TKS ANTI-ICE FLUID DISTRIBUTION SYSTEM - MAINTENANCE PRACTICES

1. General

A. This section contains the removal and installation procedures for the TKS anti-ice fluid distribution system, which include the nylon tubing and connections and the fluid proportioning units installed in the wings and fuselage. The tail bracket assembly includes the proportioning unit and low pressure switches for the horizontal and vertical stabilizers. The procedures in this section apply the cargo pod and the fairing installations of the TKS system.

B. Recommended maintenance to keep the TKS fluid at its correct viscosity is as follows:

- Operate the pumps monthly, or as necessary, in the HIGH mode until the air is removed from the fluid system.
- Keep the TKS system operational at all times to keep air pockets out of the system.
- If the fluid tank is removed and installed or replaced, do the porous panel purge and test procedures.

NOTE: If the fluid is too thick, the porous panels can become blocked or clogged.

2. Tools and Equipment

A. For a list of tools and equipment, refer to Ice and Rain Protection - General.

B. Special Tools

NOTE: Equivalent substitutes may be used for the following listed items:

(1) Fittings (couplings) for tubing repair.

- 3/16 Straight Connector (aluminum) part number MN6070
- 5/16 Straight Connector (aluminum) part number MN4852
- 1/2 Straight Connector (aluminum) part number MN6213

3. TKS Propeller Proportioning Unit Removal/Installation

WARNING: For health and environmental data, review the applicable Safety Data Sheet (SDS).

WARNING: Before you disconnect components of the TKS anti-ice system, slowly loosen the coupling that is connected to the component to be removed because it is possible that pressure is still in the system.

WARNING: Immediately remove (clean) or contain all the TKS fluid that is spilled. TKS fluid on the floor will cause a slip hazard.

WARNING: Before you operate the TKS system during this procedure put plastic sheets or absorbent cloths under the porous panels to keep the TKS fluid off the floor. This will help to prevent injury to personnel.

WARNING: Discard all unwanted TKS fluid and/or dirty cloths correctly. TKS fluid is a hazardous waste and must be discarded in accordance with approved procedures.

CAUTION: Use only approved TKS fluids in accordance with specification DTD 406B. Fluid density is approximately 9.2 lbs/gal.

CAUTION: Use only clean, filtered fluid in the TKS system. Contamination will cause fluid blockage and/or damage to the porous panel.

CAUTION: Do not use the seals again after you loosen or disconnect a tube coupling. Replace the 3/16-inch and 5/16-inch sealing ring and/or 1/2-inch O-ring, as applicable, when you assemble a tube coupling. Examine the seal for damage and make sure that it is in the correct position in the coupling as shown in Figure 204. This will help to prevent fluid leakage from the coupling.

NOTE: The propeller proportioning unit is installed on the right side at FS179.36.

A. Remove the Propeller Proportioning Unit (Refer to Figure 201, Figure 202, and Figure 203).

(1) Remove external electrical power from the airplane.

(2) Disengage the PRIMARY ANTI-ICE and BACKUP ANTI-ICE circuit breakers on the left circuit breaker panel.

(3) To get access to the propeller proportioning unit, remove floorboard access panels 232DR and 252GR, as applicable. Refer to Chapter 6, Access Plates and Panels Identification.

(4) Slowly loosen and disconnect the inlet and outlet tubes from the proportioning unit.

(5) Put caps on all tube ends to keep FOD out of the fluid system.

(6) Remove the proportioning unit from the airplane.

B. Install the Propeller Proportioning Unit (Refer to Figure 201, Figure 202, and Figure 203).

(1) Put the proportioning unit in position in the airplane.
   (a) Make sure that the arrow on the proportioning unit points in the direction of fluid flow.
(2) Remove the caps from the tube ends.
(3) Install new seals in the couplings as shown in Figure 204.
(4) Connect and tighten the inlet and outlet tubes to the proportioning unit.
(5) Engage the PRIMARY ANTI-ICE and BACKUP ANTI-ICE circuit breakers on the left circuit breaker panel.
(6) Supply external electrical power to the airplane.
(7) Put the EXTERNAL POWER switch on the circuit breaker switch panel in the ON position.

NOTE: For airplanes that have G1000, the EXTERNAL POWER switch reference designator is (SC006) and for airplanes that do not have G1000, the reference designator is (S17).

(8) Put the ANTI-ICE-FLUID FLOW, PRIMARY switch (SI022) on the left switch panel in the HIGH position.
   (a) Make sure that there is no fluid leakage from the couplings.
(9) Put the ANTI-ICE-FLUID FLOW, PRIMARY switch on the left switch panel in the OFF position.
(10) Put the EXTERNAL POWER switch on the circuit breaker switch panel in the OFF position.
(11) Do a check of the porous panel flow. Refer to TKS Anti-Ice Leading Edge Porous Panel - Adjustment/Test Porous Panel Flow Operational Test .
(12) Clean the floor and the airplane surfaces as necessary.
(13) Install the floorboard access panels 232DR and 252GR, as applicable. Refer to Chapter 6, Access Plates and Panels Identification.
(14) Remove external electrical power from the airplane.

4. TKS Wing Proportioning Unit Removal/Installation

WARNING: For health and environmental data, review the applicable Safety Data Sheet (SDS).

WARNING: Before you disconnect components of the TKS anti-ice system, slowly loosen the coupling that is connected to the component to be removed because it is possible that pressure is still in the system.

WARNING: Immediately remove (clean) or contain all the TKS fluid that is spilled. TKS fluid on the floor will cause a slip hazard.

WARNING: Before you operate the TKS system during this procedure put plastic sheets or absorbent cloths under the porous panels to keep the TKS fluid off the floor. This will help to prevent injury to personnel.

WARNING: Discard all unwanted TKS fluid and/or dirty cloths correctly. TKS fluid is a hazardous waste and must be discarded in accordance with approved procedures.

CAUTION: Use only approved TKS fluids in accordance with specification DTD 406B. Fluid density is approximately 9.2 lbs/gal.

CAUTION: Use only clean, filtered fluid in the TKS system. Contamination will cause fluid blockage and/or damage to the porous panel.

CAUTION: Do not use the seals again after you loosen or disconnect a tube coupling. Replace the 3/16-inch and 5/16-inch sealing ring and/or 1/2-inch O-ring, as applicable, when you assemble a tube coupling. Examine the seal for damage and make sure that it is in the correct position in the coupling as shown in Figure 204. This will help to prevent fluid leakage from the coupling.

NOTE: The wing proportioning units are installed at WS170.60

NOTE: The removal and installation of the wing proportioning units are typical.

NOTE: The wing proportioning units also supply fluid to the wing struts.

A. Remove the Wing Proportioning Unit (Refer to Figure 201, Figure 202, and Figure 203).
(1) Remove external electrical power from the airplane.
(2) Disengage the PRIMARY ANTI-ICE circuit breaker on the left circuit breaker panel.
(3) Remove wing access panels 503AB and 503BB left, or 603AB and 603BB right. Refer to Chapter 6, Access Plates and Panels Identification - Description and Operation.

NOTE: On airplanes that have a radome installed on the right wing, you can only remove wing access

panel 603BB.

(4) Remove the screws, washers, and spacers that attach the proportioning unit to the airplane structure.

(5) Identify, slowly loosen, and disconnect the inlet and outlet tubes from the proportioning unit.

(6) Put caps on all tube ends to keep FOD out of the fluid system.

(7) To find the applicable proportioning unit port(s) and its related porous panel, refer to the table that follows:

TKS POROUS PANEL	PROPORTIONING UNIT PORT
Left Wing Inboard Panel	Port 1 and Port 5
Left Wing Center Panel	Port 2
Left Wing Outboard Panel	Port 3 and Port 4
Left Wing Strut Panel	Port 6 and Port 7
Right Wing Inboard Panel	Port 1 and Port 5
Right Wing Center Panel	Port 2
Right Wing Outboard Panel	Port 3 and Port 4
Right Wing Strut Panel	Port 6 and Port 7

(8) Remove the proportioning unit from the airplane.

B. Install the Wing Proportioning Unit (Refer to Figure 201, Figure 202, and Figure 203).

(1) Put the proportioning unit in position in the airplane.

