WINDOWS - GENERAL

1. General

A. This chapter gives general information for the cabin door windows, passenger windows, and the windshield. Information on care of the windows is given in Chapter 12. Information on the removal and installation of the windows is found in the LC-550FG Series Structural Repair Manual. Refer to the Model LC-550FG Series Structural Repair Manual, 56-10-00, Window Replacement and Bonding Procedure, Trimming and Bonding Surface Preparation.

B. **Windshield and Windows** - The proper care of the windshield and windows (sometimes referred to as transparencies) is one of the more important exterior care items on the airplane and often the least understood. Refer to Section 51-70-00, Transparency Repair, for approved cleaning materials and procedures.

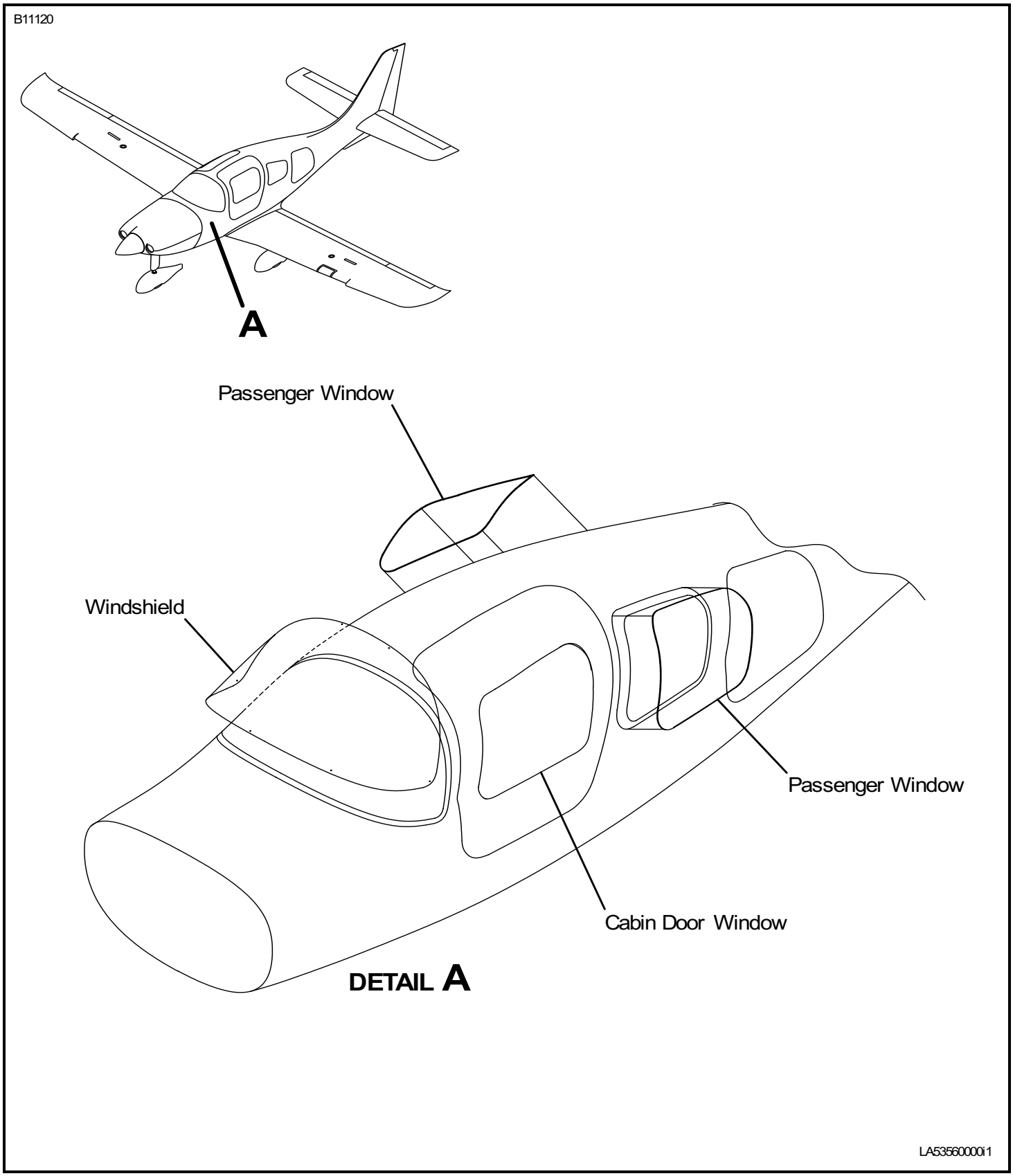
CAUTION: Do not use anything containing ammonia, aromatic solvents like methyl n-propyl ketone, acetone, lacquer thinner, paint stripper, gasoline, benzene, alcohol, anti-ice fluid, hydraulic fluid, fire extinguisher solutions, or window cleaner on the acrylic window surfaces. The use of these substances may cause the surface to craze.

2. Overview Of Window Locations

A. Figure 1 shows all of the windows on the airplane

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Figure 1 : Sheet 1 : Aircraft Windows



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WING - GENERAL

1. General Wing Overview

A. The one-piece wing of the Cessna 400 (LC41-550FG) is composite in construction, utilizing both carbon and fiberglass components bonded together using structural adhesive. The attachment to the fuselage is provided by a bolted saddle joint between the wing and the fuselage at the wing to fuselage intersection using a total of 28 bolts, 14 on each side. The primary wing structure includes the upper and lower wing skins, two redundant full span spars, and ribs.
Additional structure includes bellcrank brackets attached to the aft spar, flap and aileron hinges, and the flap and aileron control surfaces. Both of the continuous spars run from WS 198.0 on the left to WS 198.0 on the right. The forward spar is located at FS 105.7, and the aft spar is located at FS 128.8. The fuselage attachment is bolted through root ribs located between BL 20 and BL 24 on both the left and right sides, in front, between, and aft of the spars. Ribs located at WS 46 and WS 145 bind the fuel tank between the forward and aft spars. In the center of the fuel tank is an additional rib at WS 96 that also works as a fuel tank baffle. The aileron and flap control rods run behind the aft spar and through the aft ribs at WS 66.5, WS 105.5, and WS 151.0. On the right wing, a rib is located at WS 151.0, and the left wing has a joggle for the landing and taxi lights. On aircraft in which the wing was constructed with an integrated cuff, the forward rib at WS 151.0 will be absent. The aft rib at WS 151.0 will be absent in some aircraft built in late 2007 and all aircraft built thereafter.

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WING - MAINTENANCE PRACTICES

1. Procedures for Installation and Removal of the Wing

A. The major wing subassembly is removable from the fuselage subassembly, as are the ailerons and flaps. For the removal and installation of the wing, a wing cradle is required. The cradle is required to support the wing below the root ribs and should be placed approximately midspan to prevent tipping of the wing with only the center cradle. Additional supports are required for the fuselage when the fuselage mounted main landing gear is removed to aid in the removal of the wing.

CAUTION: The removal and installation of the wing requires the use of a cradle. Additional support is recommended for the wing approximately mid-span. An additional cradle is required for the fuselage when the fuselage mounted main gear is removed to aid in the removal or installation of the wing.

2. Wing Removal

NOTE: The hardware removed from the wing to fuselage attachment may be specific to an individual aircraft. This includes, but is not limited to: the washers and spacers if modified from standard hardware and the front seat belt attachments. It is recommended to number and label all the wing attachment bolts, washers, and spacers, for reassembly. Bolts may not be reused but should be labeled so that replacement bolts of identical length to the original may be used.

A. Removal of the Wing (Refer to Figure 201).

(1) Drain all the fuel from the aircraft. This includes both wing tanks, fuel lines in the wings and fuselage, and the sumps and gascolator. When draining/de-fueling the aircraft, fire precautions should be taken and the process performed in a ventilated area. Refer to Section 12-10-00, Replenishing, for detailed instructions.

(2) Remove static wicks to prevent damaging them during the process of removing the wing.

(3) Remove the front and aft seats, side interior panels below the doors, carpeting, rear seat footwell, and wing belly panels. Refer to Chapter 25 for detailed instructions.

(4) Disconnect and remove the aileron crossover tube (located in the aft wing belly access opening) from the aileron torque tubes. Disconnecting the roll servo of the autopilot may be necessary if installed. Refer to Chapter 27 for detailed instructions.

(5) Disconnect the aileron control rods from the aileron torque tubes. Refer to Section 27-10-00, Aileron Control System, for detailed instructions.

(6) It is recommended that the flap and the aileron control surfaces be removed to prevent damaging them during the removal process. Refer to Flap Control System and Aileron Control System for detailed instructions.

(7) Disconnect all fuselage to wing wiring. Note that primary wiring bundles are located along the side of the fuselage next to the front passenger seat.

(8) Disconnect all antenna wiring in the wing belly section of the wing and pull the wiring into the fuselage. Note that any wire ties must be removed prior to pulling the cables.

(9) Disconnect the oxygen system between the wing and the fuselage. Refer to Section 35-10-00, Oxygen System, for detailed instructions.

(10) Disconnect the pitot lines between the wing and the fuselage. Refer to Section 34-10-00, Pitot-Static System, for detailed instructions.

(11) Disconnect the fuel feed and return lines from the fuselage to the wing. Refer to Section 28-20-00, Fuel Distribution, for detailed instructions.

(12) Support the wing and fuselage using cradles.

(13) Remove the main landing gear, wheel pants, fairings, and landing gear panels per instructions in Section 32-10-00, Main Landing Gear.

(14) With the wing and fuselage supported and all lines, wiring, and controls disconnected, remove all bolts from the wing to fuselage attachment. Refer to Figure 201 and Figure 202.

NOTE: Any non-standard or customized washers or spacers must be marked and used upon installing the wing.

(15) After removing all bolts, nuts, and washers, carefully lower the wing and remove from the fuselage.

3. Wing Installation

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A. Installation of the Wing (Refer to Figure 201).

WARNING: Contact the factory for wing installation instructions if installing a new replacement wing, a wing from a different aircraft, or a wing that has a modified/repaired wing attachment area that affects the contour of the wing or fuselage.

CAUTION: When installing a wing, the bolts must be replaced with new standard AN4- xxA, Aircraft Undrilled Machined Bolts (125 ksi) of the same length as those removed when the wing was removed. No threads should be below the edge of the composite structure when installed. No threads of the nut should contact the unthreaded shank of the bolt.

(1) Wing installation is a direct reversal of the removal when the wing being installed was the same as the one removed from the same aircraft. Bolts are to be replaced with new bolts when installing the wing. Bolts (as shown in Figure 203 and Figure 204) are a standard AN4-xxA, Aircraft Undrilled Machined Bolts (125 ksi). Note the use of large area washers on the fuselage and the mounting of the forward seat belt attachment. Length of each bolt varies from aircraft to aircraft, and replacement bolts should be the same as those removed. Torque values for the bolts and hardware installation are shown in Figure 203 and Figure 204. Figure 205 shows the installation of the bolt, nut, and washer for the center hole of the lap belt bracket. Remove and repair any corrosion on existing hardware prior to installation per this manual. RTV 5818 silicone caulk may be applied to the exterior mating edges between the wing and fuselage (fore and aft), the wing strake, and the fuselage after the wing is attached to provide a seal against vapor, oil spray, etc.

4. Main Wing Structure

A. The one-piece wing of the Cessna 400 is a bonded composite structure providing a strong and aerodynamically clean structure. On the upper wing surface are two fuel filler caps (refer to Figure 206), and on the lower surface are various joggles and 16 access panels (18 for airplanes with the FIKI option) for inspection, maintenance, and repair of the wing structure and systems (refer to Figure 209. (Refer to Figure 207.)
The primary load carrying structure is comprised of the upper and lower wing skins made of epoxy/fiberglass and honeycomb core. Bonded to the skins are the wing spars made also of epoxy/fiberglass with honeycomb core with additional use of carbon for the spar caps. All ribs are made from epoxy/fiberglass and do not have core.

5. Location of Spars and Ribs

A. Figure 208 shows the wing station (WS) and fuselage station (FS) of the entire primary wing structure.

(1) The two C-section spars are full span between WS 198.6 and WS 198.6 with the shear web of the spars at FS 105.7 and FS 128.8 for the front and aft spar, respectively. Both spars are 2.5 inches wide and face inward to the center of the wing.

(2) The root ribs include two ribs forward of the forward spar, two center ribs between the forward and aft spars, and the aft root ribs aft of the aft spar. These root ribs provide the structure through which the wing to fuselage bolts pass.

(3) The leading edge of the wing has one rib on the right wing only at WS 151.0 with a 1-inch wide bonding flange facing inboard. This rib will not be present in some aircraft. In addition, the inboard strakes also have ribs just outboard of the fuselage.

(4) There are three center ribs in each wing located at WS 46.0, WS 91.0, and WS 145.0 with the 1.0 in. wide flanges all facing inboard. The ribs at WS 46.0 and WS 145.0 are the inboard and outboard closeouts for the integral fuel tanks. The center rib at WS 91.0 is also the anti-slosh baffle for the fuel tank.

(5) Along the aft section behind the aft spar are three ribs in addition to the aft root rib. These ribs are located at WS 67.0, WS 105.6, and WS 151.0. These ribs provide additional structure for the flap and aileron attachment hinges. The rib at WS 151.0 will be absent in some aircraft built in late 2007 and all aircraft built after.

6. Location of Inspection Covers (Access Panels)

A. The wing of the Cessna 400 is equipped with two fuel filler caps on the upper wing surface and 16 access panels (18 for airplanes with the FIKI option) on the lower wing surface.

B. The access panels are described below, and their location is shown in Figure 209. For airplanes with the Flight Into Known Icing (FIKI) option there are two additional access panels on the lower wing surface. A TKS fluid tank access panel on the right wing and a TKS equipment access panel on the the left wing. There are no wing access panels on the upper surface of the wing. Refer to Figure 208 for approximate station locations of the access panels.

CAUTION: The inboard and outboard fuel bay access panels (refer to Figure 209) are sealed using PRC-1428 fuel tank access door sealant. Special care must be taken during the removal and installation of

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these panels due to the wet-wing design of the Cessna 400. Prior to opening of the fuel tanks, de-fuel the aircraft and follow the procedures in Chapter 28 of this manual.

7. Detection Procedures For Delamination And Latent Damage

A. Field detection of delamination and latent damage is accomplished primarily by visual inspection. Additional detection methods include tap-testing (refer to Section 20-90-00, Tap Testing), ultrasonic inspection, or other approved methods. Areas where the structure is bonded or where there is a change in the composite lay-up will be apparent during tap-testing, or equivalent inspection method.

(1) Other common names for tap-testing are: coin tap, ring-tap, and metallic ring test.

(2) In general, composite honeycomb structures can be inspected using a tap test as done on metal bonded honeycomb. Use of this method can quickly determine if additional inspection is required.

B. The Cessna 400 is designed to allow for a certain amount of Beyond Visual Damage (BVD) that is difficult to detect except with non-destructive inspection (NDI) methods as described above. Any depression, dents, cracks, gouging, scratches, or scoring that are visible must be investigated for structural damage.

(1) Depressions, Dents, and Scratches may indicate more serious damage below the paint. A minimum of a tap-test must be performed to determine if damage has been done to the structure underneath. If damage is suspected, sanding down through the paint and primer to the lightning mesh should be performed for a more in-depth inspection. Refer to Chapter 51 for classification and repair.

(2) Scoring, Cracking, and Gouging are an indication of damage to the structure and must be inspected, classified, and repaired per Chapter 51 of this manual

8. Paint Schemes

WARNING: The Cessna 400 lightning protection is dependent on paint type and thickness. Only approved paints and paint colors may be used. Paint thickness and locations are also controlled. Paint in accordance with instructions in Section 51-70-00, Paint Repair and Painting.

WARNING: The composite construction of the Cessna 400 requires ultraviolet protection in the paint for protection of the composite structure. The topcoat applied to the external aircraft structure provides this protection. When repainting use only paints approved in Section 51-70-00, Paint Repair and Painting.

WARNING: The 175° F operating temperature limit does limit the use of dark colors on certain areas of the aircraft. Colors must meet the specifications in Section 51-70-00, Paint Repair and Painting.

A. All re-painting must be done in accordance with the instructions in Section 51-70-00, Paint Repair and Painting.

9. Leading Edge Tape and Turbulator Triangles

A. Optional leading edge anti-chafe tape may be added to the wings, horizontal stabilizer, vertical stabilizer, cowling near the latch, door tread, tow bar attachment point, wheel pants, gear leg fairings, and the landing light lens. The anti-chafe tape is either a 1-inch wide strip or of a shape and size as required; it is adhesive-backed, clear, urethane tape that prevents pitting and wear on the leading edges. For S/N 41563 and On, triangular shaped turbulator tape is added atop the anti-chafe tape; from WS 145.0 to the fuselage and 0.400±0.150 inches up from the chord line to the back of the triangles. The apex of the triangles faces downward. The gap between wing feature and triangular tape edge should be 1 inch maximum. Triangles are spaced 1 inch center to center. For S/N 41563 and On, zig-zag shaped turbulator tape is installed under the leading edge of the horizontal stabilizer. Refer to Chapter 55.

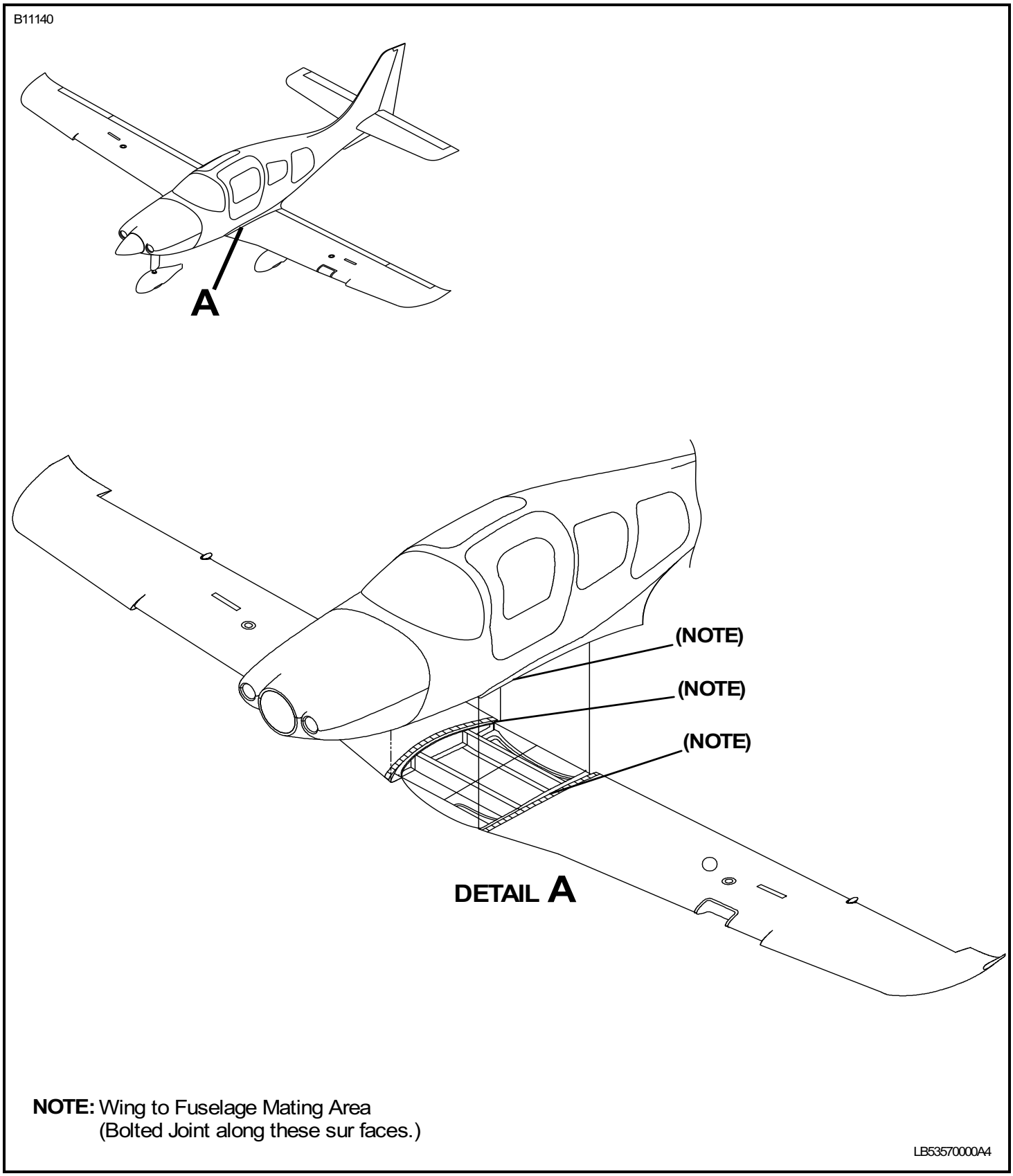
To apply the anti-chafe tape, thoroughly clean the leading edges using isopropyl alcohol. The 1-inch wide tape should be centered along the leading edge of the surface. The tape should end at the beginning of the wing tip curve and may not be installed over the stall strips or landing light joggle. Use a rubber scraper/squeegee as required to smooth the tape and remove air bubbles from underneath the tape. To remove the tape, slowly pull the tape back on itself; then clean the wing surface with isopropyl alcohol.

To apply triangles, thoroughly clean the leading edge tape using isopropyl alcohol. Apply 3M 86 A adhesion promoter per the manufacturer's instructions before placing the triangles. Apply the triangles over the anti-chafe tape. If the triangles are installed using a prefabricated strip, only the triangles may remain after installation; the remainder of the strip material must be removed. Do not apply triangles to stall strips, the stall vane, and the landing light lens. To remove the triangles, slowly pry them off; then clean the surface with isopropyl alcohol.

The anti-chafe tape and turbulator triangles should be inspected at each 100 hr. or annual inspection to ensure that they are not peeling up and are properly attached.

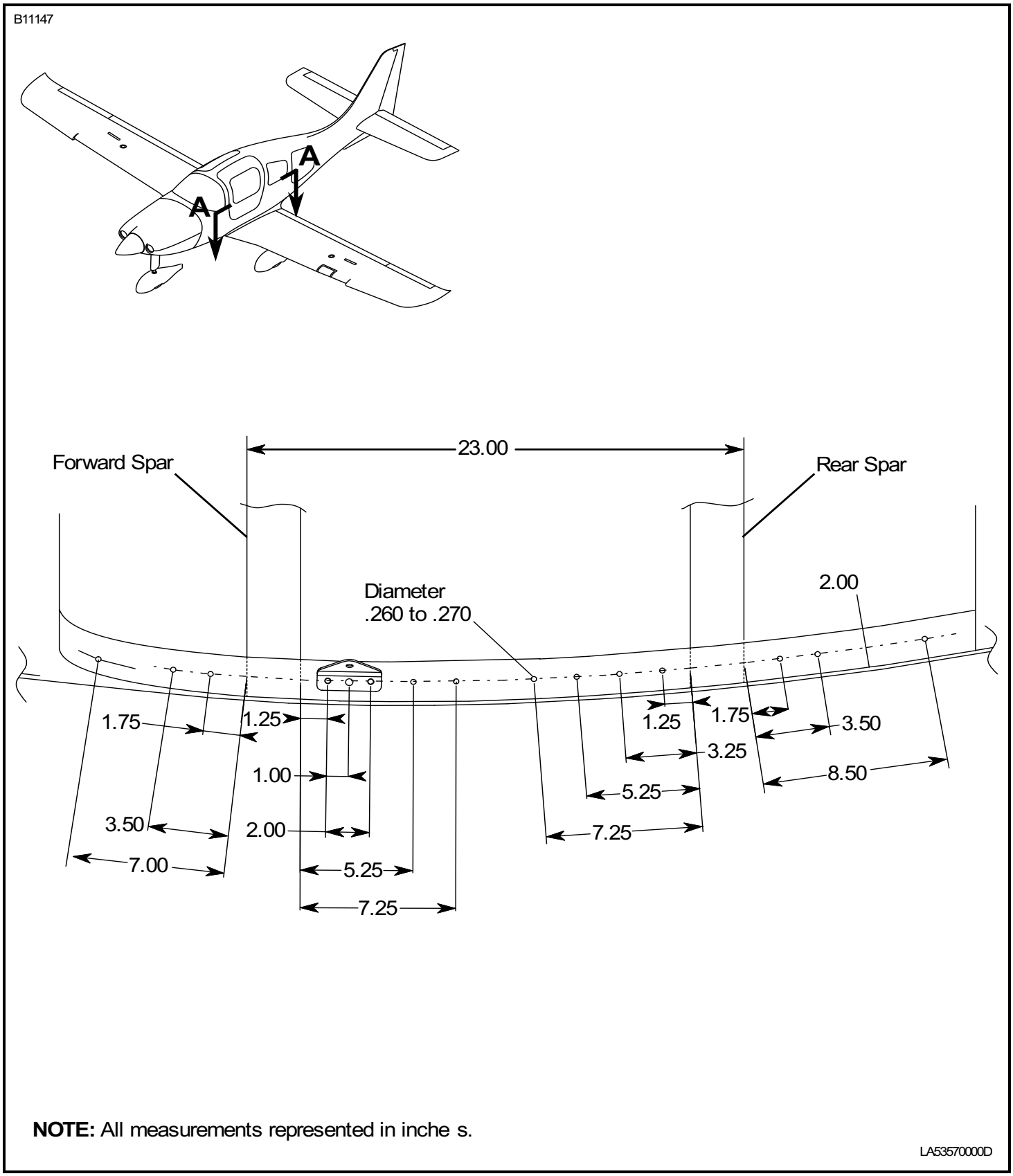
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Figure 201 : Sheet 1 : Wing Fuselage Attachment



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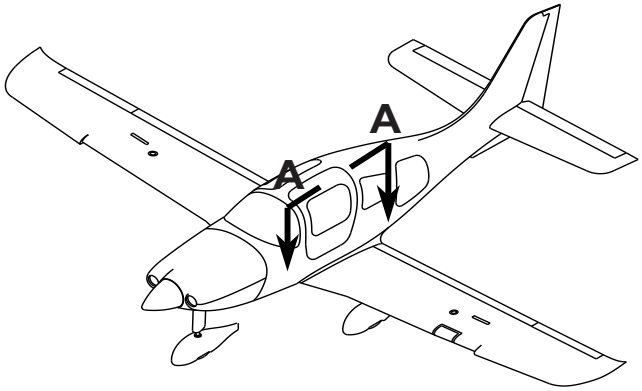
Figure 202 : Sheet 1 : Wing to Fuselage Attachment Bolt Locations

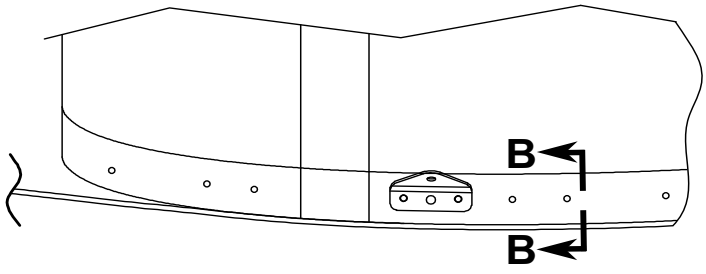


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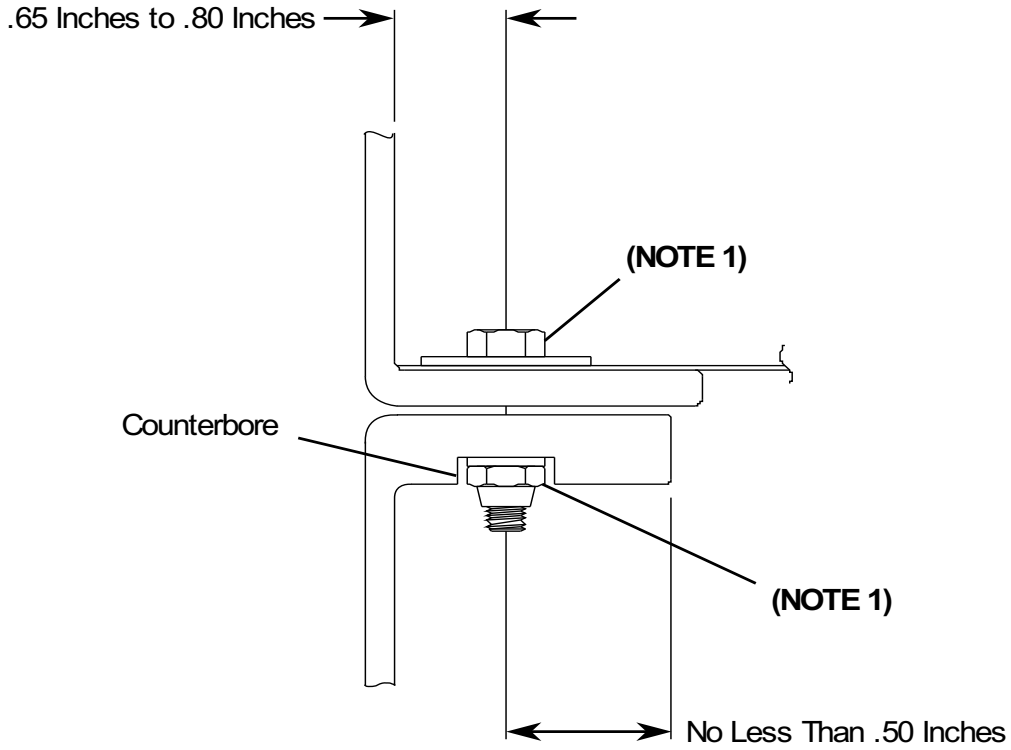
Figure 203 : Sheet 1 : Wing to Fuselage Attachment Bolt

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VIEW A-A



VIEW B-B

UP INBD

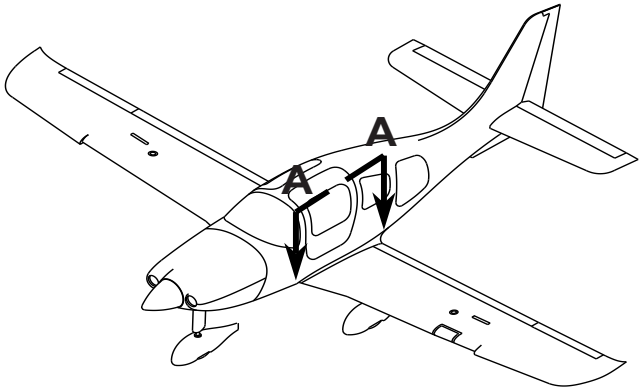
NOTE 1: Torque nuts 72 to 84 lbs.-in. Where nuts are not accessible, torque bolt heads 79 to 92 lbs.-in.
NOTE 2: Tolerance on all dimensions is ±0.10.

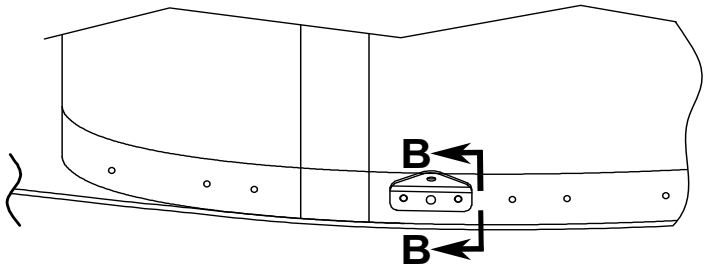
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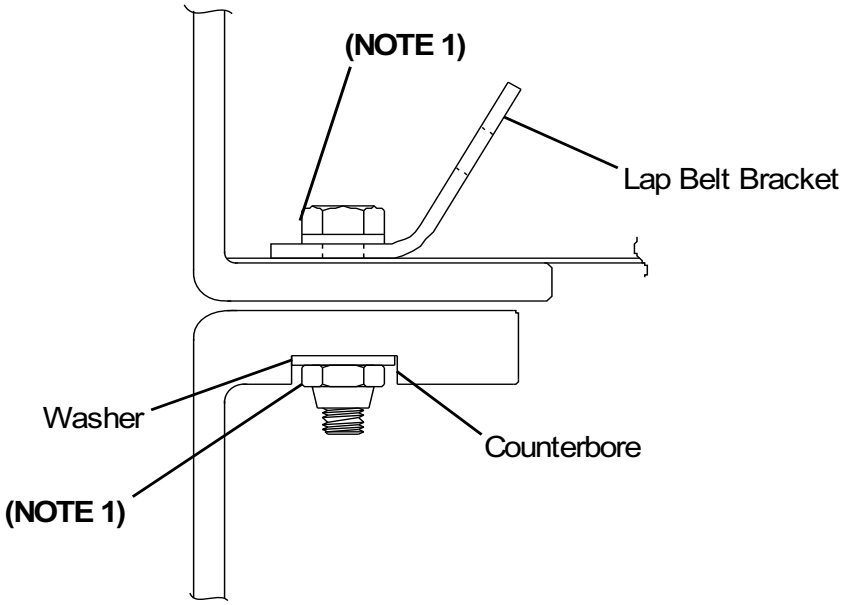
Figure 204 : Sheet 1 : Wing to Fuselage Attachment Bolt with Lap Belt Bracket

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VIEW A-A



Seat Belt (Lap) Installation

VIEW B-B

UP INBD

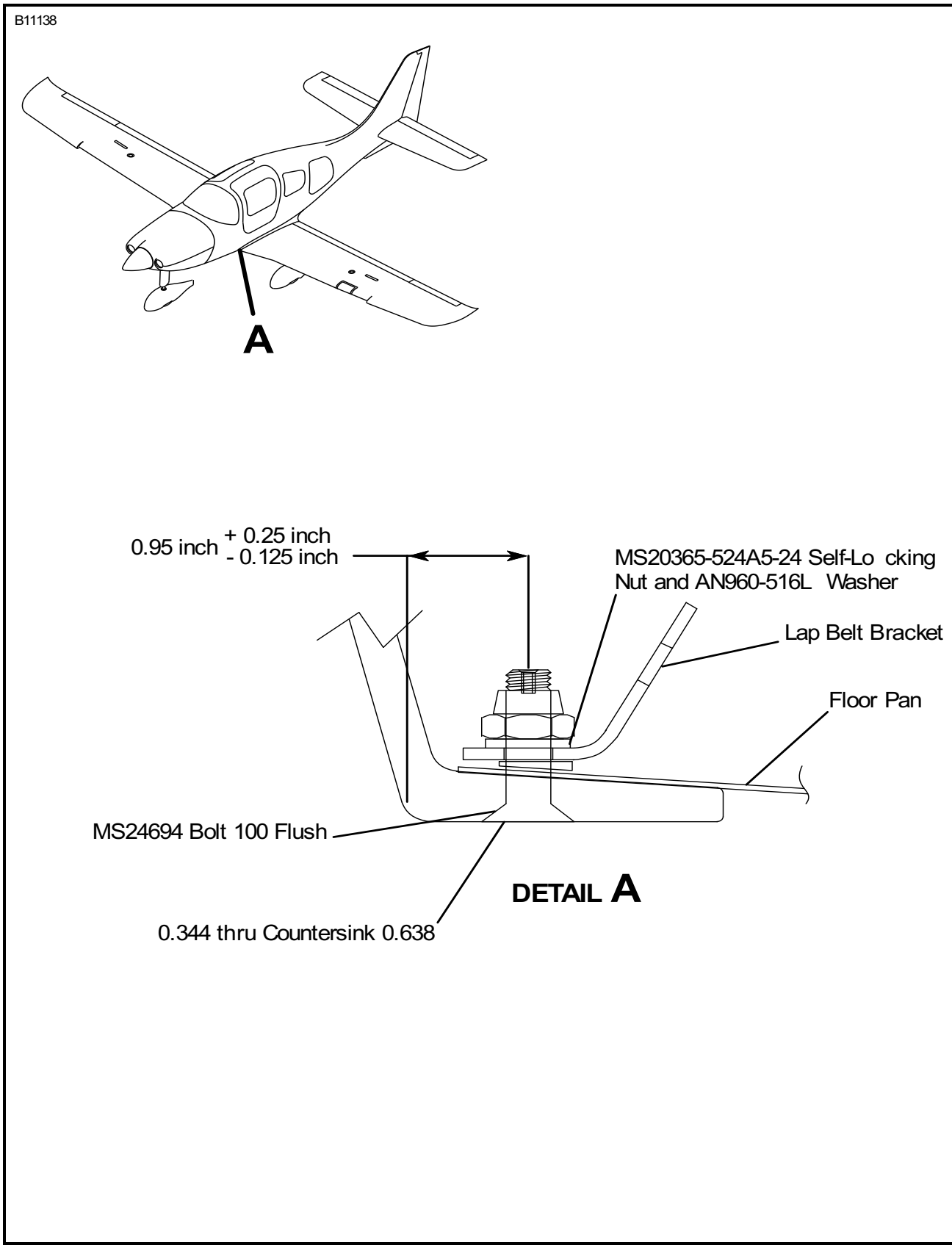
NOTE 1: Torque nuts 72 to 84 pound-inches. Where nuts are not accessible, torque bolt heads 79 to 92 pounds-inches

NOTE 2: Tolerance on all dimensions is ±0.10 inches.

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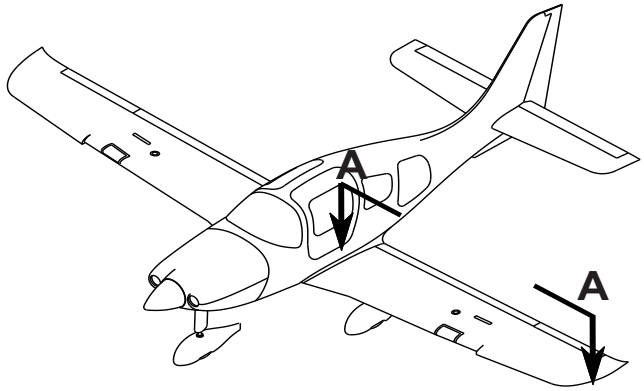
Figure 205 : Sheet 1 : Bolt and Lap Belt Bracket Attachment

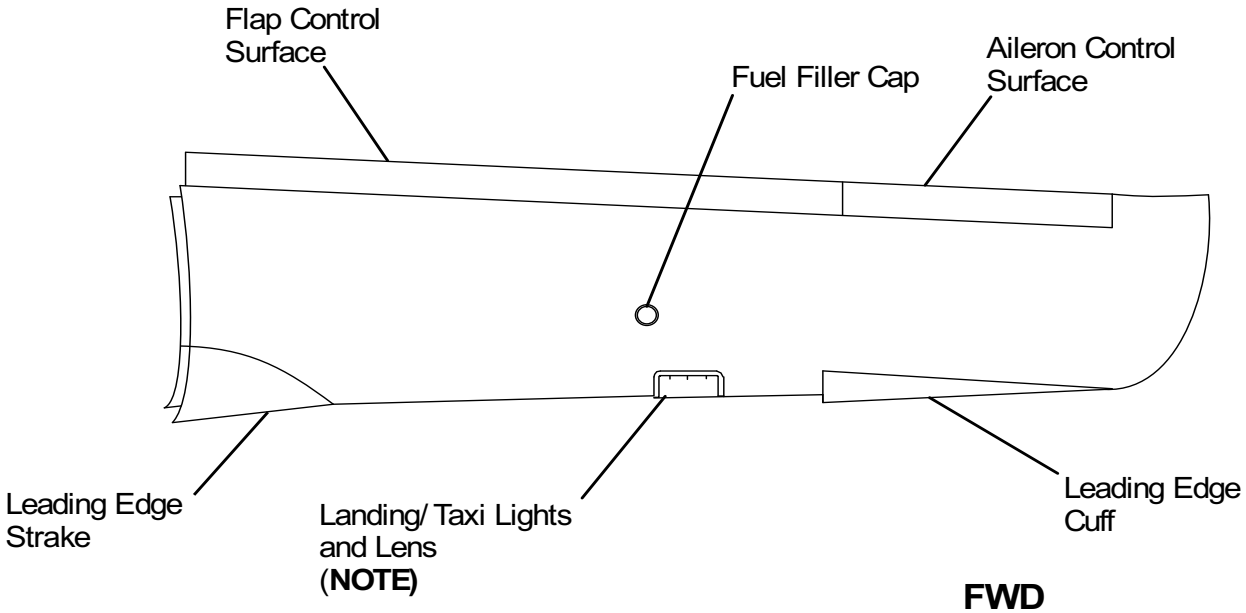


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Figure 206 : Sheet 1 : Upper Wing Surface Key Components

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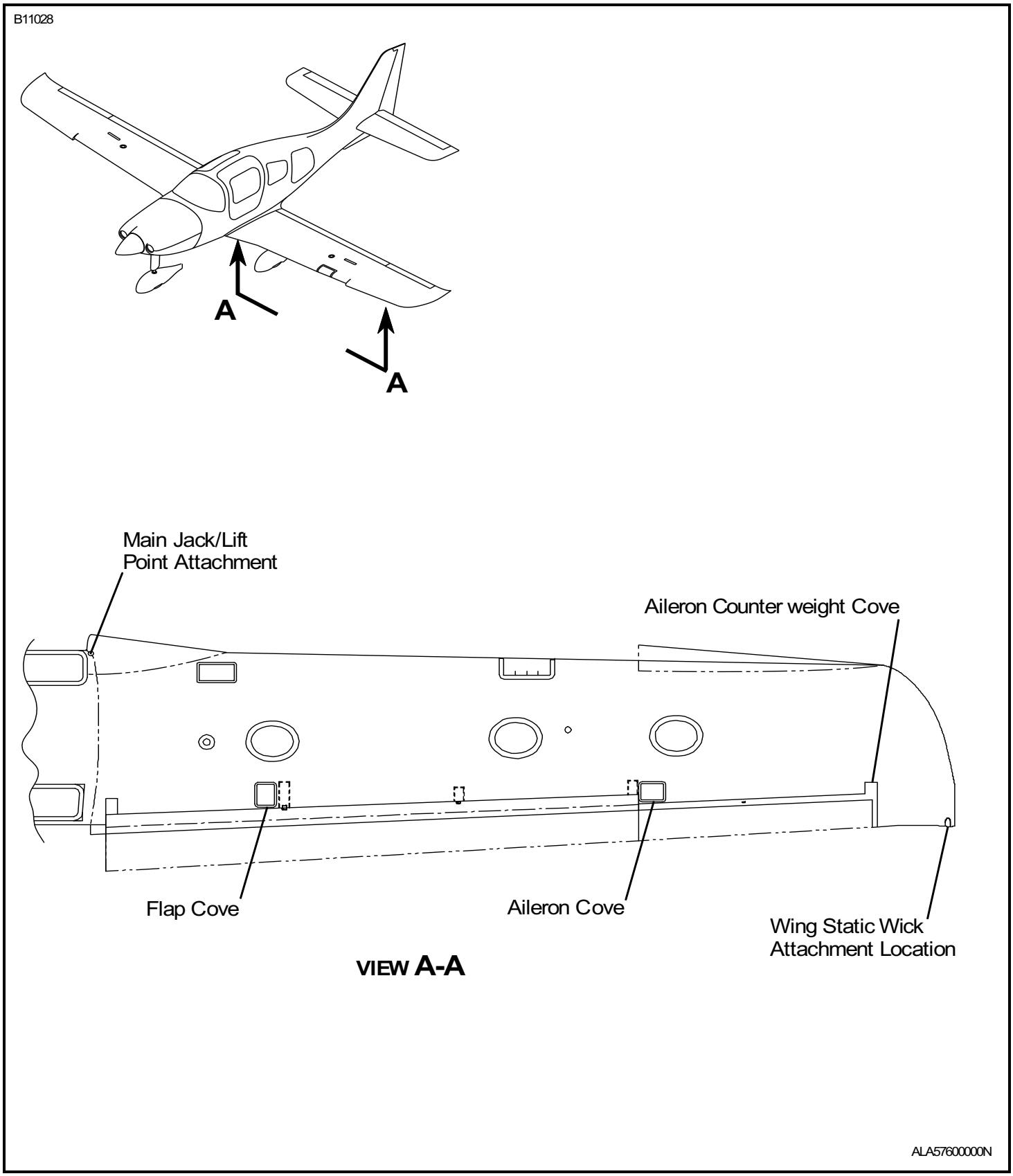
VIEW A-A
Left side Shown, Right side Opposite

NOTE: Airplanes -2001 th ru -2048, Landing/ Taxi Lights and Lens on Left side Wing only.

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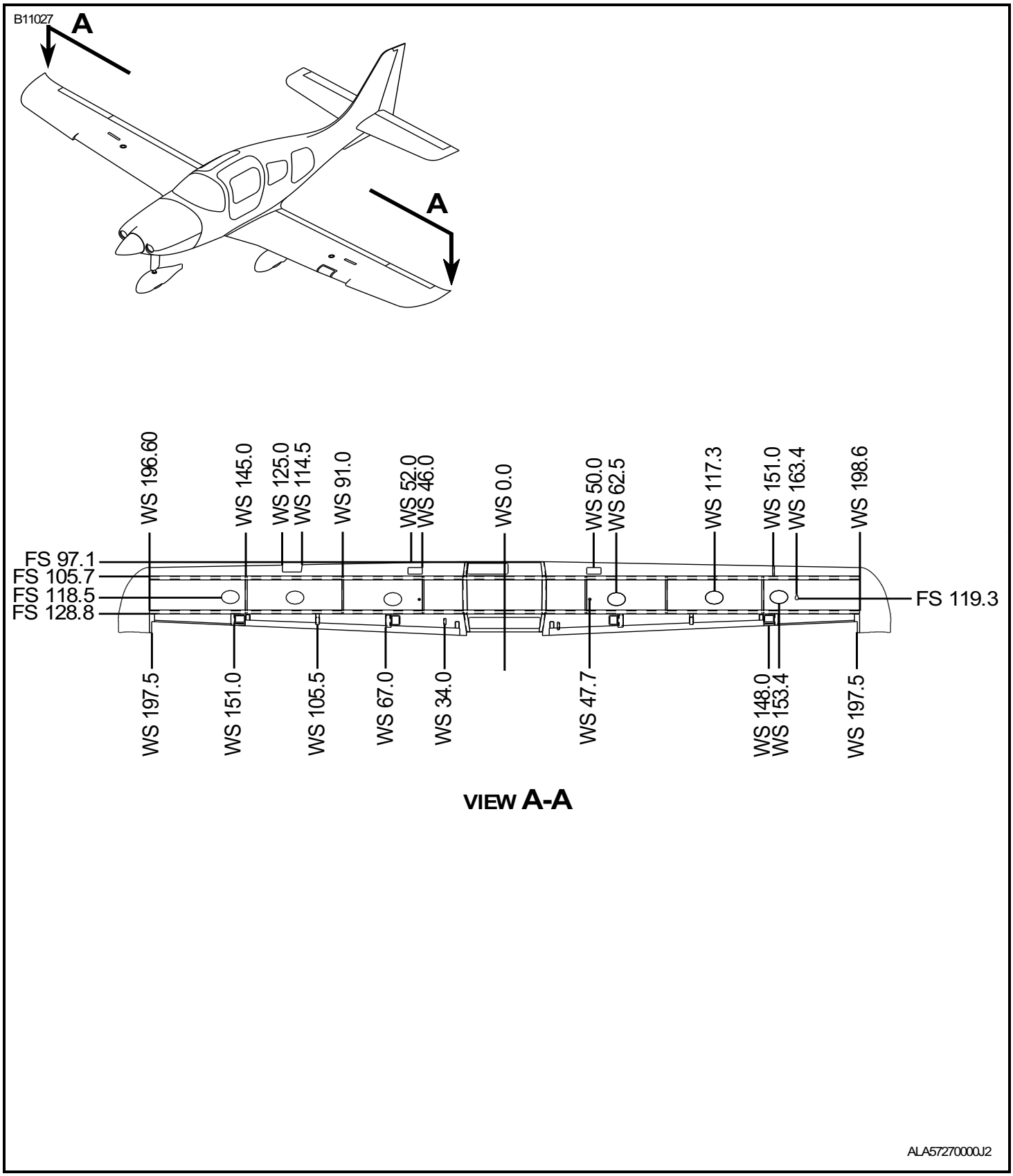
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Figure 207 : Sheet 1 : Lower Wing Surface Key Components (Left Wing Shown)



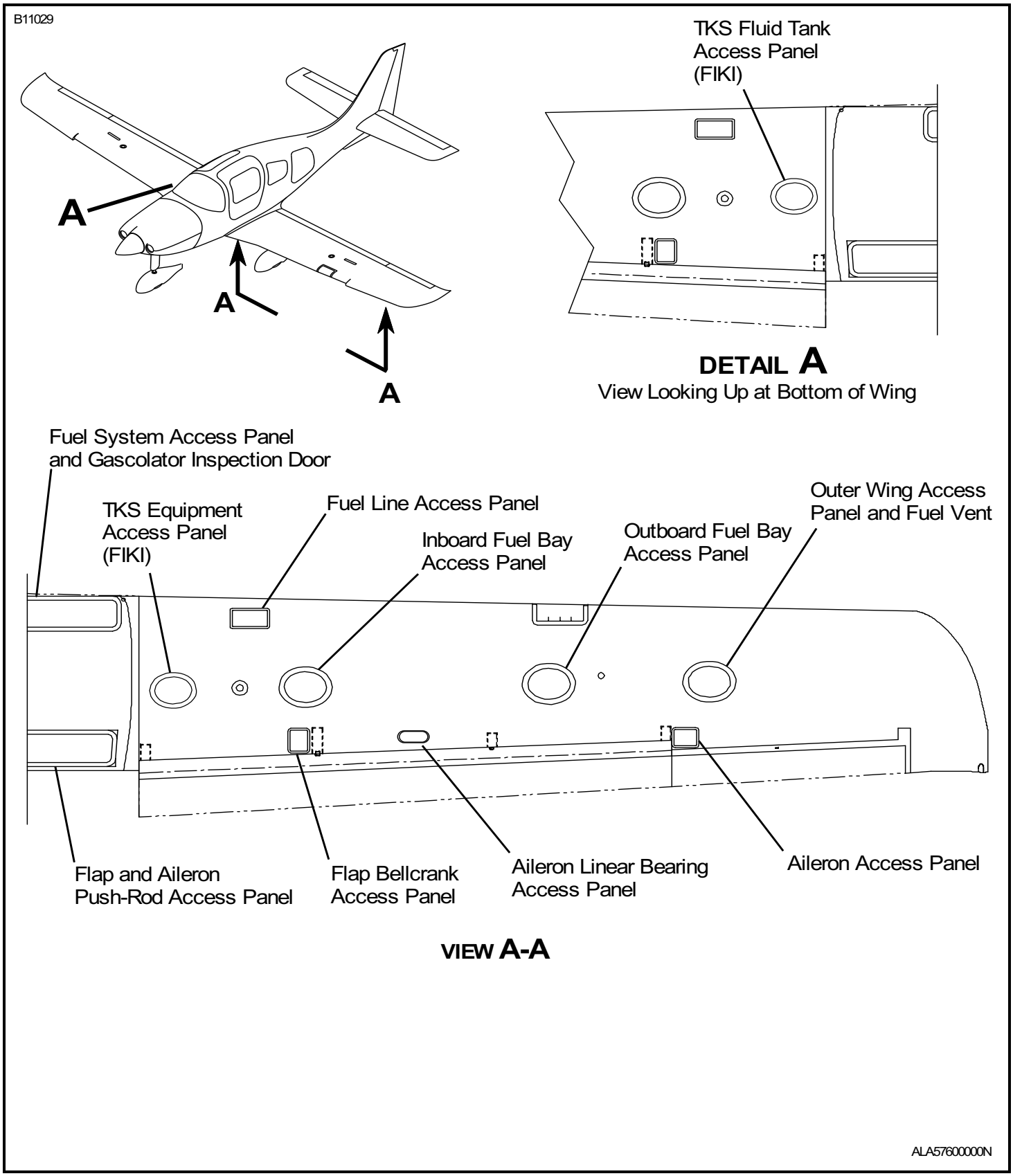
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Figure 208 : Sheet 1 : Wing Structure



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Figure 209 : Sheet 1 : Lower Wing Surface Access Panel Locations



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PROPELLER - GENERAL

1. General Description

A. The propeller is a constant-speed type that operates by engine-driven hydraulic pressure opposing the natural centrifugal twisting moment of rotating blades and spring force to obtain the correct pitch for the engine load. Engine oil is supplied to a power piston in the propeller hub by means of the propeller shaft. An engine-driven McCauley governor controls the amount of oil pressure applied. Increasing oil pressure decreases RPM and increases pitch. Decreasing oil pressure increases RPM and decreases pitch.

B. This section discusses the description, removal, and installation of the propeller. The scope of this chapter is to help guide the service and repair technician through the description, removal, inspection, servicing, and installation of the following: 1) Hartzell 3-bladed propeller and hub (model HC-H3YF-1RF) and blades (model F7693DF) and 2) McCauley 3-bladed propeller (model D3A34C447/78MLB-0) and hub (model E-7838/C447) and blades (model 78MLB-0), found in the Supplier Publication List.

2. Propeller Manufacturer Information

A. Refer to the Standard Practices Manual No. 202A for complete maintenance instructions.

NOTE: Follow the FAA or local regulations for propeller maintenance.

B. Refer to the McCauley MPC-26 Propeller Owner/Operator Information Manual for complete maintenance instructions.

NOTE: Follow the FAA or local regulations for propeller maintenance.

3. Tools & Equipment

A. The mechanic should be equipped with a complete set of the necessary tools that include the following:

(1) Wrenches - 1/4 in. through 1-1/4 in.
(2) Common and Phillips Head Screwdrivers
(3) Pliers - Common, Diagonal Cutters, Needle Nose, Duck Bill, Snap Ring, Safety Wire
(4) Ratchets 1/4 in., 3/8 in., 1/2 in. drive
(5) Sockets - 1/4 in. drive 5/32 in. through 1/2 in., 3/8 in. drive 3/8 in. through 1 in., 1/2 in. drive 7/16 in. through 1-1/4 in.
(6) Sockets (Deepwell) – 1/2 in. drive, 7/16 in. through 1 in.
(7) Feeler Gauges
(8) Leather or Soft Plastic Mallet
(9) Torque Wrenches 0-500 in.-lbs. and 0-100 ft.-lbs. (see Note)
(10) Micrometers (see Note)
(11) Slide Hammer
(12) Pullers
(13) Thickness Gauges
(14) Vernier Calipers (see Note)
(15) Small Hole Gauges

NOTE: Must be currently calibrated, and the calibration must be traceable to the National Bureau of Standards.

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SPINNER AND PROPELLER - MAINTENANCE PRACTICES

1. Spinner and Propeller Removal and Installation

A. Remove the Spinner and Propeller (Refer to Figure 201).

(1) Remove the upper and lower engine cowling per Section 71-10-00, Engine Cowling.

(2) Disconnect the battery wires attached to the left alternator.

(3) Remove the spinner from the spinner bulkhead.

(a) Remove the screws and fiber washers that attach the spinner to the bulkhead.

(4) Loosen the left alternator adjustment rod and remove the belt from the pulley.

NOTE: The adjustment rod ends are threaded such that rotating the rod itself will loosen or tighten the ends equally.

(5) Use a black felt tip marker to mark the position of the propeller hub to the engine crankshaft/flange.

(6) Remove the six propeller hub flange to engine crankshaft flange retaining nuts and washers.

(a) Remove the propeller, hub assembly, and drive pulley from the aircraft.

NOTE: Use clean rags to cover the cavity in the crankshaft and hub.

(7) For Hartzell, remove the six spinner bulkhead to propeller hub nuts and washers.

(a) Remove the spinner bulkhead from the propeller hub.

B. Install the Spinner and Propeller

(1) For Hartzell, install the spinner bulkhead onto the propeller hub. Install six spinner bulkhead-to-propeller hub retaining nuts. Torque the nuts from 240 to 264 inch pounds.

(2) If required for the McCauley spinner bulkhead, refer to the MPC-26 Propeller Owner/Operator Information Manual (Propeller Removal/Installation, Constant Speed Reciprocating Engine Propeller installation procedures), the applicable installation decals, and to Figure 201. Unless otherwise specified (for example on a decal), use the torques that follow:

- Screws that attach the hub sleeve adapter to the propeller hub: 75 to 85 inch pounds.
- Bolts that attach the hub sleeve adapter to the spinner bulkhead: 30 to 36 inch pounds.

(3) For Hartzell, install a new O-ring seal into the propeller hub groove. Place alternator drive belt on propeller hub. Fit the drive pulley and propeller hub assembly onto the engine crankshaft dowl pins with index marks aligned. Install six new propeller hub to engine crankshaft flange retaining nuts and washers. Torque the nuts from 70 to 80 foot pounds. Apply torque seal to all six retaining nuts and hub studs.

(4) For a McCauley propeller, refer to the MPC-26 Propeller Owner/Operator Information Manual (Propeller Removal/Installation, Constant Speed Reciprocating Engine Propeller installation procedures), the applicable installation decals, and to Figure 201. Unless otherwise specified (for example on a decal), torque the nuts that attach the propeller hub to the engine flange from 45 to 50 foot pounds.

(5) For Hartzell, install the spinner over the propeller bulkhead so that spinner mounting holes align with the nutplate holes in the spinner bulkhead. Install 15 spinner-to-spinner bulkhead attachment screws and fiber washers. Torque the screws from 30 to 36 inch pounds.

(6) For a McCauley spinner, refer to the MPC-26 Propeller Owner/Operator Information Manual (Propeller Removal/Installation, Constant Speed Reciprocating Engine Propeller installation procedures), the applicable installation decals, and to Figure 201. Unless otherwise specified (for example on a decal), torque the screws that attach the spinner and spinner fillet to the spinner bulkhead from 30 to 36 inch pounds.

(7) Align belt onto drive pulley and alternator pulley.

(8) Connect a torque wrench to the alternator pulley retention nut. With an assistant holding the propeller, to prevent the engine crank shaft from rotating, tighten the adjustment rod until the belt no longer slips on the alternator pulley and force applied to the torque wrench is 15 to 25 foot pounds. Do not overtighten belt. After final belt adjustment has been made torque jam nut on both ends of adjustment rod and nuts attaching the adjustment rod to the alternator and to the bracket attached to the engine 15 to 20 foot pounds.

(9) After the belt is tensioned torque the nut attaching the alternator to the mounting bracket 40 to 45 foot pounds.

WARNING: Make sure that there is a minimum clearance of 1/2 inch between the upper cowling skin and

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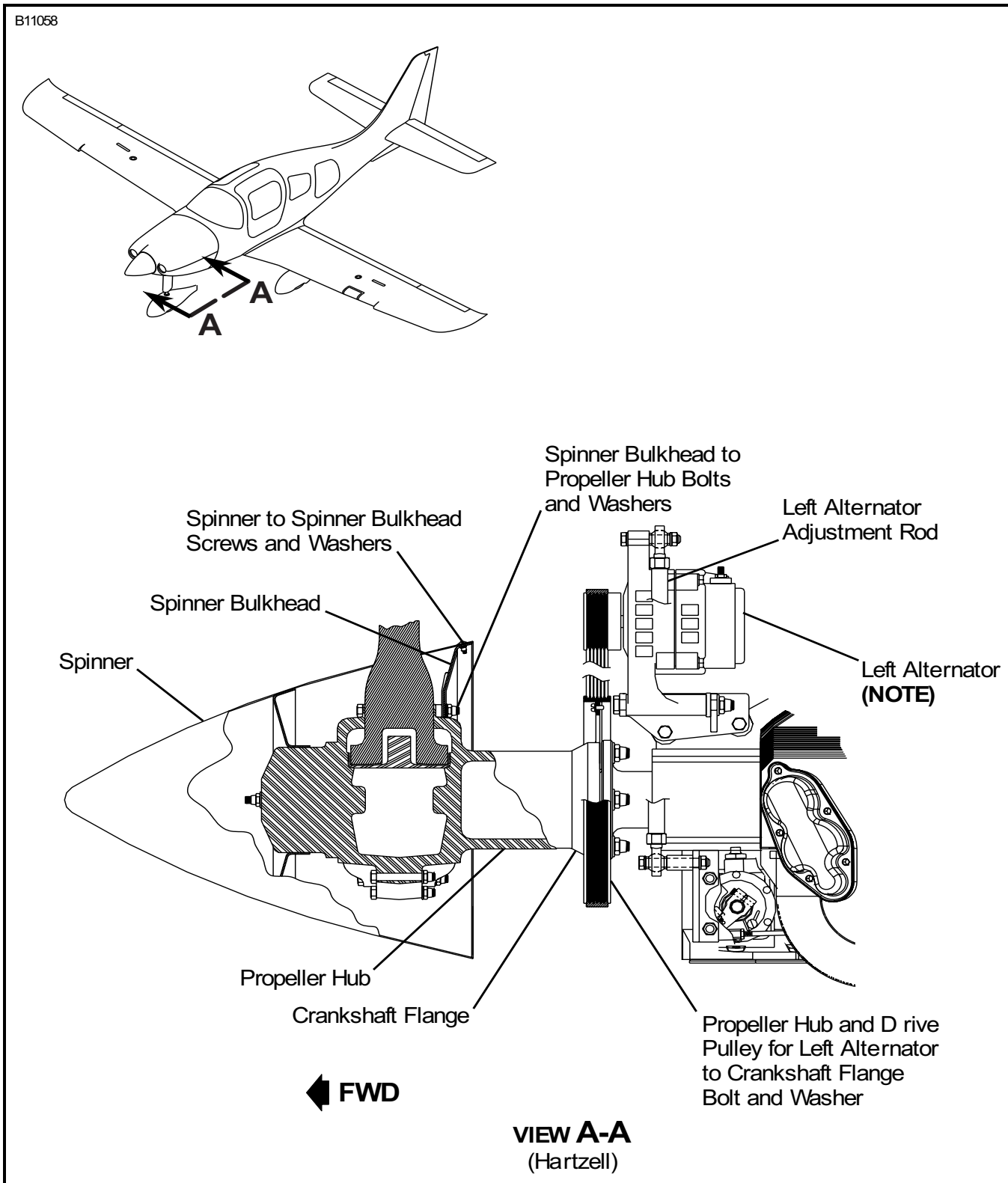
the alternator case, fan, belt, and pulley.

(10) Connect the battery wires to the alternator.

(11) Install the upper and lower engine cowling per Section 71-10-00, Engine Cowling.

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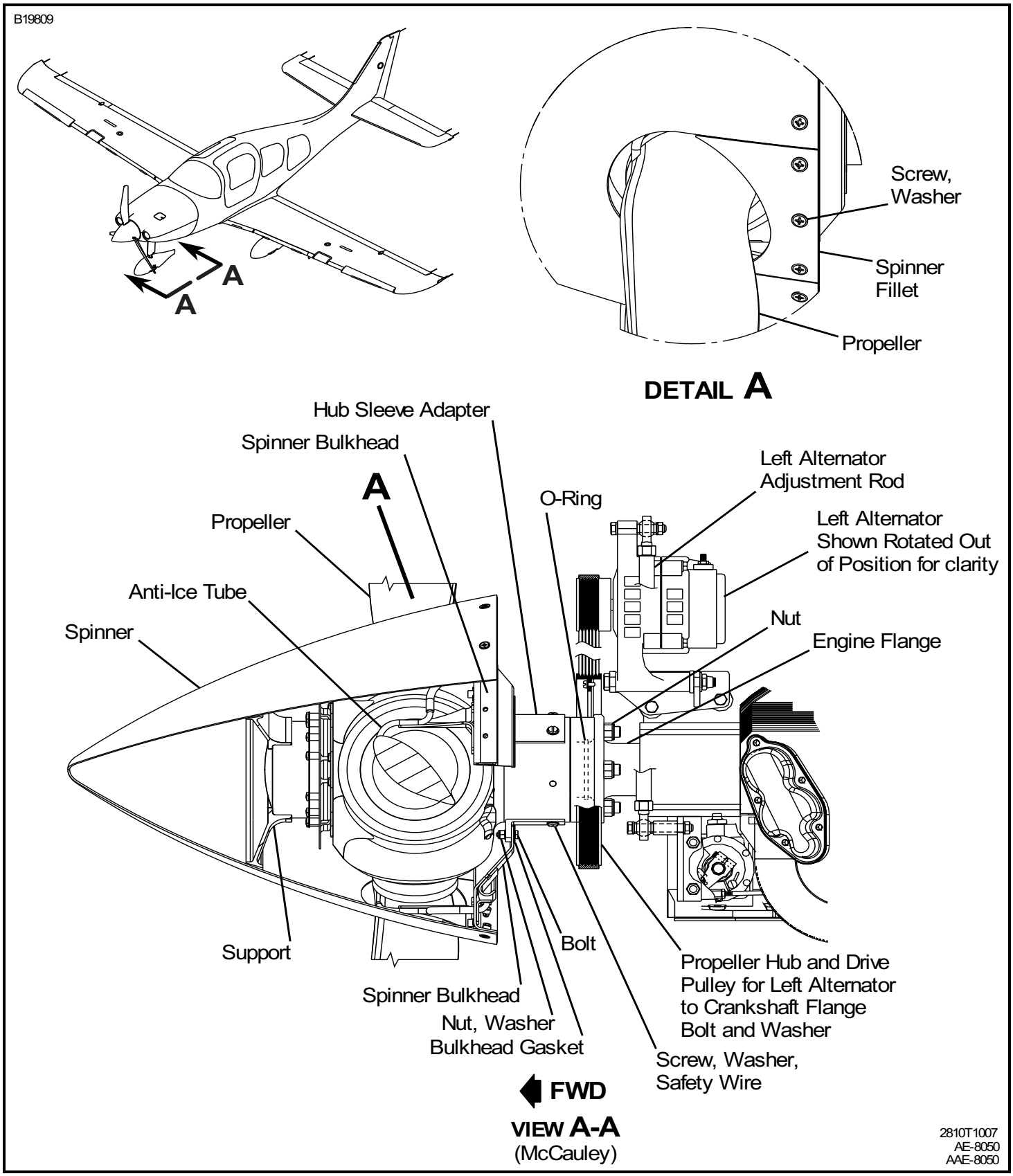
Figure 201 : Sheet 1 : Propeller Hub



NOTE: Shown rotated out of position for clarity.

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Figure 201 : Sheet 2 : Propeller Hub



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PROPELLER GOVERNOR - MAINTENANCE PRACTICES

1. Propeller Governor Removal and Installation

A. Removal of Propeller Governor

(1) Remove the lower engine cowling. Refer to Chapter 71, Engine Cowling - Maintenance Practices.

(2) Disconnect the battery wires attached to the left alternator.

(3) Disconnect the governor control cable from the governor. Refer to Figure 202.

(4) The left alternator adjustment is accomplished with either a rod or a banana bracket. Loosen the rod; the rod ends are threaded such that rotating the rod itself will loosen or tighten the ends equally. If the banana bracket is installed, remove the two bolts, washers, and alternator tension plate attaching the alternator to the banana bracket.

(5) Remove the self locking nut, washers and bolt attaching the alternator adjustment rod or banana bracket to the bracket attached to the governor. Note the position of the washers for reinstallation.

(6) Remove four governor to engine attachment nuts and washers. Refer to Figure 201.

(7) Remove the alternator adjustment rod (or banana bracket) attachment bracket. Refer to Figure 203. Note the position of the washers for reinstallation.

(8) Remove the governor from the engine. Refer to Figure 201.

B. Installation of Propeller Governor

(1) Install a new governor gasket over the mounting pad studs on the engine. Refer to Figure 201.

(2) Install the governor onto the mounting pad studs. Refer to Figure 201.

(3) Install the alternator adjustment rod (or banana bracket) attachment bracket onto the mounting pad studs. Refer to Figure 203.

(4) Install four governor to engine attachment nuts and washers. Torque nuts 180 to 220 in.-lbs. lubricated with TCM Part No. 646943 Anti-seize Lubricant or Loctite Anti-Seize Lubricant. Refer to Figure 201.

(5) **Adjustment Rod**

(a) Ensuring that the alternator adjustment rod ends are assembled into the rod equal distance attach the adjustment rod to the attachment bracket.

(b) Connect a torque wrench to the alternator pulley retention nut. With an assistant holding the propeller, to prevent the engine crank shaft from rotating, tighten the adjustment rod until the belt no longer slips on the alternator pulley and force applied to the torque wrench is 15 to 25 ft.-lbs. Do not over tighten belt. After final belt adjustment has been made torque jam nut on both ends of adjustment rod, and nuts attaching the adjustment rod to the alternator and to the bracket attached to the engine 15 to 20 ft.-lbs.

(c) After the belt is tensioned, torque the nut attaching the alternator to the mounting bracket 40 to 45 ft.-lbs.

(6) **Banana Bracket**

(a) Insert the alternator tension plate into the banana bracket and hand tighten the hardware attaching the assembly to the alternator.

(b) Connect a torque wrench to the alternator pulley retention nut. With an assistant holding the propeller, to prevent the engine crank shaft from rotating, tighten the alternator tension plate until the belt no longer slips on the alternator pulley and force applied to the torque wrench is 13 to 17 ft.-lbs. Do not over tighten the belt. Torque the alternator tension plate bolts 12 to 15 ft.- lbs. and ensure that a minimum of two threads extend past the alternator body.

(c) After the belt tension has been fully adjusted, torque the nut attaching the banana bracket to the propeller governor bracket and the nut attaching the alternator to the mounting bracket 15 to 20 ft.-lbs.

WARNING: Ensure that there is a minimum clearance of 1/2 inch between the upper cowling skin and the alternator case, fan, belt, and pulley.

(7) Ensure a minimum of 5 threads engagement of the governor control cable into the rod end of the cable eyelet. Using a new cotter pin, connect the governor control cable to the governor control arm in reverse order as disassembled. Refer to Figure 202.

(8) Install the lower engine cowling. Refer to Chapter 71, Engine Cowling - Maintenance Practices.

2. Governor Adjustment

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A. The following governor adjustment procedures are required to allow for proper maximum engine RPM adjustment. Before any adjustment is made to the McCauley governor, the engine oil supply must be at normal operating temperature. For safety reasons it is necessary that two technicians perform the governor adjustment procedure described below.

B. **Propeller Governor Adjustment**

(1) Remove engine cowling. Refer to Chapter 71, Engine Cowling - Maintenance Practices.

(2) If the wind is blowing, point the airplane into the wind.

(3) Using wheel blocks, block the airplane's main gear.

(4) With the emergency brake engaged and feet on the rudder pedals, start the engine and allow the engine oil to warm up to a normal operating temperature. 170 °F recommended.

(5) With the engine at normal operating temperature and the brakes fully engaged, push the propeller control knob into the full high RPM position.

(6) Slowly push in the throttle control until maximum engine RPM is achieved. If maximum RPM is not 2600 RPM (+0, -25 RPM), shut down the engine. The RPM gauge located on the airplane instrumentation panel may be used to determine engine RPM. If necessary, use a calibrated tachometer to verify the reading of the airplane RPM gauge.

(7) Carefully adjust the limit screw on the McCauley governor. Extrapolate for 2600 RPM assuming one turn equals 25 RPM.

(8) Start the engine and perform the procedures above until a maximum engine RPM of 2600 is achieved or adjustments do not affect RPM.

(9) Shut down the engine.

(10) Tighten the jam nut and safety wire the governor limit screw per MS33540.

(11) Install the engine cowling. Chapter 71, Engine Cowling - Maintenance Practices.

(12) Fly the aircraft.

(13) Readjust the governor, if required, to achieve 2600 RPM maximum.

(14) When the propeller is correctly adjusted, there must be 1/8 inch to 1/4 inch nominal distance between the knob and the panel. Refer to Chapter 76, Fuel Mixture Control - Maintenance Practices, Figure 210.

(15) Tighten the jam nut and safety wire the governor limit screw per MS33540.

(16) Install the engine cowling. Refer to Chapter 71, Engine Cowling - Maintenance Practices.

C. **Propeller RPM at Static Conditions** - Note that a properly set governor may not achieve 2600 RPM static, even at full power. The propeller low pitch stop will prevent the required low pitch for full RPM. Proper static RPM is 2550 to 2600.

3. Troubleshooting

A. **Symptom** - Propeller surging or wandering is observed.

- **Probable Cause No. 1** - There is excessive transfer bearing leakage. Engines with excessive transfer bearing leakage can experience surging because the governor may not be able to get enough pressure to the propeller. This will cause a delay in propeller responsiveness, and by the time the propeller responds to earlier governor inputs, they have changed, resulting in propeller wandering.
- **Solution for No. 1** - Perform a transfer bearing leakage test per engine manufacturer's instructions. If the test indicates a high rate of leakage (even though it may still be on the high side of "acceptable" tolerance), this may be your cause. Install the suspect governor on a known "good" aircraft. If the problem disappears, engine work may be indicated.
- **Probable Cause No 2.** - The engine oil is dirty. Contaminants in dirty engine oil can cause blockages of close tolerance passages in the governor, leading to erratic operation.
- **Solution No. 2** - Frequent engine oil changes, as often as every 30 hours, should eliminate the problem.
- **Probable Cause No. 3** - There is excessive play in the aircraft propeller control linkage. Excessive "play" in the linkage between the governor and the cockpit control often leads to erratic operation. Specifically, if the propeller RPM is suddenly changing and holding a new setting on its own, this could indicate a loose linkage.
- **Solution No. 3** - Trace the linkage, locate unsecured sections, and tighten as needed. Please note that although linkages may appear to allow full governor control while the engine is off, it may not in the air. Engine vibration and "stretch" of the mount during operation can often aggravate the condition; therefore, it is important the entire length of the linkage be properly secured, even if the ends alone are tight.

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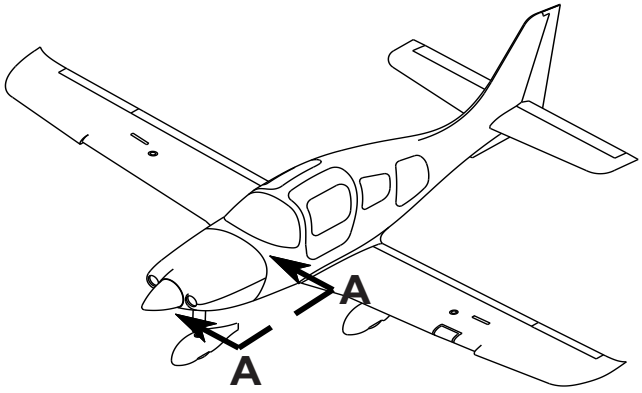
- **Probable Cause No. 4** - There is excessive propeller friction. The propeller may be over-resistant to pitch movement. Either excessively tight shimming of the propeller blades, internal corrosion, or part failure causing binding can cause friction.

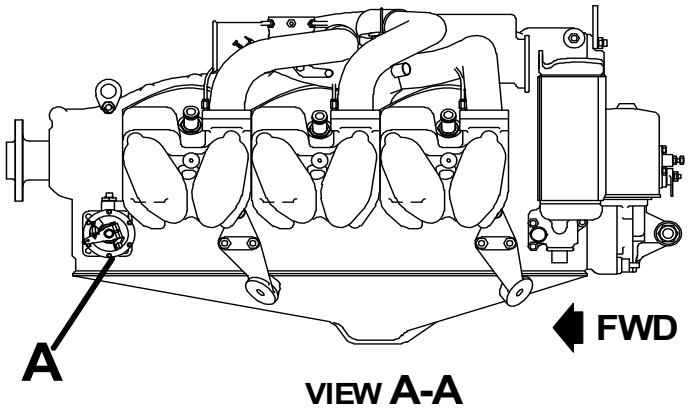
  NOTE: This is rarely the cause of RPM malfunction.
- **Solution No. 4** - Check amount of blade play. A total lack of blade "shake" may indicate excessively tight blade shims. If this is suspected, have the propeller checked by a qualified FAA approved propeller repairman. Note that this check and any needed correction can usually be performed with the propeller installed on the aircraft.

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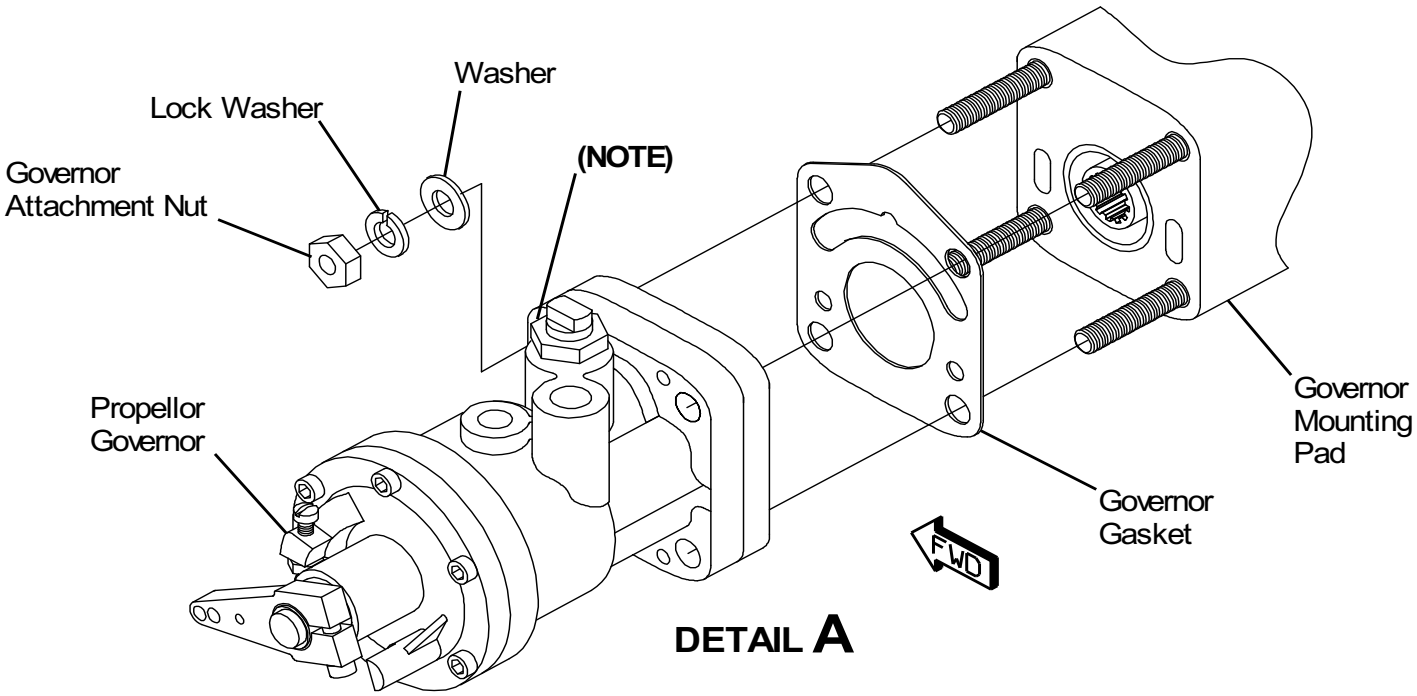
Figure 201 : Sheet 1 : Governor to Engine Attachment

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VIEW **A-A**



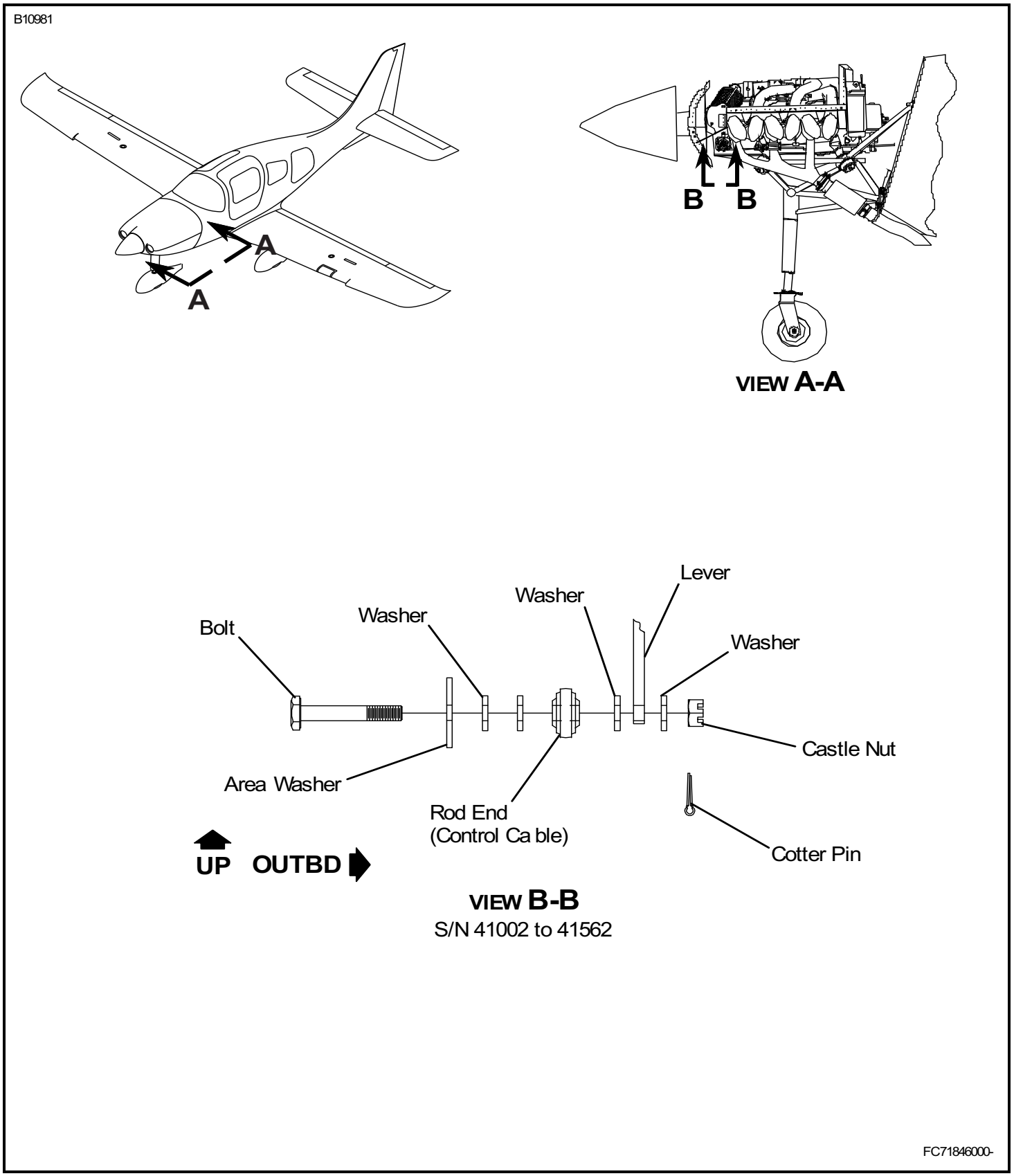
DETAIL A

NOTE: Alternator adjustment rod attachment bracket not shown. Bracket installed on mounting studs this side and front of governor. May have 0.032 thick washer on engine side of bracket (two places).

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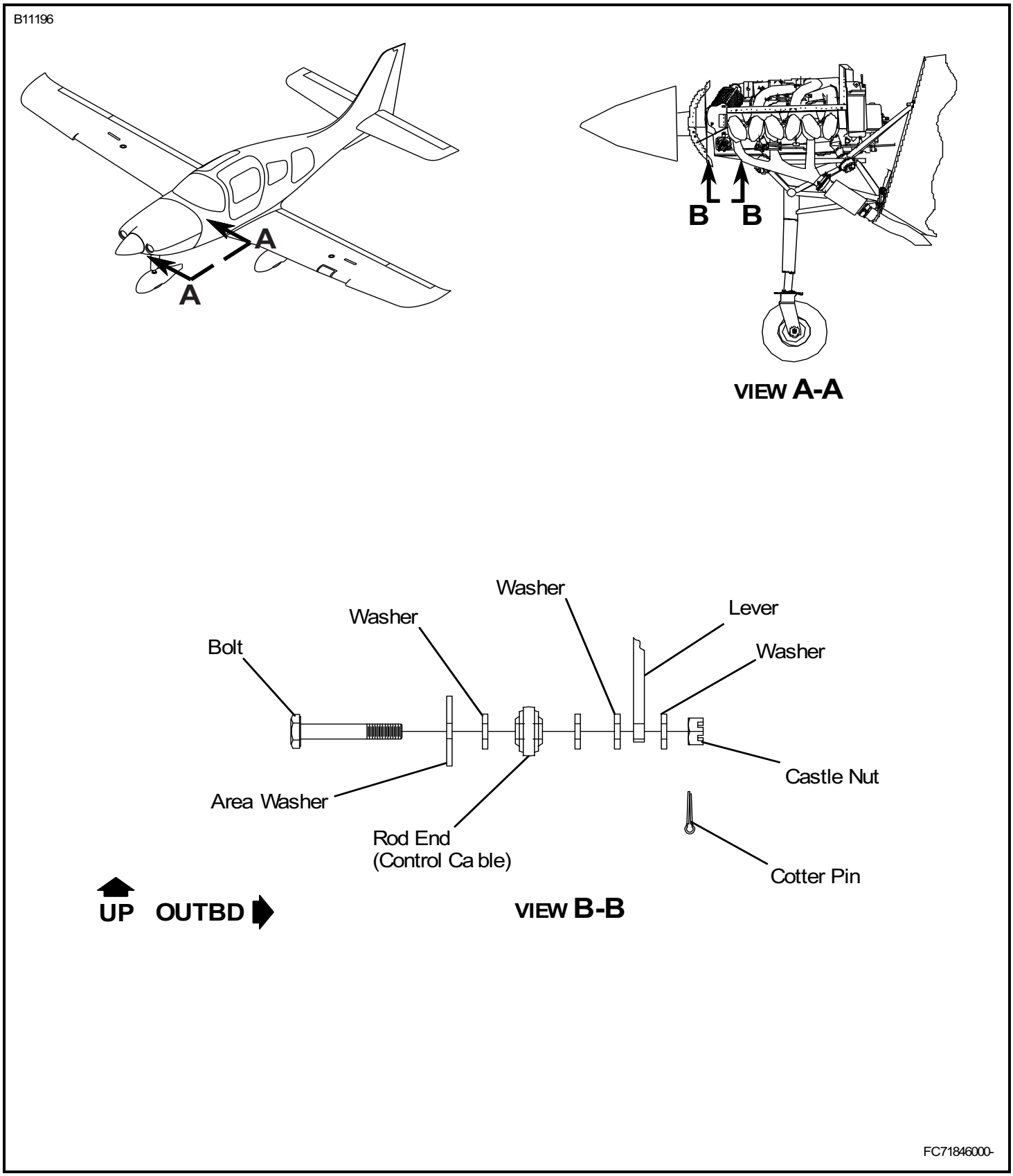
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Figure 202 : Sheet 1 : Governor Control Cable Attachment



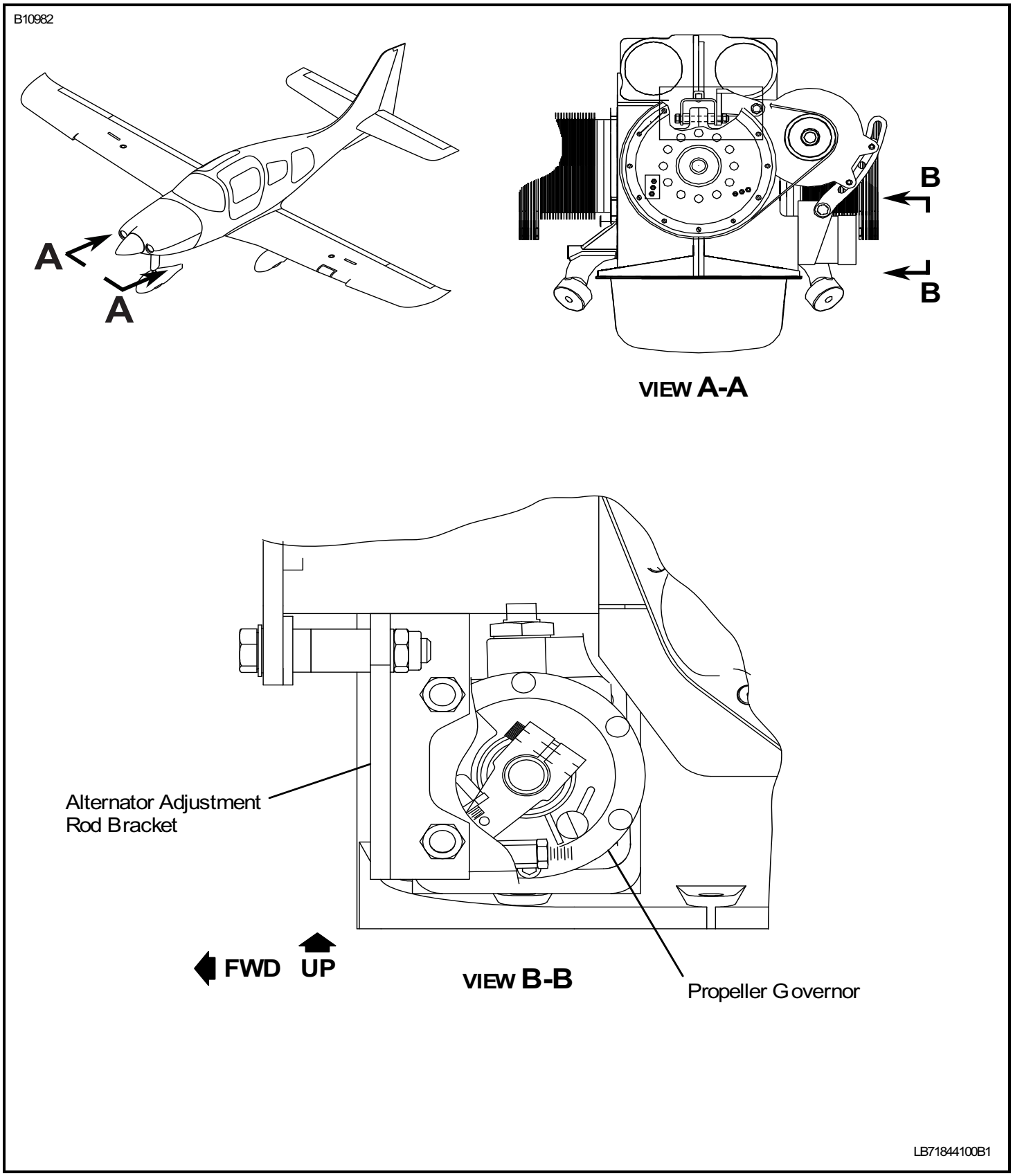
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Figure 202 : Sheet 2 : Governor Control Cable Attachment



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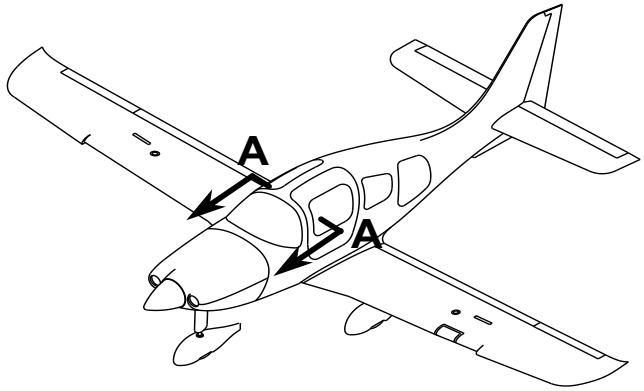
Figure 203 : Sheet 1 : Alternator Adjustment Rod Bracket

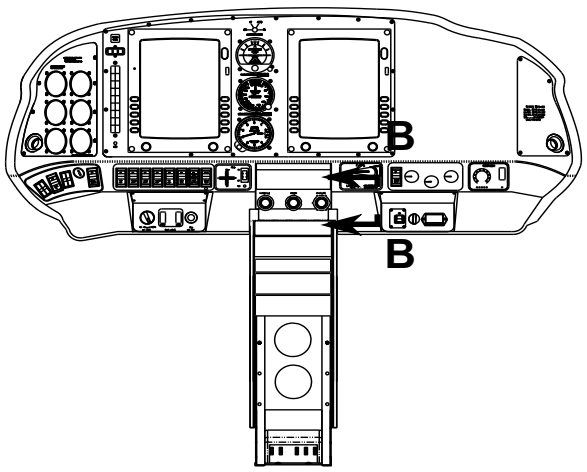


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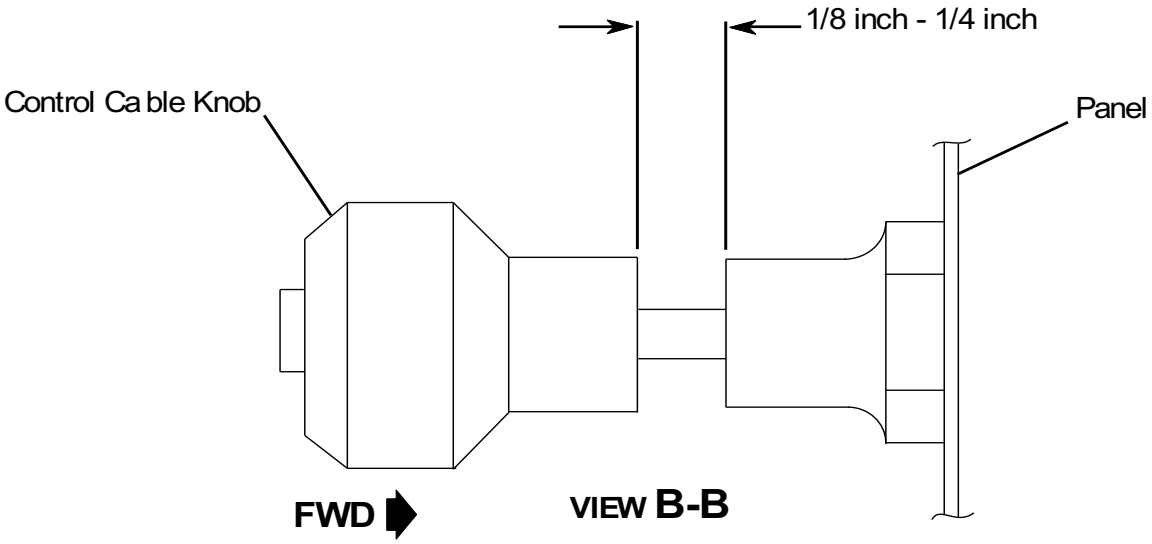
Figure 210 : Sheet 1 : Proper Control Position

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VIEW A-A



VIEW B-B

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POWERPLANT - GENERAL

1. General Description

A. This document describes the troubleshooting, maintenance, removal, installation, and storage of the TSIO-550-C engine. For engine related information not found in this document, refer to applicable Teledyne Continental Motors maintenance manuals.

2. Tools and Equipment

A. The mechanic should be equipped with a complete set of the necessary tools that include the following:

(1) Wrenches - 1/4 in. through 1-1/4 in.
(2) Common and Phillips Head Screwdrivers
(3) Pliers - Common, Diagonal Cutters, Needle Nose, Duck Bill, Snap Ring, Safety Wire
(4) Ratchets 1/4 in., 3/8 in., 1/2 in. drive
(5) Sockets - 1/4 in. drive 5/32 in. through 1/2 in., 3/8 in. drive 3/8 in. through 1 in., 1/2 in. drive 7/16 in. through 1-1/4 in.
(6) Sockets (Deepwell) - 1/2 in. drive, 7/16 in. through 1 in.
(7) Feeler Gauges
(8) Leather or Soft Plastic Mallet
(9) Torque Wrenches 0-500 in.-lbs. and 0-100 ft.-lbs. (see Note)
(10) Micrometers (see Note)
(11) Slide Hammer
(12) Pullers
(13) Thickness Gauges
(14) Vernier Calipers (see Note)
(15) Small Hole Gauges

NOTE: Must be currently calibrated, and the calibration must be traceable to the National Bureau of Standards.

3. Engine Description and Operation

A. **TSIO-550-C Technical Description:**

(1) Manufacturer - Teledyne Continental Motors
(2) Model - TSIO-550-C

B. **Cylinders:**

(1) Arrangement - horizontally opposed
(2) Compression Ratio - 7.5:1
(3) Firing Order - 1-6-3-2-5-4
(4) Number of Cylinders - 6
(5) Bore (inches) - 5.25
(6) Stroke (inches) - 4.25
(7) Piston Displacement (cubic inches) - 550
(8) Brake Horsepower - 310

C. **Operating Limits:**

(1) Crankshaft Speed (RPM, rated maximum continuous operation) - 2600
(2) Crankshaft Speed (RPM, idle) - 600 Min.
(3) Fuel Control System - Continental Continuous Flow Injector
(4) Oil Pressure at Idle (psi at 75° F) - 10
(5) Oil Pressure at Normal Operation (psi at 200° F) - 30 to 60
(6) Oil Sump Capacity (U.S. Quarts) - 8
(7) Oil Temperature Limits:

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(a) Minimum for Takeoff - 100° F
(b) Limit - 240° F
(c) Recommended Operational - 170° to 200° F

D. **Ignition Timing (compression stroke, breaker opens):**
(1) Right Magneto, degrees BTC - 24±1°
(2) Left Magneto, degrees BTC - 24±1°

E. **Ignition:**
(1) Spark Plug - TCM 634675 or Champion RHB32E (RHB32S for platinum engine)
(2) Spark Plug Gap - Per manufacturer
(3) Spark Plug Torque (in.-lbs.) - 300 to 360
(4) Magnetos (left and right) - S6RSC-25P

4. Engine Removal, Cleaning, and Installation

A. This section provides instructions to remove and install the engine and engine mount. Refer to the following sheets in Figure 1:
(1) Sheet 1: Left Intercooler, Propeller Governor, Left Side Exhaust, Warm Air Induction Assembly, Left Turbocharger
(2) Sheet 2: Right Intercooler, Right Turbocharger, Warm Air Induction Assembly
(3) Sheet 3: Magnetos, Oil Filler/Dipstick, Crankcase Breather Hose, Fuel Distribution Valve
(4) Sheet 4: Oil Cooler, Oil Filter, Brake Fluid Reservoir, Exhaust Wastegate, Tailpipe, Turbocharger
(5) Sheet 5: Air/Oil Separator, Starter, Flame Shield, Tailpipe, Turbocharger
(6) Sheet 6: Magnetos, Fuel Flow Transducer, No. 1 Alternator
(7) Sheet 7: Oil Filler/Dipstick, Fuel Distribution Valve, No. 2 Alternator

(1) **Engine Removal**

NOTE: Always install new cotter pins at all control cable connections.

(a) Place all cabin switches and the fuel shutoff valve in the off position.
(b) Secure the tail of the aircraft using a jack stand and an undertail tiedown configuration.
(c) Remove the upper and lower engine cowling per Section 71-10-00, Removal of the Engine Cowling.
(d) Remove the hat rack floor per instructions in Section 25-30-00, Removal of the Hat Rack Carpet.
(e) Remove the battery compartment access cover and disconnect the negative battery leads from the batteries.
(f) Disconnect the ground strap between the engine mount and engine case at the engine mount side of the ground strap.
(g) Loosen the No. 2 (left) alternator adjustment rod and slip the drive belt off the alternator pulley.
(h) Remove the propeller, spinner, hub assembly, and alternator drive pulley from the engine. Refer to Chapter 61.
(i) Disconnect the alternator output wires from the left and right alternators.
(j) Disconnect the starter power lead at the starter terminal stud.
(k) Disconnect and label all wiring harness connections to components attached to the engine (ie. magnetos, fuel flow transducer, fuel pressure switch, manifold pressure transducer, CHT, EGT, and TIT probes, etc.).
(l) Remove all clamps and tie straps, and pull the alternator output wires and wiring harness bundles through the engine baffling.
(m) Disconnect the exhaust expansion joint bracket. Retain the bracket bolts, bushings, and nuts for reinstallation. Refer to Figure 2.
(n) Remove the tailpipes, wastegate and crossover tube, and turbochargers per the latest version of TCM Form No. X30616A.
(o) Disconnect the main and return fuel lines from the firewall bulkhead fittings.
(p) Disconnect the fuel injection head drain hose from the drain tube.
(q) Disconnect the engine fuel pump drain hose from the drain tube.

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(r) Remove the manifold drain hose sniffle valve from the drain tube flange leaving hoses attached.

(s) Disconnect the crankcase breather hose from the drain tube.

(t) Remove the fresh air ventilation ducting hose from the fresh air manifold on the firewall.

(u) Remove the hot air ventilation ducting hoses from the sonic nozzles.

(v) Remove the throttle cable from the throttle control lever and cable attachment bracket.

(w) Remove the fuel mixture cable from the engine fuel pump mixture control arm and cable attachment bracket.

(x) Remove the propeller governor cable from the governor control lever and cable attachment bracket.

(y) Disconnect the ducting hose from the underside of the air filter assembly.

(z) Remove all clamps and tie straps used to fasten down wiring, cables, fuel lines, and hoses that will interfere with engine removal.

(aa) Remove four engine isolator bolts, outer isolator cushions, spacers, and heat shields (aft isolators only) from the engine. With the proper hoist and hoist attachment connected to the engine lifting eyes, remove the engine from the aircraft.

(2) **Engine Cleaning** - Before cleaning the engine, cover or remove all electrical components subject to damage from cleaning solution saturation. Plug all openings using suitable plastic caps, rubber plugs, and covers. Use standard solvent or mineral spirits to thoroughly clean all areas of the engine. Low air pressure may be carefully used to assist cleaning and drying of the engine components.

CAUTION: Never use high pressure washers or cleaning devices to clean the engine.

(3) **Engine Installation** - With the proper hoist and hoist attachment connected to the engine lifting eyes, hoist the engine into position making sure attachment bolt holes in the engine standoff legs align with the center holes in the engine isolator cushions.

(a) Install four engine outer isolator cushions, spacers, heat shields (aft isolators only), safety wire tabs, and bolts. Maintain 0.40 inch clearance between the heat shield and the engine frame. Slight bending and/or trimming of the heat shield is acceptable to achieve the required clearance. Torque bolts 33 to 37 ft.-lbs (44.75 to 50.16 Nm).

(b) Install safety wire per MS33540.

(c) Connect ducting hose to the underside of the air filter assembly and tighten the steel retaining clamps.

(d) Install the propeller governor cable to the cable attachment bracket. Torque retaining bolts 30 to 36 in.-lbs. Connect the cable end to the propeller governor control lever.

(e) Install the fuel mixture control cable to the mixture control bracket. Torque retaining bolts 30 to 36 in.-lbs. Connect the end of the cable to the engine fuel pump mixture control arm lever.

(f) Install the throttle control cable to the cable attachment bracket. Torque retaining bolts 30 to 36 in.-lbs. Connect the end of the cable to the throttle control lever.

(g) Install the inlet and outlet hot air ventilation ducting to the sonic nozzles, and tighten the steel retaining clamp.

(h) Install the fresh air ventilation ducting hose to the fresh air manifold on the firewall, and tighten the steel retaining clamp.

(i) Connect the crankcase breather hose to the drain tube, and tighten the steel retaining clamp.

(j) Install the manifold drain hose sniffle valve to the drain tube flange. Torque the sniffle valve retaining nut 240 to 280 in.-lbs.

(k) Connect the engine fuel pump drain hose to the drain tube, and tighten the steel retaining clamp.

(l) Connect the fuel injection head drain hose to the drain tube, and tighten the steel retaining clamp.

(m) Connect the main and return fuel lines to the firewall bulkhead fittings. Torque the main fuel line fitting 450 to 500 in.-lbs. Torque the return fuel line fitting 270 to 300 in.-lbs.

(n) Connect the starter power lead to the starter terminal stud. Torque the terminal stud retaining nut 140 to 180 in.-lbs.

(o) Insert alternator output wires and wiring harness bundles through their respective penetrations in the engine baffling. Seal the penetration with high temperature sealant.

(p) Connect the output wires to both alternators. Double wrench the retaining nuts.

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(q) Install the turbochargers, wastegate and crossover tube, and tailpipes per the latest version of TCM Form No. X30616A. Safety wire the right side tailpipe clamp per Figure 3 using 0.032-inch diameter MS20995C32 safety wire, or equal.

(r) Install the exhaust expansion joint bracket. Insert the bushing into the bracket hole or slot and tighten the bracket bolt and nut snug to remove all play in the bolted assembly.

(s) Install the propeller, spinner, hub assembly, and alternator drive pulley to the engine per instructions in Chapter 61.

(t) Connect the ground strap between the engine and engine mount. Torque the retaining bolt on the mount side of the ground strap 30 to 36 in.-lbs.

(u) Install in reverse order as disassembled all clamps and tie straps used to fasten down wiring, cables, fuel lines, and hoses which will chafe, rub, or interfere with surrounding objects during engine operation. If any hoses, wires or lines are touching the engine induction tubes, oil radiator, or engine mount, use a dab of high temperature silicone between them. If clearance between the engine isolation assembly and the induction air SCAT tubing is less than 1/2 inch apply high temperature silicone between.

(v) Connect the negative battery leads to the batteries. Install the battery compartment access cover.

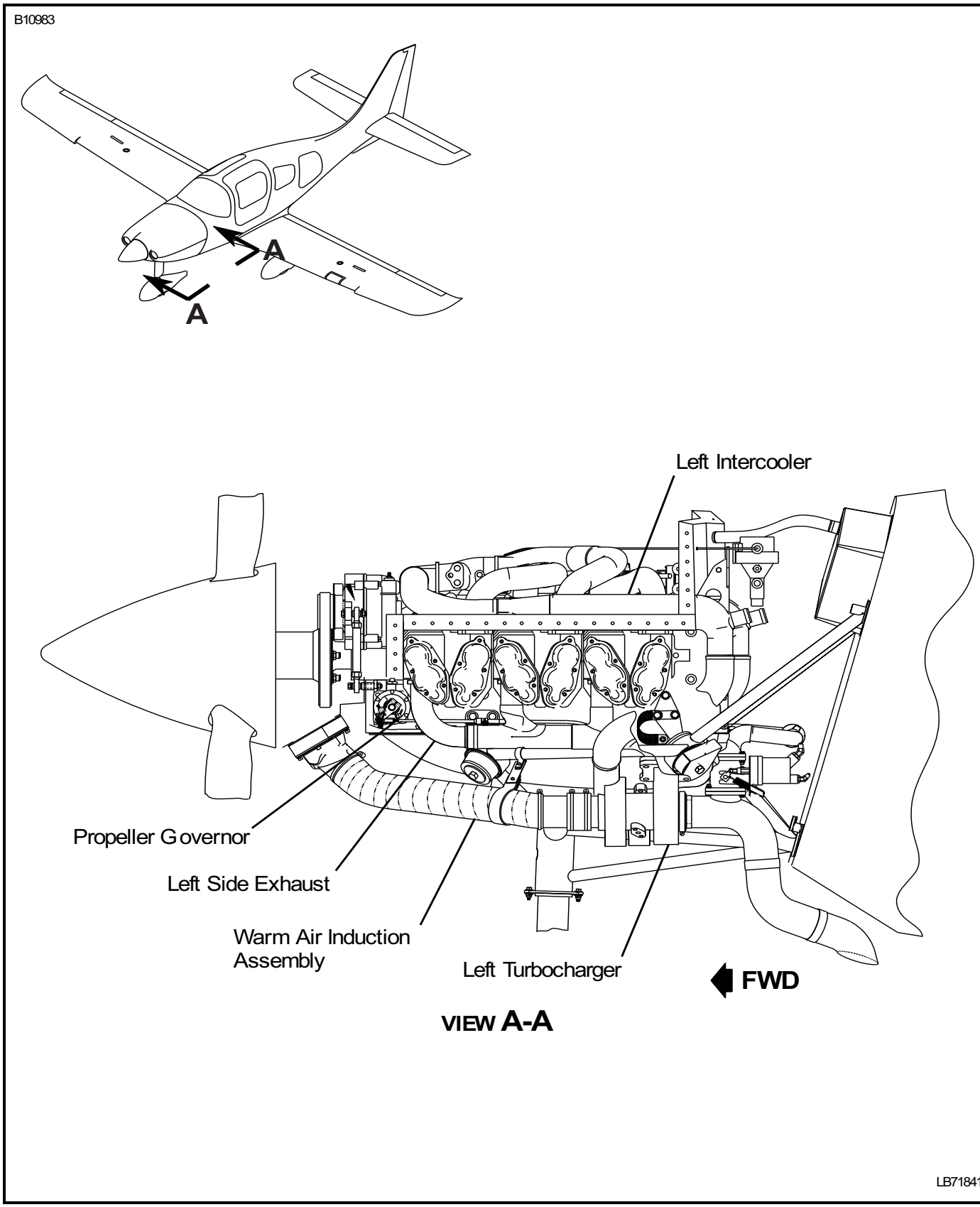
(w) Reinstall the hat rack floor per instructions in Chapter 25.

(x) Install the upper and lower cowling per Section 71-10-00, Installation of the Engine Cowling.

(y) Remove the jack stand and undertail tie down configuration from the tail of the aircraft.

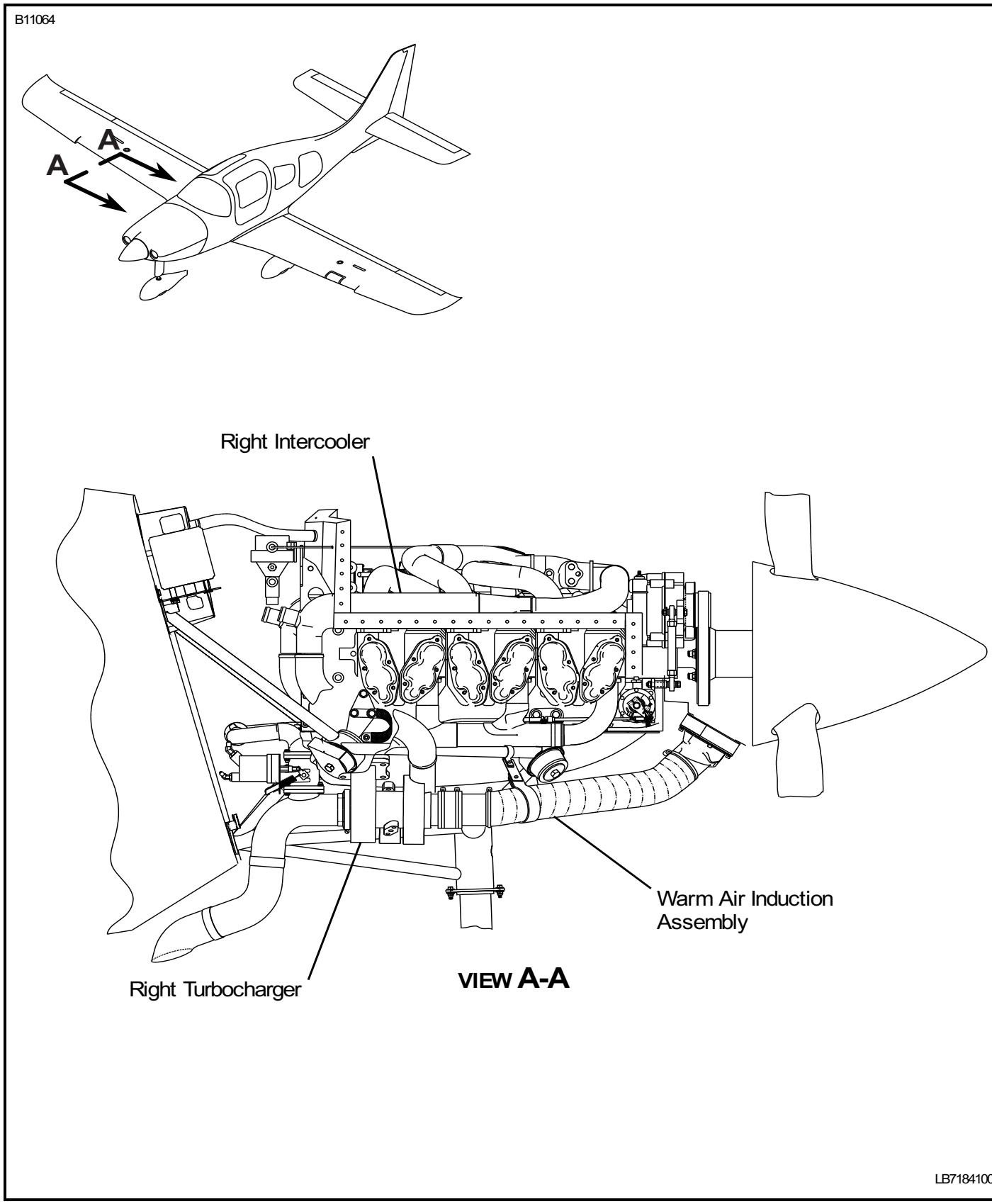
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Figure 1 : Sheet 1 : Engine



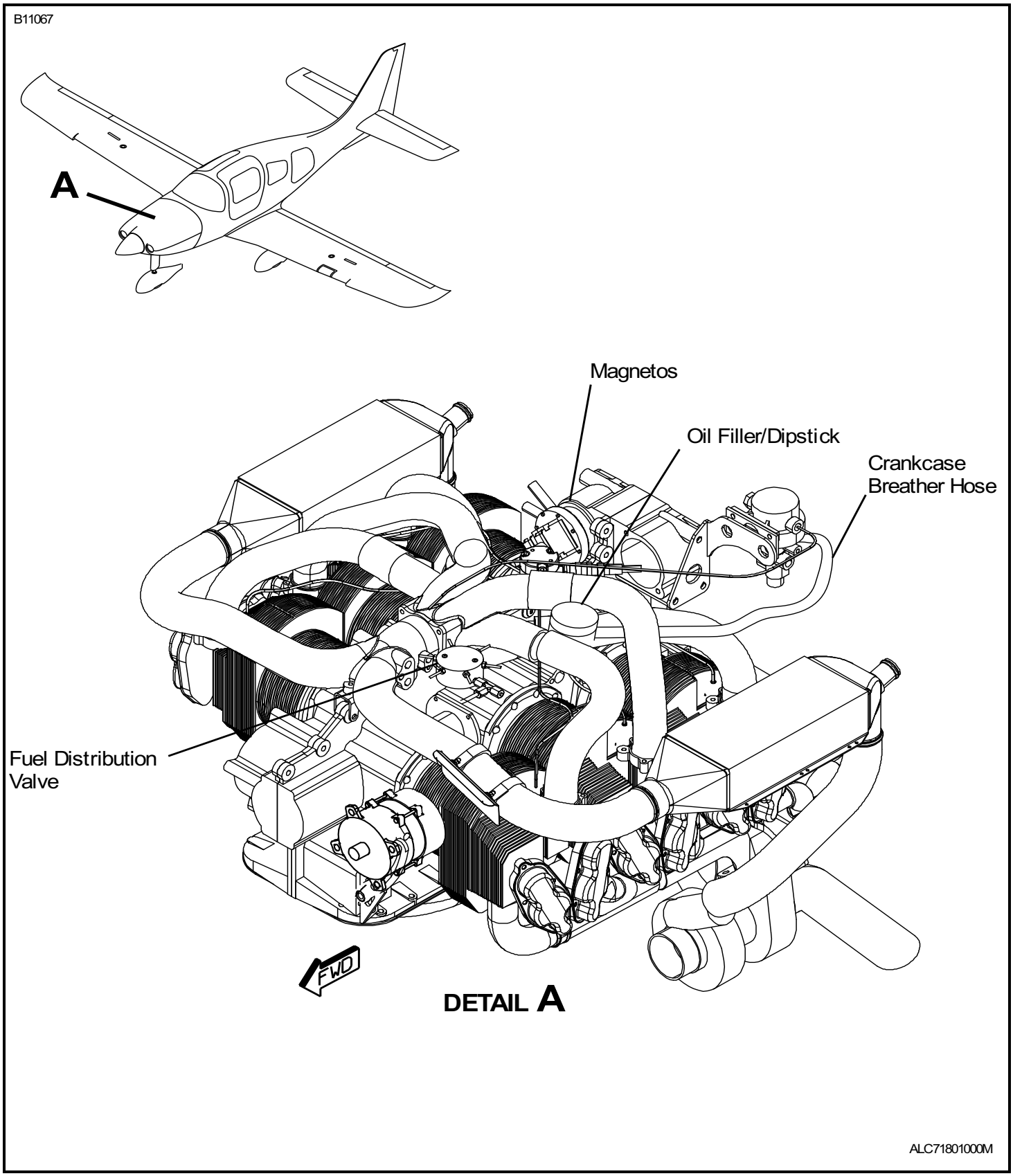
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Figure 1 : Sheet 2 : Engine



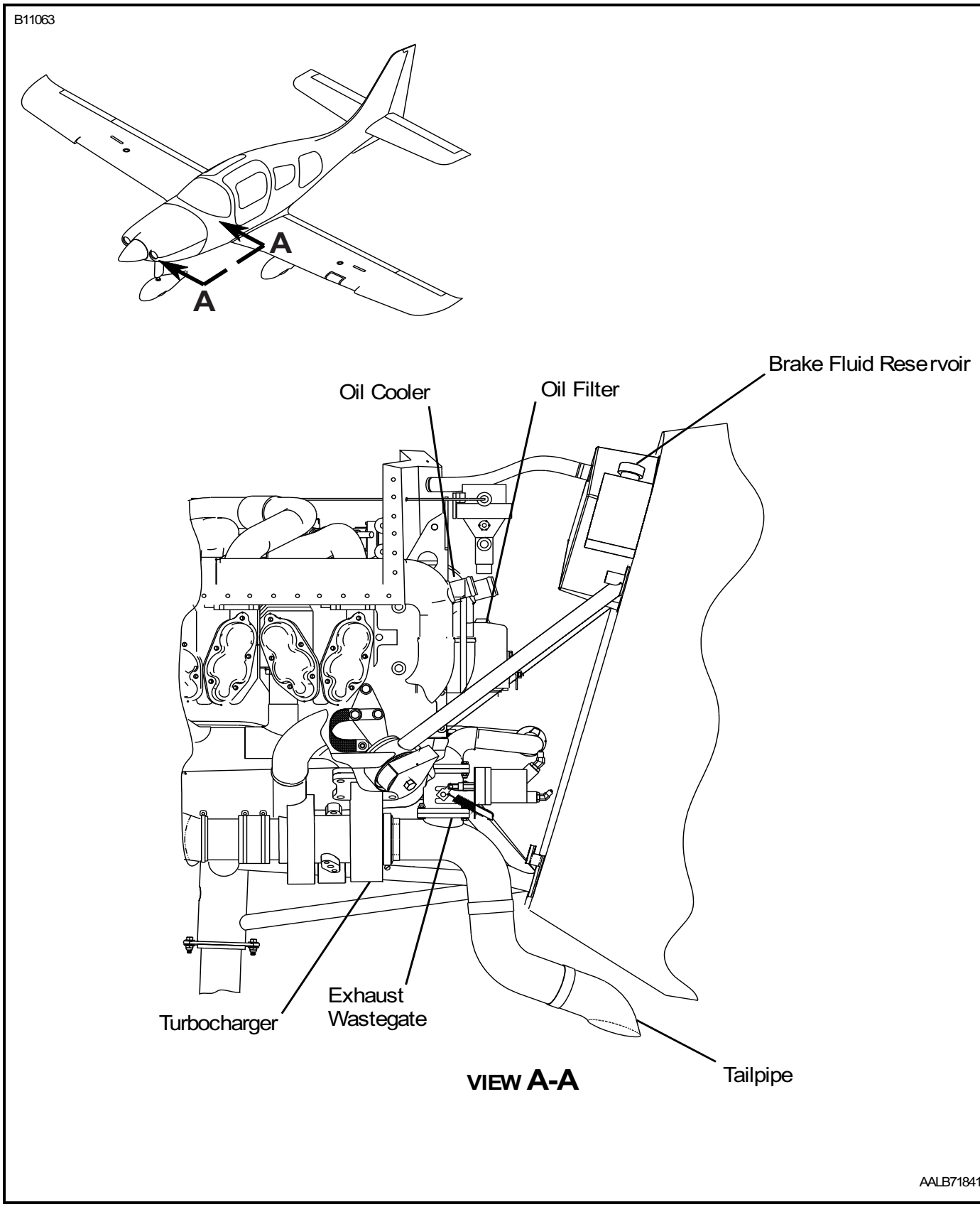
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Figure 1 : Sheet 3 : Engine



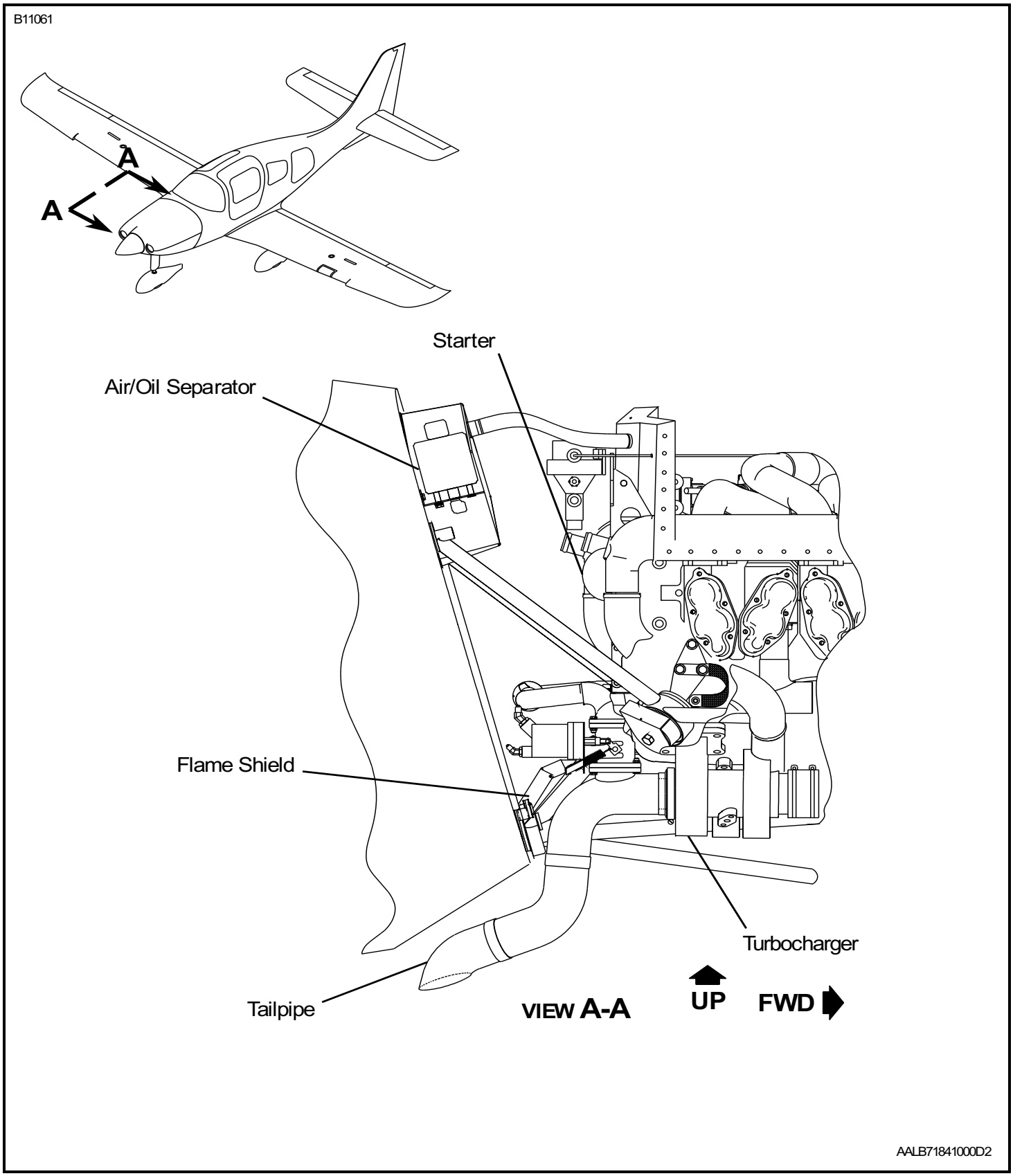
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Figure 1 : Sheet 4 : Engine



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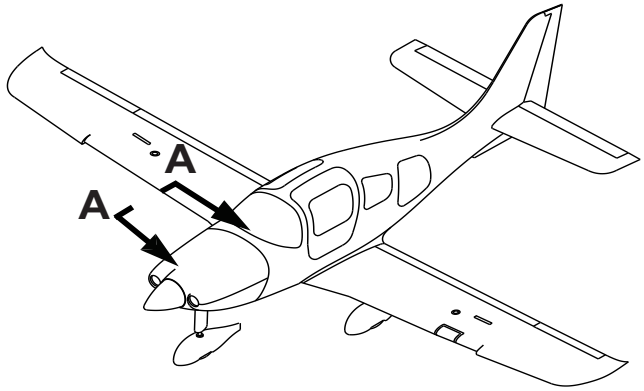
Figure 1 : Sheet 5 : Engine

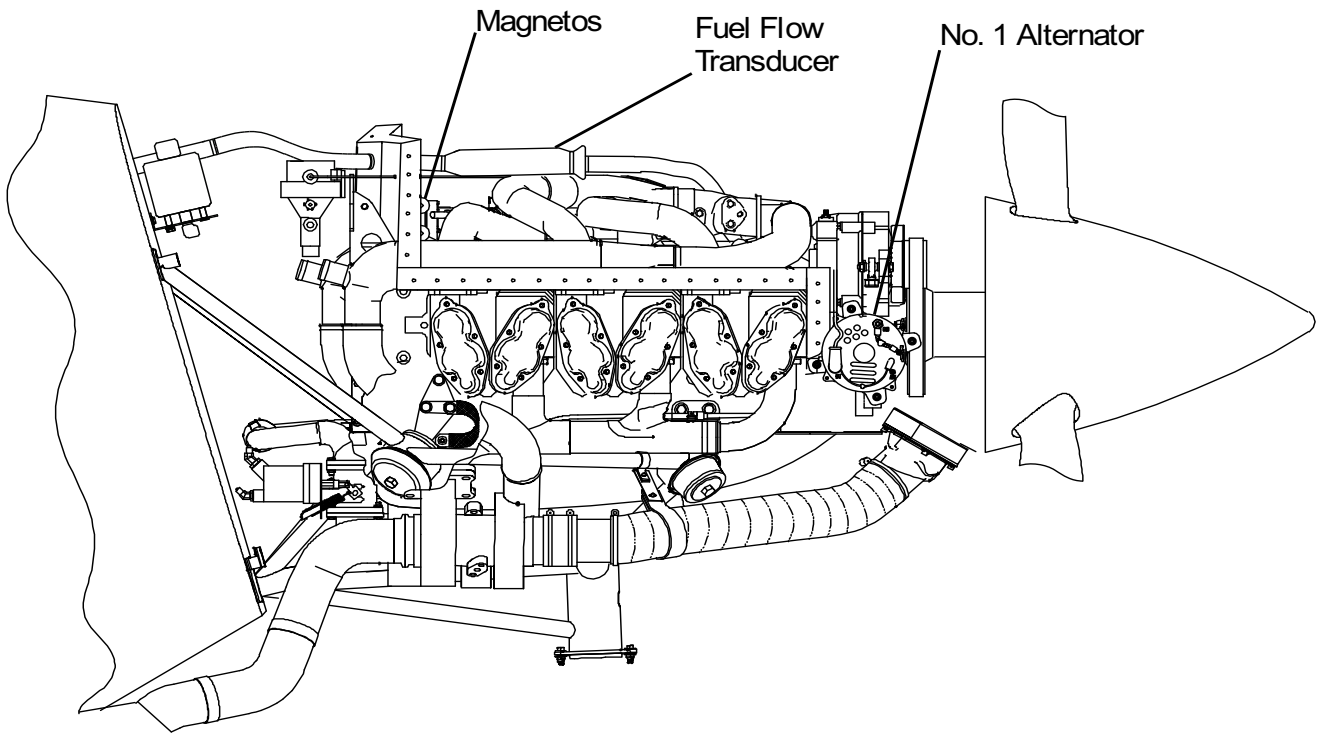


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Figure 1 : Sheet 6 : Engine

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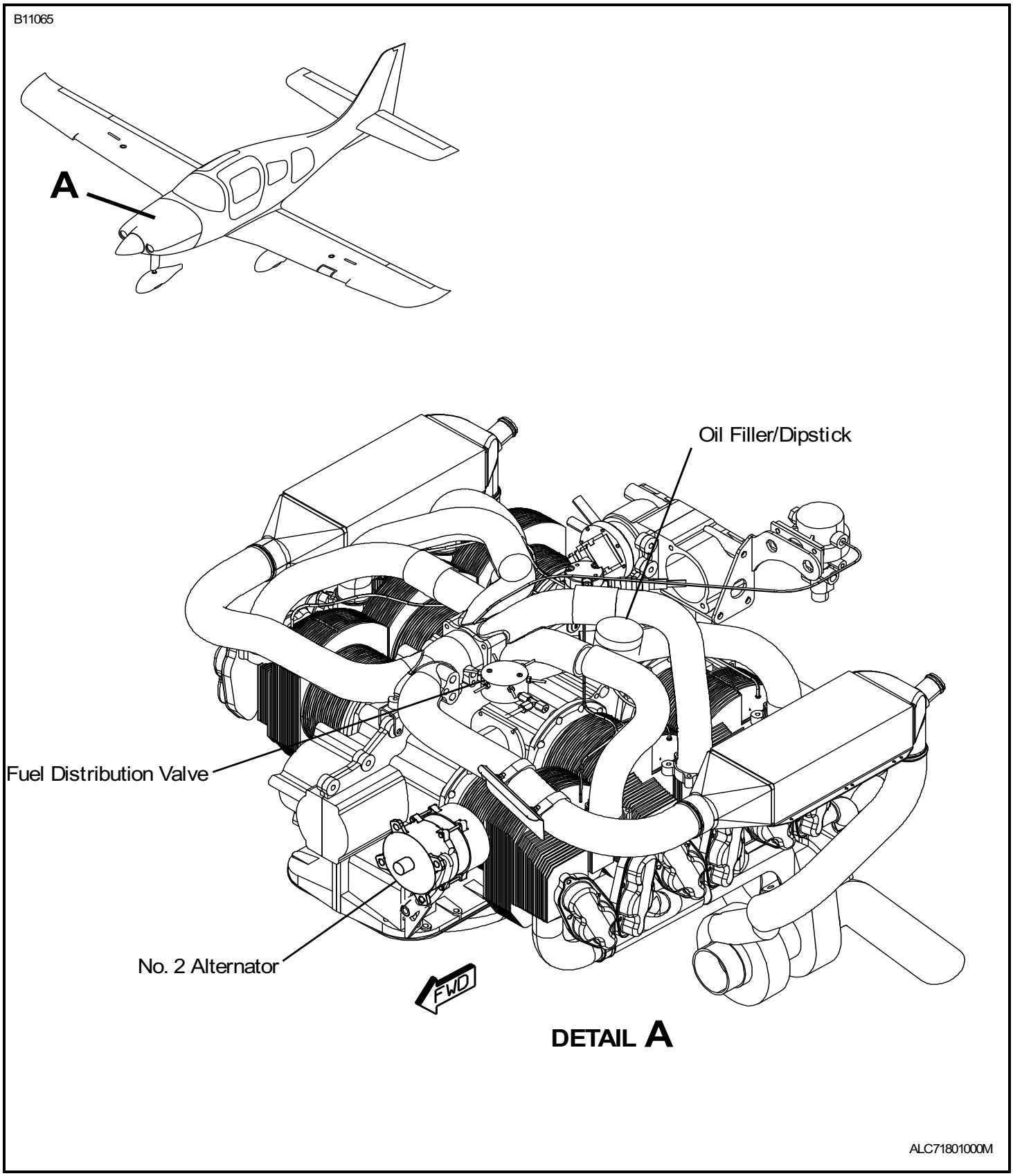


VIEW A-A

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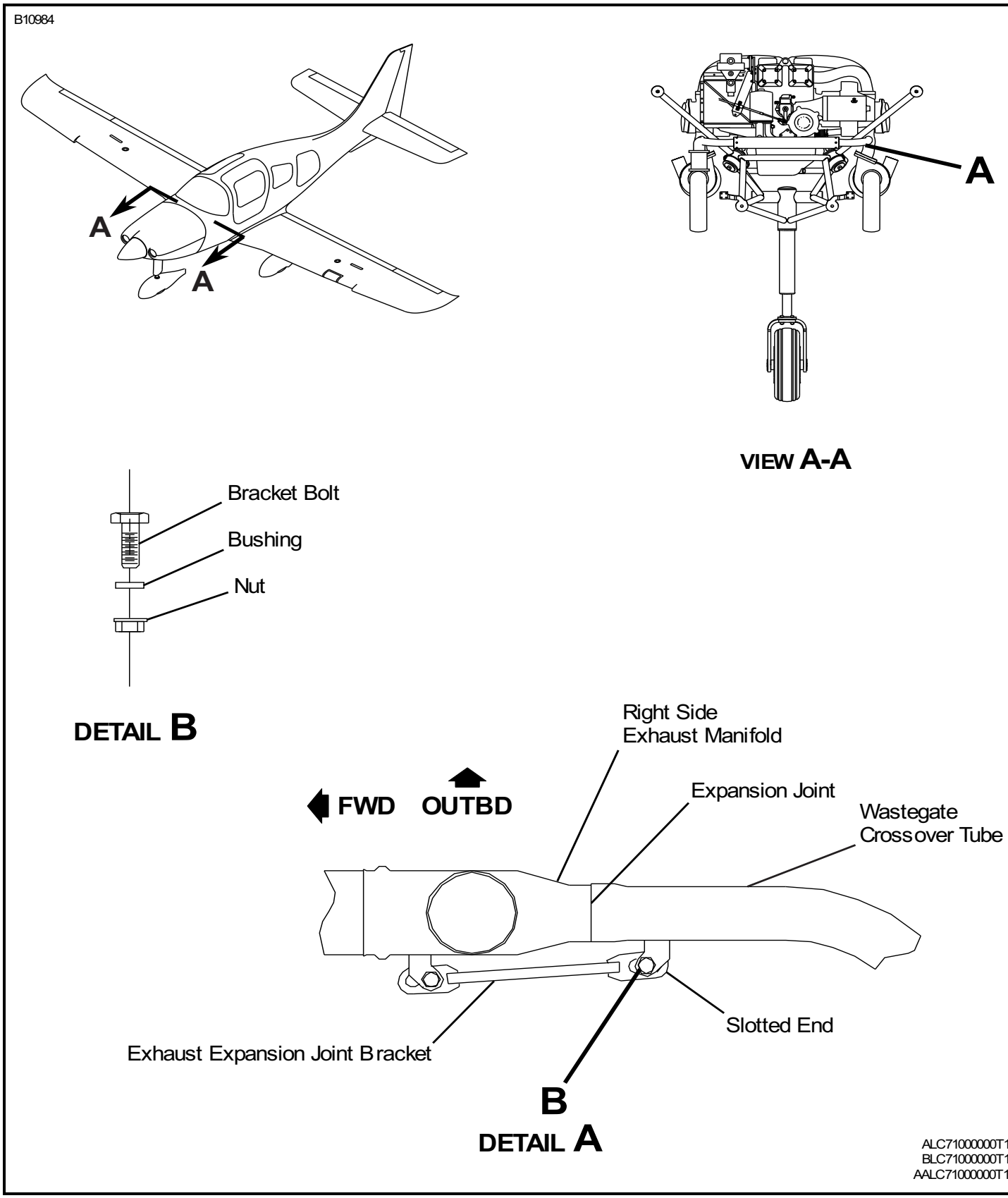
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Figure 1 : Sheet 7 : Engine



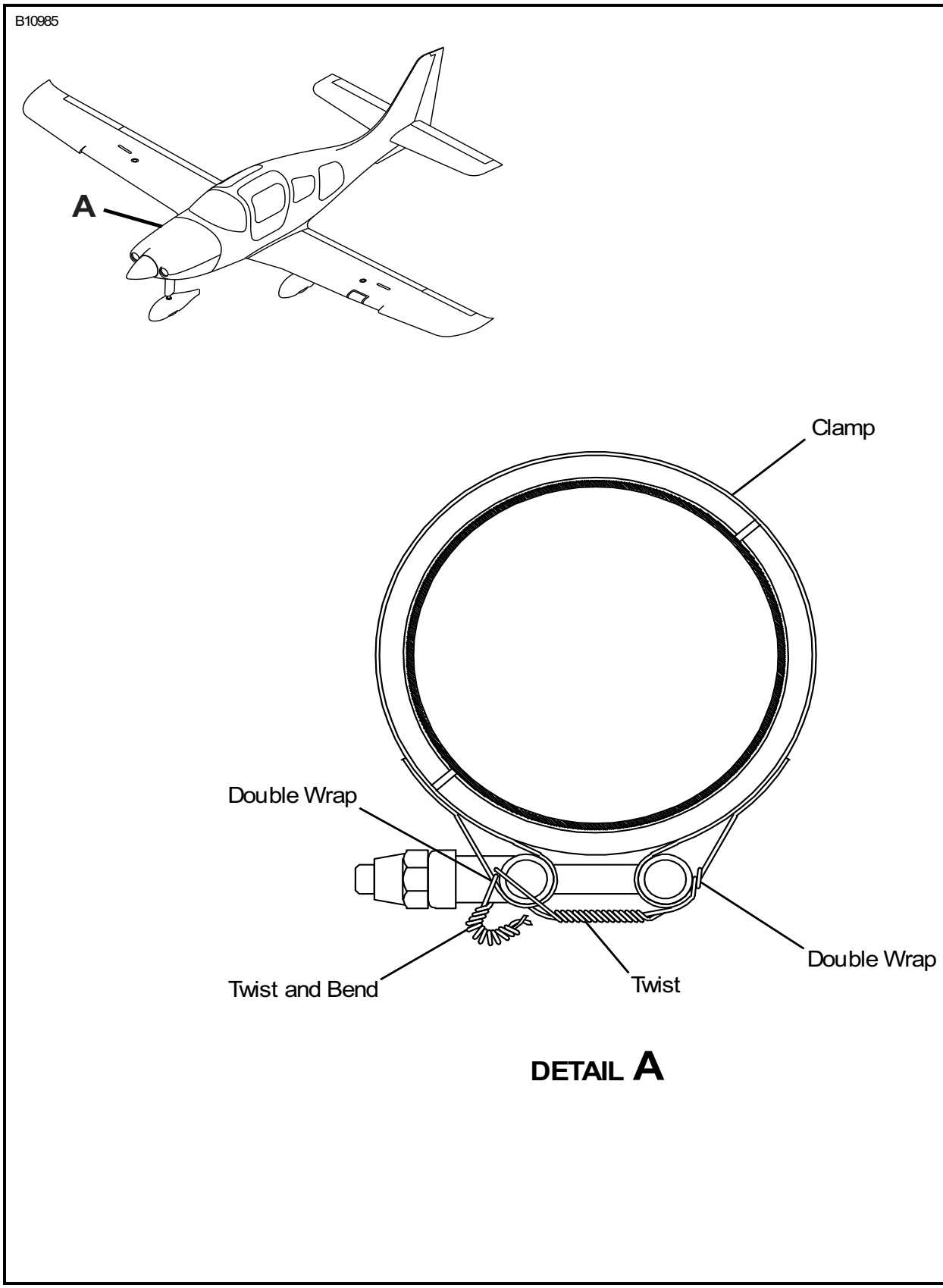
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Figure 2 : Sheet 1 : Exhaust Expansion Joint Bracket



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Figure 3 : Sheet 1 : Right Side Tailpipe Clamp Safety Wire



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POWERPLANT - TROUBLESHOOTING

1. Engine Troubleshooting

A. The following diagnostic tests are basic guidelines to follow when diagnosing engine starting and running problems. More detailed information on the engine's internal components can be found in the Teledyne Continental Motors Maintenance and Overhaul Manual FORM NO. X30616A. These tests address the following issues:

(1) Engine Cranks Over But Will Not Start

(2) Engine Stalls At Idle RPM

(3) Engine Misfires During High RPM

(4) High Engine Oil Temperature

(5) High Engine Cylinder Head Temperature

Table 101. Engine Cranks Over But Will Not Start

If:	Action To Be Taken:
Engine is not cranking over fast enough	Replace or recharge batteries, clean or replace battery terminal connections, or replace faulty starter.
NOTE: Before considering the following options, ensure that the low boost pump has been turned on to prevent possible vapor lock.	
No spark is present at engine spark plugs AND impulse couplings are not clicking	Replace or repair magnetos.
No spark is present at engine spark plugs AND impulse couplings are clicking	Repair or replace ungrounded magnetos.
No fuel flow is present on fuel gauge AND no fuel is present in fuel tanks	Fill tanks with fuel.
No fuel flow is present on fuel gauge AND fuel is present in fuel tanks	Check that fuel pump mixture control is in proper position, boost pump is working properly, all fuel valves are open, and all fuel filters are free flowing.
Fuel flow is present at fuel gauge	Check for flooded engine.

Table 102. Engine Stalls At Idle RPM

If:	Action To Be Taken:
Idle stop screw is not adjusted correctly	Adjust idle stop screw.
Mixture control lever is not adjusted correctly	Adjust mixture control lever.
Magneto capacitor is not functioning properly	Repair or replace magneto capacitor as necessary.
Engine spark plugs are oil fouled	Check engine compression and overhaul top of engine.

Table 103. Engine Misfires During High RPM

If:	Action To Be Taken:
Fuel line, valve, or filter is blocked	Clean or replace fuel lines, valves, and filters to remove all restrictions.
Engine fuel pump operation is inadequate	Repair or replace fuel pump or pump shaft.
Timing is incorrect	Re-time magnetos.
Magneto internal timing fails due to broken keyway, worn out bearings, or oil saturation from leaking oil seal	Repair or replace magneto as necessary.
Breaker points are improperly adjusted	Readjust breaker points.
Capacitor is not functioning correctly	Replace capacitor.
Valve spring is broken	Replace valve spring.
Valve is sticking or burnt	Overhaul top end of engine.

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None of the above	Replace worn or sticking hydraulic tappet or worn camshaft.

Table 104. High Engine Oil Temperature

If:	**Action To Be Taken:**
Oil level in engine crankcase is low	Fill with correct grade engine oil.
Engine oil viscosity is incorrect	Re-service engine oil system using correct grade of oil.
Engine oil filter is plugged	Replace oil filter.
Engine oil cooler is externally blocked	Clean oil cooler fins.
Engine oil cooler vernatherm is not functioning correctly	Replace vernatherm valve.
Engine oil cooler is internally blocked	Remove and flush oil cooler.
Oil temperature gauge or sending unit is not functioning correctly	Replace as necessary.

Table 105. High Engine Cylinder Head Temperature

If:	**Action To Be Taken:**
Improper grade of fuel is being used	Drain fuel tanks and refill using proper grade of fuel.
Cylinder head cooling fins are blocked	Clean cooling fins.
Magneto timing is incorrect	Re-time magnetos.
Magneto internal timing fails due to broken key-way, worn out bearings, or oil saturation from leaking oil seal	Repair or replace magneto as necessary.
Breaker points are improperly adjusted	Readjust breaker points.
Capacitor is not functioning correctly	Replace capacitor.
CHT probe or temperature gauge is not working correctly	Replace as necessary.
Engine pistons have excessive carbon buildup	Overhaul top of engine.
Engine cylinders have leaking exhaust valves	Overhaul top of engine

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ENGINE COWLING - MAINTENANCE PRACTICES

1. General

A. This section gives the maintenance procedures for the upper and lower engine cowling. The Model T240 with the TKS Anti-Ice FIKI option has a different upper cowling installed to allow for the operation of the windshield TKS nozzles. The removal, installation and general maintenance procedures are identical to the non-TKS option airplanes.

2. Engine Cowling Removal, Installation, and Maintenance

A. Removal of the Engine Cowling

(1) Using suitable pliers or by attaching a drill/driver, remove the hinge pins from the left and right side of the cowling by pulling the pins outward through the front inlet holes. Refer to Figure 201.

NOTE: When using a powered drill/driver, select low speed and low torque.

(2) Remove the screws attaching the nose gear fairing to the lower cowling and the two screws on the outboard rear nose gear attaching the cowling to the fuselage. Do not remove the screw attaching the rear center fairing to the fuselage. This screw will hold the nose fairing in place when installing the lower cowling. Refer to Figure 202.

(3) Remove the six front cowling attachment screws. Refer to Figure 203.

(4) Remove the screws attaching the lower cowling to the fuselage. An assistant will be required to help hold the lower cowling and prevent it from falling and hitting the nose wheel pant or ground. Refer to Figure 203.

(5) Remove the lower cowling from the aircraft.

(6) Remove screws attaching the upper cowling to the fuselage. Refer to Figure 203.

NOTE: The removal procedures for airplanes with the TKS option are identical with the procedures for the airplanes that do not have the TKS option.

(7) Lift up the cowling to gain access to the fresh air tube that attaches to the NACA duct at the side of the cowl. Remove clamp at the NACA duct, then remove the tube.

(8) Remove the upper cowling from the aircraft.

B. Installation of the Engine Cowling

(1) With an assistant, install the lower cowling onto the fuselage so that cowling attachment screw holes align with the corresponding holes in the fuselage joggle. Install the number one attachment screw (closest to the hinge) and the lowest screw that shows good alignment. Repeat for the opposite side. The screws should be loose. Do not final torque at this time. Refer to Figure 203.

(2) Position the upper cowl against the bulkhead and insert all fasteners. Do not start the threads at this time.

NOTE: The installation procedures for airplanes with the TKS option are identical with the procedures for the airplanes that do not have the TKS option.

(3) Insert the hinge pins by hand through the front pin holes, located next to the outboard areas of the air inlet holes, and into the hinge elements until they stop. The pin holes are not on all aircraft and their use is optional, if present. Refer to Figure 204. As necessary, apply a light coating of Aeroshell 15W50 engine oil, Mil-L-7870 lubricating oil, or Dow Corning DC 7 silicone release compound to the first two inches of the hinge pin to aid installation.

(4) Attach the hinge pin to a drill/driver and feed the pin into the hinge elements while simultaneously manipulating the cowl halves as required. Insert both pins completely before proceeding.

NOTE: When using a powered drill/driver select low speed and low torque.

NOTE: It is recommended to insert the copilot side hinge pin first. Hinge elements at the leading edge become obscured by engine baffling on the pilot's side.

(5) Install all remaining lower cowl fasteners. Tighten all upper and lower cowl fasteners beginning with the top center progressing circumferentially toward the nose wheel fairing. Torque screws 30 to 36 in.-lbs.

(6) Align the nose fairing attachment screw holes with the corresponding holes in the lower cowling, and install the attachment screws. Torque screws 20 to 25 in.-lbs. Install two outboard rear nose gear and cowling-to-fuselage attachment screws. Torque screws 30 to 36 in.-lbs. Refer to Figure 202.

(7) Attach the fresh air tube to the NACA duct on the right side of the cowl with a clamp. Tighten clamp.

(8) Install front six cowling attachment screws. Torque screws 30 to 36 in.-lbs. Refer to Figure 203.

C. **Maintenance of the Engine Cowling** - The only cowling maintenance item is to repair the fire resistant paint on the

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inside of the upper and lower cowl that may have been worn off due to the rubbing of the baffling on the cowl. The fire protective paint used is Ocean Fire Retardants No. 477 two-part epoxy. When the paint is exposed to flame, it puffs up to form a very dense, insulating, spongy foam crust, which retards heat penetration to the underlying surface. Use the following repair method to repaint worn areas inside the cowling:

(1) Ensure the surface of the damaged area is dry and free from oil or grease.

(2) Mix eight parts No. 477A with one part No. 477B by volume. Allow 60 minutes for the paint to activate at a room temperature of 70° F.

(3) Using a brush, apply two coats of paint to the damaged area 23 to 27 mils thick. Allow 60 minutes of drying time between coats.

(4) Cure times at 70° F are:

  (a) Dry to recoat - 60 minutes

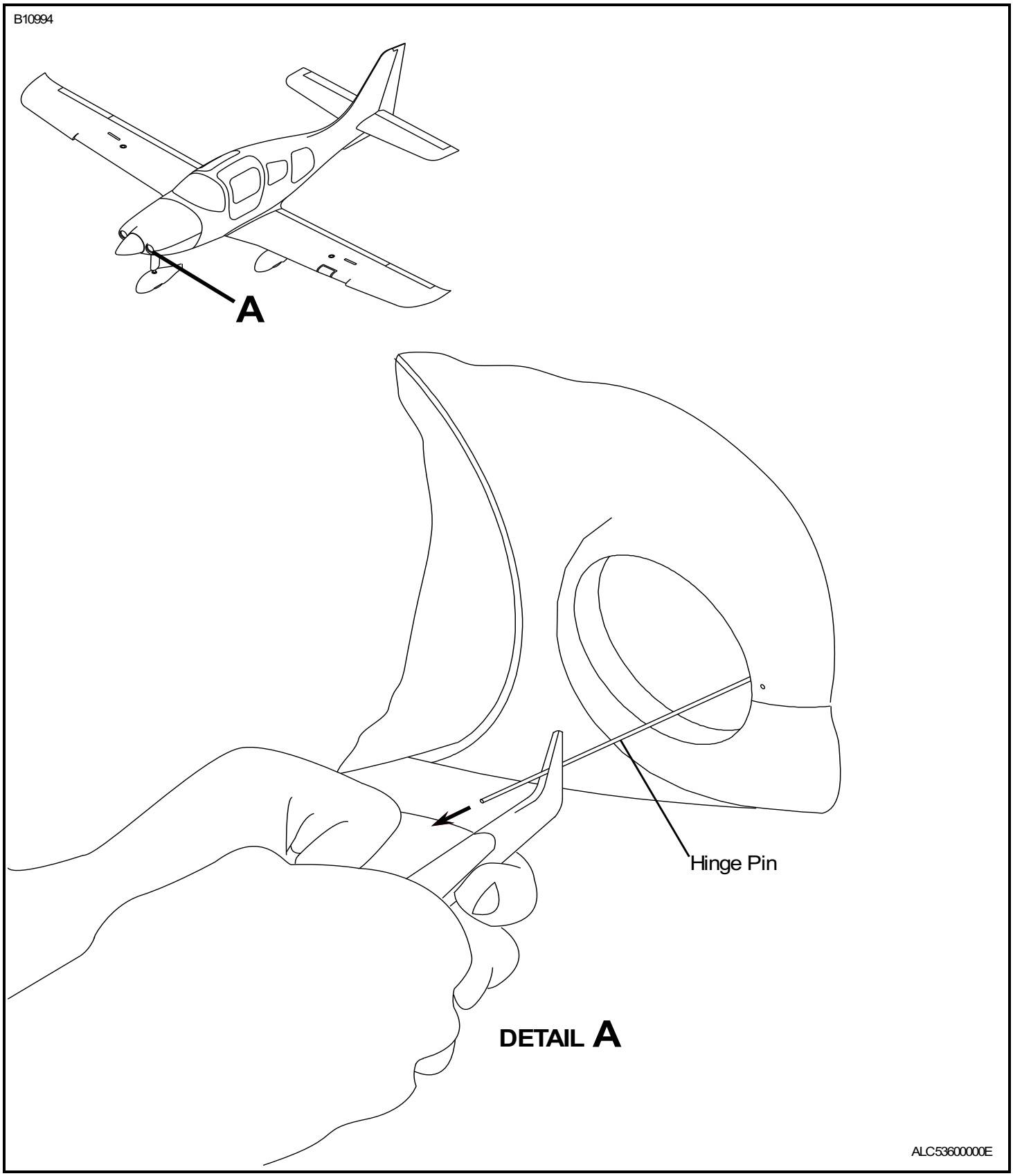
  (b) Dry to touch - 4 hours

  (c) Dry to handle - 24 hours

  (d) Through cure - 7 days

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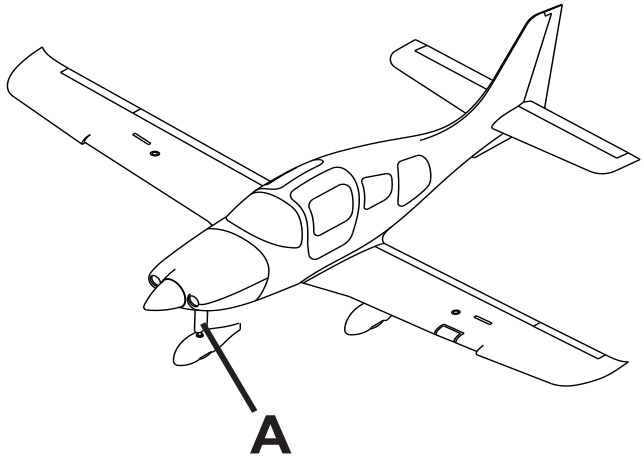
Figure 201 : Sheet 1 : Removing Hinge Pins from Cowl

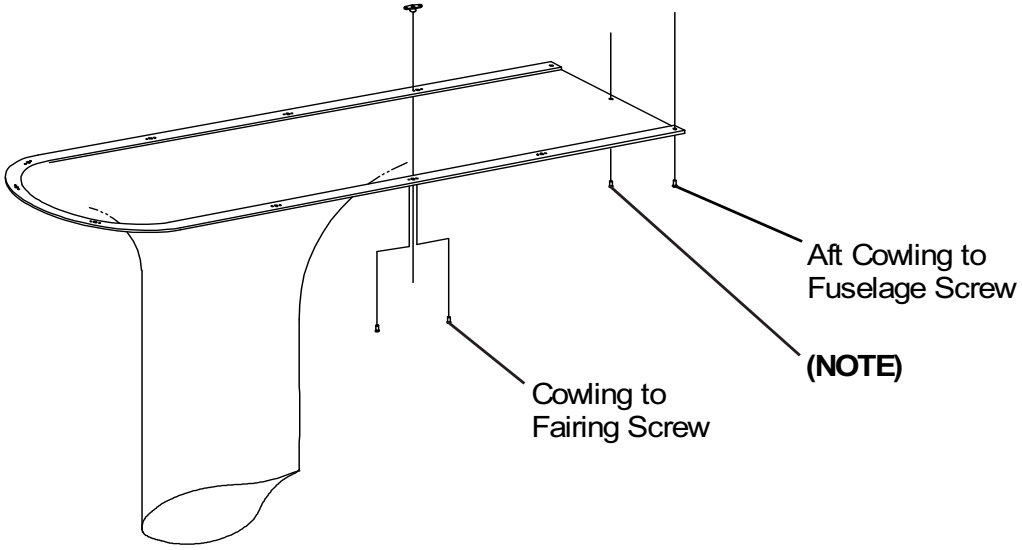


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Figure 202 : Sheet 1 : Cowling Screws

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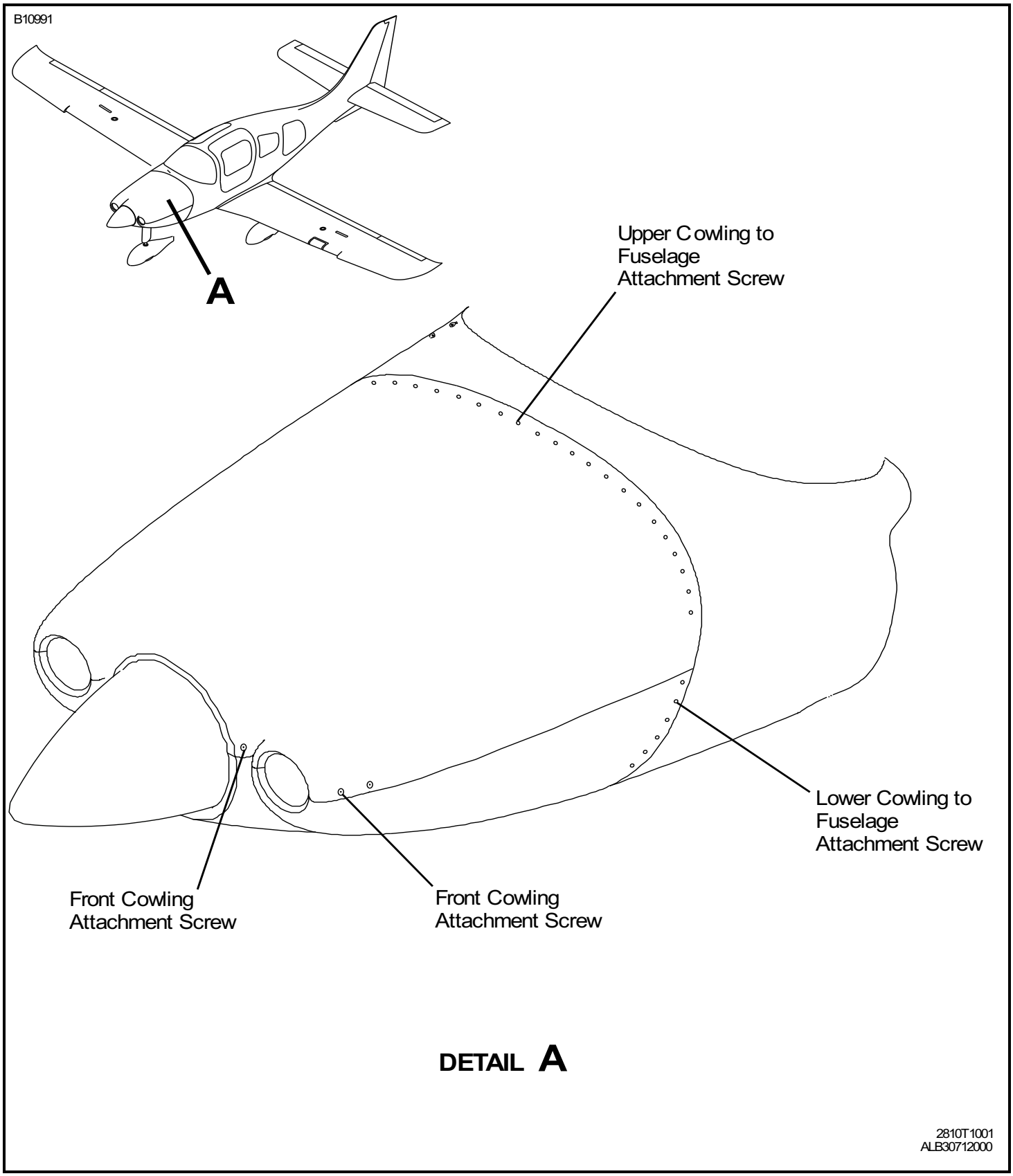
DETAIL A

NOTE: Leave this screw attached during Lower Cowling removal.

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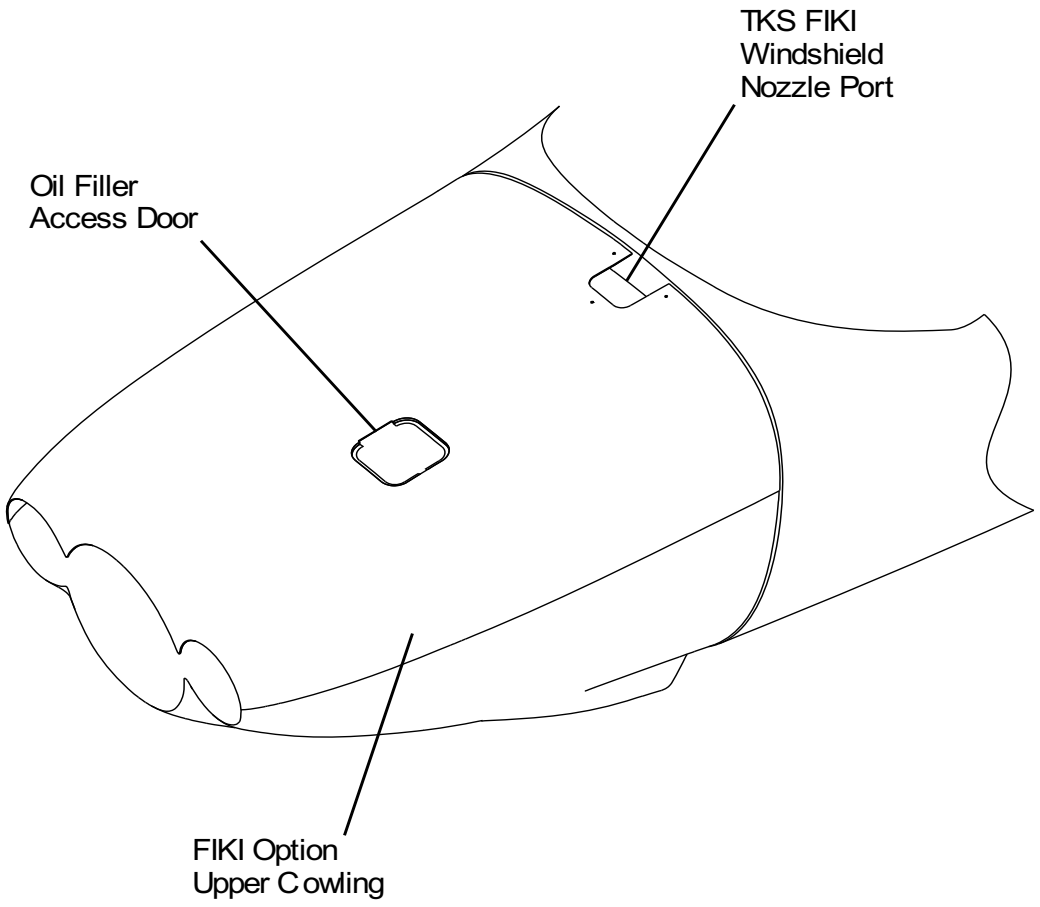
Figure 203 : Sheet 1 : Engine Cowling Installation



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Figure 203 : Sheet 2 : Engine Cowling Installation

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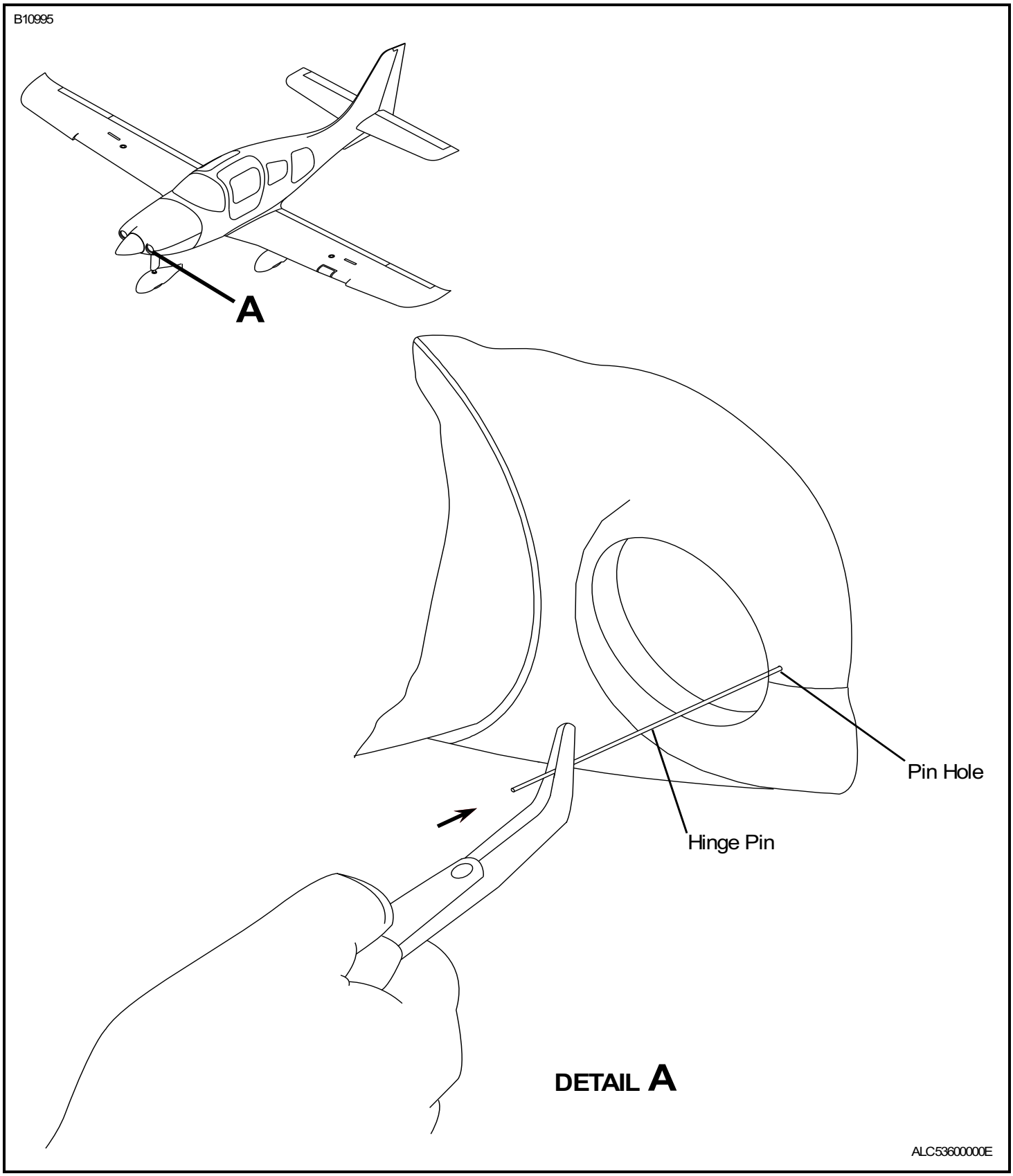


DETAIL A

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Figure 204 : Sheet 1 : Installing Hinge Pins



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ENGINE MOUNT - MAINTENANCE PRACTICES

1. Engine Mount Removal, Inspection, and Installation

A. Removal of the Engine Mount (Refer to Figure 201.)

(1) With the engine removed per Section 71-00-00, Engine Removal, Cleaning, and Installation, and the tail of the aircraft fully secured using a jack stand and undertail tie strap, remove the nose gear and nose gear fairing per instructions in Section 32-20-00, Nose Landing Gear

(2) Remove all additional clamps and tie straps used to attach wiring, cables, and hoses to the engine mount.

(3) Remove the bolts attaching the upper and lower engine mount to the firewall.

CAUTION: Use caution when removing the bolts from the firewall to prevent bushings and washers on the inside of the firewall from falling out and getting lost.

(4) Remove the engine mount from the firewall.

B. Inspection of the Engine Mount

Inspect all engine mount tubes and welds using bright light and a 10X (ten power) magnifying glass for signs of cracking, chafing, rusting, and pitting. Do not weld any part of the engine mount. If a crack is found, replacement of the engine mount is required. Small undamaged areas where corrosion protection has chafed off may be protected by removing all visible surface rust with a wire brush and applying a quality high temperature rust preventative paint.

C. Installation of the Engine Mount

(1) Position the engine mount onto the firewall with the upper mounting pad tubes protruding through the firewall and into the backside bushings.

(2) Install the four engine mount bolts and washers through the front of the engine mounting pad tubes. To ensure the bolts do not "shank out", one additional AN960-716 washer (for a total of two washers) may be used under the bolt head to attain a minimum protrusion of two threads and a maximum protrusion of 3.5 threads through the nut after torquing. Thread protrusion includes the chamfer at the end of the bolt. Make sure the upper engine mount firewall bushings do not fall out while inserting the bolts. When correctly installed, bushings slide inside of the engine mounting pad tubes.

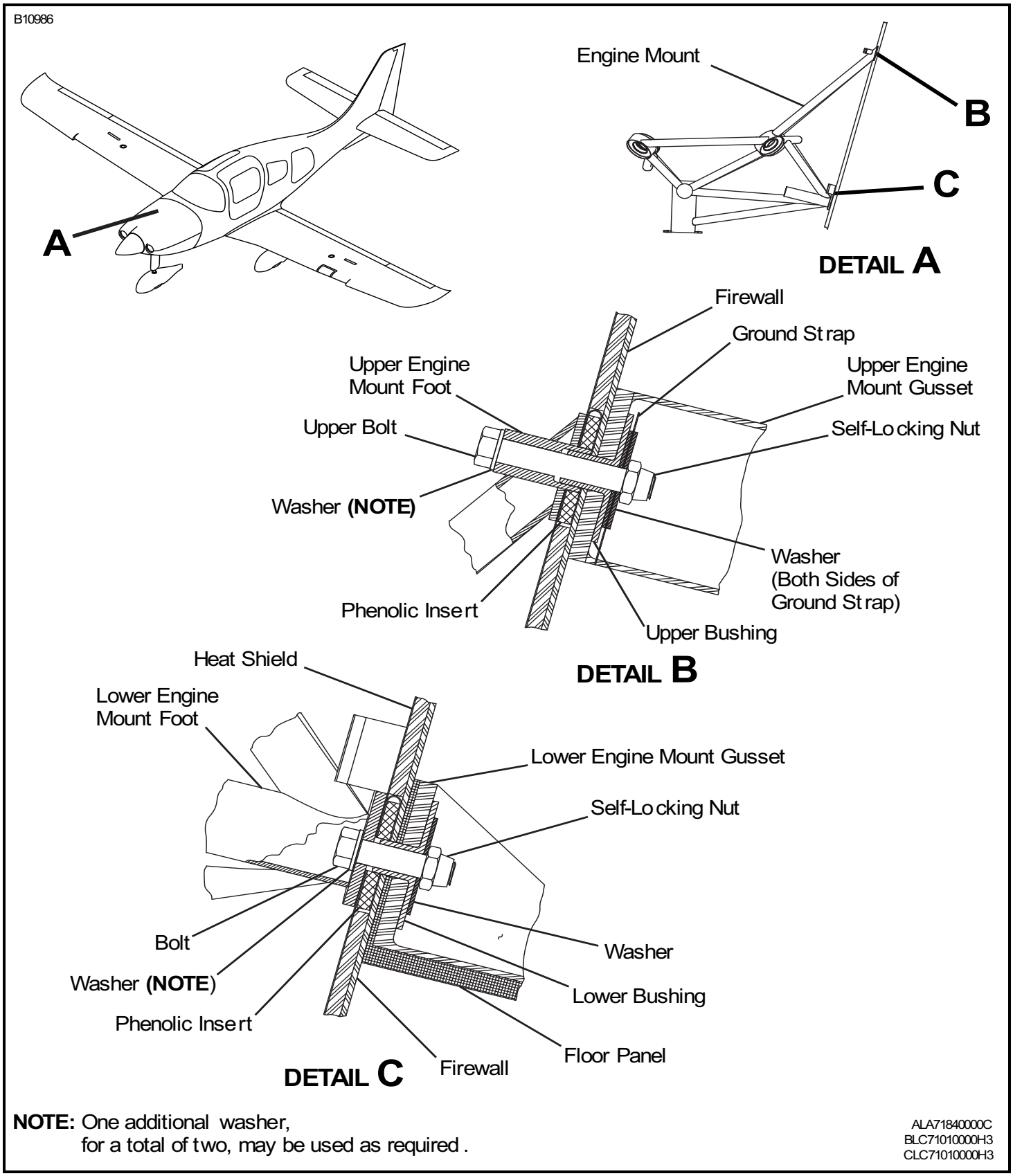
(3) Install engine mount washers and nuts at the backside of the firewall. One washer at each lower bolt and two washers at each upper bolt. Make sure that the ground straps are installed between the two washers at the upper mounting bolt location.

(4) Torque the engine mount bolts 55 to 60 ft.-lbs.

(5) Install in reverse order as disassembled all clamps and tie straps used to fasten down wiring, cables, and hoses which will chafe, rub, or interfere with surrounding objects during engine operation.

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Figure 201 : Sheet 1 : Engine Mount to Fuselage Attachment



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AIR INDUCTION SYSTEM - MAINTENANCE PRACTICES

1. Engine Air Filter Removal and Replacement

A. The engine air filter element is a disposable unit that must be replaced annually or every 100 hours. The filter element must also be replaced if its face is covered by dust or debris by 50 percent or greater. The air filter frame and grill assembly are Bracket Aircraft Company, Inc. Part No. BA-345. The air filter element is Brackett Aircraft Company, Inc. Part No. BA-345E. Refer to Figure 201.

(1) Remove the upper cowling from the aircraft per instructions in Section 71-10-00, Engine Cowling Removal, Installation, and Maintenance.

(2) Remove the hex head bolts and washers securing the grill to the air filter frame.

(3) Remove the filter element from the air filter frame and discard.

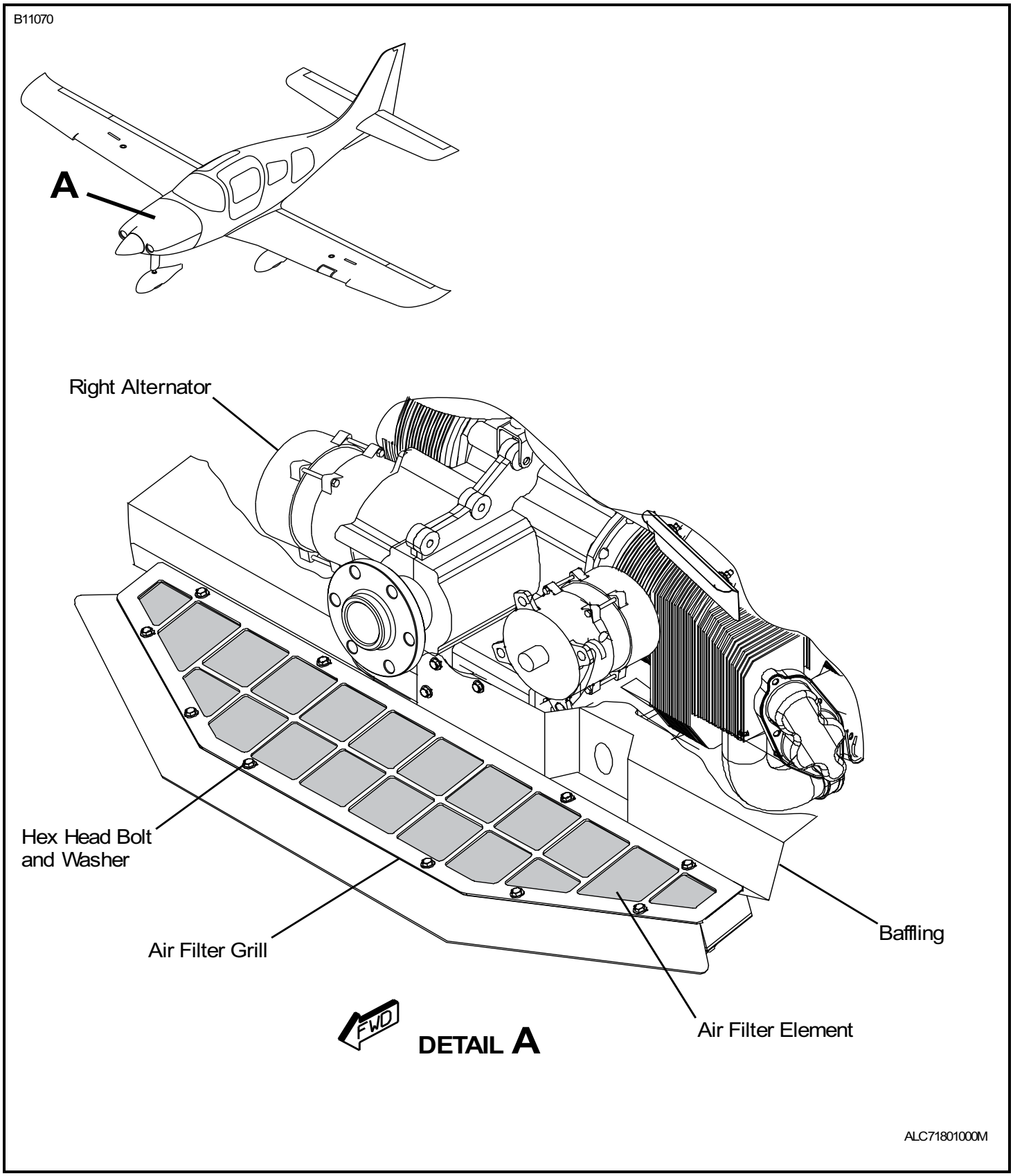
(4) Wipe down the inside of the air filter frame and housing to remove any dirt, debris, or excess filter wettant. WD-40 or similar solvent may be used to aid in removal of excess filter wettant.

(5) Install new filter element into the air filter frame and grill assembly in reverse order as disassembled.

(6) Hand-tighten screws securing air filter frame grill snug.

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Figure 201 : Sheet 1 : Engine Air Filter



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ENGINE FUEL DRAIN - MAINTENANCE PRACTICES

1. Engine Fuel Drain Tree Removal, Inspection, and Installation

A. Engine Fuel Drain Tree Removal (Refer to Figure 201.)

(1) Remove the upper cowling from the aircraft per instructions in Section 71-10-00, Engine Cowling Removal, Installation, and Maintenance.

(2) Using suitable wrenches, remove the fuel drain tree hard line fittings from the left and right side of the engine. Use caution not to back out fittings in the engine cylinders during removal.

(3) Using suitable wrenches, remove the left and right side drain hoses from the sniffle valve fitting. Refer to Figure 202.

(4) Remove the engine oil pan retaining screws at the fuel line hose clamp locations, and remove hose clamps.

(5) Detach the fuel line retaining clamps at the aft end of the engine mount, and remove the hose clamps.

(6) Remove all tie straps that will prevent the fuel drain tree hoses and hard line from being removed.

(7) Remove the fuel drain tree hoses and hard lines.

(8) Using suitable wrenches, remove the fuel drain hoses from the fuel drain tree hard lines.

(9) Remove the sniffle valve to drain tube flange retaining nut and washer, and remove the sniffle valve. Refer to Figure 202.

B. Inspection of Engine Fuel Drain Tree

(1) Inspect all fuel drain tree hoses for burning, cracking, deterioration, and chafing. Inspect all fuel drain tree hose fitting ends for cracking and stripped or cross-threaded threads. Inspect fuel drain tree hard lines for vibration cracks, crushed tubes, and bending deformities. Inspect fuel drain tree hard line fitting ends for stripped or cross-threaded threads.

(2) If in doubt about a possible crack, use a 10X (ten power) magnifying glass to thoroughly inspect the suspicious area.

(3) Inspect the sniffle valve for a jammed or blocked internal check ball by blowing through the inlet side of the valve. Air should freely pass the check ball and exit the outlet side of the valve. Blowing air through the outlet side of the valve or applying vacuum to the inlet side of the valve should seat the check ball and prevent air from passing through the valve.

(4) Replace all defective parts found in any of the fuel drain tree hoses, hard lines, or sniffle valve components.

C. Installation of Engine Fuel Drain Tree

(1) Install the sniffle valve into the drain tube flange, and install the retaining nut. Torque the retaining nut 240 to 280 in.-lbs. Refer to Figure 202.

(2) Using suitable wrenches, attach the drain hoses to the fuel drain tree hard line fittings. Torque fittings 135 to 150 in.-lbs. Refer to Figure 202.

(3) Connect the fuel drain tree hard line fittings to the engine cylinder heads. Use caution not to turn the fittings in the engine cylinders during installation Refer to Figure 201.

(4) Route the drain hose in reverse order as disassembled. Torque fitting 135 to 150 in.- lbs.

(5) Connect the fuel drain hose fittings to the sniffle valve fitting ends. Torque the hose fittings 135 to 150 in.-lbs.

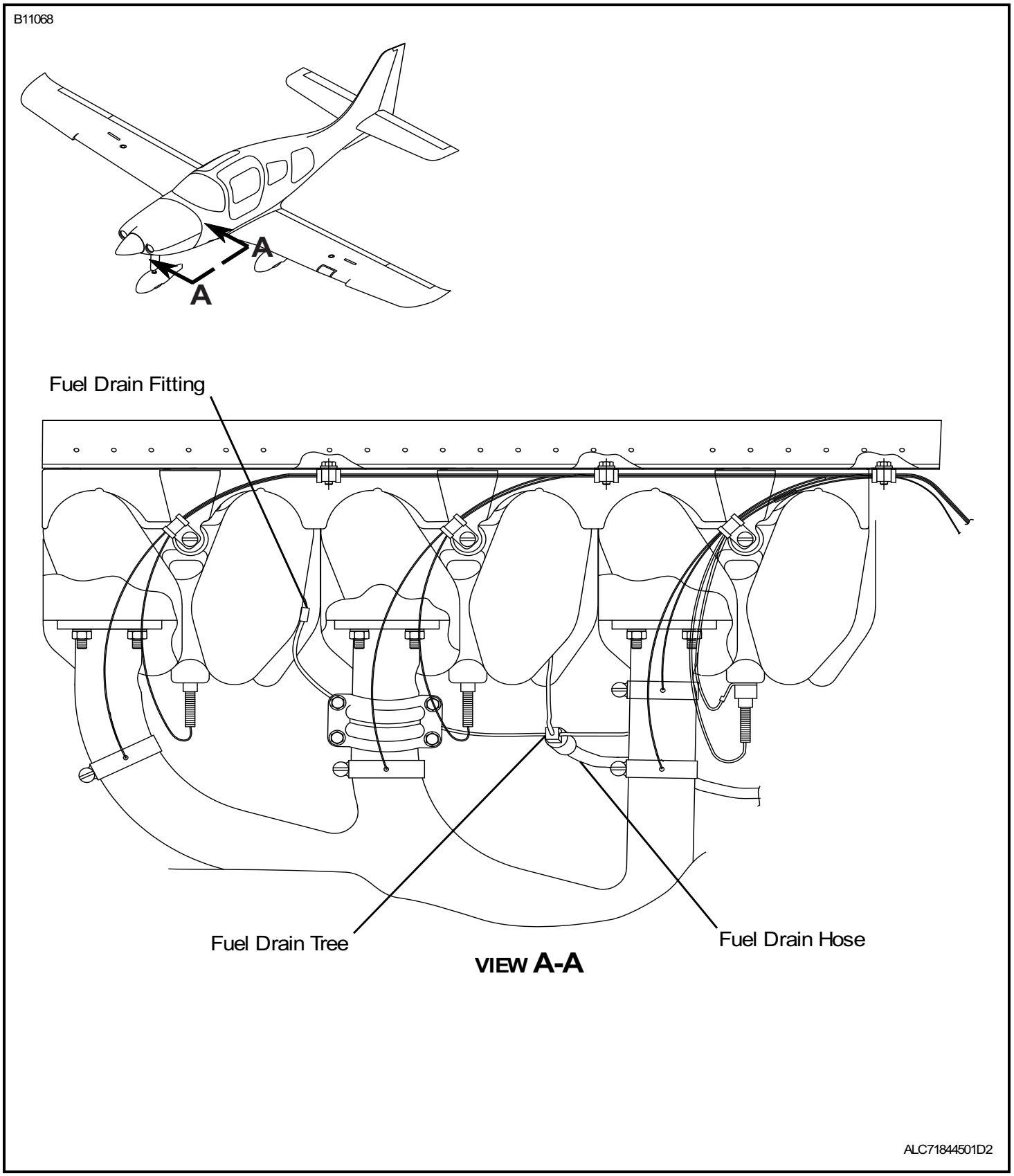
(6) Install the fuel drain hose retaining clamps over the fuel drain hoses at the oil pan attachment screw locations. Attach the hose clamps to the oil pan using the oil pan retaining screws. Torque the oil pan retaining screws 155 to 175 in.-lbs.

(7) Install the fuel drain hose retaining clamps over the fuel drain hoses at the aft engine mount locations using hose clamp bolts, nuts, and washers in reverse order as disassembled. Torque hose clamp retaining bolts 30 to 36 in.-lbs.

(8) Install new tie straps at all locations noted prior to removing the fuel drain tree hoses and hard lines.

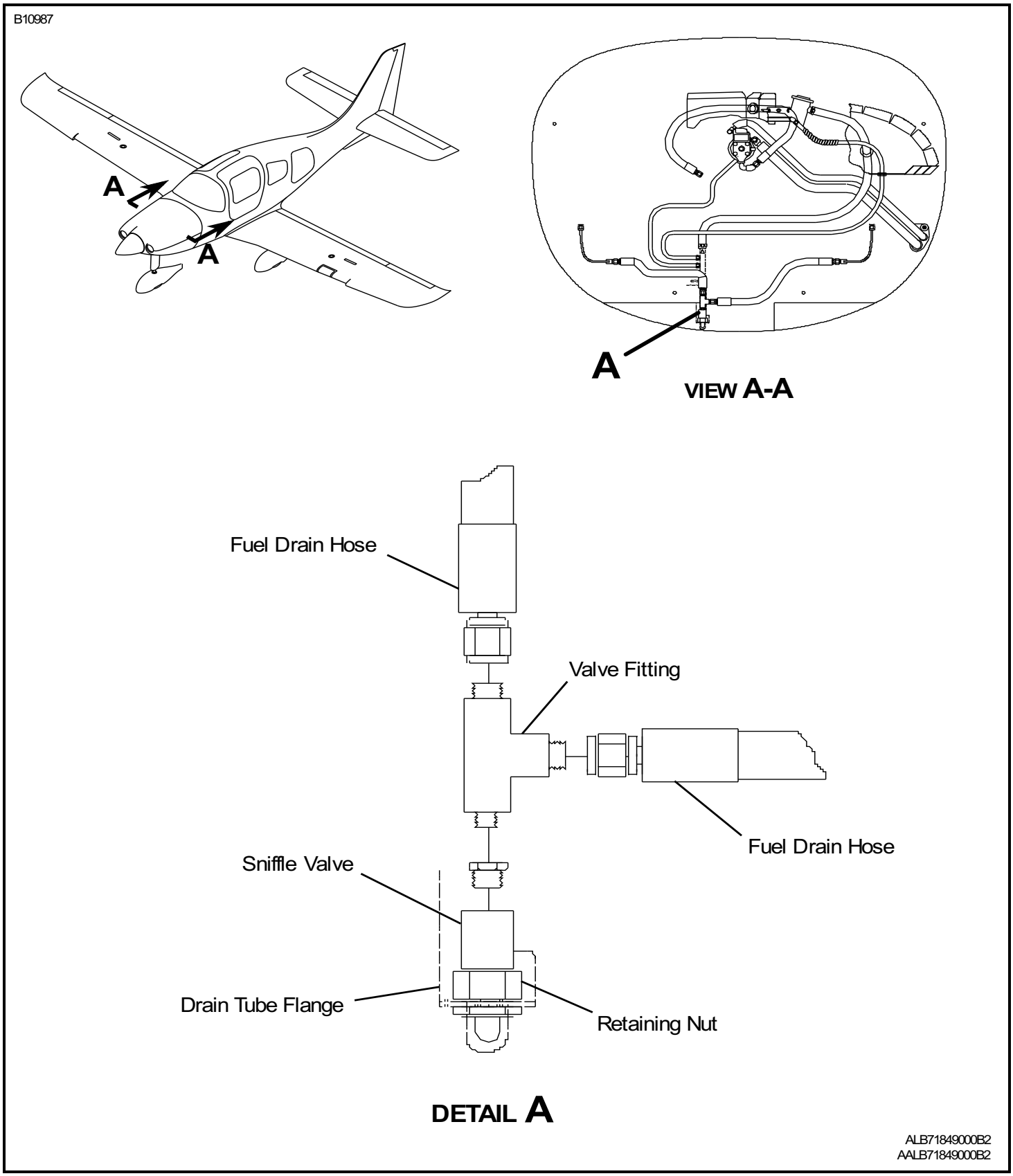
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Figure 201 : Sheet 1 : Fuel Drain Tree



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Figure 202 : Sheet 1 : Fuel Drain Hoses and Valves



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ENGINE BAFFLING - MAINTENANCE PRACTICES

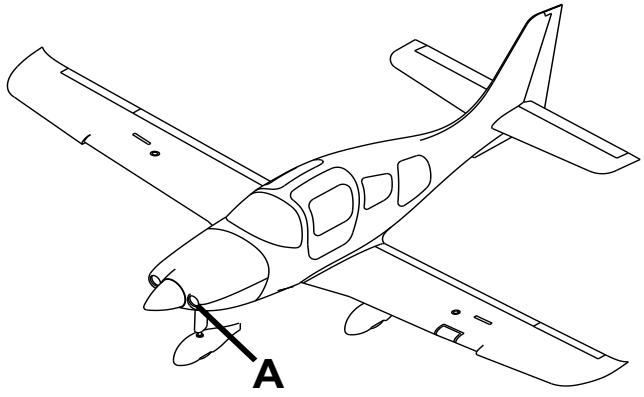
1. Engine Baffling

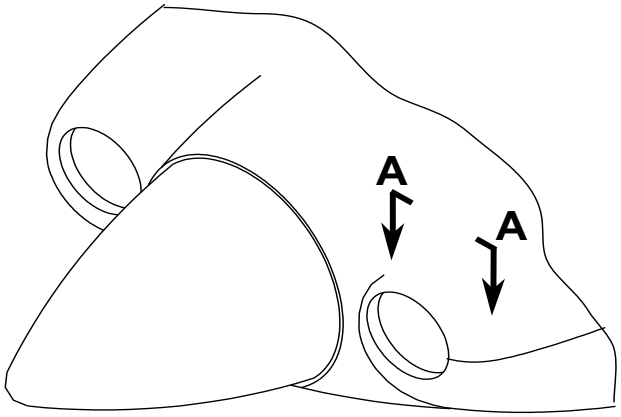
A. The engine baffling directs airflow over the engine for proper cooling and consists of thin carbon fiber composite sheets with silicone sheet seals. Baffling should be checked at each inspection for cracks, excessive gaps, and security of mounting to engine. During routine inspections, the gap between the forward left and right side baffling and cowling skin just below the air inlet locations should be checked. A minimum of 0.30 inches must exist between the edge of the baffling and the lower cowling skin at these locations. If adjustment is necessary, pull back the baffling seal, and trim away the baffling material as needed. Leave no less than 3/16 inch of material between the center of the rivets used to attach the baffling seal and the edge of the baffling. Refer to Figure 201.

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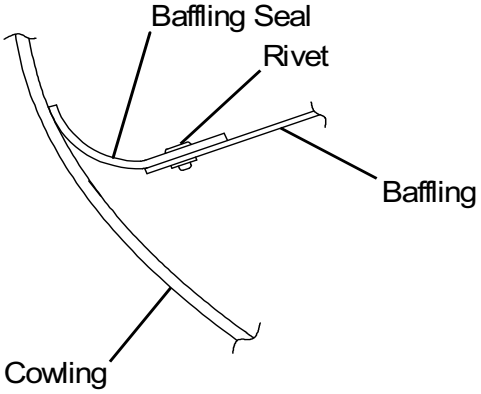
Figure 201 : Sheet 1 : Baffling at Cowling Below Air Inlet

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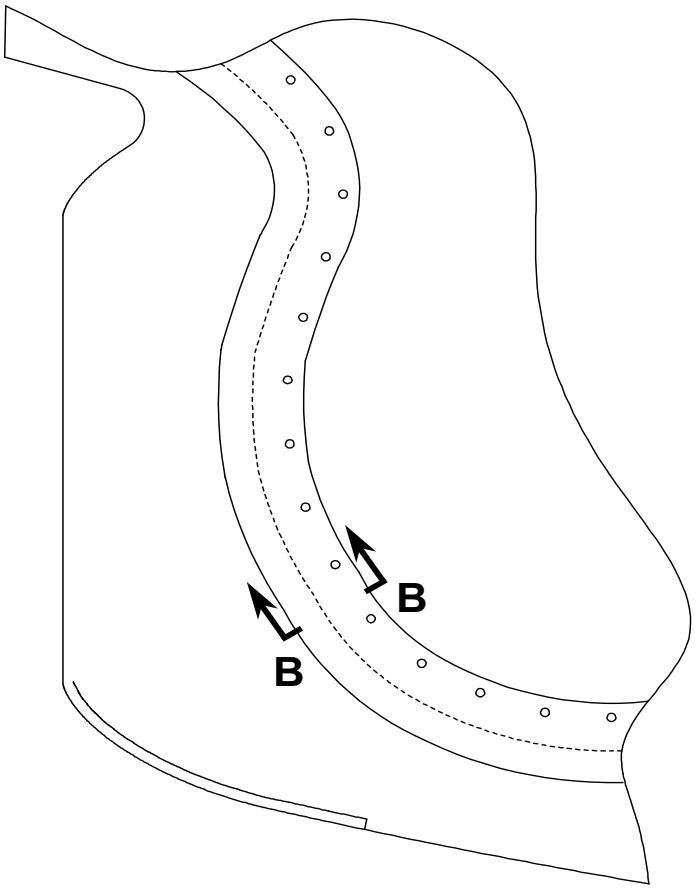




DETAIL A



VIEW B-B



FWD VIEW A-A

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BBLC71801003F1

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ENGINE FUEL SYSTEM - GENERAL

1. General

A. Refer to the Teledyne Continental Motors TSIO-550 Permold Series Engine Maintenance Manual (Publication P/N: M-18) for specific maintenance information of the engine fuel system. Contact Teledyne Continental Motors to ensure you have the latest revision to their manual. It is the responsibility of the owner or operator of the airplane to maintain the revision schedule for all manuals related to the Teledyne Continental Motors Model TSIO-550-C.

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IGNITION - GENERAL

1. General

A. Refer to the Teledyne Continental Motors Maintenance and Overhaul Manual Model TSIO-550-C Form Number X30616A for specific maintenance information of the ignition system. Contact Teledyne Continental Motors to ensure you have the latest revision to their manual. It is the responsibility of the owner or operator of the airplane to maintain the revision schedule for all manuals related to the Teledyne Continental Motors Model TSIO-550-C.

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IGNITION SWITCH - MAINTENANCE PRACTICES

1. Ignition Switch

A. **Ignition Switch Description** - The ignition switch is located on the lower left side of the instrument panel and is a standard aircraft switch that provides on and off electrical control of the magnetos and includes the start position. The switch is key-operated and mounts from the rear of the master switch panel.

CAUTION: With the ignition switch removed or disconnected, the magnetos will be "hot". With impulse couplings on both magnetos, personal injury may result from turning the propeller with the spark plug wires loose. Additionally, the engine may "catch" if the spark plugs are installed.

B. **Ignition Switch Removal and Installation**

(1) Remove the left knee bolster panel per instructions in Section 25-11-00, Removal and Installation of the Knee Bolsters, to gain access to the rear of the master switch panel.

(2) Remove the metal collar around the front side of the switch, and pull the switch out through the rear of the panel.

(3) Remove and label the seven wires on the back of the switch.

(4) Installation is a direct reversal of removal. Install the wires as labeled.

C. **Ignition Switch Troubleshooting**

(1) If there is no magneto drop or no shutoff, verify the ground wire at the back of the switch is intact.

(2) If the starter will not engage, verify that there is power to the switch on the "B" terminal (marked on the back of the switch).

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IGNITION SWITCH (T240) - REMOVAL/INSTALLATION

1. General

A. This section gives the maintenance practices for the Ignition switch and the Primer switch. For a general description of the ignition system, refer to Ignition - General.

2. Ignition Switch Removal/Installation

CAUTION: When the ignition switch is removed or disconnected the magnetos are "hot" (operational). With impulse couplings on each of the magnetos, personal injury can result from turning the propeller with the spark plug wires loose. Additionally, the engine can "catch" (start) if the spark plugs are installed.

A. Remove the Ignition Switch (SI002) (Refer to Figure 401).

(1) Remove the Ignition Switch LED Panel (UI908). Refer to Chapter 33 Interior LED Panels (T240) - Maintenance - Practices, Ignition Switch LED Panel Removal/Installation.

(2) Make sure that the master BATT switches (left SW01 and right SW02) are in the OFF position.

(3) Make sure that the AVIONICS MASTER switch (SW04) is in the OFF position.

(4) Remove the collar from the front side of the Ignition switch (SI002).

(5) Remove the nut from the front of the ignition switch that attaches it to the instrument panel.

(6) Remove the ignition switch from the rear of the instrument panel.

(7) Identify and remove the electrical wires from the ignition switch terminals.

(8) Remove the ignition switch from the airplane.

B. Install the Ignition Switch (SI002) (Refer to Figure 401).

(1) Identify and install the electrical wires on the ignition switch terminals.

(2) Put the ignition switch in its correct position trough the instrument panel from the rear side of the panel.

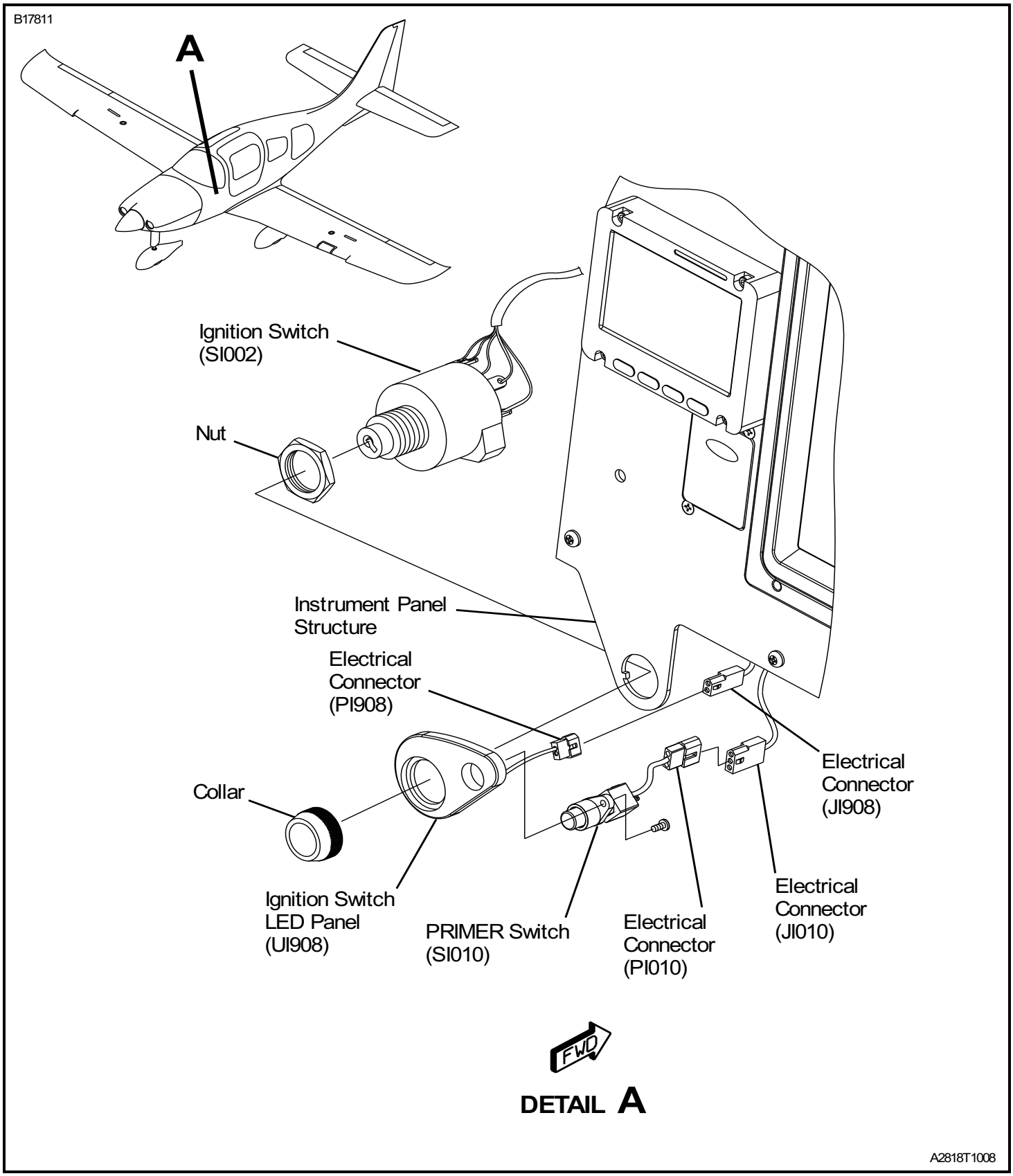
(3) Install the nut on the front of the ignition switch that attaches it to the instrument panel and tighten.

(4) Install the Ignition Switch LED Panel (UI908). Refer to Chapter 33 Interior LED Panels (T240) - Maintenance - Practices, Ignition Switch LED Panel Removal/Installation.

(5) Install the collar on the front side of the Ignition switch.

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Figure 401 : Sheet 1 : Ignition and Primer Switch Installation



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ENGINE INDICATION - GENERAL

1. General

A. This chapter includes instructions on the maintenance, removal, and installation of equipment that provides a means of monitoring the operating conditions of the engine. Information from technical publications provided by the manufacturers of the various pieces of engine monitoring equipment are not covered in this manual and should be consulted prior to any maintenance of the equipment. Information contained in this chapter provides the basic procedures for the removal and installation of the different pieces of the engine indicating system.

B. **Avidyne Option** - Aircraft equipped with the Avidyne Entegra EX5000 Multifunction Display (MFD) with EMAX total engine monitoring system will display engine operating conditions on this unit, as well as on the instruments in the engine instrument panel. The MFD is discussed in Chapter 34. The following instruments on the engine instrument panel are provided to offer information in addition to that provided by the Avidyne MFD.

(1) The left and right fuel quantity gauge is at the top left of the panel and is discussed in Chapter 28.

(2) The dual ammeter gauge is at the middle left of the panel and is discussed in Chapter 24.

(3) The oil pressure and oil temperature gauge is located at the bottom left of the panel and is discussed in Chapter 79.

(4) The tachometer, manifold pressure, fuel flow, cylinder head/turbine intake, and exhaust gas temperature gauges are located on the right side of the engine instrument panel and are discussed in this chapter.

C. **Garmin G1000 Option or the Model T240 G2000 Installation** - Airplanes that have the Garmin G1000 or G2000 system installed display engine operating conditions on the multifunction display (MFD). More engine indicating gauges are not installed in the engine instrument panel.

CAUTION: Before any maintenance, removal, or installation of equipment is performed, make sure both the master and avionics switches are in the off position. Failure to do so could result in damage to these instruments.

NOTE: If any hoses, wires, or lines are touching the engine induction tubes, oil radiator, or engine mount apply a dab of high temperature silicone between them.

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TACHOMETER, MANIFOLD PRESSURE AND FUEL FLOW - MAINTENANCE PRACTICES

1. Tachometer

A. Removing the Tachometer

(1) Remove the engine instrument panel per instructions in Chapter 25.

(2) Unplug the connector going into the back of the tachometer.

(3) Unscrew the four screws surrounding the tachometer.

B. Installation of the Tachometer

(1) Put the tachometer in its slot, and screw it into the engine instrument panel.

(2) Plug the connector into the back of the tachometer.

(3) Reinstall the engine instrument panel.

C. Troubleshooting the Tachometer Transducer

(1) The tachometer transducer is located in the right magneto.

(2) Verify that there is approximately 10VDC of excitation to the transducer with the master switch on and the tachometer connected to the aircraft wire harness.

(3) Verify ground is good.

(4) Check the continuity of the signal wire to the tachometer.

(5) If all these points check good, replace the transducer.

D. Removing the Tachometer Transducer

(1) The tachometer transducer is located in the right magneto.

(2) Loosen the magneto to gain access to the bottom of the magneto.

(3) Remove the transducer.

(4) Re-time the magneto.

E. Installing the Tachometer Transducer

(1) Loosen the right magneto.

(2) Install the transducer.

(3) Re-time the magneto.

2. Manifold Pressure/Fuel Flow Gauge

A. Removing the Manifold Pressure/Fuel Flow Gauge (Avidyne Option Only)

(1) Remove the engine instrument panel per instructions in Chapter 25.

(2) Unplug the connector going into the back of the gauge.

(3) Unscrew the four screws surrounding the fuel flow gauge.

B. Installation of the Manifold Pressure/Fuel Flow Gauge (Avidyne Option Only)

(1) Put the gauge in its slot and screw it into the engine instrument panel.

(2) Plug the connector into the back of the gauge.

(3) Reinstall the engine instrument panel.

C. Troubleshooting the Manifold Pressure Transducer

(1) The manifold pressure transducer is located on the No. 6 cylinder intake runner tube for S/N 41002 to 41046 and affixed to the baffling at the right rear of the engine for S/N 41047 and On. Refer to Figure 201, Sheet 1 or Figure 201, Sheet 2.

(2) Verify that there is approximately 10VDC of excitation to the transducer with the master switch on and the manifold pressure gauge connected to the aircraft wire harness.

(3) Verify ground is good.

(4) Check the continuity of the signal wire to the manifold pressure gauge.

(5) If all these points check good, replace the manifold pressure transducer.

D. Removing the Manifold Pressure Transducer

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(1) The manifold pressure transducer is attached by an upper and lower bracket to the No. 6 cylinder intake runner tube for S/N 41002 to 41046 and to the baffling at the right rear of the engine for S/N 41047 and On. Refer to Figure 201, Sheet 1 or Figure 201, Sheet 2.

(2) Disconnect the manifold pressure hose from the bottom of the transducer.

(3) Remove the electrical connector from the top of transducer.

(4) Remove the tangential worm clamp used to secure the transducer to the upper bracket.

(5) Remove the screws, washers, and nuts used to attach the upper and lower brackets together.

(6) Remove the rubber vibration washer from the top of the transducer.

(7) Remove the transducer.

E. **Installing the Manifold Pressure Transducer**

(1) Install the transducer into the lower bracket.

(2) Install the rubber vibration washer onto the upper part of the transducer.

(3) Install the upper bracket over the transducer.

(4) Reinstall the upper and lower bracket attachment screws, washers, and nuts in reverse order as disassembled. Hand tighten snug.

(5) Reinstall the tangential worm clamp around the transducer and the upper bracket. Tighten the clamp until the transducer is completely contained.

(6) Install the electrical connector to the top of the transducer.

(7) Reconnect the manifold pressure hose to the bottom of the transducer. Apply Loctite 592 thread sealant to pipe threads on the fittings and the transducer. Assemble fittings to hand tight position, mark male and female fittings appropriately and add 1.5 turns to achieve proper angular orientation. Always loosen (back off) fitting within 0.5 turn from the ending torque position to achieve desired position.

F. **Troubleshooting the Fuel Flow Transducer**

(1) The fuel flow transducer is located on the top of the engine on the right side.

(2) Verify that there is approximately 5VDC (S/N 41002 to 41500) or 10VDC (S/N 41501 and On) of excitation to the transducer with the master switch on and the fuel flow gauge connected to the aircraft wire harness.

(3) Verify ground is good.

(4) Check the continuity of the signal wire to the fuel flow gauge.

