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EXHAUST – GENERAL – DESCRIPTION AND OPERATION

1. General

A. The exhaust system receives and discharges the fan and turbine air through separate propelling nozzles to the atmosphere at a velocity and direction that produces the required thrust.

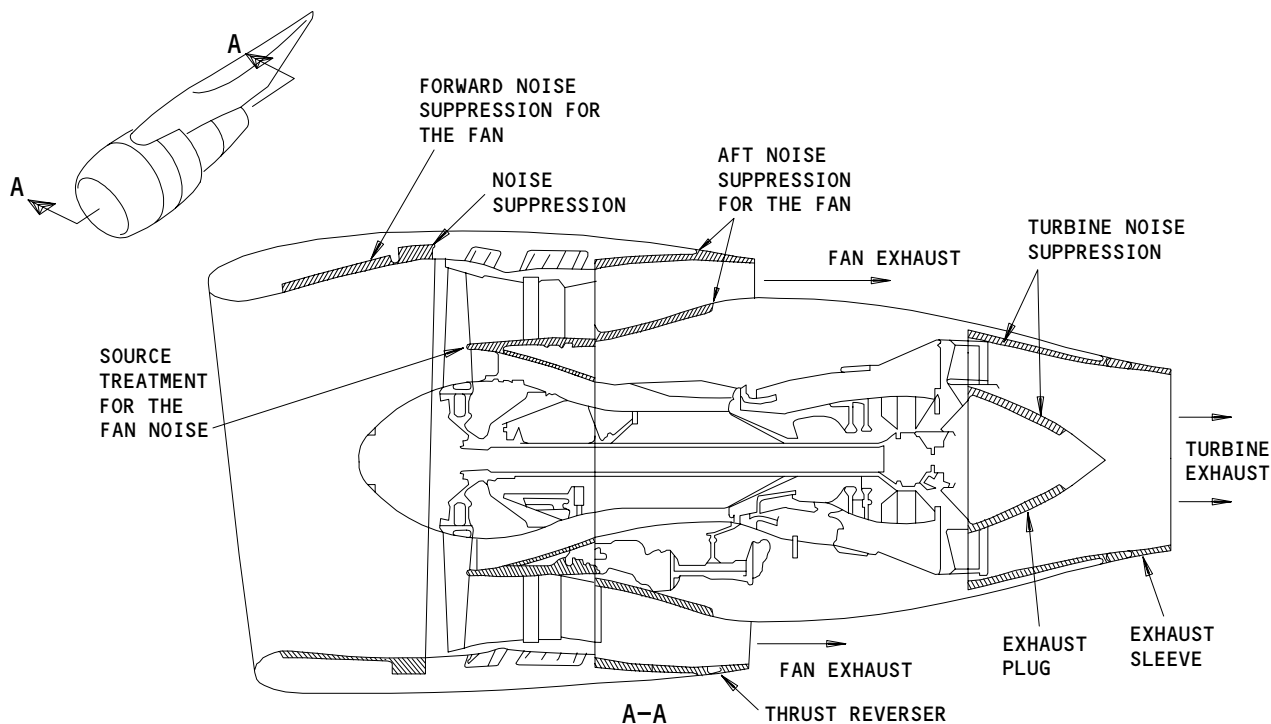
2. Component Details (Fig. 1)

A. Turbine Exhaust

(1) The turbine exhaust system provides an efficient exit for the turbine exhaust. The turbine exhaust consists of hot, combusted gases exiting the low pressure turbine at high velocity. The major components of the turbine exhaust system are the turbine exhaust sleeve and turbine exhaust plug. Turbine exhaust accounts for 21 percent of forward thrust.

B. Fan Exhaust

(1) The fan exhaust is high velocity exhaust exiting the fan or first stage compressor. The fan exhaust provides 79 percent of the total forward thrust.



Engine Exhaust
Figure 1

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(2) The direction of the fan exhaust is reversed during landing by the thrust reverser to produce additional braking power for the airplane.

C. Thrust Reverser

- (1) The thrust reverser system reverses the direction of the fan exhaust during landing for braking of the airplane.
- (2) Stowed, the thrust reverser provides a smooth surface for the fan exhaust to produce thrust. Deployed, the thrust reverser redirects the fan exhaust to produce reverse thrust.
- (3) The thrust levers in the flight compartment initiate forward or reverse thrust.
- (4) The control system for the thrust reverser initiates and synchronizes the deployment of the thrust reverser sleeves.
- (5) The indicating system for the thrust reverser provides visual and tactile indication to the flight compartment of thrust reverser position.

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EXHAUST - INSPECTION/CHECK

1. General

- A. This procedure has the instructions to do these tasks:
- (1) Inspection of the Exhaust System.
 - (2) Inspection of the Blocker Doors for the Thrust Reverser.
 - (a) The Inspection of the Blocker Doors for the Thrust Reverser is also in the Inspection of the Exhaust System. If you do the Inspection of the Exhaust System, then it is not necessary to also do the Inspection of the Blocker Doors for the Thrust Reverser.
 - (3) Inspection of the Nacelle/Strut Fire and Drain Seals for the Thrust Reverser.
 - (a) The Inspection of the Nacelle/Strut Fire and Drain Seals for the Thrust Reverser is also in the Inspection of the Exhaust System. If you do the Inspection of the Exhaust System, then it is not necessary to also do the Inspection of the Nacelle/Strut Fire and Drain Seals for the Thrust Reverser.
 - (4) Inspection of the Bullnose Seal for the Thrust Reverser.
 - (a) The Inspection of the Bullnose Seal for the Thrust Reverser is also in the Inspection of the Exhaust System. If you do the Inspection of the Exhaust System, then it is not necessary to also do the Inspection of the Bullnose Seal for the Thrust Reverser.

TASK 78-00-00-206-001-N00

2. Inspection of the Exhaust System

- A. Consumable Materials
- (1) D00250, Petroleum Jelly, VV-P-236
 - (2) G00384 Transfer Dye - HYSPO7 107
- B. References
- (1) AMM 06-43-00/201, Engine and Nacelle Strut Access Doors and Panels
 - (2) AMM 27-61-00/201, Spoiler/Speed Brake Control System
 - (3) AMM 54-52-01/401, Strut Fairings
 - (4) AMM 54-54-00/601, Strut Fire Seal and Firewall
 - (5) AMM 71-11-04/201, Fan Cowl Panels
 - (6) AMM 71-11-06/401, Core Cowl Panels
 - (7) AMM 78-00-00/601, Turbine Exhaust System

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- (8) AMM 78-00-00/801, Exhaust
- (9) AMM 78-31-00/201, Thrust Reverser System
- (10) AMM 78-31-01/501, Thrust Reverser

C. Access

(1) Location Zones

- 410 Left Power Plant Nacelle
- 420 Right Power Plant Nacelle

(2) Access Panels

- 413AL/414AR Fan Cowl Panels, Left Power Plant
- 415AL/416AR Thrust Reverser, Left Power Plant
- 417AL/418AR Core Cowl Panels, Left Power Plant
- 423AL/424AR Fan Cowl Panels, Right Power Plant
- 425AL/426AR Thrust Reverser, Right Power Plant
- 427AL/428AR Core Cowl Panels, Right Power Plant
- 431DT Forward Strut Fairing, Left Power Plant
- 441DT Forward Strut Fairing, Right Power Plant
- 437BL/437BR Strut Hydraulic Bay Panel, Left Power Plant
- 447BL/447BR Strut Hydraulic Bay Panel, Right Power Plant

D. Prepare to Do the Inspection of the Exhaust System.

S 046-056-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILER/SPEED BRAKE CONTROL SYSTEM. IF YOU DO NOT DO THIS, THE SPOILERS CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (1) Do the deactivation procedure for the Spoiler/Speed Brake Control System (AMM 27-61-00/201).

S 866-057-N00

- (2) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

S 866-058-N00

- (3) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

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S 046-059-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.

- (4) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 016-002-N00

- (5) Open the forward fairing on the strut (AMM 54-52-01/401).

S 016-060-N00

- (6) Open the access panels for the hydraulic bay on each strut (AMM 06-43-00/201).

S 016-003-N00

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

S 016-004-N00

- (8) Remove the core cowl panels (AMM 71-11-06/401).

S 016-082-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (9) Open the thrust reverser (AMM 78-31-00/201).

E. Do the Inspection of the Exhaust System (Figs. 601, 602, 603, and 604).

S 216-083-N00

- (1) Make sure the insulation and seals on the inner cowl of the thrust reverser are not damaged and are correctly installed.

S 216-005-N00

- (2) Make sure the turbine exhaust plug is not damaged and is installed correctly.

S 216-006-N00

- (3) Make sure the spring seals of the turbine exhaust sleeve are not damaged and are installed correctly.

NOTE: If the seals are cracked, badly bent, worn or gone, replace the spring seals.

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- S 216-007-N00
- (4) Examine the turbine exhaust sleeve.
- (a) Make sure the external surfaces of the inner and outer honeycomb sleeve of the turbine exhaust are not damaged.
 - (b) Make sure the turbine exhaust sleeve is installed correctly.
- S 216-008-N00
- (5) Make sure all hydraulic tubing, tubing blocks and mounting brackets are installed correctly and are not damaged.
- S 216-009-N00
- (6) Examine the hinges and adjacent structure of the fan cowl and thrust reverser.
- (a) Make sure the hinges and structure are not damaged and are installed correctly.
- S 216-010-N00
- (7) Make sure the wires for the directional control valve are installed correctly and are not damaged.
- S 216-011-N00
- (8) Make sure the wires for the stow valve solenoid are installed correctly and are not damaged.
- S 216-012-N00
- (9) Make sure the wires for the stow valve pressure switch are installed correctly and are not damaged.
- S 216-052-N00
- (10) Make sure the wires for the motorized isolation valve are installed correctly and are not damaged.
- S 216-053-N00
- (11) Make sure the wires for the pressure switch for the motorized isolation valve are installed correctly and are not damaged.
- S 216-013-N00
- (12) Make sure the wires for the actuator lock proximity sensors are installed correctly and are not damaged.
- S 216-014-N00
- (13) Make sure the wires for the actuator deploy proximity sensors are installed correctly and are not damaged.

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S 216-104-N00
(14) Make sure the wires for the thrust reverser sync locks are installed correctly and are not damaged.

S 216-015-N00
(15) Make sure the linear variable differential transformer (LVDT) and its wires are installed correctly and are not damaged.

S 216-089-N00
(16) Make sure each blocker door makes a continuous surface with (is at the same level as) the adjacent structure (AMM 78-31-14/601).

NOTE: The blocker doors must not extend above the surface of the fan cowl when the thrust reverser is fully retracted.

S 216-019-N00
(17) Make sure the fire insulation on the inner cowl is installed correctly and is not damaged.

S 216-020-N00
(18) Make sure the skirt fairing fire seal for the core cowl is installed correctly and is not damaged.

S 216-021-N00
(19) Make sure the tension latches on the fan cowl are installed correctly and are not damaged.

S 216-022-N00
(20) Make sure the latch band and anchor strap are installed correctly and are not damaged.

S 216-023-N00
(21) Make sure the hinges and latches on the slotted exhaust door are installed correctly and are not damaged.

S 216-024-N00
(22) Make sure the flow path for the exhaust gas through the thrust reverser is not damaged.

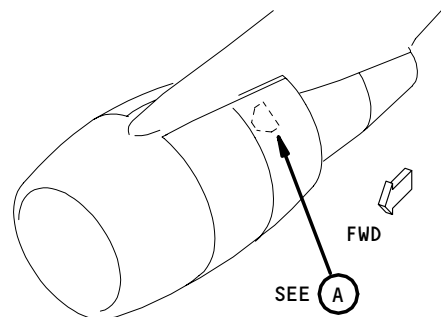
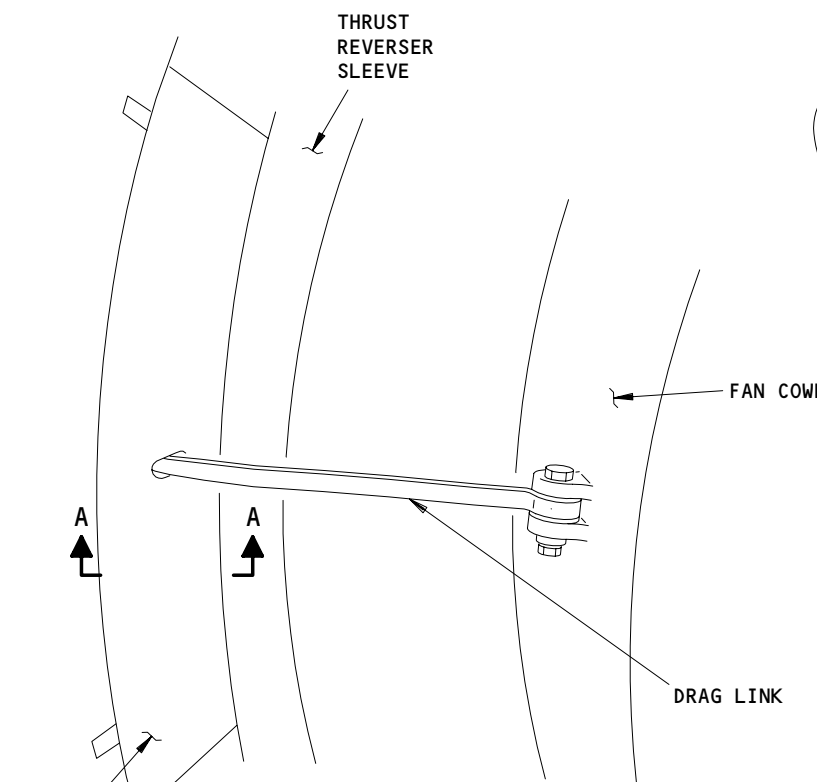
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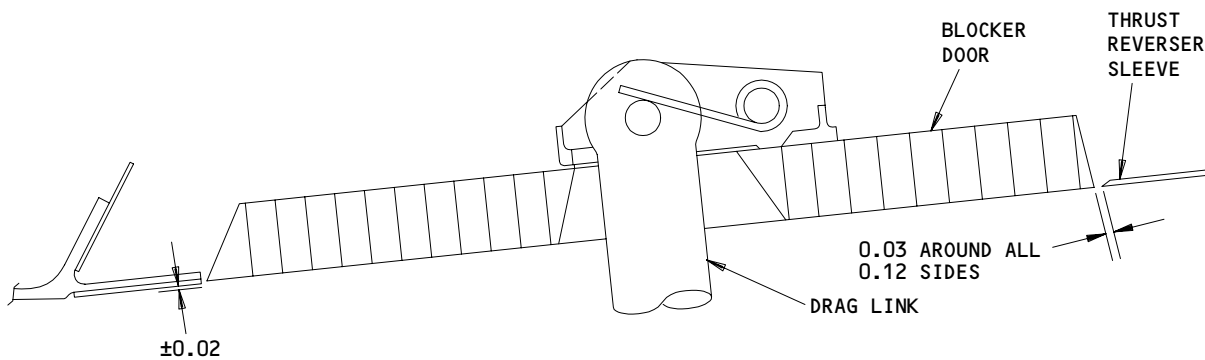
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THRUST REVERSER
(VIEW IN THE AFT DIRECTION)

A



A-A

NOTE: ALL DIMENSIONS ARE IN INCHES.

Blocker Door Flushness
Figure 601

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S 216-025-N00

- (23) Make sure the drag links and the mounting fittings for the blocker doors are installed correctly and are not damaged.

S 986-102-N00

CAUTION: DO NOT EXTEND THE THRUST REVERSER SLEEVES WHILE THE THRUST REVERSER HALVES ARE OPEN AND THE CORE COWL PANELS ARE INSTALLED. THIS WILL CAUSE DAMAGE TO THE THRUST REVERSER SLEEVES AND THE CORE COWL PANELS.

CAUTION: DO NOT EXTEND THE THRUST REVERSER SLEEVES WHEN THE THRUST REVERSER HALVES ARE OPEN MORE THAN 23-DEGREES. THIS WILL CAUSE DAMAGE TO THE THRUST REVERSER SLEEVES AND THE STRUT.

CAUTION: MAKE SURE THE AREA BEHIND THE THRUST REVERSER IS CLEAR OF ALL GROUND SUPPORT EQUIPMENT AND WORKSTANDS. DAMAGE WILL OCCUR IF THE THRUST REVERSER SLEEVES HIT THE GROUND SUPPORT EQUIPMENT OR THE WORKSTANDS.

- (24) Manually extend the thrust reverser (AMM 78-31-00/201).

NOTE: You can fully extend the thrust reverser when it is open only if the core cowl panels are removed and the thrust reverser is not open more than 23-degrees.

S 216-027-N00

- (25) Visually examine the thrust reverser structure with the thrust reverser sleeves extended.
(a) Make sure the structure is not damaged and is installed correctly.

S 216-028-N00

- (26) Examine the bullnose seal on the translating sleeve of the thrust reverser for each engine as follows (Fig. 602):
(a) Visually examine the bullnose seal for material that is gone.

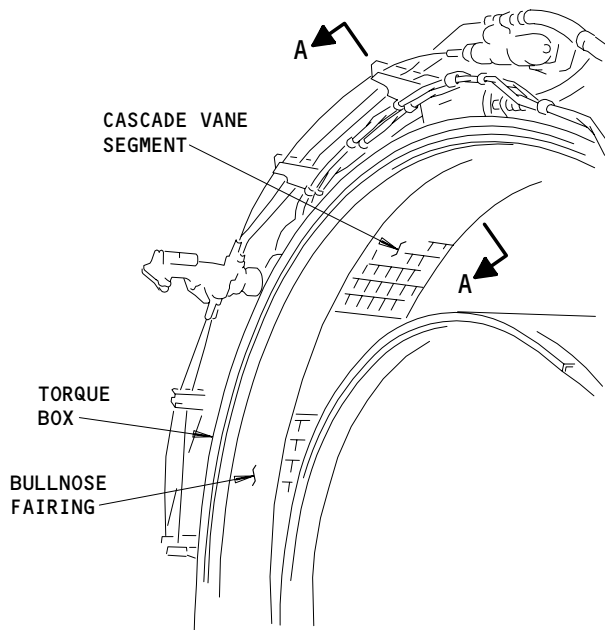
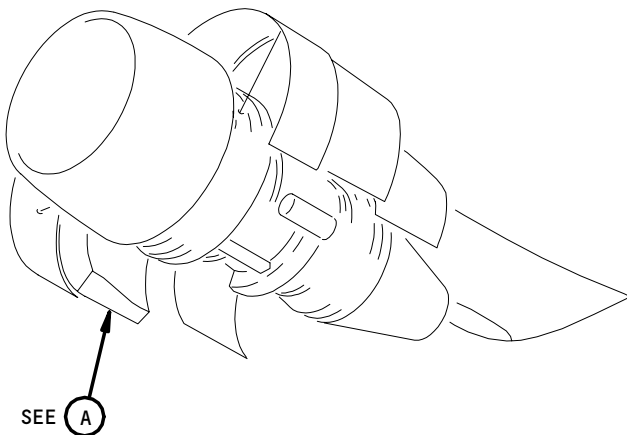
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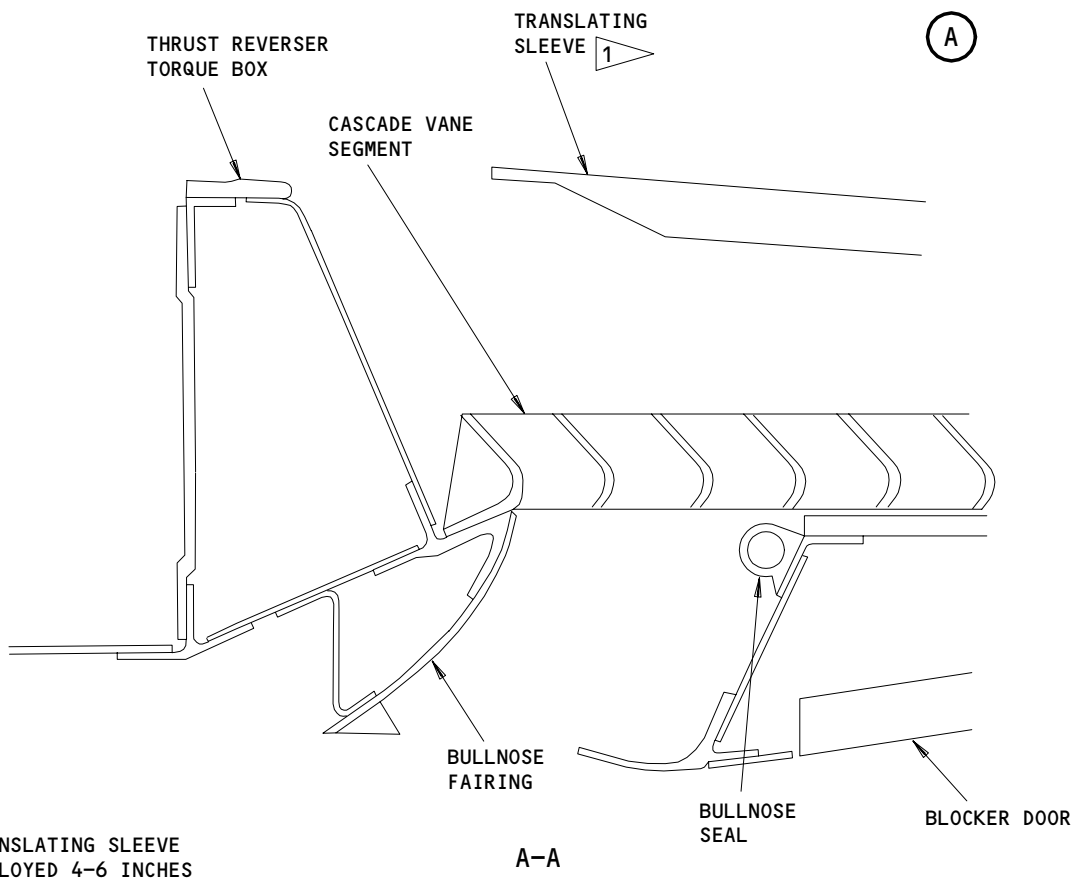
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REVERSER OPEN TO
23 DEGREE POSITION



Bullnose Fairing and Seal Check
Figure 602

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(b) Look for cuts, gouges, and holes that extend through the seal.

NOTE: Damage to the seal that does not extend through the seal is permitted.

NOTE: A bullnose seal may be made from one piece of seal material or from two pieces of seal material. A splice that connects two pieces feels harder than the other parts of the seal. Do not reject a seal splice if it is not damaged.

(c) Measure the length of all space made from the material that is gone.

(d) Measure the length of the area that has damage that extends through the seal.

(e) Add the lengths together of all these damaged areas.

(f) If this sum is more than 10.0 inches, replace the bullnose seal.

NOTE: You can replace the bullnose seal with the translating sleeve removed or attached (AMM 78-31-10/401).

S 216-096-N00

(27) Make sure the bullnose seal fairing on the torque box does not have damage and is installed correctly.

S 216-030-N00

(28) Make sure the wires for the auto-restow proximity sensors are installed correctly and are not damaged.

S 986-031-N00

(29) Manually retract the thrust reverser (AMM 78-31-00/201).

S 216-032-N00

(30) Do the inspection of the nacelle/strut fire and drain seals as follows:

(a) Make sure the full length of the seal is correctly attached by the seal bead and groove.

(b) Make sure each corner and joint of each seal section is not damaged.

1) Replace the seal section if the seal has a 1/16 inch separation in it or it is damaged (AMM 78-00-00/801).

(c) If there is sealant on the seal, make sure that it is correctly attached to the seal.

1) Replace all sealant that is loose or gone.

(d) Examine the forward end of each seal for tears, looseness or separation.

1) If you find these conditions, replace the applicable section of the seal (AMM 78-00-00/801).

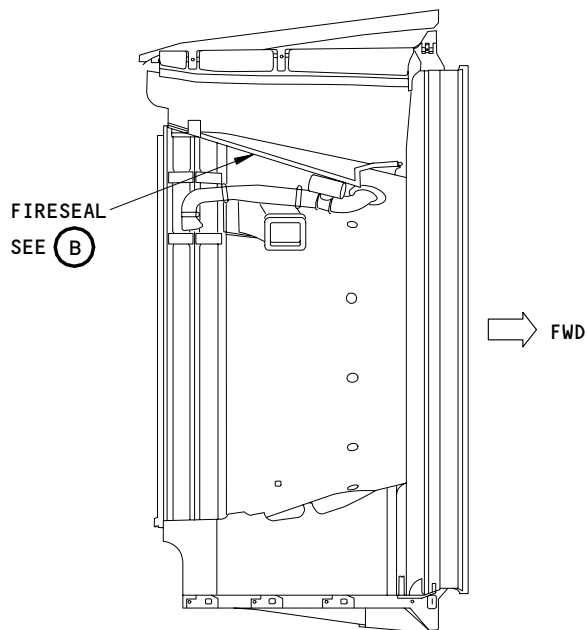
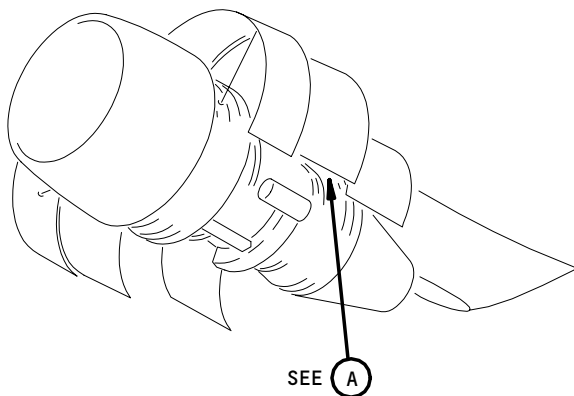
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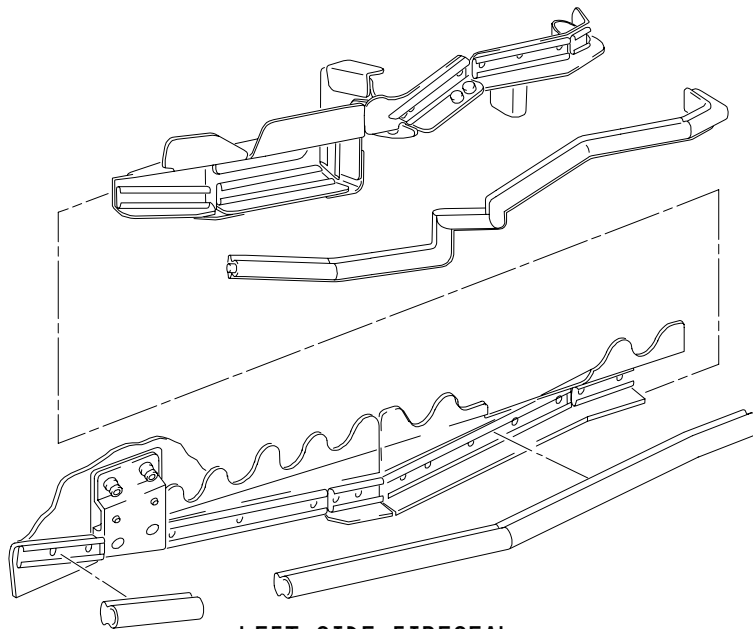
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THRUST REVERSER - LEFT HALF
(RIGHT HALF EQUIVALENT)

(A)



LEFT SIDE FIRESEAL
(RIGHT SIDE EQUIVALENT)

(B)

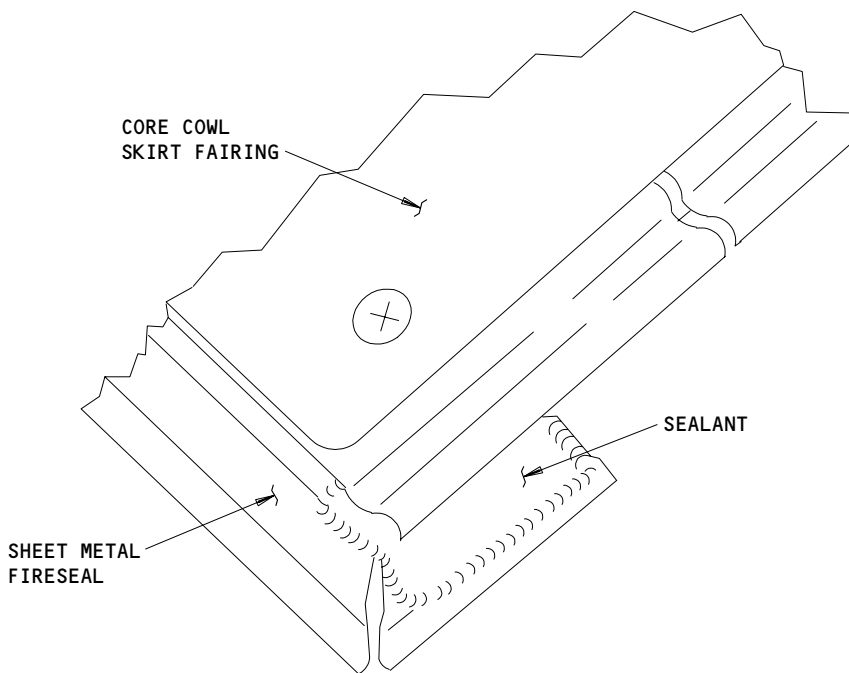
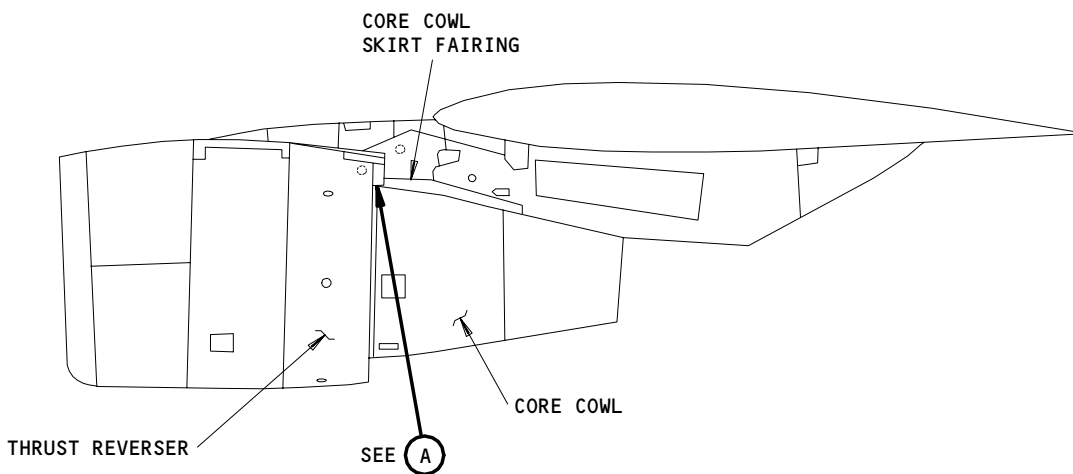
Fireseals
Figure 603

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(A)

Thrust Reverser/Core Cowl Skirt Fairing Fireseal
Figure 604

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- (e) Examine the seal surface for these defects:
 - 1) Look for damage to the surface such as bubbles that are greater than 0.20 inch (5.10 mm) diameter and wrinkles.
 - 2) Make sure the surface is not worn more than 1/16 inch (1.60 mm) or the outer layer of fabric worn through.
 - 3) Make sure any discoloration of the surface is not caused by deterioration.
 - 4) If any of the above defects are found on the seal surface, repair the seal (AMM 78-00-00/801).
- (f) Visually examine the vertical blade seals on the forward edge of the upper bifurcation (Fig. 605).
 - 1) Make sure the blade seals are not damaged, loose or torn.
 - 2) If any of the above conditions are found, repair or replace the seals (AMM 78-00-00/801).
- (g) Make sure the vertical blade seals engage the forward end of the fire wall seal when the thrust reverser is closed.
 - 1) Repair or replace the seals if you do not find these conditions (AMM 78-00-00/801).

S 216-090-N00

- (31) Examine the seal depressors (Fig. 604).
 - (a) Examine the seal depressor along the forward side of the strut.
 - 1) Make sure it is attached correctly and the fire insulation on the seal depressor is not damaged.
 - (b) Make sure that the seal depressor bracket is attached correctly and the horizontal seal at the front end of the bracket is not damaged (AMM 54-54-00/601).

S 216-091-N00

- (32) Visually examine the segmented metal spring-seals on the skirt fairing of the core cowl.
 - (a) If one or more pieces are cracked, severely bent, worn, or gone, replace the skirt fairing (AMM 54-52-01/401).

S 226-092-N00

- (33) Do the following to make sure the thrust reverser is adjusted correctly:
 - (a) Clean the thrust reverser fire seals and the two sides of the seal contact area on the strut with naphtha.

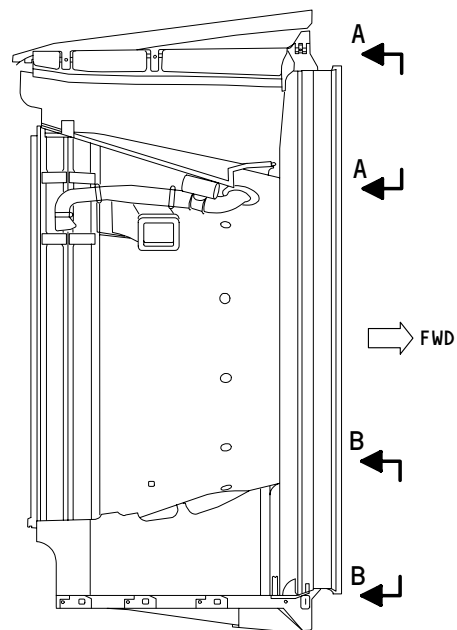
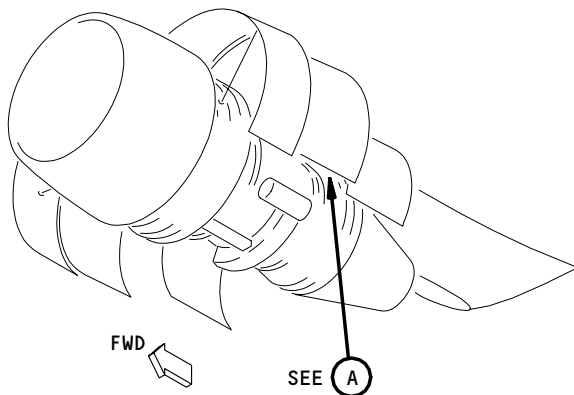
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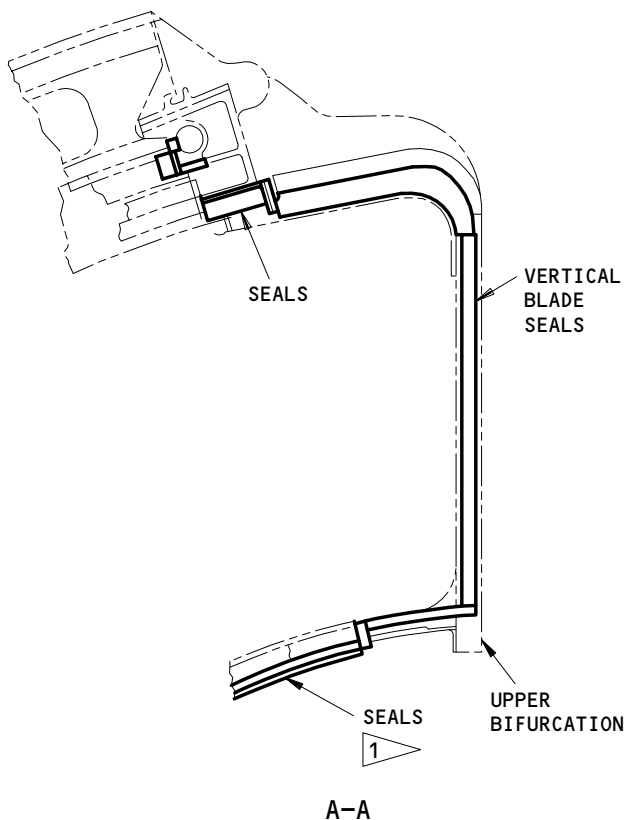
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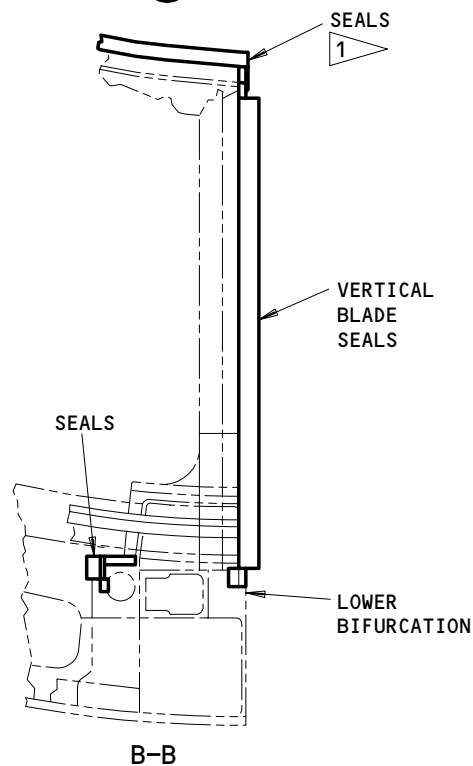
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THRUST REVERSER - LEFT HALF
(RIGHT HALF SIMILAR)



(A)



1 SEAL EXTENDS AROUND CIRCUMFERENCE OF FAN COWL

Vertical Blade Seals
Figure 605

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- (b) Apply transfer dye or petroleum jelly approximately one inch wide and very thinly to the strut along the fire seal contact area.

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURES TO CLOSE AND OPEN THE THRUST REVERSER. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (c) Close the thrust reverser to compress the fire seal, then open the thrust reverser to the 45-degree position (AMM 78-31-00/201).

NOTE: Make sure the fan cowl panels are in the open position and the core cowl panels are removed before you close the thrust reverser halves.

- (d) Do a check of the transfer dye or petroleum jelly on the fire seal.

NOTE: The width of the petroleum jelly or transfer dye must be a minimum of 0.25 inch along the full length of the seal.

- 1) If the width is less than 0.25 inch, do the adjustment procedure for the thrust reverser (AMM 78-31-01/501).

- (e) Clean the transfer dye or petroleum jelly from the seal and the strut.

F. Put the Airplane Back to Its Usual Condition.

S 416-034-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO CLOSE THE THRUST REVERSER. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

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

S 416-035-N00

- (2) Install the core cowl panels (AMM 71-11-06/401).

S 416-037-N00

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

S 416-038-N00

- (4) Close the access panels for the hydraulic bay on each strut (AMM 06-43-00/201).

S 416-097-N00

- (5) Install the fairing on the forward strut (AMM 54-52-01/401).

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- S 446-036-N00
- (6) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

- S 446-039-N00
- (7) Do the activation procedure for the spoiler/speed brake control system (AMM 27-61-00/201).

- S 866-040-N00
- (8) Remove the DO-NOT-OPERATE tags from the thrust levers.

TASK 78-00-00-206-039-N00

3. Do the Inspection of the Blocker Doors for the Thrust Reverser

A. References

- (1) AMM 27-61-00/201, Speed Brake Control System
- (2) AMM 71-11-04/201, Fan Cowl Panels
- (3) AMM 71-11-06/401, Core Cowl Panels
- (4) AMM 78-31-00/201, Thrust Reverser System

B. Access

(1) Location Zones

- 410 Left Power Plant Nacelle
- 420 Right Power Plant Nacelle

(2) Access Panels

- 413AL/414AR Fan Cowl Panels, Left Power Plant
- 415AL/416AR Thrust Reverser, Left Power Plant
- 417AL/418AR Core Cowl Panels, Left Power Plant
- 423AL/424AR Fan Cowl Panels, Right Power Plant
- 425AL/426AR Thrust Reverser, Right Power Plant
- 427AL/428AR Core Cowl Panels, Right Power Plant

C. Prepare to Do the Inspection of the Blocker Doors for the Thrust Reverser.

S 046-041-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILER/SPEED BRAKE CONTROL SYSTEM. IF YOU DO NOT DO THIS, THE SPOILERS CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (1) Do the deactivation procedure for the Spoiler/Speed Brake Control System (AMM 27-61-00/201).

S 866-042-N00

- (2) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

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S 866-043-N00

- (3) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

S 046-100-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.

- (4) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 016-099-N00

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

S 016-098-N00

- (6) Open the core cowl panels (AMM 71-11-06/401).

S 016-103-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO OPEN THE THRUST REVERSER. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

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

D. Do the Inspection of the Blocker Doors for the Thrust Reverser (Fig. 601).

S 216-054-N00

- (1) Make sure each blocker door makes a continuous surface with (is at the same level as) the adjacent structure (AMM 78-31-14/601).

NOTE: The blocker doors must not extend above the surface of the fan cowl when the thrust reverser is fully retracted.

E. Put the Airplane Back to Its Usual Condition.

S 416-041-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO CLOSE THE THRUST REVERSER. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Close the thrust reverser (AMM 78-31-00/201).

S 416-044-N00

- (2) Close the core cowl panels (AMM 71-11-06/401).

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- S 416-045-N00
- (3) Close the fan cowl panels (AMM 71-11-04/201).

- S 446-046-N00
- (4) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

- S 446-047-N00
- (5) Do the activation procedure for the spoiler/speed brake control system (AMM 27-61-00/201).

- S 866-048-N00
- (6) Remove the DO-NOT-OPERATE tags from the thrust levers.

TASK 78-00-00-206-042-N00

4. Do the Inspection of the Nacelle/Strut Fire and Drain Seals

A. Consumable Materials

- (1) D00250, Petroleum Jelly, VV-P-236
- (2) G00384 Transfer Dye - HYSPO107

B. References

- (1) AMM 27-61-00/201, Speed Brake Control System
- (2) AMM 54-52-01/401, Strut Fairings
- (3) AMM 54-54-00/601, Strut Fire Seal and Firewall
- (4) AMM 71-11-04/201, Fan Cowl Panels
- (5) AMM 71-11-06/401, Core Cowl Panels
- (6) AMM 78-00-00/801, Exhaust
- (7) AMM 78-31-00/201, Thrust Reverser System

C. Access

(1) Location Zones

- 410 Left Power Plant Nacelle
- 420 Right Power Plant Nacelle

(2) Access Panels

- 413AL/414AR Fan Cowl Panels, Left Power Plant
- 415AL/416AR Thrust Reverser, Left Power Plant
- 417AL/418AR Core Cowl Panels, Left Power Plant
- 423AL/424AR Fan Cowl Panels, Right Power Plant
- 425AL/426AR Thrust Reverser, Right Power Plant
- 427AL/428AR Core Cowl Panels, Right Power Plant
- 431DT Forward Strut Fairing, Left Power Plant
- 441DT Forward Strut Fairing, Right Power Plant

D. Prepare to do the Inspection of the Nacelle/Strut Fire and Drain Seals.

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S 046-049-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILER/SPEED BRAKE CONTROL SYSTEM. IF YOU DO NOT DO THIS, THE SPOILERS CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (1) Do the deactivation procedure for the Spoiler/Speed Brake Control System (AMM 27-61-00/201).

S 866-050-N00

- (2) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

S 866-051-N00

- (3) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

S 046-052-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.

- (4) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 016-053-N00

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

S 016-054-N00

- (6) Open the core cowl panels (AMM 71-11-06/401).

S 016-055-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO OPEN THE THRUST REVERSER. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

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

S 016-043-N00

- (8) Open the forward fairing on the strut (AMM 54-52-01/401).

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E. Do the Inspection of the Nacelle/Strut Fire and Drain Seals (Figs. 603 and 604).

S 216-044-N00

- (1) Do the Inspection of the nacelle/strut fire and drain seals as follows:
 - (a) Make sure the full length of the seal is correctly attached with the seal bead and groove.
 - (b) Make sure each corner and joint of each seal section is not damaged.
 - 1) Replace the seal section if the seal has a 1/16 inch separation in it or it is damaged (AMM 78-00-00/801).
 - (c) If there is sealant on the seal, make sure that it is correctly attached to the seal.
 - 1) Replace all sealant that is loose or gone.
 - (d) Examine the forward end of the seal for tears, looseness or separation.
 - 1) If you find these conditions, replace the applicable section of the seal (AMM 78-00-00/801).
 - (e) Examine the seal surface for these defects:
 - 1) Look for damage to the surface such as bubbles that are greater than 0.20 inch (5.10 mm) diameter and wrinkles.
 - 2) Make sure the surface is not worn more than 1/16 inch (1.60 mm) or the outer layer of fabric worn through.
 - 3) Make sure any discoloration of the surface is not caused by deterioration.
 - 4) If any of the above defects are found on the seal surface, repair the seal (AMM 78-00-00/801).
 - (f) Visually examine the vertical blade seals on the forward edge of the upper bifurcation.
 - (g) Make sure the blade seals are not damaged, loose or torn.
 - 1) If any of the above conditions are found, repair or replace the seals (AMM 78-00-00/801).
 - (h) Make sure the vertical blade seals engage the forward end of the fire wall seal when the thrust reverser is closed.
 - 1) Repair or replace the seals if you do not find these conditions (AMM 78-00-00/801).

S 216-093-N00

- (2) Examine the seal depressors.
 - (a) Do a check of the seal depressor on the forward side of the strut.
 - 1) Make sure it is attached correctly and the fire insulation on the seal depressor is not damaged.
 - (b) Make sure that the seal depressor bracket is attached correctly and the horizontal seal at the front end of the bracket is not damaged (AMM 54-54-00/601).

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S 216-094-N00

- (3) Visually examine the segmented metal spring-seals on the skirt fairing of the core cowl.
- (a) If one or more pieces are cracked, severely bent, worn, or gone, replace the skirt fairing (AMM 54-52-01/401).

S 226-095-N00

- (4) Do the following to make sure the thrust reverser is adjusted correctly:
- (a) Clean the thrust reverser fire seals and the two sides of the seal contact area on the strut with naphtha.
- (b) Apply transfer dye or petroleum jelly approximately one inch wide and very thinly to the strut along the fire seal contact area.

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO CLOSE AND OPEN THE THRUST REVERSER. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (c) Close the thrust reverser to compress the fire seal, then open the thrust reverser to the 45-degree position (AMM 78-31-00/201).

NOTE: Make sure the fan cowl panels and core cowl panels are in the open position before you close the thrust reverser halves.

- (d) Do a check of the transfer dye or petroleum jelly on the fire seal.

NOTE: The width of the petroleum jelly or transfer dye must be a minimum of 0.25 inch along the full length of the seal.

- 1) If the width is less than 0.25 inch, do the adjustment procedure for the thrust reverser (AMM 78-31-01/501).

- (e) Clean the transfer dye or petroleum jelly from the seal and the strut.

F. Put the Airplane Back to Its Usual Condition.

S 416-056-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO CLOSE THE THRUST REVERSER. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

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

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- S 416-057-N00
- (2) Close the core cowl panels (AMM 71-11-06/401).

- S 416-058-N00
- (3) Close the fan cowl panels (AMM 71-11-04/201).

- S 416-059-N00
- (4) Install the fairing on the forward strut (AMM 54-52-01/401).

- S 446-060-N00
- (5) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

- S 446-061-N00
- (6) Do the activation procedure for the spoiler/speed brake control system (AMM 27-61-00/201).

- S 866-062-N00
- (7) Remove the DO-NOT-OPERATE tags from the thrust levers.

TASK 78-00-00-206-047-N00

5. Do the Inspection of the Bullnose Seal for the Thrust Reverser

A. References

- (1) AMM 27-61-00/201, Speed Brake Control System
- (2) AMM 71-11-04/201, Fan Cowl Panels
- (3) AMM 71-11-06/401, Core Cowl Panels
- (4) AMM 78-00-00/801, Exhaust
- (5) AMM 78-31-00/201, Thrust Reverser System

B. Access

(1) Location Zones

- 410 Left Power Plant Nacelle
- 420 Right Power Plant Nacelle

(2) Access Panels

- 413AL/414AR Fan Cowl Panels, Left Power Plant
- 415AL/416AR Thrust Reverser, Left Power Plant
- 417AL/418AR Core Cowl Panels, Left Power Plant
- 423AL/424AR Fan Cowl Panels, Right Power Plant
- 425AL/426AR Thrust Reverser, Right Power Plant
- 427AL/428AR Core Cowl Panels, Right Power Plant

C. Prepare to do the Inspection of the Bullnose Seal.

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S 046-063-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILER/SPEED BRAKE CONTROL SYSTEM. IF YOU DO NOT DO THIS, THE SPOILERS CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (1) Do the deactivation procedure for the Spoiler/Speed Brake Control System (AMM 27-61-00/201).

S 866-064-N00

- (2) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

S 866-065-N00

- (3) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

S 046-066-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 DDAMAGE TO EQUIPMENT.

- (4) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 016-067-N00

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

S 016-068-N00

- (6) Open the core cowl panels (AMM 71-11-06/401).

S 016-069-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO OPEN THE THRUST REVERSER. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (7) Open the thrust reverser to the 23-degree position (AMM 78-31-00/201).

NOTE: Do not open the thrust reverser halves more than 23-degrees.

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S 986-101-N00

CAUTION: DO NOT EXTEND THE THRUST REVERSER SLEEVES WHEN THE THRUST REVERSER HALVES ARE OPEN MORE THAN 23-DEGREES. THIS WILL CAUSE DAMAGE TO THE THRUST REVERSER SLEEVES AND THE STRUT.

CAUTION: MAKE SURE THE AREA BEHIND THE THRUST REVERSER IS CLEAR OF ALL GROUND SUPPORT EQUIPMENT AND WORKSTANDS. DAMAGE WILL OCCUR IF THE THRUST REVERSER SLEEVES HIT THE GROUND SUPPORT EQUIPMENT OR THE WORKSTANDS.

CAUTION: BE VERY CAREFUL TO MAKE SURE THE THRUST REVERSER SLEEVES DO NOT HIT THE OPEN CORE COWL PANELS WHEN YOU EXTEND THE THRUST REVERSER. THE THRUST REVERSER WILL NOT FULLY EXTEND WITH THE CORE COWL PANELS IN THE OPEN POSITION. IF YOU ARE NOT CAREFUL, YOU CAN CAUSE DAMAGE TO THE THRUST REVERSER SLEEVES OR THE CORE COWL PANELS.

(8) Manually extend the thrust reverser approximately 6 inches (15 cm) (AMM 78-31-00/201).

NOTE: To prevent damage to the thrust reverser sleeves or the core cowl panels, DO NOT extend the thrust reverser more than 6 inches (15 cm).

D. Do the Inspection of the Bullnose Seal (Fig. 602).

S 216-071-N00

- (1) Examine the bullnose seal on the translating sleeve of the thrust reverser as follows:
- (a) Visually examine the bullnose seal for material that is gone.
 - (b) Look for cuts, gouges, and holes that extend through the seal.

NOTE: Damage to the seal that does not extend through the seal is permitted.

NOTE: A bullnose seal may be made from one piece of seal material or from two pieces of seal material. A splice that connects two pieces feels harder than the other parts of the seal. Do not reject a seal splice if it is not damaged.

- (c) Measure the length of all space made from the material that is gone.

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- (d) Measure the length of the area that has damage that extends through the seal.
- (e) Add the lengths together of all these damaged areas.
- (f) If this sum is more than 10.0 inches, replace the bullnose seal.

NOTE: You must remove the translating sleeve to replace the bullnose seal (AMM 78-31-10/401).

- (g) Make sure the bullnose seal fairing on the torque box does not have damage and is installed correctly.

E. Put the Airplane Back to Its Usual Condition.

S 986-072-N00

- (1) Manually retract the thrust reverser (AMM 78-31-00/201).

S 416-073-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO CLOSE THE THRUST REVERSER. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (2) Close the thrust reverser (AMM 78-31-00/201).

S 416-076-N00

- (3) Close the core cowl panels (AMM 71-11-06/401).

S 416-077-N00

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

S 446-078-N00

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

S 446-079-N00

- (6) Do the activation procedure for the spoiler/speed brake control system (AMM 27-61-00/201).

S 866-080-N00

- (7) Remove the DO-NOT-OPERATE tags from the thrust levers.

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TASK 78-00-00-786-106-N00

6. Do a Check of the Thrust Reverser After Deactivation For Flight Dispatch

A. General

- (1) If the thrust reverser was deactivated for flight, you must do a visual check for damage to the thrust reverser sleeve, the deactivation pin and the aft cascade ring.

B. References

- (1) AMM 78-31-00/201, Thrust Reverser System
- (2) AMM 78-31-10/401, Thrust Reverser Sleeve
- (3) SRM 54-30-00

C. Procedure

S 846-107-N00

- (1) Extend the thrust reverser (AMM 78-31-00/201).

S 216-108-N00

- (2) Do a visual check for damage to the thrust reverser sleeve, the deactivation pin and the aft cascade ring.
 - (a) Do a check of the bushing in the aft cascade ring for any deformation in the hole.
 - (b) Do a check of the deactivation pin for any deformation.
 - (c) Do a check of the insert in the thrust reverser sleeve for any damage.
 - (d) Do a check of the outer panel of the thrust reverser sleeve around the insert, the honeycomb and the bonded panel for any signs of delamination or disbonds around the insert flange.

S 816-109-N00

- (3) If the bushing in the aft cascade ring shows deformation, do these steps:
 - (a) Remove the thrust reverser sleeve (AMM 78-31-10/401).
 - (b) Remove the bushing from the aft cascade ring.
 - (c) Do a check for deformation around the hole in the aft cascade ring.
 - (d) Do a check for deformation of the flange and body of the bushing.

S 816-110-N00

- (4) If any damage is found in the outer panel of the thrust reverser sleeve or the aft cascade ring, refer to the structural repair manual for the allowable damage limits (SRM 54-30-00).

S 816-111-N00

- (5) If any damage or deformation are found on the bushing from the aft cascade ring, the deactivation pin or the insert in the thrust reverser sleeve, contact the Boeing Company.

S 846-112-N00

- (6) Install the thrust reverser sleeve if it was removed (AMM 78-31-10/401).

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- S 846-113-N00
(7) Retract the thrust reverser (AMM 78-31-00/201).

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EXHAUST - APPROVED REPAIRS

1. General

- A. There are three tasks in this procedure.
- (1) The first task is a repair for the fire seal on the thrust reverser. The fire seals are attached along the bottom section of the higher bifurcation and compress against the lower strut side.
 - (2) The second task is a repair for the vertical blade seals. The vertical blade seals are installed between the engine fan case and the thrust reverser.
 - (3) The third task is a repair for the bullnose seal. The bullnose seals are on the inner, forward-edge of the translating sleeves and compress against the bullnose fairings.

TASK 78-00-00-038-001-N00

2. Repair the Fire Seals

- A. Equipment
- (1) Knife - Xacto
- B. Consumable Materials
- (1) A00303 Adhesive - RTV 174, General Electric or A00087 Adhesive - RTV 102, General Electric
 - (2) G00384 Transfer Dye - HYSPO107
 - (3) B00316 Naphtha
 - (4) D00250, Petroleum Jelly - White
- C. 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
 - (4) AMM 78-31-01/501, Thrust Reverser
- D. Access
- (1) Location Zones

410	Left Engine Nacelle
420	Right Engine Nacelle
 - (2) Access Panels

413AL/414AR	Fan Cowl Panels, Left Engine
415AL/416AR	Thrust Reverser, Left Engine
417AL/418AR	Core Cowl Panels, Left Engine
423AL/424AR	Fan Cowl Panels, Right Engine
425AL/426AR	Thrust Reverser, Right Engine
427AL/428AR	Core Cowl Panels, Right Engine
- E. Prepare for the Fire Seal Repair.

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S 048-003-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 018-002-N00

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

S 018-004-N00

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

S 018-005-N00

WARNING: OBEY THE INSTRUCTIONS IN 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 reverser (AMM 78-31-00/201).

F. Repair the Fire Seal (Fig. 801).

S 358-006-N00

- (1) Find the fire seals that are necessary to repair.

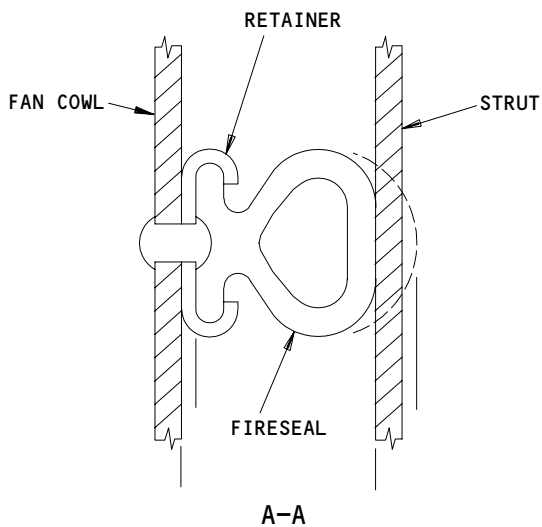
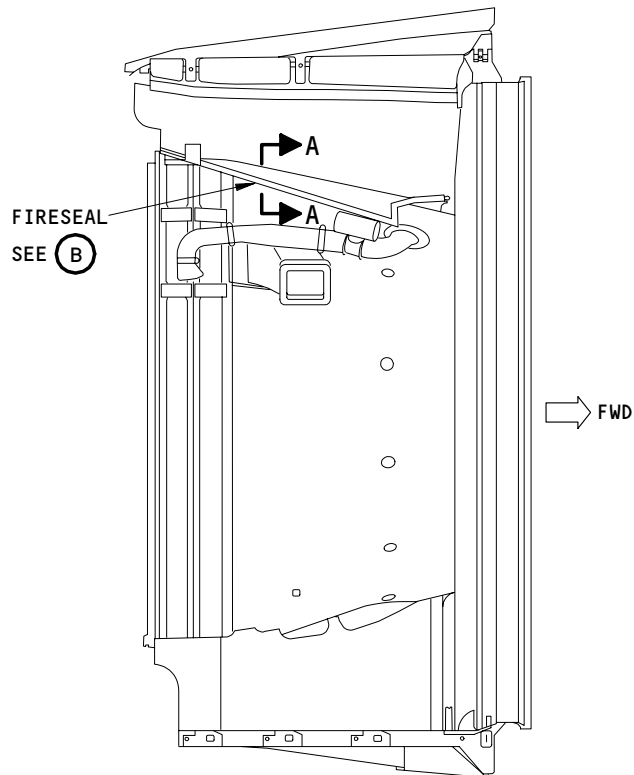
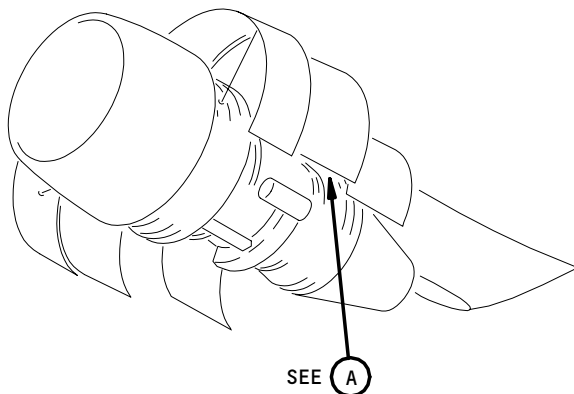
NOTE: If it is necessary to replace more than one fire seal section, you can replace all of the seal assembly with a one-piece fire seal.

S 358-007-N00

- (2) Use a sharp knife to cut and remove the seals with damage.
 - (a) Examine the inner diameters of the adjacent seals.
 - (b) Remove the splice plugs from the adjacent seals if they have damage.

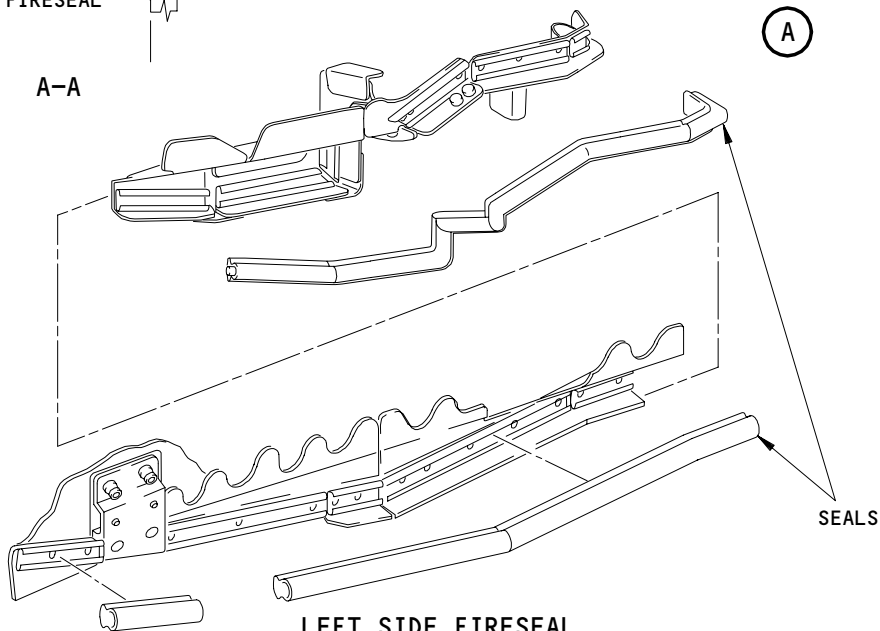
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THRUST REVERSER - LEFT HALF
(RIGHT HALF EQUIVALENT)

(A)



LEFT SIDE FIRESEAL
(RIGHT SIDE EQUIVALENT)

(B)

Fireseal Installation
Figure 801

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S 358-010-N00

- (3) Do these steps to install new splice plugs in the adjacent seals:
- (a) Make sure the splice plug has a minimum length of 1.0 inch (25.4 mm).
 - (b) Use the adhesive to install the splice plugs in the adjacent seals.
 - 1) Make sure splice plugs go into the adjacent seals a minimum of 0.50 inch (12.7 mm).
 - 2) Make sure the splice plugs will go into the replacement seal a minimum of 0.50 inch (12.7 mm).

S 358-011-N00

- (4) Do these steps to install the replacement seal:
- (a) Apply the adhesive to the splice plugs in the adjacent seals.
 - (b) Install the replacement seal.
 - (c) Seal all of the open areas between the adjacent seals and the replacement seal.
 - (d) Make sure the fire seal is correctly installed the retainer.
 - (e) Do not touch the seal area for a minimum of 24 hours.

S 228-013-N00

- (5) Examine the compression of the fire seal.
- (a) Clean the fire seals and the area of the strut that the seals touch with the naphtha.
 - (b) Apply the transfer dye or the petroleum jelly to the area on the strut that the fire seals touch.
 - 1) Apply a thin layer of the transfer dye (petroleum jelly) with a width of approximately one inch.

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO CLOSE AND OPEN THE THRUST REVERSER. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (c) Close the thrust reverser to compress the fire seal (AMM 78-31-00/201).

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- (d) Open the thrust reverser to the 45 degree position (AMM 78-31-00/201).
 - (e) Examine the transfer dye (petroleum jelly) on the fire seal.
 - 1) Make sure the width of the transfer dye (petroleum jelly) is a minimum of 0.25 inches (6.35 mm) along the full length of the fire seal.
 - 2) If the width of the transfer dye (petroleum jelly) is less than 0.25 inch (6.35 mm), remove or install shims on the thrust reverser hinges (AMM 78-31-01/501).
 - (f) Clean the petroleum jelly from the fire seal and the strut.
- G. Put the Airplane Back to Its Usual Condition

S 418-014-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.

- (1) Close the thrust reverser (AMM 78-31-00/201).

S 418-015-N00

- (2) Close the core cowl panel (AMM 71-11-06/201).

S 418-016-N00

- (3) Close the fan cowl panel (AMM 71-11-04/201).

S 448-017-N00

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

TASK 78-00-00-308-018-N00

3. Repair the Vertical Blade Seal

A. Equipment

- (1) Knife - Xacto

B. Consumable Materials

- (1) A00303 Adhesive - RTV 174, General Electric or
A00087 Adhesive - RTV 102, General Electric

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- (2) G00033 Cheesecloth - BMS 15-5B, Woven Class A
- (3) G00320 Glasscloth - Fabric Style 120, type D

C. 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

D. Access

(1) Location Zones

- 410 Left Engine Nacelle
- 420 Right Engine Nacelle

(2) Access Panels

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

E. Prepare to Repair the Vertical Blade Seals.

S 048-020-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 018-014-N00

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

S 018-021-N00

- (3) Open the core cowl panel (AMM 71-11-06/201).

S 018-022-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 reverser (AMM 78-31-00/201).

F. Repair the Vertical Blade Seal (Fig. 802).

S 358-023-N00

- (1) Find the vertical blade seals that are necessary to repair.

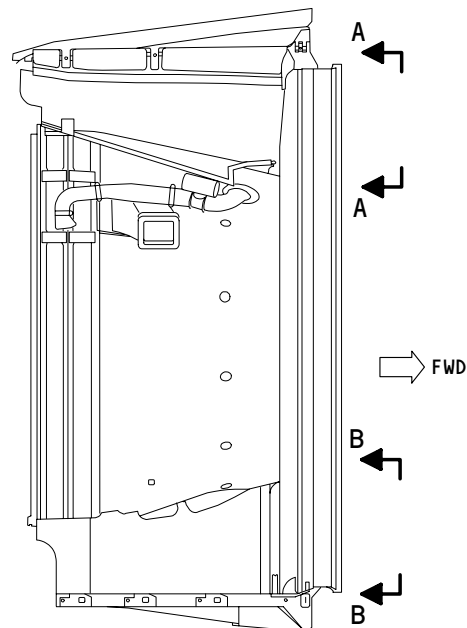
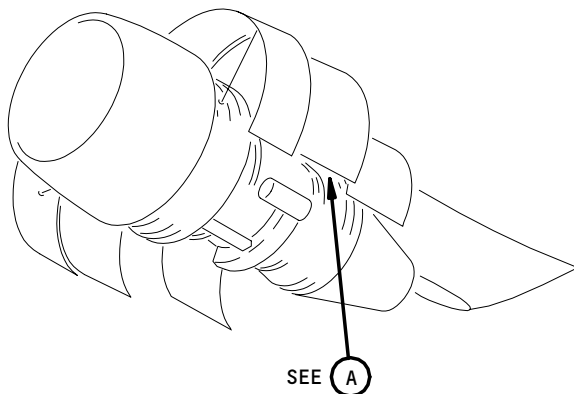
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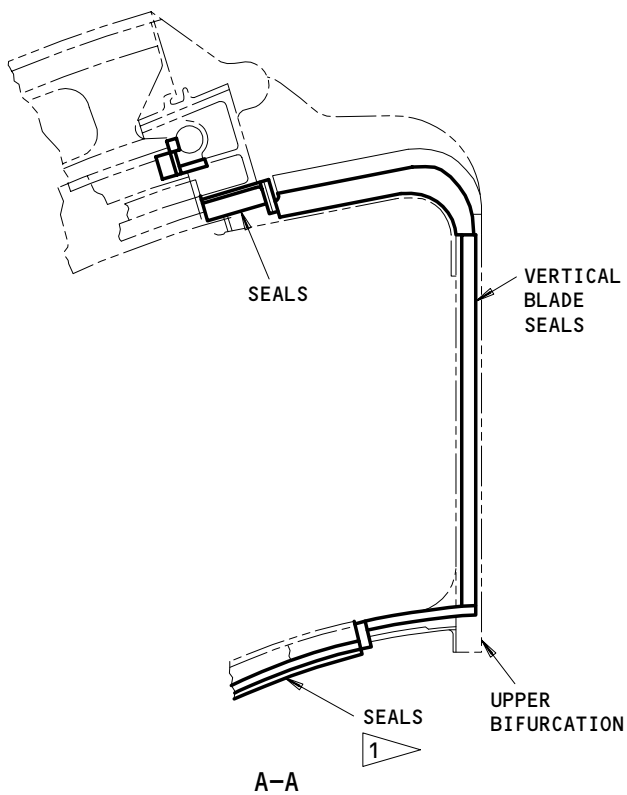
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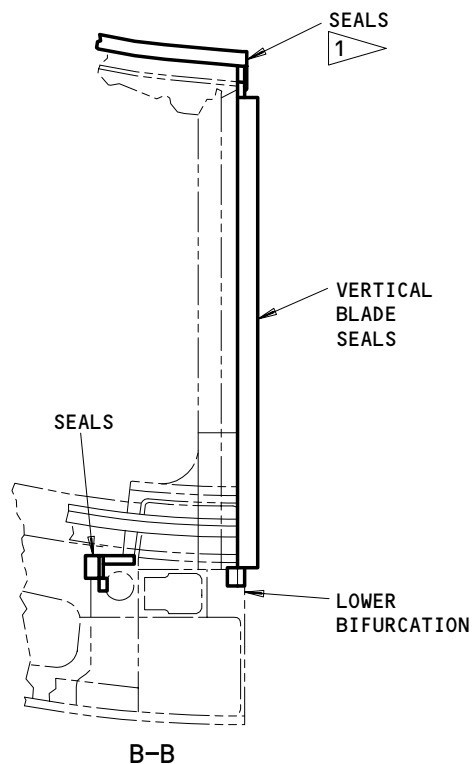
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THRUST REVERSER - LEFT HALF
(RIGHT HALF EQUIVALENT)



(A)



1 SEAL EXTENDS AROUND CIRCUMFERENCE OF FAN COWL

Vertical Blade Seal Installation
Figure 802

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S 358-024-N00

- (2) With a sharp knife, cut away and remove the damaged seal section.

NOTE: You can replace all of the vertical blade seal. You can also make a splice where the seal has damage.

S 358-039-N00

- (3) If you will make a splice in the vertical blade seal, do these steps:
(a) Cut a piece of the seal material that is the same length as the missing seal.

NOTE: You can have a maximum distance of 0.020 inch (0.51 mm) between the ends of the splice piece and adjacent seal.

- (b) Use a clean, dry cheesecloth to remove the unwanted material from the splice piece.
(c) Put the splice piece in its position on the thrust reverser.
(d) Do these steps to install the splice piece:
1) Cut two pieces of the fiberglass cloth with a width of 0.50 inch (12.7 mm) and a length of 1.0 inch (25.4 mm).
2) Apply a thin layer of the adhesive to the cut ends of the splice piece and the ends of blade seal.
3) Put the pieces of the fiberglass cloth on the cut ends of the splice piece and the vertical blade seal.
4) Make sure the fiberglass cloth extends 0.45 to 0.55 inch (11.4 to 14.0 mm) on the end of the splice piece and must be on the end of the vertical blade seal.
5) Apply adhesive in the open areas between the splice piece and vertical blade seal to make a smooth contour.
6) Make sure the adhesive is aligned with the vertical blade seal at the surface which is sealed.
7) Use a clean, dry cloth to remove the unwanted adhesive.
8) Do not touch the seal for a minimum of 24 hours.

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G. Put the Airplane Back to Its Usual Condition

S 418-042-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.

(1) Close the thrust reverser (AMM 78-31-00/201).

S 418-041-N00

(2) Close the core cowl panel (AMM 71-11-06/201).

S 418-035-N00

(3) Close the fan cowl panel (AMM 71-11-04/201).

S 448-036-N00

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

TASK 78-00-00-358-025-N00

4. Repair the Bullnose Seal

A. Consumable Materials

- (1) A00303 Adhesive - RTV 174 or A00087 Adhesive - RTV 102, General Electric
- (2) G00033 Cheesecloth - BMS 15-5B, Woven Class A
- (3) B00083 Solvent - TT-N-95, Type 2, aliphatic naphtha
- (4) G02276 Fabric, Dacron, D-2000
- (5) G00380 Abrasive Paper, Aluminum Oxide, 320 grit

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
- (4) AMM 78-31-10/401, Thrust Reverser Sleeve

C. Access

- (1) Location Zones
 - 410 Left Engine Nacelle
 - 420 Right Engine Nacelle

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- (2) Access Panels
 - 413AL/414AR Fan Cowl Panels, Left Engine
 - 415AL/416AR Thrust Reversers, Left Engine
 - 417AL/418AR Core Cowl Panels, Left Engine
 - 423AL/424AR Fan Cowl Panels, Right Engine
 - 425AL/426AR Thrust Reversers, Right Engine
 - 427AL/428AR Core Cowl Panels, Right Engine

D. Prepare to Repair the Bullnose Seal.

S 048-027-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 018-040-N00

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

S 018-028-N00

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

S 018-029-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

- (4) Open the thrust reverser (AMM 78-31-00/201).

E. Repair the Bullnose Seal (Fig. 803, 804).

NOTE: You can replace the bullnose seal with the translating sleeve removed or attached.

S 028-030-N00

WARNING: DO NOT PUT YOUR WEIGHT ON A THRUST REVERSER THAT IS KEPT OPEN WITH A HOLD-OPEN ROD ONLY. YOUR WEIGHT CAN CAUSE THE FAILURE OF THE HOLD-OPEN ROD. THE THRUST REVERSER HALVES CAN FALL CLOSED QUICKLY, WHICH CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (1) Remove the seal retainer bolts.

S 028-031-N00

- (2) Remove the bullnose seal.

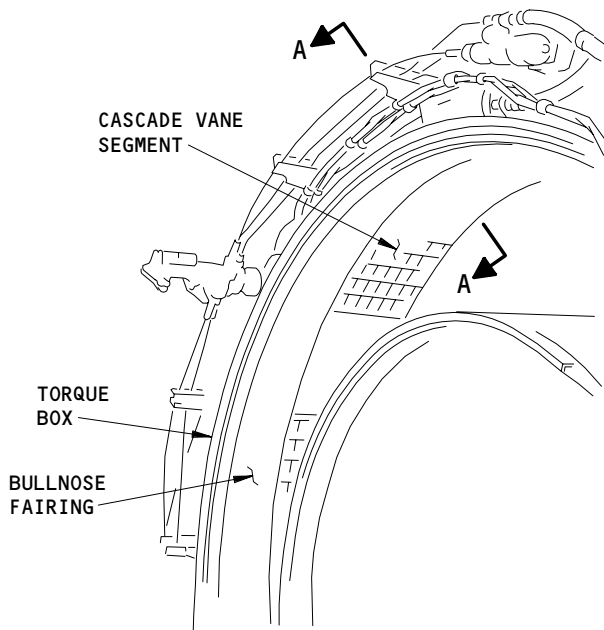
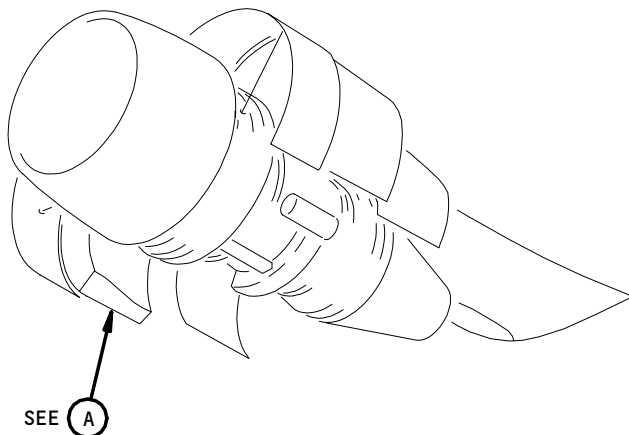
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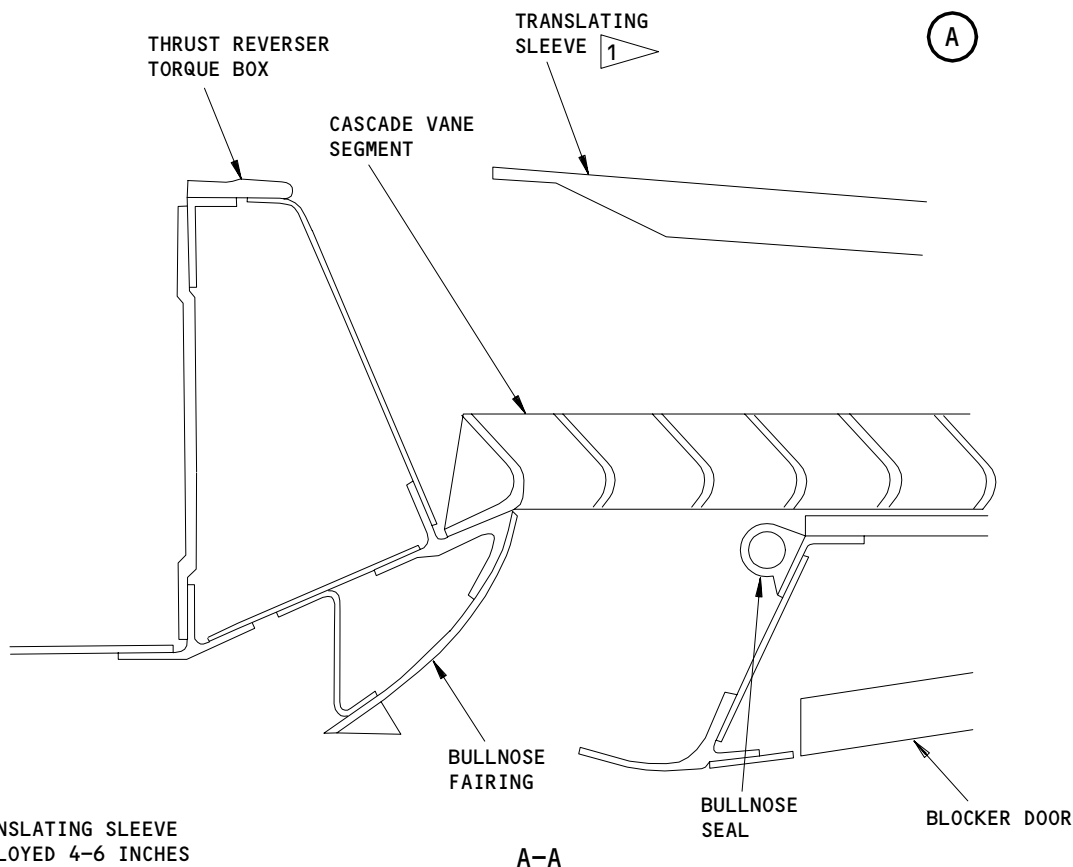
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REVERSER OPEN TO THE
23 DEGREE POSITION



1 TRANSLATING SLEEVE
DEPLOYED 4-6 INCHES

A-A

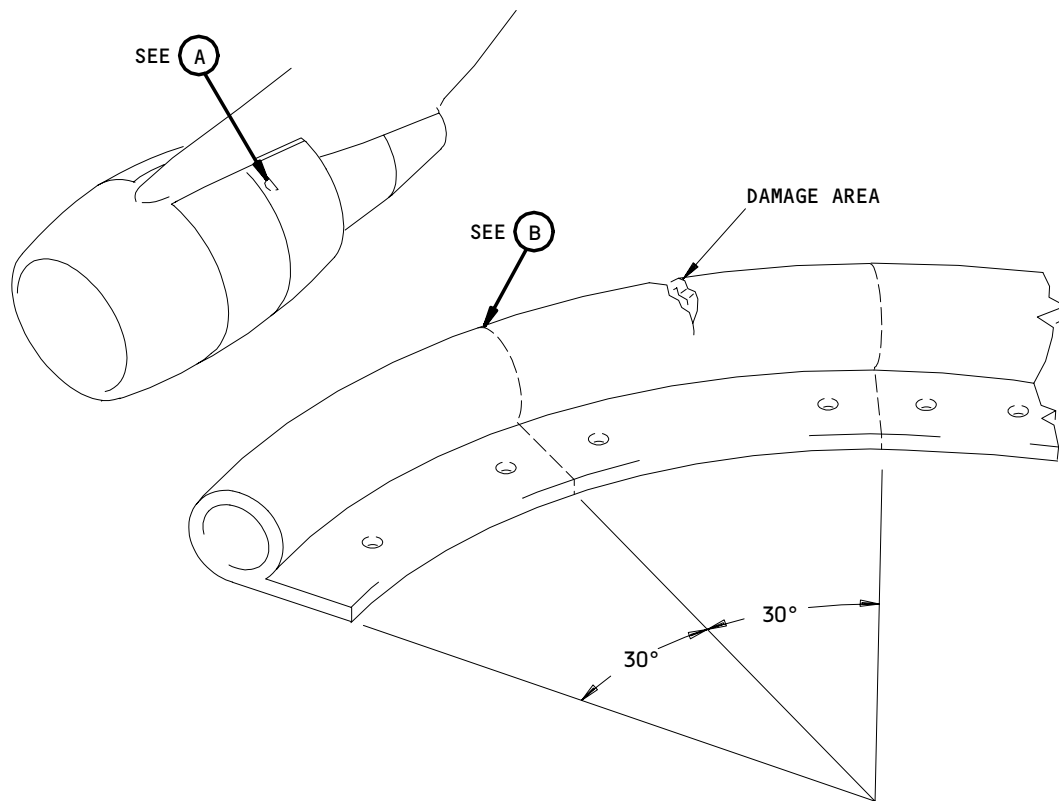
Bullnose Fairing and Seal Repair
Figure 803

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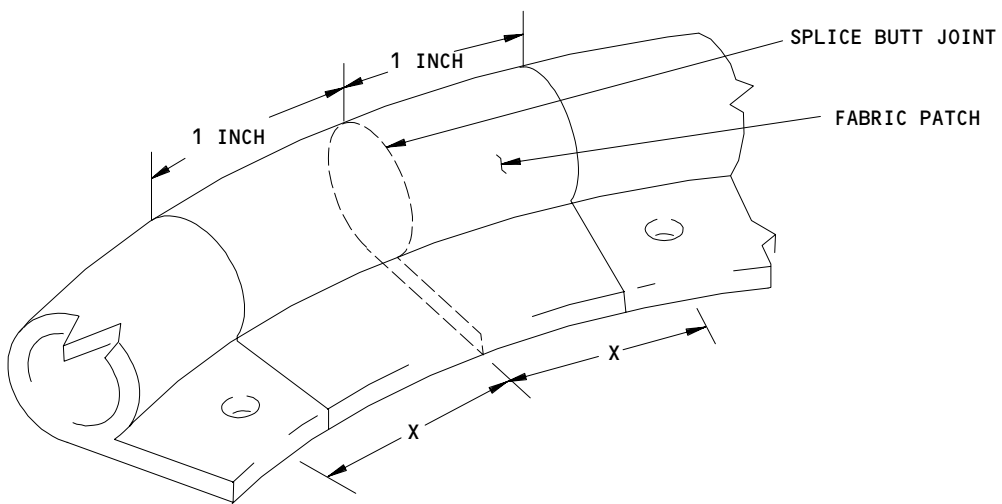
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BULLNOSE SEAL

(A)



BULLNOSE SEAL REPAIR SPLICE

(B)

Bullnose Seal Repair
Figure 804

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C70567

S 348-032-N00

(3) Repair the bullnose seal:

- (a) Use a knife and cut through the bullnose seal to remove the damaged piece.

NOTE: The shape of the bullnose seal is a half of a circle (180 degrees). Use bullnose seal replacements at approximately 30 degree increments (30, 60, 90, 120, 150). Also, the splice must be made so that the splice butt-joints are halfway between adjacent fasteners.

- (b) Lightly sand the cut edges of the bullnose seal to remove any unwanted material.
(c) Make sure the new piece is a correct fit.

WARNING: AVOID SKIN AND EYE CONTACT WITH THE SOLVENT. MAKE SURE YOU HAVE ADEQUATE VENTILATION. FAILURE TO COMPLY CAN CAUSE INJURY TO PERSONS.

- (d) Use solvent and a clean cheesecloth to clean the area to be spliced.
(e) Cut two pieces of the Dacron fabric.
1) Make the width 2.0 inches (50.8 mm).
2) Make the length sufficient to go fully around the bullseal.
(f) Apply a thin layer of adhesive to the surfaces to be bonded.
(g) Put the splice piece in position.
(h) Apply a thin layer of adhesive to the surfaces where the Dacron fabric goes.
(i) Put the Dacron fabric on the splice area.
1) Make sure the fabric extends 1.0 inch (25.4 mm) on each side of the splice.
(j) Use a clean, dry cloth to remove the unwanted adhesive.
(k) Do not touch the seal for a minimum of 24 hours.

NOTE: This adhesive must have a minimum of 20 percent relative humidity to cure. The temperature must be 65-100 °F (18-38 °C).

S 418-037-N00

(4) Replace the bullnose seal.

S 428-038-N00

(5) Replace the seal retainer bolts.

F. Put the Airplane Back to its Usual Condition.

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S 418-033-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.

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

S 418-034-N00

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

S 418-036-N00

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

S 448-035-N00

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

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EXHAUST - DDG MAINTENANCE PROCEDURES

1. General

- A. This procedure includes these DDG maintenance procedures:
- (1) DDG 78-31-1 Preparation - Thrust Reverser Inoperative
 - (2) DDG 78-31-1 Restoration - Thrust Reverser Inoperative
 - (3) DDG 78-34-1 Preparation - REV ISLN VALVE Light Inoperative
 - (4) DDG 78-34-1 Restoration - REV ISLN VALVE Light Inoperative
 - (5) DDG 78-36-1 Preparation - REV Unlock Indications Inoperative
 - (6) DDG 78-36-3 Preparation - Reverser Position Indicating System Inoperative

TASK 78-00-00-049-016-N00

2. DDG 78-31-1 Preparation - Thrust Reverser Inoperative

A. References

- (1) AMM 71-11-04/201, Fan Cowl Panels
- (2) AMM 78-31-00/201, Thrust Reverser System
- (3) AMM 78-31-15/401, Thrust Reverser Drag Links

B. Access

- (1) Location Zones
 - 411 Engine, Left
 - 421 Engine, Right

- (2) Access Panels
 - 413AL Fan Cowl Panels (Left)
 - 414AR Fan Cowl Panels (Right)
 - 423AL Fan Cowl Panels (Left)
 - 424AR Fan Cowl Panels (Right)

C. Procedure

S 869-002-N00

- (1) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:

NOTE: The circuit breaker effectivities are not the same for each each airplane. Not all of the circuit breakers are installed on all of the airplanes. After you complete the deactivation procedure, make sure you close the circuit breakers.

- (a) 11D14, L ENG T/R CONT

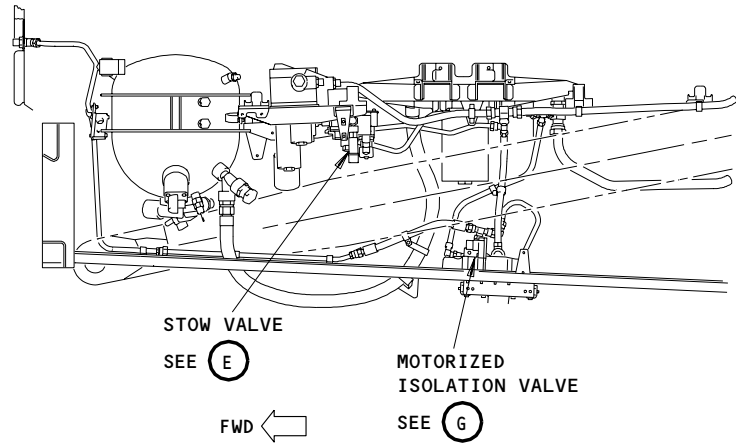
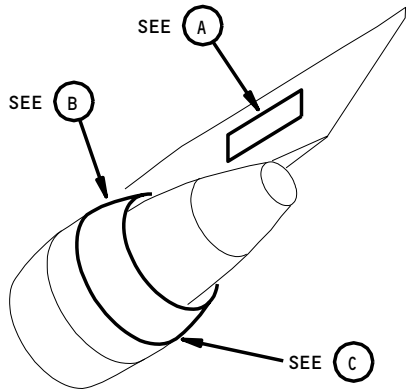
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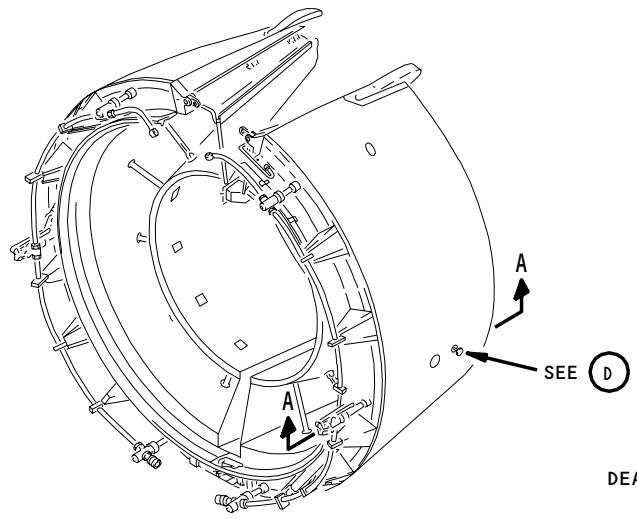
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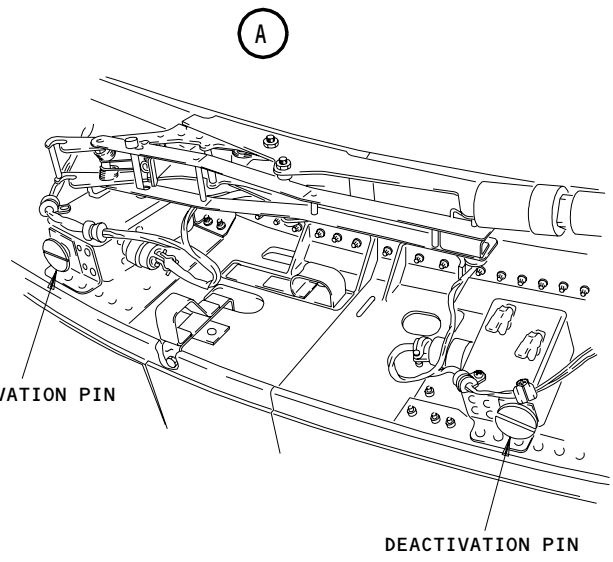
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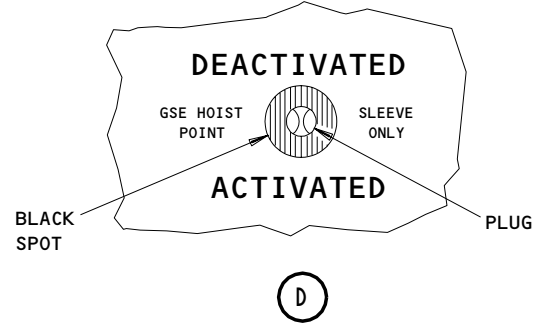
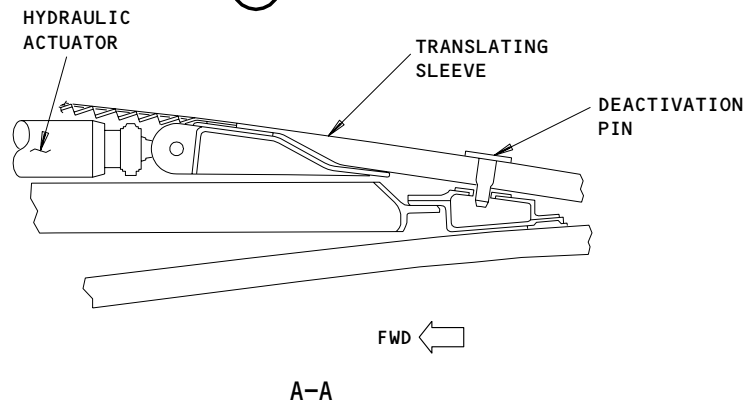
ENGINE STRUT HYDRAULIC BAY



THRUST REVERSER



THRUST REVERSER TORQUE BOX



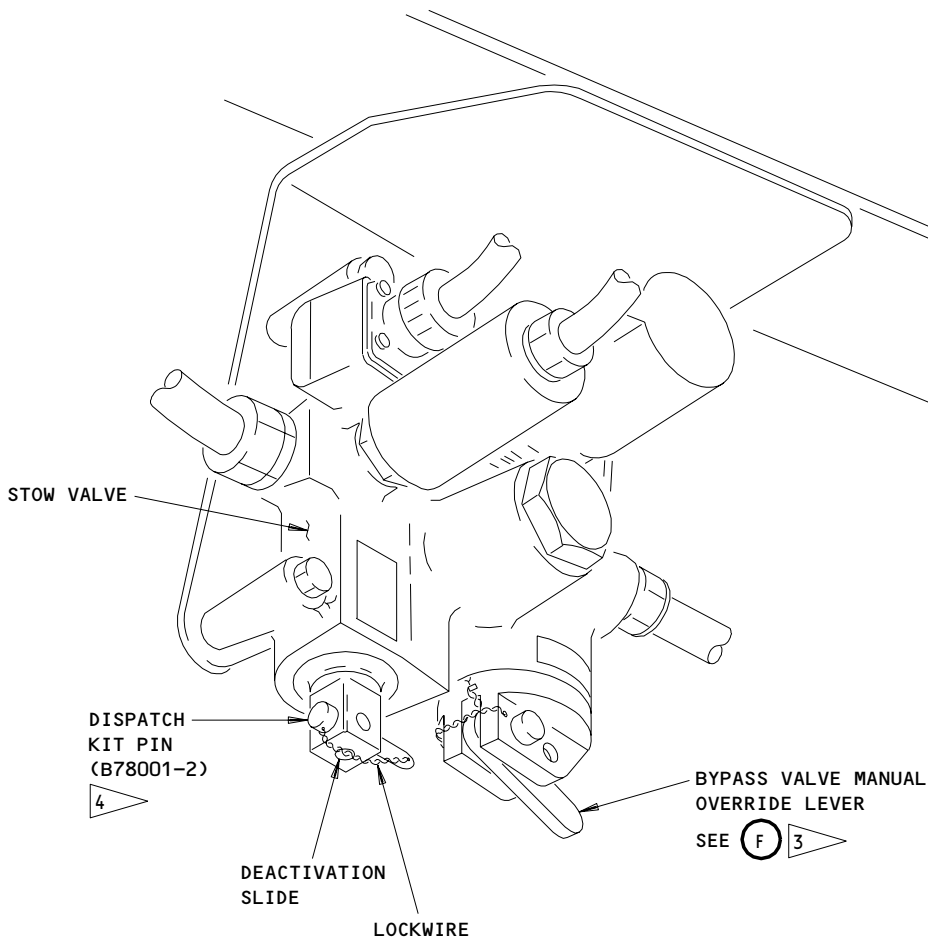
- 1 RED LETTERS MATCH THE DEACTIVATION PIN HEAD COLOR WHEN INSTALLED TO DEACTIVATE THE THRUST REVERSER
- 2 BLACK LETTERS MATCH THE SPOT, AND INDICATE THAT THE DEACTIVATION PIN IS NOT INSTALLED

Thrust Reversers
Figure 901 (Sheet 1)

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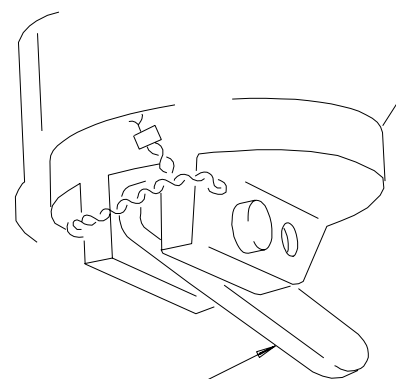
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STOW VALVE

(E)



BYPASS VALVE MANUAL
OVERRIDE LEVER

3

(F)

- 3 **DO NOT** PUT A PIN IN THE BYPASS VALVE MANUAL OVERRIDE LEVER FOR FLIGHT DISPATCH. THIS VALVE IS **NOT** INCLUDED IN THE DEACTIVATION PROCEDURE FOR FLIGHT DISPATCH
- 4 INSTALL THE DISPATCH KIT PIN (B78001-2) IN THE DEACTIVATION SLIDE AND INSTALL THE LOCKWIRE FOR FLIGHT DISPATCH DEACTIVATION OF THE THRUST REVERSER

Thrust Reversers
Figure 901 (Sheet 2)

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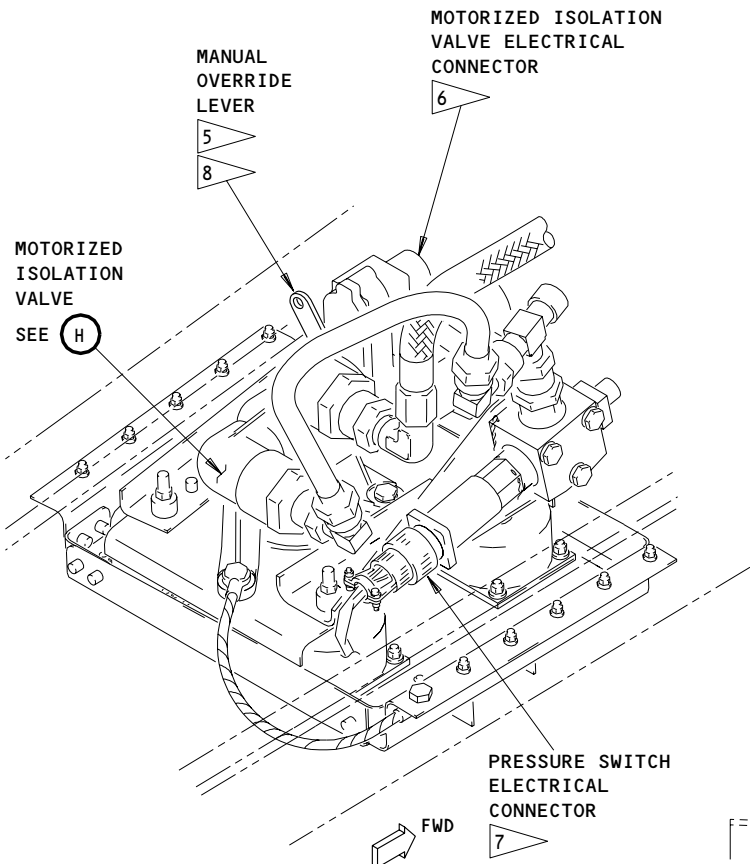
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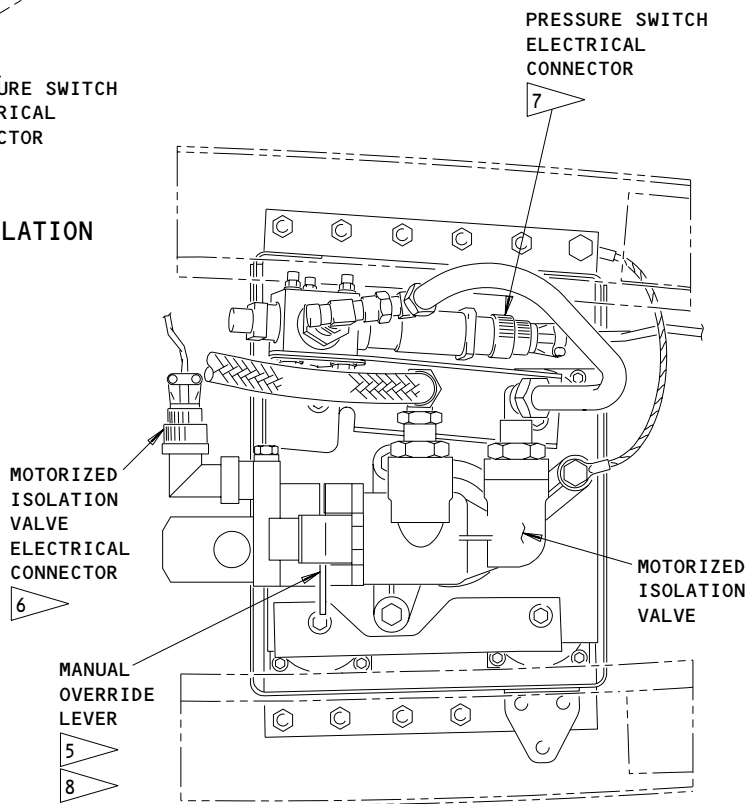
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MOTORIZED ISOLATION VALVE INSTALLATION

(G)

- 5 ▷ TO DEACTIVATE THE MOTORIZED ISOLATION VALVE, MOVE THE MANUAL OVERRIDE LEVER TO POSITION NO. 1 (UP) AND INSTALL THE LOCKWIRE. ALSO, REMOVE THE ELECTRICAL CONNECTOR FROM THE MOTORIZED ISOLATION VALVE. INSTALL THE PROTECTION CAPS AND STOW THE ELECTRICAL CONNECTOR.
- 6 ▷ REMOVE THIS ELECTRICAL CONNECTOR TO DEACTIVATE THE MOTORIZED ISOLATION VALVE.
- 7 ▷ DO NOT REMOVE THE PRESSURE SWITCH ELECTRICAL CONNECTOR TO DEACTIVATE THE MOTORIZED ISOLATION VALVE.
- 8 ▷ TO ACTIVATE THE MOTORIZED ISOLATION VALVE, CUT AND REMOVE THE LOCKWIRE FROM THE MANUAL OVERRIDE LEVER, BUT DO NOT PUSH THE LEVER DOWN. ALSO, REMOVE THE PROTECTION CAPS AND CONNECT THE ELECTRICAL CONNECTOR TO THE MOTORIZED ISOLATION VALVE.



VIEW IN THE DOWN DIRECTION

(H)

Thrust Reversers
Figure 901 (Sheet 3)

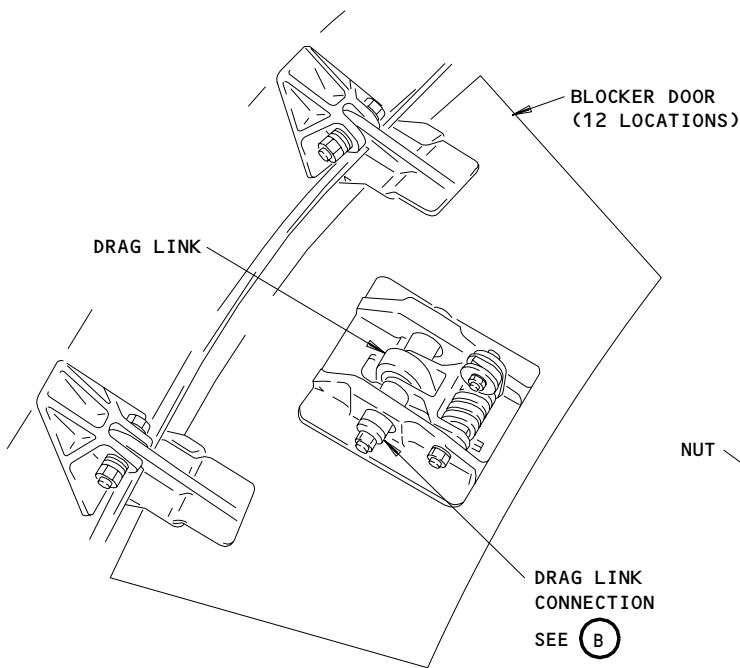
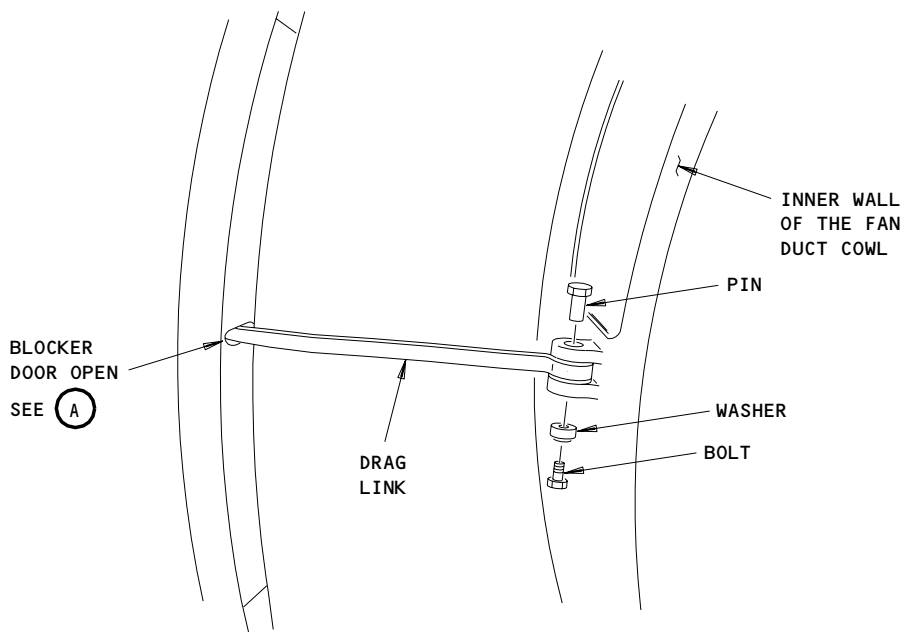
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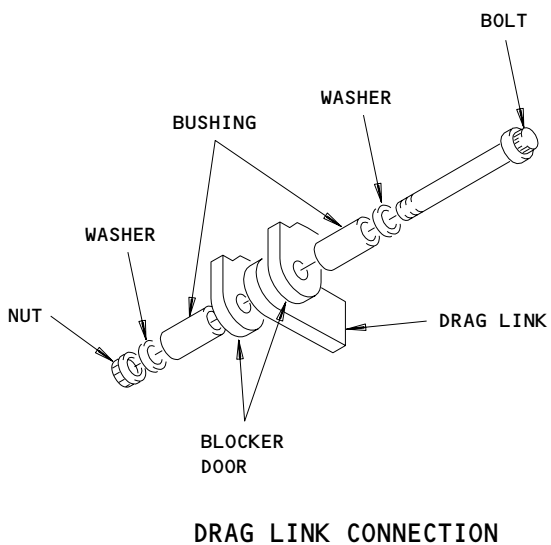
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BLOCKER DOOR OPEN
(VIEW IN THE FORWARD DIRECTION)

(A)



DRAG LINK CONNECTION

(B)

Blocker Door Drag Link Installation
Figure 902

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- (b) 11D13, L ENG T/R IND
- (c) 11D18, L ENG T/R SSL CONT
- (d) 11C21, R ENG T/R SSL CONT
- (e) 11D32, R ENG T/R IND ATLN
- (f) 11D33, R ENG T/R CONT ATLN
- (g) 11L32, R ENG T/R IND
- (h) 11L33, R ENG T/R CONT

S 019-003-N00

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

S 869-004-N00

- (3) Make sure the thrust reverser sleeves are in the fully retracted and locked position (AMM 78-31-00/201).

S 019-005-N00

- (4) Open the access door for the thrust reverser isolation valve on the side of the strut.

NOTE: The deactivation procedure for flight dispatch includes the hydraulic deactivation of the stow valve and the motorized isolation valve, and the mechanical deactivation of the thrust reverser sleeves.

S 049-006-N00

- (5) Do the steps that follow for the hydraulic deactivation:
 - (a) Get the dispatch kit which is found in the main equipment center.

CAUTION: DO NOT PUT A DEACTIVATION PIN IN THE BYPASS VALVE MANUAL OVERRIDE LEVER OF THE STOW VALVE FOR FLIGHT DISPATCH. IF YOU DO, DAMAGE TO THE THRUST REVERSER SYSTEM CAN OCCUR.

MAKE SURE THE BYPASS VALVE MANUAL OVERRIDE LEVER IS LOCKWIRED IN THE EXTENDED POSITION.

- (b) Put a pin from the dispatch kit in the deactivation slide of the stow valve housing (Fig. 901, View E).
 - 1) Install a lockwire.
- (c) Move the manual override lever to the No. 1 position (up) to deactivate the motorized isolation valve (Fig. 901, View G or H).
 - 1) Install a lockwire.

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- (d) Remove the electrical connector from the motorized isolation valve.
 - 1) Put a cap on the electrical connector.
 - 2) Attach the electrical connector in a safe location.

S 419-007-N00

- (6) Close the access door for the thrust reverser isolation valve.

S 869-008-N00

- (7) Remove the red deactivation pins from the storage bracket below the bottom actuator (Fig. 901, View C).

NOTE: The actuator is on the bottom of the thrust reverser torque box.

S 869-009-N00

- (8) Remove the plug from the outer sleeve near the access panel for the center locking hydraulic actuator (Fig. 901, View D).

S 869-010-N00

- (9) Install a cap on the torque box where the deactivation pin was removed.

S 869-011-N00

- (10) Install the red deactivation pin in the structure through the sleeve.

NOTE: When you install the deactivation pin, the top of it will be above the skin surface of the translating sleeve.

S 419-012-N00

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

S 869-013-N00

- (12) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
 - (a) 11D13, L ENG T/R IND

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- (b) 11D32, R ENG T/R IND ATLN
- (c) 11L32, R ENG T/R IND

S 869-049-N00

- (13) Keep these circuit breakers for the deactivated thrust reverser open and collar these circuit breakers on the panel P11:
 - (a) 11D14, L ENG T/R CONT
 - (b) 11D18, L ENG T/R SSL CONT
 - (c) 11C21, R ENG T/R SSL CONT
 - (d) 11D33, R ENG T/R CONT ATLN
 - (e) 11L33, R ENG T/R CONT

S 039-015-N00

- (14) Remove damaged or broken drag links (AMM 78-31-15/401).
 - (a) Use tape to hold the blocker doors in the closed position.

TASK 78-00-00-449-017-N00

3. DDG 78-31-1 Restoration - Thrust Reverser Inoperative

A. References

- (1) AMM 71-11-04/201, Fan Cowl Panels
- (2) AMM 78-31-15/401, Thrust Reverser Drag Links

B. Access

- (1) Location Zones
 - 211 Flight Compartment
 - 212 Flight Compartment
 - 411 Left Engine
 - 421 Right Engine

C. Procedure

S 869-039-N00

- (1) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:

NOTE: The circuit breaker effectivities are not the same for each airplane. Not all of the circuit breakers are installed on each airplane. After you complete the deactivation procedure, make sure you close the circuit breakers.

- (a) 11D13, L ENG T/R IND
- (b) 11D32, R ENG T/R IND ATLN
- (c) 11L32, R ENG T/R IND
- (d) 11D14, L ENG T/R CONT
- (e) 11D18, L ENG T/R SSL CONT
- (f) 11C21, R ENG T/R SSL CONT
- (g) 11D33, R ENG T/R CONT ATLN
- (h) 11L33, R ENG T/R CONT

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S 909-038-N00

- (2) If the damaged or broken drag links were not replaced, replace the drag links (AMM 78-31-15/401).
(a) Make sure to remove the tape from the blocker doors.

S 019-040-N00

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

S 439-041-N00

- (4) Remove the deactivation pin from the thrust reverser sleeve:
(a) Remove the red deactivation pin which is installed in the thrust reverser sleeve (Fig. 901, View D).
(b) Remove the cap which is installed on the thrust reverser torque box (Fig. 901, View C).
(c) Install the red deactivation pin in the storage location on the thrust reverser torque box.
(d) Install the plug on the outer side of the thrust reverser sleeve.

S 449-042-N00

- (5) Do the steps to activate the thrust reverser hydraulic system:

NOTE: The activation procedure of the thrust reverser hydraulic system includes the hydraulic activation of the stow valve and the motorized isolation valve, and the mechanical activation of the thrust reverser sleeves.

- (a) Open the access door for the thrust reverser isolation valve on the side of the strut.
(b) Get the dispatch kit which is found in the main equipment center.
(c) Remove the lockwire from the manual override lever on the motorized isolation valve (Fig. 901, View G or H).
(d) Remove the cap and install the electrical connector on the motorized isolation valve.

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- (e) Remove the lockwire from pin which is installed in the deactivation slide of the stow valve housing (Fig. 901, View E).
- (f) Remove the pin from the deactivation slide of the stow valve housing and put the pin into the dispatch kit.
- (g) Put the dispatch kit back in the main equipment center.
- (h) Close the access door for the thrust reverser isolation valve on the side of the strut.

S 419-043-N00

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

S 869-045-N00

- (7) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
 - (a) 11D14, L ENG T/R CONT
 - (b) 11D13, L ENG T/R IND
 - (c) 11D18, L ENG T/R SSL CONT
 - (d) 11C21, R ENG T/R SSL CONT
 - (e) 11D32, R ENG T/R IND ATLN
 - (f) 11D33, R ENG T/R CONT ATLN
 - (g) 11L32, R ENG T/R IND
 - (h) 11L33, R ENG T/R CONT

S 819-046-N00

- (8) Look for related maintenance messages and do the necessary corrective action.

TASK 78-00-00-049-037-N00

4. DDG 78-34-1 Preparation - Rev Isln Valve Light Inoperative

A. References

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

B. Access

(1) Location Zones

- 211 Flight Compartment
- 212 Flight Compartment
- 411 Left Engine
- 421 Right Engine

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C. Procedure

S 719-018-N00

- (1) Do a check to make sure the thrust reverser system operates correctly.

WARNING: MAKE SURE THERE ARE NO PERSONS OR EQUIPMENT NEAR THE THRUST REVERSERS WHEN YOU OPERATE THEM. IF THERE ARE PERSONS OR EQUIPMENT NEAR THE THRUST REVERSERS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

- (a) With the electrical power on and power to the left and right hydraulic systems, operate each thrust reverser (one thrust reverser at a time).
- (b) Monitor the operation of the thrust reverser and the unlock indications to make sure they operate correctly.

TASK 78-00-00-449-019-N00

5. DDG 78-34-1 Restoration - Rev Isln Valve Light Inoperative

A. References

- (1) AMM 78-31-00/501, Thrust Reverser System

B. Access

- (1) Location Zones

211	Flight Compartment
212	Flight Compartment

C. Procedure

S 909-020-N00

- (1) If the thrust reverser system operates correctly, replace the inoperative Rev Isln Valve light (WDM 78-34-11).

S 719-047-N00

- (2) Do an operational test (engines not in operation) of the thrust reverser to make sure the REV ISLN VALVE light operates correctly (AMM 78-31-00/501).

TASK 78-00-00-049-036-N00

6. DDG 78-36-1 Preparation - Rev Unlock Indications Inoperative

A. Access

- (1) Location Zones

411	Left Engine
421	Right Engine

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B. Procedure

S 219-021-N00

- (1) Examine the thrust reverser to make sure it is aligned and there is no damage.

S 049-022-N00

- (2) Do the above steps in DDG 78-31-1 Preparation to deactivate the thrust reverser.
 - (a) Tell dispatch that one of the thrust reversers does not operate.

TASK 78-00-00-049-034-N00

7. DDG 78-36-3 Preparation - Reverser Position Sensing System Inoperative

A. Access

(1) Location Zones

- 211 Flight Compartment
- 212 Flight Compartment
- 411 Left Engine
- 421 Right Engine

B. Procedure

S 049-048-N00

- (1) Do the above steps in DDG 78-31-1 Preparation to deactivate the thrust reverser.
 - (a) Tell dispatch that one of the thrust reversers does not operate.

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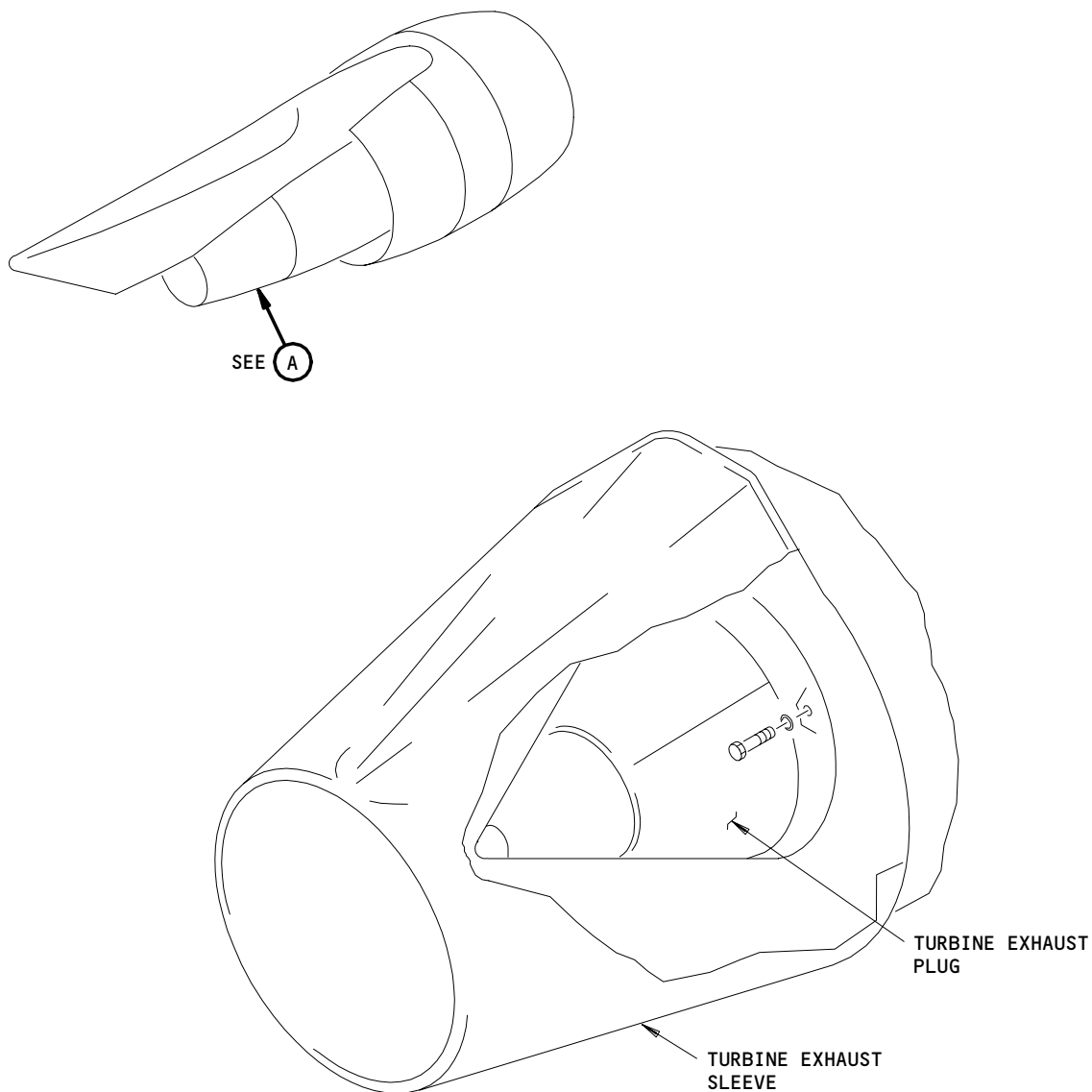
TURBINE EXHAUST SYSTEM – DESCRIPTION AND OPERATION

1. General
 - A. Turbine exhaust system provides a smooth exit path for turbine exhaust. The major components are turbine exhaust sleeve and turbine exhaust plug.
2. Component Details (Fig. 1)
 - A. Turbine Exhaust Sleeve
 - (1) Turbine exhaust sleeve is a tapered cylindrical structure attached to the rear outer flange of the engine exhaust case. The forward outer surface of the sleeve is faired with the core cowl panels. Sleeve inner surface, in conjunction with the exhaust plug, establishes cross sectional area of turbine exhaust nozzle and forms an exhaust annulus.
 - B. Turbine Exhaust Plug
 - (1) Exhaust plug is attached to rear inner flange of turbine exhaust case. Plug forms inner contour of exhaust annulus.

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TURBINE EXHAUST SLEEVE/TURBINE EXHAUST PLUG

(A)

Turbine Exhaust System
Figure 1

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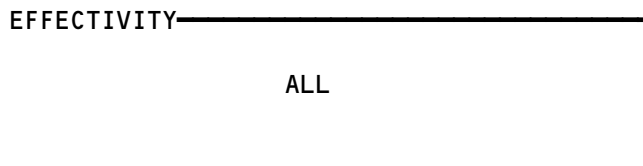
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TURBINE EXHAUST SYSTEM

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
PLUG - LEFT ENGINE TURBINE EXHAUST	--	1	AFT END OF ENGINE	78-11-02
PLUG - RIGHT ENGINE TURBINE EXHAUST	--	1	AFT END OF ENGINE	78-11-02
SLEEVE - LEFT ENGINE TURBINE EXHAUST	--	1	AFT END OF ENGINE	78-11-01
SLEEVE - RIGHT ENGINE TURBINE EXHAUST	--	1	AFT END OF ENGINE	78-11-01

Turbine Exhaust System - Component Index
Figure 101

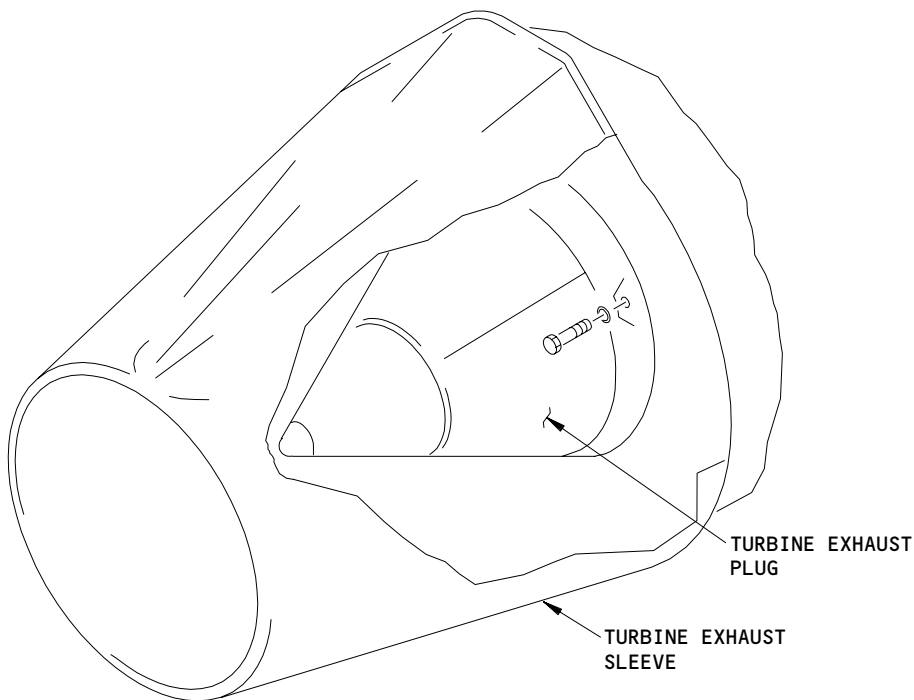
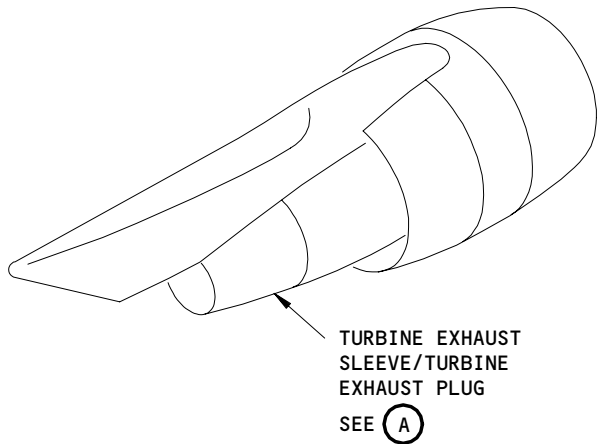


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TURBINE EXHAUST SLEEVE/TURBINE EXHAUST PLUG

(A)

Turbine Exhaust System - Component Location
 Figure 102

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TURBINE EXHAUST SYSTEM – INSPECTION/CHECK

1. General

- A. This procedure gives instructions to do an inspection of the turbine exhaust sleeve and the turbine exhaust plug for damage.

TASK 78-11-00-206-001-N00

2. Do an Inspection of the Turbine Exhaust System

A. References

- (1) AMM 27-61-00/201, Speed Brake Control System
- (2) AMM 71-11-06/201, Core Cowl Panels
- (3) AMM 78-11-01/401, Turbine Exhaust Sleeve
- (4) AMM 78-11-02/401, Turbine Exhaust Plug
- (5) AMM 78-31-00/201, Thrust Reverser System
- (6) SRM 54-43-30, Primary Exhaust Allowable Damage – PW4000 Engine

B. Access

(1) Location Zones

- 411 Left Engine
- 421 Right Engine

(2) Access Panels

- 417AL Core Cowl (Left)
- 418AR Core Cowl (Right)
- 427AL Core Cowl (Left)
- 428AR Core Cowl (Right)

C. Prepare to Do an Inspection of the Turbine Exhaust System.

S 046-007-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE AUTOMATIC SPEED BRAKE CONTROL SYSTEM. IF YOU DO NOT DO THIS, THE AUTOMATIC SPEED BRAKES CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

- (1) Do this procedure: Automatic Speed Brake System Deactivation (AMM 27-61-00/201).

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S 866-009-N00

- (2) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

S 866-008-N00

- (3) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

S 046-002-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 INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

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

S 016-003-N00

- (5) Open the core cowl panels (AMM 71-11-06/201).
- D. Do an Inspection of the Turbine Exhaust System (Fig. 601).

S 216-004-N00

- (1) Examine the fasteners on the turbine exhaust sleeve and the turbine exhaust plug for tightness and the correct installation.

S 216-010-N00

- (2) Make sure the spring seals at the top of the turbine exhaust sleeve are installed and in good condition.

S 016-011-N00

- (3) Remove the turbine exhaust sleeve (AMM 78-11-01/401).

S 216-012-N00

- (4) Examine these areas of the turbine exhaust sleeve for dents, nicks, cracks, gouges, holes, punctures, corrosion, and surface delaminations:

- (a) Inner sleeve attachment member
- (b) Inner sleeve forward ring
- (c) Inner sleeve TRE 3300 panel
- (d) Inner sleeve aft ring
- (e) Inner sleeve nozzle
- (f) Outer sleeve aft skin
- (g) Outer sleeve aft ring
- (h) Outer sleeve TRE 3200 panel

- 1) If you find damage in one or more of these areas, refer to the repair limits in the Primary Exhaust Allowable Damage Table in the Structural Repair Manual (SRM 54-43-30).

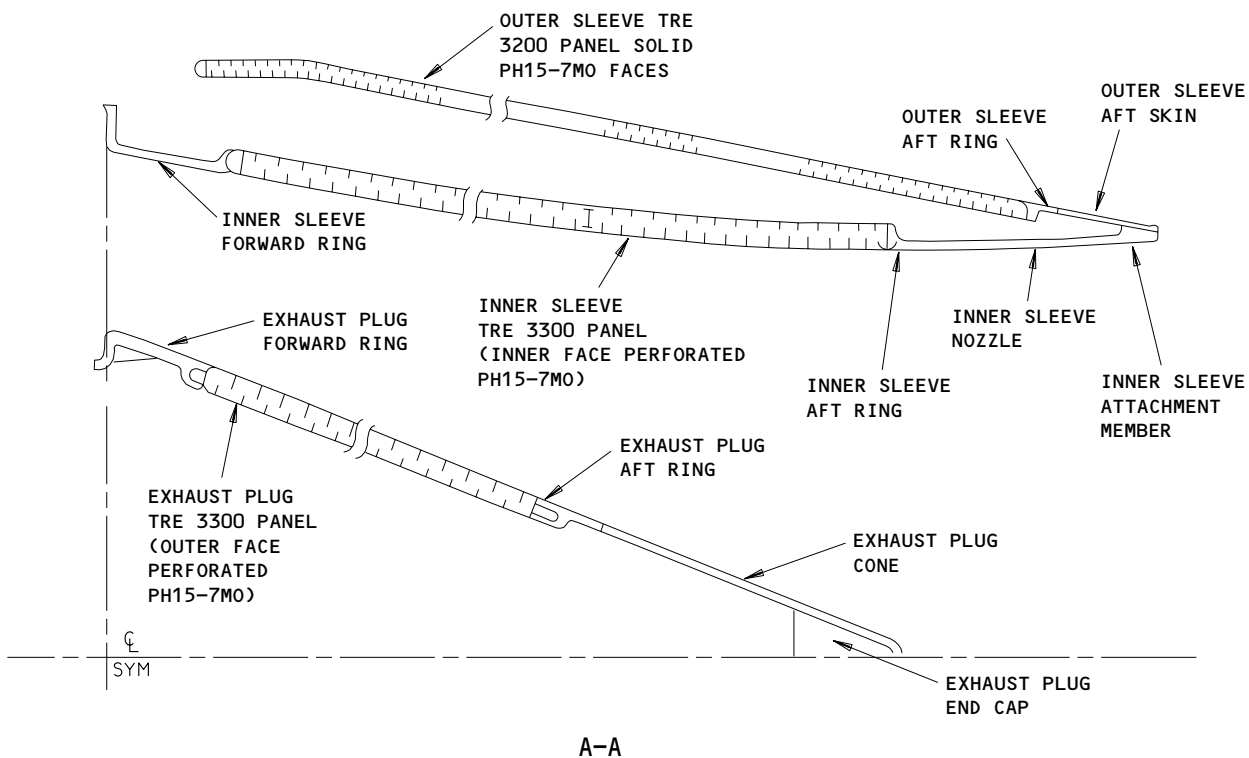
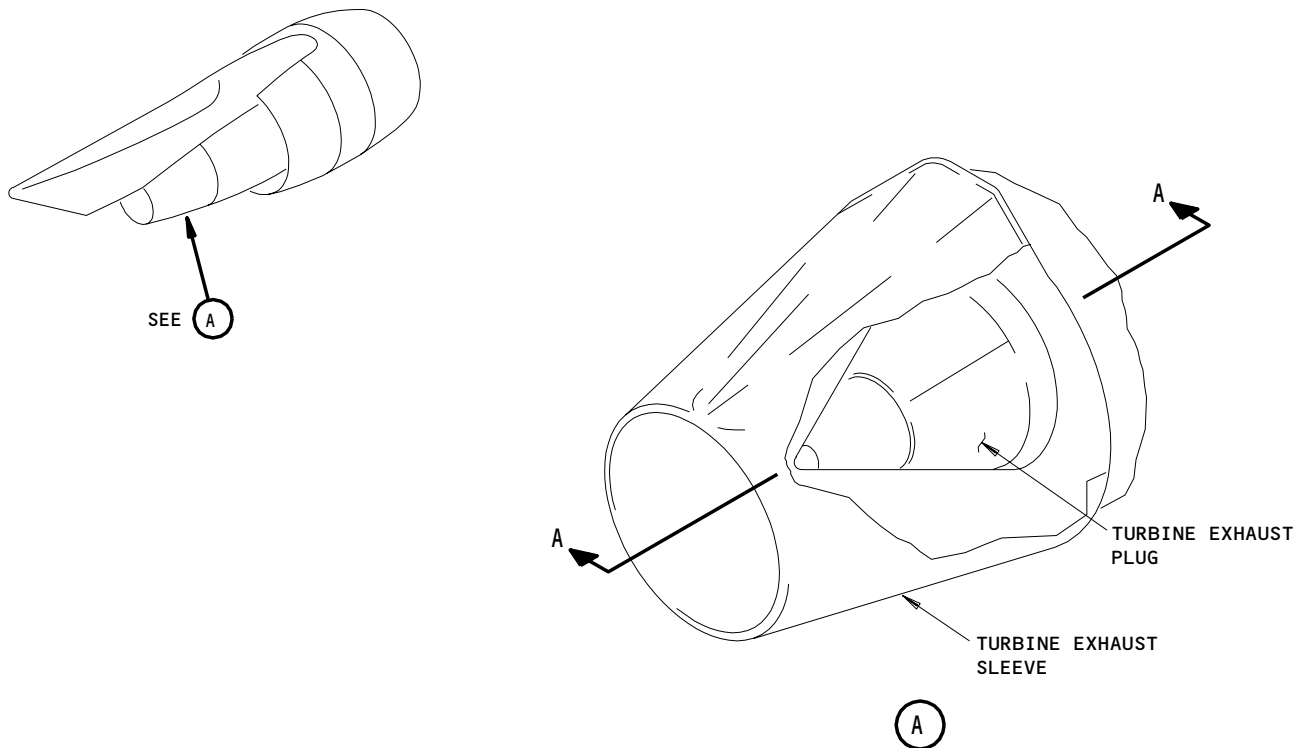
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A-A
Turbine Exhaust Sleeve and Plug Inspection
Figure 601

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- S 016-013-N00
(5) Remove the turbine exhaust plug (AMM 78-11-02/401).

- S 216-014-N00
(6) Examine these areas of the turbine exhaust plug for dents, nicks, cracks, gouges, holes, punctures, corrosion, and surface delamination:
(a) Exhaust plug forward ring
(b) Exhaust plug aft ring
(c) Exhaust plug cone
(d) Exhaust plug end cap
(e) Exhaust plug TRE 3300 panel
1) If you find damage in one or more of these areas, refer to the repair limits in the Primary Exhaust Allowable Damage Table in the Structural Repair Manual (SRM 54-43-30).

E. Put the Airplane Back to Its Usual Condition.

- S 416-015-N00
(1) Install the turbine exhaust plug (AMM 78-11-02/401).

- S 416-016-N00
(2) Install the turbine exhaust sleeve (AMM 78-11-01/401).

- S 416-005-N00
(3) Close the core cowl panels (AMM 71-11-06/201).

- S 446-006-N00
(4) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

- S 446-018-N00
(5) Do the activation procedure for the speed brake control system (AMM 27-61-00/201).

- S 866-017-N00
(6) Remove the DO-NOT-OPERATE tags from the thrust levers.

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TURBINE EXHAUST SLEEVE – REMOVAL/INSTALLATION

1. General

- A. This procedure gives instructions when you remove and install the turbine exhaust sleeve of the engine.

TASK 78-11-01-004-001-N00

2. Remove the Turbine Exhaust Sleeve (Fig. 401)

A. Equipment

- (1) A78003-41 – Cradle, Engine Exhaust Sleeve (Recommended)

A78003-28 – Cradle, Engine Exhaust Sleeve (Alternative)

- (2) Lift Fixture, A71015-87

B. Consumable Materials

- (1) D00006 Lubricant – Anti-Seize thread compound,
Never – Seez Pure Nickel Special
(AMM 20-30-04/201)

C. References

- (1) AMM 71-11-06/201, Core Cowl Panels.
(2) AMM 78-31-00/201, Thrust Reverser System

D. Access

- (1) Location Zones

411 Left Engine
421 Right Engine

- (2) Access Panels

415AL Thrust Reverser (Left)
416AR Thrust Reverser (Right)
425AL Thrust Reverser (Left)
426AR Thrust Reverser (Right)

- E. Remove the Turbine Exhaust Sleeve (Fig. 401)

S 044-002-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER COULD CAUSE INJURY TO YOU AND 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 494-004-N00

- (3) Hold the sleeve on the cradle.

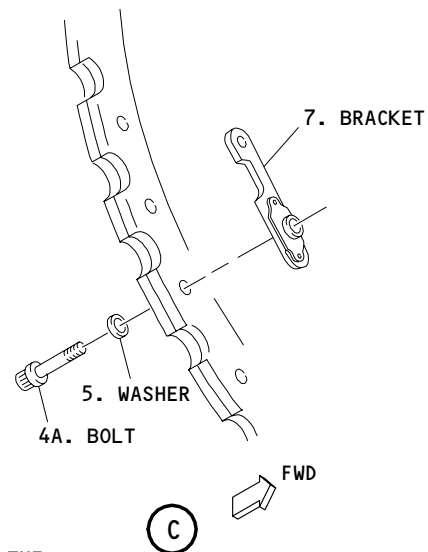
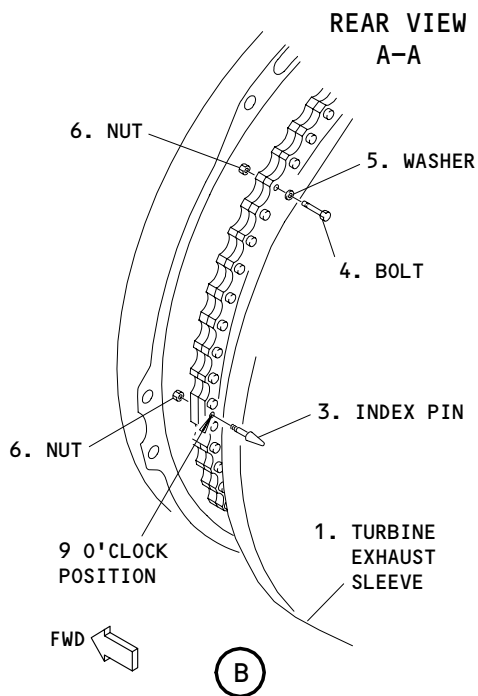
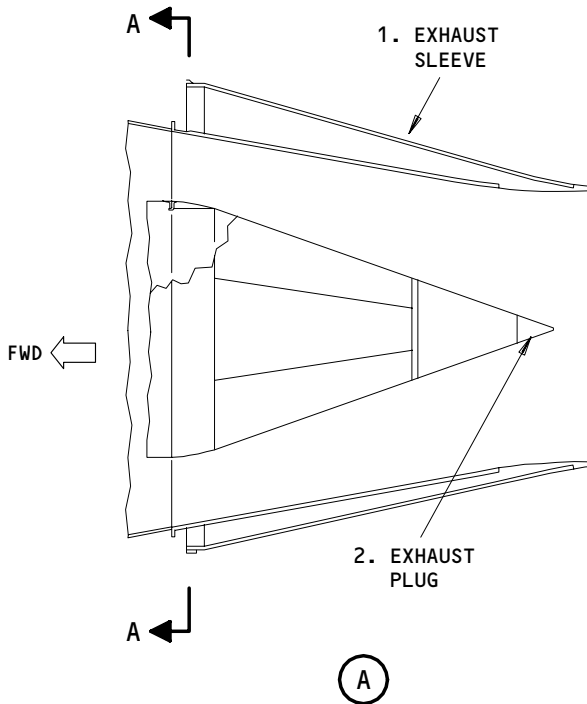
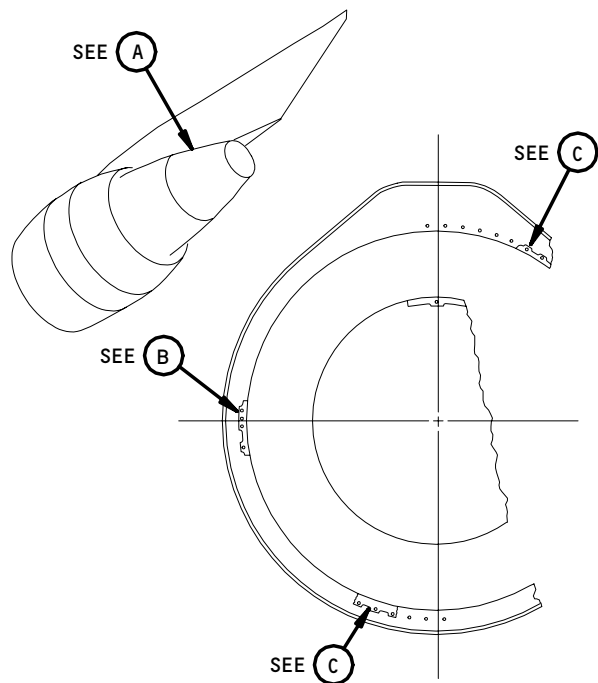
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NOTE: BECAUSE THERE IS NOT SUFFICIENT SPACE NEAR THE BOLT HOLES ON THE FORWARD SIDE OF THIS FLANGE, INSTALL THE BOLTS WITH THE BOLT HEADS ON THE AFT SIDE OF THE FLANGE.

Turbine Exhaust Sleeve Installation
Figure 401

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S 024-005-N00

WARNING: MAKE SURE THE FULL WEIGHT OF THE SLEEVE IS HELD BY THE CRADLE BEFORE YOU REMOVE THE BOLTS. INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR IF THE SLEEVE MOVES OR FALLS.

- (4) Remove bolts (4 and 4A), washers (5), nuts (6) and brackets (7) which attach the sleeve to the engine flange.

S 024-006-N00

- (5) Move the sleeve (1) rearward away from the exhaust plug (2) before you lower it.

S 024-007-N00

- (6) Lower the sleeve away from the engine.

TASK 78-11-01-404-008-N00

3. Install the Turbine Exhaust Sleeve

A. Equipment

- (1) A78003-41 - Cradle, Engine Exhaust Sleeve (Recommended)

A78003-28 - Cradle, Engine Exhaust Sleeve (Alternative)

B. Consumable Materials

- (1) D00006 Lubricant - Anti-Seize thread compound,
Never - Seez Pure Nickel Special
(AMM 20-30-04/201)

C. Parts

- (1) Refer to the IPC for all the part numbers and effectivities for the items which follow:

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Turbine Exhaust Sleeve	78-11-01	04	5

D. References

- (1) AMM 71-11-06/201, Core Cowl Panels.
- (2) AMM 78-31-00/201, Thrust Reverser System

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E. Access

(1) Location Zones

411 Left Engine
421 Right Engine

(2) Access Panels

415AL Thrust Reverser (Left)
416AR Thrust Reverser (Right)
425AL Thrust Reverser (Left)
426AR Thrust Reverser (Right)

F. Install the Turbine Exhaust Sleeve

S 494-009-N00

(1) Hold the sleeve on the cradle.

S 424-010-N00

(2) Do these steps when you attach the turbine exhaust sleeve to the engine:

- (a) Use the index pin (3) to align the sleeve with the engine flange.
- (b) Install the bracket (7) on the 6th hole which is counterclockwise from the top dead center of the engine.
- (c) Install the bracket (7) on the 4th hole which is clockwise from the bottom dead center of the engine.
- (d) Apply a thin layer of the antiseize thread compound on the threads of the bolts (4A).
- (e) Install the bolts (4A) and washers (5).
- (f) Apply a thin layer of the antiseize thread compound on the threads of the bolts (4).
- (g) Install the bolts (4), washers (5), and nuts (6) which attach the sleeve (1) to the engine flange.
- (h) Do a check for the run-on torque.
 - 1) With the nut installed, make sure the run-on torque is a minimum of 3.5 inch-pounds after the two threads are through the locking device. To do this, hold the bolt and turn the nut.
 - 2) Without the nut fully engaged, make sure the break-away torque is a minimum of 3.5 pounds-inches.

NOTE: If the break-away torque for the new bolts is not a minimum of 3.5 pound-inches, you must replace the bolt.

- (i) Tighten all the bolts to 85-95 pound-inches (9.6-10.7 newton-meters).

S 094-011-N00

(3) Remove the cradle.

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- S 414-012-N00
(4) Close the core cowl panels (AMM 71-11-06/201).
- S 444-013-N00
(5) Do the activation procedure for the thrust reverser
(AMM 78-31-00/201).

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TURBINE EXHAUST PLUG – REMOVAL/INSTALLATION

1. General

- A. This procedure contains two tasks. The first task removes the turbine exhaust plug from the engine. The second task installs the turbine exhaust plug on the engine.

TASK 78-11-02-004-013-N00

2. Remove the Turbine Exhaust Plug

A. References

- (1) AMM 78-11-01/401, Turbine Exhaust Sleeve
- (2) AMM 78-31-00/201, Thrust Reverser System

B. Access

- (1) Location Zones
 - 411 Left Engine
 - 421 Right Engine

C. Prepare to Remove the Turbine Exhaust Plug

S 044-012-N00

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

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

S 014-011-N00

- (2) Remove the exhaust sleeve to get access to the exhaust plug (1) (AMM 78-11-01/401).

D. Remove the Turbine Exhaust Plug (Fig. 401)

S 024-010-N00

- (1) Remove the bolts (2) and washers (3) from the lower half of the plug (1).

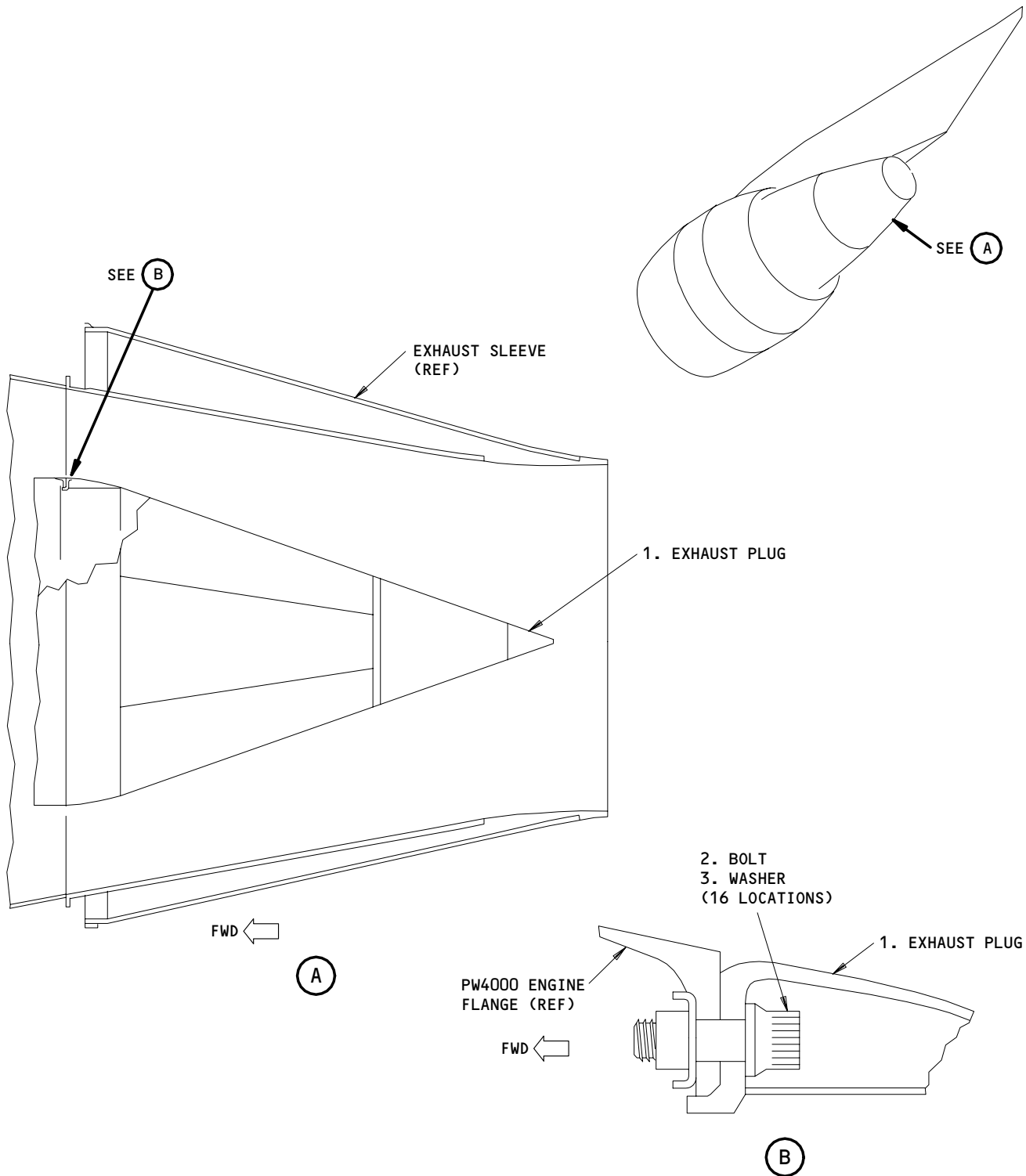
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Turbine Exhaust Plug Installation
Figure 401

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S 024-009-N00

CAUTION: MAKE SURE THE FULL WEIGHT OF THE PLUG IS SATISFACTORILY HELD BEFORE YOU REMOVE THE BOLTS FROM THE UPPER HALF OF THE PLUG. THE PLUG COULD MOVE AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

- (2) Remove the remaining bolts (2) and washers (3) from the upper half of the plug (1) while you hold the weight of the plug.

S 024-008-N00

- (3) Move the plug (1) aft and remove it from the engine.

TASK 78-11-02-404-007-N00

3. Install the Turbine Exhaust Plug

A. Consumable Materials

- (1) Antiseize Compound - Bostik Never-seize Pure Nickel Special.

B. Parts

- (1) Refer to the Illustrated Parts Catalog for the part numbers and effectivities of the items in the table that follows:

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Exhaust Plug	78-11-01	04	90

C. References

- (1) AMM 78-11-01/401, Turbine Exhaust Sleeve
- (2) AMM 78-31-00/201, Thrust Reverser System

D. Access

- (1) Location Zones
 - 411 Left Engine
 - 421 Right Engine

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E. Install the Turbine Exhaust Plug

S 824-006-N00

- (1) Align the exhaust plug (1) with the engine flange.

S 424-005-N00

- (2) Lubricate bolt (2) threads and shank with the anti-seize compound and install the bolts (2) and washers (3) on the upper half of the plug (1).
 - (a) Tighten the bolts with your hand.

S 424-004-N00

- (3) Lubricate bolt (2) threads and shank with the anti-seize compound and install the remaining bolts (2) and washers (3) on the lower half of the plug (1).
 - (a) Tighten the bolts with your hand.

S 434-007-N00

- (4) Tighten the bolts (2) to a final torque of 65-75 pound-inches (7.3-8.5 N.m) with the procedure that follows:

NOTE: A snug fit is defined as no gaps between the flanges on the plug and the engine case and the bolts are tightened to 10 percent of the final torque.

- (a) Tighten the bolts at the clock position 6:00 and 12:00 to a snug fit.
- (b) Tighten the bolts at the clock position 3:00 and 9:00 to a snug fit.
- (c) Tighten the remaining fasteners at opposite sides of the clock position to a snug fit.
- (d) Tighten the bolts at the clock position 3:00 and 9:00 to the final torque value.
- (e) Tighten the bolts at the clock position 6:00 and 12:00 to the final torque value.

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- (f) Tighten the remaining fasteners at opposite sides of the clock position to the final torque value.
- (g) Do a check that the bolts are tightened to the correct torque.
- (h) If the bolts are not tightened to the correct torque, tighten the bolts again, in order, on opposite sides of the clock position.

S 414-002-N00

- (5) Install the turbine exhaust sleeve (AMM 78-11-01/401).

S 444-001-N00

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

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THRUST REVERSER - DESCRIPTION AND OPERATION

1. General

A. The thrust reverser augments wheel and speed brake systems to reduce landing roll. Thrust reversal is obtained by redirecting the bypass fan air to the forward direction. The thrust reverser can be divided into three parts: thrust reverser system, 78-31-00; thrust reverser control, 78-34-00; and thrust reverser indicating, 78-36-00.

2. Thrust Reverser

- A. The thrust reverser redirects the bypass fan air by deploying a translating sleeve aft which positions blocker doors across the air stream. The air stream is forced to exit in the forward direction through exposed cascade vane segments.
- B. The thrust reverser consists of two halves. Each half consists primarily of a fixed structure, translating sleeve, blocker doors, and cascade vane segments. Each half incorporates two non-locking hydraulic actuators, and a locking hydraulic actuator to deploy/stow the reverser half.
- C. The reverser halves are located just aft of the fan case and are attached to the strut.

3. Control System for the Thrust Reverser

- A. The control system for the thrust reverser provides electrical signals to initiate thrust reverser deployment or stow, depending on the position of the reverse thrust levers on the aisle stand.
- B. The principle components are the motorized isolation valve, restrictor tees for the flow control, and the directional control valve.

4. Indicating System for the Thrust Reverser

- A. The indicating system for the thrust reverser provides flight deck indications of the position of each thrust reverser during its operation. These indications are provided on the EICAS display, the engine control stand, and the maintenance test panel for the thrust reverser.
- B. The principle components are the proximity sensors for the deploy/actuator lock on the locking hydraulic actuators, the interlock actuators for the thrust lever, the linear variable differential transducers (LVDTs) and auto-restow proximity sensors on the reverser torque box.

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THRUST REVERSER SYSTEM - DESCRIPTION AND OPERATION

1. General

- A. The thrust reversers on the PW4000 engines are located in the fan section of the engine. There are no thrust reversers in the turbine section. The thrust reversers decrease the speed by redirecting the bypass fan air. The thrust reversers will only operate when the airplane is on the ground.
- B. The PW4000 thrust reverser is an annular cascade design that is hydraulically operated and electrically controlled. The movement of the reverse thrust levers causes the reverser to move. The reverse thrust levers are a conventional "piggyback" design. They give the signal to the thrust reverser to extend and retract. The reverse thrust levers also control the engine power while the thrust reverser extends.
- C. A feedback LVDT/interlock actuator controls the engine power when the thrust levers are in the reverse thrust position. The interlock actuator prevents the engine power levels above idle unless the thrust reverser extends more than 60 percent of the full extension. Thrust reverser positions (stowed and deployed) are shown on the pilot's instrument panel.
- D. The thrust reverser system contains these components:
 - (1) The translating sleeve, cascade vane segments, and blocker doors which change the direction of the air flow from the fan exhaust.
 - (2) The reverse thrust levers which are connected to the electronic engine control (EEC) by the linkage on the autothrottle clutch pack and thrust lever angle transducers. For more information, refer to the Engine Control System - Description and Operation (AMM 76-11-00).
 - (3) The electrical control system includes the fire switch, AIR/GND relays, microswitch pack, and the reverser control switches in the reverse thrust levers. For more information, refer to the Thrust Reverser Control System - Description and Operation (AMM 78-34-00).
 - (4) The hydraulic system includes the motorized isolation valve, stow valve, directional control valve, and flow control tees. The motorized isolation valve isolates the reverser hydraulic system from the airplane hydraulic system.
 - (5) The hydraulic ballscrew actuators and flexible rotary drive shafts extend and retract the thrust reverser. There are two types of ballscrew actuators, the type that locks and the type that does not lock. The flexible drive shafts connect the ballscrew actuators on the thrust reverser.
 - (6) The feedback LVDT on each hydraulic ballscrew actuator which locks, sends the thrust reverser position to the electronic engine control (EEC). The EEC uses the position information to control the feedback interlock actuator which is installed below the autothrottle clutch pack.

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(7) The system that causes the thrust reverser position on the Engine Indication and Crew Alerting System (EICAS) display includes these components:

- (a) The proximity sensor electronic unit (PSEU)
- (b) Two proximity sensors (actuator locked and deploy) on each of the hydraulic actuators that lock
- (c) A pressure switch on the isolation valve
- (d) The REV ISLN light
- (e) The REV ISLN VAL EICAS message
- (f) The REV (amber) or (green) EICAS display.

- E. The primary components of the thrust reverser assembly are installed on the thrust reverser torque box. The torque box holds the dynamic loads caused by the operation of the thrust reverser operation.
- F. The thrust reverser has two halves which attach to the nacelle strut immediately aft of engine fan case. They make the fan air exhaust duct. Each half of the thrust reverser includes a translating sleeve, blocker doors, cascade vanes, tension latches, latch band, louvered exhaust door, hydraulic actuators, rotary flex shafts, and assorted hydraulic tubes and fittings.
- G. The system used to open and close the thrust reverser halves includes the opening actuators, a pressure manifold, and a ground support hand pump.

2. Description

A. General

- (1) This section gives the description of the components of the thrust reverser. The components include the translating sleeve, blocker doors, cascade vanes, tension latches, latch band, louvered exhaust door, hydraulic actuators, and rotary flex shafts.
- (2) This section also gives the description of the system and the components which open and close the thrust reverser. These components include the pump, opening actuators, and hold open rods.

B. Thrust Reverser (Fig. 1, 2)

- (1) The thrust reverser includes two 40 in. long, C-shaped fan ducts which each contain these components:
 - (a) Nine cascade vanes installed around the circumference of the thrust reverser which can not move.
 - (b) A translating cowl which is a cover for the cascade vanes when the thrust reverser is in the forward thrust mode.
 - (c) Six blocker doors installed around the circumference of the thrust reverser. The blocker doors turn the fan exhaust air radially outward through the cascade vanes when the thrust reverser is in the reverse thrust mode.
- (2) The inner and outer walls of the each C-duct are structurally attached at the ends of the duct by the upper and lower bifurcation. The left and right thrust reverser are each made from one C-duct and are the same but opposite to each other.
- (3) The thrust reverser is immediately aft of the fan case. Three hinges independently attach each thrust reverser half to the strut. Each half of the thrust reverser make a bifurcation duct when they are closed on the fan case.

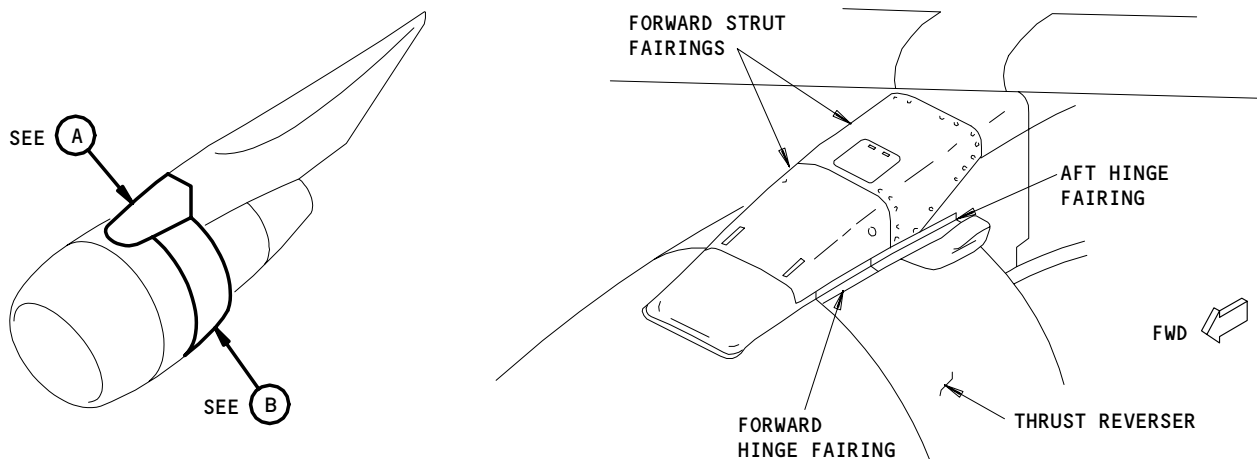
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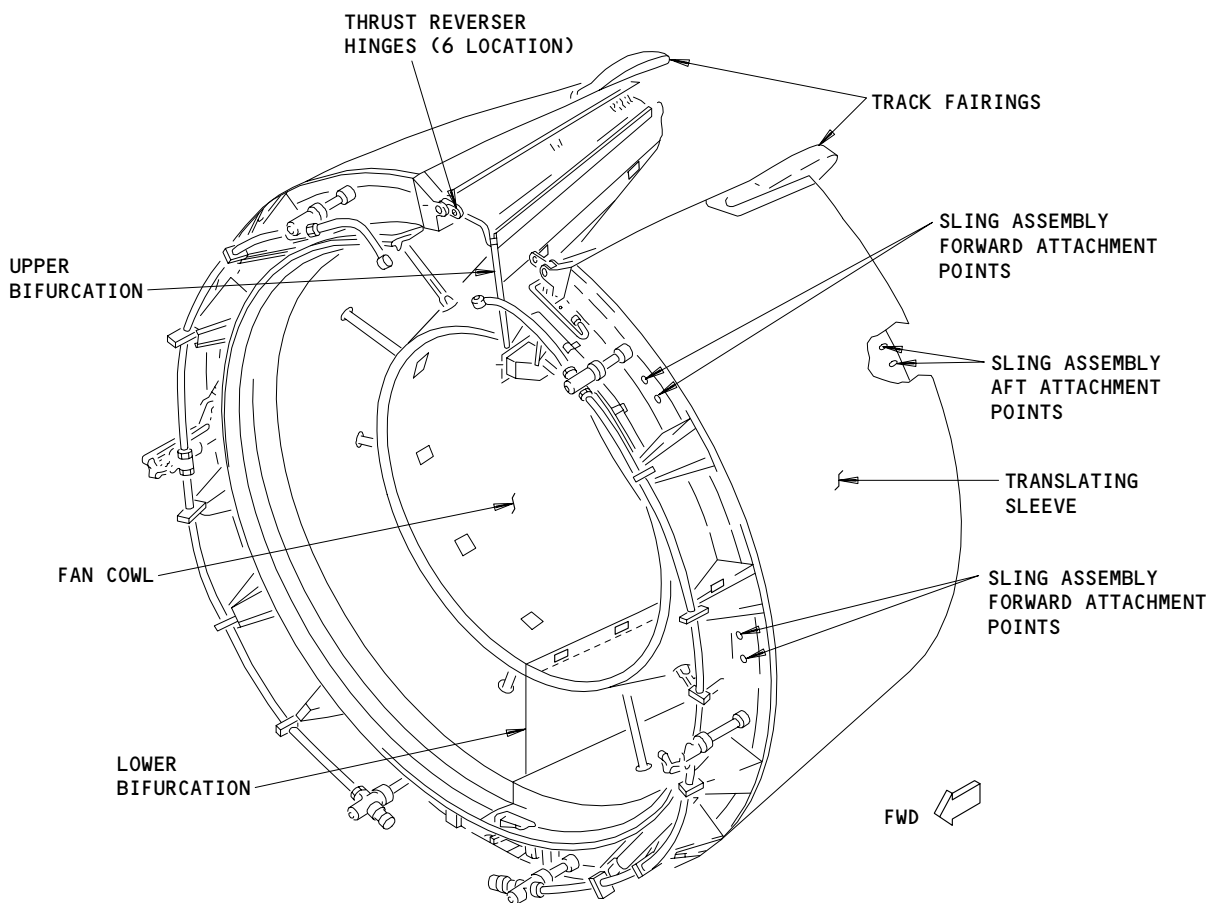
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(A)



(B)

Thrust Reverser
Figure 1

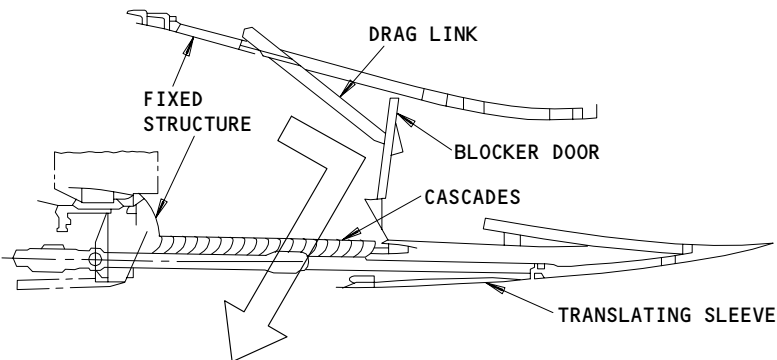
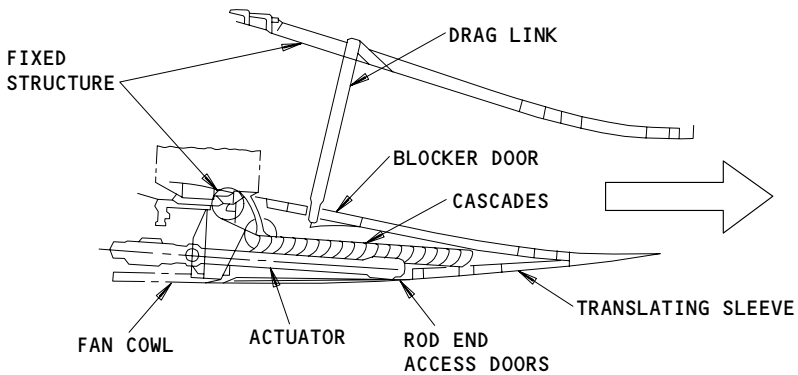
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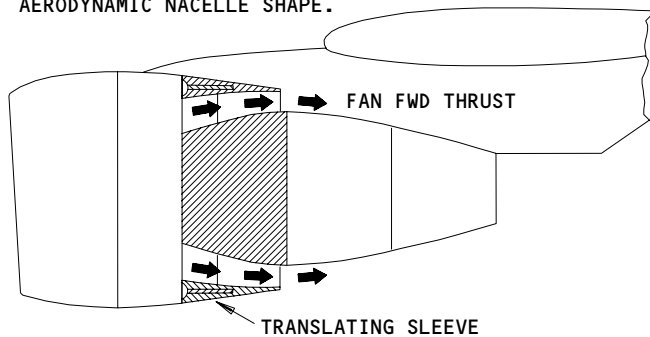
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THRUST REVERSER TRANSLATING SLEEVE

STOWED POSITION

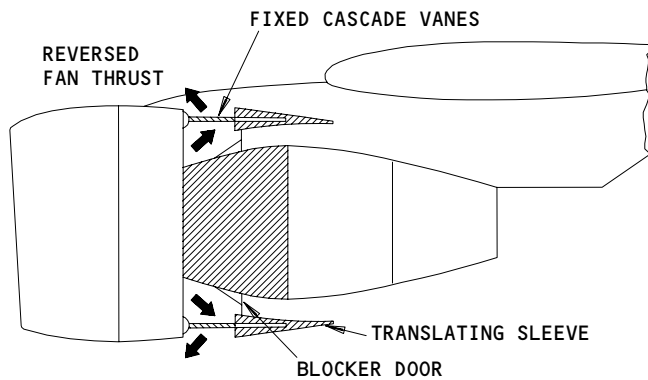
STOWED, THE TR PROVIDES A SMOOTH AIRFLOW FOR FAN TO PRODUCE THRUST AND AN EXTERNAL AERODYNAMIC NACELLE SHAPE.



TR COWLING IS LOCATED AFT OF THE FAN COWL AND SURROUNDS THE ENGINE.

EXTENDED POSITION

DEPLOYED, THE TR REDIRECTS THE AIRFLOW FROM THE FAN TO PRODUCE REVERSE THRUST.



**Thrust Reverser Deployed/Stowed
Figure 2**

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- (4) A latch band holds each half of the thrust reverser on the fan case. Three tension latches hold the two halves together at the bottom. Deflection limiters and wear pads make it possible to correctly attach the thrust reverser to the airplane. They also help the thrust reverser keep its initial shape.
 - (5) To help with maintenance, the thrust reverser has a system which opens each half of the thrust reverser independently. The system includes hold open rods which help to hold the thrust reverser in the open position.
 - (6) It is not necessary to remove the thrust reverser or the core cowls when you change an engine on the airplane.
 - (7) The upper and lower sidewalls of the bifurcation duct are made of an aluminum honeycomb. They are aft of and are not attached to the fan frame struts. The sidewalls divide the flowpath between the inner cowl and the translating sleeves. A flow splitter is made by the forward edges of the sidewalls.
 - (8) The upper sidewall includes three hinge clevises, a opening actuator fitting, three deflection limiters, and three wear pads.
 - (9) The lower sidewall includes the two deflection limiters, two wear pads, and three lower latch assemblies with alignment pins. The outer surface of the lower sidewall contains the lower access panels on the right reverser half. The access panel latches are on the left reverser half.
 - (10) The inner cowl is made from bonded aluminum honeycomb which gives an aerodynamic inner flow surface for the fan duct. Rivets hold the inner cowl to the duct sidewalls.
 - (11) A V-flange on the forward edge of the inner cowl engages a V-groove at the aft edge of the fan case. This holds the thrust reverser to the fan case when the thrust reverser is closed. A mating surface at the aft end of the inner cowl goes below the core cowl when the thrust reverser and core cowls are closed.
 - (12) Six hinge fittings for the drag links on the blocker doors attach to each inner cowl. An air duct for the fan air pre-cooler goes through the inner cowl.
 - (13) The torque box is a framework made from aluminum (sheet and extrusion) that is held together with rivets and bolts. The torque box holds the translating cowl and the vaned deflector assembly and is riveted to the duct sidewalls. The torque box has a forward thrust ring which engages a V-groove on the fan case. When the torque box is clamped to the fan case by the latch band, the thrust ring and Vee will not let it move.
- C. Translating Sleeve (Fig. 3)

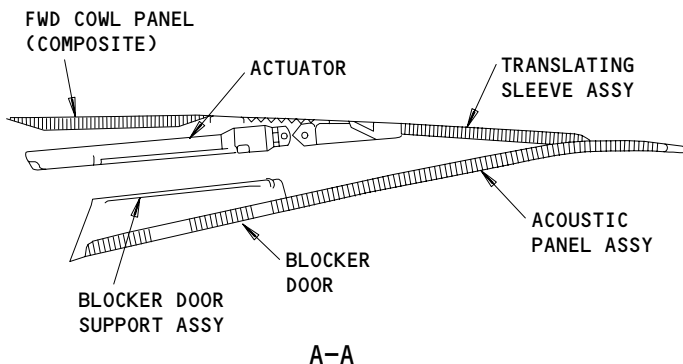
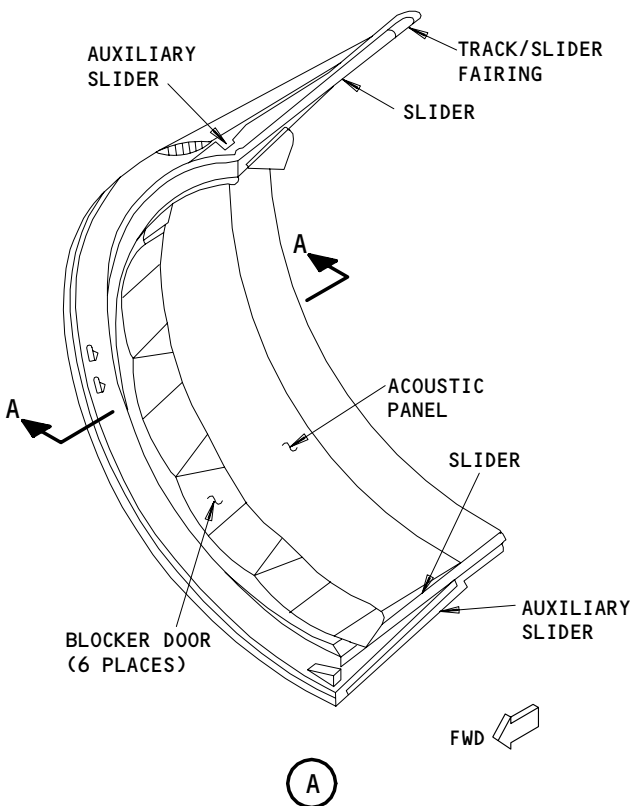
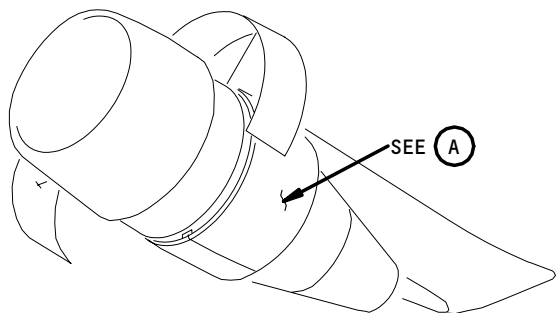
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Translating Sleeve
 Figure 3

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- (1) Two translating sleeves are installed on each engine, one for each thrust reverser half. There is no connection between the two sleeves on an engine.
 - (2) The translating sleeve is made from bonded honeycomb and is used as a cover for both sides of the cascades during forward thrust operation. The outer wall of the sleeve is the outer surface of the fan nacelle. The inner wall of the sleeve is the internal surface of the outer wall of the fan duct.
 - (3) The blocker doors are installed in the inner wall of the translating sleeve. The inner and outer walls of the sleeve come together at their trailing edge and become the exit lip of the fan cruise nozzle.
 - (4) Two axial tracks and sliders at the top and bottom of each C-duct attach the inner wall of the translating sleeve to the C-duct. A cylindrical track is machined into the forged aluminum track which is installed on the part of the duct that does not move. Each track contains a liner made from nickel-plated stainless steel. A cylindrical slider which engages the track is installed on each translating sleeve. A layer of a low friction material (Rulon J) is bonded to the slider which helps the sleeve move smoothly.
 - (5) The track and slider transmit the tension loads of the duct outer wall into the nacelle structure to help the sleeve keep its shape. The track and slider also make a seal against the internal pressure in the duct during forward thrust.
 - (6) An auxiliary track and slider also transmits the tension loads of the sleeve outer wall into the nacelle structure. The aerodynamic pressure from the cascade exhaust during sleeve movement and operation in reverse thrust cause the tension in the outer wall.
 - (7) A bulb type seal along the forward edge of the inner wall prevents fan duct leakage during forward thrust operation.
 - (8) The two pins used to deactivate the thrust reverser are kept on the torque box. The pin heads are painted red so that when they are put in the deactivation holes on each sleeve, you can easily see that the thrust reverser is deactivated.
- D. Blocker Doors and Drag Links (Fig. 4)
- (1) The inner wall of each translating sleeve holds six blocker doors installed so they make a smooth surface with the inner wall. The blocker doors can be made of aluminum honeycomb, or they can be made of composite materials. The blocker doors have the shape of a trapezoid. Each blocker door is hinged to the translating sleeve at the wide, forward end of the door.
 - (2) A radial drag link connects the inner wall with the center of each blocker door. As the translating sleeve moves aft, the narrower, aft end of the blocker door turns radially inward approximately 90 degrees around its hinge. When the translating sleeve has moved fully aft, the blocker doors make a wall which turns the fan flow radially out.
 - (3) The blocker door extends only aft of its hinge line and is contained in the area behind the front frame of the translating sleeve. In the reverse thrust position, the front frame of the translating sleeve is the aft ramp to the cascade vanes.

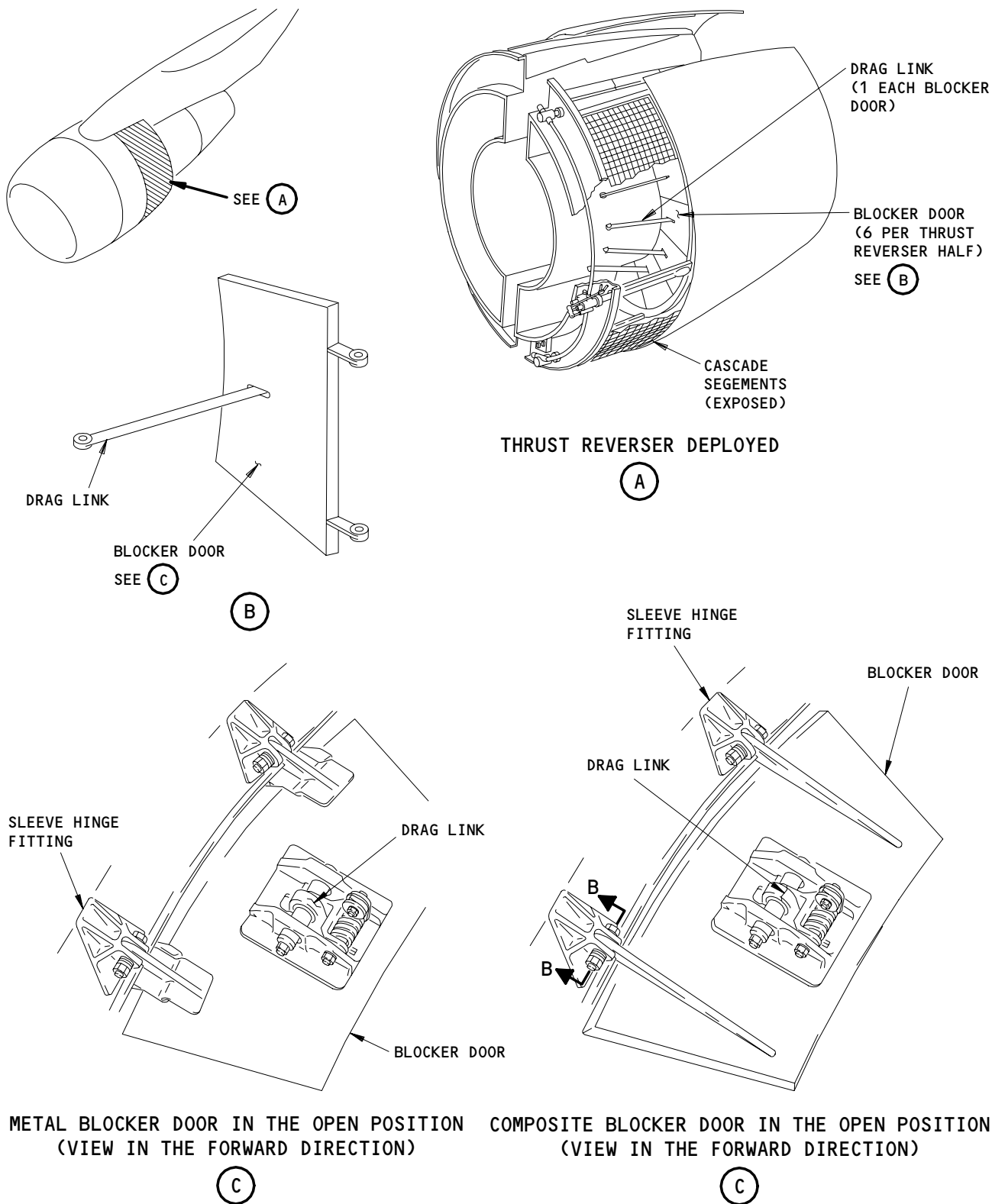
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Blocker Doors and Drag Links
Figure 4

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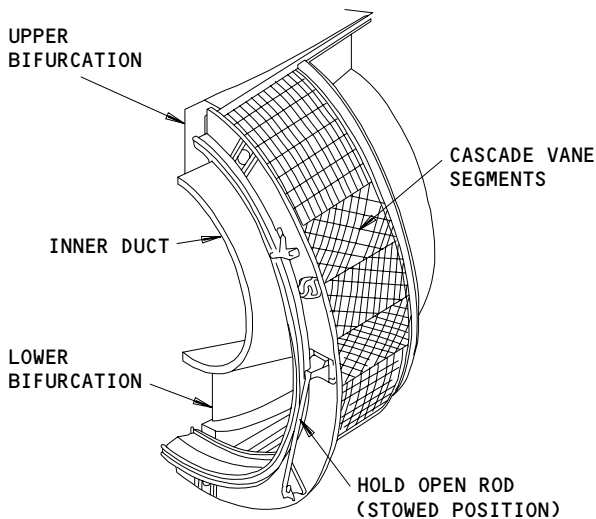
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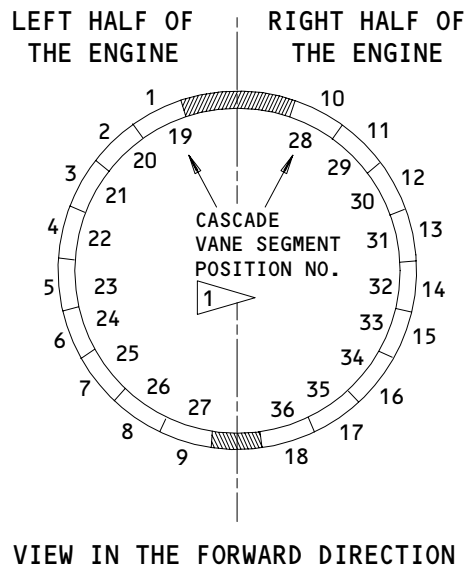
- (4) You can get access to the blocker doors and hinges if you move the translating sleeve aft.
- (5) A pinned clevis joint connects the drag link to the inner wall. The other end of the link goes through the center of the blocker door and is bolted to a slotted clevis fitting on the back of the door. The hinge and drag link joints at the blocker door are clamped spherical bearings.
- (6) A coil spring installed in the door clevis fitting supplies a preload to the door and linkage during cruise. The slot in the door clevis and the spring preload supply the necessary action between the door and drag link during operation.