(2) Remove the caps from the tube ends.

(3) Install new seals in the couplings as shown in Figure 204.

(4) Connect and tighten the inlet and outlet couplings to the proportioning unit.

(5) Install the screws, washers, and spacers that attach the proportioning unit to the airplane structure.

(6) Engage the PRIMARY ANTI-ICE circuit breaker on the left circuit breaker panel.

(7) Supply external electrical power to the airplane.

(8) Put the EXTERNAL POWER switch on the circuit breaker switch panel in the ON position.

NOTE: For airplanes that have G1000, the EXTERNAL POWER switch reference designator is (SC006) and for airplanes that do not have G1000, the reference designator is (S17).

(9) Put the ANTI-ICE-FLUID-FLOW, PRIMARY switch on the left switch panel in the HIGH position.

(a) Make sure that there is no fluid leakage from the couplings.

(10) Put the ANTI-ICE-FLUID-FLOW, PRIMARY switch on the left switch panel in the OFF position.

(11) Put the EXTERNAL POWER switch on the circuit breaker switch panel in the OFF position.

(12) Do a check of the porous panel flow. Refer to TKS Anti-Ice Leading Edge Porous Panel - Adjustment/Test Porous Panel Flow Operational Test .

(13) Clean the floor and the airplane surfaces as necessary.

(14) Install wing access panels 503AB and 503BB left, or 603AB and 603BB right. Refer to Chapter 6, Access Plates and Panels Identification - Description and Operation.

(15) Remove external electrical power from the airplane.

5. TKS Stabilizer Proportioning Unit and Low Pressure Switch (Tail Bracket Assembly) Removal/Installation

WARNING: For health and environmental data, review the applicable Safety Data Sheet (SDS).

WARNING: Before you disconnect components of the TKS anti-ice system, slowly loosen the coupling that is connected to the component to be removed because it is possible that pressure is still in the system.

WARNING: Immediately remove (clean) or contain all the TKS fluid that is spilled. TKS fluid on the floor will cause a slip hazard.

WARNING: Before you operate the TKS system during this procedure put plastic sheets or absorbent cloths under the porous panels to keep the TKS fluid off the floor. This will help to prevent injury to personnel.

WARNING: Discard all unwanted TKS fluid and/or dirty cloths correctly. TKS fluid is a hazardous waste and must be discarded in accordance with approved procedures.

CAUTION: Use only approved TKS fluids in accordance with specification DTD 406B. Fluid density is approximately 9.2 lbs/gal.

CAUTION: Use only clean, filtered fluid in the TKS system. Contamination will cause fluid blockage and/or damage to the porous panel.

CAUTION: Do not use the seals again after you loosen or disconnect a tube coupling. Replace the 3/16-inch and 5/16-inch sealing ring and/or 1/2-inch O-ring, as applicable, when you assemble a tube coupling. Examine the seal for damage and make sure that it is in the correct position in the coupling as shown in Figure 204. This will help to prevent fluid leakage from the coupling.

NOTE: The tail bracket assembly is installed at FS415.20 (208B), and FS367.20 (208).

A. Remove the Tail Bracket Assembly (Refer to Figure 201, Figure 202, and Figure 203).
   (1) Remove external electrical power from the airplane.
   (2) Disengage the PRIMARY ANTI-ICE and BACKUP ANTI-ICE circuit breakers on the left circuit breaker panel.
   (3) Remove the tailcone access panel 320A. Refer to Chapter 6, Access Plates and Panels Identification - Description and Operation.
   (4) Disconnect the airplane electrical connector on the bracket assembly.
   (5) Remove the screws, washers, and nuts that attach the electrical connector to the bracket assembly.
   (6) Identify and slowly loosen and disconnect the inlet and outlet tubes from the tail bracket assembly and quickly put the tube ends in the container.
   (7) Remove the screws and washers that attach the tail bracket assembly to the airplane structure.
   (8) Remove the tail bracket assembly from the airplane.

B. Install the Tail Bracket Assembly (Refer to Figure 201, Figure 202, and Figure 203).
   (1) Put the tail bracket assembly in its correct position on the airplane.
   (2) Install the screws that attach the tail bracket assembly to the airplane.
   (3) Install new seals on the tubing ends. Refer to Figure 204.
   (4) Connect the inlet and outlet tubes to tail bracket and tighten.
   (5) Put the electrical connector in its correct position on the tail bracket assembly.
   (6) Install the screws, washers, and nuts that attach the electrical connector to the bracket assembly.
   (7) Connect the low pressure switches electrical connector to the electrical connector on the tail bracket assembly.
   (8) Engage the PRIMARY ANTI-ICE and BACKUP ANTI-ICE circuit breakers on the left circuit breaker panel.
   (9) Supply external electrical power to the airplane.
   (10) Put the EXTERNAL POWER switch on the circuit breaker switch panel in the BUS position.
      NOTE: For airplanes that G1000, the EXTERNAL POWER switch reference designator is (SC006) and for airplanes that do not have G1000, the reference designator is (S17).
   (11) Put the ANTI-ICE FLUID FLOW BACKUP (SI022) switch on the left switch panel in the ON position.
   (12) On airplanes with the G1000 system installed, monitor the EICAS display.
      (a) Make sure that the applicable A-ICE LOW PRESS red CAS message comes on.
   (13) On airplanes that do not have the G1000 system installed, monitor the anti-ice annunciators.
      (a) Make sure that the red anti-ice WARN annunciator comes on.
   (14) Let the system operate for a minimum of one minute to purge air from the porous panels and start the flow of anti-ice fluid from the panels.
   (15) Make sure that there is not any fluid leakage from the couplings.
   (16) Put the ANTI-ICE FLUID FLOW BACKUP (SI022) switch on the left switch panel in the OFF position.
   (17) Put the EXTERNAL POWER switch on the circuit breaker switch panel in the OFF position.
   (18) Remove external electrical power to the airplane.

(19) Do a check of the porous panel flow. Refer to TKS Anti-Ice Leading Edge Porous Panel - Adjustment/Test Porous Panel Flow Operational Test .

(20) Clean the floor and airplane surface as necessary.

(21) Install the tailcone access panel 320A. Refer to Chapter 6, Access Plates and Panels Identification - Description and Operation.

C. Remove the Low Pressure Switch(es) (Refer to Figure 201.

(1) Remove external electrical power from the airplane.

(2) Disengage the PRIMARY ANTI-ICE and BACKUP ANTI-ICE circuit breakers on the left circuit breaker panel.

(3) Remove the tailcone access panel 320A. Refer to Chapter 6, Access Plates and Panels Identification - Description and Operation.

(4) Disconnect the electrical connector from the pressure switch.

(5) Slowly disconnect the inlet and outlet tubes from the pressure switch assembly and quickly put the inlet tube end in the container.

(6) Remove the screws and spacers that attach the pressure switch to the bulkhead.

(7) Remove the pressure switch from the airplane.

D. Install the Low Pressure Switch(es) (Refer to Figure 201.

(1) Put the switch in its correct position on the bulkhead.

(2) Install the screws and spacers that attach the switch to the bulkhead.

(3) Install new seals on the tubing ends. Refer to Figure 204.

(4) Connect and tighten the inlet and outlet tubes to the pressure switch assembly.

(5) Connect the electrical connector to the switch.

(6) Engage the PRIMARY ANTI-ICE and BACKUP ANTI-ICE circuit breakers on the left circuit breaker panel.

(7) Supply external electrical power to the airplane.

(8) Put the EXTERNAL POWER switch on the circuit breaker switch panel in the BUS position.

NOTE: For airplanes that G1000, the EXTERNAL POWER switch reference designator is (SC006) and for airplanes that do not have G1000, the reference designator is (S17).

(9) Put the ANTI-ICE FLUID FLOW BACKUP (SI022) switch on the left switch panel in the ON position.

(10) On airplanes with the G1000 system installed, monitor the EICAS display and do the following:

(a) Make sure that the A-ICE PRESS LOW red CAS message initially comes ON then goes OFF as system flow and pressure build.

