	PART NUMBER
Two 20 gauge wires	BACS13S156BNP
Two 18 gauge wires	BACS13S205BNP
Two 20 gauge wires	BACS13S205BNP
Three 20 gauge wires	BACS13S205BNP
Two 18 gauge wires	BACS13S219BNP
Two 20 gauge wires	BACS13S219BNP
Three 18 gauge wires	BACS13S219BNP
Three 20 gauge wires	BACS13S219BNP

OUTER FERRULE	
APPLICATION	PART NUMBER
Two 20 gauge wires	BACS13S261CNP
Two 18 gauge wires	BACS13S312CNP
Two 20 gauge wires	BACS13S312CNP
Three 20 gauge wires	BACS13S312CNP
Two 18 gauge wires	BACS13S327CNP
Two 20 gauge wires	BACS13S327CNP
Three 18 gauge wires	BACS13S327CNP
Three 20 gauge wires	BACS13S327CNP

(3) Replacement cable (Refer to the WDM wire diagrams and a wire list to get the correct replacement cable).

NOTE: Use the same type of cable as the damaged cable. If the same type of cable is not available, use the alternate cable shown in Table 801. You must splice thermocouple circuits with chromel and alumel wire and splices as applicable. The wire type codes used in the wire list are identified in the Standard Wiring Practices Manual D6-54446.

E. References
(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 71-11-04/201, Fan Cowl Panels
(3) AMM 71-11-06/201, Core Cowl Panels
(4) AMM 71-51-00/501, Engine Wire Harness
(5) AMM 78-31-00/201, Thrust Reverser System
(6) Standard Wiring Practices Manual D6-54446

F. Access
(1) Location Zones
411 Engine, Left
421 Engine, Right

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

G. Prepare to Do the Cable Splice Repair.

S 018-002-N00

(1) Open the fan cowl panels (AMM 71-11-04/201).

S 048-003-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 018-004-N00

(3) Open the core cowl panels (AMM 71-11-06/201).

S 018-005-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the thrust reversers (AMM 78-31-00/201).

S 868-006-N00

(5) Remove electrical power (AMM 24-22-00/201).

S 868-007-N00

(6) Make sure the engine was not operated for a minimum of five minutes.

S 358-008-N00

(7) Identify the type of replacement cable necessary to do this repair.

NOTE: Use a cable with the same wire gage, specifications, and insulation color as the damaged engine cable. If the same type cable is not available, use an alternate cable shown in Table 801. You must splice the thermocouple circuits with chromel and alumel wire and splices as applicable.

Alternate Shielded and Unshielded Cables
Table 801

FIRST ALTERNATE CABLE: BMS 13-55 Cable, 16, 18, and 20 gage wires NOTE: Use the first alternate cable only if the initial cable is not available. This is a fire resistant cable.	
Type 1 or 2 for unshielded cables, class and gage size as applicable	Type 3 or 4 for shielded cables, class and gage size as applicable
Class 1 - single conductor cable Class 2 - two conductor twisted cable Class 3 - three conductor twisted cable Class 4 - four conductor twisted cable	
SECOND ALTERNATE CABLE: BMS 13-31 Cable, 16, 18 and 20 gage wires NOTE: Use the second alternate cable only if the initial cable or first alternate cable is not available. You cannot use the second alternate cable in a fire detection circuit or the fuel shutoff circuit.	

H. Do the Cable Splice Repair.

S 018-103-N00

WARNING: DO NOT USE HEAT GUNS, SOLDERING GUNS, AND SOLDERING IRONS FOR THE ON-WING REPAIRS. THEY ARE NOT RESISTANT TO EXPLOSION AND CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Remove the lacing tape and the harness clamps from the wire harness to get sufficient access to the damaged cable.

S 358-010-N00

(2) Cut, remove, and discard the damaged part of the cable from the wire harness.

NOTE: Repair one cable at a time.

S 358-011-N00

(3) Do these steps to prepare the two ends of the remaining engine cable (Fig. 801):
- (a) Clean the cable 12 inches (300 mm) from the ends.
- (b) Cut and remove the insulation jacket 6 inches (150 mm) from the end of the cable to show the braided shield.
- (c) Cut and remove the braided shield so that 0.75 inch (19 mm) of the shield shows.
- (d) Cut one wire 4 inches (100 mm) from the insulation jacket.
- (e) Cut the other wire 2 inches (50 mm) from the end of the first wire.

S 358-012-N00

(4) Cut a piece of the replacement cable 12 inches (300 mm) longer than the distance between the two ends of the remaining cable.

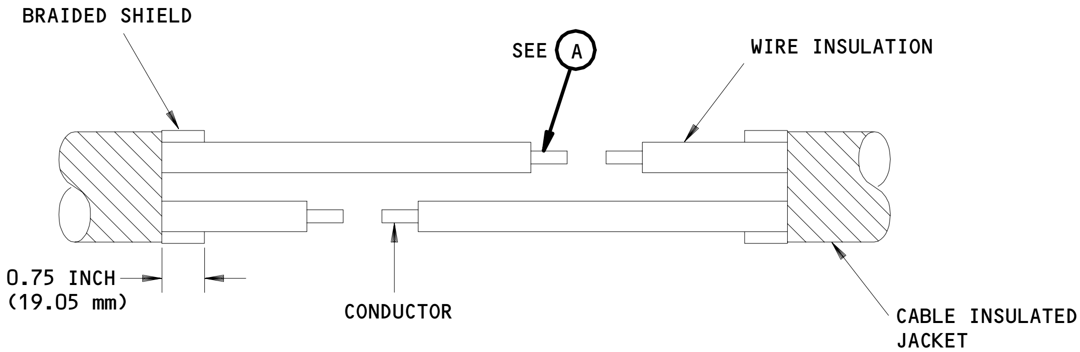
S 358-013-N00

(5) Do the steps above to prepare one end of the replacement cable as you did for the remaining engine cable.

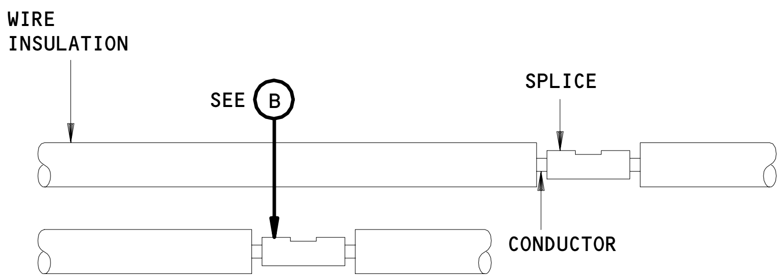
NOTE: Align the insulation colors on the replacement cable wires with the engine cable wires. Cut the wires such that the long engine wire aligns with the short replacement wire.

S 358-014-N00

(6) Do these steps to install the replacement cable:
- (a) Get the correct size inner and outer termination ferrules (Ref Consumable Materials).
- (b) Install one outer termination ferrule on each end of the cable.
  - 1) Move the ferrules away from the splice area.
- (c) Cut a length of tubular braid to put on the splice area.

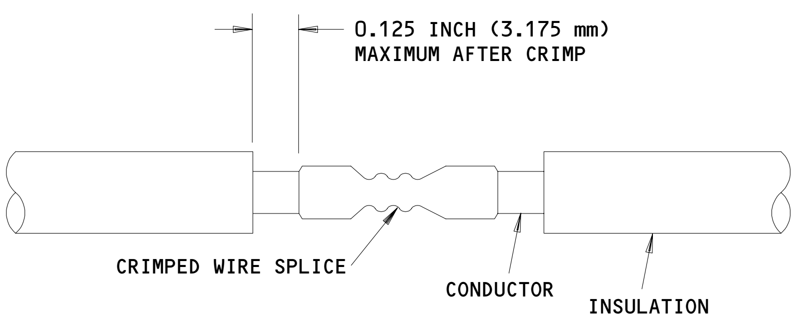


PREPARE THE SPLICE



INSTALLATION OF THE WIRE SPLICE

A



CRIMPED WIRE SPLICE

B

Wire Splice
Figure 801

(d) With the tubular braid expanded, install it on one end of the cable.
  1) Move the braid away from the splice area.

(e) Install one inner termination ferrule on each end of the cable.
  1) Move the ferrules away from the splice area.

(f) Make a splice on each of the wires as follows (Fig. 801):
  1) Use the wire stripper to remove sufficient insulation to make it easy to put the conductor into the splice correctly.
  2) Put the wires into each end of the wire splice to make an overlap.

     NOTE: This is a parallel splice and not a butt splice. The ends of the wires show at each end of the splice.

  3) Use the correct crimp tool to attach the splice.
  4) Pull on the splices to make sure they will not come off the wires.
  5) Remove all the sharp edges from the splices.

     NOTE: The splice will not have sharp edges if you install it correctly.

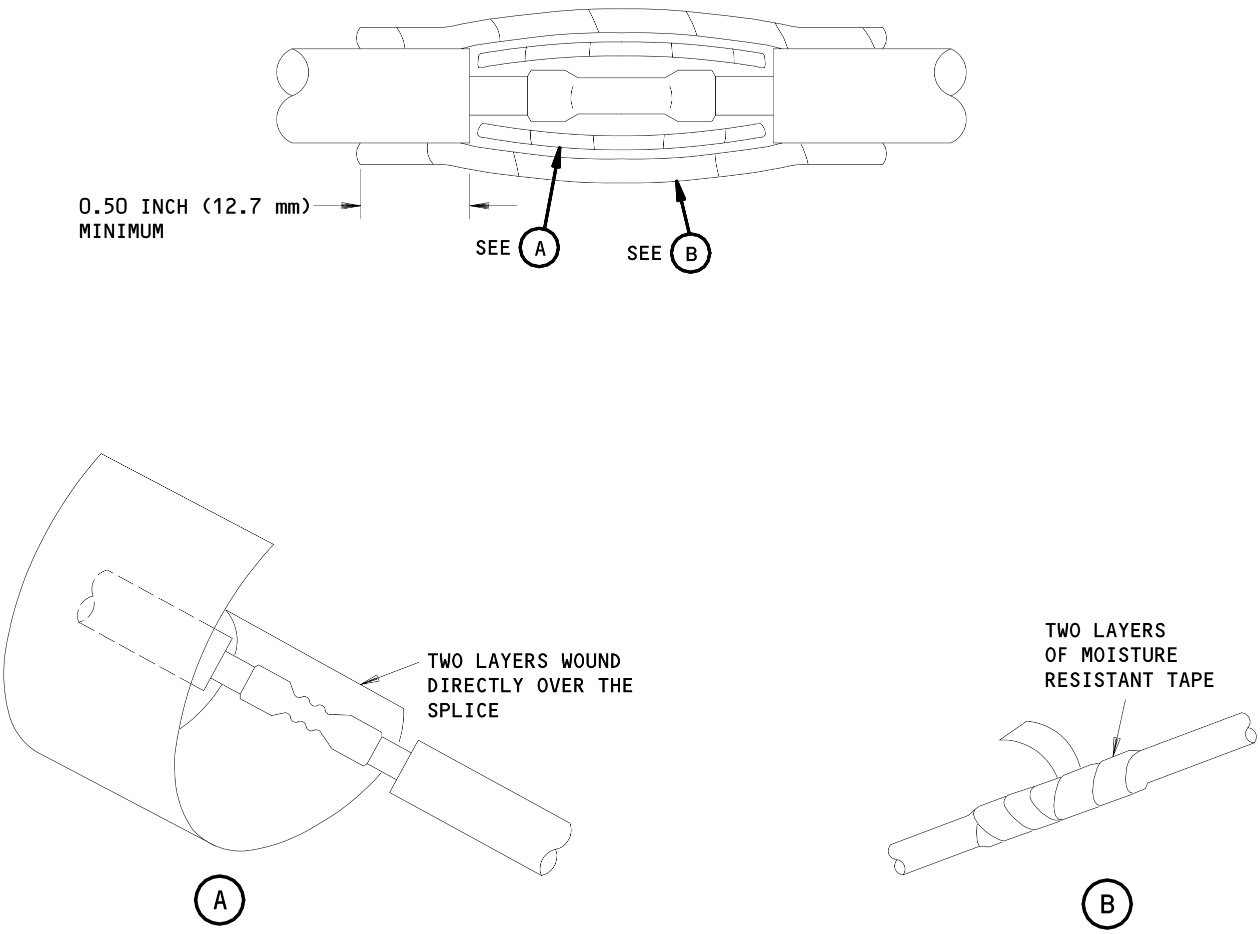
  6) Wind two layers of the red rubber tape (Moxness 620-3/4) directly around the splice with a 50% overlap on each turn of the tape (Fig. 802).

     NOTE: Wind the second layer in the opposite direction to the first layer. The tape wrap must be sufficiently tight to give a moisture-resistant seal.

  7) Wind two layers of the electrical silicone tape (Scotch 92) for abrasion protection with a 50% overlap on each turn of the tape.

     NOTE: Wind the second layer in the opposite direction to the first layer. The tape wrap must be sufficiently tight to give a moisture-resistant seal.

     a) Extend the tape a minimum of one-half inch more than each end of the inner tape.



Tape Wrap for Moisture Resistance
Figure 802

8) For the repair of a 1-wire cable without a braided shield do these steps (Fig. 803):

NOTE: Do not do these steps if the cable has a braided shield.

a) Wind two layers of the electrical silicone tape (Scotch 62) directly around the splice with a 50% overlap on each turn of the tape.

NOTE: Wind the second layer in the opposite direction to the first layer.

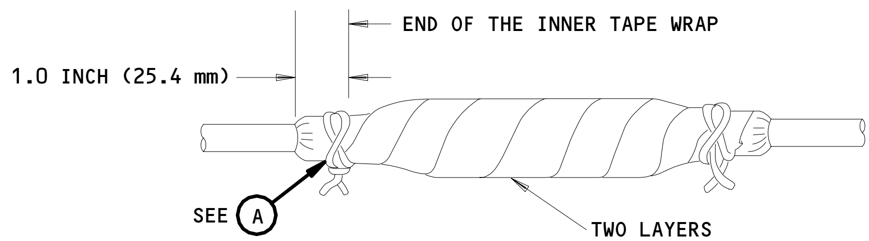
b) Extend the tape one inch more than each end of the inner tape.
c) With the lacing tape, make a clove hitch and a square knot on each end of the tape.

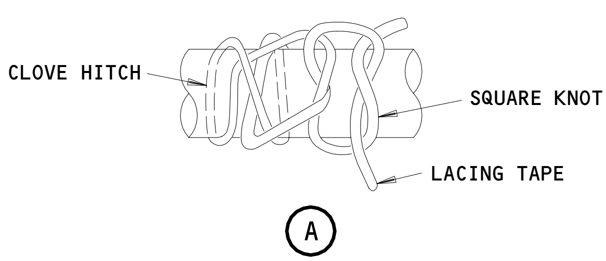
NOTE: Tighten the clove hitch before you tighten the square knot.

d) Cut the free ends to 0.25-0.50 inch (6-12 mm).

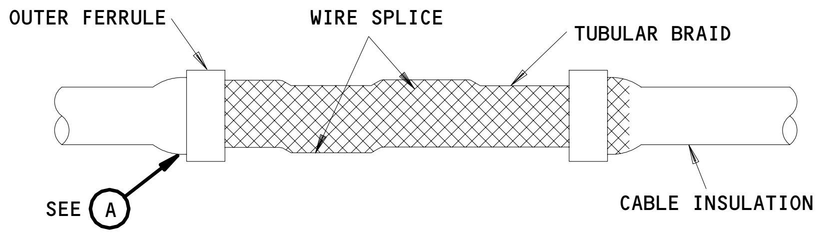
(g) Make sure the metal strands of the braided shield are straight.
(h) Put the inner ferrule near the end of the cable insulation and fold the braided shield back over the ferrule (Fig. 804).
   1) Make sure the metal strands of the braided shield have an equal proportion around the ferrule.
(i) Put one end of the tubular braid on the metal strands of the shield.
   1) Move the outer ferrule over the tubular braid and the inner ferrule.
   2) Use the crimp tool to attach the outer ferrule on the inner ferrule and braided shield (Fig. 805).

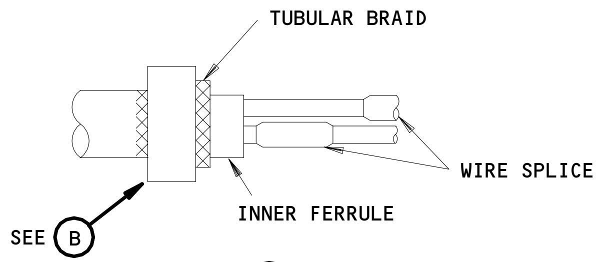
NOTE: Make sure the braided shield stays between the inner and the outer ferrules when you install the outer ferrule.





Abrasion Resistant Tape Wrap and Lacing Tape
Figure 803





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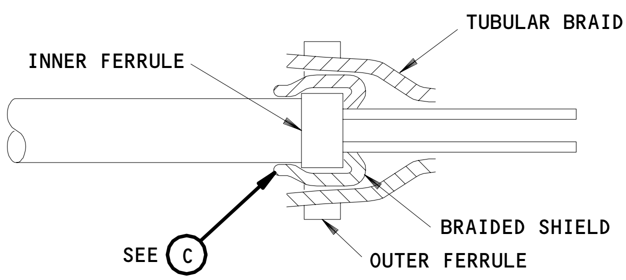
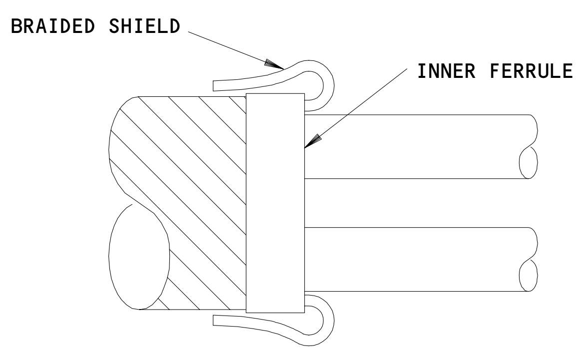


TUBULAR BRAID AND OUTER FERRULE INSTALLATION

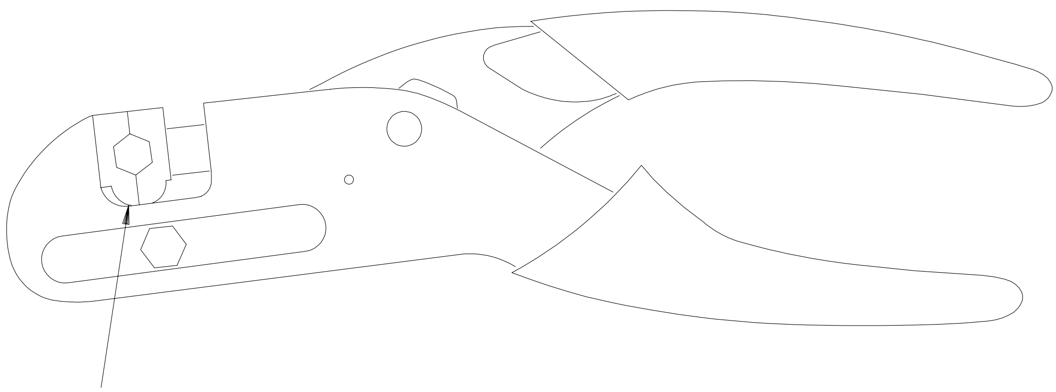
B



INNER FERRULE INSTALLATION

C

Tubular Braid Installation
Figure 804



Crimp Tool for the Outer Ferrule
Figure 805

(j) Pull the tubular braid tight across the splice area.
(k) Install the inner and outer ferrules on the other end as shown in the steps above.
(l) Cut the unwanted braid near the outer end of the two outer ferrules.
(m) For abrasion protection, wind two layers of the electrical silicone tape (Scotch 62) directly around the splice (Fig. 806).

NOTE: Wind the second layer in the opposite direction to the first layer with a 50% overlap on each turn of the tape.

1) Extend the tape a minimum of one-half inch (13 mm) more than each end of the inner tape.

(n) With the lacing tape, make a clove hitch and a square knot on each end of the tape (Fig. 803).

NOTE: Tighten the clove hitch before you tighten the square knot.

1) Cut the free ends to 0.25-0.50 inch (6-12 mm).

(o) Do the above procedure again to attach the other end of the replacement cable to the remaining engine cable.

S 768-080-N00

(7) Do the adjustment/test procedure for the cable you repaired (AMM 71-51-00/501).

S 438-079-N00

(8) Install the lacing tape to the repaired wire harness, as necessary.

S 438-086-N00

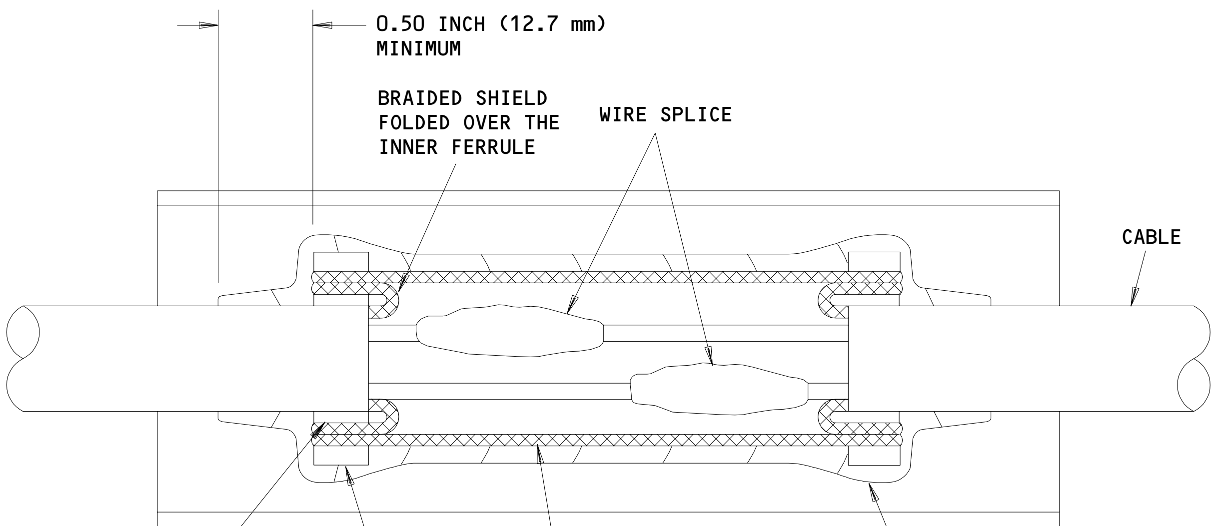
(9) Install all the clamps that you removed.

I. Put the Airplane Back to its Usual Condition.

S 418-019-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Close the thrust reversers (AMM 78-31-00/201).



Cable Splice for Shielded Cable with Two Conductors
Figure 806

S 418-020-N00

(2) Close the core cowl panels (AMM 71-11-06/201).

S 418-081-N00

(3) Close the fan cowl panels (AMM 71-11-04/201).

S 448-021-N00

(4) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

TASK 71-51-00-358-023-N00

3. Cable Insulated Jacket and Braid Repair

A. General

(1) This procedure has a repair for cables that have damage to the braided shield and insulated jacket. If the braided shield and insulated jacket are damaged more than the repair limits, cut the wire and do the splice repair procedure. The limits for this repair are shown as follows:

(a) The braided shield shows through the insulated jacket a maximum of 50% around the cable.

(b) The braided shield shows through the insulated jacket a maximum of 2 inches (51 mm) along the cable.

(c) A maximum of 20% of the metal strands of the braided shield are damaged in one location.

B. Consumable Materials

(1) Tape, electrical silicone - Scotch 92, Minnesota Mining and Mfg. Co., 6801 River Place Blvd, Austin, TX 94023, USA

(2) Tape, electrical silicone - Scotch 62, Minnesota Mining and Mfg. Co., 6801 River Place Blvd, Austin, TX 94023, USA

(3) Tape, Lacing - BMS13-54 Grade D, Type 3; or Gudebrod 718Z

C. References

(1) AMM 24-22-00/201, Electrical Power - Control

(2) AMM 71-11-04/201, Fan Cowl Panels
(3) AMM 71-11-06/201, Core Cowl Panels
(4) AMM 78-31-00/201, Thrust Reverser System

D. Access

(1) Location Zones

411	Engine, Left
421	Engine, Right

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

E. Prepare to Do the Cable External Jacket or Braid Repair.

S 018-024-N00

(1) Open the fan cowl panels (AMM 71-11-04/201).

S 048-025-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 018-026-N00
(3) Open the core cowl panels (AMM 71-11-06/201).

S 018-027-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the thrust reversers (AMM 78-31-00/201).

S 868-028-N00
(5) Remove electrical power (AMM 24-22-00/201).

S 868-029-N00
(6) Make sure the engine was not operated for a minimum of five minutes.

F. Do the Cable Insulated Jacket and Braid Repair.

S 018-102-N00

WARNING: DO NOT USE HEAT GUNS, SOLDERING GUNS, AND SOLDERING IRONS FOR THE ON-WING REPAIRS. THEY ARE NOT RESISTANT TO EXPLOSION AND CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Remove the lacing tape and the harness clamps from the wire harness as necessary to get access to the damaged cable.

S 358-031-N00
(2) Clean the cable 3 inches (75 mm) on each side of the damage.

S 438-087-N00
(3) Wind one layer of the electrical silicone tape (Scotch 92) around the cable with 20% overlap on each turn of the tape.
   (a) Extend the tape 1.0 inch (2.5 cm) more on each side of the worn area of the insulated jacket.