E. Cascade Vane Segments (Fig. 5)

- (1) Each half of the thrust reverser contains nine cascade vane segments of approximately 20" x 14" x 2" in size. The segments are made of cast magnesium and each contains up to 19 vanes (cascades) of different arrangements. The cascade vanes turn the fan exhaust into the necessary radial flow pattern. Each cascade vane segment can be individually removed for replacement of the segment or for access into the fan duct.



RADIAL SECTION EXAMPLE



VIEW IN THE FORWARD DIRECTION

1 CASCADE VANE SEGMENT POSITIONS 1 THROUGH 18 ARE ON THE LEFT ENGINE, POSITIONS 19 THROUGH 36 ARE ON THE RIGHT ENGINE

Positions of the Cascade Vane Segments
Figure 5

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- (2) The cascade vane segments use the the translating sleeves as a cover during forward thrust. In reverse thrust, the translating sleeves move aft which removes the cover from the cascade vanes. The fan exhaust air is turned radially out by the blocker doors. The air goes through the cascade vanes and supplies reverse thrust to the airplane.
- (3) The cascade vanes are put in the necessary position to move the airflow away from the aircraft structure or engine air inlet during reverse thrust. The correct position of the vanes is different for the right and left sides on each engine. When you replace a segment, make sure you install a segment that keeps the correct flow pattern through the vanes.
- (4) The front flanges of the cascade vanes are attached to the torque box with bolts. The aft flanges are attached to the cascade support ring with bolts.

F. Tension Latches (Fig. 6)

- (1) Four tension latches attach the two thrust reverser halves together. The aft latch is aft of the louvered exhaust door and the forward latch is on the lower forward surface of the torque box. The other two latches are behind the louvered exhaust door in the lower bifurcation area.
- (2) The forward latch is installed on the lower torque box of the right thrust reverser half and can not be adjusted. This latch engages an adjustable keeper eyebolt on the left reverser half.
- (3) The other three latches are installed on the right reverser half. Individual adjustment wheels move the latch hooks. These latches engage bolts in the structure of the opposite half of the reverser.

G. Latch Band (Fig. 7)

- (1) The latch band contains an anchor strap, two bands (one for each reverser half), a T-bolt clevis, and a T-bolt latch handle. The anchor strap connects the two latch bands together at the top of the fan case. The anchor strap is not connected to the fan case. The T-bolt clevis is attached to the right reverser half and the T-bolt latch handle is attached to the left reverser half.
- (2) The T-bolt (barrel nut) on the left band connects to a claw-type clevis bracket on the right band. The T-bolt is adjustable to control the force necessary to close the latch handle.
- (3) The latch band attaches the outer forward edge of the thrust reverser to the aft flange of the fan case. The latch band transmits the reverser loads to the fan frame and not to the hinges on the strut.

H. Louvered Exhaust Door

- (1) The louvered exhaust door is an exit for the air which cools the accessory compartment. It also gives access to the two fixed tension latches. The door is on the aft bottom of the thrust reverser section. The door is usually closed. You can keep it open during ground operations to help with the routing of the test instrument lines.

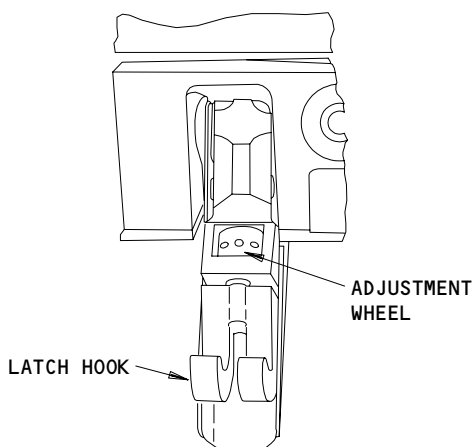
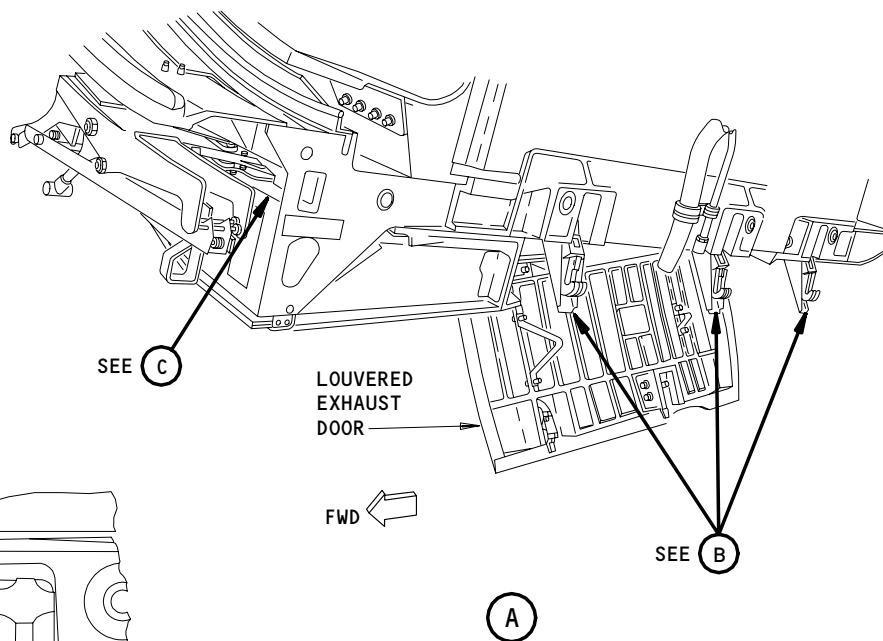
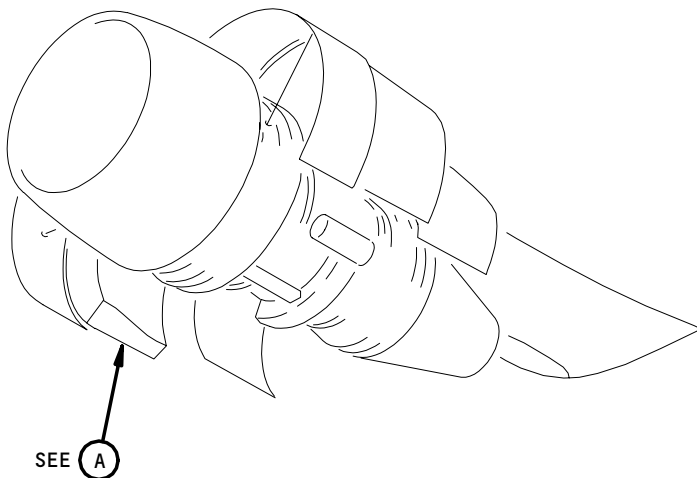
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ADJUSTABLE TENSION LATCH

B

Tension Latches
Figure 6 (Sheet 1)

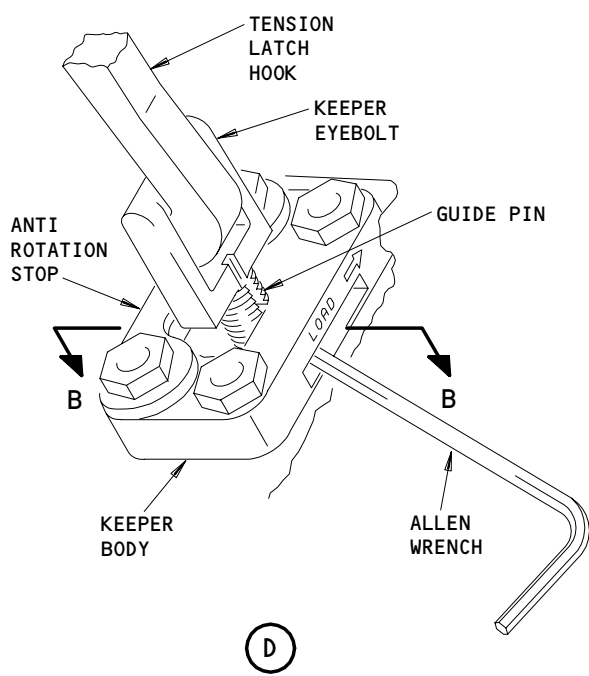
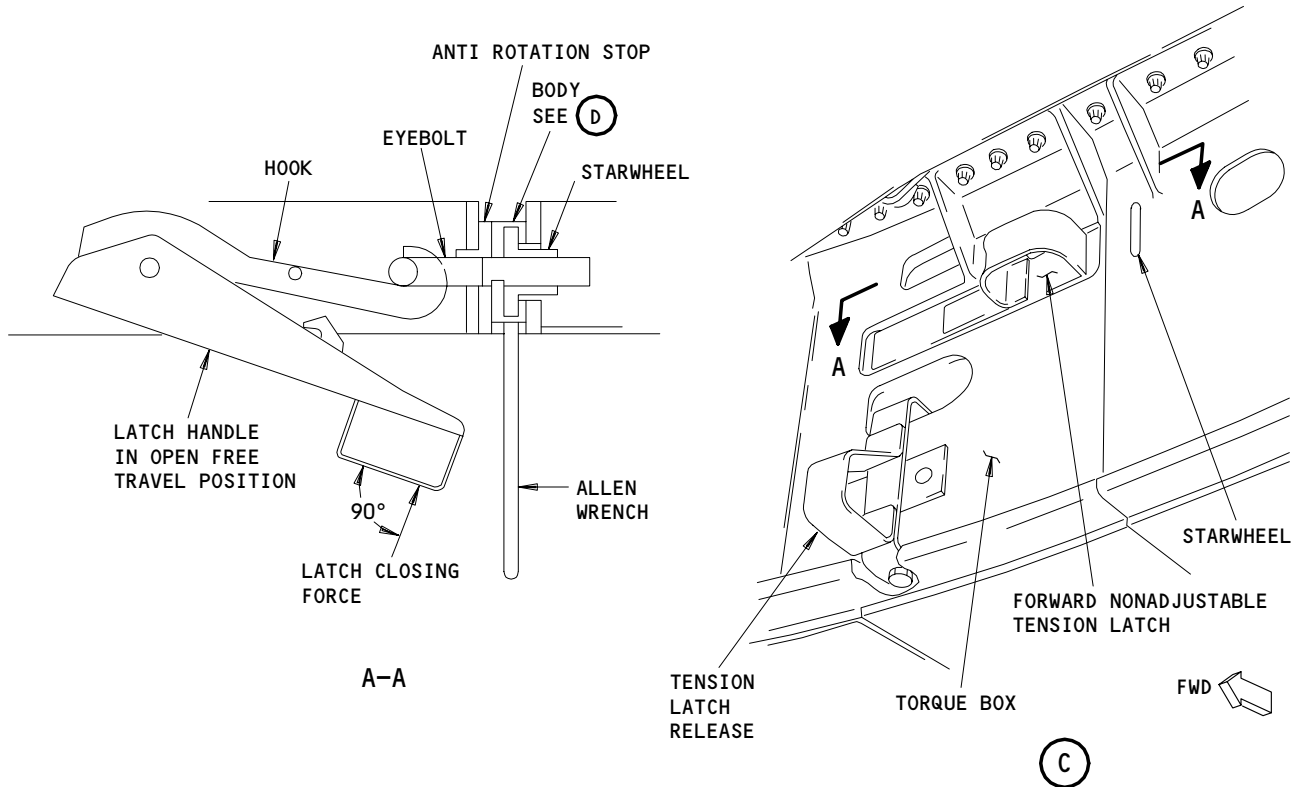
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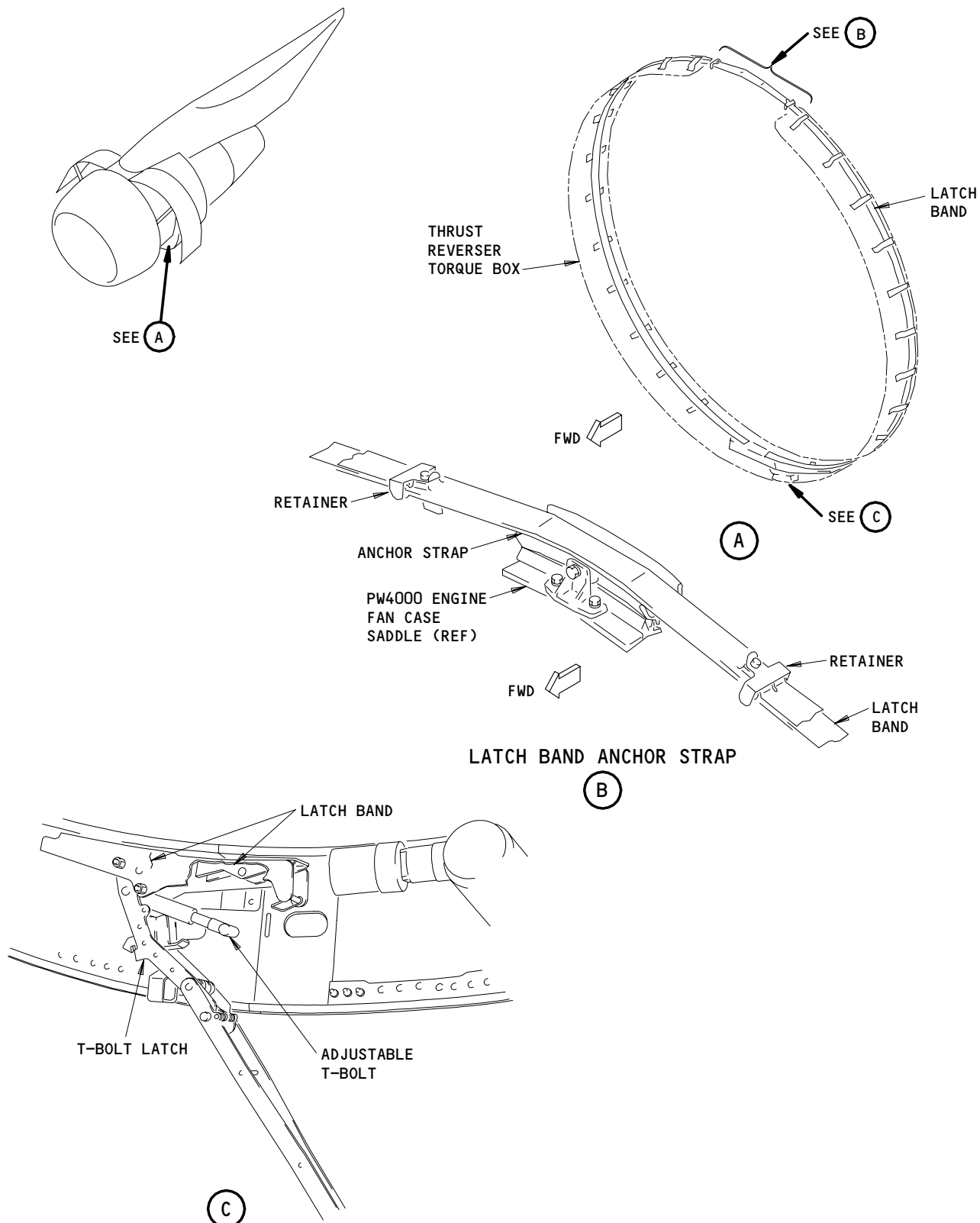
Tension Latches
Figure 6 (Sheet 2)

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Latch Band and Latch Band Anchor Strap
Figure 7

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I. Thrust Reverser Hydraulic Actuation (Fig. 8)

- (1) Three linear hydraulic actuators operate the translating sleeve. A flexible drive shaft contained in the hydraulic supply tubing keeps the actuators synchronized.
- (2) The upper and lower non-locking actuators are found at the 1:30, 4:30, 7:30, and 10:30 o'clock positions on each engine. The locking actuators are at the 3 and 9 o'clock positions on each engine.
- (3) The six actuators which operate the thrust reverser are linear piston devices that are hydraulically controlled. Each actuator has a head end area on 0.88 in², a rod end area of 0.44 in², and a stroke of 21.75 inches. The actuators use BMS3-11 hydraulic fluid and seals of ethylene propylene rubber to operate.
- (4) The actuator extends when the head end and rod end cavities are connected to the hydraulic source. This supplies a force equal to the supply pressure multiplied by the difference between the head end and rod end areas which extends the reverser. The actuator retracts when the rod end cavity is connected to the hydraulic supply and the head end cavity is connected to the hydraulic return.
- (5) The linear movement of an actuator piston turns a screw that is installed in the piston rod and has the same axis as the rod. The piston rod can not turn in relation to the actuator body because the body is attached to the torque box gimbal and the rod end is pinned to the translating sleeve.
- (6) When the acme screw in the locking actuator turns, it moves the synchronization worm gear and the flexible drive shafts (flexshafts). The sychronization worm gears of the upper and lower hydraulic actuators are connected by flexshafts. The flexshafts go through the hydraulic tubing which connects the head end cavities of the upper and lower actuators. A 0.25 inch square end drive on each end of the flexshafts is put into the worm gear of the upper and lower actuators to complete the mechanical connection. The connectors between the hydraulic tubing and the actuators are telescopic. This makes it easier to do an inspection of the flexshafts for correct installation.
- (7) As the actuators extend, the fluid source supplies one-half of the fluid flow to the head ends. The other half of the fluid flow comes from the restrictor tee and is returned to the directional control valve.

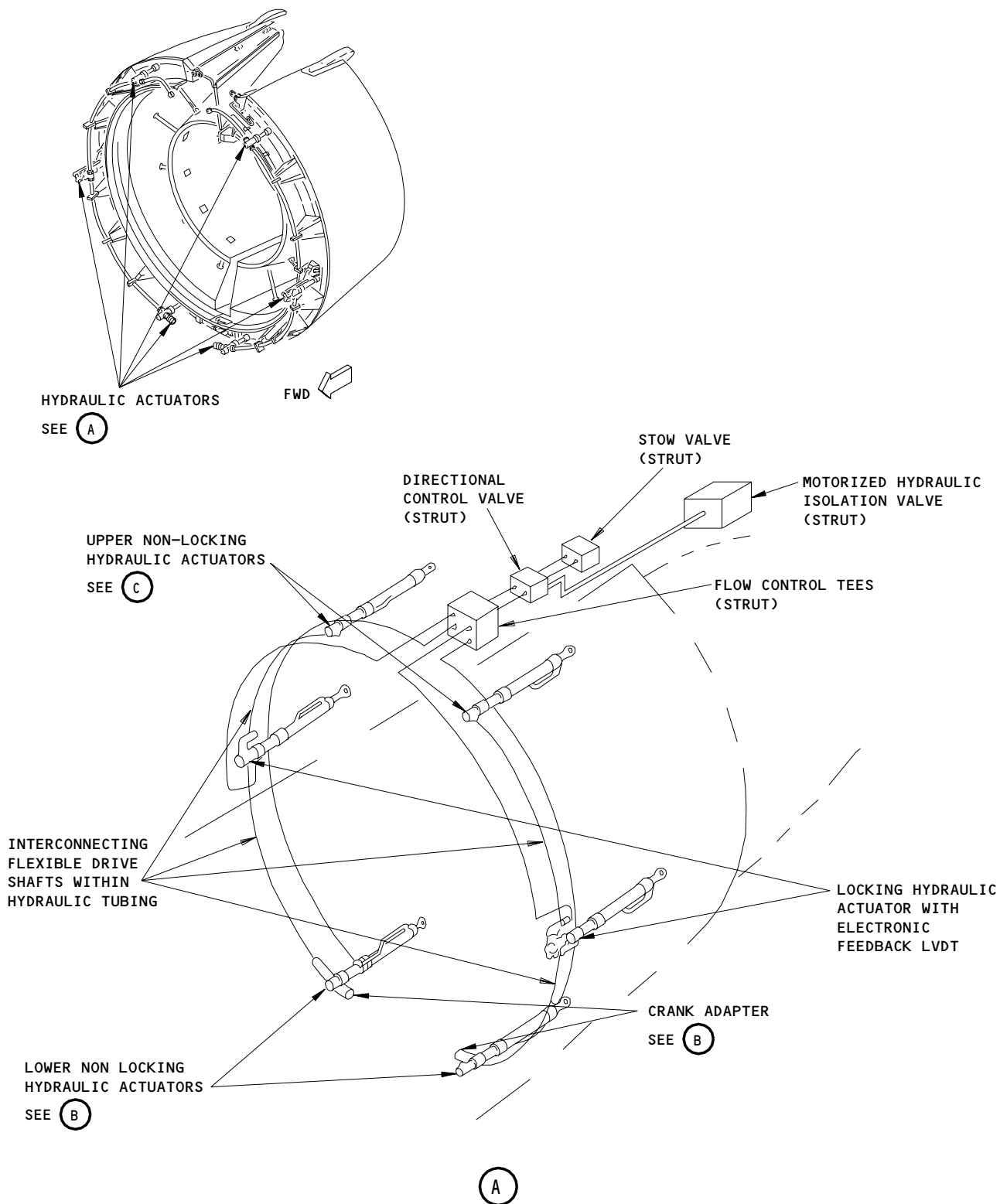
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Thrust Reverser Hydraulic Actuation System
Figure 8 (Sheet 1)

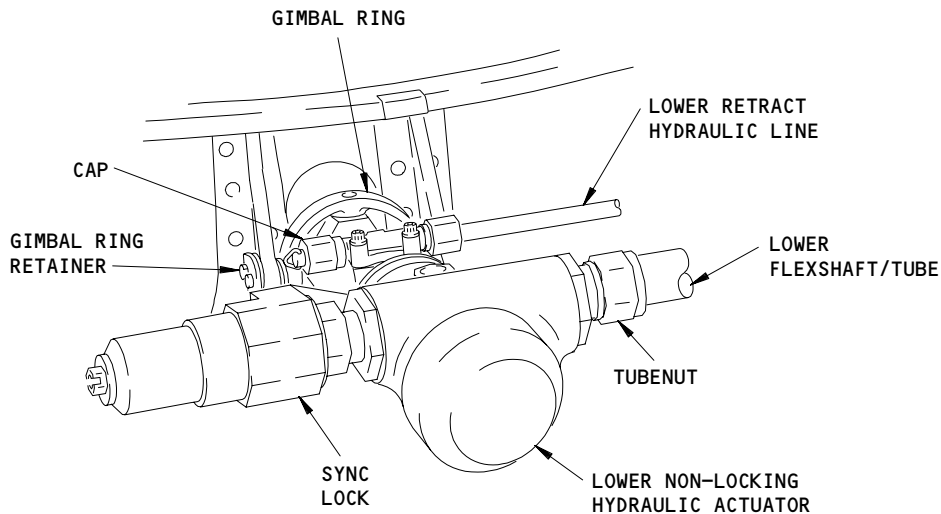
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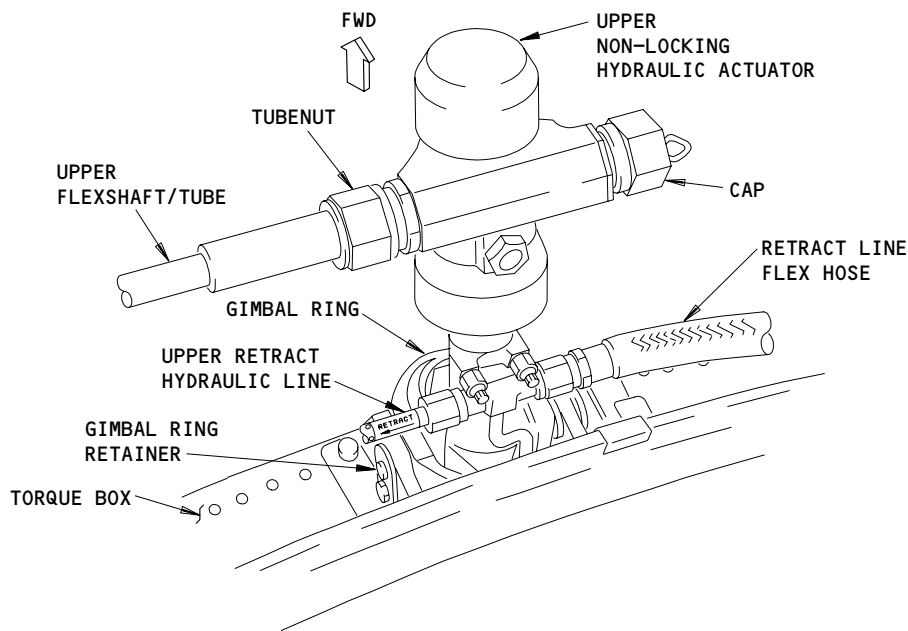
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LOWER NON-LOCKING HYDRAULIC ACTUATOR

(B)



UPPER NON-LOCKING HYDRAULIC ACTUATOR

(C)

Thrust Reverser Hydraulic Actuation System
Figure 8 (Sheet 2)

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- (8) When the actuator extends, the fluid goes out of the rod end through the hydraulic fluid fitting on the actuator rod end. The fluid comes in and goes out of the rod end through a snubbing ring. The snubbing ring is part of a system which stops the movement of the thrust reverser after it extends 20.6 inches.
 - (9) As the reverser extends, the snubbing skirt on the piston rod decreases the area between the piston rod and the snubbing ring. This limits the fluid flow which increases the pressure on the rod end of the piston. The actuator movement slows, but the pressure on the rod end increases until the sleeve movement stops. The snubber is designed to stop the actuator in approximately one inch of movement. A snubber is not necessary when the thrust reverser retracts, because the movement is slower and there are no aerodynamic loads.
 - (10) The head end of each actuator attaches to the torque box with a gimble. The rod end of each actuator attaches to the translating sleeve with a spherical bearing and clevis. The locking actuator of each reverser includes a device that locks the actuation system in the retracted position. The locking actuator also includes the linear variable differential transducer (LVDT) for reverser position feedback.
 - (11) A 3/8 inch crank adapter is attached to the lower actuator on each thrust reverser for the manual operation of the reverser.
- J. Locking Hydraulic Actuator (Fig. 9)
- (1) The center actuator on each thrust reverser half has a mechanism which engages two disks with serrations to lock the reverser in position. The mechanism will not let the flexshafts, which connect the three actuators, turn and the reverser will not extend.
 - (2) One of the lock disks is related to the acme screw in the actuator and turns when the actuator extends or retracts. The other lock disk does not turn and is attached to the actuator barrel by splines. A helical spring is used to move the disk that does not turn along the splines until it engages the other disk. A piston which locks is used through the lock lever pivot arm to move the two disks apart.
 - (3) When reverse thrust is used, the hydraulic pressure increases and causes the lock piston to move and engage the lock lever pivot arm. After they engage, more movement of the lock piston moves the two lock disks apart. As the piston continues to move, it moves the hydraulic fluid through an opening to the head end of the center actuator. The fluid then goes through the flexshafts to the head ends of the upper and lower actuators which causes the reverser to extend. The hydraulic pressure through the opening holds the lock piston in the unlocked position for all load conditions while the reverser is extended.

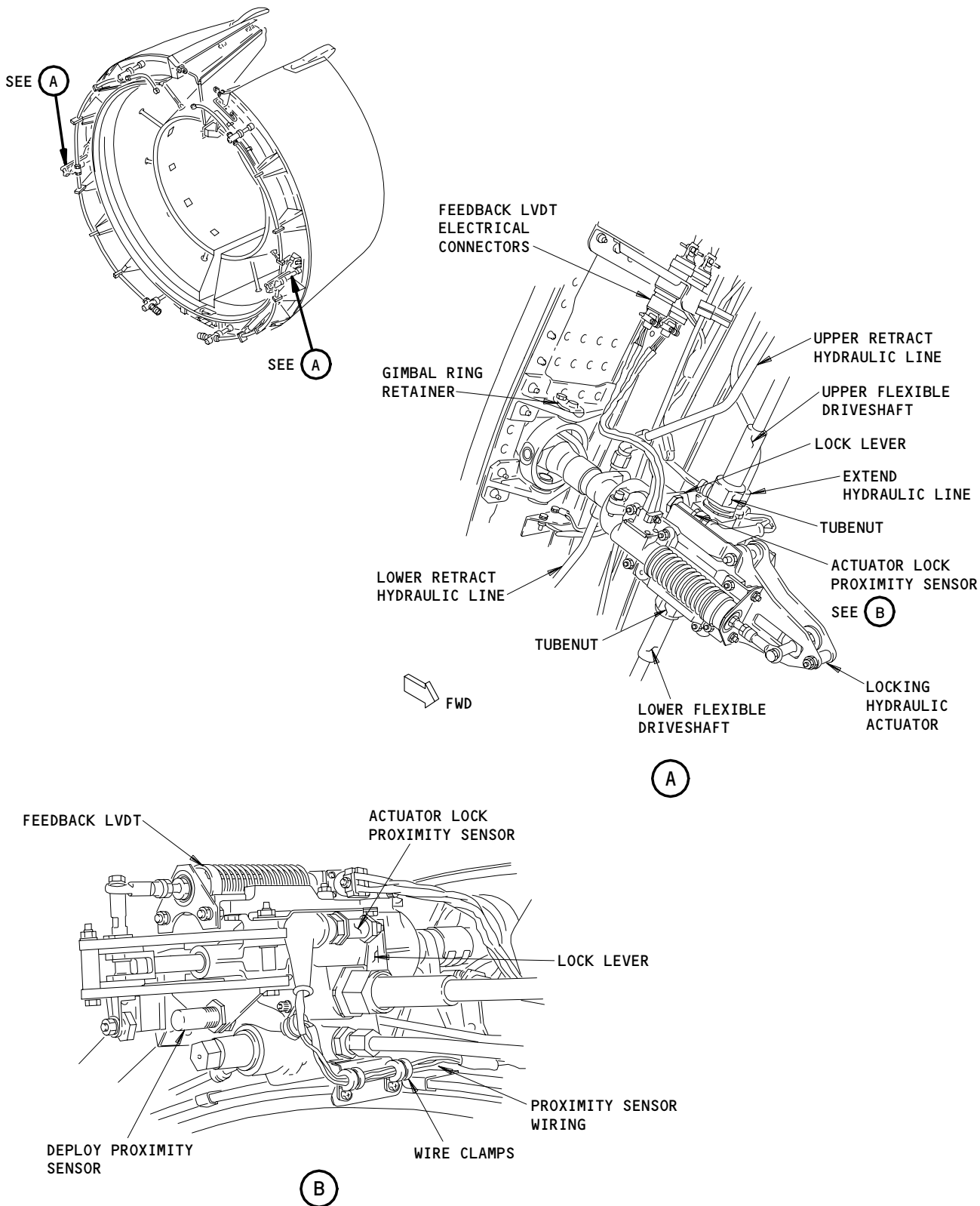
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Locking Hydraulic Actuator
Figure 9

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- (4) When the head end of the center actuator moves away from the retract position, the force is removed from the helical lock spring. When the force is removed from the helical spring, the torsion lock spring on the lock lever pivot arm holds the two lock disks apart.
 - (5) When the thrust reverser retracts, the flow from the head end of the center actuator does not go through the lock piston but through a check valve. After the reverser is retracted, the preload spring holds the lock piston in the locked position. The spring has a preload to keep the two lock disks together during a pressure surge while the reverser is stowed.
 - (6) The lock lever pivot arm follows the movement of the disk that does not turn and the torsion spring keeps a force on the arm in the extend direction. This spring force is necessary for the correct indication of the lock condition because the target for the actuator lock proximity sensor is installed on the lock lever. The torsion spring also keeps the lock disks apart when the reverser should not be locked.
 - (7) As the center actuator nears the retracted position, the helical lock spring is compressed which forces the two lock disks together. This causes the two disks to move like a ratchet until the actuator piston is at its bottom position. The serrations lock the center actuator when the two lock disks engage. The disk related to the acme screw can not turn, thus, the actuator piston can not move.
- K. Rotary Flexible Drive Shafts (Flexshafts) and Tubing (Fig. 10)
- (1) The rotary flexshafts keep the three actuators on each thrust reverser half synchronized. The flexshafts are connected to the actuator worm gears by a 0.25 inch square drive fitting. The flexshaft goes through the hydraulic tubing which connects the hydraulic actuators. Hydraulic fluid flows from the center actuator through the hydraulic tubing to the upper and lower actuators. The flexshafts force all three actuators to move when any one actuator moves and this keeps the actuators synchronized.
- L. Thrust Reverser Opening System (Fig. 11)
- (1) One actuator is installed on each half of the thrust reverser. Each half of the reverser can open independently to get access to the engine. The actuators are installed on the strut. They push against the actuator mount fitting on the upper bifurcation of the thrust reverser.

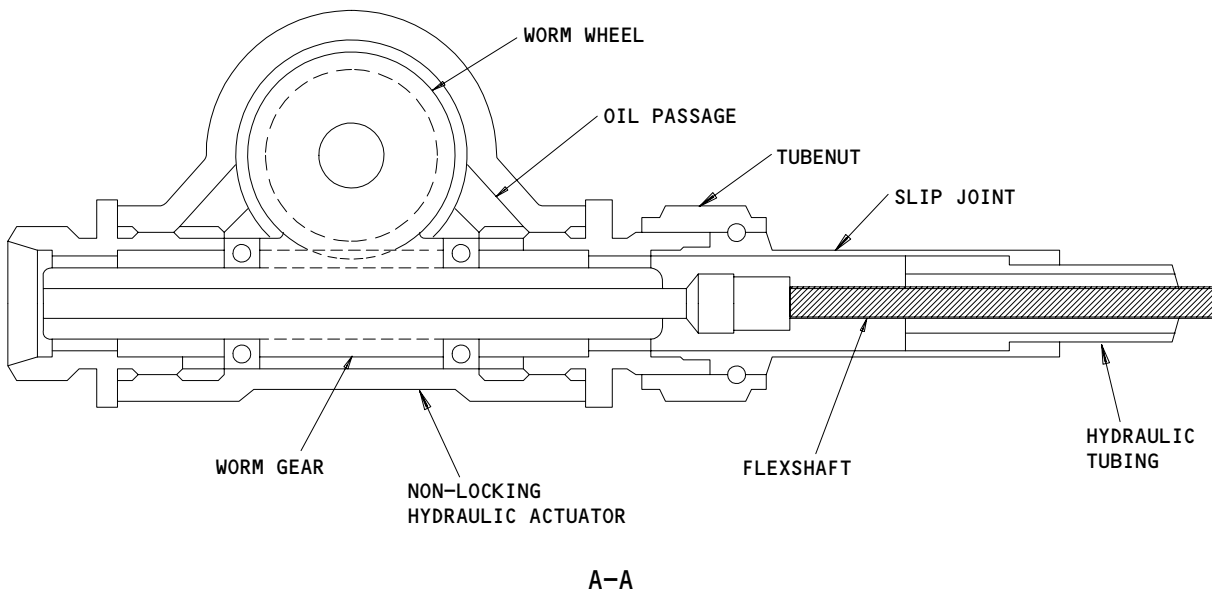
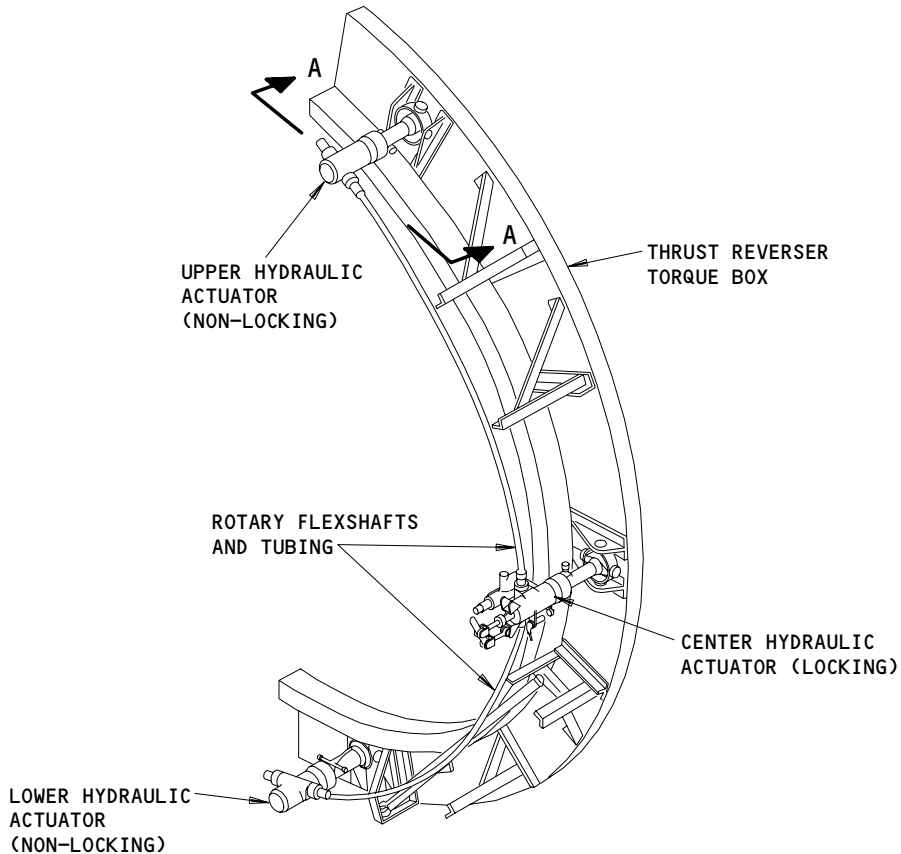
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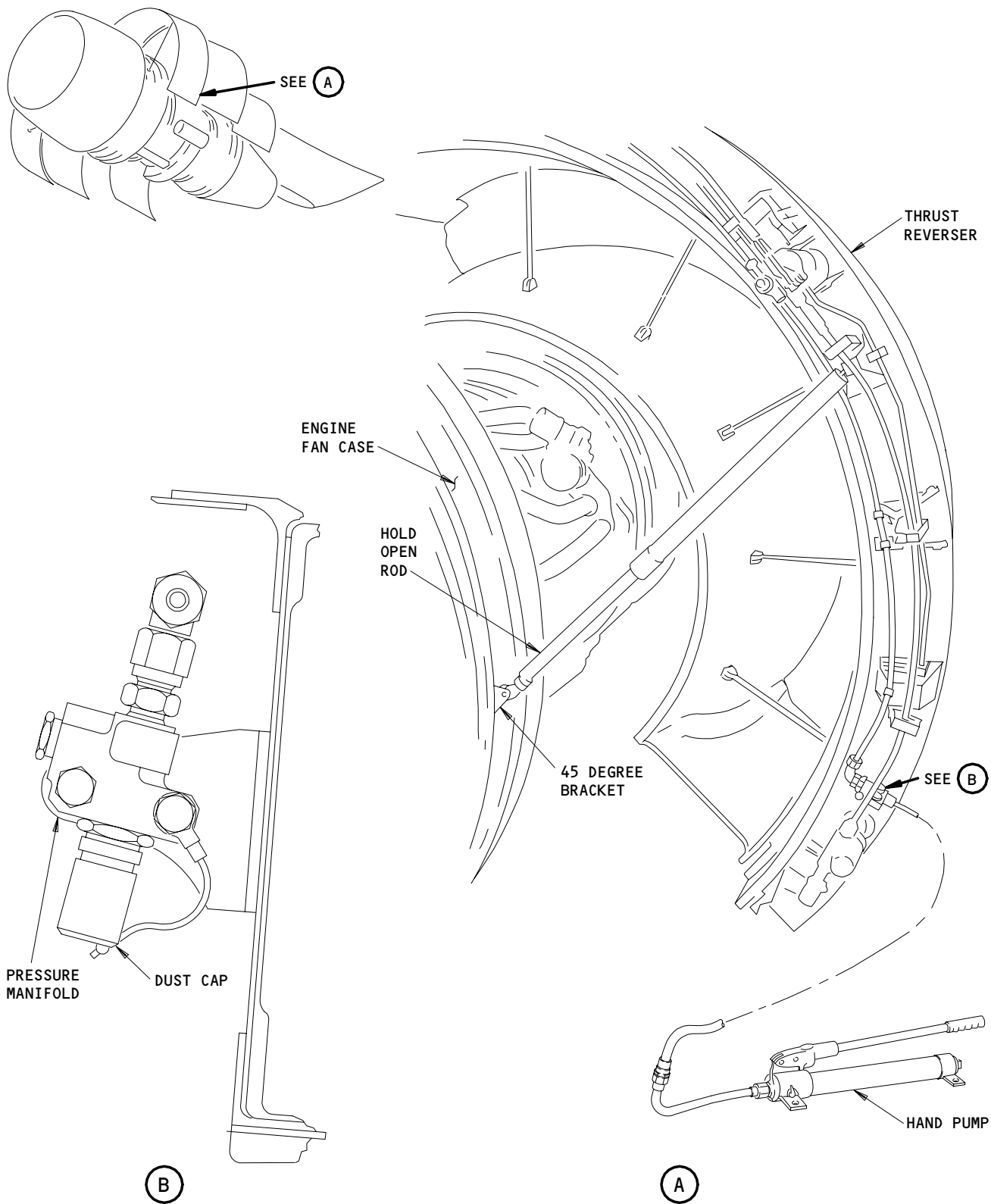
Rotary Flexshafts and Tubing
Figure 10

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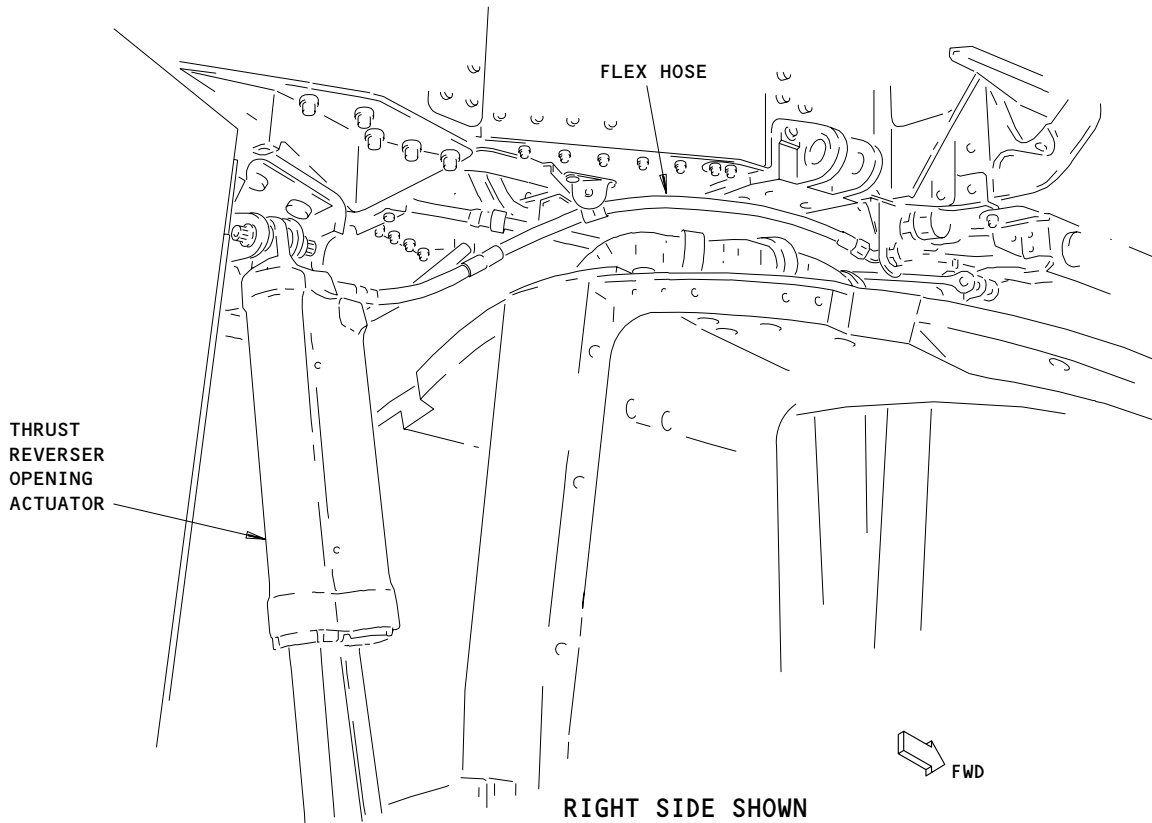
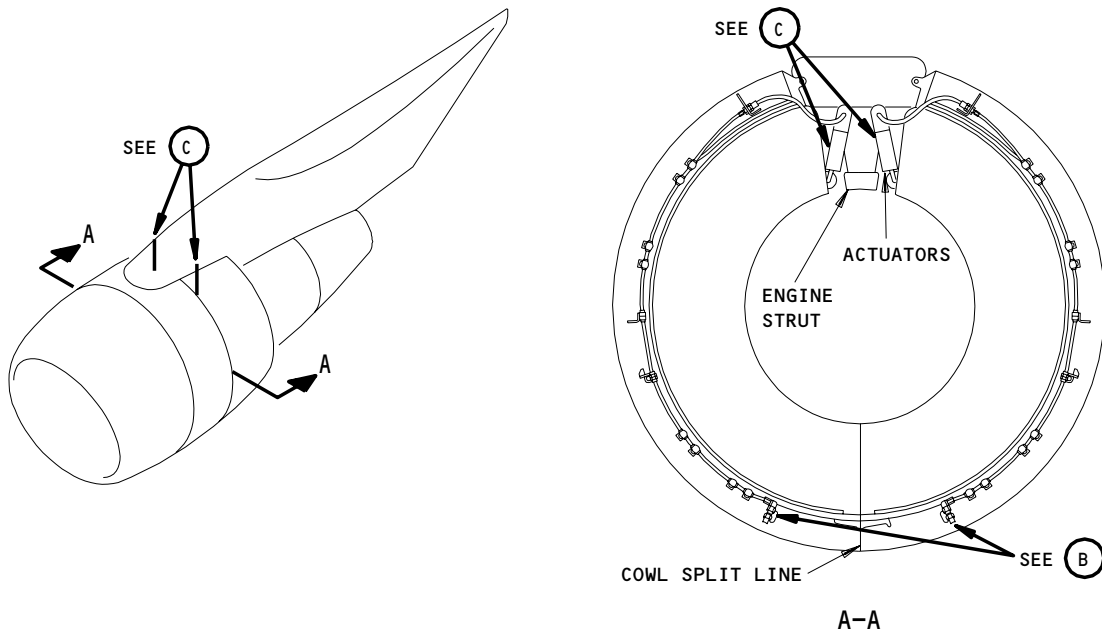
Thrust Reverser Cowl Opening System
Figure 11 (Sheet 1)

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RIGHT SIDE SHOWN
(LEFT SIDE OPPOSITE)
(REVERSER REMOVED FOR CLARITY)

(C)

Thrust Reverser Cowl Opening System
Figure 11 (Sheet 2)

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- (2) The actuator inlet fitting uses a restrictor to make sure the reverser closes at a slow rate. In the event of rapid closure (hold open rod dislocated, pressure loss, etc.), the restrictor will not let the reverser close in less than 15 seconds.

M. Reverser Opening - Hand Pump

- (1) The opening system for each thrust reverser includes one actuator, a flexhose which connects the actuator to the tubing installed on the torque box, and the quick-release manifold.
- (2) The handpump connects to a quick-release manifold installed at the bottom of each torque box. The manifolds are at the 5 and 7 o'clock positions on the thrust reverser. Access to the manifolds is through the fan cowl panels.
- (3) A handpump which contains an oil reservoir is attached to the manifold with the return valve on the handpump closed. The handpump pushes oil to the actuator. This opens the thrust reverser half.
- (4) When you open the return valve on the handpump, the oil goes back into the pump reservoir. The thrust reverser half closes in approximately 15 seconds.

N. Reverser Opening Actuator

- (1) The opening actuator is extended by hydraulic pressure and retracted by the weight of the reverser when hydraulic pressure is removed. The actuator contains a flow control plug which lets the hydraulic fluid flow freely when the actuator extends. However, the plug limits the flow when the actuator retracts to control the rate at which the reverser closes.

O. Hold Open Rods (Fig. 12)

- (1) One hold open rod is found on each half of the thrust reverser. The rod is attached to the torque box under the center actuator. It is held in position by its rod end connector when not used.
- (2) The rod end not attached to the torque box can move to engage one of two brackets on the engine fan case. The two brackets hold the reverser half open to the 23 or the 45-degree position.

3. Operation

A. Extension (Fig. 13)

- (1) When the thrust levers are moved to the reverse thrust position, hydraulic flow is routed from the applicable left or right main hydraulic system. The hydraulic fluid flows through the motorized isolation valve, directional control valve, and flow control tees as given in Thrust Reverser Control System (Ref 78-34-00). Hydraulic flow moves first to disengage the locks on the center actuators and then moves to the actuators. The actuators extend and move the translating sleeves to the reverse thrust position. As the sleeves extend, the blocker doors are moved by the drag links into the fan exhaust flow. The fan exhaust flow is turned radially through the cascade vanes which are open after the translating sleeve extends.

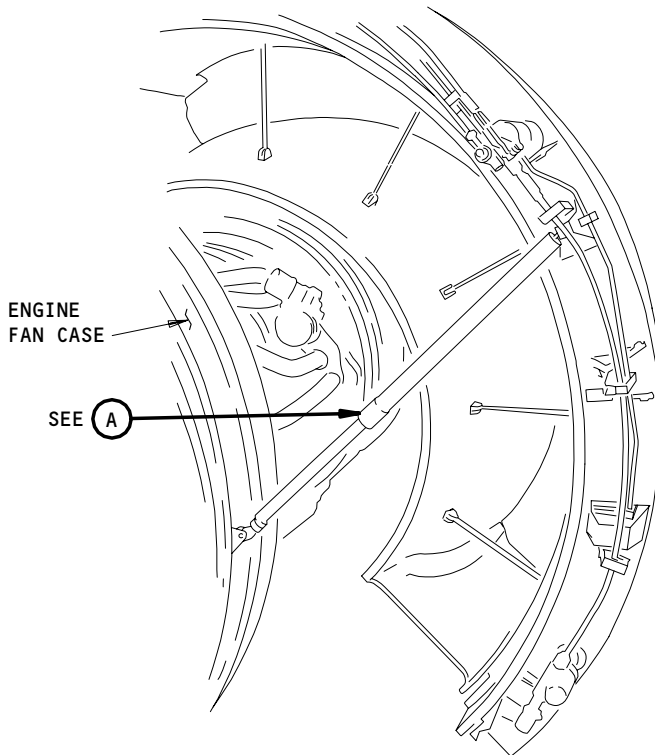
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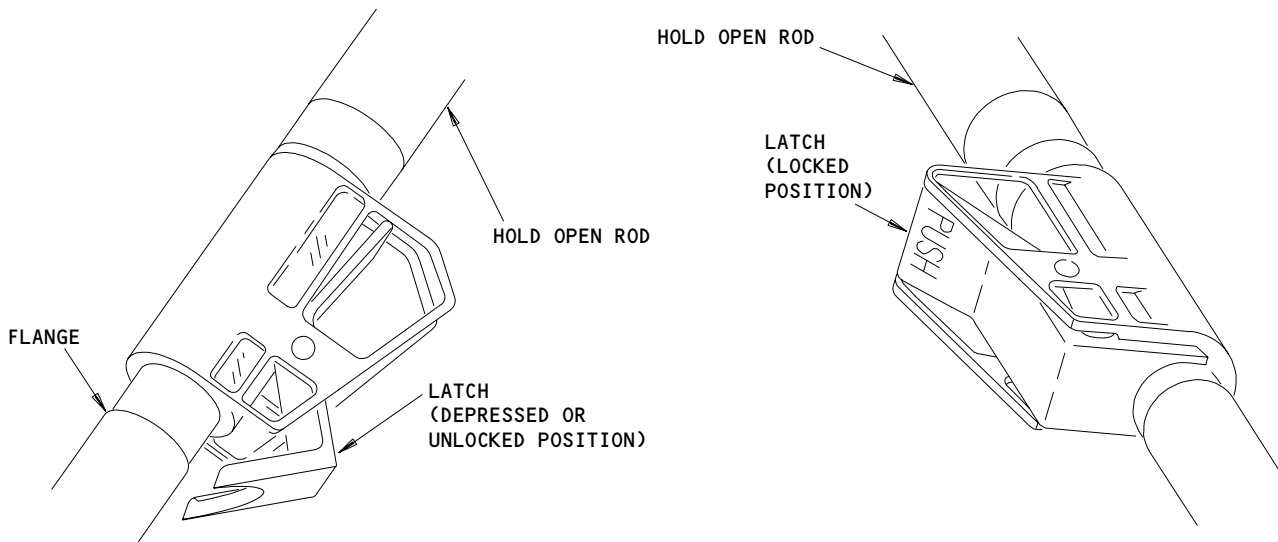
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LEFT THRUST REVERSER HALF
(RIGHT HALF SIMILAR)



(A)

Thrust Reverser Hold Open Rod
Figure 12

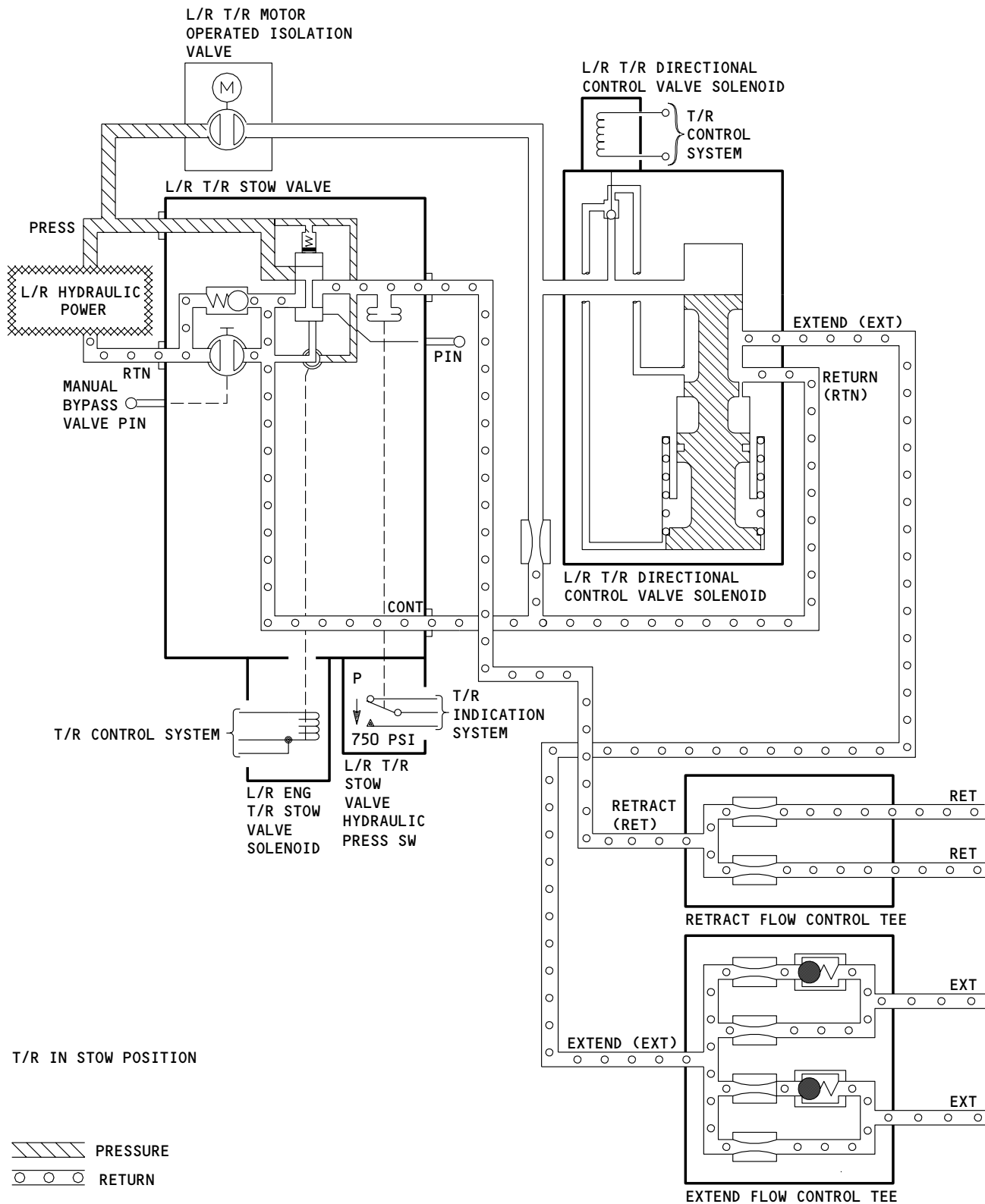
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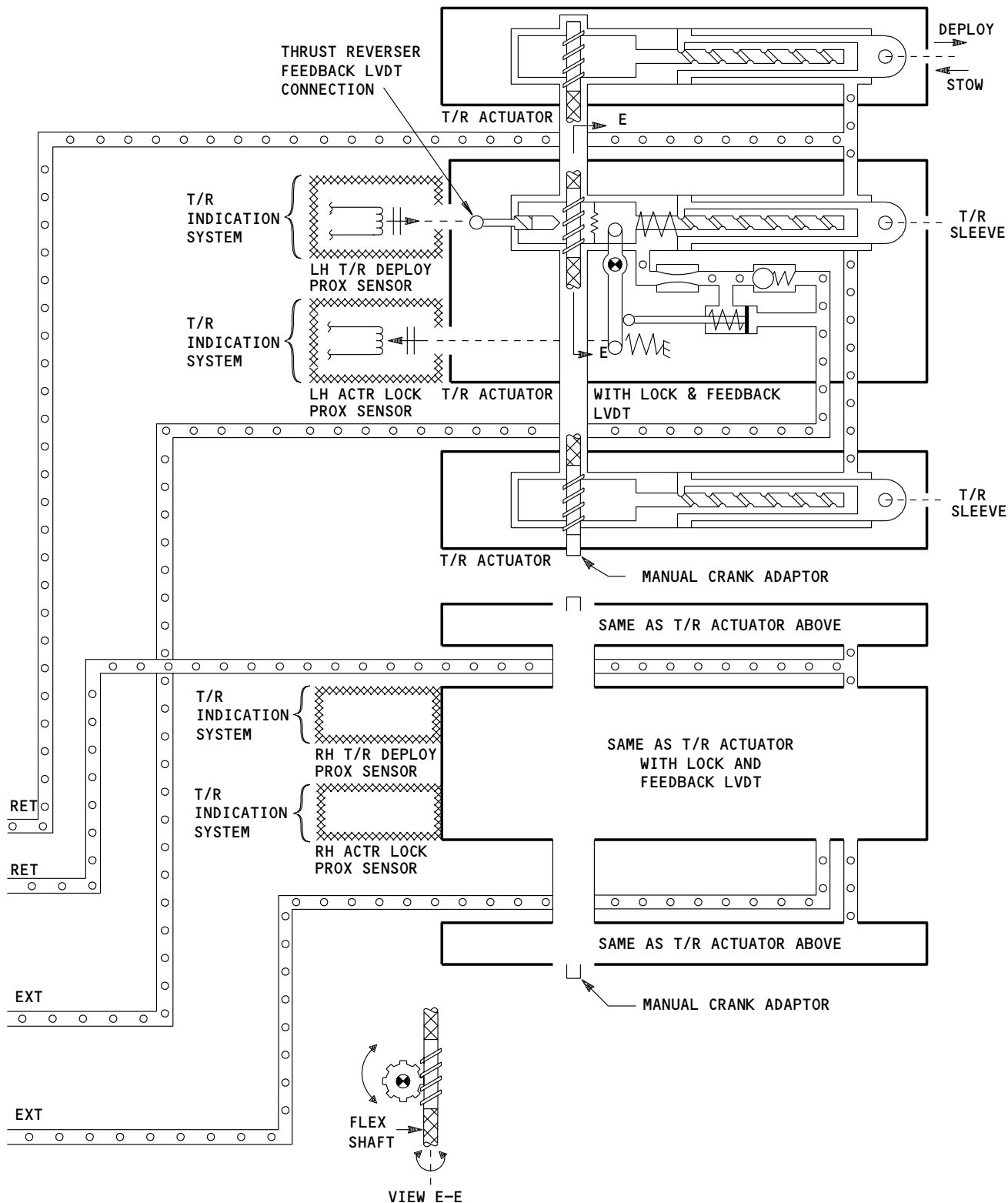
Thrust Reverser Hydraulic System Schematic (Example)
Figure 13 (Sheet 1)

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Thrust Reverser Hydraulic System Schematic (Example)
Figure 13 (Sheet 2)

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B. Retraction

(1) When the thrust levers are moved to the forward thrust position, the directional control valve moves the hydraulic flow to the rod ends of actuator. The actuators retract and the translating sleeves move to the forward thrust (cruise) position. When the sleeves move forward, they make a cover around the cascade vanes and the blocker doors are moved out of fan exhaust flow.

C. Open and Close the Thrust Reverser

(1) Use a handpump to open one half of the thrust reverser. Attach the hand pump to the applicable hydraulic line manifold installed on the reverser torque box under the fan cowl panel. The hand pump pressurizes the hydraulic line to the actuator. This opens the thrust reverser half. Use the hold open rod when the reverser is open to the necessary position.

(2) Use the procedure which opens open the thrust reverser to remove the force on the hold open rod when you close the reverser half. Disconnect the rod and put it back in its usual position. Open the return valve on the hand pump to let the hydraulic fluid go back to the reservoir. The weight of the reverser will cause it to close.

D. Adjustment of the Thrust Reverser after Engine Replacement

(1) The adjustment of the thrust reverser (AMM 78-31-01/501) is necessary to get the correct compression of the fire and drain seals. It is also necessary to get the correct fit of the thrust reverser halves with the engine, strut and adjustment of the thrust reverser tension and T-bolt latches.

(a) The hinges at the top of the thrust reverser support the static vertical load of the thrust reverser on the airplane. The v-blade at the front of the thrust reverser engages into the v-groove of the engine fan case and transmits the thrust load on the thrust reverser into the engine in flight and in reverse thrust.

(b) Because the thrust reverser splits into the left and right half, it is important that the latch band at the front of the thrust reverser and the tension latches on the bottom of the reverser keep the thrust reverser attached to the airplane strut and engine for an engine problem such as a fan blade out condition.

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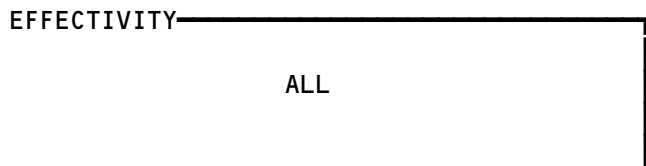
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Not Used
Figure 14



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- (c) The correct force to close the handles for the latch band and tension latches requires wear pads on the upper and lower bifurcation of the inner wall and latch pads around the tension latches are shimmed for the correct gap measurement.
 - (d) In addition, the correct force to close the latches also ensures the correct compression of the bulb type fire seal which contains an external engine fire under the thrust reverser cowl and allows the fire to be extinguished with the fire bottles.
- (2) The thrust reverser inspection/check procedure (AMM 78-31-01/601) is only used after an engine change.
- (a) This procedure does a clay check to make sure the v-blades correctly engage the v-groove, the gaps at the wear pads at the upper and lower bifurcation are correct and the forces to close the latch band and tension latches are correct.
 - (b) If the thrust reverser does not pass this check, there is a physical change in the thrust reverser installation relative to the engine.
- (3) The thrust reverser check procedure (AMM 78-31-01/601) is done if you changed the engine.
- (a) The thrust reverser adjustment procedure (AMM 78-31-01/501) is done if the thrust reverser does not pass this check.
 - (b) The airplane can be returned to service if the thrust reverser does pass this check.
- (4) The thrust reverser adjustment procedure (AMM 78-31-01/501) is done for these conditions:
- (a) If a new, spare or rebuilt thrust reverser or strut is installed on the airplane.
 - (b) If structural work or component maintenance work is done to the existing strut or the thrust reverser.
 - (c) If a thrust reverser or strut is removed from another airplane and installed on the airplane in maintenance.

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THRUST REVERSER SYSTEM

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
ACTUATOR - L ENGINE T/R HYDRAULIC LOCKING	5	2	413AL,415DL,414AR,416DR	78-31-17
ACTUATOR - R ENGINE T/R HYDRAULIC LOCKING	5	2	423AL,425DL,424AR,426DR	78-31-17
ACTUATOR - L ENGINE T/R HYDRAULIC NONLOCKING	5	4	413AL,415CL,413AL,415EL, 414AR,416CR,414AR,416ER	78-31-17
ACTUATOR - R ENGINE T/R HYDRAULIC NONLOCKING	5	4	423AL,425CL,423AL,425EL, 424AR,426CR,424AR,426ER	78-31-17
ACTUATOR - L ENGINE T/R OPENING	7	2	415AL,416AR	78-31-06
ACTUATOR - R ENGINE T/R OPENING	7	2	425AL,426AR	78-31-06
ANCHOR STRAP - L ENGINE LATCH BAND	3	1	415AL,416AR	78-31-03
ANCHOR STRAP - R ENGINE LATCH BAND	3	1	425AL,426AR	78-31-03
BAND - L ENGINE LATCH	3	2	413AL,414AR	78-31-02
BAND - R ENGINE LATCH	3	2	423AL,424AR	78-31-02
CASCADE SEGMENTS - L ENGINE	2	18	415AL,416AR	78-31-16
CASCADE SEGMENTS - R ENGINE	2	18	425AL,426AR	78-31-16
DOORS - L ENGINE T/R BLOCKER	2	12	415AL,416AR	78-31-14
DOORS - R ENGINE T/R BLOCKER	2	12	425AL,426AR	78-31-14
FAIRINGS - L ENGINE T/R TRACK	1	4	AFT END OF FAN DUCT COWL AND THRUST REVERSER	78-31-12
FAIRINGS - R ENGINE T/R TRACK	1	4	AFT END OF FAN DUCT COWL AND THRUST REVERSER	78-31-12
HOSES - FLEX, L ENGINE T/R OPENING	7	2	431BT,415AL,416AR	78-31-08
HOSES - FLEX, R ENGINE T/R OPENING	7	2	441BT,425AL,426AR	78-31-08
LATCH - TENSION, L ENGINE T/R	2	1	414AR, FORWARD BULKHEAD OF FAN DUCT COWL AND T/R	78-31-04
LATCH - TENSION, L ENGINE T/R	2	2	T/R ACCESS DOOR 415FB	78-31-04
LATCH - TENSION, L ENGINE T/R	2	1	AFT OF T/R ACCESS DOOR 415FB	78-31-04
LATCH - TENSION, R ENGINE T/R	2	1	424AR, FORWARD BULKHEAD OF FAN DUCT COWL AND T/R	78-31-04
LATCH - TENSION, R ENGINE T/R	2	2	T/R ACCESS DOOR 425FB	78-31-04
LATCH - TENSION, R ENGINE T/R	2	1	AFT OF T/R ACCESS DOOR 425FB	78-31-04
LINERS - TRACK, L ENGINE	4	2	415AL	78-31-11
LINERS - TRACK, L ENGINE	4	2	414AR	78-31-11
LINERS - TRACK, R ENGINE	4	2	425AL	78-31-11
LINERS - TRACK, R ENGINE	4	2	426AR	78-31-11
LINKS - DRAG, L ENGINE BLOCKER DOOR	2	12	413AL,414AR	78-31-15
LINKS - DRAG, R ENGINE BLOCKER DOOR	2	12	423AL,424AR	78-31-15
REVERSER - L ENGINE THRUST (HALVES)	2	2	LEFT ENGINE	78-31-01
REVERSER - R ENGINE THRUST (HALVES)	2	2	RIGHT ENGINE	78-31-01
SHAFT AND TUBING - L ENGINE T/R ROTARY FLEX	5	4	413AL,414AR	78-31-18
SHAFT AND TUBING - R ENGINE T/R ROTARY FLEX	5	4	423AL,424AR	78-31-18
SLEEVE - L ENGINE THRUST REVERSER	2	2	415AL,416AR, LEFT ENGINE	78-31-10
SLEEVE - R ENGINE THRUST REVERSER	2	2	425AL,426AR, RIGHT ENGINE	78-31-10
SLIDERS - L ENG T/R TRACK		4	LEFT ENGINE THRUST REVERSER SLEEVES	78-31-13
SLIDERS - R ENG T/R TRACK		4	RIGHT ENGINE THRUST REVERSER SLEEVES	78-31-13

 Thrust Reverser System - Component Index
 Figure 101

EFFECTIVITY

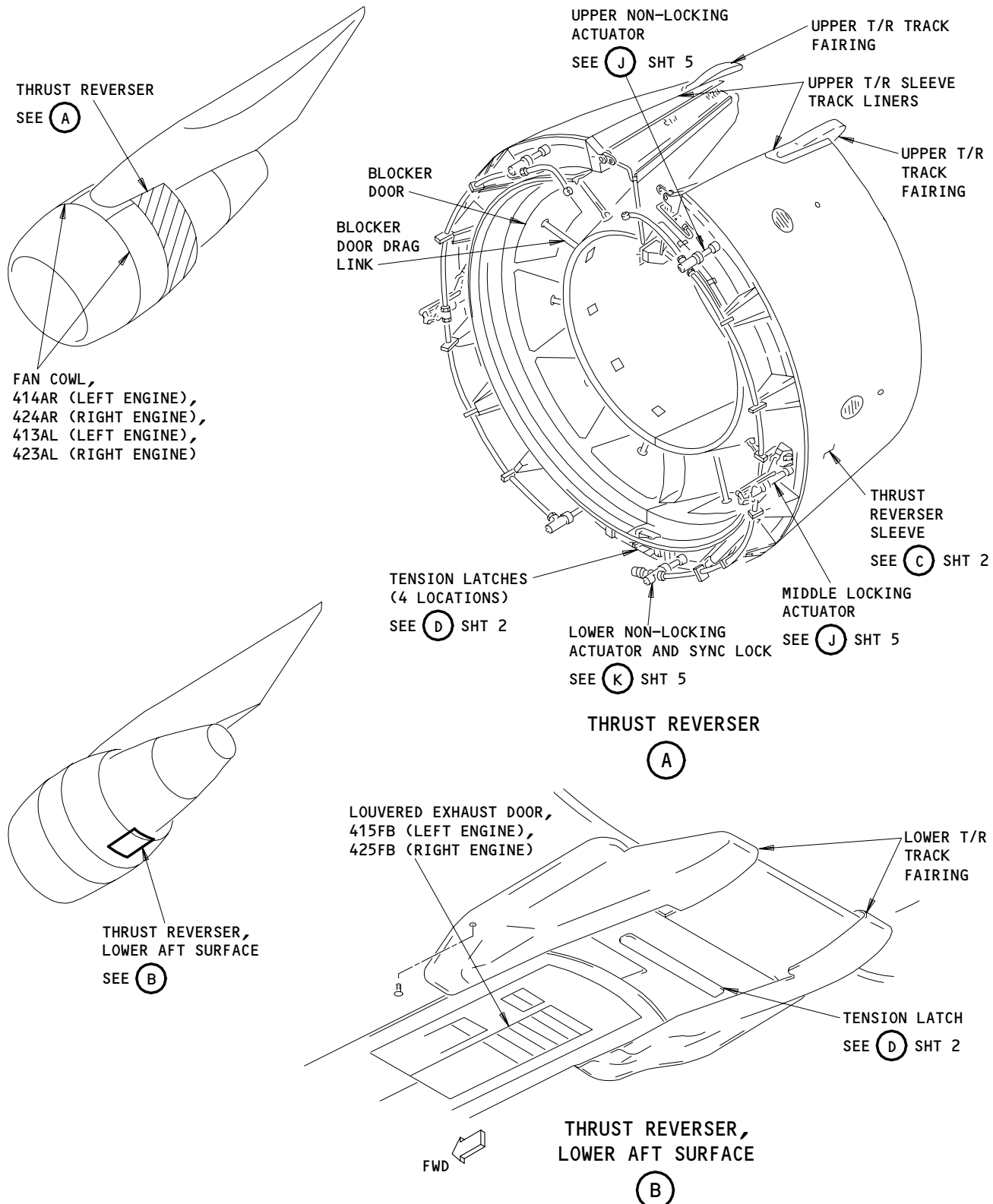
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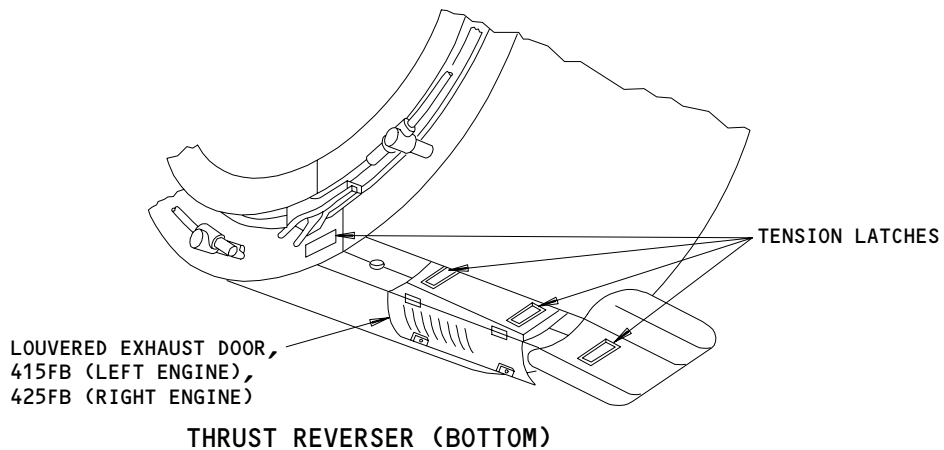
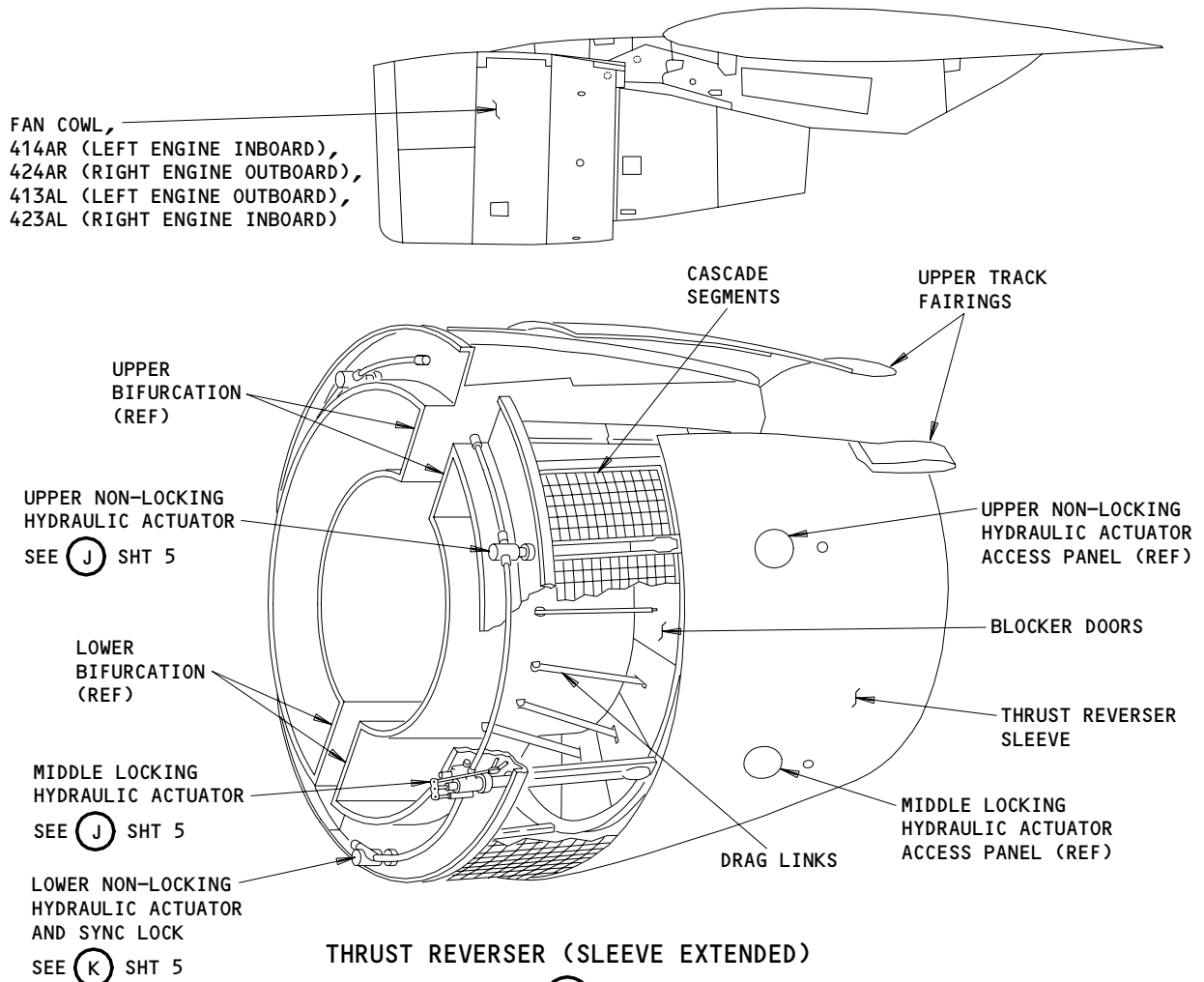
Thrust Reverser System - Component Location
Figure 102 (Sheet 1)

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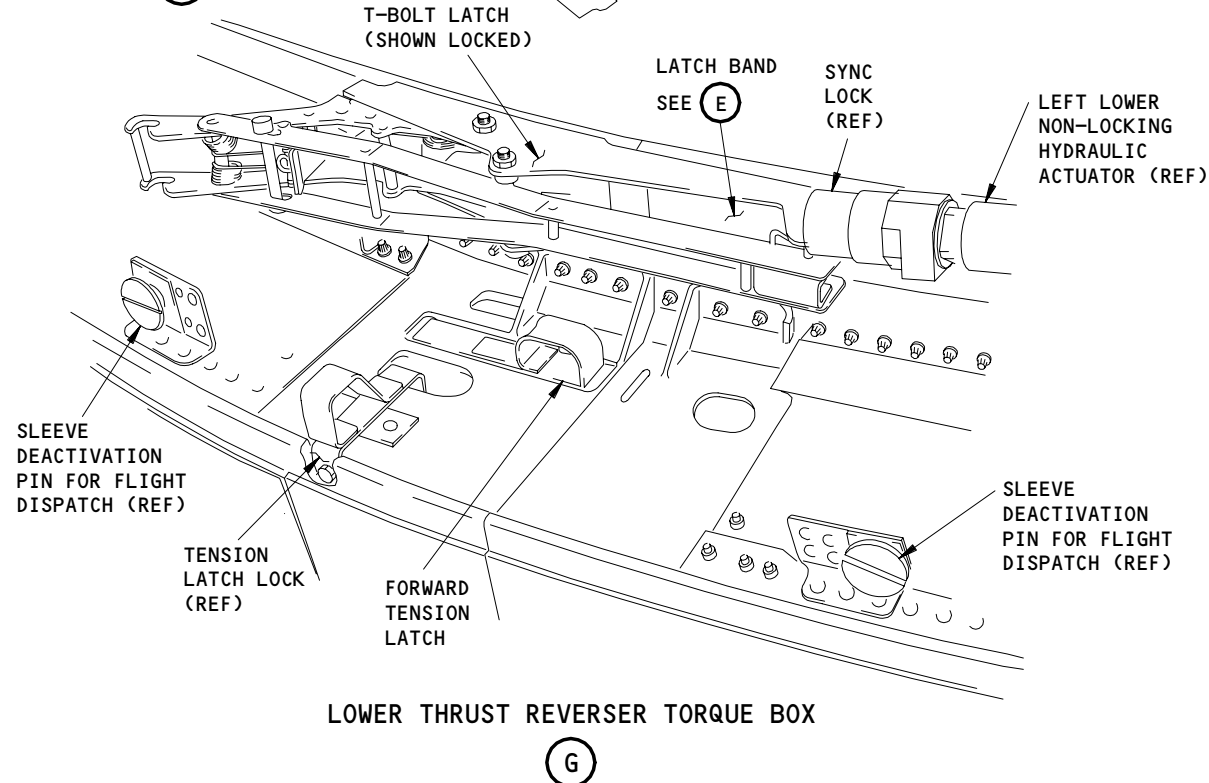
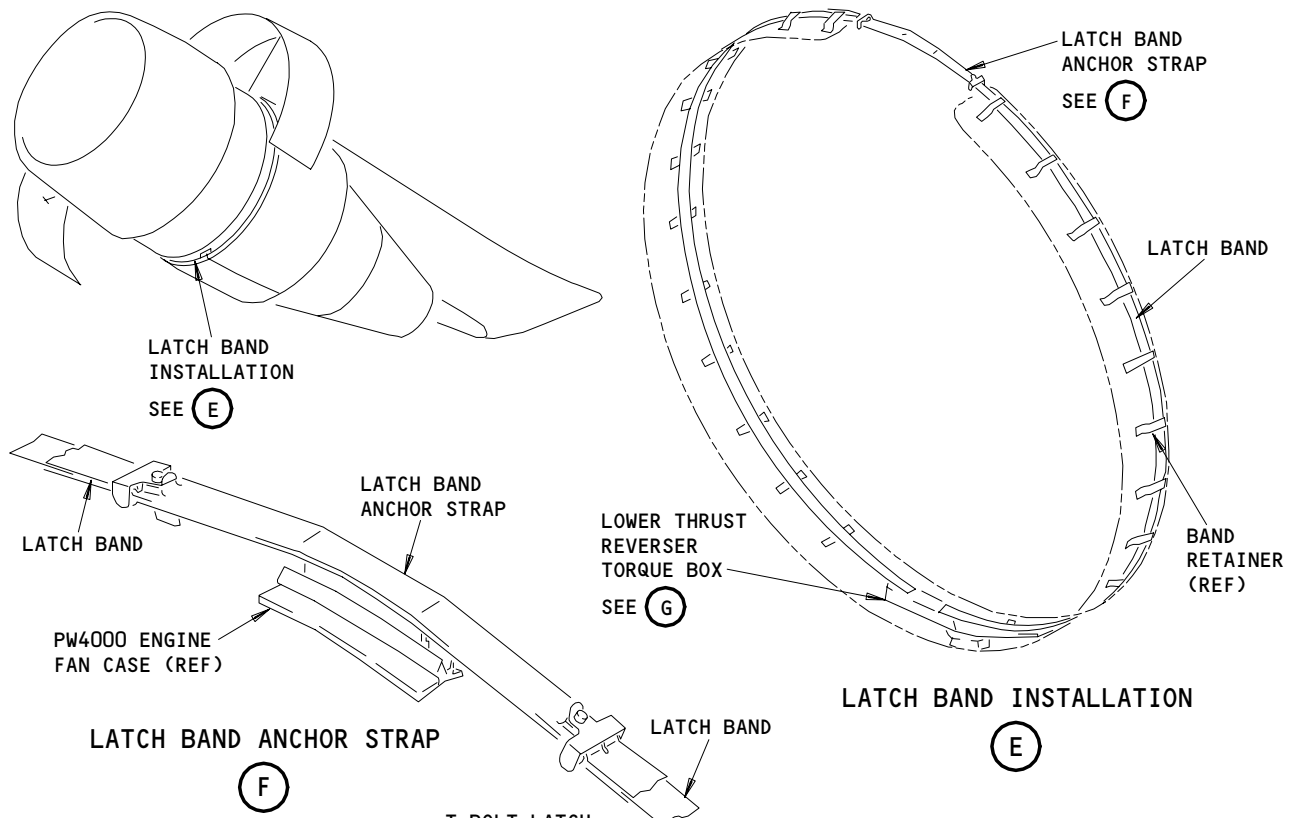
Thrust Reverser System - Component Location (Details from Sht 1)
Figure 102 (Sheet 2)

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Thrust Reverser System - Component Location
Figure 102 (Sheet 3)

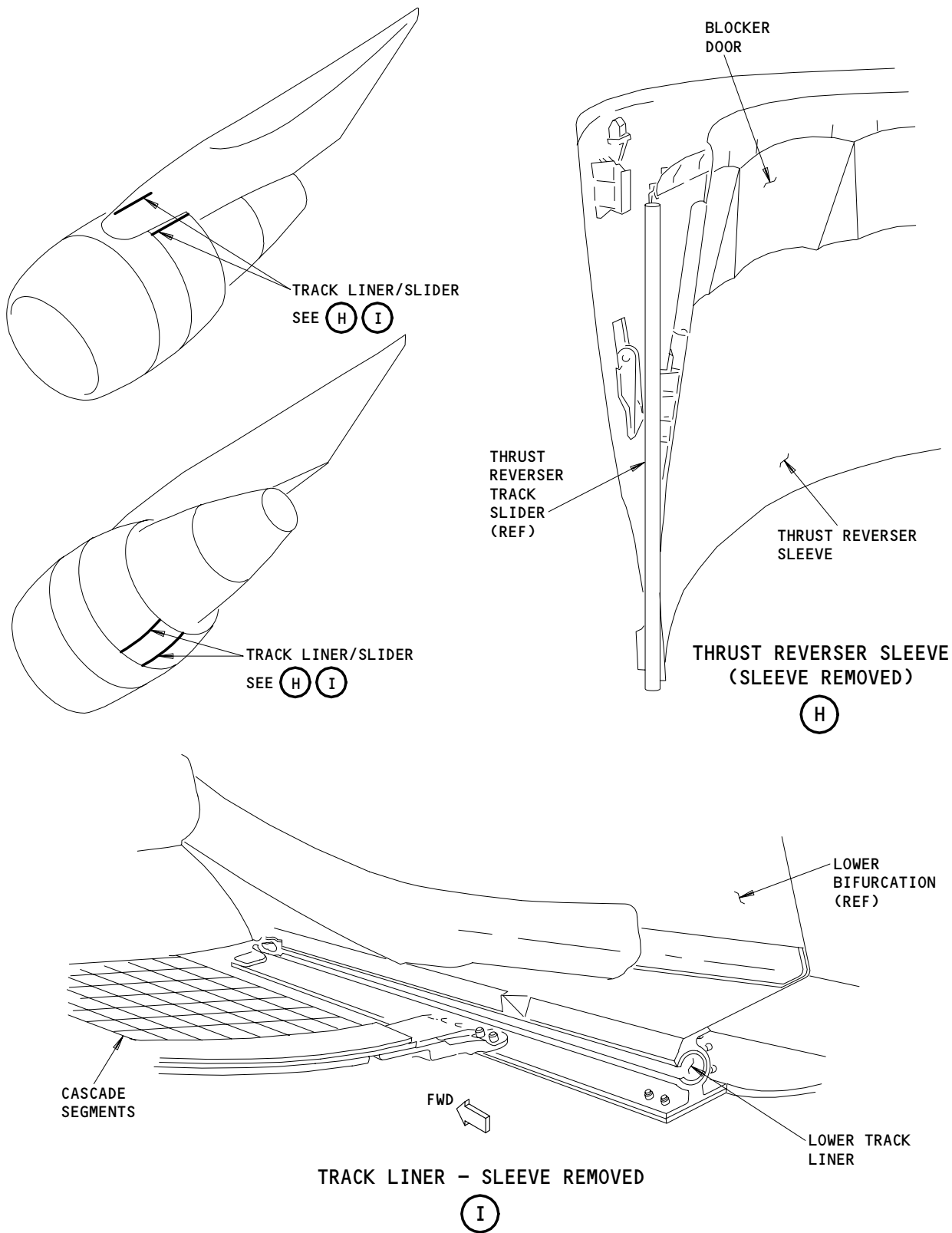
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Thrust Reverser System - Component Location
Figure 102 (Sheet 4)

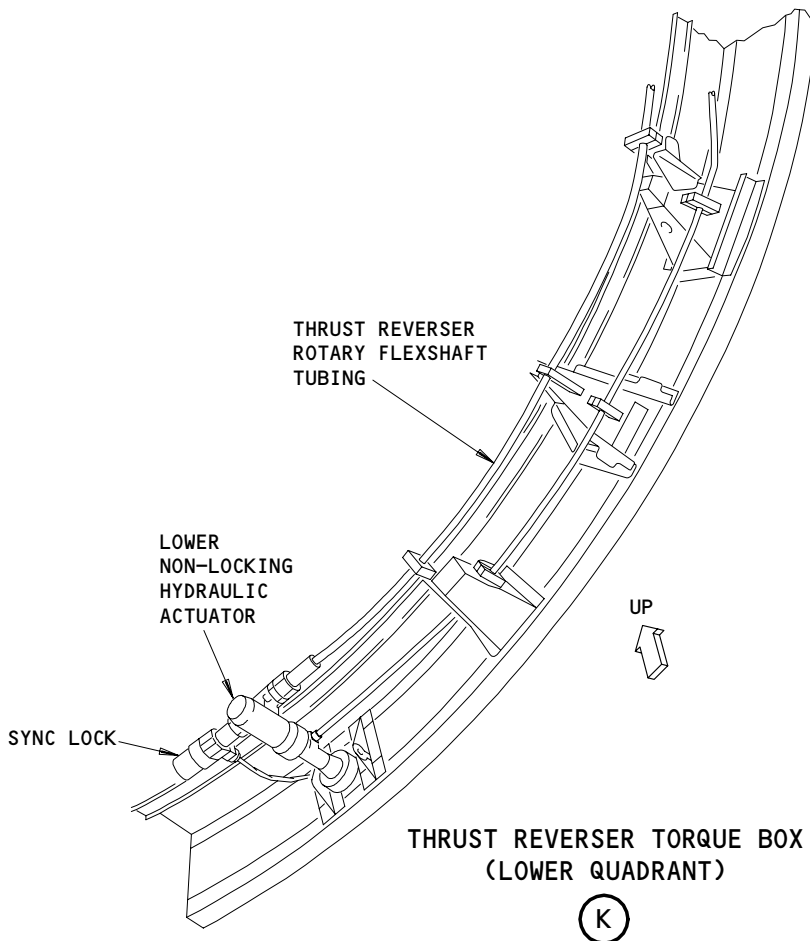
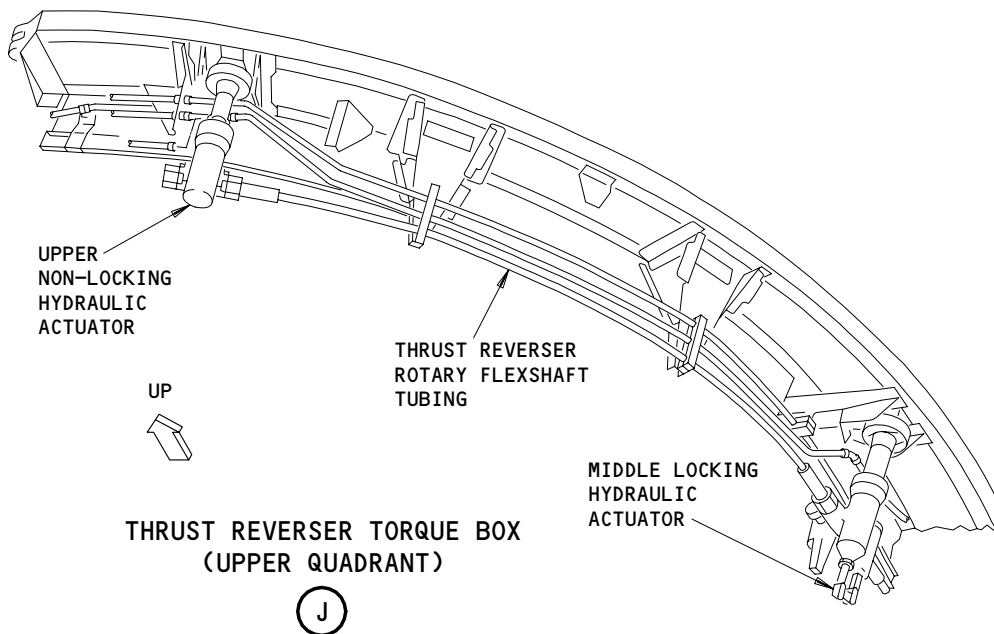
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Thrust Reverser System - Location (Details from Sht 1 and 2)
Figure 102 (Sheet 5)

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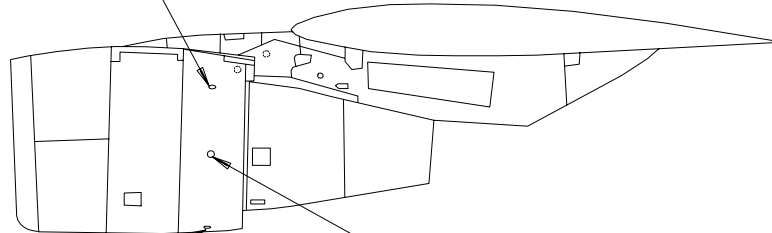
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UPPER NON-LOCKING
HYDRAULIC ACTUATOR
ACCESS PANEL,
415CL (LEFT ENGINE OUTBOARD),
425CL (RIGHT ENGINE INBOARD),
416CR (LEFT ENGINE INBOARD),
426CR (RIGHT ENGINE OUTBOARD)

SEE (L)

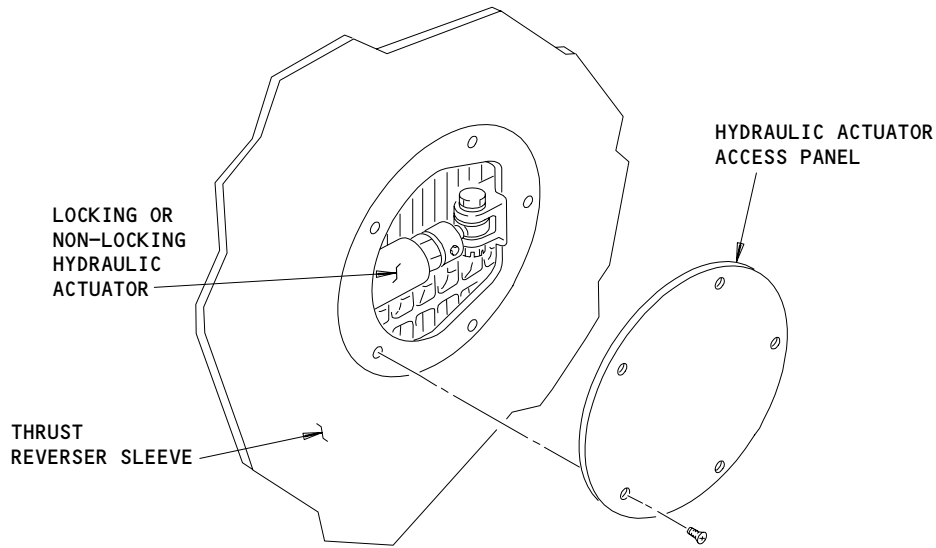


LOWER NON-LOCKING
HYDRAULIC ACTUATOR
ACCESS PANEL,
415EL (LEFT ENGINE OUTBOARD),
425EL (RIGHT ENGINE INBOARD),
416ER (LEFT ENGINE INBOARD),
426ER (RIGHT ENGINE OUTBOARD)

SEE (L)

MIDDLE LOCKING
HYDRAULIC
ACCESS PANEL,
415DL (LEFT ENGINE OUTBOARD),
425DL (RIGHT ENGINE INBOARD),
416DR (LEFT ENGINE INBOARD),
426DR (RIGHT ENGINE OUTBOARD)

SEE (L)



HYDRAULIC ACTUATOR/THRUST
REVERSER SLEEVE INTERFACE

(L)

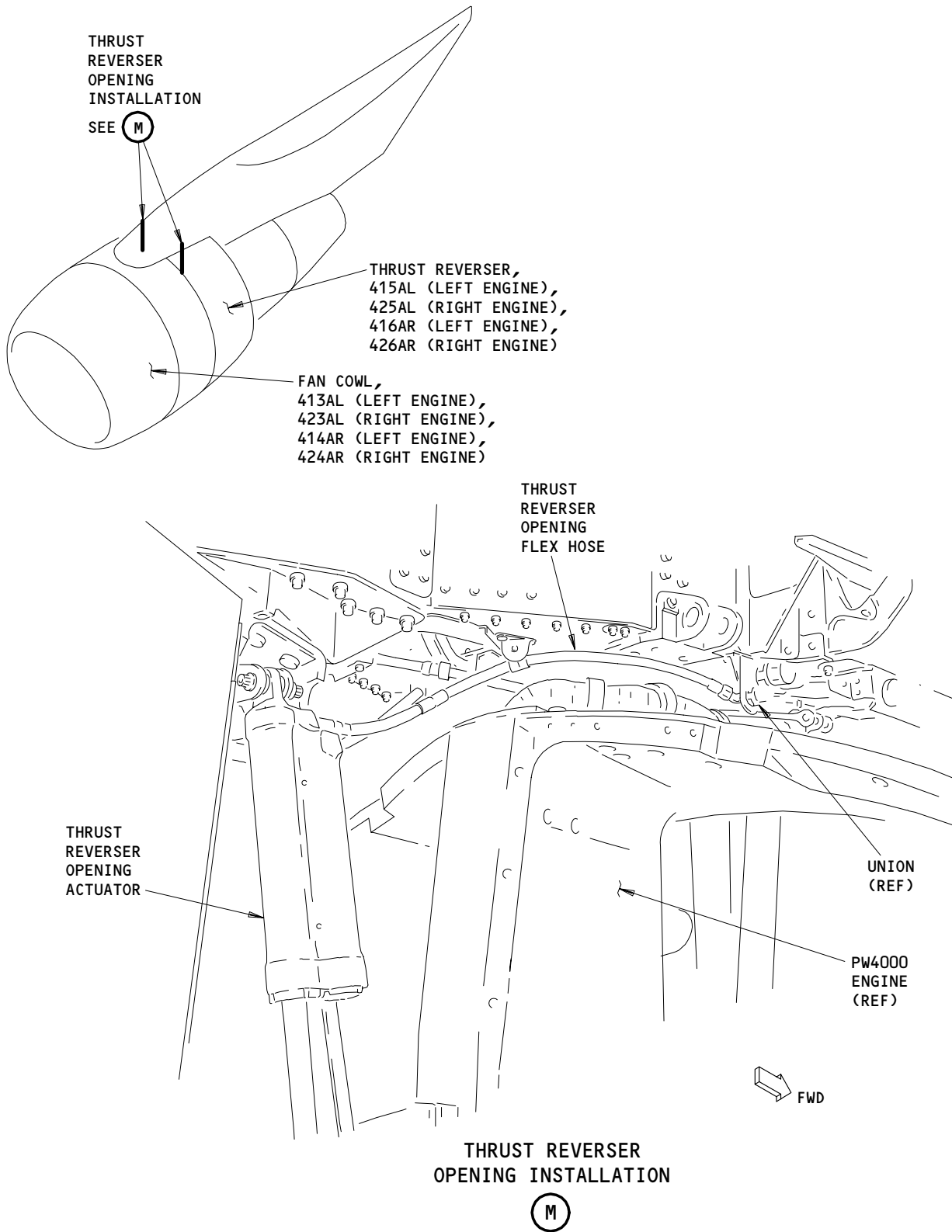
Thrust Reverser System - Component Location
Figure 102 (Sheet 6)

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Thrust Reverser System - Component Location
Figure 102 (Sheet 7)

(M)

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THRUST REVERSER SYSTEM – MAINTENANCE PRACTICES

1. General

- A. This section of the maintenance manual gives the instructions to do the tasks that follow:
 - (1) Open the Thrust Reverser (Hand Pump Method)
 - (2) Close the Thrust Reverser (Hand Pump Method)
 - (3) Open the Thrust Reverser (Sling Method)
 - (4) Close the Thrust Reverser (Sling Method)
 - (5) Thrust Reverser Operation – Extend (Manual Method)
 - (6) Thrust Reverser Operation – Retract (Manual Method)
 - (7) Thrust Reverser Operation – Extend (Power Method)
 - (8) Thrust Reverser Operation – Retract (Power Method)
 - (9) Thrust Reverser Deactivation for Ground Maintenance
 - (10) Thrust Reverser Activation After Ground Maintenance
- B. To open and close the thrust reverser refers to the opening, or separation, of the two halves of the thrust reverser. You usually will do this procedure to get access to the engine, or to the inner parts of the thrust reverser.
- C. To extend (to the deploy position) and retract (to the stow position) the thrust reverser refers to the operation positions of the thrust reverser. You usually will do this procedure to put the thrust reverser in the correct position for maintenance, or to do a check of the thrust reverser operation.

TASK 78-31-00-002-001-N00

2. Open the Thrust Reverser (Hand Pump Method)

- A. General
 - (1) You must not open, extend or lift the thrust reverser if more than six cascade vane segments are removed. You must install a minimum of three cascade vane segments in each thrust reverser half. The empty space between these three cascade vane segments must be equivalent. There must not be more than two adjacent empty spaces between the three cascade vane segments which are installed.
 - (2) Do not extend the thrust reverser sleeves when the core cowl panels are in the open position. If you do not obey this instruction, damage to the thrust reverser sleeves and the core cowl panels can occur.
 - (3) Do not open the thrust reverser halves more than 23-degrees if the thrust reverser sleeves are extended to the deploy position. Do not extend the thrust reverser sleeves to the deploy position if the thrust reverser halves are open more than 23-degrees. If you do not obey these instructions, damage to the strut and the thrust reverser sleeves can occur.

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- (4) Hold each thrust reverser half in the open position with a minimum of two devices at all times. There are three devices that can hold the thrust reverser open: The hold-open rod, the cowl opening system (opening actuator), and the sling equipment.
- (5) If it is necessary to open the thrust reverser halves to do maintenance on the cowl opening system, use the sling method to open the thrust reverser halves. Do not use the hand pump method which follows.

B. Equipment

- (1) Hand Pump - Thrust Reverser Opening System, C78005-17

C. References

- (1) AMM 06-43-00/201, Engine and Nacelle Access Doors and Panels
- (2) AMM 24-22-00/201, Electrical Power - Control
- (3) AMM 27-61-00/201, Speed Brake Control System
- (4) AMM 27-81-00/201, Leading Edge Slat System
- (5) AMM 27-81-01/601, Inboard Leading Edge Slat
- (6) AMM 71-11-04/201, Fan Cowl Panels
- (7) AMM 71-11-06/201, Core Cowl Panels

D. Access

(1) Location Zones

- 410 Left Power Plant Nacelle
- 420 Right Power Plant Nacelle

(2) Access Panels

- 413 Fan Cowl Panel - Engine No. 1 (LH)
- 423 Fan Cowl Panel - Engine No. 2 (LH)
- 414 Fan Cowl Panel - Engine No. 1 (RH)
- 424 Fan Cowl Panel - Engine No. 2 (RH)
- 415 Fan Reverser - Engine No. 1 (LH)
- 425 Fan Reverser - Engine No. 2 (LH)
- 416 Fan Reverser - Engine No. 1 (RH)
- 426 Fan Reverser - Engine No. 2 (RH)
- 417 Core Cowl Panel - Engine No. 1 (LH)
- 427 Core Cowl Panel - Engine No. 2 (LH)
- 418 Core Cowl Panel - Engine No. 1 (RH)
- 428 Core Cowl Panel - Engine No. 2 (RH)
- 415FB Louvered Exhaust Door - Engine No. 1
- 425FB Louvered Exhaust Door - Engine No. 2

E. Prepare to Open the Thrust Reverser With the Hand Pump.

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S 042-232-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE AUTOMATIC SPEED BRAKE CONTROL SYSTEM. IF YOU DO NOT DO THIS, THE AUTOMATIC SPEED BRAKES CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

- (1) Do this procedure: Automatic Speed Brake System Deactivation (AMM 27-61-00/201).

S 862-002-N00

- (2) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

S 862-003-N00

- (3) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

S 042-004-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE THRUST REVERSER TO PREVENT THE ACCIDENTAL 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 862-005-N00

- (5) Make sure the alternate flap/slat position selector on the first officer's instrument panel, P3, is in the normal position.

S 862-006-N00

- (6) Make sure the flap control lever is in the fully stowed position.

S 862-007-N00

- (7) Attach the DO-NOT-OPERATE tags to the flap control lever and the alternate flap/slat position selector.

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S 042-008-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE LEADING EDGE SLATS BEFORE YOU OPEN THE THRUST REVERSER HALVES. IF YOU DO NOT DO THIS, INJURIES TO PERSONS AND DAMAGE TO THE THRUST REVERSER, LEADING EDGE SLATS, OR WING STRUCTURE CAN OCCUR.

- (8) Do this procedure: Deactivation of the Leading Edge Slats (AMM 27-81-00/201).
(a) If the leading edge slats touch the thrust reverser, examine the slat control rods (AMM 27-81-01/601).

S 862-009-N00

- (9) Remove electrical power (AMM 24-22-00/201).

S 012-010-N00

WARNING: MAKE SURE THE FAN COWL PANELS AND CORE COWL PANELS ARE OPEN BEFORE YOU OPEN THE THRUST REVERSER HALVES. IF YOU DO NOT DO THIS, INJURY TO PERSONS AND DAMAGE TO THE FAN COWL PANELS, CORE COWL PANELS, AND THRUST REVERSER CAN OCCUR.

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

S 012-011-N00

- (11) Open the core cowl panels (AMM 71-11-06/201).
F. Open the Thrust Reverser With the Hand Pump (Fig. 201, 202 and 203).

S 212-012-N00

CAUTION: DO NOT OPEN THE THRUST REVERSER HALVES TO MORE THAN THE 23-DEGREE POSITION IF THE THRUST REVERSER SLEEVES ARE EXTENDED. IF YOU DO NOT OBEY THIS INSTRUCTION, DAMAGE TO THE THRUST REVERSER SLEEVES OR THE STRUT CAN OCCUR.

- (1) If you will open the thrust reverser halves more than 23-degrees, make sure the thrust reverser sleeves are in the fully retracted (stowed) position.

S 012-013-N00

- (2) Open the louvered exhaust door on the bottom of the applicable engine (AMM 06-43-00/201).

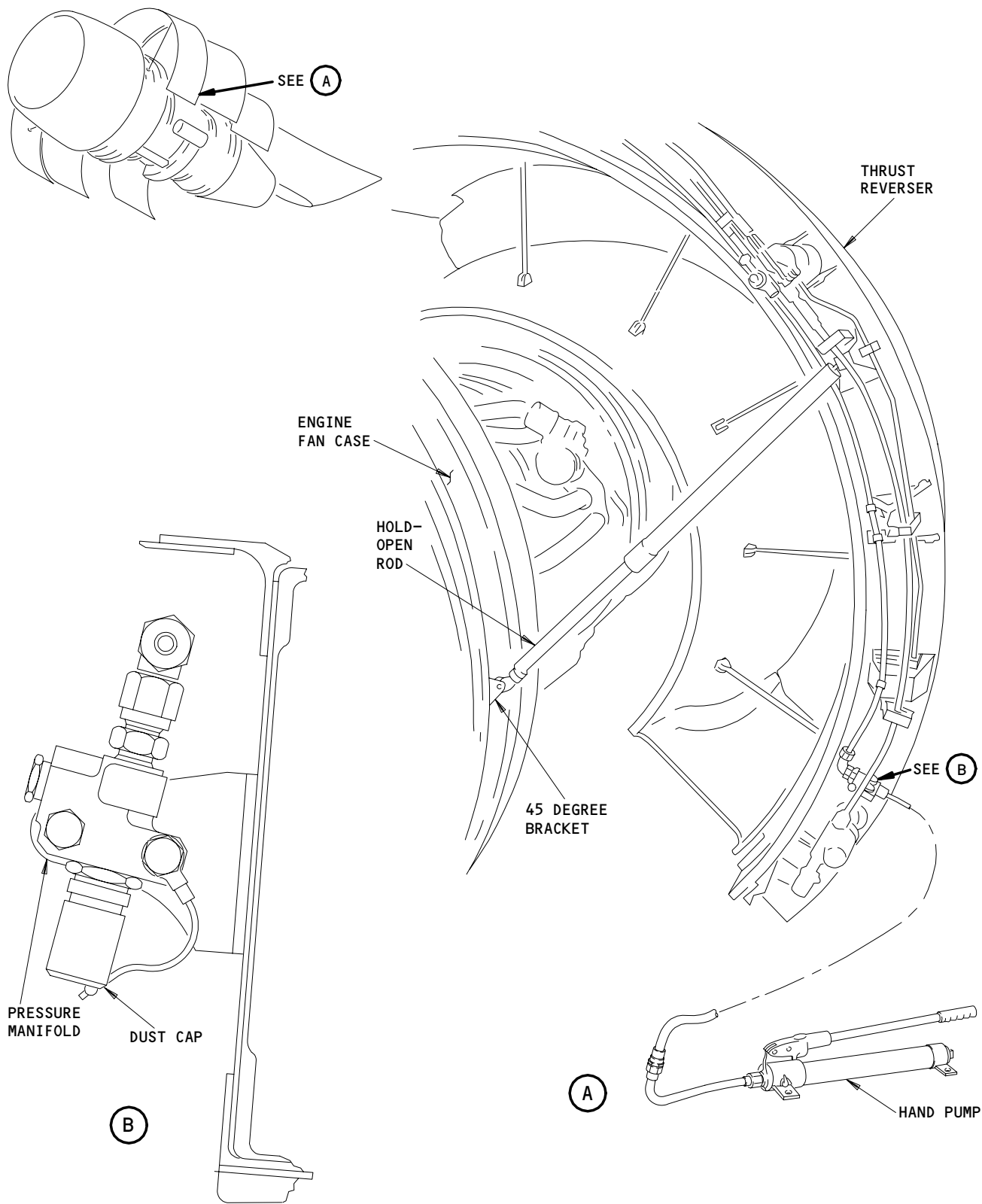
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Thrust Reverser Open and Close
Figure 201

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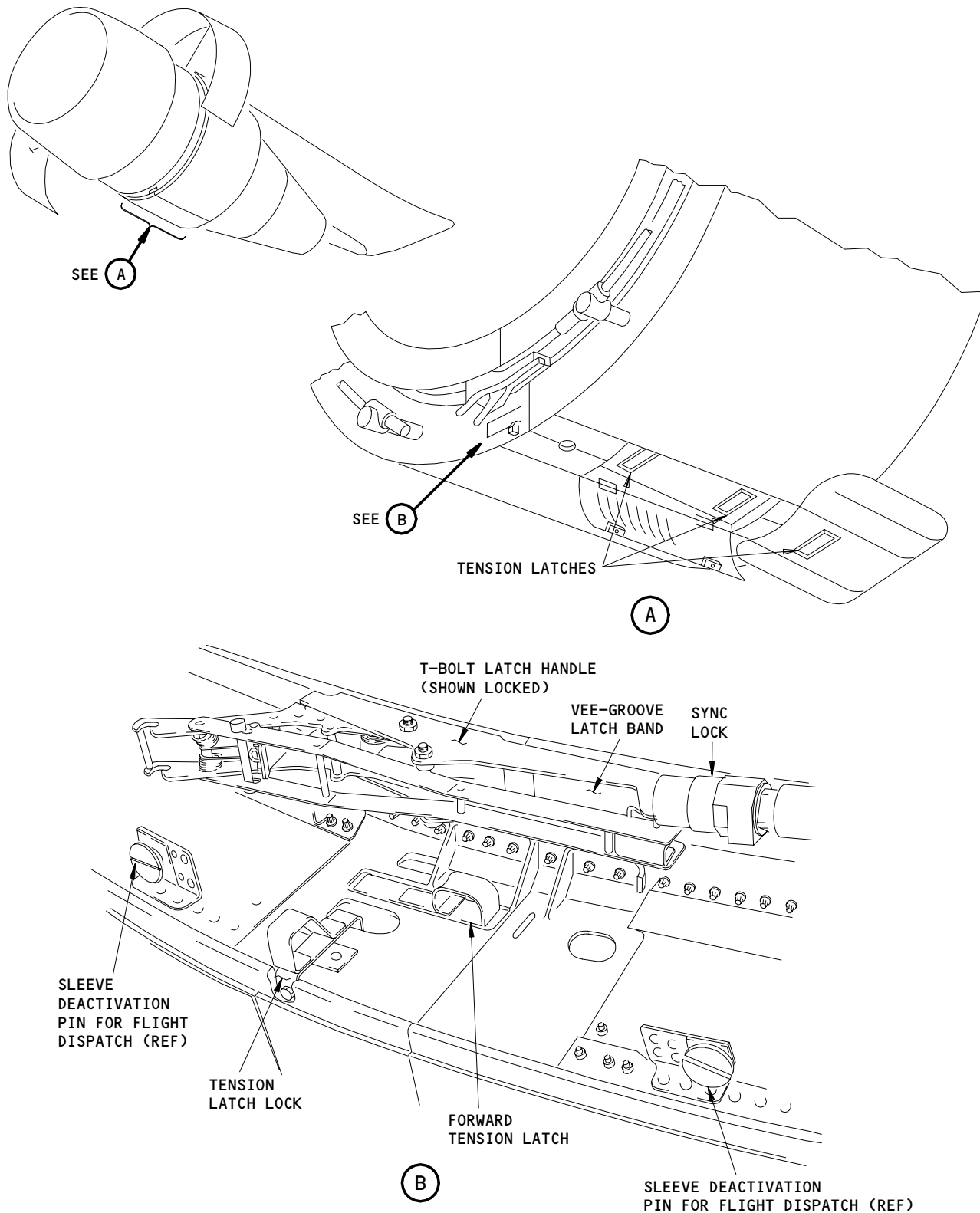
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Thrust Reverser Open and Close
Figure 202

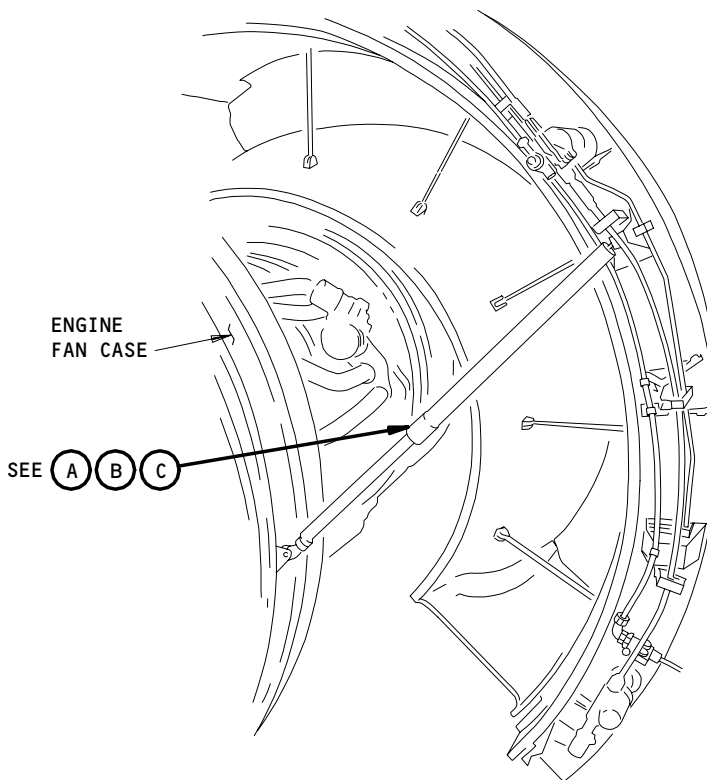
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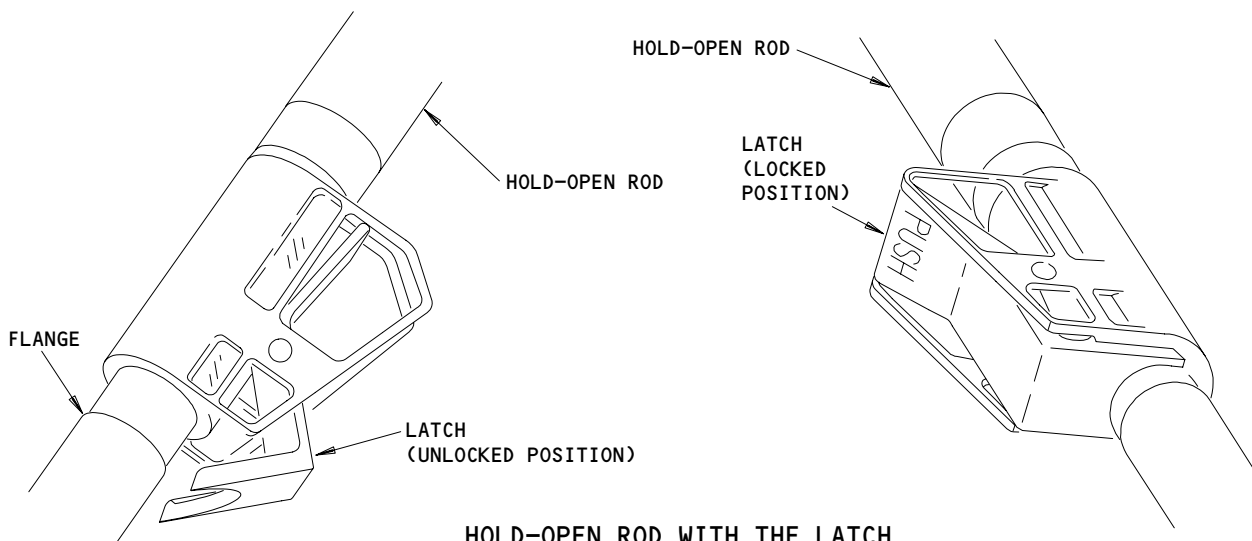
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LEFT THRUST REVERSER HALF
(RIGHT HALF IS EQUIVALENT)



HOLD-OPEN ROD WITH THE LATCH

(A)

Thrust Reverser Hold-Open Rod
Figure 203 (Sheet 1)

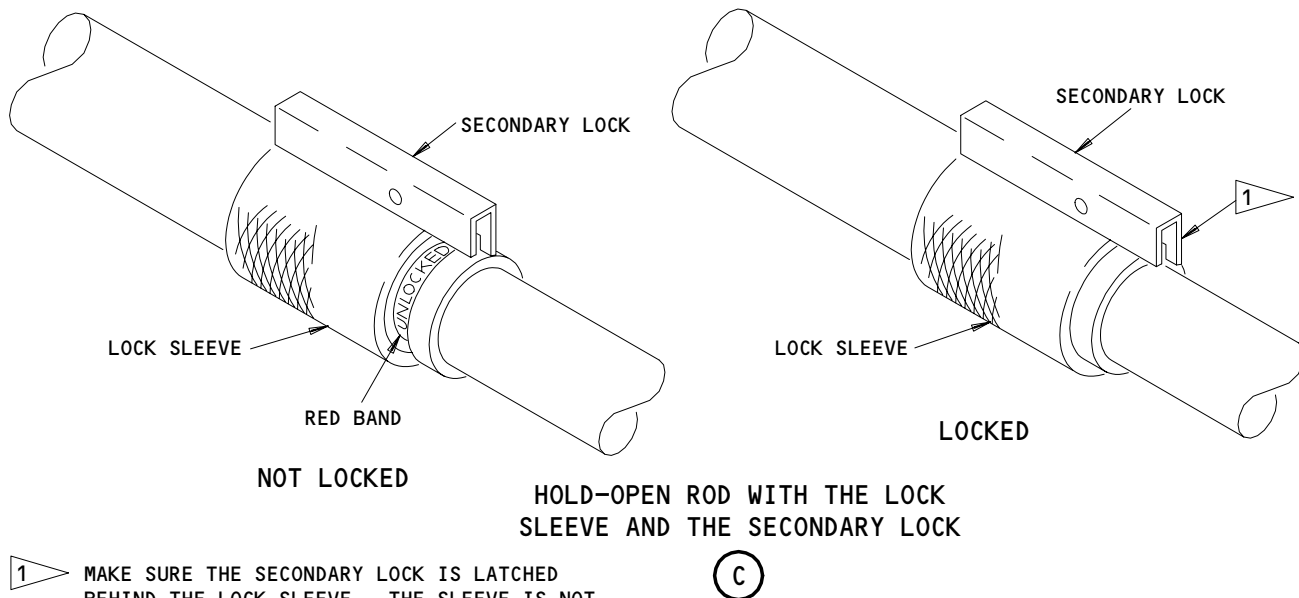
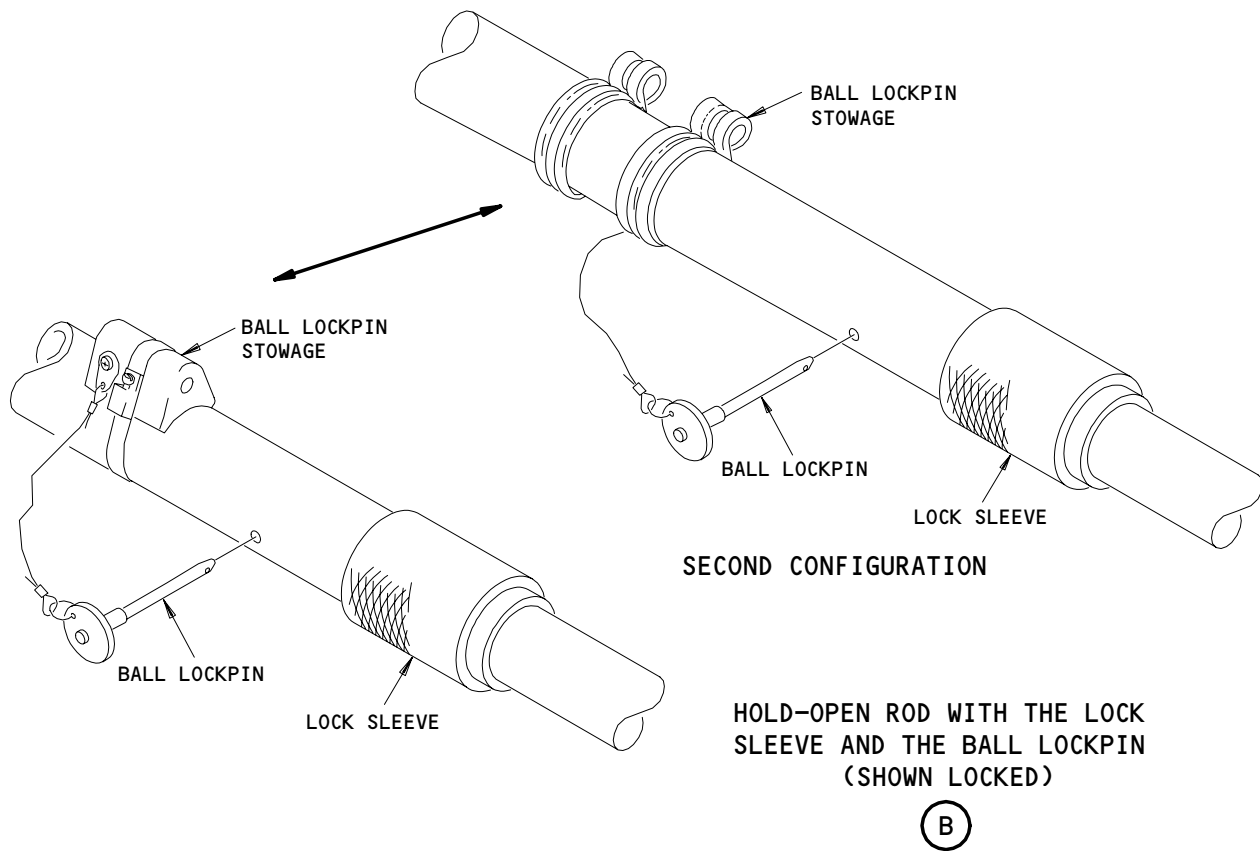
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1 MAKE SURE THE SECONDARY LOCK IS LATCHED BEHIND THE LOCK SLEEVE. THE SLEEVE IS NOT FULLY LOCKED IF YOU CAN SEE THE RED BAND WITH THE WORD UNLOCKED ON IT.

Thrust Reverser Hold-Open Rod
Figure 203 (Sheet 2)

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S 012-014-N00

- (3) Release all four tension latches on the bottom of the thrust reverser.

NOTE: Start with the aft tension latch and continue forward until you open all four tension latches.

S 012-015-N00

- (4) Release the T-bolt latch handle that attaches the v-groove latch band around the thrust reverser.

S 212-016-N00

- (5) Examine the hand pump to make sure it is full of oil.

S 492-017-N00

- (6) Connect the hose from the hand pump to the pressure manifold on the bottom of the applicable thrust reverser half.

NOTE: Make sure the return valve on the hand pump is in the closed position.

S 012-018-N00

WARNING: DO NOT MOVE BETWEEN THE ENGINE AND THE OPEN THRUST REVERSER UNTIL YOU INSTALL THE HOLD-OPEN ROD. THE THRUST REVERSER IS HEAVY AND CAN FALL CLOSED QUICKLY IF THE HAND PUMP OR ITS HYDRAULIC SYSTEM HAS A FAILURE. THIS CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

- (7) Slowly operate the hand pump until the applicable thrust reverser half is approximately half-open.

S 492-019-N00

- (8) Do these steps to install the hold-open rod:
- (a) Disconnect the bottom end of the hold-open rod from the bracket on the thrust reverser.
 - (b) Extend the hold-open rod to engage the support bracket at the 23-degree (bottom) or the 45-degree (top) position on the engine fan case.
 - (c) Continue to operate the hand pump until the hold-open rod locks in the fully extended position.

NOTE: If you install the hold-open rod in the bracket at the 45-degree position, it is usually necessary to manually push up on the thrust reverser to fully extend and lock the hold-open rod.

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S 212-020-N00

WARNING: MAKE SURE THE HOLD-OPEN ROD IS FULLY EXTENDED AND LOCKED BEFORE YOU MOVE BETWEEN THE ENGINE AND THE OPEN THRUST REVERSER. THE THRUST REVERSER IS HEAVY AND CAN FALL CLOSED QUICKLY IF THE HAND PUMP OR ITS HYDRAULIC SYSTEM HAS A FAILURE. THIS CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

WARNING: DO NOT PUT YOUR WEIGHT ON A THRUST REVERSER THAT IS KEPT OPEN WITH A HOLD-OPEN ROD ONLY. YOUR WEIGHT CAN CAUSE THE FAILURE OF THE HOLD-OPEN ROD. THE THRUST REVERSER IS HEAVY AND CAN FALL CLOSED QUICKLY, WHICH CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

- (9) Examine the hold-open rod to make sure it is fully extended and locked:

NOTE: DO NOT release the hydraulic pressure from the hand pump at this time. The hydraulic pressure from the hand pump will help to keep the thrust reverser in the open position.

- (a) FOR THE HOLD-OPEN ROD WITH THE LATCH;
Make sure the latch fully engages the face of the flange on the hold-open rod.
- (b) FOR THE HOLD-OPEN ROD WITH THE LOCK SLEEVE AND THE BALL LOCKPIN;
Do the steps that follow:
- 1) Make sure you cannot see the red band (with the word UNLOCKED on it) on the hold-open rod.
 - 2) Make sure the ball lockpin is installed through the hold-open rod.
- (c) FOR THE HOLD-OPEN ROD WITH THE LOCK SLEEVE AND THE SECONDARY LOCK;
Do the steps that follow:
- 1) Make sure you cannot see the red band (with the word UNLOCKED on it) on the hold-open rod.
 - 2) Make sure the secondary lock is engaged in the slot of the hold-open rod.

TASK 78-31-00-402-021-N00

3. Close the Thrust Reverser (Hand Pump Method)

A. General

- (1) You must not extend or lift the thrust reverser if more than six cascade vane segments are removed. You must install a minimum of three cascade vane segments in each thrust reverser half. The empty space between these three cascade vane segments must be equivalent. There must not be more than two adjacent empty spaces between the three cascade vane segments which are installed.

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- (2) Hold each thrust reverser half in the open position with a minimum of two devices at all times. There are three devices that can hold the thrust reverser open: The hold-open rod, the cowl opening system (opening actuator), and the sling equipment.

B. Equipment

- (1) Hand Pump - Thrust Reverser Opening System, C78005-17

C. References

- (1) AMM 06-43-00/201, Engine and Nacelle Access Doors and Panels
- (2) AMM 27-61-00/201, Speed Brake Control System
- (3) AMM 27-81-00/201, Leading Edge Slat System
- (4) AMM 71-11-04/201, Fan Cowl Panels
- (5) AMM 71-11-06/201, Core Cowl Panels

D. Access

- (1) Location Zones

- 410 Left Power Plant Nacelle
- 420 Right Power Plant Nacelle

- (2) Access Panels

- 413 Fan Cowl Panel - Engine No. 1 (LH)
- 423 Fan Cowl Panel - Engine No. 2 (LH)
- 414 Fan Cowl Panel - Engine No. 1 (RH)
- 424 Fan Cowl Panel - Engine No. 2 (RH)
- 415 Fan Reverser - Engine No. 1 (LH)
- 425 Fan Reverser - Engine No. 2 (LH)
- 416 Fan Reverser - Engine No. 1 (RH)
- 426 Fan Reverser - Engine No. 2 (RH)
- 417 Core Cowl Panel - Engine No. 1 (LH)
- 427 Core Cowl Panel - Engine No. 2 (LH)
- 418 Core Cowl Panel - Engine No. 1 (RH)
- 428 Core Cowl Panel - Engine No. 2 (RH)
- 415FB Louvered Exhaust Door - Engine No. 1
- 425FB Louvered Exhaust Door - Engine No. 2

E. Prepare to Close the Thrust Reverser With the Hand Pump.

S 042-022-N00

- (1) For safety, make sure the applicable airplane systems continue to be set in the deactivated configuration.

NOTE: The deactivated configuration for each applicable system can be found in this task: Prepare to Open the Thrust Reverser With the Hand Pump (which is at the start of the task before this one) (AMM 78-31-00/201).

F. Close the Thrust Reverser With the Hand Pump (Figs. 201, 202 and 203).

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S 092-023-N00

WARNING: DO NOT MOVE BETWEEN THE ENGINE AND THE OPEN THRUST REVERSER WHEN YOU CLOSE THE THRUST REVERSER. THE THRUST REVERSER IS HEAVY AND CAN FALL CLOSED QUICKLY IF THE HAND PUMP OR ITS HYDRAULIC SYSTEM HAS A FAILURE. THIS CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

WARNING: DO NOT PUT YOUR WEIGHT ON A THRUST REVERSER THAT IS KEPT OPEN WITH A HOLD-OPEN ROD ONLY. YOUR WEIGHT CAN CAUSE THE FAILURE OF THE HOLD-OPEN ROD. THE THRUST REVERSER IS HEAVY AND CAN FALL CLOSED QUICKLY, WHICH CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

WARNING: YOU MUST OPERATE THE HAND PUMP TO PRESSURIZE THE COWL OPENING SYSTEM TO THE FULLY OPEN POSITION BEFORE YOU REMOVE THE HOLD-OPEN ROD. IF YOU REMOVE THE HOLD-OPEN ROD WITHOUT HYDRAULIC PRESSURE IN THE COWL OPENING SYSTEM, THE THRUST REVERSER CAN FALL QUICKLY. THIS CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

- (1) Do these steps to remove the hold-open rod which holds the applicable thrust reverser in the open position:

NOTE: For safety, you must close each thrust reverser half independently. Remove only one hold-open rod, and close only one thrust reverser half at a time.

- (a) Operate the hand pump to pressurize the cowl opening system in the fully open direction.

NOTE: This usually will remove the load from the hold-open rod until you can release it from its bracket. But, if it is installed in the bracket at the 45-degree position, a load will remain on the hold-open rod. For this condition, carefully push up on the thrust reverser while you release the end of the hold-open rod from the bracket.

- (b) Disengage the end of the hold-open rod from the bracket on the fan case.

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- (c) Do the steps that follow to retract the hold-open rod:
- 1) FOR THE HOLD-OPEN ROD WITH THE LATCH;
Push on the latch release handle and retract the hold-open rod.
 - 2) FOR THE HOLD-OPEN ROD WITH THE LOCK SLEEVE AND THE BALL LOCKPIN;
Do the steps that follow:
 - a) Remove the ball lockpin and put it in the stowage bracket.
 - b) Move the lock sleeve until you can see the red band (with the word UNLOCKED on it), then retract the hold-open rod.
 - 3) FOR THE HOLD-OPEN ROD WITH THE LOCK SLEEVE AND THE SECONDARY LOCK;
Do the steps that follow:
 - a) Push on the secondary lock to release the lock.
 - b) Move the lock sleeve until you can see the red band (with the word UNLOCKED on it), then retract the hold-open rod.
- (d) Put the hold-open rod in the stowage bracket on the thrust reverser.

S 412-024-N00

CAUTION: MAKE SURE THE V-FLANGE OF THE THRUST REVERSER GOES INTO THE V-GROOVE ON THE ENGINE WHEN YOU CLOSE THE THRUST REVERSER. IF THE V-FLANGE DOES NOT ALIGN CORRECTLY WITH THE V-GROOVE, DAMAGE TO THE ENGINE OR THE THRUST REVERSER CAN OCCUR.

- (2) Slowly open the return valve on the hand pump.

NOTE: Each thrust reverser half must be closed independently. If the opposite thrust reverser half is open, continue to hold it in the open position (with its hold-open rod) while you close the first thrust reverser half. When you open the return valve on the hand pump, hydraulic pressure in the cowl opening system is released. This will lower the thrust reverser to the closed position.

S 092-025-N00

- (3) Disconnect the hand pump from the pressure manifold on the bottom of the thrust reverser.

NOTE: Make sure you install the dust cap on the pressure manifold after you remove the hand pump.

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S 412-026-N00

- (4) If it is necessary, do the steps (above) again to close the opposite thrust reverser half.

S 412-027-N00

CAUTION: MAKE SURE THE T-BOLT IS CORRECTLY ENGAGED IN THE RECEIVER OF THE V-GROOVE LATCH BAND BEFORE YOU CLOSE THE T-BOLT LATCH HANDLE. FAILURE TO OBEY THIS INSTRUCTION CAN CAUSE DAMAGE TO THE T-BOLT OR THE RECEIVER ON THE V-GROOVE LATCH BAND.

- (5) Close the T-bolt latch handle to attach the v-groove latch band around the thrust reverser.

S 412-028-N00

- (6) Close the four tension latches on the bottom of the engine.

NOTE: Start with the front tension latch on the torque box and continue aft until you close all four tension latches.

S 412-029-N00

- (7) Close the louvered exhaust door on the bottom of the engine (AMM 06-43-00/201).

G. Put the Airplane Back to Its Usual Condition.

S 412-030-N00

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

S 412-031-N00

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

S 442-032-N00

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

S 442-033-N00

- (4) Do the activation procedure for the speed brake control system (AMM 27-61-00/201).

S 442-034-N00

- (5) Do the activation procedure for the leading edge slats (AMM 27-81-00/201).

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S 862-035-N00

- (6) Remove the DO-NOT-OPERATE tags from the thrust levers.

TASK 78-31-00-002-107-N00

4. Open the Thrust Reverser (Sling Method)

A. General

- (1) You must not open, extend or lift the thrust reverser if more than six cascade vane segments are removed. You must install a minimum of three cascade vane segments in each thrust reverser half. The empty space between these three cascade vane segments must be equivalent. There must not be more than two adjacent empty spaces between the three cascade vane segments which are installed.
- (2) Do not extend the thrust reverser sleeves when the core cowl panels are in the open position. If you do not obey this instruction, damage to the thrust reverser sleeves and the core cowl panels can occur.
- (3) Do not open the thrust reverser halves more than 23 degrees if the thrust reverser sleeves are extended to the deploy position. Do not extend the thrust reverser sleeves to the deploy position if the thrust reverser halves are open more than 23 degrees. If you do not obey these instructions, damage to the strut and the thrust reverser sleeves can occur.
- (4) Hold each thrust reverser half in the open position with a minimum of two devices at all times. For this procedure, hold each thrust reverser half up with the sling hoist and the hold-open rod at the same time.
- (5) You must do this procedure when it is necessary to open the thrust reverser halves to do maintenance on the cowl opening system. You also can do it as a secondary type of support for the open thrust reverser after you use one of the other procedures to open it.
- (6) THRUST REVERSERS WITH COWL OPENING POWER UNITS;
The cowl-opening-power-unit is referred to as the power unit in this procedure.
- (7) The center-locking-hydraulic-actuator is referred to as the center locking actuator in this procedure.

B. Equipment

- (1) Sling, PW4000 Thrust Reverser - A71002-48

C. References

- (1) AMM 06-43-00/201, Engine and Nacelle Strut Access Doors and Panels
- (2) AMM 24-22-00/201, Electrical Power - Control
- (3) AMM 27-61-00/201, Speed Brake Control System
- (4) AMM 27-81-00/201, Leading Edge Slat System
- (5) AMM 27-81-01/601, Inboard Leading Edge Slat
- (6) AMM 71-11-04/201, Fan Cowl Panels
- (7) AMM 71-11-06/201, Core Cowl Panels

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D. Access

(1) Location Zones

- 410 Left Power Plant Nacelle
- 420 Right Power Plant Nacelle

(2) Access Panels

- 413 Fan Cowl Panel - Engine No. 1 (LH)
- 423 Fan Cowl Panel - Engine No. 2 (LH)
- 414 Fan Cowl Panel - Engine No. 1 (RH)
- 424 Fan Cowl Panel - Engine No. 2 (RH)
- 415 Fan Reverser - Engine No. 1 (LH)
- 425 Fan Reverser - Engine No. 2 (LH)
- 416 Fan Reverser - Engine No. 1 (RH)
- 426 Fan Reverser - Engine No. 2 (RH)
- 417 Core Cowl Panel - Engine No. 1 (LH)
- 427 Core Cowl Panel - Engine No. 2 (LH)
- 418 Core Cowl Panel - Engine No. 1 (RH)
- 428 Core Cowl Panel - Engine No. 2 (RH)
- 415FB Louvered Exhaust Door - Engine No. 1
- 425FB Louvered Exhaust Door - Engine No. 2

E. Prepare to Open the Thrust Reverser with the Sling Equipment.

S 042-108-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE AUTOMATIC SPEED BRAKE CONTROL SYSTEM. IF YOU DO NOT DO THIS, THE AUTOMATIC SPEED BRAKES CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

- (1) Do this procedure: Automatic Speed Brake System Deactivation (AMM 27-61-00/201).

S 862-109-N00

- (2) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

S 862-110-N00

- (3) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

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S 042-111-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE THRUST REVERSER TO PREVENT THE ACCIDENTAL 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 862-112-N00

- (5) Make sure the alternate flap/slat position selector on the first officer's instrument panel, P3, is in the NORMAL position.

S 862-113-N00

- (6) Make sure the flap control lever is in the fully stowed position.

S 862-114-N00

- (7) Attach the DO-NOT-OPERATE tags to the flap control lever and the alternate flap/slat position selector.

S 042-115-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE LEADING EDGE SLATS BEFORE YOU OPEN THE THRUST REVERSER HALVES. IF YOU DO NOT DO THIS, INJURIES TO PERSONS AND DAMAGE TO THE THRUST REVERSER, LEADING EDGE SLATS, OR WING STRUCTURE CAN OCCUR.

- (8) Do this procedure: Deactivation of the Leading Edge Slats (AMM 27-81-00/201).
(a) If the leading edge slats touch the thrust reverser, examine the slat control rods (AMM 27-81-01/601).

S 862-116-N00

- (9) Remove electrical power (AMM 24-22-00/201).

S 012-117-N00

WARNING: MAKE SURE THE FAN COWL PANELS AND CORE COWL PANELS ARE OPEN BEFORE YOU OPEN THE THRUST REVERSER HALVES. IF YOU DO NOT DO THIS, INJURY TO PERSONS AND DAMAGE TO THE FAN COWL PANELS, CORE COWL PANELS, AND THRUST REVERSER CAN OCCUR.

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

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S 012-118-N00

- (11) Open the core cowl panels (AMM 71-11-06/201).
F. Open the Thrust Reverser with the Sling Equipment (Fig. 204).

S 212-119-N00

CAUTION: DO NOT OPEN THE THRUST REVERSER HALVES TO MORE THAN THE 23-DEGREE POSITION IF THE THRUST REVERSER SLEEVES ARE EXTENDED. IF YOU DO NOT OBEY THIS INSTRUCTION, DAMAGE TO THE THRUST REVERSER SLEEVES OR THE STRUT CAN OCCUR.

- (1) If you will open the thrust reverser halves more than 23 degrees, make sure the thrust reverser sleeves are in the fully stowed position.

S 012-120-N00

- (2) Open the louvered exhaust door on the bottom of the applicable engine (AMM 06-43-00/201).

S 012-121-N00

- (3) Release all four tension latches on the bottom of the thrust reverser.

NOTE: Start with the aft tension latch and continue forward until you open all four tension latches.

S 012-122-N00

- (4) Release the T-bolt latch handle that attaches the v-groove latch band around the thrust reverser.

S 492-123-N00

- (5) Do these steps to install the sling equipment on the applicable thrust reverser half:
(a) Remove the bolts from the attachment points on the thrust reverser.

NOTE: There are two bolts at each of the three attachment points for the sling equipment. One of the two forward attachment points is on the torque box below the top non-locking actuator. The other forward attachment point is on the torque box above the center locking actuator. The aft attachment point is on the aft end of the thrust reverser.

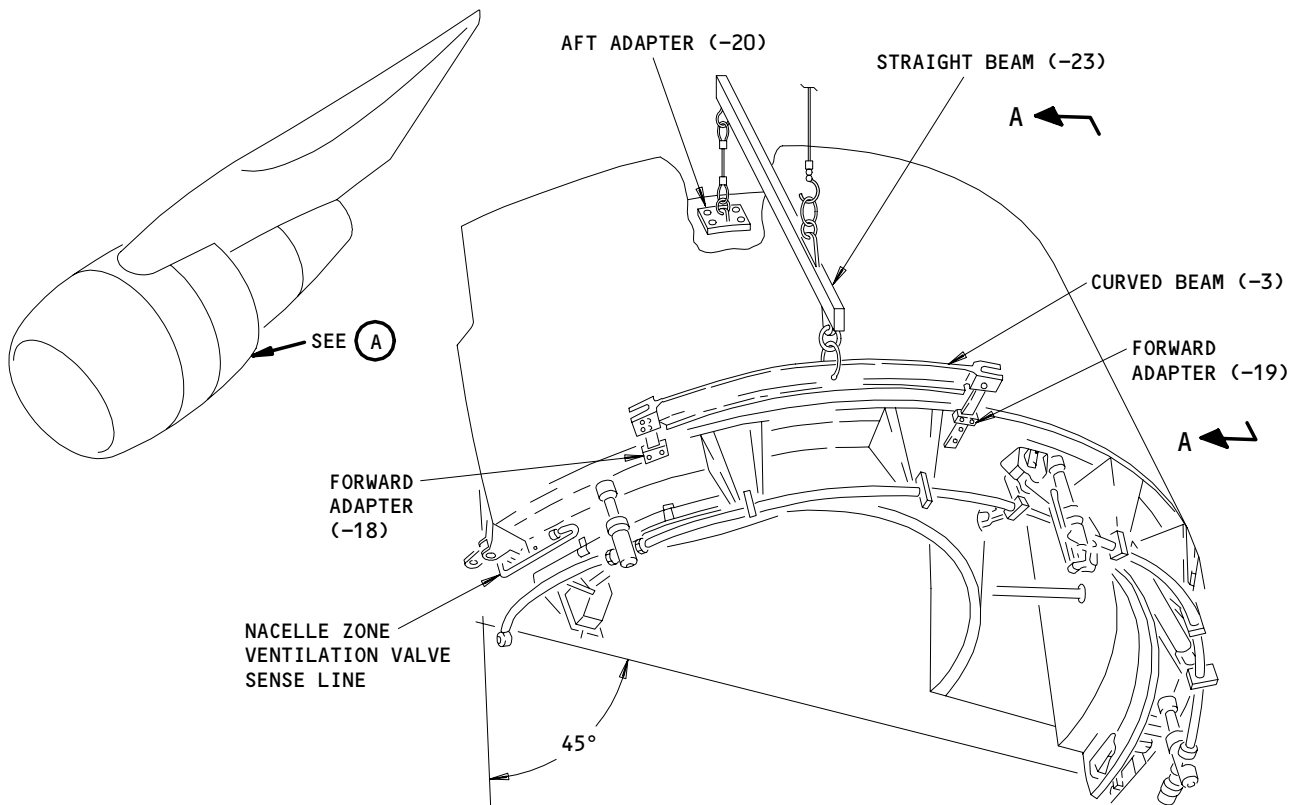
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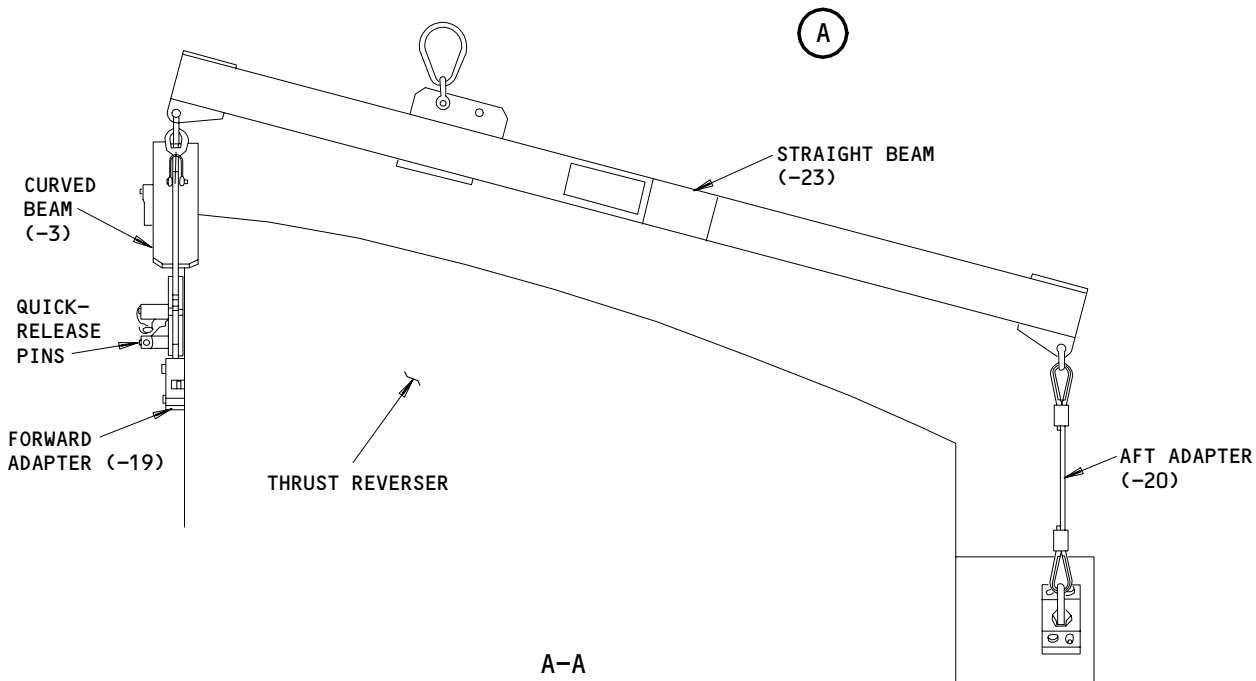
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LEFT THRUST REVERSER
SLING INSTALLATION
(RIGHT SIDE IS EQUIVALENT)



A-A
Thrust Reverser Sling
Figure 204

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- (b) Install the forward adapter (-18) with the two bolts and washers at the attachment point near the top non-locking actuator.
- (c) Install the forward adapter (-19) with the two bolts and washers at the attachment point near the center locking actuator.
 - 1) Install the forward adapter (-19) with the small hole on the inboard side and the slot on the outboard side.
 - 2) If the forward adapter (-19) touches the torque box fittings, install the forward adapter in the opposite direction.
- (d) Install the aft adapter (-20) with the two bolts and the washers at the aft attachment point.
- (e) Use the quick-release pins to attach the curved beam (-3) to the two forward adapters (-18 and -19).

NOTE: The curved beam (-3) has a stencil with instructions on it to show its correct installation. These instructions identify which side of the beam to install in the forward direction for each (inboard or outboard) thrust reverser half.

- (f) Attach the straight beam (-23) to the curved beam (-3) and to the cable on the aft adapter (-20).

NOTE: The straight beam (-23) has an arrow and the letters FWD on it to show its correct installation. Also, there is a stencil with instructions to identify the correct lift point location for each (inboard or outboard) thrust reverser half.

- (g) Attach the hoist to the correct lift point on the straight beam (-23) for the applicable (inboard or outboard) thrust reverser half.

S 492-124-N00

WARNING: DO NOT MOVE BETWEEN THE ENGINE AND THE OPEN THRUST REVERSER UNTIL YOU INSTALL THE HOLD-OPEN ROD. THE THRUST REVERSER IS HEAVY AND CAN FALL CLOSED QUICKLY IF THERE IS A FAILURE OF THE SLING OR THE HOLD-OPEN ROD. THIS CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

- (6) Operate the hoist until the applicable thrust reverser half is approximately half-open.

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S 492-125-N00

- (7) Do these steps to install the hold-open rod:
- (a) Disconnect the bottom end of the hold-open rod from the bracket on the thrust reverser.
 - (b) Extend the hold-open rod to engage the support bracket at the 23-degree (bottom) or the 45-degree (top) position on the engine fan case.
 - (c) Continue to operate the hoist to lift the thrust reverser until the hold-open rod locks in the fully extended position.

NOTE: If you install the hold-open rod in the bracket at the 45-degree position, it is usually necessary to manually push up on the thrust reverser to fully extend and lock the hold-open rod.

S 212-126-N00

WARNING: MAKE SURE THE HOLD-OPEN ROD IS FULLY EXTENDED AND LOCKED BEFORE YOU MOVE BETWEEN THE ENGINE AND THE OPEN THRUST REVERSER. THE THRUST REVERSER IS HEAVY AND CAN FALL CLOSED QUICKLY IF THE HOIST OR THE SLING EQUIPMENT HAS A FAILURE. THIS CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

WARNING: DO NOT PUT YOUR WEIGHT ON A THRUST REVERSER THAT IS KEPT OPEN WITH A HOLD-OPEN ROD ONLY. YOUR WEIGHT CAN CAUSE THE FAILURE OF THE HOLD-OPEN ROD. THE THRUST REVERSER IS HEAVY AND CAN FALL CLOSED QUICKLY, WHICH CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

- (8) Examine the hold-open rod to make sure it is fully extended and locked:
- (a) FOR THE HOLD-OPEN ROD WITH THE LATCH;
Make sure the latch fully engages the face of the flange on the hold-open rod.
 - (b) FOR THE HOLD-OPEN ROD WITH THE LOCK SLEEVE AND THE BALL LOCKPIN;
Do the steps that follow:
 - 1) Make sure you cannot see the red band (with the word UNLOCKED on it) on the hold-open rod.
 - 2) Make sure the ball lockpin is installed through the hold-open rod.

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- (c) FOR THE HOLD-OPEN ROD WITH THE LOCK SLEEVE AND THE SECONDARY LOCK;
Do the steps that follow:
1) Make sure you cannot see the red band (with the word UNLOCKED on it) on the hold-open rod.
2) Make sure the secondary lock is engaged in the slot of the hold-open rod.

S 412-128-N00

- (9) Lower the hoist a very small distance to put some of the thrust reverser weight on the hold-open rod.

NOTE: Keep the cable on the hoist tight. DO NOT remove the sling equipment or the hoist until you complete the maintenance and close the thrust reverser.

S 012-129-N00

- (10) If it is necessary, do the steps (above) again to open the opposite thrust reverser half.

TASK 78-31-00-402-130-N00

5. Close the Thrust Reverser (Sling Method)

A. General

- (1) You must not extend or lift the thrust reverser if more than six cascade vane segments are removed. You must install a minimum of three cascade vane segments in each thrust reverser half. The empty space between these three cascade vane segments must be equivalent. There must not be more than two adjacent empty spaces between the three cascade vane segments which are installed.
- (2) Hold each thrust reverser half in the open position with a minimum of two devices at all times. For this procedure, hold each thrust reverser half up with the sling hoist and the hold-open rod at the same time.

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- (3) THRUST REVERSERS WITH COWL OPENING POWER UNITS;
The cowl-opening-power-unit is referred to as the power unit in this procedure.
- (4) The center-locking-hydraulic-actuator is referred to as the center locking actuator in this procedure.

B. Equipment

- (1) Sling, PW4000 Thrust Reverser - A71002-48

C. References

- (1) AMM 06-43-00/201, Engine and Nacelle Strut Access Doors and Panels
- (2) AMM 27-61-00/201, Speed Brake Control System
- (3) AMM 27-81-00/201, Leading Edge Slat System
- (4) AMM 71-11-04/201, Fan Cowl Panels
- (5) AMM 71-11-06/201, Core Cowl Panels

D. Access

(1) Location Zones

- 410 Left Power Plant Nacelle
- 420 Right Power Plant Nacelle

(2) Access Panels

- 413 Fan Cowl Panel - Engine No. 1 (LH)
- 423 Fan Cowl Panel - Engine No. 2 (LH)
- 414 Fan Cowl Panel - Engine No. 1 (RH)
- 424 Fan Cowl Panel - Engine No. 2 (RH)
- 415 Fan Reverser - Engine No. 1 (LH)
- 425 Fan Reverser - Engine No. 2 (LH)
- 416 Fan Reverser - Engine No. 1 (RH)
- 426 Fan Reverser - Engine No. 2 (RH)
- 417 Core Cowl Panel - Engine No. 1 (LH)
- 427 Core Cowl Panel - Engine No. 2 (LH)
- 418 Core Cowl Panel - Engine No. 1 (RH)
- 428 Core Cowl Panel - Engine No. 2 (RH)
- 415FB Louvered Exhaust Door - Engine No. 1
- 425FB Louvered Exhaust Door - Engine No. 2

E. Prepare to Close the Thrust Reverser With the Sling Equipment.

S 042-131-N00

- (1) For safety, make sure the applicable airplane systems continue to be set in the deactivated configuration.

NOTE: The deactivated configuration for each applicable system can be found in this task: Prepare to Open the Thrust Reverser With the Sling Equipment (which is at the start of the task before this one) (AMM 78-31-00/201).

F. Close the Thrust Reverser with the Sling Equipment (Fig. 204).

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S 012-132-N00

WARNING: DO NOT MOVE BETWEEN THE ENGINE AND THE OPEN THRUST REVERSER WHEN YOU CLOSE THE THRUST REVERSER. THE THRUST REVERSER IS HEAVY AND CAN FALL CLOSED QUICKLY IF THE HOIST OR THE SLING EQUIPMENT HAS A FAILURE. THIS CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

WARNING: DO NOT PUT YOUR WEIGHT ON A THRUST REVERSER THAT IS KEPT OPEN WITH A HOLD-OPEN ROD ONLY. YOUR WEIGHT CAN CAUSE THE FAILURE OF THE HOLD-OPEN ROD. THE THRUST REVERSER IS HEAVY AND CAN FALL CLOSED QUICKLY, WHICH CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

WARNING: YOU MUST OPERATE THE HOIST TO LIFT THE THRUST REVERSER TO THE FULLY OPEN POSITION BEFORE YOU REMOVE THE HOLD-OPEN ROD. IF YOU REMOVE THE HOLD-OPEN ROD BEFORE YOU DO THIS, THE THRUST REVERSER CAN FALL QUICKLY. THIS CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

- (1) Do these steps to remove the hold-open rod which holds the applicable thrust reverser half in the open position:

NOTE: For safety, you must close each thrust reverser half independently. Remove only one hold-open rod, and close only one thrust reverser half at a time.

- (a) Operate the hoist to lift the applicable thrust reverser half to the fully open position.

NOTE: This usually will remove the load from the hold-open rod until you can release it from its bracket. But, if it is installed in the bracket at the 45-degree position, a load will remain on the hold-open rod. For this condition, carefully push up on the thrust reverser while you release the end of the hold-open rod from the bracket.

- (b) Disengage the end of the hold-open rod from the bracket on the fan case.

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- (c) Do the steps that follow to retract the hold-open rod:
 - 1) FOR THE HOLD-OPEN ROD WITH THE LATCH;
Push on the latch release handle and retract the hold-open rod.
 - 2) FOR THE HOLD-OPEN ROD WITH THE LOCK SLEEVE AND THE BALL LOCKPIN;
Do the steps that follow:
 - a) Remove the ball lockpin and put it in the stowage bracket.
 - b) Move the lock sleeve until you can see the red band (with the word UNLOCKED on it), then retract the hold-open rod.
 - 3) FOR THE HOLD-OPEN ROD WITH THE LOCK SLEEVE AND THE SECONDARY LOCK;
Do the steps that follow:
 - a) Push on the secondary lock to release the lock.
 - b) Move the lock sleeve until you can see the red band (with the word UNLOCKED on it), then retract the hold-open rod.
- (d) Put the hold-open rod in the stowage bracket on the thrust reverser.

S 412-133-N00

CAUTION: MAKE SURE THE V-FLANGE OF THE THRUST REVERSER GOES INTO THE V-GROOVE ON THE ENGINE WHEN YOU CLOSE THE THRUST REVERSER. IF THE V-FLANGE DOES NOT ALIGN CORRECTLY WITH THE V-GROOVE, DAMAGE TO THE ENGINE OR THE THRUST REVERSER CAN OCCUR.

- (2) Operate the hoist to lower the applicable thrust reverser half to the fully closed position.

NOTE: Each thrust reverser half must be closed independently. If the opposite thrust reverser half is open, continue to hold it in the open position (with its hold-open rod) while you close the first thrust reverser half.

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S 092-134-N00

- (3) Do these steps to remove the sling equipment from the applicable thrust reverser:
- (a) Lower the hoist until you can disconnect it from the sling equipment.
 - (b) Remove the hoist from the sling equipment.
 - (c) Remove the straight beam (-23) from the curved beam (-3).
 - (d) Remove the aft adapter (-20) from the aft attachment point on the thrust reverser.
 - 1) Put the two bolts back into the aft attachment point on the thrust reverser.
 - (e) Release the quick-disconnect pins to remove the curved beam (-3) from the forward adapters (-18 and -19) on the torque box.
 - (f) Remove the two forward adapters (-18 and -19) from the forward attachment points on the torque box of the thrust reverser.
 - 1) Put the four bolts back into the forward attachment points on the torque box of the thrust reverser.

S 412-135-N00

- (4) If it is necessary, do the steps (above) again to remove the hold-open rod and close the opposite thrust reverser half.

S 412-136-N00

CAUTION: MAKE SURE THE T-BOLT IS CORRECTLY ENGAGED IN THE RECEIVER OF THE V-GROOVE LATCH BAND BEFORE YOU CLOSE THE T-BOLT LATCH HANDLE. FAILURE TO OBEY THIS INSTRUCTION CAN CAUSE DAMAGE TO THE T-BOLT OR THE RECEIVER ON THE V-GROOVE LATCH BAND.

- (5) Close the T-bolt latch handle to attach the v-groove latch band around the thrust reverser.

S 412-137-N00

- (6) Close the four tension latches on the bottom of the engine.

NOTE: Start with the front tension latch on the torque box and continue aft until you close all four tension latches.

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- S 412-138-N00
- (7) Close the louvered exhaust door on the bottom of the engine (AMM 06-43-00/201).
- G. Put the Airplane Back to Its Usual Condition.
 - S 412-139-N00
 - (1) Close the core cowl panels (AMM 71-11-06/201).
 - S 412-140-N00
 - (2) Close the fan cowl panels (AMM 71-11-04/201).
 - S 442-141-N00
 - (3) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).
 - S 442-142-N00
 - (4) Do the activation procedure for the speed brake control system (AMM 27-61-00/201).
 - S 442-143-N00
 - (5) Do the activation procedure for the leading edge slats (AMM 27-81-00/201).
 - S 862-144-N00
 - (6) Remove the DO-NOT-OPERATE tags from the thrust levers.

TASK 78-31-00-982-145-N00

6. Thrust Reverser Operation - Extend (Manual Method)

A. General

- (1) You must not open, extend or lift the thrust reverser if more than six cascade vane segments are removed. You must install a minimum of three cascade vane segments in each thrust reverser half. The empty space between these three cascade vane segments must be equivalent. There must not be more than two adjacent empty spaces between the three cascade vane segments which are installed.
- (2) Do not extend the thrust reverser sleeves when the core cowl panels are in the open position. If you do not obey this instruction, damage to the thrust reverser sleeves and the core cowl panels can occur.
- (3) Do not open the thrust reverser halves more than 23 degrees if the thrust reverser sleeves are extended to the deploy position. Do not extend the thrust reverser sleeves to the deploy position if the thrust reverser halves are open more than 23 degrees. If you do not obey these instructions, damage to the strut and the thrust reverser sleeves can occur.
- (4) The bypass-valve-manual-override lever is referred to as the bypass valve lever in this procedure.
- (5) The actuator-lock-proximity sensor is referred to as the lock proximity sensor in this procedure.

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(6) The center-locking-hydraulic actuator is referred to as the center locking actuator in this procedure.

B. References

- (1) AMM 24-22-00/201, Electrical Power - Control
- (2) AMM 27-61-00/201, Speed Brake Control System
- (3) AMM 71-11-04/201, Fan Cowl Panels
- (4) AMM 71-11-06/201, Core Cowl Panels
- (5) AMM 71-11-06/401, Core Cowl Panels
- (6) AMM 78-31-00/201, Thrust Reverser System

C. Access

(1) Location Zones

- 410 Left Power Plant Nacelle
- 420 Right Power Plant Nacelle

(2) Access Panels

- 413 Fan Cowl Panel - Engine No. 1 (LH)
- 423 Fan Cowl Panel - Engine No. 2 (LH)
- 414 Fan Cowl Panel - Engine No. 1 (RH)
- 424 Fan Cowl Panel - Engine No. 2 (RH)
- 415 Fan Reverser - Engine No. 1 (LH)
- 425 Fan Reverser - Engine No. 2 (LH)
- 416 Fan Reverser - Engine No. 1 (RH)
- 426 Fan Reverser - Engine No. 2 (RH)
- 417 Core Cowl Panel - Engine No. 1 (LH)
- 427 Core Cowl Panel - Engine No. 2 (LH)
- 418 Core Cowl Panel - Engine No. 1 (RH)
- 428 Core Cowl Panel - Engine No. 2 (RH)

D. Prepare to Manually Extend the Thrust Reverser to the Deploy Position.

S 042-146-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE AUTOMATIC SPEED BRAKE CONTROL SYSTEM. IF YOU DO NOT DO THIS, THE AUTOMATIC SPEED BRAKES CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

- (1) Do this procedure: Automatic Speed Brake System Deactivation (AMM 27-61-00/201).

S 862-147-N00

- (2) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

S 862-148-N00

- (3) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

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S 042-149-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE THRUST REVERSER TO PREVENT THE ACCIDENTAL 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).

NOTE: Do the deactivation tasks for the stow valve and the motorized isolation valve only. DO NOT put the sleeve deactivation pin with the streamer in the thrust reverser sleeve for this procedure.

S 862-150-N00

- (5) Remove electrical power (AMM 24-22-00/201).

S 012-151-N00

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

S 212-152-N00

CAUTION: MAKE SURE THE THRUST REVERSER AND THE CORE COWL PANELS ARE IN THE CORRECT CONFIGURATION FOR THE EXTENSION OF THE THRUST REVERSER. IF THE THRUST REVERSER OR CORE COWL PANELS ARE NOT IN THE CORRECT CONFIGURATION, YOU CAN CAUSE DAMAGE TO THE STRUT, THE THRUST REVERSER, OR THE CORE COWL PANELS.

- (7) Examine the thrust reverser and core cowl panels for these conditions:
(a) Make sure the thrust reverser halves are not open more than 23 degrees.

NOTE: If you extend the thrust reverser when the halves are open more than 23 degrees, damage to the thrust reverser or the strut can occur.

- (b) If the thrust reverser halves are open to the 23-degree position, remove the core cowl panels from the engine (AMM 71-11-06/401).
(c) If the thrust reverser halves are not open, make sure the core cowl panels are fully closed (AMM 71-11-06/201).

E. Manually Extend the Thrust Reverser to the Deploy Position (Fig. 205).

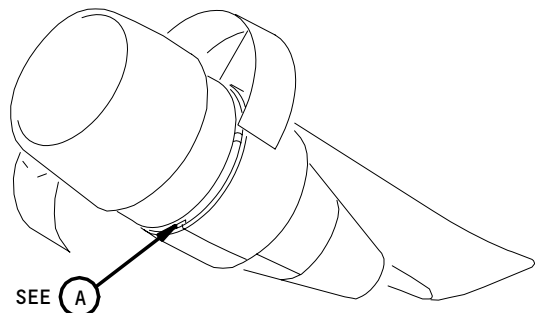
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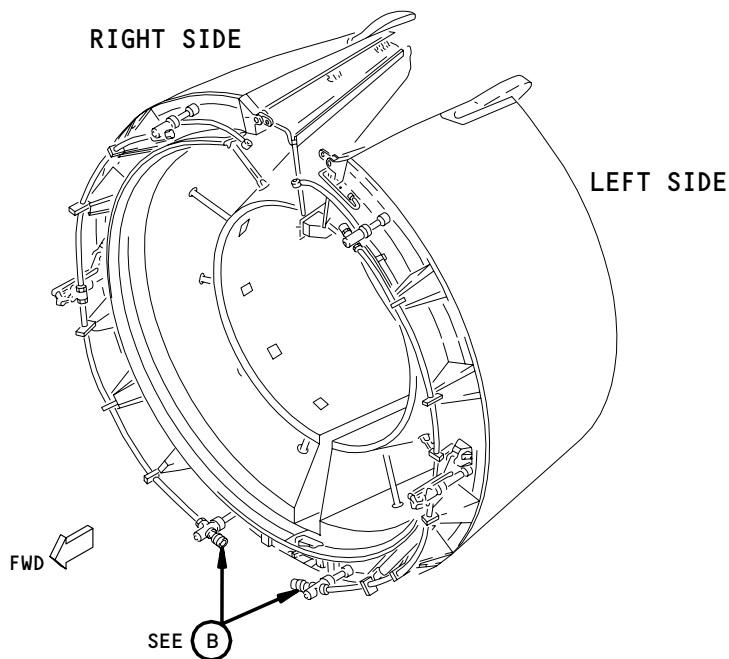
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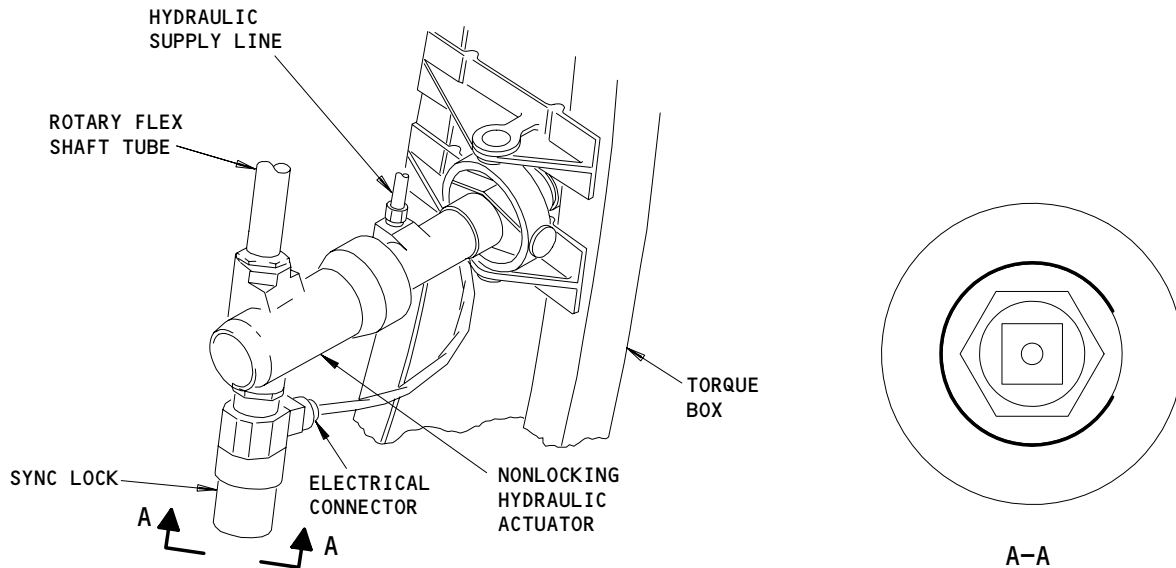


FAN COWLS OPEN



LOWER NONLOCKING HYDRAULIC ACTUATOR AND SYNC LOCK LOCATION

(A)



LEFT SIDE LOWER NONLOCKING HYDRAULIC ACTUATOR INSTALLATION (RIGHT SIDE EQUIVALENT)

(B)

Thrust Reverser Operation - Extend/Retract (Manual or Power Method)
Figure 205 (Sheet 1)

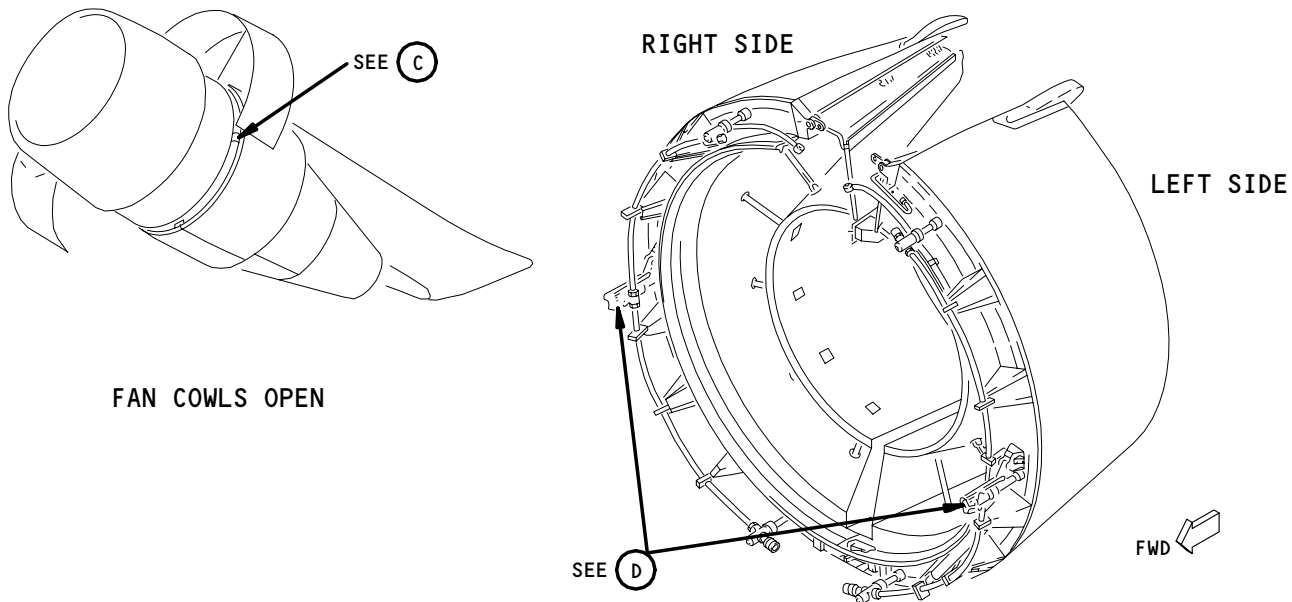
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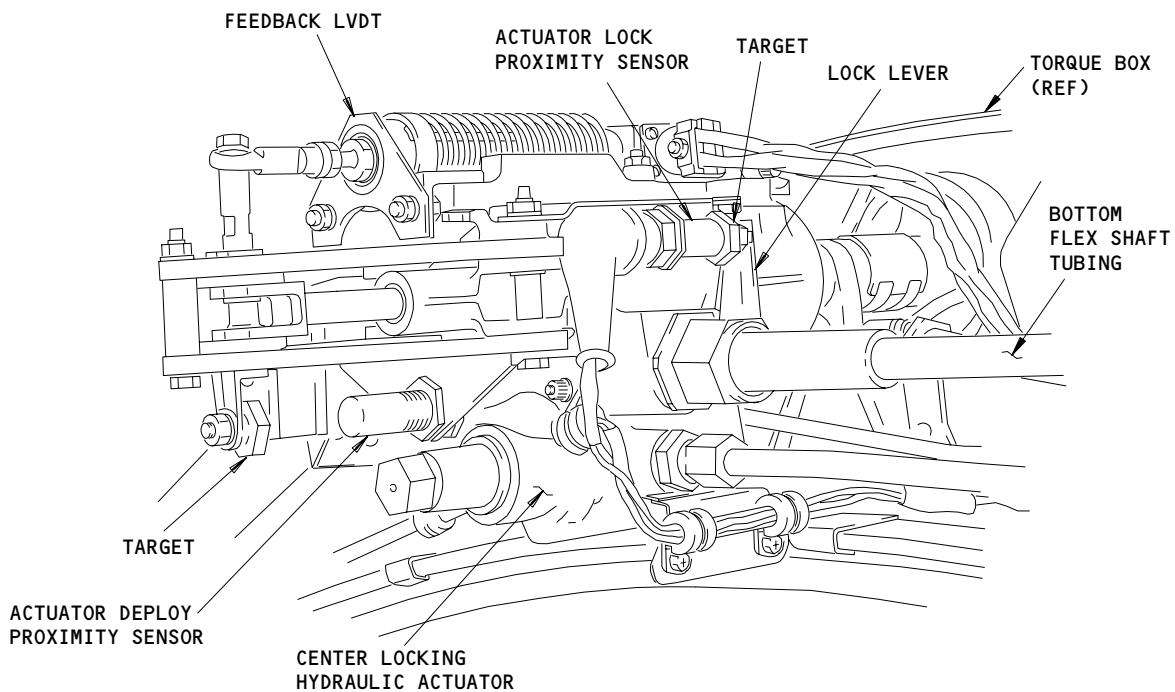
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CENTER LOCKING HYDRAULIC ACTUATOR LOCATION

(C)



LEFT SIDE CENTER LOCKING HYDRAULIC ACTUATOR INSTALLATION

(D)

Thrust Reverser Operation - Extend/Retract (Manual or Power Method)
Figure 205 (Sheet 2)

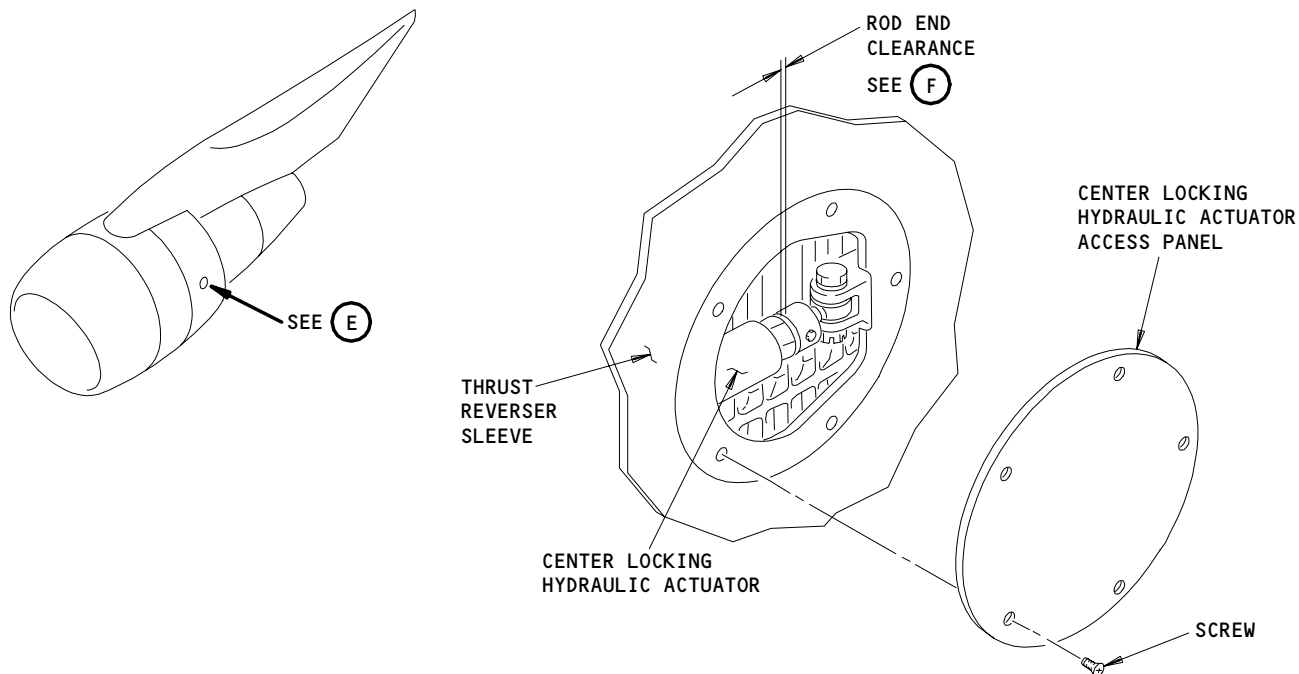
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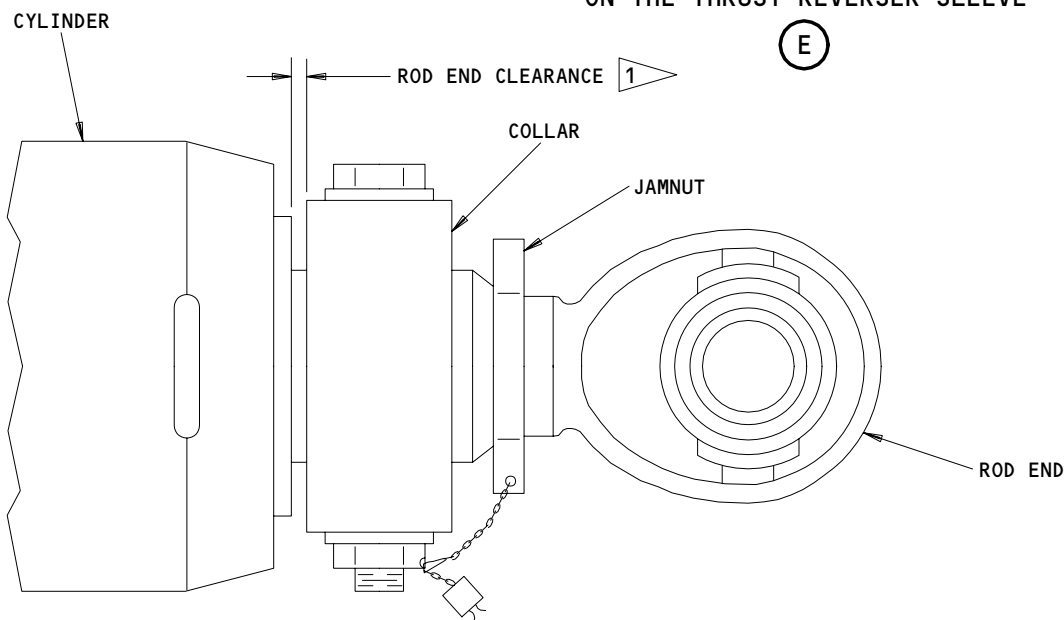
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CENTER LOCKING HYDRAULIC ACTUATOR ACCESS PANEL ON THE THRUST REVERSER SLEEVE



ROD END CLEARANCE FOR THE CENTER LOCKING HYDRAULIC ACTUATOR

1 THE ROD END CLEARANCE MUST NOT BE MORE THAN 0.100 INCH WITH THE HYDRAULIC PRESSURE REMOVED

Thrust Reverser Operation - Extend/Retract (Manual or Power Method)
Figure 205 (Sheet 3)

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S 982-153-N00

CAUTION: DO NOT USE A SCREWDRIVER BETWEEN THE LOCK PROXIMITY SENSOR AND THE TARGET TO MOVE THE LOCK LEVER TO THE UNLOCKED POSITION. IF YOU USE A SCREWDRIVER OR OTHER TOOL TO APPLY A SEPARATION FORCE, YOU CAN CAUSE DAMAGE TO THE LOCK PROXIMITY SENSOR OR THE TARGET.