(11) On airplanes that do not have the G1000 system installed, monitor the anti-ice annunciator and do the following:

(a) Make sure that the red anti-ice WARN annunciator initially comes ON then goes OFF as system flow and pressure build.

(12) Let the system operate for a minimum of one minute to purge air from the porous panels and start the flow of anti-ice fluid from the panels.

(13) Make sure that there is not any fluid leakage from the couplings.

(14) Put the ANTI-ICE FLUID FLOW BACKUP (SI022) switch on the left switch panel in the OFF position.

(15) Put the EXTERNAL POWER switch on the circuit breaker switch panel in the OFF position.

(16) Remove external electrical power to the airplane.

(17) Clean the floor and airplane surface as necessary.

(18) Install the tailcone access panel 320A. Refer to Chapter 6, Access Plates and Panels Identification - Description and Operation.

6. Nylon Tubing Repair/Replacement

A. All plumbing used in the fluid anti-ice system is flexible nylon tubing connected with special compression-type couplings. Three different sizes of tubing are used. For the correct tubing fitting part numbers refer to Special Tools.

B. The couplings used to connect sections of nylon tubing are metallic compression-type couplings, which include a

machined coupling end, an olive (ferrule), a nut, and an elastomeric sealing ring (Refer to Figure 204). The couplings used to connect the tubing to all the anti-ice porous panels and the cuff, fairing, and tail bracket low-pressure switches are stainless steel. All other couplings used to connect the fluid anti-ice system components are made of aluminum. To help to prevent electrolytic corrosion, aluminum couplings must be assembled only to aluminum couplings and stainless steel couplings must be assembled only to stainless steel or titanium couplings. The compression-type couplings used in the fluid anti-ice system are not interchangeable with standard-type couplings (AN or MS). To make sure that the correct couplings are used, refer to the Model 208 Illustrated Parts Catalog to find the correct coupling.

C. When you do maintenance of the fluid distribution system, examine all tubing for kinks, cuts, abrasion, crushing, or other indications of damage. The nylon tubing can discolor to a light straw color with age. Discoloration of the tubing is normally not a cause for rejection. Any damaged or deteriorated tubing found must be replaced with tubing and couplings of the correct size and type (aluminum or stainless steel). Additionally, when the tube couplings are disconnected from components or other couplings, it is recommended to install a new seal in the coupling.

D. Minimum bend radii for fluid tubing at ambient temperature is shown in Table 202. In some areas of the airplane, tighter bend radii is necessary. In these areas, you can use a heat gun to bend the tubing as follows:

Table 201. Minimum Bend Radii for Fluid Tubing (At Ambient Temperature)

TUBING OUTSIDE DIAMETER	MINIMUM BEND RADII
1/2 Inch	3.0 Inches
5/16 Inch	2.0 Inches
3/16 Inch	1.5 Inches

(1) Put the tubing in position to find the necessary bend radius.

NOTE: You can use a piece of soft wire as a pattern.

CAUTION: Be careful not to overheat, burn, or collapse the tubing, which can prevent the correct flow of fluid and/or fluid leakage.

(2) Hold the tubing and carefully apply heat to the area where the bend will be.

NOTE: The tube will become flexible at approximately 300°F.

(3) After the radius is correct, hold the tube in that position and let it become cool (ambient temperature).

(4) When the tube is at ambient temperature, carefully examine it to make sure that the it has not been heated too much (burned) and that there is no restriction of fluid flow through the tubing.

CAUTION: Do not use the coupling to clench the olive to the fluid tubing. Use only specified clenching tools to do the clenching operation. Also, do not torque the couplings too much during the repair or replacement procedure. If the couplings leak, install new seals as necessary.

E. When tubing repair or replacement is necessary, the olive must always be clenched (swaged) to the tubing as a separate operation. Use approved clenching tools before you assemble the coupling. For clenching tools, refer to Ice and Rain Protection - General.

F. When installing a new fitting, refer to Table 202 for Tubing Dimension and Table 203 for Torque Requirements.

Table 202. Tubing Dimension

Aluminum Alloy / Stainless Steel Fittings on Nylon Tubes			
Tube Outside Diameter (OD) in Inches	**Olive Distance (Dimensions A) (+0.05 inch or - 0.05 inch)**	**Clenching Torque for Aluminum Fittings (+10% or -10%) (inch pounds)**	**Clenching Torque for Steel Fittings (+10% or -10%) (inch pounds)**
3/16	0.22	70	90
5/16	0.22	120	200
1/2	0.38	250	N/A

Table 203. Torque Requirements

Aluminum Alloy / Stainless Steel Fittings on Nylon Tubes

Tube Outside Diameter (OD) in Inches	Tightening Torque (Reference) (+10% or -10%) (inch pounds)
3/16	28
5/16	48
1/2	63

G. The recommended procedure for replacement of damaged or deteriorated fluid tubing is to replace the full length of tubing from coupling to coupling. However, in areas of the airplane where this type of replacement is not possible, it is permitted to do a tube repair as an alternative to complete tubing replacement.

(1) To repair a damaged section of tubing, cut out the damaged area and replace it with a new section of tubing. Connect the new tubing to the other tube ends with straight couplings.

(2) All new connections used in the repair must be tested for leaks. Operate the system before you install the access panels.

NOTE: If bulk tubing is installed, it is necessary to attach an identification tag to each end of the tube with the tube part number labeled on it for tube identification.

(3) Do a check of the porous panel flow. Refer to TKS Anti-Ice Leading Edge Porous Panel - Adjustment/Test Porous Panel Flow Operational Test .