S 438-088-N00
(4) Wind one layer of the electrical silicone tape (Scotch 62) over the first layer of tape with a 20% overlap on each turn of the tape.
   (a) Extend the tape 0.5 inch (13 mm) more on each side of the first layer of tape.

S 438-089-N00
(5) Install the lacing tape to the wire harness as necessary.

S 438-090-N00

(6) Install the harness clamps that you removed.

G. Put the Airplane Back to its Usual Condition.

S 418-037-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Close the thrust reversers (AMM 78-31-00/201).

S 418-038-N00

(2) Close the core cowl panels (AMM 71-11-06/201).

S 418-082-N00

(3) Close the fan cowl panels (AMM 71-11-04/201).

S 448-039-N00

(4) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

TASK 71-51-00-358-056-N00

4. Cable Replacement

A. General

(1) This task gives the steps to replace a damaged or open circuit cable with a new shielded or unshielded cable. The new cable will be installed on the outer side of the damaged wire harness. For replacement cables, use the same type of cable as the damaged cable. If the same cable is not available, use the alternate cables given in Table 801. You must splice thermocouple circuits with chromel and alumel wire and splices as applicable.

B. Equipment

(1) Wrench - Glenair TG-70 (or equivalent); Glenair Inc., 1211 Air Way, Glendale, CA 91201, USA

(2) Wrench, strap - Daniels BT-BS-611 (or equivalent); Daniels Manufacturing Corp., 6103 Anno Ave., Orlando, FL 32809-5033, USA
(3) Pliers, connector soft jaw - Glenair TG-69 (or equivalent); Glenair Inc., 1211 Air Way, Glendale, CA 91201, USA
(4) Kit, connector adapter - CM-S-837 (for MIL-C-26500 series connectors) or CM-S-839T (for MIL-C-38999 series connectors) or equivalent,
Daniels Manufacturing Corp.,
6103 Anno Ave., Orlando, FL 32809-5033, USA
(5) Contact insertion tool (16 gage) - MS27495A16, Daniels Manufacturing Corp.
(6) Contact insertion tool (20 gage) - MS27495A20, Daniels Manufacturing Corp.
(7) Contact removal tool (16 gage) - MS27495R16, Daniels Manufacturing Corp.
(8) Contact removal tool (20 gage) - MS27495R20, Daniels Manufacturing Corp.
(9) Wire stripper, 16 to 20 gauge -
Strip Master 45092 (or equivalent),
Ideal Industries, Inc., 1008 Becker Pl.,
Sycamore, IL 60178, USA
(10) Crimp tool frame (crimp contact), or equivalent, - M22520/1-01,
Daniels Manufacturing Corp.
(11) Crimp tool positioner (crimp 16 gage contact), or equivalent, - M22520/1-02,
Daniels Manufacturing Corp.
(12) Crimp tool positioner (crimp 20 gage contact), or equivalent, - M22520/1-04,
Daniels Manufacturing Corp.
(13) Tool, retention test (16 gage) - HT210-16 or equivalent,
Daniels Manufacturing Corp.
(14) Tool, retention test (20 gage) - HT210-20 or equivalent,
Daniels Manufacturing Corp.
(15) Replacement socket tip (16 gage) - 68-016-01 or equivalent,
Daniels Manufacturing Corp.
(16) Replacement socket tip (20 gage) - 68-020-01 or equivalent,
Daniels Manufacturing Corp.
(17) Replacement pin tip (16 gage) - PN 67-016-02 or equivalent,
Daniels Manufacturing Corp.
(18) Replacement pin tip (20 gage) - PN 67-020-02 or equivalent,
Daniels Manufacturing Corp.

C. Consumable Materials
   (1) Replacement cable (Refer to the WDM for the wire diagrams and a wire list for the correct replacement cable).

   NOTE: The wire type codes used in the wire list are identified in the Standard Wiring Practices Manual D6-54446.

   (2) Tape, red rubber, self-bonding - Moxness 620-3/4, Moxness Products Inc., 1914 Indiana St., Racine, WI 53405-3649, USA
   (3) Tape, Lacing - BMS13-54 Grade D, Type 3; or Gudebrod 718Z
   (4) Connector contacts - refer to the Standard Wiring Practices Manual as follows for the correct contacts to use for the connectors and the wires that you have:

MIL-C-26500 Series Connector	20-61-11
MIL-C-38999 Series Connector	20-63-19
MIL-C-83723 Series Connector	20-63-13

D. References
   (1) AMM 24-22-00/201, Electrical Power - Control
   (2) AMM 71-11-04/201, Fan Cowl Panels
   (3) AMM 71-11-06/201, Core Cowl Panels
   (4) AMM 71-51-00/501, Engine Wire Harness
   (5) AMM 78-31-00/201, Thrust Reverser System
   (6) Standard Wiring Practices Manual D6-54446

E. Access
   (1) Location Zones

411	Engine, Left
421	Engine, Right

   (2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

F. Prepare to Do the Cable Replacement.

S 018-057-N00

(1) Open the fan cowl panels (AMM 71-11-04/201).

S 048-058-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 018-059-N00

(3) Open the core cowl panels (AMM 71-11-06/201).

S 018-060-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the thrust reversers (AMM 78-31-00/201).

S 868-061-N00

(5) Remove electrical power (AMM 24-22-00/201).

S 868-062-N00

(6) Make sure the engine was not operated for a minimum of five minutes.

S 358-063-N00

(7) Identify the replacement cable that is necessary for the circuit that you will replace.
    (a) Use a cable with the same wire gage, specifications, and insulation color as the damaged engine cable.

    NOTE: If the same type cable is not available, use the alternate cables given in Table 801. You must splice thermocouple circuits with chromel and alumel wire and splices as applicable.

G. Do the Cable Replacement.

S 358-101-N00

WARNING: DO NOT USE HEAT GUNS, SOLDERING GUNS, AND SOLDERING IRONS FOR THE ON-WING REPAIRS. THEY ARE NOT RESISTANT TO EXPLOSION AND CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Do these steps to install a new cable on the external side of the harness:
 (a) Find the two connectors which are attached to the ends of the broken cable.
 (b) Put the end of the new cable so it extends 6 inches (150 mm) longer than the broken cable at the connector.
 (c) Use the tape to attach the new cable to the external side of the connector.
 (d) Put the new cable along the wire harness.
 (e) Cut the other end of the cable 6 inches (150 mm) longer than the broken cable at the second connector.
 (f) Use the tape to attach the new cable to the external side of the connector.
 (g) Put a label on each end of the new cable.
  1) Write on each label the connector contact numbers of the wires in the cable that you will replace.
 (h) Install the new cable in all of the clamps that hold the wire harness to the engine.

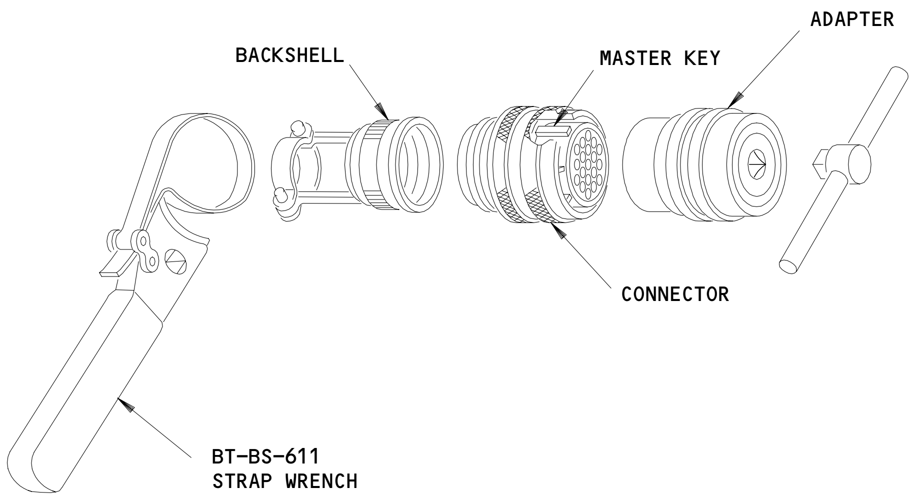
S 358-065-N00

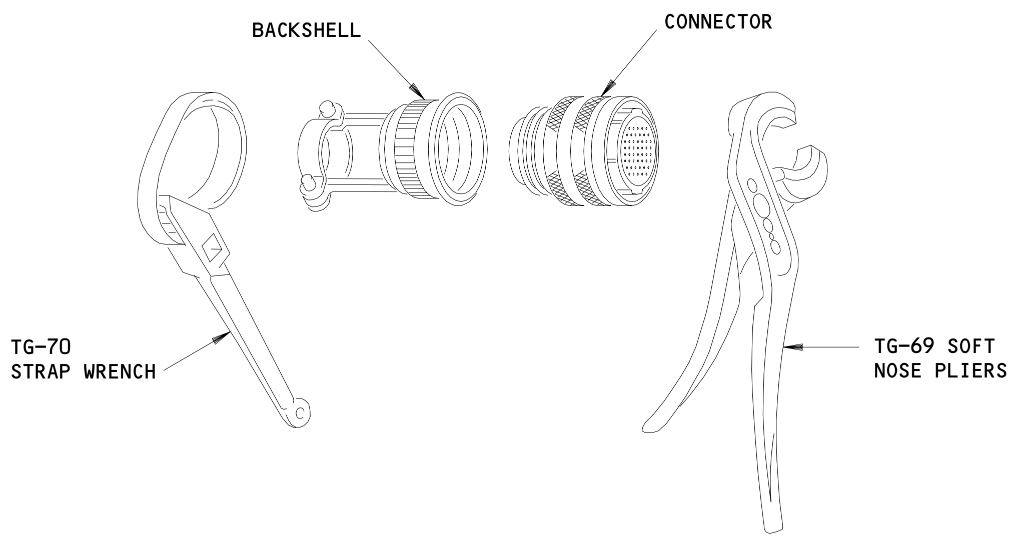
(2) Disconnect the two connectors for the cable with the damaged wire (Fig. 807).

NOTE: Use the TG-70 or BT-BS-611 strap wrench or TG-69 pliers, or equivalent.

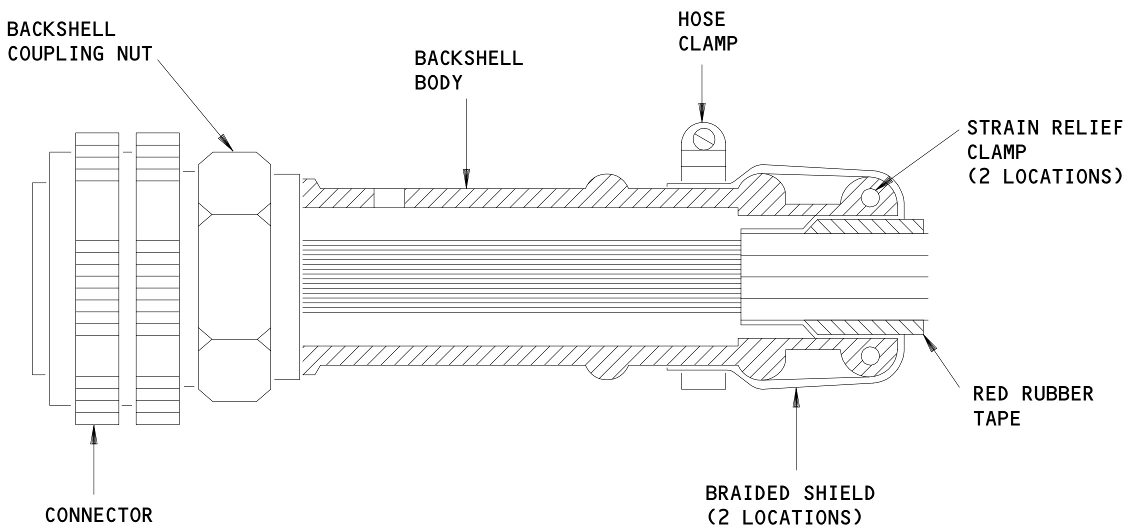
S 038-091-N00

(3) Remove the backshell and the strain relief clamp from each connector (Fig. 808 or 809).
 (a) If necessary, remove the lockwire on the backshell.
 (b) For stainless steel backshells, do as follows:
  1) Loosen the hose clamp on the backshell that attaches the shielded cable to the backshell.

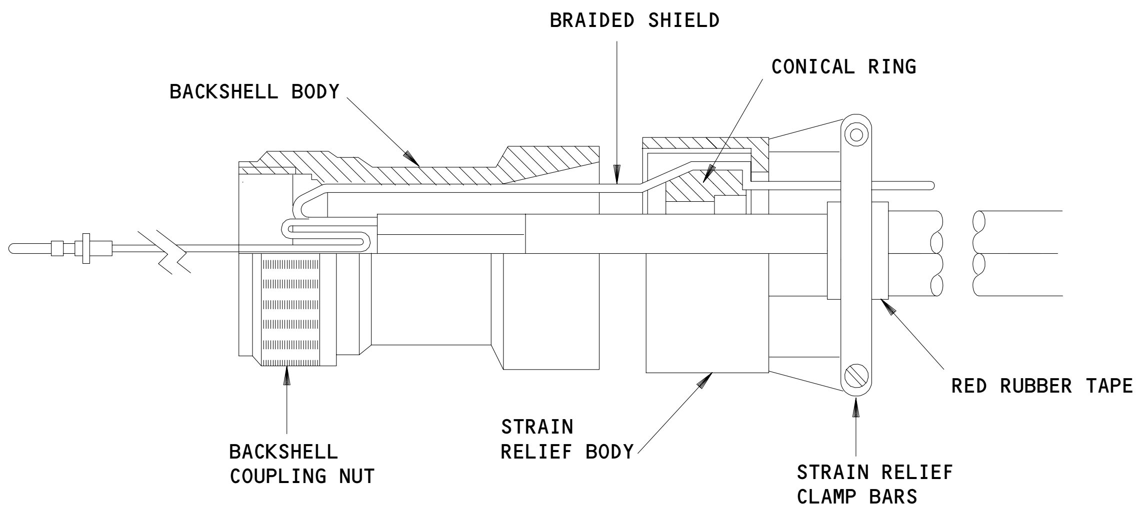




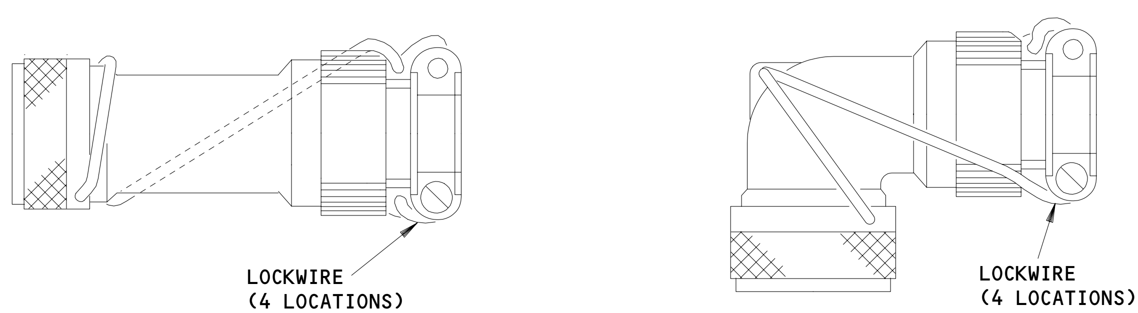
Backshell and Connector Tools for Removal/Installation
Figure 807



Stainless Steel Backshell Assembly
Figure 808



ALUMINUM BACKSHELL ASSEMBLY



LOCKWIRE INSTALLATION

Aluminum Backshell Assembly and Lockwire
Figure 809

2) Move the hose clamp to the rear of the harness and away from the repair area.
3) Fold the braided shields over the strain relief clamp to make the shields straight.

(c) Loosen the screws that attach the backshell strain relief clamps to permit the clamp halves to move over the harness.

(d) For aluminum backshells, do as follows:

1) Disconnect the strain-relief clamp assembly from the backshell.

NOTE: Use a TG-70 or BT-BS-611 strap wrench or TG-69 pliers, or equivalent.

2) Move the strain-relief clamp assembly to the rear of the harness and away from the repair area.
3) Remove the conical ring from the rear side of the backshell and move the ring to the rear of the harness.

(e) Install the correct size connector adapter on the connector assembly (Fig. 807).

NOTE: The connector adapter kit holds the connector assembly and prevents movement of the connector when you remove the backshell. Use the CM-S-837 or CM-S-839T connector adapter kit, or equivalent.

(f) Hold the connector and adapter in your hand and disconnect the backshell.

NOTE: Use a TG-70 or BT-BS-611 strap wrench or TG-69 pliers, or equivalent. You can also use a standard crowfoot wrench for the stainless steel backshells.

(g) Move the backshell to the rear of the harness and away from the repair area.

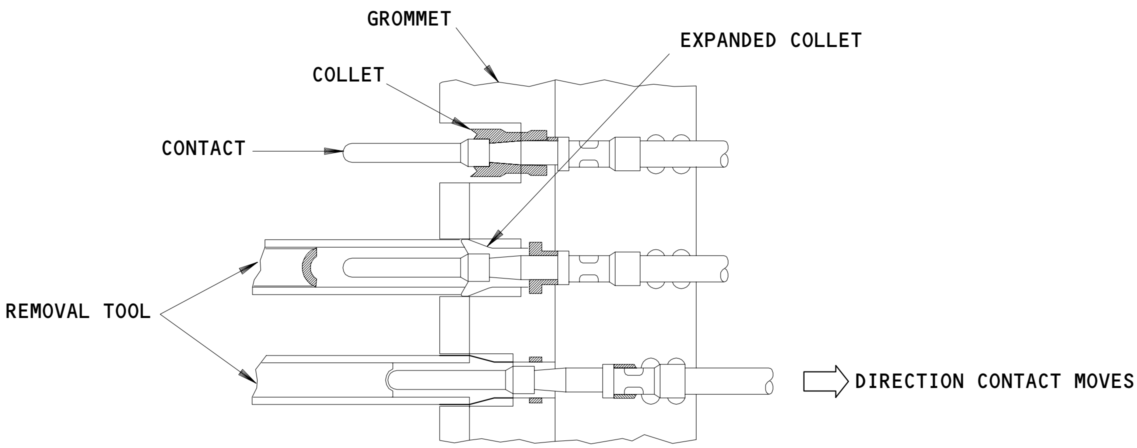
S 038-092-N00

(4) Remove the red rubber tape found below the strain relief clamps.

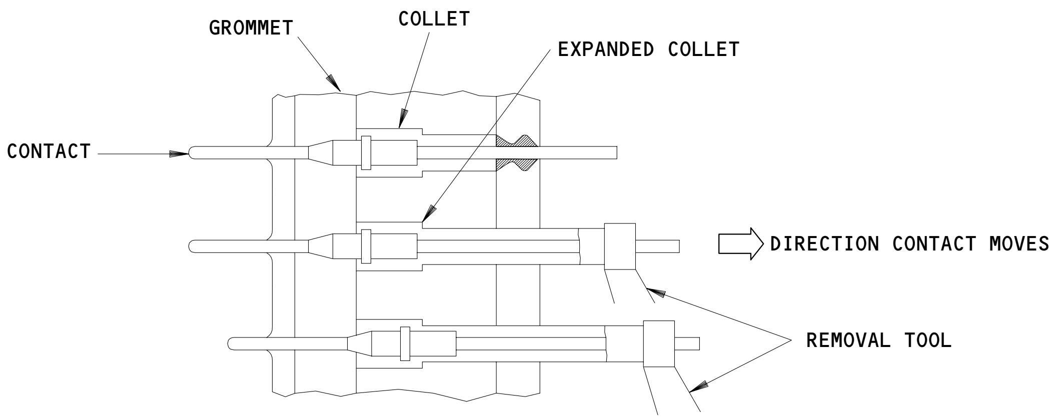
S 038-093-N00

(5) Remove the contacts of the damaged wire from the two connectors.

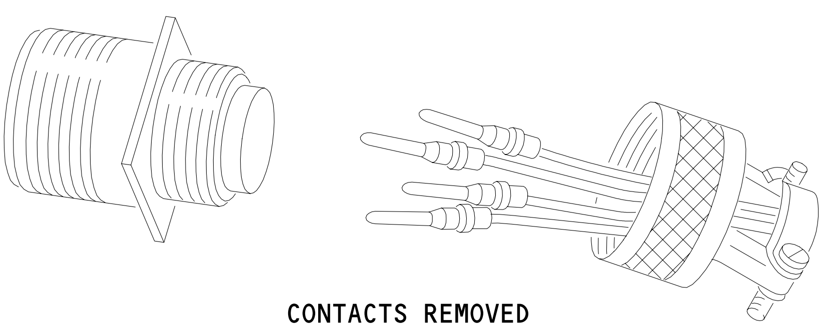
(a) Use the correct contact removal tool for the wire gage of the conductor and series connector (Fig. 810).



CONTACTS RELEASED FROM THE FRONT



CONTACTS RELEASED FROM THE REAR



CONTACTS REMOVED

Connector Contact Removal
Figure 810

S 358-067-N00

(6) Do these steps to prepare each end of the new cable:
   (a) Cut the jacket of the new cable at the same location as the jacket on the damaged cable.
   (b) Cut the braided shield of the new cable at the same location as the braided shield of the damaged cable.
      1) Pull the braided shield around the cable as far back as the braided shield on the damaged cable.
   (c) Cut the new cable wires at the same length as the wires of the damaged cable.

S 358-100-N00

(7) Cut the damaged wires at each end of the damaged cable where the wires come out of the braided shield.

S 358-094-N00

(8) Use the wire stripper to remove 0.276 inch (7 mm) of insulation from each end of the new wire (Fig. 811).

S 358-095-N00

CAUTION: DO NOT RELEASE THE LATCH FOR THE CRIMP TOOL POSITIONER IF THE TOOL FRAME HANDLE IS IN THE CLOSED POSITION. THE TOOL HANDLE MUST BE OPEN WHEN THE POSITIONER IS INSTALLED, REMOVED, OR RELEASED. INCORRECT USE CAN CAUSE DAMAGE TO THE POSITIONER AND CRIMP TOOL.

(9) Crimp the contacts on each end of the wire.
   (a) Use the correct tool for the wire gage of the conductor and series connector.

S 358-083-N00

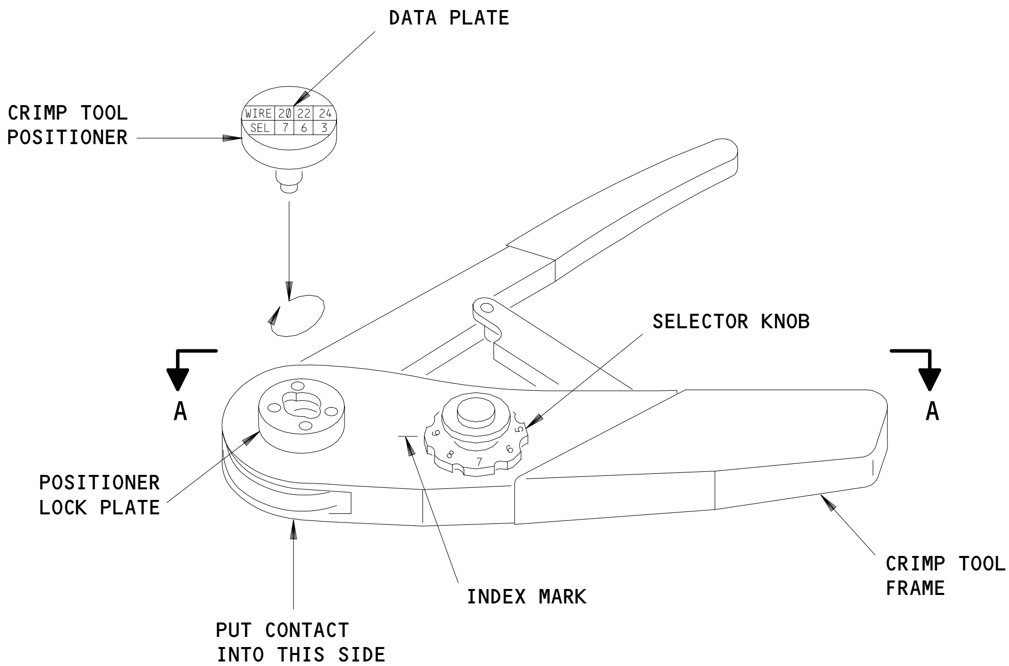
(10) Install the contacts in the electrical connectors:
   (a) Use the correct tool for the wire gage of the conductor and series connector (Fig. 812).

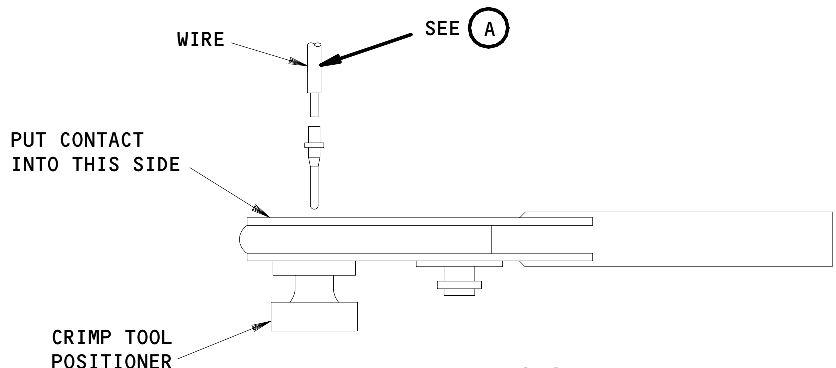
S 718-096-N00

(11) Do a check of each contact to make sure they are installed correctly:

NOTE: Each contact should be resistant to a force of 7 to 13 pounds (31.1 to 57.8 newtons).