- (1) Move the lock lever and target away from the lock proximity sensor to release the lock in the center locking actuator.

NOTE: If the lock lever does not move easily, turn the manual drive in the direction which stows the thrust reverser sleeve. For the left sleeve, turn the manual drive clockwise. For the right sleeve, turn the manual drive counterclockwise.

S 492-154-N00

CAUTION: MAKE SURE THE MANUAL DRIVE IS FULLY ENGAGED WITH THE SYNC LOCK DRIVE SHAFT BEFORE YOU TURN IT. DO NOT USE FORCE TO ENGAGE THE MANUAL DRIVE. ALSO, MAKE SURE THE MANUAL DRIVE STAYS FULLY ENGAGED WHILE YOU OPERATE THE SQUARE DRIVE. IF THE MANUAL DRIVE IS NOT FULLY ENGAGED OR IF YOU USE FORCE TO ENGAGE IT, DAMAGE TO THE SYNC LOCK CAN OCCUR.

- (2) Install a 3/8 inch (9.4 mm) square drive into the end of the manual drive on the sync lock.

NOTE: You must push the square drive in until it stops and hold it there to manually disengage the synch lock and engage the manual drive shaft.

NOTE: Small position adjustments of the manual drive may be necessary to align it with the sync lock drive shaft. If you can not install the 3/8 inch square drive, use a 5/8 inch hex drive on the outer hex nut and turn counterclockwise and clockwise a very small amount.

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S 982-155-N00

WARNING: MAKE SURE ALL PERSONS AND EQUIPMENT ARE CLEAR OF THE AREA AFT OF THE APPLICABLE THRUST REVERSER. IF YOU DO NOT OBEY THIS INSTRUCTION, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN THE THRUST REVERSER IS EXTENDED.

CAUTION: MAKE SURE ALL THE ACTUATORS OPERATE CORRECTLY WHEN YOU EXTEND THE THRUST REVERSER. IF THE FLEXSHAFT BETWEEN THE ACTUATORS IS BROKEN, OR IS NOT INSTALLED, ONLY THE BOTTOM ACTUATOR WILL OPERATE. IF YOU CONTINUE TO OPERATE THE THRUST REVERSER WITH THIS CONDITION, DAMAGE TO THE THRUST REVERSER CAN OCCUR.

- (3) While you keep the sync lock disengaged, turn the square drive to fully extend the applicable thrust reverser sleeve.

NOTE: Make sure you turn the square drive in the direction that extends the thrust reverser sleeve. For the left sleeve, turn the manual drive counterclockwise. For the right sleeve, turn the manual drive clockwise.

NOTE: Make sure the manual drive turns smoothly. If it does not turn smoothly, stop the manual operation and install the square drive again. If the manual drive continues to operate roughly, use the power method to extend the thrust reverser sleeve (AMM 78-31-00/201).

S 092-156-N00

- (4) Remove the square drive from the end of the manual drive on the sync lock.

S 442-157-N00

- (5) Do these steps if you must remove the hydraulic components or tubing from the thrust reverser for maintenance:
- (a) Remove the hitch pin from the streamered pin in the bypass valve lever, which is on the bypass valve of the stow valve.
 - (b) Remove the streamered pin that holds the bypass valve in the open (bypass lever retracted) position.
 - (c) Make sure the bypass valve moves to the closed (bypass lever extended) position.

NOTE: The bypass valve of the stow valve must be in the closed position when you remove hydraulic system components. If the bypass valve is not closed, leakage of the hydraulic fluid from the reservoir will occur when you remove the components.

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S 982-158-N00

- (6) If it is necessary, do the steps (above) again to extend the opposite thrust reverser sleeve.

TASK 78-31-00-982-159-N00

7. Thrust Reverser Operation - Retract (Manual Method)

A. General

- (1) You must not open, extend or lift the thrust reverser if more than six cascade vane segments are removed. You must install a minimum of three cascade vane segments in each thrust reverser half. The empty space between these three cascade vane segments must be equivalent. There must not be more than two adjacent empty spaces between the three cascade vane segments which are installed.
- (2) The bypass-valve-manual-override lever is referred to as the bypass valve lever in this procedure.
- (3) The actuator-lock-proximity sensor is referred to as the lock proximity sensor in this procedure.
- (4) The center-locking-hydraulic actuator is referred to as the center locking actuator in this procedure.

B. References

- (1) AMM 27-61-00/201, Speed Brake Control System
- (2) AMM 71-11-04/201, Fan Cowl Panels
- (3) AMM 71-11-06/201, Core Cowl Panels
- (4) AMM 71-11-06/401, Core Cowl Panels
- (5) AMM 78-31-00/201, Thrust Reverser System

C. Access

(1) Location Zones

- 410 Left Power Plant Nacelle
- 420 Right Power Plant Nacelle

(2) Access Panels

- 413 Fan Cowl Panel - Engine No. 1 (LH)
- 423 Fan Cowl Panel - Engine No. 2 (LH)
- 414 Fan Cowl Panel - Engine No. 1 (RH)
- 424 Fan Cowl Panel - Engine No. 2 (RH)
- 415 Fan Reverser - Engine No. 1 (LH)
- 425 Fan Reverser - Engine No. 2 (LH)
- 416 Fan Reverser - Engine No. 1 (RH)
- 426 Fan Reverser - Engine No. 2 (RH)
- 417 Core Cowl Panel - Engine No. 1 (LH)
- 427 Core Cowl Panel - Engine No. 2 (LH)
- 418 Core Cowl Panel - Engine No. 1 (RH)
- 428 Core Cowl Panel - Engine No. 2 (RH)

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D. Prepare to Manually Retract the Thrust Reverser to the Stow Position.

S 042-160-N00

- (1) For safety, make sure the applicable airplane systems continue to be set in the deactivated configuration.

NOTE: The deactivated configuration for each applicable system can be found in this task: Prepare to Manually Extend the Thrust Reverser to the Deploy Position (which is at the start of the task before this one) (AMM 78-31-00/201).

S 042-161-N00

- (2) Do these steps to open the bypass valve of the stow valve if you did hydraulic system maintenance:
- (a) Make sure the applicable hydraulic components and tubing are installed, and that all connections and fasteners are tightened correctly.
 - (b) Push in the bypass valve lever to open the bypass valve of the stow valve.
 - (c) Install the streamered pin to hold the bypass valve in the open (bypass lever retracted) position.

NOTE: The bypass valve of the stow valve must be open before you retract the thrust reverser. This will prevent a hydraulic lock, which can prevent the retraction of the thrust reverser.

- (d) Install the hitch pin in the streamered pin.

E. Manually Retract the Thrust Reverser to the Stow Position (Fig. 205).

S 982-162-N00

CAUTION: DO NOT USE A SCREWDRIVER BETWEEN THE LOCK PROXIMITY SENSOR AND THE TARGET TO MOVE THE LOCK LEVER TO THE UNLOCKED POSITION. IF YOU USE A SCREWDRIVER OR OTHER TOOL TO APPLY A SEPARATION FORCE, YOU CAN CAUSE DAMAGE TO THE LOCK PROXIMITY SENSOR OR THE TARGET.

- (1) Move the lock lever and target away from the lock proximity sensor to release the lock in the center locking actuator.

EFFECTIVITY
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S 492-163-N00

CAUTION: MAKE SURE THE MANUAL DRIVE IS FULLY ENGAGED WITH THE SYNC LOCK DRIVE SHAFT BEFORE YOU TURN IT. DO NOT USE FORCE TO ENGAGE THE MANUAL DRIVE. ALSO, MAKE SURE THE MANUAL DRIVE STAYS FULLY ENGAGED WHILE YOU OPERATE THE SQUARE DRIVE. IF THE MANUAL DRIVE IS NOT FULLY ENGAGED OR IF YOU USE FORCE TO ENGAGE IT, DAMAGE TO THE SYNC LOCK CAN OCCUR.

- (2) Install a 3/8 inch (9.4 mm) square drive into the end of the manual drive on the sync lock.

NOTE: You must push the square drive in until it stops and hold it there to manually disengage the synch lock and engage the manual drive shaft.

NOTE: Small position adjustments of the manual drive may be necessary to align it with the sync lock drive shaft. If you can not install the 3/8 inch square drive, use a 5/8 inch hex drive on the outer hex nut and turn counterclockwise and clockwise a very small amount.

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S 982-164-N00

WARNING: MAKE SURE ALL PERSONS AND EQUIPMENT ARE CLEAR OF THE THRUST REVERSER AND THE ADJACENT AREA. IF YOU DO NOT OBEY THIS INSTRUCTION, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN THE THRUST REVERSER IS RETRACTED.

CAUTION: MAKE SURE ALL THE ACTUATORS OPERATE CORRECTLY WHEN YOU RETRACT THE THRUST REVERSER. IF THE FLEXSHAFT BETWEEN THE ACTUATORS IS BROKEN, OR IS NOT INSTALLED, ONLY THE BOTTOM ACTUATOR WILL OPERATE. IF YOU CONTINUE TO OPERATE THE THRUST REVERSER WITH THIS CONDITION, DAMAGE TO THE THRUST REVERSER CAN OCCUR.

- (3) While you keep the sync lock disengaged, turn the square drive to fully retract the applicable thrust reverser sleeve.

NOTE: Make sure you turn the square drive in the direction that retracts the thrust reverser sleeve. For the left sleeve, turn the manual drive clockwise. For the right sleeve, turn the manual drive counterclockwise.

NOTE: Make sure the manual drive turns smoothly. If it does not turn smoothly, stop the manual operation and install the square drive again. If the manual drive continues to operate roughly, use the power method to retract the thrust reverser sleeve. Also, the manual drive has a clutch to make sure you do not apply too much torque. If you hear clicks before the thrust reverser sleeve is fully retracted, and the rod end clearance for the center locking actuator is more than 0.100 inch, use the power method to retract the thrust reverser sleeve (AMM 78-31-00/201).

S 492-233-N00

CAUTION: WHEN YOU REMOVE THE 3/8-INCH SQUARE DRIVE FROM THE MANUAL DRIVE, MAKE SURE THE LOCK RELEASE PIN RETURNS TO ITS ORIGINAL (OUT) POSITION. IF THE RELEASE PIN DOES NOT RETURN TO THE OUT POSITION, THE THRUST REVERSER HALF WILL NOT DEPLOY WITH HYDRAULIC POWER.

- (4) Remove the square drive from the end of the manual drive on the sync lock.

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S 222-166-N00

- (5) To make sure the thrust reverser sleeve is in the fully stowed position, measure the rod end clearance for the center locking actuator.

NOTE: If you used the power method to retract the thrust reverser sleeve, measure the rod end clearance after the hydraulic power is removed.

- (a) The rod end clearance for the center locking actuator must not be more than 0.100 inch with the hydraulic power removed.

S 982-167-N00

- (6) If it is necessary, do the steps (above) to retract the opposite thrust reverser sleeve.

F. Put the Airplane Back to Its Usual Condition.

S 412-168-N00

- (1) If it is necessary, install and close the core cowl panels (AMM 71-11-06/401).

S 412-169-N00

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

S 442-170-N00

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

S 442-171-N00

- (4) Do the activation procedure for the speed brake control system (AMM 27-61-00/201).

S 862-172-N00

- (5) Remove the DO-NOT-OPERATE tags from the thrust levers.

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TASK 78-31-00-862-173-N00

8. Thrust Reverser Operation - Extend (Power Method)

A. General

- (1) You must not open, extend or lift the thrust reverser if more than six cascade vane segments are removed. You must install a minimum of three cascade vane segments in each thrust reverser half. The empty space between these three cascade vane segments must be equivalent. There must not be more than two adjacent empty spaces between the three cascade vane segments which are installed.
- (2) Do not extend the thrust reverser sleeves when the core cowl panels are in the open position. If you do not obey this instruction, damage to the thrust reverser sleeves and the core cowl panels can occur.
- (3) Do not open the thrust reverser halves more than 23 degrees if the thrust reverser sleeves are extended to the deploy position. Do not extend the thrust reverser sleeves to the deploy position if the thrust reverser halves are open more than 23 degrees. If you do not obey these instructions, damage to the strut and the thrust reverser sleeves can occur.

B. References

- (1) AMM 24-22-00/201, Electrical Power - Control
- (2) AMM 27-61-00/201, Speed Brake Control System
- (3) AMM 29-11-00/201, Main Hydraulic Systems
- (4) AMM 71-11-06/201, Core Cowl Panels
- (5) AMM 71-11-06/401, Core Cowl Panels
- (6) AMM 78-31-00/201, Thrust Reverser System

C. Access

(1) Location Zones

- 410 Left Power Plant Nacelle
- 420 Right Power Plant Nacelle

(2) Access Panels

- 415 Fan Reverser - Engine No. 1 (LH)
- 425 Fan Reverser - Engine No. 2 (LH)
- 416 Fan Reverser - Engine No. 1 (RH)
- 426 Fan Reverser - Engine No. 2 (RH)
- 417 Core Cowl Panel - Engine No. 1 (LH)
- 427 Core Cowl Panel - Engine No. 2 (LH)
- 418 Core Cowl Panel - Engine No. 1 (RH)
- 428 Core Cowl Panel - Engine No. 2 (RH)

D. Prepare to Extend the Thrust Reverser to the Deploy Position With Hydraulic Power.

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S 042-174-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE AUTOMATIC SPEED BRAKE CONTROL SYSTEM. IF YOU DO NOT DO THIS, THE AUTOMATIC SPEED BRAKES CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

- (1) Do this procedure: Automatic Speed Brake System Deactivation (AMM 27-61-00/201).

S 862-175-N00

- (2) Make sure the forward thrust levers are in the idle position.

S 862-176-N00

- (3) Make sure the reverse thrust levers are in the fully stowed position.

S 212-177-N00

CAUTION: MAKE SURE THE THRUST REVERSER AND THE CORE COWL PANELS ARE IN THE CORRECT CONFIGURATION FOR THE EXTENSION OF THE THRUST REVERSER. IF THE THRUST REVERSER OR CORE COWL PANELS ARE NOT IN THE CORRECT CONFIGURATION, YOU CAN CAUSE DAMAGE TO THE STRUT, THE THRUST REVERSER, OR THE CORE COWL PANELS.

- (4) Examine the thrust reverser and core cowl panels for these conditions:
 - (a) Make sure the thrust reverser halves are not open more than 23 degrees.

NOTE: If you extend the thrust reverser when the halves are open more than 23 degrees, damage to the thrust reverser or the strut can occur.

- (b) If the thrust reverser halves are open to the 23-degree position, remove the core cowl panels from the engine (AMM 71-11-06/401).
- (c) If the thrust reverser halves are not open, make sure the core cowl panels are fully closed (AMM 71-11-06/201).

S 862-178-N00

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

S 862-179-N00

- (6) Pressurize the applicable (left or right) hydraulic system and reservoir (AMM 29-11-00/201).

E. Extend the Thrust Reverser to the Deploy Position With Hydraulic Power (Fig. 205).

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S 862-180-N00

WARNING: MAKE SURE ALL PERSONS AND EQUIPMENT ARE CLEAR OF THE AREA AFT OF THE APPLICABLE THRUST REVERSER. IF YOU DO NOT OBEY THIS INSTRUCTION, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN THE THRUST REVERSER IS EXTENDED.

- (1) Move the applicable reverse thrust lever up and aft to extend the thrust reverser to the deploy position.

S 042-181-N00

WARNING: WITH HYDRAULIC POWER SUPPLIED, AN EXTENDED THRUST REVERSER WILL QUICKLY RETRACT IF ELECTRICAL POWER IS MOMENTARILY STOPPED. IF IT IS NECESSARY TO KEEP THE THRUST REVERSER IN THE EXTENDED POSITION FOR MAINTENANCE WORK, YOU MUST IMMEDIATELY DO THE THRUST REVERSER DEACTIVATION PROCEDURE FOR GROUND MAINTENANCE. IF YOU DO NOT DO THIS AND THE THRUST REVERSER RETRACTS QUICKLY, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (2) If you must keep the thrust reverser in the extended position for ground maintenance, do the steps that follow:

- (a) Immediately do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

NOTE: Do the deactivation tasks for the stow valve and the motorized isolation valve only. DO NOT put the sleeve deactivation pin with the streamer in the thrust reverser sleeve for this procedure.

- (b) Remove the pressure from the applicable (left or right) hydraulic system and reservoir (AMM 29-11-00/201).
- (c) Remove electrical power if it is not necessary (AMM 24-22-00/201).
- (d) Do these steps if you must remove the hydraulic components or tubing from the thrust reverser for maintenance:
 - 1) Remove the hitch pin from the streamered pin in the bypass valve lever, which is on the bypass valve of the stow valve.
 - 2) Remove the streamered pin that holds the bypass valve in the open (bypass lever retracted) position.
 - 3) Make sure the bypass valve moves to the closed (bypass lever extended) position.

NOTE: The bypass valve of the stow valve must be in the closed position when you remove hydraulic system components. If the bypass valve is not closed, leakage of the hydraulic fluid from the reservoir will occur.

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TASK 78-31-00-862-182-N00

9. Thrust Reverser Operation - Retract (Power Method)

A. General

- (1) You must not open or lift the thrust reverser if more than six cascade vane segments are removed. You must install a minimum of three cascade vane segments in each thrust reverser half. The empty space between these three cascade vane segments must be equivalent. There must not be more than two adjacent empty spaces between the three cascade vane segments which are installed.
- (2) The center-locking-hydraulic actuator is referred to as the center locking actuator in this procedure.

B. References

- (1) AMM 24-22-00/201, Electrical Power - Control
- (2) AMM 27-61-00/201, Speed Brake Control System
- (3) AMM 29-11-00/201, Main Hydraulic Systems
- (4) AMM 71-11-06/201, Core Cowl Panels
- (5) AMM 71-11-06/401, Core Cowl Panels
- (6) AMM 78-31-00/201, Thrust Reverser System

C. Access

(1) Location Zones

- | | |
|-----|---------------------------|
| 410 | Left Power Plant Nacelle |
| 420 | Right Power Plant Nacelle |

(2) Access Panels

- | | |
|-----|-------------------------------------|
| 415 | Fan Reverser - Engine No. 1 (LH) |
| 425 | Fan Reverser - Engine No. 2 (LH) |
| 416 | Fan Reverser - Engine No. 1 (RH) |
| 426 | Fan Reverser - Engine No. 2 (RH) |
| 417 | Core Cowl Panel - Engine No. 1 (LH) |
| 427 | Core Cowl Panel - Engine No. 2 (LH) |
| 418 | Core Cowl Panel - Engine No. 1 (RH) |
| 428 | Core Cowl Panel - Engine No. 2 (RH) |

D. Prepare to Retract the Thrust Reverser to the Stow Position With Hydraulic Power.

S 042-183-N00

- (1) For safety, make sure the applicable airplane systems continue to be set in the deactivated configuration.

NOTE: The deactivated configuration for each applicable system can be found in this task: Prepare to Extend the Thrust Reverser to the Deploy Position With Hydraulic Power (which is at the start of the task before this one) (AMM 78-31-00/201).

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S 862-184-N00

WARNING: MAKE SURE THE POSITIONS OF THE REVERSE THRUST LEVER AND THE THRUST REVERSER AGREE BEFORE YOU DO THE REACTIVATION PROCEDURE FOR THE THRUST REVERSER. IF YOU DO NOT SET THE REVERSE THRUST LEVER IN THE SAME POSITION AS THE THRUST REVERSER, THE THRUST REVERSER CAN RETRACT QUICKLY WHEN IT IS REACTIVATED. THIS CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

- (2) Make sure the position of the reverse thrust lever agrees with the position of the thrust reverser.

NOTE: For example, the applicable reverse thrust lever must be in the extended (reverser deployed) position when the thrust reverser sleeves are in the extended (deployed) position.

S 442-185-N00

- (3) If it is necessary, do the activation procedure for the stow valve and the motorized isolation valve of the thrust reverser (AMM 78-31-00/201).

S 862-186-N00

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

S 862-187-N00

WARNING: MAKE SURE ALL PERSONS AND EQUIPMENT ARE CLEAR OF THE THRUST REVERSER AND THE ADJACENT AREA. WITH HYDRAULIC POWER SUPPLIED, AN EXTENDED THRUST REVERSER WILL QUICKLY RETRACT IF ELECTRICAL POWER IS MOMENTARILY STOPPED. IF YOU DO NOT OBEY THIS INSTRUCTION, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (5) Pressurize the applicable (left or right) hydraulic system and reservoir (AMM 29-11-00/201).

E. Retract the Thrust Reverser to the Stow Position With Hydraulic Power (Fig. 205).

S 862-188-N00

WARNING: MAKE SURE ALL PERSONS AND EQUIPMENT ARE CLEAR OF THE THRUST REVERSER AND THE ADJACENT AREA. IF YOU DO NOT OBEY THIS INSTRUCTION, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN THE THRUST REVERSER IS RETRACTED.

- (1) Move the applicable reverse thrust lever forward and down to retract the thrust reverser to the fully stowed position.

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- S 862-189-N00
- (2) Remove the pressure from the applicable (left or right) hydraulic system and reservoir (AMM 29-11-00/201).

- S 222-190-N00
- (3) To make sure the thrust reverser is in the fully stowed position, measure the rod end clearance for the center locking actuator.

NOTE: Measure the rod end clearance after the hydraulic power is removed.

(a) The rod end clearance for the center locking actuator must not be more than 0.100 inch with the hydraulic power removed.

F. Put the Airplane Back to Its Usual Condition.

- S 862-191-N00
- (1) Remove electrical power if it is not necessary (AMM 24-22-00/201).

- S 412-192-N00
- (2) If it is necessary, install and close the core cowl panels (AMM 71-11-06/401).

- S 442-193-N00
- (3) Do the activation procedure for the speed brake control system (AMM 27-61-00/201).

TASK 78-31-00-002-194-N00

10. Thrust Reverser Deactivation For Ground Maintenance

A. General

- (1) You must do the thrust reverser deactivation when you do maintenance work on the mechanical, electrical or hydraulic systems of the thrust reverser. You also must do the thrust reverser deactivation when you do maintenance work on other airplane systems adjacent to the engine or the thrust reverser.

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- (2) This thrust reverser deactivation task has three topics:
 - (a) Deactivate the Motorized Isolation Valve for the Thrust Reverser
 - (b) Deactivate the Stow Valve for the Thrust Reverser
 - (c) Deactivate the Thrust Reverser Sleeves
 - (3) The first two topics give instructions to deactivate the electrical and hydraulic systems of the thrust reverser. The third topic gives instructions to deactivate the thrust reverser sleeves only.
 - (4) For most maintenance tasks, you must obey the instructions given in all three topics. But, for some maintenance tasks, you only must do the deactivation of the electrical and hydraulic systems (the first two topics of the deactivation task). Do not deactivate the thrust reverser sleeve if it will need to be manually translated.
 - (5) The bypass-valve-manual-override lever is referred to as the bypass valve lever in this procedure.
 - (6) The center-locking-hydraulic actuator is referred to as the center locking actuator in this procedure.
 - (7) The streamered-sleeve-deactivation pin is referred to as the sleeve deactivation pin in this procedure.
- B. Equipment
- (1) B78001-14, Lock Assembly
- C. References
- (1) AMM 06-43-00/201, Engine and Nacelle Strut Access Doors and Panels
 - (2) AMM 71-11-04/201, Fan Cowl Panels
- D. Access
- (1) Location Zones
 - 211 Flight Compartment (LH)
 - 212 Flight Compartment (RH)
 - 410 Left Power Plant Nacelle
 - 420 Right Power Plant Nacelle
 - (2) Access Panels
 - 413 Fan Cowl Panel - Engine No. 1 (LH)
 - 423 Fan Cowl Panel - Engine No. 2 (LH)
 - 414 Fan Cowl Panel - Engine No. 1 (RH)
 - 424 Fan Cowl Panel - Engine No. 2 (RH)
 - 415 Fan Reverser - Engine No. 1 (LH)
 - 425 Fan Reverser - Engine No. 2 (LH)
 - 416 Fan Reverser - Engine No. 1 (RH)
 - 426 Fan Reverser - Engine No. 2 (RH)
 - 437BL Strut Hydraulic Bay - Engine No. 1 (LH)
 - 437BR Strut Hydraulic Bay - Engine No. 1 (RH)
 - 447BL Strut Hydraulic Bay - Engine No. 2 (LH)
 - 447BR Strut Hydraulic Bay - Engine No. 2 (RH)

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E. Deactivate the Motorized Isolation Valve for the Thrust Reverser (Fig. 206).

S 862-326-N00

WARNING: USE THIS TASK FOR GROUND MAINTENANCE ONLY. ACCIDENTAL THRUST REVERSER MOVEMENT CAN OCCUR IF YOU USE THIS TASK TO DO THE THRUST REVERSER DEACTIVATION FOR FLIGHT DISPATCH. IF YOU DO NOT OBEY THIS INSTRUCTION, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Make sure that this procedure is for ground maintenance.

S 212-201-N00

- (2) For the left engine, make sure these circuit breakers are open and the DO-NOT-CLOSE tags are attached:
- (a) On the overhead equipment panel, P11:
- 1) 11D14, L ENG T/R CONT
 - 2) 11D18, L ENG T/R SSL CONT

S 862-223-N00

- (3) For the right engine, make sure these circuit breakers are open and the DO-NOT-CLOSE tags are attached:
- (a) On the overhead equipment panel, P11:
- 1) 11L33, R ENG T/R CONT
 - 2) 11D33, R ENG T/R CONT ALTN
 - 3) 11D21, R ENG T/R SSL CONT

S 012-202-N00

- (4) Open the access door for the motorized isolation valve on the applicable strut hydraulic bay (AMM 06-43-00/201).

S 042-203-N00

- (5) Move the manual override lever on the side of the motorized isolation valve to position No. 1 (up).

S 432-222-N00

- (6) Lock the manual override lever in the deactivated (No. 1) position.

NOTE: The manual override lever can be locked in the deactivated position with the Lock Assembly or a lockwire. The preferred method is to use the Lock Assembly.

- (a) Install the Lock Assembly (Fig. 206).
- 1) Make sure the REMOVE-BEFORE-FLIGHT streamer hangs out of the strut hydraulic bay.

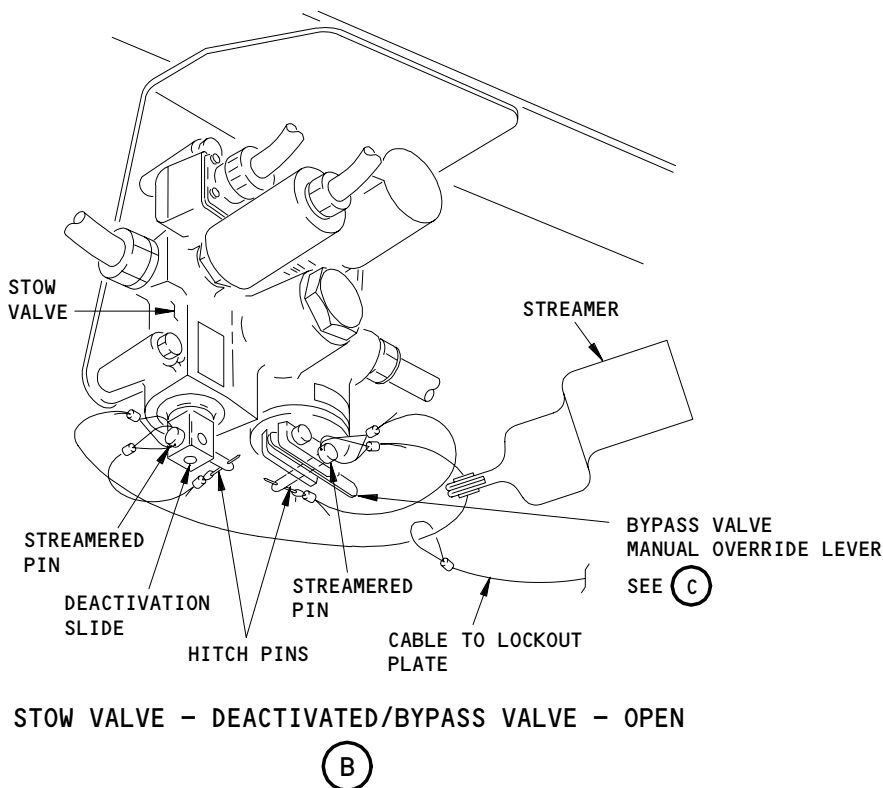
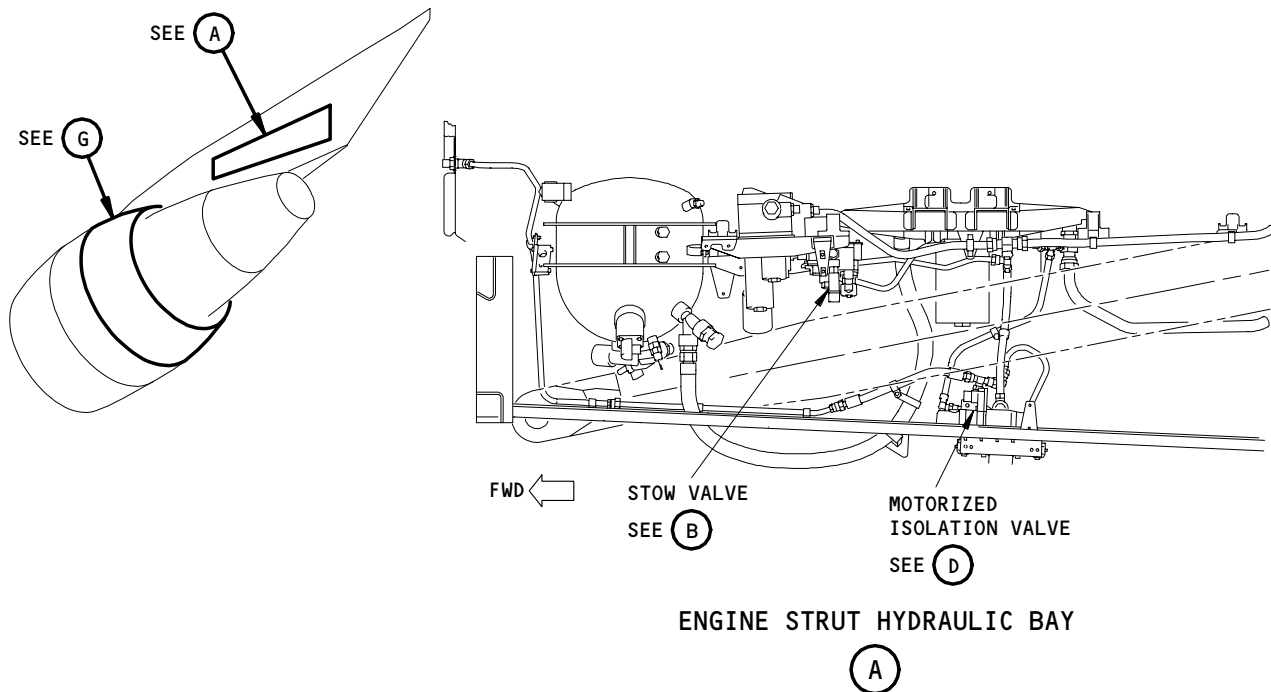
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Thrust Reverser Deactivation for Ground Maintenance
Figure 206 (Sheet 1)

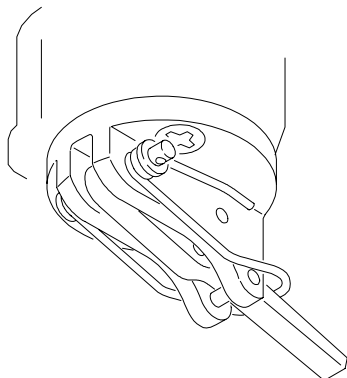
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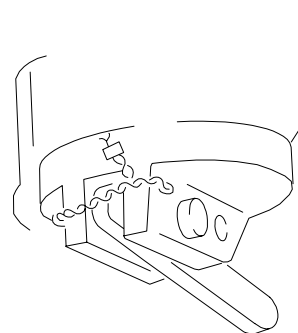
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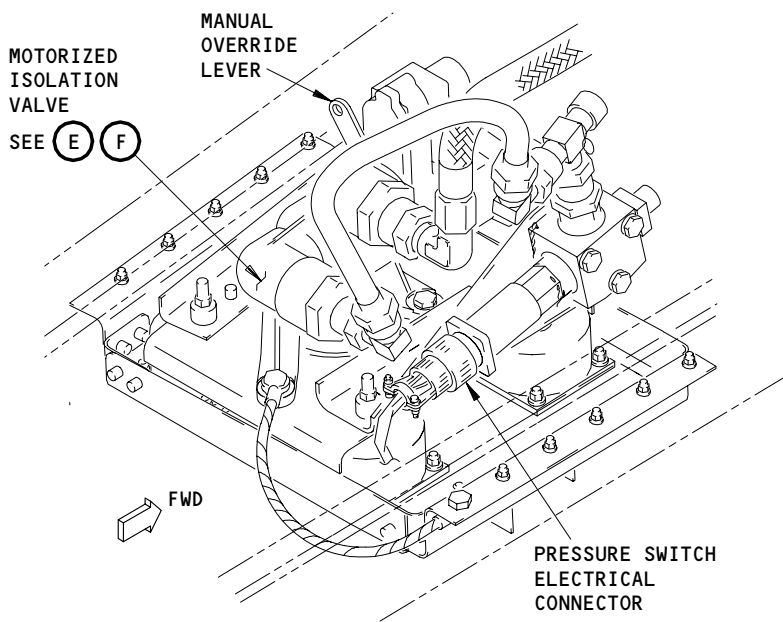
BYPASS VALVE - CLOSED
(SPRING CONTROLLED MANUAL OVERRIDE LEVER)

(C)



BYPASS VALVE - CLOSED
(LOCKWIRED MANUAL OVERRIDE LEVER)

(C)



MOTORIZED ISOLATION VALVE INSTALLATION

(D)

Thrust Reverser Deactivation for Ground Maintenance
Figure 206 (Sheet 2)

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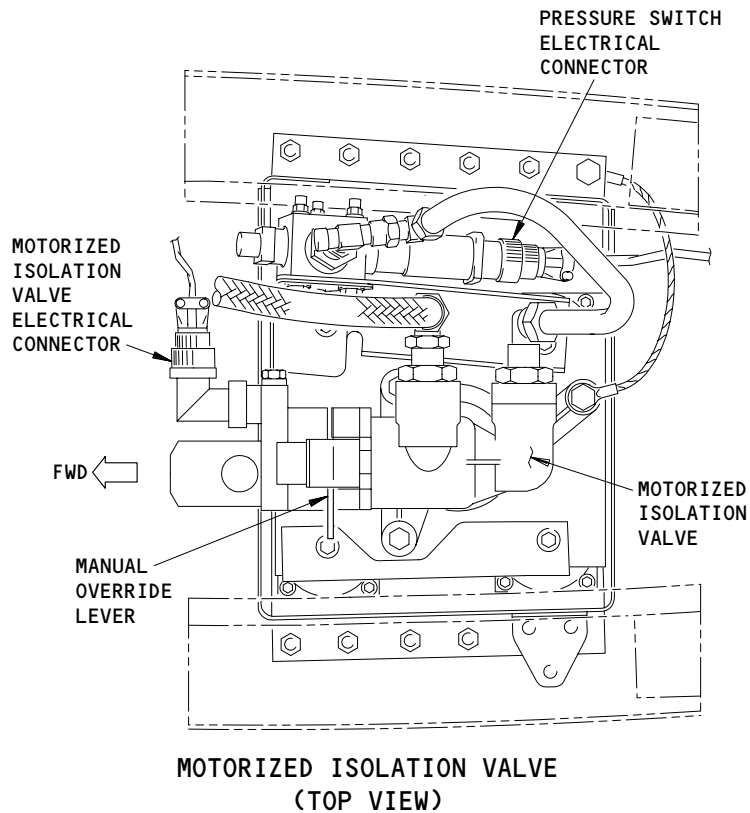
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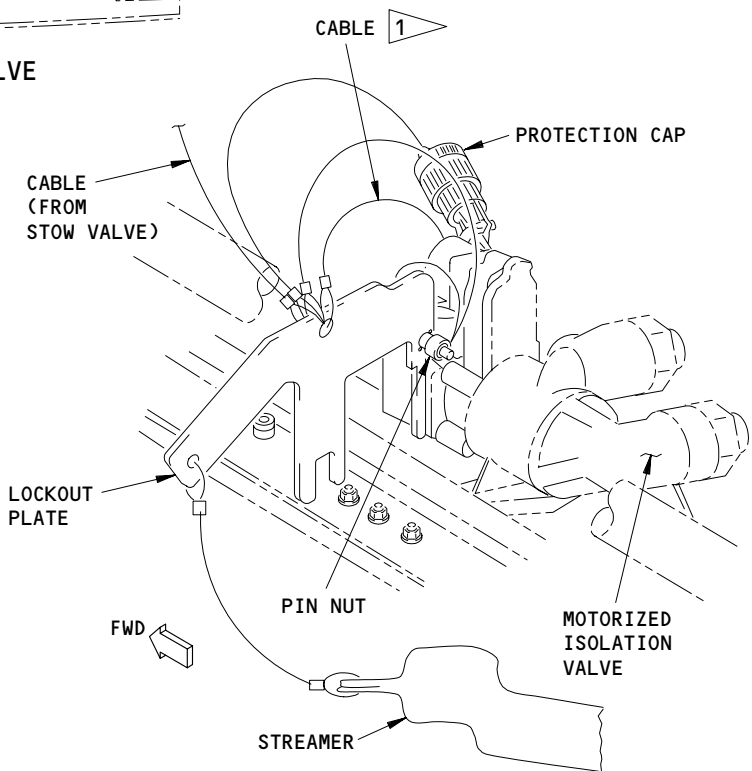
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(E)



MOTORIZED ISOLATION VALVE, LOCKOUT PLATE INSTALLED

(F)

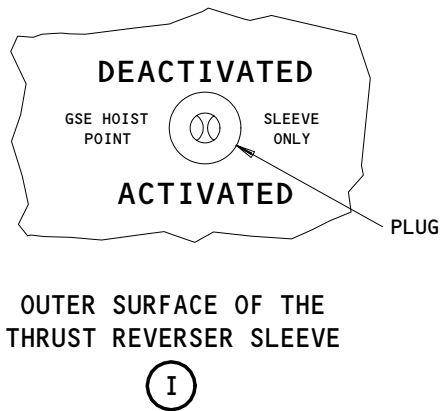
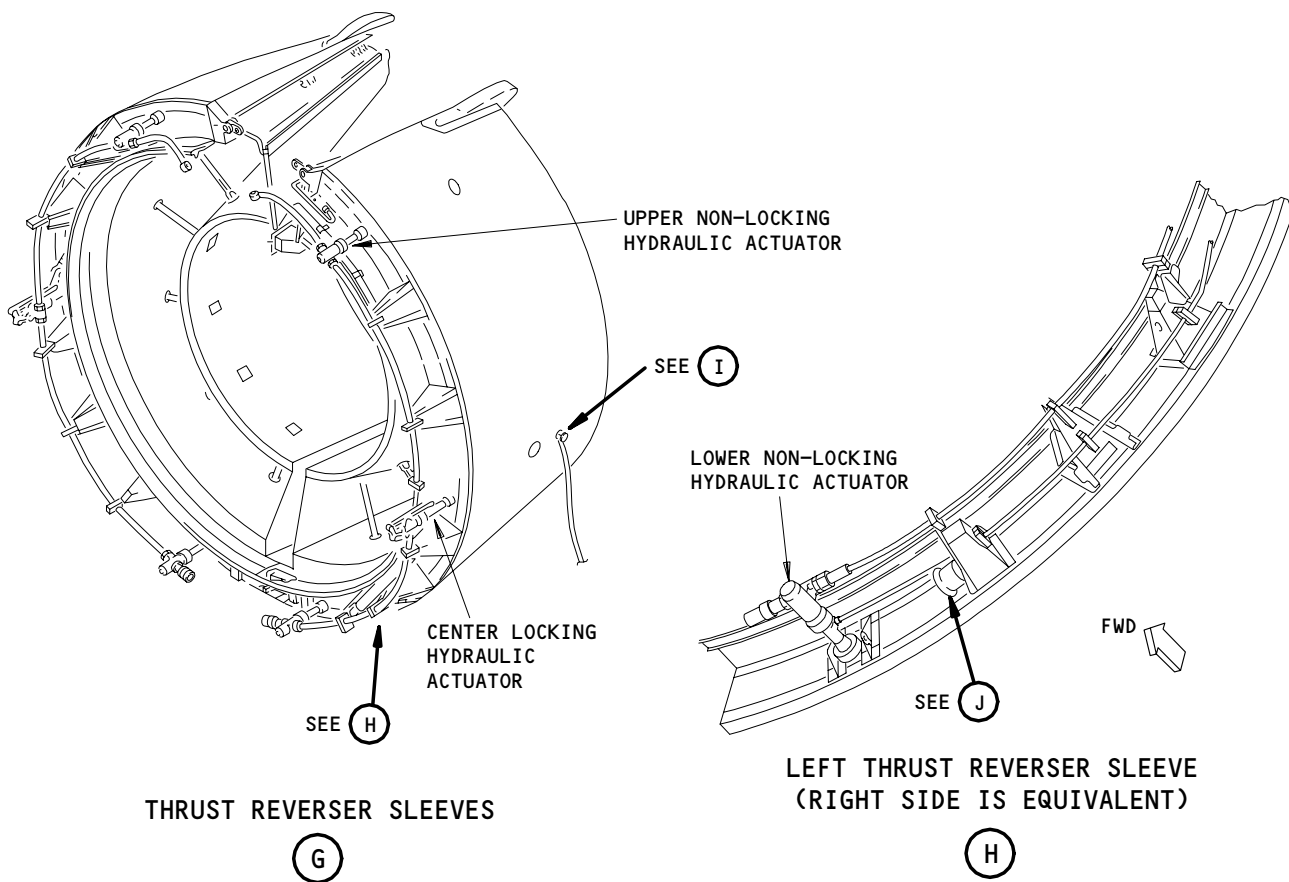
1 ▽ CABLE FOR PROTECTION CAP (NOT SHOWN)

Thrust Reverser Deactivation for Ground Maintenance
Figure 206 (Sheet 3)

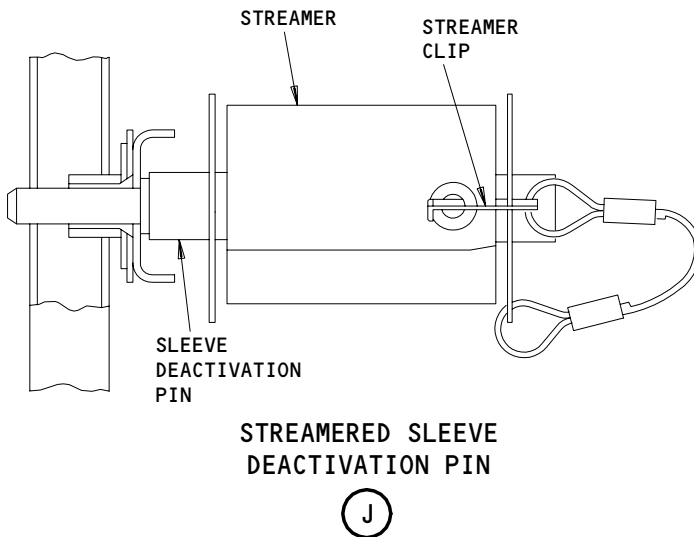
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OUTER SURFACE OF THE THRUST REVERSER SLEEVE
I



STREAMERED SLEEVE DEACTIVATION PIN
J

THRUST REVERSER SLEEVE DEACTIVATION

Thrust Reverser Deactivation for Ground Maintenance
Figure 206 (Sheet 4)

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- (b) If the Lock Assembly is not used, install lockwire between the manual override lever and the adjacent structure.

NOTE: We recommend that you put a REMOVE-BEFORE-FLIGHT streamer on the lockwire, and make sure it hangs out of the strut hydraulic bay.

S 042-205-N00

- (7) Disconnect the electrical connector from the motorized isolation valve.

NOTE: DO NOT disconnect the electrical connector from the pressure switch.

S 032-206-N00

- (8) If the Lock Assembly is not used, use a lockwire to safety the electrical connector to the adjacent structure.

NOTE: We recommend that you put a REMOVE-BEFORE-FLIGHT streamer on the lockwire, and make sure it hangs out of the strut hydraulic bay.

S 022-224-N00

- (9) Put the protection caps on the electrical connector and its receptacle on the motorized isolation valve.

F. Deactivate the Stow Valve for the Thrust Reverser (Fig. 206).

S 862-225-N00

- (1) For the left engine, open these circuit breakers and attach the DO-NOT-CLOSE tags:

- (a) On the overhead equipment panel, P11:

- 1) 11D14, L ENG T/R CONT

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2) 11D18, L ENG T/R SSL CONT

S 862-226-N00

- (2) For the right engine, open these circuit breakers and attach the DO-NOT-CLOSE tags:
- (a) On the overhead equipment panel, P11:
 - 1) 11L33, R ENG T/R CONT
 - 2) 11D33, R ENG T/R CONT ALTN
 - 3) 11D21, R ENG T/R SSL CONT

S 012-227-N00

- (3) Open the access door for the stow valve on the applicable strut hydraulic bay (AMM 06-43-00/201).

S 042-228-N00

- (4) Do these steps for the stow valve deactivation:
- (a) Push the deactivation slide into the stow valve housing.
 - (b) Install the streamered pin (of the Lock Assembly) in the deactivation slide.
 - (c) Install the hitch pin (of the Lock Assembly) in the streamered pin.

S 042-229-N00

- (5) Do these steps to open the bypass valve (of the stow valve) only if you will manually extend or retract the thrust reverser:

NOTE: The bypass valve must be open before you manually extend or retract the thrust reverser. This will prevent a hydraulic lock, which can prevent the movement of the thrust reverser. But, you must close the bypass valve again if you will remove the thrust reverser components or hydraulic tubing (after you extend or retract the thrust reverser). If you do not close the bypass valve again, leakage of the hydraulic fluid from the reservoir will occur when you remove the components or tubing.

- (a) For the bypass valve lever with the lockwire, remove the lockwire.

NOTE: The other type of bypass valve lever has a spring which controls the position of the lever. The lockwire is not necessary on this type of bypass valve lever.

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- (b) Push in the bypass valve lever to open the bypass valve of the stow valve.
- (c) Install the streamered pin to hold the bypass valve in the open position.
- (d) Install the hitch pin in the streamered pin.

S 212-230-N00

- (6) After you complete the deactivation procedure, make sure the REMOVE-BEFORE-FLIGHT streamer hangs out of the strut hydraulic bay.

G. Deactivate the thrust reverser sleeves (Fig. 206).

S 012-207-N00

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

S 982-208-N00

- (2) If it is necessary, manually retract the thrust reverser to the fully stowed position (AMM 78-31-00/201).

S 042-209-N00

- (3) Do these steps for the deactivation of the thrust reverser sleeves:
 - (a) Remove the sleeve deactivation pin (with the REMOVE-BEFORE-FLIGHT streamer) from the tube support structure on the torque box of the thrust reverser.
 - (b) Let the REMOVE-BEFORE-FLIGHT streamer hang down from the sleeve deactivation pin.
 - (c) Remove the screw plug from the outer surface of the thrust reverser sleeve (near the center locking actuator).
 - (d) Install the screw plug (from the outer sleeve surface) on the tube support structure of the thrust reverser.
 - (e) Install the sleeve deactivation pin in the hole in the outer surface of the thrust reverser sleeve (where the screw plug was before you removed it).
 - (f) Do the same steps (above) for the other thrust reverser sleeve on the applicable engine.

NOTE: You must install the sleeve deactivation pins in each of the two thrust reverser sleeves on each applicable engine.

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TASK 78-31-00-402-210-N00

11. Thrust Reverser Activation After Ground Maintenance

A. General

- (1) The thrust reverser activation task has three topics:
 - (a) Activate the Stow Valve for the Thrust Reverser
 - (b) Activate the Motorized Isolation Valve for the Thrust Reverser
 - (c) Activate the Thrust Reverser Sleeves
- (2) The bypass-valve-manual-override lever is referred to as the bypass valve lever in this procedure.
- (3) The center-locking-hydraulic actuator is referred to as the center locking actuator in this procedure.
- (4) The streamered-sleeve-deactivation pin is referred to as the sleeve deactivation pin in this procedure.

B. Equipment

- (1) B78001-14, Lock Assembly

C. References

- (1) AMM 06-43-00/201, Engine and Nacelle Strut Access Doors and Panels
- (2) AMM 71-11-04/201, Fan Cowl Panels

D. Access

(1) Location Zones

- 211 Flight Compartment (LH)
- 212 Flight Compartment (RH)
- 410 Left Power Plant Nacelle
- 420 Right Power Plant Nacelle

(2) Access Panels

- 413 Fan Cowl Panel - Engine No. 1 (LH)
- 423 Fan Cowl Panel - Engine No. 2 (LH)
- 414 Fan Cowl Panel - Engine No. 1 (RH)
- 424 Fan Cowl Panel - Engine No. 2 (RH)
- 415 Fan Reverser - Engine No. 1 (LH)
- 425 Fan Reverser - Engine No. 2 (LH)
- 416 Fan Reverser - Engine No. 1 (RH)
- 426 Fan Reverser - Engine No. 2 (RH)
- 437BL Strut Hydraulic Bay - Engine No. 1 (LH)
- 437BR Strut Hydraulic Bay - Engine No. 1 (RH)
- 447BL Strut Hydraulic Bay - Engine No. 2 (LH)
- 447BR Strut Hydraulic Bay - Engine No. 2 (RH)

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E. Activate the Stow Valve for the Thrust Reverser (Fig. 206).

S 012-211-N00

- (1) If it is necessary, open the access door for the stow valve on the applicable strut hydraulic bay (AMM 06-43-00/201).

S 442-212-N00

WARNING: BEFORE YOU ACTIVATE THE STOW VALVE, MAKE SURE THE POSITION OF THE REVERSE THRUST LEVER (DEPLOYED OR STOWED) AGREES WITH THE POSITION OF THE THRUST REVERSER (EXTENDED OR RETRACTED). IF YOU DO NOT OBEY THIS INSTRUCTION, THE THRUST REVERSER CAN RETRACT OR EXTEND QUICKLY WHEN YOU ACTIVATE THE STOW VALVE. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

- (2) Do these steps to activate the stow valve:
 - (a) Remove the two hitch pins from the two streamered pins in the stow valve.
 - (b) Remove the streamered pin from the deactivation slide of the stow valve.
 - (c) Remove the streamered pin from the bypass valve lever of the stow valve.
 - (d) For the bypass valve lever without the spring, install the lockwire to hold the bypass valve lever in the closed position.

F. Activate the Motorized Isolation Valve for the Thrust Reverser (Fig. 206).

S 012-213-N00

- (1) If it is necessary, open the access door for the motorized isolation valve on the applicable strut hydraulic bay (AMM 06-43-00/201).

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S 442-214-N00

WARNING: BEFORE YOU ACTIVATE THE MOTORIZED ISOLATION VALVE, MAKE SURE THE POSITION OF THE REVERSE THRUST LEVER (DEPLOYED OR STOWED) AGREES WITH THE POSITION OF THE THRUST REVERSER (EXTENDED OR RETRACTED). IF YOU DO NOT OBEY THIS INSTRUCTION, THE THRUST REVERSER CAN RETRACT OR EXTEND QUICKLY WHEN YOU ACTIVATE THE MOTORIZED ISOLATION VALVE. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

CAUTION: DO NOT MOVE THE MANUAL OVERRIDE LEVER ON THE MOTORIZED ISOLATION VALVE AFTER YOU REMOVE THE LOCKWIRE. IF YOU MOVE THE MANUAL OVERRIDE LEVER, DAMAGE TO THE MOTORIZED ISOLATION VALVE OR THE THRUST REVERSER SYSTEM CAN OCCUR.

- (2) Do these steps to activate the motorized isolation valve:
- (a) Remove the Lock Assembly (or the lockwire) from the manual override lever on the motorized isolation valve.

NOTE: DO NOT move the manual override lever to a new position.

- (b) Remove the protection caps from the electrical connector and its receptacle on the motorized isolation valve.
- (c) Connect the electrical connector to the receptacle on the motorized isolation valve.

S 862-215-N00

- (3) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers:
- (a) On the P11 panel:
 - 1) 11D14, L ENG T/R CONT
 - 2) 11D18, L ENG T/R SSL CONT

S 862-216-N00

- (4) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers:
- (a) On the P11 panel:
 - 1) 11L33, R ENG T/R CONT

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- 2) 11D33, R ENG T/R CONT ALTN
- 3) 11D21, R ENG T/R SSL CONT

S 412-217-N00

- (5) Close the access door for the strut hydraulic bay on each applicable engine (AMM 06-43-00/201).

G. Activate the Thrust Reverser Sleeves (Fig. 206).

S 442-218-N00

WARNING: BEFORE YOU ACTIVATE THE THRUST REVERSER SLEEVES, MAKE SURE THE POSITION OF THE REVERSE THRUST LEVER (DEPLOYED OR STOWED) AGREES WITH THE POSITION OF THE THRUST REVERSER (EXTENDED OR RETRACTED). IF YOU DO NOT OBEY THIS INSTRUCTION, THE THRUST REVERSER CAN RETRACT OR EXTEND QUICKLY WHEN YOU ACTIVATE THE THRUST REVERSER SLEEVES. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

- (1) Do these steps to activate the thrust reverser sleeves:
 - (a) Remove the sleeve deactivation pin (with the REMOVE-BEFORE-FLIGHT streamer) from the thrust reverser sleeve.
 - (b) Wind the REMOVE-BEFORE-FLIGHT streamer on the sleeve deactivation pin and install the streamer clip.
 - (c) Remove the screw plug from the tube support structure on the torque box of the thrust reverser.
 - (d) Install the screw plug in the hole in the outer surface of the thrust reverser sleeve (where the sleeve deactivation pin with the REMOVE-BEFORE-FLIGHT streamer was before you removed it).
 - (e) Install the sleeve deactivation pin on the tube support structure of the torque box (where the screw plug was before you removed it).

S 442-219-N00

- (2) Do the steps (above) again to activate the thrust reverser sleeve on the opposite side of the engine.

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S 412-220-N00
(3) Close the fan cowl panels on each applicable engine
(AMM 71-11-04/201).

S 712-221-N00
(4) Extend and retract the thrust reverser three times with hydraulic
power to make sure it operates correctly and the flight compartment
indications are correct (AMM 78-31-00/201).

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THRUST REVERSER SYSTEM – ADJUSTMENT/TEST

1. General

- A. These procedures are included in this section:
- (1) Thrust Reverser Operational Test – Engine Not in Operation
 - (2) Thrust Reverser Operational Test – Engine in Operation
 - (3) Thrust Reverser Control and Stow Circuit Test
 - (4) Center Locking Hydraulic Actuator Check
 - (5) Rod End Gap Adjustment for the Center Locking Hydraulic Actuator.

TASK 78-31-00-715-001-N00

2. Thrust Reverser Operational Test – Engine Not in Operation

A. References

- (1) AMM 24-22-00/201, Electrical Power – Control
- (2) AMM 27-61-00/201, Spoiler/Speedbrake Control System
- (3) AMM 29-11-00/201, Pressurize/Depressurize Main Hydraulic System
- (4) AMM 29-11-00/601, Main Hydraulic Supply System
- (5) AMM 31-41-00/201, Engine Indication and Crew Alerting Systems
- (6) AMM 32-09-02/201, Air/Ground Relay System

B. Access

- (1) Location Zones
211/212 Flight Compartment

C. Prepare to Do the Operational Test

S 045-002-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILER/SPEEDBRAKE CONTROL SYSTEM. IF YOU DO NOT DO THIS, THE SPOILERS CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (1) Do the deactivation procedure for the spoiler/speedbrake control system (AMM 27-61-00/201).

S 865-003-N00

- (2) Put the forward thrust lever on the control stand to the idle position.
 - (a) The reverse thrust lever is in the stowed position.

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S 415-004-N00

CAUTION: DO NOT TRY TO OPERATE THE THRUST REVERSER WHILE THE CORE COWL PANEL IS OPEN. IF YOU OPERATE THE THRUST REVERSER, YOU CAN CAUSE DAMAGE TO THE THRUST REVERSER OR THE CORE COWL PANELS.

- (3) Make sure the core cowl panels are closed and latched.

S 415-005-N00

- (4) Make sure the thrust reverser halves are closed and latched.

S 865-006-N00

- (5) Open these circuit breakers and install the DO-NOT-CLOSE tags:
- (a) On the Overhead Circuit Breaker panel, P11:
 - 1) 11D33, R ENG T/R CONT ALTN
 - (b) On the Main Distribution Panel, P6:
 - 1) 6H01, FIRE EXT ENG L BTL 1
 - 2) 6H02, FIRE EXT ENG L BTL 2
 - 3) 6H03, FIRE EXT ENG R BTL 1
 - 4) 6H04, FIRE EXT ENG R BTL 2

S 865-208-N00

- (6) Prepare the safety-sensitive systems for air mode simulation (AMM 32-09-02/201).

S 865-008-N00

- (7) Make sure these circuit breakers are closed:
- (a) On the P11 panel:
 - 1) 11U15, LDG GR AIR/GND SYS 1
 - 2) 11C30, LDG GR POS AIR/GND SYS 1
 - 3) 11U23, LDG GR POS AIR/GND SYS 2
 - 4) 11C29, LDG GR POS AIR/GND SYS 2 ALT
 - 5) 11D13, L ENG T/R IND
 - 6) 11D14, L ENG T/R CONT
 - 7) 11L32, R ENG T/R IND

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- 8) 11L33, R ENG T/R CONT
- 9) 11M30, 28V DC R PWR BUS SENSE
- 10) 11D32, R ENG T/R IND ALTN
- 11) 11D18, L ENG T/R SSL CONT
- 12) 11D21, R ENG T/R SSL CONT

S 865-010-N00

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

S 865-011-N00

- (9) Put the EEC MAINT L(R) ENG POWER switch on the right side panel, P61, in the TEST position.

S 865-012-N00

- (10) Supply hydraulic pressure to the thrust reverser system (AMM 29-11-00/201).
 - (a) Make sure the hydraulic system is pressurized to 3000 ±300 psi.

S 865-013-N00

WARNING: MAKE SURE THERE ARE NO PERSONS OR EQUIPMENT IN THE AREA BEHIND THE THRUST REVERSERS. THE STEPS THAT FOLLOW WILL EXTEND THE THRUST REVERSER. IF YOU DO NOT HAVE A CLEAR AREA, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

- (11) Move the applicable reverse thrust lever to the deploy position.

NOTE: Do the subsequent step in less than 3 seconds.

S 865-014-N00

- (12) For the applicable engine, open this circuit breaker immediately after the previous step is done:
 - (a) On the P11 panel:
 - 1) 11D14, L ENG T/R CONT
 - 2) 11L33, R ENG T/R CONT

S 215-015-N00

- (13) Make sure the applicable thrust reversers stop.

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S 215-016-N00
(14) Make sure the applicable amber REV message shows on the EICAS.

S 865-017-N00
(15) For the applicable engine, close this circuit breaker:
(a) On the P11 panel:
1) 11D14, L ENG T/R CONT
2) 11L33, R ENG T/R CONT

S 215-018-N00
(16) Make sure the applicable thrust reversers extend to the fully deployed position.

S 215-019-N00
(17) Make sure the applicable green REV message shows on the EICAS.

S 865-020-N00
(18) For the applicable engine, open this circuit breaker:
(a) On the P11 panel:
1) 11D14, L ENG T/R CONT
2) 11L33, R ENG T/R CONT

S 865-021-N00
(19) Put the applicable reverse thrust lever in the stow position.

S 865-022-N00
(20) For the applicable engine, close this circuit breaker:
(a) On the P11 panel:
1) 11D14, L ENG T/R CONT
2) 11L33, R ENG T/R CONT

S 215-023-N00
(21) Make sure the applicable thrust reversers retract to the fully stowed position.

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S 865-024-N00

- (22) Open these circuit breakers to put the airplane in the air mode:
(a) On the P11 panel:
1) 11C30, LDG GR POS AIR/GND SYS 1
2) 11U15, LDG GR AIR/GND SYS 1
3) 11C29, LDG GR POS AIR/GND SYS 2 ALT
4) 11U23, LDG GR POS AIR/GND SYS 2

S 865-025-N00

- (23) Move the applicable reverse thrust lever to the deploy position.

S 215-026-N00

- (24) Make sure the applicable thrust reversers do not move.

S 865-027-N00

- (25) Close these circuit breakers to put the airplane in the ground mode:
(a) On the P11 panel:
1) 11C30, LDG GR POS AIR/GND SYS 1
2) 11U15, LDG GR AIR/GND SYS 1
3) 11C29, LDG GR POS AIR/GND SYS 2 ALT
4) 11U23, LDG GR POS AIR/GND SYS 2

S 865-028-N00

- (26) Make sure the applicable thrust reversers deploy.

S 865-029-N00

- (27) For the applicable engine, open this circuit breaker:
(a) On the P11 panel:
1) 11D14, L ENG T/R CONT
2) 11L33, R ENG T/R CONT

S 865-030-N00

- (28) Open these circuit breakers to put the airplane in the air mode:
(a) On the P11 panel:
1) 11C30, LDG GR POS AIR/GND SYS 1
2) 11U15, LDG GR AIR/GND SYS 1
3) 11C29, LDG GR POS AIR/GND SYS 2 ALT
4) 11U23, LDG GR POS AIR/GND SYS 2

S 865-031-N00

- (29) Move the applicable reverse thrust lever to the stow position.

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S 865-032-N00

- (30) For the applicable engine, close this circuit breaker:
- (a) On the P11 panel:
 - 1) 11D14, L ENG T/R CONT
 - 2) 11L33, R ENG T/R CONT

S 865-033-N00

- (31) Make sure the applicable thrust reversers fully stow.

S 865-034-N00

- (32) Close these circuit breakers to put the airplane in the ground mode:
- (a) On the P11 panel:
 - 1) 11C30, LDG GR POS AIR/GND SYS 1
 - 2) 11U15, LDG GR AIR/GND SYS 1
 - 3) 11C29, LDG GR POS AIR/GND SYS 2 ALT
 - 4) 11U23, LDG GR POS AIR/GND SYS 2

S 865-268-N00

- (33) Push and release the applicable L(R) ENG RESET button on the front panel of the M1987 Thrust Reverser Relay Module located on the E1-4 or E2-6 shelf.

S 865-035-N00

- (34) Operate the applicable thrust reverser ten times.
- (a) Make sure the REV ISLN light is not shown.
 - (b) Make sure the EICAS message R REV ISLN VAL is not shown.

S 215-036-N00

- (35) Examine the applicable thrust reversers for signs of abnormal operation, leakage, and other problems (AMM 29-11-00/601).

S 865-037-N00

- (36) AIRPLANES WITH ETOPS;
For the right engine, do these steps:

NOTE: These steps examine the backup circuit for airplanes with extended range capability. These steps are for the right engine only.

- (a) Open these circuit breakers on the P11 panel:
 - 1) 11M30, 28 VDC R BUS PWR SENSE
 - 2) 11L33, R ENG T/R CONT
- (b) Close this circuit breaker on the P11 panel:
 - 1) 11D33, R ENG T/R CONT ALT
- (c) Move the right reverse thrust lever to the deploy position.
- (d) Make sure the thrust reversers deploy.
- (e) Move the right reverse thrust lever to the stow position.
- (f) Make sure the thrust reversers fully stow.
- (g) Open this circuit breaker on the P11 panel:
 - 1) 11D33, R ENG T/R CONT ALT

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- (h) Make sure the REV ISLN light is on after eight (8) seconds.
- (i) Make sure the EICAS message R REV ISLN VAL is shown after ten seconds.
- (j) Move the right reverse thrust lever to the deploy position.
- (k) Make sure the thrust reversers do not move.
- (l) Move the right reverse thrust lever to the stow position.
- (m) Make sure the REV ISLN light stays on.
- (n) Make sure the EICAS message R REV ISLN VAL stays on.
- (o) Close these circuit breakers on the P11 panel:
 - 1) 11M30, 28 VDC R BUS PWR SENSE
 - 2) 11L33, R ENG T/R CONT
- (p) Make sure the EICAS message R REV ISLN VAL does not show.
- (q) Make sure the REV ISLN light is off.

S 865-038-N00

- (37) Open these circuit breakers to put the air/ground system 1 in the air mode:
 - (a) On the P11 panel:
 - 1) 11C30, LDG GR POS AIR/GND SYS 1
 - 2) 11U15, LDG GR AIR/GND SYS 1

S 865-039-N00

- (38) Move the applicable reverse thrust lever to the deploy position.

S 215-040-N00

- (39) Make sure the applicable thrust reversers do not move.

S 865-041-N00

- (40) Close these circuit breakers to put the air/ground system 1 in the ground mode:
 - (a) On the P11 panel:
 - 1) 11C30, LDG GR POS AIR/GND SYS 1
 - 2) 11U15, LDG GR AIR/GND SYS 1

S 215-042-N00

- (41) Make sure the applicable thrust reversers fully deploy.

S 865-043-N00

- (42) Move the applicable reverse thrust lever to the stow position.

S 215-044-N00

- (43) Make sure the applicable thrust reversers fully stow.

S 865-045-N00

- (44) Open these circuit breakers to put the air/ground system 2 in the air mode:
 - (a) On the P11 panel:
 - 1) 11C29, LDG GR POS AIR/GND SYS 2 ALT
 - 2) 11U23, LDG GR POS AIR/GND SYS 2

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S 865-046-N00
(45) Move the applicable reverse thrust lever to the deploy position.

S 215-047-N00
(46) Make sure the applicable thrust reversers do not move.

S 865-048-N00
(47) Close these circuit breakers to put the air/ground system 2 in the ground mode:
(a) On the P11 panel:
1) 11C29, LDG GR POS AIR/GND SYS 2 ALT
2) 11U23, LDG GR POS AIR/GND SYS 2

S 215-049-N00
(48) Make sure the applicable thrust reversers fully deploy.

S 865-050-N00
(49) Move the applicable reverse thrust lever to the stow position.

S 215-051-N00
(50) Make sure the applicable thrust reversers fully stow.

S 865-269-N00
(51) Erase the L (R) REV ISLN VAL EICAS maintenance message if it is shown (AMM 31-41-00/201).

S 865-270-N00

CAUTION: DO NOT TURN THE FIRE HANDLES WHEN YOU PULL THEM. THE ENGINE FIRE EXTINGUISHER SYSTEMS COULD OPERATE.

(52) Pull the fire handle for the applicable engine.

S 215-053-N00
(53) Make sure the applicable REV ISLN light on the P10 panel is on after eight (8) seconds.

S 215-054-N00
(54) Make sure the EICAS advisory message L(R) REV ISLN VAL is shown after ten (10) seconds.

S 865-055-N00
(55) Move the applicable reverse thrust lever to the deploy position.

S 215-056-N00
(56) Make sure the applicable thrust reversers do not move.

S 865-057-N00
(57) Push the fire handle for the applicable engine back to the usual position.

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- S 215-058-N00
(58) Make sure the applicable thrust reversers fully deploy.
- S 215-059-N00
(59) Make sure the applicable REV ISLN light on the P10 panel is off.
- S 215-060-N00
(60) Make sure the EICAS advisory message L(R) REV ISLN VAL does not show on the EICAS.
- S 865-061-N00
(61) Move the applicable reverse thrust lever to the stow position.
- S 215-062-N00
(62) Make sure the applicable thrust reversers fully stow.
- S 715-260-N00
(63) Do the steps that follow to measure the time for the thrust reverser to extend and retract.

NOTE: You must also check relative position of one thrust reverser sleeve to another.

- (a) Move the applicable reverse thrust lever to the deploy position.
1) Make a record of the time for thrust reverser to extend.

NOTE: The time must not be more than 3 seconds from the fully retracted position to the fully extended position.

- 2) Make sure the related position of one thrust reverser half to the other is not more than 8 inches as the halves go from the fully retracted position to the fully extended position.

- (b) Move the applicable reverse thrust lever to the stow position.
1) Make a record of the time for thrust reverser to retract.

NOTE: The time must not be more than 5 seconds from the fully extended position to the fully retracted position.

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- 2) Make sure the related position of one thrust reverser half to the other is not more than 8 inches as the halves go from the fully extended position to the fully retracted position.
- (c) Do this sequence of steps 10 times to measure the time for the thrust reverser to extend and retract.
- (d) Examine for signs of abnormal operation (hydraulic leaks, indicator light malfunctions, etc.).

T/R Actuator Leakage Limits:	
Normal Operation Limits	Dispatch Limits to Avoid Delay
8 drops per minute (stopped or in operation)	60 drops per minute (stopped or in operation)

- S 865-266-N00
- (64) Do the steps that follow to measure the force necessary to move the thrust levers.
 - (a) Move the applicable reverse thrust lever to the deploy position and measure the lever load.
 - (b) Make sure the load necessary to move the reverse thrust lever is not more than 6.0 pounds, from 0 to 51 degrees from the reverse idle position or 4.0 pounds from 51 degrees to full travel.
 - (c) Put the reverse thrust levers to the reverse idle position.
 - (d) Make sure the load necessary to move the reverse thrust levers from the full travel to 51 degrees from the reverse idle position is not more than 4.0 pounds, or 8.0 pounds between 51 degrees and reverse idle position.
- D. Put the Airplane Back to Its Usual Condition

- S 865-073-N00
- (1) Remove the hydraulic pressure from the thrust reverser system (AMM 29-11-00/201).

- S 445-074-N00
- (2) Do the activation procedure for the spoiler/speedbrake control system (AMM 27-61-00/201).

- S 865-075-N00
- (3) Make sure these circuit breakers are closed:
 - (a) On the P11 panel:
 - 1) 11D13, L ENG T/R IND
 - 2) 11D14, L ENG T/R CONT
 - 3) 11L32, R ENG T/R IND

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- 4) 11L33, R ENG T/R CONT
- 5) 11M30, 28 VDC R PWR BUS SENSE
- 6) 11D32, R ENG T/R IND ALT
- 7) 11D33, R ENG T/R CONT ALTN
- 8) 11D18, L ENG T/R SSL CONT
- 9) 11D21, R ENG T/R SSL CONT

S 865-207-N00

- (4) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
 - (a) On the P6 panel:
 - 1) 6H01, FIRE EXT ENG L BTL 1
 - 2) 6H02, FIRE EXT ENG L BTL 2
 - 3) 6H03, FIRE EXT ENG R BTL 1
 - 4) 6H04, FIRE EXT ENG R BTL 2

S 865-210-N00

- (5) Put the safety sensitive systems back to their normal condition (AMM 32-09-02/201).

S 865-076-N00

- (6) Put the EEC MAINT L(R) ENG POWER switch on the right side panel, P61, in the NORM position.

S 865-077-N00

- (7) Erase the L(R) REV ISLN VAL maintenance message (AMM 31-41-00/201).

S 865-078-N00

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

S 865-267-N00

- (9) Put the airplane back to its usual condition.

TASK 78-31-00-715-079-N00

3. Thrust Reverser Operational Test - Engine in Operation

A. References

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

B. Access

- (1) Location Zones
211/212 Flight Compartment

C. Do the Operational Test for the Thrust Reverser

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S 415-080-N00

WARNING: DO NOT OPERATE THE ENGINE IN REVERSE THRUST WITH THE FAN COWL PANELS OPEN. IF THE FAN COWL PANELS ARE OPEN, YOU CAN CAUSE DAMAGE TO THE ENGINE, COWLING, OR INJURY TO PERSONS.

- (1) Make sure the fan cowl panels and core cowl panels are closed and latched.

S 415-081-N00

- (2) Make sure the thrust reverser halves (with the louvered exhaust door) are closed and latched.

S 215-082-N00

CAUTION: IF YOU DO NOT HAVE ALL OF THE CASCADE VANE SEGMENTS, DO NOT OPERATE THE ENGINE IN THE REVERSE THRUST. IF YOU DO NOT OBEY THIS INSTRUCTION, YOU CAN CAUSE DAMAGE TO THE THRUST REVERSER STRUCTURE.

- (3) Make sure you have all of the cascade vane segments.

S 865-083-N00

WARNING: MAKE SURE THERE ARE NO PERSONS OR EQUIPMENT IN THE AREA BEHIND THE THRUST REVERSERS. IF YOU DO NOT HAVE A CLEAR AREA WHEN YOU OPERATE THE THRUST REVERSER, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

OBEY THE INSTRUCTIONS IN THE PROCEDURE TO OPERATE THE POWER PLANT. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE DAMAGE TO EQUIPMENT OR INJURY TO PERSONS.

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

S 865-084-N00

- (5) Operate the engine at the minimum idle.
 - (a) Make sure the hydraulic system is pressurized to 3000 ±300 psi.
 - (b) Make a record of the N1 rpm.

S 865-085-N00

- (6) Pull up and slowly move the reverse thrust lever aft until the thrust reverser is fully extended as told by a person on the ground.

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S 865-086-N00

- (7) Continue to move the reverse thrust lever aft to the idle detent.

NOTE: The REV amber and REV green lights will go on, in that sequence, as thrust reverser moves rearward. The REV light indication is found on the Engine Indication and Crew Alerting System (EICAS) display.

- (a) Monitor the N1 indication.
- (b) Make sure the N1 indication is more than the N1 rpm at the minimum idle.

S 865-087-N00

- (8) Put the reverse thrust lever to the stowed position to retract the thrust reverser.

NOTE: The REV green and REV amber lights will go off, in that sequence, as the thrust reverser moves forward.

S 865-088-N00

- (9) Quickly move the reverse thrust lever from the stowed position to the idle detent.
- (a) Hold the reverse thrust lever at the idle detent.
 - (b) Make sure the maximum deploy time of the thrust reverser is not more than 3.0 seconds.
 - 1) Refer to the REV amber and REV green messages on the EICAS display.
 - (c) Make sure the N1 rpm at the idle detent is the same value as the N1 rpm at the minimum idle.

S 865-089-N00

- (10) Move the reverse thrust lever forward to the stowed position.
- (a) Make sure the maximum stow time of the thrust reverser is not more than 5.0 seconds.
 - (b) Make sure the sequence of the EICAS REV message lights is correct.

S 865-090-N00

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

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TASK 78-31-00-715-091-N00

4. Thrust Reverser Control and Stow Circuit Test

A. General

- (1) This procedure examines the function of the left and right engine thrust reversers at the same time.

B. References

- (1) AMM 29-11-00/201, Main Hydraulic Systems
- (2) AMM 32-09-02/201, Air/Ground Relays

C. Access

- (1) Location Zones
211/212 Flight Compartment

D. Procedure

S 865-092-N00

WARNING: DURING THIS TEST, KEEP PERSONS AND EQUIPMENT AWAY FROM THE AREA NEAR THE THRUST REVERSERS. THE THRUST REVERSERS WILL MOVE AND COULD CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

- (1) Supply hydraulic power with the ACMP (AMM 29-11-00/201).

S 865-093-N00

- (2) Make sure that the left and right reverse thrust levers are in the stow position.

S 865-094-N00

- (3) Put the EEC MAINT L (R) ENG POWER switches on the P61 panel to the TEST position.

S 865-095-N00

- (4) Open these circuit breakers and attach the DO-NOT-CLOSE tags:
 - (a) On the Overhead Circuit Breaker Panel, P11:
 - 1) 11D33, R ENG T/R CONT ALT
 - (b) On the Main Power Distribution Panel, P6:
 - 1) 6H01, FIRE EXT ENG L BTL 1
 - 2) 6H02, FIRE EXT ENG L BTL 2
 - 3) 6H03, FIRE EXT ENG R BTL 1
 - 4) 6H04, FIRE EXT ENG R BTL 2

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- S 865-211-N00
- (5) Prepare the safety-sensitive systems for air mode simulation (AMM 32-09-02/201).

- S 865-097-N00
- (6) Make sure these circuit breakers are closed:
- (a) On the P11 panel:
- 1) 11D14, L ENG T/R CONT
 - 2) 11M30, 28V DC R PWR BUS SENSE
 - 3) 11L33, R ENG T/R CONT
 - 4) 11D13, L ENG T/R IND
 - 5) 11L32, R ENG T/R IND
 - 6) 11D32, R ENG T/R IND ALT

- S 865-098-N00
- (7) Move the left and right reverse thrust levers to the deploy position.

NOTE: After you put the reverse thrust levers to the deploy position, you must open the circuit breakers in the subsequent step in less than 3 seconds.

- S 865-099-N00
- (8) Immediately open these circuit breakers:
- (a) On the P11 panel:
- 1) 11D14, L ENG T/R CONT
 - 2) 11L33, R ENG T/R CONT

- S 865-100-N00
- (9) Make sure that the left and right thrust reverser sleeves for each engine stop.

- S 865-101-N00
- (10) Make sure that the left and right amber REV messages come into view on EICAS.

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- S 865-102-N00
- (11) Close these circuit breakers:
- (a) On the P11 panel:
- 1) 11D14, L ENG T/R CONT
 - 2) 11L33, R ENG T/R CONT
- S 865-103-N00
- (12) Make sure that the left and right thrust reverser sleeves for each engine move to the fully extended position.
- S 865-104-N00
- (13) Make sure that the left and right green REV messages come into view on EICAS.
- S 865-105-N00
- (14) Open these circuit breakers:
- (a) On the P11 panel:
- 1) 11D14, L ENG T/R CONT
 - 2) 11L33, R ENG T/R CONT
- S 865-106-N00
- (15) Put the left and right reverse thrust levers to the stow position.
- S 865-107-N00
- (16) Make sure the left and right thrust reverser sleeves for each engine do not move.
- S 865-108-N00
- (17) Close these circuit breakers:
- (a) On the P11 panel:
- 1) 11D14, L ENG T/R CONT
 - 2) 11L33, R ENG T/R CONT
- S 865-109-N00
- (18) Make sure the left and right thrust reverser sleeves for each engine move to the fully retracted position.

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- S 865-110-N00
(19) Put the airplane in the AIR mode (AMM 32-09-02/201).
- S 865-111-N00
(20) Move the left and right reverse thrust levers to the deploy position.
- S 865-112-N00
(21) Make sure that the left and right thrust reverser sleeves for each engine do not move.
- S 865-113-N00
(22) Put the airplane in the GROUND mode (AMM 32-09-02/201).
- S 865-114-N00
(23) Make sure that the left and right thrust reverser sleeves for each engine extend.
- S 865-115-N00
(24) Open these circuit breakers:
(a) On the P11 panel:
1) 11D14, L ENG T/R CONT
2) 11L33, R ENG T/R CONT
- S 865-116-N00
(25) Put the airplane in the AIR mode (AMM 32-09-02/201).
- S 865-117-N00
(26) Move the left and right engine reverse thrust levers to the STOW position.
- S 865-118-N00
(27) Close these circuit breakers:
(a) On the P11 panel:
1) 11D14, L ENG T/R CONT

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2) 11L33, R ENG T/R CONT

S 865-119-N00

- (28) Make sure that the left and right thrust reverser sleeves for each engine fully retract.

S 865-120-N00

- (29) Put the airplane in the GROUND mode (AMM 32-09-02/201).

S 865-121-N00

- (30) Operate the left and right engine thrust reversers five (5) times.

S 865-212-N00

- (31) For the right engine, do these steps:

NOTE: These steps examine the backup circuit for airplanes with extended range capability. These steps are for the right engine only.

- (a) Open these circuit breakers on the P11 panel:
 - 1) 11M30, 28V DC R BUS PWR SENSE
 - 2) 11L33, R ENG T/R CONT
- (b) Close this circuit breaker on panel P11:
 - 1) 11D33, R ENG T/R CONT ALT
- (c) Move the right reverse thrust lever to the deploy position.
- (d) Make sure that the right engine thrust reverser extends.
- (e) Move the right reverse thrust lever to the stow position.
- (f) Make sure that the right engine thrust reverser fully retracts.
- (g) Open this circuit breaker on the P11 panel:
 - 1) 11D33, R ENG T/R CONT ALT
- (h) Make sure that the REV ISLN light is on in 8 seconds after you open the circuit breaker, 11D33.
- (i) Make sure that the R REV ISLN VAL EICAS message is shown in 10 seconds after you open the circuit breaker, 11D33.
- (j) Move the right reverse thrust lever to the deploy position.
- (k) Make sure that the right engine thrust reverser does not move.
- (l) Move the right reverse thrust lever to the stow position.
- (m) Close these circuit breakers on panel P11:
 - 1) 11M30, 28V DC R BUS PWR SENSE
 - 2) 11L33, R ENG T/R CONT

S 865-135-N00

- (32) Open these circuit breakers to put the air/ground system 1 in the air mode:
- (a) On the P11 panel:
 - 1) 11C30, LDG GR POS AIR/GND SYS 1
 - 2) 11U15, LDG GR AIR/GND SYS 1

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- S 865-136-N00
- (33) Move the left and right reverse thrust levers to the deploy position.
- S 865-137-N00
- (34) Make sure that the left and right engine thrust reversers do not move.
- S 865-138-N00
- (35) Close these circuit breakers to put the air/ground system 1 in the ground mode:
- (a) On the P11 panel:
- 1) 11C30, LDG GR POS AIR/GND SYS 1
 - 2) 11U15, LDG GR AIR/GND SYS 1
- S 865-139-N00
- (36) Make sure that the left and right engine thrust reversers fully deploy.
- S 865-140-N00
- (37) Move the left and right reverse thrust levers to the stow position.
- S 865-141-N00
- (38) Make sure that the left and right engine thrust reversers fully stow.
- S 865-142-N00
- (39) Open these circuit breakers to put the air/ground system 2 in the air mode:
- (a) On the P11 panel:
- 1) 11C29, LDG GR POS AIR/GND SYS 2 ALT
 - 2) 11U23, LDG GR POS AIR/GND SYS 2
- S 865-143-N00
- (40) Move the left and right reverse thrust levers to the deploy position.
- S 865-144-N00
- (41) Make sure that the left and right engine thrust reversers do not move.

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S 865-145-N00

(42) Close these circuit breakers to put the air/ground system 2 in the ground mode:

(a) On the P11 panel:

- 1) 11C29, LDG GR POS AIR/GND SYS 2 ALT
- 2) 11U23, LDG GR POS AIR/GND SYS 2

S 865-146-N00

(43) Make sure that the left and right engine thrust reversers fully deploy.

S 865-147-N00

(44) Move the left and right thrust reverse levers to the stow position.

S 865-148-N00

(45) Make sure that the left and right engine thrust reversers fully stow.

S 865-149-N00

(46) Erase the L (R) REV ISLN VAL EICAS maintenance message if it is shown (AMM 31-41-00/201).

S 865-150-N00

CAUTION: DO NOT TURN THE FIRE HANDLES WHEN YOU PULL THEM. THE ENGINE FIRE EXTINGUISHER SYSTEMS COULD OPERATE.

(47) Pull the left and right engine fire handles.

S 865-151-N00

(48) Make sure that the REV ISLN light on the P10 panel is on in eight (8) seconds.

S 865-152-N00

(49) Make sure that the L and R REV ISLN VAL EICAS messages are shown in ten (10) seconds.

S 865-153-N00

(50) Move the left and right reverse thrust levers to the deploy position.

S 865-154-N00

(51) Make sure that the left and right engine thrust reversers do not move.

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- S 865-155-N00
(52) Push the left and right engine fire handles back into their usual position.
- S 865-156-N00
(53) Make sure that the left and right engine thrust reversers fully deploy.
- S 865-157-N00
(54) Make sure that the REV ISLN light on the P10 panel goes off.
- S 865-158-N00
(55) Make sure that the L and R REV ISLN VAL EICAS messages are no longer shown on EICAS.
- S 865-159-N00
(56) Move the left and right reverse thrust levers to the stow position.
- S 865-160-N00
(57) Make sure that the left and right engine thrust reversers fully stow.
- S 865-161-N00
(58) Erase the L and R REV ISLN VAL EICAS maintenance messages (AMM 31-41-00/201).
- S 865-162-N00
(59) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) On the P11 panel:
1) 11D33, R ENG T/R CONT ALT
(b) On the P6 panel:
1) 6H01, FIRE EXT ENG L BTL 1
2) 6H02, FIRE EXT ENG L BTL 2
3) 6H03, FIRE EXT ENG R BTL 1
4) 6H04, FIRE EXT ENG R BTL 2
- S 865-213-N00
(60) Put the safety sensitive systems back to their normal condition (AMM 32-09-02/201).

TASK 78-31-00-715-163-N00

5. Center Locking Hydraulic Actuator Check

A. General

- (1) This task includes a check of the lock mechanism in the center locking hydraulic actuator to hold the thrust reverser translating sleeve in the stowed position.

B. Equipment

- (1) Wrench, 3/8 inch square drive

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(2) Wrench, 5/8 inch open end

C. References

- (1) AMM 06-43-00/201, Engine and Nacelle Strut Access Doors and Panels
- (2) AMM 27-61-00/201, Spoiler/Speedbrake Control System
- (3) AMM 71-11-04/201, Fan Cowl Panels
- (4) AMM 78-31-00/201, Thrust Reverser System
- (5) AMM 78-31-17/401, Thrust Reverser Hydraulic Actuators
- (6) AMM 78-36-00/501, Thrust Reverser Indication System

D. Access

(1) Location Zone

- 410 L Power Plant
- 420 R Power Plant

(2) Access Panel

- 413AL Fan Cowl Panels - L Power Plant
- 414AR Fan Cowl Panels - L Power Plant
- 423AL Fan Cowl Panels - R Power Plant
- 424AR Fan Cowl Panels - R Power Plant

E. Do a Check of the Center Locking Hydraulic Actuator (Fig. 501).

S 045-164-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILER/SPEEDBRAKE CONTROL SYSTEM. IF YOU DO NOT DO THIS, THE SPOILERS CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(1) Do the deactivation procedure for the applicable spoiler/speedbrake control system (AMM 27-61-00/201).

S 015-165-N00

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

S 225-166-N00

(3) Make sure the clearance between the face of the actuator lock proximity sensor and the lock lever target on the center locking hydraulic actuator is 0.010 to 0.040 inch (0.254 - 1.016 mm).

S 865-167-N00

(4) If the clearance is not correct, extend and retract the thrust reverser with hydraulic power to fully retract each sleeve (AMM 78-31-00/201).

S 225-168-N00

(5) Do a check of the clearance between the actuator lock proximity sensor and the lock lever target again.

S 825-169-N00

(6) If the clearance is not correct, do the adjustment procedure for the actuator lock proximity sensor (AMM 78-36-00/501).

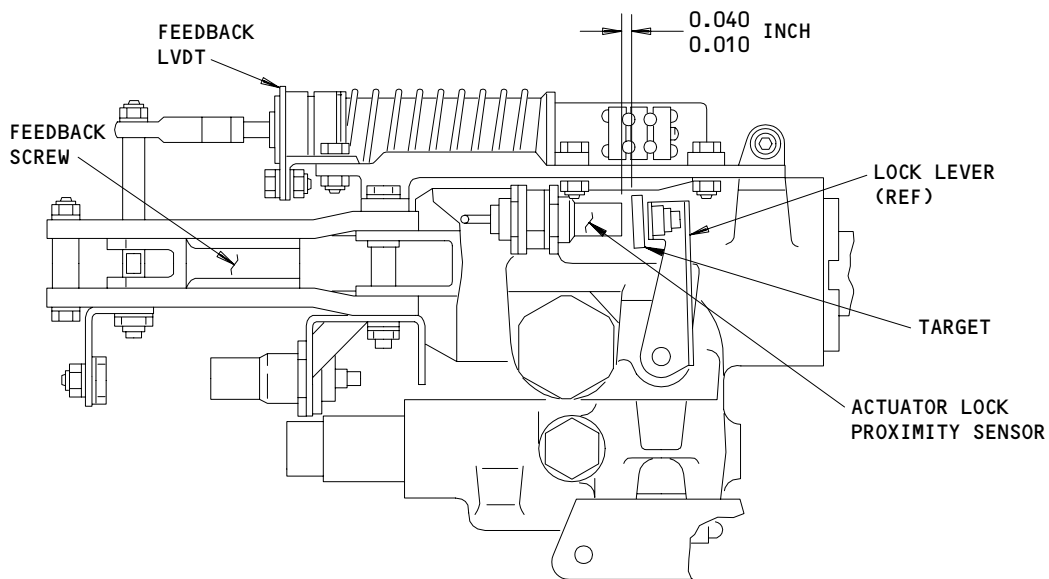
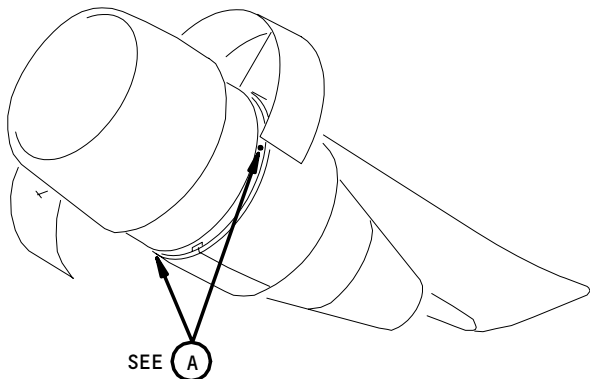
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CENTER LOCKING HYDRAULIC ACTUATOR
(STOW POSITION)

(A)

Center Locking Hydraulic Actuator Check
Figure 501

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S 865-170-N00
(7) Use hydraulic power to extend and retract the thrust reverser again (AMM 78-31-00/201).

S 225-171-N00
(8) Do a check of the clearance between the actuator lock proximity sensor and the lock lever target again.

S 025-172-N00
(9) If the clearance is not correct, replace the center locking hydraulic actuator (AMM 78-31-17/401).

S 865-173-N00
(10) Make sure the reverse thrust lever is in the stow position and attach a DO-NOT-OPERATE tag.

S 045-174-N00

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

(11) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

NOTE: Do the deactivation procedure for the stow valve and the motorized isolation valve only. DO NOT put the streamered pins in the thrust reverser sleeves. It will be necessary to manually operate the thrust reverser in the subsequent steps.

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S 865-175-N00

CAUTION: DO NOT EXTEND THE THRUST REVERSER IF THE THRUST REVERSER IS OPEN AND THE CORE COWL PANELS ARE INSTALLED. DAMAGE TO THE THRUST REVERSER OR CORE COWL PANELS COULD OCCUR.

DO NOT EXTEND THE THRUST REVERSER SLEEVE IF THE THRUST REVERSER IS OPEN BEYOND THE 23-DEGREE POSITION. DAMAGE TO THE SLEEVE AND STRUT COULD OCCUR.

DO NOT EXTEND THE THRUST REVERSER IF THE CORE COWL PANELS ARE OPEN. DAMAGE TO THE THRUST REVERSER AND CORE COWL PANELS COULD OCCUR.

MAKE SURE THE AREA AFT OF THE THRUST REVERSER IS CLEAR OF ALL EQUIPMENT, WORKSTANDS, ETC. DAMAGE COULD OCCUR IF THE THRUST REVERSER CONTACTS THE EQUIPMENT.

WHEN YOU MOVE THE THRUST REVERSER MANUALLY, LOOK FOR LOWER ACTUATOR OPERATION, OR LOWER AND CENTER ACTUATOR OPERATION. IF YOU SEE THIS OPERATION, STOP AND LOOK FOR BROKEN FLEXSHAFTS.

- (12) Make sure that thrust reversers are not opened beyond the 23-degree position.

NOTE: You can extend the thrust reverser sleeve with the reverser opened only in the 23-degree position and with core cowl panels removed.

S 865-176-N00

- (13) Make sure that the core cowl panels are closed with the thrust reversers closed, or the core cowl panels are removed with the thrust reversers opened.

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S 865-290-N00

- (14) Make sure that the lock lever on the center locking actuator is in the locked position.

S 865-274-N00

CAUTION: MAKE SURE THE MANUAL DRIVE IS FULLY ENGAGED WITH THE SYNC LOCK DRIVE SHAFT BEFORE YOU TURN IT. DO NOT USE FORCE TO ENGAGE THE MANUAL DRIVE SHAFT. ALSO, MAKE SURE THE MANUAL DRIVE STAYS FULLY ENGAGED WHILE YOU OPERATE THE SQUARE DRIVE. IF THE MANUAL DRIVE IS NOT FULLY ENGAGED OR IF YOU USE FORCE TO ENGAGE IT, DAMAGE TO THE SYNC LOCK CAN OCCUR.

DO NOT USE A PNEUMATIC WRENCH TO EXTEND THE THRUST REVERSER. THIS CAN CAUSE DAMAGE TO THE SYNC LOCK OR LOCKING ACTUATOR.

- (15) Install a 3/8 inch (9.4 mm) square drive wrench into the end of the manual drive on the sync lock and push the square drive into the sync lock.
- (a) You must push the square drive in until it stops and hold it in the sync lock to manually disengage the sync lock and engage the manual drive shaft.
 - (b) If it is necessary, you must make small position adjustments of the manual drive to align it with the sync lock drive shaft.
 - 1) Put a 5/8 inch open end wrench on the manual drive nut.
 - 2) Push the 3/8 inch square drive wrench in and gently turn the 5/8 inch wrench a small amount in one direction or the other to fully engage the manual drive (wiggle it).

S 865-271-N00

- (16) While you keep the sync lock disengaged, turn the manual drive on the sync lock to try to extend the thrust reverser sleeve; the sleeve must not extend.

NOTE: Make sure you turn the square drive in the direction that extends the thrust reverser sleeve. For the left sleeve, turn the manual drive counterclockwise. For the right sleeve, turn the manual drive clockwise.

NOTE: The sync lock/manual drive will not turn smoothly. While you turn the drive, you will hear a ratchet sound. The sync lock has a clutch which limits the torque to the actuation system to 45-60 inch-pounds (5-6.78 N-m) to prevent damage to the flexible drive shafts and actuators.

- (a) If the thrust reverser extends, replace the center locking hydraulic actuator (AMM 78-31-17/401).

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- S 725-291-N00
- (17) Do a check of the remaining locking actuator on the opposite thrust reverser half.

- S 415-179-N00
- (18) Close the fan cowl panels (AMM 71-11-04/201).

- S 445-180-N00
- (19) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

- S 445-181-N00
- (20) Do the activation procedure for the spoiler/speedbrake control system (AMM 27-61-00/201).

- S 945-182-N00
- (21) Remove the DO-NOT-OPERATE tags from the thrust levers.

TASK 78-31-00-825-183-N00

6. Rod End Gap Adjustment for the Center Locking Hydraulic Actuator

A. General

- (1) Do this task to adjust the rod end gap of the center locking hydraulic actuator if the rod end gap is more than the specified limit of 0.100 inch (2.54 mm) with the hydraulic power removed.
- (2) The center locking hydraulic actuator is referred to as the locking actuator in this procedure.

B. References

- (1) AMM 24-22-00/201, Electrical Power - Control
- (2) AMM 29-11-00/201, Pressurize/Depressurize Main Hydraulic System
- (3) AMM 71-11-04/201, Fan Cowl Panels
- (4) AMM 78-31-00/201, Thrust Reverser System

C. Access

- (1) Location Zones
 - 410 Left Engine
 - 420 Right Engine

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- (2) Access Panels
 - 413AL/414AR Fan Cowl Panels, Left Engine
 - 415DL/416DR Access Panel for the Rod End of the Locking Actuator, Left Engine
 - 423AL/424AR Fan Cowl Panels, Right Engine
 - 425DL/426DR Access Panel for the Rod End of the Locking Actuator, Right Engine

D. Prepare to Do the Rod End Gap Adjustment For the Center Locking Hydraulic Actuator.

S 865-184-N00

- (1) For the left engine, make sure these circuit breakers are closed:
 - (a) On the Overhead Circuit Breaker panel, P11:
 - 1) 11D13, L ENG T/R IND
 - 2) 11D14, L ENG T/R CONT

S 865-272-N00

- (2) For the right engine, make sure these circuit breakers are closed:
 - (a) On the P11 panel:
 - 1) 11L32, R ENG T/R IND
 - 2) 11L33, R ENG T/R CONT
 - 3) 11D32, R ENG T/R IND ALTN
 - 4) 11D33, R ENG T/R CONT ALTN

S 865-185-N00

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

S 865-186-N00

- (4) Supply hydraulic pressure to the thrust reverser system (AMM 29-11-00/201).

E. Do the Rod End Gap Adjustment For the Center Locking Hydraulic Actuator (Fig. 502).

S 865-187-N00

- (1) Extend and retract the thrust reverser five times with hydraulic power (AMM 78-31-00/201).

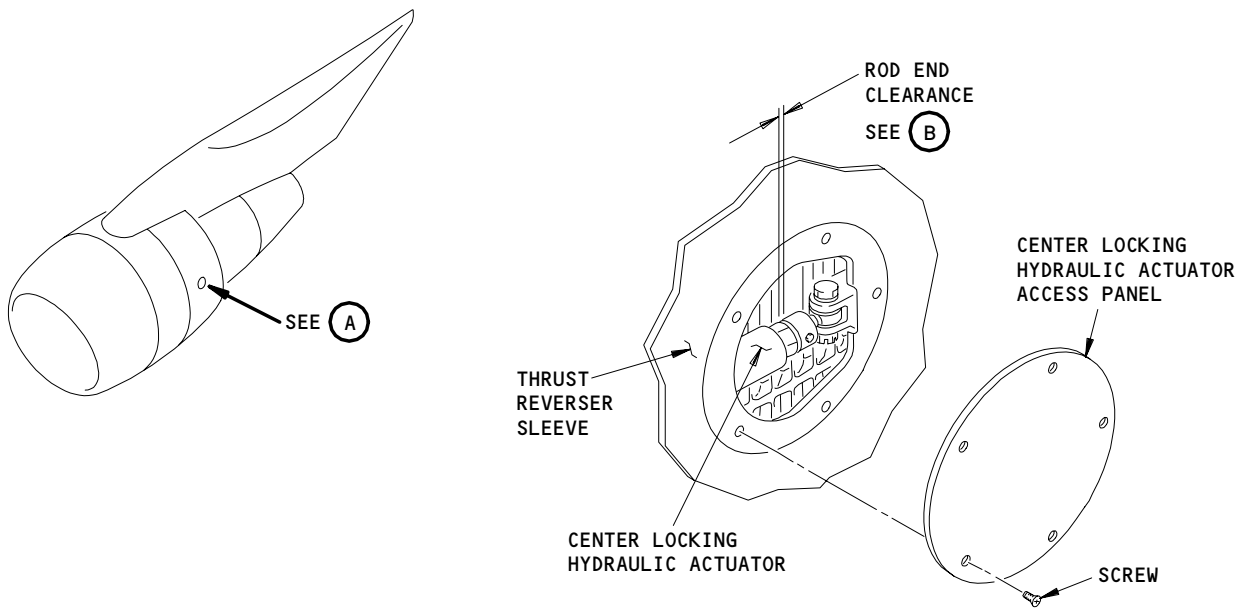
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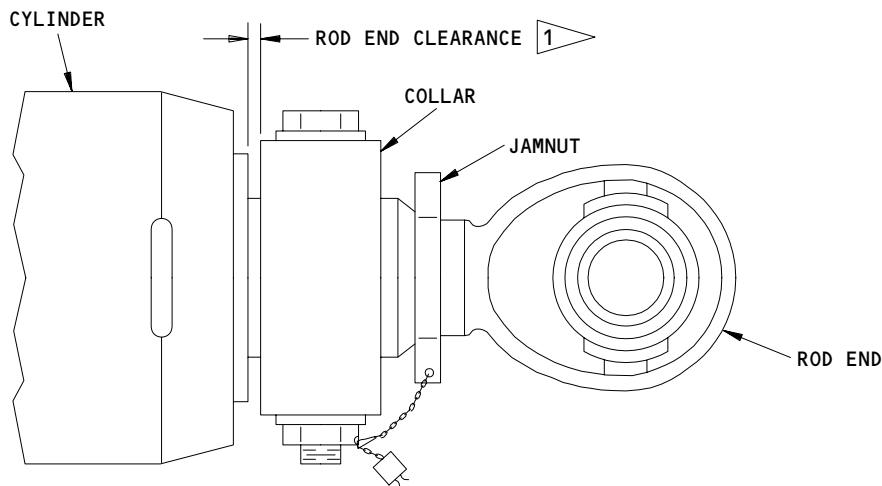
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CENTER LOCKING HYDRAULIC ACTUATOR ACCESS PANEL
ON THE THRUST REVERSER SLEEVE

(A)



ROD END CLEARANCE FOR THE CENTER
LOCKING HYDRAULIC ACTUATOR

(B)

1 THE ROD END CLEARANCE MUST NOT BE MORE
THAN 0.100 INCH WITH THE HYDRAULIC PRESSURE REMOVED

Rod End Gap Adjustment for the Center Locking Hydraulic Actuator
Figure 502

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- S 015-188-N00
- (2) Remove the access panel for the rod end of the applicable locking actuator.
- S 225-189-N00
- (3) Measure the clearance between the actuator rod end and the actuator cylinder.
- S 225-190-N00
- (4) If the clearance between the actuator rod end and the actuator cylinder is 0.100 inch (2.54 mm) or less, the clearance is correct and you have completed this task.
- S 825-191-N00
- (5) If the distance between the actuator rod end and the actuator cylinder is more than 0.100 inch (2.54 mm), do these steps:

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

NOTE: Do the deactivation procedure for the stow valve and the motorized isolation valve only. DO NOT put the streamered pins in the thrust reverser sleeves. It will be necessary to manually operate the thrust reverser in the subsequent steps.

- (b) Open the fan cowl panels (AMM 71-11-04/201).
- (c) Manually extend the thrust reverser (AMM 78-31-00/201).
- (d) Make sure there is no unwanted material in the tracks or on the sliders of the thrust reverser sleeves.
- (e) Do a check for indications of excessive drag on the interface between the thrust reverser sleeve and the torque box.
- 1) Look for a highly polished area on the nylatron rub strip as a sign of excessive drag.

NOTE: The nylatron rub strip should have a smooth, flat finish.

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- 2) If there is an area that rubbed, remove a thin layer of the nylatron rub strip.
 - a) Lightly sand the nylatron strips with emery cloth where the sleeve rubs.
 - b) Use a series of finer grit emery cloth to get a smooth, flat finish to the surface.
- (f) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 865-192-N00

- (6) Extend and retract the thrust reverser five times with hydraulic power (AMM 78-31-00/201).

S 225-193-N00

- (7) Measure the clearance between the actuator rod end and the actuator cylinder again.

S 225-194-N00

- (8) If the clearance between the actuator rod end and the actuator cylinder is 0.100 inch (2.54 mm) or less, the clearance is correct and you have completed this task.

S 825-195-N00

- (9) If the clearance between the actuator rod end and the actuator cylinder continues to be more than 0.100 inch (2.54 mm), do these steps:
 - (a) Make sure the reverse thrust levers are in the fully forward and down position.

WARNING: DO NOT MOVE THE REVERSE THRUST LEVERS. THE THRUST REVERSER SYSTEM IS ACTIVE AND WILL OPERATE IF YOU MOVE THE REVERSE THRUST LEVERS. IF YOU DO NOT OBEY THIS INSTRUCTION, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (b) Attach the DO-NOT-OPERATE tags to the reverse thrust levers.

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- (c) Examine the thrust reverser to make sure it is in the fully retracted position.
- (d) For the left engine, open this circuit breaker and attach the DO-NOT-CLOSE tag:
 - 1) On the P11 panel:
 - a) 11D14, L ENG T/R CONT
- (e) For the right engine, open this circuit breaker and attach the DO-NOT-CLOSE tag:
 - 1) On the P11 panel:
 - a) 11D33, R ENG T/R CONT ALTN
 - b) 11L33, R ENG T/R CONT
- (f) Remove hydraulic power (AMM 29-11-00/201).
- (g) Cause a "target far" condition to occur on the auto-restow sensor.

NOTE: A "target far" condition on the auto-restow sensor will supply hydraulic pressure at 3000 psi to the retract side of the actuators when hydraulic power is supplied to the airplane.

- 1) Disconnect the electrical connector D4180P (for the left thrust reverser sleeve) or D4182P (for the right thrust reverser sleeve) at the strut disconnect panel.

NOTE: This causes the auto-restow system to see the thrust reverser sleeve in the extended ("target far") condition.

- 2) Alternatively, you can remove the auto-restow sensor target to cause a "target far" condition.

NOTE: If you remove the auto-restow sensor target you will have to Adjust the Thrust Reverser Position Indication System (AMM 78-36-00/501).

- (h) Remove the rotary flexshaft and tubing between the actuators on the applicable thrust reverser sleeve (AMM 78-31-18/401).
- (i) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker:
 - 1) On the P11 panel:
 - a) 11D14, L ENG T/R CONT

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- (j) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker:
 - 1) On the P11 panel:
 - a) 11D33, R ENG T/R CONT ALTN
 - b) 11L33, R ENG T/R CONT
- (k) Supply hydraulic power to the stow side (AMM 29-11-00/201).
- (l) While you keep 3000 psi of hydraulic pressure on the locking actuator, install the rotary flexshaft and tubing between the actuators (AMM 78-31-18/401).

S 865-196-N00

- (10) Extend and retract the thrust reverser five times with hydraulic power (AMM 78-31-00/201).

S 225-197-N00

- (11) Remove the hydraulic power (AMM 29-11-00/201).

S 225-198-N00

- (12) Measure the clearance between the actuator rod end and the actuator cylinder again.

S 225-199-N00

- (13) If the clearance between the actuator rod end and the actuator cylinder is 0.100 inch (2.54 mm) or less, the clearance is correct and you have completed this task.

S 905-200-N00

- (14) If the clearance between the actuator rod end and the actuator cylinder continues to be more than 0.100 inch (2.54 mm), replace the locking actuator (AMM 78-31-17/401).

F. Put the Airplane Back to Its Usual Condition.

S 435-201-N00

- (1) Connect the electrical connector D4180P (for the left thrust reverser sleeve) or D4182P (for the right thrust reverser sleeve) at the strut disconnect panel.

S 415-202-N00

- (2) Install the access panel for the rod end of the applicable locking actuator.

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S 415-203-N00
(3) Close the fan cowl panels (AMM 71-11-04/201).

S 865-204-N00
(4) Remove the DO-NOT-OPERATE tags from the reverse thrust levers.

S 445-205-N00
(5) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 715-206-N00
(6) Do an operational test of the thrust reverser system (AMM 78-31-00/501).

TASK 78-31-00-405-275-N00

7. Thrust Reverser Witness Mark Installation

A. Equipment

(1) Brush

B. Consumable Materials

- (1) C00033 Coating, Enamel, Exterior Protective, Flexible Use, BMS 10-60 Type II, BAC 701 gloss black
- (2) G50020 Mat, Abrasive, Non-Woven, Non Metallic 400 Grit
- (3) B00062 Solvent, Acetone, ASTM D329
- (4) G01674 Tape, Adhesive Masking
- (5) G00034 Wiper, Clean, Lint free, Cotton, BMS15-5

C. References

- (1) AMM 24-22-00/201, Electrical Power - Control
- (2) AMM 29-11-00/201, Pressurize/Depressurize Main Hydraulic Systems

D. Access

- (1) Location Zones
 - 211/212 Flight Compartment
 - 410 Left Engine
 - 420 Right Engine

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E. Apply The Witness Mark (Fig. 503)

- S 865-276-N00
(1) Supply electrical power (AMM 24-22-00/201).
- S 865-278-N00
(2) Make sure the reverse thrust levers are in the full forward and down position.
- S 865-277-N00
(3) Supply hydraulic power (AMM 29-11-00/201).
- S 865-279-N00
(4) Wait for 5 to 10 seconds to make sure the thrust reverser is fully retracted.
- S 865-280-N00
(5) For the left engine, open this circuit breaker and attach the DO-NOT-CLOSE tag:
(a) On the Overhead Circuit Breaker panel, P11:
1) 11D14, L ENG T/R CONT
- S 865-281-N00
(6) For the right engine, open this circuit breaker and attach the DO-NOT-CLOSE tag:
(a) On the Overhead Circuit Breaker panel, P11:
1) 11D33, R ENG T/R CONT ALTN
2) 11L33, R ENG T/R CONT
- S 375-287-N00
(7) Prepare the painted surface.
(a) Apply a mask around the witness mark area with adhesive masking tape.
(b) Use an abrasive mat, 400 grit, to roughen and activate the enamel paint on the surface.
(c) Use a clean cloth wiper, BMS15-5 that is moist with acetone solvent to make the roughened surface clean.
(d) Wipe the surface dry with a dry clean, cloth wiper before the solvent becomes dry.
- S 375-286-N00
(8) Immediately apply one coat BMS10-60 Type II enamel, gloss black color, to the area on the inside of the aft thrust reverser sleeves and the lower bifurcations.
(a) Use a brush to apply a uniform coat.

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- S 375-288-N00
- (9) Remove the masking tape.
- S 865-282-N00
- (10) Remove the hydraulic power (AMM 29-11-00/201).
- S 865-283-N00
- (11) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker:
- (a) On the Overhead Circuit Breaker panel, P11:
- 1) 11D14, L ENG T/R CONT
- S 865-284-N00
- (12) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker:
- (a) On the Overhead Circuit Breaker panel, P11:
- 1) 11D33, R ENG T/R CONT ALTN
- 2) 11L33, R ENG T/R CONT
- S 865-285-N00
- (13) Remove electrical power if it is not necessary (AMM 24-22-00/201).

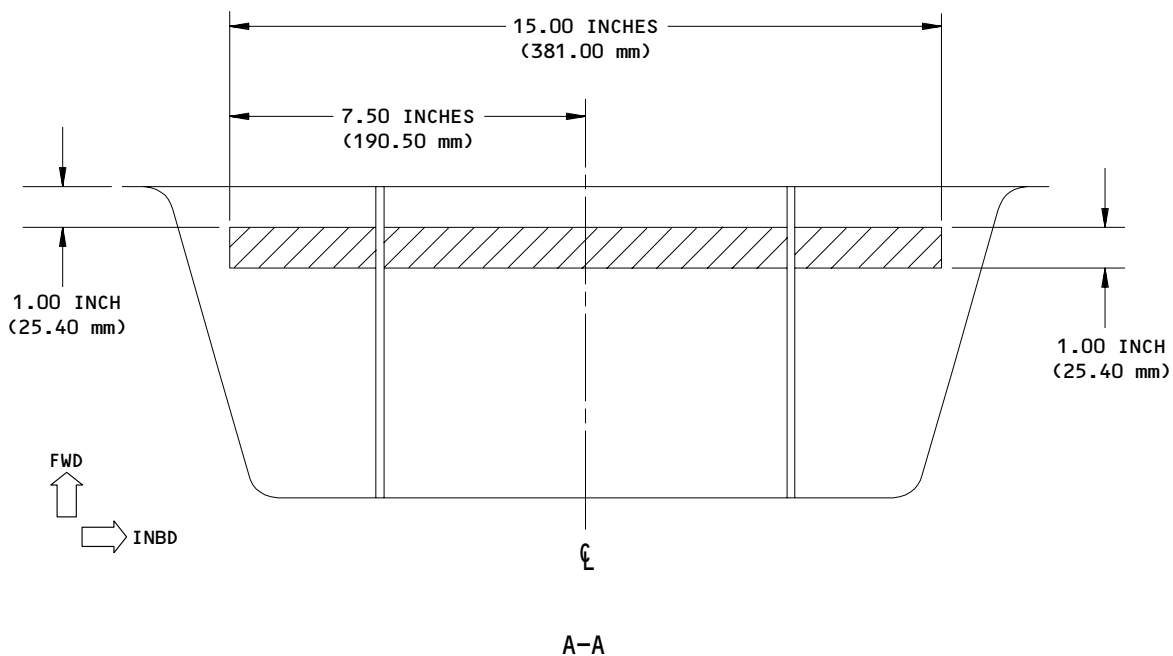
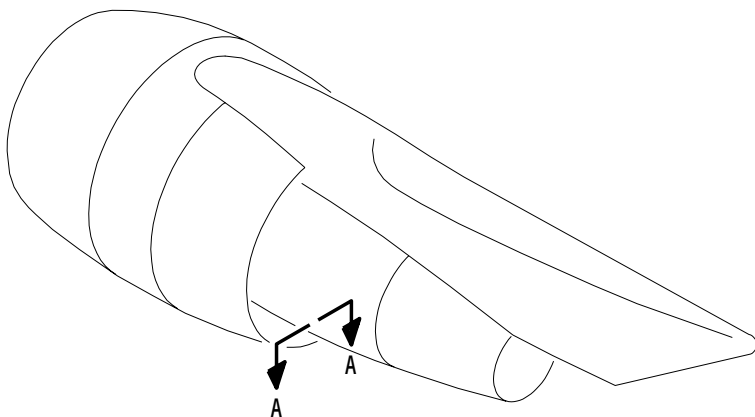
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Thrust Reverser Witness Marking Position
Figure 503

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THRUST REVERSER - REMOVAL/INSTALLATION

1. General

A. This procedure has two tasks:

- (1) Remove the L (R) thrust reverser half.
- (2) Install the L (R) thrust reverser half.

TASK 78-31-01-004-001-N00

2. Remove the Thrust Reverser

A. General

- (1) You must not open, extend or lift the thrust reverser if more than six cascade vane segments are removed. You must install a minimum of three cascade vane segments in each thrust reverser half. The empty space between these three cascade vane segments must be equivalent. There must not be more than two adjacent empty spaces between the three cascade vane segments which are installed.
- (2) You can change the left and right thrust reverser halves between the left and right engines if the cascade vane segments are installed in the specified locations (AMM 78-31-16/401).
- (3) When you change the engine, thrust reverser or strut, it is necessary to adjust the thrust reverser shims (AMM 78-31-01/501).

B. Equipment

- (1) Sling, Thrust Reverser - A71002-48
- (2) Protector, Thread - A78002-1
- (3) Hoist - (Crane) 1000 pounds lift capacity.

C. Consumable Materials

- (1) G00488 Tape, Duct - Pressure Sensitive, Fabric Base

D. References

- (1) AMM 54-52-01/401, Strut Fairings
- (2) AMM 71-11-04/401, Fan Cowl Panels
- (3) AMM 71-11-06/401, Core Cowl Panels
- (4) AMM 78-31-00/201, Thrust Reverser System
- (5) AMM 78-31-02/401, Latch Bands
- (6) AMM 78-31-06/401, Thrust Reverser Opening Actuators

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E. Access

(1) Location Zones

- 411 Left Engine
- 421 Right Engine

(2) Access Panels

- 415AL Thrust Reverser (Left)
- 416AR Thrust Reverser (Right)
- 425AL Thrust Reverser (Left)
- 426AR Thrust Reverser (Right)

F. Prepare to Remove the Thrust Reverser (Fig. 401).

S 864-002-N00

(1) For the left engine, open these circuit breakers and attach the DO-NOT-CLOSE tags:

(a) On the overhead equipment panel, P11:

- 1) 11D13, ENG T/R IND L
- 2) 11K9, L ENG NAC VENT VALVE
- 3) 11D14, L ENG T/R CONT

S 864-003-N00

(2) For the right engine, open these circuit breakers and attach the DO-NOT-CLOSE tags:

(a) On the P11 panel:

- 1) 11D32, R ENG T/R IND ALTN
- 2) 11L32, R ENG T/R IND
- 3) 11L35, R ENG NAC VENT VALVE
- 4) 11M30, 28V DC R BUS PWR SENSE
- 5) 11D33, R ENG T/R CONT ALT
- 6) 11L33, R ENG T/R CONT

S 864-004-N00

(3) Attach the DO-NOT-OPERATE tags to the thrust levers.

S 044-005-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.

(4) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

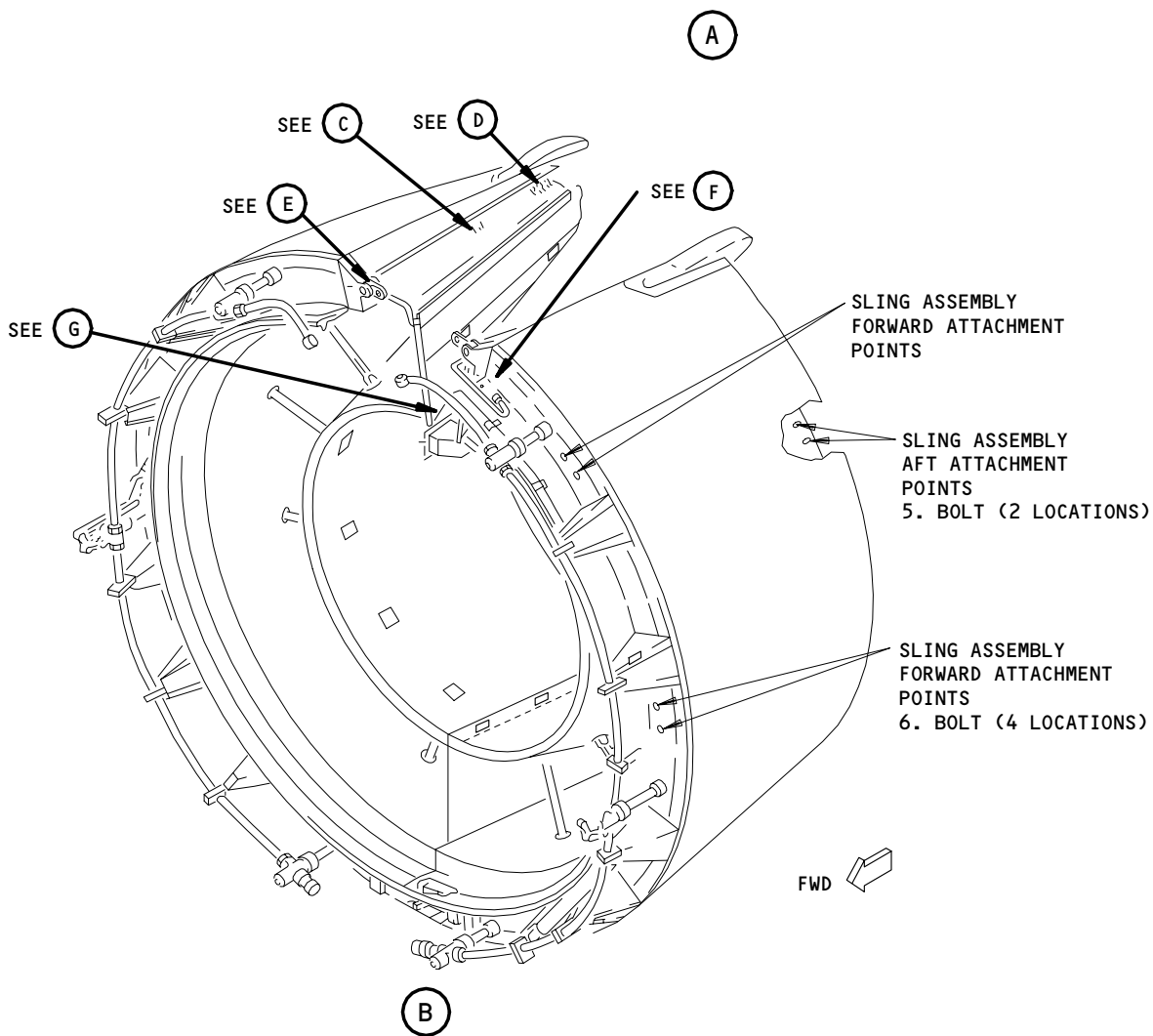
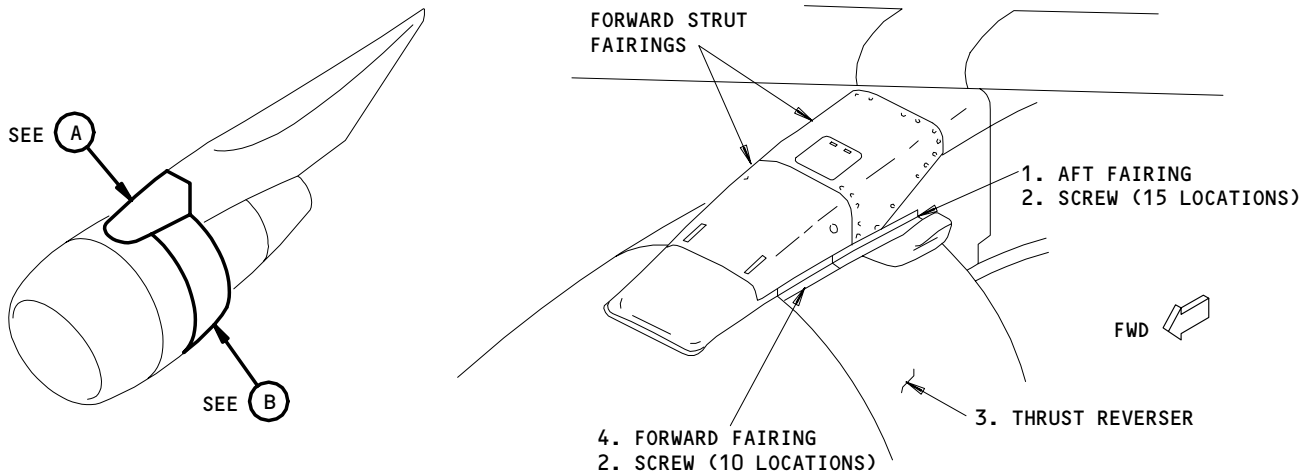
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Thrust Reverser Installation
Figure 401 (Sheet 1)

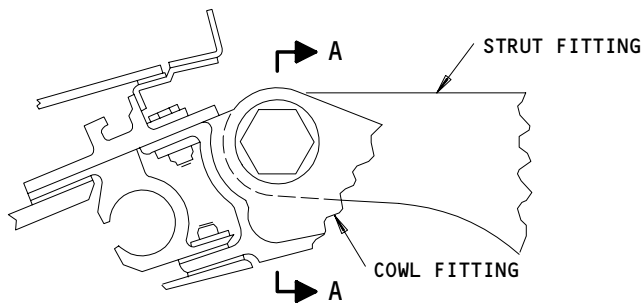
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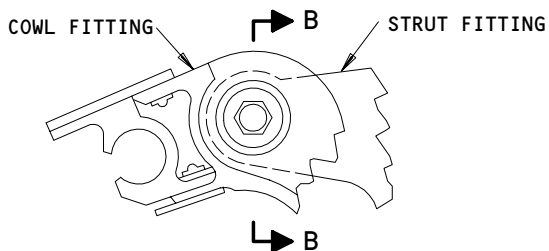
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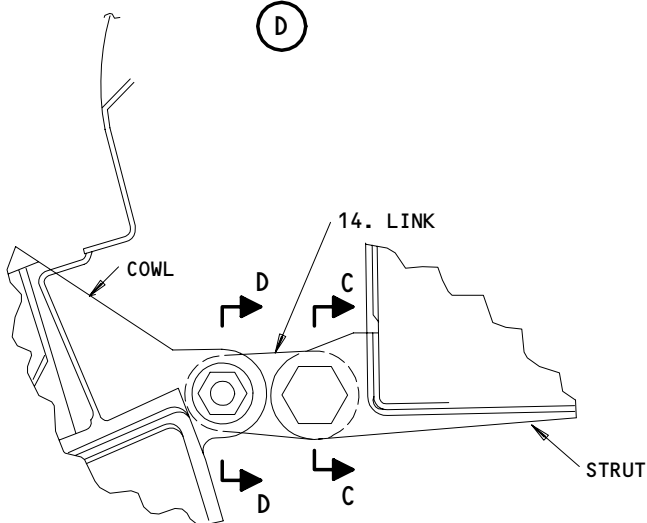
CENTER HINGE
(VIEW IN THE FORWARD DIRECTION)

(C)



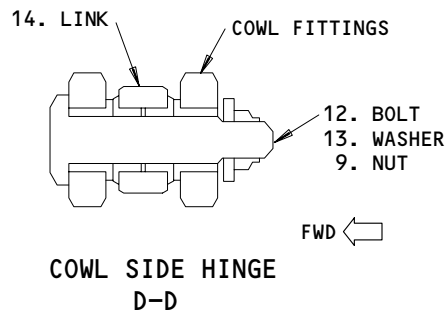
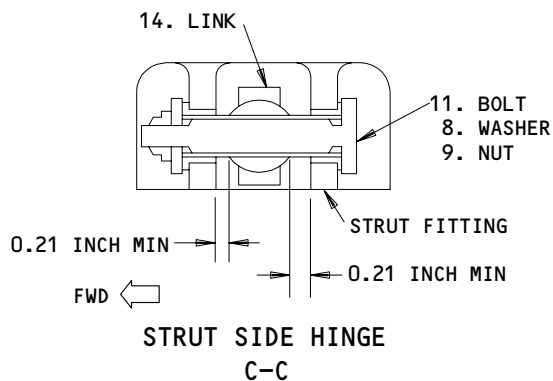
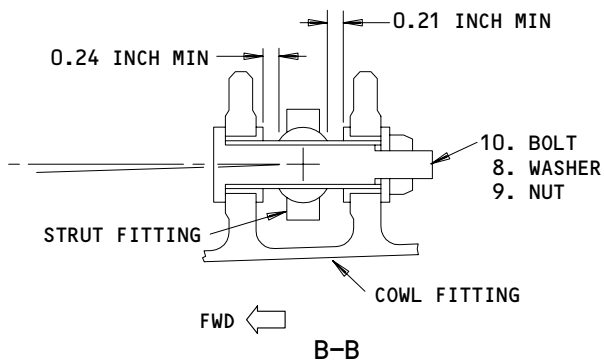
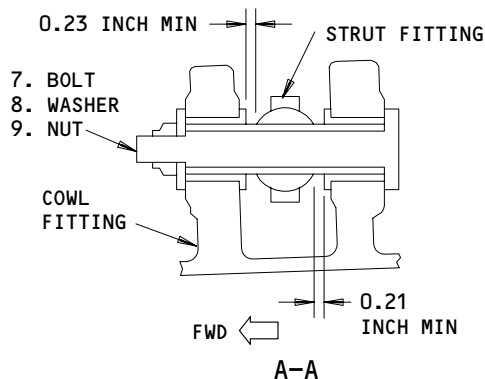
AFT HINGE
(VIEW IN THE FORWARD DIRECTION)

(D)



FORWARD HINGE
(VIEW IN THE FORWARD DIRECTION)

(E)



Thrust Reverser Installation
Figure 401 (Sheet 2)

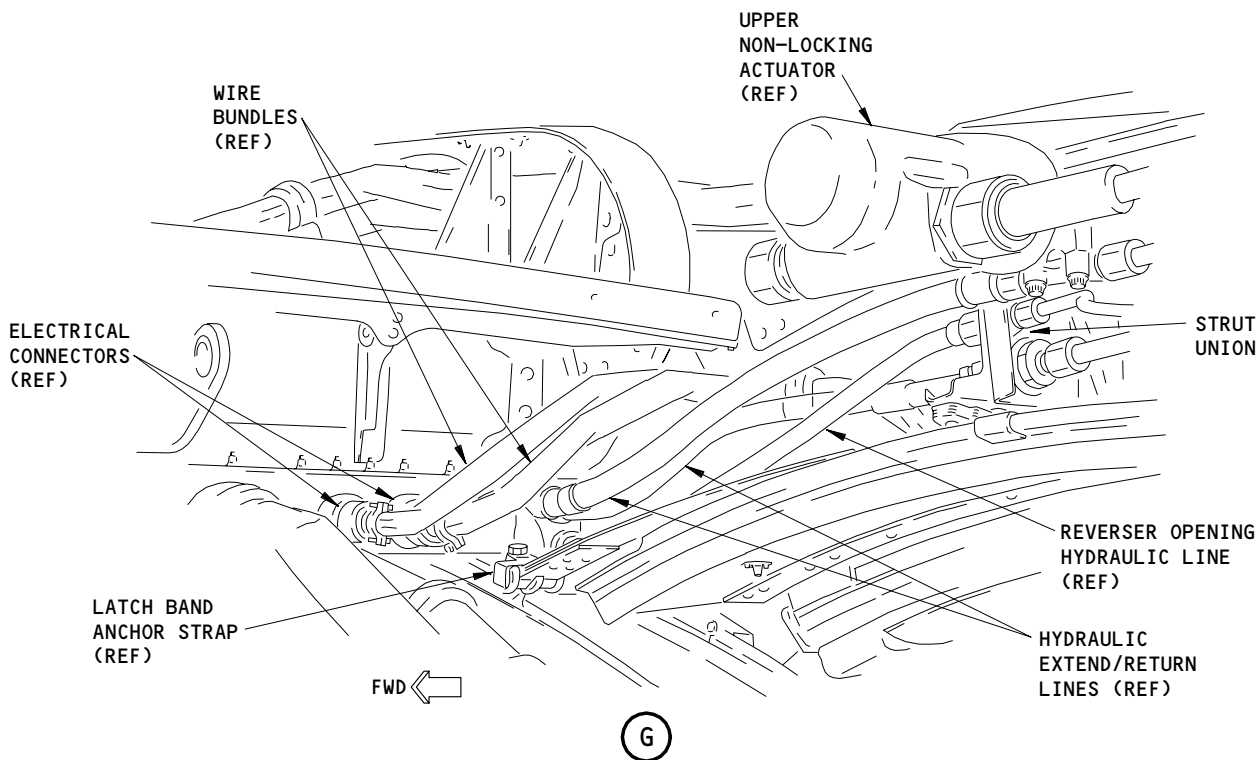
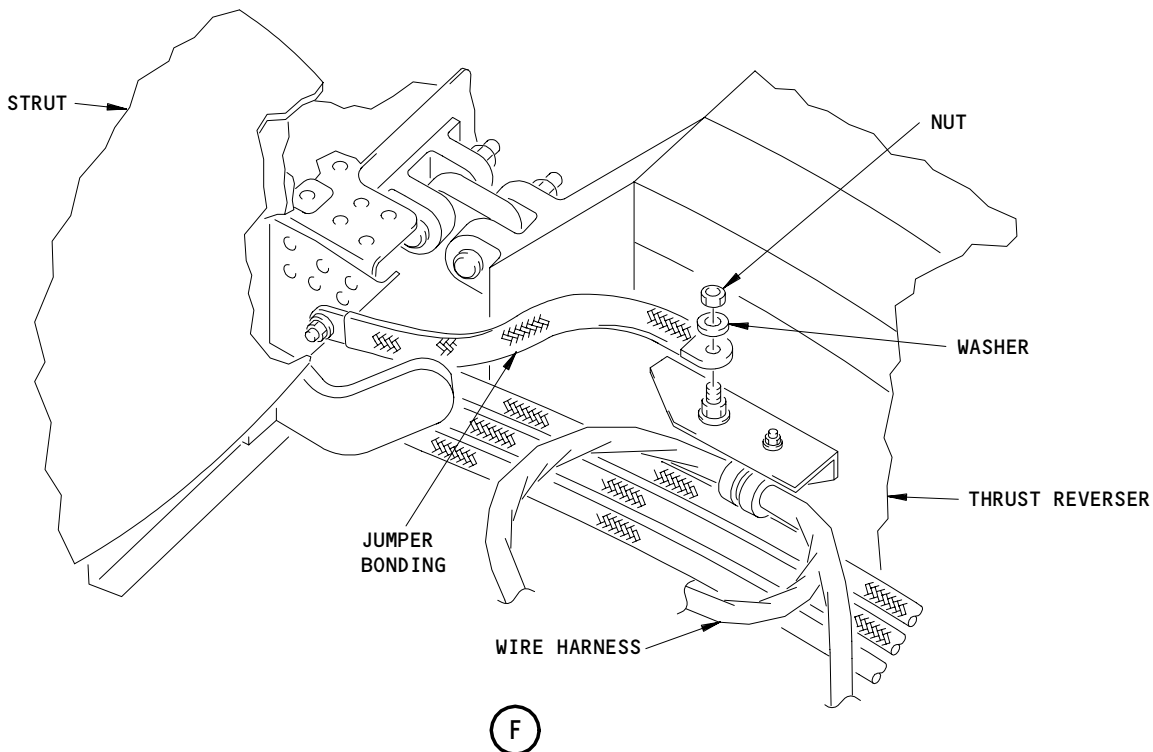
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Thrust Reverser Installation
Figure 401 (Sheet 3)

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S 864-084-N00

CAUTION: DO NOT LIFT OR MOVE THE THRUST REVERSER HALF WITH MORE THAN SIX CASCADE VANE SEGMENTS REMOVED. IF YOU DO NOT HAVE A MINIMUM OF THREE CASCADE VANE SEGMENTS, YOU CAN CAUSE DAMAGE TO THE THRUST REVERSER STRUCTURE.

- (5) Make sure that a minimum of three cascade vane segments in each thrust reverser half are installed.
 - (a) Make sure that the empty space between these three cascade vane segments must be equivalent.
 - (b) Make sure that there is not more than two adjacent empty spaces between the three cascade vane segments which are installed.

S 014-006-N00

- (6) Remove the forward strut fairings (AMM 54-52-01/401).

S 014-007-N00

- (7) Remove the fan cowl panels (AMM 71-11-04/401).

S 034-008-N00

- (8) Remove the latch band pins from the anchor strap for the latch band (AMM 78-31-02/401).

S 014-009-N00

- (9) Remove the core cowl panels (AMM 71-11-06/401).

S 014-010-N00

- (10) Open the strut access cover (437BL or 447BL) for the applicable thrust reverser.

S 034-011-N00

- (11) Attach a protective mat with duct tape to the leading edge of the wing where the sling hoist can touch.

S 034-012-N00

- (12) Attach the protection mat with the duct tape to the reverser translating sleeve where the sling can touch.

S 014-013-N00

- (13) Remove the two skirt fairings (left engine, 415GZ, 416FZ; right engine 425GZ, 426FZ) from the top of the reverser translating sleeve for each thrust reverser half which is removed.
 - (a) Remove the screws (2) from the small forward fairing (4).
 - (b) Remove the screws (2) and the large aft fairing (1).

NOTE: When you remove the skirt fairings you will give access to all three hinge bolts.

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G. Remove the Thrust Reverser (Fig. 401 and 402).

S 024-014-N00

- (1) Remove the nuts (9) and washers (8) from the forward hinge on the strut side, and the center hinge.

NOTE: Remove the aft hinge nut and washer when the thrust reverser is in the opened position.

- (a) Keep the bolts installed and install the thread protectors (A78002) on the bolts.

S 494-015-N00

- (2) Attach the sling assembly (A71002) for the thrust reverser to the thrust reverser half at the forward and aft hoist points.

- (a) Remove the bolts (5, 6) from the hoist points.

NOTE: There are two bolts at each of two GSE hoist attach points on each torque box of the thrust reverser half. The hoist points are found below the upper non-locking hydraulic actuator and above the center locking actuator and on the aft end of the thrust reverser cowl.

- (b) Install the forward adapter (-18) with the two bolts and washers at the hoist point nearest to the upper non-locking hydraulic actuator.
- (c) Install the forward adapter (-19) with the two bolts and washers at the hoist point nearest to the center locking hydraulic actuator.

NOTE: Turn the bottom side of the forward adapter to the top if the forward adapter touches the torque box fittings.

- 1) Attach the forward adapter (-19) with the smaller hole nearest the inboard and the slot farthest outboard from the centerline of the nacelle.

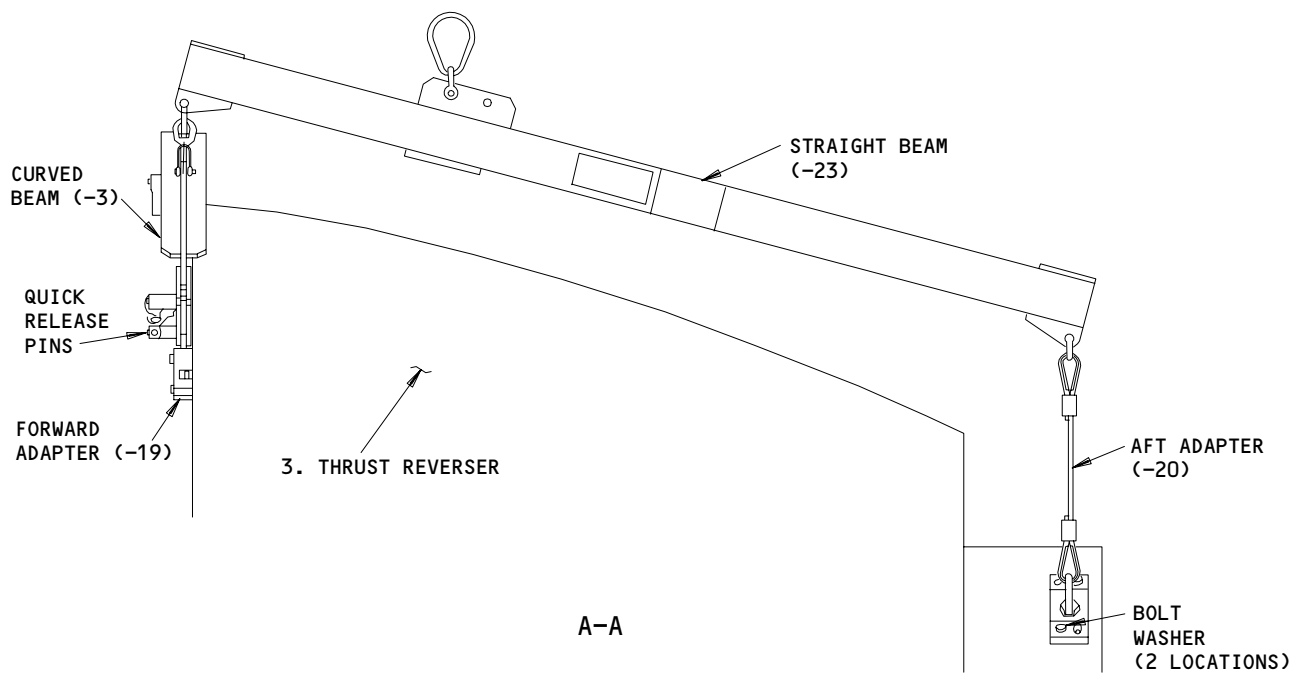
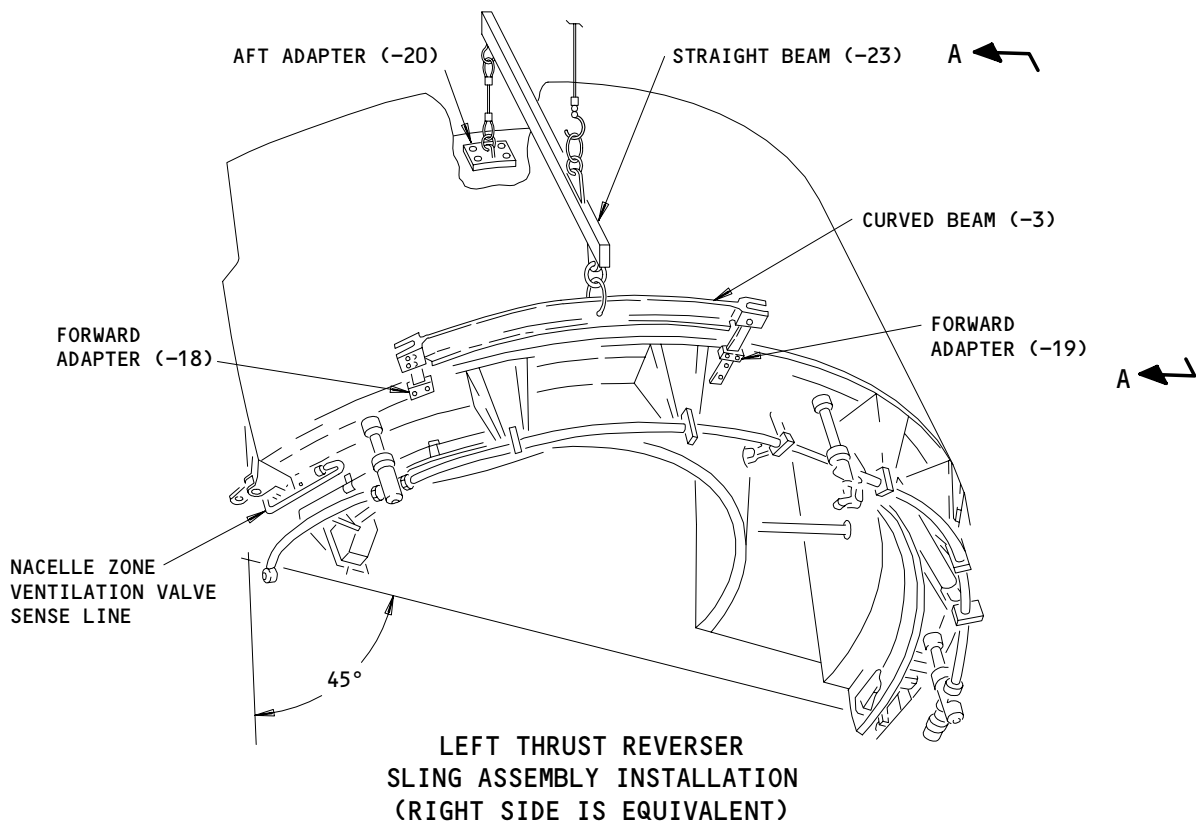
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**Thrust Reverser Sling Assembly
Figure 402**

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- (d) Install the aft adapter (-20) to the aft hoist point on the thrust reverser cowl with the two bolts and washers.
- (e) Attach the curved beam (-3) with the three quick release pins to the forward adapters.

NOTE: Know the stencil instructions on the curved beam which identify the side which must point forward for the inboard or outboard thrust reverser half.

- (f) Attach the straight beam (-23) to the curved beam (-3) and aft adapter (-20) cable.

NOTE: Make sure the FWD arrow on the straight beam points in the correct direction. Know the stencil instructions on the curved beam to identify the correct attachment point on the straight beam for the inboard or outboard thrust reverser half.

- (g) Attach the tag lines to the thrust reverser.
- (h) Attach the hoist to the sling straight beam.

NOTE: Make sure you know the stencil which shows the lift point for the PW4000.

- 1) Keep the hoist loose.

S 864-016-N00

CAUTION: DO NOT OPEN THE THRUST REVERSER MORE THAN THE 23 DEGREE POSITION WITH THE REVERSER TRANSLATING SLEEVE DEPLOYED. IF THE REVERSER TRANSLATING SLEEVE IS EXTENDED, IT CAN CAUSE DAMAGE TO THE STRUT AND REVERSER TRANSLATING SLEEVE.

- (3) Make sure the thrust reverser sleeve is in the stowed position.

S 864-017-N00

- (4) Make sure the leading edge slats are retracted.

S 014-018-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.

- (5) Open the thrust reverser to the 45 degree position (AMM 78-31-00/201).
 - (a) Make sure the hold-open rod is fully extended and locked.

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- (b) Release the hoist tension to let the hold-open rod hold some weight.

S 034-021-N00

- (6) Disconnect the systems that follow which are between the strut and thrust reverser.
 - (a) The wire harness at the two locations for each thrust reverser half.
 - 1) Install the dust caps on the electrical connectors.
 - (b) The bonding jumper, one on each thrust reverser half, installed near the upper non-locking hydraulic actuator.

CAUTION: BE PREPARED TO CATCH THE HYDRAULIC FLUID IN THE APPLICABLE CONTAINER. IMMEDIATELY CLEAN THE ENGINE IF HYDRAULIC FLUID FALLS ON THE ENGINE. IF YOU DO NOT QUICKLY CLEAN THE HYDRAULIC FLUID OFF THE ENGINE, THE HYDRAULIC FLUID CAN CAUSE DAMAGE TO THE ENGINE.

- (c) The hydraulic pressure and return hoses which go to the thrust reverser actuators.
 - 1) Install the protection caps on all hydraulic lines.
 - 2) Use an applicable container to catch the hydraulic fluid.
- (d) The sense line for the nacelle zone ventilation valve on the torque box near the forward hinge of the left thrust reverser half only.
- (e) Disconnect the flex hose of the opening system installed on the thrust reverser from the strut installed union.

NOTE: The flexhose starts from a union near the upper non-locking actuator and connects to the quick release manifold for the hand pump.

- 1) Install the protection caps on all hydraulic lines.
- 2) Use an applicable container to catch the hydraulic fluid.

S 024-022-N00

WARNING: MAKE SURE THE THRUST REVERSER IS CORRECTLY HELD BY THE HOLD-OPEN RODS AND SLING HOIST. IF THE THRUST REVERSER IS NOT CORRECTLY ATTACHED, THE THRUST REVERSER CAN SUDDENLY CLOSE AND CAUSE INJURY TO PERSONS.

- (7) Make sure the hoist holds some of the weight of the thrust reverser half.

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S 034-023-N00

- (8) Remove the nut (9) and washer (8) from the aft hinge.

NOTE: You can easily get to the aft hinge from behind the open thrust reverser. Go between the strut and reverser upper bifurcation to remove the aft hinge nut and washer.

- (a) Keep the hinge bolt installed and install a thread protector (A78002).

S 034-024-N00

- (9) Disconnect the rod end of the opening actuator from the thrust reverser upper bifurcation (AMM 78-31-06/401).

NOTE: Make sure the opening actuator remains extended.

S 494-025-N00

WARNING: DO NOT GET BELOW OR NEAR THE THRUST REVERSER WHEN YOU LIFT IT. INJURY TO PERSONS CAN OCCUR IF THE THRUST REVERSER FALLS OR MOVES.

CAUTION: WHEN YOU CAREFULLY LIFT THE THRUST REVERSER, DO NOT LET THE THRUST REVERSER AND STRUT TOUCH. CONTROL THE MOVEMENT OF THE THRUST REVERSER WITH THE TAG LINES. YOU CAN CAUSE DAMAGE TO THE THRUST REVERSER IF IT TOUCHES THE ENGINE OR OTHER EQUIPMENT.

MAKE SURE THE TOP SKIRT FAIRING SUPPORTS DO NOT TOUCH THE STRUT. DAMAGE TO THE SUPPORTS WILL OCCUR.

- (10) Make sure the thrust reverser is correctly held by the hoist, and close the hold-open rods.

S 024-026-N00

- (11) Remove the forward hinge bolt (11), aft hinge bolt (10), and then the center hinge bolt (7).

NOTE: A curved drift is necessary to make for an easier removal of the aft hinge bolt.

S 024-027-N00

- (12) Lift the thrust reverser away from the fittings on the strut.

S 024-028-N00

- (13) Lower the thrust reverser on the pallet.

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S 034-029-N00

- (14) If you must remove the link (14), remove the nut (9), washer (13) and bolt (12).

S 534-030-N00

- (15) Attach the center and aft hinge bearing in the strut hinge fitting with the plastic or wire ties to make sure the bearings do not fall out.

S 914-080-N00

- (16) If necessary, repeat the above procedure for the remaining thrust reverser half.

TASK 78-31-01-404-031-N00

3. Install the Thrust Reverser

A. General

- (1) You must not open, extend or lift the thrust reverser if more than six cascade vane segments are removed. You must install a minimum of three cascade vane segments in each thrust reverser half. The empty space between these three cascade vane segments must be equivalent. There must not be more than two adjacent empty spaces between the three cascade vane segments which are installed.
- (2) You can change the left and right thrust reverser halves between the left and right engines if the cascade vane segments are installed in the specified locations (AMM 78-31-16/401).
- (3) When you change the engine, thrust reverser or strut, it is necessary to adjust the thrust reverser shims (AMM 78-31-01/501).

B. Equipment

- (1) Sling, Thrust Reverser - A71002-48
- (2) Hoist - (Crane) 1000 pounds lift capacity.

C. Consumable Materials

- (1) D00633 Grease, Corrosion Preventive - BMS 3-33 (Preferred)
- (2) D00015 Grease, Corrosion Preventive - BMS 3-24 (Alternate)

D. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	3	Thrust Reverser	78-31-01	03	1,5

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E. References

- (1) AMM 24-22-00/201, Electrical Power - Control
- (2) AMM 54-52-01/401, Strut Fairings
- (3) AMM 71-11-04/401, Fan Cowl Panels
- (4) AMM 71-11-06/401, Core Cowl Panels
- (5) AMM 78-31-00/201, Thrust Reverser System
- (6) AMM 78-31-00/501, Thrust Reverser System
- (7) AMM 78-31-01/501, Thrust Reverser
- (8) AMM 78-31-02/501, Latch Bands
- (9) AMM 78-31-04/501, Tension Latches
- (10) AMM 78-31-06/401, Thrust Reverser Opening Actuators
- (11) AMM 78-31-16/401, Thrust Reverser Cascade Vane Segments

F. Access

- (1) Location Zones
 - 411 Left Engine
 - 421 Right Engine

- (2) Access Panels
 - 415AL Fan Reverser (Left)
 - 416AR Fan Reverser (Right)
 - 425AL Fan Reverser (Left)
 - 426AR Fan Reverser (Right)

G. Install the Thrust Reverser

S 864-085-N00

CAUTION: DO NOT LIFT OR MOVE THE THRUST REVERSER HALF WITH MORE THAN SIX CASCADE VANE SEGMENTS REMOVED. IF YOU DO NOT HAVE A MINIMUM OF THREE CASCADE VANE SEGMENTS, YOU CAN CAUSE DAMAGE TO THE THRUST REVERSER STRUCTURE.

- (1) Make sure that a minimum of three cascade vane segments in each thrust reverser half are installed.
 - (a) Make sure that the empty space between these three cascade vane segments must be equivalent.

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(b) Make sure that there is not be more than two adjacent empty spaces between the three cascade vane segments which are installed.

S 864-086-N00

- (2) Make sure the configuration of the deflectors is correct for the position where you will install the thrust reverser half.
(a) If the configuration is not correct, change the deflectors.

NOTE: If you change the configuration, you must also change the identification number on the assembly nameplate.

S 864-032-N00

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

S 494-033-N00

- (4) Attach the sling assembly (A71002) for the thrust reverser to the thrust reverser half at the forward and aft hoist points.
(a) Attach the tag lines to the thrust reverser.

S 434-034-N00

- (5) Make sure the thread protectors are installed on all bolts.

S 644-035-N00

- (6) Lubricate the shank of the bolts with the grease.

NOTE: Do not let the grease get on the threads.

S 034-036-N00

- (7) Remove the plastic or wire ties on the center and aft hinge bearing.

S 434-037-N00

- (8) If the link (14) attachment is necessary, install the link (14) with the bolt (12), washer (13) and nut (9).

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S 494-038-N00

WARNING: DO NOT GET BELOW OR NEAR THE THRUST REVERSER WHEN YOU LIFT IT. INJURY TO PERSONS CAN OCCUR IF THE THRUST REVERSER FALLS OR MOVES.

CAUTION: WHEN YOU CAREFULLY LIFT THE THRUST REVERSER, DO NOT LET THE THRUST REVERSER AND STRUT TOUCH. CONTROL THE MOVEMENT OF THE THRUST REVERSER WITH THE TAG LINES. YOU CAN CAUSE DAMAGE TO THE THRUST REVERSER IF IT TOUCHES THE ENGINE OR OTHER EQUIPMENT.

MAKE SURE THE TOP SKIRT FAIRING SUPPORTS DO NOT TOUCH THE STRUT. DAMAGE TO THE SUPPORTS WILL OCCUR.

- (9) Attach the hoist to the sling assembly.

S 424-039-N00

- (10) Slowly lift the thrust reverser half into its position.

NOTE: When you lift the thrust reverser, it will be in the air at an angle of approximately 45 degrees.

- (a) Align the hinge fittings on the thrust reverser with the strut fittings.

S 424-040-N00

- (11) Install the hinge bolts for the thrust reverser with the steps that follow:

NOTE: The hinge bolts have a tight tolerance fit. The installation of the hinge bolts is easier if you correctly install the hoist and the correctly operate the hoist control. Do not use the air hammers or rivet guns to install the hinge bolts.

- (a) Manually install the bolt (7) in the center hinge from the aft side.

NOTE: The thread protector will point in the forward direction. Move the bolt at a angle to install it around the rib on the fitting of the thrust reverser hinge.

- (b) Manually install the bolt (10) in the aft hinge from the forward side.

NOTE: The thread protector will point to the rear.

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- (c) Manually install the bolt (11) in the forward hinge link (14) nearest to the strut from the aft side.

NOTE: The thread protector will point in the forward direction.

S 424-042-N00

- (12) Remove the thread protectors from the hinge bolts.

S 424-043-N00

- (13) Install the washer (8) and nut (9) on the aft hinge bolt.

NOTE: It is easier to install the aft hinge nut with the thrust reverser open. Install and tighten the aft hinge nut from behind the thrust reverser, through the clearance between the strut and reverser upper bifurcation.

- (a) Tighten the nut (9).

S 824-044-N00

- (14) Move the thrust reverser half on the hinge bolts to make sure the reverser vee-flange aligns with the vee-groove on the engine fan case.

S 414-045-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.

- (15) Close the thrust reverser half with the sling assembly (AMM 78-31-00/201).

S 424-046-N00

- (16) Install the washers (8) and nuts (9) on the forward and center hinge bolts.

NOTE: You can get easier access to the forward and center hinge bolts and nuts with the thrust reverser closed.

- (a) Tighten the nuts (9).

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S 014-047-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.

(17) Open the thrust reverser to the 45 degree position with the sling assembly (AMM 78-31-00/201).

NOTE: Do not remove the hoist tension.

S 434-048-N00

WARNING: MAKE SURE THE THRUST REVERSER IS CORRECTLY HELD BY THE HOLD-OPEN RODS AND SLING HOIST. IF THE THRUST REVERSER IS NOT CORRECTLY ATTACHED, THE THRUST REVERSER CAN SUDDENLY CLOSE AND CAUSE INJURY TO PERSONS.

(18) Engage the hold-open rod to the 45 degree position.
(a) Make sure the hold-open rod is extended and locked.

S 874-053-N00

CAUTION: BE PREPARED TO CATCH THE ENGINE OIL IN THE APPLICABLE CONTAINER. IMMEDIATELY CLEAN THE ENGINE IF HYDRAULIC FLUID FALLS ON THE ENGINE. IF YOU DO NOT QUICKLY CLEAN THE HYDRAULIC FLUID OFF THE ENGINE, THE HYDRAULIC FLUID CAN CAUSE DAMAGE TO THE ENGINE.

(19) Operate the opening system for the thrust reverser to bleed the air which is caught in the opening system with the steps that follow:
(a) Connect the flex hose of the opening system which is installed on the thrust reverser to the strut installed union.
(b) Loosen the flex hose on the fitting of the opening actuator.
(c) Operate the handpump until the engine oil leakage starts from the loose flex hose fitting.
(d) Tighten the flex hose on the fitting for the opening actuator to 30-40 pound-inches.

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO OPEN AND CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(e) Do the procedure to remove the air from the opening system (AMM 78-31-06/401).
(f) Open the thrust reverser (AMM 78-31-00/201).
(g) Make sure the hold-open rod is fully extended and locked.

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(h) Look for engine oil leakage from the opening actuator and from the flex hoses.

S 434-055-N00

- (20) Connect the systems that follow between the strut and thrust reverser.
- (a) The sense line for the nacelle zone ventilation valve on the torque box near the forward hinge of the left thrust reverser half only.
 - (b) The hydraulic pressure and return hoses which go to the locking and non-locking actuators.
 - (c) The bonding jumper, one on each thrust reverser half, installed near the top non-locking hydraulic actuator.
 - (d) The wire harness at the two locations for each thrust reverser half.
 - 1) Tighten with your hand.
 - 2) Install the lockwire.

S 434-056-N00

- (21) Install the latch band on the anchor strap (AMM 78-31-02/401).

S 914-081-N00

- (22) If necessary, install the opposite thrust reverser half.

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S 824-059-N00

(23) Determine if the adjustment of the thrust reverser is necessary:

NOTE: The adjustment of the thrust reverser (AMM 78-31-01/501) is necessary to get the correct compression of the fire and drain seals. It is also necessary to get the correct fit of the thrust reverser halves with the engine, strut and adjustment of the thrust reverser tension and T-bolt latches.

The hinges at the top of the thrust reverser support the static vertical load of the thrust reverser on the airplane. The v-blade at the front of the thrust reverser engages into the v-groove of the engine fan case and transmits the thrust load on the thrust reverser into the engine in flight and in reverse thrust. Because the thrust reverser splits into the left and right half, it is important that the latch band at the front of the thrust reverser and the tension latches on the bottom of the reverser keep the thrust reverser attached to the airplane strut and engine for an engine problem such as a fan blade out condition. The correct force to close the handles for the latch band and tension latches requires wear pads on the upper and lower bifurcation of the inner wall and latch pads around the tension latches are shimmed for the correct gap measurement. In addition, the correct force to close the latches also ensures the correct compression of the bulb type fire seal which contains an external engine fire under the thrust reverser cowl and allows the fire to be extinguished with the fire bottles.

(a) If you changed the engine, do the thrust reverser check procedure (AMM 78-31-01/601).

NOTE: Procedure AMM 78-31-01/601, is an inspection/check procedure that is only used after an engine change. This procedure does a clay check to make sure the v-blades correctly engage the v-groove, the gaps at the wear pads at the upper and lower bifurcation are correct and the forces to close the latch band and tension latches are correct. If the thrust reverser does not pass this check, there is a physical change in the thrust reverser installation relative to the engine.

- 1) If the thrust reverser does not pass this check, do the thrust reverser adjustment procedure (AMM 78-31-01/501).
- 2) If the thrust reverser does pass this check, the airplane can be returned to service.

(b) If a new, spare or rebuilt thrust reverser or strut is installed on the airplane, do the thrust reverser adjustment procedure (AMM 78-31-01/501).

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- (c) If structural work or component maintenance work is done to the existing strut or the thrust reverser, do the thrust reverser adjustment procedure (AMM 78-31-01/501).
- (d) If a thrust reverser or strut is removed from another airplane and installed on the airplane in maintenance, do the thrust reverser adjustment procedure (AMM 78-31-01/501).

S 414-060-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.

- (24) Close the thrust reverser and engage the latches (AMM 78-31-00/201).
 - (a) Make sure the vee-flange engages with the vee-groove on the engine fan case.

S 214-061-N00

- (25) Examine the force which was necessary to close the T-bolt latch handle.
 - (a) If it is necessary, adjust the latch bands (AMM 78-31-02/501).

S 824-062-N00

- (26) Make sure all four tension latches have the correct force to close the latch handles.
 - (a) If it is necessary, adjust the tension latches (AMM 78-31-04/501).

S 224-063-N00

- (27) Examine the dimensions at the three hinge locations for the thrust reverser half.

S 864-064-N00

- (28) Manually extend the thrust reverser sleeves (aft) (AMM 78-31-00/201).

S 214-065-N00

- (29) Look at the part number of the cascade vane segments for the thrust reverser to make sure they are installed in the correct location (AMM 78-31-16/401).

NOTE: The left and right halves of the thrust reverser are interchangeable between the left and right engines. But the deflectors must be installed in the specified configuration for that engine.

S 864-066-N00

- (30) Manually move the thrust reverser sleeves to the closed position (AMM 78-31-00/201).

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- S 414-067-N00
(31) Install and adjust the core cowl panels (AMM 71-11-06/401).
- S 414-068-N00
(32) Install and adjust the fan cowl panels (AMM 71-11-04/401).
- S 414-069-N00
(33) Install the forward strut fairing (AMM 54-52-01/401).
- S 414-070-N00
(34) Install the two skirt fairings (left engine, 415GZ, 416FZ; right engine, 425GZ, 426FZ).
- S 094-071-N00
(35) Remove the protection mats from the wing leading edge and reverser translating sleeve.
- S 444-072-N00
(36) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).
- S 864-073-N00
(37) Remove the DO-NOT-OPERATE tags from the thrust levers.
- S 864-074-N00
(38) For the left engine, close these circuit breakers and remove the DO-NOT-CLOSE tags:
(a) On the P11 panel:
1) 11D13, ENG T/R IND L
2) 11K9, L ENG NAC VENT VALVE
3) 11D14, L ENG T/R CONT
- S 864-075-N00
(39) For the right engine, close these circuit breakers and remove the DO-NOT-CLOSE tags:
(a) On the P11 panel:
1) 11D32, R ENG T/R IND ALTN
2) 11L32, R ENG T/R IND
3) 11L35, R ENG NAC VENT VALVE
4) 11M30, 28V DC R BUS PWR SENSE
5) 11D33, R ENG T/R CONT ALT
6) 11L33, R ENG T/R CONT
- S 714-077-N00
(40) Do a test of the thrust reverser operation (AMM 78-31-00/501).
- S 214-078-N00
(41) Examine the thrust reverser for hydraulic leaks.

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S 864-079-N00
(42) Remove electrical power if it is not necessary (AMM 24-22-00/201).

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THRUST REVERSER – ADJUSTMENT/TEST

1. General

- A. The adjustment of the thrust reverser is necessary for the correct compression of the fire and drain seals and the fit of the thrust reverser halves with the points on the engine and strut that touch. The thrust reverser must install correctly for the adjustment of the thrust reverser tension latches and latch ring.

TASK 78-31-01-825-001-N00

2. Adjustment – Thrust Reverser

A. References

- (1) AMM 24-22-00/201, Electrical Power – Control
- (2) AMM 71-11-04/401, Fan Cowl Panels
- (3) AMM 71-11-06/401, Core Cowl Panels
- (4) AMM 78-31-00/201, Thrust Reverser System
- (5) AMM 78-31-02/501, Latch Bands
- (6) AMM 78-31-04/501, Tension Latches

B. Consumable Materials

- (1) G02020 Modeling Clay – Commercially available
- (2) D00250 Petroleum Jelly – White
- (3) A00299 Transfer Dye – HYSPO107
- (4) B00135 Naphtha
- (5) C00535 Primer – BMS 10-11, Type 1
- (6) A00134 Adhesive – Contact, BMS 5-14

C. Access

(1) Location Zones

- 410 No. 1 Power Plant (Left)
- 420 No. 2 Power Plant (Right)

(2) Access Panels

- 413AL Fan Cowl Panel (Left)
- 414AR Fan Cowl Panel (Right)
- 415AL Thrust Reverser (Left)
- 416AR Thrust Reverser (Right)
- 417AL Core Cowl Panel (Left)
- 418AR Core Cowl Panel (Right)
- 423AL Fan Cowl Panel (Left)
- 424AR Fan Cowl Panel (Right)
- 425AL Thrust Reverser (Left)
- 426AR Thrust Reverser (Right)
- 427AL Core Cowl Panel (Left)
- 428AR Core Cowl Panels (Right)

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D. Prepare to do the Adjustment.

S 865-002-N00

- (1) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

S 865-058-N00

- (2) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

S 045-003-N00

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

- (3) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 015-009-N00

- (4) Remove the fan cowl panels (AMM 71-11-04/401).

S 015-010-N00

- (5) Remove the core cowl panels (AMM 71-11-06/401).

S 015-011-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.

- (6) Open the thrust reverser (AMM 78-31-00/201).

S 865-004-N00

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

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E. Do the Thrust Reverser Adjustment (Fig. 501)

S 025-012-N00

- (1) Remove the bumper pad shims (12, 17, 20) (7 locations) from the three latch fittings and torque box latch.

S 025-000-N00

- (2) Remove the shims (1, 3, 5, 7, 22, 23) from the top and bottom compression pads on the two thrust reverser halves.

S 935-006-N00

- (3) Attach the temporary shims and clay to find the necessary shim thickness with the steps that follow:
 - (a) Attach a temporary shim, 0.165 inches thick, on each side of the three latch fittings and adjacent to the torque box latch (7 locations for shims 12, 17 and 20).
 - (b) Attach a temporary 0.100 inch spacer at the rear compression pad on the top inner wall (at the location for shim 23) on the right thrust reverser half.
 - 1) Apply clay 0.20 inches thick to the spacer.
 - (c) Apply clay 0.20 inches thick to the latch fittings and to the temporary shims on the torque box latch (7 locations for shims 12, 17, 20).
 - (d) Apply clay 0.20 inches thick to the three compression pads on the top inner wall (shim locations 1, 3, and 5) for the two thrust reverser halves.
 - (e) Apply clay 0.20 inches thick to the three bottom compression pads on the inner wall (shim locations 7, 22, and 23), on the right hand thrust reverser half, and at the front compression pad on the left hand thrust reverser half.

S 645-014-N00

- (4) Apply petroleum jelly to prevent a clay bond as follows:
 - (a) Where the clay on the top compression pads touch the strut.
 - (b) Where the clay on the bottom compression pads will touch the opposite thrust reverser half.

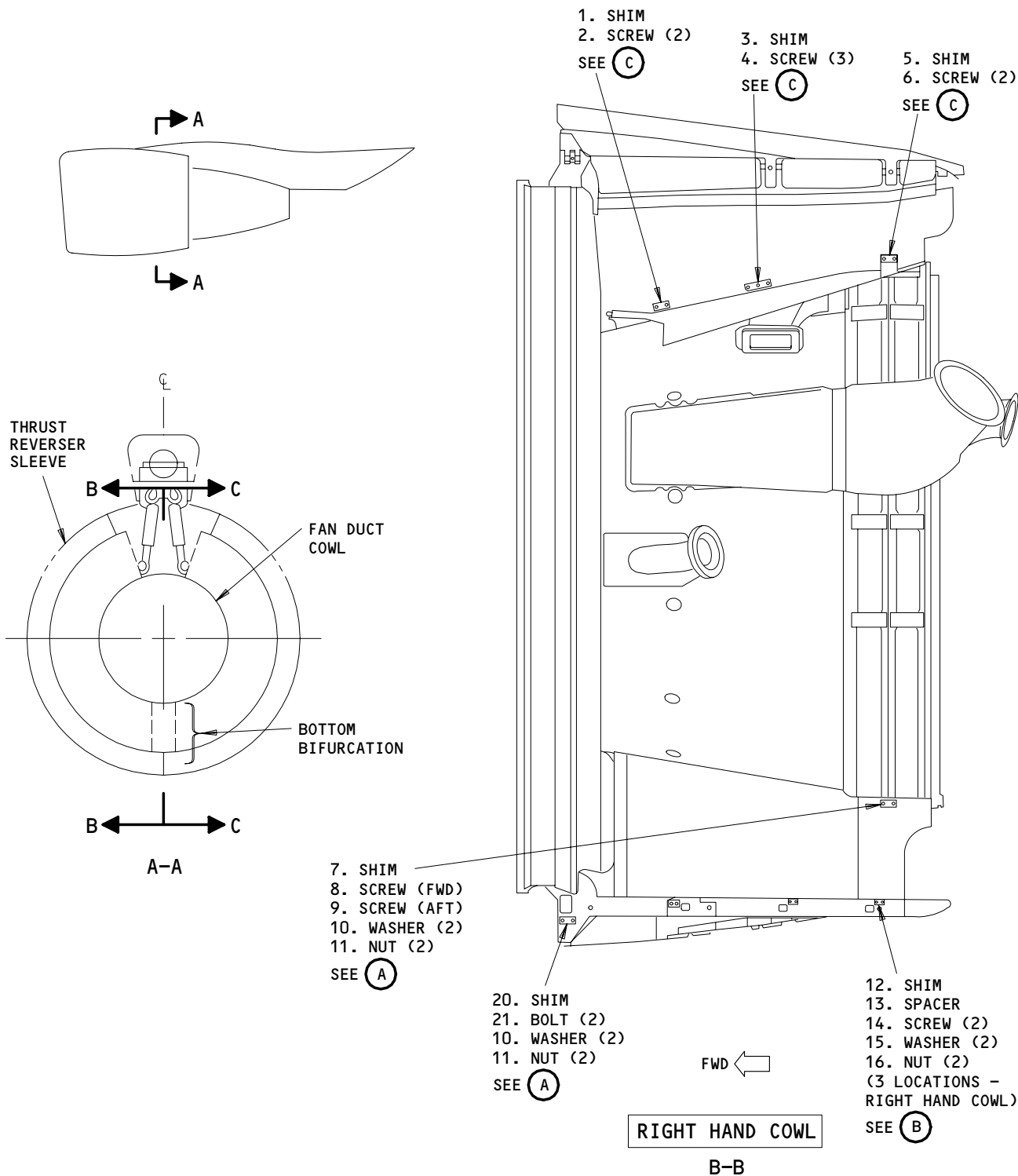
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Thrust Reverser Adjustment
Figure 501 (Sheet 1)

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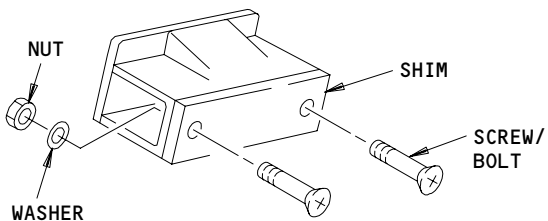
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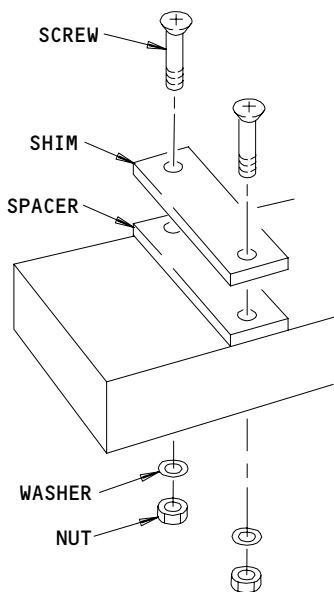
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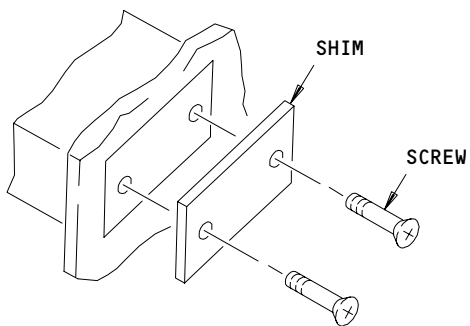
EXAMPLE SHIM INSTALLATION

(A)



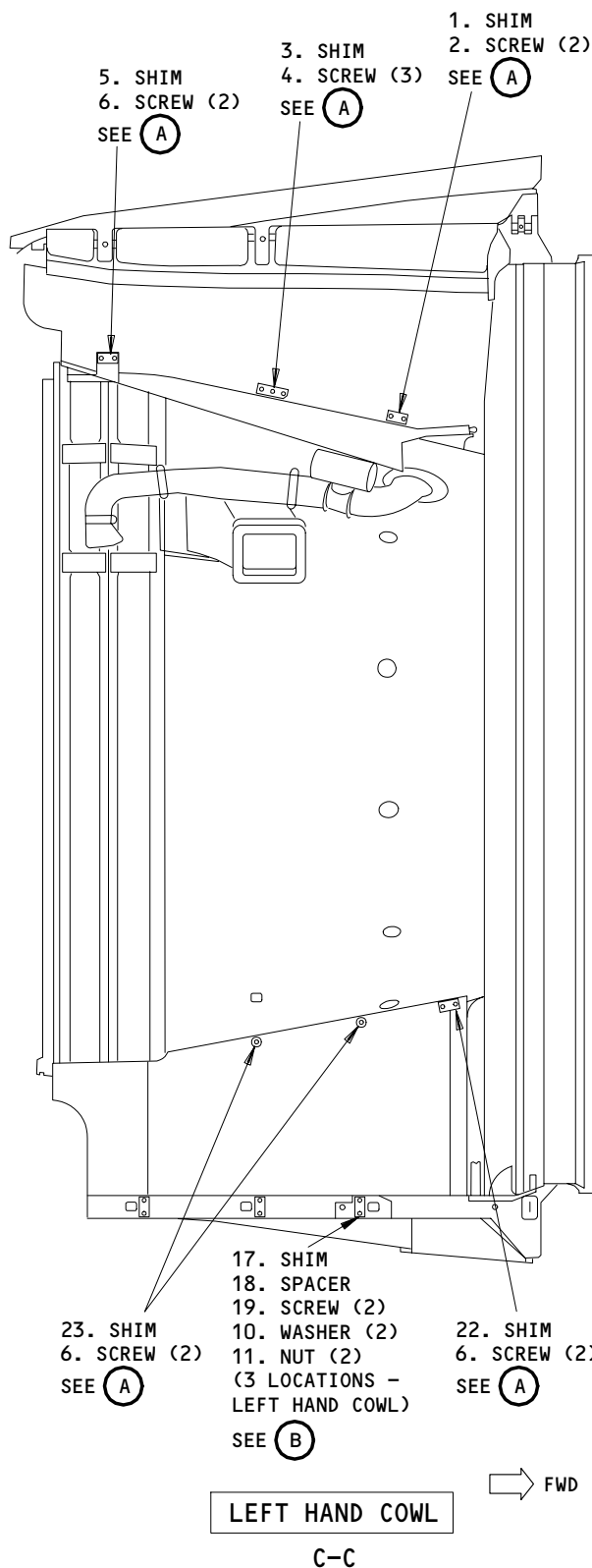
EXAMPLE SHIM/SPACER
INSTALLATION

(B)



EXAMPLE SHIM INSTALLATION

(C)



Thrust Reverser Adjustment
Figure 501 (Sheet 2)

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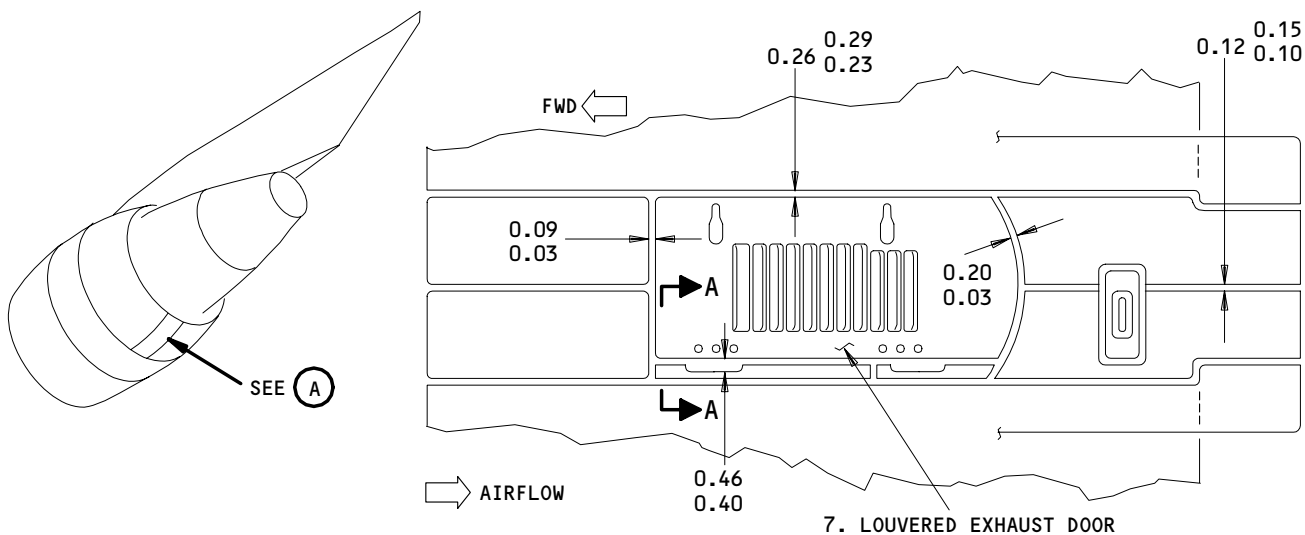
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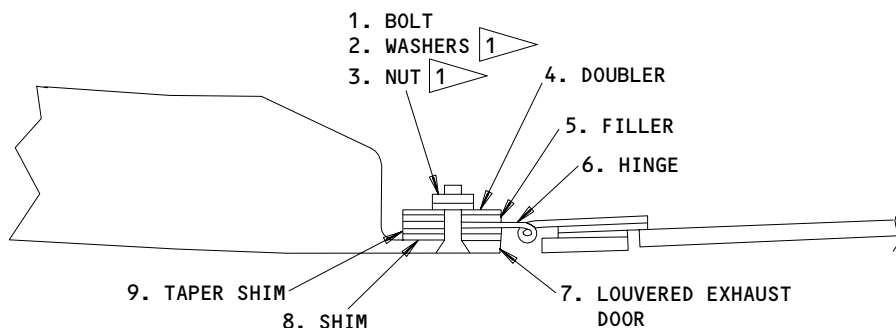
NECESSARY AERODYNAMIC SMOOTHNESS TOLERANCES				
CLEARANCES	1	LONGITUDINAL (STREAMWISE) BUTT JOINT-MAX. CLEARANCES	REMOVABLE PANELS	0.060
			HINGED PANELS	0.080
FLUSHNESS	2	TRANSVERSE (NORMAL TO AIRSTREAM) BUTT JOINT CLEARANCES	REMOVABLE & HINGED PANELS	0.07 0.01
			3	LONGITUDINAL JOINT FLUSHNESS
FLUSHNESS	4	TRANSVERSE JOINT FLUSHNESS	REMOVABLE & HINGED PANELS	0.02 -0.04

(USE THE ABOVE TOLERANCES UNLESS SHOWN DIFFERENTLY IN THE SECTION VIEWS)



VIEW LOOKING UP

A



USUAL LOUVERED EXHAUST DOOR HINGE

A-A

1 IF IT IS NECESSARY TO INSTALL SHIMS IN THE LOUVERED EXHAUST DOOR, THE HI-LOK BOLT CAN BE USED WITH ONE TO THREE WASHERS AND A NUT IN PLACE OF THE HI-LOK COLLAR.

NOTE: ALL DIMENSIONS ARE IN INCHES.

Exhaust Door Adjustment
Figure 502

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(c) Seven locations on the left thrust reverser half for the latch pads.

S 645-015-N00

(5) Apply white petroleum jelly to lubricate the inner engine vee-groove.

NOTE: Lubricant makes the installation of the vee-blade in the vee-groove and the clay removal easier.

(a) Apply the clay into the inner engine vee-groove at the 1, 3, 5, 7, 9, and 11 o'clock positions.

S 645-016-N00

(6) Apply petroleum jelly to the thrust reverser vee-ring at the same locations as the clay to prevent a clay bond.

S 115-008-N00

WARNING: DO NOT GET THE NAPHTHA IN YOUR MOUTH OR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM THE NAPHTHA. PUT ON A PROTECTIVE SPLASH GOGGLE AND GLOVES WHEN YOU USE THE NAPHTHA. KEEP THE NAPHTHA AWAY FROM SPARKS, FLAME AND HEAT. NAPHTHA IS A POISONOUS AND FLAMMABLE SOLVENT WHICH CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(7) Clean the fire seals on the thrust reverser and the two sides of the strut with naphtha.