(5) If all these points check good, replace the fuel flow transducer.

G. **Removing the Fuel Flow Transducer**

(1) The fuel flow transducer is located on the top of the engine on the right side.

(2) Remove the fire sleeve.

(3) Remove the electrical connectors.

(4) Remove the transducer.

H. **Installing the Fuel Flow Transducer**

(1) Install the transducer.

(2) Install the electrical connectors.

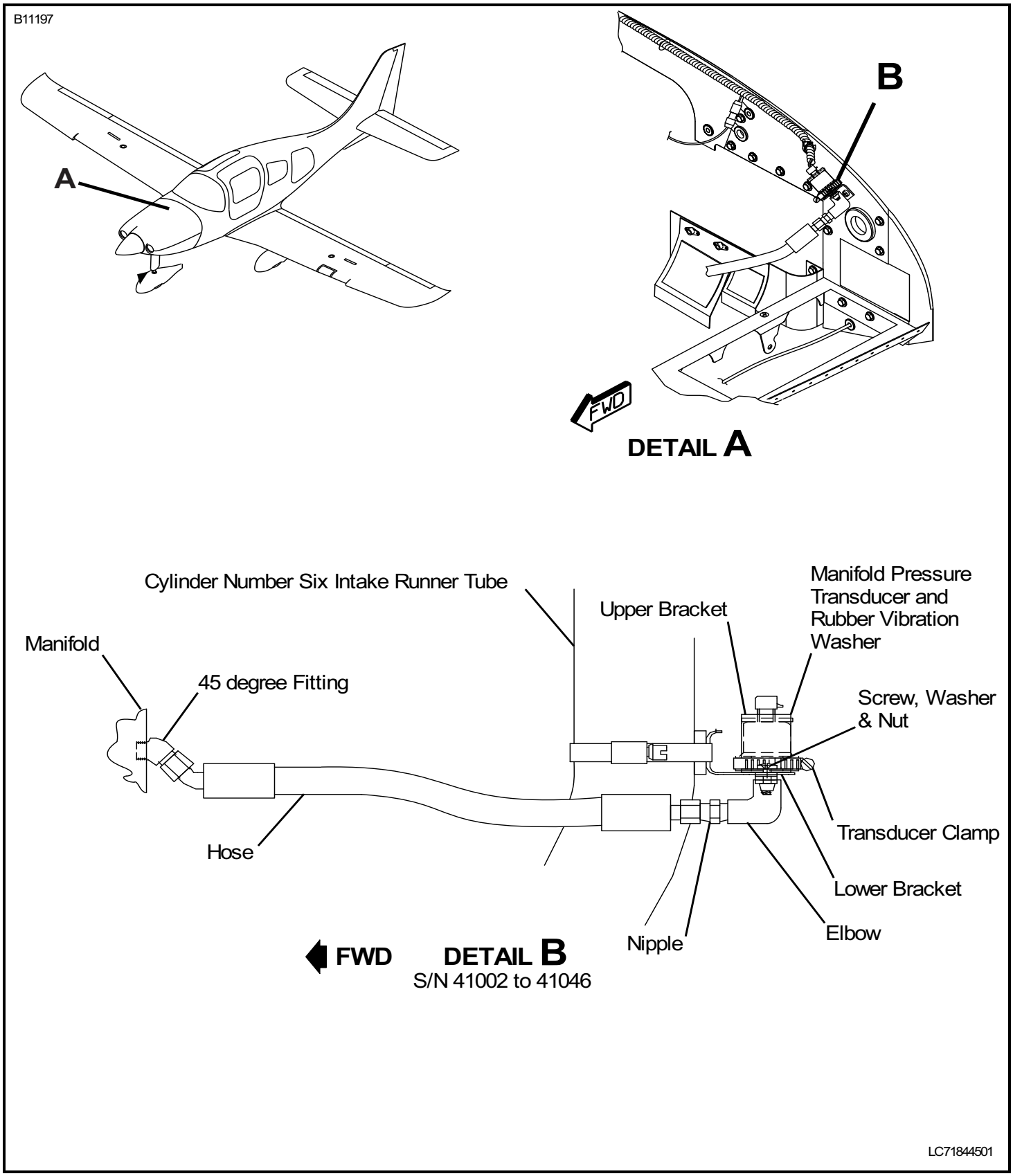
(3) Check for leaks by pulling back on the throttle, pushing the mixture control forward, and turning on the boost pump.

(4) Install the fire sleeve.

I. **Other References** - Refer to Chapter 28 for information on the fuel system.

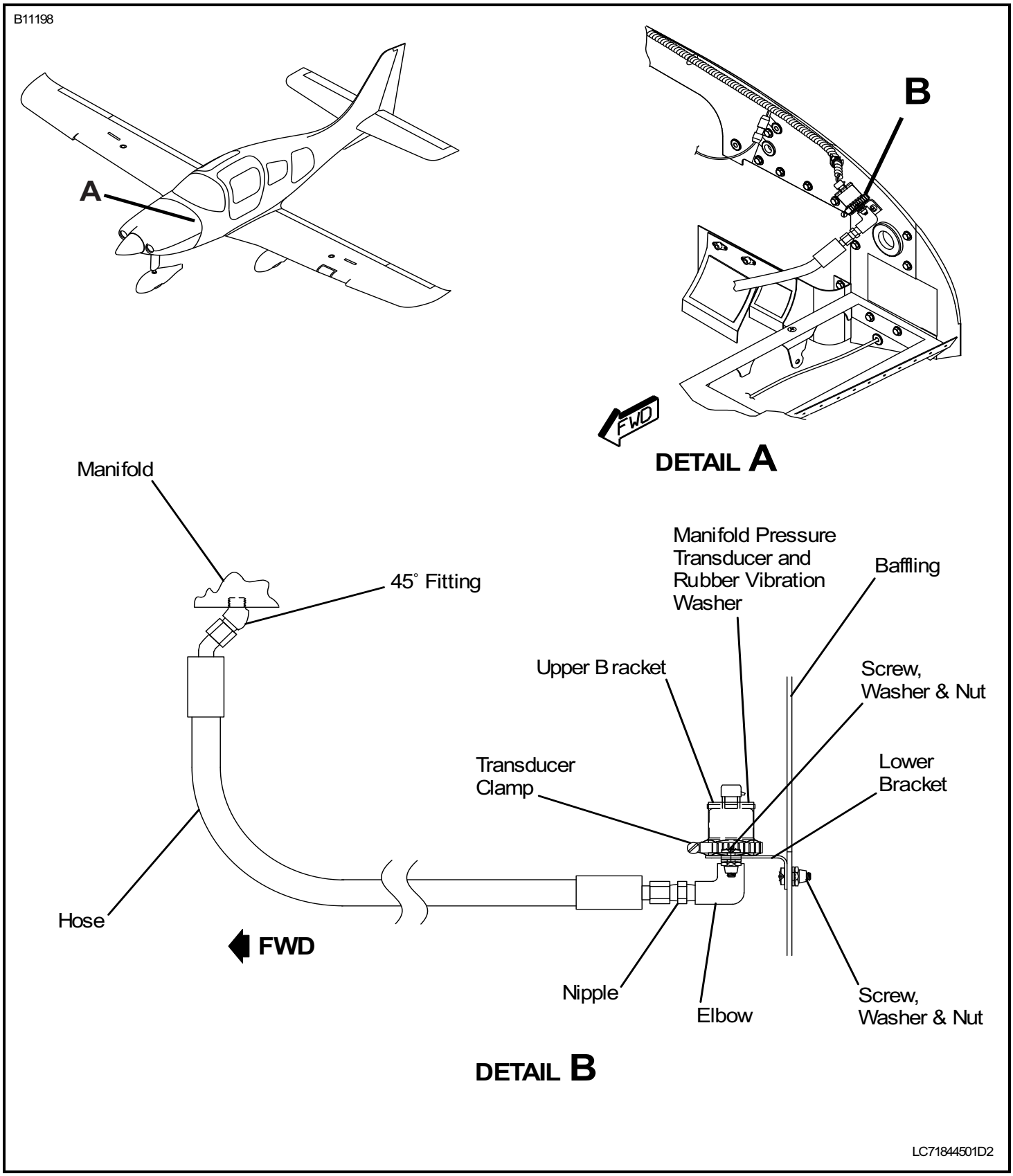
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Figure 201 : Sheet 1 : Manifold Pressure Transducer



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Figure 201 : Sheet 2 : Manifold Pressure Transducer



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ENGINE TEMPERATURE - MAINTENANCE PRACTICES

1. Cylinder Head Temperature/Turbine Intake Temperature (CHT/TIT)

A. Airplanes have the CHT/TIT system installed as follows:

(1) Airplanes with the Avidyne option have the EMAX Total Engine Monitoring System installed. The system has six cylinder head temperature (CHT) probes with an adapter probe attached to the probe in the No. 2 cylinder (refer to Figure 201), and two turbine intake temperature (TIT) probes. The adaptor probe reports to the CHT/TIT gauge in the engine instrument panel. These probes are resistive thermal devices (RTD) and must have clean connections to work correctly. If a connection is resistive, the CHT/TIT reading will be high.

(2) Airplanes with the Garmin G1000 option or the Model T240 Garmin G2000 system have six cylinder head temperature type J thermocouples probes installed. The No. 2 cylinder adaptor probe is not installed for this configuration.

B. **Removing the CHT/TIT Gauge (Avidyne Option)**

(1) Remove the engine instrument panel (See Chapter 25 for instructions).

(2) Unplug the connector going into the back of the gauge.

(3) Unscrew the four screws surrounding the gauge.

C. **Installation of the CHT/TIT Gauge (Avidyne Option)**

(1) Put the gauge in its slot, and screw it into the engine instrument panel.

(2) Plug the connector into the back of the gauge.

(3) Reinstall the engine instrument panel.

D. **Removing the CHT Probe(s)**

(1) With EMAX

(a) Remove the cowling per instructions in Chapter 76.

(b) The probes are attached with either integral tube nuts or bayonet attachment. except at the No. 2 cylinder. The probe at cylinder No. 2 includes an additional adapter probe which will be either tube nut style or push and turn bayonet style. Refer to Figure 201.

(c) Cut tie wraps and slide the protective sleeve from the wiring connections to the probe.

(d) Disconnect wiring from the probe.

(e) Unscrew the tube nut and remove the probe assembly. For the No. 2 cylinder, remove the probe from the adaptor probe and then unscrew the adapter probe from the cylinder head.

(2) Without EMAX

(a) Remove the cowling per instructions in Chapter 76.

(b) Cut tie wraps and slide protective sleeve from the wiring connections to the probe.

(c) Disconnect wiring from the probe.

(d) Unscrew the tube nut and remove the probe or push the probe up into the cylinder, turn it, and remove, depending upon the style of probe installed.

E. **Installation of CHT Probe(s)**

(1) With EMAX

(a) Apply anti-seize compound to the CHT probe threads and to the CHT adaptor probe threads.

(b) For the No. 1, 3, 4, 5, and 6 cylinders, The probe is attached with either a tube nut or a bayonet clip. For bayonet style, push the probe up into the cylinder and turn it, thus locking the probe into place. For tube nut style, tighten the tube nut tight plus 0.25 turn.

(c) For the No. 2 cylinder, insert the adaptor probe into the threaded hole in the bottom of the cylinder head and tighten tight plus 1/4 turn. Then insert the CHT probe. If the CHT probe is attached by tube nut, tighten the tube nut tight plus 0.25 turn. If the CHT probe is bayonet style, push the probe up into the cylinder and turn it to lock it into place.

(d) Connect wiring to the probe(s). Slide the protective sleeve over the wiring connections and secure with tie wraps.

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(e) Install the cowling per instructions in Chapter 76.

(2) Without EMAX

(a) Apply anti-seize compound to the CHT probe threads and to the CHT adaptor probe threads.

(b) The probe is attached with either a tube nut or a bayonet clip. For bayonet style, push the probe up into the cylinder and turn it, thus locking the probe into place. For tube nut style, tighten the tube nut tight plus 0.25 turn.

(c) Connect wiring to the probe. Slide the protective sleeve over the wiring connections and secure with tie wraps.

(d) Install the cowling per instructions in Chapter 76.

F. **Removing the TIT Probe(s)**

The probes are attached with integral tube nuts at each of the two exhaust manifold bosses.

(1) Remove the cowling per instructions in Chapter 76.

(2) Cut the wire ties and slide the protective sleeve from the wiring connections to probe.

(3) Disconnect the wiring to the probe(s).

(4) Unscrew the tube nut and remove the probe assembly.

G. **Installation of TIT Probe(s)**

(1) Apply anti-seize compound to the TIT probe threads.

(2) Insert the probe into the threaded hole in the exhaust manifold boss and tighten the tube nut tight plus 0.25 turn.

(3) Connect wiring to the probe(s). Slide protective sleeve over connections and secure with tie wrap

(4) Install the cowling per instructions in Chapter 76.

H. **Testing of the CHT/TIT Gauge**

NOTE: Testing of the CHT/TIT gauge will require the use of a thermocouple oven, a reliable heat probe, and a power source independent of the airplane.

(1) Plug the thermocouple oven into the power source.

(2) Place the probe from the CHT/TIT gauge into the top of the thermocouple oven heating element.

(3) Place the standard probe into the bottom of the heating element.

(4) Compare the temperatures.

I. **Calibration of the CHT/TIT Gauge**

(1) Field calibration of the CHT/TIT gauge is not available. For calibration of the cylinder head temperature gauge, see a qualified instrument technician.

2. Exhaust Gas Temperature (EGT)

A. Aircraft equipped with the Avidyne EMAX Total Engine Monitoring System or the Garmin G1000 or G2000 system have six exhaust gas temperature probes. The temperature probes are attached with a clamp to each of the 6 exhaust tubes.

B. **Removing the EGT Probes**

(1) Remove the cowling per instructions in Chapter 76.

(2) Cut the tie wraps and slide the pipe nipple off the probe wiring connection.

(3) Disconnect the wiring to the probe.

(4) Loosen the clamp, and remove the entire clamp and probe assembly.

(5) If necessary, remove wiring from the clamps at the baffling and baffling attachment bracket on the engine boss by removing the bolt, washers, clamp, and nut.

C. **Installation of EGT Probe(s)** - (Refer to Figure 202.)

(1) Insert the probe in the exhaust stack so that the tip of the probe is in the approximate center of the exhaust stack.

(2) Torque clamp 40 to 50 in.-lbs., and trim excess strap from clamp (not to exceed a 1 inch tab).

(3) Connect wiring to probe and slide protective sleeve over the connections. Secure protective sleeve with tie wraps.

(4) If wiring was removed from the clamps, install the bolt, washers, clamp, and nut. For clamps on the baffling, tighten the nut until the clamp is compressed and does not rotate. For clamps on the baffling attach bracket on the engine boss, torque bolt 72 to 84 in.-lbs.

(5) Install the cowling per instructions in Chapter 76.

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3. Oil Pressure Gauge

A. **Oil Pressure Transducer Removal**

(1) Remove the electrical connection from the end of the oil pressure transducer.

NOTE: On Garmin equipped airplanes, the oil pressure transducer is installed on a cross fitting just aft of oil cooler with the Hobbs oil pressure switch. Refer to Chapter 31, Indicating/Recording Systems - Maintenance Practices.

(2) Using a wrench, hold the AN912-3J bushing. Remove the oil pressure transducer from the oil cooler case. Refer to Figure 203.

B. **Oil Pressure Transducer Installation**

(1) Apply Teflon thread sealant (not tape) to the threads of the oil pressure transducer.

(2) Install the oil pressure transducer into the AN912-3J fitting. Using a wrench, hold the AN912-3J bushing, and torque the oil pressure transducer 60 to 80 in.-lbs.

(3) Attach the electrical connection to the end of the oil pressure transducer.

C. **Oil Pressure Transducer Troubleshooting**

(1) The oil pressure transducer is located next to the Hobbs oil pressure switch under the oil cooler.

(2) Make sure that there is approximately 5VDC of excitation to the transducer with the master switch on and the oil pressure gauge connected to the aircraft wire harness.

(3) Make sure that the ground is good.

(4) Check the continuity of the signal wire to the oil pressure gauge.

(5) If all these points check good, replace the oil pressure transducer.

4. Hobbs Oil Pressure Switch

A. Refer to Chapter 31, Indicating/Recording Systems - Maintenance Practices for information on the Hobbs oil pressure switch.

5. Oil Temperature Bulb

A. Oil Temperature Bulb Removal

(1) Remove the engine cowl. Refer to Chapter 71, Engine Cowling.

(2) Remove the safety wire from the oil temperature bulb located below the oil cooler.

(3) Place a suitable container under the oil temperature bulb to contain the oil that will drain from the engine when the oil temperature bulb is removed.

(4) Remove the oil temperature connector from the oil temperature bulb.

(5) Remove the oil temperature bulb and discard the gasket.

B. Oil Temperature Bulb Installation

(1) Install a new gasket with the oil temperature bulb below the oil cooler.

(2) Torque the oil temperature bulb 190 to 210 in.-lbs. Refer to Chapter 20, Torque Data - Maintenance Practices.

(3) Remove the container used to catch oil drained from the engine during the removal of the oil temperature bulb and clean any oil drips or spills with a clean cloth.

(4) Install the oil temperature connector to the oil temperature bulb.

(5) Install .032 safety wire on the oil temperature connector and oil temperature bulb to the engine. Refer to Chapter 20, Safetying - Maintenance Practices.

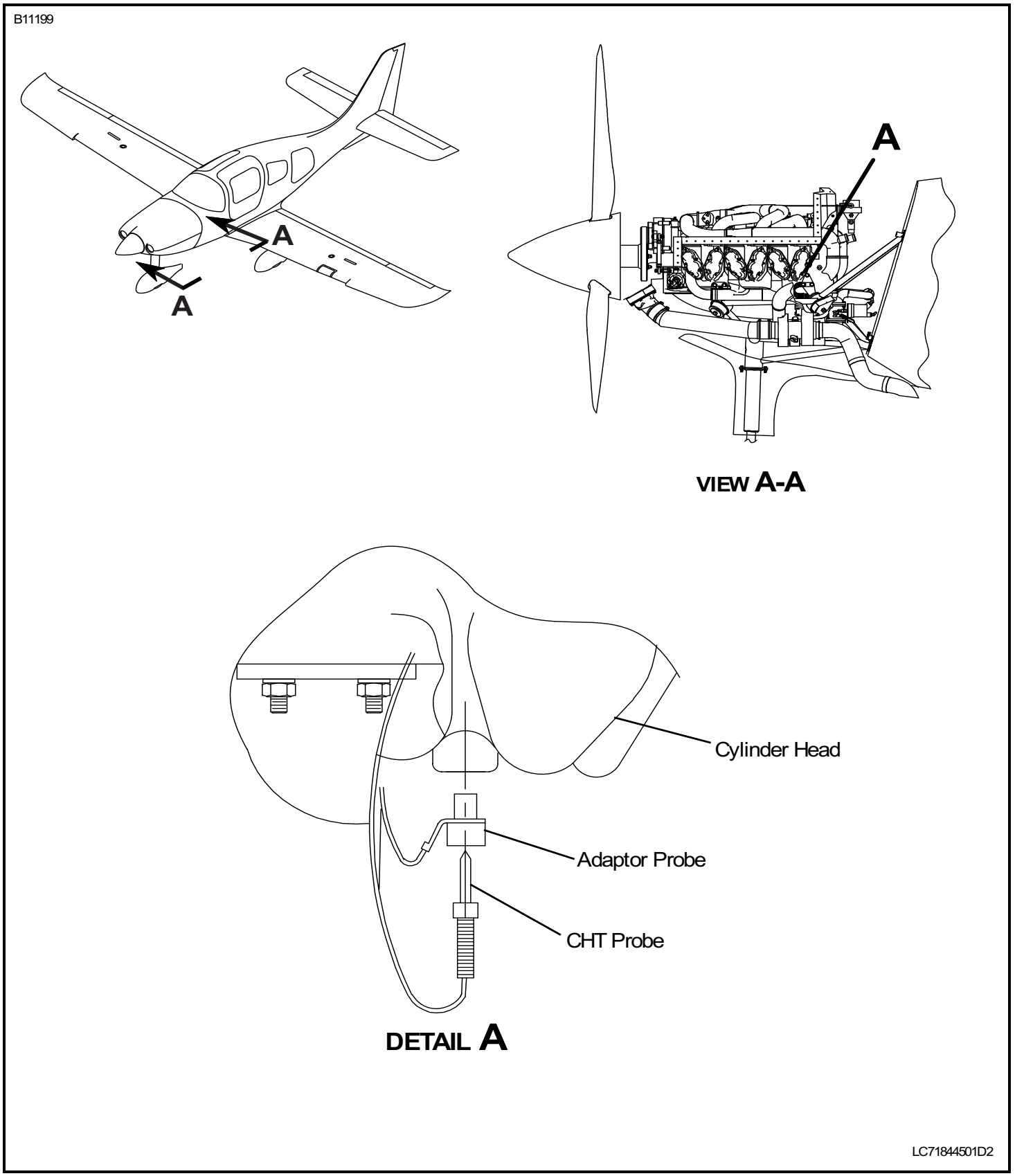
(6) Run the engine and check for normal operating temperatures in accordance with Airplane Flight Manual.

(7) With the engine shut down, check the installation to ensure there are no oil leaks.

(8) Install the engine cowl. Refer to Chapter 71, Engine Cowling.

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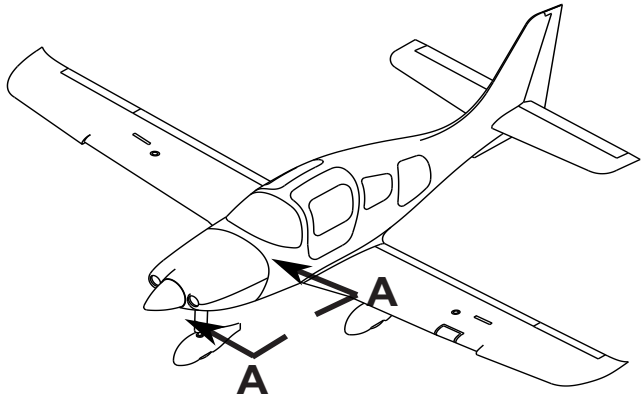
Figure 201 : Sheet 1 : CHT Adaptor Probe

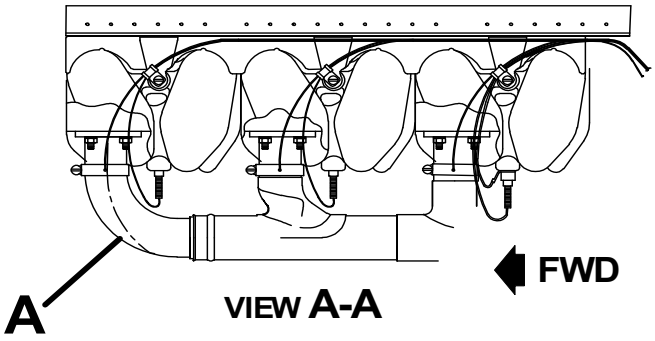


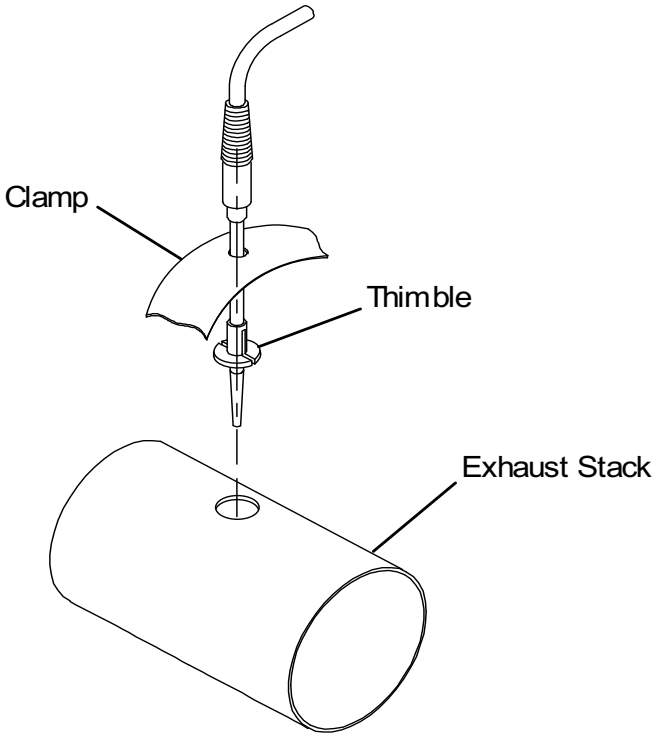
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Figure 202 : Sheet 1 : EGT Probe

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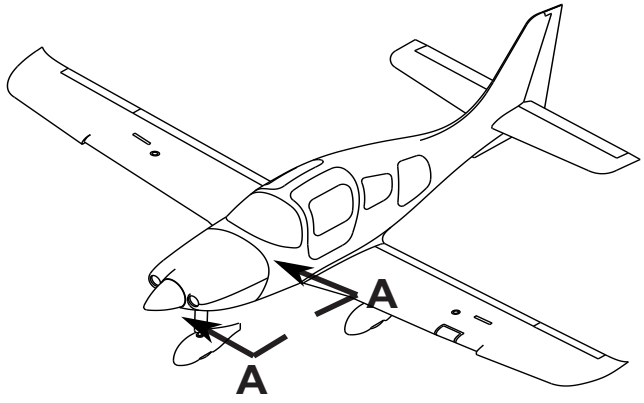
DETAIL A

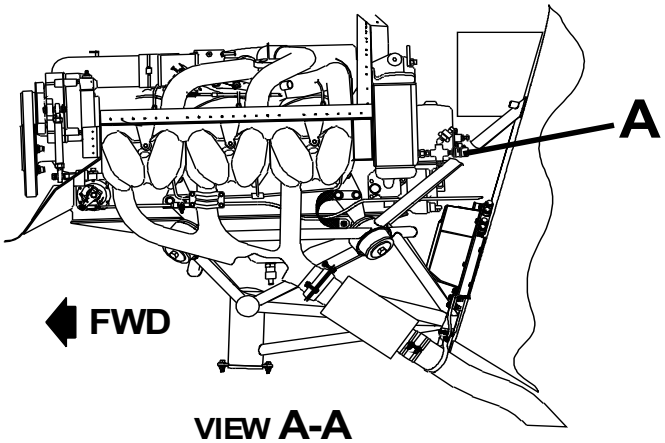
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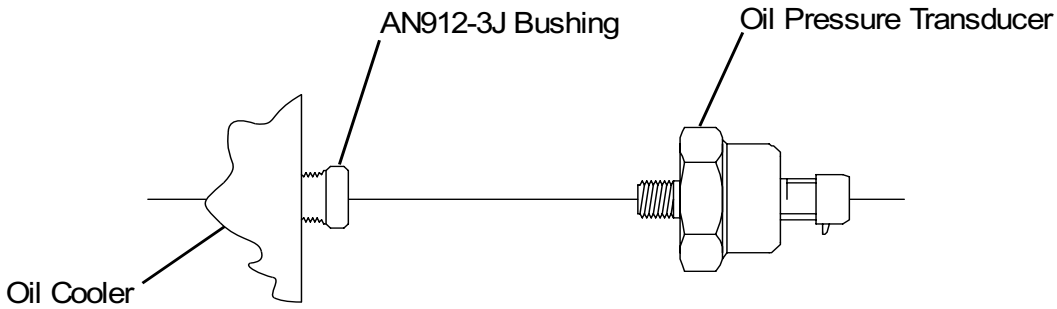
Figure 203 : Sheet 1 : Oil Pressure Transducer

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VIEW A-A



DETAIL A

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GARMIN GEA 71 ENGINE/AIRFRAME UNIT (G2000) - REMOVAL/INSTALLATION

1. General

A. This section gives the removal and installation procedures for the Garmin G2000 GEA 71 Engine/Airframe Unit. For a general description of the GEA 71, refer to Chapter 34, Garmin G2000 - Description and Operation.

B. For the GEA 71 thermocouple removal and installation procedures, refer to Chapter 34, Garmin G2000 Configuration Module.

2. Tools and Equipment

A. None.

3. Garmin GEA 71 Engine/Airframe Unit Removal/Installation

CAUTION: When removing and/or replacing a G2000 component, make sure that the airplane power is off. Disconnect auxiliary power supplies.

A. Remove the GEA 71 Engine/Airframe Unit (UI400) (Refer to Figure 401).

(1) Remove external electrical power from the airplane.

(2) Make sure that the master BATT switches (left SW01 and right SW02) are in the OFF position.

(3) Make sure that the AVIONICS MASTER switch (SW04) is in the OFF position.

(4) Disengage the ENGINE AIRFRAME circuit breaker found on the cockpit circuit breaker panel.

(5) Remove the right GDU 1400 Multifunctional Display (MFD) (UI406). Refer to Chapter 34, Garmin GDU 1400 Displays (G2000) - Removal/Installation.

(6) Unlock the GEA 71 handle by unscrewing the Phillips screw.

(7) Pull the handle upwards to unlock the GEA 71.

(8) Carefully remove the unit from the rack.

B. Install the GEA 71 Engine/Airframe Unit (UI400) (Refer to Figure 401).

(1) Visually inspect the connectors to make sure there are no bent or damaged pins.

(a) Repair any damage.

(2) Carefully insert the GEA 71 into the rack. The handle should engage the dogleg track.

(3) Press down on the handle to lock the unit into place.

(4) Lock the handle to the GEA 71 body using the Phillips screw.

(5) Install the MFD (UI406). Refer to Chapter 34, Garmin GDU 1400 Displays (G2000) - Removal/Installation.

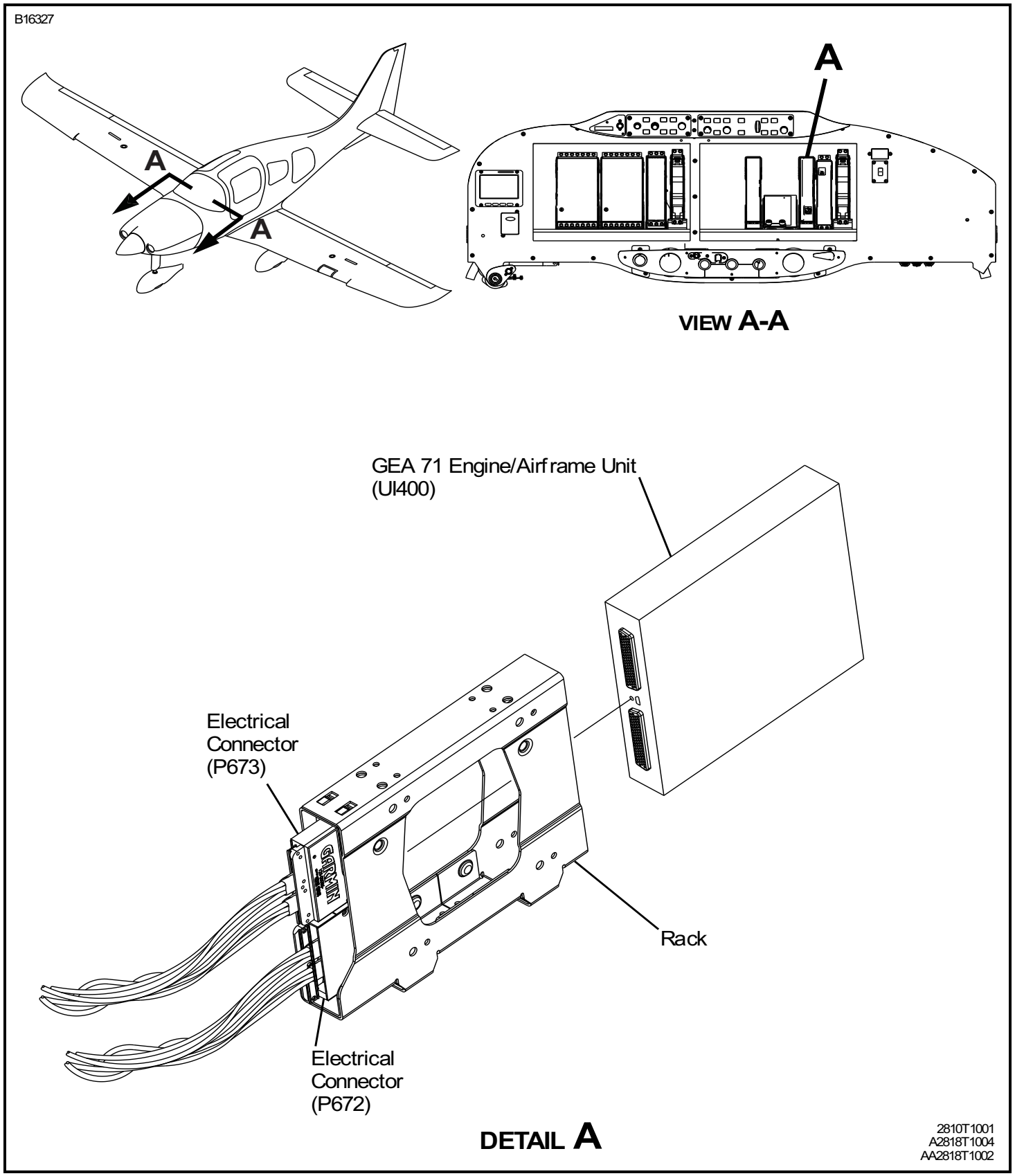
(6) Engage the ENGINE AIRFRAME circuit breaker found on the cockpit circuit breaker panel.

(7) If you installed the same GEA 71, no software loading is necessary.

(8) If you installed a new GEA 71 you must upload the software and configuration files to the unit. Refer to Garmin G2000 - Adjustment/Test PFD and MFD Initial Baseline Software and Configuration Files Upload. For more data applicable to the upload of software and configuration files, refer to the Loading and Testing LRU Software section of the most current revision of the Garmin G2000 Integrated Avionics System Line Maintenance Manual, P/N 190-01185-00, found on the Supplier Publication List.

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Figure 401 : Sheet 1 : GEA 71 Engine/Airframe Unit Installation



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EXHAUST - GENERAL

1. General

A. Except as indicated in Section 78-10-00, Right Side Tailpipe Clamp Safety Wire, Section 78-10-00, Tailpipe Clearance and Section 78-20-00, Turbocharger and Exhaust System Inspection, refer to the Teledyne Continental Motors Maintenance and Overhaul Manual Model TSIO-550-C Form Number X30616A for specific maintenance information of the exhaust system. Contact Teledyne Continental Motors to ensure you have the latest revision to their manual. It is the responsibility of the owner or operator of the airplane to maintain the revision schedule for all manuals related to the Teledyne Continental Motors Permold Series Model TSIO-550-C.

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EXHAUST - MAINTENANCE PRACTICES

1. Right Side Tailpipe Clamp Safety Wire

A. Remove and install the right side tailpipe per the Teledyne Continental Motors Maintenance and Overhaul Manual Model TSIO-550-C Form Number X30616A. Safety wire the clamp per Figure 201 using 0.032-inch diameter MS20995C32 safety wire, or equal.

2. Tailpipe Clearance

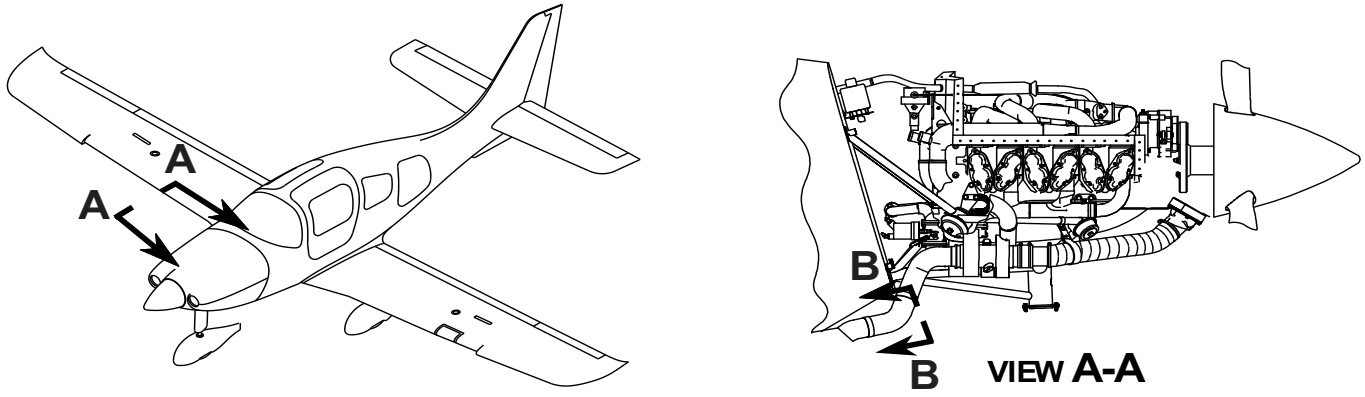
A. Ensure a minimum 0.5 inch clearance between the left and right tailpipes and the forward face of the firewall heat shield.

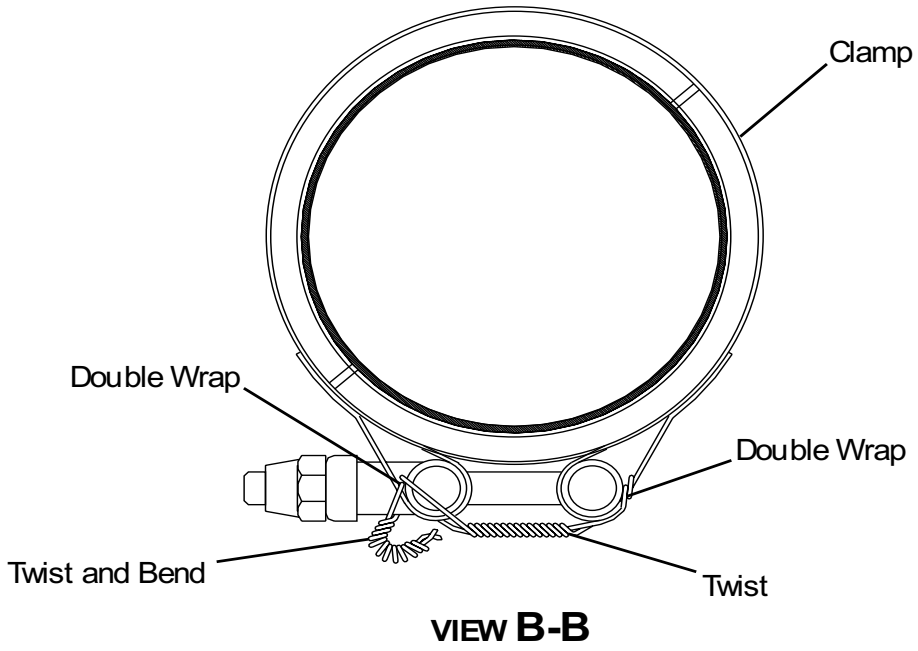
B. Ensure a minimum 0.75 inch clearance between the left and right tailpipes and the forward face of the exhaust tunnel heat shield on the fuselage.

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Figure 201 : Sheet 1 : Right Side Tailpipe Clamp Safety Wire

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TURBOCHARGER AND EXHAUST SYSTEM - MAINTENANCE PRACTICES

1. Turbocharger and Exhaust System Inspection

A. The following visual inspections apply to both the 50 hour and 100 hour or annual inspections.

- Inspect the engine exhaust system for erosion, burned areas, bulging, looseness, cracks, and integrity of welds. If any repaired components are found, they must be replaced with new components.
- Inspect exhaust system clamps for cracks and looseness.
- Inspect slip joints for erosion, burned areas, thinning of material, bulging, looseness, cracks, and integrity of welds.

CAUTION: Ensure the exhaust system is cool before performing any inspection to prevent burns.

WARNING: All repaired components must be replaced with new components.

WARNING: A thorough inspection of the engine exhaust system is require to detect any breaks or cracks causing leaks which might result in the loss of optimum turbocharger efficiency and engine power. A leaking exhaust system may also promote deterioration of engine compartment structure and components or could result in a fire.

WARNING: Never use lead pencils on the engine exhaust system.

WARNING: Never use a wire brush or abrasives to clean engine exhaust systems.

NOTE: Particular attention should be given to condition of the multi-segment Vband clamp flanges and multi-segment clamps outer band spot welds.

NOTE: Do not use dye penetrant inspection procedures, since non-critical metal forming folds yield misleading failure indications.

NOTE: Inspection procedures for both left and right sides of the engine exhaust system are typical.

NOTE: For slip joints, minor exhaust stains on airframe and/or surrounding accessories must be considered normal since these joints will exhibit a perceptible leakage during their entire service life.

NOTE: The use of artificial light and a mirror will be required.

(1) **50 Hour Inspection**

(a) Perform the 100 hour or annual inspection described below, but do not perform any disassembly. The 50 hour inspection is a visual inspection only.

(2) **100 Hour or Annual Inspection**

(a) Remove any item that hinders the visual inspection of the parts. Refer to Figure 202.

(b) Clean the exhaust system (refer to Figure 201), removing oil and grease, by spraying the exhaust system parts with Stoddard solvent, allow the solvent to drain, and wipe the parts dry with a clean cloth.

(c) Clean the multi-segment V-band clamps located between the turbocharger and tailpipe using crocus cloth on the outer band of the clamp assembly.

NOTE: Before performing the visual inspection, the parts must be cleaned.

(d) Visually inspect the exhaust system components listed in Figure 202 for the conditions listed in Table 201.

Table 201. Exhaust Inspection Criteria

Part	Inspection Action
RisersElbows	Check parts for the following:
	• Burned areas
	• Cracks
	• Loose parts/hardware
	• Pay particular attention to welded areas and seams, checking for cracks. Replace any cracked, burnt, or worn part.
Slipjoints	Check for bulges and cracks. Refer to Figure 203.

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Multi-Segment V-Band Clamps	Inspect spot weld (or rivet) areas for cracks and looseness.Inspect the corner radii of clamp inner segments for cracks with a flashlight and mirror.Inspect the inner segment spacing.Inspect the clamp outer band for flatness using a straight edge, especially within 2 inches of spot weld tabs that retain the Tbolt fastener - clearance must be less than 0.062 inches.Verify 100% inner and outer band segment contact.

(e) Connect a high volume, dust-free, air pressure source (pressure/vacuum cleaner) to the exhaust tailpipe outlet.

(f) Apply 5 psi of air pressure to the exhaust system.

(g) Apply soapy water to the exhaust system and check for bubbling. If bubbling is found, replace the leaking exhaust components using instructions in Chapter 10 of the latest version of TCM Publication M-18.

WARNING: Welding exhaust system components is not permitted.

NOTE: Exhaust system components cannot be welded. Replace any malfunctioning component.

(h) Visually inspect the turbocharger center housing for general condition. Replace the housing if it is worn. Refer to the Kelly Aerospace Power Systems Aircraft Overhaul Manual Turbocharger (400600-0000).

(i) Inspect the turbocharger oil reservoirs, oil inlet and outlet fittings and surrounding area for signs of leakage. Torque fasteners or fitting or replace leaking parts, as required to remedy leaking reservoirs or fittings.

(j) Remove the induction air supply duct to the turbocharger compressor.

(k) Remove the turbocharger exhaust tailpipe.

(l) Remove the turbocharger compressor discharge duct.

(m) Inspect the compressor interior for evidence of oil. If evidence of oil is found, inspect the turbocharger according to the turbocharger manufacturer’s inspection procedures. Refer to the Kelly Aerospace Power Systems Aircraft Overhaul Manual Turbocharger (400600-0000).

(n) Inspect the air supply duct and compressor discharge duct for wear, chafing, deformation, cracks or other physical damage; replace, if necessary.

(o) Visually inspect the exhaust tailpipe and transition unit for wear, leaks, cracks, or distortion. Replace worn, leaking, cracked, or distorted exhaust parts. Removal and installation procedures per Chapter 12 and 17, respectively, of the latest version of TCM Publication M-18.

(p) Turn the compressor wheel by hand and check for freedom of rotation and endplay. If the wheel binds or endplay is absent, repair or replace the turbocharger according to the turbocharger manufacturer's instructions.

(q) Inspect the turbine wheel and compressor blades for damage, evidence of foreign object damage, freedom of rotation, and evidence of oil.

(r) Inspect the wastegate actuator and butterfly valve for general condition and freedom of movement. Check the link rod pins and levers for wear. If the wastegate actuator, butterfly valve, link rod pins or levers are worn, binding, or damaged, refer to Kelly Aerospace Power Systems Aircraft Overhaul Manual, Turbocharger (400600-0000) for repair instructions.

(s) Lubricate the wastegate butterfly valve with Mouse Milk penetrating oil manufactured by:

Worldwide Filter
1685 Abram Court
San Leandro, CA 94577

(t) Inspect the compressor housing V-band clamp, exhaust housing bolts and lock tabs for security. Torque any loose hardware per Appendix B of the latest version of TCM Publication M-18.

(u) Reassemble the turbocharger and exhaust system.

1 Install the induction system air supply duct per the applicable engine removal, cleaning, and installation procedures in Chapter 71 of this manual.

2 Install the turbocharger compressor discharge duct per the latest version of TCM Publication M-18.

3 Install the exhaust pipe per the latest version of TCM Publication M-18.

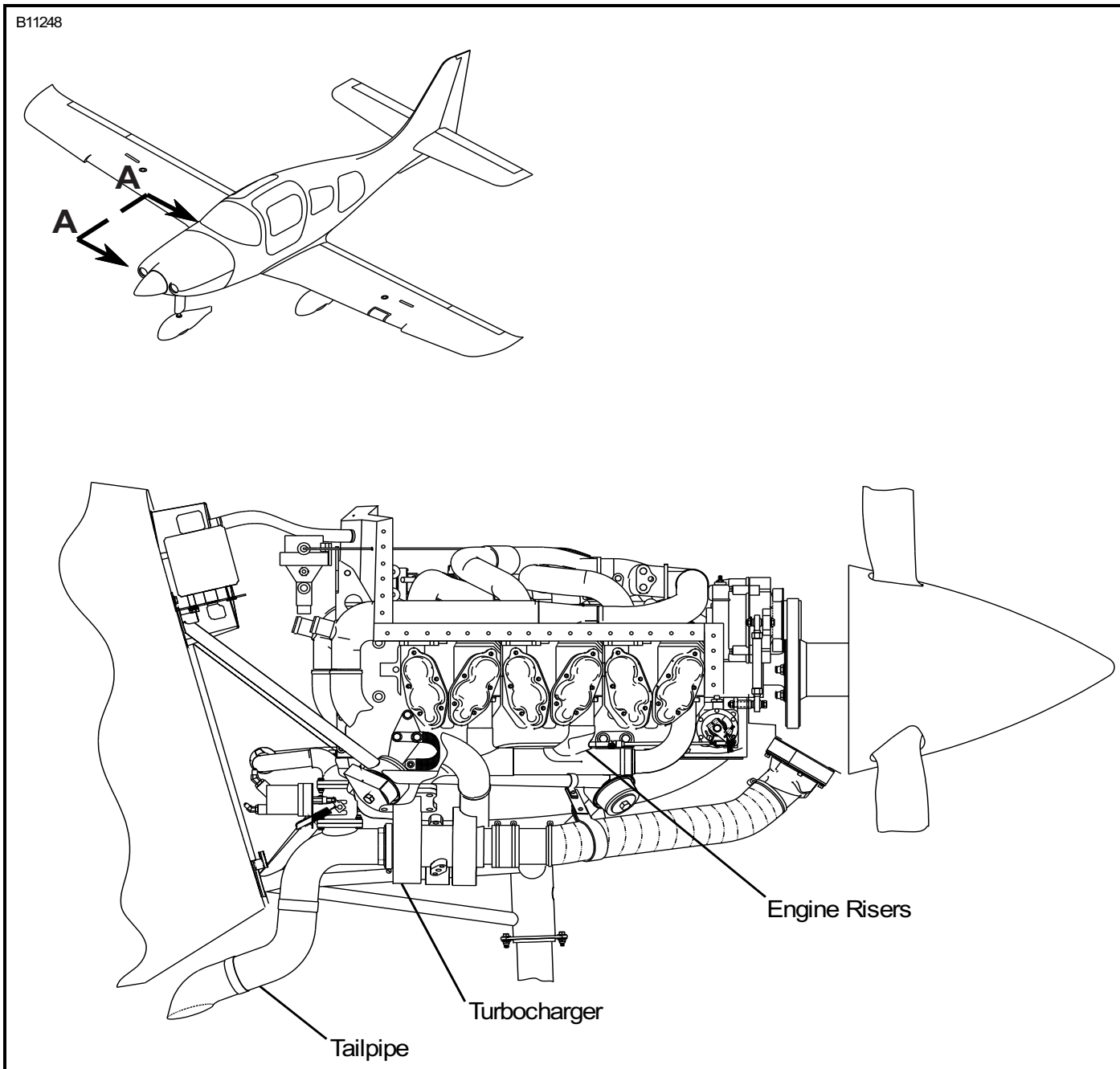
(v) Inspect the turbocharger control system linkage for correct rigging, security and freedom of movement. Lubricate

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the turbocharger control system link rod pins with Permatex Maintain lubricant.

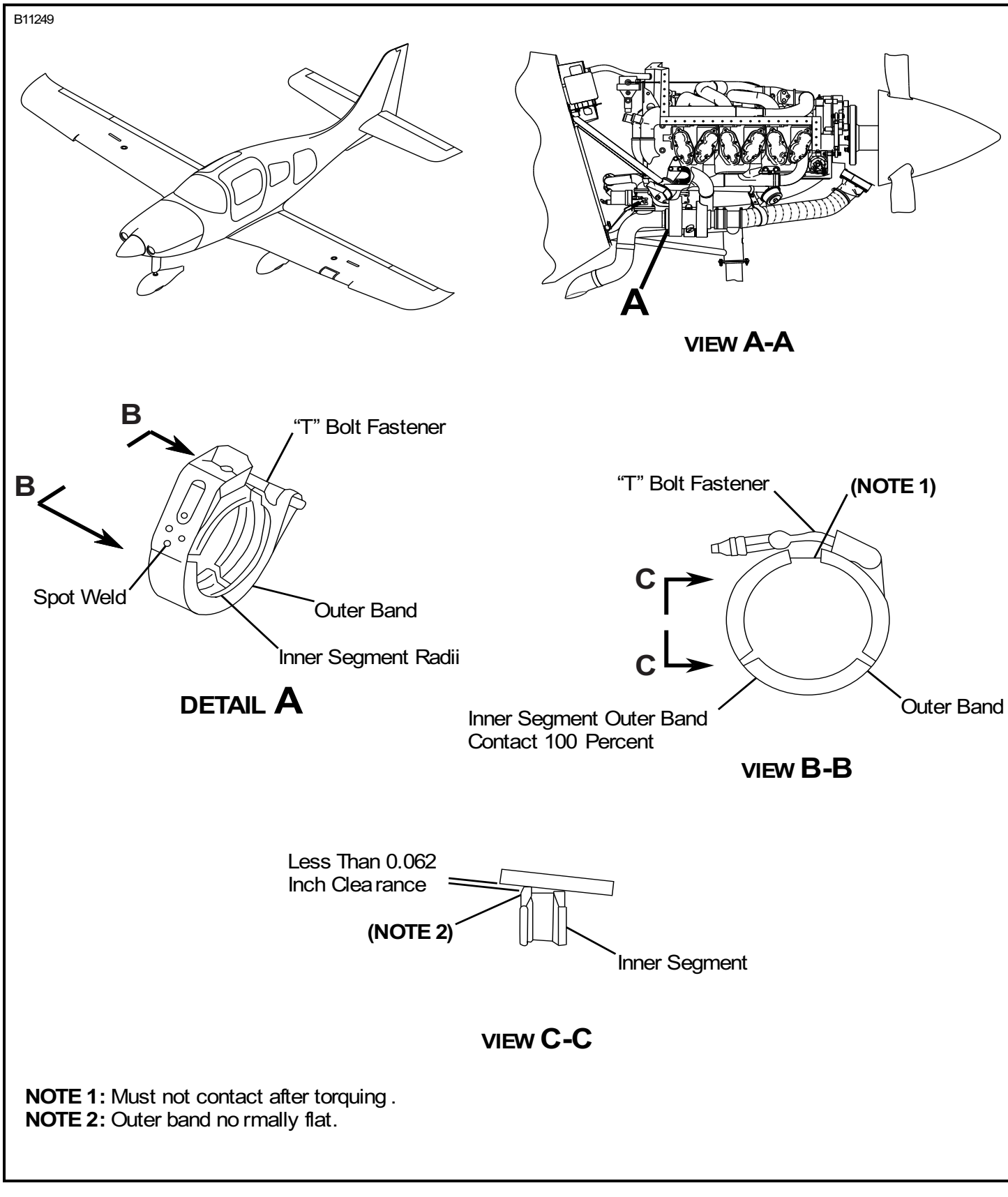
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Figure 201 : Sheet 1 : Exhaust System – Right Side (Left Side Similar)



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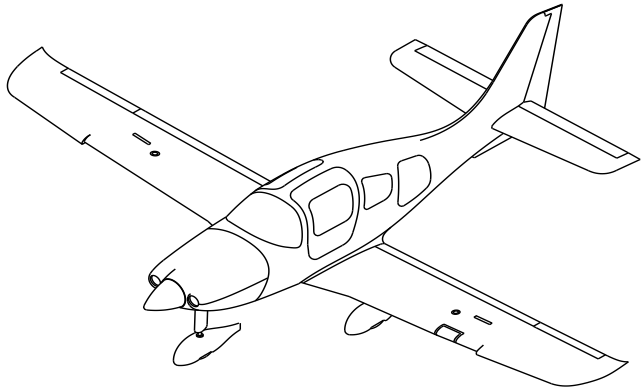
Figure 202 : Sheet 1 : Exhaust System V-Band Clamp

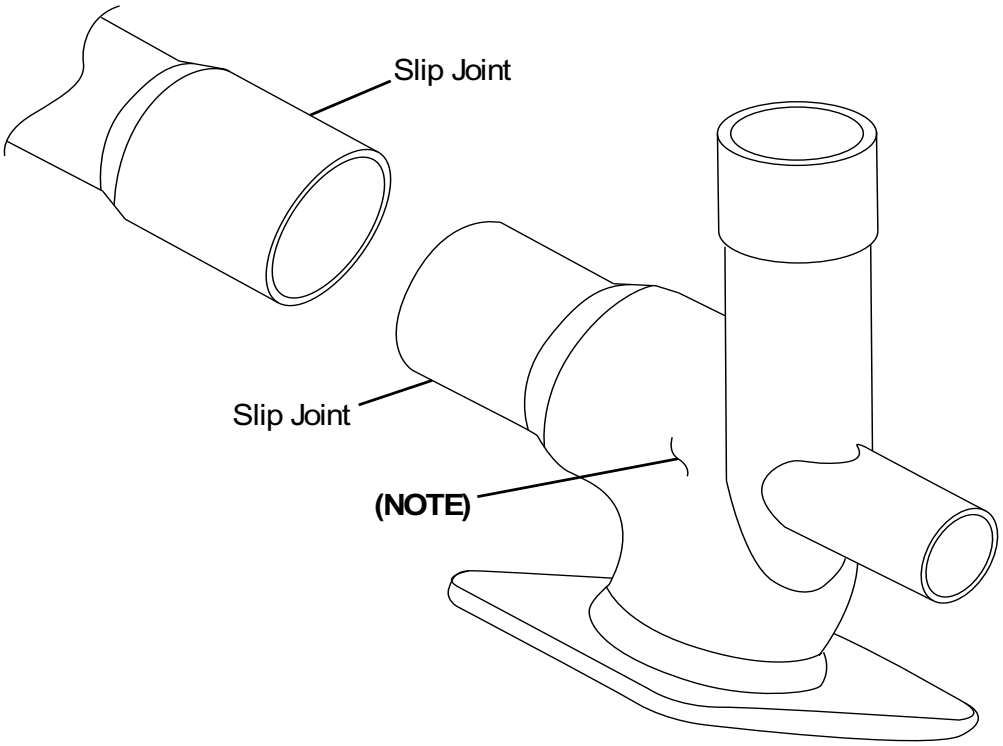


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Figure 203 : Sheet 1 : Exhaust Slip-joint Coupling

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NOTE: Inspect for bulges or hot spots.

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OIL - GENERAL

1. General

A. The oil system for the engine has several important functions. The engine oil reduces friction of moving parts, removes heat from the engine, removes contaminants from the engine with a filter and protects the engine from corrosion. The engine oil system provides lubrication and a hydraulic source for the constant-speed propeller and governor. This section provides reference information to the procedures to maintain the airplane oil system.

NOTE: This manual contains some information about operating limits for convenience, refer to the approved Airplane Flight Manual or Type Certificate Data Sheet for a complete listing operating limitations.

B. Engine Oil Pressure and Temperature Indication

(1) For Garmin equipped airplanes the engine oil pressure and oil temperature indication is located on the left side of the MFD.

(a) Garmin G1000 airplanes, refer to Chapter 34, Primary and Multifunction Display Systems – Maintenance Practices.

(b) Garmin G2000 airplanes, refer to Chapter 34, Garmin G2000 - Description and Operation.

(2) For Avidine equipped airplanes a combination oil temperature/oil pressure indicator is located on the bottom-left of the engine instrument panel. Refer to Chapter 25, Instrument Panels and Electrical Panels - Maintenance Practices.

C. Engine Oil Pressure and Temperature Sensing

(1) The engine oil pressure transducer is found near the oil cooler on the left side of the engine and is installed in a cross fitting just above the Hobbs oil pressure switch. Refer to Chapter 77, Engine Temperature - Maintenance Practices for oil pressure transducer maintenance procedures.

(2) The engine oil temperature bulb is installed at the oil cooler drain screen.

D. Oil Servicing

(1) For information about oil servicing and change intervals, refer to Chapter 12, Replenishing - Servicing.

E. Refer to the Teledyne Continental Motors Maintenance Overhaul Manual Model TSIO-550-C Form Number X30616A for specific maintenance information. Contact Teledyne Continental Motors to ensure you have the latest revision to their manual. It is the responsibility of the owner or operator of the airplane to maintain the revision schedule for all manuals related to the Teledyne Continental Motors Model TSIO-550-C.

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STARTING - GENERAL

1. General

A. Refer to the Teledyne Continental Motors Maintenance Manual Model TSIO-550-C Form Number X30616A for specific maintenance information. Contact Teledyne Continental Motors to ensure you have the latest revision to their manual. It is the responsibility of the owner or operator of the airplane to maintain the revision schedule for all manuals related to the Teledyne Continental Motors Model TSIO-550-C.

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S-TEC 55X AUTOPILOT WITH AUTOTRIM - GENERAL

1. General

A. **System Overview** – The S-Tec 55X autopilot is a two axis system that controls movement around the pitch and roll axes. Information for movement around the roll axis is obtained from the turn coordinator of the airplane. The roll axis of the System 55X has heading select, VOR/Localizer front and back course intercept and tracking. It is also interfaced with the GPS and Nav system that provides standard autopilot outputs.

B. The System 55X derives pitch axis information from a solid-state absolute pressure transducer and an internal, sensitive accelerometer that provide precise pitch axis altitude hold, automatic/manual glideslope intercept and capture, and vertical speed commands totally independent of the aircraft's artificial horizon gyro. The System 55X autopilot delivers accurate altitude, vertical speed, and vertical acceleration data to the system's pitch computer, regardless of aircraft flight attitude.

2. The System 55 Flight Guidance Programmer/Computer

A. The System 55X Flight Guidance Programmer/Computer serves the function of converting pilot commands to logic signals for the roll and pitch computer functions. As the pilot enters the desired mode by pressing the appropriate mode selector switch, the computer acknowledges the mode, causing the appropriate annunciator to illuminate.

B. The roll computer receives signal inputs from the Directional Gyro or HSI, VOR/LOC and GPS deviation indicators, and the turn coordinator. The roll computer computes roll servo commands for stabilization, turns, radial intercepts, and tracking.

C. The pitch computer receives signal inputs from the altitude pressure transducer; accelerometer; glideslope deviation indicator; and vertical speed modifier control, optional altitude selector/alerter, or altitude/vertical speed selector if installed. The pitch computer computes pitch servo commands for vertical speed, altitude hold, and glide slope intercept and tracking. Sensing for trim annunciation or automatic elevator trim (STec 55X) is provided by the pitch servo. Drive for the elevator trim servo is provided by the pitch computer. Refer to Figure 2 for a diagram of the autopilot system.

3. Preflight Self-Test Procedure (S-Tec 55X Autopilot)

A. The System 55X incorporates a self-test that must pass before the autopilot can be engaged. To perform the test, aircraft DC electrical power must be on and the avionics master on. Place the Autopilot Master switch to the on position, and observe that all annunciators of the Programmer/Computer and remote display illuminate for approximately five seconds, then extinguish. When the system is first turned on, the Flight Guidance Programmer/Computer and Annunciator will display all functions as shown in Figure 1. When the self-test is complete, a RDY (ready) annunciation is displayed. Should a fault be detected, the FAIL annunciator will remain on and the auto pilot will not operate.

4. Checking The Autotrim System (S-Tec 55X)

A. Place the Trim Master Switch in the on position.

B. Press and release the HDG and VS switches and make sure that HDG and VS illuminate on the annunciator.

C. Press the VS button. The control stick will move slowly aft.

D. Rotate the VS knob. The control stick will move slowly forward.

E. Press the autopilot disconnect switch (APD) on the control stick (refer to Figure 3) and make sure that the autopilot disconnects.

F. Engage HDG mode and move the DG or HSI HDG bug left and right. The control stick will follow the HDG bug.

(1) If HSI equipped, center the course arrow under the lubber line and push the NAV button. Move the course arrow on the HSI left then right. The control stick will follow the course arrow. Channel a valid VOR signal and move course arrow just enough to deflect the left/right needle 1 or 2 dots. The control stick will follow the Course Deviation Indicator (CDI) left/right needle during the test. (This test is only valid if the left/right needle is centered with the course arrow under the lubber line.)

(2) If DG equipped, center the HDG bug under the lubber line. Channel a valid VOR signal. Move the OBS to cause left/right CDI needle deflection. The control stick will follow the left / right needle movement.

G. Press the REV mode switch. The control stick will respond opposite to the course arrow and CDI left/right needle inputs.

H. Press the ALT (Altitude Hold) switch. Slowly pull aft (nose up) on the control stick. Autotrim will run nose down with TRIM flashing on the remote annunciator and the autopilot computer/programmer after approximately 3 seconds. Slowly move the control stick forward (nose down). After 3 seconds, Autotrim will move nose up with TRIM flashing on the remote annunciator and the autopilot computer/programmer after approximately 3 seconds.

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I. Place the Trim Master Switch in the off position.

5. Manual Electric Trim Test

A. Place the Trim Master switch in the on position.

B. Move the elevator trim switch (hat switch on the control stick) up and down. The autopilot will disengage. The RDY (ready) annunciation will flash, then display a steady indication, and the trim will operate in the commanded direction. (The elevator trim switch will disengage the autopilot only when a pitch mode is engaged.) Re-engage the heading and VS modes, and press the Autopilot disconnect switch (APD). The autopilot will disengage. As before, the RDY indication will flash, then annunciate steady. An audible tone will be heard when the autopilot is disconnected.

6. Flight Director Equipped

A. Place the Autopilot Master Switch in SELECT FD position. Verify the roll, pitch, and trim servos are disengaged. The steering bar will be in view on the attitude indicator.

B. Engage HDG mode. Move the HDG bug 45 degrees left. The roll steering bar will slowly indicate a left steering command. Repeat the same test for the right side.

C. Engage VS mode. Select 1500 FPM rate of climb. Verify the pitch steering bar moves slowly up. Repeat the same test for the down direction.

D. Place the Autopilot Master Switch in SELECT FD/AP. The servos will re-engage.

E. Place the Trim Master switch in the on position.

F. Place the Manual Electric Trim Command switch to MOVE FWD or AFT. The autopilot will disconnect.

G. The Manual Electric Trim Command switch will disconnect the autopilot only if there is a Pitch Mode engaged.

7. Autopilot Disconnect Switch

A. The autopilot disconnect switch is a spring loaded rocker switch on the top left side of the pilot's control stick and is normally operated with the thumb of the left hand. Pressing either the top or the bottom portion of the rocker switch will disengage the autopilot. (Note: Operating the elevator trim switch will also disconnect the autopilot.)

8. S-Tec Autopilot Integration With Avidyne Flightmax Entegra Primary Flight Display (PFD)

A. Whenever the S-Tec System 55X Autopilot or the Avidyne PFD are replaced, perform setup procedures indicated in Chapter 34.

9. Instructions For Continued Airworthiness (S-Tec Corp.)

A. **Description** - The S-Tec flight control system includes the following items:

(1) Roll servo

(2) Pitch servo

(3) Trim servo (elevator)

B. **Installed Equipment** - Panel or remotely mounted pitch/roll/yaw computers include the following:

(1) Panel mounted controllers, indicators, switches, and breakers

(2) Barometric pressure transducer/static source

C. **Servos** - Servo installations utilize aluminum brackets to secure the servos to the airframe. Attachment to the aircraft primary flight controls and trim systems is accomplished through cable and push rod assemblies.

D. **Controls Operation Information** - Operation of the autopilot and other systems is described in FAA Approved S-TEC Flight Manual Supplement P/N 891830S. Specialized controls, annunciation, operation and interpretation are covered in this required document and in S-TEC Pilot's Operating Handbook S-TEC P/N 87109 that supplements the approved AFMS. This information is also contained in the POH/AFM.

E. **Servicing Information** - Approved S-TEC dealers holding the appropriate FAA certification must accomplish all servicing of items. Locations and access to the components installed are described and depicted in the installation drawings and Installation Instructions ST- 852. Removal and replacement of components should be determined by functional checks indicated in S-TEC AFM Supplement 891830S, Pilot's Operating Handbook document number, 87109 (55X) and the Post Installation Ground Checks document number 05110.

F. **Maintenance Instructions** - Condition and/or airworthiness inspections required under FAR Part 43, or other FAA approved programs, should include several items regarding the S-TEC autopilot system installed in the aircraft.

(1) Visual Inspections

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(a) Flight Control Components - Check control cables, pulleys, servos, and associated equipment for condition, attachment, clearance, and proper operation. Replace cables that have broken strands or evidence of corrosion. Check cables for proper tension.

(b) Electrical Wiring and Components - Check for security, chafing, damage and attachment. For replacement of any of the autopilot wiring, cables or associated components, refer to the Master Drawing List 921139 for the appropriate drawing or document associated with the action to be performed.

(2) System Operation Check after Maintenance - Refer to the following procedures:

(a) Preflight Self-Test Procedure (S-Tec 55X Autopilot)

(b) Checking The Autotrim System (S-Tec 55X)

(c) Manual Electric Trim Test

(d) Flight Director Equipped

10. Troubleshooting Information

A. Troubleshooting this equipment should only be accomplished by FAA approved repair facilities, holding the appropriate FAA certifications, with required test equipment and service data. System function should be determined through functional checks indicated in the AFM Supplement 891830S, Pilot's Operating Handbook document number 87109, and the Post Installation Ground Checks document number 05110.

11. Special Issues

A. **Removal and Replacement Information** - All components can be removed with common tools and practices.

B. **Diagrams/Special Inspections** - Refer to Master Drawing List 921139 for all diagrams. There are no special inspection requirements.

C. **Application of Protective Treatments** - Servos and transducers should be removed prior to application of corrosion (or other) treatments. Panel mounted components should not be exposed to these treatments.

D. **Structural Fasteners** - Refer to S-Tec document No. 761017, Installation, S-Tec System 55/55X Autopilot

E. **Special Tools**

(1) **Crimp Tools** - A crimp tool and positioner/locator meeting MIL Specification M22520/1-01 or equivalent are required to ensure consistent, reliable crimp contact connections for the rear d-sub connectors. These tools are available from ITT Cannon or other vendors:

Insertion Tool:	ITT Part Number 274-7048-000 (Desc. CIET-22D-01)
Crimp Tool (HD):	ITT Part Number 995-0001-584 (Desc. M22520/2-01)
Locator Tool:	ITT Part Number 995-0001-244 (Desc. M22520/2-07)
Locator Tool (HD)	ITT Part Number 995-0001-739 (Desc. M22520/2-06)
Locator Tool (HD)	Desc. M22520/2-09

(2) **S-TEC Special Tool**

Clutch Adjustment Spanner	Part Number 6622	Drawing No. 6622 and 1
Clutch Adjustment Spanner	Part Number 66228	Drawing No. 66228 and 1 N/A

F. **Normal Category Aircraft** - Electrical load must be maintained within 80 percent of generator capacity for systems installed (AC 43.13-1B). Electrical loads are described in the Component Weights and Current Drain section of the S-Tec Installation Instructions ST-852.

G. **Overhaul Time Limitations** - N/A

H. **Airworthiness Limitations** - Limitations are listed in the Limitations Section of AFM /POH.

I. **Revisions** - The S-Tec Service Letter program will be utilized to inform aircraft operators of significant changes to this ICA. Contact S-Tec Corporation at 1-800-USA-STEC.

12. Autopilot Roll Servo

A. **General** - The autopilot roll servo is located under the flap drive bracket. It is accessed through the wing controls access panel located under the fuselage at the aft end of the wing saddle, near the wing trailing edge. The servo is attached to the bracket at an angle. This angle aligns the servo drive capstan grooves with the bridle cable. The bridle cable is attached to

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the aileron interconnect pushrod with two saddle assemblies. Refer to Chapter 27 for a discussion of the aileron system. Refer to Figure 4 for a diagram of the aileron roll servo.

B. **Removal** – The roll servo bridle cable must be detached to remove the roll servo. Remove the MS-21256-1 locking clips from the barrel of the turnbuckle. Detach this cable from both ends by loosening the turnbuckle and removing the clevis pins. Retain the MS20392-2C-11 clevis pin and NAS1149F0363P washer for reuse. A new MS24665- 134 cotter pin will be required for reinstallation.

(1) **Bridle Cable Removal and Inspection** – The bridle cable does not have to be removed from the servo drive capstan for most maintenance procedures. Check cable for signs of wear or corrosion. Replace cable assembly if required. Autopilot installation bulletins must be followed for this process.

(2) **Unplug Roll Servo** – Cut the nylon tie used to secure the electrical wiring. Unplug the autopilot roll servo electrical connection at the connector.

(3) **Servo Removal** – The servo is attached to the bracket with four AN3-4A bolts and MS20365-1032 nuts with NAS1149F036P washers. These are located on the corners of the servo attach flange and can be seen in Figure 4. When the four AN3-4A bolts and AN365-1032 nuts with NAS1149F036P washers are removed, the servo can be removed.

C. **Servo Installation** – Installation is the reverse of removal.

(1) Adjust Roll Servo clutch torque to 18 inch pounds +3 inch pounds or -3 inch pounds (2.03 N-m + 0.339 N-m or -.0.339 N-m). Refer to Chapter 20, Control Cables and Pulleys - Maintenance Practices.

(2) Adjust bridle cable tension to 30 pounds + 2 pounds or - 2 pounds (133.4 N-m + 8.89 N-m or -8.89 N-m). Refer to Chapter 20, Control Cables and Pulleys - Maintenance Practices.

(3) The four AN3-4A bolts and MS20365-1032 nuts are torqued 30 to 36 inch pounds (3.38 N-m to 4.06 N-m). Refer to Chapter 20, Torque Data - Maintenance practices.

(4) Be sure to check cable tension and installation per autopilot installation requirements

13. Autopilot Pitch Servo

A. **General** – The autopilot pitch servo is located under the baggage bulkhead. It is accessed through the baggage bulkhead access panel located under the upholstery on the hat rack. The servo is attached to a composite bracket mounted at an angle to the fuselage centerline. This angle aligns the servo drive capstan grooves with the bridle cable. The bridle cable is attached to the elevator final drive pushrod with two saddle assemblies. Refer to Figure 5.

B. **Removal** – The pitch servo bridle cable must be detached to remove the roll servo. Remove the MS-21256-1 locking clips from the barrel of the turnbuckle. Detach this cable from both ends by loosening the turnbuckle and removing the clevis pins. Retain the MS20392-2C-11 clevis pin and NAS1149F0363P washer for reuse. A new MS24665-134 cotter pin will be required for reinstallation.

(1) **Bridle Cable Removal and Inspection** - The bridle cable does not have to be removed from the servo drive capstan for most work. Check cable for signs of wear or corrosion. Replace cable assembly if required. Autopilot installation bulletins must be followed for this process.

(2) **Unplug Pitch Servo** - Cut the nylon tie used to secure the electrical wiring. Unplug the autopilot pitch servo electrical connection at the connector.

(3) **Servo Removal** - The servo is attached to the bracket with two MS24694-C50 flat head screw on the upper two mounting locations and two AN3-4A bolts with NAS1149F036P washers on the lower two mounting locations. Each screw and bolt is installed into a clip nut (ESNA RM52LHA4972-8-02) attached to the servo mounting flange. These mounting bolts are located on the corners of the servo attach flange, and the bolts can be seen in Figure 6. Remove the servo.

C. **Servo Installation** - Installation is the reverse of the removal.

(1) Adjust Pitch Servo clutch torque to 22 inch pounds +3 inch pounds or -3 inch pounds (2.48 N-m + 0.339 N-m or -.0.339 N-m). Refer to Chapter 20, Control Cables and Pulleys - Maintenance Practices.

(2) Adjust bridle cable tension to 30 pounds + 2 pounds or - 2 pounds (133.4 N-m + 8.89 N-m or -8.89 N-m). Refer to Chapter 20, Control Cables and Pulleys - Maintenance Practices.

(3) Torque all bolts 30 to 36 inch pounds (3.38 N-m to 4.06 N-m). Refer to Chapter 20, Torque Data - Maintenance practices.

(4) Be sure to check cable tension and installation per autopilot installation requirements.

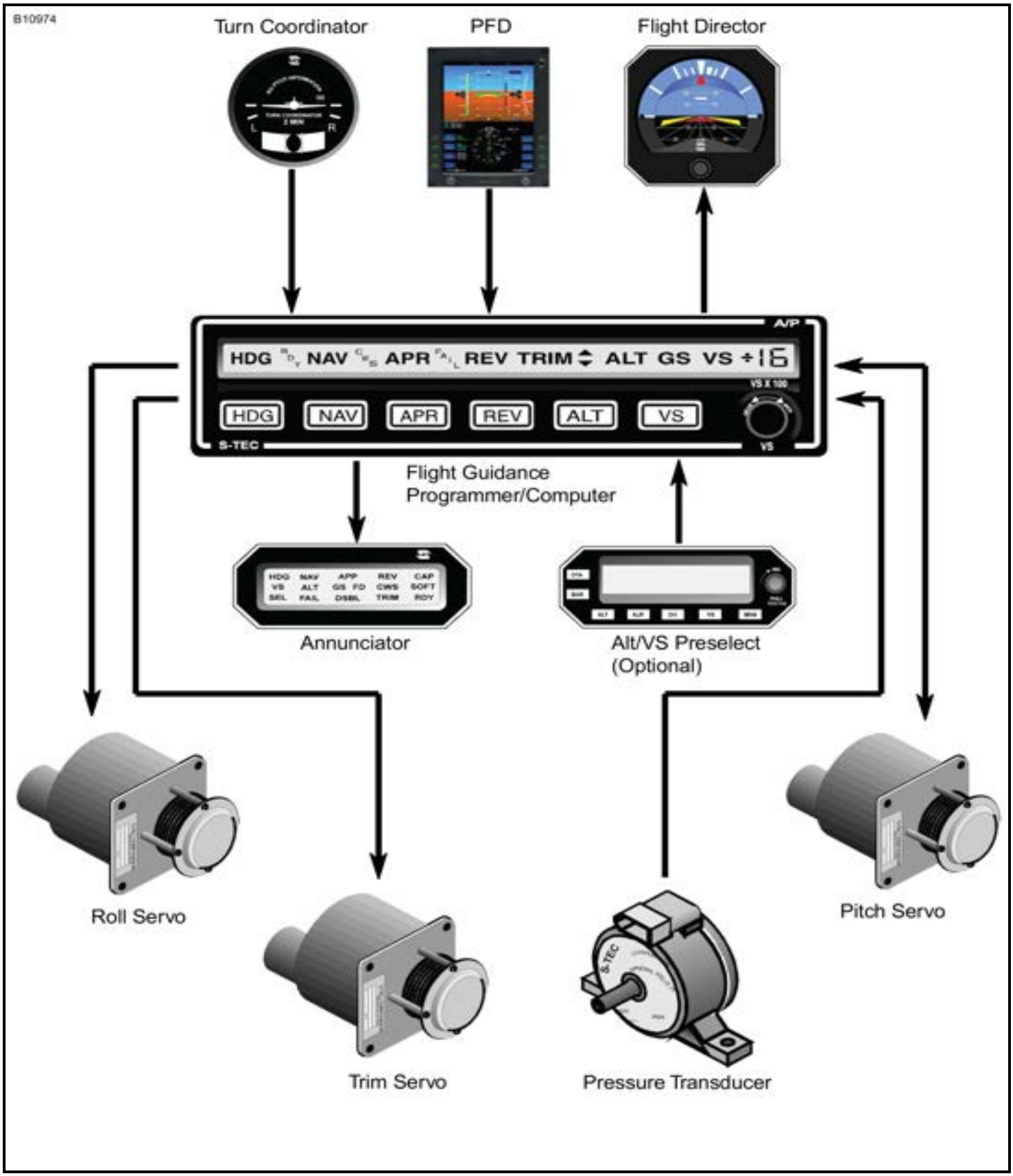
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Figure 1 : Sheet 1 : S-Tec 55X Control Panel



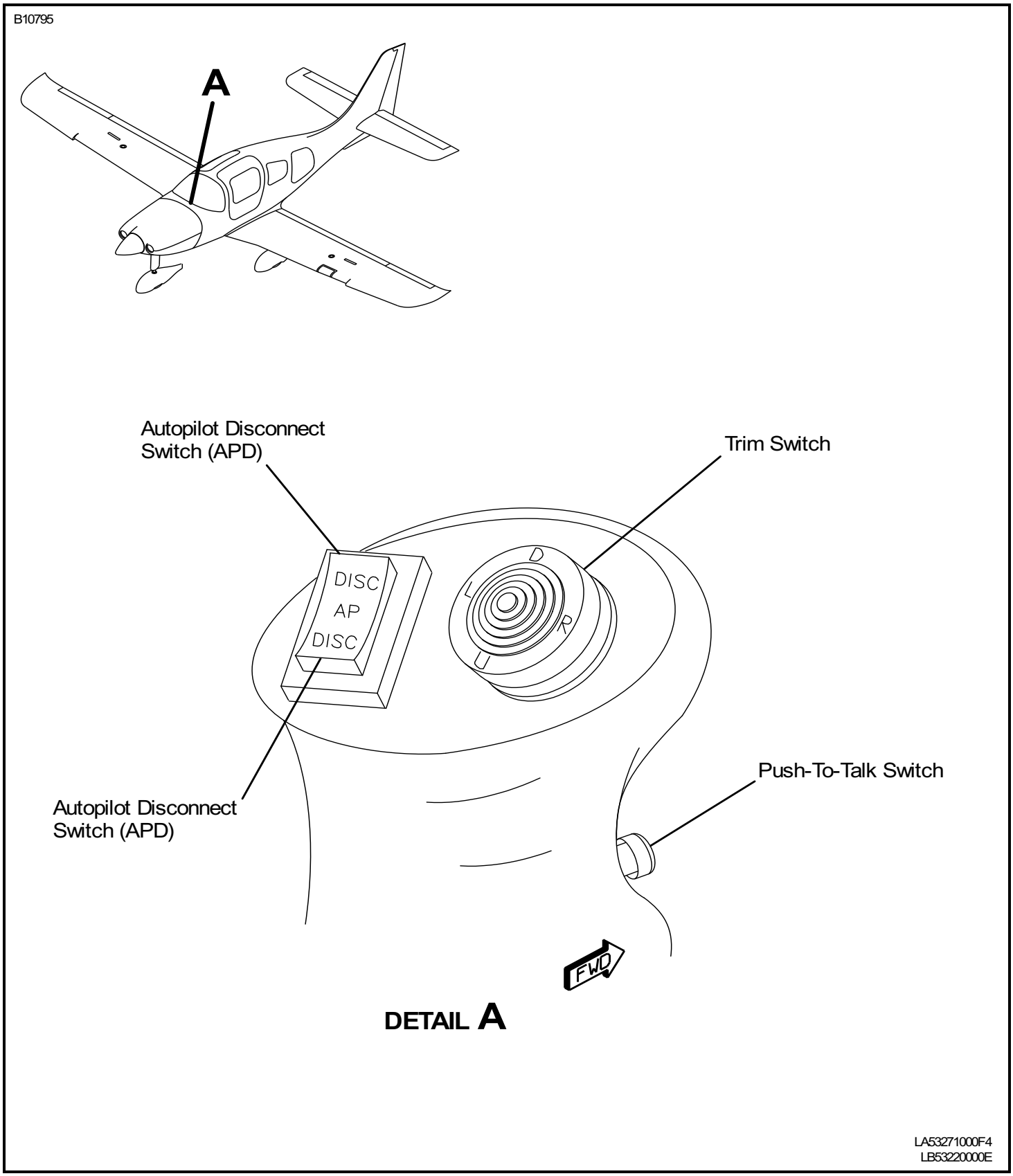
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Figure 2 : Sheet 1 : S-Tec 55X Autopilot System



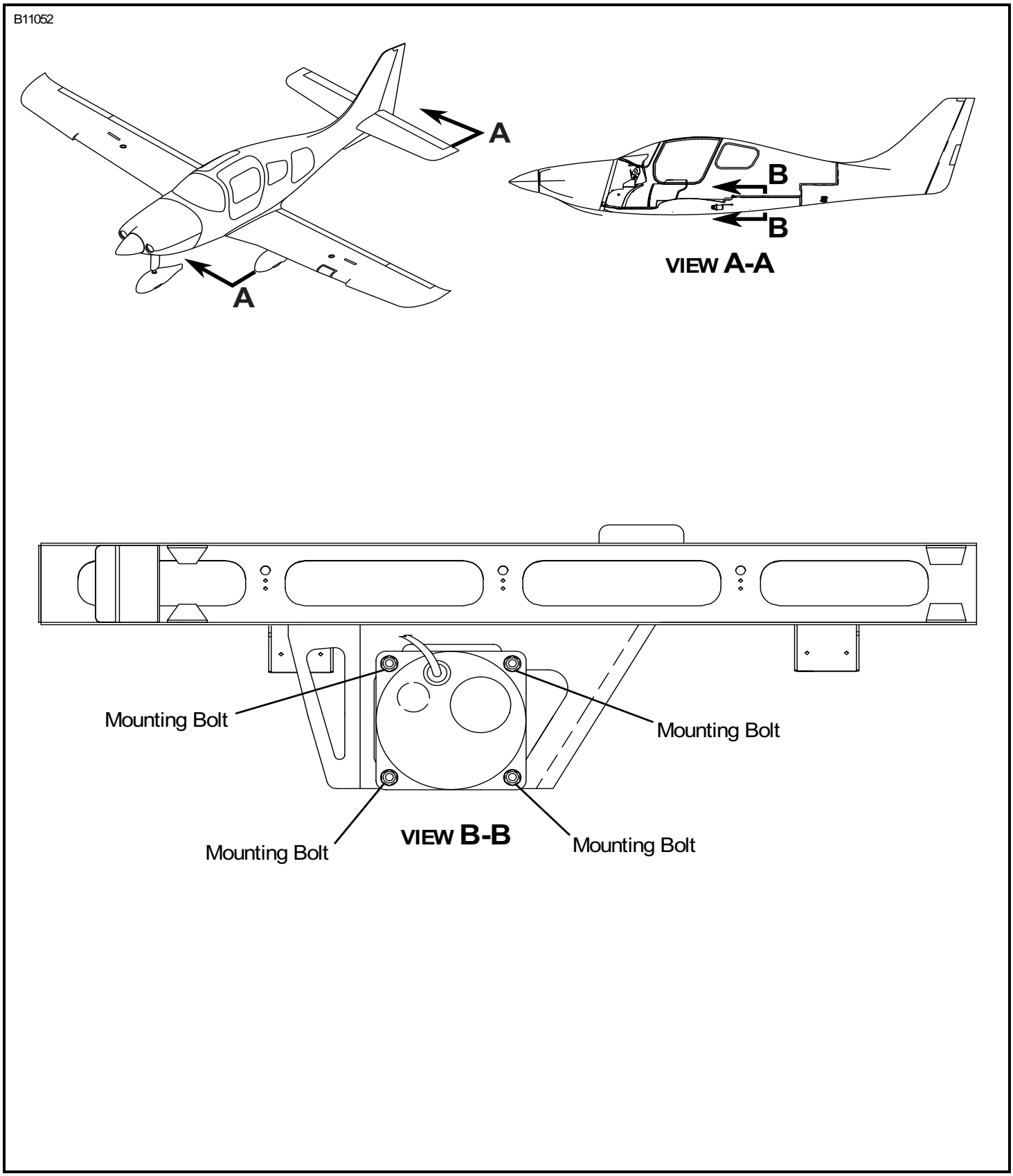
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Figure 3 : Sheet 1 : Autopilot Switches on the Control Stick



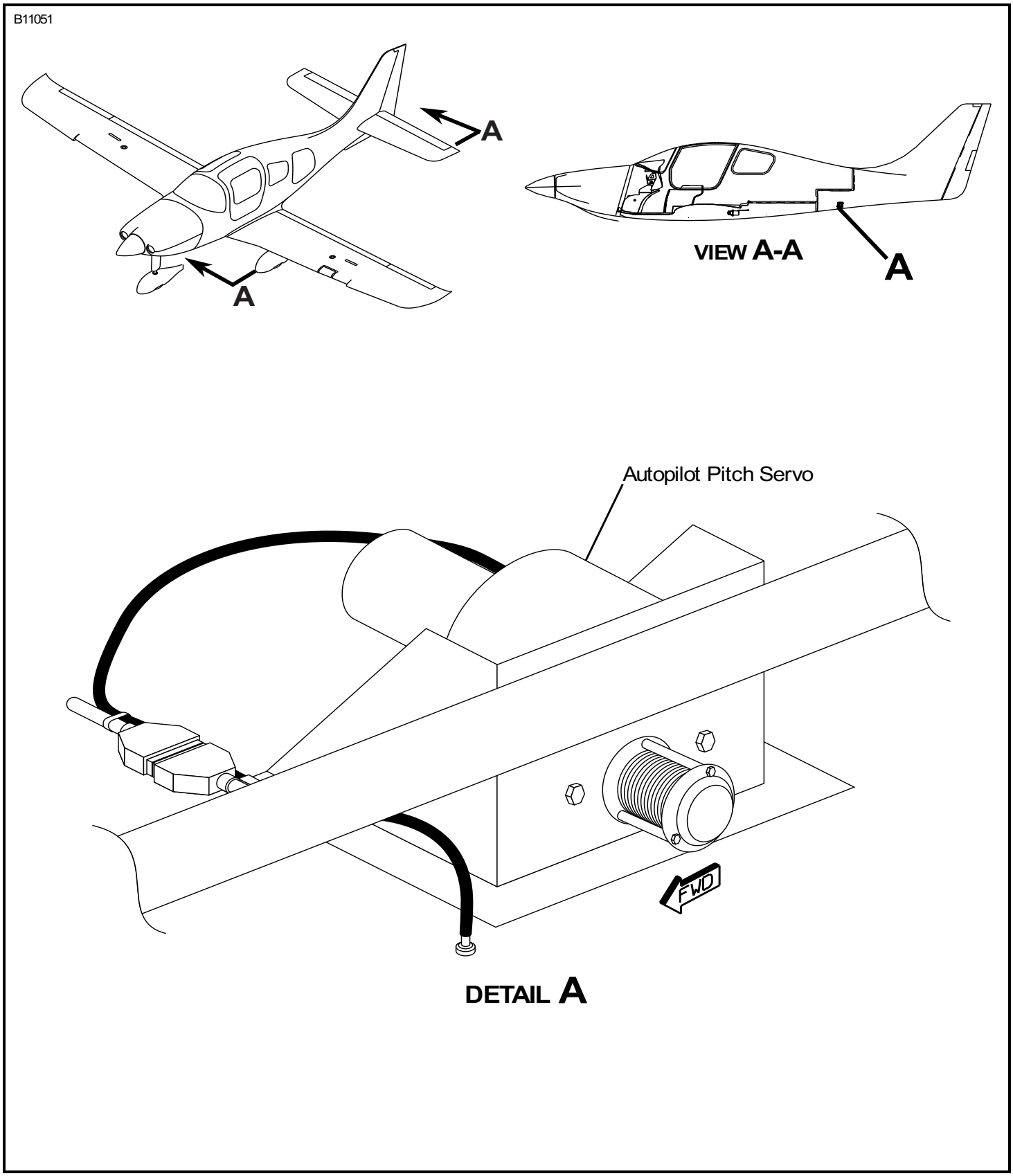
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Figure 4 : Sheet 1 : Autopilot Roll Servo (View looking forward)



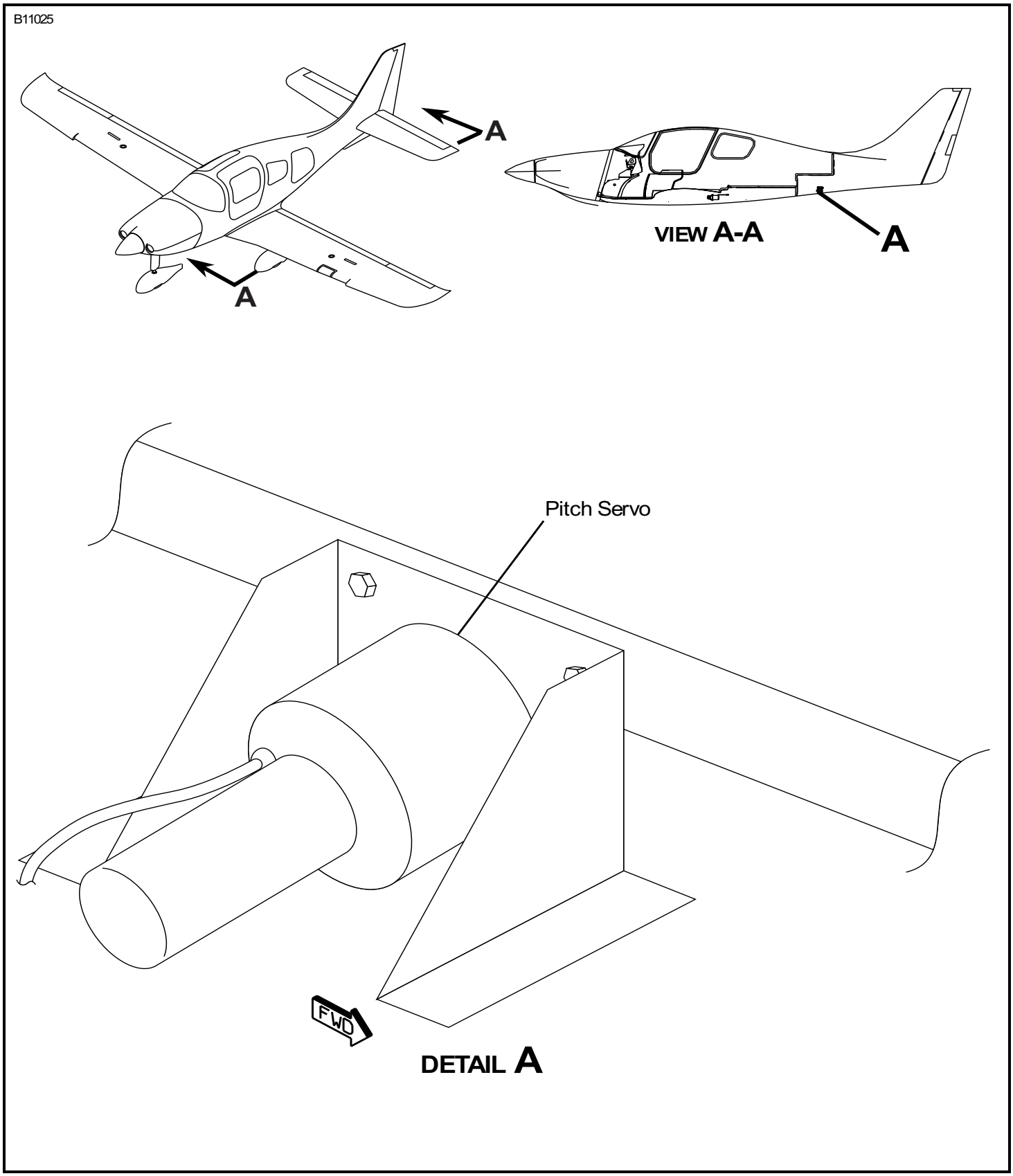
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Figure 5 : Sheet 1 : Autopilot Pitch Servo



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Figure 6 : Sheet 1 : Autopilot Pitch Servo



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GARMIN GFC 700 AUTOPILOT (G1000) - MAINTENANCE PRACTICES

1. General

A. The GFC 700 is a two-axis fail-safe digital flight control system. There is no single LRU with the name "GFC 700"; rather, "GFC 700" refers to an integrated autopilot and flight director system, with functions provided by multiple G1000 LRUs and servos. Refer to Figure 201. The following functions are provided by the GFC 700 in this installation:

- Flight Director
- Autopilot
- Manual Electric Trim

B. **Flight Director** - The Flight Director operates within the No. 1 GIA 63/GIA 63W and uses data from the G1000 system, including air data, attitude, and navigation data, to calculate commands for display to the pilot and for the Autopilot. Flight Director command bars and mode annunciations are sent to the PFD through a high-speed Ethernet connection for display to the pilot. The Flight Director operates independently of the Autopilot, and allows the pilot to hand-fly the command bars, if desired.

C. **Autopilot** - The Autopilot operates within the two GSA 81 servos. Flight Director data is processed within the two servos and turned into aircraft flight control surface commands. The autopilot cannot operate unless the Flight Director is engaged.The following is a summary of the autopilot functions provided by each LRU:

- GDU 1040 PFD - Displays the Flight Director command bars and the autopilot mode annunciations.
- GDU 1042/GDU 1044 MFD - Provides controls for the autopilot functions.
- GIA 63/GIA 63W - Performs the calculations to display the Flight Director command bars on the PFD and sends control movement commands to the GSA 81 autopilot servos.
- GSA 81 - Actuates the control surfaces based on commands received from the GIA 63/GIA 63W.
- GSA 82 Trim Adapter - Operates the elevator trim tab.

D. **Configuration and Testing** - After removal and replacement, LRUs must be configured and tested per the *Garmin G1000 System Maintenance Manual*, P/N 190-00577-03.

CAUTION: When removing and/or replacing any G1000 component, always ensure that aircraft power is off. Unplug any auxiliary power supplies.Before removing any G1000 LRU, it is required that the technician verify the LRU software part number and version against the Required Equipment List RB011002.

2. Autopilot Disconnect Switch

A. The autopilot disconnect switch is a push button switch on the top left side of the pilot's control stick and the top right side of the co-pilot's control stick, and is normally operated with the thumb. Refer to Figure 202. Pressing the switch will disengage the autopilot and the trim system. (Note: Operating the elevator trim switch in the overhead will also disconnect the autopilot.)

3. Troubleshooting

A. Troubleshoot the GFC 700 system per the Garmin *G1000 System Maintenance Manual*, P/N 190-00577-03.

4. GSA 81 Autopilot Roll Servo

A. The GSA 81 is mated to the GSM 85 Servo Mount to form a single servo unit. Refer to Figure 203.The design of the servo assembly allows the servo portion (GSA 81) to be removed from the capstan (GSM 85) without the need to de-rig the aircraft control cables. The roll servo is located beneath the rear passenger seats.

B. **Removal of the GSA 81 Autopilot Roll Servo**

(1) Ensure aircraft power is off. Unplug any auxiliary power supplies.

(2) On the underside of the wings at the fuselage remove the Flap and Aileron Push-Rod Access Panel.

(3) Disconnect servo connector P680.

(4) Remove the two bolts holding the servo to the servo mount. Refer to Figure 204.

(5) Remove the unit.

CAUTION: Do not use solvents to clean the output gear!

(6) Remove excess grease build-up from the single servo output gear using a lint-free cloth.

NOTE: It is not necessary to remove all of the grease from the output gear, only the excess grease.

(7) Using a brush or other applicator, apply a thin coat of grease to the servo output gear. Use Aeroshell 33 MS

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(preferred) or Aeroshell 17 grease.

C. **Installation of the GSA 81 Autopilot Roll Servo**

(1) Set unit in place.

(2) Visually inspect the connectors to ensure there are no bent or damaged pins. Repair any damage.

(3) Install the two bolts holding the servo to the servo mount.

(4) Connect servo connector P680.

(5) Configure and test the GSA 81 per the *Garmin G1000 System Maintenance Manual*, P/N 190- 00577-03.

(6) Operate all controls through full travel and ensure that no binding or restriction occurs.

(7) Reinstall the Flap and Aileron Push-Rod Access Panel.

5. GSM 85 Autopilot Roll Servo Mount

A. **Removal of the GSM 85 Autopilot Roll Servo Mount**

(1) Remove the GSA 81 servo per the GSA 81 Roll Servo Removal procedure above.

(2) Loosen the bridle cable turnbuckle and remove the clevis pins.

(3) Remove the four screws holding the mount to the servo bracket.

(4) Remove the unit with the bridle cable.

B. **Installation of the GSM 85 Autopilot Roll Servo Mount**

(1) Prior to installation, adjust and verify the slip clutch torque is set to 24±4 in-lb.

(a) Place the servo mount onto the Garmin Servo Adjustment Fixture (011-01085-XX) and secure with toggle clamps. Refer to Figure 205.

(b) Install the cable, supplied with the fixture, between the capstan under test and the fixture capstan.

(c) Remove slack in the cable with the tension adjust knob.

(d) Tighten the thumbscrews on the fixture capstan.

(e) Attach a socket to a calibrated torque wrench of the appropriate range and place the assembly on top of the fixture capstan. Adjust the wrench support as required to support the torque wrench in a level, horizontal position. Ensure the torque wrench is set to "ZERO" while the motor and solenoid are "OFF".

(f) Connect a 24 VDC power supply to the fixture.

(g) Place the solenoid switch to "ON" and move the direction switch to the "CW" or "CCW" position. Allow the capstan to rotate about 1 revolution in each direction. Adjust the castle nut on the servo mount until the torque value indicates 24±4 in-lb.

(h) Switch the motor direction back and forth as necessary to allow adjustment until the required torque range is achieved in both directions. Ensure the castle nut aligns with one of the holes in the shaft.

(i) Observe the slip clutch torque reading for at least two full revolutions in each direction.

(j) Ensure the minimum and maximum torque readings are within tolerance of 24±4 in-lbs.

(k) When finished, remove the servo mount from the servo adjustment fixture.

(l) Install a new cotter pin through the capstan nut and servo mount shaft.

(2) Set the unit in place.

(3) Install the four screws holding the mount to the servo bracket.

(4) Install the bridle cable. Wrap the turnbuckle end approximately 270 degrees over the capstan. Wrap the fork end approximately 450 degrees over the capstan. Set the cable tension to 25 to 60 lbs. The bridle cable should make two complete revolutions around the capstan and the lock ball should be mated in its seat. System rigging to be accomplished with controls neutral.

(5) Safety wire the turnbuckle using a single wrap method with .040 safety wire or a double wrap method using .030 safety wire.

(6) Install the GSA 81 servo per the GSA 81 Roll Servo Installation procedure above.

6. GSA 81 Autopilot Pitch Servo

A. The GSA 81 is mated to the GSM 85 Servo Mount to form a single servo unit. Refer to Figure 206.The design of the servo

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assembly allows the servo portion (GSA 81) to be removed from the capstan (GSM 85) without the need to de-rig the aircraft control cables. The pitch servo is located beneath the aft baggage area. Refer to Figure 206.

B. **Removal of the GSA 81 Autopilot Pitch Servo**

(1) Ensure aircraft power is off. Unplug any auxiliary power supplies.

(2) Remove the baggage bulkhead access panel located under the hat rack per Chapter 25, Access Panels.

(3) Disconnect servo connector P681.

(4) Remove the two bolts holding the servo to the servo mount. Refer to Figure 204.

(5) Remove the unit.

(6) Remove excess grease build-up from the single servo output gear using a lint-free cloth.

NOTE: It is not necessary to remove all of the grease from the output gear, only the excess grease. DO NOT USE SOLVENTS TO CLEAN THE OUTPUT GEAR!

(7) Using a brush or other applicator, apply a thin coat of grease to the servo output gear. Use Aeroshell 33 MS (preferred) or Aeroshell 17 grease.

C. **Installation of the GSA 81 Autopilot Pitch Servo**

(1) Set unit in place.

(2) Visually inspect the connectors to ensure there are no bent or damaged pins. Repair any damage.

(3) Install the two bolts holding the servo to the servo mount.

(4) Connect servo connector P681.

(5) Configure and test the GSA 81 per the *Garmin G1000 System Maintenance Manual*, P/N 190- 00577-03.

(6) Operate all controls through full travel and ensure that no binding or restriction occurs.

(7) Reinstall the baggage bulkhead access panel and the hat rack per Chapter 25.

7. GSM 85 Autopilot Pitch Servo Mount

A. **Removal of the GSM 85 Autopilot Pitch Mount**

(1) Remove the GSA 81 servo per the GSA 81 Pitch Servo Removal procedure above.

(2) Remove the two clamps holding the bridle cable to the main control cable.

(3) Remove the four screws, two washers, and two self locking nuts holding the mount to the servo bracket.

(4) Remove the unit with the bridle cable.

(5) A tapered shim is attached to the face of the servo mount by two 10-32 x 17/32 screws and two 10-32 x 25/32 screws. Remove shim and retain for installation.

B. **Installation of the GSM 85 Autopilot Pitch Mount**

(1) Prior to installation, adjust and verify the slip clutch torque is set to 24±4 in-lb. per the GSM 85 Roll Servo Mount Installation procedure above.

(2) Install tapered shim.

(3) Set the unit in place.

(4) Install the four screws, two washers, and two self locking nuts holding the mount to the servo bracket. Apply Loctite 242 to the two screws without washers and nuts.

(5) Install the bridle cable. Wrap the turnbuckle end approximately 270 degrees over the capstan. Wrap the fork end approximately 450 degrees over the capstan. Set the cable tension to 25 to 60 lbs. The bridle cable should make two complete revolutions around the capstan and the lock ball should be mated in its seat. System rigging to be accomplished with controls neutral.

(6) Install the GSA 81 servo per GSA 81 Pitch Servo Installation procedure above.

8. GTA 82 Trim Adapter

A. The Garmin GTA 82 Trim Adapter is a remote mounted device that is used to allow the GFC 700 to drive a pitch trim actuator provided by the airframe manufacturer. The GTA 82 adapter is located under the instrument panel on the pilot side beneath the standby instruments. The trim adapter is powered by the Essential Bus and interfaces with two GIA 63/GIA 63W Integrated Avionics units through serial communication on separate RS-485 ports. Refer to Figure 207.

B. **Removal of the GTA 82 Trim Adapter**

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(1) Remove four screws securing the GTA 82 to the panel. The GTA 82 is located under the instrument panel on the pilot side beneath the standby instruments.

(2) Disconnect connector.

(3) Remove unit.

C. **Replacement of the GTA 82 Trim Adapter**

(1) Set unit in place.

(2) Install four screws to secure unit to panel.

(3) Connect connector.

(4) After installation of unit, reload the software and the autopilot gain files.

9. Inspections for the GTA 82 Trim Adapter

A. **Annual Inspection of the GTA 82 Trim Adapter**

(1) Move the flight controls through their full range of motion. Check for any signs of binding or resistance.

(2) Engage the A/P, check the Pitch, Roll, and Trim servos for normal operation.

(3) Press the A/P disconnect switch on the pilot control stick and verify that the A/P disengages and a disconnect tone is played through the aircraft speaker. Repeat for the copilot stick.

(4) Visually inspect each Servo Mount (GSM 85), moving the control surface through its full range of motion. Ensure there is no binding in the control or bridle cables. Check the cables for fraying or corrosion, and check the mount brackets for cracks or wear.

(5) Check that bridle cable tension is 25 to 60 lbs., and slip clutch settings are 24±4 in- lb. for each capstan in accordance with the GSM 85 Autopilot Roll Servo Mount and GSM 85 Autopilot Pitch Mount sections.

(6) Perform servo checks per the *Garmin G1000 System Maintenance Manual*, P/N 190-00577-03.

B. **1000 Hour Inspection of the GTA 82 Trim Adapter** - Perform a visual inspection every 1000 airframe hours or 12 months, whichever occurs first, in conjunction with the next scheduled inspection and check for corrosion, damage, or other defects for each of the items listed below. Replace any damaged parts as required. Inspection may require the temporary removal of a unit or units to gain access to connectors.

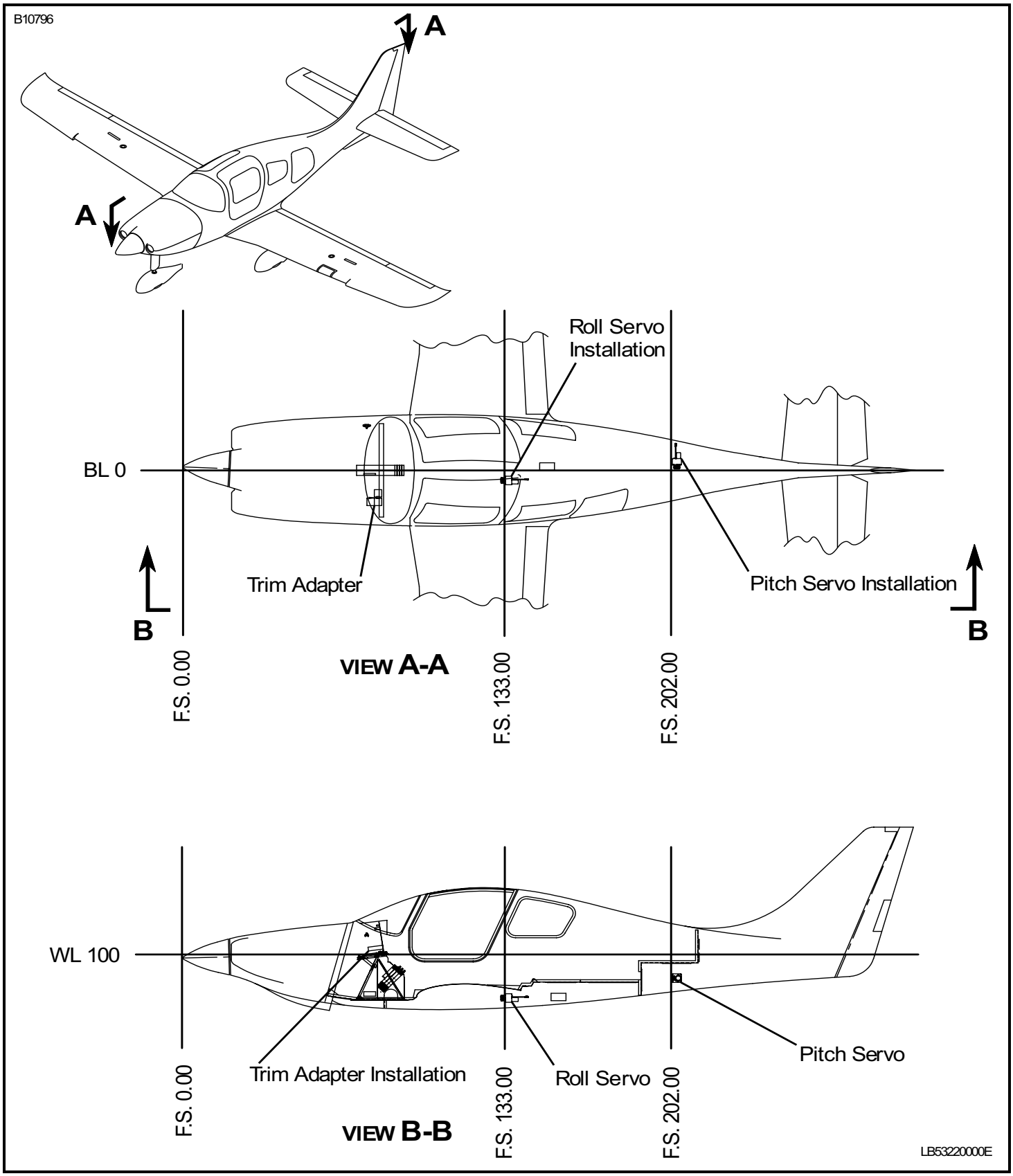
(1) **GSA 81 Servo Actuator** - Separate each GSA 81 from the GSM 85 Servo Mount (pitch, roll). Clean and re-grease the output gear every 1000 hours or 3 years, whichever occurs first, in accordance with the *Garmin G1000 System Maintenance Manual*, P/N 190-00577-03. Check connector and wiring.

(2) **GSM 85 Servo Mount** - Inspect the GSM 85 Mounts. Look for excessive wear in the capstan, and bridle cables.

(3) **GTA 82 Trim Adapter** - Inspect the GTA 82 unit and connector for corrosion or other defects.

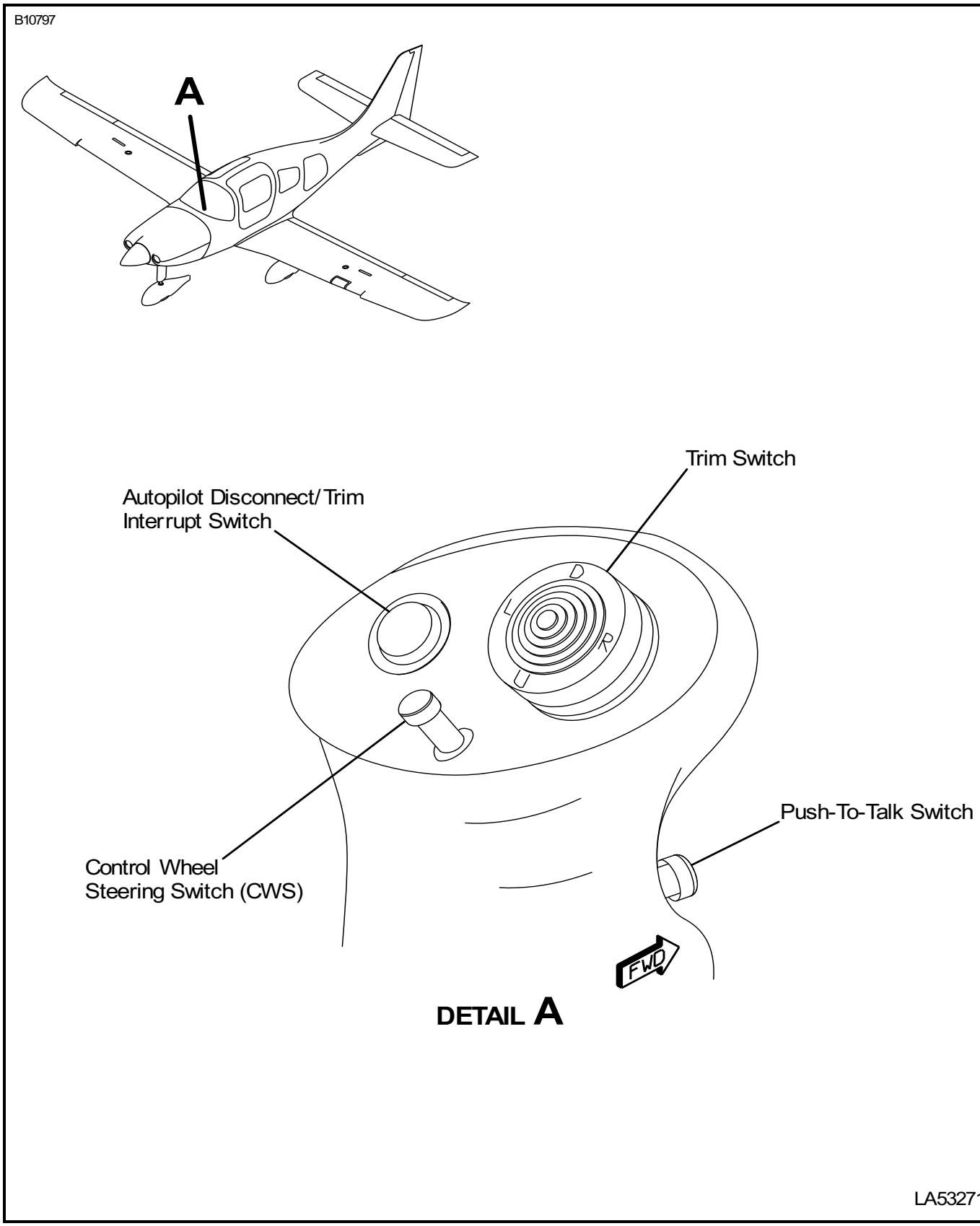
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Figure 201 : Sheet 1 : GFC 700 Autopilot



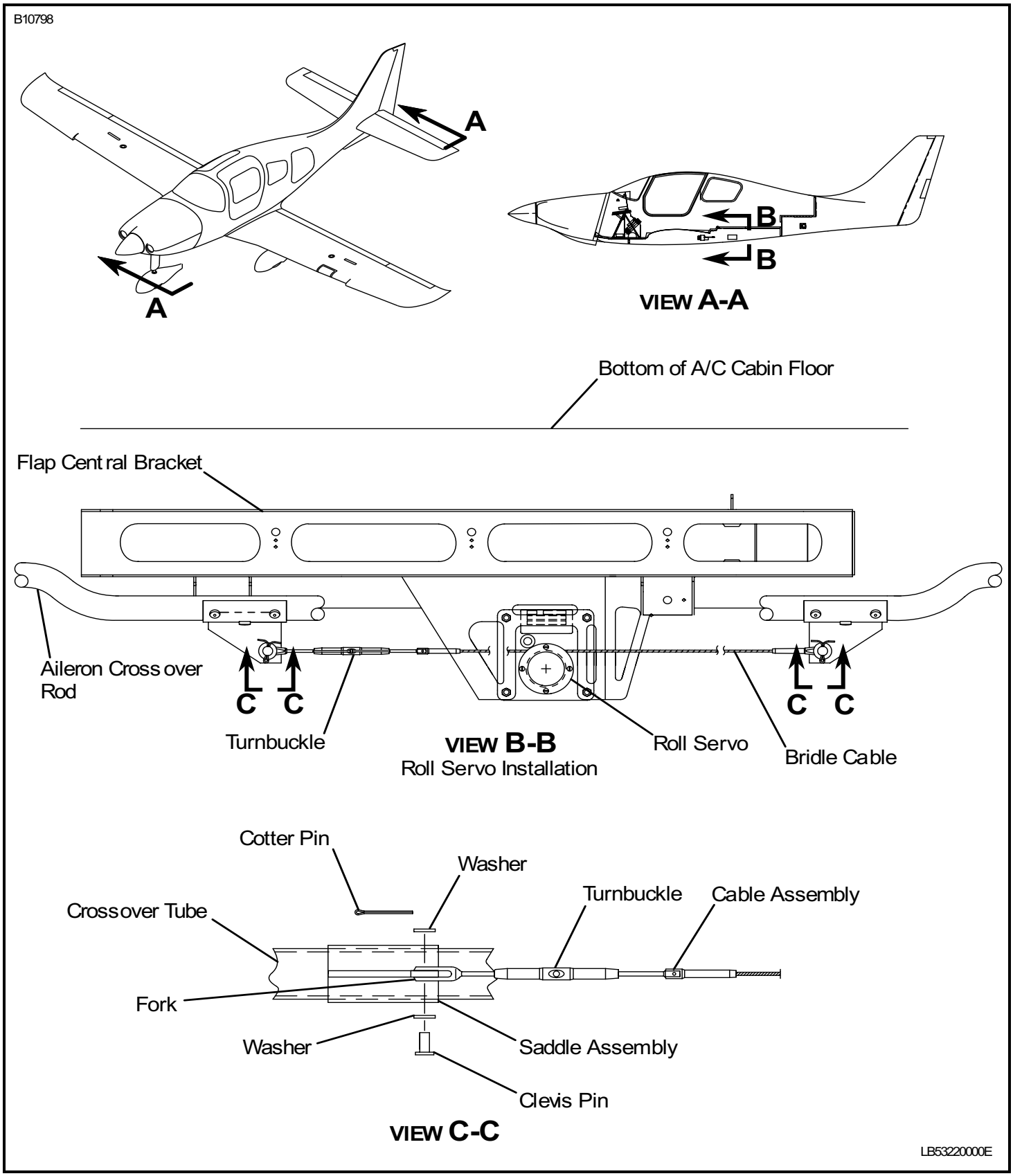
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Figure 202 : Sheet 1 : Autopilot Switch on the Control Stick



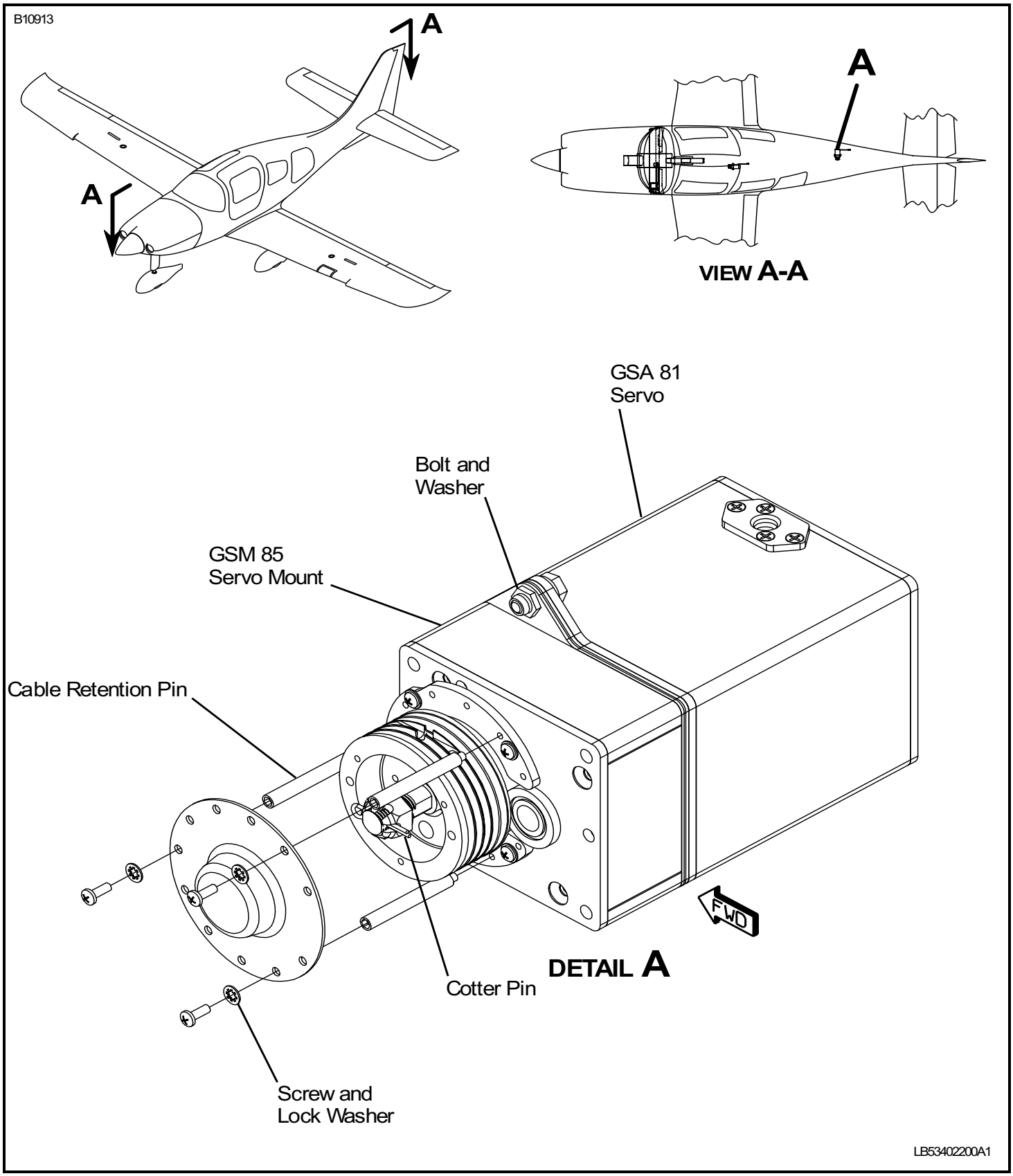
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Figure 203 : Sheet 1 : Roll Servo



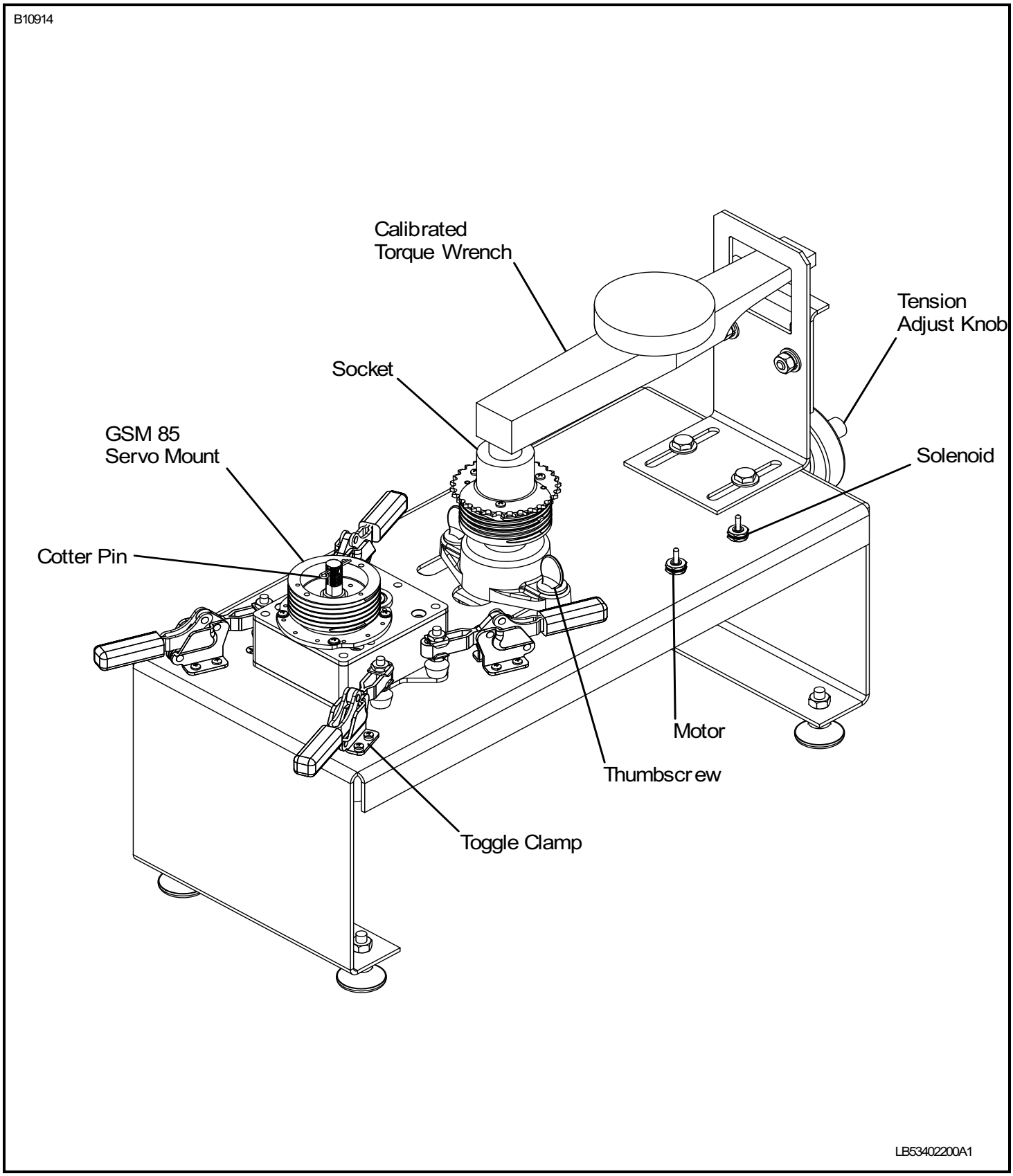
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Figure 204 : Sheet 1 : Servo Assembly



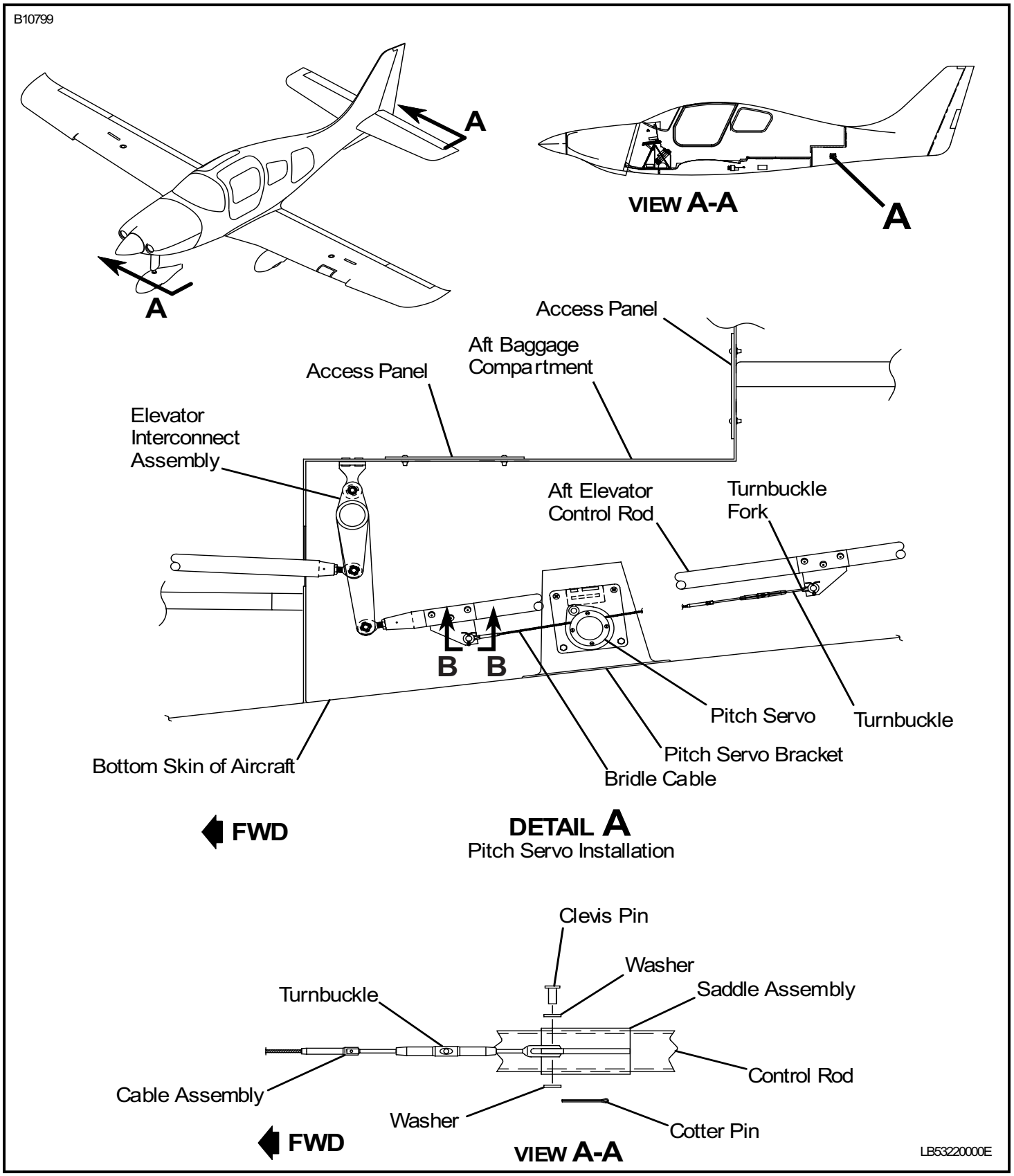
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Figure 205 : Sheet 1 : Garmin Servo Adjustment Fixture



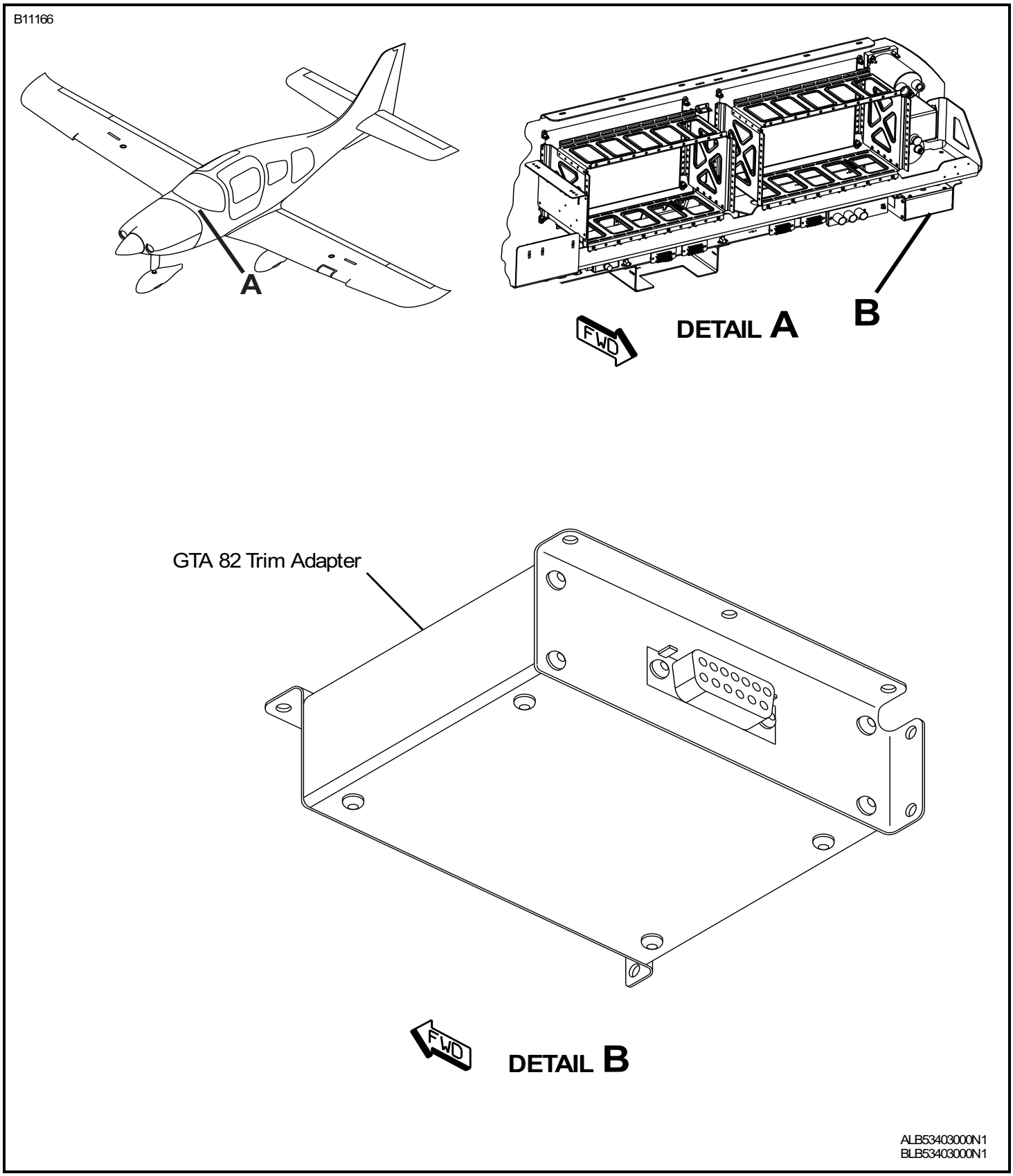
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Figure 206 : Sheet 1 : Pitch Servo



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Figure 207 : Sheet 1 : GTA 82 Trim Adapter



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GARMIN AUTOPILOT (G2000) - DESCRIPTION AND OPERATION
Garmin GFC 700

1. General

A. The Garmin G2000 Autopilot GFC 700 is a two-axis fail-safe digital flight control system. The GFC 700 refers to a fully integrated autopilot and flight director system, with functions provided by multiple G2000 LRUs. The LRU's include, the GRU 1400 Primary Flight Display (PFD), GRU 1400 Multifunctional Display (MFD), GIA 63W Integrated Avionics Units No. 1 and No. 2, two GSA 81 AFCS Servos, GTA 81 Pitch Trim Adapter, and two GSM 86 Servo mounts. Refer to Figure 1.

B. The following functions are provided by the GFC 700 in this installation:

- Flight Director
- Autopilot
- Manual Electric Trim

C. The flight crew controls the G2000 Autopilot system functions with Garmin GMC 720 AFCS Mode Controller, found on the top near right-center of the instrument panel. For more data applicable to the GMC 720, refer to Chapter 34, Garmin G2000 - Description and Operation.

D. The AFCS mode annunciations are sown on the upper-center area of the PFD whenever the flight director or the autopilot is active. Roll modes are shown on the left side, and pitch modes on the right. Armed modes are shown (white) on the outer edge of the AFCS annunciation field of the PFD. Active modes are shown (green) next to the armed modes.

2. Operation

A. After power is applied to the aircraft, each part of the GMC 720 AFCS will begin a basic self test to ensure that the system is functioning properly. Before, during, and after this process is being performed, there are visual and aural cues to associate with this test.

B. Before the preflight test (PFT) begins, the red AFCS message is shown in the upper center area of the PFD. The red AFCS is shown while the main system is still not fully energized. When the AFCS begins its PFT, the red AFCS message is replaced by a white PFT message. When the test is complete, the white PFT message is removed. If the system fails the PFT, then the white PFT is replaced by a red PFT or AFCS message. If the test is successfully completed, no additional messages are shown in the place of the white PFT. Also at the successful completion of the test, a two-tone aural message, repeated three times, is heard.

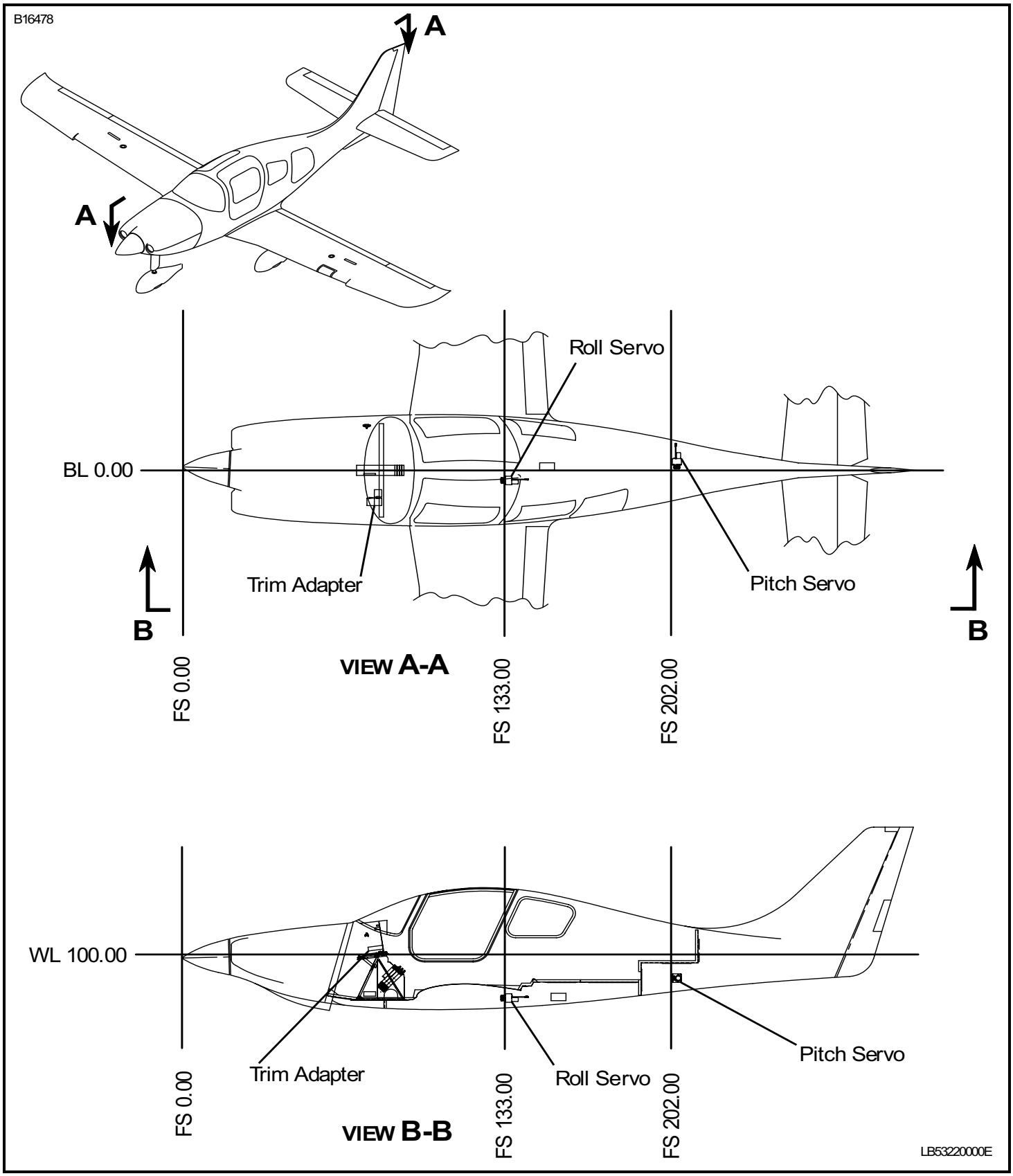
C. The Garmin GFC 700 Flight Director functions are accomplished by the No.1 GIA 63W that uses data from the G2000 system, including air data, attitude, and navigation data, to calculate commands for display to the pilot and for the Autopilot. Flight Director command bars and mode annunciations are sent to the PFD through a high-speed Ethernet connection for display to the pilot. The Flight Director operates independently of the Autopilot, and allows the pilot to hand-fly the command bars, if necessary.

D. The Garmin GFC 700 command data is given to the two GSA 81 servos. Flight Director data is processed by the two servos for aircraft flight control surface commands. The autopilot cannot operate unless the Flight Director is engaged. The following is a summary of the autopilot functions provided by each LRU:

- GDU 1400 Primary Flight Display - Displays the Flight Director command bars and the autopilot mode annunciations.
- GMC 720 AFCS Controller- Supplies controls for the autopilot functions.
- GIA 63W No.1 - Does the calculations to display the Flight Director command bars on the PFD and supplies the control movement commands to the GSA 81 autopilot servos.
- GSA 81 - Actuates the control surfaces based on commands received from the GIA 63W.
- GSA 82 Trim Adapter - Operates the elevator trim tab.

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Figure 1 : Sheet 1 : G2000 Autopilot Installation



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GARMIN AUTOPILOT (G2000) - ADJUSTMENT/TEST
GFC 700

1. General

A. This section has the inspections and checks necessary to keep the Garmin G2000 GFC 700 autopilot system pitch and roll servos and the Garmin GMC 720 AFCS Mode Controller (G2000) and associated switches in a serviceable condition. For additional maintenance data for the GFC 700 autopilot system components, refer to the Garmin G2000 Integrated Avionics Line Maintenance Manual 190-01263-01, found in the Supplier Publication List. For more data on the functions of the GMC 720 AFCS Mode Controller refer to, Garmin G2000 - Description and Operation.

2. Garmin GFC 700 AFCS Operational Check

A. Do the Garmin GFC 700 AFCS Self-Test

(1) Supply electrical power to the airplane as follows:

(a) Supply external electrical power to the airplane.

(b) Set the master BATT switches (left SW01 and right SW02) to the ON position.

(c) Set the AVIONICS MASTER switch (SW04) to the ON position.

(d) Set the CROSS TIE switch (SW03) to the ON position.

(2) Make sure that when electrical power is initially supplied, the AFCS (red) message shows on the primary flight display (PFD).

(a) The AFCS message shows system failure.

(3) When the self-test starts the AFCS (red) message is replaced by the PFT (white) on the PFD.

(a) The PFT message shows that the preflight test is operating.

(4) When the test is complete the steps that follow occur:

(a) The A/P (white) no longer shows on the PFD.

(b) A two-tone aural tone operates.

(5) Push the AP button on the AFCS mode controller.

(a) The AP (green) message shows on the PFD.

(6) If no more tests are to be done, remove electrical power as follows:

(a) Set the AVIONICS MASTER switch (SW04) to the OFF position.

(b) Set the master BATT switches (left SW01 and right SW02) to the OFF position.

(c) Set the CROSS TIE switch (SW03) to the OFF position.

(d) Remove external power from the airplane.

B. Do the GMC 720 AFCS Mode Controller Operational Check.

(1) If necessary, supply electrical power to the airplane as follows:

(a) Supply external electrical power to the airplane.

(b) Set the master BATT switches (left SW01 and right SW02) to the ON position.

(c) Set the AVIONICS MASTER switch (SW04) to the ON position.

(d) Set the CROSS TIE switch (SW03) to the ON position.

(2) On the GMC 720 push the AP button to engage the autopilot.

(a) Make sure that the AP (green) shows on the Primary Flight Display (UI407) PFD.

(3) On the pilot's control stick, momentarily push the AP DISC switch (SW31).

(a) Make sure that the AP (green) no longer shows on the PFD.

(b) Make sure that the AP (yellow) flashes on the PFD for approximately five seconds.

(c) Make sure that the autopilot disengage tone is heard in the overhead speaker.

(4) On the GMC 720 push the AP button to engage the autopilot.

(a) Make sure that the AP (green) shows on the PFD.

(5) On the copilot's control stick, momentarily push the AP DISC switch (SW32).

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(a) Make sure that the AP (green) no longer shows on the PFD.
(b) Make sure that the AP (yellow) flashes on the PFD for approximately five seconds.
(c) Make sure that the autopilot disengage tone is heard in the overhead speaker.

(6) On the GMC 720 push the AP button to engage the autopilot.
(a) Make sure that the AP (green) shows on the PFD.

(7) Momentarily push the GA switch (SI003) located near the throttle.
(a) Make sure that the GA (green) indicator shows on the PFD
(b) Make sure that the flight director bars show a 5 to 10 degree pitch up command.

(8) On the pilot's control stick, push the CWS switch (SW33).
(a) Make sure that the CWS (white) shows on the PFD.
(b) Make sure that the AP (green) no longer shows on the PFD.

(9) On the pilot's control stick, release the CWS switch.
(a) Make sure that the AP (green) shows on the PFD.
(b) Make sure that the CWS (white) no longer shows on the PFD.

(10) If no more tests are to be done, remove electrical power as follows:
(a) Set the AVIONICS MASTER switch (SW04) to the OFF position.
(b) Set the master BATT switches (left SW01 and right SW02) to the OFF position.
(c) Set the CROSS TIE switch (SW03) to the OFF position.
(d) Remove external power from the airplane.

C. Slip Clutch Override Test

NOTE: The slip clutch override test is typical for the pitch and roll clutch assembles.

(1) With no electrical power supplied to the airplane, make sure that there is freedom of movement in all control axes.

(2) Supply electrical power to the airplane as follows:
(a) Supply external electrical power to the airplane.
(b) Set the master BATT switches (left SW01 and right SW02) to the ON position.
(c) Set the AVIONICS MASTER switch (SW04) to the ON position.
(d) Set the CROSS TIE switch (SW03) to the ON position.

(3) Use the GCU 275 controller PFD large knob to navigate to the configuration mode on the PFD.

(4) Use the GCU 275 controller PFD inner knob to navigate to the GFC page group second page.

(5) Push the pitch or roll ENG CLCH soft key.
(a) The internal engage clutch is turned on.

(6) Push the DRV SRVO soft key.

NOTE: This holds the servo actuator at zero speed for the check.

(7) Move the pilot's control stick forward and aft for pitch or side to side for roll as applicable, through its full range of motion.
(a) Make sure that the controls move through the full range of motion with some resistance.
(b) When you override the slip clutch, monitor the SPEED (servo speed) on the PFD GFC page SERVO DATA area.
1 Make sure that the servo does not turn.

(8) Push the DIS CLCH and STP SRVO soft keys.

(9) Move the pilot's control stick forward and aft through its full range of motion.
(a) Make sure that the controls move through the full range of motion no resistance.

(10) If no more tests are to be done, remove electrical power as follows:
(a) Set the AVIONICS MASTER switch (SW04) to the OFF position.
(b) Set the master BATT switches (left SW01 and right SW02) to the OFF position.

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(c) Set the CROSS TIE switch (SW03) to the OFF position.
(d) Remove external power from the airplane.

D. Trim Operational Test

(1) If necessary, supply electrical power to the airplane as follows:
(a) Supply external electrical power to the airplane.
(b) Set the master BATT switches (left SW01 and right SW02) to the ON position.
(c) Set the AVIONICS MASTER switch (SW04) to the ON position.
(d) Set the CROSS TIE switch (SW03) to the ON position.
(2) Move the trim switch (SW27) on the pilot's control stick down (D).
(a) Make sure that the elevator trim indicator on the Multifunction Display (MFD) (UI406), moves up.
(b) Make sure that the right elevator trim panel moves down.
(3) Move the trim switch on the pilot's control stick up (U).
(a) Make sure that the elevator trim indicator on the MFD, moves down.
(b) Make sure that the right elevator trim panel moves up.
(4) Move the trim switch on the pilot's control stick right (R).
(a) Make sure that the elevator trim indicator on the MFD, moves right.
(b) Make sure that the right elevator trim panel moves down.
(5) Move the trim switch on the pilot's control stick left (L).
(a) Make sure that the elevator trim indicator on the MFD, moves left.
(b) Make sure that the right elevator trim panel moves up.
(6) Use the trim switch (SW28) on the copilot's control stick and do the test again.
(7) If no more tests are to be done, remove electrical power as follows:
(a) Set the AVIONICS MASTER switch (SW04) to the OFF position.
(b) Set the master BATT switches (left SW01 and right SW02) to the OFF position.
(c) Set the CROSS TIE switch (SW03) to the OFF position.
(d) Remove external power from the airplane.

3. Garmin GFC 700 Annual Inspection

NOTE: The inspection of the roll and pitch components are identical.

A. Do the GFC 700 Annual Inspection.

(1) Remove the antenna bulkhead panel, located under the hat rack to get access to the pitch servo. Refer to Chapter 25 Equipment/Furnishings Access Panels - Maintenance Practices.
(2) Remove the flap and aileron pushrod access panel, located under aft/center of the wing to get access to the roll servo.
(3) Visually inspect each of the two GSM 86 Servo Mounts as follows:
(a) Check the cables for fraying or corrosion.
(b) Check the mount brackets for cracks or wear.
(c) If necessary, replace cables or mount brackets as applicable.
(4) Check system wiring bundles for chaffing or other damage.
(a) If necessary, repair or replace wire bundles.
(5) Have a second certified technician manually move the control surfaces through their full range of motion.
(a) Monitor the components that follow:
- Servos
- Connectors
- Support structures
- Control cables.

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(b) Make sure that:

- The control cables are not binding
- The capstan pulleys turn freely.

(6) Check that bridle cable tension is 25 to 60 pounds.

(7) Do the servo slip clutch override check. Refer to Garmin GFC 700 AFCS Operational Check

(8) Do the autopilot operation check. Refer to Garmin GFC 700 AFCS Operational Check.

(9) Install the antenna bulkhead panel. Refer to Chapter 25 Equipment/Furnishings Access Panels - Maintenance Practices.

(10) Install the flap and aileron pushrod access panel.

4. Garmin GFC 700 Three Year or 1000 Hour Inspection

A. Garmin GFC 700 1000 Hour Inspection

B. GSA Servo Actuator Inspection

NOTE: The inspection of the roll and pitch components are identical.

(1) Remove the antenna bulkhead panel, located under the hat rack to get access to the pitch servo. Refer to Chapter 25 Equipment/Furnishings Access Panels - Maintenance Practices.

(2) Remove the flap and aileron pushrod access panel, located under aft/center of the wing to get access to the roll servo.

(3) Visually inspect each of the two GSM 86 Servo Mounts cables for fraying or corrosion and the mount brackets for cracks or wear.

(a) If necessary, replace cables or mount brackets as applicable.

(4) Check system wiring bundles for chaffing or other damage.

(a) If necessary, repair or replace wire bundles.

(5) Manually move the control surfaces through their full range of motion.

(a) Make sure that:

- The control cables are not binding
- The capstan pulleys turn freely.

(6) Remove the pitch and roll GSA 81 servos from their related GSA 86 mounts. Refer to Garmin G2000 Roll Servo Unit, GSA 81 Autopilot Roll Servo Removal/Installation or to Refer to Garmin G2000 Pitch Servo Unit GSA 81 Autopilot Pitch Servo Removal/Installation, as applicable.

(a) Clean and grease each of the two servos output gears every 1000 hours or 3 years, whichever occurs first, Refer to the Garmin Corvalis G2000 Line Maintenance Manual 190-01185-00, found in the Supplier Publication List.

(7) Remove the pitch and roll GSA 86 mounts from the airplane. Refer to Garmin G2000 Roll Servo Unit, GSM 86 Autopilot Roll Servo Mount Removal/Installation or to Refer to Garmin G2000 Pitch Servo Unit GSM 86 Autopilot Pitch Servo Mount Removal/Installation, as applicable.

(8) Do a check of the GSM 86 slip clutch torque. Refer to GSM 86 Slip Clutch Torque Check.

(9) When the inspection is complete install the pitch and roll GSA 81 servos. Refer to Garmin G2000 Roll Servo Unit, GSA 81 Autopilot Roll Servo Removal/Installation or to Refer to Garmin G2000 Pitch Servo Unit GSA 81 Autopilot Pitch Servo Removal/Installation, as applicable.

(10) Install the pitch and roll GSA 86 mounts in the airplane. Refer to Garmin G2000 Roll Servo Unit, GSM 86 Autopilot Roll Servo Mount Removal/Installation or to Refer to Garmin G2000 Pitch Servo Unit GSM 86 Autopilot Roll Servo Mount Removal/Installation, as applicable.

C. GSM 86 Slip Clutch Torque Check (Refer to Figure 501).

NOTE: The GSM 86 slip clutches are not adjustable once manufactured. Refer to the Slip-Clutch Setting Procedure found in the GSA 8X/GSM 85(A) Installation Manual, Garmin part number 190-00303-72, found in the Supplier Publication List.

(1) Put the servo in its correct position on the Garmin Servo Adjustment Fixture (011-01085-XX).

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(a) Attach the servo to the fixture with the fixture toggle clamps.

(2) Install the cable, supplied with the fixture, between the capstan under test and the fixture capstan.

(3) Remove slack in the cable with the tension adjust knob.

(4) Tighten the thumbscrews on the fixture capstan.

(5) Attach a socket to a calibrated torque wrench of the appropriate range and place the assembly on top of the fixture capstan. Adjust the wrench support as required to support the torque wrench in a level, horizontal position.

(a) Make sure that the torque wrench is set to "ZERO" while the motor and solenoid are "OFF".

(6) Connect a 24 Vdc power supply to the fixture.

(7) Place the solenoid switch to "ON" and move the direction switch to the "CW" or "CCW" position.

(a) Allow the capstan to rotate at least two full revolutions revolution in each direction.

(8) Use the torque wrench to check the slip clutch torque value.

(a) Make sure the torque value the torque wrench shows is equal to the torque value stamped on the servo mount + 4 inch pounds to - 4 inch pounds.

(b) If the servo mount torque value does not agree with the torque setting stamped on the servo mount, the servo mount must be replaced. The torque setting is not adjustable at the field level.

D. GTA 82 Trim Adapter Inspection

(1) Check the GTA 82 Trim Adapter connector and wiring for damage.

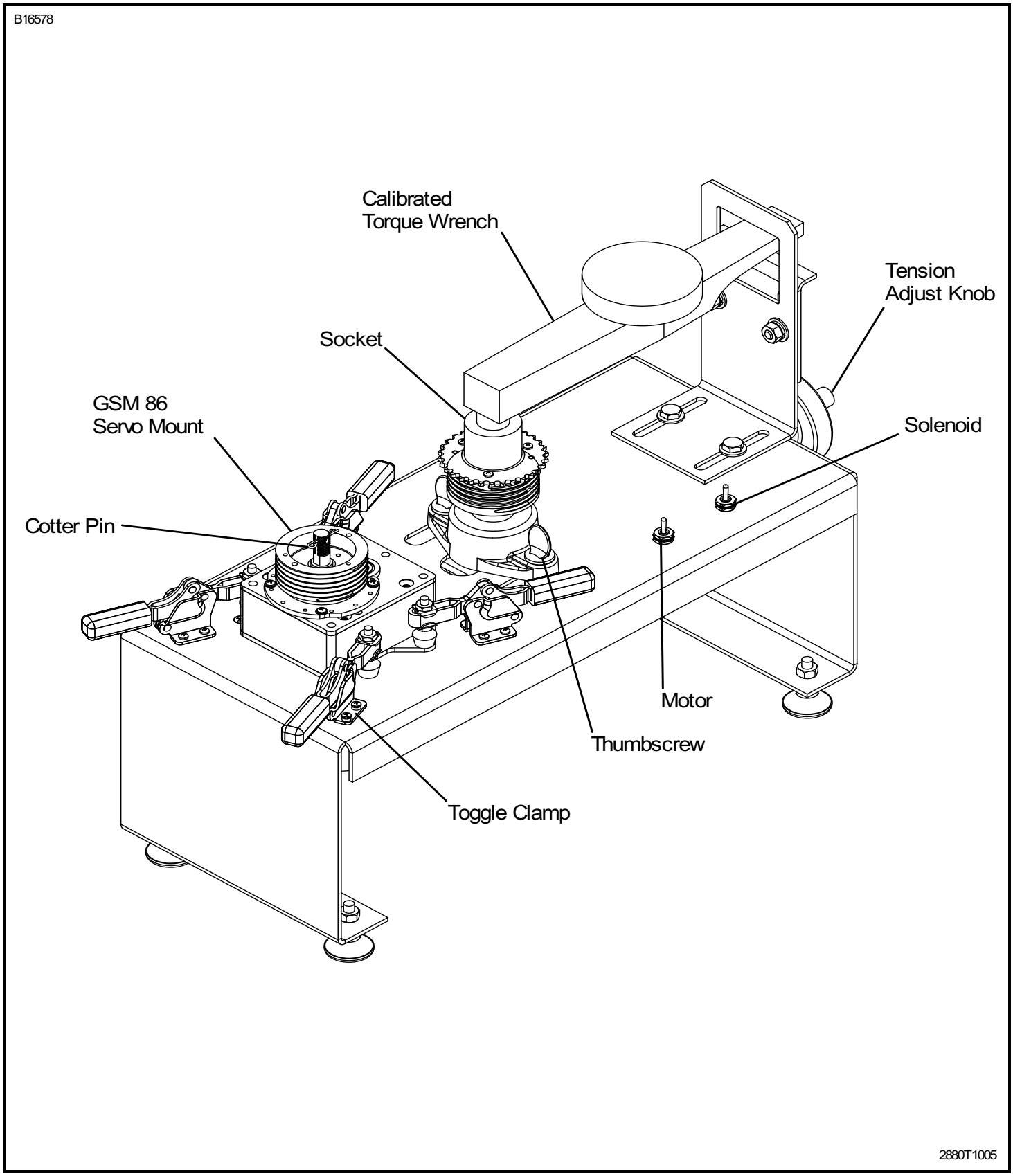
(a) Repair or replace unserviceable wiring components as necessary.

(2) Check the GTA 82 Trim Adapter for corrosion or other damage.

(a) Repair or replace the as GTA 82 Trim Adapter necessary. Refer to, Garmin Trim Adapter (G2000) - Removal/Installation.

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Figure 501 : Sheet 1 : Garmin Servo Adjustment Fixture



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GARMIN ROLL SERVO UNIT (G2000) - REMOVAL/INSTALLATION

1. General

A. The GSA 81 and the GSM 86 are components of the Garmin G2000 Auto Pilot System (GFC700). The GSA 81 is mated to the GSM 86 Servo Mount to form a single servo unit. Refer to Figure 402. Because of the design of the servo unit the servo portion (GSA 81) can be removed from the capstan (GSM 86) without the need to de-rig the aircraft control cables. The roll servo is located beneath the rear passenger seats.

CAUTION: When removing and/or replacing a G2000 component, make sure that the aircraft power is off. Disconnect auxiliary power supplies.

2. GSA 81 Autopilot Roll Servo Removal/Installation

A. Remove the GSA 81 Autopilot Roll Servo (MF300) (Refer to Figure 401).

(1) Remove external electrical power from the airplane.

(2) Make sure that the master BATT switches (left SW01 and right SW02) are in the OFF position.

(3) Make sure that the AVIONICS MASTER switch (SW04) is in the OFF position.

(4) Disengage the AUTOPILOT and A/P CTRL circuit breakers found on the cockpit circuit breaker panel.

(5) Remove the flap and aileron push-rod access panel found on the underside of the wings near the fuselage.

(6) Remove the servo. Refer to Figure 402.

(a) Disconnect electrical connector P680 from electrical connector P801.

(b) Remove the bolts that attach the servo to the servo mount.

(c) Remove the servo from the servo mount.

CAUTION: Do not use solvents to clean the output gear.

(7) Remove excess grease buildup from the single servo output gear using a lint-free cloth.

NOTE: It is not necessary to remove all of the grease from the output gear, only the excess grease.

(8) Using a brush or other applicator, apply a thin coat of grease to the servo output gear. Use Aeroshell 33 MS (preferred) or Aeroshell 17 grease.

B. Install the GSA 81 Autopilot Roll Servo (MF300) (Refer to Figure 401).

(1) Put the GSA 81 in its correct position on the GSM 86 servo mount. Refer to Figure 402.

(a) Make sure that you align the servo mount gears and the servo gears correctly.

(2) Install the bolts that attach the servo to the servo mount.

(3) Torque the bolts 25 to 40 inch pounds (2.82 to 4.51 N-m).

(4) Visually inspect the connectors to make sure that there are no bent or damaged pins.

(a) Repair any damage.

(5) Connect electrical connector P680 to electrical connector P801.

(6) Engage the AUTOPILOT and A/P CTRL circuit breakers found on the cockpit circuit breaker panel.

(7) Configure and test the GSA 81. Refer to the Garmin Corvalis G2000 Line Maintenance Manual 190-01185-00, found in the Supplier Publication List

(8) Operate the controls through full travel and make sure that no binding or restriction occurs.

(9) Install the Flap and Aileron Push-Rod Access Panel.

3. GSM 86 Autopilot Roll Servo Mount Removal/Installation

A. Remove the GSM 86 Autopilot Roll Servo Mount (Refer to Figure 402).

(1) Remove the servo. Refer to the GSA 81 Roll Servo Removal procedure in this section.

(2) Remove the servo mount.

(a) Disconnect the turnbuckle end of the cable.

1 Remove the clip from the turnbuckle.

2 Loosen and separate the turnbuckle.

(b) Disconnect the fork end of the cable from the left saddle assembly.

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1 Remove the cotter pin from the clevis pin.
2 Remove the washers and clevis pin.
3 Remove the fork end of the cable from the left saddle assembly.

(c) If necessary, remove the cable from the capstan.
1 Remove the capstan cover and cable retention pins.
2 Record how the cable is installed on the capstan.
3 Remove the cable from the capstan.

(d) Remove the four bolts that attach the mount to the servo mount bracket.

(e) Remove the servo mount with the bridle cable.

NOTE: If the servo mount is removed for an extended time, a cover can be installed on the servo mount to prevent contamination of the unit.

B. Install the GSM 86 Autopilot Roll Servo Mount (Refer to Figure 402).

(1) Install the servo mount.
(a) Put the servo mount in its correct position on the servo mount bracket.
1 Install the four bolts that attach the servo mount to the servo mount bracket.
2 Torque the bolts 25 to 40 inch pounds (2.82 to 4.51 N-m).

(2) Install the bridle cable. as follows:
(a) If necessary, install the cable on the capstan
1 If necessary, remove the capstan cover and cable retention pins from the capstan
2 Put the cable in position on the capstan
a Wrap the fork end approximately 450 degrees over the capstan
b Make sure the lock ball is correctly mated in its seat
c Wrap the turnbuckle end approximately 270 degrees over the capstan.

NOTE: When installed correctly, the bridle cable will make two complete revolutions around the capstan.

3 Instal the capstan cover and cable retention pins on the capstan.

(b) Connect the two halves of the turnbuckle.

NOTE: Do not tighten the turnbuckle at this point.

(c) Install the fork end of the cable.
1 Put the fork end of the cable in position in the left saddle assembly
2 Install the clevis pin and washers
3 Install the cotter pin in the clevis pin.

(d) Do the system rigging with the controls at neutral.
(e) Set the cable tension to 25 to 60 pounds.
(f) Install new clips on the turnbuckle.

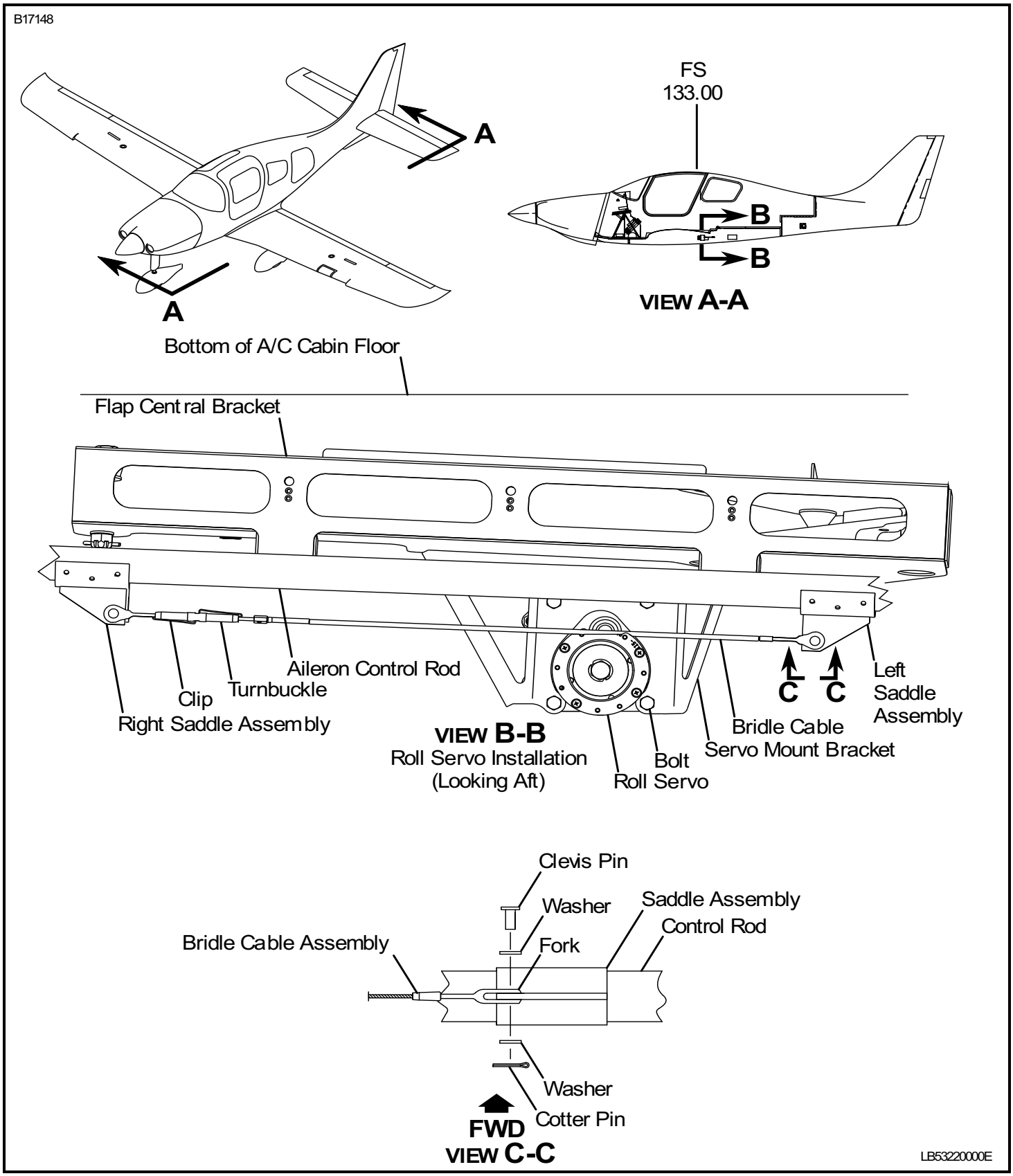
(3) Install the servo. Refer to the GSA 81 Roll Servo Installation procedure in this section.

(4) If you installed a new GSA 81 Roll Servo you must upload the G2000 system baseline software and configuration files to the unit. Refer to Garmin G2000 - Adjustment/TestG2000 System Baseline Software and Configuration File Upload. For more data applicable to the upload of software and configuration files, refer to the Loading and Testing LRU Software section of the most current revision of the Garmin G2000 Integrated Avionics System Line Maintenance Manual, P/N 190-01185-00, found on the Supplier Publication List.

(5) To test and troubleshoot the Garmin G2000 Roll Servo Unit. Refer to the Garmin Corvalis G2000 Line Maintenance Manual 190-01185-00, found in the Supplier Publication List.

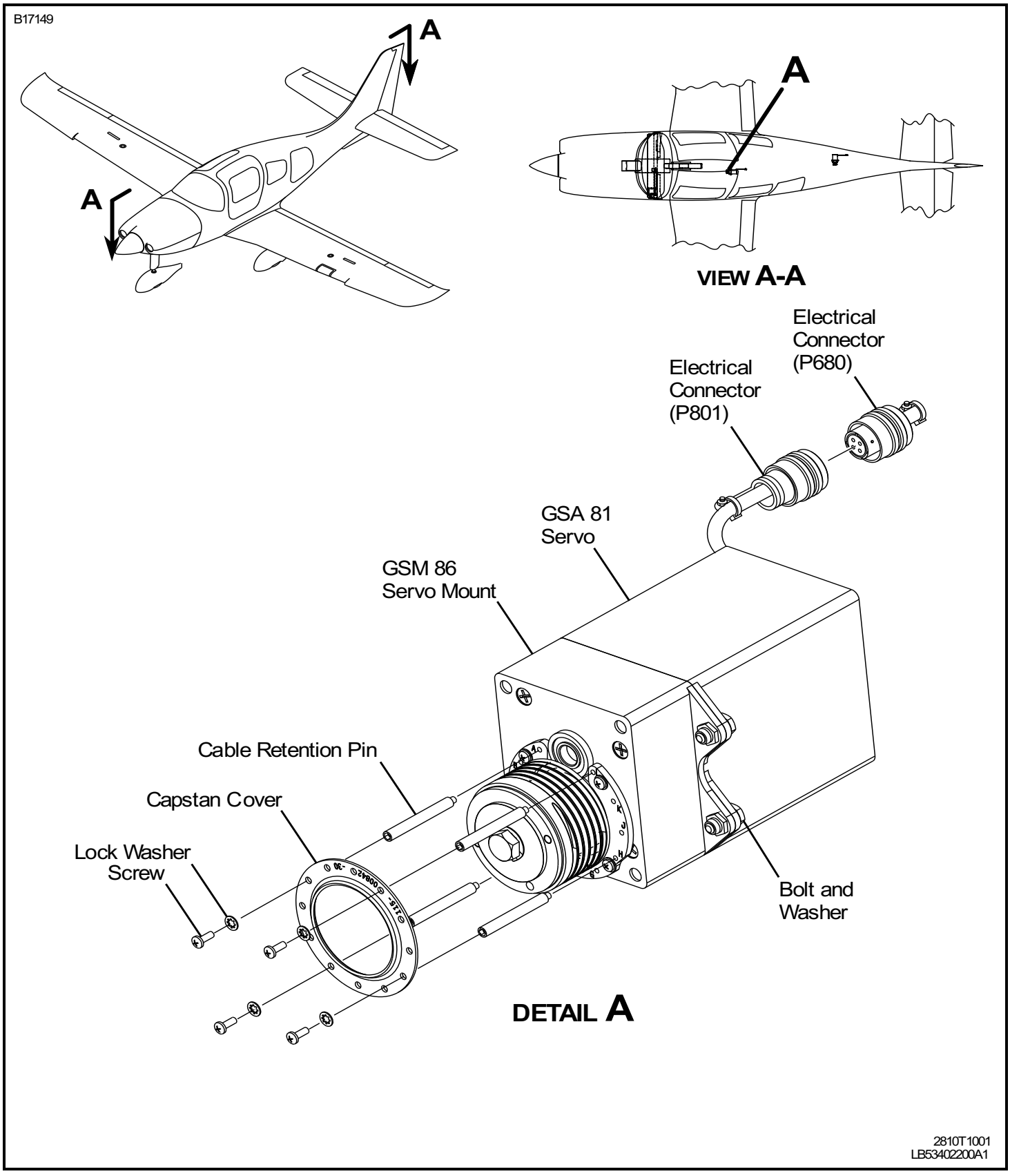
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Figure 401 : Sheet 1 : Roll Servo Installation



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Figure 402 : Sheet 1 : Servo Assembly



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GARMIN PITCH SERVO UNIT (G2000) - REMOVAL/INSTALLATION

1. General

A. The GSA 81 and the GSM 86 are components of the G2000 Garmin Auto Pilot system (GFC 700). The GSA 81 is mated to the GSM 86 Servo Mount to form a single servo unit. Refer to Figure 402. Because of the design of the servo unit the servo portion (GSA 81) can be removed from the capstan (GSM 86) without the need to de-rig the aircraft control cables. The pitch servo is found below the aft baggage compartment.

CAUTION: When removing and/or replacing a G2000 component, make sure that the aircraft power is off. Disconnect auxiliary power supplies.

2. GSA 81 Autopilot Pitch Servo Removal/Installation

A. Remove the GSA 81 Autopilot Pitch Servo (MF301) (Refer to Figure 401).

(1) Remove external electrical power from the airplane.

(2) Make sure that the master BATT switches (left SW01 and right SW02) and the AVIONICS MASTER switch (SW04) are in the OFF position.

(3) Disengage the AUTOPILOT and A/P CTRL circuit breakers found on the cockpit circuit breaker panel.

(4) Remove the baggage bulkhead access panel found under the hat rack in accordance with Chapter 25, Access Panels.

(5) Remove the servo. Refer to Figure 402.

(a) Disconnect electrical connector P681 from electrical connector P801.

(b) Remove the four bolts and washers that attach the servo to the servo mount.

(c) Remove the servo from the servo mount.

CAUTION: Do not use solvents to clean the output gear.

(6) Remove excess grease buildup from the single servo output gear using a lint-free cloth.

NOTE: It is not necessary to remove all of the grease from the output gear, only the excess grease.

(7) Using a brush or other applicator, apply a thin coat of grease to the servo output gear. Use Aeroshell 33 MS (preferred) or Aeroshell 17 grease.

B. Install the GSA 81 Autopilot Pitch Servo (MF301) (Refer to Figure 401).

(1) Put the servo in its correct position on the servo mount. Refer to Figure 402.

(a) Make sure that you align the servo mount gears and the servo gears correctly.

(2) Install the four bolts and washers that attach the servo to the servo mount.

(3) Torque the bolts 25 to 40 inch pounds (2.82 to 4.51 N-m).

(4) Visually inspect the electrical connector to make sure there are no bent or damaged pins.

(a) Repair any damage.

(5) Connect electrical connector P681 to electrical connector P801.

(6) Engage the AUTOPILOT and A/P CTRL circuit breakers found on the cockpit circuit breaker panel.

(7) Configure and test the GSA 81. Refer to the Garmin Corvalis G2000 Line Maintenance Manual 190-01185-00, found in the Supplier Publication List.

(8) Operate all controls through full travel and make sure that no binding or restriction occurs.

(9) Install the baggage bulkhead access panel and the hat rack in accordance with Chapter 25.

3. GSM 86 Autopilot Pitch Servo Mount Removal/Installation

A. Remove the GSM 86 Autopilot Pitch Servo Mount (Refer to Figure 402).

(1) Remove the servo. Refer to the GSA 81 Pitch Servo Removal procedure in this section.

(2) Remove the servo mount.

(a) Disconnect the turnbuckle end of the cable.

1 Remove the clip from the bridle cable turnbuckle.

2 Loosen and separate the turnbuckle.

(b) Disconnect the fork end of the cable from the aft saddle assembly.

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1 Remove the cotter pin from the clevis pin.
2 Remove the clevis pin and washers.
3 Remove the fork end of the cable from the aft saddle assembly.

(c) If necessary, remove the cable from the capstan.
1 Remove the capstan cover and cable retention pins.
2 Record how the cable is installed on the capstan.
3 Remove the cable from the capstan.

(d) Remove the four bolts that attach the mount to the pitch servo bracket.

(e) Remove the servo mount with the bridle cable.

NOTE: If the servo mount is removed for an extended time, a cover can be installed on the servo mount to prevent contamination of the unit.

(f) If installed, remove the tapered shim attached to the face of the servo mount by removing the two 10-32 x 17/32 screws and two 10-32 x 25/32 screws.
1 Remove shim and retain for installation.

B. Install the GSM 86 Autopilot Pitch Servo Mount (Refer to Figure 402).

(1) Install the servo mount.
(a) If removed, install the tapered shim on the mount with two 10-32 x 17/32 screws and two 10-32 x 25/32 screws.
(b) Put the servo mount in its correct position on the pitch servo bracket.
1 Install the four bolts that attach the mount to the pitch servo bracket.
2 Torque the bolts 25 to 40 inch pounds (2.82 to 4.51 N-m).

(2) Install the bridle cable as follows:
(a) If necessary, install the cable on the capstan
1 If necessary, remove the capstan cover and cable retention pins from the capstan
2 Put the cable in position on the capstan
a Wrap the fork end approximately 450 degrees over the capstan
b Make sure the lock ball is correctly mated in its seat
c Wrap the turnbuckle end approximately 270 degrees over the capstan.

NOTE: When installed correctly, the bridle cable will make two complete revolutions around the capstan.

3 Instal the capstan cover and cable retention pins on the capstan.

(b) Connect the two halves of the turnbuckle.

NOTE: Do not tighten the turnbuckle at this point.

(c) Install the fork end of the cable.
1 Put the fork end of the cable in position in the aft saddle assembly.
2 Install the clevis pin and washers.
3 Install the cotter pin in the clevis pin.

(d) Do the system rigging with the controls at neutral.
(e) Set the cable tension to 25 to 60 pounds.
(f) Install new clips on the turnbuckle.
(g) Make sure that there is a minimum clearance of 0.125 inches (3.175 mm) between the aft elevator control rod and the pitch servo bracket.

(3) Install the servo. Refer to the GSA 81 Pitch Servo Installation procedure in this section.

(4) If you installed a new GSA 81 Roll Servo you must upload the G2000 system baseline software and configuration files to the unit. Refer to Garmin G2000 - Adjustment/TestG2000 System Baseline Software and Configuration File Upload. For more data applicable to the upload of software and configuration files, refer to the Loading and Testing LRU Software section of the most current revision of the Garmin G2000 Integrated Avionics System Line

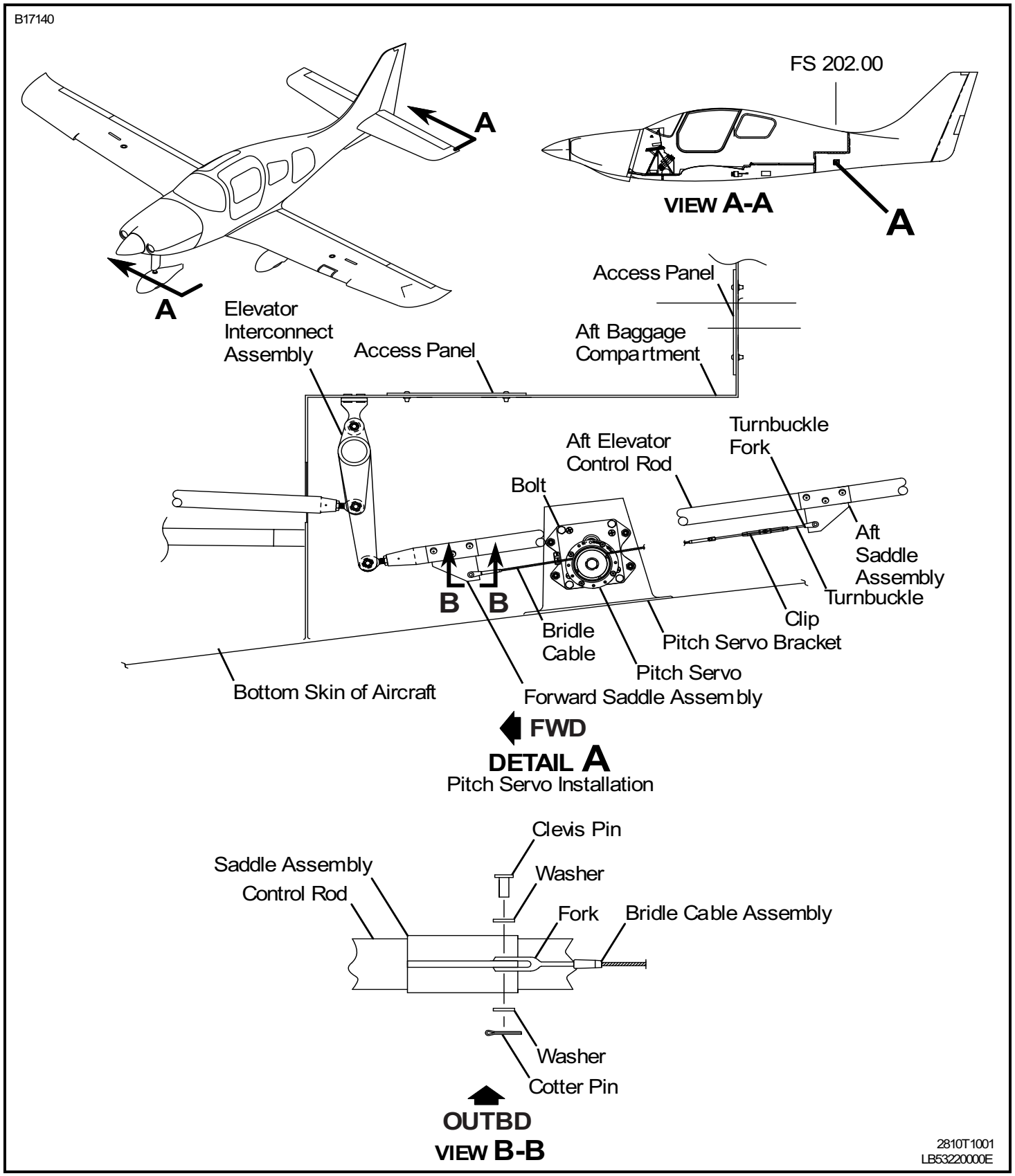
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Maintenance Manual, P/N 190-01185-00, found on the Supplier Publication List.

(5) To test and troubleshoot the Garmin G2000 Roll Servo Unit. Refer to the Garmin Corvalis G2000 Line Maintenance Manual 190-01185-00, found in the Supplier Publication List.

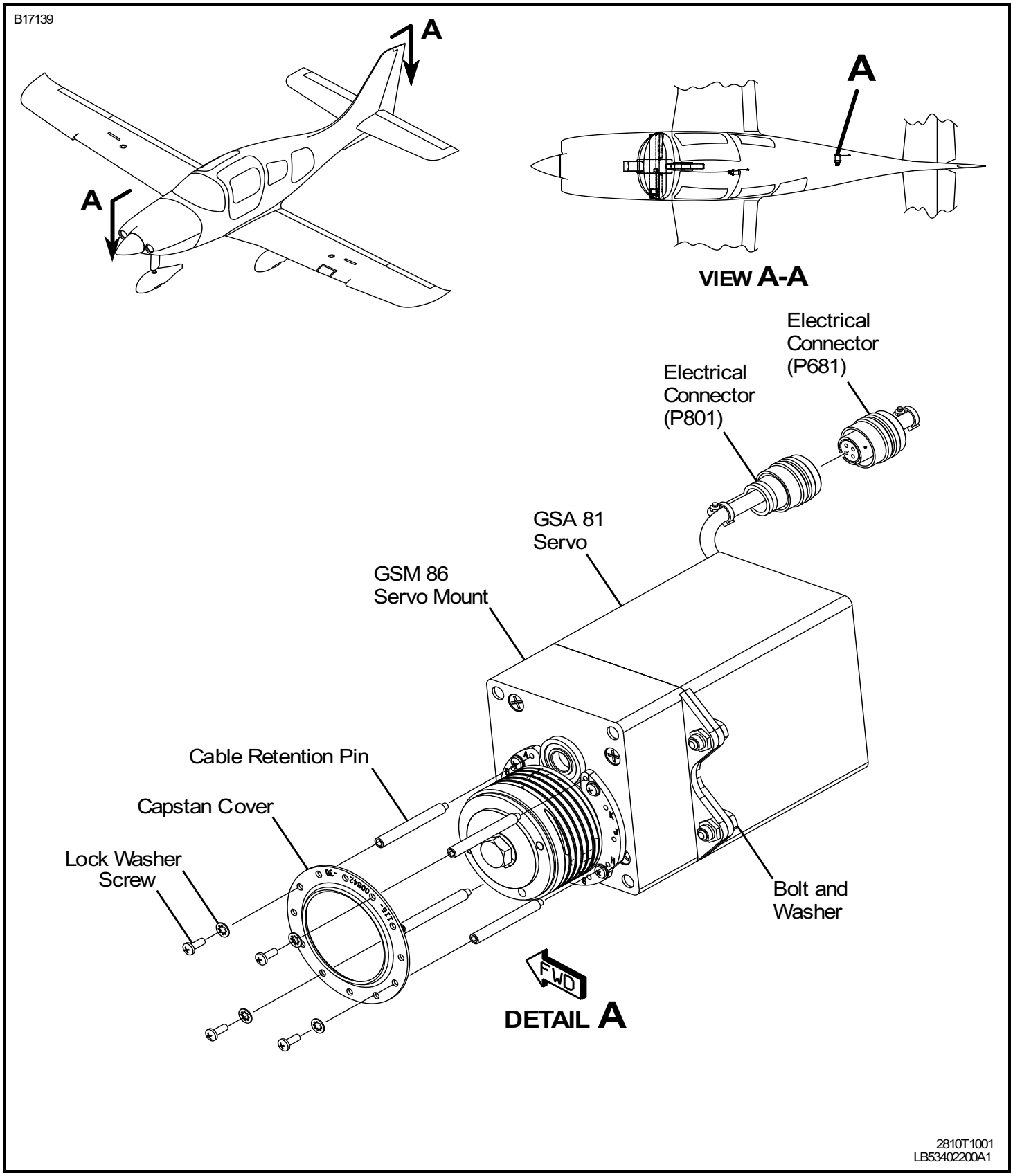
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Figure 401 : Sheet 1 : Pitch Servo



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Figure 402 : Sheet 1 : Pitch Servo Unit Installation



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GARMIN GMC 720 AFCS MODE CONTROLLER (G2000) - REMOVAL/INSTALLATION

1. General

A. This section gives the removal and installation procedures for the G2000 Garmin GMC 720 AFCS Mode Controller (GMC 720). For a general description of the GMC 720, refer to Chapter 34, Garmin G2000 - Description and Operation.

2. Tools and Equipment

A. None.

3. Garmin GMC 720 AFCS Mode Controller Removal/Installation

CAUTION: When removing and/or replacing a G2000 component, make sure that the airplane power is off. Disconnect auxiliary power supplies.

A. Remove the GMC 720 Mode Controller (UI302) (Refer to Figure 401).

(1) Remove external electrical power from the airplane.

(2) Make sure that the master BATT switches (left SW01 and right SW02) are in the OFF position.

(3) Make sure that the AVIONICS MASTER switch (SW04) is in the OFF position.

(4) Disengage the A/P CTRL circuit breaker found on the cockpit circuit breaker panel.

(5) Use a 3/32 hex tool to rotate each of the GMC 720 quarter-turn fasteners counter-clockwise until they reach their stops.

(6) Carefully remove the GMC 720 from the panel sufficiently to get access to the electrical connector (PI302).

(7) While supporting the GMC 720, disconnect the electrical connector (PI302).

B. Install the GMC 720 Mode Controller (UI302) (Refer to Figure 401).

(1) Visually inspect the GMC 720 electrical connector and pins for signs of damage.

(a) Repair any damage.

(2) While supporting the GMC 720, connect the electrical connector (PI302) to the unit.

CAUTION: Do not use excessive force while inserting the control unit. Excessive force could damage the controller or panel.

(3) Carefully put the GMC 720 in the instrument panel and make sure that all four quarter-turn fasteners align with the corresponding holes.

(4) Use a 3/32 hex tool to rotate each of the GMC 720 quarter-turn fasteners clockwise until they reach their stops.

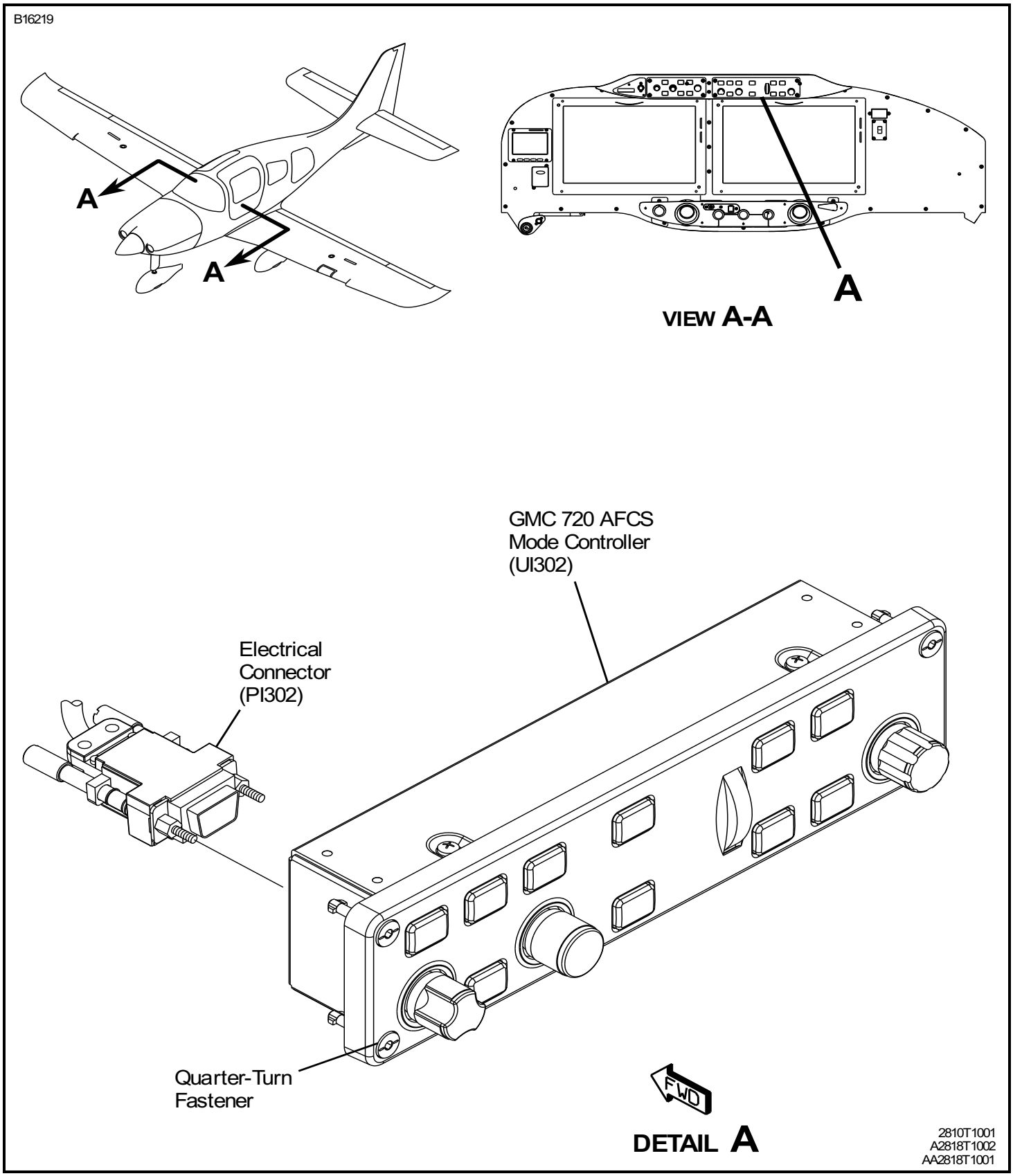
(5) Engage the A/P CTRL circuit breaker found on the cockpit circuit breaker panel.

(6) Configure the GMC 720. Refer to the most recent revision of the Garmin Corvalis G2000 Line Maintenance Manual, P/N 190-01185-00 and Garmin GMC 720 Installation manual P/N 190-00303-70. Refer to the Supplier Publication List.

(7) Do a check of the GMC 720. Refer to Garmin GFC 700 Auto Pilot (G2000) - Adjustment/Test,Garmin GFC 700 AFCS Operational Check.

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Figure 401 : Sheet 1 : GMC 720 AFCS Mode Controller Installation



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COMMUNICATIONS - GENERAL

1. General

A. The Cessna 400 (LC41-550FG/T240) utilizes the Garmin GMA 340, the Garmin GMA 1347 or the Garmin Remote Audio Panel (GMA) 36 and Garmin Touchscreen Controller (GTC) 570 . There are variations of the aircraft communications and navigation systems (refer to Chapter 34 for navigation system description). Refer to Chapter 34 and the Garmin manuals for specific information on the actual Nav/Comm hardware. Airplanes can also have optional satellite data link system(s) installed. Refer to Chapter 23 for maintenance data applicable to for each satellite system. This chapter describes the system of providing communications output to the occupants and protection from precipitation static and lightning. For a specific listing of installed equipment, refer to Section 6, Appendix A, of the POH/AFM.

B. **The Audio Panels are Installed as Follows** -

(1) The Avidyne option has the Garmin GMA 340 audio panel installed.

(2) The Garmin G1000 option has the Garmin GMA 1347 audio panel installed.

(3) The Model T240 G2000 and airplanes with the G2000 option installed, have the Garmin Remote Audio Panel GMA 36 and Garmin Touchscreen Controller (GTC) 570 installed. For more data applicable to the GTC and the GMA refer to Chapter 34, Garmin G2000 - Description and Operation.

C. **Description of Audio Panel** -

(1) The Garmin GMA 340 audio panel is installed in airplanes with the Avidyne Option. The primary purpose of the panel is to control communication and navigation audio selections, intercom functions, and the marker beacons. In addition, the unit has provisions for a stereo entertainment input. The audio panel is located in the top of the radio rack panel assembly.

(2) The Garmin GMA 1347 audio panel is installed in airplanes with the Garmin G1000 Option. For description and maintenance procedures, refer to Chapter 34, GMA 1347 Audio Panel,

D. **Description of Static Discharge System** - During use, the airplane is susceptible to a build-up of static electricity. An accumulated static electrical charge can render radio navigation and communication inoperative. The purpose of the static discharge system is to transfer the electrical charge off the airplane's surface and quietly discharge it into the air.

E. **Description of Lightning Protection System** - The composite construction of the Cessna 400 has a very high resistance to electricity and very little conductivity. Having a high conductivity is critical to lightning protection because it is important that all parts of the airplane have the same electrical potential. To achieve high conductivity, aluminum and copper mesh was integrated with the composite construction of the airplane. The mesh varies from being 10 to 30 thousandths of an inch below the surface of the paint and encompasses most surfaces of the airplane. Various parts of the airplane are interconnected through use of metal fasteners inserted through several plies of mesh, mesh overlaps, and bonding straps. Refer to Section 20-70-00, Lightning Protection and Static Dissipation, for other lightning protection information.

CAUTION: Before any maintenance, removal, or installation of equipment is done, make sure that the master and avionics switches are in the off position. Failure to do so could result in damage to these instruments.

2. Audio Communications

A. All communication radios (except for satellite data link systems) are integrated with some form of navigational receiver, and it is impracticable to segregate the discussion of each function in two separate chapters. Accordingly, air-to-ground speech communications are found in Chapter 34 and satellite data link voice and data systems are found in Chapter 23. The satellite data link systems normally communicate with the GIA 63A units through a RS 232 bus and also provide a discrete of operational status of the system.

B. The Garmin G2000 audio (radio) components are part of the GIA 63A Integrated Avionics Units. The GIA 63A units also have navigation components as part of the integrated functions. For ease of maintenance, the audio systems operational tests are found in Chapter 34, Garmin GIA 63W Integrated Avionics Units (G2000) - Adjustment/Test.

C. The Model T240 G2000 and airplanes with an optional G2000 system installed can also have satellite data link system(s) installed. The satellite systems that follow can installed:

(1) Garmin GDL 69A Data Link (G2000)

(2) Garmin GSR 56 Iridium Data Link (G2000).

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GARMIN GSR 56 IRIDIUM DATA LINK SYSTEM (G2000) - DESCRIPTION AND OPERATION

1. General

A. The Garmin GSR 56 Iridium Data link System consists of the Iridium GSR 56 Data Link (UC503) satellite transceiver unit, and the Iridium Antenna (YC504). The IRIDIUM DL 5 Amp circuit breaker found on the cockpit circuit breaker panel, supplies electrical power to the GSR 56 system. The Iridium GSR 56 is installed on the avionics shelf forward the of the instrument pane on the left side. The Iridium Antenna is installed on the forward oxygen bracket in the aft fuselage at FS 222.7, WL 1067.9, and LBL 4.6. (Reference Figure 1).

B. For more maintenance data applicable to the Garmin GSR 56 Iridium Data Link System refer to the latest revision of the Garmin GSR 56 Satellite Receiver Installation Manual, P/N 190-00836-00 found in the Supplier Publication List.

2. Description

A. Iridium Data Link System Installation provides worldwide weather, voice and data transmission capability.

(1) The Iridium is an airborne data link system that provides low speed data link communication. The Iridium GSR 56 Data Link System has worldwide weather capability. The system informs the pilot of Metrological Aviation Reports (METAR)s, Terminal Aerodrome Forecasts (TAF)s, and winds aloft around the globe. Radar and satellite imagery are available in the United States, southern Canada, and western Europe.

(2) The Iridium GSR 56 system has data service available that lets pilots and passengers make worldwide Iridium-based text messages. The calls can be completed in the air or the ground. The receiver supports one data transmission (SMS text messaging) at a time. The interface is controlled by the pilot with the Garmin Touchscreen Controller (GTC) 570. A service subscription is necessary for this service to be provided.

3. Operation

A. The Iridium GSR 56 Data Link System is operated with the GTC 570 controller.

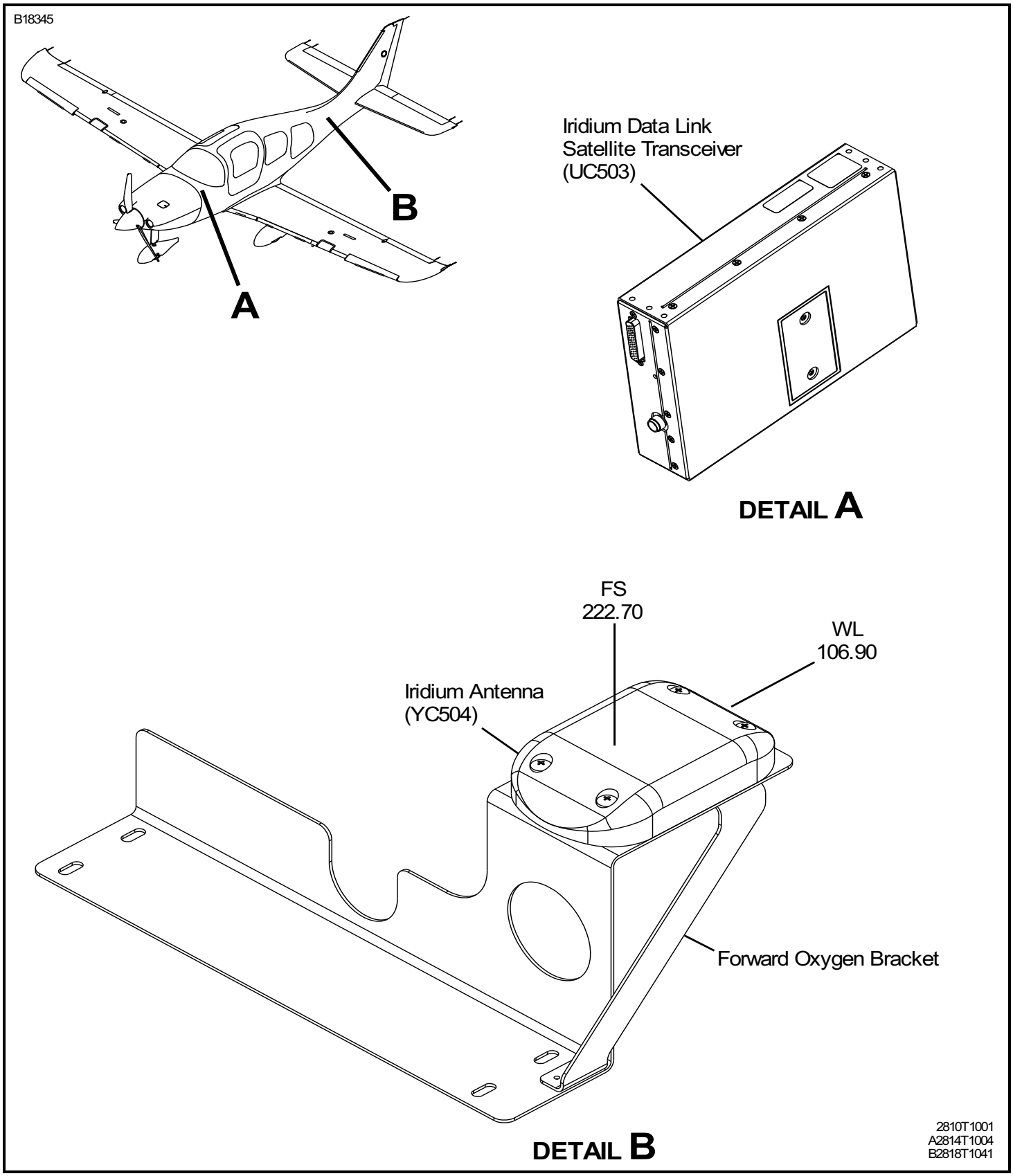
(1) When the GSR 56 system is energized a discrete signal is sent to the Integrated Avionics (GIA) 63 No. 2. The GSR 56 also sends a status discrete to the GIA No. 1. The GSR 56 has one RS-232 port that is used to communicate with the GIA No. 2.

(2) The GTC 570 is used to operate the GSR 56 system. The GTC 570 is for the text messaging and to check the operational status of the system on the system status page.

(3) If the GSR 56 has a system failure an advisory message shows on the GTC 570.

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Figure 1 : Sheet 1 : Garmin GSR 56 Iridium Data Link System



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GARMIN GSR 56 IRIDIUM ANTENNA (G2000) - REMOVAL/INSTALLATION

1. General

A. This section gives the removal and installation procedures for the Garmin GSR 56 Iridium Antenna. The antenna is installed on a bracket in the aft fuselage at FS 222.7, WL 106.9, and LBL 4.6. The antenna is used for the Iridium Data System for worldwide weather to inform pilots of METARs, TAFs, and winds aloft (subscription required).

2. Tools and equipment

A. None.

3. Garmin GSR 56 Iridium Antenna Removal/Installation

A. Remove the GSR 56 Iridium Antenna (YC504) (Refer to Figure 401).

(1) Remove external electrical power from the airplane.

(2) Make sure that the master BATT switches (left SW01 and right SW02) and the AVIONICS MASTER switch (SW04) are in the OFF position.

(3) Disengage the IRIDIUM DL circuit breaker found on the cockpit circuit breaker panel.

(4) Remove the antenna bulkhead panel. Refer to Chapter 25 Access Panels - Maintenance Practices.

(5) Remove the screws that attach the antenna to the bracket.

(6) Carefully pull the antenna away from the bracket sufficiently to get access to the Iridium antenna coaxial connector.

(7) Disconnect the antenna coaxial cable connector (PC512) from the Iridium antenna.

(8) Remove the antenna from the airplane.

(9) Examine the bracket to make sure that there are no cracks or damage.

B. Install the GSR 56 Iridium Antenna (YC504) (Refer to Figure 401).

(1) Make sure that the bracket mounting surface of the Iridium antenna is clean.

(2) Connect the antenna coaxial cable connector (PC512) to the Iridium antenna.

(3) Put the Iridium antenna in its correct position on the bracket.

(a) Install the screws that attach the Iridium antenna to the bracket.

(4) Engage the IRIDIUM DL circuit breaker found on the cockpit circuit breaker panel.

(5) Apply external electrical power on the airplane.

(6) Set the master BATT switches (left SW01 and right SW02) to the ON position.

(7) Set the AVIONICS MASTER switch (SW04) to the ON position.

(8) Set the CROSS TIE switch (SW03) to the ON position.

(9) Make sure that no Iridium Data Link System Crew Advisory System (CAS) or advisory messages that indicate the system is unserviceable, show on the PFD or on the GTC 570 Touchscreen Controller (UI405).

(10) Set the master BATT switches to the OFF position.

(11) Set the AVIONICS MASTER switch to the OFF position.

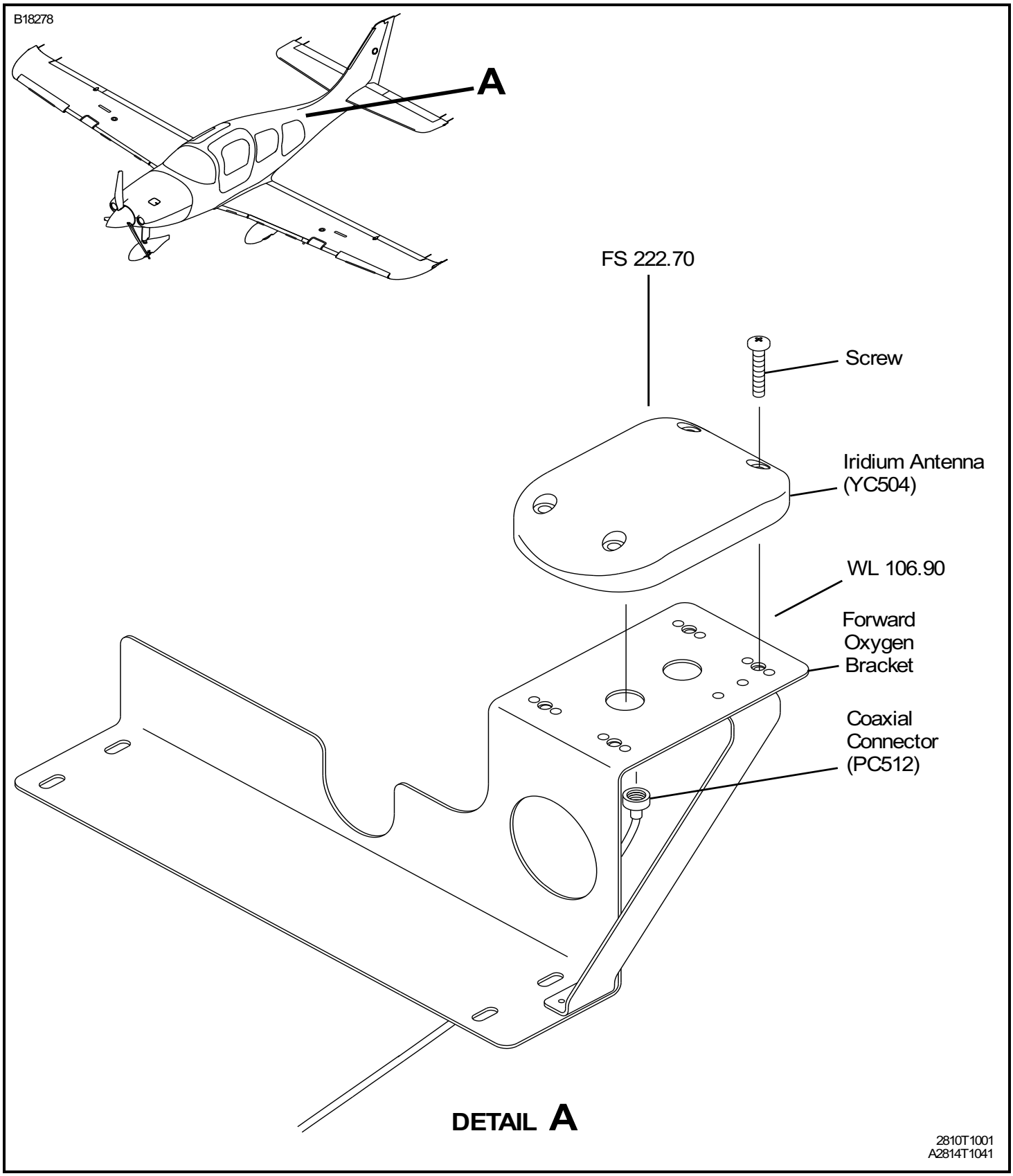
(12) Set the CROSS TIE switch to the OFF position.

(13) Remove external electrical power from the airplane.

(14) Install the antenna bulkhead panel. Refer to Chapter 25Access Panels - Maintenance Practices.

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Figure 401 : Sheet 1 : Iridium Antenna Installation



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GARMIN GSR 56 IRIDIUM DATA LINK RECEIVER (G2000) - REMOVAL/INSTALLATION

1. General

A. This section gives the removal and installation procedures for the Garmin GSR 56 Data Link Receiver unit. For a general description of the GSR 56 Iridium system refer to Garmin Iridium Data Link System (G2000) - Description and Operation.

B. The Garmin GSR 56 Data Link is installed forward of the instrument panel on the avionics shelf.

2. Tools and Equipment

A. None.

3. Garmin GSR 56 Data Link Removal/Installation

CAUTION: When removing and/or replacing a Garmin component, make sure that the airplane power is off. Disconnect auxiliary power supplies.