   (a) Use the correct retention test tool, replacement pin, and replacement socket tools.
      1) Use the pin replacement tips when you do a test of the socket contacts.

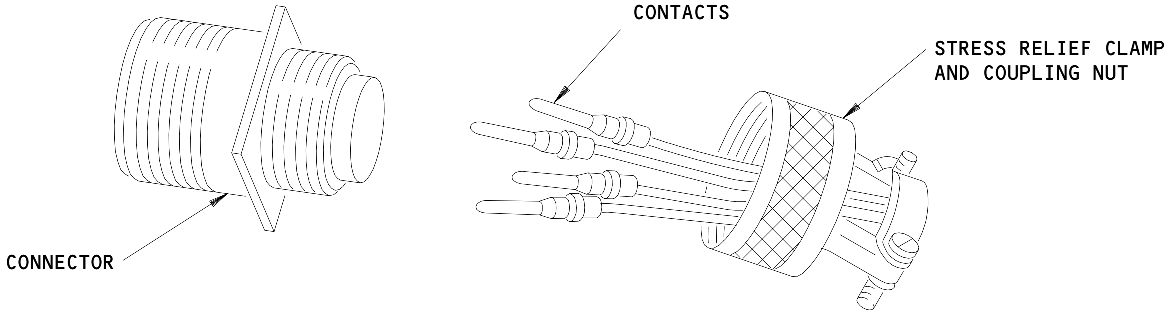


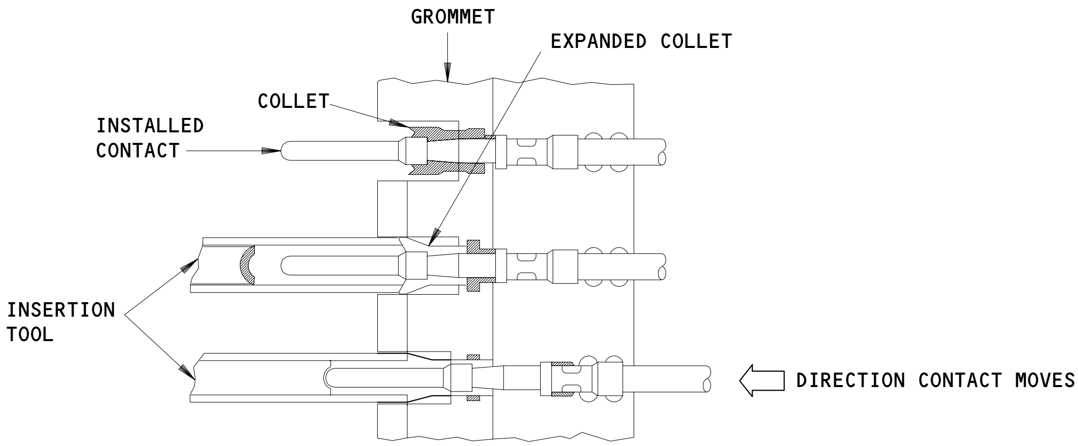


A-A

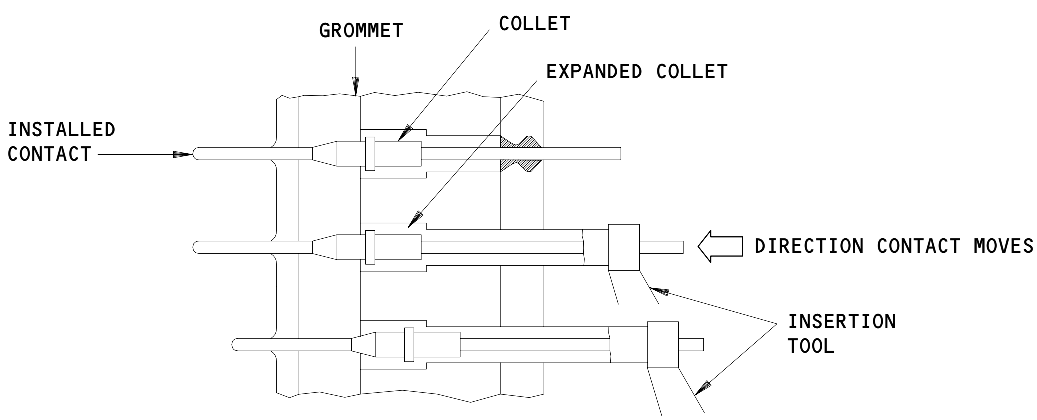
A

Wire Contact Installation
Figure 811





CONTACTS INSTALLED FROM THE FRONT



CONTACTS INSTALLED FROM THE REAR

Connector Contact Installation
Figure 812

2) Use the socket replacement tips when you do a test of the pin contacts.

CAUTION: BE CAREFUL WHEN YOU DO A CHECK OF THE CONTACTS. INCORRECT USE OF THE RETENTION TEST TOOL CAN CAUSE DAMAGE TO THE CONTACT, CONNECTOR GROMMET, OR TEST TOOL.

(b) Put the 16 or 20 gage retention test tool and replacement pin on the contact so they are in a straight line.
(c) To get the most accurate results, keep this position when you do a test on each contact.
(d) Apply pressure to the tool until you see that a minimum of half of the color-coded area is covered.
  1) At this point, there is 10 pounds (44.5 newtons) of pressure applied.
  2) If the contact is still in the same condition and position, the contact is satisfactory.
(e) Repeat the above steps for the other contacts.

S 438-104-N00
(12) Prepare the harness for the backshell connection.
(a) Make sure the braided shield in the harness is straight.

CAUTION: DO NOT PUT TAPE AROUND THE BRAIDED SHIELDS. THIS COULD CAUSE AN INCORRECT GROUND AND CAUSE DAMAGE TO THE EQUIPMENT.

(b) Wind the red rubber tape (Moxness 620-3/4) around the area of the harness assembly where the two halves of the backshell strain-relief clamp are installed (Fig. 808 or 809).
  1) Use a sufficient amount of tape around the harness to hold the harness tight between the clamps.
    a) The two clamp bar surfaces must touch at the two screw hole locations.
    b) No movement of the harness in the clamp is permitted.
(c) Fold the braided shield to the rear of the harness and over the top of the red rubber tape.
  1) For the aluminum backshell, put the braided shield equally around the harness.
  2) For the stainless steel backshell, make the braided shields into two groups:
    a) Put one group of the braided shields on the top of the harness to align with the backshell strain-relief clamp.
    b) Put the other group 180 degrees from the first group.

S 438-097-N00
(13) Connect the backshell to the connector (Fig. 807):
(a) Hold the connector in your hand and move the backshell over the harness and the folded braided shield.
(b) Connect the backshell coupling nut to the connector.

(c) Tighten the coupling nut by hand to engage the anti-rotation teeth.

(d) Install the correct size of connector adapter on the connector assembly (Fig. 807).

NOTE: The connector adapter kit is used to hold the connector assembly and prevent movement of the connector when you install the backshell. Use the CM-S-837 or CM-S-839T connector adapter kit, or equivalent.

(e) Tighten the backshell coupling nut to the connector until the metal surface of the coupling nut touches the metal surface of the connector.
   1) For the aluminum backshell, use a TG-70 or BT-BS-611 strap wrench, or equivalent.
   2) For the stainless steel backshell, use a standard crowfoot, TG-70, or BT-BS-611 strap wrench, or equivalent.

   NOTE: The rubber strap on the strap wrench will not hold the backshell if you apply too much force.

S 438-105-N00

(14) Install the backshell strain-relief clamp (Fig. 808 or 809).

(a) For connectors with aluminum backshells do as follows:
   1) Put the braided shields equally around the conical seat of the backshell.
   2) Move the conical ring over the harness.
   3) Put the conical ring into the rear of the backshell with the braided shields located between the backshell and the ring.
   4) Seat the conical ring into the backshell.
   5) If necessary, cut the braided shields that are not necessary on the rear side of the conical seat.
   6) Connect the nut for the strain relief clamp on the backshell and tighten the nut by hand.
   7) Tighten the strain-relief clamp assembly to the backshell with a TG-70 or BT-BS-611 strap wrench, or equivalent.

   NOTE: The rubber strap on the strap wrench will not hold the backshell if you apply too much force.

   8) Align the harness with each half of the strain-relief clamp.
      a) Make sure the harness is straight.
   9) Tighten the strain-relief clamp screws equally to engage the harness in the clamp correctly.
   10) Continue to tighten the screws until the clamp bar surfaces touch.
      a) The harness must not move in the clamp.

b) If the harness is not tight in the clamp, repeat the step to add the red rubber tape around the harness assembly.
c) If the clamp bar surfaces do not touch, remove some of the red rubber tape.
11) Torque the screws to 20 pound-inches (2.26 newton-meters).
(b) For the connectors with the stainless steel backshells, do as follows:
1) Align the harness in each half of the strain-relief clamp.
a) Make sure the harness is straight.
2) Make sure the two braided shield groups go between the red rubber tape and the strain-relief clamp halves.
a) Do this for each side of the clamp halves.
3) Tighten the strain-relief clamp screws equally to engage the harness in the clamp correctly.
a) Make sure the braided shields are straight.
4) Continue to tighten the screws until the clamp bars touch.
a) The harness must not move in the clamp.
b) If the harness is not tight in the clamp, repeat the step to add the red rubber tape around the harness assembly.
c) If the clamp bar surfaces do not touch, remove some of the red rubber tape.
5) Torque the screws to 20 pound-inches (2.26 newton-meters).
6) Fold the two groups of the braided shield over the strain-relief clamps and into the rear groove of the backshell.
7) To hold the braided shield, install the hose clamp on the rear backshell groove over the braided shields.
8) Tighten and torque the hose clamp screws to 20 pound-inches (2.26 newton-meters).
9) If necessary, cut the front side of the braided shield to the front of the clamp.

S 768-074-N00
(15) Do the adjustment/test procedure for the cable you repaired (AMM 71-51-00/501).

S 438-099-N00
(16) Install the lacing tape to the repaired wire harness, as necessary.

S 438-098-N00
(17) Install all the clamps that you removed.
H. Put the Airplane Back to its Usual Condition.

S 418-075-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Close the thrust reversers (AMM 78-31-00/201).

S 418-076-N00

(2) Close the core cowl panels (AMM 71-11-06/201).

S 418-085-N00

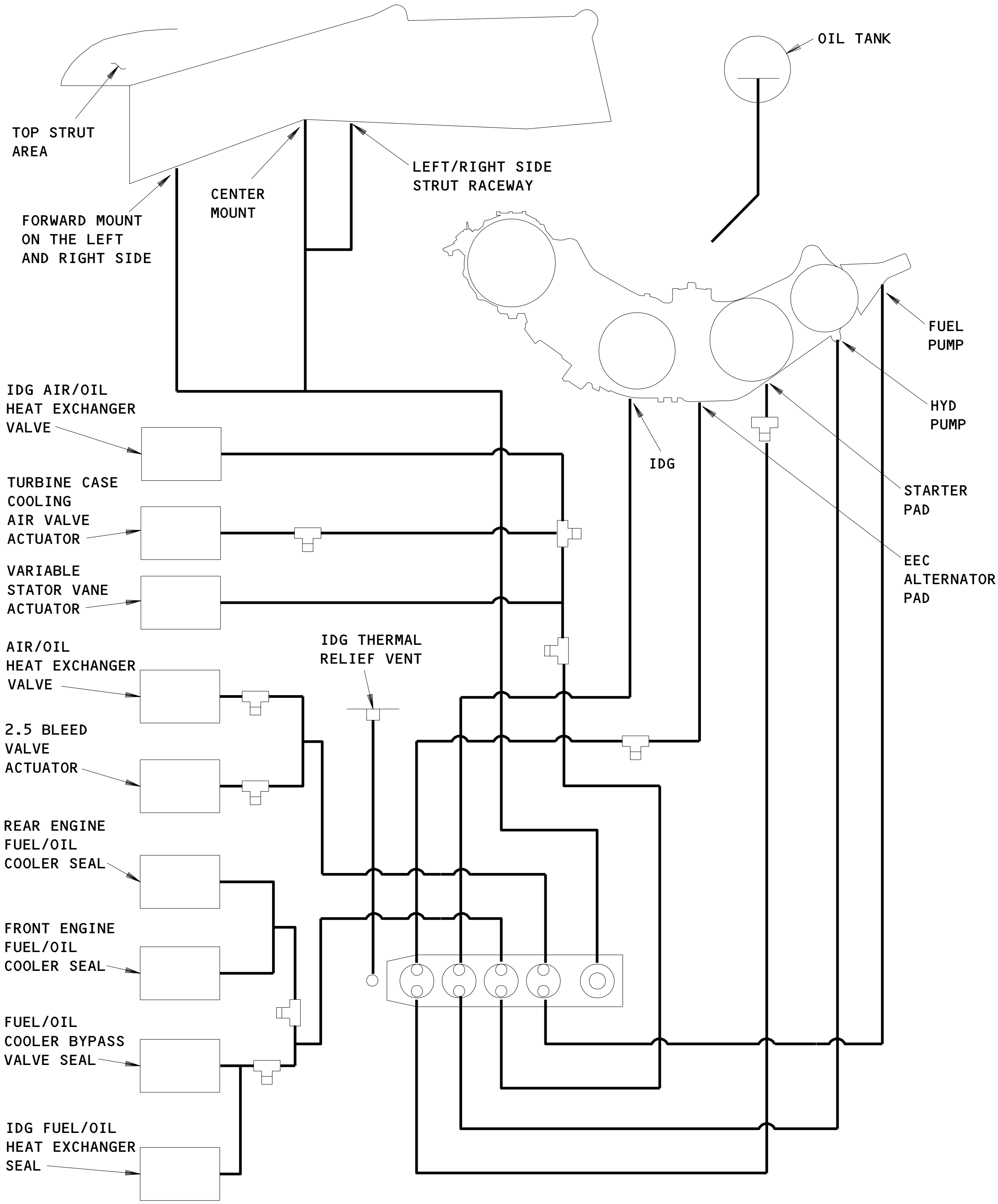
(3) Close the fan cowl panels (AMM 71-11-04/201).

S 448-077-N00

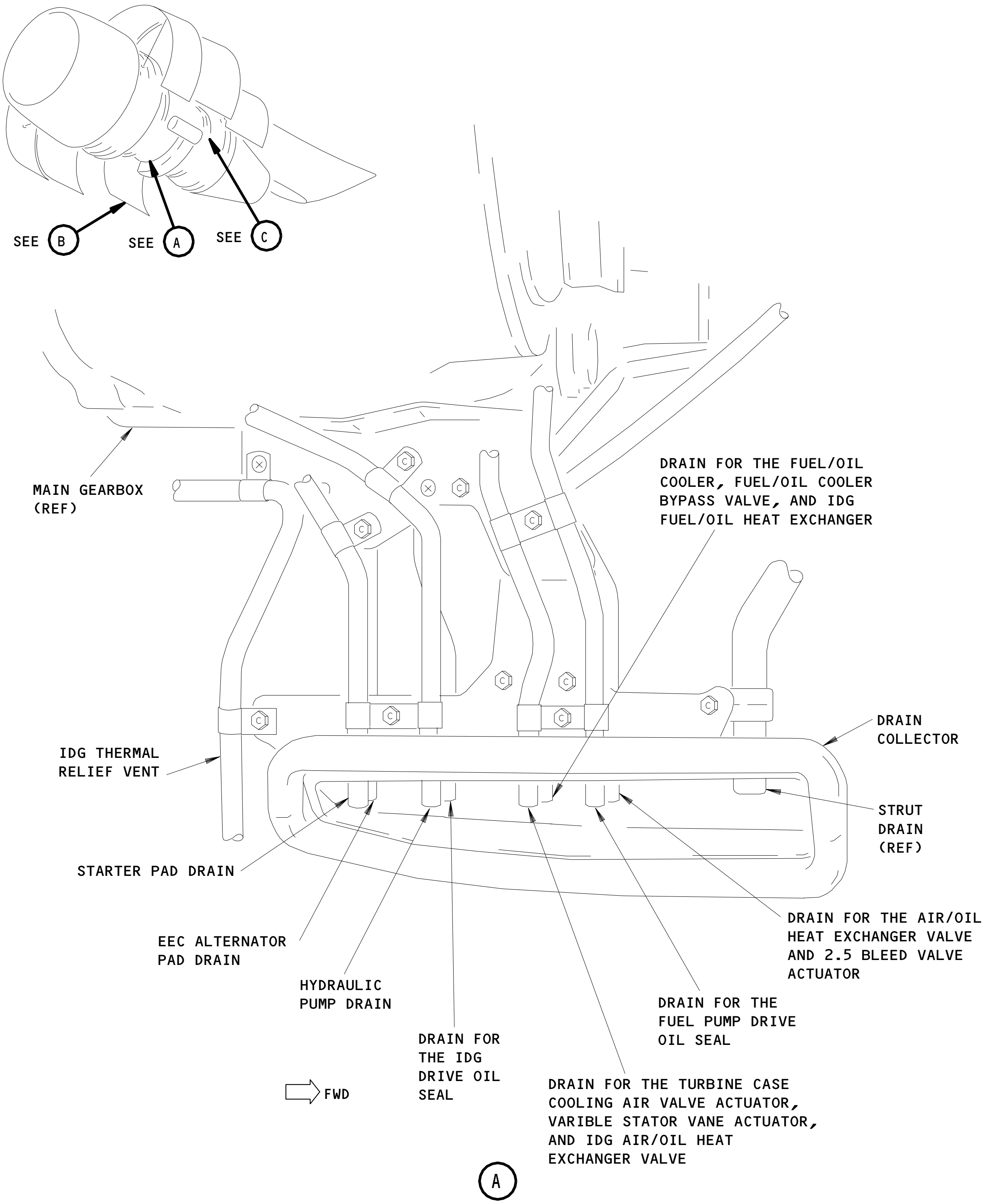
(4) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

ENGINE VENTS AND DRAINS - DESCRIPTION AND OPERATION

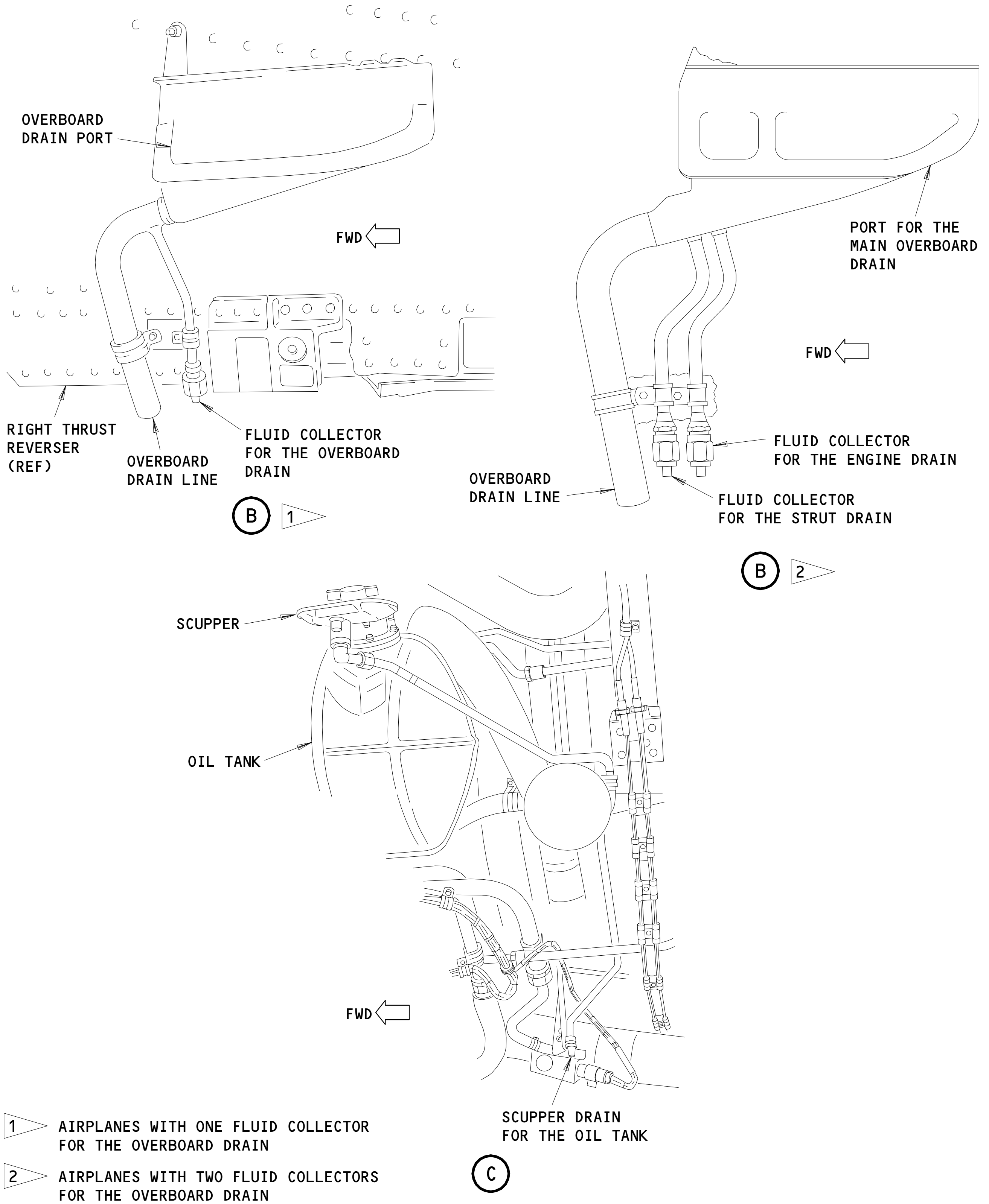
1. General (Fig. 1)
   A. The engine drains collect and discharge drain fluids overboard. Drain distribution consists of a front and rear drain system.
      (1) The front drain system consists of nine drains mounted on both sides of the engine. The drain outlets are grouped together at a drain collector on the lower right hand side of the engine.
      (2) The rear drain system conists of one drain line on the left side of the engine with its drain outlet located at a hole in the left core cowl.
   B. The engine vent system consists of the thermal relief vent for the IDG. This vent provides a path for excess heat to be dumped overboard.
   C. There are nine capped fittings in the front drain system which act as fluid traps. These fluid traps can be used to isolate the source of leakage when fluids are found draining from the drain collector.
2. Component Details (Fig. 2)
   A. The front drain system consists of the following drains.
      (1) Strut Drain
         (a) This drain collects fluid from the left/right side fireseal, the main strut and the strut raceway on the left and right sides.
      (2) Oil Seal Drain for the Fuel Pump Drive
      (3) Drain of the Air Shutoff Valve for Turbine Case Cooling, Actuator Drain for the Variable Stator Vanes, and the Valve Drain for the Heat Exchanger of the IDG Air/Oil
         (a) All of the above components have a separate capped fitting in the drain line except the actuator drain for the variable stator vanes.
         (b) The capped fittings in the drain line can be used as fluid traps to isolate the source of leakage.
      (4) Oil Seal Drain for the Hydraulic Pump Drive
      (5) Oil Seal Drain for the Starter Drive
         (a) This drain line has a capped fitting in line to be used as a fluid trap to indicate whether this component is leaking.
      (6) Oil Seal Drain for the Alternator Drive of the Electronic Engine Control (EEC)
         (a) This drain line has a capped fitting in line to be used as a fluid trap to indicate whether this component is leaking.
      (7) Oil Seal Drain for the Drive of the Integrated Drive Generator (IDG)
      (8) Fuel/Oil Cooler Drain
         (a) This drain collects fluids from the Heat Exchanger for the IDG Fuel/Oil, the Bypass Valve for the Fuel/Oil Cooler, the Fuel/Oil Cooler on the front of the engine and the Fuel/Oil Cooler on the rear of the engine.
         (b) The drain system of the heat exchanger for the IDG fuel/oil and the bypass valve for the fuel/oil cooler has a capped fitting which can be used as a fluid trap to isolate the source of leakage.



Drains and Vents System Schematic
Figure 1



Engine Vents and Drains
Figure 2 (Sheet 1)



Engine Vents and Drains
Figure 2 (Sheet 2)

(c) The drain system for the fuel/oil coolers on the front and rear of the engine has a capped fitting which can be used as a fluid trap to isolate the source of leakage.

(9) Valve Drain for the Air/Oil Heat Exchanger and the Actuator Drain for the 2.5 Bleed Valve

(a) The drain system for the valve for the air/oil heat exchanger and the actuator for the 2.5 bleed valve has a capped fitting which can be used as a fluid trap to isolate the source of leakage.

B. The rear drain system consists of the following drain:

(1) Drain for the Oil Tank Scupper

(a) This drain exits through the lower side of the left core cowl panel.

C. Vents

(1) The thermal relief vent for the IDG discharges just aft of the main drain collector.

D. Drain Collector

(1) All the drain discharge ends are secured to a drain collector attached to the bottom of the main gearbox. The drain fluids then exit from an overboard drain line through the main overboard drain port in the right thrust reverser.

(2) AIRPLANES WITH ONE FLUID COLLECTOR TUBE FOR THE OVERBOARD DRAIN;
A fluid collector tube for the overboard drain with a capped fitting off the overboard drain line serves as a fluid trap to indicate whether leakage has occurred in the forward drain system.