Figure 201 : Sheet 1 : TKS Anti-Ice System Flow Diagram

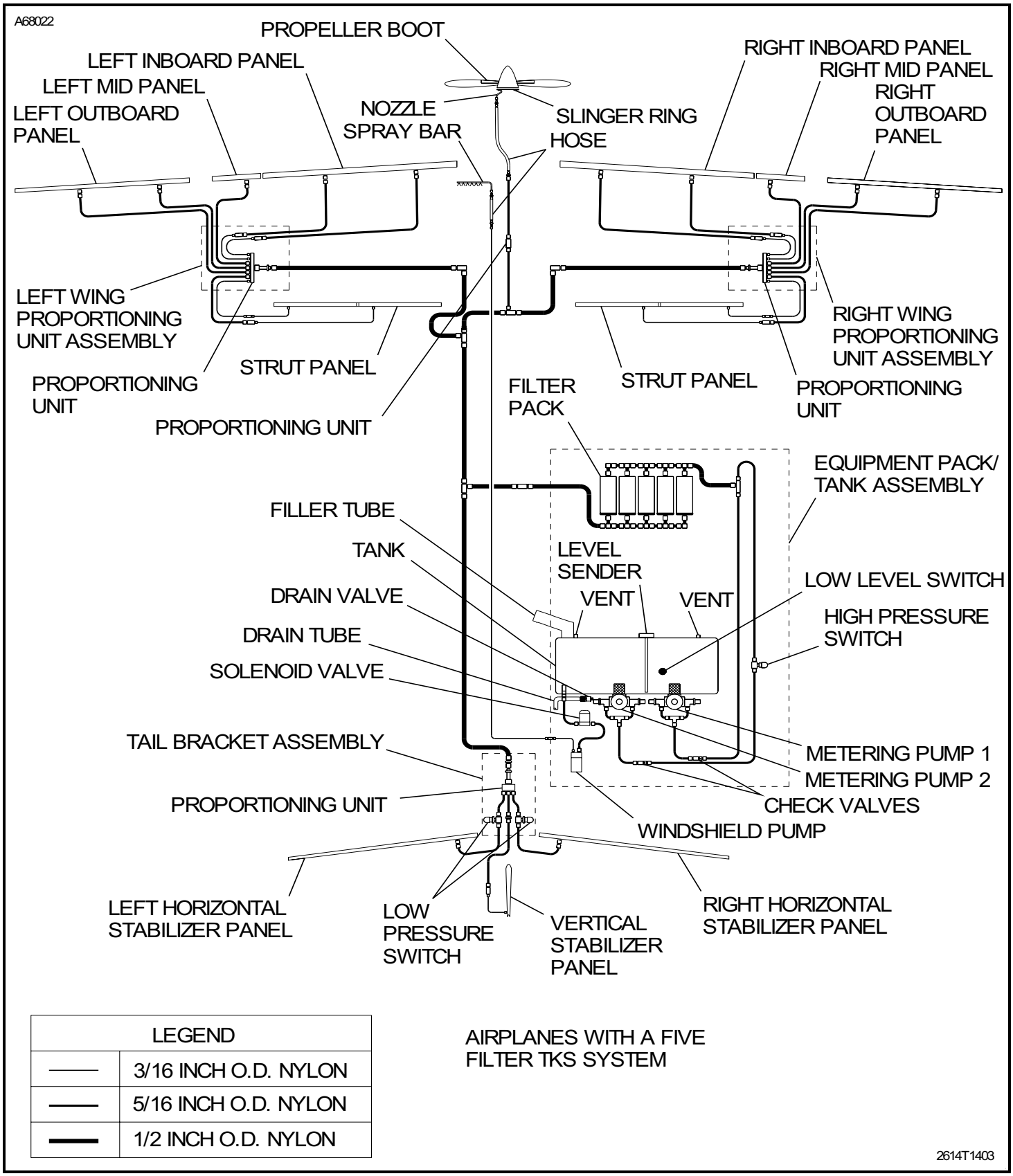

Figure 201 : Sheet 2 : TKS Anti-Ice System Flow Diagram

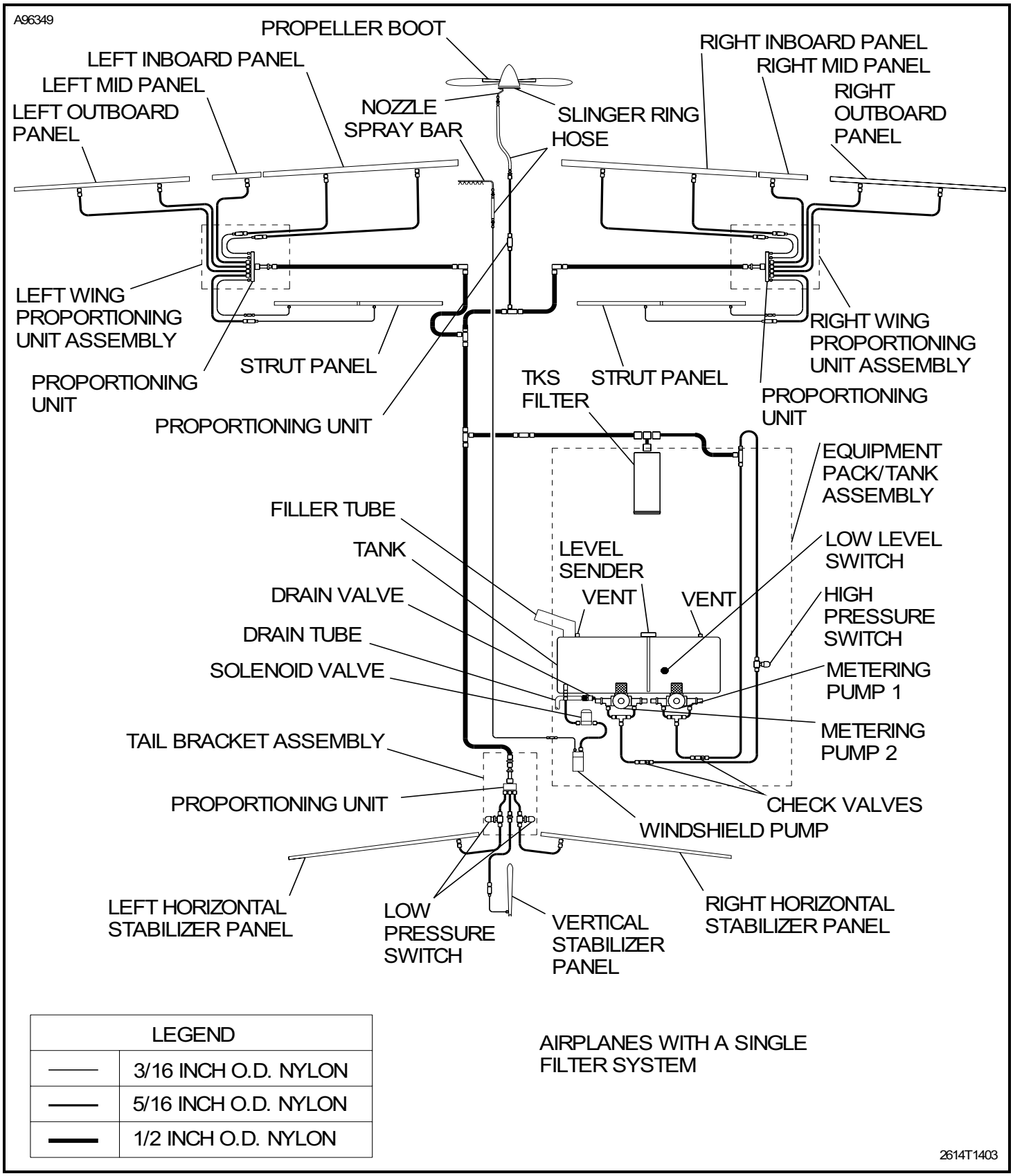

Figure 202 : Sheet 1 : TKS Fluid Distribution Installation

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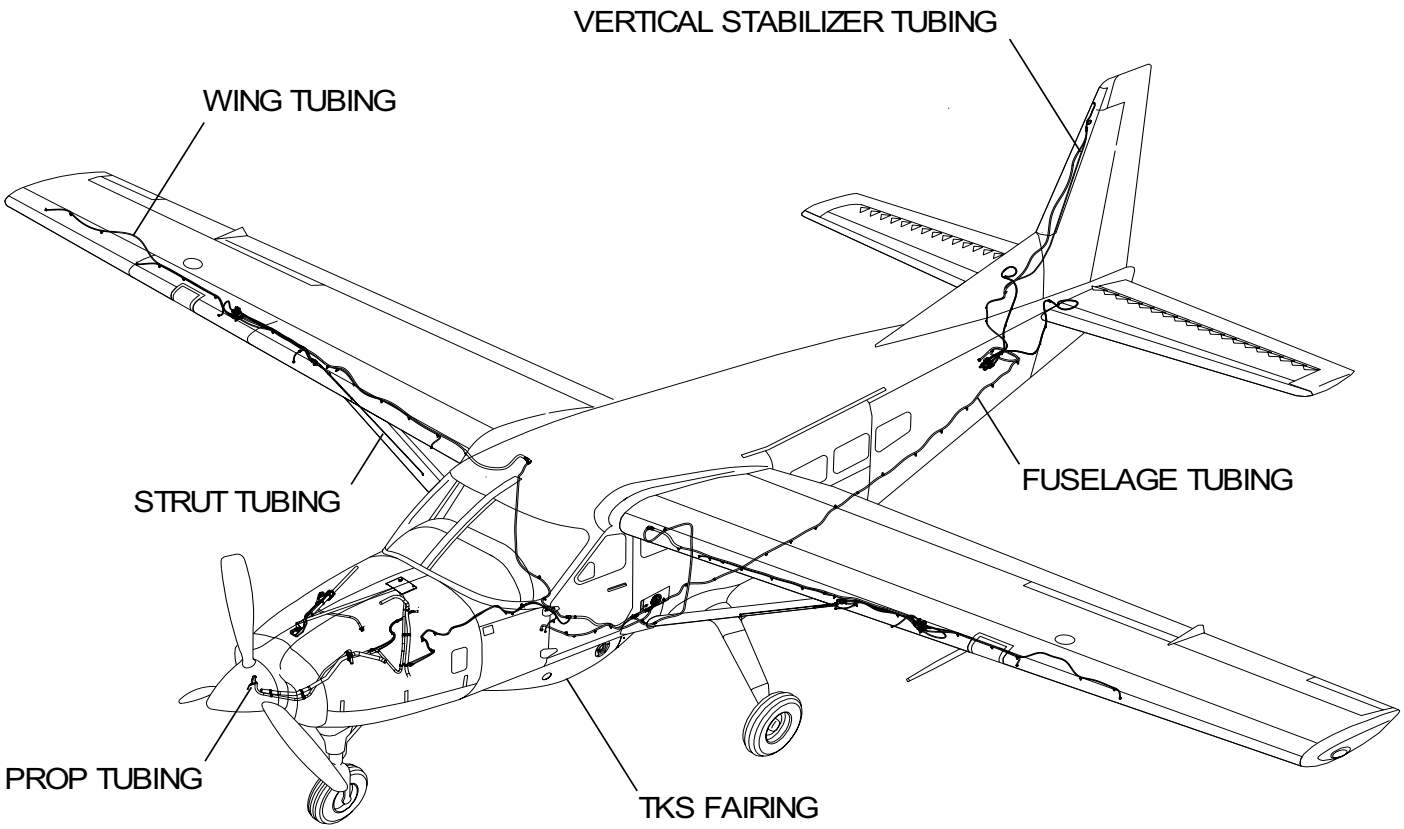