A. Remove the GSR 56 Data Link (UC503) (Refer to Figure 401).

(1) Remove external electrical power from the airplane.

(2) Make sure that the master BATT switches (left SW01 and right SW02) are in the OFF position.

(3) Make sure that the AVIONICS MASTER switch (SW04) is in the OFF position.

(4) Disengage the IRIDIUM DL circuit breaker found on the cockpit circuit breaker panel.

(5) Remove the GDU 1400 Primary Flight Display (PFD) (UI407). Refer to Chapter 34, Garmin GDU 1400 Displays (G2000) - Removal/Installation.

(6) Loosen the ratcheting knurled nut.

(7) Remove the knurled nut from the mounting bracket.

(8) Carefully remove the unit from the rack.

B. Install the GSR 56 Data Link (UC503) (Refer to Figure 401)

(1) Visually inspect the connectors to ensure there are no bent or damaged pins.

(a) Repair any damage.

(2) Carefully insert the GSR 56 into the rack.

(3) Set the knurled nut in its correct position on the mounting bracket.

(4) Tighten the knurled nut on the mounting bracket.

(5) Install the right GDU 1400 PFD (UI407). Refer to Chapter 34, Garmin GDU 1400 Displays (G2000) - Removal/Installation.

(6) You must establish service for the new receiver. Contact Garmin International Incorporated, or Iridium Communications Incorporated.

(7) Engage the IRIDIUM DL circuit breaker found on the cockpit circuit breaker panel.

(8) Apply external electrical power on the airplane.

(9) Set the master BATT switches (left SW01 and right SW02) to the ON position.

(10) Set the AVIONICS MASTER switch (SW04) to the ON position.

(11) Set the CROSS TIE switch (SW03) to the ON position.

(12) Make sure that no Iridium Data Link System Crew Advisory System (CAS) or advisory messages that indicate the system is unserviceable, show on the PFD or on the GTC 570 Touchscreen Controller (UI405).

(13) Set the master BATT switches to the OFF position.

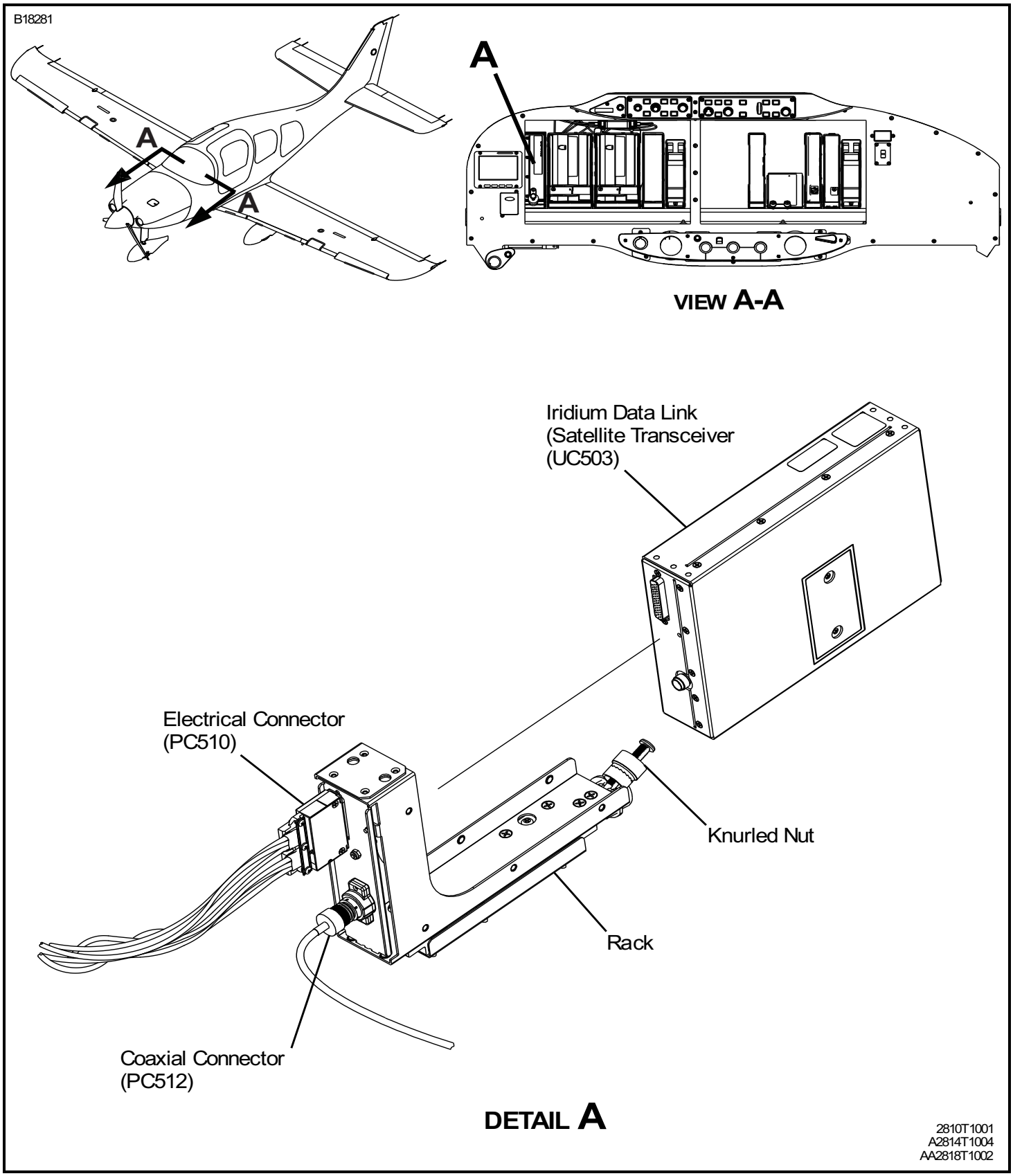
(14) Set the AVIONICS MASTER switch to the OFF position.

(15) Set the CROSS TIE switch to the OFF position.

(16) Remove external electrical power from the airplane.

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Figure 401 : Sheet 1 : GSR 56 Data Link Installation



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GARMIN GDL 69A DATA LINK (G2000) - REMOVAL/INSTALLATION

1. General

A. This section gives the removal and installation procedures for the G2000 Garmin GDL 69A Data Link. For a general description of the GDL 69A, refer to Chapter 34, Garmin Iridium Dat Link System - Description and Operation. For maintenance procedures for the GPS2/XM antenna refer to Chapter 34, Garmin GPS2/WAAS/XM Antenna (G2000) - Removal/Installation.

2. Tools and Equipment

A. None.

3. Garmin GDL 69A Data Link Removal/Installation

CAUTION: When removing and/or replacing a G2000 component, make sure that the airplane power is off. Disconnect auxiliary power supplies.

A. Remove the GDL 69A Data Link (UC502) (Refer to Figure 401).

(1) Remove external electrical power from the airplane.

(2) Make sure that the master BATT switches (left SW01 and right SW02) are in the OFF position.

(3) Make sure that the AVIONICS MASTER switch (SW04) is in the OFF position.

(4) Disengage the XM DL circuit breaker found on the cockpit circuit breaker panel.

(5) Remove the right GDU 1400 Multifunctional Display (MFD) (UI406). Refer to Chapter 34, Garmin GDU 1400 Displays (G2000) - Removal/Installation.

(6) Unlock the GDL 69A handle by unscrewing the Phillips screw.

(7) Pull the handle upwards to unlock the GDL 69A.

(8) Carefully remove the unit from the rack.

B. Install the GDL 69A Data Link (UC502) (Refer to Figure 401).

(1) Visually inspect the connectors to ensure there are no bent or damaged pins.

(a) Repair any damage.

(2) Carefully insert the GDL 69A into the rack. The handle should engage the dogleg track.

(3) Press down on the handle to lock the unit into place.

(4) Lock the handle to the GDL 69A body using the Phillips screw.

(5) Install the MFD (UI406). Refer to Chapter 34, Garmin GDU 1400 Displays (G2000) - Removal/Installation.

(6) Engage the XM DL circuit breaker found on the cockpit circuit breaker panel.

(7) Apply external electrical power on the airplane.

(8) Set the master BATT switches (left SW01 and right SW02) to the ON position.

(9) Set the AVIONICS MASTER switch (SW04) to the ON position.

(10) Set the CROSS TIE switch (SW03) to the ON position.

(11) If you installed a new GDL 69A unit you must upload the units software and configuration files. Refer to Garmin G2000 - Adjustment/Test G2000 Cessna Options Software and Configuration Upload. For more data applicable to software and configuration file uploading refer to the Loading and Testing LRU Software section of the most current revision of the Garmin G2000 Integrated Avionics System Line Maintenance Manual, P/N 190-01185-00, found on the Supplier Publication List.

(12) If a new GDL A unit was install you must activate a XM radio subscription for the new radio Id number.

(13) On the GTC 570 go the the XM INFORMATION page and make sure that the GDL 69A is operating correctly and no there are no system errors.

(14) Set the master BATT switches (left SW01 and right SW02) to the OFF position.

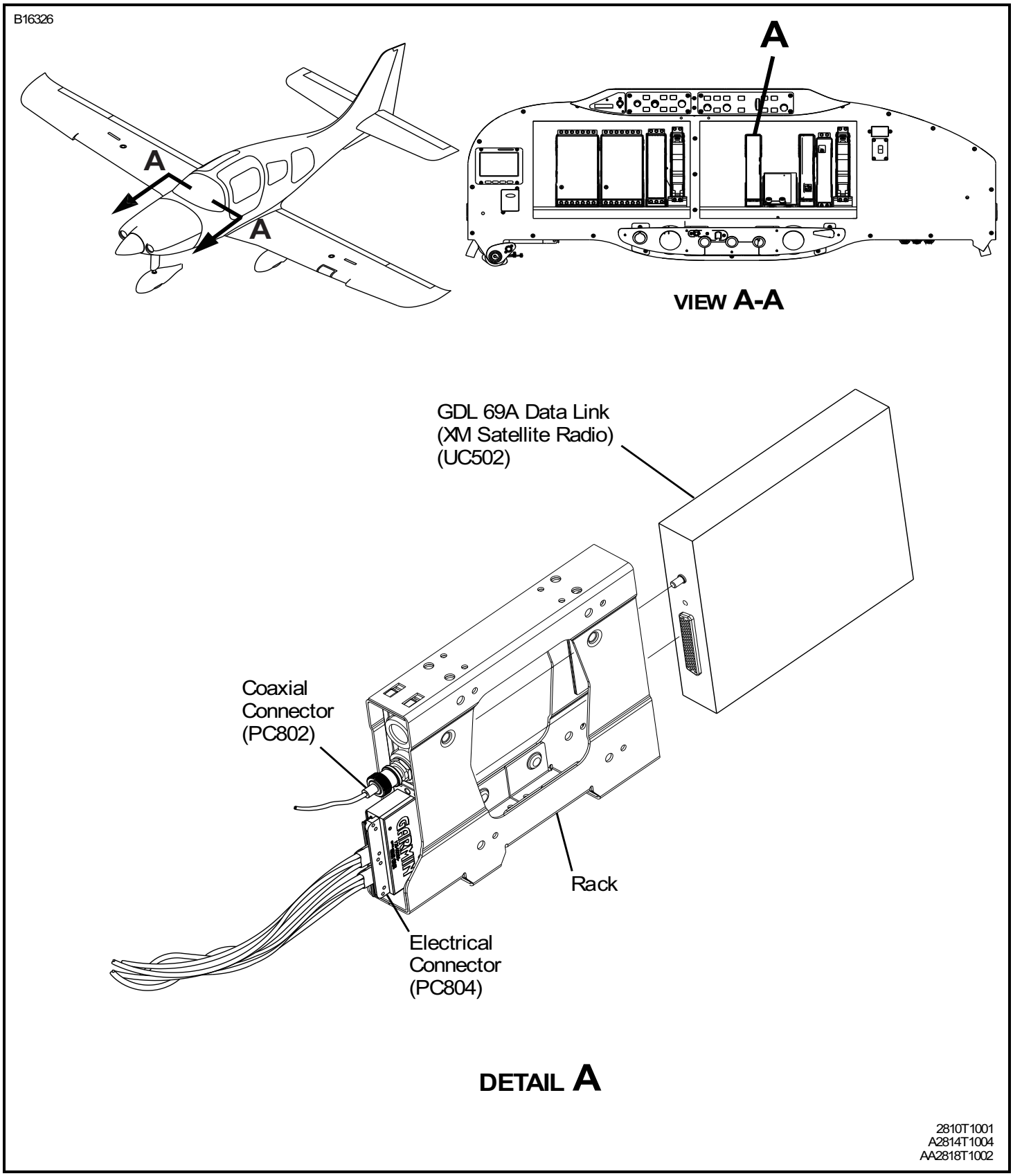
(15) Set the AVIONICS MASTER switch (SW04) to the OFF position.

(16) Set the CROSS TIE switch (SW03) to the OFF position.

(17) Remove external electrical power from the airplane.

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Figure 401 : Sheet 1 : GDL 69A Data Link Installation



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GARMIN GMA 340 AUDIO PANEL AND AUDIO COMPONENTS - MAINTENANCE PRACTICES

1. General

A. This sections gives the maintenance procedures for the Garmin GMA 340 Audio Panel, audio and stereo jacks, speaker and audio function/control switch installations.

B. For the Model T240 Audio Jack Panel maintenance procedures refer to, Audio Jack Panel (T240) - Removal/Installation.

2. Garmin GMA 340 Audio Panel

A. The GMA 340 Audio Panel acts as the audio selector for the airplane. The GMA 340 is a VHF Communication Transceiver/VOR/ILS Receiver/GPS Receiver. The system is a fully integrated panel-mounted instrument which contains audio and microphone switching and amplification, a marker beacon receiver, and an intercom system. The GMA 340 also contains a voice activated intercom system, which allows the pilot, copilot, and passengers of the airplane to communicate among themselves. Refer to Figure 201. The intercom select switch can be set to three modes.

(1) In the "All" mode, the intercom is linked to all four-seat positions; everyone hears radio communications, and everyone hears music from input Music 1.

(2) In the "Crew" mode, the pilot and front seat passenger are linked together and can receive radio communications. The rear seat passengers are linked together but cannot hear radio communications or the pilot or front passenger.

(3) In the "Pilot" mode, the pilot hears the radios, but is not connected to the intercom, while the front and rear passengers are on the same intercom loop but cannot hear radio communications or communicate with the pilot.

B. All four headsets are hooked up to the intercom system. There is a volume knob for the pilot and copilot’s sides.

C. **Removal of GMA 340 Audio Panel**

(1) Insert a 3/32 inch Allen wrench into the jack screw on the faceplate.

(2) Turn the wrench counterclockwise until loose.

(3) Slide out the GMA 340 unit, and disconnect the connectors.

D. **Installation of GMA 340 Audio Panel**

(1) Install fittings into the back of the GMA 340.

(2) Slide the unit into the rack until the jack screw makes contact with the receptacle located in the back plate.

(3) Insert a 3/32 inch Allen wrench into the jackscrew access hole on the faceplate.

(4) Turn the Allen wrench clockwise until the unit is secured in the rack. Continue turning until tight, but do not over-tighten.

3. Speaker

A. **Removal of the Speaker**

(1) Remove the overhead center panel per instructions in Section 25-30-00, Interior Panels.

(2) For Type A, remove the four screws connecting the stall warning buzzer mounting, speaker, loop clamp, and speaker mounting. For Type B, remove the four screws connecting the speaker to the adapter plate. Refer to Figure 202.

(3) Remove the stall warning buzzer mounting, as required.

(4) Disconnect the wires.

(5) Pull the speaker from the mounting.

B. **Installation of the Speaker**

(1) Put the speaker on the speaker mounting.

(2) Connect the wires.

(3) Place the stall warning buzzer mounting on top of the speaker, as required.

(4) For Type A, tighten the four nuts connecting the stall warning buzzer mounting, speaker, loop clamp, and speaker mounting. For Type B, tighten the four nuts connecting the speaker to the adapter plate. Refer to Figure 202.

(5) Install the overhead center panel per instructions in Chapter 25.

4. Push-To-Talk Switch

A. **Location** - Each control stick has a push-to-talk switch located on the forward part of the stick where it is easily accessed by the index finger. Refer to Figure 203. The switch is press-fit into the stick and connected by wire on the inside of the stick assembly.

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B. **Description** - The push-to-talk switch is a single-button switch that when pressed, makes a connection required to energize the Comm unit by way of the Audio Panel.

5. Troubleshooting Push-To-Talk Function

A. **Symptom** - Push-to-talk function not working properly.

(1) Locate the defective connection:

(a) Remove the interior panel covering the control stick

(b) Locate P-46 (pilots side) and P-47 (copilot's side), and disconnect the plug.

(2) Using a digital volt ohmmeter (DVOM), check for operation of the push-to-talk function switch. Place one probe on Pin 1 and ground the other. The DVOM should show a closed circuit with the switch depressed (less than 2 ohms).

(3) Check the jack side of the connection. Pin 2 should be ground and Pin 1 should be for the audio panel.

(4) If the switch needs to be replaced, cut the tie-wraps at the base of the control stick to allow the switch to be gently pulled out of the wooden handle.

(5) Solder in a new switch, and pull the wires tight at the base of the control stick tube.

(6) Secure the wires with tie-wraps, and check for freedom of movement.

6. Nav/Com Bypass Switch

A. **Description** - With the Garmin G1000 system the Nav/Com bypass switch is not installed. With the Avidyne option the aircraft is equipped with a Nav/Com bypass switch located above the annunciator panel. The switch is designed to be used in situations where the engine is not running. The switch is an alternate action device that activates when depressed and needs to be depressed again to cycle off. When activated, the switch turns on the No. 1 GPS, No. 1 Com, and No. 1 Nav by connecting them directly to the right battery, bypassing the power grid, circuit breaker panel, and associated wiring. Communications is only through the pilot's headset and activated with the pilot's PTT switch.

B. **Removal of Switch**

(1) Remove the glare shield per instructions in Chapter 25 to gain access to the back side of the instrument panel.

(2) Disconnect the connector at the back of the switch.

(3) Pull the press-fit switch out of its housing at the back of the instrument panel.

C. **Installation of Switch** - Installation is a direct reversal of removal.

7. Headphone Jacks/Microphone Plugs

A. **Description** - The Cessna 400 (LC41-550FG) is designed to handle both standard headphone/microphone jacks as well as Bose™ Stereo headphone jacks

B. **Location** - Each seat has a jack plug receptacle.

(1) **Front Seats** - The location of the front seat receptacles are at the lower part of the center console for the Avidyne option and at the front of the center console for the Garmin G1000 option. Refer to Figure 204 for Avidyne option and refer to Chapter 25 for Garmin G1000 option.

(2) **Rear Seats** - The location of the rear seat receptacles are on the rear seat side panels. Refer to Figure 205.

CAUTION: Bose™ headphones require power, which is supplied by the Bose™ jack. Before removing the intercom jack, ensure the system master switch is in the off position.

C. **Removal of Rear Passenger Intercom Jacks**

(1) To gain access to the backside of the jacks, remove the interior sidewall panel per instructions in Chapter 25.

(2) Unscrew and remove the Bose™ jack cover. Loosen and remove the jam nuts securing the jacks to the interior panel. Refer to Figure 206.

(3) Label all wires according to where they were connected.

(4) Cut wire near the solder point at each jack.

D. **Installation of Rear Passenger Intercom Jacks**

(1) Remove all traces of old solder from the jacks.

(2) Reconnect and solder the wires to the jacks. Ensure all wires are soldered to the correct pins on the jacks.

(3) Secure the jacks to the sidewall panel using jam nuts.

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(4) Install the Bose jack cover.

(5) Install the sidewall panel.

CAUTION: Bose™ headphones require power, which is supplied by the Bose™ jack. Before removing the intercom jack ensure the system master switch is in the off position.

E. **Removal of Pilot/Front Passenger Intercom Jacks/Microphone Plug**

(1) To gain access to the jacks, remove both sides of the center console panels. Only one panel in Garmin G1000 option.

(2) Unscrew and remove the Bose™ jack cover. Loosen and remove the jam nuts securing the jacks to the interior panel. Refer to Figure 206.

(3) Label all wires according to where they were connected.

(4) Cut wire near the solder point at each jack.

F. **Installation of Pilot/Front Passenger Intercom Jacks/Microphone Plug**

(1) Remove all traces of old solder from jacks.

(2) Reconnect and solder wires to the jacks. Ensure all wires are soldered to the correct pins on the jacks.

(3) Secure the jacks to the sidewall panel using jam nuts.

(4) Install the Bose™ jack cover.

(5) Install the sidewall panel.

8. Stereo Audio Input Jack, Optional

A. **Avidyne Option**

(1) **Removal of Stereo Audio Input Jack**

(a) To gain access to the jack, remove the center console access panel.

(b) Lift up the armrest and locate the jack at the forward end of the pencil box.

(c) Loosen and remove the jam nut securing the jack to the pencil box. Refer to Figure 207.

(d) Label all wires according to where they were connected.

(e) Cut the wire near the solder point at each jack.

(2) **Installation of Stereo Audio Input Jack**

(a) Remove all traces of old solder from the jack.

(b) Reconnect and solder wires to the jack. Ensure all wires are soldered to the correct pins on the jack.

(c) Secure the jack to the pencil box using the jam nut.

(d) Install the center console access panel.

B. **Garmin G1000 Option** - The stereo audio input jack is located under the instrument panel to the right of the tower on the co-pilot's side.

(1) **Removal of Stereo Audio Input Jack**

(a) Loosen and remove the jam nut securing the jack to the instrument panel.

(b) Reach up behind the instrument panel and remove the jack.

(c) Label all wires according to where they were connected.

(d) Cut the wire near the solder point at each jack.

(2) **Installation of Stereo Audio Input Jack**

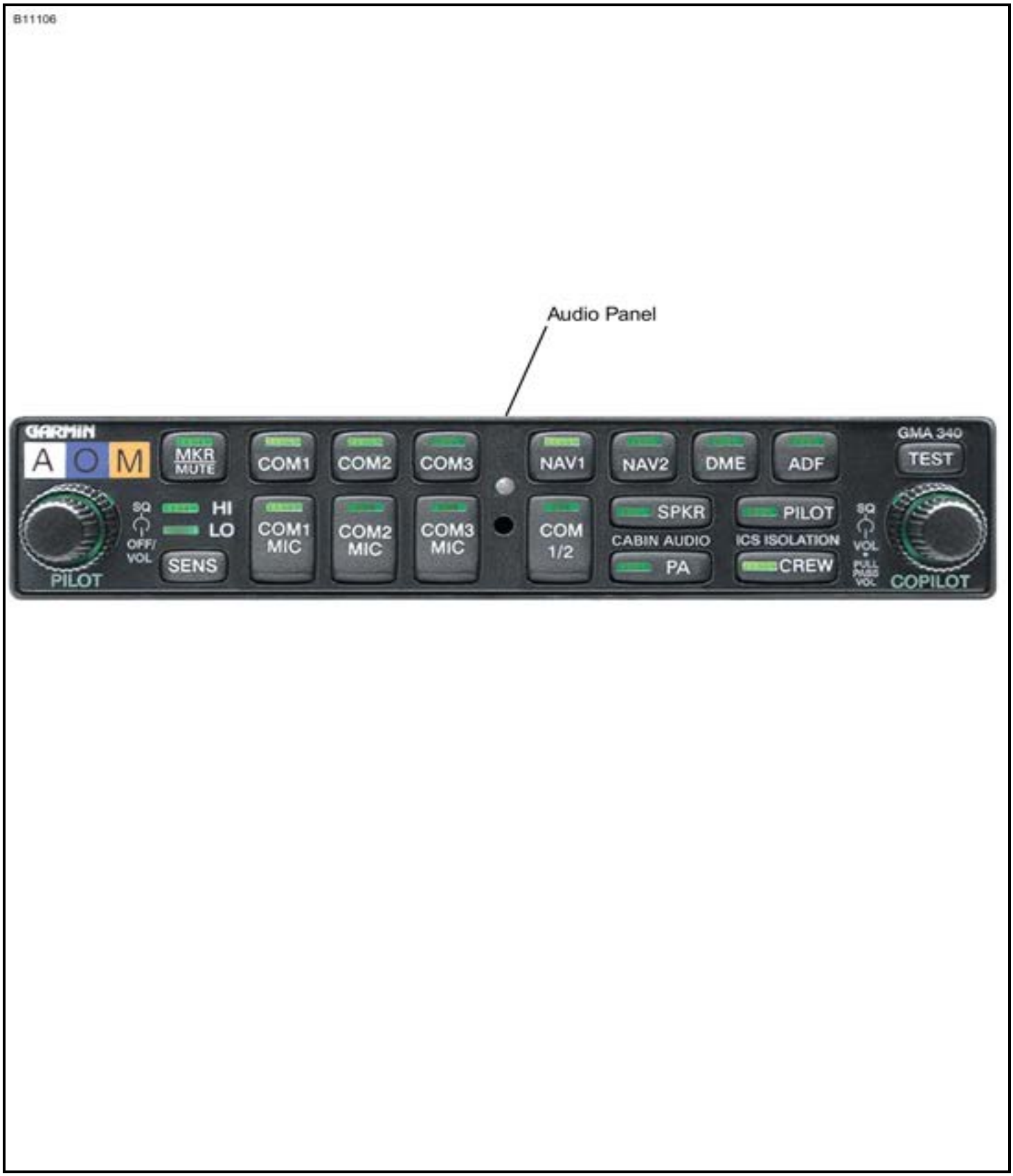
(a) Remove all traces of old solder from the jack.

(b) Reconnect and solder wires to the jack. Ensure all wires are soldered to the correct pins on the jack.

(c) Secure the jack to the instrument panel using the jam nut. Apply one drop of Loctite 243 to the threads and tighten snug (no looseness plus 1/4 turn).

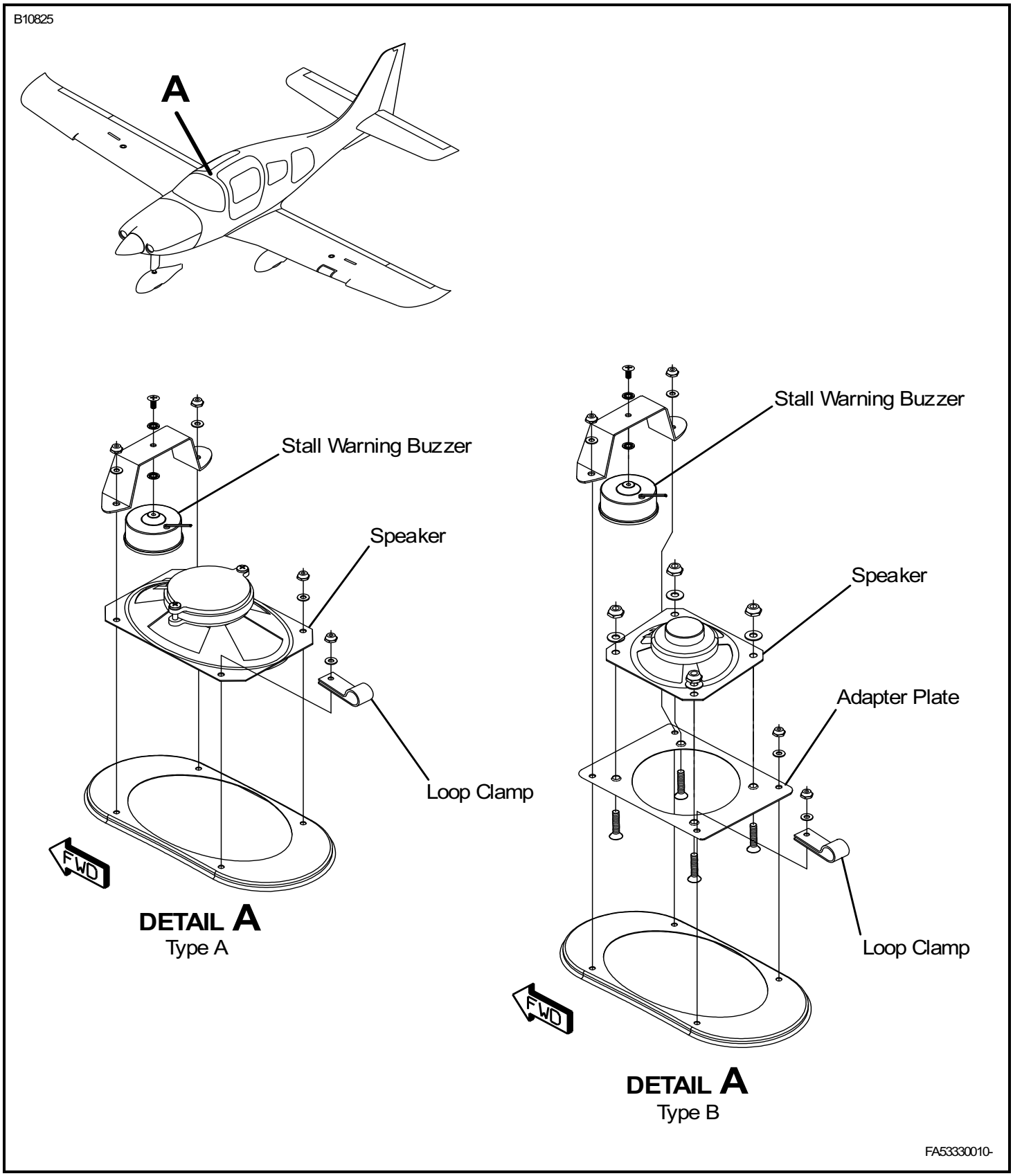
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Figure 201 : Sheet 1 : Garmin GMA 340 Audio Panel



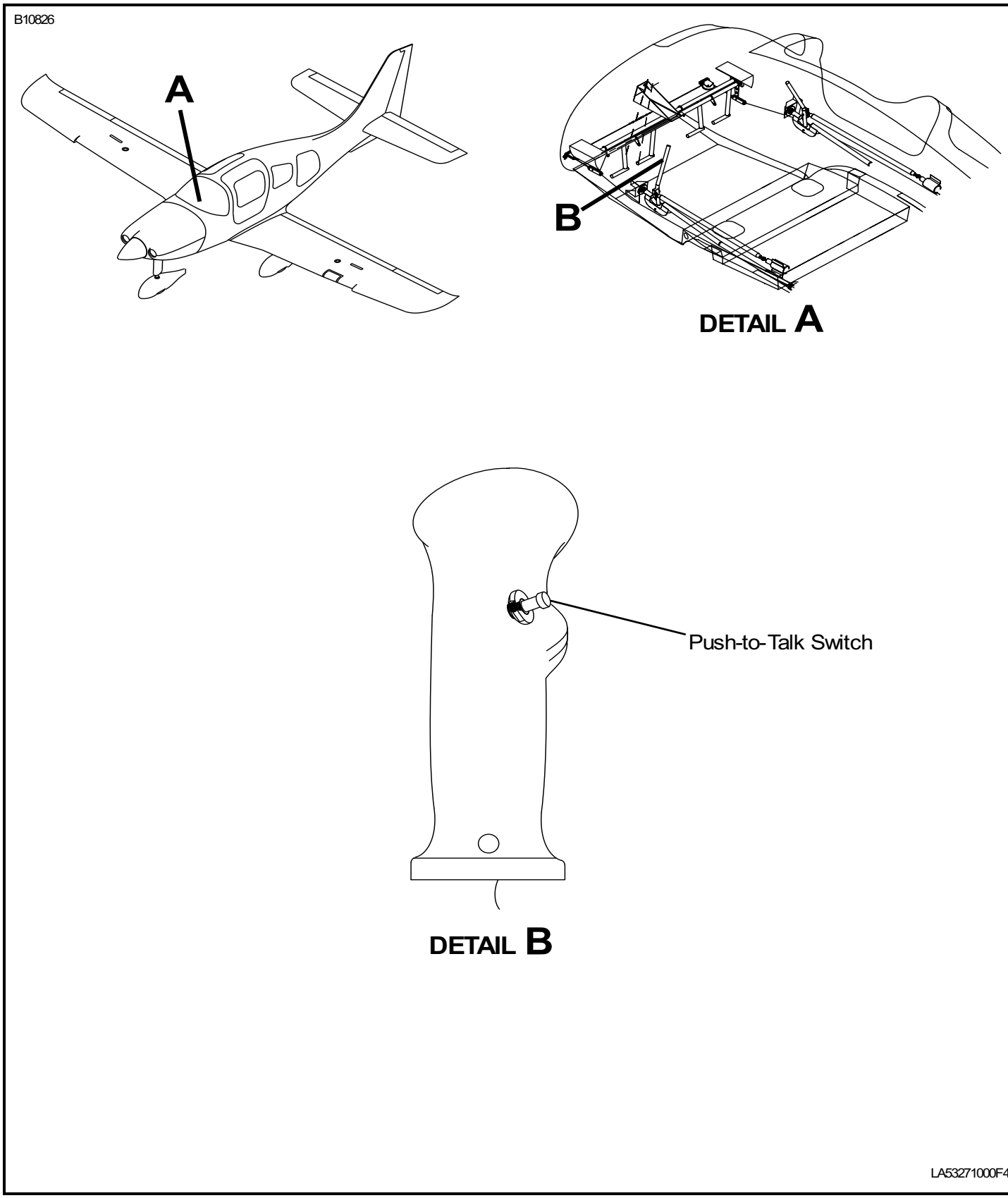
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Figure 202 : Sheet 1 : Overhead Speaker Installation



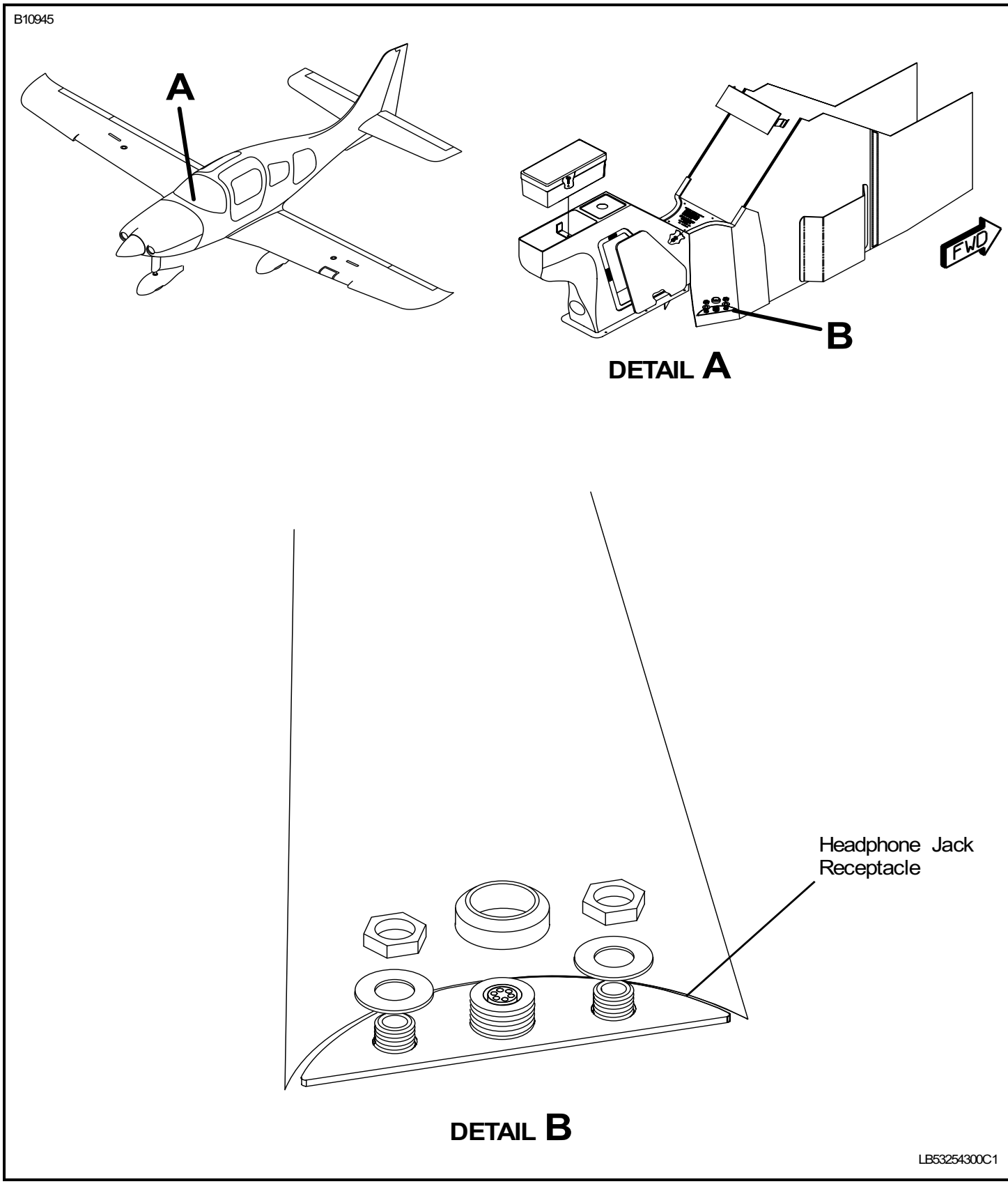
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Figure 203 : Sheet 1 : Push-To-Talk Switch Location



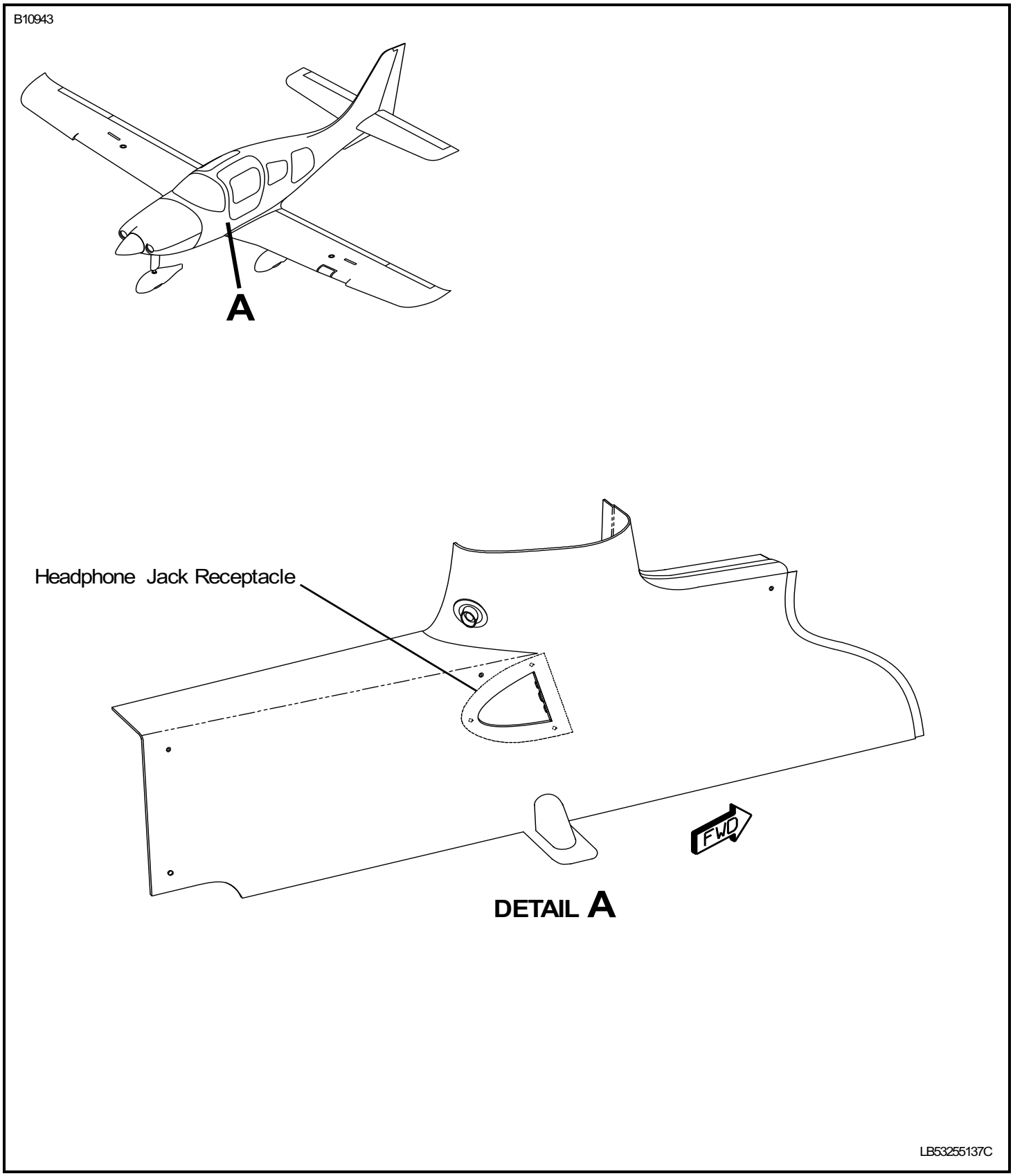
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Figure 204 : Sheet 1 : Front Seat Headphone Jack Receptacle



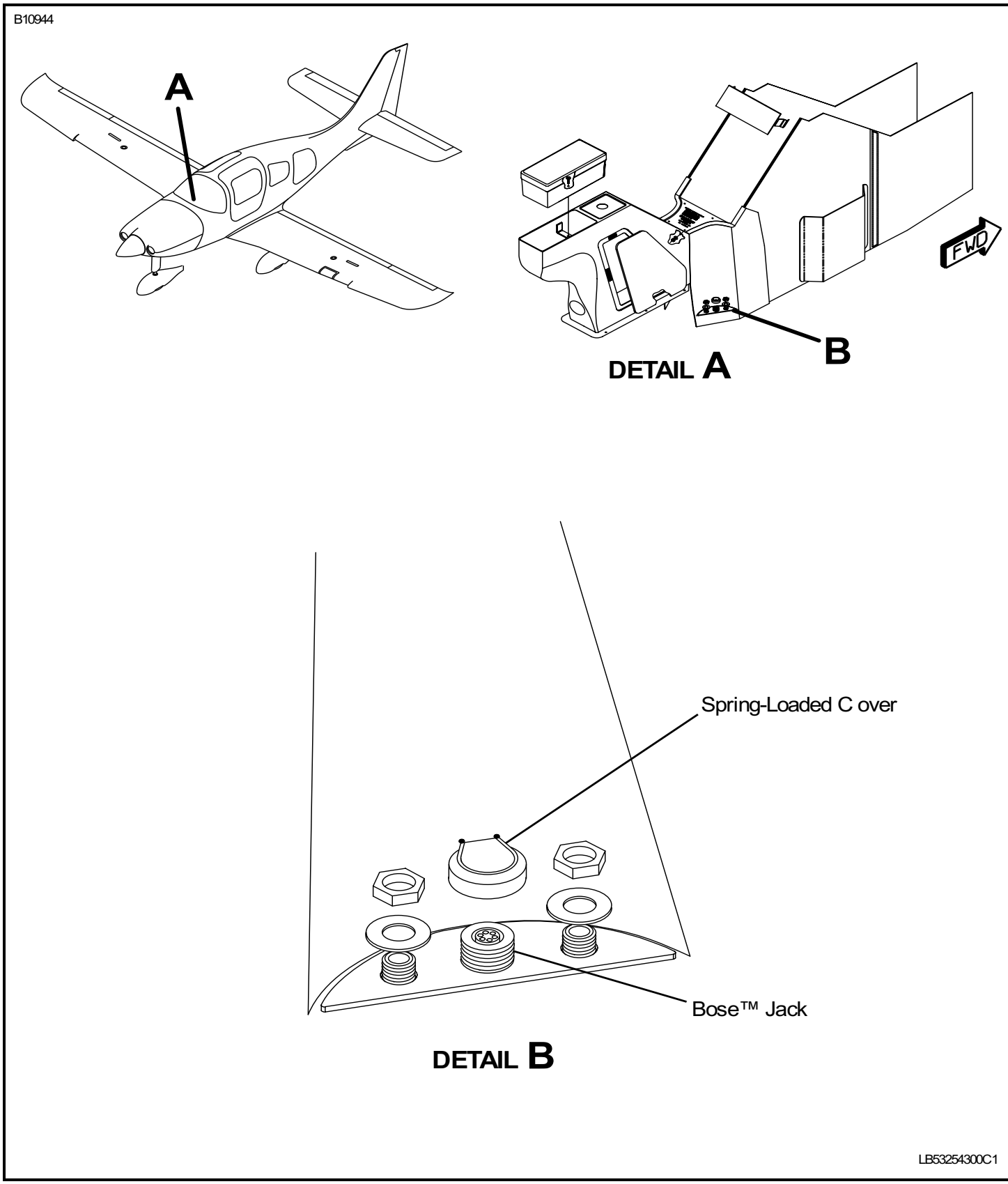
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Figure 205 : Sheet 1 : Rear Seat Headphone Jack Receptacle



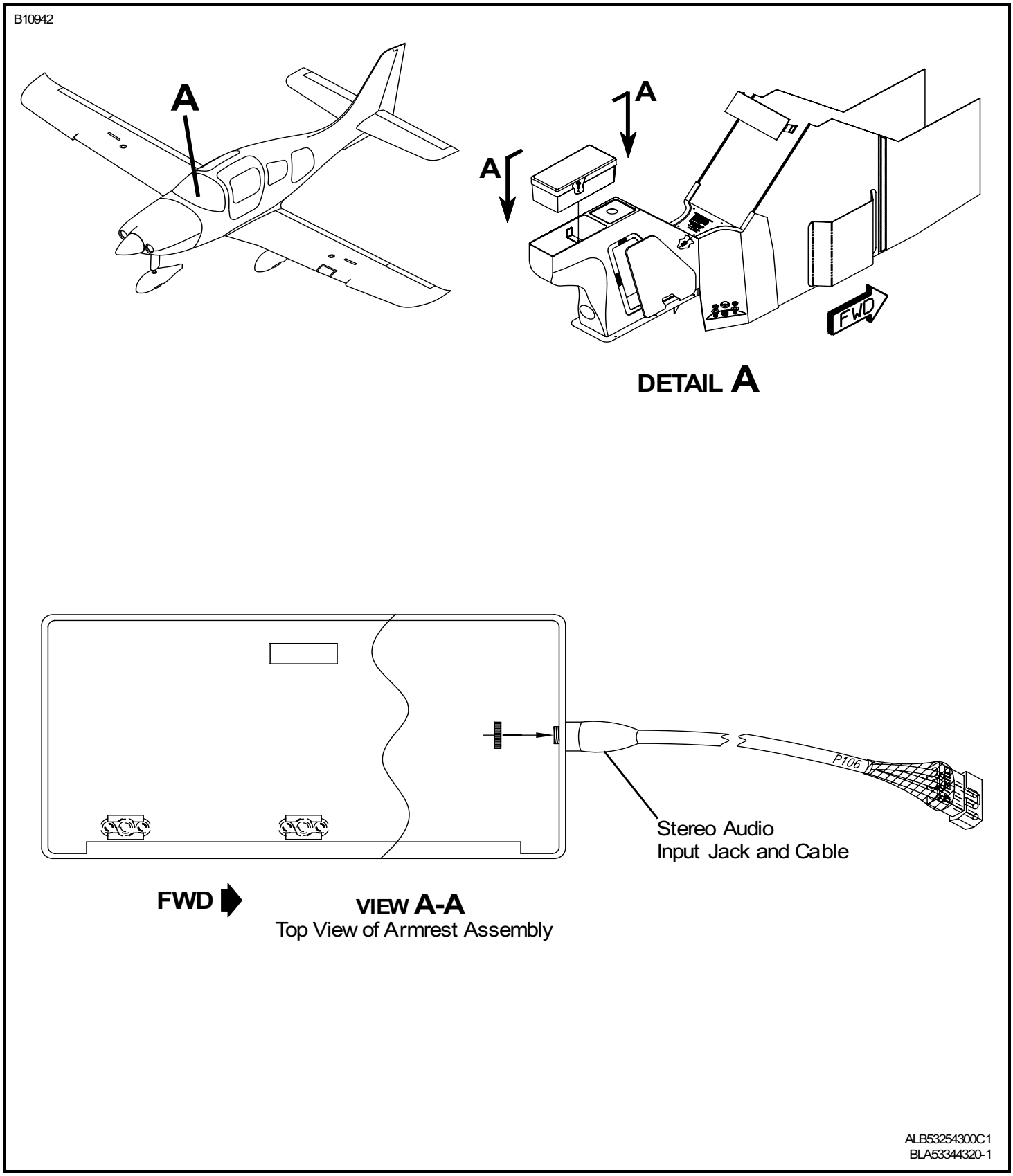
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Figure 206 : Sheet 1 : Headphone/Microphone Jack Installation



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Figure 207 : Sheet 1 : Stereo Audio Input Jack



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GARMIN GMA 36 REMOTE AUDIO PANEL AND AUDIO COMPONENTS - ADJUSTMENT/TEST

1. General

A. This sections gives the adjustment test for the Garmin GMA 36 Remote Audio Panel, audio jacks, GTC 570 Touchscreen Controller audio function/control operation and the Marker Beacon function operational test.

B. The Garmin G2000 audio (radio) components are part of the GIA 63W Integrated Avionics Units. The GIA 63W units also have navigation components as part of the integrated functions. For ease of maintenance, the audio systems operational tests are found in Chapter 34, Garmin GIA 63W Integrated Avionics Units (G2000) - Adjustment/Test.

2. Tools and Equipment

A. Three or more aviation headsets that have separate microphone and headphone plugs are needed to complete this audio system test. Commercially available .

B. NAV/COMM/ELT Ramp Test Set - Aeroflex IFR 4000 or equivalent.

3. Headset Microphone and Isolation Operational Test

A. Test the Headset Microphone and Audio Isolation Function

(1) Supply external electrical power to the airplane.

(2) Set the master BATT switches (left SW01 and right SW02) to the ON position.

(3) Set the AVIONICS MASTER switch (SW04) to the ON position.

(4) Set the CROSS TIE switch (SW03) to the ON position.

(5) Plug the headsets in the pilot's, copilot's and a passenger's headset jacks.

(6) On the GTC 570 homepage, push the Intercom button.

(a) The intercom screen shows on the GTC 570 display.

(7) Make sure that each of the isolation arrow buttons on the screen are on (green).

(a) If one or more isolation arrow button is not on (grey), push the button(s) that are not on.

(8) Speak in the pilot's headset microphone and make sure that:

(a) The audio is crisp and clear

(b) This no distortion in each of the headsets.

(9) On the GTC 570, push the isolation arrows between the PILOT and COPILOT and PILOT and PASSENGER labels.

(a) The isolation arrow buttons change to grey.

(b) Make sure that the pilot position cannot hear the copilot's or passenger's audio in the headset.

(10) On the GTC 570, push the isolation arrow between the COPILOT and PASSENGER labels.

(a) The isolation arrow button changes to grey.

(b) Make sure that the copilot position cannot hear the pilot's or passenger's audio in the headset.

(11) On the GTC 570, push the isolation arrow between the PILOT and COPILOT labels.

(a) The isolation arrow button changes to grey.

(b) Make sure that the pilot and copilot positions cannot hear the passenger's audio in the headset.

(c) Make sure that the pilot and copilot positions can hear each others audio in the headset.

(12) On the GTC 570, push the isolation arrows between the PILOT and COPILOT and PASSENGER labels.

(a) The isolation arrow buttons change to green.

(b) The audio system goes back to the initial configuration.

(13) Set the master BATT switches (left SW01 and right SW02) to the OFF position.

(14) Set the AVIONICS MASTER switch (SW04) to the OFF position.

(15) Set the CROSS TIE switch (SW03) to the OFF position.

(16) Remove external electrical power from the airplane.

4. Marker Beacon Operational Test

A. Do a check of the Marker Beacon.

NOTE: The Marker Beacon annunciations are shown on the PFD to the left of the Selected Altitude. Outer

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marker reception is indicated in blue, middle in yellow, and inner in white.

(1) Supply external electrical power to the airplane.
(2) Set the master BATT switches (left SW01 and right SW02) to the ON position.
(3) Set the AVIONICS MASTER switch (SW04) to the ON position.
(4) Set the CROSS TIE switch (SW03) to the ON position.
(5) On the ramp test set select the settings that follow:
    (a) Push the power button (green) to set the test set to on.
    (b) Select MARKER BEACON mode
    (c) Select a frequency of 75.000 MHz
    (d) Set the RF LVL to dBm
    (e) Select a tone of 400 Hz
(6) On the GTC 570 Touchscreen controller push the Audio & Radios button.
    (a) Make sure the MKR MUTE annunciator is on.
    (b) Set the speaker to on.
(7) On the Audio & Radios screen, push the High Sense button.
    (a) The High Sense button, the bar (green) comes on.
(8) Make sure that:
    (a) The flashing O (blue) shows on the PFD.
    (b) A 400 Hz tone is heard through the cockpit overhead speaker.
(9) On the Audio & Radios screen, push the Marker button.
    (a) The High Sense button bar goes off.
    (b) On the Marker button, the bar (green) comes on.
(10) On the ramp test set, select a tone of 1300 Hz and make sure that:
    (a) The flashing middle marker M (amber) shows on the PFD.
    (b) A 1300 Hz tone is heard through the cockpit overhead speaker.
(11) On the ramp test set, select a tone of 3000 Hz and make sure that:
    (a) The flashing inner marker I (white) shows on the PFD.
    (b) A 3000 Hz tone is heard through the cockpit overhead speaker.
(12) Push the power button to set the test set power to off.
(13) Set the master BATT switches (left SW01 and right SW02) to the OFF position.
(14) Set the AVIONICS MASTER switch (SW04) to the OFF position.
(15) Set the CROSS TIE switch (SW03) to the OFF position.
(16) Remove external electrical power from the airplane.

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GARMIN GMA 36 REMOTE AUDIO PANEL (G2000) - REMOVAL/INSTALLATION

1. General

A. This section gives the removal and installation procedures for the G2000 Garmin GMA 36 Remote Audio Panel. For a general description of the GMA 36, refer to Chapter 34, Garmin G2000 - Description and Operation.

2. Tools and Equipment

A. None.

3. Garmin GMA 36 Remote Audio Panel Removal/Installation

CAUTION: When removing and/or replacing a G2000 component, make sure that the airplane power is off. Disconnect auxiliary power supplies.

A. Remove the GMA 36 Remote Audio Panel (UI501) (Refer to Figure 401).

(1) Remove external electrical power from the airplane.

(2) Make sure that the master BATT switches (left SW01 and right SW02) are in the OFF position.

(3) Make sure that the AVIONICS MASTER switch (SW04) is in the OFF position.

(4) Disengage the AUDIO circuit breaker found on the cockpit circuit breaker panel.

(5) Remove the right GDU 1400 Multifunctional Display (MFD) (UI406). Refer to Chapter 34, Garmin GDU 1400 Displays (G2000) - Removal/Installation.

(6) Unlock the GMA 36 handle by unscrewing the Phillips screw.

(7) Pull the handle upwards to unlock the GMA 36.

(8) Carefully remove the unit from the rack.

B. Install the GMA 36 Remote Audio Panel (UI501) (Refer to Figure 401).

(1) Visually inspect the connectors to make sure there are no bent or damaged pins.

(a) Repair any damage.

(2) Carefully insert the GMA 36 into the rack.

(a) Make sure that the handle engages the dogleg track.

(3) Press down on the handle to lock the unit into place.

(4) Lock the handle to the GMA 36 body using the Phillips screw.

(5) Install the MFD (UI406). Refer to Chapter 34, Garmin GDU 1400 Displays (G2000) - Removal/Installation.

(6) Engage the AUDIO circuit breaker found on the cockpit circuit breaker panel.

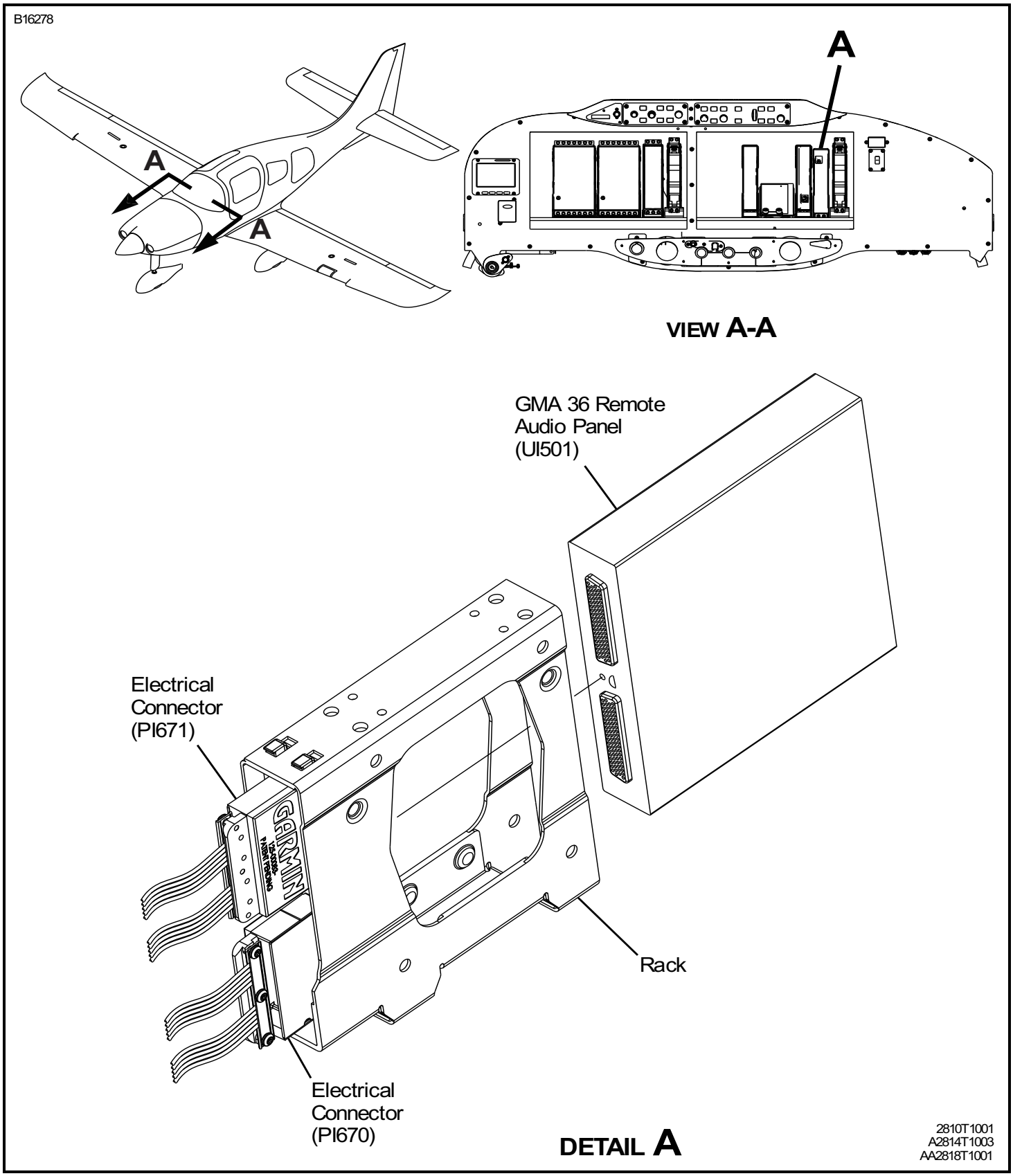
(7) If you installed a new GMA 36 you must upload the software and configuration files. Refer to Garmin G2000 - Adjustment/Test. For more data applicable to the upload of software and configuration files, refer to the Loading and Testing LRU Software section of the most current revision of the Garmin G2000 Integrated Avionics System Line Maintenance Manual, P/N 190-01185-00, found on theSupplier Publication List.

(8) Do a check of the GMA 36 Remote Audio Panel. Refer to GMA 36 Remote Audio Panel and Audio Components (G2000) - Adjustment/Test.

(9) For GMA 36 troubleshooting procedures refer to the Troubleshooting section of the most current revision of the Garmin G2000 Integrated Avionics System Line Maintenance Manual, P/N 190-01185-00, found on theSupplier Publication List

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Figure 401 : Sheet 1 : GMA 36 Remote Audio Panel Installation



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AUDIO JACK PANEL (T240) - REMOVAL/INSTALLATION

1. General

A. This section gives the removal and installation procedures for the audio jack panel. For a general description of the audio jack panel, refer to Equipment/Furnishings - General.

2. Tools and Equipment

A. No special tools or equipment are required for this procedure.

3. Audio Jack Panel

A. Remove the Audio Jack Panel (Refer to Figure 401).

(1) Remove external electrical power from the airplane.

(2) Make sure that the master BATT switches (left SW01 and right SW02) and the AVIONICS MASTER switch (SW04) are in the OFF position.

(3) Disengage the AUDIO/MKR circuit breaker found on the cockpit circuit breaker panel.

(4) Loosen the captive screws that attach the audio jack panel to the center console.

(5) Carefully pull the audio jack panel away from the console.

(6) Disconnect electrical connector PJ507 from electrical connector JJ507.

(7) Remove the audio jack panel from the airplane.

B. Install the Audio Jack Panel (Refer to Figure 401).

(1) Connect electrical connector PJ507 to electrical connector JJ507.

(2) Carefully put the audio jack panel in position on the center console.

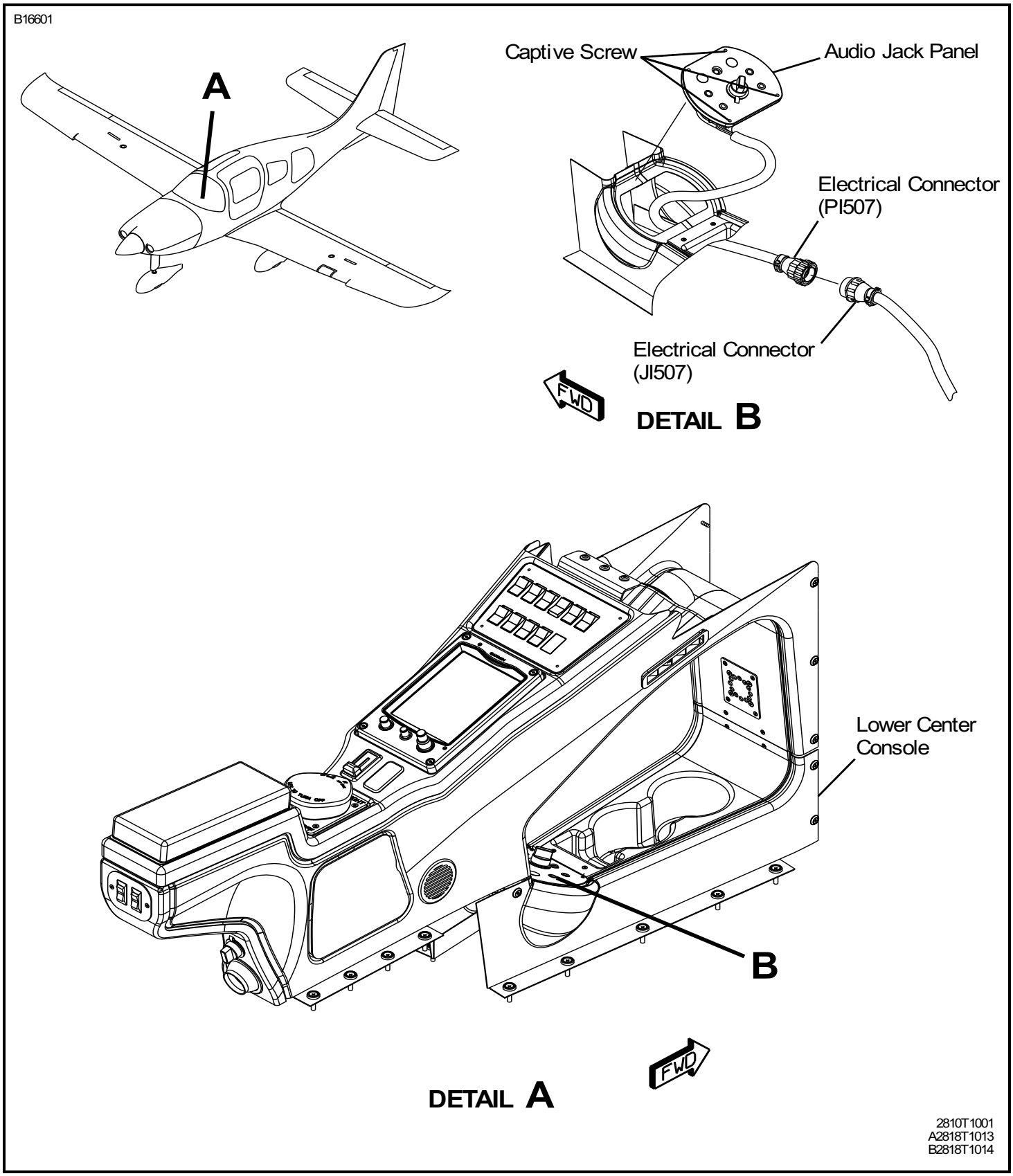
(3) Tighten the captive screws that attach the audio jack panel to the center console.

(4) Engage the AUDIO/MKR circuit breaker found on the cockpit circuit breaker panel.

(5) Do a check of the audio jack panel. Refer to Garmin GMA 36 Remote Audio Panel and Audio Components (G2000) - Adjustment/Test, Headset Microphone and Isolation Operational Test.

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Figure 401 : Sheet 1 : Audio Jack Panel Installation



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STATIC DISCHARGE WICKS - MAINTENANCE PRACTICES

1. Static Discharge Wicks

A. **Detection of a Broken Static Wick** - To check the wick's integrity, hold the trailing edge between the thumb and forefinger, and gently move it left and right approximately 2 in. If the unit flexes at point A, as shown in Figure 201, the wick is broken and should be replaced.

B. **Removal of Static Wick** - Refer to Chapter 20, Repair of Static Wicks, for repair details.

CAUTION: When removing and handling a good static wick, do not bend it. The static wick can be broken without obvious exterior indications.

WARNING: If the wicks are removed and not reinstalled before flight, problems with navigation and communication equipment can occur.

(1) Unscrew the screw connecting the static wick to its housing.

(2) Remove the static wick from the housing.

NOTE: If the static wick does not slide out after removing the screw, use a pair of pliers and gently pull the static wick from its housing.

C. **Installation of Static Wick** - Refer to Chapter 20, Repair of Static Wicks, for repair details.

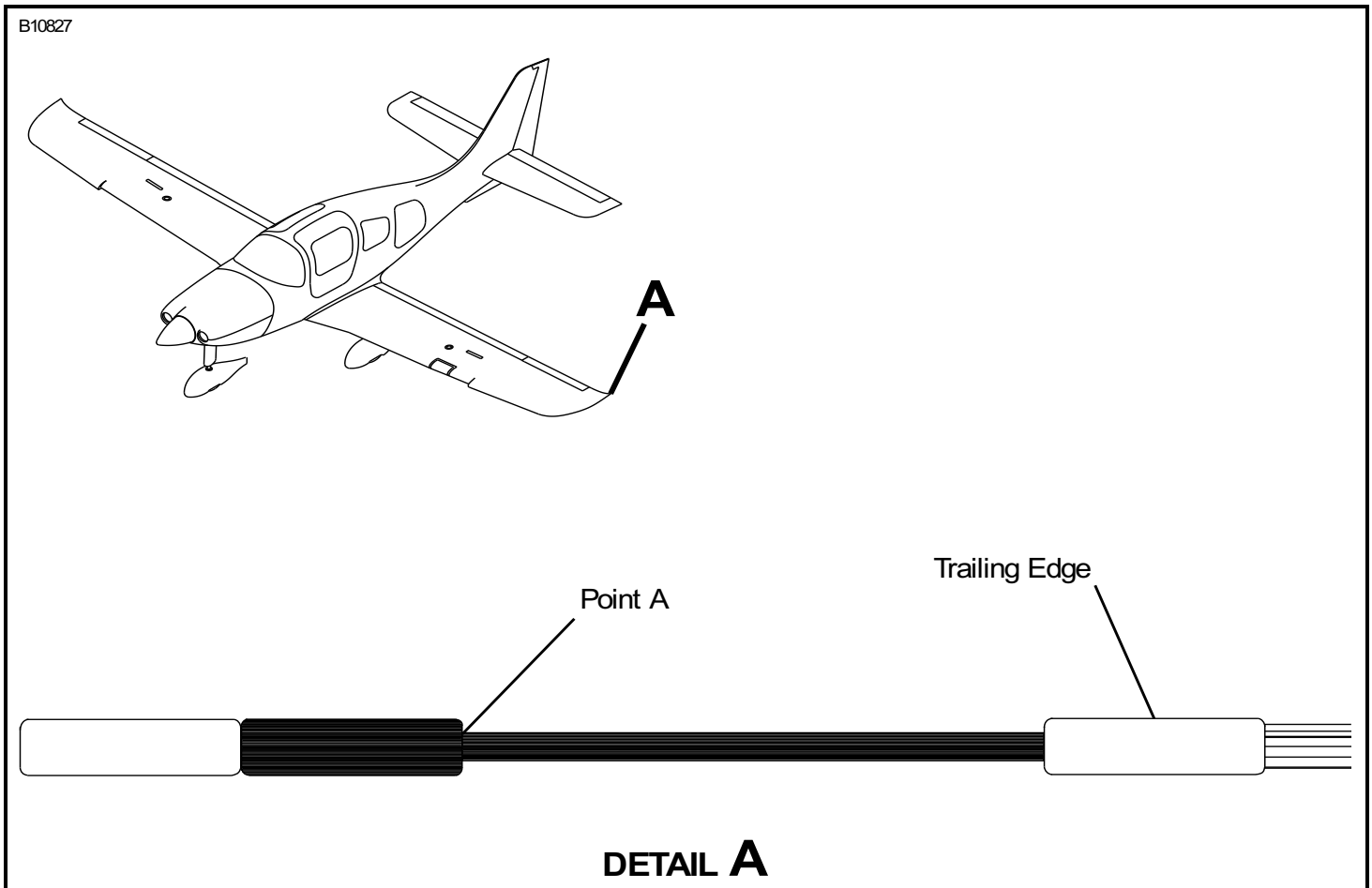
CAUTION: Before installing the static wick, perform the broken static wick test described below. A static wick can be broken without any obvious exterior indications.

(1) To install a static wick place the wick in its housing.

(2) Screw the static wick and its housing together.

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Figure 201 : Sheet 1 : Static Wick



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FLIGHT CONTROLS - GENERAL

1. General - Scope And Definition

A. **General Description of System** - The Cessna 400 (LC41-550FG/T240) has dual flight controls and can be flown the pilot's or copilot's position. Dual pairs of foot pedals mechanically-actuate the rudder and control the brakes, which are also used for steering (differential braking). Push-pull tubes mechanically-actuate the ailerons and elevator. The rudder is mechanically-actuated with foot pedals and control cables. The electrically operated drive motor connected to push-pull tubes operate the flaps. Rod end bearings are used throughout the control system. It is not necessary for you to do maintenance to the bearings.

B. **General Description of Trim System** - An electrically operated trim tabs located in the elevator, and the right aileron give longitudinal pitch trim and lateral trim, respectively. A fixed trim tab located the rudder gives directional trim.

C. **Tolerances and Play** - Table 1 lists the allowable control and trim tab deflections, free play limits, and tolerances.

Table 1. Control Surface Deflections, Tolerances, and Free Play Limitations

		Deflection	Tolerance	Free Play Limits (NOTE 1)
Wing Flaps	Cruise	0 degrees	±1 degree	---
	Takeoff	12 degrees		
	Landing	40 degrees		
Ailerons	Up	21.6 degrees	±1 degree	---
	Down	17.7 degrees		
Aileron Trim Tab	Up	22.4 degrees	±1 degree	0.050 inch (2.5 percent c)
	Down	19.6 degrees		
Aileron Servo Tab	Up	13 degrees at 17.7 degrees ail. deflection	±2 degrees	0.063 inch (2.5 percent c)
	Down	19 degrees at 21.6 degrees ail. deflection		
Elevator	Up	23 degrees	±1 degree	---
	Down	14 degrees		
Elevator and Elevator Fairings **(NOTE 2)**	Left	---	±1 degree	---
	Right	---		
Elevator Trim Tab	Up	21 degrees	±2 degrees	0.075 inch (2.5 percent c)
	Down	30 degrees		
Rudder	Left	30 degrees	±1 degree	---
	Right	30 degrees		
Rudder Trim Tab	---	±30 degrees	N/A	---

NOTE 1:

The tab free play at the tab trailing edge should be less than 2.5 percent of the tab chord aft of the hinge line, measured at the station where the free play is measured.

NOTE 2:

Elevator and elevator fairing top surfaces must be in line with the outboard, trailing top surface of the left hand horizontal.

D. **Rigging and Flight Controls** - Rigging and adjustment of the control system and surfaces are covered in their respective sections.

2. Trim System - General

A. The Cessna 400 (LC41-550FG/T240) has a two-axis electric trimming system. The elevator trim tab is located on the right side of the elevator, and the aileron trim tab is on the right aileron. Both tabs are electrically controlled by a hat switch on each control stick, and the trim position is annunciated on the trim panel located to the right of the rocker switch panel for

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the Avidyne option or the Engine Indication System (EIS) page of the MFD for the Garmin G1000 or G2000 systems. The trim servos are protected by one-amp circuit breakers. Refer to Figure 1 or Figure 2 for an illustration of the system.
The trim surfaces are moved by push rods connected between each tab and a servomotor. The aileron tab has one actuating rod and the elevator tab has two. The second actuating rod on the elevator is a redundant system and is provided for the more critical tab in the system. The frictional device installed on the aileron tab should never be lubricated.

B. **Hat Switches** - The trim tabs are controlled through the use of a hat switch on the top portion of the pilot's and copilot's control stick at the three and nine o'clock positions, respectively. Moving the switch forward will correct a tail heavy condition, and moving it back will correct a nose heavy condition. Moving the hat switch left or right will correct right wing heavy and left wing heavy conditions, respectively.

C. **Simultaneous Trim Application** - If both switches, pilot's and copilot's, are moved in the same direction at the same time, the trim will operate in the direction selected. If the switches are simultaneously moved in opposite directions, e.g., pilot's is nose down and copilot's is nose up, the pilot's selection overrides the copilot's, and the trim will move to a nose down position (trim will not move with the Garmin G1000 option in this case). Finally, if the switches are simultaneously selected in different directions, e.g., elevator trim is input by one pilot and aileron trim is input by the other, each trim tab will move in the direction selected.

D. **Trim Position Indicator**

(1) **Avidyne Option** - The trim position is displayed on two light bars using a series of blue LED's and two green LED's that are arranged on the trim panel in the shape of a plus sign. The vertical lights indicate the position of the elevator trim, and the horizontal lights show the position of the aileron trim. The middle green lights in each bar indicate the approximate neutral position.
The blue lights are sequentially lit and extinguished as the trim tab moves through its range of travel. If the two green LED's in the middle of the "+" are lit and no blue lights are illuminated, both tabs are in the approximate neutral position. The LED's level of brightness is controlled by the position lights switch. When the position lights are on, the trim lights are in the dim mode, and when the position lights are off, the trim lights are in the bright mode.
Should one or all of the trim indicator LED's stop functioning, remove the trim panel, and have it serviced by a qualified avionics repair technician.

(2) **Garmin G1000 Option and Model T240/G2000 Installation** - The trim position is displayed in the Trim Group on the Engine Indication System (EIS) page of the MFD. The vertical mark indicates the position of the elevator trim and the horizontal mark shows the position of the aileron trim. The blue band for each axis indicates the approved takeoff ranges.

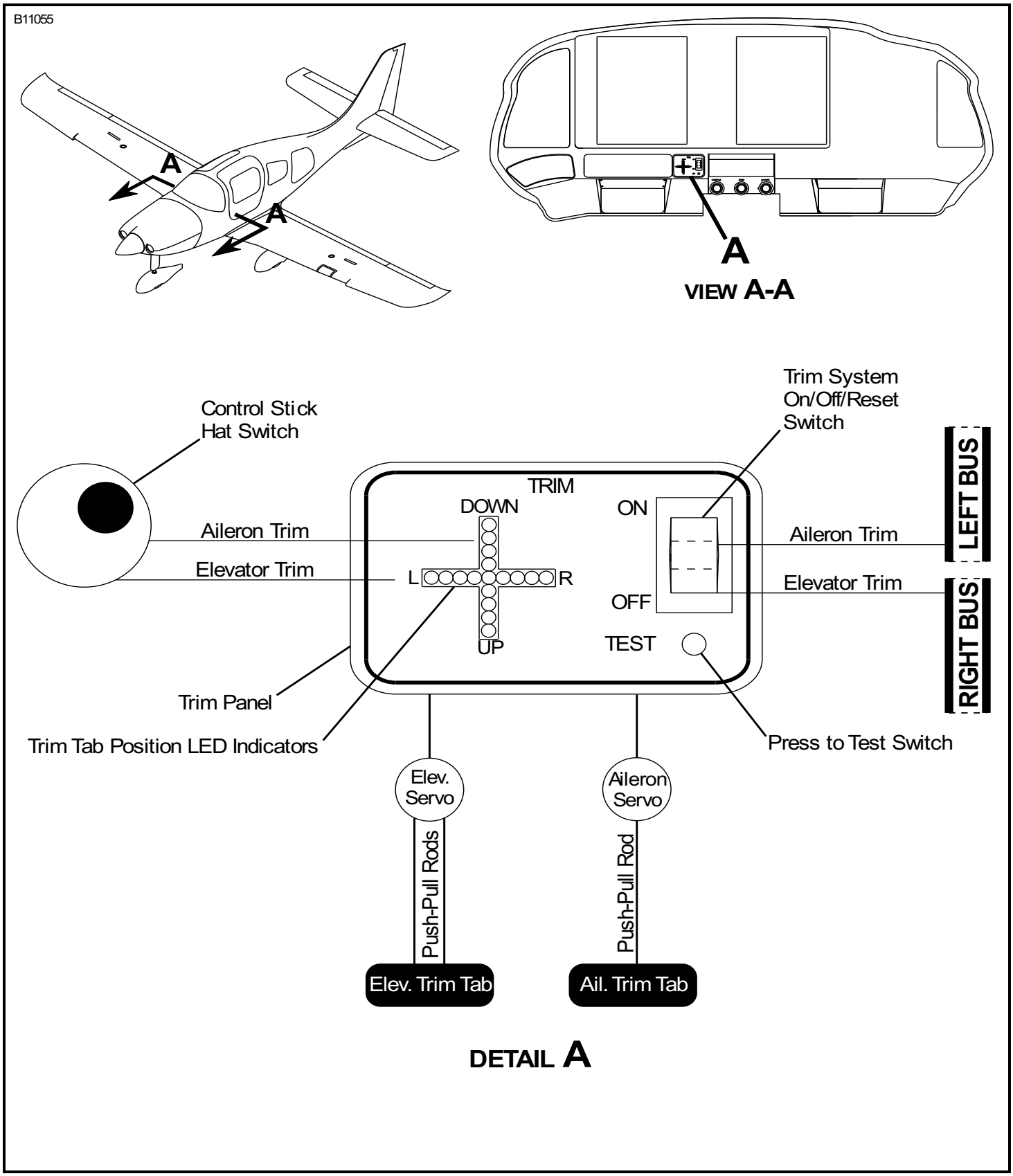
E. **Trim Switch**

(1) **Trim On/Off/Reset Switch (Avidyne Option)** - The trim system on/off/reset switch on the right side of the panel turns off power on all the trim tabs. This switch is used if a runaway trim condition is encountered. Refer to the POH for an expanded discussion of this issue. The press-to-test switch verifies the operation of all the LED's associated with the trim, flaps, fuel tank position, and annunciator panel. When the test position is selected, all related LED's illuminate in the bright mode. A light that fails to illuminate should be replaced.

(2) **Autopilot/Trim Master Switch** - The autopilot/trim master switch, to the right of the avionics master switch in the overhead console, turns off power on all the trim tabs. This switch is used if a runaway trim condition is encountered. The switch can be cycled to reset or restore normal trim operations. Refer to the POH for an expanded discussion of this issue. The press-to-test switch is discussed in chapter 7 of the POH under the heading *Flaps, and 5 Pack Switch Annunciation (Press-to-Test)*.

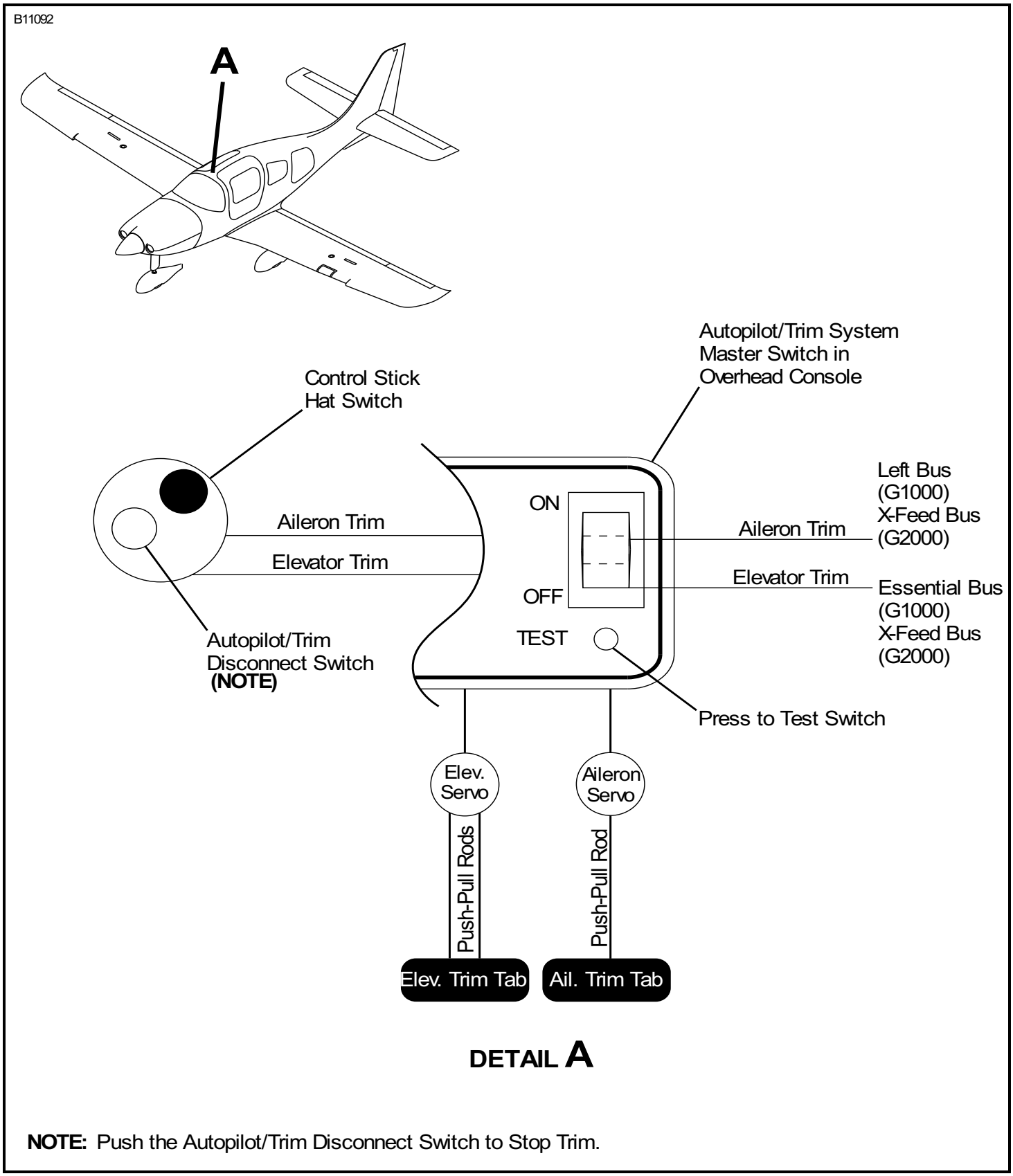
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Figure 1 : Sheet 1 : Trim System Layout (Avidyne Option)



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Figure 2 : Sheet 1 : Trim System Layout (Garmin G1000 Option or G2000 Installation)



NOTE: Push the Autopilot/Trim Disconnect Switch to Stop Trim.

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CONTROL SURFACE STATIC BALANCING - MAINTENANCE PRACTICES

1. Control Surface Static Balancing - General

A. Control surface balance must be checked when control surfaces are repaired, altered, or repainted. All control surfaces must be repainted in accordance with Chapter 51. The control surface balance limits shown in Table 201 apply to a complete painted control surface only. Complete control surfaces include (as applicable) balance weight, all attachment hinges and hardware, trim tabs, access panels, grounding straps, and static wicks.

Table 201. Control Surface Static Balance Limits

		Maximum Total Weight (lbs.)	TE Hinge Moment (in.-lbs.) (see Note 1)
Aileron	Left	6.8 to 8.6	-4.4 to +0.9
	Right	6.8 to 8.6	-4.4 to +0.9
Elevator (see Note 2)	Left	8.9 Ref.	-1.0 Ref.
	Right	12.4 Ref.	+6.5 Ref.
	Tube	2.7	+2.6
	Assembly	19.8 to 26.9	-3.54 to +3.54
Rudder	---	14.1 to 19.8	+8.9 to +15.4.

NOTE 1:

A positive value indicates trailing edge heavy.

NOTE 2:

Elevator moment is the sum of the left, right, and tube moments. Left and right individual weights and moments may vary from values shown but the assembly values must fall within ranges indicated.

NOTE: If specified moments cannot be met, heavier balance weights may be obtained from the manufacturer. This approach should be considered before reworking any repair or restripping and repainting the affected control surface. A lighter weight can be produced by shaving existing balance weight per the instructions outlined in the sections below.

2. Required Equipment For Balancing

A. Obtain or otherwise fabricate two knife-edges (refer to Figure 201) and supports approximately 6 - 12 inches in height such that they may be placed on a table and stabilized to prevent tipping. The knife-edge hinge supports must be level and perpendicular to the control surface hinge axis. The knife-edges should have attached a 1.5 to 2.0 inch section of MS20001P5 piano hinge to match the elevator attachment hinge. The knife-edges should also be small enough in height to fit within the rudder at the hinge pin locations.

B. A calibrated scale accurate to ±0.01 lbs.

C. Calculator.

D. Calibrated leveling device (digital inclinometer, bubble level, etc) accurate to ±0.2 degrees.

3. Balancing Procedures - Aileron

A. **Aileron static balancing** - Use the following procedure for static balancing the ailerons.

(1) Mount the two knife-edges horizontally such that a line drawn through the hinge line support points is level and perpendicular to the supporting knife-edges.

(2) Set the aileron trim tab to the neutral position.

(3) Remove the ailerons per the instructions in Section 27-10-00, Ailerons.

(4) On the left aileron, tape the servo tab in the neutral position with a small piece of masking tape. Tape the two drive rods to the servo tab hinge. Include all attachment hardware for the control rods.

(5) Install the attachment hardware into each of the three hinges.

(6) Place either aileron on the knife-edges such that the inboard and outboard attachment bolts are resting on the knife-edges. Swing the aileron up and down to ensure that the knife-edges do not interfere with the aileron and hinges.

(7) Position the aileron such that the chord line is level, and accurately measure the control surface load at the inboard end of trailing edge. To check that the chord line is level, measure the angle of the top surface of the aileron at the

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inboard end, and confirm that it is 10.9 degrees ±0.2 degrees from horizontal. Refer to Figure 202.

(8) Calculate the moment by multiplying the control surface load by 6.72 inches (moment arm). Compare this value with that in Table 201.

WARNING: Do not remove material from the forward or lower edge of the balancing weights. It is important that the contour of the forward and lower edge and the width of the balancing weights be maintained.

(9) If the moment is too light, material may be removed from the balancing weight to achieve the correct moment. Remove material from the aft face of the balancing weight first. If further weight reduction is needed, remove material from between the two fastener holes. The cross-hatched areas in Figure 203 indicate the areas where material may be removed from the aileron balancing weights. The width may be adjusted as long as a minimum clearance of 0.125 inches is maintained between the counterweight and the aileron cove in the wing.

(10) If the moment is too heavy, a heavier balancing weight may be obtained from the manufacturer.

(11) Use new MS20365-1032A self-locking nuts at final installation of the aileron balancing weights to the aileron. Dry torque the nuts 28 to 34 in.-lbs.

4. Balancing Procedures - Elevator

A. **Elevator Static Balancing** - The elevator shells must be balanced individually and the total weight and trailing edge moment calculated by adding the component values (elevators and torque tube).

(1) Remove the rudder per the instructions in Section 27-20-00, Rudder Removal and Installation.

(2) Remove the elevator per the instructions in Section 27-30-00, Elevator Removal and Installation.

(3) Place each of the elevators upside-down on the test fixture and attach them to the hinge sections on the fixture with a length of hinge pin in each hinge section. Alternatively, the elevators may be balanced on knife edges placed perpendicular to the axis of the hinge. If this method is used, make certain the elevator shell does not interfere with the knife edge supporting the elevator hinge. Also, use care to ensure the elevator does not fall off the knife edge, as the hinge must be place very near the edge of the edge.

NOTE: You must weigh and balance each elevator half with their metal end caps removed from the elevator. Refer to Chapter 27-30-00, Elevator Control System - Maintenance Practices. The weight and moment of the metal end caps is included in the weight and moment of the torque tube assembly.

(4) Set the elevator trim tab in the right-hand shell to the neutral position.

NOTE: Position the knife-edges such that they are equally distant from each end of the elevator.

(5) With the elevator chord line level, accurately measure the control surface load at the trailing edge a distance of 20.00±0.13 inches from the outboard end of the elevator. The elevator chord line is level when the angle of the upper or lower surface is 6.0±0.2 degrees, measured perpendicular to the hinge line. Add a measured amount of tare weight to the trailing edge of the left-hand elevator if required to give it a positive trailing edge weight. Refer to Figure 204.

(6) Calculate the total moment by multiplying the combined left-hand and right-hand elevator weights by 10.00 inches (moment arm) and adding 2.6 in.-lbs. for the torque tube. Compare this value with that in Table 201.

WARNING: Do not remove material from the forward or lower edge of the balancing weights and do not reduce the overall width of the balancing weights. It is important that the contour of the forward and lower edge and the width of the balancing weights be maintained.

(7) If the moment is too light, material may be removed equally from the balancing weights on both elevators to achieve the correct moment. Refer to Figure 205; crosshatched areas indicate where material can be removed. Remove material from the aft hole first.

(8) Use new MS20365-428A self locking nuts at final installation of the elevator balancing weights to the elevator. Dry torque the nuts 45 to 50 in.-lbs.

5. Balancing Procedures - Rudder

A. **Rudder Static Balancing** - Use the following procedure for static balancing the rudder.

(1) Remove the rudder per the instructions in Section 27-20-00, Rudder Removal and Installation.

(2) Mount both knife-edges horizontally and parallel to each other.

(3) Place the rudder on the knife-edges such that there is one knife-edge on the top and one on the bottom hinge pins. A

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line drawn through the hinge line support points must be level and perpendicular to the supporting knife-edges. Move the rudder up and down to ensure that the knife-edges do not interfere with the rudder and cause friction that could affect the surface load.

(4) With the rudder chord line level, accurately measure the control surface load at the trailing edge at the lower edge of the trim tab. Refer to Figure 206. The rudder has a symmetrical cross section and thus the chord line is level when the center of the leading edge is at the same height as the center of the trailing edge.

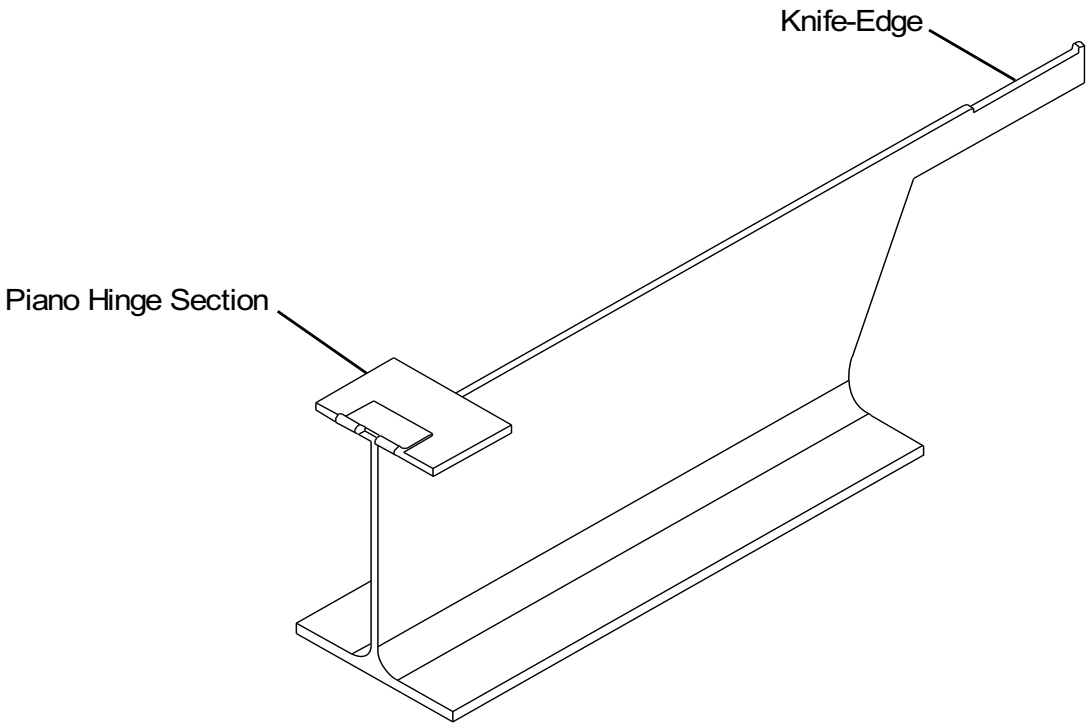
(5) Calculate the moment by multiplying the control surface load by 17.3 inches (moment arm). Compare this value with that in Table 201.

(6) If the moment is too light, the balancing weight may be reduced by drilling into the bottom edge of the balancing weight. Holes are to be 3/8 inch diameter. Drill hole "A" first. If more removal of material is necessary, drill hole "B". Holes should be a maximum depth of 1.3 inches. Refer to Figure 207.

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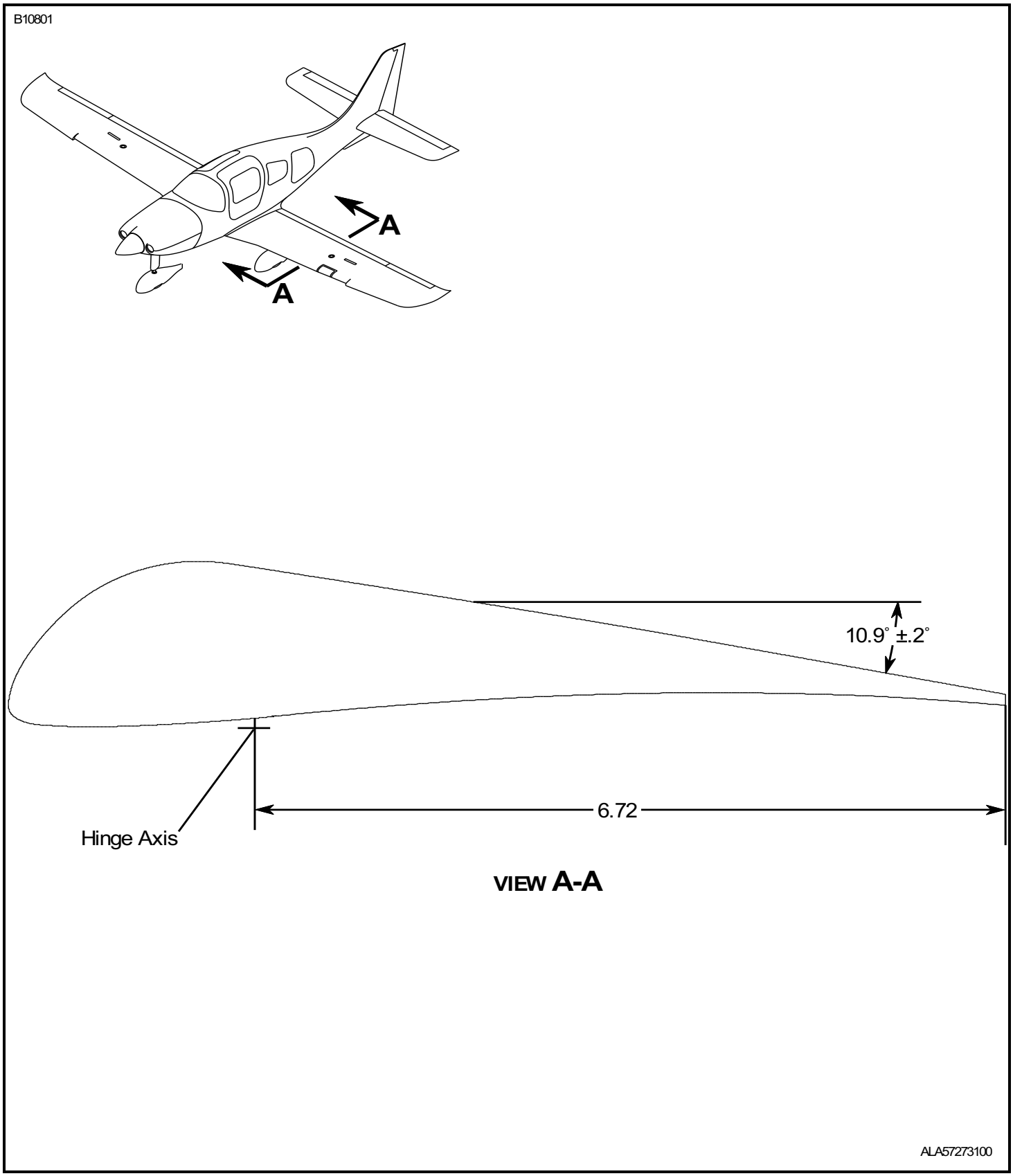
Figure 201 : Sheet 1 : Typical Knife-Edge

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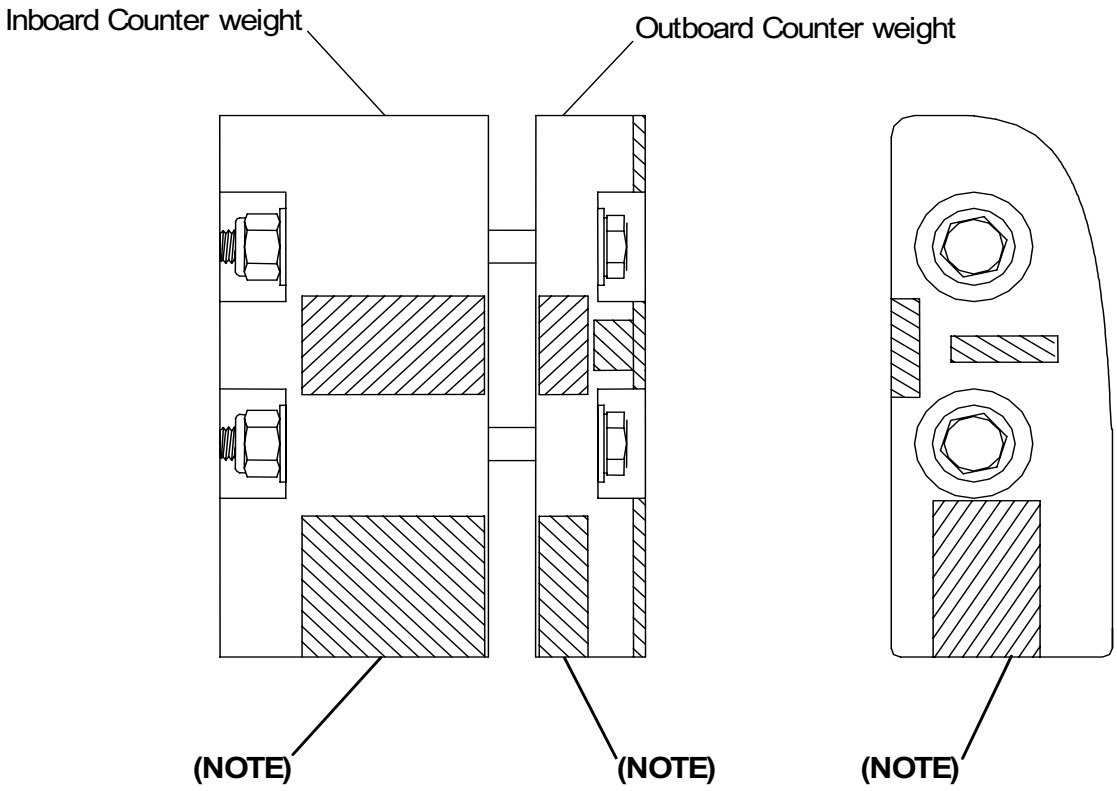
Figure 202 : Sheet 1 : Level Aileron Chord Line and Moment Arm



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Figure 203 : Sheet 1 : Allowable Areas of Material Removal, Aileron Balancing Weight

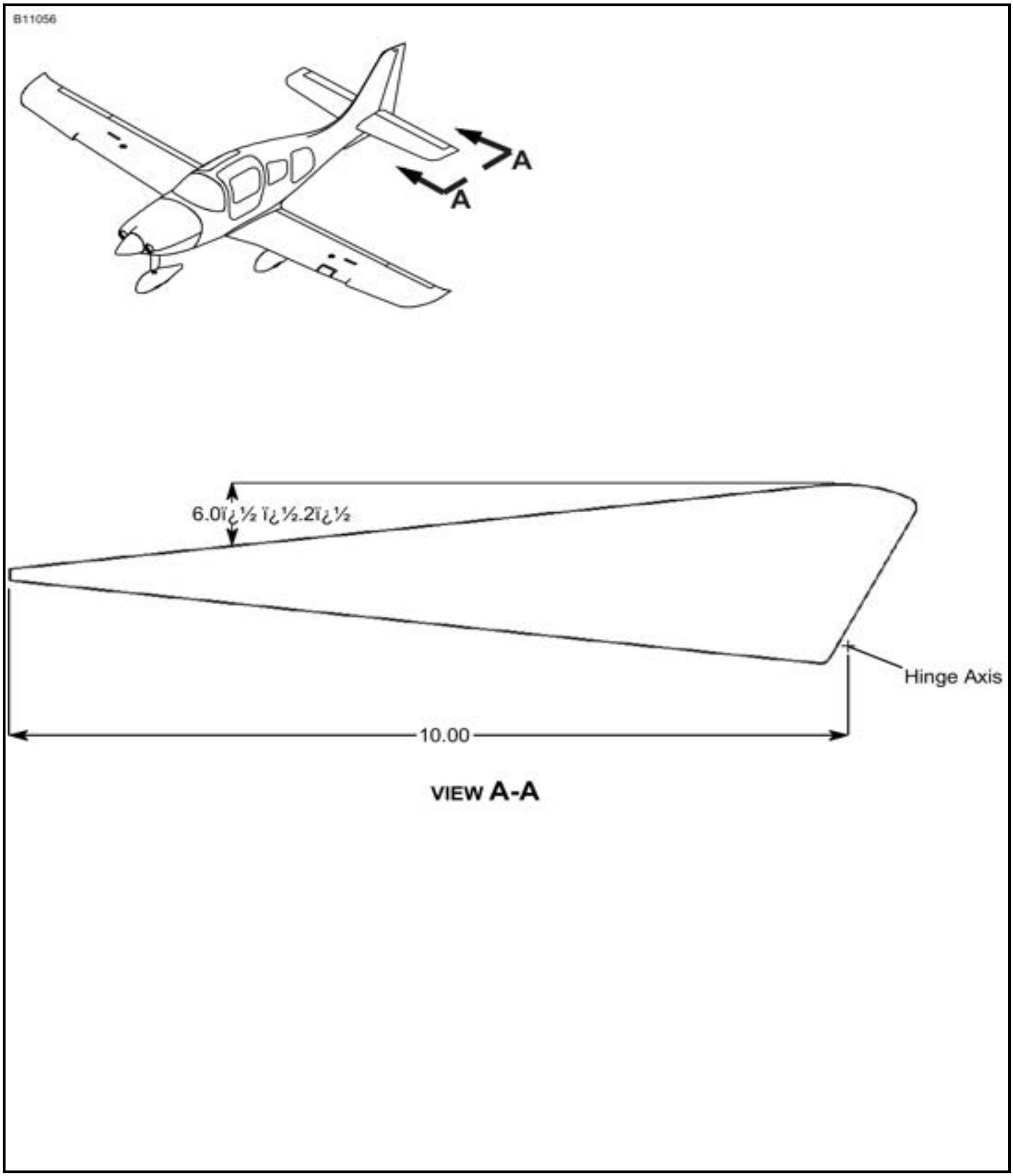
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NOTE: Remove Material from these areas first .

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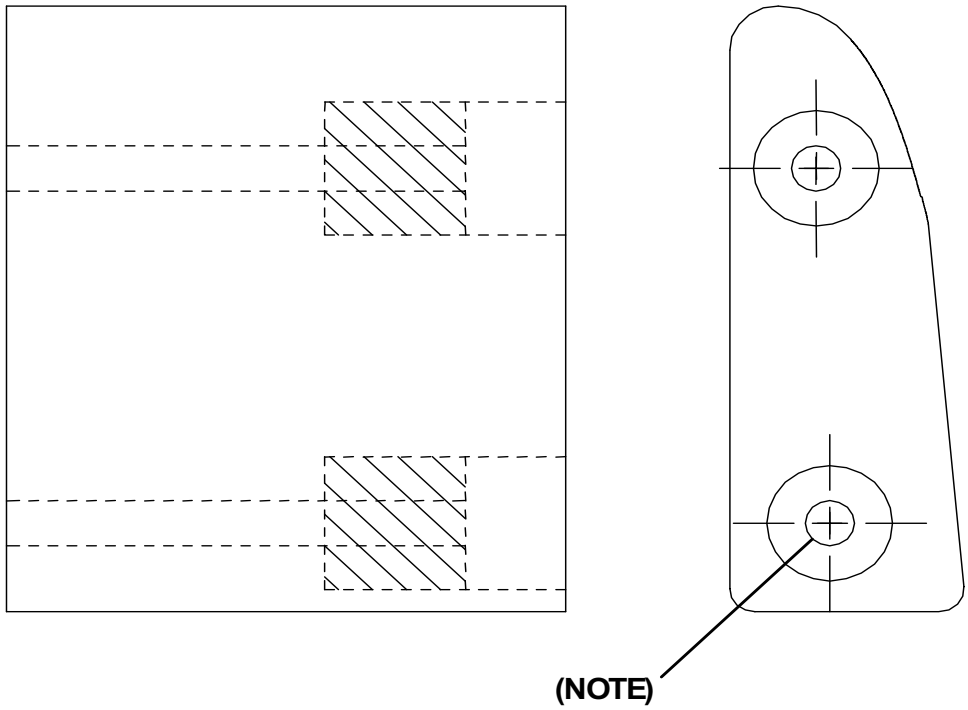
Figure 204 : Sheet 1 : Level Elevator Chord Line and Moment Arm



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Figure 205 : Sheet 1 : Allowable Areas of Material Removal, Elevator Balancing Weight

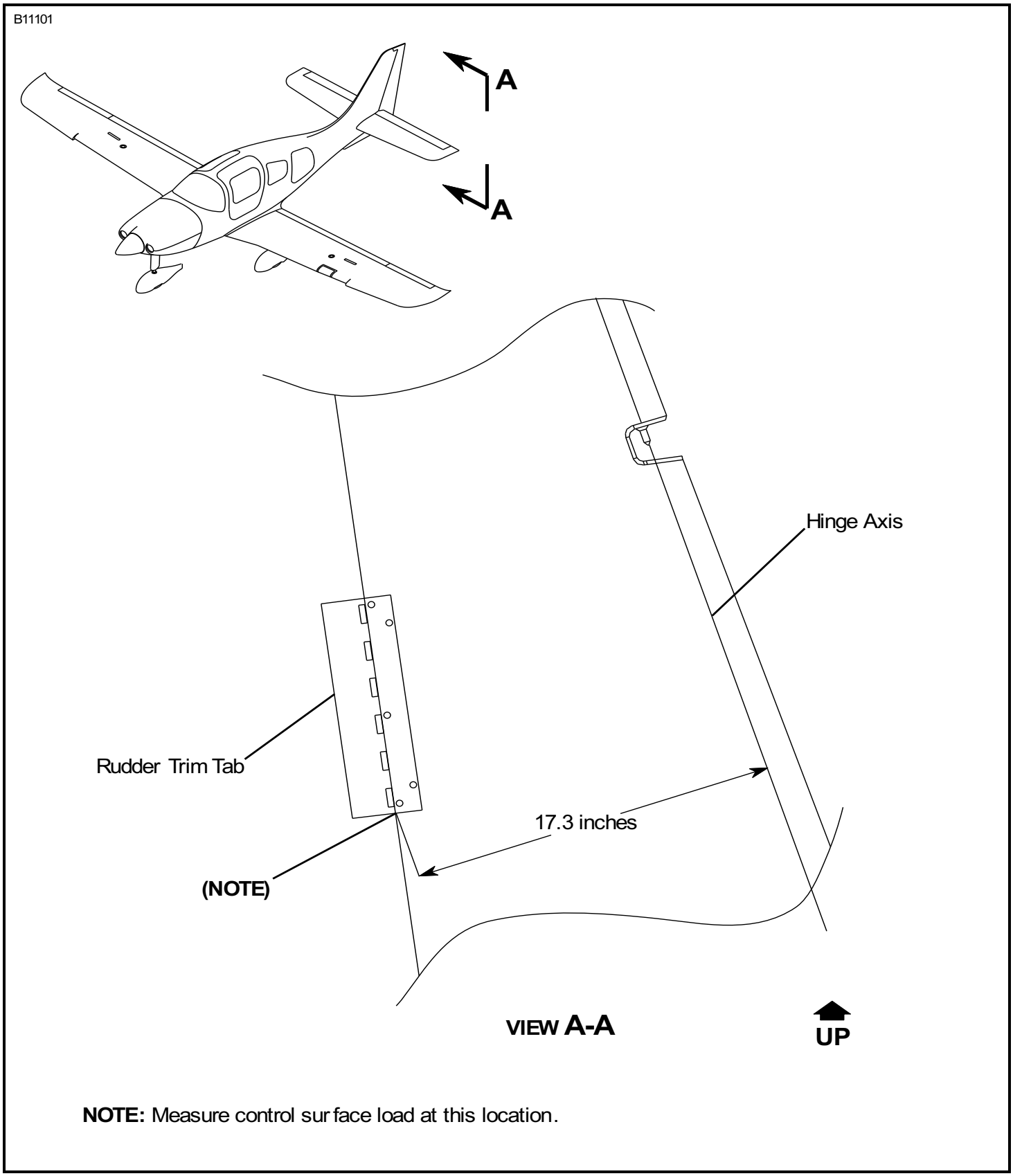
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NOTE: 0.260 inch ±0.005 inch through and counterbore 0.65 inch × 0.50 inch deep in two places. Counterbores may be deepened up to 1.25 inch for mass balance.

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Figure 206 : Sheet 1 : Location for Measuring the Rudder Surface Load

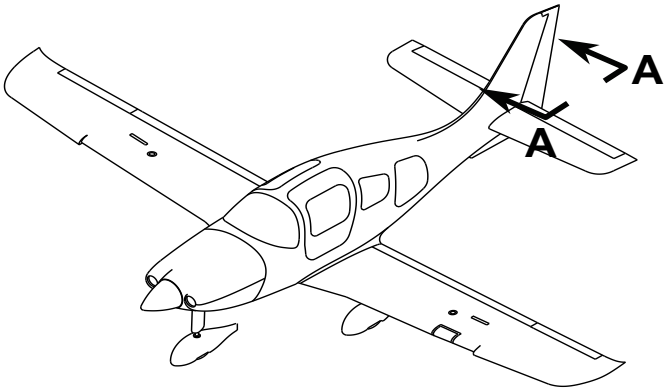


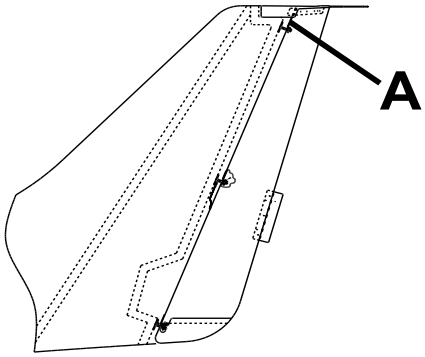
NOTE: Measure control surface load at this location.

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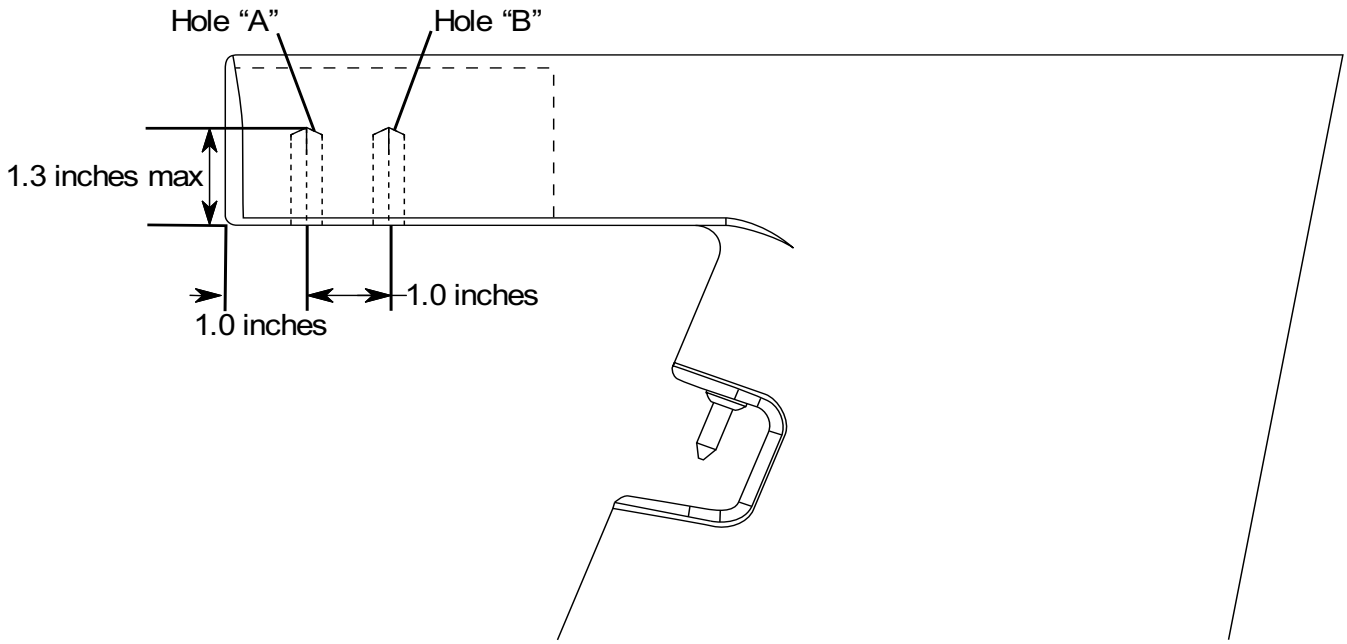
Figure 207 : Sheet 1 : Material Removal From Rudder Balancing Weight

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VIEW A-A



DETAIL A

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GARMIN G2000 AILERON AND ELEVATOR CALIBRATION - ADJUSTMENT/TEST

1. General

A. This section gives the instructions for the Garmin G2000 aileron and elevator trim calibration procedures. This procedure gives flight neutral system rigging instructions for the cockpit Multifunction Display (MFD). This procedure is applicable for aileron and rudder trim tab pointer flight neutral indications. You must only do the calibration in this section, after the adjustment and test procedures of a new trim tab actuator have been completed.

2. Aileron and Elevator Trim Calibration Procedures

A. Do the Aileron and Elevator Trim Calibration Procedures. (Refer to Figure 501).

(1) Before this adjustment is started, make sure that all applicable flight control adjustment and test procedures are complete. Refer to Chapter 27, Flight Controls for the applicable return to service tests for the applicable flight control system.

(2) On the cockpit circuit breaker panel, disengage the circuit breakers that follow:

(a) PFD

(b) MFD

(c) GTC.

(3) Apply external power to the airplane.

(4) Set the master BATT switches (left SW01 and right SW02) to the ON position.

(5) Set the AVIONICS MASTER switch (SW04) to the ON position.

(6) Set the CROSS TIE switch (SW03) to the ON position.

(7) Set the PFD to the configuration mode as follows:

(a) On the PFD, push and hold the number 12 softkey (the far right softkey).

(b) Engage the PFD circuit breaker.

(c) Release the softkey, when the "INITIALIZING SYSTEM" message shows on the PFD.

(8) Set the MFD to the configuration mode as follows:

(a) On the MFD push and hold the number 11 softkey (the far right softkey).

(b) Engage the MFD circuit breaker.

(c) Release the softkey, when the "INITIALIZING SYSTEM" message shows on the MFD.

(9) Set the GTC 570 to the configuration mode as follows:

(a) Push down and hold the small right knob on the GTC.

(b) Engage the GTC circuit breaker on the cockpit circuit breaker.

(c) Release the small right knob, when the "INITIALIZING SYSTEM" message shows on the GTC.

(10) On the GTC, push the GDU button.

(11) On the GTC, turn the large right knob to select the CAL page group.

(12) On the GTC, turn the small right knob to select the "FLAPS AND TRIM CALIBRATION" page.

(13) This page is protected and requires a keystroke password to do the calibration. Press the softkeys that follow in sequence:

(a) Softkey 1 (Far left softkey)

(b) Softkey 2

(c) Softkey 3

(d) Softkey 4.

(14) On the PFD, push the elevator trim RESET softkey number 6 (sixth key from the left).

(a) A window opens on the PFD and gives the message that follows: WARNING ! Pressing OK will cause the calibration to revert to default settings.

(b) On the GTC push the Enter key, to acknowledge the message.

(15) On the pilot's control stick, use the hat switch (SW27) to set the elevator trim to the FULL UP position.

(16) On the PFD, push the elevator trim UP softkey number 4 (forth from the left).

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(17) On the pilot's control stick, use the hat switch to set the elevator trim to the FULL DOWN position.

(18) On the PFD, push the elevator trim DN softkey number 5 (fifth from the left).

(19) On the pilot's control stick, use the hat switch to set the elevator trim to the FULL UP position.

(a) Make sure that the CAL VAL in the ELEVATOR TRIM window shows 1.00000 +0.2000 or - 0.2000.

(20) On the PFD, push the aileron trim RESET softkey number 12 (the far right key).

(21) A window opens on the PFD and gives the message that follows, "WARNING! Pressing OK will cause the calibration to revert to default settings".

(a) On the GTC push the Enter key, to acknowledge the message.

(22) On the pilot's control stick, use the hat switch to set the aileron trim to the FULL RIGHT position.

(23) On the PFD, push the aileron trim RIGHT softkey number 11 (second key from the right).

(24) On the pilot's control stick, use the hat switch to set the aileron trim to the FULL LEFT position.

(25) On the PFD, push the aileron trim LEFT softkey number 10 (third key from the right).

(26) On the pilot's control stick, use the hat switch to set the aileron trim to the FULL RIGHT position.

(a) Make sure that the CAL VAL in the AILERON TRIM window shows 1.00000 +0.2000 or - 0.2000.

(27) Set the master BATT switches (left SW01 and right SW02) to the OFF position.

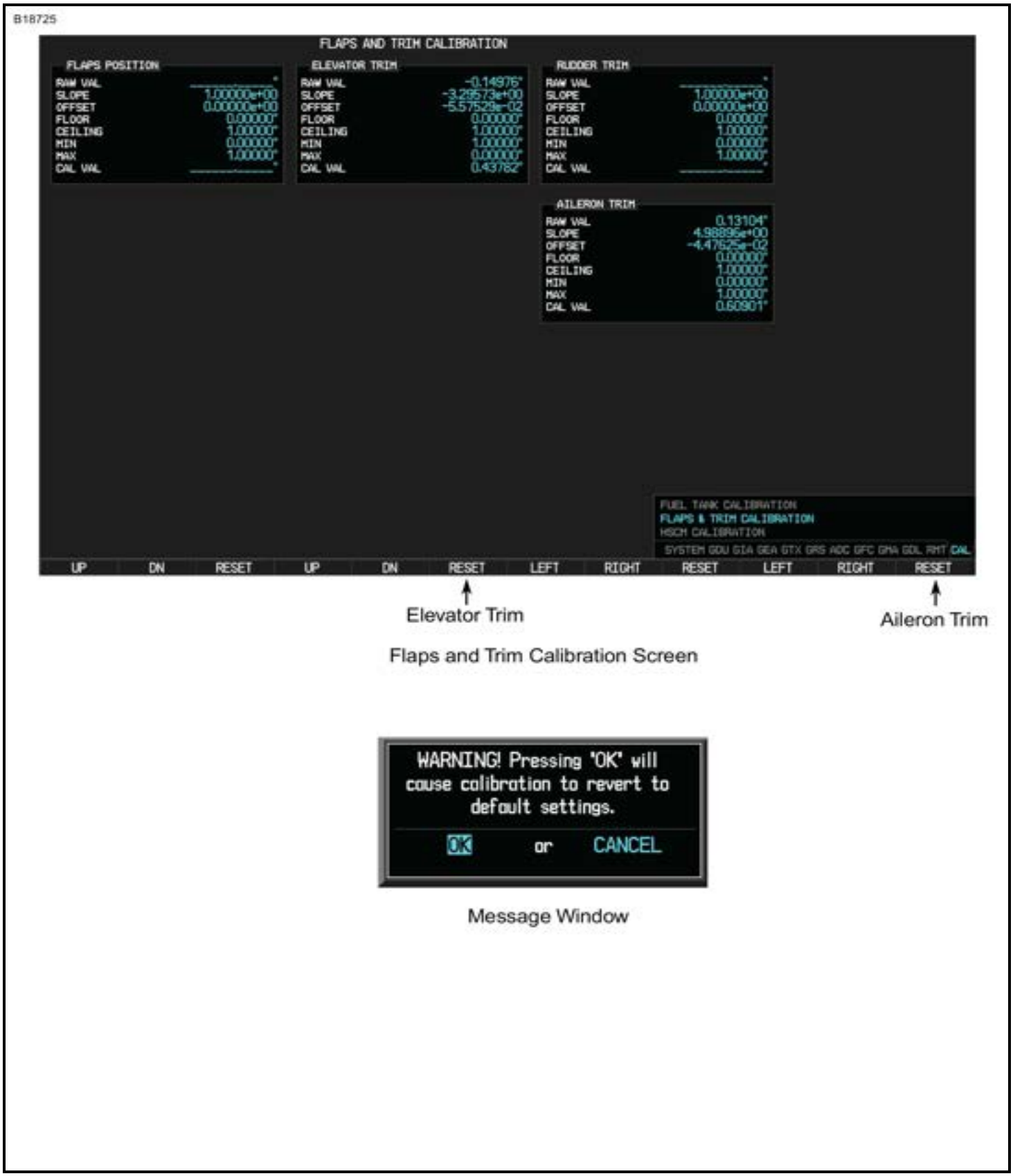
(28) Set the AVIONICS MASTER switch (SW04) to the OFF position.

(29) Set the CROSS TIE switch (SW03) to the OFF position.

(30) Remove external electrical power from the airplane.

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Figure 501 : Sheet 1 : Aileron and Elevator Trim Calibration Screen



Flaps and Trim Calibration Screen

Message Window

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AILERON CONTROL SYSTEM - MAINTENANCE PRACTICES

1. Aileron System - General

A. The ailerons are of a carbon fiber composite construction. The left aileron has a servo tab for reducing pilot forces during flight. The right aileron has an electrically actuated trim tab that is used for lateral trim during flight. Lead counterweights static balance the ailerons.

2. Ailerons

A. Aileron Removal and Installation

(1) Disconnect the aileron final drive from the aileron drive horn by removing the cotter pin, castellated nut, and bolt.

(2) Disconnect the grounding strap at the middle aileron hinge from the aileron by removing the AN526-832R8 screw.

(3) On the right wing, disconnect the aileron trim servo wire, accessed through the outer wing-bay access panel.

(4) On the left aileron, disconnect the servo tab drive rods from the wing aileron hinge by removing the cotter pins and clevis pins.

(5) Remove the aileron from the wing aileron hinges by removing the cotter pin, castellated nut, and bolt at each of the three hinge locations.

(6) Slide the aileron straight aft. Take care not to move the right aileron too far aft and break the wiring connector for the trim system.

(7) Gently pull the wiring harness for the aileron servo from out of the wing, and disconnect the wiring connector.

(8) Reinstall the ailerons in the reverse order.

(9) Measure the resistance from the static wicks to the nose gear or engine bonding strap. Make sure the resistance is less than 10 ohms.

(10) After installing the ailerons, check that the deflections (per Section 27-00-00, Table 1) are correct.

B. Aileron Hinge Element Removal and Installation

NOTE: If there is high electrical resistance it may be necessary remove the hinges and inspect for corrosion.

(1) Remove the aileron hinge element from the wing.

(a) Inspect the condition of the ground strap for corrosion and make note of the installed position.

(b) Remove the bolts, washers and aileron grounding strap from the wing aileron hinge.

NOTE: Shims maybe installed between hinge and wing. Make note of number of shims and location.

(c) Remove hinge half and retain the shims for installation.

(2) Install the aileron hinge element to the wing.

(a) Inspect for signs of corrosion and clean the aileron hinge elements and the mating wing surface.

(b) Replace any shims, hardware or ground straps that are corroded.

NOTE: No more than three shims can be used in one location with a maximum shim thickness of 0.130 inches.

(c) Install the bolts, washers and the shims as required in the aileron hinge element.

(d) Install the aileron hinge elements to the wing and torque the bolts. Refer to Chapter 20, Torque Data - Maintenance Practices.

(3) Remove the aileron hinge element from the aileron.

(a) For the middle and outboard aileron hinge elements, remove the two screws from each of the aileron hinge elements.

1 Remove the aileron hinge elements from the aileron.

(b) For the inboard aileron hinge elements, remove the 4 bolts from the aileron actuator hinge.

1 Remove the aileron actuator hinge from the aileron.

(4) Install the aileron hinge element to the aileron.

NOTE: The aileron surface under the aileron hinge elements and shims must be painted prior to the installation of the hinges to the aileron.

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(a) For the middle and outboard aileron hinge elements, put the aileron hinge elements in place on the aileron.

1 Install the two screws on each of the aileron hinge elements.

(b) For the inboard aileron hinge elements, aileron actuator hinge from the aileron.

1 Install the 4 bolts from the aileron actuator hinge.

C. **Aileron Rigging and Adjustment**

(1) The aileron control system is rigged at the factory and should not need any further adjustments. For new ailerons, or ailerons requiring significant readjustment in order to achieve the correct deflection limits, use the following procedure.

NOTE: Keep the flaps in the fully-retracted position (0 degrees) during the rigging process.

(a) With the aileron final drives disconnected, verify smooth operation throughout the full range of travel for each aileron.

(b) Place the flap/aileron deflection template, part number TA57270000, on the upper surface of the wing between the outboard end of the flaps and the inboard end of the aileron.

(c) The downward deflection of an aileron should be approximately 17.7 degrees. If the deflection of an aileron is not enough, carefully sand material from its down-stop to achieve this deflection. If the deflection is too great, contact Cessna Aircraft Company for new aileron down-stops.

(d) Level the aircraft about the roll axis before proceeding.

(e) Disconnect the aileron crossover control rod in the center section of the wing from the aileron torque tubes. Set both control sticks in the cockpit to a position of 88±2 degrees as shown in Figure 201. Adjust the rod ends on the crossover tube so the assembly may be installed between the torque tubes and tighten the jam nuts. Reinstall the torque tube.

(f) With the aileron control rods disconnected, lock both the left-hand and right-hand aileron bellcranks in the neutral position within the bellcrank brackets by placing a 1/4 inch diameter pin through the rigging hole. An AN4 bolt works well for this.

(g) With the control sticks still at 88±2 degrees, adjust the rod ends on the aileron control rods as required to allow them to fit between the aileron torque tubes and the bellcranks. Finger-tighten the control rod connections.

(h) Clamp the ailerons in the neutral position (0 degree deflection on the rigging template). Adjust the length of the final drive to fit between the bellcrank and the aileron hinge and finger-tighten the connections.

(i) Remove the pins from the bellcranks and release the control sticks. Unclamp the ailerons and rotate them until they reach the up-stop (which is controlled by the down-stop on the opposite aileron). The up-stop on one aileron and the down-stop on the opposite aileron should make contact at the same time while ensuring the trailing edge is inside the template up-travel window. Both right-hand and left-hand sides are set in this manner. If more travel is needed, a combination of up-stop adjustment and/or careful sanding of material from the down-stop on the opposite aileron may be required. Continue this procedure until both ailerons meet all of the deflection requirements of Section 27-00-00, Table 1.

(j) Ensure that the gap at the outboard edge of the aileron between the wing and the aileron is 0.123 to 0.309 inch.

(k) Ensure that the gap at the inboard edge of the aileron between the flap and the aileron (when the flaps are retracted) is 0.125 to 0.375 inch. Ensure minimum 0.125 inch clearance when the flaps are extended.

(l) While the aileron is in neutral position, ensure that the gap between the wing trailing edge and the aileron is 0.150 to 0.350 inch along the entire span of the aileron.

(m) Verify there is sufficient thread engagement on all rod ends by checking that the threads are visible within the witness hole on each.

(n) Once the correct aileron deflections and proper gaps are achieved, retighten all jam nuts and torque 90 to 120 in.-lbs.

(o) Ensure the aileron bellcrank, final drive, and all associated hardware has a minimum of 0.040 inch clearance from the wing skins through full range of travel after the aileron is properly rigged.

D. **Ailerons Requiring Only Minor Adjustment**

(1) With the aileron final drives disconnected, verify smooth operation throughout the full range of travel for each aileron.

(2) Place the flap/aileron deflection template, part number TA57270000, on the upper surface of the wing between the

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outboard end of the flaps and the inboard end of the aileron.

(3) The downward deflection of an aileron should be approximately 17.7 degrees. If the deflection of an aileron is not enough, carefully sand material from its down-stop to achieve this deflection. If the deflection is too great, contact Cessna Aircraft Company for new aileron down-stops.

(4) Level the aircraft about the roll axis before proceeding.

(5) Remove the pins from the bellcranks and release the control sticks. Unclamp the ailerons and rotate them until they reach the up-stop (which is controlled by the down-stop on the opposite aileron). The up-stop on one aileron and the down-stop on the opposite aileron should make contact at the same time while ensuring the trailing edge is inside the template up-travel window. Both right-hand and left-hand sides are set in this manner. If more travel is needed, a combination of up-stop adjustment and/or careful sanding of material from the down-stop on the opposite aileron may be required. Continue this procedure until both ailerons meet all of the deflection requirements of Section 27-00-00, Table 1.

(6) Ensure that the gap at the outboard edge of the aileron between the wing and the aileron is 0.123 to 0.309 inch.

(7) Ensure that the gap at the inboard edge of the aileron between the flap and the aileron (when the flaps are retracted) is 0.125 to 0.375 inch. Ensure minimum 0.125 inch clearance when the flaps are extended.

(8) While the aileron is in neutral position, ensure that the gap between the wing trailing edge and the aileron is 0.150 to 0.350 inch along the entire span of the aileron.

(9) Verify there is sufficient thread engagement on all rod ends by checking that the threads are visible within the witness hole on each.

(10) Once the correct aileron deflections and proper gaps are achieved, retighten all jam nuts and torque 90 to 120 in.-lbs.

(11) Ensure the aileron bellcrank, final drive, and all associated hardware has a minimum of 0.040 inch clearance from the wing skins through full range of travel after the aileron is properly rigged.

E. **Aileron Service and Maintenance**

(1) The ailerons do not require any service or maintenance. The ailerons should be visually inspected annually for cracking at all hinge attachment locations. A tap test should be conducted on the aileron at the outboard end cap to aid in detection of any latent damage, delaminations, or disbonds. The rod end bearings used throughout the aileron control system do not require maintenance other than cleaning during routine inspections to remove any accumulation of dust or grime. Liquid lubricants should not be used on the rod end bearings as this may cause the Teflon liner to swell, creating excess friction in the bearing. Should the rod end need to be replaced, please contact Cessna Aircraft Company. The aileron linear bearing should be inspected every 100 hours or annually. Inspect each side of the bearing for foreign object debris. Ensure there is no debris or adhesive attached to the control rod, bearing housing, bearing race, ball bearings or rollers, as applicable. Move the aileron controls through their full range of motion and ensure there is no scarring or damage to the control rod, especially in the vicinity of the linear bearing. Normal wear at the linear bearing is indicated by a slightly darker color on the control rod. If damage is noted contact Cessna Aircraft Company. The aileron control rods should be visually inspected every 500 hours or biennially. To remove the push-pull tubes for inspection:

CAUTION: Never lubricate the bearings that support the aileron torque tube.

(a) Remove the aileron bellcrank access panel located on the lower surface of the wing directly in front of the inboard aileron hinge.

(b) Disconnect the aileron push-pull tube from the aileron bellcrank.

(c) Remove the aft wing belly access panel to gain access to the aileron crossover tube.

(d) Disconnect the aileron push-pull tube from the aileron torque tube bellcrank.

(e) Slide the push-pull tube out and down to clear the wing belly.

NOTE: It may be necessary to loosen or reposition the roll servo mount to give enough clearance to prevent damage to the rod during removal and installation. Refer to Chapter 22, Garmin GFC 700 Autopilot - Maintenance Practices for additional information on the installation of the roll servo mount.

(f) Reinstall the push-pull tubes in the reverse order.

(g) Reinstall all access panels and check the aileron controls for binding and friction.

3. Aileron Trim Tab

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A. **Aileron Trim Tab Removal and Installation** - Refer to Figure 203.

(1) To remove the trim tab do the steps that follow:

(a) Remove the four MS24693-C28 countersunk screws from the aileron trim servo access panel located on the lower surface of the right aileron.

1 Remove the access panel from the right aileron.

(b) Disconnect the aileron trim tab drive rod and friction device clevis from the trim tab drive horn by removing the cotter pins and the clevis pins.

(c) Remove the MS24665-151 cotter pins on either end of the piano hinge, and remove the hinge wire.

(d) Remove the trim tab from the airplane.

(2) To install the trim tab do the steps that follow:

(a) Connect the aileron trim tab drive rod and friction device clevis from the trim tab drive horn by removing the cotter pins and the clevis pins.

(b) Put the the trim tab in its correct position on the aileron.

(c) Install the piano hinge wire in the piano hinge.

1 Install new MS24665-151 cotter pins on either end of the piano hinge.

(d) Put the access panel in its correct position on the right aileron.

1 Install the four MS24693-C28 countersunk screws that attach the aileron trim servo access panel to the aileron.

(3) Do the elevator trim calibration. Refer to Garmin G2000 Aileron and Elevator Trim Calibration - Adjustment/Test.

B. **Aileron Trim Tab Rigging and Adjustment**

The aileron trim tab and servo are preset at the factory, and further adjustment should not be necessary. Should the trim tab servo motor need to be replaced, contact Cessna Aircraft Company for a replacement part and for detailed rigging instructions. The trim tab deflections should be checked periodically to ensure that the trim system is functioning properly. Use the following procedure for checking the trim tab deflections.

(1) Set the aileron to the neutral (0 degree) position.

(2) Using a digital inclinometer or other calibrated angle-measuring device, check the deflections shown in Figure 202.

(3) Do the elevator trim calibration. Refer to Garmin G2000 Aileron and Elevator Trim Calibration - Adjustment/Test.

C. **Aileron Trim Tab Service and Maintenance**

The aileron trim tab is a flat aluminum plate. The trim tab does not require any maintenance. The trim tab hinge should be inspected annually for wear and corrosion. The hinge may be lubricated with MIL-L-7870 general purpose lubricating oil to help reduce wear and friction. The aileron trim tab friction device should be inspected every 500 hours, or biennially, and adjusted as necessary to 13.4 to 19.0 lbs. sliding friction. The friction device should be free from oils, grease, dirt, etc. If excessive wear is noted or smooth operation is not possible, the friction device should be replaced. A replacement, part number LA57273240, may be obtained from the manufacturer. The attachment bracket should be inspected every 500 hours or biennially for wear and replaced as necessary. The trim tab motor is a sealed unit and does not require service or maintenance.

4. Aileron Trim Tab Servo

A. **Aileron Trim Tab Servo Removal and Installation**

(1) Remove the four MS24693-C28 countersunk screws from the aileron trim servo access panel.

(2) Disconnect the aileron trim tab drive rod and friction device clevis from the trim tab drive horn by removing the cotter pins and clevis pins.

(3) Remove the four MS24693-C28 countersunk screws from the upper surface of the right aileron.

(4) Carefully remove the trim tab motor from within the aileron.

(5) Once the trim motor is clear of the aileron, disconnect the wiring harness.

(6) Reinstall the trim tab motor in the reverse order. Torque all screws 10 to 12 in.-lbs.

B. **Aileron Trim Tab Servo Rigging and Adjustment**

The trim tab motor is preset at the factory and should not need further adjustment. Should adjustment be necessary, use the following procedure.

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(1) Disconnect the friction device drive rod from the trim tab drive horn.

(2) Extend the trim motor drive arm all the way out.

(3) Set the trim tab at the up deflection limit, and adjust the drive rod as necessary to line up with the trim tab drive horn.

(4) Retract the trim motor drive arm, and check that the trim tab deflection angle is correct. Adjust the clevis on the drive rod as necessary to achieve the correct deflection. Maintain proper thread engagement (threads must be visible through the inspection hole located in the clevis).

(5) With the trim tab connected to the motor, retract the tab to the neutral position.

(6) Adjust the friction device drive rod, and connect it to the trim tab drive horn.

(7) Reinstall all clevis pins and cotter pins.

(8) Recheck deflection angles, and repeat above procedure if necessary.

(9) Do the elevator trim calibration. Refer to Garmin G2000 Aileron and Elevator Trim Calibration - Adjustment/Test.

C. **Aileron Trim Tab Servo Service and Maintenance**

The aileron trim tab servo is a sealed unit and does not require service or maintenance. Should the motor begin to slip or stop functioning properly, contact Cessna Aircraft Company for a replacement.

5. Aileron Servo Tab

A. **Aileron Servo Tab Removal and Installation**

(1) Remove the cotter pins and clevis pins that attach the threaded drive rods to the servo tab bracket.

(2) Remove the MS24665-151 cotter pins from both ends of the piano hinge.

(3) Remove the hinge wire from the hinge, and remove the servo tab from the aileron.

(4) Reinstall the servo tab in the reverse order. Apply zinc oxide to the threaded push rod where the clevis attaches. Recheck deflections.

B. **Aileron Servo Tab Rigging and Adjustment**

The aileron servo tab is preset at the factory and further adjustment should not be necessary. The servo tab deflections should be checked periodically to ensure that the system is functioning properly. Use the following procedure for checking the servo tab deflections.

(1) Place the aileron/flap deflection template, part number TA57270000, on the upper wing surface between the outboard end of the flap and the inboard end of the aileron.

(2) Set the aileron to the neutral, 0 degree, position.

(3) Set the servo tab to the neutral, 2 degrees trailing edge down, position (refer to Figure 204) by adjusting the drive rod clevises as necessary. Maintain proper thread engagement (threads must be visible through the inspection hole located in the clevis).

(4) Cycle the aileron to the up and down deflection limits, and check the servo tab deflection angles as shown in Figure 204.

(5) Adjust the drive rods as necessary to achieve the correct deflections. Maintain proper thread engagement (threads must be visible through the inspection hole located in the clevis). Torque all jam nuts 30 to 36 in.-lbs.

NOTE: Aileron servo tab deflection angles are measured with respect to a nominal horizontal reference plane.

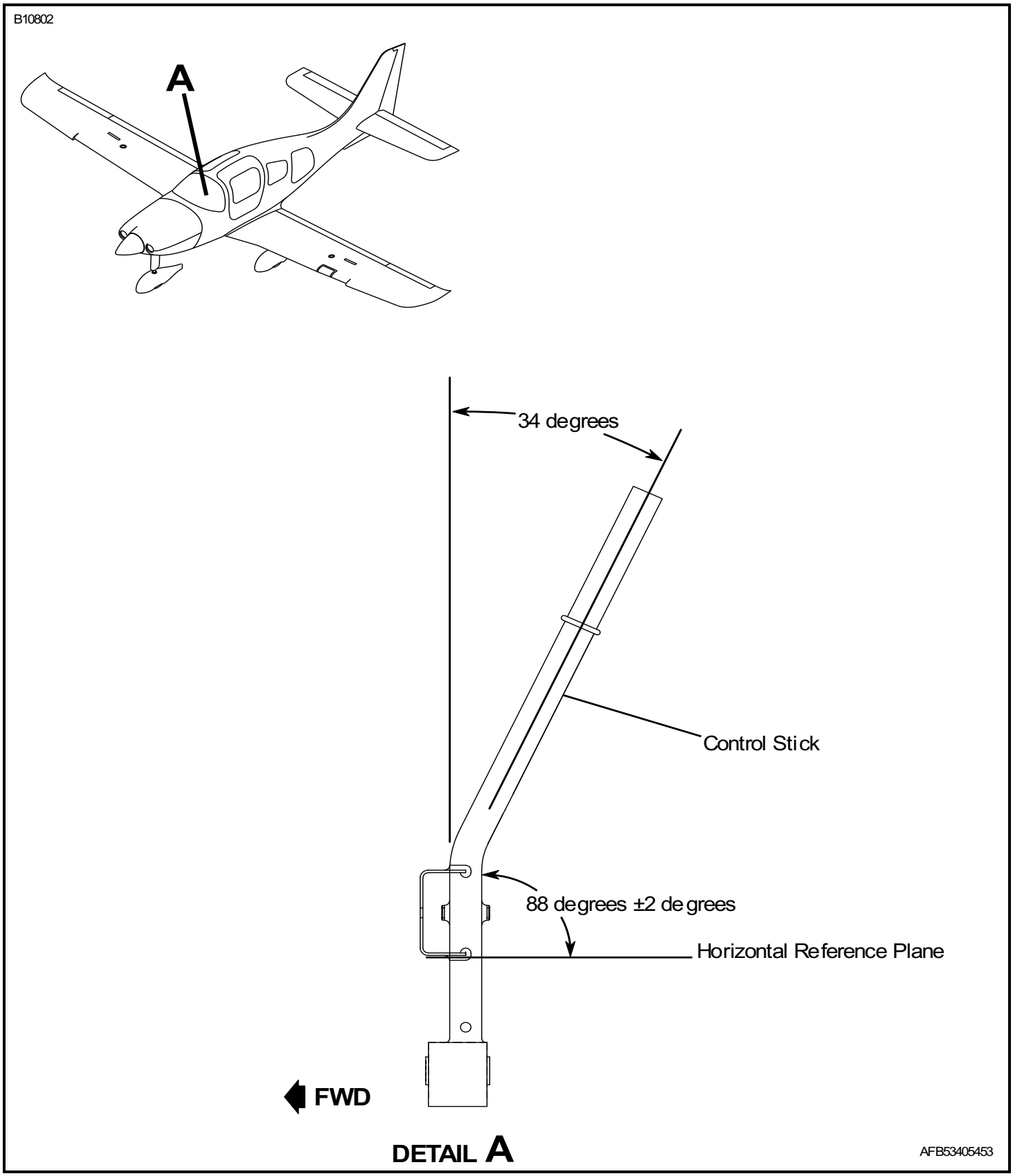
(6) Do the elevator trim calibration. Refer to Garmin G2000 Aileron and Elevator Trim Calibration - Adjustment/Test.

C. **Aileron Servo Tab Servicing and Maintenance**

The aileron servo tab does not require any service or maintenance. The attachment hinge should be inspected every 500 hours or biennially for wear and replaced if necessary. The hinge may be lubricated with MIL-L-7870 general purpose lubricating oil to help reduce friction and wear.

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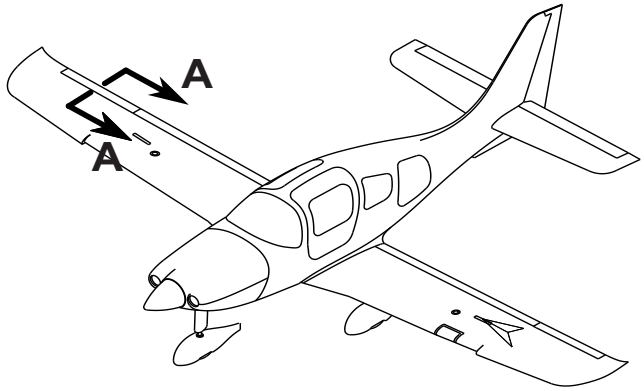
Figure 201 : Sheet 1 : Control Stick Neutral Position for Aileron Rigging

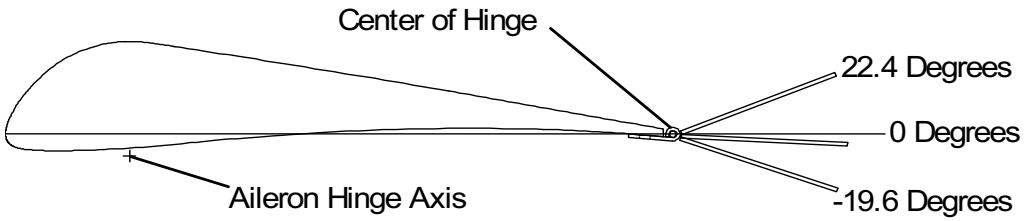


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Figure 202 : Sheet 1 : Aileron Trim Tab Deflection Angles

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VIEW **A-A**

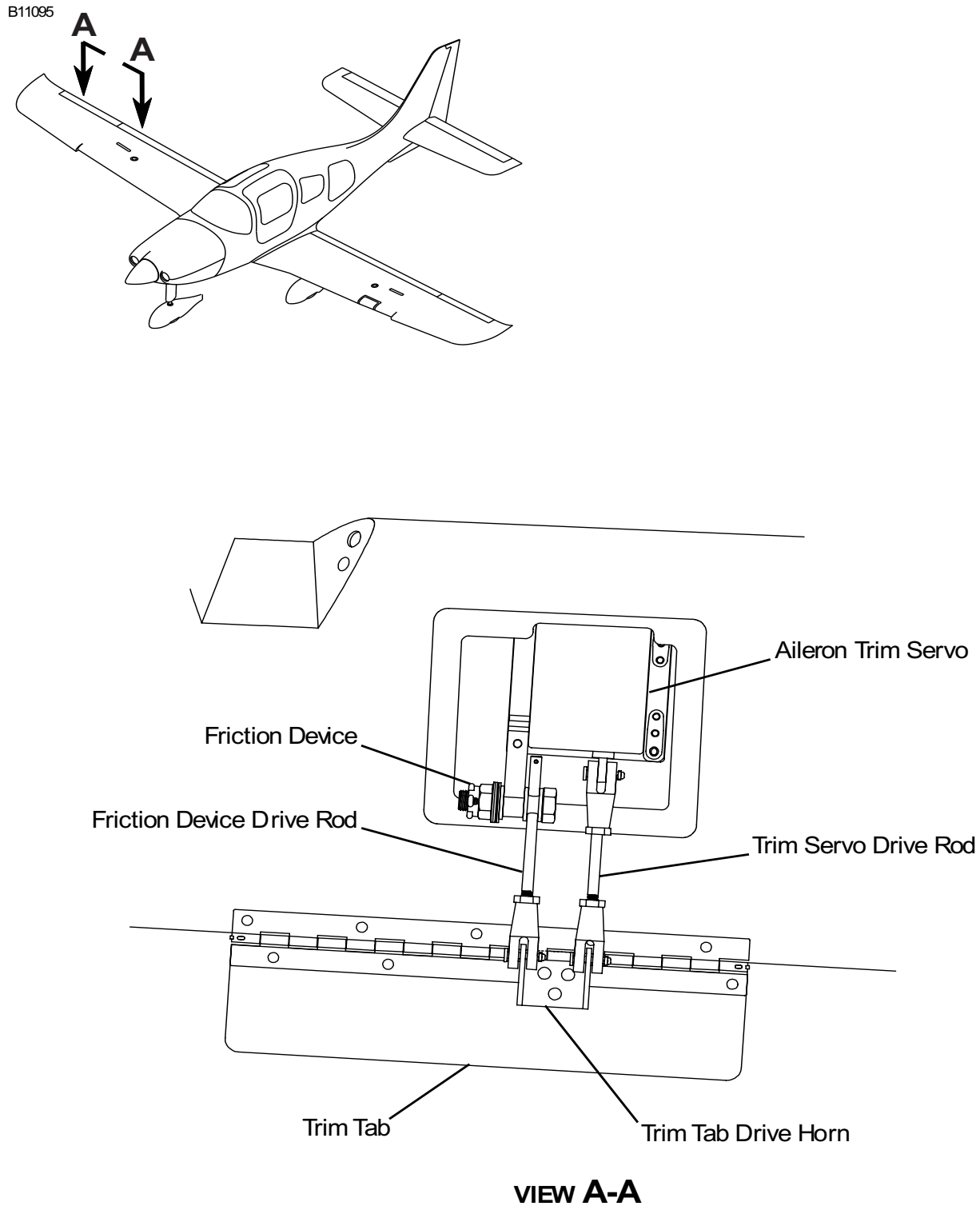
Tab 22.4 Up ± 1 Degree
With Aileron at 0 Degrees

Tab 3 Down ± 1 Degree
With Aileron at 0 Degrees
(NEUTRAL R EF)

Tab 19.6 Down ± 1 degree
With Aileron at 0 Degrees

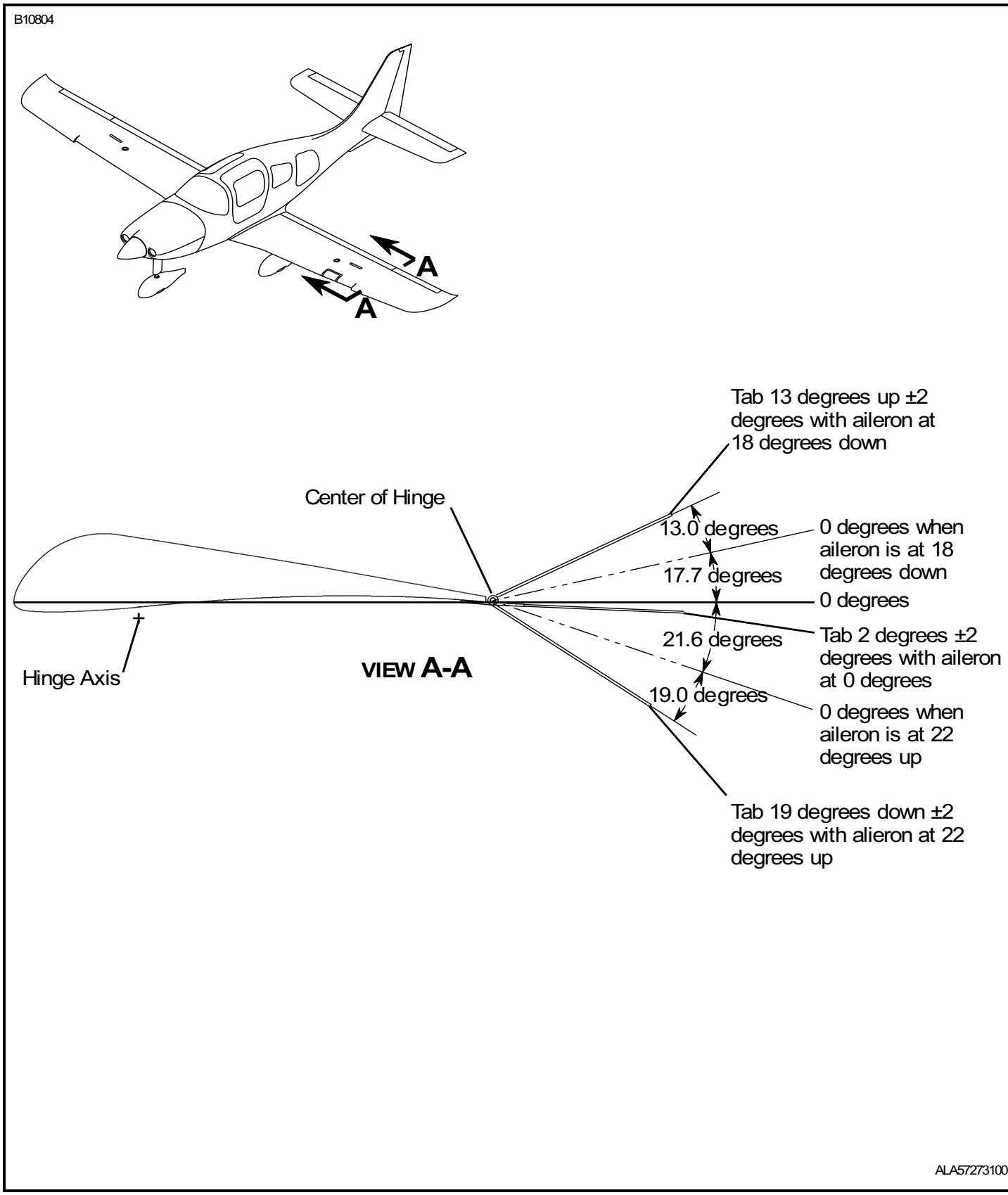
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Figure 203 : Sheet 1 : Aileron Trim System



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Figure 204 : Sheet 1 : Aileron Servo Tab Deflection Angles



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RUDDER CONTROL SYSTEM - MAINTENANCE PRACTICES

1. Rudder System - General

A. The rudder attaches to the aft vertical closeout rib at three hinge points. Rudder cables attached to the rudder drive horn link the rudder to the rudder pedals. For S/N 41501 and On, a rudder cable connector allowing optional pedal positioning may be installed. A fixed rudder trim tab is attached to the rudder. The trim tab is ground adjustable for pilot comfort during cruise or takeoff power settings. A lead counterweight is used to static balance the rudder.

2. Rudder

A. Rudder Removal and Installation (Refer to Figure 201).

(1) Detach the two rudder cables from the drive horn by removing the cotter pin from each nut, and then removing the bolt.

(2) Remove and discard the cotter pin from the lower hinge, and remove the castellated nut and washer.

NOTE: If the washer between the nut and the lower bracket is an NAS1149F0463P, (approximately 0.500 inch diameter) then you must discard it and replace it with an MS15795-853 (approximately 0.688 inch diameter).

(3) Remove the rudder by lifting it up and aft. Take care not to pull too far aft and break the metal braid that is still attached to the rudder leading edge.

(4) Once the rudder is removed, detach the metal braid by removing the attachment screw.

(5) Put the rudder in its position on the vertical stabilizer.

NOTE: Before you install the castellated nut at the lower hinge bolt, it is necessary to examine the clearance between the rudder counterweight and the vertical stabilizer.

(6) Make sure that there is a 0.13 inch, +0.25 or -0.00 inch clearance between the forward edge and the bottom edge of the rudder counterweight and the vertical stabilizer

(a) If the clearance is less than the specified limit, do the steps that follow:

1 Remove the rudder by lifting it up and aft.

2 Remove the bolts, washers, spacers, and rudder horn from the rudder.

3 Install a 2831100-9 shim between the rudder horn and the rudder.

4 Install the bolts, washers, spacers, and rudder horn to the rudder.

(7) Install the rudder in the reverse order and make sure that you use a MS15795-853 washer under the castellated nut.

(8) Use a maximum of one NAS1149F0416P or NAS1149F0432P or NAS1149F0463P washer to make sure that there is a minimum clearance of 0.062 to 0.125 inches (1.58 to 3.17 mm) between the rudder actuator and the rudder attachment assembly.

(9) Recheck all attachments for security and safety.

B. Upper Rudder Hinge Removal and Installation

NOTE: The Instructions are the same for both the middle and upper hinge.

(1) Remove the Upper Rudder Hinges. Refer to Figure 201.

(a) Remove the rudder. Refer to Rudder Removal and Installation.

(b) Remove the bolts and washers that attach the hinge to the vertical stabilizer.

(c) Remove the hinge from the airplane.

(2) Install the Upper Rudder Hinges. Refer to Figure 201.

(a) Put the hinge in place on the airplane.

(b) Attach the hinge with bolts and washers.

(c) Install the rudder. Refer to Rudder Removal and Installation.

C. Lower Rudder Hinge Removal and Installation

(1) Remove the Lower Rudder Hinge. Refer to Figure 201.

(a) Remove the rudder. Refer to Rudder Removal and Installation.

(b) Remove the screws that attach the hinge to the vertical stabilizer.

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(c) Remove the hinge from the airplane.

(2) Install the Lower Rudder Hinge. Refer to Figure 201.

(a) Put the hinge in place on the airplane.

(b) Attach the hinge with screws.

(c) Install the rudder. Refer to Rudder Removal and Installation.

D. Rudder Rigging and Adjustment

NOTE: The rudder deflections are preset at the factory and should not need any further adjustment. If the rudder cable is replaced, the deflections will need to be rechecked and adjusted as necessary. Should this need to be done, use the rigging procedure as outlined below.

CAUTION: If the inner rudder cable tube is removed, make sure that when the tube is installed again the barbed insert is installed in the forward end of the tube. If the inner and outer tube clamp bolt and nut were loosened, the nut must be torqued between 20 inch pounds and 25 inch pounds. Reference Figure 204.

(1) Remove the locking clips from the left and right turnbuckles at the forward end of the rudder cable near the rudder pedals. Remove the locking clips from the rudder pedal interconnect turnbuckle (located behind the instrument panel near the firewall), and loosen the interconnect cable.

(2) Ensure that the rudder cables are not attached to the rudder pedal crossover arms.

(3) Thread the left rudder cable, right rudder cable and rudder pedal interconnect turnbuckles so that the clevis threads are just visible. Apply three turns to each clevis to put the threads inside the turnbuckle.

(4) Clamp the elevator in the neutral position such that the trailing edge is in alignment with the trailing edge of the horizontal stabilizer.

(5) Adjust the rudder to the neutral position by moving it left and right until it is centered about the vertical tail.

(6) Position the rudder deflection template, part number TC53550000, on the rudder such that the radius portion is located along the trailing edge of the rudder at WL 104.74 ±0.50 (approximately the bottom edge of the rudder trim tab) and the middle portion is perpendicular to the rudder hinge axis. Rotate the template about the rudder hinge axis until there is equal distance between the forward inside corners of the template and the vertical stabilizer. The use of shims on either side of the vertical stabilizer is permissible.

(7) Confirm that the trailing edge of the rudder is within the two outer slots on the template. If the deflection limits are greater than the allowed tolerance, select a larger diameter stop bushing, LC53553000-1 through -5, to achieve the correct deflection. Each successively larger bushing decreases the rudder deflection by 1 degree. If the limits are less than the allowed tolerance, select a smaller diameter bushing. Rudder stop bushings, part nos. LC53443000-1 through -5, may be obtained from the manufacturer.

(8) Attach the rudder cables to the rudder pedal crossover rods. Depending upon the rudder cable connector installed on aircraft S/N 41501 and on, the rudder pedal position may be set standard (aft) or forward. Left side and right side must be set the same. Refer to Figure 202. Contact Cessna Aircraft Company to obtain this part, only available on S/N 41501 and On, if required or desired.

(9) Pedal Positioning - Refer to Figure 203.

(a) Standard Pedal Position (Aft) - Position the left rudder pedal so that the vertical portion of the corresponding crossover tube is 83±2 degrees for the left pedal and 87±2 degrees for the right pedal, measured from the horizontal surface of the floor.

(b) Optional Pedal Position (Forward) - Position the left rudder pedal so that the vertical portion of the corresponding crossover tube is 94±2 degrees for the left pedal and 76±2 degrees for the right pedal, measured from the horizontal surface of the floor.

(10) Two methods, as follows, may be used for attaching the rudder cables to the rudder drive horn. The first method employs a cable thimble, compression sleeve, and shackle. The second method utilizes a fork end cable terminal. Whichever method is used, contact Cessna Aircraft Company for parts and instructions.

(a) Cable Thimble, Compression Sleeve and Shackle - Refer to Figure 204.

1 At the aft of the plane pull the left side rudder cable taut and mark the cable with an indelible marker where it intersects with the forward edge of the connection hole in the rudder drive horn.

2 Using a cable thimble, sleeve, and temporary clamp form a loop at the end of the rudder cable with the

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indelible mark at the apex of the loop. DO NOT remove excess cable.

3 Align the right rudder pedal with the left rudder pedal.

4 At the aft of the plane pull the right side rudder cable taut and mark the cable, with an indelible marker, where it intersects with the forward edge of the connection hole in the rudder drive horn.

5 Using a cable thimble, sleeve, and temporary clamp, form a loop at the end of the rudder cable with the indelible mark at the apex of the loop. DO NOT remove excess cable.

6 Temporarily connect the rudder drive cables to the rudder drive horn. Insert excess cable into the fuselage. Ensure that the temporary clamp does not catch on the fuselage as the rudder deflections are adjusted.

7 Adjust the left and right rudder cable turnbuckles until the rudder cables are tight.

8 With the rudder at 0 degrees deflection, adjust the rudder pedal interconnect turnbuckle until a reading of 37 lbs. is attained on a tensiometer, except as follows:

a If autopilot is installed, but not rudder hold, refer to Chapter 22.

b If rudder hold is installed, tighten until 72 lbs +8 lbs./ -7 lbs. is attained.

9 Recheck all movement, alignment, and deflections, and repeat the rigging procedure as necessary.

10 Without disturbing the turnbuckles, disconnect the rudder cables from the rudder pedal crossover rods.

11 Disconnect the rudder cables from the rudder drive horn.

12 Using an indelible marker, make three marks on the rudder cable and cable thimble to facilitate alignment of the cable onto the thimble after the temporary clamp has been removed.

13 Remove the temporary clamp.

14 Insert the cable end into a compression sleeve and form a loop.

15 Align the cable onto the thimble using the three indelible marks as a guide.

16 Snug the compression sleeve up against the thimble and compress the fitting.

17 Reattach the rudder cables to the rudder horn and to the pedal crossover rods and recheck all deflections. Repeat the rigging procedure as necessary until the proper movement, alignment, and deflections are achieved.

18 Cut off excess rudder cable at the compression fitting.

(b) Fork End Cable Terminal - Refer to Figure 205.

1 Temporarily attach fork end cable terminals to the left and right side of the rudder drive horn.

2 Insert the rudder cable into one of the fork end cable terminals and pull it taut. Mark the cable, with an indelible marker, where it intersects with the inner edge of the terminal sleeve just behind the fork of the terminal. Repeat this procedure for the other terminal.

3 Disconnect the rudder cables from the pedal crossover rods.

4 Remove the terminals and cut the rudder cables 1/8 inch behind the mark toward the fore of the aircraft.

5 Insert the rudder cable into the left cable terminal so that the cable is 1/8 inch inside the terminal sleeve at the fork end.

6 Swage the fork end cable terminal.

NOTE: The swaging tool required to swage the fork end cable terminal is a special tool not available in most repair shops. Contact Cessna Aircraft Company for instructions.

7 Repeat the following steps for the right cable terminal.

a Insert the rudder cable into the left cable terminal so that the cable is 1/8 inch inside the terminal sleeve at the fork end.

b Swage the fork end cable terminal.

8 Reattach the rudder cables to the rudder horn and to the pedal crossover rods and recheck all deflections.

9 With the rudder at 0 degrees deflection, adjust the rudder pedal interconnect turnbuckle until a reading of 37 lbs. is attained on a tensiometer, except as follows:

a If autopilot is installed, but not rudder hold, refer to Chapter 22

b If rudder hold is installed, tighten until 72 + 8 lbs./- 7 lbs. is attained.

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10 Repeat the rigging procedure as necessary until the proper movement, alignment, and deflections are achieved.

11 Reinstall the locking clips into all turnbuckles.

12 Cycle the rudder from left to right to ensure that there is no binding or excessive friction in the system.

E. Rudder Service and Maintenance

The rudder does not require any service or maintenance. However, due to its composite construction, the rudder should be visually inspected annually for cracking at all hinge attachment locations and the trim tab attachment location. A tap test should be conducted on the rudder at the drive horn location to aid in detection of any latent damage or disbonds along the lower rudder rib. The rudder may also be inspected via the holes at the middle and top rudder hinge pin locations. Common inspection tools that may be used or needed are mirrors, bore scopes, etc.

The rudder should be removed and inspected for wear or corrosion of the hinge pins. If wear or corrosion results in a hinge pin diameter of less than 0.238 inch (upper and middle hinge pins) or 0.245 inch (lower hinge pin) it must be replaced. For additional information on the replacement procedure for the hinge pins refer to the Model LC-550FG Series Structural Repair Manual, 55-40-01, Rudder Repair - Upper and Middle Rudder Hinge Pins. You can apply lubricant or a corrosion preventative compound to the hinge pins on the assembly to help minimize corrosion. The spherical bearings used in the attachment brackets on the vertical closeout rib do not require any maintenance and should not be lubricated. The hinge brackets should be inspected for corrosion or other damage and replaced if necessary.

F. Rudder Cable Removal

The rudder cable should be inspected thoroughly and replaced if any excessive wear or damage is observed. To remove the rudder cable use the following steps.

(1) Contact Cessna Aircraft Company for a replacement.

(2) Detach the rudder cable from the rudder drive horn per the rudder installation and removal instructions in this section.

(3) Cut the rudder cable to remove the turnbuckle, and slide the cable aft through the aft end of the fuselage.

(4) Install the new rudder cable by inserting the end without turnbuckle into the fore end of the rudder cable tube and sliding it aft to exit at the rudder drive horn.

(5) Follow the procedures in the section on Rudder Rigging and Adjustment above for connection, rigging, and adjustment. make sure that that the requirements listed in Flight Controls - General, , Table 1 are met.

3. Rudder Trim Tab

A. Rudder Trim Tab Removal and Installation

Should the trim tab need to be replaced, carefully drill out the five CCR264CS-4-02 attachment rivets to remove the trim tab. Obtain a new trim tab, part number LC53553003-1, from the manufacturer. Match drill to rudder holes and reinstall with five new rivets of the same type and size. Take care when drilling out rivets so as not to enlarge holes.

CAUTION: Due to the carbon fiber composite construction of the rudder, do not use aluminum rivets. The new rivets must be of a corrosion resistant material (i.e. stainless steel) in order to prevent galvanic corrosion.

B. Rudder Trim Tab Adjustment

The rudder trim tab is a flat aluminum plate that is riveted to the trailing edge of the rudder. The trim tab is attached with five CCR264CS-4-02 countersunk rivets. The trim tab may be adjusted for pilot comfort during cruise or takeoff power settings. The trim tab is not adjustable during flight and must be adjusted while on the ground. To adjust the rudder trim tab use the following instructions.

(1) Clamp two pieces of wood or other rigid material to either side of the trim tab. The wood blocks should be equal in length to the trim tab.

(2) Align the edges of the wood block with the slots in the trim tab.

(3) Once the wood blocks are positioned correctly, simply bend the trim tab in the desired direction. Do not exceed the deflection angles described in Flight Controls - General, Table 1.

C. Rudder Trim Tab Service and Maintenance

The rudder trim tab should be inspected for wear and cracking of the slots that run the length of the tab (bend line). If excessive wear or cracking is observed, the trim tab should be replaced.

4. Rudder Hold System (Optional)

A. Description of the Rudder Hold System - The rudder hold system allows the pilot to hold the rudder at a set deflection.

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Initially, the pilot provides rudder pedal force required for proper trim, and then activates the rudder hold system. Once active, the pilot can remove pedal pressure, and the system will hold the rudder at the set deflection. When inactive, the rudder hold device will be undetectable by the pilot.
With the system active the pilot can manually control the rudder by exerting pressure on the rudder pedals, as the clutch in the rudder hold assembly will supply only a limited torque before slipping. In the unlikely event of a rudder hold assembly brake seizure, a shear pin will fracture, thus disengaging the capstan from the brake, and allowing free movement of rudder. The capstan will be contained on the brake shaft, and prevent the rudder pedal interconnect cable from falling from the spool.
The rudder hold system uses an electrically actuated rotary brake, affixed to a capstan winch drum. There is an intermediate friction clutch to allow the rotary brake to be overridden if necessary. When activated by the rudder hold switch, the brake will engage and the clutch will provide a limited torque resistance to the capstan, which is linked to the rudder control cables via the rudder-pedal interconnect cable.

(1) For the Avidyne and Garmin G1000 options, the system is operated when electrical current is supplied through the push-button switch found on the flaps panel. The RUDDER HOLD ENGAGE switch (SI005), can only operate when the trim system is set to on. When the RUDDER HOLD ENGAGE switch is pushed to on, a blue indicator light comes on to show that the system is engaged. The system is turned off by either pushing the autopilot disconnect button on the control stick or by pushing the rudder hold engage switch again. The system is automatically disengaged if the circuit breaker is opened, the master trim switch is turned off, or the stall warning signal is activated.

(2) For the Garmin G2000 installation, the system is operated when electrical current is supplied through the rocker switch found on the Center Console Switch Panel. Electrical power is supplied to the rudder hold system from the AIL TRIM/RDR HOLD circuit breaker. When the A/P TRIM switch (SW19) found in the overhead panel, is set to the ON position the electrical power is supplied to the RUDDER HOLD switch (SI010), When the RUDDER HOLD switch (SI010) is set to the ON position, the Crew Alert System (CAS) message RUDER HOLD shows on the Primary Flight Display (UI407) display, found on the left side of the instrument panel. The system is turned off by either pushing the autopilot disconnect button on the control stick or setting the RUDDER HOLD switch to the OFF position. The system is automatically disengaged if the circuit breaker is opened, the master trim switch is turned off, or the stall warning signal is activated.

B. Rudder Hold Assembly Removal

(1) Disconnect the electrical connector to the rudder hold assembly.

(2) Disassemble the left and right pulleys by removing the AN3-7 10-32 x 7/8 hex head bolt, MS24665-151 cotter pin, AN310-3 10-32 castle nut, and four NAS1149F0332P washers. Refer to Figure 206.

NOTE: Only Airplane 41012 incorporating SB-04-016A has the O3FBO4 bushings installed.

(3) Remove the rudder pedal interconnect cable from the rudder hold assembly.

(4) . Refer to Figure 207.

(a) For Aircraft 41012 incorporating Service Bulletin SB-04-016A, remove the four 8-32 MS51957-47 pan head machine screws, NAS1149FN832P No. 8 flat washers and the O3FBO4 bushings attaching the rudder hold assembly to the rudder hold bracket.

(5) Remove the rudder hold assembly.

C. Rudder Hold Assembly Installation

(1) Installation is the reverse of removal. Dry torque the 10-32 nuts 28 to 34 in.-lbs, and the 8-32 screws 17 to 21 in.-lbs. Install new cotter pins.

(2) Make sure that the rudder deflection requirements listed in Flight Controls - General, Table 1, are met. Follow the procedures in the section on Rudder Rigging and Adjustment above if necessary.

NOTE: Ensure the brake surface is clean and free from lubrication of any kind. Lubrication on the brake surface will reduce the brake force and adversely effect the performance of the rudder hold assembly.

(3) For the Model T240 Garmin G2000 installation, do a rudder hold system check. Refer to Rudder Hold System (G2000) - Adjustment/Test.

D. Rudder Hold Assembly Maintenance - The rudder hold assembly does not require maintenance.

E. Rudder Pedal Bushing Removal. Refer to Figure 206 and Figure 207.

(1) Remove the forward seat bottom cushions. Refer to the Chapter 25, Airplane Seats - Maintenance Practices.

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(2) Remove the turnbuckle clips and disconnect the rudder interconnect cable at the turnbuckle.

NOTE: The rudder interconnect cable is located down and forward of the instrument panel.

(3) Remove the left and right pulley holder from the firewall bracket by removing the attaching bolt.

(4) Remove the cotter pins, nuts and bushings from the AN3-26 bolts.

NOTE: Discard the cotter pins.

F. Rudder Pedal Bushing Installation. Refer to Figure 206 and Figure 207.

(1) Put one bushing into each end of each pulley holder (four total)

NOTE: For Airplane LC41-550FG -41012 incorporating SB-04-016A, install bushing P/N 03FB04.

(2) Install the pulley holder to the firewall bracket.

(3) Install the nuts and new cotter pins P/N MS24655-151 on the bolts.

(4) Connect the rudder interconnect cable.

(5) Put the rudder at 0° deflection.

(6) Adjust the rudder interconnect turnbuckle until it takes a weight of 5.00 lbs. (2.27 kg) to deflect the cable 1.00 inch + 0.25 or - 0.25 inch (25.40 mm +6.35 or - 6.35 mm).

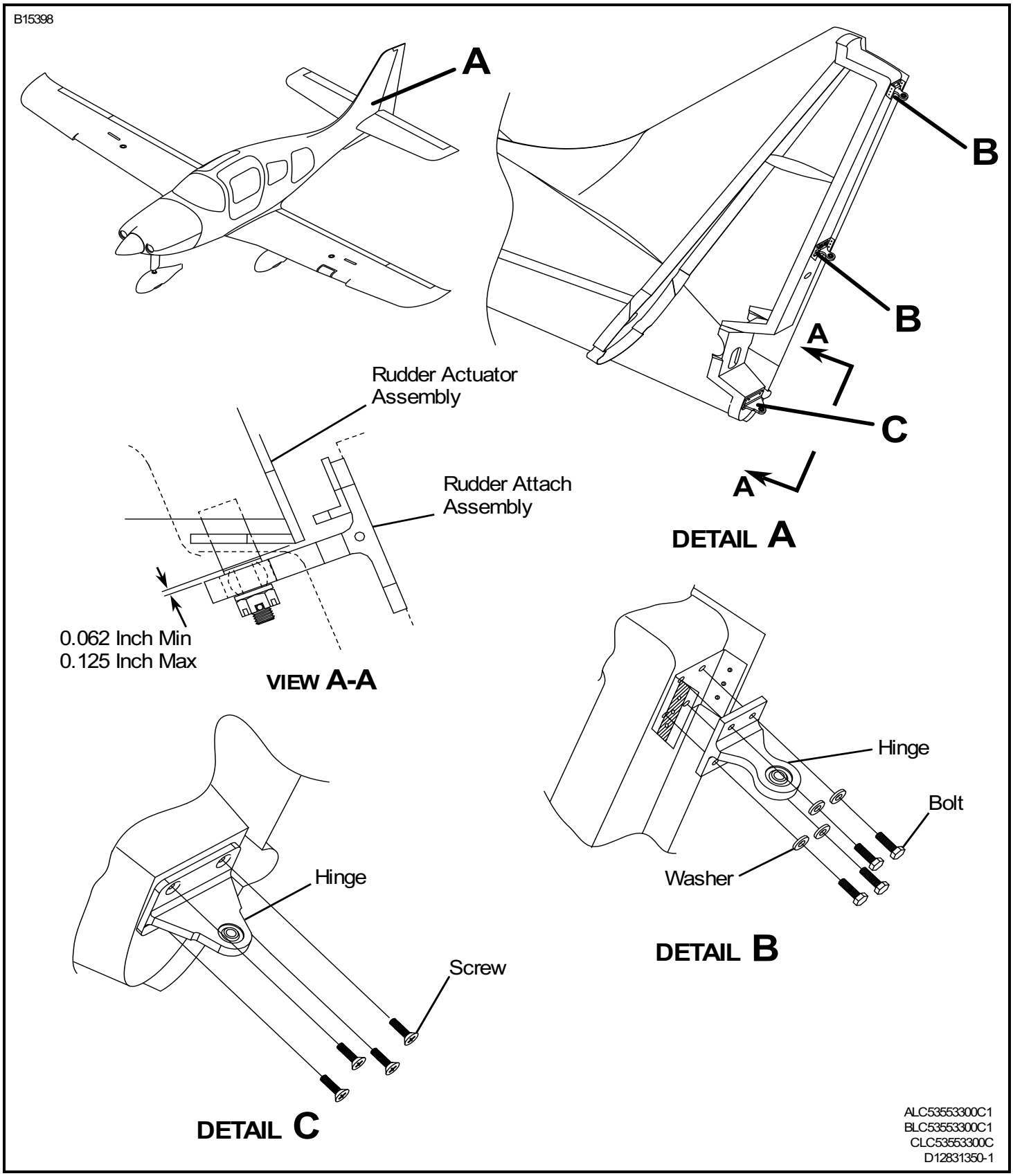
(7) After adjusting the turnbuckle, install the turnbuckle clips.

(8) Install the seat bottom cushions.

(9) Do an operational check of the rudder controls to make sure there is freedom of movement and full rudder deflection.

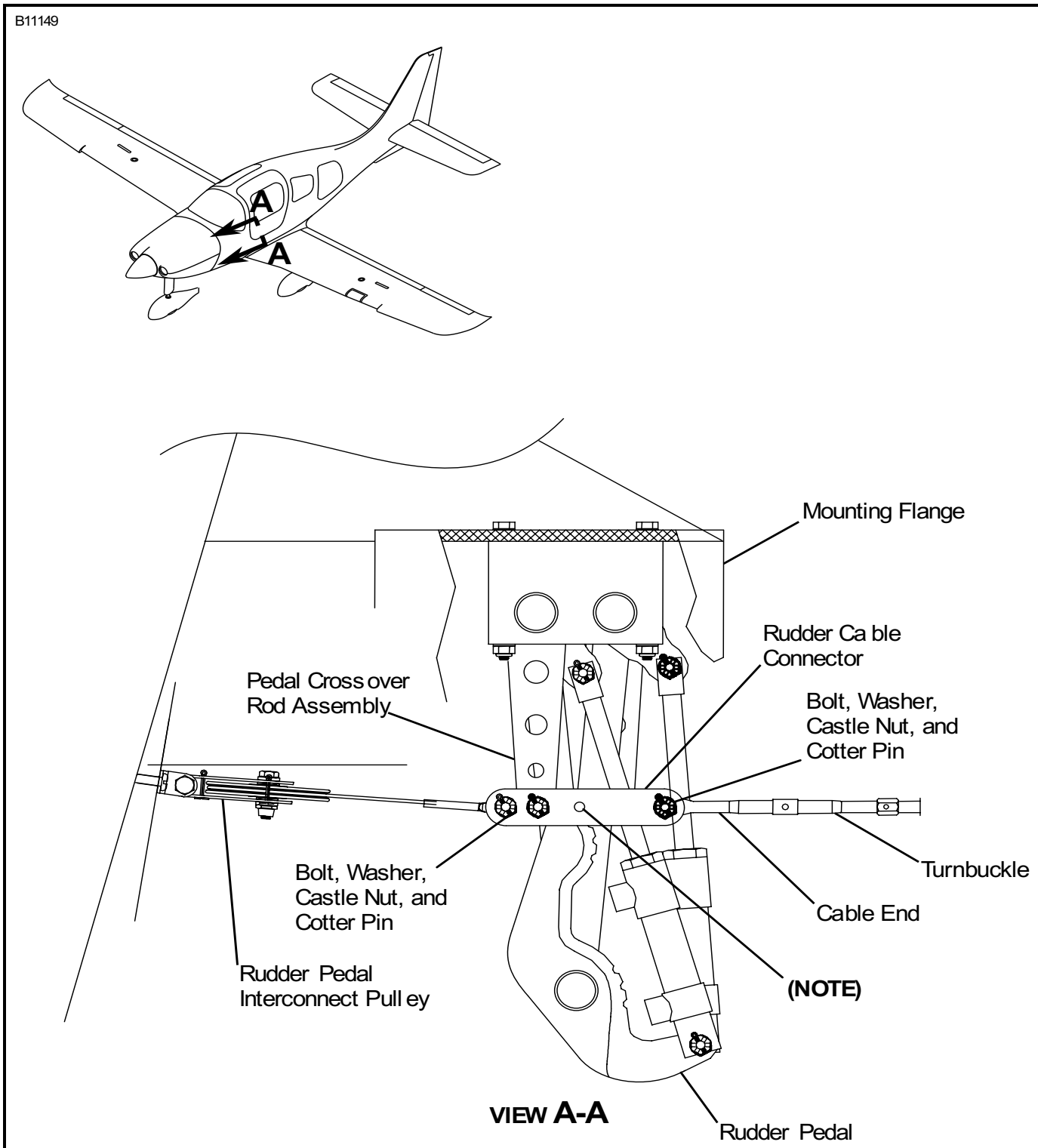
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Figure 201 : Sheet 1 : Rudder Installation



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Figure 202 : Sheet 1 : Left Rudder Cable to Rudder Pedal Attachment (Right Side Similar)

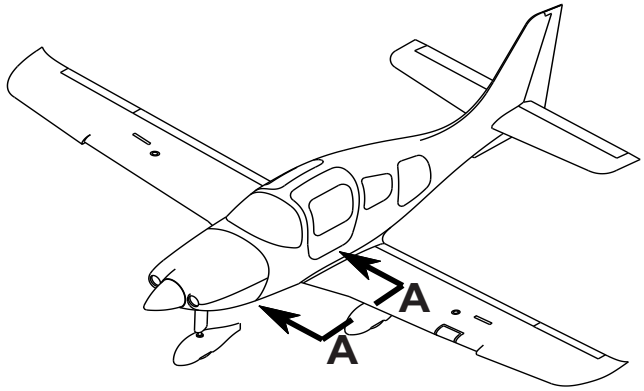


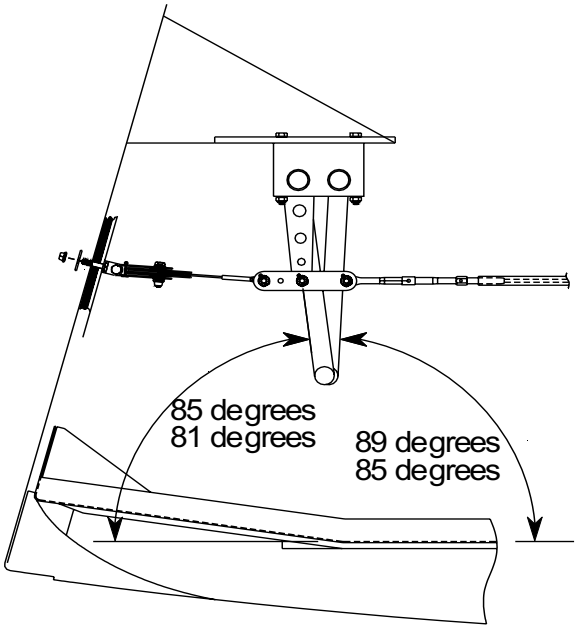
NOTE: Attach pedal crossover rod assembly here for pedal aft position .

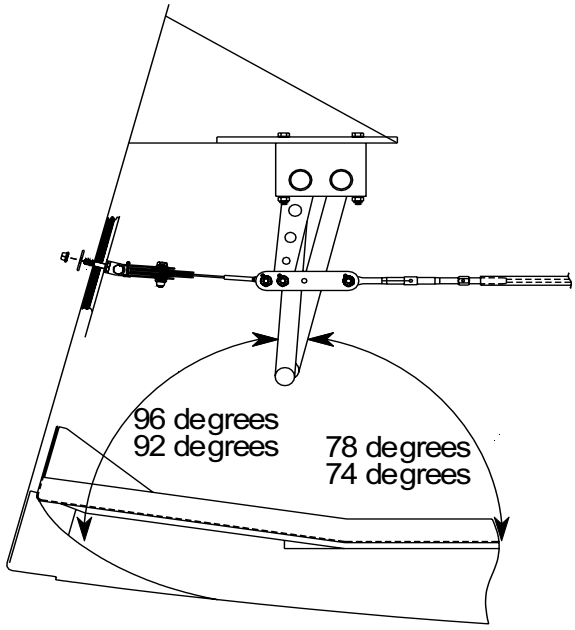
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Figure 203 : Sheet 1 : Rudder Control System Rigging

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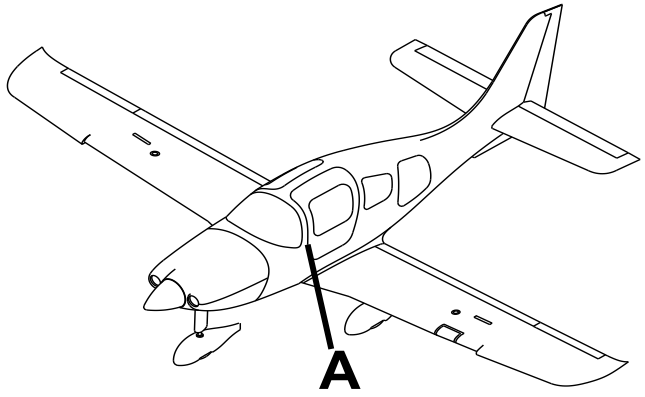


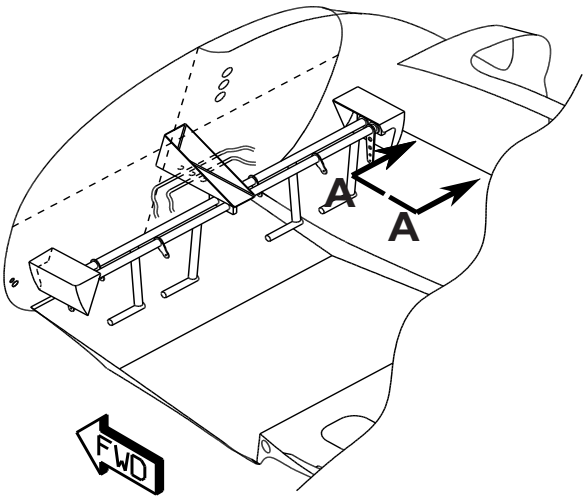
VIEW A-A

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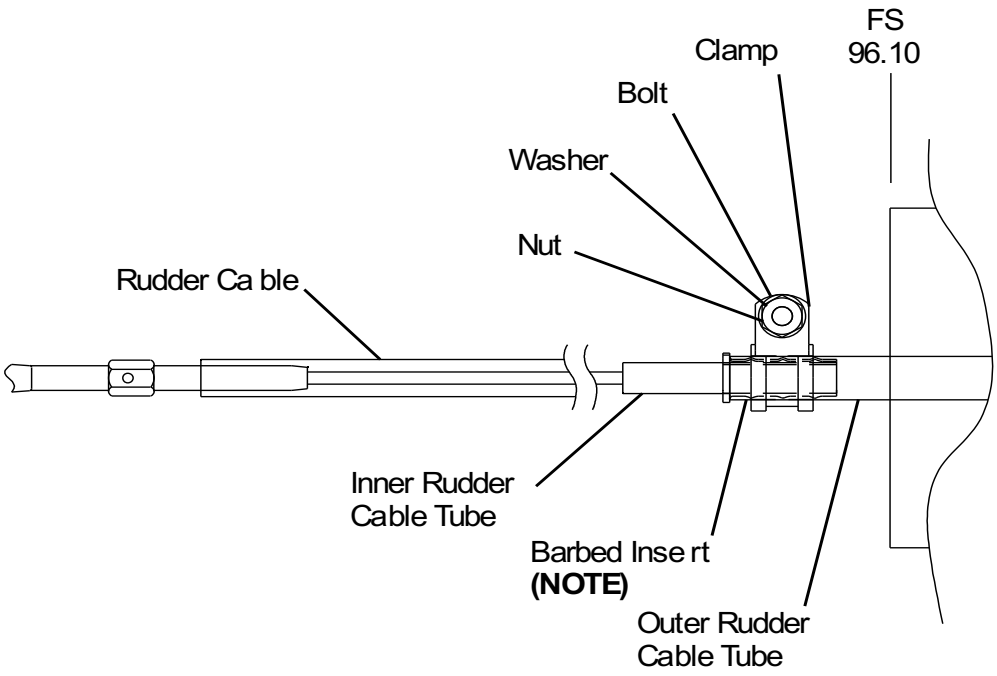
Figure 204 : Sheet 1 : Cable Thimble, Compression Sleeve and Shackle

B10805





DETAIL A



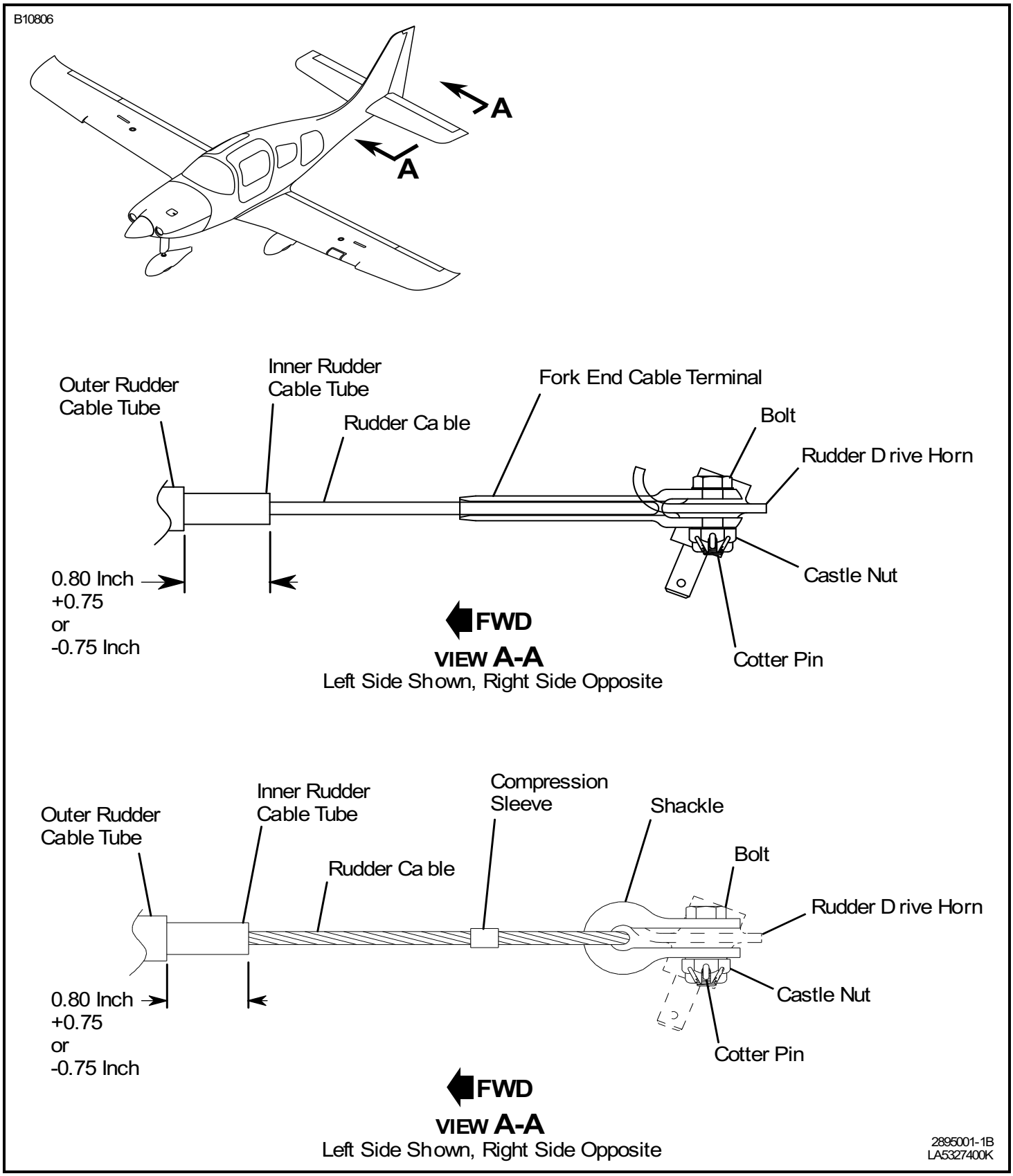
VIEW A-A
Right Side Shown, Left Side Opposite

NOTE: Airplanes that incorporate SB10-27-03 and Model T240

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ALA53274000
AA2895001-1

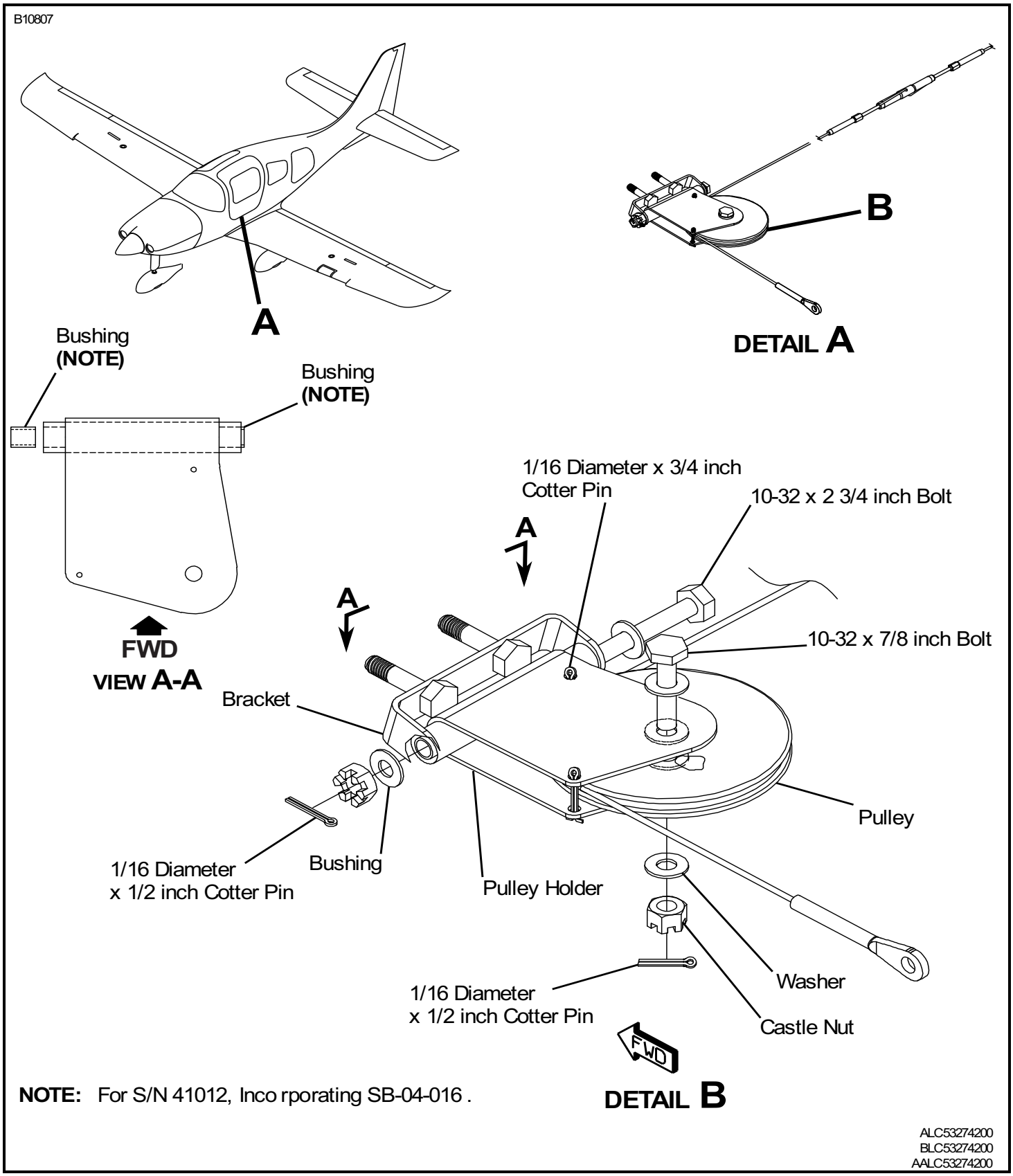
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Figure 205 : Sheet 1 : Fork End Cable Terminal



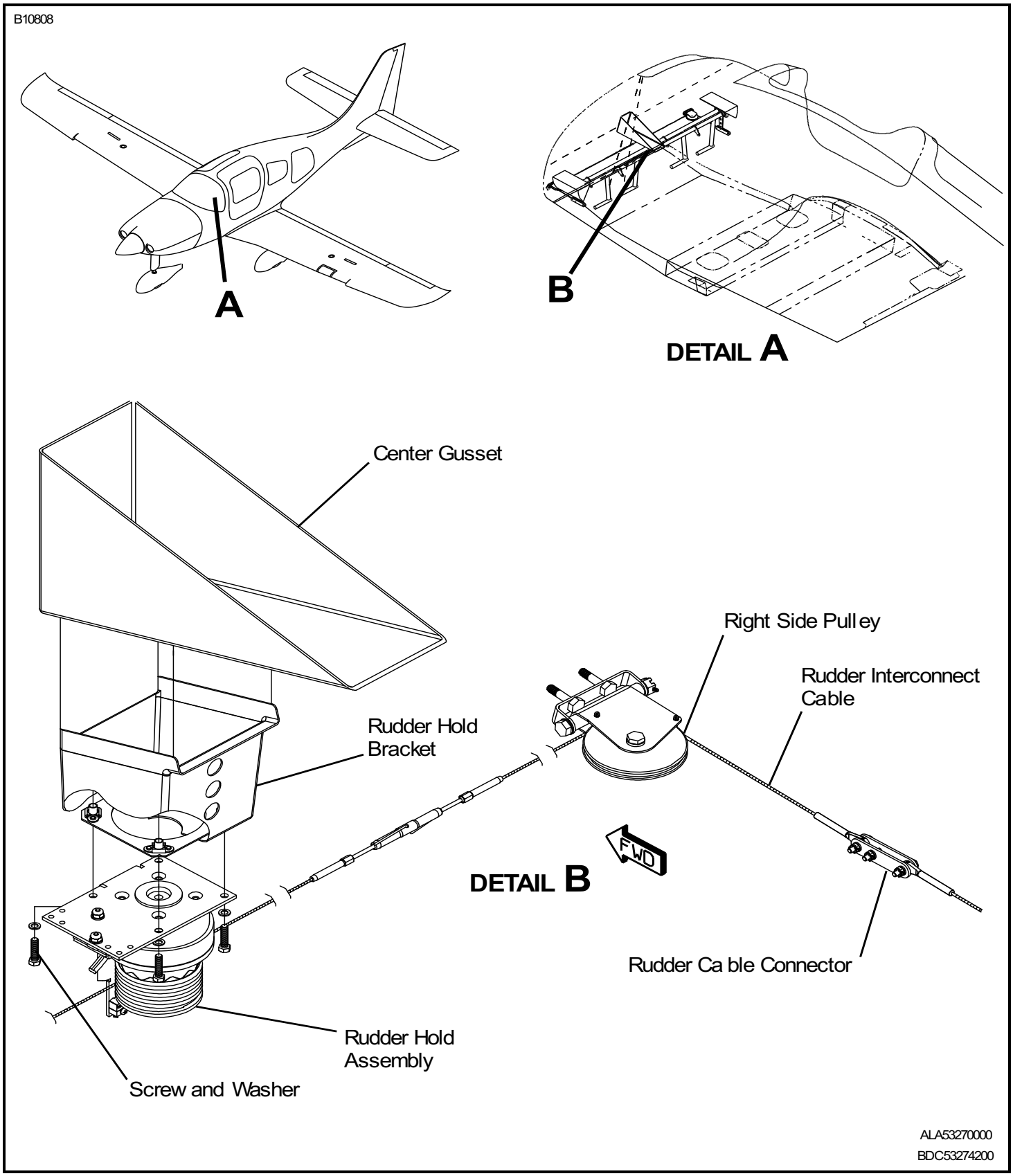
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Figure 206 : Sheet 1 : Left Rudder Interconnect Pulley (Right Pulley Similar)



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Figure 207 : Sheet 1 : Rudder Hold Assembly



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RUDDER HOLD SYSTEM (G2000) - ADJUSTMENT/TEST

1. General

A. This section gives the procedures to do a check of the rudder hold system. For rudder hold system maintenance procedures refer to, Rudder Control System - Maintenance Practices.

2. Rudder Hold Operational Check

A. Do the Rudder Hold Operational Check.

(1) Supply external electrical power to the airplane.

(2) Set the master BATT switches (left SW01 and right SW02) to the ON position.

(3) Set the AVIONICS MASTER switch (SW04) to the ON position.

(4) Set the CROSS TIE switch (SW03) to the ON position.

(5) Make sure that the RUDR HOLD CAS message does not show on the Primary Flight Display (PFD) (UI407).

(6) Set the A/P TRIM switch (SW19) found on the overhead panel, to the ON position.

(7) Make sure that the flaps are in the up position

(8) Make sure that rudder pedal is free to move.

(9) Push the RUDDER HOLD ENGAGE switch (SI010), found on the center console, to the on position and release.

(a) Make sure that the RUDR HOLD CAS message shows on the PFD.

(b) Make sure that when the rudder pedals are pushed gently they do not move freely.

(10) Push the RUDDER HOLD ENGAGE switch, to the OFF position and release.

(a) Make sure that the RUDR HOLD CAS message does not show on the PFD

(b) Make sure that when the rudder pedals are pushed gently they move freely.

(11) Push the RUDDER HOLD ENGAGE switch to the on position and release.

(a) Make sure that the RUDR HOLD CAS message shows on the PFD.

(b) Make sure that when the rudder pedals are pushed gently they do not move freely.

(12) Apply 40 to 50 pounds of force to the left or right rudder pedal.

(a) Make sure that the RUDR HOLD CAS message does not show on the PFD.

(b) Make sure that when the rudder pedals are pushed gently they move freely.

(13) Push the RUDDER HOLD ENGAGE switch to the on position and release.

(a) Make sure that the RUDR HOLD CAS message shows on the PFD.

(b) Make sure that when the rudder pedals are pushed gently they do not move freely.

(14) On the pilot control stick push and then release the autopilot disconnect push button switch (SW31).

(a) Make sure that the RUDR HOLD CAS message does not show on the PFD.

(b) Make sure that when the rudder pedals are pushed gently they move freely.

(15) Push the RUDDER HOLD ENGAGE switch to the on position and release.

(a) Make sure that the RUDR HOLD CAS message shows on the PFD.

(b) Make sure that when the rudder pedals are pushed gently they do not move freely.

(16) On the copilot control stick push and release the autopilot disconnect push button switch.

(a) Make sure that the RUDR HOLD CAS message does not show on the PFD.

(b) Make sure that when the rudder pedals are pushed gently they move freely.

(17) Push the RUDDER HOLD ENGAGE switch to the on position and release.

(a) Make sure that the RUDR HOLD CAS message shows on the PFD.

(b) Make sure that when the rudder pedals are pushed gently they do not move freely.

(18) On the overhead panel set the A/P TRIM MASTER (SW19) switch to the OFF position.

(a) Make sure that the RUDR HOLD CAS message does not show on the PFD.

(b) Make sure that when the rudder pedals are pushed gently they move freely.

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(19) Set the A/P TRIM MASTER switch to the ON position.

(20) Push the RUDDER HOLD ENGAGE switch to the on position and release.

(a) Make sure that the RUDR HOLD CAS message shows on the PFD.

(b) Make sure that when the rudder pedals are pushed gently they do not move freely.

(21) Set the FLAPS switch (SI005) to the TO position.

(a) Make sure that the RUDR HOLD CAS message does not show on the PFD.

(b) Make sure that when the rudder pedals are pushed gently they move freely.

(22) Set the FLAPS switch to the UP position.

(23) Push the RUDDER HOLD ENGAGE switch to the on position and release.

(a) Make sure that the RUDR HOLD CAS message shows on the PFD.

(b) Make sure that when the rudder pedals are pushed gently they do not move freely.

(24) Disengage the AIL TRIM/RDR HOLD circuit breaker found on the cockpit circuit breaker panel.

(a) Make sure that the RUDR HOLD CAS message does not show on the PFD.

(b) Make sure that when the rudder pedals are pushed gently they move freely.

(25) Engage the AIL TRIM/RDR HOLD circuit breaker.

(26) Push the RUDDER HOLD ENGAGE switch to the on position and release.

(27) Push the RUDDER HOLD ENGAGE switch to the on position and release.

(a) Make sure that the RUDR HOLD CAS message shows on the PFD.

(b) Make sure that when the rudder pedals are pushed gently they do not move freely.

(28) Push the RUDDER HOLD ENGAGE switch to the on position and release.

(a) Make sure that the RUDR HOLD CAS message does not show on the PFD.

(b) Make sure that when the rudder pedals are pushed gently they move freely.

(29) On the left wing, move the stall warning vane up until the stall warning horn is heard.

(a) Make sure that the RUDR HOLD CAS message does not show on the PFD.

(b) Make sure that when the rudder pedals are pushed gently they move freely.

(30) Connect the air data test set pitot line to the pitot probe on the right wing. Refer to the applicable manufacturers test set operation manual.

(31) Connect the air data test set static line to the static port on the right fuselage. Refer to the applicable manufacturers test set operation manual.

(32) Move the stall warning vane up until the warning horn sounds.

(a) Make sure that the RUDR HOLD CAS message does not show on the PFD.

(b) Make sure that when the rudder pedals are pushed gently they move freely.

(33) Release the stall warning vane.

(34) Remove the air data test set. Refer to the applicable manufacturers test set operation manual.

(35) Set the master BATT switches (left SW01 and right SW02) to the OFF position.

(36) Set the AVIONICS MASTER switch (SW04) to the OFF position.

(37) Remove external electrical power from the airplane.

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ELEVATOR CONTROL SYSTEM - MAINTENANCE PRACTICES

1. Elevator System - General

A. The elevator is a two-part control surface split in the center at the vertical tail with each half connected by a torque tube The elevator is attached to the horizontal stabilizer with two piano hinges. A series of push-pull tubes connects the elevator to the left and right control sticks. Simple rod end bearings are used throughout the elevator control system. Lead counterweights balance the elevator.

CAUTION: Do not remove, install, or carry the elevator assembly in one piece. Damage may occur to the torque tube.

2. Elevator

A. Elevator Removal and Installation

(1) Remove the rudder per the instructions in Section 27-20-00, Rudder Installation and Removal.