(3) AIRPLANES WITH TWO FLUID COLLECTOR TUBES FOR THE OVERBOARD-DRAIN;
Two fluid collector tubes for the overboard drain with capped fittings off the overboard drain line are used as fluid traps. One fluid trap catches leakage from the strut drain system while the other fluid trap catches the leakage from the engine drain system.

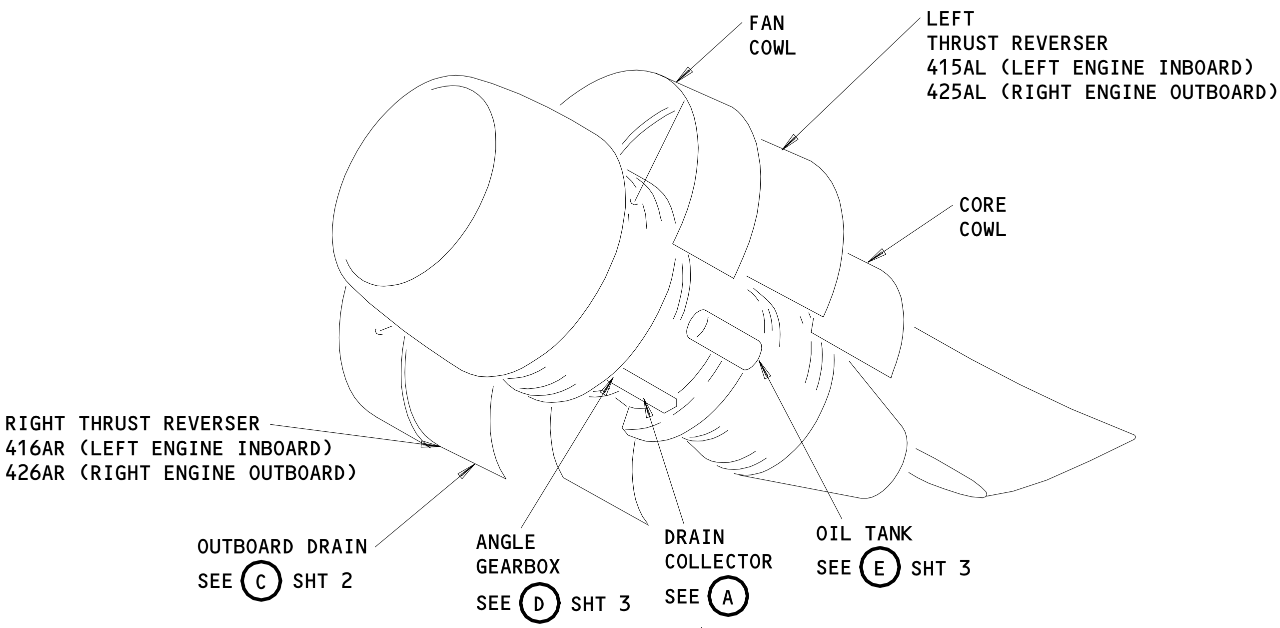
ENGINE VENTS AND DRAINS

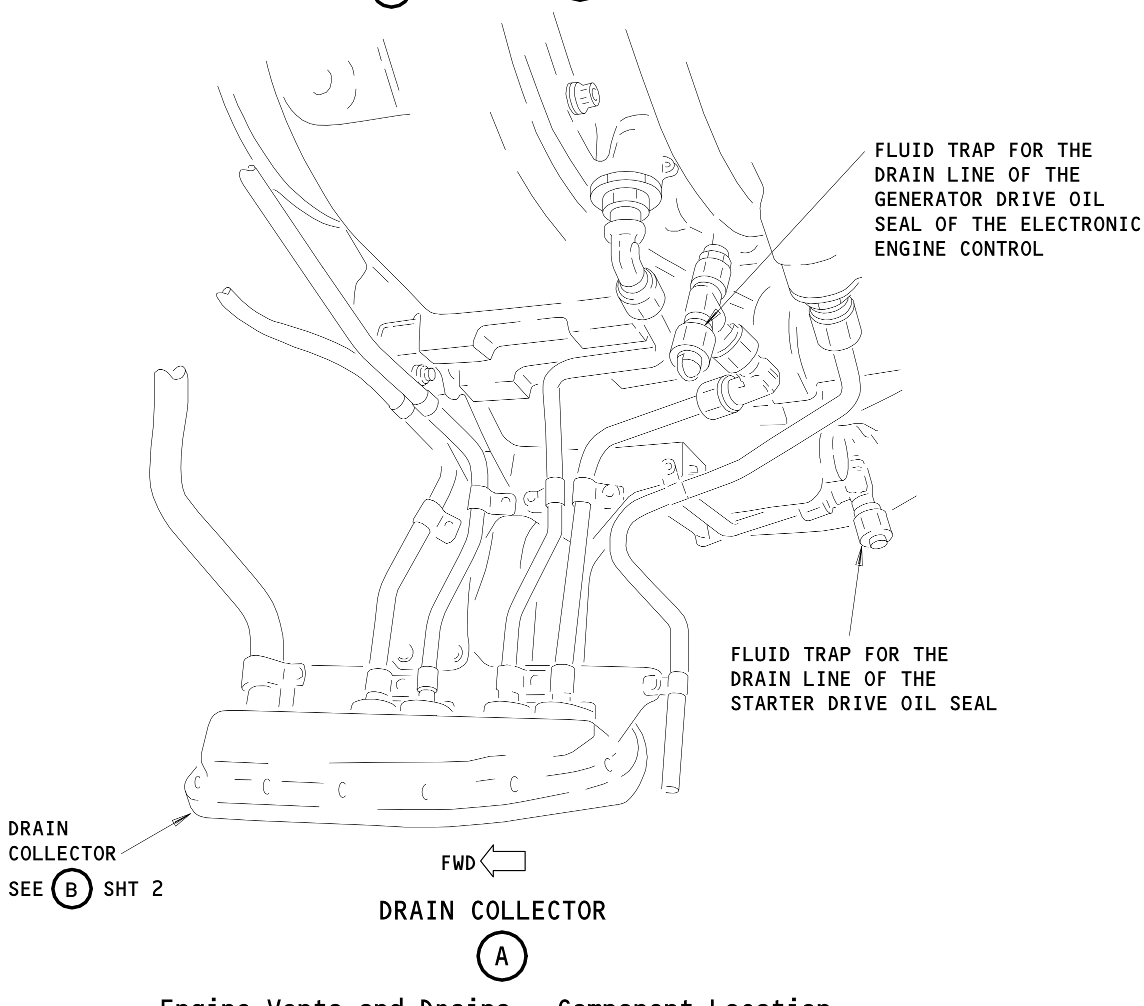
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
COLLECTOR - LEFT ENGINE DRAIN	1	1	416AR, DRAIN COLLECTOR	71-71-00
COLLECTOR - LEFT ENGINE OVERBOARD DRAIN FLUID	2	1	416AR, OVERBOARD DRAIN	71-71-00
COLLECTOR - RIGHT ENGINE DRAIN	1	1	426AR, DRAIN COLLECTOR	71-71-00
COLLECTOR - RIGHT ENGINE OVERBOARD DRAIN FLUID	2	1	426AR, OVERBOARD DRAIN	71-71-00
DRAIN - LEFT ENGINE AIR/OIL HEAT EXCHANGER VALVE AND 2.5 BLEED VALVE ACTUATOR	2	1	416AR, DRAIN COLLECTOR	71-71-00
DRAIN - LEFT ENGINE EEC ALTERNATOR DRIVE OIL SEAL	2	1	416AR, DRAIN COLLECTOR	71-71-00
DRAIN - LEFT ENGINE FUEL/OIL COOLER, FUEL/OIL COOLER BYPASS VALVE, AND IDG FUEL/OIL HEAT EXCHANGER	2	1	416AR, DRAIN COLLECTOR	71-71-00
DRAIN - LEFT ENGINE FUEL PUMP DRIVE OIL SEAL	2	1	416AR, DRAIN COLLECTOR	71-71-00
DRAIN - LEFT ENGINE HYDRAULIC PUMP DRIVE OIL SEAL	2	1	416AR, DRAIN COLLECTOR	71-71-00
DRAIN - LEFT ENGINE IDG DRIVE OIL SEAL	2	1	416AR, DRAIN COLLECTOR	71-71-00
DRAIN - LEFT ENGINE OIL TANK SCUPPER	5	1	417AL, AFT DRAIN	71-71-00
DRAIN - LEFT ENGINE STARTER DRIVE OIL SEAL	2	1	416AR, DRAIN COLLECTOR	71-71-00
DRAIN - LEFT ENGINE STRUT	2	1	416AR, DRAIN COLLECTOR	71-71-00
DRAIN - LEFT ENGINE TURBINE CASE COOLING AIR SHUTOFF VALVE, VARIABLE STATOR VANE ACTUATOR, AND IDG AIR/OIL HEAT EXCHANGER	2	1	416AR, DRAIN COLLECTOR	71-71-00
DRAIN - RIGHT ENGINE AIR/OIL HEAT EXCHANGER VALVE AND 2.5 BLEED VALVE ACTUATOR	2	1	426AR, DRAIN COLLECTOR	71-71-00
DRAIN - RIGHT ENGINE EEC ALTERNATOR DRIVE OIL SEAL	2	1	426AR, DRAIN COLLECTOR	71-71-00
DRAIN - RIGHT ENGINE FUEL/OIL COOLER, FUEL/OIL COOLER BYPASS VALVE, AND IDG FUEL/OIL HEAT EXCHANGER	2	1	426AR, DRAIN COLLECTOR	71-71-00
DRAIN - RIGHT ENGINE FUEL PUMP DRIVE OIL SEAL	2	1	426AR, DRAIN COLLECTOR	71-71-00
DRAIN - RIGHT ENGINE HYDRAULIC PUMP DRIVE OIL SEAL	2	1	426AR, DRAIN COLLECTOR	71-71-00
DRAIN - RIGHT ENGINE IDG DRIVE OIL SEAL	2	1	426AR, DRAIN COLLECTOR	71-71-00
DRAIN - RIGHT ENGINE OIL TANK SCUPPER	5	1	427AL, AFT DRAIN	71-71-00
DRAIN - RIGHT ENGINE STARTER DRIVE OIL SEAL	2	1	426AR, DRAIN COLLECTOR	71-71-00
DRAIN - RIGHT ENGINE STRUT	2	1	426AR, DRAIN COLLECTOR	71-71-00
DRAIN - RIGHT ENGINE TURBINE CASE COOLING AIR SHUTOFF VALVE, VARIABLE STATOR VANE ACTUATOR, AND IDG AIR/OIL HEAT EXCHANGER	2	1	426AR, DRAIN COLLECTOR	71-71-00
PORT - LEFT ENGINE MAIN OVERBOARD DRAIN	2	1	416AR, OVERBOARD DRAIN	71-71-00
PORT - RIGHT ENGINE MAIN OVERBOARD DRAIN	2	1	426AR, OVERBOARD DRAIN	71-71-00
TRAP - LEFT ENGINE AIR/OIL HEAT EXCHANGER ENGINE SEAL DRAIN LINE FLUID	2	1	415AL, ANGLE GEARBOX	71-71-00
TRAP - LEFT ENGINE EEC ALTERNATOR DRIVE OIL SEAL DRAIN LINE FLUID	1	1	415AL, DRAIN COLLECTOR	71-71-00
TRAP - LEFT ENGINE FUEL/OIL COOLER BYPASS VALVE AND IDG FUEL/OIL HEAT EXCHANGER DRAIN LINE FLUID	3	1	415AL, OIL TANK	71-71-00
TRAP - LEFT ENGINE FUEL/OIL HEAT EXCHANGER VALVE DRAIN LINE FLUID	3	1	415AL, OIL TANK	71-71-00
TRAP - LEFT ENGINE IDG AIR/OIL HEAT EXCHANGER VALVE DRAIN LINE FLUID	4	1	416AR, STATOR VANE ACTUATOR	71-71-00
TRAP - LEFT ENGINE STARTER DRIVE OIL SEAL DRAIN LINE FLUID	1	1	416AR, DRAIN COLLECTOR	71-71-00
TRAP - LEFT ENGINE TURBINE CASE COOLING AIR SHUTOFF VALVE DRAIN LINE FLUID	4	1	416AR, STATOR VANE ACTUATOR	71-71-00

Engine Vents and Drains - Component Index
Figure 101 (Sheet 1)

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
TRAP - LEFT ENGINE TURBINE CASE COOLING AIR SHUTOFF VALVE, VARIABLE STATOR VANE ACTUATOR, AND IDG AIR/OIL HEAT EXCHANGER VALVE DRAIN LINE FLUID	4	1	416AR, STATOR VANE ACTUATOR	71-71-00
TRAP - LEFT ENGINE 2.5 BLEED VALVE ACTUATOR DRAIN LINE FLUID	2	1	415AL, ANGLE GEARBOX	71-71-00
TRAP - RIGHT ENGINE AIR/OIL HEAT EXCHANGER ENGINE SEAL DRAIN LINE FLUID	2	1	425AL, ANGLE GEARBOX	71-71-00
TRAP - RIGHT ENGINE EEC ALTERNATOR DRIVE OIL SEAL DRAIN LINE FLUID	1	1	425AL, DRAIN COLLECTOR	71-71-00
TRAP - RIGHT ENGINE FUEL/OIL COOLER BYPASS VALVE AND IDG FUEL/OIL HEAT EXCHANGER DRAIN LINE FLUID	3	1	425AL, OIL TANK	71-71-00
TRAP - RIGHT ENGINE FUEL/OIL HEAT EXCHANGER VALVE DRAIN LINE FLUID	3	1	425AL, OIL TANK	71-71-00
TRAP - RIGHT ENGINE IDG AIR/OIL HEAT EXCHANGER VALVE DRAIN LINE FLUID	4	1	426AR, STATOR VANE ACTUATOR	71-71-00
TRAP - RIGHT ENGINE STARTER DRIVE OIL SEAL DRAIN LINE FLUID	1	1	426AR, DRAIN COLLECTOR	71-71-00
TRAP - RIGHT ENGINE TURBINE CASE COOLING AIR SHUTOFF VALVE DRAIN LINE FLUID	4	1	426AR, STATOR VANE ACTUATOR	71-71-00
TRAP - RIGHT ENGINE TURBINE CASE COOLING AIR SHUTOFF VALVE, VARIABLE STATOR VANE ACTUATOR, AND IDG AIR/OIL HEAT EXCHANGER VALVE DRAIN LINE FLUID	4	1	426AR, STATOR VANE ACTUATOR	71-71-00
TRAP - RIGHT ENGINE 2.5 BLEED VALVE ACTUATOR DRAIN LINE FLUID	2	1	425AL, ANGLE GEARBOX	71-71-00
VENT - LEFT ENGINE IDG THERMAL RELIEF	2	1	416AR, DRAIN COLLECTOR	71-71-00
VENT - RIGHT ENGINE IDG THERMAL RELIEF	2	1	426AR, DRAIN COLLECTOR	71-71-00

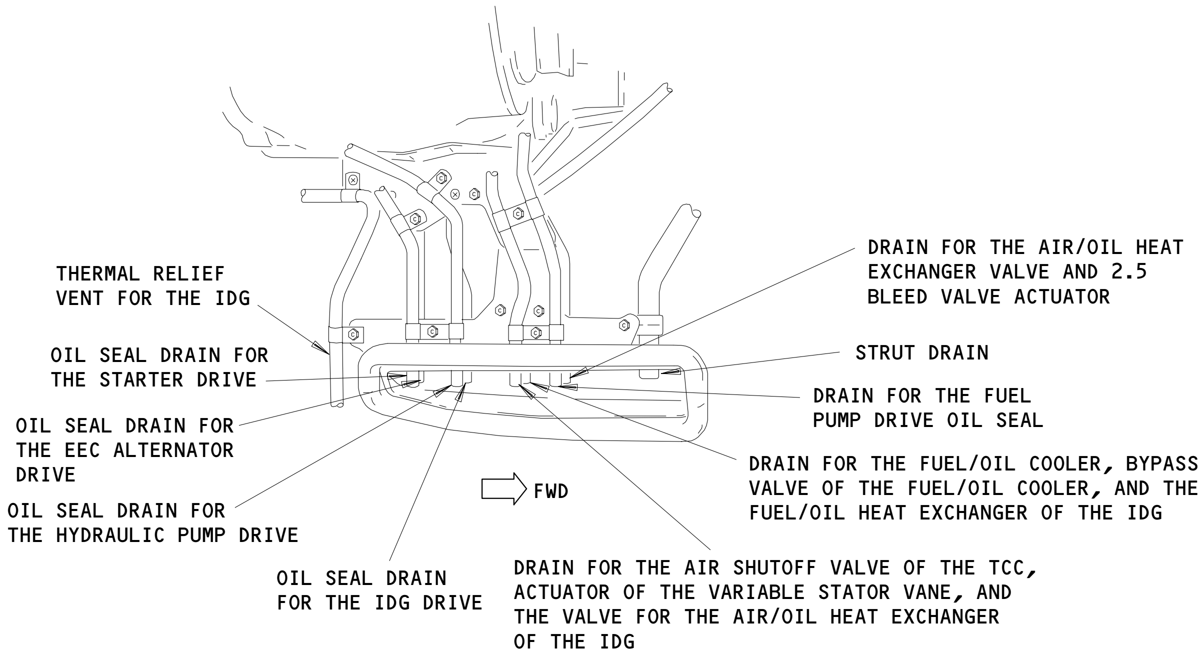
Engine Vents and Drains - Component Index
Figure 101 (Sheet 2)



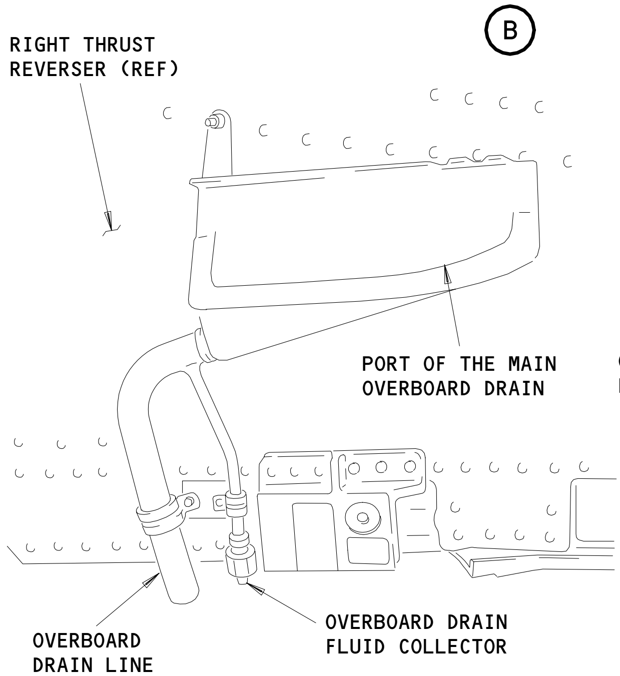


DRAIN COLLECTOR
A

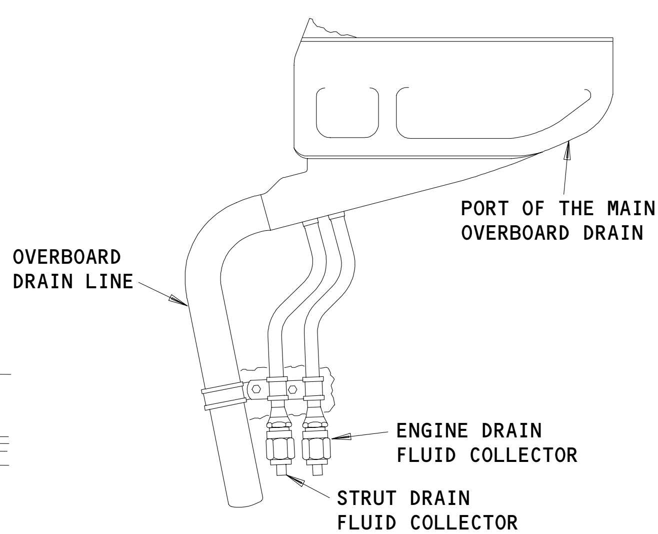
Engine Vents and Drains - Component Location
Figure 102 (Sheet 1)



DRAIN COLLECTOR
B



OVERBOARD DRAIN
C 1

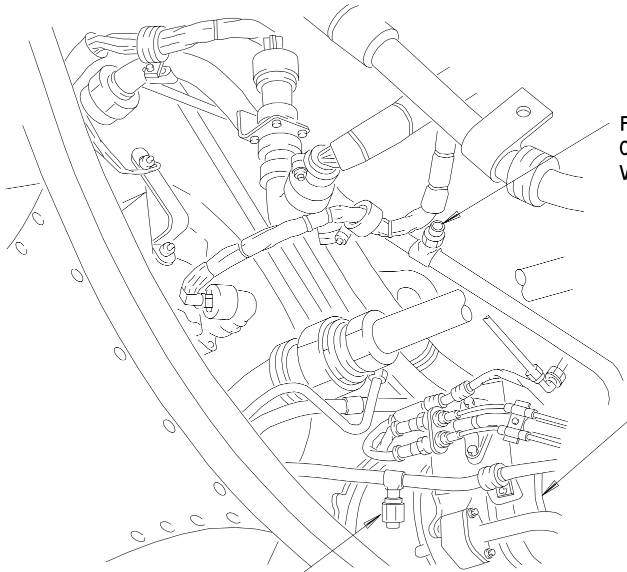


OVERBOARD DRAIN
C 2

1 AIRPLANES WITH ONE FLUID COLLECTOR TUBE FOR THE OVERBOARD DRAIN

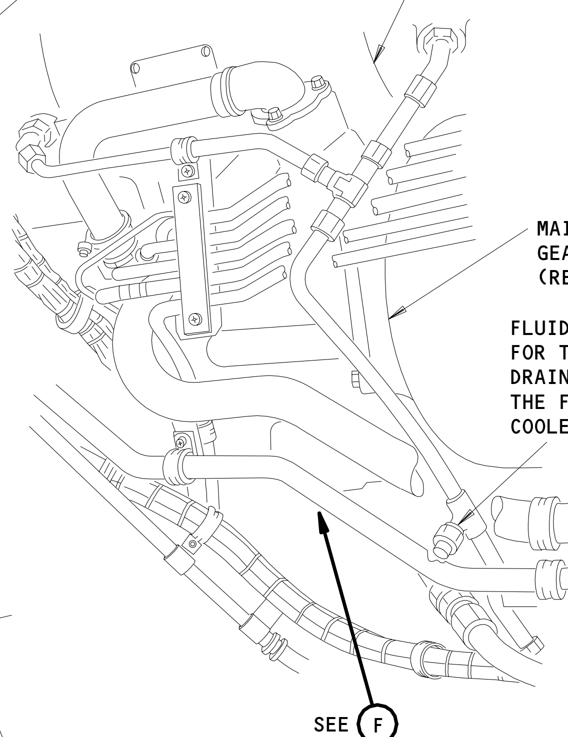
2 AIRPLANES WITH TWO FLUID COLLECTOR TUBES FOR THE OVERBOARD DRAIN

Engine Vents and Drains - Component Location (Details from Sht 1)
Figure 102 (Sheet 2)