S 645-018-N00

(8) Apply transfer dye or petroleum jelly to the strut along the area where the fire seal connects, approximately one inch in width and very thin.

S 415-019-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(9) Close the thrust reverser (AMM 78-31-00/201) and make sure that the vee-flange engages the fan case vee-groove.

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- S 825-020-N00
- (10) Push the thrust reverser halves together until the bottom four latches can be engaged on the mating bolt.
- S 435-021-N00
- (11) Install the latch band on the vee-band anchor (AMM 78-31-02/401).
- S 415-022-N00
- (12) Close all the latches, start at the latch band and move to the aft direction with the tension latches.
- S 825-023-N00
- (13) Adjust the latch band (AMM 78-31-02/501).
- S 825-024-N00
- (14) Adjust the four tension latches (AMM 78-31-04/501).
- S 425-025-N00
- (15) Install and adjust the core cowl panels (AMM 71-11-06/401).
- S 215-026-N00
- (16) Examine the aft most bottom bifurcation walls of the thrust reverser and make sure there is a clearance of 0.10-0.13 inches.

NOTE: Adjust and latch the core cowl to control this clearance.

S 015-027-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.

- (17) Open the thrust reverser to the 45 degree position (AMM 78-31-00/201).
- S 975-028-N00
- (18) Measure the thickness of the clay at three points, with equal distances between them, at the bottom of the engine vee-groove.
- (a) The clay thickness must be 0.00-0.10 inches.
- (b) The average of the three values must be a minimum of 0.04 inches.
- S 215-029-N00
- (19) Examine the transfer dye or petroleum jelly on the fire seal.
- (a) The width of the transfer dye or petroleum jelly must be equal to or more than 0.25 inches along the full length of the seal.

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S 165-030-N00

- (20) Clean the petroleum jelly from the strut and seals.

NOTE: Cut the edges of the shims to make them the same shape as the fittings and install the shims with the thicker laminated shim countersunk.

S 975-031-N00

- (21) Measure the clay thickness at each of the three bifurcation compression pads in the top position (shim 1, 3, 5 location).

S 825-032-N00

- (22) Make the 0.125 inch shims equal to the difference between the clay thickness and the specified clearance of 0.06 inches.

NOTE: Specified clearances are limits which apply after the shims are installed. These clearances let the thrust reverser vee-blade and compression pads seal during the engine operation.

S 375-033-N00

- (23) Apply the primer to the shims and let it dry.

S 435-034-N00

- (24) Install the shims with the thicker laminated shim countersunk.

S 435-035-N00

- (25) Install the shim (1) with the screws (2).

S 435-036-N00

- (26) Install the shims (3, 5) with the screws (4, 6).

S 975-037-N00

- (27) Measure the clay thickness at each of the four bifurcation compression pads in the bottom position (shim 7, 22, 23, location).

S 825-038-N00

- (28) Make the 0.125 inch shims equal to the difference between the clay thickness and the specified clearance of 0.06 inches.

S 375-039-N00

- (29) Apply the primer and let it dry.

S 435-040-N00

- (30) Install the shims with the thicker laminated shim countersunk.

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- S 435-041-N00
(31) Install the shim (7) with the screws (8, 9), washers (10) and nuts (11).
- S 435-042-N00
(32) Install the shims (23) with the screws (6).
- S 435-043-N00
(33) Install the shim (22) with the screws (6).
- S 975-044-N00
(34) Measure the clay thickness for the seven bumper pad shims at the latch fittings (shim 12, 17, 20 locations).
- S 825-045-N00
(35) Make the 0.125 inch shims equal to the sum of the temporary shim and the clay thickness.
- S 825-007-N00
(36) Make the shims the necessary thickness with a tolerance of plus or minus 0.003 inch.

NOTE: It can be necessary to change the dimension of the countersunk holes.

- S 375-046-N00
(37) Apply the primer to the shim and let it air dry for 10 minutes or until it feels tacky.

NOTE: You can make the adhesive thinner by 50% with MEK.

- S 435-047-N00
(38) Install the bumper pad shims (17) and the spacers (18) with the screw (19), washer (10) and nut (11).

- S 435-048-N00
(39) Install the bumper pad shims (12) and the spacer (13) with the screw (14), washer (15) and nut (16).

- S 435-049-N00
(40) Install the latch shim on the torque box (20) with the bolts (21), washers (10) and nuts (11).

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S 415-050-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

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

NOTE: Keep the fan cowl panels and core cowl panels open.

S 225-051-N00

(42) Examine the closing force on the T-bolt handle of the latch band and adjust it if it is necessary (AMM 78-31-02/501).

S 225-052-N00

(43) Examine the closing force of the tension latch at the four latch locations and adjust them if it is necessary (AMM 78-31-04/501).

S 415-053-N00

(44) Close the louvered exhaust door.

S 825-054-N00

(45) Make sure the door and bottom fairing are aligned and examine the clearance (Fig. 502).

S 435-055-N00

(46) If the clearances are more than the limits, install shims on the louvered exhaust door (7) if it is necessary.

S 415-056-N00

(47) If the adjustment of the thrust reverser is done after the thrust reverser is replaced, go to AMM 78-31-01/401 to complete the procedure.

S 415-057-N00

(48) If the adjustment of the thrust reverser is done after you examine the thrust reverser shims because of an engine change, go to AMM 71-00-02/401 to complete the procedure.

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THRUST REVERSER – INSPECTION/CHECK

1. General

- A. You must do the thrust reverser adjustment procedure when you change the strut or the thrust reverser. When you change the engine, only the inspection procedure will be necessary to verify the adjustment is correct.
- B. This inspection/check procedure is used after an engine change. This procedure does a clay check to make sure the v-blades correctly engage the v-groove, the gaps at the wear pads at the upper and lower bifurcation are correct and the forces to close the latch band and tension latches are correct. If the thrust reverser does not pass this check, there is a physical change in the thrust reverser installation relative to the engine.
- C. The hinges at the top of the thrust reverser support the static vertical load of the thrust reverser on the airplane. The v-blade at the front of the thrust reverser engages into the v-groove of the engine fan case and transmits the thrust load on the thrust reverser into the engine in flight and in reverse thrust.
- D. Because the thrust reverser splits into the left and right half, it is important that the latch band at the front of the thrust reverser and the tension latches on the bottom of the reverser keep the thrust reverser attached to the airplane strut and engine for an engine problem such as a fan blade out condition.
- E. The correct force to close the handles for the latch band and tension latches requires wear pads on the upper and lower bifurcation of the inner wall and latch pads around the tension latches are shimmed for the correct gap measurement. In addition, the correct force to close the latches also ensures the correct compression of the bulb type fire seal which contains an external engine fire under the thrust reverser cowl and allows the fire to be extinguished with the fire bottles.

TASK 78-31-01-206-001-N00

2. Inspection – Thrust Reverser

A. References

- (1) AMM 24-22-00/201, Electrical Power – Control
- (2) AMM 78-31-00/201, Thrust Reverser System
- (3) AMM 78-31-01/501, Thrust Reverser

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- (4) AMM 78-31-02/501, Latch Band
- (5) AMM 78-31-04/501, Tension Latches
- B. Equipment
 - (1) Spring Scale, Push-Pull, 100 pound capacity
 - (2) Caliper - Vernier, 0-6 Inch, Readable to 1/1000 Inch
 - (3) Micrometer, Depth, 0-1 Inch, Readable to 1/1000 Inch
- C. Consumable Materials
 - (1) G02020 Modeling Clay - Commercially available
 - (2) D00504 Grease (Petrolatum or Petroleum Jelly - White)
 - (3) B00083 Solvent, Naphtha TT-N-95
 - (4) G00034 Cloth Wiper, Clean, Lint Free, BMS15-5
- D. Access
 - (1) Location Zones
 - 410 No. 1 Power Plant (Left)
 - 420 No. 2 Power Plant (Right)
 - (2) Access Panels
 - 413AL Fan Cowl Panel (Left)
 - 414AR Fan Cowl Panel (Right)
 - 415AL Thrust Reverser (Left)
 - 416AR Thrust Reverser (Right)
 - 417AL Core Cowl Panel (Left)
 - 418AR Core Cowl Panel (Right)
 - 423AL Fan Cowl Panel (Left)
 - 424AR Fan Cowl Panel (Right)
 - 425AL Thrust Reverser (Left)
 - 426AR Thrust Reverser (Right)
 - 427AL Core Cowl Panel (Left)
 - 428AR Core Cowl Panels (Right)
- E. Prepare for the Procedure
 - S 866-002-N00
 - (1) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

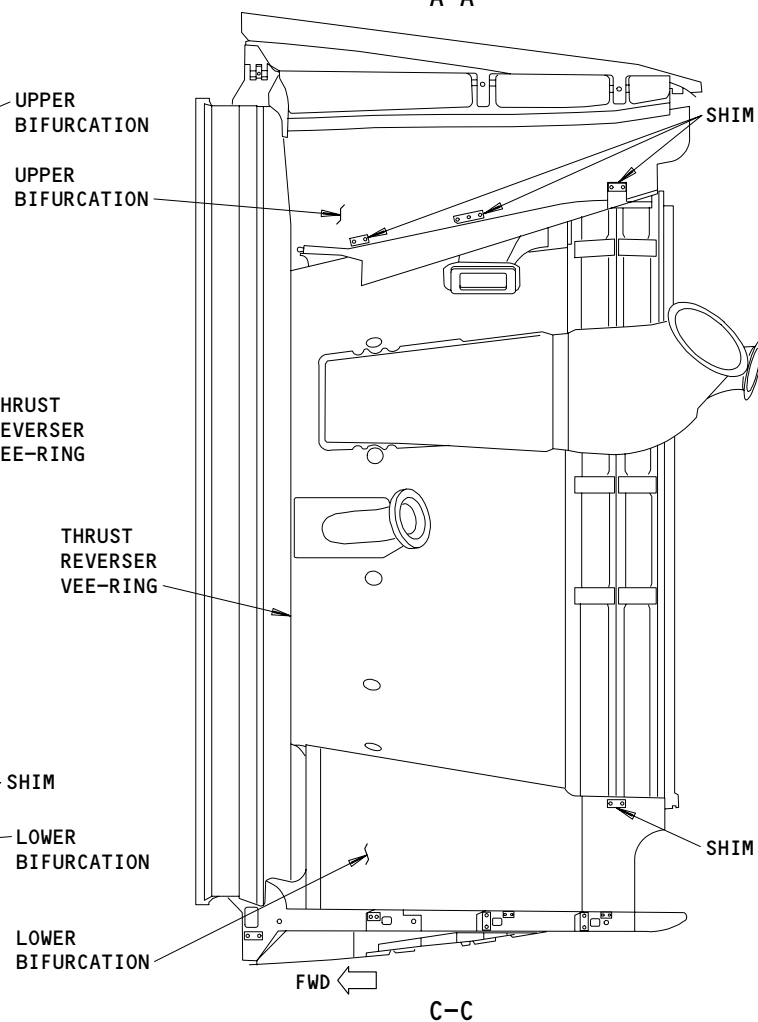
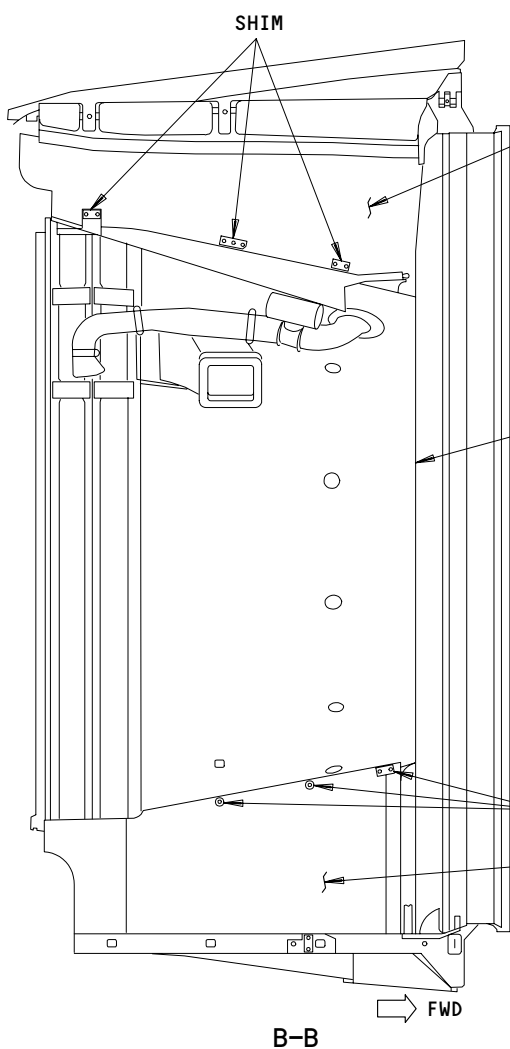
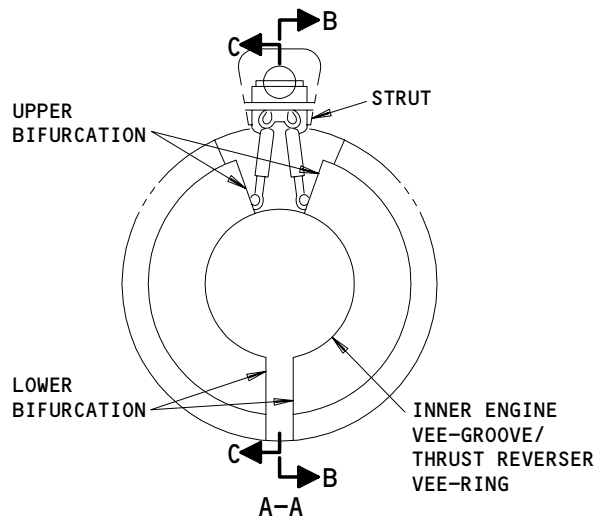
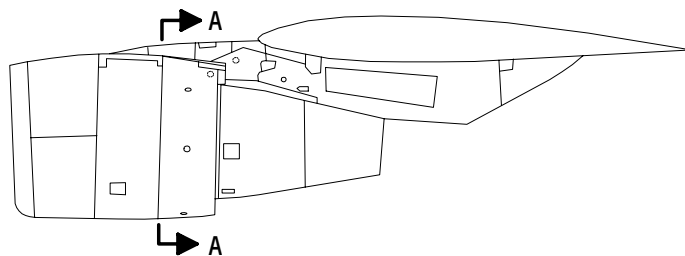
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Thrust Reverser Inspection/Check
Figure 601

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S 216-024-N00

- (2) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

S 046-025-N00

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

- (3) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 016-026-N00

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

S 016-027-N00

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

S 016-004-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

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

F. Examine the Thrust Reverser

S 216-036-N00

- (1) Apply the petroleum jelly to lubricate the inner engine vee-groove.

NOTE: The lubricant will make it easier to install the vee-blade in the vee-groove and to cause the clay to come out.

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S 216-037-N00

- (2) Apply modeling clay into the inner vee-groove at the 1, 3, 5, 7, 9, and the 11 o'clock positions.

S 436-006-N00

- (3) Apply the modeling clay, approximately 0.20 inch thick, to these shims:
- (a) The three upper bifurcation shims on each thrust reverser half.
 - (b) The three lower bifurcation shims on the left thrust reverser half.
 - (c) The one lower bifurcation shim on the right thrust reverser half.

S 646-007-N00

- (4) Apply petroleum jelly to the six points on the strut that touch the shims when you close the thrust reverser.

NOTE: The petroleum jelly is a parting agent to make sure the modeling clay cannot bond to the opposite structure.

S 646-020-N00

- (5) Apply petroleum jelly to the four lower bifurcation shim points that touch the opposite thrust reverser halves.

S 416-021-N00

WARNING: OBEY THE INSTRUCTION IN THE PROCEDURE TO TO CLOSE THE THRUST REVERSER. IF YOU DO NOT OBEY THESE INSTRUCTIONS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (6) Close and latch the thrust reverser (AMM 78-31-00/201).

S 216-038-N00

- (7) Do a check of the force to close the T-bolt latch on the latch band and the four tension latches.

CAUTION: MAKE SURE THE T-BOLT IS CORRECTLY ENGAGED IN THE RECEIVER OF THE VEE-GROOVE LATCH BAND BEFORE YOU CLOSE THE T-BOLT LATCH HANDLE. FAILURE TO OBEY THIS INSTRUCTION CAN CAUSE DAMAGE TO THE T-BOLT OR THE RECEIVER ON THE VEE-GROOVE LATCH BAND.

- (a) For the T-bolt latch on the latch band, use the spring scale to measure the force you must use to close the T-bolt latch handle.
- 1) Make sure the force to close the T-bolt latch handle is 40-60 pounds (178-267 Newtons).
 - 2) Adjust the T-bolt latch on the latch band as necessary (AMM 78-31-02/501).

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- (b) For the No.1 tension latch, use the spring scale to measure the force to close the latch.
 - 1) Make sure the tension latch fully engages the eyebolt with the specified closing force.

NOTE: The tension latches that are correctly adjusted will open with a noise.

- 2) Make sure the force to close the latch is 40-60 pounds (178-267 Newtons).
 - 3) Adjust the tension latch as necessary (AMM 78-31-04/501).
- (c) For the No.2 to No.4 aft tension latches, use the spring scale to measure the force to close each latch.
 - 1) Make sure the force to close each latch is 40-60 pounds (178-267 Newtons).
 - 2) Adjust the tension latches as necessary (AMM 78-31-04/501).

S 016-022-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

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

S 216-039-N00

- (9) Measure the thickness of the clay at the three points at the bottom of the engine vee-groove for each thrust reverser half with a caliper or depth micrometer.
 - (a) The clay thickness must be 0.00-0.10 inch (0.00-2.54 millimeters).
 - (b) The average of the three values must be a minimum of 0.04 inch (1.02 millimeter).

S 216-010-N00

- (10) Examine the clay on the shims.
 - (a) If the clay is pushed from between the thrust reverser halves, adjust the thrust reverser (AMM 78-31-01/501).

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(b) If the clay is not pushed from between the thrust reverser halves, continue and complete this procedure.

S 216-023-N00

- (11) Measure the thickness of the remaining modeling clay on each lower bifurcation shim with a caliper or depth micrometer.
(a) The thickness of the remaining modeling clay on each shim must be 0.04-0.09 inch (1.02-2.29 millimeters).

S 216-028-N00

- (12) Measure the thickness of the remaining modeling clay on each upper bifurcation shim with a caliper or depth micrometer.
(a) The thickness of the remaining modeling clay on each shim must be 0.06-0.09 inch (1.52-2.29 millimeters).

S 216-040-N00

- (13) If the thickness of the clay at the upper and lower bifurcation shims or the vee-groove are not correct, do the adjustment of the thrust reverser again (AMM 78-31-01/501).

G. Put the Airplane Back to Its Usual Condition.

S 166-041-N00

- (1) Clean the petroleum jelly from the strut, upper and lower bifurcation thrust reverser pads, the thrust reverser vee-blade, and the engine vee-groove with naphtha and a cloth wiper.

S 416-029-N00

WARNING: OBEY THE INSTRUCTION IN THE PROCEDURE TO TO CLOSE THE THRUST REVERSER. IF YOU DO NOT OBEY THESE INSTRUCTIONS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

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

S 416-030-N00

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

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- S 416-031-N00
- (4) Close the fan cowl panels (AMM 71-11-04/201).

- S 446-032-N00
- (5) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

- S 866-033-N00
- (6) Remove the DO-NOT-OPERATE tags from the thrust levers.

- S 866-042-N00
- (7) Remove the electrical power if it is not necessary (AMM 24-22-00/201).

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THRUST REVERSER – APPROVED REPAIRS

1. General

- A. This procedure gives instructions to repair these areas:
 - (1) The insulation coating that is not metal
 - (2) The fire barrier material on the strut firewall
 - (3) The inside areas of the fan duct cowl
 - (4) The thrust reverser.
- B. These procedures are limited to small, not-highly-contoured areas. No flight delay is necessary for cure of the insulative coating systems, or for precure of the repair plug material used in the procedures.
- C. These procedures include minor and major damage repair. You can do all procedures on the lower 270 degree arc of the fan duct cowl and thrust reverser if it is necessary.
- D. The repair of the upper 90 degrees arc, which includes the strut firewall, is in the major damage procedure.
- E. These are the procedure titles, and the applicable areas for the repair:

Procedure Title	Applicable Area
Repair of Slight Abrasions/ Minor Damage	Lower 270° Arc Only, but not the Lower Bifurcation
Repair of Scratches, Cuts and Minor Damage down to Base Metal	Lower 270° Arc Only, but not the Lower Bifurcation
Repair of Major Damage and Insulation that is Gone - Molded Patch Method	All Areas

TASK 78-31-01-308-031-N00

2. Fan Duct Cowl and Thrust Reverser Fire Insulation Repair

- A. Equipment
 - (1) Shore A Durometer
 - (2) Brush, Soft Bristle

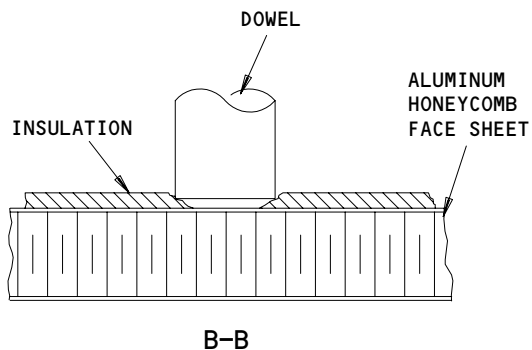
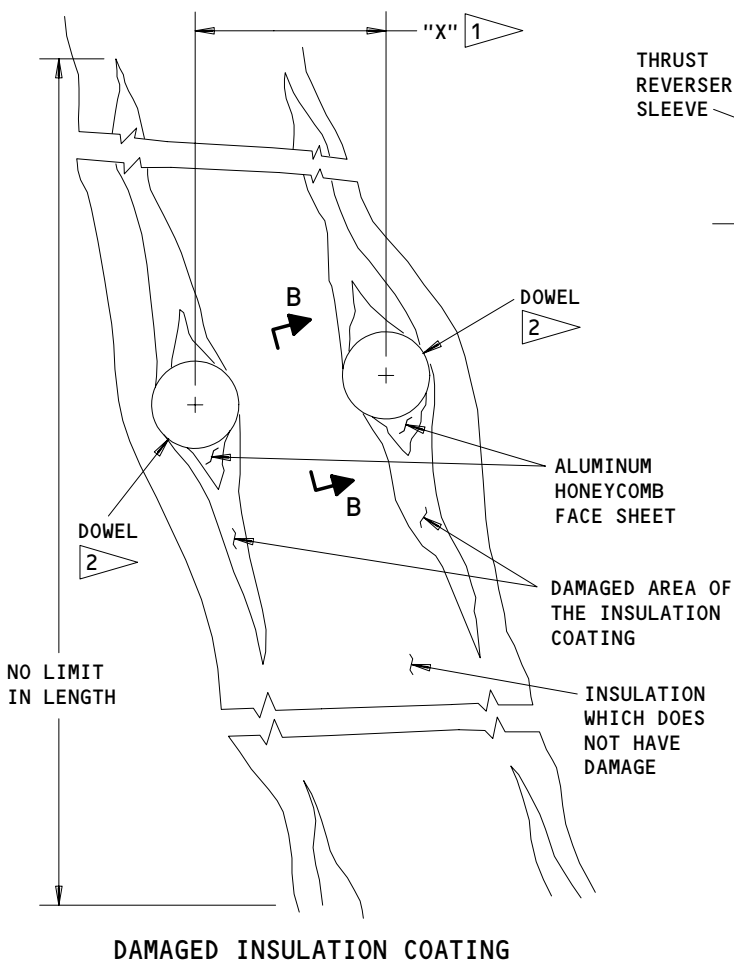
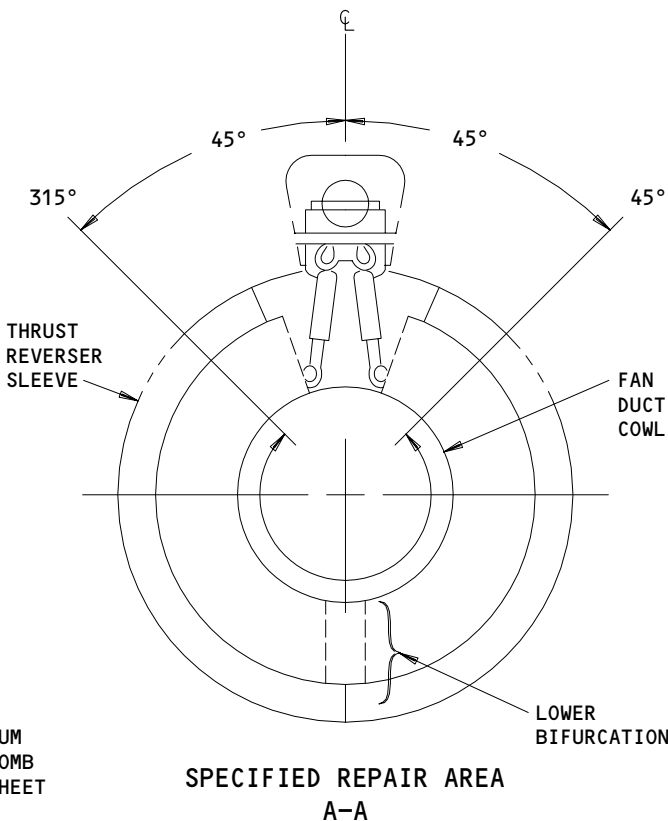
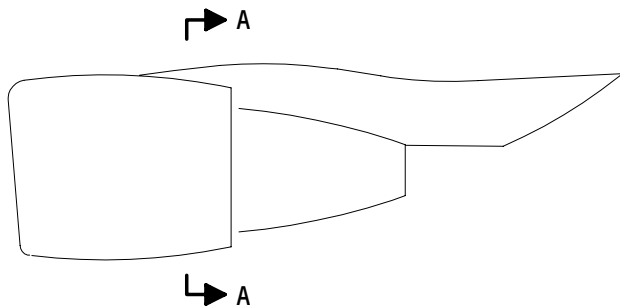
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- 1 DIMENSION "X" OF 2.0 INCHES OR MORE ARE DIFFERENT DAMAGE AREAS (LESS THAN 2.0 INCHES IS ONE DAMAGE AREA)
- 2 1.0 INCH DIAMETER DOWEL

Thrust Reverser Insulation Repair
Figure 801 (Sheet 1)



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B. Consumable Materials

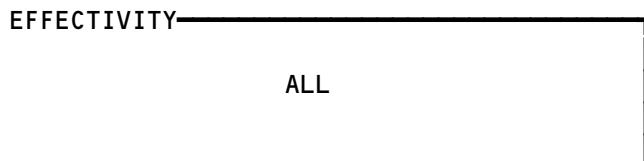
- (1) Abrasive Paper, Aluminum Oxide, 180, 240 and 320 grit (AMM 20-30-07/201)
- (2) Cheesecloth - New, Clean, Dry, Lint Free, BMS 15-5 (AMM 20-30-07/201)
- (3) B00666 Solvent, Methyl Propyl Ketone (MPK)
- (4) A00309 Dibutyl Tin Dilaurate (Thermolyte-12)
- (5) A00964 Chemical and Solvent Resistant Finish, BMS 10-11, Type II, (QPL)
- (6) C00926 Insulation Coating, BMS 10-102, Type I, Class 1, Grade 28
- (7) C00926 Insulation Coating, BMS 10-102, Type I, Class 1, Grade 25
- (8) C00926 Insulation Coating, BMS 10-102, TYPE I, CLASS 2, GRADE 32
- (9) C00926 Insulation Coating, BMS 10-102, TYPE I, CLASS 2, GRADE 30
- (10) Insulation Sealant, Crown Metro 68-C3-1, Precured Type III, Crown Metro Inc., P.O. Box 5695, Elchon Road, Donaldson Center, Greenville, SC 29606

RTV560 OR RTV60 CURING AGENT CONCENTRATION AND CATALYST MEASURING GUIDE

Curing Agent Concentration (Parts per 100)	Nuocure 28 (Tin Octoate)				Thermolyte-12 (Dibutyl Tin Dilaurate)				
	No. of Drops of Catalyst at the Specified Concentration 		Pot Life (Hours)	Full Cure (Hours)	No. of Drops of Catalyst at the Specified Concentration 		Pot Life (Hours)	Surface is not Tacky (Hours)	Full Cure (Hours)
	Per 100g	Per lb			Per 100g	Per lb			
0.1	4	21	0.5	1.0	5	23	4-6	10-12	36-40
0.25	12	62	0.25	0.75	15	69	2-3.5	5-7	26-30
0.5	20	105	0.1	0.5	25	115	1-1.5	1.5-2.5	16-24

 FROM CONVENTIONAL TYPE MEDICINE DROPPER

Thrust Reverser Insulation Repair
Figure 801 (Sheet 2)



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- (11) C00870 Silicone Primer, DC-1200, Red Tinted
- (12) A01047 RTV 60 Grade A Topcoat, BMS 10-102, TYPE II
- (13) A01047 RTV 60 Grade B Topcoat, BMS 10-102,
Type II w/ fiber reenforcement
- (14) Thinner, Naphtha, BMS 3-2 Type II
(AMM 20-30-01/201)
- (15) A00308 Tin Octoate (Nuocure 28)
(AMM 20-30-01/201)
- (16) Teflon Sheet
- (17) Cleara Mold Release Wax
(100% yellow carnuba base wax, no silicones)
Cleara Products, Inc., P.O. Box 5724,
Denver CO
- (18) Frekote 33 Aerosol Spray
Frekote, Inc., Boca Raton, FL
- (19) KRAX0 1711 Aerosol Spray
Contour Chemical Company, North Reading, MA
- (20) MS-122 Aerosol Spray
Miller-Stephenson Chemical Company, Danbury, CN
- (21) Release-All No. 30 Aerosol Spray (blue)
Airtech International, Carson CA

C. 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

D. Access

- (1) Location Zones
 - 411 Left Engine
 - 421 Right Engine
- (2) Access Panels
 - 415AL Fan Reverser (Left)
 - 416AR Fan Reverser (Right)
 - 425AL Fan Reverser (Left)
 - 426AR Fan Reverser (Right)

E. Preparation for the Repair (Fig. 801 and 802)

S 048-032-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).

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S 018-033-N00

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

S 018-059-N00

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

S 018-034-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE 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 218-035-N00

- (5) Examine all insulation.

S 358-036-N00

- (6) If you can put a one inch diameter dowel into the area where there is no insulation, do these steps:
- (a) Examine the honeycomb panel face sheet for delamination.
 - 1) Repair the honeycomb if delamination has occurred.
 - (b) Repair the loose insulation before the insulation falls off.
 - (c) Replace the insulation with the same or more than the initial thickness.

S 218-037-N00

- (7) Examine the insulation for damage.

S 398-038-N00

- (8) Seal all of the damaged areas with BMS 10-102, Type II.

S 358-039-N00

- (9) Use the major damage repair procedure if the damaged areas of the insulation are less than two inches between the dowel centers.

S 358-040-N00

- (10) The thicknesses of the insulation layer are shown on Fig. 802.
- (a) The areas coated to keep the structure serviceable during operation are shown.
 - (b) Other areas are coated to decrease the damage and repair costs if a duct rupture or fire occurs.

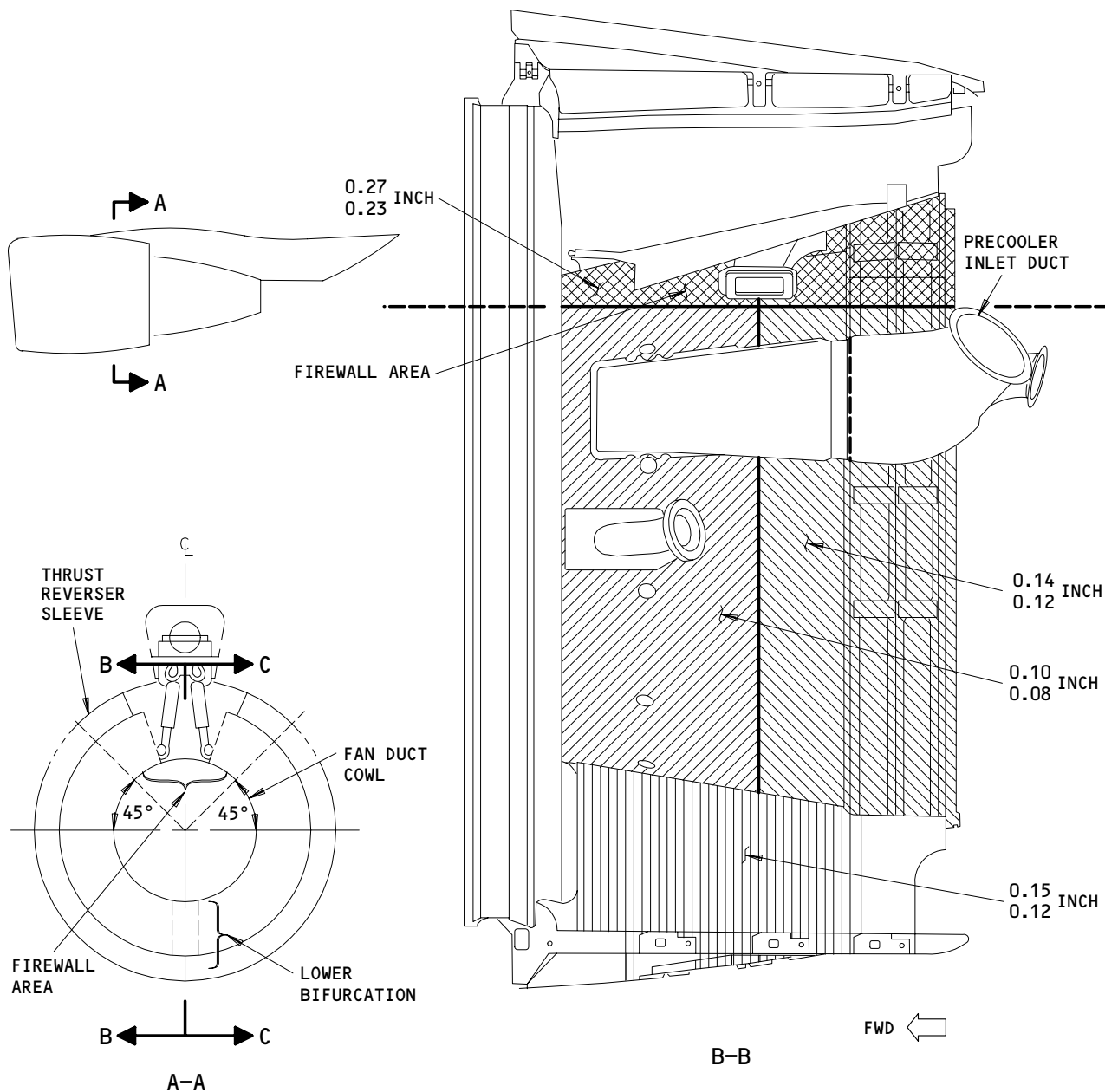
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Insulation Coating Thickness
Figure 802 (Sheet 1)

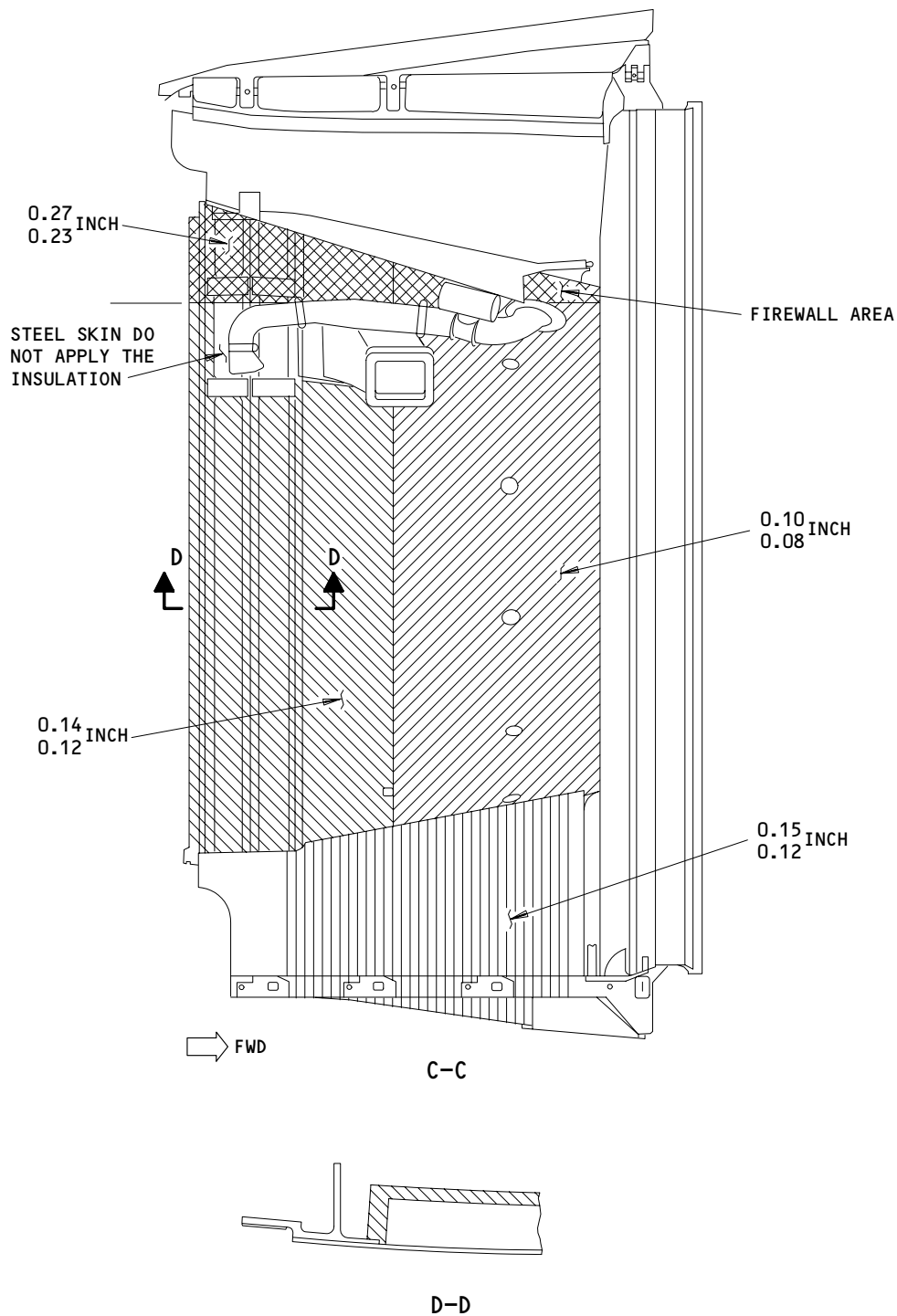
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NOTE: DO NOT APPLY INSULATION TO THE FACE OF THE COMPRESSION PADS, OR LATCH KEEPER. DO NOT CAUSE BLOCKAGE OF THE DRAIN PATHS.

Insulation Coating Thickness
Figure 802 (Sheet 2)

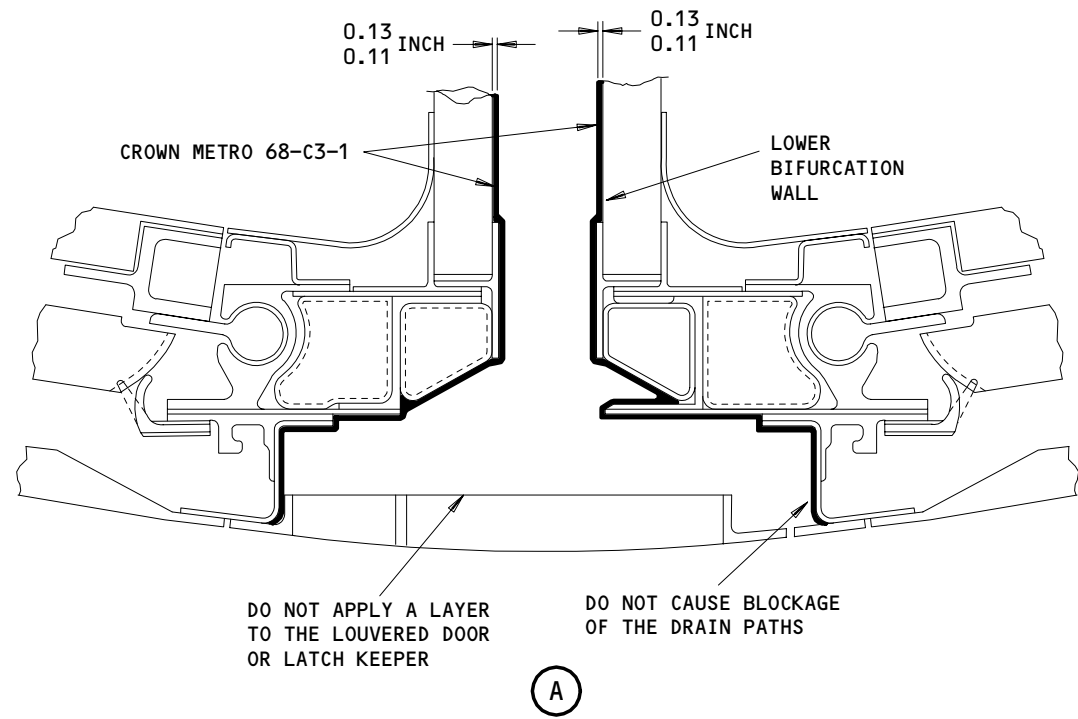
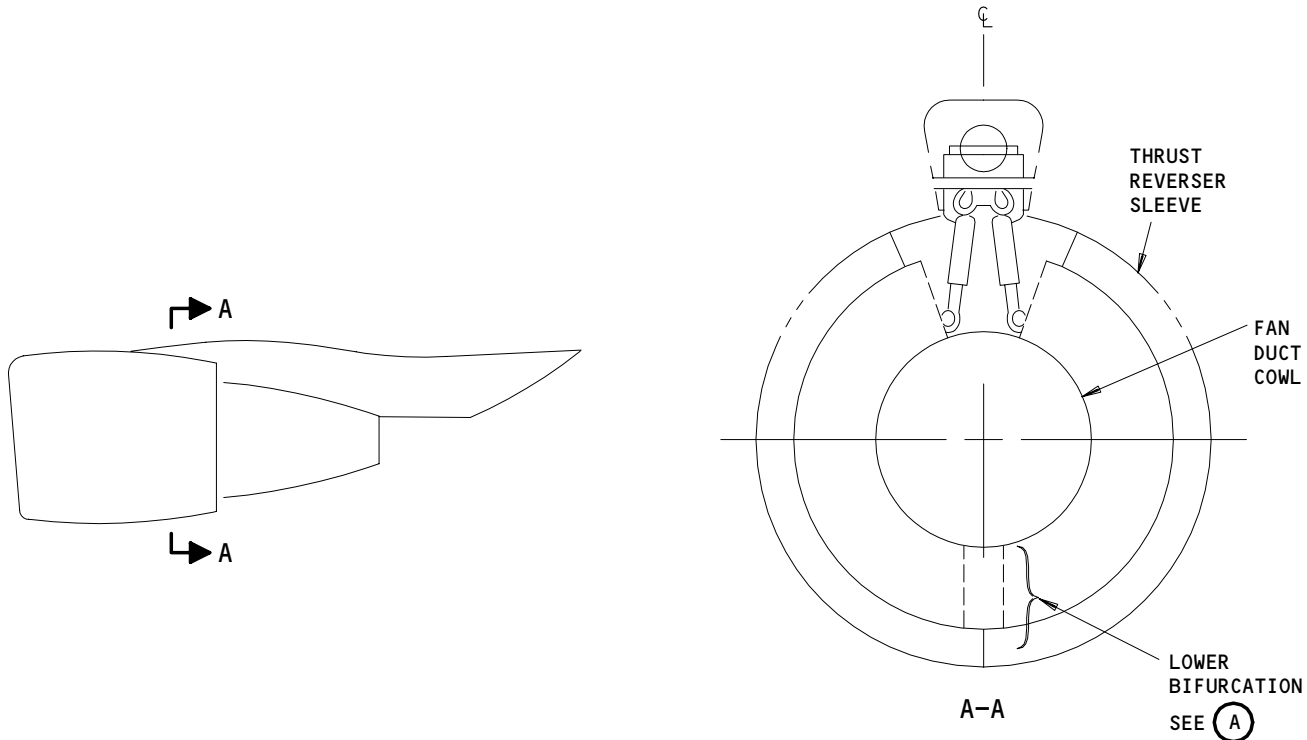
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Lower Bifurcation Coating Thickness
Figure 803

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F. Repair of Slight Abrasions/Minor Damage

S 358-041-N00

- (1) Do the steps that follow for repair of slight abrasions and minor damage.

NOTE: This repair is for areas less than four square inches and the depth of the damage is less than 20 percent of the insulation thickness.

CAUTION: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO CLEAN THE REPAIR AREAS. DO NOT USE SOLVENTS TO CLEAN THE REPAIR AREA BECAUSE CONTAMINATION OF THE INSULATION CAN OCCUR EASILY. IF YOU DO NOT OBEY THESE INSTRUCTIONS, YOU CAN CAUSE DAMAGE TO THE EQUIPMENT.

- (a) Move abrasive paper lightly on the edges to make them smooth.
- (b) Remove the dust with a soft brush or a clean cheesecloth.
- (c) Seal the areas where you see the insulation.
- (d) Use your BMS 10-11, Type II sealant.

NOTE: Refer to the supplier's recommendations when you mix BMS 10-102, Type II.

G. Repair of the Scratches, Cuts and Minor Damage Down to Base Metal

S 358-042-N00

- (1) Do the steps that follow for repair of the scratches, cuts and minor damage down to base metal.

NOTE: This repair procedure is for damage less than one-half inch in width that goes down to the base metal.

CAUTION: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO CLEAN THE REPAIR AREAS. DO NOT USE SOLVENTS TO CLEAN THE REPAIR AREA BECAUSE CONTAMINATION OF THE INSULATION CAN OCCUR EASILY. IF YOU DO NOT OBEY THESE INSTRUCTIONS, YOU CAN CAUSE DAMAGE TO THE EQUIPMENT.

- (a) Remove the loose material with a soft brush or a clean cheesecloth.
- (b) Seal the areas where you see the insulation.
- (c) Use BMS 10-102, Type II.

NOTE: Refer to the supplier's recommendations when you mix BMS 10-102, Tpye II.

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H. Repair of Major Damage and Insulation that is Missing - Molded Patch Method.

S 358-043-N00

- (1) Do the steps that follow for repair of the major damage and insulation that is missing.

NOTE: This repair procedure uses molded patches of insulation with the same thickness or more than that of the original insulation on the cowl.

CAUTION: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO CLEAN THE REPAIR AREAS. DO NOT USE SOLVENTS TO CLEAN THE REPAIR AREA BECAUSE CONTAMINATION OF THE INSULATION CAN OCCUR EASILY. DO NOT CAUSE SCRATCHES ON THE BASE METAL. IF YOU DO NOT OBEY THESE INSTRUCTIONS, YOU CAN CAUSE DAMAGE TO THE EQUIPMENT.

- (a) Cut through the top coat layer of the insulation with a sharp knife that is not metal.
 - 1) Remove the insulation with a scraper that is not metal.
 - 2) Remove the loose material with a soft brush or a clean cheesecloth.
- (b) Apply the primer to the repair area.
 - 1) Apply a constant layer to make the surface wet.
 - 2) Dry the primer for 30 minutes at 75 ±10°F.
 - 3) The maximum cure time before you can apply a top coat layer over the primer is two hours at 50 percent (or more) humidity.
- (c) The maximum cure time is four hours at 30 to 49 percent humidity.
- (d) Where necessary, use BMS 10-102, Type I, Class 2, to apply a molded patch insulative coating system.
- (e) Cut the repair plug from the plug material to the accurate dimension of the repair area.
- (f) WHEN YOU USE BOEING MATERIAL SPECIFICATION 10-102 TO APPLY A TYPE I INSULATION COATING;
Refer to the supplier's recommendations when you mix the coating.
- (g) WHEN YOU USE BMS 10-102 TYPE II;
Prepare as follows:
 - 1) Use the Nuocure 28 (Tin Octoate) to prepare the BMS 10-102, Type II.
 - 2) Mix the base material before you add the catalyst.
 - 3) Use the table in Fig. 801 to find the necessary pot life.
 - 4) Add the catalyst to the base material.
 - 5) Mix the catalyst and base material fully.
- (h) Apply the BMS 10-102, Type II to the primed area and the repair plug mating surface.
- (i) Push the repair plug into position.

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- (j) Seal the mating area between the insulation and the repair plug with the BMS 10-102, TYPE II.
- (k) Use the teflon sheet to hold the plug in its position.
- (l) Push out all the air that is caught.
 - 1) Work out the air from the center.
- (m) Permit sufficient time for the BMS 10-102, TYPE II to dry.
- (n) Make sure the repair plug bonded correctly.
- (o) If the edges did not bond, apply the BMS 100-102, Type II and push it correctly into its position.
- (p) Permit sufficient time for the BMS 10-102, Type II to dry.
- (q) If you use a patch without the BMS 10-102 top coat layer, apply the BMS 10-102, Type II topcoat layer to the repair area.
 - 1) Do this procedure: Apply the BMS 10-102, Type II topcoat coat layer.

I. Prepare the BMS 10-102 Type II Molded Patch:

S 848-044-N00

- (1) Prepare tooling molds from master models or other engineering approved models.
 - (a) Lightly abrade the mold surfaces to remove any release agent.
 - (b) Remove all residues with solvent.
 - (c) Apply release agent to mold.

S 918-045-N00

- (2) BMS 10-102, Type I, Class 2, Grade 32 insulative systems usually come in kits that include these parts:
 - (a) Part A (base material)
 - (b) Part B (catalyst)
 - (c) Part C (catalyst thinner)

S 338-046-N00

- (3) Do these steps to mix the materials and cast it in the molds as soon as possible:
 - (a) Use a rigid blade that is not wood to fully mix part A until you get a constant mixture.
 - (b) Mix part C and part B in a 1:1 ratio by weight.
 - (c) Fully mix one part of the mixture of parts B and C, by weight, to 7.77 parts by weight of part A.

NOTE: The pot life of the mixed plug material is ten minutes at 50-90°F.

S 338-047-N00

- (4) Cast the insulation coating that you selected into the mold in a flat layer which is thicker than necessary.
 - (a) Use a trowel to make it smooth.

S 918-048-N00

- (5) Use one of these steps to dry the plug material:

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CAUTION: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO DRY THE INSULATION TOP COAT. THE BMS 10-102 INSULATIVE SYSTEM WILL NOT DRY CORRECTLY BELOW 70°F. THE PROPERTIES OF THE INSULATION AND THE RATE TO DRY CAN CHANGE. IF YOU DO NOT OBEY THESE INSTRUCTIONS, YOU CAN CAUSE DAMAGE TO THE EQUIPMENT.

- (a) Dry the plug at room temperature between 70°F and 90°F for 24 hours or until it has minimum hardness of 40 measured with a Shore A durometer.

NOTE: A durometer value of 40 is the same hardness as a rubber band.

- (b) Dry the plug at a room temperature between 70°F and 90°F for 12 hours and four hours at 140 ±10°F.
 - 1) The molded patch is dry when it has a minimum hardness of 40 measured with a Shore A durometer.
- (c) Remove the dried material from the mold.
- (d) Examine the molded patch for holes and wet areas.
 - 1) Make sure the layers are smooth, free of blisters, and free of contamination.
- (e) Keep the dried plug material in containers to prevent damage and contamination (i.e. solvents/hydrocarbon fluids).
 - 1) Prevent long exposure to sunlight.
- (f) You can apply a BMS 10-102, TYPE II, top coat layer when the patch is dried.
 - 1) Do this procedure: Apply the BMS 10-102, Type II top coat layer.

J. Prepare a molded patch with the BMS 10-102, Type I Class 2, Spec insulation coating

S 848-049-N00

- (1) Prepare tooling molds from master models or other engineering approved models.
 - (a) Lightly abrade the mold surfaces to remove any release agent.
 - (b) Remove all residues with solvent.
 - (c) Apply release agent to mold.

S 918-050-N00

- (2) The BMS 10-102 type insulation coating systems come in kits that include these parts:
 - (a) Part A (base material)
 - (b) Part B (catalyst)
 - (c) Part C (catalyst thinner)

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S 338-051-N00

- (3) When the supplier's instructions are not used, use these steps to mix the materials and cast it in the molds as soon as possible:
- (a) Use a rigid blade that is not wood to fully mix part A until you get a constant mixture.
 - (b) Fully mix the necessary quantity of part B and part C in a ratio of 1:1 by weight.
 - (c) Fully mix one part of the mixture of part B and part C, by weight, to 12.7 parts by weight of part A.
 - (d) Let the material you mixed stay for ten minutes to get the correct density before you apply it.

NOTE: The pot life of the mixed material is 60 minutes at 70-90°F.

S 338-052-N00

- (4) Cast the BMS 10-102 insulation coating material into the mold in a flat layer which is thicker than necessary.
- (a) Use a trowel to make it smooth.

S 918-053-N00

- (5) Do one of the steps to dry the plug material:

CAUTION: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO DRY THE INSULATION COATING SYSTEM. THE BMS 10-102 INSULATIVE SYSTEM WILL NOT DRY CORRECTLY BELOW 70°F. THE PROPERTIES OF THE INSULATION AND THE RATE TO DRY CAN CHANGE. IF YOU DO NOT OBEY THESE INSTRUCTIONS, YOU CAN CAUSE DAMAGE TO THE EQUIPMENT.

- (a) Dry the plug at room temperature between 70°F and 90°F for ten hours or until it has minimum hardness of 40 measured with a Shore A durometer.

NOTE: A durometer value of 40 is the same hardness as a rubber band.

- (b) Dry the plug at a room temperature of between 70°F and 90°F for two hours and one hour at 160 ±10°F.
 - 1) The molded patch is dry when it has a minimum hardness of 40 measured with a Shore A durometer.
- (c) Remove the dried material from the mold.
- (d) Examine the molded patch for holes and wet areas.
 - 1) Make sure the layers are smooth, free of blisters, and free of contamination.
- (e) Keep the dried plug material in containers to prevent damage and contamination (i.e. solvents/hydrocarbon fluids).
 - 1) Prevent long exposure to sunlight.

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- (f) You can apply an BMS 10-102 Type II top layer when the patch is dried.
 - 1) Do this procedure: Apply the BMS 10-102 Type II Top Layer.
- K. Use your BMS 10-102, Type II and these steps to apply the top coat of an insulative coating system:

S 848-054-N00

- (1) Prepare the area.
 - (a) Sand the patch or repair area with 180 grit abrasive paper until it is smooth.
 - (b) Finish with a 240 grit or finer abrasive paper.
 - (c) Remove the dust with a soft brush or a clean cheesecloth.

S 848-055-N00

- (2) Prepare the BMS 10-102, Type II as follows:
 - (a) Use the Thermolyte - 12 (Dibutyl Tin Dilaurate) or Nuocure 28 (Tin Octoate) to prepare the RTV560 sealant.
 - (b) Mix the sealant before you add the catalyst.
 - (c) Use the table in Fig. 801 to find the necessary pot life.
 - (d) Add the catalyst to the sealant.
 - (e) Mix the catalyst and the sealant fully.
 - (f) Make the sealant thin with the naphtha 10 to 45 percent by volume so you can apply it with a brush.
 - 1) Mix the sealant fully.
 - (g) Use BMS 10-102, Type II to apply the Mold Patch.
 - 1) Apply the BMS 10-102 Type II equally to cover the repair plug material and the mating area between the plug and existing insulation.

NOTE: Permit the sealant to dry at ambient temperature. The sealant will stay tacky for 28-36 hours.

WARNING: DO NOT GET THE SOLVENT IN YOUR MOUTH OR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM THE SOLVENT. PUT ON A PROTECTIVE SPLASH GOGGLE AND GLOVES WHEN YOU USE THE SOLVENT. KEEP THE SOLVENT AWAY FROM SPARKS, FLAMES, AND HIGH TEMPERATURES. THE SOLVENT IS POISONOUS. FLAMMABLE SOLVENT CAN CAUSE INJURY OR DAMAGE.

- (h) Clean the brushes with the methyl propyl ketone or naphtha.
- L. Put the Airplane Back to its Usual Condition.

S 418-056-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE 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 reverser (AMM 78-31-00/201).

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- S 418-057-N00
(2) Close the core cowl panels (AMM 71-11-06/201).
- S 418-060-N00
(3) Close the fan cowl panels (AMM 71-11-04/201).
- S 448-058-N00
(4) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

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LATCH BANDS - REMOVAL/INSTALLATION

1. General

A. This procedure contains steps to remove and install the Latch Bands.

TASK 78-31-02-004-001-N00

2. Remove the Latch Bands

A. References

(1) AMM 71-11-04/201, Fan Cowl Panels

B. Access

(1) Location Zones

410 Left Engine
420 Right Engine

(2) Access Panels

413AL Fan Cowl (LH)
414AR Fan Cowl (RH)
423AL Fan Cowl (LH)
424AR Fan Cowl (RH)

C. Remove the Latch Bands (Fig. 401).

S 014-002-N00

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

S 034-003-N00

(2) Release the T-bolt latch handle.

S 034-004-N00

(3) Remove the lockwire, the bolt, the washer and the pin retainer.

S 034-005-N00

(4) Remove the cotter pin and the pin that attaches the latch band to the latch band anchor.

S 034-006-N00

(5) Remove the bolts and washers that attach the latch band retainers to the thrust reverser.

S 024-007-N00

(6) Remove the latch band.

NOTE: The T-bolt latch handle is fastened to the right side latch band. The latch band bracket is attached to the left side latch band.

TASK 78-31-02-404-008-N00

3. Install the Latch Bands (Fig. 401)

A. References

(1) AMM 71-11-04/201, Fan Cowl Panels

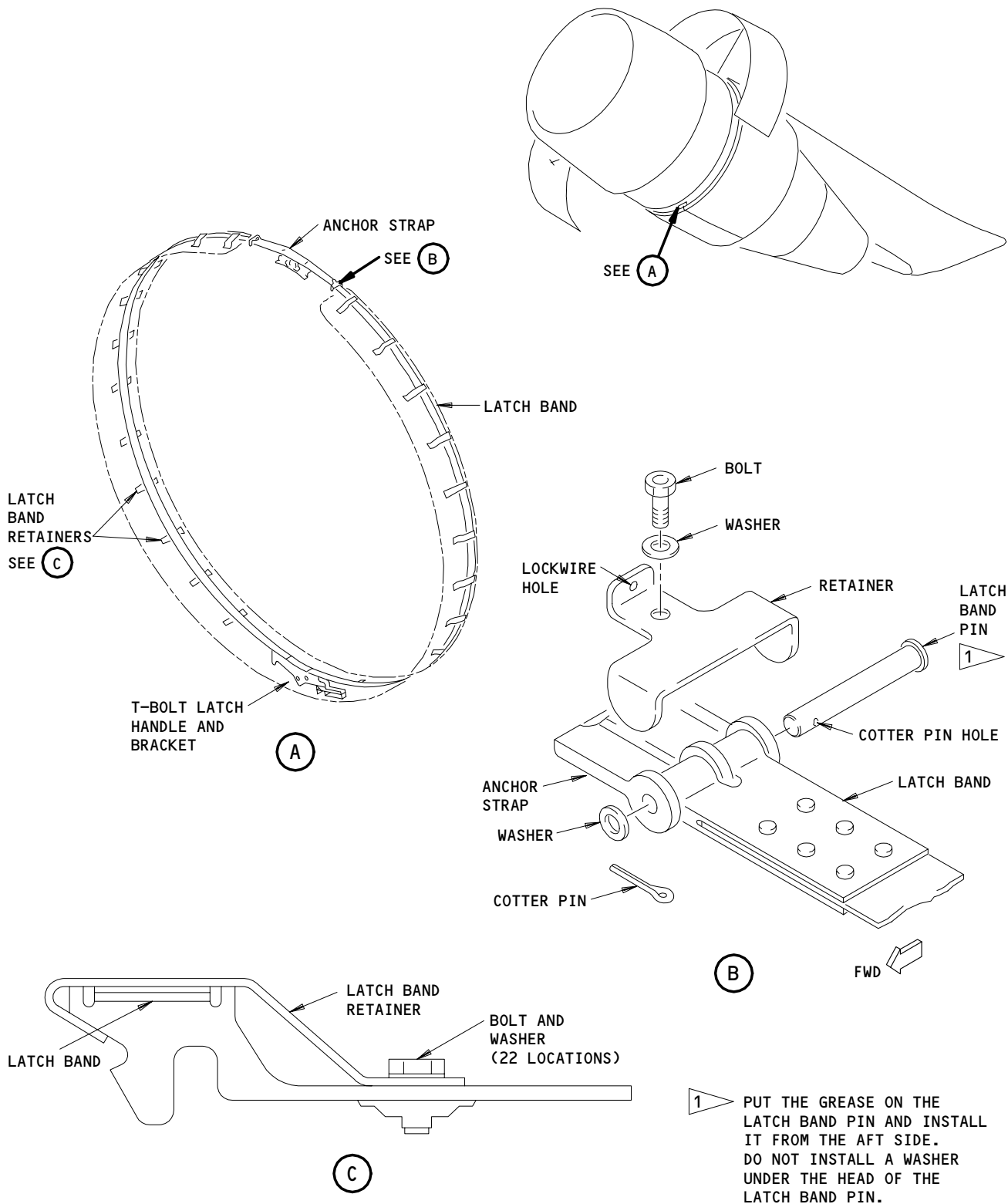
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Latch Band Installation
Figure 401

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(2) AMM 78-31-02/501, Latch Bands

B. Consumable Materials

(1) D00015 Grease - BMS 3-24

C. Access

(1) Location Zones

410 Left Engine
420 Right Engine

(2) Access Panels

413AL Fan Cowl (LH)
414AR Fan Cowl (RH)
423AL Fan Cowl (LH)
424AR Fan Cowl (RH)

D. Install the latch band.

S 434-009-N00

(1) Put the latch band into the anchor strap.

S 644-010-N00

(2) Lubricate the pin with grease.

S 434-011-N00

(3) Install the pin, the washer and the cotter pin that attach the latch band to the anchor.

NOTE: Install the pin from the aft side.

S 434-012-N00

(4) Install the bolts and washers that attach the pin retainer to the anchor strap.

S 434-013-N00

(5) Install a lockwire on the bolt.

S 024-014-N00

(6) Install the latch band retainers (11 locations, each half).

S 824-015-N00

(7) Adjust the latch band T-bolt (AMM 78-31-02/501).

S 434-017-N00

CAUTION: MAKE SURE THE T-BOLT IS CORRECTLY ENGAGED IN THE RECEIVER OF THE VEE-GROOVE LATCH BAND BEFORE YOU CLOSE THE T-BOLT LATCH HANDLE. FAILURE TO OBEY THIS INSTRUCTION CAN CAUSE DAMAGE TO THE T-BOLT OR THE RECEIVER ON THE VEE-GROOVE LATCH BAND.

(8) Close the T-bolt latch handle on the bottom of the engine to lock the latch band.

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- S 414-016-N00
(9) Close the fan cowl panels (AMM 71-11-04/201).

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LATCH BANDS - ADJUSTMENT/TEST

1. General

- A. This procedure has a check of the latch force you must use to close the T-bolt latch handle.
- B. You can find the T-bolt latch handle on the lower bifurcation of the thrust reverser.
- C. You can get access to the T-bolt latch handle when you open the fan cowl panels.

TASK 78-31-02-805-005-N00

2. Adjust the Latch Bands

- A. Equipment
 - (1) Spring Scale - commercially available, minimum 25-pound capacity
- B. References
 - (1) AMM 71-11-04/201, Fan Cowl Panels
- C. Access
 - (1) Location Zones
 - 410 Left Engine
 - 420 Right Engine
 - (2) Access Panels
 - 413AL Fan Cowl Panel (Left)
 - 414AR Fan Cowl Panel (Right)
 - 423AL Fan Cowl Panel (Left)
 - 424AR Fan Cowl Panel (Right)
- D. Adjust the Latch Force for the Latch Band (Fig. 501).
 - S 015-002-N00
 - (1) Open the fan cowl panels (AMM 71-11-04/201).
 - S 015-006-N00
 - (2) Open the T-bolt latch handle.

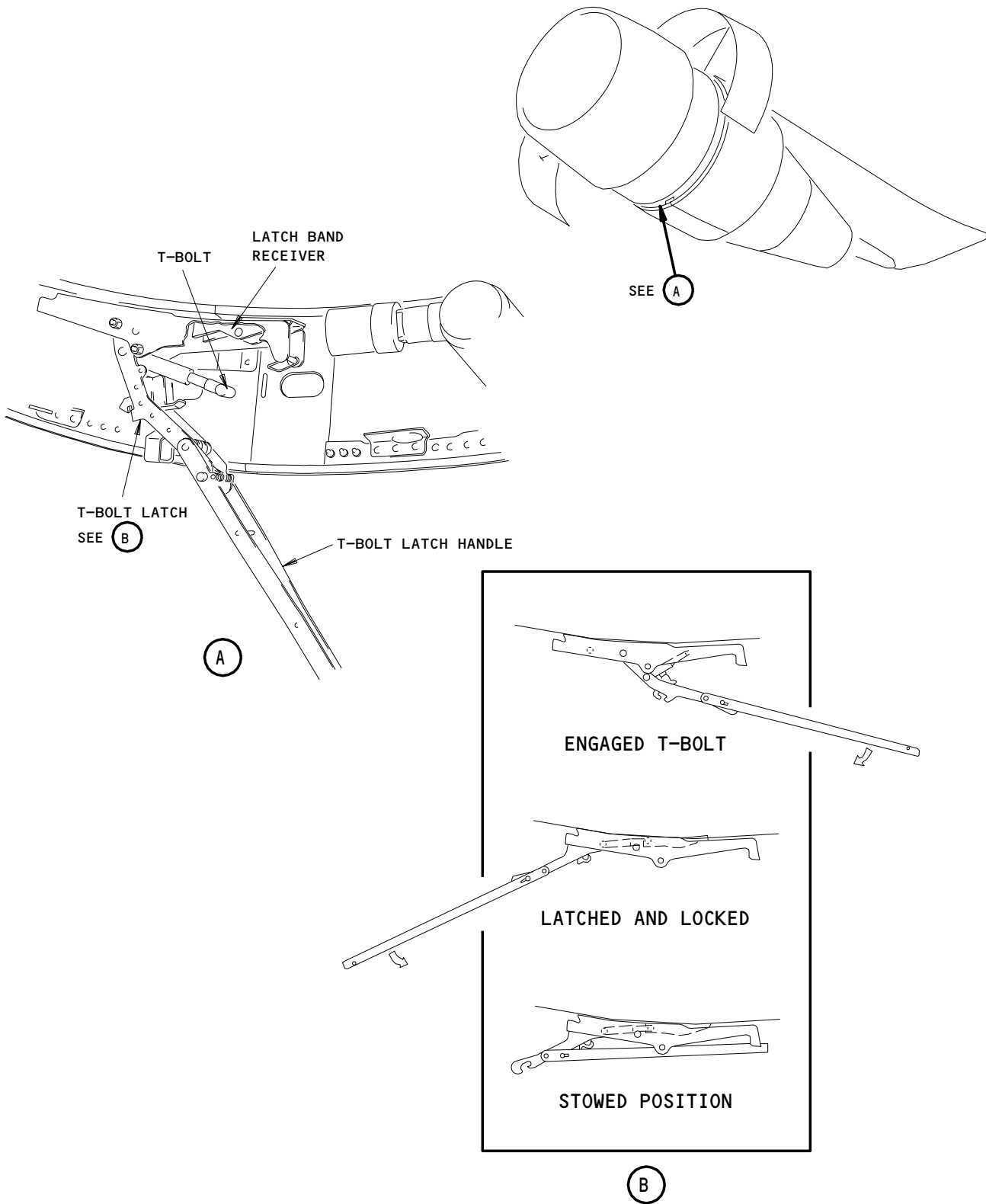
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Latch Band Adjustment
Figure 501

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S 225-008-N00

CAUTION: MAKE SURE THE T-BOLT IS CORRECTLY ENGAGED IN THE RECEIVER OF THE VEE-GROOVE LATCH BAND BEFORE YOU CLOSE THE T-BOLT LATCH HANDLE. FAILURE TO OBEY THIS INSTRUCTION CAN CAUSE DAMAGE TO THE T-BOLT OR THE RECEIVER ON THE VEE-GROOVE LATCH BAND.

- (3) Use the spring scale to measure the force you must use to close the T-bolt latch handle.

NOTE: You must attach the spring scale at the handle end of the T-bolt latch handle.

S 825-003-N00

- (4) To adjust the latch force, turn the T-bolt clockwise into the latch mechanism to increase the force or counterclockwise out of the latch mechanism to decrease the force.

NOTE: Adjust the T-bolt until you must use 40-60 pounds of force to close the T-bolt latch handle.

S 415-004-N00

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

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LATCH BAND ANCHOR STRAP – REMOVAL/INSTALLATION

TASK 78-31-03-004-013-N00

1. Remove the Latch Band Anchor Strap (Fig. 401)

A. References

- (1) AMM 71-11-04/201, Fan Cowl Panels
- (2) AMM 78-31-02/401, Latch Band

B. Access

- (1) Location Zones
 - 410 Left Engine
 - 420 Right Engine

- (2) Access Panels

- 413AL Fan Cowl (Left)
- 414AR Fan Cowl (Right)
- 423AL Fan Cowl (Left)
- 424AR Fan Cowl (Right)

C. Procedure

S 014-002-N00

- (1) Open the fan cowl panels (AMM 71-11-04).

S 034-003-N00

- (2) Release the latch band handle on the bottom of the thrust reverser torque box.

S 034-004-N00

- (3) Disconnect the latch bands (AMM 78-31-02/401).

S 024-005-N00

- (4) Remove the anchor strap from the engine fan case saddle.

TASK 78-31-03-404-006-N00

2. Install the Latch Band Anchor Strap (Fig. 401)

A. References

- (1) AMM 71-11-04/201, Fan Cowl Panels
- (2) AMM 78-31-02/401, Latch Band
- (3) AMM 78-31-02/501, Latch Band

B. Access

- (1) Location Zones
 - 410 Left Engine
 - 420 Right Engine

- (2) Access Panels

- 413AL Fan Cowl (Left)
- 414AR Fan Cowl (Right)
- 423AL Fan Cowl (Left)
- 424AR Fan Cowl (Right)

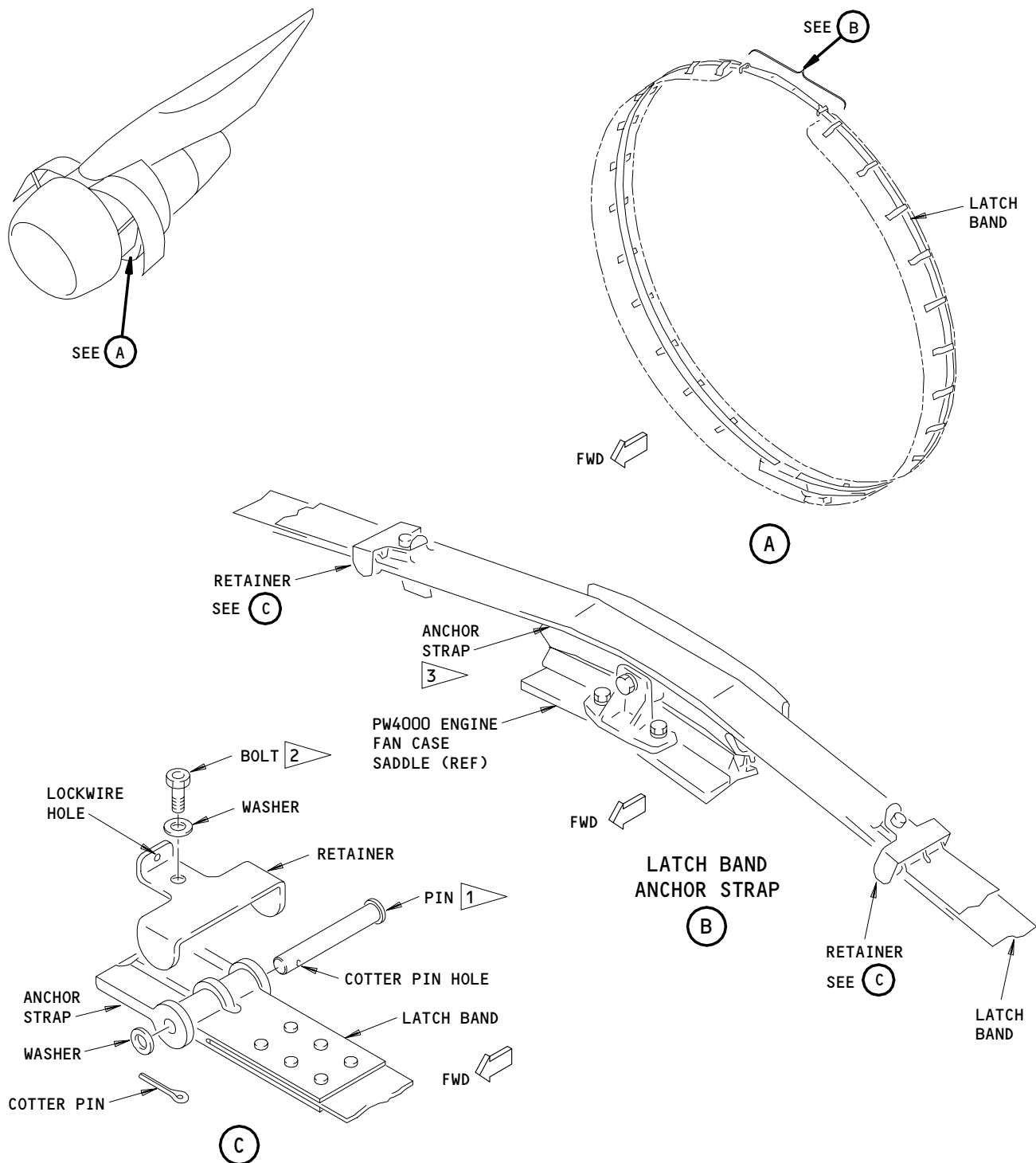
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1 INSTALL PIN FROM AFT SIDE. INTERCHANGE PIN RETAINER AS NECESSARY. DO NOT INSTALL WASHER UNDER PIN HEAD. LUBRICATE WITH GREASE

2 LOCKWIRE BOLT TO RETAINER

3 INSTALL ANCHOR STRAP SO END FITTINGS BEVEL FACES FORWARD

Latch Band Anchor Strap Installation
Figure 401

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C. Procedure

- S 434-007-N00
- (1) Make sure that the latch band handle at the bottom of the latch band is released.

- S 424-008-N00
- (2) Put the anchor strap onto the engine fan case saddle.

- S 424-009-N00
- (3) Install the anchor strap so the bevel-in-end fittings point forward.

- S 434-010-N00
- (4) Attach the latch bands (AMM 78-31-02/401).

- S 824-011-N00
- (5) Adjust the latch band T-bolt (AMM 78-31-02/501).

- S 414-012-N00
- (6) Close the fan cowl panels (AMM 71-11-04).

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TENSION LATCHES - REMOVAL/INSTALLATION

1. General

- A. This procedure contains two tasks. The first task is to remove the tension latches on the fan duct. The second task is to install the tension latches on the fan duct.

TASK 78-31-04-024-001-N00

2. Remove the Tension Latches (Fig. 401)

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
- (4) AMM 78-31-04/501, Tension Latches

B. Access

(1) Location Zones

- 410 Left Engine
- 420 Right Engine

(2) Access Panels

- 413AL Fan Cowl Panel (LH)
- 414AR Fan Cowl Panel (RH)
- 423AL Fan Cowl Panel (LH)
- 424AR Fan Cowl Panel (RH)
- 415AL Fan Reverser (LH)
- 416AR Fan Reverser (RH)
- 425AL Fan Reverser (LH)
- 426AR Fan Reverser (RH)
- 417AL Core Cowl (LH)
- 418AR Core Cowl (RH)
- 427AL Core Cowl (LH)
- 428AR Core Cowl (RH)

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

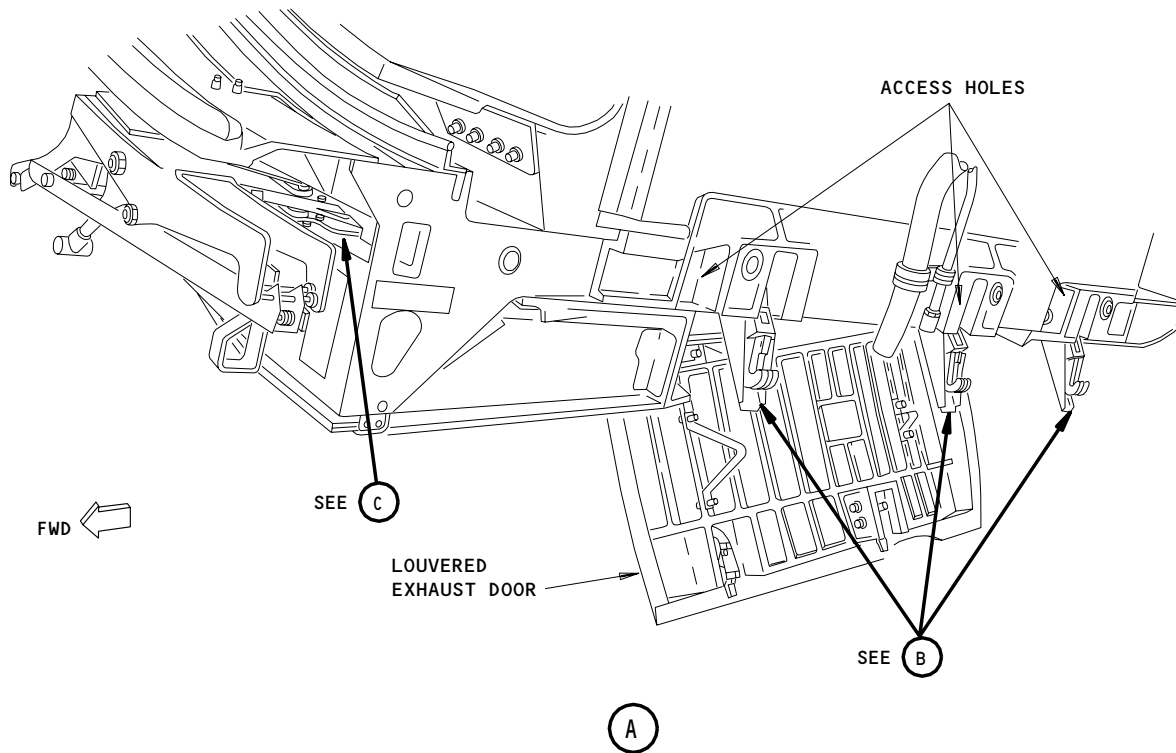
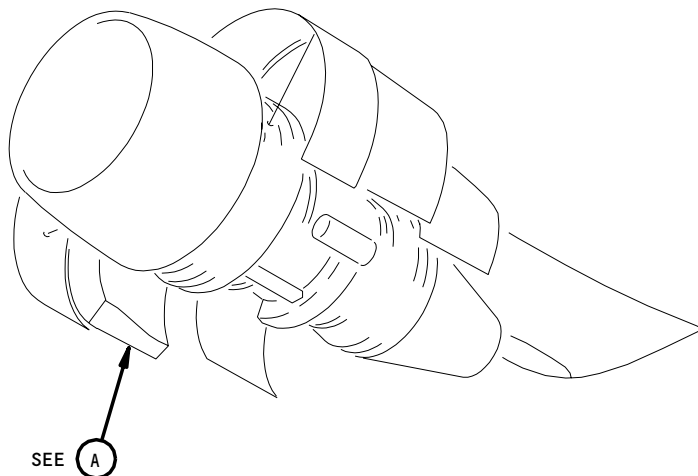
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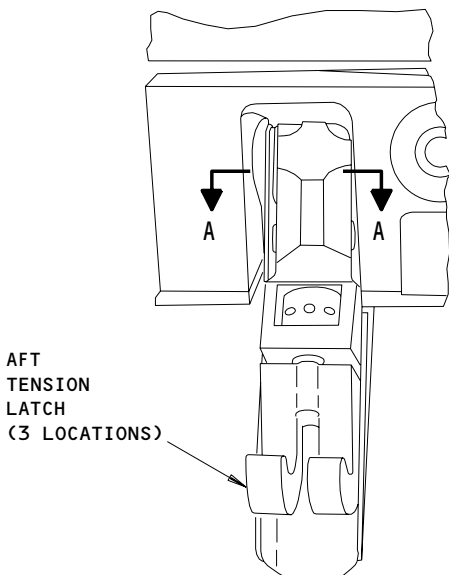
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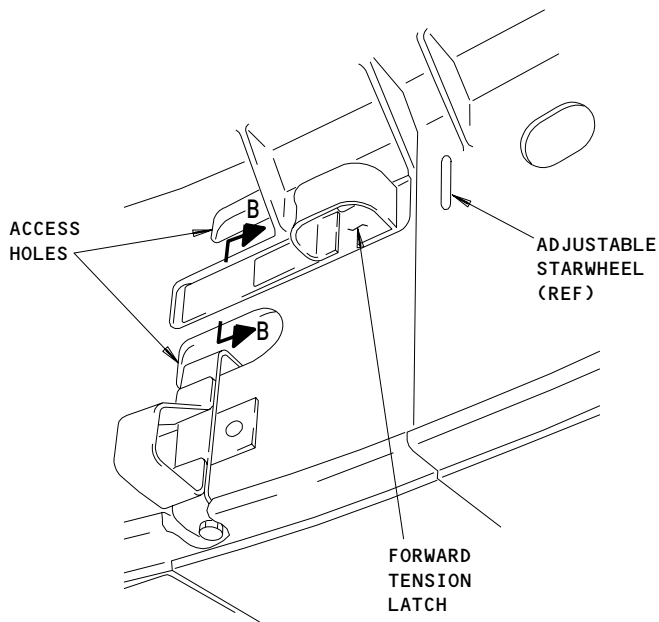
Tension Latch Installation
Figure 401 (Sheet 1)

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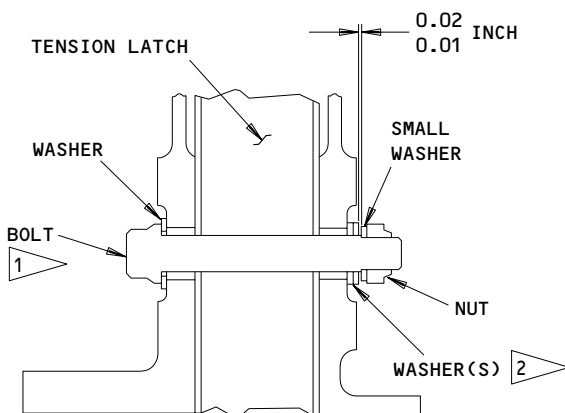


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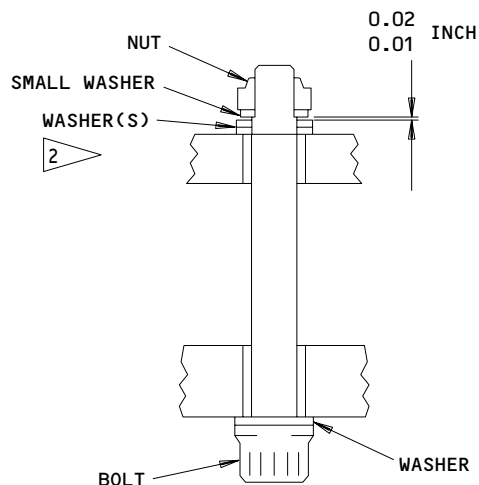


(C)

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EXAMPLE INSTALLATION
A-A



B-B

1 INSTALL THE BOLTHEAD SO IT POINTS FORWARD ON THE FORWARD TENSION LATCH, WHICH IS BY THE LOUVERED EXHAUST DOOR. THE BOLTHEAD MUST POINT AFT ON THE TWO AFT TENSION LATCHES.

2 INSTALL THE WASHERS (AN960KD616L, AN960-616L, AN960-616) TO SET A 0.01-0.02 INCH CLEARANCE BETWEEN THE SURFACE OF THE CASTING AND THE WASHERS.

Tension Latch Installation
Figure 401 (Sheet 2)

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- S 014-004-N00
(3) Open the core cowl panels (AMM 71-11-06/201).

S 014-005-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 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 024-006-N00

- (5) Remove the bolt, washers, and nut that attach the tension latch to the reverser structure.

NOTE: You can get access to the fasteners through the holes in the structure near the latches.

S 024-007-N00

- (6) Remove the latch.

TASK 78-31-04-424-014-N00

3. Install the Tension Latches (Fig. 401)

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
- (4) AMM 78-31-04/501, Fan Duct Tension Latches

B. Access

(1) Location Zones

- 410 Left Engine
- 420 Right Engine

(2) Access Panels

- 413AL Fan Cowl Panel (LH)
- 414AR Fan Cowl Panel (RH)
- 423AL Fan Cowl Panel (LH)
- 424AR Fan Cowl Panel (RH)
- 415AL Fan Reverser (LH)
- 416AR Fan Reverser (RH)
- 425AL Fan Reverser (LH)
- 426AR Fan Reverser (RH)
- 417AL Core Cowl (LH)
- 418AR Core Cowl (RH)
- 427AL Core Cowl (LH)
- 428AR Core Cowl (RH)

C. Procedure

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S 424-019-N00

CAUTION: DO NOT APPLY PRESSURE TO THE STRUCTURE AROUND THE LATCH. IF YOU APPLY PRESSURE TO THE STRUCTURE, DAMAGE TO THE STRUCTURE CAN OCCUR.

- (1) Install the tension latches as follows:
 - (a) Put the tension latch in the structure.
 - (b) Install the bolt with the countersunk washer below the bolt head.
 - (c) Install one to four flat washers to decrease the travel of the bolt in the structure.

NOTE: Make sure there is a small clearance between the bolt head and the structure surface.

- (d) Install the small washer and nut at the forward tension latch on the torque box.

NOTE: The tension latches are on the reverser structure. The structure is made of castings. Because of the casting tolerances, the latch bolt shanks and sections with threads extend more than the casting surface. The installation of flat washers on the bolt shank decreased the clearance (between the casting surface and section of the bolt with threads) to 0.01 - 0.02 inch. Do not add too many washers and cause a load on the structure around the latch.

- (e) Install the nuts at the remaining tension latches.

S 824-017-N00

CAUTION: CORRECTLY ADJUST THE TENSION LATCHES. IF THE TENSION LATCHES ARE NOT CORRECTLY ADJUSTED, DAMAGE TO THE FAN COWL AND THRUST REVERSER CAN OCCUR.

- (2) Adjust the tension latch of the fan duct (AMM 78-31-04/501).

S 414-015-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

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

S 414-011-N00

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

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- S 414-012-N00
- (5) Close the fan cowl panels (AMM 71-11-04/201).

- S 444-013-N00
- (6) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

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TENSION LATCHES – ADJUSTMENT/TEST

1. General

A. Use this procedure to adjust the tension latches on the thrust reversers.

TASK 78-31-04-825-001-N00

2. Adjust the Tension Latches

A. Equipment

- (1) Scale – spring compression type, minimum 60 pound (270 Newtons) capacity, commercially available
- (2) Wrench – Allen, 5/32 inch (4 mm), commercially available

B. References

- (1) AMM 71-11-04/201, Fan Cowl Panels
- (2) AMM 71-11-06/201, Core Cowl Panels
- (3) AMM 78-31-02/501, Latch Band
- (4) AMM 78-31-04/401, Tension Latches

C. Access

- (1) Location Zones
 - 410 Left Engine
 - 420 Right Engine
- (2) Access Panels
 - 416AR Fan Reverser (Right)
 - 426AR Fan Reverser (Right)

D. Prepare to adjust the Tension Latches (Fig. 501)

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

- (4) Open the louvered exhaust door on the bottom of the thrust reverser.

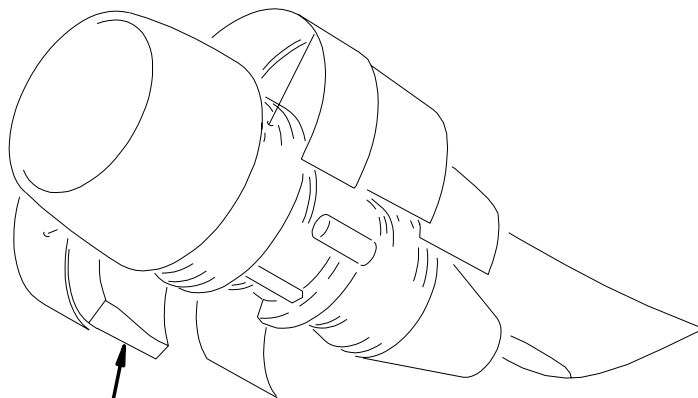
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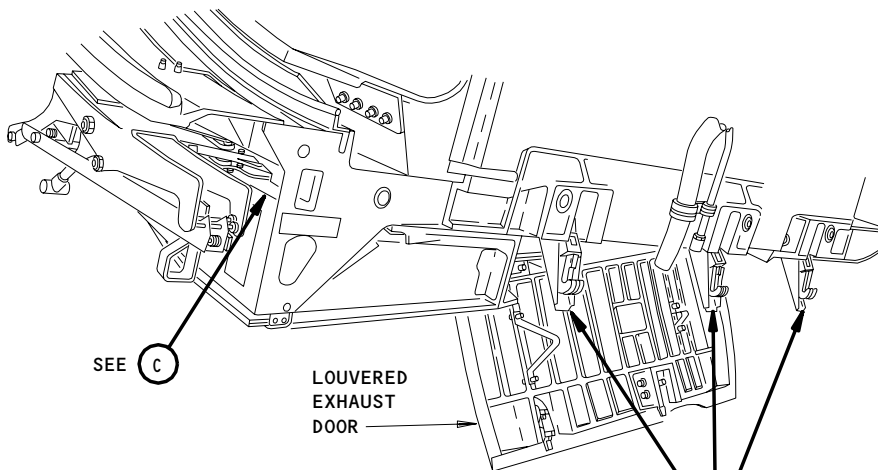
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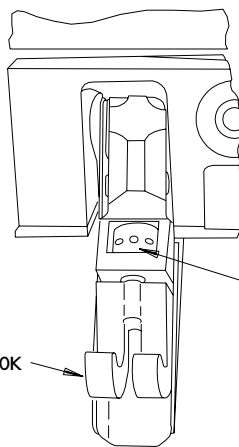
SEE (C)

LOUVERED EXHAUST DOOR

FWD ←

SEE (B)

(A)



LATCH HOOK

ADJUSTMENT WHEEL

1

AFT TENSION LATCHES

(B)

1 INSTALL THE ALLEN WRENCH AND TURN THE ADJUSTMENT WHEEL

Tension Latch Adjustment
Figure 501 (Sheet 1)

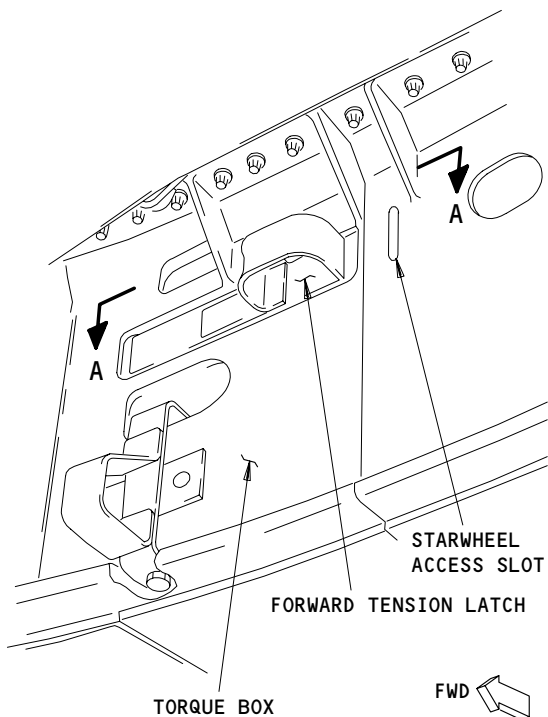
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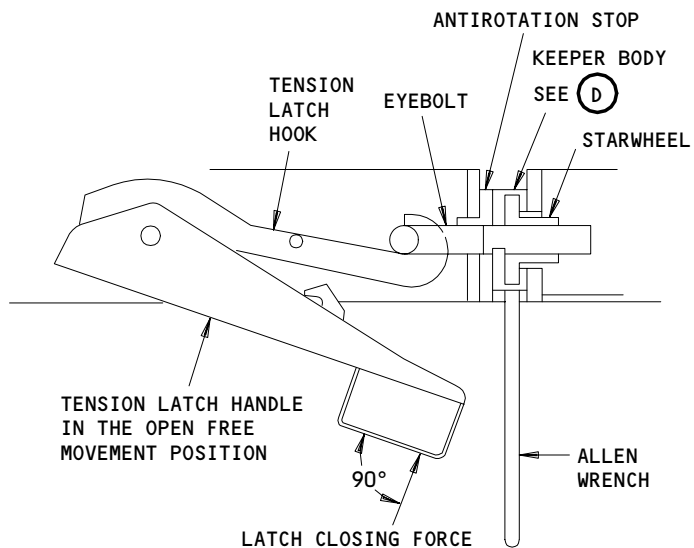
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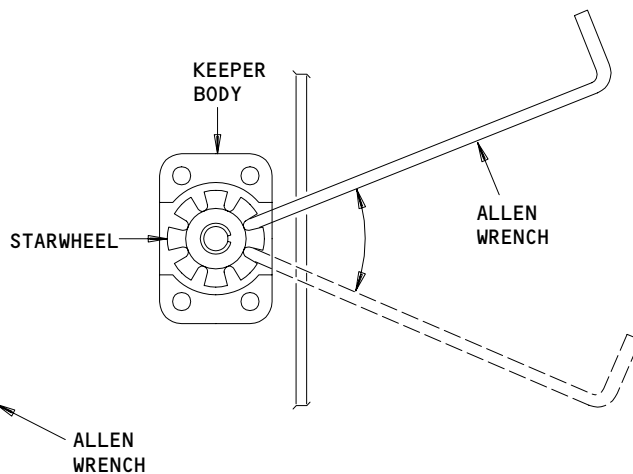
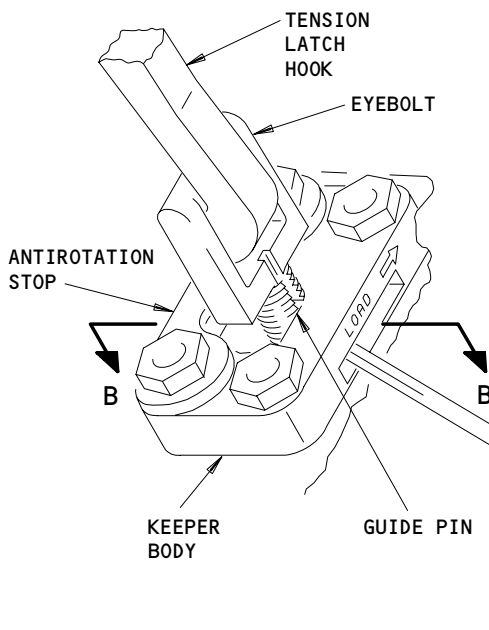
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(C)



A-A



B-B

Tension Latch Adjustment
Figure 501 (Sheet 2)

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S 025-006-N00

- (5) Release all four tension latches.

NOTE: Start from the aft latch and go forward.

S 825-007-N00

- (6) Adjust and latch the latch band (AMM 78-31-02/501).

E. Adjust the tension latches.

NOTE: Start from the forward latch and go to the aft tension latch. On the forward tension latch, you can adjust the length of the eyebolt with the starwheel in the keeper body. You cannot adjust the length of the latch hook. On the aft tension latches, you can adjust the length of the latch hook with the adjustment wheel.

S 825-015-N00

- (1) To adjust the forward tension latch, do the steps that follow:
(a) Examine the forward tension latch and the eyebolt for damage and make sure they are not loose.

NOTE: The eyebolt moves into or out of the keeper body when the starwheel is turned. An eyebolt which turns in the keeper body shows the guide pin, on the keeper body is broken. This can cause the adjustment of the tension latch keeper to be incorrect and causes the tension latch to latch incorrectly.

- (b) Replace the tension latches which are broke or have damage (AMM 78-31-04/401).

CAUTION: DO NOT TURN THE EYEBOLT. IF YOU TURN THE EYEBOLT IT WILL BREAK THE BODY GUIDE PIN ON THE KEEPER BODY. THIS CAUSES THE ADJUSTMENT OF THE TENSION LATCH TO BE INCORRECT AND CAN CAUSE TENSION LATCH TO INCORRECTLY LATCH.

- (c) Use the spring scale to make sure the closing force for the latch is 40-60 pounds (178-267 Newtons).
(d) Turn the starwheel in the keeper body with an allen wrench to adjust the eyebolt to the necessary closing force.
1) After each adjustment, make sure the tension latch fully engages the eyebolt with the correct closing force applied to the end of the tension latch handle.

NOTE: The tension latches which are correctly adjusted will open with a noise.

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S 825-016-N00

- (2) To adjust the aft tension latches, do the steps that follow:
- (a) Examine the aft tension latches for the damage.
 - (b) Replace the tension latches which have the damage (AMM 78-31-04/401).
 - (c) Use the spring scale to make sure the closing force for the latch is 40-60 pounds (178-267 Newtons).
 - (d) Turn the adjustment wheel on the latch hook with the allen wrench to set the necessary closing force.
 - (e) After each adjustment, make sure the tension latch fully engages the eyebolt with the correct closing force applied to the end of the tension latch handle.

NOTE: The tension latches which are correctly adjusted will open with a noise.

S 415-017-N00

- (3) Start at the forward tension latch and move rearward to engage all of the tension latches.

S 215-009-N00

- (4) Make sure there is no distance between the bumper pads at all latch locations.

NOTE: If there is a distance, it can cause the latch tension to decrease because of thermal expansion, relative motion, and vibration or the related motion.

F. Put the Airplane Back to Its Usual Condition.

S 415-010-N00

- (1) Close the louvered exhaust door on the bottom of the thrust reverser.

S 415-011-N00

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

S 415-012-N00

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

S 445-013-N00

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

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THRUST REVERSER OPENING ACTUATORS – REMOVAL/INSTALLATION

1. General

- A. This procedure has two tasks. The first task removes the opening actuators for the thrust reversers. The second task installs the opening actuators.
- B. The opening actuators are installed at the top of each thrust reverser half and are used to open the thrust reverser for access.

TASK 78-31-06-004-001-N00

2. Remove the Thrust Reverser Opening Actuators

- A. Equipment
 - (1) Container, 1 gallon capacity, fuel and oil resistant
- B. References
 - (1) AMM 27-61-00/201, Spoiler/Speedbrake Control System
 - (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
 - 410 No. 1 Power Plant (Left)
 - 420 No. 2 Power Plant (Right)
 - (2) Access Panels
 - 415AL Fan Reverser (Left)
 - 416AR Fan Reverser (Right)
 - 425AL Fan Reverser (Left)
 - 426AR Fan Reverser (Right)
- D. Prepare to remove the Opening Actuator for the Thrust Reverser

S 044-023-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPEEDBRAKE CONTROL SYSTEM. IF YOU DO NOT DO THIS, THE SPOILERS CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (1) Do the deactivation procedure for the Speedbrake Control System (AMM 27-61-00/201).

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S 864-024-N00

- (2) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

S 864-025-N00

- (3) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

S 044-026-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.

- (4) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 014-027-N00

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

S 014-028-N00

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

S 014-002-N00

WARNING: MAKE SURE THE THRUST REVERSER IS HELD BY THE SLING HOIST AND THE HOLD-OPEN ROD. THE THRUST REVERSER CAN SUDDENLY CLOSE WHICH CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (7) Open the thrust reverser (sling method) (AMM 78-31-00/201).
 - (a) Make sure the hold-open rod and sling hoist are correctly attached to hold the weight of the thrust reverser.

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E. Remove the Opening Actuator for the Thrust Reverser (Fig. 401).

S 024-041-N00

CAUTION: BE PREPARED TO CATCH THE ENGINE OIL IN THE APPLICABLE CONTAINER. IMMEDIATELY CLEAN THE ENGINE IF ENGINE OIL FALLS ON THE ENGINE. IF YOU DO NOT QUICKLY CLEAN THE ENIGNE OIL OFF THE ENGINE, THE ENGINE OIL CAN CAUSE DAMAGE TO THE ENGINE.

- (1) Remove the opening actuator (1), do these steps:
 - (a) Disconnect the flex hose (2) from the opening actuator (1).
 - (b) Install the protection cap on the flex hose (2) and the port on the actuator (1).
 - (c) Remove the bolt (10), bushing (12), washer (11), damper washer (9), flanged washer (13), and nut (14) which attaches the actuator rod end to the thrust reverser.
 - (d) Remove the bolt (3), bushing (8), washer (4), damper washer (5), washer (6), and nut (7) which attaches the opening actuator (1) to the strut support structure.
 - (e) Remove the opening actuator (1).
 - (f) Apply a light force to the rod end to carefully retract the opening actuator.
 - (g) When you retract the opening actuator, drain the remaining engine oil into an applicable container.

TASK 78-31-06-404-009-N00

3. Install the Thrust Reverser Opening Actuator

A. Equipment

- (1) Hand Pump - Opening System Thrust Reverser, C78005-17
- (2) Container, 1 gallon capacity, fuel and oil resistant

B. Consumable Materials

- (1) D00148 Oil, Engine - MIL-L-7808 or the equivalent

C. Parts

- (1) Refer to the AIPC for the part numbers and effectivities of the items in the table that follows:

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM

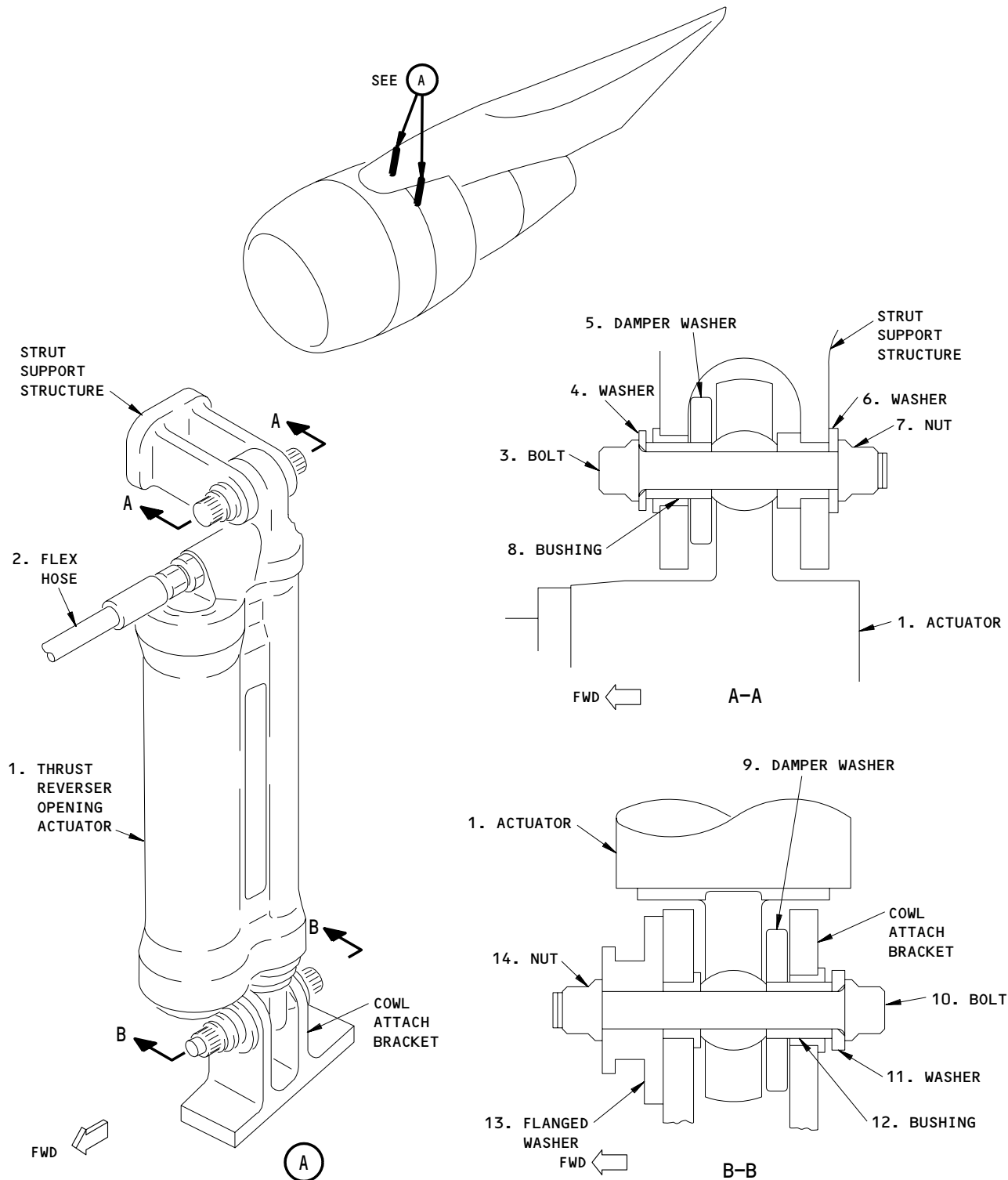
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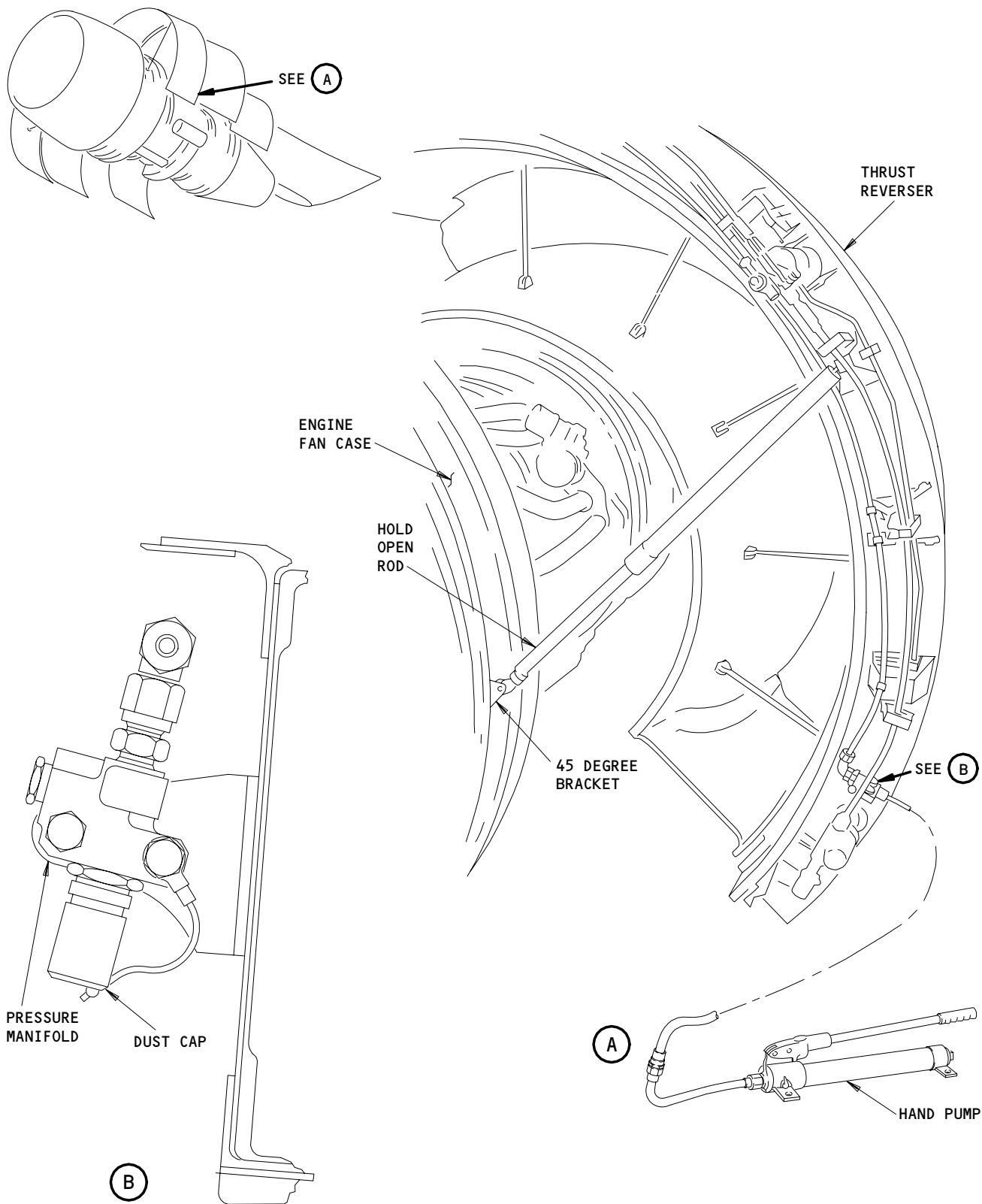
Thrust Reverser Cowl Opening Actuator Installation
Figure 401 (Sheet 1)

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Thrust Reverser Cowl Opening Actuator Installation
Figure 401 (Sheet 2)

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401	1	Actuator	78-31-05	07 15	120 75
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D. References

- (1) AMM 27-61-00/201, Speed Brake Control System
- (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

E. Access

- (1) Location Zones
 - 410 No. 1 Power Plant (Left)
 - 420 No. 2 Power Plant (Right)
- (2) Access Panels
 - 415AL Fan Reverser (Left)
 - 416AR Fan Reverser (Right)
 - 425AL Fan Reverser (Left)
 - 426AR Fan Reverser (Right)

F. Install the Opening Actuator for the Thrust Reverser (Fig. 401)

S 864-010-N00

- (1) Make sure the hold-open rod and sling hoist correctly hold the weight of the thrust reverser.

S 424-043-N00

CAUTION: BE PREPARED TO CATCH THE ENGINE OIL IN THE APPLICABLE CONTAINER. IMMEDIATELY CLEAN THE ENGINE IF ENGINE OIL FALLS ON THE ENGINE. IF YOU DO NOT QUICKLY CLEAN THE ENGINE OIL OFF THE ENGINE, THE ENGINE OIL CAN CAUSE DAMAGE TO THE ENGINE.

- (2) Install the opening actuator (1), do these steps:
 - (a) Install the bolt (3), bushing (8), damper washer (5), washer h7 (4), washer (6), and nut (7) to attach the opening actuator (1) to the strut structure.
 - (b) Remove the protection cap from the flex hose (2) and actuator (1).

CAUTION: DO NOT EXTEND THE ACTUATOR ROD END WITH THE CAP REMOVED FROM THE SEALING PORT. THE AIR CAN GO INTO THE ACTUATOR WHEN YOU EXTEND THE ROD END. THE AIR CAN CAUSE THE THRUST REVERSER TO CLOSE QUICKLY.

- (c) Connect the flex hose (2) to the opening actuator (1).

NOTE: Use the hand pump to extend the rod end.

- (d) If the replacement opening actuator is not fully extended and full of engine oil, do these steps:

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CAUTION: MAKE SURE THE HAND PUMP IS FULL OF ENGINE OIL. IF THE HAND PUMP IS NOT FULL, THE OPENING ACTUATOR WILL NOT EXTEND OR RETRACT CORRECTLY.

- 1) Make sure the hand pump is full of engine oil.
 - 2) Connect the hand pump hose to the manifold at the bottom of the torque box on the thrust reverser half.
 - 3) Operate the hand pump slowly until the rod end moves.
 - 4) Continue to operate the hand pump to extend the rod end until you can connect the rod end to the thrust reverser.
- (e) Install the bolt (10), bushing (12), damper washer (9), washer (11), flanged washer (13) and nut (14) to attach the rod end to the thrust reverser.

S 414-016-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (3) Close the thrust reverser half (sling method) (AMM 78-31-00/201).
- (a) Remove the sling hoist when the thrust reverser half is closed.
 - (b) Keep the core cowl and the fan cowl panels open.

S 424-045-N00

WARNING: DO NOT MOVE BETWEEN THE ENGINE AND THRUST REVERSER WHEN YOU OPEN AND CLOSE THE THRUST REVERSER. IF YOU ARE BETWEEN THE ENGINE AND THE THRUST REVERSER, IT CAN CAUSE INJURY TO YOU.

WARNING: YOU MUST BLEED THE AIR FROM THE OPENING SYSTEM FOR THE THRUST REVERSER. FAILURE TO BLEED THE AIR CAN CAUSE THE SPEED AT WHICH THE COWL OPENS TO BE IRREGULAR. THE REVERSER CAN QUICKLY CLOSE AND CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

- (4) THRUST REVERSERS WITH A HAND PUMP;
Do these steps to remove the air in the opening system for the thrust reverser:
- (a) Make sure the hand pump is full of engine oil.
 - (b) Close the return valve for the hand pump.

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CAUTION: MAKE SURE THE HAND PUMP IS FULL OF THE SPECIFIED ENGINE OIL. IF THE HAND PUMP IS NOT FULL OF THE SPECIFIED ENGINE OIL, THE THRUST REVERSER MAY NOT OPEN AND CLOSE CORRECTLY. THIS CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

- (c) Operate the hand pump to slowly open the thrust reverser to 50 percent of the fully open position.
- (d) Open the return valve on the hand pump to slowly close the thrust reverser.
- (e) Do these steps three times.
 - 1) Close the return valve for the hand pump.
 - 2) Operate the hand pump to open the thrust reverser to the full open position.
 - 3) Open the return valve on the hand pump to slowly close the thrust reverser.
- (f) Do these steps to measure the rate the thrust reverser closes:
 - 1) Operate the hand pump to open the thrust reverser to the full open position.
 - 2) Slowly open the return valve again to slowly close the thrust reverser half.
 - 3) Monitor the time and motion while the thrust reverser half closes.
 - a) The rate the thrust reverser closes must be more than 10 seconds.
 - b) The thrust reverser must close with a smooth movement with the return valve in the open position.

S 014-019-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, YOU CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (5) Open the thrust reverser (AMM 78-31-00/201).
 - (a) Make sure the hold-open rods are fully extended and locked to hold the weight of the thrust reverser.

S 214-020-N00

- (6) Examine the opening actuator, flex hoses, and fittings for leakage.
- G. Put the Airplane Back to Its Usual Condition.

S 414-022-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO CLOSE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Close the thrust reverser (AMM 78-31-00/201).

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- S 414-029-N00
- (2) Close the core cowl panels (AMM 71-11-06/201).

- S 414-030-N00
- (3) Close the fan cowl panels (AMM 71-11-04/201).

- S 444-031-N00
- (4) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

- S 444-032-N00
- (5) Do the activation procedure for the Speedbrake Control System (AMM 27-61-00/201).

- S 864-033-N00
- (6) Remove the DO-NOT-OPERATE tags from the thrust levers.

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THRUST REVERSER COWL OPENING FLEX HOSES – REMOVAL/INSTALLATION

TASK 78-31-08-004-001-N00

1. Remove the Thrust Reverser Cowl Opening Flex Hose

A. Equipment

- (1) Hand Pump – Opening System Thrust Reverser C78005-17

B. References

- (1) AMM 54-52-01/401, Strut Fairings
- (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

- 410 No. 1 Engine (Left)
- 420 No. 2 Engine (Right)

(2) Access Panels

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

D. Prepare to Remove the Flex Hoses.

S 014-002-N00

- (1) Remove the forward strut fairings (AMM 54-52-01/401).

S 044-004-N00

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

- (2) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

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S 014-026-N00
(3) Open the fan cowl panels (AMM 71-11-04/201).

S 014-005-N00
(4) Open the core cowl panels (AMM 71-11-06/201).

S 014-006-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(5) Open the thrust reverser (sling method) (AMM 78-31-00/201).
(a) Make sure the hold-open rod and the sling equipment will hold the thrust reverser open.

S 684-023-N00

CAUTION: BE PREPARED TO CATCH THE ENGINE OIL IN THE APPLICABLE CONTAINER. IMMEDIATELY CLEAN THE ENGINE IF ENGINE OIL FALLS ON THE ENGINE. IF YOU DO NOT QUICKLY CLEAN THE ENGINE OIL OFF THE ENGINE, THE ENGINE OIL CAN CAUSE DAMAGE TO THE ENGINE.

(6) Put a container in the correct position to catch all leakage of fluid from the opening system.

E. Remove the Flex Hose.

S 024-010-N00

- (1) Do these steps to remove the flex hoses:
- (a) Disconnect the flex hose from the actuator.
 - 1) Immediately put protective caps on the actuator and on the flex hoses.
 - (b) Disconnect the flex hose from the union on the strut fitting.
 - 1) Immediately put caps on the flex hose and the union on the strut.
 - (c) Remove the clamps which attach the hose to the strut structure.
 - (d) Remove the flex hose.

TASK 78-31-08-404-011-N00

2. Install the Thrust Reverser Cowl Opening Flex Hoses

A. Equipment

- (1) Hand Pump - Opening System Thrust Reverser C78005-17

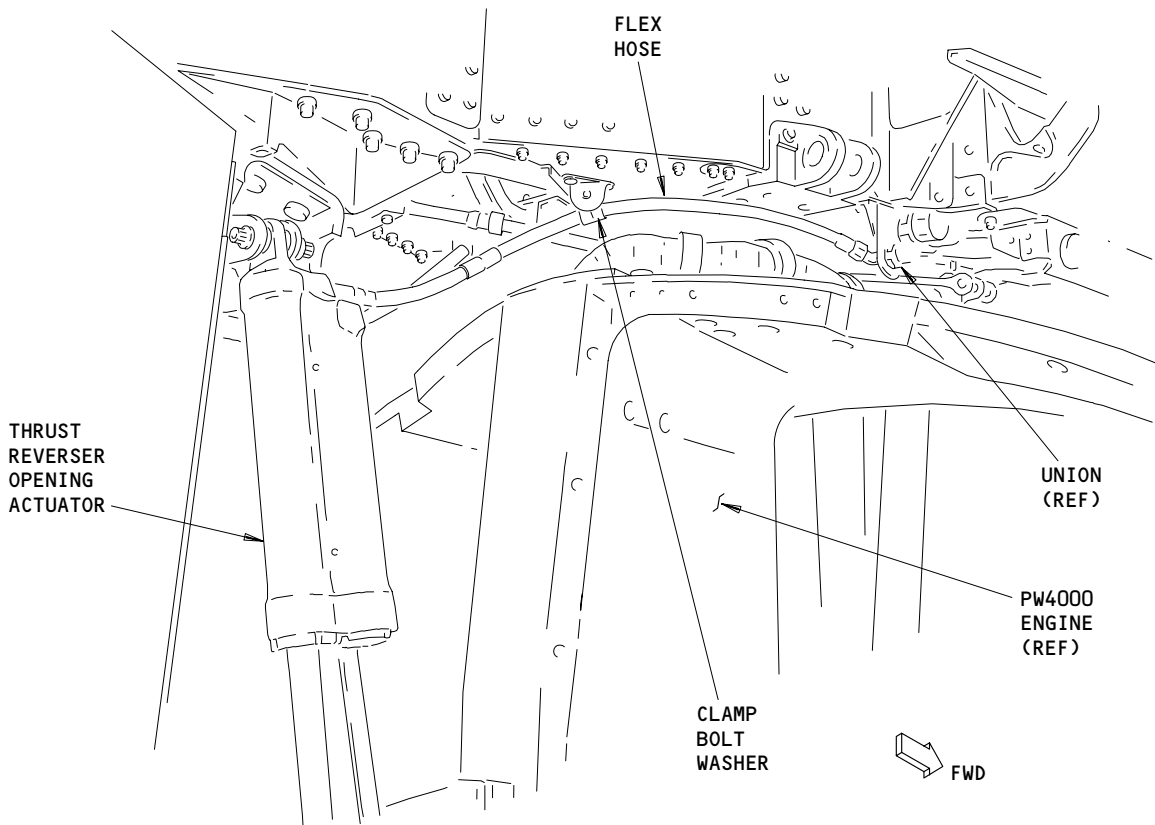
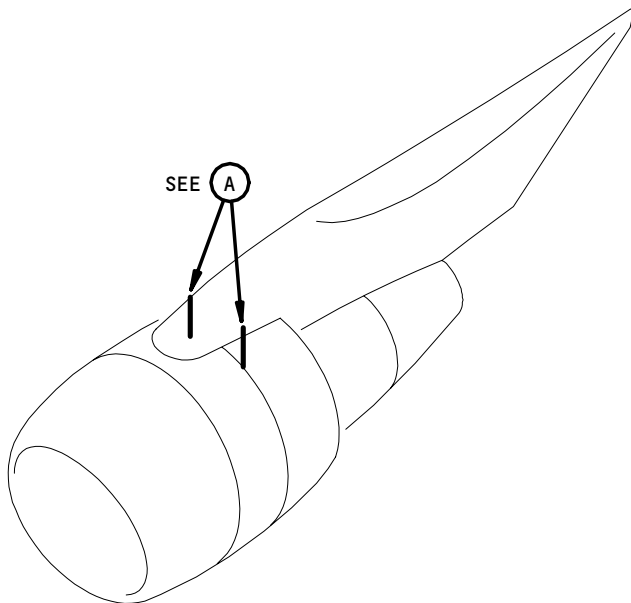
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RIGHT SIDE SHOWN
(LEFT SIDE OPPOSITE)

(A)

Thrust Reverser Cowl Opening Flex Hose Installation
Figure 401 (Sheet 1)

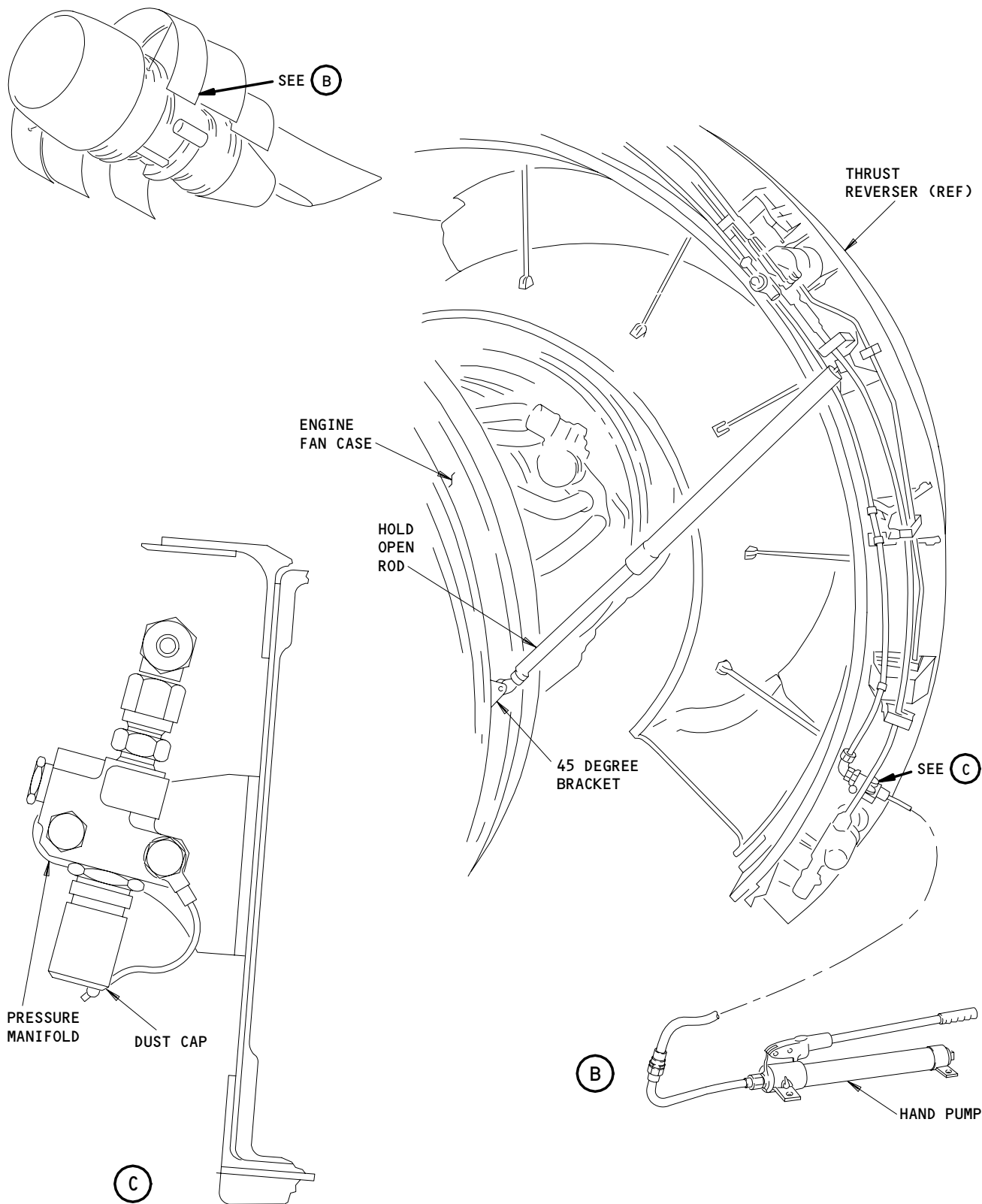
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Thrust Reverser Cowl Opening Flex Hose Installation
Figure 401 (Sheet 2)

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B. Consumable Materials

- (1) D00071 Oil, Engine - MIL-L-7808 or equivalent

C. References

- (1) AMM 54-52-01/401, Strut Fairings
- (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

- 410 No. 1 Power Plant (Left)
- 420 No. 2 Power Plant (Right)

(2) Access Panels

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

E. Install the Flex Hose.

S 424-034-N00

- (1) Do these steps to install the flex hoses (Fig. 401).
 - (a) Remove the protective caps and connect the bottom ends of the flex hoses to the actuator.
 - (b) Install the clamps which attach the hose to the strut structure.
 - (c) Connect the top ends of the flex hoses to the union on the strut.
 - (d) Loosen the flex hose on the fitting of the opening actuator.
 - (e) Operate the hand pump until the engine oil leakage starts from the loose flex hose fitting.
 - (f) Tighten the flex hose fitting for the opening actuator to 30-40 pound-inches.

S 414-017-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (2) Close the thrust reverser (sling method) (AMM 78-31-00/201).
 - (a) Remove the sling hoist when the thrust reverser half is closed.

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(b) Keep the core cowl and fan cowl panels open.

S 874-021-N00

WARNING: DO NOT MOVE BETWEEN THE ENGINE AND THRUST REVERSER WHEN YOU OPEN AND CLOSE THE THRUST REVERSER. IF YOU ARE BETWEEN THE ENGINE AND THE THRUST REVERSER, IT CAN CAUSE INJURY TO YOU.

WARNING: YOU MUST BLEED THE AIR FROM THE OPENING SYSTEM FOR THE THRUST REVERSER. FAILURE TO BLEED THE AIR CAN CAUSE THE SPEED AT WHICH THE COWL MOVES TO BE IRREGULAR. THE REVERSER CAN QUICKLY CLOSE AND CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(3) Do these steps to remove the air in the opening system for the thrust reverser:

CAUTION: MAKE SURE THE HAND PUMP IS FULL OF THE SPECIFIED ENGINE OIL. IF THE HAND PUMP IS NOT FULL OF THE SPECIFIED ENGINE OIL, THE THRUST REVERSER MAY NOT OPEN AND CLOSE CORRECTLY. THIS CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

- (a) Make sure the hand pump is full of engine oil.
- (b) Close the return valve on the hand pump.
- (c) Connect the hand pump hose to the pressure manifold at the bottom of the torque box.
- (d) Operate the hand pump to slowly open the thrust reverser to 50 percent of the fully open position.
- (e) Carefully open the return valve on the hand pump to slowly close the thrust reverser.
- (f) Do these steps three times:
 - 1) Close the return valve on the hand pump.
 - 2) Operate the hand pump to open the thrust reverser to the fully open position.
 - 3) Slowly open the return valve again to slowly close the thrust reverser half.

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- (g) Do these steps to measure the rate the thrust reverser closes:
 - 1) Operate the hand pump to open the thrust reverser to the full open position.
 - 2) Slowly open the return valve again to slowly close the thrust reverser half.
 - 3) Monitor the time and motion while the thrust reverser half closes.
 - a) The rate the thrust reverser closes must be more than 10 seconds.
 - b) The thrust reverser must close with a smooth movement with the return valve in the fully open position.

S 014-022-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (4) Open the thrust reverser (AMM 78-31-00/201).
 - (a) Make sure the hold-open rods are fully extended and locked to hold the weight of the thrust reverser.

S 794-027-N00

- (5) Examine the opening actuator, flex hoses, and fittings for leakage.
- F. Put the Airplane Back to Its Usual Condition

S 414-026-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, YOU CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (1) Close the thrust reverser (AMM 78-31-00/201).

S 414-027-N00

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

S 414-030-N00

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

S 444-028-N00

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

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S 844-027-N00

- (5) Remove the DO-NOT-OPERATE tags from the thrust levers.

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THRUST REVERSER OPENING FLEX HOSES – INSPECTION/CHECK

1. General

A. This procedure examines the flex hoses for damage and leakage.

TASK 78-31-08-206-001-N00

2. Do the Inspection of the Thrust Reverser Opening Flex Hoses

A. References

- (1) AMM 54-52-01/401, Strut Fairings
- (2) AMM 78-31-00/201, Thrust Reverser System
- (3) AMM 78-31-08/401, Thrust Reverser Opening Flex Hoses

B. Access

(1) Location Zones

- 410 No. 1 Power Plant (Left)
- 420 No. 2 Power Plant (Right)

(2) Access Panels

- 415AL Fan Reverser (Left)
- 416AR Fan Reverser (Right)
- 425AL Fan Reverser (Left)
- 426AR Fan Reverser (Right)
- 431 Forward Nacelle Strut Fairing
- 441 Forward Nacelle Strut Fairing

C. Examine the Flex Hoses for the Cowl Opening System.

S 046-004-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 016-003-N00

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

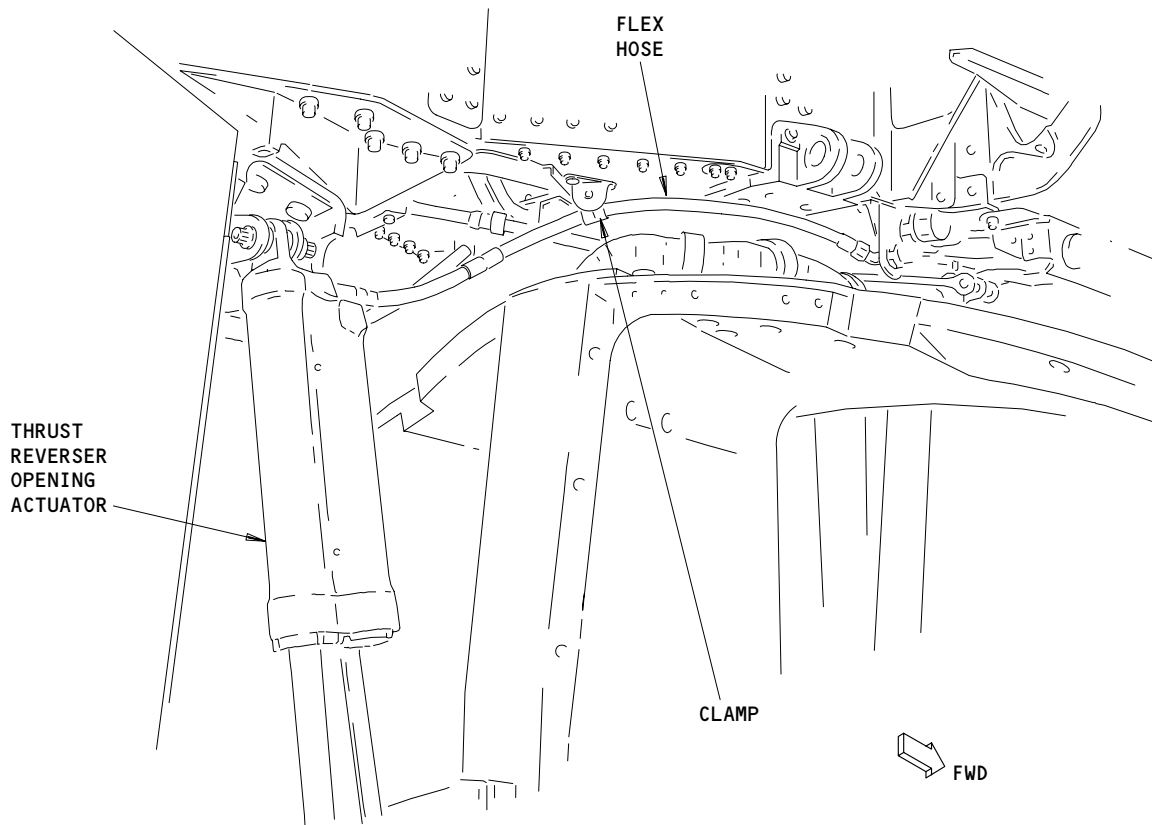
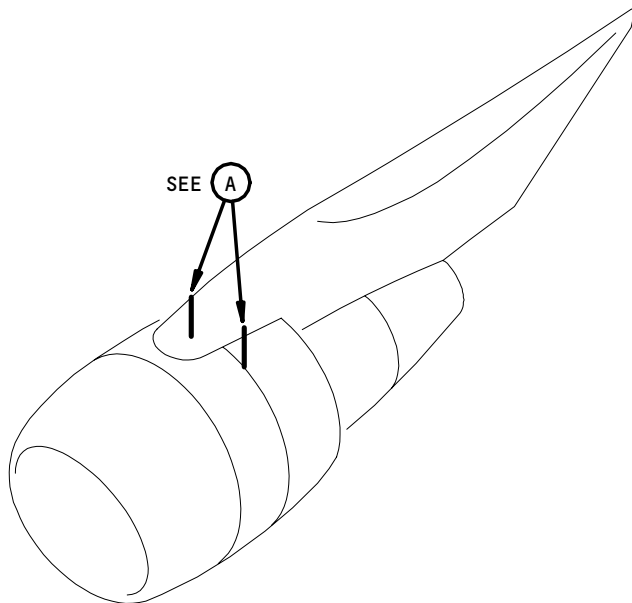
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RIGHT SIDE SHOWN
(LEFT SIDE OPPOSITE)

A

Thrust Reverser Cowl Opening Flex Hose
Figure 601

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S 016-005-N00

- (3) Open the core cowl panel (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 reverser (AMM 78-31-00/201).

S 216-007-N00

- (5) Do these steps to examine the flex hoses.
(a) Examine the flex hoses for damage or rubbed areas.
(b) Examine the hoses and hose fittings for leakage.

NOTE: Be very careful to examine the areas around the flex hose connections, clamps and fittings. Look for liquid on the external side of each flex hose. Also look for the drops of liquid that fell off on the components below each flex hose.

- (c) If you find any damage, rubbed areas or leakage, replace the flex hose (AMM 78-31-08/401).

- D. Put the Airplane Back to Its Usual Condition.

S 416-010-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.

- (1) Close the thrust reverser (AMM 78-31-00/201).

S 416-011-N00

- (2) Close the core cowl panel (AMM 71-11-06/201).

S 416-012-N00

- (3) Close the fan cowl panel (AMM 71-11-04/201).

S 446-013-N00

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

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THRUST REVERSER SLEEVE – REMOVAL/INSTALLATION

1. General

A. This procedure has two tasks. The first task removes the thrust reverser sleeve. The second task installs the thrust reverser sleeve.

TASK 78-31-10-004-001-N00

2. Remove the Thrust Reverser Sleeve

A. Equipment

- (1) Sling, Thrust Reverser Sleeve - A78008-16
- (2) Hoist - A20001-79
- (3) Hoist, Arm Extension - A20001-55

B. Consumable Materials

- (1) G02129 Tape - Vinyl, Permacel P-29
- (2) G02483 Tape - Speed, 3M Y436 (optional to vinyl tape)

C. References

- (1) AMM 6-43-00/201, Engine and Nacelle Strut Access Doors and Panels
- (2) AMM 27-61-00/201, Spoiler/Speedbrake Control System
- (3) AMM 78-31-00/201, Thrust Reverser System
- (4) AMM 78-31-11/601, Thrust Reverser Track Liners
- (5) AMM 78-31-13/601, Thrust Reverser Track Sliders
- (6) AMM 78-31-15/401, Thrust Reverser Blocker Door Drag Links
- (7) AMM 78-31-17/401, Thrust Reverser Hydraulic Actuators

D. Access

(1) Location Zones

- 411 Left Engine
- 421 Right Engine

(2) Access Panels

- 415AL Fan Reverser (Left)
- 416AR Fan Reverser (Right)
- 425AL Fan Reverser (Left)
- 426AR Fan Reverser (Right)

E. Prepare to Remove the Thrust Reverser Sleeve

S 044-002-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).

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S 044-003-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILER/SPEEDBRAKE CONTROL SYSTEM. IF YOU DO NOT DO THIS, THE SPOILERS CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (2) Do the deactivation procedure for the spoiler/speedbrake control system (AMM 27-61-00/201).

S 864-004-N00

- (3) Make sure the forward thrust lever is in the idle position.
 - (a) Attach the DO-NOT-OPERATE tag to the forward thrust lever.

S 864-005-N00

- (4) Make sure the reverse thrust lever is in the full forward (down) position.
 - (a) Attach the DO-NOT-OPERATE tag to the reverse thrust lever.

S 034-006-N00

- (5) Make sure the deactivation pins are not installed in the thrust reverser sleeve (AMM 78-31-00/201).

F. Remove the Thrust Reverser Sleeve (Fig. 401 and 402).

S 494-007-N00

- (1) Attach the sling to the thrust reverser sleeve (Fig. 402).
 - (a) Remove the four screw plugs from the thrust reverser sleeve.
 - 1) The plugs are found forward of the top and middle access panels for the hydraulic actuator.
 - (b) Install the fittings on the thrust reverser sleeve at the applicable position with the mark.
 - 1) Make sure you know the fitting names for the sling attach points to correctly install the sling.
 - 2) All four fittings have a mark.

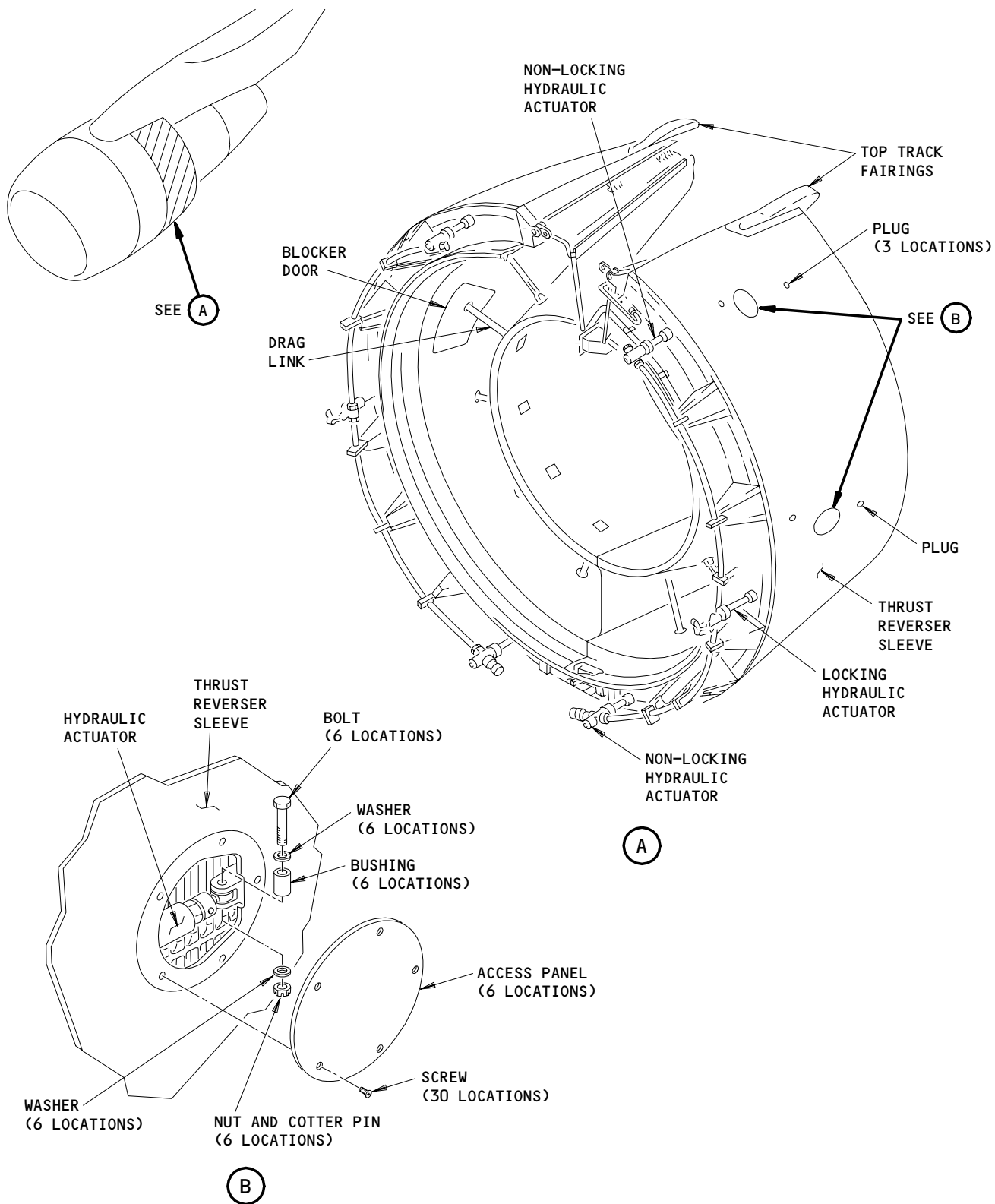
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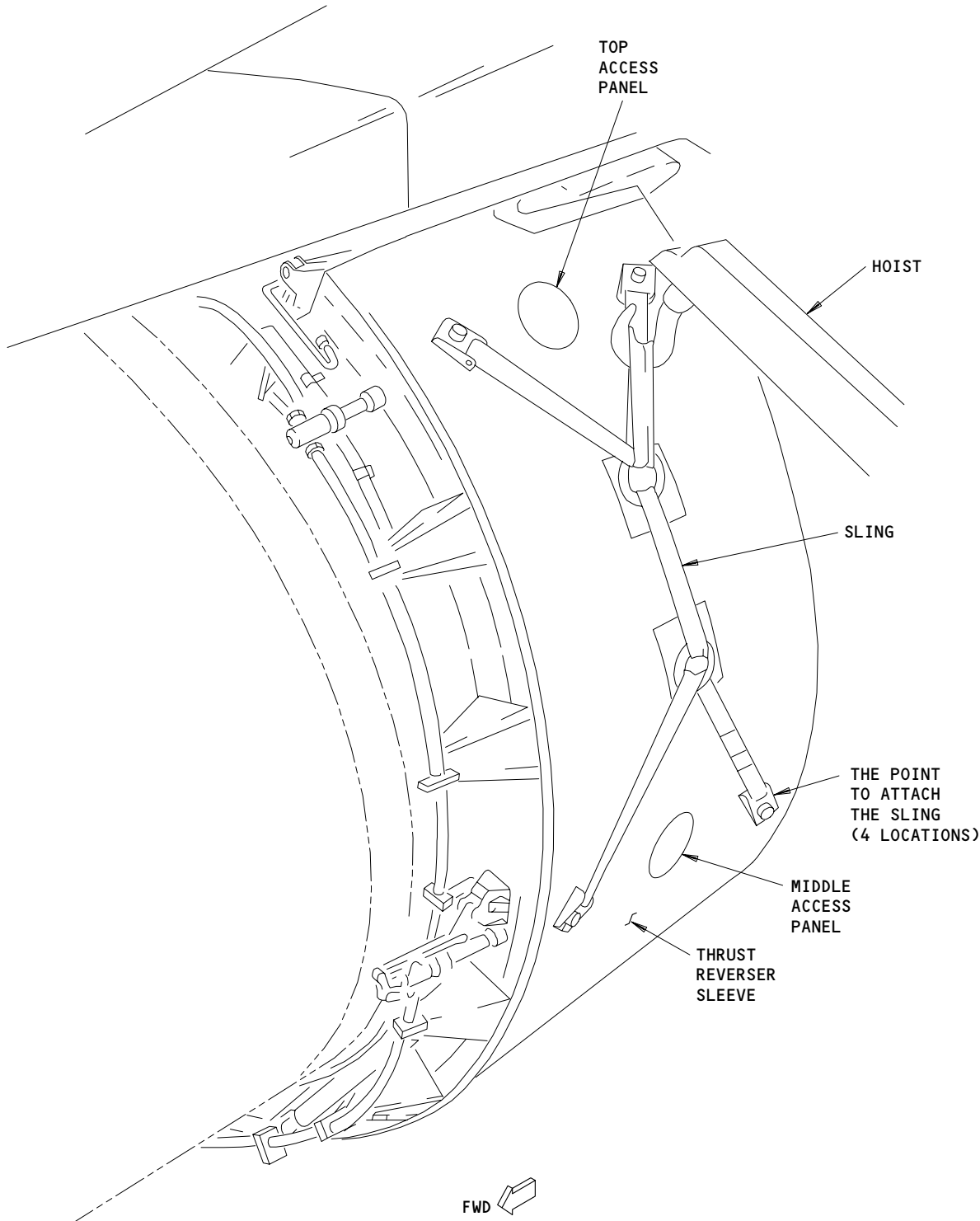
Thrust Reverser Sleeve Installation
Figure 401

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THRUST REVERSER IN THE CLOSED POSITION

Thrust Reverser Sleeve Sling Installation
Figure 402

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S 864-008-N00

CAUTION: REMOVE ALL EQUIPMENT, WORK STANDS, AND OTHER ITEMS WHICH ARE IN THE AREA AFT OF THE THRUST REVERSER. IF YOU DO NOT DO THIS, YOU CAN CAUSE DAMAGE TO THE THRUST REVERSER.

- (2) Manually extend the thrust reverser (AMM 78-31-00/201).

S 014-009-N00

- (3) Remove the access panels for the hydraulic actuator from the thrust reverser (AMM 6-43-00/201).

ENGINE	POSITION	ACCESS DOOR NUMBER
Left	Outboard	415 CL, 415 DL, 415 EL
Left	Inboard	416 CR, 416 DR, 416 ER
Right	Inboard	425 CL, 425 DL, 425 EL
Right	Outboard	426 CR, 426 DR, 426 ER

S 034-010-N00

CAUTION: DO NOT LET THE ROD ENDS OF THE HYDRAULIC ACTUATOR TURN WHEN YOU REMOVE THE BOLTS. IF THE ROD ENDS TURN, THE ROD ENDS ARE NOT ALIGNED WITH THE HYDRAULIC ACTUATOR, BODY OR WORMGEAR.

- (4) Remove the cotter pin, nut, washer and bolt which attach the rod end to the thrust reverser sleeve (AMM 78-31-17/401).
(a) Attach the rod ends to prevent movement.

S 034-035-N00

WARNING: HOLD THE BLOCKER DOOR WHEN YOU DISCONNECT IT FROM THE DRAG LINK. THE BLOCKER DOOR IS FREE TO TURN ON ITS HINGES AND CAUSE INJURY TO YOU AND DAMAGE TO THE FAN COWL.

- (5) Disconnect the drag links from the blocker doors (AMM 78-31-14/401).
(a) Wind a clean cloth around the drag link and attach it to the inner wall of the fan cowl with tape.

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S 424-037-N00

- (6) Put the blocker door in the stowed position and attach it to the thrust reverser sleeve with tape (AMM 78-31-15/401).

S 034-012-N00

- (7) Remove the maximum extension stop blocks which are attached to the top and lower auxiliary tracks.

S 494-013-N00

CAUTION: MAKE SURE THE WEIGHT OF THE THRUST REVERSER SLEEVE IS FULLY HELD BY THE GROUND SUPPORT EQUIPMENT BEFORE YOU REMOVE IT. IF YOU DO NOT DO THIS, YOU CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

- (8) Use the sling to hold the thrust reverser sleeve.
 - (a) Attach the hoist to the sling loop which has a mark for the inboard or outboard thrust reverser sleeve.
 - (b) Make sure the weight of the thrust reverser sleeve is fully held by the sling.

S 024-014-N00

- (9) Move the thrust reverser sleeve rearward to remove it.

S 214-015-N00

- (10) Examine the track liners of the thrust reverser (AMM 78-31-11/601).

S 214-036-N00

- (11) Examine the track sliders of the thrust reverser (AMM 78-31-13/601).

TASK 78-31-10-404-016-N00

3. Install the Thrust Reverser Sleeve

A. References

- (1) AMM 6-43-00/201, Engine and Nacelle Strut Access Doors and Panels
- (2) AMM 27-61-00/201, Spoiler/Speedbrake Control System
- (3) AMM 78-31-00/201, Thrust Reverser System
- (4) AMM 78-31-11/601, Thrust Reverser Track Liners
- (5) AMM 78-31-13/601, Thrust Reverser Track Sliders

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- (6) AMM 78-31-15/401, Thrust Reverser Blocker Door Drag Links
- (7) AMM 78-31-17/401, Thrust Reverser Hydraulic Actuators

B. Access

(1) Location Zones

- 411 Left Engine
- 421 Right Engine

(2) Access Panels

- 415AL Fan Reverser (Left)
- 416AR Fan Reverser (Right)
- 425AL Fan Reverser (Left)
- 426AR Fan Reverser (Right)

C. Install the Thrust Reverser Sleeve (Fig. 401)

S 214-017-N00

- (1) Make sure the DO-NOT-OPERATE tags are attached to the forward thrust lever and the reverse thrust lever.

S 214-018-N00

- (2) Examine the tracks and the track liners (AMM 78-31-11/601).

S 214-041-N00

- (3) Examine the track sliders (AMM 78-31-13/601).

S 824-020-N00

CAUTION: MAKE SURE THE TOP AND THE BOTTOM OF THE THRUST REVERSER SLEEVE MOVE TOGETHER WHEN YOU MOVE THE THRUST REVERSER SLEEVE ON THE TRACKS. IF THE TOP AND THE BOTTOM DO NOT MOVE TOGETHER, YOU CAN CAUSE DAMAGE TO THE "RULON J".

CAUTION: MAKE SURE TO CORRECTLY ALIGN THE TRACK SLIDERS AND THE TRACKS BEFORE YOU TRY TO MOVE THE THRUST REVERSER SLEEVE. IF THEY ARE NOT ALIGNED, YOU CAN CAUSE DAMAGE TO THE "RULON J" LAYER WHICH WILL DECREASE THE PERFORMANCE OF THE THRUST REVERSER SLEEVE.

- (4) Align the track sliders with the tracks.

NOTE: If necessary, you can add a radius of 0.005 to 0.015 at the entry end of the "Rulon J" on the main thrust reverser slider. This could make it easier to install the thrust reverser sleeve.

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S 424-021-N00

- (5) Move the thrust reverser sleeve forward.
(a) Make sure the top and bottom of the thrust reverser sleeve move together.

S 034-022-N00

CAUTION: DO NOT LET THE ROD ENDS OF THE HYDRAULIC ACTUATOR TURN WHEN YOU INSTALL THE BOLTS. IF THE ROD ENDS TURN, THE ROD ENDS ARE NOT ALIGNED WITH THE HYDRAULIC ACTUATOR, BODY OR WORMGEAR.

- (6) Remove the device which locks the rod ends before you install the rod end fasteners.

S 824-023-N00

- (7) Align the rod ends with the points in the thrust reverser.

S 434-024-N00

- (8) Install the bolt, washer, and nut to attach the rod ends for each hydraulic actuator.
(a) Tighten the bolts to 20 pound-inches.
(b) Tighten the bolt until the hole in the bolt aligns with a slot in the nut.
(c) Install the cotter pin in the hole.

S 094-025-N00

- (9) Remove the sling and the hoist from the thrust reverser sleeve.

S 434-026-N00

- (10) Install the plugs into the thrust reverser sleeve.
(a) Tighten the plugs to 125-150 pound-inches.

S 434-034-N00

WARNING: HOLD THE BLOCKER DOOR WHEN YOU DISCONNECT IT FROM THE DRAG LINK. THE BLOCKER DOOR IS FREE TO TURN ON ITS HINGES AND CAUSE INJURY TO YOU AND DAMAGE TO THE FAN COWL.

- (11) Remove the tape which was used to hold the blocker door in the stowed position.

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- S 024-038-N00
(12) Remove the tape and cloth from the drag link.
- S 424-039-N00
(13) Connect the drag links to the blocker doors (AMM 78-31-14/401).
- S 434-028-N00
(14) Install the maximum extension stop blocks to the top and lower tracks.
- D. Put the Airplane Back to Its Usual Condition
- S 414-029-N00
(1) Install the access panels for the hydraulic actuators (AMM 6-43-00/201).
- S 864-030-N00
(2) Manually retract the thrust reverser (AMM 78-31-00/201).
- S 034-031-N00
(3) Remove the DO-NOT-OPERATE tags on the thrust levers.
- S 444-032-N00
(4) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).
- S 864-033-N00
(5) Operate the thrust reverser to make sure it operates correctly (AMM 78-31-00/201).
- S 444-040-N00
(6) Do the activation procedure for the spoiler/speedbrake control system (AMM 27-61-00/201).

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THRUST REVERSER TRACK LINERS – REMOVAL/INSTALLATION

1. General

- A. For this procedure the thrust reverser main track liners are referred to as the track liners and the auxiliary thrust reverser track liners are referred to as the aux track liners.
- B. This procedure has two tasks. The first task removes and installs the the track liners. The second task removes and installs the aux track liners.

TASK 78-31-11-004-001-N00

2. Remove the Track Liners

A. References

- (1) AMM 78-31-10/401, Thrust Reverser Sleeve

B. Access

(1) Location Zones

- 411 Left Engine
- 421 Right Engine

(2) Access Panels

- 415AL Fan Reverser (Left)
- 416AR Fan Reverser (Right)
- 425AL Fan Reverser (Left)
- 426AR Fan Reverser (Right)

C. Remove the Track Liner (Fig. 401)

S 024-039-N00

- (1) Remove the applicable thrust reverser sleeve (AMM 78-31-10/401).

S 024-003-N00

- (2) Remove the bolt, washer and nut which attach the track liner to the track.

S 024-013-N00

- (3) Remove the bolt and washer which keeps the track liner retainer.

S 034-004-N00

- (4) Remove the track liner retainer and the pin retainer from the track liner.

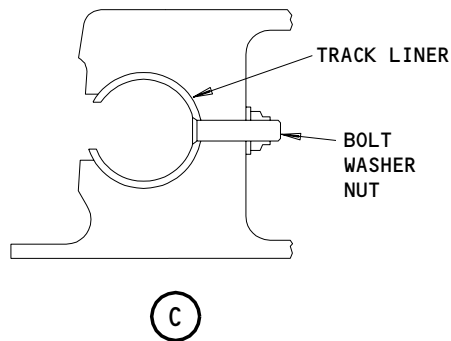
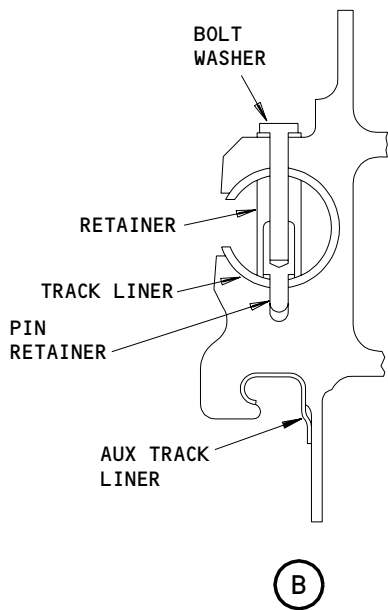
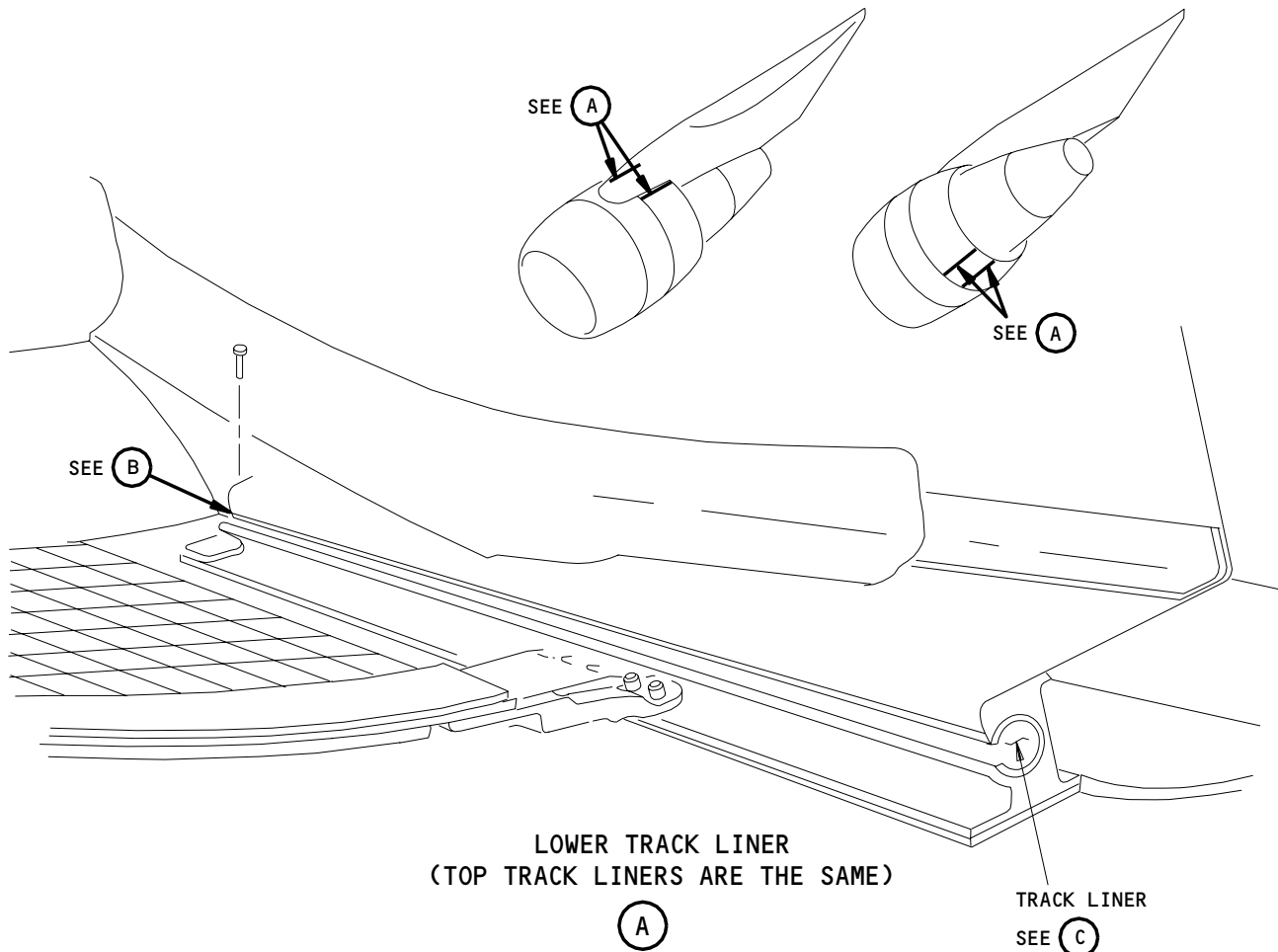
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Thrust Reverser Track Liners Installation
Figure 401

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S 024-005-N00

CAUTION: WHEN YOU HOLD THE FREE EDGES OF THE TRACK LINER TOGETHER, APPLY ONLY SUFFICIENT FORCE TO LET THE LINER MOVE IN THE TRACK. IF YOU APPLY TOO MUCH FORCE, YOU CAN CAUSE DAMAGE TO THE TRACK LINER.

- (5) Hold (squeeze) the free edges of the track liner together until the track liner can be moved in the track.

S 024-006-N00

- (6) Pull the track liner out of the track.

TASK 78-31-11-404-007-N00

3. Install the Track Liner

A. References

- (1) AMM 78-31-10/401, Thrust Reverser Sleeve

B. Access

(1) Location Zones

- 411 Left Engine
- 421 Right Engine

(2) Access Panels

- 415AL Fan Reverser (Left)
- 416AR Fan Reverser (Right)
- 425AL Fan Reverser (Left)
- 426AR Fan Reverser (Right)

C. Install the Track Liner (Fig. 401)

S 424-008-N00

CAUTION: WHEN YOU HOLD THE FREE EDGES OF THE TRACK LINER TOGETHER, APPLY ONLY SUFFICIENT FORCE TO LET THE LINER MOVE IN THE TRACK. IF YOU APPLY TOO MUCH FORCE, YOU CAN CAUSE DAMAGE TO THE TRACK LINER.

- (1) Hold (squeeze) the free edges of the track liner together until the track liner can be moved in the track.
 - (a) Put the track liner into the track.
 - (b) Make sure the edges of the track liner are parallel with the track.
 - (c) Make sure the track liner is tightly installed to not let contamination get between the track liner and the track.

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- S 434-009-N00
- (2) Install the retainer and the pin retainer in the track liner.

- S 424-014-N00
- (3) Install the washer and bolt into the retainer.

- S 824-010-N00
- (4) Align the track liner and the holes in the track.

- S 434-011-N00
- (5) Install the bolts in the holes.
 - (a) Install the washers and nuts.
 - (b) Install the lockwire in the forward bolt.
- D. Put the Airplane Back to Its Usual Condition.
 - S 424-040-N00
 - (1) Install the thrust reverser sleeve (AMM 78-31-10/401).

TASK 78-31-11-784-016-N00

4. Remove the Aux Track Liners

A. References

- (1) AMM 78-31-11/601, Thrust Reverser Track Beam Inspection

B. Access

(1) Location Zones

- 411 Left Engine
- 421 Right Engine

(2) Access Panels

- 415AL Fan Reverser (Left)
- 416AR Fan Reverser (Right)
- 425AL Fan Reverser (Left)
- 426AR Fan Reverser (Right)

C. Remove the Aux Track Liner (Fig. 401)

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S 864-045-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO MANUALLY EXTEND THE THRUST REVERSER SLEEVE. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Manually extend the thrust reverser sleeve (AMM 78-31-00/201).

S 024-041-N00

- (2) Remove the applicable thrust reverser Slider.
- (a) Remove the nuts from the fasteners which attach the Slider fitting to the translating sleeve.
 - (b) Carefully break the bondline between the Slider fitting and the translating sleeve.
 - (c) Remove the Slider fitting while you keep the fastening bolts on the translating sleeve.
 - (d) Keep the shim for re-use.

S 024-019-N00

- (3) Drill out the fasteners that attach the existing track liner.

NOTE: The forward most fastener may be a hi-lock which can be removed. Remove the skin panel just below the fastener to get access to the hi-lok.

S 024-020-N00

- (4) Pull outward on the wavy section of the aux track liner and roll the liner out of the track.

NOTE: Do not damage or deform the wavy section of the liner. It may be necessary to transfer the fastener locations to the new liner.

Track liners can not be re-used.

S 214-021-N00

- (5) Examine the aux track beam (AMM 78-31-11/601).

TASK 78-31-11-784-022-N00

5. Install the Aux Track Liner

A. Access

- (1) Location Zones

411 Left Engine
421 Right Engine

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(2) Access Panels

- 415AL Fan Reverser (Left)
- 416AR Fan Reverser (Right)
- 425AL Fan Reverser (Left)
- 426AR Fan Reverser (Right)

B. Install the Aux Track Liner (Fig. 401)

S 304-023-N00

- (1) Drill six holes (0.164 to 0.168 inch dia.) in the new liner to match the removed liner fastener pattern.

NOTE: If necessary, make a template to transfer the fastener hole locations from the old liner to the new liner.

S 424-027-N00

- (2) Install the new liner.
- (a) Slide the new track liner into the aft end of the aux track and align the holes in the track liner with the holes in the track beam.

NOTE: The liner may have to be tapped into position (Do not damage or deform the liner when you tap it).

- 1) Install the forward most hi-lock fastener, if applicable.
- 2) Install flush head rivets.

- (b) Install the Slider in the reverse order from the way you removed it.

NOTE: If a new silder is being installed, transfer the 6/32 inch bolt hole pattern from the replaced slider to the new slider.

C. Put the Airplane Back to Its Usual Condition.

S 984-043-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO MANUALLY RETRACT THE THRUST REVERSER SLEEVE. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Manually retract the thrust reverser sleeve (AMM 78-31-00/201).

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THRUST REVERSER MAIN/AUXILIARY TRACK LINER AND AUXILIARY
THRUST REVERSER TRACK BEAM - INSPECTION/CHECK

1. General

- A. This procedure does an inspection of:
 - (1) Thrust reverser main track liners.
 - (2) Thrust reverser auxiliary track liners.
 - (3) Thrust reverser auxiliary track beams.
- B. For this procedure the thrust reverser main and auxiliary track liners and the thrust reverser upper/lower auxiliary track beams are referred to as:
 - (1) Main track liner as TRACK LINER.
 - (2) Upper/lower auxiliary track liner as AUX TRACK LINER.
 - (3) Upper/lower auxiliary track beam as AUX TRACK BEAM.

TASK 78-31-11-206-001-N00

2. Thrust Reverser Track Liners - Inspection/Check

- A. References
 - (1) AMM 78-31-10/401, Thrust Reverser Sleeve
 - (2) AMM 78-31-11/401, Thrust Reverser Track Liners
 - (3) AMM 78-31-13/601, Thrust Reverser Track Sliders
- B. Access
 - (1) Location Zones
 - 411 Left Engine
 - 421 Right Engine
 - (2) Access panels
 - 415AL Fan Reverser (Left)
 - 416AR Fan Reverser (Right)
 - 425AL Fan Reverser (Left)
 - 426AR Fan Reverser (Right)

C. Prepare to Do the Inspection of the Track Liners

S 016-003-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO REMOVE THE THRUST REVERSER SLEEVE. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Remove the thrust reverser sleeve (AMM 78-31-10/401).
- D. Do the Inspection of the Track Liners.

S 216-004-N00

- (1) Examine the track liners for areas which have worn too much.
 - (a) If you find damage, replace the track liner (AMM 78-31-11/401).

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- S 166-005-N00
 - (2) Remove all unwanted material from the track and track liner with a clean cloth.

 - S 216-006-N00
 - (3) Make sure there is no unwanted material between the track and the track liner.

 - S 216-007-N00
 - (4) Examine the thrust reverser track sliders (AMM 78-31-13/601).
- E. Put the Airplane Back to Its Usual Condition

S 416-008-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO INSTALL THE THRUST REVERSER SLEEVE. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Install the thrust reverser sleeve (AMM 78-31-10/401).

TASK 78-31-11-206-029-N00

3. Thrust Reverser Aux Track Liners and Aux Track Beam - Inspection/Check

A. References

- (1) AMM 78-31-10/401, Thrust Reverser Sleeve
- (2) AMM 78-31-11/401, Thrust Reverser Track Liner
- (3) AMM 78-31-13/601, Thrust Reverser Aux Track Slider

B. Access

(1) Location Zones

- 411 Left Engine
- 421 Right Engine

(2) Access panels

- 415AL Fan Reverser (Left)
- 416AR Fan Reverser (Right)
- 425AL Fan Reverser (Left)
- 426AR Fan Reverser (Right)

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C. Prepare to do the Inspection of the Aux Track Liners and Aux Track Beams.

S 016-030-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO MANUALLY EXTEND THE THRUST REVERSER SLEEVE. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Manually extend the thrust reverser sleeve (AMM 78-31-00/201).

D. Do the Inspection of the Aux Track Liners and Aux Track Beams.

S 216-031-N00

(1) Examine the auxiliary thrust reverser track sliders (AMM 78-31-13/601).

S 216-032-N00

(2) Examine the Aux Track Liners and Aux Track Beams for damage.

NOTE: Use a flashlight and a mirror to do the inspection.

S 216-033-N00

(3) If there is no visible wear to Aux Track Liners, Aux Track Beams or auxiliary slider fittings then no further action is required.

(a) Put the Airplane Back to Its Usual Condition.

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO MANUALLY RETRACT THE THRUST REVERSER SLEEVE. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(b) Manually retract the thrust reverser sleeve (AMM 78-31-00/201).

S 896-034-N00

(4) If only the Aux Track Liners are worn or gouged anywhere along their length, replace the liner (AMM 78-31-11/401).

S 226-035-N00

(5) If the Aux Track Beam is worn, gouged or damaged, do a detailed inspection of the beam.

(a) Leave the aux track liner in place and measure dimension A Fig. 601.

1) Use a T-Type snap gage and a micrometer to make detailed measurements every 4 inches of the Aux Track Beam.

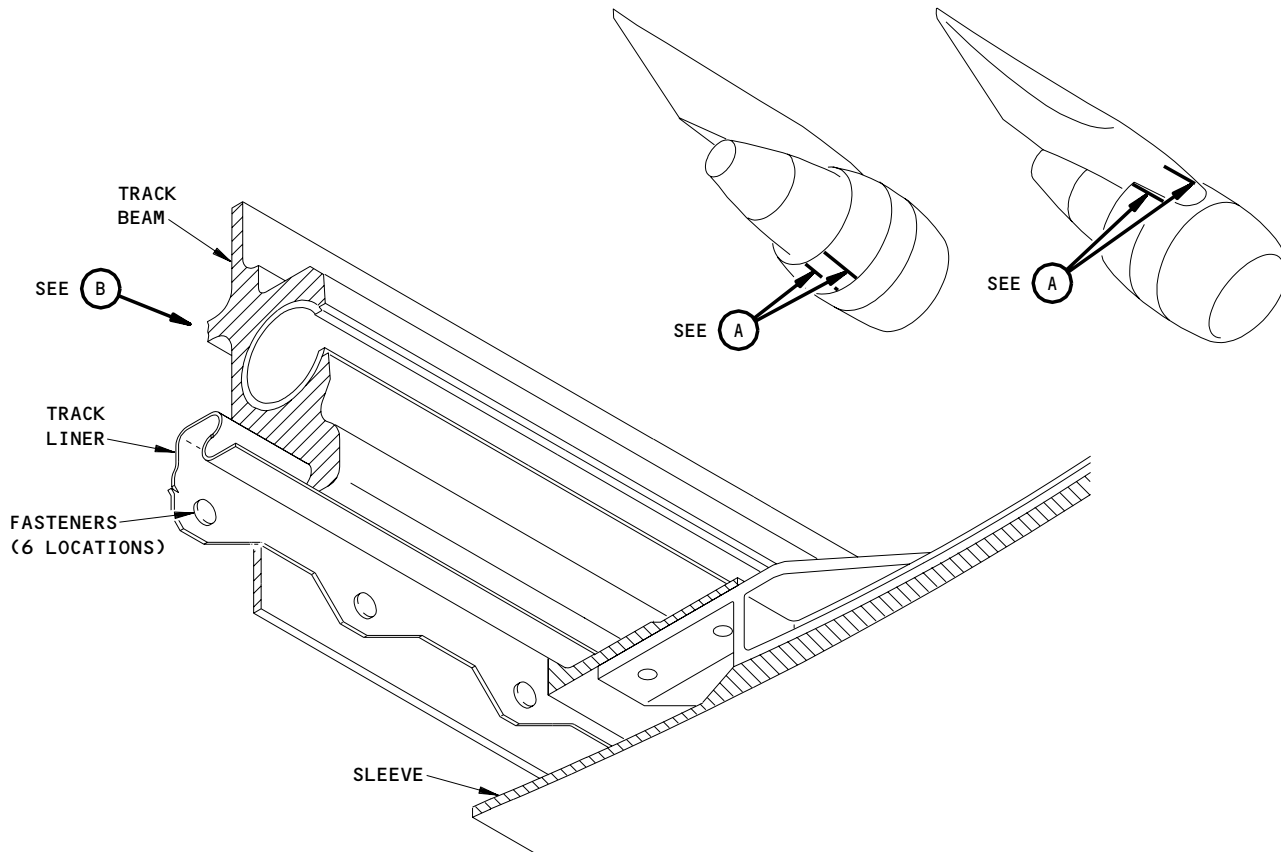
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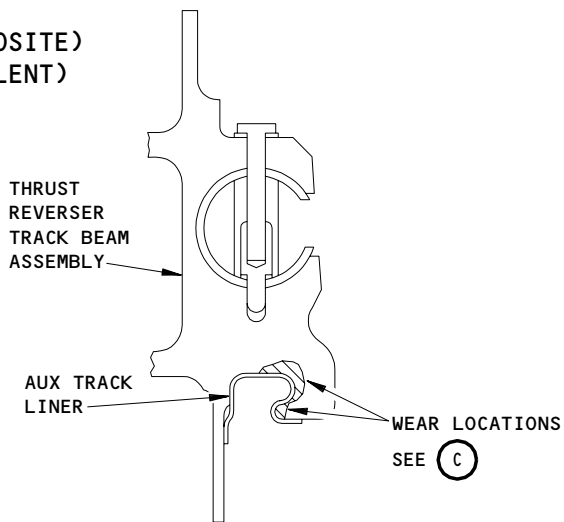
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RIGHT LOWER TRACK ASSEMBLY
(LEFT LOWER TRACK ASSEMBLY IS OPPOSITE)
(TOP TRACK ASSEMBLIES ARE EQUIVALENT)

(A)



(B)

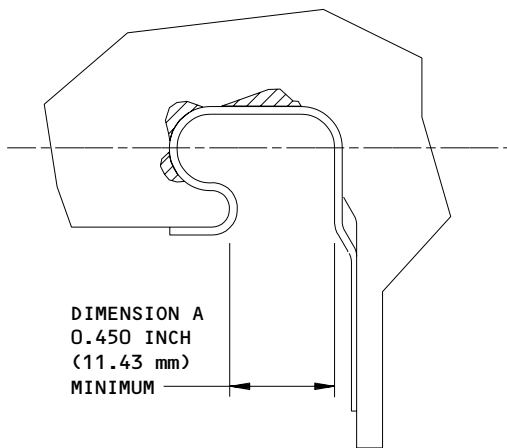
Thrust Reverser Aux Track Liner Inspection
Figure 601 (Sheet 1)

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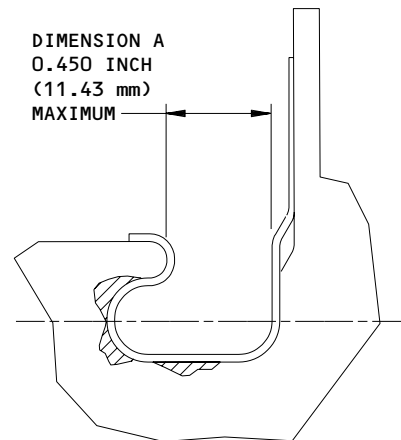
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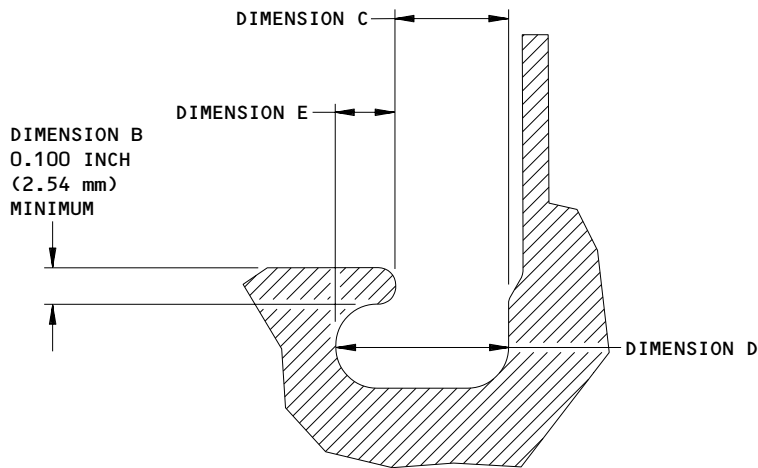
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LOWER AUX
TRACK BEAM



UPPER AUX
TRACK BEAM



WEAR LOCATIONS

(C)

Thrust Reverser Aux Track Liner Inspection
Figure 601 (Sheet 2)

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- 2) If any measurement of dimension A is greater than or equal to 0.450 inches, remove the aux track liner and aux track slider.
- 3) Measure every 2 inches along the aux track beam for dimension B, C, D in Fig. 601.
- 4) Subtract dimension C from dimension D to compute dimension E.
- 5) If dimension B is less than 0.100 inches and dimension E is greater than or equal to 0.140 inches then repair the aux track beam with the steps that follow.
 - a) Break sharp edges of the worn areas.
 - b) Clean and alodine finish worn areas of the auxiliary track.
 - c) Install a new Aux Track Liner (AMM 78-31-11/401).
 - d) Fill in worn areas of the aux track beam.
 1. Inject BMS5-28, type 25 or type 6 potting compound under the outside edge of the aux track liner.
 2. Remove the excess potting before it becomes hard.
 3. Let the potting compound dry before you replace the Slider.
 - e) Install a new aux track slider (AMM 78-31-11/401).
 - f) Do the thrust reverser functional test 2 times (AMM 78-31-00/501).
 - g) Do visual inspection of the aux track and aux track slider (AMM 78-31-11/601).

NOTE: If there are any problems correct them and repeat the thrust reverser functional test.

- (b) If dimension B is less than 0.100 inches and dimension E is less than or equal to 0.080 inches, replace the aux track beam (CMM 78-11-56).
- (c) If dimension B is less than 0.100 inches and dimension E is between 0.080 and 0.140 inches repair the aux track beam (AMM 78-31-11/801).

E. Put the Airplane Back to Its Usual Condition

S 416-036-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO MANUALLY RETRACT THE THRUST REVERSER SLEEVE. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Manually retract the thrust reverser sleeve (AMM 78-31-00/201).

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THRUST REVERSER AUXILIARY TRACK BEAM – APPROVED REPAIR

1. General

- A. This procedure gives instructions to repair a worn thrust reverser auxiliary track beam assembly.

TASK 78-31-11-308-001-N00

2. Repair the Thrust Reverser Auxiliary Track Beam

A. References

- (1) AMM 78-31-00/201, Thrust Reverser System
(2) AMM 78-31-11/401, Thrust Reverser Track Liner

B. Access

(1) Location Zones

- 411 Left Engine
421 Right Engine

(2) Access panels

- 415AL Fan Reverser (Left)
416AR Fan Reverser (Right)
425AL Fan Reverser (Left)
426AR Fan Reverser (Right)

- C. Prepare to do the the repair of the Aux Track Beam.