TKS TUBING INSTALLATION WITH FAIRING

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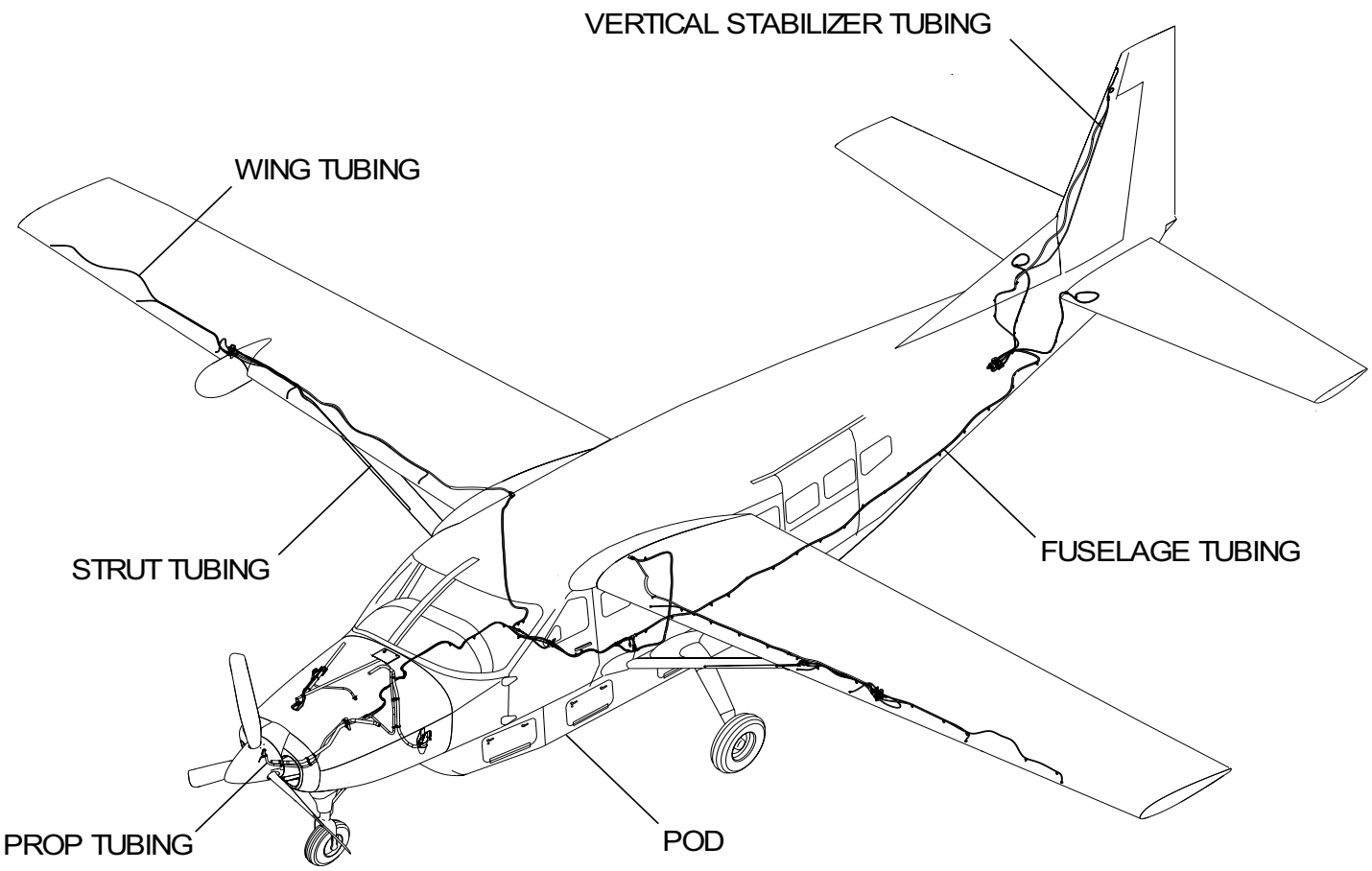
Figure 202 : Sheet 2 : TKS Fluid Distribution Installation

A70437



TKS TUBING INSTALLATION WITH POD

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Figure 203 : Sheet 1 : TKS Proportioning Unit Installation