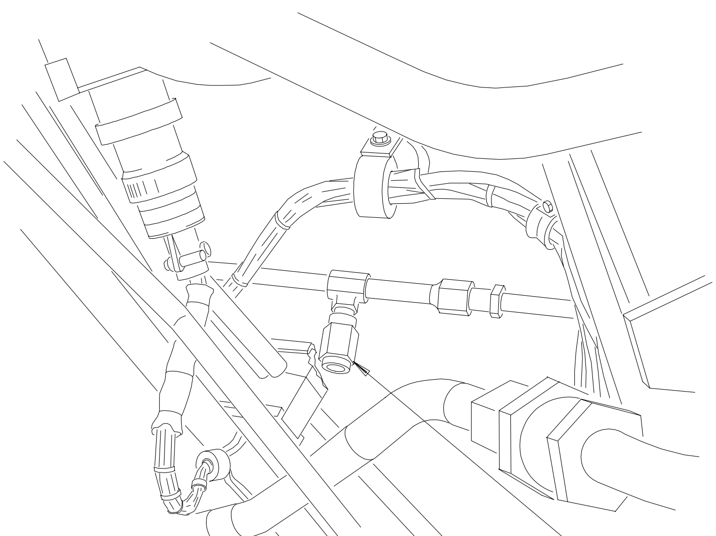
ANGLE GEARBOX

D FROM SHT 1



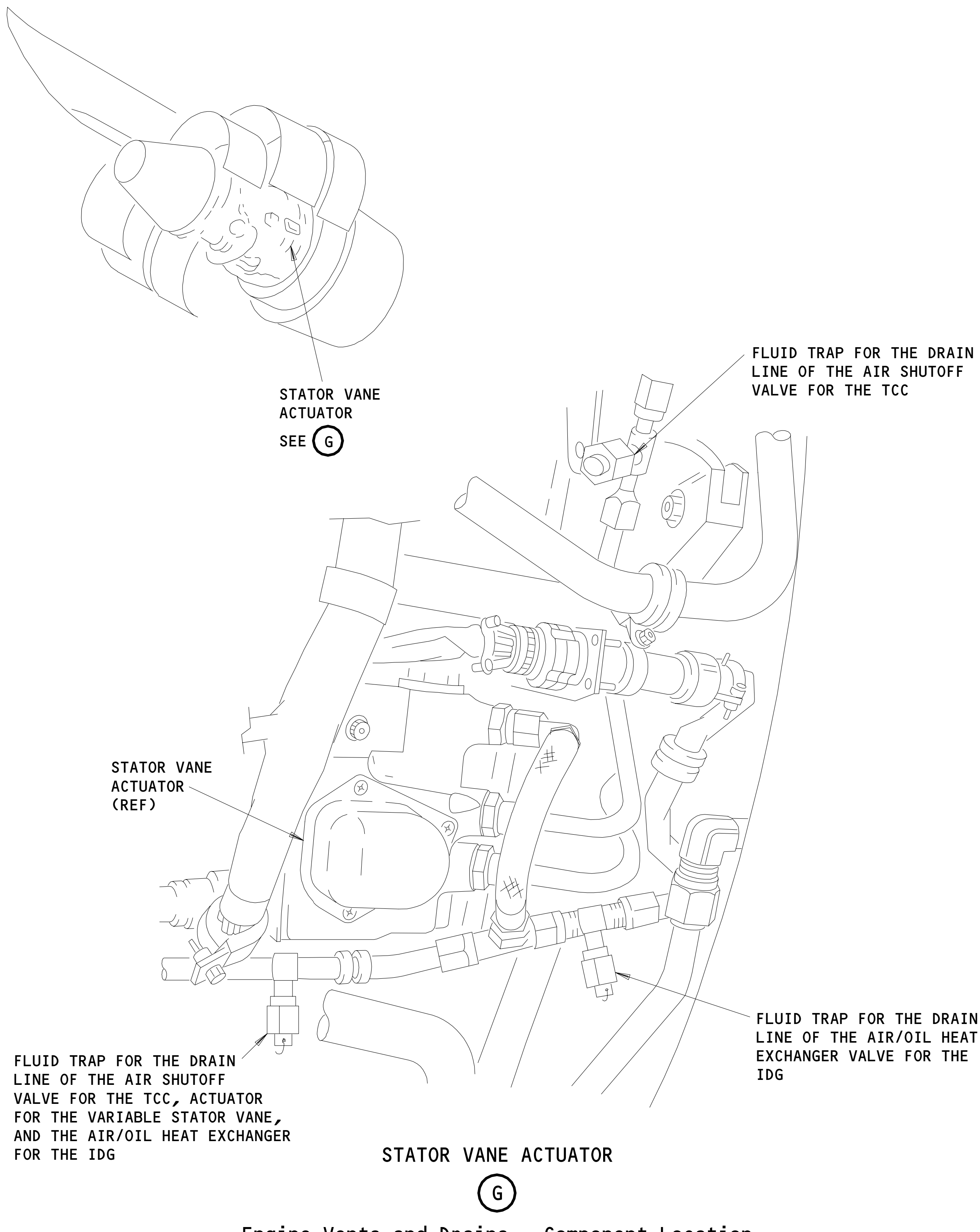
OIL TANK

E FROM SHT 1



F

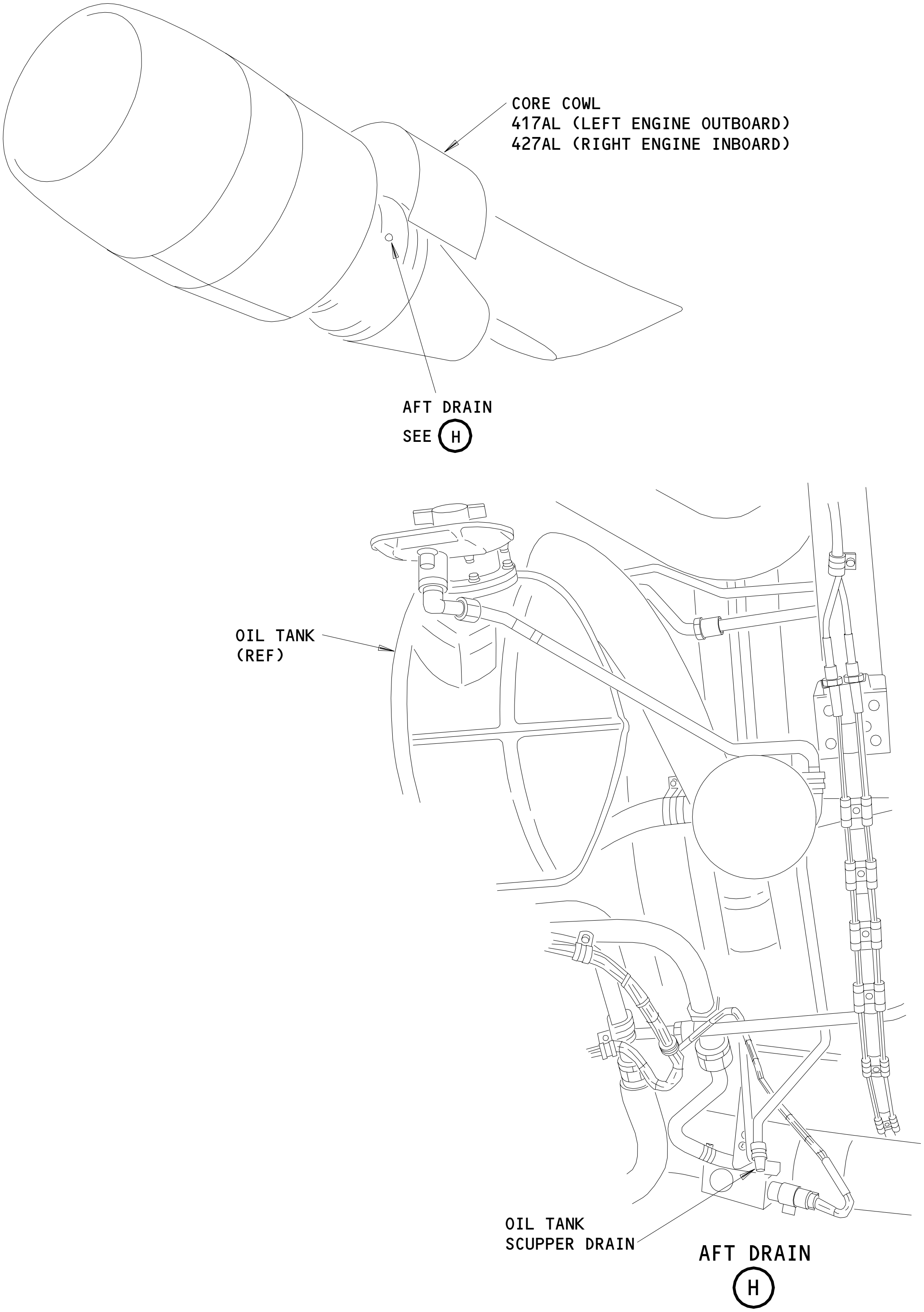
Engine Vents and Drains - Component Location
Figure 102 (Sheet 3)



STATOR VANE ACTUATOR

G

Engine Vents and Drains - Component Location
Figure 102 (Sheet 4)



Engine Vents and Drains - Component Location
Figure 102 (Sheet 5)

ENGINE VENTS AND DRAINS - MAINTENANCE PRACTICES (STRUT DRAIN CLEARING)

1. General
   A. This section gives instructions to clean the strut drain lines. You can do this task when you can get access to the drain line during other maintenance procedures.

TASK 71-71-00-102-022-N00

2. Clean the Strut Drain Lines
   A. Equipment
      (1) Supply, hose and nozzle for the regulated, air pressure
      (2) Plugs for 3/8, 1/2, and 3/4 inch drain lines
   B. References
      (1) AMM 54-53-01/401, Strut Pressure Relief and Access Doors
      (2) AMM 71-11-04/201, Fan Cowl Panels
      (3) AMM 71-11-06/201, Core Cowl Panels
      (4) AMM 78-31-00/201, Thrust Reverser System
   C. Access
      (1) Location Zones

411	Left Engine
421	Right Engine

      (2) Access Panels

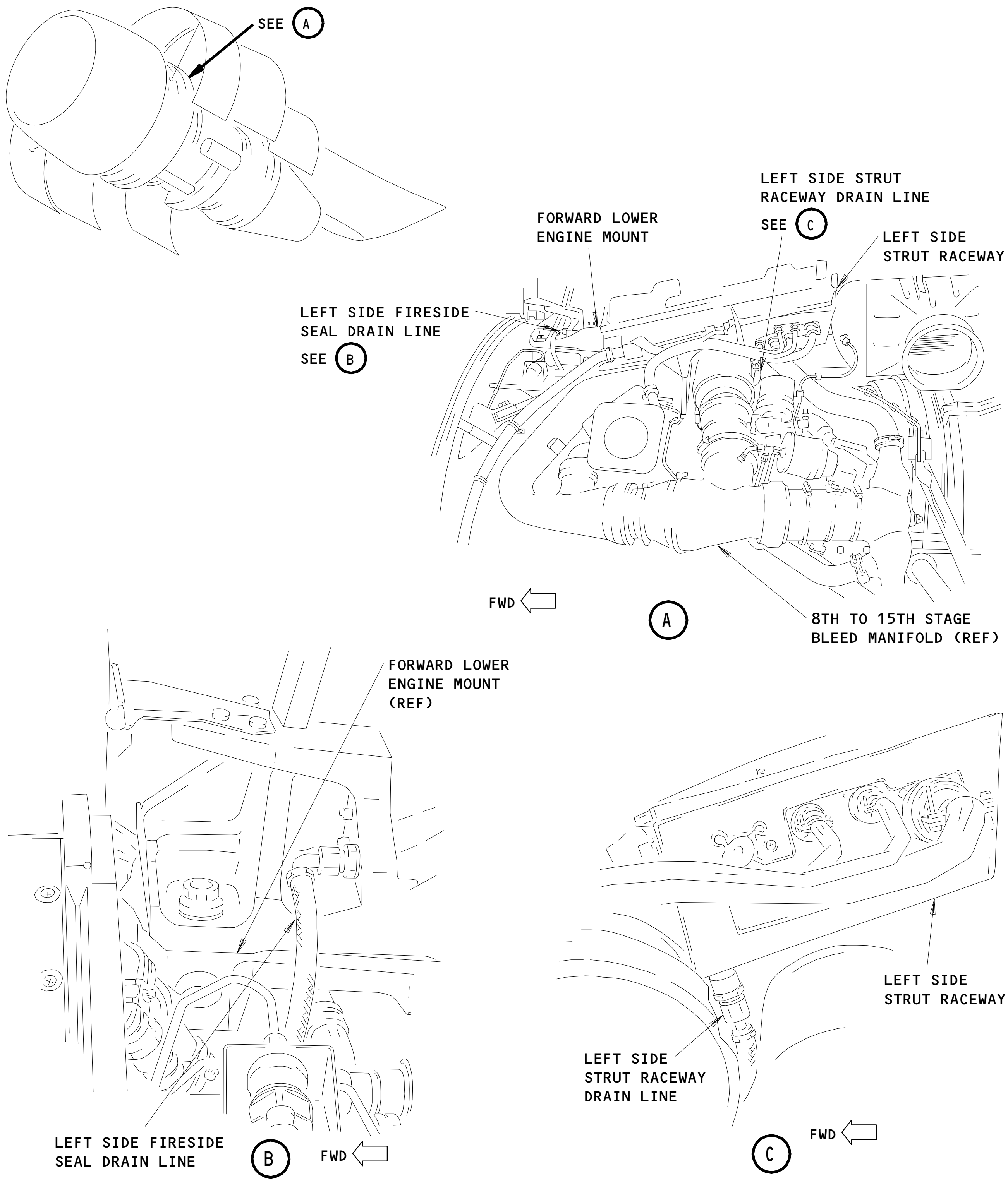
413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
416BR	Push-Pull Cable Access Panel, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
426BR	Push-Pull Cable Access Panel, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

   D. Prepare to clear the strut drain lines

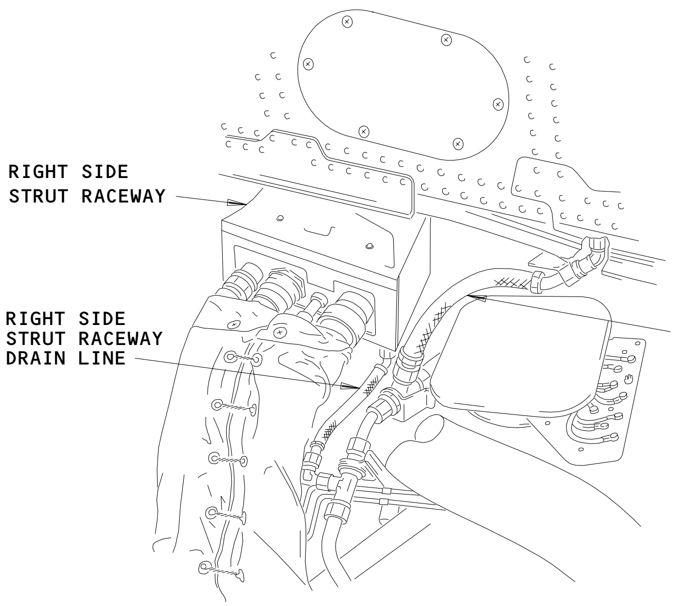
S 042-023-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE THRUST REVERSER TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

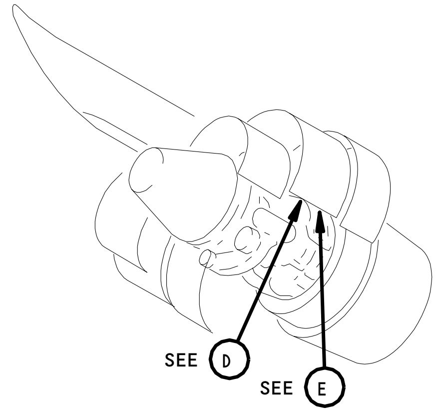
      (1) Do the deactivation procedure for the thrust reverser for ground Maintenance (AMM 78-31-00/201).

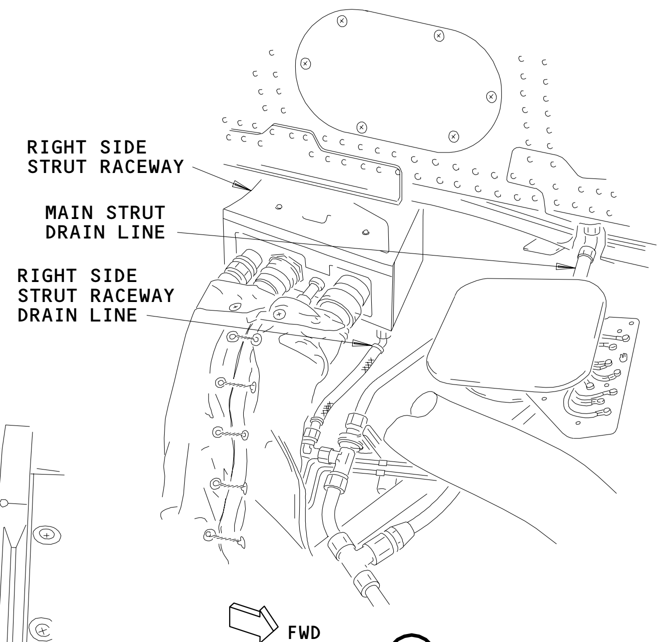


Strut Drains
Figure 201 (Sheet 1)

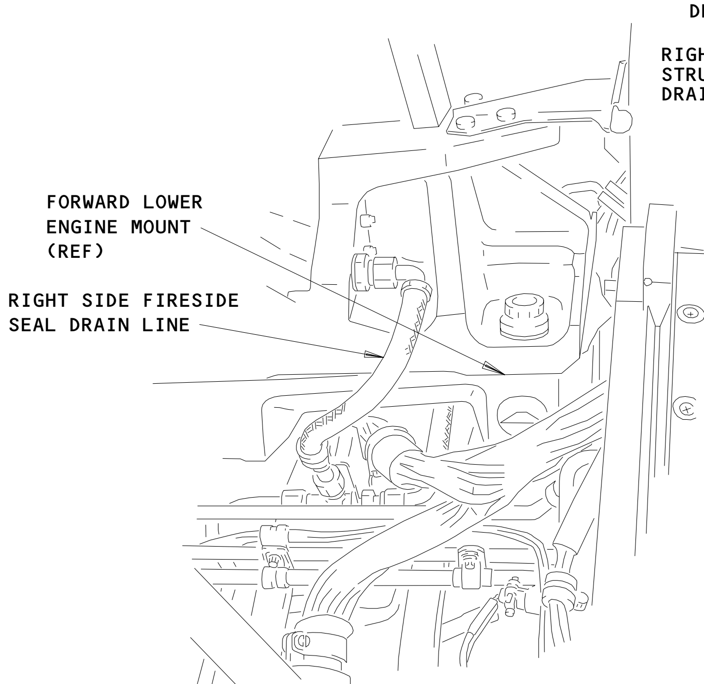


D 1





D 2

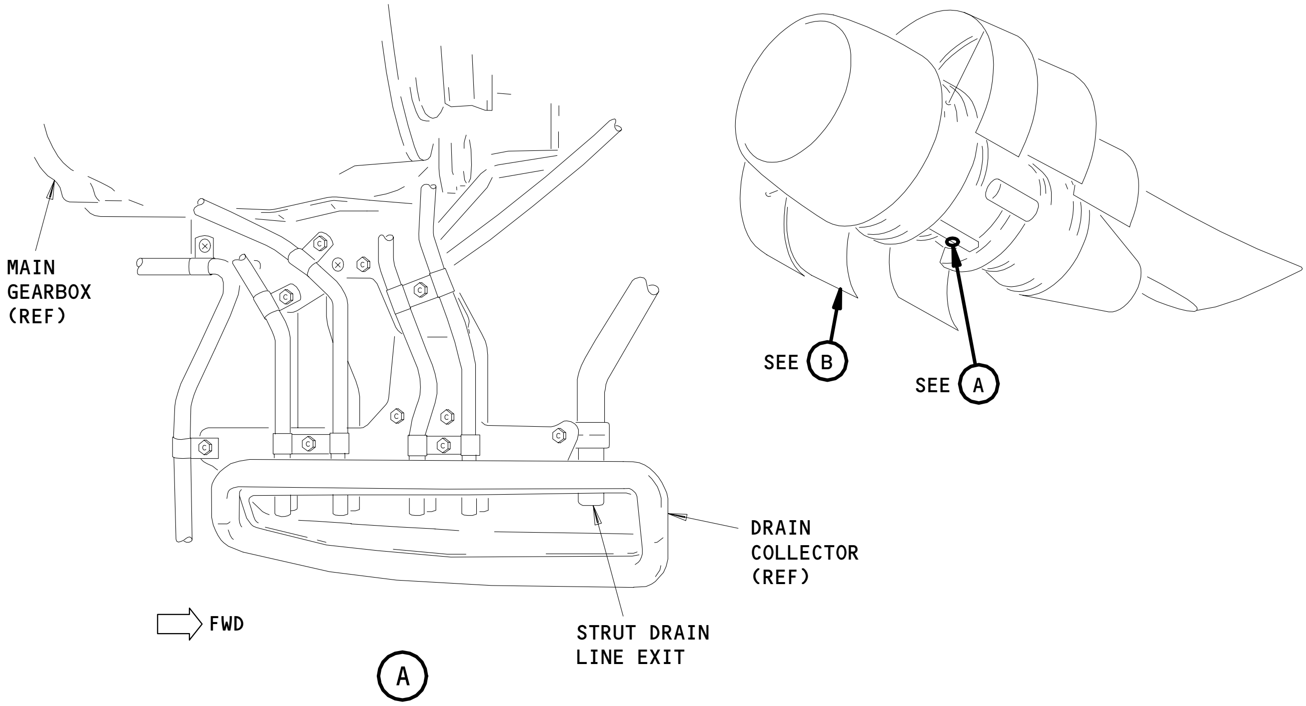


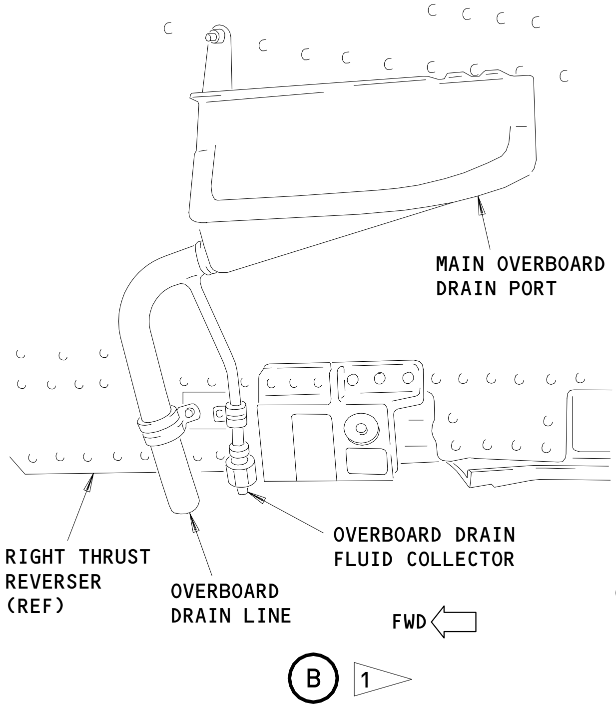
E

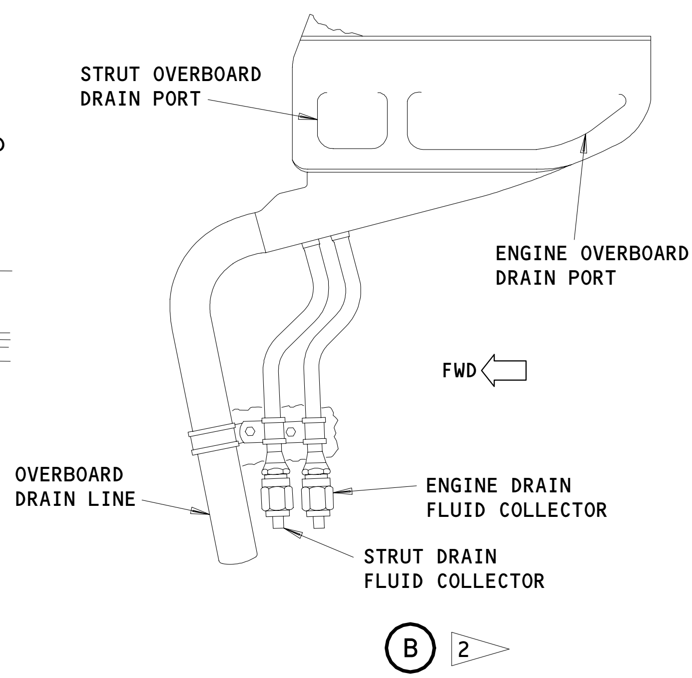
1 AIRPLANES WITH MAIN-STRUT DRAIN LINE AFT OF THE SURGE BLEED VALVE

2 AIRPLANES WITH MAIN-STRUT DRAIN LINE FORWARD OF THE SURGE BLEED VALVE

Strut Drains
Figure 201 (Sheet 2)







1 AIRPLANES WITH ONE OVERBOARD-DRAIN FLUID-COLLECTOR TUBE

2 AIRPLANES WITH TWO OVERBOARD-DRAIN FLUID-COLLECTOR TUBES

Strut Overboard Drain Lines
Figure 202

S 012-013-N00
(2) Open the fan cowl panel (AMM 71-11-04/201).

S 012-002-N00
(3) Open the core cowl panels (AMM 71-11-06/201).

S 012-003-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS WHEN YOU OPEN THE THRUST REVERSERS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the thrust reverser (AMM 78-31-00/201).

S 012-004-N00
(5) Remove the forward access panel 416BR and 426BR (AMM 54-53-01/401).

S 482-005-N00
(6) Connect the air pressure source to the exit on the strut drain line.

E. Clean the Drain Lines of the Main Strut

S 162-007-N00
(1) Clean the drain lines on the main strut as follows:
   (a) Install the plugs to the drain line entrances on the left and right side strut raceway.
   (b) Install the plugs to the drain line entrances on the left and right side fireside seal.
   (c) Remove the unwanted materials from the drain line entrance on the main strut.
   (d) Apply 20-30 psig air pressure to the drain line exit on the main strut.
      1) Make sure that the drain line from the entrance to the exit is clean.
   (e) Remove the unwanted materials from the drain line entrance on the main strut.
   (f) Install a plug on the drain line entrance on the main strut.

F. Clean the Drain Lines on the Strut Raceway

S 162-008-N00
(1) Clean the drain lines on the left side strut raceway as follows:
   (a) Remove the plug from the drain line entrances on the left side strut raceway.
   (b) Remove the unwanted materials from the drain line entrance on the left side strut raceway.
   (c) Apply 20-30 psig air pressure to the drain line exit on the strut raceway.
      1) Make sure that the drain line from the entrance to the exit is clean.

(d) Remove the unwanted materials from the drain line entrance on the left side strut raceway.

S 162-009-N00

(2) Clean the drain line on the right side strut raceway as follows:
(a) Remove the plug from the drain line entrance on the right side strut raceway.
(b) Install a plug on the drain line entrance on the left side strut raceway.
(c) Remove the unwanted materials from the drain line entrance on the right side strut raceway.
(d) Apply 20-30 psig air pressure to the drain line exit of the strut raceway.
1) Make sure that the drain line from the entrance to the exit is clear.
(e) Remove the unwanted materials from the drain line entrance on the right side strut raceway.
(f) Install a plug on the drain line entrance of the right side strut raceway.

G. Clean the drain lines of the fireside seal

S 162-010-N00

(1) Clean the drain line entrance on the right side fireside seal as follows:
(a) Remove the plug from the drain line entrance on the right side fireside seal.
(b) Remove the unwanted materials from the drain line entrance on the right side of the strut fireside seal.
(c) Apply 20-30 psig air pressure to the drain line exit on the right side fireside seal.
1) Make sure that the drain line from the entrance to the exit is clear.
(d) Remove the unwanted materials from the drain line entrance on the right side fireside seal.