S 018-002-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO MANUALLY EXTEND THE THRUST REVERSER SLEEVE. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Manually extend the thrust reverser sleeve (AMM 78-31-00/201).

S 358-003-N00

- (2) On the thrust reverser auxiliary track, do these steps:
- (a) Break sharp edges of the worn areas.
 - (b) Clean, per SOPM 20-30-03, and alodine finish the worn areas of the auxiliary track.
 - (c) Install a new Aux Track Liner (AMM 78-31-11/401).
 - (d) Fill in worn areas of the aux track beam.
 - 1) Inject BMS5-28, type 25 or type 6 potting compound under the outside edge of the aux track liner.
 - 2) Remove the excess potting before it becomes hard.

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- (e) Remove primer coating from aux track beam flange area to allow for installation of retainer assembly.
- (f) Chamfer edges of slider to make sure there is smooth contact between the slider and retainer.
- (g) Put the slider in its position at one end of the track. Shim the slider against track as shown in Fig. 801 until contact is made between slider and the lip of the aux track beam channel.

NOTE: Make sure the potting compound under the track liner is dry before you install the slider.

- (h) Align the retainer assembly (PN: 315T4405) flush with the forward end of the aux track liner.
- (i) Clamp the retainer assembly in position with 0.05 in. clearance from positioned slider.
- (j) Move the slider to the other end of the track.
 - 1) Shim the slider against the track as shown in Fig. 801 until contact is made between the slider and the lip of the aux track beam channel.
- (k) Clamp the retainer assembly in position with 0.05 in. clearance from the positioned slider.

NOTE: Both ends of the retainer assembly must have a 0.05 in. clearance on the slider.

- (l) Drill holes (0.164/0.168 in. dia.) through the retainer assembly pilot holes and structure (Fig. 802).
 - 1) Debur the holes (SOPM 20-10-02).
- (m) Install the temporary fasteners.
- (n) Mark the retainer where existing fasteners were removed from the structure.
 - 1) Remove the temporary fasteners.
- (o) Drill pilot holes where you marked the retainer assembly for existing holes.
- (p) Drill pilot holes in the retainer for the remaining locations.
- (q) Install the retainer assembly with temporary fasteners.
- (r) Drill holes (0.164/0.168 in. dia.) through retainer assembly pilot holes and structure (Fig. 802).
 - 1) Debur the holes (SOPM 20-10-02).
- (s) Remove the retainer assembly.
- (t) Counter bore each of the holes in the retainer assembly.
 - 1) Diameter = 0.50 - 0.52 in.
 - 2) Depth = 0.39 in.
 - 3) Fillet radius = 0.032 - 0.062 in.
- (u) Epoxy prime any exposed reworked parent material.

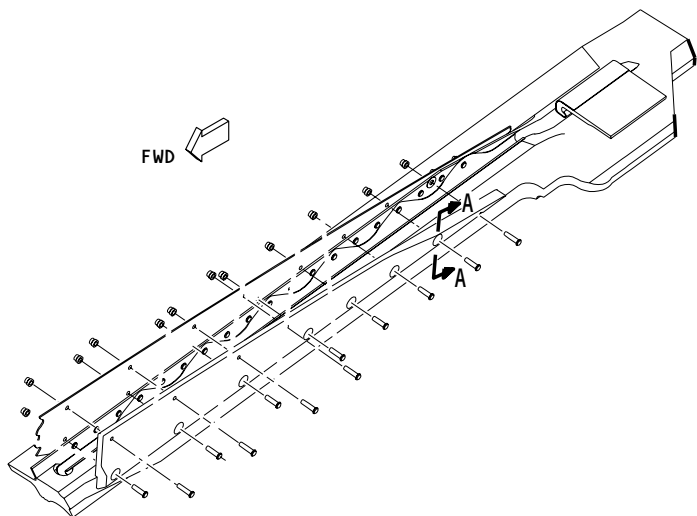
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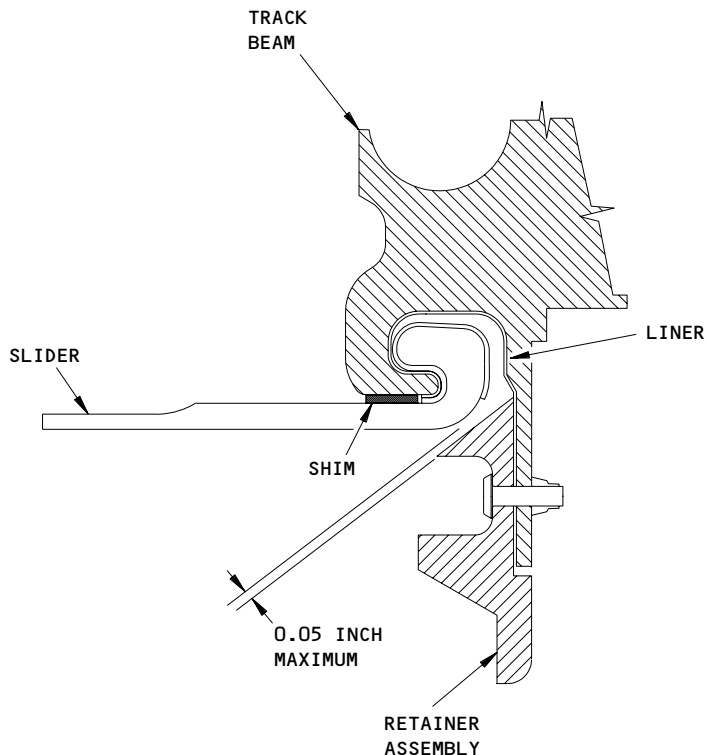
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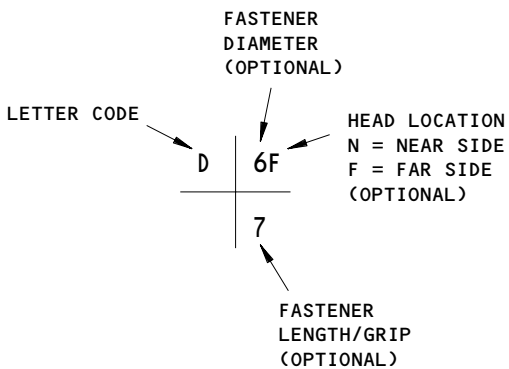
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UPPER LEFT RETAINER SHOWN
(UPPER RIGHT OPPOSITE)



A-A



EXAMPLE OF FASTENER SYMBOL

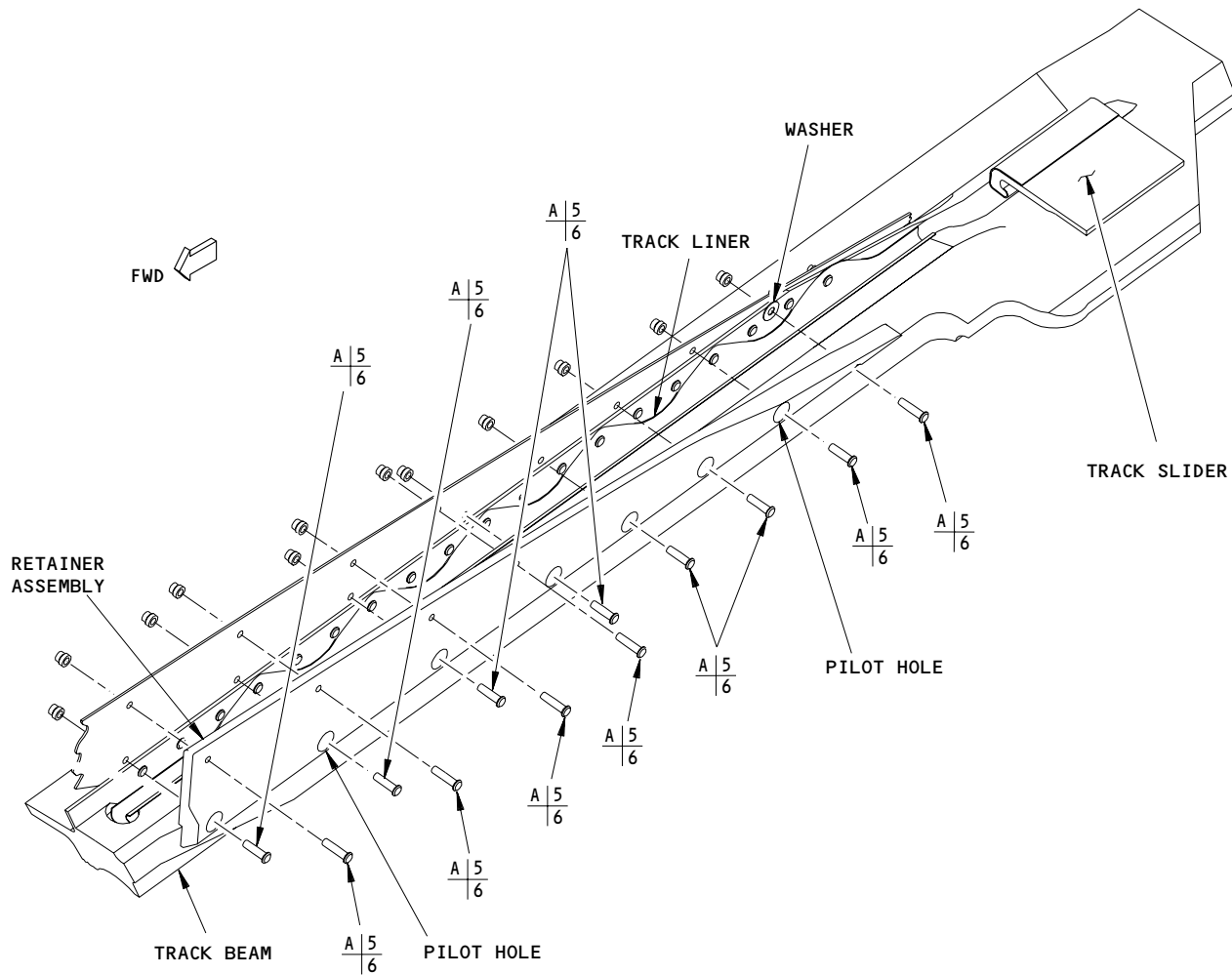
Auxiliary Track Beam Retainer Installation
Figure 801

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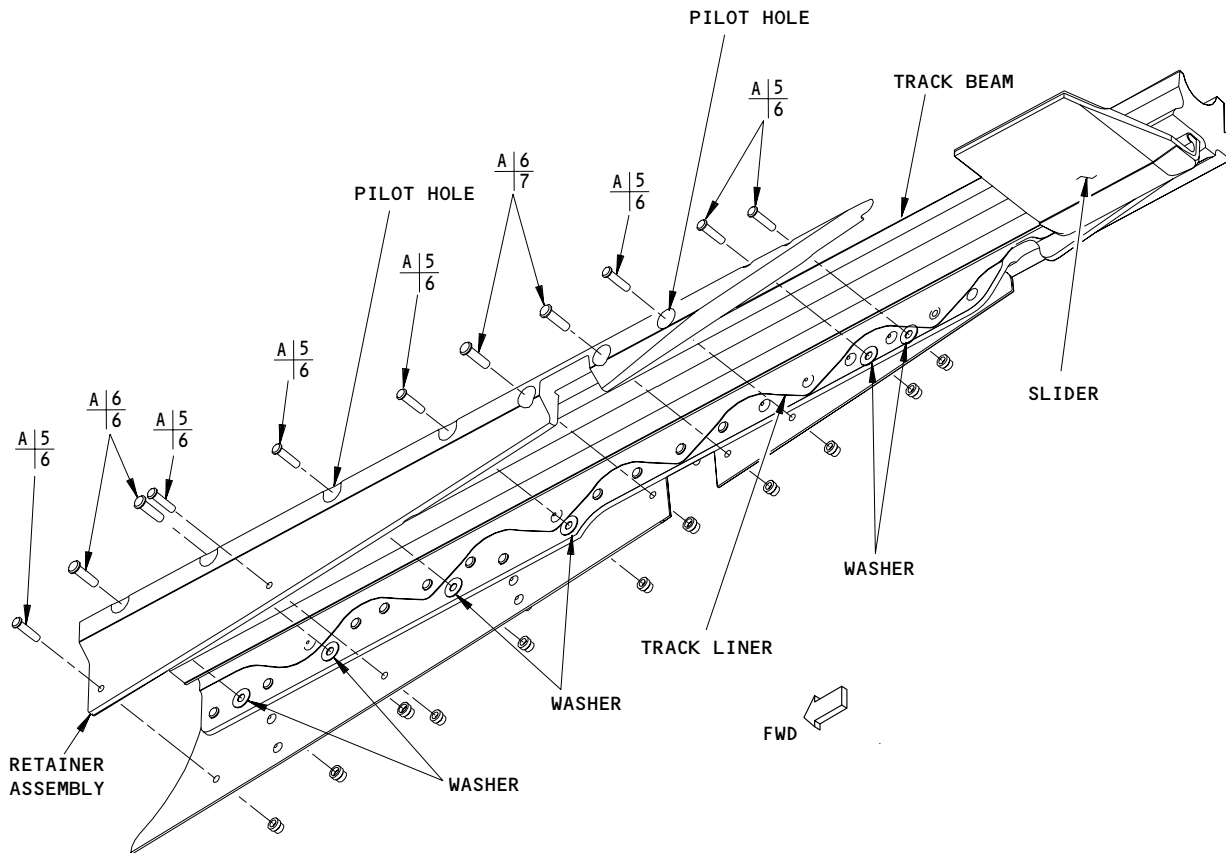
UPPER LEFT RETAINER SHOWN
(UPPER RIGHT OPPOSITE)

Auxiliary Track Beam Retainer Installation
Figure 802 (Sheet 1)

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LOWER LEFT RETAINER

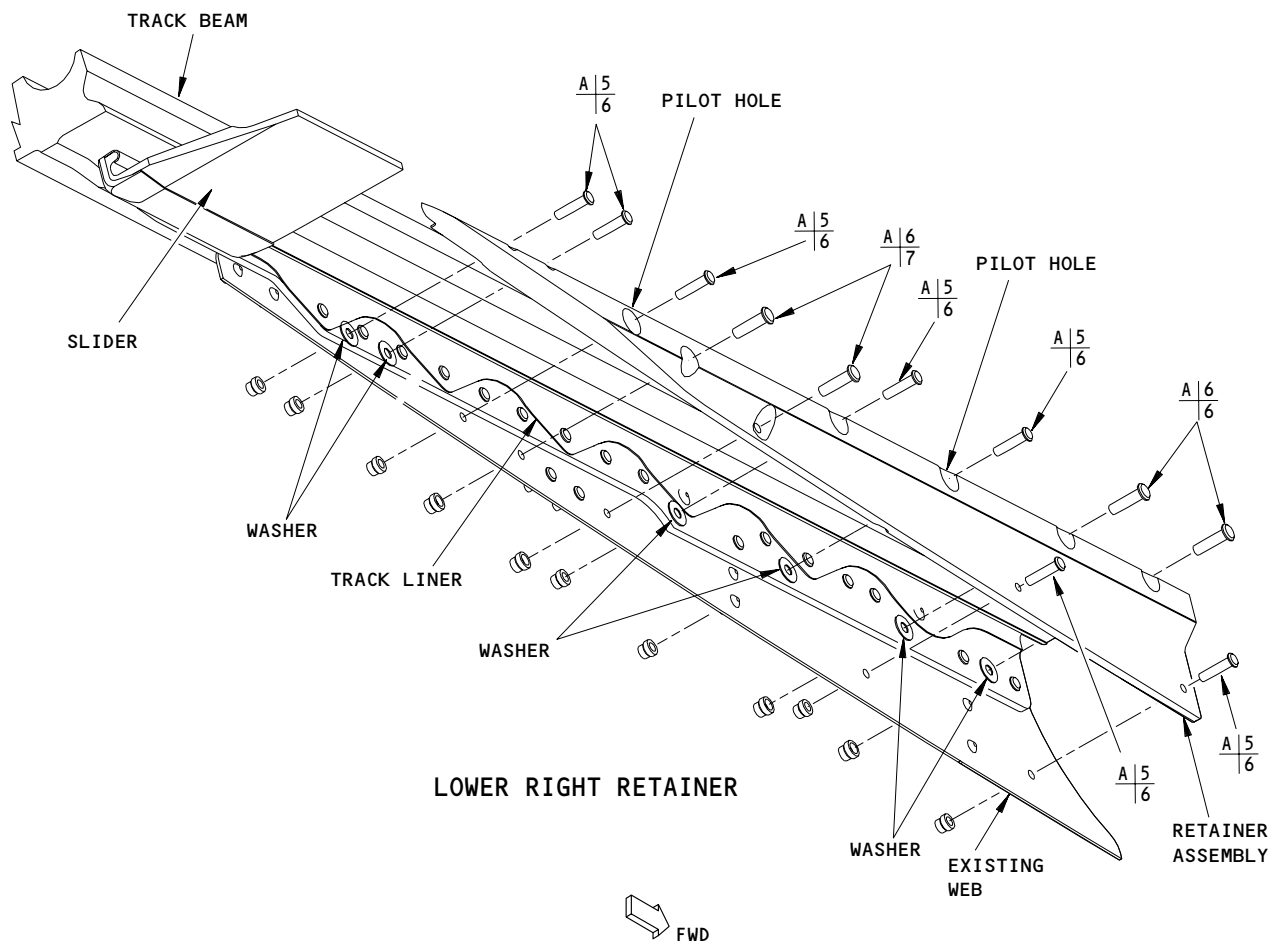
Auxiliary Track Beam Retainer Installation
Figure 802 (Sheet 2)

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Auxiliary Track Beam Retainer Installation
Figure 802 (Sheet 3)

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- (v) Install washers where indicated to shim retainer assembly (Fig. 802).
- (w) Make washers from CRES sheet type 304 per AMS5513.
 - 1) Thickness = 0.02 in.
 - 2) Outer diameter = 0.47 - 0.53 in.
 - 3) Inner diameter = 0.20 - 0.22 in.
 - 4) Concentricity = 0.030 in.
 - 5) Part mark per SOPM 20-50-10.
- (x) Apply BMS5-95 sealant on the mating surface of the retainer assembly.
- (y) Install the retainer assembly.
 - 1) Install fasteners per fastener lookup code (Fig. 801).
 - a) Install fasteners wet with BMS5-63.
 - b) Fill counter bores with potting compound (BMS5-28, type 25 or BMS5-141).
 - c) Permit time for the potting compound to dry.
 - (z) Replace access panel.
- D. Put the Airplane Back to Its Usual Condition

S 418-004-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO MANUALLY RETRACT THE THRUST REVERSER SLEEVE. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Manually retract the thrust reverser sleeve (AMM 78-31-00/201).

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THRUST REVERSER AUXILIARY TRACK SLIDER – REMOVAL/INSTALLATION

1. General

- A. The thrust reverser auxiliary track slider is referred to as the auxiliary track slider in this procedure.
- B. This procedure has two tasks. The first task removes the auxiliary track slider. The second task installs the auxiliary track slider.

TASK 78-31-13-004-001-N00

2. Remove the Auxiliary Track Slider

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)
- 416AR Fan Reverser (Right)
- 425AL Fan Reverser (Left)
- 426AR Fan Reverser (Right)

C. Prepare to Remove the Auxiliary Track Slider

S 864-024-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO MANUALLY EXTEND THE THRUST REVERSER SLEEVE. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Manually extend the thrust reverser sleeve (AMM 78-31-00/201).

D. Remove the Auxiliary Track Slider (Fig. 401)

S 024-021-N00

- (1) Remove the applicable auxiliary track slider.
 - (a) Remove the nuts from the fasteners which attach the auxiliary track slider to the translating sleeve.

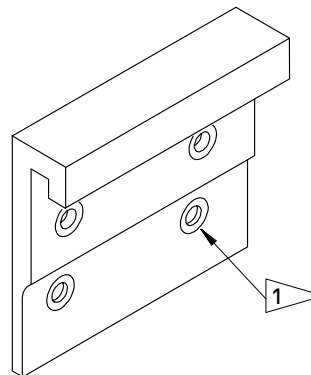
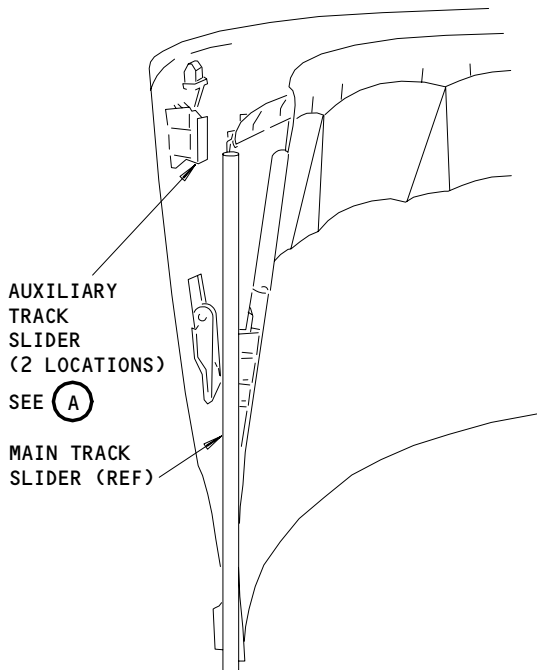
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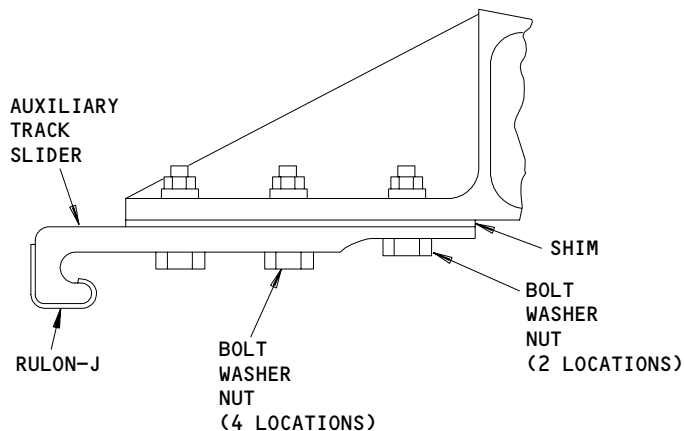
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AUXILIARY SLIDER (EXAMPLE)

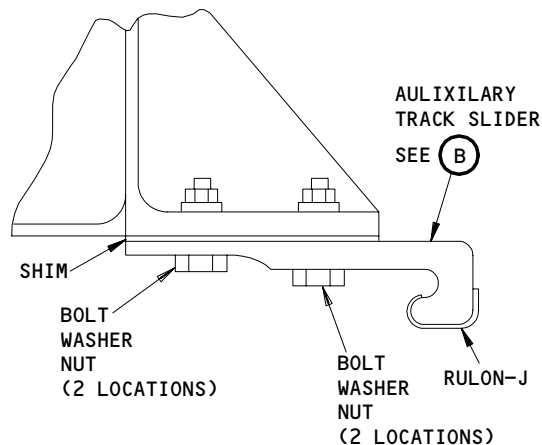
(B)

THRUST REVERSER SLEEVE
(REMOVED FROM THE THRUST REVERSER)



LOWER AUXILIARY TRACK SLIDER

(A)



TOP AUXILIARY TRACK SLIDER

(A)

NOTE: ALL DIMENSIONS ARE IN INCHES.

1 DRILL AND COUNTERSINK
0.1895-0.1905 DIA HOLE

Thrust Reverser Auxiliary Track Slider Installation
Figure 401

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- (b) Carefully break the bondline between the auxiliary track slider and the translating sleeve.
- (c) Remove the auxiliary track slider while you keep the fastening bolts on the translating sleeve.
- (d) Keep the shim for the installation.

TASK 78-31-13-404-006-N00

3. Install the Auxiliary Track Slider

A. Consumable Materials

- (1) A00955 Sealant - BMS 5-26, Class B

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

- 415AL Fan Reverser (Left)
- 416AR Fan Reverser (Right)
- 425AL Fan Reverser (Left)
- 426AR Fan Reverser (Right)

D. Install the Auxiliary Track Slider (Fig. 401).

S 284-017-N00

- (1) Examine the surface of the anti-friction (Rulon-J) material.
 - (a) No areas of bare metal can show.
 - (b) Remove all unwanted material from the slider with a clean cloth.

S 424-007-N00

- (2) Drill and countersink through the bolt holes on the hook side of the auxiliary track slider (See Fig. 401 for dimensions).

S 644-008-N00

- (3) Apply sealant to the mating surfaces of the shim.

S 434-009-N00

- (4) Install the shim.

S 424-010-N00

- (5) Install the auxiliary track slider on the bolts in the thrust reverser translating sleeve.

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S 434-012-N00

- (6) Install the washers and the nuts on the bolts.
 - (a) Tighten the bolts.

E. Put the Airplane Back to Its Usual Condition

S 864-023-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO MANUALLY RETRACT THE THRUST REVERSER SLEEVE. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Manually retract the thrust reverser (AMM 78-31-00/201).

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THRUST REVERSER TRACK SLIDERS – INSPECTION/CHECK

1. General

- A. This procedure has two tasks. The first task examines the thrust reverser main track slider. The second task examines the thrust reverser auxiliary track slider.
- B. The thrust reverser main track sliders are referred to as the the main track sliders. The thrust reverser auxiliary track sliders are referred to as the auxiliary track sliders.

TASK 78-31-13-206-001-N00

2. Thrust Reverser Track Sliders – Inspection/Check

A. Consumable Materials

- (1) G00034, Cloth – Clean Absorbent Wiper (cheesecloth, gauze), BMS15-5

B. References

- (1) AMM 70-11-06/201, Fluorescent Penetrant Inspection
- (2) AMM 78-31-10/401, Thrust Reverser Sleeve
- (3) AMM 78-31-13/401, Thrust Reverser Auxiliary Track Slider

C. Access

(1) Location Zones

- 415 L Power Plant Fan Reverser
- 416 L Power Plant Fan Reverser
- 425 R Power Plant Fan Reverser
- 426 R Power Plant Fan Reverser

(2) Access Panels

- 415AL Fan Reverser (Left)
- 416AR Fan Reverser (Right)
- 425AL Fan Reverser (Left)
- 426AR Fan Reverser (Right)

D. Prepare to Do an Inspection of the Track Sliders

S 026-013-N00

- (1) Remove the thrust reverser sleeve (AMM 78-31-10/401).
- E. Do an Inspection of the Main Track Sliders (Fig. 601)

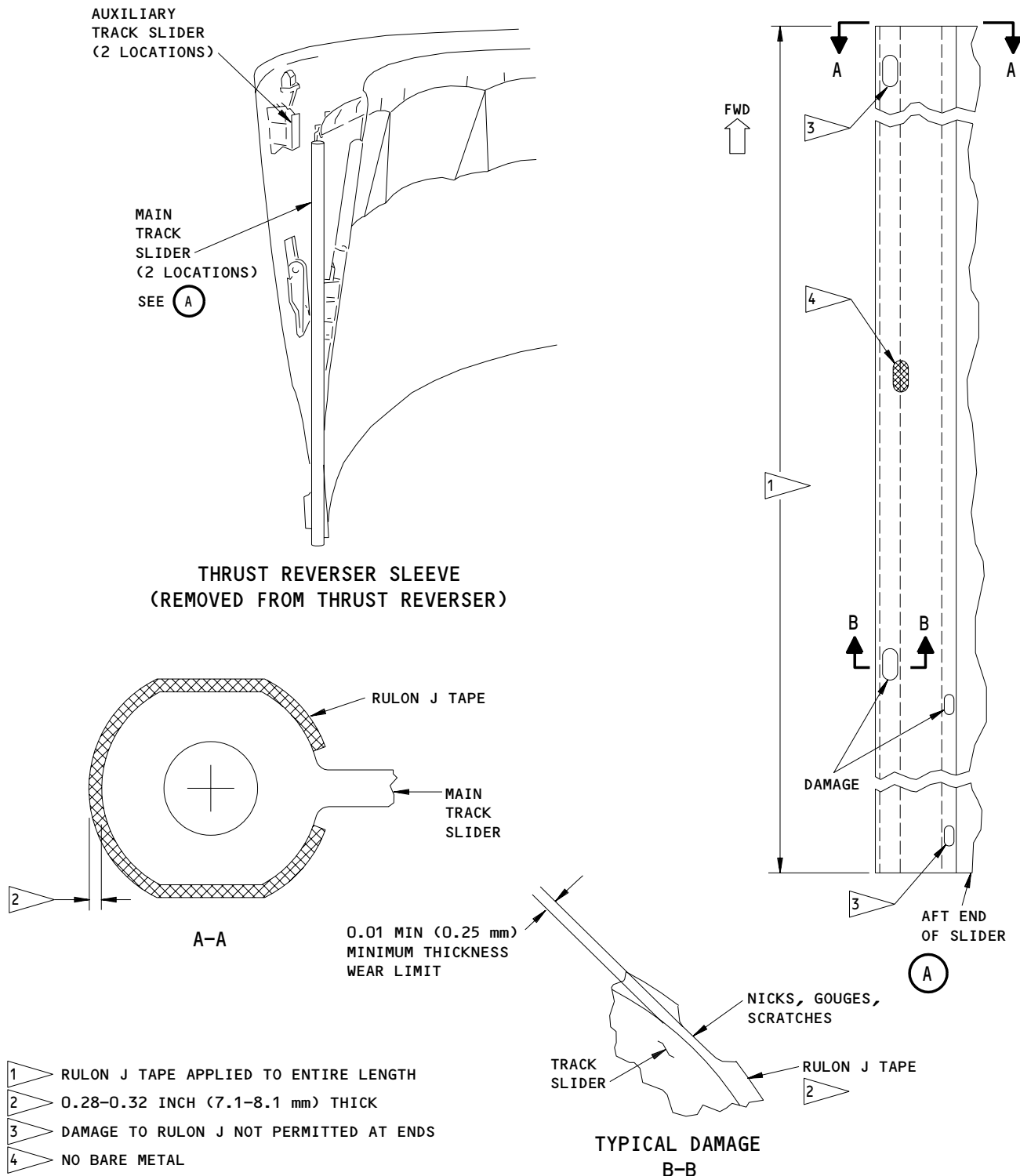
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Thrust Reverser Track Slider Inspection
Figure 601

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S 166-009-N00

- (1) Remove all unwanted material from the main track slider with a dry, clean cloth, G00034.

S 216-004-N00

- (2) Examine the main track sliders for worn areas, cracks or contamination.

S 286-010-N00

- (3) Examine the Rulon-J surface on the main track slider (Fig. 601).

NOTE: The Rulon-J layer on the surface of the main track slider decreases the friction between the track slider and the track liner.

Refer to CMM 78-31-45 for the damage limits along the length and around the circumference of the main track slider.

- (a) No areas with bare metal can show.
- (b) A small amount of damage to the Rulon-J is allowed if it is not at the ends of the track slider.
- (c) If the damage to the Rulon-J layer is more than the permitted damage limits, replace the thrust reverser sleeve (AMM 78-31-10/401).

NOTE: Use the component repair instructions to repair the Rulon-J surface (CMM 78-31-45). The Rulon-J surface can be repaired with the main track slider installed on the thrust reverser sleeve.

F. Do an Inspection of the Auxiliary Track Sliders (Fig. 601)

S 166-012-N00

- (1) Remove all unwanted material from the auxiliary track sliders with a dry, clean cloth, G00034.

S 216-011-N00

- (2) Examine the auxiliary track sliders at the top and the bottom of the thrust reverser sleeve for damage.

S 906-016-N00

- (3) Replace worn or gouged auxiliary track sliders (AMM 78-31-13/401).

NOTE: Use the component repair instructions to repair the Rulon-J surface on the auxiliary track slider (CMM 78-31-45).

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S 236-005-N00

- (4) Do the standard fluorescent penetrant inspection procedure to examine the auxiliary track sliders for cracks (AMM 70-11-06/201).

NOTE: Do the inspection on the part of the slider that does not have Rulon-J.

- (a) If you find cracks in the auxiliary track sliders, replace the auxiliary track sliders (AMM 78-31-13/401).

NOTE: The auxiliary track sliders that are made of aluminum are susceptible to cracks. The auxiliary track sliders that are made of steel should be more resistant to cracks.

G. Put the Airplane Back to Its Usual Condition

S 426-019-N00

- (1) Install the thrust reverser sleeve (AMM 78-31-10/401).

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THRUST REVERSER BLOCKER DOORS – REMOVAL/INSTALLATION

1. General

- A. The thrust reverser blocker doors are referred to as the blocker doors in this procedure.
- B. The thrust reverser blocker door drag links are referred to as the drag links in this procedure.
- C. This procedure has two tasks. The first task gives instructions to remove the blocker doors. The second task gives instructions to install the blocker doors.
- D. Each blocker door has two hinges. One is known as the floating hinge. The other is known as the clamped hinge.

TASK 78-31-14-004-002-N00

2. Remove the Thrust Reverser Blocker Doors

- A. Consumable Materials
 - (1) G02129 Tape - Vinyl, Permacel P-29
 - (2) G02483 Tape - Speed, 3M Y436 (optional to vinyl tape)
- B. References
 - (1) AMM 27-61-00/201, Spoiler/Speedbrake Control System
 - (2) AMM 78-31-00/201, Thrust Reverser System
 - (3) AMM 78-31-15/401, Thrust Reverser Blocker Door Drag Links
- C. Access
 - (1) Location Zones
 - 410 Engine 1 Nacelles
 - 420 Engine 2 Nacelles
 - (2) Access Panels
 - 415AL Fan Reverser (Left)
 - 416AR Fan Reverser (Right)
 - 425AL Fan Reverser (Left)
 - 426AR Fan Reverser (Right)
- D. Prepare to Remove the Blocker Door.

S 044-031-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILER/SPEEDBRAKE CONTROL SYSTEM. IF YOU DO NOT DO THIS, THE SPOILERS CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (1) Do the deactivation procedure for the spoiler/speedbrake control system (AMM 27-61-00/201).

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S 864-032-N00

- (2) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

S 864-033-N00

- (3) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

S 044-034-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.

- (4) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

NOTE: Do the deactivation procedure for the stow valve and the motorized isolation valve only. DO NOT put the streamered pins in the thrust reverser sleeves. You will need to manually extend and retract the thrust reverser sleeves in the steps that follow.

S 984-035-N00

WARNING: MAKE SURE ALL PERSONS AND EQUIPMENT ARE OUT OF THE FAN COWL AND AWAY FROM THE THRUST REVERSER. IF YOU DO NOT DO THIS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR WHEN YOU EXTEND THE THRUST REVERSER.

- (5) Manually extend the thrust reverser to lift the blocker doors into the deployed position (AMM 78-31-00/201).

E. Remove the Blocker Doors (Fig. 401).

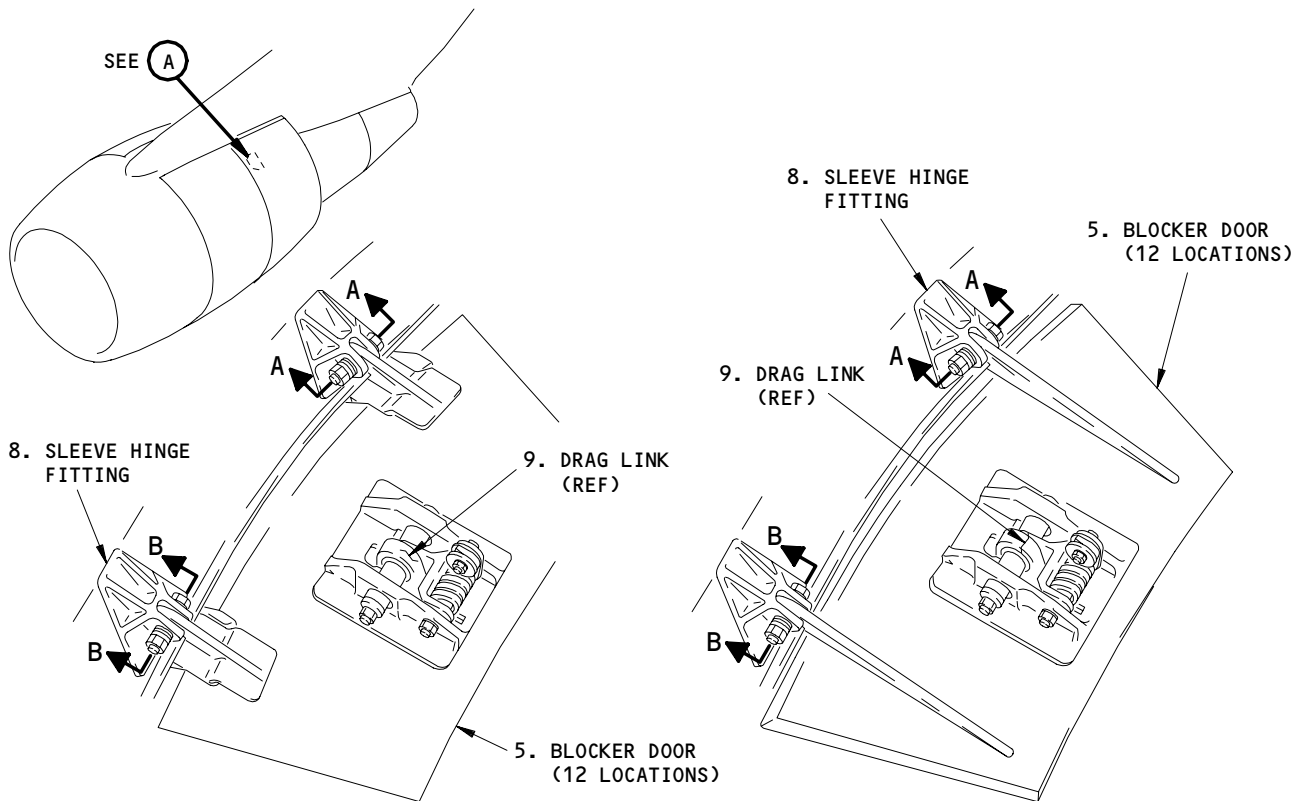
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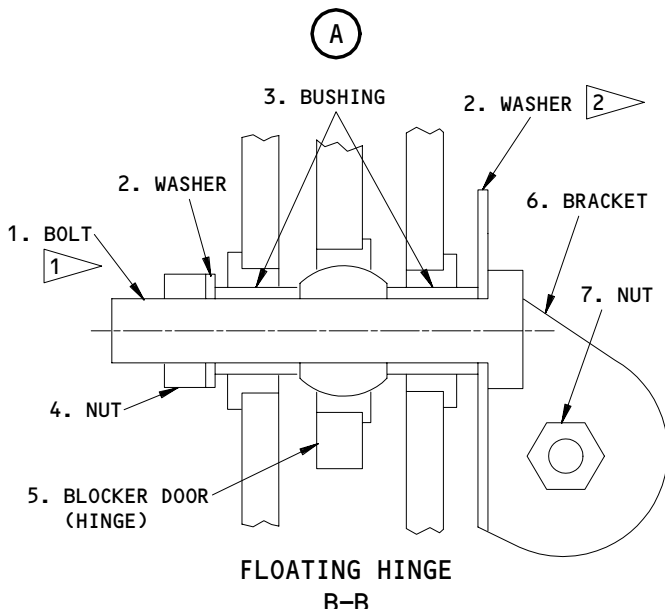
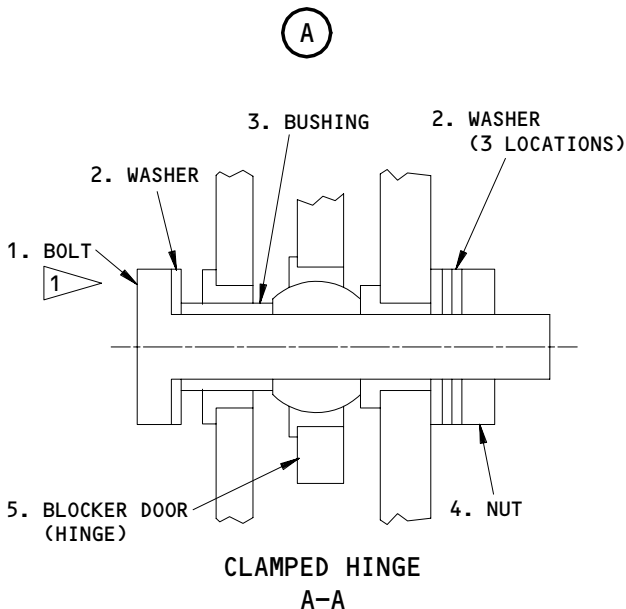
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METAL BLOCKER DOOR IN THE OPEN POSITION
(VIEW IN THE FORWARD DIRECTION)

COMPOSITE BLOCKER DOOR IN THE OPEN POSITION
(VIEW IN THE FORWARD DIRECTION)



1 THE BOLT HEAD DIRECTION IS OPTIONAL

2 AIRPLANES WITHOUT AN ANTI ROTATION BRACKET

Thrust Reverser Blocker Door Installation
Figure 401

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S 014-036-N00

WARNING: DO NOT OPEN THE THRUST REVERSER HALVES TO REMOVE THE BLOCKER DOORS. IF YOU DO, YOUR WEIGHT CAN CAUSE THE FAILURE OF THE HOLD-OPEN ROD WHEN YOU GO INTO THE FAN COWL. THE THRUST REVERSER HALVES WILL FALL TO THE CLOSED POSITION QUICKLY, WHICH CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (1) Go into the fan cowl to get access to the aft side of the blocker doors.

NOTE: Be careful when you get access to the blocker doors at the top of the thrust reverser. Push on the opposite sides of the inner walls of the fan cowl with your hands and feet while you lift your body up. Do not pull on the drag links or you will cause damage to them.

S 024-037-N00

WARNING: HOLD THE BLOCKER DOOR WHEN YOU DISCONNECT IT FROM THE DRAG LINK. THE BLOCKER DOOR IS FREE TO TURN ON ITS HINGES AND CAUSE INJURY TO YOU AND DAMAGE TO THE FAN COWL.

- (2) Disconnect the drag link (9) from the blocker door (5) (AMM 78-31-15/401).
 - (a) Wind a clean shop rag around the drag link (9) and attach it to the inner wall of the fan cowl with tape.

S 024-038-N00

- (3) Remove the bolts (1), washers (2), bushings (3), and nuts (4) from the blocker door hinges.

S 024-039-N00

- (4) Remove the blocker door (5) from the fan cowl of the thrust reverser.

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TASK 78-31-14-404-011-N00

3. Install the Thrust Reverser Blocker Doors

A. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	5	Door Assy - Blocker	78-31-01	16	225,230 235,240 245,250
				18	200,215 225,235 240
				18A	285,290 295,300 305
				15	300,301 303,305 306,308 310,311 313,315 316,318 320,321 323

B. References

- (1) AMM 27-61-00/201, Spoiler/Speedbrake Control System
- (2) AMM 78-31-00/201, Thrust Reverser System
- (3) AMM 78-31-14/601, Thrust Reverser Blocker Doors
- (4) AMM 78-31-15/401, Thrust Reverser Blocker Door Drag Links

C. Access

- (1) Location Zones
 - 410 Engine 1 Nacelles
 - 420 Engine 2 Nacelles
- (2) Access Panels
 - 415AL Fan Reverser (Left)
 - 416AR Fan Reverser (Right)
 - 425AL Fan Reverser (Left)
 - 426AR Fan Reverser (Right)

D. Install the Blocker Doors (Fig. 401).

S 864-030-N00

- (1) Make sure the DO-NOT-OPERATE tags are installed on the reverse thrust levers in the flight compartment.

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S 424-031-N00

- (2) Install the blocker door (5) through the aft end of the thrust reverser:

- (a) Remove the tape and the shop rag from the drag link (9).
- (b) If the bracket (6) is installed, loosen the nut (7) that attaches the bracket (6) to the sleeve hinge fitting (8).

NOTE: The bolt cannot turn with the bracket installed.

- (c) Align the bolt holes in the hinge arms of the blocker door (5) with the holes in the sleeve hinge fittings (8).
- (d) Install the bolt at the clamped hinge.
 - 1) Install the bushing (3), one washer (2) below the bolt head, bolt (1), three washers (2) and nut (4).
 - 2) Tighten the nut (4) to 80 - 100 pound-inches (10.6 - 13.3 newton-meters).
- (e) Install the bolt at the floating hinge.
 - 1) Install the bolt (1), washer (2), the two bushings (3) and nut (4) through hinge fitting and bracket (6).

NOTE: If the bracket (6) is not on the sleeve, install a washer (2) below the head of the bolt (1).

- 2) Adjust the bracket (6).
- 3) Tighten the nut (4) to 80 - 100 pound-inches (10.6 - 13.3 newton-meters).
- 4) If bracket (6) is installed, tighten the nut (7) to hold the bracket (6) on the sleeve hinge fitting (8).

S 984-015-N00

- (3) Make sure there is no side to side movement of the blocker door.

NOTE: This does not include the movement of the race on the spherical ball in the bearings. Side movement shows that the sleeve bushing has not pushed the hinge bearing against the flanged bushing. This shows the nut on the hinge bolt is not correctly tightened.

- (a) Hold the blocker door (5) in the open position.

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- (b) Try to move the blocker door (5) from side to side on the hinge axis.
- (c) If the blocker door moves, install a washer (2) below the nut (4).
- (d) Tighten the nut (4) to 80-100 pound-inches (10.6-13.3 newton-meters).

S 424-029-N00

- (4) Connect the drag link (9) to the fitting on the blocker door (5) (AMM 78-31-15/401).

S 984-016-N00

WARNING: MAKE SURE ALL PERSONS AND EQUIPMENT ARE OUT OF THE FAN COWL AND AWAY FROM THE THRUST REVERSER. IF YOU DO NOT DO THIS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR WHEN YOU RETRACT THE THRUST REVERSER.

- (5) Manually retract the thrust reverser to put the blocker doors into the stowed position (AMM 78-31-00/201).

S 444-017-N00

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

S 444-018-N00

- (7) Do the activation procedure for the spoiler/speedbrake control system (AMM 27-61-00/201).

S 864-019-N00

- (8) Remove the DO-NOT-OPERATE tags from the thrust levers.

S 714-020-N00

- (9) Operate the thrust reverser, manual or power method (AMM 78-31-00/201).

NOTE: Operate the thrust reverser a minimum of three full cycles to make sure it is serviceable.

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S 044-021-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILER/SPEEDBRAKE CONTROL SYSTEM. IF YOU DO NOT DO THIS, THE SPOILERS CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(10) Do the deactivation procedure for the spoiler/speedbrake control system (AMM 27-61-00/201).

S 864-022-N00

(11) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

S 864-023-N00

(12) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

S 044-024-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.

(13) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

NOTE: Do the full deactivation procedure for ground maintenance. This includes the deactivation of the stow valve, the motorized isolation valve, and the thrust reverser sleeves.

S 214-025-N00

(14) Make sure each blocker door makes a continuous surface with (is at the same level as) the adjacent structure (AMM 78-31-14/601).

NOTE: The blocker doors must not extend above the surface of the fan cowl when the thrust reverser is fully retracted.

E. Put the Airplane Back to Its Usual Condition.

S 444-026-N00

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

S 444-027-N00

(2) Do the activation procedure for the spoiler/speedbrake control system (AMM 27-61-00/201).

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S 864-028-N00

- (3) Remove the DO-NOT-OPERATE tags from the thrust levers.

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THRUST REVERSER BLOCKER DOORS – INSPECTION/CHECK

1. General

- A. The thrust reverser blocker doors are referred to as the blocker doors in this procedure.
- B. The thrust reverser blocker door drag links are referred to as the drag links in this procedure.
- C. This procedure has two tasks:
 - (1) The second task is a copy of a section from the first task. Thus, if you do the first task, Thrust Reverser Blocker Door – Inspection/Check, it is not necessary to do the second task.

TASK 78-31-14-206-016-N00

2. Thrust Reverser Blocker Door – Inspection/Check

A. General

- (1) These are scheduled maintenance tasks.
- (2) For each task, you must examine all the blocker doors on the two halves of each thrust reverser.

B. References

- (1) AMM 27-61-00/201, Spoiler/Speedbrake Control System
- (2) AMM 78-31-00/201, Thrust Reverser System
- (3) AMM 78-31-14/401, Thrust Reverser Blocker Doors

C. Access

- (1) Location Zones
 - 410 Engine 1 Nacelles
 - 420 Engine 2 Nacelles
- (2) Access Panels
 - 415AL Fan Reverser (Left)
 - 416AR Fan Reverser (Right)
 - 425AL Fan Reverser (Left)
 - 426AR Fan Reverser (Right)

D. Prepare to Do a Check of the Blocker Doors (Fig. 601).

S 046-011-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILER/SPEEDBRAKE CONTROL SYSTEM. IF YOU DO NOT DO THIS, THE SPOILERS CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (1) Do the deactivation procedure for the spoiler/speedbrake control system (AMM 27-61-00/201).

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S 866-017-N00

- (2) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

S 866-018-N00

- (3) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

S 046-012-N00

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

- (4) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

NOTE: Do the deactivation procedure for the stow valve and the motorized isolation valve only. DO NOT put the streamered pins in the thrust reverser sleeves. You will need to manually extend and retract the thrust reverser sleeves in the steps that follow.

S 866-031-N00

WARNING: MAKE SURE ALL PERSONS AND EQUIPMENT ARE OUT OF THE FAN COWL AND AWAY FROM THE THRUST REVERSER. IF YOU DO NOT DO THIS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR WHEN YOU EXTEND THE THRUST REVERSER.

- (5) Manually extend the thrust reverser to lift the blocker doors (AMM 78-31-00/201).
 - (a) Do not fully deploy the thrust reverser.
 - (b) Extend the thrust reverser sleeve until you can hold the blocker door with your hands as close to the hinges fittings as possible.

E. Do a Check of the Blocker Doors (Fig. 601).

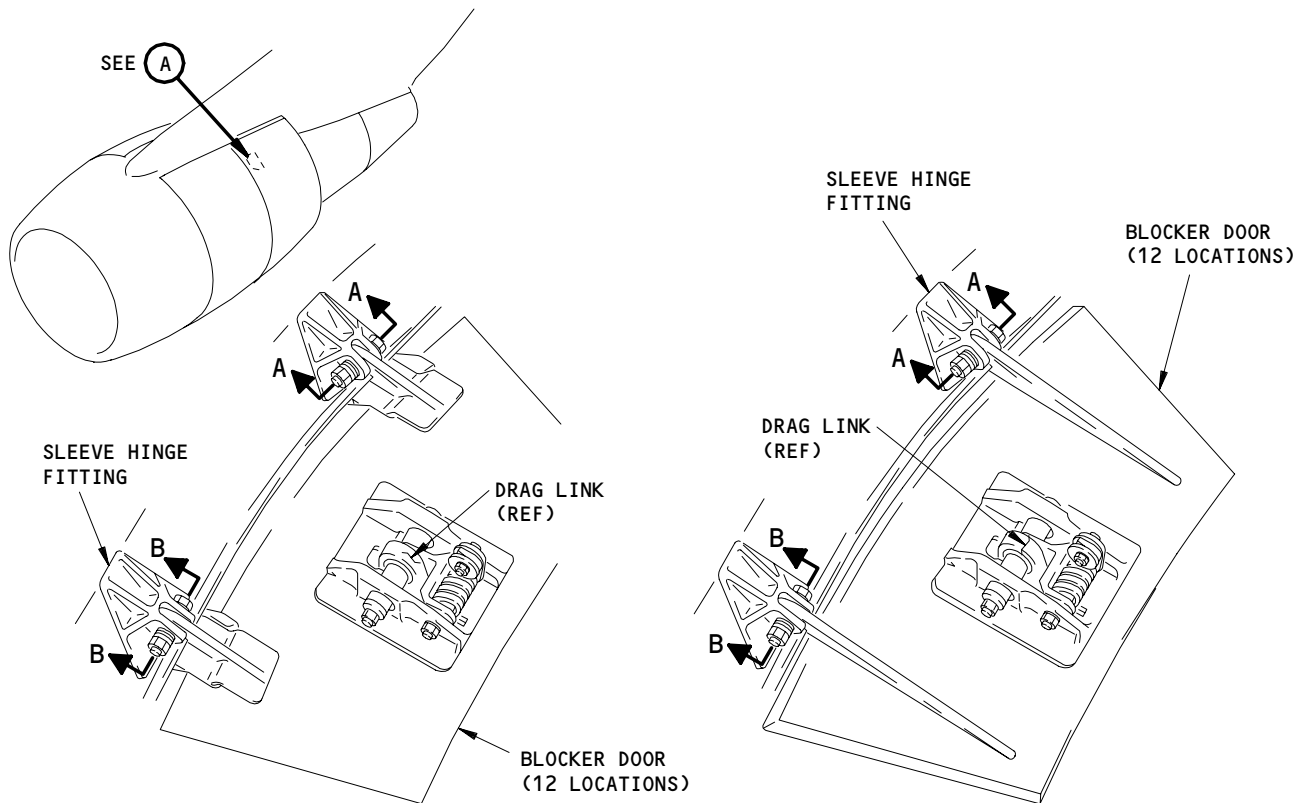
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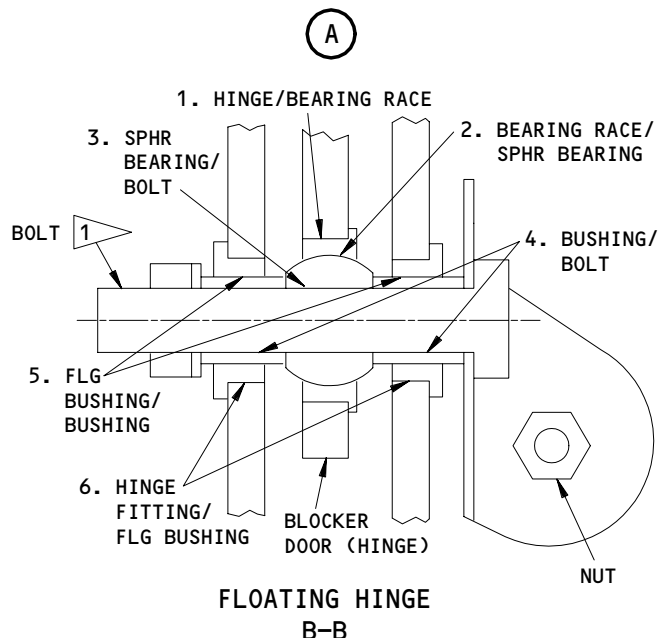
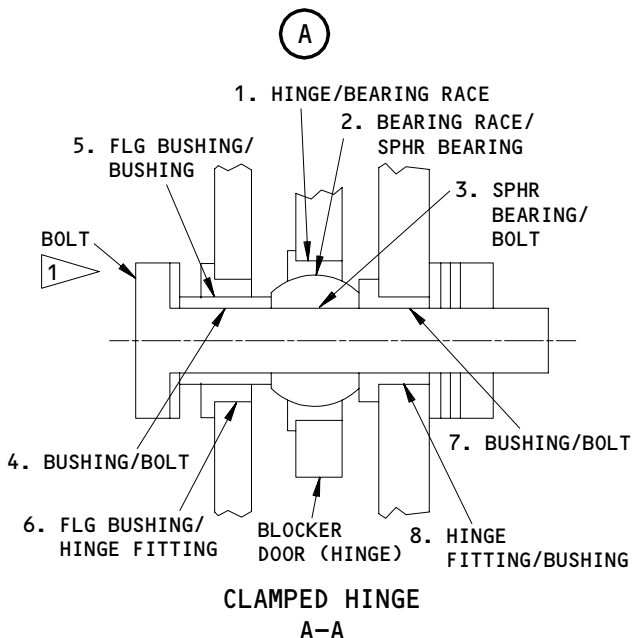
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METAL BLOCKER DOOR IN THE OPEN POSITION
(VIEW IN THE FORWARD DIRECTION)

COMPOSITE BLOCKER DOOR IN THE OPEN POSITION
(VIEW IN THE FORWARD DIRECTION)



1 THE BOLT HEAD DIRECTION IS OPTIONAL

Thrust Reverser Blocker Door Wear Limits
Figure 601 (Sheet 1)

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INDEX NO.	PART NAME	DIM.	DESIGN LIMITS		WEAR LIMITS		REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR
			DIAMETER		PER-MITTED WEAR DIM.	MAX DIA CLEAR-ANCE			
			MIN	MAX					
1	HINGE	ID	0.6251	0.6258	--	0.0020		X	
	BEARING RACE	OD	0.6245	0.6250	--		X		1
2	BEARING RACE	ID	0.5010	0.5015	0.5045	0.0060 RADIAL	X		
	SPHR BEARING	OD	0.4995	0.5000	--		X		
3	SPHR BEARING	ID	0.2497	0.2502	0.2510	0.0080 AXIAL	X		
	BOLT	OD	0.2490	0.2496	0.2480		X		
4	BUSHING	ID	0.2500	0.2505	0.2520	0.0060	X	X	
	BOLT	OD	0.2485	0.2495	0.2475		X		
5	FLG BUSHING	ID	0.3750	0.3756	0.3770	0.0060	X		
	BUSHING	OD	0.3740	0.3745	0.3725		X		
6	HINGE FITTING	ID	0.5000	0.5006	--	-0.0000		X	2
	FLG BUSHING	OD	0.5010	0.5016	--		X		
7	BUSHING	ID	0.2500	0.2505	0.2520	0.0030	X		
	BOLT	OD	0.2485	0.2495	0.2475		X		
8	HINGE FITTING	ID	0.3750	0.3756	--	-0.0000		X	2
	BUSHING	OD	0.3759	0.3765	--		X		

1 REMOVE FLANGE TO PRESS OUT BEARING RACE. 0.6880 MAX ID FOR REWORK. NO LOOSENESS IS PERMITTED AFTER SWAGING.

2 SHOP REPAIRABLE

Thrust Reverser Blocker Door Wear Limits
Figure 601 (Sheet 2)

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S 226-013-N00

WARNING: DO NOT OPEN THE THRUST REVERSER HALVES TO DO THIS INSPECTION. YOUR WEIGHT CAN CAUSE THE FAILURE OF THE HOLD-OPEN ROD WHEN YOU GO INTO THE FAN COWL. THE THRUST REVERSER HALVES WILL FALL TO THE CLOSED POSITION QUICKLY, WHICH CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (1) Go into the aft end of the fan cowl and examine each blocker door for too much play.

NOTE: Be careful when you get access to the blocker doors at the top of the thrust reverser. Push on the opposite sides of the inner walls of the fan cowl with your hands and feet while you lift your body up. Do not pull on the drag links or you will cause damage to them.

S 226-027-N00

- (2) With your hands, try to move the blocker door from side to side and forward to aft at the hinge fittings.

NOTE: Hold the blocker door as close to the fitting as possible.

S 226-028-N00

- (3) If there is play in the blocker door, make a record of the blocker door location and continue the inspection.

S 226-039-N00

WARNING: MAKE SURE ALL PERSONS AND EQUIPMENT ARE OUT OF THE FAN COWL AND AWAY FROM THE THRUST REVERSER. IF YOU DO NOT DO THIS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR WHEN YOU RETRACT THE THRUST REVERSER.

- (4) Manually retract the thrust reverser to move the blocker doors into the stowed position (AMM 78-31-00/201).

S 226-029-N00

- (5) Examine each blocker door which has play for too much clearance.
 - (a) Measure the clearance between the aft edge of the blocker door and the forward edge of the acoustic panel.
 - 1) Make a record of this dimension.

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WARNING: BE CAREFUL WHEN YOU WEDGE THE BLOCKER DOOR AWAY FROM THE ACOUSTIC PANEL. IF YOU ARE NOT CAREFUL, THE WEDGE CAN CAUSE INJURY TO YOU AND DAMAGE TO THE BLOCKER DOOR OR THE ACOUSTIC PANEL.

- (b) Carefully push a hardwood or phenolic wedge (approximately one inch in width) between the aft edge of the blocker door and the forward edge of the acoustic panel.

NOTE: This will push the blocker door forward.

- (c) While you carefully push the blocker door forward, measure the clearance between the blocker door and the acoustic panel again.
 - 1) Again, make a record of this dimension.
- (d) Subtract the first dimension from the second dimension, which you got after you pushed the blocker door forward.

NOTE: This gives you a measure of the play, or movement, in the blocker door bearings and hinge bolts.

- (e) If the play is more than 0.008 inch, make a record of the blocker door location and continue the inspection.

WARNING: BE CAREFUL WHEN YOU WEDGE THE BLOCKER DOOR AWAY FROM THE PANEL ADJACENT TO IT. IF YOU ARE NOT CAREFUL, THE WEDGE CAN CAUSE INJURY TO YOU AND DAMAGE TO THE BLOCKER DOOR OR THE PANEL ADJACENT TO IT.

- (f) Carefully push a hardwood or phenolic wedge (approximately one inch in width) between the side edge of the blocker door and the panel adjacent to it.

NOTE: This will push the blocker door sideways.

- (g) While you carefully push the blocker door sideways, measure the clearance between the blocker door and the adjacent panel.
- (h) If the clearance is more than 0.135 inch, make a record of the blocker door location and continue the inspection.

S 986-014-N00

WARNING: MAKE SURE ALL PERSONS AND EQUIPMENT ARE OUT OF THE FAN COWL AND AWAY FROM THE THRUST REVERSER. IF YOU DO NOT DO THIS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR WHEN YOU EXTEND THE THRUST REVERSER.

- (6) Manually extend the thrust reverser to move the blocker doors into the deployed position (AMM 78-31-00/201).

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S 216-019-N00

- (7) Go into the fan cowl and look for these conditions on each blocker door that has too much play or clearance:
- (a) Make sure the nuts on the hinge bolts are tight.
 - (b) Make sure the nuts on the drag link bolts are tight.
 - (c) Make sure the shank lengths of the hinge bolts are correct.
 - (d) Make sure the shank length of the drag link bolt is correct.

NOTE: With the nut tightened, the bushings must not push too tightly against the spherical bearings of the drag link assembly.

- (e) Make sure the bushings in the drag link hinge and the blocker door hinges are not worn.
- (f) Make sure the hinge fittings on the blocker door do not have cracks or other damage.
- (g) If you find these conditions, replace the blocker door or the applicable hinge components that have the damage (AMM 78-31-14/401).

S 216-020-N00

- (8) For composite blocker doors, examine the aft side of each door for resin cracks (Fig. 602).

NOTE: The aft side of each metal blocker door is painted green. The aft side of each composite blocker door is painted silver. Each thrust reverser half can have the two types of blocker doors together on the same assembly.

- (a) Examine the top of the hinge arms for resin cracks.

NOTE: Resin cracks are permitted on the top of the hinge arms. These resin cracks must not extend to the hinge arm sides or be in the circular portion (lug) of the hinge arm.

- (b) Examine the bead (joint) between the hinge arm and the blocker door.

NOTE: Resin cracks are permitted in the bead on the two sides of the hinge arm at the same time. These cracks must not extend more than 0.12 inch from the edge radius onto the aft side of the blocker door.

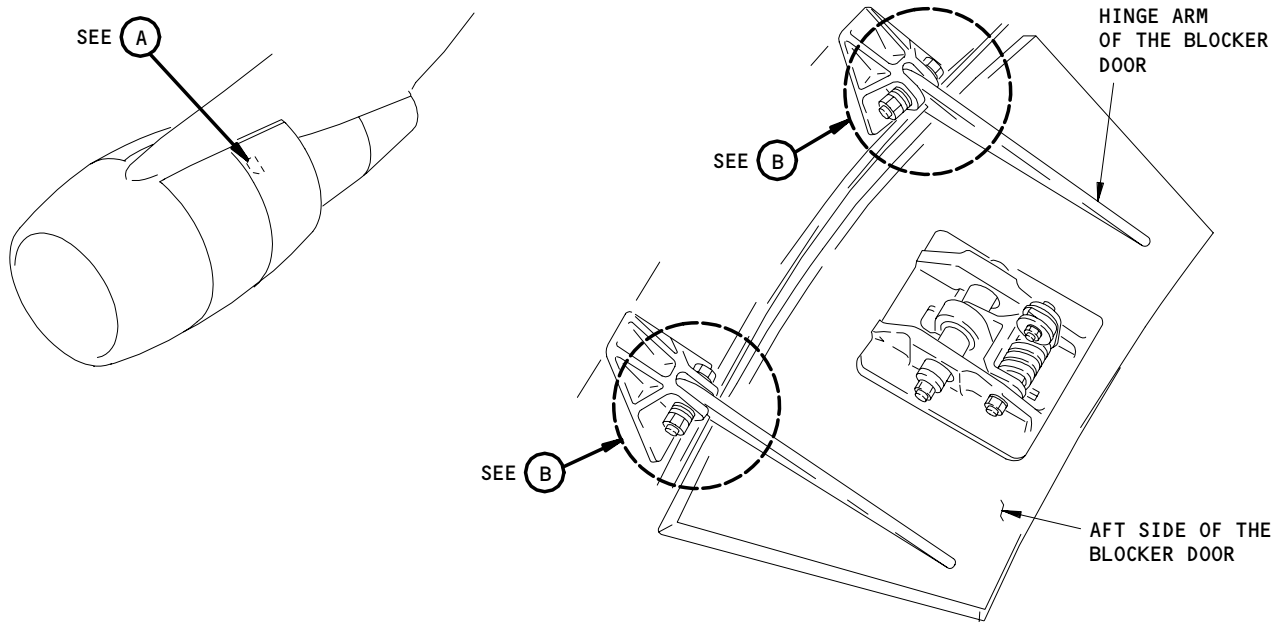
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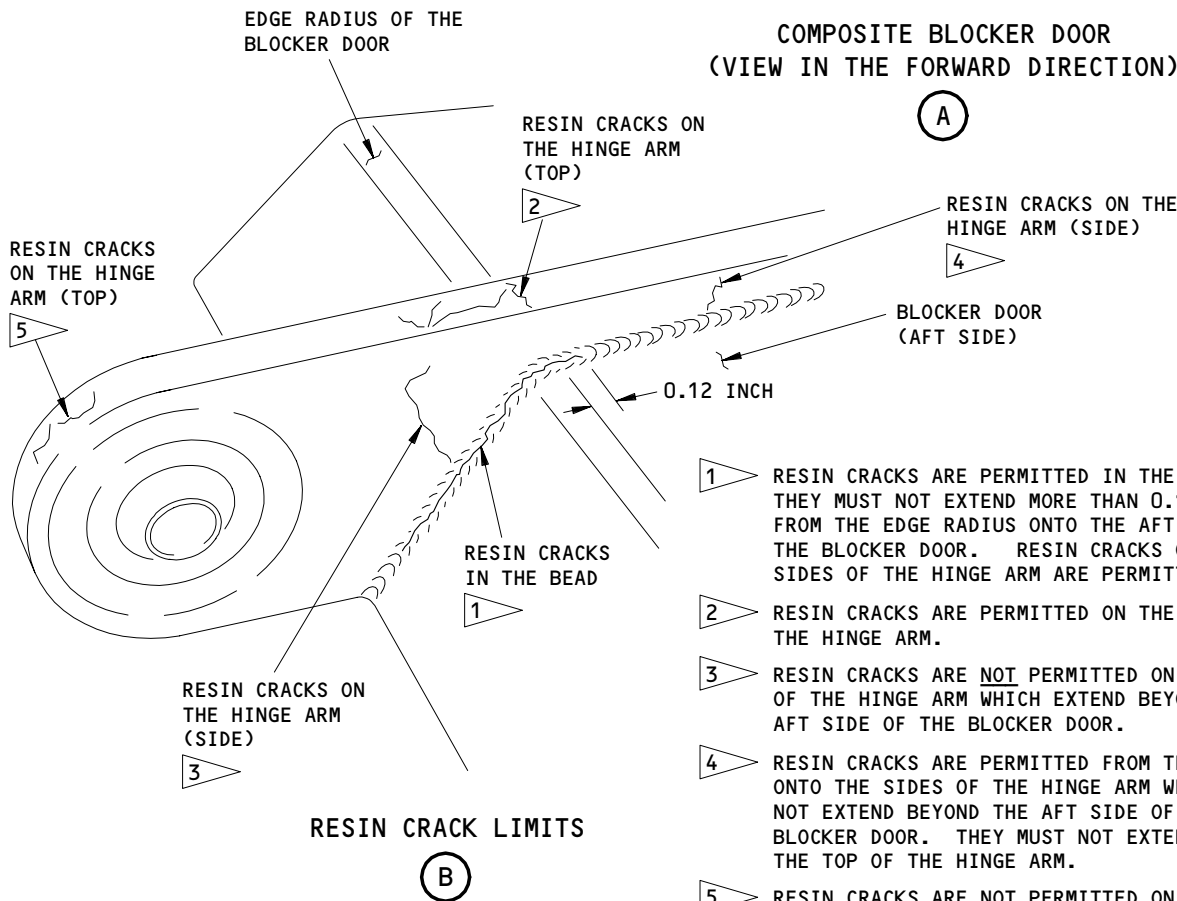
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COMPOSITE BLOCKER DOOR
(VIEW IN THE FORWARD DIRECTION)



- 1 RESIN CRACKS ARE PERMITTED IN THE BEAD. THEY MUST NOT EXTEND MORE THAN 0.12 INCH FROM THE EDGE RADIUS ONTO THE AFT SIDE OF THE BLOCKER DOOR. RESIN CRACKS ON BOTH SIDES OF THE HINGE ARM ARE PERMITTED.
- 2 RESIN CRACKS ARE PERMITTED ON THE TOP OF THE HINGE ARM.
- 3 RESIN CRACKS ARE NOT PERMITTED ON THE SIDES OF THE HINGE ARM WHICH EXTEND BEYOND THE AFT SIDE OF THE BLOCKER DOOR.
- 4 RESIN CRACKS ARE PERMITTED FROM THE BEAD ONTO THE SIDES OF THE HINGE ARM WHICH DOES NOT EXTEND BEYOND THE AFT SIDE OF THE BLOCKER DOOR. THEY MUST NOT EXTEND ONTO THE TOP OF THE HINGE ARM.
- 5 RESIN CRACKS ARE NOT PERMITTED ON THE TOP OF THE CIRCULAR AREA OF THE HINGE ARM.

RESIN CRACK LIMITS

Thrust Reverser Composite Blocker Door - Inspection/Check
Figure 602

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(c) Examine the sides of the hinge arms for resin cracks.

NOTE: Resin cracks are permitted from the bead onto the sides of the hinge arm for the portion of the hinge arm which does not extend beyond the aft side of the blocker door. These cracks must not extend onto the top of the hinge arm.

(d) If you find cracks that are longer than the permitted limits, remove and replace the blocker door (AMM 78-31-14/401).

F. Put the Airplane Back to Its Usual Condition.

S 986-015-N00

WARNING: MAKE SURE ALL PERSONS AND EQUIPMENT ARE OUT OF THE FAN COWL AND AWAY FROM THE THRUST REVERSER. IF YOU DO NOT DO THIS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR WHEN YOU RETRACT THE THRUST REVERSER.

(1) Manually retract the thrust reverser (AMM 78-31-00/201).

S 446-021-N00

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

S 446-022-N00

(3) Do the activation procedure for the spoiler/speedbrake control system (AMM 27-61-00/201).

S 866-023-N00

(4) Remove the DO-NOT-OPERATE tags from the thrust levers.

TASK 78-31-14-206-024-N00

3. Thrust Reverser Composite Blocker Door - Inspection/Check

A. General

(1) This is a scheduled maintenance task that gives instructions to do an inspection of the hinges on composite blocker doors.

B. References

- (1) AMM 27-61-00/201, Spoiler/Speedbrake Control System
- (2) AMM 78-31-00/201, Thrust Reverser System
- (3) AMM 78-31-14/401, Thrust Reverser Blocker Doors

C. Access

(1) Location Zones

- 410 Engine 1 Nacelles
- 420 Engine 2 Nacelles

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(2) Access Panels

- 415AL Fan Reverser (Left)
- 416AR Fan Reverser (Right)
- 425AL Fan Reverser (Left)
- 426AR Fan Reverser (Right)

D. Prepare to Do a Check of the Composite Blocker Doors

S 046-025-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILER/SPEEDBRAKE CONTROL SYSTEM. IF YOU DO NOT DO THIS, THE SPOILERS CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (1) Do the deactivation procedure for the spoiler/speedbrake control system (AMM 27-61-00/201).

S 866-026-N00

- (2) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

S 866-027-N00

- (3) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

S 046-028-N00

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

- (4) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

NOTE: Do the deactivation procedure for the stow valve and the motorized isolation valve only. DO NOT put the streamered pins in the thrust reverser sleeves. You will need to manually extend and retract the thrust reverser sleeves in the steps that follow.

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S 986-029-N00

WARNING: MAKE SURE ALL PERSONS AND EQUIPMENT ARE OUT OF THE FAN COWL AND AWAY FROM THE THRUST REVERSER. IF YOU DO NOT DO THIS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR WHEN YOU EXTEND THE THRUST REVERSER.

- (5) Manually extend the thrust reverser to lift the blocker doors into the deployed position (AMM 78-31-00/201).
- E. Do a Check of the Composite Blocker Doors (Fig. 602).

S 226-037-N00

WARNING: DO NOT OPEN THE THRUST REVERSER HALVES TO DO THIS INSPECTION. YOUR WEIGHT CAN CAUSE THE FAILURE OF THE HOLD-OPEN ROD WHEN YOU GO INTO THE FAN COWL. THE THRUST REVERSER HALVES WILL FALL TO THE CLOSED POSITION QUICKLY, WHICH CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (1) Go into the aft end of the fan cowl to do the inspection of the composite blocker doors.

NOTE: Be careful when you get access to the blocker doors at the top of the thrust reverser. Push on the opposite sides of the inner walls of the fan cowl with your hands and feet while you lift your body up. Do not pull on the drag links or you will cause damage to them.

S 226-031-N00

- (2) Examine the aft side of each door for resin cracks (Fig. 602).

NOTE: The aft side of each metal blocker door is painted green. The aft side of each composite blocker door is painted silver. Each thrust reverser half can have the two types of blocker doors together on the same assembly.

- (a) Examine the top of the hinge arms for resin cracks.

NOTE: Resin cracks are permitted on the top of the hinge arms. These resin cracks must not extend to the hinge arm sides or be in the circular portion (lug) of the hinge arm.

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- (b) Examine the bead (joint) between the hinge arm and the blocker door.

NOTE: Resin cracks are permitted in the bead on the two sides of the hinge arm at the same time. These cracks must not extend more than 0.12 inch from the edge radius onto the aft side of the blocker door.

- (c) Examine the sides of the hinge arms for resin cracks.

NOTE: Resin cracks are permitted from the bead onto the sides of the hinge arm for the portion of the hinge arm which does not extend beyond the aft side of the blocker door. These cracks must not extend onto the top of the hinge arm.

- (d) If you find cracks that are longer than the permitted limits, remove and replace the blocker door (AMM 78-31-14/401).

F. Put the Airplane Back to Its Usual Condition.

S 986-032-N00

WARNING: MAKE SURE ALL PERSONS AND EQUIPMENT ARE OUT OF THE FAN COWL AND AWAY FROM THE THRUST REVERSER. IF YOU DO NOT DO THIS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR WHEN YOU RETRACT THE THRUST REVERSER.

- (1) Manually retract the thrust reverser (AMM 78-31-00/201).

S 446-033-N00

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

S 446-034-N00

- (3) Do the activation procedure for the spoiler/speedbrake control system (AMM 27-61-00/201).

S 866-035-N00

- (4) Remove the DO-NOT-OPERATE tags from the thrust levers.

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TASK 78-31-14-226-041-N00

4. Thrust Reverser Blocker Door Aerosmoothness - Inspection/Check

A. Consumable Materials

- (1) G50228 Tape - Speed, 3 inches wide, 3M Y436

B. Access

(1) Location Zones

- 410 Engine 1 Nacelles
- 420 Engine 2 Nacelles

(2) Access Panels

- 415AL Fan Reverser (Left)
- 416AR Fan Reverser (Right)
- 425AL Fan Reverser (Left)
- 426AR Fan Reverser (Right)

C. Procedure

S 226-042-N00

- (1) Examine the clearance gap between the blocker door and the acoustic panel fairings (Fig. 603).
 - (a) The gap is 0.05-0.12 inch (1.27-3.05 millimeters).

S 226-043-N00

- (2) Make sure the acoustic fairings around the blocker doors are not broken or cracked.
 - (a) If the fairing is broken or bent, replace the acoustic panel fairing.

NOTE: As a temporary repair, a 0.15 inch (3.81 millimeters) thick, aluminum sheet, 2024-T3, can be installed in the cavity after the broken fairing is removed. This repair must be inspected every A-check until a new part is installed. The cavity can also be covered with speed tape but the thrust reverser must be deactivated for flight because the speed tape will interfere with the operation of the blocker doors.

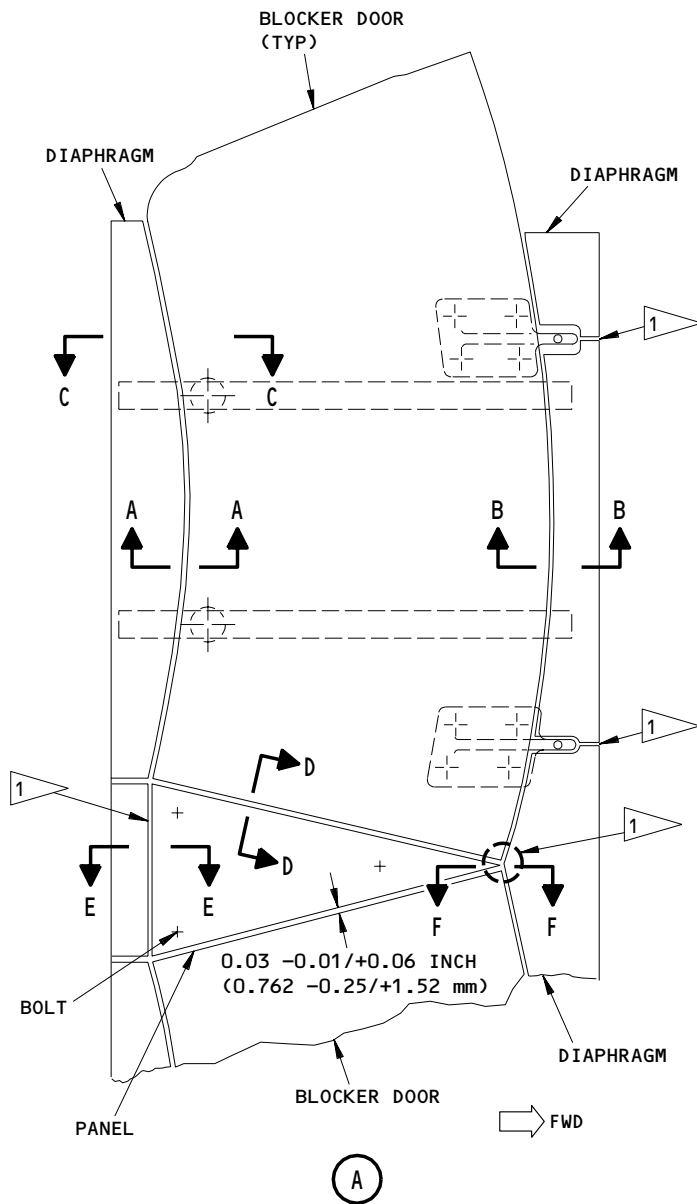
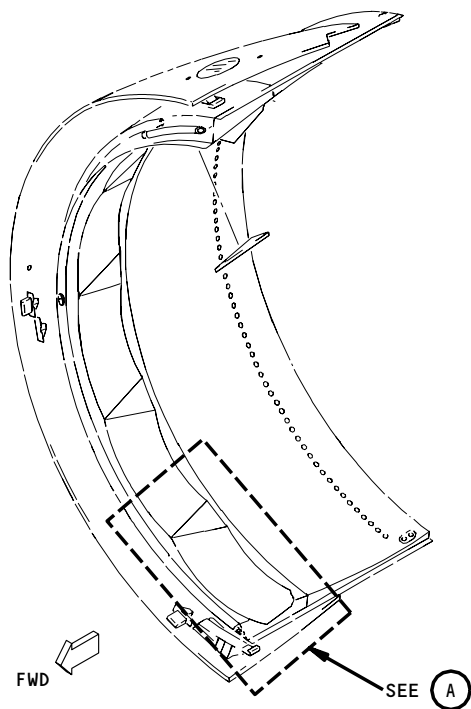
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1 FILL GAP WITH BMS 5-79 SEALANT

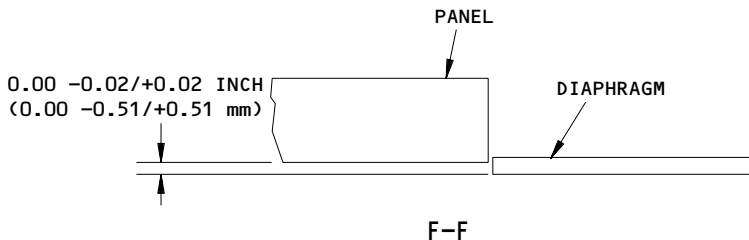
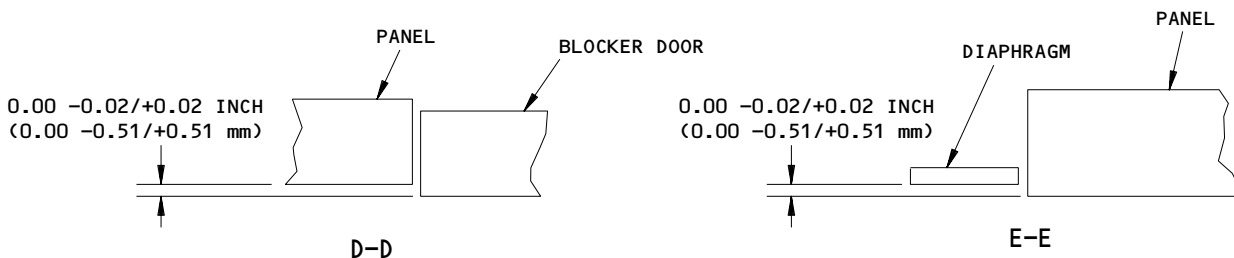
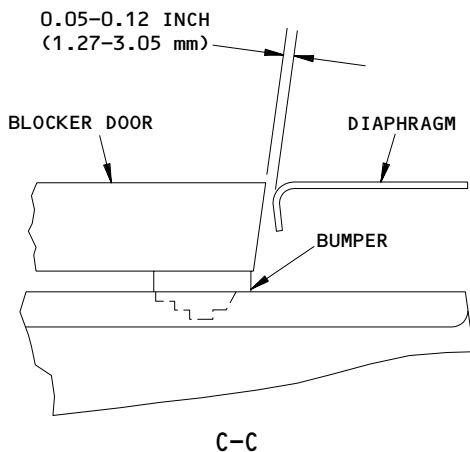
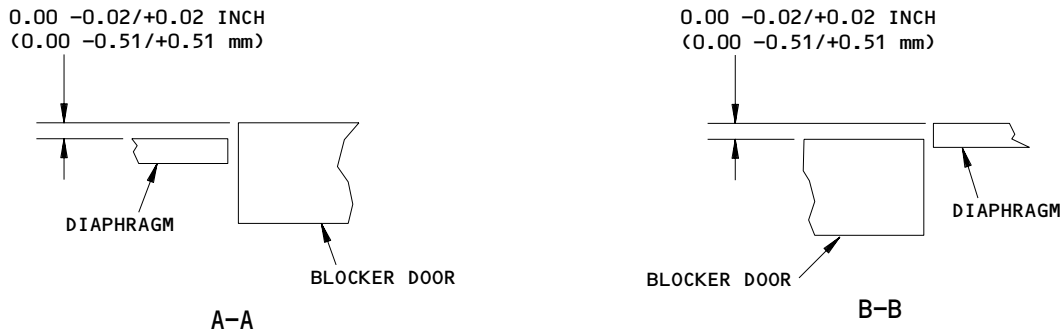
Thrust Reverser Blocker Door Aerosmoothness
Figure 603 (Sheet 1)

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Thrust Reverser Blocker Door Aerosmoothness
Figure 603 (Sheet 2)

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THRUST REVERSER BLOCKER DOOR DRAG LINKS – REMOVAL/INSTALLATION

1. General

- A. The thrust reverser blocker door drag links are referred to as the drag links in this procedure.
- B. This procedure has two tasks. The first task gives instructions to remove the drag link from the blocker door pivot link and fan cowl anchor fitting. The second task gives instructions to install the drag link. These procedures are performed without opening the thrust reverser.
- C. For flight dispatch ONLY: If a damaged drag link has been removed, deactivate the thrust reverser and hold the blocker door in a closed position with speed tape.

TASK 78-31-15-004-001-N00

2. Remove the Thrust Reverser Blocker Door Drag Link

A. References

- (1) AMM 27-61-00/201, Spoiler/Speedbrake Control System
- (2) AMM 78-31-00/201, Thrust Reverser System

B. Access

(1) Location Zones

- 410 Engine 1 Nacelles
- 420 Engine 2 Nacelles

(2) Access Panels

- 415AL Fan Reverser (Left)
- 416AR Fan Reverser (Right)
- 425AL Fan Reverser (Left)
- 426AR Fan Reverser (Right)

C. Prepare to Remove the Drag Link.

S 044-002-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILER/SPEEDBRAKE CONTROL SYSTEM. IF YOU DO NOT DO THIS, THE SPOILERS CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (1) Do the deactivation procedure the the spoiler/speedbrake control system (AMM 27-61-00/201).

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S 864-025-N00

- (2) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

S 864-026-N00

- (3) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

S 044-004-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE THRUST REVERSER TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (4) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

D. Remove the Drag Link (Fig. 401).

S 014-027-N00

WARNING: DO NOT OPEN THE THRUST REVERSER HALVES TO REMOVE THE DRAG LINKS. IF YOU DO, YOUR WEIGHT CAN CAUSE THE FAILURE OF THE HOLD-OPEN ROD WHEN YOU GO INTO THE FAN COWL. THE THRUST REVERSER HALVES WILL FALL TO THE CLOSED POSITION QUICKLY, WHICH CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (1) Go into the aft end of the fan cowl to get access to the drag links.

NOTE: Be careful when you get access to the drag links at the top of the thrust reverser. Push on the opposite sides of the inner walls of the fan cowl with your hands and feet while you lift your body up. Do not pull on the drag links or you will cause damage to them.

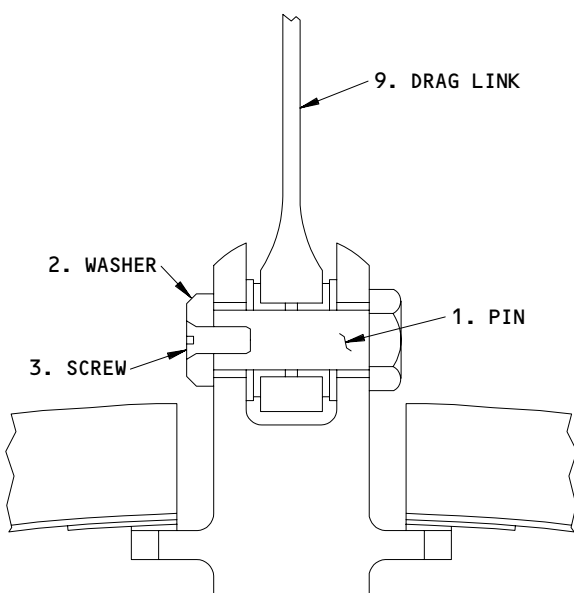
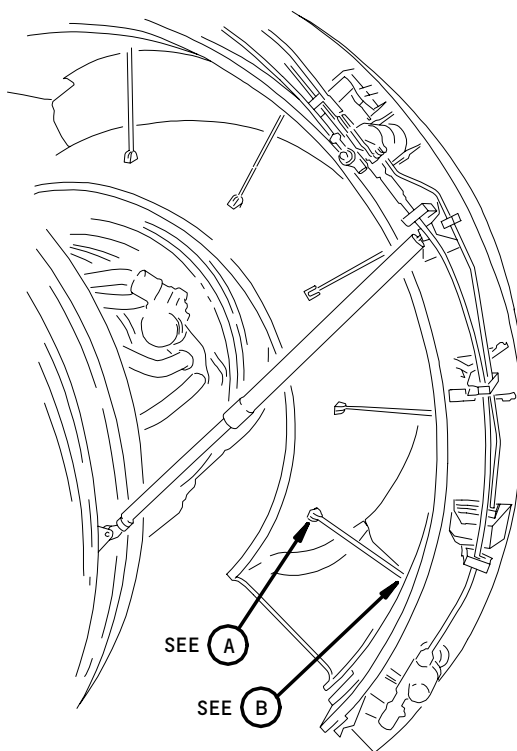
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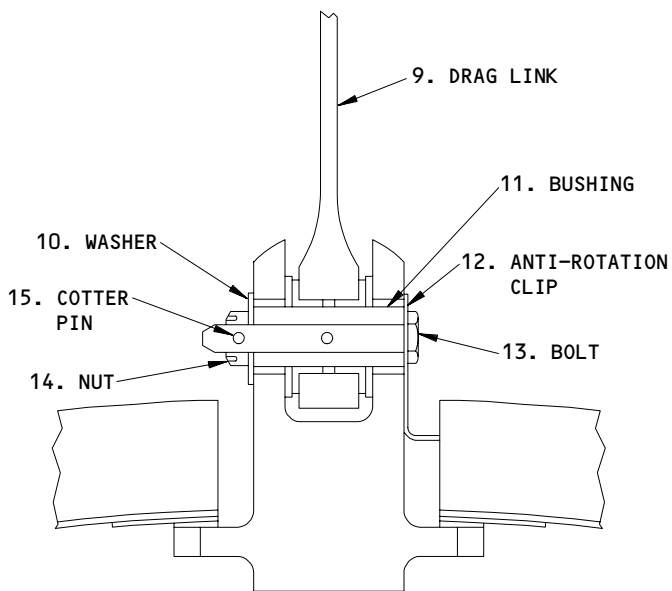
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DRAG LINK ANCHOR FITTING
WITHOUT ANTI-ROTATION CLIP

(A)



DRAG LINK ANCHOR FITTING
WITH ANTI-ROTATION CLIP

(A)

Blocker Door Drag Link Installation
Figure 401 (Sheet 1)

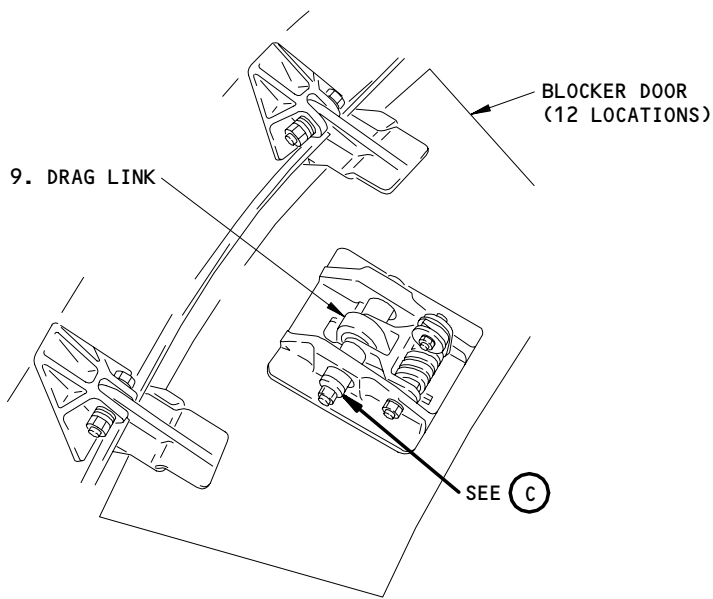
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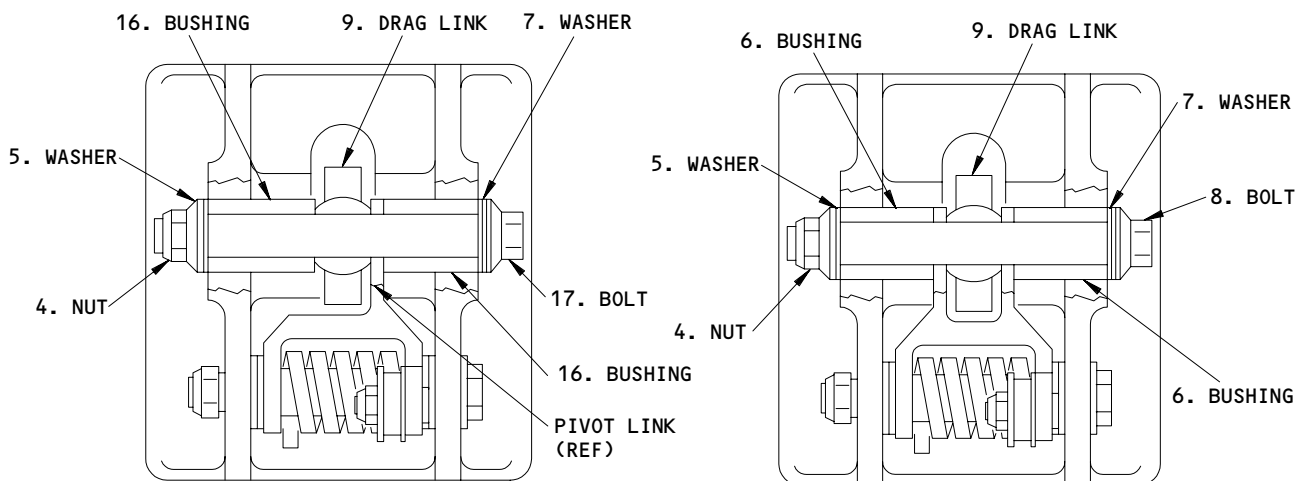
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LOOKING FORWARD, DOOR OPEN

(B)



WITH SINGLE-LUG PIVOT LINK

WITH DOUBLE-LUG PIVOT LINK

(C)

Blocker Door Drag Link Installation
Figure 401 (Sheet 2)

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S 034-018-N00

- (2) Disconnect the drag link (9) from the anchor fitting on the fan cowl.

WARNING: HOLD THE BLOCKER DOOR WHEN YOU REMOVE THE BUSHING. WHEN YOU REMOVE THE BUSHING, THE BLOCKER DOOR IS FREE TO TURN ON ITS HINGES AND CAUSE INJURY TO YOU AND DAMAGE TO THE FAN COWL.

- (a) ANCHOR FITTINGS WITH THE ANTI-ROTATION CLIP;
Remove the cotter pin (15), nut (14), washer (10), bolt (13) and bushing (11).

WARNING: HOLD THE BLOCKER DOOR WHEN YOU REMOVE THE PIN. WHEN YOU REMOVE THE PIN, THE BLOCKER DOOR IS FREE TO TURN ON ITS HINGES AND CAUSE INJURY TO YOU AND DAMAGE TO THE FAN COWL.

- (b) ANCHOR FITTINGS WITHOUT THE ANTI-ROTATION CLIP;
Remove the screw (3), washer (2) and pin (1).

S 034-023-N00

- (3) Disconnect the drag link (9) from the pivot link on the blocker door.

- (a) Open the blocker door.
(b) BLOCKER DOORS WITH A DOUBLE-LUG PIVOT LINK;
Remove the nut (4), washers (5 and 7), bolt (8) and the bushings (6).
(c) BLOCKER DOORS WITH A SINGLE-LUG PIVOT;
Remove the nut (4), washers (5 and 7), bolt (17) and the bushings (16).

S 024-025-N00

- (4) Remove the drag link (9).

TASK 78-31-15-404-008-N00

3. Install the Thrust Reverser Blocker Door Drag Link

A. Parts

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AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	9	Drag Link	78-31-01	15 16 18 18A	240,375 195 175 165

B. References

- (1) AMM 27-61-00/201, Spoiler/Speedbrake Control System
- (2) AMM 78-00-00/601, Exhaust
- (3) AMM 78-31-00/201, Thrust Reverser System
- (4) AMM 78-31-14/601, Thrust Reverser Blocker Doors

C. Access

- (1) Location Zones
 - 410 Engine 1 Nacelles
 - 420 Engine 2 Nacelles
- (2) Access Panels
 - 415AL Fan Reverser (Left)
 - 416AR Fan Reverser (Right)
 - 425AL Fan Reverser (Left)
 - 426AR Fan Reverser (Right)

D. Install the Drag Link (Fig. 401).

S 424-009-N00

- (1) Install the drag link (9) on the blocker door.
 - (a) Lift the blocker door to get access to the pivot link on the aft side of the blocker door.
 - (b) Put the end of the drag link (9) through the slot in the blocker door.
 - (c) Align the hole in the end of the drag link (9) with the holes in the pivot link.

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- (d) BLOCKER DOORS WITH A DOUBLE-LUG PIVOT LINK;
Install the bushings (6), washers (5 and 7), bolt (8), and nut (4).
- (e) BLOCKER DOORS WITH A SINGLE-LUG PIVOT;
Install the bushings (16), washers (5 and 7), bolt (17), and nut (4).
- (f) Tighten the nut to 300-400 pound-inches (33.9-45.2 newton-meters).

S 424-024-N00

- (2) Install the drag link (9) to the anchor fitting on the fan cowl.
 - (a) Align the hole in the end of the drag link (9) with the holes in the anchor fitting.
 - (b) ANCHOR FITTINGS WITH THE ANTI-ROTATION CLIP;
Install the bushing (11) through the drag link (9) and the attachment fitting on the fan cowl.
 - 1) Install the bolt (13) through the clip (12), bushing (11), washer (10) and castellated nut (14).
 - 2) Tighten the nut to 50-80 pound-inches (5.6-9.0 newton-meters).

NOTE: Align the slot in the castellated nut (14) with the hole in the bolt (13) as you tighten it to the correct torque.

- 3) Install the cotter pin (15) through the end of the bolt (13) and the castellated nut (14).
- (c) ANCHOR FITTINGS WITHOUT THE ANTI-ROTATION CLIP;
Install the pin (1), washer (2) and screw (3).

S 444-012-N00

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

S 444-015-N00

- (4) Do the activation procedure for the spoiler/speedbrake control system (AMM 27-61-00/201).

S 864-013-N00

- (5) Remove the DO-NOT-OPERATE tags from the thrust levers.

S 714-014-N00

- (6) Operate the thrust reverser, manual or power method (AMM 78-31-00/201).

NOTE: Operate the thrust reverser a minimum of three full cycles to make sure it is serviceable.

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S 044-016-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILER/SPEEDBRAKE CONTROL SYSTEM. IF YOU DO NOT DO THIS, THE SPOILERS CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (7) Do the deactivation procedure for the spoiler/speedbrake control system (AMM 27-61-00/201).

S 864-017-N00

- (8) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

S 864-018-N00

- (9) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

S 044-014-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE THRUST REVERSER TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS AND DAMAGE TO THE EQUIPMENT.

- (10) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 214-017-N00

- (11) Make sure each blocker door makes a continuous surface with (is at the same level as) the adjacent structure (AMM 78-31-14/601).

NOTE: The blocker doors must not extend above the surface of the fan cowl when the thrust reverser is fully retracted.

E. Put the Airplane Back to Its Usual Condition.

S 444-020-N00

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

S 444-016-N00

- (2) Do the activation procedure for the spoiler/speedbrake control system (AMM 27-61-00/201).

S 864-019-N00

- (3) Remove the DO-NOT-OPERATE tags from the thrust levers.

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THRUST REVERSER BLOCKER DOOR DRAG LINKS - INSPECTION/CHECK

1. General

- A. The thrust reverser blocker door drag links are referred to as the drag links in this procedure.
- B. This procedure gives instructions to examine the drag links without opening the thrust reverser.

TASK 78-31-15-206-001-N00

2. Do a Check of the Thrust Reverser Blocker Door Drag Links

A. References

- (1) AMM 27-61-00/201, Spoiler/Speedbrake Control System
- (2) AMM 78-31-00/201, Thrust Reverser System
- (3) AMM 78-31-15/401, Thrust Reverser Blocker Door Drag Links

B. Access

(1) Location Zones

- 410 Engine 1 Nacelles
- 420 Engine 2 Nacelles

(2) Access Panels

- 415AL Fan Reverser (Left)
- 416AR Fan Reverser (Right)
- 425AL Fan Reverser (Left)
- 426AR Fan Reverser (Right)

C. Prepare to Do a Check of the Drag Links.

S 046-016-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILER/SPEEDBRAKE CONTROL SYSTEM. IF YOU DO NOT DO THIS, THE SPOILERS CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (1) Do the deactivation procedure for the spoiler/speedbrake control system (AMM 27-61-00/201).

S 866-017-N00

- (2) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

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S 866-018-N00

- (3) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

S 046-003-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE THRUST REVERSER TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (4) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

NOTE: Do the deactivation procedure for the stow valve and the motorized isolation valve only. DO NOT put the streamered pins in the thrust reverser sleeves. You will need to manually extend and retract the thrust reverser sleeves in the steps that follow.

D. Do a Check of the Drag Links (Fig. 601)

S 016-019-N00

WARNING: DO NOT OPEN THE THRUST REVERSER HALVES TO EXAMINE THE DRAG LINKS FOR THE BLOCKER DOORS. IF YOU DO, YOUR WEIGHT CAN CAUSE THE FAILURE OF THE HOLD-OPEN ROD WHEN YOU GO INTO THE FAN COWL. THE THRUST REVERSER HALVES WILL FALL TO THE CLOSED POSITION QUICKLY, WHICH CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (1) Go into the aft end of the fan cowl to get access to the drag links.

NOTE: Be careful when you get access to the drag links at the top of the thrust reverser. Push on the opposite sides of the inner walls of the fan cowl with your hands and feet while you lift your body up. Do not pull on the drag links or you will cause damage to them.

S 216-006-N00

- (2) Examine the end of the drag link at the anchor fitting of the fan cowl.
 - (a) ANCHOR FITTINGS WITH THE ANTI-ROTATION CLIP;
Do the steps that follow:
 - 1) Make sure the bushing through the drag link and the anchor fitting of the fan cowl is not damaged or worn.

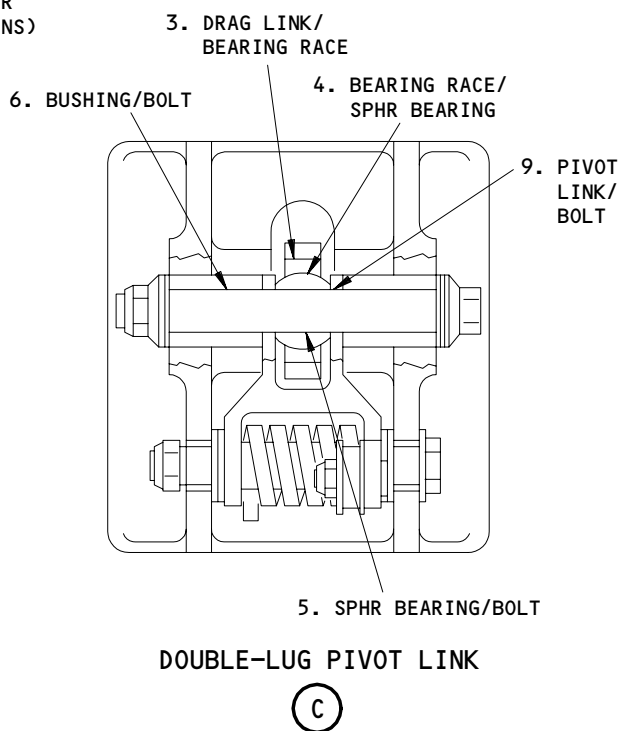
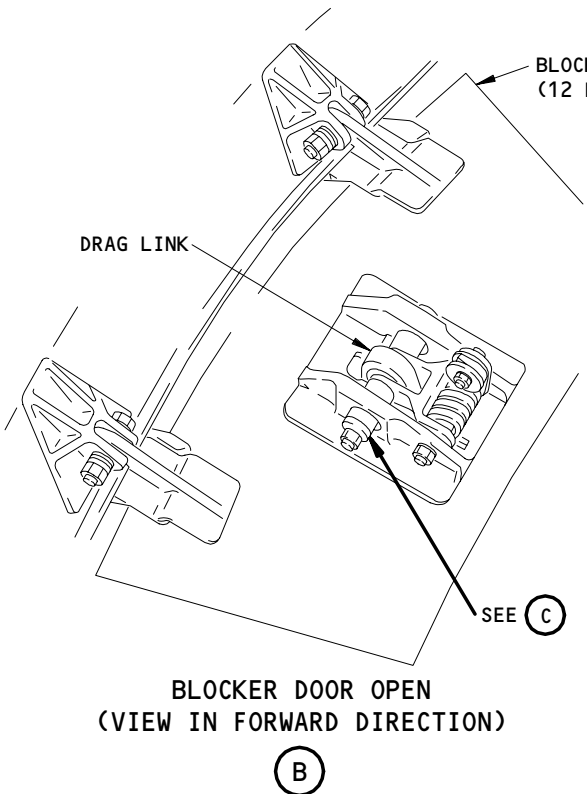
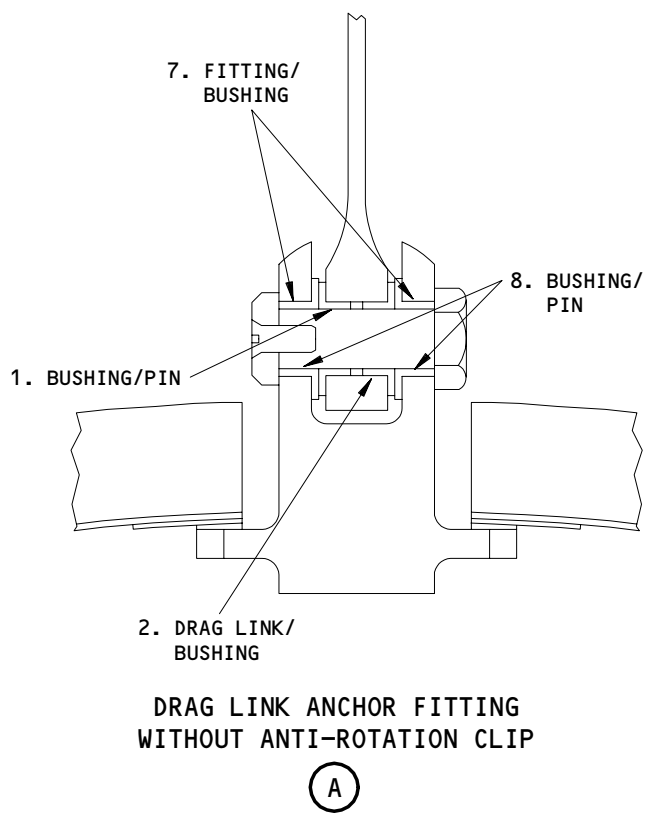
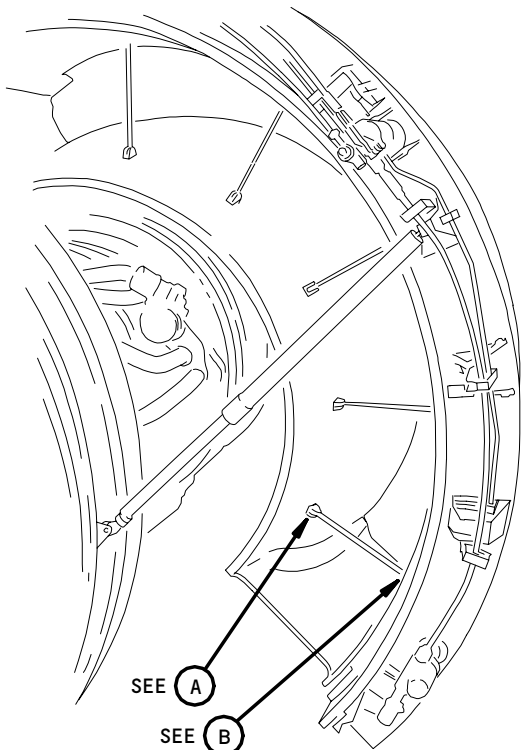
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Blocker Door Drag Link Wear Limits
Figure 601 (Sheet 1)

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INDEX NO.	PART NAME	DIM.	DESIGN LIMITS		WEAR LIMITS		REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR
			DIAMETER		PERMITTED WEAR DIM.	MAX DIA CLEARANCE			
			MIN	MAX					
1	BUSHING	ID	0.5000	0.5007	0.5020	0.0030	X		
	BOLT	OD	0.4990	0.4995	0.4975			X	1
2	DRAG LINK	ID	0.6250	0.6256	--	-0.0000		X	1
	BUSHING	OD	0.6261	0.6267	--		X		
3	DRAG LINK	ID	0.9063	0.9070	--	0.0020		X	1
	BEARING RACE	OD	0.9057	0.9062	--		X		2
4	BEARING RACE	ID	0.6990	0.6995	0.7075	0.0060 RADIAL 0.0080 AXIAL	X		
	SPHR BEARING	OD	0.6975	0.6980	--		X		
5	SPHR BEARING	ID	0.3750	0.3754	0.3770		X		
	BOLT	OD	0.3740	0.3745	0.3725	X			
6	BUSHING	ID	0.3750	0.3755	0.3765	0.0030	X		
	BOLT	OD	0.3735	0.3745	0.3725		X		
7	FITTING	ID	0.6250	0.6256	--	-0.0000		X	
	BUSHING	OD	0.6261	0.6267	--		X		
8	BUSHING	ID	0.5000	0.5007	0.5020	0.0030	X		
	PIN	OD	0.4990	0.4995	0.4975			X	1
9	PIVOT LINK	ID	0.3750	0.3756	0.3770	0.0030		X	1
	BOLT	OD	0.3740	0.3745	0.3725		X		

- 1 SHOP REPAIRABLE
- 2 NO LOOSENESS IS PERMITTED AFTER SWAGING

Blocker Door Drag Link Wear Limits
Figure 601 (Sheet 2)

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- 2) Make sure the bushing, bolt, washers, nut and cotter pin are correctly installed in the drag link.

NOTE: If the bushing is loose in the drag link, replace the bushing or the drag link (AMM 78-31-15/401).

(b) ANCHOR FITTINGS WITHOUT THE ANTI-ROTATION CLIP;

Do the steps that follow:

- 1) Make sure the anchor fitting on the fan cowl is not damaged or worn.
- 2) Make sure the bushing that goes through the drag link is not damaged and is not worn.

NOTE: If the bushing is loose in the drag link, replace the bushing or the drag link (AMM 78-31-15/401).

S 226-007-N00

- (3) Examine the surface of the drag link for nicks, dents, gouges, or other damage.

NOTE: If the depth of the nick, dent or gouge is more than 0.020 inch, replace the drag link (AMM 78-31-15/401).

S 986-008-N00

WARNING: MAKE SURE ALL PERSONS AND EQUIPMENT ARE OUT OF THE FAN COWL AND AWAY FROM THE THRUST REVERSER. IF YOU DO NOT DO THIS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR WHEN YOU EXTEND THE THRUST REVERSER.

- (4) Manually extend the thrust reverser to lift the blocker doors into the deployed position (AMM 78-31-00/201).

S 216-012-N00

- (5) Go into the fan cowl and examine the end of the drag link at the blocker door:
 - (a) Examine the spherical bearing in the drag link.
 - 1) If the spherical bearing is loose in the race, replace the drag link (AMM 78-31-15/401).
 - 2) If the race is loose in the drag link, replace the drag link (AMM 78-31-15/401).
 - (b) Examine the bolt and the inner diameter of the bushings.
 - 1) If there is a clearance between the shank of the bolt and the bushing, make sure the correct bolt is installed.

NOTE: If the bolt is correct, replace the bushing or the drag link (AMM 78-31-15/401).

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- (c) Make sure the bolt, bushing, washers and nut are correctly installed in the drag link.
- E. Put the Airplane Back to Its Usual Condition.

S 986-009-N00

WARNING: MAKE SURE ALL PERSONS AND EQUIPMENT ARE OUT OF THE FAN COWL AND AWAY FROM THE THRUST REVERSER. IF YOU DO NOT DO THIS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR WHEN YOU RETRACT THE THRUST REVERSER.

- (1) Manually retract the thrust reverser (AMM 78-31-00/201).

S 446-015-N00

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

S 446-011-N00

- (3) Do the activation procedure for the spoiler/speedbrake control system (AMM 27-61-00/201).

S 866-010-N00

- (4) Remove the DO-NOT-OPERATE tags from the thrust levers.

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THRUST REVERSER CASCADE VANE SEGMENTS – REMOVAL/INSTALLATION

1. General

A. This procedure has these tasks:

- (1) Remove the Thrust Reverser Cascade Vane Segments
- (2) Install the Thrust Reverser Cascade Vane Segments

TASK 78-31-16-004-001-N00

2. Remove the Thrust Reverser Cascade Vane Segments

A. General

- (1) The cascade vane segments are attached on the perimeter of the thrust reverser to move the fan flow forward and away from the engine inlet. Make sure you replace the cascade vane segment with the correct cascade vane segment because of the necessary angle of the airflow.
- (2) The hydraulic actuators cause a blockage for some of the cascade vane segments. If you must remove a blocked cascade vane segment, you must first remove the adjacent cascade vane segment to open an area. The you must remove the access panel for the hydraulic actuator and disconnect the actuator rod end from the thrust reverser sleeve.
- (3) Do not operate the engine in reverse thrust for ground maintenance if you do not have all of the cascade vane segments.
- (4) Operate the engine in forward thrust for ground maintenance only with the conditions that follow:
 - (a) Thrust reverser is set to off for ground maintenance.
 - (b) No more than three cascade vane segments which are not on each thrust reverser half.
 - (c) No two adjacent cascade vane segments which are not on each thrust reverser half.
 - (d) You must have the nearest top and bottom cascade vane segments to the top and bottom of each thrust reverser half.
- (5) You cannot lift or move the thrust reverser halves unless a minimum of three cascade vane segments are installed. But, you must have equal space between the three cascade vane segments on each thrust reverser half with no more than two adjacent open spaces.

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B. References

- (1) AMM 78-31-00/201, Thrust Reverser System
- (2) AMM 78-31-17/401, Thrust Reverser Hydraulic Actuators

C. Access

(1) Location Zones

- 411 Left Engine
- 421 Right Engine

(2) Access Panels

- 415AL Fan Reverser (Left)
- 416AR Fan Reverser (Right)
- 425AL Fan Reverser (Left)
- 426AR Fan Reverser (Right)

D. Remove the Cascade Vane Segments (Fig. 401)

S 864-002-N00

- (1) Extend the thrust reverser (AMM 78-31-00/201).

S 044-003-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 434-004-N00

- (3) Install the DO-NOT-OPERATE tags on the reverse thrust levers in the flight compartment.

S 024-005-N00

- (4) Remove the bolts which attach the cascade vane segment.

S 024-006-N00

- (5) Remove the cascade vane segment.

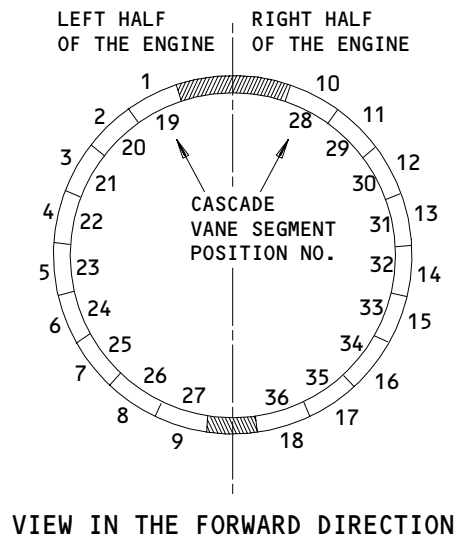
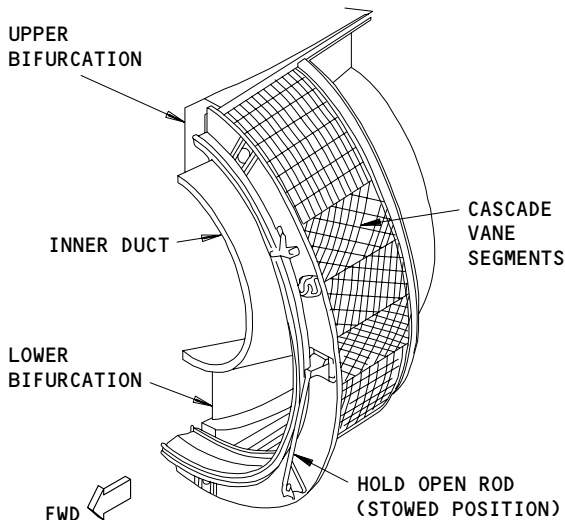
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









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

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**RADIAL SECTION EXAMPLE
(LEFT HALF OF THE THRUST REVERSER)**

	ENGINE 1		ENGINE 2	
	VANE POSITION	VANE PART NUMBER	VANE POSITION	VANE PART NUMBER
LEFT HALF OF ENGINE	1	315T4210-1	19	315T4210-1
	2	315T4210-3	20	315T4210-3
	3	315T4210-3	21	315T4212-3
	4	315T4212-3	22	315T4259-2 
	5	315T4210-3	22	315T4259-8 
	6	315T4210-3	23	315T4259-10
	7	315T4210-3	23	315T4259-2 
	8	315T4212-3	24	315T4259-8 
	9	315T4212-1	25	315T4214-4
RIGHT HALF OF ENGINE	10	315T4210-2	26	315T4262-1
	11	315T4210-3	27	315T4262-1
	12	315T4212-4	28	315T4214-1
	13	315T4259-1 	28	315T4210-2
	13	315T4259-7 	29	315T4210-3
	13	315T4259-9 	30	315T4210-3
	14	315T4259-1 	31	315T4212-4
	14	315T4259-7 	32	315T4210-3
	14	315T4259-9 	33	315T4210-3
15	315T4214-3	34	315T4210-3	
16	315T4262-1	35	315T4212-4	
17	315T4262-1	36	315T4212-2	
18	315T4214-2			

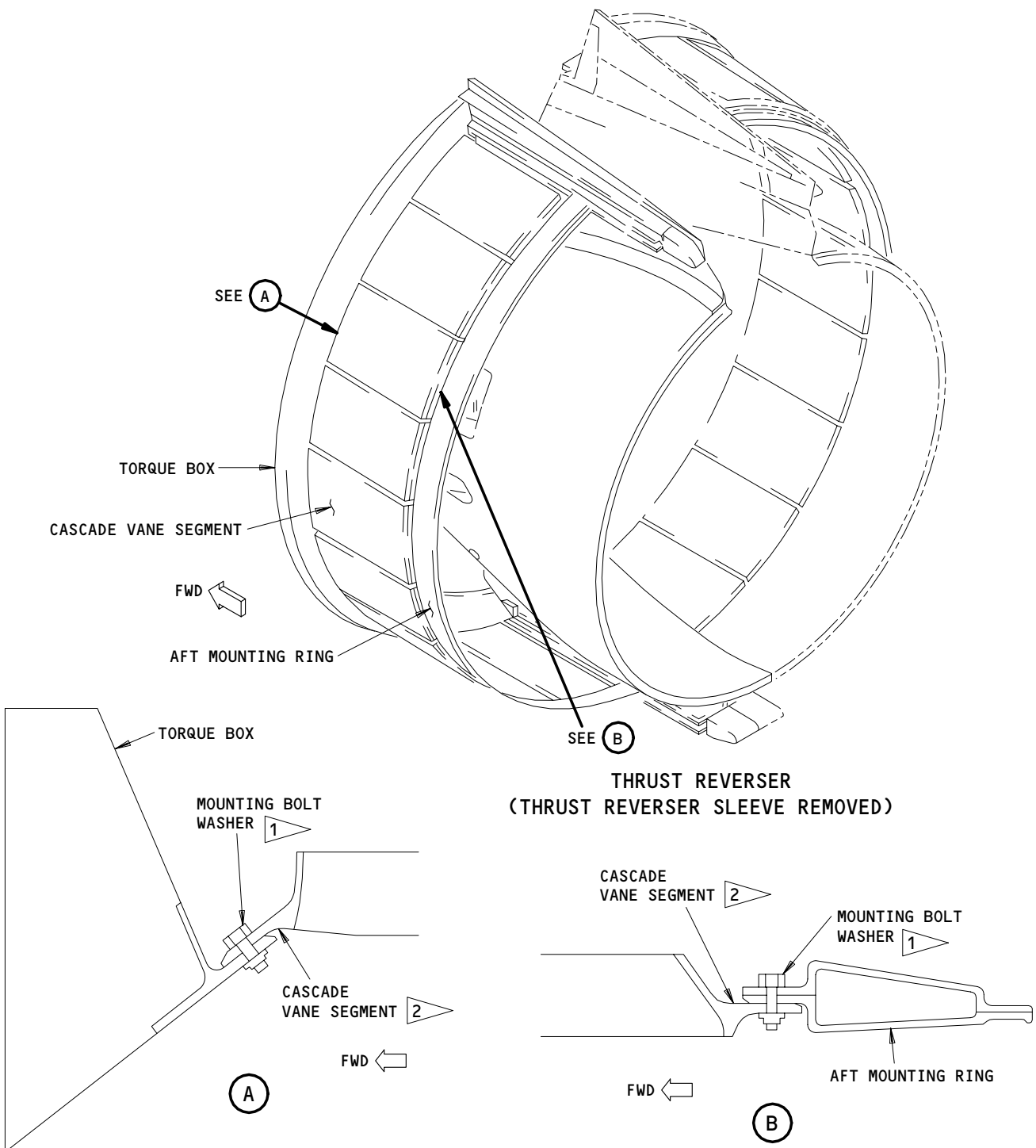
-  THRUST REVERSERS WITHOUT SB 78-69
-  THRUST REVERSERS WITH SB 78-69

**Positions of the Cascade Vane Segments
Figure 401**

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- 1 ▷ APPLY THE CORROSION PREVENTIVE COMPOUND BELOW THE BOLT HEADS AND ON THE BOLT SHANKS. DO NOT APPLY THE CORROSION PREVENTIVE COMPOUND TO THE BOLT THREADS.
- 2 ▷ APPLY THE WET PRIMER TO THE TORQUE BOX AND THE MATING SURFACE OF THE AFT MOUNTING RING

Cascade Vane Segment Installation
Figure 402

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S 024-007-N00

- (6) If the locking and nonlocking hydraulic actuators cause a blockage to remove the cascade vane segments, do the steps that follow:
 - (a) Remove the access panel for the hydraulic actuator.
 - (b) Disconnect the actuator rod end from the thrust reverser sleeve (AMM 78-31-17/401).
 - (c) Remove the bolts which attach the adjacent cascade vane segment.
 - (d) Remove the cascade vane segment.
 - (e) Remove the bolts which attach the blocked cascade vane segment.
 - (f) Turn the hydraulic actuator outward.
 - (g) Move the cascade vane segment into the opening from the adjacent cascade vane segment.
 - (h) Remove the cascade vane segment from the thrust reverser.

TASK 78-31-16-404-008-N00

3. Install the Thrust Reverser Cascade Vane Segments

A. General

- (1) The cascade vane segments are attached on the perimeter of the thrust reverser to move the fan flow forward and away from the engine inlet. Make sure you replace the cascade vane segment with the correct cascade vane segment because of the necessary angle of the airflow.
- (2) The hydraulic actuators cause a blockage for some of the cascade vane segments. If you must remove a blocked cascade vane segment, you must first remove the adjacent cascade vane segment to open an area. Then you must remove the access panel for the hydraulic actuator and disconnect the actuator rod end from the thrust reverser sleeve.
- (3) Do not operate the engine in reverse thrust for ground maintenance if you do not have all of the cascade vane segments.
- (4) Operate the engine in forward thrust for ground maintenance only with the conditions that follow:
 - (a) Thrust reverser is set to off for ground maintenance.

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- (b) No more than three cascade vane segments which are not on each thrust reverser half.
- (c) No two adjacent cascade vane segments which are not on each thrust reverser half.
- (d) You must have the nearest top and bottom cascade vane segments to the top and bottom of each thrust reverser half.
- (5) You cannot lift or move the thrust reverser halves unless a minimum of three cascade vane segments are installed. But, you must have equal space between the three cascade vane segments on each thrust reverser half with no more than two adjacent open spaces.

B. Consumable Materials

- (1) C00149 Primer - Green, BMS 10-11 Type I Class A
- (2) C00308 Compound - Corrosion Preventive, MIL-C-11796, Class 3

C. References

- (1) AMM 24-22-00/201, Electrical Power - Control
- (2) AMM 29-11-00/201, Pressurize/Depressurize Main Hydraulic System
- (3) AMM 78-31-00/201, Thrust Reverser System
- (4) AMM 78-31-17/401, Thrust Reverser Hydraulic Actuators

D. Access

(1) Location Zones

- 411 Left Engine
- 421 Right Engine

(2) Access Panels

- 415AL Fan Reverser (Left)
- 416AR Fan Reverser (Right)
- 425AL Fan Reverser (Left)
- 426AR Fan Reverser (Right)

E. Install the Cascade Vane Segments for the Thrust Reverser (Fig. 401)

S 424-009-N00

CAUTION: MAKE SURE YOU CORRECTLY INSTALL THE CASCADE VANE SEGMENTS ON THE THRUST REVERSER. IF YOU DO NOT DO THIS, YOU CAN CAUSE DAMAGE TO THE ENGINE.

- (1) Install the cascade vane segment into the correct position.

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- S 424-010-N00
- (2) Install one or two threads of the bolts which attach the cascade vane segment.
- S 424-011-N00
- (3) For the blocked cascade vane segment, do the steps that follow:
- (a) Put the cascade vane segment into the opening by the adjacent cascade vane segment.
 - (b) Turn the cascade vane segment outward.
 - (c) Move the cascade vane segment into the blocked position.
 - (d) Install one or two threads of the bolts to attach the cascade vane segment.
- S 434-012-N00
- (4) Tighten the bolts at the aft mounting ring to 72-88 pound-inches.
- S 434-013-N00
- (5) Apply a load of 25 pounds across the cascade strongbacks, five inches aft of the torque box bolts.
- S 224-014-N00
- (6) Measure the distance between the cascade vane segment and the mating surface of the torque box.
- NOTE: The maximum distance is 0.030 inch. Know the area which has the best fit.
- S 024-015-N00
- (7) Remove the cascade vane segment.
- S 644-016-N00
- (8) Apply the wet primer to the mating surface of the torque box and the aft mounting ring which includes the fastener holes.

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- S 424-017-N00
- (9) Put the cascade vane segment into the position.
- (a) Apply the corrosion preventive compound below the heads of the bolts and on the bolt shanks.
- (b) Do not apply the corrosion preventive compound on the threads of the bolts.
- S 424-018-N00
- (10) Install the bolts which attach the cascade vane segment.
- S 434-019-N00
- (11) Tighten the bolts at the aft mounting ring to 72-88 pound-inches.
- S 434-020-N00
- (12) Tighten the bolts, at the area of the smallest distance between the cascade vane segment and the mating surface of the torque box, to 72-88 pound-inches.
- S 434-021-N00
- (13) Tighten the other bolts on each side to 72-88 pound-inches.
- S 034-022-N00
- (14) After all the bolts are tightened, loosen the bolts one-half turn.
- S 434-023-N00
- (15) Tighten the bolts to 72-88 pound-inches again.
- S 424-024-N00
- (16) Install the cascade vane segments adjacent to the blocked cascade vane segments with the steps from above.
- S 434-025-N00
- (17) Install the actuator rod end (AMM 78-31-17/401).
- S 414-026-N00
- (18) Install the access panel for the hydraulic actuator.

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F. Put the Airplane Back to Its Usual Condition

- S 034-027-N00
- (1) Remove the DO-NOT-OPERATE tags from the reverse thrust levers in the flight compartment.

- S 444-028-N00
- (2) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

- S 864-029-N00
- (3) Retract the thrust reverser sleeve (AMM 78-31-00/201).

- S 714-030-N00
- (4) Do a test of the thrust reverser operation (AMM 78-31-00/201).

- S 864-031-N00
- (5) Remove hydraulic power (AMM 29-11-00/201).

- S 864-032-N00
- (6) Remove electrical power if it is not necessary (AMM 24-22-00/201).

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THRUST REVERSER CASCADE SEGMENTS – INSPECTION/CHECK

1. General

A. This procedure examines the cascade vane segments of the thrust reverser.

TASK 78-31-16-206-001-N00

2. Do an Inspection of the Thrust Reverser Cascade Segments

A. References

- (1) AMM 78-31-00/201, Thrust Reverser System
- (2) AMM 78-31-16/401, Thrust Reverser Cascade Vane Segments

B. Access

- (1) Location Zones
 - 411 Left Engine
 - 421 Right Engine

- (2) Access Panels
 - 415AL Fan Reverser (Left)
 - 416AR Fan Reverser (Right)
 - 425AL Fan Reverser (Left)
 - 426AR Fan Reverser (Right)

C. Do an Inspection of the Cascade Segments (Fig. 601).

S 866-002-N00

- (1) Operate the thrust reverser to the deploy position (AMM 78-31-00/201).

S 046-003-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 216-004-N00

- (3) Examine the cascade vanes for damage and correct installation.
 - (a) Examine for nicks, gouges, scratches, cracks, or damage caused by corrosion in the cascade vanes, strongbacks and forward and aft fastener hole flanges.
 - 1) Replace the cascade vane segments that have damage or cracks (AMM 78-31-16/401).
 - (b) Examine the cascade vane segment for loose fasteners.
 - 1) If it is necessary, tighten the fasteners (AMM 78-31-16/401).

S 446-005-N00

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

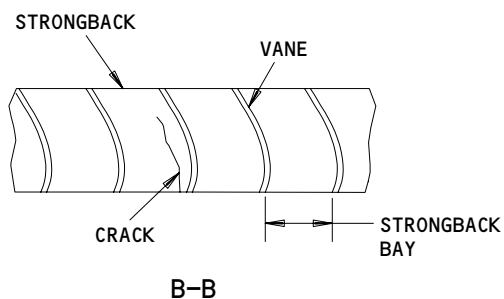
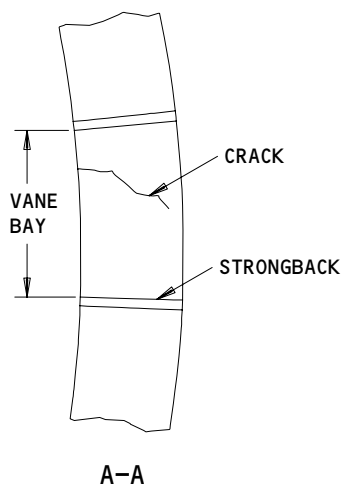
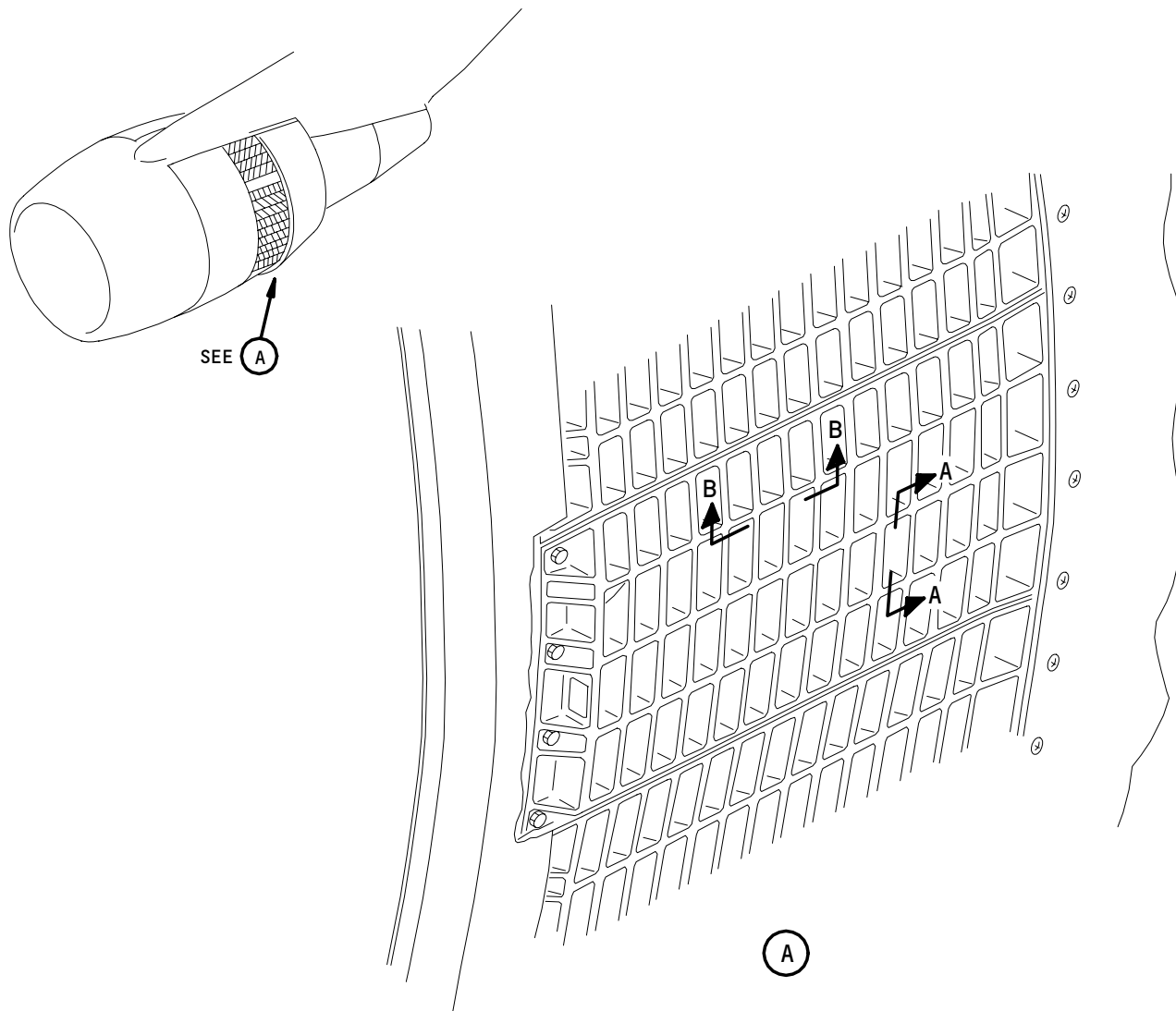
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Cascade Vane Inspection/Check
Figure 601

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S 866-006-N00

- (5) Operate the thrust reverser to the stow position (AMM 78-31-00/201).

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THRUST REVERSER HYDRAULIC ACTUATORS – MAINTENANCE PRACTICES

1. General

A. The purpose of this procedure is to test for internal leaks of the thrust reverser actuators and to show which actuator has internal leakage. A thrust reverser stow time of more than three seconds is the only operational indication of severe internal leakage of the thrust reverser actuators. This procedure applies hydraulic pressure to the stow side of the thrust reverser actuators.

TASK 78-31-17-002-001-N00

2. Do a Test for Internal Leaks of the Thrust Reverser Hydraulic Actuator

A. References

- (1) AMM 24-22-00/201, Manual Control – Maintenance Practices
- (2) AMM 29-11-00/201, Main (Left, Right, and Center) Hydraulic
- (3) AMM 71-11-04/201, Fan Cowl Panels
- (4) AMM 78-31-00/201, Thrust Reverser System
- (5) AMM 78-31-00/501, Thrust Reverser System
- (6) AMM 78-36-01/401, Thrust Reverser Proximity Sensors

B. Access

(1) Location Zones

- 410 Engine No. 1 (Left) Power Plant
- 420 Engine No. 2 (Right) Power Plant

(2) Access Panels

- 413AL Fan Cowl Panel (Left)
- 414AR Fan Cowl Panel (Right)
- 415AL Fan Reverser (Left)
- 416AR Fan Reverser (Right)
- 415DL Locking Actuator Panel (Left)
- 416DR Locking Actuator Panel (Right)
- 423AL Fan Cowl Panel (Left)
- 424AR Fan Cowl Panel (Right)
- 425AL Fan Reverser (Left)
- 426AR Fan Reverser (Right)
- 425DL Locking Actuator Panel (Left)
- 426DR Locking Actuator Panel (Right)

C. Prepare to test for internal leaks of the thrust reverser actuators.

S 862-069-N00

- (1) Make sure the thrust reverser to be tested is fully stowed.

S 862-002-N00

- (2) Make sure the forward thrust lever is in the idle position and the reverse thrust lever is fully forward.
 - (a) Install the DO-NOT-OPERATE tags on the forward thrust lever and reverse thrust lever.

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S 042-003-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.

- (3) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 012-004-N00

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

S 862-005-N00

- (5) For the left engine, open this circuit breaker and attach the DO-NOT-CLOSE tag:

- (a) On the overhead circuit breaker panel, P11:

- 1) 11D13, L ENG T/R IND

S 862-006-N00

- (6) For the right engine, open these circuit breakers and attach the DO-NOT-CLOSE tags:

- (a) On the P11 panel:

- 1) 11L32, R ENG T/R IND
- 2) 11D32, R ENG T/R IND ALTN

S 022-077-N00

CAUTION: IMMEDIATELY CLEAN ALL OF THE HYDRAULIC FLUID THAT FALLS. THE HYDRAULIC FLUID CAN CAUSE CONTAMINATION OF THE AIRPLANE OR THE ENGINE.

- (7) Disconnect the two flex shafts tubes (1) and (2) from the center locking hydraulic actuator (4) (Fig. 201).
 - (a) Loosen and move the tube nuts (3) back off of the fittings at the hydraulic actuator ports.
 - 1) Catch the hydraulic fluid in an approved container.
 - (b) Loosen the support block clamps that attach the tube assembly to the torque box.

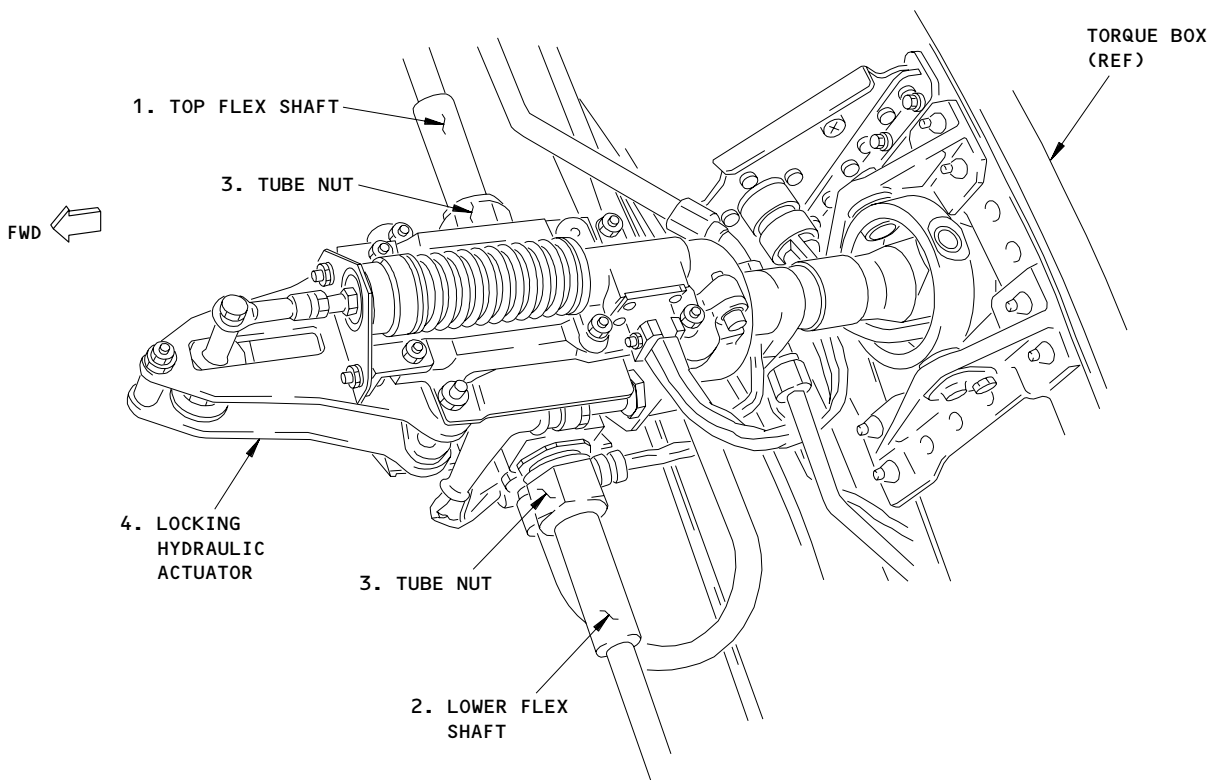
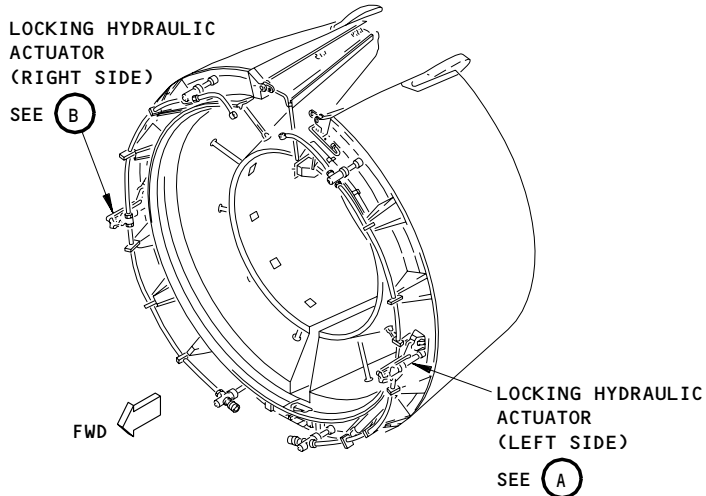
EFFECTIVITY

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LOCKING HYDRAULIC ACTUATOR (LEFT SIDE)

A

Locking Hydraulic Actuator
Figure 201 (Sheet 1)

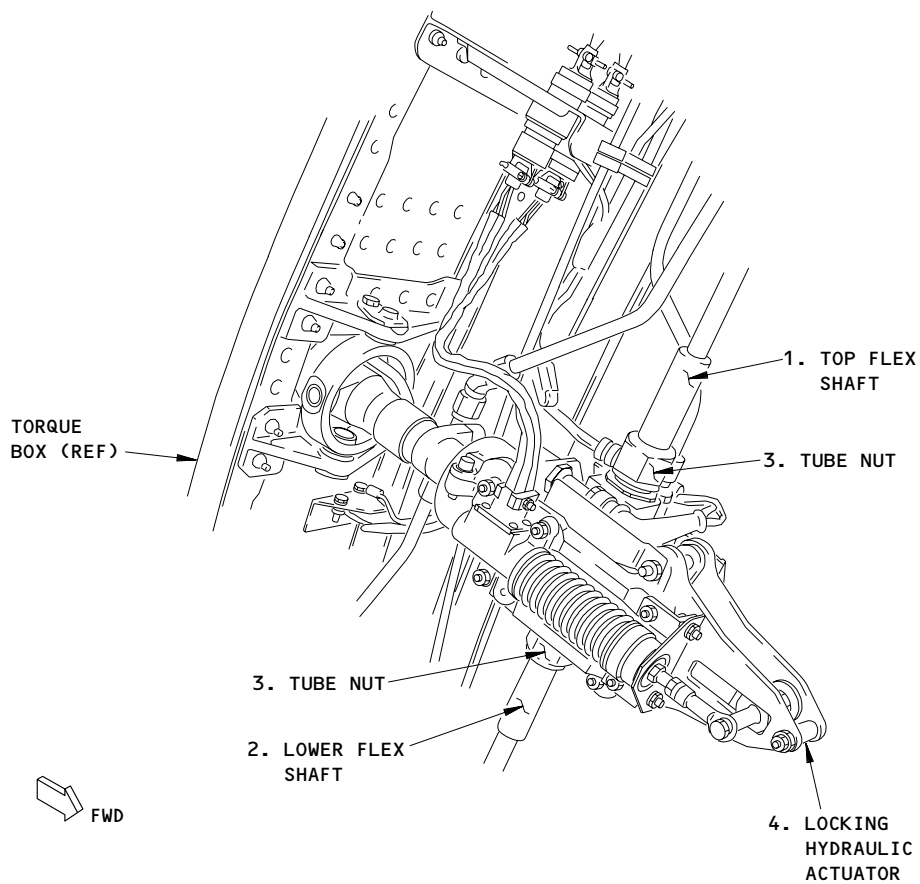
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K10778



LOCKING HYDRAULIC ACTUATOR
 (RIGHT SIDE)

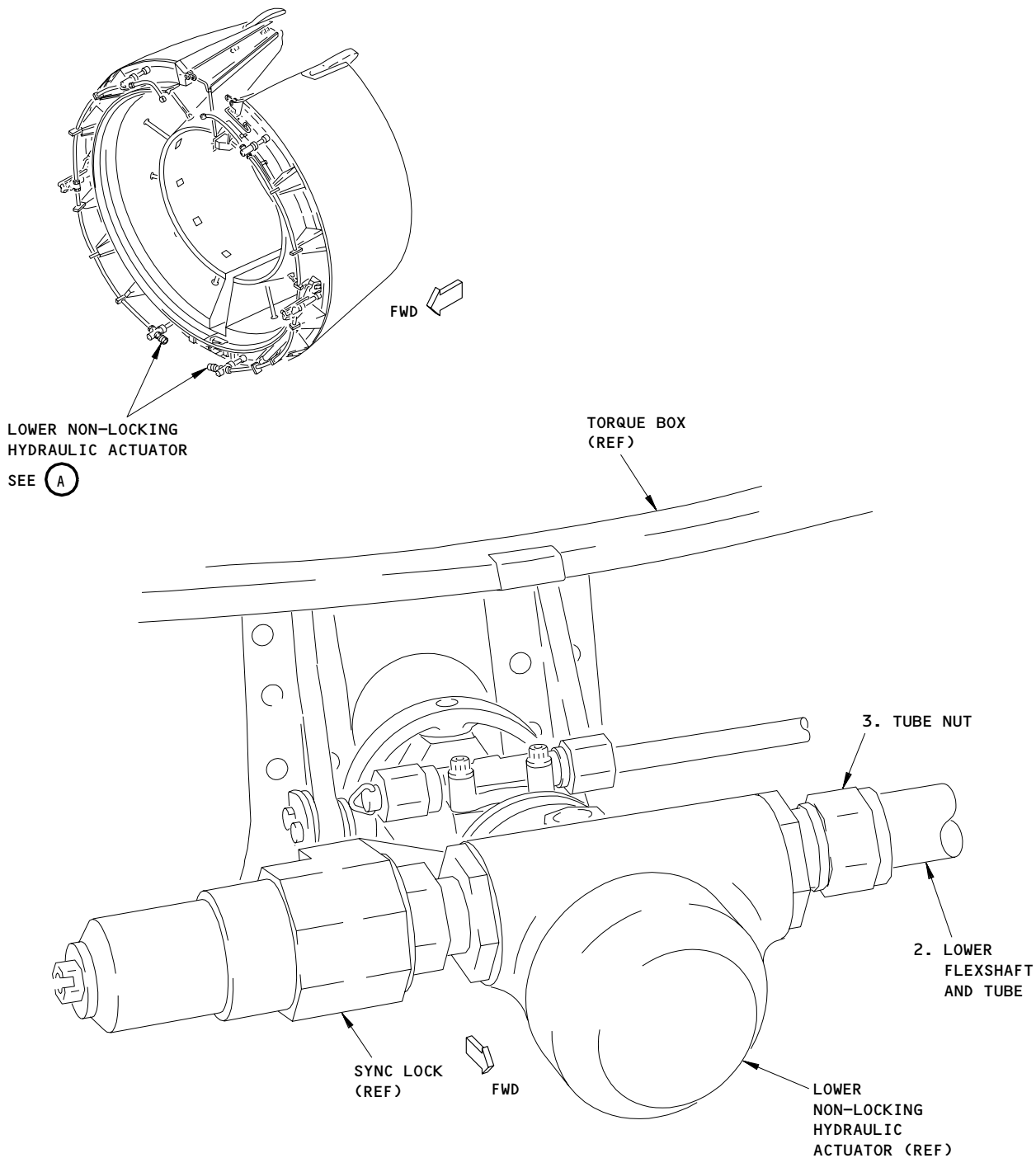
(B)

Locking Hydraulic Actuator
 Figure 201 (Sheet 2)

EFFECTIVITY	
	ALL

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K10871



LOWER NON-LOCKING HYDRAULIC ACTUATOR
(LEFT SIDE IS SHOWN, RIGHT SIDE IS OPPOSITE)

(A)

Lower Non-Locking Hydraulic Actuator
Figure 202

EFFECTIVITY	
	ALL

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N02

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K10925

CAUTION: DO NOT DISENGAGE THE FLEX SHAFTS FROM THE ACTUATORS.
IF YOU DISENGAGE THE FLEX SHAFTS FROM THE ACTUATORS, IT
MAY CAUSE THE THRUST REVERSER TO BE OUT OF ADJUSTMENT.

- (c) Apply a force to the upper and lower flex tubes to push them into the tube nuts at the upper and lower actuators.

NOTE: This will give more distance at the open end of the tube to observe the origin of any hydraulic fluid flow.

- (d) Move the tube nuts, at the center locking actuator, along the tube until the outer end of the nut and tube are aligned.

D. Apply hydraulic stow pressure to the thrust reverser actuators.

NOTE: There are two methods to apply stow hydraulic pressure to the thrust reverser sleeve which puts pressure on all three actuators. The first method uses airplane hydraulic pressure. The second method uses a hydraulic ground service cart.

S 942-071-N00

- (1) If you use the airplane hydraulic power, do the steps that follow:
 - (a) Make sure the reverser thrust levers are in the forward, stowed position with the DO-NOT-OPERATE tags installed.
 - (b) For the left engine, make sure this circuit breaker is open and the DO-NOT-CLOSE tag is attached:
 - 1) On the overhead circuit breaker panel, P11:
 - a) 11D14, L ENG T/R CONT
 - (c) For the right engine, make sure these circuit breakers are open and the DO-NOT-CLOSE tags are attached:
 - 1) On the overhead circuit breaker panel, P11:
 - a) 11L33, R ENG T/R CONT
 - b) 11D33, R ENG T/R CONT ALTN
 - (d) Disconnect the electrical connector D4180P (LH sleeve) or D4182P (RH sleeve) for the engine strut.

NOTE: The auto restow system is in the deployed condition of the thrust reverser sleeve.

- (e) Supply electrical power (AMM 24-22-00/201).
- (f) Remove the streamered pin from the deactivation slide of the stow valve.
 - 1) Do not close the circuit breakers for the thrust reverser control.

EFFECTIVITY

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WARNING: MAKE SURE PERSONS AND EQUIPMENT ARE AWAY FROM THE THRUST REVERSER BEFORE HYDRAULIC PRESSURE IS SUPPLIED TO THE THRUST REVERSER. WITH THE ELECTRICAL POWER SUPPLIED, THE THRUST REVERSER MAY MOVE WHEN THE HYDRAULIC POWER IS SUPPLIED. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

- (g) Supply hydraulic power (AMM 29-11-00/201).
- (h) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker:

NOTE: The thrust reverser sleeves may move slightly.
Do not remove the hydraulic power.

- 1) On the P11 panel:
 - a) 11D14, L ENG T/R CONT
- (i) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker:

NOTE: The thrust reverser sleeves may move slightly.
Do not remove the hydraulic power.

- 1) On the P11 panel:
 - a) 11L33, R ENG T/R CONT
 - b) 11D33, R ENG T/R CONT ALTN

S 942-072-N00

- (2) If you use the hydraulic ground service cart, do the steps that follow:

CAUTION: IMMEDIATELY CLEAN ALL OF THE HYDRAULIC FLUID THAT FALLS. THE HYDRAULIC FLUID CAN CAUSE CONTAMINATION OF THE AIRPLANE OR THE ENGINE.

- (a) Disconnect the retract line flex hose for the non-locking hydraulic actuator from the strut hydraulic connection.
 - 1) Catch the hydraulic fluid in an approved container.
- (b) Connect the hydraulic ground service cart to the retract line flex hose (5) for the retract line.

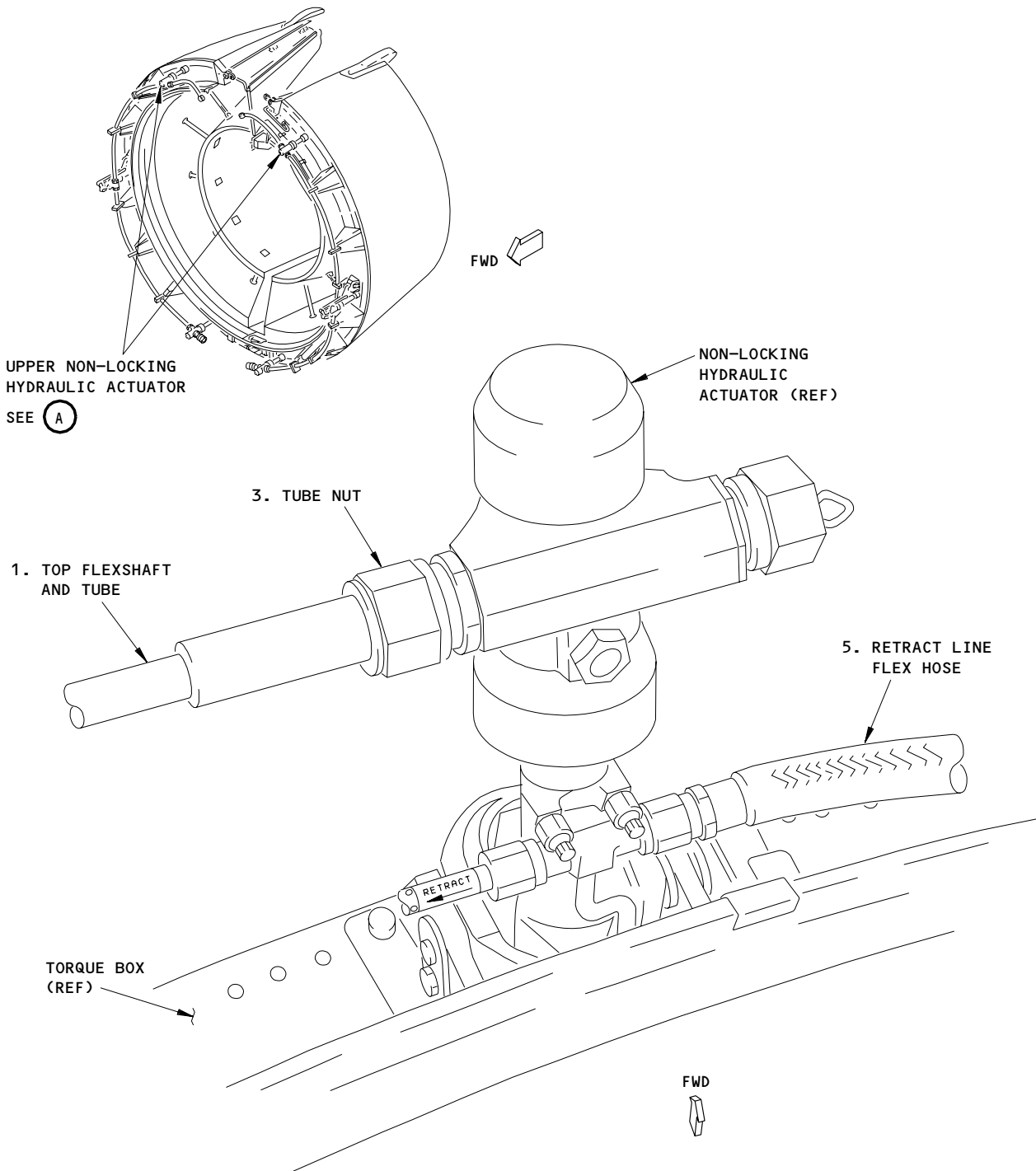
EFFECTIVITY

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UPPER NON-LOCKING HYDRAULIC ACTUATOR
(RIGHT SIDE IS SHOWN, LEFT SIDE IS OPPOSITE)

(A)

Upper Non-Locking Hydraulic Actuator
Figure 203

EFFECTIVITY	
ALL	

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WARNING: MAKE SURE PERSONS AND EQUIPMENT ARE AWAY FROM THE THRUST REVERSER BEFORE HYDRAULIC PRESSURE IS SUPPLIED TO THE THRUST REVERSER. WITH THE ELECTRICAL POWER SUPPLIED, THE THRUST REVERSER MAY MOVE WHEN THE HYDRAULIC POWER IS SUPPLIED. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

- (c) Operate the hydraulic ground service cart to supply 1800 to 3000 psi hydraulic pressure.

NOTE: The thrust reverser sleeve may move slightly.
Do not decrease the hydraulic pressure.

- E. Thrust reverser actuator internal leak check.

NOTE: Be prepared to catch hydraulic fluid in an approved container.

S 792-075-N00

- (1) Measure the rate of hydraulic leakage.

S 792-076-N00

- (2) Observe which actuator the leak is coming from.

- F. Put the airplane back in its usual condition.

S 432-040-N00

- (1) Push the top flex shaft tube (1) and lower flex shaft tube (2) back into position so that you can engage several threads of the tube nuts (3) on the drive ports of the center locking actuator (4) (Fig. 201).

NOTE: Make sure you maintain hydraulic pressure to the retract side of the actuator.

- (a) Tighten the support blocks fasteners for the flex shaft tubes.
- (b) Tighten both of the tube nuts (3) to 30-35 pound-feet.

S 942-073-N00

- (2) If the airplane hydraulic power was used, do the steps that follow:
 - (a) Connect the electrical connector D4180P (LH sleeve) or D4182P (RH sleeve) for the engine strut.
 - (b) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker:
 - 1) On the P11 panel:
 - a) 11D13, L ENG T/R IND

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- (c) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers:
 - 1) On the P11 panel:
 - a) 11L33, R ENG T/R IND
 - b) 11D33, R ENG T/R IND ALTN
- (d) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).
- (e) Remove the DO-NOT-OPERATE tags from the forward thrust lever and the reverse thrust lever.
- (f) Do the operational test for the thrust reverser (AMM 78-31-00/501).
- (g) Operate the thrust reverser through three full deploy and stow cycles.
- (h) Close the fan cowl panels (AMM 71-11-04/201).

S 942-074-N00

- (3) If the hydraulic ground service cart was used, do the steps that follow:
 - (a) Operate the hydraulic ground service cart to decrease the hydraulic pressure to zero.
 - (b) Disconnect the hydraulic ground service cart from the retract line flex hose (5).
 - (c) Install the retract line flex hose to the strut hydraulic connection.
 - (d) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).
 - (e) Remove the DO-NOT-OPERATE tags from the forward thrust lever and the reverse thrust lever.
 - (f) Do the operational test for the thrust reverser (AMM 78-31-00/501).
 - 1) Operate the thrust reverser through three full deploy and stow cycles.
 - (g) Close the fan cowl panels (AMM 71-11-04/201).

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THRUST REVERSER HYDRAULIC ACTUATORS – REMOVAL/INSTALLATION

1. General

- A. The hydraulic actuating system on the thrust reverser has two types of hydraulic actuators: locking and non-locking. Each thrust reverser has six hydraulic actuators. There are two locking type while the other four are non-locking. The locking hydraulic actuators have more hardware and linkages on the head end which make them different from the non-locking actuators. The locking hydraulic actuators are adjacent to the horizontal centerline of each engine. The removal and installation procedures are different in some steps.
- B. The hydraulic actuators are attached at one end on the perimeter of the fan cowl on the inner side of the aft end of the fan cowl. You can get access to the hydraulic actuators through the fan cowl panels.
- C. The rod ends of the hydraulic actuators are attached in the thrust reverser behind the access panels for the hydraulic actuators. You can get access to the rod ends through these access panels.
- D. The rod end gap (Dimension A) for the initial installation is 0.010–0.018 inch (0.254–0.457 mm) for non-locking and locking actuators. This is a requirement that new actuators must meet on a bench rig. A repaired or rebuilt actuator can have a gap of 0.010–0.022 inch (0.254–0.559 mm) on a bench rig. After installation and operation, the rod-end gap is 0.100 inch (2.540 mm) for any deflection from the thrust reverser weight.

TASK 78-31-17-004-001-N00

2. Remove the Thrust Reverser Locking Hydraulic Actuators

A. References

- (1) AMM 06-43-00/201, Engine Nacelle Access Doors and Panels
- (2) AMM 71-11-04/201, Fan Cowl Panels
- (3) AMM 78-00-00/601, Exhaust – General
- (4) AMM 78-00-00/801, Exhaust – General
- (5) AMM 78-31-00/201, Thrust Reverser System
- (6) AMM 78-34-13/401, Thrust Reverser Sync Lock
- (7) AMM 78-36-01/401, Thrust Reverser Proximity Sensors

B. Access

- (1) Location Zones
 - 410 Engine No. 1 (Left)
 - 420 Engine No. 2 (Right)

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(2) Access Panels

- 413AL Fan Cowl Panel (Left)
- 414AR Fan Cowl Panel (Right)
- 415AL Fan Reverser (Left)
- 416AR Fan Reverser (Right)
- 415DL Locking Actuator Panel (Left)
- 416DR Locking Actuator Panel (Right)
- 423AL Fan Cowl Panel (Left)
- 424AR Fan Cowl Panel (Right)
- 425AL Fan Reverser (Left)
- 426AR Fan Reverser (Right)
- 425DL Locking Actuator Panel (Left)
- 426DR Locking Actuator Panel (Right)

C. Prepare to Remove the Locking Hydraulic Actuator

S 864-005-N00

- (1) Make sure the forward thrust lever is in the idle position and the reverse thrust lever is fully forward.
 - (a) Install the DO-NOT-OPERATE tags on the forward thrust lever and reverse thrust lever.

S 044-002-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.

- (2) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

NOTE: Do the deactivation of the stow valve and the motorized isolation valve only. Do not put the deactivation pins in the thrust reverser sleeves.

S 014-006-N00

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

S 864-003-N00

- (4) For the left engine, open this circuit breaker and attach the DO-NOT-CLOSE tag:
 - (a) On the overhead circuit breaker panel, P11:
 - 1) 11D13, L ENG T/R IND

S 864-004-N00

- (5) For the right engine, open these circuit breakers and attach the DO-NOT-CLOSE tags:
 - (a) On the P11 panel:
 - 1) 11L32, R ENG T/R IND
 - 2) 11D32, R ENG T/R IND ALTN

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- S 864-007-N00
(6) Manually extend the thrust reverser (AMM 78-31-00/201).

- S 214-047-N00
(7) Examine the bullnose seal (AMM 78-00-00/601).

NOTE: The condition of the bullnose seal can cause difficulty when you check the rod end gap during actuator installation.

- (a) Repair the bullnose seal, if necessary (AMM 78-00-00/801).

- S 984-048-N00
(8) Move the thrust reverser forward until it is one inch from the complete stow position.

- S 034-008-N00
(9) Remove the streamered pin which holds the manual override lever for the bypass valve of the stow valve in the open position.

NOTE: Keep the bypass valve in the closed position during the removal and installation of the hydraulic component. If the bypass valve is open, the hydraulic reservoir will drain.

D. Remove the Locking Hydraulic Actuator (Fig. 401 and 402).

- S 034-009-N00
(1) Remove the screws (8) from the access panel (10) of the applicable hydraulic actuator (AMM 06-43-00/201).

- S 014-010-N00
(2) Remove the access panel (10).

- S 034-011-N00
(3) Remove the cotter pin (9), nut (7), washers (6) and bolt (5) which attach the rod end (4) to the thrust reverser sleeve (11).

- S 034-012-N00
(4) Disconnect the electrical connectors (3) for the locking actuator feedback LVDT (Fig. 402).
(a) Install the protection caps.

- S 034-013-N00
(5) Remove the actuator lock proximity sensor (10) and the actuator deploy proximity sensor (18) from the locking hydraulic actuator (11) (AMM 78-36-01/401).

- S 034-014-N00
(6) Remove the bolts (15), washers (16), and nuts (17) which attach the wire clamps (14) for the proximity sensor wire (13) to the locking hydraulic actuator (11).

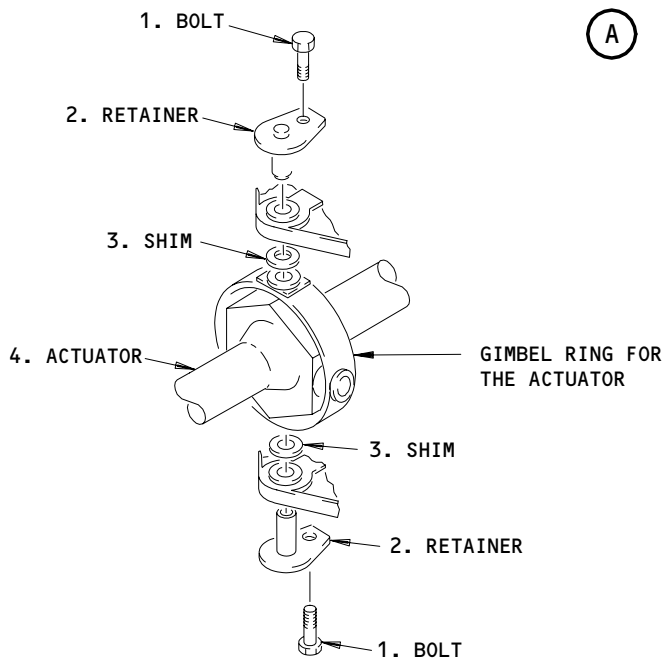
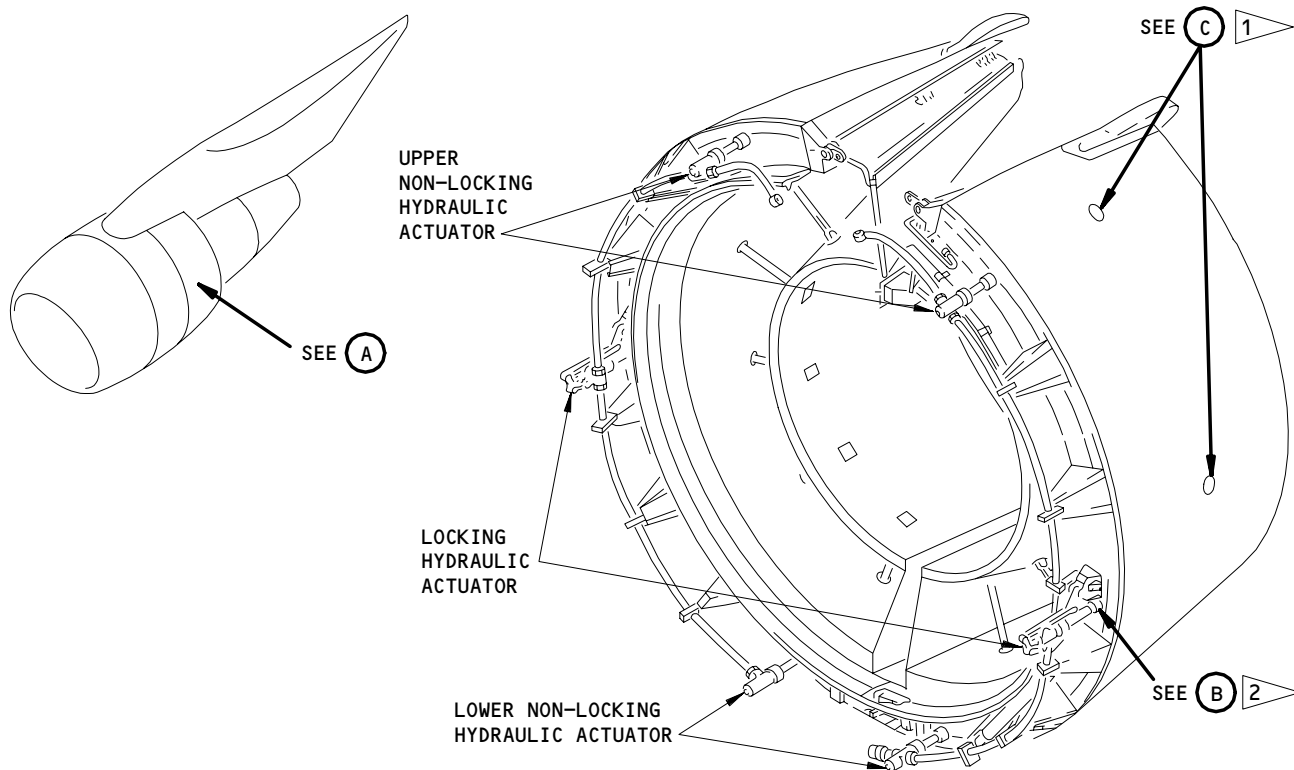
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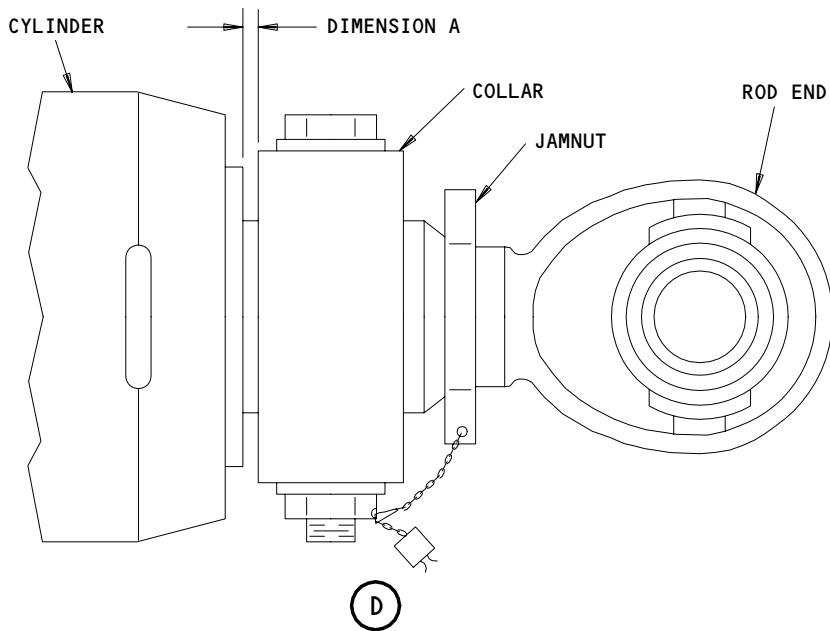
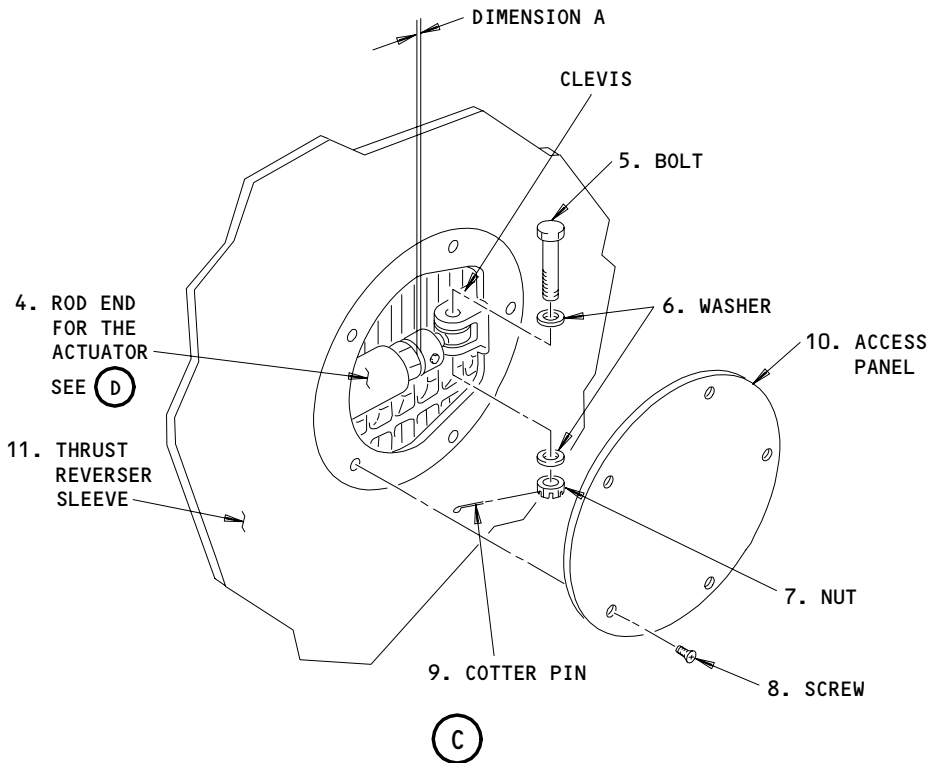


- 1 ACCESS PANEL FOR LOWER NON-LOCKING ACTUATOR NOT SHOWN
- 2 SIMILAR FOR ALL ACTUATORS

Hydraulic Actuator Installation
Figure 401 (Sheet 1)

EFFECTIVITY ————
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Hydraulic Actuator Installation
Figure 401 (Sheet 2)

EFFECTIVITY	
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LOCKING HYDRAULIC ACTUATOR (RIGHT SIDE)

SEE (B)

FWD

LOCKING HYDRAULIC ACTUATOR (LEFT SIDE)

SEE (A)

3. FEEDBACK LVDT ELECTRICAL CONNECTORS

2. TOP RETRACT HYDRAULIC LINE

TORQUE BOX (REF)

1. TOP FLEX SHAFT

9. TUBENUT

FWD

11. LOCKING HYDRAULIC ACTUATOR

10. ACTUATOR LOCK PROXIMITY SENSOR
SEE (C)

9. TUBENUT

4. GIMBAL RING RETAINER

8. EXTEND HYDRAULIC LINE

7. LOWER FLEX SHAFT

5. LOWER RETRACT HYDRAULIC LINE

6. LOCK LEVER

LOCKING HYDRAULIC ACTUATOR (LEFT SIDE)

(A)

Locking Hydraulic Actuator Installation
Figure 402 (Sheet 1)

EFFECTIVITY

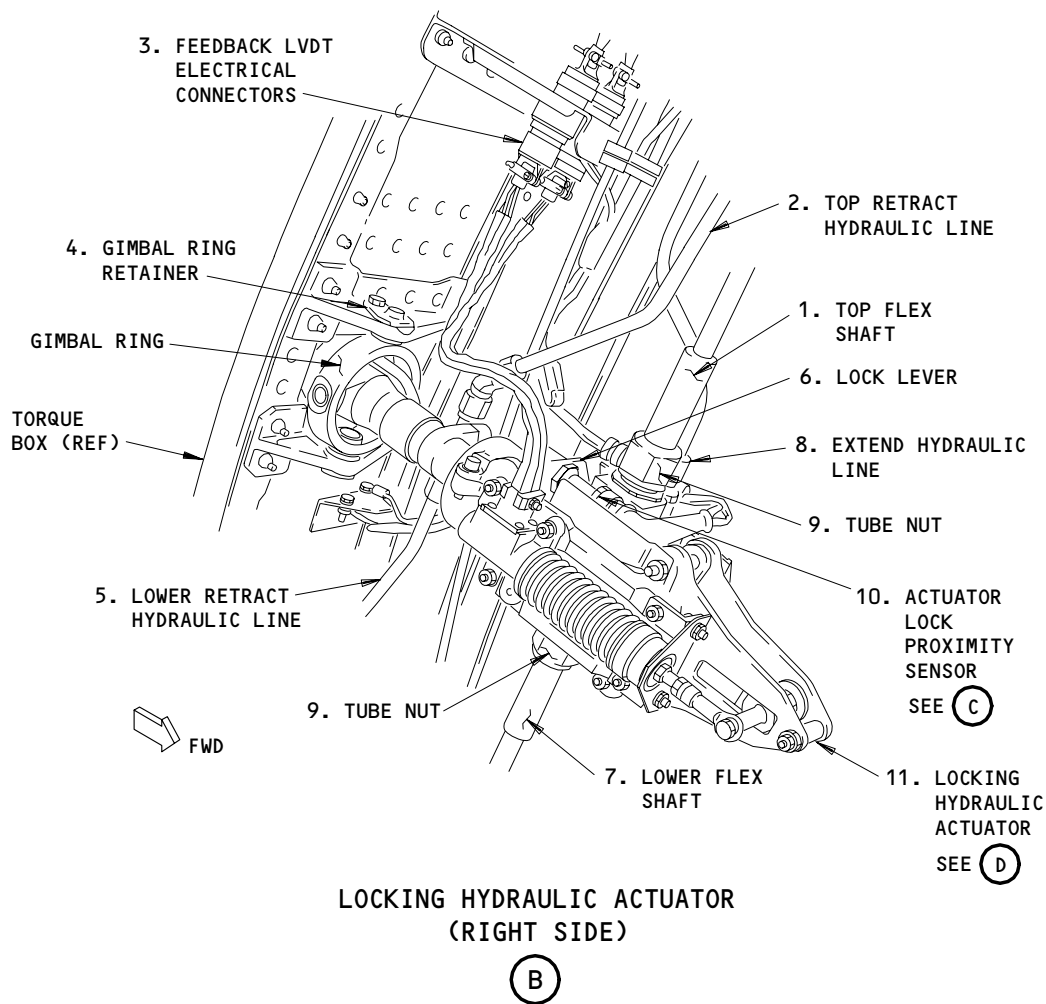
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Locking Hydraulic Actuator Installation
Figure 402 (Sheet 2)

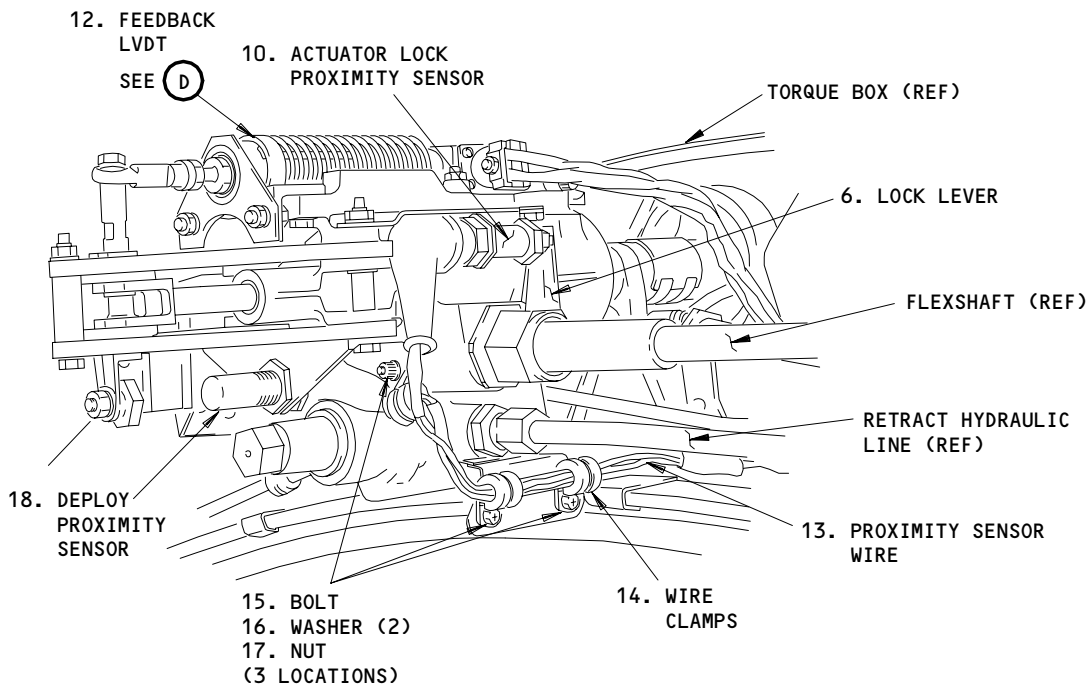
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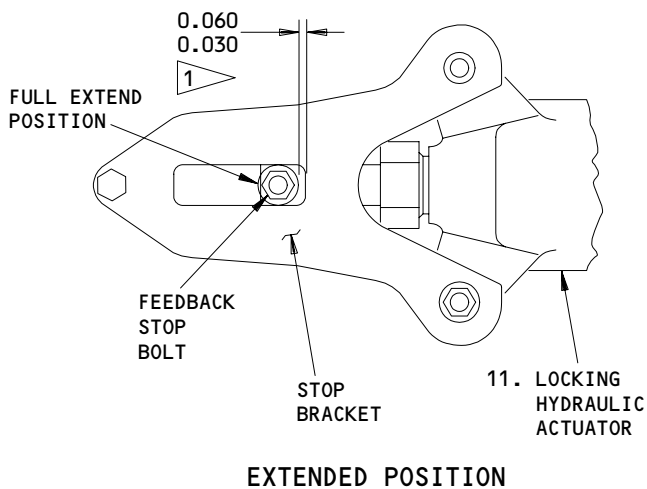
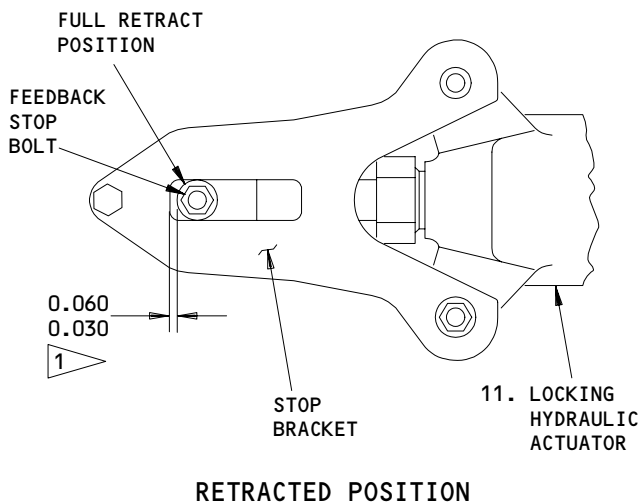
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(C)



LOCKING HYDRAULIC ACTUATOR FEEDBACK CHECK
(BOTTOM VIEW)

(D)

1 ALL DIMENSIONS ARE IN INCHES

Locking Hydraulic Actuator Installation
Figure 402 (Sheet 3)

EFFECTIVITY	
ALL	

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S 684-015-N00

CAUTION: IMMEDIATELY CLEAN ALL OF THE HYDRAULIC FLUID THAT FALLS. THE HYDRAULIC FLUID CAN CAUSE CONTAMINATION OF THE AIRPLANE OR THE ENGINE.