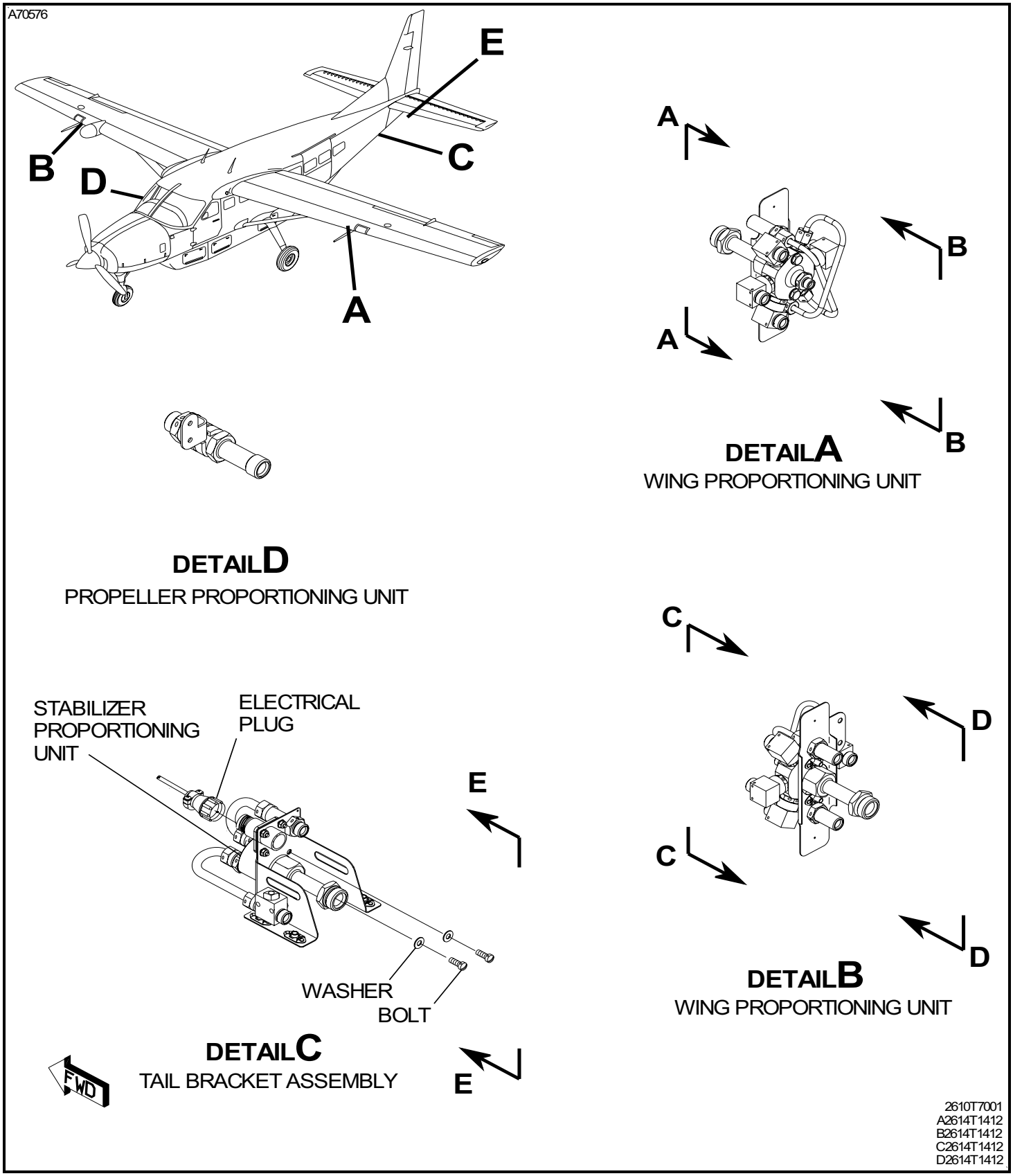

Figure 203 : Sheet 2 : TKS Proportioning Unit Installation

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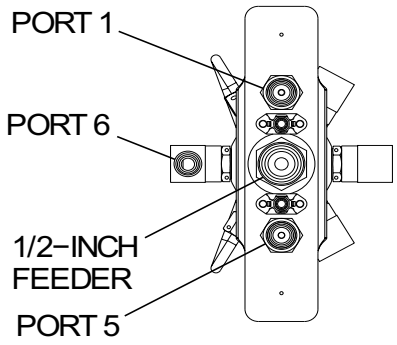
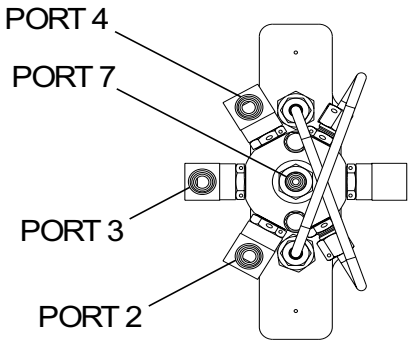
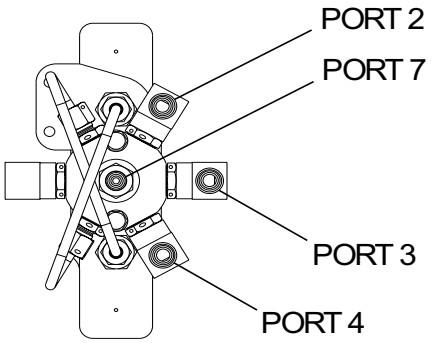