S 162-011-N00

(2) Clean the drain line on the left side fireside seal as follows:
(a) Remove the plug from the drain line entrance on the left side fireside seal.
(b) Install a plug on the drain line entrance of the right side fireside seal.
(c) Remove the unwanted materials from the drain line entrance on the left side fireside seal.
(d) Apply 20-30 psig air pressure to the drain line exit on the left side fireside seal.
1) Make sure that the drain line from the entrance to the exit is clear.
(e) Remove the unwanted materials from the drain line entrance on the left side fireside seal.
(f) Remove the plug from the drain line entrance on the right side fireside seal.

(g) Remove the plug from the drain line entrances on the left and right sides of the strut raceway.

(h) Remove the plug from the drain line entrance on the main strut.

H. Clean the overboard drain line

S 162-020-N00

CAUTION: PREVENT THE ENGINE CONTROL COMPONENTS (THE THRUST CONTROL CABLES, THE FEEDBACK PUSH-PULL CABLES FOR THE THRUST REVERSER, THE PUSH-PULL CABLES FOR THE THRUST CONTROL, AND THE STRUT CONTROL BOX) IN THE STRUT AREA FROM MOISTURE. COLLECTED MOISTURE CAN CAUSE THE ICE ON THE ENGINE CONTROL COMPONENTS AND CAUSE DAMAGE TO THE ENGINE CONTROL COMPONENTS.

(1) Clean the overboard drain line as follows:

(a) Apply 20-30 psig air pressure to the overboard drain line at the exit end.

1) Make sure the overboard drain line from the entrance to the exit is clear.

(b) Clean the unwanted materials from the port on the main drain overboard.

S 162-021-N00

(2) Clean the fluid collectors on the overboard drain line.

(a) AIRPLANES WITH ONE OVERBOARD-DRAIN FLUID-COLLECTOR TUBE; Do the steps that follow:

1) Remove the caps from the fluid collector with the 3/8 inch diameter.

2) Apply 20-30 psig air pressure to the fluid collector at the lower end.

a) Make sure the fluid collector is clear.

3) Clean the seal area of the unwanted materials.

4) Install the caps on the fluid collectors.

(b) AIRPLANES WITH TWO OVERBOARD-DRAIN FLUID-COLLECTOR TUBES; Do the steps that follow:

1) Remove the caps from the fluid collectors on the engine drain line and the strut drain line.

2) Apply 20-30 psig air pressure to each fluid collector at the lower end.

a) Make sure the fluid collectors are clear.

3) Clean the unwanted materials from the seal area.

4) Install the caps on the fluid collectors.

I. Put the airplane back to the usual configuration

S 082-014-N00

(1) Remove the air pressure source from the drain line exit on the strut.

S 412-015-N00

(2) Install the forward access panel 416BR and 426BR (AMM 54-53-01/401).

S 412-016-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO CLOSE THE THRUST REVERSER. IF YOU DO NOT OBEY THE INSTRUCTIONS WHEN YOU CLOSE THE THRUST REVERSERS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(3) Close the thrust reverser (AMM 78-31-00/201).

S 412-017-N00

(4) Close the core cowl panel (AMM 71-11-06/201).

S 412-018-N00

(5) Close the fan cowl panels (AMM 71-11-04/201).

S 442-019-N00

(6) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

ENGINE VENTS AND DRAINS - INSPECTION/CHECK

1. General
   A. This procedure has a task to examine the engine drains for leakage. There are nine fittings with caps on them in the front drain system. These fittings are used as fluid traps. These fluid traps are used to isolate the sources of the leakage when fluids drain into the drain collector. This procedure has the leakage limits and the steps to correct a leakage that is not in the specified limits.
   B. The engine drains are in two locations on the engine:
      (1) There is a group of drains at the drain collector on the bottom, right side of the engine,
      (2) There is one drain on the left side of the engine.
   C. The fluid traps on the drains help you find the component that has the leakage. A schematic shows where the traps are located.
   D. After you find which component leaks, you will run the engine to find how much leakage there is. The leakage will drain into the drain collector and then into the fluid collector for the engine drain. This tube holds approximately 10 cc of fluid. The maximum permitted leakage for a component is 1.0 cc/min. The fluid collector tube holds sufficient fluid to do this check.

TASK 71-71-00-216-001-N00

2. Examine the Vents and the Drains on the Engine
   A. References
      (1) AMM 24-11-12/401, IDG Air/Oil Heat Exchanger Valve
      (2) AMM 29-11-05/401, Engine Driven Pump
      (3) AMM 71-11-04/201, Fan Cowl Panel
      (4) AMM 71-11-06/201, Core Cowl Panel
      (5) AMM 72-61-03/401, Starter Drive Oil Seals
      (6) AMM 72-61-04/401, IDG Drive Oil Seal
      (7) AMM 72-61-05/401, EEC Alternator Drive Oil Seal
      (8) AMM 72-61-06/401, Fuel Pump Drive Oil Seal
      (9) AMM 72-61-07/401, Rear Hydraulic Pump Drive Oil Seal
      (10) AMM 75-24-05/401, Turbine Case Cooling Air Shutoff Valve Actuator
      (11) AMM 75-31-02/401, Variable Stator Vane Actuator
      (12) AMM 75-32-01/401, 2.5 Bleed Valve Actuator
      (13) AMM 78-31-00/201, Thrust Reverser System
      (14) AMM 79-21-01/401, Fuel/Oil Cooler
      (15) AMM 79-21-09/401, Air/Oil Heat Exchanger Valve
   B. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
415AL	Fan Reverser, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
425AL	Fan Reverser, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

C. Procedure

S 046-003-N00

WARNING: DO THE DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

(1) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 016-004-N00

(2) Open the fan cowl panels (AMM 71-11-04/201).

S 016-005-N00

(3) Open the core cowl panels (AMM 71-11-06/201).

S 016-006-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the thrust reversers (AMM 78-31-00/201).

S 216-002-N00

CAUTION: DO NOT ADD MATERIAL INTO THE DRAIN TUBES OR DRAIN COLLECTOR TO FIND A LEAK OR TO STOP A LEAK. IF THERE IS A BLOCKED DRAIN, THE FLUID CAN COLLECT IN THE DRAIN CAVITY. THIS FLUID CAN CAUSE DAMAGE TO THE SEALS, CONTAMINATION OF THE OIL SYSTEM, OR CONTAMINATION OF THE ACCESSORIES. A BLOCKED DRAIN CAN ALSO LET FLUIDS INTO THE COWLING AREA. THESE FLUIDS CAN BE FLAMMABLE OR THEY CAN CAUSE CORROSION WHICH CAN CAUSE DAMAGE TO THE COWLING AREA.

(5) Examine the drains for leakage (Fig. 601 through 603).
  (a) Examine the ends of the drain tubes at the gang drains to determine which drain tube has the leakage.
  (b) When you determine which drain tube has the leakage, identify which component connects to it.
  (c) If there are multiple components that lead into the drain tube, follow the tube toward the component fluid trap (Fig. 602 and 603).

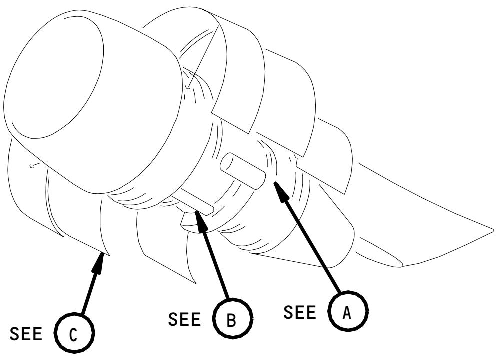
  NOTE: The fluid trap will help you to identify the component with the leakage.

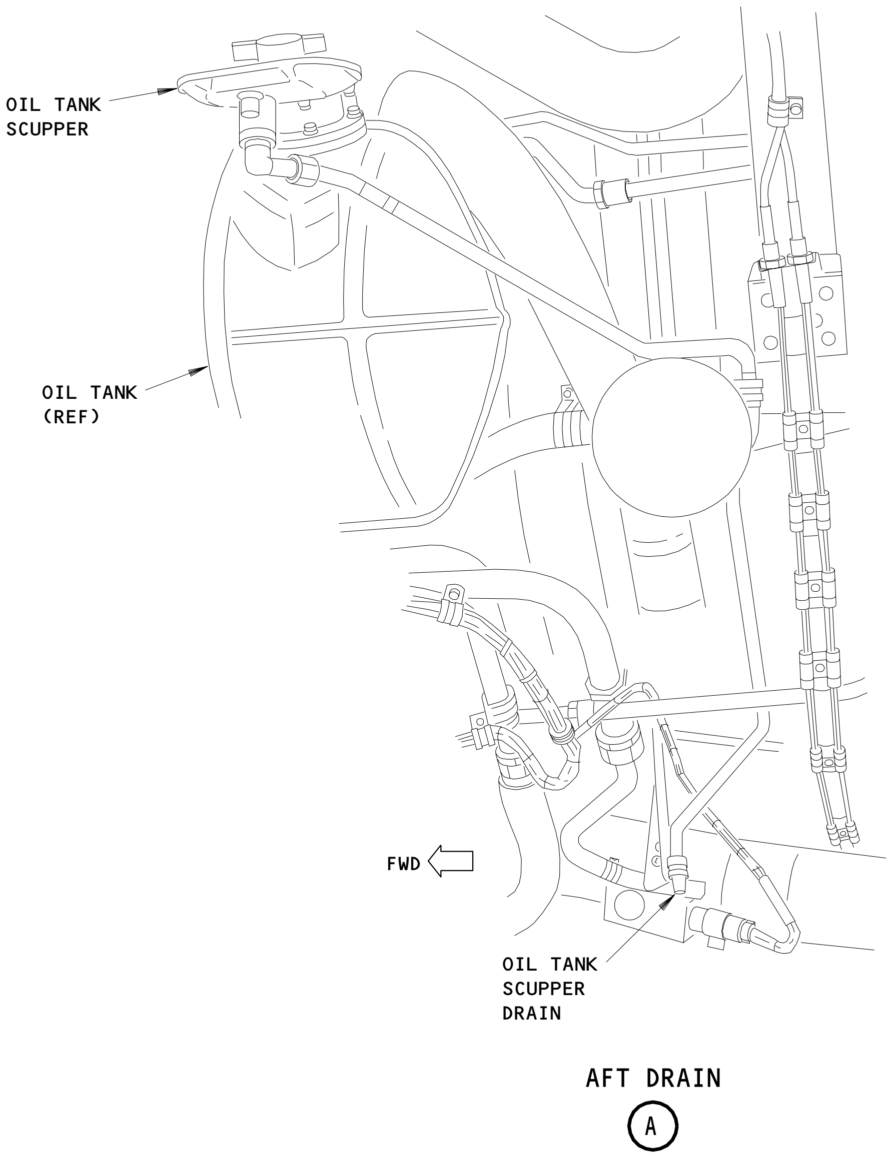
  (d) Remove the cap on the fluid trap and look for leakage.
  (e) If necessary, remove the tee between the tubes for the bypass valve for the fuel oil cooler and the heat exchanger for the IDG fuel/oil.

  NOTE: These two components lead to the same fluid trap.

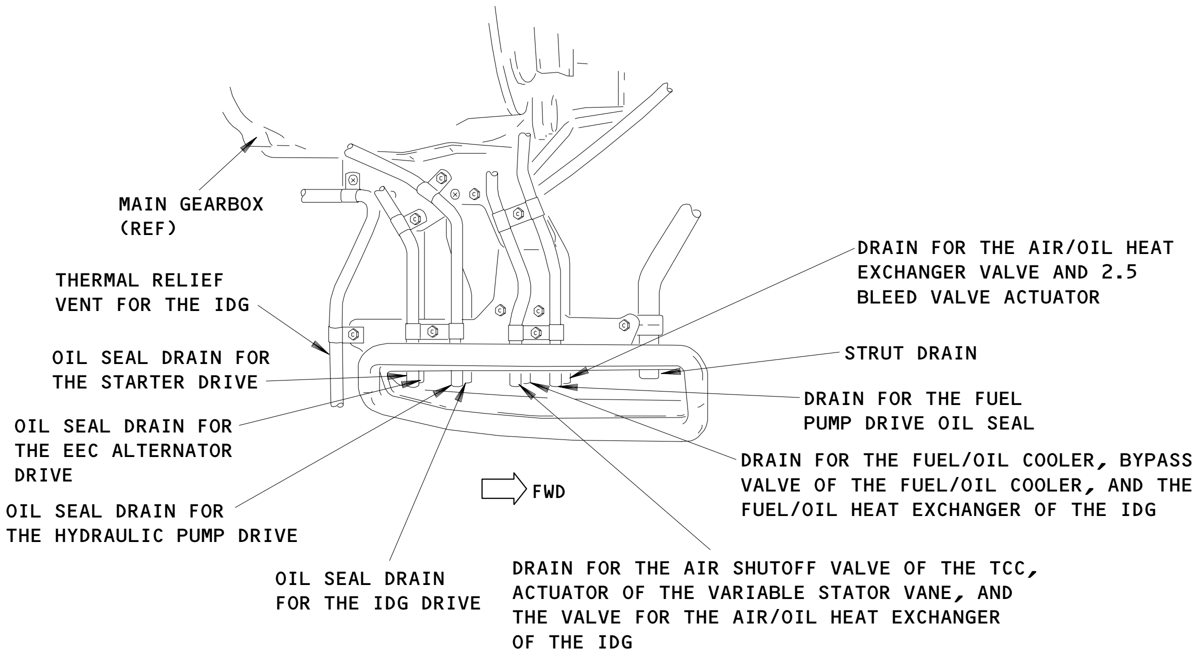
WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

  (f) Close the thrust reversers (AMM 78-31-00/201).

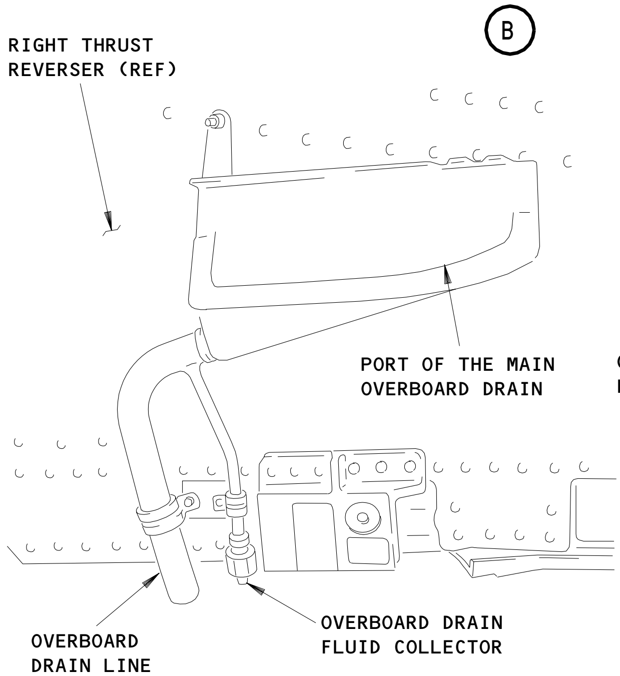




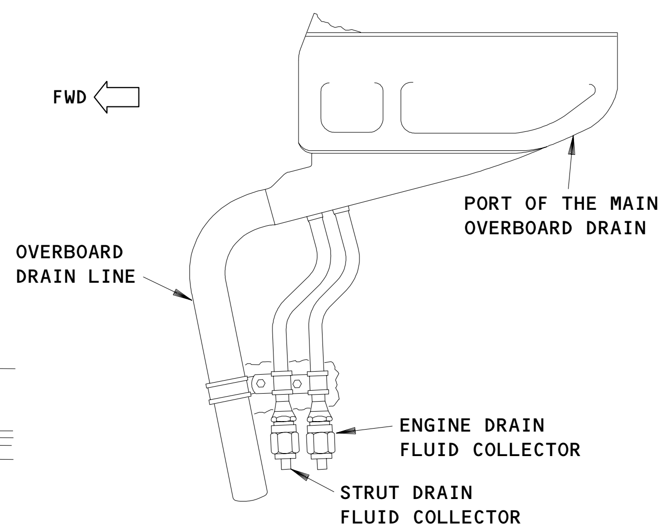
Engine Vents and Drains
Figure 601 (Sheet 1)



DRAIN COLLECTOR
B



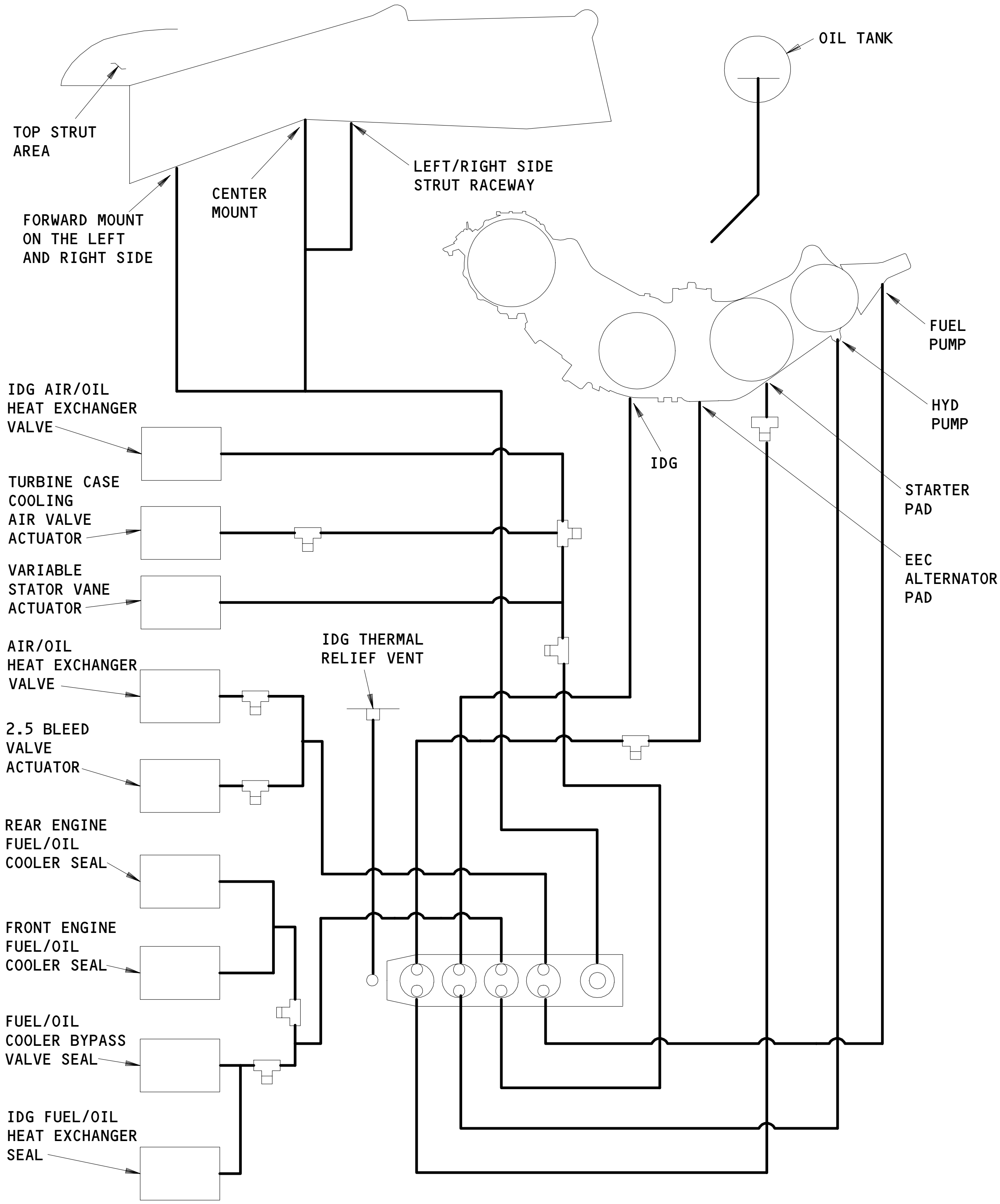
OVERBOARD DRAIN
C 1



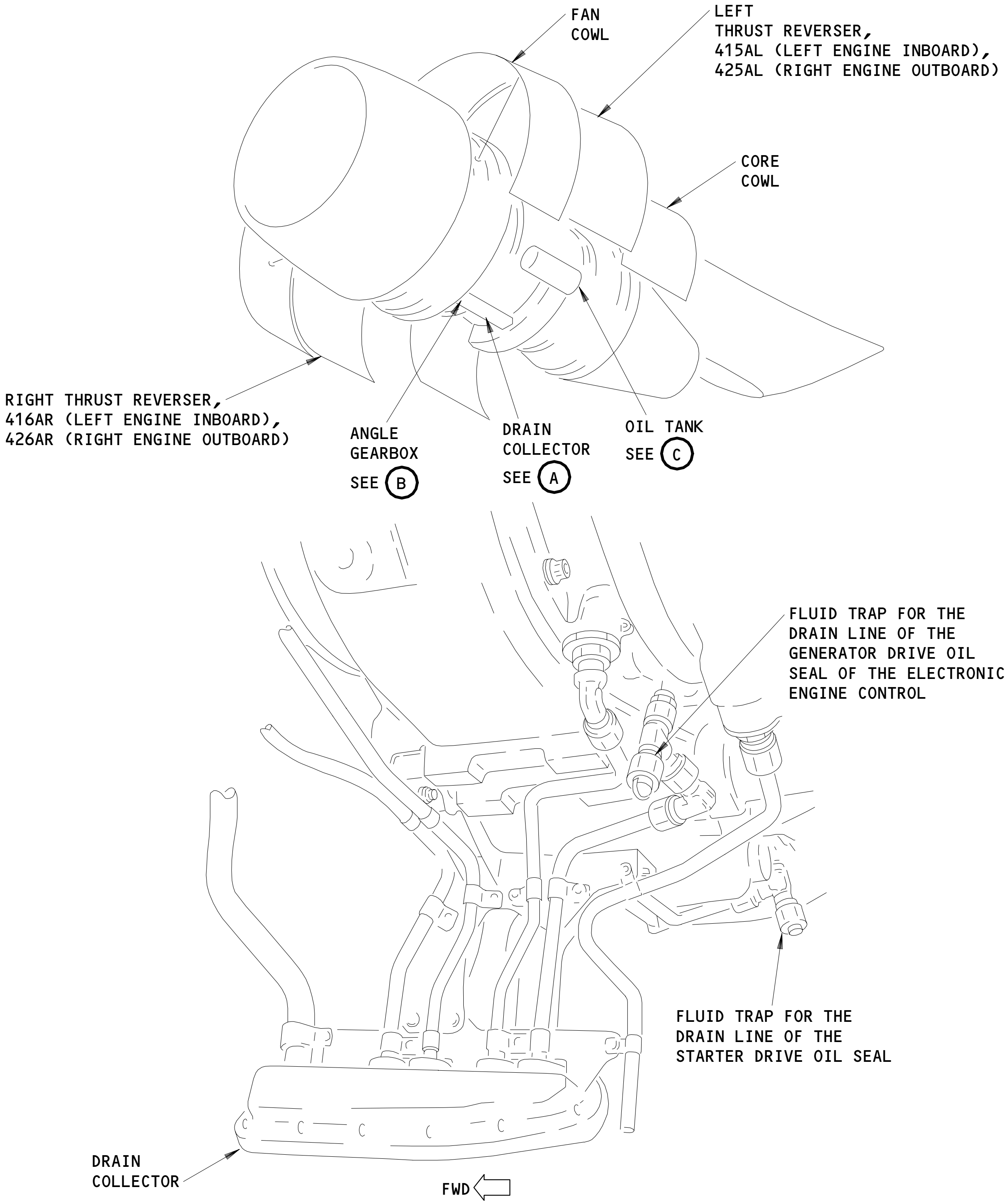
OVERBOARD DRAIN
C 2

1 AIRPLANES WITH ONE FLUID COLLECTOR TUBE FOR THE OVERBOARD DRAIN
2 AIRPLANES WITH TWO FLUID COLLECTOR TUBES FOR THE OVERBOARD DRAIN

Engine Vents and Drains
Figure 601 (Sheet 2)