- (7) Drain the hydraulic fluid from the actuator system.
 - (a) Put an applicable container below the lower hydraulic actuator (7) to catch the hydraulic fluid (Fig. 403).
 - (b) Loosen the couplings for the extend line flex hose and retract line flex hose (5) at the strut hydraulic connection (Fig. 404).

NOTE: This is done to let air into the actuator system at a high point to drain the hydraulic fluid.

- (c) Remove the extend port cap (4) on the upper non-locking hydraulic actuator (3).
- (d) Remove the sync lock (8) from the lower hydraulic actuator (7) (Fig. 403) (AMM 78-34-13/401).
 - 1) Install protective caps on the electrical connector and hydraulic ports of the sync lock.
- (e) Remove the retract port cap (2) from the lower hydraulic actuator (7).
- (f) Let the hydraulic fluid drain into an applicable container.
- (g) Install the retract port cap (2) on the lower hydraulic actuator (7).
- (h) Tighten the couplings for the extend line flex hose and retract line flex hose (5) at the strut hydraulic connection (Fig. 404).

S 034-016-N00

- (8) Disconnect the three hydraulic lines (2, 5, 8) from the ports on the locking hydraulic actuator (Fig. 402).
 - (a) Install the protection caps on the ports and the hydraulic lines.

S 034-017-N00

- (9) Release the actuator lock lever (6) for the flex shaft.

NOTE: This will decrease the preload in the system and make an easier removal of the bolts and flex shaft which attach the hydraulic actuator.

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S 034-018-N00

CAUTION: HOLD THE FLEX SHAFT WHEN THE LOWER END OF THE FLEX SHAFT TUBE IS DISCONNECTED FROM THE HYDRAULIC ACTUATOR. THE FLEX SHAFT CAN FALL OUT OF THE TUBE AND CONTAMINATION CAN OCCUR.

- (10) Disconnect the two flex shafts (1) and (7) from the hydraulic actuator (11).
 - (a) Loosen and move the tube nut (9) back off the fitting at the hydraulic actuator port.
 - (b) Loosen the support block clamps that attach the tube assembly to the torque box.
 - (c) Apply a force to the tube to put it into the nut at the opposite end of the tube.

NOTE: This will give more distance at the open end of the tube to disengage the end of the flex shaft from the drive socket.

- (d) Move the tube nut along the tube until the outer end of the nut and tube are aligned.
 - (e) Hold the flex shaft in the tube.

S 034-019-N00

- (11) Remove the retainer bolts (1) which hold the retainers (2) in the gimbal ring (Fig. 401).

S 034-020-N00

- (12) Remove the retainers (2) and shims (3) which hold the gimbal ring to the mounting bracket.

S 024-021-N00

- (13) Remove the locking hydraulic actuator (11) (Fig. 402).

TASK 78-31-17-404-022-N00

3. Install the Thrust Reverser Locking Hydraulic Actuator

A. Equipment

- (1) Hydraulic Service Cart, 0 to 3000 psi, with hydraulic fluid, fire resistant, BMS 3-11.

B. Consumable Materials

- (1) D00148 BMS 3-11, Hydraulic Fluid - Type IV Fire Resistant
- (2) A00168 BMS 5-63C, Primer, Sealant

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C. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	4	Locking Hydraulic Actuator	78-31-01	01 05 51	470 371,377 1,5
402	11	Locking Hydraulic Actuator	78-31-01	01 05 51	470 371,377 1,5

D. References

- (1) AMM 06-45-00/201, Engine Nacelle Access Doors and Panels
- (2) AMM 24-22-00/201, Electrical Power
- (3) AMM 29-11-00/201, Hydraulic Power
- (4) AMM 71-11-04/201, Fan Cowl Panels
- (5) AMM 78-31-00/201, Thrust Reverser System
- (6) AMM 78-31-00/501, Thrust Reverser System
- (7) AMM 78-34-13/401, Thrust Reverser Sync Lock
- (8) AMM 78-36-00/501, Thrust Reverser Indication System
- (9) AMM 78-36-01/401, Thrust Reverser Proximity Sensors

E. Access

- (1) Location Zones
 - 410 Engine No. 1 (Left)
 - 420 Engine No. 2 (Right)
- (2) Access Panels
 - 413AL Fan Cowl Panel (Left)
 - 414AR Fan Cowl Panel (Right)
 - 415AL Fan Reverser (Left)
 - 416AR Fan Reverser (Right)
 - 415DL Locking Actuator Panel (Left)
 - 416DR Locking Actuator Panel (Right)
 - 423AL Fan Cowl Panel (Left)
 - 424AR Fan Cowl Panel (Right)
 - 425AL Fan Reverser (Left)
 - 426AR Fan Reverser (Right)
 - 425DL Locking Actuator Panel (Left)
 - 426DR Locking Actuator Panel (Right)

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F. Install the Locking Hydraulic Actuator (Fig. 401 and 402).

S 864-023-N00

- (1) Make sure the DO-NOT-OPERATE tags are installed on the forward thrust levers and the reverse thrust levers.

S 864-024-N00

- (2) Make sure the thrust reverser sleeve is extended approximately 1.0 inch (approximately 25.0 mm) or less from the fully stowed position.

S 224-026-N00

CAUTION: DO NOT PERMIT THE ACTUATOR ROD END TO TURN WHEN YOU ATTACH IT TO THE THRUST REVERSER SLEEVE. IF THE ACTUATOR ROD END TURNS, YOU CAN CAUSE DAMAGE TO THE THRUST REVERSER OR THE ACTUATOR WHEN YOU OPERATE THE THRUST REVERSER.

- (3) Do these steps to make sure the locking actuator is fully retracted before you install it:
 - (a) Measure the clearance between the rod end collar and the actuator cylinder (dimension A in Fig. 401).
 - 1) Dimension A must be 0.010-0.018 inch (0.254-0.457 mm) when the actuator is fully retracted.

NOTE: A repaired or rebuilt actuator can have a gap of 0.010-0.022 inch (0.254-0.559.mm).

- 2) If the actuator is not in the specified limits, replace the actuator or adjust the actuator rod end.
- 3) Make sure the end of the stop bracket slot does not prevent the movement of the feedback stop bolt.

S 974-046-N00

- (4) If dimension A is out of limits, do the steps in AMM 78-31-17/501 Thrust Reverser Hydraulic Actuators - Adjustment Test

S 864-027-N00

- (5) Turn the flexshaft drive to extend the actuator rod end 1.0 inch (25.4 mm), but do not let the actuator rod end turn.

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S 424-028-N00

- (6) Install the rod end of the actuator (11) through the opening in the torque box, but do not let the actuator rod end turn.
- (a) Align the hydraulic ports on the actuator with the hydraulic lines.

S 434-029-N00

- (7) Install the bolt (5), washers (6), nut (7) and cotter pin (9) to attach the actuator rod end to the thrust reverser sleeve (Fig. 401).
- (a) Tighten the castellated nut (7) to 20 pound-inches (2.26 newton-meters).
- (b) Tighten the castellated nut (7) to the next castellation and install the cotter pin (9).
- (c) Apply BMS 5-63 sealant approximately 0.06 inch (1.524 mm) thick to the nut (7), the cotter pin (9), and the end of the bolt (5).

S 434-037-N00

- (8) Install the retainers (2) which attach the gimbal ring to the mounting bracket with the bolts (1) (Fig. 401).

NOTE: Do not completely tighten the bolts at this time.

- (a) Remove the dust cap from the top flex shaft hole on the hydraulic actuator (11) (Fig. 402).

CAUTION: BE VERY CAREFUL WHEN YOU TURN THE SQUARE DRIVE KEY. THE SQUARE DRIVE KEY CAN CAUSE DAMAGE TO THE SPLINED FLEX SHAFT HOLE.

- (b) To release the actuator lock, turn the lock lever (6) in a clockwise direction to hold the hydraulic actuator unlocked while you turn the square drive key in the subsequent step.

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- (c) Turn the actuator splined drive with the 3/16 inch square drive key to adjust the gimbal ring forward or rearward until you can install the retainers through the mounting bracket into the gimbal ring.
- (d) Release the lock lever (6) to set the actuator lock.
- (e) Measure the distance between the mounting brackets and the gimbal ring (Fig. 401).
- (f) Make the 0.050 inch (1.270 mm) thick laminated shims (3) to thickness.
- (g) Remove the bolts (1) and retainers (2).
- (h) Install the shims (3) between the gimbal ring and mounting bracket at the two locations.
- (i) Install the retainers (2) with bolts (1).
 - 1) Tighten the retainer bolt (1).

S 434-030-N00

- (9) Remove the protection caps from the retract and extend ports on the locking hydraulic actuator (Fig. 402).

S 434-031-N00

- (10) Connect the retract hydraulic line (2, 5) to each side of the locking hydraulic actuator.
 - (a) Tighten the tube nuts for the retract hydraulic lines (2, 5).

S 434-032-N00

- (11) Connect the extend hydraulic line (8).
 - (a) Tighten the tube nut for the extend hydraulic line (8).

S 434-033-N00

- (12) Tighten the support block fasteners for the hydraulic lines to attach the retract and extend hydraulic lines.

S 434-034-N00

- (13) Make sure the connections for the hydraulic lines (2, 5, and 8) are attached correctly.

NOTE: The upper and lower flex shaft lines are disconnected. These lines will not be pressurized when you apply hydraulic power to the system.

- (a) If it is necessary, tighten the tube nut(s).

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S 864-106-N00

(14) Stow the thrust reverser sleeve with hydraulic pressure.

NOTE: With the sync lock removed, a small amount of hydraulic fluid will come out of the lower non-locking hydraulic actuator.

NOTE: There are two methods to stow the thrust reverser sleeve which retracts all three actuators. The first method uses airplane hydraulic pressure. The second method uses a hydraulic ground service cart.

- (a) If you use the airplane hydraulic power, do the steps that follow:
- 1) Make sure the reverser thrust levers are in the forward, stowed position with the DO-NOT-OPERATE tags installed.
 - 2) For the left engine, make sure this circuit breaker is open and the DO-NOT-CLOSE tag is attached:
 - a) On the overhead circuit breaker panel, P11:
 1. 11D14, L ENG T/R CONT
 - 3) For the right engine, make sure these circuit breakers are open and the DO-NOT-CLOSE tags are attached:
 - a) On the overhead circuit breaker panel, P11:
 1. 11L33, R ENG T/R CONT
 2. 11D33, R ENG T/R CONT ALTN
 - 4) Disconnect the electrical connector D4180P (LH sleeve) or D4182P (RH sleeve) for the engine strut.

NOTE: The auto restow system is in the deployed condition of the thrust reverser sleeve.

- 5) Supply electrical power (AMM 24-22-00/201).
- 6) Remove the streamered pin from the deactivation slide of the stow valve.
 - a) Do not close the circuit breakers for the thrust reverser control.

WARNING: MAKE SURE PERSONS AND EQUIPMENT ARE AWAY FROM THE THRUST REVERSER BEFORE THE THRUST REVERSER OPERATION. WITH THE HYDRAULIC POWER SUPPLIED, THE DEPLOYED THRUST REVERSER WILL RETRACT WHEN THE ELECTRICAL POWER IS SUPPLIED. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

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

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- 8) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker:

NOTE: The thrust reverser sleeves will retract and lock.
Do not remove the hydraulic power.

- a) On the P11 panel:
 - 1. 11D14, L ENG T/R CONT

- 9) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker:

NOTE: The thrust reverser sleeves will retract and lock.
Do not remove the hydraulic power.

- a) On the P11 panel:
 - 1. 11L33, R ENG T/R CONT

- 10) Proceed to the task to install the flex shafts (1 and 7).
- (b) If you use the hydraulic ground service cart, do the steps that follow:
 - 1) Disconnect the retract line flex hose for the strut hydraulic connection.
 - a) Catch the hydraulic fluid in an applicable container.
 - 2) Connect the hydraulic ground service cart to the retract line flex hose (5).

WARNING: MAKE SURE PERSONS AND EQUIPMENT ARE AWAY FROM THE THRUST REVERSER BEFORE THE THRUST REVERSER OPERATION. WITH THE HYDRAULIC POWER SUPPLIED, THE DEPLOYED THRUST REVERSER WILL RETRACT WHEN THE ELECTRICAL POWER IS SUPPLIED. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

- 3) Operate the hydraulic ground service cart to supply 1800 to 3000 psi hydraulic pressure.

NOTE: The thrust reverser sleeve will retract and lock.
Do not decrease the hydraulic pressure.

- 4) Proceed to the task to install the flex shafts (1 and 7).

S 434-036-N00

- (15) Install the top flex shaft (1) and lower flex shaft (7) into the drive ports of the locking hydraulic actuator (11) (Fig. 402).

NOTE: Make sure you maintain hydraulic pressure to the retract side of the actuator.

- (a) Move the tube nut (9) for the flex shaft (1 or 7) until you can see the splined flex shaft.
- (b) Install the splined end of the flex shaft (1 or 7) into the splined hole of the hydraulic actuator.

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- (c) Engage one or two threads of the tube nut (9).
- (d) Put the flex shaft tube in the support blocks for the hydraulic tubes.
 - 1) Tighten the fasteners to attach the flex shaft tube.
- (e) Loosen and move the tube nuts (9) back to make sure the splined end of the flex shaft (1 or 7) are engaged in the hydraulic actuator.
- (f) Install the tube nut (9).
 - 1) Tighten the tube nut (9) to 30-35 pound-inches (3.39-3.95 N.m).

S 424-036-N00

- (16) Install the sync lock (AMM 78-34-13/401).

S 864-029-N00

- (17) Extend and retract the thrust reverser three times with hydraulic power (AMM 78-31-00/201).

S 864-037-N00

- (18) Remove the hydraulic pressure (AMM 29-11-00/201).
 - (a) If the airplane hydraulic power was used, do the steps that follow:
 - 1) For the left engine, open this circuit breaker and attach the DO-NOT-CLOSE tag:
 - a) On the P11 panel:
 - 1. 11D14, L ENG T/R CONT
 - 2) For the right engine, open this circuit breaker and attach the DO-NOT-CLOSE tag:
 - a) On the P11 panel:
 - 1. 11L33, R ENG T/R CONT
 - 3) Remove hydraulic power (AMM 29-11-00/201).
 - 4) Remove electrical power, if it is not necessary (AMM 24-22-00/201).
 - 5) Push the deactivation slide into the stow valve housing.
 - 6) Install the streamered pin to hold the deactivation slide in the ground deactivation position.
 - 7) Install the hitch pin in the streamered pin.
 - 8) Connect the electrical connector (D4180P or D4182P) for the engine strut.
 - (b) If the hydraulic ground service cart was used, do the steps that follow:
 - 1) Operate the hydraulic ground service cart to decrease the hydraulic pressure to zero.
 - 2) Disconnect the hydraulic ground service cart from the retract line flex hose.
 - 3) Install the retract line flex hose to the strut hydraulic connection.

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S 224-030-N00

- (19) Make sure the rod end clearance for the locking actuator (dimension "A" in Fig. 401) is not more than 0.100 inch (2.540 mm) with the hydraulic power removed.

S 984-049-N00

- (20) Manually turn the actuator system through one full cycle to check the feedback rod position reference (AMM 78-31-00/201).

S 824-038-N00

- (21) If you do not have the feedback positional reference for the rod end to the hydraulic actuator, do the procedure in AMM 78-31-17/501.

NOTE: You do not have the feedback positional reference if the rod end is turned in relation to the gimbals ring. The feedback positional reference is correct when the dimensions shown in Fig. 402 are correct for both the extend and retract positions.

S 434-040-N00

- (22) Install the actuator lock proximity sensor (10) and actuator deploy proximity sensor (18) on the locking hydraulic actuator (Fig. 402) (AMM 78-36-01/401).

S 824-103-N00

- (23) Do the adjustment procedure for the Thrust Reverser Position Indication System (AMM 78-36-00/501).

NOTE: Do the adjustment procedure for the applicable actuator lock proximity sensor and the actuator deploy proximity sensor only. You do not need to do the adjustment procedure for the auto restow proximity sensor.

- (a) Attach the proximity sensor wire (13) and clamps (14) on the hydraulic actuator bracket with the bolt (15), washers (16), and nut (17).
1) Tighten the bolt (5).

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- S 434-041-N00
- (24) Connect the two electrical connectors (3) for the feedback LVDT of the locking hydraulic actuator.
- G. Put the Airplane Back to Its Usual Condition
- S 864-042-N00
- (1) Manually turn the actuator system through one full cycle (AMM 78-31-00/201).
- S 864-043-N00
- (2) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker:
- (a) On the P11 panel:
- 1) 11D13, L ENG T/R IND
- S 864-050-N00
- (3) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers:
- (a) On the P11 panel:
- 1) 11L32, R ENG T/R IND
2) 11D32, R ENG T/R IND ALTN
- S 444-045-N00
- (4) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).
- S 214-046-N00
- (5) Make sure all tube connections for the flex shafts from the Lower hydraulic actuator (7) and the top hydraulic actuator (3) to the center hydraulic actuator (11) are correctly tightened (Fig. 402, 403, 404).
- S 714-047-N00
- (6) Do the operational test for the thrust reverser (AMM 78-31-00/501).
- (a) Operate the thrust reverser through three full deploy and stow cycles.

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- S 224-031-N00
- (7) Make sure the rod end clearance for the locking actuator (dimension "A" in Fig. 401) is not more than 0.100 inch (2.540 mm) with the hydraulic power removed.
- S 414-049-N00
- (8) Install the access panels (10) for the hydraulic actuator with the screws (8) (Fig. 401).
- S 414-050-N00
- (9) Close the fan cowl panels (AMM 71-11-04/201).
- S 864-053-N00
- (10) Remove the DO-NOT-OPERATE tags from the forward thrust lever and the reverse thrust lever.

TASK 78-31-17-004-052-N00

4. Remove the Thrust Reverser Non-Locking Hydraulic Actuator

A. References

- (1) AMM 06-45-00/201, Engine Nacelle Access Doors and Panels
- (2) AMM 71-11-04/201, Fan Cowl Panels
- (3) AMM 78-31-00/201, Thrust Reverser System
- (4) AMM 78-31-00/501, Thrust Reverser System
- (5) AMM 78-34-13/401, Thrust Reverser Sync Lock

B. Access

(1) Location Zones

- | | |
|-----|----------------------|
| 410 | Engine No. 1 (Left) |
| 420 | Engine No. 2 (Right) |

(2) Access Panels

- | | |
|-------|------------------------------|
| 413AL | Fan Cowl Panel (Left) |
| 414AR | Fan Cowl Panel (Right) |
| 415AL | Fan Reverser (Left) |
| 416AR | Fan Reverser (Right) |
| 415CL | Upper Actuator Panel (Left) |
| 416CR | Upper Actuator Panel (Right) |
| 415EL | Lower Actuator Panel (Left) |
| 416ER | Lower Actuator Panel (Right) |
| 423AL | Fan Cowl Panel (Left) |
| 424AR | Fan Cowl Panel (Right) |
| 425AL | Fan Reverser (Left) |
| 426AR | Fan Reverser (Right) |
| 425CL | Upper Actuator Panel (Left) |
| 426CR | Upper Actuator Panel (Right) |
| 425EL | Lower Actuator Panel (Left) |
| 426ER | Lower Actuator Panel (Right) |

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C. Prepare to Remove the Non-Locking Hydraulic Actuators

S 864-044-N00

- (1) Make sure the forward thrust lever is in the idle position and the reverse thrust lever is fully forward.
 - (a) Install the DO-NOT-OPERATE tags on the forward thrust lever and reverse thrust lever.

S 044-053-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.

- (2) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

NOTE: Do the deactivation of the stow valve and the motorized isolation valve only. Do not put the deactivation pins in the thrust reverser sleeves.

S 014-045-N00

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

S 864-105-N00

- (4) For the left engine, open this circuit breaker and attach the DO-NOT-CLOSE tag:
 - (a) On the overhead circuit breaker panel, P11:
 - 1) 11D13, L ENG T/R IND

S 864-055-N00

- (5) For the right engine, open these circuit breakers and attach the DO-NOT-CLOSE tags:
 - (a) On the overhead circuit breaker panel, P11:
 - 1) 11L32, R ENG T/R IND

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2) 11D32, R ENG T/R IND ALTN

S 864-056-N00

- (6) Make sure the forward thrust lever is in the idle position and the reverse thrust lever is fully forward.
(a) Install the DO-NOT-OPERATE tags on the forward thrust lever and reverse thrust lever.

S 014-057-N00

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

S 864-058-N00

- (8) Manually extend the thrust reverser about 1.0 inch (25.4 mm) (AMM 78-31-00/201).

S 034-059-N00

- (9) Remove the streamered pin which holds the manual override lever for the bypass valve of the stow valve in the open position.

NOTE: Keep the bypass valve in the closed position during the removal and installation of the hydraulic component. If the bypass valve is open, the hydraulic reservoir will drain.

D. Remove the Non-Locking Hydraulic Actuator (Fig. 401, 403 and 404).

S 034-060-N00

- (1) Remove the screws (8) (Fig. 401) from the applicable access panel (10) for the hydraulic actuator (AMM 06-43-00/201).

S 014-061-N00

- (2) Remove the applicable access panel (10).

S 024-062-N00

- (3) Remove the cotter pin (9), nut (7), washers (6) and bolt (5) which attach the rod end (4) to the thrust reverser sleeve (Fig. 401).

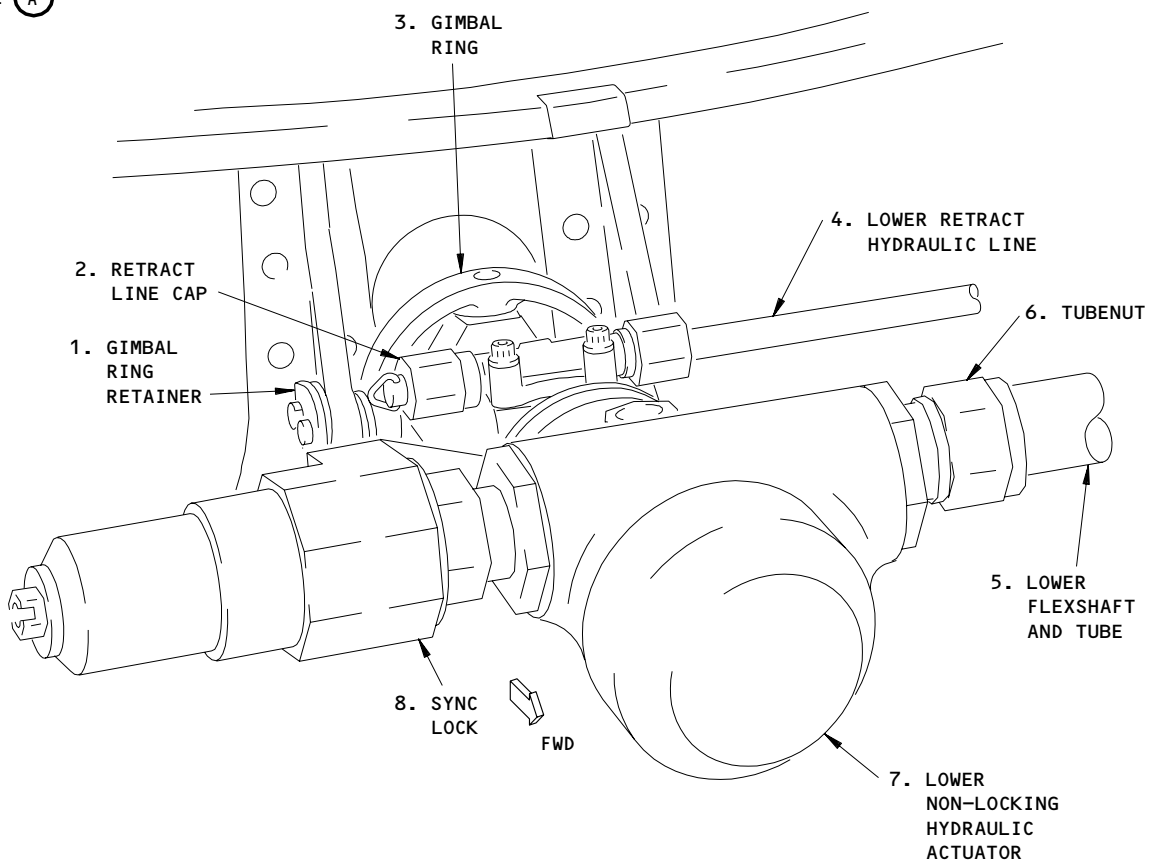
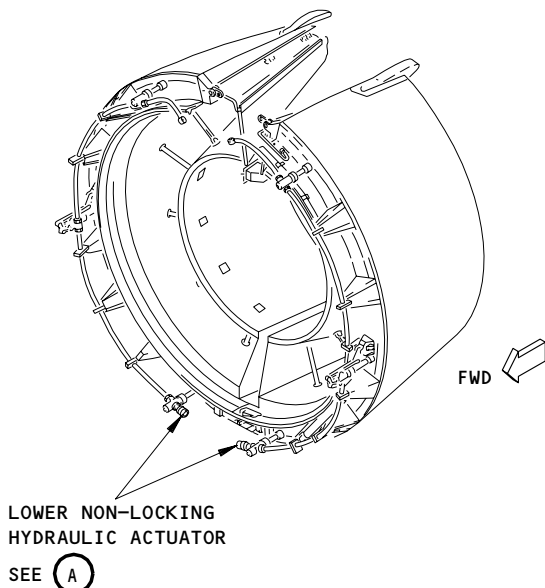
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LOWER NON-LOCKING HYDRAULIC ACTUATOR
(LEFT SIDE SHOWN, RIGHT SIDE OPPOSITE)

(A)

Lower Non-Locking Hydraulic Actuator Installation
Figure 403

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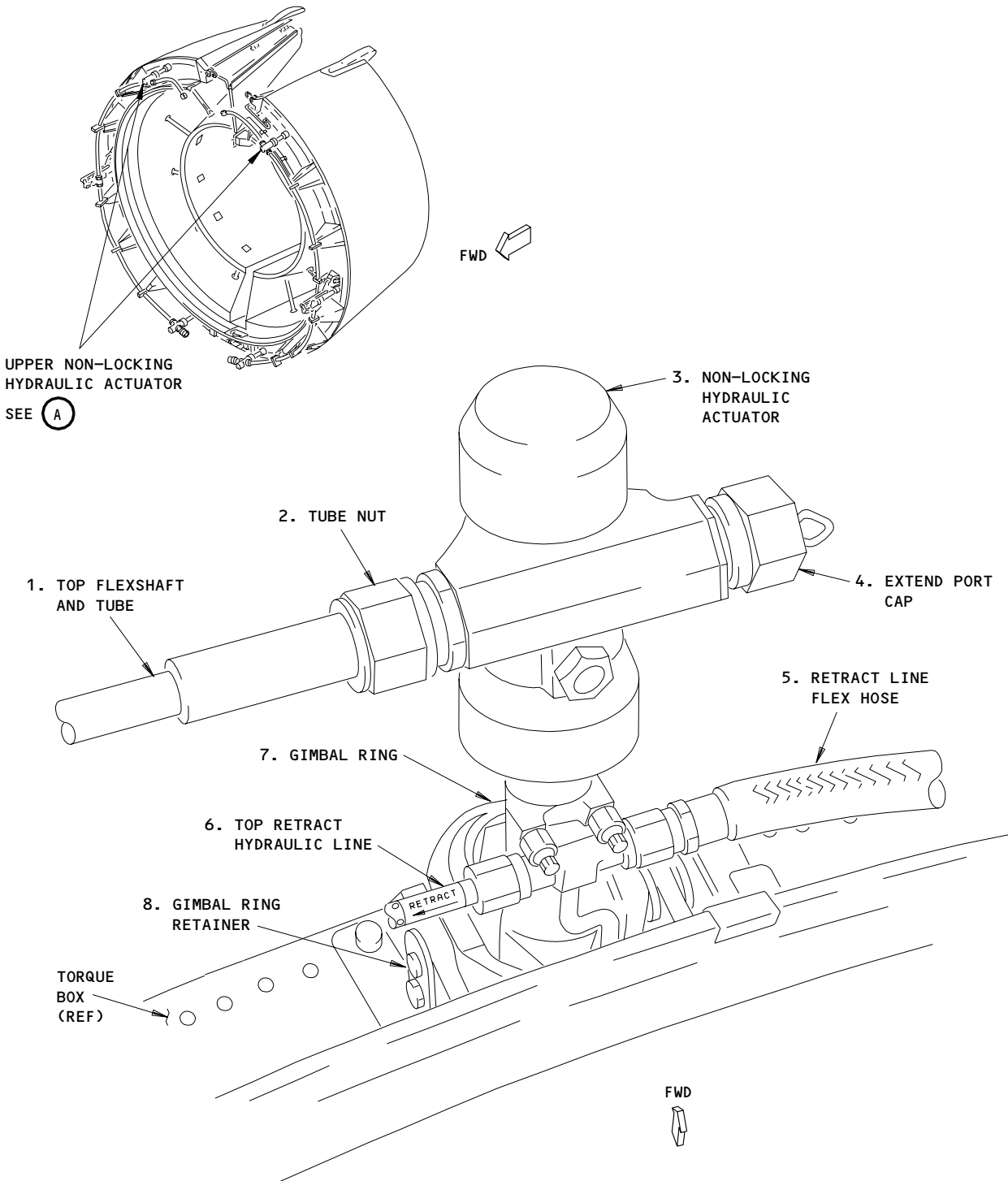
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UPPER NON-LOCKING HYDRAULIC ACTUATOR
(RIGHT SIDE SHOWN, LEFT SIDE OPPOSITE)

(A)

Upper Non-Locking Hydraulic Actuator Installation
Figure 404

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S 684-063-N00

CAUTION: IMMEDIATELY CLEAN ALL OF THE HYDRAULIC FLUID THAT FALLS. THE HYDRAULIC FLUID CAN CAUSE CORROSION OF THE AIRPLANE OR THE ENGINE.

- (4) Drain the hydraulic fluid from the actuator system.
 - (a) Put an applicable container below the lower non-locking hydraulic actuator (7) to catch the hydraulic fluid (Fig. 403).
 - (b) Loosen the couplings for the extend line flex hose and retract line flex hose (5) at the strut hydraulic connection (Fig. 404).

NOTE: This is done to let air into the actuator system at a high point to drain the hydraulic fluid.

- (c) Loosen the extend port cap (4) on the upper non-locking hydraulic actuator (3).
- (d) Remove the sync lock (8) from the lower hydraulic actuator (7) (Fig. 403) (AMM 78-34-13/401).
- (e) Remove the retract line cap (2) from the lower non-locking hydraulic actuator (7).
- (f) Let the hydraulic fluid drain into an applicable container.

S 424-041-N00

- (5) If you remove the lower non-locking hydraulic actuator do the steps that follow:
 - (a) Disconnect the lower retract hydraulic line (4) from the lower non-locking hydraulic actuator.
 - (b) Install a protection cap on the actuator port.
 - (c) Install the plug on the retract line (4).

S 024-039-N00

- (6) If you remove the upper non-locking hydraulic actuator, do the steps that follow:
 - (a) Disconnect the retract line flex hose (5) from the upper non-locking hydraulic actuator (3).

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- (b) Disconnect the top retract hydraulic line (6) from the upper non-locking hydraulic actuator (3).
- (c) Remove the extend port cap (4) from the top non-locking actuator (3).
- (d) Install protection caps on all ports of the actuator.
- (e) Install plugs on the retract line flex hose (5), the top retract hydraulic line (6).

S 424-038-N00

- (7) If you do NOT remove the upper non-locking hydraulic actuator do the steps that follow:
 - (a) Tighten the couplings for the extend line flex hose and retract line flex hose (5) at the strut hydraulic connection (Fig. 404).
 - (b) Tighten the extend port cap (4) for the upper non-locking hydraulic actuator.

S 034-065-N00

CAUTION: HOLD THE FLEX SHAFT WHEN THE LOWER END OF FLEX SHAFT TUBE IS DISCONNECTED FROM THE HYDRAULIC ACTUATOR. THE FLEX SHAFT CAN FALL OUT OF THE TUBE AND CONTAMINATION CAN OCCUR.

- (8) Disconnect the flex shaft (1 or 5) from the non-locking hydraulic actuator (3 or 7) (Fig. 403 and 404).
 - (a) Loosen the tube nut (2 or 6) and move it back off the fitting at the extend port on the hydraulic actuator.
 - (b) Move the tube nut along the flex shaft tube until the outer end of the tube nut and tube are aligned.
 - (c) Loosen the clamp that attaches the tube assembly to the fan cowl.
 - (d) Apply a force to the tube to put it into the nut at the opposite end of the tube.

NOTE: This will give more distance at the open end of the tube to disengage the end of the flex shaft from the drive socket.

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(e) Hold the flex shaft in the tube.

S 034-066-N00

(9) Remove the retainer bolts (1) which hold the retainers (2) in the gimbal ring (Fig. 401).

S 034-067-N00

(10) Remove the retainers (2) and shims (3) which hold the gimbal ring to the mounting bracket.

S 024-068-N00

(11) Remove the non-locking hydraulic actuator (3 or 7) (Fig. 403 or 404).

TASK 78-31-17-404-070-N00

5. Install the Thrust Reverser Non-Locking Hydraulic Actuator

A. Equipment

(1) Hydraulic Service Cart, 0 to 3000 psi, with hydraulic fluid, fire resistant, BMS 3-11.

B. Consumable Materials

- (1) D00148 BMS 3-11, Hydraulic Fluid - Type IV Fire Resistant
- (2) A00168 BMS 5-63C, Primer, Sealant

C. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	4	Locking Hydraulic Actuator	78-31-01	01 05 51	470 371,377 1,5
403	7	Non-Locking Hydraulic Actuator		01 51	475 2,3,4
404	3	Non-Locking Hydraulic Actuator		01 51	475 2,3,4

D. References

(1) AMM 06-45-00/201, Engine Nacelle Access Doors and Panels

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- (2) AMM 24-22-00/201, Electrical Power
- (3) AMM 29-11-00/201, Hydraulic Power
- (4) AMM 71-11-04/201, Fan Cowl Panels
- (5) AMM 78-31-00/201, Thrust Reverser System
- (6) AMM 78-31-00/501, Thrust Reverser System
- (7) AMM 78-34-13/401, Thrust Reverser Sync Lock

E. Access

(1) Location Zones

- 410 Engine No. 1 (Left)
- 420 Engine No. 2 (Right)

(2) Access Panels

- 413AL Fan Cowl Panel (Left)
- 414AR Fan Cowl Panel (Right)
- 415AL Fan Reverser (Left)
- 416AR Fan Reverser (Right)
- 415CL Upper Actuator Panel (Left)
- 416CR Upper Actuator Panel (Right)
- 415EL Lower Actuator Panel (Left)
- 416ER Lower Actuator Panel (Right)
- 423AL Fan Cowl Panel (Left)
- 424AR Fan Cowl Panel (Right)
- 425AL Fan Reverser (Left)
- 426AR Fan Reverser (Right)
- 425CL Upper Actuator Panel (Left)
- 426CR Upper Actuator Panel (Right)
- 425EL Lower Actuator Panel (Left)
- 426ER Lower Actuator Panel (Right)

F. Install the Non-Locking Hydraulic Actuator

S 864-071-N00

- (1) Make sure the DO-NOT-OPERATE tags are installed on the forward thrust lever and reverse thrust lever.

S 864-072-N00

- (2) Make sure the thrust reverser sleeve is extended approximately 1.0 inch (approximately 25.0 mm) or less from the fully stowed position.

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S 984-032-N00

- (3) If it is necessary, turn the flex shaft drive with a 3/16 inch (5.0 mm) square drive in the direction that fully retracts the actuator rod end.

S 824-040-N00

- (4) Make sure the distance (dimension A) between the rod end collar and actuator cylinder is between 0.010-0.018 inch (0.254-0.457 mm) before the installation (Fig. 401).

NOTE: A distance of 0.010-0.018 inch (0.254-0.457 mm) shows the full retract position for a new hydraulic actuator on the bench rig. A repaired or rebuilt actuator can have a gap of 0.010-0.022 inch (0.254-0.559 mm) on the bench rig.

- (a) Reject the hydraulic actuator if the clearance is not satisfactory.

S 424-033-N00

CAUTION: DO NOT LET THE ROD END OF THE HYDRAULIC ACTUATOR TURN OR BE TURNED WHEN YOU CONNECT IT TO THE THRUST REVERSER SLEEVE. IF THE ROD END IS TURNED, IT CAN CAUSE DAMAGE TO THE ACTUATOR.

- (5) Install the hydraulic actuator (3 or 7), with the rod end first, through the opening in the torque box.
(a) Align the hydraulic actuator ports with the hydraulic tubes.

S 424-075-N00

- (6) Install the bolt (5), washers (6), nut (7), and cotter pin (9) which hold the rod end to the thrust reverser sleeve.
(a) Tighten the castellated nut (7) to 20 pound-inches (2.26 newton-meters).
(b) Then, tighten the nut (7) to the subsequent castellation.
(c) Install the cotter pin (9).
(d) Apply the sealant to the end of the bolt, nut and cotter pin to approximately 0.06 inch (1.52 mm) thickness.

S 824-076-N00

- (7) Turn the actuator splined drive with the 3/16 inch (5.0 mm) square drive to adjust the gimbal ring forward or rearward until you can install the retainers.

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- S 434-077-N00
(8) Install the retainers (2).
- S 224-078-N00
(9) Measure the distance between the mounting bracket and the gimbal ring.
- S 224-080-N00
(10) Make the 0.050 inch (1.270 mm) thick laminated shims (3) to thickness.
- S 034-079-N00
(11) Remove the retainers (2).
- S 434-081-N00
(12) Install the shims (3) between the gimbal ring and mounting bracket at the two locations.
- S 434-082-N00
(13) Install the retainers (2).
- S 434-084-N00
(14) Install the retainer bolts (1) (Fig. 401).
(a) Tighten the retainer bolts (1).
- S 024-042-N00
(15) If you install the upper non-locking hydraulic actuator do the steps that follow:
(a) Remove all protective caps and plugs.
(b) Install the couplings for the extend line flex hose and retract line flex hose (5) at the strut hydraulic connection.
(c) Install the top retract hydraulic line (6) to the upper non-locking hydraulic actuator (3).
(d) Install the extend port cap (4).
- S 024-043-N00
(16) If you install the lower non-locking hydraulic actuator do the steps that follow:
(a) Remove all protective caps and plugs.

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- (b) Install the retract line cap (2) on the lower non-locking hydraulic actuator (7) (Fig. 404).
- (c) Install the lower retract hydraulic retract line (4) to the lower non-locking hydraulic actuator (7).

S 864-089-N00

- (17) Stow the thrust reverser sleeve with hydraulic pressure.

NOTE: There are two methods to stow the thrust reverser sleeve which retracts all three actuators. The first method uses airplane hydraulic pressure. The second method uses a hydraulic ground service cart.

- (a) If you use the airplane hydraulic power, do the steps that follow:
 - 1) Make sure the reverser thrust levers are in the forward, stowed position with the DO-NOT-CLOSE tags installed.
 - 2) For the left engine, make sure this circuit breaker is open and the DO-NOT-CLOSE tag attached:
 - a) On the overhead circuit breaker panel, P11:
 - 1. 11D14, L ENG T/R CONT
 - 3) For the right engine, make sure these circuit breakers are open and the DO-NOT-CLOSE tags attached:
 - a) On the P11 panel:
 - 1. 11L33, R ENG T/R CONT
 - 2. 11D33, R ENG T/R CONT ALTN
 - 4) Disconnect the electrical connector D4180P (LH sleeve) or D4182P (RH sleeve) for the engine strut.

NOTE: The auto restow system is in the deployed condition of the thrust reverser sleeve.

- 5) Supply electrical power (AMM 24-22-00/201).
- 6) Remove the streamered pin from the deactivation slide of the stow valve.
 - a) Do not close the circuit breakers for the thrust reverser control.

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WARNING: MAKE SURE PERSONS AND EQUIPMENT ARE AWAY FROM THE THRUST REVERSER BEFORE THE THRUST REVERSER OPERATION. WITH THE HYDRAULIC POWER SUPPLIED, THE DEPLOYED THRUST REVERSER WILL RETRACT WHEN THE ELECTRICAL POWER IS SUPPLIED. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

- 7) Supply hydraulic power (AMM 29-11-00/201).
- 8) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker:

NOTE: The thrust reverser sleeves will retract and lock. Do not remove the hydraulic power.

- a) On the P11 panel:
 - 1. 11D14, L ENG T/R CONT

- 9) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker:

NOTE: The thrust reverser sleeves will retract and lock. Do not remove the hydraulic power.

- a) On the P11 panel:
 - 1. 11L33, R ENG T/R CONT

- 10) Proceed to the task to install the flex shafts (1 and 7).
- (b) If you use the hydraulic ground service cart, do the steps that follow:
 - 1) Disconnect the top retract hose for the non-locking hydraulic actuator from the strut hydraulic connection.
 - a) Catch the hydraulic fluid in an applicable container.
 - 2) Connect the hydraulic ground service cart to the flex hose (5) for the retract line.

WARNING: MAKE SURE PERSONS AND EQUIPMENT ARE AWAY FROM THE THRUST REVERSER BEFORE THE THRUST REVERSER OPERATION. WITH THE HYDRAULIC POWER SUPPLIED, THE DEPLOYED THRUST REVERSER WILL RETRACT WHEN THE ELECTRICAL POWER IS SUPPLIED. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

- 3) Operate the hydraulic ground service cart to supply 1800 to 3000 psi hydraulic pressure.

NOTE: The thrust reverser sleeve will retract and lock. Do not decrease the hydraulic pressure.

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4) Proceed to the task to install the flex shafts (1 and 7).

S 434-090-N00

- (18) Install the flex shaft (1 or 7) into the drive ports of the hydraulic actuator.

NOTE: Make sure you maintain hydraulic pressure to the retract side of the actuator.

CAUTION: WHEN YOU ENGAGE THE FLEX SHAFT, DO NOT TWIST MORE THAN 1/16 TURN, CLOCKWISE OR COUNTERCLOCKWISE, TO ENGAGE THE SPLINES. IF YOU TWIST IT TOO MUCH, YOU CAN CAUSE DAMAGE TO THE FLEX SHAFT.

- (a) Remove the dust cap from the drive port for the extend hydraulic line.
- (b) Move the tube nut for the flex shaft (2 or 6) back until you can see the splined flex shaft.
- (c) Install the splined end of the flex shaft into the drive port.
- (d) Engage one or two threads of the tube nut (2 or 6) (Fig. 403 or 404).
- (e) Put the flex shaft tube in the support blocks for the hydraulic tube.
 - 1) Tighten the fasteners to attach the flex shaft tube.
- (f) Loosen and move back the tube nuts (2 or 6) to make sure the splined end of the flex shaft is engaged in the hydraulic actuator.
- (g) Tighten the tube nut (2 or 6) to 30-35 pound-inches (3.39-3.95 N.m).

S 864-091-N00

- (19) Remove the hydraulic pressure after the installation of the rotary flex shaft.
- (a) If the airplane hydraulic power was used, do the steps that follow:
 - 1) For the left engine, open this circuit breaker and attach the DO-NOT-CLOSE tag:
 - a) On the P11 panel:

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1. 11D14, L ENG T/R CONT
 - 2) For the right engine , open this circuit breaker and attach the DO-NOT-CLOSE tag:
 - a) On the P11 panel:
 1. 11L33, R ENG T/R CONT
 - 3) Remove hydraulic power (AMM 29-11-00/201).
 - 4) Remove electrical power, if it is not necessary (AMM 24-22-00/201).
 - 5) Push the deactivation slide into the stow valve housing.
 - 6) Install the steamed pin to hold the deactivation slide in the ground deactivation position.
 - 7) Install the hitch pin in the steamed pin.
 - 8) Connect the electrical connector (D4180P or D4182P) for the engine strut.
- (b) If the hydraulic ground service cart was used, do the steps that follow:
- 1) Operate the hydraulic ground service cart to decrease the hydraulic pressure to zero.
 - 2) Disconnect the hydraulic ground service cart from the retract line flex hose.
 - 3) Install the retract line flex hose to the strut hydraulic connection.

S 434-052-N00

- (20) Install the sync lock (8) on the lower non-locking actuator (7) (AMM 78-34-13/401).

G. Put the Airplane Back to Its Usual Condition.

S 864-093-N00

- (1) Manually turn the actuator system through one full cycle (AMM 78-31-00/201).

S 864-094-N00

- (2) For the left engine, remove the DO-NOT-CLOSE tags and close this circuit breaker:
- (a) On the P11 panel:
- 1) 11D13, L ENG T/R IND

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- S 864-095-N00
- (3) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers:
- (a) On the P11 panel:
- 1) 11L32, R ENG T/R IND
 - 2) 11D32, R ENG T/R IND ALTN
- S 444-096-N00
- (4) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).
- S 214-097-N00
- (5) Make sure all tube connections for the flex shafts from the lower hydraulic actuator (7) and the top hydraulic actuator (3) to the center hydraulic actuator (11) are correctly tightened (Fig. 402, 403, 404).
- S 714-098-N00
- (6) Do the operational test for the thrust reverser (AMM 78-31-00/501).
- (a) Operate the thrust reverser through three full deploy and stow cycles.
- S 414-100-N00
- (7) Install the access panels for the hydraulic actuator with the screws (8) (Fig. 401).
- S 414-101-N00
- (8) Close the fan cowl panels (AMM 71-11-04/201).
- S 864-102-N00
- (9) Remove the DO-NOT-OPERATE tags from the forward thrust lever and the reverse thrust lever.

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THRUST REVERSER HYDRAULIC ACTUATORS – ADJUSTMENT / TEST

1. General

- A. This procedure gives the instructions to adjust the feedback rod positional reference for the rod end to the hydraulic actuator.
- B. There are two types of thrust reverser hydraulic actuators: locking and non-locking. With the actuator rod end bolt (Fig. 501) NOT installed in the thrust reverser, both types of actuators have an initial requirement for a 0.010–0.018 inch gap between the rod end collar and the actuator cylinder when the actuator is fully retracted. Removing the actuator rod end bolt from the thrust reverser is equivalent to removing the actuator from the thrust reverser. The gap on the locking actuators is adjusted by rotating the rod end of the actuator. The gap on the non-locking actuator is not adjustable and is set at the time of manufacture.

TASK 78-31-17-605-003-N00

2. Adjust the Center Locking Hydraulic Actuator (Fig. 501)

A. References

- (1) AMM 71-11-04/201, Fan Cowl Panels
- (2) AMM 78-31-00/201, Thrust Reverser System

B. Access

(1) Location Zones

- 410 Engine No. 1 (Left)
- 420 Engine No. 2 (Right)

(2) Access Panels

- 413AL Fan Cowl Panel (Left)
- 414AR Fan Cowl Panel (Right)
- 415AL Fan Reverser (Left)
- 416AR Fan Reverser (Right)
- 415DL Locking Actuator Panel (Left)
- 416DR Locking Actuator Panel (Right)
- 423AL Fan Cowl Panel (Left)
- 424AR Fan Cowl Panel (Right)
- 425AL Fan Reverser (Left)
- 426AR Fan Reverser (Right)
- 425DL Locking Actuator Panel (Left)
- 426DR Locking Actuator Panel (Right)

C. Prepare to Adjust the Center Locking Hydraulic Actuator

S 215-005-N00

- (1) Make sure the forward thrust levers are in the idle position and the reverse thrust levers are fully forward.
 - (a) Install the DO-NOT-OPERATE tags on the forward and reverse thrust levers.

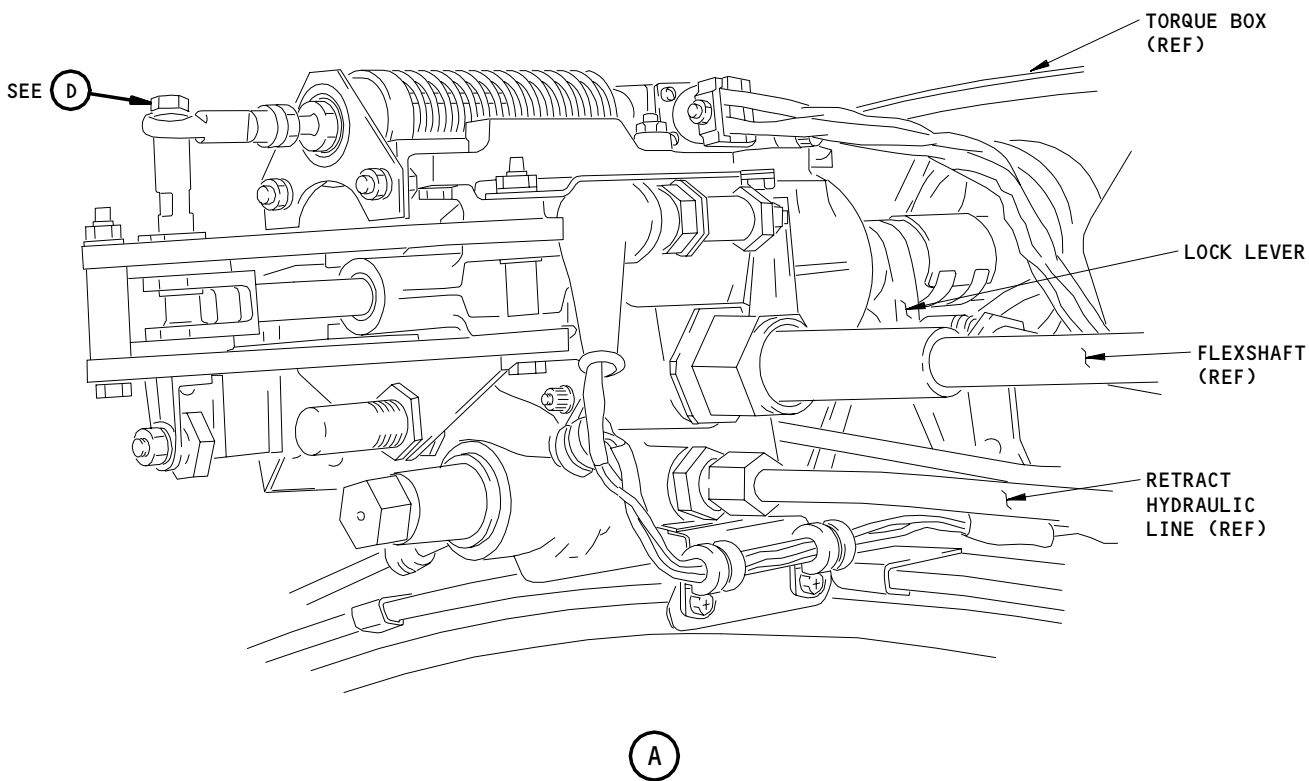
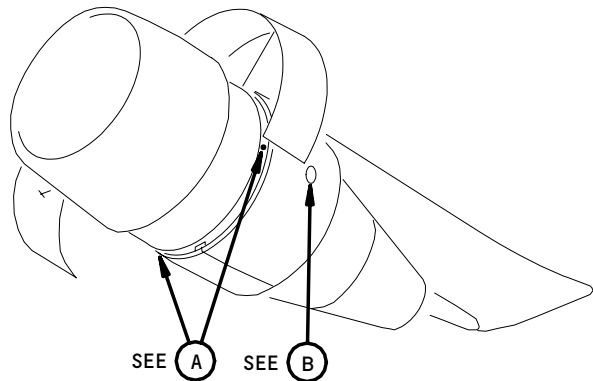
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Center Locking Hydraulic Actuator Rod End Gap - Adjustment
Figure 501 (Sheet 1)

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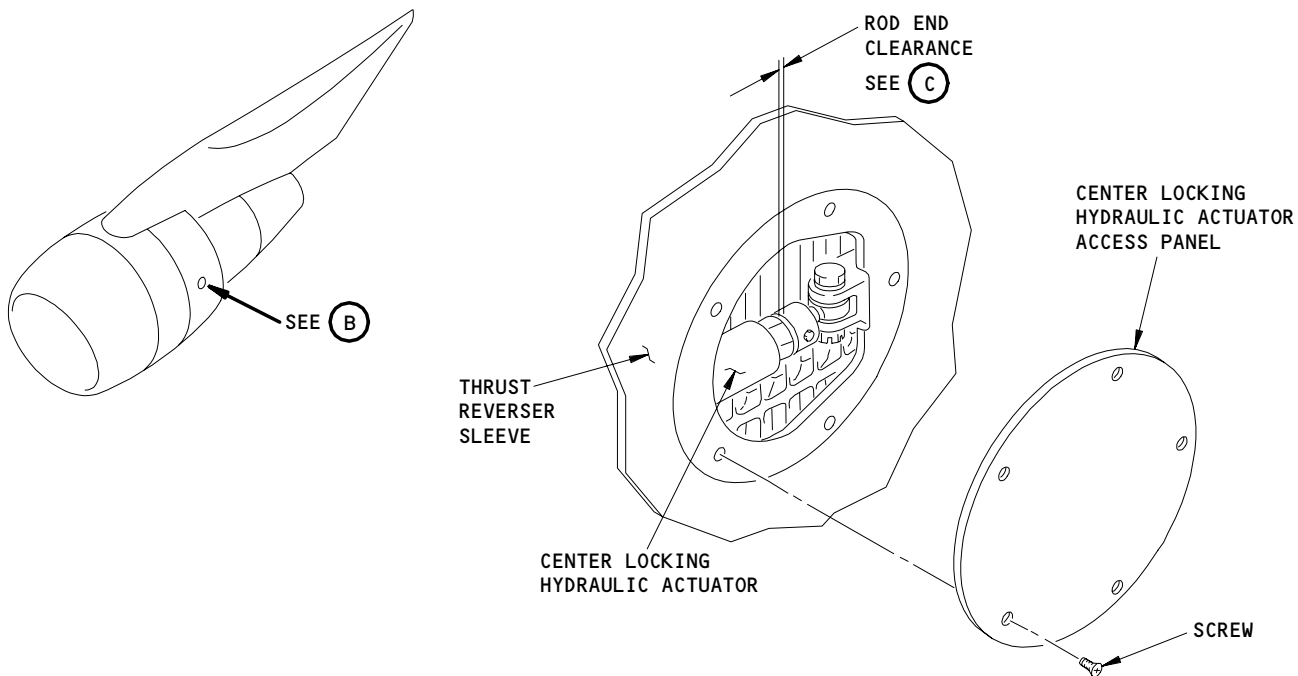
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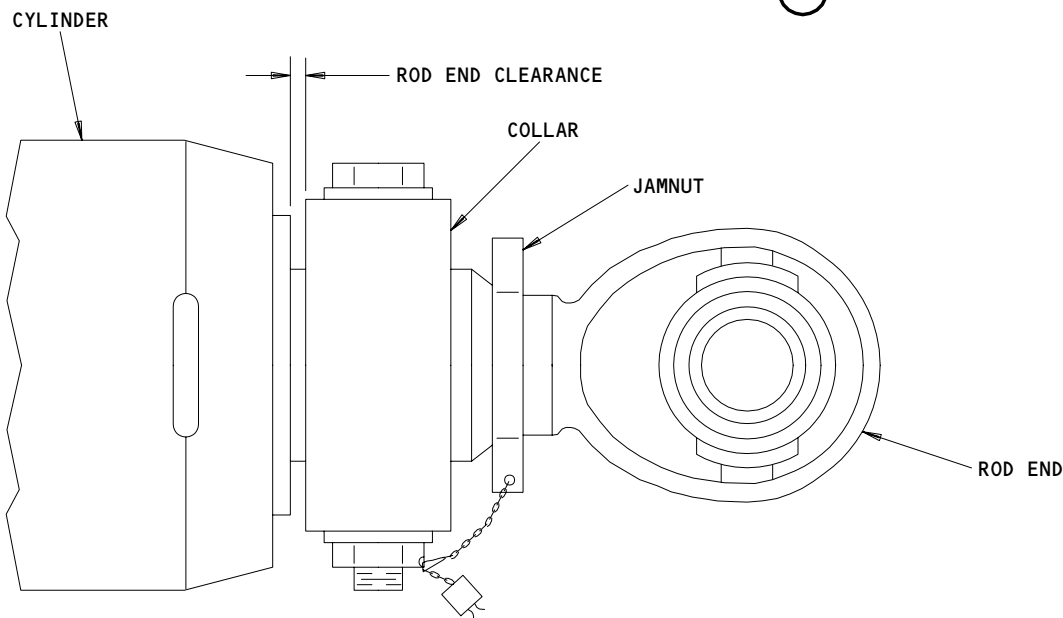
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CENTER LOCKING HYDRAULIC ACTUATOR ACCESS PANEL ON THE THRUST REVERSER SLEEVE

(B)



ROD END CLEARANCE FOR THE CENTER LOCKING HYDRAULIC ACTUATOR

(C)

Center Locking Hydraulic Actuator Rod End Gap - Adjustment
Figure 501 (Sheet 2)

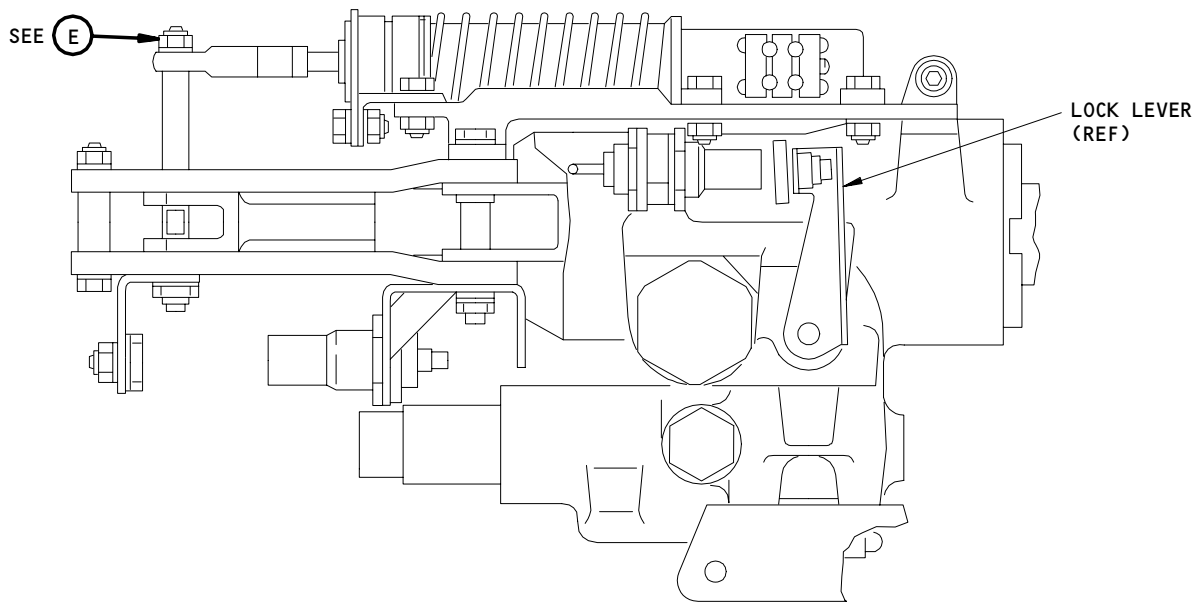
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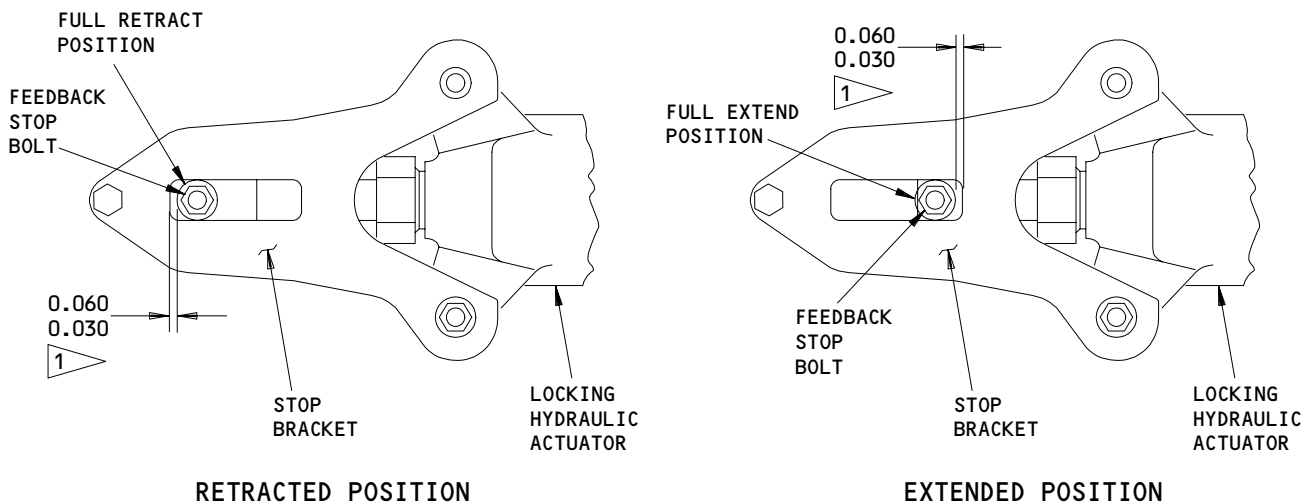
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CENTER LOCKING HYDRAULIC ACTUATOR

(D)



LOCKING HYDRAULIC ACTUATOR FEEDBACK CHECK
(BOTTOM VIEW)

(E)

1 ALL DIMENSIONS ARE IN INCHES

Center Locking Hydraulic Actuator Rod End Gap - Adjustment
Figure 501 (Sheet 3)

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S 045-006-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 OR DAMAGE TO EQUIPMENT.

- (2) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 015-008-N00

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

S 015-009-N00

- (4) Manually extend the thrust reverser (AMM 78-31-00/201).
 - (a) Make sure the thrust reverser sleeve is approximately one to two inches to the rear in the deployed direction.

S 025-010-N00

- (5) Remove the streamered pin which holds the manual override lever for the bypass valve of the isolation valve in the open position.

NOTE: Keep the bypass valve in the closed position during the removal and installation of the hydraulic component. If the bypass valve is open, the hydraulic reservoir will drain.

S 685-011-N00

CAUTION: IMMEDIATELY CLEAN ALL OF THE HYDRAULIC FLUID THAT FALLS. THE HYDRAULIC FLUID CAN CAUSE CONTAMINATION OF THE AIRPLANE OR THE ENGINE.

- (6) Put an applicable container below the lower hydraulic actuator to catch the hydraulic fluid.

S 025-012-N00

- (7) Disconnect the flex shaft from the lower non-locking hydraulic actuator to drain the hydraulic fluid from the flex shaft.

S 025-013-N00

- (8) Disconnect the upper flex shaft and the lower flex shaft from the locking hydraulic actuator (Fig. 501).

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S 625-014-N00

- (9) Install protective caps on the upper and lower flexshaft ports on the center locking hydraulic actuator.

S 025-015-N00

- (10) Remove the screws from the applicable access panel on the side of the thrust reverser sleeve (Fig. 501).

S 025-016-N00

- (11) Remove the access panel.

S 025-017-N00

- (12) Remove the nut, washers and bolt to disconnect the rod end of the locking hydraulic actuator from the clevis fitting on the thrust reverser sleeve (Fig. 501).

NOTE: Removing the actuator rod end bolt from the thrust reverser clevis is equivalent to having the actuator removed from the thrust reverser.

S 025-018-N00

- (13) Remove the cap from the top flexshaft port on the actuator.

S 985-019-N00

- (14) Turn the flexshaft drive with a 3/16-inch square drive to retract the actuator.
(a) Turn the flex shaft drive until the actuator is in the fully retracted position.

S 215-034-N00

- (15) Make sure the actuator rod end is aligned with the clevis on the thrust reverser sleeve before you measure the clearance.

S 625-020-N00

- (16) Install the protective cap on the upper flexshaft port of the locking hydraulic actuator.

D. Do the following steps to adjust the locking actuator:

S 215-021-N00

- (1) Measure the clearance between the rod end collar and the actuator cylinder (dimension A in Fig. 501).

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S 215-022-N00

- (2) If dimension A is within the specified tolerance of 0.010–0.018 inches (0.254–0.457 mm), the actuator is adjusted correctly and no further steps are necessary.

NOTE: A repaired or rebuilt actuator can have a gap of 0.010–0.022 inch (0.254–0.559 mm).

S 215-023-N00

- (3) If dimension A is out of the specified tolerance of 0.010–0.018 inch (0.254–0.457 mm), do the steps that follow to adjust the clearance of the actuator rod end.

S 215-024-N00

- (4) Measure the clearance between the feedback stop bolt and the stop bracket slot on the center locking actuator (Fig. 501).
(a) Make a record of this dimension.

NOTE: The correct dimension is 0.030–0.060 inch (0.762–1.524 mm).

S 985-025-N00

- (5) Turn the lock lever clockwise to release the actuator lock and extend the actuator rod end approximately 2 inches (50.8 mm).
(a) Pull on the actuator rod end to extend it, but do not turn the actuator rod end at this time.

S 825-026-N00

- (6) If the clearance between the feedback stop bolt and the stop bracket slot was more than 0.060 inch (1.524 mm), do this adjustment:
(a) Turn the actuator rod end counterclockwise one-half turn for each 0.020 inch (0.508 mm) of stop bolt clearance that is more than the specified dimension.
1) If the dimension you measured falls between 0.020 inch (0.508 mm) increments, do the quantity of turns for the subsequent (higher) 0.020 inch (0.508 mm) increment.

S 825-027-N00

- (7) If the clearance between the feedback stop bolt and the stop bracket slot was less than 0.030 inch (0.762 mm), do this adjustment:
(a) Turn the actuator rod end clockwise one-half turn for each 0.020 inch (0.508 mm) of clearance that is less than the specified dimension.
1) If the dimension you measured falls between 0.020 inch (0.508 mm) increments, do the quantity of turns for the subsequent (higher) 0.020 inch (0.508 mm) increment.

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- S 025-028-N00
- (8) Remove the cap from the top flexshaft port on the actuator.
- S 985-029-N00
- (9) Turn the flexshaft drive with a 3/16-inch square drive to retract the actuator.
- (a) Turn the flex shaft drive until the actuator is in the fully retracted position.
- (b) Make sure the actuator rod end is aligned with the clevis on the thrust reverser sleeve before you measure the clearance.
- S 215-030-N00
- (10) Measure the clearance between the rod end collar and the actuator cylinder again (dimension A in Fig. 501).
- (a) Dimension A must be 0.010-0.018 inch (0.254-0.457 mm) when the actuator is fully retracted.
- NOTE: A repaired or rebuilt actuator can have a gap of 0.010-0.022 inch (0.254-0.559 mm).
- S 825-031-N00
- (11) If dimension A continues to be out of limits, you must replace the center locking actuator with one that is correctly adjusted.
- S 425-032-N00
- (12) After you correctly adjust or replace the actuator, safety wire the rod end to the actuator cylinder with wire to keep the correct rod end adjustment.
- S 425-035-N00
- (13) Safety wire the lock lever to the actuator with wire to prevent the release of the actuator lock.
- S 405-033-N00
- (14) Do the installation procedure for the Thrust Reverser Locking Hydraulic Actuator (AMM 78-31-17/401).

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THRUST REVERSER ROTARY FLEX SHAFTS AND TUBING -
REMOVAL/INSTALLATION

1. General

- A. This procedure has two tasks. The first task removes the rotary flex shafts and the tubing. The second task installs the rotary flex shafts and the tubing.
- B. The thrust reverser rotary flex shaft is called the flex shaft for this procedure.

TASK 78-31-18-004-001-N00

2. Remove the Flex Shafts and Tubing

A. References

- (1) AMM 71-11-04/201, Fan Cowl Panels
- (2) AMM 78-31-00/201, Thrust Reverser System

B. Access

- (1) Location Zones
 - 410 Engine No. 1 (Left)
 - 420 Engine No. 2 (Right)

- (2) Access Panels

- 413AL Fan Cowl Panel (Left)
- 414AR Fan Cowl Panel (Right)
- 423AL Fan Cowl Panel (Left)
- 424AR Fan Cowl Panel (Right)

C. Prepare to remove the Flex Shafts and the Tubing

S 864-004-N00

- (1) Make sure the forward thrust lever is in the idle position.
 - (a) Attach the DO-NOT-OPERATE tag to the forward thrust lever.

S 864-006-N00

- (2) Make sure the reverse thrust lever is fully forward.
 - (a) Attach the DO-NOT-OPERATE tag to the reverse thrust lever.

S 044-005-N00

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

- (3) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 014-008-N00

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

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S 984-009-N00

- (5) Manually extend the thrust reverser about one inch (AMM 78-31-00/201).

D. Remove the Flex Shafts and the Tubing (Fig. 401).

S 684-010-N00

CAUTION: BE PREPARED TO CATCH THE HYDRAULIC FLUID IN AN APPROPRIATE CONTAINER. IMMEDIATELY CLEAN ALL OF THE HYDRAULIC FLUID THAT FALLS. HYDRAULIC FLUID CAN CAUSE DAMAGE TO THE ENGINE AND THE AIRPLANE STRUCTURE.

- (1) Drain the hydraulic fluid from the actuator system.
 - (a) Put an applicable container below the lower hydraulic actuator.
 - (b) Loosen the coupling for the extend line flex hose at the strut hydraulic connection.

NOTE: This is done to let air into the actuator system at a high point to drain the hydraulic fluid.

- (c) Remove the extend port cap on the upper non-locking hydraulic actuator.
- (d) Remove the sync lock from the lower hydraulic actuator (AMM 78-34-13/401).
- (e) Let the hydraulic fluid drain into an applicable container.
- (f) Install the extend port cap on the upper non-locking hydraulic actuator.
- (g) Tighten the coupling for the extend line flex hose at the strut hydraulic connection to 30-35 pound-inches (3.389-3.954 newton-meters).

S 034-011-N00

CAUTION: HOLD THE FLEX SHAFT WHEN THE LOWER END OF THE FLEX SHAFT TUBE IS DISCONNECTED FROM THE HYDRAULIC ACTUATOR. THE FLEX SHAFT CAN FALL OUT OF THE TUBE AND CONTAMINATION CAN OCCUR.

- (2) Loosen and move the tube nut back off the fitting at the hydraulic actuator port.

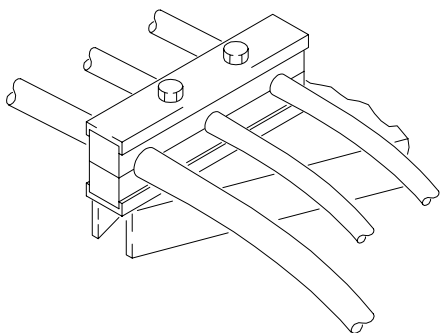
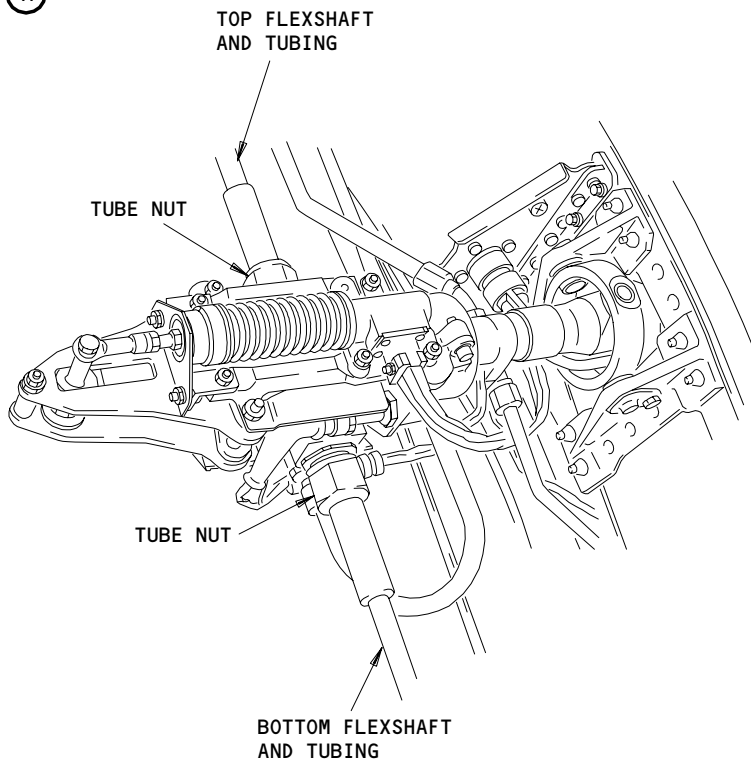
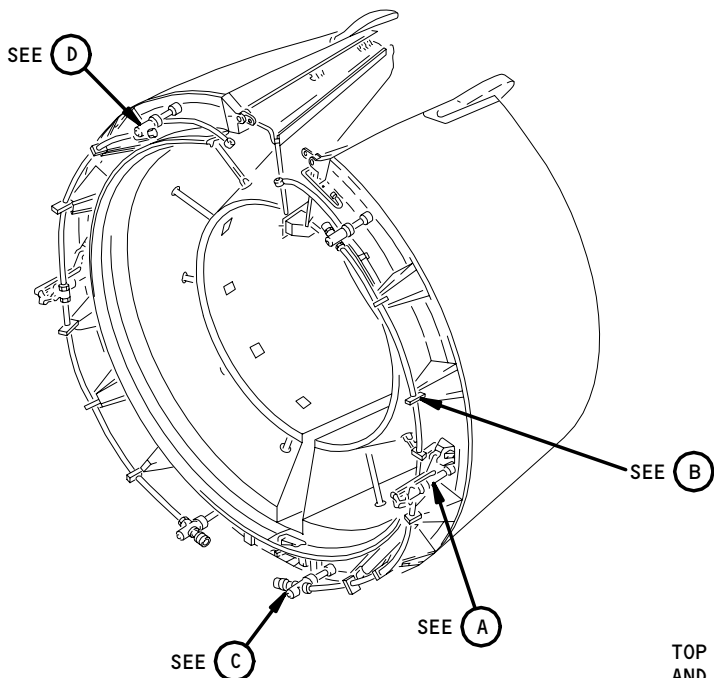
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SUPPORT BLOCK

(B)

LEFT SIDE LOCKING HYDRAULIC ACTUATOR
(RIGHT SIDE EQUIVALENT)

(A)

Thrust Reverser Rotary Flexshafts and Tubing
Figure 401 (Sheet 1)

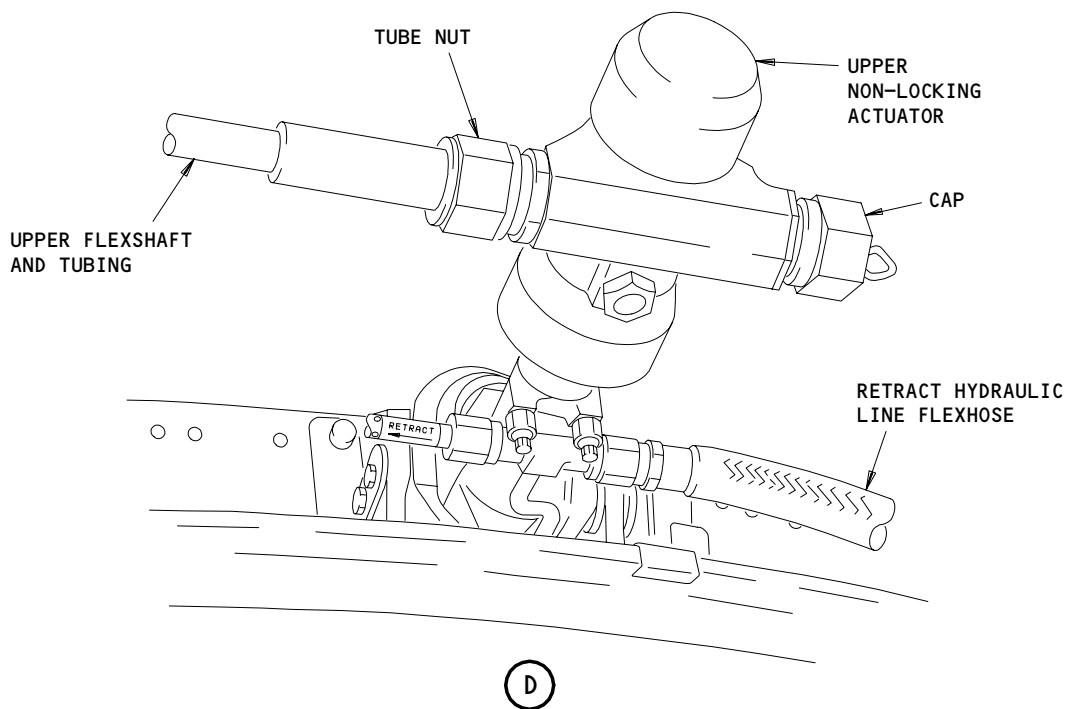
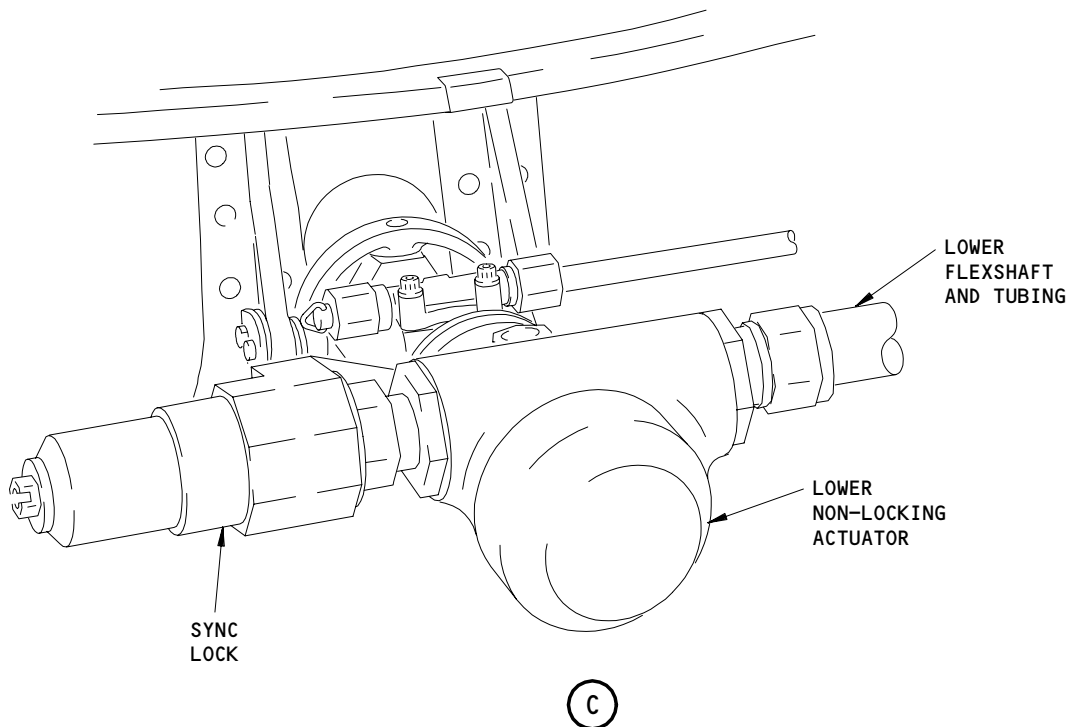
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Thrust Reverser Rotary Flexshafts and Tubing
Figure 401 (Sheet 2)

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- S 034-013-N00
- (3) Remove the bolts and the support block clamps that attach the flex shaft tubing to the torque box.

- S 034-014-N00
- (4) Disengage the splines on the ends of the flex shafts from the actuators to remove the flex shafts and the tubing.

NOTE: Do not let the flex shafts come out of the tubing.

- S 034-015-N00
- (5) Install the caps on the flex shaft ports on the actuators.

- S 034-016-N00
- (6) On a clean work bench, remove the flex shafts from the tubing.

- S 214-035-N00
- (7) Make sure the flex shafts and the inner surface of the tubing are clean.

TASK 78-31-18-404-036-N00

3. Install the Thrust Reverser Rotary Flex Shafts and the Tubing

A. Equipment

- (1) Hydraulic Service Cart, 0 to 3000 psi with hydraulic fluid, BMS 3-11

B. Consumable Materials

- (1) D00148 Fluid - Hydraulic, Fire Resistant, BMS 3-11

C. References

- (1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 29-11-00/201, Main Hydraulic System
(3) AMM 71-11-04/201, Fan Cowl Panels
(4) AMM 78-31-00/201, Thrust Reverser System

D. Access

- (1) Location Zones
410 Engine No. 1 (Left)
420 Engine No. 2 (Right)

(2) Access Panels

- 413AL Fan Cowl Panel (Left)
414AR Fan Cowl Panel (Right)
423AL Fan Cowl Panel (Left)
424AR Fan Cowl Panel (Right)

E. Install the Rotary Flex Shafts and the Tubing (Fig. 401).

- S 864-017-N00
- (1) Make sure the forward thrust lever is in the idle position and the DO-NOT-OPERATE tag is attached to it.

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- S 864-018-N00
- (2) Make sure the reverse thrust lever is fully forward and the D0-NOT-OPERATE tag is attached to it.

- S 144-020-N00
- (3) Rub the flex shafts with a clean, lint-free cloth to remove the contamination.

- S 434-021-N00
- (4) Put the flex shaft into the tubing.

NOTE: Do not let the flex shaft come out of the tubing.

- S 434-022-N00
- (5) Tighten the support block fasteners to hold up the retract and extend hydraulic lines.

- S 434-023-N00
- (6) Make sure all hydraulic line and flex hose connections are attached correctly.

- S 864-039-N00
- (7) Stow the thrust reverser sleeve with hydraulic pressure.

NOTE: With the sync lock removed, a small amount of hydraulic fluid will come out of the lower non-locking actuator.

NOTE: There are two methods to stow the thrust reverser sleeve which retracts all three actuators. The first method uses airplane hydraulic pressure. The second method uses a ground service cart.

- (a) If you use the airplane hydraulic pressure, do the steps that follow:
- 1) Make sure the reverser thrust levers are in the forward, stowed position with D0-NOT-OPERATE tags installed.

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- 2) For the left engine, make sure this circuit breaker is open and the DO-NOT-CLOSE tag is attached:
 - a) On the overhead circuit breaker panel, P11:
- 3) For the right engine, make sure these circuit breakers are open and the DO-NOT-CLOSE tags are attached:
 - a) On the overhead circuit breaker panel, P11:
 - 1. 11L33, R ENG T/R CONT
 - 2. 11D33, R ENG T/R CONT ALTN
- 4) Disconnect the electrical connector D4180P (LH sleeve) or D4182P (RH sleeve) for the engine strut.

NOTE: The auto restow system is "reverser sleeve deployed" condition.

- 5) Supply electrical power (AMM 24-22-00/201).
- 6) Remove the pin with the streamer from the deactivation slide on the stow valve.

NOTE: Do not close the circuit breakers for the thrust reverser controls.

WARNING: MAKE SURE PERSONS AND EQUIPMENT ARE AWAY FROM THE THRUST REVERSER BEFORE THE THRUST REVERSER OPERATION. WITH HYDRAULIC POWER SUPPLIED, THE DEPLOYED THRUST REVERSER WILL RETRACT WHEN ELECTRIC POWER IS SUPPLIED. INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- 7) Supply hydraulic power (AMM 29-11-00/201).
- 8) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker:

NOTE: The thrust reverser sleeves will retract and lock.

Do not remove hydraulic power.

- a) On the P11 panel:

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1. 11D14, L ENG T/R CONT
- 9) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker:

NOTE: The thrust reverser sleeves will retract and lock.

Do not remove the hydraulic power.

- a) On the P11 panel:
1. 11L33, R ENG T/R CONT
- 10) Proceed to the task to install the flex shaft.
- (b) If you use the hydraulic ground service cart, do the steps that follow:
- 1) Disconnect the retract line flex hose for the upper non-locking actuator from the strut hydraulic connection.
- a) Catch the hydraulic fluid in an applicable container.
- 2) Connect the hydraulic ground service cart to the retract line flex hose.

WARNING: MAKE SURE PERSONS AND EQUIPMENT ARE AWAY FROM THE THRUST REVERSER BEFORE THE THRUST REVERSER OPERATION. WITH HYDRAULIC POWER SUPPLIED, THE DEPLOYED THRUST REVERSER WILL RETRACT WHEN ELECTRIC POWER IS SUPPLIED. INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- 3) Operate the hydraulic ground service cart to supply 1800 to 3000 psi hydraulic pressure.

NOTE: The thrust reverser sleeve will retract and lock. Do not decrease the hydraulic pressure.

- 4) Proceed to the task to install the flex shafts.

- S 424-027-N00
- (8) Install the flex shaft.

NOTE: Make sure you maintain hydraulic pressure to the retract side of the actuator.

- S 434-025-N00
- (9) Remove the caps from the flex shaft ports on the actuators.

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S 434-026-N00

- (10) Loosen the fasteners for the hydraulic line support block so you can set the position of the flex shafts and tubing.
- (a) Move the tube nut for the flex shaft until you can see the splined flex shaft.
 - (b) Put the end of the flex shaft with splines into the hole in the actuator.
 - (c) Engage the first one or two threads of each flex shaft tube nut.
 - (d) Put the flex shaft tube into the support block for the hydraulic tubes.
 - 1) Tighten the fasteners to attach the flex shaft tube.
 - (e) Loosen and move the tube nuts back to make sure the splined end of the flex shaft is engaged in each hydraulic actuator.
 - (f) Tighten the tube nuts to 30-35 pound-inches (3.389-3.954 newton-meters).
 - (g) Install the sync lock on the lower hydraulic actuator (AMM 78-34-13/401).

S 094-028-N00

- (11) Remove the hydraulic pressure.
- (a) If airplane hydraulic power was used, do the steps that follow:
 - 1) For the left engine, open this circuit breaker and attach the DO-NOT-CLOSE tag:
 - a) On the P11 panel:
 - 1. 11D14, L ENG T/R CONT
 - 2) For the right engine, open this circuit breaker and attach the DO-NOT-CLOSE tag:
 - a) On the P11 panel:
 - 1. 11L33, R ENG T/R CONT
 - 3) Remove the hydraulic power (AMM 29-11-00/201).
 - 4) Remove electrical power, if it is not necessary (AMM 24-22-00/201).
 - 5) Push the deactivation slide into the stow valve housing.
 - 6) Install the streamered pin to hold the deactivation slide in the ground deactivation position.
 - a) Install a hitch pin in the streamered pin.
 - 7) Connect the electrical connector (D4180P or D4182P) for the engine strut.
 - (b) If the hydraulic ground service cart was used, do the steps that follow:
 - 1) Operate the hydraulic ground service cart to decrease the hydraulic pressure to zero.
 - 2) Disconnect the hydraulic ground service cart from the retract line flex hose.
 - 3) Install the retract line flex hose to the strut hydraulic connection.

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- S 984-029-N00
 (12) Manually turn the actuator system through one full cycle (AMM 78-31-00/201).

- S 614-038-N00
 (13) Service the hydraulic reservoir (AMM 12-12-01/301).
 F. Put the Airplane Back to Its Usual Condition

- S 444-030-N00
 (1) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

- S 944-031-N00
 (2) Remove the DO-NOT-OPERATE tag from the thrust reverser lever.

- S 714-032-N00
 (3) Do this task: Thrust Reverser Operation - Deploy/Stow (Power Method) (AMM 78-31-00/201).

- S 214-033-N00
 (4) Examine the thrust reverser area for hydraulic fluid leaks.

TRAS Actuator Leakage Limit:	
Normal Operation Limits	Dispatch Limits to Avoid Delay
8 drops per minute (stopped or in operation)	60 drops per minute (stopped or in operation)

- S 414-034-N00
 (5) Close the fan cowl panels (AMM 71-11-04/201).

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THRUST REVERSER CONTROL SYSTEM - DESCRIPTION AND OPERATION

1. General

- A. The control system of the thrust reverser controls the extension and retraction of the thrust reverser. The control system operates when the reverse thrust lever in the flight compartment is moved. The thrust control system used to control forward thrust is also used to control reverse thrust (AMM 76-11-00).
- B. The control system for the thrust reverser contains the systems and components that follow:
 - (1) An engine-power control system which contains a forward/reverse thrust lever which is connected to a thrust lever angle (TLA) transducer. The (TLA) transducer sends a signal to the electronic engine control (EEC). The EEC then uses the signal to operate the fuel metering unit (FMU) (AMM 76-11-00).
 - (2) An electrical circuit that operates the motorized isolation valve which supplies hydraulic fluid to the system. The electrical circuit also prevents reverser operation unless all of the conditions that follow occur:
 - (a) The Air/Gnd relays are in the ground position
 - (b) The fire switch is in the normal position
 - (c) 28v dc is provided by the electrical power bus.
 - (3) An electrical circuit which operates the directional control valve (DCV). The DCV supplies hydraulic fluid to the extend side of the thrust reverser actuators. The electrical circuit prevents reverser operation unless all of the conditions that follow occur:
 - (a) The Air/Gnd relays are in the ground position
 - (b) The fire switch is in the normal position
 - (c) 28v dc is provided by the electrical power bus.
 - (4) An electrical circuit that operates a synchronizing cable lock. The lower non-locking acuator on each sleeve half is equipped with a synchronizing cable lock. A rotor and pin lock inside the sync lock holds the sync cable in the locked position unless the sync lock is energized.
 - (5) Flow control restrictor tees to make sure each half of the thrust reverser receives an even distribution of hydraulic fluid.
 - (6) A linear variable differential transducer (LVDT) provides reverser position feedback to the EEC. The EEC controls the interlock actuator of the thrust levers and makes sure that the proper sequence of engine power and thrust reverser position is correct.
- C. To operate the thrust reverser, the airplane must be on the ground with the forward thrust lever in the idle position. When the airplane is on the ground, the air/ground relays are closed. The reverse thrust lever is lifted which closes the reverser control switch. This energizes a deploy relay that completes the electrical circuit to open the motorized isolation valve and the stow valve. This allows hydraulic power to extend or retract the thrust reverser.
- D. When the above electrical circuit is completed the sync locks will become energized.

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- E. With more movement of the reverse thrust lever, the DCV switch closes. This energizes the DCV, which allows hydraulic fluid to flow to the lock and extend side of the center hydraulic actuator. The center hydraulic actuator is the only actuator that has a lock on it. After the fluid flows to the center actuator it then flows to the extend side of the upper and lower hydraulic actuators which do not lock.
- F. The interlock actuator of the thrust levers will not allow movement of the reverse thrust levers to a high power, reverse thrust position until the two thrust reverser sleeves have extended to about 60% of their full deployment. When the thrust reverser sleeves are at about 60% deployment, the EEC completes the electrical circuit to the interlock relay. The interlock relay will energize, which will extend the interlock actuator. When the interlock actuator extends, the lock will be removed and the reverse thrust levers can move freely to the high power, reverse thrust position. When stowing the thrust reverser sleeves, the electrical power will be removed from the interlock relay when the sleeves have retracted to their 20% deployed position. When the electrical power is removed from the interlock relay, the interlock actuator will retract. This will prevent movement of the reverse thrust levers to the high power, reverse thrust position.
- G. The thrust reversers are retracted when the reverse thrust levers are moved to the full down position. The thrust reverser control switch in the thrust lever is moved to the off position and opens the electrical circuit to the deploy relay. The deploy relay de-energizes and closes the circuit to the close the motorized isolation valve. The control switch also de-energizes the DCV, which closes.
- H. When the above electrical circuit is de-energized, the sync locks will become de-energized causing them to lock.
- I. The auto-restow proximity sensors get input when the translating sleeve is moved aft from the retracted position. When the sleeve is moved aft the target is moved out of the sensor's range. This causes a "target far" condition at the proximity switch electronic unit (PSEU). This keeps the stow valve open until both reverser halves are retracted. The auto-restow circuit is automatically de-energized 5 seconds after the reverser is fully retracted.
- J. Two air/ground relays keep an open circuit to the motorized isolation valve when the airplane is in the air.
- K. Two air/ground relays keep an open circuit to the DCV when the airplane is in the air.

2. Component Details

A. Stow Valve (Fig. 1)

- (1) The function of the stow valve is to supply hydraulic pressure, when needed, to the retract side of the thrust reverser system. The stow valve includes a 2-stage valve (deactivation slide and pilot valve) which is operated by a solenoid. It also includes a check valve, a bypass valve, and a pressure switch. The stow valve is used to isolate the thrust reverser system from any accidental command to stow the reverser during ground maintenance. It is also used to isolate the thrust reverser system during flights when the thrust reversers do not work.

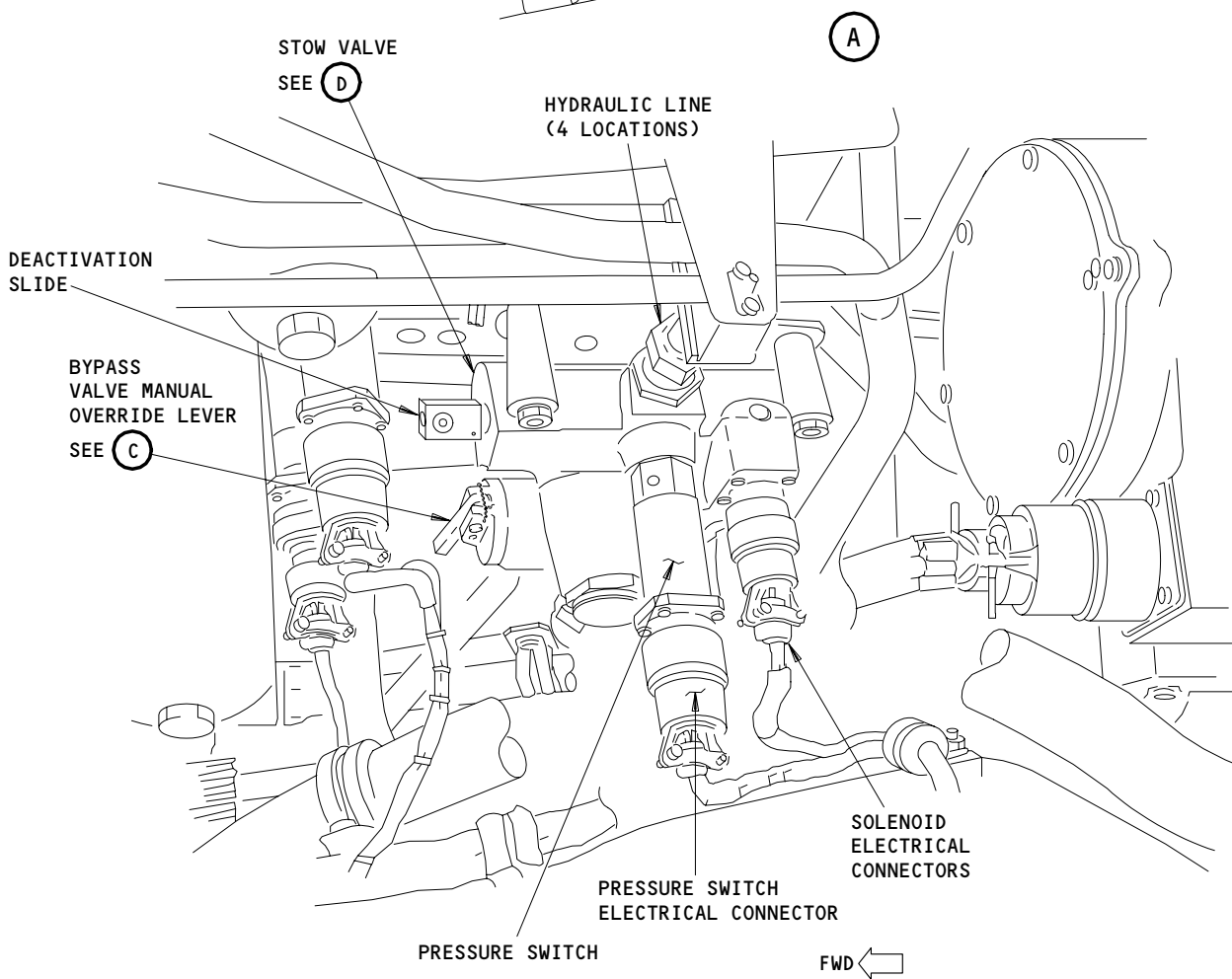
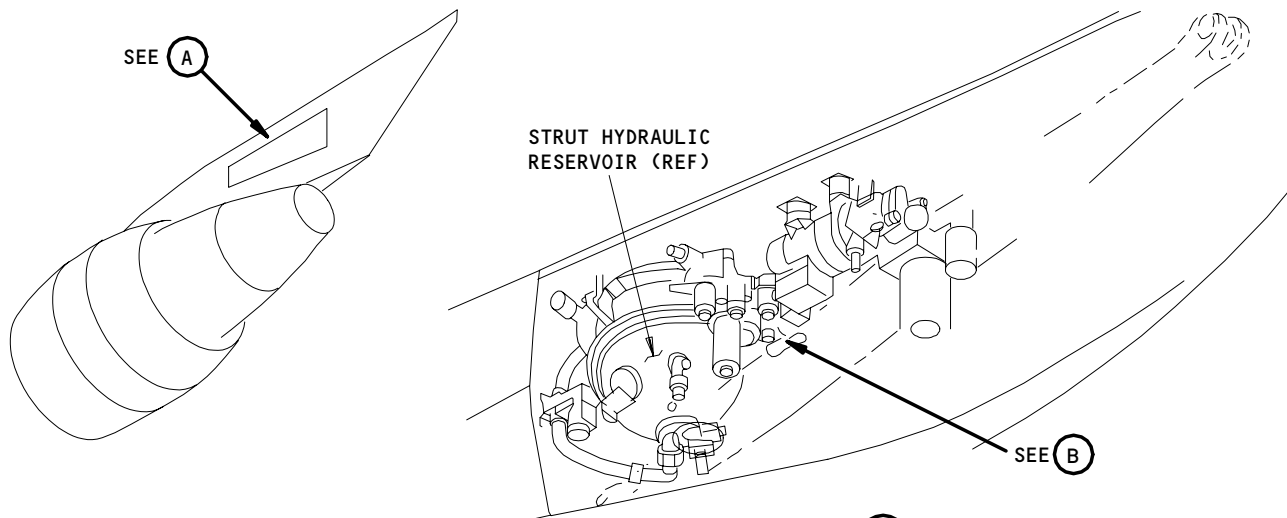
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LEFT STRUT INSTALLATION

(B)

Thrust Reverser Stow Valve
Figure 1 (Sheet 1)

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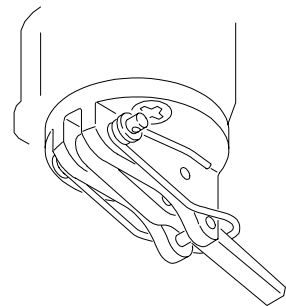
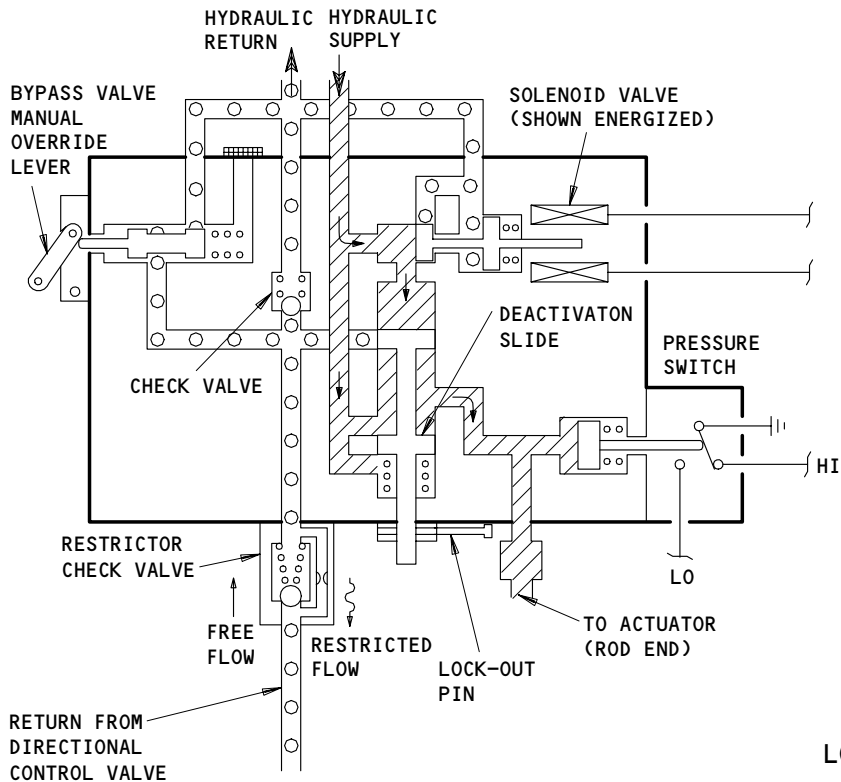
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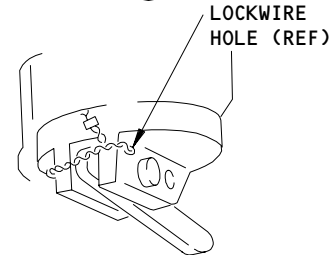
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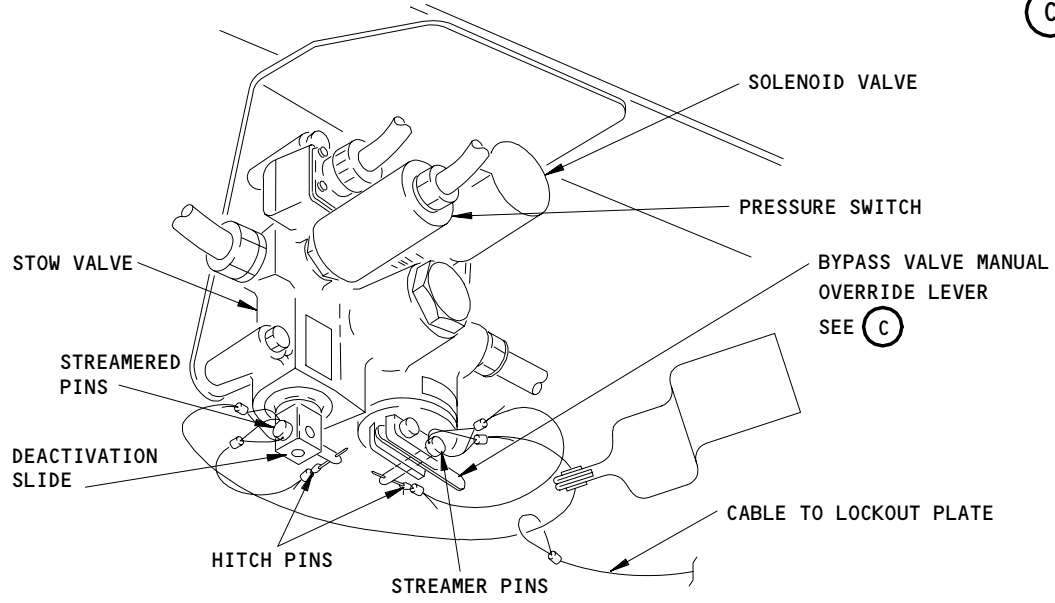
SPRING CONTROLLED MANUAL
OVERRIDE LEVER

(C)



LOCKWIRED MANUAL OVERRIDE LEVER

(C) 1



RIGHT STOW VALVE INSTALLATION
(SHOWN DEACTIVATED FOR GROUND MAINTENANCE)

(D)

1 LOCKWIRE THE LEVER IN THE OPEN
POSITION WHEN THE VALVE IS ACTIVATED

Thrust Reverser Stow Valve
Figure 1 (Sheet 2)

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- (2) The stow valve is a hydraulic valve with a deactivation slide actuated by a pilot valve. The pilot valve is operated by a solenoid.
 - (3) When the solenoid is de-energized, a spring moves the deactivation slide to the closed position. This closes the hydraulic supply tube and connects the tube from the retract side of the hydraulic actuators to the hydraulic system return.
 - (4) When the solenoid is energized, the pilot valve opens and fluid flows to one end of the deactivation slide which moves the slide to the open position. The hydraulic supply is connected to the tube for the retract side of the hydraulic actuators.
- B. Directional Control Valve (Fig. 2)
- (1) The directional control valve (DCV) is located in the forward upper strut. The DCV allows hydraulic power to the extend side of the hydraulic actuators.
 - (2) The DCV is connected to the motorized isolation valve and to the flow control tees by hydraulic tubing.
 - (3) There are three fluid openings in the valve:
 - (a) The pressure (PRESS) opening is connected to the motorized isolation valve which provides the airplane with hydraulic system pressure (3000 psi, nominal).
 - (b) The return (RTN) port is connected to the return line of the airplane hydraulic system (200 psi, nominal).
 - (c) The extend (EXT) opening connects to the extend restrictor tee.
 - (4) The valve has an aluminum body which contains a hydraulic spool, a spring, and a solenoid valve. The spool is spring and hydraulic pressure operated. The spring keeps the spool in the closed mode.
 - (5) When the valve is in the closed mode, the PRESS opening is closed and the EXT opening is connected to the RTN opening. The spool is spring actuated to the closed position.
 - (6) When the valve is in the open mode, the energized solenoid valve allows hydraulic fluid to flow to the extend side of the spool. This fluid pressure is larger than the spool spring force and moves the spool to connect the PRESS opening to the EXT opening.
 - (7) When the valve is in the closed mode, the solenoid valve becomes de-energized. Hydraulic pressure to the extend side of the spool is stopped and the spool spring moves the spool to the closed mode.
- C. Motorized Hydraulic Isolation Valve
- (1) The function of the motorized isolation valve is to supply hydraulic pressure, when needed, to the extend side of the thrust reverser system. The motorized isolation valve is a valve which is operated by a an electric motor. It also includes a pressure switch. The motorized isolation valve is used to isolate the thrust reverser system from any accidental command to extend the reverser during ground maintenance. It is also used to isolate the thrust reverser system during flights when the thrust reversers do not work.

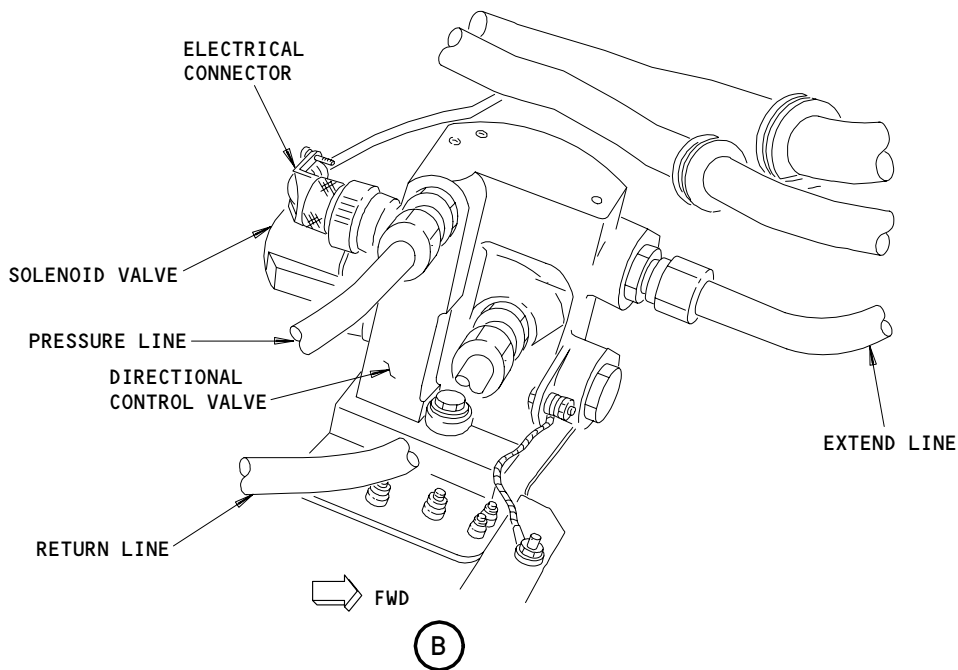
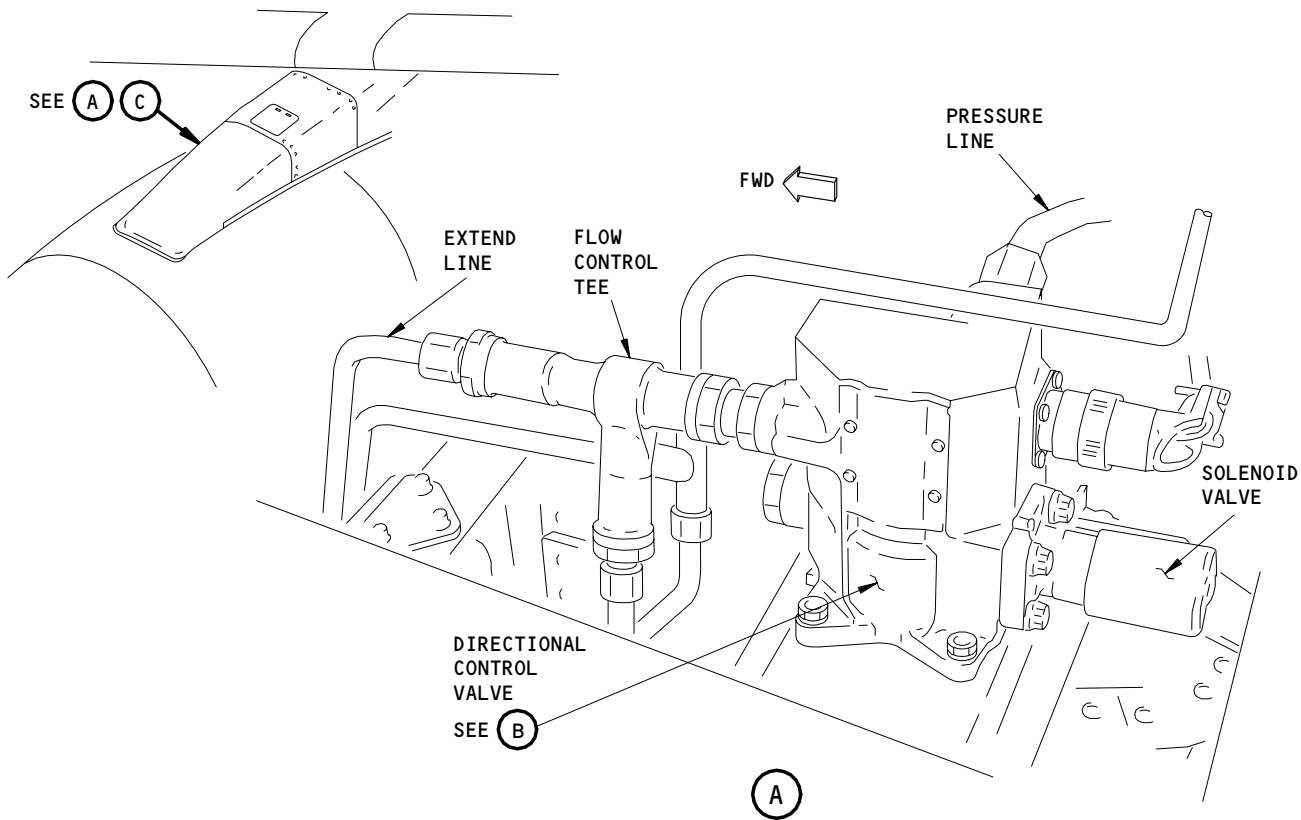
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Directional Control Valve and Flow Control Tee
Figure 2 (Sheet 1)

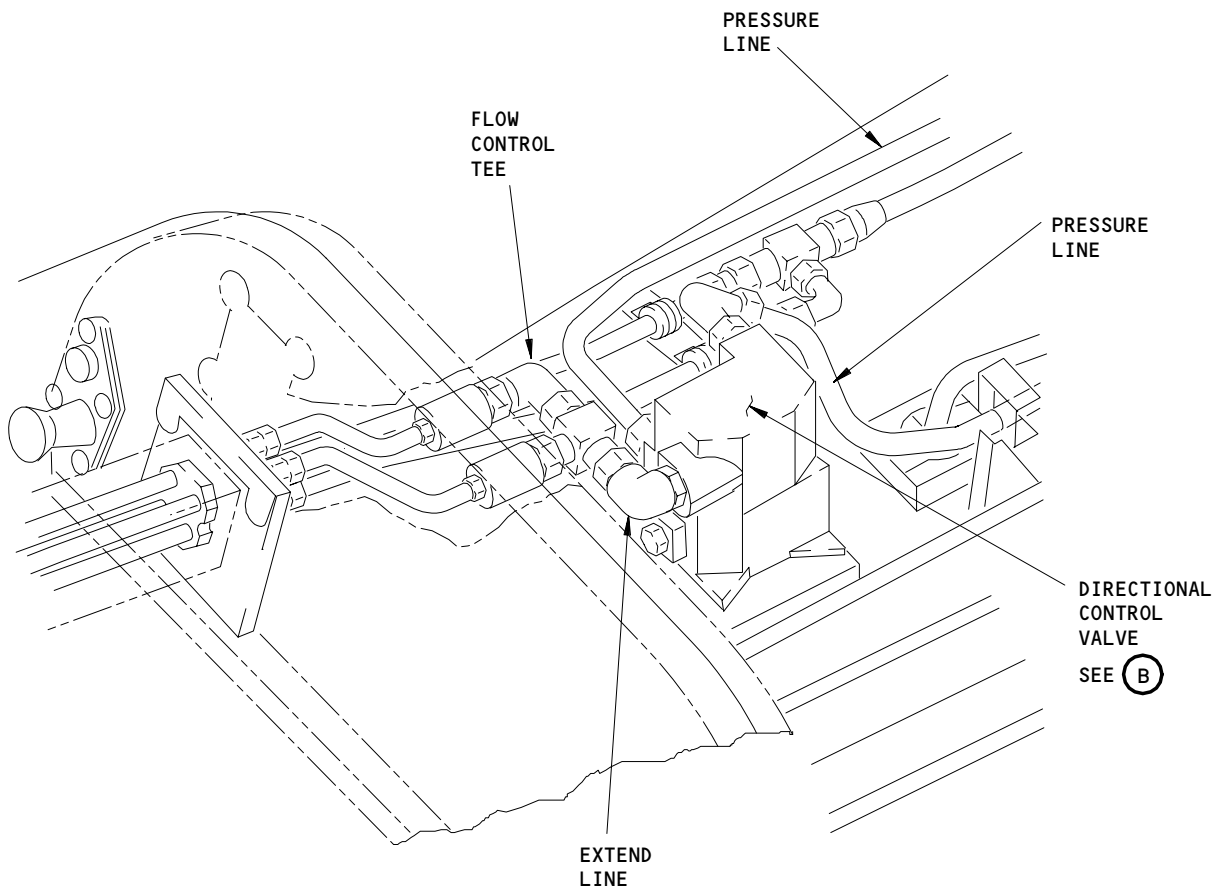
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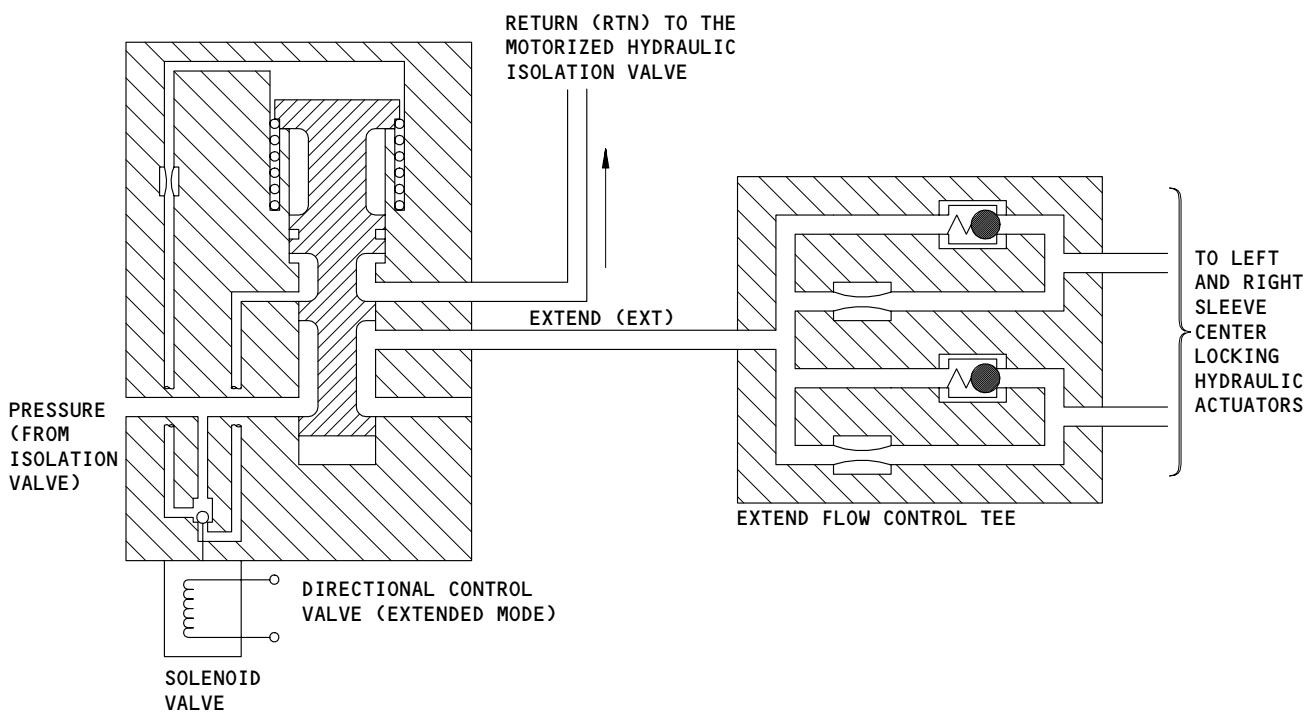
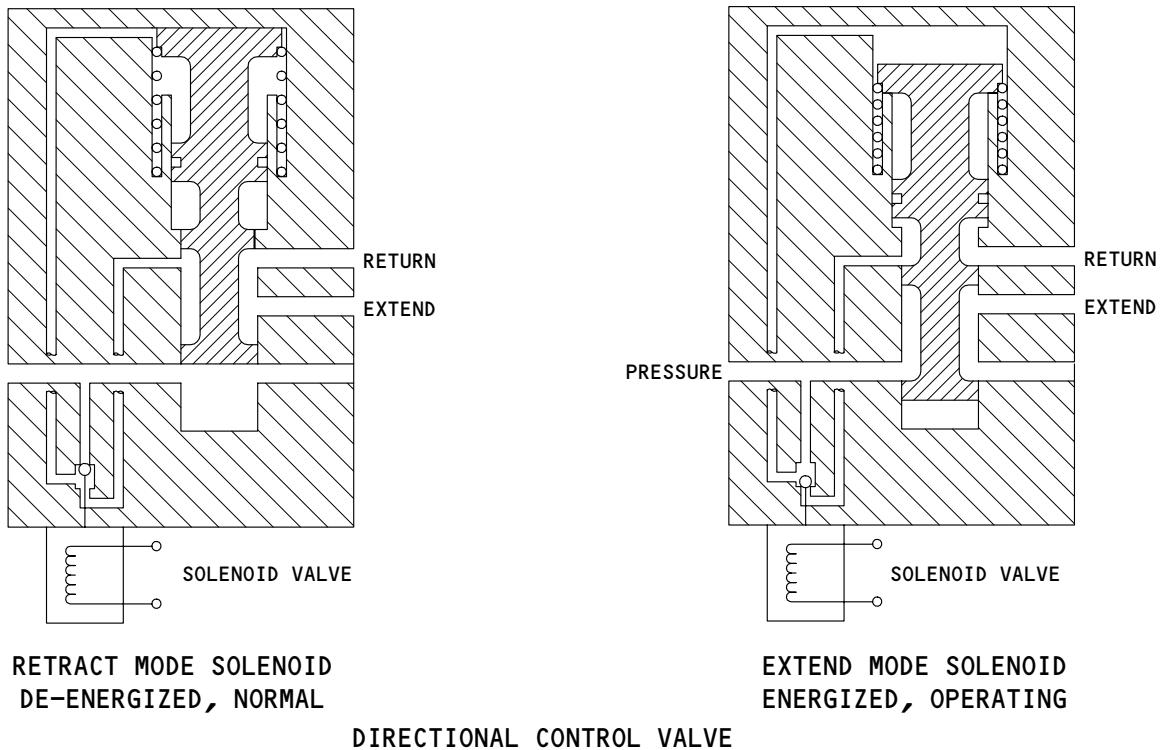
Directional Control Valve and Flow Control Tee
Figure 2 (Sheet 2)

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Directional Control Valve and Flow Control Tees
Figure 2 (Sheet 3)

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- (2) There are limit switches in the motorized isolation valve which control the operation and direction of the electric motor. The motorized isolation valve has a position lever to show if the valve is in the open or closed position. The pressure switch is used for the REV ISLN light disagreement circuit for the thrust reverser indication system.
- D. Synchronizing Cable Locks
- (1) The lower non-locking actuator on each sleeve half is equipped with a synchronizing cable lock. The lock is attached to the threaded end of the actuator. The synchronizing lock is equipped with a 1/4 inch square drive that is inserted into the worm gear and synchronized cable mechanism of the actuator. A rotor and pin lock inside the synchronizing lock holds the synchronizing cable in the locked position unless the synchronizing lock is energized. In the energized condition the solenoid inside the synchronizing lock pulls an armature which in turn pulls the two lock pins away from the teeth of a rotor allowing it and its connected square drive to rotate.
- E. Flow Control Tees
- (1) The flow control system is designed to divide and balance hydraulic fluid flow to both reverser halves after it flows through the DCV. The system contains an extend restrictor tee and a retract restrictor tee. The extend and retract restrictor tees contain flow restrictors and check valves for each reverser half.
- (2) During reverser extension, hydraulic pressure goes through both the extend and retract restrictor tees. During reverser retraction, hydraulic pressure goes through the retract restrictor tee. The extend restrictor tee is connected to the hydraulic system return tube through the DCV and the stow valve.
- F. Thrust Reverser Control Switches and Directional Control Valve Switches (Fig. 3)
- (1) The DCV and the motorized isolation valve are operated by two cam operated microswitches. The first of these switches (S5,S6) is the reverser control switch installed at the pivot of each reverse thrust lever. The second switch is the directional valve switch (S8, S11) which is found below the forward autothrottle quadrant in the microswitch pack. These switches are in series with the fire switch and the air/gnd relays. The switches operate the motorized isolation valve at 10 degrees and the DCV at 29 degrees of reverse thrust lever rotation.
- (2) Data on the microswitch pack, the T/R directional control valve microswitches (S8, S11), and the switch cam operation by the forward autothrottle quadrant are found in the Thrust Management System (AMM 22-32-00).
- G. Thrust Reverser Auto-Restow Proximity Sensor (Fig. 4)
- (1) The thrust reverser auto-restow proximity sensors (S1604,S1605) are installed on the aft side of the thrust reverser torque box. They are installed below each center locking hydraulic actuator on each of the reverser sleeves.

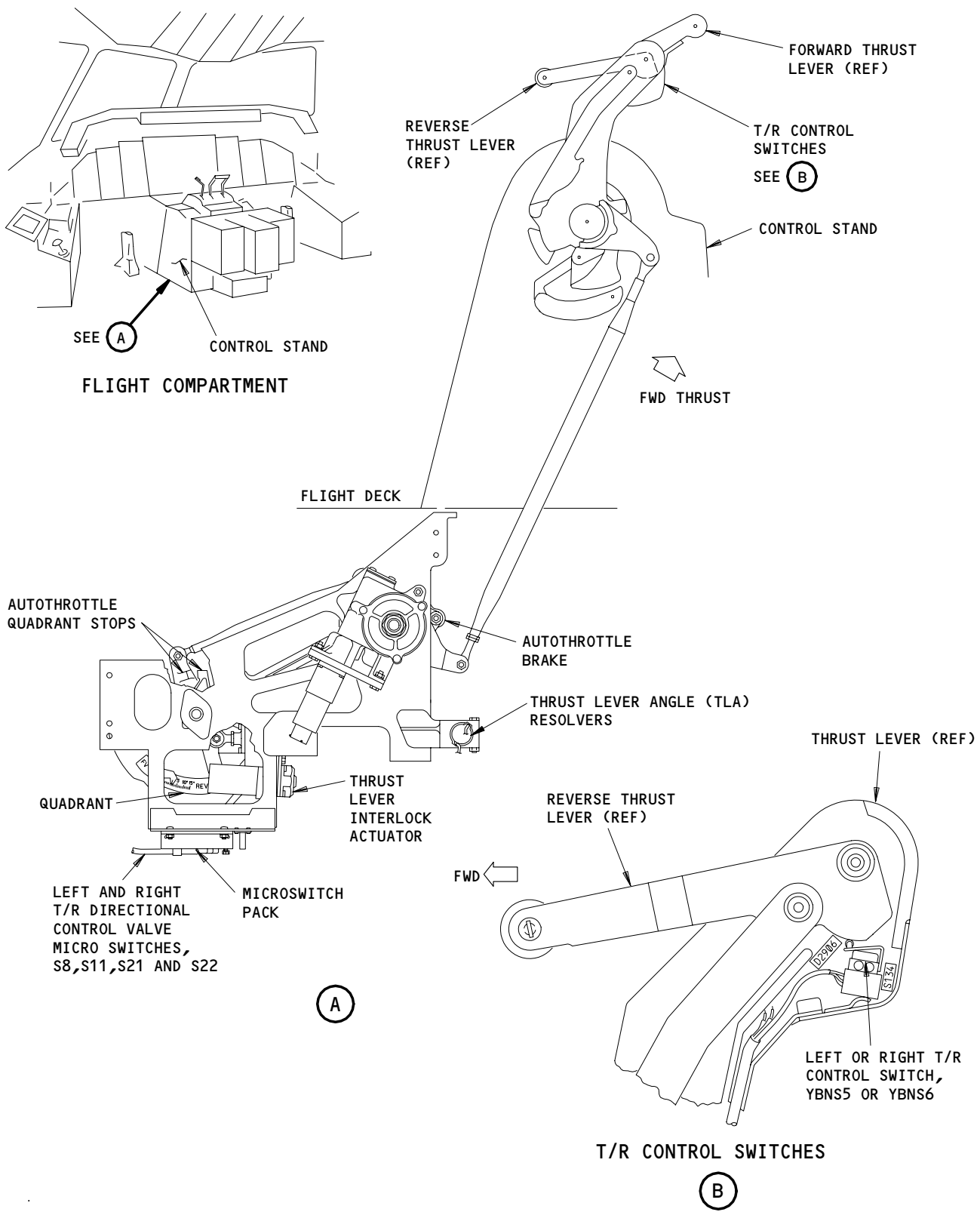
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Thrust Reverser Control Switch and Directional Valve Control Switch
Figure 3

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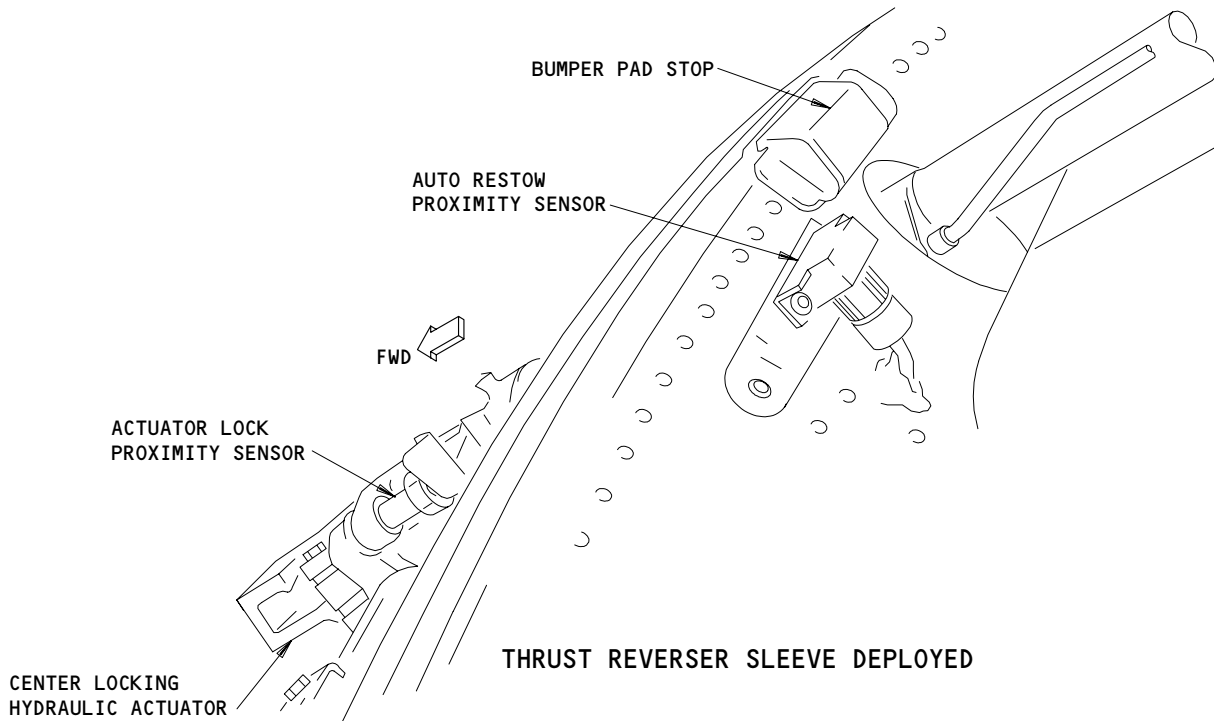
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- (2) The target for the auto-restow proximity sensor is located on the translating sleeve.
- (3) When the sleeve is translated aft from the retracted position, the target is moved out of the sensor's range. This causes a "target far" condition at the proximity switch electronic unit (PSEU).
- (4) The PSEU supplies a ground which energizes the T/R STOW relay (K26, K27). When the T/R STOW relay is energized the auto restow circuit to the stow valve becomes closed. This supplies hydraulic power to the thrust reverser for retraction. After the thrust reverser is retracted, a 5 second time delay in the PSEU stops electrical power to the T/R STOW relay. This does not allow electrical power to go to the stow valve. The 5 second time delay makes sure hydraulic power is available to retract and lock the thrust reverser.
- (5) The proximity sensor removal/installation, sensor target adjustment and fault isolation procedures are found in the Thrust Reverser Indication System (AMM 78-36-00).

3. Operation

A. Functional Description

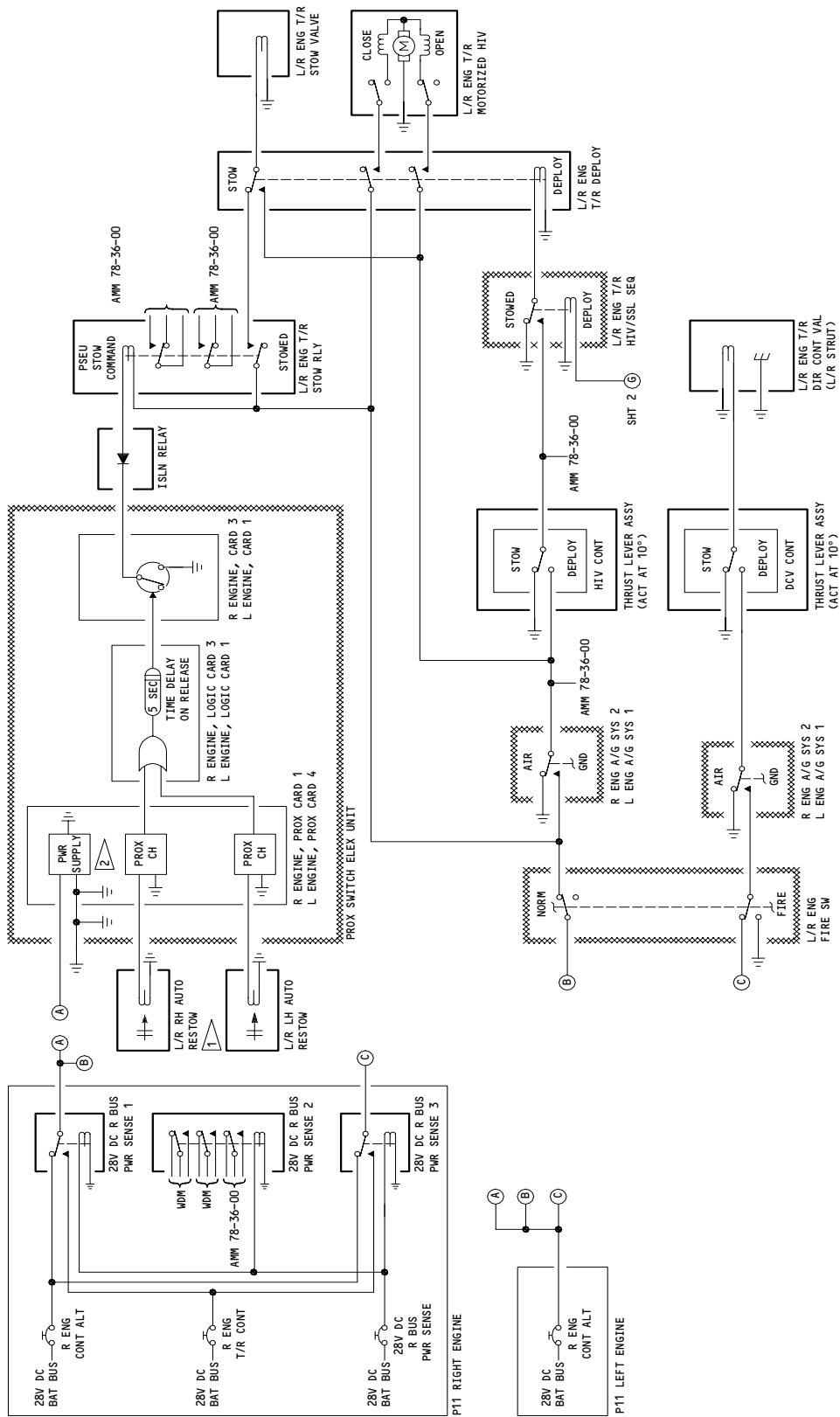
- (1) Thrust Reverser Retracted Position (Fig. 5)



Auto Restow Proximity Sensor
Figure 4

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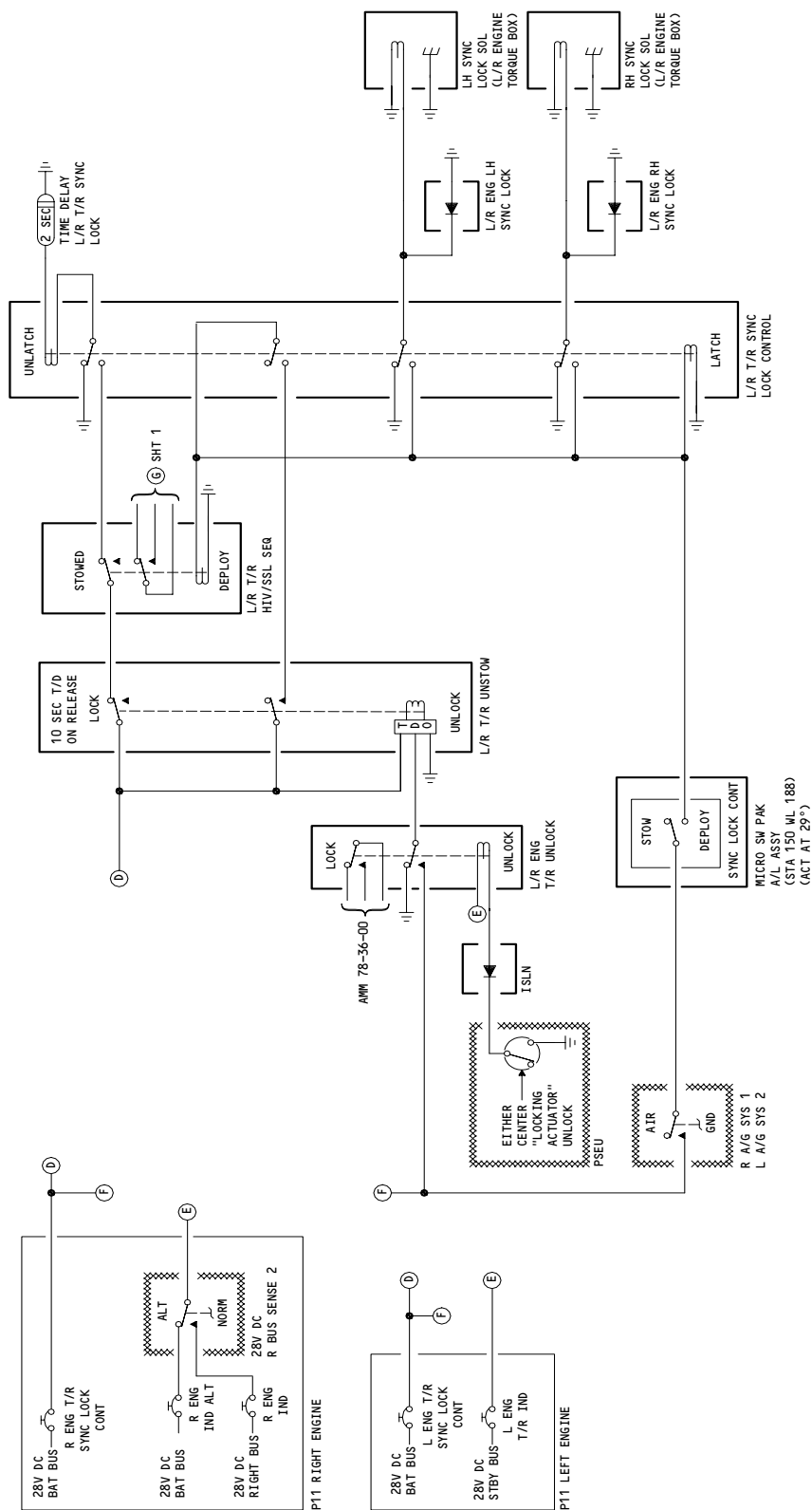


ARROWS SHOW POSITION OF TARGET WHEN T/R STONED
LOGIC "1" = TARGET FAR
LOGIC "0" = TARGET NEAR

Left and Right Engines
Thrust Reverser Control System Schematic (Example)
Figure 5 (Sheet 1)

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Left and Right Engines
Thrust Reverser Control System Schematic (Example 2)
Figure 5 (Sheet 2)

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- (a) When the forward thrust lever is in the idle position, the reverse thrust lever is in the retract position. This puts the thrust reverser in the retracted position. Also, the interlock actuator of the thrust levers is in the retracted position. With the interlock actuator in the retracted position, the forward thrust lever can be advanced but movements of the reverse thrust lever are restricted to the reverse idle range only.
 - (b) The hydraulic actuators are in the retracted position and the center locking hydraulic actuators are locked.
 - (c) The actuator lock proximity sensors on the center locking hydraulic actuators are in the "target near" condition. The actuator deploy proximity sensor on each center locking hydraulic actuator is in the "target far" condition. The auto-restow proximity sensor on each thrust reverser half is in the "target near" condition.
 - (d) The blocker doors of the thrust reverser are in the retracted position. This provides a smooth passage for fan exhaust airflow.
- (2) Thrust Reverser Extension
- (a) The forward thrust levers must be in the idle position before the reverse thrust levers are moved. The reverse thrust levers are pulled up and back from stowed position to the idle detent position.
 - 1) A internal mechanical interlock on the forward/reverse thrust levers prevents movement of the reverse thrust levers unless the forward thrust levers are in the idle position. This mechanical interlock is different from the interlock actuator.
 - 2) The latch on the reverse thrust lever disengages from the forward thrust lever. This allows the thrust lever crank to rotate in the reverse thrust range.
 - 3) The angular displacement of the reverse thrust levers from the retract position to the idle detent position is 42.6 degrees.
 - (b) The control switches of the thrust reverser (S5, S6) are closed in reverse thrust. This operates the motorized isolation valve if:
 - 1) The 28v dc bus power is available
 - 2) The fire handle is in the normal position
 - 3) The airplane is on the ground and the air/gnd relays are in the ground position.
 - (c) When the reverse thrust lever is moved, motion is transmitted through the control rods of the thrust levers to the autothrottle brake and forward quadrant. This actuates the DCV control switches (S8, S11) located in the microswitch pack which energizes the directional control valve (DCV) solenoid circuit.
 - (d) The motorized isolation valve circuit is energized through the thrust reverser control switches and the deploy relay.

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- (e) The synchronizing cable lock circuit is energized through the thrust reverser control switches and the deploy relay. In the energized condition the solenoid inside the sync lock pulls a armature which in turn pulls the two lock pins away from the teeth of a rotor. This allows the synchronizing cables to rotate.
- (f) The stow valve circuit is closed through the deploy relay.
- (g) The DCV circuit goes through an air/ground relay and a fire switch, through the DCV control switches in the autothrottle microswitch pack, to the DCV solenoid.
- (h) When the stow valve solenoid is energized, the pilot valve is opened and hydraulic fluid flows to one end of the arming spool. This moves the the spool to the open position. The PRESS opening is then connected to the CYLINDER opening. This causes hydraulic fluid to flow to restrictor tees on the retract side of the hydraulic actuators. The stow valve RTN opening is connected to the CONT opening. The CONT opening is connected to the RTN opening of the DCV.
- (i) When the motorized isolation valve circuit is closed, the limit switches are set in the "valve open" position. The motor opens the valve. The limit switches are reset to the close position when the valve reaches the "valve open" position and the motor stops.
- (j) When the DCV solenoid is energized, the pilot valve is opened. This moves the spool to the extend side. Hydraulic fluid then flows to the EXT opening of the DCV and to the extend restrictor tees. The DCV RTN port is not connected to the thrust reverser actuators for extend operation.
- (k) When fluid flows through the restrictor tees, the rod end and head ends of the hydraulic actuators become pressurized. The same pressure exists at the head and rod ends of all actuators.
- (l) Hydraulic fluid goes through the DCV to the extend restrictor tee. The fluid then goes into the head end of the center locking hydraulic actuators through a device that locks the reverser. As pressure increases in the lock, a piston moves which causes a lever to move. When the lever moves it disengages the lock and allows hydraulic fluid to flow into the head end of the center locking hydraulic actuators. When the fluid pressure has increased enough, both the head end and rod end of the actuator will be at equal pressure. Since the head end of the actuator has a cross sectional area that is twice that of the rod end, there is sufficient force to move the translating sleeve aft at a fast rate. When the translating cowl approaches full extension, a mechanism slows the movement of the cowl. This decreases the loads at the rod end when the actuator extends to the fully extended position.

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- (m) The upper and lower actuators are synchronized with the center locking hydraulic actuator. Hydraulic fluid that goes into the head end of the center actuator flows directly to the head end of the upper and lower actuators. This causes the pressure to be equal in all three actuators so they translate aft at an equal rate.
 - (n) A flexible driveshaft system makes sure all three actuators move the sleeve at the same rate. The flexshafts are connected to the actuator's gear train. As each actuator operates, movement of the piston at the head end forces an Acme nut aft. The Acme nut causes a threaded shaft to rotate at a rate in proportion to the piston movement. A pinion gear rotates with the shaft which then moves a worm gear. The worm gear is connected to the flexshafts. The flexshafts are routed through hydraulic tubing which connects the head ends of the upper and lower non-locking actuators with the head end of the center locking hydraulic actuator.
- (3) Thrust Reverser Retraction
- (a) To retract the thrust reverser, the reverse thrust lever is moved to the idle position. This causes the thrust reverser control switch to open, which opens the circuit to the deploy relay. The motorized isolation valve circuit is opened. The auto restow circuit keeps power on the stow valve, which was energized when the translating sleeve began its movement aft. A five second delay keeps the motorized isolation valve energized after the sleeve is fully retracted. This allows the center locking hydraulic actuator to fully lock.
 - (b) Hydraulic power from the stow valve to the retract side of the hydraulic actuators retracts the thrust reverser.
 - (c) When the motorized isolation valve circuit is opened, the limit switches are set to the " valve closed" position. The motor closes the valve. The limit switches are reset to the open position when the valve reaches the "valve closed" position and the motor stops.
 - (d) Four relays control power to the sync lock solenoids during the stow cycle. The following relays must be energized:
 - 1) Unlock relay

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- 2) Unstow relay
- 3) Hydraulic isolation valve / Sync lock sequencing relay
- 4) Sync lock control relay
- (e) When the thrust reverser control switch in the thrust lever is moved to the off position it opens the electrical circuit to the deploy relay. The deploy relay de-energizes and opens the circuit to the sync locks. This causes the sync lock solenoid to de-energize and lock.
- (f) The auto-restow proximity sensor, which is located on the aft torque box below the center locking hydraulic actuator, reads a "target far" condition. A "target far" signal is sent to the proximity cards in the proximity switch electronic unit (PSEU) any time the translating sleeve is not fully retracted.
- (g) The "target far" (logic 1) or "target near" (logic 0) signals from the left or right auto-restow proximity sensors are sent to an OR gate in the PSEU logic card. An input of logic 1 from either proximity sensor causes a logic 1 output. After a 5 second time delay the PSEU driver card grounds the T/R STOW relay circuit. The T/R STOW relay (K26, K27) energizes and completes an electrical circuit to apply hydraulic power to the motorized isolation valve.
- (h) When the reverse thrust lever is moved to the idle position, the directional control valve circuit opens. This de-energizes the DCV solenoid. The DCV is spring operated to the closed position, which allows hydraulic fluid to flow from the actuator head ends through the return line to the hydraulic reservoir. This causes the actuators to retract at a rapid rate.

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THRUST REVERSER CONTROL SYSTEM

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
CIRCUIT BREAKER -	4		FLT COMPT, P11	
L ENG T/R CONT, C1482		1	11D14	*
R ENG T/R CONT, C1483		1	11L33	*
R ENG T/R CONT ALTN, C1479		1	11D33	*
L ENG T/R SSL CONT, C1576		1	11D18	
R ENG T/R SSL CONT, C1577		1	11C21	
28V DC R BUS PWR SENSE, C1486		1	11M30	*
DIODE -				
L ENG L SSL, R702		1		
R ENG L SSL, R703		1		
L ENG R SSL, R704		1		
R ENG R SSL, R705		1		
DIODE - ISOLATION			119AL, MAIN EQUIP CTR, SHELF E1-2, TB130D	*
L T/R HIV ISLN, R228		1		
R T/R HIV ISLN, R230		1		
LEVER - (FIM 76-11-00/101) THRUST, M985				
MODULE - RELAY		1	119AL, MAIN EQUIP CTR, SHELF E1-4 OR E2-6	78-36-03
RELAY -				
NO. 1 28V DC R BUS PWR SENSE, K853	4	1	FLT COMPT, P11-5	*
NO. 2 28V DC R BUS PWR SENSE, K854	4	1	FLT COMPT, P11-5	*
NO. 3 28V DC R BUT PWR SENSE, K898	4	1	FLT COMPT, P11-5	*
RELAY - (FIM 31-01-33/101) AIR/GND SYS 2, K520				
L T/R HIV/SSL SEQ, K2186				
L T/R UNSTOW, K2182				
L T/R SSL CONTROL, K2188				
R T/R HIV/SSL SEQ, K2185				
R T/R UNSTOW, K2181				
R T/R SSL CONTROL, K2187				
RELAY - (FIM 31-01-36/101)			P36	
L ENG T/R DEPLOY, K2164				
L ENG T/R STOW RLY, K26				
L ENG T/R UNLOCK, K165				
SYS NO. 1 AIR/GND, K178				
SYS NO. 1 AIR/GND, K895				
SYS NO. 1 AIR/GND, K2155				
RELAY - (FIM 31-01-37/101)			P37	
R ENG T/R DEPLOY, K2165				
R ENG T/R STOW RLY, K27				
R ENG T/R UNLOCK, K166				
SYS NO. 2 AIR/GND, K204				
SYS NO. 2 AIR/GND, K2157				
RELAY - (FIM 78-36-00/101), M1987				
SENSOR - L ENG, L T/R SLEEVE AUTO RESTOW, S1604	5	1	413AL, L T/R SLEEVE	78-36-01
SENSOR - R ENG, L T/R SLEEVE AUTO RESTOW, S1604	5	1	423AL, L T/R SLEEVE	78-36-01
SENSOR - L ENG, R T/R SLEEVE AUTO RESTOW, S1605	5	1	414AR, R T/R SLEEVE	78-36-01
SENSOR - R ENG, R T/R SLEEVE AUTO RESTOW, S1605	5	1	424AR, R T/R SLEEVE	78-36-01

* SEE THE WDM EQUIPMENT LIST

 Thrust Reverser Control System - Component Index
 Figure 101 (Sheet 1)

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COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
SOLENOID - L ENG T/R DIRECTIONAL CONTROL VALVE	1,2	1	431BT, DIRECTIONAL CONTROL VALVE, V342	78-34-09
SOLENOID - R ENG T/R DIRECTIONAL CONTROL VALVE	1,2	1	441BT, DIRECTIONAL CONTROL VALVE, V343	78-34-09
SOLENOID - L ENG T/R STOW VALVE	3	1	437BL, ISOLATION VALVE, V106	78-34-08
SOLENOID - R ENG T/R STOW VALVE	3	1	447BL, ISOLATION VALVE, V107	78-34-08
SWITCH - L T/R SSL CONT, S21	4	1	M966, MICROSWITCH PACK	22-32-04
R T/R SSL CONT, S22	4	1	M966, MICROSWITCH PACK	22-32-04
SWITCH - (FIM 26-21-00/101) L ENGINE FIRE, S37				
R ENGINE FIRE, S38				
SWITCH - (FIM 78-36-00/101) L T/R HYD PRESS, S330				
R T/R HYD PRESS, S331				
SWITCH - L ENGINE, L T/R AUTO RESTOW, S1604	5	1	413AL, LEFT FORWARD BULKHEAD, AT LH THRUST REVERSER LOCKING ACTUATOR	*
SWITCH - R ENGINE, L T/R AUTO RESTOW, S1604	5	1	423AL, LEFT FORWARD BULKHEAD, AT LH THRUST REVERSER LOCKING ACTUATOR	*
SWITCH - L ENGINE, R T/R AUTO RESTOW, S1605	5	1	414AR, RIGHT FORWARD BULKHEAD AT RH THRUST REVERSER LOCKING ACTUATOR	*
SWITCH - R ENGINE, R T/R AUTO RESTOW, S1605	5	1	424AR, RIGHT FORWARD BULKHEAD AT RH THRUST REVERSER LOCKING ACTUATOR	*
SWITCH - R ENG REV THRUST DIRECTIONAL VALVE MICRO, S8	4	1	FLT COMPT, MICRO SW PK, M966	22-32-04
SWITCH - L ENG REV THRUST DIRECTIONAL VALVE MICRO, S11	4	1	FLT COMPT, MICRO SW PK, M966	22-32-04
SWITCH - L T/R CONT, YBNS5	4	1	FLT COMPT, THRUST LEVER ASSY, M985	78-34-06
SWITCH - R T/R CONT, YBNS6	4	1	FLT COMPT, THRUST LEVER, M985	78-34-06
SYNC LOCK - L ENG T/R (LH V170, RH V171)	6	2	413AL,414AR, FAN COWL	78-34-13
SYNC LOCK - R ENG T/R (LH V170, RH V171)	6	2	423AL,424AR, FAN COWL	78-34-13
TEE - L ENGINE, THRUST REVERSER FLOW CONTROL	1,2	1	431AT,413AL,414AR	78-34-02
TEE - R ENGINE, THRUST REVERSER FLOW CONTROL	1,2	1	441AT,423AL,424AR	78-34-02
UNIT - (FIM 32-09-00/101) ELEX PROX SW, M162		1		
VALVE - L ENGINE, THRUST REVERSER DIRECTIONAL CONTROL, V342	1,2	1	431AT	78-34-01
VALVE - R ENGINE, THRUST REVERSER DIRECTIONAL CONTROL, V343	1,2	1	441AT	78-34-01
VALVE - L ENGINE, T/R MOTORIZED ISOLATION VALVE, V167	3	1	437BL,437BR	78-34-10
VALVE - R ENGINE, T/R MOTORIZED ISOLATION VALVE, V168	3	1	447BL,447BR	78-34-10
VALVE - L ENGINE, T/R STOW, V106	3	1	437BL	78-34-05
VALVE - R ENGINE, T/R STOW, V107	3	1	447BL	78-34-05

* SEE THE WDM EQUIPMENT LIST

Thrust Reverser Control System - Component Index
Figure 101 (Sheet 2)

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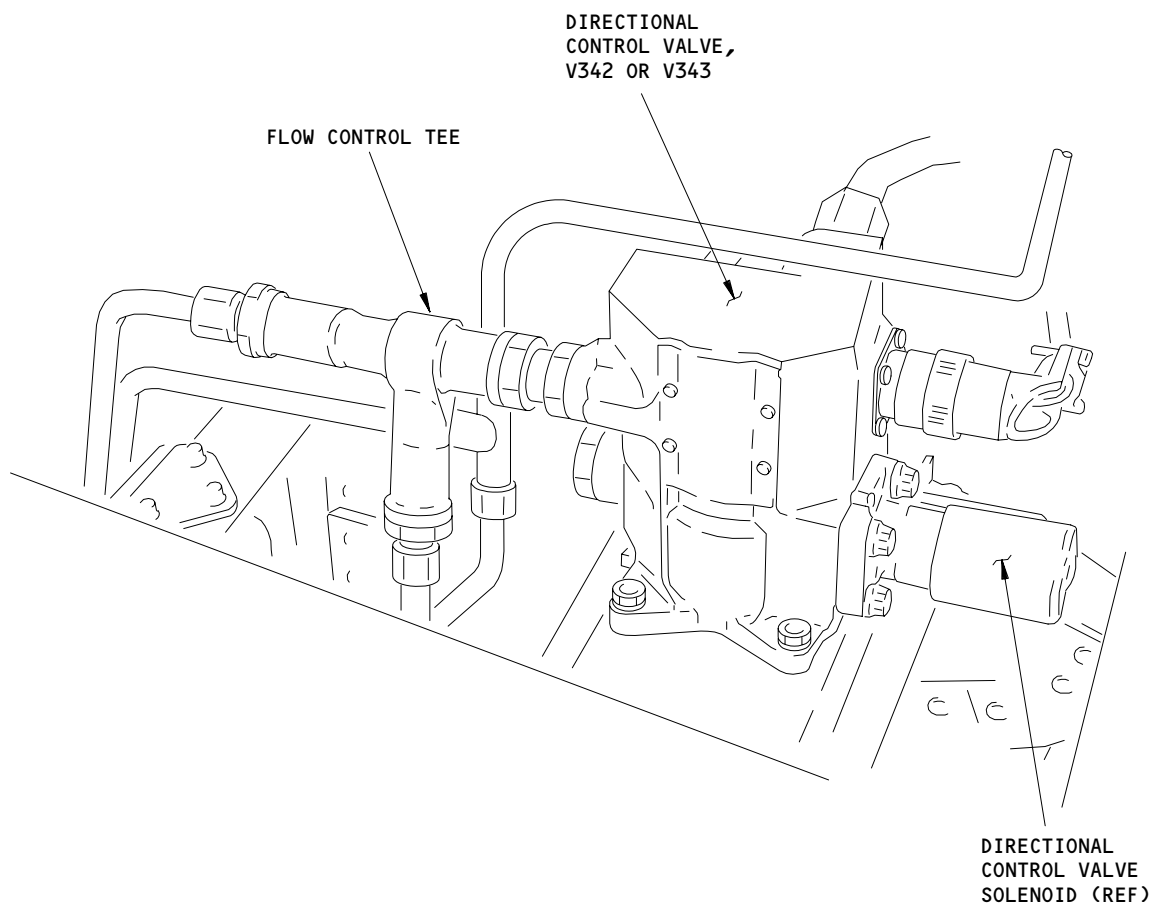
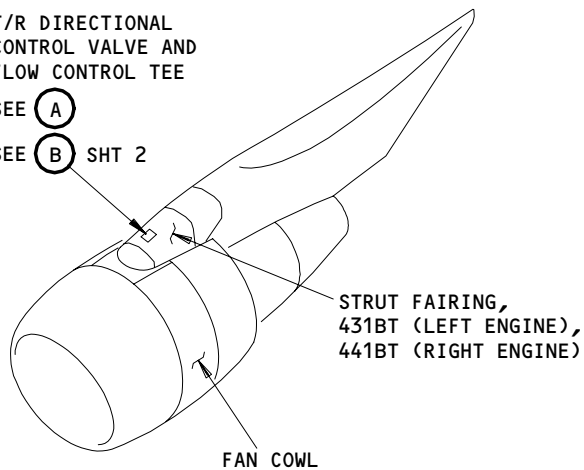
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T/R DIRECTIONAL
CONTROL VALVE AND
FLOW CONTROL TEE

SEE (A)

SEE (B) SHT 2



LEFT OR RIGHT ENGINE T/R DIRECTIONAL
CONTROL VALVE AND FLOW CONTROL TEE

(A)

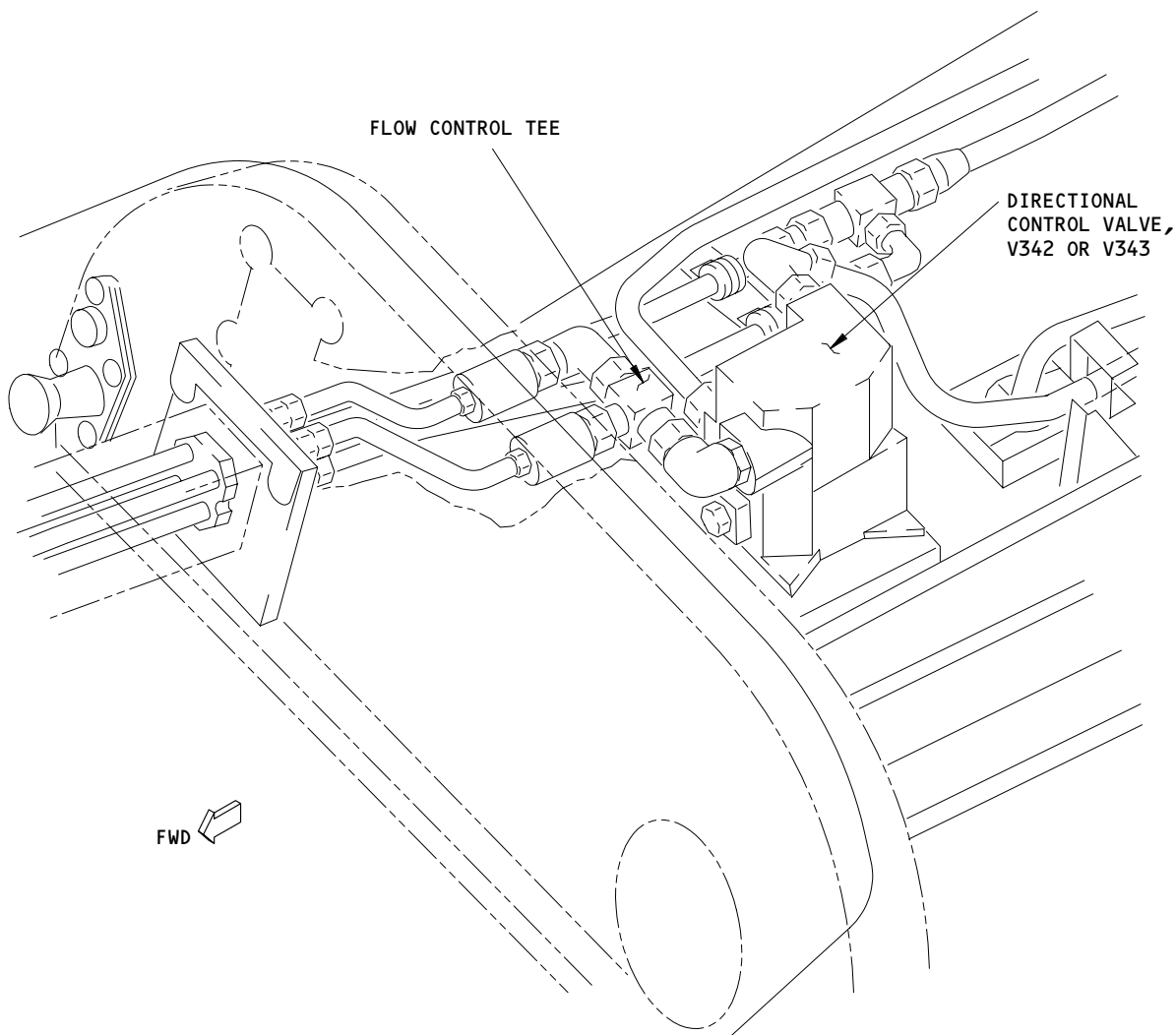
Thrust Reverser Control System - Component Location
Figure 102 (Sheet 1)

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LEFT OR RIGHT ENGINE T/R DIRECTIONAL
 CONTROL VALVE AND FLOW CONTROL TEE

(B)

Thrust Reverser Control System - Component Location (Detail From Sht 1)
 Figure 102 (Sheet 2)

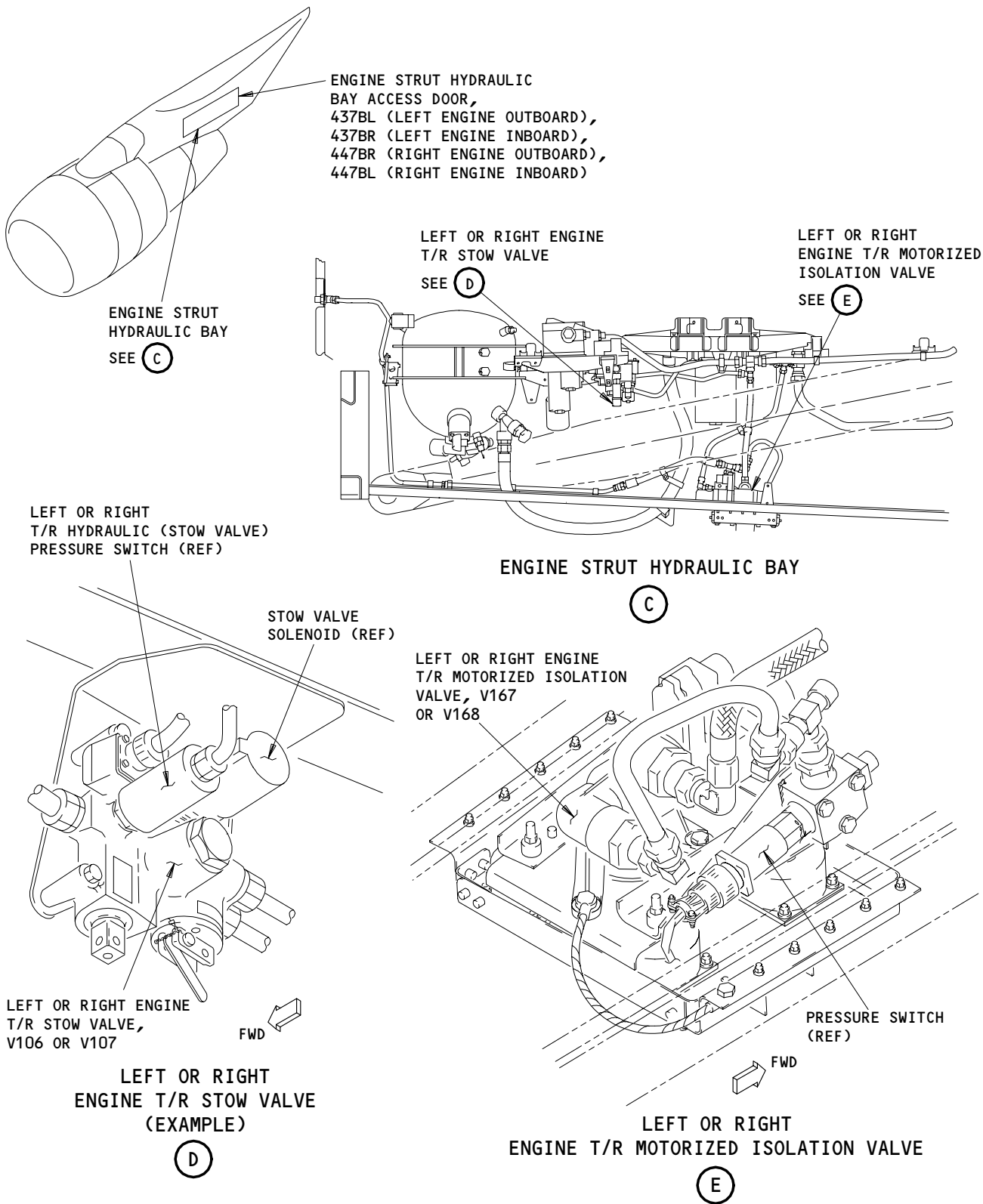
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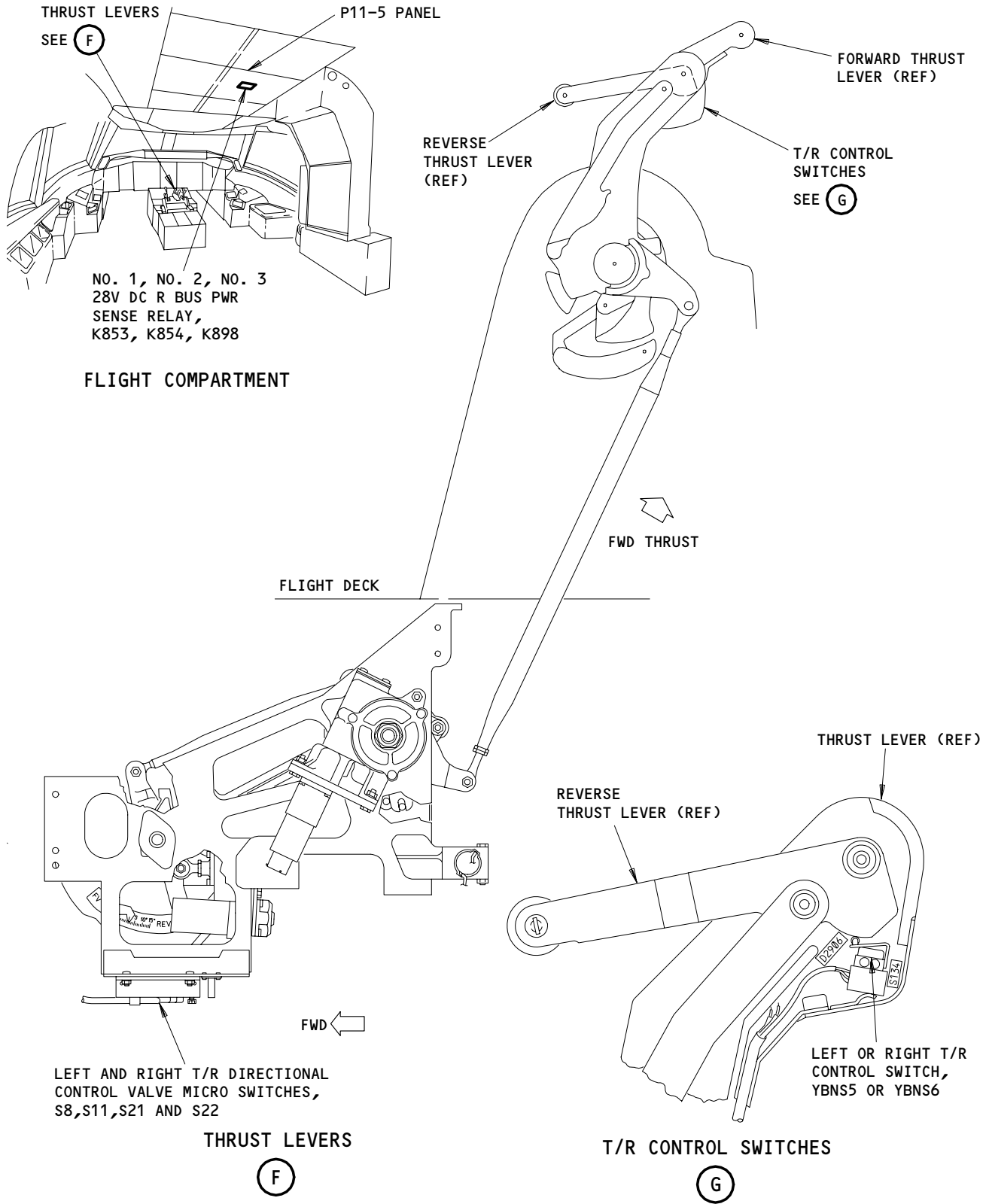
Trust Reverser Control System - Component Location
Figure 102 (Sheet 3)

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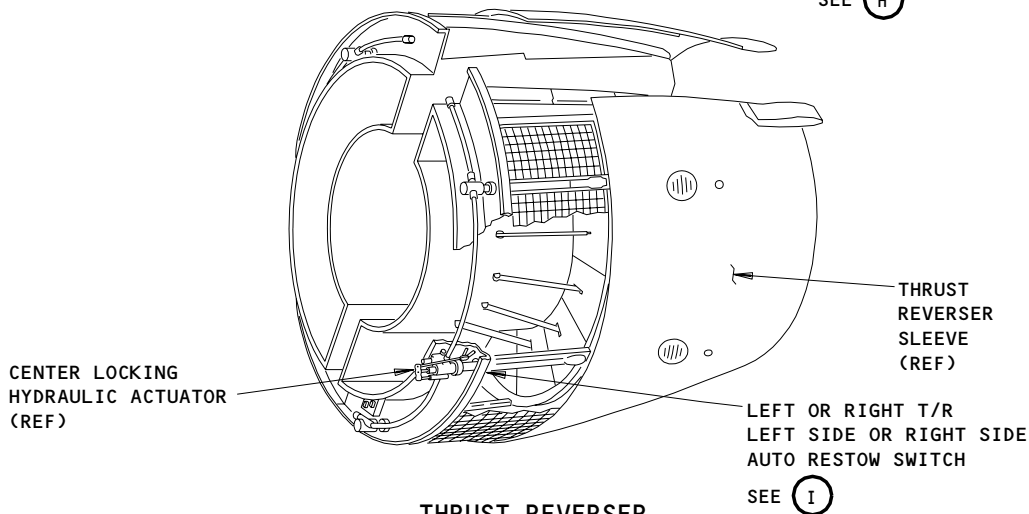
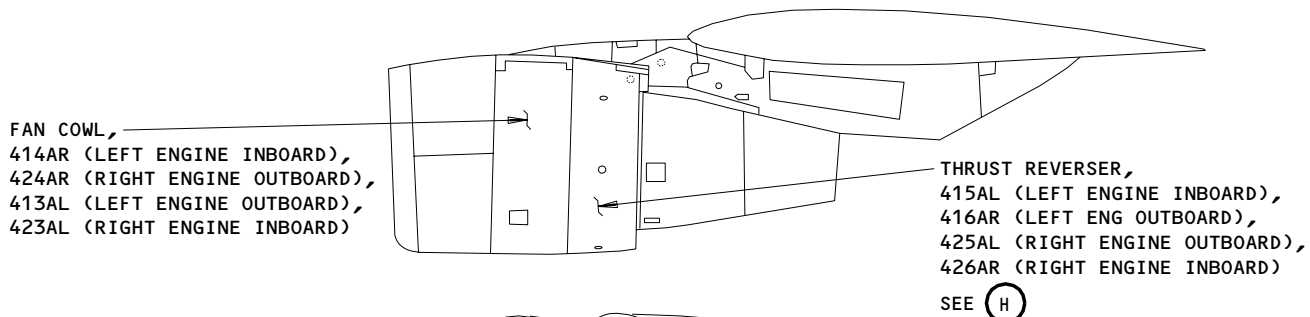


Thrust Reverser Control System - Component Location
Figure 102 (Sheet 4)

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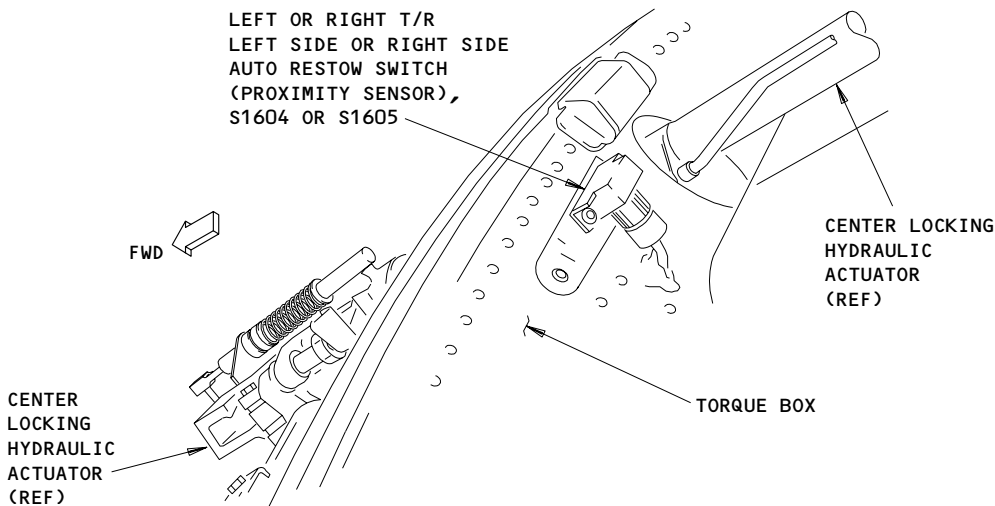
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THRUST REVERSER (SLEEVE EXTENDED)

(H)



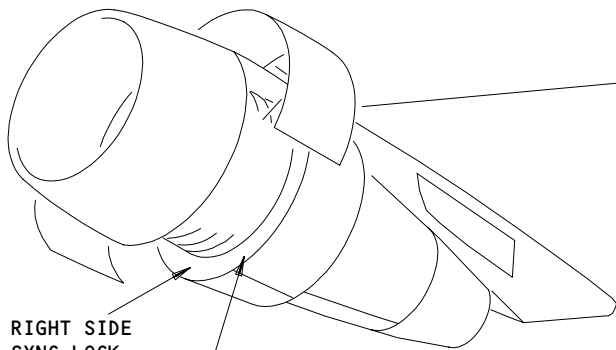
LEFT OR RIGHT T/R LEFT SIDE OR RIGHT SIDE AUTO RESTOW SWITCH (THRUST REVERSER SLEEVE EXTENDED)

(I)

**Thrust Reverser Control System - Component Location
Figure 102 (Sheet 5)**

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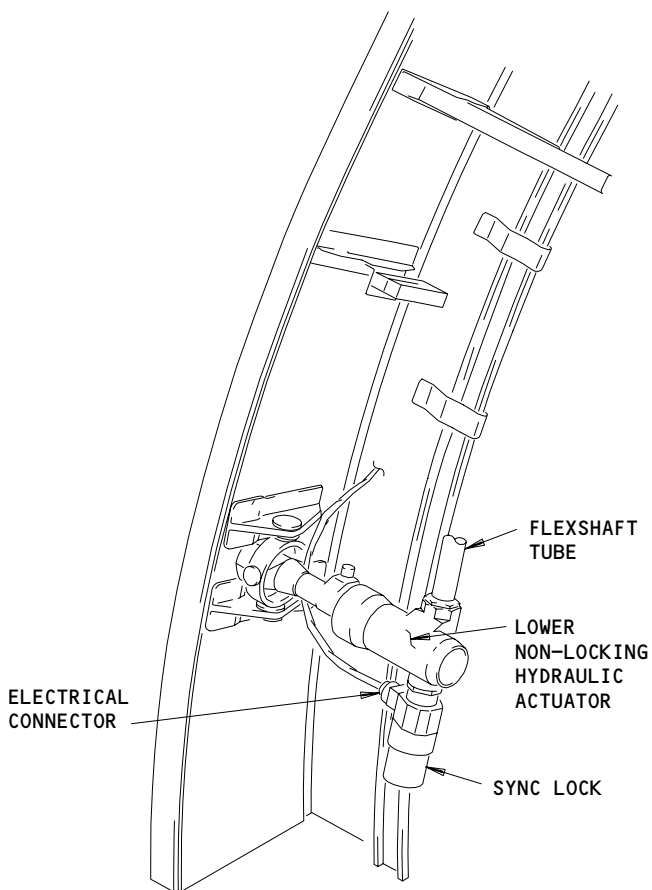


RIGHT SIDE
 SYNC LOCK

SEE (J)

LEFT SIDE
 SYNC LOCK

SEE (K)



ELECTRICAL
 CONNECTOR

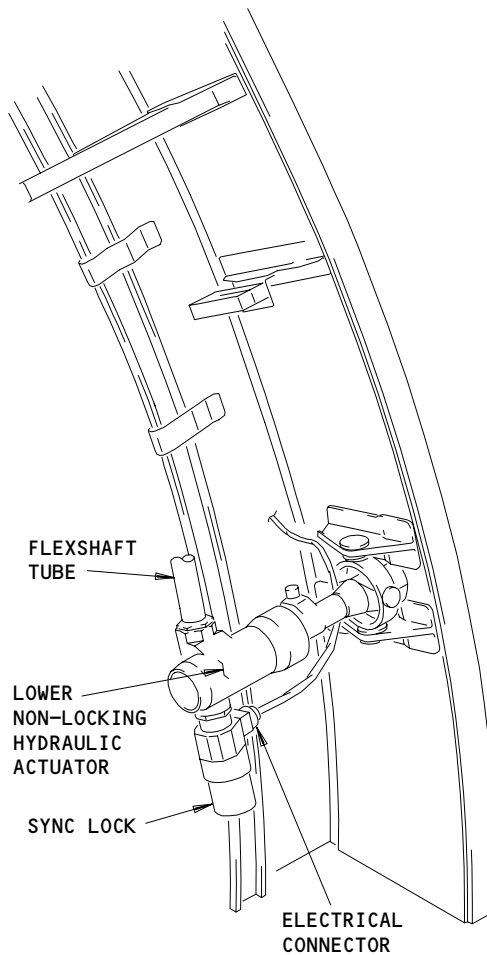
FLEXSHAFT
 TUBE

LOWER
 NON-LOCKING
 HYDRAULIC
 ACTUATOR

SYNC LOCK

RIGHT SIDE

(J)



FLEXSHAFT
 TUBE

LOWER
 NON-LOCKING
 HYDRAULIC
 ACTUATOR

SYNC LOCK

ELECTRICAL
 CONNECTOR

LEFT SIDE

(K)

Thrust Reverser Control System - Component Location
 Figure 102 (Sheet 6)

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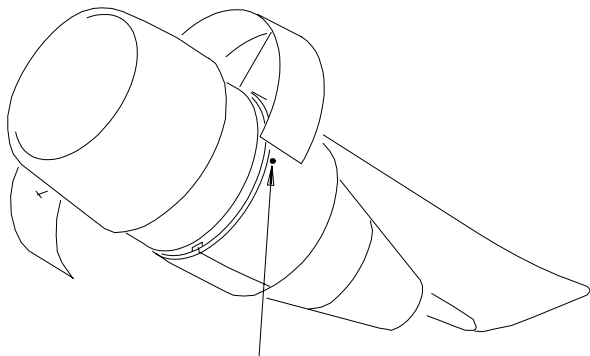
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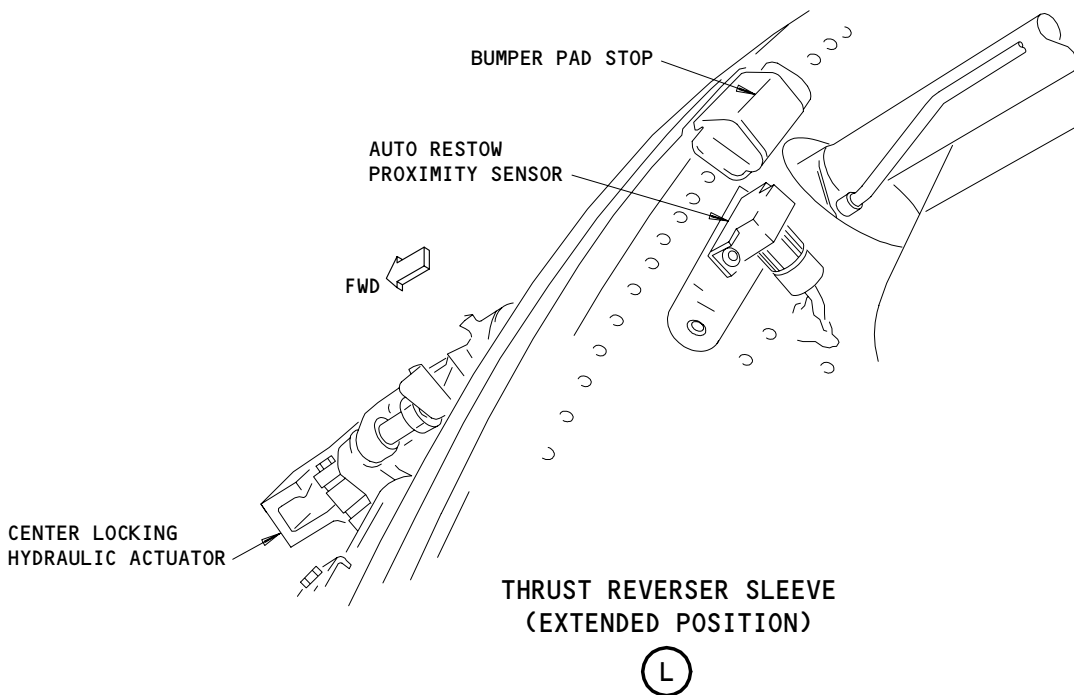
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THRUST REVERSER SLEEVE
SEE (L)



Thrust Reverser Control System - Component Location
Figure 102 (Sheet 7)

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D211593

THRUST REVERSER DIRECTIONAL CONTROL VALVE – REMOVAL/INSTALLATION

1. General

- A. This procedure has two tasks. The first task gives instructions to remove the directional control valve for the thrust reverser. The second task gives instructions to install the directional control valve for the thrust reverser.