(2) Remove the cotter pin and retaining hardware from the aft elevator control rod and the elevator drive horn. Refer to Figure 203.

(3) Remove the MS24694-C50 or AN526C1032R9 screws and washers that attach the left and right elevator fairings to the horizontal stabilizer. Refer to Figure 203. Screws are located on the top and bottom of the fairing. Note: Two MS24694-C50 or MS24694-C51 screws in each side of the stabilizer appear to attach the fairing; they actually attach the forward hinges of the elevator torque tube to the stabilizer and should not be removed until after the wiring connector has been disconnected.

(4) Remove the MS24963-C270 or AN526C1032R9 screws and washers that attach the elevator torque tube to the metal end caps on the left and right halves of the elevator.

(a) Remove the MS51957-46 screws that attach the elevator torque tube to the both left and right elevator torque tube cap.

(5) Remove the hardware that attaches the end caps to the left and right elevators; then remove the end caps prior to balancing the elevators.

(6) Disconnect the wiring connector for the elevator trim servo and the two grounding straps at the elevator horn. The grounding straps are connected to the elevator horn by an AN3C-10A bolt, one washer, self-locking nut and aluminum spacer.

(7) Remove the MS24694-C50, -C51, -C52, or -C54 screws, washers, self-locking nuts (if present), and shim (if present) that attach the torque tube hinges to the horizontal stabilizer. Remove grounding straps and note location for reinstallation.

(8) By gently sliding the ends of the torque tube within the elevator halves, there is enough play to remove the torque tube from the assembly.

(9) Remove the MS24694-C50, -C51, -C52, or -C54 screws and washers that attach the elevator hinges to the horizontal stabilizer.

(10) Remove the elevator halves.

(11) Install the elevator in the reverse order. Recheck all attachment hardware for security and safety. Torque all attachment screws 30 to 36 in.-lbs. Torque grounding strap attachment hardware 20 to 25 in.-lbs. and apply zinc chromate primer.

B. Elevator Rigging and Adjustment

(1) Remove the following interior panels per the instructions in Chapter 25: FLSPL, FLSPR, MLSPL, MLSPR, right and left door tread.

(2) Remove the baggage bulkhead access panel per the instructions in Chapter 53.

(3) With the elevator securely fastened to the horizontal stabilizer, clamp the elevator such that its trailing edge is aligned with the trailing edge of the horizontal stabilizer. With the elevator fairings loosely attached to the horizontal stabilizer, clamp the fairings to the elevator and secure the fairings to the horizontal stabilizer. When the clamp is removed, confirm that angular tolerance between the horizontal stabilizer and the elevator fairing is per Section 27-00-00, Table 1.

(4) With the aircraft leveled about its lateral axis (pitch), Set the control stick to the vertical position (0 degrees, 7 degrees forward/ 2 degrees aft) as shown in Figure 201.

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(5) Loosen the jam nuts on the rod end bearings on all elevator push-pull tubes as shown in Figure 202.

(6) Place template TC55270000 between the left-hand elevator shell and the elevator fairing. Seat it firmly against the leading edge and upper surface of the horizontal stabilizer and parallel with the longitudinal axis of the aircraft.

(7) Starting with the elevator in the neutral position rotate the elevator upward until it just contacts the stop. Check that deflection conforms to Section 27-00-00, Table 1.

CAUTION: Do not press too hard on the elevator against the elevator up stop, as this will cause a false indication of the elevator deflection.

(8) Rotate the elevator to the down position, and allow the elevator to rest freely against the down stops. Check that deflection conforms to Section 27-00-00, Table 1.

(9) Adjust the elevator up and down stops as necessary to achieve deflection per Section 27-00-00, Table 1.

(a) To adjust the elevator up stop, loosen the jam nut, turn the hex head cap screw in the desired direction until the proper up deflection is met, then re-tighten the jam nut to 100 in.-lbs.

(b) To adjust the elevator down stops and increase the amount of down deflection, sand on the surface of the stop located in the counterweight pockets until the proper down deflection is achieved. If the down deflection is too much, contact Cessna Aircraft Company for new elevator stops.

(10) Adjust the rod end bearings in the elevator push-pull tubes such that the following criteria are met:

(a) The elevator deflections per Section 27-00-00, Table 1 are achieved.

(b) The control stick is in the vertical position (0 degrees, 7 degrees forward/ 2 degrees aft) when the elevator is at neutral deflection. Refer to Figure 201.

(c) The elevator interconnect weldment has adequate clearance (0.125 inch minimum) with the adjacent aircraft structure.

(d) Control stick is free from interference with adjacent side interior panels and the instrument panel.

(e) All rod ends have a minimum 0.5 inch thread engagement (threads should be visible through inspection hole in ends of push-pull tubes).

(11) Ensure that the gap between the outboard end of the elevator and the horizontal stabilizer is 0.125 to 0.500 inch

(12) Ensure that the gap between the inboard end of the elevator and the horizontal stabilizer fairing is 0.125 to 0.500 inch

(13) Torque all AN316-6 jam nuts at control rod ends to 95 to 110 in.-lbs. and all AN316-5 jam nuts to 70 to 85 in.-lbs.

(14) Cycle the control stick fore and aft to ensure that there is no binding in the system.

C. **Elevator Servicing and Maintenance**

(1) Hinges - The elevator is attached to the horizontal stabilizer with two piano hinges. Each hinge should be inspected annually for excessive wear and cracks. The hinge may be lubricated with MIL-L-7870 general purpose lubricating oil to help reduce wear and friction.

(2) Rod End Bearings - The rod end bearings used throughout the elevator control system do not require maintenance other than cleaning during routine inspections to remove any accumulation of dust or grime. Liquid lubricants should not be used on the rod end bearings as this may cause the Teflon liner to swell, creating excessive friction in the bearing. Should the rod end need to be replaced, contact Cessna Aircraft Company.

(3) Torque Tube - The torque tube should be visually inspected every 200 hours or annually. Elevator attachment to the torque tube should be inspected for integrity, excessive wear, and cracks. Inspect welds for cracks. Remove the elevator fairings for access to the torque tube.

3. Elevator Trim Tab

A. **Elevator Trim Tab Removal and Installation**

(1) Gain access to the elevator trim motor by removing the access panel located on the lower surface of the elevator.

(2) Disconnect the trim motor drive rods from the trim tab drive horn by removing the cotter pins and clevis pins.

(3) Rotate the trim tab upward to gain access to the screws attaching the trim tab hinge to the elevator.

(4) Remove the nine AN526C632R screws attaching the hinge to the elevator.

(5) Reinstall the trim tab in the reverse order, and torque all screws 10 to 12 in.-lbs.

(6) Run the trim tab to the up and down deflection positions to ensure that there is no binding of the system.

(7) Do the elevator trim calibration. Refer to Garmin G2000 Aileron and Elevator Trim Calibration - Adjustment/Test.

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B. **Elevator Trim Tab Rigging and Adjustment**

The elevator trim tab deflections are preset at the factory and should not require any further adjustment. The trim tab deflections should be checked periodically to ensure that the system is functioning properly. If the trim tab deflections are checked and found to be outside the acceptable limits per Section 27-00-00, Table 1, contact Cessna Aircraft Company for further instructions.

C. **Elevator Trim Tab Servicing and Maintenance**

The trim tab is attached to the elevator with one piano hinge. The hinge should be visually inspected annually for excessive wear and cracking and replaced as necessary. The hinge should be replaced if the hinge becomes worn to the point that the trim tab free play limits per Section 27-00-00, Table 1 are exceeded. The hinge may be lubricated with MIL-L-7870 general purpose lubricating oil. Should the nutplates located on the nutplate assembly, part number LA55273818, inside the elevator become worn or stripped, contact Cessna Aircraft Company for a replacement.

4. Elevator Trim Tab Servo

A. **Removal and Installation**

CAUTION: Take care when removing the trim motor so as not to damage the wiring and connectors located on the outside of the trim motor housing. Should any of the wiring or connectors become damaged or break, contact Cessna Aircraft Company for a replacement.

(1) Gain access to the elevator trim motor by removing the access panel located on the lower surface of the elevator.

(2) Disconnect the trim motor drive rods from the trim tab drive horn by removing the cotter pins and clevis pins.

(3) Remove the six AN526C632R10 screws that attach the trim motor hinge to the elevator hinge.

(4) Carefully remove the trim motor from within the elevator.

(5) After removing the trim motor, disconnect the wiring harness.

(6) Reinstall the trim motor in the reverse order. Torque all screws 10 to 12 in.-lbs.

(7) Do the elevator trim calibration. Refer to Garmin G2000 Aileron and Elevator Trim Calibration - Adjustment/Test.

B. **Rigging and Adjustment**

The elevator trim motor is an integral part of the elevator trim tab. The trim tab deflections are preset at the factory. Therefore, the trim tab and motor should not require any further adjustment unless they need to be removed and replaced. If the trim tab deflections are checked and found to be outside the acceptable limits per Section 27-00-00, Table 1, the following procedure should be used.

(1) Using a digital inclinometer to determine deflection, have an assistant drive the elevator trim tab to the full down position (trim tab up).

NOTE: Actuation of the elevator trim system may have to be stopped before the 'DOWN' microswitch is activated. If the microswitch is activated before full down travel is achieved, back off the screw on the potentiometer drive bracket so that the full throw of the trim tab can be accomplished.

(2) With the trim tab in the full down position (trim tab up), adjust the down screw on the potentiometer drive bracket (refer to Figure 204) so that the screw just closes the microswitch, deactivating the motor. Tighten the jam nut on the adjusting screw.

(3) Using a digital inclinometer to determine deflection, have an assistant drive the elevator trim system to the full up position (trim tab down).

NOTE: Actuation of the elevator trim system may have to be stopped before the 'UP' microswitch is activated. If the microswitch is activated before full up travel is achieved, back off the up-screw on the potentiometer drive bracket so that the trim tab can be moved to match the required template markings.

(4) With the trim tab in the full up position (trim tab down) adjust the up screw on the potentiometer drive bracket so that the screw just closes the microswitch deactivating the motor. Tighten the jam nut on the adjusting screw.

(5) Drive the elevator trim system to the full down position using the control stick trim button while an assistant watches the actuator and trim tab linkage for clearances and smooth operation.

CAUTION: If the microswitch is severely misadjusted, damage to the aircraft and/or components may occur while trimming to either stop. Watch carefully during this phase of operation for clearances and any indication of binding.

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(6) Using a digital inclinometer, check position of the trim tab. Check trim panel position indications. If necessary, repeat as follows:

(a) With the trim tab in the full down position (trim tab up), adjust the down screw on the potentiometer drive bracket (refer to Figure 204) so that the screw just closes the microswitch, deactivating the motor. Tighten the jam nut on the adjusting screw.

(7) Drive the elevator trim system to the full up position while an assistant checks actuator and trim tab linkage for clearances and smooth operation.

CAUTION: If the microswitch is severely misadjusted, damage to the aircraft and/or components may occur while trimming to either stop. Watch carefully during this phase of operation for clearances and any indication of binding.

(8) Using a digital inclinometer to determine deflection, check position of trim tab. Check the position of the trim tab per instructions above if necessary. Check trim panel position indication.

(9) Cycle the elevator trim system through full deflections, checking for security, proper travel, and indications.

NOTE: When the trim tab is in the neutral position (faired evenly with elevator), the trim panel should indicate one green light above center.

(10) Install the elevator trim actuator cover panel.

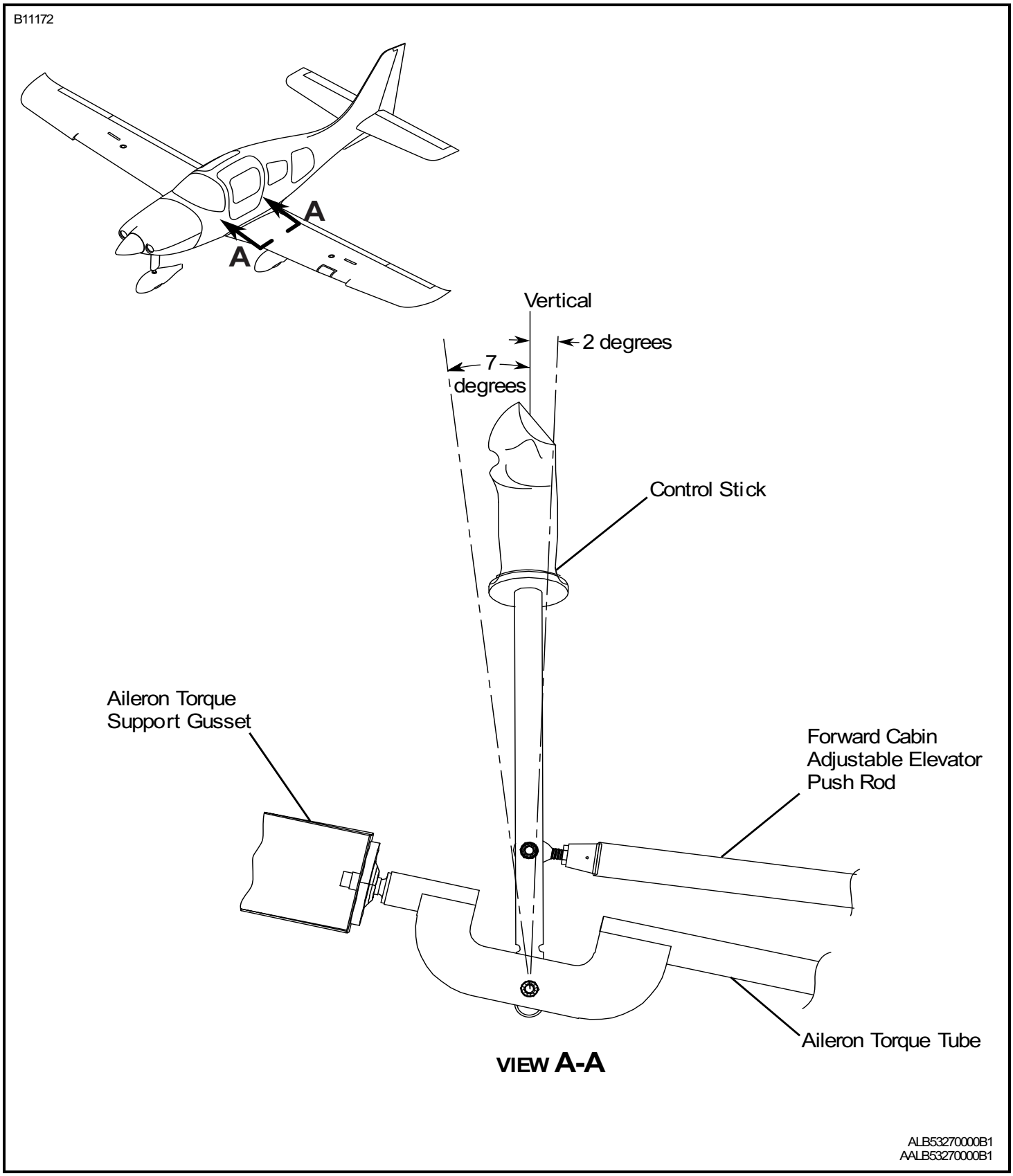
(11) Do the elevator trim calibration. Refer to Garmin G2000 Aileron and Elevator Trim Calibration - Adjustment/Test.

C. **Servicing and Maintenance**

The elevator trim motor should be removed for inspection and service every 3000 hours. The trim motor drive rod gears should be inspected for wear and lubricated with heavy-duty gear grease. The worm gears attached to the drive motor shaft do not need to be lubricated but should be inspected for wear. If any of the gears are worn, they should be replaced. Replacements may be obtained from Cessna Aircraft Company.

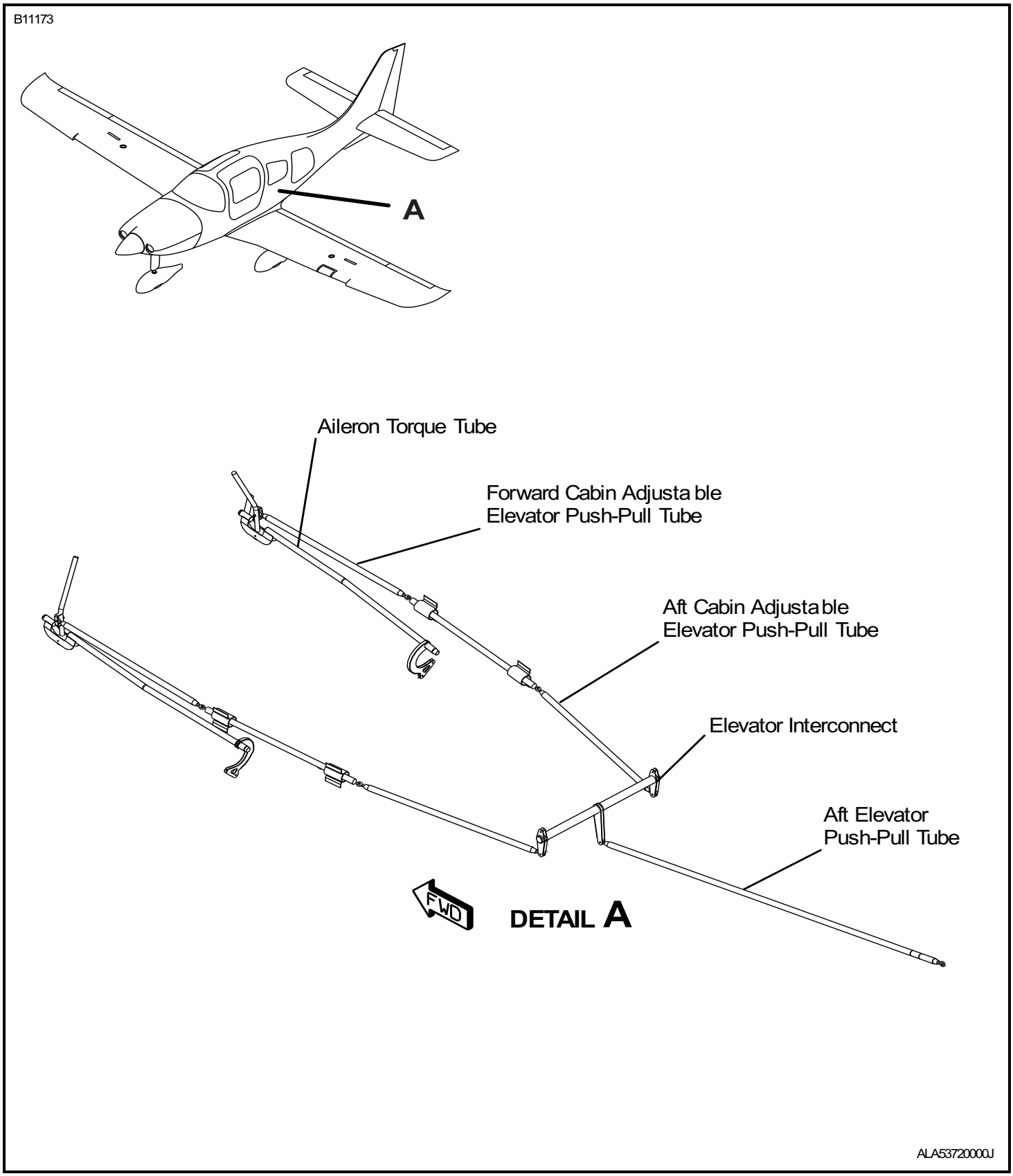
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Figure 201 : Sheet 1 : Control Stick Neutral Position



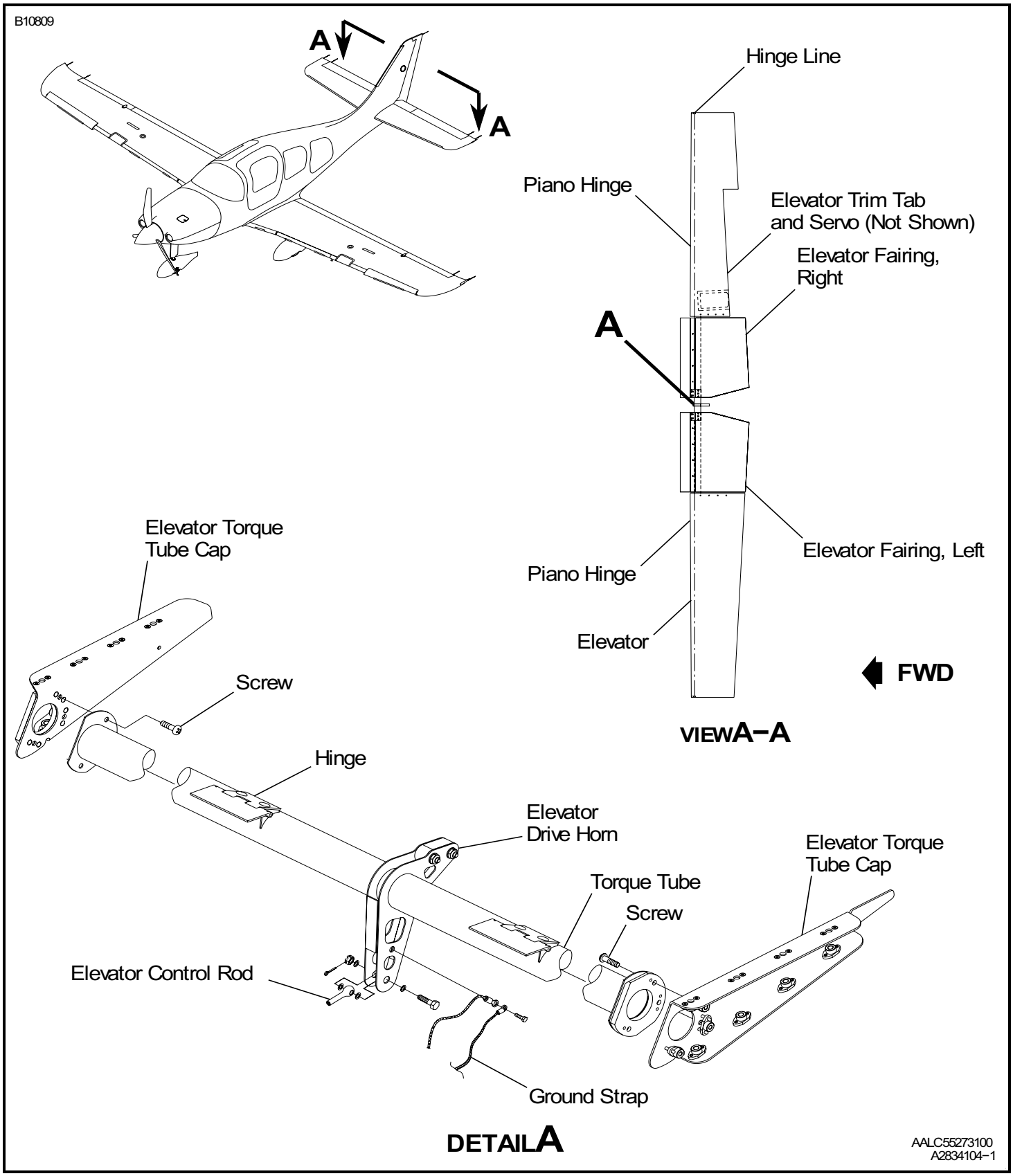
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Figure 202 : Sheet 1 : Fuselage Control System Layout



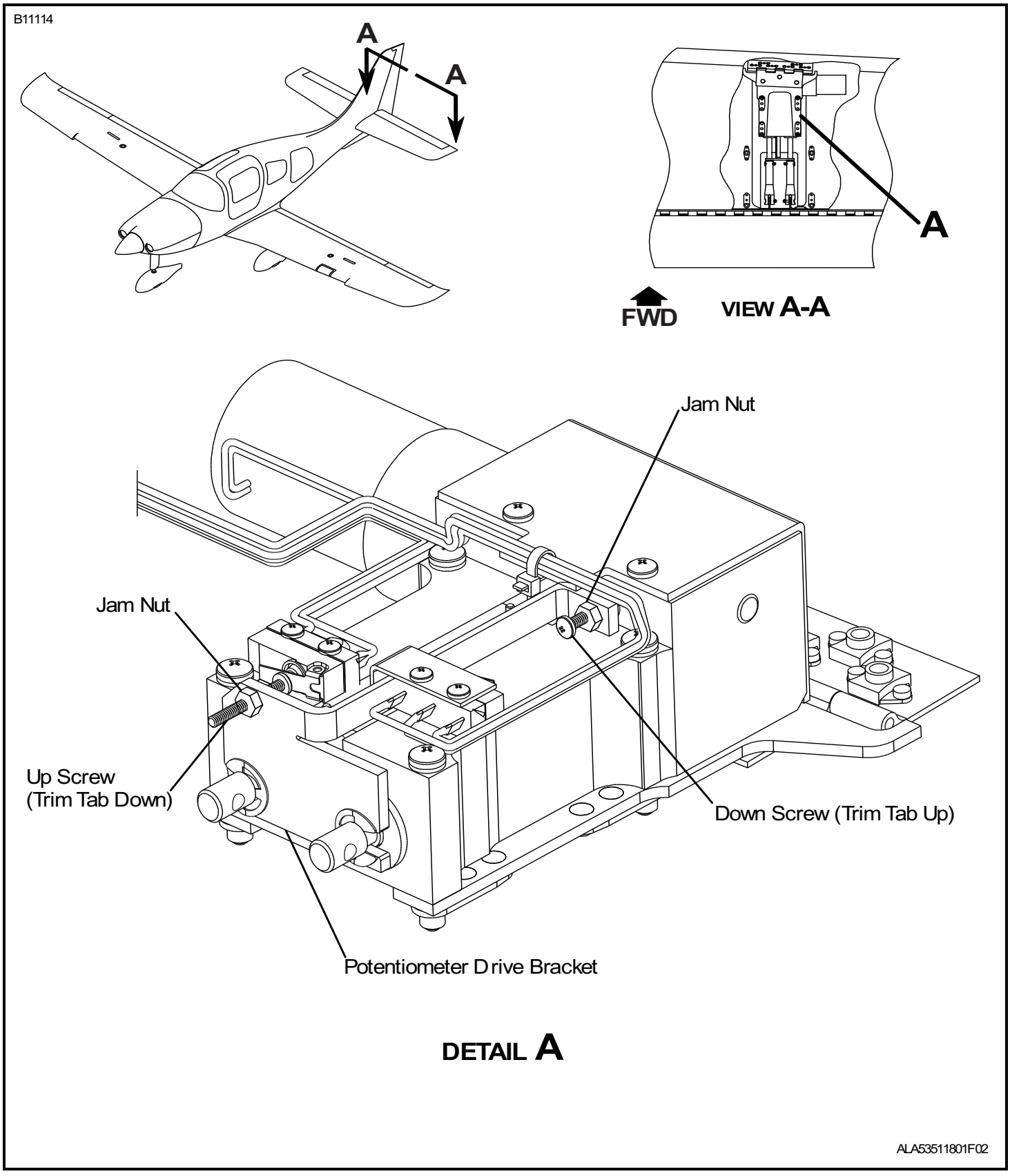
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Figure 203 : Sheet 1 : Elevator Fairing and Drive Horn



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Figure 204 : Sheet 1 : Elevator Trim Actuator



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GARMIN PITCH TRIM ADAPTER (G2000) - REMOVAL/INSTALLATION

1. General

A. This section gives the removal and installation for the G2000 Garmin GTA 82 Trim Adapter. The GTA 82 is installed below the instrument panel below on the bottom of the avionics shelf.

B. The Garmin GTA 82 Trim Adapter is a remote mounted device that is used to allow the GFC 700 Auto Pilot to drive a pitch trim actuator. The trim adapter is powered by the Essential Bus and interfaces with each of the two GIA 63W Integrated Avionics units through serial communication on separate RS-485 ports.

CAUTION: When removing and/or replacing a component, make sure that the airplane power is off. Disconnect auxiliary power supplies.

2. Garmin GTA 82 Trim Adapter Removal/Installation

A. Remove the GTA 82 Trim Adapter (UC304) (Refer to Figure 401).

(1) Remove external electrical power from the airplane.

(2) Make sure that the master BATT switches (left SW01 and right SW02) are in the OFF position.

(3) Make sure that the AVIONICS MASTER switch (SW04) is in the OFF position.

(4) Disengage the PITCH TRIM circuit breaker, found on the cockpit circuit breaker panel.

(5) Remove the screws that attach the trim adapter to the avionics shelf.

(a) If necessary, remove the pilot seat to get access to the trim adapter. Refer to Chapter 25, Airplane Seats - Maintenance Practices.

(6) Disconnect the electrical connector (P682) from the trim adapter electrical connector (P821).

(7) Remove the trim adapter from the airplane.

B. Install the GTA 82 Trim Adapter (UC304) (Refer to Figure 401).

(1) Put the trim adapter in its correct position on the bottom of the avionics shelf.

(2) Install the screws that attach the trim adapter to the avionics shelf.

(3) Visually inspect the connectors to make sure that there are no bent or damaged pins.

(a) Repair any damage.

(4) Connect the electrical connector (P682) to the trim adapter electrical connector (P821).

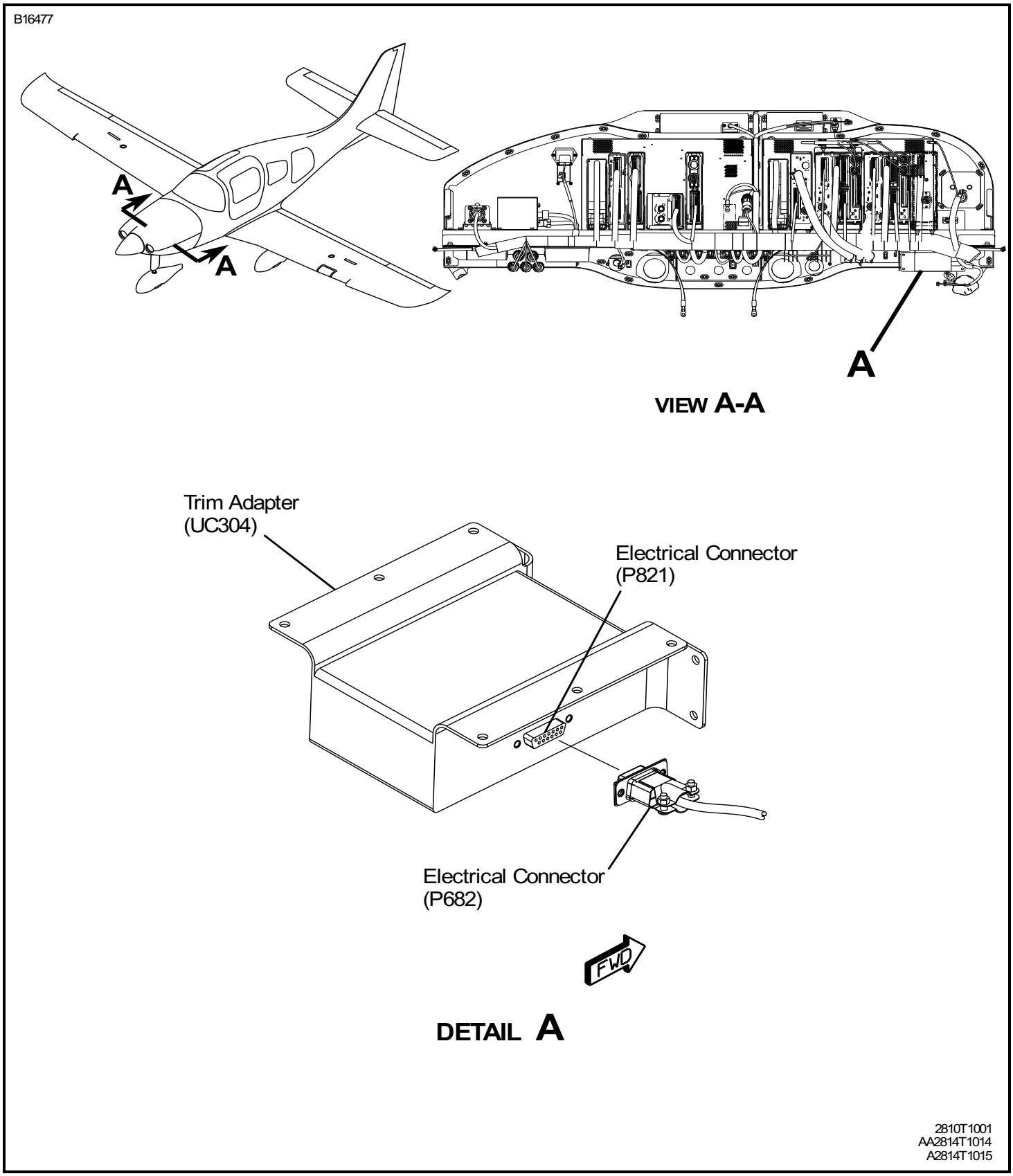
(5) If removed, install the pilot seat. Refer to Chapter 25, Airplane Seats - Maintenance Practices.

(6) Engage the PITCH TRIM circuit breaker, found on the cockpit circuit breaker panel.

(7) To troubleshoot the trim adapter, refer to the Garmin Corvalis G2000 Line Maintenance Manual 190-01185-00, found in the Supplier Publication List.

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Figure 401 : Sheet 1 : GTA 82 Trim Adapter Installation



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FLAP CONTROL SYSTEM - MAINTENANCE PRACTICES

1. Flap System - General

A. The flap system is located in the wing, aft of the rear spar, with the exception of the electrical system linking the flap switch to the electric flap actuator. The system uses four control rods with rod ends mounted on each threaded control rod. Refer to Figure 201. The rod ends use a Teflon liner which requires no lubrication.

B. Primary flap stops are electric, provided by the limit switch assembly. The flap system secondary stops are mechanical with up stops provided by the flap hinges and the flap central bellcrank assembly. Down stops are provided by the flap actuator. Refer to Figure 204. Refer to Chapter 33 for additional information regarding the electrical connections and flap switch.

2. Flaps

A. Flap Removal and Installation

(1) Lower flaps to the landing position.

(2) Remove the cotter pin, castellated nut, bolt, and washers from the flap drive control rod to the flap. Note that small washers may be installed between the flap drive hinge and the control rod end. These washers are used to increase the misalignment capability of the rod ends, and each aircraft may have a different number of washers, or none at all.

(3) Remove the cotter pins, castellated nuts, washers, and bolts from the flap hinge pivots.

(4) Remove the flap by pulling the flap aft and away from the wing

(5) Reinstall in the reverse order. When installing a new flap or reinstalling an existing flap, ensure positive clearance between the flap upper surface and the flap cove. Also ensure that all four flap hinges align with no binding. Flap position may be adjusted, if necessary, by removing or installing shims to the flap hinges as follows:

(a) No more than 3 shims (P/N LA57265125) are allowed per hinge element of each hinge.

(b) When removing the hinge, note the location and type of all fasteners and washers.

(c) Due to the addition or removal of shims, replace any bolts or screws as required so that their length maintains two threads minimum projection (including the chamfer on the end of the bolt) through the nut, nutplate, or rivnut. The bolt must also have sufficient threads to prevent bottoming out before the part is secured.

(d) Dry torque 10-32 fasteners 28-34 in-lbs.

(e) Dry torque 6-32 fasteners 6-11 in-lbs.

(6) Torque all castellated nuts 72 to 84 in.-lbs., and install cotter pins.

B. Flap Rigging and Adjustment

Once the flap system is properly rigged, only minor adjustments are required unless components such as control rods, actuator, or limit switches are replaced. It is important to start the rigging with the flap actuator and the flap central bellcrank. Refer to Figure 202. To rig the flap system, use the following steps.

(1) With the flap control rods disconnected from the outboard bellcranks, extend the actuator (flap switch up/cruise position).

(2) By adjusting the limit switch rod (refer to Figure 204) and the actuator rod end if necessary, adjust the flap up position so a 0.063-inch spacer fits between the flap central bellcrank and the web on the central bellcrank bracket as shown in Figure 203. Adjustments can easily be made with the actuator retracted (landing position). Torque the limit switch jam nuts 72 to 84 in.-lbs. and the flap actuator rod end jam nut 30 to 36 ft.-lbs. A minimum of 1.5 diameter thread engagement is required on the actuator rod end.

(3) Pin the outboard bellcranks with a 0.25 inch diameter bolt, (AN4) or equivalent, and adjust the flap control rods with the actuator set in the up position (refer to Figure 204).

(4) Adjust the left and right control rod assemblies to length between the flap central bellcrank in the up position and the pinned outboard bellcranks. After adjusting the control rod assemblies, torque the jam nuts 140 to 180 in.-lbs., and verify that the minimum thread engagement is achieved by checking that the threads extend past the inspection hole in the control rods. Torque bolts through the bellcrank and control rods 72 to 84 in.-lbs., and install the cotter pin in the castellated nut (refer to Figure 204). Note the use of washers between the bellcrank and both sides of the rod end. If replacement of these washers is necessary, they may be replaced with AN960-416 washers.

(5) After adjusting the left and right control rod assemblies, adjust the final drive length to achieve a 0±1 degrees deflection with the flaps in the up position. After adjusting the correct length, torque the jam nuts 140 to 180 in.-lbs., and verify that the minimum thread engagement is achieved by checking that the threads extend past the inspection

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hole in the control rods. Refer to Figure 205. Torque bolts through the bellcrank and control rods 72 to 84 in.-lbs., and install the cotter pin in the castellated nut. Note the use of washers between the bellcrank and both sides of the rod end. If replacement of these washers is necessary, they may be replaced with AN960-416 washers.

(6) Using the flap/aileron template, part number TA57270000, lower the flaps to the takeoff position, and adjust the takeoff micro-switches to achieve 12±1 degrees deflection on both flaps. With the extension micro-switch adjusted, move the retraction microswitch as close as possible to the extension switch without interference. Note when adjusting the switches, always check deflection when the flaps are extended from the up position to the takeoff position. Refer to Figure 206.

(7) Lower the flaps to the landing position, and adjust the landing micro-switch to achieve 40±1 degrees deflection on both flaps using the rigging template.

(8) Ensure that the gap at the inboard edge of the aileron between the flap and the aileron (when the flaps are retracted) is 0.125 to 0.375 in. Ensure positive clearance when the flaps are extended.

(9) Actuate the flap system, and check for binding or rubbing of components. If problems are noted, re-check the rigging.

C. **Flap Servicing and Maintenance**

The flaps do not require any service or maintenance. The flaps should be visually inspected annually for cracking at all hinge attachment locations. A tap test should be conducted on the flap at the inboard and outboard end caps to aid in detection of latent damage or disbonds. Liquid lubricants should not be used on the rod end bearings as this may cause the Teflon liner to swell, creating excessive friction in the bearing. Should a rod end need to be replaced, contact Cessna Aircraft Company.

3. Flap Actuator

A. The flap system is actuated by an electric linear actuator mounted to a bracket on the aft spar in the belly-section of the aircraft wing. This actuator assembly includes a motor, clutch, ball-screw, and limit switch assembly. The limit switch assembly provides the electronic flap stops for the three positions: cruise, takeoff, and landing.

(1) **Flap Actuator Removal and Installation**

(a) Flaps must be in the cruise or landing position to remove the actuator. It is recommended to place the flaps in the cruise (up) position.

(b) Access the flap actuator through the flap and aileron pushrod access panel.

(c) Disconnect the power wire bundle to the actuator assembly. Refer to Figure 207.

(d) Tape or block the flaps to prevent them from moving when the flap actuator is disconnected from the central flap bellcrank.

(e) Through the holes in the flap central bellcrank bracket, disconnect the flap actuator from the bellcrank as shown in Figure 207.

(f) Remove the bolt holding the actuator to the bracket. Note the spacers and washers as shown in Figure 208 and Figure 209.

(g) Remove the actuator from the airplane.

(h) Reinstall in the reverse order.

(i) If the limit switches have been moved, a recheck of the flap rigging is required and adjustments required as necessary.

(j) Torque all 0.250 inch diameter bolts 72 to 84 in.-lbs. and all 0.375 in. diameter bolts 240 to 260 in.-lbs., and install the cotter pin.

(2) **Flap Actuator Maintenance**

(a) During normal inspections and maintenance, there should be checks for binding, fretting, chafed wires, and slop in the actuator mounting. Check the groove for the limit switch assembly and the limit switch rod. Refer to Figure 204.

(b) If there is excessive play in the actuator mounting, inspection and possible replacement of the spacers is required. To replace the spacers, follow the instructions for actuator removal and installation. Install new spacers, bolts, and washers as necessary.

(c) Reinstall in the reverse order.

(d) If the limit switches have not been moved, a recheck of the flap rigging is required and adjustments required as

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necessary.

(e) Torque all 0.250 inch diameter bolts 72 to 84 in.-lbs. and all 0.375 inch diameter bolts 240 to 260 in.-lbs., and install the cotter pin.

(f) If problems are found with the micro-switches, replacement is required. Contact Cessna Aircraft Company for replacement micro-switches. Replace the micro-switch by removing wires and unscrewing the micro-switch. Replacement is a direct reversal of the removal. Re-rigging is required for the replaced micro-switch.

(g) If the internal clutch requires replacement, contact Cessna Aircraft Company for a replacement actuator.

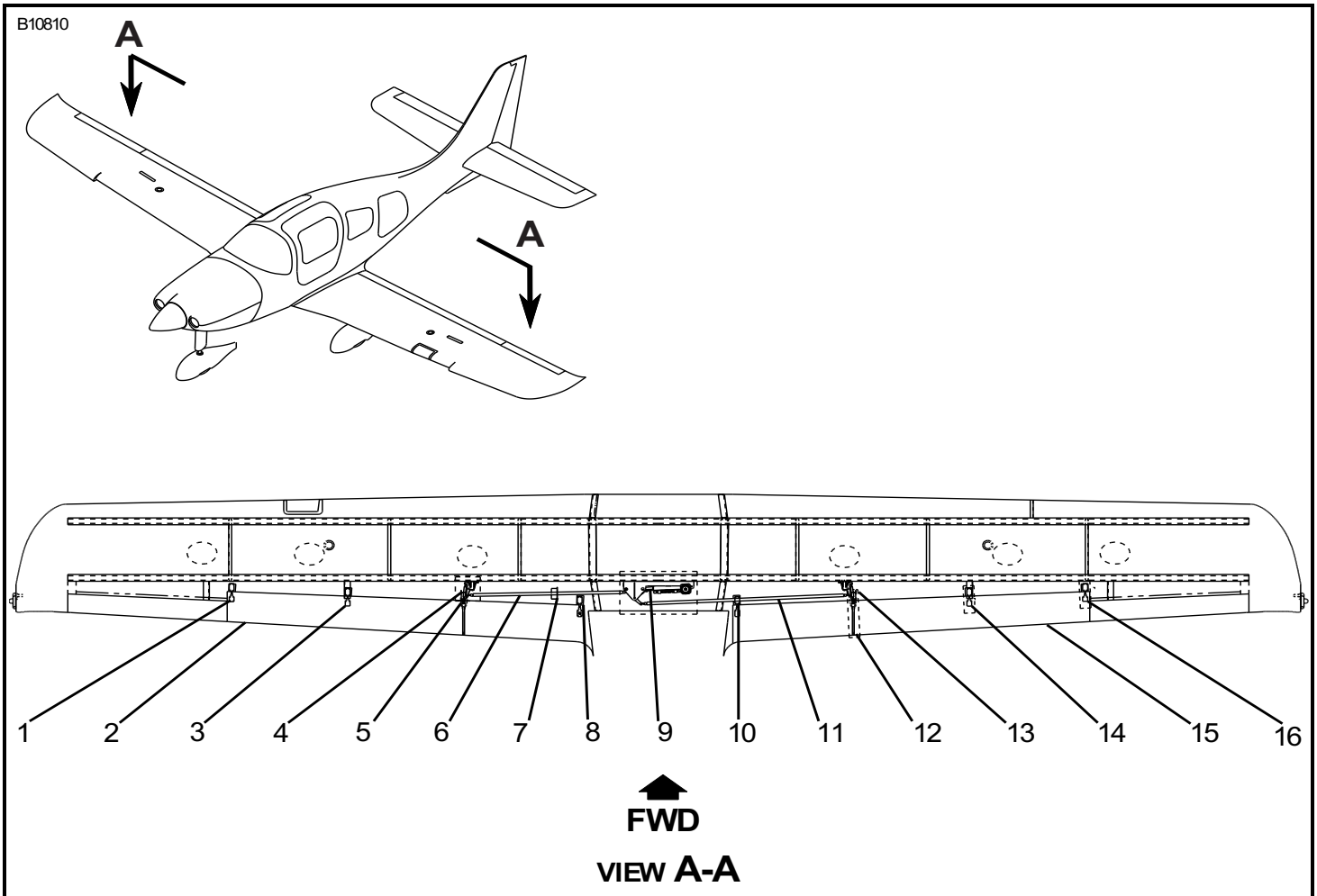
(h) All the bearings and rod ends used in the flap system are Teflon ball bearings that require little maintenance other than cleaning during routine inspections. Do not use liquid lubricants as they cause the Teflon to swell, creating excessive friction in the bearing. If bearings or rod ends require replacement, contact Cessna Aircraft Company for replacement parts.

(i) During normal inspections, check control rods, bellcranks, hinges, and brackets for excessive wear, cracks, scratches, and corrosion. Replace worn or damaged components as necessary.

(j) Refer to Chapter 33 of this manual for detailed maintenance procedures of the flap electrical system.

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Figure 201 : Sheet 1 : Flap System Overview



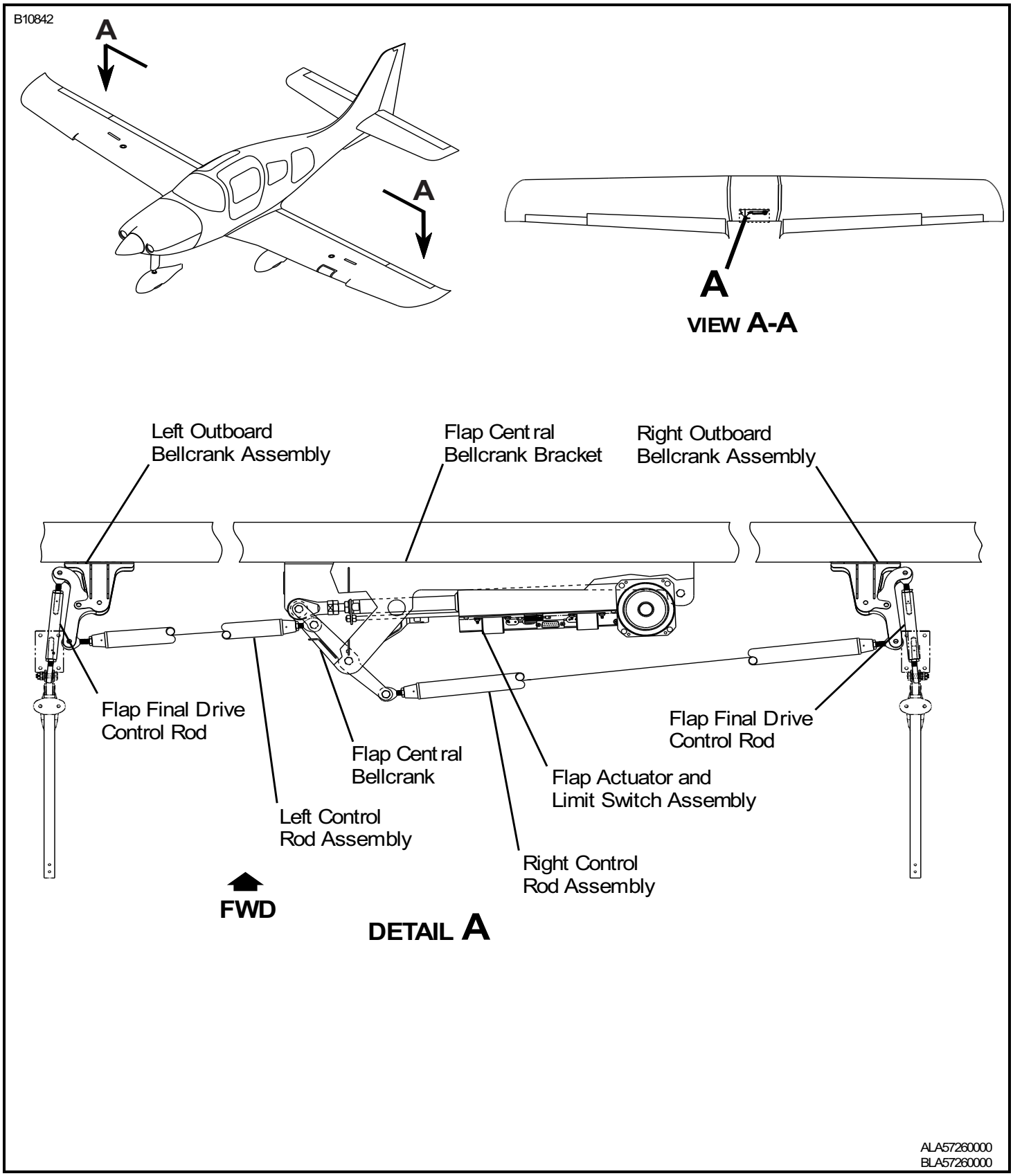
#	ITEM	#	ITEM
1.	WS 143.5 flap hinge assembly	9.	Flap central bellcrank and actuator assembly
2.	Left flap control surface	10.	WS 26.5 flap hinge assembly
3.	WS 104.5 flap hinge assembly	11.	Right flap control rod
4.	Flap drive bellcrank and final drive - left wing	12.	WS 65.5 flap hinge assembly (drive hinge)
5.	WS 65.5 flap hinge assembly (drive hinge)	13.	Flap drive bellcrank and final drive - right wing
6.	Left flap control rod	14.	WS 104.5 flap hinge assembly
7.	Left flap control rod guide*	15.	Right flap control surface
8.	WS 26.5 flap hinge assembly	16.	WS 144 flap hinge assembly

* The control rod guide is not present on all aircraft

ALA57260000

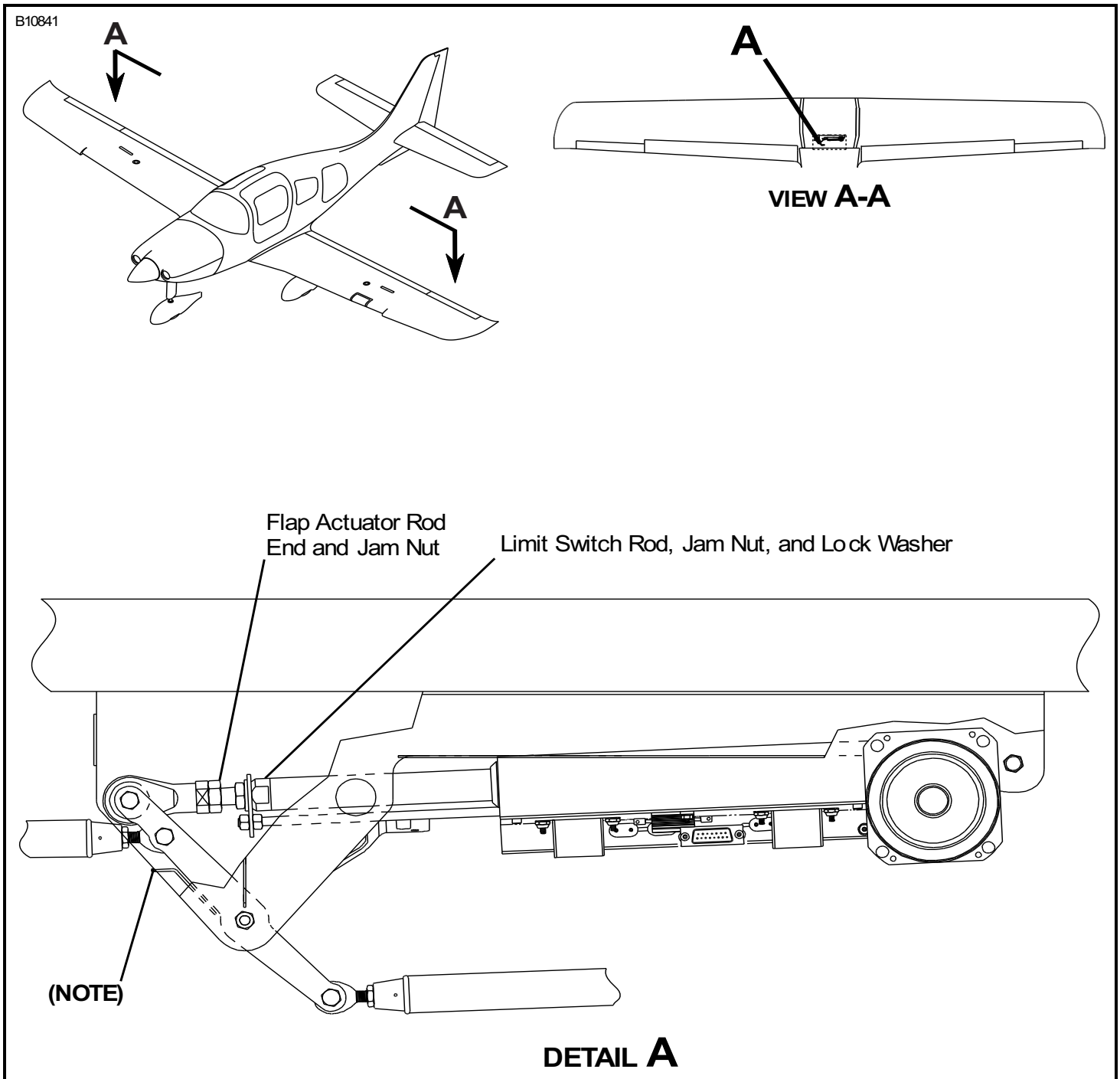
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Figure 202 : Sheet 1 : Flap Rigging Overview



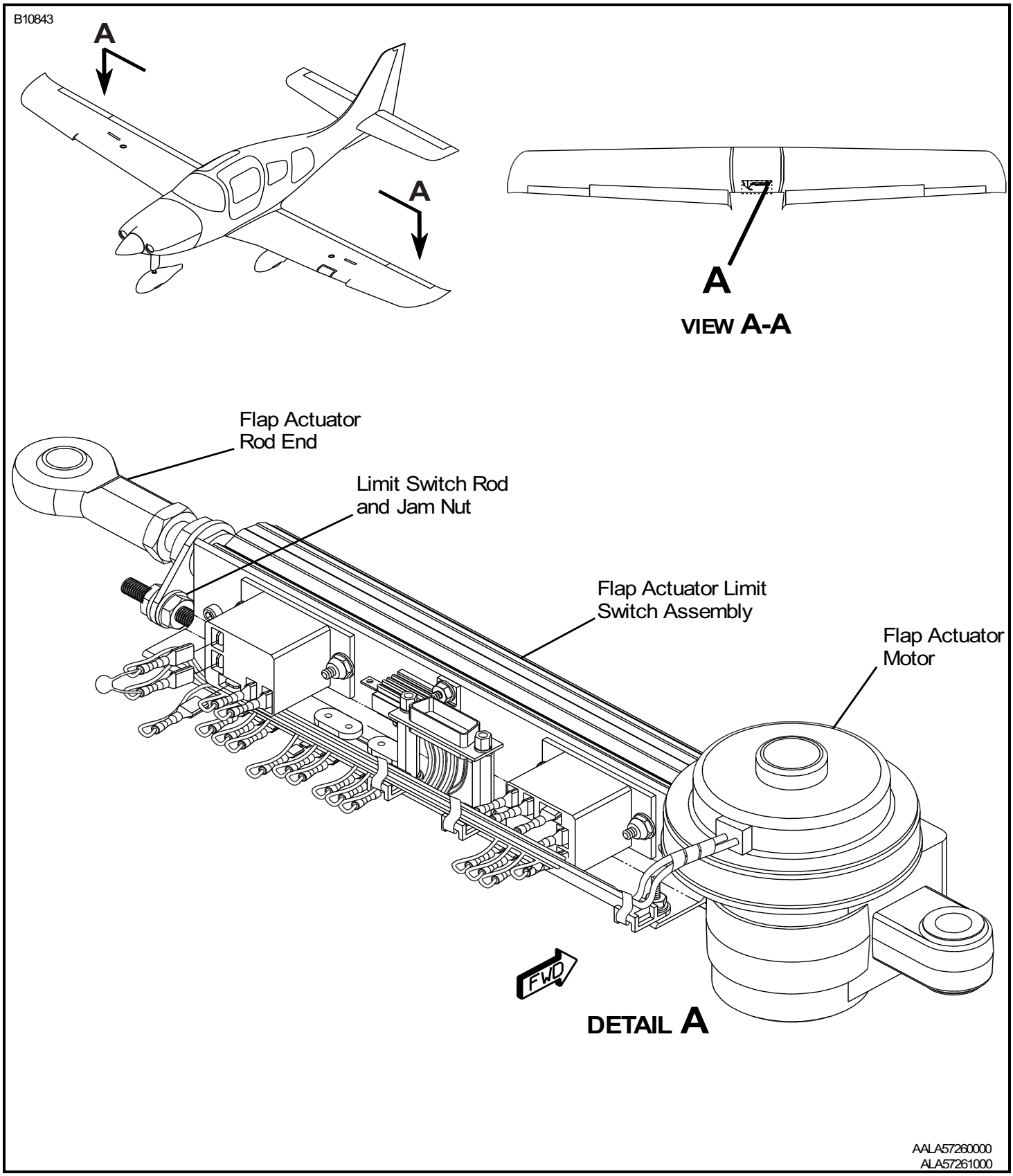
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Figure 203 : Sheet 1 : Flap Central Bellcrank and Flap Actuator



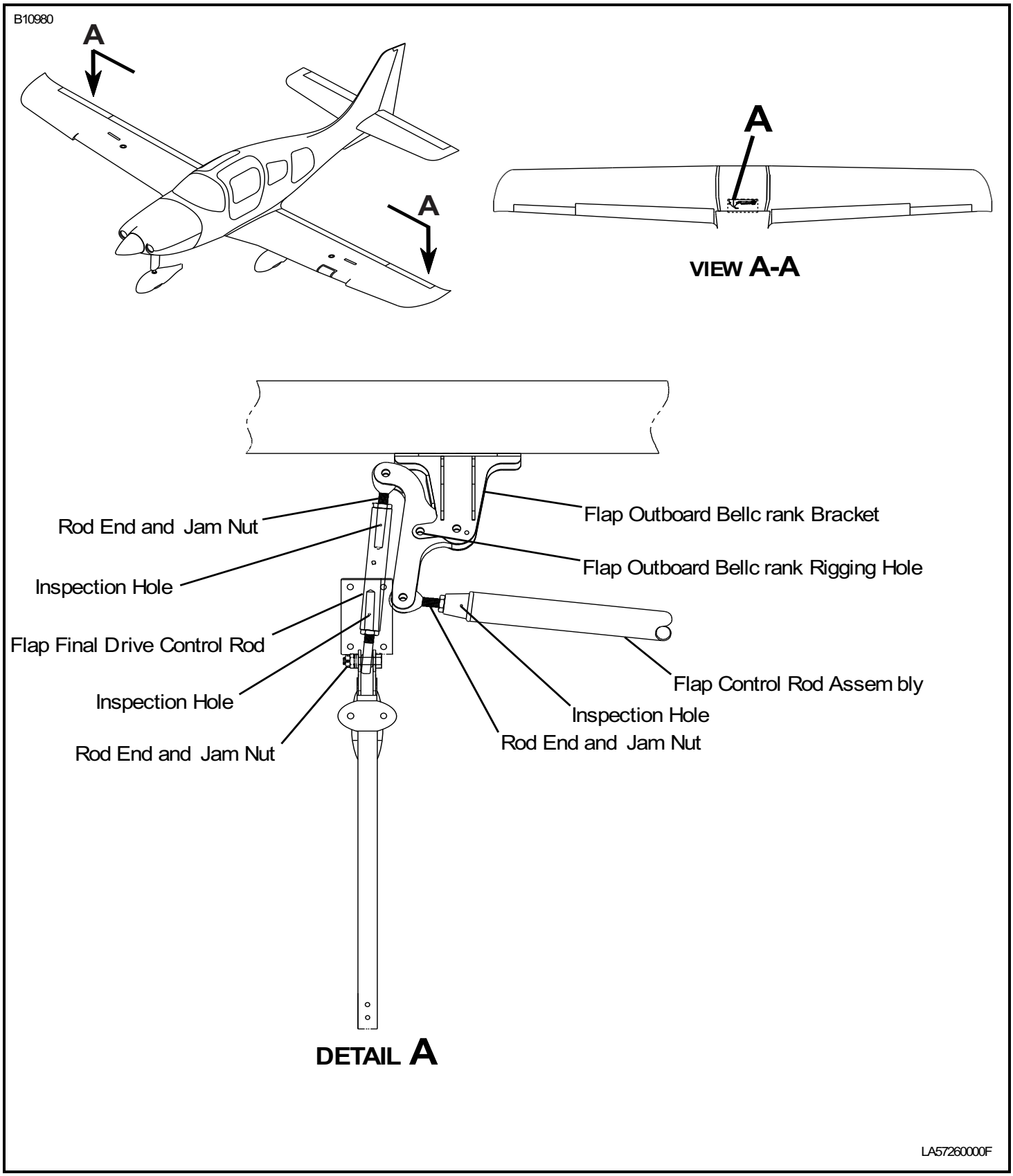
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Figure 204 : Sheet 1 : Flap Actuator Detail - Top View



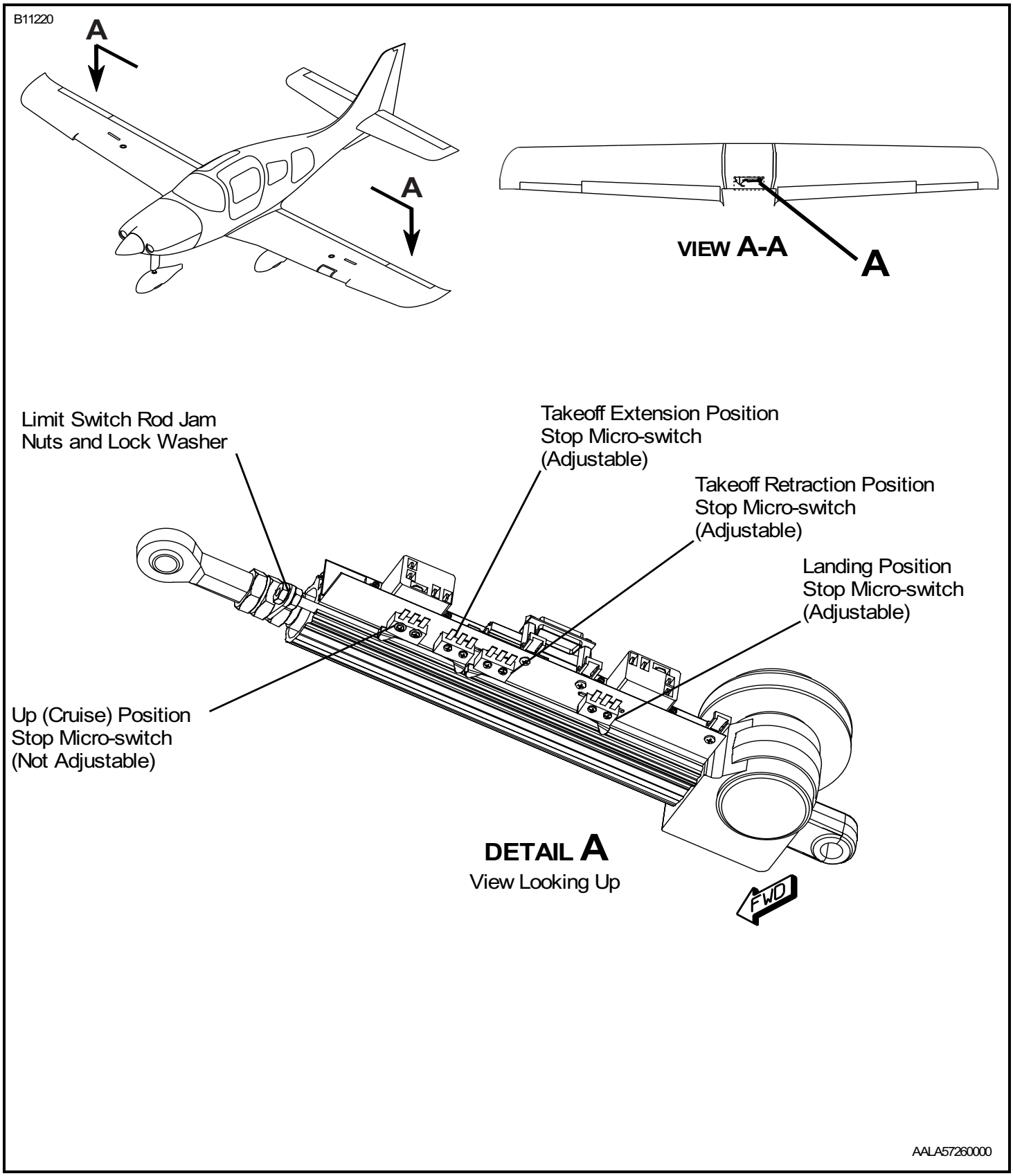
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Figure 205 : Sheet 1 : Flap Outboard Bellcrank and Final Drive



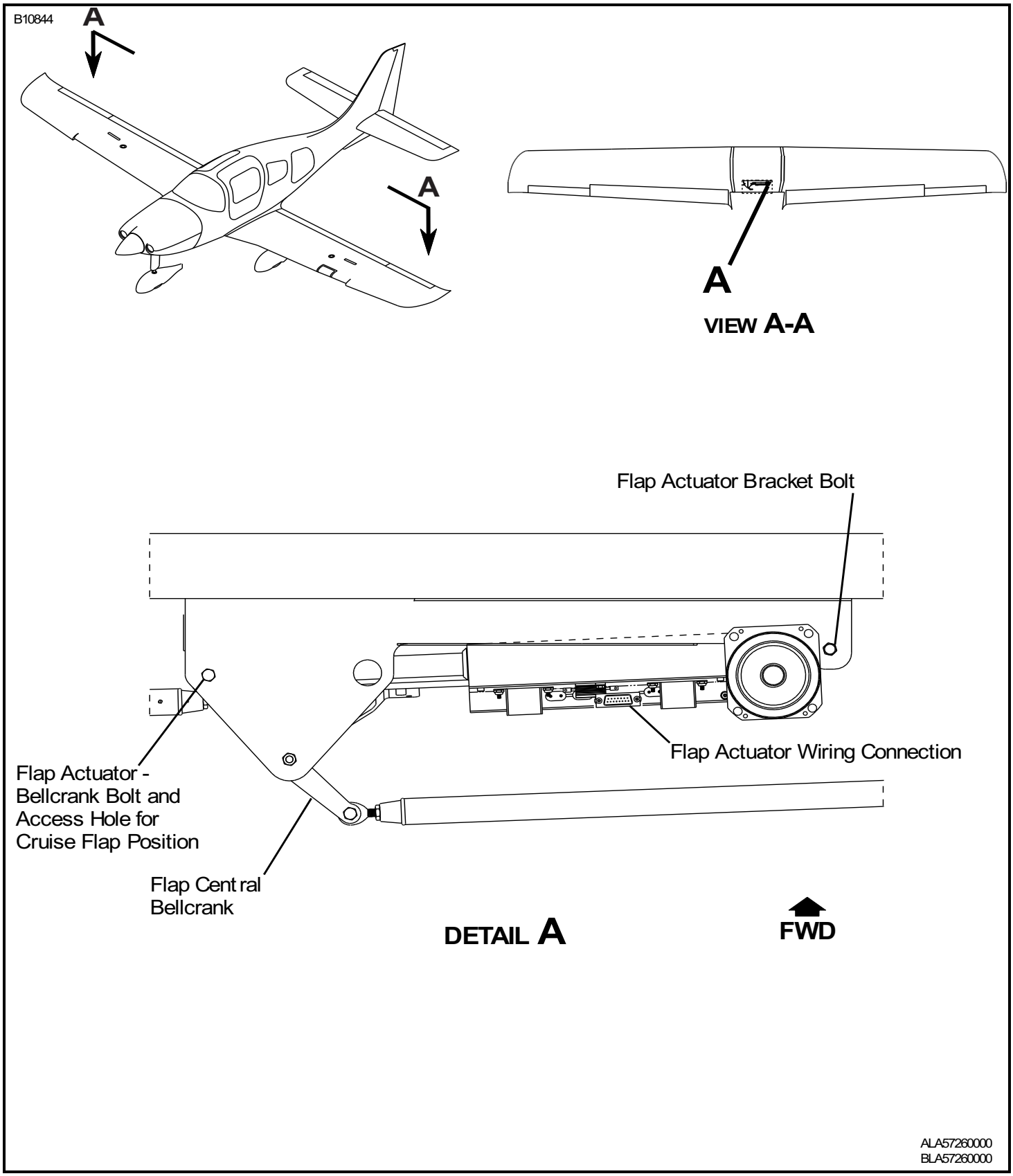
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Figure 206 : Sheet 1 : Flap Actuator and Limit Switch Detail



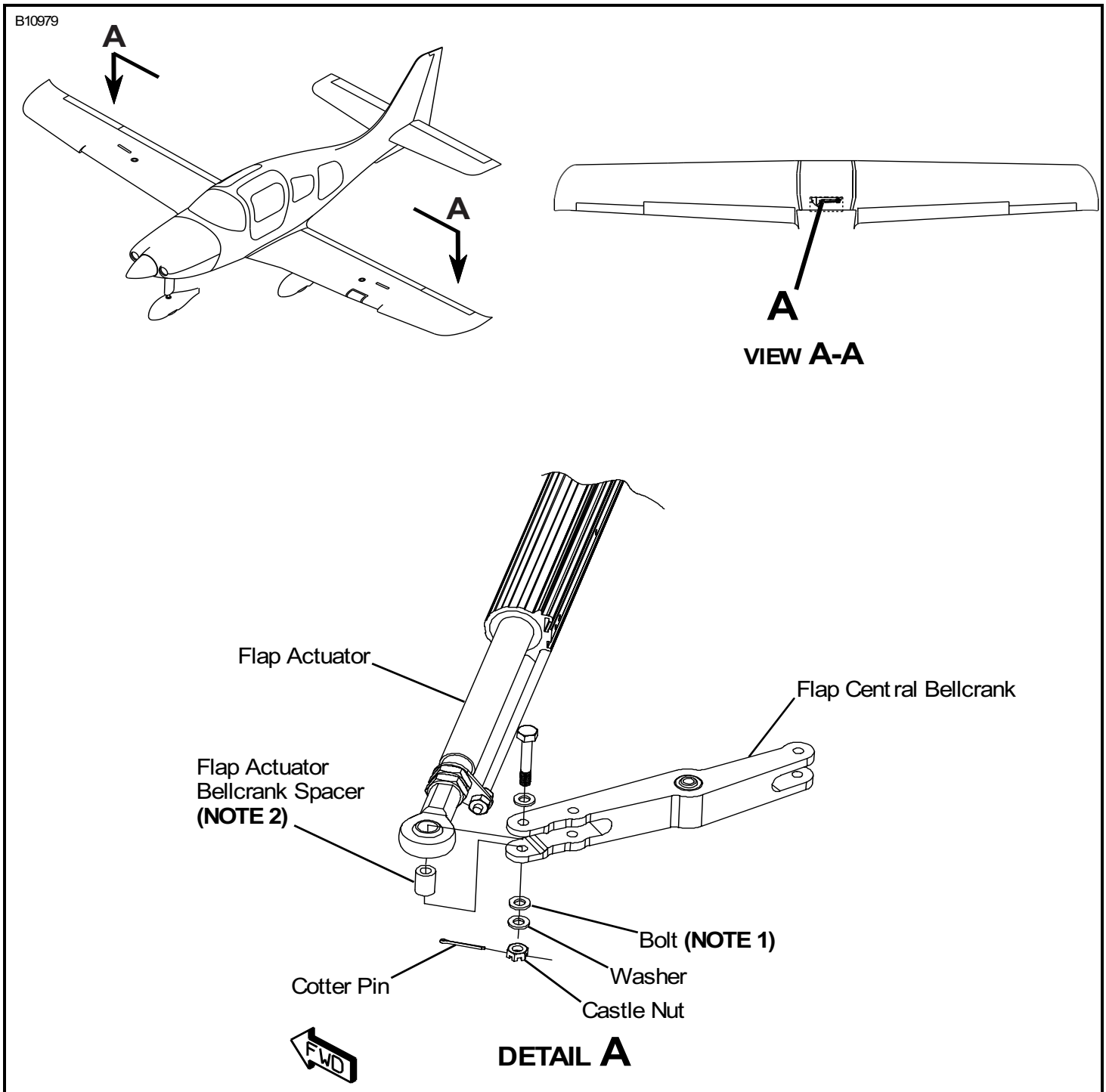
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Figure 207 : Sheet 1 : Flap Central Bellcrank and Actuator Assembly



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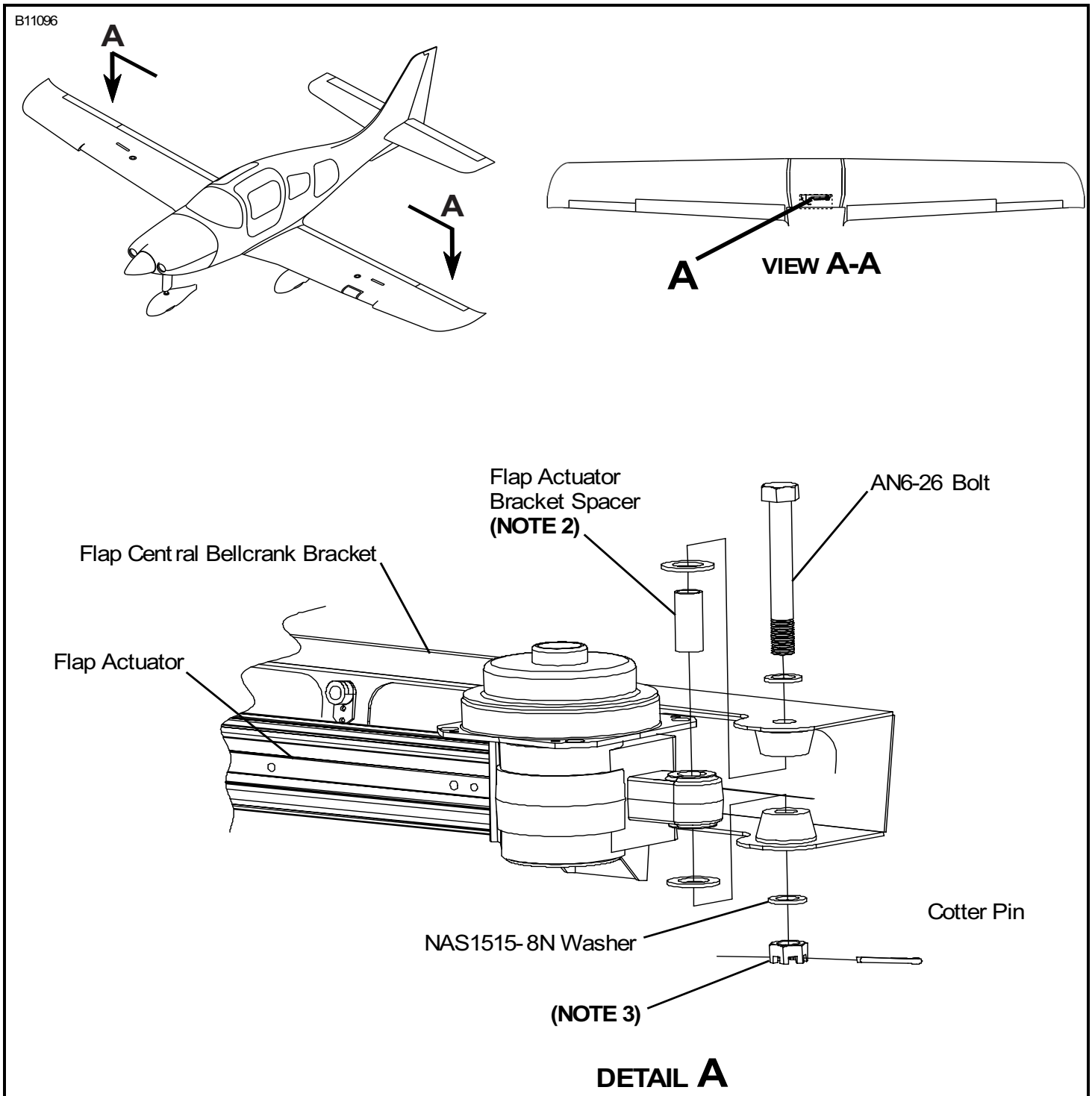
Figure 208 : Sheet 1 : Flap Actuator to Bellcrank Bolt and Spacer Detail



NOTE 1: P/N: LA57261013 NAS1 149F0463P
NOTE 2: P/N: LA57261007

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Figure 209 : Sheet 1 : Flap Actuator to Bracket Bolt and Spacer Detail



NOTE 1: Limit Switches not shown.
NOTE 2: P/N: LA57261011
NOTE 3: NAS1149F0663P Washer and AN310-6 Nut

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SPEED BRAKE SYSTEM - MAINTENANCE PRACTICES

1. SpeedBrake™ System - General

A. **SpeedBrake™ System** - The Precise Flight SpeedBrake™ 2000 System is an option on Avidyne option and Garmin G1000 option airplanes. On the Model T24/G2000 installations the Precise Flight SpeedBrake™ 2000 System is standard. The installation of the system is similar except for the Asymmetric Logic Control that is installed on the of the right side on the bottom of the avionics shelf. For the Model T240/G2000 Asymmetric Logic Control Assembly removal and installation procedures refer to, , Asymmetric Logic Control Assembly (T240) - Removal/Installation.

B. **SpeedBrake™ System** - The Precise Flight SpeedBrake™ 2000 System provides expedited descents at low cruise power, glide path control on final approach, airspeed reduction, and an aid to the prevention of excessive engine cooling in descent. The SpeedBrakes™ will retract, will not automatically re-extend, and the activation rocker switch must be cycled OFF and then ON after the following conditions:

(1) Circuit breaker pull.

(2) Automatic stowage due to asymmetric deployment or low voltage.

C. **SpeedBrake™ Components** - Refer to Figure 201. The Series 2000 SpeedBrake™ consists of wing-mounted electric SpeedBrake™ Cartridges. A central logic-switching unit interconnects each SpeedBrake™ Cartridge electronically and a panel mounted SpeedBrake™ actuator switch controls SpeedBrake™ deployment. The SpeedBrake™ Cartridges receive electrical power from the aircraft electrical bus through a disconnect-type circuit breaker.

(1) Speed Brake Switch (SI004)

(a) Garmin G1000 Option and Avidyne Option - The SpeedBrake™ rocker switch is found next to the throttle in the center of the instrument panel. The switch is positioned UP/ON to fully deploy and is positioned DOWN/OFF to retract the SpeedBrakes™.

(b) Model T240/G2000 installation - The speed brake switch is found a small distance above the throttle controls, on the engine control panel.

(2) The speed brake annunciator is found as follows:

(a) Avidyne option - The SpeedBrake™ Annunciator is located above and to the right of the airspeed indicator on the pilot instrument panel. The Annunciator will fully light after the SpeedBrake™ Switch is toggled ON and both brakes are in the up position. If one or both lights in the annunciator do not come on and both brakes do not extend after the switch is set to on, it indicates a failure of one or both SpeedBrake™ cartridge(s). The SpeedBrake™ switch should be set to OFF. When the SpeedBrake™ Switch is set to OFF, both brakes stow in the wing and the annunciator goes out.

(b) Model T240/G2000 - The SPEED BRAKE message shows on the Crew Alert System (CAS) window on the MFD when the speed brakes are active. When the speed brake switch is set to OFF, both brakes stow in the wing and the CAS message goes out. If the CAS message does not come and both brakes do not extend after the switch is set to on, it indicates a failure of one or both SpeedBrake™ cartridge(s). The SpeedBrake™ switch should be set to OFF.

NOTE: The SpeedBrake™ Cartridges and/or the Asymmetric Logic Control Unit must be returned to the manufacturer should repair or replacement be required. Even though only one cartridge may require repair or replacement, both cartridges must be returned to the manufacturer.

2. SpeedBrake™

A. **SpeedBrake™ Cartridge Removal** - The SpeedBrake™ cartridges are located within the upper side of the wing and approximately 1/3 of the wing length from the tip of the wing. One SpeedBrake™ cartridge is installed in each wing. Refer to Figure 202 and Figure 203.

(1) Remove the access panel on the underside of the left or right outboard wing.

(2) Disconnect the electrical connection.

(3) Remove the two 8-32 screws and remove the cartridge. Note the screw length and the hole from which it was removed. The screws may be of differing lengths and must be reinstalled in the holes from which they were removed.

(4) A bottom mount bar is attached to the bottom of the SpeedBrake™ cartridge by two 8-32 round head screws. The bottom mount bar may be removed by removal of these screws.

B. **SpeedBrake™ Cartridge Installation** - Refer to Figure 202 and Figure 203.

(1) Attach the bottom mount bar to the bottom of the SpeedBrake™ cartridge with two 8-32 round head screws. Torque

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the screws 6 to 8 in.-lbs.

(2) Insert the speed brake cartridge into the wing.

(3) Connect the electrical connection.

(4) Install the 8-32 screws. Screws may be of differing lengths and must be reinstalled in the holes from which they were removed. Torque 15 to 18 in-lbs. Installed SpeedBrake™ cartridge should be flush with the wing surface within ±0.020 inches. Bottom wing skin should have no more than 0.003 inches distortion after torquing.

(5) Replace the access panel.

C. **Asymmetric Logic Control Unit Removal (Avidyne Option and G1000 Option)** - The asymmetric logic control unit is located in the avionics shelf under the baggage compartment floor. Refer to Figure 201.

NOTE: The Model T240/G2000 Asymmetric Logic Control Assembly removal/Installation procedures are found at, Asymmetric Logic Control Assembly (T240) - Removal/Installation.

(1) Remove the carpet and access panel from the baggage compartment floor per instructions in Chapter 25.

(2) Loosen the mounting screws that hold the unit to the avionics shelf.

(3) Disconnect all connectors to the unit.

(4) Remove the unit.

D. **Asymmetric Logic Control Unit Installation** - Refer to Figure 201.

(1) Connect the connectors.

(2) Place the unit in its place on the avionics shelf.

(3) Install screws to connect the unit to the shelf and torque screws 15 in.-lbs.

(4) Install the access panel.

(5) Replace the carpet.

E. **Servicing and Maintenance**

(1) Check SpeedBrake™ Cartridge cap strip cover screws and top attachment screws for security. If loose, remove screws and apply Loctite 242 and retorque to 8 in-lbs.

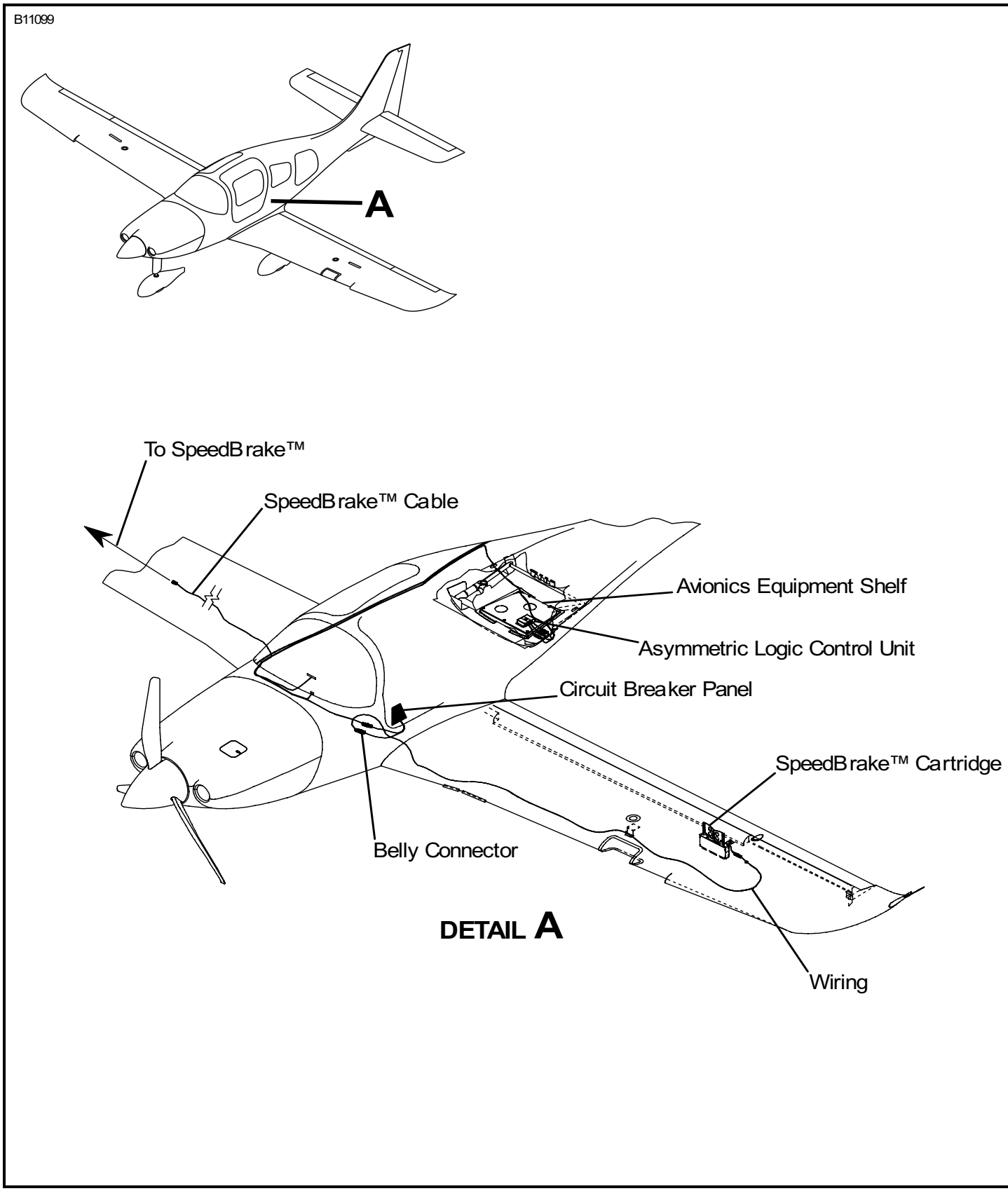
(2) Annually remove the SpeedBrake™ Cartridge cover plate, clean and inspect for damage, corrosion, looseness and proper operation. Lubricate worm and worm gear with LUBRIPLATE. Reinstall the cover plate by applying Loctite 242 to the screw threads and torque to 8 in-lbs.

(3) Return the SpeedBrake™ Cartridge to the manufacturer every 1000 hours for clutch lubrication and spring replacement.

(4) Return the SpeedBrake™ Cartridge to the manufacturer every 5000 hours for drive assembly replacement.

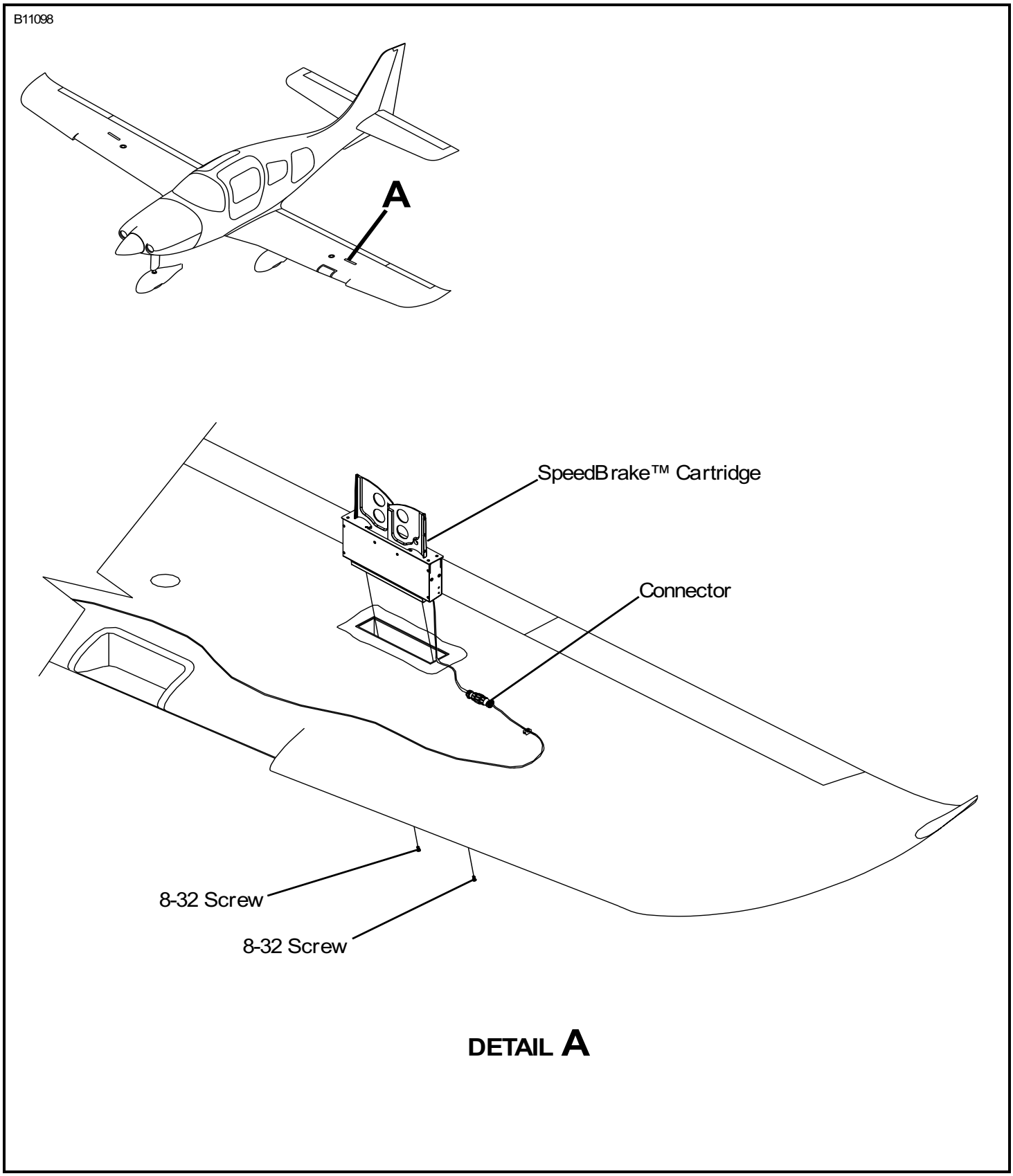
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Figure 201 : Sheet 1 : SpeedBrake™ System



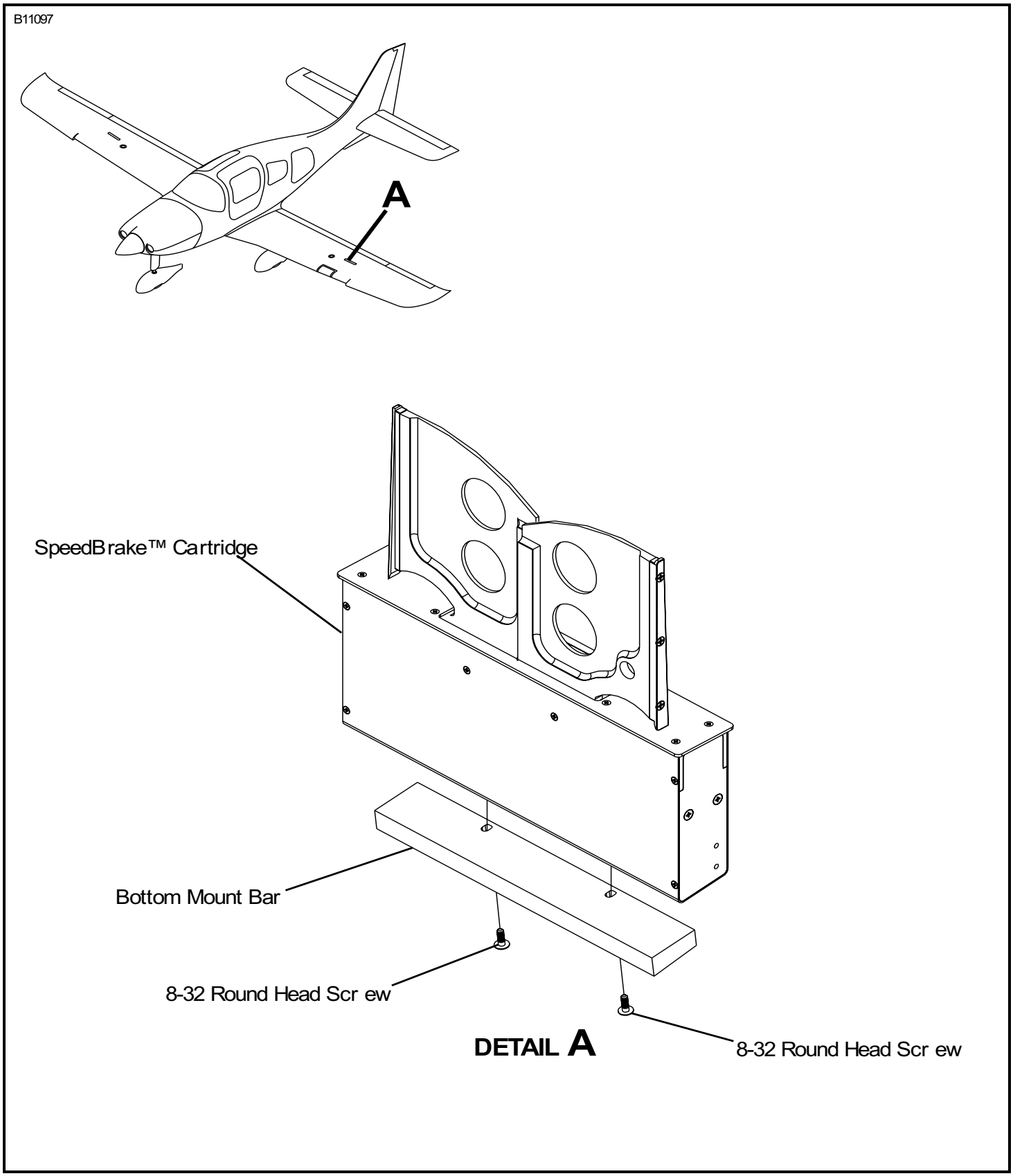
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Figure 202 : Sheet 1 : SpeedBrake™ Cartridge



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Figure 203 : Sheet 1 : SpeedBrake™ Cartridge Detail



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ASYMMETRIC LOGIC CONTROL ASSEMBLY (T240) - REMOVAL/INSTALLATION

1. General

A. This section gives the removal and installation for the Model T240 Asymmetric Logic Control Assembly (ALC). The ALC is installed on the bottom of the avionics shelf, below the right side of the instrument panel. The ALC is a asymmetric logic control-switching unit that controls the speed brakes. The ALC connects the left and right wing speed brake components electronically. For the maintenance procedures of the other components of the speed brake system and airplanes that have the Avidyne option or the Garmin G1000 option installed refer to, Speed Brake System - Maintenance Practices.

2. ALC Removal/Installation

A. Remove the ALC (UC305) (Refer to Figure 401).

(1) Remove external electrical power from the airplane.

(2) Make sure that the master BATT switches (left SW01 and right SW02) are in the OFF position.

(3) Make sure that the AVIONICS MASTER switch (SW04) is in the OFF position.

(4) Disengage the SPEED BRAKES circuit breaker, found on the cockpit circuit breaker panel.

(5) Remove the screws that attach the ALC to the bottom of the avionics shelf.

(a) If necessary, remove the copilot seat to get access to the ALC. Refer to Chapter 25, Airplane Seats - Maintenance Practices.

(6) Disconnect the electrical connectors as follows:

(a) Disconnect the electrical connector (J161) from electrical connector (P1)

(b) Disconnect the electrical connector (P162) from electrical connector (P2)

(c) Disconnect the electrical connector (P163) from electrical connector (P3).

(7) Remove the ALC from the airplane.

B. Install the ALC (UC305) (Refer to Figure 401).

(1) Put the ALC in its correct position below the avionics shelf.

(2) Install the screws that attach the trim ALC to the avionics shelf.

(3) Visually inspect the connectors to make sure that there are no bent or damaged pins.

(a) Repair any damage.

(4) Connect the electrical connectors as follows:

(a) Connect the electrical connector (J161) to electrical connector (P1)

(b) Connect the electrical connector (P162) to electrical connector (P2)

(c) Connect the electrical connector (P163) to electrical connector (P3).

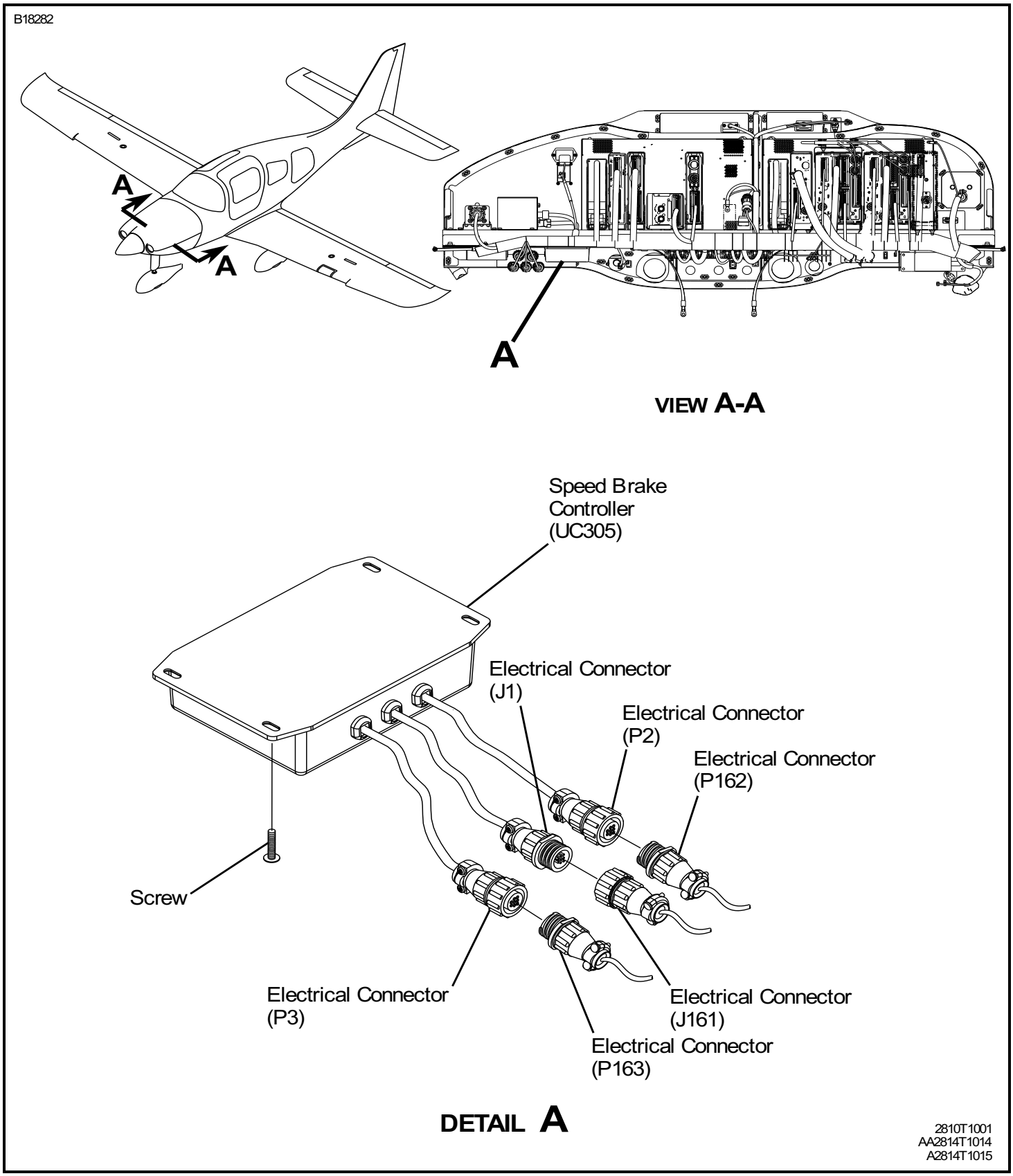
(5) If removed, install the copilot seat. Refer to Chapter 25, Airplane Seats - Maintenance Practices.

(6) Engage the SPEED BRAKES circuit breaker, found on the cockpit circuit breaker panel.

(7) Do a test of the speed brake and adjustment as necessary. Refer to Chapter 20, Lightning Protection And Static Dissipation - Maintenance Practices, Speed Brake Operational Checks.

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Figure 401 : Sheet 1 : ALC Installation



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FUEL - GENERAL

1. General - Fuel System

A. **Overview** - The fuel system has two tanks that gravity feed to a three position (Left, Right, and Off) fuel selector valve located in the wing and actuated from the selector knob in the forward part of the arm rest between the pilot and copilot seats. The fuel flows from the selected tank to the auxiliary fuel pump and then to the strainer. From this point, the fuel goes to the engine-driven pump where, under pressure, it is sent through a fuel flow transducer to the throttle/mixture control unit and then on to the fuel manifold valve for distribution to the cylinders. Unused fuel from the continuous flow fuel injector system is returned to the selected fuel tank. Refer to Figure 1 or Figure 2 for a general layout of the fuel system.
Each fuel tank contains a slosh box near the fuel supply lines. A partial rib near the inboard section of the fuel tank creates a small containment area with a check valve that permits fuel flow into the box but restricts outflow. The slosh box is like a mini-fuel tank that is always full. The slosh box's function, in conjunction with the flapper valves, is to ensure short-term positive fuel flow during adverse flight attitudes, such as when the airplane is in an extended sideslip or subject to the bouncing of heavy turbulence.

B. **Fuel Quantity Indication** - The airplane has integral fuel tanks, commonly referred to as a "wet wing". Each wing has two internal, interconnected compartments that hold fuel. The wing's slope or dihedral produces different fuel levels in each compartment and requires two floats in each tank to accurately measure total quantity. The floats move up and down on a pivot point between the top and bottom of the compartment, and the position of each float is summed into a single indication for the left and right tanks. The positions of the floats depends on the fuel level; changes in the float position increases or decreases resistance in the sending circuit, and the change in resistance shows as a fuel quantity indication on either the gauge (Avidyne option) or the MFD System Page (Garmin G1000 option or G2000 installation). The indicators are powered by the airplane's electrical system, protected by a two-amp circuit breaker and will not operate with the master switch turned off.

NOTE: The fuel calculation group of the Garmin G1000 or G2000 systems MFD's System Page provides approximate indications and are never substitutes for proper planning and pilot technique. Always verify the fuel onboard through a visual inspection, and compute the fuel used through time and established fuel flows.

C. **Fuel Selector** - The fuel tank selector handle is between the two front seats, at the forward part of the arm rest. The selector is movable to one of three positions: Left, Right, and Off. The fuel tank selector handle is connected to a drive shaft that moves the actual fuel valve assembly located in the wing saddle. Moving the fuel tank selector handle applies a twisting force to move the fuel selector valve.

D. When the fuel tank selector handle is moved to a particular position, positive engagement occurs when the fuel selector valve rests in one of the three available detents: Left, Right, and Off. The left and right tanks are changed by rotating the handle to the desired tank position; initially, a small amount of additional pressure is required to move the valve out of its detent. A spring-loaded release knob in the selector handle prevents inadvertent movement beyond the right and left tank positions. To move to the off position, pull up on the fuel tank selector and rotate the handle until the pointer is in the off position and the fuel valve is seated in the detent. To move the handle from the off position to the left or right tank, pull up on the selector, and rotate the handle to the desired tank.

E. When a tank is selected and the selector is properly seated in its detent, one of two green lights on the left and right side of the fuel gauge (Avidyne option) or one of two blue lights on the fuel calculation group on the MFD System Page (Garmin G1000 option or G2000 installation) will illuminate to indicate which tank is selected. If a tank is selected, and a light is not illuminated, then the selector handle is not properly seated in the detent. In addition, if the fuel selector is not positively seated in either the left or right detent, or is in the off position, a red FUEL VALVE light indication shows on the annunciator panel (Avidyne option) or the PFD Annunciation window (Garmin G1000 option or G2000 installation).

F. **Fuel Low Annunciators** - There is a separate system, independent of the fuel quantity indicators, that shows a low fuel state. A fuel level switch in each tank operates a L LOW FUEL or R LOW FUEL light on the annunciator panel (Avidyne option) or shows on the PFD Annunciation window (Garmin G1000 option or Model T240/G2000 installation) when there is less than 8 gallons (S/N 41501 to 41799), or 10 gallons (S/N 41800 and On and Model T240) of usable fuel remaining in that tank. The fuel warning light has a 30 second delay switch, that limits false indications during flight in turbulent air conditions.

G. **Fuel Vents** - There is a ventilation source for the fuel tank in each wing. The vents are wedge-shaped recesses built into the access panel. They are located under the wing approximately five feet inboard from the wing tip and positioned to provide positive pressure to each tank. The vents should be open and free of dirt, mud and other types of clogging substances. When fuel expands beyond a tank's capacity, it is sent out the fuel vent if both tanks are full. An internal tank

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pressure of more than two to three psi will allow fuel to drain from the vents.

H. **Fuel Drains and Strainer** - The inboard section of each tank contains a fuel drain near the lowest point in each tank. The fuel drain can be opened intermittently for a small sample, or it can be locked open to remove a large quantity of fuel. The gascolator, or fuel strainer, is located under the fuselage, on the left side, near the wing saddle. Open the accessory door in this area for access to the gascolator. The gascolator is a conventional drain device that operates by pushing up on the valve stem. There is an internal bypass in the strainer that routes fuel around the filter if it becomes clogged.

2. Servicing

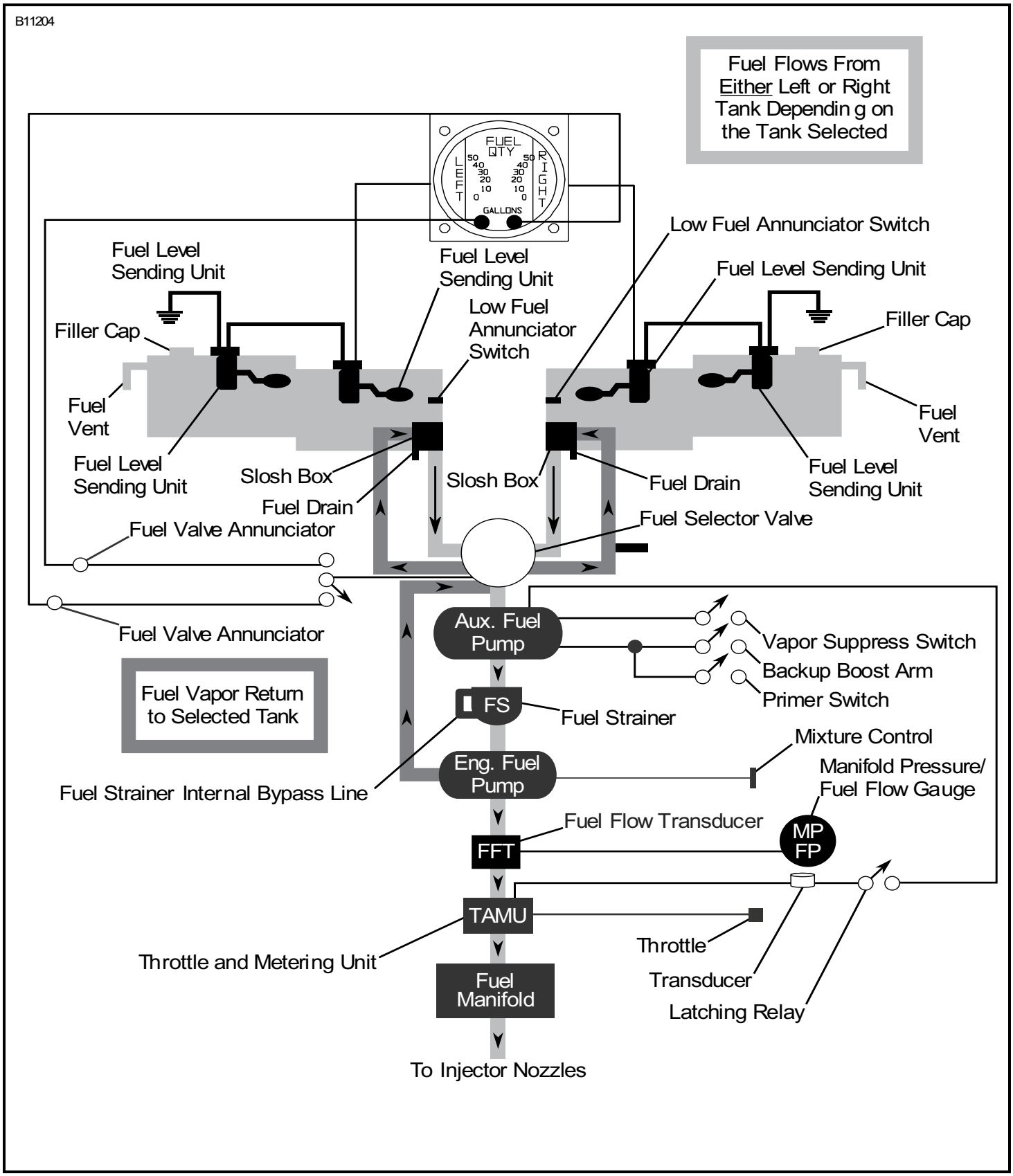
A. Refer to Chapter 12 of this manual for detailed instructions.

3. Fuel Additives

A. Refer to Chapter 12 of this manual for detailed instructions.

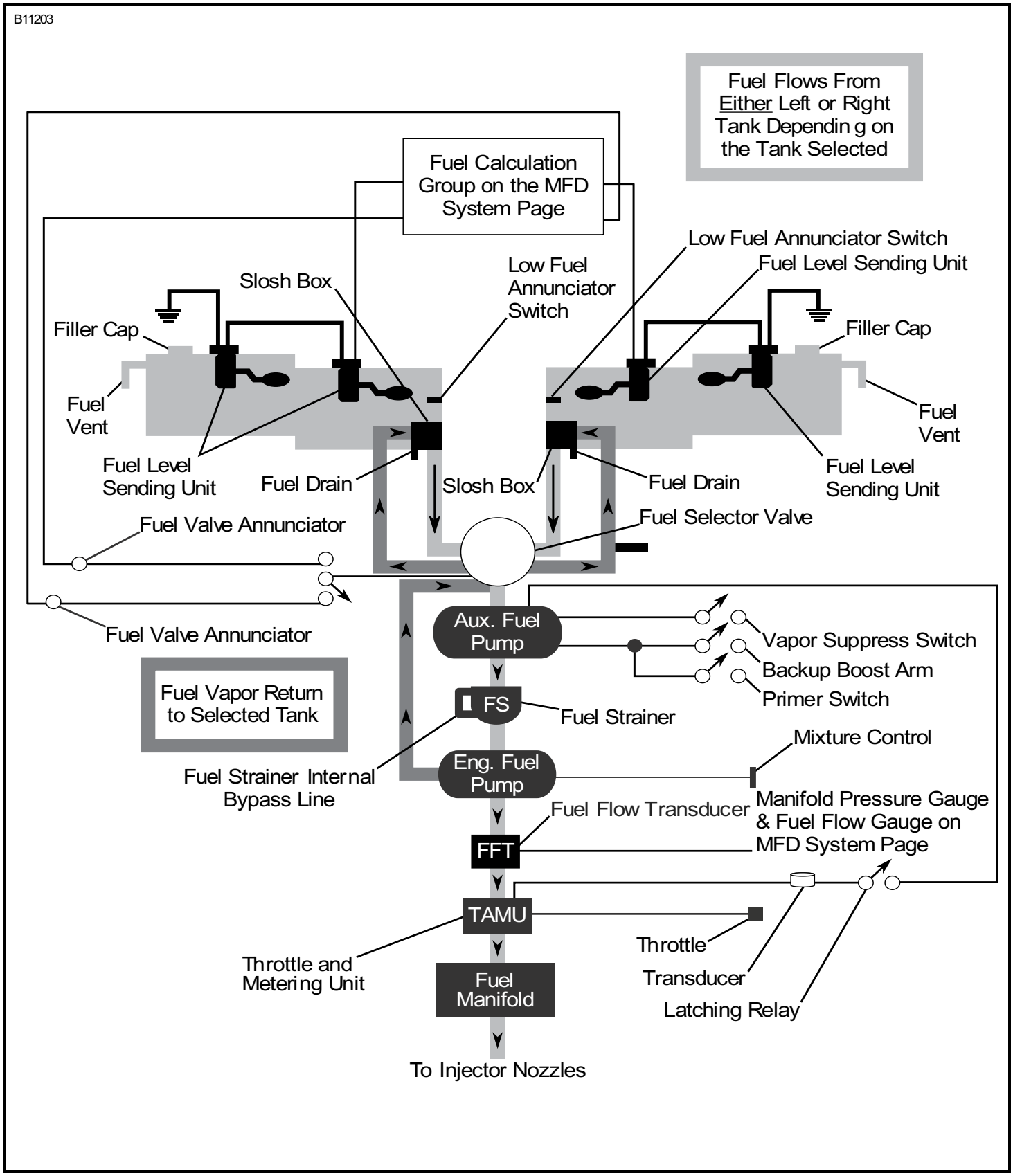
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Figure 1 : Sheet 1 : Fuel System Diagram (Avidyne Option)



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Figure 2 : Sheet 1 : Fuel System Diagram (Garmin G1000 Option and Model T240/G2000)



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STORAGE - MAINTENANCE PRACTICES

1. Storage - Venting

A. The fuel tank vents are located in the outboard access panels. These panels have a molded scoop mounted flush with the lower surface of the wing with a bonded aluminum tube for the attachment of the fuel vent hose from the expansion area of the fuel tank. The fuel vent hose connects to the fuel vent near the top of the rib at WS 145.00. The hose is installed such that the lowest point in the line is the vent opening.

B. **Vent Removal** - Refer to Figure 201.

(1) De-fuel the fuel tanks and open the outboard access panel/fuel vent and the outboard fuel bay access panel.

(2) Remove the hose clamp around the vent hose, and slide the hose off the vent tube in the rib.

(3) If required for hose replacement, remove the hose clamp around the access panel vent tube, and slide off the tube.

C. **Vent Installation** - Refer to Figure 201.

(1) Slide the vent hose over the vent tube in the rib, and install the clamp. Torque 17 to 18 in.-lbs.

(2) Slide the vent hose over the access panel vent tube, and install the clamp. Torque 17 to 18 in.-lbs.

(3) Re-install access panels. Apply Loctite 222 or Permatex No. 2 and torque 12 to 15 in.-lbs.

2. Fuel Level Sensors

A. **General Description** - Each wing tank has two fuel level float sensors that indicate the quantity of fuel in the tank; the combined resistance of both sensors is 185±5 ohms (at empty tank) and 0 - 10 ohms (at full tank). Refer to Figure 202.

B. **Removal of the Fuel Level Sensors**

(1) Remove the 15, 6-32 flat head screws from the fuel tank access panel nearest the fuel level sensor that requires access. (There are four fuel tank access panels, two on each wing. The access panel locations are shown in Chapter 57.) Slowly peel the panel away from the wing (the panel is also attached with sealant).

(2) Remove four, 10-32 hex head bolts attaching the sensor to the bracket, noting the position of the grounding strap.

(3) Remove the nut from the center fuel sensor bolt, noting the attachment of the grounding strap. Refer to Figure 203.

(4) Remove the sensor.

C. **Installation of the Fuel Level Sensors**

(1) Set the sensor on the bracket and align the four bolt holes, ensuring that the float on the sensor is pointed inboard. Refer to Figure 202.

(2) Install four, 10-32 hex head bolts with the bolt heads away from the bracket (only four of the five sensor holes will be bolted through) while reattaching the ground strap under the bolt it was initially removed from. Torque the bolts 30 to 36 in.-lbs.

(3) Reattach the grounding strap under the center sensor bolt, and replace the nut. Refer to Figure 203.

(4) Replace the access panel by applying PR-1428 sealant to the side of the access panel that will contact the wing skin joggle. Replace the screws in the access panel. Torque the screws 12 to 20 in.-lbs.

3. Slosh Boxes, Fuel Pickup, and Vapor Return

A. **General Description** - The slosh box is an internal sub-compartment mounted in the inboard section of the fuel tank. Refer to Figure 204 and Figure 205. The purpose of the slosh box is to provide a compartment around the fuel pickup to hold fuel during low fuel level operation.

B. **Replacing Vapor Return Lines**

(1) Contact the manufacturer when replacing the in-tank vapor return lines.

C. **Removal - Fuel Tank Strainer**

(1) Defuel the aircraft, then open the inboard fuel bay panel.

(2) Remove the slosh box lid to gain access to the fuel tank finger strainer. Refer to Figure 207.

(3) Loosen the hose clamp, and remove the finger strainer.

D. **Installation - Fuel Tank Strainer**

(1) Installation is a direct reversal of the removal.

(a) Torque nut 17 to 18 in.-lbs.

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E. **Replacing the Slosh Door**

(1) During normal operation, the slosh door should not wear. During tank inspections verify smooth operation of the door without binding.

(2) **Removing the Slosh Door**

(a) Access the slosh door through the inboard fuel bay access panel.

(b) Unbolt and remove the four mounting bolts that attach the slosh door to the slosh box. Refer to Figure 208.

(3) **Installing the Slosh Door**

(a) Installation is a direct reversal of removal.

4. Testing Fuel System

CAUTION: When testing the fuel system, DO NOT over-pressurize the wing tanks. Doing so could result in structural damage to the wings.

A. **Procedures for Pressure Testing of Fuel Tank**

(1) Two people are required to perform this test. One person is needed to observe the manometer, and one person is needed to pressurize the tanks.

(2) Place the fuel selector in the off position.

(3) Connect a 4 foot length of plastic hose such as Tygon (OD 3/8 inch and ID 1/4 inch) to the left wing static air vent. Use sealant tape at the connection points to ensure a tight seal.

(4) Connect a digital manometer that reads between 0 and 5 psi (in 1/100 of an inch) with a T-fitting to the vent hose.

(5) Pressurize the wing from the manometer until the manometer reads 1.2 ±0.1 psi. Measurements can be taken with a low-pressure, hand-held pump, however, great care must be taken not to over-pressurize the tanks. The observer should call out manometer readings at each tenth of an inch.

(6) Crimp or cap off the hose and wait for 20 minutes. The pressure cannot drop more than 0.10 of an inch.

(7) While the fuel tank is still under pressure, apply a soapy solution to the following items to check for leak: All fittings and connectors on the fuel system from the spar to the fuel selector, around the left and right flap outboard bellcrank brackets, and the left and right fuel vent line fitting and attachment to the WS 145 rib.

(8) Repeat the procedure for the right wing.

5. Fuel Tank Drains

CAUTION: It is recommended to operate the drain in a well-ventilated area away from structures when working with fuel or fuel vapors.

CAUTION: When operating the fuel sump drain, care must be taken not to force the internal poppet into the drain, as damage to the drain may occur, and the drain may be stuck in the open position.

A. Each of the two integral fuel tanks are equipped with a sump drain for the sampling of fuel and removal of moisture and residual fuel from the tanks. Refer to Figure 206. The fuel tank sump is located inside the slosh box as described in the Slosh Boxes, Fuel Pickup, and Vapor Return paragraph above. Each drain is mounted to the wing skin with a castellated nut. An O-ring and sealant seal the drain to the wing skin. Some features of the drains used on the Cessna 400 include a replaceable primary O-ring seal that can be replaced without draining the tanks and a locking position to aid in the defueling of the aircraft.

NOTE: The primary O-ring seal on the fuel tank sump drain is replaceable when the drain is installed without defueling the aircraft. Refer to 'Replacement of Primary O-Ring Seal' below for detailed instructions on primary O-ring seal replacement.

NOTE: Contact the factory for replacement drains and access panels if required.

B. **Removal of Fuel Tank Sump Drain**

(1) Defuel the fuel tank that will have the drain removed. It is recommended to at least partially defuel the other wing tank to prevent a large fuel imbalance.

(2) Remove the inboard fuel tank access panel taking special care in the removal of the panel.

(3) Remove the slosh box lid as shown in Figure 209 by removing the eight bolts (S/N 41001 to 41786) or 5 bolts (S/N 41787 and on) to gain access to the drain.

(4) Remove the castellated nut from the drain; use a two-prong spanner on the outside of the drain to prevent spinning

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during removal. Remove the drain valve. Refer to Figure 210.

C. **Installation of the Fuel Tank Sump Drain**

(1) Add a film of the fuel tank sealant discussed in the Sealants For Panels, Valves, Fittings, And Switches section, to the upper surface of the valve assembly flange. Do not allow the sealant into the O-ring groove in the flange.

(2) Slip a new O-Ring, MS29513-021 or equivalent, over the drain, and insert in the wing.

(3) Torque castellated nut 48 to 60 in.-lbs.

NOTE: The final position of the nut must allow the inlet port of the drain to be centered in an opening between two of the castellations.

D. **Maintenance Practices**

(1) Cleaning - Periodic cleaning of the bottom of the drain and primary O-ring seal is recommended.

(a) To open the drain to access the primary O-ring seal, turn the white poppet 55 degrees clockwise using a Phillips screwdriver and let the poppet drop down as shown in Figure 211. An internal seal will stop the flow of fuel so defueling of the tank is not necessary.

(b) Clean the O-ring and area surrounding the primary seal.

(c) Push gently up and rotate 55 degrees counterclockwise to re-seal.

(2) Replacement of Primary O-Ring Seal

(a) To open the drain to access the primary O-ring seal, turn the white poppet 55 degrees clockwise using a Phillips screwdriver and let the poppet drop down. An internal seal will stop the flow of fuel so defueling of the tank is not necessary.

(b) Remove the worn seal; clean the O-ring groove and surrounding area.

(c) Replace the primary O-Ring seal, available through the manufacturer.

(d) Push gently up and rotate 55 degrees counterclockwise to re-seal.

E. **Fuel Testing**

The fuel should be tested for contaminants before each flight by taking a fuel sample from the fuel drains. The operation of the fuel drain is similar to other aircraft. To operate, gently push up on the white poppet, and drain the required amount of fuel. Do not force the poppet past the initial stop or damage may occur to the drain, and the poppet may not return to the closed position.

F. **Fuel Tank Draining**

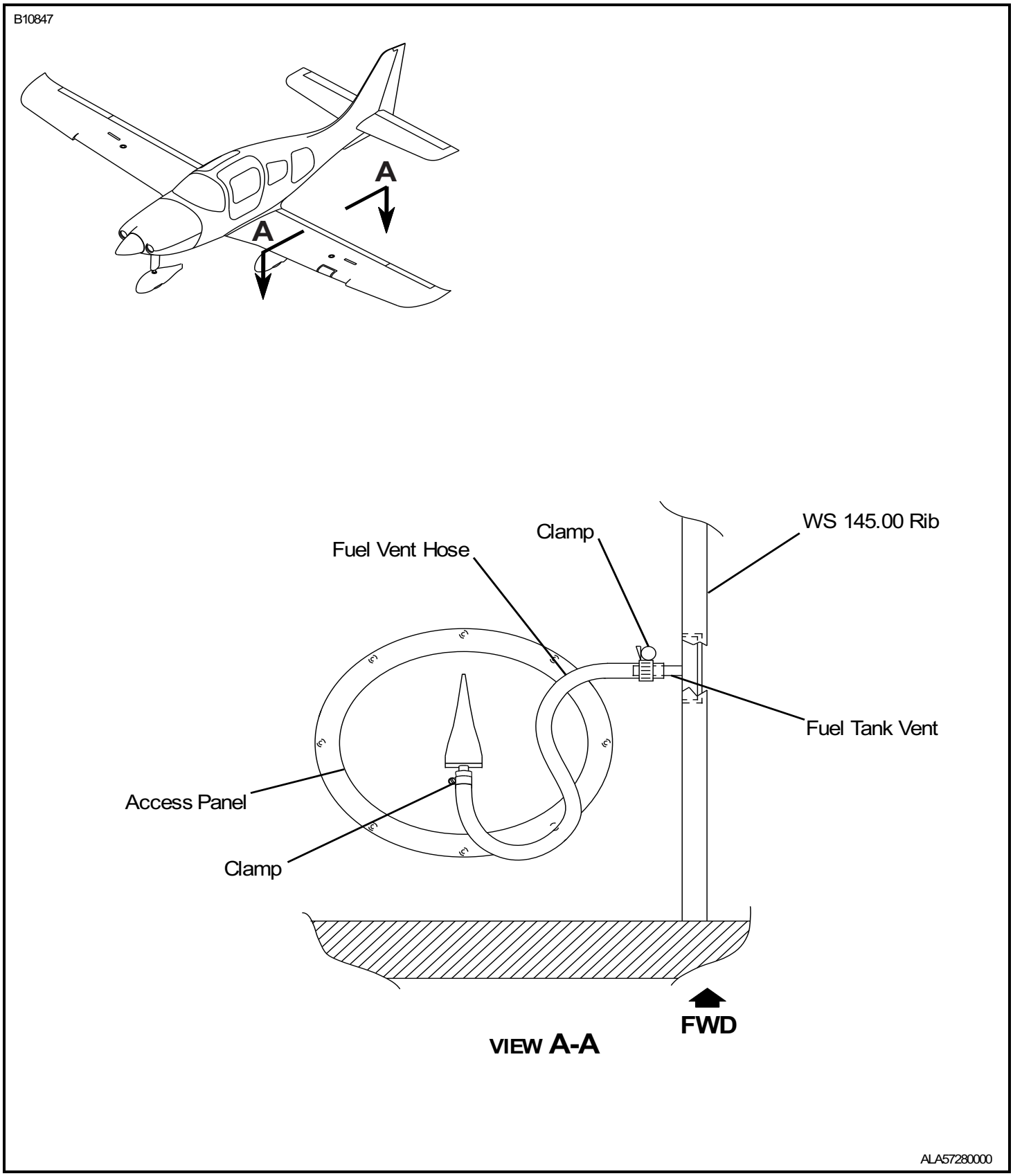
(1) To drain the fuel tanks, use a Phillips head screwdriver, push gently up on the internal poppet of the valve to open the primary seal, and rotate counterclockwise approximately 15 degrees.

(2) Close the drain by reversing the process.

NOTE: Fuel will start flowing once the internal poppet is pushed up. Have a suitable container placed below the drain prior to opening the valve.

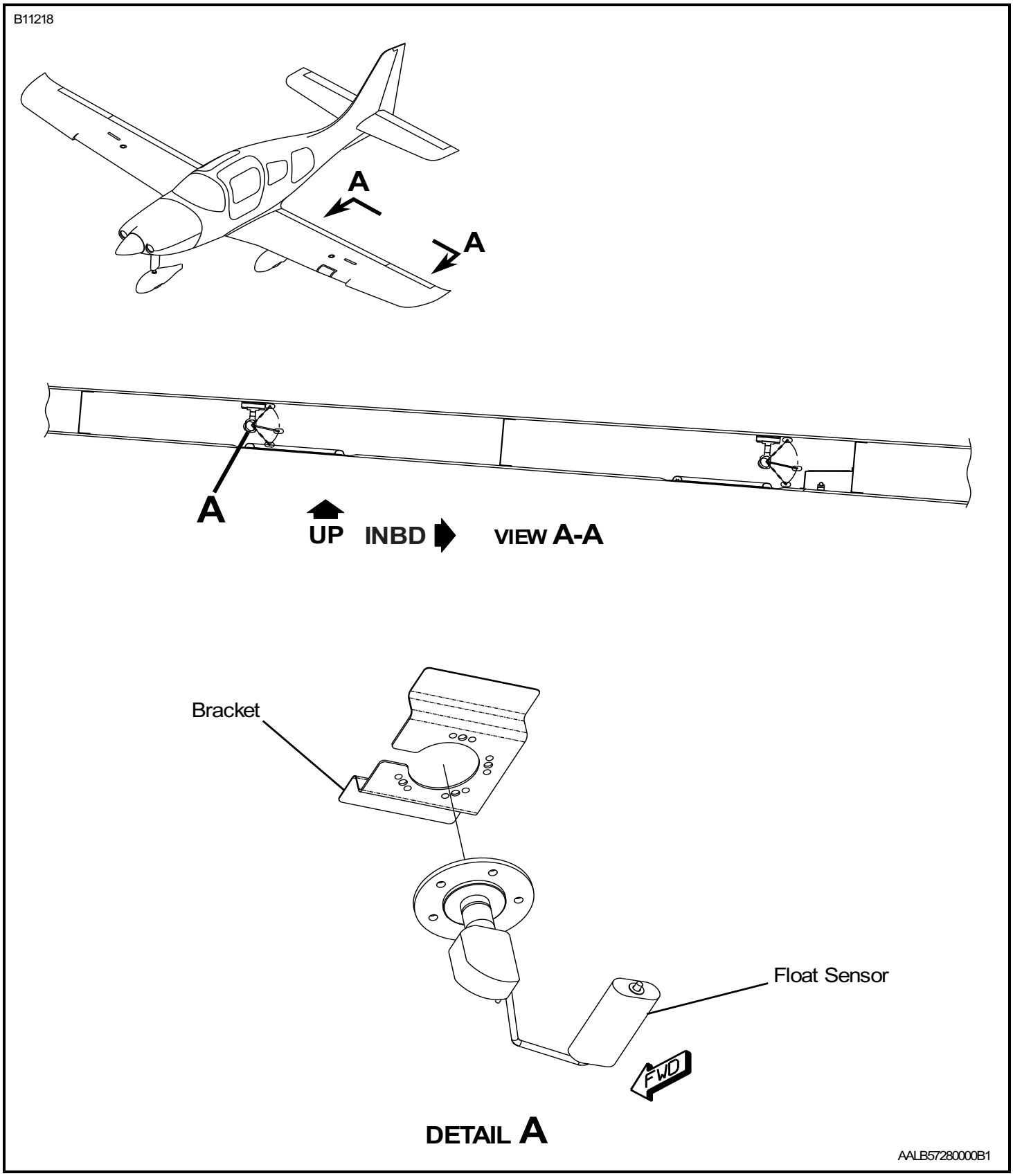
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Figure 201 : Sheet 1 : Fuel Tank Vent (Left Side Shown)



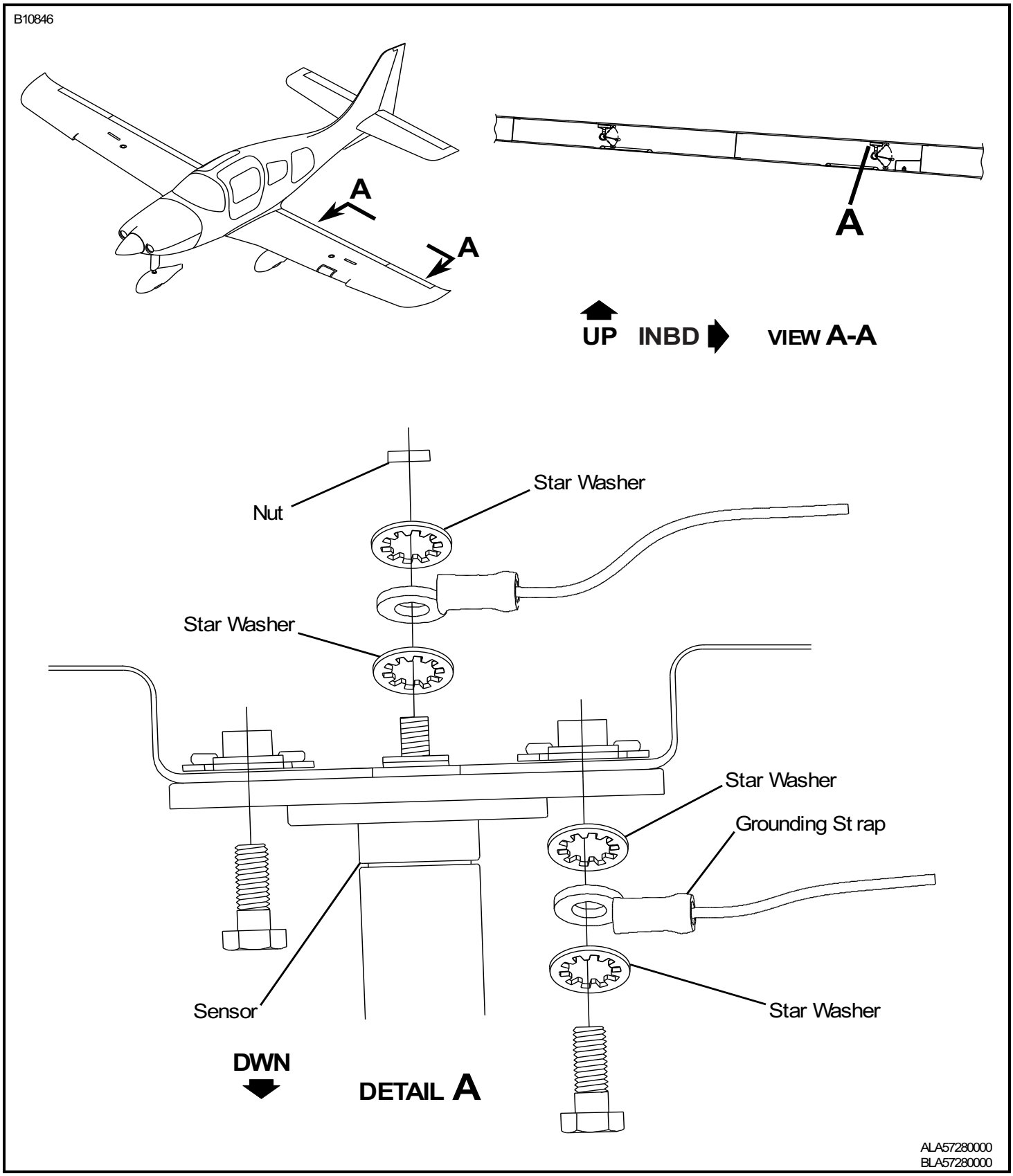
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Figure 202 : Sheet 1 : Outboard Fuel Level Sensor



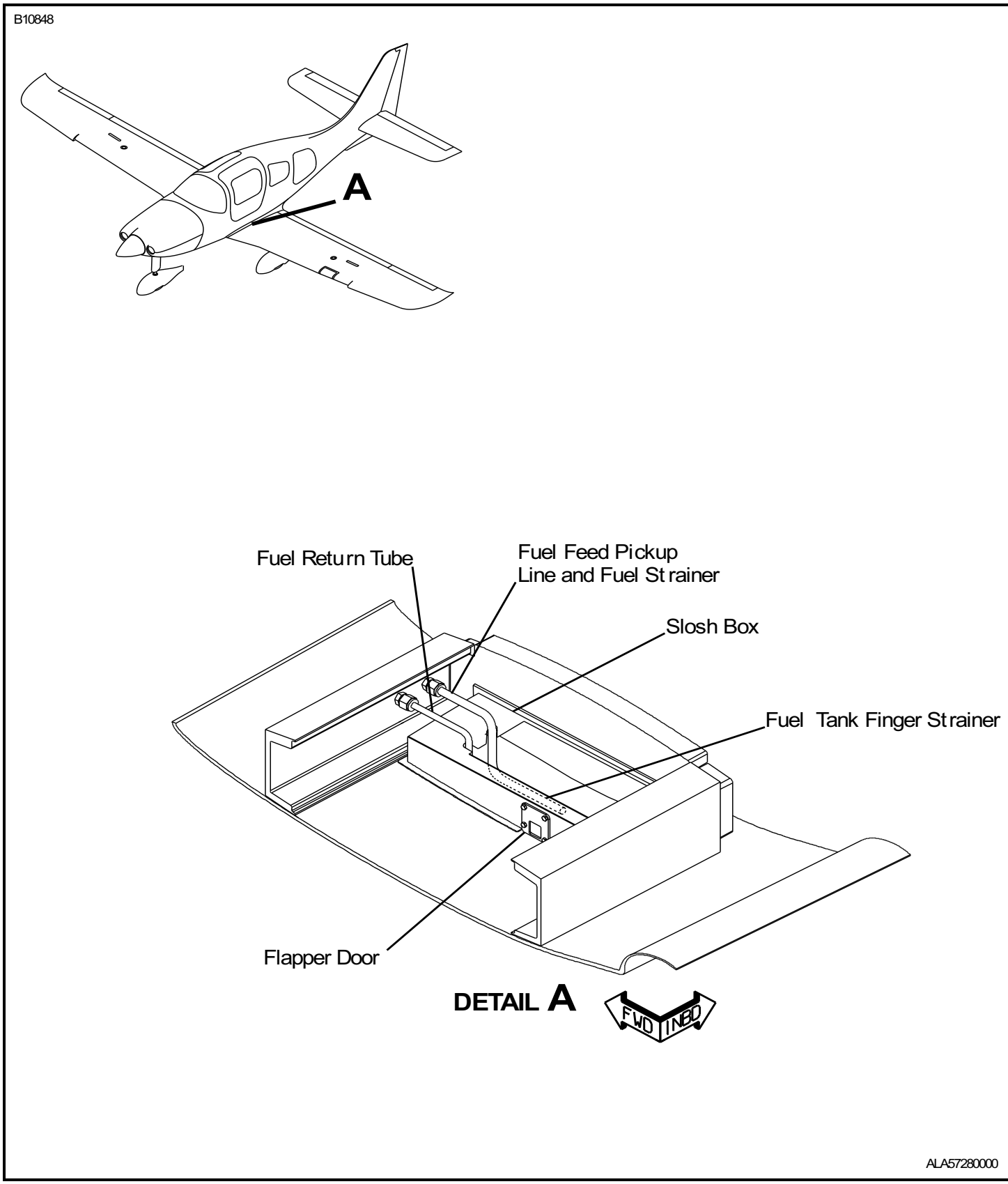
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Figure 203 : Sheet 1 : Grounding Strap Locations for Fuel Level Sensor



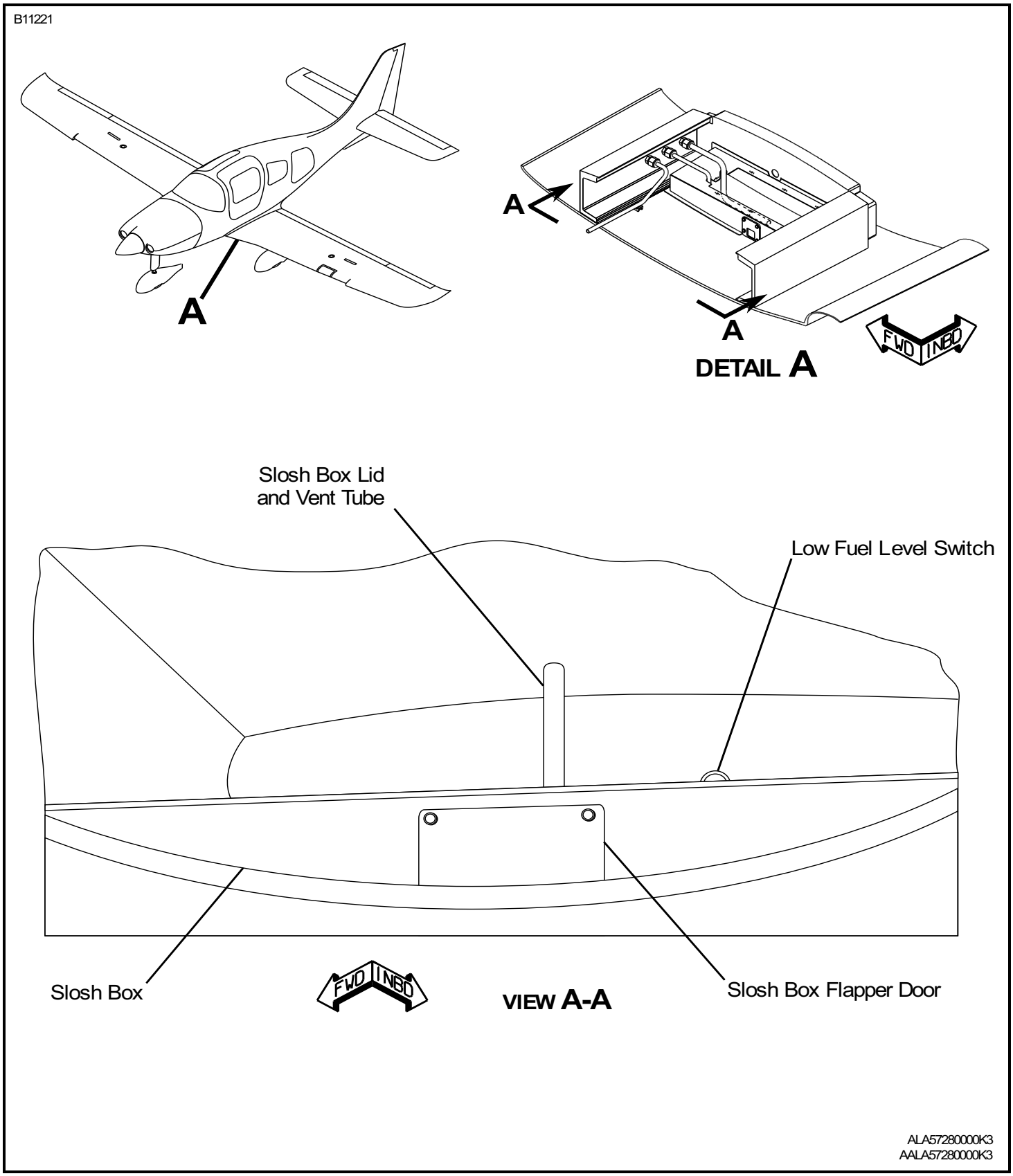
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Figure 204 : Sheet 1 : Slosh Box, Fuel Pickup, Fuel Return



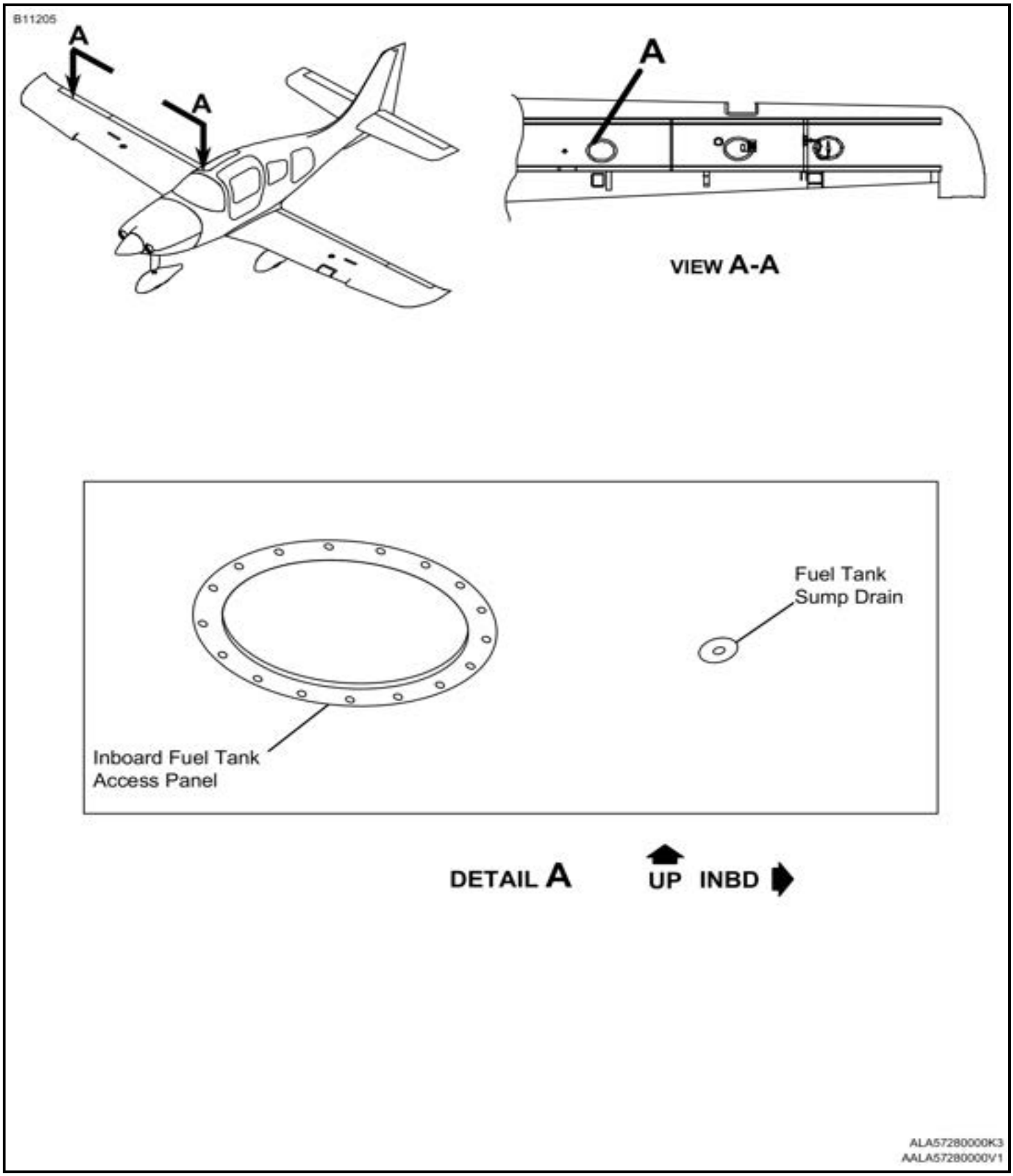
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Figure 205 : Sheet 1 : Slosh Box, Slosh Door, Low Level Float Switch (Facing Inboard)



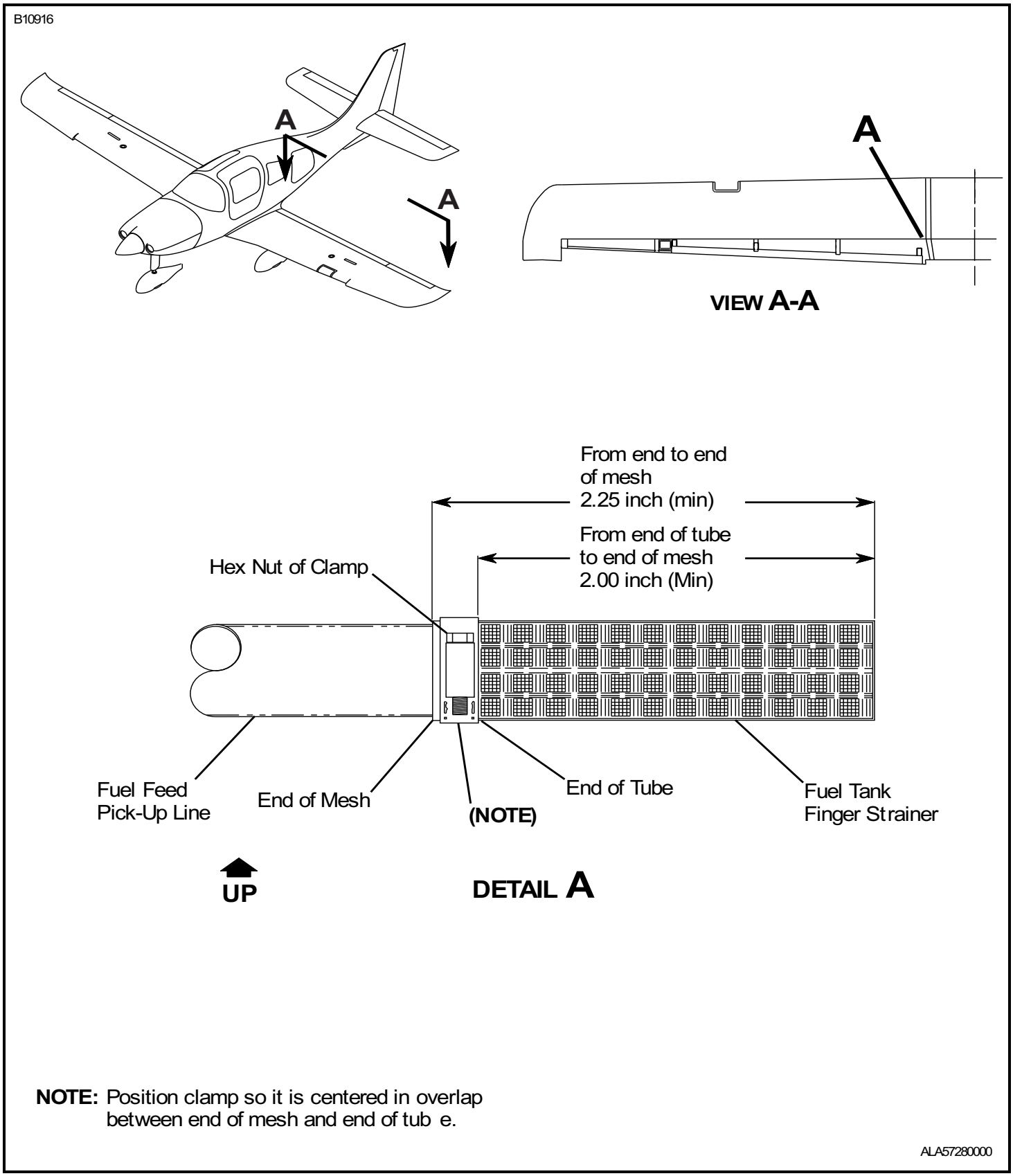
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Figure 206 : Sheet 1 : Inner Fuel Tank Access Panel and Fuel Drain



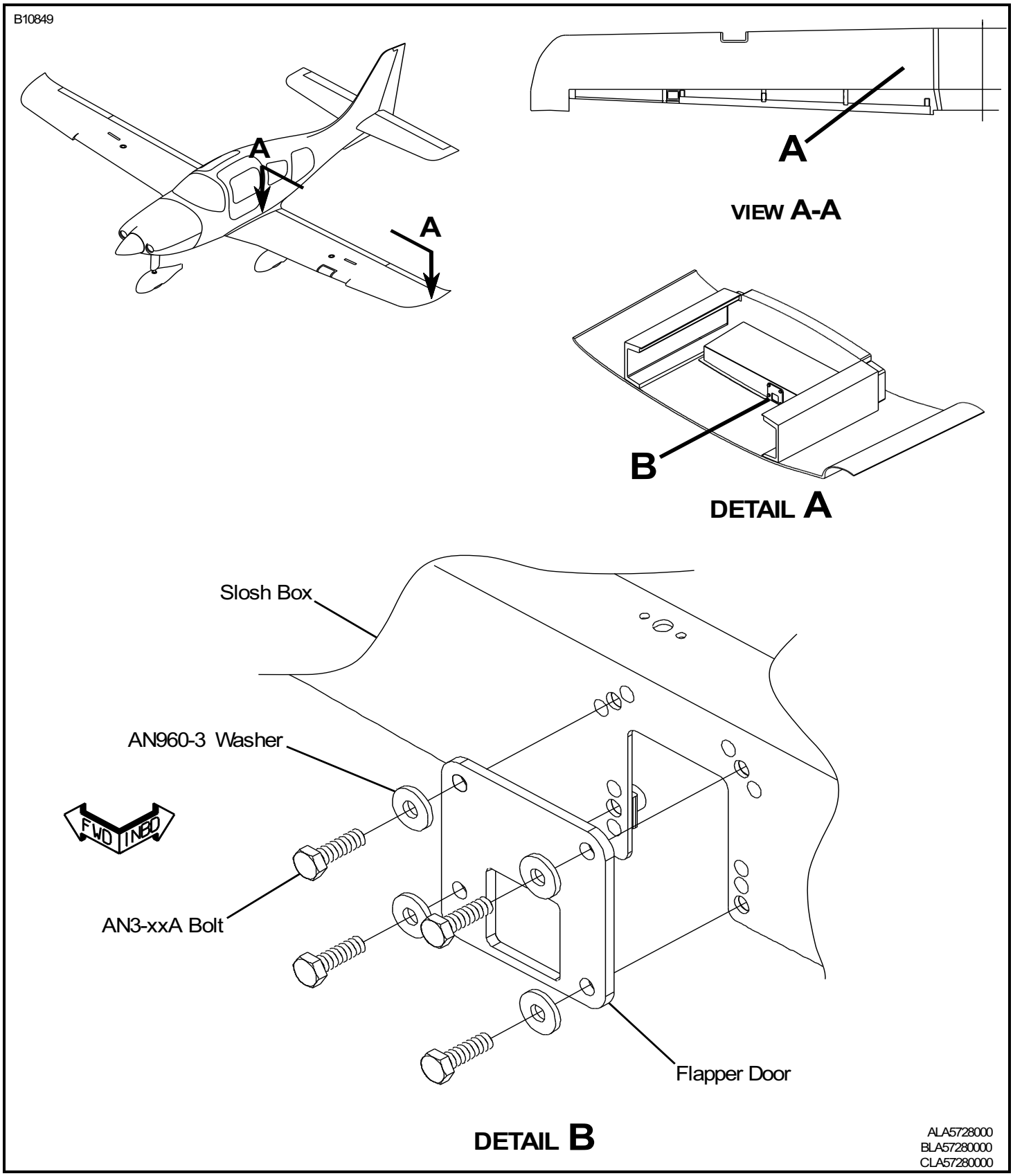
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Figure 207 : Sheet 1 : Finger Strainer Attachment Detail



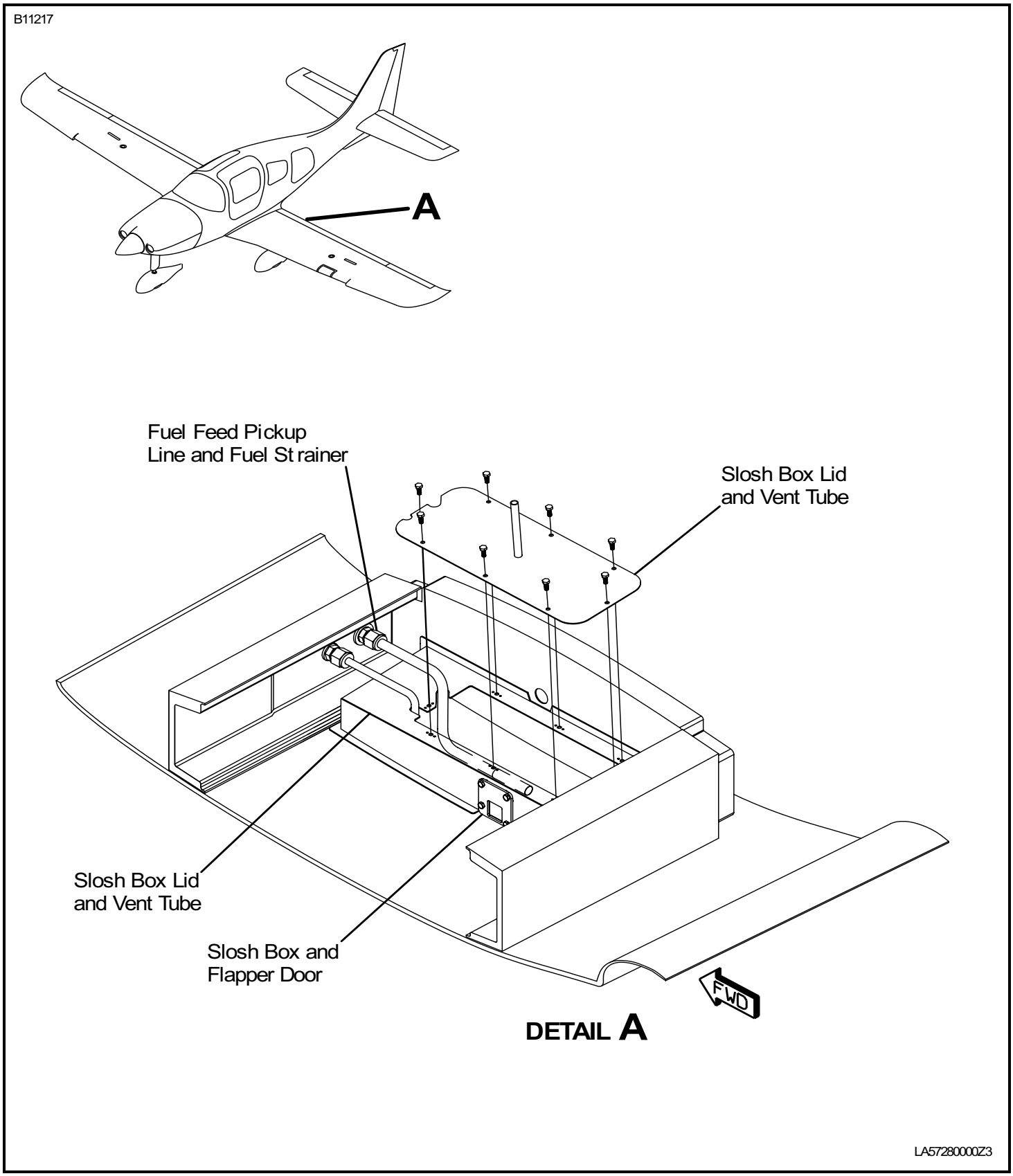
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Figure 208 : Sheet 1 : Slosh Door Installation/Removal



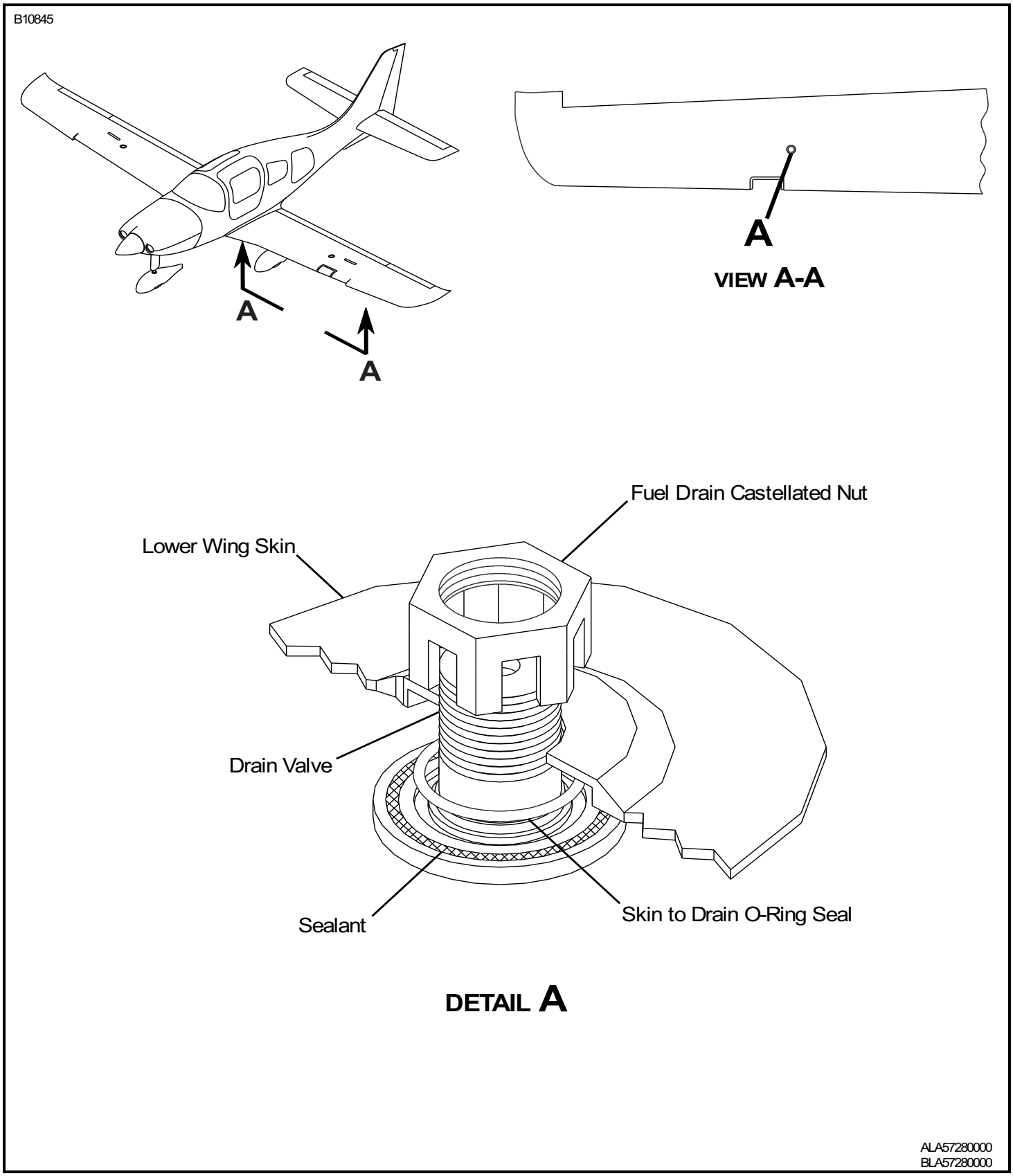
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Figure 209 : Sheet 1 : Slosh Box Lid Removal



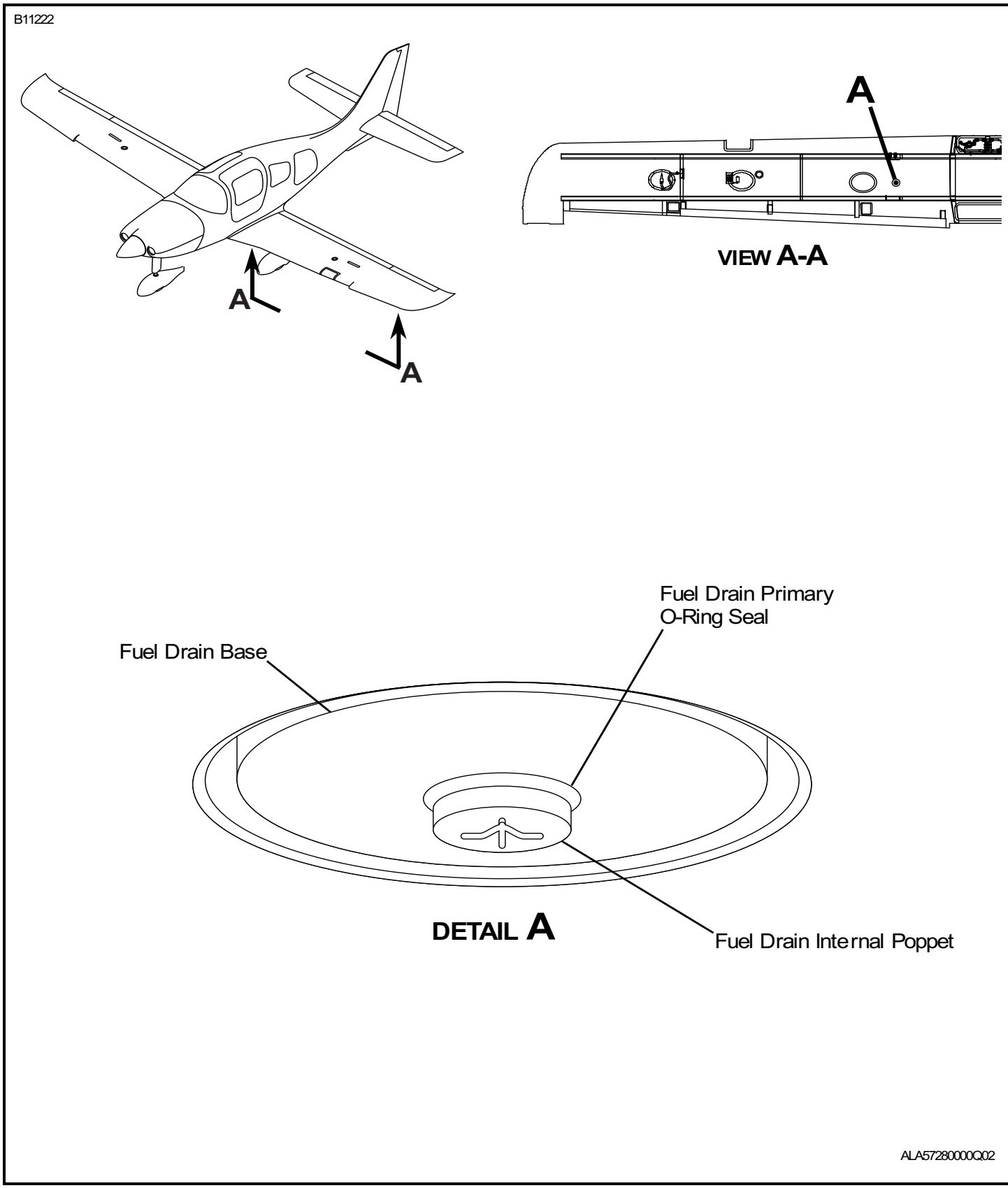
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Figure 210 : Sheet 1 : Fuel Tank Sump Drain Installation



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Figure 211 : Sheet 1 : Fuel Drain Primary Seal Replacement



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FUEL TANK SEALING - MAINTENANCE PRACTICES

1. Fuel Tank Sealing Maintenance Practices

A. This section discusses the general procedures and special tools and equipment for repairing leaks in the fuel tanks.

WARNING: The use of sealant is safe provided reasonable care and protective equipment is used. When working with fuel tank sealant, avoid ingestion, direct contact with skin, eyes, open breaks in the skin, etc. A well-ventilated area is required when working with sealant. Wash hands before eating or smoking. If sealant contacts skin, flush area with warm water.

NOTE: Approved fuel system materials may be obtained from the manufacturer.

(1) **General Procedures**

(a) When working with fuel tanks and the fuel system, take all applicable safety precautions, and perform work in a well-ventilated area.

(b) The materials used for the Cessna 400 are selected for long life under normal conditions expected in the life of the aircraft. This section covers minor maintenance of the fuel tanks and fuel tank sealing. If a problem is outside the scope of this section, contact Cessna Aircraft Company.

(2) **Special Tools and Equipment**

(a) Gloves - Polyethylene

(b) Cheese cloth

(c) Brush - if brushable sealants are used.

(d) Soft plastic spatula

(e) Mixing cup or container

(f) Mixing sticks

(g) MPK and/or Acetone for surface preparation

2. Discussion Of Terms And Techniques

A. Application Life: Refer to Pot-Life.

B. Pot-Life: Time after mixing a material until it becomes difficult to work with and apply.

C. MPK: Methyl n-Propyl Ketone

D. MSDS: Material Safety Data Sheet

3. Classification of Leaks

A. It is required to inspect for leaks both inside and outside the aircraft on a periodic basis. Note that leaks can form inside the wing away from the slipstream and can be inspected for through the access panels and holes on the wing. Refer to Section 57-10-00, Location Of Inspection Covers (Access Panels), for access panel locations.

B. Fuel Leak Classification - Refer to Figure 201.

(1) Stain - A slow fuel leak that evaporates soon after it is exposed to the air, leaving a blue or green stain (blue for 100 LL, green for 100).

(2) Seep - A slow fuel leak that reappears shortly after the area is cleaned.

(3) Slow to Heavy Seeps - A seeping occurring in open and closed areas that do not constitute a flight hazard.

(4) Running Leaks - A leak occurring in open areas, and must be repaired prior to flight. This is usually an indication of other damage, and Cessna Aircraft Company should be contacted.

4. Sealants for Panels, Valves, Fittings, and Switches

A. The same sealant is used on the fuel bay access panels, float valve, fittings through the forward spar, and low level float switches.

(1) **Approved Sealants:**

(a) PRC PR-1428 Class B

1 PR-1428 Class B is a two-part, manganese cured, polysulfide-based sealant. When mixed, it can be applied by spatula or extrusion gun.

2 The sealant is available from the manufacturer or directly from the sealant manufacturer.

3 Manufacturer:

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PRC Aerospace Sealants, PRC-DeSoto International, Inc.
5454 San Fernando Road, PO Box 1800
Glendale, CA 91209
USA
Phone: (818) 240-2060
Fax: (818) 549-7771

4 Health Precautions:

a Refer to sealant manufacturer's warnings and MSDS.

b Uncured PR-1428 may produce irritation following contact with skin. When handling PR-1428 Class B, avoid contact with the body, especially contact with open breaks in the skin and ingestion. Wash hands before eating or smoking after working with any sealants or chemicals. Obtain medical attention in case of extreme exposure or ingestion. For further information, see the MSDS for the product.

5 Cure rates available:

Table 201. PR-1428 Available Cure Rates

Sealant Number	Tack Free Time at 77° F (25° C)	Cure Time at 77° F (25° C)
PR-1428 B-1/2	4 Hours	8 Hours
PR-1428 B-2	8 Hours	20 Hours

NOTE: PRC PR-1428 B1/2 is recommended because of its workability and potlife.

6 Mixing Instructions:

a Mix per manufacturer's instructions.

7 Storage Life:

a The storage life of PR-1428 Class B is approximately nine months when stored at temperatures below 80° F (27° C) in original unopened containers. Check date of sealant prior to use.

5. Sealant Repair

A. Minor Sealant Repairs:

(1) Clean around the damaged area to remove any fuel residue.

(2) Clean around the damaged area, scuffing the sealant, and cleaning with MPK and Acetone.

(3) Dry the area prior to applying fuel tank sealant.

(4) Apply fuel tank sealant with a brush or spatula avoiding blobs, stalactites, or stalagmites. Any flakes or splashes also must be removed to prevent blockage of the fuel strainers and filters.

(5) Allow sealant to completely cure prior to closing tanks and returning aircraft to service.

B. Major Sealant Repairs:

(1) Contact Cessna Aircraft Company for repair procedures.

C. Approved Sealants:

(1) AC-236

(a) AC-236 is a two-component, liquid polysulfide polymer system for fuel tank sealing. When mixed it can be applied by brush, spatula, extrusion, injection gun, or roller depending on class of sealant.

(b) The sealant is available from the manufacturer or directly from the sealant manufacturer.

(c) Manufacturer:

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Advanced Chemistry and Technology (AC-Tech)
7341 Anaconda Avenue
Garden Grove, CA 92841
USA
Phone: (714) 373-2837
Fax: (714) 373-1913

(d) Health Precautions:

1 Refer to sealant manufacturer's warnings and MSDS

2 The sealant is considered safe when handled with reasonable care. Avoid contact with the body, especially contact with open breaks in the skin and ingestion.

3 Wash hands before eating or smoking after working with any sealants or chemicals. Obtain medical attention in case of extreme exposure or ingestion. If accelerator contacts the skin, immediately wipe off and wash with waterless hand cleaner followed by soap and water. For further information, see the sealant manufacturer's MSDS for the product.

(e) Cure rates available:

Table 202. AC-236 Available Cure Rates

Sealant Number	Application Life at 77° F (25° C) and 50 percent RH	Tack Free Time at 77° F (25° C) and 50 percent RH	Cure Time at 77° F (25° C) and 50 percent RH
AC-236 A-1/2	0.5 Hour	7 Hours	24 Hours
AC-236 A-1	1 Hour	16 Hours	30 Hours
AC-236 A-2	2 Hours	24 Hours	48 Hours
AC-236 B-1/2	1/2 Hour	8 Hours	24 Hours
AC-236 B-1	1 Hour	16 Hours	40 Hours
AC-236 B-2	2 Hours	24 Hours	48 Hours
AC-236 B-4	4 Hours	30 Hours	90 Hours
AC-236 B-6	6 Hours	48 Hours	120 Hours
AC-236 C-20	20 Hours	48 Hours	Not Available
AC-236 C-80	80 Hours	96 Hours	Not Available

NOTE: AC-Tech AC-236 A-1/2 and B-1/2 is recommended because of its workability and pot-life. The longer pot life and cure times are not recommended for field repair.

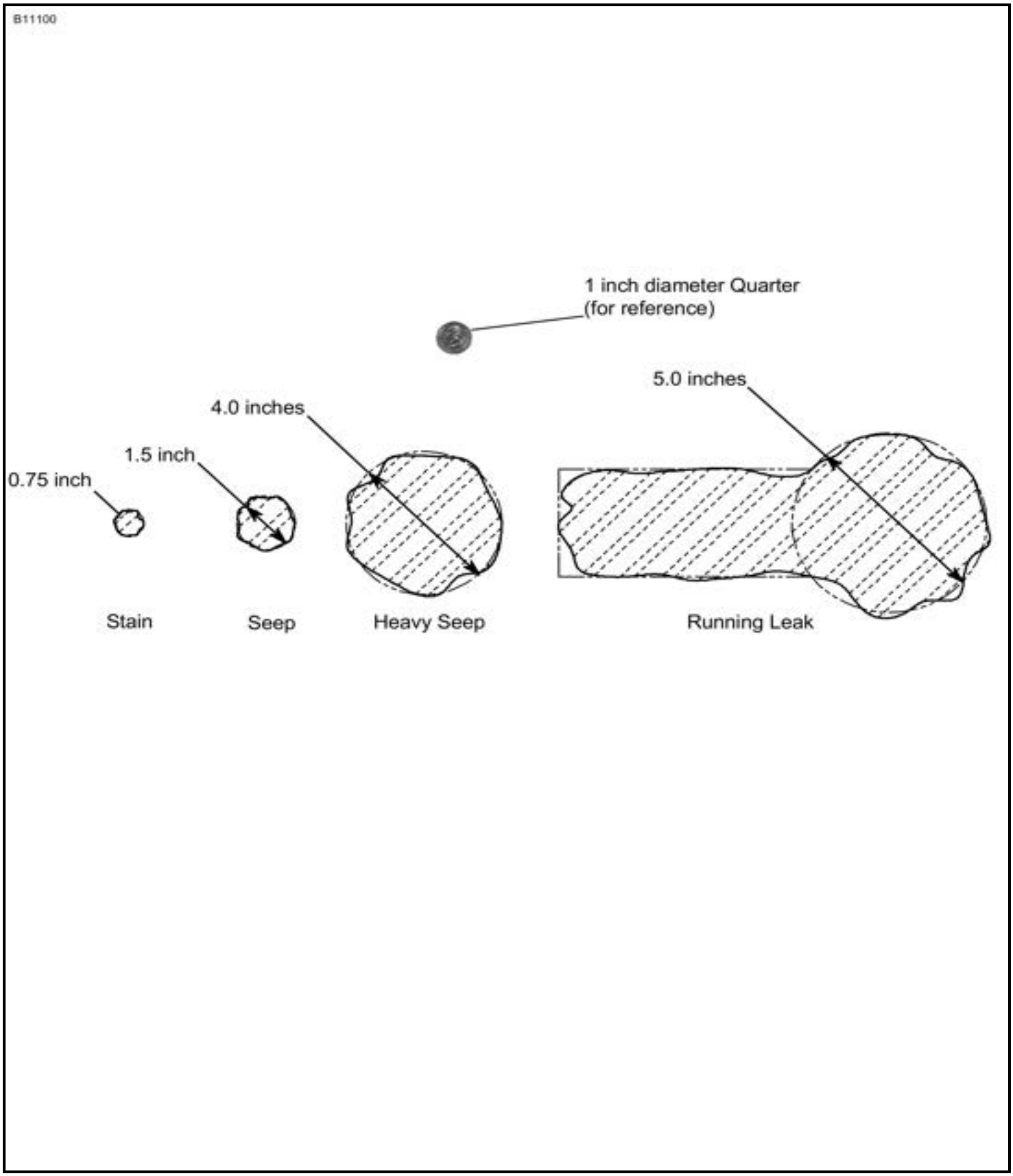
(f) Mixing Instructions: Mix per manufacturer's instructions.

(g) Curing of Sealant: Cure sealant per sealant manufacturer's recommendations prior to fueling the aircraft.

(h) Storage Life: The storage life of AC-236 is nine months after the date of shipment when stored at temperatures below 80° F (27° C) in original unopened containers. Storage at lower temperatures increases shelf life. Contact sealant manufacturer for more information. Check date of sealant prior to use.

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Figure 201 : Sheet 1 : Fuel Leak Classification



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FUEL DISTRIBUTION - MAINTENANCE PRACTICES

1. Fuel Lines

A. General Practices for Fuel Line Assembly

(1) Re-bending, unbending, or tweaking tube assemblies to accomplish proper thread alignment and engagement is permissible on assembly with all established clearances, tie-downs, high points, and/or low points maintained. Prior to assembly, blow tubes clean and make sure that the ends are not damaged prior to installation. If the tube is not going to be installed after cleaning, cap ends to prevent contamination. As an aid for assembly and to prevent galling of mating surfaces, lubricants (e.g. petroleum based) or anti-seize products may be used on the threaded portions of fittings, connectors, etc. Such lubrication is required for stainless steel-to-stainless steel fitting connections.

(2) **AN Fittings** - When required or specified, standard AN flare (i.e. 37 degrees) shall be added to the end(s) of tubing. In forming flares, cut the tube ends square per the cutting procedures in this section, and deburr the ends per the deburring procedures in this section. The tubing is then flared using the correct 37-degree aviation flare forming tool for the size of tubing and type of fitting. A double flare is used on soft aluminum tubing 3/8 (O.D.) and under, and a single flare on all other tubing sizes. Use appropriate caution when tightening; tighten per the Installation of Fuel Return and Fuel Feed Fuel/Fuel Pickup Line at WS 48.0 and 50.25 instructions below. Overtightening will damage the tube or fitting, which may cause a failure. Under-tightening may cause leakage which could result in system failure. After flaring, tubes formed with the "Standard AN flare" (i.e. 37 degrees) will conform to the angles shown in Figure 202 and dimensions shown in Table 201. In addition, the flares must meet the following requirements:

(a) The flare shall be square with the center line of the tube within 0.5 inch for the distance covered by the length of the sleeve.

(b) The circular runout between the inner and outer surfaces of the flare shall not exceed 0.005 full indicator movement (F.I.M.) with the tubing O.D

(c) The sealing surface shall be free of pit marks, radial or longitudinal scratches and indentations. Flare sealing surface shall not exceed 32 micro inches.

(d) If necessary, it is recommended that the flared end of the tube be burnished during installation.

Table 201. AN Flared Tube Dimensions

TUBE SIZE NOMINAL O.D. (inches)	"A" DIAMETER (inches)		"B" RADIUS ±0.010 (inches)
0.125	0.200	+0.000-0.010	0.032
0.188	0.302		
0.250	0.359		
0.313	0.421		
0.375	0.484		0.048
0.500	0.656		0.062
0.625	0.781		
0.750	0.937		0.078
1.000	1.187	+0.000-0.015	0.093
1.250	1.500		
1.500	1.721		0.109
1.750	2.106		
2.000	2.356		
2.500	2.856		
3.000	3.356		

(3) **Tube Cutting** - This section is provided as a guideline for tube cutting prior to installation of fuel lines. It is assumed that personnel performing this have had basic training on the use of the tools involved in correctly cutting tubing and preparing the tubing for installation.

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NOTE: For a good quality cut, do not rush the process, always use a sharp cutting wheel, and replace the wheel when it becomes dull.

(a) Measure and mark the tubing in the correct location for cutting/trimming. Note that based on the method of deburring, the user may have to compensate for the removal of material after cutting.

(b) Maintain pressure on the cutter wheel by gradually tightening the handle as you rotate the cutter around the tube. Refer to Figure 203 and Figure 204.

(c) Cutting the tube can be accomplished by either rotating the tube, the cutter completely around the tube, or by rocking it back and forth as shown in Figure 204.

(d) To cut deeper, give a 1/8 turn of the knob for each two revolutions around the tube as shown in Figure 205.

(e) Deburr the ends of the tubing per the following procedure.

(4) **Tube Deburring** - To ensure proper sealing of tubing with the fittings outlined in this specification, the ends of the tubing must be free of burrs, scratches, etc. This section describes some methods of deburring the ends of the tubing to provide the best surface for sealing and for proper system operation. Tube cutters burr into the ID of the tube and this must be removed prior to installation of the tube. Cutting tubing with a hacksaw will burr both the OD and the ID of the tubing. These also must be removed prior to tube installation. Small burrs on the OD may prevent the tubing from being fully inserted into the fitting. ID burrs, or chips, may cause the fittings to leak or cause damage and contamination to the system. Small scratches in the outside surface of the tubing may be removed by carefully polishing out the defect using fine grit sandpaper, Scotch-Brite™, or other equivalent. Following any deburring or polishing, the tube must be cleaned inside and out to prevent introducing foreign material into the systems. Figure 206 shows the proper way to deburr the OD of a cut tube using a file. Note that the file is at a shallow angle to chamfer the end slightly. If there is a raised portion of the tube from cutting, remove this also while deburring. Be careful only to remove the least amount of material from the tube to remove the burr. Removing too much material during deburring at this point will weaken the tube when installed.
Figure 207, Sheet 1 shows the use of a deburring tool to deburr the ID. As in deburring the OD, be careful not to remove excessive material, and only remove the burrs from the tube. There should be a slight chamfer on the ID end of the tube, and it must be free of nicks, protrusions, etc., as these affect the system operation and the strength of the tube.
Figure 207, Sheet 2 shows the use of a tubing deburring tool that can deburr both the OD and ID of the tubing. As with the above noted methods, be careful not to remove excessive material from the tube as this will weaken the tube when installed.

(5) **Torque Values for Flared Tube Fittings** - The following torque values must be used when tightening flared tube fittings. Over-tightening will damage the tube or fitting, which may cause a failure. Under-tightening may cause leakage which could result in system failure.

Size	Tube O.D.	Material and Torque Specification			
		Tube Material	Fitting Material	* Inch Pounds	* Foot Pounds
-2	1/8	Steel	Steel	75 - 85	6.3 - 7.1
		Aluminum	Steel/Aluminum/Brass	20 - 30	1.7 - 2.5
		Plastic	Steel/Aluminum/Brass/Plastic	10 - 15	.8 - 1.3
-3	3/16	Steel	Steel	95 - 105	7.9 - 8.8
		Aluminum	Steel/Aluminum/Brass	25 - 35	2.1 - 2.9
		Plastic	Steel/Aluminum/Brass/Plastic	15 - 20	1.3 - 1.7
-4	1/4	Steel	Steel	135 - 150	11.3 - 12.5
		Aluminum	Steel/Aluminum/Brass	50 - 65	4.2 - 5.4
		Plastic	Steel/Aluminum/Brass/Plastic	25 - 30	2.1 - 2.5
-5	5/16	Steel	Steel	170 - 200	14.2 - 16.7
		Aluminum	Steel/Aluminum/Brass	70 - 90	5.8 - 7.5
		Plastic	Steel/Aluminum/Brass/Plastic	35 - 45	2.9 - 3.8
		Steel	Steel	270 - 300	22.5 - 25

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-6	3/8	Aluminum	Steel/Aluminum/Brass	110 - 130	9.2 - 10.8
		Plastic	Steel/Aluminum/Brass/Plastic	55 - 65	4.6 - 5.4
-8	1/2	Steel	Steel	450 - 500	37.5 - 41.7
		Aluminum	Steel/Aluminum/Brass	230 - 260	19.2 - 21.7
		Plastic	Steel/Aluminum/Brass/Plastic	115 - 130	9.6 - 10.8
-10	5/8	Steel	Steel	650 - 700	54.2 - 58.3
		Aluminum	Steel/Aluminum/Brass	330 - 360	27.5 - 30
		Plastic	Steel/Aluminum/Brass/Plastic	165 - 180	13.8 - 15
-12	3/4	Steel	Steel	900 - 1000	75 - 83.3
		Aluminum	Steel/Aluminum/Brass	460 - 500	38.3 - 41.2
		Plastic	Steel/Aluminum/Brass/Plastic	230 - 250	19.2 - 20.8
* Dry torque values shown, except as noted in General Notes below					
General Notes					
Use a steel flare nut when using steel tubing. Either steel, brass or aluminum flare nut may be used with aluminum or plastic tubing. Plastic flare nuts to be used with plastic tubing only. Pre-Install tube flare fitting finger tight. If parts do not assemble finger tight, check for foreign material on threads and/or damaged threads. Do not force assemblies together. Maintain cleanliness of tube fittings. Protect all fitting threads from damage and dirt contamination. When attaching stainless steel to stainless steel or stainless steel to aluminum, use MIL-T-5544 Anti-seize/lubricant on fitting threads. To prevent contamination, do not apply Anti-seize to tapered seat. Use lower torque value when Anti-seize is used.					

B. **Removal of Fuel Return and Fuel Feed/Fuel Pickup Lines at WS 48.0 and 50.25** (Refer to Figure 208.)

(1) Loosen the B-nut on both sides of the bulkhead fittings, and slide the nuts onto the fuel lines. Slide off the fuel lines from both sides of the bulkhead fitting.

(2) Remove the nuts on both sides of the bulkhead fitting, and slide out the bulkhead fitting as shown in Figure 209 and Figure 210.

C. **Installation of Fuel Return and Fuel Feed/Fuel Pickup Lines at WS 48.0 and 50.25** (Refer to Figure 208.)

(1) Insert the bulkhead fitting through the O-ring and through the spar insert as shown in Figure 209 and Figure 210. Tighten the bulkhead nuts at WS 48.0, 18 to 20 ft.- lbs. and at WS 50.25, 10 to 12 ft- lbs.

(2) Slide the fuel line onto the bulkhead fitting, then slide the B-nut over the bulkhead fitting. Tighten the flared tube fittings at WS 48.0, 150 to 250 in.-lbs. and at WS 50.25, 75 to 125 in.-lbs.

D. **General Leak Check for Each Line, Tube, or Fitting** - After any maintenance on the fuel lines or fittings, check each system for leaks with 90 psi air or nitrogen, and apply a soapy solution at each junction for 30 seconds. After a successful no-bubbles leak check, clean and dry the junctions. Apply a sentry stripe at nut to tube, nut to fitting, and fitting to mounting surface.

2. Fuel Selector

A. **Removal and Installation of the Fuel Selector Knob**

(1) Remove the co-pilot's side seat per instructions in Chapter 25.

(2) Remove the center console access panels per instructions in Chapter 25.

(3) Insert a Phillips screwdriver up through the inside of the center console through the access hole in the fuel selector plate, and remove the three fuel selector knob retaining screws; rotating the knob to gain access to each screw. Remove the knob. Refer to Figure 214.

(4) Inspect the knob screw holes for evidence of stripping. If stripped, contact Cessna Aircraft Company for a replacement fuel selector knob.

(5) Installation is the direct reverse of removal.

(a) Apply Loctite 242 thread lock adhesive to the threads of the fuel selector plate retaining screw.

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(b) Torque the fuel selector plate retaining screw between 8.5 lb.-in to 11 lb.-in, then apply torque putty.

(c) Tighten the knob retaining screw snug.

(d) If the fuel selector knob is removed, repeat the installation steps above.

B. **Removal of the Fuel Selector Valve** (Refer to Figure 213).

(1) Remove the co-pilot's side seat per instructions in Chapter 25.

(2) Remove the carpet to gain access to the forward wing saddle access panel, and remove that panel per instructions in Chapter 25.

(3) Remove the center console access panels per instructions in Chapter 25.

(4) Disconnect all wiring to the selector, and mark and label connectors.

CAUTION: Alignment of the shaft assembly from the fuel selector knob to the fuel selector is critical to ensure full and proper valve operation and indication. Follow the next step in the procedure carefully.

(5) For the Model T240 installation do the steps that follow:

(a) Note and record the position of the fuel selector knob in relation to the left or right tank detents. If necessary, mark each shaft connection so that you can maintain the correct alignment during the reassembly.

(b) Remove the four countersunk 6-32 screws, self-locking nuts, and washers attaching the upper fuel selector plate to the center console.

(c) Remove the cotter pin, pin, and washer that attach the upper fuel selector shaft assembly to the spindle.

(d) Slide the upper portion of the fuel selector assembly out of the spindle.

(6) For Airplanes thru 02000 do the steps that follow:

(a) All the couplings and the spline shaft in this assembly have alignment markings comprised of either dimples or 1/8" tall letters. If the alignment markings are visible note and record their position. If the alignment markings are not visible mark each shaft connection so that you can maintain the correct alignment during the reassembly.

(b) Remove the four countersunk 6-32 screws, self-locking nuts, and washers that attach the upper fuel selector plate to the center console.

(c) Slide the upper portion of the fuel selector assembly off the spline shaft.

(d) Remove the two truss head screws and large area washers securing the vapor barrier and grommet to the floor. Slide the vapor barrier and grommet off of the spindle and spline shaft. Refer to Figure 212.

C. **Installation of the Fuel Selector Valve** (Refer to Figure 212 and Figure 213).

(1) Wire the fuel selector valve per instructions in the LC41-550FG Wiring Manual.

(2) Rotate the spindle selector to the left fuel tank detent, and adjust the micro-switch so that the roller face on the activated switch is 1.01+0.03/-0.05 from the face of the spindle (refer to Figure 211). Ensure the left fuel tank annunciator illuminates, and tighten the micro-switch attachment screws 3.8 to 4.5 in.-lbs.

(3) Rotate the spindle selector to the right tank position, and repeat the previous step.

(4) Rotate the selector back to the left tank position.

(5) Slide the vapor barrier plate and grommet over the top of the fuel selector spindle, and position the grommet so it is mounted in the vapor barrier plate and over the solid shaft of the selector. While sliding the grommet, it is acceptable to stretch the grommet over the lower universal joint. The vapor barrier plate should be flush with the top of the floor.

(6) Install two 10-32 truss head screws and two large area washers in the two rivnuts installed in the floor as shown in Figure 212.

(7) For the Model T240 installation do the steps that follow:

(a) Slide the upper fuel selector assembly shaft in the spindle.

1 Make sure that you align the shaft applicable to the shaft position recorded before it was removed.

(b) Install the pin, washer and cotter pin that attach the upper fuel selector assembly shaft to the spindle.

(8) For Airplanes thru 02000 do the steps that follow:

(a) Slide the upper portion of the fuel selector coupling over the spline shaft, as shown in Figure 213.

1 Make sure that the alignment marks (existing dimples, existing 1/8-inch letters, or marks applied during disassembly) are aligned with the mating part.

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2 Make sure that the alignment marks are toward the same side of the aircraft they faced before disassembly.

(9) Attach the upper fuel selector plate to the center console by installing the four countersunk 6-32 screws, self-locking nuts, and washers in the upper fuel selector plate. Torque to 4 to 6 in.-lbs.

(10) Install the center console access panels per instructions in Chapter 25.

(11) Install the co-pilot's side wing saddle access panel, carpet, and co-pilot's seat per instructions in Chapter 25.

D. **General Leak Check for Each Line, Tube, or Fitting** - After any maintenance on the fuel lines or fittings, check each system for leaks with 90 psi air or nitrogen, and apply a soapy solution at each junction for 30 seconds. After a successful no-bubbles leak check, clean and dry the junctions. Apply a sentry stripe at nut to tube, nut to fitting, and fitting to mounting surface.

E. **System Check** - Follow the instructions in Section 28-10-00, Slosh Boxes, Fuel Pickup, and Vapor Return, to assure system integrity.

F. **Maintenance Practices**

(1) Periodic inspection of the fuel lines, hoses, fittings, etc., is required to check for leaks, chafing, or damage.

(2) Cleaning is required on top of and around the fuel selector linkage by vacuuming or wiping with a damp cloth to clean away dust and debris that may have worked into the area.

G. **First 500 Hour Inspection and Every 1000 Hours Thereafter**

(1) Ensure valve rotates freely to all positions.

(2) With power applied to the aircraft, ensure that annunciators on instrument panel indicate correct selector position.

(3) Remove upper knob and ensure socket-head, countersunk screw is tight. If not, remove screw, apply a drop of thread-locking compound (Loctite 242 or equivalent), and reinstall. Tighten until snug.

(4) Inspect interconnect shaft between upper detent plate and the valve body. Check that roll pins are securely in place and that there is no sign of chafing or excessive wear.

(5) Check lobed plate on valve body and make sure that it actuates micro switches as selector is moved to the various positions. Replace broken or worn microswitches.

(6) Inspect valve body for any signs of leaking. If leakage is evident, check security of fuel line connections. Correct any loose connections. If no loose connections are found, remove valve body and repair or replace.

3. Auxiliary Fuel Pump

A. The Cessna 400 is equipped with an electric auxiliary fuel pump to provide both vapor suppression and backup boost pump operation. The pump is located on the fuel module mounted to the forward spar below the front seats. Access is through the fuel system access panel located on the belly of the aircraft. Refer to Figure 201.

(1) **Removal of Auxiliary Fuel Pump**

(a) Make sure that aircraft power is turned off.

(b) Turn the fuel selector to the off position.

(c) Disconnect the auxiliary fuel pump wire connector.

(d) Disconnect the fuel lines.

(e) Loosen and move the hose clamps to release the fuel pump.

(2) **Installation of Auxiliary Fuel Pump**

(a) Installation is a direct reversal of the removal of the auxiliary fuel pump.

(b) Hand tighten the flared tube fittings connecting the fuel lines to the fuel pump until the assembly is complete and then tighten 150-250 in.-lbs.

(c) Prior to tightening the hose clamps around the fuel pump, ensure that the fuel lines are not pre-stressed. Tighten hose clamps 10-15 in.-lbs.

4. Primer Switch

A. **Primer Switch Removal and Installation**

(1) For the primer switch (SI010) removal and installation refer to applicable section:

(a) For the Avidyne and Garmin G1000 installations refer to, Chapter 25 Instrument Panels and Electrical panels -

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Maintenance Practices, Master Switch Panel.

(b) For the Model T240 installation refer to, Chapter 33 Interior LED Panels (T240) - Maintenance Practices, Ignition Switch LED Panel Removal/Installation.

5. Automatic Fuel Boost Pump System (Avidyne and Garmin G1000 Options)

A. **General** - The Model 400 Airplanes with the Avidyne or Garmin G1000 options have an automatic fuel boost system installed. The Model T240 has a manually controlled emergency pump system installed.

B. For the Model T240 Garmin G2000 installation the VAPOR SUPPR and EMER FUEL PUMP switches are installed in the Center Console Switch Panel. Refer to Center Console Switch Panel (T240) - Removal/Installation. The Primer Switch (UI908) is located adjacent to the Ignition Switch (UI002). Refer to Interior LED Panels (T240) - Maintenance Practices.

C. The purpose of the automatic fuel boost pump system is to reduce pilot workload in case of a primary engine driven fuel pump failure during takeoff. The system is operated by arming the backup pump system prior to takeoff and during climb to cruise altitude. Once armed, the system will turn on the backup pump if it senses a pressure drop in the unmetered fuel line. The system provides at least 100 percent power, or 310 hp, within two seconds of an engine driven fuel pump failure as tested by Cessna. For an overview of the automatic boost pump system and the relationship of the primer switch, the vapor suppression switch, and the boost pump arm switch to the boost pump, refer to Figure 215. The system includes The fuel line is located between the T-fitting on the throttle metering unit valve and the fuel pressure switch. Refer to Figure 216.

(1) The Avidyne and G1000 options include the components that follow: a fuel line, boost pump pressure switch, a warning light, system-armed light, system-arming switch, and the wires and connectors to the auxiliary fuel pump. Refer to the Auxiliary Fuel Pump section above.

(2) For the Avidyne option, Figure 217 shows the location of the cockpit controls for the fuel pump and automatic fuel pump system.

(3) For the Garmin G1000 option the vapor suppression switch and backup pump arm switch are located in the flap panel. The primer button is located adjacent to the ignition switch.

D. **System Operation** - When backup pump switch is set to ARMED the backup pump system is activated and the system-armed light located directly below the switch comes on. The boost pump pressure switch senses unmetered fuel pressure coming from the engine's fuel injection system by means of a fuel line connected directly between the boost pump pressure switch and the fuel injection metering valve on the unmetered fuel pressure side. When the fuel pressure drops below 5.5±0.5 psi and the backup pump switch is in the armed position, the switch operates a latching relay, causing the on the boost pump to operate and the fuel pump annunciator to come on. If the system is off and the unmetered fuel pressure is less than 5 psig, the annunciator light comes on.

E. **Automatic Fuel Boost Pump System Maintenance Practices**

(1) System Check Out

WARNING: Testing of the backup boost pump system requires engine runs, running the fuel boost pump, and priming the engine. As with any work around aircraft, the engine must be assumed to be ready to run and able to turn over at any time. Precautions must be taken to prevent personnel injury and damage to aircraft and surroundings.

(a) Verification of Normal Operation

1 If the operation of the automatic boost pump system is in question, a ground test, at a minimum, should be conducted prior to the next flight. This includes an engine warm-up and run-up test to make sure that the system is operating correctly. If the system fails the ground test, or the system is still in question, further system checks must be performed.

(b) Ground Testing

1 For the ground tests, an indication different from what is defined as normal constitutes a test failure, and testing should be stopped. In case of a system failure, check the pressure switch, follow the electrical troubleshooting section, or contact Cessna Aircraft Company. This test requires starting the engine, and due to the nature of the testing, may cause flooding of the engine. Proper safety precautions must be taken to prevent fire and damage to personnel, the system, or the aircraft.

1 Turn the master switch on. With the engine not running, Make sure that the FUEL PUMP annunciator light (Avidyne option) comes on. Make sure that for the Garmin G1000 option, the FUEL PUMP CAS message in the PFD message window does not show. If fuel pressure is too low, it will only display when engine

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RPM is above 1000 RPM. The steps that follow apply to Avidyne option aircraft only:

a With the throttle partially open and the mixture full rich, press the primer button until an indication is registered on the manifold pressure/fuel flow gauge on the Avidyne Entegra PFD. When flow indicated is above 0 GPH, the FUEL PUMP annunciator light must be extinguished.

b Return the throttle and mixture to the full aft position, (mixture to idle cutoff and throttle to closed).

c Turn the back-up pump switch to ARMED. The system armed light must be illuminated, the fuel pump must be running, and the FUEL PUMP annunciator light must be illuminated. Turn the switch to off after verification of the above items.

2 Start the engine and allow the engine to warm up prior to performing any engine run-up tests. During startup, the FUEL PUMP annunciator light (Avidyne option only) must extinguish once the engine starts.

CAUTION: At this point in the backup boost pump system testing, the engine should be well primed, if not flooded. Care must be taken to prevent damage to personnel, the engine, and the aircraft during starting. Refer to the Pilot's Operating Handbook for starting the engine with a flooded engine.

3 With the engine running mixture rich and with engine temperatures in the green, turn on the backup boost pump system. Only the system-armed light should illuminate, and the boost pump should not operate. If it operates, the engine will quit due to flooding.

4 With the system armed, prop set at full forward (max RPM), and engine running at 2000 RPM, slowly pull the mixture back to the aft stop. The boost pump system turns on the boost pump. If the pressure drops below 0 GPH and/or the engine quits, the system is not operating correctly. If the mixture is at idle cut-off, the system did not engage as indicated by the FUEL PUMP annunciator light or annunciation display, and the engine is still running, the engine fuel system must be re-calibrated per Chapter 73. Return the mixture to the previous setting when completed with this test point.

NOTE: If the mixture is pulled completely back to the idle cut-off position, the system may not be able to provide enough fuel pressure to run the engine.

5 With the system armed, perform a full power run-up with a quick retraction of the throttle to idle. The system should not operate as indicated by the illumination of the FUEL PUMP annunciator light, or Garmin G1000 PFD CAS message "FUEL PUMP", or engaging of the electric boost pump.

6 Turn off the system, and shutdown the engine. If no failures are noted, the system is considered safe for flight. If the system is in question, re-test, or contact Cessna Aircraft Company prior to flight. In case of a system failure, check the electrical system as documented in the following section.

CAUTION: Do not run the pump more than 2-3 seconds.

(2) Electrical Troubleshooting (T240).

(a) If the pump does not operate with the EMER FUEL PUMP switch (SI007) set to the ON position do the steps that follow:

1 Check the wiring between the switch and pump for damage and continuity.

2 If the wiring is unserviceable, repair or replace the wiring and check the pump operation again. Refer to the Model T240 Wiring Manual.

3 If the wiring checks good replace the EMER FUEL PUMP switch and check the pump operation again. Refer to Chapter 25, Switch Panel Rocker Switch (T240) - Removal/Installation.

4 If the switch is serviceable replace the pump and check the pump operation again. Auxiliary Fuel Pump.

(b) If the pump does not operate with the VAPOR SUPPR switch (SI008) set to the ON position do the steps that follow:

1 Check the wiring between the switch and pump for damage and continuity.

2 If the wiring is unserviceable, repair or replace the wiring and check the pump operation again. Refer to the Model T240 Wiring Manual.

3 If the wiring checks good replace the VAPOR SUPPR switch and check the pump operation again. Refer to Chapter 25, Switch Panel Rocker Switch (T240) - Removal/Installation.

4 If the switch is serviceable replace the pump and check the pump operation again. Auxiliary Fuel Pump.

(3) Electrical Troubleshooting (Avidyne and G1000)

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CAUTION: Do not run the pump more than 2-3 seconds.

(a) Pump does not turn on with zero fuel pressure and the BACKUP PUMP (Avidyne and G1000) switch (SW11) switch is armed.

1 Backup Pump Rocker Switch

a With aircraft power on, move the rocker switch to the armed position.

b If the light does not come on or CAS message does show, but the pump turns on, replace the "armed" light or troubleshoot the PFD as applicable.

c If the light does not come on or CAS message does show, and the pump does not turn on, depress the primed button briefly.

1. If the pump operates, replace the rocker switch. For Avidyne and G1000 options refer Chapter 33 Interior Lighting - Maintenance Practices, Rocker Switch Removal and Installation.
2. If the pump does not operate, replace the circuit breaker.

2 Find the K-7 Latching Relay as follows:

a For the Avidyne option, the relay is found on right side of fuselage behind the right kidney panel on the instrument panel.

b For the Garmin G1000 option, the relay is found forward of the instrument panel to the right of the PFD and LRU's.

3 With the fuel pressure sensor terminals jumpered, move the backup pump switch to the armed position. With your hand on the relay, you should feel the relay actuate. If not, replace the relay.

4 Boost Pump

a With an ohmmeter, make sure that the pump has a good ground at pin 3 of the disconnect plug (0-1 ohms).

b With a voltmeter, make sure that 12 volts (S/N 41002 to 41500) or 24 volts (S/N 41501 and on) is on pin 2 of the disconnect plug while the vapor suppress switch in on.

c Make sure that 12 volts (S/N 41002 to 41500) or 24 volts (S/N 41501 and on) is on pin 3 of the disconnect plug while the backup switch is in the armed position.

d If all three above checks are OK, replace the pump. Refer to the Auxiliary Fuel Pump section above for installation and removal instructions.

5 Vapor Suppression is Inoperative (Low Speed).

a Check for operation of pump's low-speed operation with the backup pump switch in the off and armed position.

1. If the low speed only works with the backup pump switch off, check for voltage (±12 volts for S/N 41002 to 41500 or ±24 volts for S/N 41501 and on) on both sides of the power diode (located on the instrument panel under the terminal junction block, Avidyne and Garmin G1000 installations). If there is only voltage on one side, replace the diode.
2. If the low speed only works with the backup pump in the armed position replace the backup pump switch.

F. **Removal and Installation of Automatic Fuel Boost Pump System**

(1) Boost Pump Pressure Switch Removal (Refer to Figure 216).

(a) Make sure that aircraft power is turned off.

(b) Make sure that the mixture is in the idle cutoff position and the engine is not primed.

(c) Turn the fuel selector to off.

(d) Remove the upper engine cowling.

(e) Remove the sealant from wire terminals.

(f) Disconnect the pressure line from the boost pump pressure switch.

(g) Remove the jam nut, lock washer, and pressure switch.

(2) Boost Pump Pressure Switch Installation (Refer to Figure 216).

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(a) Installation is a direct reversal of the removal of the boost pump pressure switch.

(b) Torque the nut 240 to 280 in-lbs.

(c) Reconnect the unmetered pressure hose to the bottom of the switch. Torque the fitting 75 to 80 in.-lbs.

(d) Clean the terminals and the base of the switch with isopropyl alcohol or LPS Electro Contact Cleaner (MIL-PRF-29608 Class C).

1 Make sure that the terminals and the switch body are completely dry.

(e) Reconnect the electrical connections to the top of the switch.

(f) Use Type V, Class E sealant (RTV162) to completely cover the wire terminals and the wire bundle assembly where it attaches to the switch. Refer to Chapter 20, Solvents, Sealants and Adhesives - Description and Operartion, Table 1, Engine and General Purpose Materials.

1 Make sure there are no voids in the sealant.

2 Make sure the sealant fully covers as follows:

- the terminals on the switch
- the entire top of the switch and extends approximately 1/8 inch down the sides of the switch
- the ring terminals and the full length of the plastic sleeves where they attach to the switch.

(3) Fuel Pump Removal and Installation.

(a) Refer to the Auxiliary Fuel Pump section above for removal and installation instructions.

(4) Electrical Components (Avidyne and Garmin G1000).

NOTE: For the Model T240 G2000 installation, the power diode is installed in the Small Parts Module. Refer to Chapter 24, Small Parts Module - Removal/Installation.

(a) Power Diode Removal (For the Avidyne option, refer to Figure 218; for the Garmin G1000 option, the diode is located in the wiring cluster near the boost pump switch).

1 For the Avidyne option, remove the glare shield and right side kidney panel. For the Garmin G1000 option, remove the flap panel.

2 Cut the wires from the diode, and mark the cut wires.

3 Remove the diode, and replace with a new diode.

(b) Power Diode Replacement

1 Install diode.

2 Slide heat shrink over the wire, and using good solder practices, solder and heat shrink the wires.

3 For the Avidyne option, install the right side kidney panel and glare shield. For the Garmin G1000 option, install the flap panel.

4 Test the system by turning on the vapor suppress (Low Speed). The pump should stay on when the backup pump is activated.

(c) Arm Light Removal

1 Remove the left side knee bolster.

2 Loosen the switch plate and pull out from the instrument panel 2-3 in.

3 Remove the old light after cutting the wires.

(d) Arm Light Installation

1 Install a new light and crimp the terminals on after inserting through the mounting hole.

2 Reinstall the switch plate and left knee bolster.

3 Test the arm light operation by momentarily arming the backup pump switch.

(e) K-7 Latching Relay Removal (Avidyne and Garmin G1000 installations).

1 For the Avidyne option, remove the glare shield and right side kidney panel. For the Garmin G1000 option, access the relay from underneath the instrument panel.