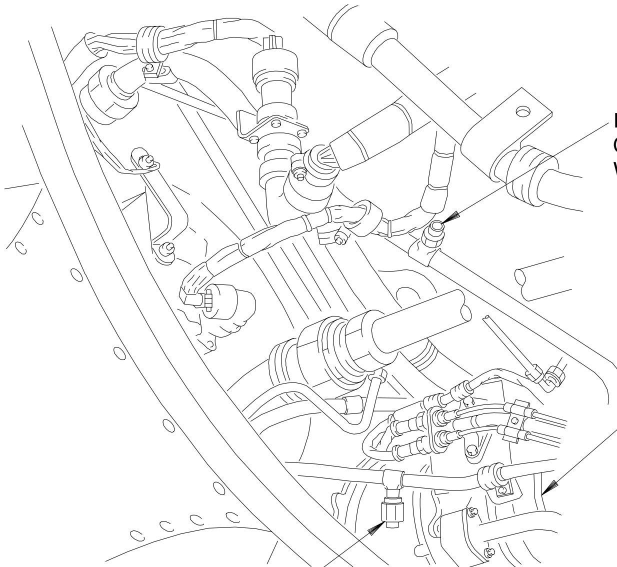


Engine Vents and Drain - Schematics
Figure 602

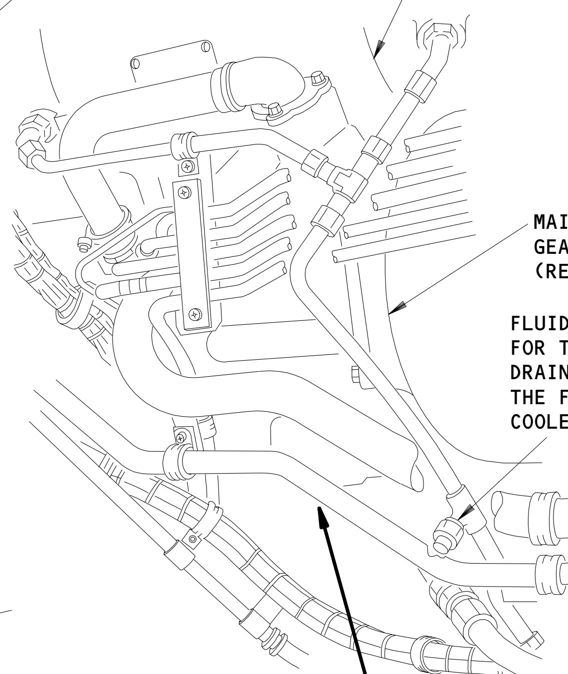


DRAIN COLLECTOR
A

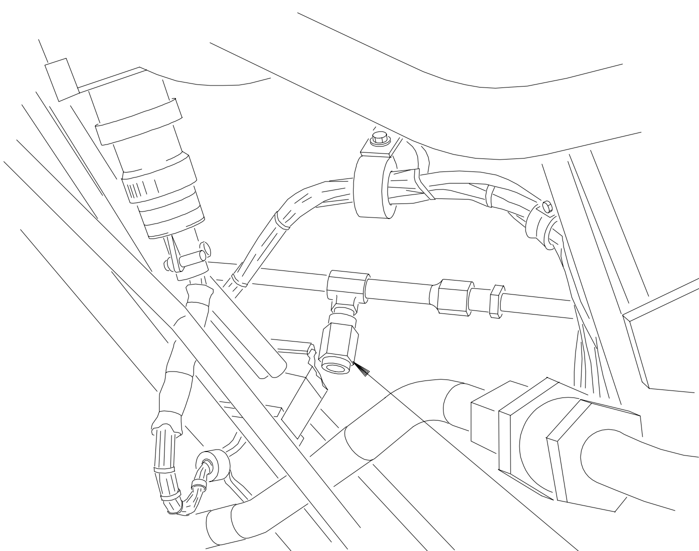
Fluid Trap Location
Figure 603 (Sheet 1)



ANGLE GEARBOX
B

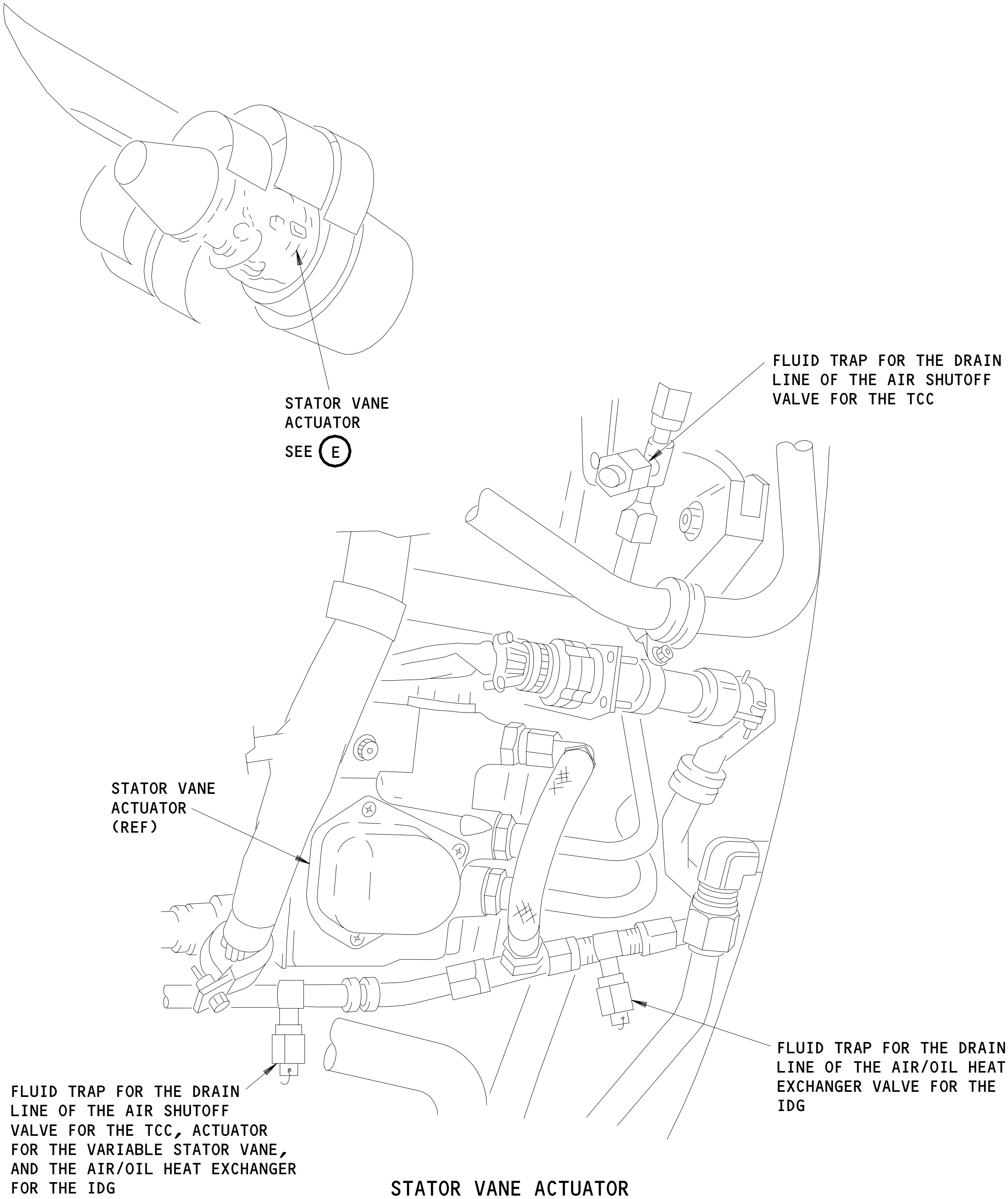


OIL TANK
C



D

Fluid Trap Location
Figure 603 (Sheet 2)



STATOR VANE ACTUATOR

E

Fluid Trap Location
Figure 603 (Sheet 3)

(g) Close the core cowl panels (AMM 71-11-06/201).
(h) Close the fan cowl panels (AMM 71-11-04/201).
(i) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

S 216-008-N00

(6) Do a check to see if the leakage is in the limits.

WARNING: DO THE DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

(a) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

WARNING: DO NOT TOUCH THE COMPONENTS OF THE DRAIN SYSTEM IF THE ENGINE IS HOT. HOT COMPONENTS CAN BURN YOU.

WARNING: DO NOT LET HOT FLUIDS GET ON YOU. PUT ON PREOTECTIVE CLOTHING, GOGGLES, AND EQUIPMENT OR LET THE ENGINE BECOME COOL. HOT FLUIDS CAN BURN YOU.

WARNING: DO NOT LET THE FUEL OR OIL STAY ON YOUR SKIN. YOU CAN ABSORB POISONOUS MATERIALS FROM THE OIL THROUGH YOUR SKIN.

(b) Open the louvered exhaust door (AMM 78-31-00/201).
(c) Use a container to catch the fluids which come from the fluid collector.
(d) Remove the cap from the fluid collector for the engine overboard drain.
(e) Drain the remaining fluid from the fluid collector.
(f) Put the cap back on the fluid collector.
(g) Close the louvered exhaust door (AMM 78-31-00/201).
(h) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).
(i) Use the Power Plant Operation (Normal) procedure to start the engine (AMM 71-00-00/201).
(j) Run the engine at idle for 5 minutes.
(k) Use the Power Plant Operation (Normal) procedure to do the engine shutdown (AMM 71-00-00/201).

WARNING: DO THE DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

(l) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

WARNING: DO NOT TOUCH THE COMPONENTS OF THE DRAIN SYSTEM IF THE ENGINE IS HOT. HOT COMPONENTS CAN BURN YOU.

WARNING: DO NOT LET HOT FLUIDS GET ON YOU. PUT ON PROTECTIVE CLOTHES, GOGGLES, AND EQUIPMENT OR LET THE ENGINE BECOME COOL. HOT FLUIDS CAN BURN YOU.

WARNING: DO NOT LET THE FUEL OR OIL STAY ON YOUR SKIN. YOU CAN ABSORB POISONOUS MATERIALS FROM THE OIL THROUGH YOUR SKIN.

(m) Open the louvered exhaust door (AMM 78-31-00/201).
(n) Use a container to catch the fluids which come from the fluid collector.
(o) Remove the cap from the fluid collector for the engine overboard drain.
(p) Drain the fluid that collected during the engine run.
(q) Put the cap back on the fluid collector.
(r) Determine the volume of fluid in the container.
(s) Divide this quantity by 5 minutes to determine the leakage rate.
(t) Use the table that follows for the leakage limits and for the steps to correct the leakage:

DRAIN/COMPONENT	LIQUID	PERMITTED LEAKAGE DURING OPERATION	PERMITTED LEAKAGE AFTER SHUTDOWN	CORRECTIVE ACTION
Strut	Fuel, Oil, and Water	None	None	Examine the tubes and the hoses in the strut and repair them as necessary. NOTE: The strut area is usually dry. Fluid is an indication of a leakage.
Stator Vane Actuator (SVA) Drain Port (FD17) *[1]	Fuel	1.0 cc/min (20 drops/ min)	1.0 cc/min (20 drops/ min)	Replace the variable stator vane actuator (AMM 75-31-02/401). See *[4]
Turbine Case Cooling (TCC) Actuator Drain Port (AP14) *[1]	Fuel	0.5 cc/min (10 drops/ min)	0.5 cc/min (10 drops/ min)	Replace the TCC air shutoff valve actuator (AMM 75-24-05/401). See *[4]
IDG Air/Oil Heat Exchanger Valve Drain Tube *[1]	Fuel	0.5 cc/min (10 drops/ min)	0.5 cc/min (10 drops/ min)	Replace the IDG air/oil heat exchanger valve (AMM 24-11-12/401). See *[4]
2.5 Bleed Valve Actuator Drain Port (FD19) *[1]	Fuel	1.0 cc/min (20 drops/ min)	1.0 cc/min (20 drops/ min)	Replace the 2.5 bleed valve actuator (AMM 75-32-01/401). See *[4]

DRAIN/COMPONENT	LIQUID	PERMITTED LEAKAGE DURING OPERATION	PERMITTED LEAKAGE AFTER SHUTDOWN	CORRECTIVE ACTION
Fuel/Oil Cooler Bypass Valve Drain Port (AP30) *[2]	Oil	0.5 cc/min (10 drops/ min)	0.5 cc/min (10 drops/ min)	Replace the fuel/oil cooler bypass valve (AMM 79-21-01/401).
IDG Fuel/Oil Cooler Front Drain Port (AP21) *[2]	----	None	None	Replace the IDG fuel/oil heat exchanger (AMM 79-21-01/401).
Fuel/Oil Cooler (Front/Rear) (AP24/AP25) *[1]	----	None	None	Replace the fuel/oil cooler (AMM 79-21-01/401).
Gearbox Hydrau- lic Pump Drive Pad Drain Port (Front/Rear) (SD3/SD4)	Oil	0.32 cc/min (6 drops/ min) *[3]	0.32 cc/min (6 drops/ min) *[3]	Replace the hydraulic pump drive oil seal (AMM 72-61-07/401). See *[5]
Gearbox EEC Alternator Drive Pad Drain Port (SD8) *[1]	Oil	0.32 cc/min (6 drops/ min)	0.32 cc/min (6 drops/ min)	Replace the EEC alternator drive oil seal (AMM 72-61-05/401). See *[5]
Gearbox Fuel Pump Pad Drain Port (SD2)	Fuel	1.0 cc/min (20 drops/ min)	1.0 cc/min (20 drops/ min)	Replace the fuel pump (AMM 73-11-01/401) and examine the fuel pump drive oil seal. See *[4]

DRAIN/COMPONENT	LIQUID	PERMITTED LEAKAGE DURING OPERATION	PERMITTED LEAKAGE AFTER SHUTDOWN	CORRECTIVE ACTION
Gearbox Fuel Pump Drive Pad Port (SD2)	Oil	0.32 cc/min (6 drops/ min)	0.32 cc/min (6 drops/ min)	Replace the fuel pump drive oil seal (AMM 72-61-06/401). See *[5]
Gearbox Starter Drive Pad Drain Port (SD5) *[1]	Oil	0.32 cc/min (6 drops/ min)	0.32 cc/min (6 drops/ min)	Replace the starter drive oil seal (AMM 72-61-03/401). See *[5]
Gearbox IDG Drive Pad Drain Port (SD6)	Oil	0.32 cc/min (6 drops/ min)	0.32 cc/min (6 drops/ min)	Replace the IDG drive oil seal (AMM 72-61-04/401). See *[5]
Air/Oil Heat Exchanger Valve Drain Port	Fuel	0.5 cc/min (10 drops/ min)	0.5 cc/min (10 drops/ min)	Replace the air/oil heat exchanger valve (AMM 79-21-09/401). See *[4]

DRAIN/COMPONENT	LIQUID	PERMITTED LEAKAGE DURING OPERATION	PERMITTED LEAKAGE AFTER SHUTDOWN	CORRECTIVE ACTION
Oil Tank Scupper	Oil	Servicing spillage only.	Servicing spillage only.	Make sure oil cap is correctly installed. Examine the oil tank filler neck for cracks. Prevent the spillage when you fill the oil.

*[1] There is a fluid trap to find the component that has a leakage.
*[2] There is one fluid trap for the fuel/oil cooler bypass valve seal and the IDG fuel/oil cooler. This fluid trap helps you find the component that has the leakage.
*[3] If the leakage limit for the hydraulic pump shaft is more than the operation limit, refer to 29-11-00 for the leakage limits.

*[4] A one time flyback limit of 120 drops/min (6.0 cc/min) to the nearest maintenance base capable of replacing the component is permissible.

*[5] Oil leakage of 6 drops/min (0.32 cc/min) or less is permitted and maintenance is not necessary. Oil leakage can be greater than 6 drops/min (0.32 cc/min) at one gearbox seal drain. The engine can continue in service to the next layover at a maintenance station if you obey all these conditions:
- Oil leakage with the engine operating cannot be more than 30 drops/min (1.5 cc/min).
- Current oil consumption (not average) is less than 0.3 qt/hr (0.28 liter/hr).
- The oil tank is full.
- Only one engine is affected.
- A deferred item is entered in the log to replace the affected drive seal.
- For the deferred period, leakage is checked prior to each departure and consumption is checked after each flight and still meets the limits given above.

D. Put the Airplane Back to its Usual Condition.

S 416-013-N00

(1) Close the louvered exhaust door (AMM 78-31-00/201).

S 446-012-N00

(2) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

TASK 71-71-00-206-031-N00

3. Examine the Strut Drains for Heavy Deposits

A. Equipment

(1) Air source - regulated, compressed, 25-35 psi (170-240 kPa)

B. References

(1) AMM 54-51-00/201, Strut Drain Line Inspection and Cleaning
(2) AMM 71-11-04/201, Fan Cowl Panel
(3) AMM 71-11-06/201, Core Cowl Panel
(4) AMM 78-31-00/201, Thrust Reverser System

C. Access

(1) Location Zones

410	Power Plant (Left Engine)
420	Power Plant (Right Engine)
430	Nacelle Strut (Left Engine)
440	Nacelle Strut (Right Engine)

(2) Access Panels

413AL/414AR	Fan Cowl Panels (Left Engine)
415AL/416AR	Thrust Reverser Halves (Left Engine)
417AL/418AR	Core Cowl Panels (Left Engine)
423AL/424AR	Fan Cowl Panels (Right Engine)
425AL/426AR	Thrust Reverser Halves (Right Engine)
427AL/428AR	Core Cowl Panels (Right Engine)
436BL/436BR	Aft Engine Mount Access Doors, Left Engine
446BL/446BR	Aft Engine Mount Access Doors, Right Engine
416BR	Forward Right Strut Access Door, Left Engine
426BR	Forward Right Strut Access Door, Right Engine

D. Procedure

S 046-032-N00

WARNING: DO THE DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

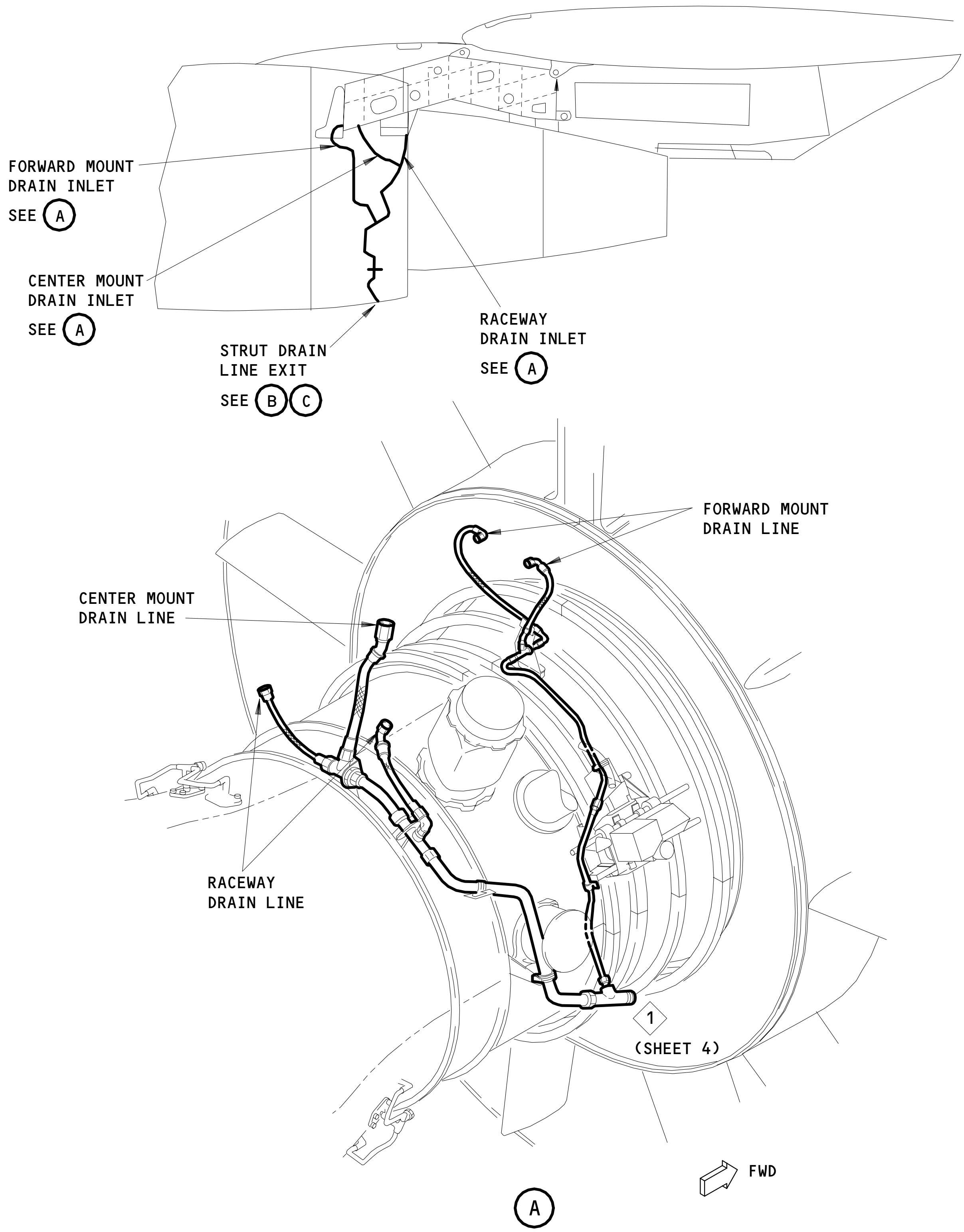
(1) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 016-033-N00

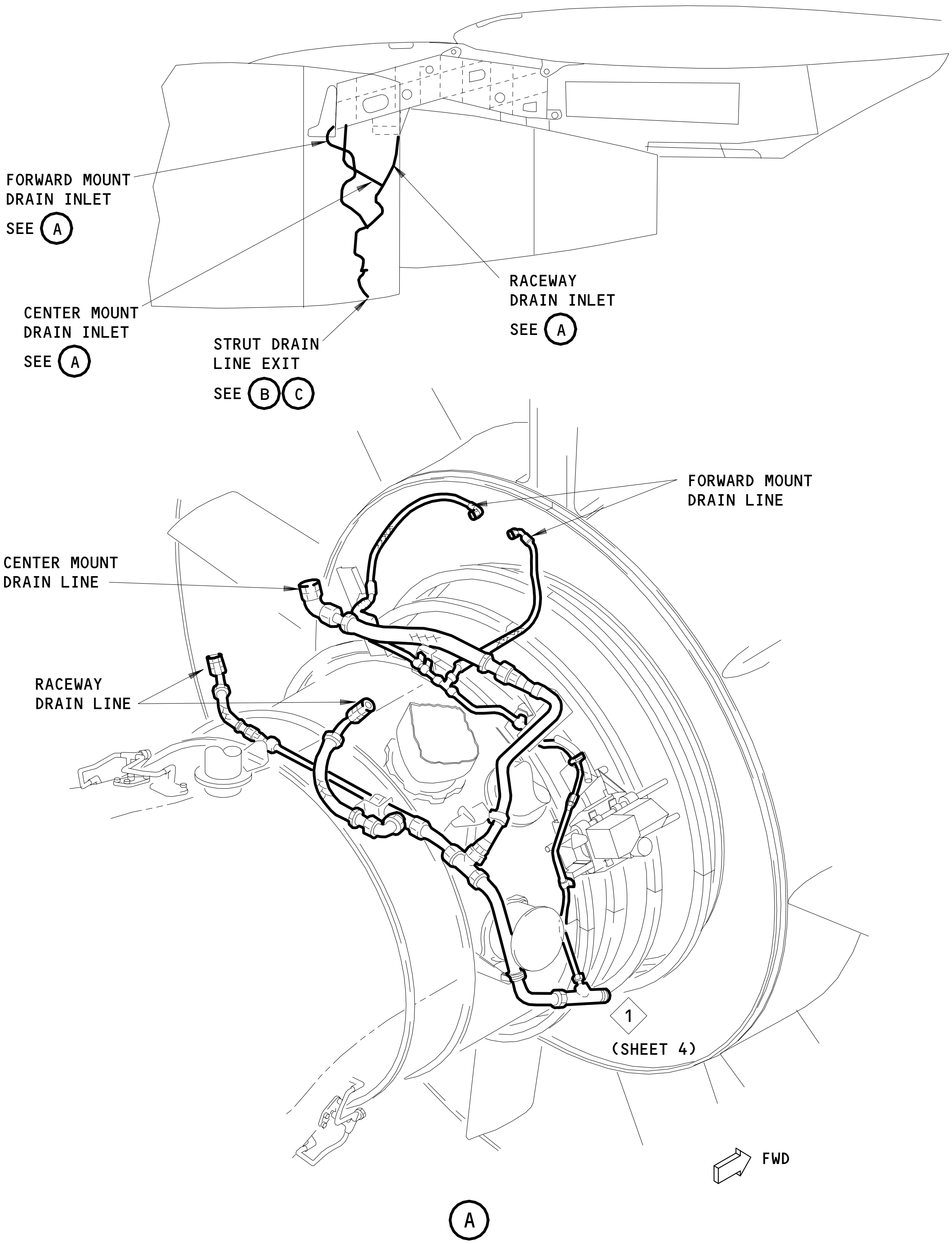
(2) Open the fan cowl panels (AMM 71-11-04/201).