TASK 78-34-01-004-001-N00

2. Directional Control Valve Removal

A. Equipment

- (1) Container, Hydraulic fluid resistant - 5 gallons

B. References

- (1) AMM 27-61-00/201, Spoiler/Speedbrake Control System
- (2) AMM 29-11-00/201, Main (Left, Right and Center) Hydraulic Systems
- (3) AMM 54-52-01/401, Strut Fairings
- (4) AMM 78-31-00/201, Thrust Reverser System
- (5) AMM 78-34-02/401, Thrust Reverser Flow Control Tee

C. Access

- (1) Location Zones
 - 430 Left Nacelle Strut
 - 440 Right Nacelle Strut

D. Prepare to Remove the Directional Control Valve

S 044-049-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR SPEEDBRAKE CONTROL SYSTEM. IF YOU DO NOT DO THIS, THE SPOILERS CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (1) Do the deactivation procedure for the Speedbrake Control System (AMM 27-61-00/201).

S 864-050-N00

- (2) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

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S 864-051-N00

- (3) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

S 044-052-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.

- (4) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 864-053-N00

- (5) Release the pressure in the main hydraulic system and reservoir for the applicable strut (AMM 29-11-00/201).

S 014-005-N00

- (6) Remove the forward strut fairing (AMM 54-52-01/401).

E. Remove the Directional Control Valve (Fig. 401)

S 024-064-N00

- (1) Do these steps to remove the DCV with large valves and tee installed in the extend port.
 - (a) Disconnect the electrical connector (6) from the aft face of the directional control valve (8).
 - (b) Install the protection caps on the electrical connector (6) and its receptacle on the directional control valve (8).

CAUTION: BE PREPARED TO CATCH THE HYDRAULIC FLUID IN THE APPLICABLE CONTAINERS WHEN YOU DISCONNECT THE HYDRAULIC LINES. IF THE HYDRAULIC FLUID FALLS ON THE AIRPLANE OR THE ENGINE, QUICKLY CLEAN THE AIRPLANE OR THE ENGINE. IF YOU DO NOT DO THIS, THE HYDRAULIC FLUID CAN CAUSE DAMAGE TO THE AIRPLANE OR THE ENGINE.

- (c) Disconnect the hydraulic pressure line (16) from the directional control valve (8).

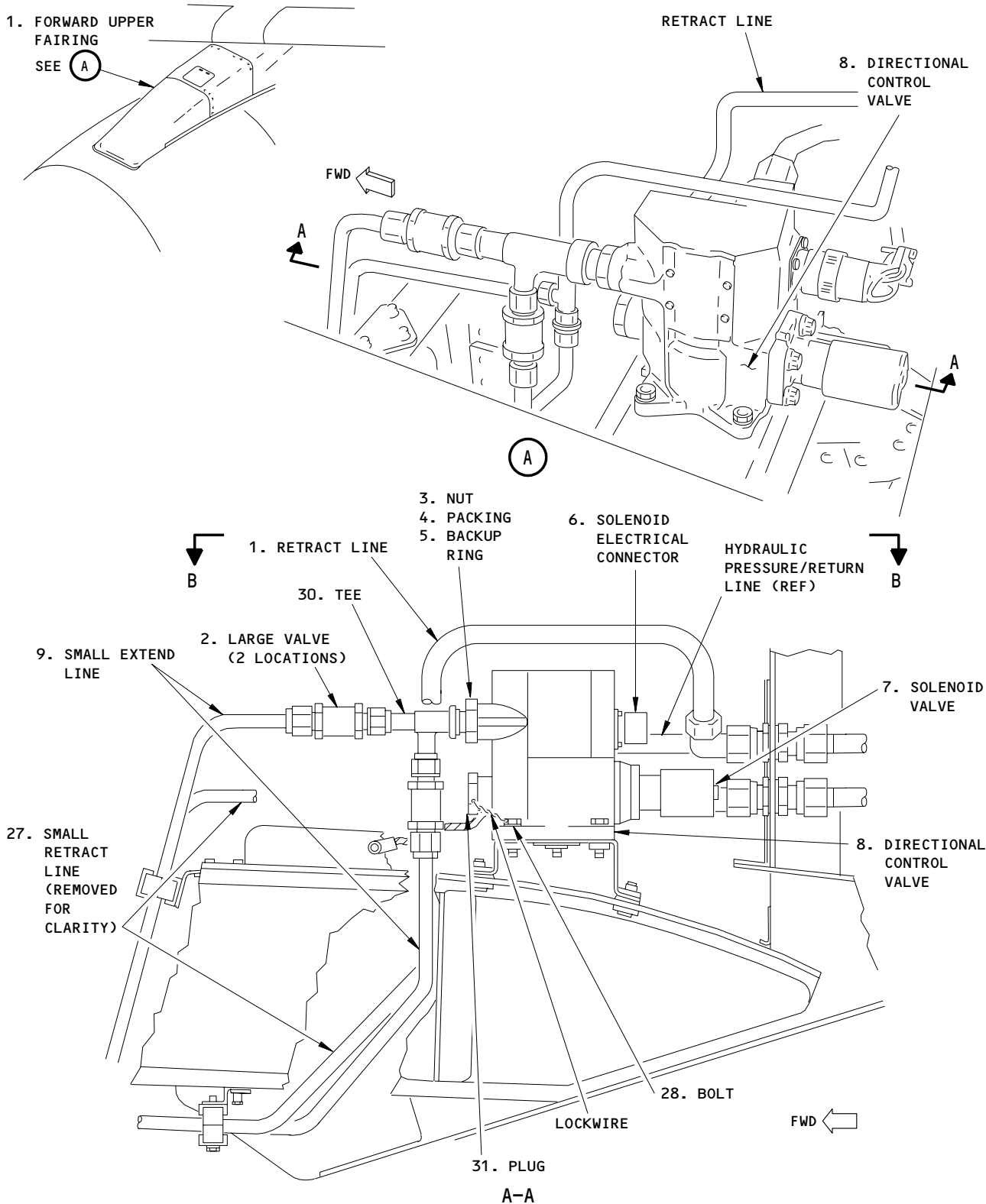
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Thrust Reverser Directional Control Valve Installation
Figure 401 (Sheet 1)

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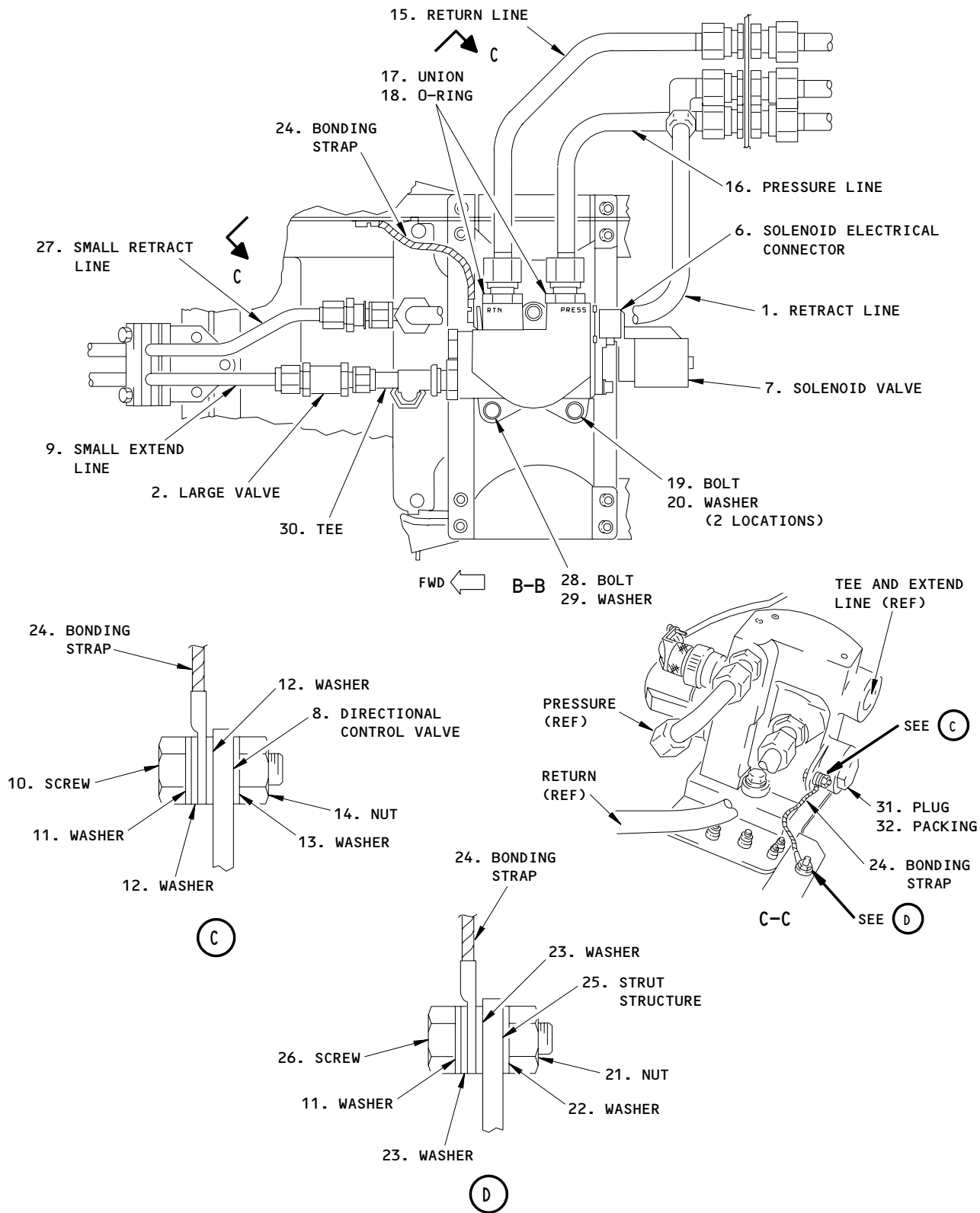
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Thrust Reverser Directional Control Valve Installation
Figure 401 (Sheet 2)

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- (d) Disconnect the hydraulic return line (15) from the directional control valve (8).
- (e) Remove the large valves (2) from the extend port in the directional control valve (AMM 78-34-02/401).
- (f) Disconnect the bonding strap (24) from the directional control valve (8).

NOTE: The bonding strap (24) is found below the forward hydraulic connection.

- 1) Remove the screw (10), washer (11), washers (12) on each side of the strap, washer (13) under the nut, and nut (14) to disconnect the bonding strap (24).
- (g) Remove the directional control valve (8).
 - 1) Remove the lockwire between the plug (31) and the bolt (34).
 - 2) Remove the long bolt (34) and the washer (35).
 - 3) Remove the remaining two short bolts (19) and two washers (20) that attach the directional control valve (8) to the strut bracket.
- (h) Remove the hydraulic fittings from the ports on the directional control valve (8).
 - 1) Remove the tee (30) from the extend port on the directional control valve (8).
 - a) Loosen the nut (3) and remove the tee (30) from the directional control valve (8).
 - b) Remove the nut (3), packing (4) and a backup ring (5) from the tee (30).
 - c) Discard the packing (4).
 - 2) Remove the two unions (17) and o-rings (18) from the hydraulic pressure and return ports on the directional control valve (8).
 - a) Discard the o-rings (18).
 - 3) Remove a plug (31) and packing (32) from the return port in the directional control valve (8).
 - a) Discard the packing (4).
- (i) Install the protection plugs and covers on the hydraulic lines and ports.
 - 1) Remove the bolt (119) and the washer (120).

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TASK 78-34-01-404-019-N00

3. Directional Control Valve Installation

A. Equipment

- (1) Bonding Multimeter

B. Consumable Materials

- (1) D00196 Hydraulic Fluid - BMS 3-11 (Type IV, Class 1)
- (2) D00293 Lubricant, Hydraulic System - MCS 352
- (3) G00434 Lockwire - NAS20995C32

C. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	2	Valve, Large (Restrictor)	78-34-01	05	379
	4	Packing	78-34-01	05	320
					321
					322
	5	Backup Ring	78-34-01	05	325
					326
	8	Directional Control Valve	78-34-01	05	380
					382
	18	Packing (O-Ring)	78-34-01	05	320
	32	Packing	78-34-01	05	320
				321	
				322	

D. References

- (1) AMM 12-12-01/301, Hydraulic Systems
- (2) AMM 27-61-00/201, Spoiler/Speedbrake Control System
- (3) AMM 54-52-01/401, Strut Fairings

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- (4) AMM 78-31-00/201, Thrust Reverser System
- (5) AMM 78-31-00/501, Thrust Reverser System - Operational Test
- (6) AMM 78-34-02/401, Thrust Reverser Flow Control Tee

E. Access

(1) Location Zones

- 431 L Power Plant Forward Strut Fairing
- 441 R Power Plant Forward Strut Fairing

(2) Access Panels

- 431AL Forward Strut Fairing (Left)
- 431AR Forward Strut Fairing (Right)
- 441AL Forward Strut Fairing (Left)
- 441AR Forward Strut Fairing (Right)

F. Install the Directional Control Valve (Fig. 401)

S 864-067-N00

- (1) Remove the protection plugs and covers on the hydraulic lines and ports.

S 424-068-N00

- (2) Do these steps to install the DCV with large valves and tee installed in the extend port.
 - (a) Install the hydraulic fittings into the ports on the directional control valve (8).
 - 1) Lubricate the two new o-rings (18) with hydraulic fluid.
 - 2) Install the new o-rings (18) on the unions (17).
 - 3) Install the unions (17) in the hydraulic pressure and return ports of the directional control valve (8) and tighten.
 - 4) Lubricate the two new packing (32) with hydraulic fluid.
 - 5) Install a plug (31) and packing (32) into the return port in the directional control valve (8) and tighten the plug.
 - 6) Install a tee (30) into the extend port in the directional control valve.
 - a) Lubricate the new packing (4) with hydraulic fluid.
 - b) Install a nut (3), packing (4) and a backup ring (5) on the tee (30).

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- c) Install the tee (30), packing (4) and backup ring (5) into the extend port of the directional control valve (8) and manually tighten the nut (3) at this time.
- d) Do not tighten the nut (3) until you align the extend tubes (9).
- (b) Install the directional control valve (8) on the support bracket.
 - 1) Install long bolt (34) and washer (35) in the forward hole.

NOTE: This bolt has a drilled head for the installation of lockwire.

- 2) Install two short bolts (19) and washers (20) in the remaining holes.
- (c) Install the bonding strap (24) on the directional control valve (8) near the plugged port.
 - 1) Install the bonding strap (24) with screw (10), washer (11), washers (12) on each side of the strap, washer (13) under the nut, and nut (14).
- (d) Install the large valves (2) on the tee (30) on the directional control valve (8) (AMM 78-34-02/401).
 - 1) Align and install the two extend lines (9) on the two large valves (2).
 - 2) Tighten the nut (3) on the tee (30).
 - 3) Tighten the b-nuts on the two extend lines (9).
 - 4) Tighten the screws on the tube clamp.
- (e) Install the hydraulic pressure line (16) on the directional control valve (8).
- (f) Install the hydraulic return line (15) on the directional control valve (8).
- (g) Install lockwire between the plug (31) and the bolt (34).
- (h) Connect the electrical connector (6) to its receptacle on the directional control valve (8).

S 284-038-N00

- (3) Make sure that the bonding resistance between the bonding strap and the directional control valve and the structure is not more than 0.0025 ohms with a multimeter.

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S 614-055-N00
(4) Do the servicing procedure for the applicable hydraulic system reservoir (AMM 12-12-01/301).

S 444-039-N00
(5) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 714-041-N00
(6) Do the Thrust Reverser Operational Test - Engine Not in Operation (AMM 78-31-00/501).
(a) Operate the thrust reverser a minimum of three full cycles.

S 044-042-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.

(7) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 214-043-N00
(8) Examine the large valves, the directional control valve and the adjacent hydraulic tubing for hydraulic fluid leakage.

G. Put the Airplane Back to Its Usual Condition

S 414-044-N00
(1) Install the forward strut fairing (AMM 54-52-01/401).

S 444-045-N00
(2) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 444-041-N00
(3) Do the activation procedure for the Speedbrake Control System (AMM 27-61-00/201).

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S 864-040-N00

- (4) Remove the DO-NOT-OPERATE tags from the thrust levers.

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THRUST REVERSER FLOW CONTROL VALVES – REMOVAL/INSTALLATION

1. General

- A. This procedure has two tasks.
 - (1) The first task gives instructions to remove the flow control valves on the extend lines and the restrictor valves on the retract lines.
 - (2) The second task gives instructions to install the flow control valves on the extend lines and the restrictor valves on the retract lines.
- B. The flow control valves are the restrictor valves in the extend and retract lines for each thrust reverser half. The valves are mounted on tees. The tee on the retract line is an orifice tee.
- C. The large restrictor valves are known as the large valves.
- D. The small restrictor valves are known as the small valves.
- E. The flow control valves for the thrust reverser are forward of the directional control valve, which is on the strut. You must remove the forward strut fairing to get access to the flow control valves.

TASK 78-34-02-004-007-N00

2. Flow Control Valve Removal

- A. Equipment
 - (1) Container, Hydraulic fluid resistant - 5 gallon
- B. References
 - (1) AMM 27-61-00/201, Spoiler/Speedbrake Control System
 - (2) AMM 29-11-00/201, Main (Left, Right and Center) Hydraulic Systems
 - (3) AMM 54-52-01/401, Strut Fairings
 - (4) AMM 78-31-00/201, Thrust Reverser System
- C. Access
 - (1) Location Zones
 - 430 Engine 1 - Left Power Plant Forward Strut
 - 440 Engine 2 - Right Power Plant Forward Strut
 - (2) Access Panels
 - 431BT Forward Strut Fairing (Left Engine)
 - 441BT Forward Strut Fairing (Right Engine)
 - 431DT Aft Strut Fairing (Left Engine)
 - 441DT Aft Strut Fairing (Right Engine)
- D. Prepare to Remove the Flow Control Valve (Fig. 401)

S 044-008-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILER/SPEEDBRAKE CONTROL SYSTEM. IF YOU DO NOT DO THIS, THE SPOILERS CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (1) Do the deactivation procedure for the Spoiler/Speedbrake Control System (AMM 27-61-00/201).

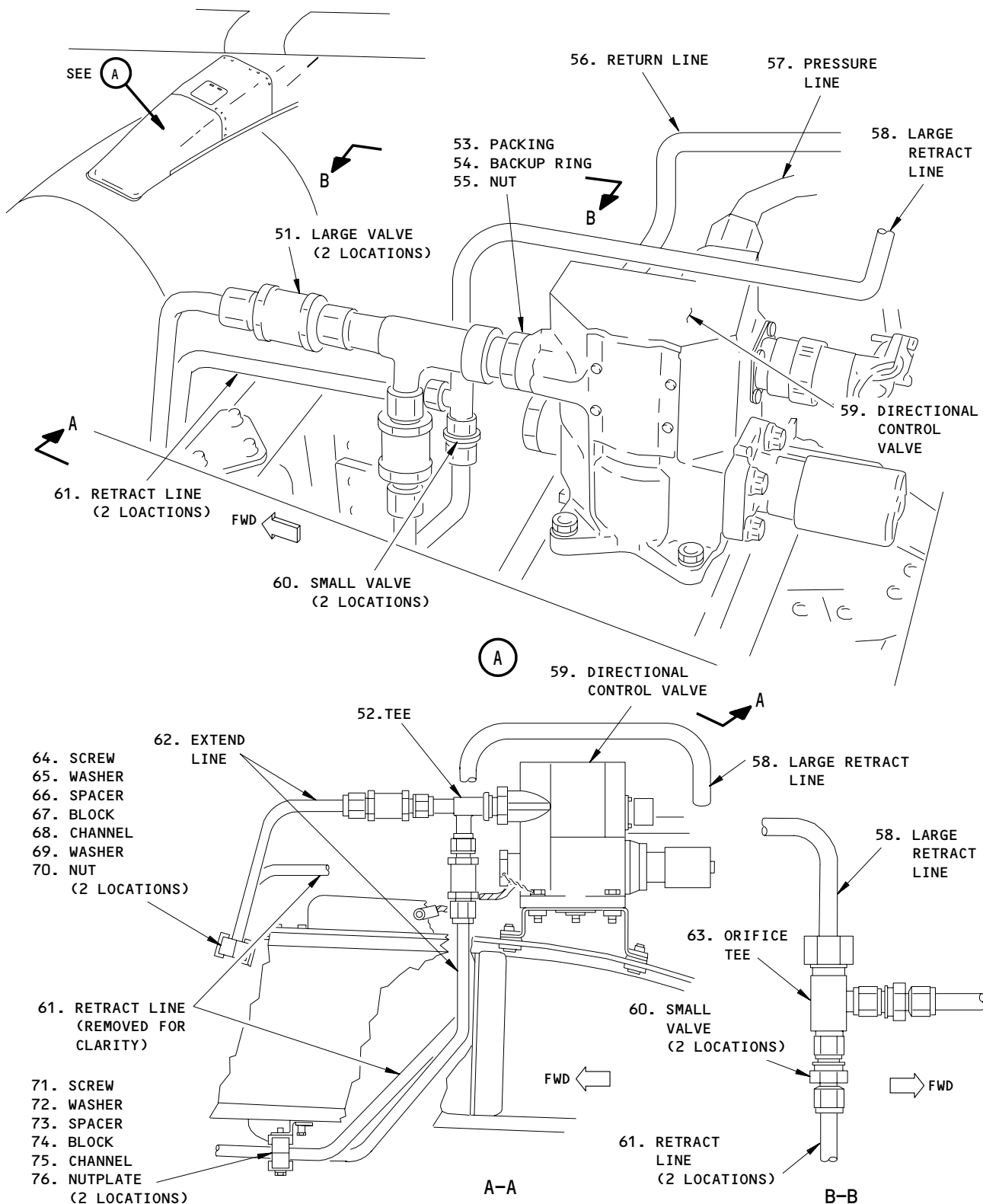
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Thrust Reverser Flow Control Tee Installation
Figure 401

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S 864-009-N00

- (2) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

S 864-010-N00

- (3) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

S 044-011-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.

- (4) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 014-017-N00

- (5) Remove the forward strut fairing (AMM 54-52-01/401).

S 864-021-N00

- (6) Release the pressure in the main hydraulic system and reservoir for the applicable strut (AMM 29-11-00/201).

E. Remove the Flow Control Valves On The Extend Lines (Fig. 401)

S 024-040-N00

CAUTION: CATCH THE HYDRAULIC FLUID IN THE APPLICABLE CONTAINERS WHEN YOU DISCONNECT THE HYDRAULIC LINES. IF THE HYDRAULIC FLUID FALLS ON THE AIRPLANE OR THE ENGINE, QUICKLY CLEAN THE AIRPLANE OR THE ENGINE. THE HYDRAULIC FLUID CAN CAUSE DAMAGE TO THE AIRPLANE OR THE ENGINE.

- (1) Get a container to catch the hydraulic fluid leakage from the disconnected hydraulic lines.

S 024-050-N00

- (2) Remove the large valves (51) and tee (52) from the extend port in the directional control valve (59).
 - (a) Loosen or remove the two screws (64), washers (65), spacers (66), washers (69) and nuts (70) to loosen or remove the tube blocks (67) that hold the forward most extend line (62) and retract line (61) to the strut structure.

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- (b) Loosen or remove the two screws (71), washers (72), spacers (73) to loosen or remove the tube blocks (74) that hold the aft most extend line (62) and retract line (61) to the strut structure.
- (c) Disconnect the two extend lines (62) from the large valves (51).
- (d) Loosen the nut (55) to remove the tee (52) from the directional control valve (59).
- (e) Remove the nut (55), packing (53) and a backup ring (54) from the tee (52).
- (f) Discard the packing (53).
- (g) Loosen the swivel nuts and remove the large valves (51) from the tee (52).

F. Remove the Restrictor Valves On The Retract Lines (Fig. 401)

S 024-034-N00

CAUTION: CATCH THE HYDRAULIC FLUID IN THE APPLICABLE CONTAINERS WHEN YOU DISCONNECT THE HYDRAULIC LINES. IF THE HYDRAULIC FLUID FALLS ON THE AIRPLANE OR THE ENGINE, QUICKLY CLEAN THE AIRPLANE OR THE ENGINE. THE HYDRAULIC FLUID CAN CAUSE DAMAGE TO THE AIRPLANE OR THE ENGINE.

- (1) Remove the small valves (60) and the orifice tee (63) from the large retract line (58) that goes over the directional control valve (59).
 - (a) Loosen or remove the two screws (64), washers (65), spacers (66), washers (69) and nuts (70) to loosen or remove the tube blocks (67) that hold the forward most extend line (62) and retract line (61) to the strut structure.
 - (b) Loosen or remove the two screws (71), washers (72), spacers (73) to loosen or remove the tube blocks (74) that hold the aft most extend line (62) and retract line (61) to the strut structure.
 - (c) Disconnect the two retract lines (61) from the two small valves (60).

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- (d) Remove the large retract line (58) and the orifice tee (63).
- (e) Remove the two small valves (60) from the orifice tee (63).

S 494-052-N00

- (2) Install the protection caps on all open hydraulic tubing.

TASK 78-34-02-404-019-N00

3. Flow Control Valve Installation

A. Consumable Materials

- (1) D00196 Hydraulic Fluid - BMS 3-11 (Type IV, Class 1)
- (2) D00293 Lubricant, Hydraulic System - MCS 352

B. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	51	Valve, Restrictor (Large)	78-34-01	05	379
	60	Valve, Restrictor (Small)	78-34-01	05	378
	53	Packing	78-34-01	05	320
					321
54	Backup Ring	78-34-01	05	322	
				325	
				326	

C. References

- (1) AMM 12-12-01/301, Hydraulic Systems
- (2) AMM 27-61-00/201, Spoiler/Speedbrake Control System
- (3) AMM 54-52-01/401, Strut Fairings
- (4) AMM 78-31-00/201, Thrust Reverser System
- (5) AMM 78-31-00/501, Thrust Reverser System

D. Access

- (1) Location Zones
 - 430 Engine 1 - Left Power Plant Forward Strut
 - 440 Engine 2 - Right Power Plant Forward Strut

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(2) Access Panels

- 431BT Forward Strut Fairing (Left Engine)
- 441BT Forward Strut Fairing (Right Engine)
- 431DT Aft Strut Fairing (Left Engine)
- 441DT Aft Strut Fairing (Right Engine)

E. Install the Flow Control Valves on the Extend Lines (Fig. 401)

S 094-051-N00

- (1) Remove all the protection caps on all hydraulic tubing.

S 424-005-N00

- (2) Install the large valves (51) and tee (52) in the extend port in the directional control valve (59).
- (a) Lubricate a new packing (53) with hydraulic fluid.
 - (b) Install the new packing (53), backup ring (54), and nut (55) on the tee (52).
 - (c) Install the two large valves (51) on the tee (52).
 - (d) Install the tee (52) into the pressure port on the directional control valve (59) but do not tighten the nut (55) until you align the extend lines (62).
 - (e) Align and install the two extend lines (62) on the large valves (51).
 - (f) Tighten the nut (55) on the tee (52).
 - (g) Tighten the b-nuts on the two extend lines (62).

F. Install the Restrictor Valves on the Retract Lines (Fig. 401)

S 424-044-N00

- (1) Install the small valves (60) and the orifice tee (63) to the large retract line (58) that goes over the directional control valve (59).
- (a) Install the two small valves (60) on the orifice tee (63).
 - (b) Install the large retract line (58).
 - 1) Do not tighten the b-nuts at this time until the other lines are aligned and connected.
 - (c) Install the orifice tee (63) on the large retract line (58).
 - 1) Do not tighten the b-nuts at this time until the other lines are aligned and connected.

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- (d) Connect the two retract lines (61) on the two small valves (60).
- (e) Tighten all the b-nuts on the small valves, the retract lines, and the large retract line.
- (f) Tighten or install the two screws (71), washers (72), spacers (73) to tighten or install the tube blocks (74) that hold the aft most extend line (62) and retract line (61) to the strut structure.
- (g) Tighten or install the two screws (64), washers (65), spacers (66), washers (69) and nuts (70) to tighten or install the tube blocks (67) that hold the forward most extend line (62) and retract line (61) to the strut structure.

S 614-023-N00

- (2) Do the servicing procedure for the applicable hydraulic system reservoir (AMM 12-12-01/301).

S 444-024-N00

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

S 714-025-N00

- (4) Do the procedure for the Thrust Reverser Operational Test - Engine Not in Operation (AMM 78-31-00/501).
 - (a) Operate the thrust reverser a minimum of three full cycles.

S 044-026-N00

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

- (5) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 214-027-N00

- (6) Examine the flow control tee, directional control valve, and adjacent hydraulic tubing for hydraulic fluid leaks.

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G. Put the Airplane Back to Its Usual Condition

- S 414-028-N00
- (1) Install the forward strut fairing (AMM 54-52-01/401).

- S 444-029-N00
- (2) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

- S 444-030-N00
- (3) Do the activation procedure for the Spoiler/Speedbrake Control System (AMM 27-61-00/201).

- S 864-031-N00
- (4) Remove the DO-NOT-OPERATE tags from the thrust levers.

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THRUST REVERSER MOTORIZED ISOLATION VALVE – REMOVAL/INSTALLATION

1. General

- A. This procedure has two tasks. The first task removes the motorized isolation valve for the thrust reverser. The second task installs the motorized isolation valve for the thrust reverser.

TASK 78-34-05-004-001-N00

2. Remove the Thrust Reverser Motorized Isolation Valve

A. References

- (1) AMM 06-43-00/201, Engine and Nacelle Strut Access Doors and Panels
- (2) AMM 27-61-00/201, Speed Brake Control System
- (3) AMM 29-11-00/201, Main (Left, Right and Center) Hydraulic System
- (4) AMM 78-31-00/201, Thrust Reverser System
- (5) AMM 78-34-07/401, Thrust Reverser Motorized Isolation Valve Pressure Switch

B. Access

(1) Location Zones

- 437 L Power Plant Strut
- 447 R Power Plant Strut

(2) Access Panels

- 437AL Engine Strut Hydraulic Bay (Left)
- 437AR Engine Strut Hydraulic Bay (Right)
- 447AL Engine Strut Hydraulic Bay (Left)
- 447AR Engine Strut Hydraulic Bay (Right)

C. Prepare to Remove the Motorized Isolation Valve for the Thrust Reverser.

S 044-057-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILER/SPEED BRAKE CONTROL SYSTEM. IF YOU DO NOT DO THIS, THE SPOILERS CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (1) Do the deactivation procedure for the Spoiler/Speed Brake Control System (AMM 27-61-00/201).

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S 864-058-N00

- (2) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

S 864-059-N00

- (3) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

S 044-060-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.

- (4) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 864-003-N00

- (5) For the left engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
 - (a) 11D13, L ENG T/R IND
 - (b) 11D14, L ENG T/R CONT

S 864-004-N00

- (6) For the right engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
 - (a) 11D32, R ENG T/R IND ALTN
 - (b) 11D33, R ENG T/R CONT ALTN
 - (c) 11L32, R ENG T/R IND
 - (d) 11L33, R ENG T/R CONT

D. Remove the Motorized Isolation Valve for the Thrust Reverser (Fig. 401).

S 014-005-N00

- (1) Open the access panels for the hydraulic bay on the engine strut (AMM 06-43-00/201).

NOTE: Open the access panels 437BL and 437BR for the left engine.
Open the access panels 447BL and 447BR for the right engine.

S 864-006-N00

- (2) Release the pressure in the main hydraulic system and reservoir for the applicable strut (AMM 29-11-00/201).

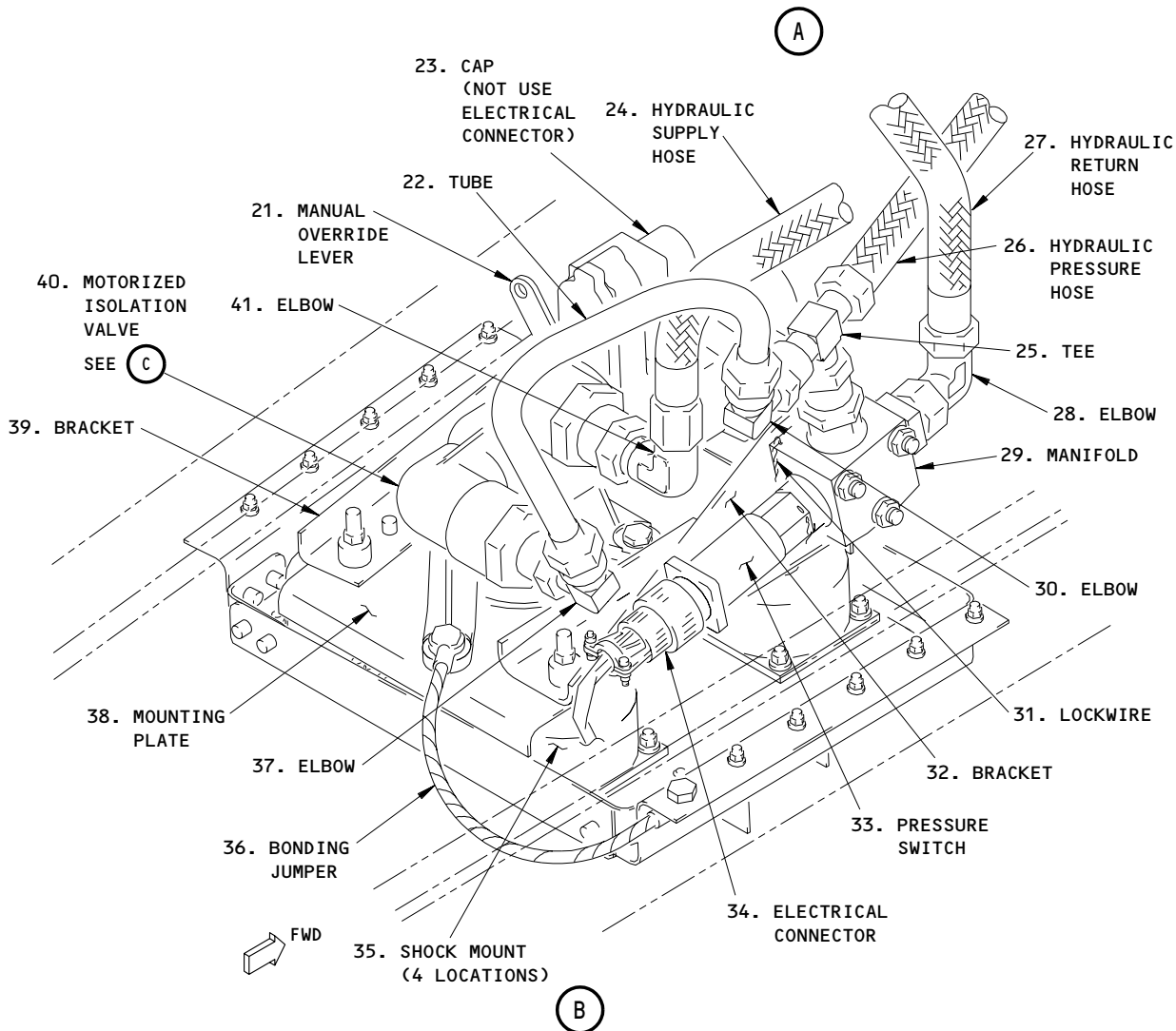
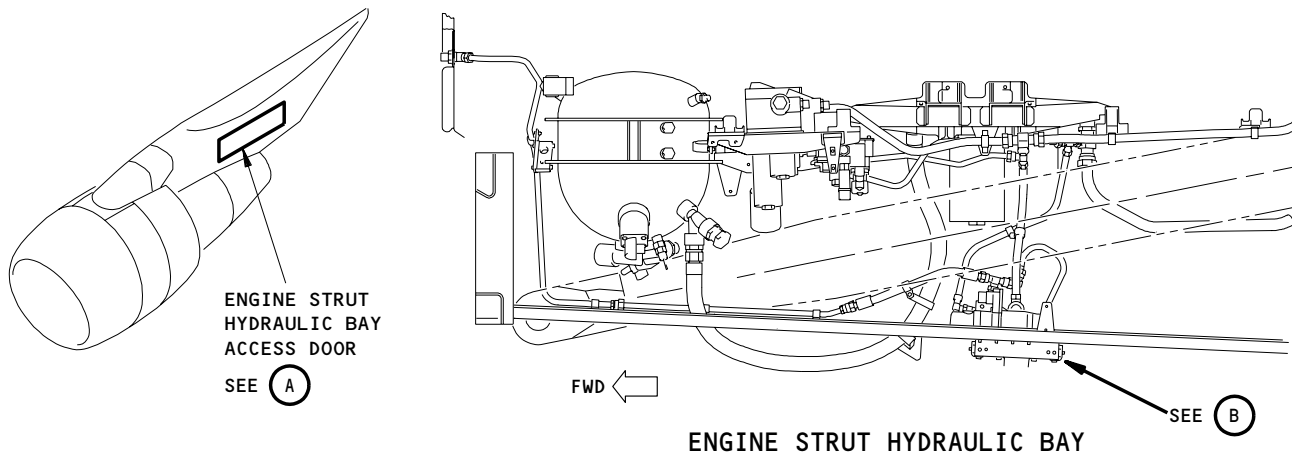
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Motorized Isolation Valve Installation
Figure 401 (Sheet 1)

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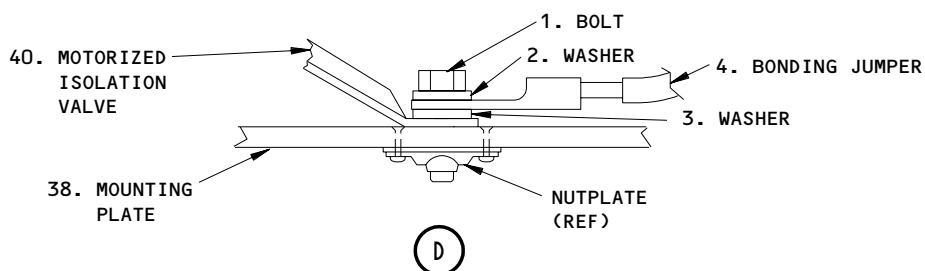
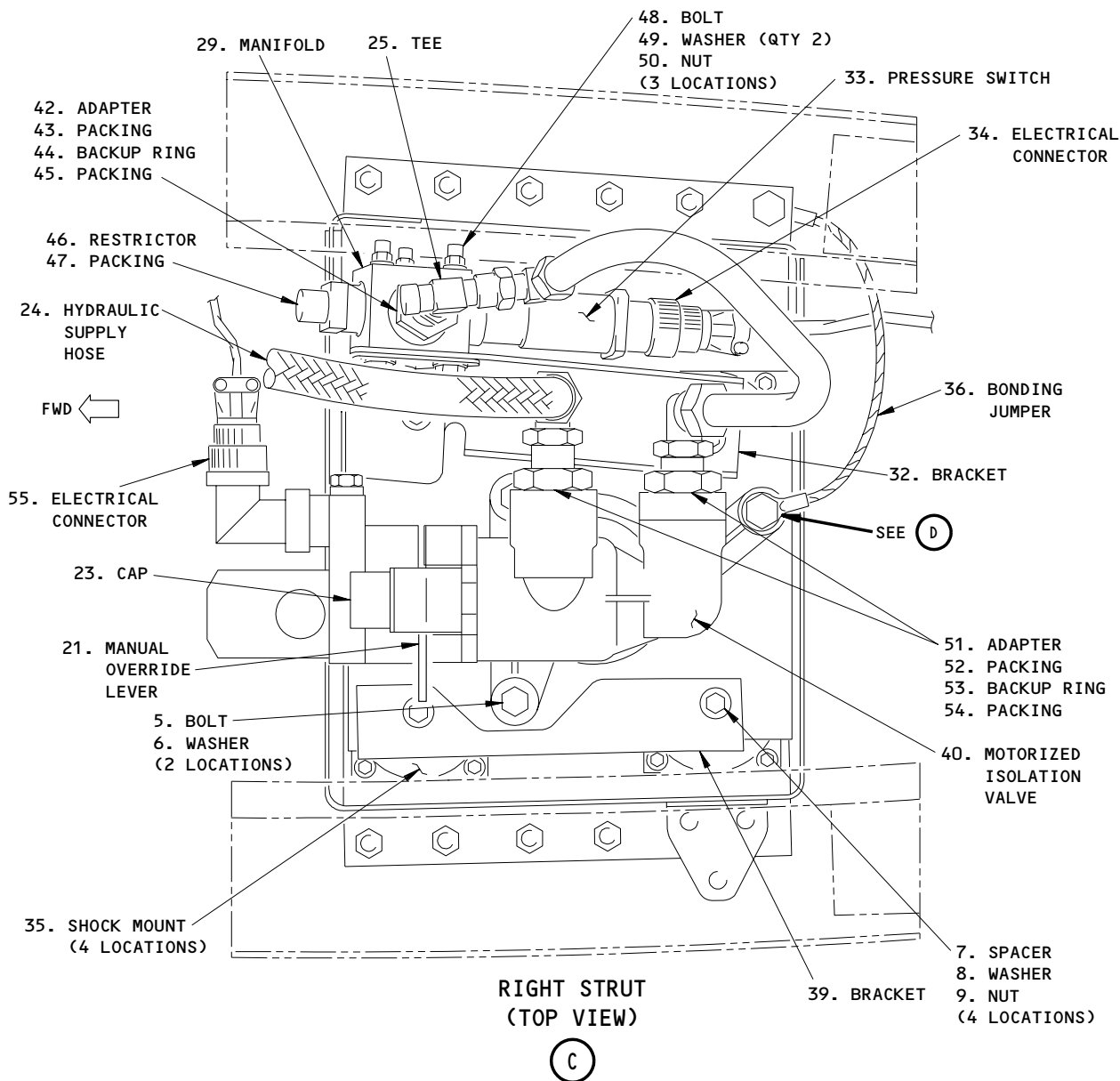
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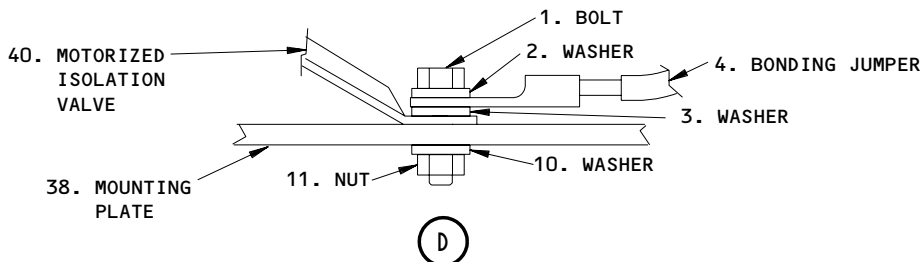
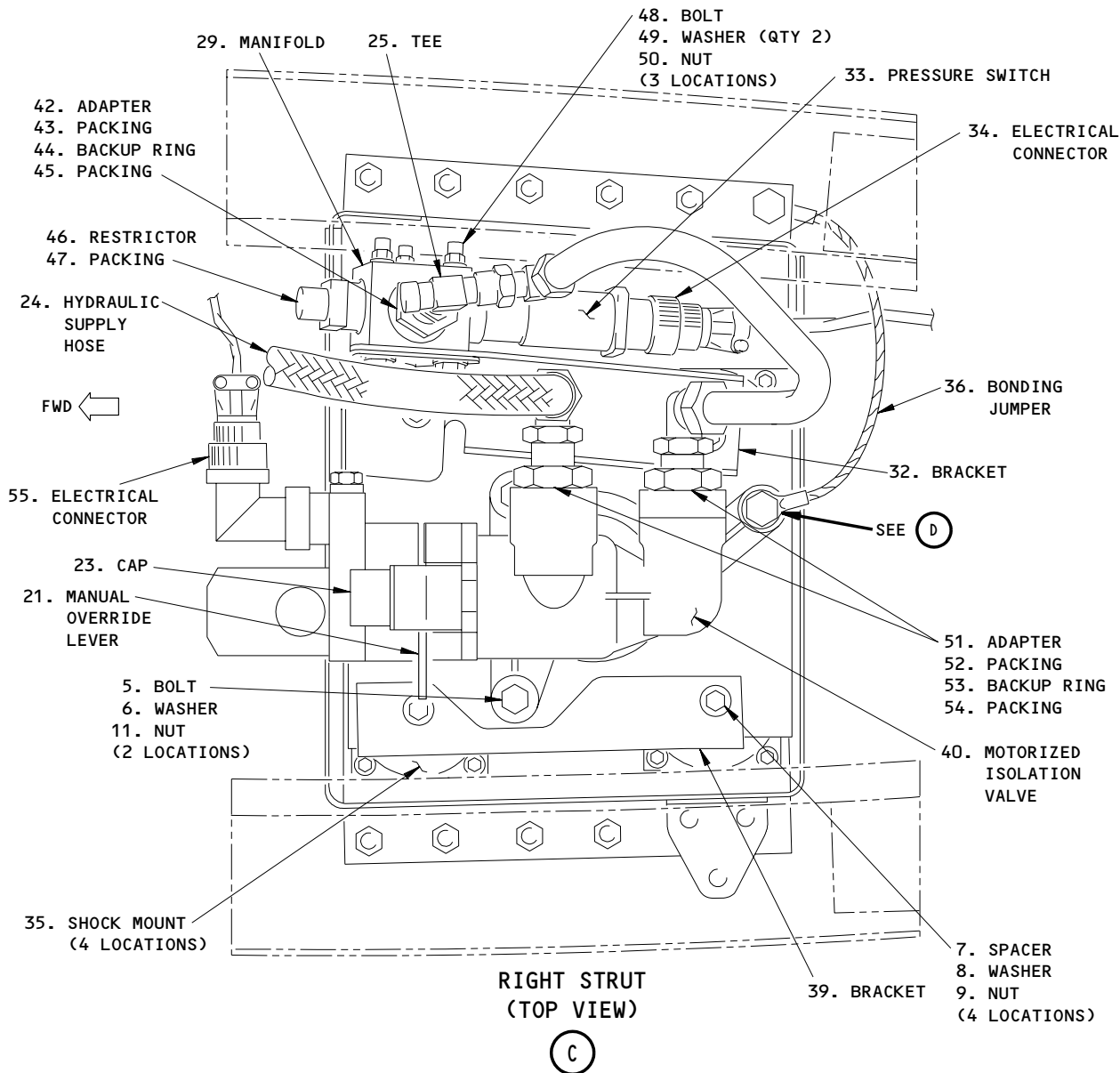
Motorized Isolation Valve Installation
Figure 401 (Sheet 2)

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MOTORIZED ISOLATION VALVE
ATTACHED WITH NUTPLATES

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Motorized Isolation Valve Installation
Figure 401 (Sheet 3)

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MOTORIZED ISOLATION VALVE
ATTACHED WITH NUTS

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S 684-007-N00

CAUTION: BE PREPARED TO CATCH THE HYDRAULIC FLUID IN THE APPLICABLE CONTAINERS. IF THE HYDRAULIC FLUID FALLS ON THE ENGINE, QUICKLY CLEAN THE ENGINE. IF YOU DO NOT QUICKLY CLEAN THE HYDRAULIC FLUID, THE HYDRAULIC FLUID CAN CAUSE DAMAGE TO THE ENGINE.

- (3) Open the drain valve on the applicable hydraulic system reservoir to drain the hydraulic fluid into the container.

NOTE: The hydraulic system reservoir is found in the strut.

S 434-008-N00

- (4) When the hydraulic fluid has drained, close the drain valve.
(a) Install the lockwire on the drain valve.

S 034-009-N00

- (5) Disconnect the electrical connector (55) from the motorized isolation valve (40).
(a) Install the protection caps on the electrical connector and the receptacle on the motorized isolation valve.

S 034-064-N00

- (6) Remove the tube (22) from the elbow (37) and the elbow (30).
(a) Install the protection caps on the tube.

S 034-010-N00

- (7) Disconnect the hydraulic supply hose (24) from elbow (41) on the motorized isolation valve (40).
(a) Install the protection cap on the hydraulic lines.

S 024-065-N00

- (8) **MOTORIZED ISOLATION VALVES ATTACHED WITH NUTPLATES;**
Remove the motorized isolation valve (40) from the mounting plate (38).
(a) Remove bolt (1), washers (2,3) and bonding jumper (4).
(b) Remove two bolts (5) and washers (6).

S 024-066-N00

- (9) **MOTORIZED ISOLATION VALVES ATTACHED WITH NUTS;**
Remove the motorized isolation valve (40) and the mounting plate (38).
(a) Disconnect the electrical connector (34) from the pressure switch (33).
1) Install the protection caps on the electrical connector and the receptacle on the pressure switch.

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- (b) Disconnect the hydraulic pressure hose (26) from the tee (25) on the manifold (29).
 - 1) Install a protection cap on the hydraulic line.
- (c) Disconnect the hydraulic return hose (27) from the elbow (28) on the manifold (29).
 - 1) Install a protection cap on the hydraulic line.
- (d) Remove the spacer (7), washer (8), and nut (9) to remove the bracket (39) from the shock mounts (35).
- (e) Remove the spacer (7), washer (8), and nut (9) to remove the pressure switch (33), manifold (29) and bracket (32) from the shock mounts (35).
- (f) Remove the mounting plate (38) and the motorized isolation valve (40) from the shock mounts (35).
- (g) Remove bolt (1), washers (2,3,10) and bonding jumper (4) and nut (11).
- (h) Remove the two bolts (5), washers (6) and nuts (11).
- (i) Remove the motorized isolation valve (40) from the mounting plate (38).

S 024-063-N00

- (10) Remove the elbow (37) and the elbow (41) from the adapters (51).

S 034-012-N00

- (11) Remove the adapters (51), packings (52, 54) and backup rings (53) from the motorized isolation valve (40).
 - (a) Discard the packings and backup rings.

S 034-056-N00

- (12) Install the protective caps on the hydraulic ports of the motorized isolation valve.

S 024-062-N00

- (13) If it is necessary to remove the manifold (29), bracket (32), pressure switch (33), elbow (30), tee (25), restrictor (46), or adapter (42), do the applicable steps:
 - (a) Remove the pressure switch (33) for the motorized isolation valve (40) (AMM 78-34-07/401).
 - (b) Remove the elbow (30) from the tee (25).
 - (c) Remove the tee (25) from the adapter (42).
 - (d) Remove the adapter (42), packing (43), backup ring (44) and packing (45) from the manifold (29).
 - (e) Remove the restrictor (46) and the packing (47) from the manifold (29).
 - (f) Remove the three bolts (48), washers (49) and nuts (50) to remove the manifold (29) from the bracket (32).

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TASK 78-34-05-404-018-N00

3. Install the Thrust Reverser Motorized Isolation Valve

A. Equipment

- (1) Bonding Meter - Microhm Bridge, Type 2 Bonding Meter, Avtron Model T477W, Avtron Manufacturing Inc., Cleveland Ohio

B. Consumable Materials

- (1) D00148 Hydraulic Fluid, BMS 3-11 Type 4 Class 1
- (2) D00273 Lubricant, Hydraulic Assembly MCS352
- (3) C00259 Primer, BMS10-11 Type I
- (4) C00064 Coating, Aluminim Chemical Conversion, MIL-C-5541 Class A (Alodine)
- (5) G00251 Abrasive Mat, Non-Woven, Non-Metallic, Grit 180-400, Scotchbrite (A-A-58054)

C. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	40	Motorized Isolation Valve	78-34-07	01	160
	43	Packing			230
	44	Backup Ring			235
	45	Packing			240
	47	Packing			220
	52	Packing			170
	53	Backup Ring			175
	54	Packing			180

D. References

- (1) AMM 06-43-00/201, Engine and Nacelle Strut Access Doors and Panels
- (2) AMM 12-12-01/301, Hydraulic Systems
- (3) AMM 20-10-21/401, Electrical Bonding
- (4) AMM 27-61-00/201, Speed Brake Control System
- (5) AMM 29-11-00/201, Main (Left, Right and Center) Hydraulic System
- (6) AMM 78-31-00/201, Thrust Reverser System
- (7) AMM 78-31-00/501, Thrust Reverser Operational Test
- (8) AMM 78-34-07/401, Thrust Reverser Motorized Isolation Valve Pressure Switch

E. Access

- (1) Location Zones
 - 437 L Power Plant Strut
 - 447 R Power Plant Strut

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(2) Access Panels

- 437AL Engine Strut Hydraulic Bay (Left)
- 437AR Engine Strut Hydraulic Bay (Right)
- 447AL Engine Strut Hydraulic Bay (Left)
- 447AR Engine Strut Hydraulic Bay (Right)

F. Install the Motorized Isolation Valve for the Thrust Reverser (Fig. 401).

S 864-019-N00

- (1) Make sure the pressure in the main hydraulic system is released (AMM 29-11-00/201).

S 024-069-N00

- (2) If it is necessary to install the manifold (29), bracket (32), pressure switch (33), elbow (30), tee (25), restrictor (46), or adapter (42), do the applicable steps:
- (a) Install the manifold (29) on the bracket (32).
 - 1) At the forward, upper hole in the bracket (32), clean the area around the hole with an abrasive mat to remove all corrosion.
 - 2) Install the manifold (29) with three bolts (48), washers (49) and nuts (50).
 - 3) Make sure the resistance between the bracket and the manifold is not more than 0.0025 ohms with the bonding meter.
 - 4) Apply one coat of aluminum chemical conversion coating (alodine), MIL-C-5541, to the areas of exposed metal on the bracket.
 - 5) Apply one coat of BMS10-11 Type I primer to cover the surface.
 - (b) Install the restrictor (46) and the packing (47) on the manifold (29).
 - 1) Apply BMS3-11, hydraulic fluid or MCS352, hydraulic assembly lube to the threads and the seal before you install the restrictor.
 - (c) Install the adapter (42), packing (43), backup ring (44) and packing (45) on the manifold (29).
 - 1) Apply BMS3-11, hydraulic fluid or MCS352, hydraulic assembly lube to the adapter threads and the seals before you install the adapter.
 - 2) Tighten the adapter against the manifold to 243-297 inch-pounds (27.4-33.5 Newton-meters).
 - (d) Install the tee (25) on the adapter (42).
 - 1) Do not tighten the tee at this time.

NOTE: It is necessary to adjust the tee to the correct angle before you connect the hose.

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- (e) Install the elbow (30) from the tee (25).
 - 1) Do not tighten the elbow at this time.

NOTE: It is necessary to adjust the elbow to the correct angle before you connect the tube.

- (f) Install the pressure switch (33) for the motorized isolation valve (40) on the bracket (32) (AMM 78-34-07/401).

S 434-057-N00

- (3) Remove the protection caps from the ports of the motorized isolation valve.

S 434-022-N00

- (4) Install the backup rings (53) and packings (52, 54) on the adapters (51).
 - (a) Apply BMS3-11, hydraulic fluid or MCS352, hydraulic assembly lube to the adapter threads and the seals before you install the adapter.

S 434-023-N00

- (5) Install the adapters (51) on the motorized isolation valve (40).
 - (a) Tighten the adapter against the boss on the valve to 810-990 inch-pounds (91.5-111.8 Newton-meters).

S 424-068-N00

- (6) Install the elbow (37) and the elbow (41) on the adapters (51).
 - (a) Do not tighten the elbows at this time.

NOTE: It is necessary to adjust the elbows to the correct angle before you connect the tube or the hose.

S 424-045-N00

- (7) **MOTORIZED ISOLATION VALVES ATTACHED WITH NUTPLATES;**
Install the motorized isolation valve (40) on the mounting plate (38) in the strut.
 - (a) Position the motorized isolation valve (40) on the mounting plate (38) in the strut.
 - (b) Install two bolts (5) and washers (6).
 - 1) Tighten the bolt to 72-88 inch-pounds (8.1-9.9 Newton-meters).
 - (c) Install bolt (1), washers (2,3) and bonding jumper (4).
 - 1) Tighten the bolt to 72-88 inch-pounds (8.1-9.9 Newton-meters).

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S 424-067-N00

- (8) **MOTORIZED ISOLATION VALVES ATTACHED WITH NUTS;**
Install the motorized isolation valve (40) on the mounting plate (38) in the strut.
- (a) Position the motorized isolation valve (40) on the mounting plate (38).
 - (b) Install bolt (5), washer (6) and nut (11).
 - 1) Tighten the bolt to 72-88 inch-pounds (8.1-9.9 Newton-meters).
 - (c) Install bolt (1), washers (2,3,10) and bonding jumper (4) and nut (11).

NOTE: Make sure you attach the bonding wire below the bolt head on the aft leg of the motorized isolation valve (AMM 20-10-21/401).

- 1) Tighten the bolt to 72-88 inch-pounds (8.1-9.9 Newton-meters).
- (d) Position the mounting plate (38) on the shock mounts (35).
- (e) Install the bracket (39) on the shock mounts (35).
- (f) Install bracket (32) with the pressure switch (33) and manifold (29) on the shock mounts (35).
- (g) Install the four spacers (7), washers (8), and nuts (9) on the stud on shock mount (35).
 - 1) Tighten the nut to 60-90 pound-inches (6.8-10.1 Newton-meters).

S 284-046-N00

- (9) Make sure the resistance across the bonding wire (4) is no more than 0.0025 ohms with the bonding meter.

S 684-047-N00

CAUTION: BE PREPARED TO CATCH THE HYDRAULIC FLUID IN THE APPLICABLE CONTAINERS. IF THE HYDRAULIC FLUID FALLS ON THE ENGINE, QUICKLY CLEAN THE ENGINE. IF YOU DO NOT QUICKLY CLEAN THE HYDRAULIC FLUID, THE HYDRAULIC FLUID CAN CAUSE DAMAGE TO THE ENGINE.

- (10) Remove the protection caps from the two hydraulic lines.

S 434-071-N00

- (11) Connect the hydraulic return hose (27) on the elbow (28) on the manifold (29) and tighten the B-nut to 243-297 inch-pounds (27.4-33.5 Newton-meters).

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- S 434-030-N00
- (12) Align the elbow (28) with the return hose (27) and tighten the elbow to the restricter (46).
- S 434-072-N00
- (13) Connect the hydraulic pressure hose (26) to the tee (25) on the manifold (29) and tighten the B-nut to 450-550 inch-pounds (50.8-62.1 Newton-meters).
- S 434-073-N00
- (14) Align the tee (25) with the pressure hose (26) and tighten the tee on the adapter (42) to 243-297 inch-pounds (27.4-33.5 Newton-meters).
- S 434-070-N00
- (15) Connect the hydraulic supply hose (24) to the elbow (41) and tighten the B-nut to 450-550 inch-pounds (50.8-62.1 Newton-meters).
- S 434-074-N00
- (16) Align the elbow (41) with the supply hose (24) and tighten the elbow nut on the adapter (51) to 450-550 inch-pounds (50.8-62.1 Newton-meters).
- S 434-075-N00
- (17) Align the elbow (37) and elbow (30) with tube (22) and tighten the tube B-nuts to 450-550 inch-pounds (50.8-62.1 Newton-meters).
- S 434-076-N00
- (18) Tighten the elbow (37) to the adapter (51) to 450-550 inch-pounds (50.8-62.1 Newton-meters).
- S 434-077-N00
- (19) Tighten the elbow (30) to the tee (25) and tighten to 450-550 inch-pounds (50.8-62.1 Newton-meters).

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- S 434-031-N00
- (20) Remove the protection caps and connect the electrical connector (55) to the motorized isolation valve (40).
- S 614-033-N00
- (21) Do the servicing procedure for the applicable hydraulic system reservoir (AMM 12-12-01/301).
- S 864-034-N00
- (22) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the overhead circuit breaker panel, P11:
- (a) 11D13, L ENG T/R IND
 - (b) 11D14, L ENG T/R CONT
- S 864-035-N00
- (23) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the overhead circuit breaker panel, P11:
- (a) 11D32, R ENG T/R IND ALTN
 - (b) 11D33, R ENG T/R CONT ALTN
 - (c) 11L32, R ENG T/R IND
 - (d) 11L33, R ENG T/R CONT
- S 864-036-N00
- (24) Pressurize the main hydraulic system (AMM 29-11-00/201).
- S 864-037-N00
- (25) Remove the DO-NOT-OPERATE tags from the thrust levers.
- S 444-048-N00
- (26) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).
- S 714-049-N00
- (27) Do this procedure: Thrust Reverser Operational Test - Engine Not In Operation (AMM 78-31-00/501).

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S 864-050-N00

- (28) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

S 864-051-N00

- (29) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

S 044-056-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.

- (30) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 214-039-N00

- (31) Examine the motorized isolation valve for leakage of hydraulic fluid.

G. Put the Airplane Back to Its Usual Condition

S 414-040-N00

- (1) Close the access panels for the hydraulic bay on the engine strut (AMM 06-43-00/201).

S 444-053-N00

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

S 444-054-N00

- (3) Do the activation procedure for the speed brake control system (AMM 27-61-00/201).

S 864-055-N00

- (4) Remove the DO-NOT-OPERATE tags from the thrust levers.

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THRUST REVERSER CONTROL SWITCH - REMOVAL/INSTALLATION

1. General

- A. This procedure has two tasks. The first task removes the control switches for the thrust reverser. The second installs the control switches.
- B. There are two lever-operated control switches. One is found in each thrust lever.
- C. The control switch is referred to as the switch for this procedure.

TASK 78-34-06-004-001-N00

2. Remove the Thrust Reverser Control Switches

- A. References
 - (1) AMM 27-61-00/201, Spoiler/Speedbrake Control System
- B. Access
 - (1) Location Zones
211/212 Flight Compartment
- C. Prepare to Remove the Control Switches for the Thrust Reverser

S 044-002-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILER/SPEEDBRAKE CONTROL SYSTEM. IF YOU DO NOT DO THIS, THE SPOILERS CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (1) Do the deactivation procedure for the spoiler/speedbrake control system (AMM 27-61-00/201).

S 864-003-N00

- (2) For the left engine, open this circuit breaker on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
 - (a) 11D14, L ENG T/R CONT

S 864-004-N00

- (3) For the right engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
 - (a) 11D33, R ENG T/R CONT ALTN
 - (b) 11L33, R ENG T/R CONT

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D. Remove the Control Switches for the Thrust Reverser (Fig. 401)

S 034-005-N00

- (1) Remove the screw (8) and switch cover (1) from the thrust lever (Fig. 401).

S 034-007-N00

- (2) Remove the switch (2) from the thrust lever.
 - (a) Remove the electrical connector (6) from the switch (2).
 - (b) Remove the two screws (5) from the switch (2) and actuator (4).

NOTE: Access to the screw heads is through a slot in the side of the thrust lever.

- 1) Keep the screws for the installation.
- (c) Remove the switch (2) and actuator (4) from the thrust lever.
 - 1) For some installations, it will also be necessary to remove the switch shim (7).
 - 2) Remove the flexible insulator (3).
- (d) Make a record of the direction of the actuator arm on the switch.

TASK 78-34-06-404-009-N00

3. Install the Thrust Reverser Control Switches

A. Equipment

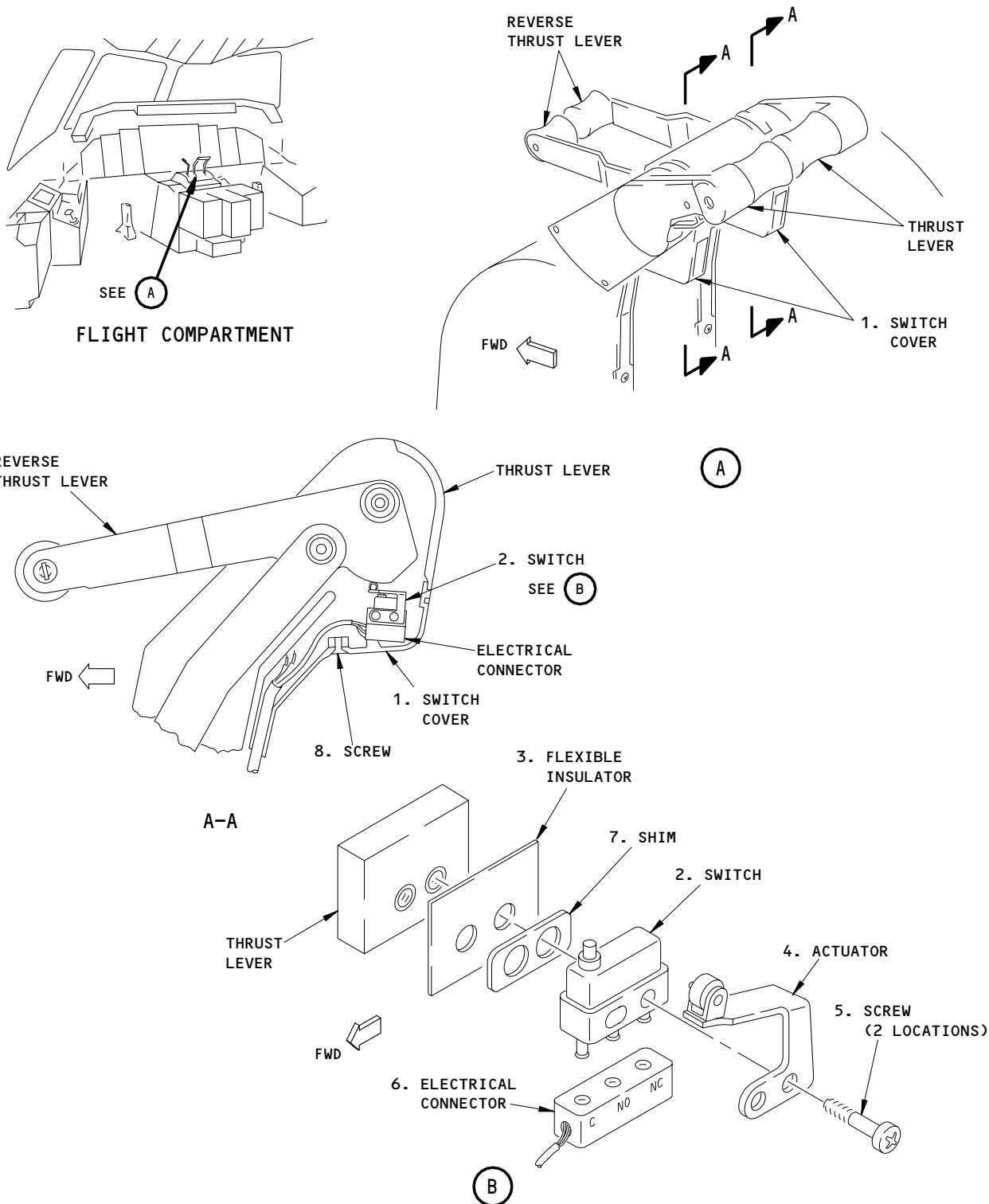
- (1) Protractor - A27021-30
- (2) Protractor - G76002-15
- (3) Adapter - A27097-1
- (4) Multimeter

B. Parts

- (1) Refer to the Illustrated Parts Catalog for the part numbers and the effectivities of the items in these tables:

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Thrust Reverser Control Switches Installation
Figure 401

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AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	2	Switch	76-11-00	01	19 87
	4	Actuator		01A	525 530
	7	Shim		01	18 85
				01A	510 515
				01	17D 17E
				01A	95 500 495

C. References

- (1) AMM 27-61-00/201, Spoiler/Speedbrake Control System
- (2) AMM 78-31-00/501, Thrust Reverser System

D. Access

- (1) Location Zones
211/212 Flight Compartment

E. Install the Control Switch for the Thrust Reverser.

S 424-017-N00

- (1) Install the switch (2) in the thrust lever (Fig. 401).
 - (a) Find the direction the switch was installed from the record.
 - (b) Put the switch (2), switch shim (7) and actuator (4) in the correct direction in the thrust lever.

NOTE: For some installations, the switch shim (7) may not be necessary for alignment.

- 1) Install the switch with the actuation button adjacent to the actuator roller.
- 2) Install the flexible insulator (3) between the switch (2) and the thrust lever.

NOTE: The flexible insulator is provided with the switch.

- (c) Install the screws (5) that hold the switch (2) in the thrust lever.
 - 1) Tighten the screws until the head of the screw touches the switch.

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- 2) If a replacement screw (5) is used, make sure the screw is flush or under flush by one thread maximum; trim the screw to meet this requirement.

NOTE: The screw is threaded through the wall of the thrust lever and the threads of the screw can protrude from the outside lever surface.

- (d) Make sure that a minimum of 50 percent of the switch roller touches the cam surface of the thrust lever.
- (e) Attach the protractor to the reverse thrust lever (Fig. 402).
 - 1) Attach the protractor to the adapter with two screws.
 - 2) Loosen the knurled wheel on the J-bolt.
 - 3) Put the adapter on the reverse thrust lever.
 - 4) Adjust the position of the adapter to prevent the interference of the J-bolt with the angled part of the lever.
 - 5) Tighten the knurled wheel to hold the adapter to the reverse thrust lever.
 - 6) Set the protractor to zero degrees.
- (f) Slowly move the reverse thrust lever rearward from the retracted position.
 - 1) Listen for a click sound.
 - 2) Stop the movement of the reverse thrust lever when you hear the click sound.
- (g) Measure the angle that the reverse thrust lever moved when you heard the click sound.
 - 1) AIRPLANES PRE-SL 78-0044A;
Make sure the angle is between 10-26 degrees.
 - 2) AIRPLANES POST-SL 78-0044A;
Make sure the angle is between 10-16 degrees.

NOTE: This is the preferred angle.

CAUTION: DO NOT BEND THE ACTUATOR ARM. YOU WILL DAMAGE THE SWITCH AND THE ACTUATOR ARM.

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- (h) If the angle is not correct, turn or position the actuator and switch to get the correct switch operation.
- (i) Tighten the screws (5).
- (j) Make sure the actuator roller moves smoothly on the cam surface of the reverse thrust lever.
- (k) Connect the electrical connector (6) to the switch (2).

S 764-158-N00

- (2) Do a test of the thrust reverser control switch:
 - (a) Remove the side panel on the control stand (Fig. 403).
 - (b) Make sure the reverse thrust levers are in the down and stowed position.
 - (c) Disconnect the applicable plug P3 (left engine), or P1 (right engine).
 - (d) Connect a multimeter to the pins on the applicable plug and make sure the contacts show the proper condition:

Engine	Plug	Pin No.	Stowed	Extend
Left	P3	8 and 9	Open	Closed
Left	P3	9 and 10	Closed	Open
Right	P1	7 and 8	Open	Closed
Right	P1	8 and 9	Closed	Open

- 1) If the contacts do not show the proper condition and angle, do the step to adjust the thrust reverser control switch again.
- 2) If it is necessary, replace the thrust reverser control switch.
- (e) Move the reverse thrust levers up and rearward to the extend position to engage the thrust reverser control switch.

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- (f) Connect a multimeter to the pins on the applicable plug and make sure the contacts show the proper condition:
 - 1) If the contacts do not show the proper condition, do the step to adjust the thrust reverser control switch again.
 - 2) If it is necessary, replace the thrust reverser control switch.
- (g) Connect the applicable plug P3 (left engine), or P1 (right engine).
- (h) Install the side panel on the control stand.

S 094-160-N00

- (3) Remove the protractor and the adapter from the reverse thrust lever.

S 414-159-N00

- (4) Install the switch cover (1) on the thrust lever with the screw (8).

F. Put the Airplane Back to Its Usual Condition

S 864-013-N00

- (1) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
 - (a) 11D14, L ENG T/R CONT

S 864-014-N00

- (2) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
 - (a) 11D33, R ENG T/R CONT ALTN
 - (b) 11L33, R ENG T/R CONT

S 714-015-N00

- (3) Do a test of the thrust reverser operation (AMM 78-31-00/201).

S 444-016-N00

- (4) Do the activation procedure for the spoiler/speedbrake control system (AMM 27-61-00/201).

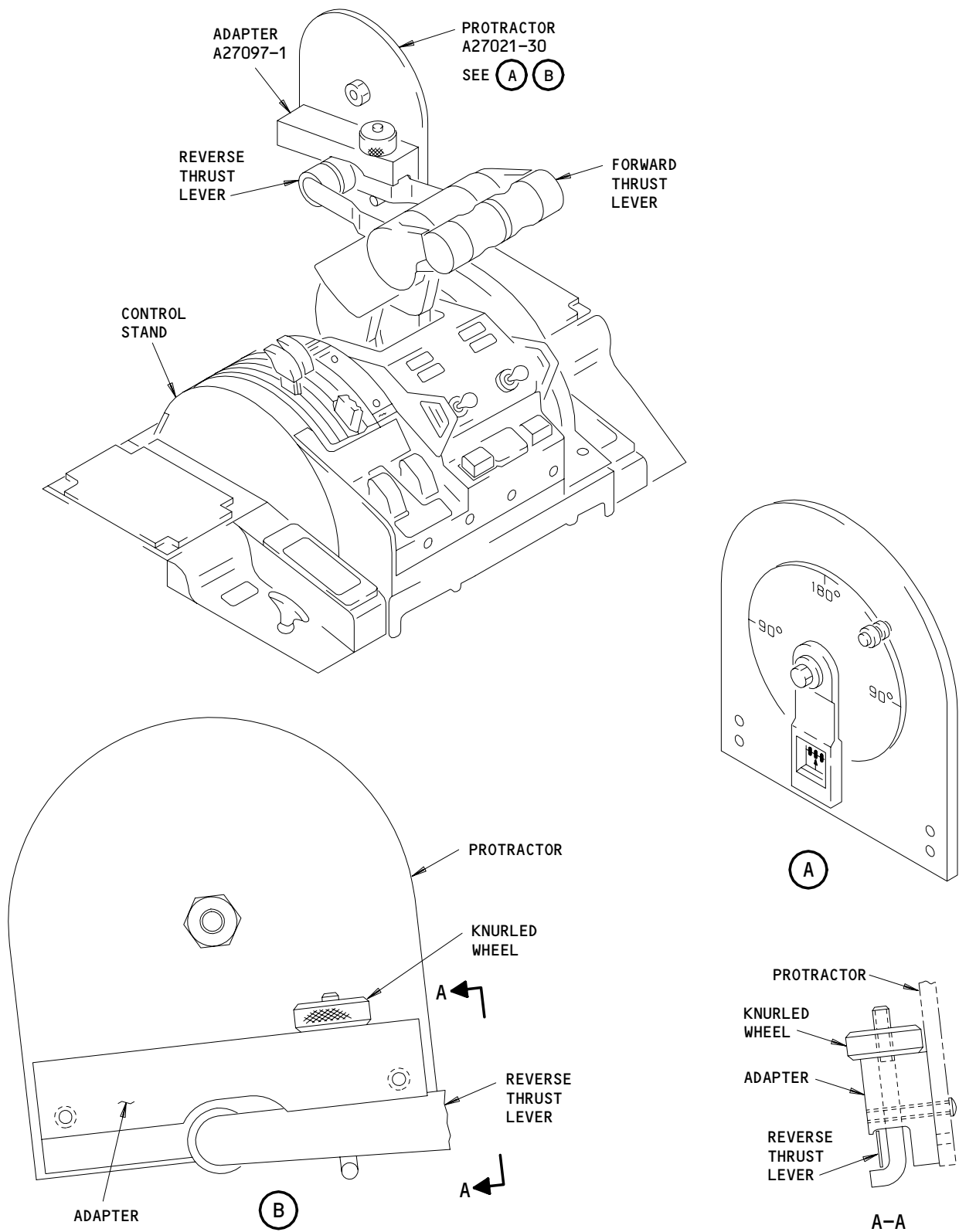
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Reverse Thrust Lever Protractor Adapter
Figure 402

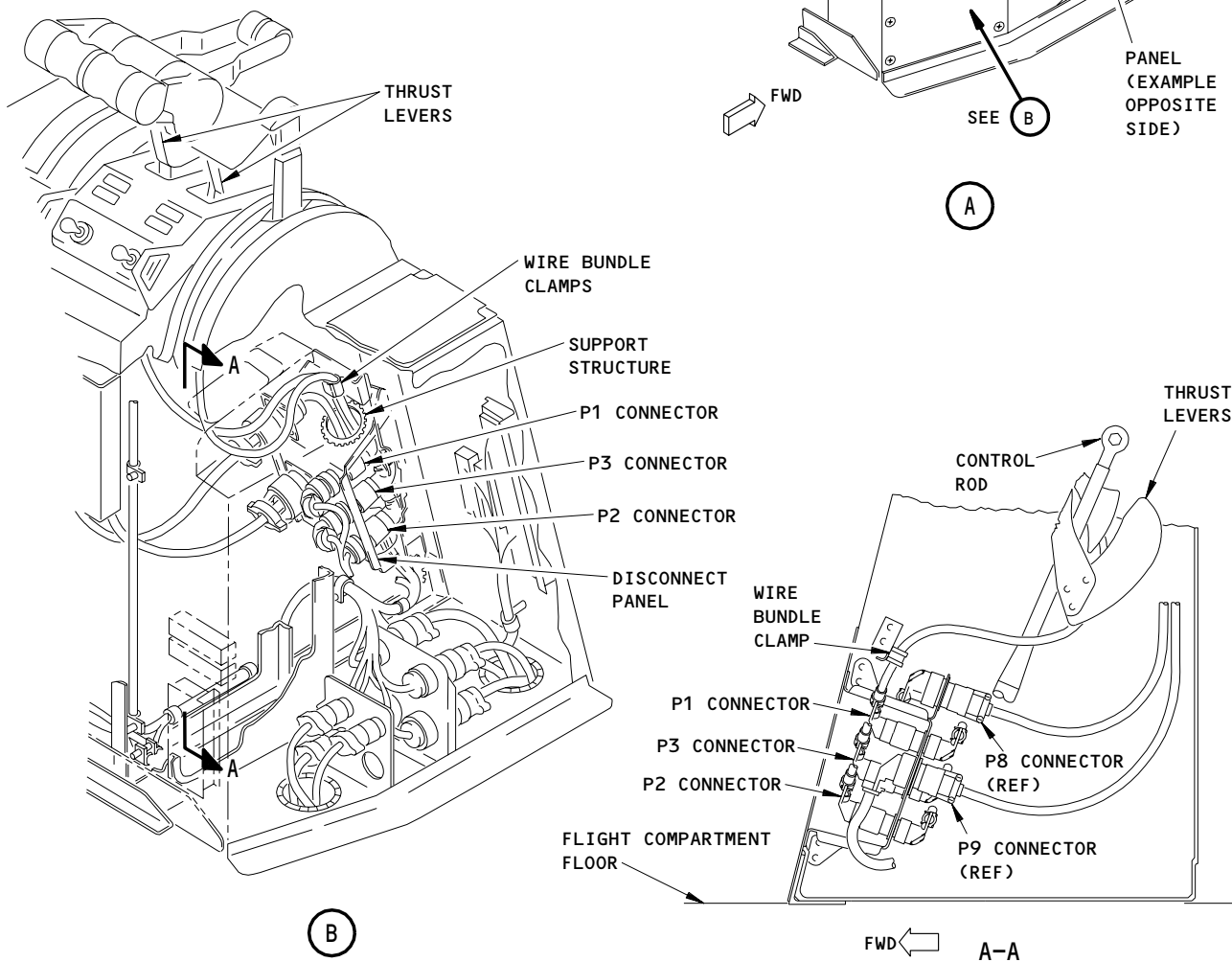
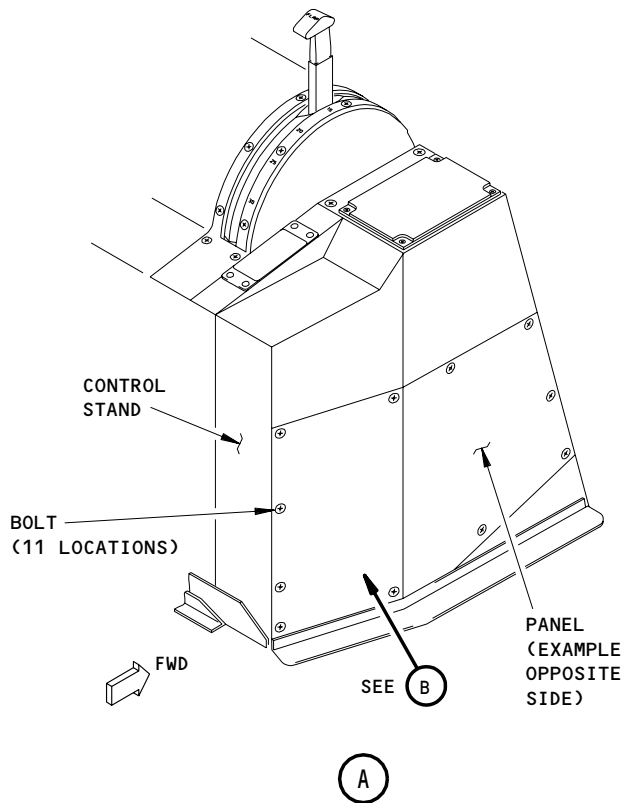
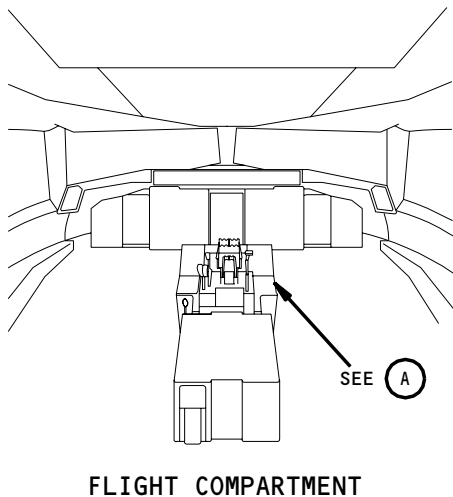
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Thrust Reverser Control Switch Adjustment
Figure 403

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THRUST REVERSER MOTORIZED ISOLATION VALVE PRESSURE SWITCH -
REMOVAL/INSTALLATION

1. General

- A. This procedure has two tasks. The first task removes the pressure switch for the motorized isolation valve. The second task installs the pressure switch for the motorized isolation valve.

TASK 78-34-07-004-001-N00

2. Remove the Thrust Reverser Motorized Isolation Valve Pressure Switch

A. References

- (1) AMM 27-61-00/201, Speed Brake Control System
- (2) AMM 29-11-00/201, Main (Left, Right and Center) Hydraulic System
- (3) AMM 78-31-00/201, Thrust Reverser System

B. Access

(1) Location Zones

- 437 L Power Plant Strut
- 438 R Power Plant Strut

(2) Access Panels

- 437AL Engine Strut Hydraulic Bay (Left)
- 437AR Engine Strut Hydraulic Bay (Right)
- 447AL Engine Strut Hydraulic Bay (Left)
- 447AR Engine Strut Hydraulic Bay (Right)

- C. Prepare to Remove the Pressure Switch for the Motorized Isolation Valve.

S 044-009-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE AUTOMATIC SPEED BRAKES. IF YOU DO NOT DO THIS, THE AUTOMATIC SPEED BRAKES CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

- (1) Do this task: Automatic Speed Brake System Deactivation (AMM 27-61-00/201).

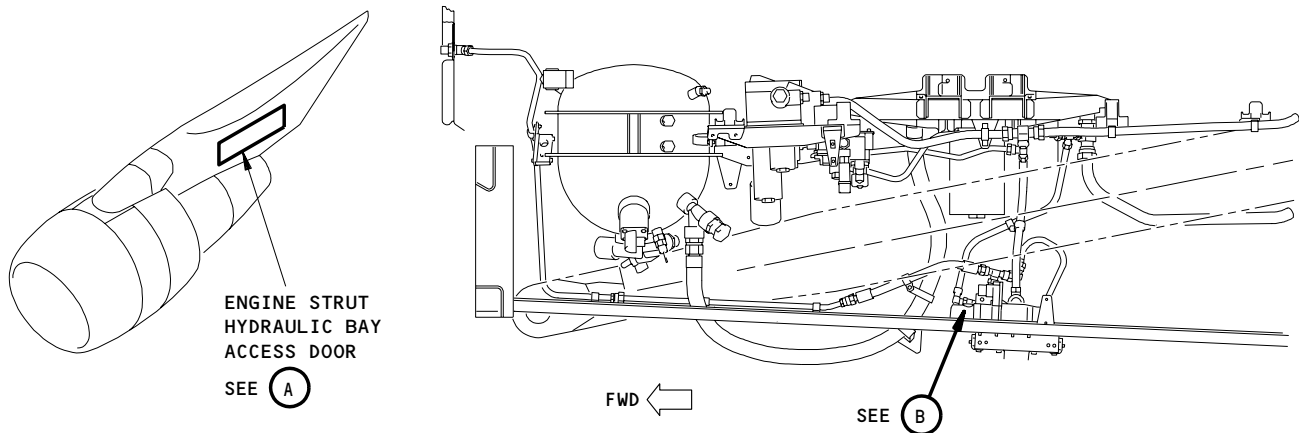
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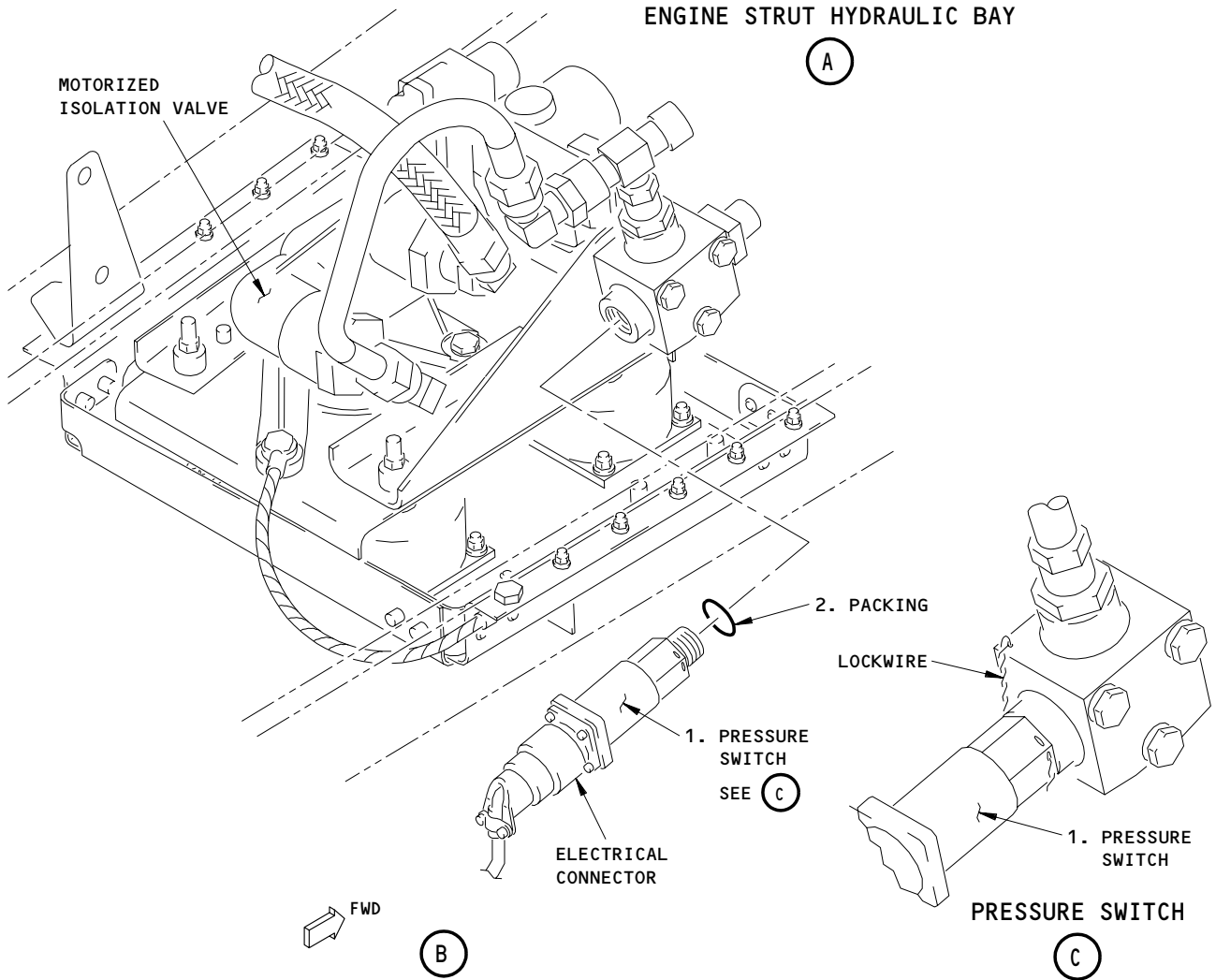
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ENGINE STRUT HYDRAULIC BAY



**Motorized Isolation Valve Pressure Switch Installation
Figure 401**

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S 864-010-N00

- (2) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

S 864-011-N00

- (3) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

S 044-013-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 task: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

D. Remove the Pressure Switch for the Motorized Isolation Valve (Fig. 401).

S 034-004-N00

- (1) Disconnect the electrical connector from the pressure switch (1) for the motorized isolation valve.
 - (a) Put the protection caps on the electrical connector and the receptacle on the pressure switch (1).

S 864-019-N00

- (2) Release the pressure in the main hydraulic system and reservoir for the applicable strut (AMM 29-11-00/201).

S 024-020-N00

CAUTION: BE PREPARED TO CATCH THE HYDRAULIC FLUID IN THE APPLICABLE CONTAINER WHEN YOU REMOVE THE PRESSURE SWITCH. IF THE HYDRAULIC FLUID FALLS ON THE ENGINE, QUICKLY CLEAN THE ENGINE. IF YOU DO NOT QUICKLY CLEAN THE HYDRAULIC FLUID, THE HYDRAULIC FLUID CAN CAUSE DAMAGE TO THE ENGINE.

- (3) Cut the lockwire and remove the pressure switch from the manifold that is adjacent to the motorized isolation valve.
 - (a) Put protection caps on the end of the pressure switch and in the orifice on the manifold.

S 034-014-N00

- (4) Remove the packing (2) from the pressure switch (1).
 - (a) Discard the packing (2).

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TASK 78-34-07-404-005-N00

3. Install the Thrust Reverser Motorized Isolation Valve Pressure Switch

A. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Pressure Switch	78-34-07	01	245
	2	Packing			250

B. References

- (1) AMM 12-12-01/301, Hydraulic Systems
- (2) AMM 27-61-00/201, Speed Brake Control System
- (3) AMM 78-31-00/201, Thrust Reverser System
- (4) AMM 78-34-13/501, Thrust Reverser Sync Lock

C. Access

- (1) Location Zones
 - 437 L Power Plant Strut
 - 438 R Power Plant Strut
- (2) Access Panels
 - 437AL Engine Strut Hydraulic Bay (Left)
 - 437AR Engine Strut Hydraulic Bay (Right)
 - 447AL Engine Strut Hydraulic Bay (Left)
 - 447AR Engine Strut Hydraulic Bay (Right)

D. Install the Pressure Switch for the Motorized Isolation Valve (Fig. 401).

S 434-021-N00

- (1) Remove the protection caps from the orifice in the manifold and the end of the pressure switch.

S 434-006-N00

- (2) Install a new packing (2) on the pressure switch (1).

S 424-007-N00

- (3) Install the pressure switch on the manifold.
 - (a) Install the lockwire on the pressure switch.

S 434-008-N00

- (4) Remove the protection caps and connect the electrical connector to the receptacle on the pressure switch.

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- S 614-022-N00
- (5) Do the servicing procedure for the applicable hydraulic system reservoir (AMM 12-12-01/301).
- E. Put the Airplane Back to Its Usual Condition.
- S 424-015-N00
- (1) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).
- S 714-024-N00
- (2) Do the Sync-Lock Integrity Test (AMM 78-34-13/501).
- S 444-016-N00
- (3) Do the activation procedure for the speed brake control system (AMM 27-61-00/201).
- S 864-017-N00
- (4) Remove the DO-NOT-OPERATE tags from the thrust levers.

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THRUST REVERSER DIRECTIONAL CONTROL VALVE SOLENOID VALVE -
REMOVAL/INSTALLATION

1. General

- A. This procedure has two tasks. The first task removes the solenoid valve from the directional control valve. The second task installs the solenoid valve on the directional control valve.
- B. The solenoid valve is attached to the directional control valve in the strut. The forward strut fairing must be removed to get access to the valve.

TASK 78-34-09-004-001-N00

2. Remove the Solenoid Valve on the Directional Control Valve

A. References

- (1) AMM 54-52-01/401, Strut Fairings

B. Access

(1) Location Zones

- 210 Control Cabin
- 430 Nacelle Strut Left
- 440 Nacelle Strut Right

(2) Access Panels

- 431BT Left Forward Strut Fairing
- 441BT Right Forward Strut Fairing

C. Remove the Solenoid Valve on the Directional Control Valve (Fig. 401)

S 864-002-N00

- (1) For the left engine, open these circuit breakers and attach the DO-NOT-CLOSE tags:
 - (a) On the Overhead Circuit Breaker Panel, P11:
 - 1) 11D14, L ENG T/R CONT

S 864-003-N00

- (2) For the right engine, open these circuit breakers and attach the DO-NOT-CLOSE tags:
 - (a) On the P11 panel:
 - 1) 11D33, R ENG T/R CONT ALT
 - 2) 11L33, R ENG T/R CONT

S 014-004-N00

- (3) Remove the forward strut fairing (AMM 54-52-01/401).

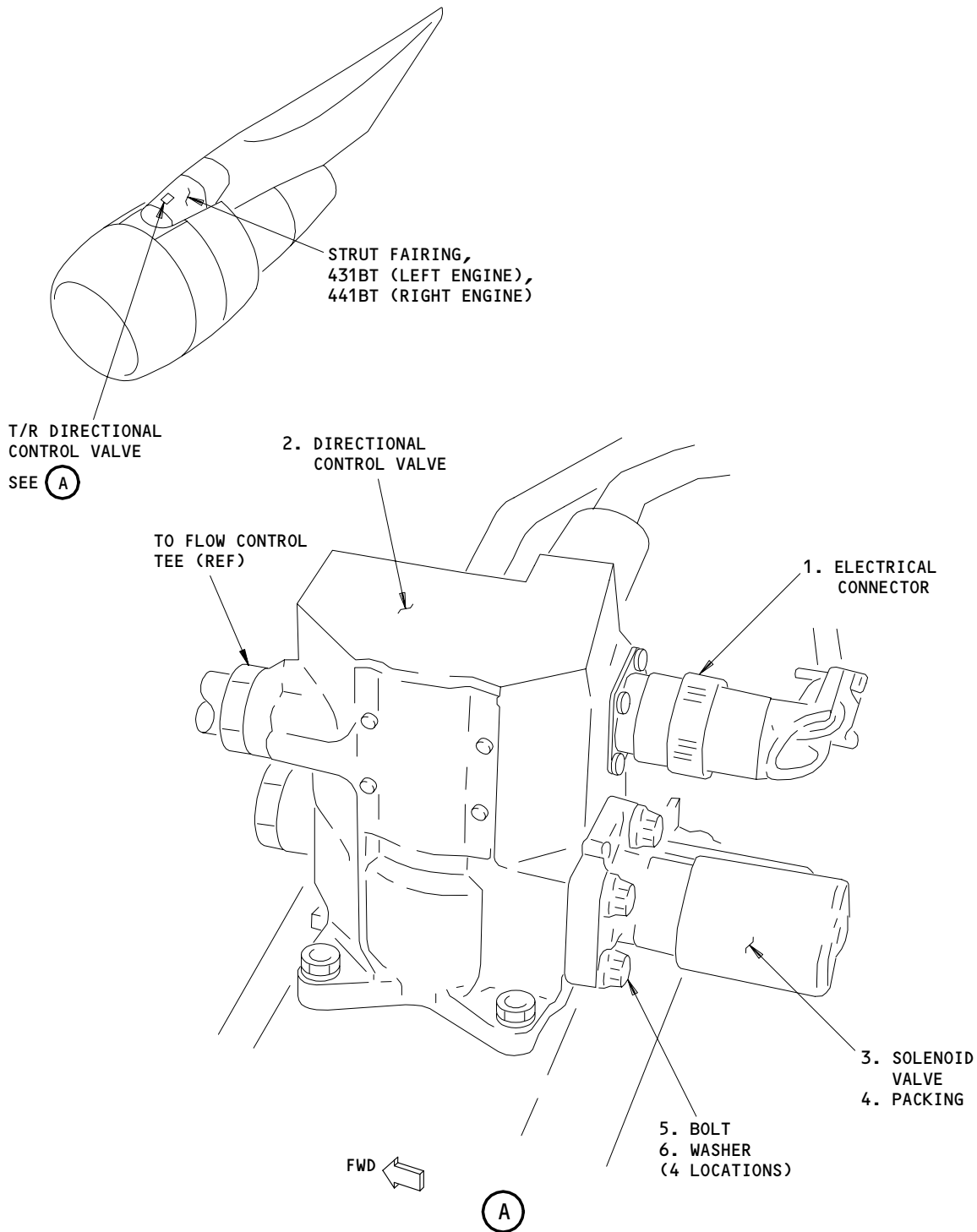
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Thrust Reverser Directional Control Valve Solenoid Valve Installation
Figure 401

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- S 024-013-N00
(4) Remove the lockwire from the bolts (5) that attach the solenoid valve (3) to the control valve (2).

- S 024-005-N00
(5) Remove the bolts (5) and the washers (6) that attach the solenoid valve (3) to the directional control valve (2).

- S 024-006-N00
(6) Remove the solenoid valve (3).
(a) Discard the packing (4).

TASK 78-34-09-404-007-N00

3. Install the Solenoid Valve on the Directional Control Valve

A. References

- (1) AMM 54-51-01/401, Strut Fairings

B. Access

(1) Location Zones

- | | |
|-----|---------------------|
| 210 | Control Cabin |
| 430 | Nacelle Strut Left |
| 440 | Nacelle Strut Right |

(2) Access Panels

- | | |
|-------|--|
| 431AT | Left Forward Strut Fairing, Fwd Section |
| 441AT | Right Forward Strut Fairing, Fwd Section |

C. Install the Solenoid Valve on the Directional Control Valve (Fig. 401)

- S 424-008-N00
(1) Install the packing (4) on the solenoid valve (3).

- S 424-009-N00
(2) Put the solenoid valve (3) on the directional control valve (2) and install the bolts (5) and the washers (6).
(a) Tighten the bolts to 50-75 pound-inches.
(b) Install the lockwire on the bolts.

- S 414-010-N00
(3) Install the forward strut fairing (AMM 54-52-01/401).

- S 864-012-N00
(4) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) On the Overhead Circuit Breaker Panel, P11:
1) 11D14, L ENG T/R CONT

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S 864-011-N00

(5) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers:

(a) On the P11 panel:

- 1) 11D33, R ENG T/R CONT ALT
- 2) 11L33, R ENG T/R CONT

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THRUST REVERSER STOW VALVE – REMOVAL/INSTALLATION

1. General

- A. This procedure has two tasks. The first task removes the stow valve for the thrust reverser. The second task installs the stow valve for the thrust reverser.

TASK 78-34-10-004-049-N00

2. Remove the Thrust Reverser Stow Valve

A. References

- (1) AMM 06-43-00/201, Engine and Nacelle Strut Access Doors and Panels
- (2) AMM 27-61-00/201, Speed Brake Control System
- (3) AMM 29-11-00/201, Main (Left, Right and Center) Hydraulic System
- (4) AMM 78-31-00/201, Thrust Reverser System
- (5) AMM 78-31-00/501, Thrust Reverser Operational Test
- (6) AMM 78-34-11/401, Thrust Reverser Stow Valve Pressure Switch
- (7) AMM 78-34-12/401, Thrust Reverser Stow Valve Solenoid Valve

B. Access

(1) Location Zones

- 437 L Power Plant Strut
- 447 R Power Plant Strut

(2) Access Panels

- 437AL Engine Strut Hydraulic Bay (Left)
- 437AR Engine Strut Hydraulic Bay (Right)
- 447AL Engine Strut Hydraulic Bay (Left)
- 447AR Engine Strut Hydraulic Bay (Right)

- C. Prepare to Remove the Stow Valve for the Thrust Reverser.

S 044-001-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE AUTOMATIC SPEED BRAKES. IF YOU DO NOT DO THIS, THE AUTOMATIC SPEED BRAKES CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

- (1) Do this task: Automatic Speed Brake System Deactivation (AMM 27-61-00/201).

S 864-002-N00

- (2) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

S 864-003-N00

- (3) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

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S 864-004-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 task: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 864-005-N00

- (5) For the left engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
(a) 11D13, L ENG T/R IND
(b) 11D14, L ENG T/R CONT

S 864-006-N00

- (6) For the right engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
(a) 11D32, R ENG T/R ALTN
(b) 11D33, R ENG T/R CONT ALTN
(c) 11L32, R ENG T/R IND
(d) 11L33, R ENG T/R CONT

- D. Remove the Stow Valve for the Thrust Reverser (Fig. 401).

S 014-007-N00

- (1) Open the access panels for the hydraulic bay on the engine strut (AMM 06-43-00/201).

NOTE: Open the access panels 437BL and 437BR for the left engine.
Open the access panels 447BL and 447BR for the right engine.

S 864-008-N00

- (2) Release the pressure in the main hydraulic system and reservoir for the applicable strut (AMM 29-11-00/201).

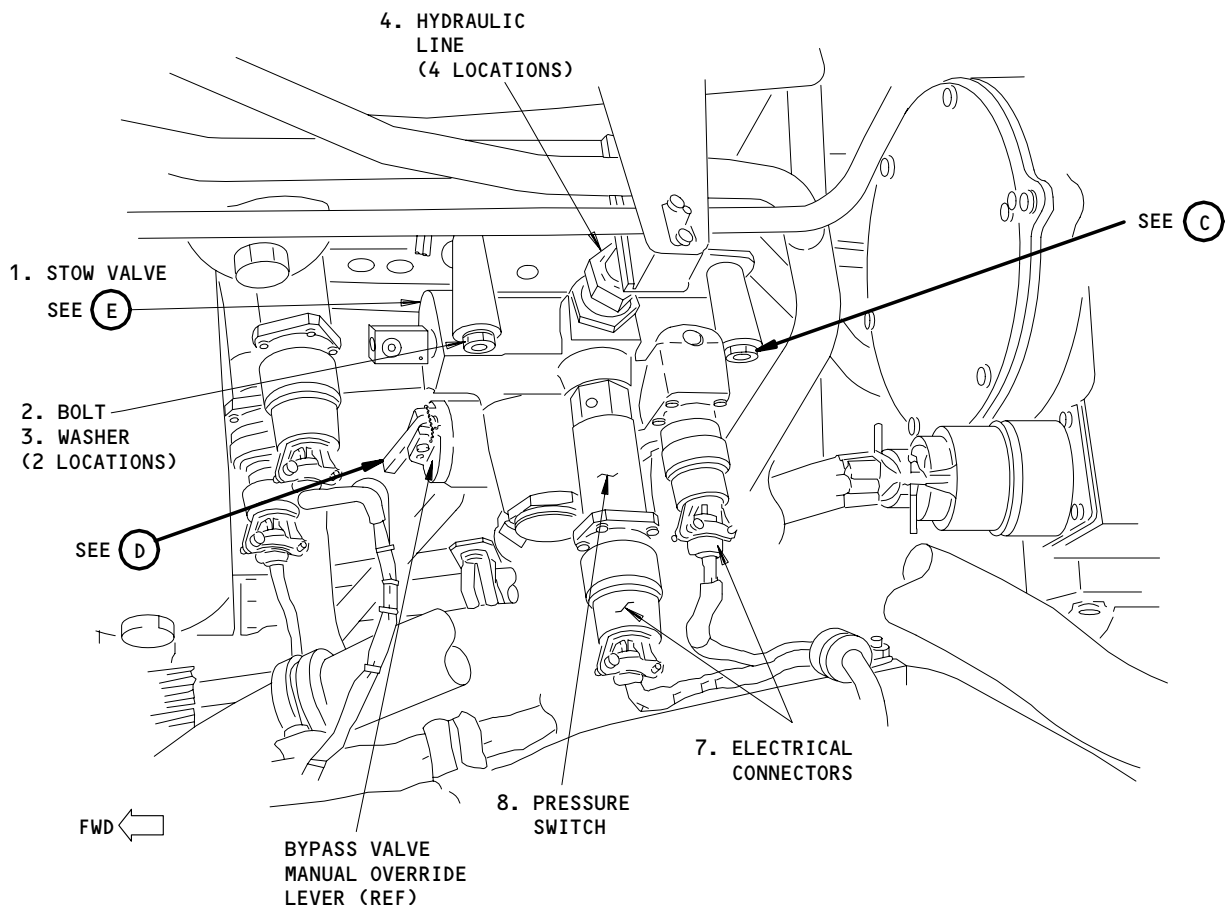
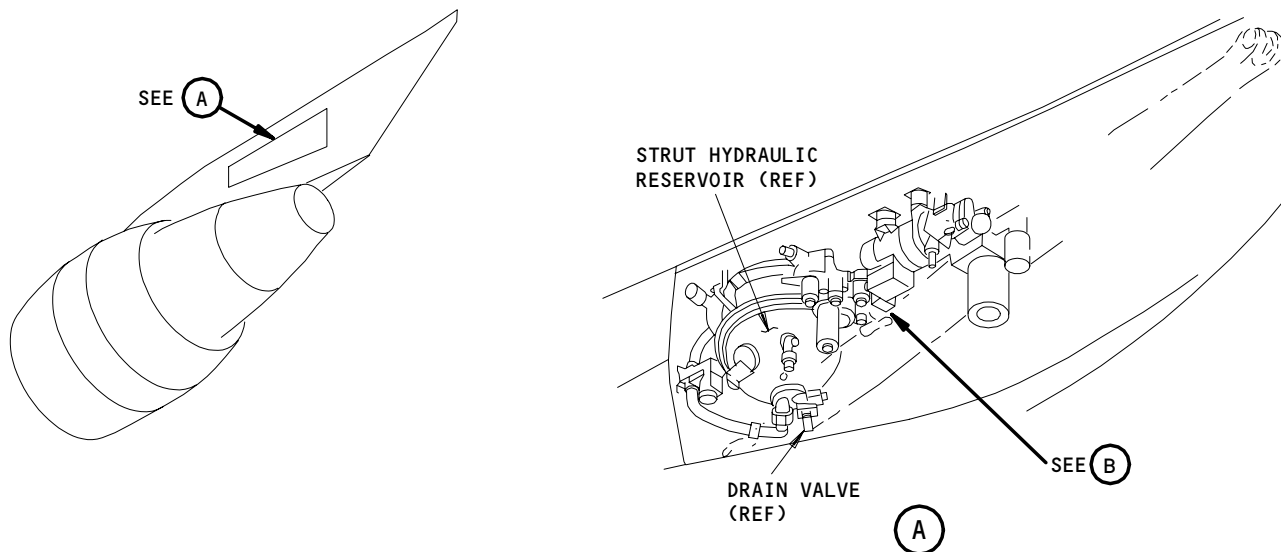
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LEFT STRUT INSTALLATION

(B)

Thrust Reverser Stow Valve Installation
Figure 401 (Sheet 1)

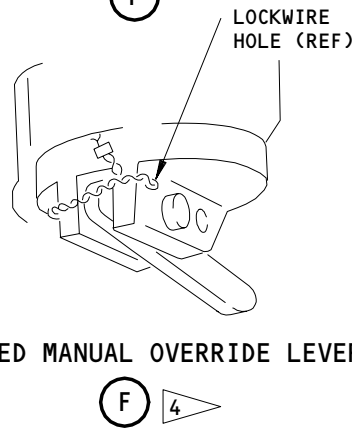
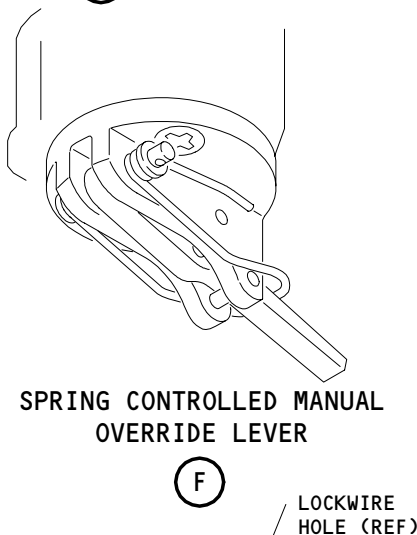
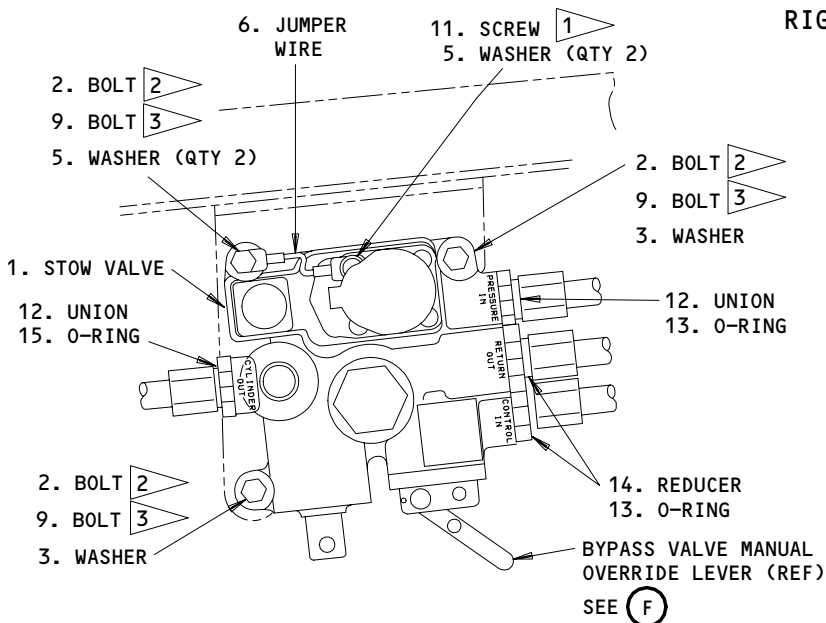
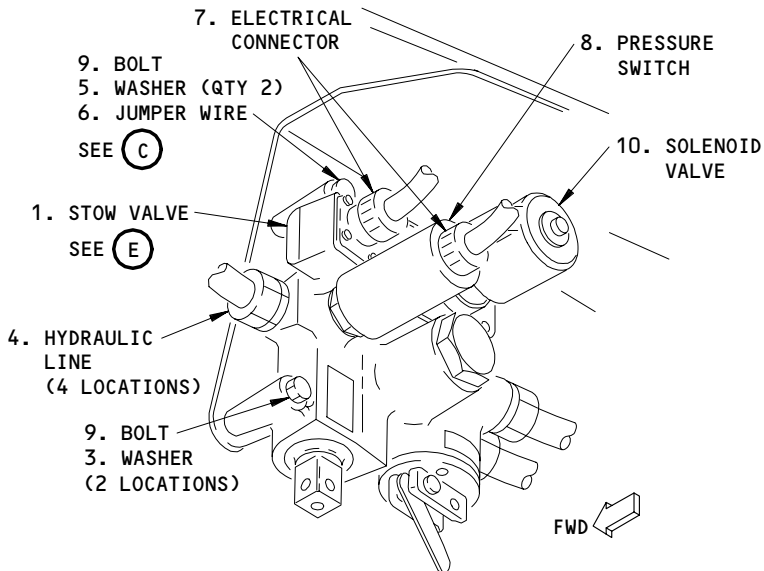
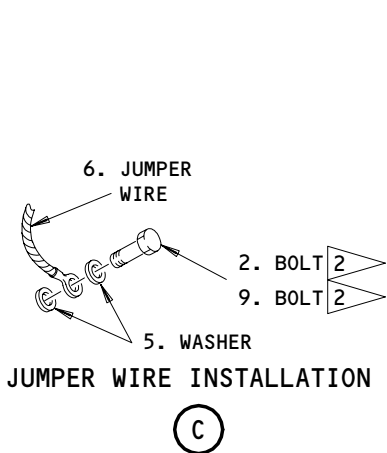
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- 1 USE THE SOLENOID VALVE SCREW WHICH WAS INSTALLED
- 2 LEFT INSTALLATION
- 3 RIGHT INSTALLATION
- 4 MAKE SURE THE LEVER IS LOCKED IN THIS POSITION WHEN THE MANUAL OVERRIDE IS NOT NECESSARY

Thrust Reverser Stow Valve Installation
Figure 401 (Sheet 2)

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S 684-009-N00

CAUTION: BE PREPARED TO CATCH THE HYDRAULIC FLUID IN THE APPLICABLE CONTAINERS. IF THE HYDRAULIC FLUID FALLS ON THE ENGINE, QUICKLY CLEAN THE ENGINE. IF YOU DO NOT QUICKLY CLEAN THE HYDRAULIC FLUID, THE HYDRAULIC FLUID CAN CAUSE DAMAGE TO THE ENGINE.

- (3) Open the drain valve on the applicable hydraulic system reservoir to drain the hydraulic fluid into the container.

NOTE: The hydraulic system reservoir is found in the strut.

S 434-010-N00

- (4) When the hydraulic fluid has drained, close the drain valve.
 - (a) Install lockwire on the drain valve.

S 034-011-N00

- (5) Disconnect the electrical connectors from the stow valve.
 - (a) Install the protection caps on the electrical connectors and the stow valve receptacles.

S 034-012-N00

- (6) Disconnect the four hydraulic lines from the stow valve.
 - (a) Install the protection caps on the hydraulic lines.

S 034-013-N00

- (7) Loosen the brackets on the hydraulic lines, as it is necessary to get the correct clearance to remove the stow valve.

S 024-014-N00

- (8) To remove the stow valve from the right strut, do the steps that follow:
 - (a) Remove the two bolts and washers from the stow valve.
 - (b) Remove the bolt, two washers and jumper wire from the stow valve.

S 024-015-N00

- (9) To remove the left stow valve from the left strut, do the steps that follow:
 - (a) Remove the two bolts and washers from the stow valve.
 - (b) Remove the bolt, two washers and jumper wire from the stow valve.

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S 034-016-N00

- (10) Remove the screw, jumper wire and two washers from the solenoid valve for the stow valve.

S 034-017-N00

- (11) Remove the unions and the O-rings from the hydraulic ports on the stow valve with the marks "PRESSURE IN" and "CYLINDER OUT".
 - (a) Install the protection caps on the hydraulic ports on the stow valve.

S 034-018-N00

- (12) Remove the reducers and the O-rings from the hydraulic ports with the marks "CONTROL IN" and "RETURN OUT".
 - (a) Install the protection caps on the hydraulic ports on the stow valve.

S 034-019-N00

- (13) If you will replace the stow valve, remove the solenoid valve (AMM 78-34-11/401) and the pressure switch (AMM 78-34-12/401).
 - (a) Install the protection covers on the component orifices on the stow valve.

TASK 78-34-10-404-050-N00

3. Install the Thrust Reverser Stow Valve

A. Equipment

- (1) Bonding Meter - Microhm Bridge, Type 2 Bonding Meter, Avtron Model T477W, Avtron Manufacturing Inc., Cleveland, Ohio.

B. Consumable Materials

- (1) D00148 BMS 3-11 Type 4 Class 1 Hydraulic Fluid

C. References

- (1) AMM 06-43-00/201, Engine and Nacelle Strut Access Doors and Panels
- (2) AMM 12-12-01/301, Hydraulic Systems
- (3) AMM 27-61-00/201, Speed Brake Control System
- (4) AMM 29-11-00/201, Main (Left, Right and Center) Hydraulic System
- (5) AMM 78-31-00/201, Thrust Reverser System
- (6) AMM 78-31-00/501, Thrust Reverser System
- (7) AMM 78-34-11/401, Thrust Reverser Stow Valve Pressure Switch
- (8) AMM 78-34-12/401, Thrust Reverser Stow Valve Solenoid Valve

D. Access

- (1) Location Zones
 - 437 L Power Plant Strut
 - 447 R Power Plant Strut

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- (2) Access Panels
 - 437AL Engine Strut Hydraulic Bay (Left)
 - 437AR Engine Strut Hydraulic Bay (Right)
 - 447AL Engine Strut Hydraulic Bay (Left)
 - 447AR Engine Strut Hydraulic Bay (Right)

E. Install the Stow Valve for the Thrust Reverser (Fig. 401).

- S 864-020-N00
 - (1) Make sure the pressure in the main hydraulic system is released (AMM 29-11-00/201).
- S 434-021-N00
 - (2) Make sure the stow valve has the pressure switch installed (AMM 78-34-11/401).
- S 434-022-N00
 - (3) Make sure the stow valve has the solenoid valve installed (AMM 78-34-12/401).
- S 434-029-N00
 - (4) Remove the protection caps from the hydraulic ports on the stow valve.
- S 434-023-N00
 - (5) Lubricate the 0-rings with hydraulic fluid.
- S 434-024-N00
 - (6) Install the reducers and the 0-rings on the hydraulic ports on the stow valve with the marks "CONTROL IN" and "RETURN OUT".
- S 434-025-N00
 - (7) Install the unions and 0-rings on the hydraulic ports with the marks "PRESSURE IN" and "CYLINDER OUT".
- S 434-026-N00
 - (8) Put the jumper wire terminal between the two washers and connect the terminal to the solenoid valve of the stow valve with the screw.
- S 424-051-N00
 - (9) Install the stow valve in the right strut with the steps that follow:
 - (a) Align the stow valve on the bracket.
 - (b) Install the two mounting bolts and washers.
 - (c) Install the bolt, two washers, and jumper wire on the stow valve.

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S 424-028-N00

- (10) Install the stow valve in the left strut with the steps that follow:
- (a) Align the stow valve on the bracket.
 - (b) Install the two mounting bolts and washers.
 - (c) Install the bolt, two washers, and jumper wire on the stow valve.

S 284-030-N00

- (11) Make sure the maximum resistance across the jumper wire is 0.0025 ohms.

S 424-027-N00

CAUTION: BE PREPARED TO CATCH THE HYDRAULIC FLUID IN THE APPLICABLE CONTAINERS. IF THE HYDRAULIC FLUID FALLS ON THE ENGINE, QUICKLY CLEAN THE ENGINE. IF YOU DO NOT QUICKLY CLEAN THE HYDRAULIC FLUID, THE HYDRAULIC FLUID CAN CAUSE DAMAGE TO THE ENGINE.

- (12) Remove the protection caps from the hydraulic lines.

S 434-031-N00

- (13) Connect the hydraulic lines to the stow valve.

S 434-032-N00

- (14) Remove the protection caps from the electrical connectors and the receptacles on the stow valve.

S 434-033-N00

- (15) Connect the electrical connectors to the receptacles on the stow valve.

S 614-034-N00

- (16) Do the servicing procedure for the applicable hydraulic system reservoir (AMM 12-12-01/301).

S 864-035-N00

- (17) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the overhead circuit breaker panel, P11:
- (a) 11D13, L ENG T/R IND
 - (b) 11D14, L ENG T/R CONT

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S 864-036-N00

- (18) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the overhead circuit breaker panel, P11:
- (a) 11D32, R ENG T/R IND ALTN
 - (b) 11D33, R ENG T/R CONT ALTN
 - (c) 11L32, R ENG T/R IND
 - (d) 11L33, R ENG T/R CONT

S 864-037-N00

- (19) Pressurize the main hydraulic system (AMM 29-11-00/201).

S 864-038-N00

- (20) Remove the DO-NOT-OPERATE tags from the thrust levers.

S 444-039-N00

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

S 714-040-N00

- (22) Do this procedure: Thrust Reverser Operational Test - Engine in Operation (AMM 78-31-00/501).

S 864-041-N00

- (23) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

S 864-044-N00

- (24) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

S 044-042-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.

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

S 214-043-N00

- (26) Examine the stow valve for leakage of hydraulic fluids.

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F. Put the Airplane Back to Its Usual Condition.

- S 414-045-N00
- (1) Close the access panels for the hydraulic bay on the engine strut (AMM 06-43-00/201).

- S 444-046-N00
- (2) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

- S 444-047-N00
- (3) Do the activation procedure for the speed brake control system (AMM 27-61-00/201).

- S 864-048-N00
- (4) Remove the DO-NOT-OPERATE tags from the thrust levers.

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THRUST REVERSER STOW VALVE PRESSURE SWITCH – REMOVAL/INSTALLATION

1. General

- A. This procedure has two tasks. The first task removes the pressure switch from the stow valve. The second task installs the pressure switch on the stow valve.

TASK 78-34-11-004-001-N00

2. Remove the Thrust Reverser Stow Valve Pressure Switch

A. References

- (1) AMM 27-61-00/201, Speed Brake Control System
- (2) AMM 29-11-00/201, Main (Left, Right and Center) Hydraulic System
- (3) AMM 78-31-00/201, Thrust Reverser System
- (4) AMM 78-34-10/401, Thrust Reverser Stow Valve

B. Access

(1) Location Zones

- 437 L Power Plant Strut
- 447 R Power Plant Strut

(2) Access Panels

- 437AL Engine Strut Hydraulic Bay (Left)
- 437AR Engine Strut Hydraulic Bay (Right)
- 447AL Engine Strut Hydraulic Bay (Left)
- 447AR Engine Strut Hydraulic Bay (Right)

C. Prepare to Remove the Pressure Switch for the Stow Valve.

S 044-002-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE AUTOMATIC SPEED BRAKES. IF YOU DO NOT DO THIS, THE AUTOMATIC SPEED BRAKES CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

- (1) Do this task: Automatic Speed Brake System Deactivation (AMM 27-61-00/201).

S 864-003-N00

- (2) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

S 864-004-N00

- (3) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

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S 044-005-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 task: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

D. Remove the Pressure Switch for the Stow Valve (Fig. 401).

S 864-006-N00

(1) Release the pressure in the main hydraulic system and reservoir of the applicable strut (AMM 29-11-00/201).

S 684-007-N00

CAUTION: BE PREPARED TO CATCH THE HYDRAULIC FLUID IN THE APPLICABLE CONTAINERS. IF THE HYDRAULIC FLUID FALLS ON THE ENGINE, QUICKLY CLEAN THE ENGINE. IF YOU DO NOT QUICKLY CLEAN THE HYDRAULIC FLUID, THE HYDRAULIC FLUID CAN CAUSE DAMAGE TO THE ENGINE.

(2) Open the drain valve on the applicable hydraulic system reservoir to drain the hydraulic fluid into the container.

NOTE: The hydraulic system reservoir is found in the strut.

S 434-008-N00

(3) When the hydraulic fluid has drained, close the drain valve.
(a) Install lockwire on the drain valve.

S 034-009-N00

(4) Remove the stow valve for the thrust reverser (AMM 78-34-10/401).

NOTE: Because of the tight pressure switch installation, it is recommended you remove the stow valve first before you replace the pressure switch.

S 024-010-N00

(5) Remove the pressure switch from the stow valve.

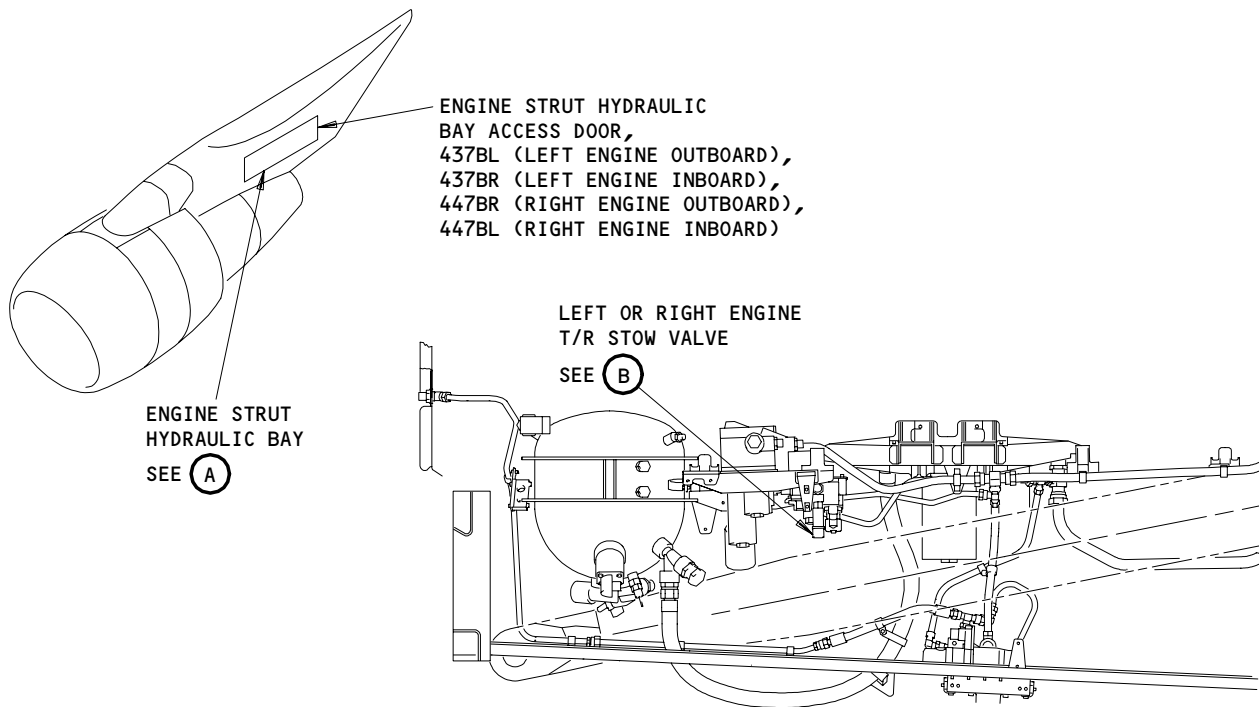
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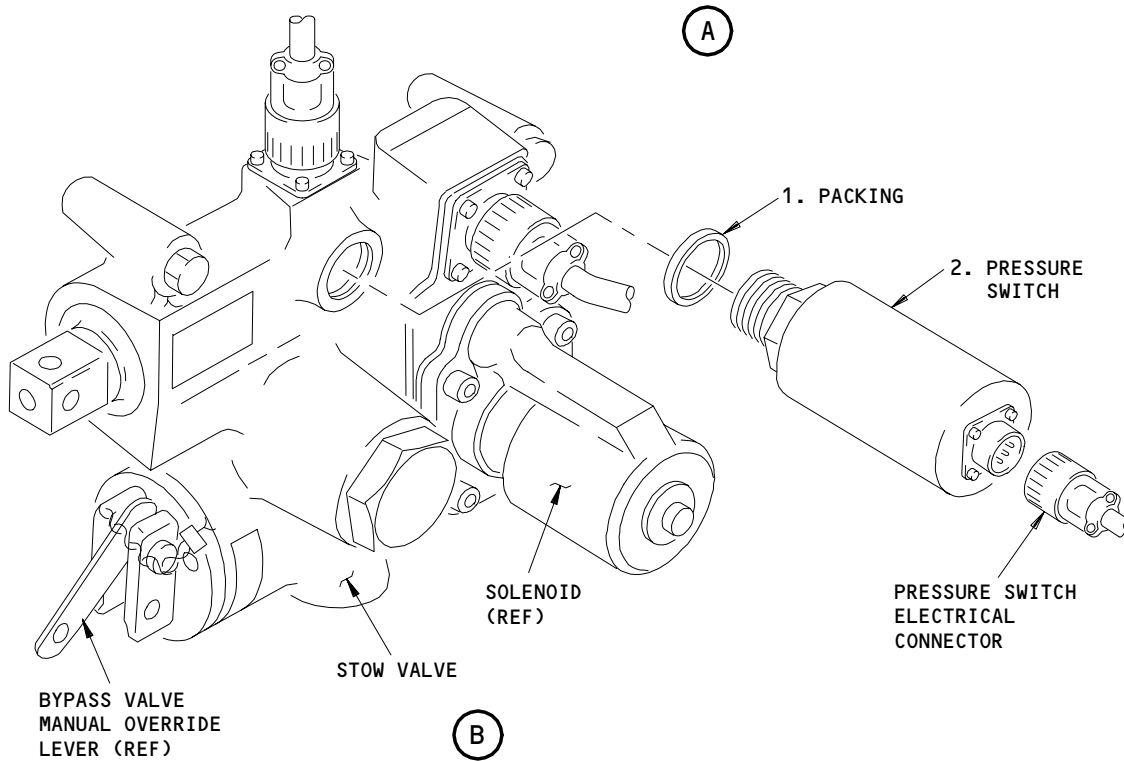
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ENGINE STRUT HYDRAULIC BAY



Thrust Reverser Stow Valve Pressure Switch Installation
Figure 401

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S 034-011-N00

- (6) Remove the packing from the pressure switch.
 - (a) Discard the packing.

TASK 78-34-11-404-012-N00

3. Install the Thrust Reverser Stow Valve Pressure Switch

A. References

- (1) AMM 12-12-01/301, Hydraulic Systems
- (2) AMM 27-61-00/201, Speed Brake Control System
- (3) AMM 78-31-00/201, Thrust Reverser System
- (4) AMM 78-34-10/401, Thrust Reverser Stow Valve

B. Access

(1) Location Zones

- 437 L Power Plant Strut
- 438 R Power Plant Strut

(2) Access Panels

- 437AL Engine Strut Hydraulic Bay (Left)
- 437AR Engine Strut Hydraulic Bay (Right)
- 447AL Engine Strut Hydraulic Bay (Left)
- 447AR Engine Strut Hydraulic Bay (Right)

C. Install the Pressure Switch for the Stow Valve (Fig. 401).

S 434-013-N00

- (1) Install a new packing on the pressure switch.

S 424-014-N00

- (2) Install the pressure switch on the stow valve.
 - (a) Install lockwire on the pressure switch.

S 434-015-N00

- (3) Install the stow valve (AMM 78-34-10/401).

S 614-019-N00

- (4) Do the servicing procedure for the applicable hydraulic system reservoir (AMM 12-12-01/301).

D. Put the Airplane Back to Its Usual Condition.

S 444-016-N00

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

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- S 444-017-N00
- (2) Do the activation procedure for the speed brake control system (AMM 27-61-00/201).
- S 864-018-N00
- (3) Remove the DO-NOT-OPERATE tags from the thrust levers.

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THRUST REVERSER STOW VALVE SOLENOID VALVE – REMOVAL/INSTALLATION

1. General

- A. This procedure has two tasks. The first task removes the solenoid valve from the stow valve. The second task installs the solenoid valve on the stow valve.

TASK 78-34-12-004-001-N00

2. Remove the Thrust Reverser Stow Valve Solenoid Valve

A. References

- (1) AMM 27-61-00/201, Speed Brake Control System
- (2) AMM 29-11-00/201, Main (Left, Right and Center) Hydraulic System
- (3) AMM 78-31-00/201, Thrust Reverser System
- (4) AMM 78-34-10/401, Thrust Reverser Stow Valve

B. Access

(1) Location Zones

- 437 L Power Plant Strut
- 447 R Power Plant Strut

(2) Access Panels

- 437AL Engine Strut Hydraulic Bay (Left)
- 437AR Engine Strut Hydraulic Bay (Right)
- 447AL Engine Strut Hydraulic Bay (Left)
- 447AR Engine Strut Hydraulic Bay (Right)

C. Prepare to Remove the Solenoid Valve for the Stow Valve.

S 044-002-N00

WARNING: DO THE DEACTICATION PROCEDURE FOR THE AUTOMATIC SPEED BRAKES. IF YOU DO NOT DO THIS, THE AUTOMATIC SPEED BRAKES CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

- (1) Do this task: Automatic Speed Brake System Deactivation (AMM 27-61-00/201).

S 864-003-N00

- (2) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.

S 864-004-N00

- (3) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.

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S 044-005-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 task: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

D. Remove the Solenoid Valve for the Stow Valve (Fig. 401).

S 864-006-N00

(1) Release the pressure in the main hydraulic system and reservoir for the applicable strut (AMM 29-11-00/201).

S 684-007-N00

CAUTION: BE PREPARED TO CATCH THE HYDRAULIC FLUID IN THE APPLICABLE CONTAINERS. IF THE HYDRAULIC FLUID FALLS ON THE ENGINE, QUICKLY CLEAN THE ENGINE. IF YOU DO NOT QUICKLY CLEAN THE HYDRAULIC FLUID, THE HYDRAULIC FLUID CAN CAUSE DAMAGE TO THE ENGINE.

(2) Open the drain valve on the applicable hydraulic system reservoir to drain the hydraulic fluid into the container.

NOTE: The hydraulic system reservoir is found in the strut.

S 434-008-N00

(3) When the hydraulic fluid has drained, close the drain valve.
(a) Install lockwire on the drain valve.

S 034-009-N00

(4) Remove the stow valve for the thrust reverser (AMM 78-34-10/401).

NOTE: Because of the tight solenoid valve installation, it is recommended you remove the stow valve first before you replace the solenoid valve.

S 024-011-N00

(5) Remove the screws from the solenoid valve.

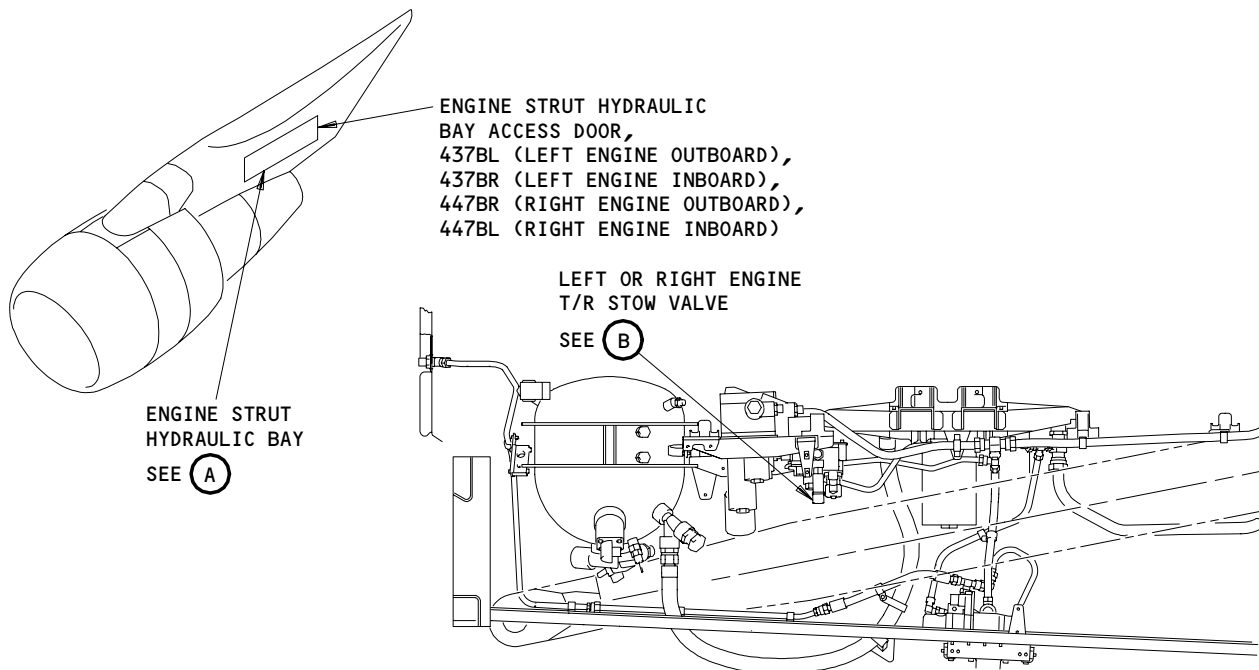
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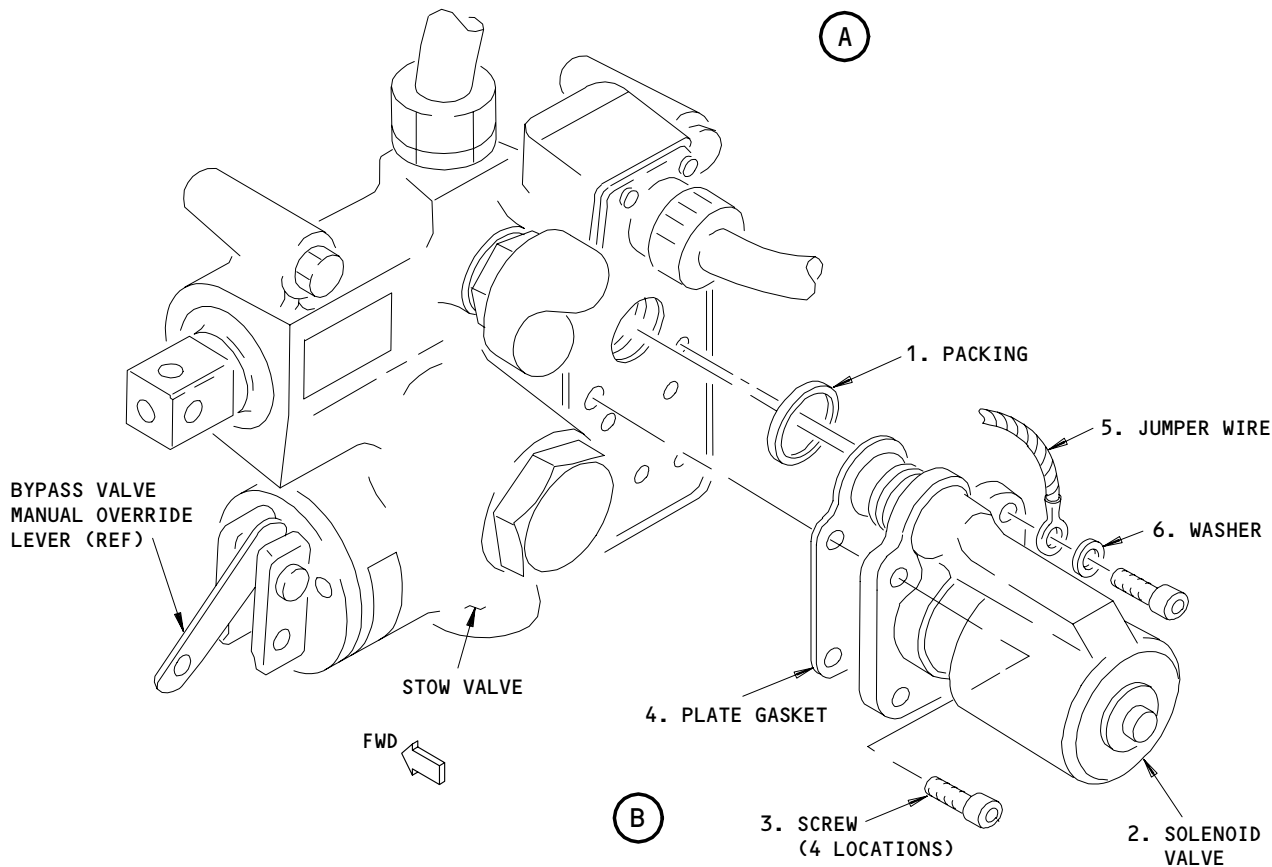
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ENGINE STRUT HYDRAULIC BAY



Thrust Reverser Stow Valve Solenoid Valve Installation
Figure 401

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- S 024-014-N00
- (6) Remove the solenoid valve from the stow valve.
 - (a) Install the protection caps on the base of the solenoid valve and its receptacle on the stow valve.

- S 034-012-N00
- (7) Remove the packing and the plate gasket from the solenoid valve.
 - (a) Discard the packing.

TASK 78-34-12-404-013-N00

3. Install the Thrust Reverser Stow Valve Solenoid Valve

A. References

- (1) AMM 12-12-01/301, Hydraulic Systems
- (2) AMM 27-61-00/201, Speed Brake Control System
- (3) AMM 78-31-00/201, Thrust Reverser System
- (4) AMM 78-34-10/401, Thrust Reverser Stow Valve

B. Access

- (1) Location Zones
 - 437 L Power Plant Strut
 - 447 R Power Plant Strut

- (2) Access Panels
 - 437AL Engine Strut Hydraulic Bay (Left)
 - 437AR Engine Strut Hydraulic Bay (Right)
 - 447AL Engine Strut Hydraulic Bay (Left)
 - 447AR Engine Strut Hydraulic Bay (Right)

C. Install the Solenoid Valve for the Stow Valve (Fig. 401).

- S 434-012-N00
- (1) Remove the protection caps from the base of the solenoid valve and its receptacle on the stow valve.

- S 434-014-N00
- (2) Install the plate gasket and a new packing on the solenoid valve.

- S 424-015-N00
- (3) Install the solenoid valve on the stow valve with the screws.

- S 434-016-N00
- (4) Install the stow valve (AMM 78-34-10/401).

NOTE: The jumper wire is connected during the stow valve installation.

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D. Put the Airplane Back to Its Usual Condition.

S 444-017-N00

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

S 444-018-N00

- (2) Do the activation procedure for the speed brake control system (AMM 27-61-00/201).

S 864-019-N00

- (3) Remove the DO-NOT-OPERATE tags from the thrust levers.

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THRUST REVERSER SYNC LOCK – REMOVAL/INSTALLATION

1. General

- A. This procedure has two tasks:
 - (1) Remove the thrust reverser sync lock.
 - (2) Install the thrust reverser sync lock.
- B. There are two thrust reverser sync locks on each engine. The thrust reverser sync locks are installed on the lower non-locking hydraulic actuator of each thrust reverser sleeve.
- C. The thrust reverser sync lock is referred to as the sync lock in this procedure.

TASK 78-34-13-004-001-N00

2. Thrust Reverser Sync Lock Removal

A. References

- (1) AMM 24-22-00/201, Electrical Power – Control
- (2) AMM 71-11-04/201, Fan Cowl Panels
- (3) AMM 78-31-00/201, Thrust Reverser System

B. Access

(1) Location Zones

- 211 Flight Compartment
- 212 Flight Compartment
- 410 No. 1 Power Plant (Left)
- 420 No. 2 Power Plant (Right)

(2) Access Panels

- 413AL Fan Cowl Panel (Left)
- 413AR Fan Cowl Panel (Right)
- 423AL Fan Cowl Panel (Left)
- 423AR Fan Cowl Panel (Right)

C. Prepare for Removal

S 864-002-N00

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

S 014-003-N00

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

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S 044-004-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 PERSONS OR DAMAGE TO EQUIPMENT.

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

D. Remove the Sync Lock (Fig. 401)

S 034-006-N00

(1) Disconnect the electrical connector DV170 (DV171) from the sync lock (3).

S 034-007-N00

- (2) Remove the sync lock bracket (6) as follows:
- (a) Remove the band clamp (8) that attaches the sync lock bracket (6) to the lower non-locking hydraulic actuator (7).
 - (b) Remove the two bolts (1) that attach the sync lock bracket (6) to the sync lock (3).
 - (c) Remove the sync lock bracket (6).
 - (d) Remove the gasket from below the sync lock bracket (6).

S 024-008-N00

- (3) Remove the sync lock (3) as follows:
- (a) Hold the sync lock (3) with a 2-7/16 wrench on the wrench flats (4).
 - (b) Loosen the torque nut (9) on the sync lock (3).
 - (c) Remove the sync lock (3) from the lower non-locking hydraulic actuator (7).

S 034-009-N00

(4) Install the protection covers on all openings.

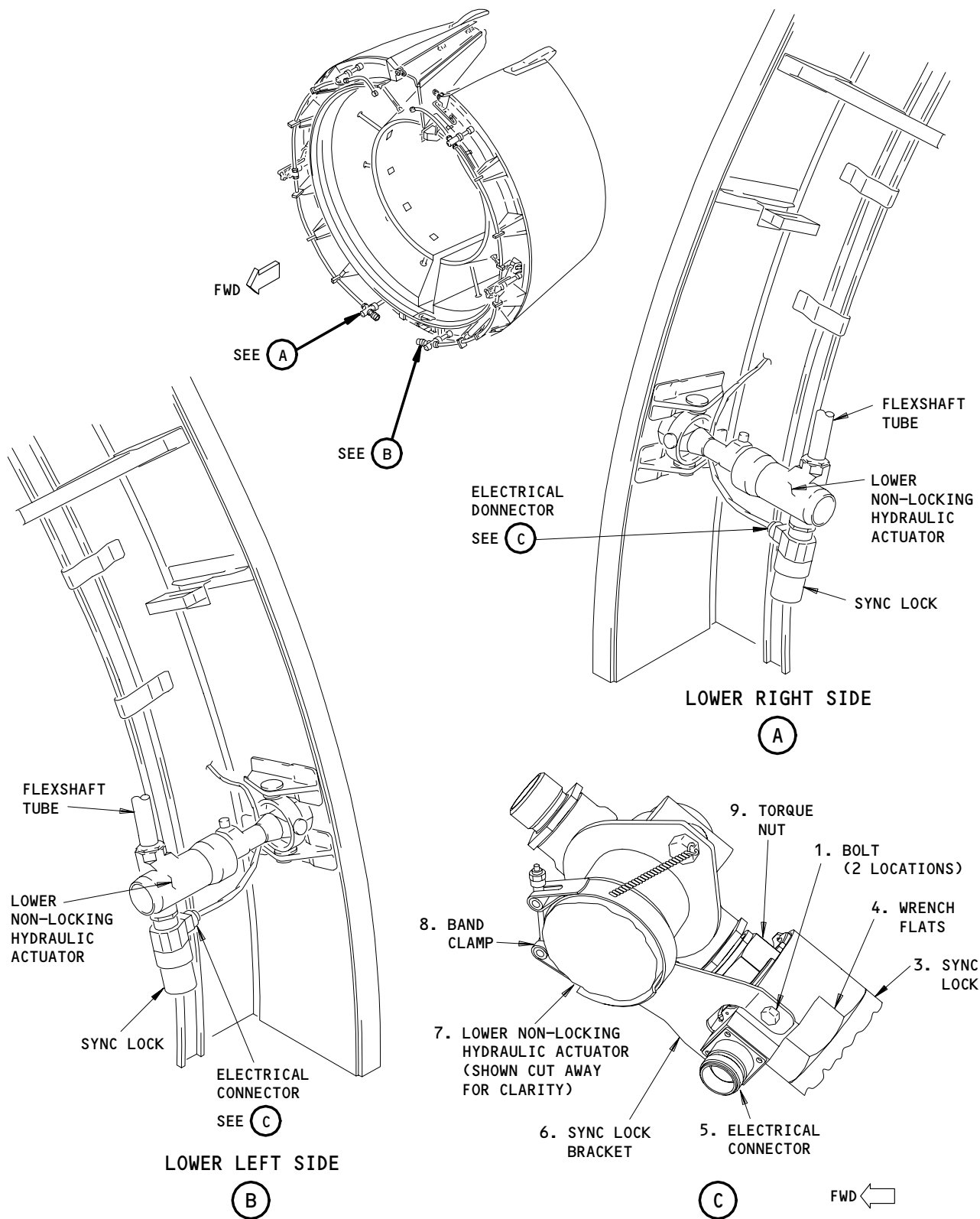
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Thrust Reverser Sync Lock Installation
Figure 401

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TASK 78-34-13-404-010-N00

3. Thrust Reverser Sync Lock Installation

A. References

- (1) AMM 24-22-00/201, Electrical Power - Control
- (2) AMM 71-11-04/201, Fan Cowl Panels
- (3) AMM 78-31-00/201, Thrust Reverser System
- (4) AMM 78-31-00/501, Thrust Reverser System

B. Access

(1) Location Zones

- 211 Flight Compartment
- 212 Flight Compartment
- 410 No. 1 Power Plant (Left)
- 420 No. 2 Power Plant (Right)

(2) Access Panels

- 413AL Fan Cowl Panels (Left)
- 413AR Fan Cowl Panels (Right)
- 423AL Fan Cowl Panels (Left)
- 423AR Fan Cowl Panels (Right)

C. Install the Sync Lock (Fig. 401)

S 434-011-N00

- (1) Remove the protection covers from all openings.

S 424-012-N00

- (2) Install the sync lock (3) as follows:
 - (a) Install the sync lock (3) on the lower non-locking hydraulic actuator (7) with the electrical connector (5) in the aft direction.
 - (b) Tighten the torque nut (9) on the sync lock (3) with your hand.

S 434-013-N00

- (3) Put the gasket around the lower non-locking hydraulic actuator (7) as follows:
 - (a) Put the gasket in position to be below the band clamp (8).
 - 1) Put the gasket in position so the ends of the gasket will be below the sync lock bracket (6).
 - 2) The ends of the gasket must not make an overlap.

NOTE: You can cut the gasket if it is necessary.

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S 434-014-N00

- (4) Install the sync lock bracket (6) as follows:
 - (a) Attach the sync lock bracket (6) to the sync lock (3) with the two bolts (1).
 - (b) Tighten the bolts (1) loosely to make sure the sync lock bracket (6) can move in the slots.
 - (c) Install the band clamp (8) on the tang of the sync lock bracket (6) and around the lower non-locking hydraulic actuator (7).
 - (d) Tighten the nut of the band clamp (8) to 30-35 pound-inches (3.4-4.0 newton-meters).

S 424-015-N00

- (5) Install the sync lock (3) as follows:
 - (a) Hold the sync lock (3) with a 2-7/16 wrench on the wrench flats (4).
 - (b) Tighten the torque nut (9) to 855-945 pound-inches (96.6-106.8 newton-meters).
 - (c) Fully tighten the two bolts (1) that attach the sync lock bracket (6) to the sync lock (3).

S 434-021-N00

- (6) Connect the electrical connector DV170 (DV171) to the electrical connector (5) on the sync lock.
- D. Put the Airplane Back to Its Usual Condition.

S 414-017-N00

- (1) Close the applicable fan cowl panel (AMM 71-11-04/201).

S 444-018-N00

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

S 714-019-N00

- (3) Do the operational test of the thrust reverser system (AMM 78-31-00/501).

S 864-020-N00

- (4) Remove electrical power (AMM 24-22-00/201).

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THRUST REVERSER SYNC LOCK – ADJUSTMENT/TEST

1. General

- A. There are two sync locks for each engine thrust reverser. The sync lock is installed on the lower non-locking hydraulic actuator of each thrust reverser sleeve.
- B. This procedure has two tasks:
 - (1) Thrust Reverser Sync Lock Integrity Test
 - (2) Sync Lock Manual Integrity Test When Hydraulic Power Is Not Available.
- C. The Thrust Reverser Sync Lock Integrity Test has these parts:
 - (1) The first part does a test of the electrical circuit which controls the operation of the sync lock on each thrust reverser sleeve.
 - (2) The second part does a test of the mechanical function of the sync lock on each thrust reverser sleeve with hydraulic power.
- D. The thrust reverser sync lock is referred to as the sync lock in this procedure.
- E. The breakout box and the appropriate patch cable is used to plug on to the end of a system electrical connector or plug into the socket of a relay to jumper across two pins or find if there is electrical power on a pin. The nomenclature on the cable markers gives the applicable airplane connectors and the box connector. The breakout box is used at the thrust reverser.

TASK 78-34-13-705-007-N00

2. Thrust Reverser Sync Lock Integrity Test

- A. Equipment
 - (1) Multi-meter, Simpson 260 or equivalent – commercially available
 - (2) Breakout Box, Thrust Reverser – A78025-77
- B. References
 - (1) AMM 24-22-00/201, Electrical Power – Control
 - (2) AMM 29-11-00/201, Main Hydraulic Systems
 - (3) AMM 71-11-04/201, Fan Cowl Panels
 - (4) AMM 78-31-00/201, Thrust Reverser System
 - (5) AMM 78-34-13/401, Thrust Reverser Sync Locks
 - (6) WDM 78-34-11, Thrust Reverser Control
 - (7) WDM 78-34-21, Thrust Reverser Control
- C. Access
 - (1) Location Zones
 - 211 Flight Compartment
 - 212 Flight Compartment
 - 410 No. 1 Power Plant (Left)
 - 420 No. 2 Power Plant (Right)
 - (2) Access Panels
 - 413AL Fan Cowl Panel (Left)
 - 413AR Fan Cowl Panel (Right)
 - 423AL Fan Cowl Panel (Left)
 - 423AR Fan Cowl Panel (Right)

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D. Prepare to Do the Integrity Test for the Sync Locks.

S 865-004-N00

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

S 865-041-N00

- (2) Make sure the left and right fire handles are in NORMAL position.

S 865-005-N00

- (3) For the left engine, make sure these circuit breakers are closed:
(a) On the Overhead Circuit Breaker Panel, P11:
1) 11C29, LDG GR POS AIR/GND SYS 2 ALT
2) 11U23, LDG GR POS AIR/GND SYS 2

S 865-042-N00

- (4) For the left engine, open these circuit breakers and attach a DO-NOT-CLOSE tag:
(a) On the Overhead Circuit Breaker Panel, P11:
1) 11D14, L ENG T/R CONT
2) 11D13, L ENG T/R IND
3) 11D18, L ENG T/R SSL CONT

S 865-006-N00

- (5) For the right engine, make sure this circuit breaker is closed:
(a) On the Overhead Circuit Breaker Panel, P11:
1) 11C30, LDG GR POS AIR/GND SYS 1

S 865-043-N00

- (6) For the right engine, open these circuit breakers and attach a DO-NOT-CLOSE tag:
(a) On the Overhead Circuit Breaker Panel, P11:
1) 11L33, R ENG T/R CONT
2) 11L32, R ENG T/R IND
3) 11D21, R ENG T/R SSL CONT
4) 11D33, R ENG T/R CONT ALTN
5) 11D32, R ENG T/R IND ALTN

S 865-040-N00

- (7) Make sure the L(R) reverse thrust levers are forward and down to the fully stowed position.

S 015-008-N00

- (8) Open the fan cowl panels for the L(R) engine (AMM 71-11-00/201).

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S 485-053-N00

- (9) If it is necessary, use the breakout box, A78025 and the applicable patch cable or your equivalent procedure and equipment to make connections to the pins referenced in this task.

S 865-037-N00

- (10) Disconnect the electrical connector from the sync locks.
(a) Disconnect the electrical connector, D20194, from the sync lock, V170, on the left thrust reverser half.

NOTE: The electrical connector, D20194, is identified by the electrical equipment number. The previous referenced connector, DV170, is the same connection as referenced against the electrical equipment number for the sync lock, V170. The equipment numbers are the same for the left and right engine.

- (b) Disconnect the electrical connector, D20196, from the sync lock, V171, on the right thrust reverser half.

NOTE: The electrical connector, D20196, is identified by the electrical equipment number. The previous referenced connector, DV171, is the same connection as referenced against the electrical equipment number for the sync lock, V171. The equipment numbers are the same for the left and right engine.

S 865-044-N00

- (11) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker.
(a) On the Overhead Circuit Breaker Panel, P11:
1) 11D18, L ENG T/R SSL CONT

S 865-045-N00

- (12) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker.
(a) On the Overhead Circuit Breaker Panel, P11:
1) 11D21, R ENG T/R SSL CONT

E. Do the Electrical Integrity Test for the Sync Locks.

S 765-039-N00

- (1) Do these steps to do a check of the air/ground relay in the sync lock control circuit.
(a) Move the L(R) reverse thrust lever up and aft to the extend position.

NOTE: Electrical power to the sync lock will cause the sync lock to unlock.

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- (b) Use a multi-meter on the plug end of the applicable electrical connector to make sure that these conditions are correct:

FROM EQUIPMENT NO.	TO EQUIPMENT NO.	CONDITION
D20194 PIN 1	D20194 PIN 2 (GROUND)	26.0 TO 28.0 VDC
D20196 PIN 1	D20196 PIN 2 (GROUND)	26.0 TO 28.0 VDC

- (c) For the left engine, open these circuit breakers and attach a DO-NOT-CLOSE tag:
- 1) On the Overhead Circuit Breaker Panel, P11:
 - a) 11C29, LDG GR POS AIR/GND SYS 2 ALT
 - b) 11U23, LDG GR POS AIR/GND SYS 2
- (d) For the right engine, open this circuit breaker and attach a DO-NOT-CLOSE tag:
- 1) On the Overhead Circuit Breaker Panel, P11:
 - a) 11C30, LDG GR POS AIR/GND SYS 1
- (e) Use a multi-meter on the plug end of the applicable electrical connector to make sure that these conditions are correct:

FROM EQUIPMENT NO.	TO EQUIPMENT NO.	CONDITION
D20194 PIN 1	D20194 PIN 2 (GROUND)	-3 TO +1 VDC AND CONTINUITY (LESS THAN 5 OHMS)
D20196 PIN 1	D20196 PIN 2 (GROUND)	-3 TO +1 VDC AND CONTINUITY (LESS THAN 5 OHMS)

- (f) Move the L(R) reverse thrust levers forward and down to the fully stowed position.
- (g) For the left engine, remove the DO-NOT-CLOSE tag and close these circuit breakers.
- 1) On the Overhead Circuit Breaker Panel, P11:
 - a) 11C29, LDG GR POS AIR/GND SYS 2 ALT
 - b) 11U23, LDG GR POS AIR/GND SYS 2
- (h) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker.
- 1) On the Overhead Circuit Breaker Panel, P11:
 - a) 11C30, LDG GR POS AIR/GND SYS 1

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S 765-010-N00

- (2) Do these steps to make sure there are no "hot" short circuits in the electrical system which can accidentally supply power to the sync locks:
- (a) Make sure the L(R) reverse thrust lever is forward and down at the fully stowed position.
 - (b) Use a multi-meter on the plug end of the applicable electrical connector to make sure that these conditions are correct:

FROM EQUIPMENT NO.	TO EQUIPMENT NO.	CONDITION
D20194 PIN 1	D20194 PIN 2 (GROUND)	-3 TO +1 VDC AND CONTINUITY (LESS THAN 5 OHMS)
D20196 PIN 1	D20196 PIN 2 (GROUND)	-3 TO +1 VDC AND CONTINUITY (LESS THAN 5 OHMS)

- (c) If you find the correct conditions, do the Mechanical Integrity Test for the sync locks.
- (d) If you did not find these conditions to be correct, you must do these steps:
 - 1) Make a careful visual inspection of all the electrical wires and connectors between the sync lock and its power circuit breaker (WDM 78-34-11, WDM 78-34-21).
 - 2) Repair all the unserviceable electrical wire and connectors that you find.
 - 3) Use the multi-meter again to make sure there are no "hot" short circuits in the electrical system which can accidentally supply power to the sync locks.

F. Mechanical Integrity Test for the Sync Locks With Hydraulic Power

S 865-011-N00

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

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S 865-038-N00

- (2) On the left or right engine, make sure that both sync lock electrical connectors on the left and right thrust reverser halves are disconnected at this time.

S 865-046-N00

- (3) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker.
 - (a) On the Overhead Circuit Breaker Panel, P11:
 - 1) 11D14, L ENG T/R CONT
 - 2) 11D13, L ENG T/R IND

S 865-047-N00

- (4) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker.
 - (a) On the Overhead Circuit Breaker Panel, P11:
 - 1) 11L33, R ENG T/R CONT
 - 2) 11L32, R ENG T/R IND
 - 3) 11D33, R ENG T/R CONT ALTN
 - 4) 11D32, R ENG T/R IND ALTN

S 865-013-N00

WARNING: MAKE SURE ALL PERSONS AND EQUIPMENT ARE CLEAR OF THE AREA BEHIND EACH THRUST REVERSER. IF YOU DO NOT OBEY THIS INSTRUCTION, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR IF THE SYNC LOCKS DO NOT OPERATE CORRECTLY AND THE THRUST REVERSER EXTENDS.

- (5) Move the L(R) reverse thrust lever aft to try to extend the thrust reverser (AMM 78-31-00/201).
 - (a) If the thrust reverser sleeves do not extend, the sync locks are serviceable.
 - (b) If the thrust reverser sleeve extends, the applicable sync lock did not operate correctly.

S 865-018-N00

- (6) Move the L(R) reverse thrust levers forward and down to the fully stowed position.

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- S 865-050-N00
- (7) For the left engine, open these circuit breakers and attach a DO-NOT-CLOSE tag:
- (a) On the Overhead Circuit Breaker Panel, P11:
- 1) 11D14, L ENG T/R CONT
 - 2) 11D13, L ENG T/R IND
 - 3) 11D18, L ENG T/R SSL CONT
- S 865-051-N00
- (8) For the right engine, open these circuit breakers and attach a DO-NOT-CLOSE tag:
- (a) On the Overhead Circuit Breaker Panel, P11:
- 1) 11L33, R ENG T/R CONT
 - 2) 11L32, R ENG T/R IND
 - 3) 11D21, R ENG T/R SSL CONT
 - 4) 11D33, R ENG T/R CONT ALTN
 - 5) 11D32, R ENG T/R IND ALTN
- S 905-019-N00
- (9) If it is necessary, replace the sync lock(s) for the thrust reverser sleeve(s) that extended (AMM 78-34-13/401).
- S 085-052-N00
- (10) If it is necessary, remove the breakout box, A78025 and the applicable patch cable or your equivalent equipment.
- S 435-015-N00
- (11) Connect the electrical connector, D20194, on the sync lock, V170, on the left thrust reverser half.
- S 425-027-N00
- (12) Connect the electrical connector, D20196, to the sync lock, V171, on the right thrust reverser half.
- S 865-048-N00
- (13) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker.
- (a) On the Overhead Circuit Breaker Panel, P11:
- 1) 11D14, L ENG T/R CONT

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- 2) 11D13, L ENG T/R IND
- 3) 11D18, L ENG T/R SSL CONT

S 865-049-N00

(14) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker.

(a) On the Overhead Circuit Breaker Panel, P11:

- 1) 11D21, R ENG T/R SSL CONT
- 2) 11L33, R ENG T/R CONT
- 3) 11L32, R ENG T/R IND
- 4) 11D33, R ENG T/R CONT ALTN
- 5) 11D32, R ENG T/R IND ALTN

S 865-017-N00

WARNING: MAKE SURE ALL PERSONS AND EQUIPMENT ARE CLEAR OF THE AREA BEHIND THE THRUST REVERSERS. IF YOU DO NOT OBEY THIS INSTRUCTION, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN THE THRUST REVERSERS ARE EXTENDED.

(15) Move the L(R) reverse thrust lever aft to try to extend the thrust reverser (AMM 78-31-00/201).

- (a) If the thrust reverser sleeves extend, the sync locks are serviceable.
- (b) If the thrust reverser sleeve does not extend, the applicable sync lock did not operate correctly.

S 905-020-N00

(16) If it is necessary, replace the sync lock(s) on the thrust reverser sleeve(s) that did not extend when you moved the reverse thrust levers (AMM 78-34-13/401).

S 715-028-N00

(17) Repeat the Thrust Reverser Sync Lock Integrity Test for the opposite engine.

G. Put the Airplane Back to Its Usual Condition.

S 865-021-N00

(1) Move the reverse thrust levers to fully retract the thrust reversers on the two engines with hydraulic power (AMM 78-31-00/201).

S 865-023-N00

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

S 865-022-N00

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

S 415-024-N00

(4) Close the fan cowl panels (AMM 71-11-00/201).

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TASK 78-34-13-705-036-N00

3. Sync Locks Manual Integrity Test When Hydraulic Power Is Not Available

A. General

- (1) This task does a manual test of the mechanical function of the sync lock on each thrust reverser sleeve when hydraulic power is not available.
- (2) The manual test is used when the thrust reverser is being deactivated for flight and there is hydraulic line leakage or a broken hydraulic actuator. Without hydraulic power, you cannot check the mechanical integrity of the sync lock. The manual mechanical integrity test will find if the sync lock can be returned to service. You can not do a check of the lock integrity on all sync locks with the manual drive.
- (3) For the Boeing P/N S315N370-2 (Supplier P/N TY1878-21) sync lock, you can check the lock integrity with the manual drive. You can push the 5/8 inch external bronze nut into the sync lock body. This engages the internal shaft on the rotor but does not disengage the lock plungers. When you turn the 5/8 inch external nut with a 5/8 inch socket wrench and the lock plungers are engaged, the input torque is limited to approximately 50 inch-pounds (5.6 newton-meters).
- (4) For the Boeing P/N S315N370-3 (Supplier P/N TY1878-22) sync lock, you can not check the lock integrity with the manual drive. You can not push the 5/8 inch external bronze nut into the sync lock body because the internal parts were changed. If you insert the 3/8 inch square drive into the center of the external bronze nut, this will push in the shaft to engage the rotor and disengage the lock plungers.

B. References

- (1) AMM 78-34-13/401, Thrust Reverser Sync Lock

C. Procedure

S 025-032-N00

- (1) Remove the sync lock from the lower hydraulic actuator (AMM 78-34-13/401).

S 865-033-N00

- (2) Do not use the manual drive to do a mechanical integrity test of the sync lock.

S 215-034-N00

- (3) Manually hold the sync lock and put a wrench or 8 point socket wrench on the 0.20 inch (5.08 millimeter) square shaft of the rotor.

NOTE: The rotor is the part of the sync lock that fits into the sync shaft in the lower hydraulic actuator. The rotor has a point on the end of the shaft.

- (a) Try to turn the sync lock rotor; do not apply more than 50 inch pounds (5.6 newton-meters) of torque.

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(b) If the sync lock rotor moves more than 180 degrees, the sync lock is not serviceable and must be replaced.

S 425-035-N00

(4) Install the serviceable or replacement sync lock on the lower hydraulic actuator (AMM 78-34-13/401).

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THRUST REVERSER SYNC LOCK - INSPECTION/CHECK

1. General

- A. This task examines the condition of the sync lock gasket for each thrust reverser sync lock. There are two thrust reverser sync locks on each engine. The sync locks are installed on the lower non-locking hydraulic actuator of each thrust reverser sleeve.
- B. The sync lock gasket, bracket, and band clamp do not let the thrust reverser sync lock turn on the end of the lower non-locking hydraulic actuator. If the sync lock gasket is not serviceable, the thrust reverser sync lock can turn in the band clamp, which can let the thrust reverser extend accidentally.
- C. It is necessary to remove the band clamp and loosen the sync lock bracket to examine the sync lock gasket for deterioration.
- D. The thrust reverser sync locks will be referred to as the sync lock in this procedure.
- E. The lower non-locking hydraulic actuator for the thrust reverser will be referred to as the lower actuator in this procedure.

TASK 78-34-13-206-022-N00

2. Thrust Reverser Sync Lock Inspection

A. References

- (1) AMM 71-11-04/201, Fan Cowl Panels
- (2) AMM 78-31-00/201, Thrust Reverser System
- (3) AMM 78-31-00/501, Thrust Reverser System

B. Access

(1) Location Zones

- 211 Flight Compartment
- 212 Flight Compartment
- 410 No. 1 Power Plant (Left)
- 420 No. 2 Power Plant (Right)

(2) Access Panels

- 413AL Fan Cowl Panel (Left)
- 413AR Fan Cowl Panel (Right)
- 423AL Fan Cowl Panel (Left)
- 423AR Fan Cowl Panel (Right)

C. Prepare to Do the Sync Lock Gasket Inspection.

S 866-006-N00

- (1) For the left engine, open these circuit breakers and install the DO-NOT-CLOSE tags:
 - (a) On the overhead circuit breaker panel, P11:
 - 1) 11D14, L ENG T/R CONT
 - 2) 11D18, L ENG T/R SSL CONT

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S 866-007-N00

- (2) For the right engine, open these circuit breakers and install the DO-NOT-CLOSE tags:
- (a) On the overhead circuit breaker panel, P11:
- 1) 11L33, R ENG T/R CONT
 - 2) 11D21, R ENG T/R SSL CONT
 - 3) FOR ETOPS AIRPLANES ONLY;
11D33, R ENG T/R CONT ALTN

S 046-002-N00

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

- (3) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 016-001-N00

- (4) Open the applicable fan cowl panels (AMM 71-11-04/201).
- D. Do the Sync Lock Gasket Inspection.

S 026-015-N00

- (1) Do these steps to remove the sync lock gasket from the lower actuator.
- (a) Disconnect the L (R) electrical connector, DV170 (DV171), from the L (R) sync lock, V170 (V171).
- (b) Loosen the two bolts that attach the sync lock bracket to the sync lock.
- (c) Remove the band clamp that attaches the sync lock bracket to the lower actuator.
- (d) Remove the sync lock gasket from the lower actuator.

S 216-012-N00

- (2) Examine the sync lock gasket for these conditions:
- (a) Look for cracks, tears, or other damage in the sync lock gasket.
- (b) Make sure the sync lock gasket is soft and has no brittle areas or deterioration.

S 966-013-N00

- (3) If you find one or more of these unserviceable conditions, replace the sync lock gasket.

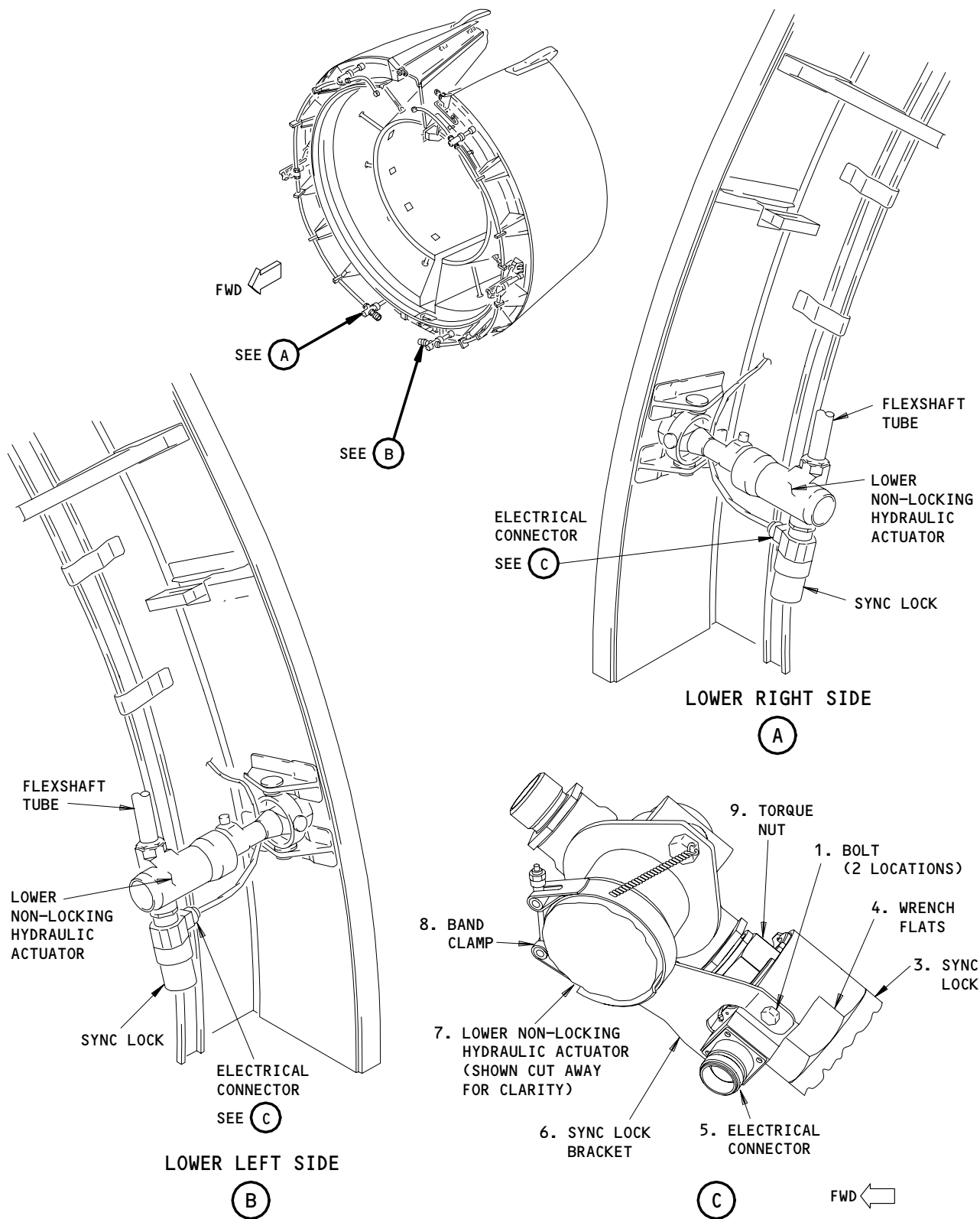
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Thrust Reverser Sync Lock Inspection
Figure 601

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S 426-014-N00

- (4) Do these steps to install the serviceable sync lock gasket:
- (a) Clean all the contamination and hydraulic fluid from the sync lock gasket if it is necessary.
 - (b) Put the sync lock gasket in the correct position on the lower actuator.

NOTE: The ends of the sync lock gasket must not make an overlap. You can cut away the unwanted gasket material.