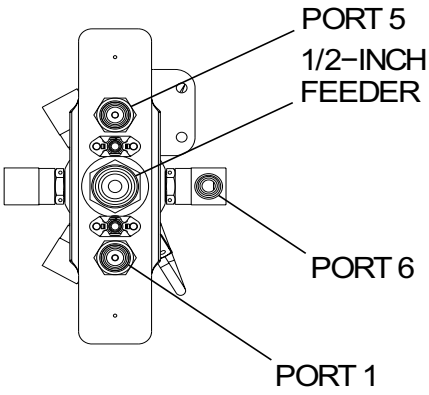
VIEW A−A
LEFT LOOKING OUTBOARD



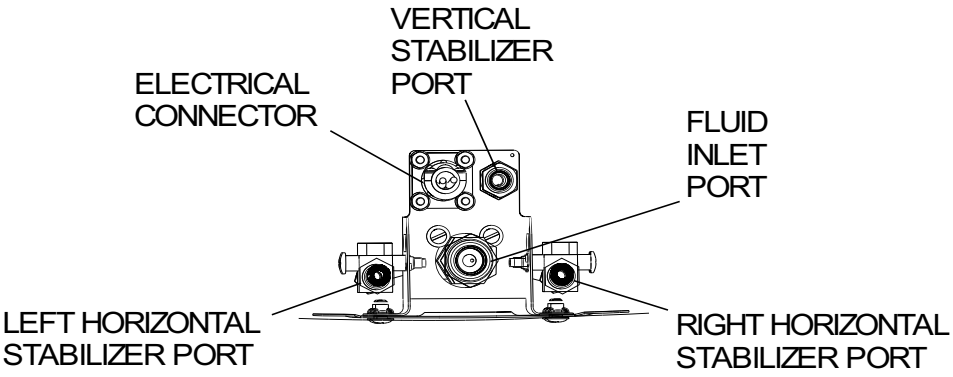
VIEW B−B
LEFT LOOKING INBOARD



VIEW C−C
RIGHT LOOKING INBOARD



VIEW D−D
RIGHT LOOKING OUTBOARD



VIEW E−E
VIEW LOOKING FORWARD

AA2614T1412
BB2614T1412
CC2614T1412
DD2614T1412
EE2698T182

Figure 204 : Sheet 1 : TKS Nylon Tubing Assembly

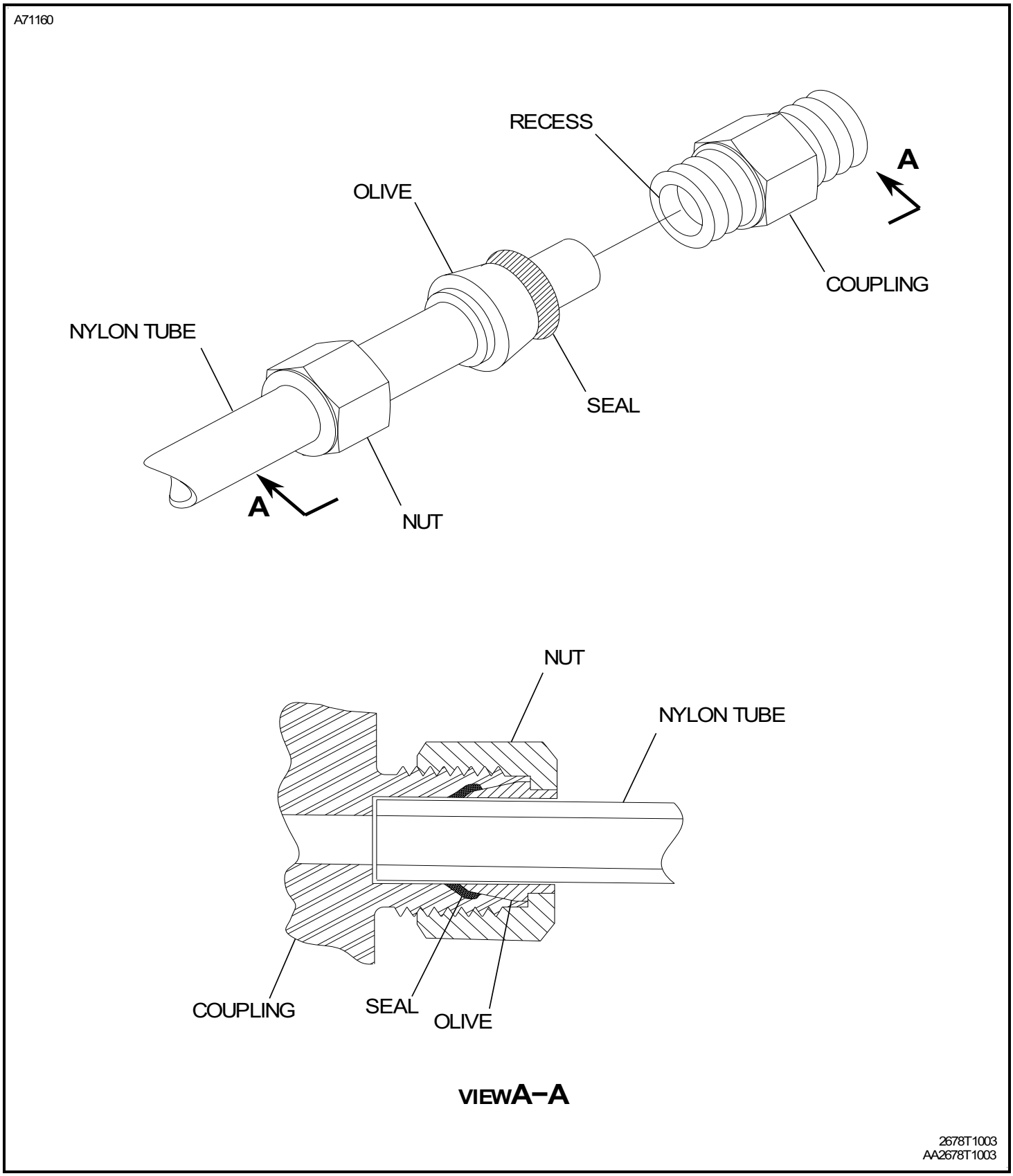


Figure 204 : Sheet 2 : TKS Nylon Tubing Assembly

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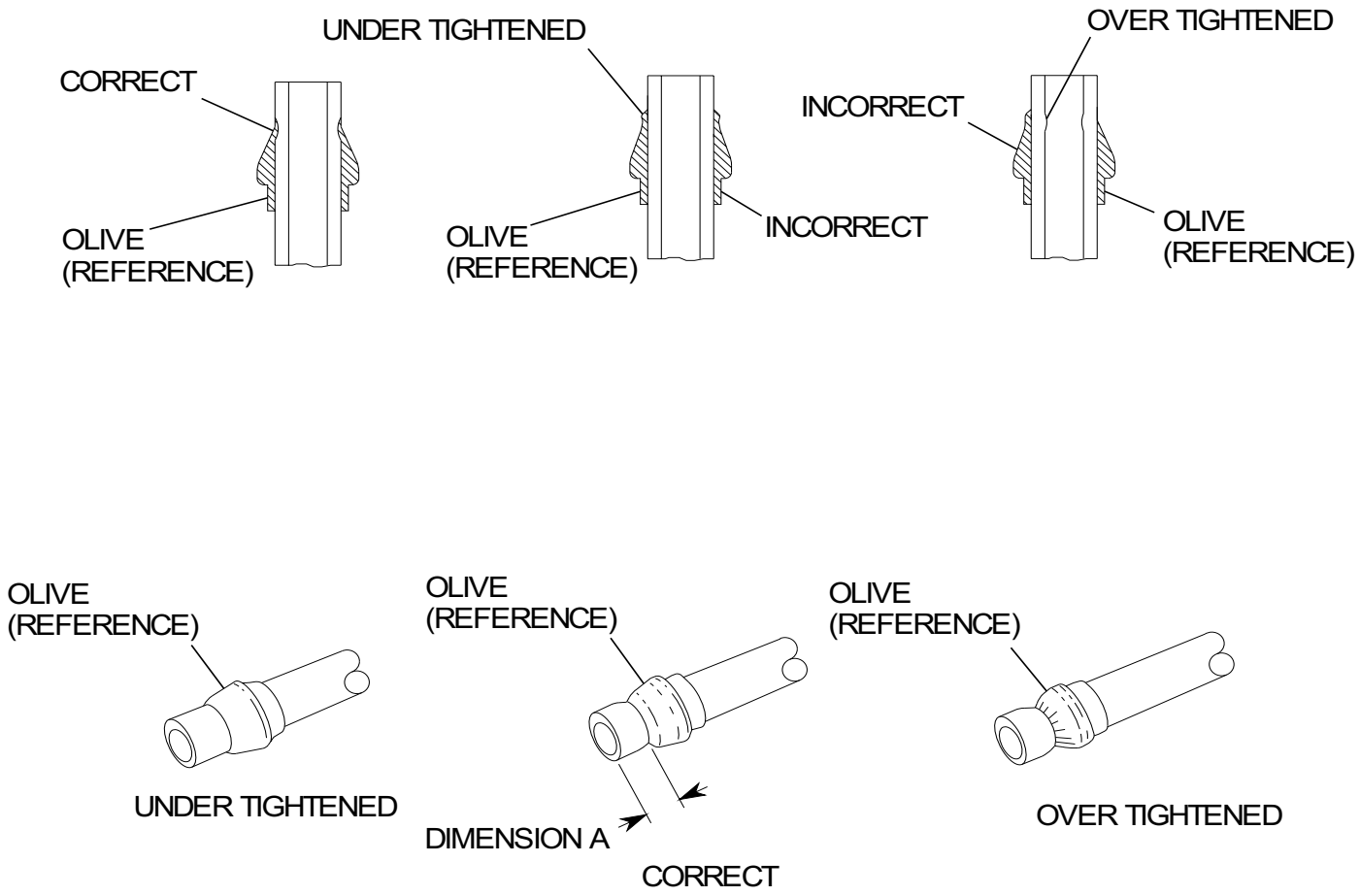