S 016-034-N00

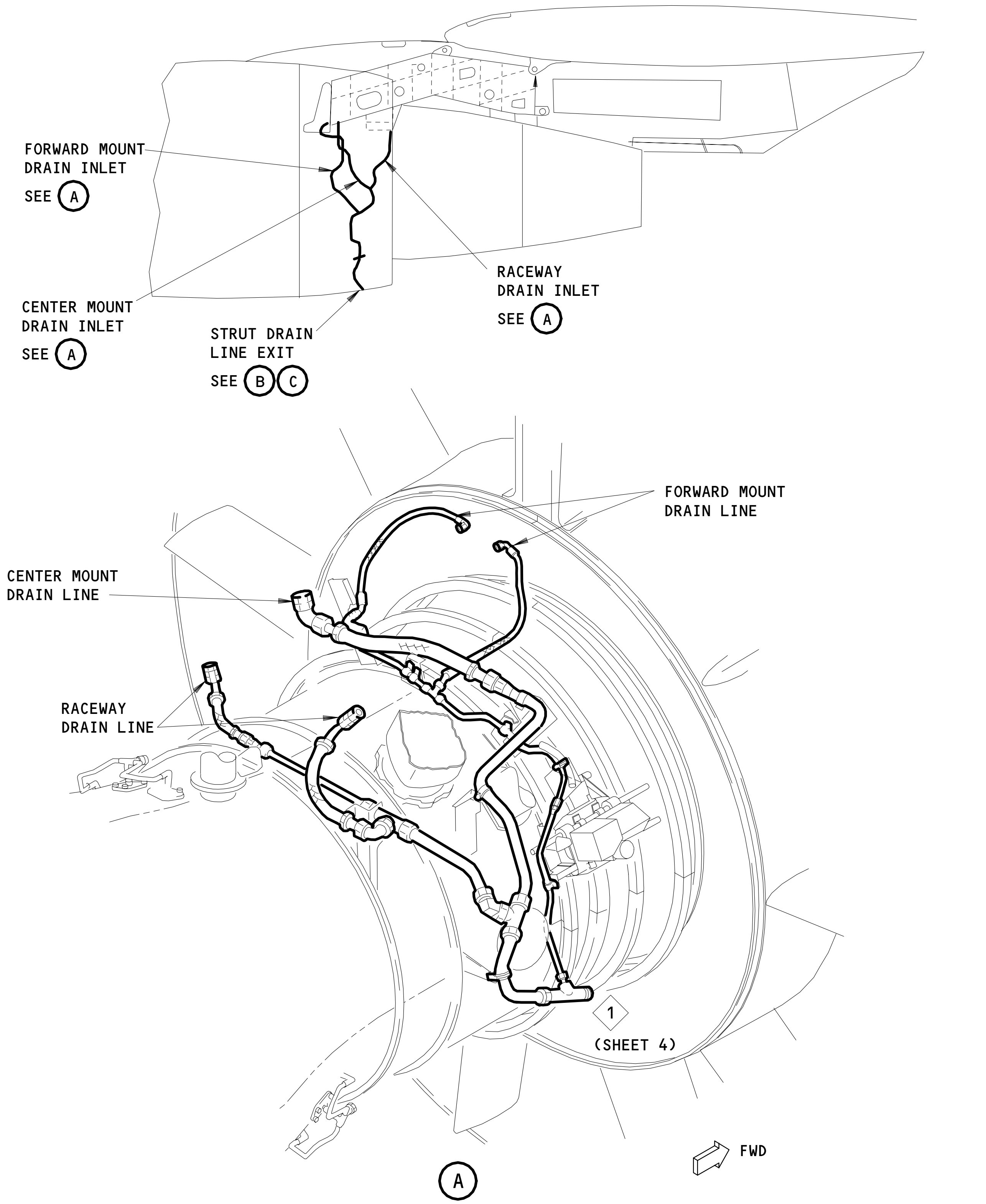
(3) Open the core cowl panels (AMM 71-11-06/201).



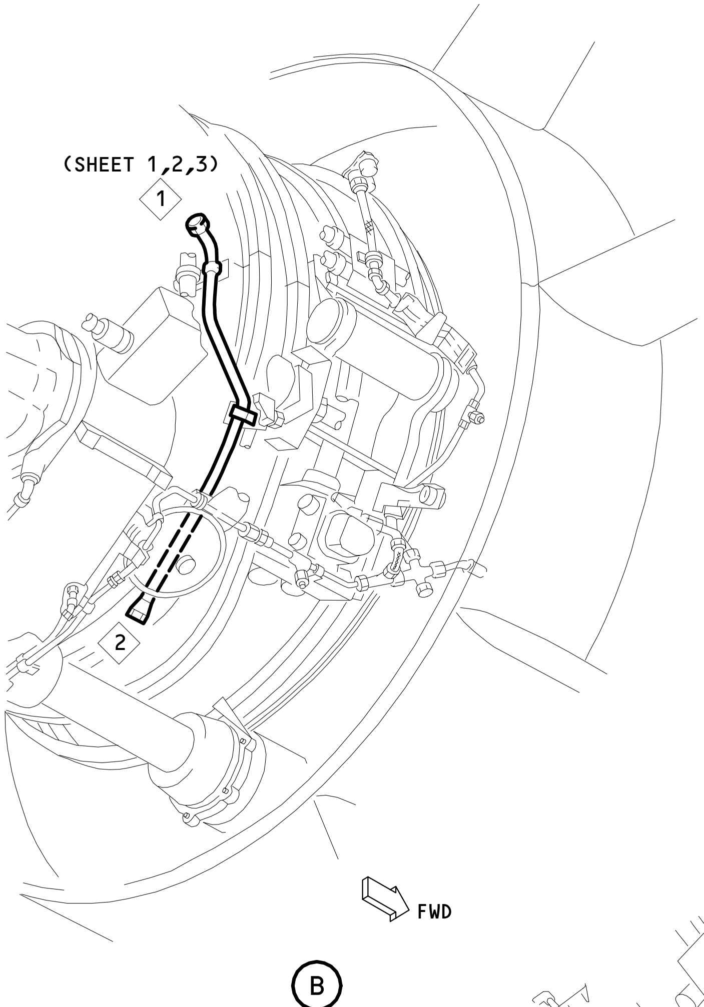
Strut Drains Inspection
Figure 604 (Sheet 1)

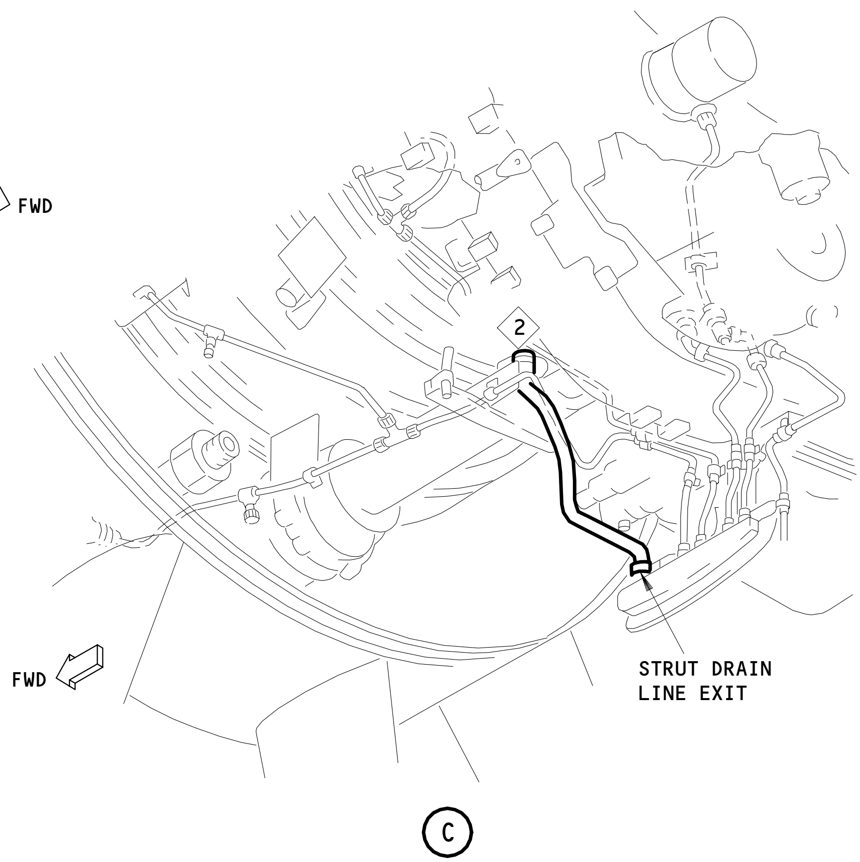


Strut Drains Inspection
Figure 604 (Sheet 2)

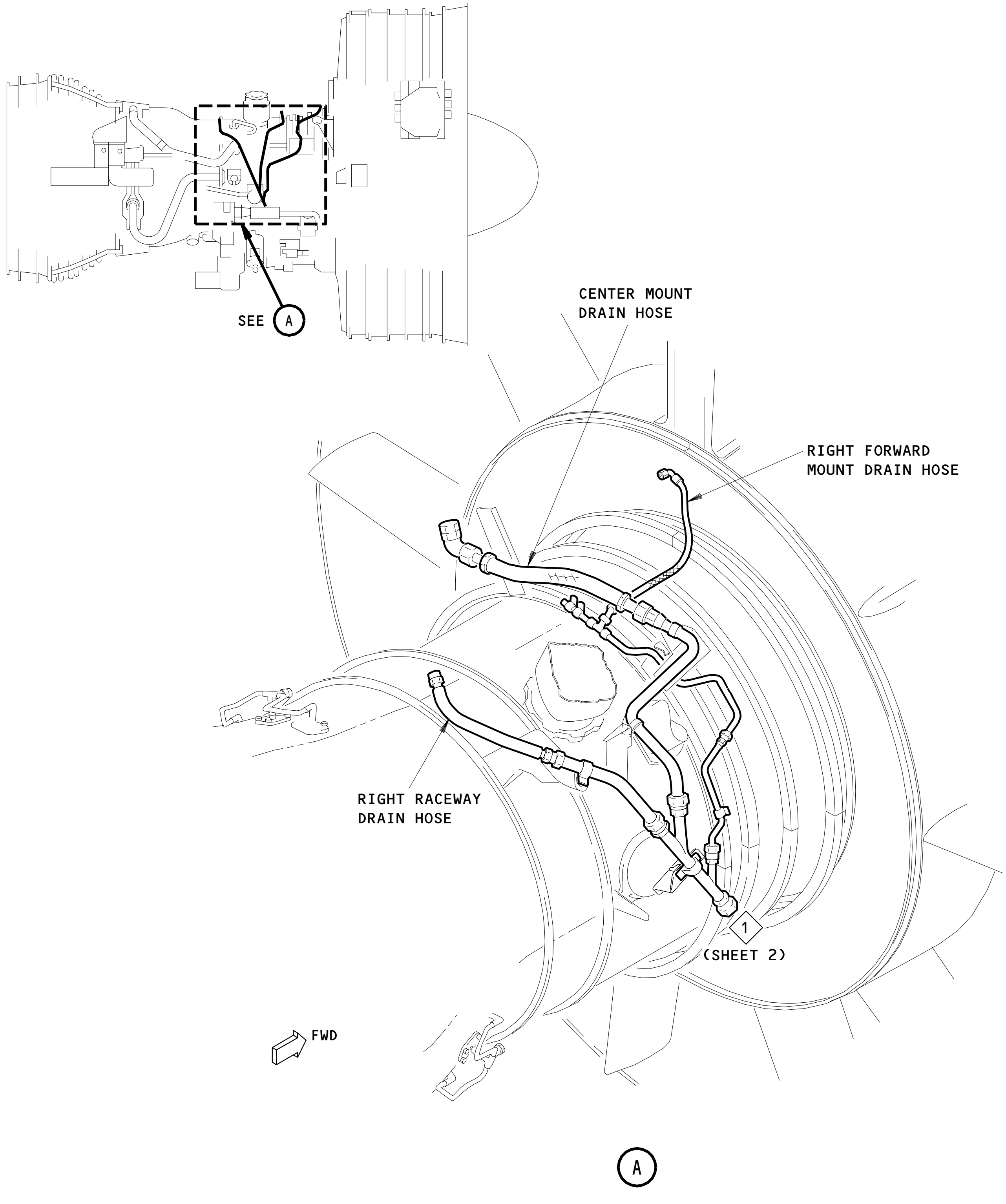


Strut Drains Inspection
Figure 604 (Sheet 3)

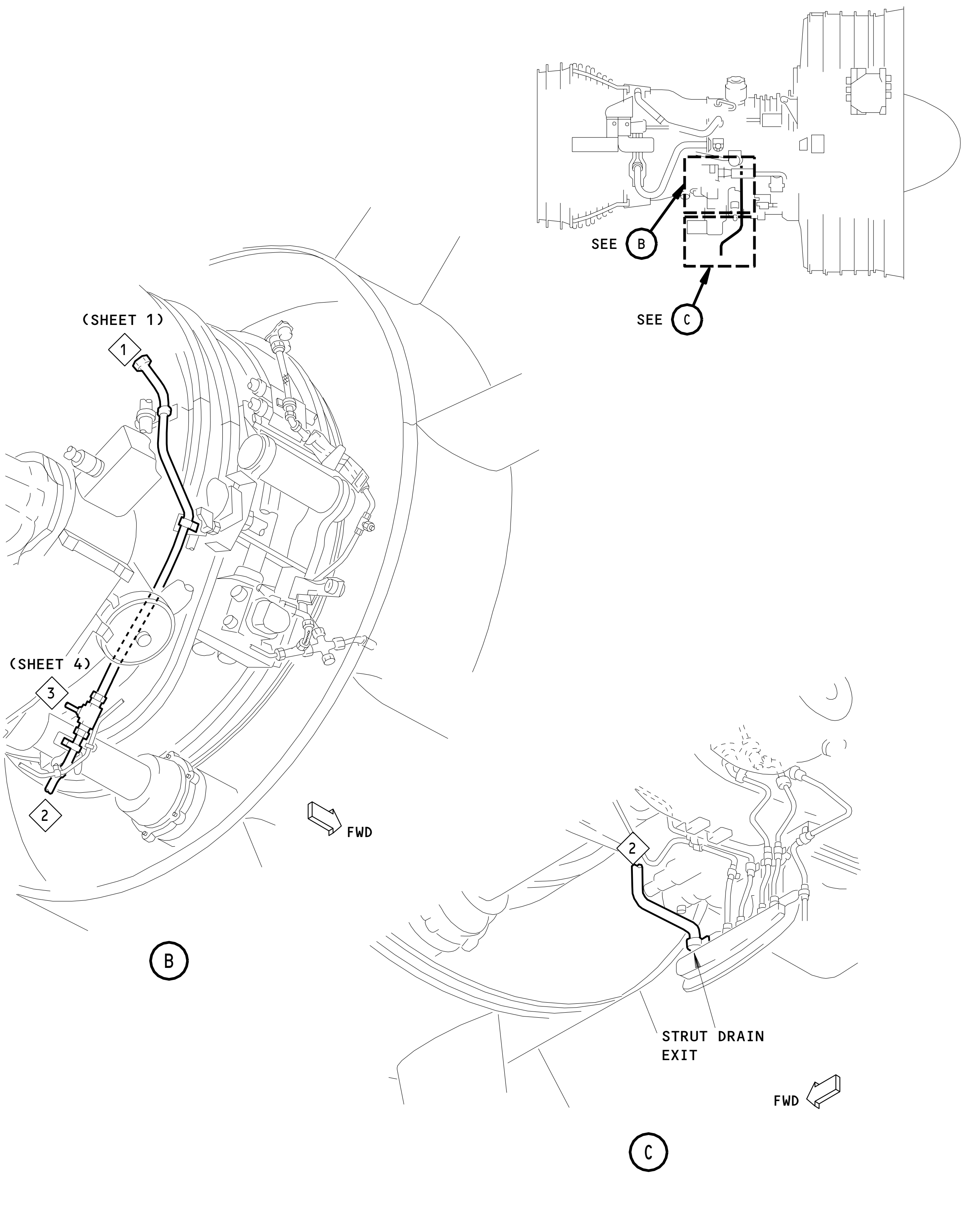




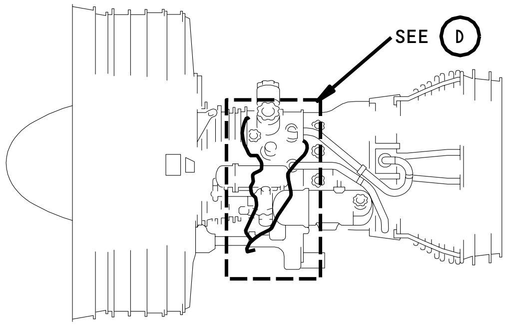
Strut Drains Inspection
Figure 604 (Sheet 4)

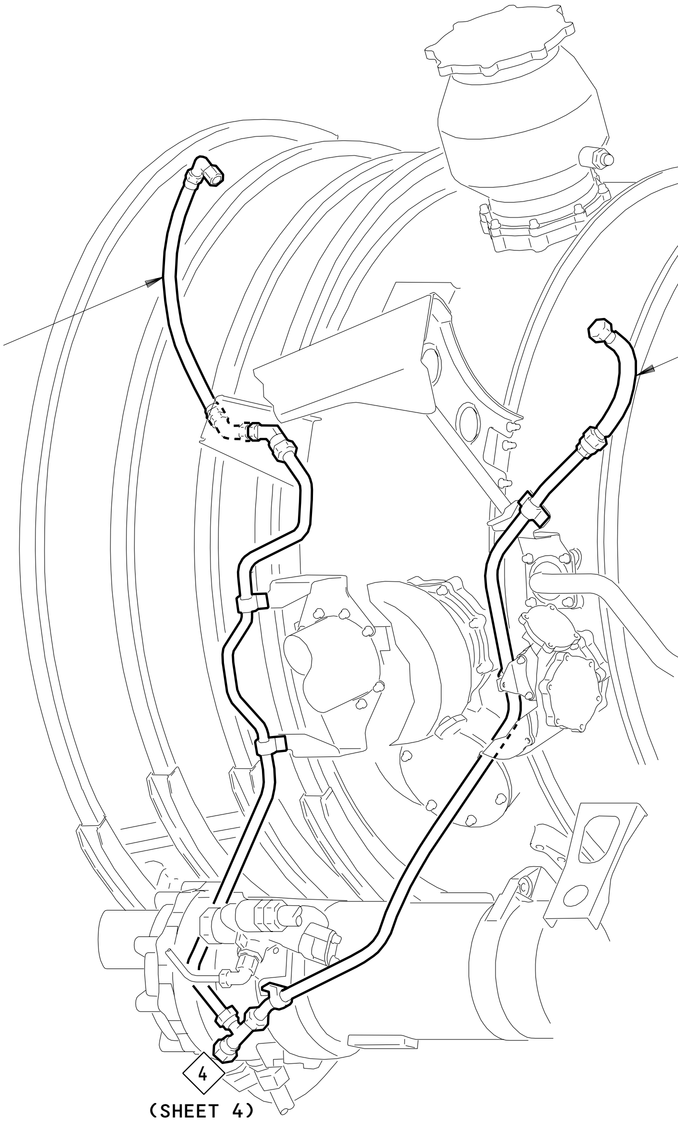


Strut Drains Inspection
Figure 605 (Sheet 1)

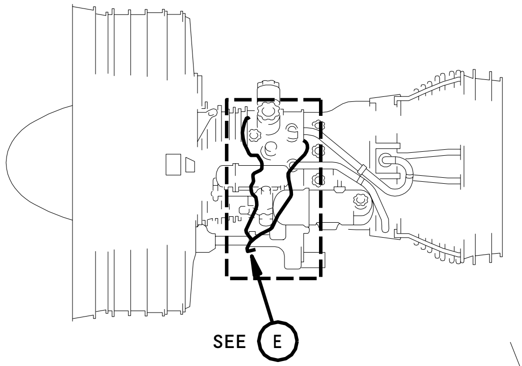


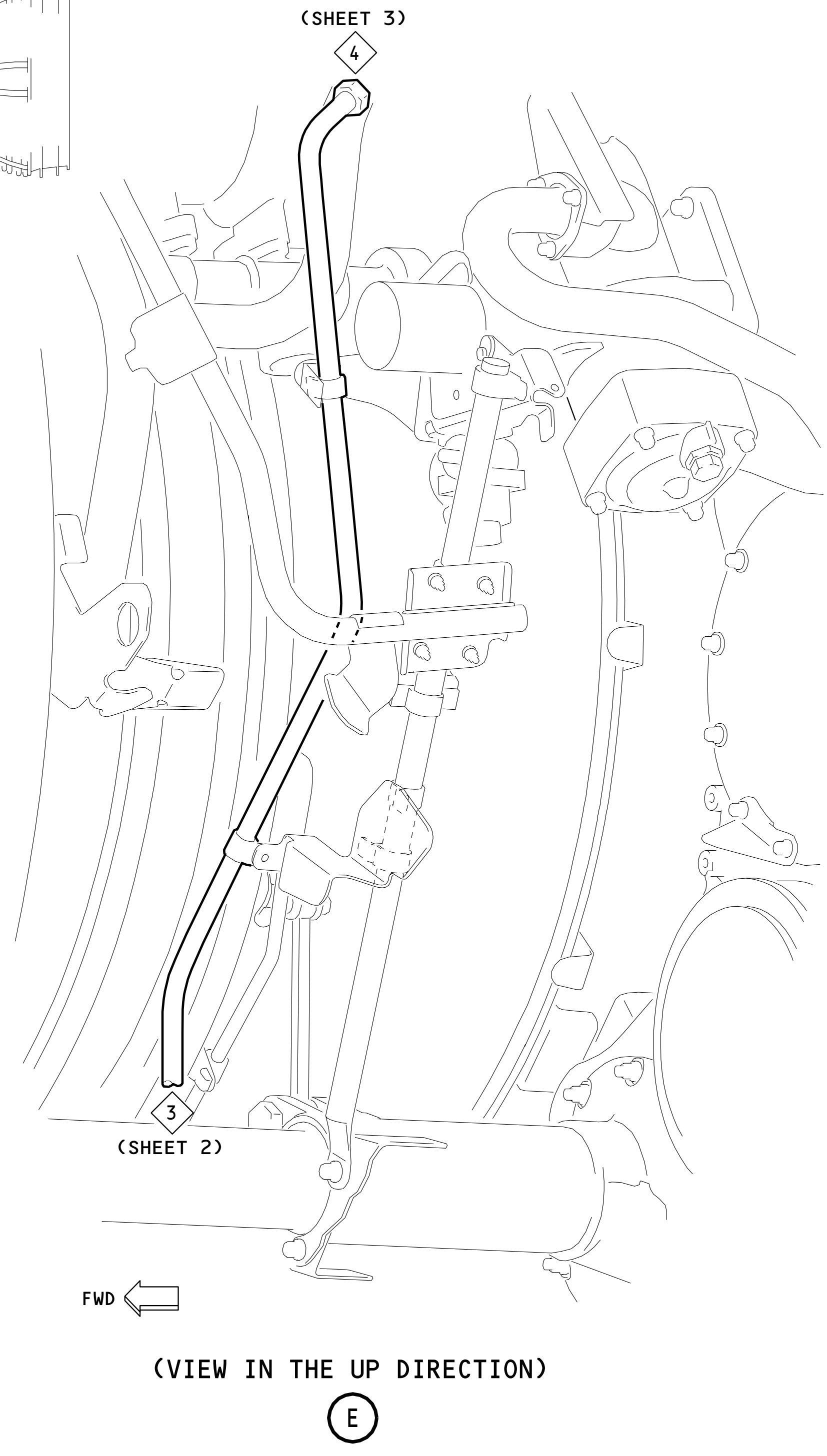
Strut Drains Inspection
Figure 605 (Sheet 2)





Strut Drains Inspection
Figure 605 (Sheet 3)





Strut Drains Inspection
Figure 605 (Sheet 4)

S 016-035-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the thrust reversers (AMM 78-31-00/201).

S 216-050-N00

(5) Visually inspect the strut raceway for leakage or collected fluid.
   (a) Remove insulation and cover plates from the strut raceway (AMM 54-51-00/201).
   (b) Remove any fluid from the compartment.
   (c) Find the fluid source(s) and treat the identified area.

S 206-051-N00

(6) Check inside the hydraulic reservoir for debris.
   (a) Check drains and drain screens for debris or clogging.
   (b) Remove any debris from the compartment and clean drain screens.

S 206-052-N00

(7) Check inside strut raceway for hydraulic fluid contamination of the electrical connectors.
   (a) Replace the contaminated connectors.
   (b) Check drain and drain screens for debris or clogging.
   (c) Remove any debris from the compartment and clean drain screens.

S 036-036-N00

(8) Disconnect these hoses from the strut (Fig. 604 and 605):
   (a) The forward mount drain hoses.
   (b) The center mount drain hose.
   (c) The raceway drain hoses.

S 286-037-N00

(9) Do a check for a clear flow of air through the engine mounted strut drain lines.
   (a) Block four inlets with plugs while you cover the fifth inlet with a rag to collect the unwanted materials.

      NOTE: The rag will ensure that material is not blown back into the strut.

   (b) Attach the air source to the strut drain line exit on the drain mast.
   (c) Blow air back up the drain lines.
   (d) Ensure that there is a clear flow of air through each of the engine mounted strut drain lines.
   (e) Remove the plugs, rag, and unwanted material from the drain inlets.
   (f) Remove the air source.

S 216-038-N00

(10) Visually examine the ends of the drain hoses and fittings for heavy deposits.

NOTE: It is usual for the ends of the drain hoses and fittings to change color. This is not residue and is acceptable.

(a) Examine the strut mounted drain fittings.
(b) Examine the ends of the drain hoses.

S 436-039-N00

(11) If you do not find a heavy deposit, install the drain hoses (no more action is necessary).

S 166-040-N00

(12) If you find a heavy deposit, replace the hose.

NOTE: You may use normal airline procedures to clean the removed hoses and fittings. These cleaned hoses and fittings may be reinstalled or put away for future use.

S 216-041-N00

(13) If the hose or fitting is fully blocked, examine the raceway for collected fluid.

S 216-042-N00

(14) Continue the visual inspection for heavy deposits in each of the next downstream tubes and fittings until you do not find heavy deposits.

(a) Replace the tubes which have heavy deposits.

S 436-043-N00

(15) Connect all disconnected drain hoses.

S 416-049-N00

(16) Reinstall the strut raceway cover plates and insulation (AMM 54-51-00/201).

(a) Seal the cover plates with BMS 5-63.

S 416-044-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(17) Close the thrust reversers (AMM 78-31-00/201).

S 416-045-N00

(18) Close the core cowl panels (AMM 71-11-06/201).

S 416-046-N00

(19) Close the fan cowl panels (AMM 71-11-04/201).

S 446-047-N00

(20) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).