- (c) Put the sync lock bracket in the correct position on the lower actuator.

NOTE: Do not tighten the two bolts for the sync lock bracket at this time.

- (d) Install the band clamp around the lower actuator and the sync lock bracket.

NOTE: Make sure the tang on the sync lock bracket is between the sync lock gasket and the band clamp.

- (e) After you make sure the applicable components are correctly aligned, tighten the band clamp nut to 30-35 pound-inches (3.4-4.0 newton-meters).
- (f) Fully tighten the two attachment bolts for the sync lock bracket.
- (g) Install the L (R) electrical connector, DV170 (DV171), on the applicable receptacle on the L (R) sync lock, V170 (V171).

E. Put the Airplane Back to Its Usual Condition.

S 416-016-N00

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

S 866-017-N00

- (2) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers:
- (a) On the P11 panel:
 - 1) 11D14, L ENG T/R CONT
 - 2) 11D18, L ENG T/R SSL CONT

S 866-018-N00

- (3) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers:
- (a) On the P11 panel:
 - 1) 11L33, R ENG T/R CONT
 - 2) 11D21, R ENG T/R SSL CONT

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3) FOR ETOPS AIRPLANES ONLY;
11D33, R ENG T/R CONT ALTN

S 446-019-N00

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

S 716-020-N00

(5) Do the operational test of the thrust reverser system
(AMM 78-31-00/501).

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THRUST REVERSER INDICATION SYSTEM – DESCRIPTION AND OPERATION

1. General

- A. The indication system for the thrust reverser provides the flight crew with visual indication of operation and position of the thrust reverser, and indication of a fault occurring in the control system for the thrust reverser (AMM 78-34-00).
- B. Indication is provided for reverser unlocked and reverser deployed by a REV display on the upper Engine Indication and Crew Alerting System (EICAS) display in the flight compartment. The REV display is colored amber when the center actuator locks are disengaged and the system is in transit, and changes to green when the system reaches the fully deployed position.
- C. A REV ISLN light indication on the pilot's control stand, P10, with a L(R) REV ISLN VAL message on the upper EICAS display in the flight compartment indicate that an anomaly exists in the thrust reverser control and/or indication circuitry. There are two independent circuits controlling the illumination of the "REV ISLN" light and EICAS advisory message, one for ground mode operation and the other for air mode operation.
During ground mode operation, the "REV ISLN" light and EICAS advisory message indicate failures within the control and/or indication circuitry. Disagreement of HIV commanded position and actual position as indicated by a downstream pressure switch; disagreement of the restow valve commanded position and actual position as indicated by a downstream pressure switch; and air/ground relay failures.
During air mode operation the "REV ISLN" light and EICAS advisory message are inhibited and fault detection is accomplished by the thrust reverser relay module. If a fault is detected in the air mode by the TRRM, it will be latched and a front panel LED illuminated. The "REV ISLN" light and EICAS advisory message will not be illuminated by the TRRM until 60 seconds after the transition from air mode to ground mode. A 7.5 second time delay is incorporated into the indication circuitry in order to avoid nuisance indications which could be generated by the thrust reverser system because of its inherent design.
- D. A linear variable differential transducer (LVDT) for the reverser position feedback provides reverser position to the EEC which commands the interlock actuator for the thrust lever to ensure proper sequencing of engine power with thrust reverser position.

2. Component Details (Fig. 1)

- A. Position Indication System for the Thrust Reverser
 - (1) Two proximity sensors on each thrust reverser sleeve signals the thrust reverser position to the PSEU.
 - (a) A deploy proximity sensor (S1609,S1610) is mounted on the center locking bracket for the hydraulic actuator stop. The sensor target is mounted to the actuator feedback screw.
 - (b) An proximity sensor for the actuator lock (S1607,S1608) is mounted on the center locking body of the hydraulic actuator. The sensor target is mounted on the actuator lockout lever.

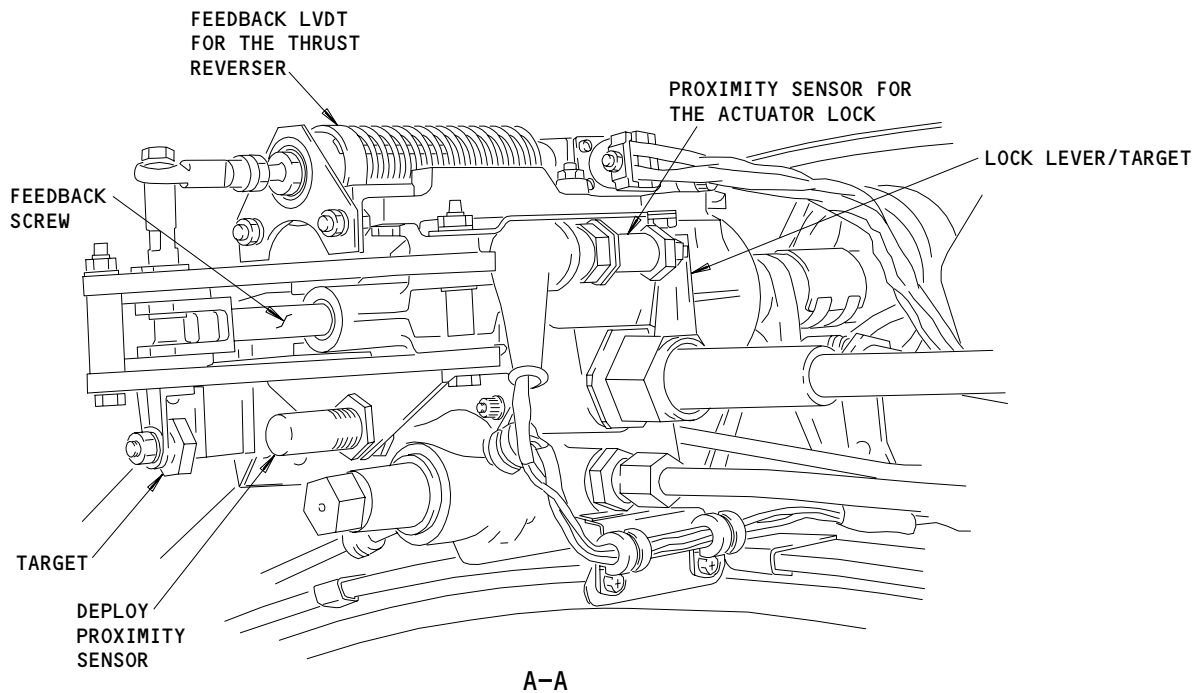
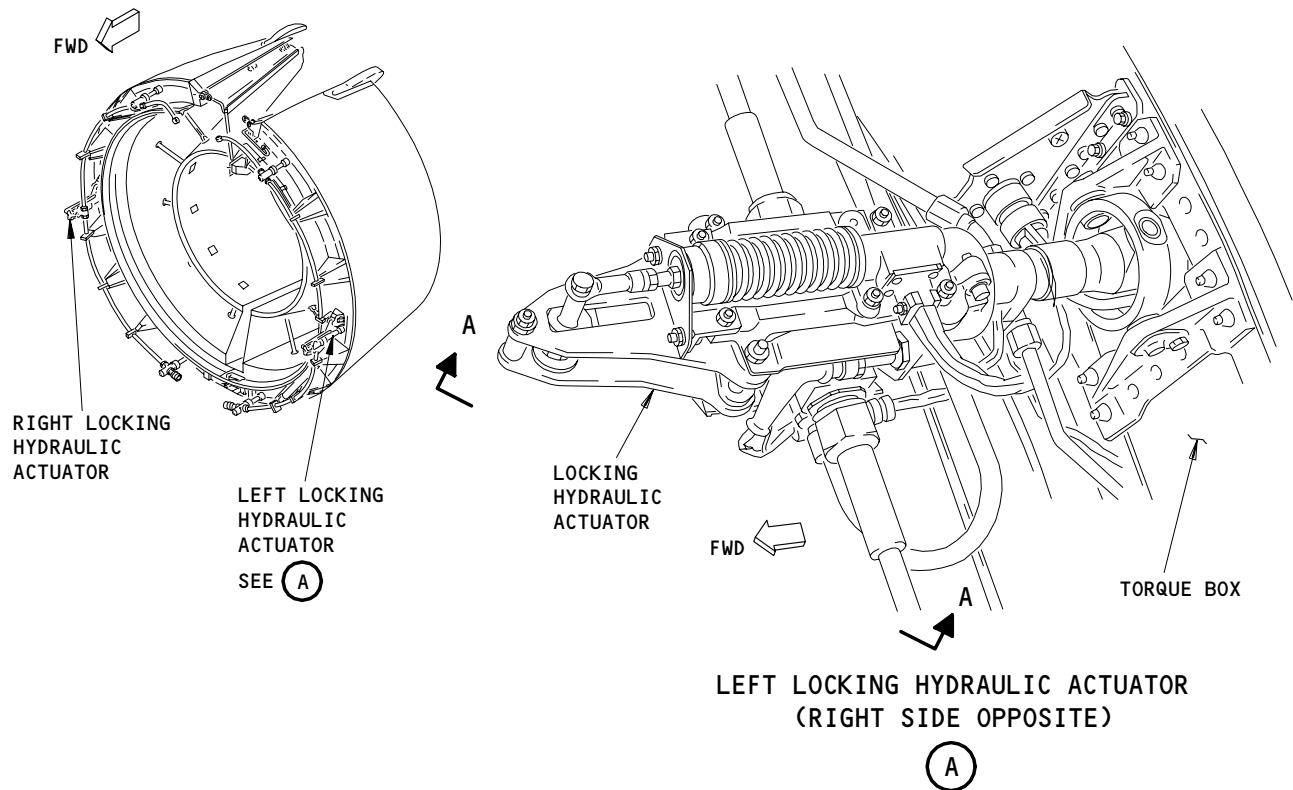
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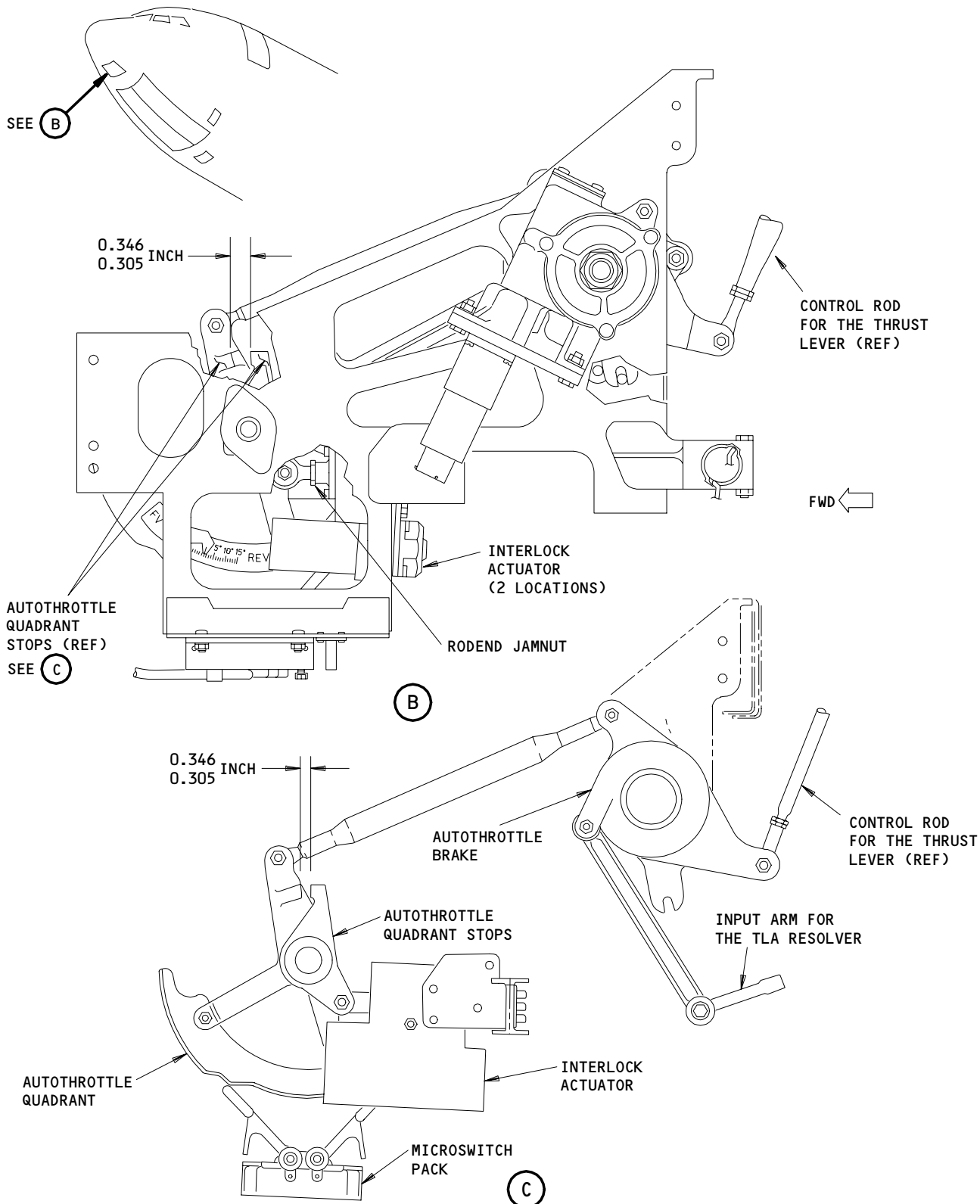
Thrust Reverser Indication System
Figure 1 (Sheet 1)

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Thrust Reverser Indication System
Figure 1 (Sheet 2)

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- (2) The proximity sensors output is processed by the PSEU (Proximity Switch Electronics Unit) which contains logic to close the appropriate internal switch which provides a ground for the appropriate EICAS message.
 - (3) The upper EICAS display in the flight compartment gives the following messages for the left or right engine; REV amber to indicate the reverser is no longer stowed and is in transit to the deployed position. REV green indicates the reverser is fully deployed.
 - (4) Each proximity sensor is driven by a periodic pulse, generated in the PSEU. The pulse is used to measure the inductance of the sensor such that with the target near, the inductance increases. For target far, the inductance decreases.
 - (5) When a specific inductance is measured, the proximity channel output of the PSEU changes state. The output is represented as follows: target near equals logic zero (0), target far equals logic one (1). The PSEU output is processed through OR gates, supplying a normal or reverse logic to an AND gate. An AND gate logic 1 generates an EICAS display message.
- B. Motorized Isolation Valve for the Thrust Reverser and the Stow Valve Fault of the Indication System
- (1) The motorized isolation valve and the indication circuit for the stow valve fault consists of these components:
 - (a) A pressure switch (S858, S860) mounted adjacent to the motorized isolation valve.
 - (b) A pressure switch (S330, S331) mounted on the stow valve.
 - (c) An auto-restow relay (K2160, K2161) controlled by the pressure switch for the stow valve.
 - (d) A relay for the motorized isolation valve (K10236, K10237) controlled by the reverser control system.
 - (e) Two air/ground relays in different systems.
 - (f) A disagree relay (K10234, K10235) controlled by one air/gnd relay in the reverser control system.
 - (g) An isolation detect relay (K10358, K10359) controls the REV ISLN light and EICAS message.
 - (2) De-energizing of the isolation detect relay (K10358, K10359) provides a ground after a 7.5 seconds time delay which illuminates the REV ISLN light on the P10 panel and illuminates the REV ISLN VLV EICAS warning and L or R REV ISLN VLV maintenance messages.
 - (3) The REV ISLN light and REV ISLN VAL EICAS warning indicates that a failure in the control system for the thrust reverser may result in a reverser deployment if the reverse thrust lever is actuated in flight, or that a reverser may not deploy when commanded on the ground.
 - (4) De-energizing of the maintenance relay (K2158, K2159) for the thrust reverser provides a ground through a five-second time delay, and latches the maintenance light for the thrust reverser light ON.

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C. Position Feedback of the Thrust Reverser with the Linear Variable Differential Transducer (LVDT)

- (1) Movement of the thrust reverser actuators and translating sleeves is transmitted electrically to electronic engine control (EEC) by four linear variable differential transducers (LVDTs). The electronic engine control uses reverser position to determine the interlock actuator command for the thrust lever and maximum allowable engine thrust when reverser is in a non-commanded position.
- (2) One position feedback LVDT for the thrust reverser (T10033,T10035) is located on each center locking hydraulic actuator. The LVDT has a primary (Ch A) and secondary (Ch B) feedback channel to each EEC and receives its excitation signal from each EEC. The actuator feedback rod operates the LVDT. Further information on the operation of the EEC feedback LVDT for the thrust reverser can be found in Fuel Control System (Ref 73-21-00).
- (3) The feedback rod on the center actuators retracts as the actuators extend. The rod travels 3.5 inches for 21.75 inches of piston travel. The feedback rod extends and retracts utilizing the same acme screw nut mechanism as the rotary flexshafts.

D. Interlock Actuator for the Thrust Lever

- (1) The interlock actuator for the thrust lever provides a tactile indication of thrust reverser position and prevents movement of reverse thrust lever above reverse idle until the reverser is deployed.
- (2) The interlock actuator for the thrust lever (M1440,M1441) is located under the autothrottle assembly. The actuator's 28v dc motor is controlled by the Electronic Engine Control (EEC) and actuates the autothrottle quadrant stops to unblock the reverse input for the thrust lever. Internal limit switches shutdown the actuator motor when the commanded position is reached and prepare the actuator for the command to operate in the reverse direction.
- (3) The L or R REV LEVER BLOCK EICAS message is illuminated by the actuator limit switches if the interlock actuator fails in the extended position. This status message is to alert the flight crew of interlock failure to block reverse input for the thrust lever during reverser deployment. No EICAS message is illuminated if the interlock actuator fails in the retracted position; the pilot will not be able to advance the reverse thrust lever past reverse idle.

3. Operation

A. Functional Description (Fig. 2)

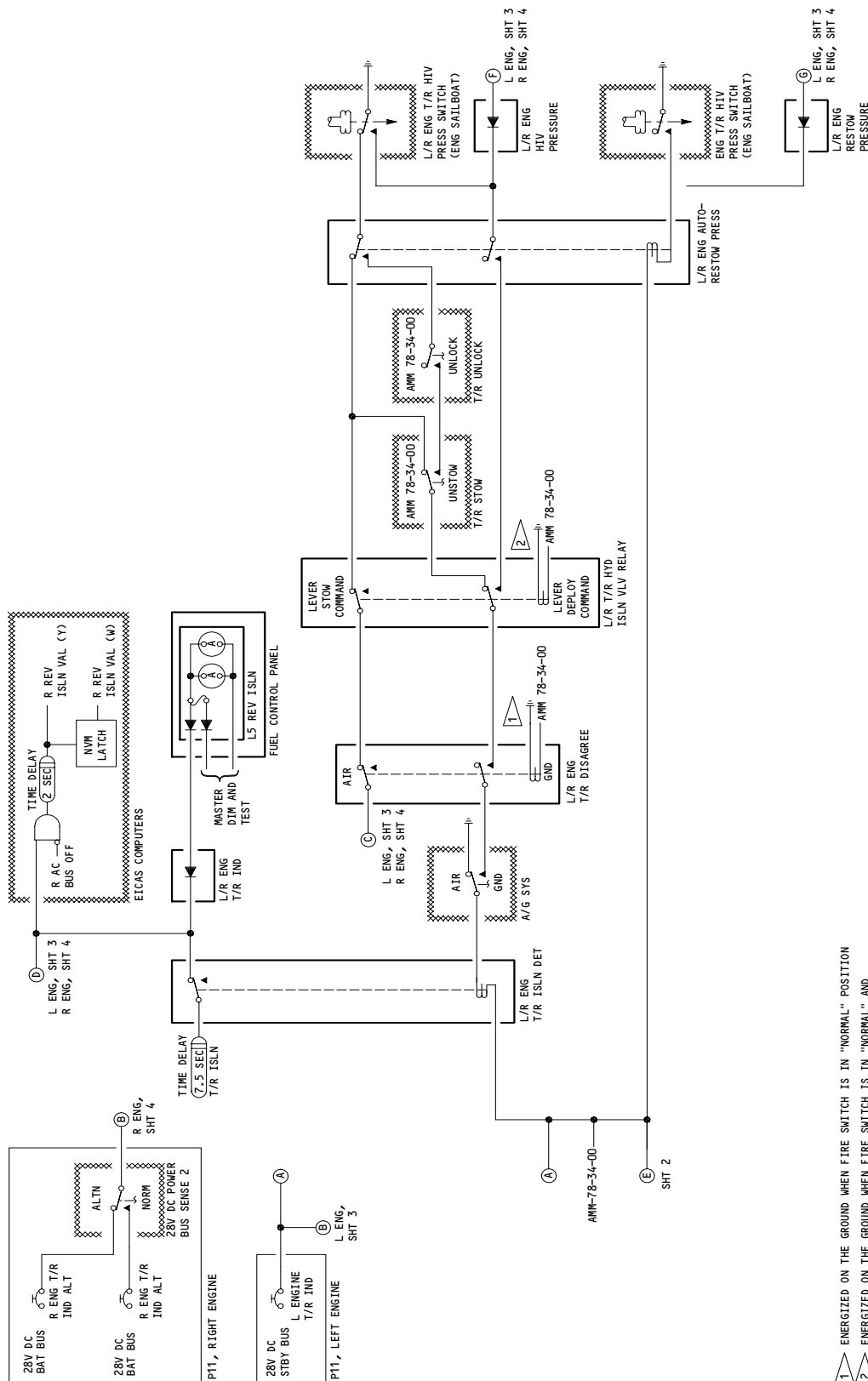
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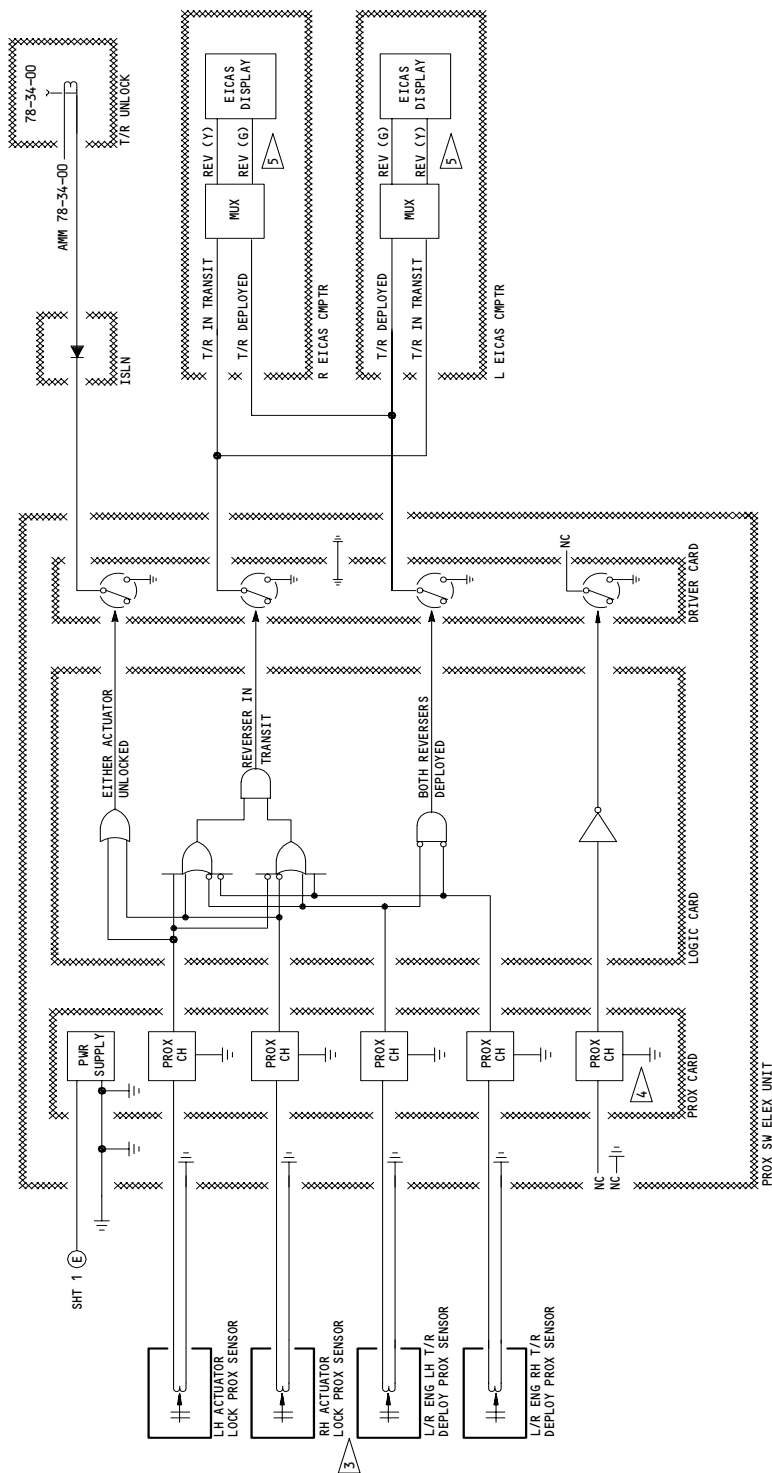


1 ENERGIZED ON THE GROUND WHEN FIRE SWITCH IS IN "NORMAL" POSITION
2 ENERGIZED ON THE GROUND WHEN FIRE SWITCH IS IN "NORMAL" AND THRUST REVERSE CONTROL SWITCH IN "DEPLOY" POSITION

Left And Right Engine Thrust Reverser Indication System Schematic (Example)
Figure 2 (Sheet 1)

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- 3 ARROWS SHOW POSITION OF TARGET WHEN ACTUATOR IS UNLOCKED AND THRUST REVERSER IS DEPLOYED
- 4 LOGIC "1" = TARGET FAR
LOGIC "0" = TARGET NEAR
- 5 IF BOTH DISCRETES SET, THEN REV (G) WILL BE DISPLAYED

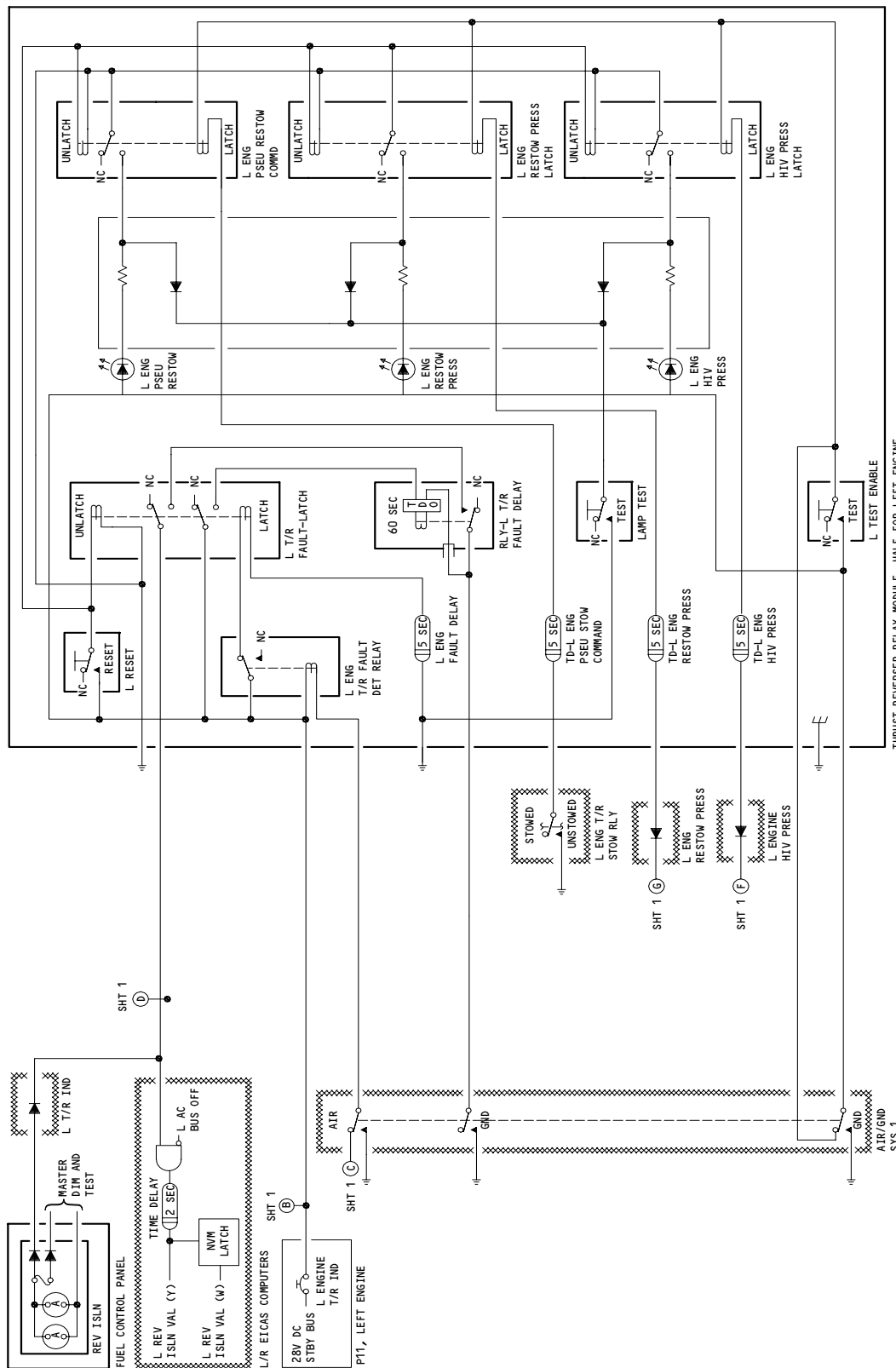
Left And Right Engine Thrust Reverser Indication System Schematic (Example)
Figure 2 (Sheet 2)

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THRUST REVERSE RELAY MODULE, HALF FOR LEFT ENGINE

Left Engine Thrust Reverser Indication System Schematic
Figure 2 (Sheet 3)

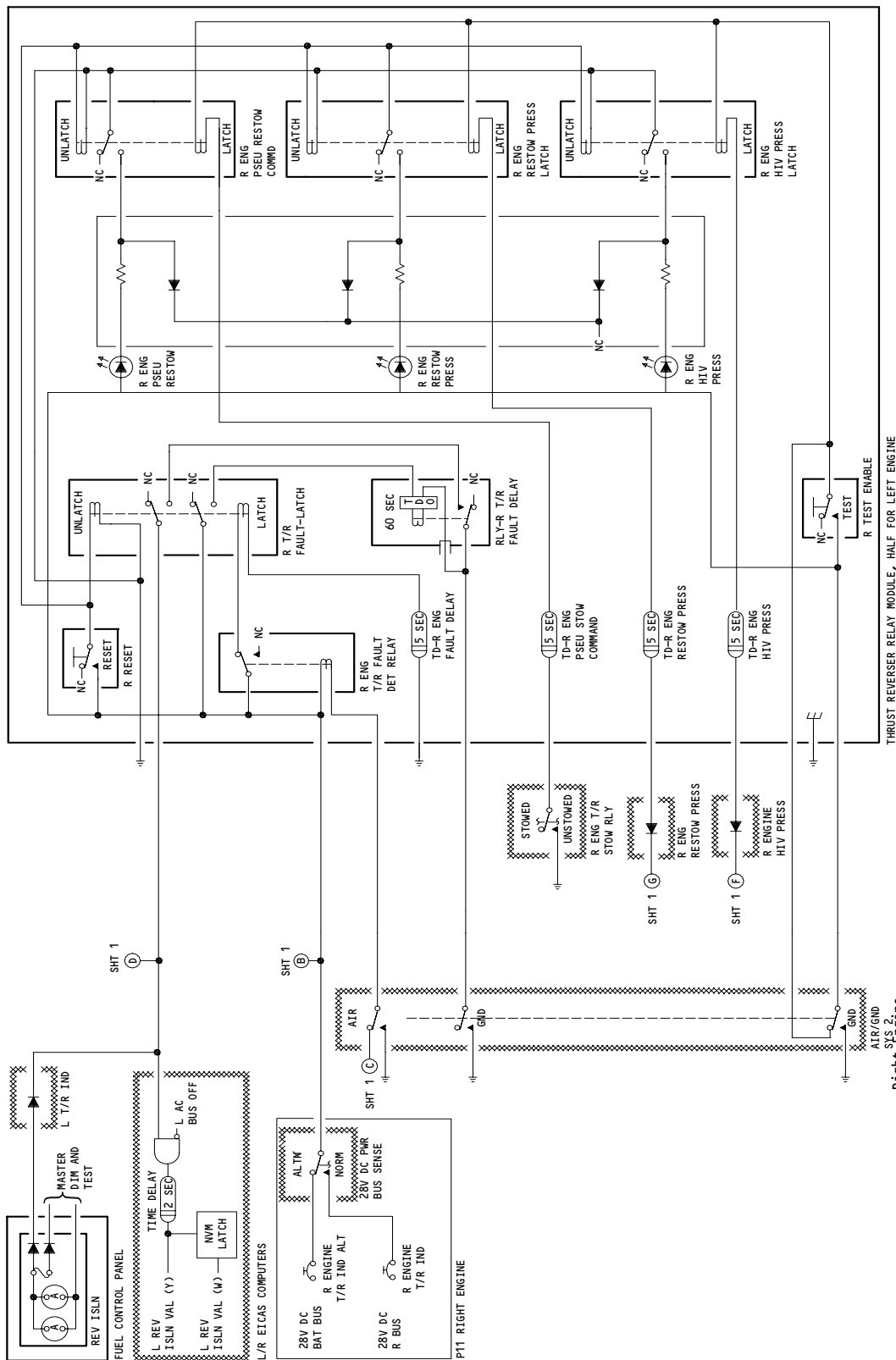
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Right Engine
Thrust Reverser Indication System Schematic
Figure 2 (Sheet 4)

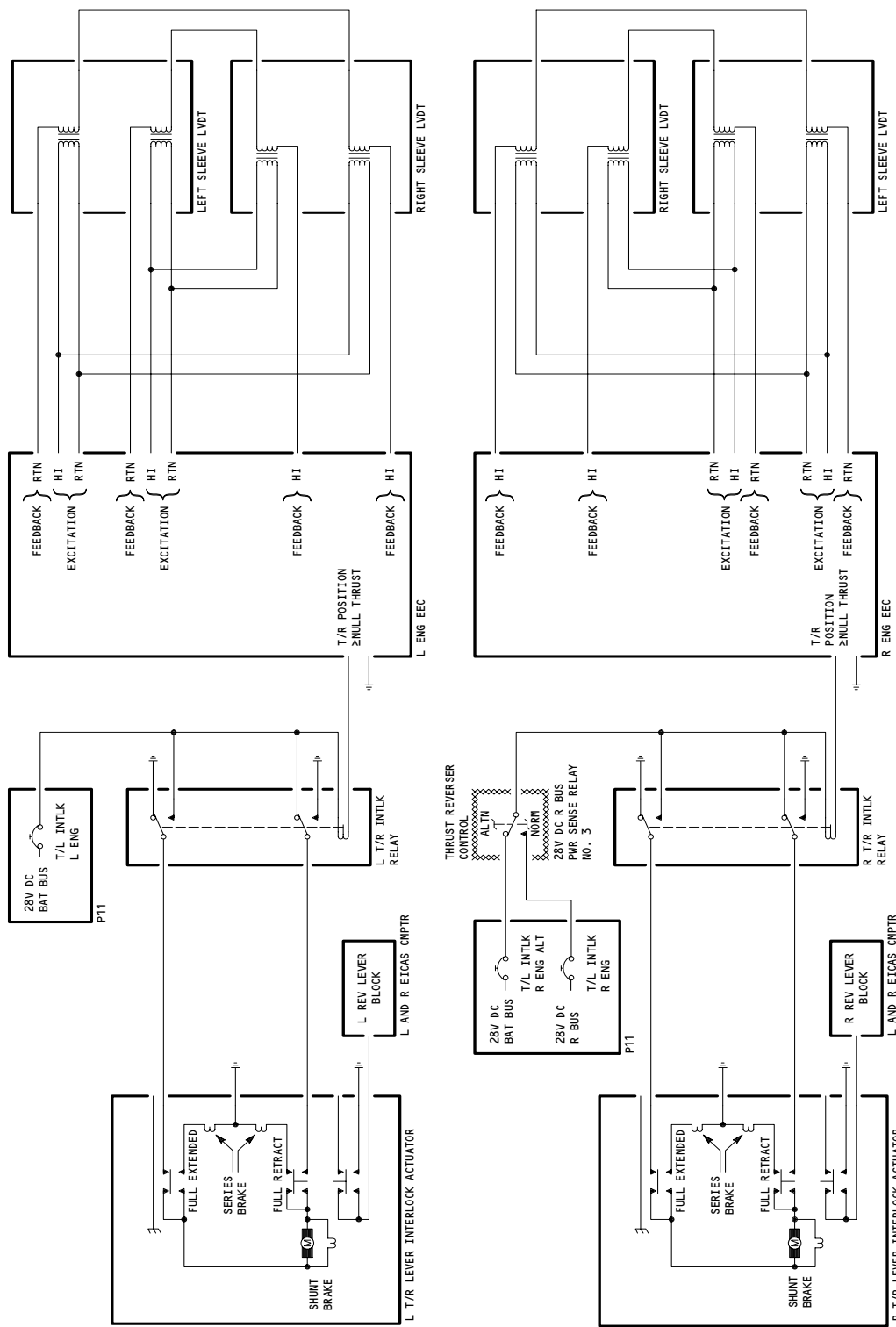
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Left and Right Engines
Thrust Reverser Indication System Schematic
Figure 2 (Sheet 5)

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- (1) Indication System for the Thrust Reverser Position
- (a) When reverser thrust is selected, the synch locks are disengaged and hydraulic pressure is provided to the hydraulic actuators. The hydraulic pressure unlocks the locking hydraulic actuators from the stowed position and causes the actuators to translate the thrust reverser sleeve aft.
 - (b) The target mounted on the lockout lever for the locking actuator moves away from the proximity sensor for the actuator lock as the actuator translates the sleeve. This target far condition generates a logic 1 output from the proximity sensors.
 - (c) The deploy proximity sensors are in a target far condition (logic 1) when the thrust reverser is stowed or in transit. This will change to a target near condition (logic 0) as the actuator drives the feedback screw target toward the deploy proximity sensor as the reverser reaches the fully deployed position.
 - (d) Output from all four proximity sensors is directed to two OR gates. Each OR gate has four inputs; two normal logic and two reverse logic. The normal logic inputs retain the logic of its inputs, a logic 1 remains logic 1 and logic 0 remains logic 0. The reverse logic input reverses the input; a logic 1 input changes to logic 0 and logic 0 changes to logic 1.
 - (e) For the condition where the thrust reverser is in transit to the fully deployed or stowed position, the proximity sensors output is logic 1 (target far). Both OR gates output logic 1 to an AND gate. The AND gate produces a logic 1 output resulting in a REV amber EICAS message.
 - (f) For the condition where the thrust reverser is fully deployed, the output from the proximity sensors for the actuator lock is logic 1 (target far) while the output for the deploy proximity sensors is logic 0 (target near). Outputs from one OR gate is logic 1 while the other outputs logic 0. The AND gate output from these inputs is logic 0 which will not produce any EICAS message. The output from both deploy proximity sensors is directed to an AND gate which reverses both logic inputs. Therefore, when the thrust reverser is fully deployed, the logic 1 output from this AND gate produces a REV green EICAS message.

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- (g) For the condition where the thrust reverser is stowed, the output from the proximity sensors for the actuator lock is logic 0 (target near) while the deploy proximity sensors is logic 1 (target far). Outputs from one OR gate is logic 0 while the other outputs logic 1. The AND gate output from these inputs is logic 0 which will not produce any EICAS message. The output from both deploy proximity sensors directed to the logic reverse input AND gate is change to logic 0 which does not produce an EICAS message.
- (2) Thrust Reverser Relay Module
 - (a) The thrust reverser relay module (M1987) is located in the EE bay on shelf E2-6 or E1-4. The relay module has six LED lights, three for each engine. The lights provide indications for PSEU Restow, Restow Pressure, and HIV Pressure.
 - (b) The Relay Module will illuminate one of these LED lights for the following conditions:
 - 1) During flight, the PSEU initiates a restow command if pressure exists downstream of either the Restow Valve or the motorized HIV for more than five seconds.
 - 2) During flight, the PSEU detects a unstowed thrust reverser sleeve. This information is provided by the autorestow proximity sensors. When the thrust reversor stow relay is energized, a ground is provided to the relay module time delays. If the fault exists for five seconds the latching relays will be energized to the latched state.
 - 3) During flight, if pressure exists downstream of either of the restow valves. The resow pressure switches provide a ground to the relay module time delays. If the condition occurs for five seconds the module will default to the latched state.
 - 4) During flight, if pressure exists downstream of either of the hydraulic isolation valves. The HIV pressure switches sense the pressure and provide a ground to the relay module time delays. If the fault condition exists for five seconds the module is energized to the latched state.
 - 5) During flight, if the thrust reverser disagree relay, the thrust reverser hydraulic isolation valve relay, or the auto-restow pressure relay provide a ground to the relay module time delays. If the condition exists for five seconds the relay module energizes to the latched state.
 - (c) The relay module has a ground test function. If the test enable buttons are pressed and held for at least ten seconds, the relay module will test the thrust reverser system as if it were in the air mode. If a fault is detected the relay module will illuminate the appropriate LED light.
 - (d) The faults will remain latched until they are reset (AMM 78-36-03/201).
 - (e) The relay module has a lamp test button to ensure all the LED lights are functioning correctly.

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- (3) Motorized Isolation Valve for the Thrust Reverser and the Indication System for the Stow Valve Fault
- (a) The Motorized Isolation Valve and the Indication System for the Stow Valve Fault will detect problems in the thrust reverser control or indication circuits, or motorized isolation valve or stow valve problems.
 - (b) The system will configure itself for four conditions and detect conditions that are not normal. The normal conditions are:
 - 1) Airplane in flight, the pressure switches for the stow and the motorized isolation valve at low pressure position.
 - 2) Airplane on the ground, thrust reverser stowed, the pressure switches for the stow and motorized isolation valve at low pressure position.
 - 3) Airplane on the ground, thrust reverser commanded to extend or already fully deployed, the two pressure switches at high pressure.
 - 4) Airplane on the ground, thrust reverser commanded to stow, the pressure switch for the stow valve at high pressure and the pressure switch for the motorized isolation valve at low pressure.
 - (c) The indication system detects faults by circuit continuity to ground through the pressure switch for the motorized isolation valve. If the pressure switch for the stow valve is in a pressure position that is not correct, it will energize or de-energize the pressure relay for the auto-restow which will open the circuit path through the pressure switch for the motorized isolation valve. If the pressure switch for the motorized isolation valve is in a pressure position that is not correct for one of the four normal conditions, the ground is lost and the isolation detect relay and the maintenance relay will de-energize and cause the REV ISLN indications or the white maintenance light to come on.
 - (d) Because the indication system depends on circuit continuity through the pressure switch to ground, wire chafing and grounds on the circuit path upstream of the pressure switch could cause loss of the indication system. REV ISLN indications or white maintenance lights (if applicable) will not come on to give warning of any control system faults or hydraulic faults. Use the functional tests of the indication system for the thrust reverser to do a check of the system (AMM 78-36-00/501).

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- (e) Moving the reverse thrust levers aft provides power to the thrust reverser solenoid and the left and right T/R HYD ISOL VLV relays. The solenoid causes the motorized isolation valve to pressurize the reverser hydraulic system which actuates the valve pressure switch. The T/R HYD ISOL VLV relay energizes to the deploy position. With the air/gnd relays in the gnd position, the T/R ISOL DETECT relay remains energized which prevents REV ISLN lights and EICAS messages.
 - (f) The fault indication circuit can detect an energized control system for the thrust reverser in flight and faults in the control system or in the hydraulic/mechanical portion of the thrust reverser during reverser operation.
- (4) Actuator Operation for the Thrust Lever Interlock.
- (a) The reverse thrust levers are blocked by the autothrottle quadrant stops when attempting to move the levers past the reverse idle position when commanding reverse thrust. The interlock actuator extends and moves the autothrottle stop backward allowing further movement of the reverse thrust levers for increasing reverse thrust.
 - (b) At 38.3 degrees of reverse thrust lever travel, the autothrottle stop is rotated clockwise to meet interlock crank stop preventing reverse input for the thrust lever past reverse idle. When the reverser has deployed about 60% as sensed by feedback LVDTs, the EEC completes the electrical circuit to the interlock relay which provides power to the actuator.
 - (c) When electrical power is applied to drive the actuator in the extend direction, the motor brake is electromagnetically released and the motor starts. Operation will continue until the extend limit switch is actuated, interrupting the power to the motor. Spring force causes the brake to be applied, preventing actuator overrun. The extending actuator rotates the interlock crank stop away from the autothrottle stop thus removing the reverse block of the thrust lever.
 - (d) Returning the reverse thrust lever to the forward stowed position returns the reverser to the stowed position and retracts the interlock actuator. Reversing electrical power polarity provides actuator operation in the reverse direction. This continues until the retract limit switch interrupts power. A load limiting clutch slips to prevent impacting the mechanical stops.

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THRUST REVERSER INDICATION SYSTEM

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
ACTUATOR - L T/R LVR INTERLOCK, M1441	4	1	113AL, FWD EQUIP COMPT	78-34-02
ACTUATOR - R T/R LVR INTERLOCK, M1440	4	1	113AL, FWD EQUIP COMPT	78-34-02
CIRCUIT BREAKER -	1		FLT COMPT, P11	
R ENG T/L INTLK, C1495		1	11L29	*
R ENG T/L INTLK ALTN, C1494		1	11C36	*
L ENG T/R IND, C1480		1	11D13	*
R ENG T/R IND, C1481		1	11L32	*
R ENG T/R IND ALTN, C1478		1	11D32	*
L ENG T/R INTLK, C1493		1	11C35	*
COMPUTER - (FIM 31-41-00/101)				
L EICAS, M10181				
R EICAS, M10182				
CONTROL - (FIM 73-21-00/101)				
ELECTRONIC ENGINE, M7198				
DIODE - (FIM 31-01-33/101)				
L ENG HIV PRESS, R696				
R ENG HIV PRESS, R697				
L ENG RESTOW PRESS, R700				
R ENG RESTOW PRESS, R701				
DIODE - (FIM 31-01-37/101)				
L T/R INDICATION, R10117				
R T/R INDICATION, R10118				
LIGHT - THRUST REVERSER ISOLATION, L5	1	1	FLT COMPT, P10 FUEL CONT PNL M73	*
PANEL - (FIM 76-11-00/101)				
FUEL CONTROL, M73				
RELAY - (FIM 31-01-33/101)				
L ENG AUTO - RESTOW PRESS, K2160				
R ENG AUTO - RESTOW PRESS, K2161				
L T/R ISLN DET, K10358				
R T/R ISLN DET, K10359				
RELAY - (FIM 31-01-36/101)				
L T/R DISAGREE, K10234				
L T/R HYD ISLN VLV RELAY, K10236				
L T/R STOW, K26				
L T/R UNLOCK, K165				
SYS NO. 1 AIR/GND, K2154				
SYS NO. 1 AIR/GND, K2155				
RELAY - (FIM 31-01-37/101)				
R T/R DISAGREE, K10235				
R T/R HYD ISLN VLV RELAY, K10237				
R T/R STOW, K27				
R T/R UNLOCK, K166				
SYS NO. 2 AIR/GND, K206				
SYS NO. 2 AIR/GND, K721				
SYS NO. 2 AIR/GND, K2157				
RELAY MODULE - THRUST REVERSER, M1987	4	1	MAIN EQUIPMENT CENTER, E2-6 OR E1-4	78-36-03

* SEE THE WDM EQUIPMENT LIST

Thrust Reverser Indication System - Component Index
Figure 101 (Sheet 1)

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COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
SENSOR - L ENGINE, L T/R ACTUATOR DEPLOY, S1609	2	1	413AL, LH THRUST REVERSER LOCKING ACTUATOR	78-36-01
SENSOR - R ENGINE, L T/R ACTUATOR DEPLOY, S1609	2	1	423AL, LH THRUST REVERSER LOCKING ACTUATOR	78-36-01
SENSOR - L ENGINE, L T/R ACTUATOR LOCK PROXIMITY, S1604	2	1	413AL, LH THRUST REVERSER LOCKING ACTUATOR	78-36-01
SENSOR - R ENGINE, L T/R ACTUATOR LOCK PROXIMITY, S1604	2	1	423AL, LH THRUST REVERSER LOCKING ACTUATOR	78-36-01
SENSOR - L ENGINE, R T/R ACTUATOR DEPLOY, S1610	2	1	414AR, RH THRUST REVERSER LOCKING ACTUATOR	78-36-01
SENSOR - R ENGINE, R T/R ACTUATOR DEPLOY, S1610	2	1	424AR, RH THRUST REVERSER LOCKING ACTUATOR	78-36-01
SENSOR - L ENGINE, R T/R ACTUATOR LOCK PROXIMITY, S1605	2	1	414AR, RH THRUST REVERSER LOCKING ACTUATOR	78-36-01
SENSOR - R ENGINE, R T/R ACTUATOR LOCK PROXIMITY, S1605	2	1	424AR, RH THRUST REVERSER LOCKING ACTUATOR	*
SWITCH - (FIM 78-34-00/101) L T/R CONT, YBNS5 R T/R CONT, YBNS6				
SWITCH - L T/R HYD PRESS, S330	3	1	437BL, ISOLATION VALVE, V106	78-34-07
SWITCH - R T/R HYD PRESS, S331	3	1	447BL, ISOLATION VALVE, V107	78-34-07
SWITCH - L ENG T/R MOTORIZED PRESS, S858	3	1	437BR, ISOLATION VALVE, V167	78-34-11
SWITCH - R ENG T/R MOTORIZED PRESS, S860	3	1	447BR, ISOLATION VALVE, V168	78-34-11
TIME DELAY - L T/R ISLN VLV, M10440	3	1	119AL, MAIN EQUIP CTR, P36	*
TIME DELAY - R T/R ISLN VLV, M10439	3	1	119AL, MAIN EQUIP CTR, P33	*
TRANSDUCER - L ENGINE, L T/R SLEEVE LINEAR VARIABLE DIFFERENTIAL, T10033	2	1	413AL, LH T/R LOCKING ACTUATOR	*
TRANSDUCER - R ENGINE, L T/R SLEEVE LINEAR VARIABLE DIFFERENTIAL, T10033	2	1	423AL, LH T/R LOCKING ACTUATOR	*
TRANSDUCER - L ENGINE, R T/R SLEEVE LINEAR VARIABLE DIFFERENTIAL, T10035	2	1	414AR, RH T/R LOCKING ACTUATOR	*
TRANSDUCER - R ENGINE, R T/R SLEEVE LINEAR VARIABLE DIFFERENTIAL, T10035	2	1	424AR, RH T/R LOCKING ACTUATOR	*
UNIT - (FIM 32-09-00/101) PROX SW ELEX, M162				

* SEE THE WDM EQUIPMENT LIST

Thrust Reverser Indication System - Component Index
Figure 101 (Sheet 2)

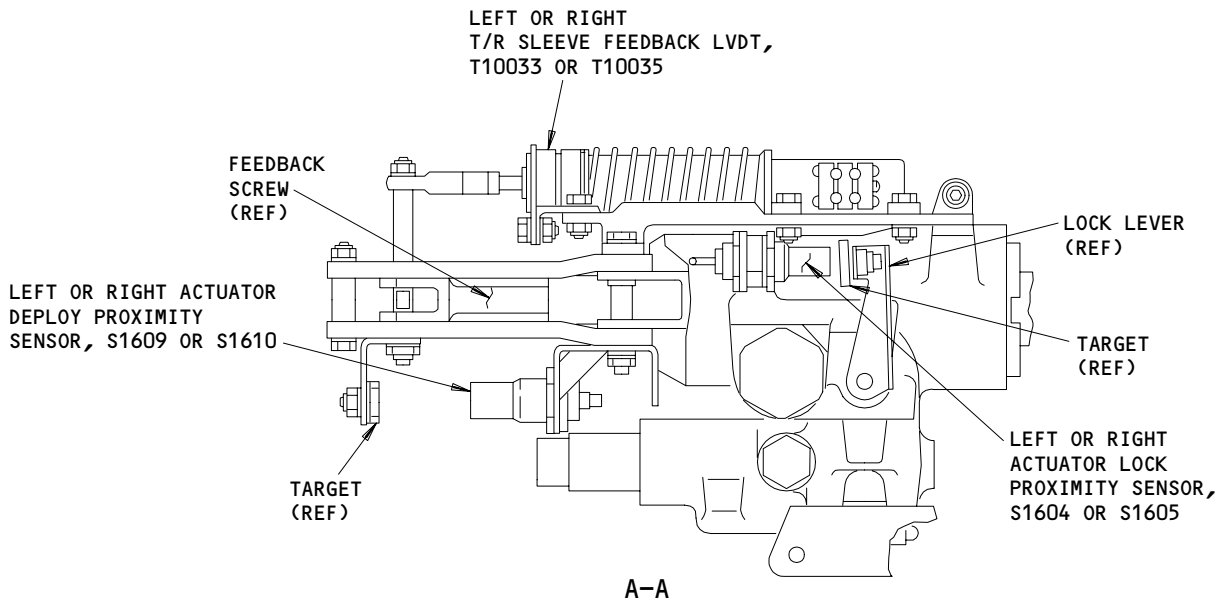
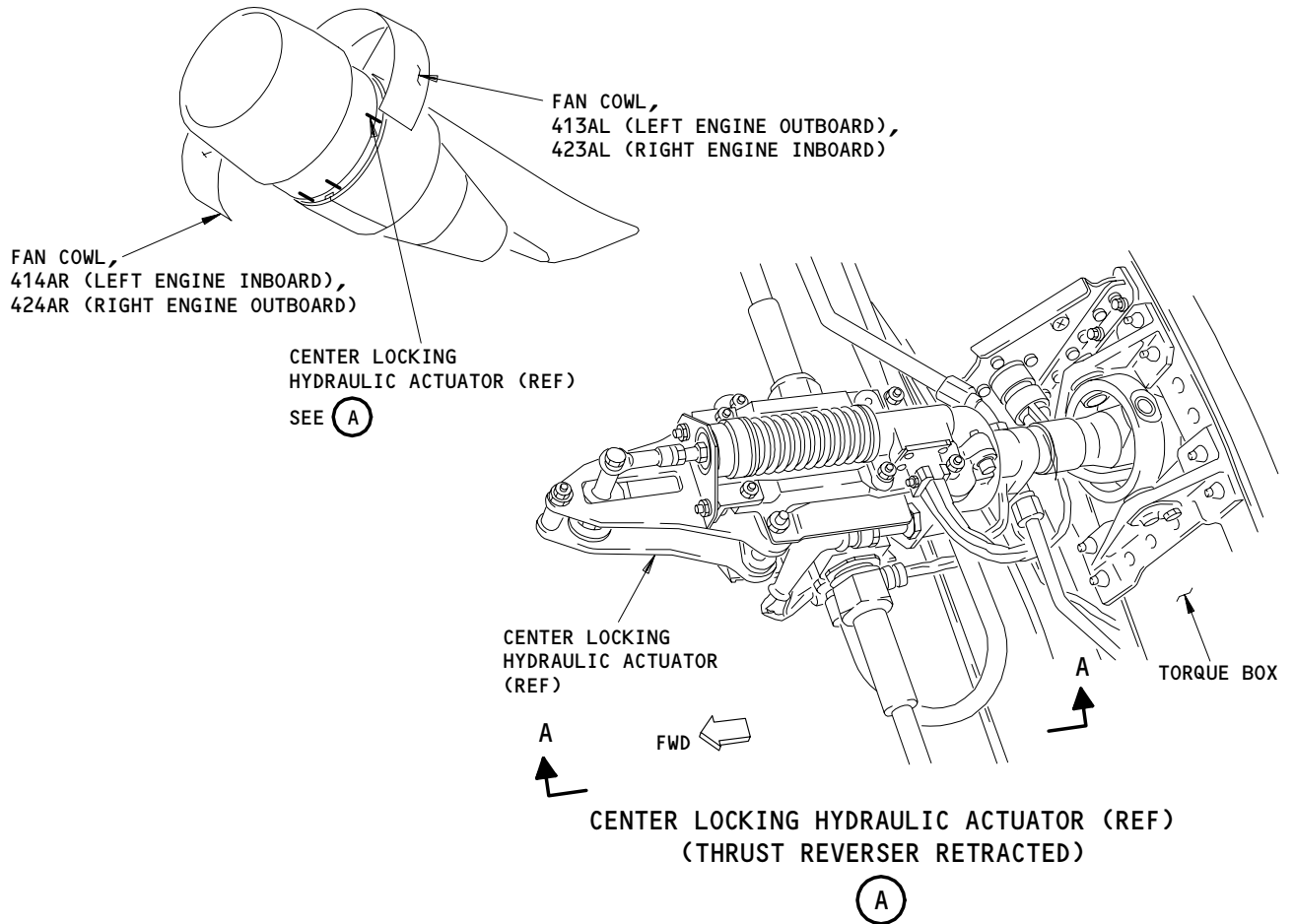
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Thrust Reverser Indication System - Component Location
Figure 102 (Sheet 1)

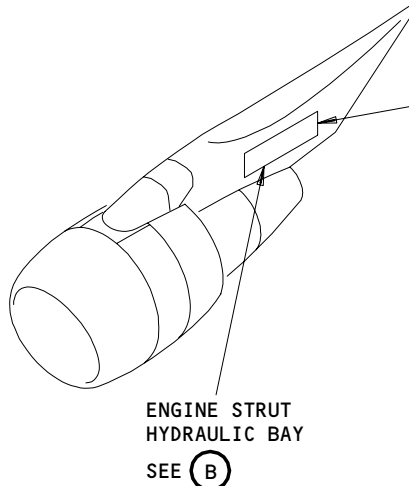
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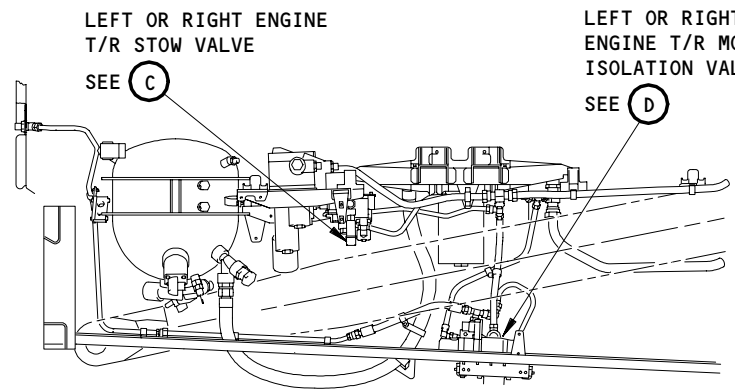
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ENGINE STRUT HYDRAULIC BAY ACCESS DOOR,
437BL (LEFT ENGINE OUTBOARD),
437BR (LEFT ENGINE INBOARD),
447BR (RIGHT ENGINE OUTBOARD),
447BL (RIGHT ENGINE INBOARD)

ENGINE STRUT HYDRAULIC BAY
SEE (B)

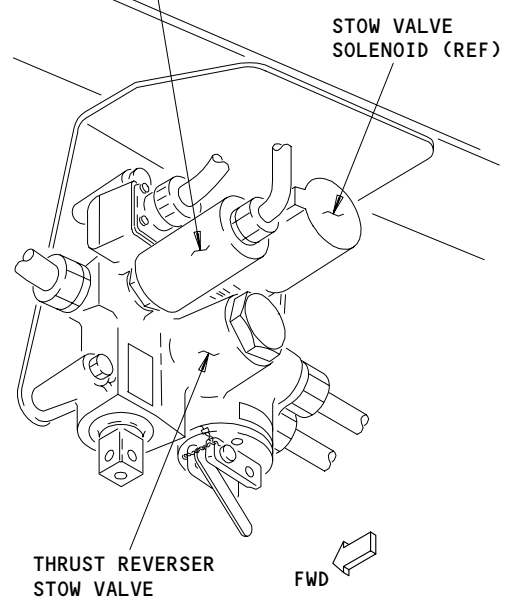


LEFT OR RIGHT ENGINE T/R STOW VALVE
SEE (C)

LEFT OR RIGHT ENGINE T/R MOTORIZED ISOLATION VALVE
SEE (D)

ENGINE STRUT HYDRAULIC BAY
(B)

LEFT OR RIGHT T/R HYDRAULIC (STOW VALVE) PRESSURE SWITCH, S330 OR S331 (REF)

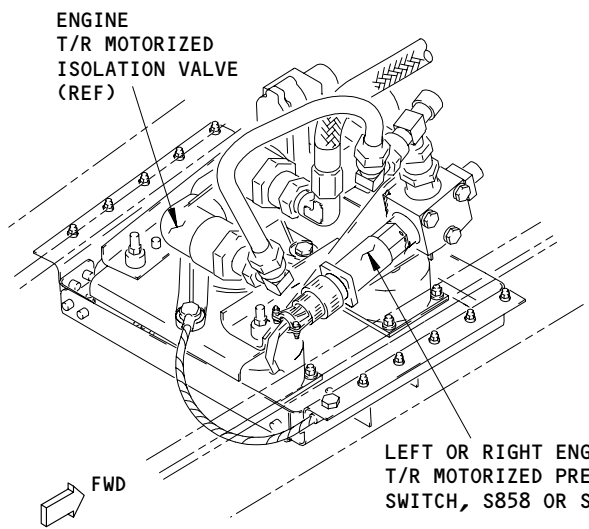


STOW VALVE SOLENOID (REF)

THRUST REVERSER STOW VALVE

FWD

LEFT OR RIGHT ENGINE T/R STOW VALVE
(C)



ENGINE T/R MOTORIZED ISOLATION VALVE (REF)

LEFT OR RIGHT ENGINE T/R MOTORIZED PRESSURE SWITCH, S858 OR S860

FWD

LEFT OR RIGHT ENGINE T/R MOTORIZED ISOLATION VALVE
(D)

Thrust Reverser Indication System - Component Location
Figure 102 (Sheet 2)

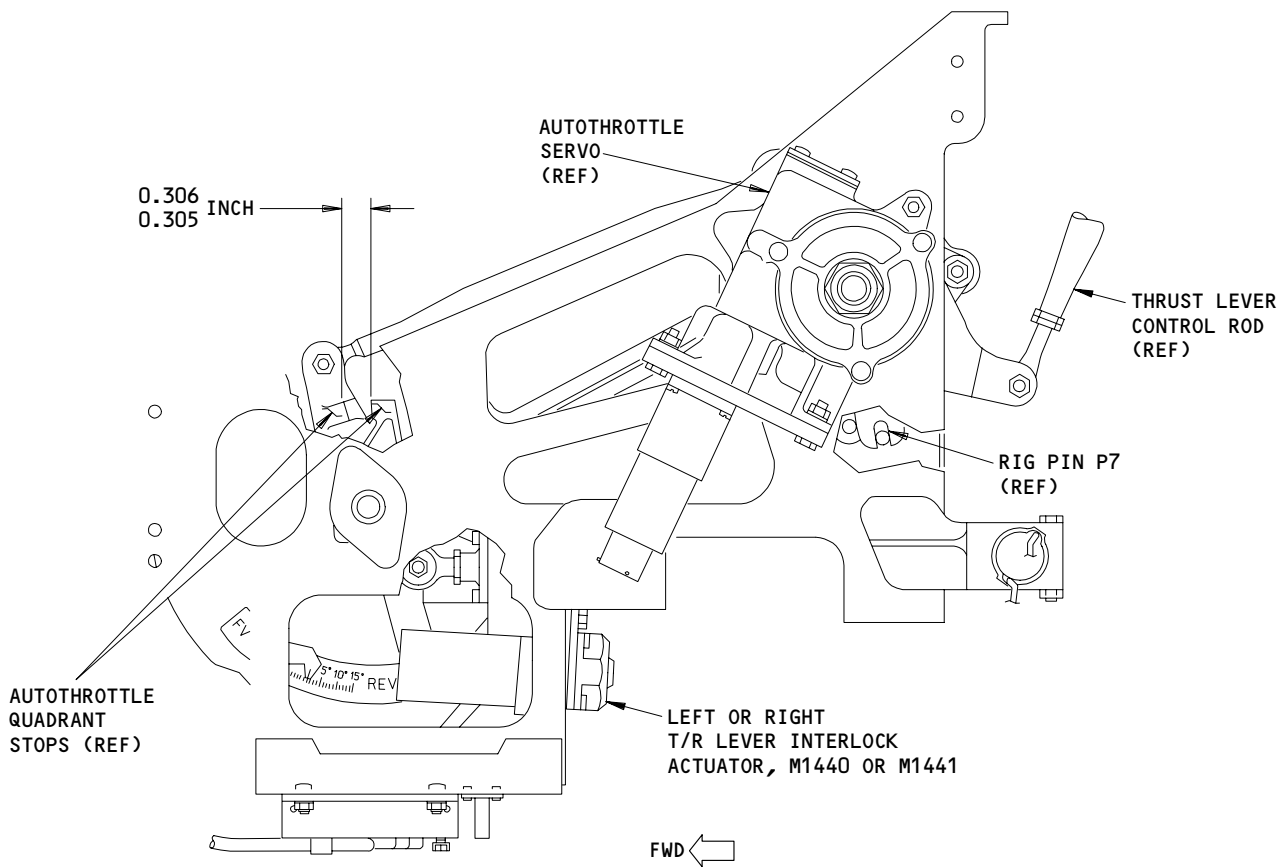
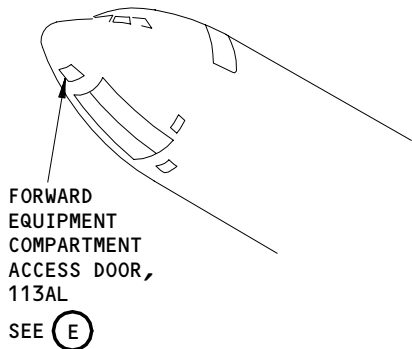
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LEFT OR RIGHT T/R LEVER INTERLOCK ACTUATOR

(E)

Thrust Reverser Indication System - Component Location
Figure 102 (Sheet 3)

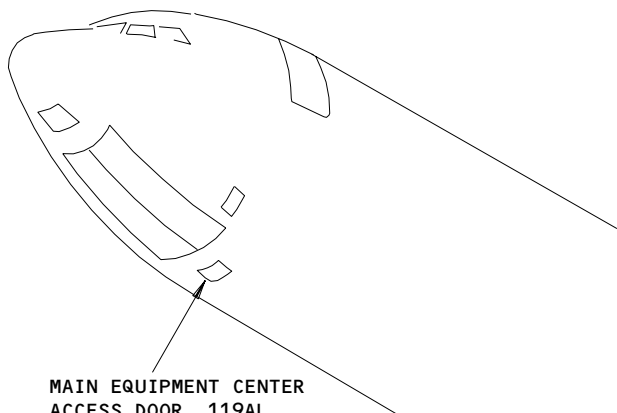
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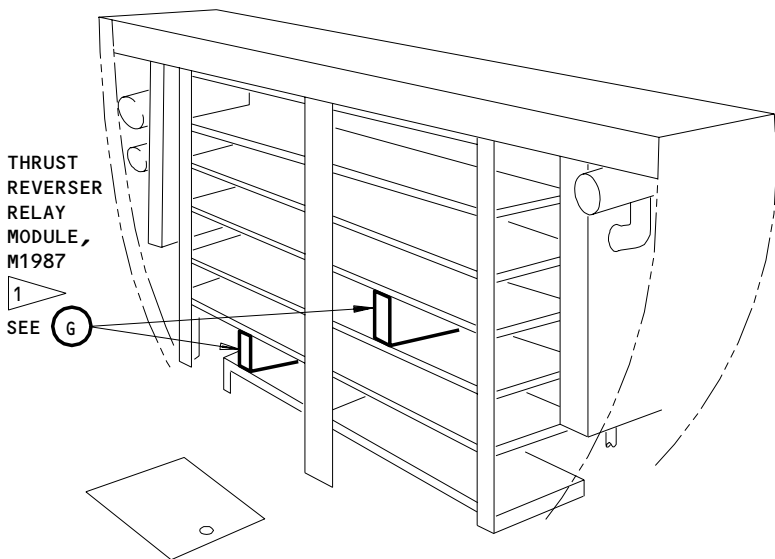
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MAIN EQUIPMENT CENTER
ACCESS DOOR, 119AL
SEE (F)

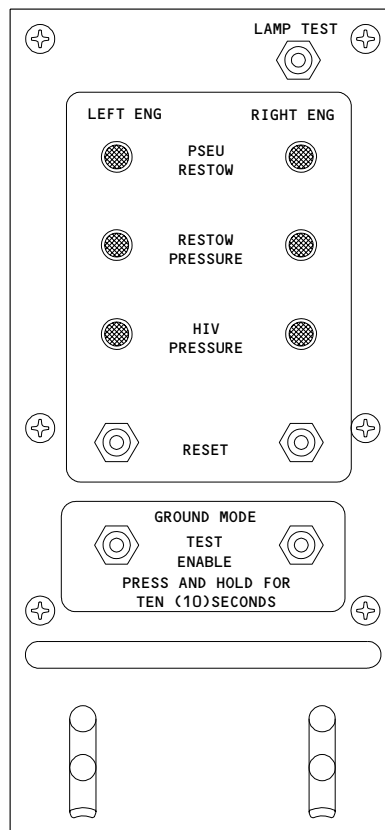


THRUST
REVERSER
RELAY
MODULE,
M1987
1
SEE (G)

MAIN EQUIPMENT CENTER



(F)



THRUST REVERSER RELAY MODULE

(G)

1 THE THRUST REVERSER RELAY MODULE IS INSTALLED
ON THE E1-4 OR THE E2-6 SHELF.

Thrust Reverser Indication System - Component Location
Figure 102 (Sheet 4)

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THRUST REVERSER INDICATION SYSTEM – ADJUSTMENT/TEST

1. General

A. This section has three tasks.

- (1) The first task gives instructions to do the adjustment of the position indication system for the thrust reverser.
- (2) The second task gives instructions to do a functional test of the indication system for the thrust reverser.
- (3) The third task gives instructions to do a functional test of the air/ground relay for the thrust reverser.

TASK 78-36-00-805-001-N00

2. Adjust the Thrust Reverser Position Indication System

A. General

- (1) This task gives the procedures to do the adjustment of the target clearances for the thrust reverser proximity sensors. These are the procedures:
 - (a) Prepare to Adjust the Thrust Reverser Proximity Sensors.
 - (b) Adjust the Actuator Lock Proximity Sensor (Feeler Gage Procedure).
 - (c) Adjust the Actuator Deploy Proximity Sensor (Soft Clay Procedure).
 - (d) Adjust the Actuator Deploy Proximity Sensor (Feeler Gage Procedure).
 - (e) Adjust the Auto Restow Proximity Sensor.
 - (f) Put the Airplane Back to Its Usual Condition.
- (2) You must do a check of the clearances when you install a thrust reverser sleeve or a center locking hydraulic actuator. You also must do a check of the clearances when there is a failure of the position indication system.
- (3) The actuator lock proximity sensor is installed on the center locking hydraulic actuator for each thrust reverser half. You must use the feeler gage procedure to measure the target clearance for the actuator lock proximity sensor. There is no equivalent soft clay procedure for the actuator lock proximity sensor.
- (4) The actuator deploy proximity sensor is installed on the center locking hydraulic actuator for each thrust reverser half. You can use one of two procedures to adjust this proximity sensor. One procedure gives instructions to use soft clay to measure the target clearance. The other procedure gives instructions to use a feeler gage to measure the target clearance. The two procedures are equivalent. You can use the one that works best for you.
- (5) The auto restow proximity sensor is installed on the aft face of the torque box adjacent to the center locking hydraulic actuator. You must use the soft clay procedure to measure the target clearance for the auto restow proximity sensor. There is no equivalent feeler gage procedure for the auto restow proximity sensor.
- (6) The thrust reverser proximity sensors will be referred to as the proximity sensors in the procedures that follow.

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B. Equipment

- (1) Gage, Proximity Sensor
A32102-25 (Recommended)
A32102-1 (Alternative)

C. Consumable Materials

- (1) G02020 - Clay, Modeling (soft)

D. References

- (1) AMM 24-22-00/201, Electrical Power - Control
- (2) AMM 27-61-00/201, Spoiler/Speedbrake Control System
- (3) AMM 29-11-00/201, Main Hydraulic Systems
- (4) AMM 71-11-04/201, Fan Cowl Panels
- (5) AMM 78-31-00/201, Thrust Reverser System

E. Access

- (1) Location Zones
 - 415 and 416 Fan Reverser Halves - Left Engine
 - 425 and 426 Fan Reverser Halves - Right Engine
- (2) Access Panels
 - 413 and 414 Fan Cowl Panels - Left Engine
 - 423 and 424 Fan Cowl Panels - Right Engine

F. Prepare to Adjust the Thrust Reverser Proximity Sensors.

S 045-002-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR SPOILER/SPEEDBRAKE CONTROL SYSTEM. IF YOU DO NOT DO THIS, THE SPOILERS CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

- (1) Do the deactivation procedure for the Spoiler/Speedbrake Control System (AMM 27-61-00/201).

S 045-003-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.

- (2) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

NOTE: Do the deactivation procedure for the stow valve and the motorized isolation valve only. DO NOT put the streamered pins in the thrust reverser sleeves. You will need to manually extend and retract the thrust reverser in the steps that follow.

S 015-004-N00

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

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G. Adjust the Actuator Lock Proximity Sensor (Feeler Gage Procedure)
(Fig. 501).

S 865-005-N00

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

S 865-006-N00

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

S 445-007-N00

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

S 865-008-N00

- (4) Extend the thrust reverser with hydraulic power (AMM 78-31-00/201).

S 865-009-N00

- (5) Retract the thrust reverser with hydraulic power (AMM 78-31-00/201).

NOTE: The above two steps will make sure the thrust reverser is
fully retracted before you measure the target clearance.

S 045-010-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.

- (6) Do the deactivation procedure for the thrust reverser for ground
maintenance (AMM 78-31-00/201).

NOTE: Do the deactivation procedure for the stow valve and the
motorized isolation valve only. DO NOT put the streamered
pins in the thrust reverser sleeves.

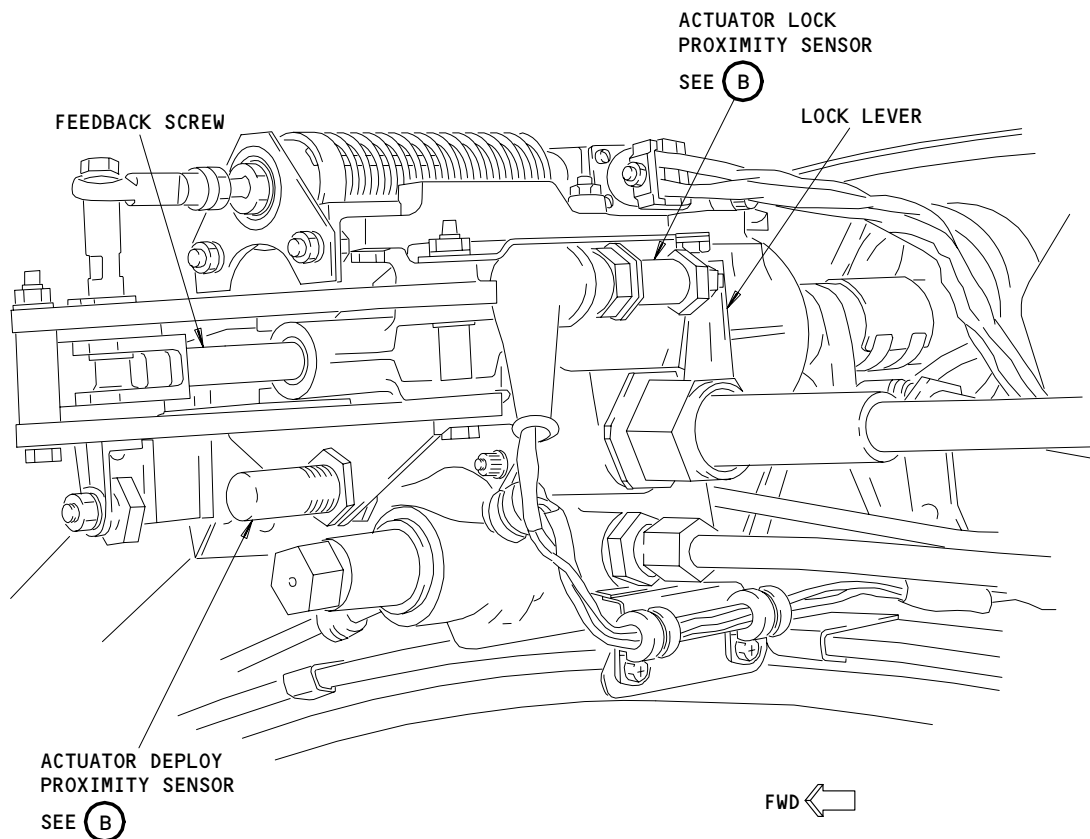
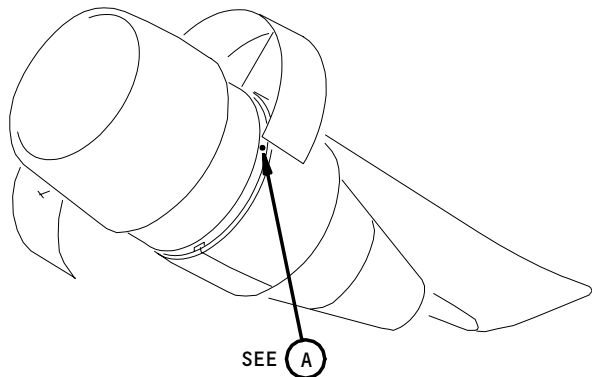
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CENTER LOCKING HYDRAULIC ACTUATOR

(A)

Actuator Lock and Actuator Deploy Proximity Sensor Adjustment
Figure 501 (Sheet 1)

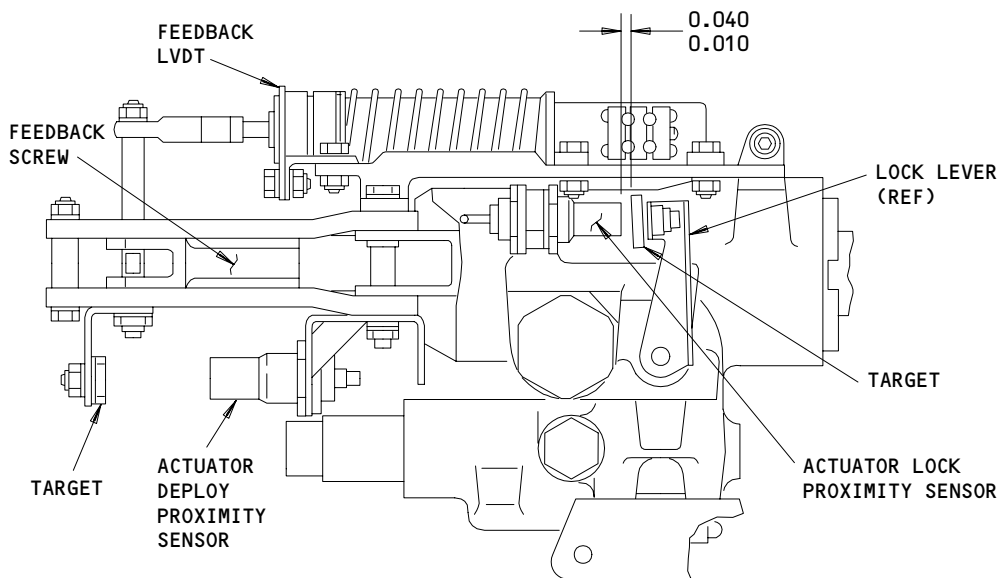
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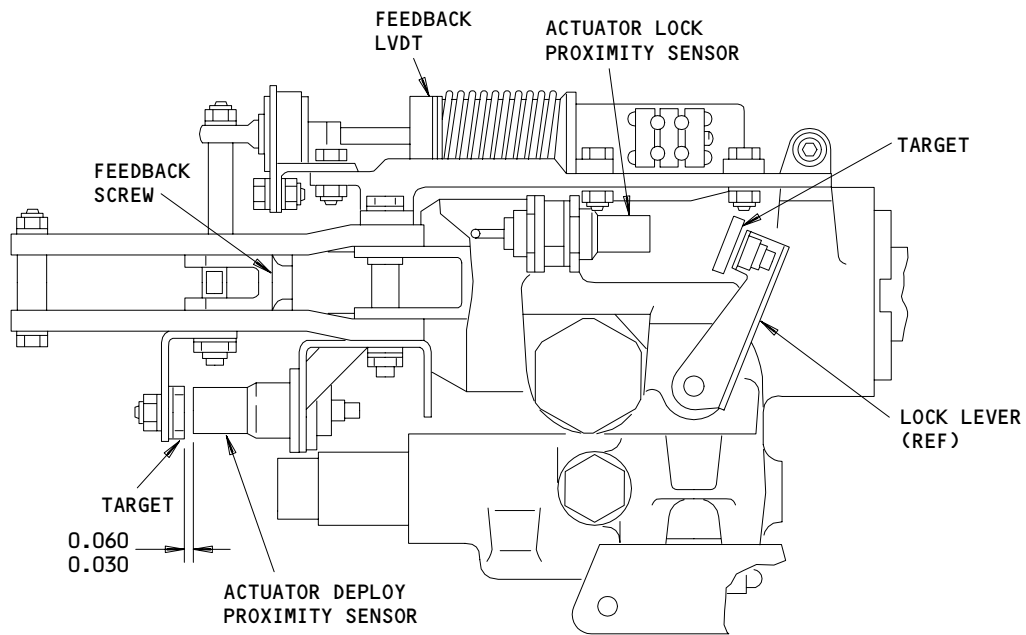
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CENTER LOCKING HYDRAULIC ACTUATOR
(STOW POSITION)

(B)



CENTER LOCKING HYDRAULIC ACTUATOR
(DEPLOY POSITION)

(B)

NOTE: ALL DIMENSIONS ARE IN INCHES.

Actuator Lock and Actuator Deploy Proximity Sensor Adjustment
Figure 501 (Sheet 2)

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S 225-011-N00

- (7) Put a feeler gage between the face of the actuator lock proximity sensor and the target to measure the clearance.

NOTE: The clearance between the face of the proximity sensor and the surface of the target must be 0.010 to 0.040 inch.

S 825-012-N00

- (8) Install or remove shims below the target to get the correct target clearance.

H. Adjust the Actuator Deploy Proximity Sensor (Soft Clay Procedure) (Fig. 501).

S 825-013-N00

- (1) Make a piece of soft clay in the shape of a cone and put it on the face of the proximity sensor.

S 865-014-N00

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

S 865-015-N00

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

S 445-016-N00

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

S 865-017-N00

- (5) Extend the thrust reverser with hydraulic power to compress the clay between the target and the proximity sensor (AMM 78-31-00/201).

S 865-018-N00

- (6) Retract the thrust reverser with hydraulic power (AMM 78-31-00/201).

S 045-019-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.

- (7) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

NOTE: Do the deactivation procedure for the stow valve and the motorized isolation valve only. DO NOT put the streamered pins in the thrust reverser sleeves.

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S 225-020-N00

- (8) Measure the thickness of the clay to find the target clearance for the proximity sensor.

NOTE: The clearance between the face of the proximity sensor and the surface of the target must be 0.030 to 0.060 inch.

S 825-021-N00

- (9) Install or remove shims below the target to get the correct target clearance.

S 165-022-N00

- (10) Make sure you clean the clay from the target and the proximity sensor.

S 985-023-N00

- (11) Manually retract the thrust reverser (AMM 78-31-00/201).

I. Adjust the Actuator Deploy Proximity Sensor (Feeler Gage Procedure) (Fig. 501).

S 985-024-N00

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

S 985-025-N00

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

S 445-026-N00

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

S 865-027-N00

- (4) Extend and retract the thrust reverser three times with hydraulic power (AMM 78-31-00/201).

S 865-028-N00

- (5) Extend the thrust reverser with hydraulic power (AMM 78-31-00/201).

NOTE: Do not retract the thrust reverser this time.

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S 045-029-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.

- (6) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

NOTE: Do the deactivation procedure for the stow valve and the motorized isolation valve only. DO NOT put the streamered pins in the thrust reverser sleeves.

S 225-030-N00

- (7) Put a feeler gage between the face of the actuator deploy proximity sensor and the target to measure the clearance.

NOTE: The clearance between the face of the proximity sensor and the surface of the target must be 0.030 to 0.060 inch with hydraulic pressure supplied.

S 825-031-N00

- (8) Install or remove shims below the target to get the correct target clearance.

S 865-032-N00

- (9) Manually retract the thrust reverser (AMM 78-31-00/201).
- J. Adjust the Auto Restow Proximity Sensor (Fig. 502).

S 865-033-N00

- (1) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker:
 - (a) On the overhead equipment panel, P11:
 - 1) 11D14, L ENG T/R CONT

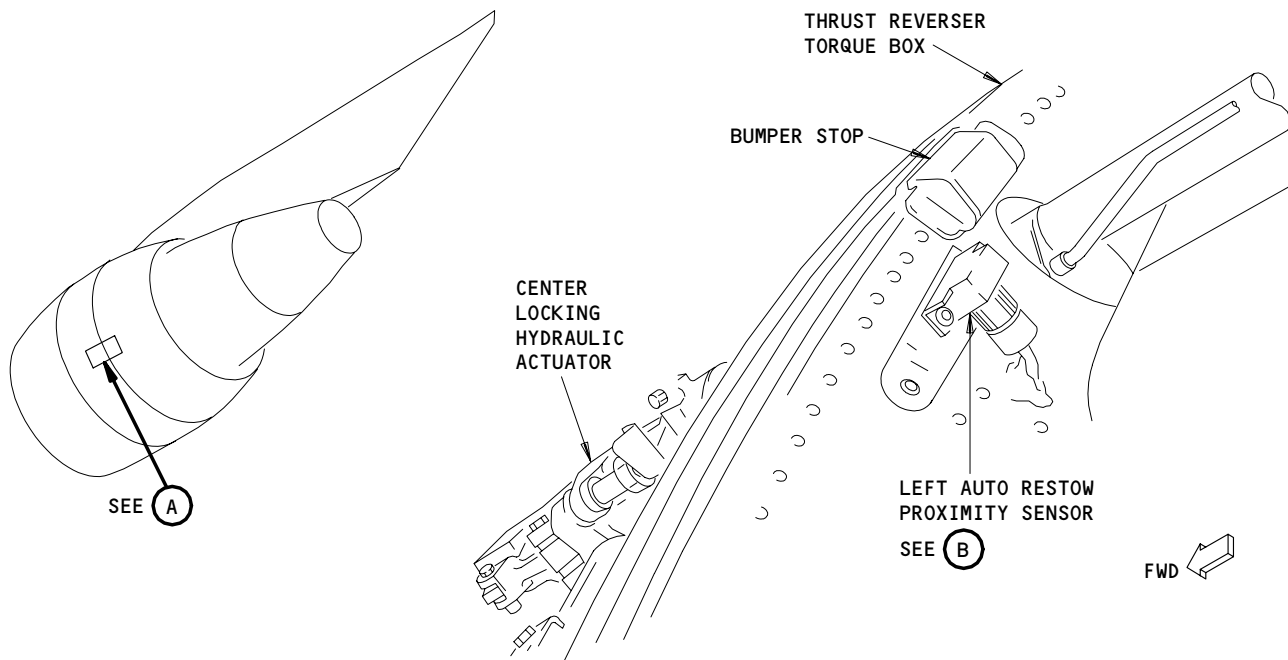
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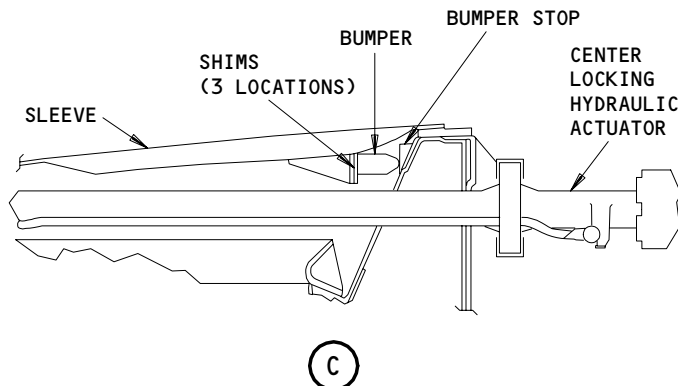
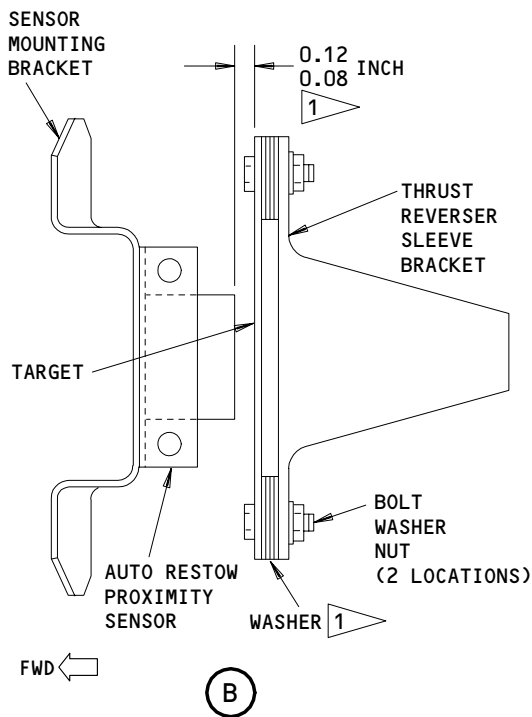
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**AUTO RESTOW PROXIMITY SENSOR
(THRUST REVERSER SLEEVE IN THE DEPLOY POSITION)**



1 INSTALL THE WASHERS TO SET A CLEARANCE OF 0.08-0.12 INCH BETWEEN THE FACE OF THE PROXIMITY SENSOR AND THE TARGET.

**Auto Restow Proximity Sensor Adjustment
Figure 502**

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- S 865-035-N00
- (2) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker:
- (a) On the overhead equipment panel, P11:
 - 1) 11L33, R ENG T/R CONT
 - 2) 11D33, R ENG T/R CONT ALT
- S 745-037-N00
- (3) Do these steps to make sure the auto restow sensor operates correctly:
- (a) Install the proximity sensor gage, A32102-1, on the applicable auto restow sensor.
 - (b) Push the PRESS/TEST switch on the PSEU and make sure the number 888 and the five indicator lights come on.
- NOTE: The PSEU is installed on the E1 rack in the main equipment center.
- (c) Use the SENSOR CHANNEL SELECT thumb switches to set the PSEU code for the applicable auto restow sensor as follows:
 - 1) The PSEU code for the left engine is:
 - a) 176 for the left thrust reverser half.
 - b) 177 for the right thrust reverser half.
 - 2) The PSEU code for the right engine is:
 - a) 180 for the left thrust reverser half.
 - b) 181 for the right thrust reverser half.
 - (d) Push and hold the TARGET TEST switch on the PSEU for one second.
 - (e) Make sure that the applicable PSEU code is shown on the LED display, and that the TARGET NEAR light comes on after 4 seconds on the PSEU.
 - (f) Remove the proximity sensor gage from the applicable auto restow sensor.
- S 825-038-N00
- (4) Make a piece of soft clay in the shape of a cone and put it on the face of the proximity sensor.
- S 865-039-N00
- (5) Supply electrical power (AMM 24-22-00/201).
- S 865-040-N00
- (6) Supply hydraulic power (AMM 29-11-00/201).
- S 445-041-N00
- (7) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

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S 865-042-N00

- (8) Retract the thrust reverser with hydraulic power to compress the clay between the target and the proximity sensor (AMM 78-31-00/201).

S 865-043-N00

- (9) Extend the thrust reverser with hydraulic power (AMM 78-31-00/201).

S 045-044-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.

- (10) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

NOTE: Do the deactivation procedure for the stow valve and the motorized isolation valve only. DO NOT put the streamered pins in the thrust reverser sleeves.

S 225-045-N00

- (11) Measure the thickness of the clay to find the target clearance for the proximity sensor.

NOTE: The clearance between the face of the proximity sensor and the surface of the target must be 0.08 to 0.12 inch.

S 825-046-N00

- (12) Install or remove shims below the target to get the correct target clearance.

S 145-047-N00

- (13) Make sure you clean the clay from the target and the proximity sensor.

S 415-048-N00

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

S 445-049-N00

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

S 865-050-N00

- (16) Retract the thrust reverser with hydraulic power (AMM 78-31-00/201).

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K. Put the Airplane Back to Its Usual Condition.

- S 865-051-N00
- (1) Remove the electrical power if it is not necessary (AMM 24-22-00/201).

- S 865-052-N00
- (2) Remove the hydraulic power if it is not necessary (AMM 29-11-00/201).

- S 445-053-N00
- (3) Do the activation procedure for the spoiler/speedbrake control system (AMM 27-61-00/201).

- S 715-054-N00
- (4) Do the operational test of the thrust reverser (AMM 78-31-00/501).

TASK 78-36-00-715-073-N00

3. Thrust Reverser Indication System Functional Test

A. General

- (1) The breakout box and the appropriate patch cable is used to plug on to the end of a system electrical connector or plug into the socket of a relay to jumper across two pins or find if there is electrical power on a pin. The nomenclature on the cable markers gives the applicable airplane connectors and the box connector. The breakout box is used at the thrust reverser.

B. Equipment

- (1) Multimeter - Commercially available
- (2) Breakout Box, Thrust Reverser - A78025-77

C. References

- (1) AMM 06-43-00/201, Engine and Nacelle Strut
- (2) AMM 31-41-00/201, Engine Indication and Crew Alerting System
- (3) AMM 78-31-00/501, Thrust Reverser System
- (4) AMM 32-09-02/201, Air/Ground Relay System

D. Access

- (1) Location Zones
 - 437 L Power Plant Strut
 - 447 R Power Plant Strut

- (2) Access Panels
 - 437AL Engine Strut Hydraulic Bay - L Power Plant Strut
 - 437AR Engine Strut Hydraulic Bay - L Power Plant Strut
 - 447AL Engine Strut Hydraulic Bay - R Power Plant Strut
 - 447AR Engine Strut Hydraulic Bay - R Power Plant Strut

E. Procedure

- S 715-074-N00
- (1) Do the functional test as follows:
 - (a) Open the hydraulic bay access panels for the applicable engine (AMM 06-43-00/201).

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- (b) Prepare the safety-sensitive systems for air mode simulation (AMM 32-09-02/201) .
- (c) For the applicable engine, open these circuit breakers and attach the DO-NOT-CLOSE tags:
 - 1) On the overhead equipment panel, P11:
 - a) 11C30, LDG GR POS AIR/GND SYS 1
 - b) 11U15, LDG GR AIR/GND SYS 1
 - c) 11U23, LDG GR POS AIR/GND SYS 2
 - d) 11C29, LDG GR POS AIR/GND SYS 2 ALT
- (d) For the left engine, open these circuit breakers and attach the DO-NOT-CLOSE tags:
 - 1) On the overhead equipment panel, P11:
 - a) 11D13, L ENG T/R IND
 - b) 11D14, L ENG T/R CONT
- (e) For the right engine, open these circuit breakers and attach the DO-NOT-CLOSE tags:
 - 1) On the overhead equipment panel, P11:
 - a) 11L32, R ENG T/R IND
 - b) 11L33, R ENG T/R CONT
 - c) 11D32, R ENG T/R IND ALT
 - d) 11D33, R ENG T/R CONT ALT
 - e) 11M30, 28V DC R BUS PWR SENSE (Right Engine only)
- (f) Open these circuit breakers and attach the DO-NOT-CLOSE tags:
 - 1) On the Main Power Distribution Panel, P6:
 - a) 06H01, FIRE EXT ENG L BTL 1
 - b) 06H02, FIRE EXT ENG L BTL 2
 - c) 06H03, FIRE EXT ENG R BTL 1
 - d) 06H04, FIRE EXT ENG R BTL 2
- (g) Disconnect the applicable connectors:

CONNECTOR	MATES WITH EQUIPMENT	LOCATION
D2134	S330 (L T/R RESTOW VAL PRESS SW)	L STRUT
D20122	S858 (L ENG T/R HIV 1 PRESS SW)	L STRUT
D2138	S331 (R T/R RESTOW VAL PRESS SW)	R STRUT
D20126	S860 (R ENG T/R HIV 1 PRESS SW)	R STRUT

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- (h) If it is necessary, use the breakout box, A78025 and the applicable patch cable or your equivalent procedure and equipment to make connections to the pins referenced in this task.
- (i) Use a multimeter to make sure the conditions that follow are true:

FROM EQUIPMENT	TO EQUIPMENT	CONDITION
D2134 PIN 2 (S330)	AIRPLANE GROUND	CONTINUITY
D2134 PIN 3 (S330)	AIRPLANE GROUND	NO CONTINUITY
D20122 PIN 2 (S858)	AIRPLANE GROUND	CONTINUITY
D20122 PIN 1 (S858)	AIRPLANE GROUND	NO CONTINUITY
D2138 PIN 2 (S331)	AIRPLANE GROUND	CONTINUITY
D2138 PIN 3 (S331)	AIRPLANE GROUND	NO CONTINUITY
D20126 PIN 2 (S860)	AIRPLANE GROUND	CONTINUITY
D20126 PIN 1 (S860)	AIRPLANE GROUND	NO CONTINUITY

- (j) Install a jumper wire between pins 3 and 2 of the applicable connector D20122 (S858) or D20126 (S860).
- (k) Remove the thrust reverser relay module, M1987 (E1-4 shelf or E2-6 shelf).
- (l) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers:
 - 1) On the P11 panel:
 - a) 11L33, R ENG T/R CONT
 - b) 11L32, R ENG T/R IND
 - c) 11C30, LDG GR POS AIR/GND SYS 1
 - d) 11U15, LDG GR AIR/GND SYS 1
 - e) 11U23, LDG GR POS AIR/GND SYS 2
 - f) 11C29, LDG GR POS AIR/GND SYS 2 ALT
 - g) 11D32, R ENG T/R IND ALTN
 - h) 11D33, R ENG T/R CONT ALTN
 - i) 11D13, L ENG T/R IND
 - j) 11D14, L ENG T/R CONT
- (m) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers:
 - 1) On the P11 panel:
 - a) 11C30, LDG GR POS AIR/GND SYS 1
 - b) 11U15, LDG GR AIR/GND SYS 1
 - c) 11U23, LDG GR POS AIR/GND SYS 2
 - d) 11C29, LDG GR POS AIR/GND SYS 2 ALT

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- e) 11M30, 28V DC R BUS PWR SENSE
 - f) 11L33, R ENG T/R CONT
 - g) 11L32, R ENG T/R IND
 - h) 11D32, R ENG T/R IND ALTN
 - i) 11D13, L ENG T/R IND
 - j) 11D14, L ENG T/R CONT
- (n) Make sure the REV ISLN light on the P10 panel is not on after eight (8) seconds.
- (o) Make sure the EICAS advisory message L(R) REV ISLN VAL is not shown after ten (10) seconds.

NOTE: From this step on, the same time delay modules will be exercised. It is necessary to verify the time delays only once.

- (p) Install a jumper wire between pins 1 and 2 of the applicable connector D2134 (S330) or D2138 (S331).
- (q) Make sure the REV ISLN light on the P10 panel is on after eight (8) seconds.
- (r) Make sure the EICAS advisory and maintenance messages L(R) REV ISLN VAL are shown after ten (10) seconds.
- (s) Open these circuit breakers and attach the DO-NOT-CLOSE tags:
1) On the P11 panel:
a) 11C30, LDG GR POS AIR/GND SYS 1
b) 11U15, LDG GR AIR/GND SYS 1
c) 11C29, LDG GR POS AIR/GND SYS 2 ALT
d) 11U23, LDG GR POS AIR/GND SYS 2
- (t) Make sure the REV ISLN light on the P10 panel is not on after eight (8) seconds.
- (u) Make sure the EICAS advisory message L(R) REV ISLN VAL is not shown after ten (10) seconds.
- (v) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
1) On the P11 panel:
a) 11C30, LDG GR POS AIR/GND SYS 1
b) 11U15, LDG GR AIR/GND SYS 1
c) 11C29, LDG GR POS AIR/GND SYS 2 ALT
d) 11U23, LDG GR POS AIR/GND SYS 2
- (w) Remove the jumper wire between pins 1 and 2 of the applicable connector D2134 (S330) or D2138 (S331).
- (x) Erase the EICAS maintenance message L(R) REV ISLN VAL (AMM 31-41-00/201).
- (y) Make sure the REV ISLN light on the P10 panel is not on after eight (8) seconds.
- (z) Make sure the EICAS advisory and maintenance messages, L(R) REV ISLN VAL, are not shown after ten (10) seconds.
- (aa) Remove the jumper wire between pins 3 and 2 of the applicable connector D20122 (S858) or D20126 (S860).
- (ab) Install a jumper wire between pins 1 and 2 of the applicable connector D20122 (S858) or D20126 (S860).
- (ac) Make sure the REV ISLN light on the P10 panel is on after eight (8) seconds.

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- (ad) Make sure the EICAS advisory and maintenance messages, L(R) REV ISLN VAL, are shown after ten (10) seconds.
- (ae) Remove the jumper wire between pins 1 and 2 of the applicable connector D20122 (S858) or D20126 (S860).
- (af) Install a jumper wire between pins 3 and 2 of the applicable connector D20122 (S858) or D20126 (S860).

NOTE: The EICAS maintenance message L(R) REV ISLN VAL will stay on for the remaining steps in this test.

- (ag) Make sure the REV ISLN light on the P10 panel is not on after eight (8) seconds.
- (ah) Make sure the EICAS advisory message L(R) REV ISLN VAL is not shown after ten (10) seconds.
- (ai) Install a jumper wire between airplane ground and pin C of the applicable diode R228 or R230 (TB130, E1-2 shelf).
- (aj) Make sure the REV ISLN light on the P10 panel is on after eight (8) seconds.
- (ak) Make sure the EICAS advisory message L(R) REV ISLN VAL is shown after ten (10) seconds.
- (al) Install a jumper wire between airplane ground and pin C of the applicable diode R227 or R229 (TB130, E1-2 shelf).
- (am) Make sure the REV ISLN light on the P10 panel stays on after eight (8) seconds.
- (an) Install a jumper wire between pins 1 and 2 of the applicable connector D2134 (S330) or D2138 (S331).
- (ao) Make sure the REV ISLN light on the P10 panel is not on after eight (8) seconds.
- (ap) Make sure the EICAS advisory message L(R) REV ISLN VAL is not shown after ten (10) seconds.
- (aq) Remove the jumper wire from between pins 3 and 2 of the applicable connector D20122 (S858) or D20126 (S860).
- (ar) Make sure the REV ISLN light on the P10 panel is on after eight (8) seconds.
- (as) Make sure the EICAS advisory message L(R) REV ISLN VAL is shown after ten (10) seconds.
- (at) Install a jumper wire between pins 1 and 2 of the applicable connector D20122 (S858) or D20126 (S860).
- (au) Move the applicable reverse thrust lever to the deploy position.
- (av) Make sure the REV ISLN light on the P10 panel is not on after eight (8) seconds.
- (aw) Make sure the EICAS advisory message L(R) REV ISLN VAL is not shown after ten (10) seconds.
- (ax) Remove the jumper wire between pins 1 and 2 of the applicable connector D20122 (S858) or D20126 (S860).
- (ay) Make sure the REV ISLN light on the P10 panel is on after eight (8) seconds.
- (az) Make sure the EICAS advisory message L(R) REV ISLN VAL is shown after ten (10) seconds.

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- (ba) Install a jumper wire between pins 3 and 2 of connector D20122 (S858) or D20126 (S860).
- (bb) Move the applicable reverse thrust lever to the stow position.
- (bc) Make sure the REV ISLN light on the P10 panel is not on after eight (8) seconds.
- (bd) Make sure the EICAS advisory message L(R) REV ISLN VAL is not shown after ten (10) seconds.
- (be) Remove the jumper wire from between airplane ground and pin C of the applicable diode R227 or R229 (TB130, E1-2 shelf).
- (bf) Make sure the REV ISLN light on the P10 panel is on after eight (8) seconds.
- (bg) Make sure the EICAS advisory message L(R) REV ISLN VAL is shown after ten (10) seconds.
- (bh) Remove the jumper wire from between pins 1 and 2 of the applicable connector D2134 (S330) or D2138 (S331).
- (bi) Remove the jumper wire from between airplane ground and pin C of the applicable diode R228 or R230 (TB130, E1-2 shelf).
- (bj) Make sure the REV ISLN light on the P10 panel is not on after eight (8) seconds.
- (bk) Make sure the EICAS advisory message L(R) REV ISLN VAL is not shown after ten (10) seconds.
- (bl) Pull the applicable fire handle (do not turn).
- (bm) Make sure the REV ISLN light on the P10 panel is on after eight (8) seconds.
- (bn) Make sure the EICAS advisory message L(R) REV ISLN VAL is shown after ten (10) seconds.
- (bo) Push the applicable fire handle in.
- (bp) Make sure the REV ISLN light on the P10 panel is not on after eight (8) seconds.
- (bq) Make sure the EICAS advisory message L(R) REV ISLN VAL is not shown after ten (10) seconds.
- (br) For the left engine, open this circuit breaker and attach the D0-NOT-CLOSE tag:
 - 1) On the P11 panel:
 - a) 11D13, L ENG T/R IND
- (bs) For the right engine, open these circuit breakers and install the D0-NOT-CLOSE tags:
 - 1) On the P11 panel:
 - a) 11M30, 28V DC R BUS PWR SENSE
 - b) 11L32, R ENG T/R IND
- (bt) For the right engine, do the steps that follow:
 - 1) Make sure the condition that follows is true:

FROM EQUIPMENT	TO EQUIPMENT	CONDITION
D2138 PIN 1 (S331)	D2138 PIN 2	26 TO 32V DC

- 2) Remove the D0-NOT-CLOSE tag and close this circuit breaker:
 - a) On the P11 panel:

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1. 11M30, 28V DC R BUS PWR SENSE
- 3) Make sure the condition that follows is true:

FROM EQUIPMENT	TO EQUIPMENT	CONDITION
D2138 PIN 1 (S331)	D2138 PIN 2	-3 to +3V DC

- (bu) For the left engine, make sure the conditions that follow at connector D20164 on the E1-4 shelf are true:

NOTE: Connector D20164 is the M1987 shelf connector, D20164A is the upper part of the connector and D20164B is the lower part of the connector. The connector may be on the E2-6 shelf.

FROM EQUIPMENT	TO EQUIPMENT	CONDITION
D20164A PIN F9	AIRPLANE GND	CONTINUITY
D20164A PIN F13	AIRPLANE GND	CONTINUITY
D20164A PIN F5	AIRPLANE GND	CONTINUITY
D20164A PIN A5	AIRPLANE GND	CONTINUITY
D20164A PIN K15	AIRPLANE GND	CONTINUITY
D20164A PIN A9	D20164A PIN K3	OPEN CIRCUIT
D20164A PIN K7	AIRPLANE GND	OPEN CIRCUIT
D20164A PIN A13	AIRPLANE GND	OPEN CIRCUIT
D20164A PIN F1	AIRPLANE GND	-3 TO +3V DC

- (bv) For the right engine, make sure the conditions that follow at connector D20164 on the E1-4 shelf are true:

NOTE: Connector D20164 is the M1987 shelf connector, D20164A is the upper part of the connector and D20164B is the lower part of the connector. The connector may be on the E2-6 shelf.

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FROM EQUIPMENT	TO EQUIPMENT	CONDITION
D20164B PIN F10	AIRPLANE GND	CONTINUITY
D20164B PIN F14	AIRPLANE GND	CONTINUITY
D20164B PIN F6	AIRPLANE GND	CONTINUITY
D20164B PIN A6	AIRPLANE GND	CONTINUITY
D20164B PIN A10	D20164B PIN K4	OPEN CIRCUIT
D20164B PIN K8	AIRPLANE GND	OPEN CIRCUIT
D20164B PIN A14	AIRPLANE GND	OPEN CIRCUIT
D20164B PIN F2	AIRPLANE GND	-3 TO +3V DC

(bw) For the applicable engine, remove the DO-NOT-CLOSE tags and close these circuit breakers:

- 1) On the P11 panel:
 - a) 11L32, R ENG T/R IND
 - b) 11D13, L ENG T/R IND

(bx) For the left engine, make sure the condition that follows is true:

FROM EQUIPMENT	TO EQUIPMENT	CONDITION
D20164A PIN F1	AIRPLANE GND	26 TO 32V DC

(by) For the right engine, make sure the condition that follows is true:

FROM EQUIPMENT	TO EQUIPMENT	CONDITION
D20164B PIN F2	AIRPLANE GND	26 TO 32V DC

(bz) Open these circuit breakers and attach the DO-NOT-CLOSE tags:

- 1) On the P11 panel:
 - a) 11C30, LDG GR POS AIR/GND SYS 1
 - b) 11U15, LDG GR AIR/GND SYS 1
 - c) 11C29, LDG GR POS AIR/GND SYS 2 ALT
 - d) 11U23, LDG GR POS AIR/GND SYS 2

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(ca) For the left engine, make sure the conditions that follow are true:

FROM EQUIPMENT	TO EQUIPMENT	CONDITION
D20164A PIN F13	AIRPLANE GND	CONTINUITY
D20164A PIN A5	AIRPLANE GND	OPEN CIRCUIT
D20164A PIN A9	D20164A PIN K3	CONTINUITY

(cb) For the right engine, make sure the conditions that follow are true:

FROM EQUIPMENT	TO EQUIPMENT	CONDITION
D20164B PIN F14	AIRPLANE GND	CONTINUITY
D20164B PIN A6	AIRPLANE GND	OPEN CIRCUIT
D20164B PIN A10	D20164B PIN K4	CONTINUITY

(cc) Remove the jumper wire between pins 3 and 2 of the applicable connector D20122 (S858) or D20126 (S860).

(cd) Install a jumper wire between pins 1 and 2 of the applicable connector D20122 (S858) or D20126 (S860).

(ce) For the left engine, make sure the conditions that follow are true:

FROM EQUIPMENT	TO EQUIPMENT	CONDITION
D20164A PIN F13	AIRPLANE GND	OPEN CIRCUIT
D20164A PIN A13	AIRPLANE GND	CONTINUITY

NOTE: Use the diode setting on the multimeter when checking pin A13.

(cf) For the right engine, make sure the conditions that follow are true:

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FROM EQUIPMENT	TO EQUIPMENT	CONDITION
D20164B PIN F14	AIRPLANE GND	OPEN CIRCUIT
D20164B PIN A14	AIRPLANE GND	CONTINUITY

NOTE: Use the diode setting on the multimeter when checking pin A14.

- (cg) Remove the jumper wire between pins 1 and 2 of the applicable connector D20122 (S858) or D20126 (S860).
- (ch) Install a jumper wire between pins 1 and 2 of the applicable connector D2134 (S330) or D2138 (S331).
- (ci) For the left engine, make sure the conditions that follow are true:

FROM EQUIPMENT	TO EQUIPMENT	CONDITION
D20164A PIN F13	AIRPLANE GND	OPEN CIRCUIT
D20164A PIN K11	AIRPLANE GND	CONTINUITY

NOTE: Use the diode setting on the multimeter when checking pin k11.

- (cj) For the right engine, make sure the conditions that follow are true:

FROM EQUIPMENT	TO EQUIPMENT	CONDITION
D20164B PIN F14	AIRPLANE GND	OPEN CIRCUIT
D20164B PIN K12	AIRPLANE GND	CONTINUTIY

NOTE: Use the diode setting on the multimeter when checking pin K12.

- (ck) Remove the jumper wire between pins 1 and 2 of the applicable connector D2134 (S330) or D2138 (S331).
- (cl) Install a jumper wire between airplane ground and pin C of the applicable diode R228 or R230 (TB130, E1-2 shelf).
- (cm) For the left engine, make sure the conditions that follow are true:

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FROM EQUIPMENT	TO EQUIPMENT	CONDITION
D20164A PIN F13	AIRPLANE GND	OPEN CIRCUIT
D20164A PIN K7	AIRPLANE GND	CONTINUITY

(cn) For the right engine, make sure the conditions that follow are true:

FROM EQUIPMENT	TO EQUIPMENT	CONDITION
D20164B PIN F14	AIRPLANE GND	OPEN CIRCUIT
D20164B PIN K8	AIRPLANE GND	CONTINUITY

- (co) Remove the jumper wire between airplane ground and pin C of the applicable diode R228 or R230 (TB130, E1-2 shelf).
- (cp) For the left engine, install a jumper wire between airplane ground and pin A1 of connector D20164A.
- (cq) For the right engine, install a jumper wire between airplane ground and pin A2 of connector D20164B.
- (cr) Make sure the EICAS advisory message L(R) REV ISLN VAL is shown.
- (cs) Make sure the REV ISLN light on the P10 panel is on.
- (ct) For the left engine, remove the jumper wire between airplane ground and pin A1 of connector D20164A.
- (cu) For the right engine, remove the jumper wire between airplane ground and pin A2 of connector D20164B.
- (cv) For the applicable engine, make sure these circuit breakers are opened:

ENGINE	CIRCUIT BREAKER
LEFT	11D13
RIGHT	11D32 11L32 11M30

NOTE: This is done to prevent damage to the thrust reverser relay module M1987 when it is installed.

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- (cw) Install the thrust reverser relay module, M1987 (E1-4 shelf or E2-6 shelf) (AMM 78-36-03/401).
- (cx) Connect the applicable connectors that follow:

CONNECTOR	MATE WITH EQUIPMENT	LOCATION
D2134	S330 (L T/R RESTOW VAL PRESS SW)	L STRUT
D20122	S858 (L ENG T/R HIV 1 PRESS SW)	L STRUT
D2138	S331 (R T/R RESTOW VAL PRESS SW)	R STRUT
D20126	S860 (R ENG T/R HIV 1 PRESS SW)	R STRUT

- (cy) If it is necessary, remove the breakout box, A78025 and the applicable patch cable or your equivalent equipment.
- F. Put the Airplane Back to Its Usual Condition

S 865-105-N00

- (1) For the applicable engine, make sure the DO-NOT-CLOSE tag is removed and these circuit breakers are closed:
- (a) On the P11 panel:
- 1) 11L32, R ENG T/R IND
 - 2) 11D32, R ENG T/R IND ALT
 - 3) 11L33, R ENG T/R CONT
 - 4) 11D33, R ENG T/R CONT ALT
 - 5) 11M30, 28V DC R BUS PWR SENSE (Right Engine only)
 - 6) 11D13, L ENG T/R IND
 - 7) 11D14, L ENG T/R CONT
 - 8) 11C30, LDG GR POS AIR/GND SYS 1
 - 9) 11U15, LDG GR AIR/GND SYS 1
 - 10) 11C29, LDG GR POS AIR/GND SYS 2 ALT
 - 11) 11U23, LDG GR POS AIR/GND SYS 2
- (b) On the P6 panel:
- 1) 06H01, FIRE EXT ENG L BTL 1

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- 2) 06H02, FIRE EXT ENG L BTL 2
- 3) 06H03, FIRE EXT ENG R BTL 1
- 4) 06H04, FIRE EXT ENG R BTL 2

S 865-075-N00

- (2) Put the safety sensitive systems back to their normal condition (AMM 32-09-02/201).

S 865-106-N00

- (3) Erase the EICAS maintenance message L(R) REV ISLN VAL (AMM 31-41-00/201).

S 415-107-N00

- (4) Close the applicable hydraulic bay access panels (AMM 06-43-00/201).

S 715-076-N00

- (5) Do the operational test for the thrust reverser (AMM 78-31-00/501).

TASK 78-36-00-725-077-N00

4. Thrust Reverser Air/Ground Relay Adjustment/Test

A. General

- (1) This procedure gives instructions to do a functional test of the air/ground relay.
- (2) The thrust reverser air/ground relay is referred to as the air/ground relay for this procedure.

B. Reference

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

C. Access

- (1) Location Zones:

119 Main Equipment Center Access
211 Flight Compartment
212 Flight Compartment

- (2) Access Panel

119AL Main Equipment Center Access Door

D. Prepare to do the Air/Ground Relay Integrity Test

S 865-078-N00

- (1) Make sure the reverse thrust levers are in the stow position.

S 865-079-N00

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

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S 865-080-N00

- (3) Make sure these circuit breakers are closed:
- (a) On the overhead equipment panel, P11:
- 1) 11C30, LDG GR POS AIR/GND SYS 1
 - 2) 11U15, LDG GR AIR/GND SYS 1
 - 3) 11D14, L ENG T/R CONT
 - 4) 11D13, L ENG T/R IND
 - 5) 11D18, L ENG T/R SSL CONT
 - 6) 11C29, LDG GR POS AIR/GND SYS 2 ALT
 - 7) 11U23, LDG GR AIR/GND SYS 2
 - 8) 11L33, R ENG T/R CONT
 - 9) 11L32, R ENG T/R IND
 - 10) 11D21, R ENG T/R SSL CONT
 - 11) 11D33, R ENG T/R CONT ALT
 - 12) 11D32, R ENG T/R IND ALT

E. Do a test of the left thrust reverser air/ground relay.

S 865-082-N00

- (1) Make sure the L5 REV ISLN LIGHT on the P10 panel is not on.

S 865-083-N00

- (2) Make sure the advisory message L REV ISLN VAL does not show on the EICAS display.

S 865-084-N00

- (3) Open this circuit breaker:
- (a) On the P11 panel:
- 1) 11D14, L ENG T/R CONT

S 865-085-N00

- (4) Make sure the L5 REV ISLN light on the P10 panel is on.

NOTE: The light can take as much as 8 seconds to show.

S 865-086-N00

- (5) Make sure the advisory message L REV ISLN VAL does show on the EICAS display.

NOTE: The advisory message can take as much as 10 seconds to show. If the advisory message does not show on the EICAS display, examine the relay K2154 and wires in the P36 panel (WDM 78-36-11).

S 865-087-N00

- (6) Open these circuit breakers:
- (a) On the P11 panel:
- 1) 11C30, LDG GR POS AIR/GND SYS 1
 - 2) 11U15, LDG GR AIR/GND SYS 1

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S 865-088-N00

- (7) Make sure the L5 REV ISLN light on the P10 panel is not on.

NOTE: The light can take up to 8 seconds to show.

S 865-089-N00

- (8) Make sure the advisory message L REV ISLN VAL does not show on the EICAS display.

NOTE: The advisory message can take as much as 10 seconds to show.

S 865-090-N00

- (9) Close these circuit breakers:
(a) On the P11 panel:
1) 11D14, L ENG T/R CONT
2) 11C30, LDG GR POS AIR/GND SYS 1
3) 11U15, LDG GR AIR/GND SYS 1

S 015-091-N00

- (10) Access the Main Equipment Center.
(a) Do the relay module reset procedure for the L ENG RESET switch (AMM 78-36-03/201).

F. Do a test of the right thrust reverser air/ground relay.

S 865-092-N00

- (1) Make sure the L5 REV ISLN LIGHT on the P10 panel is not on.

S 865-093-N00

- (2) Make sure the advisory message R REV ISLN VAL does not show on the EICAS display.

S 865-094-N00

- (3) Open this circuit breaker:
(a) On the P11 panel:
1) 11L33, R ENG T/R CONT

S 865-095-N00

- (4) Make sure the L5 REV ISLN light on the P10 panel is on.

NOTE: The light can take as much as 8 seconds to show.

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- S 865-096-N00
- (5) Make sure the advisory message R REV ISLN VAL does show on the EICAS display.

NOTE: The advisory message can take as much as 10 seconds to show. If the advisory message does not show on the EICAS display, examine the relay K206 and wires in the P37 panel (WDM 78-36-21).

- S 865-097-N00
- (6) Open these circuit breakers:
- (a) On the P11 panel:
- 1) 11C29, LDG GR POS AIR/GND SYS 2 ALT
 - 2) 11U23 LDG GR AIR/GND SYS 2

- S 865-098-N00
- (7) Make sure the L5 REV ISLN light on the P10 panel is not on.

NOTE: The light can take up to 8 seconds to show.

- S 865-099-N00
- (8) Make sure the advisory message R REV ISLN VAL does not show on the EICAS display.

NOTE: The advisory message can take as much as 10 seconds to show.

- S 865-100-N00
- (9) Close these circuit breakers:
- (a) On the P11 panel:
- 1) 11L33, R ENG T/R CONT
 - 2) 11C29, LDG GR POS AIR/GND SYS 2 ALT
 - 3) 11U23 LDG GR AIR/GND SYS 2

- S 015-101-N00
- (10) Access the Main Equipment Center.
- (a) Do the relay module reset procedure for the R ENG RESET switch (AMM 78-36-03/201).

- S 865-102-N00
- (11) Remove electrical power (AMM 24-22-00/201).

- S 865-103-N00
- (12) Put the airplane back to its usual condition.

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THRUST REVERSER PROXIMITY SENSORS – REMOVAL/INSTALLATION

1. General

- A. This procedure has these tasks:
 - (1) The first task gives instructions to remove the proximity sensors.
 - (2) The second task gives instructions to install the proximity sensors.
- B. The thrust reverser proximity sensors are referred to as the proximity sensors in this procedure.

TASK 78-36-01-004-006-N00

2. Remove the Thrust Reverser Proximity Sensors

- A. References
 - (1) AMM 27-61-00/201, Speed Brake Control System
 - (2) AMM 71-11-04/201, Fan Cowl Panels
 - (3) AMM 78-31-00/201, Thrust Reverser System

- B. Access
 - (1) Location Zones
 - 410 Engine No. 1 (Left)
 - 420 Engine No. 2 (Right)
 - (2) Access Panels
 - 415AL Fan Reverser (Left)
 - 416AR Fan Reverser (Right)
 - 425AL Fan Reverser (Left)
 - 426AR Fan Reverser (Right)

- C. Prepare to Remove the Proximity Sensors (Fig. 401).

S 044-001-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE AUTOMATIC SPEED BRAKE CONTROL SYSTEM. IF YOU DO NOT DO THIS, THE AUTOMATIC SPEED BRAKES CAN MOVE QUICKLY WHEN YOU MOVE THE THRUST LEVERS. THIS CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

- (1) Do this procedure: Automatic Speed Brake System Deactivation (AMM 27-61-00/201).

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- S 864-002-N00
- (2) Make sure the forward thrust levers are in the idle position and attach the DO-NOT-OPERATE tags.
- S 864-003-N00
- (3) Make sure the reverse thrust levers are in the fully stowed position and attach the DO-NOT-OPERATE tags.
- S 864-050-N00
- (4) For the left engine, open these circuit breakers and attach the DO-NOT-CLOSE tags:
- (a) On the overhead equipment panel, P11:
- 1) 11D13, L ENG T/R IND
- S 864-051-N00
- (5) For the right engine, open these circuit breakers and attach the DO-NOT-CLOSE tags:
- (a) On the overhead equipment panel, P11:
- 1) 11L32, R ENG T/R IND
2) 11D32, R ENG T/R IND ALTN

S 044-004-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.

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

NOTE: If you will remove the actuator lock or the actuator deploy proximity sensor, you must do the full deactivation procedure for the thrust reverser. This includes the deactivation of the stow valve, the motorized isolation valve, and the thrust reverser sleeves.

If you will remove only the auto restow proximity sensor, do the deactivation of the stow valve and the motorized isolation valve only. DO NOT put the streamered pins in the thrust reverser sleeves. You will need to manually extend and retract the thrust reverser to get access to the auto restow proximity sensor.

S 014-005-N00

- (7) Open the fan cowl panels (AMM 71-11-04/201).
- D. Remove the Actuator Deploy or the Actuator Lock Proximity Sensors (Fig. 401).

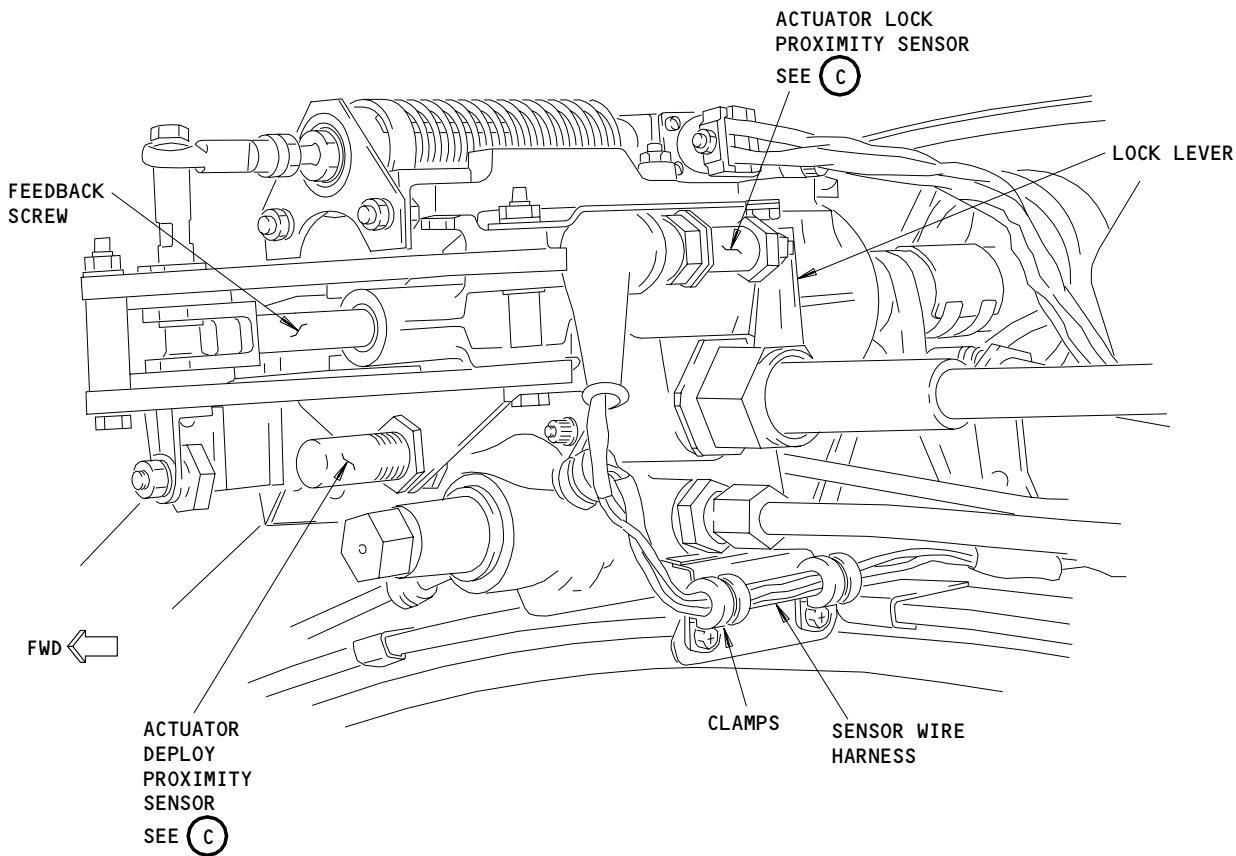
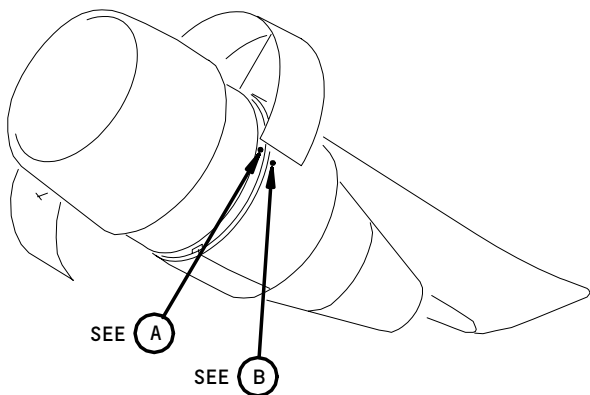
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CENTER LOCKING HYDRAULIC ACTUATOR

(A)

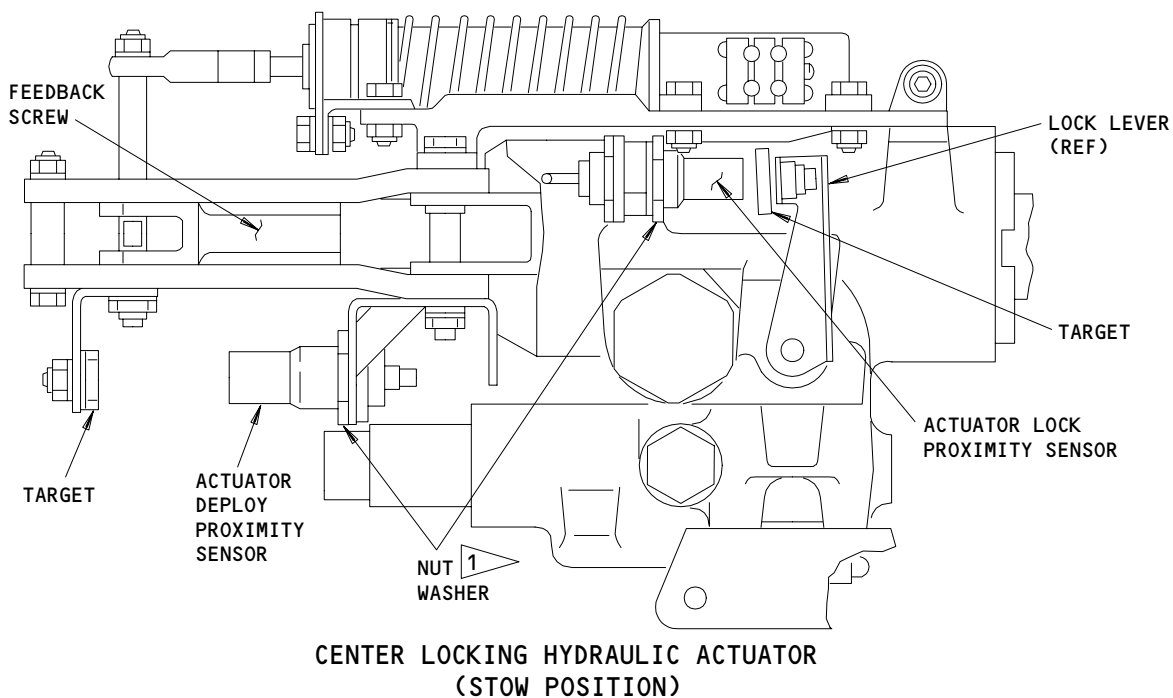
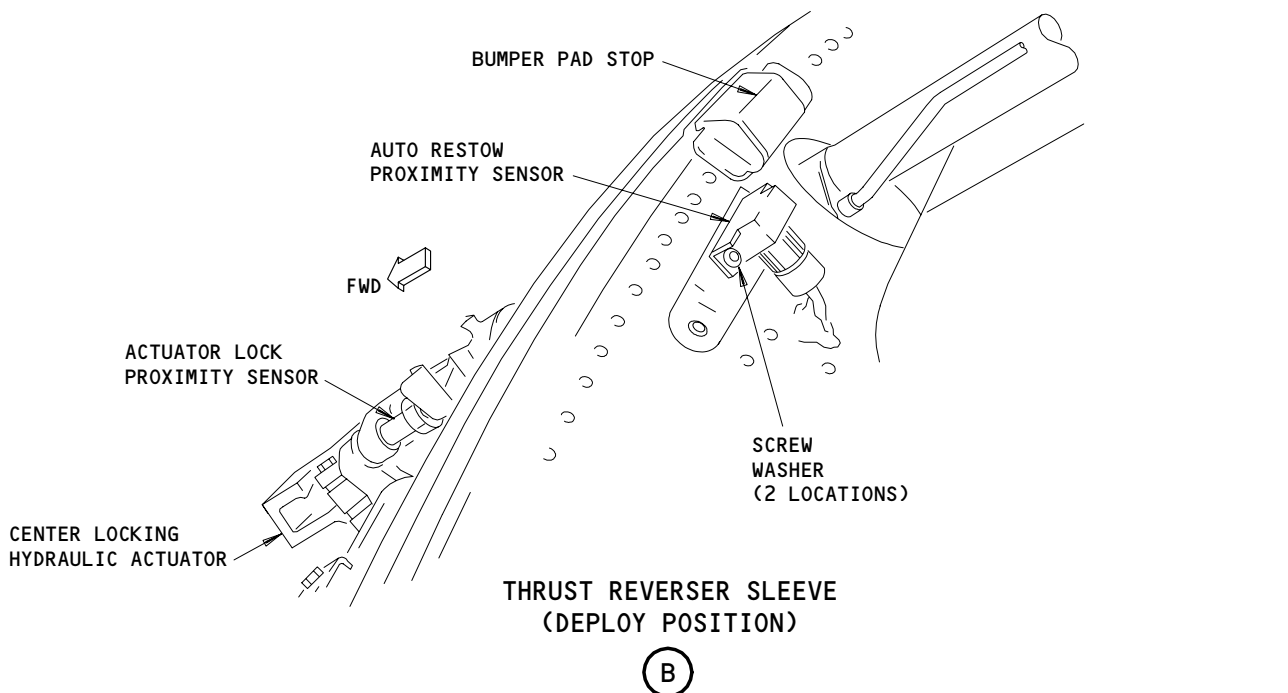
Actuator Lock and Actuator Deploy Proximity Sensor Installation
Figure 401 (Sheet 1)

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	ALL

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1 ▽ PUT THE LOCKWIRE BETWEEN THE NUT AND THE SENSOR

Actuator Lock and Actuator Deploy Proximity Sensor Installation
Figure 401 (Sheet 2)

EFFECTIVITY	
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- S 034-010-N00
- (1) Remove the fasteners and the clamps from the wire harness.

- S 034-011-N00
- (2) Disconnect each wire at the splice and attach a tag to identify the wire.

- S 024-023-N00
- (3) Remove the nut and the washer from the proximity sensor.

- S 024-013-N00
- (4) Remove the proximity sensor from the structure of the center locking hydraulic actuator.
- E. Remove the Auto Restow Proximity Sensor (Fig. 401).

- S 984-045-N00
- (1) Manually extend the thrust reverser sleeves to get access to the auto restow proximity sensor (AMM 78-31-00/201).

- S 034-015-N00
- (2) Remove the fasteners and the clamps from the wire harness.

- S 034-016-N00
- (3) Disconnect each wire at the splice and attach a tag to identify the wire.

- S 024-024-N00
- (4) Remove the mounting screws from the proximity sensor.

- S 024-018-N00
- (5) Remove the proximity sensor from the thrust reverser structure.

TASK 78-36-01-404-019-N00

3. Install the Thrust Reverser Proximity Sensors

A. References

- (1) AMM 27-61-00/201, Speed Brake Control System
- (2) AMM 71-11-04/201, Fan Cowl Panels
- (3) AMM 78-31-00/201, Thrust Reverser System
- (4) AMM 78-31-00/501, Thrust Reverser System
- (5) AMM 78-36-00/501, Thrust Reverser Position Indication System

B. Access

- (1) Location Zones
 - 410 Engine No. 1 (Left)
 - 420 Engine No. 2 (Right)

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(2) Access Panels

- 413AL Fan Cowl Panel (Left)
- 414AR Fan Cowl Panel (Right)
- 415AL Fan Reverser (Left)
- 416AR Fan Reverser (Right)
- 423AL Fan Cowl Panel (Left)
- 424AR Fan Cowl Panel (Right)
- 425AL Fan Reverser (Left)
- 426AR Fan Reverser (Right)

C. Install the Actuator Deploy or the Actuator Lock Proximity Sensors (Fig. 401).

S 424-020-N00

- (1) Put the proximity sensor in the correct position on the center locking hydraulic actuator.

S 424-022-N00

- (2) Install the washer and the nut on the proximity sensor.
(a) Install the lockwire on the nut.

S 434-025-N00

- (3) Connect each wire at the splice.
(a) Remove the identification tag from the wire.

S 434-026-N00

- (4) Install the clamps on the wire harness.

S 434-027-N00

- (5) Attach the clamps to the structure of the center locking hydraulic actuator with the screws.

D. Install the Auto Restow Proximity Sensor (Fig. 401).

S 424-029-N00

- (1) Put the proximity sensor in the correct position on the structure of the thrust reverser.

S 424-030-N00

- (2) Install the mounting screws to attach the proximity sensor to the structure.

S 434-031-N00

- (3) Connect each wire at the splice.
(a) Remove the identification tag from the wire.

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- S 434-032-N00
- (4) Install the clamps on the wire harness.
- S 434-033-N00
- (5) Attach the clamps to the structure of the thrust reverser with the screws.
- E. Put the Airplane Back to Its Usual Condition.
- S 864-052-N00
- (1) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker:
- (a) On the overhead equipment panel, P11:
- 1) 11D13, L ENG T/R IND
- S 864-053-N00
- (2) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker:
- (a) On the overhead equipment panel, P11:
- 1) 11L32, R ENG T/R IND
- 2) 11D32, R ENG T/R IND ALTN
- S 824-034-N00
- (3) Adjust the target clearance for the proximity sensor if it is necessary (AMM 78-36-00/501).
- S 714-048-N00
- (4) Do this procedure: Thrust Reverser Operational Test (AMM 78-31-00/501).
- S 414-038-N00
- (5) Close the fan cowl panels (AMM 71-11-04/201).
- S 444-039-N00
- (6) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).
- S 444-040-N00
- (7) Do the activation procedure for the speed brake control system (AMM 27-61-00/201).
- S 864-041-N00
- (8) Remove the DO-NOT-OPERATE tags from the thrust levers.

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THRUST LEVER INTERLOCK ACTUATOR – REMOVAL/INSTALLATION

1. General

- A. This procedure has two tasks. The first task removes the interlock actuator and the second task installs the interlock actuator.

TASK 78-36-02-004-001-N00

2. Remove the Interlock Actuator

A. Equipment

- (1) Rig Pin P7 – P/N A20004-23 from set A20004-XX
(AMM 20-10-24/201)
(2) Power Source – 28v dc

B. References

- (1) AMM 06-41-00/201, Fuselage Access Doors and Panels.

C. Access

- (1) Location Zones
110 Lower Forward Fuselage
210 Control Cabin

(2) Access Panels

- 113AL Forward Equipment Bay

D. Remove the Interlock Actuator (Fig. 401)

S 864-002-N00

WARNING: OPEN THE T/L INTERLOCK CIRCUIT BREAKERS BEFORE YOU START THE MAINTENANCE. THE INTERLOCK ACTUATOR OPERATES IN LESS THAN ONE SECOND. INJURY TO PERSONS AND DAMAGE TO EQUIPMENT COULD OCCUR.

- (1) For the left engine, open these circuit breakers on the overhead panel P11 and attach the DO-NOT-CLOSE tags.
(a) 11C35, L ENG T/L INTERLOCK
(b) 11D4, L ENG T/R CONT

S 864-003-N00

- (2) For the right engine, open these circuit breakers on the overhead panel P11 and attach the DO-NOT-CLOSE tags.
(a) 11C36, R ENG T/L INTERLOCK ALTN
(b) 11D33, R ENG T/R CONT ALTN
(c) 11L29, R ENG T/L INTERLOCK
(d) 11L33, R ENG T/R CONT

S 044-004-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURIES TO PERSONS OR TO EQUIPMENT.

- (3) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

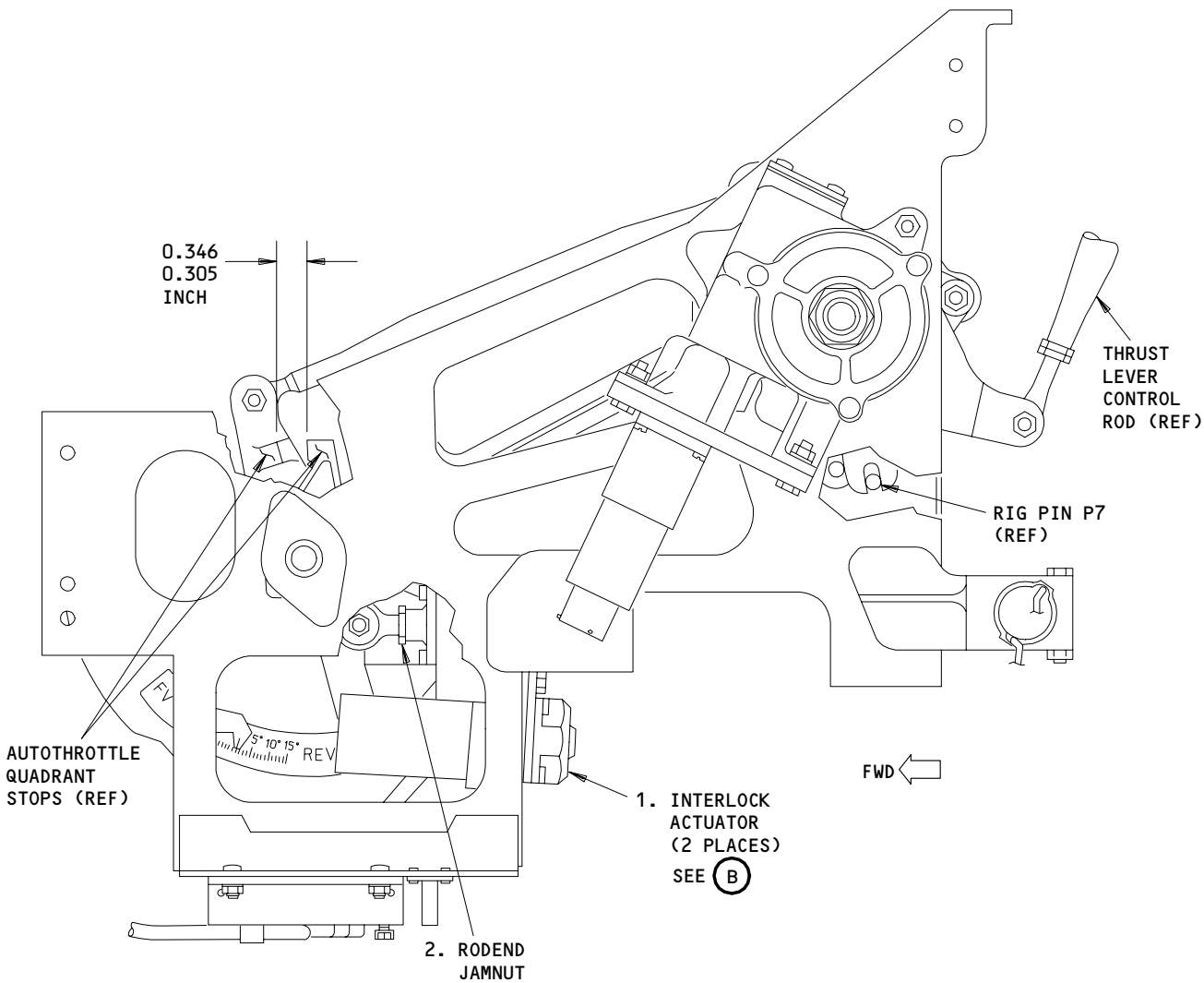
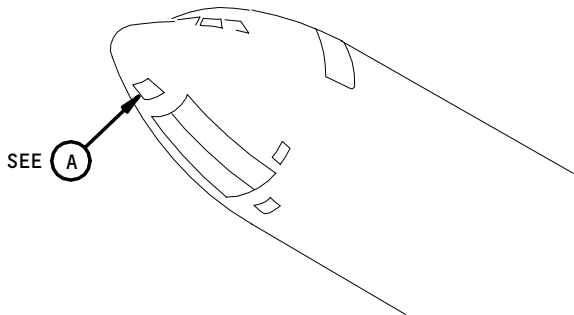
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(A)

Thrust Lever Interlock Actuator Installation
Figure 401 (Sheet 1)

EFFECTIVITY

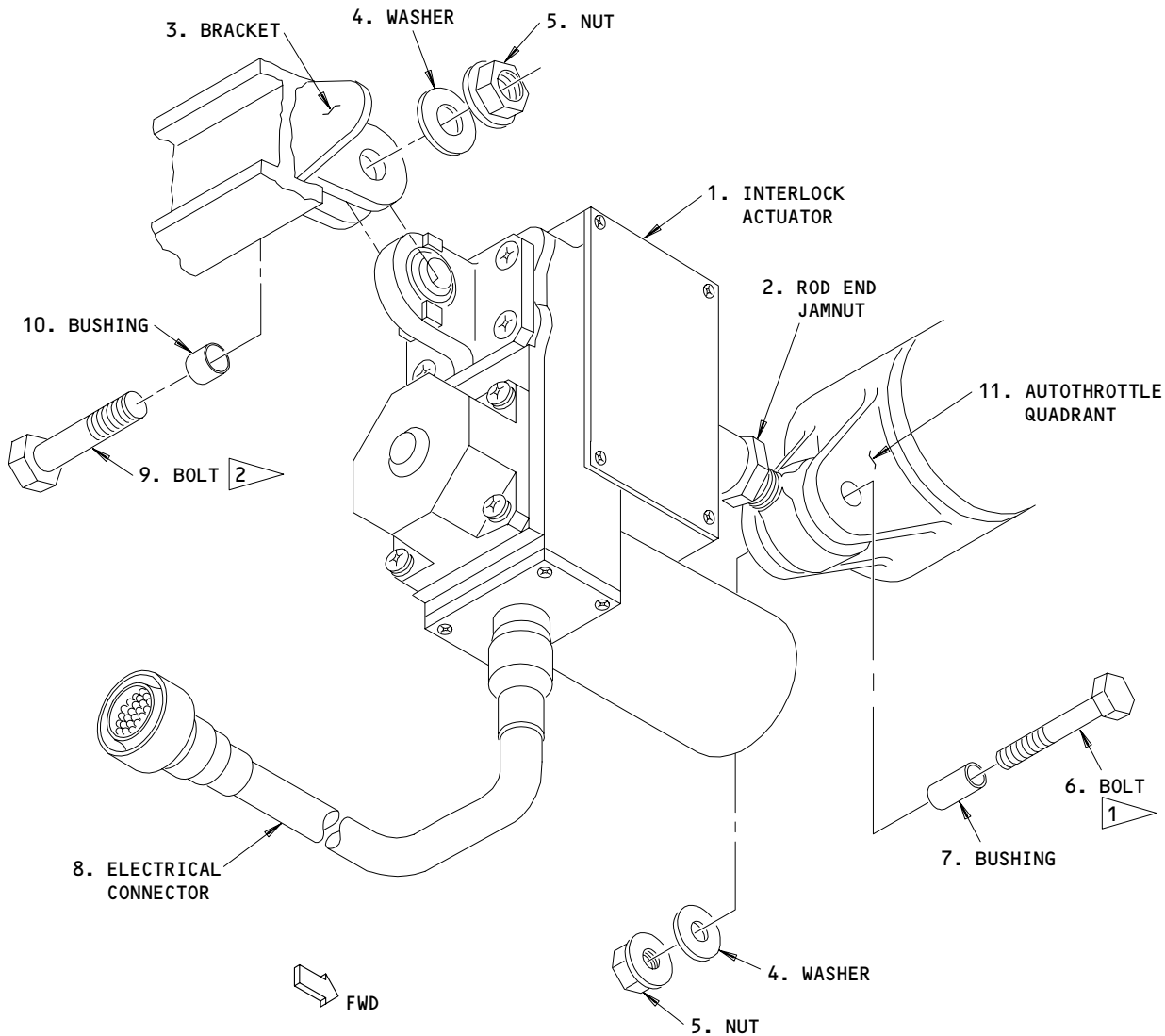
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LEFT INTERLOCK ACTUATOR
(RIGHT ACTUATOR OPPOSITE)

(B)

- 1 INSTALL FROM INBOARD SIDE
- 2 INSTALL FROM OUTBOARD SIDE

Thrust Lever Interlock Actuator Installation
Figure 401 (Sheet 2)

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- S 864-005-N00
- (4) Make a check that the forward thrust levers are in the forward idle position and the reverse thrust levers are fully forward. Attach D0-NOT-OPERATE tags to both levers.
- S 014-006-N00
- (5) Open the access door, 113AL, to get access to the interlock actuator (AMM 06-41-00/201).
- S 024-007-N00
- (6) Do these steps to remove the interlock actuator.
- (a) Disconnect the electrical connector (8) and install a cap to protect the connector.
 - (b) Remove the bolt (6) that attaches the actuator rod end to the autothrottle quadrant (11).
 - (c) Remove the bolt (9) that attaches the interlock actuator (1) to the autothrottle bracket (3).
 - (d) Remove the interlock actuator (1).

TASK 78-36-02-404-008-N00

3. Install the Interlock Actuator

A. Equipment

- (1) Rig Pin P7 - P/N A20004-23 from set A20004-2 (AMM 20-10-24)
- (2) Power source, 28 volts DC

B. References

- (1) AMM 06-41-00/201, Fuselage Access Doors and Panels.

C. Access

- (1) Location Zones
 - 110 Lower Forward Fuselage
 - 210 Control Cabin

(2) Access Panels

- 113AL Forward Equipment Bay

D. Install the Interlock Actuator (Fig. 401).

S 424-009-N00

- (1) Do these steps to install the interlock actuator.
 - (a) Put the interlock actuator (1) on the autothrottle bracket (3).
 - (b) Install the bolt (9), bushing (10), washer (4), nut (5) to attach the interlock actuator to the autothrottle bracket (3).
 - (c) Install the bolt (6), bushing (7), washer (4) and nut (5) to connect the rod end to the autothrottle quadrant (11).

S 824-010-N00

- (2) Adjust the interlock actuator.
 - (a) Make sure the rig pin P7 is not installed.
 - (b) Put 28 volts DC to pin 6 with pin 10 as ground on the actuator electrical connector to retract the actuator.

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- (c) Install rig pin P7 through both side frames and the autothrottle brakes.
- (d) Loosen the jamnut on the actuator rodend.
- (e) Adjust the rodend so that the distance between the stops on autothrottle quadrant is 0.305-0.346 inches. Tighten the jamnut to 160-190 pound-inches and install lockwire on the jamnut.
- (f) Remove the rig pin P7.
- (g) Remove the cap and connect the electrical connector (8).

S 414-011-N00

- (3) Close the access door, 113AL (AMM 06-41-00/201).

S 864-012-N00

- (4) Remove the DO-NOT-OPERATE tags from the thrust levers.

S 864-013-N00

- (5) For the left engine, remove DO-NOT-CLOSE tags and close the circuit breakers on the overhead panel P11.
 - (a) 11C35, L ENG T/L INTERLOCK
 - (b) 11D14, L ENG T/R CONT

S 864-014-N00

- (6) For the right engine, remove DO-NOT-CLOSE tags and close the circuit breakers on the overhead panel P11.
 - (a) 11C36, R ENG T/L INTERLOCK ALTN
 - (b) 11D33, R ENG T/R CONT ALTN
 - (c) 11L29, R ENG T/L INTERLOCK
 - (d) 11L33, R ENG T/R CONT

S 444-015-N00

- (7) Do the activation procedure for the spoilers (AMM 27-61-00/201).

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THRUST REVERSER RELAY MODULE – MAINTENANCES PRACTICES

1. General

A. This procedure contains:

- (1) A task that will clear only the faults that have been corrected.

B. Description

- (1) The thrust reverser relay module (M1987) is located in the EE bay on the E1-4 or E2-6 shelf. The relay module has six LED lights, three for each engine. These lights are:
 - (a) PSEU RESTOW
 - (b) RESTOW PRESSURE
 - (c) HIV PRESSURE
- (2) The thrust reverser relay module is active only in flight.
- (3) When a fault occurs in flight, a relay will latch in the relay module and one of the LEDs will illuminate.
- (4) If a fault occurs during flight, the relay box will initiate a REV ISLN VAL EICAS message approximately 60 seconds after landing.
- (5) A light on the relay module indicates which fault has occurred. These faults include:
 - (a) PSEU PRESSURE if the thrust reverser has an auto restow event in flight.
 - (b) RESTOW PRESSURE if the thrust reverser pressure switch senses pressure downstream of the restow valve during flight.
 - (c) HIV PRESSURE if the thrust reverser pressure switch senses pressure downstream of the motorized isolation valve during flight.
- (6) The relay module has a ground test function. If you press and hold the GROUND MODE TEST ENABLE buttons, the relay module will test the thrust reverser system for the same faults it looks for in the air mode.
- (7) The unit also has a LAMP TEST button to make sure all the LED lights function correctly.
- (8) Faults remain latched until they are reset. If you do not reset the relay module after you correct the problem you will continue to get the REV ISN VAL EICAS message as a nuisance message.

TASK 78-36-03-722-001-N00

2. Reset Relay Module (Fig. 201)

A. General

- (1) With this task, only faults that have been corrected will be cleared. Faults that have not been corrected will remain illuminated.

B. References

- (1) AMM 24-22-00/201 Electrical Power – Control
- (2) FIM 78-34-00/101 Thrust Reverser Control System

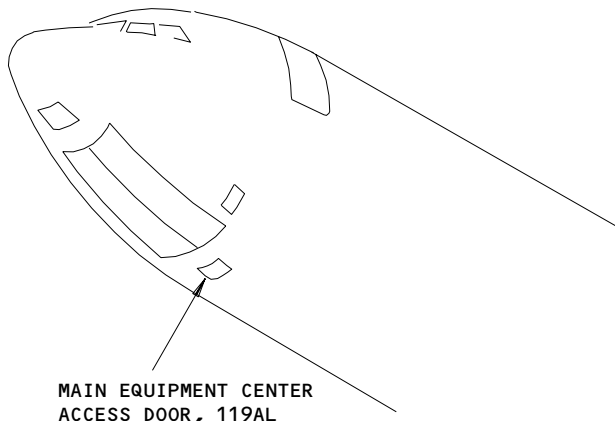
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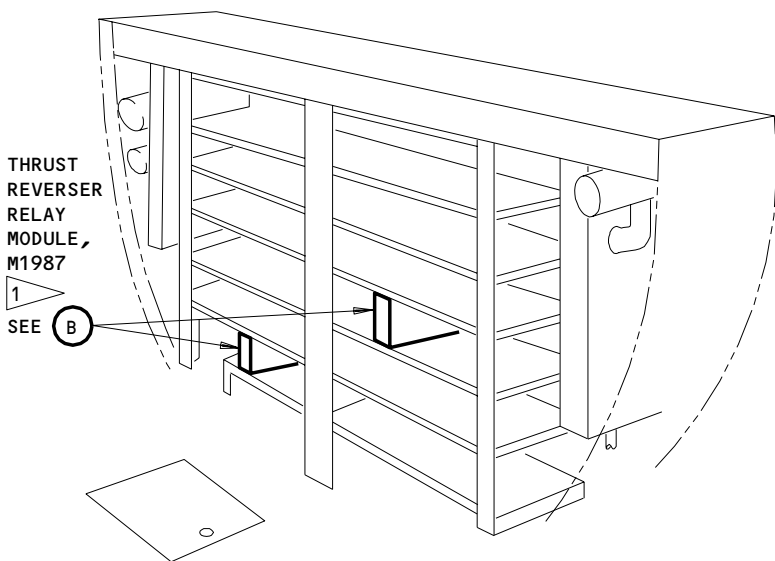
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MAIN EQUIPMENT CENTER
ACCESS DOOR, 119AL

SEE (A)



THRUST
REVERSER
RELAY
MODULE,
M1987

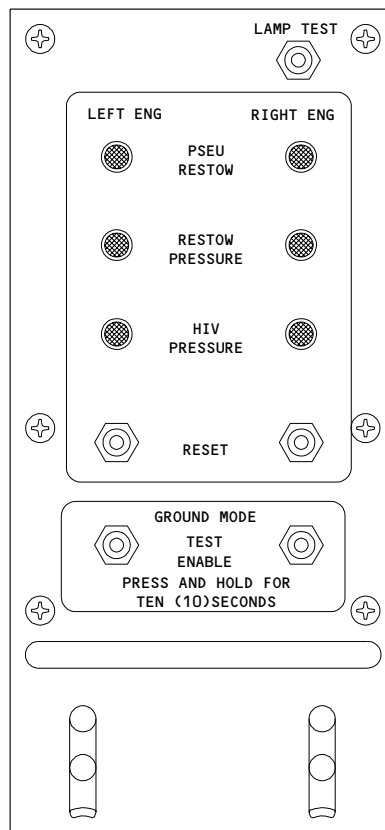
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SEE (B)

MAIN EQUIPMENT CENTER

(A)

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THRUST REVERSER RELAY MODULE

(B)

1 THE THRUST REVERSER RELAY MODULE IS INSTALLED
ON THE E1-4 OR THE E2-6 SHELF.

Thrust Reverser Relay Module - Maintenance Practices
Figure 201

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C. Access

(1) Location Zone

- 119 Main Equipment Center
- 211 Flight Compartment
- 212 Flight Compartment

(2) Access Panel

- 119AL Main Equipment Center Access Door

D. Clear The Faults That Have Been Corrected

S 862-002-N00

- (1) Supply electrical power to the airplane (AMM 24-22-00/201).

S 862-004-N00

- (2) Close the following circuit breakers on the P11 panel:

- (a) 11D14, L ENG T/R CONT
- (b) 11D13, L ENG T/R IND
- (c) 11D32, R ENG T/R IND ALT
- (d) 11D33, R ENG T/R CONT ALTN
- (e) 11L6, L ENG T/R CONT
- (f) 11L32, R ENG T/R IND
- (g) 11L33, R ENG T/R CONT

S 712-005-N00

- (3) For the left engine use these buttons on the left side of the relay module:

- (a) Hold the GROUND MODE TEST ENABLE switch down for at least 10 seconds.
- (b) While holding the GROUND MODE TEST ENABLE SWITCH, press and release the RESET BUTTON.
- (c) Release the GROUND MODE TEST ENABLE switch.

S 712-006-N00

- (4) For the right engine use these buttons on the right side of the relay module:

- (a) Hold the GROUND MODE TEST ENABLE switch down for at least 10 seconds.
- (b) While holding the GROUND MODE TEST ENABLE SWITCH, press and release the RESET BUTTON.
- (c) Release the GROUND MODE TEST ENABLE switch.

S 212-008-N00

- (5) Make sure all the LED lights are not illuminated.
- (a) If any LED stays illuminated do the corrective action (FIM 78-34-00/101).

S 862-009-N00

- (6) Remove electrical power from the airplane if no longer needed (AMM 24-22-00/201).

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THRUST REVERSER RELAY MODULE – REMOVAL/INSTALLATION

1. General

- A. There are two tasks in this procedure:
 - (1) Remove the thrust reverser relay module.
 - (2) Install the thrust reverser relay module.
- B. The thrust reverser relay module is installed on the E1-4 or the E2-6 shelf of the E/E bay. Before you remove the thrust reverser relay module, you must first disconnect the electrical power for the module.

TASK 78-36-03-004-009-N00

2. Remove Thrust Reverser Relay Module

- A. References
 - (1) AMM 20-10-01/401, E/E Rack Mounted Components
- B. Access
 - (1) Location Zone
119 Main Equipment Center
 - (2) Access Panel
119AL Main Equipment Center Access Door
- C. Remove the Thrust Reverser Relay Module (Fig. 401).

S 864-010-N00

- (1) Open these circuit breakers and attach the DO-NOT-CLOSE tags:
 - (a) On the Overhead Circuit Breaker panel, P11:
 - 1) 11D13, L ENG T/R IND
 - 2) 11D32, R ENG T/R IND ALTN
 - 3) 11L32, R ENG T/R IND

S 024-011-N00

- (2) Remove the thrust reverser relay module from the electrical equipment shelf (AMM 20-10-01/401).

TASK 78-36-03-404-012-N00

3. Install the Thrust Reverser Relay Module

- A. References
 - (1) AMM 20-10-01/401, E/E Rack Mounted Components
- B. Access
 - (1) Location Zone
119 Main Equipment Center
 - (2) Access Panel
119AL Main Equipment Center Access Door

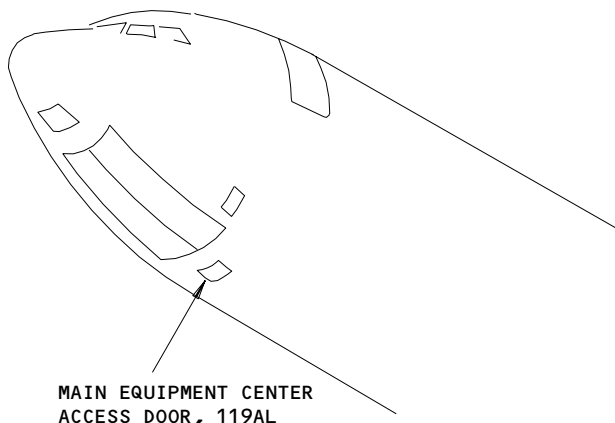
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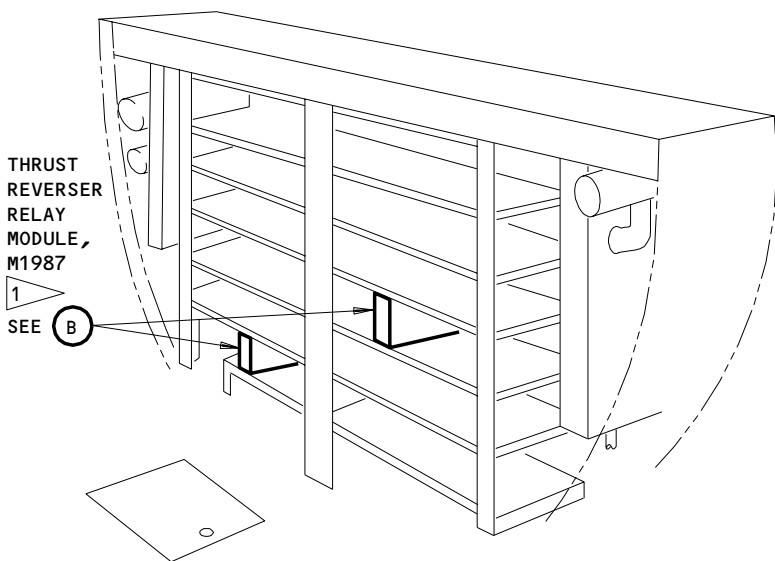
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MAIN EQUIPMENT CENTER
ACCESS DOOR, 119AL

SEE (A)



THRUST
REVERSER
RELAY
MODULE,
M1987

1

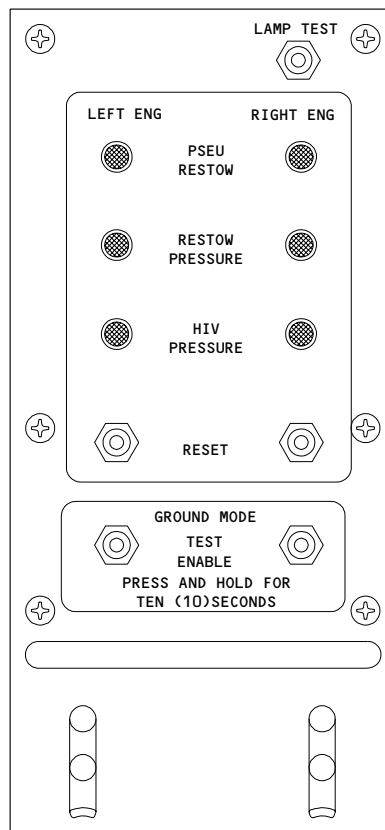
SEE (B)

MAIN EQUIPMENT CENTER

(A)



FWD



THRUST REVERSER RELAY MODULE

(B)

1 THE THRUST REVERSER RELAY MODULE IS INSTALLED
ON THE E1-4 OR THE E2-6 SHELF.

Thrust Reverser Relay Module - Removal/Installation
Figure 401

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C. Install the Thrust Reverser Relay Module (Fig. 401).

S 864-013-N00

- (1) Open these circuit breakers and attach the DO-NOT-CLOSE tags:
 - (a) On the Overhead Circuit Breaker panel, P11:
 - 1) 11D13, L ENG T/R IND
 - 2) 11D32, R ENG T/R IND ALTN
 - 3) 11L32, R ENG T/R IND

S 424-014-N00

- (2) Install the thrust reverser relay module on the electrical equipment shelf (AMM 20-10-01/401).

S 864-015-N00

- (3) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
 - (a) On the P11 panel:
 - 1) 11D13, L ENG T/R IND
 - 2) 11D32, R ENG T/R IND ALTN
 - 3) 11L32, R ENG T/R IND

S 714-016-N00

- (4) Do the Lamp Test for the relay module:
 - (a) Push and release the LAMP TEST button on the face of the relay module.
 - 1) Make sure the six lights come on when you push the LAMP TEST button.
 - 2) Make sure the six lights go off when you release the LAMP TEST button.

S 864-017-N00

- (5) Do the reset procedure for the thrust reverser relay module (AMM 78-36-03/201).
 - (a) If one or more lights stay on after you release the TEST ENABLE button, refer to the Fault Isolation Manual for the applicable troubleshooting procedure.

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THRUST REVERSER RELAY MODULE – ADJUSTMENT/TEST

1. General

- A. This procedure does an indication test of the relay module for the thrust reverser.
- B. The relay module for the thrust reverser can be found on the E1-4 or the E2-8 shelf of the main equipment center.
- C. The thrust reverser relay module will be referred to as the relay module in this procedure.
- D. There is a yellow colored L(R) ENG REV ISLN EICAS advisory message and a white colored L(R) ENG REV ISLN EICAS maintenance message. For this test white colored maintenance message will be latched on steady.

TASK 78-36-03-705-001-N00

2. Thrust Reverser Relay Module Indication Test

A. General

- (1) The breakout box and the appropriate patch cable is used to plug on to the end of a system electrical connector or plug into the socket of a relay to jumper across two pins or find if there is electrical power on a pin. The nomenclature on the cable markers gives the applicable airplane connectors and the box connector. The breakout box is used at the thrust reverser.

B. Equipment

- (1) Breakout Box, Thrust Reverser – A78025-77

C. References

- (1) AMM 06-43-00/201, Engine and Nacelle Strut Access Doors and Panels
- (2) AMM 24-22-00/201, Electrical Power – Control
- (3) AMM 78-31-00/501, Thrust Reverser System

D. Access

(1) Location Zones

- 119 Main Equipment Center
- 437 L Power Plant Strut
- 447 R Power Plant Strut

(2) Access Panels

- 119AL Main Equipment Center Access Door
- 437AL Engine Strut Hydraulic Bay (Left)
- 437AR Engine Strut Hydraulic Bay (Right)
- 447AL Engine Strut Hydraulic Bay (Left)
- 447AR Engine Strut Hydraulic Bay (Right)

E. Do the Indication Test for the Relay Module.

S 865-002-N00

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

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- S 865-044-N00
(2) Make sure the thrust reverser is in the stowed and locked position.

- S 865-045-N00
(3) Make sure the reverse thrust levers are in the forward and down (stowed) position.

- S 865-046-N00
(4) Make sure the applicable engine fire switch is in the normal position.

- S 865-003-N00
(5) Open these circuit breakers attach the DO-NOT-CLOSE tags:
(a) On the overhead circuit breaker panel, P11:

- 1) 11D13 L ENG T/R IND
- 2) 11D14 L ENG T/R CONT
- 3) 11D18 L ENG T/R SSL CONT
- 4) 11L32 R ENG T/R IND
- 5) 11D32 R ENG T/R IND ALT
- 6) 11D33 R ENG T/R CONT ALT
- 7) 11L33 R ENG T/R CONT
- 8) 11D21 R ENG T/R SSL CONT

- (b) On the Main Power Distribution Panel, P6:

- 1) 6H01 FIRE EXT ENG L BTL 1
- 2) 6H02 FIRE EXT ENG L BTL 2
- 3) 6H03 FIRE EXT ENG R BTL 1
- 4) 6H04 FIRE EXT ENG R BTL 2
- 5) 6L19 LEFT ENG PROBE HEAT
- 6) 6K25 RIGHT ENG PROBE HEAT

- S 215-042-N00
(6) Make sure the following circuit breakers are closed:

NOTE: Close these circuit breakers to set the air/ground relays to ground mode.

- (a) On the P11 panel:

- 1) 11M30 28 V DC R BUS PWR SENSE
- 2) 11C29 LDG GR POS AIR/GND SYS 2 ALT
- 3) 11U23 LDG GR POS AIR/GND SYS 2
- 4) 11C30 LDG GR POS AIR/GND SYS 1
- 5) 11U15 LDG GR AIR/GND SYS 1

- S 015-004-N00
(7) Open the hydraulic bay access doors on the applicable engine (AMM 06-43-00/201).

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- S 485-048-N00
- (8) If it is necessary, use the breakout box, A78025 and the applicable patch cable or your equivalent procedure and equipment to make connections to the pins referenced in this task.
- S 035-005-N00
- (9) Remove the applicable L(R) electrical connector, D20122(D20126), from the L(R) pressure switch, S858(S860), for the L(R) motorized isolation valve, V167(V168), in the strut hydraulic bay.
- S 035-006-N00
- (10) Remove the applicable L(R) electrical connector, D2134(D2138), from the L(R) pressure switch, S330(S331), on the L(R) stow valve, V106(V107), in the strut hydraulic bay.
- S 865-007-N00
- (11) Install a jumper wire between pins 3 and 2 of the applicable L(R) electrical connector, D20122(D20126) (for the pressure switch for the motorized isolation valve).
- S 865-008-N00
- (12) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
- (a) On the P11 panel:
- 1) For the left engine:
 - a) 11D13 L ENG T/R IND
 - b) 11D14 L ENG T/R CONT
 - 2) For the right engine:
 - a) 11L32 R ENG T/R IND
 - b) 11D32 R ENG T/R IND ALT
 - c) 11L33 R ENG T/R CONT
 - d) 11D33 R ENG T/R CONT ALT
- S 865-009-N00
- (13) Open these circuit breakers and attach the DO-NOT-CLOSE tags:
- NOTE: Open these circuit breakers to set the air/ground relays to the air mode.
- (a) On the P11 panel:
- 1) For the left engine:
 - a) 11C30 LDG GR POS AIR/GND SYS 1
 - b) 11U15 LDG GR AIR/GND SYS 1
 - 2) For the right engine:
 - a) 11U23 LDG GR POS AIR/GND SYS 2
 - b) 11C29 LDG GR POS AIR/GND SYS 2 ALT
- S 865-010-N00
- (14) Push and release the applicable L(R) ENG RESET switch on the front panel of the relay module, M1987, in the main equipment center.

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S 715-011-N00

- (15) Make sure the relay module lights for the applicable engine are in the condition that follows after you release the reset switch:
- (a) L(R) ENG PSU RESTOW - OFF
 - (b) L(R) ENG RESTOW PRESS - OFF
 - (c) L(R) ENG HIV PRESS - OFF

NOTE: The next step will start the 60-second time delay for the REV ISLN light on the pilot's quadrant stand, P10.

S 865-012-N00

- (16) Remove the jumper wire between pins 3 and 2 of the applicable L(R) electrical connector, D20122(D20126) (for the pressure switch for the motorized isolation valve).

S 865-013-N00

- (17) Install a jumper wire between pins 2 and 1 of the applicable L(R) electrical connector, D20122(D20126) (for the pressure switch for the motorized isolation valve).

S 715-014-N00

- (18) Make sure the REV ISLN light on the pilot's quadrant stand, P10, does not come on in 1 minute (plus or minus 10 seconds).

S 715-015-N00

- (19) Make sure the applicable EICAS advisory message L(R) REV ISLN VAL does not come on in 1 minute (plus or minus 10 seconds).

S 715-016-N00

- (20) Make sure the lights for the applicable engine on the relay module, M1987, are in the condition that follows after 5 seconds:
- (a) L(R) ENG PSEU RESTOW - OFF
 - (b) L(R) ENG RESTOW PRESS - OFF
 - (c) L(R) ENG HIV PRESS - ON

S 865-017-N00

- (21) Remove the jumper wire between pins 2 and 1 of the applicable L(R) electrical connector, D20122(D20126) (for the pressure switch for the motorized isolation valve).

S 865-018-N00

- (22) Install a jumper wire between pins 3 and 2 of the applicable L(R) electrical connector, D20122(D20126) (for the pressure switch for the motorized isolation valve).

S 715-019-N00

- (23) Make sure the lights for the applicable engine on the relay module, M1987, are in the condition that follows:
- (a) L(R) ENG PSEU RESTOW - OFF

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- (b) L(R) ENG RESTOW PRESS - OFF
- (c) L(R) ENG HIV PRESS - ON

S 865-020-N00

- (24) Install a jumper wire between pins 2 and 1 of the applicable L(R) electrical connector, D2134(D2138) (for the pressure switch for the stow valve).

S 715-021-N00

- (25) Make sure the lights for the applicable engine on the relay module, M1987, are in the condition that follows after 5 seconds:
 - (a) L(R) ENG PSEU RESTOW - OFF
 - (b) L(R) ENG RESTOW PRESS - ON
 - (c) L(R) ENG HIV PRESS - ON

S 865-022-N00

- (26) Remove the jumper wire between pins 2 and 1 of the applicable L(R) electrical connector, D2134(D2138) (for the pressure switch for the stow valve).

S 715-023-N00

- (27) Make sure the lights for the applicable engine on the relay module, M1987, are in the condition that follows:
 - (a) L(R) ENG PSEU RESTOW - OFF
 - (b) L(R) ENG RESTOW PRESS - ON
 - (c) L(R) ENG HIV PRESS - ON

S 865-024-N00

- (28) Install a jumper wire between airplane ground and pin C of the applicable L(R) diode, R228(R230), on the terminal block, TB130, which is on the E1-2 shelf in the main equipment center.

S 715-025-N00

- (29) Make sure the lights for the applicable engine on the relay module, M1987, are in the condition that follows after 5 seconds:
 - (a) L(R) ENG PSEU RESTOW - ON
 - (b) L(R) ENG RESTOW PRESS - ON
 - (c) L(R) ENG HIV PRESS - ON

S 865-026-N00

- (30) Remove the jumper wire between airplane ground and pin C of the applicable L(R) diode, R228(R230), on the terminal block, TB130, which is on the E1-2 shelf in the main equipment center.

S 715-027-N00

- (31) Make sure the lights for the applicable engine on the relay module, M1987, are in the condition that follows:
 - (a) L(R) ENG PSEU RESTOW - ON
 - (b) L(R) ENG RESTOW PRESS - ON

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(c) L(R) ENG HIV PRESS - ON

NOTE: The next step will start the 60-second time delay for the REV ISLN light on the pilot's quadrant stand, P10.

S 865-028-N00

(32) Remove the DO-NOT-CLOSE tags and close these circuit breakers:

NOTE: Close these circuit breakers to set the air/ground relays to ground mode.

- (a) On the P11 panel:
 - 1) For the left engine:
 - a) 11C30 LDG GR POS AIR/GND SYS 1
 - b) 11U15 LDG GR AIR/GND SYS 1
 - 2) For the right engine:
 - a) 11U23 LDG GR POS AIR/GND SYS 2
 - b) 11C29 LDG GR POS AIR/GND SYS 2 ALT

S 715-029-N00

(33) Make sure the REV ISLN light on the pilot's quadrant stand, P10, comes on in 1 minute (plus or minus 10 seconds).

S 715-030-N00

(34) Make sure the applicable EICAS advisory message L(R) REV ISLN VAL comes on in 1 minute (plus or minus 10 seconds).

S 715-031-N00

(35) Make sure the lights for the applicable engine on the relay module, M1987, are in the condition that follows:

- (a) L(R) ENG PSEU RESTOW - ON
- (b) L(R) ENG RESTOW PRESS - ON
- (c) L(R) ENG HIV PRESS - ON

S 715-032-N00

(36) Do the steps that follow in the sequence shown:

- (a) Push and hold the applicable L(R) ENG TEST switch on the front panel of the relay module, M1987, in the main equipment center.
- (b) While you continue to hold the applicable L(R) ENG TEST switch, push and release the applicable L(R) ENG RESET switch on the front panel of the relay module, M1987.
- (c) Release the applicable L(R) ENG TEST switch on the front panel of the relay module, M1987, after a minimum of 10 seconds.

S 715-033-N00

(37) Make sure the lights for the applicable engine on the relay module, M1987, are in the condition that follows:

- (a) L(R) ENG PSEU RESTOW - OFF
- (b) L(R) ENG RESTOW PRESS - OFF
- (c) L(R) ENG HIV PRESS - OFF

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S 865-034-N00

(38) Open the applicable circuit breaker and install the DO-NOT-CLOSE tags:

- (a) On the P11 panel:
 - 1) For the left engine:
 - a) 11D13 L ENG T/R IND
 - 2) For the right engine:
 - a) 11L32 R ENG T/R IND
 - b) 11D32 R ENG T/R IND ALT

S 865-035-N00

(39) Remove the jumper wire between pins 3 and 2 of the applicable L(R) electrical connector, D20122(D20126) (for the pressure switch for the motorized isolation valve).

S 085-047-N00

(40) If it is necessary, remove the breakout box, A78025 and the applicable patch cable or your equivalent equipment.

S 435-036-N00

(41) Install the applicable L(R) electrical connector, D20122(D20126), on the L(R) pressure switch, S858(S860), for the L(R) motorized isolation valve, V167(V168), in the strut hydraulic bay.

S 435-037-N00

(42) Install the applicable L(R) electrical connector, D2134(D2138), on the L(R) pressure switch, S330(S331), for the L(R) stow valve, V106(V107), in the strut hydraulic bay.

S 865-038-N00

(43) Remove the DO-NOT-CLOSE tags and close these circuit breakers:

- (a) On the P11 panel:
 - 1) 11D13 L ENG T/R IND
 - 2) 11L32 R ENG T/R IND

 - 3) 11D18 L ENG T/R SSL CONT
 - 4) 11D32 R ENG T/R IND ALT
 - 5) 11D21 R ENG T/R SSL CONT
- (b) On the Main Power Distribution Panel, P6:
 - 1) 6H01 FIRE EXT ENG L BTL 1
 - 2) 6H02 FIRE EXT ENG L BTL 2
 - 3) 6H03 FIRE EXT ENG R BTL 1
 - 4) 6H04 FIRE EXT ENG R BTL 2
 - 5) 6L19 LEFT ENG PROBE HEAT
 - 6) 6K25 RIGHT ENG PROBE HEAT

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- S 865-041-N00
- (44) Do the reset procedure for the thrust reverser relay module (AMM 78-36-03/201).
- (a) If one or more lights stay on after you release the TEST ENABLE button, refer to the Fault Isolation Manual for the applicable troubleshooting procedure.
- F. Put the Airplane Back to its Usual Condition

- S 415-039-N00
- (1) Close the hydraulic bay access doors on the applicable engine (AMM 06-43-00/201).

- S 715-040-N00
- (2) Do the operational test for the thrust reverser (AMM 78-31-00/501).

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