2 Carefully mark the wires to the relay.

3 Remove the relay.

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(f) K-7 Latching Relay Installation

1 Replace the relay, paying close attention to the orientation of the relay.

2 Re-attach the wires to the terminals.

3 Replace removed items and glare shield, as applicable.

4 Do a functional test the entire backup pump system. Refer to Automatic Fuel Boost Pump System Maintenance Practices section.

(g) Rocker Switches Removal Avidyne and Garmin 1000).

NOTE: For the Model T240 rocker switch removal and installation procedures refer to, Chapter 25 Switch Panel Rocker Switch (T240) - Removal/Installation.

1 Remove the left side knee bolster.

2 Loosen the switch plate and pull out from the instrument panel 2-3 inches.

3 Carefully identify the wires to the switch.

4 Remove the unserviceable switch from the metal plate.

(h) Rocker Switches Installation

1 Install the replacement switch, and connect the wires to the terminals.

2 Reinstall the switch plate and left side knee bolster.

3 Functional test the entire backup pump system per the Automatic Fuel Boost Pump System Maintenance Practices section.

6. Fuel Gascolator

A. Removal and Installation of Fuel Gascolator

(1) Normal use and maintenance does not require removal of the gascolator from its mounting. If removal and replacement of the whole gascolator is required, contact Cessna Aircraft Company.

(2) If maintenance practices do not maintain correct functioning of the gascolator, contact Cessna Aircraft Company for removal and replacement instructions.

B. Fuel Gascolator Maintenance Practices

(1) Periodic cleaning of the filter is required for proper operation of the fuel system as indicated in Chapter 5 of this manual.

C. Removal of the Gascolator Bowl and Filter (Refer to Figure 219 and Figure 220.)

(1) Turn the fuel selector to the off position.

(2) Drain any residual fuel from the gascolator.

(3) Remove the safety wire securing the gascolator bowl mounting ring. Refer to Figure 219.

(4) Turn the ring clockwise, as seen from the bottom, until the ring is unthreaded. Note the alignment of the arrow on the bowl to the line on the gascolator base. Refer to Figure 220.

(5) Pull gently straight down on the bowl to remove and access the filter/bypass element.

(6) Unscrew the filter/bypass element, and carefully clean the filter and bypass. Check for smooth operation of the bypass.

(7) Clean the gascolator bowl and inspect the O-ring seal. Replace the seal as necessary. Contact Cessna Aircraft Company for replacement O-rings.

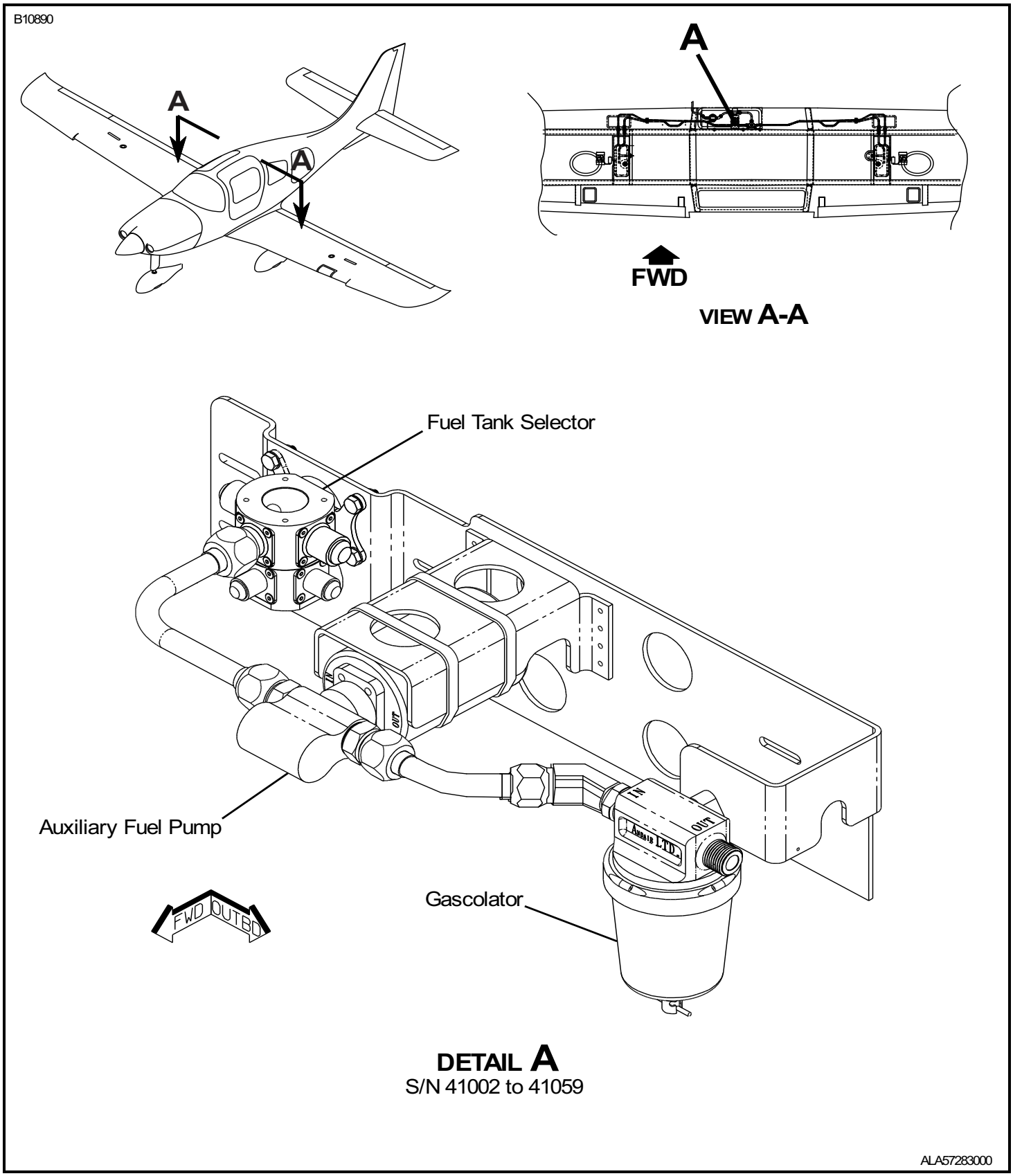
(8) Reassembly is a direct reversal of removal. Note the pin on the top of the gascolator bowl must fit into the groove of the gascolator base.

D. Fuel Strainer Internal Bypass and Filter Replacement

(1) If the internal bypass/filter requires replacement, contact Cessna Aircraft Company.

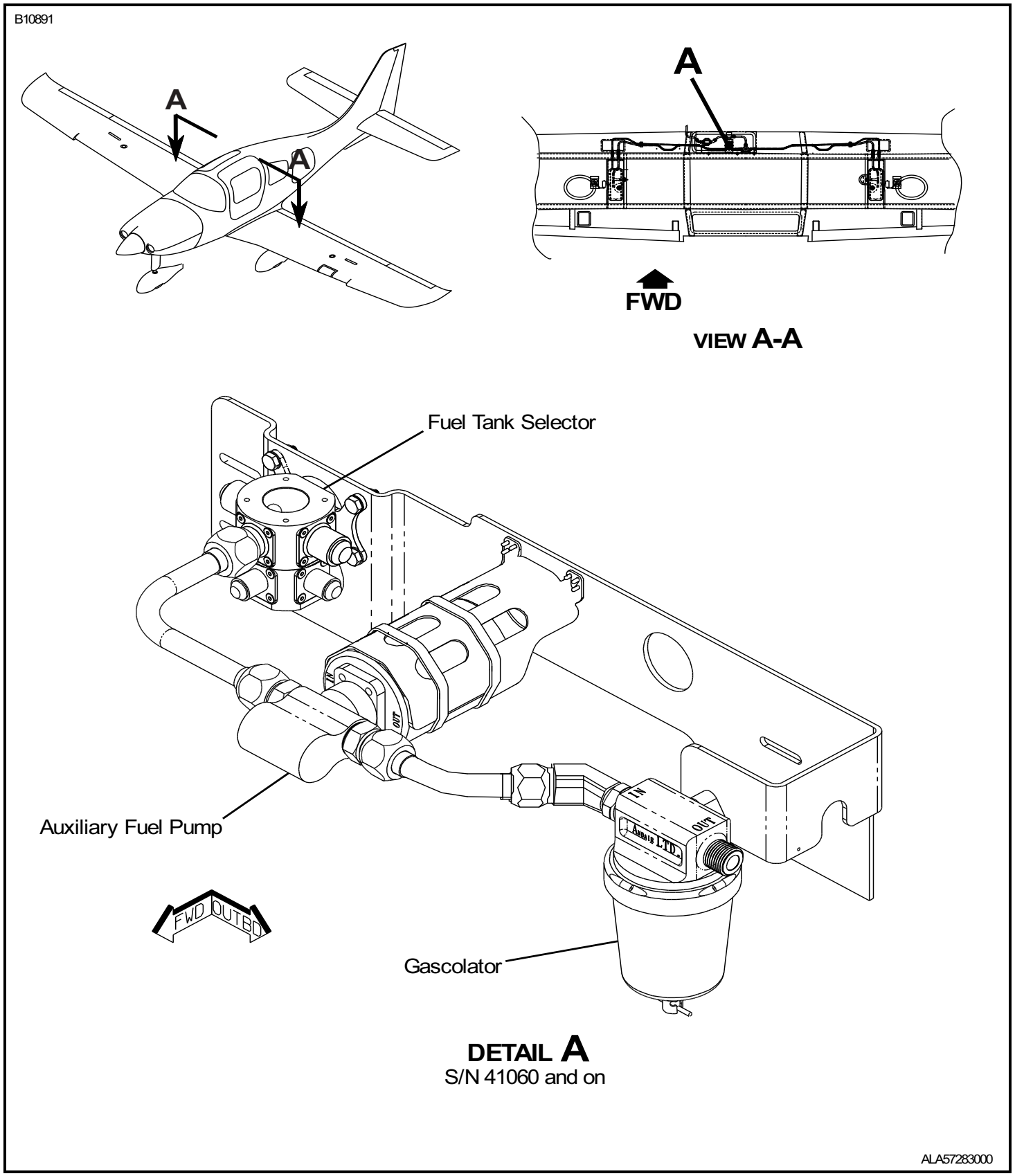
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Figure 201 : Sheet 1 : Fuel Selector, Pump, and Gascolator Module



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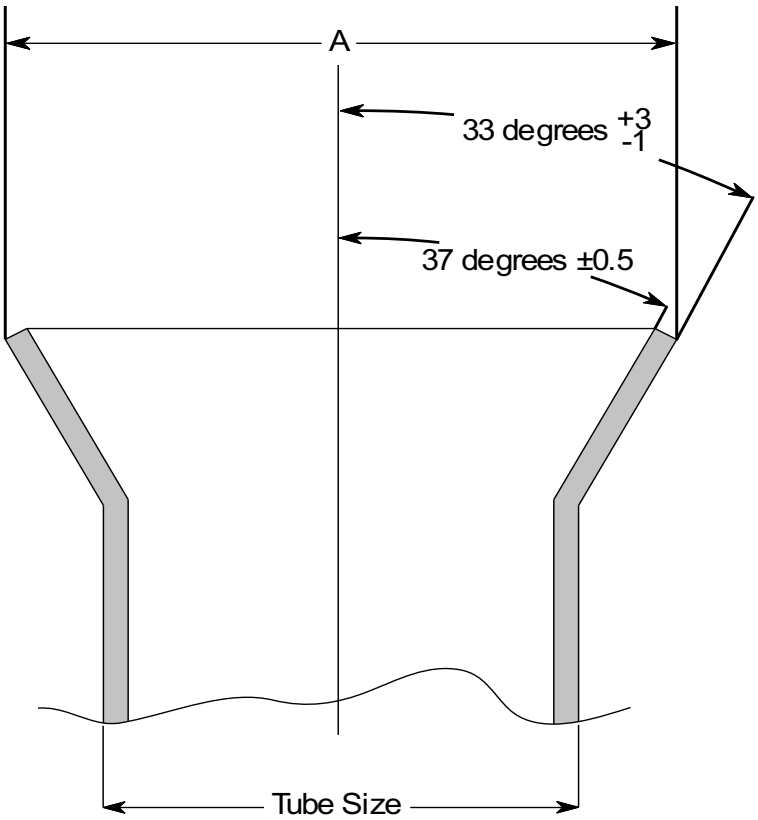
Figure 201 : Sheet 2 : Fuel Selector, Pump, and Gascolator Module



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Figure 202 : Sheet 1 : AN Flared Tube Angles

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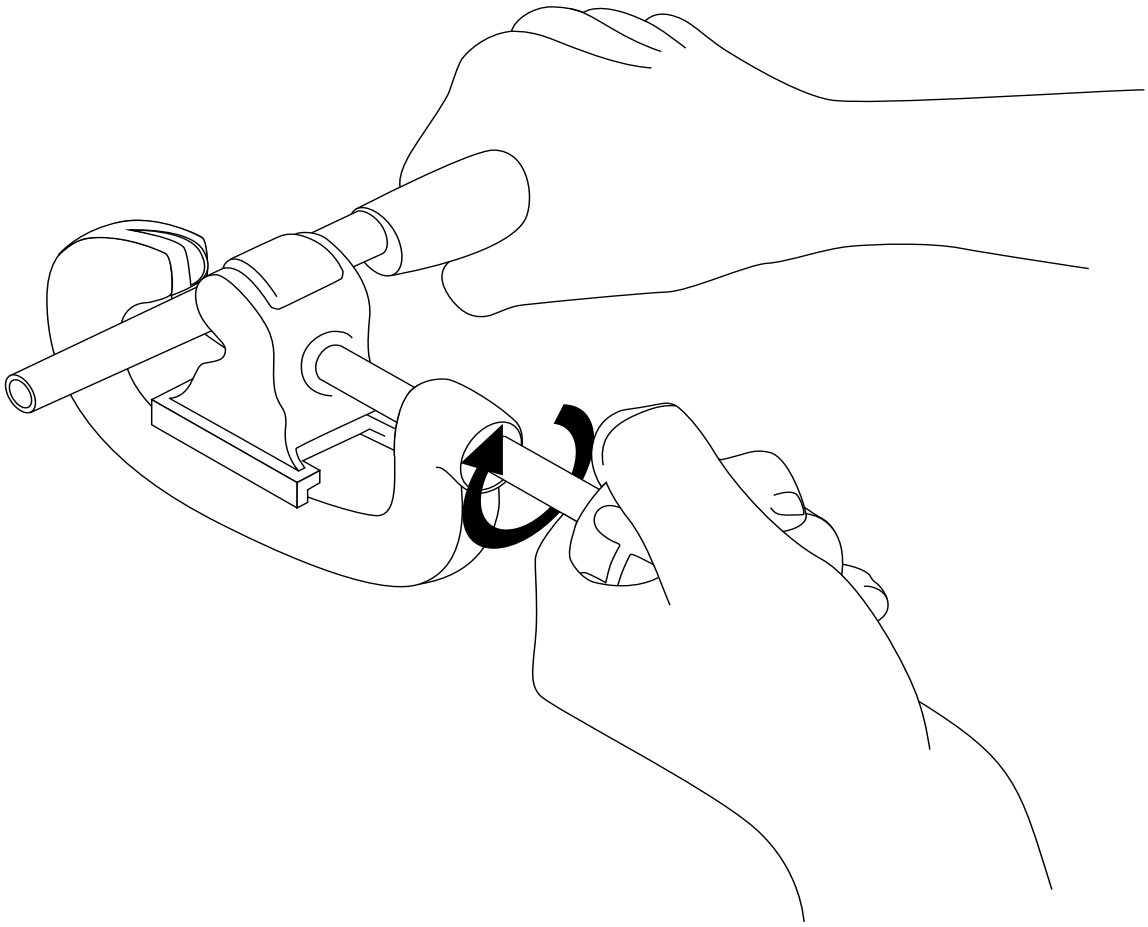


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Figure 203 : Sheet 1 : Inserting the Tubing into the Tube Cutter and Adjusting the Cutter

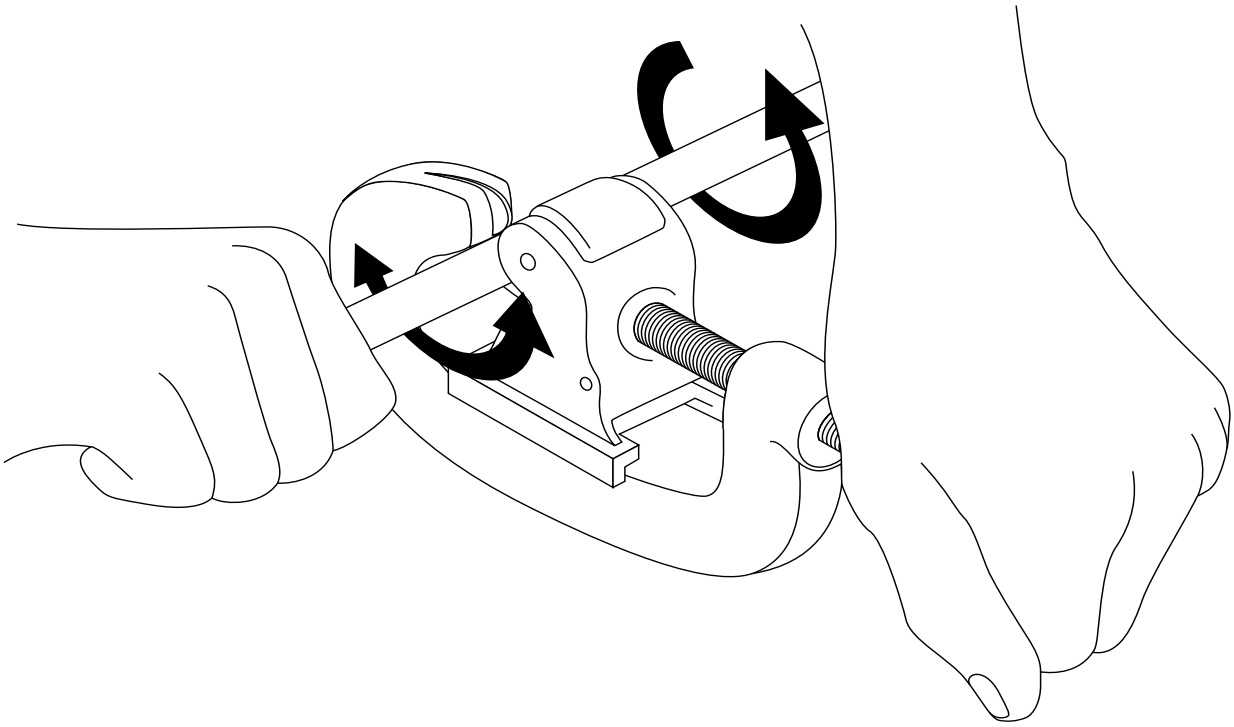
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Figure 204 : Sheet 1 : Cutting the Tube with Tube Cutter

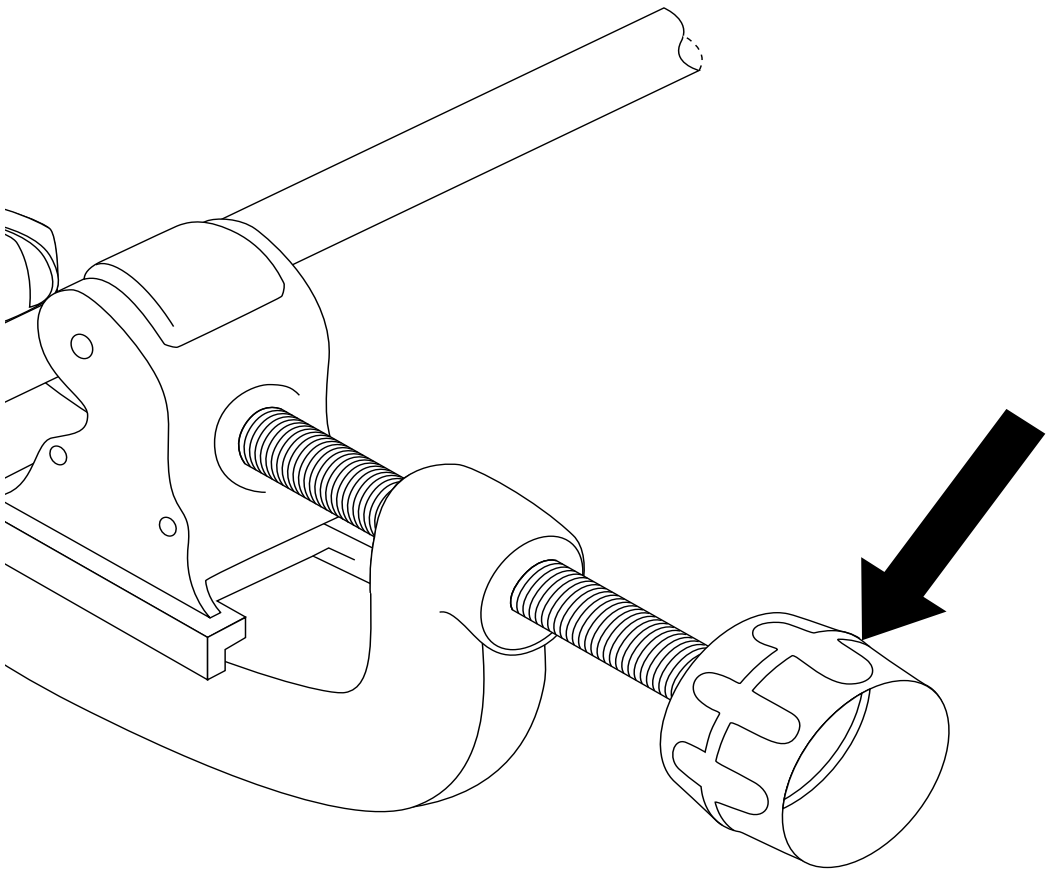
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Figure 205 : Sheet 1 : Adjusting the Tubing Cutter to Cut Deeper

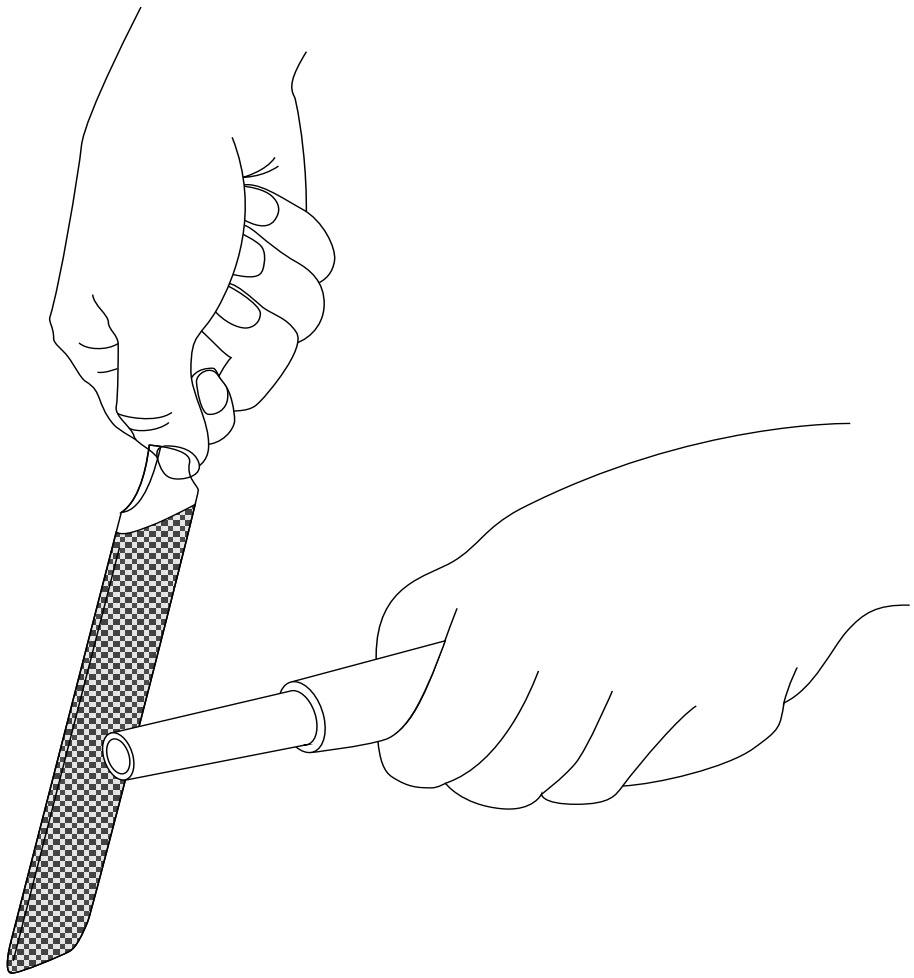
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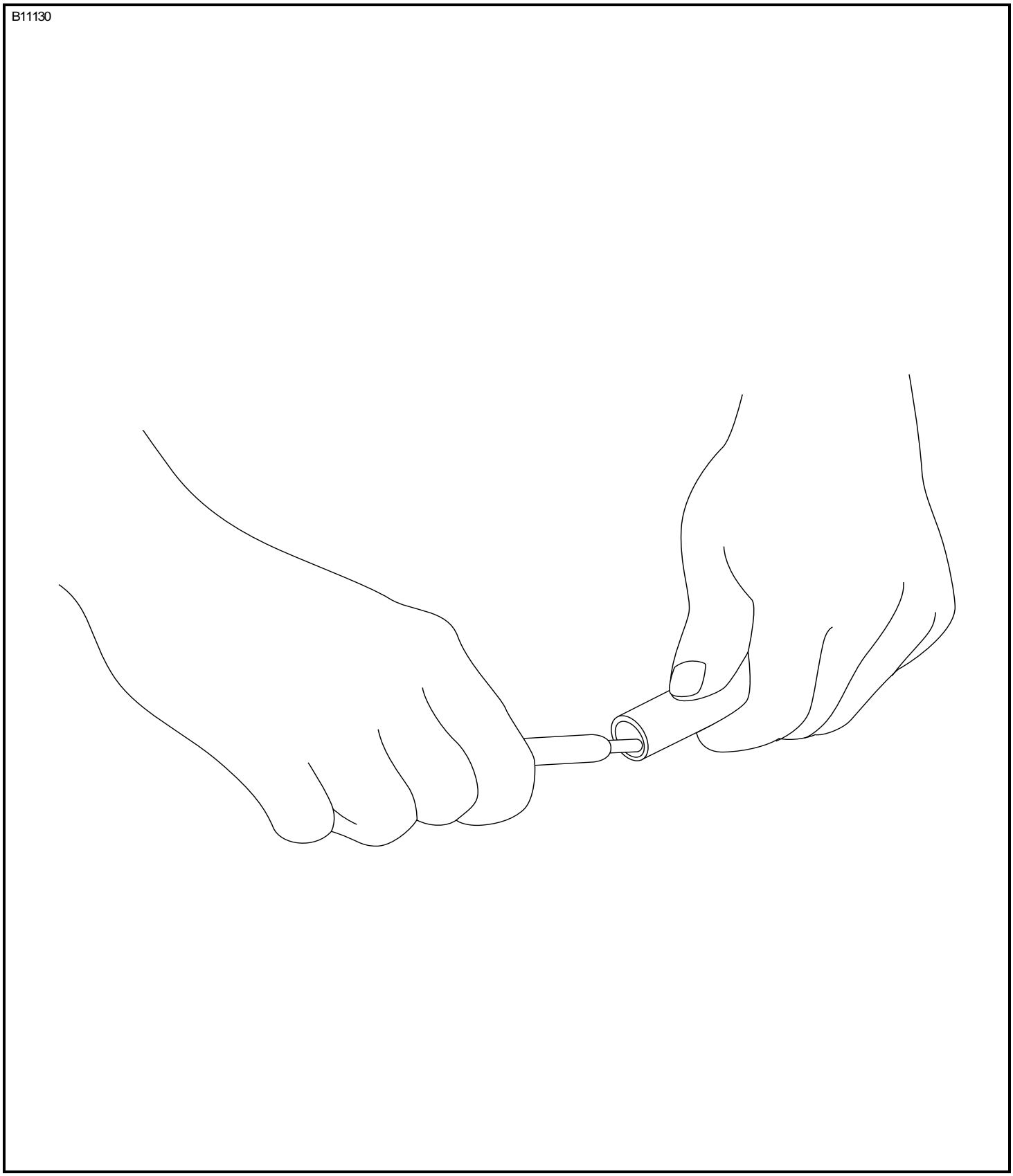
Figure 206 : Sheet 1 : OD Deburring using a File

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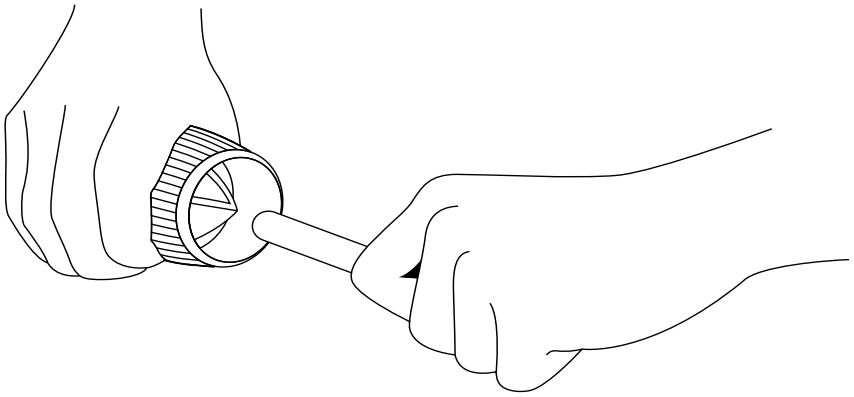
Figure 207 : Sheet 1 : ID Deburring Using a Deburring Tool



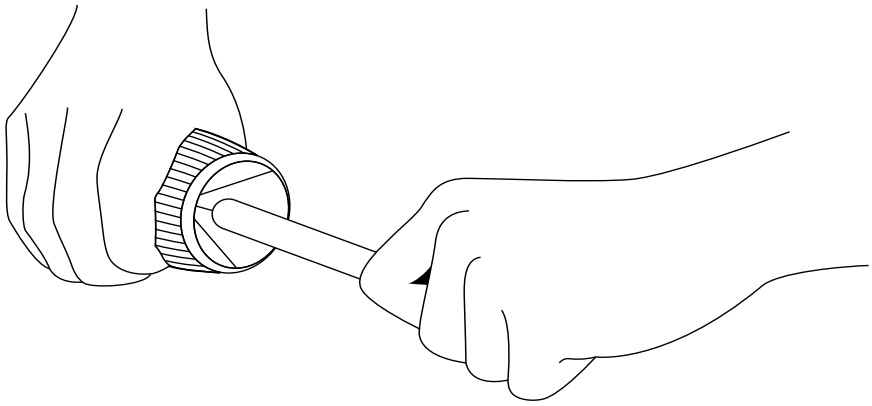
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Figure 207 : Sheet 2 : ID Deburring Using a Deburring Tool

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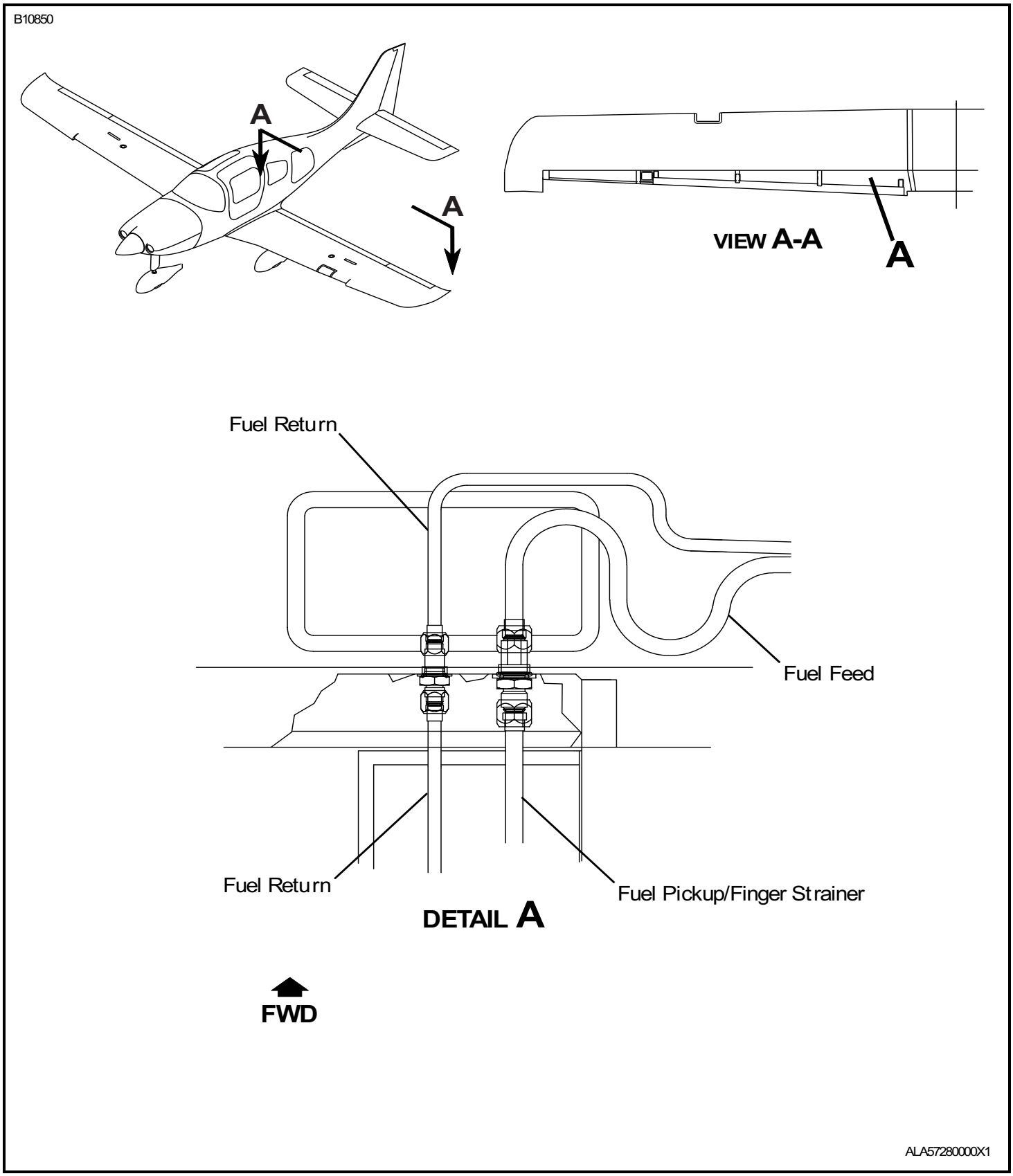
ID Deburring With Swagelok
Deburring Tools



OD Deburring With Swagelok
Deburring Tool

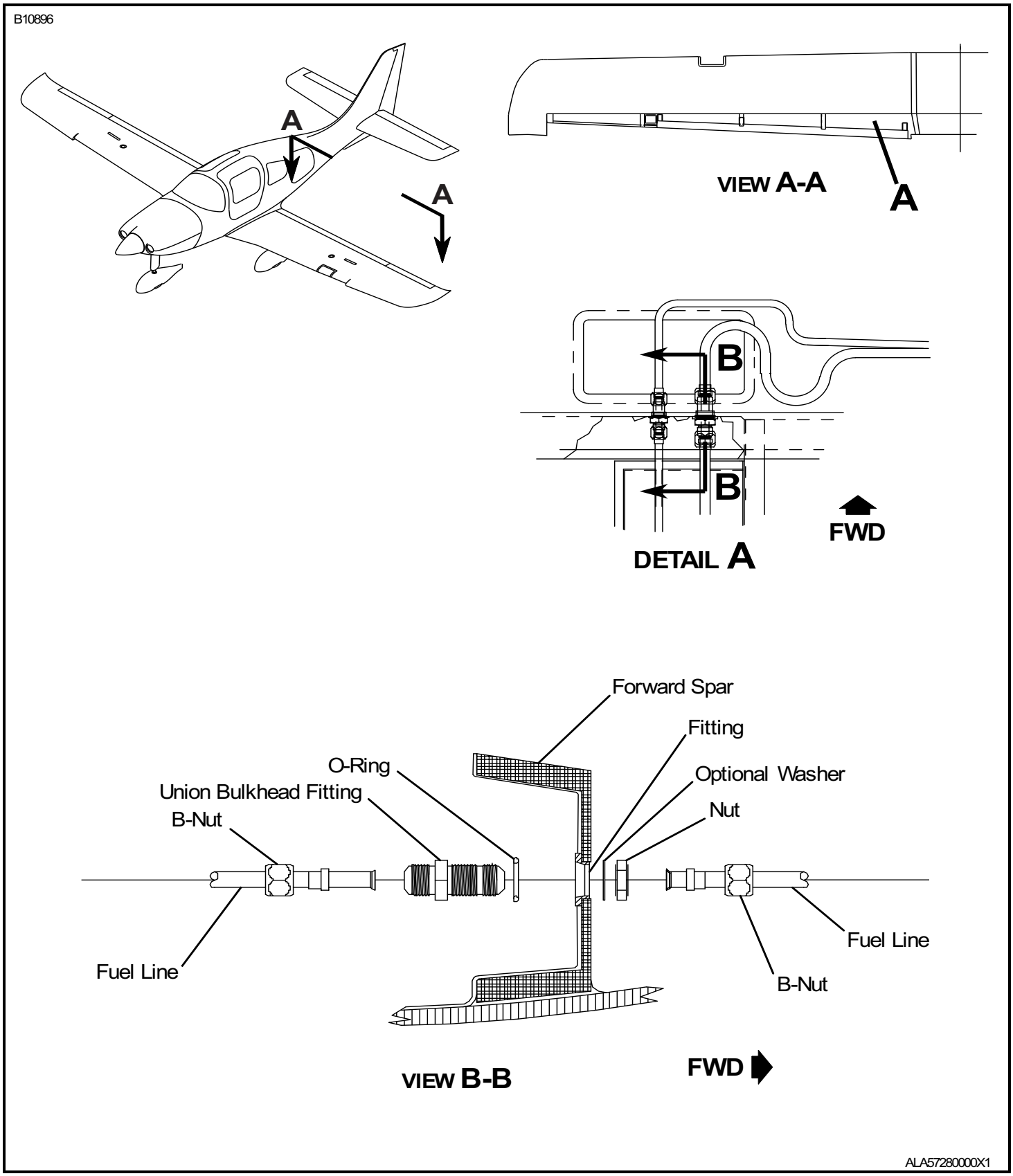
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Figure 208 : Sheet 1 : Fuel Return, Fuel Feed, and Fuel Pickup Lines (Left Wing Shown)



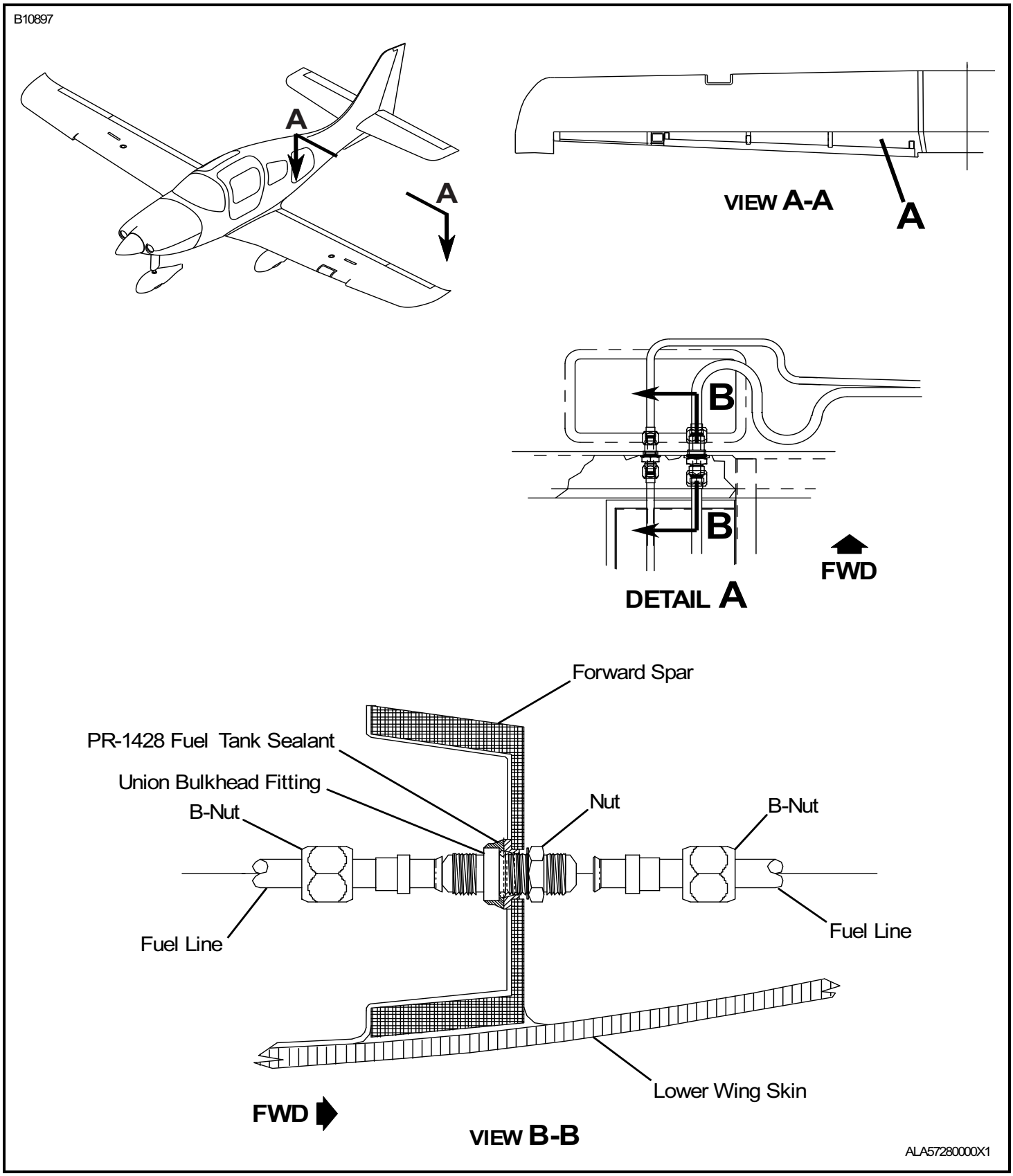
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Figure 209 : Sheet 1 : Installation of Fuel Line Fittings WS 48.0 and WS 50.25 (Section A-A)



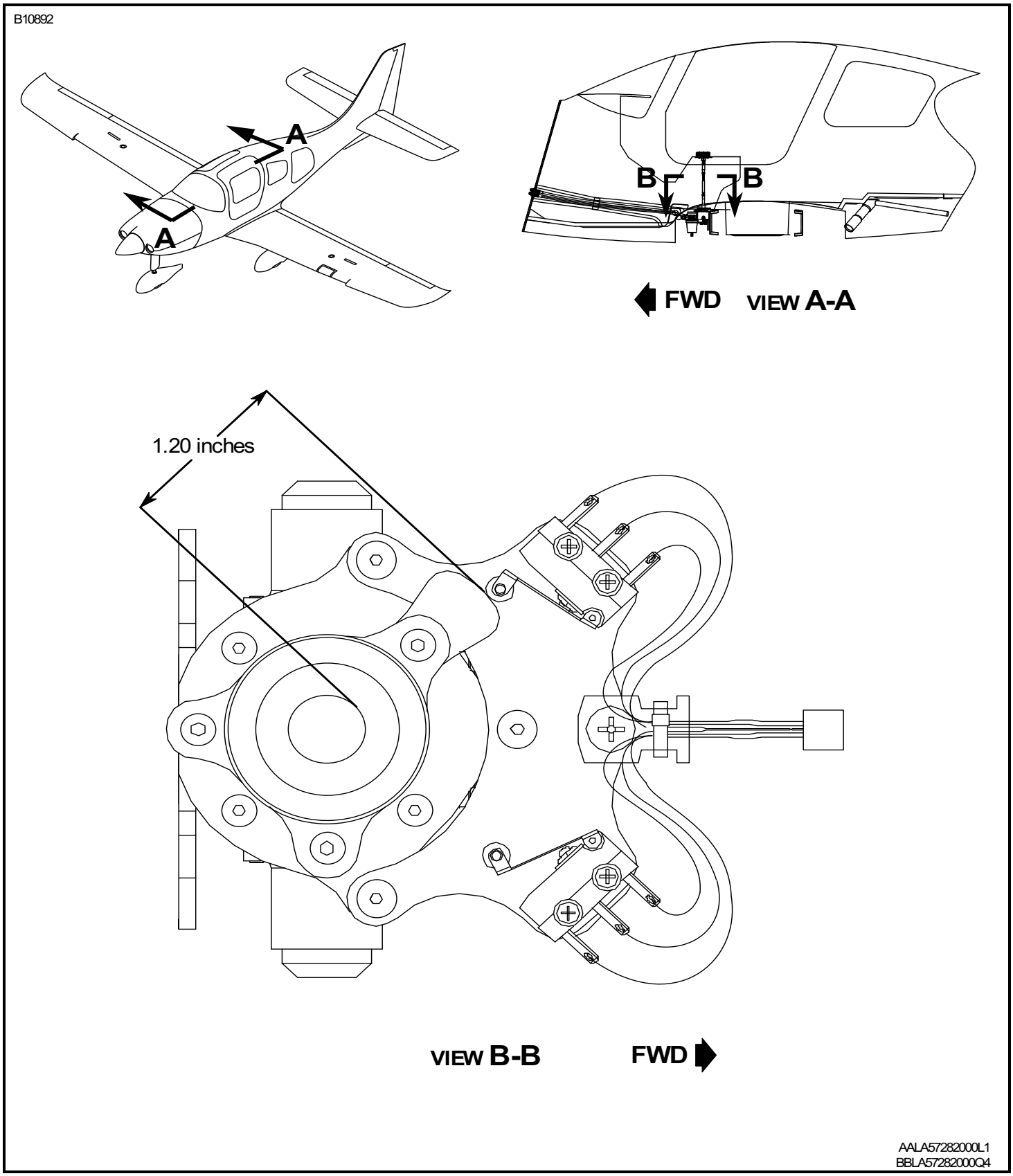
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Figure 210 : Sheet 1 : Installation of Fuel Line Fittings WS 48.0 and WS 50.25 (Section A-A)



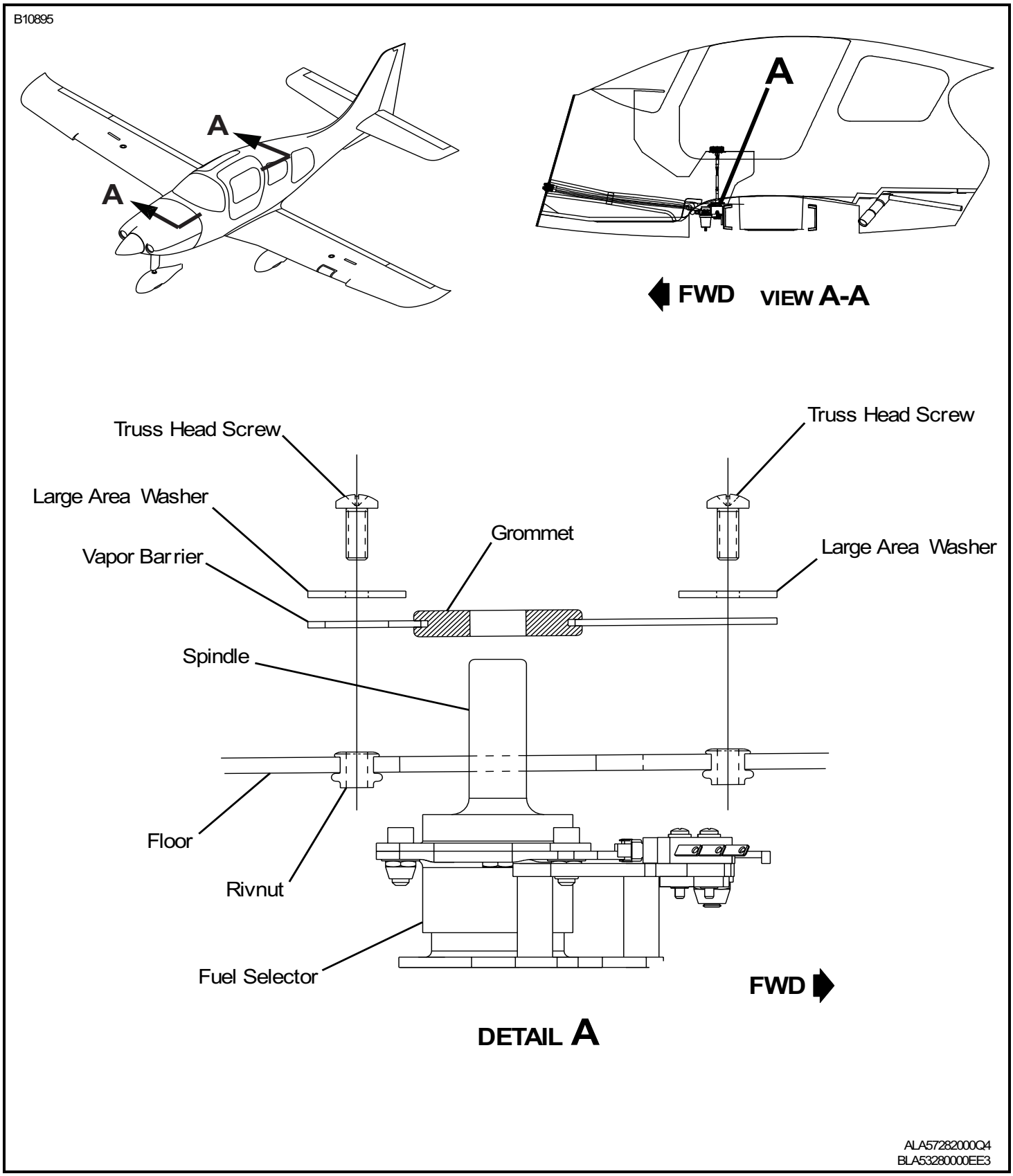
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Figure 211 : Sheet 1 : Fuel Selector Microswitch Position



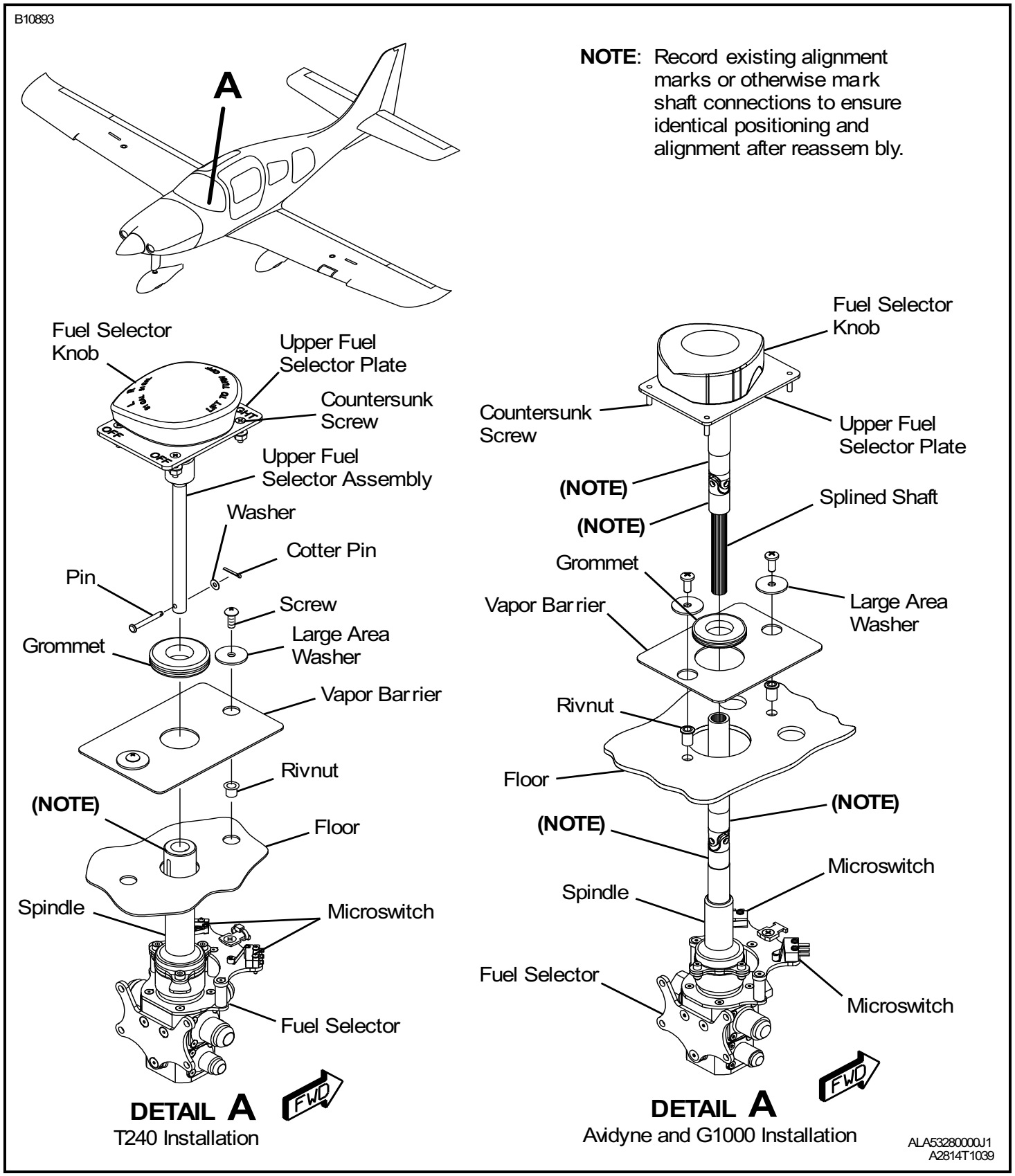
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Figure 212 : Sheet 1 : Fuel Selector Assembly Viewed from Passenger Seat



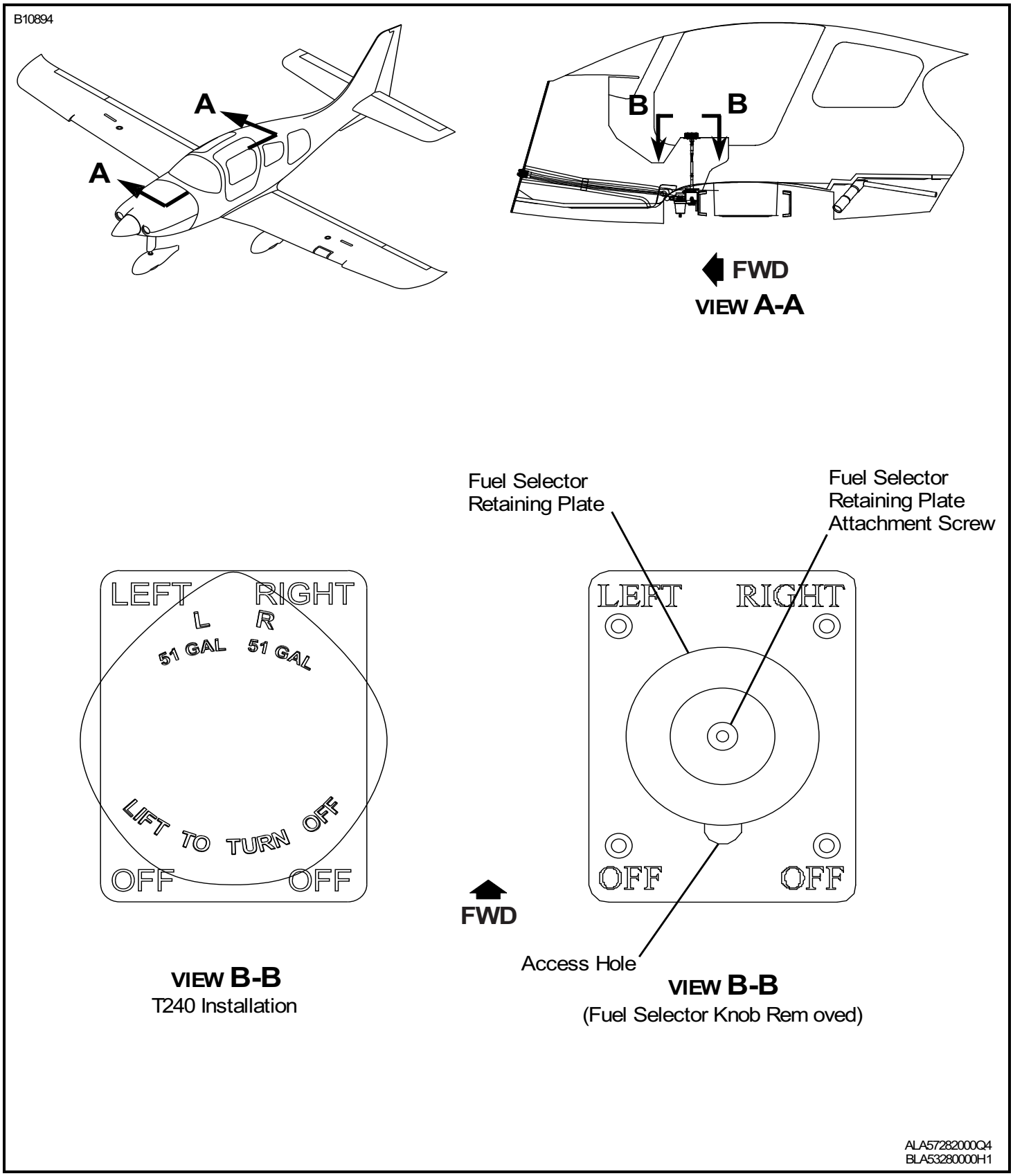
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Figure 213 : Sheet 1 : Fuel Selector Assembly



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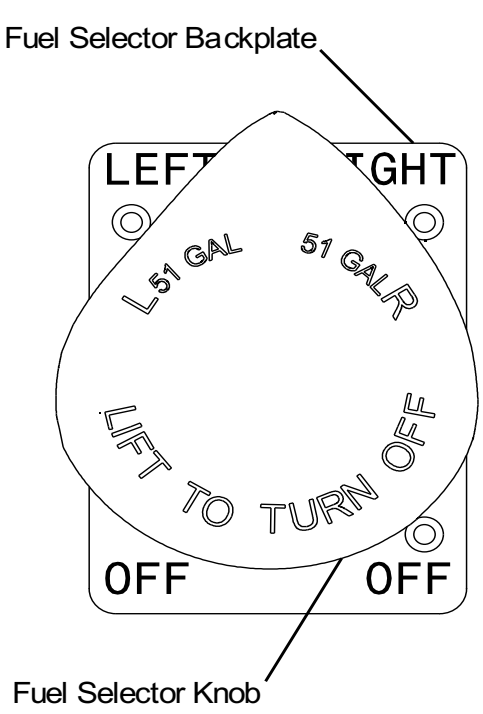
Figure 214 : Sheet 1 : Fuel Selector Knob



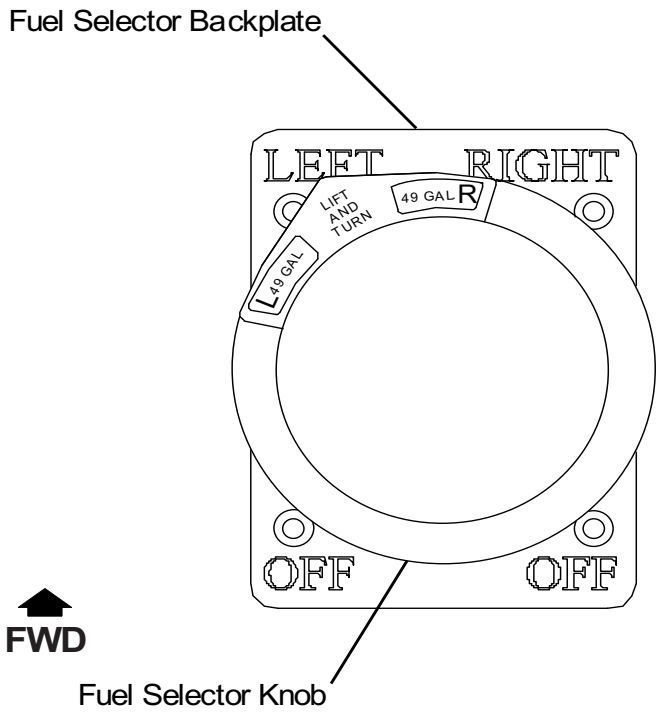
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Figure 214 : Sheet 2 : Fuel Selector Knob

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Airplanes 41800 Thru 02000

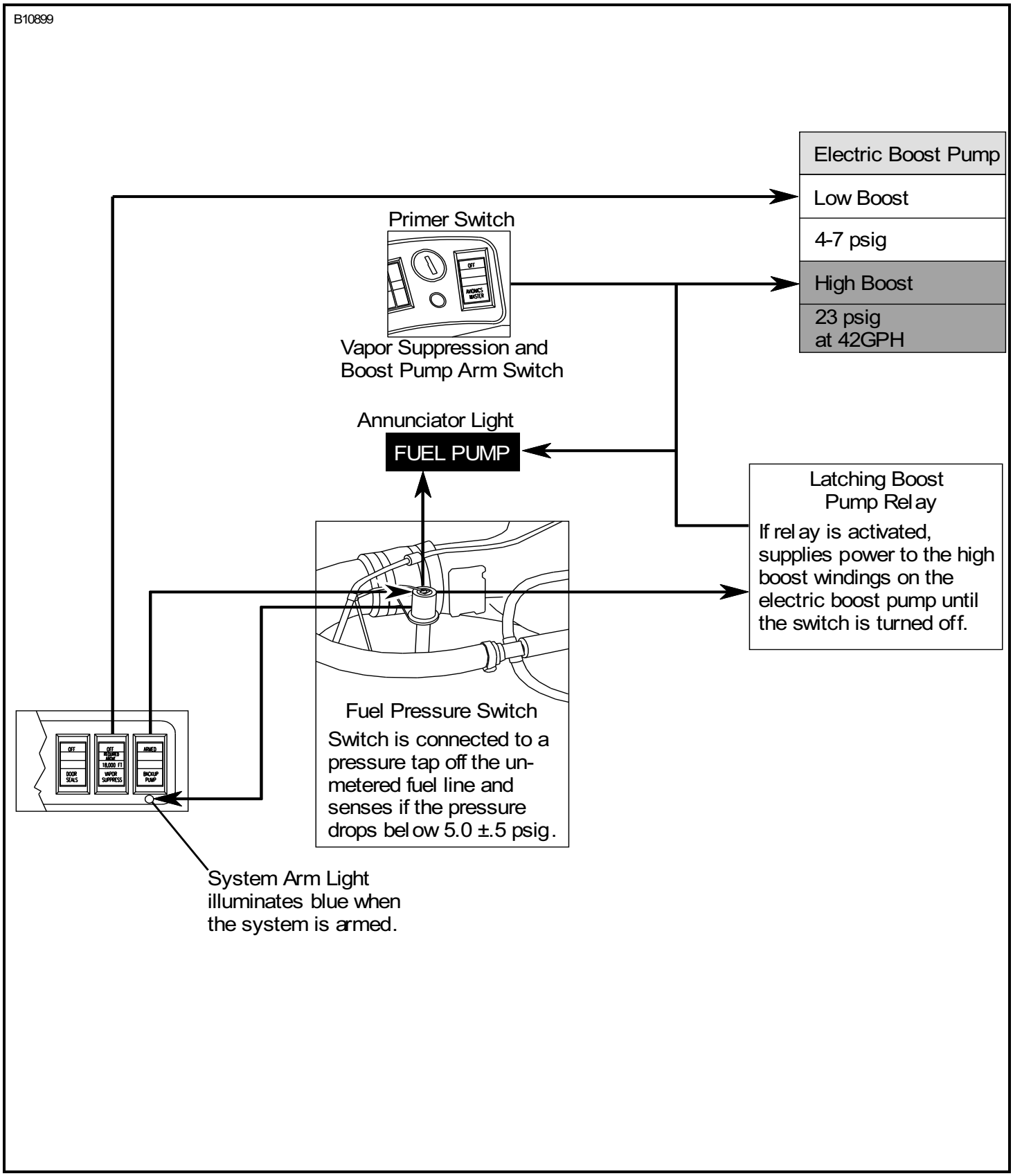


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Airplanes 41501 Thru 41799

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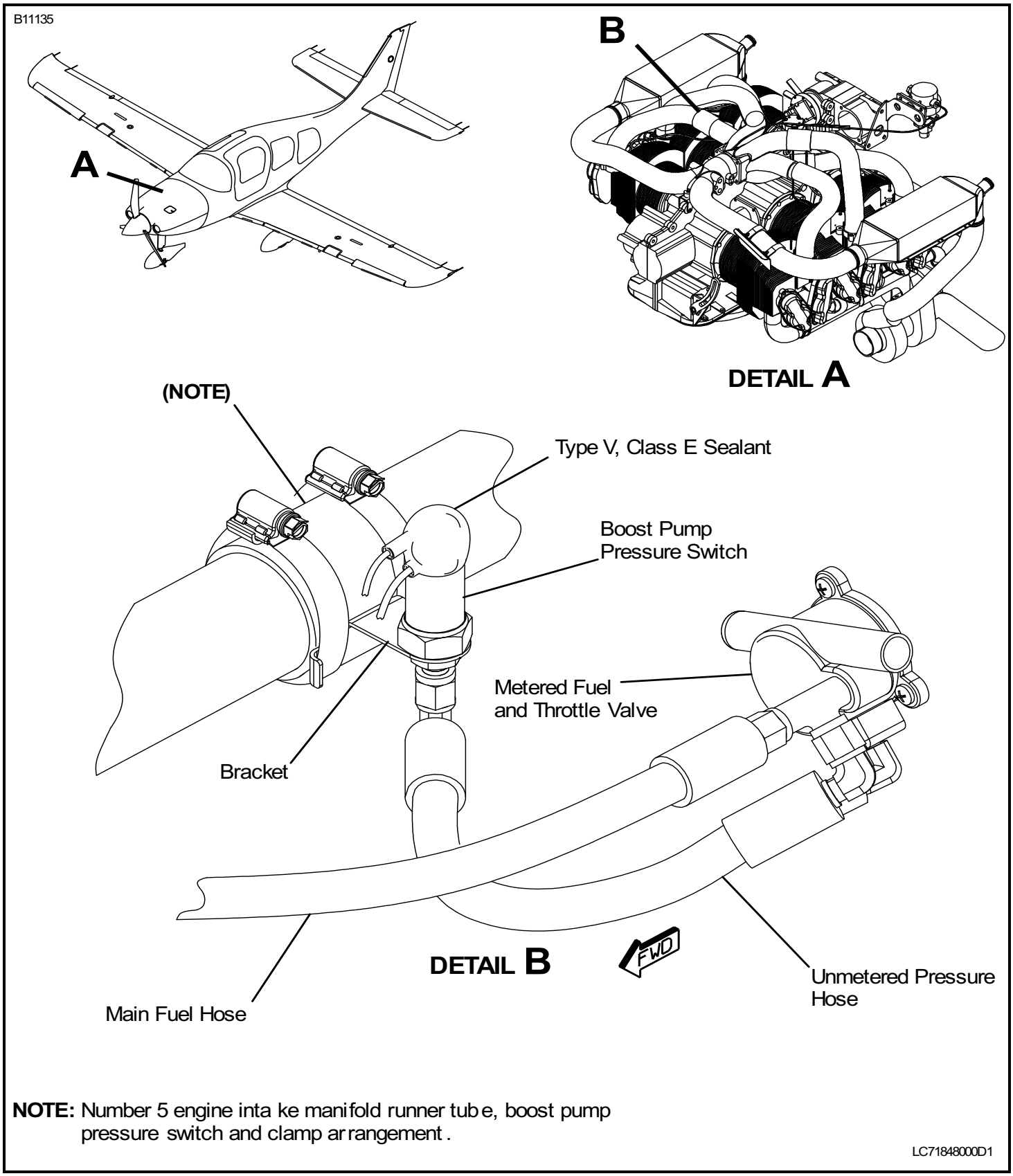
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Figure 215 : Sheet 1 : Automatic Fuel Boost Pump System (Avidyne and Garmin G1000)



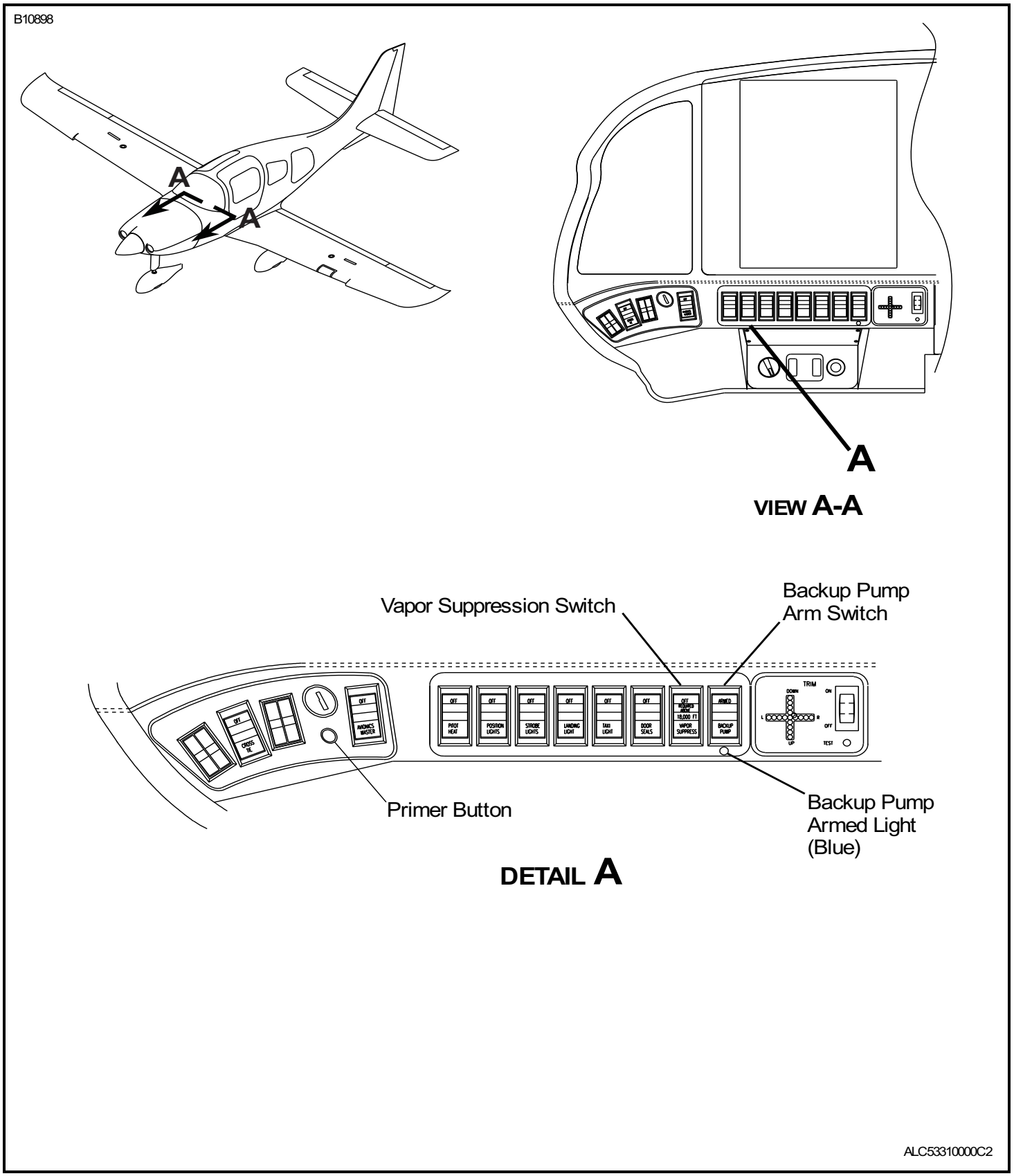
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Figure 216 : Sheet 1 : Boost Pump Pressure Switch Installation



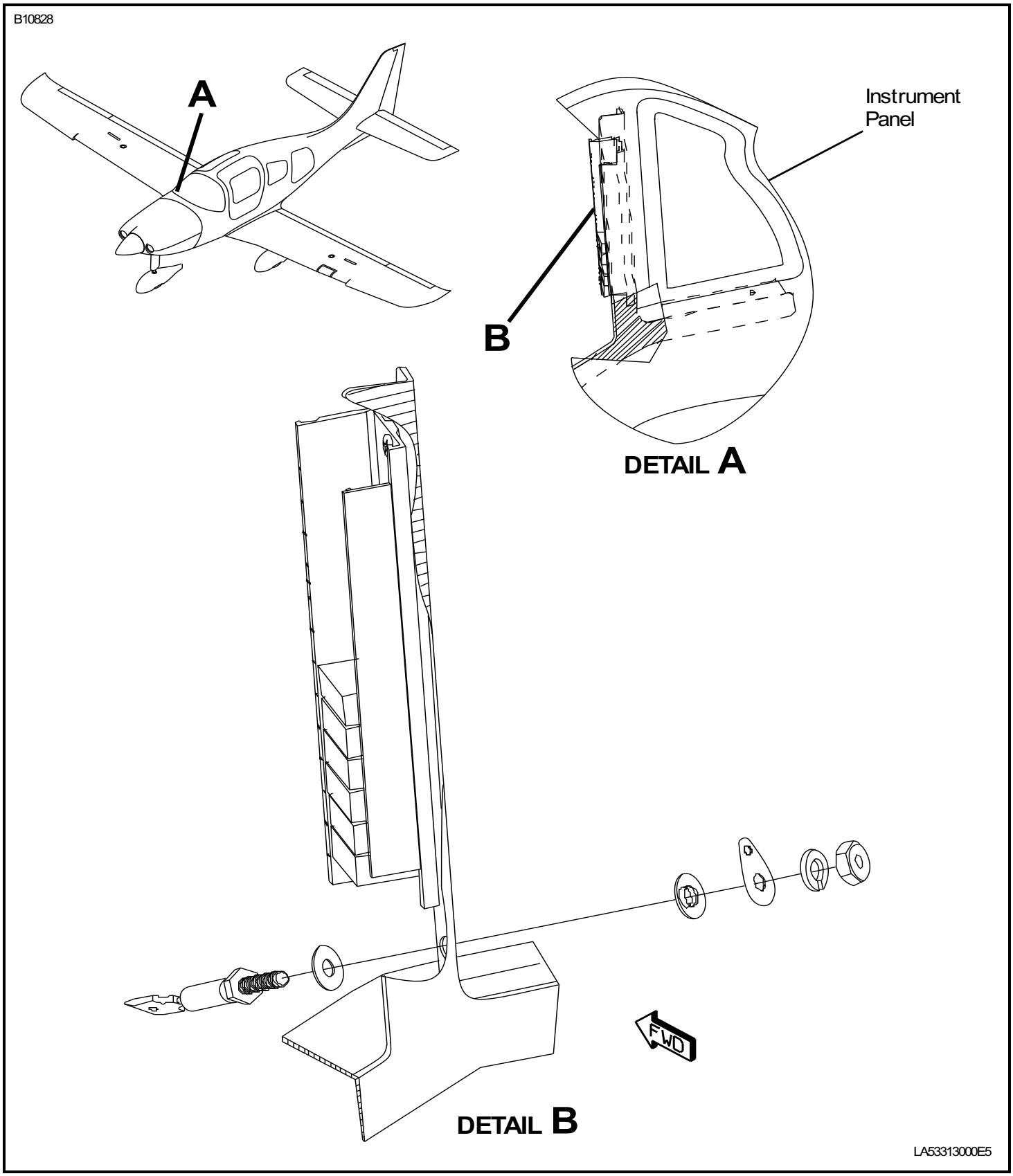
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Figure 217 : Sheet 1 : Fuel System Cockpit Switches (Avidyne Option Only)



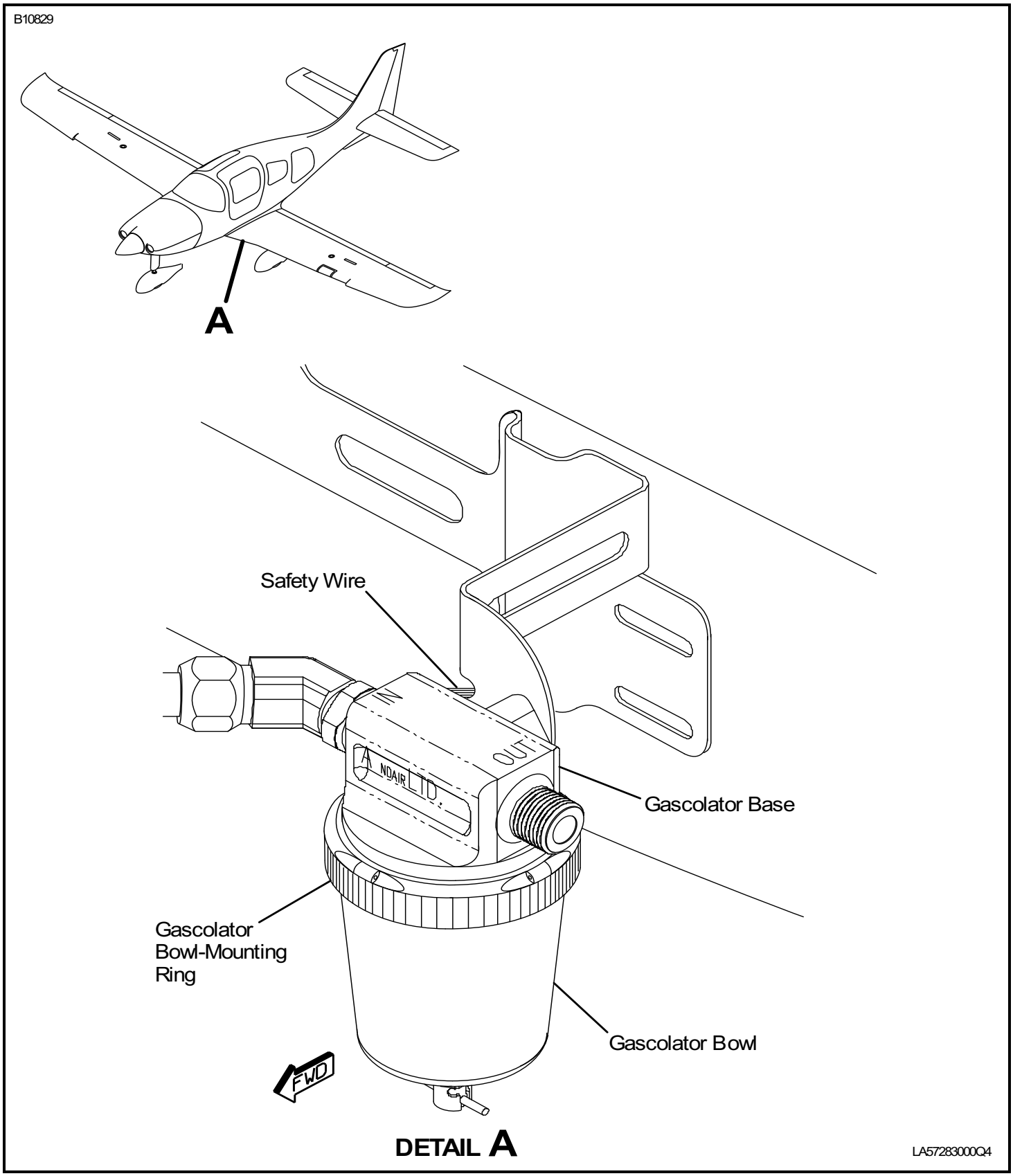
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Figure 218 : Sheet 1 : Power Diode Location and Installation



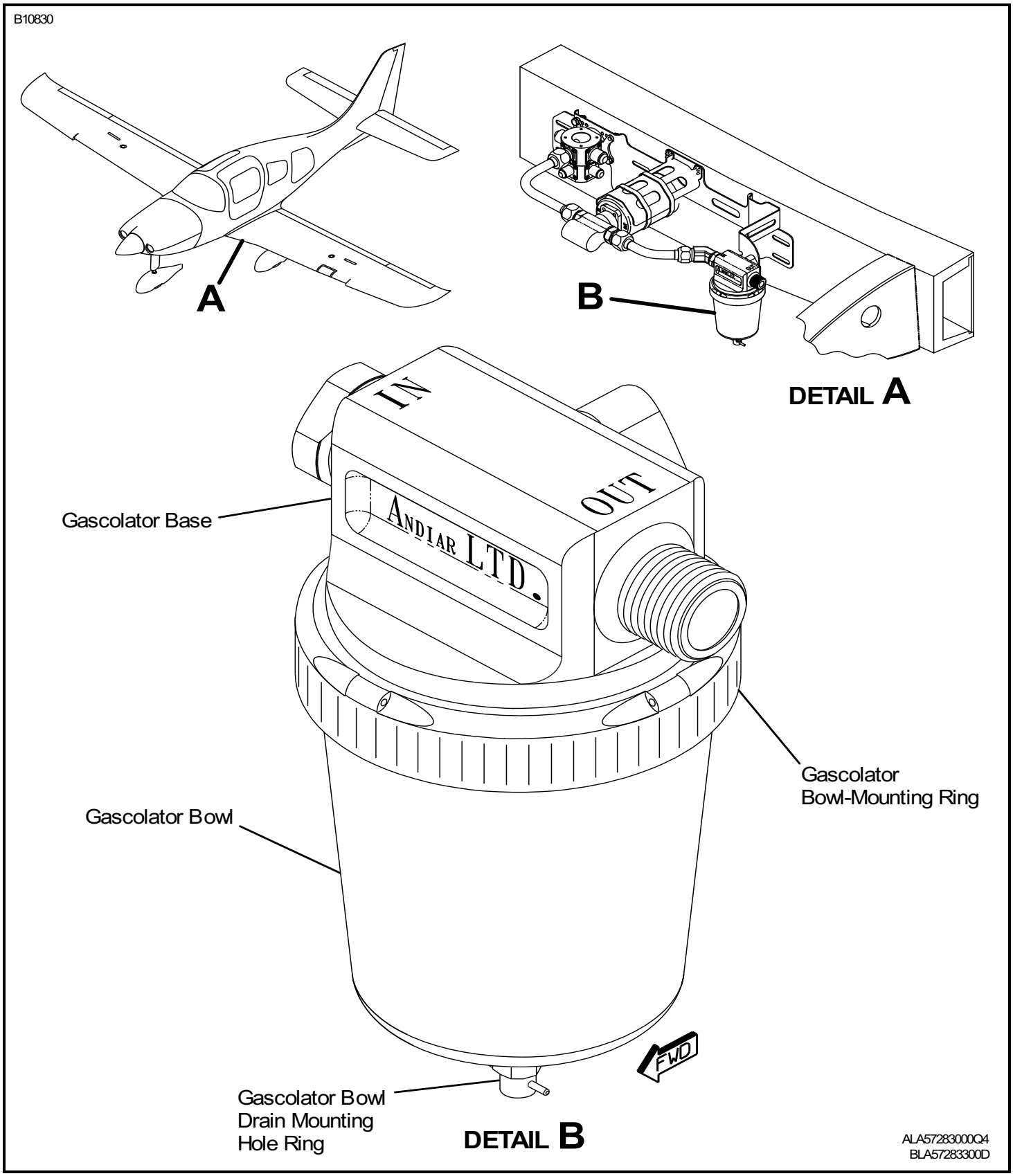
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Figure 219 : Sheet 1 : Gascolator Safety Wiring and Mounting



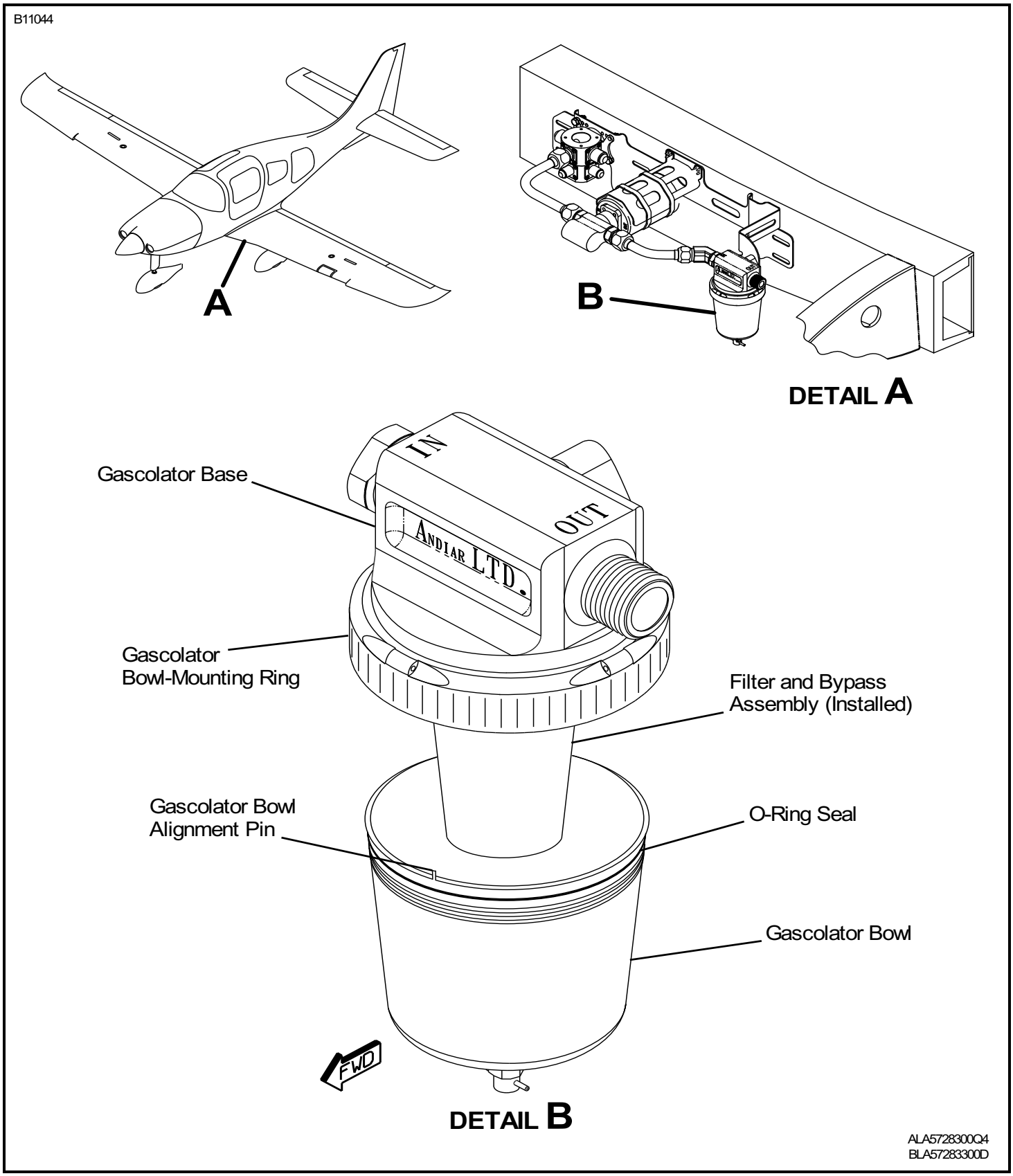
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Figure 220 : Sheet 1 : Gascolator Detail



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Figure 220 : Sheet 2 : Gascolator Detail



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FUEL INDICATING SYSTEM - MAINTENANCE PRACTICES
(Avidyne or Garmin G1000)

1. Indicating

A. **Avidyne Option** - The fuel system indicating system includes a fuel level gauge, low fuel level warning lights, fuel tank selector lights located in the fuel level gauge, a fuel selector warning light, and fuel system information display on the Avidyne Entegra EX5000 Multi-Function Display. The fuel level is measured using two tank-mounted float level sensors, one in the inboard fuel tank bay, and one in the outboard fuel tank bay. The low fuel level sensors are float switches mounted approximately through the middle of the inboard fuel tank rib at WS 46.0. The fuel selector valve indicator lights use microswitch sensors mounted on the top of the fuel selector.

B. **Garmin G1000 Option** - The fuel system indicating system displays on the Garmin G1000 MFD. The fuel level is measured using two tank-mounted float level sensors, one in the inboard fuel tank bay, and one in the outboard fuel tank bay. The low fuel level sensors are float switches mounted approximately through the middle of the inboard fuel tank rib at WS 46.0. The fuel selector valve indicator lights use microswitch sensors mounted on the top of the fuel selector.

2. Fuel Quantity Gauge Removal and Installation. (Avidyne Option)

A. Remove the Fuel Quantity Gauge.

(1) Remove electrical power from the airplane.

(2) Remove the screws that attach the instrument panel.

(3) Carefully pull the instrument panel out to get access to the back of the fuel quantity gauge.

(4) Disconnect the electrical connector from the fuel quantity gauge.

(5) Remove the screws that attach the gauge to the instrument panel.

(6) Remove the gauge from the airplane.

B. Install the Fuel Quantity Gauge.

(1) Put the gauge in position on instrument panel.

(2) Attach the gauge to the instrument panel with screws.

(3) Connect the electrical connector.

(4) Put the instrument panel into place.

(5) Use screws to attach the instrument panel.

(6) Make sure the gauge functions correctly.

(a) Put a known quantity of fuel greater than 10 gallons of fuel in each wing.

(b) Put the Master switch to the ON position.

(c) Make sure the fuel quantity gauge indicates the amount of fuel in each tank.

(d) Put the Master switch to the OFF position.

3. Fuel Valve Indicator Lights

A. **Fuel Valve Indicator Lights Description and Operation**

(1) The fuel valve is equipped with two micro-switches to sense the position of the fuel selector. The selected tank is displayed on the fuel level gauge with a green LED (Avidyne option) or displayed by a blue light on the MFD (Garmin G1000 option) showing the selected fuel tank. If no green LED or blue light, as applicable, is illuminated, the selector is off the tank, in-between tanks, or in the off position. During these conditions, a FUEL VALVE warning light illuminates (Avidyne option) or a warning annunciation displays (Garmin G1000 option).

B. **Testing the Fuel Valve Indicator Lights**

(1) Avidyne option

(a) With the master switches on (batteries only if the engine is not running) place the fuel selector in the left tank detent. The fuel warning light should be extinguished, and the green light on the fuel level gauge should be illuminated.

(b) Repeat for the right tank.

(c) Verify that both green lights, as applicable, are extinguished and the fuel warning light is illuminated when the valve is in between tanks or in the off position.

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(d) Contact Cessna Aircraft Company if the indicator lights are not functioning properly.

(2) Garmin G1000 option

(a) With the master switches on (batteries only if the engine is not running) place the fuel selector in the left tank detent. The fuel warning annunciation should clear, and the blue light on the MFD should be illuminated.

(b) Repeat for the right tank.

(c) Verify that both blue lights are extinguished and the fuel warning annunciation is displayed when the valve is in between tanks or in the off position.

(d) Contact Cessna Aircraft Company if the indicator lights are not functioning properly.

4. Low Fuel Annunciators (Left And Right Tanks)

A. **Low Fuel Annunciators Removal and Installation** - Fuel Tank Low Fuel Level Floats

(1) If removal of the low fuel level switch is required, contact Cessna Aircraft Company for further instructions.

NOTE: If the fuel switch access panel (installed on the outboard side of the FIKI TKS fluid tank) is removed to get access to the low fuel level switch, it must be correctly sealed when installed. Refer to Chapter 30, TKS Anti-Ice System (FIKI) - Description and Operation, Description.

B. **Testing Low Fuel Annunciator**

(1) With less than six gallons of usable fuel in the fuel tank and the aircraft level, the low fuel warning annunciator should be illuminated for the tank with the low fuel quantity.

(2) During fueling, the low fuel level warning should extinguish prior to 10 gallons usable fuel being in the tank.

(3) If a low fuel level sensor is suspected, replace per instructions in Section 28-10-00, Fuel Level Sensors.

(4) Visually inspect the low fuel level float switch or visible damage and freedom of movement.

(5) If a faulty switch is suspected, refer to Chapter 33 of detailed instructions.

C. **Replacing Low Fuel Annunciator Lights**

(1) Refer to Chapter 33 of this manual for detailed instructions.

5. Fuel Quantity Transducer Calibration (Garmin G1000)

NOTE: The G1000 system can be calibrated for 49 as well as 51 gallon fuel tanks. Ensure the appropriate option has been selected when performing fuel calibration. Incorrect calibration will lead to misleading displays and potential fuel starvation of the aircraft. Attention to detail is imperative.

NOTE: Use proper precautions when handling fuel. Ensure that the aircraft is grounded correctly and that there is adequate ventilation.

A. **Fuel Quantity Transducer Calibration Setup**

(1) Level the aircraft per Section 07-00-00.

(2) Drain all fuel from each fuel tank, and set the fuel selector switch to the 'OFF' position.

(3) Fill each fuel tank with unusable fuel level, 2 gallons (for 51 gallon option) or 4 gallons (for 49 gallon option).

(4) Start the G1000 system in Configuration mode. Reboot the MFD in normal mode for this procedure by pulling, then resetting, the MFD circuit breaker. On the MFD, press the SYSTEM softkey to display the full page engine instrumentation.

(5) Go to the CAL Page Group on the PFD. The FUEL TANK CALIBRATION page should be displayed as shown in Figure 201.

(6) This page is protected and requires a keystroke password to perform the calibration. Press the following softkeys in sequence:

(a) softkey 12 (Far Right softkey)

(b) softkey 11

(c) softkey 10

(d) softkey 9

(7) Press the TNK SEL softkey to activate the cursor in the CURRENT TANK field. Rotate the FMS knob as necessary throughout this procedure to select the RIGHT or LEFT tank.

B. **Fuel Quantity Transducer - Empty Calibration**

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(1) Verify that unusable fuel has been added to both tanks per the calibration setup instructions above. Allow both fuel probes to stabilize for at least 2 minutes.

(2) Select the LEFT tank on the PFD.

(3) Press the EMPTY softkey. The cursor will automatically activate and select the CALIBRATE? option. The calibrated value setting will default to 00.00.

(4) Press the ENT key. A prompt appears requesting overwrite acknowledgement. Select YES and press the ENT key. The G1000 system will 'zero' the actual fuel quantity value to be displayed.

(5) Select the RIGHT tank.

(6) Press the EMPTY softkey. The cursor will automatically activate and select the CALIBRATE? option. The calibrated value setting will default to 00.00.

(7) Press the ENT key. A prompt appears requesting overwrite acknowledgement. Select YES and press the ENT key. The G1000 system will 'zero' the actual fuel quantity value to be displayed.

(8) Observe the CALIBRATED TOTAL indication for the RIGHT tank. Verify that it remains at 0.00.

(9) Select the LEFT tank. Observe the CALIBRATED TOTAL indication for the LEFT tank. Verify that it remains at 0.00.

(10) On the MFD, verify the fuel quantity indicators correctly point to '0'.

C. **Fuel Quantity Transducer - 5 Gallon Calibration**

(1) Fill each fuel tank with 5±0.1 gallons usable fuel.

(2) Allow the fuel probes to stabilize at least 2 minutes before continuing.

(3) Validate the CALIBRATED TOTAL indication for the RIGHT tank is within the range specified using Table 201. This is the pre-calibrated value.

Table 201. 5-Gallon Calibration Table for the Right Fuel Tank

RIGHT 1 SUB-TANK				
Actual Usable Fuel	Calibration Value Range		Record Actual Indicated Fuel Quantity Here	Is Calibrated Total Within Specified Range?Yes/No
	Minimum Allowed Indication	Maximum Allowed Indication		
5	4.5	5		

(4) Select the LEFT tank. Validate the CALIBRATED TOTAL indication for the LEFT tank is within the range specified using Table 202. This is the pre-calibrated value.

Table 202. 5-Gallon Calibration Table for the Left Fuel Tank

LEFT 1 SUB-TANK				
Actual Usable Fuel	Calibration Value Range		Record Actual Indicated Fuel Quantity Here	Is Calibrated Total Within Specified Range?Yes/No
	Minimum Allowed Indication	Maximum Allowed Indication		
5	4.5	5		

(5) With the LEFT tank selected, highlight the ACTUAL FUEL QUANTITY field and enter 5.00 gallons.

(6) Press the ENT key. The cursor automatically selects the CALIBRATE? option.

(7) Press the ENT Key again to calibrate the 5 gallon point.

(8) Verify a 5.00 gallon point appears in the CALIBRATION TABLE.

(9) Verify that the CALIBRATED TOTAL value indicates 5.00.

(10) Select the RIGHT tank. Highlight the ACTUAL FUEL QUANTITY field and enter 5.00 gallons.

(11) Press the ENT key. The cursor automatically selects the CALIBRATE? option.

(12) Press the ENT key again to calibrate the 5 gallon point.

(13) Verify a 5.00 gallon point appears in the CALIBRATION TABLE.

(14) Verify that the CALIBRATED TOTAL value indicates 5.00.

D. **Low Fuel Level Check**

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(1) Using the large FMS knob, select the GEA STATUS page (2nd page in the GEA page group). GEA 1 will be shown by default. Refer to Figure 202.

(2) Press the DSCRT softkey to select the Discrete Inputs status page.

NOTE: Unless specified, the status of other discrete inputs may not match Figure 202 and does not matter for this portion of the test.

(3) Verify that the boxes beside the '1A LOW MAIN FUEL L' (low fuel quantity left) and '2A LOW MAIN FUEL R' (low fuel quantity right) are green.

(4) Continue to slowly add fuel to each tank one measured gallon at a time. Stop adding fuel when the associated LOW MAIN FUEL L or LOW MAIN FUEL R box changes from green to black.

(5) Using the large FMS knob, select the FUEL CALIBRATION page (first page in CAL page group).

(6) In Table 203, record the amount of usable fuel added to each tank. Also record the Calibration Value indications for both Right 1 and Left 1 Sub-Tanks. The Calibrated Total should be within ±2.0 gallons of the actual amount of usable fuel added.

Table 203. Usable Fuel Calibration Table - 4 Gallon Unusable Tank

4 Gallon Unusable Tank	Actual Usable Fuel Added (gal)	Allowable Range for Actual Fuel		Actual Indicated Calibrated Total (gal)	Tolerance on Calibrated Total (gal)
LEFT 1 SUB-TANK		6.0 gal	10.0 gal		±2.0
RIGHT 1 SUB-TANK		6.0 gal	10.0 gal		±2.0

Table 204. Usable Fuel Calibration Table - 2 Gallon Unusable Tank

2 Gallon Unusable Tank	Actual Usable Fuel Added (gal)	Allowable Range for Actual Fuel		Actual Indicated Calibrated Total (gal)	Tolerance on Calibrated Total (gal)
LEFT 1 SUB-TANK		8.0 gal	12.0 gal		±2.0
RIGHT 1 SUB-TANK		8.0 gal	12.0 gal		±2.0

E. Full Calibration

(1) Verify that both fuel tanks are full. Allow both fuel probes to stabilize for at least 2 minutes.

(2) Select the LEFT tank on the PFD.

(3) Press the FULL softkey. The cursor will automatically activate and select the CALIBRATE? option. The calibrated value setting will default to 49.00 or 51.00, as appropriate.

(4) Press the ENT key. A prompt appears requesting overwrite acknowledgement. Select YES and press the ENT key. The G1000 system will set the actual fuel quantity value to be full.

(5) Select the RIGHT tank.

(6) Press the FULL softkey. The cursor will automatically activate and select the CALIBRATE? option. The calibrated value setting will default to 49.00 or 51.00, as appropriate.

(7) Press the ENT key. A prompt appears requesting overwrite acknowledgement. Select YES and press the ENT Key. The G1000 system will set the actual fuel quantity value to be full.

(8) Observe the CALIBRATED TOTAL indication for the RIGHT tank. Verify that it remains at 49.00 or 51.00, as appropriate.

(9) Select the LEFT tank. Observe the CALIBRATED TOTAL indication for the LEFT tank. Verify that it remains at 49.00 or 51.00, as appropriate.

(10) On the MFD, verify the fuel quantity indicators correctly point to 'F'.

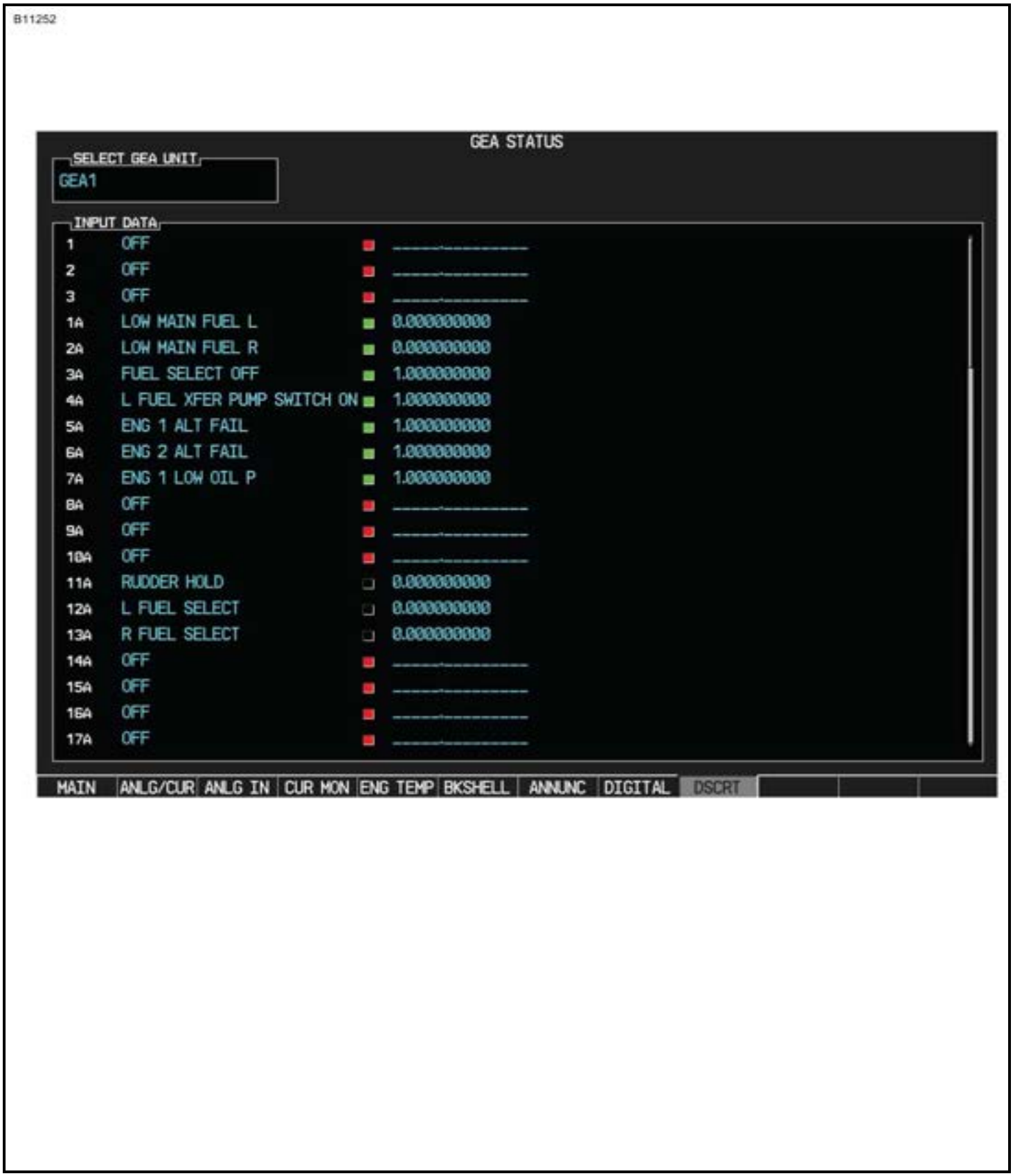
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Figure 201 : Sheet 1 : Fuel Tank Calibration Page



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Figure 202 : Sheet 1 : GEA Status Page



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FUEL INDICATING SYSTEM - ADJUSTMENT/TEST

1. General

A. This section gives the procedures for the Model T240/G2000 fuel calibration. The fuel system indicating system displays on the G2000 MFD. The fuel level is measured using two tank-mounted float level sensors, one in the inboard fuel tank bay, and one in the outboard fuel tank bay. The low fuel level sensors are float switches mounted approximately through the middle of the inboard fuel tank rib at WS 46.0. The fuel selector valve indicator lights (blue) use microswitch sensors mounted on the top of the fuel selector.

B. The fuel valve is equipped with two micro-switches to sense the position of the fuel selector. The selected tank is displayed on MFD by a blue light. If no blue light shows, the selector is off the tank, in-between tanks, or in the off position. During these conditions, a FUEL VALVE (red) CAS message shows on the PFD.

C. The G2000 Garmin Touch Screen Controller (GTC) 570 is used in the adjustment/test and fuel calibration procedures of the Model T240 fuel system. For more data applicable to the GTC refer to Chapter 34, Garmin G2000 - Description And Operation.

2. Fuel Valve Indicator

A. Test the Fuel Valve Indicator

(1) With the master switches on (batteries only if the engine is not running) place the fuel selector in the left tank detent and make sure that:

(a) The fuel warning message goes off.

(b) The blue light on the Multifunction Display (MFD) is on.

(2) With the master switches on (batteries only if the engine is not running) place the fuel selector in the right tank detent and make sure that:

(a) The fuel warning message goes off.

(b) The blue light on the MFD is on.

(3) Move the fuel selector between the tanks for a short time and make sure that:

(a) The blue lights are off.

(b) The FUEL VALVE CAS message shows on the PFD.

3. Fuel Quantity System Calibration

NOTE: Use proper precautions when handling fuel. Ensure that the aircraft is grounded correctly and that there is adequate ventilation.

A. Fuel Quantity SystemCalibration Setup

(1) Level the airplane. Refer to Chapter 7, Lifting and Shoring - General.

(2) Drain the fuel from each fuel tank.

(3) Set the fuel selector switch to the 'OFF' position.

(4) Fill each fuel tank with unusable fuel level, 2 gallons.

(5) Onthe cockpit circuit breaker panel, disengage the circuit breakers that follow:

(a) PFD

(b) MFD

(c) GTC

(6) Apply external power to the airplane.

(7) Set the master BATT switches (left SW01 and right SW02) to the ON position.

(8) Set the AVIONICS MASTER switch (SW04) to the ON position.

(9) Set the CROSS TIE switch (SW03) to the ON position.

(10) Start the G2000 system in Configuration mode as follows:

(a) On the Primary Flight Display (PFD), push and hold the far right soft key.

(b) Engage the PFD circuit breaker.

(c) Push and hold the PFD soft key until the INITIALIZING SYSTEM message shows on the PFD.

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(d) On the MFD, push and hold the far right soft key.
(e) Engage the MFD circuit breaker.
(f) Push and hold the MFD soft key until the INITIALIZING SYSTEM message shows on the MFD.
(g) On the GTC, push and hold the small right knob.
(h) Engage the GTC circuit breaker.
(i) Push and hold the GTC small right knob until the INITIALIZING SYSTEM message shows on the PFD.

(11) Turn the GTC large right knob to select the CAL page group.
(12) Turn the GTC small right knob to select to select the FUEL TANK CALIBRATION page. Refer to Figure 501.
(13) This page is protected and requires a keystroke password to do the calibration. Press the softkeys that follow in sequence:
(a) Softkey 12 (far right softkey)
(b) Softkey 11
(c) Softkey 10
(d) Softkey 9
(14) Push the small right knob to show the cursor (hightlight) on the FUEL TANK CALIBRATION page.
(15) Turn the right small knob to move the cursor to the CURRENT TANK field.
(a) Push the GTC Enter soft key to select the CURRENT TANK field.
(16) Push the small right knob to show the tank select menu.
(17) Turn the small right knob to highlight the tank to calibrate.
(a) Push the GTC Enter soft key to select the tank to calibratefield.

NOTE: On the GTC, turn and push the small right knob as necessary throughout this procedure to select the RIGHT or LEFT tank.

B. Fuel Quantity - Empty Calibration
(1) Make sure that unusable fuel has been added to both tanks.
(a) Allow both fuel probes to stabilize for at least 2 minutes.
(2) On the GTC, use the small right knob to select the LEFT tank on the PFD.
(3) On the PFD, push the EMPTY softkey.
(a) The cursor activates and selects the CALIBRATE? option.
(b) The calibrated value setting defaults to 00.00.
(4) On the GTC, push the ENT key.
(a) The G2000 system will 'zero' the actual fuel quantity value to be displayed.
(5) On the GTC, use the small right knob to select the RIGHT tank.
(6) Push the EMPTY softkey.
(a) The cursor activates and automaticly selects the CALIBRATE? option.
(b) The calibrated value setting will default to 00.00.
(7) On the GTC, push the ENT key.
(a) The G2000 system will 'zero' the actual fuel quantity value to be displayed.
(8) Observe the CALIBRATED TOTAL indication for the RIGHT tank.
(a) Make sure that it stays at 0.00.
(9) On the GTC, use the small right knob to select the LEFT tank.
(a) Make sure that the CALIBRATED TOTAL indication for the LEFT tank stays at 0.00.
(10) On the MFD, make sure that the fuel quantity indicators show '0'.
(11) If you are to continue the fuel calibration leave the eletrical power on the airplane.
(12) If you are not to continue the fuel calibration:
(a) Set the master BATT switches (left SW01 and right SW02) to the OFF position.

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(b) Set the AVIONICS MASTER switch (SW04) to the OFF position.
(c) Set the CROSS TIE switch (SW03) to the OFF position.
(d) Remove external electrical pwer from the airplane.

C. Fuel Quantity - 5 Gallon Calibration
(1) Fill each fuel tank with 5 gallons +0.1 or -0.1 gallons of usable fuel.
(2) Move the wings for a few seconds.
(a) Allow the fuel probes to stabilize at least 3minutes before continuing.
(3) On the GTC, use the small right knob to select the LEFT tank.
(4) Highlight the ACTUAL FUEL QUANTITY field.
(a) Use the small and large right knobs to enter 5.00 gallons in the field.
(5) On the GTC, push the ENT key.
(a) The cursor automatically selects the CALIBRATE? option.
(6) On the GTC , push the ENT key again to calibrate the 5 gallon point.
(a) Make sure that a 5.00 gallon point appears in the CALIBRATION TABLE.
(b) Make sure that on the MFD the CALIBRATED TOTAL value shows 5.00 on the display.
(7) On the GTC, use the small right knob to select the LEFT tank.
(8) Highlight the ACTUAL FUEL QUANTITY field.
(a) Use the small and large right knobs to enter 5.00 gallons in the field.
(9) On the GTC 570, push the ENT key.
(a) The cursor automatically selects the CALIBRATE? option.
(10) On the GTC 570, push the ENT key again to calibrate the 5 gallon point.
(a) Make sure that a 5.00 gallon point appears in the CALIBRATION TABLE.
(b) Make sure that on the MFD the CALIBRATED TOTAL value shows 5.00 on the display.
(11) If you are to continue the fuel calibration leave the eletrical power on the airplane.
(12) If you are not to continue the fuel calibration:
(a) Set the master BATT switches (left SW01 and right SW02) to the OFF position.
(b) Set the AVIONICS MASTER switch (SW04) to the OFF position.
(c) Set the CROSS TIE switch (SW03) to the OFF position.
(d) Remove external electrical pwer from the airplane.

D. Low Fuel Level Check
(1) On the GTC, move the small right knob to select the GEA STATUS page. GEA 1 is shown by default. Refer to Figure 502.
(2) On the GTC, push the DSCRT softkey to select the Discrete Inputs status page.

NOTE: Unless specified, the status of other discrete inputs may not match Figure 502 and does not matter for this portion of the test.

(3) Make sure that the boxes in the data column for the '1A LOW MAIN FUEL L' (low fuel quantity left) and '2A LOW MAIN FUEL R' (low fuel quantity right) are green.
(4) On the GTC, move the small right knob to select the FUEL CALIBRATION page (first page in CAL page group).
(5) If you are to continue the fuel calibration leave the eletrical power on the airplane.
(6) If you are not to continue the fuel calibration:
(a) Set the master BATT switches (left SW01 and right SW02) to the OFF position.
(b) Set the AVIONICS MASTER switch (SW04) to the OFF position.
(c) Set the CROSS TIE switch (SW03) to the OFF position.
(d) Remove external electrical pwer from the airplane.

E. Full Calibration

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(1) Make sure that that both fuel tanks are full.
(2) Move the wings for a few seconds.
  (a) Allow both fuel probes to stabilize for at least 3 minutes.
(3) On the GTC use the small right knob, select the LEFT tank on the PFD.
(4) Push the FULL softkey.
  (a) The cursor will automatically activate and select the CALIBRATE? option.
  (b) The calibrated value setting defaults to 51.00.
(5) On the GTC, push the ENT key.
  (a) A prompt appears requesting overwrite acknowledgement.
    1 Select YES
    2 Push the ENT key.
(6) The G2000 system sets the actual fuel quanity to full.
(7) On the PDF, select the RIGHT tank.
(8) Push the FULL softkey.
  (a) The cursor will automatically activate and select the CALIBRATE? option.
  (b) The calibrated value setting defaults to 51.00.
(9) Push the ENT key.
  (a) A prompt appears requesting overwrite acknowledgement.
    1 Select YES
    2 On the GTC, push the ENT key.
(10) The G2000 system sets the actual fuel quanity to full.
(11) On the MFD, make sure that the fuel quantity indicators correctly point to 'F'.
(12) On the GTC, move the small right knob to select the GEA STATUS page. GEA 1 is shown by default. Refer to Figure 502.
(13) Push the DSCRT softkey to select the Discrete Inputs status page.

NOTE: Unless specified, the status of other discrete inputs may not match Figure 502 and does not matter for this portion of the test.

(14) Make sure that the boxes in the data column for the '1A LOW MAIN FUEL L' (low fuel quantity left) and '2A LOW MAIN FUEL R' (low fuel quantity right) are black.
(15) Set the master BATT switches (left SW01 and right SW02) to the OFF position.
(16) Set the AVIONICS MASTER switch (SW04) to the OFF position.
(17) Set the CROSS TIE switch (SW03) to the OFF position.
(18) Remove external electrical pwer from the airplane.

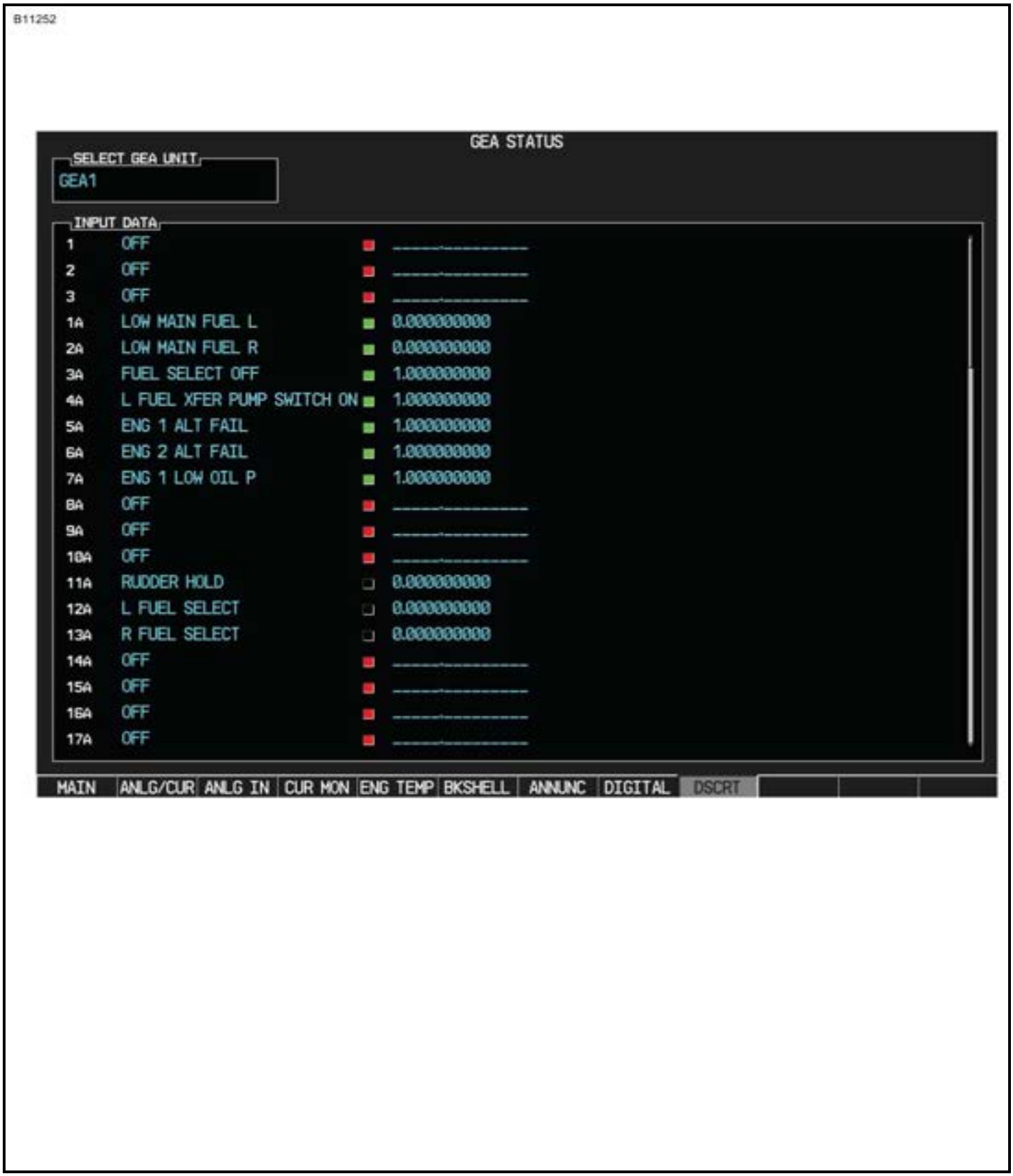
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Figure 501 : Sheet 1 : Fuel Tank Calibration Page



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Figure 502 : Sheet 1 : GEA Status Page



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LANDING GEAR AND BRAKES - GENERAL

1. General - Scope and Definition

A. The Cessna 400 (LC41-550FG) has a fixed tricycle landing gear configuration. The main gear is constructed of high strength tubular steel and mounted to the fuselage via a welded steel gearbox. The main gearbox is bolted directly to the fuselage structure. The airplane has brakes located on the main wheels. The brakes are used for steering the airplane via differential braking. The nose gear is an oleo strut which casters for steering purposes. The oleo strut has a self-centering device to lock the nose wheel in a fixed position during flight. Aerodynamic fairings are used on the airplane to cover the landing gear and help reduce drag during flight.
This chapter covers the removal and installation of the main gear, nose gear, wheel pants, and fairings. Standard maintenance procedures are also covered.

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MAIN LANDING GEAR AND BRAKES - MAINTENANCE PRACTICES

1. Main Landing Gear - General

A. The main landing gear consists of the gearbox (located inside the fuselage), the gear legs, the axle mounting foot, axle, wheel, tire and tube, upper fuselage fairing, gear leg fairing, wheel pant, and wheel pant access panel.

2. Main Gear Wheel Pants and Fairings

A. **Removal and Installation of Main Gear Wheel Pants and Fairings** - The removal and installation instructions below are for the left main gear. Removal and installation practices for the right side are typical unless otherwise noted.

(1) Remove the wheel pant access panel from the inside face of the wheel pant by removing the attachment screws.

(2) Remove the screws attaching the leg fairing to the wheel pant.

(3) Remove the two bolts attaching the wheel pant to the support bracket.

(4) Remove the bolt and washer attaching the wheel pant to the standoff shown in Figure 201 and Figure 202.

(5) Slide the wheel pant off by lifting and rotating it to clear the wheel and tire assembly.

(6) Remove the brake caliper per the instructions in Section 32-40-00, Brake System.

(7) Jack the left side of the airplane such that adequate clearance is achieved for removing the main gear wheels and leg fairings.

(8) Place a small pan or bucket under the brake caliper, and disconnect the brake line from the brake caliper. The pan will help catch any excess brake fluid that may leak from the brake line once it is removed. Once the brake line is removed, cap the end to prevent any excess brake fluid from draining out of the system.

(9) Remove the main gear axle foot from the gear leg by removing the two AN5-22A bolts and two MS20365-524C all-metal lock nuts (refer to Figure 203) and sliding it straight down along the axis of the gear leg.

(10) Slide the gear leg fairing straight down along the axis of the gear leg to remove it. Jack the airplane as necessary to remove the leg fairing from the leg.

(11) Remove the attachment screws holding the upper leg fairing to the fuselage belly.

(12) Slide the fairing straight down the gear leg to remove it.

(13) Reinstall in the reverse order. Torque all fairing attachment screws 10 to 12-inch pounds, and torque the MS20365 nuts 140 to 180-inch pounds.

(14) When installing the standoff and attaching hardware, seat the standoff in the end of the axle on the inside of the wheel pant as shown in Figure 201 and Figure 202.

(15) Make sure that when the wheel pant is installed, there is 0.5-inch + 0.125 or -0.125-inch clearance between the wheel pant and the tire.

(a) Up to two washers may be glued to the inside of the wheel pant where the pant attaches to the standoff to compensate for the variation in wheel pant size. The washer should not exceed a 1 inch diameter.

(b) Carefully torque the bolt to 23-foot pounds.

1 Make sure that you do not cause compression damage to the pant.

2 Apply Loctite 243 to the bolt.

(c) Torque two bolts that attach the pant to the support bracket 30 to 36-inch pounds.

B. **Servicing and Maintenance of Main Gear Wheel Pants and Fairings** - The main gear wheel pants and fairings are a glass fiber composite construction and do not require any servicing or maintenance. The wheel pants and fairings should be inspected periodically for cracking, chips, etc. and repaired or replaced as necessary. Refer to Chapter 57 for removal and installation of optional anti-chafe tape. Contact Cessna Aircraft Company for replacement parts. The interior of the wheel pant should be cleaned of all foreign debris.

3. Main Gear Assembly

A. **Main Gear Assembly Removal and Installation** - Use the following procedures for removal and installation of the main gear assembly.

(1) Remove the main gear wheel pant per the instructions in the Main Gear Wheel Pants and Fairings section.

(2) Raise the airplane on jacks such that adequate room is achieved for removing the main gear wheel assembly.

(3) For Airplanes 2001 thru 2087, remove the two AN5-22A bolts, two NAS1149F0563P washers and two MS21045L5 lock nuts from the main gear axle foot, and slide the wheel assembly straight down along the axis of the gear leg.

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Refer to Figure 203.

(4) For Airplanes 2088 and On, remove the two HL20PB-10-31 Hi-loks, 2841104-25 contour washers, two NAS1149F0563P washers and two MS21045L5 lock nuts from the main gear axle foot, and slide the wheel assembly straight down along the axis of the gear leg. Refer to Figure 203.

(a) When installing the wheel assembly, use Type I, Class B sealant to shank seal around the Hi-loks.

(5) Disassemble the main wheel assembly by removing the cotter pin and axle nut from the outboard end of the axle. Refer to Figure 204.

(6) Remove the wheel from the axle by sliding it straight off.

(7) Cut and remove the lockwire from the upper axle attachment bolts.

(8) Remove the upper and lower axle attachment bolts to disassemble the remaining parts. Note order of assembly for reinstallation.

(9) Remove the access panels from the aft cabin floor to gain access to the upper end of the gear legs.

(10) Remove the gear leg attachment bolt located at the top end of the gearbox.

(11) Remove the gear legs from the gearbox by pulling the leg straight out.

CAUTION: Take care when removing the gear legs so as not to cause nicks, scratches, or other damage to the surface of the leg.

(12) Installation is in the reverse order. Re-safety wire the upper axle attachment bolts prior to installing the wheel.

(13) Torque the gear leg attachment bolt 80 to 85 ft.-lbs. Torque the axle attachment bolts 240 to 280 in.-lbs., and torque the axle foot attach bolts 140 to 180 in.-lbs. Rotate the wheel while tightening the axle nut 150 to 200 in.-lbs. to seat the bearing, back off the axle nut to zero torque, tighten the axle nut to 30 to 40 in.-lbs. while rotating the wheel, rotate the axle nut to the nearest slot and cotter pin hole, and install the cotter pin.

(14) Assure that the wheel rotates freely without perceptible play.

B. **Wheel Toe-in and Camber** (Refer to Figure 205 and Figure 206) - During wheel installation it is important to determine the wheel toe-in/toe-out and camber. Wheel toe-in/toe-out and camber is established by inserting one or more shims between the axle block and spacer, if necessary, as shown in Figure 204. It is unlikely that the shims will need to be changed from what was initially manufactured; however, if the proper toe-in/toe-out and camber is not achieved, contact Cessna Aircraft Company for the required shim(s).

(1) **Toe-in/Toe-out** - Wheel toe-in/toe-out is the angle between the aircraft centerline and the wheel. Toe-out is set with all wheels on the ground, on a low-friction surface. Set toe-out to the value indicated in the toe-out vs. weight chart shown in Figure 206. No more than 4 shims may be used with a maximum total thickness of 0.254 inches.

(2) **Camber** - The camber is the angle from horizontal to the centerline of the axle. Camber is set with all wheels on the ground, on a low-friction surface. Refer to Figure 207. Set camber, to the value indicated in the camber vs. weight chart shown in Figure 208. No more than 4 shims may be used with a maximum total thickness of 0.254 inches.

C. **Main Gear Assembly Servicing and Maintenance** - The landing gear legs should be inspected every 100 hours or annually. Some of the items to inspect for are scratches, nicks, corrosion, and signs of overstress. Visually inspect the gear legs for straightness. The axles and other components should also be inspected for corrosion, cracks, signs of overstress, and wear. The main gear assembly should fit snugly together with very little, if any, free play.

4. Main Landing Gear Leg Abrasion Repair

A. The main landing gear legs may develop abrasions as a result of rubbing with the landing gear fairing upper rib. Typically, there are two abrasions opposite each other. The abrasions are located 16.0 inches from the upper tip of the gear leg; they are approximately 0.7 inches long and 0.020 inches deep.

(1) Clean the surface area surrounding the abrasions.

(2) Determine the depth and length of the abrasions. If the abrasion depth and length are greater than 0.020 inches and 1.0 inch, respectively, contact Cessna Aircraft Company for instructions.

(3) Use Scotch-Brite™ or other equivalent material to blend out nicks, scratches, or cuts at the abrasion area. The repair area must be blended over a distance at least 10 times the depth of the abrasion.

(4) After polishing or blending the abrasion, treat all bare metal with zinc chromate or zinc oxide.

(5) Before installing the repaired main landing gear on the aircraft, contact Cessna Aircraft Company for instructions on modifying the main landing gear fairing to prevent future rubbing.

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5. Gearbox

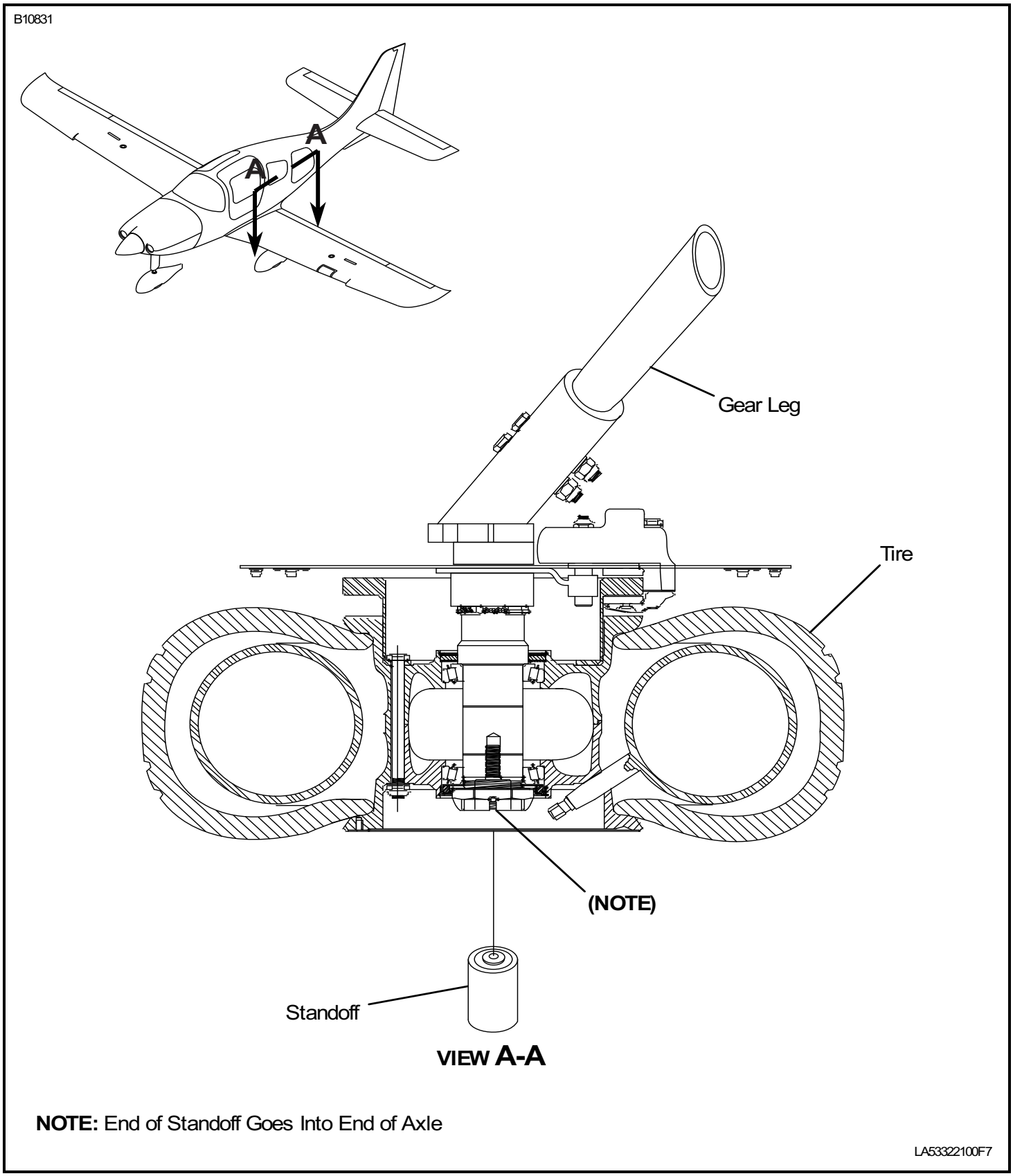
A. The main landing gear is attached to the fuselage structure via a welded steel gearbox. The gearbox is bolted directly to the fuselage structure.

(1) **Gearbox Removal and Installation** - The gearbox is not easily removable from the fuselage due to its location. Should the gearbox need to be removed or replaced, please contact Cessna Aircraft Company for further instructions.

(2) **Gearbox Servicing and Maintenance** - The gearbox is a major structural component and should be inspected every 100 hours or annually for wear and corrosion. Remove the wheel pants and fairings per the Main Gear Wheel Pants and Fairings section and remove the gear leg per the Main Gear Assembly section. Inspect the gear leg sockets of the gearbox for wear and corrosion. If surface corrosion is present, lightly hone the interior diameter of the socket using a cylinder bore hone and light machining oil. A Scotch-Brite™ pad may also be used. After the corrosion has been removed, apply a thin film of machine oil or other surface protectant to help prevent further corrosion. The bushing at the lower end of the socket should also be inspected for excessive wear and replaced if required. When replacing the bushing, P/N 32FS16, thoroughly clean the surface of the socket and install with Loctite 660 retaining compound. Allow the Loctite to fully cure prior to reinstalling the gear leg. Every 3000 hours, the gearbox bolts must be checked for evidence of corrosion. Remove one attachment bolt from each side of the gearbox and check for corrosion. If corrosion is noted, replace all attachment bolts in the gearbox. If no corrosion is noted, replace bolts that were removed and check the torque on all bolts. Torque bolts 40 to 50 in.-lbs.

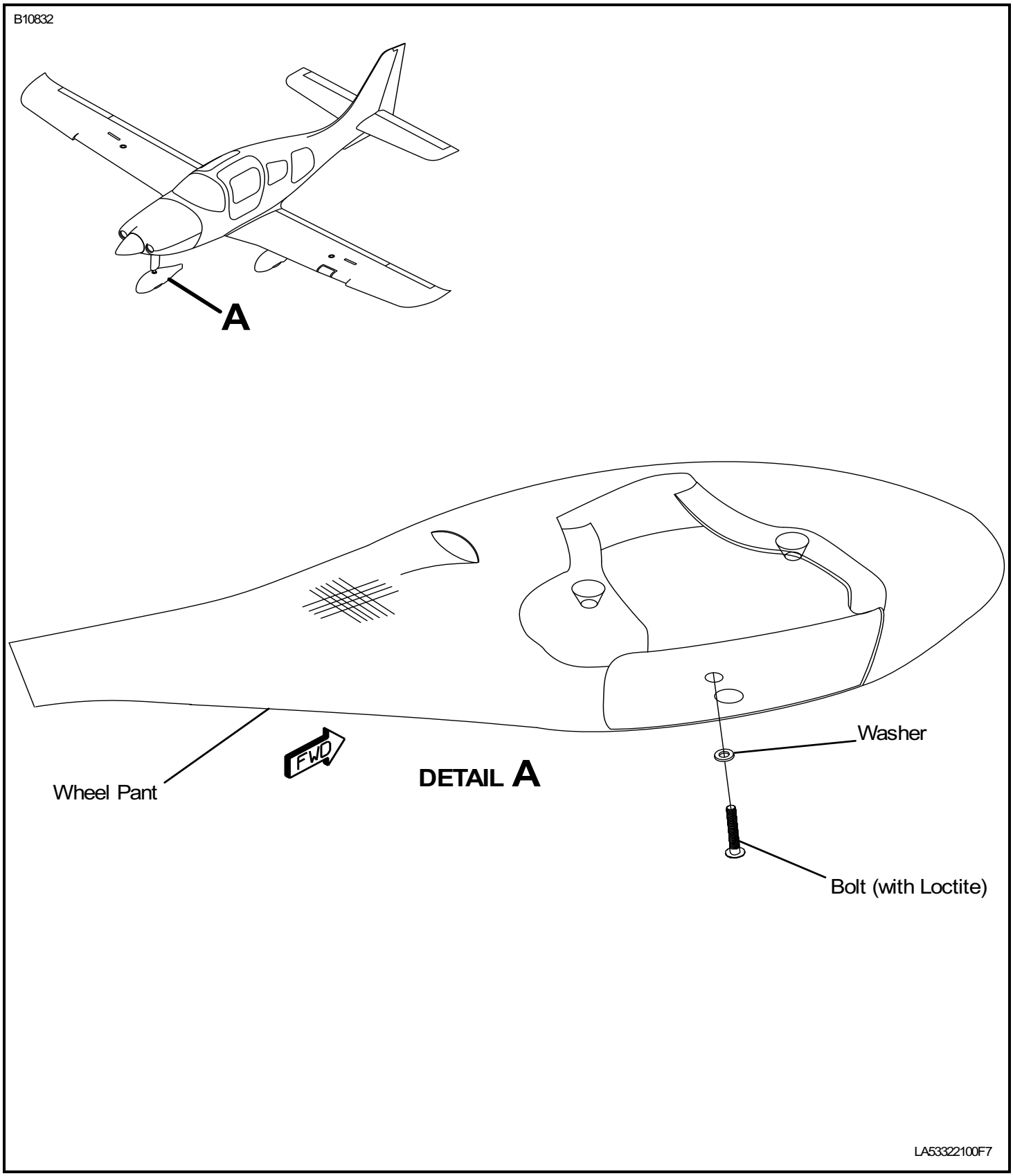
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Figure 201 : Sheet 1 : Wheel Pant Standoff Location



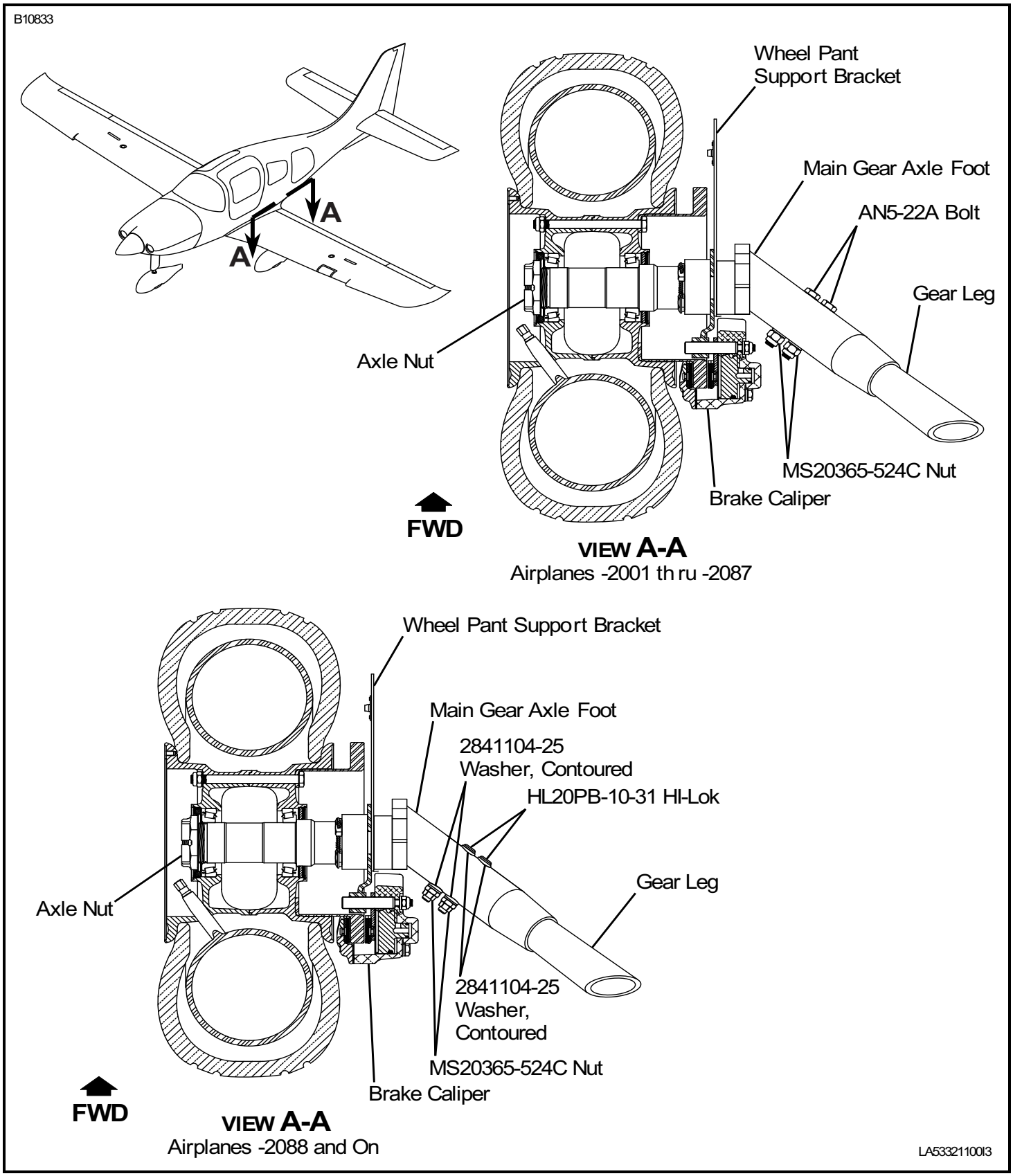
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Figure 202 : Sheet 1 : Hardware Attaching Wheel Pant to Standoff



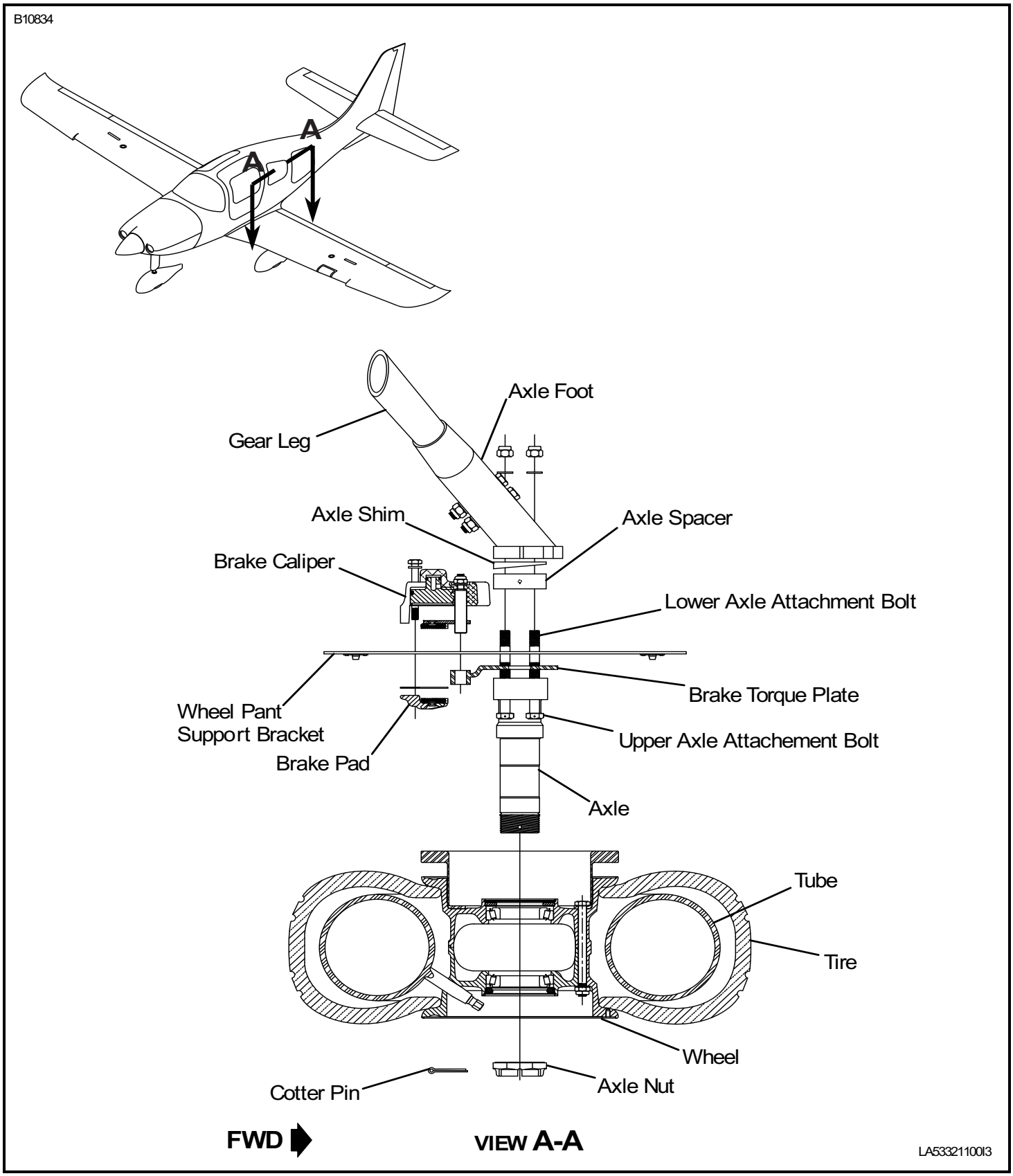
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Figure 203 : Sheet 1 : Main Gear Wheel Assembly



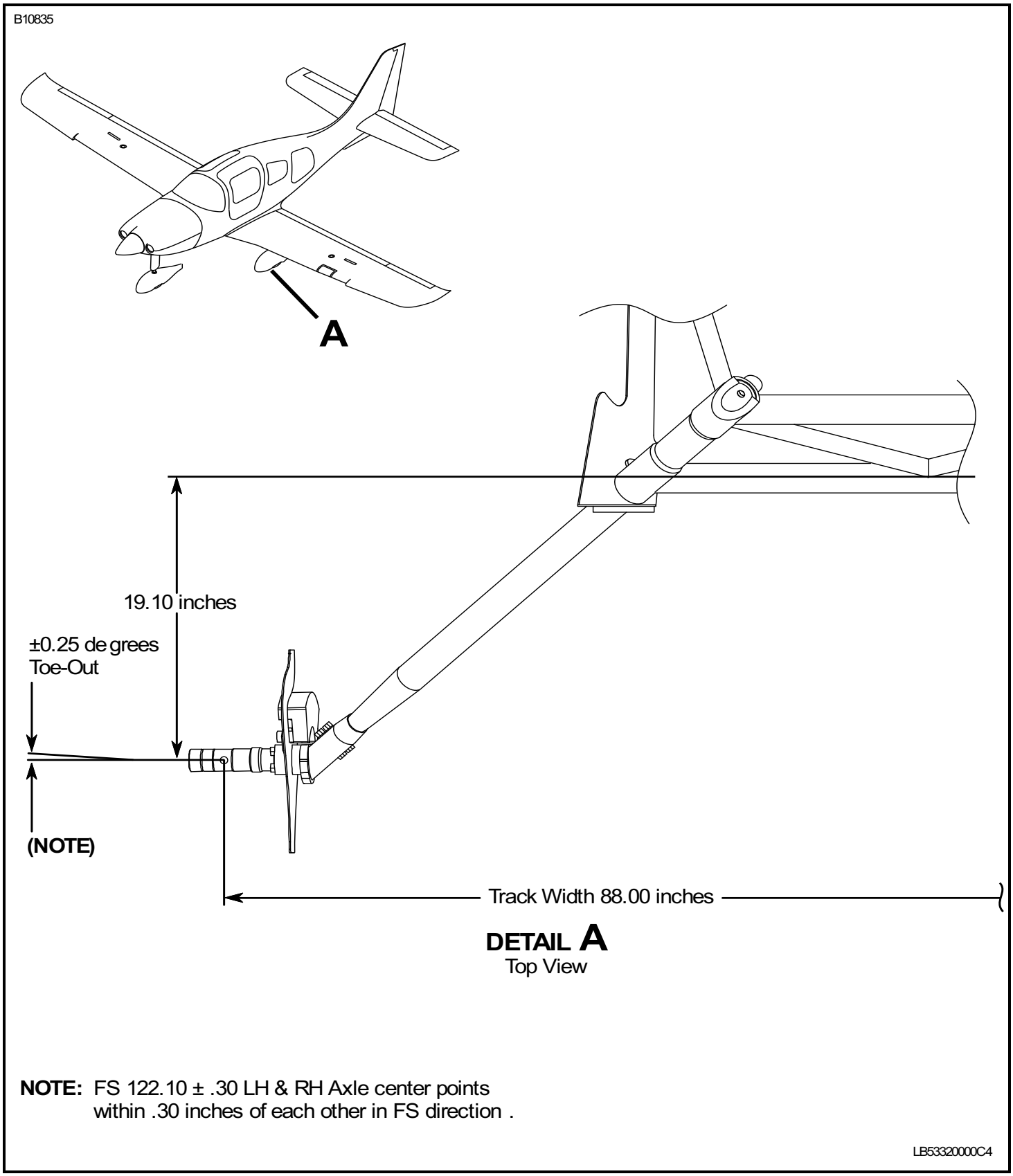
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Figure 204 : Sheet 1 : Main Gear Assembly, Exploded View



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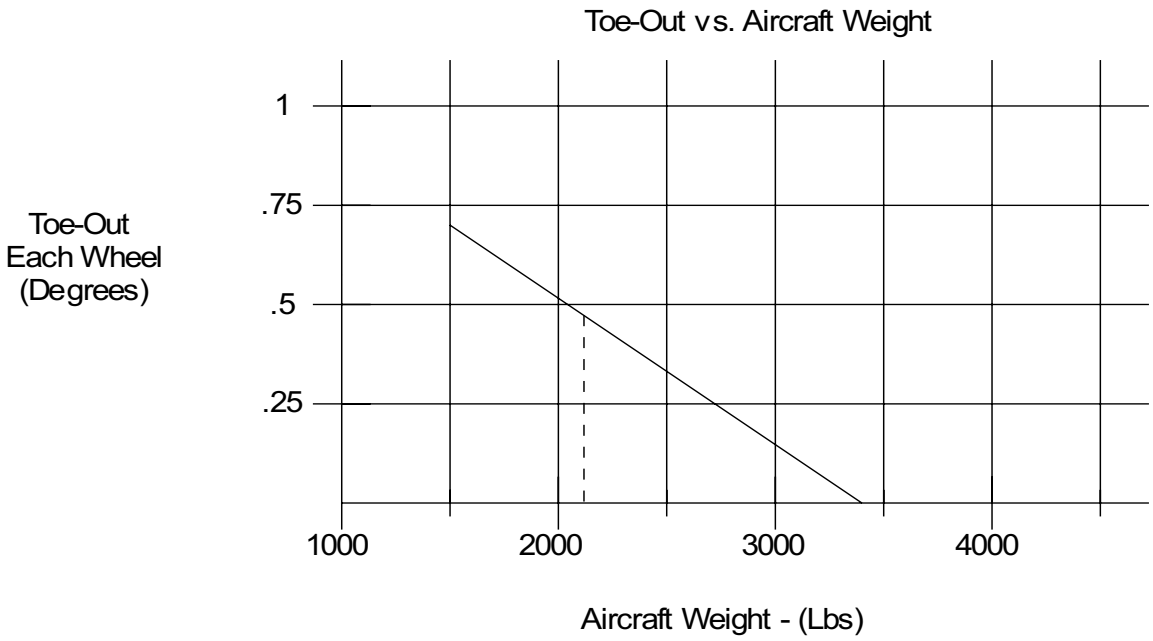
Figure 205 : Sheet 1 : Toe in/Toe out



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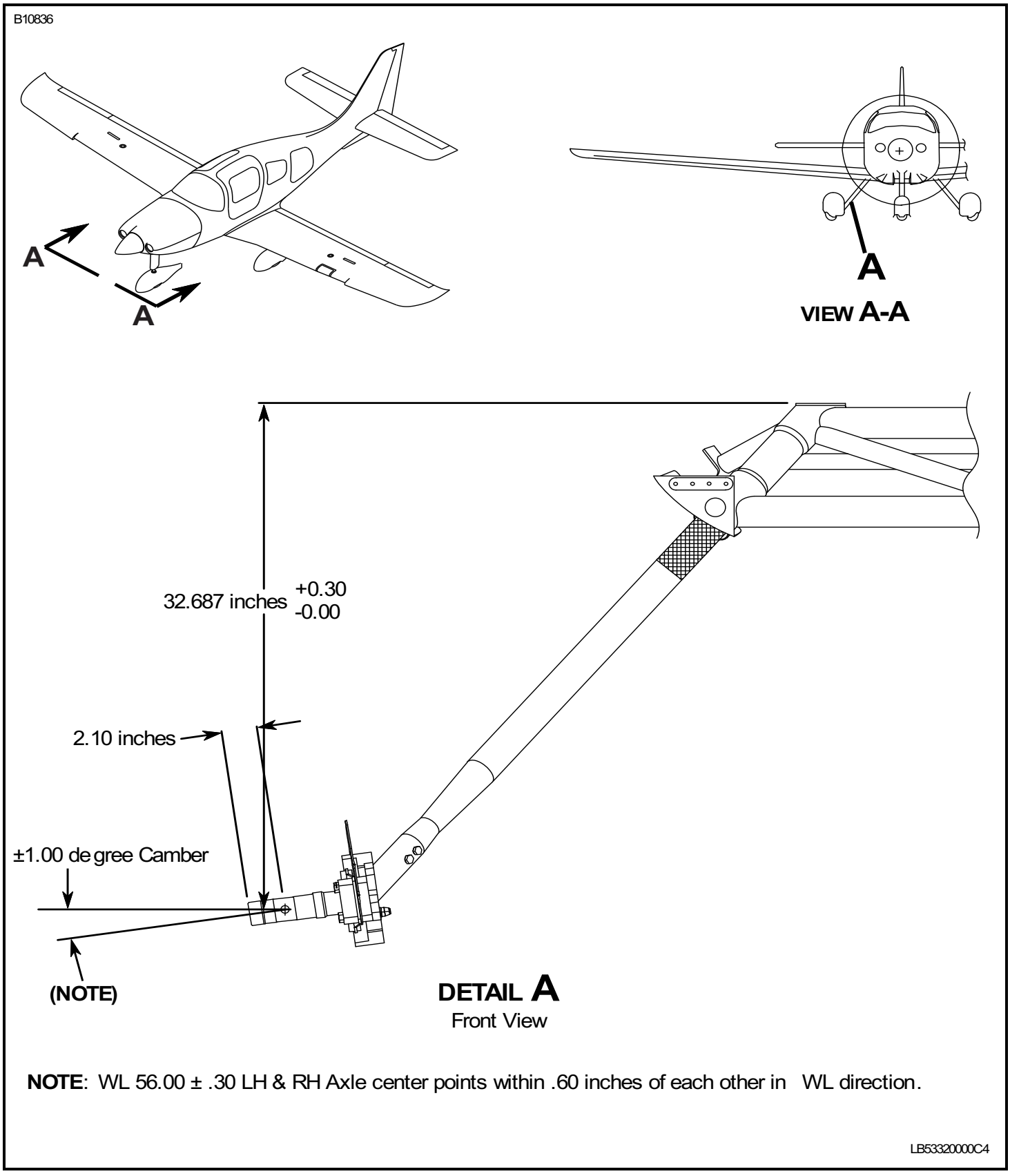
Figure 206 : Sheet 1 : Toe-out vs. Aircraft (A/C) Weight

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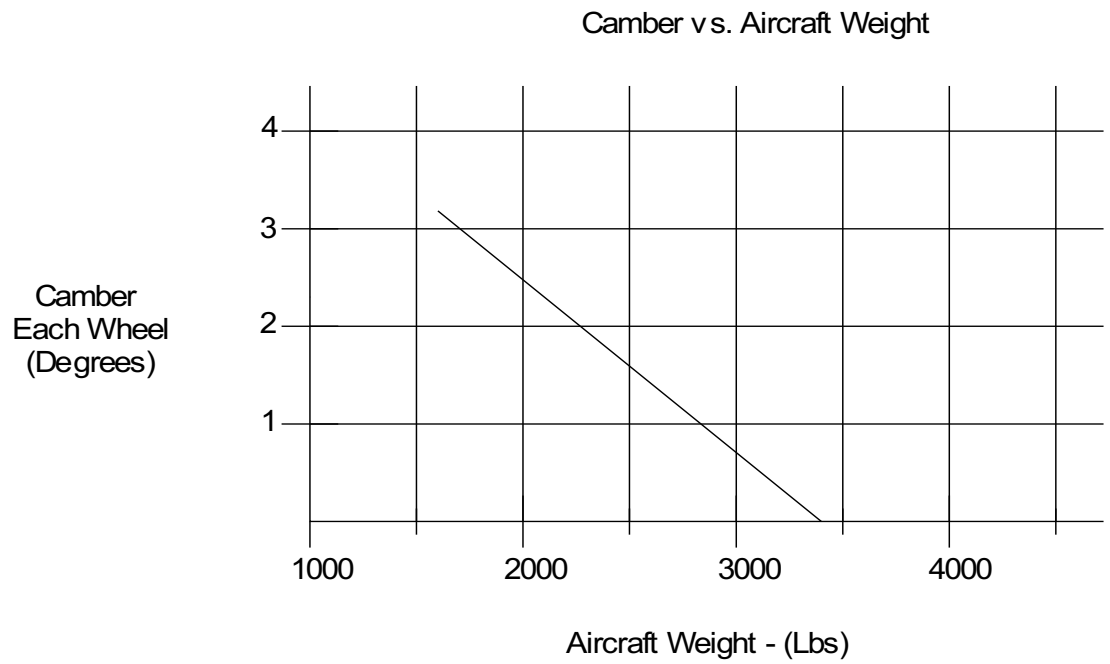
Figure 207 : Sheet 1 : Camber



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Figure 208 : Sheet 1 : Camber vs. Aircraft (A/C) Weight

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NOSE LANDING GEAR - MAINTENANCE PRACTICES

1. Nose Gear - General

A. The nose gear is a fixed hydraulic unit that casters freely during taxiing. Turning is accomplished via differential braking and optional rudder assist. Landing loads and shimmy dampening are controlled using hydraulic oil within the strut. Nitrogen gas pressure controls the ride height of the strut and supplies the necessary pressure to lock in the centering cam mechanism.
On the ground with the weight of the aircraft bearing down on the nose strut, an internal keyway within the strut slides out from a locking cam making rotational movement possible. The moment the aircraft takes flight and all weight is off the nose gear, gas pressure moves the keyway into the locking cam eliminating any ability to caster during flight.
During landing the weight of the aircraft overpowers the gas pressure and slides the keyway out from the locking cam, allowing full rotational movement of the nose wheel.

2. Nose Gear Wheel Pant and Fairing

A. **Nose Gear Wheel Pant and Fairing Removal and Installation** - Use the following procedures for removal and installation of the nose gear wheel pant and fairing.

(1) Remove the upper and lower engine cowls per instructions in Chapter 71.

(2) Remove the aft screw attaching the nose strut fairing to the fuselage.

(3) Raise the front of the airplane such that the nose wheel is completely clear of the ground.

(4) Remove the four AN5-12A bolts and washers attaching the nose wheel assembly to the base of the nose strut. Refer to Figure 201.

(5) For S/N 41002 to 41111, remove the four MS21207-6-8 self-tapping screws from the base of the strut fairing, and slide the internal rib straight down and off of the nose strut.

(6) For S/N 41112 and On, remove the two AN526C1032 or MS51958 truss head screws and NAS1149FN832P washers from the rear of the base of the strut fairing, and remove the heel plate.

(7) Slide the nose strut fairing straight down and off the nose strut.

(8) Remove the two AN526C1032 or MS51958 truss head screws from the top of the wheel pant attaching the wheel pant to the attach bracket. Refer to Figure 202.

(9) Remove the two AN526C1032 or MS51958 truss head screws from either side of the wheel pant. Refer to Figure 202.

(10) Remove the nose gear wheel pant from the wheel and fork assembly.

(11) Installation is in the reverse order. Torque all AN526C1032 or MS51958 screws 30 to 36-inch pounds. Hand tighten the MS21207 screws holding the internal rib, or the AN526C1032 or MS51958 screws holding the heel plate, to the nose strut fairing snug. Torque the AN5-12A bolts 140 to 180-inch pounds.

(12) Trim the wheel pant to get a clearance from the tire a minimum of 1-inch.

B. **Nose Gear Wheel Pant and Fairing Servicing and Maintenance** - The nose gear wheel pant and fairing are a glass fiber composite construction and do not require any servicing or maintenance. The wheel pants and fairings should be inspected periodically for cracking, chips, etc. and repaired and replaced as necessary. Contact Cessna Aircraft Company for replacement parts. The interior of the wheel pant should also be cleaned of all foreign debris.
A few owners or operators have reported hairline paint cracking in the area adjacent to the nose wheel tow bar hole. While the paint cracking does not present a structural problem, the visual presentation of the wheel pant may degrade somewhat over several years. The onset of the cracking depends, in part, on the method used to tow the airplane and the frequency of towing. Enlarging the wheel pant hole may mitigate the onset of paint cracking since the tow bar will be less likely to apply a lateral force directly to the wheel pant. To enlarge the wheel pant hole, complete the following instructions.

(1) Remove the nose wheel pant per instructions in this section.

(2) Using a suitable tool (i.e. die grinder or drill with sanding barrel), carefully enlarge the size of the lugholes to 1.25 to 1.30-inch diameter. If necessary, the hole may be enlarged eccentrically to the current hole in the wheel pant to maintain a consistent gap between the tow lug and wheel pant.

(3) Re-install the nose wheel pant per instructions in this section.

3. Nose Gear Wheel And Fork Assembly

A. **Disassembly - Wheel and Fork Assembly**

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(1) Raise the front of the airplane such that the nose wheel is completely clear of the ground.

(2) Remove the four AN5-12A bolts and washers attaching the nose wheel assembly to the base of the nose strut. Refer to Figure 201.

(3) If the aircraft has a wheel pant, remove the wheel pant per the instructions in the Nose Gear Wheel Pant and Fairing section and remove the four 10-32 screws securing the tow bar plates and blocks to the fork.

(4) If the aircraft does not have a wheel pant and tow bar, remove the four bolts and washers securing the blocks to the fork.

(5) Secure the nose wheel assembly in a soft jaw vise or equivalent fixture. Remove the nose wheel axle nut, bolt, and two washers. Using a plastic mallet, gently tap inward on the fork area around the axle bushing areas until the bushings become dislodged from the fork. Remove the bushings, wheel assembly, and axle spacer from the fork. Refer to Figure 203 or Figure 204.

B. **Reassembly - Wheel and Fork Assembly**

(1) Secure the nose wheel fork in a soft jaw vise or equivalent fixture with fork legs open and unobstructed.

(2) Insert the axle spacer into the wheel. Install the tire and wheel assembly into the nose wheel fork. Insert the axle bushings into the fork with the axle spacer inserted into the bushings. Refer to Figure 203 or Figure 204.

(3) Install the axle bolt, nut, and two washers in reverse order as disassembled, but do not tighten the axle nut. Refer to Figure 203 or Figure 204.

(4) With the axle bushings partially installed, check the clearance between the outside diameter of the tire and the edge of the nutplate on the fork. Refer to Figure 205. Clearance must not be less than 0.25 inches. If clearance is less than 0.25 inch, replace the 5.00-5, 10 ply tire with one that has an inflated outside diameter of 14.20 inches or less per TSO-C62C.

(5) Rotate the axle bushings so that the flat edges of the bushings are parallel with the edge of the blocks (blocks prevent axle bushings from rotating within the fork). If necessary, temporarily install the blocks to the fork to assist alignment of bushings during installation.

(6) Tighten the axle nut until the axle-bushing flanges are fully seated against the outside surface of the fork. If necessary, lightly tap the fork legs outward with a plastic or rubber mallet while tightening the axle bolt. Do not allow bushings to become cocked or jammed. If bushings become hard to install, stop and remove the bushings to check for any possible damage to the bushing or fork bushing holes. Replace all damaged parts. Do not file, grind, polish or sand bushings or fork bushing holes. Do not install a warm bushing into a cold fork. If necessary, place the axle bushings in a freezer for one hour and submerge fork in hot water for ten minutes prior to assembly. Anti-seize compound may be used to help install axle bushings into the fork.

(7) With axle bushings fully installed, tighten nut until all side play is eliminated from wheel bearings, then continue tightening an additional quarter turn. The wheel should have a slight drag when the bearings are properly preloaded. Verify that the wheel bearings are fully seated by attempting to rock the wheel from left to right. No movement or "play" should be felt.

(8) If the aircraft has a wheel pant, apply Loctite 242 to the threads, and torque the 10-32 screws securing the tow bar plates and blocks to the fork 30 to 36 in.-lbs. Refer to Figure 203.

(9) If the aircraft does not have a wheel pant and tow bars, install the AN3H13A bolts and NAS1149F0363P washers securing the blocks to the fork and tighten snug. Safety wire the bolts per MS33540. Refer to Figure 204.

(10) Install the wheel pant per the instructions in the Nose Gear Wheel Pant and Fairing section.

(11) Attach the nose wheel assembly to the base of the nose strut with the four AN5-12A bolts and washers. Refer to Figure 201. Torque the bolts 140 to 180 in.-lbs.

C. **Servicing and Maintenance**

The nose wheel assembly does not require any service or maintenance. The nose wheel assembly should be inspected for corrosion and other damage annually or every 100 hours. Damaged parts should be replaced as required. The nose wheel is to be serviced per the procedures outlined in Chapter 12.

4. Nose Strut

A. The nose gear will be equipped with either the Cessna nose strut or the ESCO nose strut. The Cessna strut nitrogen gas inlet Schrader valve is located at the bottom rear of the nose strut. The ESCO strut has "ESCO" clearly labeled and the nitrogen gas inlet Schrader valve is located at the upper front of the strut.

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(1) **Cessna Nose Strut**

(a) **Removal of the Nose Strut**

1 Remove the nose strut fairing per the instructions in the Nose Gear Wheel Pant and Fairing section.

2 Relieve all load from the nose gear by pushing down on the tail of the aircraft.

3 Remove the valve cap from the strut Schrader valve. Using a small flat bladed screwdriver covered by a rag, gently press in on the schrader valve core stem to slowly bleed off nitrogen gas pressure in the strut.

CAUTION: Always wear safety goggles when releasing gas pressure.

4 For engine mounts with a slot, use a felt tip marker and apply an aligning index mark between the engine mount and the strut housing. An aligning index mark is not required for engine mounts that are not slotted.

5 Remove the bolts, nuts (either castellated or self-locking) and washers connecting the nose strut to the engine mount. Refer to Figure 206.

6 Using a twisting motion, pull the nose strut straight down and out of the engine mount.

(b) **Installation of Nose Strut**

1 Using a twisting motion, slide the nose strut housing into the engine mount until the housing collar is seated flush against the engine mount tube and index marks are aligned.

2 Install the bolts, nuts, and washers connecting the nose strut to the engine mount in reverse order as disassembled. Refer to Figure 206. Torque nuts 72 to 84 in.-lbs. Install new cotter pin in the castellated nuts.

3 Service the nose strut per the instructions in Chapter 12.

4 Reinstall the nose strut fairing per the instructions in the Nose Gear Wheel Pant and Fairing section.

5 Reinstall the nose wheel assembly per the instructions in the Nose Gear Wheel Pant and Fairing section.

(c) **Servicing and Maintenance**

1 Inspection (every 100 hours or annually)

a The nose gear strut should be inspected for cracks, corrosion, scratches on the strut shaft, fluid leakage, and signs of overstress. The strut attachment to the engine mount should be checked for security. If oil leakage is present at any one of these locations, replacement of the strut is required.

b With the full weight of the aircraft on the nose and main gear inspect the ride height of the nose gear strut. There should be 3 to 4 inches of the chrome strut rod visible between the lower flange and the wiper seal. If ride height is low and no oil leakage is present, recharge the strut per Chapter 12. Recheck the filler valve and the filler valve gasket for signs of leakage.

c Remove weight off the nose gear to allow rotation of the nose wheel assembly left and right to its full range of rotation. A smooth resistance from the internal hydraulic shimmy damper device should be felt throughout its rotation. If binding is felt during rotation service the strut per Chapter 12. If the strut has been properly serviced and continues to bind, replacement of the strut is required.

d Rotate the nose gear wheel assembly to one side and remove just enough weight off the nose gear so the strut is fully extended and the wheel assembly is no longer in contact with the floor. If the wheel assembly does not center, in line with the direction of flight, service the strut per Chapter 12. If the strut has been properly serviced and does not center, replacement of the strut is required.

2 Servicing (every 200 hours or annually) - The strut should be serviced per the instructions in Chapter 12.

(2) **ESCO Nose Strut**

(a) **Removal of Nose Strut**

1 Remove the nose strut fairing per the instructions in the Nose Gear Wheel Pant and Fairing section.

2 Relieve all load from the nose gear by pushing down on the tail of the aircraft.

CAUTION: Always wear safety goggles when releasing gas pressure. Apply rags around the Schrader valve and a drip pan under the strut to catch any oil that may discharge with the nitrogen gas.

3 Remove the valve cap from the strut Schrader valve. Using a small flat bladed screwdriver covered by a rag, gently press in on the Schrader valve core stem to slowly bleed off nitrogen gas pressure in the strut.

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4 Remove the Schrader valve from the strut housing.

5 For engine mounts with a slot, use a felt tip marker and apply an aligning index mark between the engine mount and the strut housing. An aligning index mark is not required for engine mounts that are not slotted.

6 Remove the bolts, nuts (either castellated of self-locking), and washers connecting the nose strut to the engine mount. Refer to Figure 207.

7 Using a twisting motion, pull the nose strut straight down and out of the engine mount.

(b) **Installation of Nose Strut**

1 Using a twisting motion, slide the nose strut housing into the engine mount until the housing collar is seated flush against the engine mount tube and index marks are aligned.

2 Install bolts, nuts, and washers connecting the nose strut to the engine mount in reverse order as disassembled. Refer to Figure 207. Torque nuts 72 to 84 in.-lbs. Install new cotter pins in the castellated nuts.

3 Screw the schrader valve into the nose strut and torque the valve 150 to 200 in.-lbs.

4 Service the nose strut per the instructions in Chapter 12.

5 Reinstall the nose strut fairing per the instructions in the Nose Gear Wheel Pant and Fairing section.

6 Reinstall the nose wheel and wheel pant assembly per the instructions in the Nose Gear Wheel Pant and Fairing section.

(c) **Nose Strut Servicing and Maintenance**

1 Inspection (every 100 hours or annually)

a The nose gear strut should be inspected for cracks, corrosion, scratches on the strut shaft, fluid leakage, and signs of overstress. The strut attachment to the engine mount should be checked for security. If oil leakage is present at any one of these locations, replacement of the strut is required.

b With the full weight of the aircraft on the nose and main gear inspect the ride height of the nose gear strut. There should be 3 to 4 inches of the chrome strut rod visible between the lower flange and the wiper seal. If ride height is low and no oil leakage is present, recharge the strut per Chapter 12. Recheck the filler valve and the filler valve gasket for signs of leakage.

c Remove weight off the nose gear to allow rotation of the nose wheel assembly left and right to its full range of rotation. A smooth resistance from the internal hydraulic shimmy damper device should be felt throughout its rotation. If binding is felt during rotation service the strut per Chapter 12. If the strut has been properly serviced and continues to bind, replacement of the strut is required.

d Rotate the nose gear wheel assembly to one side and remove just enough weight off the nose gear so the strut is fully extended and the wheel assembly is no longer in contact with the floor. If the wheel assembly does not center, in line with the direction of flight, service the strut per Chapter 12. If the strut has been properly serviced and does not center, replacement of the strut is required.

2 Servicing (every 200 hours or annually) - The strut should be serviced per the instructions in Chapter 12.

5. Hard Landing Inspection

A. After a hard landing or a landing over maximum landing weight, the aircraft should be inspected for damage in accordance with this section. If any damage is found, it must be repaired prior to the next flight.

(1) Nose Gear - The nose gear strut should be inspected for cracks, scratches on the piston, fluid leakage, and signs of overstress. Check for proper nitrogen pressure in the strut. The strut attachment to the engine mount should be checked for security. If oil leakage is present at any one of these locations, replacement of the strut is required. Inspect the ride height of the nose gear strut. There should be 3 to 4 inches of the chrome strut rod visible between the lower flange and the wiper seal. If ride height is low and no oil leakage is present, recharge the strut per Chapter 12. Recheck the filler valve and the filler valve gasket for signs of leakage.

(2) Main Gear - Inspect the wheel, axle, axle mounting bolts, wheel shims, gear leg, and gear leg attachment bolts to assure there are no broken, bent, or loose parts. The main gear assembly should fit snugly together with very little, if any, free play.

(3) Wheel Toe-in and Camber - Assure that wheel toe-in and camber meets the requirements of the Main Gear Assembly section.

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(4) Fairings - Visually inspect the main and nose gear fairings for chips, cracks, or other damage.

(5) Gearbox - Determine if the gearbox is bent or broken. With equal pressure and wear on the tires, the aircraft evenly loaded (including fuel), and the aircraft on a level surface, the wings should be level. If a bent or broken gearbox is suspected, contact Cessna Aircraft Company, and do not fly the aircraft.

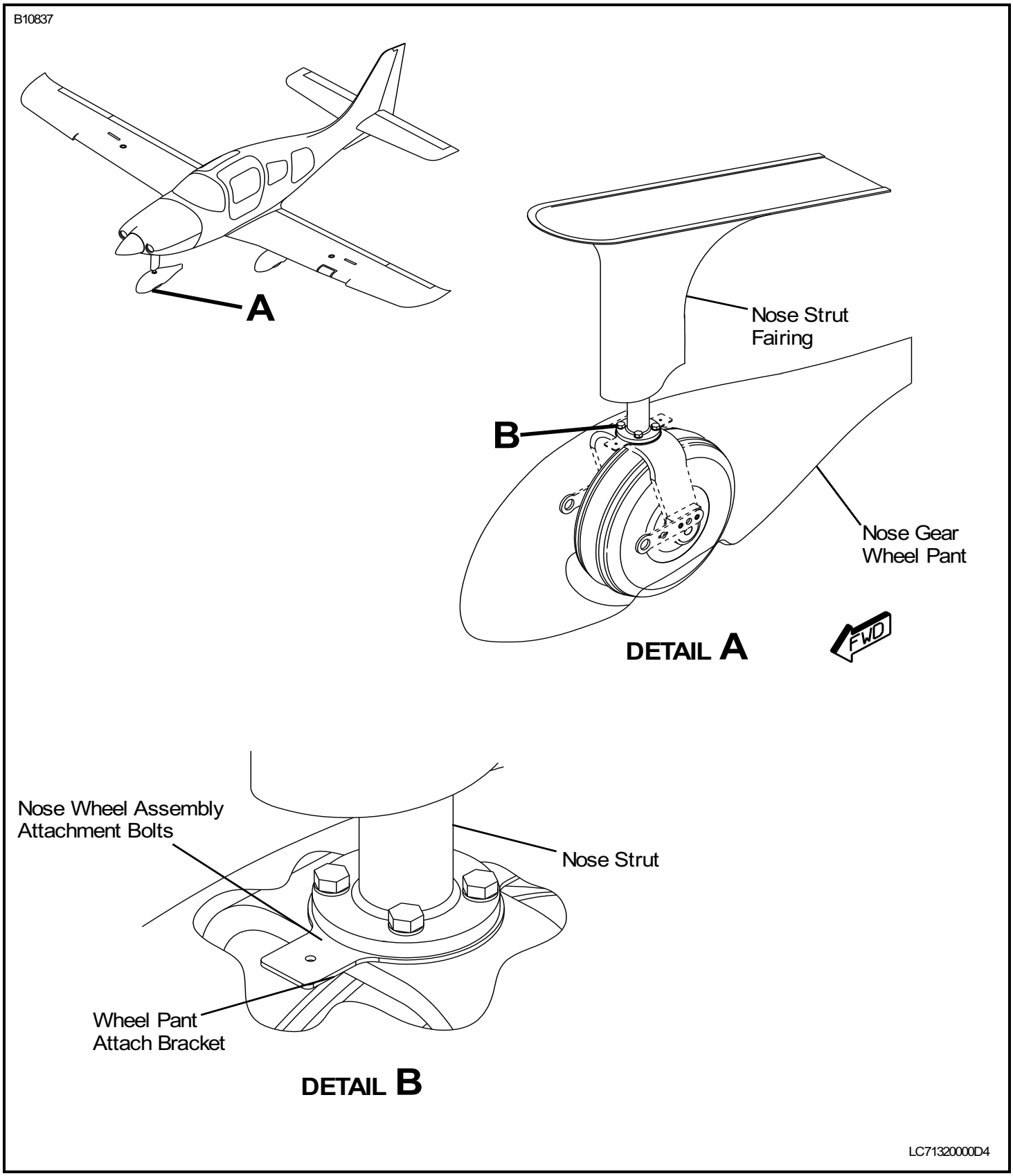
(6) Tires - Visually inspect the tires for cuts, wear, or broken belts.

(7) Engine Mount - Visually inspect the welds on the engine mount using a bright light and magnifying glass.

(8) Propeller - Visually inspect the propeller for nicks or chips.

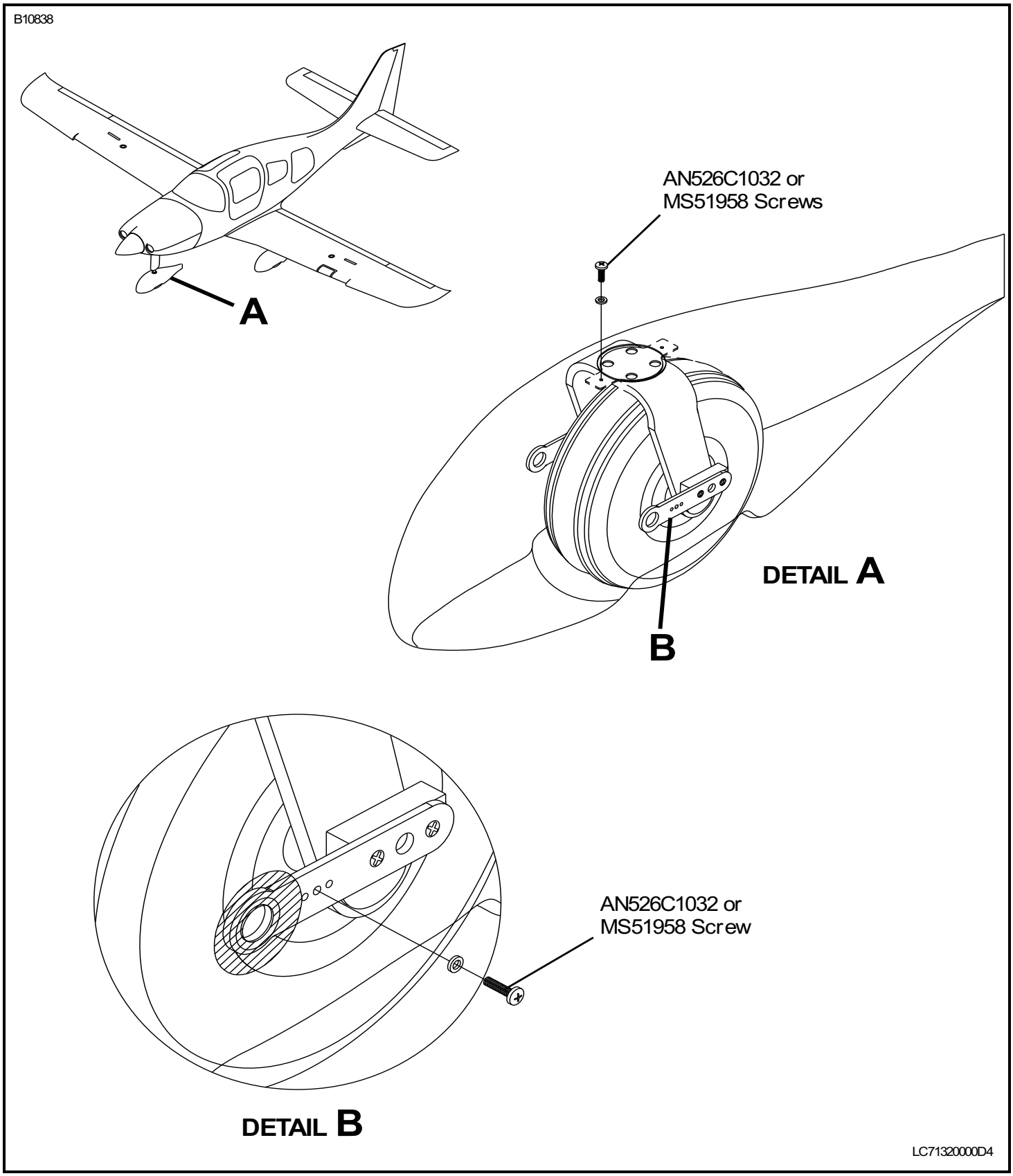
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Figure 201 : Sheet 1 : Nose Wheel Pant and Leg Fairing



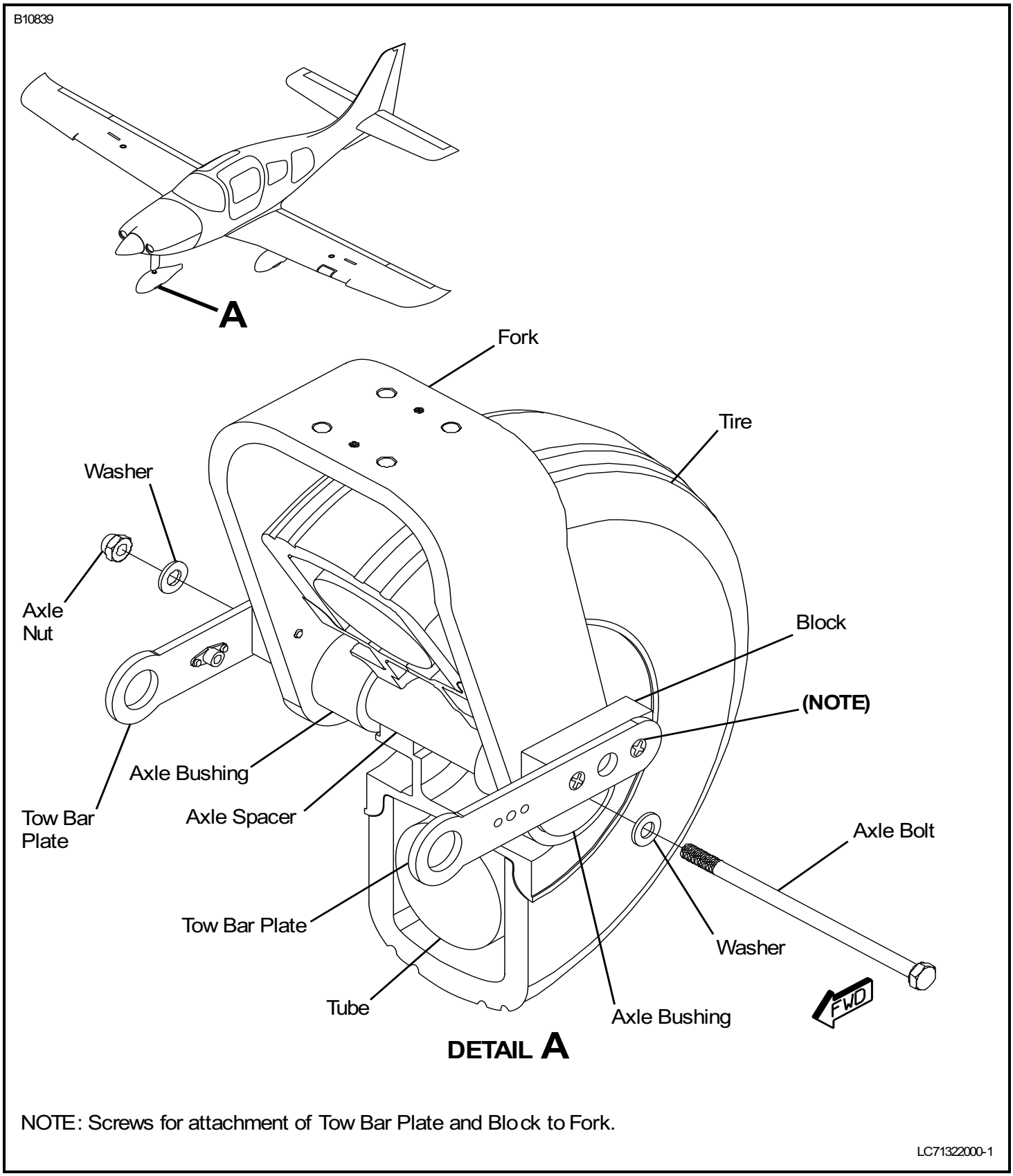
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Figure 202 : Sheet 1 : Wheel Pant Attachment Hardware



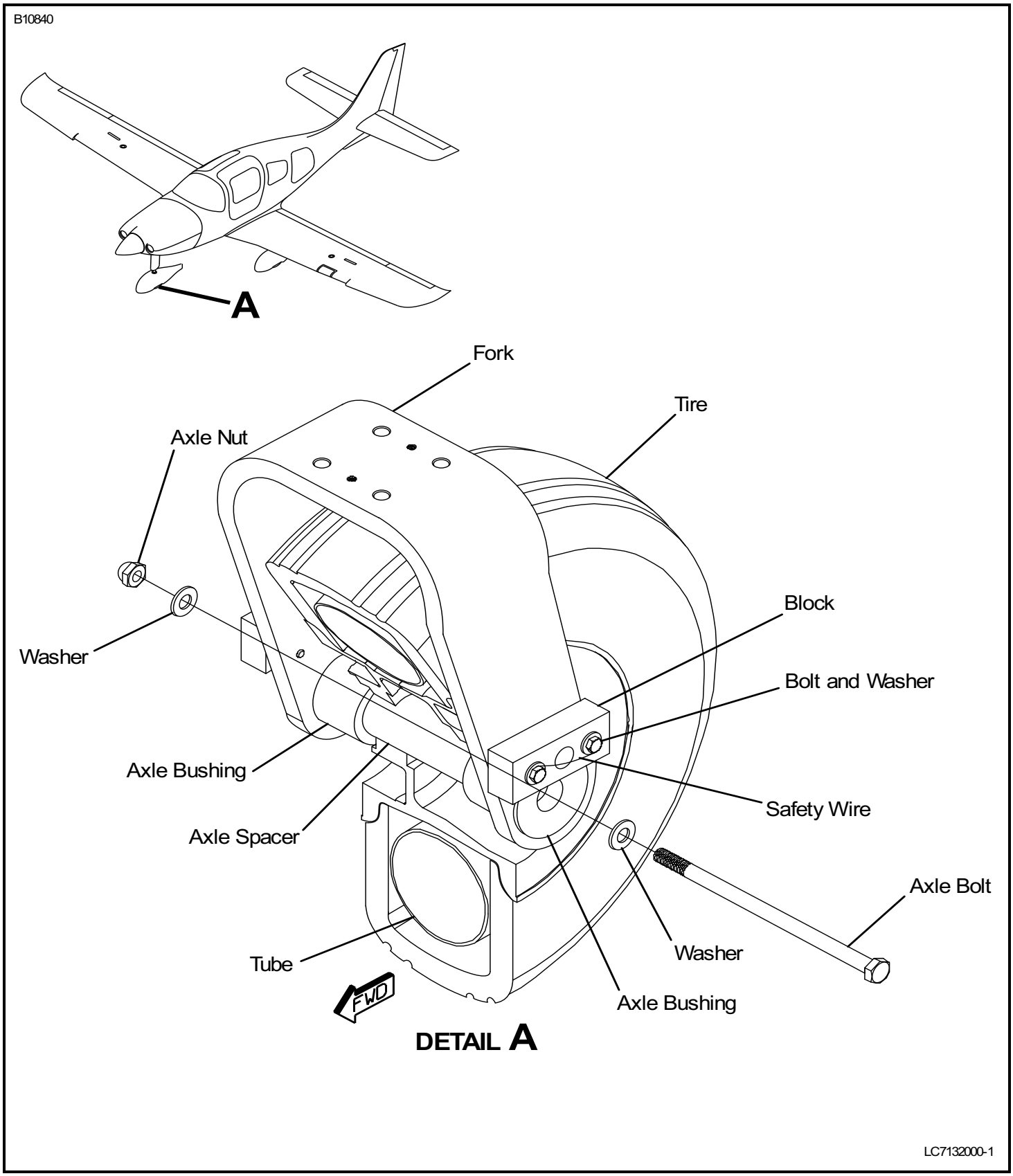
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Figure 203 : Sheet 1 : Nose Gear Wheel and Fork Assembly with Wheel Pant



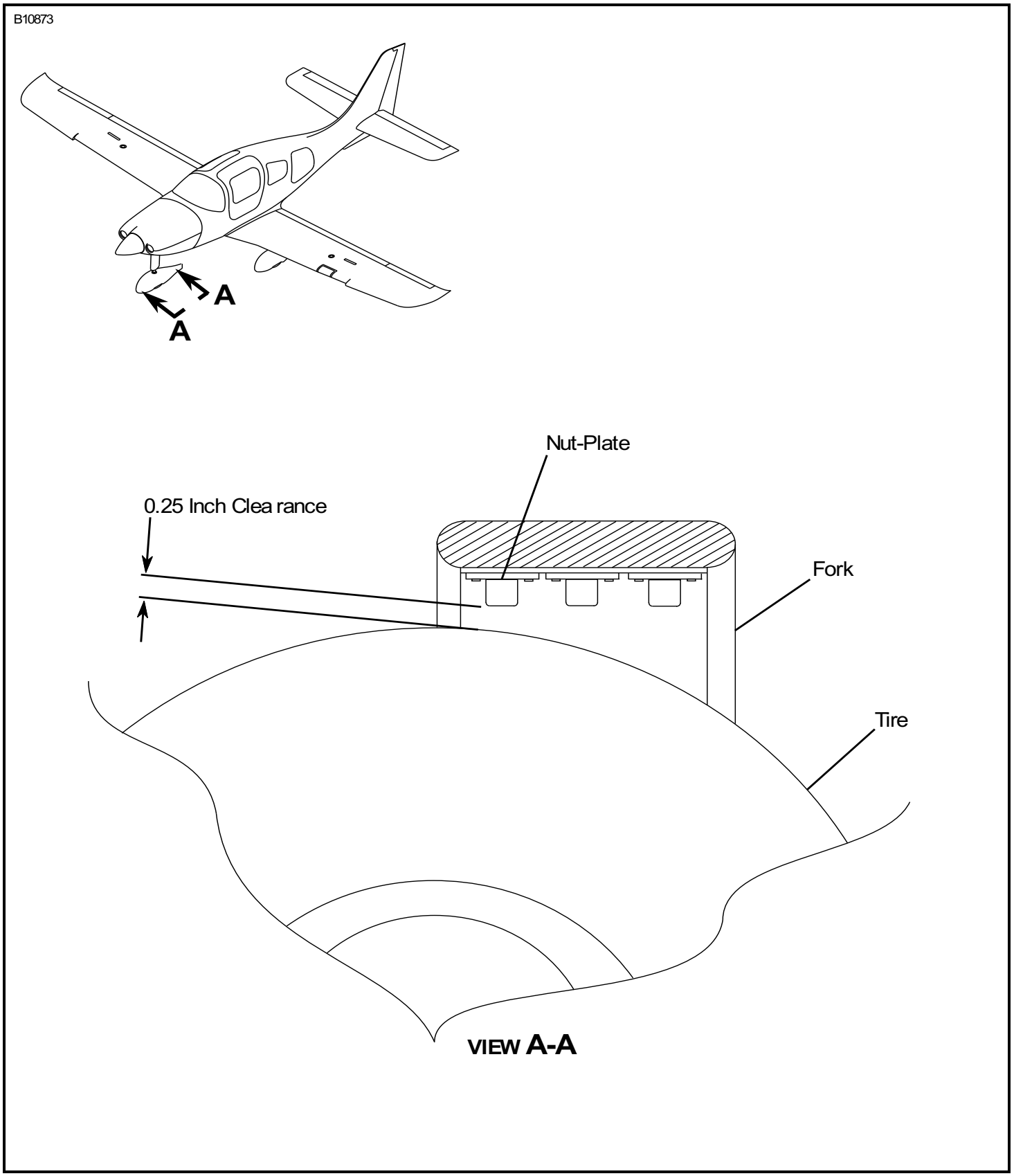
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Figure 204 : Sheet 1 : Nose Gear Wheel and Fork Assembly without Wheel Pant and Tow Bars



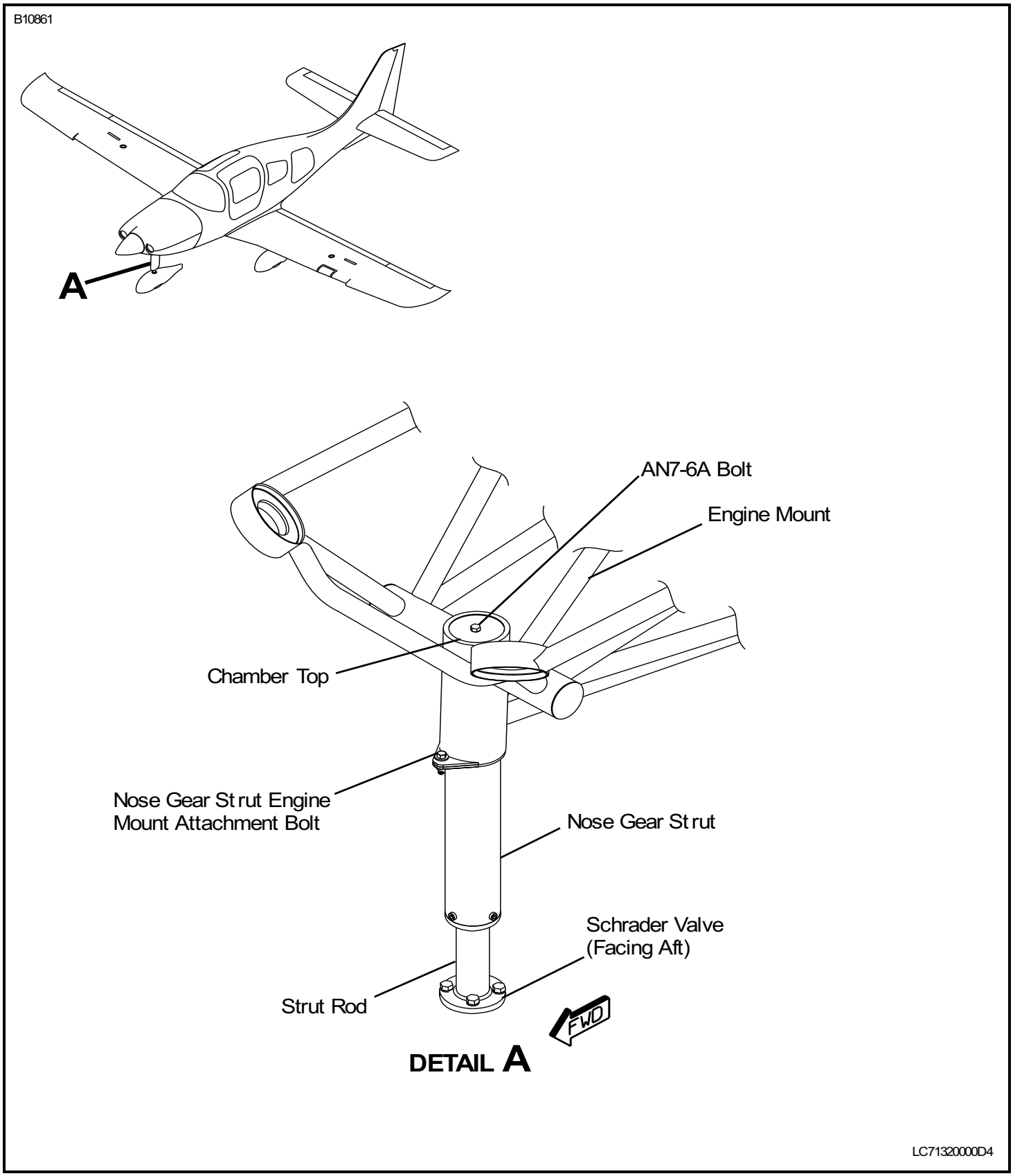
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Figure 205 : Sheet 1 : Minimum Tire Clearance



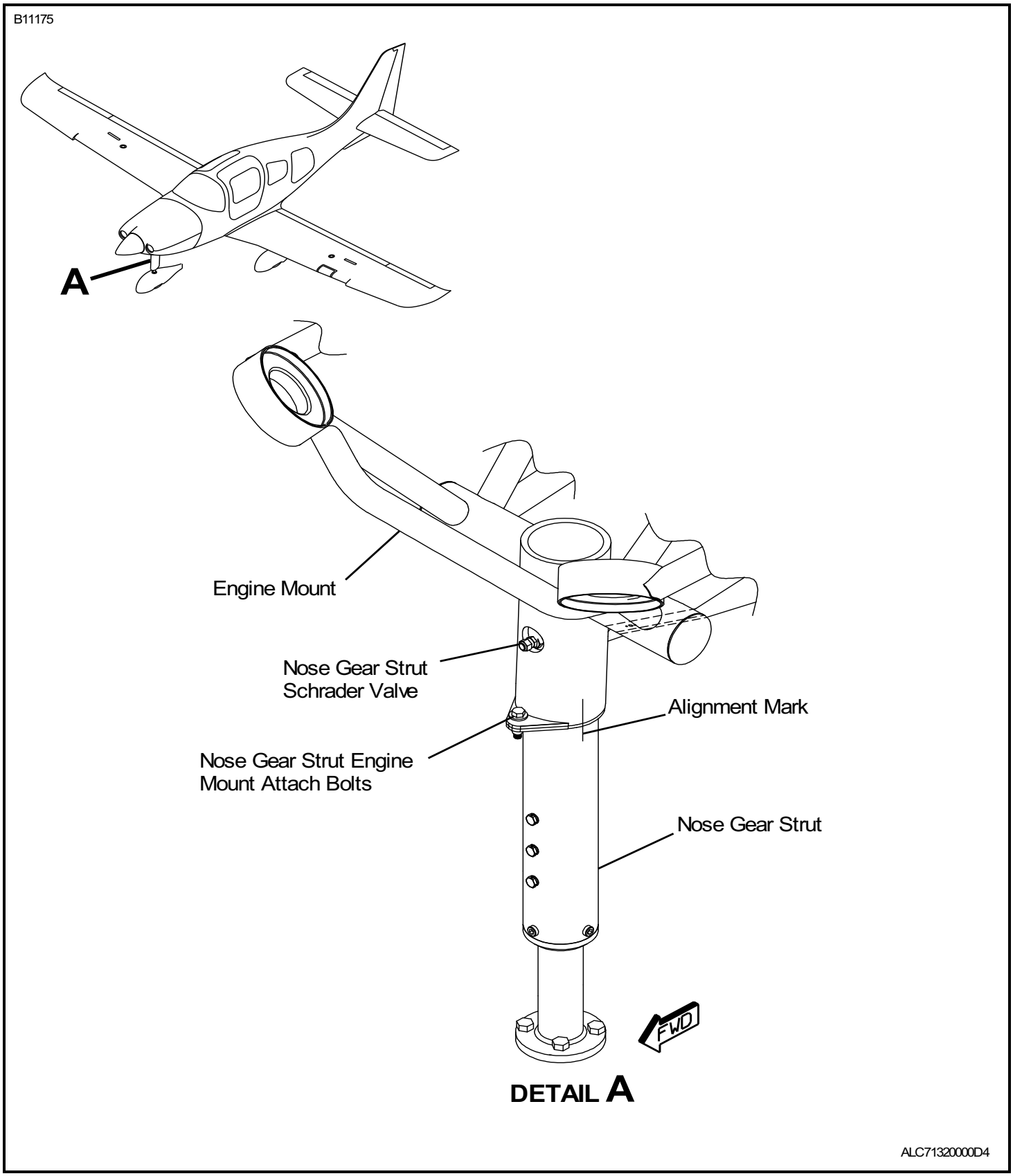
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Figure 206 : Sheet 1 : Nose Strut Assembly



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Figure 207 : Sheet 1 : ESCO Nose Strut Assembly



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WHEELS, TIRES, AND BRAKE SYSTEM - MAINTENANCE PRACTICES

1. General

A. The Cessna 400 (LC41-550FG) uses a 5.00-5 nose wheel and a 6.00-6 main wheel. The nose and main wheels are both tube type wheels. The nose wheel uses a 5.00-5 10-ply tire and the main wheel uses a 15x6.00-6 6-ply tire. Wheels and tires are certified under the requirements of TSO-C26c, and all replacement parts should be in accordance with the TSO.

B. All service and maintenance practices for the main wheels are in accordance with the latest issue of Cleveland Wheels and Brakes Maintenance Manual AWBCMM0001. The manual includes the disassembly and reassembly of the wheel and brake disk, the installation of tires and tubes, and the service and repair of wheel bearings and bearing races. Service and maintenance of the brake calipers and brake master cylinders are also covered in the Cleveland maintenance manual.

2. Brake System

A. The Cessna 400 (LC41 550FG) has dual brakes located on the main gear. The brakes are hydraulically actuated and used for steering (differential braking) as well as stopping.

B. **Removal and Installation of the Brake Calipers**

(1) Gain access to the brake calipers by removing the main gear wheel pant access panel.

(2) Remove the four bolts from the brake caliper that hold on the brake pads. Pads will drop away from behind the wheel disc.

(3) Slide the brake caliper straight out from the torque plate.

CAUTION: Depressing the brake pedals at this point will push the brake caliper pistons out of the calipers and release brake fluid.

(4) Disconnect the brake line from the brake caliper. Once the brake line is removed, use a plug or cap to seal the end of the brake line to minimize the amount of brake fluid that will drain from the line.

(5) Reinstall the brake calipers in the reverse order. Torque the brake pad attachment bolts per the latest issue of Cleveland Maintenance Manual AWBCMM0001.

(6) Service the brake system per the instruction in the Brake System - Servicing and Maintenance of the Brake System section.

C. **Removal and Installation of the Brake Master Cylinders** - The brake master cylinders are located in the cabin. There are four master cylinders, one at each rudder pedal. The brakes are actuated by depressing the rudder pedals, which in turn depresses the brake master cylinders. Use the following procedure for removing and installing the master cylinders:

NOTE: Place some rags or a small pan underneath the master cylinder and rudder pedal to catch any excess hydraulic fluid that may still be present in the line.

(1) Remove the main gear wheel pant access panel to gain access to the brake caliper.

(2) Place a small pan or bucket under the brake caliper, and remove the lower bleeder valve.

(3) Depress the rudder pedals several times to facilitate draining of the brake system.

(4) Once the brake system is drained of hydraulic fluid, disconnect the brake lines from the brake master cylinder.

(5) Remove the cap plug, cotter pins, nuts, washers, and bolts attaching the master cylinder to the rudder pedal and the rudder crossover tube. Refer to Figure 201 and Figure 202.

(6) Install the brake master cylinder in the reverse order. Check all fittings and attachments for security. Fill a new MS-3 cap plug half full with Wacker SWS-951 sealant, and install over the nut with the cotter pin.

(7) After the master cylinder is re-installed, refill the brake system with hydraulic fluid, MIL-H-5606, per the instructions in the Brake System - Servicing and Maintenance of the Brake System section.

D. **Servicing and Maintenance of the Brake System** - The brake system is a self-contained system and under normal operating conditions should not need any service or maintenance. The system will need to be serviced if the brake calipers or other components are replaced. If the brakes begin to feel soft, the brake system may have air in the lines and will need to be serviced. The brake system will also need to be serviced if any of the brake lines are disconnected. Servicing the brake system will require the use of a small garden sprayer with a modified nozzle or other similar device. The spray nozzle should be replaced with a small section of tubing that can be fitted to the brake caliper bleeder valve. Use the following procedure for bleeding and servicing the brake system:

WARNING: Only service the brake system when the brake calipers are attached to the wheel and disc assembly. If the brake system is pressurized with the caliper unattached to the wheel and disc, the

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caliper pistons will be pushed out of the caliper.

(1) Place a small bucket or pan under the drain valve located at the rear of the lower engine cowl.

(2) Gain access to the brake caliper by removing the inner wheel pant access panel.

(3) Loosen the bleeder valve located on the bottom of the brake caliper.

(4) Fill the garden sprayer with MIL-H-5606 hydraulic fluid, and connect the end to the bleeder valve. Pressurize the sprayer.

(5) Depress the handle to release hydraulic fluid into the brake system.

(6) Depress the brake pedal several times until all air is forced out of the system. When all the air is forced out of the system, the brakes will feel firm.

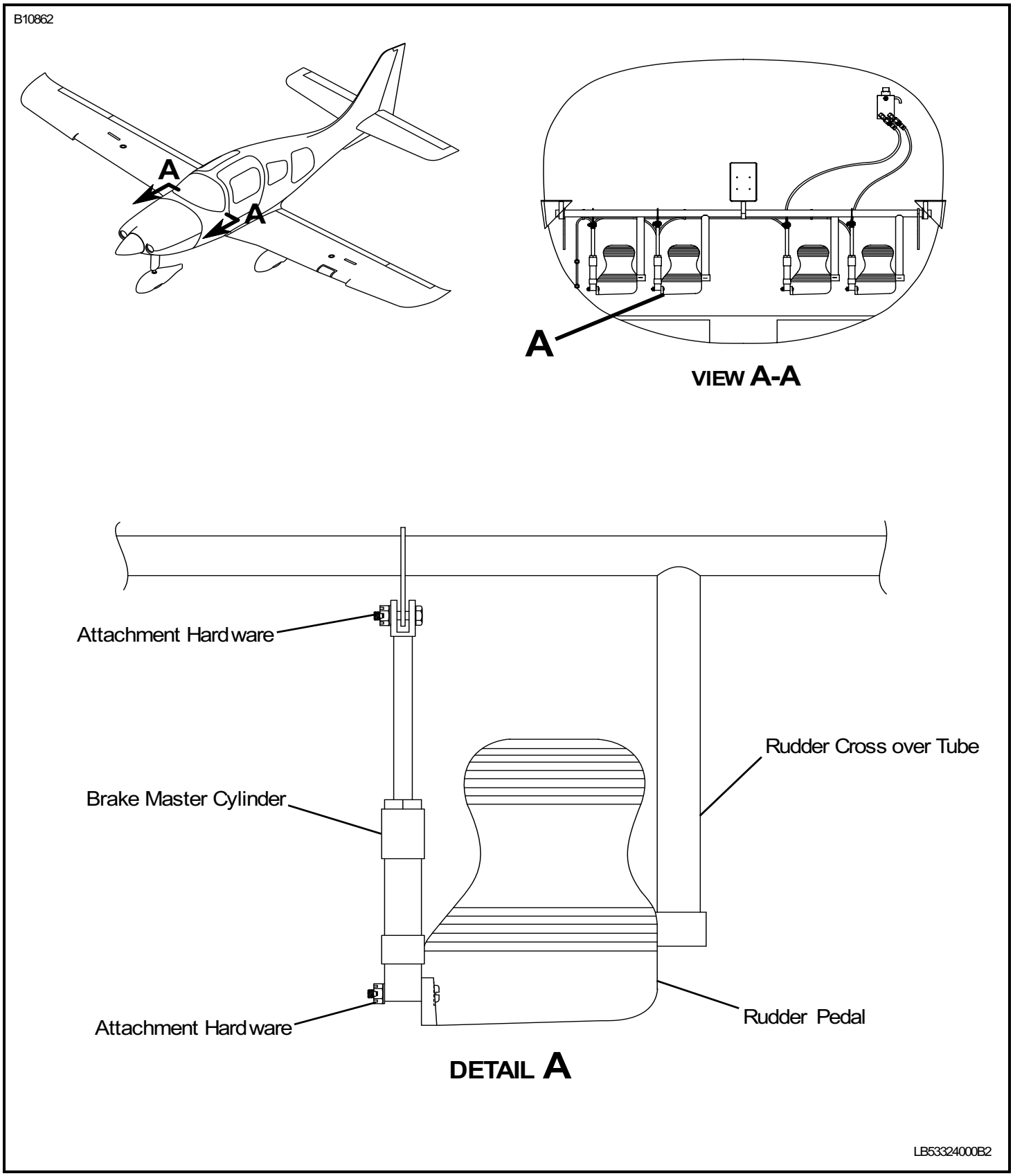
(7) Once the brake system has been serviced, tighten the bleeder valve prior to removing the sprayer.