CORRECT AND INCORRECT SWAGED OLIVES

Figure 2 : Sheet 1 : Model 208 Floorboard Access Plates/Panels Identification

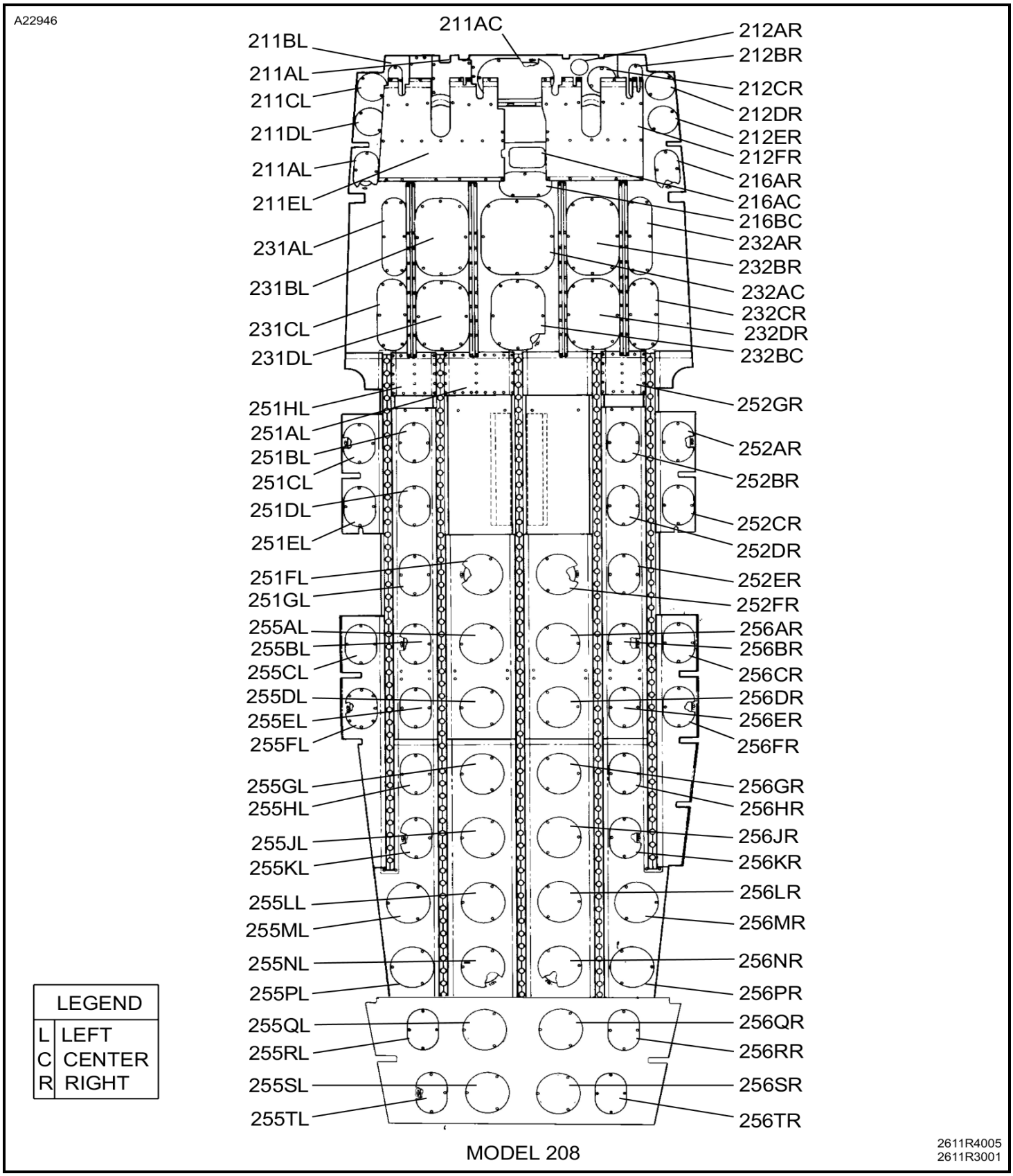

Figure 7 : Sheet 1 : Left Lower Wing Panels

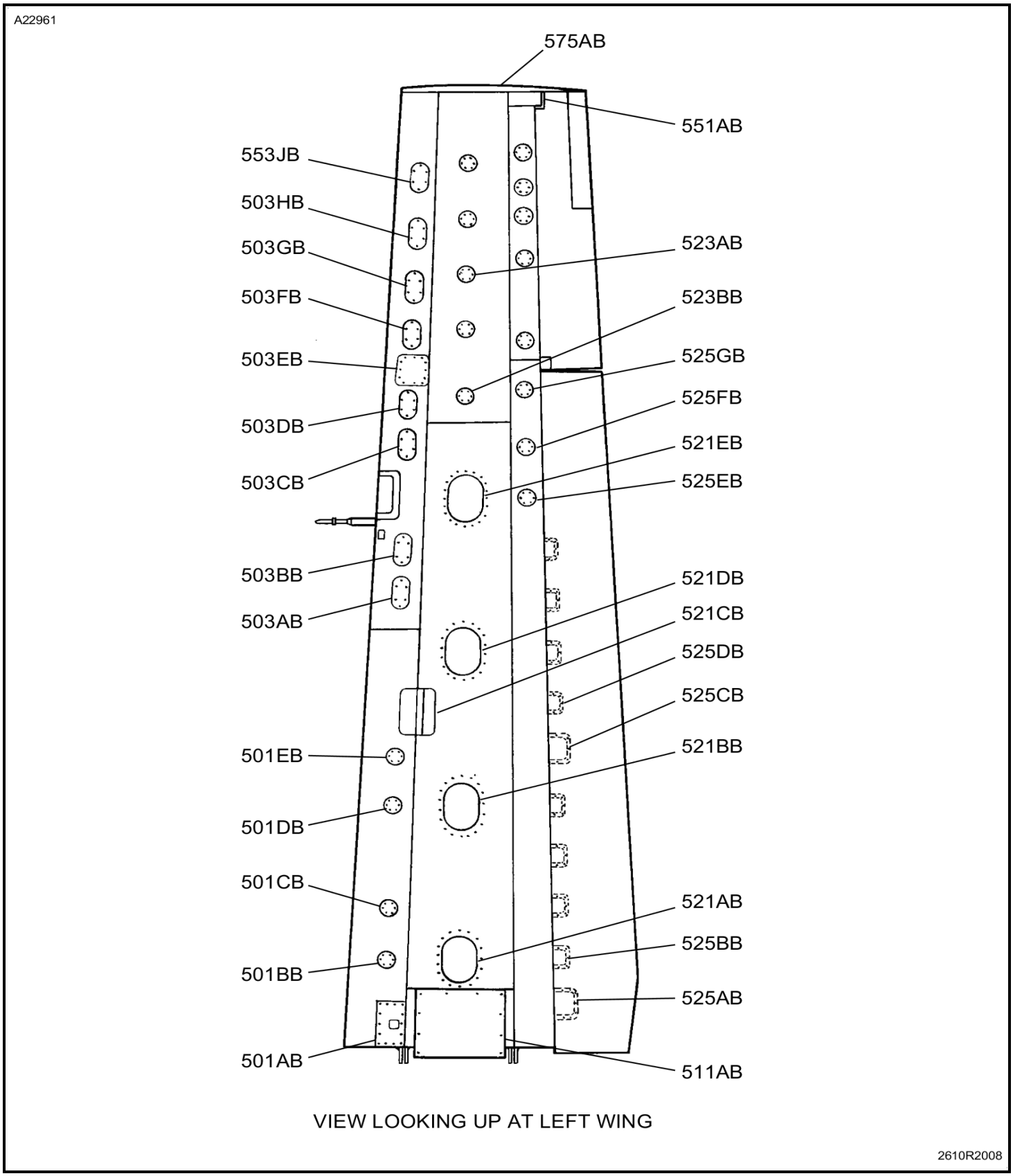

Figure 8 : Sheet 1 : Right Lower Wing Panels

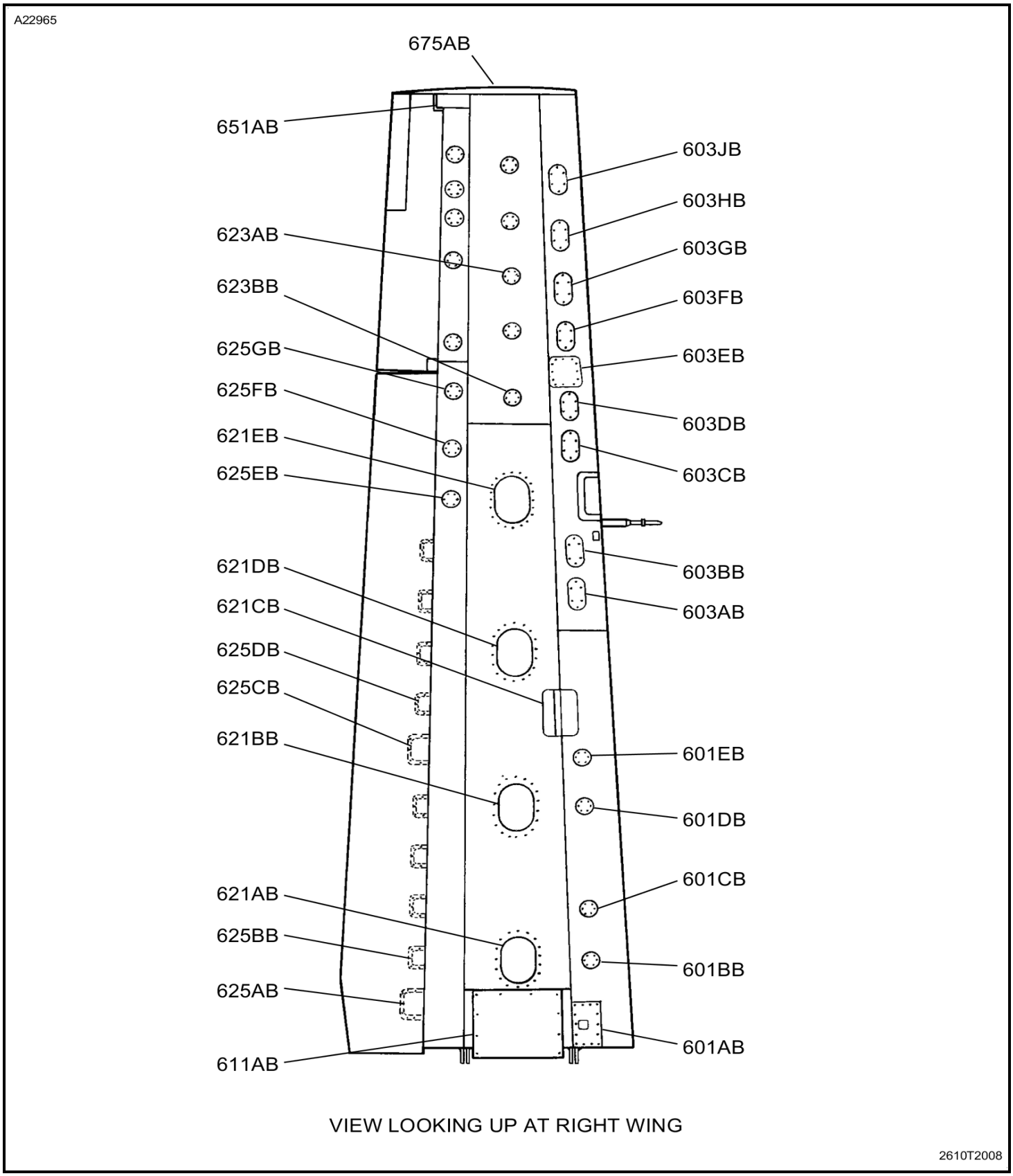

Figure 9 : Sheet 1 : Aft Fuselage, Horizontal and Vertical Stabilizer Panels