(8) Clean any excess brake fluid that may have spilled on or near the brake caliper, wheel, and brake disc.

(9) Reinstall the wheel pant access panel.

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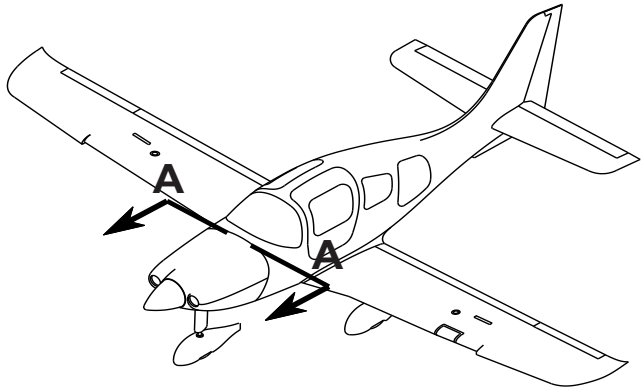
Figure 201 : Sheet 1 : Rudder Pedal and Brake Master Cylinder Attachment

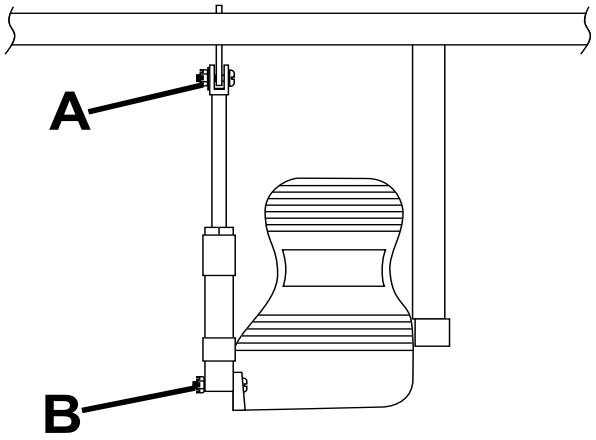


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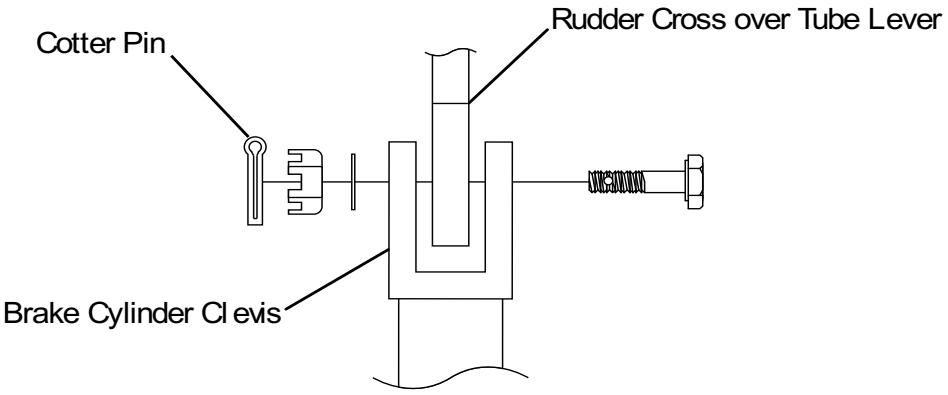
Figure 202 : Sheet 1 : Rudder Pedal and Brake Master Cylinder Attachment Details

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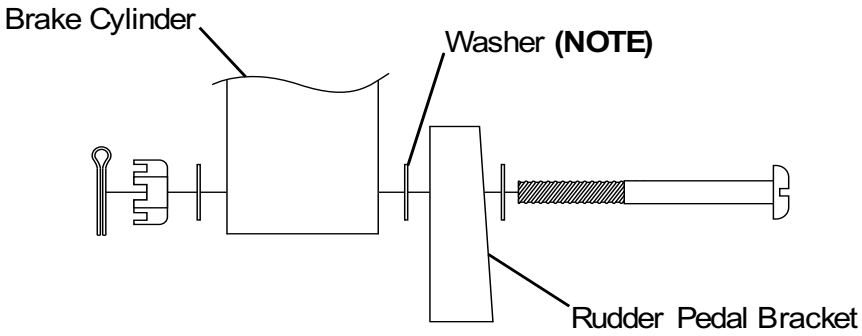




VIEW A-A



DETAIL A



DETAIL B

NOTE: Added S/N 40015 and On

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PARKING BRAKE - MAINTENANCE PRACTICES

1. General

A. The Cessna 400 (LC41-550FG) uses a parking brake to lock the brakes and prevent the aircraft from rolling. The parking brake is located on the left side of the cabin just forward of the circuit breaker panel.

(1) **Parking Brake Removal and Installation**

(a) Remove the parking brake interior panel per the instructions in Chapter 25.

(b) Drain the hydraulic system per the instructions in the Brake System - Removal and Installation of the Brake Master Cylinders section.

(c) Disconnect the brake lines from the parking brake. Place a rag under the brake lines to prevent any excess brake fluid that may still be in the lines from leaking onto the carpet.

(d) Remove the two AN526C1032R24 truss head screws and two NAS1149F0363P washers that attach the parking brake (refer to Figure 201), and slide the brake and spacer straight out.

(e) Reinstall the parking brake in the reverse order. Torque the attachment screws 30 to 36 in.-lbs.

(f) Service the brake system per the instructions in the Brake System - Servicing and Maintenance of the Brake System section.

(2) **Parking Brake Service and Maintenance** - The parking brake is a sealed system and should not need any service or maintenance. The parking brake should be inspected periodically to ensure that it is still functioning properly. Use the following procedure to check if the parking brake is functioning properly.

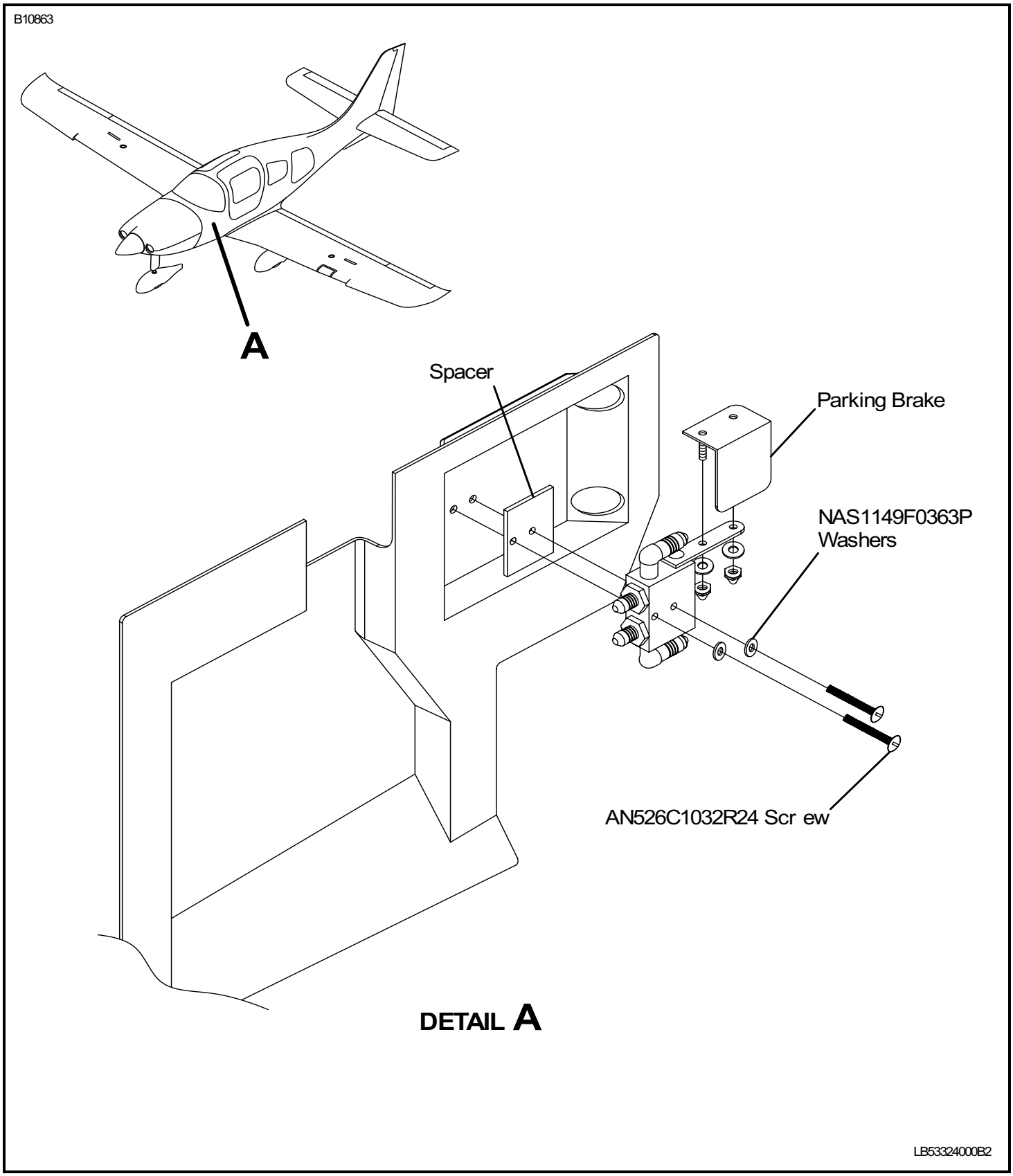
(a) Depress the rudder pedals to actuate the brakes.

(b) While pressing on the rudder pedals, pull the parking brake lever out and towards the pilot’s seat to engage the parking brake and lock the brakes.

(c) Using the tow bar, attempt to pull the airplane forward. If the airplane will not roll or the tires skid, the parking brake is functioning correctly. If the airplane does roll forward with little or no resistance the parking brake should be inspected for proper attachment of the brake lines (refer to Figure 202) and possible service of the parking brake itself. Service of the parking brake is in accordance with the latest issue of Cleveland Maintenance Manual AWBCMM0001.

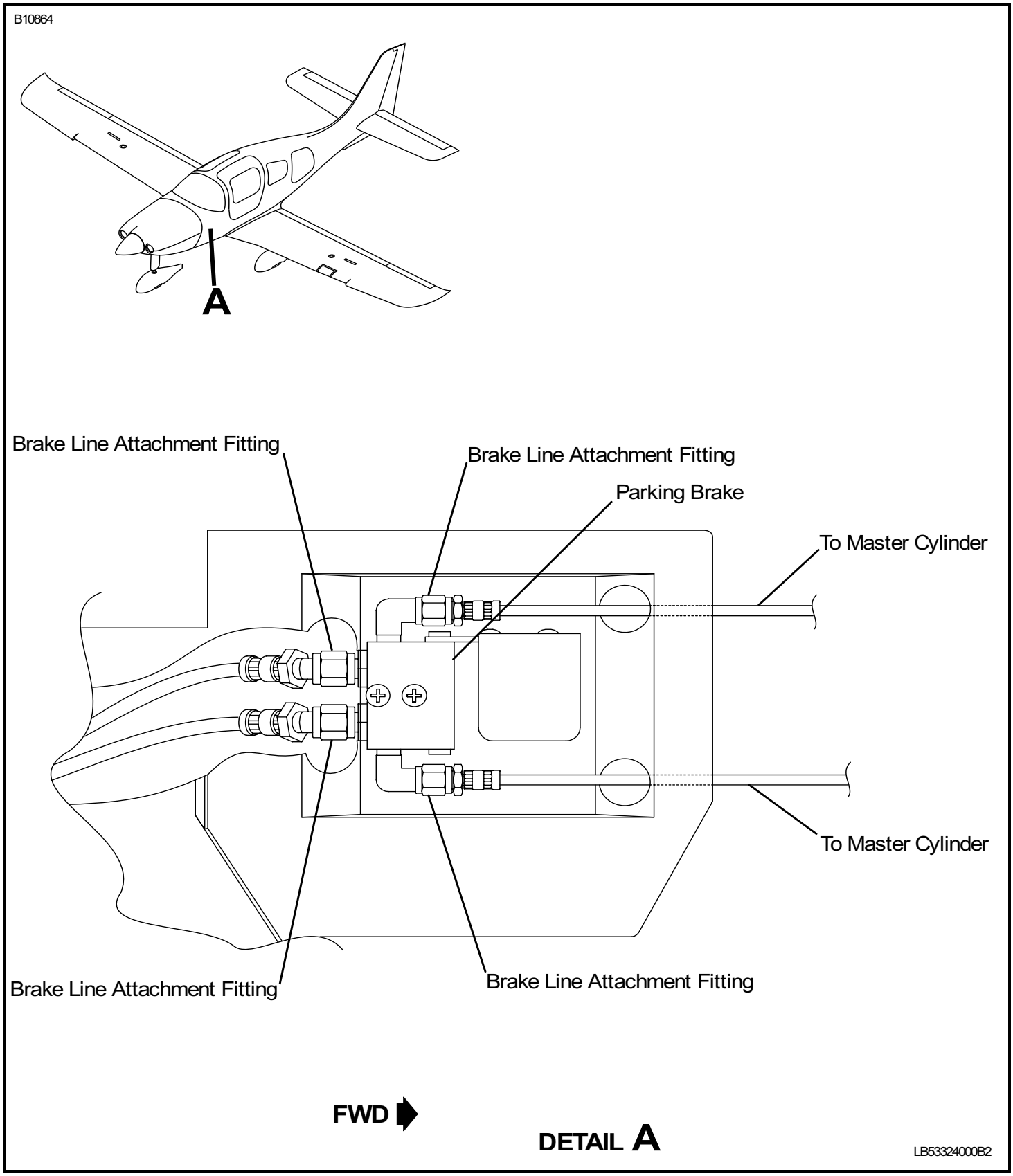
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Figure 201 : Sheet 1 : Parking Brake Installation



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Figure 202 : Sheet 1 : Parking Brake and Brake Line Attachment



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LIGHTING - GENERAL

1. Interior Lighting System - General

A. The interior lighting system of the Cessna Model LC41-550FG/T240 is one of the more sophisticated systems available for small airplanes. For a summary of the airplane lighting installations refer to the sections that follow:

(1) Garmin Model T240 LED Panels refer to Table 1.

(2) Avidyne Option lighting refer to Table 2.

(3) Garmin G1000 Option lighting refer to Table 3.

(4) For Avidyne and Garmin G1000 Options, trim, annunciators, and flap position LEDs refer to Chapter 25, Instrument Panels and Electrical Panels - Maintenance Practices.

(5) Fuel tank LEDs refer to Chapter 28, Fuel Indicating System - Maintenance Practices.

B. Flip & Access Lights - The flip-lights are rectangular shaped fixtures located in the middle of the overhead panel and in the baggage compartment. The lights bypass the system master switch and operate without turning on power to the system. The two fliplights are turned on by turning or flipping the lens right or left. In the center position, they are used as part of the airplane's access lighting system.

(1) When either main entrance door is unlatched, a switch in the door latching mechanism activates the two flip-lights and the two lights that illuminate each entrance step. The access lights are on a ten-minute timer and turn off automatically unless reset by activating both main door latching mechanisms when all the doors are closed.

(2) This design has two advantageous features. First, opening either of the main cabin doors provides an immediate light source for preflight operations, passenger access, and baggage loading. Second, the flip-lights, when turned to the left or right, operate as emergency lighting in situations which necessitate turning off the master switch. The only disadvantage is that the flip-lights can inadvertently be left on, depleting battery power. To prevent this from happening, make sure that the flip-lights are in the centered or flush position when securing the airplane at the end of a flight.

C. Overhead Reading Lights - There are four overhead reading lights, two in the forward overhead panel between the front seats and two in the aft overhead panel between the two backseats. Each light is on a swivel that can be adjusted to an infinite number of positions. The intensity of these lights is adjusted by moving the left thumb-wheel (Avidyne option) or slide-type dimmer switch (Garmin G1000 option or Model T240) in the center of the overhead panel, near the windshield. The dimmer has an on-off switch at the extreme aft position. Turn the thumb-wheel, or move the slide forward to increase the light intensity. You must have the airplane's position lights in the on position for the overhead reading lights to operate.

D. Glare Shield Flood Bar - There is a tube array of either color-corrected lights or LEDs inserted under the glare shield. This indirect light source complements the backlighting in each instrument and facilitates the use of adjustable instruments such as the true airspeed indicator, directional gyro, and navigational instruments. The intensity of the lights can be adjusted as follows:

(1) Model T240 and Garmin G1000 option.

(a) Move the slide-type dimmer switch found in the center of the overhead panel forward.

NOTE: The dimmer has an on-off switch at the extreme aft position.

(2) Avidyne option.

(a) Turn the right wheel-type dimmer switch found in the overhead panel.

E. Upper Instrument and Engine Panels

(1) Model T240 - The brightness of backlighting for the each of the two Garmin GDU 1400 displays (PFD (UI407), MFD (UI406)), the Garmin GCU 275 PFD Controller (UI404) and the Garmin GTC 570 Touch Screen Controller (UI405) are controlled by photo cells located on the devices. For each of the GDU 1400 displays and the GTC 570 Touchscren Controller you can brighten and dim the display within the baseline limits of the photo cells by the FLT INST dimmer switch (SW23) installed in the center console.

(2) Avidyne Option - The instruments in the flight and engine instrument panels have backlighting, that is, a small light within each instrument case that illuminates its dial. The right thumb-wheel switch between the pilot's legs on the knee bolster, controls the dimmer for these lights. The dimmer has an on-off switch at the extreme down position of its rotation. Turning the thumb-wheel up increases the light intensity. The airplane's position lights must be on for the upper instrument and engine panel lights to operate.

(3) Garmin G1000 Option - The brightness of backlighting for the PFD, MFD, audio panel, and keypad are controlled by

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photo cells located on the devices. The brightness of backlighting for the backup flight instruments is controlled by the left slide dimmer switch at the front of the center console. The dimmer has an on-off switch at the extreme up position, and moving the slide down increases the light intensity.

F. Lower Instrument Panel, Circuit Breaker Panel, and Rocker Switches

(1) Model T240 - The LED lighting panels found on the circuit breaker panel, instrument panel, center console panels, and overhead panels are controlled by the CB/SW dimmer switch (SW24) installed in the center console. The dimmer has an on-off switch at the extreme forward position, and moving the slide down increases the light intensity.

(2) Avidyne Option - The lower instrument, circuit breaker, and rocker switch panels contain switches and controls that have backlighting. The lighting illuminates the placards on or next to the breaker, switch, or control and the internally lighted engraved rocker switches. The dimmer for these lights is controlled by the left thumb wheel switch between the pilot's legs on the knee bolster. The dimmer has an on-off switch at the extreme down position of its rotation. Turning the thumb-wheel up increases the light intensity.

(3) Garmin G1000 Option - Backlighting of the 5 pack (pitot heat, door seals, and optional equipment) switches, flap panel, lighted position bar, slide dimmer labels, master switches and circuit breaker panel is controlled by the right slide switch at the front of the center console. Backlighting of the fuel pump armed light is controlled by the position lights switch. The backlighting illuminates the placards on or next to the breaker, switch or control, and the internally lighted switches. The dimmer has an on-off switch at the extreme up position, and moving the slide down increases the light intensity. Backlighting of the pitot heat, door seals, and optional items switches will dim down to a preset value while all other lighting controlled by this switch will dim to zero.

Table 1. Model T240 LED Panels

LED PANELS	LOCATION OF LED PANELS	CIRCUIT BREAKER
Switch Panel LED Panel	Center Console	PANEL LIGHTS
Audio Jacks LED Panel	Lower Center Console	PANEL LIGHTS
Ignition Switch LED Panel	Bottom Left Instrument Panel	PANEL LIGHTS
Display Reversion Switch LED Panel	Upper Left Instrument Panel	PANEL LIGHTS
Engine Control LED Panel	Lower Center Instrument Panel	PANEL LIGHTS
Circuit Breaker LED Panel	Circuit Breaker Panel	PANEL LIGHTS

Table 2. Lighting Systems (Avidyne Option)

LIGHT	LOCATION OF LIGHTS	LOCATION OF SWITCH	REMARKS
Courtesy Lights	Front and rear flip lights in overhead console	If all doors are latched, flip light is activated by flipping the lens from the neutral position.	Door switch activates timer that turns off access lights after 10 minutes.
	Exterior lights near the right and left entrance steps	If a door is unlatched, a switch activates flip lights when the lens is in the neutral position.	Operates with master switch on or off.
		Step lights are turned on with door switch.	
Overhead Swivel Lights	Two overhead swivel lights in the front seat area	The left thumb wheel dimmer switch is in the overhead panel.	Master switch and navigation lights must be on for the system to operate.
	Two overhead swivel lights in the rear seat area		
Glare Shield Flood Bar	Color corrected flood bar under the glare shield that lights the flight instruments and front panel areas	The right thumb wheel dimmer switch is in the overhead panel.	Master switch and navigation lights must be on for the system to operate.
			Part of the standby battery system.

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Upper Instrument Panel	Provides backlighting for engine and flight instruments	The right thumb wheel dimmer switch is in the knee bolster on the pilot's side.	Master switch and navigation lights must be on for the system to operate.
Lower Instrument and Circuit Breaker Panels	Provides backlighting for radios, switches, or placards next to switches, circuit breakers, and controls	Left thumb wheel dimmer switch is in the knee bolster on the pilot's side.	Master switch and navigation lights must be on for the system to operate.
Trim, Flaps, Fuel Tank and Annunciator Panel	The trim position LEDs are in the trim panel.	The day/night and test features for these items are located in the trim panel, just above the engine control.	Master switch and navigation lights must be on for the system to operate.
	The flap position LEDs are in the flap panel.		
	The fuel tank LEDs are on the fuel quantity gauge.		
	Annunciator LEDs are in the annunciator panel.		

Table 3. Lighting Systems (Garmin G1000 Option)

LIGHT	LOCATION OF LIGHTS	LOCATION OF SWITCH	REMARKS
Courtesy Lights	Front and rear flip lights in overhead console	If all doors are latched, fliplight is activated by flipping the lens from the neutral position.	Door switch activates timer that turns off access lights after 10 minutes.
	Exterior lights near the right and left entrance steps	If a door is unlatched, a switch activates flip-lights when the lens is in the neutral position.	Operates with master switch on or off.
Overhead Swivel Lights	Two overhead swivel lights in the front seat area	The left slide-type dimmer switch is in the overhead panel.	Master switch must be on for the system to operate.
	Two overhead swivel lights in the rear seat area		
Glare Shield Flood Bar	Flood bar under the glare shield which lights the flight instruments and front panel areas	The right slide-type dimmer switch is in the overhead panel.	Master switch must be on for the system to operate.
Upper Instrument Panel	Provides backlighting for the backup flight instruments.	The left slide-type dimmer switch is in the front of the center console.	Master switch must be on for the system to operate.
Lower Instrument and Circuit Breaker Panels	Provides backlighting for switches, or placards next to switches, circuit breakers, and controls	The right slide-type dimmer switch is in the front of the center console.	Master switch must be on for the system to operate.

2. Exterior Lighting System - General

A. Description of System - The exterior lighting system includes the position lights, the strobe or anticollision lights, the landing light(s), and the taxi light(s). These lights are activated through use of switches in the rocker switch panel. The light system is protected by circuit breakers in the circuit breaker panel.

B. Position and Anticollision Lights - The left and right position lights (red and green) are mounted on each wing tip. Each wing position light contains the required aft or rearward projecting white lights. The anticollision lights are on each wing tip and contained within the same light fixture as the position lights.

C. Taxi and Landing Lights -

(1) LED (Airplanes 02049 and On) - The LED taxi and landing lights are found in the leading edge of the wings. The LED

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light assembly supplies the landing, taxi and recognition lights all in one.

(2) Xenon and Incandescent (Airplane 01159 and Airplanes 02001 thru 02048) - The taxi and landing lights are found in the leading edge of the left wing. The outboard bulb in the light housing is the taxi light that provides a diffused light in the immediate area of the airplane. The inboard bulb is the landing light, which has a spot presentation with a slight downward focus. The taxi and landing lights are sized for continuous duty and can be left on for operations in high-density traffic areas.

D. LED Wing Inspection Light - The Model T240 with the TKS (FIKI) option installed have a wing inspection light installed on the left and right of the fuselage at WL 92.08, FS 98.71. The lights show the wing for icing inspection when the airplane is in flight.

3. Troubleshooting Light Problems

CAUTION: Before any maintenance, removal, or installation of equipment or light bulbs is performed, make sure both the master and avionics switches are in the off position. Before removing the light bulbs, be sure that they have not been in use for several minutes and have cooled sufficiently.

A. Light Bulbs - As a general rule, light bulbs that have a short life have good accessibility and can be exchanged easily. For example, most engine and flight instrument lights can be changed in 10 to 15 minutes depending on the location of the instrument. Light bulbs that have a long life require more time for access and replacement.

B. Glare Shield Flood Bar - If none of the lights in the flood bar work, it is unlikely that all 20 bulbs burned out at the same time. In this situation, there is clearly a problem with the supply to the flood bar, and the problem should be diagnosed from this perspective. Conversely, if the altimeter light is inoperative, but all other flight instrument lights are normal, the problem is probably a light bulb.

C. The Model T240 LED Panels - If a LED panel is not serviceable it must be replaced. Refer to Interior LED Panels (T240) - Maintenance Practices. To troubleshoot interior LED lighting problems refer to Interior LED Panels (T240) - Troubleshooting.

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INTERIOR LIGHTING - MAINTENANCE PRACTICES

1. Lighting - General

A. **Courtesy Lights** - There are four courtesy lights. Two courtesy lights are located in the airplane's interior on the overhead console, two are on the airplane's exterior, and are commonly referred to as step lights. The entrance step lights are located above and forward of the steps on both sides of the aircraft, on the underside of the wing-to-fuselage fairing. Each is easily accessible in the event of bulb burnout.

CAUTION: Before doing any work on a system, ensure that all power and light switches are in the off position and the light that is to be replaced has not been in use for a least five minutes.

B. **Exterior Courtesy/Step Lights Removal**

(1) Remove the light assembly by gently prying it with a flat-head screwdriver. It should slide out with very little effort. Refer to Figure 201.

(2) Gently pull the step light assembly out of the hole, and unplug it at the connector.

C. **Exterior Courtesy/Step Lights Installation or Replacement**

(1) Reconnect the connector and feed excess wire into the fuselage.

(2) Insert the light fixture into the hole, and push it in until it is flush with the surface.

(3) The exterior step light bulb is not replaceable. If a light fails, replacement of the whole assembly is required.

D. **Removing the Interior Courtesy Lights**

(1) The interior light housing can be removed by prying it off the panel with a screwdriver. Refer to Figure 202.

(2) Disconnect the three wires to the light housing.

(3) To remove the light bulb, push in the two tabs located to the left and right of the bulb.

(4) Push the bulb out of its slot to remove it.

E. **Installing the Interior Courtesy Lights**

(1) To install the interior light, place a new light bulb in the slot, and push it into place.

(2) Push the housing and the light cover together so that the two tabs click into place.

(3) Reconnect the three wires, and push the housing back into its slot in the panel. Refer to Figure 202.

F. **Troubleshooting the Interior Courtesy Lights**

(1) If the interior courtesy lights are not working, remove the housing from the panel, and make sure that all three wires are connected properly.

(2) Check each light bulb for a failure.

(3) Check the circuit protection for a blown fuse. The courtesy light system is connected directly to the battery (bypasses the master switch), and the fuse block is located next to the battery in the engine compartment. All fuses are labeled.

2. Overhead Swivel Lights

A. There are four overhead swivel lights. Two are located in the front section of the cabin in the center of the overhead console and two are located in the rear section of the cabin in the middle of the overhead console. These lights are also referred to as spot lights, map lights, or reading lights. The Model T240 has LED type lights installed. The removal and installation procedures for each of the two types of lights is identical. Refer to Figure 202 for the removal and installation of the overhead swivel lights.

CAUTION: Before doing any work on a system, ensure that all power and light switches are in the off position and the light that is to be replaced has not been in use for at least five minutes.

B. **Remove the Overhead Swivel Lights**

(1) Unscrew three screws holding the swivel light in place.

(2) Remove the swivel light from the panel.

(3) Unplug the connector.

C. **Install the Overhead Swivel Lights**

(1) Plug in the connector.

(2) Push the light into its mounting hole in the panel.

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(3) Screw in three screws to hold the swivel light in place.

(4) The overhead swivel light bulb or LED is not replaceable. If a light fails, replacement of the whole assembly is required.

D. **Troubleshooting the Overhead Swivel Lights**

(1) If the overhead swivel lights are not functioning properly, make sure the connector is plugged in correctly.

(2) Check the light bulb or LED to make sure that it is not burned out.

(3) Check the light dimmer assembly.

3. Glare Shield Flood Bar

A. The glare shield flood bar is located under the glare shield in the cabin. The flood bar is composed of light emitting diodes (LEDs) spaced at 0.5 inch intervals. If more than eight LEDs burn out, a new flood bar must be installed if the airplane is to be used for IFR operations. Refer to the *Illustrated Parts Catalog* for ordering a replacement flood bar assembly.

B. **Flood Bar Inspection/Airplane Restrictions** - With the flood bar turned on, use a mirror to count all the burned-out LEDs. If eight or more LEDs are burned out, then the flood bar must be replaced, or the airplane must be restricted to VFR operations. The flood bar is an integral component in the airplane's IFR certification. Refer to the Minimum Equipment List in Appendix A, Section 6, of the POH/AFM.

C. **Removing the Glare Shield Flood Bar**

(1) Remove the glare shield as follows

(a) For the Model T240 refer to Chapter 25, Glare Shield - Removal/Installation

(b) For the Avidyne and Garmin G1000 installations refer to Chapter 25, Instrument Panels and Electrical Panels - Maintenance Practices

(2) Put the glare shield inverted on a soft work bench.

(3) Pull the flood bar to remove it from attachment clips and to break the adhesive from the glare shield.

(4) Clean excess adhesive off the glare shield.

D. **Replacing the Glare Shield Flood Bar**

(1) Glare shield should be inverted on a work bench.

(2) Attach the flood bar to the underside of the glare shield at the front lip by snapping onto the attachment clips.

(3) Use several strips of RTV sealant along the wiring to secure it in place.

(4) Note that the wiring tail must hang from the left (pilot) side of the assembly.

(5) Install the glare shield as follows

(a) For the Model T240 refer to Chapter 25, Glare Shield - Removal/Installation.

(b) For the Avidyne and Garmin G1000 installations refer to Chapter 25, Instrument Panels and Electrical Panels - Maintenance Practices.

4. Upper Instrument Panel (Avidyne and Garmin G1000 installations)

A. **Field Repair Instrument Lights** - The field repair instrument lights are located in the engine and flight instruments. The upper instrument lights are broken into two groups, flight instruments and engine instruments. .

(1) Flight instruments include: the air speed indicator, altimeter, vertical speed indicator, turn coordinator, directional gyro, and artificial horizon.

(2) Engine instruments include: fuel quantity, manifold pressure/fuel flow, vacuum/ammeter, oil pressure/temperature, and cylinder head/exhaust gas temperature gauges. The magnetic compass is also included with the upper panel instruments.

B. **Factory Repair Instrument Lights** - There are a few flight, engine, and navigational instruments that have sealed lights, that cannot be accessed in the field. These instruments include the flight director, horizontal situation indicator (HSI), navigational indicator (OBS), and the tachometer. The lights in these instruments are designed to last several thousand hours and, under normal conditions, should never require replacement. If a light does become inoperable, and it is confirmed that there is power to the instrument, then the instrument must be removed and sent to an instrument shop for bulb replacement.

C. **Removal and Replacement of Flight Instrument Lights** - These instruments use a light tray for lighting. To change a bulb use the following steps:

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(1) Remove the glare shield, and partially remove the instrument panel to gain access to the desired flight instrument. Refer to Chapter 25 for details.

(2) If necessary, remove the flight instrument panel by removing the screws in the instrument panel.

(3) Unscrew the two screws holding the light tray to the top of the instrument. The whole light tray must be replaced since the bulb is soldered to it. Refer to Figure 203.

(4) Once the light tray is replaced, reverse the above steps for installation of the instrument. The screws holding the instrument to the instrument panel do not have torque values and should be snug tight.

D. **Removal and Replacement of Engine Instrument Lights (Avidyne Option Only)**

(1) Remove the engine instrument panel per instructions in Chapter 25.

(2) If necessary, remove the engine instrument by removing the screws in the instrument panel.

(3) To change the light bulb, unscrew the lights on top of the instrument 1/4 turn, and screw in a new light. Refer to Figure 204.

(4) Once the engine instrument light is replaced, reverse the above steps for reinstallation of the instrument. The screws holding the instrument to the instrument panel do not have torque values and should be snug tight.

E. **Magnetic Compass** - The compass light is an integral part of the compass and cannot be replaced. If the light is inoperative, replacement of the entire compass assembly is required.

5. Lower Instrument Panel (Avidyne and Garmin G1000 installations)

A. **Lower Instrument Lights** - The lower instrument panel lights include switches in the ignition panel, rocker panel, ECS panel, and circuit breaker panel.

B. **Ignition, Rocker, and ECS Panels** - There are two rocker switches in the ignition panel, eight switches in the rocker panel, and one switch in the ECS panel. The light bulb in these switches is soldered into the unit, which means you must replace the switch if the bulb in the switch burns out.

C. **Rocker Switch Removal and Installation** - Use the following steps to remove and install a switch. Refer to Figure 205.

(1) Remove the rocker switch panel. Refer to Chapter 25, Instrument Panel and Electrical Panel - Maintenance Practices .

(2) Identify the rocker switch that is to be removed, and label each wire in relationship to its spade connector.

(3) After each wire is labeled, remove it from the switch.

(4) To remove the switch, push it out from the back of the panel. To do this, simultaneously apply pressure to the top and bottom (usually the thumb and index finger) across the width of the switch to compress the four retaining clips.

(5) Install the switch by compressing the retaining clips and inserting it into the panel.

(6) Connect the wires to the spade connectors.

(7) With the master switch on, test the switch for proper operation.

D. **Circuit Breaker Panel Lights (Overview)** - The circuit breaker panel is located on the left side of the airplane, just forward of the pilot's seat. The panel contains five tiered rows. Above each row is a small overhang that spans the width of the row. Refer to Figure 206.
Within each overhang there are light elements, which are epoxied into holes in the overhead row. The number of lamps in each row depends on the length of the row. Rows 1-3 have three lamps, row 4 has four lamps, and row 5 has five. The bulbs are soldered into place in series, in pairs of two. This means that if one bulb in a pair burns out, the other bulb in series will not function.

E. **Removal and Replacement of Circuit Breaker Panel Lighting**

(1) Remove the circuit breaker panel per instructions in Chapter 25.

(2) Remove the two large bus cables, disconnect the three black connectors, and remove the circuit breaker panel. Be sure to label each cable and connector location before disconnecting it.

(3) To gain access to the bulbs in rows 2-5, remove the required circuit in the row one number lower than the row with the malfunctioning light. For example, if the lights in row three are inoperative, remove the required circuit breakers (for access to the lights) in row two.

(4) Break the burned out light bulb and the companion series bulb out of their epoxied holes, and remove excess epoxy and fragments.

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(5) Solder replacement bulbs.

(6) Place each bulb in its hole and, while holding it in, place with a screwdriver, add a BB-sized drop of epoxy on to the bulb and panel, and hold in place for about 30 seconds.

(7) Reconnect all plugs to the circuit breaker panel and, before reinstallation of the panels, turn on the power to the system to check the bulbs for proper operation.

6. Trim, Flaps, Fuel, And Annunciator LEDs

A. **14V Avidyne Avionics**

(1) The trim, flap, fuel, and annunciator panel LEDs are located in the trim and flap panels, the fuel quantity gauge, and the annunciator panel. These LEDs are not field repairable. Contact a Cessna Aircraft Company representative for referral to a qualified technician to replace the LEDs.

(2) **Electroluminescent Lamps (EL) Lighted Panels** - There are four EL panel overlays in the airplane. These include: the ignition panel, trim panel, flap panel, and ECS panel. The EL portion of each panel is AC powered, and through a so-called cool chemical reaction process, illuminates the letters on the panel. The inverter (AC power source) for the flap panel is located on the back of the flap assembly. The inverter for the ignition, trim, and ECS panel is located on the back of the trim assembly. Therefore, if the trim panel inverter fails, all three panels are affected.

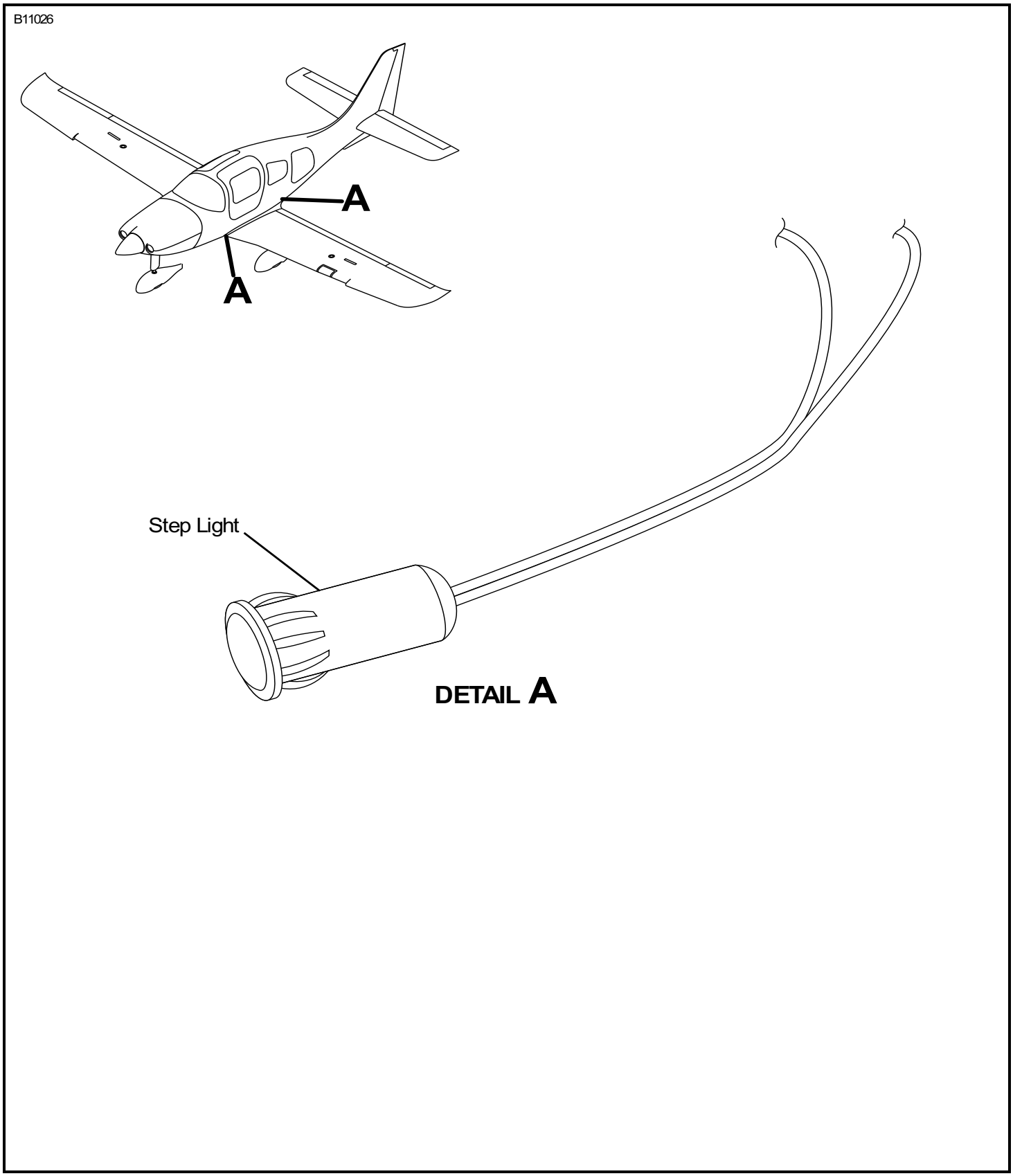
(3) **Panel Replacement** - The panel overlays are durable, and the light source has a very high mean failure cycle and should be serviceable through four airframe service cycles, or about 12,000 hours. Should a panel fail to function, contact a Cessna Aircraft Company representative for referral to a qualified technician that can replace the overlay or the inverter, depending on the problem. In some instances, particularly for airplanes with a high number of hours, it might be more cost effective to replace the entire panel assembly.

B. **28 V Avidyne Avionics and Garmin G1000 system** - All panels are LED surface lit. These LEDs are not field repairable. Contact a Cessna Aircraft Company representative for referral to a qualified technician to replace the LEDs.

C. **Model T240 Interior LED Panels** - For maintenance procedures for the T240 interior LED panels, refer to Interior LED Panels (T240) - Maintenance Practices.

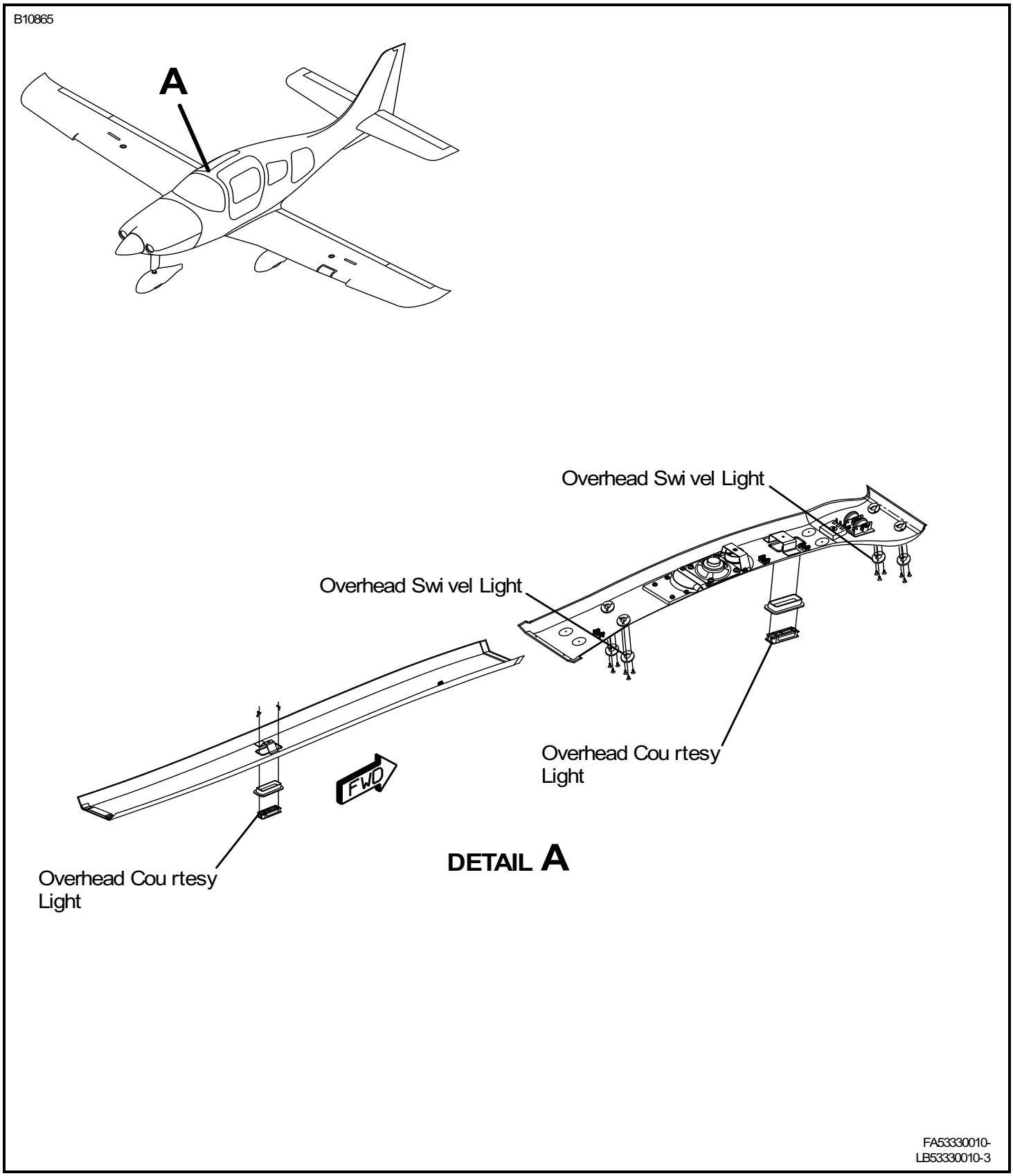
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Figure 201 : Sheet 1 : Step Light Assembly



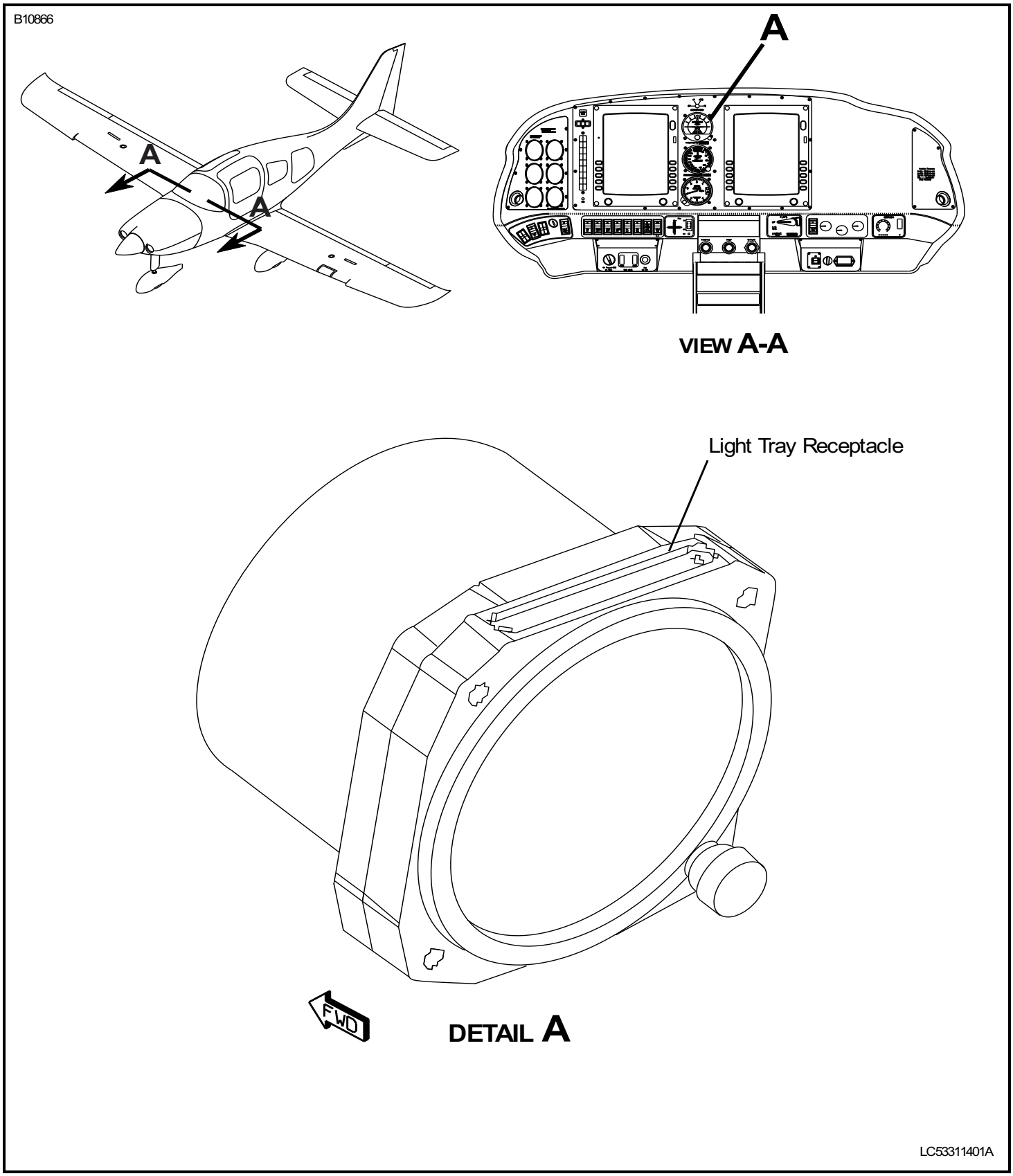
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Figure 202 : Sheet 1 : Overhead Lights



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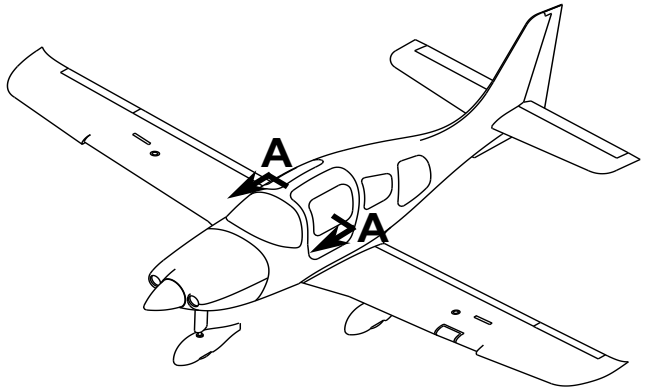
Figure 203 : Sheet 1 : Light Tray-Type of Instrument

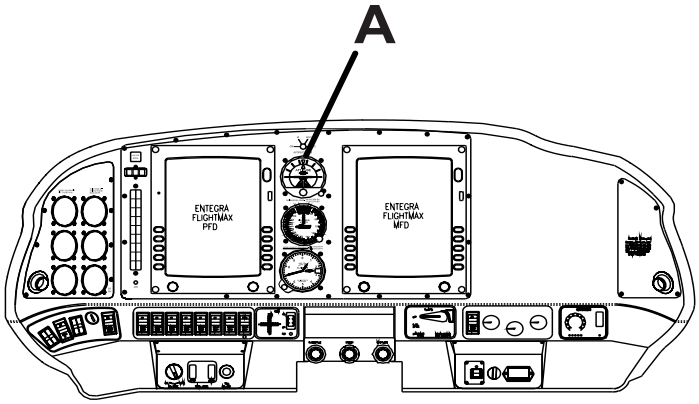


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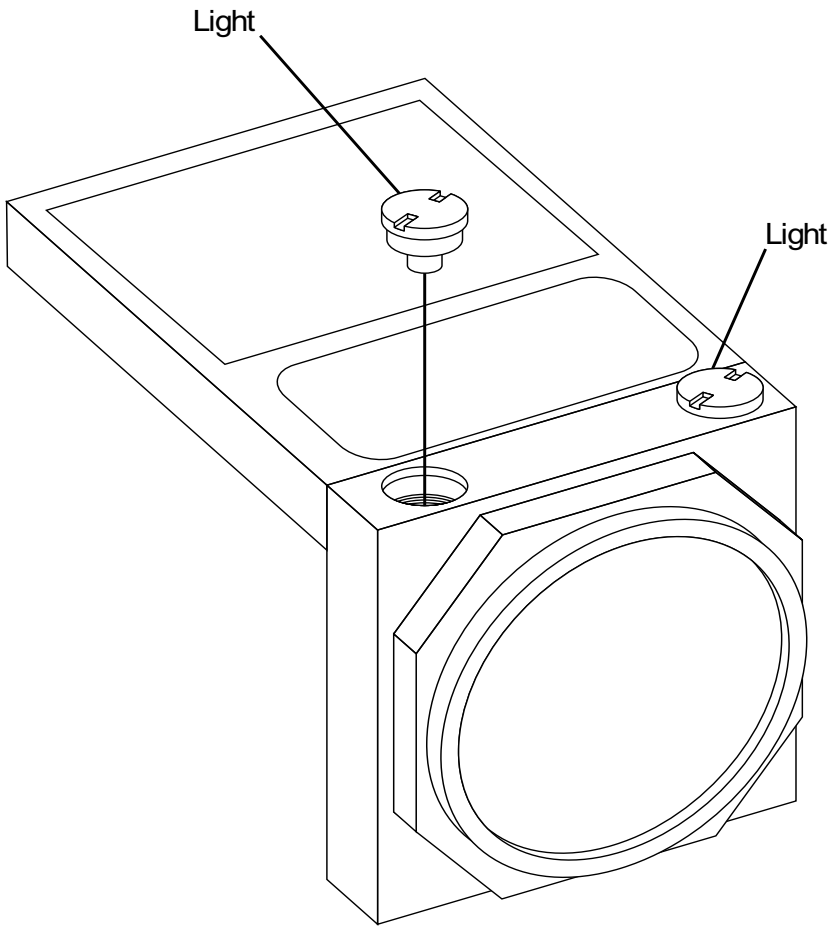
Figure 204 : Sheet 1 : Engine Instrument

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VIEW A-A

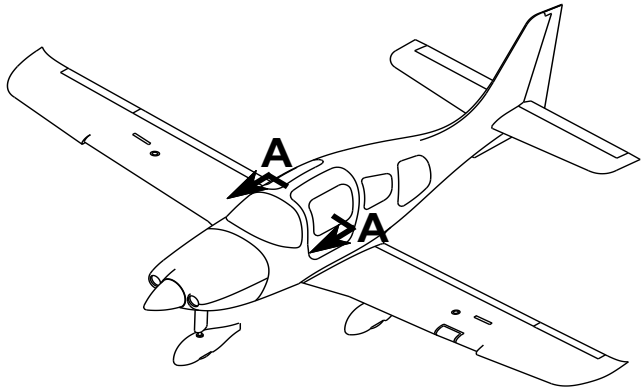


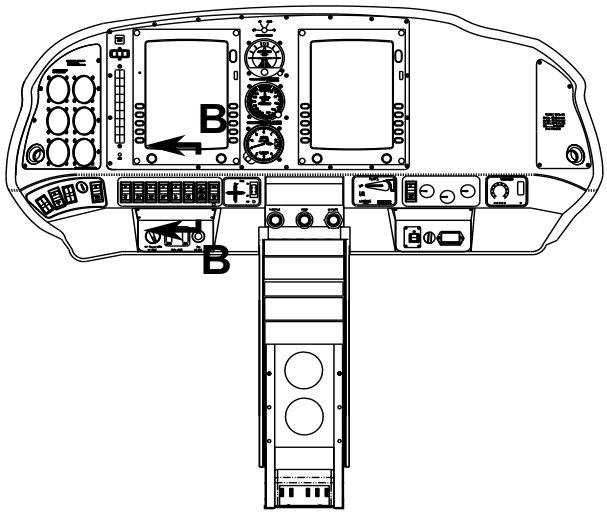
DETAIL A

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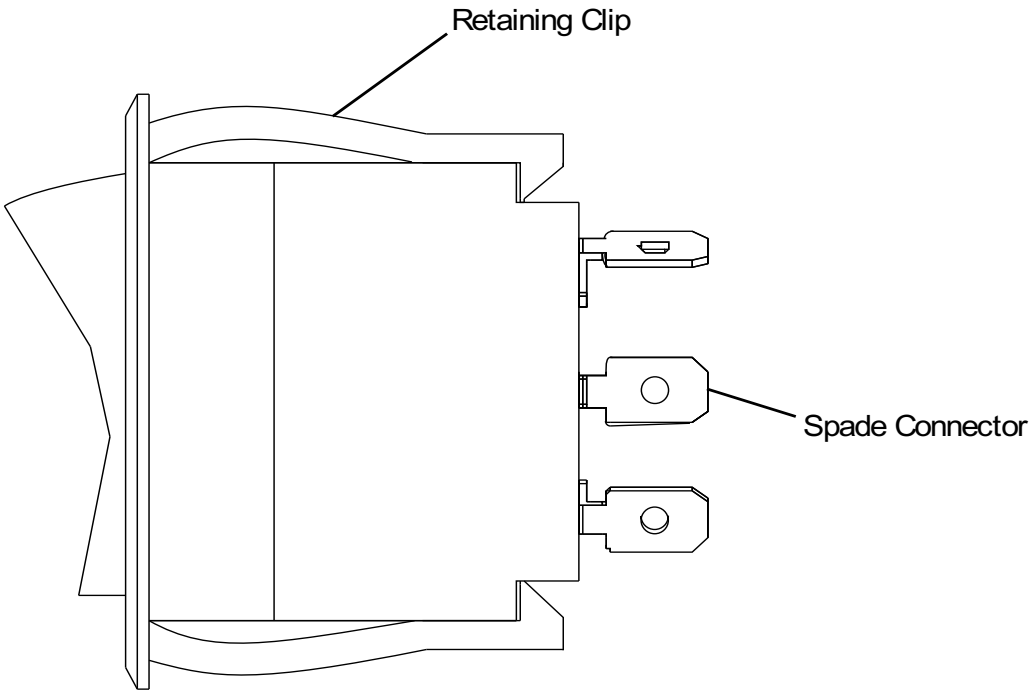
Figure 205 : Sheet 1 : Rocker Switch

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VIEW **A-A**

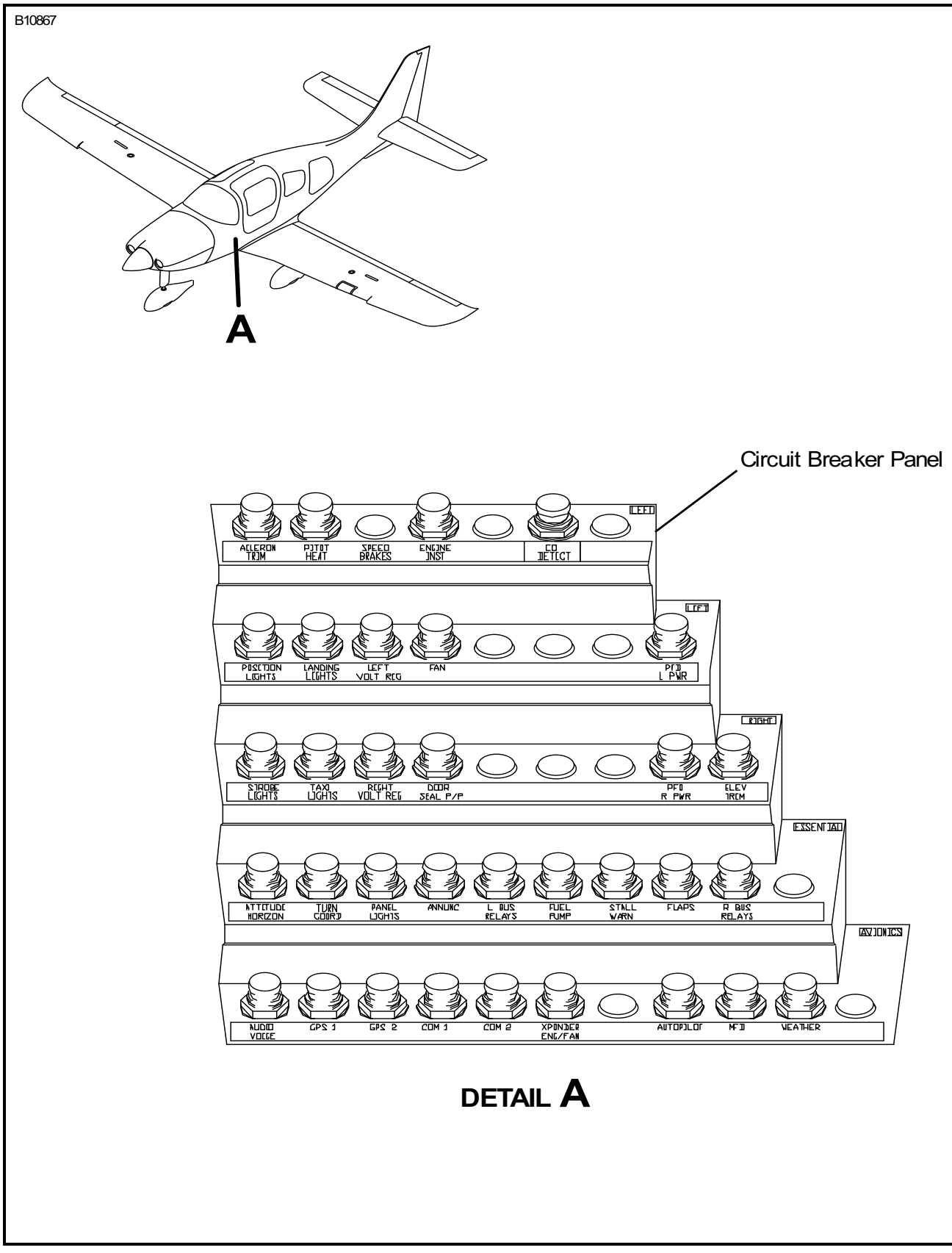


VIEW **B-B** **FWD**

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BBLA53311223C

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Figure 206 : Sheet 1 : Circuit Breaker Panel



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INTERIOR LED PANELS (T240) - TROUBLESHOOTING

1. General

A. This section gives the troubleshooting procedures for the interior LED panels and flight display light operation and intensity control function. For a general description of the interior LED panels refer to Lighting - General. For a general description of the Primary Flight Display (PFD), the Multifunction Display (MFD) and the GTC 570 Touchscreen Controller (GTC 570) refer to Garmin G2000 - Description and Operation.

B. Use the Model T240 Wiring Diagram Manual with the procedures in this section.

2. Tools and Equipment

A. No special tools or equipment are necessary to do the procedures in this section.

3. LED Panel Troubleshooting

A. A LED Panel does not come on when the CB/SW dimmer switch (SW24) or the test switch (SW20) are operated. Do the steps that follow:

(1) Remove the applicable LED panel, refer to Interior LED Panels (T240) - Maintenance Practices.

(a) Visually inspect the connector and pins for signs of damage.

(b) Repair any damage.

(c) Troubleshoot the wiring bundle between the LED panel and other lighting system components.

(2) If the connector or wiring bundle was repaired check the LED panel light operation again.

(3) If LED panel does not operate correctly replace the LED panel. Refer to Interior LED Panels (T240) - Maintenance Practices.

(4) If connector is serviceable and wiring is serviceable replace the LED panel. Refer to Interior LED Panels (T240) - Maintenance Practices.

(a) Check the LED panel light operation.

B. The Switch Dimmer (SW24) does not operate correctly. No LED panels come on or change lighting intensity when the dimmer is operated.

(1) Make sure that the PANEL LIGHTS circuit breaker found on the cockpit circuit breaker panel is engaged.

(2) If the circuit breaker is engaged push the test switch (SW20) found on the overhead console.

(3) If the LED panels come on replace the dimmer. Refer to Center Console Dimmer Switch (T240) - Removal/installation.

(4) If the test switch does not cause the LED panels to come on do a check of the FLT INST dimmer switch operation.

(5) If the FLT INST dimmer does not cause the flight displays to change intensity do a check and if necessary repair the components that follow:

(a) The PANEL LIGHTS circuit breaker.

(b) The related components electrical connectors for bent, broken, or pushed back pins.

(c) The wiring between the PANEL LIGHTS circuit breaker and the lighting module for damage and continuity.

(6) If the FLT INST dimmer causes the flight displays to change intensity do a check of the related components electrical connectors for bent, broken, or pushed back pins.

(a) Repair or replace the wiring and /or electrical connectors as necessary.

(7) If the circuit breaker is not engaged, engage it and check the dimmer switch operation again.

(8) If the dimmer switch still does not operate, push the test switch (SW20) found on the overhead console.

(9) If the LED panel lights come on replace the dimmer switch. Refer to Center Console Dimmer Switch (T240) - Removal/installation.

(10) If the LED panels do not come on do the steps that follow:

(a) Remove the external electrical power from the airplane.

(b) Set the master BATT switches (left SW01 and right SW02) to the OFF position.

(11) Remove the dimmer switch from the center console. Refer to Center Console Dimmer Switch (T240) - Removal/installation.

(12) Do a check and if necessary repair the components that follow:

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(a) The related components electrical connectors for bent, broken, or pushed back pins.

(b) The wiring between the CB/SW dimmer and the lighting module for damage and continuity.

(c) The wiring between the lighting module and the LED Power Junction Module (XC911) for damage and continuity.

4. Flight Display Lighting Intensity Control Troubleshooting

A. One of the flight displays does not change intensity when the dimmer switch is operated.

(1) If one of the displays is not operating correctly swap the PFD or the MFD installation positions in the instrument panel. Refer to Garmin GDU 1400 Displays (G2000) - Removal/Installation.

(2) Operate the FLT INST dimmer switch.

(3) If the same display does not operate correctly in its new location replace it. Refer to Garmin GDU 1400 Displays (G2000) - Removal/Installation.

(4) If the display that previously operated correctly and now does not in its new position do the steps that follow:

(a) Do a check of the related components electrical connectors for bent, broken, or pushed back pins.

(b) Do a check of the wiring between the FLT INST dimmer switch and the applicable display for damage and continuity.

(5) Install the displays in their original positions in the instrument panel. Refer to Garmin GDU 1400 Displays (G2000) - Removal/Installation.

NOTE: If the displays are not returned to their original locations in the instrument panel you must upload Garmin baseline and configuration software.

(6) If only the GTC 570 is still not operating correctly do the steps that follow:

(a) Do a check of the related components electrical connectors for bent, broken, or pushed back pins.

(b) Do a check of the wiring between the FLT INST dimmer switch and the GTC 570 for damage and continuity.

(7) Do a check the GTC 570 intensity control again.

(a) The GTC 570 is not operating correctly replace the GTC 570. Refer to Garmin GTC 570 Touchscreen Controller (G2000) - Removal/Installation.

B. The when the FLT INST dimmer switch (SW23) is operated none of the flight displays lighting intensity change.

(1) Do a check of the CB/SW dimmer switch operation.

(2) If the CB/SW dimmer switch does not operate make sure that the PANEL LIGHTS circuit breaker found on the cockpit circuit breaker panel is engaged.

(3) If the circuit breaker is engaged do a check and if necessary repair the components that follow:

(a) The PANEL LIGHTS circuit breaker.

(b) The wiring between the PANEL LIGHTS circuit breaker and the lighting module for damage, bent or pushed back pins and continuity.

(4) If the wiring and components check good replace the dimmer switch. Refer to Center Console Dimmer Switch (T240) - Removal/installation

(5) If the circuit breaker is not engaged, engage it and check the dimmer switch operation again.

(6) If the dimmer switch does not operate replace the dimmer switch. Refer to Center Console Dimmer Switch (T240) - Removal/installation.

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INTERIOR LED PANELS (T240) - MAINTENANCE PRACTICES

1. General

A. This section gives the maintenance practices for the Interior LED Panels. For a general description of the Interior Lighting LED Panels refer to Lighting - General.

B. The Model T240 interior LED panels include, Switch Panel LED Panel, Audio Jacks LED Panel, Ignition Switch LED Panel, Display Reversion Switch LED Panel, the Engine Control LED Panel, and the Circuit Breaker Panel LED Panels. The removal and installation procedures that follow are typical for all the LED panel removal and installations.

2. LED Panels Removal/Installation

A. Display Reversion LED Panel Removal/Installation.

(1) Remove the Display Reversion LED Panel (UI905). Refer to Figure 201.

(a) Make sure that the master BATT switches (left SW01 and right SW02) are in the OFF position.

(b) Make sure that the AVIONICS MASTER switch (SW04) is in the OFF position.

(c) Remove the GDU 1400 PFD. Refer to Garmin GDU 1400 Displays (G2000) - Removal/Installation.

(d) Use a 3/32 inch hex tool to loosen and remove the screws that attach the panel to the instrument panel.

(e) Disconnect the electrical connector (JI905) from the Display Reversion LED Panel.

(f) Disconnect the electrical connector (JI406) from the DISPLAY REVERSION switch (SI006).

(g) Remove the Display Reversion LED Panel from the instrument panel.

(h) If it is necessary to replace the LED panel do the steps that follow:

1 Remove the screws that attach the reversion switch mounting plate to the LED panel.

2 Remove the switch assembly from the led panel.

(2) Install the Display Reversion LED Panel (UI905). Refer to Figure 201.

(a) If the switch was removed do the steps that follow:

1 Put the switch assembly in its correct position on the LED panel.

2 Install the screws that attach the switch assembly to the LED panel.

(b) Put the LED panel near its correct position on the instrument panel.

(c) Connect the electrical connector (JI905) to the Display Reversion LED Panel.

(d) Connect the electrical connector (JI406) to the DISPLAY REVERSION switch.

(e) Put the LED panel in its correct position on the instrument panel.

(f) Install the screws that attach the LED panel to the instrument panel.

1 Use a 3/32 inch hex tool to tighten the screws. Refer to Chapter 20, Torque Data - Maintenance Practices.

(3) Do a check of the Display Reversion LED Panel. Refer to Interior LED Panels and Flight Display Lighting (T240) - Adjustment/Test.

B. Engine Controls LED Panel Removal/Installation.

(1) Remove the Engine Controls LED Panel (UI904). Refer to Figure 201.

(a) Make sure that the master BATT switches (left SW01 and right SW02) are in the OFF position.

(b) Make sure that the AVIONICS MASTER switch (SW04) is in the OFF position.

(c) Remove the instrument panel vents ducts from each of the two the vent duct plenums. Refer to Chapter 21, Eyeball Vents - Removal/Installation, Figure 401.

(d) Loosen the screw on then FLAPS switch knob.

1 Remove the knob from the FLAPS switch.

(e) Loosen the captive hex screw that attaches the filler panel to the instrument panel and Engine Controls LED Panel bracket assembly.

(f) Loosen the captive hex screws that attach the Engine Controls LED Panel to the instrument panel and Engine Controls LED Panel bracket assembly.

(g) Carefully move the Engine Controls LED Panel aft to get access to engine panel components.

(h) Disconnect the electrical connector (PC300) from the GO AROUND switch (SI003).

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(i) Disconnect the electrical connector (JI66) from the SPD BRK switch (SI004).

(j) Disconnect the electrical connector (PI005) from the FLAP SW (SI005).

(k) Disconnect the electrical connector (PI904) from the Engine Control LED panel (UI904).

(l) Loosen the nut at the rear of the ALT STATIC operator knob.

(m) Remove the nut and keyed-washer from the ALT STATIC operator knob and remove the control knob from the Engine Controls LED Panel.

(n) Remove the Engine Controls LED Panel from the airplane.

(o) If it is necessary to replace the LED panel do the steps that follow:

1 Remove the screws that attach the SPD BRK and GO AROUND switch mounting plate assembly to the LED panel.

2 Remove the switch assembly from the led panel.

(2) Install the engine control LED panel (UI904). Refer to Figure 201.

(a) If the SPD BRK and GO AROUND switch mounting plate assembly was removed do the steps that follow:

1 Put the switch assembly in its correct position on the LED panel.

2 Install the screws that attach the switch assembly to the LED panel.

(b) Put the engine controls panel near its position on the lower instrument panel.

(c) Connect the electrical connector (PC300) to the GO AROUND switch (SI003).

(d) Connect the electrical connector (PI66) to the SPD BRK switch (SI004).

(e) Connect the electrical connector (PI005) to the FLAP SW (SI005).

(f) Connect the electrical connector (PI904) to the Engine Controls LED Panel.

(g) Put the ALT STATIC operator knob in its correct position in the Engine Controls LED Panel LED panel and install the key-washer and nut.

NOTE: Do not tighten the nut at this time.

(h) Insert the rear of the ALT STATIC operator knob in the static tube valve receptacle and tighten the nut at the rear of the knob.

(i) Tighten the captive hex screws that attach the engine controls panel assembly to the instrument panel and Engine Controls LED Panel bracket assembly.

(j) Put the FLAPS switch knob in its correct position on the Flaps switch.

1 Tighten the screw on then FLAPS switch knob.

(k) Tighten the captive hex screws that attaches the filler panel to the instrument panel and Engine Controls LED Panel bracket assembly. Refer to Chapter 20, Torque Data - Maintenance Practices.

(3) Do a check of the Engine Controls LED Panel. Refer to Interior LED Panels and Flight Display Lighting (T240) - Adjustment/Test.

C. Ignition Switch LED Panel Removal/Installation.

CAUTION: With the ignition switch is removed or disconnected the magnetos are "hot" (operational). With impulse couplings on each of the magnetos, personal injury can result from turning the propeller with the spark plug wires loose. Additionally, the engine can "catch" (start) if the spark plugs are installed.

(1) Remove the Ignition Switch LED Panel (UI908). Refer to Figure 201.

(a) Make sure that the master BATT switches (left SW01 and right SW02) are in the OFF position.

(b) Make sure that the AVIONICS MASTER switch (SW04) is in the OFF position.

(c) Remove the collar from the front side of the Ignition switch (SI002).

(d) Carefully move the LED panel aft sufficiently to get access to the rear of the panel.

(e) On the PRIMER switch (SI010), disconnect the electrical connector (JI010) from electrical connector (PI010).

(f) On the Ignition Switch LED Panel, disconnect the electrical connector (PI908) from electrical connector (JI908).

(g) Remove the Ignition Switch LED Panel from the airplane.

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(h) If it is necessary to replace the LED panel do the steps that follow:

1 Remove the screws from the rear of the PRIMER switch mounting plate that attach it to the Ignition Switch LED Panel.

2 Remove the PRIMER switch assembly from the rear of the panel.

(i) If it is necessary to remove the ignition switch (SI002) from the instrument panel structure do the steps that follow:

1 Remove the nut from the front of the ignition switch that attaches it to the instrument panel.

2 Remove the ignition switch from the rear of the instrument panel.

3 Carefully bag and stow the ignition switch.

(2) Install the Ignition Switch LED Panel (UI908). Refer to Figure 201.

(a) If the PRIMER switch mounting plate assembly was removed do the steps that follow:

1 Put the switch assembly in its correct position on the LED panel.

2 Install the screws that attach the switch assembly to the LED panel.

(b) If it is necessary to install the ignition switch in the instrument panel structure do the step that follows:

1 Put the ignition switch in its correct position trough the instrument panel from the forward side of the panel.

2 Install the nut on the front of the ignition switch that attaches it to the instrument panel and tighten.

(c) Put the LED panel near its correct position on the instrument panel.

(d) On the PRIMER switch, connect the electrical connector (PI010) to electrical connector (JI010).

(e) On the ignition switch LED Panel, connect the electrical connector (JI908) to electrical connector (PI908).

(f) Put the LED panel in its correct position on the instrument panel.

(g) Install the collar on the front side of the Ignition switch.

(3) Do a check of the Ignition Switch LED Panel. Refer to Interior LED Panels and Flight Display Lighting (T240) - Adjustment/Test.

D. Audio Jack LED Panel Removal/Installation.

(1) Remove the Audio Jack LED Panel (UI910). Refer to Figure 202.

(a) Make sure that the master BATT switches (left SW01 and right SW02) are in the OFF position.

(b) Make sure that the AVIONICS MASTER switch (SW04) is in the OFF position.

(c) Loosen the screws that attach the audio jack panel to the lower center console.

1 Carefully move the audio jack panel up sufficiently to get access to the rear of the panel.

(d) If you cannot move the panel sufficiently to get access to the rear of the panel, remove the panel. Refer to Chapter 25, Center Console Audio Jack Panel (G2000) - Removal/Installation.

(e) Disconnect the LED panel electrical connector (PI910) from electrical connector (JI910).

(f) Remove the screws that attach the LED panel the audio jack panel backplate.

(g) Remove the LED Panel from the airplane.

(2) Install the Audio Jack LED Panel (UI910). Refer to Figure 202.

(a) Put the LED panel near its correct position on the audio jack panel.

(b) Connect the LED panel electrical connector (PI910) to the electrical connector (JI910).

(c) Put the LED panel in its correct position on the backplate. Install the screws that attach the LED panel to the backplate.

(d) If the audio jack panel was removed from the lower center console, do the panel installation. Refer to Chapter 25, Center Console Audio Jack Panel (G2000) - Removal/Installation.

(e) Put the audio jack panel in its correct position on the center lower console.

(f) Tighten the screws that attach the panel to the center lower console.

(3) Do a check of the Audio Jack LED Panel. Refer to Interior LED Panels and Flight Display Lighting (T240) - Adjustment/Test.

E. Switch Panel LED Panel Removal/Installation.

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(1) Remove the Switch Panel LED Panel (UI909). Refer to Figure 203.

NOTE: The LED panel can have different configurations if optional equipment is installed on the airplane.

(a) Make sure that the master BATT switches (left SW01 and right SW02) are in the OFF position.

(b) Make sure that the AVIONICS MASTER switch (SW04) is in the OFF position.

(c) Loosen the screws that attach the switch panel to the center console.

1 Carefully move the switch up sufficiently to get access to the rear of the panel.

(d) If you cannot move the panel sufficiently to get access to the rear of the panel, remove the panel. Refer to Chapter 25, Center Console Switch Panel (T240) - Removal/Installation.

(e) Disconnect the LED panel electrical connector (PI909) from electrical connector (JI909).

(f) Remove the screws at the rear of the panel assembly that attach the LED panel the audio jack panel backplate.

(g) Remove the LED Panel from the backplate.

(2) Install the Switch Panel LED Panel (UI909). Refer to Figure 203.

(a) Put the LED panel near its correct position on the center console.

(b) Connect the LED panel electrical connector (PI909) to the electrical connector (JI909).

(c) Put the LED panel in its correct position on the backplate. Install the screws that attach the LED panel to the backplate.

(d) If necessary, install the switch panel. Refer to Chapter 25, Center Console Switch Panel (T240) - Removal/Installation.

(e) Put the switch panel in its correct position on the center console.

(f) Tighten the screws that attach the panel to the center console.

(3) Do a check of the Center Console Switch Panel. Refer to Interior LED Panels and Flight Display Lighting (T240) - Adjustment/Test.

F. Circuit Breaker Panel LED Panels Removal/Installation.

(1) Remove the Circuit Breaker Panel LED Panels. Refer to Figure 204.

NOTE: The LED panels can have different configurations if optional equipment is installed on the airplane.

NOTE: The removal procedures for each of the LED panels are typical.

(a) Make sure that the master BATT switches (left SW01 and right SW02) are in the OFF position.

(b) Make sure that the AVIONICS MASTER switch (SW04) is in the OFF position.

(c) Remove the left forward lower side panel (FLSPL). Refer to Forward Lower Side Panels, Left (FLSPL) and Right (FLSPR).

(d) Remove the screws that attach the circuit breaker panel to the bracket.

(e) Carefully move the switch panel out from the bracket sufficiently to get access to the LED panel's electrical connectors and attachment screws.

(f) If you cannot move the panel sufficiently to get access to the rear of the circuit breaker panel, remove the panel. Refer to Chapter 25, Circuit Breaker Panel (T240) - Maintenance Practices.

(g) Disconnect the applicable electrical connectors. Refer to Table 201.

Table 201. LED Panel Electrical Connectors

LED Panel	LED Panel Electrical Connector	Airplane Wiring Electrical Connector
X-Feed LED Panel (UC017)	(PC017)	(JC017)
Left 1 LED Panel (UC018)	(PC018)	(JC018)
Left 2 LED Panel (UC019)	(PC019)	(JC019)
Right LED Panel (UC020)	(PC020)	(JC020)
Avionics LED Panel (UC021)	(PC021)	(JC021)

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(h) Remove the screws that attach the applicable LED panel to the circuit breaker panel.

(i) Remove the LED panel from the airplane.

(2) Install the Circuit Breaker Panel LED Panels. Refer to Figure 204.

NOTE: The installation procedures for each of the LED panels are typical.

(a) Put the LED panel in its correct position on the circuit breaker panel.

(b) Install the screws that attach the LED panel to the circuit breaker panel.

(c) Connect the applicable electrical connectors. Refer to Table 201.

(d) If necessary, install the circuit breaker panel. Refer to Chapter 25, Circuit Breaker Panel (T240) - Maintenance Practices.

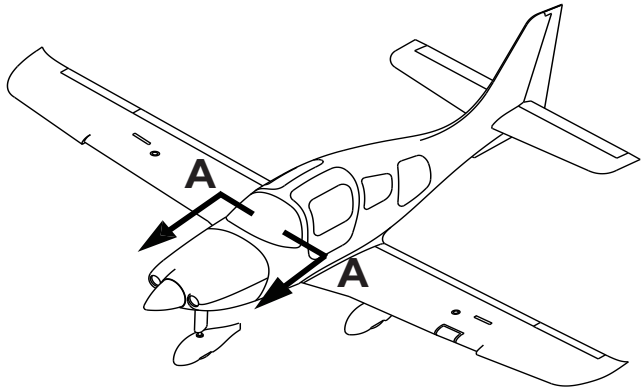
(e) Install the left forward lower side panel (FLSPL). Refer to Forward Lower Side Panels, Left (FLSPL) and Right (FLSPR).

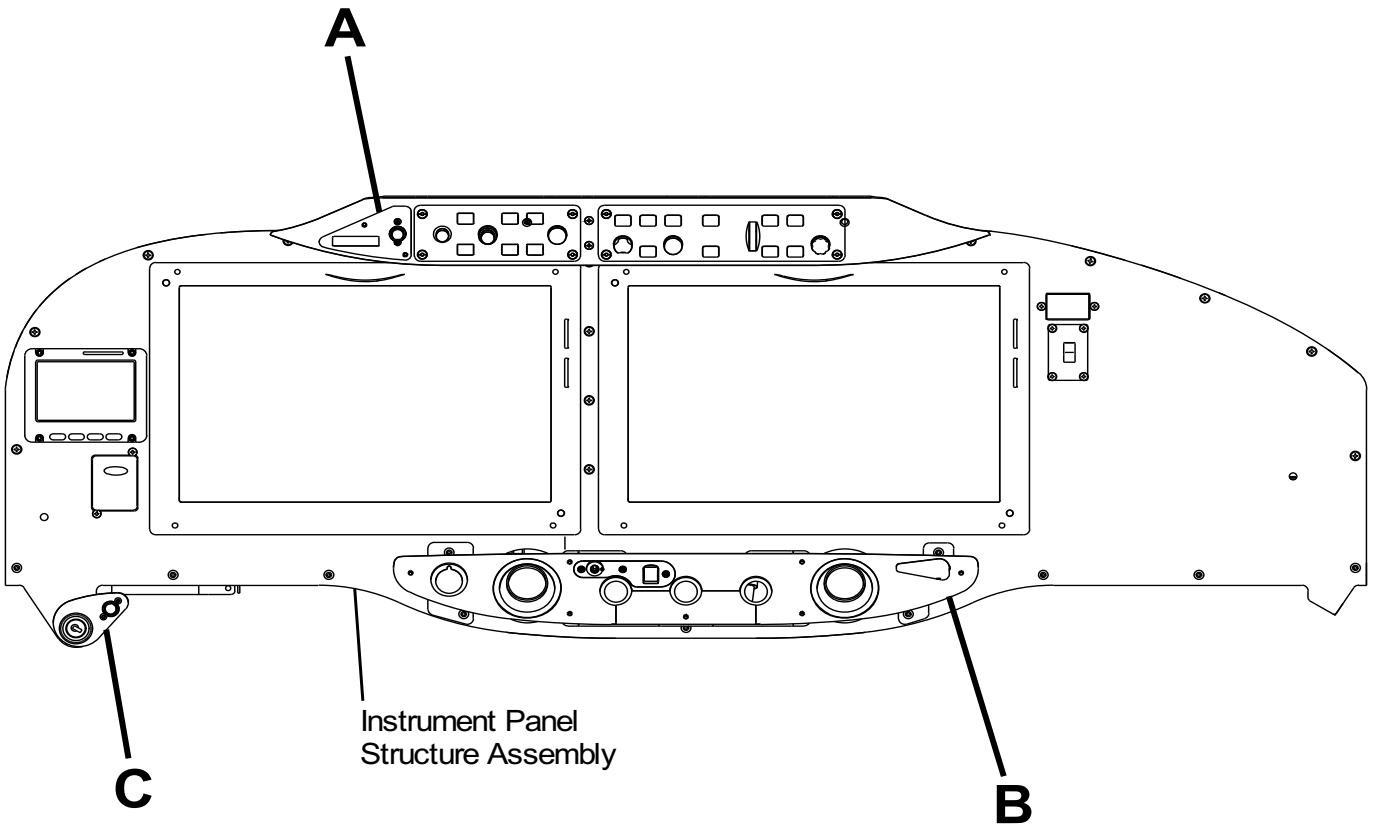
(3) Do a check of the circuit breaker panel LED panel. Refer to Interior LED Panels and Flight Display Lighting (T240) - Adjustment/Test.

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Figure 201 : Sheet 1 : Instrument Panel Components Installation

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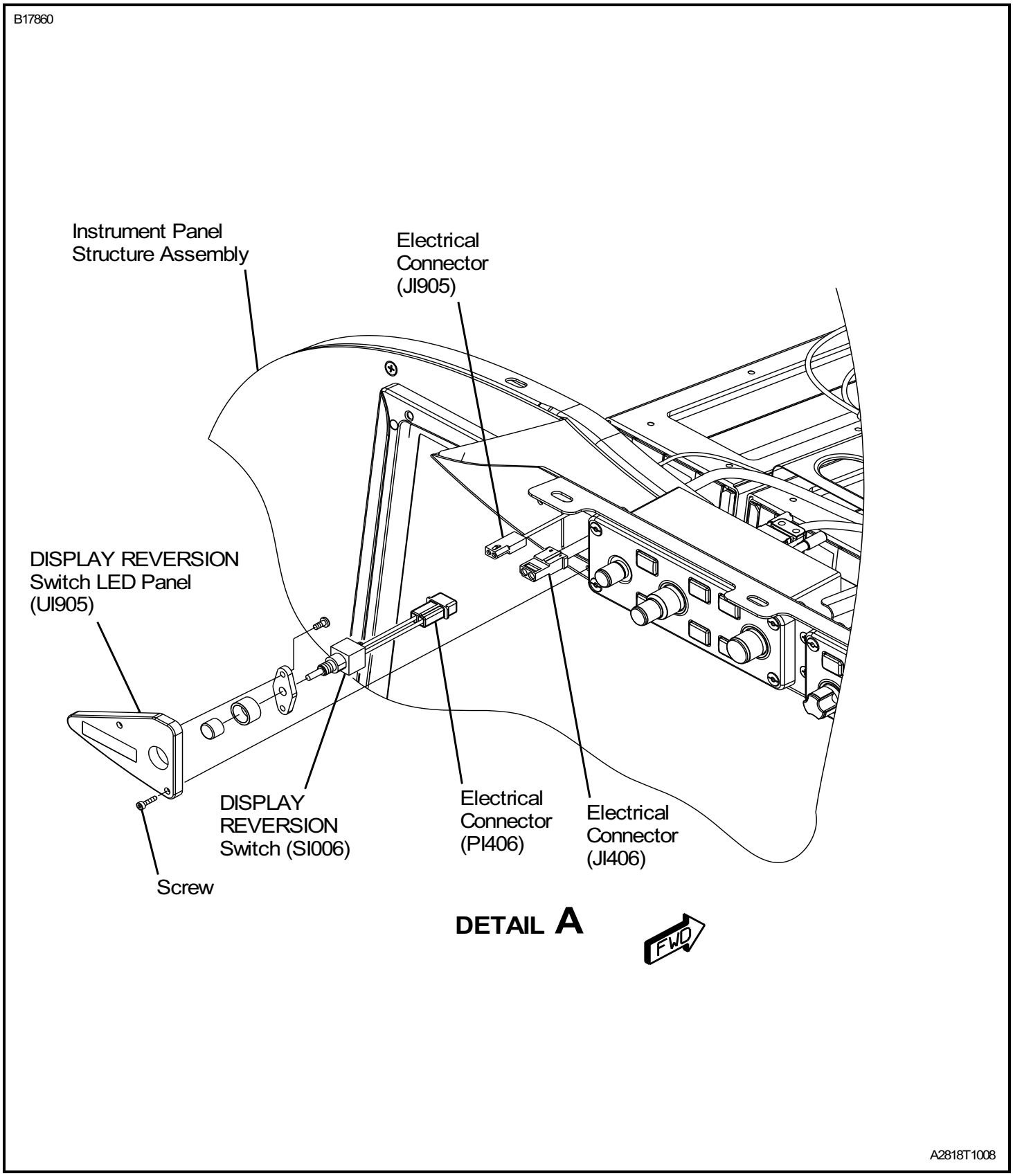
VIEW A-A

NOTE: Bolster upholstery not shown for clarity.

2810T1001
AA2818T1002

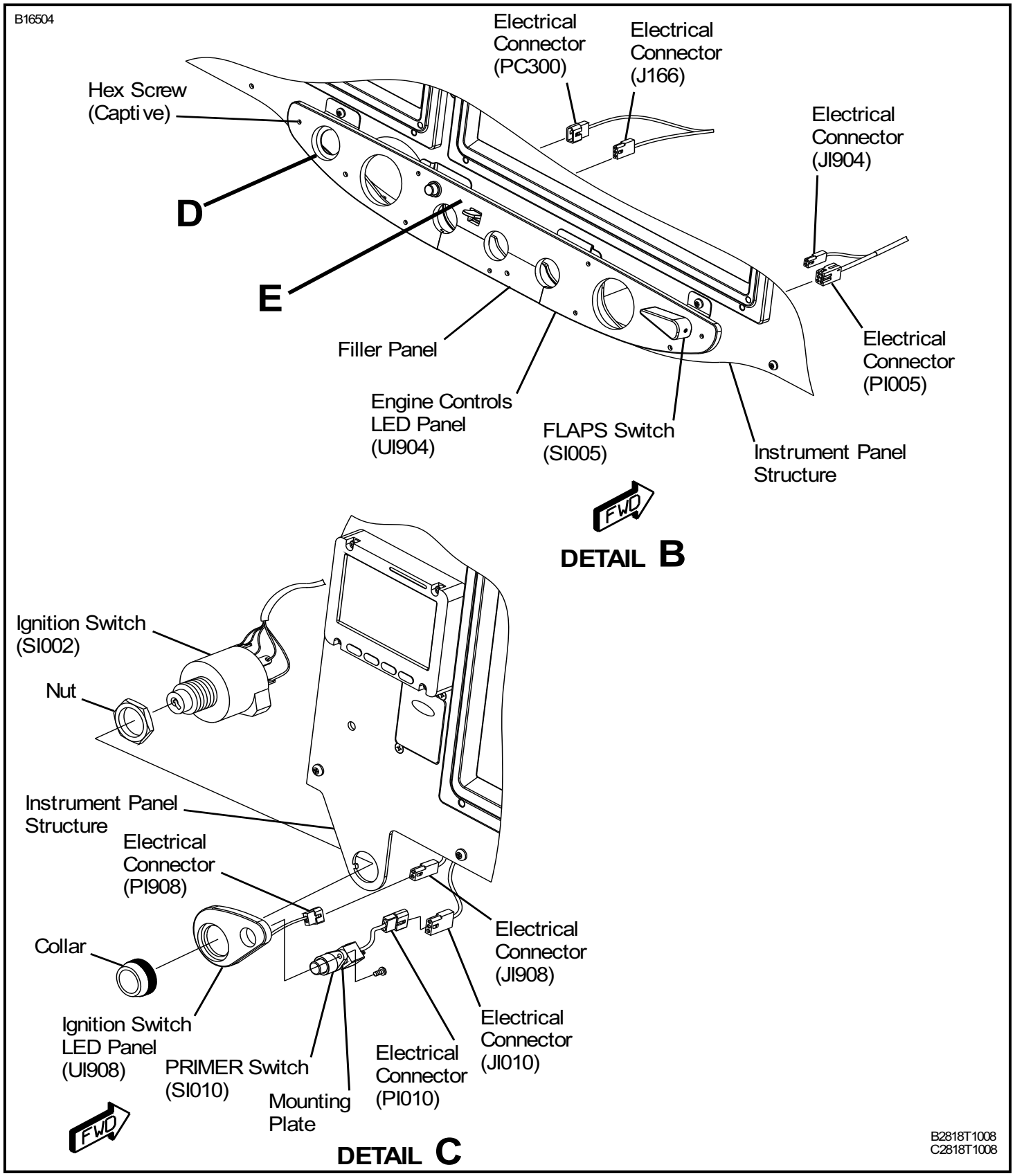
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Figure 201 : Sheet 2 : Instrument Panel Components Installation



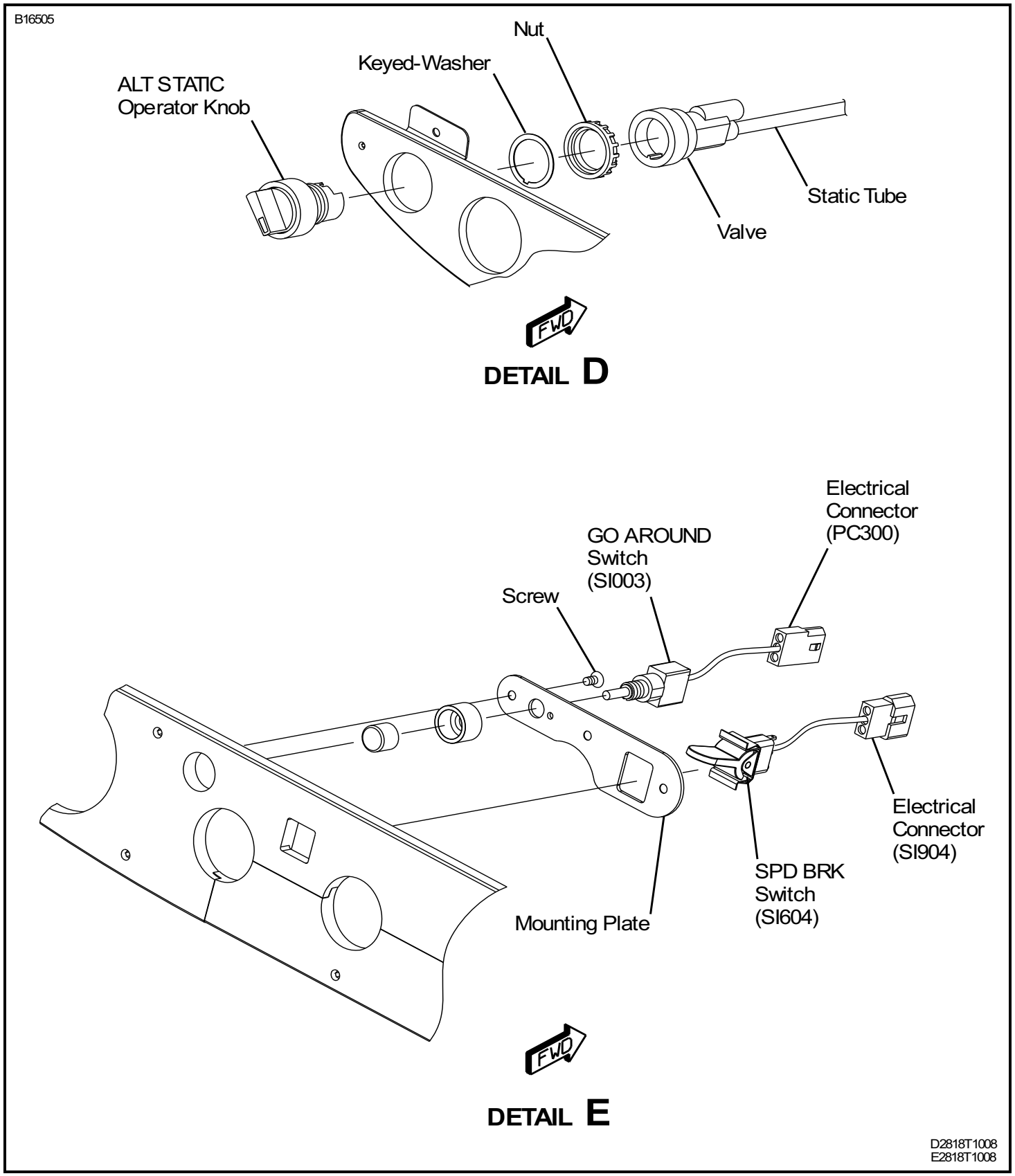
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Figure 201 : Sheet 3 : Instrument Panel Components Installation



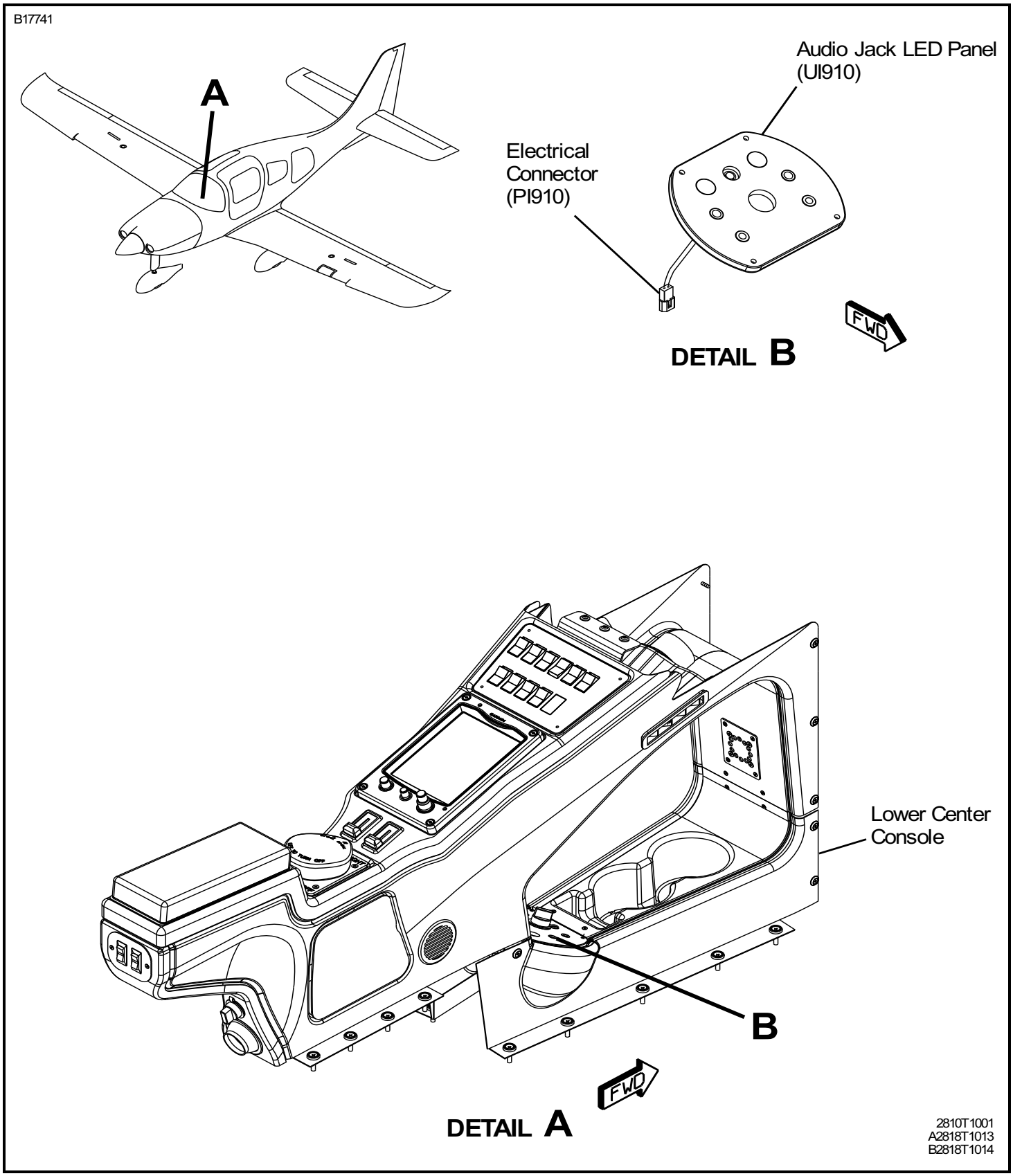
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Figure 201 : Sheet 4 : Instrument Panel Components Installation



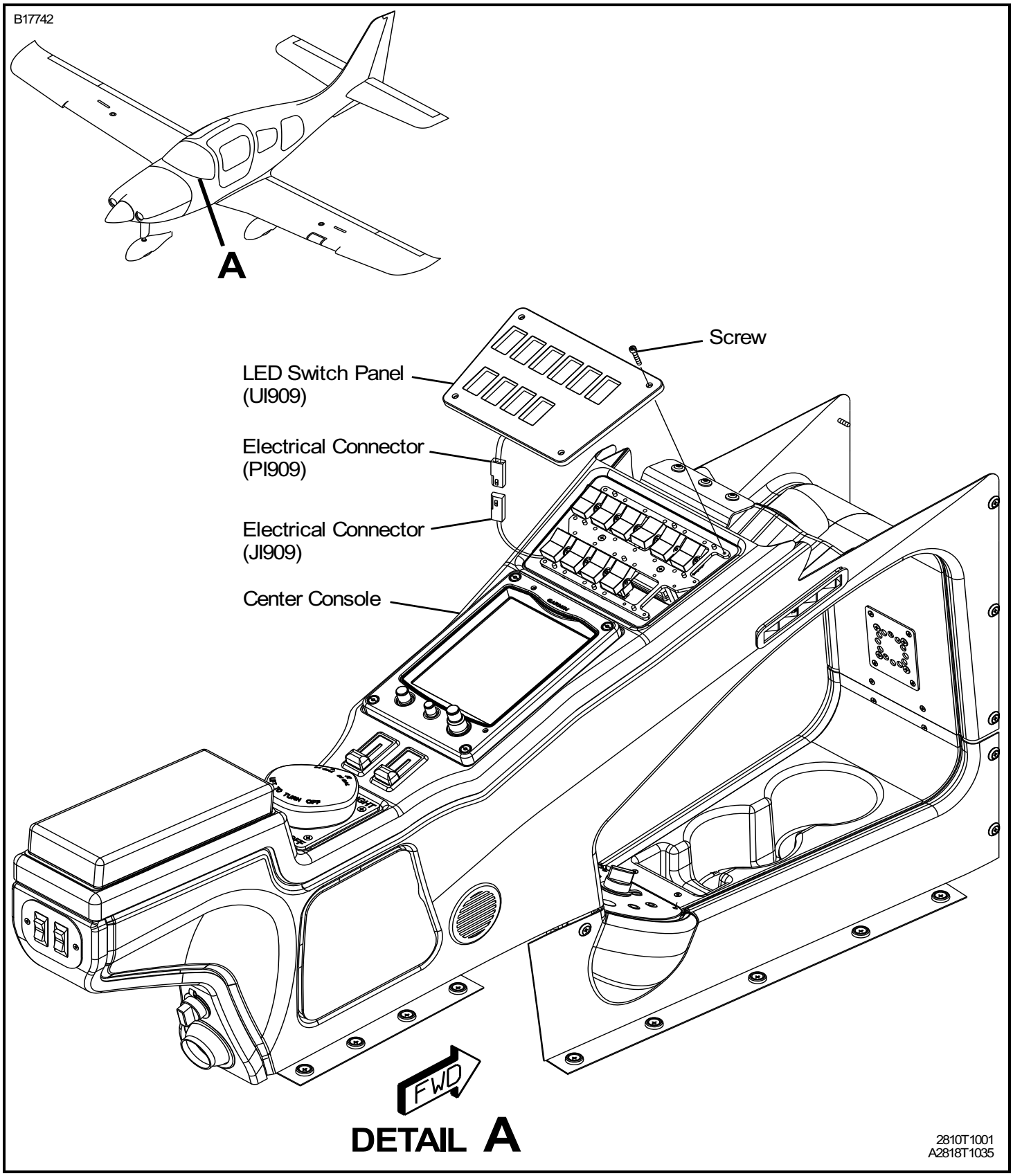
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Figure 202 : Sheet 1 : Audio Jack LED Panel Installation



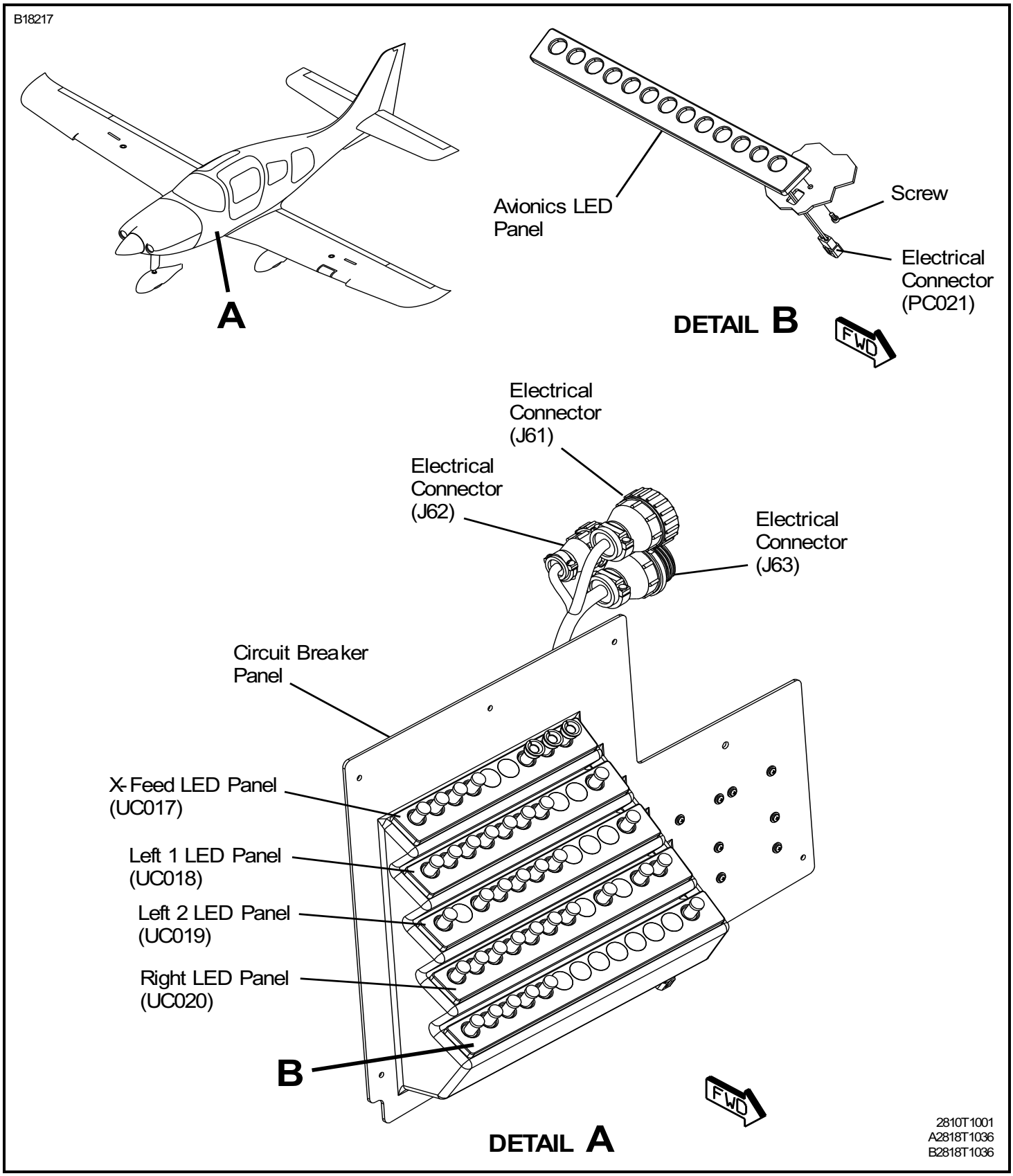
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Figure 203 : Sheet 1 : Switch Panel LED Panel Installation



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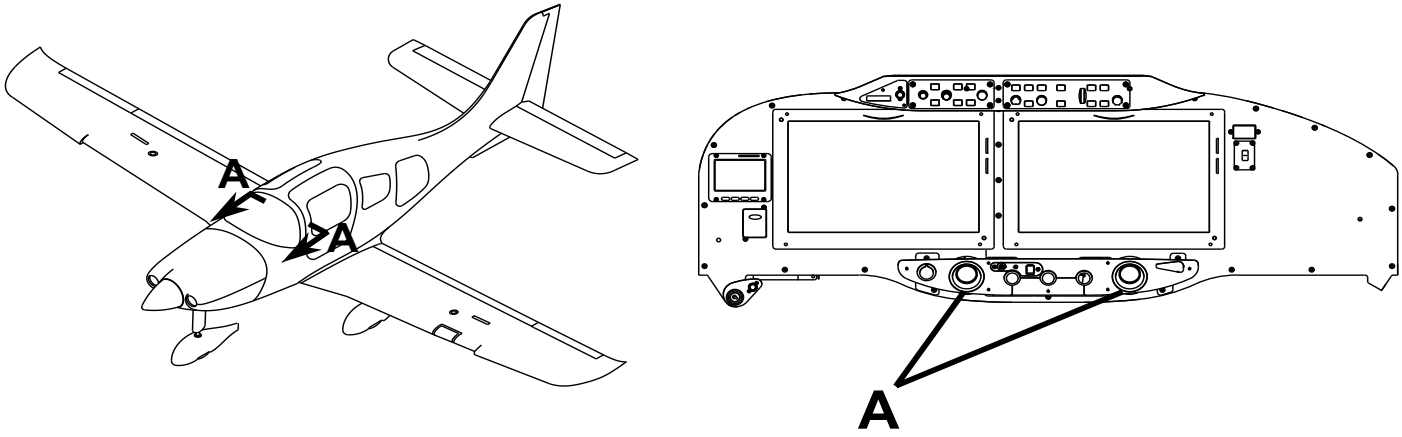
Figure 204 : Sheet 1 : Circuit Breaker Panel LED Panel Installation



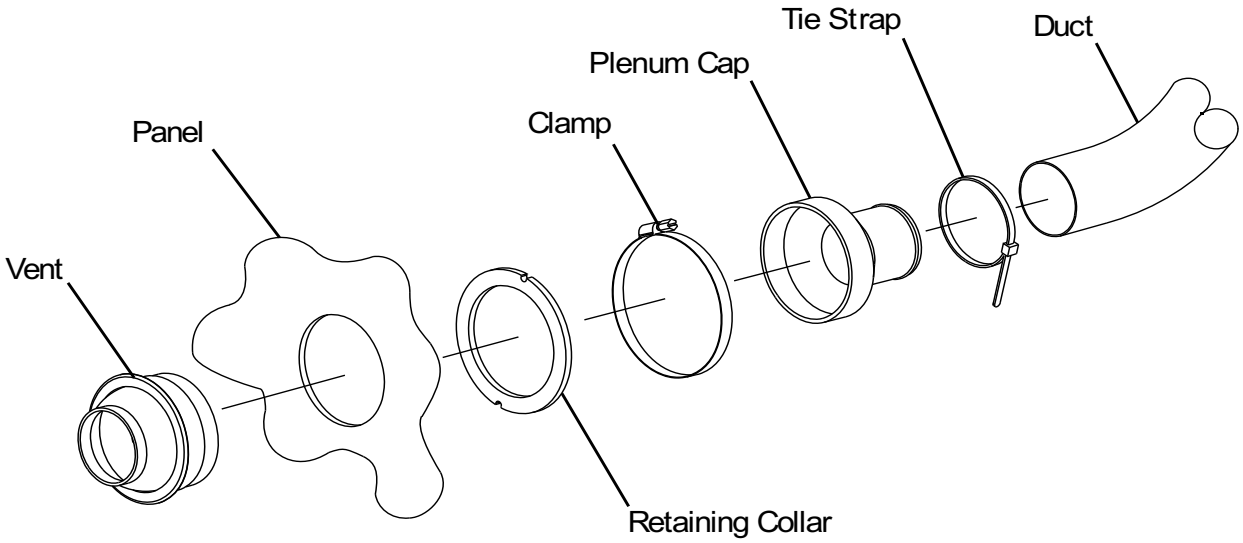
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Figure 401 : Sheet 1 : Instrument Panel Vents Installation

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VIEW A-A



DETAIL A

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AA2818T1001

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INTERIOR LED PANELS (T240) - ADJUSTMENT/TEST

1. General

A. This section gives the procedures to check the interior LED panels and the flight displays back ground lighting. For more data on the interior LED panels and the flight display lighting refer to Lighting - General.

2. LED Panel Operational Test

A. Do the LED Panel Operational Check.

(1) Supply external electrical power from the airplane.

(2) Set the master BATT switches (left SW01 and right SW02) to the ON position.

(3) Set the CROSS TIE switch (SW03) to the ON position.

(4) Push the TEST button (SW20) found on the overhead console.

(5) While the TEST button is pushed, check that the LED panel and other lights that follow are on:

- AVN Master Switch
- Cross Tie Switch
- Compass
- Fuel Selector
- Audio Jacks Led Panel
- Pedestal Switch LED Panel
- Ignition Switch LED Panel
- Reversionary Switch LED Panel
- Engine Control LED Panel
- Master Switch Backlit Panel (in the overhead)
- The Circuit Breaker LED Panels (Airplanes -2040 and On).

(6) Set the master BATT switches (left SW01 and right SW02) to the OFF position.

(7) Set the CROSS TIE switch (SW03) to the OFF position.

(8) Remove external electrical power from the airplane.

3. LED Panel Functional Test

A. Do the LED Panel Functional Check.

(1) Supply external electrical power from the airplane.

(2) Set the master BATT switches (left SW01 and right SW02) to the ON position.

(3) Set the CROSS TIE switch (SW03) to the ON position.

(4) Slide the CB/SW dimmer switch (SW24) to the bright position and make sure that the LED panels and other lights that follow come on:

- AVN Master Switch
- Cross Tie Switch
- Compass
- Fuel Selector
- Audio Jacks Led Panel
- Pedestal Switch LED Panel
- Ignition Switch LED Panel
- Reversionary Switch LED Panel
- Engine Control LED Panel
- Master Switch Backlit Panel (in the overhead)
- The Circuit Breaker LED Panels (Airplanes -2040 and On).

(5) Slide the CB/SW dimmer switch to the full ON position.

(a) Make sure that each of the lights comes on bright.

(6) Slide the CB/SW dimmer switch toward the OFF position.

(a) Make sure that the light level decreases on each of the lights.

(7) Slide the MAP LIGHT DIMMER switch (SW17) to the full ON position.

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(a) Make sure that each of the map lights come on bright.

(8) Slide the MAP LIGHT DIMMER switch to the OFF position.

(a) Make sure that each of the map lights go off.

(9) Slide the FLOOD DIMMER switch (SW18) to the full ON position.

(a) Make sure that the glareshield flood light comes on bright.

(10) Slide the FLOOD DIMMER switch to the OFF position.

(a) Make sure that the glareshield flood light goes off.

(11) Set the master BATT switches (left SW01 and right SW02) to the OFF position.

(12) Set the CROSS TIE switch (SW03) to the OFF position.

(13) Remove external electrical power from the airplane.

4. Flight Displays Lighting Functional Test

A. Do the Flight Displays Lighting Functional Check.

NOTE: Each flight display's photo cell determines the parameters of the range the display's back ground lighting will change, depending on the ambient light in the area of the displays.

(1) Supply external electrical power to the airplane.

(2) Set the master BATT switches (left SW01 and right SW02) to the ON position.

(3) Set the AVIONICS MASTER switch to the ON position.

(4) Set the CROSS TIE switch (SW03) to the ON position.

(5) Slide the FLT INST dimmer switch (SW23) to the bright position and make sure that the background lighting comes on the flight displays that follow:

- Primary Flight Display (PFD)
- Multifunction Display (MFD)
- GTC 570 Touchscreen Controller (GTC 570).

(6) Slide the FLT INST dimmer switch to the full ON position.

(a) Make sure that each of the flight display lights comes on bright.

(7) Slide the FLT INST dimmer switch toward the OFF position.

(a) Make sure that the light level decreases on each of the flight display lights.

(8) Set the master BATT switches to the OFF position.

(9) Set the AVIONICS MASTER switch to the OFF position.

(10) Set the CROSS TIE switch to the OFF position.

(11) Remove external electrical power from the airplane.

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EXTERIOR LIGHTING - MAINTENANCE PRACTICES

1. Position Lights

A. There are a total of four position lights found on the airplane. The position light housings also contain the strobe lights.

(1) For airplanes with incandescent light bulbs. - Each wing tip contains a housing that holds a colored lens forward and a clear lens aft. All four bulbs are clear. The forward lens on the left side is red and the forward lens on the right side is green. Refer to Figure 201.

(2) For airplanes with LEDs. - Each wing tip contains a housing that holds clear lens forward and aft. The left position light assembly uses red LEDs and the right position light assembly uses green LEDs. Refer to Figure 201.

NOTE: Airplane 01159 and Airplanes 02001 and On have LED position lights installed as standard equipment.

CAUTION: If lights have been in use, use protective gloves when removing hot bulbs.

B. Removal of Position Light Lamp

NOTE: The removal procedures for incandescent and LED lights is similar.

(1) Remove the screws securing the lens shield to the wing tip.

(2) Remove the lens from the position light assembly.

(3) Grasp the lamp, depress slightly, and turn counterclockwise to release and remove the lamp from the bayonet mount.

C. Installation of Position Light Lamp

NOTE: The installation procedures for incandescent and LED lights is similar.

(1) Place the lamp in the bayonet socket, depress, and gently turn clockwise until the lamp seats in the socket.

(2) Position the lens and gasket in place.

(3) Secure the lens by installing the lens shield to the wing tip with screws.

(a) For LED installations torque the screws from 12 to 15 inch pounds.

D. Maintenance of Position Light - General maintenance is limited to lamp replacement and cleaning of ozone buildup inside the position light lenses. The lenses may be cleaned with dish soap and water using a soft cotton cloth.

2. Strobe Lights

A. The strobe lights are contained in the left and right wing tip in the same housing as the position lights. Refer to Figure 201. The strobe lights and lenses are both clear. Switching the strobe rocker switch to the on position activates the strobe lights. This position supplies power to the to the strobe power supply which alternates the power between the left and right strobe light.

B. Strobe Tube Assembly Removal (Left or Right)

(1) Remove the screws securing the lens shield to the wing tip.

CAUTION: If the same strobe tube assembly is to be reinstalled after removal, use protective gloves or a cotton wrap to ensure fingertip oil does not come into contact with the strobe tube assembly.

(2) Remove the lens from the front of the strobe tube assembly.

(3) Carefully pull the strobe light assembly wiring to retrieve the strobe connector (P17/P18) from inside the wing tip. Disconnect the strobe connector.

(4) Remove the strobe tube assembly from the base assembly, and remove from the wing tip.

C. Installation of Strobe Tube Assembly

CAUTION: Use protective gloves or a cotton wrap to ensure fingertip oil does not come into contact with the strobe tube assembly.

(1) Position the strobe tube assembly, and connect the strobe connector.

(2) Feed the strobe connector and the strobe light assembly wiring into the wing tip.

(3) Position the spacer, and install the strobe tube assembly to the base assembly.

(4) Position the lens at the strobe tube assembly, and place the ground wire inside of the lens.

(5) Place the lens on the strobe tube assembly.

(6) Secure the lens by installing the lens shield with screws.

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D. Maintenance of Strobe Tube Assembly – General maintenance is limited to lamp/tube replacement, removal and installation of the strobe light power supply, and cleaning of ozone buildup inside the strobe lenses. The lenses may be cleaned with dish soap and water using a soft cotton cloth.

CAUTION: Use protective gloves or a cotton wrap to ensure fingertip oil does not come into contact with the strobe tube assembly.

E. Removal of Strobe Power Supply

(1) Ensure the system master and strobe rocker switches are in the off position.

(2) To access the strobe power supply, remove the center console access panels (Avidyne Options) or remove the tower (Garmin G1000 option). Refer to Chapter 25.

(3) Disconnect the strobe connector and strobe power supply connector. Be sure to label the location of each wire.

(4) Remove the screws securing the strobe power supply to the cabin floor, or to the tower, and disconnect the mode jumper.

(5) Remove the strobe power supply from the airplane.

F. Installation of Strobe Power Supply

(1) Position the strobe power supply to the nutplates in the cabin floor, or in the tower.

(2) Secure all required screws.

(3) Connect the ground wire with the screw used to secure the strobe power supply.

(4) Connect the strobe connectors, strobe power supply connector, and mode jumper.

(5) Install the left and right center console access panels, or the tower, as applicable.

(6) Set the system master and strobe rocker switches to the on position, and check strobes for proper operation.

3. Landing and Taxi Lights

NOTE: Airplanes 02049 and On have LED Landing, Taxi and Recognition (LTR) lights. For LED LTR maintenance information, refer to LED Landing, Taxi and Recognition Lights - Maintenance Practices.

A. The taxi and landing lights are contained in the leading edge of the left wing. The outboard bulb in the light housing is the taxi light that provides a diffused light in the immediate area of the airplane. The inboard bulb is the landing light, which has a spot presentation with a slight downward focus. Refer to Figure 202. Xenon taxi lights are only available on 28V aircraft.

CAUTION: The landing and taxi lights become extremely hot in a short period of time. Do not touch the lens or any part of the lights under any circumstances as they can cause serious burns.

CAUTION: Use protective gloves or a cotton wrap to ensure fingertip oil does not come into contact with the landing or taxi light lens.

B. Landing and Taxi Light Removal

(1) Remove four screws on top and four screws on bottom of the landing and taxi light shielding.

(2) Remove the mounting screws on each corner of the light.

(3) Pull the light out and disconnect.

C. Landing and Taxi Light Installation

(1) Install the light connector.

(2) Place the light in the slot and install the mounting screws.

(3) Reinstall the landing and taxi light shielding with four screws on top and four screws on bottom. As required, fill the gap between the edge of the joggle and the edge of the shielding with RTV 162 white silicone caulk; do not block the 0.25-inch relief channel in the gasket.

D. Xenon Landing and Taxi Light Ballast Removal and Installation (Refer to Figure 203.)

(1) Remove the nine 6-32 flat head screws from the outboard access panel on the left wing and remove the panel.

(2) Disconnect the electrical connections from the ballast.

(3) Remove the locknuts, washers, and rubber spacers (as applicable) holding the ballast to the wing and remove the ballast.

(4) Installation is the reverse of removal. Tighten the nuts hand tight plus 1/4 turn. Apply Permatex No.2 or Loctite 222 threadlocker to each screw and install the access panel. Torque the access panel screws 12 to 15 in.-lbs.

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4. Taxi and Landing Light Adjustment

NOTE: Airplanes 02049 and On have LED Landing, Taxi and Recognition (LTR) lights. For LED LTR maintenance information, refer to LED Landing, Taxi and Recognition Lights - Maintenance Practices.

CAUTION: The landing and taxi lights become extremely hot in a short period of time. Do not touch the lens or any part of the lights under any circumstances as they can cause serious burns.

A. The taxi and landing lights are aimed in a manner that maximizes coverage for each respective flight operation. Over time, hard landings and rough field operations, to mention a few reasons, may cause the lights to lose their optimum alignment. Since both lights have a 100 percent duty cycle (can be used 100 percent of the time), their luminosity is somewhat reduced. For this reason it is important that the lights be kept in proper alignment. The following paragraphs describe the method for checking the alignment of both the taxi and landing lights and, if necessary, procedures for adjusting each lens.

B. Reference Card - To determine how the taxi and landing lights are aimed, a simple reference card must be constructed. The card should be approximately four feet high and six feet wide; corrugated cardboard works quite well and is easy to handle. Draw two horizontal, parallel lines and one vertical line on the cardboard. The horizontal lines are drawn on the 6 ft. length up from the bottom of the card: one 25 inches for incandescent lights (or 29 inches for xenon lights), and the other 35 inches. The vertical line bisects the 6 ft. length. The horizontal line 35 inches from the bottom is the taxi light reference, and the horizontal line 25 inches or 29 inches from the bottom is the landing light reference. Please refer to Figure 204 Light Adjustment Reference Card for a drawing of the reference card.

C. Landing/Taxi Light Cover Removal - It is best to remove the outer light cover before performing the test to facilitate a more accurate measurement and allow easy access to the adjustment screws for re-aiming both of the lights. The acrylic plastic cover for the light assembly is secured with eight screws, four on the top and four on the bottom. Remove all eight screws, and pull forward on the cover to remove it. If the light lenses are dirty, they should be cleaned at this time.

D. Ambient Light - The test must be performed in an area of reduced ambient light such as a hanger with the doors closed and part of the overhead lighting off. Adequate lighting conditions are also available outside about one hour after sunset.

E. Placement of Reference Card - Place the reference card in front of the airplane so that the card is 9 feet forward of the landing/taxi lights, and the vertical line on the card is 10 feet 3 inches to the left (when facing forward) of the propeller spinner tip. Refer to Figure 205.

F. Checking the Alignment - Each light is operated and checked separately and should produce the displays discussed below. An approximate representation of the light dispersion patterns are shown in Figure 206.

(1) Taxi Light, and Precise Flight Landing and Taxi Lights - The brightest concentration of the taxi light should focus laterally on the line 35 inches from the bottom and the pattern should be equally dispersed on the left and right side of the vertical line. Towards the edges of the reference card, the concentration will be somewhat above the line on the left side and below the line on the right side.

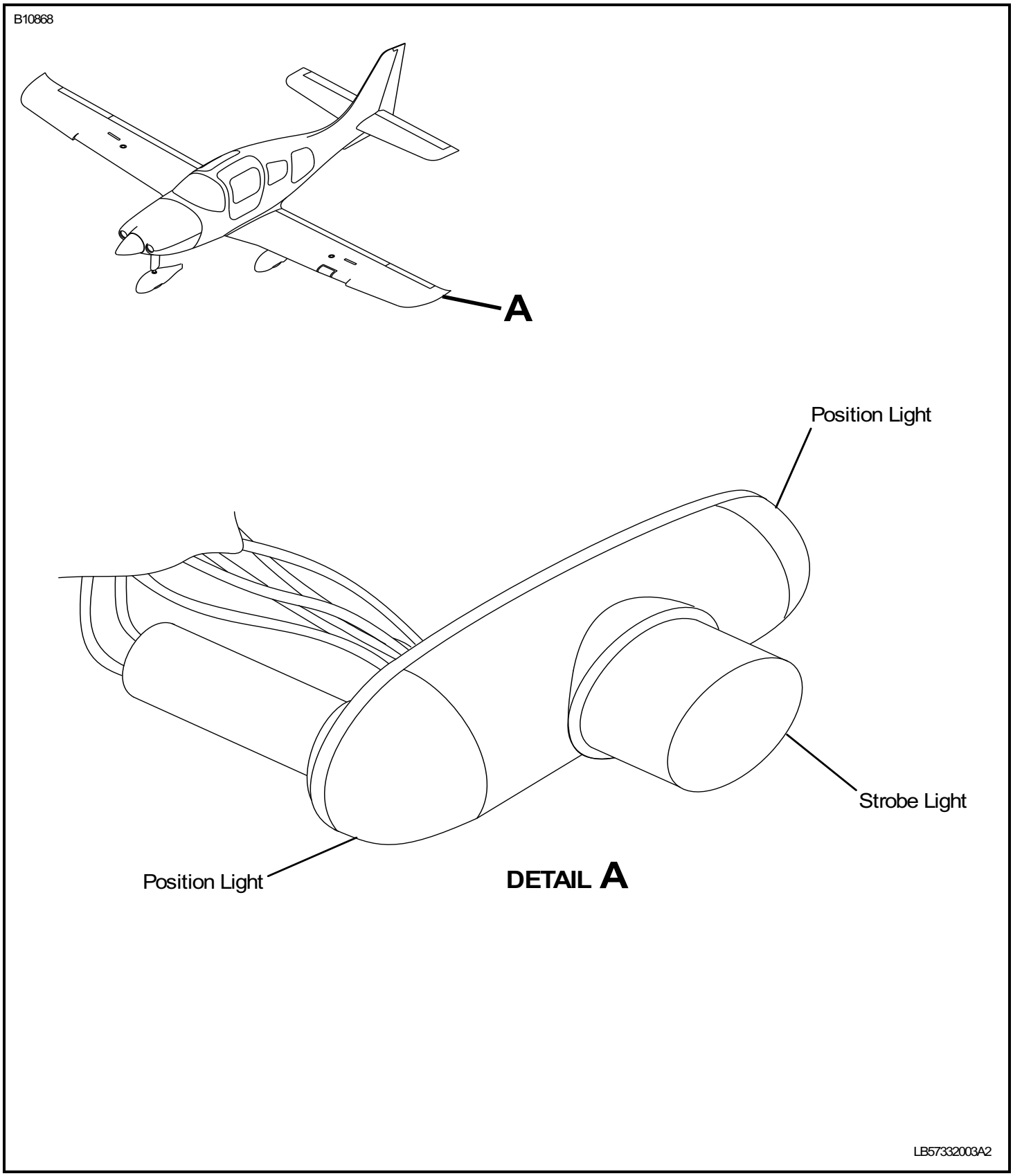
(2) Landing Light (except Precise Flight) - The center of this light should be focused on the intersection of the vertical line and the line from the bottom (25 inches for incandescent lights or 29 inches for xenon lights).

G. Aiming or Adjusting the Lights - If the lights are not properly aimed, there are adjustment screws on the face of each lens that can be turned so that each lens is properly aimed. Turning the screw on the face of the lens clockwise will cause the lens to move. The amount of adjustment to each screw is limited by physical stops, so it works best to adjust both sides of the lens in small increments. For example, a full clockwise turn on a right screw should be followed by a full counterclockwise turn on the left screw.

H. Lens Assembly - Once the lenses are properly aimed, ensure both lights and the master switches are off. Clean the acrylic plastic housing cover, and check the condition of the rubber gasket on the inside edge of the cover. Replace or re-glue the gasket as required. After the lights have cooled sufficiently, install the cover, and tighten the eight screws. Torque screws 10 to 12 in.-lbs.

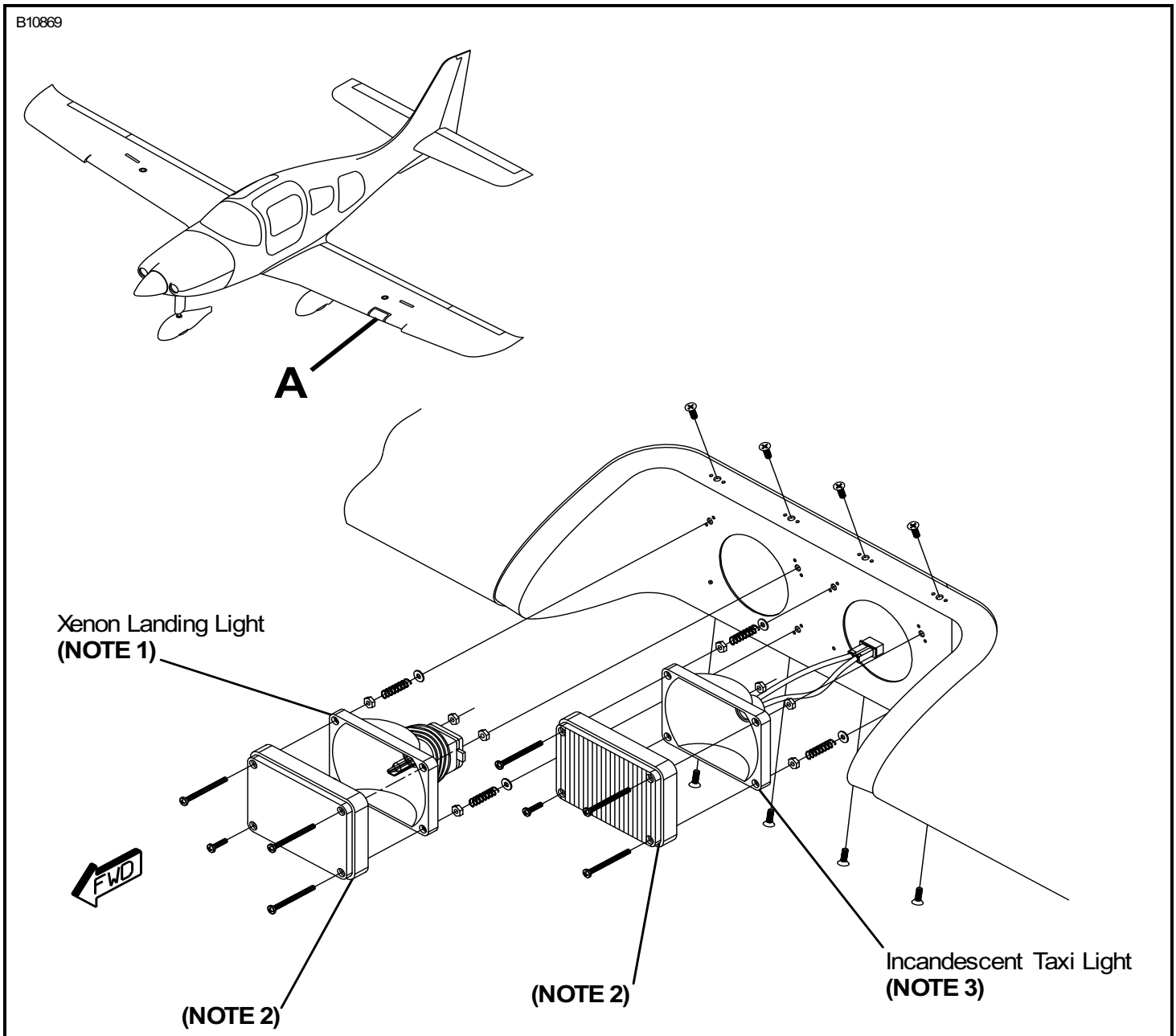
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Figure 201 : Sheet 1 : Position and Strobe Lights



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Figure 202 : Sheet 1 : Landing and Taxi Light Assembly



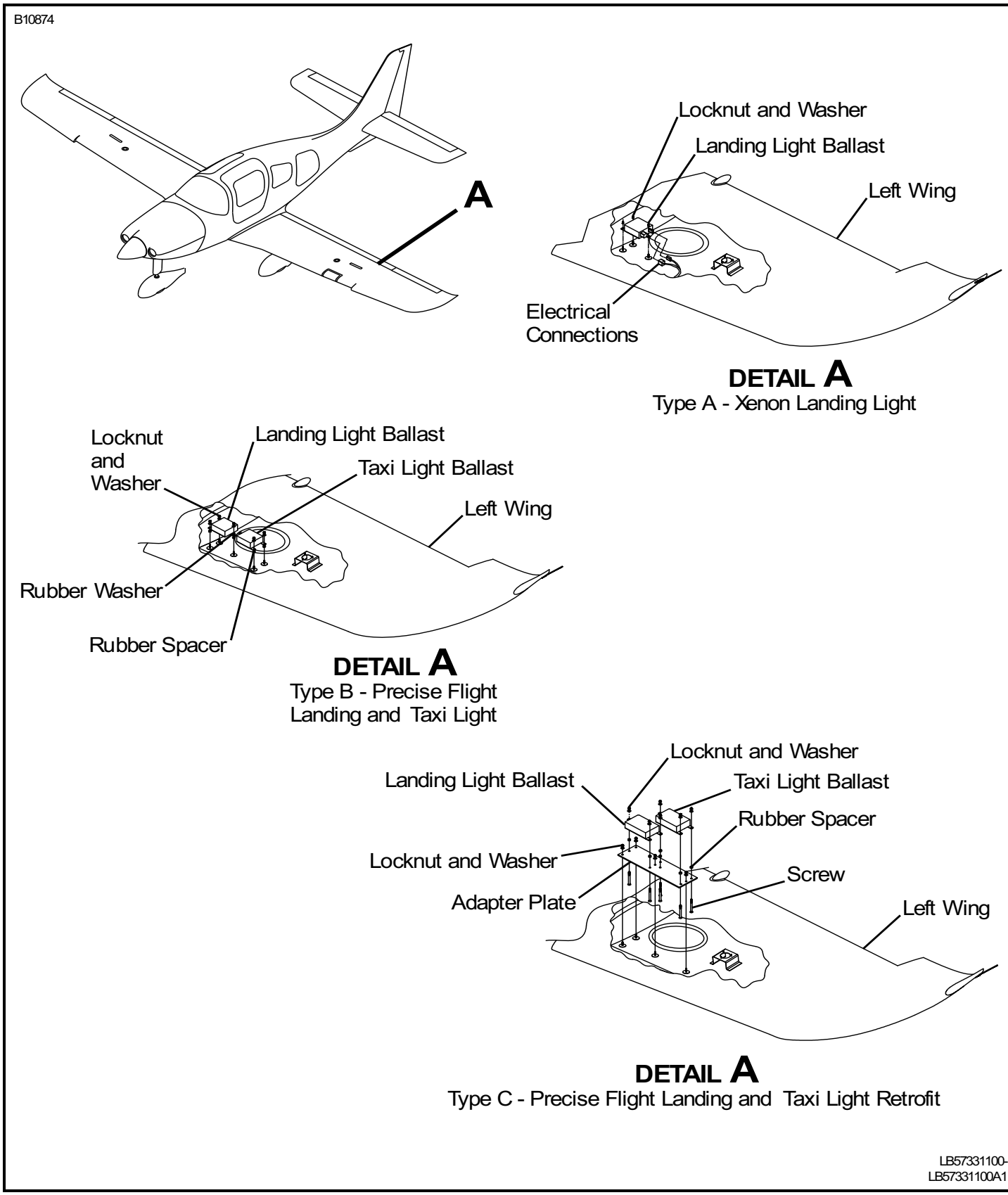
DETAIL A

NOTE 1: Xenon Taxi Light Electrical Connector similar.
NOTE 2: Precise Flight Lights have integral lenses.
NOTE 3: Incandescent Landing Light Elect rical Connector similar.

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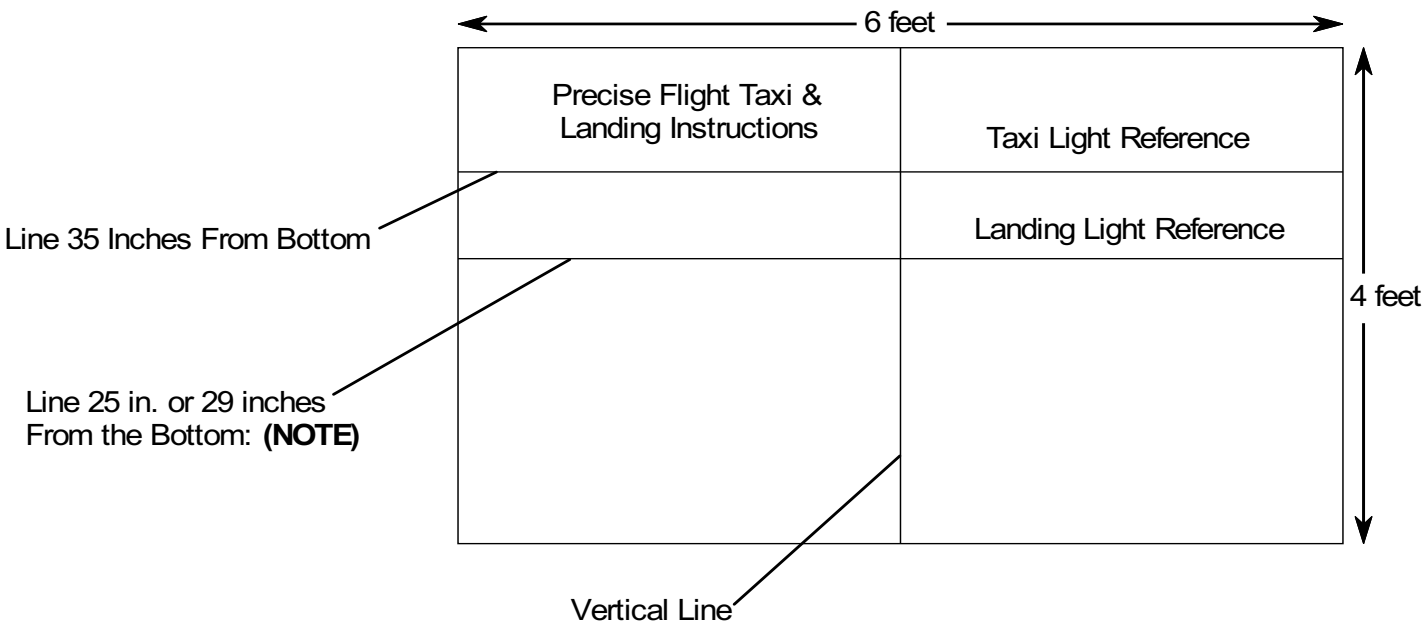
Figure 203 : Sheet 1 : Xenon Landing and Taxi Light Ballast



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Figure 204 : Sheet 1 : Light Adjustment Reference Card

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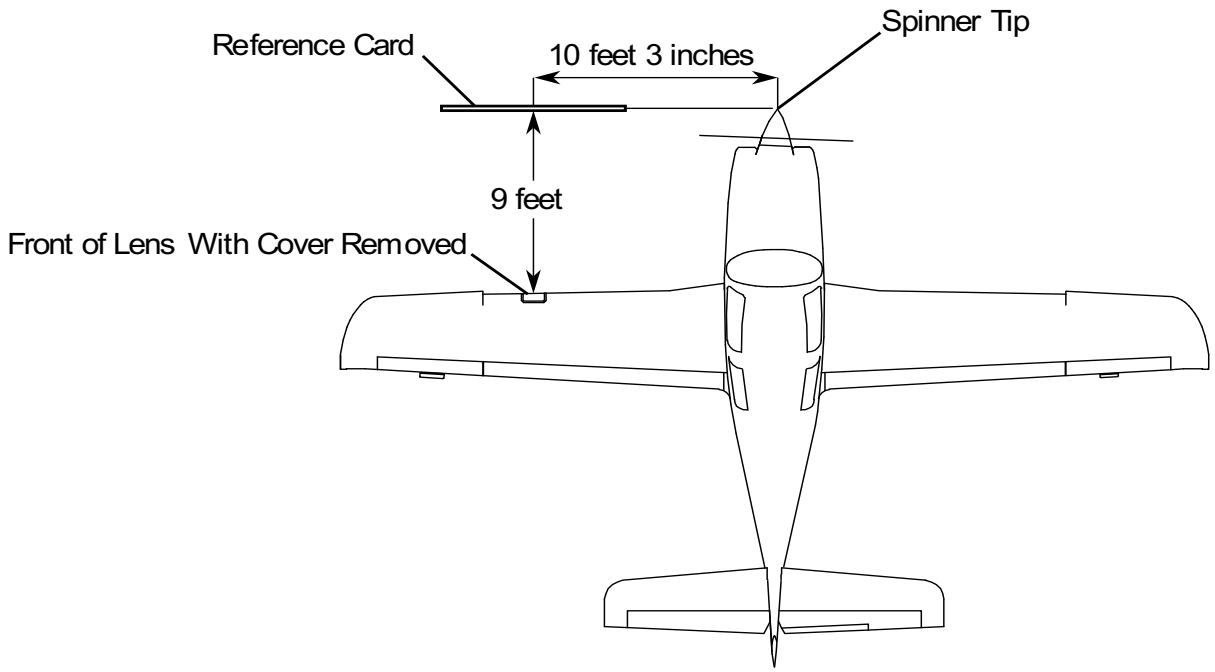


NOTE: 25 in. for incandescent Lights, 29 in. for Xenon Lights, except for Precise flight.

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Figure 205 : Sheet 1 : Placement of Light Adjustment Reference Card

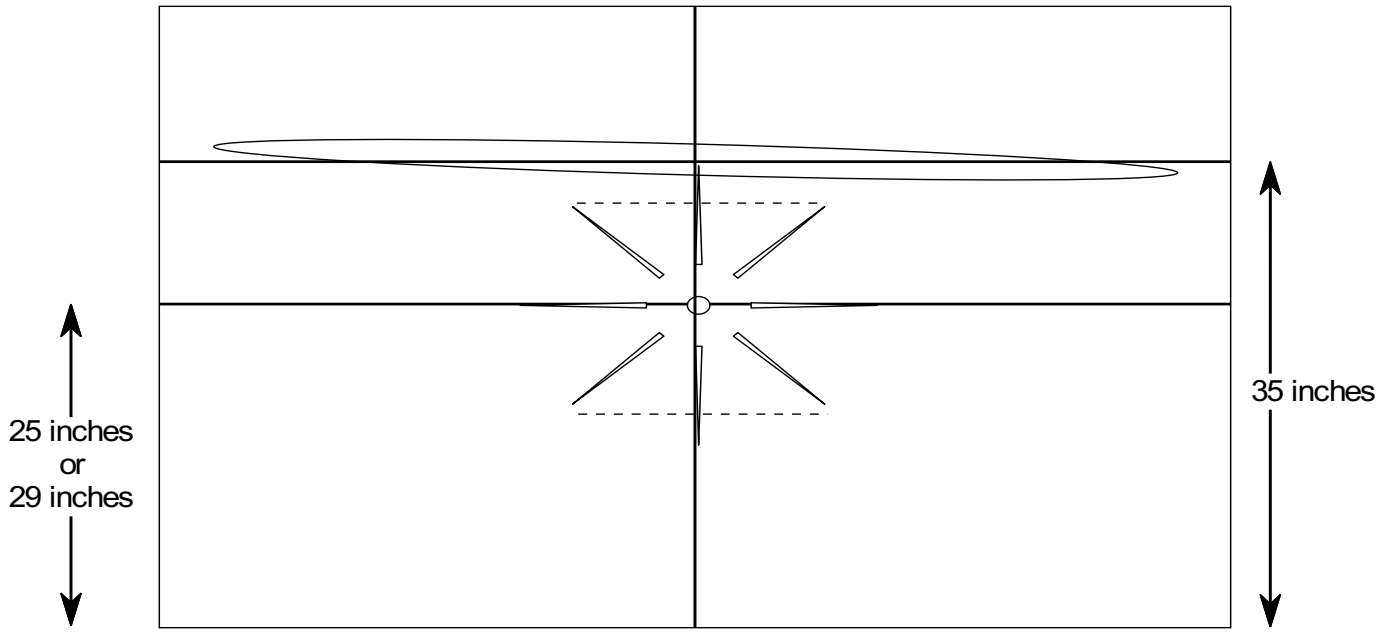
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Figure 206 : Sheet 1 : Light Adjustment

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LED WING INSPECTION LIGHT - REMOVAL/INSTALLATION

1. General

A. This section gives the procedures to remove and replace the LED Wing Inspection Light.

2. LED Wing Inspection Light Removal/Installation

NOTE: The removal and installation of the wing inspection lights are typical.

A. Remove the Wing Inspection Light (FC100 left, FF100 right) (Refer to Figure 401).

(1) Remove external electrical power from the airplane.

(2) Make sure that the BATTERY switch (SC005), found on the circuit breaker switch panel, is set to the OFF position.

(3) Make sure that the WING INSP LIGHTS circuit breaker, found on the cockpit circuit breaker panel, is disengaged.

(4) On the left or right side of cockpit (as applicable) remove the interior panel as necessary to get access to the light. Refer to Chapter 25 Interior Panels - Maintenance Panels, Middle Lower Side Panels, Left (MLSPL) and Right (MLSPR).

(5) Remove the light assembly as follows:

(a) Carefully remove the sealer from the edge of the light assembly lens and airplane skin

(b) Remove the screws that attach the light to the airplane skin

(c) Remove the screw that attaches the light electrical cable clamp to the nut plate

(d) Disconnect the applicable electrical connectors, PC108 and JC108 (left), and PF103 and JF103 (right)

(e) Carefully remove the light from the inside of the cockpit.

(6) Carefully remove the used sealant from the fuselage skin.

(7) Examine the fuselage skin to make sure that there are no cracks or damage.

B. Install the Wing Inspection Light (FC009) (Refer to Figure 401).

(1) Make sure that the mounting surface of the airplane skin is clean and free from old sealant.

(2) Insert the light from inside the cockpit with screw holes aligned correctly with the light nut plates.

(a) Install the screws that attach the light to the airplane skin.

(3) Visually inspect the electrical connectors to make sure that there are no bent or damaged pins.

(a) Repair the found damage.

(4) Connect the applicable electrical connectors, PC108 and JC108 (left), and PF103 and JF103 (right).

(5) Put the electrical cable clamp in its correct position.

(a) Install the screw that attaches the clamp to the nut plate.

(6) Use Type XII, Class B-2 sealant to filet seal the light lens to the airplane skin.

(7) Check the electrical bonding between the light housing and doubler.

(8) Do an operation test of the wing inspection light. Refer to Wing Inspection Light Operational Test.

C. Wing Inspection Light Operational Test.

(1) Make sure that the WING INSP LIGHTS circuit breaker, found on the cockpit circuit breaker panel, is engaged.

(2) Apply external electrical power to the airplane.

(3) Make sure that the BATTERY switch (SC005), found on the circuit breaker switch panel, is set to the ON position.

(4) Set the CROSS TIE switch (SW03) to the ON position.

(5) Set the WING INSP LIGHT switch (SI019), found on the center console switch panel switch panel, to the ON position.

(a) Make sure that the Wing Inspection Lights are operational.

(6) Set the WING INSP LIGHT switch to the off position.

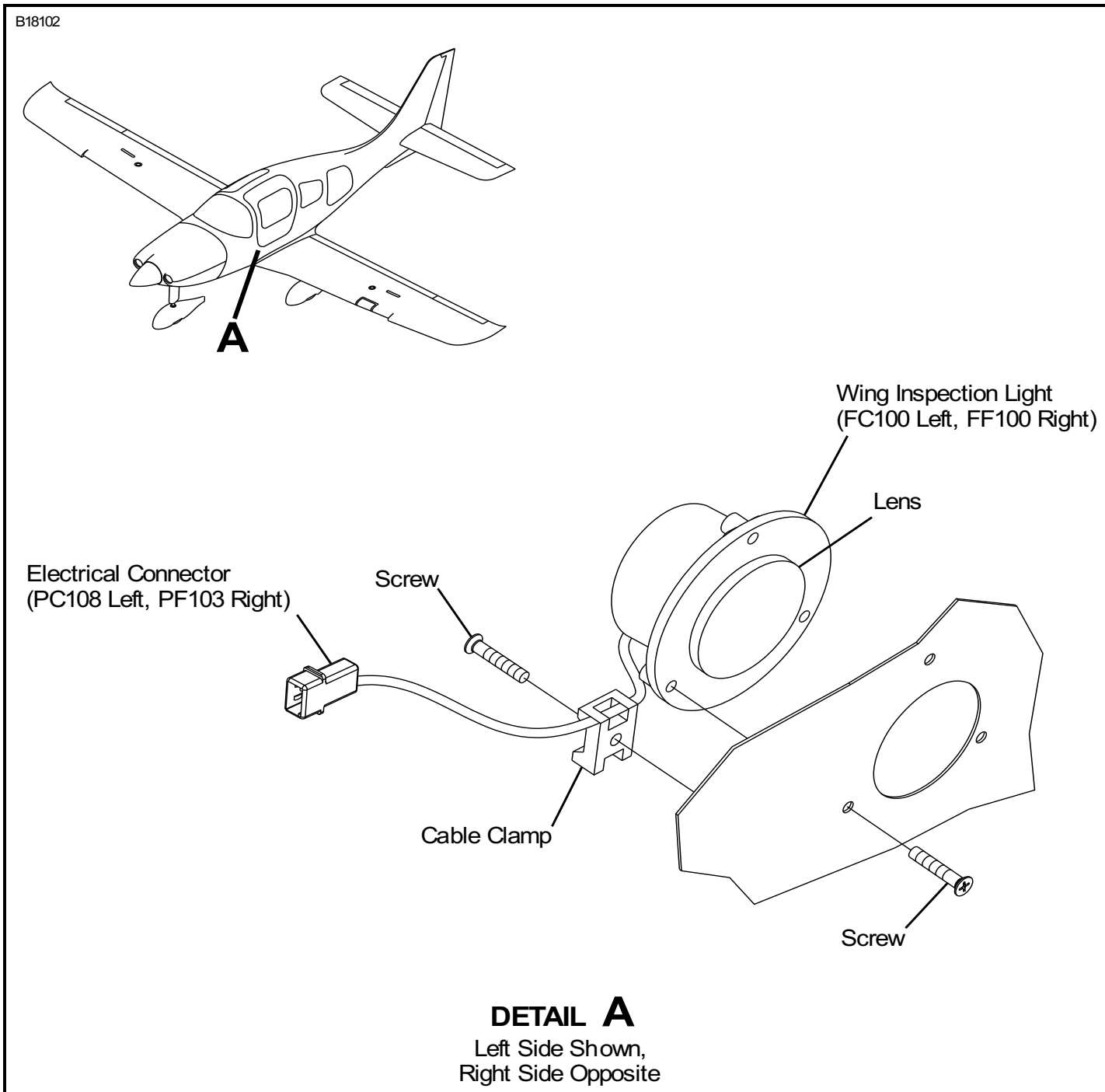
(7) Set the BATTERY switch to the OFF position.

(8) Set the CROSS TIE switch (SW03) to the OFF position.

(9) Remove external electrical power from the airplane.

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Figure 401 : Sheet 1 : Wing Inspection Light Installation



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LED LANDING/TAXI/RECOGNITION LIGHTS - TROUBLESHOOTING

1. Light Emitting Diode (LED) Landing, Taxi and Recognition (LTR) Lights Troubleshooting

A. The troubleshooting tables that follow are for airplanes that have the Light Emitting Diode (LED) Landing, Taxi and Recognition (LTR) light systems installed.

NOTE: The troubleshooting procedure is typical for the left and right LED LTR lights.

Table 101. Troubleshooting - Landing Light(s)

Aircraft Condition – Landing Light (LDG) Switch in the LDG position.	
Failure Condition	**Check or Action Items**
Individual or a group of 6 LEDs are inoperative on a light assembly.	Replace the light assembly that has the inoperative LEDs.
One light assembly is inoperative (no LEDs are illuminated on one assembly).	1. Check for 28 VDC at the inoperative light assembly connector (JW900) pin 1. If not, make sure there is continuity between the light assembly connector pin 1 and the switch panel disconnect (PC006) pin 16.
	2. Check for a ground at the inoperative light assembly connector (JW900) pin 4. If not, check for damaged wiring and/or connectors between the light assembly connector pin 4 and the ground (JF001).
	3. With an external 28 VDC power source, apply power to the suspect light assembly using connector pin 1 connected to +28 VDC and pin 4 connected to the power supply ground. Replace the light assembly if all the LEDs on the assembly are not illuminated.
Both light assemblies are Inoperative (no LEDs are illuminated).	1. Make sure that the LANDING LIGHT circuit breaker (HC034) is engaged and the bus voltage shows approximately 28 volts.
	2. Check for 28 VDC at the switch panel disconnect JC006 pin 16. If not 28 VDC, make sure there is continuity between the switch and circuit breaker panel wire bundles.
	3. Check for 28 VDC at each light assembly connector (JW900) pin 1. If not 28 VDC, make sure there is continuity between the light assembly connector pin 1 and the switch panel disconnect (PC006) pin 16.
One light assembly functions only as a Taxi light (on the ground) or Recognition light (in flight).	1. Check for 28 VDC at the inoperative light assembly connector (JW900) pin 1. If not 28 VDC, make sure there is continuity between the light assembly connector and the switch panel disconnect (PC006) pin 16.
	2. With an external 28 VDC power source, apply power to the suspect light assembly using connector pin 1 connected to +28 VDC and pin 4 connected to the power supply ground. Replace the light assembly if all the LEDs on the assembly are not illuminated.
Both light assemblies function as a Taxi light (on the ground) or Recognition light (in flight).	1. Make sure that the LANDING LIGHT circuit breaker (HC034) is engaged.
	2. Check for 28 VDC at the switch panel disconnect PC006 pin 15. If not 28 VDC, make sure there is continuity between the PC006 pin 15 and the LANDING LIGHT circuit breaker (HC034).
	3. Check for 28 VDC at each light assembly connector (JW900) pin 1. If not 28 VDC, make sure there is continuity between the light assembly connector pin 1 and the switch panel disconnect (PC006) pin 16.
	4. With an external 28 VDC power source, apply power to the suspect light assembly using connector pin 1 connected to +28 VDC and pin 4 connected to the power supply ground. Replace the light assembly if all the LEDs on the assembly are not illuminated.

Table 102. Troubleshooting - Taxi Light(s)

Aircraft Condition – Taxi and Recognition Light (TAXI/RECOG) Switch in the TAXI/RECOG position and the airplane on the ground	
Failure Condition	**Check or Action Items**

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One light assembly is inoperative (no LEDs are illuminated on one assembly).	1. Check for 28 VDC at the inoperative light assembly connector (JW900) pins 2 and 3. If not, make sure there is continuity between the light assembly connector and the switch panel disconnect (PC006).
	2. Check for a ground at the inoperative light assembly connector (JW900) pin 4. If not, check for damaged wiring and/or connectors between the light assembly connector pin 4 and the ground (JF001).
	3. With an external 28 VDC power source, apply power to the suspect light assembly using connector pins 2 and 3 connected to +28 VDC and pin 4 connected to the power supply ground. Replace the light assembly if the six center LEDs on the assembly are not illuminated.
Both light assemblies are Inoperative (no LEDs are illuminated).	1. Make sure that the TAXI LIGHT circuit breaker (HC045) is engaged.
	2. Check for 28 VDC at the switch panel disconnect PC006 pin 17. If not, make sure there is continuity between the system wiring in the switch and the circuit breaker panel wire bundles.
	3. Check for 28 VDC at each light assembly connector (JW900) pins 2 and 3. If not, make sure there is continuity between the light assembly connector and the switch panel disconnect (PC006).
One or both light assemblies function as a Recognition light (pulsing) on the ground.	1. Check for an open circuit (not a ground) at the right light assembly connector (JW900) pin 6. If there is a ground, disconnect the GEA71 connector P673 and check again for an open circuit at JW900 pin 6. If the ground remains, make sure there is continuity between JW900 pin 6 and GEA71 P673 pin 4. If there is an open circuit, check the Garmin G2000 system in accordance with Step 4 below.
	2. Check that there is no wire in the right light assembly connector (JR005) pin F.
	3. With an external 28 VDC power source, apply power to the suspect light assembly using connector pins 2 and 3 connected to +28 VDC and pin 4 connected to the power supply ground. Make sure pin 6 is not connected (open). Replace the light assembly if the six center LEDs on the assembly are not steadily illuminated.
	4. To make sure the Garmin G2000 System operates correctly, complete the following: - Make sure that GEA71 P673 pin 4 is open (not a ground). - Use the Pitot-Static Test Box and make sure of the status of pin 4 in the following conditions: Indicated TAS < 50 knots [GEA71 P673 pin 4, Open], Indicated TAS > 50 knots [GEA71 P673 pin 4, Ground]. Refer to the Operations section in LED Landing/Taxi/Recognition Lights - Maintenance Practices. - If the Indicated Airspeed does not display on the PFD, inspect, repair and replace in accordance with the G2000 Corvalis T240 Line Maintenance Manual 190-01185-00 Rev A (or later) found in the List of Manufacturers Technical Publications. - If the pin logic does not follow as provided above inspect, repair and replace the GEA in accordance with the G2000 Corvalis T240 Line Maintenance Manual 190-01185-00 Rev A (or later) found in the List of Manufacturers Technical Publications.

Table 103. Troubleshooting - Recognition Light(s)

Aircraft Condition – Taxi and Recognition Light (TAXI/RECOG) Switch in the TAXI/RECOG position and the airplane in flight (or simulated flight mode: pitot pressure set to indicate an airspeed of greater than 50 knots)	
Failure Condition	**Check or Action Items**
Left light assembly only does not pulse.	1. Disconnect the right and left light assembly connectors JW900. Check for continuity between pin 8 on the two connectors (JW900). Check for an open circuit (not a ground and not 28 VDC) on both pins. If there is no continuity and not an open circuit, troubleshoot the wiring between the two pins (8 on JW900).
	2. Interchange the left and right light assemblies on the airplane and do the system test again.

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Right light assembly only does not pulse.	With an external 28 VDC power source, apply power to the right light assembly using connector pins 2 and 3 connected to +28 VDC and pins 4 and 6 connected to the power supply ground. Replace the light assembly if all the LEDs on the assembly do not pulse.
Both light assemblies do not pulse.	1. Check for a ground at the right light assembly connector (JW900) pin 6. If there is no ground, disconnect the GEA71 connector P673 and check for a ground at P702 pin 4 on the GEA71. If there is a ground on P702 pin 4, make sure there is continuity between JW900 pin 6 and GEA71 P673 pin 4. If there is no ground, check the Garmin 2000 system in accordance with Step 3 below.
	2. With an external 28 VDC power source, apply power to the right light assembly using connector pins 2 and 3 connected to +28 VDC and pins 4 and 6 connected to the power supply ground. Replace the light assembly if all LEDs on the assembly do not pulse.
	3. To make sure the Garmin G2000 System operates correctly, complete the following: - Make sure that the GEA71 P673 pin 4 is grounded (not open). - Use the Pitot-Static Test Box and make sure of the status of pin 4 in the following conditions: Indicated TAS < 50 knots [GEA71 P673 pin 4, Open], Indicated TAS > 50 knots [GEA71 P673 pin 4, Ground]. Refer to the Operations section in LED Landing/Taxi/Recognition Lights - Maintenance Practices. - If the Indicated Airspeed does not display on the PFD, inspect, repair and replace in accordance with the G2000 Corvalis T240 Line Maintenance Manual 190-01185-00 Rev A (or later) found in the List of Manufacturers Technical Publications. - If the pin logic does not follow as provided above inspect, repair and replace the GEA in accordance with the G2000 Corvalis T240 Line Maintenance Manual 190-01185-00 Rev A (or later) found in the List of Manufacturers Technical Publications.
Both light assemblies pulse simultaneously (not alternately).	1. Make sure that there is no wire in pin 7 on each light assembly connector (JW900). Pin 7 must be an open circuit.
	2. Disconnect the right and left light assembly connectors JW900. Check for continuity between pin 8 on the two connectors (JW900). If there is no continuity, troubleshoot the wiring between the two pins (8 on JW900).
	3. With an external 28 VDC power source, apply power to the right light assembly using connector pins 2 and 3 connected to +28 VDC and pins 4 and 6 connected to the power supply ground. Make sure pin 7 is not connected (an open circuit). Replace the right light assembly if all LEDs on the assembly pulse at approximately 75 pulses per minute (the correct output should be approximately 37.5 pulses per minute). An alternative to the replacement of light assembly is to interchange the left and right light assemblies on the airplane and do the system test again.

Table 104. Troubleshooting - Traffic Alert Recognition Light(s)

Aircraft Condition – Taxi and Recognition Light (TAXI/RECOG) Switch in the ARM position and the airplane in flight (or simulated flight mode: pitot pressure set to indicate an airspeed of greater than 50 knots) and a traffic alert signal present (or simulated traffic alert signal: use a test set to simulate the traffic alert signal)	
Failure Condition	**Check or Action Items**
Both light assemblies do not pulse when a traffic alert is present.	1. Make sure that both light function correctly when the Taxi and Recognition Light (TAXI/RECOG) Switch in the TAXI/RECOG position. Refer to the Troubleshooting - Recognition Light(s) table above.
	2. Disconnect the left light assembly connector JW900. Make sure there is continuity between JW900 pin 5 and GTS 800 TAS PC819 pin 53. If there is no continuity, troubleshoot the wiring between the two pins

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		3. If there is continuity inspect, repair and/or replace the GTS 1 in accordance with the G2000 Corvalis T240 Line Maintenance Manual 190-01185-00 Rev A (or later) found in the List of Manufacturers Technical Publications.

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LED LANDING/TAXI/RECOGNITION LIGHTS - MAINTENANCE PRACTICES

1. General

A. The multifunction Light Emitting Diode (LED) Landing, Taxi and Recognition (LTR) lights are installed on the left and right wing leading edges at WS 118.00. The LTR light consists of 18 high intensity LEDs whose light emitting angles are determined by three lenses. Each lens diffuses the light for a string of 6 LEDs. The two outboard lenses have a high intensity narrow beam spread while the center lens (known as the spreader lens) has a lower intensity but broader horizontal beam spread.

B. In addition to the light assemblies found in the wings, the system includes two switches and two circuit breakers. The two-position landing light (LDG) switch and the three-position taxi light (TAXI/RECOG) switch are found on the center panel switch panel. The circuit breakers (LANDING LIGHT and TAXI LIGHT) are found on the pilot's circuit breaker panel.

2. Operation

A. The LED LTR light system supplies 3 functions for the pilot: landing light, taxi light and pulsing recognition light. The landing function is selected by its own landing lights (LDG) switch. The taxi and recognition functions share a three-position (TAXI/RECOG, ARM, OFF) switch (TAXI/RECOG). The ARM position puts the lights in the recognition mode whenever a traffic alert is present and the airplane is in the airborne mode. Since taxi and recognition functions share the upper position on the rocker switch, the operation of the Recognition or Taxi function will depend on a discrete electrical input from Garmin G2000 system that defines when the airplane is in the Airborne Mode (“In-Air” pin grounded) or in the Ground Mode (“In-Air” pin open). With the rocker switch in the TAXI/RECOG position, the Airborne Mode activates the Recognition function and the Ground Mode activates the Taxi function. Airborne and Ground Mode logic is as follows:

- The airplane is in the Airborne Mode when a valid GPS groundspeed is greater than 30 knots or a valid True Airspeed is greater than 50 knots or both GPS and True Airspeed are invalid.
- The airplane is in the Ground Mode when it is not in the Airborne Mode.

(1) The landing function is usually used during the Landing and Takeoff operations. With the landing switch in the LDG position, all 18 LEDs on each left and right light assembly are illuminated continuously. Power for all LEDs is supplied through the LANDING LIGHT circuit breaker.

(2) The taxi function is usually used for taxiing or ground operations. With the switch in the TAXI/RECOG position and the airplane on the ground (“In-Air’ pin open) the 6 center LEDs on each assembly are on steady. Power for these 12 LEDs is supplied through the TAXI LIGHT circuit breaker.

(3) The recognition function is designed for use during flight operations (other than night landing or night takeoff) where there is a desire to increase the airplane visibility to other close proximity aircraft. With the switch in the top (TAXI/RECOG) position and the airplane in flight (“In-Air” pin grounded), all 18 LEDs on each light assembly pulse alternately between the left and right assemblies. A “Sync” function wire between each assembly controls the synchronization of the system pulsing. The left light assembly is the controlling “master” unit and the right light is the “slave”. The total system pulse frequency is 75 pulses per minute with a 75 percent duty cycle. Power for all pulsing LEDs is supplied through the TAXI LIGHT circuit breaker.

B. The LTR system is designed so that even with a complete single system function failure, the Landing function can be used as a backup for Taxi or Recognition functions, and the Recognition and Taxi functions can be used as a backup for Landing function. For the Landing and Taxi functions, both the left and right LTR assemblies function independently. This means that the loss of function of one assembly does not result in the functional loss of the other.

3. Troubleshooting

A. For troubleshooting of the LED landing and taxi light installation, refer to Chapter 33, LED Landing/Taxi/Recognition Lights - Troubleshooting.

4. LED Landing, Taxi and Recognition Light Removal/Installation

NOTE: The removal and installation is typical for the left and right LED LTR lights.

A. Remove the LED Landing, Taxi and Recognition (LTR) Light (Refer to Figure 201).

(1) Set the master BATT switches (left SW01 and right SW02) to the OFF position.

(2) Set the AVIONICS MASTER switch (SW04) to the OFF position.

(3) Set the LDG and TAXI/RECOG light switches to the OFF position.

(4) Disengage the LANDING LIGHT and TAXI LIGHT circuit breakers.

(5) Disconnect external power from the airplane.

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(6) Disconnect the negative terminal from the battery. Refer to Battery - Maintenance Practices.

(7) Remove the screws that attach the cover to the landing light closeout assembly (wing skin).

(a) Remove the cover from the airplane.

(8) Disconnect the electrical connector (JW900) from the LED Light connector (PW901).

(9) Remove the screws and washers from the brackets that attach the LED light assembly to the landing light closeout assembly (wing skin).

(a) Remove the light assembly from the airplane.

(b) Make sure to record which bracket is inboard and which is outboard.

NOTE: The brackets are not interchangeable.

(10) Remove the screws and lock washers that attach the brackets to the light.

(a) Remove the brackets from the light.

B. Install the LED Landing, Taxi and Recognition (LTR) Light (Refer to Figure 201).

(1) Put the brackets in position to the light.

NOTE: The light is symmetrical. There is not a defined top or bottom of the light.

(a) Install the screws and lock washers that attach the brackets to the light.

(2) Install the LED light assembly as follows:

(a) Identify the inboard and outboard brackets.

(b) Put the LED light assembly in position to the landing light closeout assembly (wing skin).

(c) Install the screws and washers through the brackets that attach the LED light assembly.

(d) Make sure that the electrical bond between the inboard bracket and airplane mesh is less than or equal to 0.0025 ohms.

(3) Connect the electrical connector (JW900) to the LED Light connector (PW901).

(4) Examine the tape (gasket) to make sure it is serviceable.

(a) If necessary, replace the tape that is not serviceable.

(5) Put the cover in position to the landing light closeout assembly (wing skin).

CAUTION: Do not over tighten the screws. This can cause damage to the cover.

(a) Install the screws that attach the cover.

1 Tighten the screws so the surface of the cover is flush with the landing light closeout assembly (wing skin).

(6) Connect the negative terminal to the battery. Refer to Battery - Maintenance Practices.

(7) Do the LED Landing, Taxi and Recognition Light Test. Refer to LED Landing, Taxi and Recognition Light System Test.

(8) Use Type XII, Class B sealant to fillet seal the gap between the cover and the landing light closeout assembly (wing skin). (PR-1425 or PR-1829, PPG Industries, PRC-Desoto, or equivalent)

5. LED Landing, Taxi and Recognition Light System Test

A. A controllable pitot pressure source is necessary for this Recognition Light function test to simulate the Garmin G2000 Airborne Mode. Refer to Chapter 34, Pitot and Static Systems – Maintenance Practices, Pitot System Leak Test/Inspection for a method of pressurizing the pitot system.

B. Do the LED Landing, Taxi and Recognition Light System Test.

CAUTION: LEDs are bright to the eye to look at. When you make sure that the LEDs are on, do not look directly into the light face. Look from at least a 45 degree angle.

(1) Connect external power to the airplane.

(2) Engage the LANDING LIGHT and TAXI LIGHT circuit breakers.

(3) Set the master BATT switches (left SW01 and right SW02) to the ON position.

(4) Set the AVIONICS MASTER switch (SW04) to the ON position.

(5) Make sure that landing lights operate correctly.

(a) Set the landing light (LDG) switch to the LDG position.

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(b) Make sure that the landing lights, all 18 LEDs on each light assembly, stay on continuously.

(c) Set the landing light (LDG) switch to the OFF position.

(6) Make sure that taxi lights operate correctly.

(a) Set the taxi light (TAXI/RECOG) switch to the TAXI/RECOG position.

(b) Make sure that the taxi lights, center 6 LEDs on each light assembly, stay on continuously.

(7) Make sure that recognition lights operate correctly.

(a) Set the recognition light (TAXI/RECOG) switch to the OFF position.

(b) Apply pitot system pressure to simulate the airplane in the Airborne Mode.

1 Put a piece of air tight tape over the small hole in the lower aft end of the pitot tube.

2 Attach a controllable pressure source to the end of the pitot tube. Refer to Chapter 34, Pitot-Static System (T240) – Adjustment/Test, Pitot-Static System Test for a method of pressurizing the pitot system.

CAUTION: Always apply pressure or suction slowly to the system. This will help prevent damage to the equipment.

3 Slowly increase the pitot pressure to a minimum of 60 knots as shown on the Garmin primary flight display airspeed indicator.

a Make sure that the True Airspeed (TAS) is also more than 50 knots in the True Airspeed window.

(c) Set the recognition light (TAXI/RECOG) switch to the TAXI/RECOG position.

1 Make sure that the recognition lights, all 18 LEDs on each light assembly, pulse alternately between the left and right assemblies.

(d) Set the recognition light (TAXI/RECOG) switch to the ARM position.

1 Use a test set and simulate a traffic alert.

2 Make sure that the LED LTR lights operate in the recognition mode while the traffic alert signal is transmitted.

(e) Set the recognition light (TAXI/RECOG) switch to the OFF position.

CAUTION: Always remove pressure or suction slowly from the system. This will help prevent damage to the equipment.

(f) Remove the pitot system pressure as follows:

1 Slowly decrease the pitot pressure to 0 knots.

2 Remove the pressure source from the end of the pitot tube.

3 Remove the piece of tape from the small hole in the lower aft end of the pitot tube.

(8) Set the AVIONICS MASTER switch to the OFF position.

(9) Set the master BATT switches (left and right) to the OFF position.

(10) Disconnect external power from the airplane.

6. LED Landing, Taxi and Recognition Light Aiming Check and Adjustment

A. The LED Landing, Taxi and Recognition (LTR) Lights are set to specified positions at the factory, but you can make minor adjustments as necessary. The procedures that follow give checks for the approved aiming of the LED lights.

NOTE: The procedures that follow are typical for the left and right LED LTR lights.

B. Do the Vertical Aiming Check and Adjustment.

NOTE: A digital inclinometer that can measure to the nearest tenth of a degree is necessary for this procedure.

(1) Park the airplane on a flat, level surface.

(2) Connect external power to the airplane.

(3) Set the master BATT switches (left SW01 and right SW02) to the ON position.

(4) Set the AVIONICS MASTER switch (SW04) to the ON position.

(5) Make sure that the LANDING LIGHT and TAXI LIGHT circuit breakers are engaged.

(6) Set the landing light (LDG) switch to the OFF position.

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(7) Level the airplane to waterline 0 degrees, +0.1 or -0.1 degrees, and wings level 0 degrees, +2.0 or -2.0 degrees. Refer to Chapter 8, Leveling and Weighing - General.

(8) Remove the screws that attach the cover to the leading edge of the wing. Refer to Figure 201.

(a) Remove the cover from the airplane.

(9) Use a digital inclinometer on the center of the light face to find the light vertical aiming angle.

NOTE: For this procedure, it is assumed that the light's center beam emits normal to the face of the light.

(a) Set the landing light (LDG) switch to the LDG position.

(b) Record the vertical aiming angle to the nearest tenth of a degree.

1 Record if the angle is with the light pointed up or down from water line zero.

(c) Is the light aimed within the approved range? Refer to Figure 202.

NOTE: The approved factory-set vertical aiming is with the light pointing 0.0 degrees, +0.5 or -0.5 degrees, from the waterline zero.

(10) If necessary, adjust the light vertical aiming to the approved position.

(a) Set the landing light (LDG) switch to the OFF position.

(b) To adjust the light add 0.016 or 0.032 inch flat washers to the upper or lower screws that attach the brackets to the landing light closeout assembly. Refer to Figure 201.

(11) As necessary, do again the steps above to check and adjust the light vertical aiming angle.

(12) Disconnect external power from the airplane.

C. Do the Horizontal Aiming Check and Adjustment.

NOTE: The horizontal aiming must be checked visually at night on a flat, level, and light colored surface.

(1) Park the airplane on a flat, level, and light colored surface.

(2) Connect external power to the airplane.

(3) Set the master BATT switches (left SW01 and right SW02) to the ON position.

(4) Set the AVIONICS MASTER switch (SW04) to the ON position.

(5) Make sure that the LANDING LIGHT and TAXI LIGHT circuit breakers are engaged.

(6) Set the landing light (LDG) switch to the LDG position.

(7) Do a check of the horizontal aiming.

(a) Make sure that the left and right Landing Light Main Beams converge equally in front of the center of the aircraft. Refer to Figure 202.

(8) If necessary, adjust the light horizontal aiming to the approved position.

(a) Set the landing light (LDG) switch to the OFF position.

(b) To adjust the light add 0.016 or 0.032 inch flat washers between the bracket and the closeout assembly to the screws that attach the applicable bracket (inboard or outboard). Refer to Figure 201.

(9) As necessary, do again the steps above to check and adjust the light horizontal aiming angle.

(10) Install the cover on the airplane. Refer to the applicable steps in LED Landing, Taxi and Recognition Light Removal/Installation.

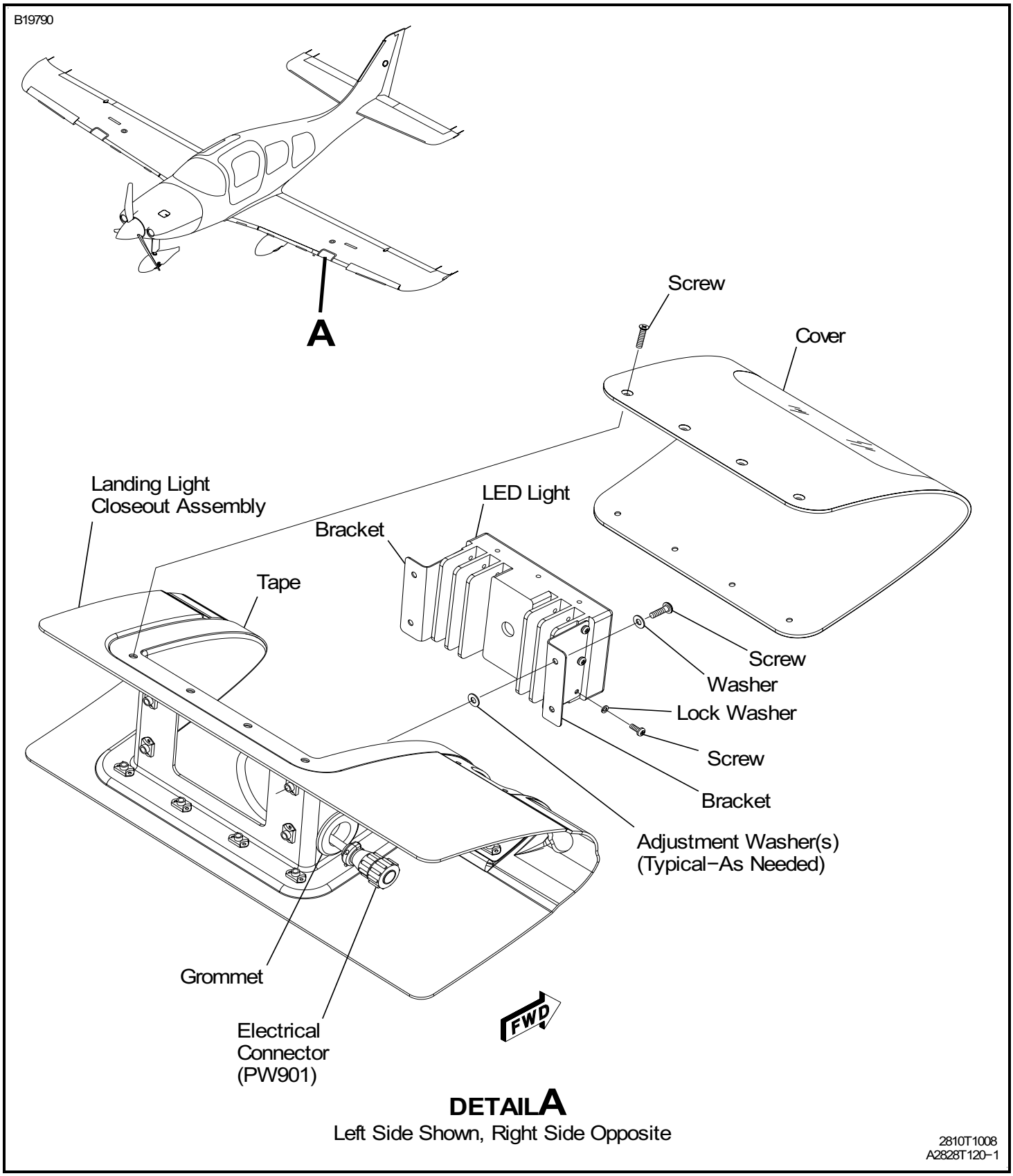
(11) Set the AVIONICS MASTER switch to the OFF position.

(12) Set the master BATT switches (left and right) to the OFF position.

(13) Disconnect external power from the airplane.

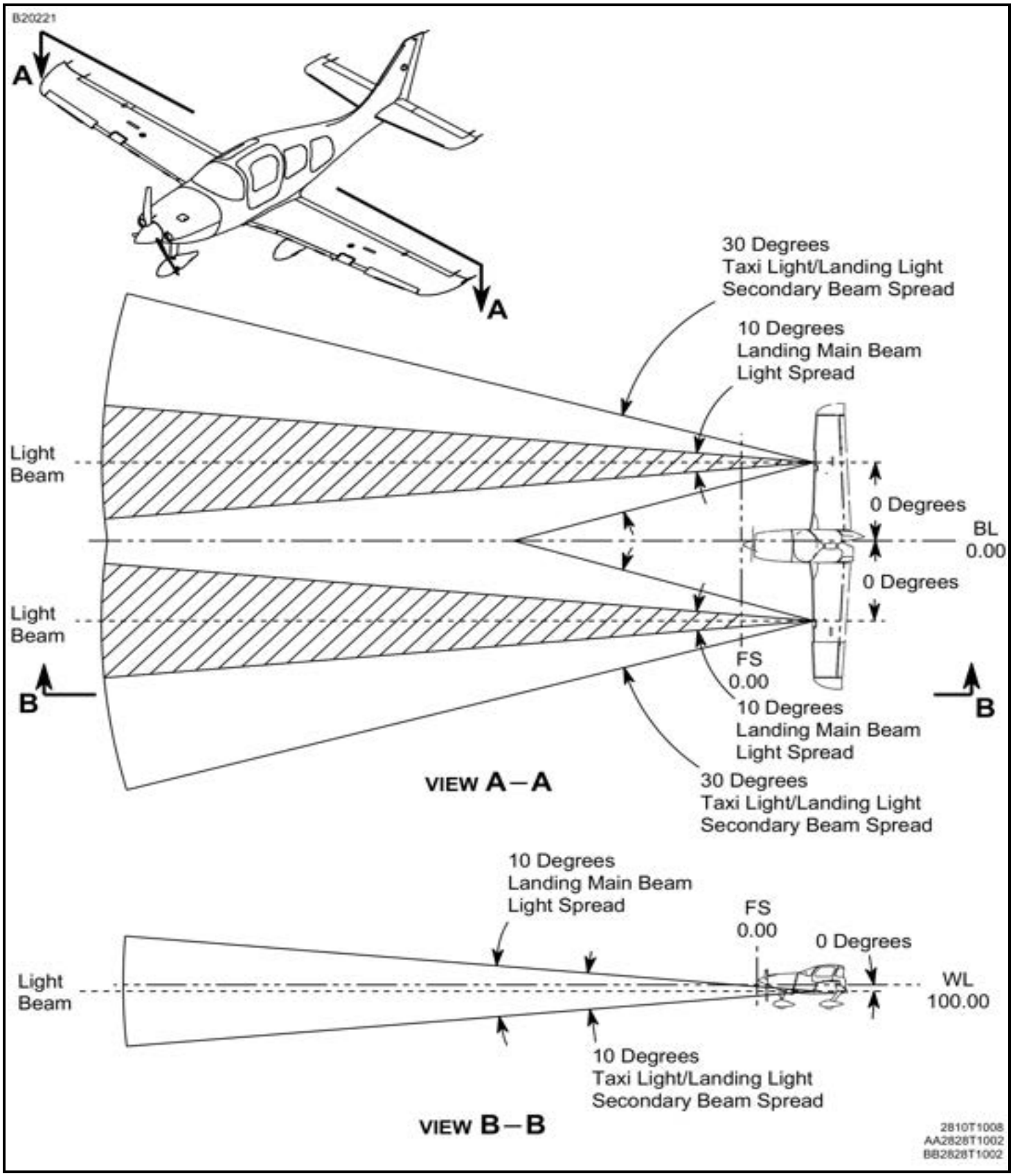
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Figure 201 : Sheet 1 : LED Landing, Taxi and Recognition Light Installation



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Figure 202 : Sheet 1 : LED Landing, Taxi and Recognition Light Aiming



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OXYGEN - GENERAL

1. General

A. The fixed oxygen system consists of three oxygen cylinders (S/N 41001 thru 411124) or one oxygen cylinder (S/N 411125 and on and the Model T240), high and low-pressure lines and fittings, a fill port, an overfill/over pressure burst valve, a regulator/valve assembly, an oxygen distribution manifold, a guarded emergency manual low-pressure oxygen shut-off, a logic and display panel (Avidyne only), oxygen distribution devices, and flow meters. High-pressure lines connect the oxygen cylinders, filler port, overfill/over pressure burst valve and the regulator/valve assembly to the system. From the regulator/valve assembly, low-pressure oxygen lines are routed to the overhead console where a manual switch and distribution manifold are located. Attached to the low pressure manifold and the regulator/valve assembly are pressure transducers that are connected electronically to the display/logic controller mounted in the instrument panel (Basic and Avidyne option) or to the MFD (Garmin G1000 option and the T240 Garmin G2000). Refer to Figure 1.

(1) **Oxygen Cylinders**

(a) **S/N 41001 thru 411124** - The oxygen cylinders are manufactured to DOT-3AL/2015 with a 2015 psi working pressure, per 49 CFR 178.46. There are three oxygen cylinders, each with 14 cubic feet capacity at 2000 psi. They are located in the right wing between the root rib and the WS 46 rib, and between the forward and aft spars. They are mounted to brackets attached to the lower wing skin. Stainless steel band clamps secure the cylinders to the brackets.

(b) **S/N 411125 and On and Model T240** - The oxygen cylinder is manufactured to DOT-CFFC with 77 cubic feet capacity at a service pressure of 1850 psig. The cylinder is mounted in a channel section along the centerline of the permanently bonded-in antenna box located between the baggage bulkhead and the vertical shear web. A composite bracket bonded on the aft section of the channel retains the aft section of the cylinder while a stainless steel band clamp with a rubber grommet that passes through two slotted cutouts at the forward section of the channel secures the cylinder to the antenna box. An aluminum bracket that is mounted on the antenna box, forward of the cylinder, supports the neck of the cylinder and retains it from forward motion.

(2) **Tubing** - Stainless steel tubing is used throughout the system, except on aircraft S/N 411125 and on and Model T240, which have aluminum tubing for the low pressure portions of the system. The tubing routes high-pressure oxygen from the fill port to the high-pressure manifold on the regulator/valve assembly. For aircraft S/N 41001 to 41132 additional high pressure tubing is routed from the regulator/valve assembly to the cylinder(s) and the overfill/over pressure burst valve. All oxygen lines are marked with breathing oxygen identification tape, per MIL-STD-595B and MIL-STD-1247C, located within 3 inches of all fittings and at intervals along the lines not to exceed 48 inches. The flared ends of tubing are flared at 37 degrees. The system uses stainless steel 37 degrees JIC fittings for stainless steel tubing and aluminum 37 degrees JIC fittings for aluminum tubing. There is one Swagelok fitting in the system on the low pressure side. Fitting seals (Seco seals) have been incorporated at every flared tube connection to help ensure leak free connections; copper seals for stainless steel tubing and aluminum seals for aluminum tubing.

(3) **Flexible Hose (S/N 41070 and On and Model T240)** - Behind the forward overhead light panel a flexible hose connects the cabin distribution manifold to the low pressure side of the system. Flexible hose connection to tubing is accomplished using quick disconnect fittings.

(4) **Fill Port** - The oxygen system fill port is located just inside the baggage door on the baggage hat rack. For aircraft S/N 41001 thru 411124, the fill port consists of a Schrader type valve, silver soldered to a stainless line which is routed to the high pressure manifold. The assembly is placarded cautioning "OXYGEN FILL PORT DO NOT EXCEED 2000 p.s.i." For aircraft S/N 411125 and on and Model T240, the fill port assembly includes a flip cover and a pressure gage indicating the amount of oxygen in the cylinder. This assembly is placarded "OXYGEN 2000 PSI MAX".

(5) **Overfill/Over Pressure Burst Valve Assembly** - The system incorporates an overfill/over pressure burst valve assembly that functions to discharge the system in the event it is over pressured.

(a) **S/N 41001 thru 411124** - The valve is located in the center of the lower wing skin just under the rear footwell. Stainless steel tubing connects the assembly to the high pressure manifold located on the root rib. A threaded cartridge (S/N 41070 and on and Model T240) or a small copper or stainless steel disk (S/N 41002 to 41069) bursts when oxygen pressure exceeds 2800 psi. The burst valve exhausts through a hole in the lower wing skin. Under normal conditions there is a pressed-in cap plug that closes the hole in the wing skin and protects the system from dust and dirt. In the event of an over pressure condition, the cap will be blown out of the hole from the internal pressure and act as an additional indication of the system overpressure protection being activated

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during preflight.

(b) **S/N 411125 and On and Model T240** - The overfill/over pressure burst valve is a component of the regulator/valve. A threaded cartridge bursts when oxygen pressure exceeds 2800 psi and vents through cutouts in the aft of the fuselage.

(6) **Oxygen Regulator/Valve** - The oxygen regulator/valve assembly includes the high pressure manifold, high-pressure transducer, regulator, low-pressure valve, overfill/over pressure burst valve (S/N 411125 and on and Model T240), and valve actuating solenoid. The pressure regulator provides 22 to 33 psig (S/N 41001 thru 411124) or 22 to 27 psig (S/N 411125 and on and Model T240) to the cabin distribution manifold. The remote high-pressure control is an electrically operated on-off valve that is actuated by a latching solenoid connected to the aircraft essential electrical bus through the logic and display assembly (Avidyne) or MFD (Garmin G1000). There is one low-pressure outlet port on the assembly. The assembly also contains a high pressure transducer that sends a signal to the logic and display unit (Avidyne) or MFD (Garmin G1000 and G2000) to show cylinder pressure. The cylinder pressure directly relates to the quantity of oxygen in the system.

(a) **S/N 41001 thru 411124** - The high pressure manifold part of the assembly has three external ports for the fill line, the cylinder line and the over pressure burst valve line. The regulator/valve assembly is located on the inboard side of the root rib and is attached to the root rib with bolts, washers, and locknuts.

(b) **S/N 411125 and On and Model T240** - The high pressure manifold part of the assembly has one external port for the fill line. The regulator/valve assembly is connected directly to the top of the oxygen cylinder.

(7) **Cabin Distribution Manifold** - The oxygen distribution manifold is located in the overhead console, just behind the pilot's head. It has four quick-disconnect ports. The manifold is either attached to a structural bracket bonded to the interior of the fuselage (S/N 41002 to 41039) or attached to the forward center overhead light panel (S/N 41040 and On and the Model T240).

(8) **Manual Low Pressure Oxygen Shut-Off Valve** - The manual oxygen shut-off valve is located next to the distribution manifold. Its function is to turn off the flow of low pressure oxygen as necessary in case of a failure of the regulator/valve assembly. There is a guard around the switch to prevent inadvertent contact with the shut-off switch.

(9) **Logic and Display Unit (Avidyne Option Only)** - The logic and display unit consists of two assemblies: the display located on the lower right of the instrument panel and the remote unit located behind the right kidney panel. The remote unit contains a circuit board, a display board assembly, and a dust cover. The display consists of a three position switch (ON, OFF, and, DISP) that controls the main high-pressure regulator, an LED lit oxygen quantity indicator, an LED lit low pressure indicator, and a fault light. The DISP position on the switch turns on the low pressure and oxygen quantity indicators without energizing the regulator. The ON position turns power on to the display, and energizes the solenoid for a short duration to open the low pressure valve and provide low pressure oxygen to the cabin distribution manifold. The OFF position will disengage the solenoid and there will be no display. The logic controller also includes a fault indication for a short to ground, or an open wire for the solenoid wiring only. The system has built-in current protection in case the solenoid wires short each other.

(10) **Oxygen Flow Controls** - Four manually operated oxygen flow controls can be connected to the oxygen distribution manifold. The flow controls provide the means to distribute the appropriate amount of oxygen for the pressure altitude of flight and indicate the presence of flowing oxygen to the pilot or passenger(s). The flow controls can be either an A4/A5 Flowmeter and Oxygen Conserving Cannulas or an A4/A5 Flowmeter and Mask (Standard and Microphone).

(11) **Grounding and Bonding** - All lines are electrically bonded across fittings, and to the oxygen system components to prevent the build up of static electricity. The whole system is electrically bonded to the ground plane of the aircraft for both static electricity and lightning protection.

2. Safety Guidelines For Servicing The Oxygen System

A. In servicing and maintaining oxygen equipment, the greatest potential hazard is fire and explosion. Given conducive conditions, gaseous oxygen will cause combustibles like oil and grease to ignite and burn vigorously or explode. Other materials that do not burn in air will burn vigorously in an oxygen enriched environment. Oxygen equipment must be kept free of all types of oil and grease. Refer to this chapter and FAA Advisory Circular 43.13-1B/1 or subsequent prior to servicing the oxygen system.

(1) **Cleanliness of Tools and Equipment** - Servicing tools and equipment must be cleaned regularly with anhydrous ethyl alcohol, isopropyl alcohol, or other suitable oxygen safe cleaning agents. After being cleaned and dried, tools and equipment must be protected with caps, plugs, or covers as applicable and stored in a clean storage area.

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(2) **Cleanliness of Personnel** - All clothing must be free of oil, grease, fuel, hydraulic fluid, etc. Personnel must be clean without any lotions or lip balms. Thorough washing of hands and face should be adopted as standard practice before handling of any oxygen equipment or servicing tools.

(3) **Grounding** - Ground the system and servicing equipment before connecting to the fill port.

(4) **Electric Power** - Disconnect all unnecessary electrical power from the aircraft. When charging the oxygen system keep operation of electrical switches to the minimum required. Do not connect or disconnect the ground power supply.

(5) **Ignition Sources** - Avoid making sparks. Keep fire and burning cigarettes away from the vicinity of the aircraft during oxygen servicing.

(6) **Fueling** - Do not service or perform maintenance on the oxygen system when fueling, or servicing with other flammable fluid, of the aircraft is in progress.

(7) **Oxygen System Charging** - Do not charge the system too quickly. Rapid charging can generate heat and thus create a hazard to safety.

(8) **Oxygen System Pressure** - The oxygen system is designed to be filled to a maximum pressure of 2000 psi. Verify the pressure of oxygen filling equipment prior to servicing the aircraft to prevent over-pressurizing system.

3. Oxygen System Servicing

A. Servicing of the oxygen system is as indicated in Chapter 12.

WARNING: Refer to Safety Guidelines For Servicing The Oxygen System before attempting any servicing or maintenance of the oxygen system.

4. Oxygen System Purging

A. The oxygen system should be purged anytime the system's pressure drops below 50 psig or the lines are left open. Removal of offensive odors in the system may also be accomplished by purging of the system. Use only MIL-O-27210 aviator's breathing oxygen for system purging.

WARNING: Do not use medical or industrial quality oxygen. They may contain excessive moisture that could freeze and cause malfunction of the oxygen system during flight.

(1) Open all aircraft doors to provide air circulation.

(2) Remove all unnecessary electrical power to the airplane as follows:

(a) For the Avidyne option, energize only the left bus.

(b) For the Garmin G1000 option, energize only the right and avionics bus.

(c) For the T240 Garmin G2000 installation, energize only the left and avionics bus.

(3) Locate the oxygen fill port in the baggage bulkhead.

(4) Ground the oxygen system by connecting a grounding cable from the oxygen fill port to the oxygen recharging cart, ensuring that the cart is properly grounded.

(5) Remove the fill port protective cap and attach the hose from the oxygen recharging cart to the fill port.

(6) Set the recharging cart to deliver 50 psig of oxygen to the system.

(7) Turn on the regulator/valve as follows:

(a) For the Avidyne option, use the switch on the logic and display panel.

(b) For the Garmin G1000 option, use the softkey on the MFD.

(c) For the T240 Garmin G2000 installation, use the Touchscreen Controller 570.

(8) Open one of the ports in the cabin distribution manifold by using an oxygen mask line or equivalent and ensure that oxygen is flowing.

(9) Purge the system for one hour.

(10) If purging was performed to remove offensive odors and odors still linger after one hour, purge the system for an additional hour. If offensive odors still persist, replace the supply cylinders, and repurge the system.

(11) Turn off the regulator/valve as follows:

(a) For the Avidyne option, use the switch on the logic and display panel.

(b) For the Garmin G1000 option, use the softkey on the MFD.

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(c) For the T240 Garmin G2000 installation, use the Touchscreen Controller 570.

(12) Turn off the recharging cart.

(13) Remove the oxygen mask line or equivalent from the cabin distribution manifold.

(14) After successful completion of system purging, service the system as described in Chapter 12.

WARNING: Refer to Safety Guidelines For Servicing The Oxygen System before attempting any servicing or maintenance of the oxygen system.

5. Oxygen System Depressurization and Evacuation

A. The oxygen system must be depressurized and the oxygen removed for any work done to the system that involves removal of component(s).

(1) **Using an Oxygen Cart Capable of Oxygen Recovery**

(a) Open all aircraft doors to allow for air circulation.

(b) Remove all unnecessary electrical power to the airplane as follows:

1 For the Avidyne option, energize only the left bus.

2 For the Garmin G1000 option, energize only the right and avionics bus.

3 For the T240 Garmin G2000 installation, energize only the left and avionics bus

(c) Locate the oxygen fill port in the baggage bulkhead.

(d) Ground the oxygen system by connecting a grounding cable from the oxygen fill port to the oxygen cart, ensuring that the cart is properly grounded.

(e) Remove the fill port protective cap and attach the hose from the oxygen cart to the fill port.

(f) Evacuate the oxygen system.

(g) Turn off the oxygen cart.

(2) **Using the Aircraft Cabin Distribution Manifold**

(a) Open all aircraft doors to allow for air circulation.

(b) Remove all unnecessary electrical power to the airplane as follows:

1 For the Avidyne option, energize only the left bus.

2 For the Garmin G1000 option, energize only the right and avionics bus.

3 For the T240 Garmin G2000 installation, energize only the left and avionics bus

(c) Turn on the regulator/valve as follows:

1 For the Avidyne option, use the switch on the logic and display panel.

2 For the Garmin G1000 option, use the softkey on the MFD.

3 For the T240 Garmin G2000 installation, use the Touchscreen Controller 570.

(d) Open one or more of the ports in the cabin distribution manifold by using an oxygen mask line or equivalent.

(e) Wait until all oxygen in the system has discharged.

(f) Remove the oxygen mask line or equivalent from the cabin distribution manifold.

(g) Turn off the regulator/valve as follows:

1 For the Avidyne option, use the switch on the logic and display panel.

2 For the Garmin G1000 option, use the softkey on the MFD.

3 For the T240 Garmin G2000 installation, use the Touchscreen Controller 570.

WARNING: Refer to Safety Guidelines For Servicing The Oxygen System before attempting any servicing or maintenance of the oxygen system.

6. Leakage Testing

A. Any removal and replacement of components or tubing in the oxygen system requires that leakage testing be performed. Apply oxygen safe leak detection compound conforming to MIL-L-25567 to fittings and connections. Observe the tested area for a minimum of 30 seconds. Any formation of bubbles or deformation of the leak detection compound constitutes failure of the test.

(1) Verify that the solenoid valve operates properly when the oxygen is electrically switched on and off.

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(2) If complete evacuation of oxygen from the system was required, perform the following tests:

(a) Charge the system to 50 psig with oxygen and verify there are no leaks.

(b) Increase the system pressure to 400 psig and verify there are no leaks.

(c) Increase the system pressure to 1,000 psig and verify there are no leaks.

(d) Increase the system pressure to 2,000 psig and verify there are no leaks.

(e) Remove all leak test compound from fittings and connections after successful completion of the leak test.

(3) Any repair work to the low-pressure portion of the oxygen system from the regulator/valve to the cabin distribution manifold may not require complete evacuation of oxygen from the system. In this case test the system at its current pressure and verify there are no leaks.

(4) Remove all leak test compound from fittings and connections after successful completion of the leak test.

7. Flow Testing

A. Connect an oxygen flow meter to one of the overhead cabin manifold ports.

B. Toggle the oxygen logic and display panel switch to ON.

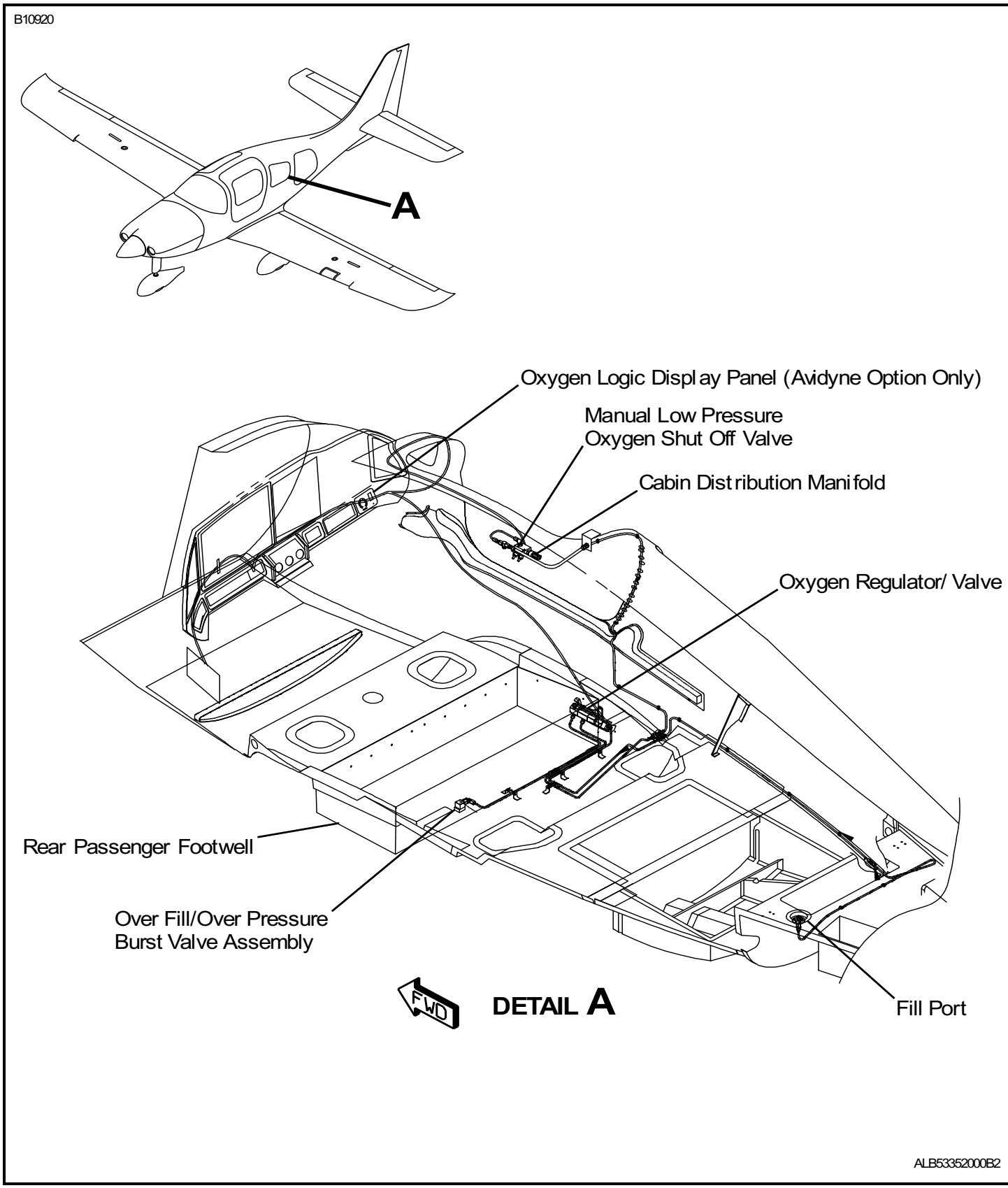
C. Immediately check the oxygen flow and verify that it is a minimum of 0.43 cubic feet per minute. Flow of less than 0.43 cubic feet per minute is indication of a constriction in the system or a malfunction of one or more system components.

D. Immediately switch the oxygen logic and display panel switch to OFF.

E. Disconnect the oxygen flow meter.

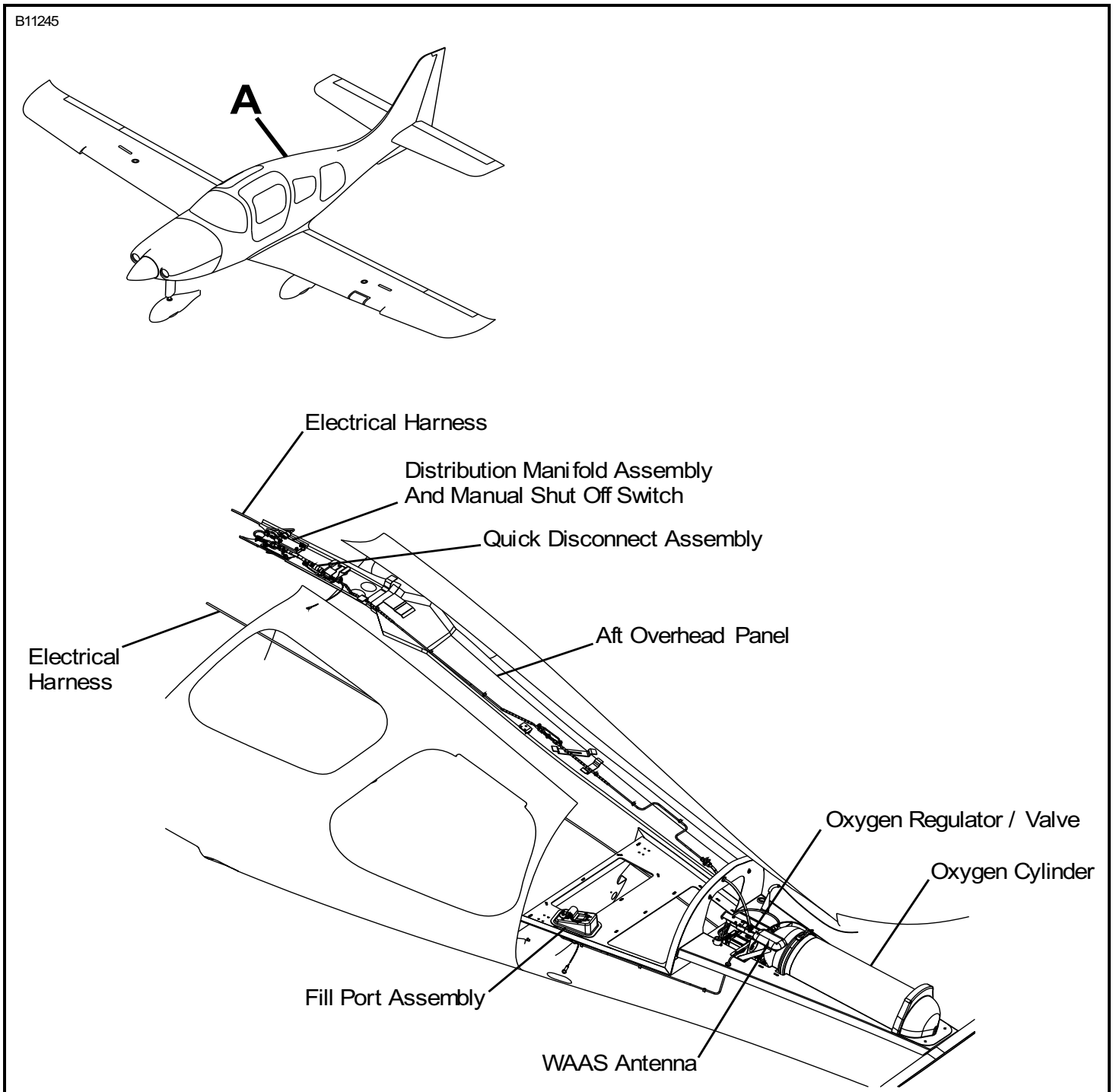
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Figure 1 : Sheet 1 : Oxygen System



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Figure 1 : Sheet 2 : Oxygen System



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OXYGEN - ADJUSTMENT/TEST

1. Garmin G1000 System Annual Inspection

A. If the Garmin G1000 system is installed do the steps that follow and the regular annual inspection of the oxygen system.

(1) Put external electrical power on the airplane.

(2) Set the master BATT switches (left SW01 and right SW02) to the ON position.

(3) Set the AVIONICS MASTER switch (SW04) to the ON position.

(4) Make sure that the oxygen system is charged to more than 250 PSI.

(a) Make sure that an oxygen CAS message does not show on the muliti-functional display (MFD).

(5) Plug an oxygen mask with a flow indicator into the distribution manifold.

(6) Push the oxygen soft key on the MFD.

(7) Set the oxygen switch at the distribution manifold to ON.

(8) Make sure that:

(a) A CAS message for oxygen (airplane on the ground) shows on the MFD.

(b) The oxygen outlet pressure is in the green band.

(c) The mask is flowing oxygen.

(9) Turn the oxygen switch at the distribution manifold to the OFF position.

(10) Push the oxygen key on the GTC 570 to set the oxygen to on.

(11) Make sure that:

(a) The oxygen outlet pressure stays at zero.

(b) No oxygen is flowing to the mask.

(c) A no flow detected but the oxygen system is turned on CAS message shows on the MFD.

(12) Turn the oxygen switch at the distribution manifold to ON and make sure that:

(a) The outlet pressure increases.

(b) the oxygen pressure CAS message on the MFD no longer shows.

(13) Push the oxygen soft key on the MFD to turn off the oxygen system.

(a) Oxygen CAS messages do not show on the MFD.

2. Garmin G2000 System Annual Inspection

A. If the Garmin G2000 system is installed do the steps that follow and the regular annual inspection of the oxygen system.

(1) Put external electrical power on the airplane.

(2) Set the master BATT switches (left SW01 and right SW02) to the ON position.

(3) Set the AVIONICS MASTER switch (SW04) to the ON position.

(4) Make sure that the oxygen system is charged to more than 250 PSI.

(a) Make sure that an oxygen CAS message does not show on the multifunctional display (MFD).

(5) Plug an oxygen mask with a flow indicator into the distribution manifold.

(6) On the Aircraft Systems page, push the oxygen key on the Touchscreen Controller (GTS 570).

(7) Set the oxygen switch at the distribution manifold to ON.

(8) Make sure that:

(a) The CAS message OXYGEN ON (white) shows on the MFD.

(b) The oxygen outlet pressure is 17 to 41 psi.

(c) The mask is flowing oxygen.

(9) Press the oxygen key on the GTC 570 and make sure that:

(a) The oxygen outlet pressure decreases to zero as the system runs out of air.

(b) The mask should stop flowing oxygen.

(10) Turn the oxygen switch at the distribution manifold to the OFF position.

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(11) Push the oxygen key on the GTC 570 to set the oxygen to on.

(12) Make sure that:

(a) The oxygen outlet pressure stays at zero.

(b) No oxygen is flowing to the mask.

(c) The OXYGEN PRES CAS message shows on the MFD.

(13) Turn the oxygen switch at the distribution manifold to ON and make sure that:

(a) The outlet pressure increases.

(b) The OXYGEN PRES CAS message on the MFD no longer shows.

(14) Push the oxygen key on the GTC 570 to turn off the oxygen system.

(a) Oxygen CAS messages do not show on the MFD.

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OXYGEN SYSTEM - MAINTENANCE PRACTICES

1. Oxygen Cylinder

A. **S/N 41001 thru 411124** - (Refer to Figure 201 and Figure 202).

(1) **Removal of Oxygen Cylinder(s)**

(a) Remove the oxygen regulator/valve as described in the Oxygen Regulator/Valve paragraph.

(b) Cap or plug the open ends of tubing and fittings to protect against contamination.

(c) Disconnect the grounding strap from the cylinder distribution manifolds.

(d) Disconnect tubing from the center cylinder distribution manifold. Discard Seco seals.

(e) Cap or plug the open ends of tubing and fittings to protect against contamination.

(f) Loosen the ring clamp that secures the center cylinder to the cylinder support cradle in the wing.

(g) Slide the center cylinder out through the ring clamp and through the opening in the footwell. Retain the ring clamp.

(h) Remove the cylinder.

(i) Disconnect tubing from the left cylinder distribution manifold and cap or plug the open ends of tubing and fittings to protect against contamination. Discard Seco Seals.

(j) Loosen the ring clamp that secures the cylinder to the cylinder support cradle in the wing.

(k) Slide the cylinder forward until its base clears the rear cradle. The cylinder may now be maneuvered into the center cylinder support cradle and out through the aircraft footwell. Retain the ring clamp.

(l) Repeat the steps above beginning at disconnecting the tubing from the left cylinder distribution manifold for the right cylinder.

(2) **Installation of Oxygen Cylinder(s)**

(a) Insert the right cylinder, base first, through the opening in the aircraft footwell and maneuver it into the right cradle. Ensure the base of the cylinder seats into the rear of the cylinder cradle.

(b) Slide the ring clamp over the top of the cylinder and under the lip of the forward cylinder cradle.

(c) Insert the left cylinder, base first, through the opening in the aircraft footwell and maneuver it into the left cradle. Ensure the base of the cylinder seats into the rear of the cylinder cradle.

(d) Slide the ring clamp over the top of the cylinder and under the lip of the forward cylinder cradle.

(e) Insert the center cylinder, base first, through the opening in the aircraft footwell and maneuver it into the center cradle. Ensure the base of the cylinder seats into the rear of the cylinder cradle.

(f) Connect the tubing between the left cylinder distribution manifold and the center cylinder distribution manifold. Use new Seco seals.

(g) Connect tubing between the right cylinder distribution manifold and the center cylinder distribution manifold. Use new Seco seals.

(h) Install the oxygen regulator/valve as described in the Oxygen Regulator/Valve paragraph.

(i) Adjust the position of the cylinders within the cylinder cradle until the lower lip of the forward cradle is just aft of the sloped top of the cylinder.

(j) Tighten the ring clamps and torque 90 in-lbs.

(k) Connect the tubing between the center cylinder distribution manifold and the oxygen regulator/valve.

(l) Reconnect the grounding strap to the cylinder distribution manifolds.

(m) Charge and test the system for leakage. Refer to, Leakage Testing.

(n) If leakage is found, discharge the oxygen and reinstall the tubing and fittings until the leakage is corrected. Do not attempt to correct any leakage or misalignment of a joint by overtorquing. Instead, disassemble and check for nicks, burrs, dirt, etc. Reassemble using new parts if necessary.

(o) Test the system for flow rate. Refer to, Flow Testing .

(p) Purge the system. Refer to, Oxygen System Purging .

(q) Replace the rear seat footwell and carpet. Refer to Chapter 25, Footwell - Maintenance Practices for detailed instructions.

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(r) Service the system as described in Chapter 12.

B. **S/N 411125 and On and Model T240**

(1) **Removal of the Oxygen Cylinder**

(a) Discharge the oxygen system per the Oxygen System Depressurization and Evacuation section.

(b) Remove the antenna bulkhead access panel per Chapter 25.

(c) Disconnect all grounding braids, as necessary.

(d) Disconnect all electrical connectors.

(e) Disconnect the WAAS antenna.

(f) Disconnect all tubing from the regulator/valve.

(g) Discard the Seco seals.

(h) Cap or plug the open ends of tubing and the regulator/valve inlets and outlets to protect against contamination.

(i) Remove the oxygen cylinder forward support bracket. Retain hardware.

(j) Release the cylinder band clamp and remove the cylinder.

(2) **Installation of the Oxygen Cylinder**

(a) Insert the cylinder into its cradle ensuring that it seats correctly into the aft cylinder support bracket.

(b) Install the cylinder forward support bracket. Ensure the cylinder is secured against the aft bracket and there is no gap between the aft face of the vinyl trim of the cylinder neck support and the cylinder before fastening the bolts. Torque 28 to 34 inch-pounds.

(c) Fasten the cylinder band clamp. Torque 25 to 28 inch-pounds.

(d) Connect all tubing. Use new Seco seals.

(e) Connect all ground braids and electrical connections.

(f) Charge and test the system for leakage. Refer to Oxygen - Maintenance Practices, Leakage Testing.

(g) If leakage is found, discharge the oxygen and reinstall the tubing and fittings until the leakage is corrected. Do not attempt to correct any leakage or misalignment of a joint by over-torquing. Instead, disassemble and check for nicks, burrs, dirt, etc. Reassemble using new parts if necessary.

(h) Test the system for flow rate. Refer to Oxygen - Maintenance Practices, General Oxygen System.

(i) Purge the system. Refer to Oxygen - Maintenance Practices, Oxygen System Purging.

(j) Reconnect the WAAS antenna.

(k) Replace the antenna bulkhead access panel. Refer to Chapter 25, Access Panels - Maintenance Practices, Antenna Bulkhead Panel.

(l) Service the system as described in Chapter 12.

C. **Servicing and Maintenance** - The oxygen cylinders must be inspected whenever malfunction occurs, and hydrostatically tested every 5 years. However, if oxygen cylinder P/N 026N2001-3SCI is installed, it must be hydrostatically tested every 3 years.

(1) Concurrent with hydrostatic testing of the cylinders, all lines and connections should be carefully examined for leaks and abrasions, scratches, or any other damage due to vibration or looseness. Cylinder cradles and ring clamps should be examined for security and to ascertain that they do not damage the cylinder in any way. Check clamps for tightness and retorque as necessary.

(2) The date of hydrostatic testing must be metal stamped on the shoulder of each metal cylinder or on the metal neck of the non-metallic cylinder. A cylinder should never be refilled if it is near the expiration point of the most recent date stamp. At the time of hydrostatic testing, all cylinders should be examined for evidence of scratches, abrasions, bulges, or mishandling per Compressed Gas Association Pamphlet, "Standards for Visual Inspection of Compressed Gas Cylinders (CGA Pamphlet C-6)." If cylinder damage is suspected, properly dispose of the cylinder and replace with new.

WARNING: Refer to Section 35-00-00, Safety Guidelines For Servicing The Oxygen System before attempting any servicing or maintenance of the oxygen system.

2. Tubing

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A. **General** - All internal surfaces of tubing, hose assemblies, and fittings must be kept clean, and free of dust and petroleum contaminants. External and internal threads must be protected from contamination and damage prior to use in assembly. Regulators, gauges, and valves should have all open ports closed with oxygen clean and non-shredding polyethylene plugs or caps. Caps and plugs should be green or of a color to distinguish them from caps or plugs used on oily equipment. Where a cap or plug cannot be used, the opening should be sealed in a manner that insures protection.

(1) Masking or self-sealing tapes, paper, pressure sensitive materials, hot dip coatings, rubber, soft plastic or adhesives should not be used. High density plastic closure materials such as Teflon or polyethylene are acceptable.

(2) All items are to be shipped in clean plastic bags with nomenclature tags in or securely attached to the package and shipping container. Nomenclature tags must include title, part number, other information as required and include the following or similar statement: CLEANED FOR OXYGEN SERVICE. DO NOT ALLOW PETROLEUM CONTAMINANTS OF ANY KIND TO BE USED OR STORED ON OR ABOUT THIS CONTAINER. Nomenclature tags must be attached to the package or shipping container in such a way as to allow identification of the item without breaking the container or tag.

(3) No component of the oxygen system is to be internally exposed for more than 10 minutes. If exposed for more than 10 minutes the component must be cleaned.

(4) Any component of the oxygen system that requires cleaning, should have contamination blown out using canned or dry filtered air and be cleaned with oxygen system cleaning compound conforming to MIL-C-8638, Heavy Duty Degreaser C by Micro Care, trichloroethylene, acetone, or hexane. These solvents must be fresh, not having been used for any other purpose. Blow the tubing and fittings clean and dry with a steam of nitrogen (Heavy Duty Cleaner C does not require this step). Visually inspect immediately for cleanliness, and cover with clean protective plugs, caps and bags.

NOTE: All oxygen tubing flare fittings are to be installed with Chrsto-Lube MCG111 (MIL-PRF- 27617) lubricant. All pipe thread joints, on tapered pipe threads only and not on flare fittings, must be wrapped with teflon tape conforming to MIL-T-27730A.

B. **O-Ring Installation** - Use only O-rings that conform to MS 28778 which specifies 90 durometer nitrile per MIL-P-5510.

(1) Prior to installation, visually inspect the O-ring for cuts, nicks, and excessive flashing. Most leaks are caused by damaged O-rings. No lubrication is allowed on the O-rings in the oxygen system. Protect O-rings from damage from threads during assembly with a sleeve temporarily installed over the threads.

(2) Ensure the O-ring port is free of contamination prior to assembly. If necessary, remove contaminants with oxygen system cleaning compound conforming to MIL-C- 8638. On tapered pipe thread joints only, wrap the threads with teflon tape conforming to MIL-T-27730A. When installing O-ring sealed fittings, turn the fitting into the straight thread boss until the metal back-up washer contacts the face of the boss, forcing the O-ring into the port. For elbows and tees, back off fitting one turn and position fitting to proper angular direction. Hold fitting in position while tightening locknut.

(3) Torque steel to steel O-ring port fittings 95 to 140 in.-lbs. (7.9 to 11.7 ft.-lbs.) dry torque value.

(4) Torque steel, aluminum, or brass to any combination of steel, aluminum, or brass Oring port fittings 70 to 105 in.-lbs. (5.8 to 8.8 ft.-lbs.) dry torque value.

(5) When attaching stainless steel to stainless steel or stainless steel to aluminum, use Christo-Lube MCG111 (MIL-PRF-27617) lubricant on the fitting threads. To prevent contamination, do not apply the lubricant to the tapered seat. Use the lower torque value indicated above when lubricant is used.

C. **Removal of Tubing**

(1) Discharge the oxygen system per the Section 35-00-00, Oxygen System Depressurization And Evacuation paragraph.

(2) Remove the rear seats, the center overhead light panel (COLP), aft overhead side panel right (AOSPR), middle lower side panel right (MLSPR), baggage lower side panel right (BLSPR), carpeting on floor and hat rack, and rear seat footwell as required. Refer to Section 25-30-00 for detailed instructions.

(3) Remove clamps and grounding strap from the portion of tubing to be removed. Retain hardware.

(4) Cut tie wraps securing tubing.

(5) Unscrew the nut at the end of the tubing and slide it away from the end of the fitting. At the Swagelok fitting, disconnect tubing per the fitting manufacturer's instructions.

(6) Disconnect the tubing and remove the Seco seal. Discard the Seco seal.

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(7) Temporarily cap or plug the end of the fitting so that contamination will not enter the oxygen system.

(8) Repeat the following steps at the other end of the tubing.

(a) Remove clamps and grounding strap from the portion of tubing to be removed. Retain hardware.

(b) Cut tie wraps securing tubing.

(c) Unscrew the flare nut at the end of the tubing and slide it away from the flared end of the fitting.

(d) Disconnect the tubing and remove the Seco seal. Discard the Seco seal.

(e) Temporarily cap or plug the end of the fitting so that contamination will not enter the oxygen system.

(9) Remove the tubing.

D. **Installation of Tubing**

(1) Apply spiral wrap to new tubing to match that of the tubing removed.

(2) At the Swagelok fitting, attach tubing per the fitting manufacturer's instructions.

(3) For flared tubing, apply Christo-Lube MCG111 (MIL-PRF-27617) lubricant to the male fitting threads. Do not apply compound to the first thread of the fitting or to the tapered seat of the tubing.

(4) As applicable, install the Seco seal (dry, no lubricant permitted) onto male portion of fitting.

(5) Thread flare nut onto male fitting several turns with fingers until connection is snug. If the nut cannot be tightened with fingers, disassemble and correct problem to prevent damage to Seco seal.

(6) Torque flare nut to the value in Table 201.

(7) Wait 15 seconds for Seco seal to compress and deform.

(8) Do not loosen the flare nut. Torque flare nut again to value in Table 201.

(9) Charge and test the system for leakage per the Section 35-00-00, Leakage Testing paragraph.

(10) If leakage is found, discharge the oxygen and reinstall the tubing until the leakage is corrected. Do not attempt to correct any leakage or misalignment of a joint by overtorquing. Instead, disassemble and check for nicks, burrs, dirt, etc. Reassemble using new parts if necessary. The Seco seal must be replaced if the joint is disassembled.

(11) Fittings equipped with O-rings are installed as indicated in the O-Ring Installation section. Remove old O-rings and replace with new.

(12) Test the system for flow rate per the Section 35-00-00, Flow Testing paragraph.

(13) Secure the tubing to tie blocks with tie wrap.

(14) Reinstall the grounding strap across all affected fittings. Refer to Figure 203.

(15) Mark all tubing with breathing oxygen label tape, per MIL-STD-595B and MIL-STD- 1247C, located within 3 inches of all fittings and at intervals along the lines not to exceed 48 inches.

(16) Purge the system as described in the Section 35-00-00, Oxygen System Purging paragraph.

(17) Reinstall the rear seat footwell, carpeting on the floor and the hat rack, and the interior panels. Refer to Chapter 25 for detailed instructions.

(18) Service the system as described in Chapter 12.

Table 201. Flare Nut Torque with Seco Seals

Tube Flare Nut Torque (with Seco seals)					
Size	**Tube O.D.**	**Material and Torque Specification**			
		Tube Material	**Fitting Material**	**Threads PER MIL-S-8879**	***Inch Pounds**
- 2	0.125	SST	Steel	.3125-24UNJF-3B	35-50
		Aluminum	Steel	.3125-24UNJF-3B	22-30
		Aluminum	Aluminum	.3125-24UNJF-3B	22-30
		SST	Steel	.375-24UNJF-3B	75-100

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- 3	0.188	Aluminum	Steel	.375-24UNJF-3B	30-45
		Aluminum	Aluminum	.375-24UNJF-3B	30-45
- 4	0.250	SST	Steel	.4375-20UNJF-3B	115-150
		Aluminum	Steel	.4375-20UNJF-3B	40-60
		Aluminum	Aluminum	.4375-20UNJF-3B	40-60

* Wet torque values shown

E. **Servicing and Maintenance** - The oxygen system tubing must be inspected every 5 years or whenever malfunction occurs.

WARNING: Refer to Section 35-00-00, Safety Guidelines For Servicing The Oxygen System before attempting any servicing or maintenance of the oxygen system.

3. Fill Port

A. **S/N 41001 to 411124** - (Refer to Figure 204, Sheet 1 and Figure 204, Sheet 2.)

(1) **Removal of Fill Port**

(a) Discharge the oxygen system per the Section 35-00-00, Oxygen System Depressurization And Evacuation paragraph.

(b) Remove the hat rack carpet. Refer to Section 25-30-00, Hat Rack Carpet for detailed instructions.

(c) Remove the baggage bulkhead access panel by unscrewing the attachment screws.

(d) Disconnect the tubing.

(e) Temporarily seal the end of the fitting so that contamination will not enter the oxygen system.

(f) Remove the three pan head screws, nuts, and washers that secure the fill port to the baggage bulkhead.

(g) Remove the fill port, screw on cap, and bezel.

(2) **Installation of Fill Port**

(a) Insert the fill port into the baggage bulkhead.

(b) Place the bezel over the fill port and align all screw holes with the holes in the baggage bulkhead.

(c) Install three pan head screws, washers, and nuts ensuring that the screw on cap chain and the grounding strap are attached to the fill port. Tighten the screws snug.

(d) Attach tubing.

(e) Charge and test the system for leakage as described in the Section 35-00-00, Leakage Testing paragraph.

(f) If leakage is found, discharge the oxygen and reattach the tubing until the leakage is corrected. Do not attempt to correct any leakage or misalignment of a joint by over-torquing. Instead, disassemble and check for nicks, burrs, dirt, etc. Reassemble using new parts if necessary.

(g) Purge the system as described in Section 35-00-00, Oxygen System Purging paragraph.

(h) Reinstall the baggage bulkhead access panel.

(i) Reinstall the hat rack carpet. Refer to Section 25-30-00, Hat Rack Carpet for detailed instructions.

(j) Service the system as described in Chapter 12.

B. **S/N 411125 and On and Model T240**

(1) **Removal of Fill Port**

(a) Discharge the oxygen system per Section 35-00-00, Oxygen System Depressurization and Evacuation.

(b) Remove the filler bezel in order to gain access to the filler bracket.

(c) Remove the hat rack carpet. Refer to Section 25-30-00, Hat Rack Carpet for detailed instructions.

(d) Remove the baggage bulkhead access panel.

(e) Disconnect the ground braid, as necessary.

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(f) Disconnect the tubing.

(g) Temporarily seal the end of the fittings so that contamination will not enter the oxygen system.

(h) Remove the 8 screws attaching the filler block to the filler bracket.

(i) Remove the filler block.

(2) **Installation of Fill Port**

(a) Insert the filler block into the filler bracket.

(b) Attach the filler block to the filler bracket. Ensure the terminal ring of the ground braid is installed between the lock washer and the screw.

(c) Attach tubing.

(d) Charge and test the system for leakage as described in Section 35-00-00, Leakage Testing.

(e) If leakage is found, discharge the oxygen and reattach the tubing until the leakage is corrected. Do not attempt to correct any leakage or misalignment of a joint by over-torquing. Instead, disassemble and check for nicks, burrs, dirt, etc. Reassemble using new parts if necessary.

(f) Purge the system as described in Section 35-00-00, Oxygen System Purging.

(g) Reinstall the baggage bulkhead access panel.

(h) Reinstall the hat rack carpet. Refer to Section 25-30-00, Hat Rack Carpet for detailed instructions.

(i) Reinstall the filler bezel.

(j) Service the system as described in Chapter 12.

C. **Servicing and Maintenance** - The fill port must be inspected every 5 years or whenever malfunction occurs.

WARNING: Refer to Section 35-00-00, Safety Guidelines For Servicing The Oxygen System before attempting any servicing or maintenance of the oxygen system.

4. Overfill/Over-Pressure Burst Valve Assembly

A. On S/N 41002 to 41069, the burst valve assembly operates using a copper or stainless steel disk that will fail due to overfill or over-pressure of the oxygen system. Should this ever occur, the burst valve should be replaced with a new burst valve equipped with a burst cartridge. Refer to Figure 205, Sheet 1 and Figure 205, Sheet 2.For aircraft S/N 411125 and on, the over fill/over pressure burst valve assembly is integral with the regulator/valve. Should replacement of the burst valve be required, the oxygen cylinder with regulator/valve attached must be returned to Precise Flight, Inc.

(1) **Removal and Installation of the Burst Cartridge** - Replacement of the burst cartridge is only required when the cartridge has burst due to an overfill or overpressure of the oxygen system. Refer to Figure 205, Sheet 2.

(a) Locate the exit orifice of the burst valve assembly in the underside of the wing.

(b) Using a hex wrench inserted into the orifice, unscrew the burst cartridge from the burst valve assembly.

(c) Installation is the reverse of removal.

(d) Install a green plug to cap the burst valve at the opening in the underside of the wing.

(e) Purge the system per Section 35-00-00, Oxygen System Purging.

(f) Service the system per Chapter 12.

(2) **Removal of Overfill/Over-Pressure Burst Valve Assembly**

(a) Discharge the oxygen system per Section 35-00-00, Oxygen System Depressurization And Evacuation.

(b) Seal the burst valve with a plug, cap, or other means to prevent contamination from entering the oxygen system.

(c) Remove the rear seat carpet and footwell. Refer to Chapter 25 for detailed instructions.

(d) Disconnect tubing and remove the Seco seals. Discard the Seco seals.

(e) Temporarily cap or plug the end of the tubing so that contamination will not enter the oxygen system.

(f) Remove the grounding strap from the burst valve. Retain hardware.

(g) If present, remove the green plug that caps the burst valve at the underside of the wing.

(h) From the underside of the wing, unscrew the four nylon screws that hold the burst valve to the fuselage.

(i) Remove the valve.

(j) Temporarily cap or plug the end of the fitting or tubing so that contamination will not enter the oxygen system.

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(3) **Installation of Overfill/Over-Pressure Burst Valve Assembly**

(a) Align all screw holes in the burst valve with the holes in the fuselage.

(b) With an assistant, install the four nylon screws and torque to 5 in-lbs.

(c) Attach tubing.

(d) Charge and test the system for leakage per the Section 35-00-00, Leakage Testing paragraph.

(e) If leakage is found, discharge the oxygen and reinstall the tubing until the leakage is corrected. Do not attempt to correct any leakage or misalignment of a joint by overtorquing. Instead, disassemble and check for nicks, burrs, dirt, etc. Reassemble using new parts if necessary. The Seco seal must be replaced if the joint is disassembled.

(f) Test the system for flow rate per the Section 35-00-00, Flow Testing paragraph.

(g) Reinstall the grounding strap to the burst valve.

(h) Purge the system per the Section 35-00-00, Oxygen System Purging paragraph.

(i) Install the green plug to cap the burst valve at the opening in the underside of the wing.

(j) Reinstall the rear seat footwell and carpet. Refer to Section 25-96-00, Footwell for detailed instructions.

(k) Service the system per Chapter 12.

(4) **Servicing and Maintenance** - The overfill/over-pressure burst valve must be inspected every 5 years or whenever malfunction occurs.

WARNING: Refer to Safety Guidelines For Servicing The Oxygen System before attempting any servicing or maintenance of the oxygen system.

5. Oxygen Regulator/Valve

A. For aircraft S/N 41001 thru 411124, refer to Figure 206 and the procedures below. For aircraft S/N 411125 and On, the regulator/valve is attached directly to the oxygen cylinder; the oxygen cylinder with regulator/valve attached must be sent to Precise Flight, Inc. should maintenance or repair be required.

(1) **Removal of Regulator/Valve**

(a) Discharge the oxygen system per Section 35-00-00, Oxygen System Depressurization And Evacuation.

(b) Remove the rear seat carpet and footwell. Refer to Chapter 25 for detailed instructions.

(c) Remove the clamp and grounding strap from the tubing as required. Retain hardware.

(d) Disconnect the electrical connector.

(e) Disconnect all tubing from the regulator/valve.

(f) Discard the Seco seals.

(g) Cap or plug the open ends of tubing and the regulator/valve inlets and outlets to protect against contamination.

(h) Remove the two hex head cap screws, washers, and nuts holding the regulator/valve to the wing rib.

(i) Remove the regulator/valve.

(2) **Installation of Regulator/Valve**

(a) Align screw holes in the regulator/valve with the holes in the wing rib.

(b) Install the two hex head cap screws, washers, and nuts ensuring that the grounding strap is attached to the upper screw. Tighten 30 to 36 in-lbs.

(c) Attach fittings and tubing.

(d) Fittings equipped with O-rings are installed as indicated in the paragraph O-Ring Installation. Remove the old O-ring and replace with new.

(e) Charge and test the system for leakage per Section 35-00-00, Leakage Testing.

(f) If leakage is found, discharge the oxygen, and reinstall the tubing until the leakage is corrected. Do not attempt to correct any leakage or misalignment of a joint by overtorquing. Instead, disassemble and check for nicks, burrs, dirt, etc. Reassemble using new parts if necessary. The Seco seal must be replaced if the joint is disassembled.

(g) Test the system for flow rate per Section 35-00-00, Flow Testing.

(h) Purge the system per Section 35-00-00, Oxygen System Purging.

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(i) Replace the rear seat footwell and carpet. Refer to Section 25-96-00, Footwell for detailed instructions.

(j) Service the system as described in Chapter 12.

(3) **Regulator/Valve Servicing and Maintenance** - The regulator/valve must be inspected whenever malfunction occurs, and overhauled every 5 years. During overhaul replace o-rings and verify the regulator pressure setting.

WARNING: Refer to Section 35-00-00, Safety Guidelines For Servicing The Oxygen System before attempting any servicing or maintenance of the oxygen system.

6. Manual Low Pressure Oxygen Shut-Off Valve

A. **S/N 41002 to 41069** - (Refer to Figure 207, Sheet 1, Figure 207, Sheet 2, Figure 208, Sheet 1 and Figure 208, Sheet 2.)

(1) **Removal of the Manual Low Pressure Oxygen Shut-Off Valve**

(a) Discharge the oxygen system per the Section 35-00-00, Oxygen System Depressurization And Evacuation paragraph.

(b) Remove the nut, washer, and switch cover attaching the shut-off valve to the overhead light panel and the overhead bracket beneath.

(c) Remove the four pan head screws affixing the cover plate to the overhead light panel and the overhead bracket beneath; and remove the plate.

(d) Remove the forward center overhead light panel per Chapter 25.

(e) Disconnect the tubing and remove the Seco seals. Discard the Seco seals.

(f) Temporarily cap or plug any open fittings or tubing so that contamination will not enter the oxygen system or the valve.

(g) Remove the shut-off valve.

(2) **Installation of the Manual Low-Pressure Oxygen Shut-Off Valve**

(a) Attach the tubing to the shut-off valve.

(b) Temporarily attach the shut-off valve to the overhead bracket with the washer and nut.

(c) Charge and test the system for leakage as described in the paragraph Section 35-00-00, Leakage Testing.

(d) If leakage is found, discharge the oxygen and reinstall the tubing until the leakage is corrected. Do not attempt to correct any leakage or misalignment of a joint by overtorquing. Instead, disassemble and check for nicks, burrs, dirt, etc. Reassemble using new parts if necessary. The Seco seal must be replaced if the joint is disassembled.

(e) Test the system for flow rate per the Section 35-00-00, Flow Testing paragraph.

(f) Remove the nut and washer holding the shut-off valve to the overhead bracket.

(g) Reinstall the forward center overhead light panel per Chapter 25.

(h) Reinstall the cover plate and tighten the four pan head screws 10 to 12 in.-lbs.

(i) Place the switch cover over the shut-off valve toggle switch, and attach the assembly to the overhead light panel and cover plate using the nut and washer.

(j) Purge the system as described in the paragraph Section 35-00-00, Oxygen System Purging.

(k) Service the system as described in Chapter 12.

B. **S/N 41070 and On and Model T240**

(1) **Removal of the Manual Low Pressure Oxygen Shut-Off Valve**

(a) Turn off the low-pressure oxygen supply to the cabin distribution manifold as follows:

1 For the Avidyne option, use the switch on the logic and display panel.

2 For the Garmin G1000 option, use the softkey on the MFD.

3 For the T240 Garmin G2000 installation, use the Touchscreen Controller 570.

(b) Remove the forward center overhead light panel per Section 25-30-00, Forward Center Overhead Light Panel.

(c) Disconnect the electrical connector from the manifold.

(d) Remove the clamps and grounding strap as required. Retain hardware.

(e) Disconnect the flexible oxygen hose at the quick disconnect bulkhead connector. Refer to Figure 209, Sheet 1.

(f) Remove the nut, washer, and switch cover attaching the shut-off valve to the overhead light panel and the

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overhead bracket beneath.

(g) Disconnect the tubing from the shut-off valve and remove the Seco seals. Discard the Seco seals.

(h) Temporarily cap or plug all open tubing and fittings so that contamination will not enter the oxygen system or the manifold.

(i) Remove the shut off valve.

(2) **Installation of the Manual Low Pressure Oxygen Shut-Off Valve**

(a) Attach the tubing to the shut off valve.

(b) Temporarily attach the shut off valve to the overhead bracket with the washer and nut.

(c) Charge and test the system for leakage as described in the paragraph Section 35-00-00, Leakage Testing.

(d) If leakage is found, reinstall the tubing fittings until the leakage is corrected. Do not attempt to correct any leakage or misalignment of a joint by over-torquing. Instead, disassemble and check for nicks, burrs, dirt, etc. Reassemble using new parts if necessary. The Seco seal must be replaced if the joint is disassembled.

(e) Fittings equipped with O-rings are installed as indicated in the paragraph O-Ring Installation. Remove the old O-rings and replace with new.

(f) Test the system for flow rate per the Section 35-00-00, Flow Testing.

(g) Remove the nut and washer holding the shut off valve to the overhead bracket.

(h) Reinstall the forward center overhead light panel per Section 25-30-00, Forward Center Overhead Light Panel.

(i) Reinstall the cover plate and tighten the 4 pan head screws 10 to 12 in.-lbs.

(j) Place the switch cover over the shut off valve toggle switch and attach the assembly to the overhead light panel and cover plate using the nut and washer.

(k) Purge the system as described in Section 35-00-00, Oxygen System Purging.

(l) Service the system as described in Chapter 12.

C. **Servicing and Maintenance** - The shut off valve must be inspected every 5 years or whenever malfunction occurs.

WARNING: Refer to Section 35-00-00, Safety Guidelines For Servicing The Oxygen System before attempting any servicing or maintenance of the oxygen system.

7. Cabin Distribution Manifold

A. **S/N 41002 to 41069** - (Refer to Figure 208, Sheet 1, Figure 208, Sheet 2, Figure 208, Sheet 3, Figure 209, Sheet 1, Figure 209, Sheet 2, and Figure 209, Sheet 3.)

(1) **Removal of Cabin Distribution Manifold**

(a) Discharge the oxygen system per Section 35-00-00, Oxygen System Depressurization And Evacuation.

(b) Switch the shut off valve for the cabin distribution manifold to OFF.

(c) Remove the nut and washer that affix the shut off valve and switch cover to the overhead panel and the bracket beneath.

(d) Remove the four pan head screws affixing the cover plate to the overhead light panel and the bracket beneath; and remove the plate.

(e) Remove the forward center overhead light panel per Section 25-30-00, Forward Center Overhead Light Panel.

(f) Disconnect the electrical connector from the manifold.

(g) Disconnect the tubing from the manifold and remove the Seco seals. Discard the Seco seals.

(h) Temporarily cap or plug all open tubing and fittings so that contamination will not enter the oxygen system or the manifold.

(i) Remove the four cap screws and washers holding the manifold to the overhead bracket.

(j) Remove the manifold.

(2) **Installation of the Cabin Distribution Manifold**

(a) Align the screw holes in the manifold with the holes in the overhead bracket and install the four cap screws and washers. Torque the screws 20 to 25 in.-lbs.

(b) Attach the tubing.

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(c) Temporarily attach the shut off valve to the overhead bracket with the washer and nut.

(d) Charge and test the system for leakage as described in Section 35-00-00, Leakage Testing.

(e) If leakage is found, discharge the oxygen and reinstall the tubing fittings until the leakage is corrected. Do not attempt to correct any leakage or misalignment of a joint by overtorquing. Instead, disassemble and check for nicks, burrs, dirt, etc. Reassemble using new parts if necessary. The Seco seal must be replaced if the joint is disassembled.

(f) Fittings equipped with O-rings are installed as indicated in the paragraph O-Ring Installation . Remove the old O-rings and replace with new.

(g) Test the system for flow rate per the Section 35-00-00, Flow Testing.

(h) Remove the nut and washer holding the shut-off valve to the overhead bracket.

(i) Reinstall the forward center overhead light panel per Chapter 25.

(j) Reinstall the cover plate and tighten the 4 pan head screws 10 to 12 in.-lbs.

(k) Place the switch cover over the shut-off valve toggle switch and attach the assembly to the overhead light panel and cover plate using the nut and washer.

(l) Reinstall the forward center overhead light panel per Chapter 25.

(m) Purge the system as described in the paragraph Section 35-00-00, Oxygen System Purging.

(n) Service the system as described in Chapter 12.

B. **S/N 41070 and On and Model T240**

(1) **Removal of Cabin Distribution Manifold**

(a) Turn off the low-pressure oxygen supply to the cabin distribution manifold as follows:

1 For the Avidyne option, use the switch on the logic and display panel.

2 For the Garmin G1000 option, use the softkey on the MFD.

3 For the T240 Garmin G2000 installation, use the Touchscreen Controller 570.

(b) Remove the forward center overhead light panel per Chapter 25.

(c) Disconnect the electrical connector from the manifold.

(d) Remove the clamps and grounding strap as required. Retain hardware.

(e) Disconnect the flexible oxygen hose at the quick disconnect bulkhead connector. Refer to Figure 208, Sheet 2.

(f) Disconnect the tubing from the manifold and remove the Seco seals. Discard the Seco seals.

(g) Temporarily cap or plug all open tubing and fittings so that contamination will not enter the oxygen system or the manifold.

(h) Remove the four pan head screws affixing the cover plate and the cabin distribution manifold support bracket to the overhead light panel.

(i) Remove the four cap screws and washers, or screws, washers and nuts, as applicable, holding the manifold to the manifold support bracket.

(j) Remove the manifold.

(2) **Installation of the Cabin Distribution Manifold**

(a) Align the screw holes in the manifold with the holes in the manifold support bracket and install the four cap screws and washers. Torque the screws 20 to 25 in.-lbs.

(b) Install the four pan head screws affixing the cover plate and the cabin distribution manifold support bracket to the overhead light panel. Tighten the screws snug.

(c) Attach the tubing.

(d) Connect the flexible oxygen hose to the quick disconnect bulkhead connector. Refer to Figure 209, Sheet 2.

(e) Connect the electrical connector

(f) Install the clamps and grounding strap.

(g) Charge and test the system for leakage as described in Section 35-00-00, Leakage Testing.

(h) If leakage is found, reinstall the tubing fittings until the leakage is corrected. Do not attempt to correct any

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leakage or misalignment of a joint by overtorquing. Instead, disassemble and check for nicks, burrs, dirt, etc. Reassemble using new parts if necessary. The Seco seal must be replaced if the joint is disassembled.

(i) Fittings equipped with O-rings are installed as indicated in the paragraph O-Ring Installation. Remove the old O-rings and replace with new.

(j) Test the system for flow rate per the Section 35-00-00, Flow Testing paragraph.

(k) Reinstall the forward center overhead light panel per Section 25-30-00, Forward Center Overhead Light Panel.

(l) Service the system as described in Chapter 12.

C. **Servicing and Maintenance** - The cabin distribution manifold must be inspected every 5 years or whenever malfunction occurs.

WARNING: Refer to Section 35-00-00, Safety Guidelines For Servicing The Oxygen System before attempting any servicing or maintenance of the oxygen system.

8. Logic and Display Unit (Avidyne Option Only)

A. **Removal of the Logic and Display Unit** - (Refer to Figure 210.)

(1) Remove the kidney panel as described in Section 25-11-00, Kidney Panel. This will give access to the Logic and Display Unit.

(2) Disconnect the 25 pin connector from the logic and display unit.

(3) The logic and display unit display panel has four threaded 6-32 studs that protrude through mating holes into the backside of the instrument panel. Four self-locking 6- 32 nuts with washers, accessible from the backside of the instrument panel, screw onto these studs to secure the display panel to the instrument panel. Removal of the nuts and washers allows the display panel to slide out for access to, and disconnection of, the bayonet plugs and ribbon cable connector. Make note or label each plug for reconnection to its proper location.

(4) Remove the three pan head screws and washers securing the Logic and Display Unit to the cross member at the back of the instrument panel and remove the unit.

B. **Installation of Logic and Display Unit** - Installation is the reverse of removal.

C. **Logic and Display Unit Servicing and Maintenance** - The oxygen system logic and display unit requires no service or maintenance but must be inspected annually, or whenever malfunction occurs.

9. Disconnection and Re-connection for Wing Removal

A. **Disconnection** - Applies to aircraft S/N 41001 thru 411124 only. Refer to Figure 211.

(1) Discharge the oxygen system as indicated in Section 35-00-00, Oxygen System Depressurization And Evacuation.

(2) Remove the clamps and grounding strap from the tubing at the wing to fuselage connection. Retain hardware.

(3) Cut the tie wrap securing the tubing to the fuselage stand off.

(4) Disconnect the tubing at the wing to fuselage connection, and remove the Seco seals. Discard the Seco seals.

(5) Temporarily cap or plug the tubing and fittings so that contamination will not enter the oxygen system.

(6) Proceed with wing removal per Section 57-10-00, Wing Removal.

B. **Re-connection**

(1) Connect the tubing at the wing to fuselage connection.

(2) Charge and test the system for leakage as described in the paragraph Section 35-00-00, Leakage Testing.

(3) If leakage is found, discharge the oxygen and reinstall the tubing until the leakage is corrected. Do not attempt to correct any leakage or misalignment of a joint by overtorquing. Instead, disassemble and check for nicks, burrs, dirt, etc. Reassemble using new parts if necessary. The Seco seal must be replaced if the joint is disassembled.

(4) Secure the tubing to fuselage stand-off with a tie wrap.

(5) Reinstall the grounding strap across the fittings at the wing to fuselage connection.

(6) Proceed with wing installation per Section 57-10-00, Wing Installation.

(7) Service the oxygen system as described in Chapter 12.

WARNING: Refer to Safety Guidelines For Servicing The Oxygen System before attempting any servicing or maintenance of the oxygen system.

10. Oxygen System Troubleshooting

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Condition	Probable Cause	Remedy
Excessive leakage of system pressure.	Fill Port leaking. Overfill/over-pressure burst valve blown. Leak in lines.	Replace the fill port Replace the overfill/overpressure burst valve. Check tubing, fittings, and connections and repair or replace as necessary. Refer to Oxygen System Leaks below.
No low pressure reading at the logic and display panel (Avidyne option) or on the MFD (Garmin G1000 option or G2000)	System not charged. Defective logic and display unit or panel. Defective low pressure transducer in cabin distribution manifold.	Replenish the oxygen supply. Replace the logic and display unit or panel. Replace the low pressure transducer.
No system oxygen quantity reading at logic and display panel (Avidyne option) or on the MFD (Garmin G1000 option or G2000)	System not charged. Defective logic and display unit or panel. Defective high pressure transducer and switch in the regulator/valve.	Replenish the oxygen supply. Replace the logic and display unit or panel. Replace the regulator/valve.
Oxygen does not flow from the masks when the system is turned on.	System not charged. Oxygen mask defective. Defective low pressure shutoff valve Defective high pressure transducer and switch in the regulator/valve.	Replenish oxygen supply. Overhaul or replace mask. Replace the low pressure shutoff valve. Replace the regulator/valve.

A. **Oxygen System Leaks** - With the oxygen system turned off, leakage is most likely to occur in the high pressure side of the system.

(1) Remove the hat rack carpet and cushion, the aft baggage bulkhead access panel, the baggage lower side panel right (BLSPR), and the middle lower side panel right (MLSPR). Refer to Section 25-30-00, Baggage Lower Side Panel for specific instructions.

(2) Perform leakage testing as stated in the paragraph Section 35-00-00, Leakage Testing on the fill port, tubing, fittings, and connections accessible in this area of the aircraft.

(3) Repair any leaks and perform leakage testing. If no leaks are found in this area or the system is still losing pressure after leaks are repaired, the remainder of the high pressure side of the system must be exposed and tested as indicated below.

(4) Remove the flap and aileron push rod access panel on the underside of the plane, and the aft cabin footwell to gain access to the overfill/overpressure burst valve and the oxygen regulator/valve.

(5) Perform leakage testing as stated in the paragraph Section 35-00-00, Leakage Testing on the overfill/overpressure burst valve, oxygen regulator/valve, oxygen cylinders, tubing, fittings, and connections.

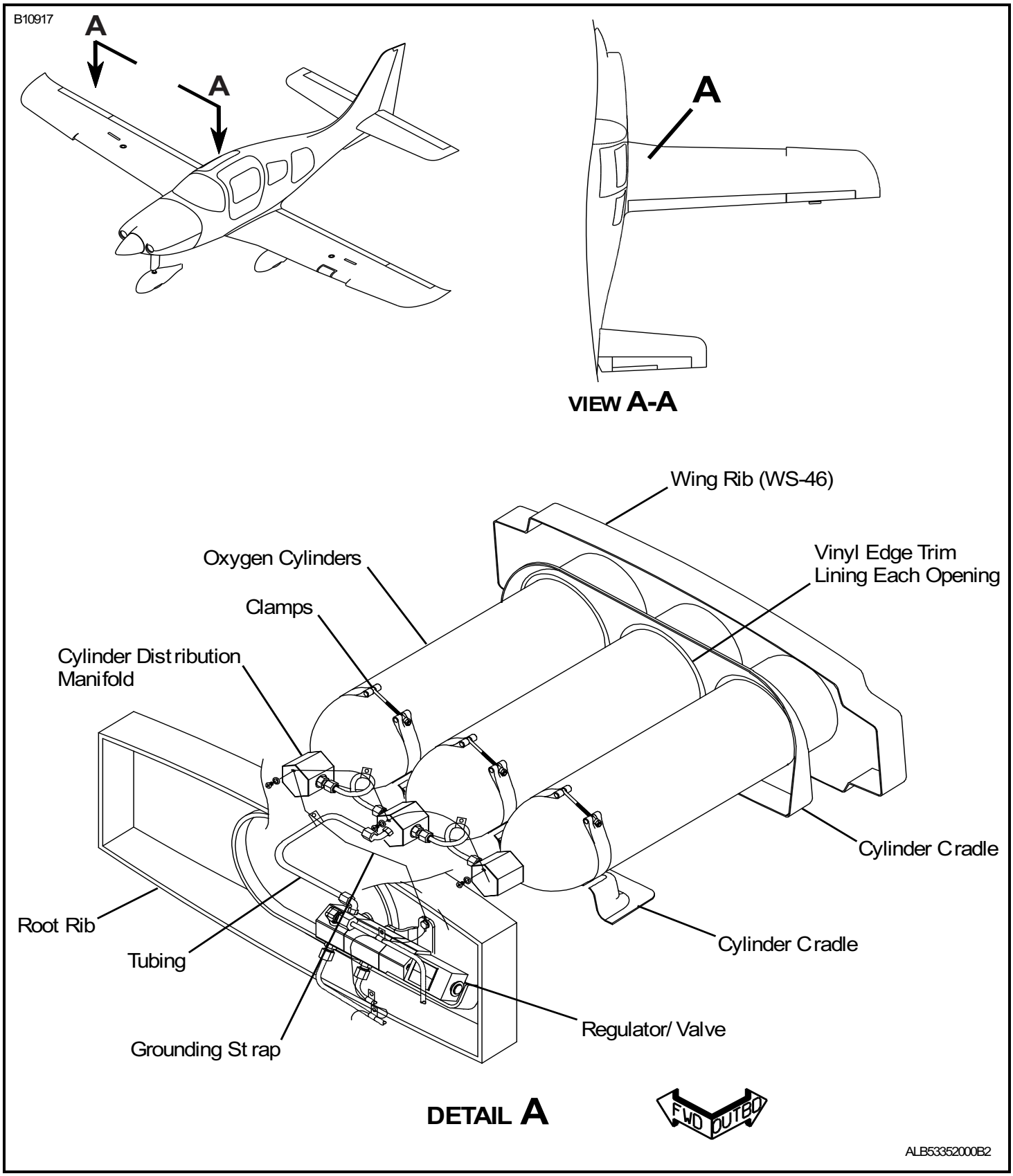
(6) Repair any leaks and perform leakage testing.

(7) Upon successful completion of leakage testing replace all access panels, the footwell, interior panels, hat rack and carpeting.

(8) Service the oxygen system. Refer to Chapter 12.

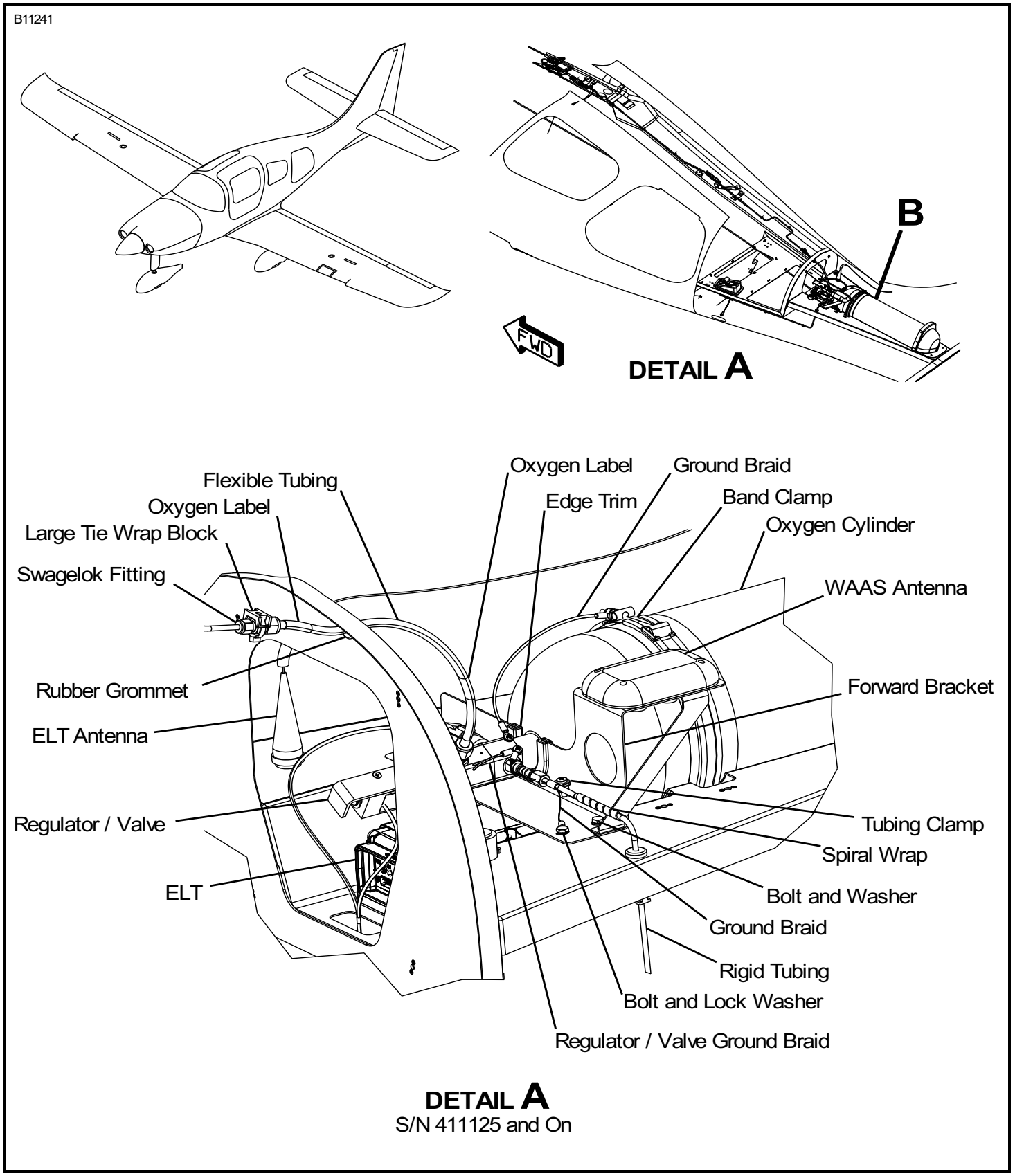
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Figure 201 : Sheet 1 : Oxygen Cylinders



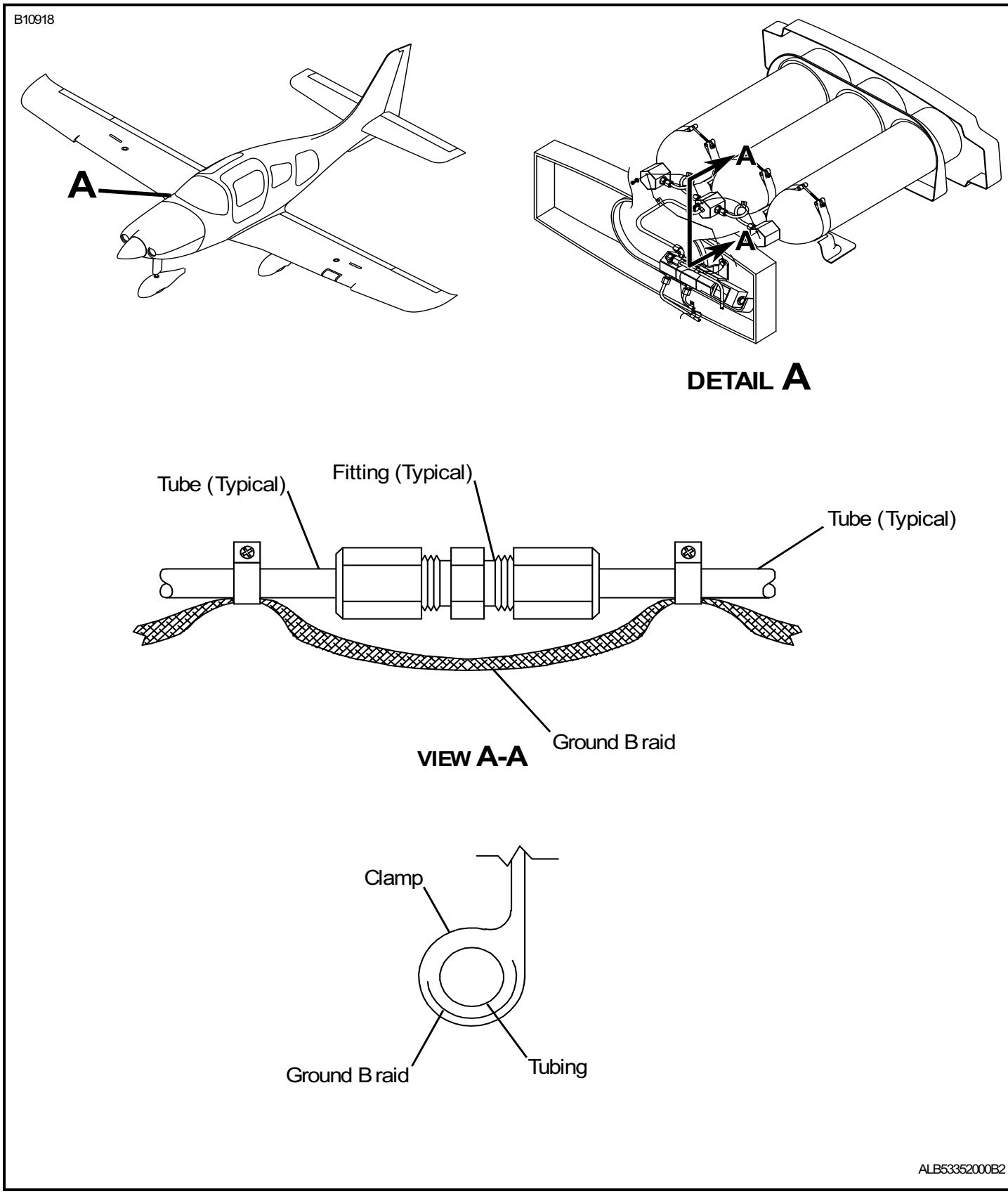
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Figure 202 : Sheet 1 : Oxygen Cylinder Installation



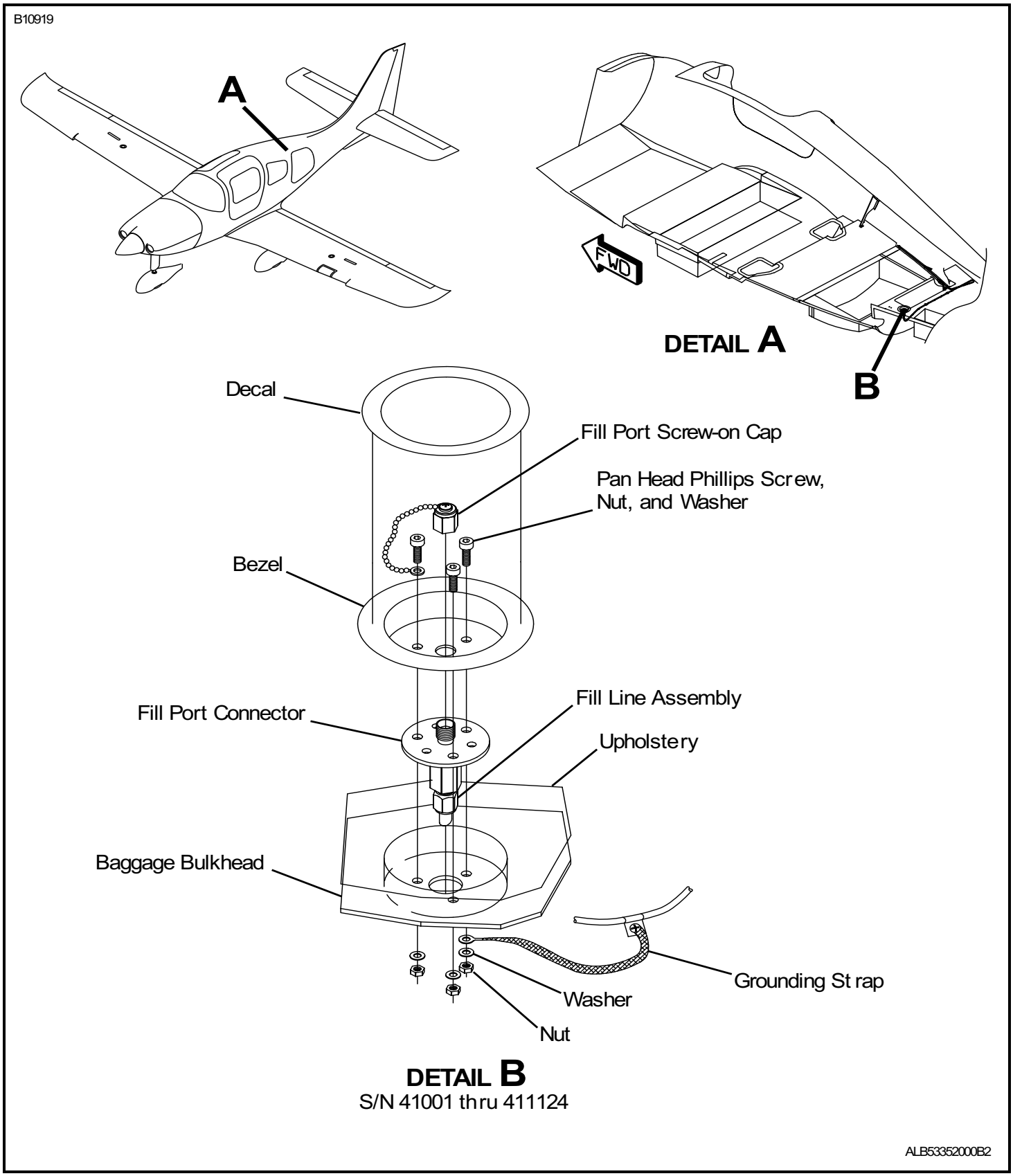
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Figure 203 : Sheet 1 : Typical Grounding Strap Installation



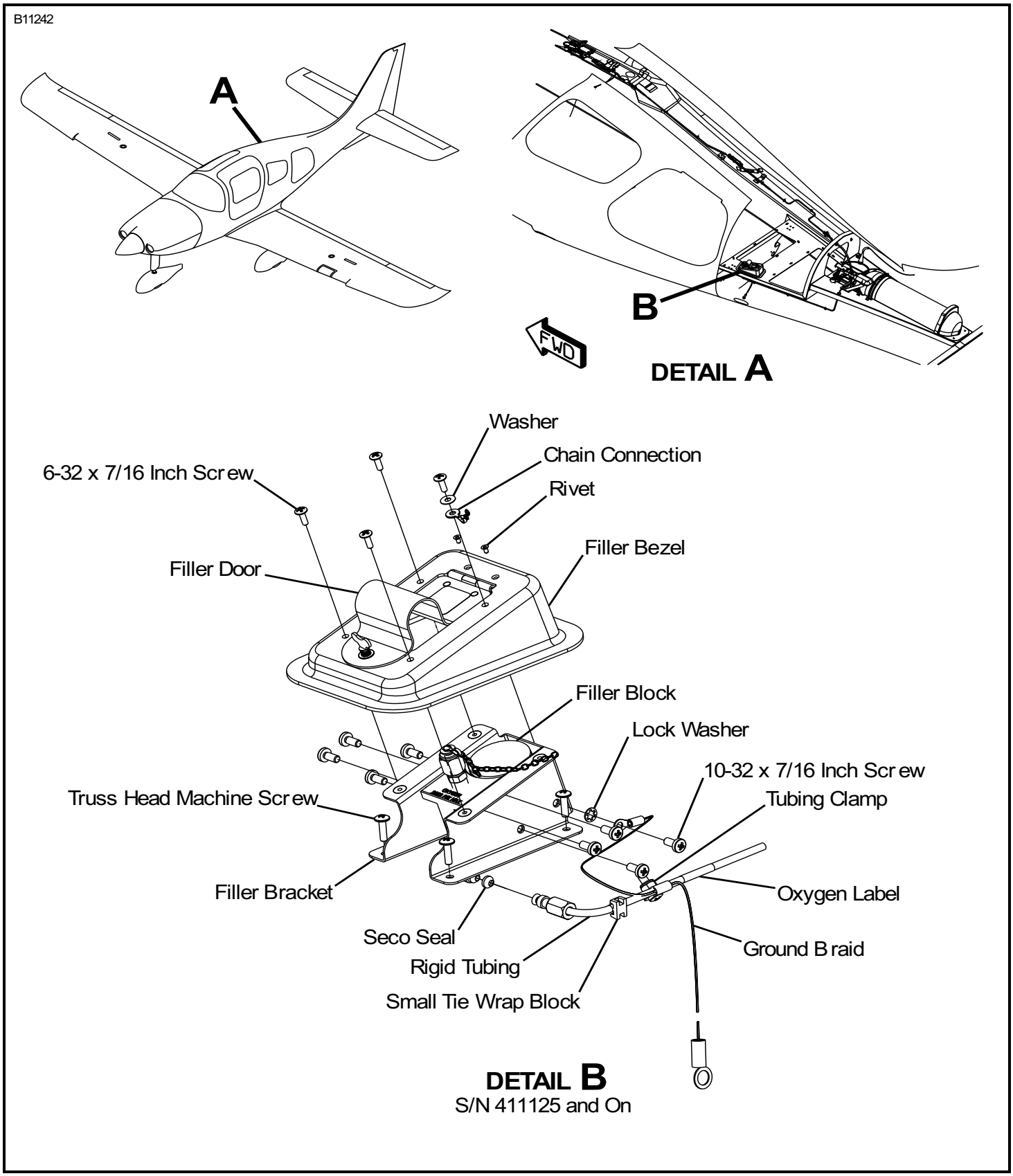
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Figure 204 : Sheet 1 : Fill Port



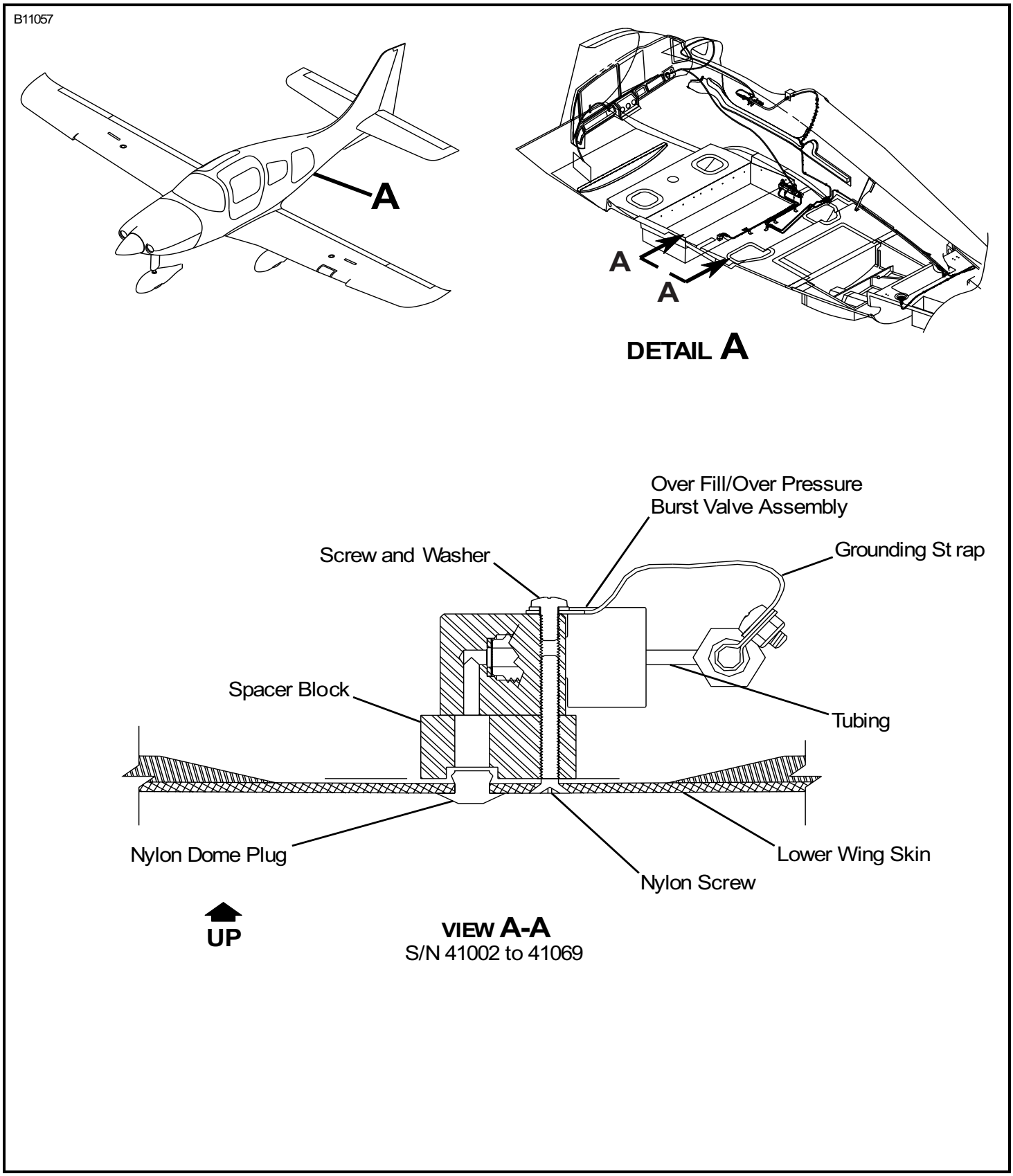
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Figure 204 : Sheet 2 : Fill Port



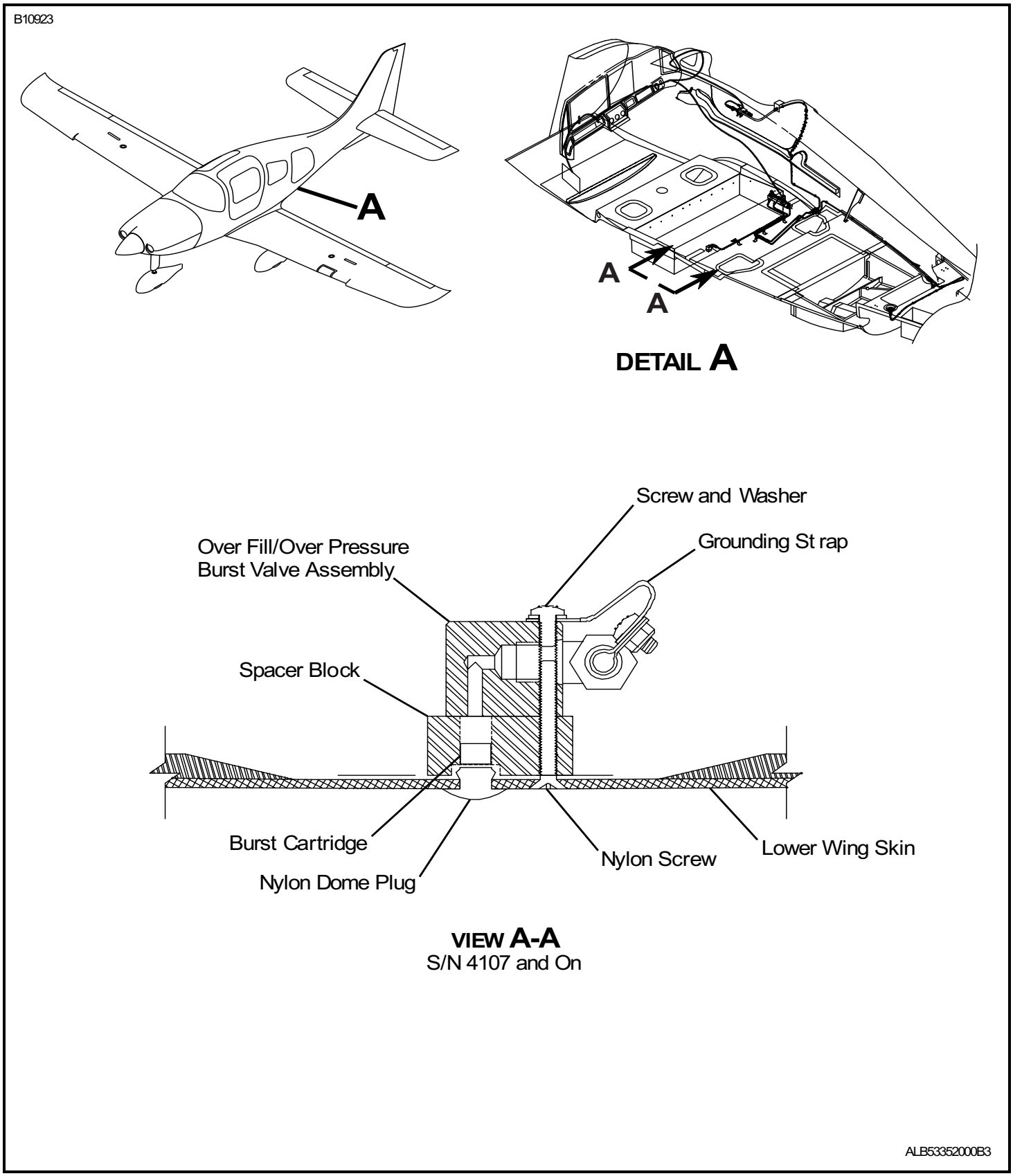
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Figure 205 : Sheet 1 : Overfill/Over pressure Burst Valve Assembly



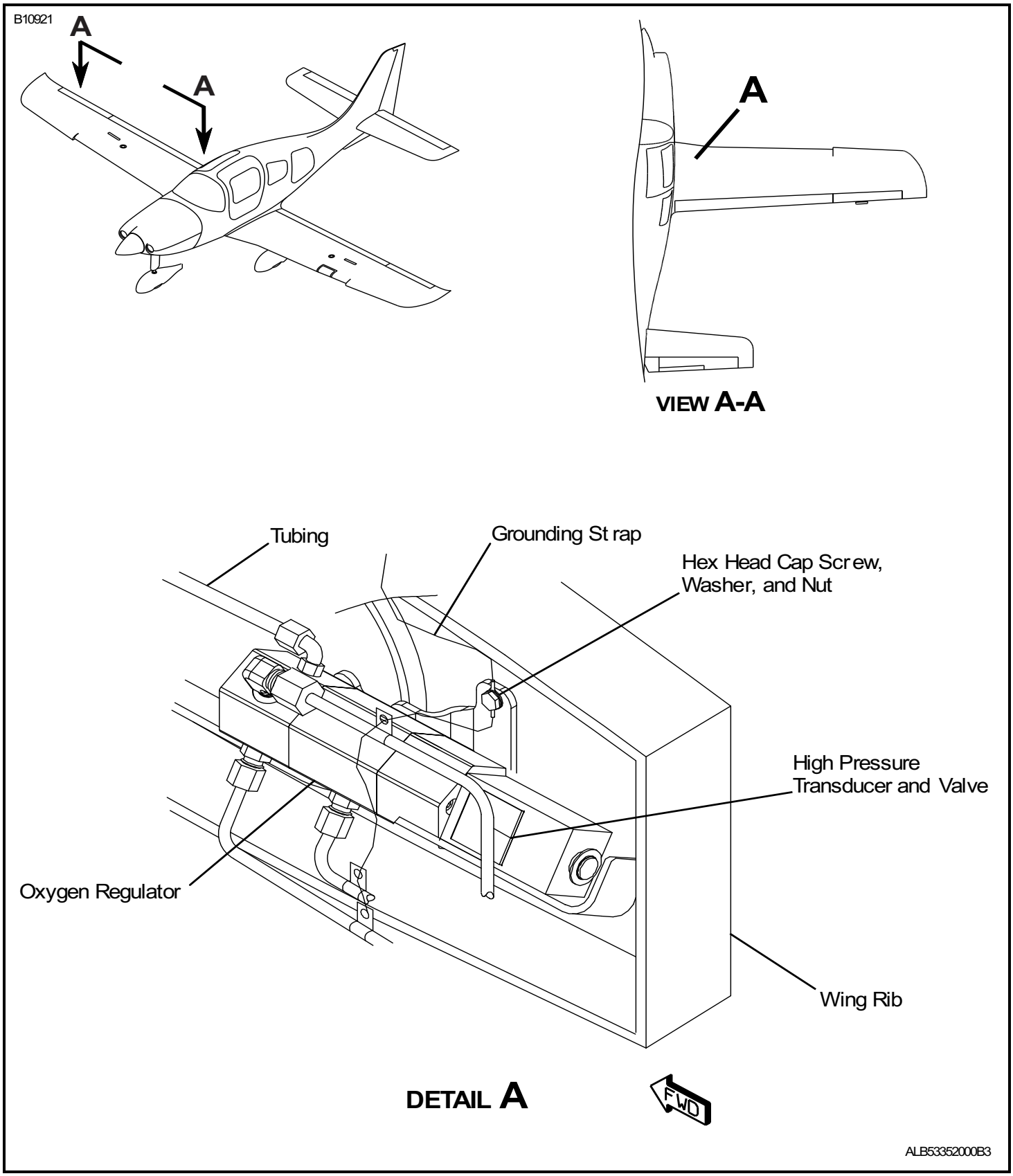
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Figure 205 : Sheet 2 : Overfill/Over pressure Burst Valve Assembly



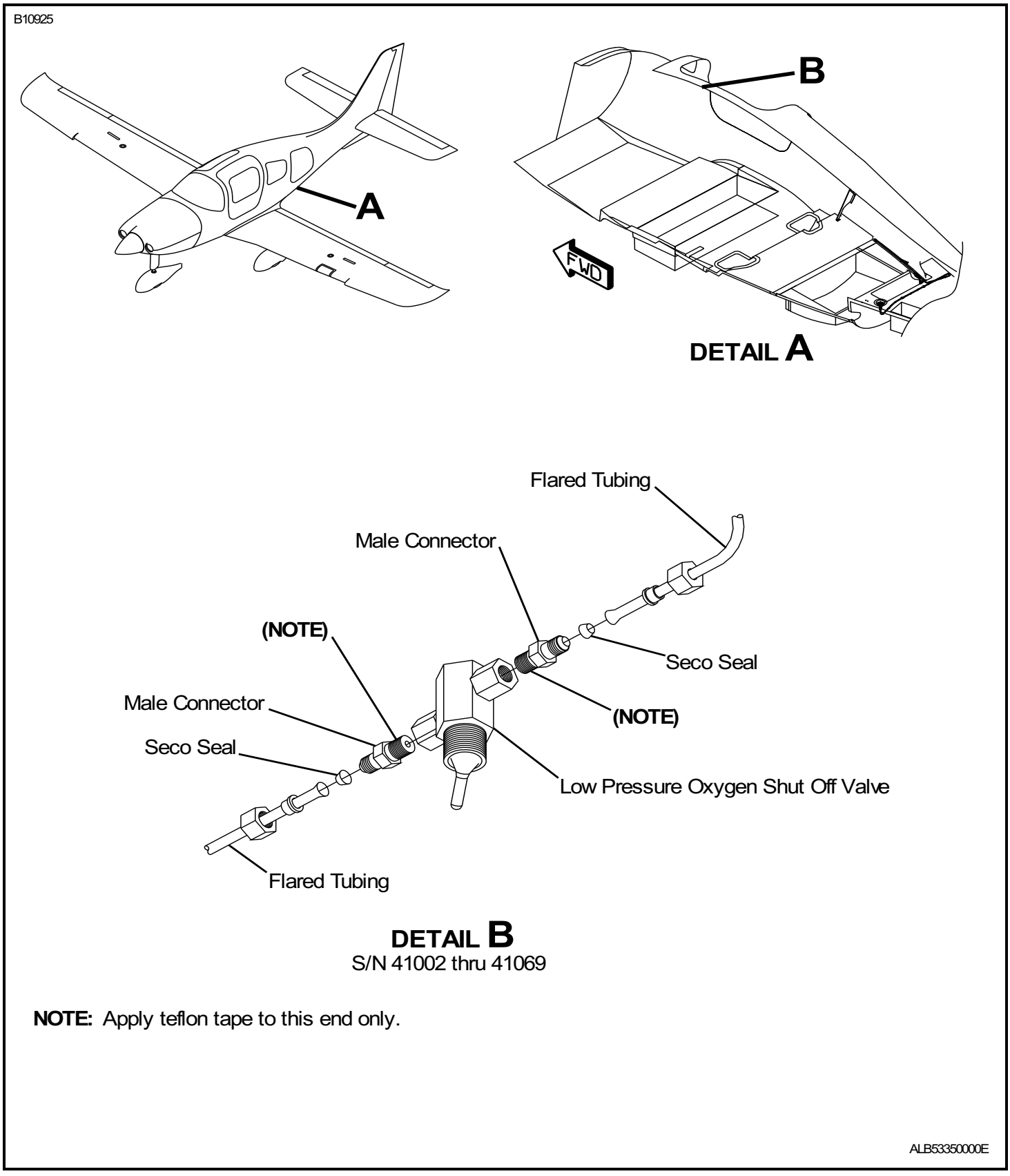
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Figure 206 : Sheet 1 : Regulator/Valve Assembly



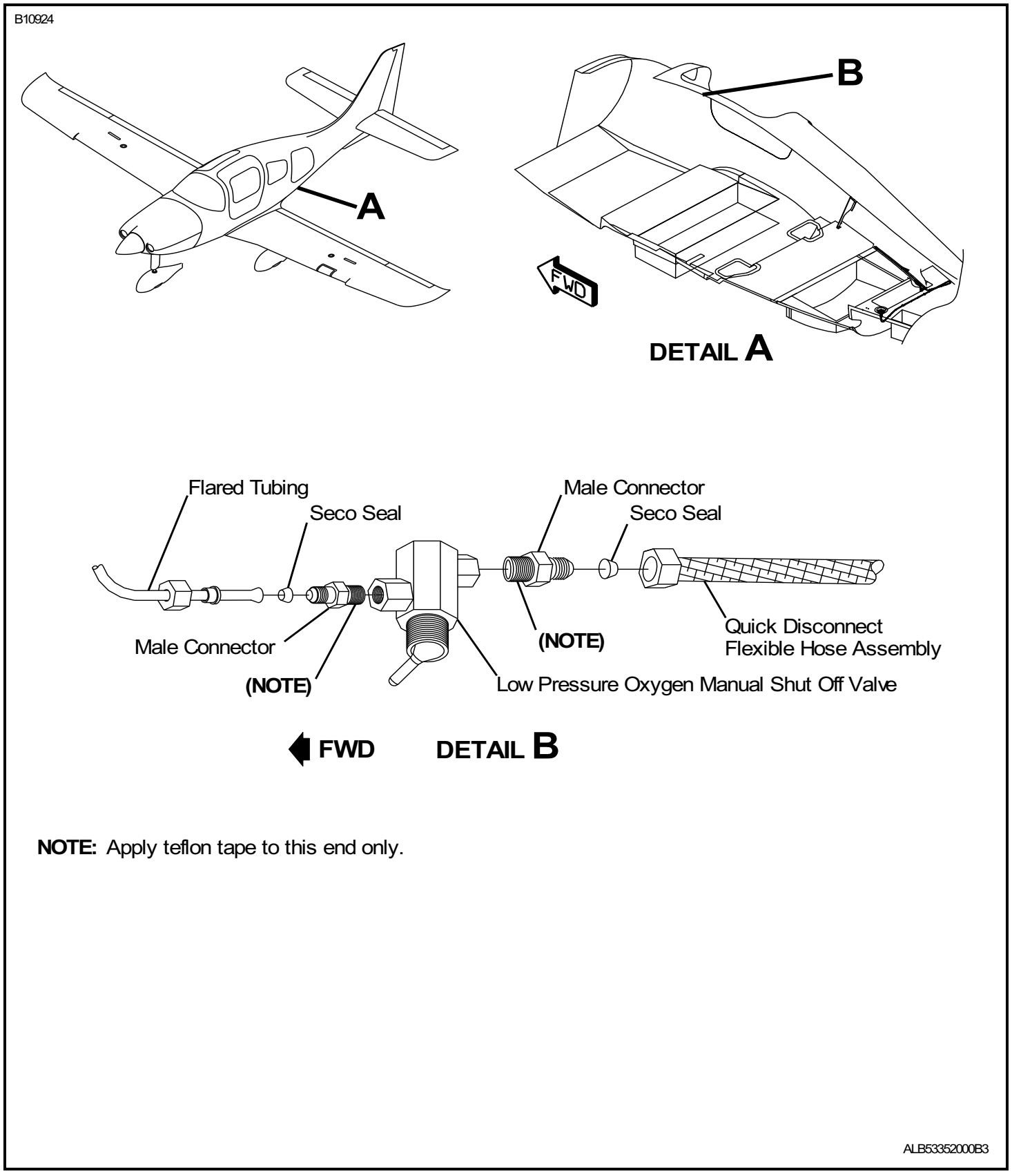
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Figure 207 : Sheet 1 : Manual Low Pressure Oxygen Shut Off Valve



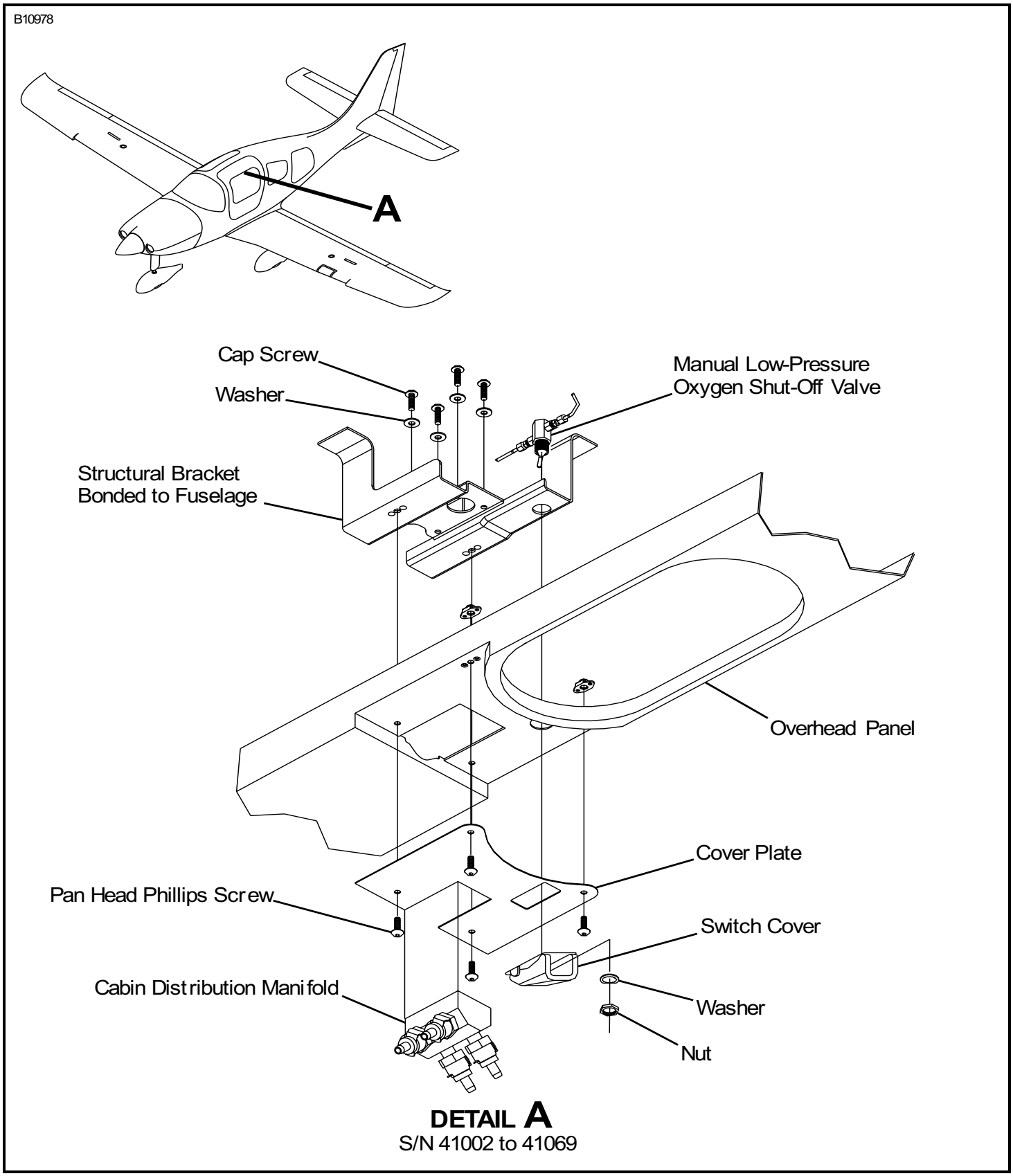
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Figure 207 : Sheet 2 : Manual Low Pressure Oxygen Shut Off Valve



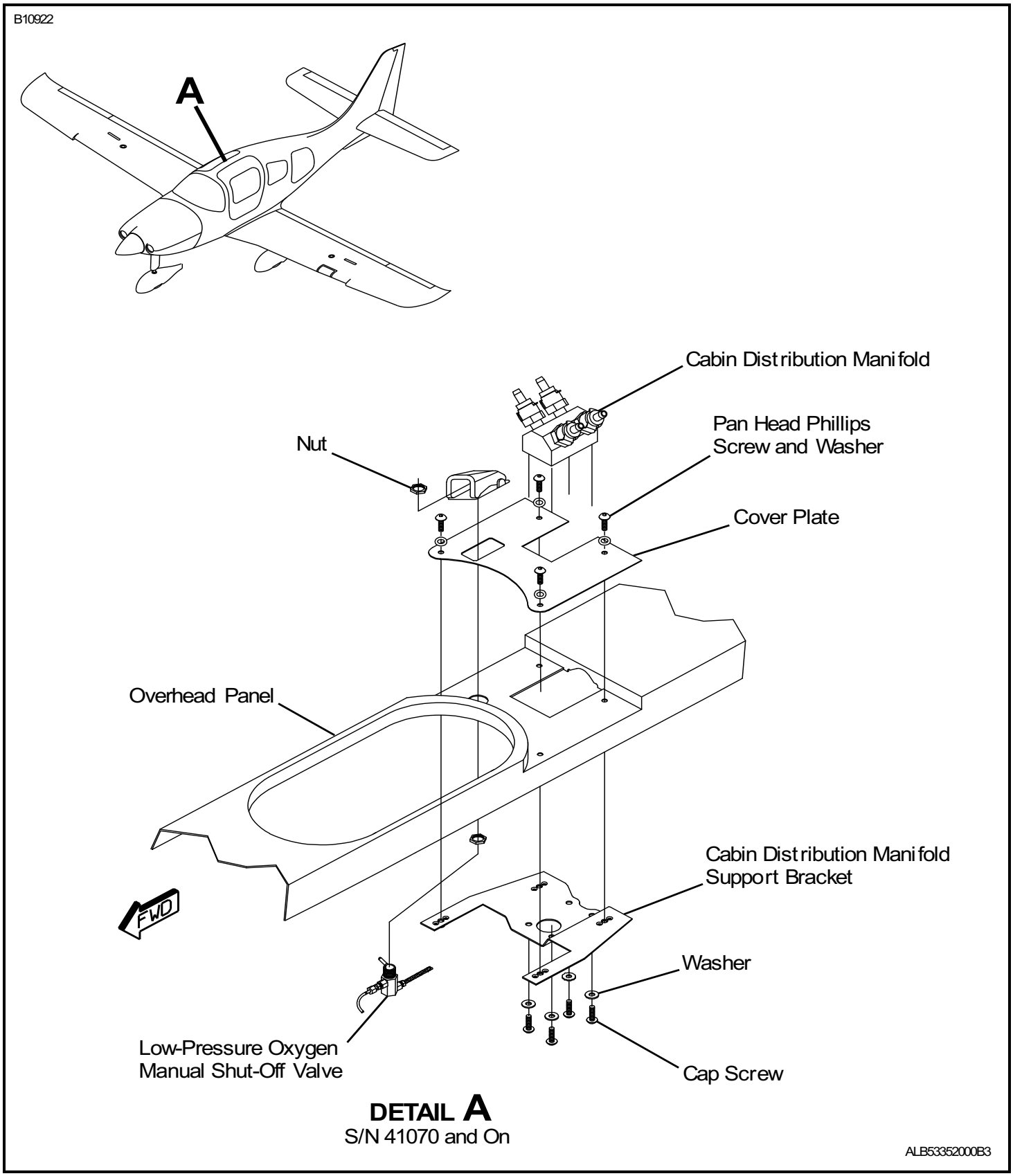
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Figure 208 : Sheet 1 : Cabin Distribution Manifold



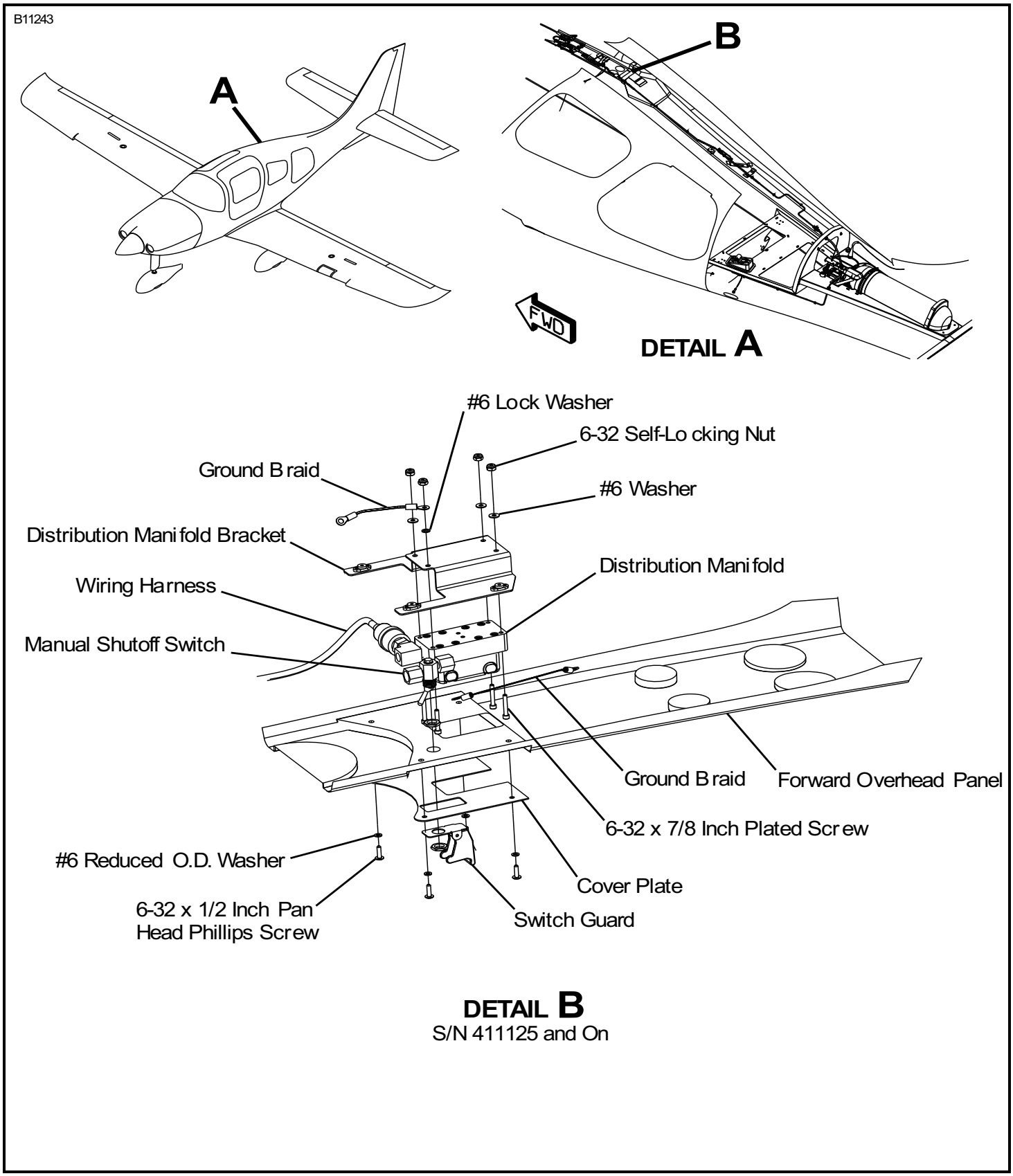
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Figure 208 : Sheet 2 : Cabin Distribution Manifold



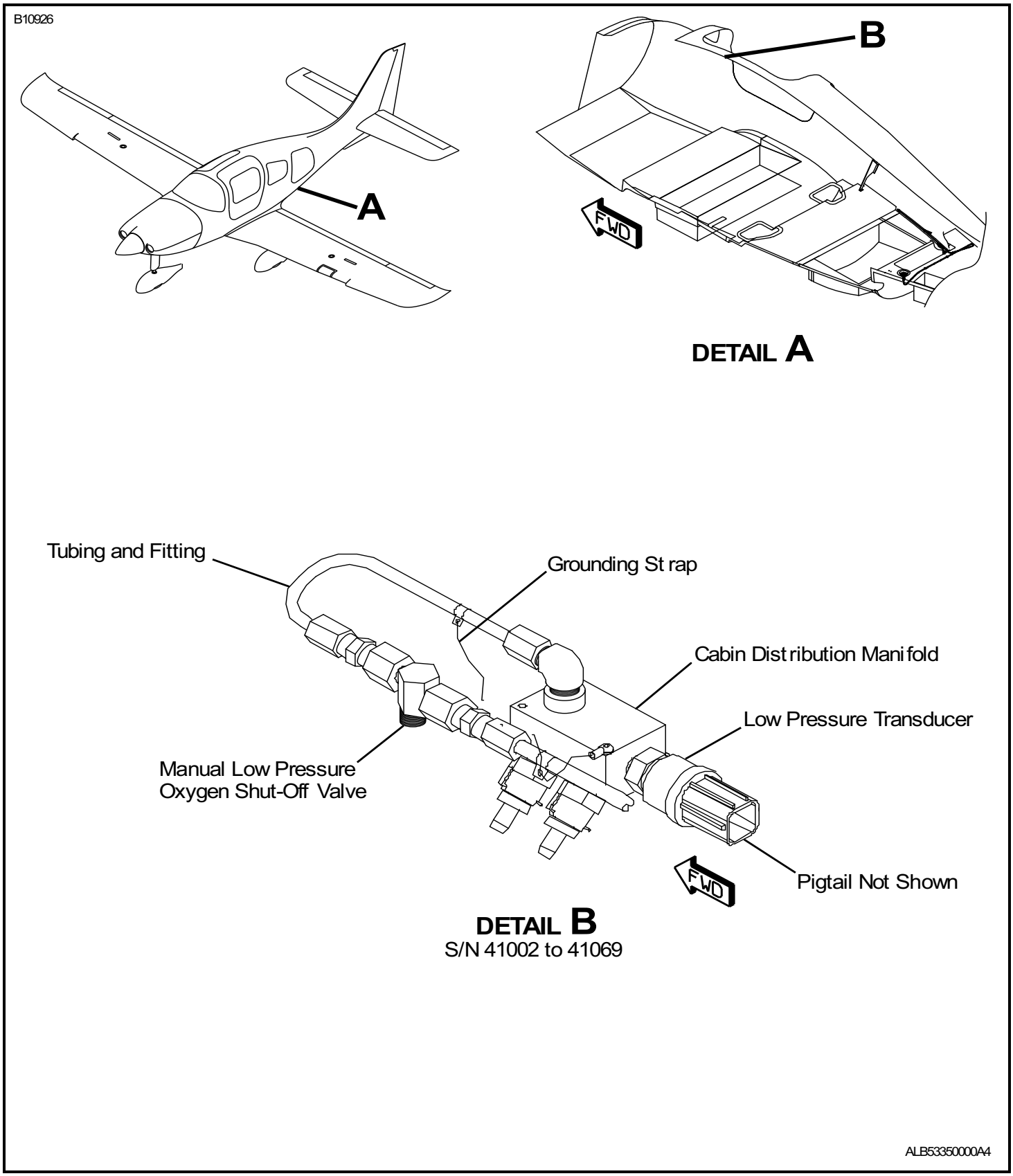
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Figure 208 : Sheet 3 : Cabin Distribution Manifold



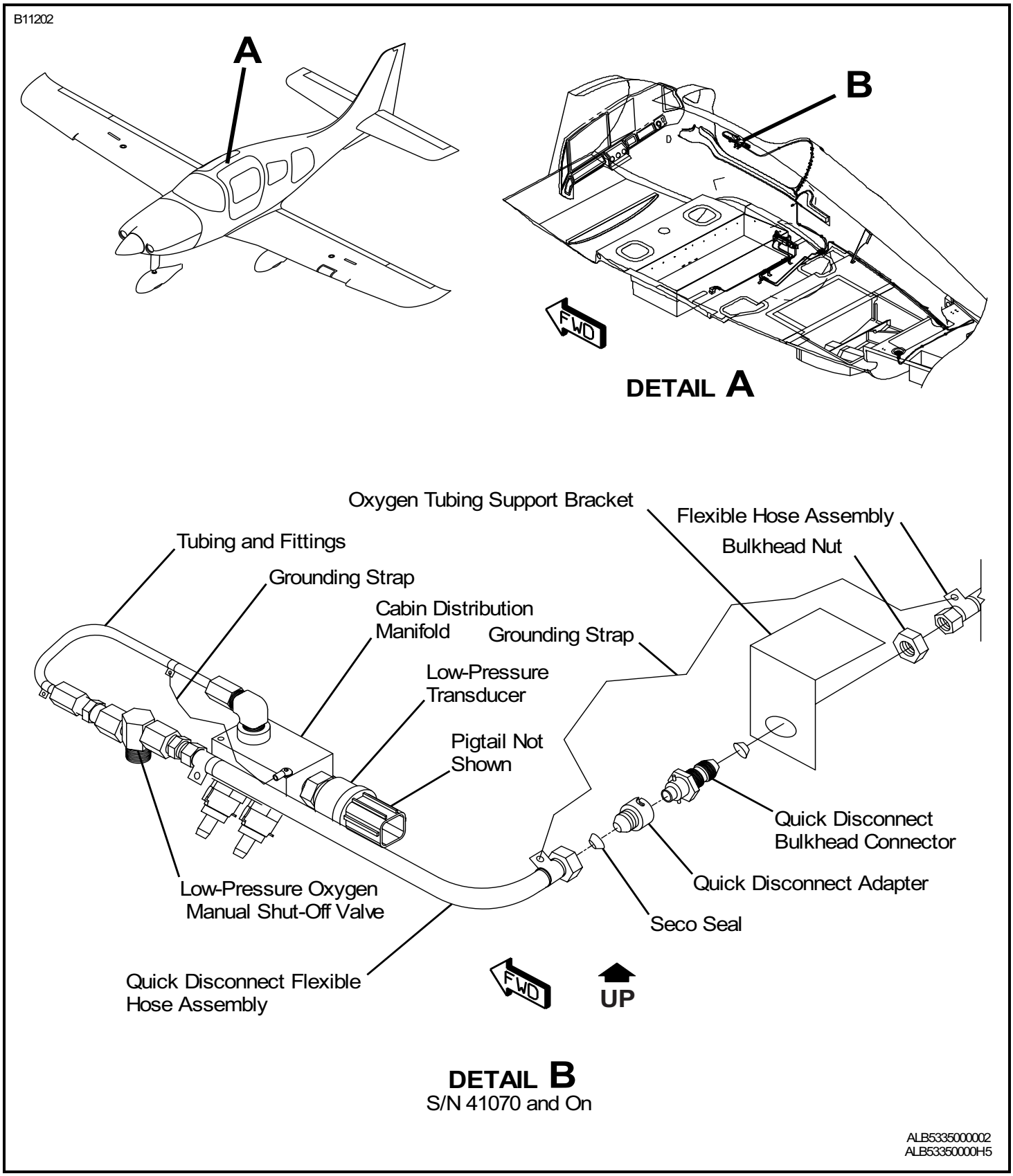
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Figure 209 : Sheet 1 : Cabin Distribution Manifold Assembly



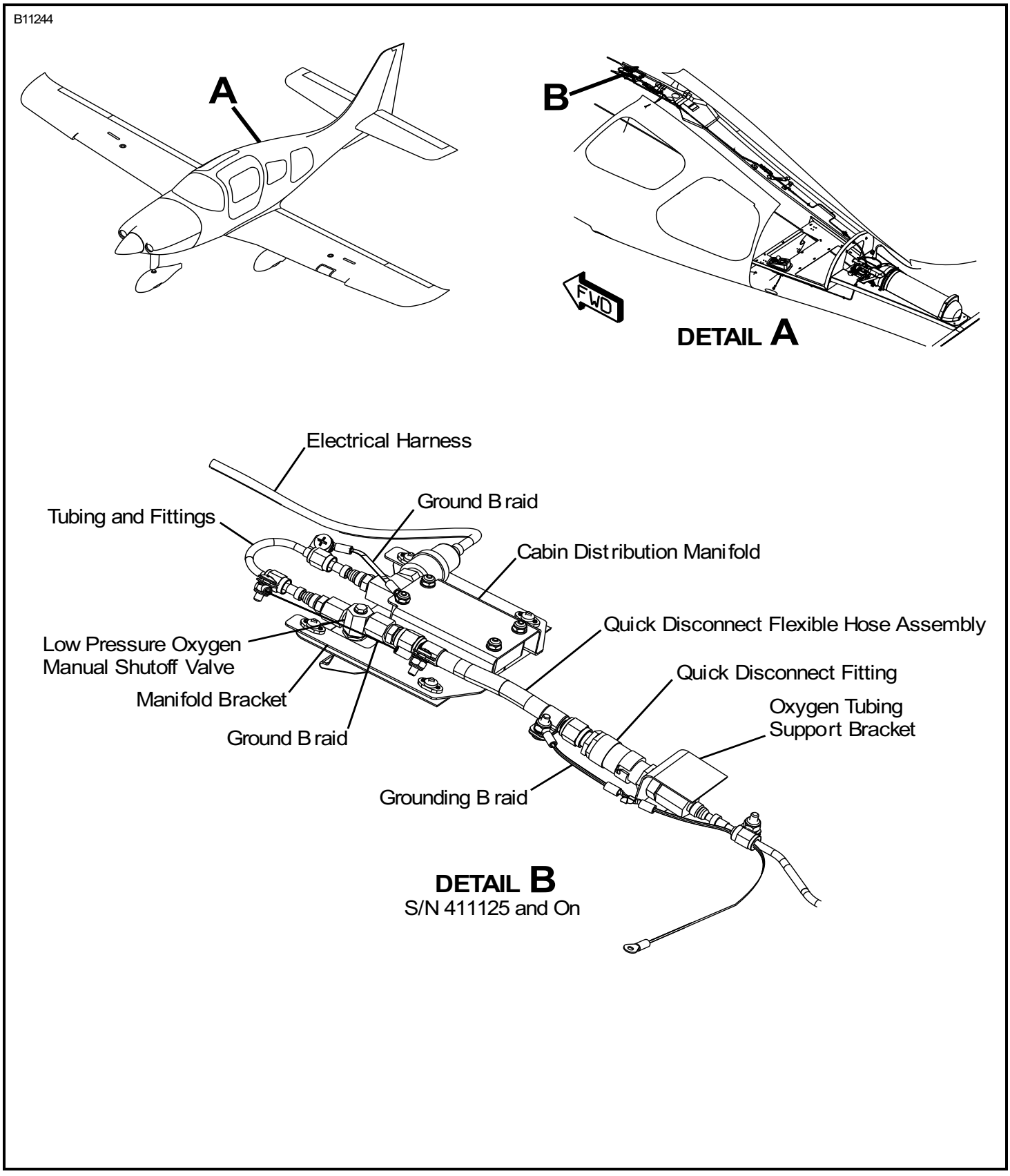
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Figure 209 : Sheet 2 : Cabin Distribution Manifold Assembly



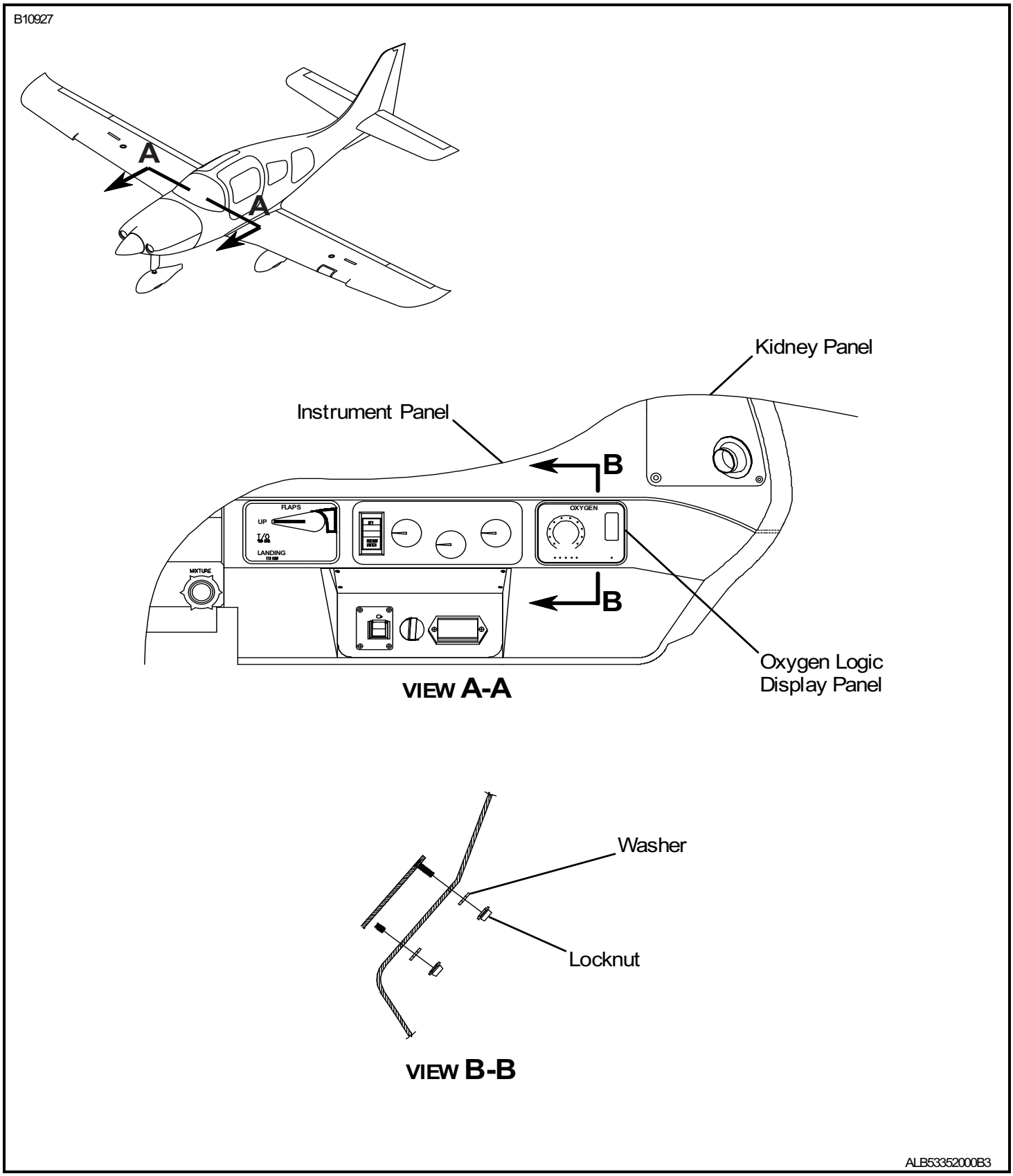
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Figure 209 : Sheet 3 : Cabin Distribution Manifold Assembly



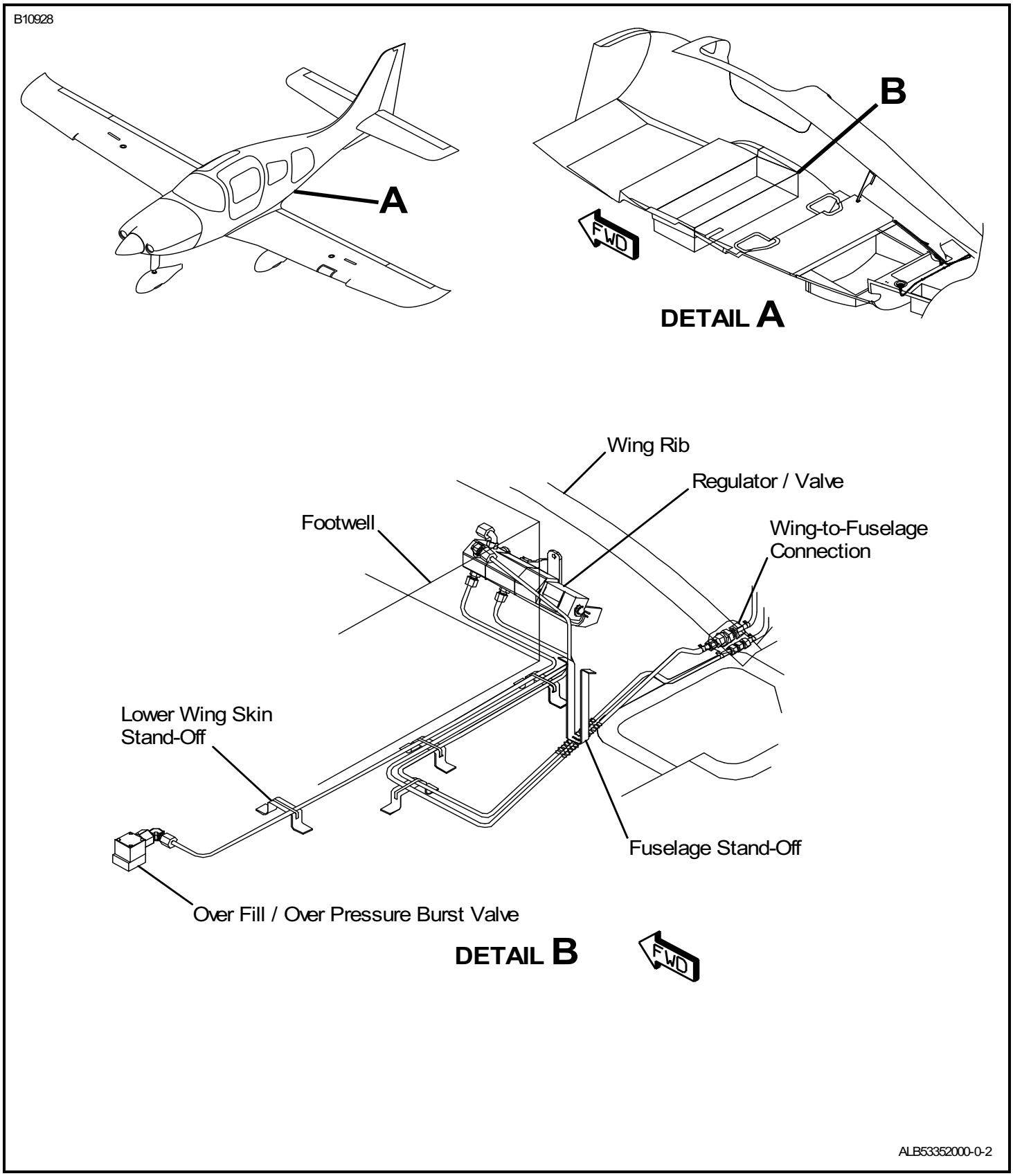
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Figure 210 : Sheet 1 : Logic Display Panel



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Figure 211 : Sheet 1 : Wing to Fuselage Connection



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DOORS - GENERAL

1. General Description of Cabin and Baggage Doors

A. **Cabin Doors** - Each cabin door is constructed of an inner and outer composite panel bonded together. The door skin is constructed of carbon cloth. The doubler or door inner panel is constructed of glass and carbon cloth. The doors are mounted in a gull wing configuration with the hinges located at the top of the aircraft. With the door unlatched, a slight nudge or pull will start the opening of the door, and a gas strut will assist to fully open the door.

B. **Latching Mechanism** - From the exterior, the latching mechanism on each cabin door is operated through movement of the exterior door handle. The handle is mounted on the side of the door in the bottom, aft position and has two ranges of movement. The handle is recessed into the door with adequate room for a handhold. A safety release on the handle must be disengaged before the door will open. The release is activated by pulling the handle away from the door. Moving the forward end of the handle from its normal middle position to the six o'clock position disengages the latching mechanism. To secure the door, return the handle to the middle position.
In the full open position, the handle will be somewhat lifted in an internal mechanism detent. This prevents the latching pins from striking the side of the fuselage as the door is closed. After closing the door, lifting the handle will free it from the detent and allow it to rotate and engage the latching pins.
From the interior, both latching mechanisms are engaged and disengaged through use of a handle near the bottom, aft position of the interior door. Again, the safety release is disengaged by pulling the handle away from the door. To activate the latching mechanism, move the door handle down from its near horizontal position until the slide bolts are fully engaged and the curved end of the handle is resting in the safety detent. There are placards on the interior doors labeled Open and Closed with direction arrows.

(1) When both doors are properly closed with the latching mechanism correctly engaged and the baggage door is locked, the applicable indication occurs:

(a) For the Model T240, the Crew Alert System (CAS) DOOR OPEN (RED) message on the Primary Fight Display (PDF) goes out.

(b) For airplanes with the Avidyne option or the Garmin G1000 option, the Door Open annunciator in the upper left position of the annunciator panel goes out.

C. **Door Locks** - The right cabin door can only be locked from the inside using a finger/thumb latch. It is placarded to remain unlocked during flight. The left cabin door can only be key locked from the outside. A distinction is made here between the terms latching mechanism and the security door locks. The latching mechanism ensures that the doors will remain secured during flight. The door locks are primarily antitheft devices and restricts use of the latching mechanism.

D. **Door Hinges** - Each door is hinged at the top of the door with two hinges. Half of the hinge is attached to the cabin door. The other half of the hinge, the hinge block, is bolted into cutouts in the top of the fuselage. There are hinge pins attached to the hinge element, which are secured with a dowel. The hinge pins of each hinge are inserted into the hinge block, however, they are secured differently on each side. On the left side the pins are held in the hinge block by the emergency exit wires, and on the right side the pins are secured with roll pins. Refer to Figure 1.

E. **Emergency Exit Door Release** - There is an emergency door release located in the forward left wing saddle in the compartment that contains the fuel gascolator. The release cable is designed to release the hinges on the pilot's door during emergency egress from the airplane when it is in the inverted position, and the passengers are incapacitated. Detailed operational information is contained in the *Pilot's Operating Handbook and FAA Approved Airplane Flight Manual*.
The emergency door release cable is in a spiral metal housing that runs from the gascolator compartment, under the front seat box, and exits the seat box on the copilot's side. From this point, the cable runs forward to the right kick-panel, then up through the right rollover structure and across the front of the windshield to an area near the left, forward overhead light panel. Refer to Figure 1. When the emergency cable strap in the gascolator compartment is activated, the steel wires that run through the hinge pins and hinge block are pulled out of the hinge block, which permits removal of the door, once the latching mechanism is disengaged. Refer to Figure 2.
The forward part of the cable is connected to a thimble-ring, which is part of the thimblering assembly. The thimble-ring contains a stainless steel wire with a Nicopress swage collar. One of the steel wires runs through the forward hinge block of the left door, through a hole in the hinge pin, and exits slightly aft of the hinge block. The other stainless steel wire runs through a guide block and then into the aft hinge block in the same manner as the forward hinge block. Refer to Figure 3.

F. **Baggage Door** - The baggage door is piano hinged at the top and opens with a gas spring assist similar to the cabin door. The baggage door is key locked fore and aft by a common key, which is the same key that is used in the left cabin

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door lock. The forward lock of the baggage door retains the key so that it can only be removed when the lock is in the latched position. The aft baggage door lock, like the left cabin door lock, allows key removal in either the latched or unlatched positions.

To open the baggage door, insert the key into each lock and rotate 90 degrees clockwise. Open the aft lock first. Once the aft lock is unlatched, remove the key, and open the forward lock. This design reduces the possibility of taking off with the baggage door open, provided the ignition and baggage door keys are on the same key ring. When the second lock is unlatched, the gas strut will raise the door. The baggage door is part of the door alert system.

(1) If the baggage door is not properly closed and the forward latch engaged correctly, the applicable indication occurs:

(a) For the Model T240 Garmin G2000 Installation, the Crew Alert System (CAS) DOOR OPEN (RED) message on the Primary Fight Display (PDF) comes on.

(b) For airplane with the Avidyne option or the Garmin G1000 option, the Door Open annunciator in the upper left position of the annunciator panel comes on.

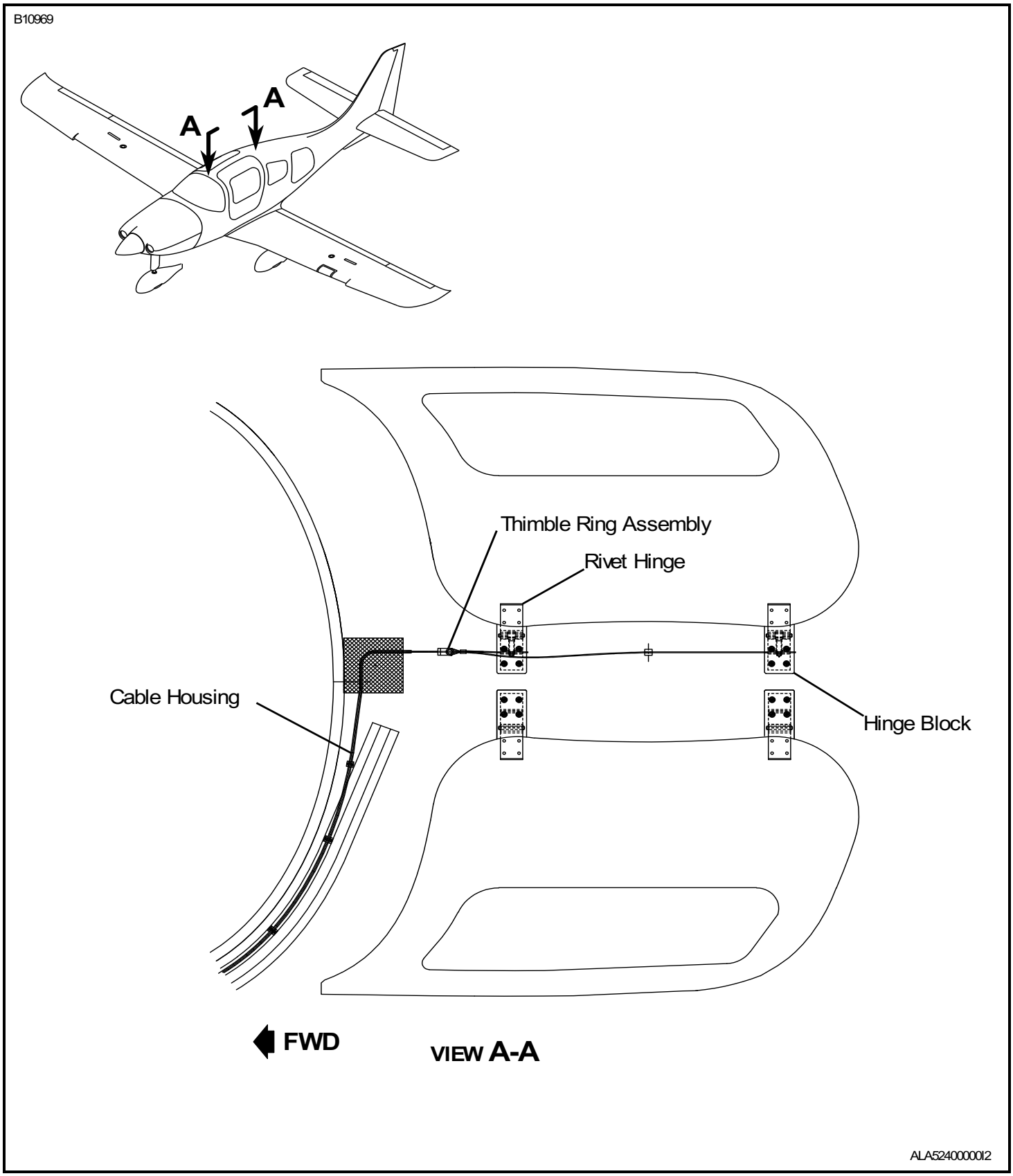
G. **Door Seal System** - The airplane is equipped with a pneumatic door seal system that limits air leakage and improves soundproofing. An inflatable gasket around each main door expands when the door seal system is turned on. An electric motor near the pilot’s rudder pedals operates the system, which maintains a differential pressure of 12 to 15 psi. The system is activated by a switch in the rocker switch panel labeled "Door Seal" and is protected by a five-amp circuit breaker. The cabin doors must be closed for the door seal system to operate. The latching mechanism of each door moves a plunger-type switch, which, assuming the baggage door and the other main door are properly latched, turns off the door open annunciator and enables the system.

The cabin door latching mechanism also controls the dump valve. When either cabin door latching mechanism is moved more than a half inch towards the open position, the dump valve is engaged, the pump is turned off, and the pressure in the seals is dumped. This prevents inadvertent operation of the doors when they are sealed; however, setting the doors seal switch to the off position after landing is recommended.

Normally, the door seal switch remains in the on position for the entire flight. If the system pressure drops below 12 psi, the air pump will cycle on until pressure is restored. If the pump runs continuously, it is an indication that a seal is damaged and incapable of holding pressure. In this situation, the door seal system should not be operated until repairs are made.

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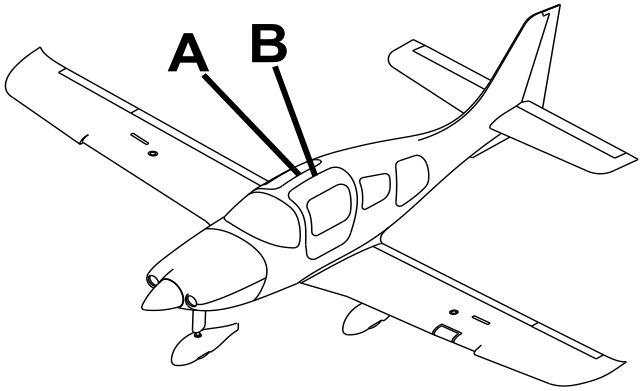
Figure 1 : Sheet 1 : Door Hinges

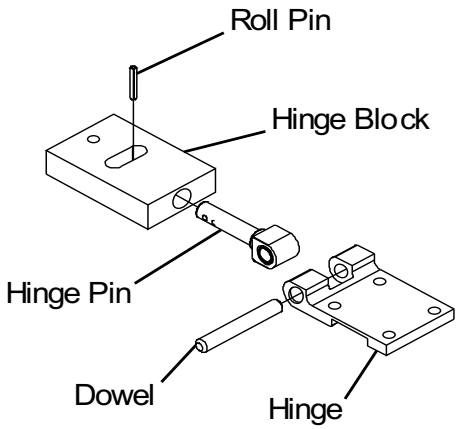


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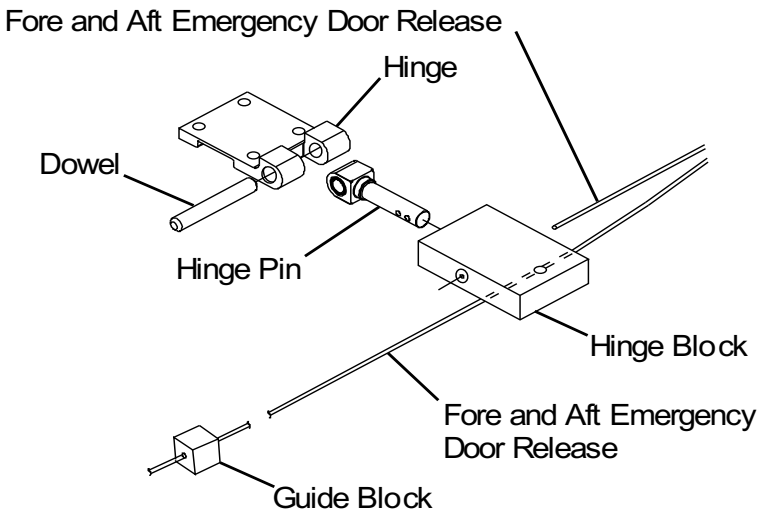
Figure 2 : Sheet 1 : Door Hinge Assembly

B10929





DETAIL A



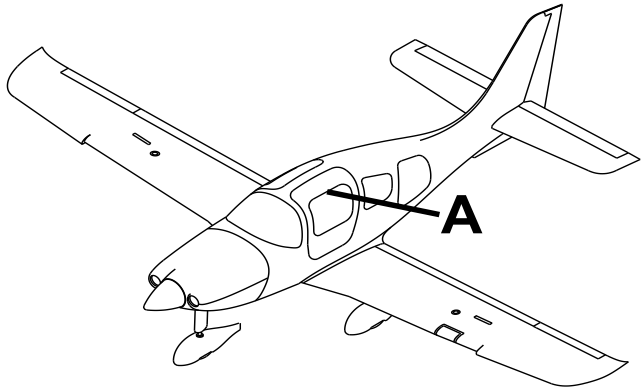
DETAIL B

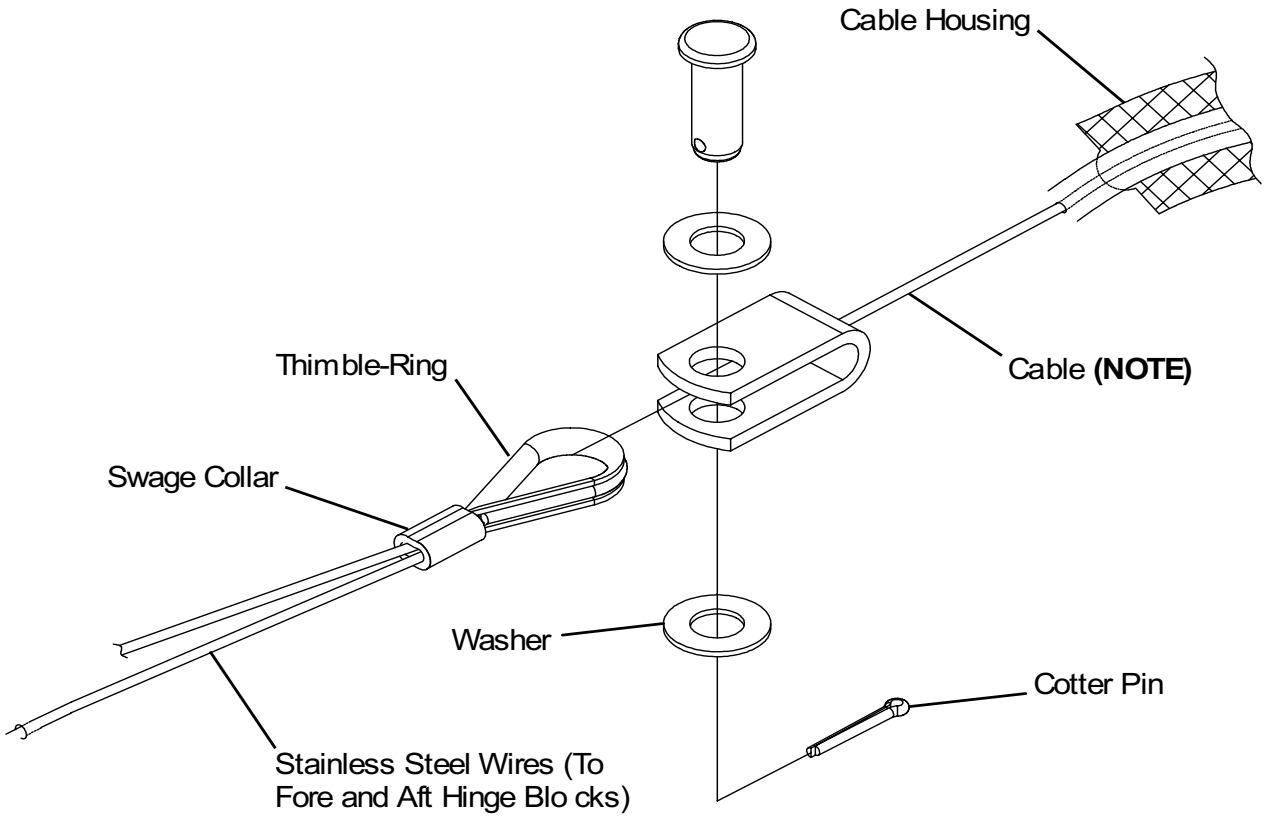
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Figure 3 : Sheet 1 : Emergency Door Release Cable

B11103





DETAIL A

NOTE: Runs forward to composite channel .

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CABIN AND BAGGAGE DOOR - MAINTENANCE PRACTICES

1. Cabin Door Removal

A. Removal of the cabin door can be accomplished as follows.

(1) Disconnect the pneumatic door seals using the following steps.

(a) With the door in the full open position, use a Phillips screwdriver to loosen the Adel Clamp on the air supply hose near the air supply nipple in the overhead panel. Refer to Figure 201.

(b) Disconnect the supply hose from the nipple in the overhead panel.

(2) Disconnect the gas strut from the door jam using the following steps.

(a) Support the door in the full open position so that all weight is removed from the gas strut.

(b) The gas strut is secured to the door by a retaining cap located in the end of the strut. Remove the strut retaining cap by inserting a small flat-blade screwdriver just under the base of the cap and prying up on it. Raise the cap in increments by moving the blade of the screwdriver around the circumference of the cap. Refer to Figure 202.

(3) There are two methods for removing the doors:

(a) Quick Removal–door removal without removing the interior hinge bolts.

(b) Standard Removal–removal of the interior hinge bolts.

The Quick Removal method may only be used for removal of the left door. The right door must be removed with the Standard Removal technique. The technique used depends on the maintenance task.

(4) Overhead Panel Description - here are basically five panels in the overhead portion of the main cabin area.

(a) **Center Overhead Light Panel (COLP)** - his panel is located in the center portion of the main cabin area and contains the electrical lights and speaker. Refer to Chapter 25 in this manual for removal of the COLP.

(b) **Forward Overhead Side-Panels (FOSP)** - The forward panels to the left and right of the COLP are referred to as the left and right overhead side-panels. Remove the left and right forward panels by removing the six forward screws in each door casing.

(c) **Aft Overhead Side-Panels (AOSP)** -These side panels are just aft of the FOSP and normally require only removal of the first two screws in the door casing that supports these panels. Normally, removing these two screws will provide sufficient access to the aft hinge bolts and emergency door release cable. Care must be taken to not damage these panels when removing/installing the hinge bolts and emergency door release stainless steel wire.

2. Quick Removal of the Left Door

A. Follow the steps below for quick removal of the left door.

(1) Remove the pneumatic air supply line and gas strut as described in the Cabin Door Removal paragraph.

(2) Remove the COLP, left FOSP, and the forward two screws of the left AOSP.

(3) Close the door, and engage the latching mechanism.

(4) Pre-load the door, i.e., a person on the outside of the door should push in and down.

(5) Grasp the thimble-ring, which is connected to the emergency door release wires, and pull forward toward the windshield until the stainless steel wires are removed from the hinge blocks. The thimble-ring is located forward of the door cutout in the area of the left overhead panel. Refer to Chapter 52, Doors - General Figure 1. It may work better to grasp the thimble-ring with needle-nose pliers.

(6) From the outside, disengage the door locking mechanism, and carefully open the door while keeping pressure on the door hinges. When the door is about half open, pull it away from the cabin. It works best if two people perform this operation. While the door is not too heavy, its size and shape makes it somewhat awkward to handle with just one person.

3. Installation For Left Door (Quick Removal Method)

A. Use the following steps for installing the left door after it was removed using the Quick Removal Method.

(1) Insert the hinge pins into the hinge blocks. It works best if two people do this since the size and shape of the door makes it somewhat awkward to handle. Also, the door should be held in about the half open position while the hinge pins are inserted into the hinge blocks.

(2) After the hinge pins are inserted in the hinge block, slowly rotate the door into the door opening, and secure the door

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latching mechanism.

(3) Preload the door, i.e., a person on the outside of the door should push in and down.

(4) Apply wax or mold release to the last 3 inches of the wire, then with the door preloaded, use needle-nose pliers to reinsert the fore and aft stainless steel wires through the hole in the composite cutout and into the hinge block. Ensure that the wire goes through the block and exits each hinge block on the aft side.

(5) Reinstall all overhead panels that were removed or partially removed. Follow instructions in Chapter 25 for the COLP. Torque screws in the FOSP and AOSP 10 to 12 in.-lbs.

(6) Reconnect the gas strut and the pneumatic air supply line using the reverse of the procedures. Refer to Chapter 52, Cabin and Baggage Door - Maintenance Practices, Cabin Door Removal.

4. Standard Removal Of The Left Door

A. **General** - The "Standard Removal" of the left door involves removal of the hinge blocks. Refer to Chapter 52 Doors - General Figure 2. The hinge blocks are secured by four bolts that are inserted into threaded holes in the bottom of the block. The bolts, which have a 3/8 inch hex head, are accessed from within the cockpit. The following points must be considered when removing the hinge blocks.

(1) The locations of the hinge blocks are **not** interchangeable. Accordingly, each hinge block must be labeled with its location prior to removal, i.e., LF, LR, etc.

(2) The screws on the dynamic hinge need not be removed unless there is a compelling reason to do so, e.g., a cracked hinge or a door replacement. Contact the manufacturer for specific instructions for removing and installing the screws on the door hinge.

B. Use the following procedure for the Standard Removal of the left door

(1) Follow the instructions in the Quick Removal Left Door.

(2) Remove the lockwire from the hinge bolts.

(3) Using a 3/8 inch socket wrench, back all the bolts about halfway out of the hinge block.

(4) Apply an upward pressure on the hinge bolts to break the silicone seal around the base of both the forward and aft hinge blocks.

(5) Remove all hinge bolts from the hinge block.

(6) Remove all excess silicon from the hinge block and cutout in the top of the fuselage.

5. Standard Removal Of The Right Door

A. General - The "Standard Removal" of the right door involves removal of the hinge blocks. Refer to Figure 2. The hinge blocks are secured by four bolts that are inserted into threaded holes in the bottom of the block. The bolts, which have a 3/8 inch hex head, are accessed from within the cockpit. The following points must be considered when removing the hinge blocks.

(1) The locations of the hinge blocks are **not** interchangeable. Accordingly, each hinge block must be labeled with its location prior to removal, i.e., RF, RR, etc.

(2) The rivets on the rivet hinge should never be removed unless there is a compelling reason to do so, for example, a cracked rivet hinge or a door replacement. Contact the manufacturer for specific instructions for removing and installing the rivets on the door hinge.

B. Use the following procedure for the Standard Removal of the right door

(1) Remove the pneumatic air supply line and gas strut by disconnecting the pneumatic door seals and the gas strut as described in the Cabin Door Removal paragraph.

(2) Close the door and engage the latching mechanism.

(3) Remove the roll pin in the right door hinge blocks. Refer to Chapter 52, Doors General - Maintenance Practices, Figure 2.

(4) From the outside, disengage the door locking mechanism, and carefully open the door while keeping pressure on the door hinges. When the door is about half open, pull it away from the cabin. It works best if two people perform this operation. While the door is not too heavy, its size and shape makes it somewhat awkward to handle with just one person.

NOTE: It is permissible to remove the right door, using the Standard Door Removal, without disconnecting the roll pins. If this technique is used, the hinge block remains attached to the

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right door. While this eliminates the need to remove and possibly damage the roll pin, it does require removal of interior paneling and breaking the silicon seal. If the interior panels are removed, follow instructions in the Installation Of Hinge Blocks And Doors paragraph to reinstall the hinge blocks.

(5) Remove the lockwire from the hinge bolts.

(6) Using a 3/8 inch socket wrench, back all the bolts about halfway out of the hinge block.

(7) Apply an upward pressure on the hinge bolts to break the silicone seal around the base of both the fore and aft hinge blocks.

(8) Remove all hinge bolts from the hinge block.

(9) Remove all excess silicon from the hinge block and cutout in the top of the fuselage.

6. Installation Of Hinge Blocks And Doors

A. Use the following steps for installing the door hinge blocks.

(1) Place the hinge block over its appropriate position as previously marked.

(2) Install the No. 10 hinge block bolts (four per hinge) and torque 30 to 36 inch-pounds.

(3) Lockwire the four bolts on each hinge per MS33540.

(4) Place a small bead of RTV 5818 (or equivalent) silicone around the base of each hinge block. Do not allow RTV on hinge wires.

(5) Install the left door. Refer to Installation for Left Door (Quick Removal Method).

(6) Install the right door per the following instructions:

(a) Insert the hinge pins into the hinge blocks. It works best if two people do this because the size and shape of the door makes it somewhat awkward to handle. Also, the door should be held in about the half open position while the hinge pins are inserted into the hinge blocks.

(b) After the hinge pins are inserted in the hinge block, slowly rotate the door into the door opening, and secure the door latching mechanism.

(c) Preload the door, i.e., a person on the outside of the door should push in and down.

(d) With the door preloaded, installed the roll pin in the hinge block.

(7) Reinstall all overhead panels that were removed or partially removed. Follow instructions in Chapter 25 for the COLP. Torque the screws in the FOSP and AOSP 10 to 12 in.-lbs.

(8) Reconnect the gas strut and. the pneumatic air supply line using the reverse of the procedures described in the Cabin Door Removal paragraph.

7. Baggage Door Removal And Installation

A. Use the following steps for baggage door removal. Refer to Figure 203.

(1) Remove the left side push-pull tube channel cover in the baggage compartment by first removing the fore and aft screws on top of the channel cover and sliding it out of the floor clips.

(2) Remove the gas strut from the door in the same manner as described in the Cabin Door Removal paragraph

(3) Remove the covered cabin door surround inside the baggage compartment for access to the self-locking nuts (Nyloks). The surround is secured by two self-locking nuts with washers on the bottom and is inserted in clips on the top of the door opening. Remove the nuts and screws on the bottom of the surround, and slide down to remove the surround from the clips. If the surround does not easily slide down, the clips are rotated 180 degrees and the surround must be slid up then out and down.

(4) Remove the baggage door piano hinge by removing the six, No. 8 x 1/2 inch screws with self-locking nuts (Nyloks) that hold it to the top of the doorjamb. Note: The two top clips which hold the cabin door surround are removed when the piano hinge is removed.

B. To install the baggage door use the following steps.

(1) Using two people, attach the piano hinge and torque the six screws 20 to 25 in.-lbs.

NOTE: Be sure to reattach the clips for the surround.

(2) Reinstall the baggage door surround. First, insert the top portion into the clips and then attach the screws to the base. Torque screws 30 to 36 in.-lbs.

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(3) Reinstall the gas strut onto the ball stud.

(4) Install the push-pull tube channel cover and torque screws 30 to 36 in.-lbs.

C. Other parts on the baggage door have the following specifications.

(1) If the self-locking nuts on the door brace are removed and installed, they should be torqued 30 to 36 in.-lbs.

(2) If the ball studs on the door brace or overhead bracket are removed and installed, they should be torqued 140 to 180 in.-lbs.

8. Cabin And Baggage Door Locks

A. **Left Door Lock** - To remove the left door lock, use the following steps.

(1) Set the door latching mechanism to the open position, open the door completely, and stand on the skid strips of the left wing. Ensure that the door lock is in the unlocked position.

(2) Remove the interior door handle by removing the aft cotter pin and clevis. Refer to Figure 204.

NOTE: There are two clevis pins in the door handle.

(3) When the clevis is removed, slide the handle aft to remove it.

(4) Remove the four Phillips screws on the interior door access panel, and remove the panel.

NOTE: A spacer around the door mechanism will normally fall out as the panel is removed.

(5) Mark the position of the drive tab on the interior of the door panel. This is a convenient reference when reinstalling the door lock.

(6) Remove the two pan head Phillips screws that hold the door lock in place, and remove the door lock. Refer to Figure 204.

B. **Right Door Lock** - To remove the right door lock, use the following steps.

(1) Place the thumb latch in the locked position, and remove the four Phillips screws holding the right door access panel in place. Remove the panel.

(2) Before removing the right door lock from the access panel, mark the inside of the access panel with the location of the drive tab when in the locked position. This is a convenient reference when reinstalling the door lock. Refer to Figure 205.

NOTE: When viewing the panel from the exterior, the thumb latch is in the three o'clock position, and the drive tab (behind the panel) is in the one o'clock position.

(3) Remove the latch screw and lock washer. It is important to mark the relationship of the latch to the drive tab, the drive tab to lock, and lock to the access panel since the drive tab can be assembled upside down and rotated to any of four positions.

(4) Remove the nut from the lock assembly to remove the lock.

C. **Baggage Door Locks** - To remove the baggage door locks, use the following steps. Refer to Figure 206.

CAUTION: Do not pull the upholstered panel by the edges since this can cause damage to the panel.

(1) Remove the upholstered panel on the interior of the door. The panel is held onto the baggage door with four panel fastener clips approximately arranged in the shape of a diamond.

NOTE: The upholstered panel is installed with Velcro instead of clips on some airplanes.

(2) It works best to insert a hand between the panel and the door with the palm facing the panel. Move palm towards the area of the bottom or right clamp, and force the panel away from the door.

(3) Note the orientation of the door lock, and make a reference mark for reinstallation.

(4) Remove the two No. 6 self-locking nuts (Nyloks), the two washers, locating plate, and the lock.

(5) The self-locking nut holding the lock tab can be removed if the tab needs to be replaced.

9. Installing Door Locks

A. To install the locks, reverse the steps described in the Baggage Door Removal And Installation paragraph for each particular door lock. However, the following items need to be considered.

(1) Ensure that the door locks are oriented in the proper direction since it is possible to install both the left and right locks backwards or upside down.

(2) Access panel screws should be tightened until they bottom out.

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(3) The two screws holding the lock on the left door should be torqued 12 to 15 inch-pounds.

(4) The screw on the right door lock should be torqued 38 to 44 inch-pounds.

(5) The nut on the right door lock should be torqued 100 to 120 inch-pounds.

(6) The two No. 6 baggage door self-locking nuts should be torqued 6 to 8 inch-pounds.

(7) The self-locking baggage door nut that retains the lock tab should be torqued 36 to 42 inch-pounds.

(8) It is permissible to install one AN690-516 washer between the lock and the lock tab if required. Two threads must extend past the nut attaching the tab.

10. Cabin And Baggage Door Annunciator System

A. **Cabin Doors** - The cabin door annunciator switch is mounted on the forward door pin receptacle in the fuselage. The switch is retained with two opposing setscrews. The left or right FOSP (refer to the Overhead Panel Description - Cabin Door Removal for details) must be removed to gain access to the switch. To remove or adjust the switch, use the following steps. Refer to Figure 207.

(1) **General** - With the right or left side panel removed (depending on which switch is accessed), loosen the set screws on the top and bottom of the door bolt receptacle.

(2) **Installation or Adjustment of Door Annunciator Switch** - With the door closed and latched and the baggage door locked, move the switch aft towards the door bolt until it activates the plunger switch and the applicable indication that follows occurs:

(a) For the Model T240 Garmin G2000 Installation, the Crew Alert System (CAS) DOOR OPEN (RED) message on the Primary Fight Display (PDF) comes on.

(b) For the Avidyne and Garmin G1000 options, the Door Open in the upper left position of the panel comes on.

(3) Move the switch an additional 0.025 inch aft.

(a) Remove the set screws.

1 Apply Form-A Gasket number 2 by Permatex to the threads.

(b) Install the screws.

(4) **Switch Removal** - To remove the switch, loosen the two set screws, unplug the commercial-type connector, and remove the switch.

B. **Baggage Door** - The baggage door switch is part of the forward locking mechanism. When the lock tab is moved to the locked position, the tab moves the contact on the snap-action switch. When the left and right doors are closed with the ground removed from their switches, this action removes the ground on the switch and turns off the door annunciator light or the CAS DOOR OPEN message on the PFD as applicable. To remove or adjust the baggage door annunciator switch, use the following steps. Refer to Figure 208.

(1) **Switch Removal or Adjustment** - The baggage door annunciator switch is mounted to a stud plate that mounts through the switch bracket with two washers and self-locking nuts. To remove the switch, remove the two self-locking nuts and washers, and disconnect the commercial-type connector. To adjust the switch, close and lock the door, and slide the switch toward the lock tab until the switch is activated. Slide an additional 0.020 inch toward the lock tab before torquing the nuts.

(2) **Switch Installation** - To install the switch, secure it to the stud plate that mounts through the switch bracket with two washers and self-locking nuts with Loctite. Torque nuts 2 to 3 in.-lbs.

(3) **Test the System**

(a) Close and lock the cabin and baggage doors.

(b) Put electrical power on the airplane.

(c) Make sure that the applicable indication occurs:

1 For the Model T240 Garmin G2000 installation, the Crew Alert System (CAS) DOOR OPEN (RED) message on the Primary Fight Display (PDF) does not comes on

2 For the Avidyne and Garmin G1000 options, the Door Open annunciator in the upper left position of the annunciator panel does not comes on.

(d) If the applicable OPEN DOOR annunciator stays on, adjust the switch. Refer to Switch Removal or Adjustment .

(e) Do the test again.

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(f) Remove electrical power from the airplane.

(4) **Troubleshooting** - If during flight as applicable, the DOOR OPEN annunciator light or the DOOR OPEN CAS message shows on the PFD comes on intermittently, do the troubleshooting procedures that follow:

(a) Make sure that the baggage door hinge is securely fastened to both the door and the fuselage. Check the hinge for excessive wear. Repair or replace the hinge as required.

(b) Check the locks for correct mounting and function. With the key inserted into the lock, the key should only turn approximately 90 degrees. If there is under or over-rotation, replace the lock.

(c) Make sure that the lock is properly secured to the door. The lock must be firmly held inside the tapered hole in the door by the locating plate. The protruding studs for attachment of the lock plate to the door should not be bent, causing misalignment of the lock. The lock plate should not be loose. Repair or replace as required.

(d) Make sure that the lock tab is secured to the lock. Confirm that the lock tab is fully seated onto the lock shaft and the shaft nut is tight. When closed and latched, there should be minimal (0.06 maximum when measured at the lock tab) inboard or outboard door movement. Make sure that the rain seal is not loose and interfering with door closing. The lock tab can bent inboard or outboard as required to decrease this door movement.

(e) Inspect the switch lever arm to see if it is bent excessively or broken. Also, examine the lever arm attachment/pivot points for wear or breakage.

(f) Finally, make sure that the switch retaining screws are tight enough to prevent switch movement during activation of the switch. Repair or replace as required.

(g) If, after performing the above listed preliminary checks along with any required repairs or parts replacements resulting from above inspections, the problem still exists, adjustments to the switch may be required.

(h) Loosen the switch retaining screws, and move the switch as far as possible toward the lock. Although there is a very limited amount of movement available for this adjustment, it is usually sufficient to ensure switch activation. Tighten screws 2 to 4 in.-lbs.

(i) There is also a very limited amount of adjustment available by loosening the shaft nut on the lock and moving the lock tab as far as possible toward the switch before tightening the shaft nut 36 to 42 in.-lbs.

(j) A new, longer lock tab can also be fabricated and used to replace the existing lock tab in extreme cases.

(k) Although bending the lever arm can result in proper switch activation, it is not the preferred or recommended method. The lever arm is brittle and can break when you bend it. In addition, without proper support of the lever arm, the arm pivot points are easily distorted or destroyed when trying to bend the lever arm.

11. Removal Of The Cabin Door Latching Mechanisms

A. Removal of the cabin door mechanism is accomplished by using the following instructions. Refer to Figure 209.

(1) Remove each door handle by removing the cotter pin of the short clevis pin, located through the ears of drum, and then removing the clevis pin. Each handle can be slipped out of the remaining clevis pin in the spindle.

(2) Remove four screws attaching the access panel in the cabin door. Remove the bushing in the access panel before removing the panel. The bushing may be glued to the access panel.

(3) Remove the cotter pin, washer, and clevis pin for each push tube at the connection of the drum ears. The latching pin assemblies can be removed from the door through the access panel.

(4) From the access panel, remove the hex head bolt, washers, nut (located under mounting plate), and spacer.

(5) Remove the truss head screw (located under the exterior handle), washer, nut (located on the access panel side), spacer and the pan head screw. This will allow removal of the remaining mechanism. The mechanism will need to be rotated to get the ears through the slot in the mounting block.

(6) Depressing the spring retainer will allow access to remove the snap ring. Remove the snap ring, spring retainer, spring, and spring housing.

(7) Identify the mating cam, drum, and spindle to the door (left or right) before disassembly. The spindle has two buttons which are opposite of each other and positioned to match the door. The remaining two holes match button locations for the other door.

(8) Remove the cam and spindle from the drum by removing the pin through the drum.

(9) Remove the cotter pins and clevis pins from the spindle.

(10) Some parts are common to both left and right cabin doors; however, it is not good practice to interchange door parts

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without close examination to size, shape, and length.

12. Reassembling The Cabin Door Mechanisms

A. Use the following steps for reassembling the cabin door mechanism. Refer to Figure 209. As needed, use CRC lubricant 3-36 (or equivalent) on moving parts during assembly, but keep fasteners dry.

(1) Assemble the long clevis pins and new cotter pins to the spindle per MS33540.

(2) Assemble the mating cam on the drum with the flat face adjacent to the face of the latch pin drive ears. Button positions on the cam must match the door to be assembled (left or right). Buttons may be bonded with Loctite 243 or equivalent.

(3) Assemble the mating spindle with the drum, and align the slots of the spindle with the ears of the drum. Insert the pin through the cam, drum, and spindle.

(4) Assemble the spring housing, spring, and spring retainer onto the pin. Depress the spring retainer, and assemble the retaining ring with the sharp edge away from the retainer and into the groove of the drum.

(5) Add nylon washer to each end of the assembly by assembling through the access panel of the mating door. With the washer end of the drum toward the mounting plate, pass the drum ears through the slot in the mounting plate. Rotate the assembly to position the ears on the exterior of door at the aft location of the door.

(6) Attach the cam to the mounting block with spacers, washers, bolt, screw, and nuts. Assemble the screw from the exterior of the door. Torque nut of screw and bolt 30 to 36 in.-lbs.

(7) Reassemble the latch arms and pins with new cotter pins per MS33540. Assemble mating latch arms and pins of door through the access panel and through bushings in the door. Attach to the drum ears with the clevis pin and new cotter pins per MS33540.

(8) Assemble the left door lock assembly with the mounting plate over the spindle, drive tab (marking shown) on lock, lock tab on drive tab, and nut torqued 36 to 42 in.-lbs.

(9) Install pan head screw through door skin and mounting plate. Torque 12 to 15 in.-lbs.

(10) Assemble the left door lock assembly to the mounting plate from the access panel with the plate over studs with two nuts and washers torqued 12 to 15 in.-lbs.

(11) Assemble the right door lock assembly to the access panel with the thumb latch pointing aft on the panel side with countersink screw holes. Assemble with a star washer, and torque nut 100 to 120 in.-lbs. Align marks on the lock tab, drive tab, and lock assembly, and attach with lock washer and screw. Torque screw 36 to 42 in.-lbs.

(12) Assemble the access panel bushing over the ears of the drum. After cycling latches several times with the access panel in place, bond the bushing to the access panel (countersunk screw holes showing) with Loctite 454, and attach the access panel to the door with flat head screws.

13. Remote Keyless Entry System

A. On 28V aircraft an optional remote keyless entry system allows unlocking of the pilot's door through use of a remote transmitter. The system consists of a transmitter, a remote keyless entry assembly, a receiver, relay, LED located in the left edge of the overhead console, and associated wiring. The system is activated by keying the door lock to LOCK and then to AUTO. An LED illuminates indicating the remote keyless entry system is armed.

(1) Remote Keyless Entry Assembly - (Refer to Figure 210.)

(a) Removal

1 Set the door latching mechanism to the open position, open the door completely, and stand on the skid strips of the left wing. Ensure the door lock is in the unlocked position.

2 Remove the interior door handle by removing the aft cotter pin and clevis. There are two clevis pins in the door handle.

3 When the clevis is removed, slide the handle aft to remove it.

4 Remove the four Phillips screws on the interior door access panel, and remove the panel. A spacer around the door mechanism will normally fall out as the panel is removed.

5 Mark the position of the drive tab on the interior of the door panel. This is a convenient reference when reinstalling the remote keyless entry assembly.

6 Disconnect the electrical connectors.

7 Remove the two flat head screws holding the remote keyless entry assembly in place, and remove the

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assembly.

8 If necessary the door lock may be removed at this time by removing the nut, drive tab, cam, and locknut holding the lock to the mounting bracket. Refer to Figure 210.

(b) Installation - Installation is the reverse of removal. Refer to the Installing Door Locks paragraph for additional instructions.

(c) Maintenance - The components of the remote keyless entry assembly require no maintenance.

(2) Receiver and Relay

(a) Removal

1 Remove the overhead console and aft roof panel per Chapter 25.

2 Disconnect the electrical connectors.

3 Remove the flat washer, lock washer, and nut (1 each for the relay and 2 each for the receiver) affixing the respective component to the overhead console or aft roof panel. Refer to Figure 211 and Figure 212.

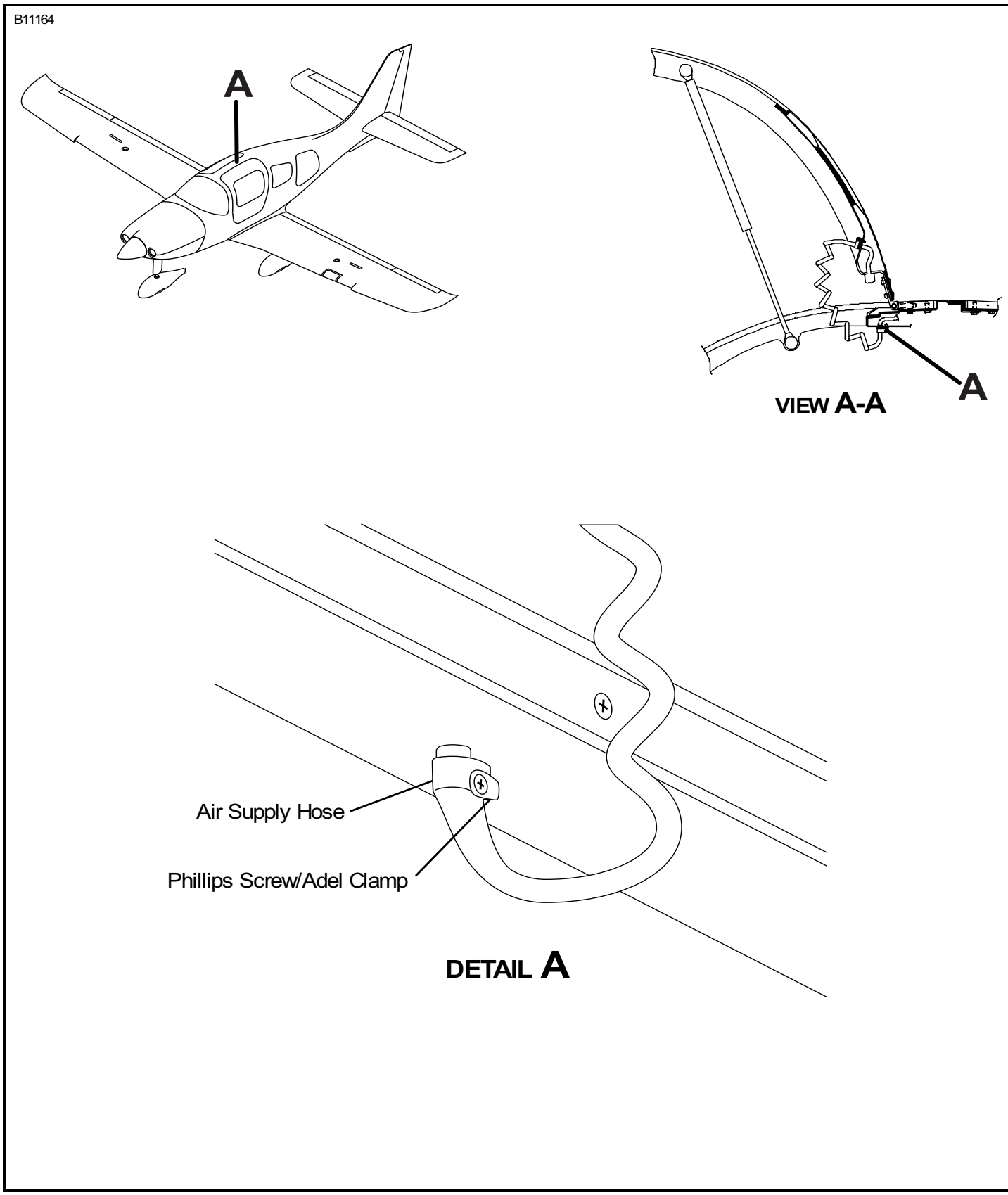
4 Remove the receiver or relay.

(b) Installation - Installation is the reverse of removal.

(c) Maintenance - The receiver and relay are self-contained components and require no maintenance.

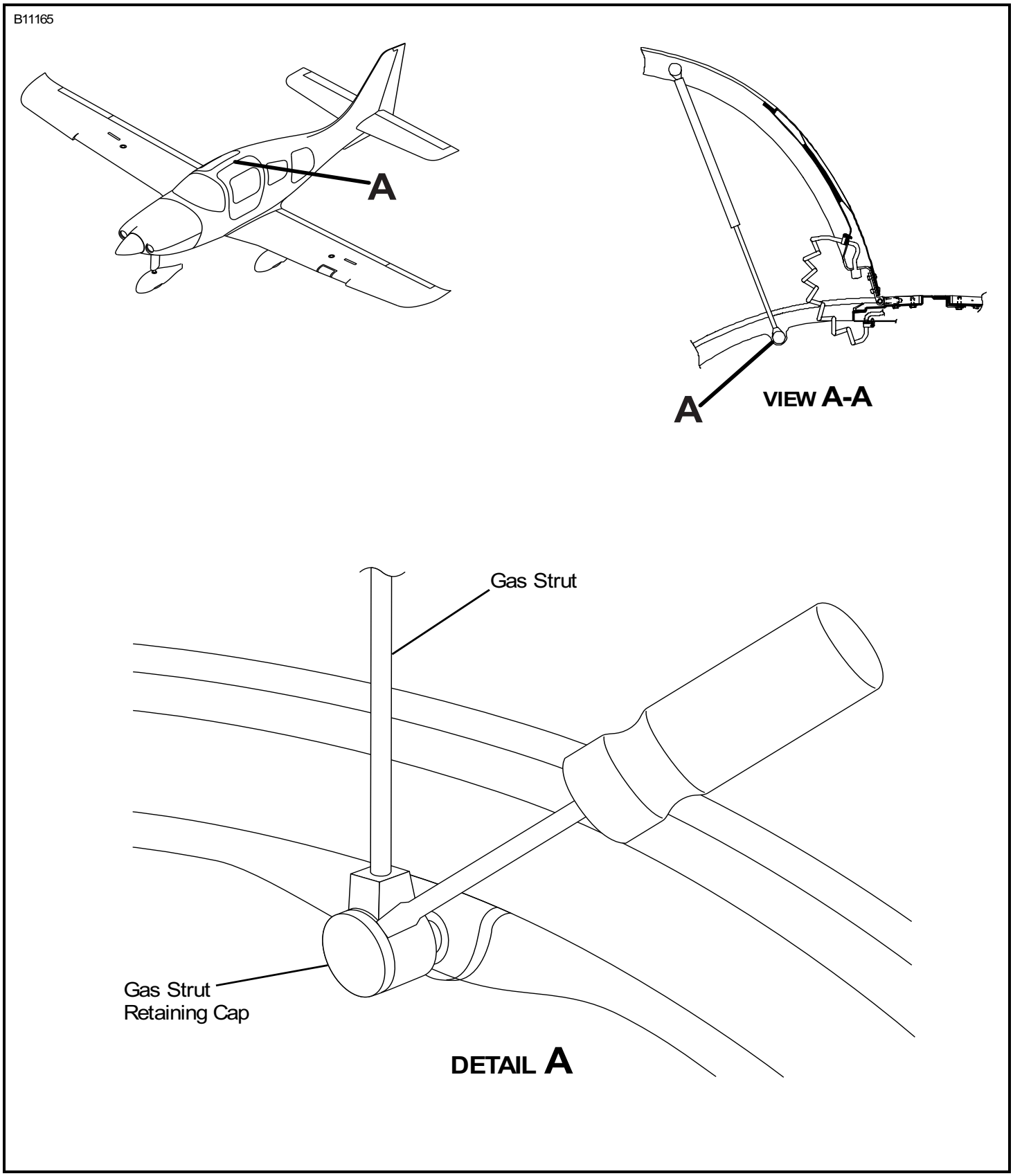
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Figure 201 : Sheet 1 : Pneumatic Door Seal Removal



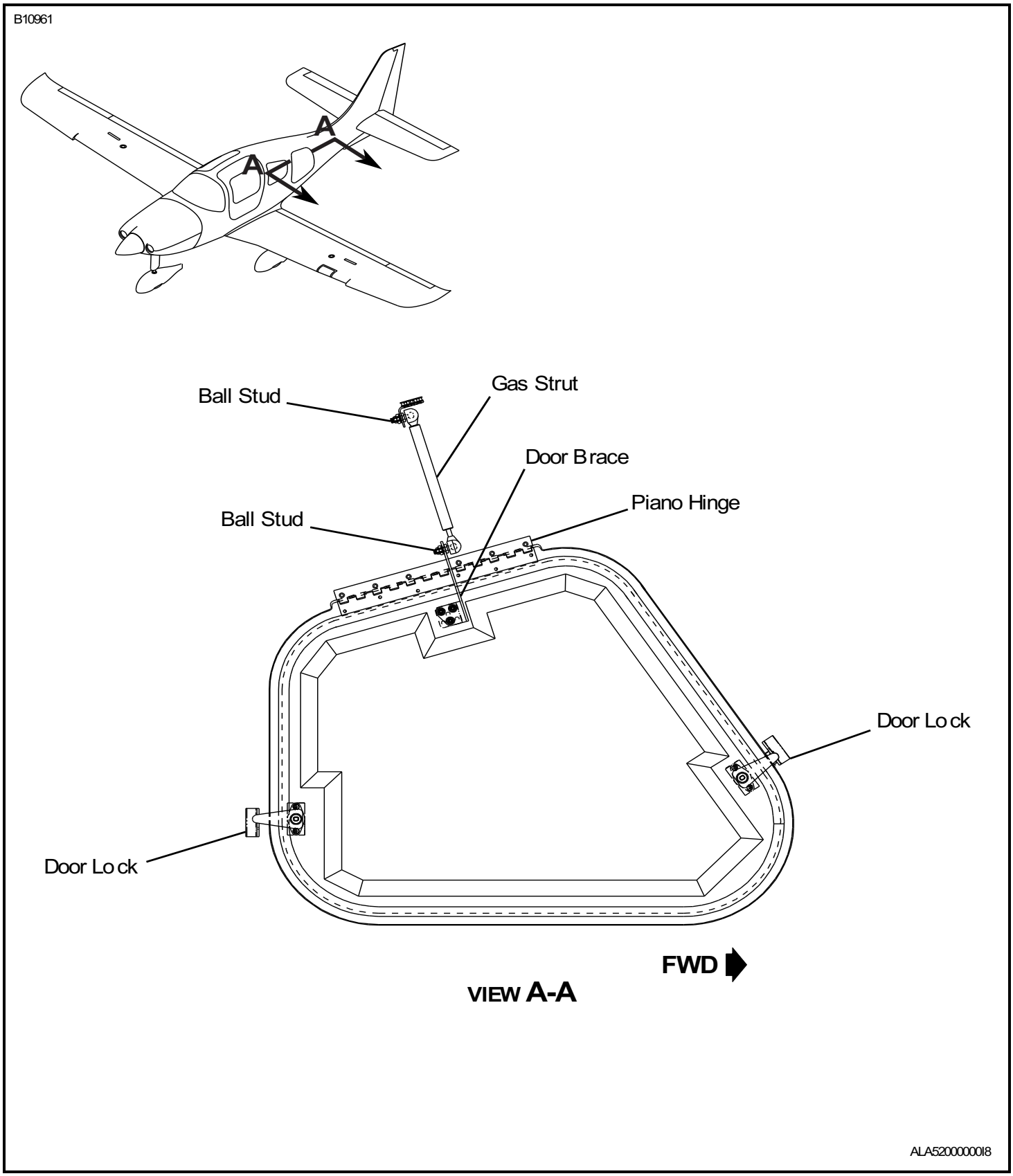
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Figure 202 : Sheet 1 : Gas Strut Removal



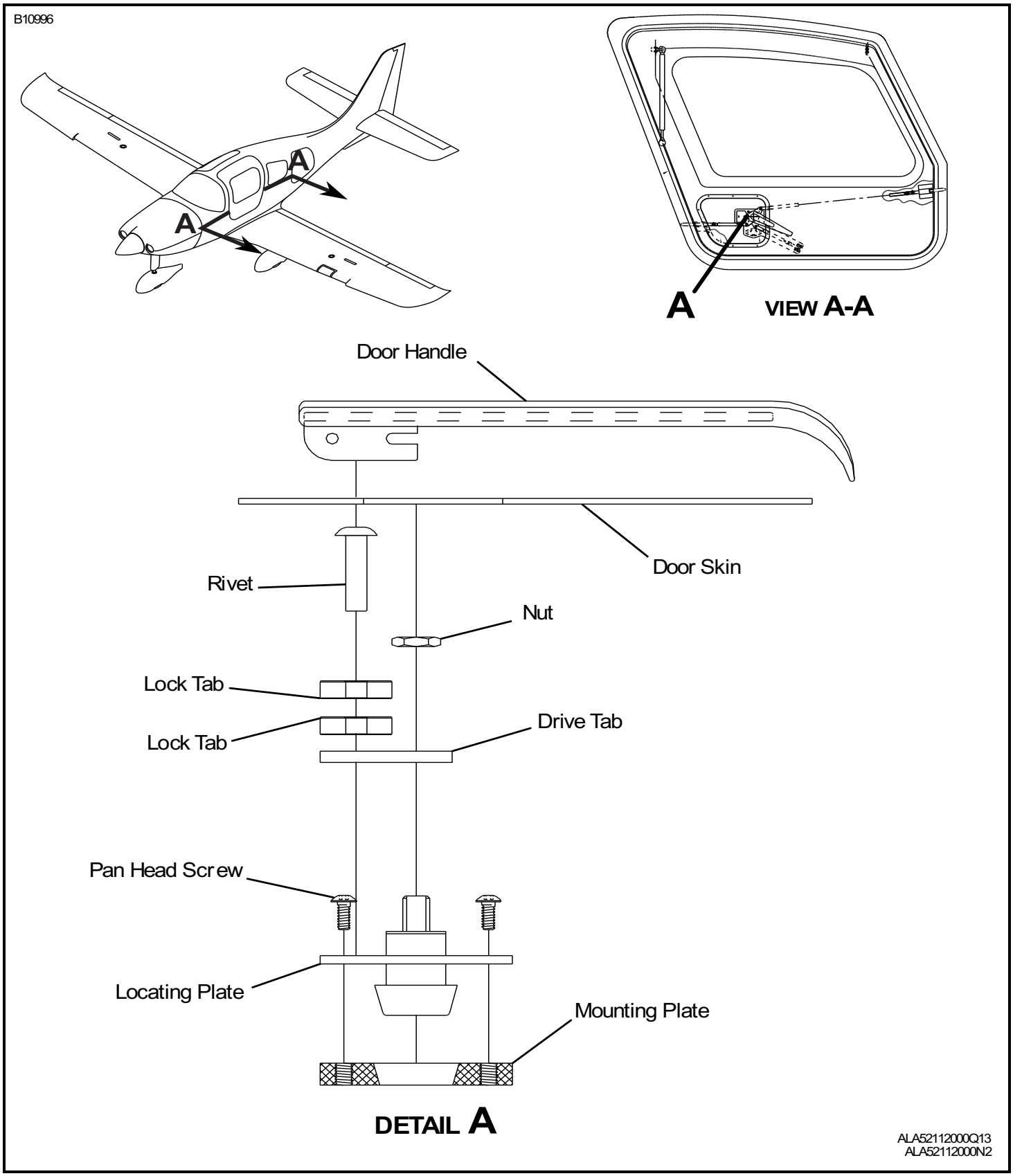
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Figure 203 : Sheet 1 : Baggage Door



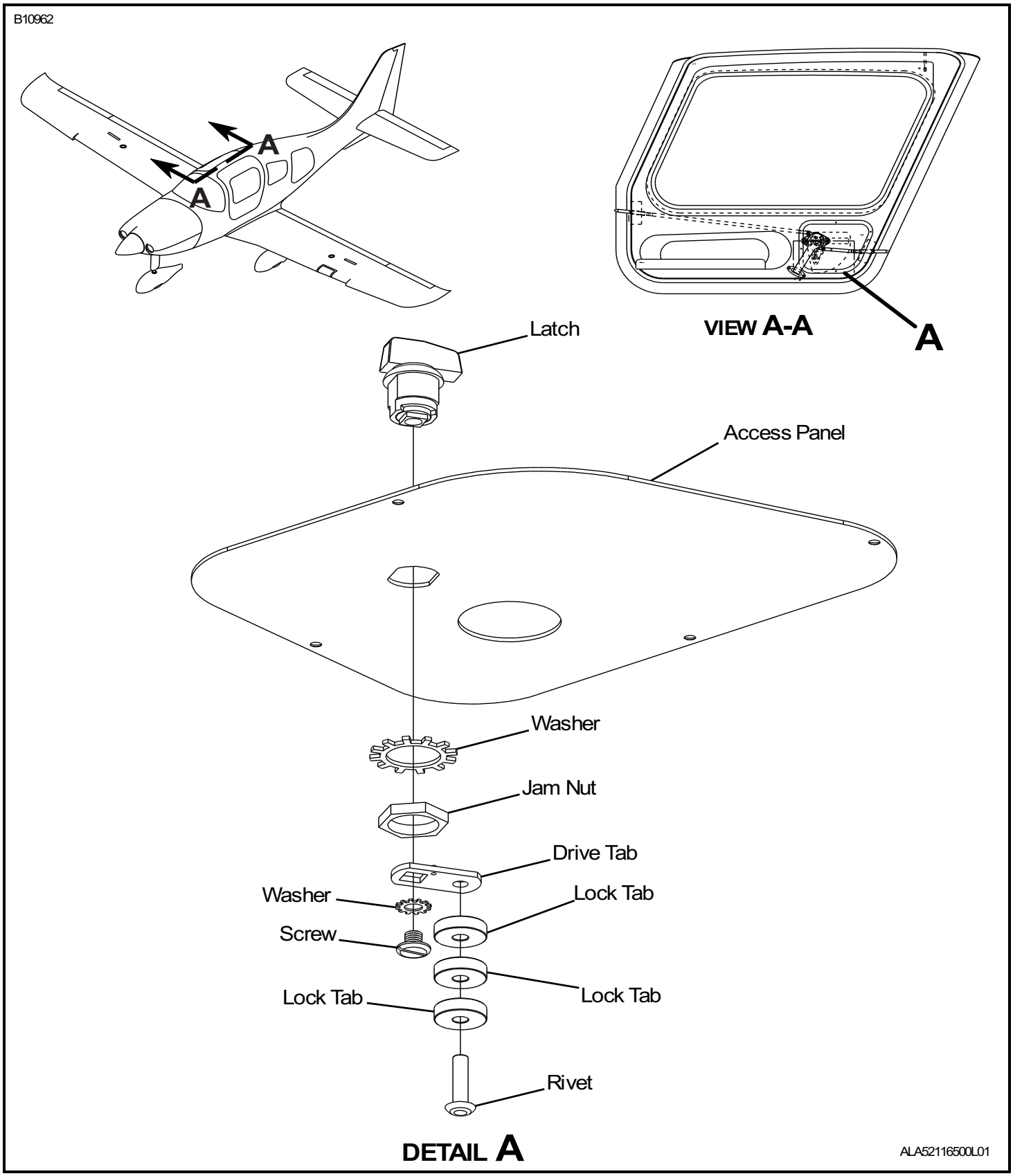
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Figure 204 : Sheet 1 : Left Door Lock Assembly



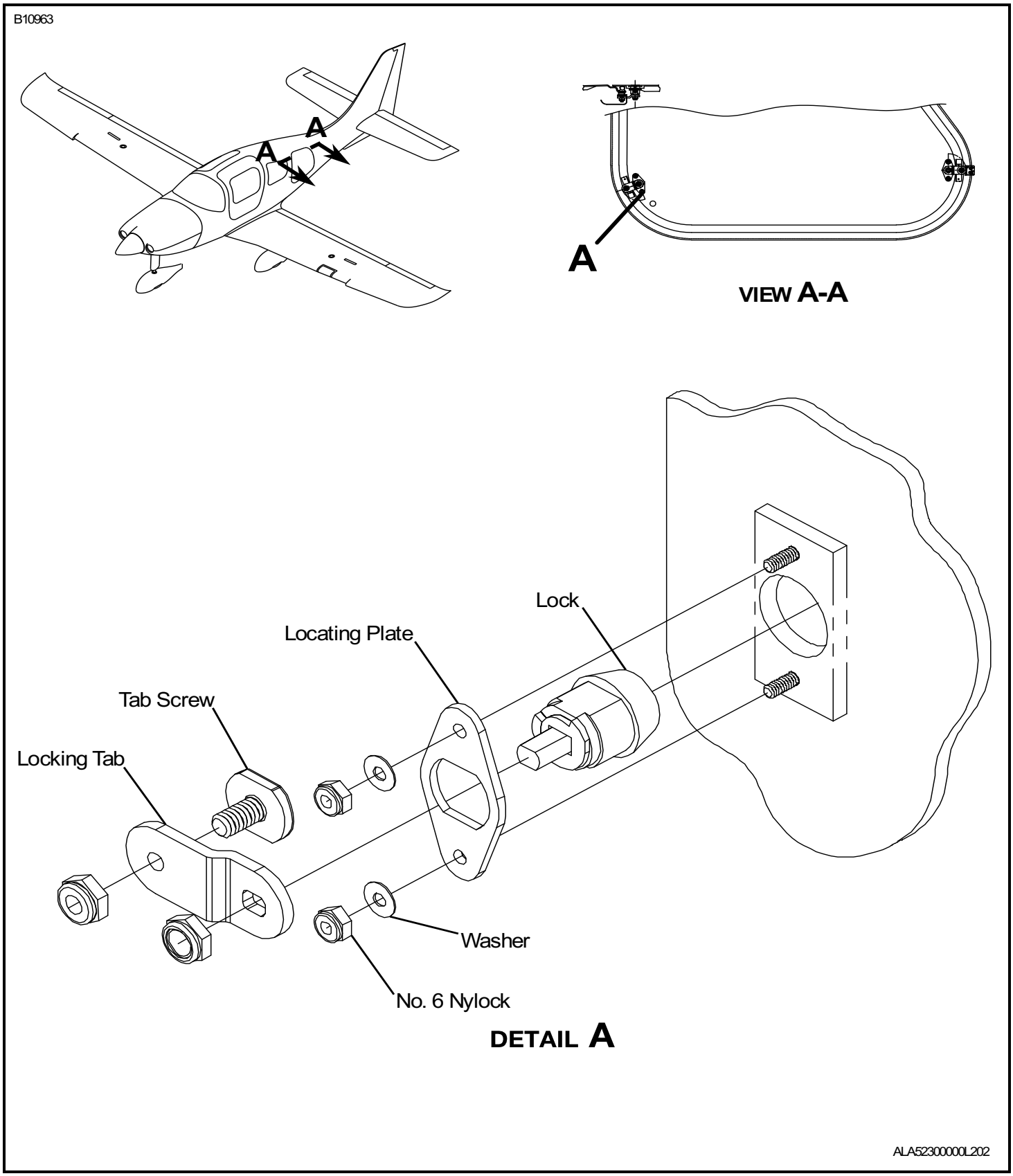
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Figure 205 : Sheet 1 : Right Door Lock Assembly



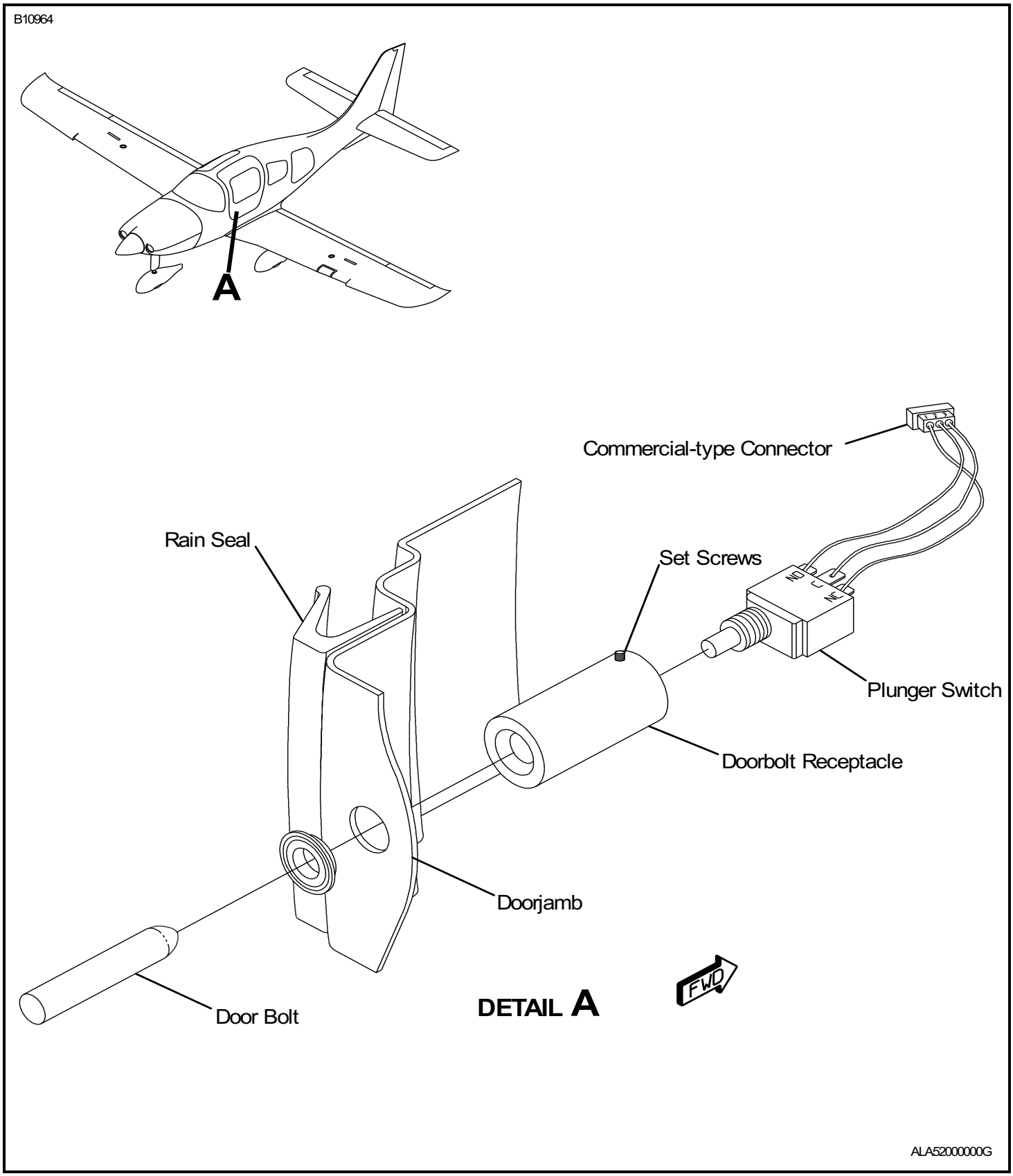
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Figure 206 : Sheet 1 : Baggage Door Lock



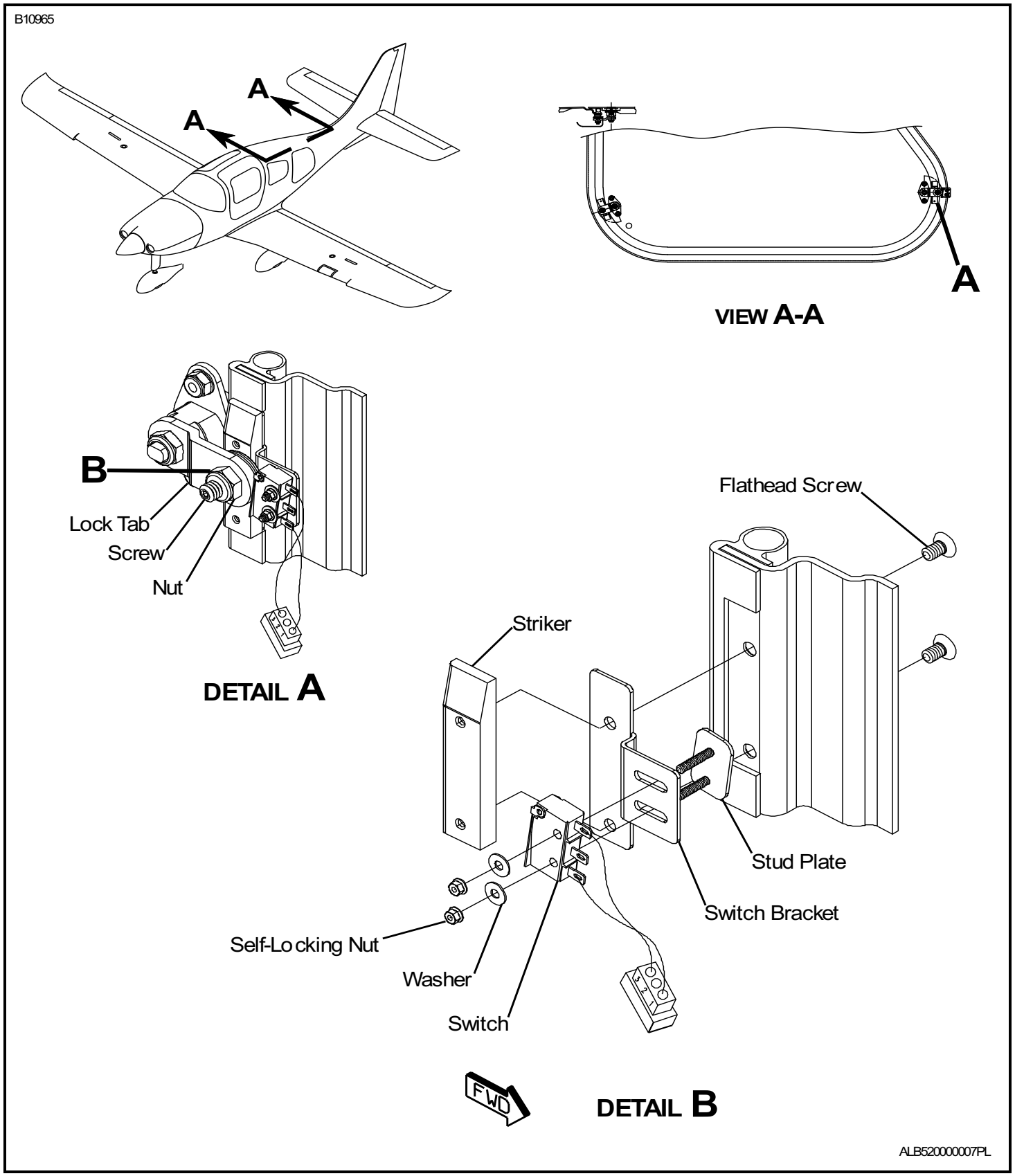
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Figure 207 : Sheet 1 : Cabin Door Annunciator Switch Assembly



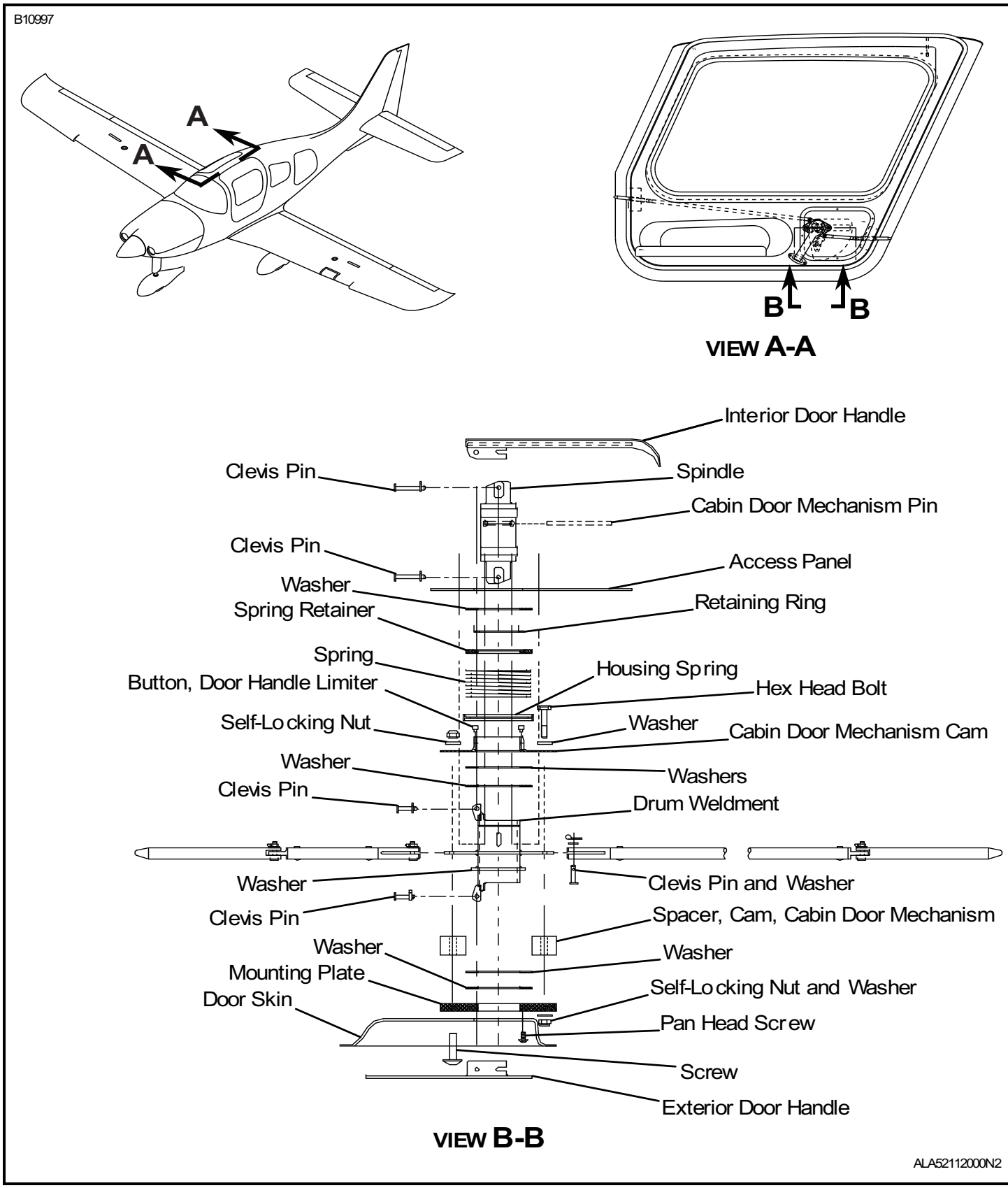
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Figure 208 : Sheet 1 : Baggage Door Switch Assembly



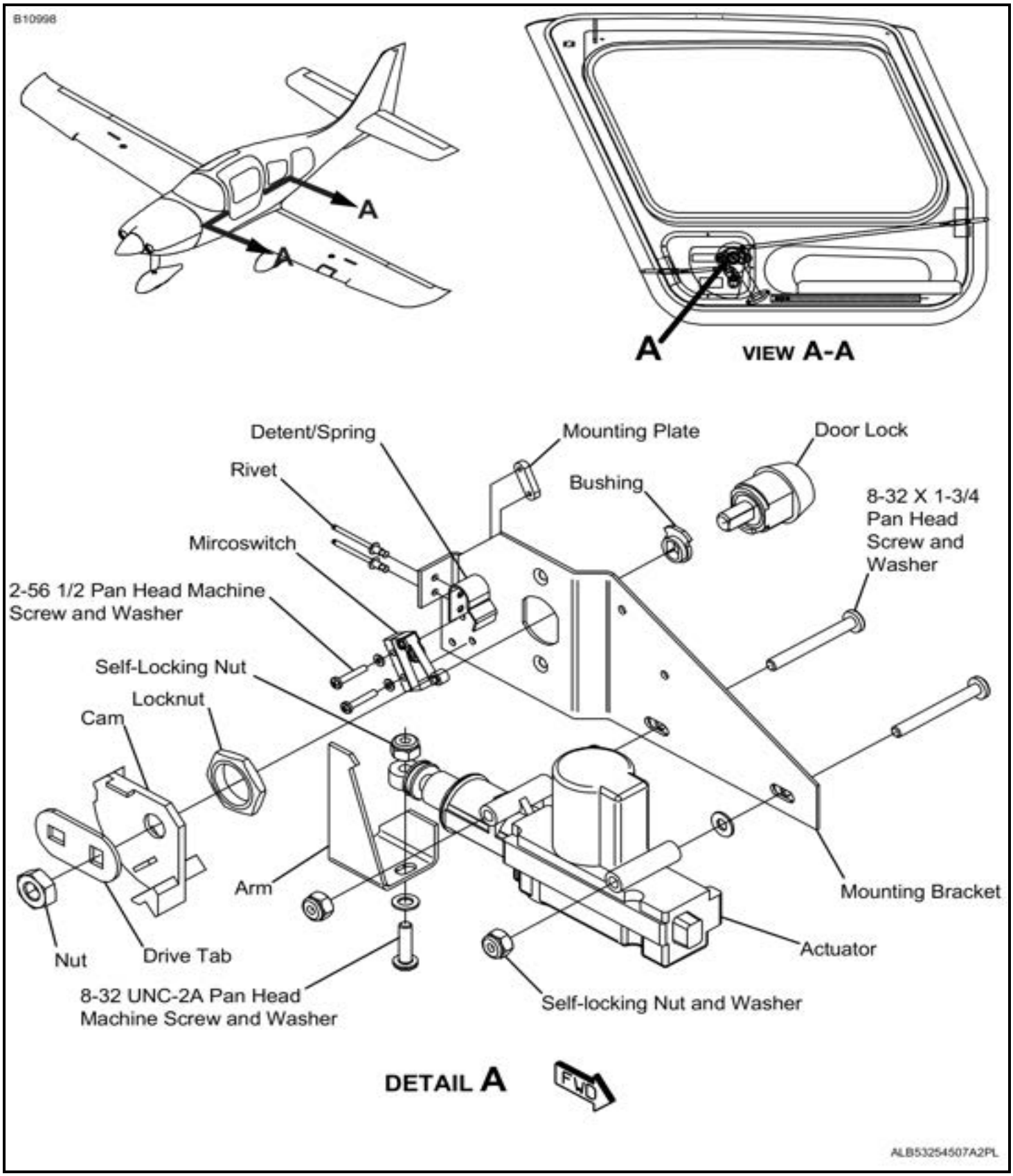
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Figure 209 : Sheet 1 : Cabin Door Locking Mechanism



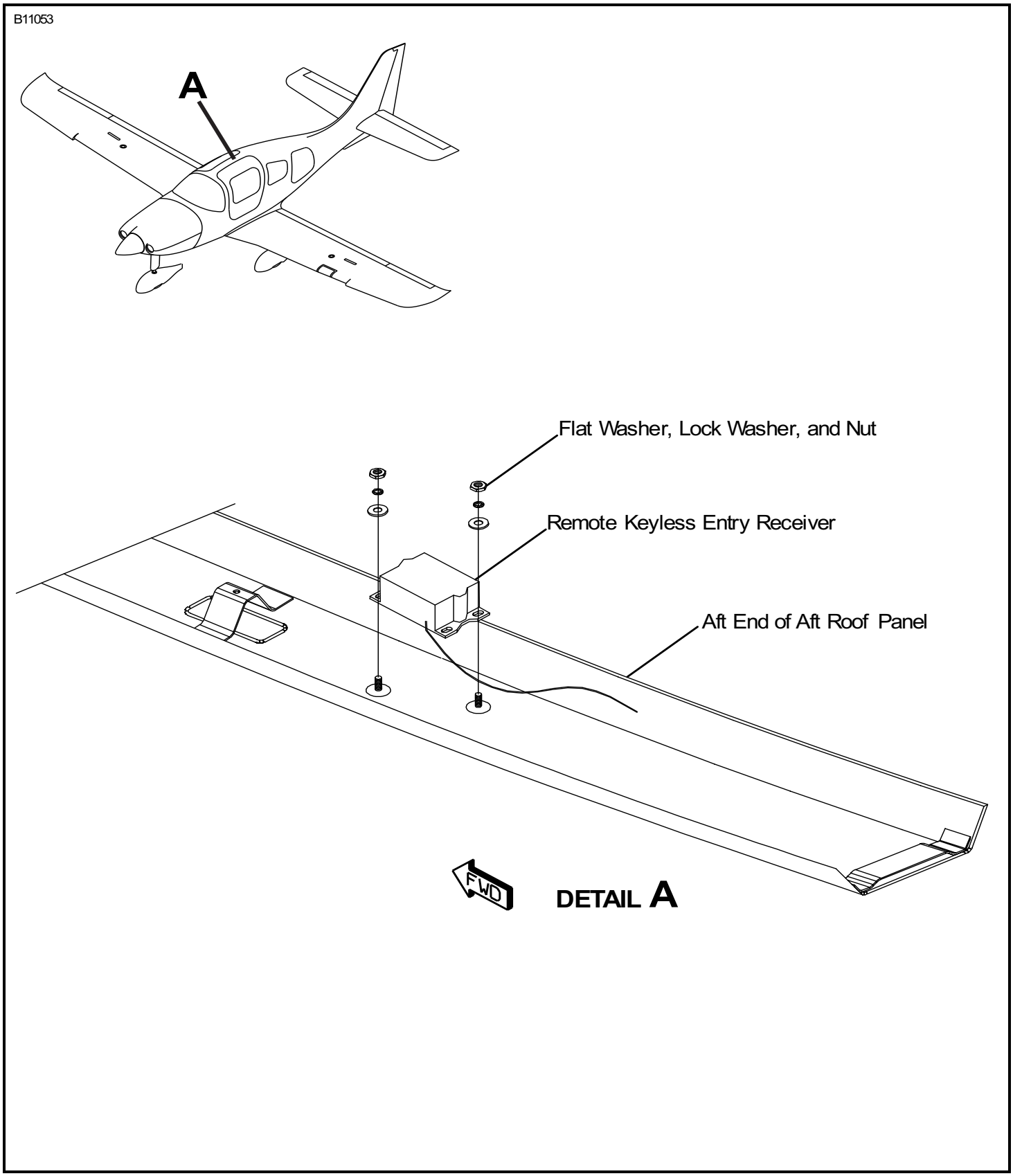
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Figure 210 : Sheet 1 : Remote Keyless Entry Assembly



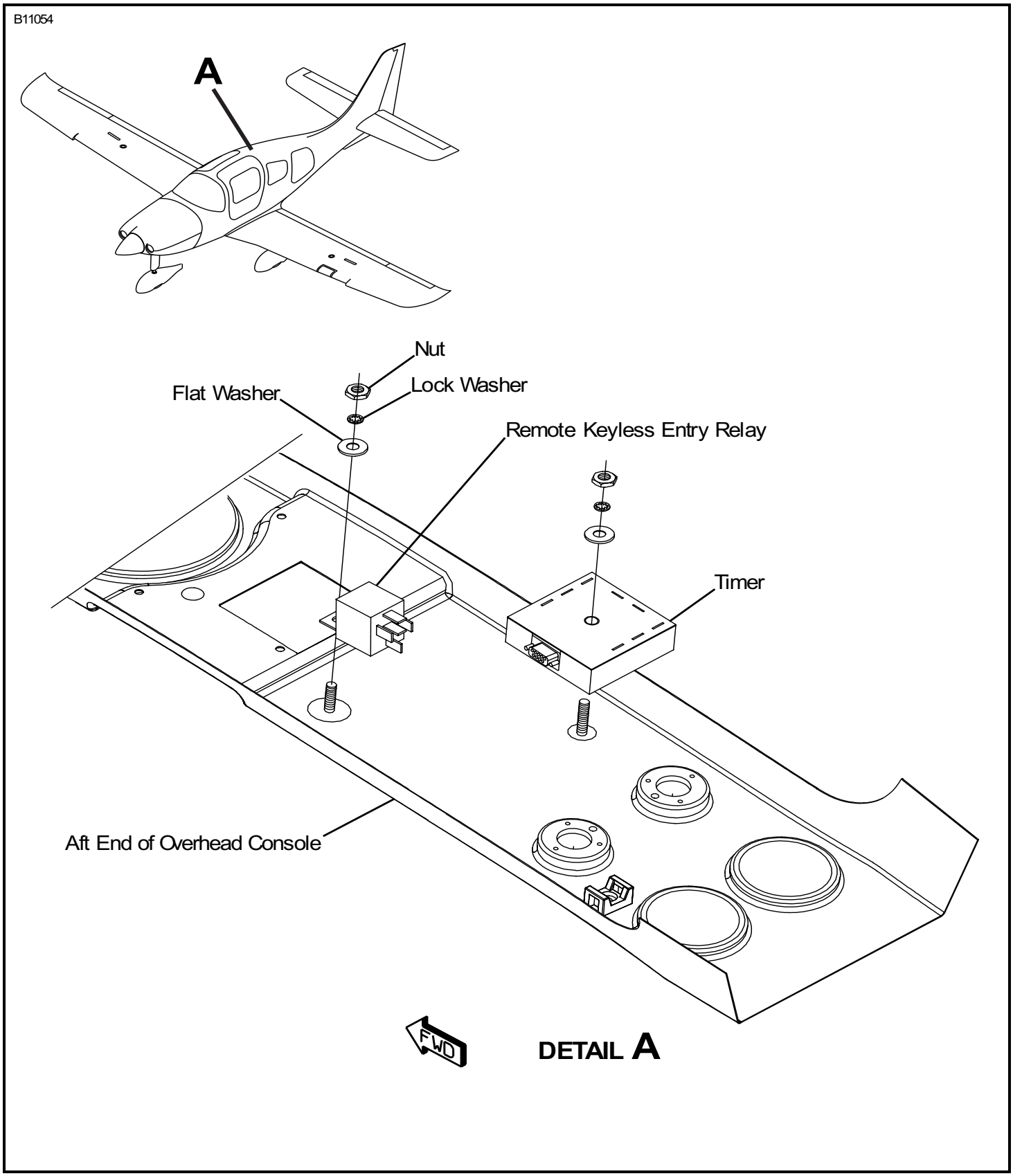
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Figure 211 : Sheet 1 : Remote Keyless Entry Receiver



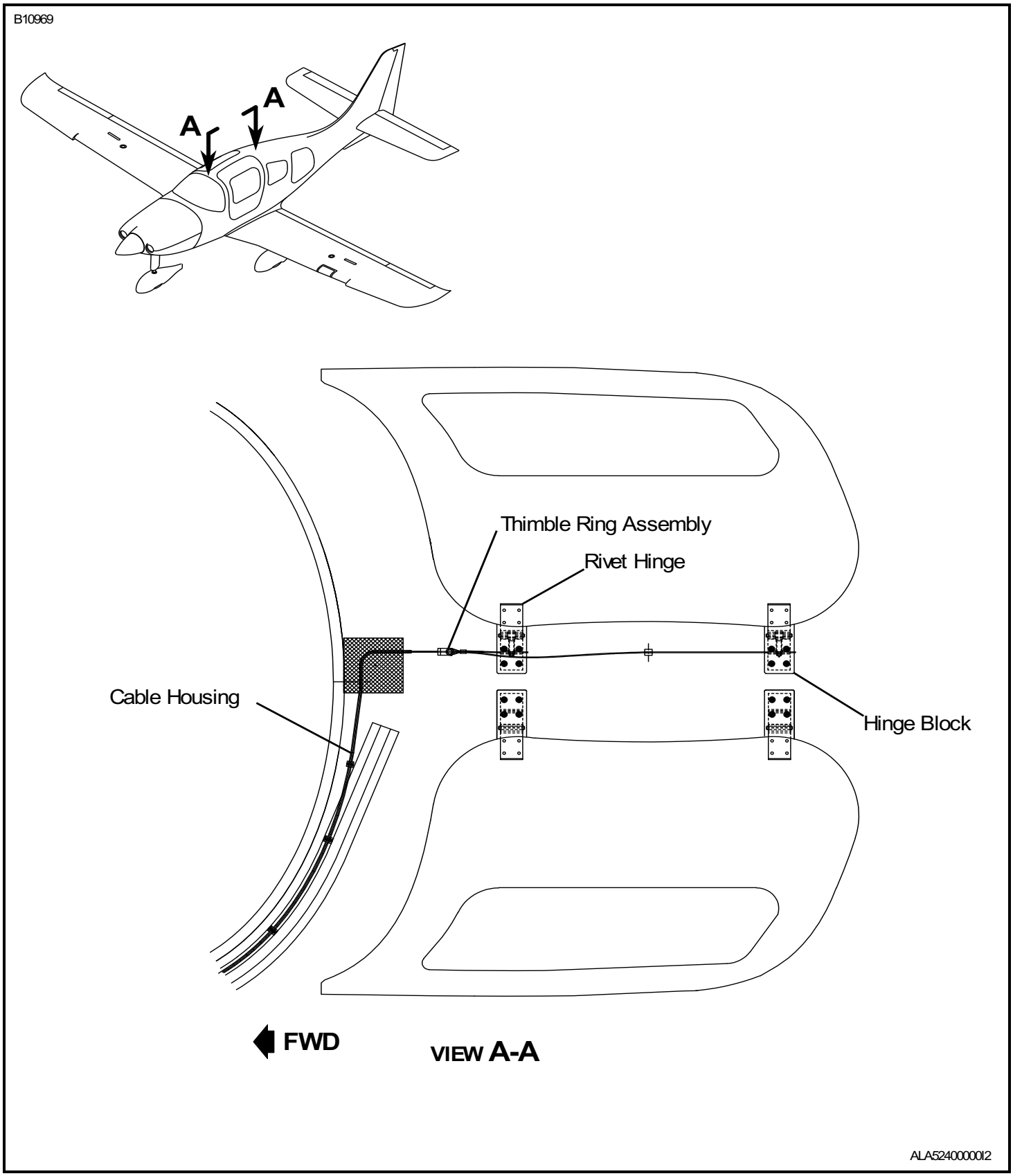
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Figure 212 : Sheet 1 : Remote Keyless Entry Relay



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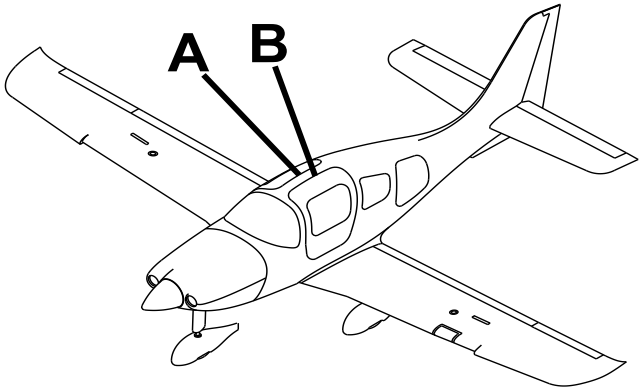
Figure 1 : Sheet 1 : Door Hinges

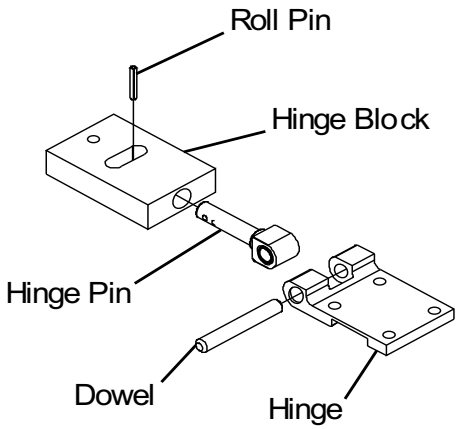


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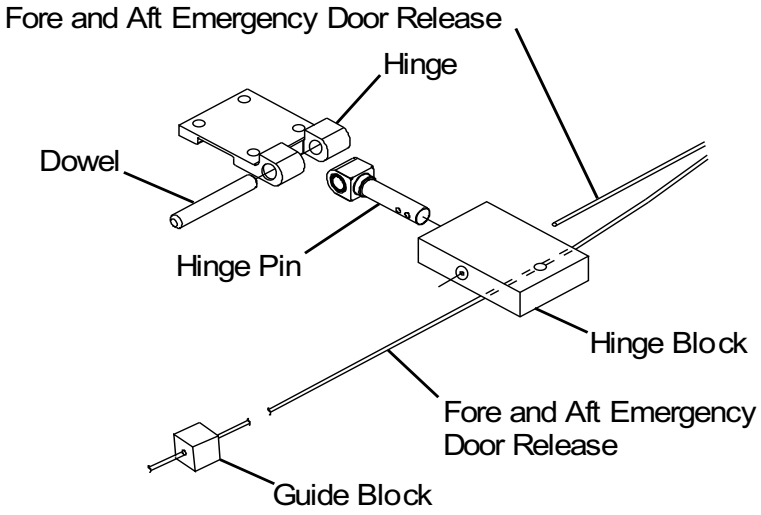
Figure 2 : Sheet 1 : Door Hinge Assembly

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DETAIL A



DETAIL B

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DOOR SEAL SYSTEM - MAINTENANCE PRACTICES

1. Door Seal System

A. **General** - The door seals are inflated by an electric pump located forward of the pilot's side rudder pedals near the firewall. Refer to Figure 201. Two other devices are associated with the electric pump: a pressure switch and a dump valve, which are mounted to the same surface as the pump. Refer to Figure 204 and Figure 205. The electric pump draws air from the cabin, through a filter, and then pumps it to a pressure switch. From that point the air moves to a T-fitting. Refer to Figure 202. One part of the T-fitting supplies pressure to a dump valve, and the other part supplies pressure to the door seals. Refer to Figure 203.

B. **Pressure Switch** - The pressure switch maintains the system pressure at between 12 and 15 psi and turns the pump on and off at these two limits, respectively.

C. **Dump Valve** - The dump valve is a solenoid that requires two conditions to be energized and not dump pressure from the system. The master switch must be on and the Door Open Annunciator must be extinguished. If one of the cabin doors is opened or the master switch is turned off, the solenoid will de-energize and pressure is dumped from the system.

D. **Supply Lines** - The supply lines for the door seal are routed from the pump assembly, behind the lower kick panel, up through the rollover structure, and then aft, above the emergency release cables, to the aft part of the door openings. At this point a T-fitting routes air to the right and left doors. A coil assembly transfers the flow from the cabin to the door.

E. **Location of Nipples** - There are 14 plastic nipples in the system to which plastic hosing is connected. Since system leaks are frequently at the connection points, the location of each nipple is important.

(1) Seven nipples are located in the pump assembly.

(2) Three nipples are located in the overhead panel.

(3) Two nipples are associated with each door, one at the cabin connection and one at the door connection.

2. Troubleshooting The Door Seal System

A. **Symptom** - Door seal system cycles on and off every few seconds.

(1) **Probable Cause** - Supply line between the pump and pressure switch has a leak.

(2) **Action** - Replace the supply hose, and recheck the system.

B. **Symptom** - Pump runs continuously or turns on and off every minute or so.

(1) **Probable Cause** - A leak somewhere in the system

(2) **Action** - Isolate the area of the leak.

(a) Use a hemostat to isolate a leak in the system. First, clip off the system at a point between the output of the pump assembly and the supply to the door seals. It will be necessary to remove the left side kick panel (refer to Chapter 25, Interior Panels - Maintenance Practices) or the right FOSP (refer to Quick Removal of the Left Door). Operate the system with the hemostat in place. If it holds pressure for more than two minutes, the problem is in one of the following areas:

1 The overhead T-fitting supply lines

2 The supply lines to the doors

3 The supply line from the pump to the overhead T-fitting, somewhere forward of the hemostat.

(b) If the system leaks when the hemostat is applied between the output of the pump and the supply to the system, the leak is probably in one of the following areas:

1 The supply line between the hemostat and the pump assembly

2 The supply line between the pump assembly T-fitting and the dump valve

3 The supply line between the pressure switch and the pump assembly T-fitting

(c) Depending on which side of the system the leak is first isolated, continue to move the hemostat in the appropriate direction until the exact location is determined, and replace the supply line/Clippard hose per instructions in the Replacing Air Supply Lines/Clippard Hose paragraph. The following points should be remembered:

1 There may be more than one leak in the system.

2 To access the pump assembly, it works best to remove the engine instrument panel.

C. **Symptom** - Door Seal System will not turn on.

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(1) **Probable Cause** - The most probable causes are listed below in their most likely order:

(a) Door latch plunger-type switches need adjustment.

(b) Doors are not completely closed.

(c) Circuit breaker is open.

(d) Pressure switch is defective.

(e) Pump is defective.

(2) **Action** - Perform the actions below in the order listed.

(a) Make sure that when the door latching mechanism is activated the action that follows occurs:

1 The DOOR OPEN annunciator (Avidyne or Garmin G1000 options) goes out.

2 The DOOR OPEN Crew Alert System (CAS) message on the Primary Flight Display (PFD) (Garmin G2000 installation) goes off.

(b) Make sure that the door seal circuit breaker is in.

(c) If the doors are functioning properly, jumper past the pressure switch. If the pump turns on, the problem is a defective pressure switch. Replace switch per instructions in the Replacing Pump Assembly Components paragraph.

(d) If you jumper past the pressure switch does not turn on the pump, the pump is defective. Replace the pump per instructions in the Replacing Pump Assembly Components paragraph.

D. **Symptom** - There are no leaks in the system, however, the pump runs but will not adequately inflate the door seals.

(1) **Probable Cause** - The pump filter is clogged or the dump valve is defective.

(2) **Action** - Clean the filter. If this does not cure the problem, place a hemostat on the line between the pump assembly T-fitting and the dump valve. If the system pressurizes the door seals, the problem is a defective dump valve. Replace the dump valve per instructions in the Replacing Pump Assembly Components paragraph.

3. Replacing Air Supply Lines/Clippard Hose

A. If a supply line leak is isolated, it must be replaced with Clippard hose Part No. 3814-6.

B. The fit of the hose to the supply nipple is very tight, and in most cases, it will require cutting the hose off. The hose can be heated slightly with a heat gun, however, extreme care must be used to not damage the nipple or other components.

C. Ensure the new hose is routed through the same plastic guides as the old hose. Normally, if the hose is inserted past the first barb on the nipple, this is sufficient.

D. To replace the door coil, use the following steps:

(1) Remove the Adel clamps from the cabin and the door. Refer to Cabin and Baggage Door - Maintenance Practices, Figure 201.

(2) Gently pull on the door coil so that it draws the nipple and Clippard hose from the overhead cabin hole and the hole in the door.

(3) Remove the door coil from each nipple, and install the new one.

(4) Feed the Clippard hose back into the overhead panel and door, and reinstall the Adel clamps.

4. Replacing Pump Assembly Components

A. For airplane S/N 411133 and on, the pump assembly components are mounted to a base plate which is then attached to a flange in the airplane. Remove the assembly before removal or installation of the individual components using the procedures below. Remove the assembly by disconnecting the electrical connectors and the Clippard hose, and then removing two 6-32 pan head screws and washers attaching the base plate to the flange. Installation of the assembly is the reverse of removal. Torque the screws 20 to 25 in.-lbs.

B. **Dump Valve** (Refer to Figure 204 or Figure 205)

(1) Disconnect the Clippard hosing and the electrical connections.

(2) Remove the two No. 6 screws and lock washers which are inserted into threaded holes in the dump valve.

(3) Remove the dump valve.

(4) Installation is the reverse of removal. Torque the screws 10 to 12 in.-lbs.

C. **Pressure Switch** (Refer to Figure 204 or Figure 205) - To **adjust the switch pressure**, T-in a calibrated pressure

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reading device to the system and turn the pressure adjustment screw until the output pressure is 14 psi (pump type A) or 10 psi (pump type B).

(1) Disconnect the Clippard hosing and the electrical connections.

(2) Remove the four No. 2 screws with self-locking nuts and washers. There are no nuts and washers when the pressure switch is attached to the base plate.

(3) Remove the pressure switch.

(4) Installation is the reverse of removal. Torque the screws 2 to 3 in.-lbs.

D. **Pump** (Refer to Figure 204 or Figure 205)

(1) Disconnect the Clippard hosing and the electrical connections.

(2) Remove the three top screws and washers (pump type A), which are attached to a threaded rubber isolator, or the four screws, nuts, and washers (pump type B) attaching the pump to the flange or the base plate. There are no nuts and washers when the pump is attached to the base plate.

(3) Remove the pump.

(4) An additional mounting platform attached to pump type B may be removed by the removal of 2 screws threaded through the platform into the bottom of the pump.

(5) Installation is the reverse of removal. Torque the screws attaching the pump assembly to the base plate 20 to 25 in.-lbs.

E. **Nipples** - Nipples for the dump valve and the air filter are installed at the factory. If it is necessary to replace the nipples, they should be hand tightened plus 1/4 of a turn.

5. Replacing Door Seals

A. Remove the door using the standard removal procedure. Do not attempt to remove the door by removing the hinge rollpins.

B. Place the door on a clean padded surface and protect the window and the paint.

C. Remove the damaged or malfunctioning door seal by cutting it away from the door using a razor blade. Take care not to damage the paint or upholstery. Trim away any clear silicone and black RTV sealant to a thickness of 1/32 inch or less. It is not necessary to remove all of the sealant, but the surface to receive the new seal must be as smooth and clean as possible.

D. Remove the air supply coil from the door and disconnect it from the door seal stem. Remove and discard the old seal stem. Retain the air supply coil.

E. Wearing rubber gloves and using isopropyl alcohol, clean the bonding area on the door and wipe the door seal.

F. Before applying adhesive (silicone sealant), test fit the seal around the perimeter of the door. Take note if the seal is too large because any slack will have to be uniformly distributed as it is installed around the perimeter of the door.

NOTE: Do not stretch the door seal. Stretching the door seal will create excess slack.

G. Position the door seal seam weld so that it is oriented forward of the door seal stem at the flat portion of the door frame.

NOTE: The door seal may fail prematurely if the seam weld is not positioned forward of the stem in relation to the aircraft.

H. Insert a .040 safety wire (or similar) up through the door seal stem hole in the door. Hook the wire through the very end of the stem.

I. Apply a 1/8 inch bead of SWS 951 clear silicone around the perimeter of the door.

J. Using the wire, pull the door seal stem through the hole in the door and pull the door seal flush against the clear silicone. Do not stretch the seal. If the seal was found to be too large during test fitting, remember to uniformly distribute any slack by compressing or scrunching the seal as it is installed around the perimeter of the door. An extra person is helpful for this step.

K. Set the door seal in place and secure it with 2 inch wide strips of masking tape at approximately 2 inch intervals.

L. When the door seal is secured around the entire perimeter of the door allow the clear silicone sealant to cure for 24 hours.

M. After the clear silicone sealant has fully cured, remove the masking tape and any excess silicone that has extruded from underneath the door seal.

N. Using 0.5 inch wide electrical tape, tape the perimeter of the door where the black RTV meets the upholstery and then

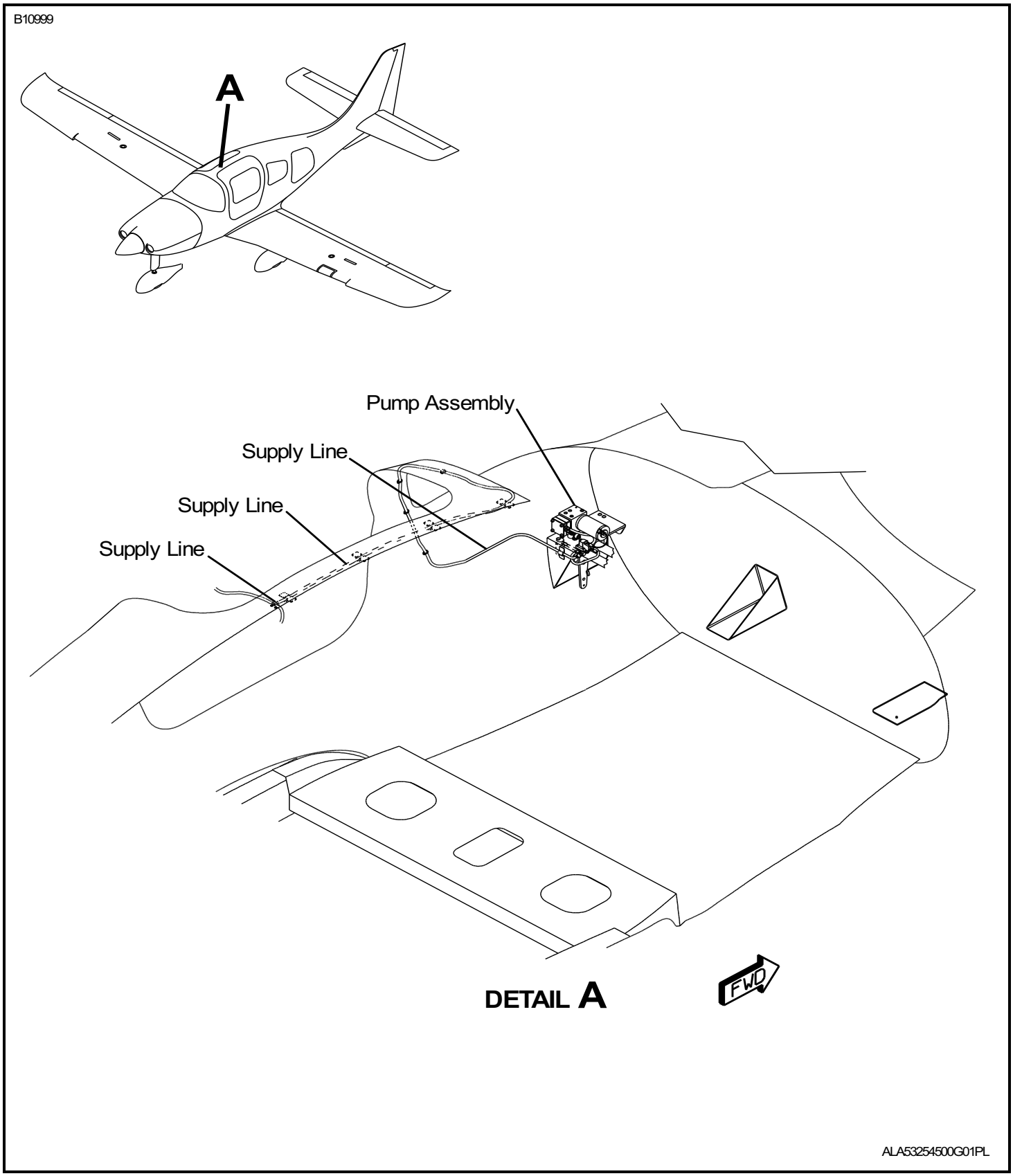
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tape the perimeter of the door seal. This is done to assist in the creation of a uniform fillet of black RTV.

O. Apply a 0.25 inch bead of black RTV in the space formed by the electrical tape masks.
P. Using a 3/8 inch dowel (or similar) smooth the black RTV into a uniform fillet around the perimeter of the door seal.
Q. Carefully remove the electrical tape while the black RTV is still wet. Allow the black RTV to fully cure.
R. Trim the door seal stem so that approximately 2 inch protrudes from the door.
S. Reinstall the air supply coil.
T. Reinstall the door.

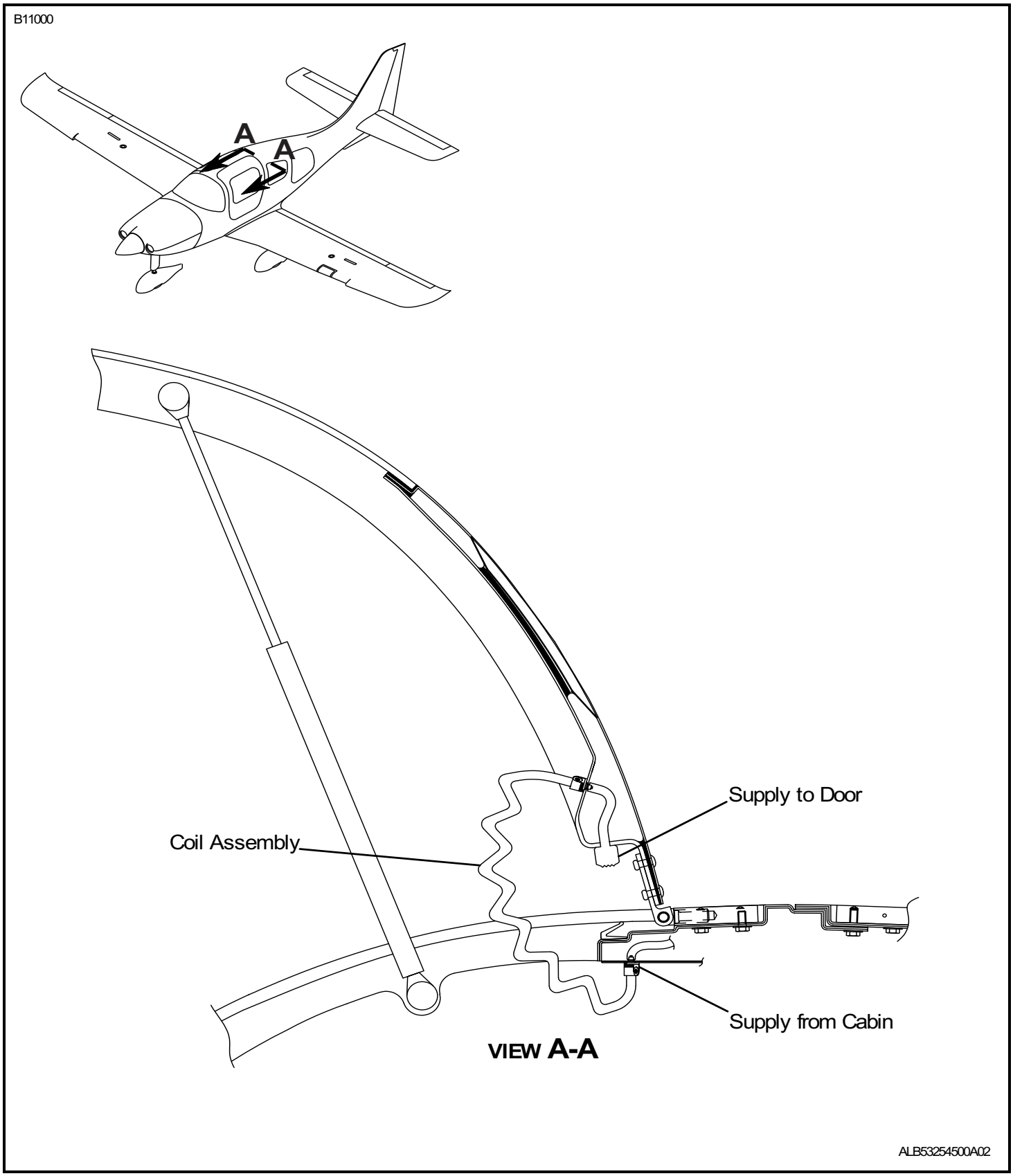
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Figure 201 : Sheet 1 : Location of Door Seal Pump and Lines



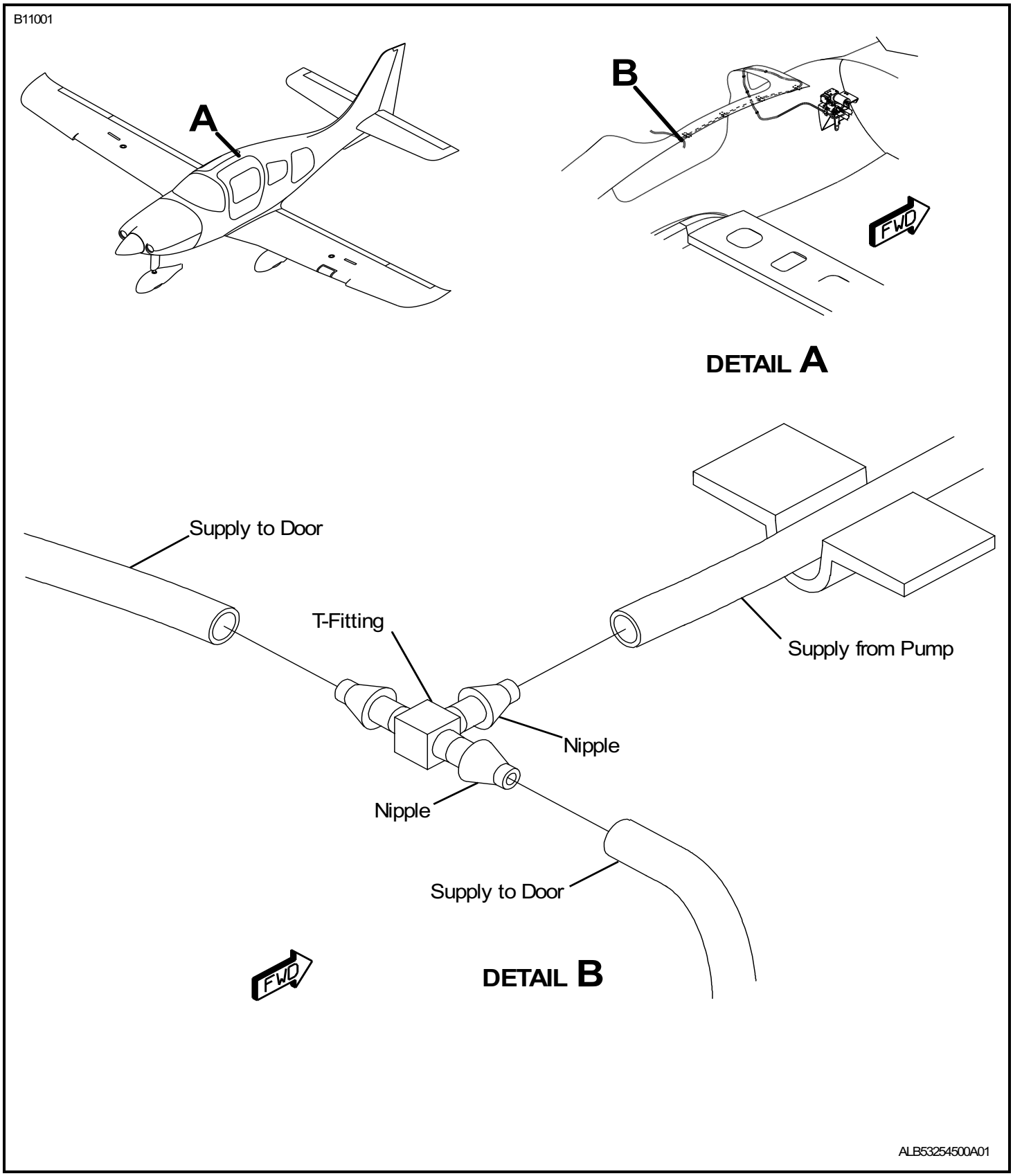
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Figure 202 : Sheet 1 : Door Seal T-Connector



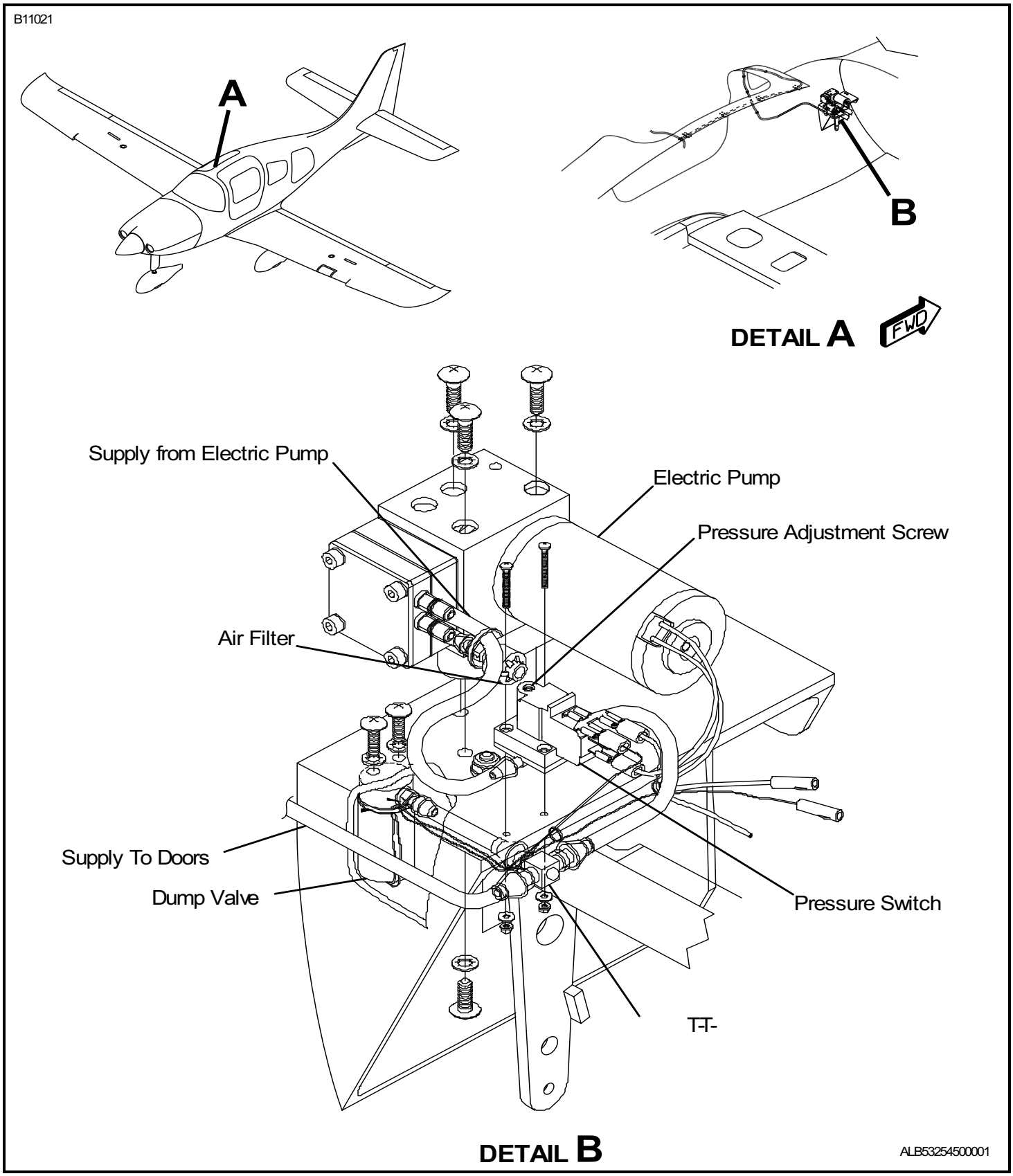
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Figure 203 : Sheet 1 : Door Seal Door Connections



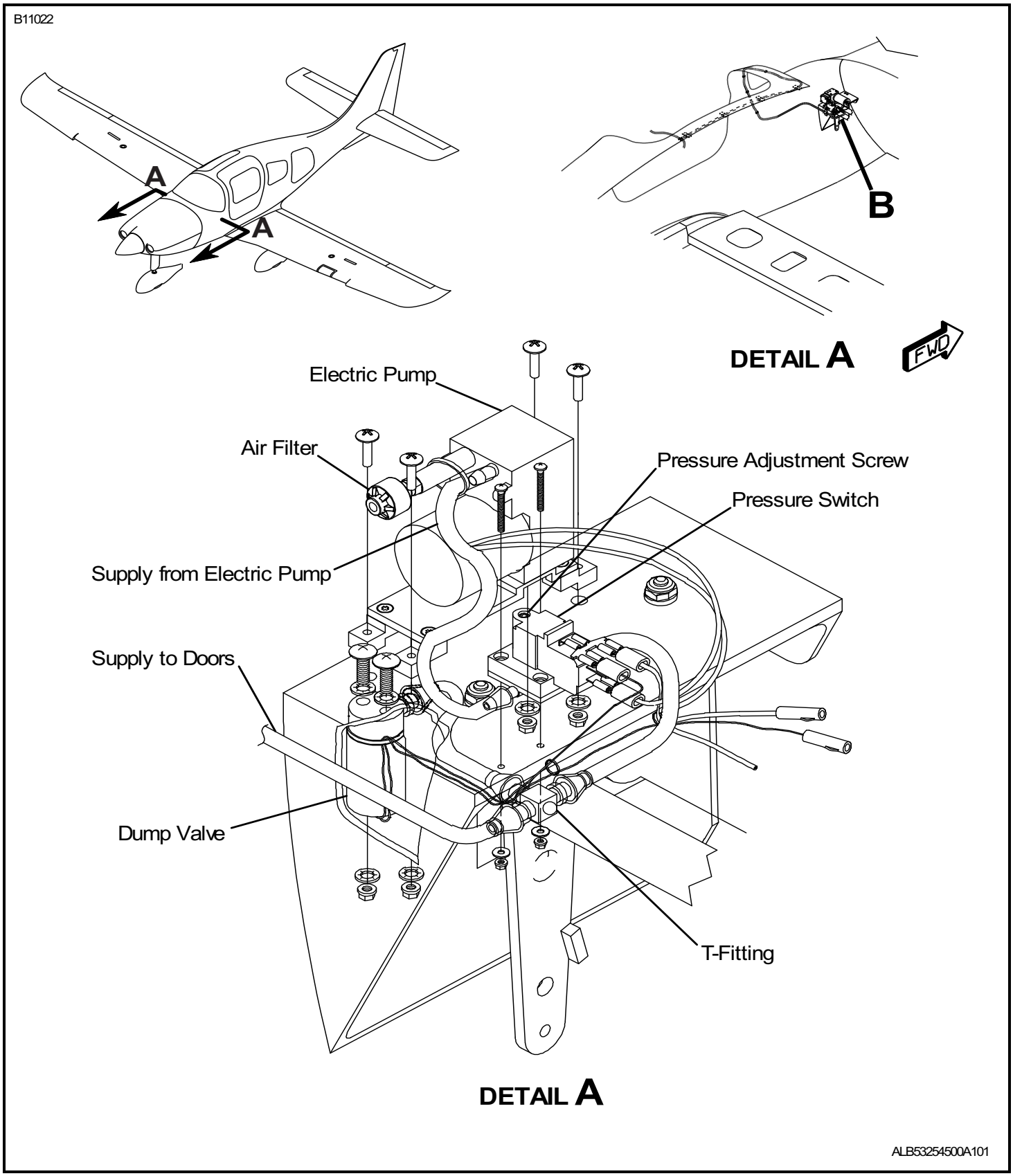
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Figure 204 : Sheet 1 : Door Seal Pump Assembly (Pump Type A)



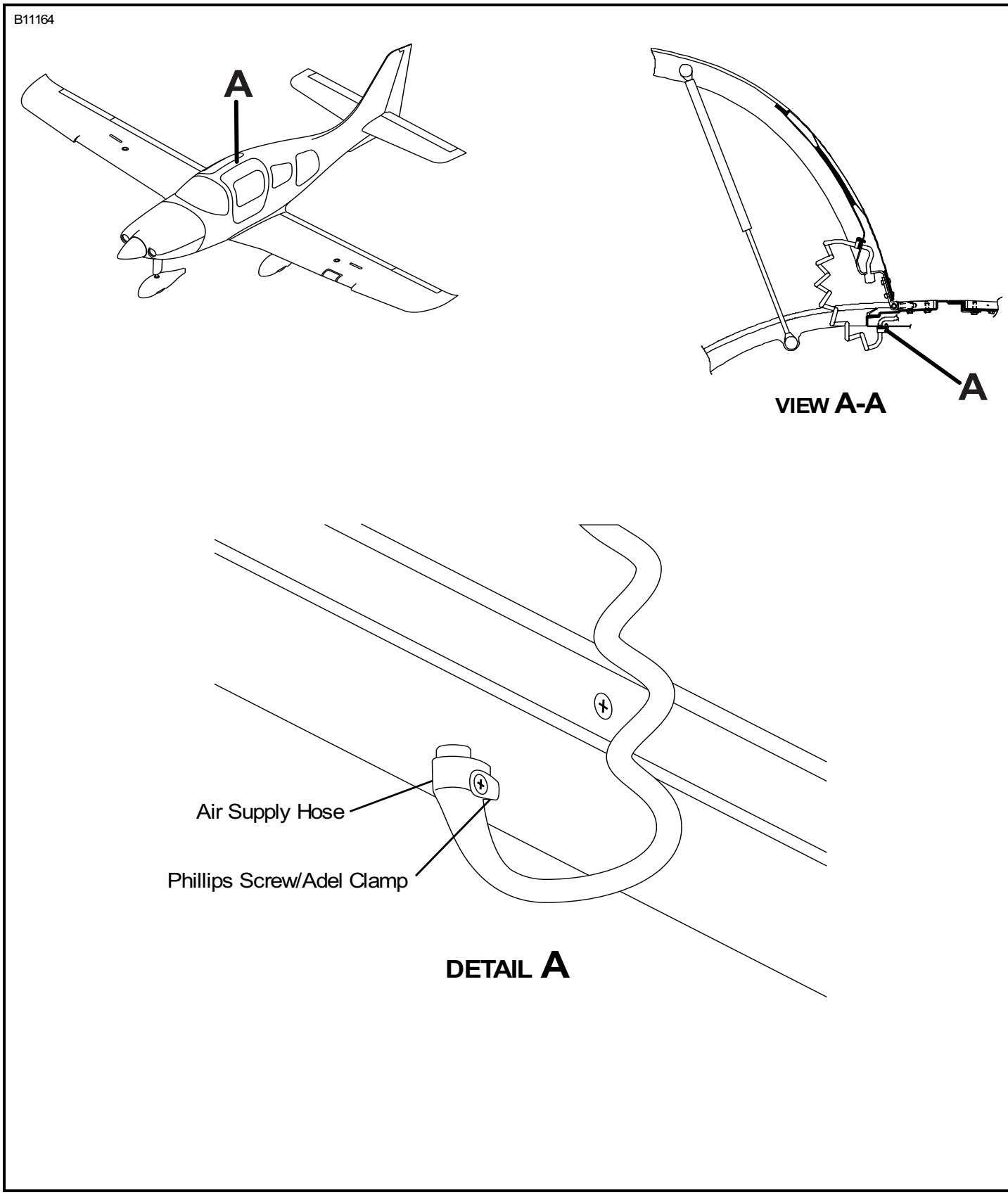
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Figure 205 : Sheet 1 : Door Seal Pump Assembly (Pump Type B)



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Figure 201 : Sheet 1 : Pneumatic Door Seal Removal



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FUSELAGE - GENERAL

1. General

A. This chapter will provide information on the fuselage structure and attach items for the Cessna Model LC41/T240 airplanes. The fuselage of the Model LC41/T240 airplanes is a composite semi-monocoque design with an integral vertical stabilizer structure. Doors and access panels allow access to the interior areas for inspection and maintenance. Most of the structural components are permanently bonded together.

The fuselage structure carries loads from the engine mount, wing, horizontal, and main landing gear. This structure consists of the fuselage skins, ventral fin, vertical shear web, vertical shear closeout, antenna bulkhead, baggage bulkhead, rear floor, footwell, forward floor, and forward floor under-floor bulkhead. Hardware hardpoints exist for the seatbelts, engine mount, and instrument panel. Aileron, elevator, and rudder controls also run in the fuselage, and support structure and hardpoints allow mounting provisions for these components.

The fuselage is primarily constructed from glass fabric composites with honeycomb cores. Carbon fiber fabric is used on the engine mount attachment gussets. Uni-carbon fiber is used in the fuselage longerons and rollover structure. The fuselage longerons are located in two strips along the fuselage sides above the wing saddle. The rollover stiffeners are located in the A and B pillars on the fore and aft sides of the doors. The bulkheads and floors are permanently bonded to the fuselage shells with specially thickened epoxy adhesive and an epoxy primer. Moisture drain holes are located in the bottom of the fuselage along the centerline.

CAUTION: Only experienced personnel should attempt the repair work described in this manual. The repair of composite materials is not difficult but requires certain hands-on skills where experience is necessary. These composite repairs will be time limited due to resin gel time and must be completed in a timely fashion.

WARNING: To prevent personal injury, refer and adhere to instructions contained in the appropriate Safety Data Sheet (SDS) accompanying the material you are using for any repair.

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FUSELAGE AND PRIMARY STRUCTURE - DESCRIPTION AND OPERATION

1. Identification and Inspection of Fuselage Components

A. Inspection of Fuselage Primary Structure - Damage to the composite fuselage structure can usually be identified visually where the structure is unpainted or where paint has been removed. Damaged areas will show a characteristic white or milky color. Undamaged areas will be translucent brown to green. The use of tap testing and other non-destructive methods may be required.
Carbon fiber damage is more difficult to identify. The use of tap testing and other nondestructive methods will be required. Tap testing and other non-destructive methods can identify damage to the bonded joints in the fuselage. Refer to Chapters 20 and 51 for specific inspection techniques.

2. Painting

A. Painting of the fuselage should follow the requirements in Chapter 51.

3. Lightning Strike Protection

A. Lightning Strike Protection must comply with the requirements of Chapters 20 and 51.

4. Fuselage Primary Structure Description

A. **Firewall** - The fuselage firewall is a structural composite member. Refer to Figure 1 and Figure 2.The firewall features co-cured carbon fiber upper engine mount gussets and lower carbon fiber engine mount gussets, together with the forward floor, that are bonded to the firewall. On the engine side, the firewall is covered with a stainless steel firewall plate with fiberfrax and phenolic insulators and phenolic hard points. The firewall plate is sealed around the edge with silicone rubber. The hardware attached to the firewall holds the stainless steel plate and phenolic fittings in place. The engine mount bolts to the firewall. Engine controls, fuel lines, electrical wiring, and heating and ventilation air pass through the firewall. The cockpit side of the firewall is covered by sound barrier foam.

B. **Forward Cabin Floor** - The forward cabin floor extends from the firewall to the footwell. The forward cabin floor is bonded to the fuselage skins, firewall, and wing mount saddle. Sound insulation is bonded to the bottom side of this floor.

C. **Forward Cabin Floor Support** - The forward cabin floor support is located under the forward floor and provides stiffening for the forward floor and instrument panel radio rack assembly. The support is bonded to the forward cabin floor and fuselage skins. There is no access to this structure.

D. **Cabin Footwell** - The footwell is a structural member that is attached to the fuselage floors by screws. The center attachment bracket for the front seat belts is bolted to the footwell.

E. **Aft Cabin Floor and Aft Baggage Floor** - The aft cabin and aft baggage floors are bonded together, and the joint is reinforced with glass cloth. These floors cover the main gearbox. The main gearbox can only be removed from the aircraft by cutting away these floor bulkheads.

NOTE: Removal of these floors can only be done with factory approval and specific instructions. These floors are bonded to the fuselage sides, wing attach saddle, and aft baggage bulkhead.

F. **Avionics Shelf Frame** - The avionics shelf frame supports the avionics shelf. This shelf is designed to hold a multitude of components and hardware. The shelf frame is bonded to the fuselage skins.

G. **Aft Baggage Bulkhead** - The Z-shaped aft baggage bulkhead carries the elevator crossover torque tube. It also serves as the hat rack baggage floor. The bulkhead features two access panels, the baggage bulkhead and antenna bulkhead panels. The bulkhead is bonded to the fuselage sides, aft baggage floor, and antenna bulkhead.

H. **Antenna Bulkhead** - The antenna bulkhead is a structural member that provides lateral and torsional shear carry-through. It is bonded to the aft baggage bulkhead, fuselage sides, and vertical shear web.

I. **Vertical Shear Web** - The vertical shear web is the main structural shear web in the vertical stabilizer. It is bonded to the fuselage sides, which form the vertical stabilizer, antenna bulkhead, and NAV bulkhead.

J. **Vertical Shear Closeout** - The vertical shear closeout is a shear web and provides hardpoints for the rudder hinges and elevator up stop. This shear web is bonded to the fuselage sides and NAV bulkhead.

K. **Ventral Fin** - The ventral fin is bonded to the underside of the fuselage at the vertical stabilizer.

L. **NAV Bulkhead** - The NAV bulkhead provides a mount for the NAV antenna. It spans the NAV antenna access panel opening and ties into the vertical shear webs.

M. **Seat Back Flange** – The seat back flange is a bonded support for the rear seat backs. It is bonded to the fuselage skins and aft cabin floor.

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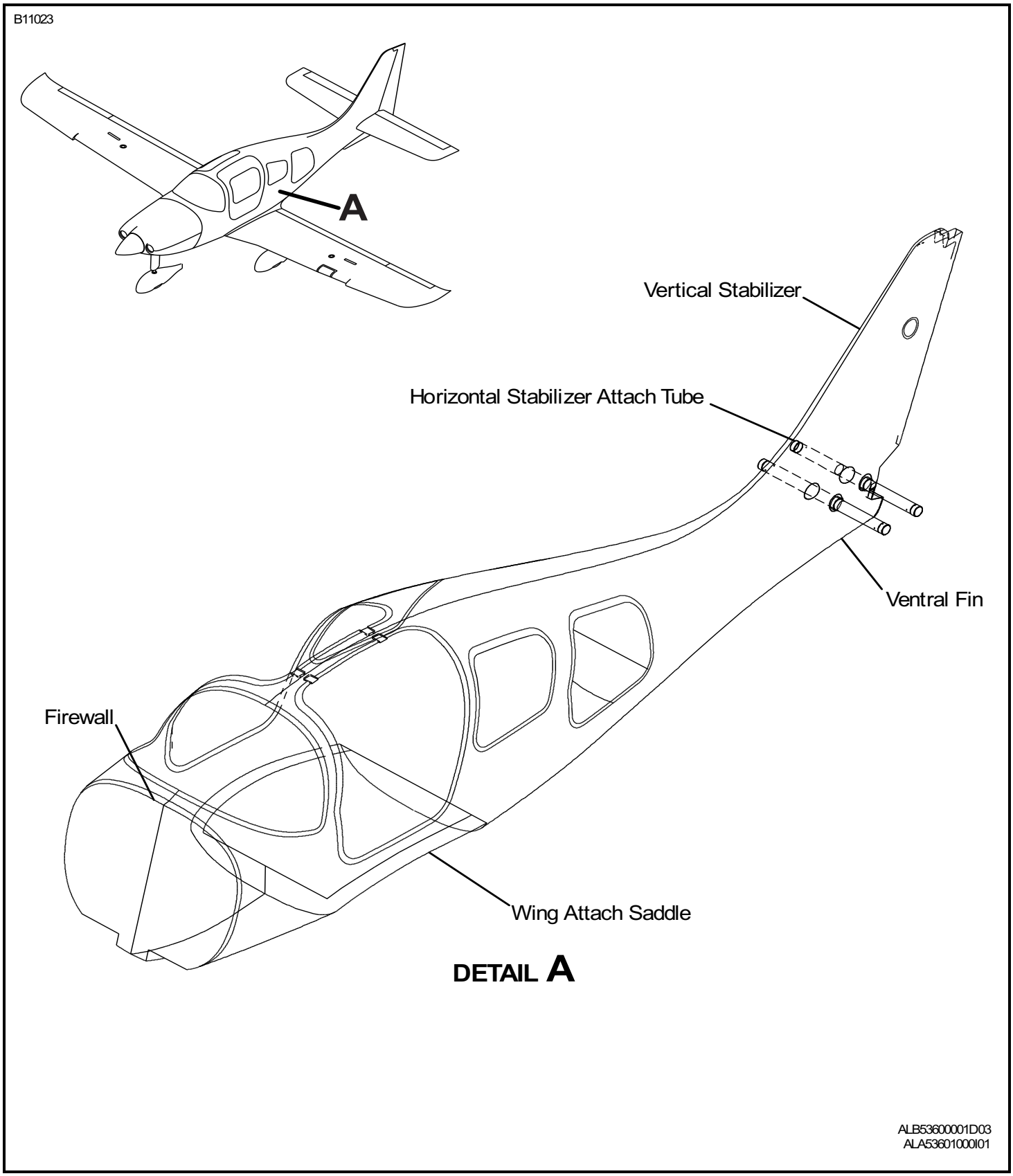
N. **Instrument Panel Mounting Brackets (S/N 41002 to 41500)** - The instrument panel is mounted to three bonded-on composite brackets and two threaded inserts. The brackets are located on the top center and the left and right sides just forward and below the bottom of the "A" pillar. The threaded inserts are located on the left and right sides, forward near the firewall.

O. **Instrument Panel Mounting Brackets (S/N 41501 and On)** - The instrument panel is mounted to two bonded-on composite brackets. On the left and right sides of the fuselage.

P. **Oxygen Bracket** - For S/N 41002 to 41039, the cabin oxygen distribution manifold is mounted to a composite bracket bonded to the fuselage behind the Forward Center Overhead Light Panel (FCOLP). For S/N 41040 and on, the cabin oxygen distribution manifold is mounted directly to the FCOLP. An oxygen quick disconnect bracket behind the right aft overhead side panel (AOSPR) replaces the oxygen bracket behind the FCOLP.

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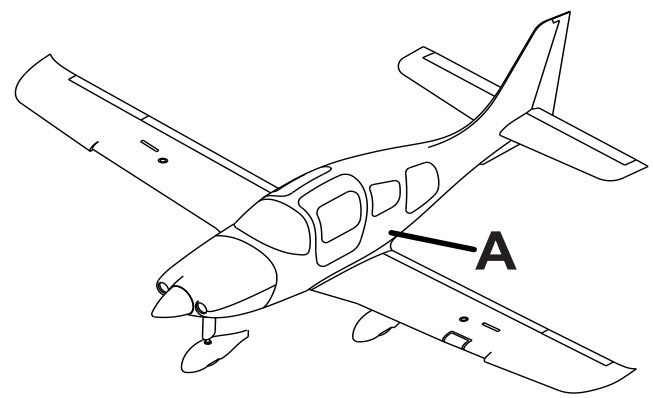
Figure 1 : Sheet 1 : Fuselage Structure - External Features

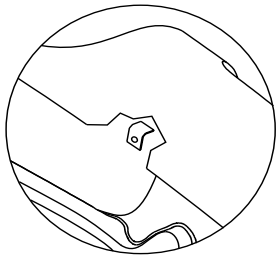


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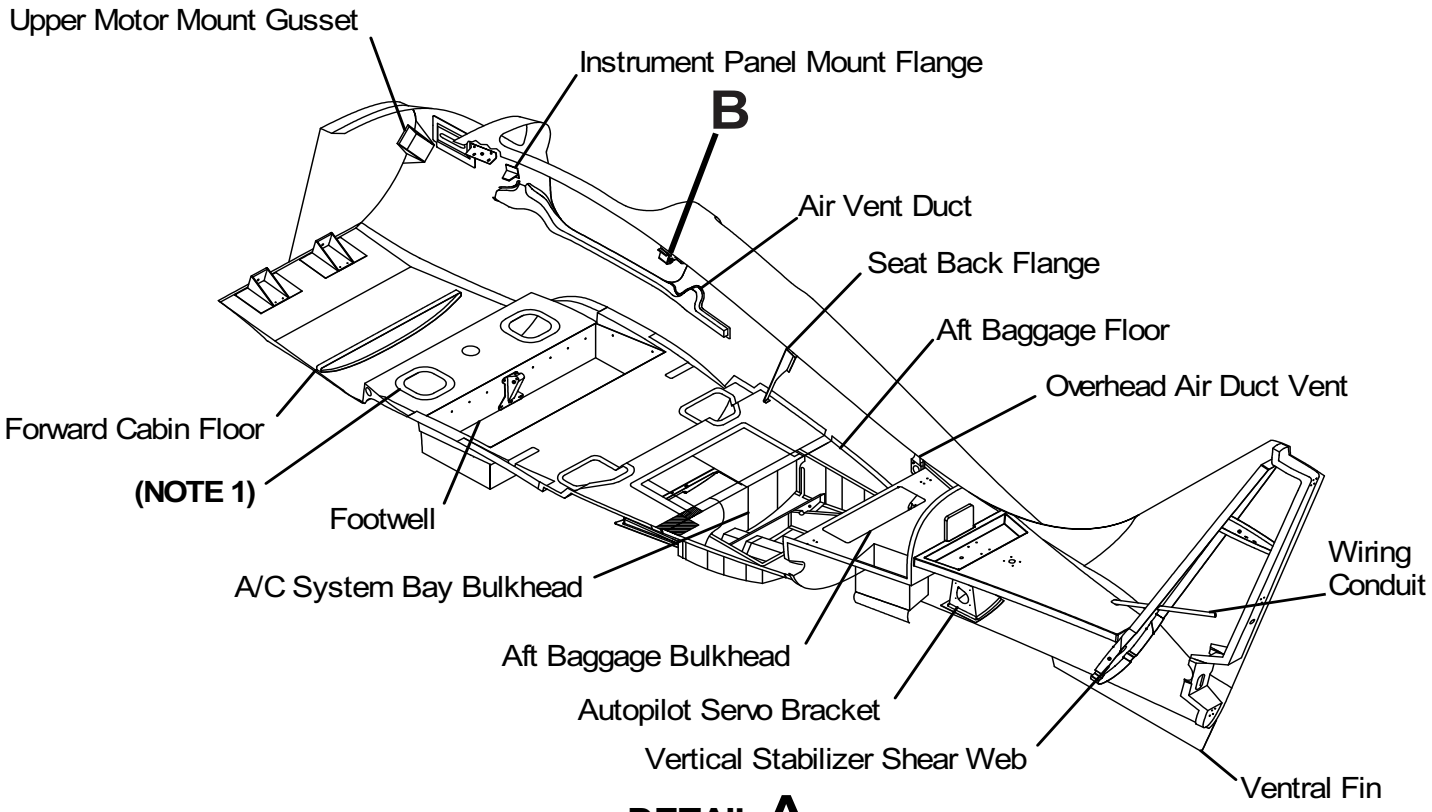
Figure 2 : Sheet 1 : Fuselage Structure - Internal Features

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DETAIL B
Oxygen Bracket S/N 41040 and On



DETAIL A

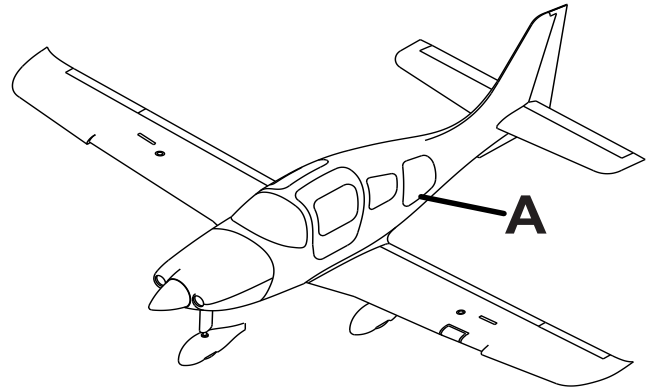
NOTE: A/C System Components will only be present on aircraft built with the A/C ready option.
NOTE 1: This access not in all aircraft.

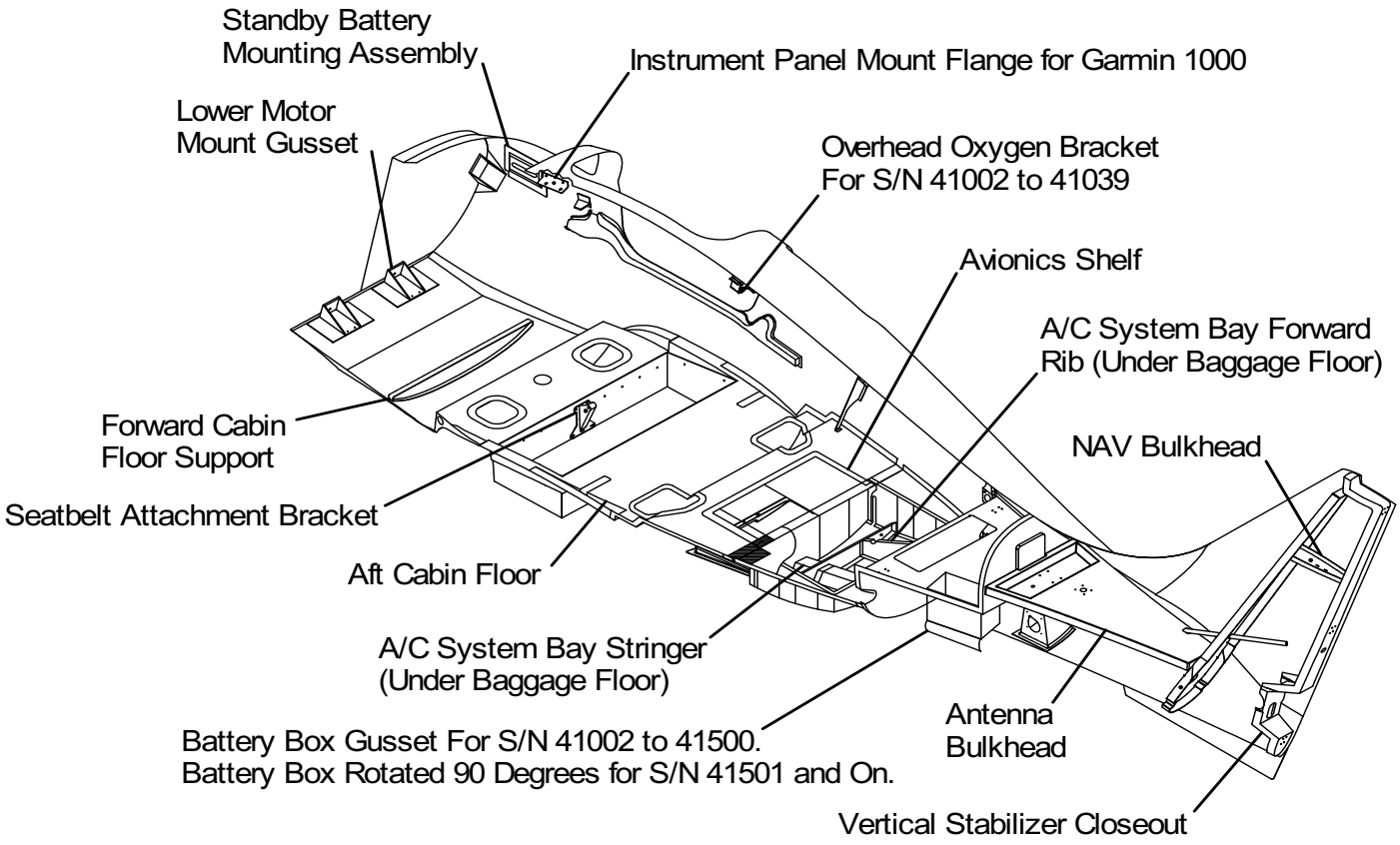
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Figure 2 : Sheet 2 : Fuselage Structure - Internal Features

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DETAIL A

NOTE: A/C System Components will only be present on aircraft built with the A/C ready option.

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FUSELAGE ACCESS - DESCRIPTION AND OPERATION

1. Fuselage Access Panels

A. The fuselage has numerous access panels located on the exterior and interior of the fuselage as shown in Figure 1. This paragraph describes the panels and how to remove and replace them.

(1) **NAV Antenna Access Cover** - The NAV antenna access cover is located on the left side of the vertical stabilizer about mid span and provides access to the NAV antenna. This panel is removed by unscrewing the attachment screws. Installation is a direct reversal of the removal process.

(2) **Air Outlet Vent Access Panel** - The air outlet vent access panel is located under the horizontal stabilizer on the right hand side of the aircraft. It can be used to inspect the fuselage between the vertical stabilizer shear webs. The aft-most end of the elevator push rod can also be seen from this location. The panel is removed by unscrewing the attachment screws. Installation is a direct reversal of the removal process.

(3) **Antenna Bulkhead Access Panel** - The antenna bulkhead access panel is located on the baggage bulkhead. It provides access to the antennas mounted on the shelf. Access to both the top and bottom of this shelf is accomplished through the same access panel. The panel is removed by unscrewing the attachment screws. Installation is a direct reversal of the removal process.

(4) **Baggage Bulkhead Access Panel** - The baggage bulkhead access panel is located in the rear of the baggage area. It can be used to access the elevator crossover and its three elevator pushrod fittings, the oxygen system, the Comm antenna, and the autopilot pitch servo. The panel is removed by unscrewing the attachment screws. Installation is a direct reversal of the removal process.

(5) **Air Conditioning (A/C) System Access Panel** - This panel is in aircraft that are air conditioning ready. The panel allows access to the a/c system and the a/c condenser.

(6) **Air Conditioning (A/C) Evaporator Cover** - This cover is in aircraft that are equipped with air conditioning and encloses the evaporator.

(7) **Avionics Shelf Access Panel** - The avionics shelf access panel is located in the middle of the forward baggage floor. It is used to access the avionics shelf, Comm antenna, step bolts, and rear gearbox attachment bolts. The panel is removed by unscrewing the attachment screws. Installation is a direct reversal of the removal process.

(8) **Main Gearbox Access Panels** - Left and right side main gearbox access panels are located on the rear seat floor. These panels can be used to access the gearbox and forward attachment bolts for inspection. These panels are removed by unscrewing the attachment screws. Installation is a direct reversal of the removal process.

(9) **Footwell** - The footwell can be removed to provide access to the wing attach bolts. This is a structural member of the fuselage and contains the front seat belt attach bracket. It is installed with AN526C1032R10 screws torqued 30 to 36 in.-lbs. with NAS1149F0363P washers (AN960-10). The length of these screws shall be appropriate for the attachment. Refer to Chapter 25 for removal and installation procedures.

(10) **Forward Cabin Floor Access Panels** - The forward cabin floor access panels are located under the pilot's and co-pilot's seat. The panel provides access for the front seat rail mounting. It also allows inspection of the fuel system components mounted on the front wing spar from above. This panel is removed by unscrewing the attachment screws. Installation is a direct reversal of the removal process.

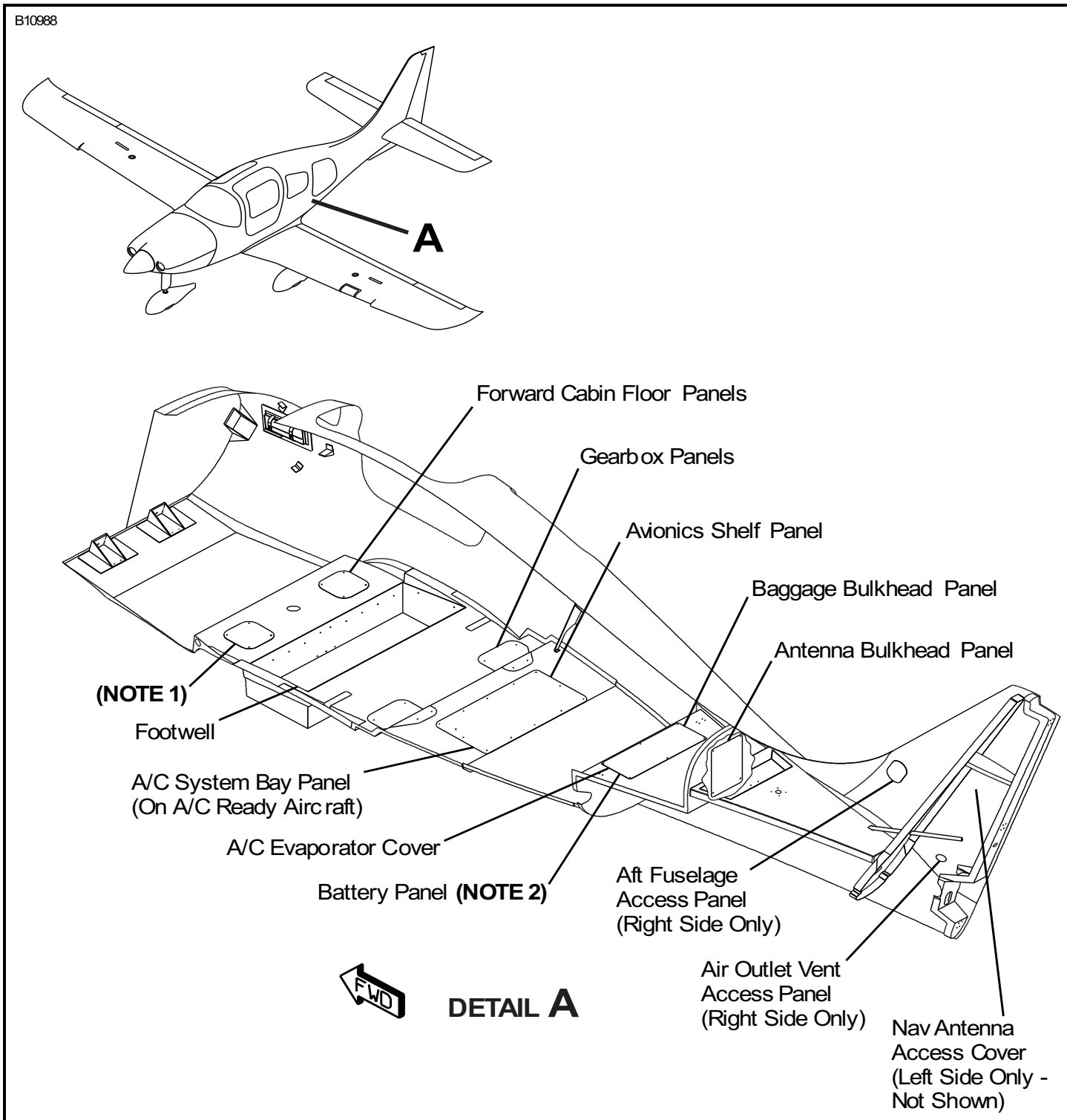
(a) The Model T240 with the FIKI option has the Stall Warning System, Stall Computer (UI307) installed in the area below the right access panel.

(11) **Battery Access Panel** - The battery access panel is located to the rear, on the pilots side, in the baggage bulkhead. It is used to access the batteries. The panel is removed by unscrewing the attachment screws. Installation is a direct reversal of the removal process.

(12) **Aft Fuselage Access Panel** - The aft fuselage access panel is found on the right side of the vertical stabilizer. It is used to get access the TKS components in the tail section. The panel is removed by unscrewing the attachment screws. Installation is a direct reversal of the removal process.

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Figure 1 : Sheet 1 : Fuselage Access Panels



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AERODYNAMIC FAIRINGS - DESCRIPTION AND OPERATION

1. Aerodynamic Fairings

A. Aerodynamic fairings attached to the fuselage consist of left and right wing fillets.

(1) **Wing Fillets** – The wing fillets are bonded to the fuselage skin outside surface. They form an aerodynamic transition between the fuselage and the wing. The fillets are not bonded to the wing. The main gear leg fuselage transition panel is located at the junction of the main gear legs and the fuselage. They extend out to the root of the flaps and butt up to the wing belly at the forward edge. The fillets have a small panel for the ingress and egress steps. These steps are optional. If the steps are not present, this panel will not serve any function. The step panel allows access to the step attachment bolts. The wing fillets should be inspected periodically for cracks and impact damage.

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CONTROL SYSTEM SUPPORTS - DESCRIPTION AND OPERATION

1. Control System Supports

A. This section describes the location of control system supports in the fuselage. Refer to Figure 1.

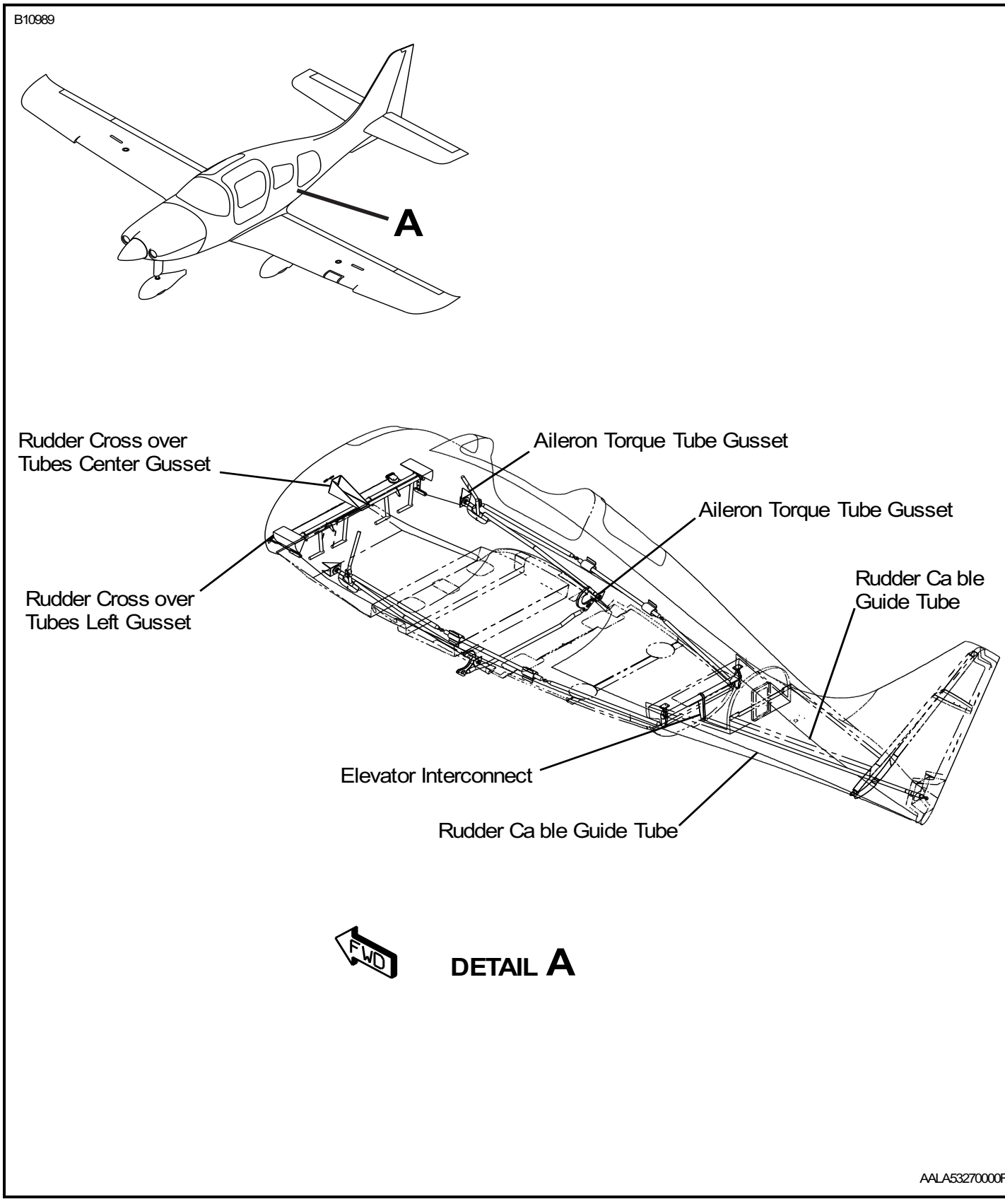
(1) **Rudder Pedal Crossover Tube Support Brackets** - Three bonded composite brackets support the rudder pedal control system. The brackets are located on the left and right fuselage sides under the instrument panel and at the firewall centerline.

(2) **Aileron Torque Tube Gussets** - Two gussets located at the forward and aft ends of each aileron torque tube support the stick assembly. The spherical bearing cups for the aileron torque tubes are bolted to these gussets.

(3) **Rudder Cable Guide Tubes** - Rudder control cable guide tubes are co-cured with the fuselage skins. These guide tubes normally hold a control cable sleeve secured with hose clamps on either end. The rudder control cables run fore and aft in these sleeves. The control cable sleeves are only replaceable with replacement of the rudder control cables.

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Figure 1 : Sheet 1 : Control System Support



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FUSELAGE COMPONENTS - MAINTENANCE PRACTICES

1. Removal, Installation, and Maintenance Practices For Fuselage Components

A. This section describes the basic inspection, removal, and installation of components attached to the fuselage.

(1) **Horizontal Stabilizer Attach Tubes** - The horizontal stabilizer mounting is accomplished with two steel tubes permanently attached to the fuselage structure.

(a) The horizontal tubes should be securely bonded to the fuselage. There should be no free play. Contact the factory for repair instructions upon discovery of any cracks between the tubes and the fuselage structure.

(b) These tubes should be visually inspected for corrosion and nicks.

(c) Surface corrosion and shallow nicks should be removed with careful application of fine grit sanding paper or crocus cloth. The surface finish of the reworked area must be 63 micro inches per inch or better. This process will remove the protective plating from the tubes. These areas should be protected with zinc chromate primer. Care must be taken with the application of any protective coatings as they may prevent the reinstallation of the horizontal stabilizers.

(d) Deep nicks and corrosion will require factory approval for repair. Replacement of the horizontal attach tubes will also require factory approval.

(2) **Fuselage Seat Belt Attach Hardpoints** - Each shoulder belt inertial reel is mounted to the fuselage. The forward inertial reels mount to steel brackets on the B pillar. The rear seat shoulder belt inertial reels are tang mounted to a through bolt in the fuselage skin. Refer to Chapter 25 for details on removal and replacement of seat belts.

(3) **Cabin Door Attach Hardpoints** - The cabin doors mount with two hinges and are secured with two pins. The door hinges are mounted on the top of the door. The hardpoints provide a structural mounting for the metallic door hinges. Emergency release cable guides are bonded to the fuselage and run from the belly to the door hinges. Each door is secured front and aft by latch pins. The latch pins interface with the fuselage hardpoints in the fuselage door flanges. Refer to Chapter 52 for details on inspection, removal, and replacement of the cabin door and components.

(4) **Leading Edge Tape and Zig Zag Tape** - Optional leading edge anti-chafe tape may be added to the aircraft. The anti-chafe tape is 1 in. wide, adhesive-backed, clear, urethane tape that prevents pitting and wear on the leading edges of the vertical and horizontal stabilizer. For S/N 41563 and On, zig zag tape is added to the underside of the horizontal stabilizer; aligned between the inboard and outboard edges of the elevator and 1.25in. ± 0.25in. down from the chord line to the front edge of the tape.
To apply the anti-chafe tape and/or zig zag tape, thoroughly clean the leading edges using isopropyl alcohol. The anti-chafe tape is 1 in. wide and should be centered along the leading edge of the surface. The anti-chafe tape should end at the beginning of the vertical and horizontal stabilizer tip curve. Use a rubber scraper/squeegee as required to smooth the tape and remove air bubbles from underneath the tape. To remove the tape, slowly pull the tape back on itself, and clean the surface with isopropyl alcohol. Application and removal procedure for the zig zag tape is identical except its position is per the paragraph above.
The anti-chafe tape and zig zag tape should be inspected at each 100 hr. or annual inspection to ensure that it is not peeling up and is properly attached.

(5) **Fuselage Handles** - Optional fuselage handles are available with certain aircraft to assist entering the aircraft. The handles are located behind the passenger windows. Certain aircraft may be retrofitted with handles. Contact the manufacturer to determine if the aircraft may be retrofitted and for instructions. The handles may not be permanently removed without getting additional instructions from the manufacturer.

(a) **Temporary Removal of Handle**

1 Remove the portion of the headliner on the inside of the aircraft to gain access to the handle screws.

2 Remove the two 10-32 screws and washers, and remove the handle.

(b) **Handle Installation or Tightening of Loose Handle**

1 Apply 262 threadlocker to the two 10-32 screws, and install the washer and screw. Torque 20 to 25 in.-lbs.

2 Re-install the headliner using Keystone ADH105P adhesive as necessary.

(6) **Fuselage Steps** - Optional fuselage steps are available with certain aircraft to assist entering the aircraft. The steps are located behind and below the trailing edge of the wing. Certain aircraft may be retrofitted with the steps. Contact the manufacturer to determine if the aircraft may be retrofitted and for instructions. The steps may not be permanently removed without getting additional instructions from the manufacturer.

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(a) **Temporary Removal of Step**

1 Remove the exterior step access panel by removing the four countersunk screws.

2 Remove the interior aft cabin floor access panel per instructions in Chapter 25 to gain access to the nuts, or nutplates, securing the steps.

3 For steps secured with flanged nuts

a Remove the two lower hex-head bolts, flanged nuts, and washers, and mark the hardware so that it can be put back in the same lower holes.

b Remove the two upper hex-head bolts, flanged nuts, and washers, and mark the hardware so that it can be put back in the same upper holes.

4 For steps secured with nutplates

a Remove the two lower hex-head bolts and washers, and mark the hardware so that it can be put back in the same lower holes.

b Remove the two upper socket head cap screws, washers, and nutplates, and mark the hardware so that it can be put back in the same upper holes.

5 Remove the step and any shims that may be present.

(b) **Step Installation**

1 Position step against fuselage and align using shims.

2 For steps secured with flanged nuts

a Install the two upper hex-head bolts, flanged nuts, and washers. Tighten snug plus 1/4 turn.

b Install the two lower hex-head bolts, flanged nuts, and washers. Tighten snug plus 1/4 turn.

3 For steps secured with nutplates

a Install the two upper socket head cap screws, washers, and nutplates. Hand tighten loosely.

b Align the nutplates and install the two lower hex-head bolts and washers.

c Torque the two upper socket head cap screws 72 to 84 in.-lbs.

d Replace the exterior step access panel by installing the four countersunk screws. Torque 12 to 15 in.-lbs.

e Replace interior aft cabin floor access panel per instructions in Chapter 25.

(7) **Ventral Fin** - The ventral fin is an aerodynamic feature bonded to the fuselage skin outside surface. A pad attached by two 10-32 screws and lock nuts is affixed to the bottom of the fin.
The ventral fin should be inspected at each 100 hour or annual inspection to ensure that it is properly attached. Perform generalized inspection of the ventral fin for visible damage and evidence of latent damage. Inspect the ventral fin pad for condition and proper security.

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FUSELAGE COMPONENTS - ADJUSTMENT/TEST

1. General

A. This section gives the information needed to complete the inspection of fuselage components and related structural components. For additional information on the fuselage structure, refer to Section 53-00-00, Fuselage - General.

2. Aft Fuselage Inspection

A. Complete an inspection of the aft fuselage.

(1) Remove the horizontal stabilizers. Refer to Section 55-10-00, Horizontal Stabilizer Removal and Installation.

(2) Remove the aft baggage bulkhead access panel and the antenna bulkhead access panel. Refer to Section 53-30-00, Fuselage Access - Description and Operation.

(3) Remove the air outlet vent access panel from below the right horizontal stabilizer. Refer to Section 53-30-00, Fuselage Access - Description and Operation.

(4) Thoroughly clean and dry the inspection surface on the exterior skin of the aft fuselage to remove any loose dirt, contaminates and grease.

(5) Complete a visual inspection of the left and right aft fuselage exterior skin surfaces shown in Figure 501.

(a) Inspections must be completed in accordance with Section 20-95-00, Structural Inspections - Description and Operation.

(b) Put a mark on damaged areas to indicate the location and size of the area where the damage is found.

(c) Put a mark on any areas where you are uncertain whether damage exists to indicate that the area is suspect.

(6) Complete a visual inspection of the left and right aft fuselage interior skin surfaces shown in Figure 501 that are visible through the air outlet vent panel and through the aft baggage bulkhead access panel.

(a) Inspections must be completed in accordance with Section 20-95-00, Structural Inspections - Description and Operation.

(b) Use of a borescope or digital camera attached to a pole is recommended for areas that are not visible to the technician.

(c) Put a mark on damaged areas to indicate the location and size of the area where the damage is found.

(d) Put a mark on any areas where you are uncertain whether damage exists to indicate that the area is suspect.

(7) Complete a tap test of the left and right aft fuselage exterior skin surfaces that are within a 7-inch radius of the leading edge of the horizontal stabilizers. Refer to Figure 501.

(a) The tap test must be completed in accordance with Section 20-90-00, Tap Testing - Description and Operation as well as the instructions that follow:

CAUTION: Do not strike the fuselage with a sharpened hammer or any other tool that has sharp edges. Fuselage damage can result if a blunt-ended tap hammer or equivalent is not used.

(b) Use a blunt-ended tap hammer or equivalent with a head that weighs 1.0 ounce, +0.3 or -0.3 ounce to lightly tap the fuselage in each 1-inch^2 area throughout the inspection zone.

(c) Compare similar structures within the inspection zone for changes in the response pitch.

1 Areas with structure under the skin will have a higher pitch response than areas where there is no structure under the skin. Refer to Figure 501 to see areas that have structure under the skin.

(d) The inspection area is 2 plies thick (less than 0.020 inch), except for a 4-ply band that is located 5.0 inches above to 4.0 inches below the chord of the horizontal stabilizer. This 4-ply band extends forward and aft through the entire inspection zone.

(e) A "flat" or "dead" pitch response is considered unacceptable.

(f) Put a mark on damaged areas to indicate the location and size of the area where the damage is found.

(g) Put a mark on any areas where you are uncertain whether damage exists to indicate that the area is suspect.

(h) If any damage is found or if there are suspect areas that have not been proven to be acceptable, contact Cessna Customer Service by phone or fax at the following numbers:

1 Phone: 316-517-5800

2 Fax: 316-517-7271

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(8) Install the aft baggage bulkhead access panel and the antenna bulkhead access panel. Refer to Section 53-30-00, Fuselage Access - Description and Operation.

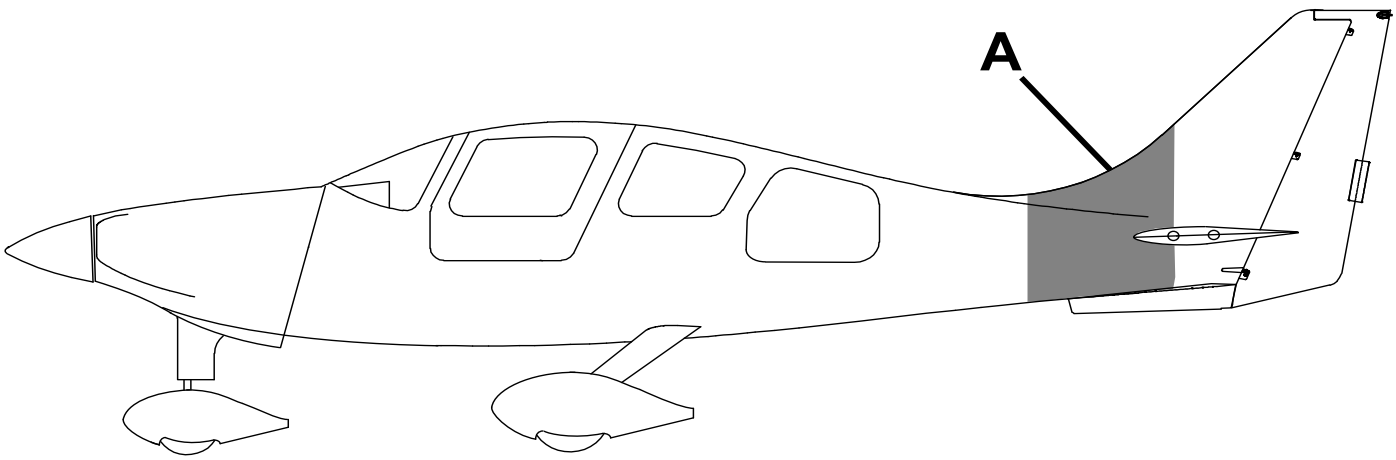
(9) Install the air outlet vent access panel on the right horizontal stabilizer. Refer to Section 53-30-00, Fuselage Access - Description and Operation.

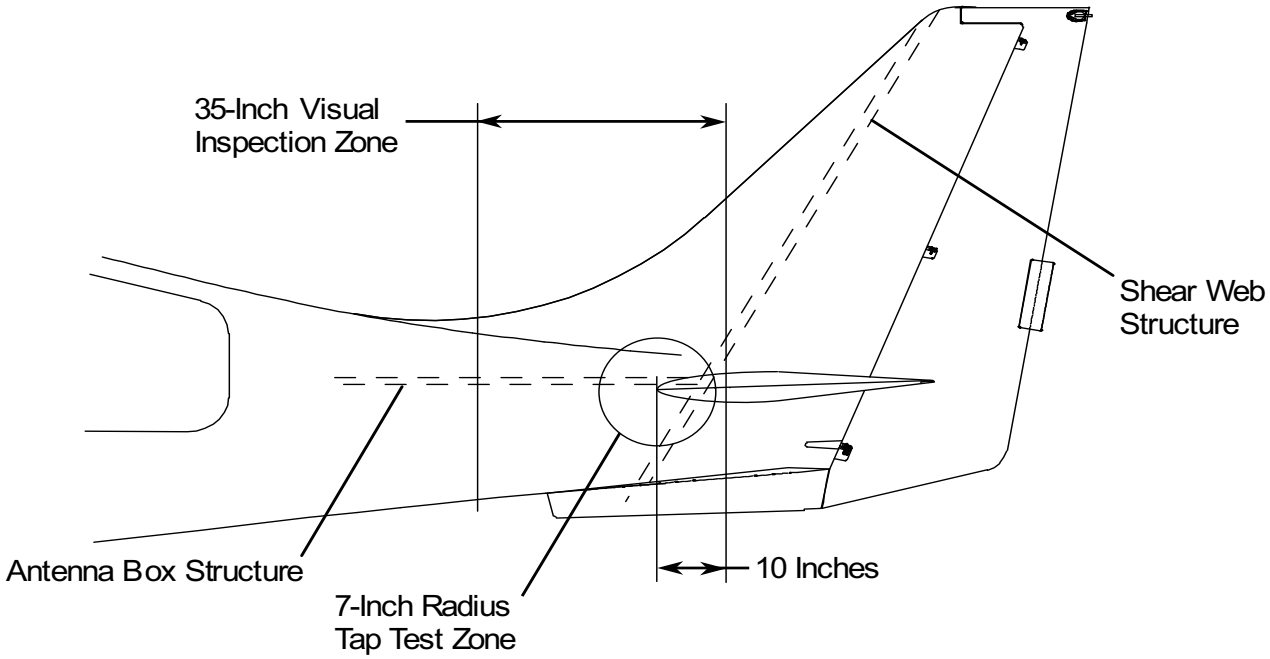
(10) Install the horizontal stabilizers. Refer to Section 55-10-00, Horizontal Stabilizer Removal and Installation.

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Figure 501 : Sheet 1 : Aft Fuselage Inspection Zone

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DETAIL A

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ENGINE CONTROLS - GENERAL

1. General Description

A. This document discusses the description, operation, removal, installation, adjustment, testing, maintenance, and inspection of the TSIO-550-C engine fuel mixture and throttle control systems.

NOTE: Cosmetic shrink wrap exterior coating on control cables is not required; it may be removed if it is damaged.

NOTE: If any hoses, wires, or lines are touching the engine induction tubes, oil radiator, or engine mount apply a dab of high temperature silicone between them.

2. Tools & Equipment

A. The mechanic should be equipped with a complete set of the necessary tools that include the following:

(1) Wrenches - 0.25 inch through 1.25 inches
(2) Common and Phillips Head Screwdrivers
(3) Pliers - Common, Diagonal Cutters, Needle Nose, Duck Bill, Snap Ring, Safety Wire
(4) Ratchets - 0.25 inch, 3/8 inch, 0.5 inch drive
(5) Sockets - 0.25 inch drive 5/32 inch through 0.5 inch, 3/8 inch drive 3/8 inch through 1 inch, 0.5 inch drive 7/16 inch through 1.25 inches
(6) Sockets (Deepwell) - 0.5 inch drive, 7/16 inch through 1 inch
(7) Feeler Gauges
(8) Leather or Soft Plastic Mallet
(9) Torque Wrenches (refer to Note) - 0-500 in.-lbs. and 0-100 ft.-lbs.
(10) Micrometers (refer to Note)
(11) Slide Hammer
(12) Pullers
(13) Thickness Gauges
(14) Vernier Calipers (refer to Note)
(15) Small Hole Gauges

NOTE: Must be currently calibrated, and the calibration must be traceable to the National Bureau of Standards.

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THROTTLE CONTROL - MAINTENANCE PRACTICES

1. Throttle Description, Operation, Removal, and Installation

A. A throttle plate located inside the intake manifold controls combustion air during engine operation. A linear motion push-pull control cable is directly connected to the throttle plate lever arm. Refer to Figure 201. During engine operation, the pilot adjusts the incoming air quantity by either pulling out or pushing in on the control cable. One of two types of locking mechanism (friction or vernier) is built into the push-pull cable to prevent the cable from moving after the desired position has been set. With the friction mechanism, rotating the thumb wheel clockwise increases the force required to move the throttle (increases friction). Rotating the thumb wheel counterclockwise decreases the force required to move the throttle (decreases friction).

B. **Throttle Cable Removal**

(1) Remove the throttle control cable from the throttle plate control arm. Remove the bolt, nut, washers, and cotter pin. Refer to Figure 202.

(2) Remove the throttle control cable housing from the throttle cable bracket. Remove the bolts, nuts, clamp, spacer, and washers. Refer to Figure 203.

(3) Remove the cable guide plates from the firewall heat shield. Remove the screws, guide plates, and washers. Refer to Figure 204.

(4) For the Avidyne and Garmin G1000 options do the steps that follow. Refer to, Fuel Mixture Control - Maintenance Practices, as applicable Figure 206, Figure 207, Figure 208, or Figure 209.

(a) Remove the GPS panel.

(b) Remove the screws that attach the panel cover to the instrument panel.

(c) Pull the panel out from the instrument panel to get access to the throttle control cable backing nut.

(d) Loosen the cable housing backing nut.

(e) Gently pull the throttle control cable out of the panel.

1 Remove the backing nut and washer from the cable housing.

(5) For the Model T240 do the steps that follow:

(a) Remove the engine controls LED and filler panel. Refer to Chapter 33, Interior LED Panels (T240) - Maintenance Practices

(b) Loosen the cable backing nut at the rear of the engine controls bracket assembly.

(c) Remove the cable from the cable bracket and airplane.

1 Remove the backing nut and washer from the cable housing.

C. **Throttle Cable Installation**

(1) For the Avidyne and Garmin G1000 options do the steps that follow:

(a) Install the throttle control cable through the panel cover.

1 Slide the backing nut and washer over the cable housing.

2 Torque the backing nut 240 to 280 inch-pounds.

(2) Install the panel cover assembly into the instrument console. Refer to Fuel Mixture Control - Maintenance Practices, Figure 206 or Figure 207.

(a) Install two panel screws that attach the panel to the instrument console.

1 Torque the panel screws 20 to 25 inch-pounds.

(3) For the Model T240 installation do the steps that follow:

(a) Install the throttle control cable through the engine controls bracket.

1 Slide the backing nut and washer over the cable housing from behind the bracket.

2 Torque the backing nut 240 to 280 inch-pounds.

(b) Install the engine controls LED and filler panel. Refer to Chapter 33, Interior LED Panels (T240) - Maintenance Practices.

(4) Route the cable through the firewall bulkhead. Install the GPS and cover plates in reverse order as disassembled.

(5) Install the throttle control cable to the throttle plate control arm. Install the bolt, washers, new cotter pin, and nut in

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reverse order as disassembled. Torque nut 30 to 36 inch-pounds. Refer to Figure 202.

(6) Install the throttle cable housing to the throttle cable bracket. Install the bolts, washers, clamp, spacer, and nuts in reverse order as disassembled. Torque nuts 30 to 36 in.-lbs. Refer to Figure 203.

(7) Install the cable guide plates, screws, and washers in reverse order as disassembled. Torque screws 30 to 36 inch-pounds. Refer to Figure 204.

D. **Throttle Cable Adjustment and Testing**

(1) Remove the throttle cable from the throttle plate control arm. Refer to Figure 202. Push the cable into the full open condition.

(2) Loosen the jam nut on the eyelet end of the throttle control cable.

(3) Move the throttle plate control arm into the full open position, and check that the arm is fully seated against its stop.

(4) Keeping a minimum of 5 threads engagement of the throttle control cable into the rod end of the cable eyelet, adjust the cable eyelet until the backside of the throttle control cable knob is 1/8 in. to 0.25 inch from the cable panel nut. Refer to, Fuel Mixture Control - Maintenance Practices Figure 210 and the bolt can be reinserted through the rod eye and throttle plate lever arm. In this position and with the bolt inserted, push in on the throttle control knob. A spring effect should be felt while pushing in on the cable knob the distance shown in Fuel Mixture Control - Maintenance Practices Figure 210 due to flexing in the cable housing.

(5) Install the throttle control cable to the throttle plate control arm. Install the bolt, washers, and nut in reverse order as disassembled. Torque nut 30 to 36 inch-pounds. Refer to Figure 202.

(6) Push then pull the throttle control cable fully in and out. No binding should be felt throughout its full range of motion.

(7) Check the throttle plate control arm motion while operating the cable.

(8) Check that all outside entities such as wiring and hoses are clear of the arm motion.

(9) Check that the cable-locking mechanism is functioning properly by not allowing cable movement unless the thumb wheel is loosened.

E. **Throttle System Inspection and Maintenance**

(1) Check that no binding is present during push-pull cable operation. Replace the throttle control cable if binding is felt with the cable disconnected from the throttle plate control arm. If binding is present only with the cable connected to the throttle plate control arm, throttle plate service is required.

(2) Check that the throttle plate control arm is fully seated in the full open position with proper clearance between the control knob and cable panel nut. If required, adjust the fuel throttle control cable. Refer to, Fuel Mixture Description, Operation, Removal, Installation.

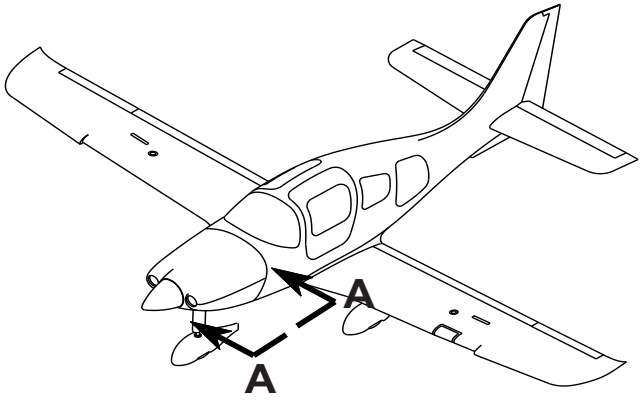
(3) Check bolt torque at the cable to throttle cable bracket location. Refer to Figure 203. If nuts are loose or backed off, replace both bolts and nuts. Torque nuts 30 to 36 inch-pounds.

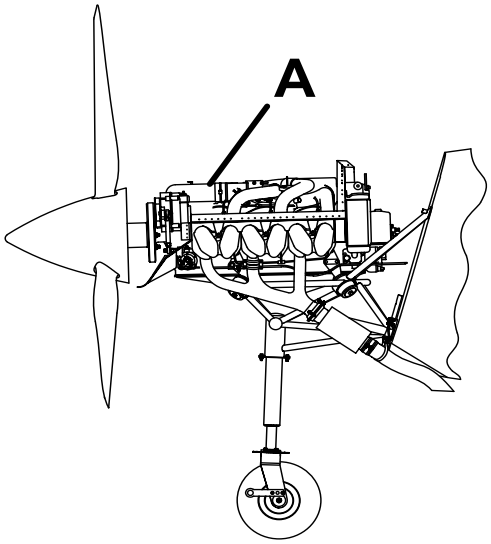
(4) The throttle control cable is a self-contained unit. No servicing of the cable is required.

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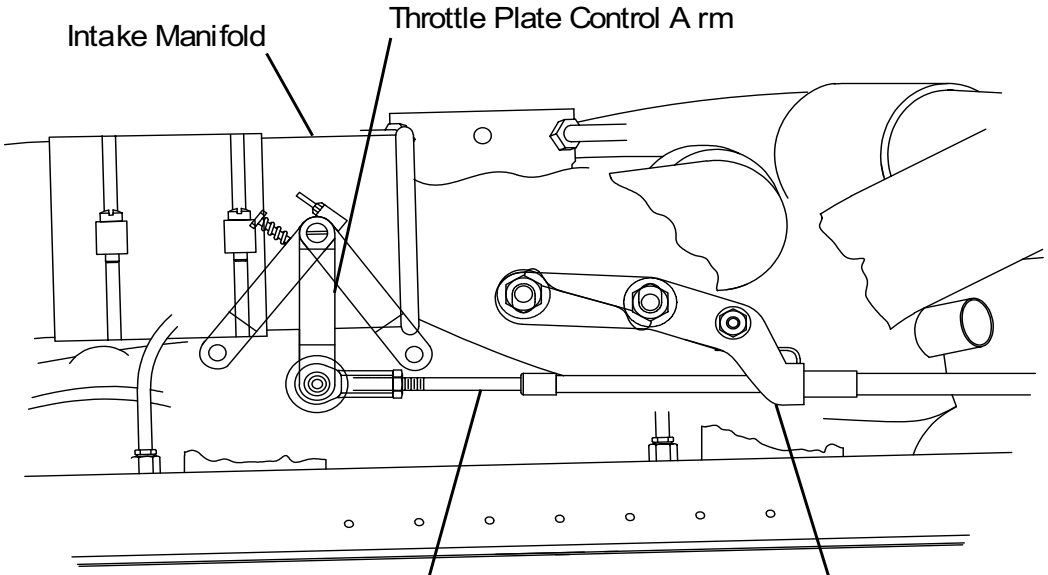
Figure 201 : Sheet 1 : Throttle Cable Assembly

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VIEW A-A



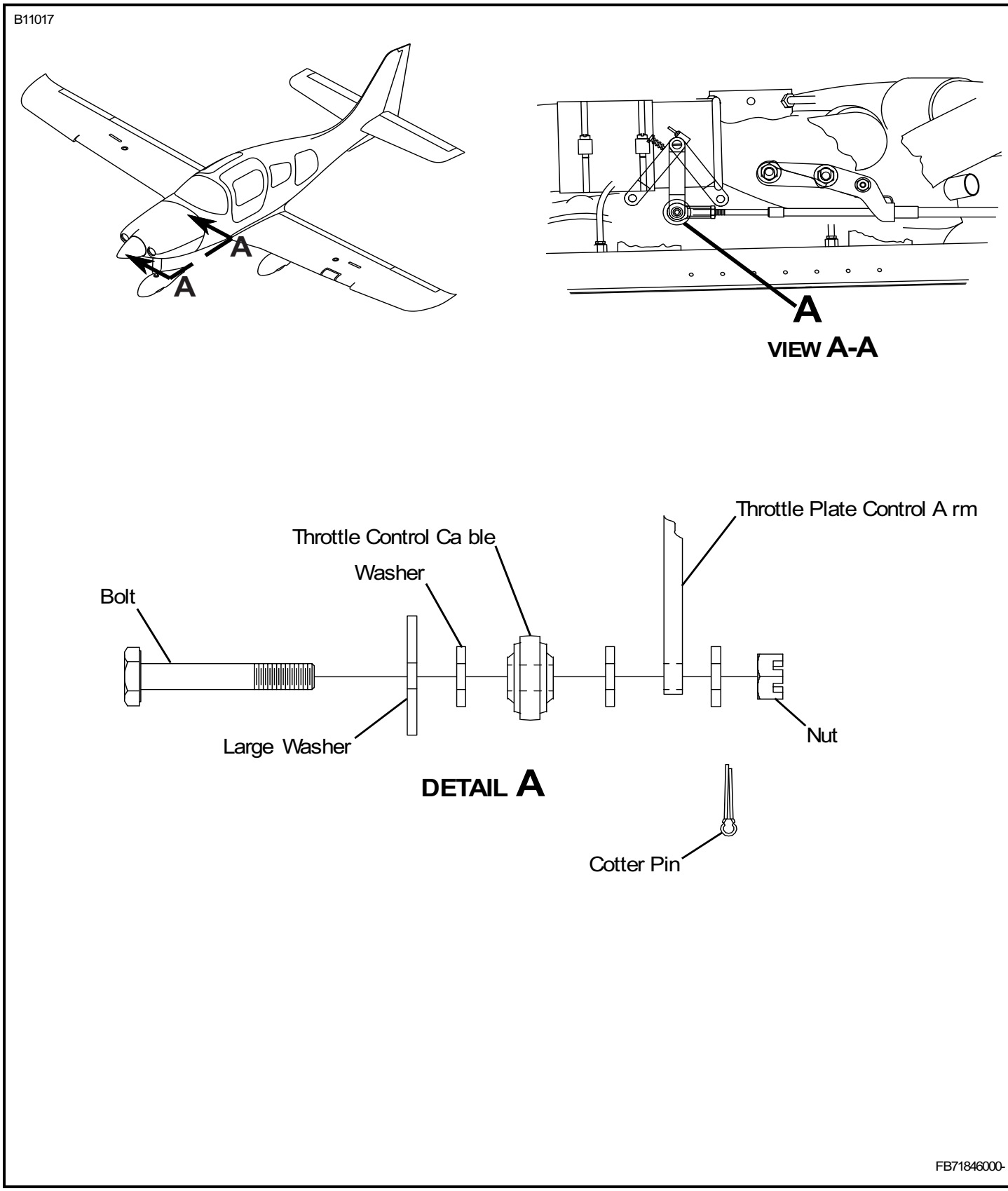
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DETAIL A

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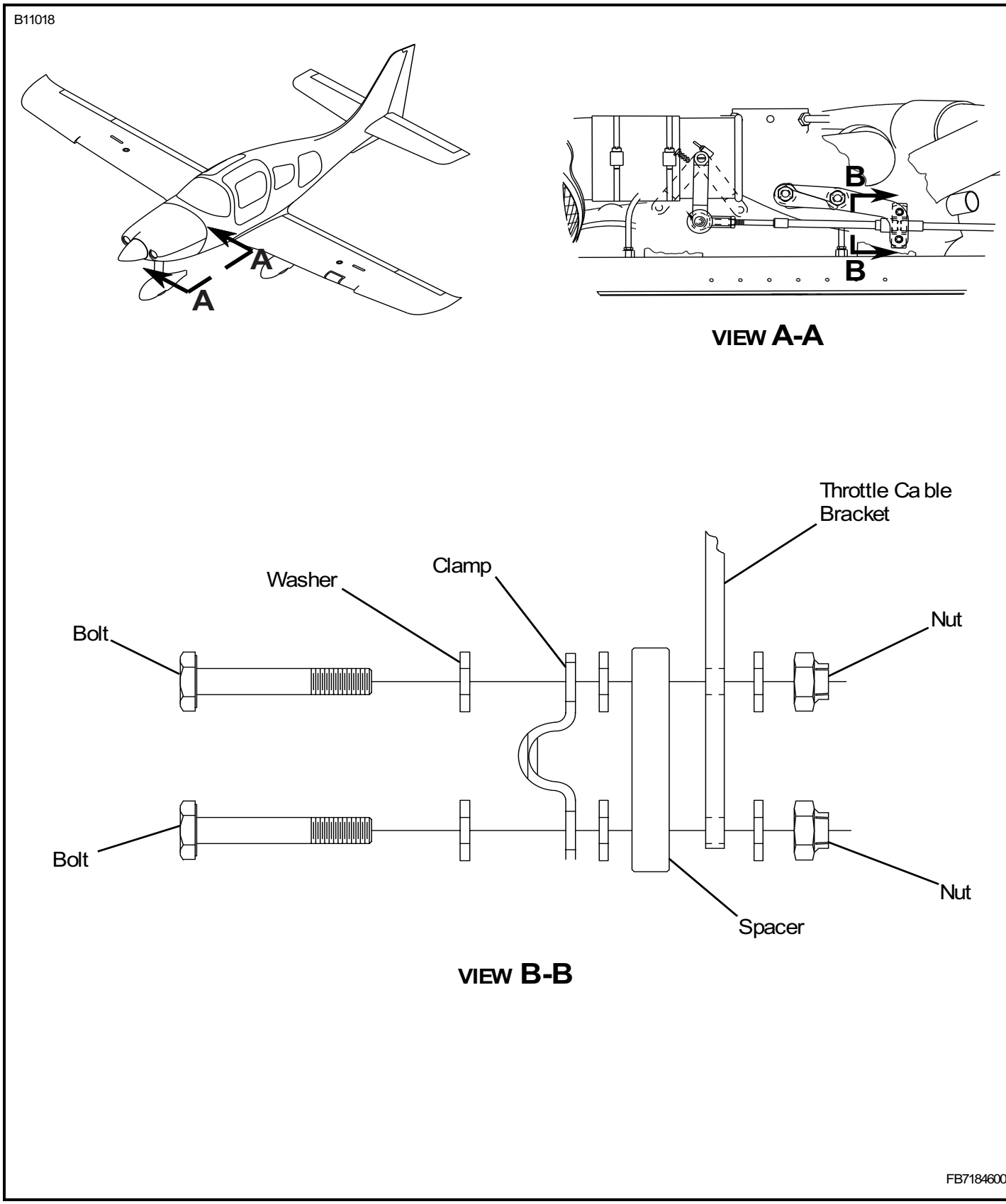
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Figure 202 : Sheet 1 : Throttle Cable



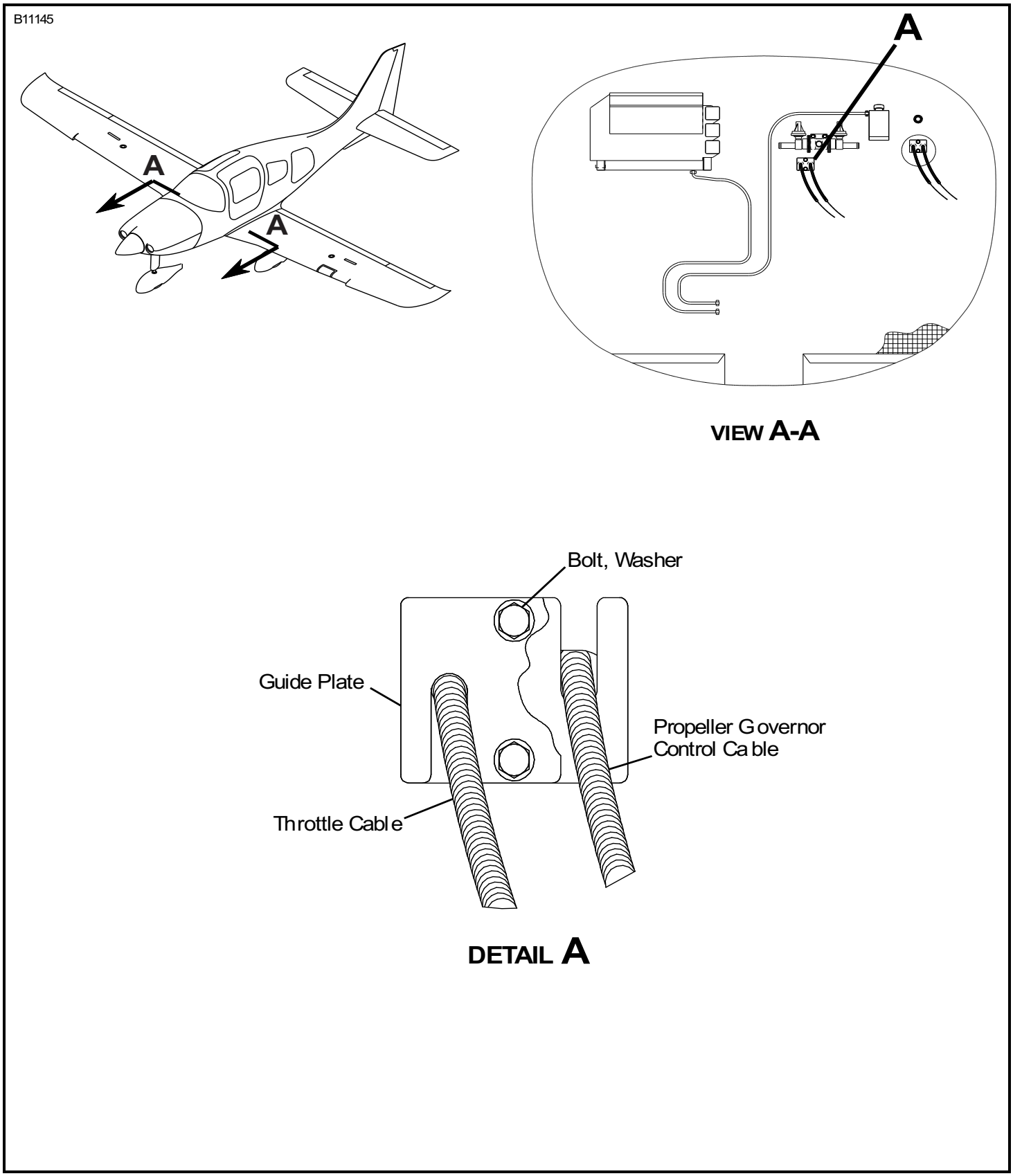
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Figure 203 : Sheet 1 : Throttle Cable Attachment to Bracket



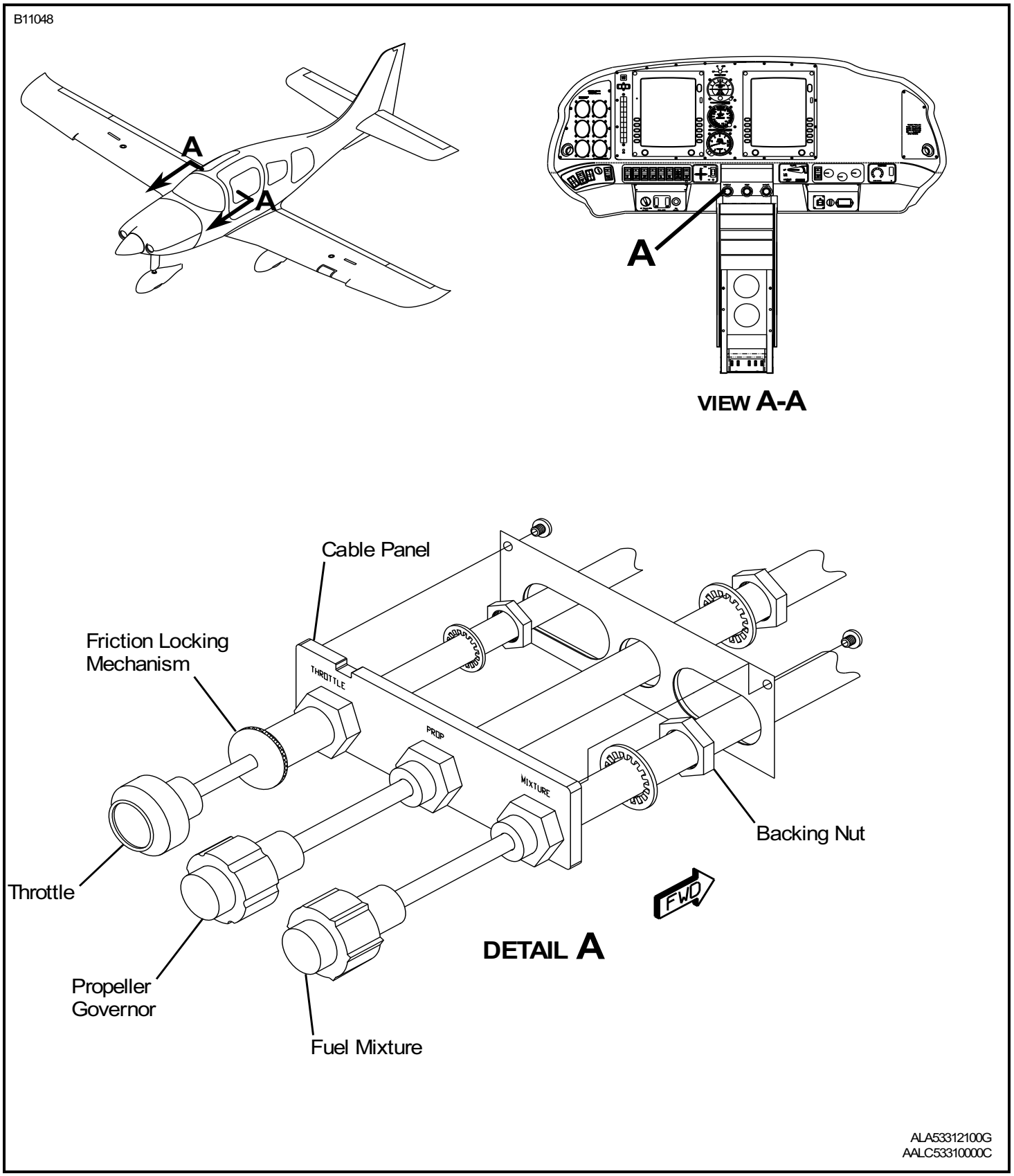
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Figure 204 : Sheet 1 : Throttle Cable Guide Plate



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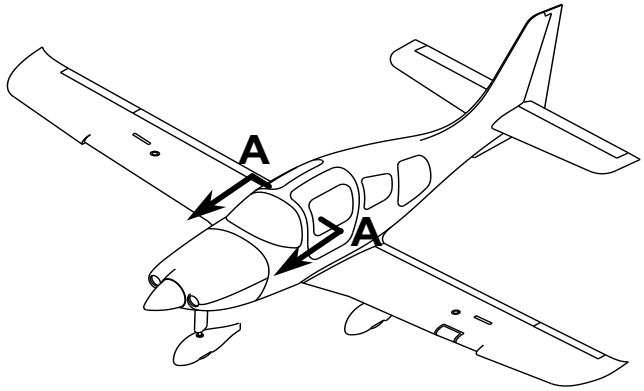
Figure 206 : Sheet 1 : Fuel Mixture Control Panel Type 1

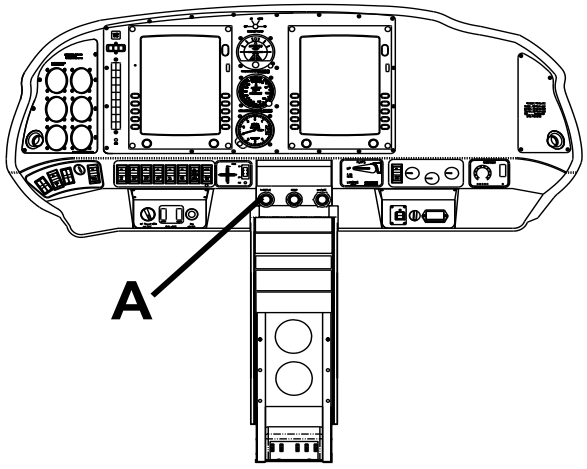


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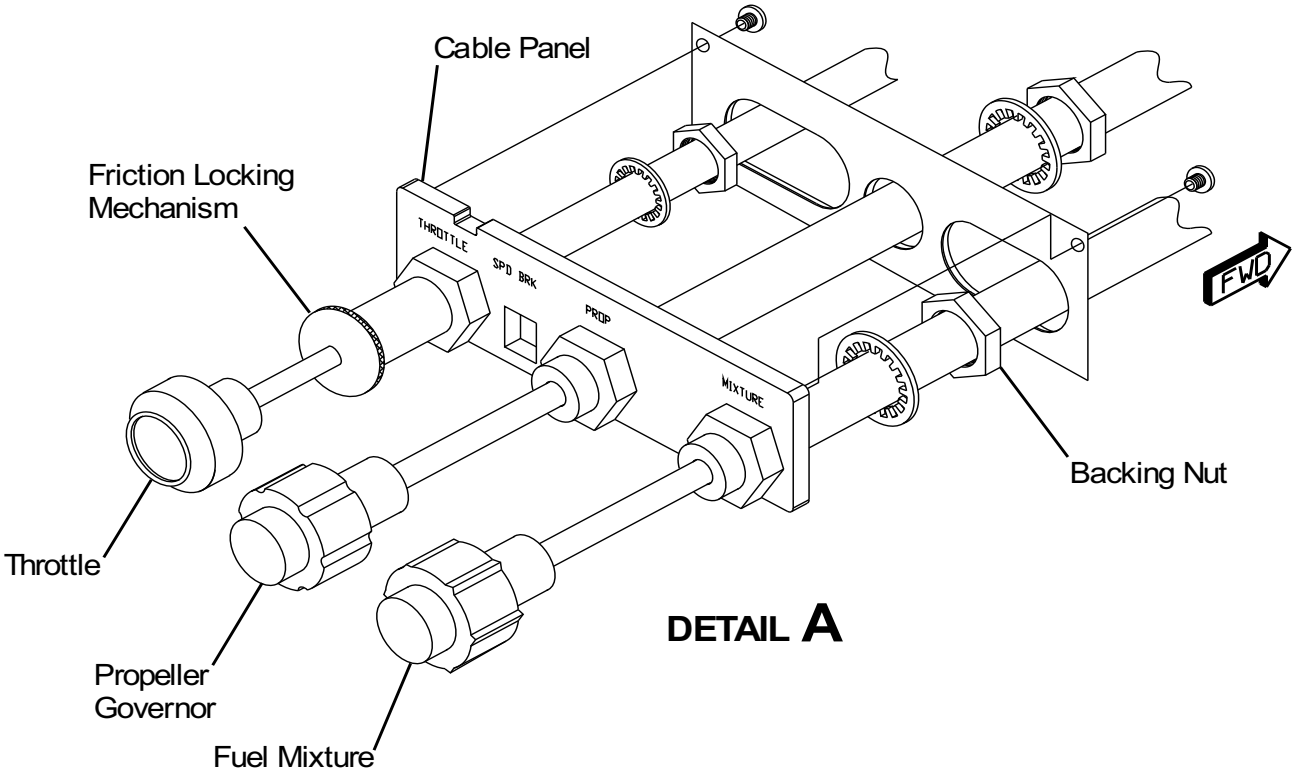
Figure 207 : Sheet 1 : Fuel Mixture Control Panel Type 2

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VIEW A-A

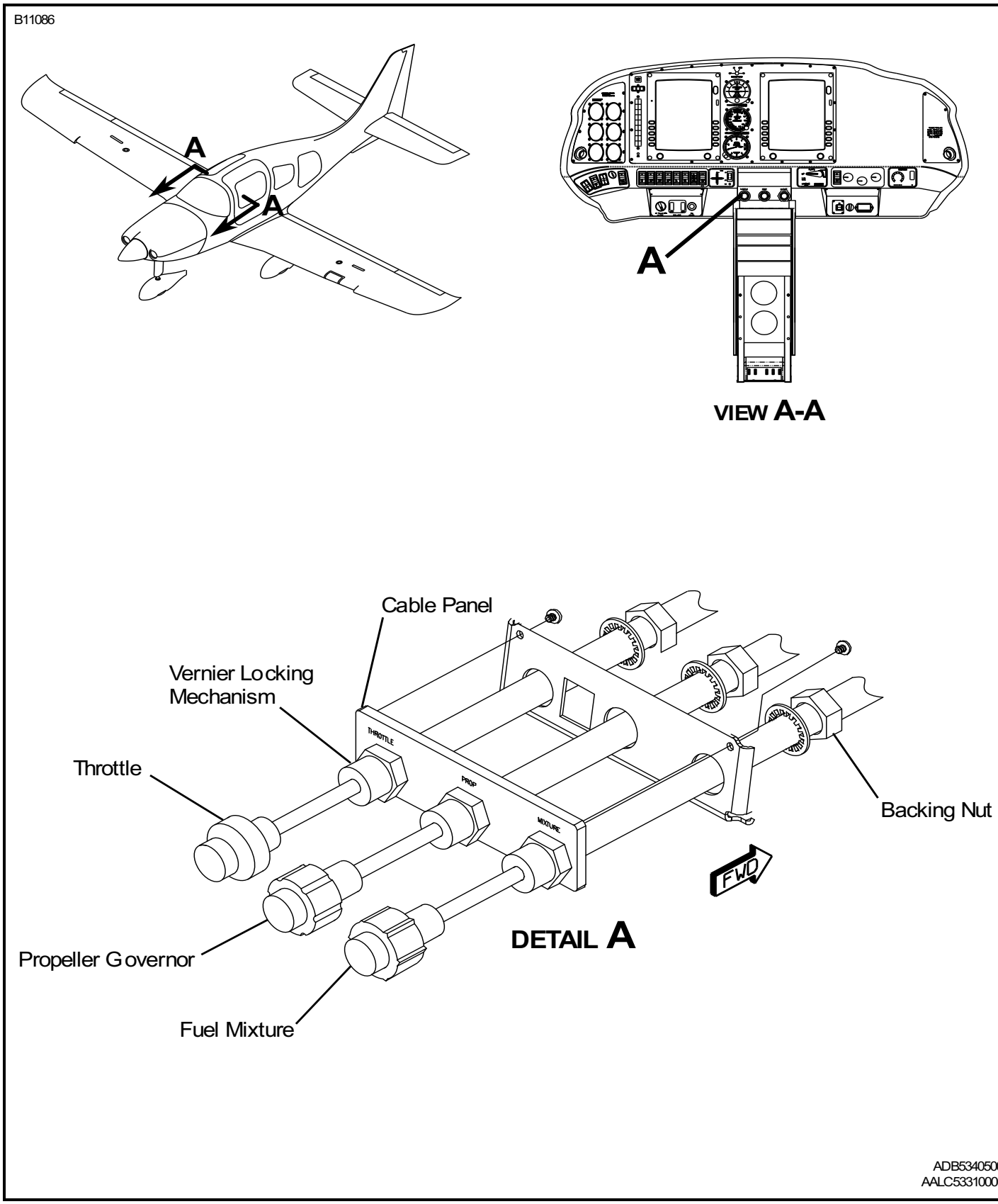


DETAIL A

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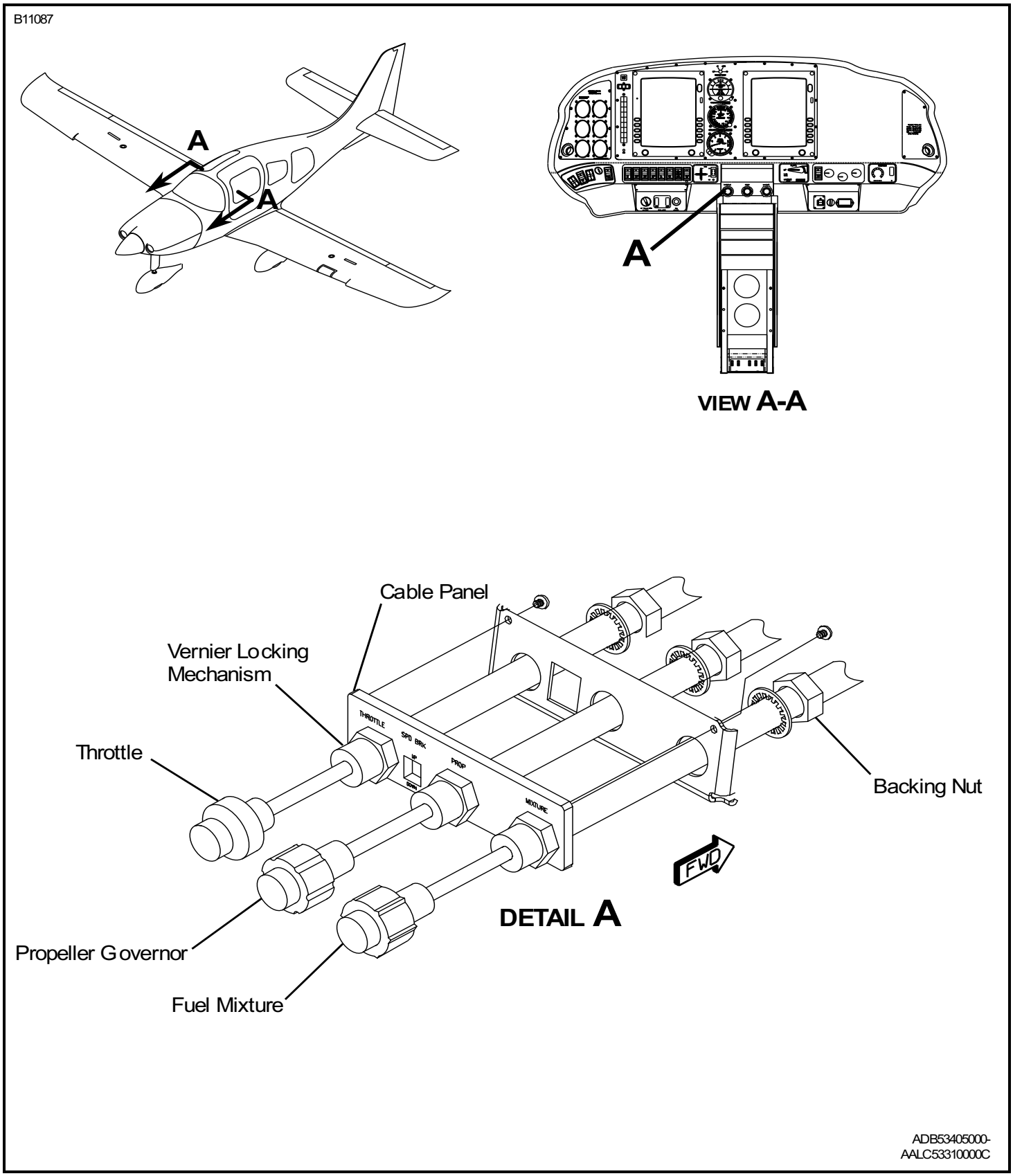
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Figure 208 : Sheet 1 : Fuel Mixture Control Panel Type 3



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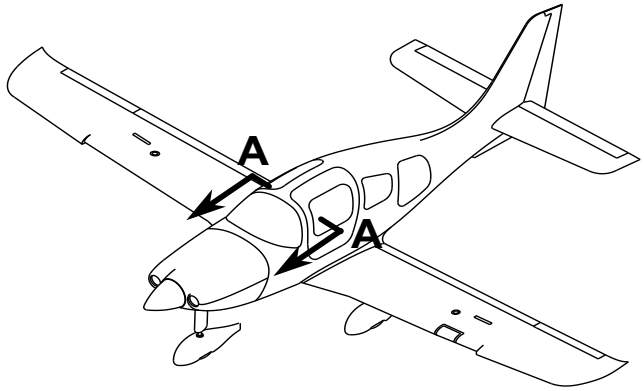
Figure 209 : Sheet 1 : Fuel Mixture Control Panel Type 4

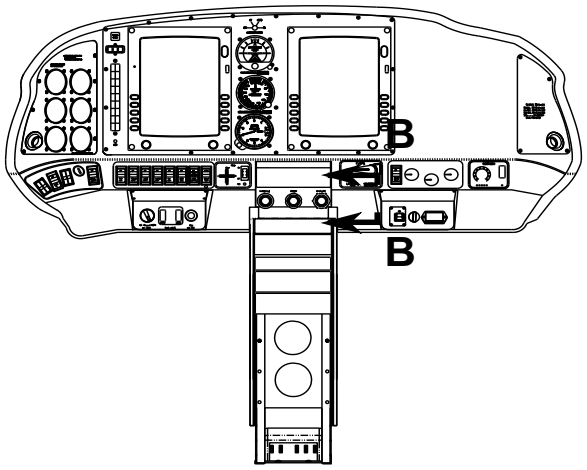


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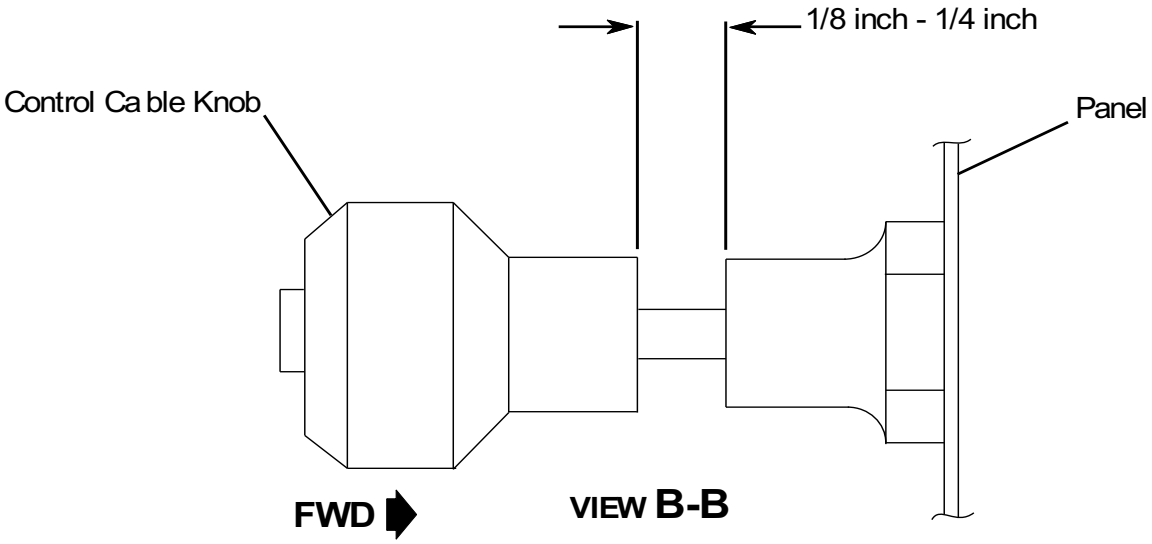
Figure 210 : Sheet 1 : Proper Control Position

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VIEW A-A



VIEW B-B

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FUEL MIXTURE CONTROL - MAINTENANCE PRACTICES

1. General

A. This section gives the maintenance procedures for the components that follow:

- The fuel mixture control cable
- The induction heat cable (Avidyne and Garmin G1000 options).

B. For the Model T240, induction heat cable maintenance procedures refer to, Induction Heat Cable (T240) - Removal/Installation.

C. Fuel is delivered to the engine by a mechanical fuel pump mounted directly to the engine. The quantity or mixture of fuel is controlled by a linear motion push-pull cable attached directly to the fuel pump's mixture control arm (Refer to Figure 201). During engine operation, the pilot adjusts the fuel mixture by either pulling out or pushing in on the control cable. A locking mechanism is built into the push-pull cable to prevent the cable from moving after the desired position has been set. To deactivate the locking mechanism the pilot presses a button located on the end on the cable knob allowing movement. Fine or precise adjust to the fuel pump mixture control arm can be accomplished by rotating the control knob either clockwise or counterclockwise resulting in small and controlled cable movement.

2. Fuel Mixture Control Cable Removal/Installation

A. Fuel Mixture Control Removal

(1) Remove the fuel mixture control cable from the fuel pump mixture control arm. Remove the bolt, nut, washers, and cotter pin. Refer to Figure 202 or Figure 203.

(2) Remove the mixture control cable housing from the fuel mixture control bracket by removing the bolts, nuts, clamp, spacer, and washers. Refer to Figure 204.

(3) Remove the cable guide plates from the firewall heat shield by removing the screws, guide plates, and washers. Refer to Figure 205.

(4) For the Avidyne and Garmin G1000 options do the steps that follow:

(a) Remove the screws that attach the panel cover to the instrument panel.

(b) Pull the panel out from the panel cover from the instrument panel to get access to the mixture control cable backing nut.

(c) Loosen the cable backing nut.

(d) Gently remove the cable from the panel cover and airplane.

1 Remove the backing nut and washer from the cable.

(5) For the Model T240 do the steps that follow:

(a) Remove the engine controls LED and filler panel. Refer to Chapter 33, Interior LED Panels (T240) - Maintenance Practices.

(b) Loosen the cable backing nut at the rear of the engine controls bracket assembly.

(c) Remove the cable from the cable bracket and airplane.

1 Remove the backing nut and washer from the cable housing.

B. Fuel Mixture Cable Installation

(1) For the Avidyne and Garmin G1000 options do the steps that follow:

(a) Install the fuel mixture control cable through the panel cover.

1 Slide the backing nut and washer over the cable housing from behind the panel cover.

2 Torque the backing nut 240 to 280 inch-pounds.

(b) Install the panel cover assembly into the instrument console, and install two panel screws. Refer to Figure 206, Figure 207, Figure 208, or Figure 209.

1 Torque the panel screws 20 to 25 inch-pounds.

(2) For the Model T240 installation do the steps that follow:

(a) Install the fuel mixture control cable through the engine controls bracket.

1 Slide the backing nut and washer over the cable housing from behind the bracket.

2 Torque the backing nut 240 to 280 inch-pounds.

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(b) Install the engine controls LED and filler panel. Refer to Chapter 33, Interior LED Panels (T240) - Maintenance Practices.

(3) Route the cable through the firewall bulkhead.

(4) Install the GPS and cover plates in reverse order as disassembled.

(5) Install the fuel mixture control cable to the engine driven fuel pump by installing the bolt, washers, new cotter pin, and nut in the order shown in Figure 202 or Figure 203. Torque the nut 30 to 36 inch-pounds.

(6) Install the fuel mixture control cable housing to the fuel mixture bracket by installing bolts, washers, clamp, spacer, and nuts in reverse order as disassembled. Torque nuts 30 to 36 inch-pounds.

(7) With a large bend radius in the fuel mixture control cable between the firewall heat shield and the fuel mixture bracket, install the cable guide plates, screws, and washers. Torque screws 30 to 36 inch-pounds. Refer to Figure 205.

C. **Fuel Mixture Adjustment and Testing**

(1) Loosen the jam nut at the eyelet end of the fuel mixture control cable.

(2) Remove the fuel mixture control cable from the fuel pump mixture control arm (refer to Figure 202 or Figure 203) and push the cable knob into the full rich position.

(3) Move the mixture control arm into the full rich position, and check that the arm is fully seated against its stop.

(4) Keeping a minimum of 5 threads engagement of the fuel mixture control cable into the rod end of the cable eyelet, adjust the cable eyelet until the backside of the fuel mixture control cable knob is 1/8 inch to 1/4 inch from the cable panel nut (refer to Figure 210) and the bolt can be reinserted through the rod eye and mixture control lever. In this position, and with the bolt inserted, push in on the mixture control knob. A spring effect should be felt while pushing in on the cable knob the distance shown in Figure 210 due to flexing in the cable housing.

(5) Install the fuel mixture control cable to the fuel pump mixture arm by installing the bolt, washers, cotter pin, and nut in order shown in Figure 203. Torque nut 30 in.- lbs., then apply additional torque, if necessary, until the slot of the nut aligns with the hole in the bolt.

(6) Push then pull the fuel mixture control cable fully in and out. No binding should be felt throughout its full range of motion.

(7) Check the fuel pump mixture control arm motion while operating the cable. For S/N 41563 and On, ensure the angle between the control arm and cable (measured upward from the centerline of the cable end to the centerline of the control arm) is a maximum of 170 degrees when the control arm is in the idle position.

(8) Check that all outside entities such as engine components, wiring, and hoses are clear of arm motion. For S/N 41501 and On (with air conditioning) or S/N 41563 and On (without air conditioning), check that clearance is a minimum of 0.25 inches. For S/N 41563 and On, the existing No. 10 AN970-3 washer between the mixture control cable and the arm may be replaced with a No. 10 MS27183-9 washer as required.

(9) Check that the cable-locking mechanism is functioning properly by not allowing cable movement unless the knob button is pressed.

(10) Rotate the fuel mixture control cable knob fully clockwise and counterclockwise. Check that the fuel pump mixture control arm is moving in a smooth fashion while rotating the knob.

D. **Fuel Mixture System Inspection and Maintenance**

(1) Check that no binding is present during push-pull and clockwise/counterclockwise cable operation. Replace the fuel mixture control cable if binding is felt with the cable disconnected from the fuel pump mixture control arm. If binding is present only with the cable connected to the fuel pump mixture control arm, fuel pump service is required.

(2) Check that the fuel pump mixture control arm is fully seated in the full rich position with proper clearance between the control knob and cable panel nut. If required, adjust the fuel mixture control cable. Refer to, Fuel Mixture Control Cable Removal/Installation.

(3) Check the bolt torque at the cable to fuel mixture bracket location. Refer to Figure 204. If nuts are loose or backed off, replace both bolts and nuts. Torque nuts 30 to 36 in.- lbs.

(4) The fuel mixture control cable is a self-contained unit. No servicing of the cable is required.

3. Induction Heat Cable

A. Two valves located inside the engine warm air induction tubes direct either fresh, mixed, or hot air into the engine. A linear motion push-pull control cable is directly connected to the valve on the right side of the engine and an inner link cable is

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connected from the right side valve to the left side valve. Refer to Figure 211, Figure 212, and Figure 213. As the cable moves, the two butterfly valves operate simultaneously through a 90 degrees rotation. Mixing of the air is accomplished when the two valves are positioned somewhere between the fully closed and fully open positions.
During engine operation the pilot adjusts the incoming air temperature by either pulling out or pushing in on the control cable. A locking mechanism is built into the push-pull cable to prevent the cable from moving after the desired position has been set. To deactivate the locking mechanism, the pilot presses a button located on the end on the cable knob allowing movement.

B. **Induction Heat Cable Removal**

(1) Remove the induction heat control inner link cable and the induction heat control cable from the induction tube butterfly valve levers. At each valve control connection, loosen the bolt, nut, and washer until the cable can be pulled out from the bolt. Refer to Figure 211.

(2) Loosen the loop clamps restraining the induction heat control cable and inner link cable. Remove the inner link cable and pull the induction heat control cable out and away from the induction tube.

(3) Remove all of the cable ties attaching the control cable to the engine and the engine mount.

(4) Remove the cable guide plates from the firewall heat shield by removing the screws, guide plates, and washers. Refer to Figure 214.

(5) Working from behind the left side knee bolster panel, loosen the control cable nut until completely disengaged from the cable threads. Refer to Figure 215. Pull the cable out from the knee bolster panel.

C. **Induction Heat Cable Installation**

(1) Install the induction heat cable through the knee bolster panel by installing the lock washer and retaining nut over the cable housing, and screwing the nut onto the threaded part of the cable. Refer to Figure 215. Torque retaining nut 55 to 60 inch-pounds.

(2) Route the end of the control cable through the firewall.

(3) Reinstall the guide plates over the control cables passing through the firewall in reverse order as disassembled. Torque guide plate retaining screws and washers 30 to 36 inch-pounds.

(4) Route the end of the cable through the loop clamp, and slide the end of the cable wire through the control valve lever bolt.

(5) With the control cable knob in the full fresh air position (pushed completely in), position the butterfly plate inside of the right induction valve so that the valve is completely closed. Verify that when the control cable is completely pushed up against the housing, the butterfly plate is in the correctly adjusted position. Torque the cable wire retaining nut 25 to 30 inch-pounds. while in this position. Tighten all other hardware snug.

(6) Attach the inner link control cable between the remaining right side control valve lever arm and the left side control valve lever arm. Position the left side valve butterfly plate to the full closed position and tighten all remaining valve attachment hardware. Torque the cable wire retaining nut 25 to 30 inch-pounds. Tighten all other hardware snug.

(7) Slowly pull the control cable knob out and inspect both the left and right side control valves for full open position. Readjust the cables as required to maintain fully closed and fully open valve positions while the control cable knob is in the full closed and full open positions. Ensure that 1/8 inch to 0.25 inch cable housing protrudes from the loop clamps after final cable adjustments are made.

(8) Using cable ties, attach the induction heat cable to the engine and engine mount as required.

D. **Induction Heat Control Cable Maintenance**

The induction heat control cable is a maintenance-free component. No lubrication is required.

E. **Induction Heat Control Cable Inspection**

(1) Check the control cable function by pressing in the cable locking button and moving the cable fully in and out. No binding should be felt during cable operation

(2) Check that the butterfly valves are moving through 90 degrees of rotation. Check the butterfly plate position in both valves by pushing in fully on the control cable knob. The valves should be fully closed while in this position.

(3) Check the safety wire connections at the cable to induction tube retaining ears. Connections should be tight and not allow any cable movement.

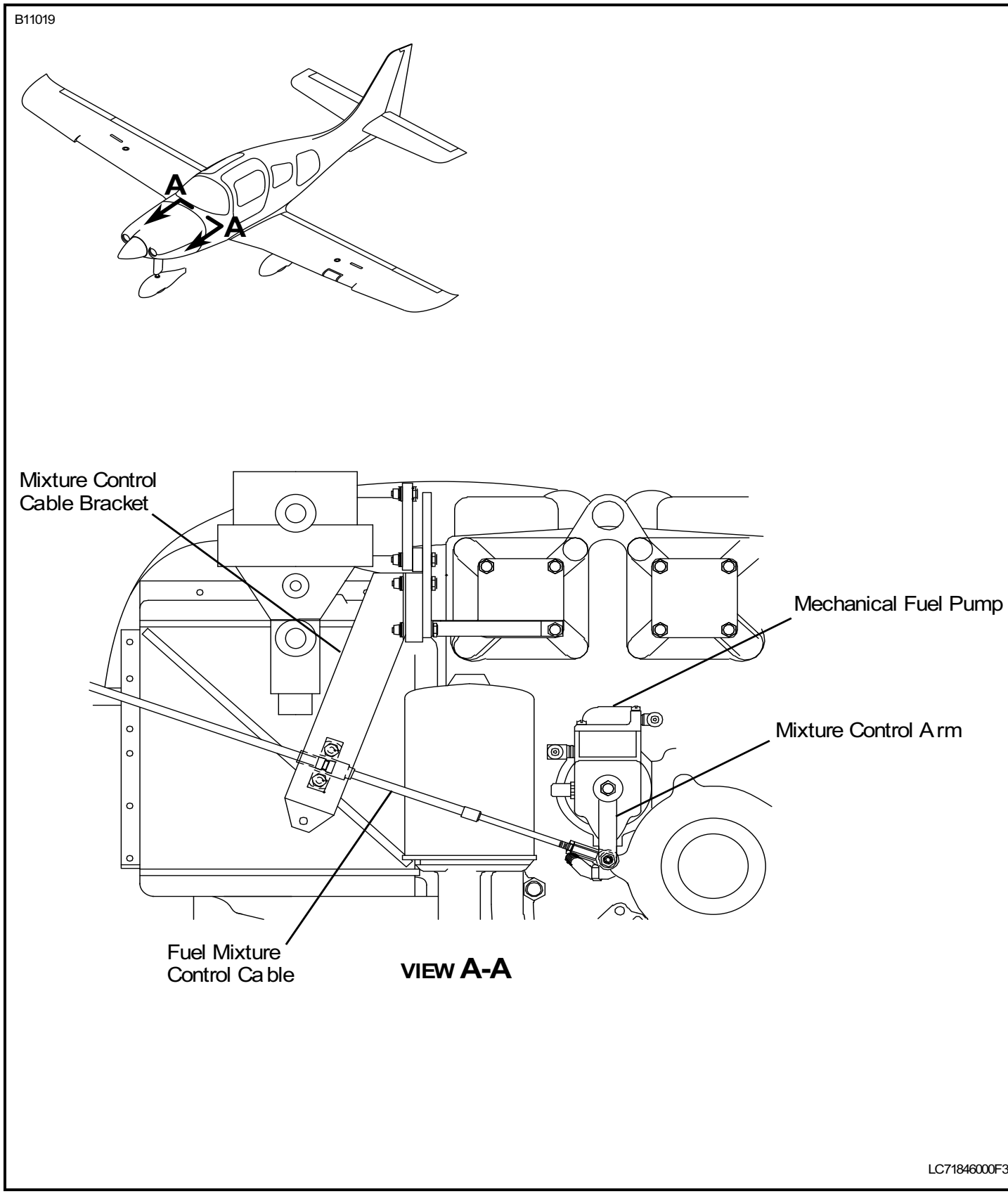
(4) Check the control cable wire to the hot air lever retaining bolt connection. Cable wire should be secure within the bolt with no slippage between the bolt and wire.

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(5) Check the interconnect wire connections at both the fresh air valve and the hot air valve lever arms. Wire should be secure within the bolt with no slippage between the bolt and wire.

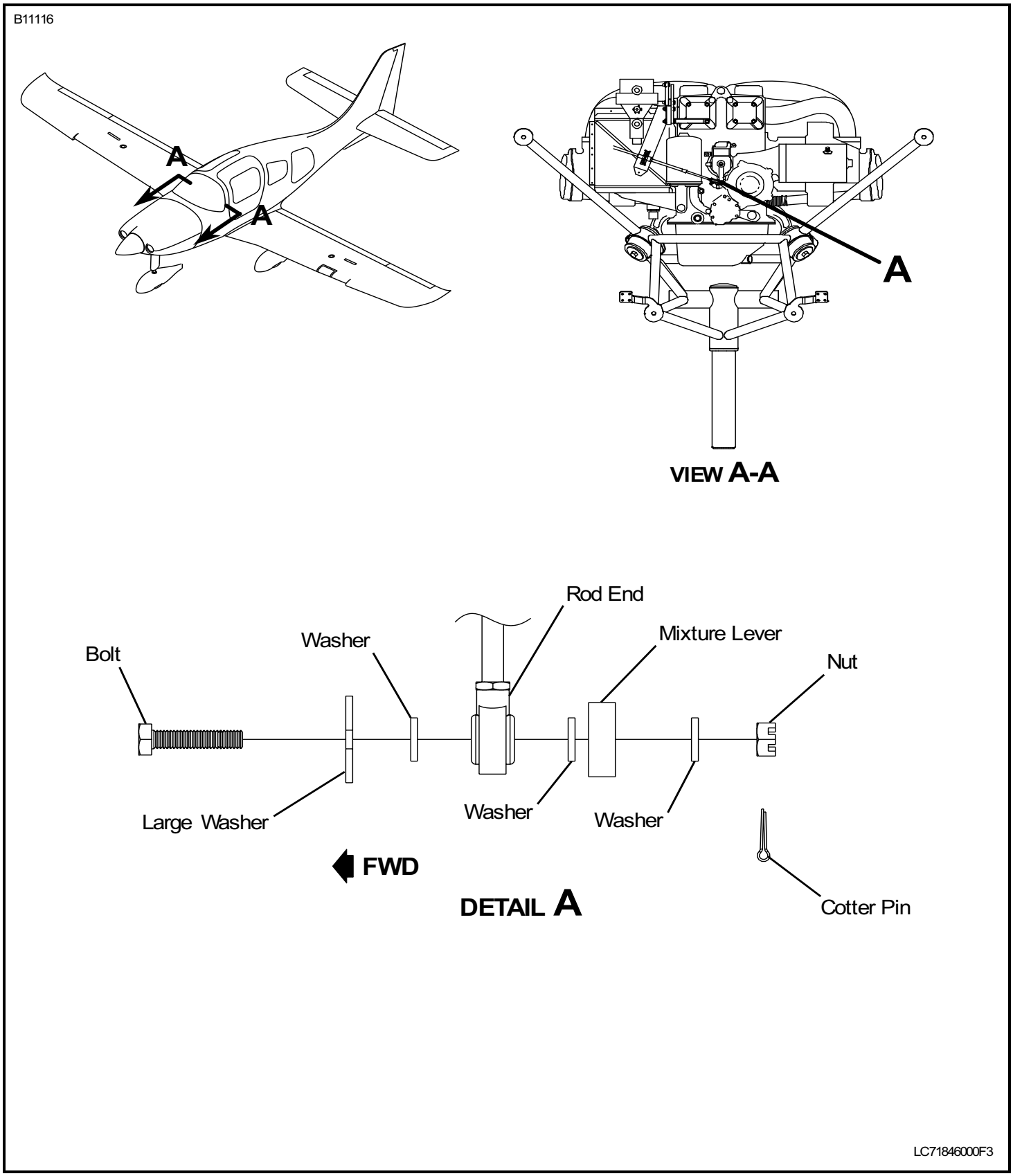
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Figure 201 : Sheet 1 : Fuel Mixture Control



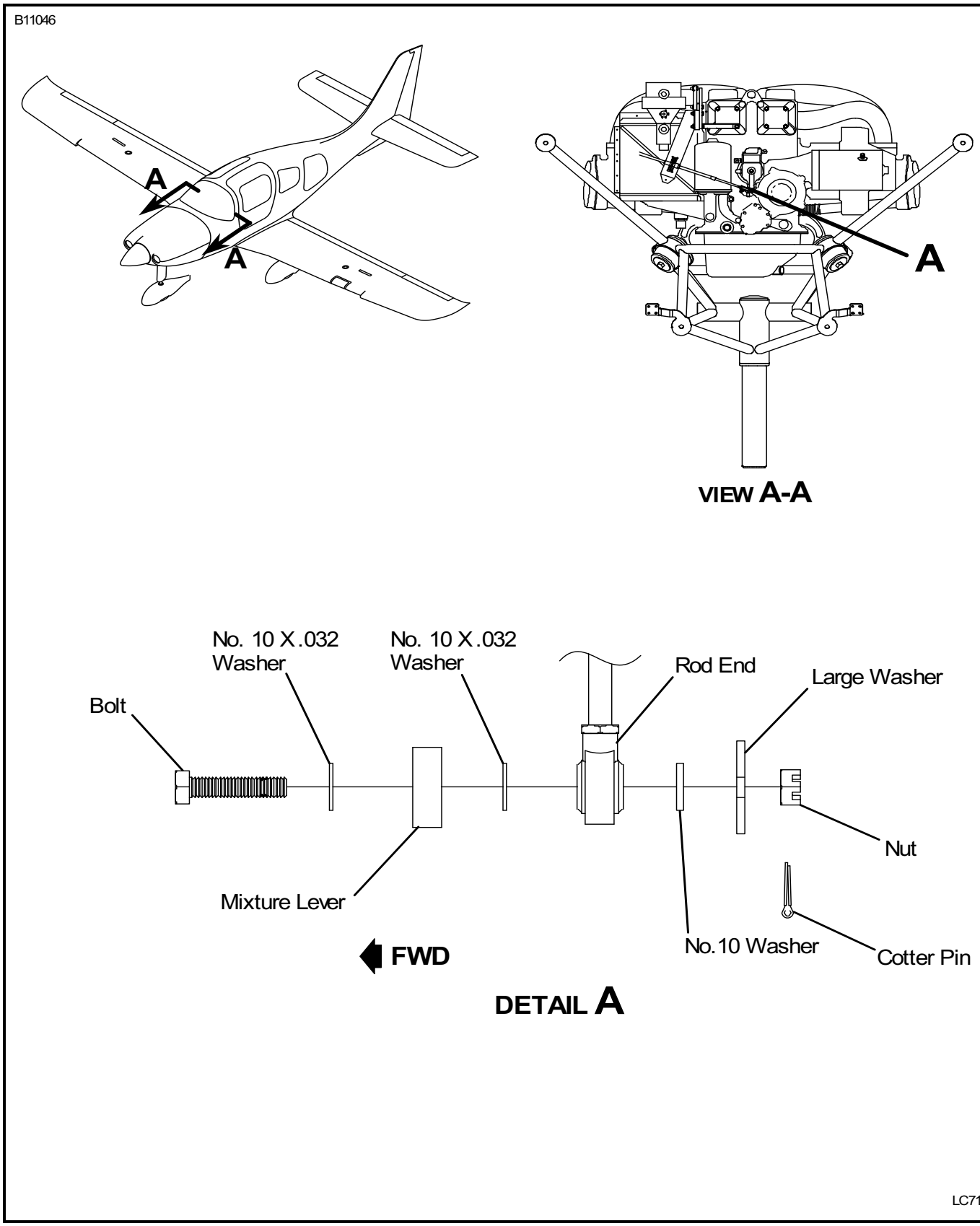
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Figure 202 : Sheet 1 : Fuel Mixture Control Assembly (S/N 41002 to 41047)



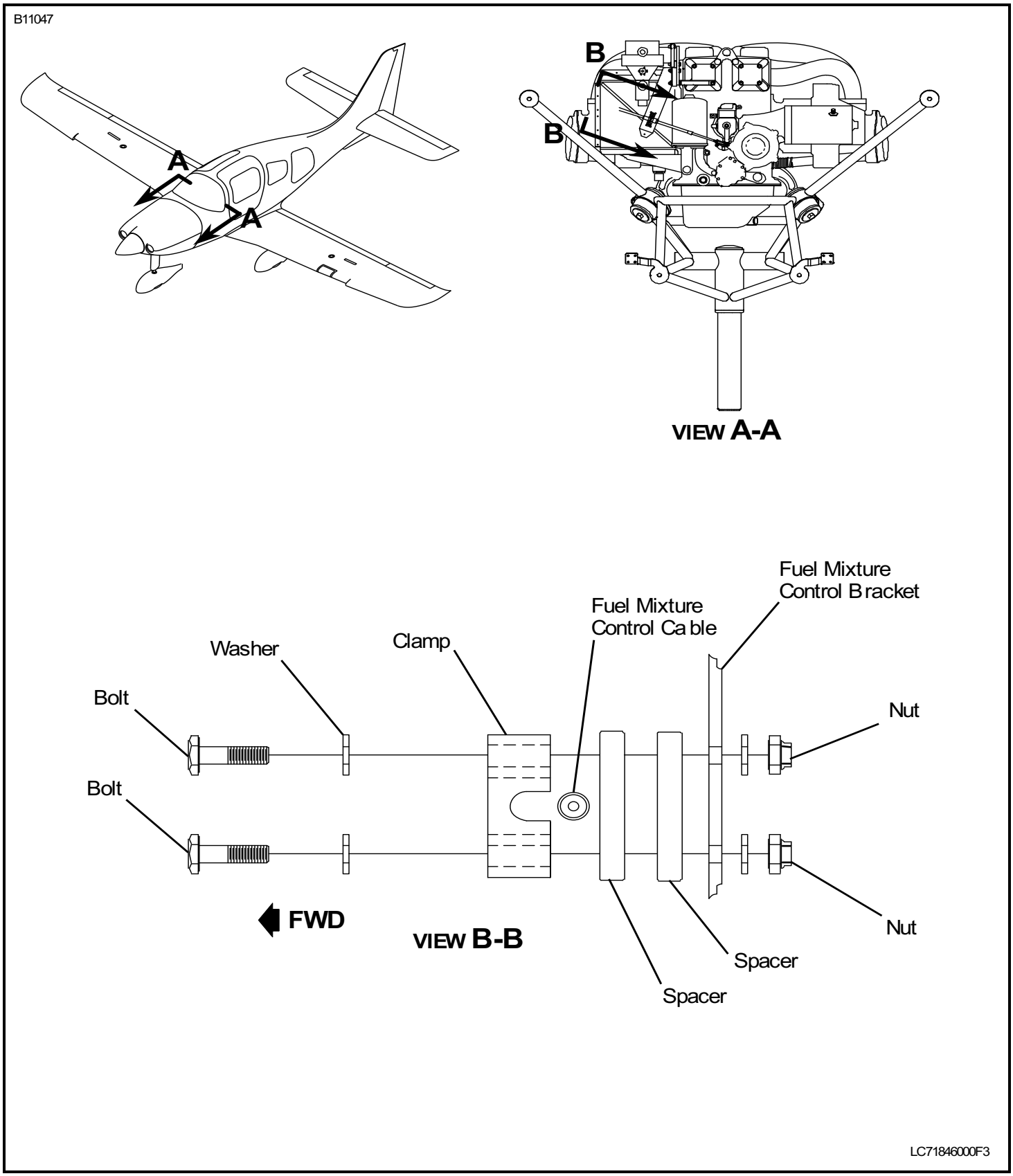
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Figure 203 : Sheet 1 : Fuel Mixture Control Assembly



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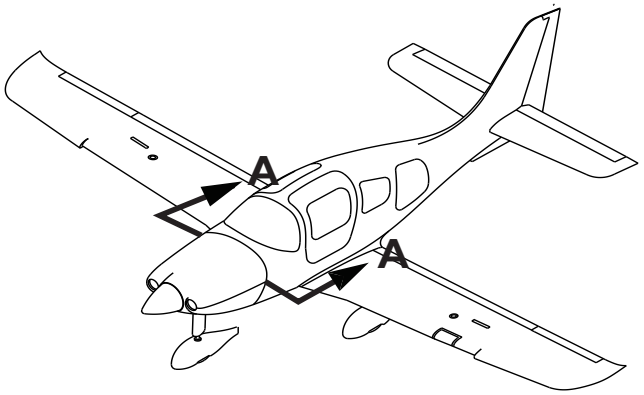
Figure 204 : Sheet 1 : Fuel Mixture Control Assembly

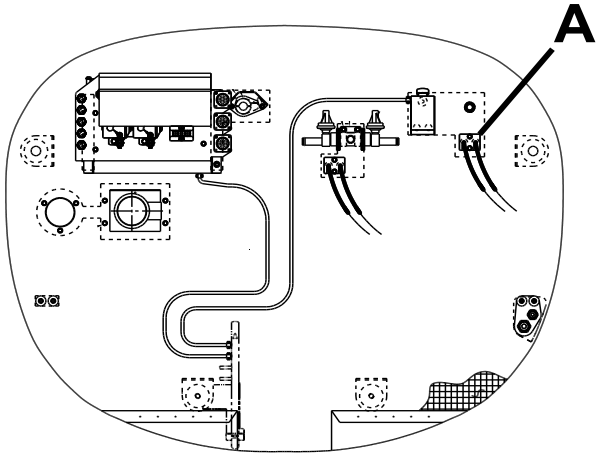


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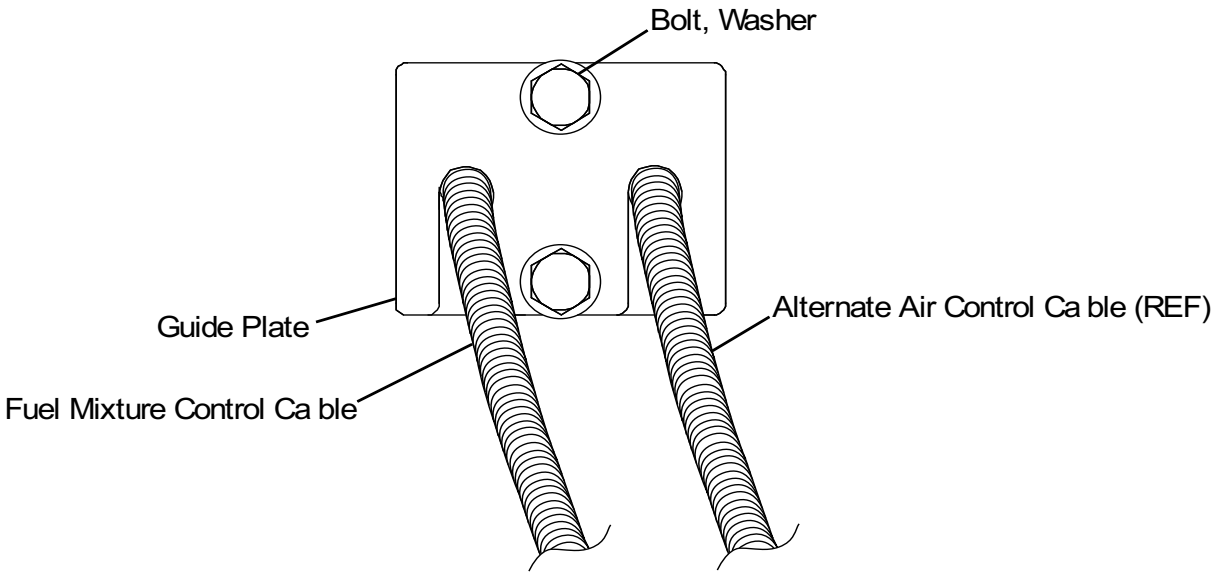
Figure 205 : Sheet 1 : Fuel Mixture Control Guide Plate

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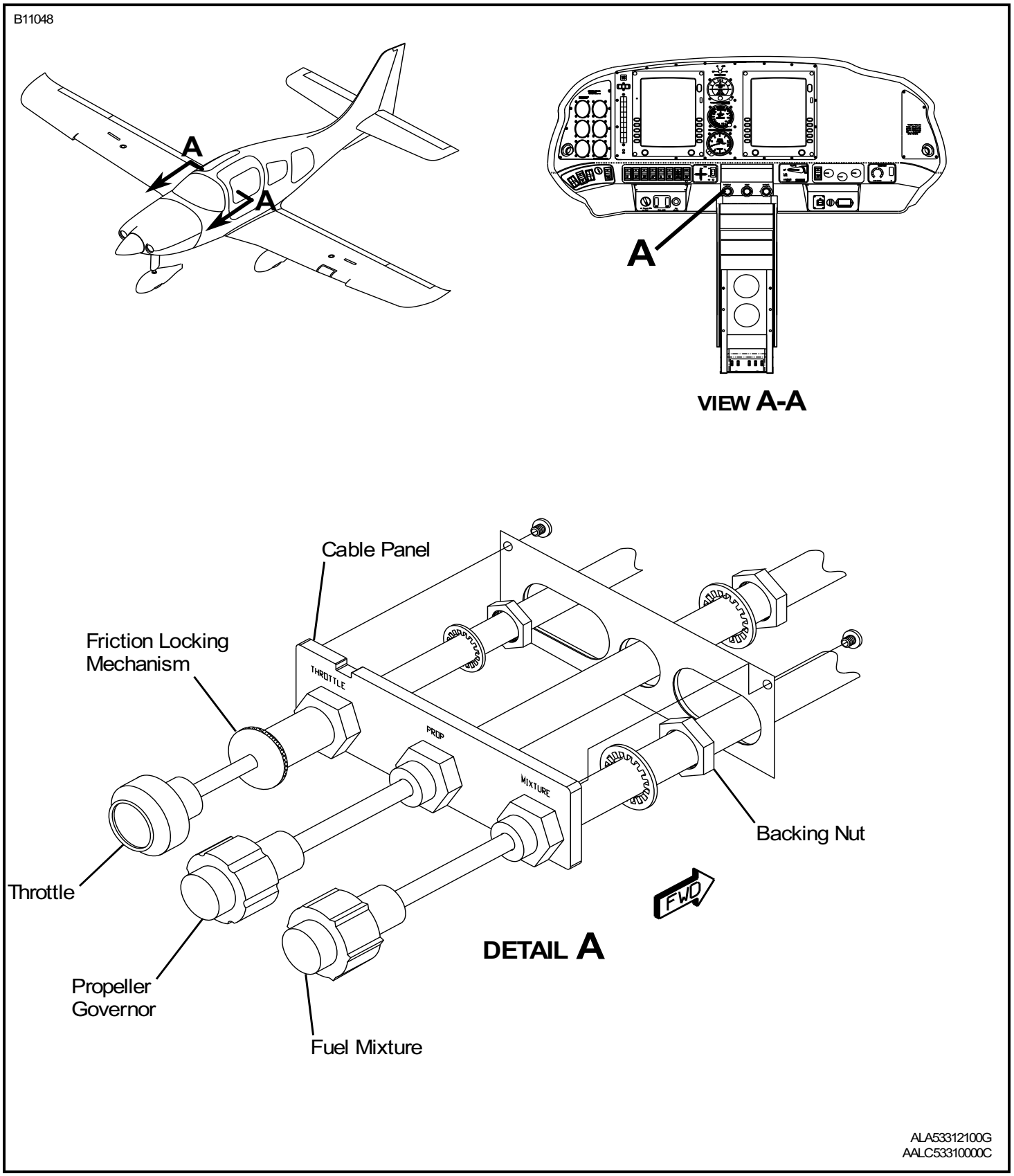
VIEW A-A



DETAIL A

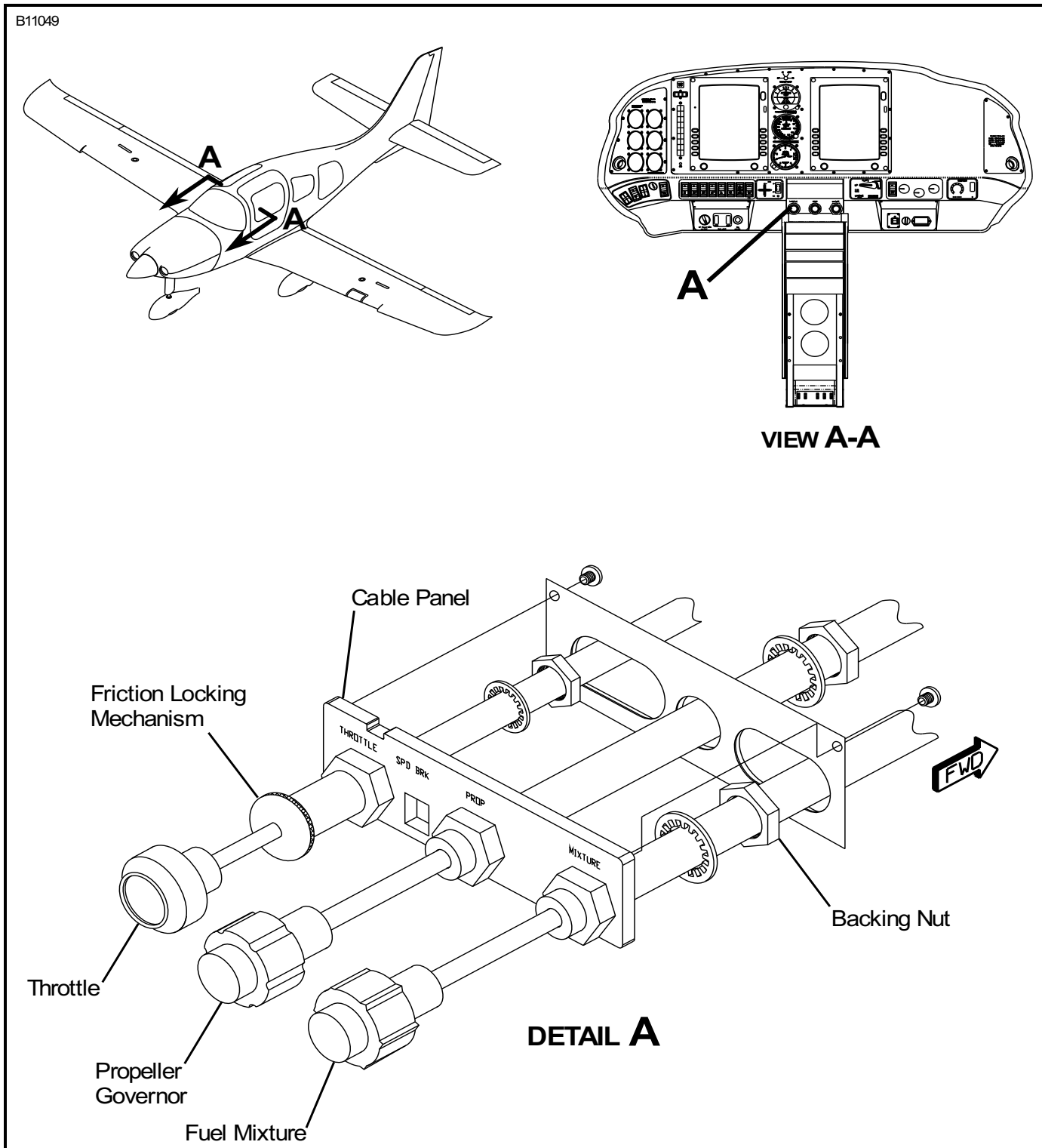
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Figure 206 : Sheet 1 : Fuel Mixture Control Panel Type 1



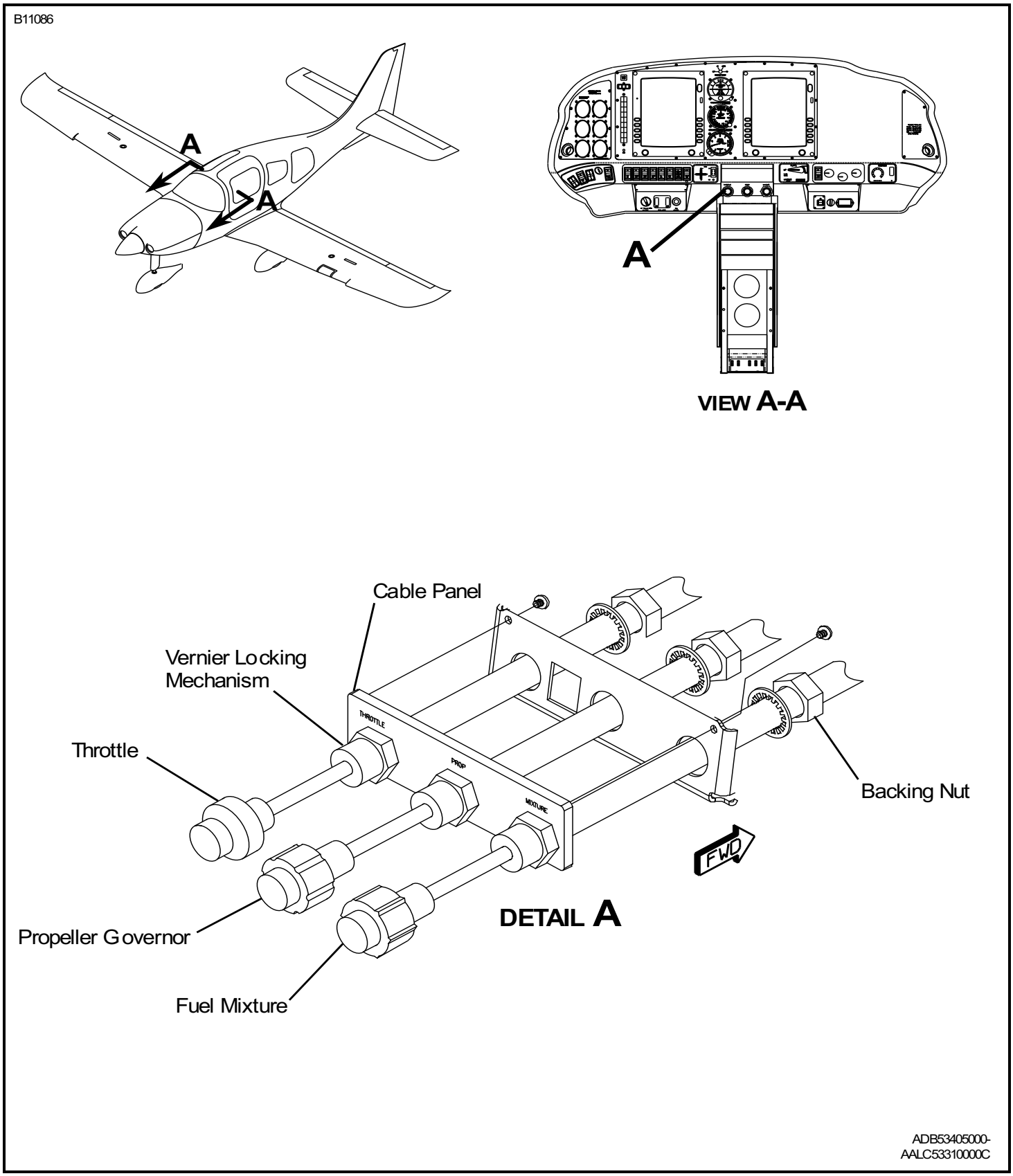
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Figure 207 : Sheet 1 : Fuel Mixture Control Panel Type 2



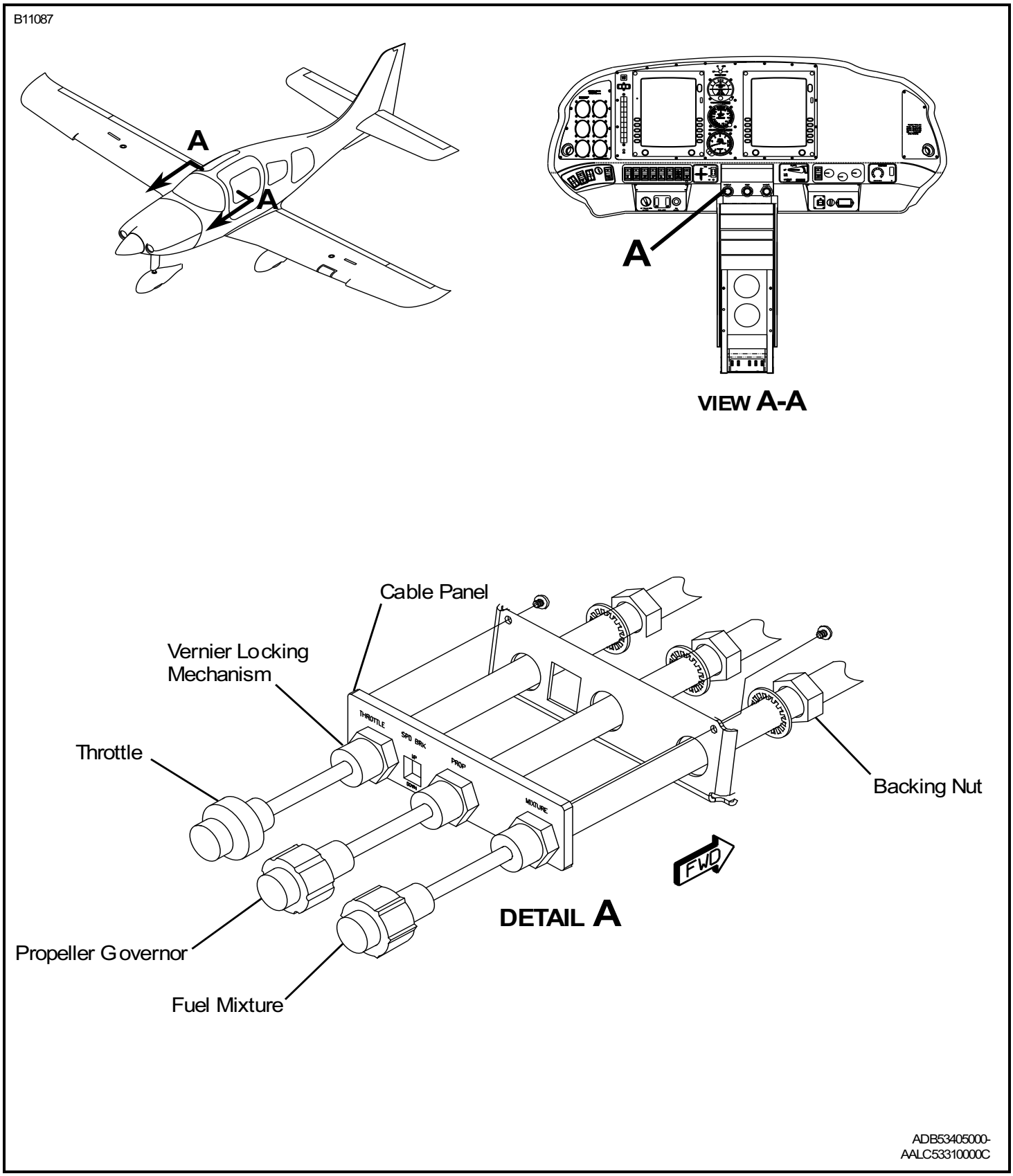
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Figure 208 : Sheet 1 : Fuel Mixture Control Panel Type 3



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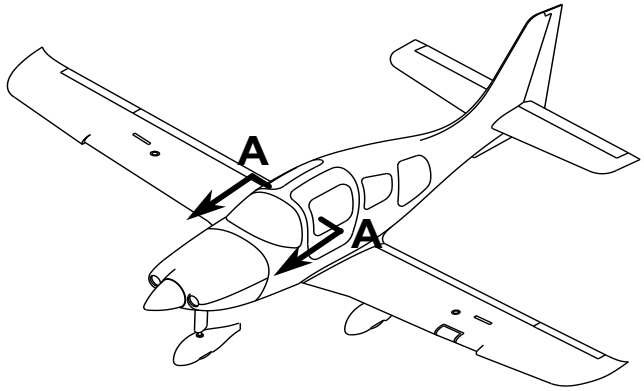
Figure 209 : Sheet 1 : Fuel Mixture Control Panel Type 4

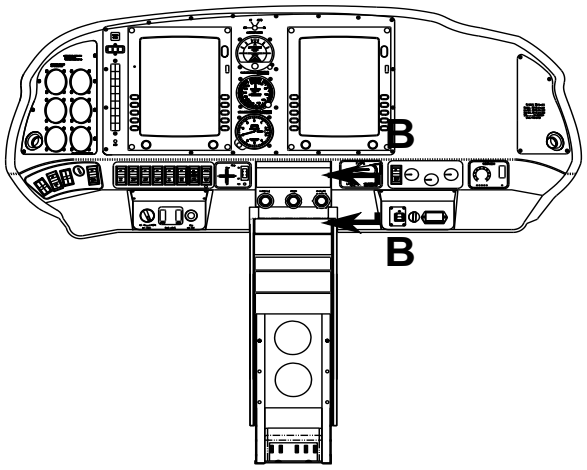


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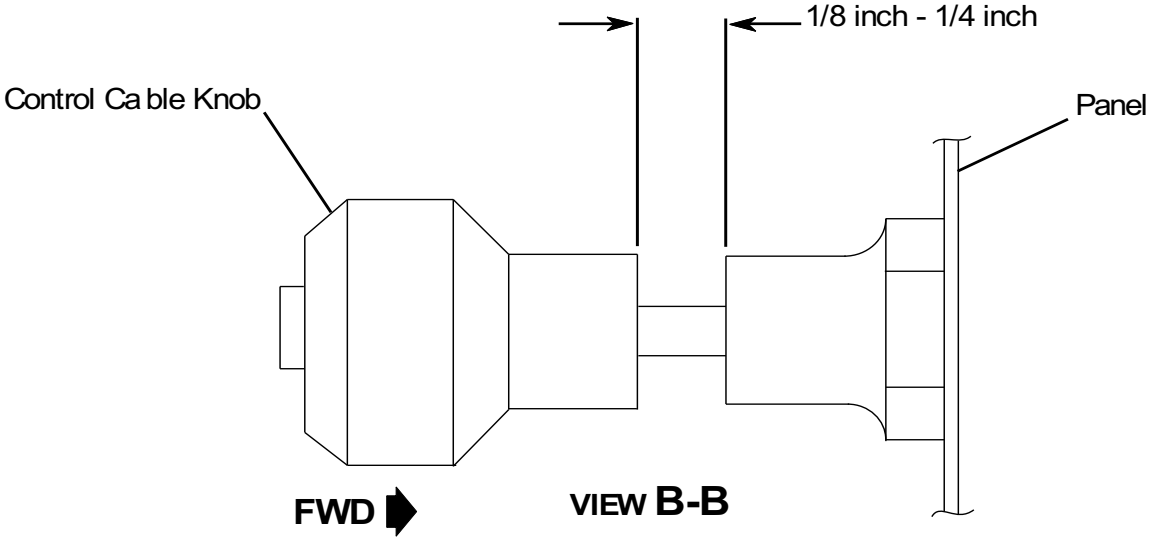
Figure 210 : Sheet 1 : Proper Control Position

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VIEW A-A

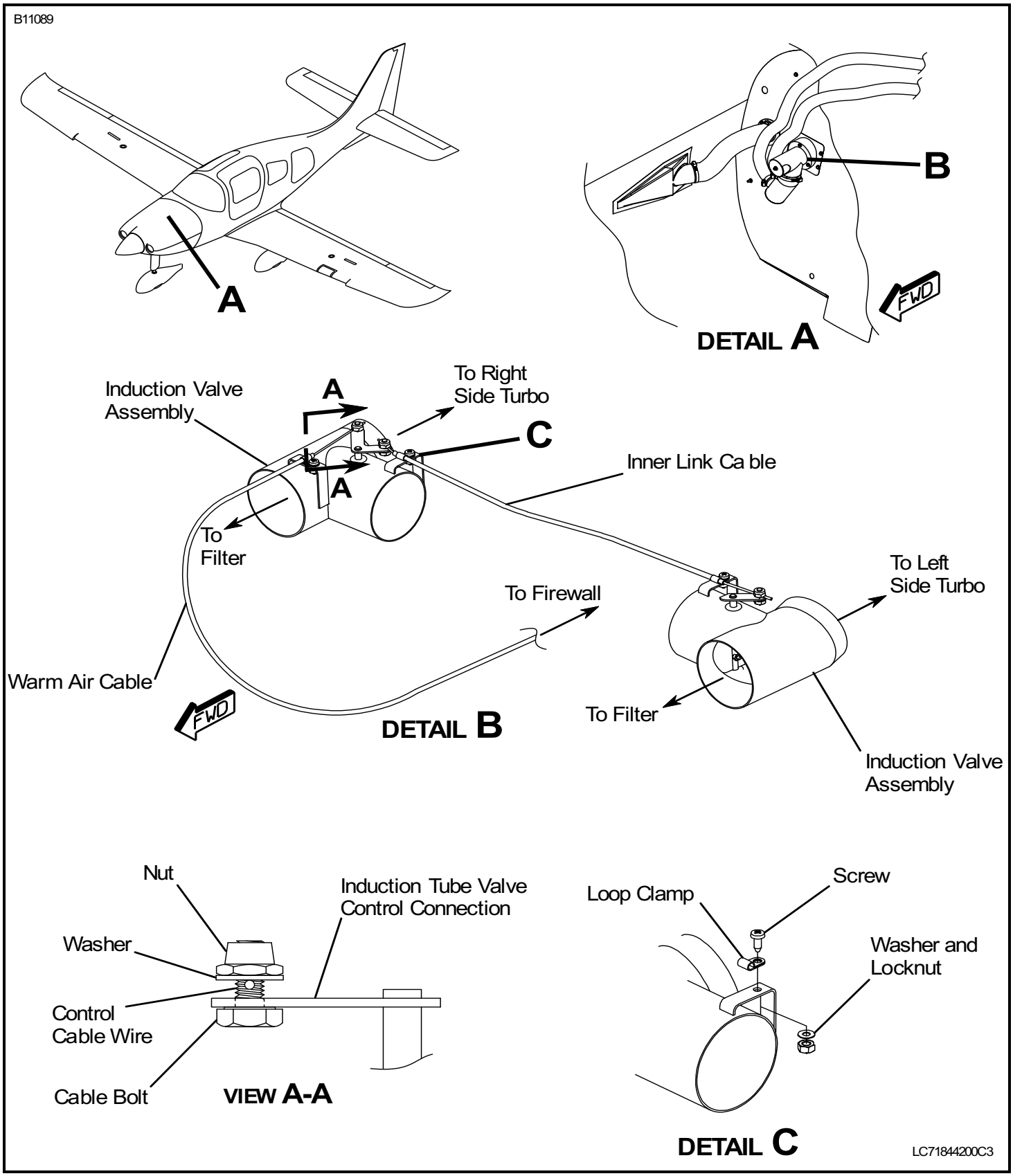


VIEW B-B

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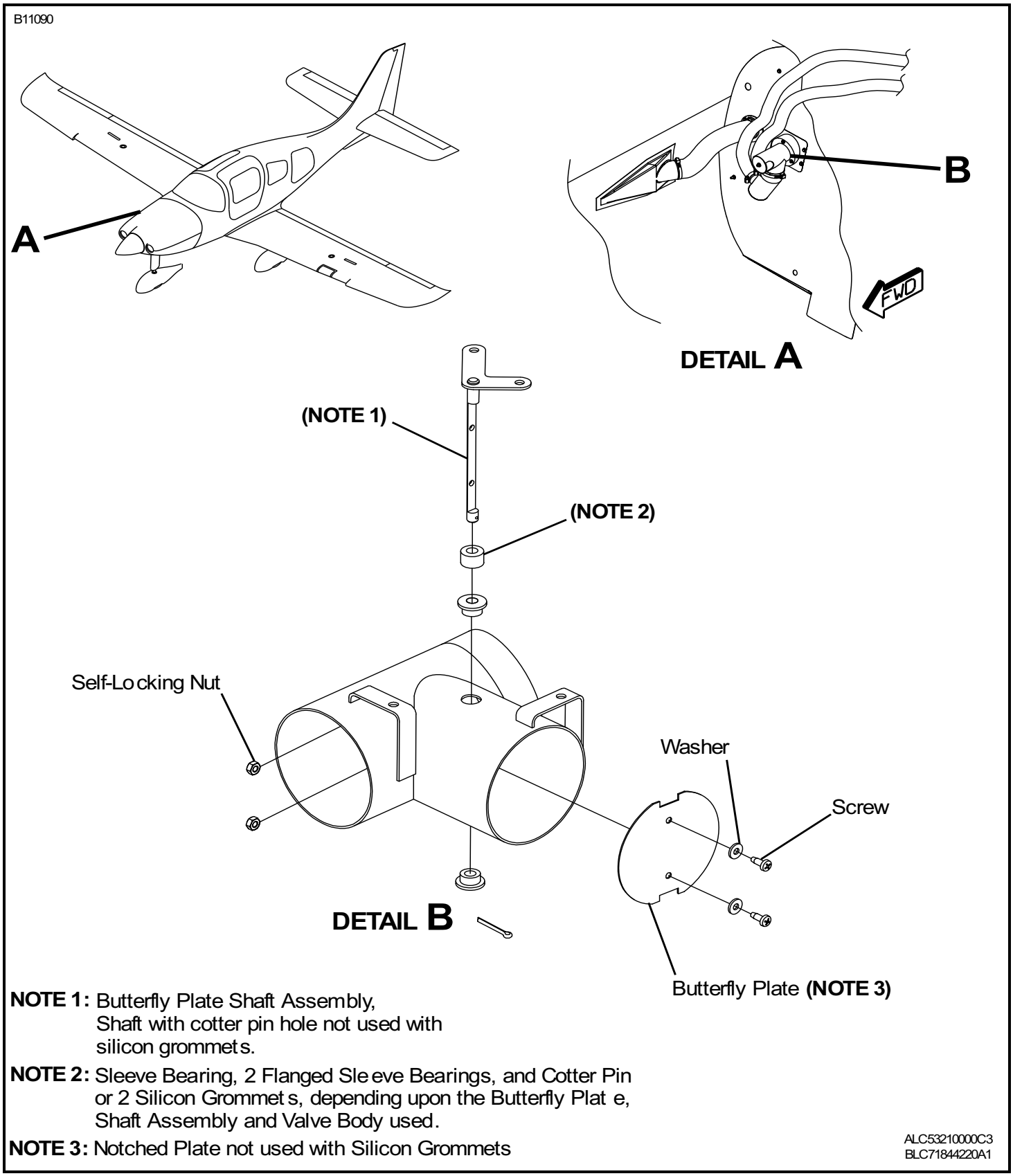
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Figure 211 : Sheet 1 : Warm Air Induction Assembly



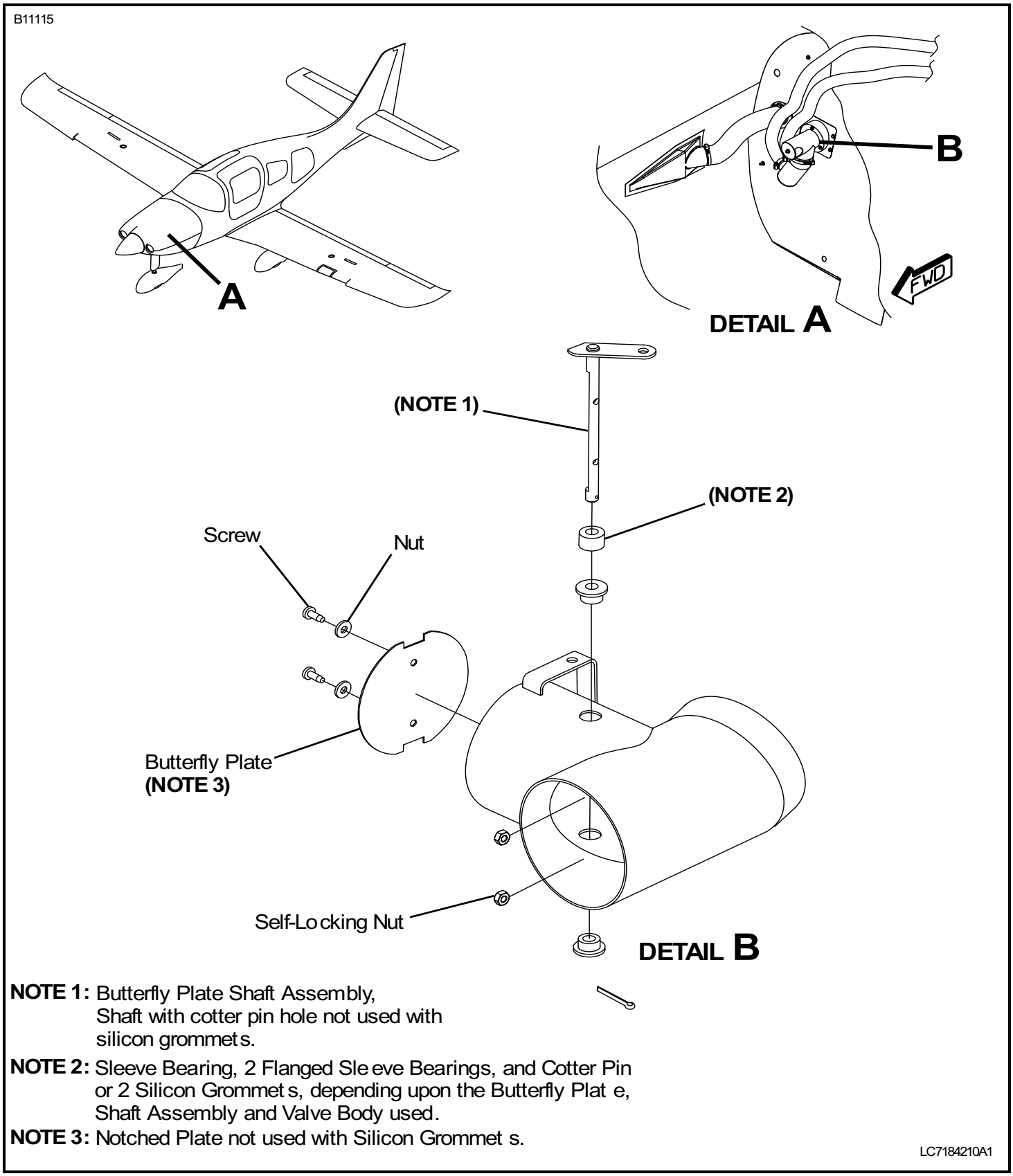
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Figure 212 : Sheet 1 : Right Warm Air Induction Valve Assembly



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Figure 213 : Sheet 1 : Left Warm Air Induction Valve Assembly



NOTE 1: Butterfly Plate Shaft Assembly, Shaft with cotter pin hole not used with silicon grommets.

NOTE 2: Sleeve Bearing, 2 Flanged Sleeve Bearings, and Cotter Pin or 2 Silicon Grommets, depending upon the Butterfly Plate, Shaft Assembly and Valve Body used.

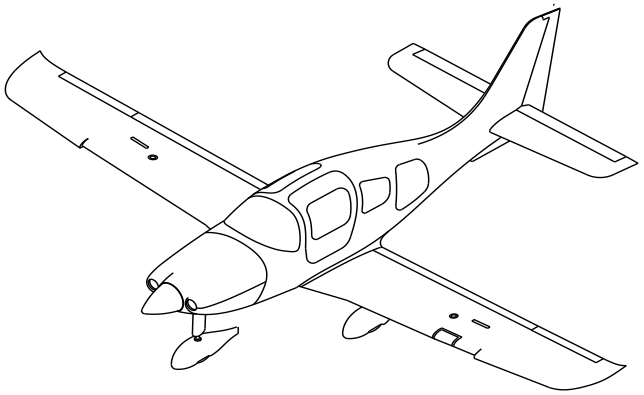
NOTE 3: Notched Plate not used with Silicon Grommets.

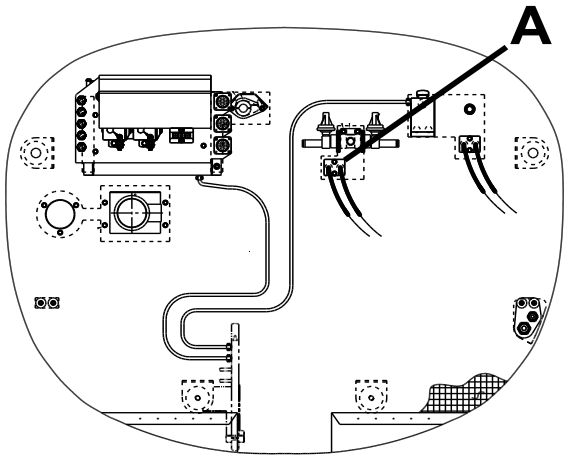
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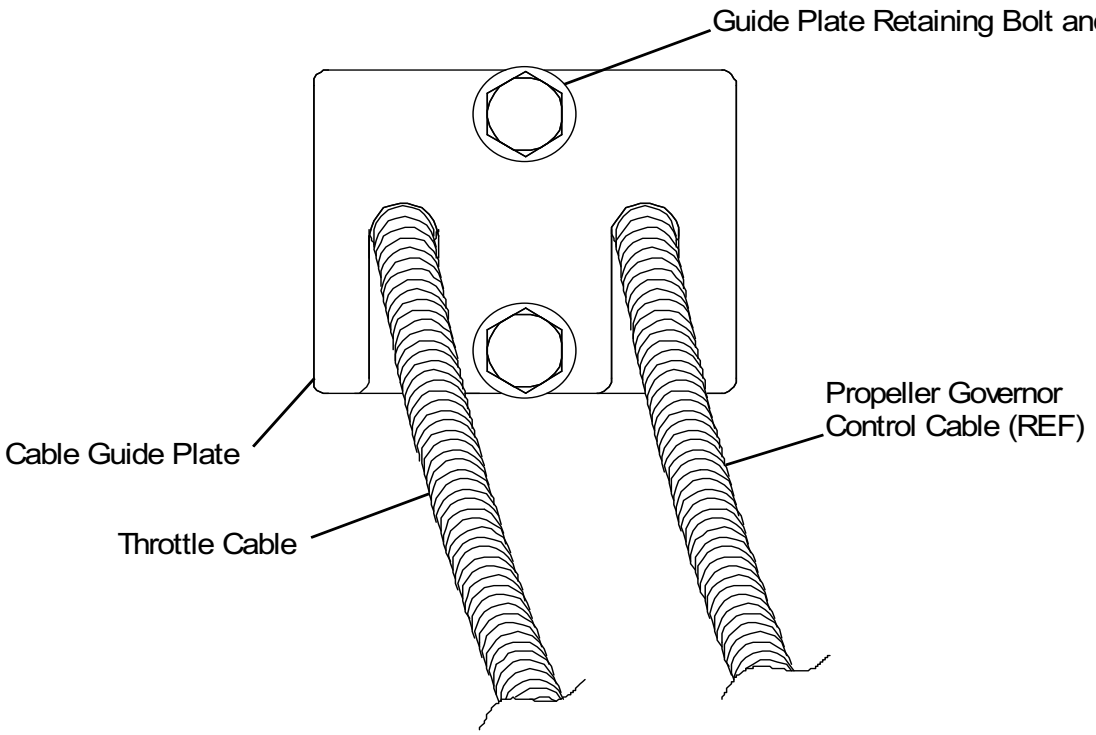
Figure 214 : Sheet 1 : Induction Air Guide Plate

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VIEW A-A

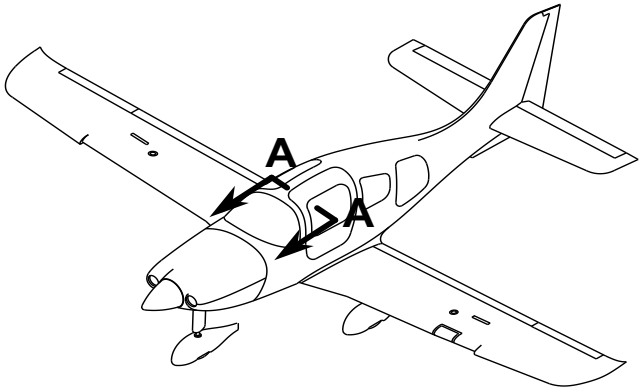


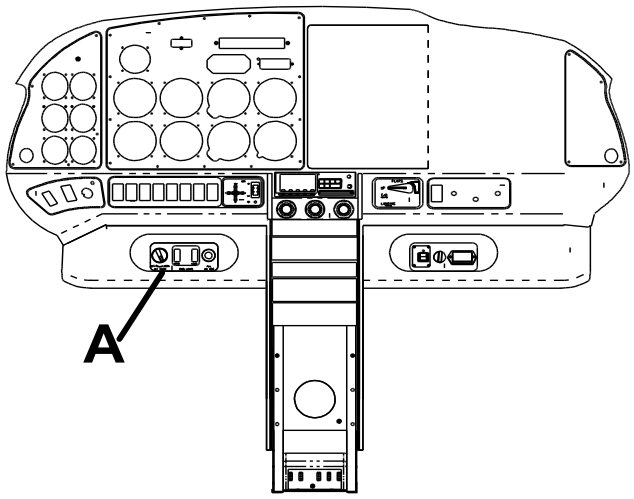
DETAIL A

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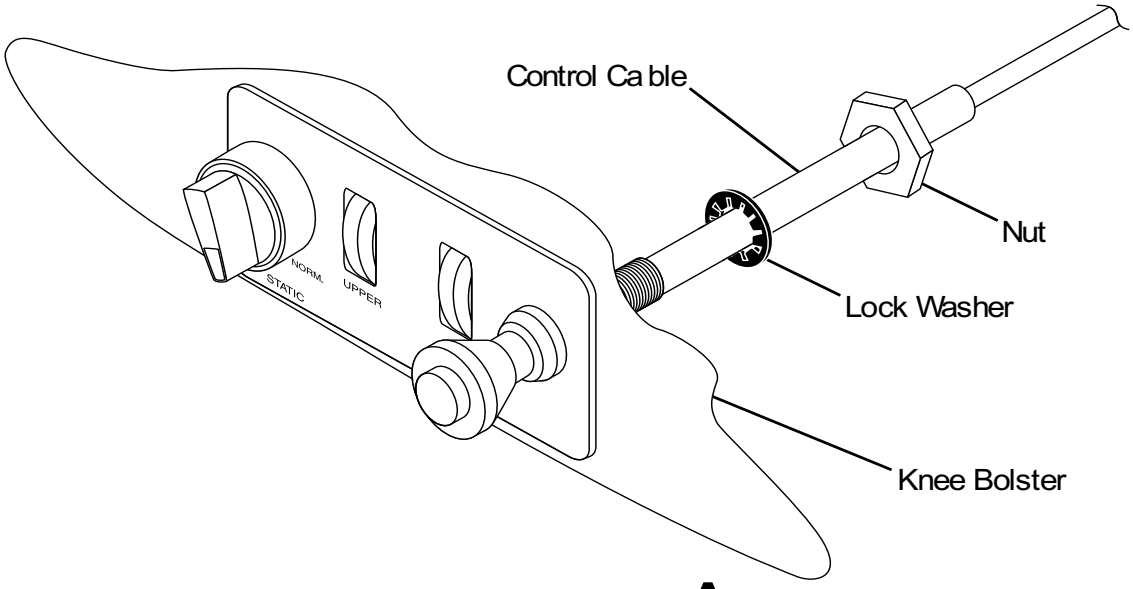
Figure 215 : Sheet 1 : Induction Air Control Cable Panel Assembly

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VIEW A-A



DETAIL A

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INDUCTION HEAT CABLE (T240) - REMOVAL/INSTALLATION

1. General

A. This section gives the removal and installation procedures for the Model T240 Induction Heat Cable.

B. For the Avidyne and Garmin G1000 options, heat induction cable maintenance procedures refer to, Fuel Mixture control - Maintenance Practices.

2. Tools and Equipment

A. For a list of tools and equipment, refer to Engine Controls - General.

3. Induction Heat Cable Removal/Installation

A. Remove the Induction Heat Cable (Refer to Figure 401).

(1) Remove the induction heat control Inner Link Cable and the Induction Heat Cable (control cable) from the induction valve assemblies.

(a) At each valve control connection, loosen the bolt, nut, and washer until the cable wire can be pulled out from the cable bolt.

(2) Loosen the loop clamps restraining the control cable and Inner Link Cable.

(3) Remove the Inner Link Cable and pull the control cable out and away from the induction valve assembly.

(4) Remove all of the tie straps that attach the control cable to the engine and the engine mount.

(5) Remove the cable guide plates from the firewall heat shield by removing the bolts, guide plates, and washers.

(6) Remove the screws and washers that attach the induction heat bracket to the instrument panel.

(7) Gently pull the control cable through the firewall.

(8) Remove the control cable from the airplane.

B. Install the Induction Heat Cable (Refer to Figure 401).

(1) Route the end of the Induction Heat Cable (control cable) through the induction heat bracket, nut, and firewall.

(2) Put the induction heat bracket in position to the instrument panel.

(a) Install the screws and washers that attach the induction heat bracket.

(3) Put the guide plates in position over the control cable passing through the firewall.

(a) Install the bolts and washers that attach the guide plates to the firewall

(b) Torque the bolts 30 to 36 inch-pounds.

(4) Route the end of the control cable through the loop clamp, and slide the end of the cable wire through the valve control connection cable bolt.

(5) Put the control cable knob to the full fresh air position (pushed completely in).

(a) Make sure that the butterfly plate (inside of the right induction valve) is completely closed

(b) Torque the cable wire retaining nut 25 to 30 inch-pounds while in this position

(c) Tighten all other hardware snug.

(6) Attach the Inner Link Cable between the remaining right side valve control connection and the left side valve control connection.

(7) Put the left side valve butterfly plate to the full closed position and tighten all remaining valve attachment hardware.

(a) Torque the cable wire retaining nut 25 to 30 inch-pounds

(b) Tighten all other hardware snug.

(8) Slowly pull the control cable knob out and inspect both the left and right side control valves for full open position.

(9) Adjust the cables as required to maintain fully closed and fully open valve positions while the control cable knob is in the full closed and full open positions.

(10) Make sure that 0.125 inch to 0.250 inch cable housing protrudes from the loop clamps after final cable adjustments are made.

(11) Attach the Induction Heat Cable to the engine and engine mount with tie straps as required.

C. Induction Heat Control Cable Inspection.

(1) Check the Induction Heat Cable (control cable) function by pressing in the control cable locking button and moving the

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control cable knob fully in and out. No binding should be felt during cable operation.

(2) Make sure that the butterfly valves are moving through 90 degrees of rotation. Check the butterfly plate position in both valves by pushing in fully on the control cable knob.

NOTE: The valves should be fully closed while in this position.

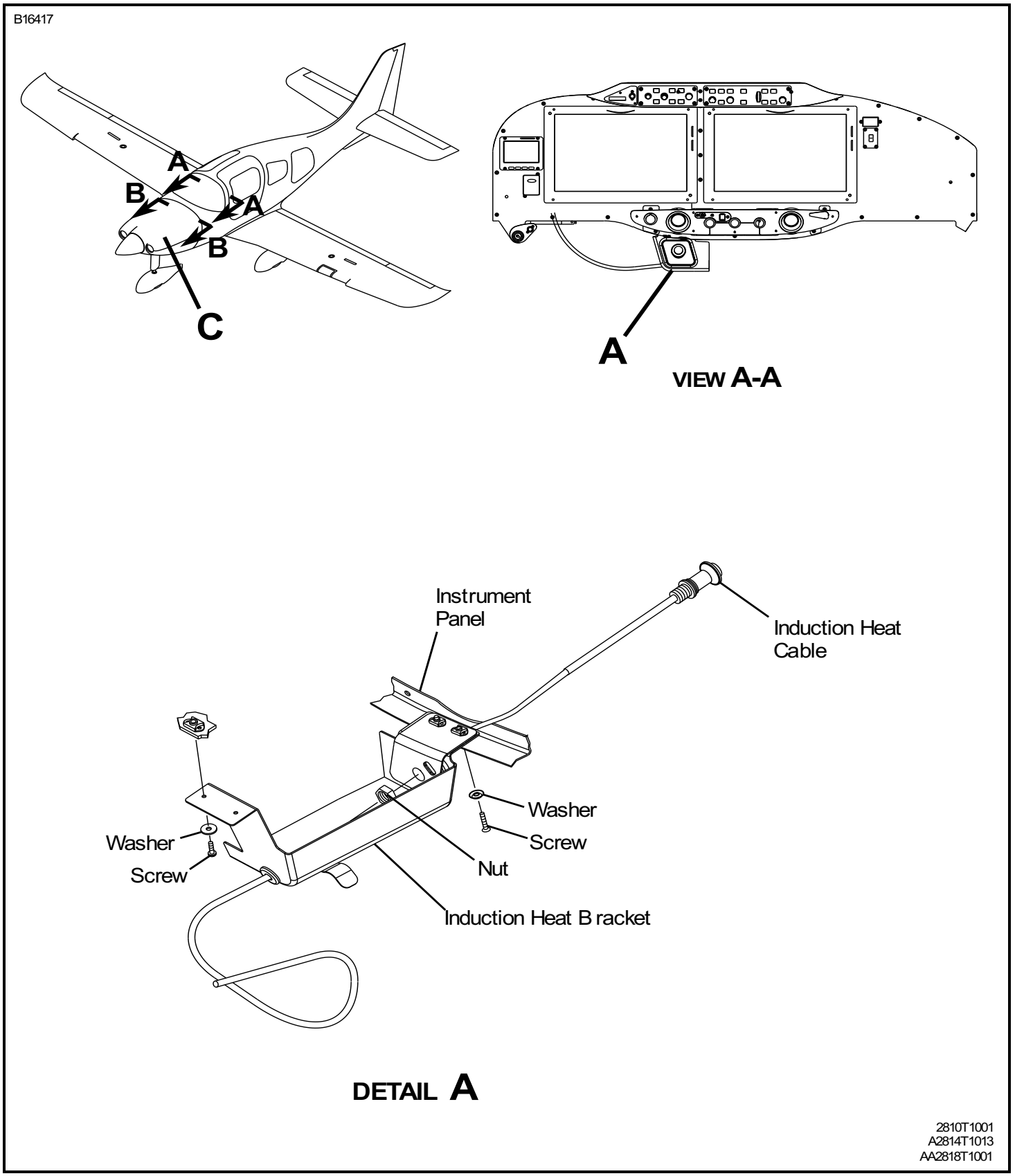
(3) Check the safety wire connections at the cable to induction tube retaining ears. Connections should be tight and not allow any cable movement.

(4) Check the control cable wire to the induction valve assembly valve control connection. The cable wire should be secure within the cable bolt with no slippage between the bolt and wire.

(5) Check the Inner Link Cable wire connections at both the induction valve assembly valve control connections. The wire should be secure within the cable bolts with no slippage between the bolt and wire.

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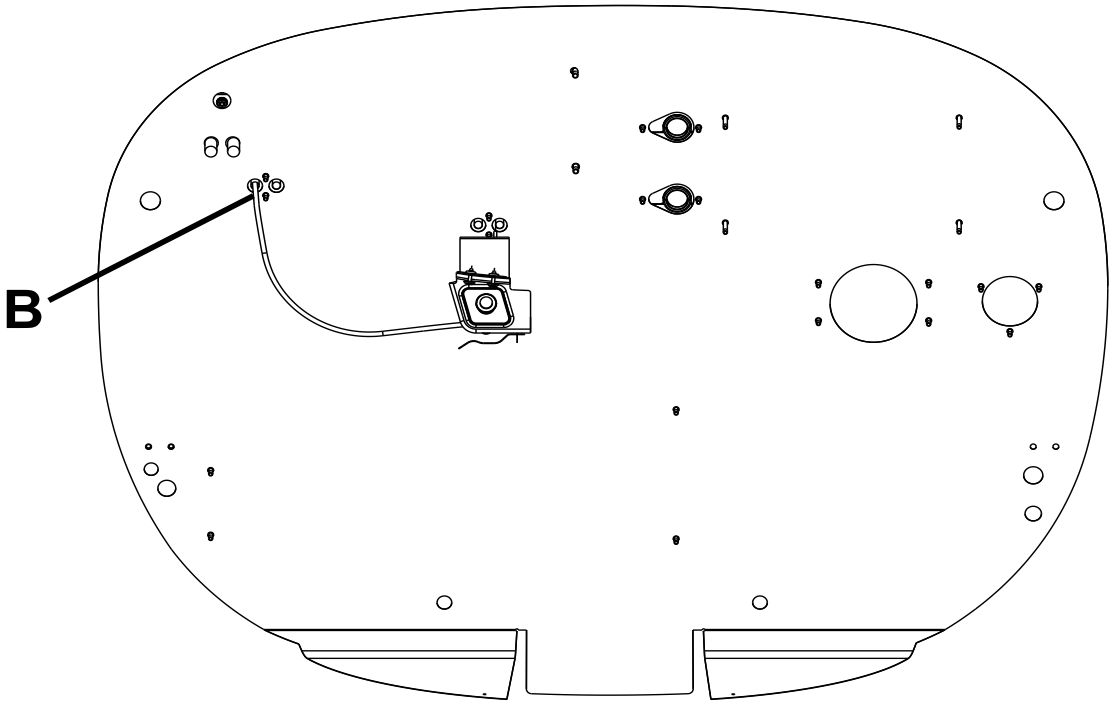
Figure 401 : Sheet 1 : Induction Heat Cable Installation



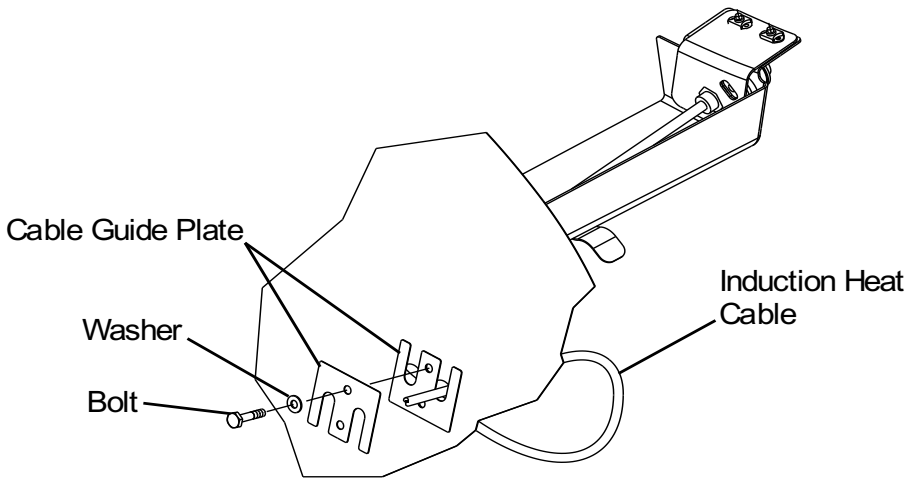
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Figure 401 : Sheet 2 : Induction Heat Cable Installation

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VIEW B-B

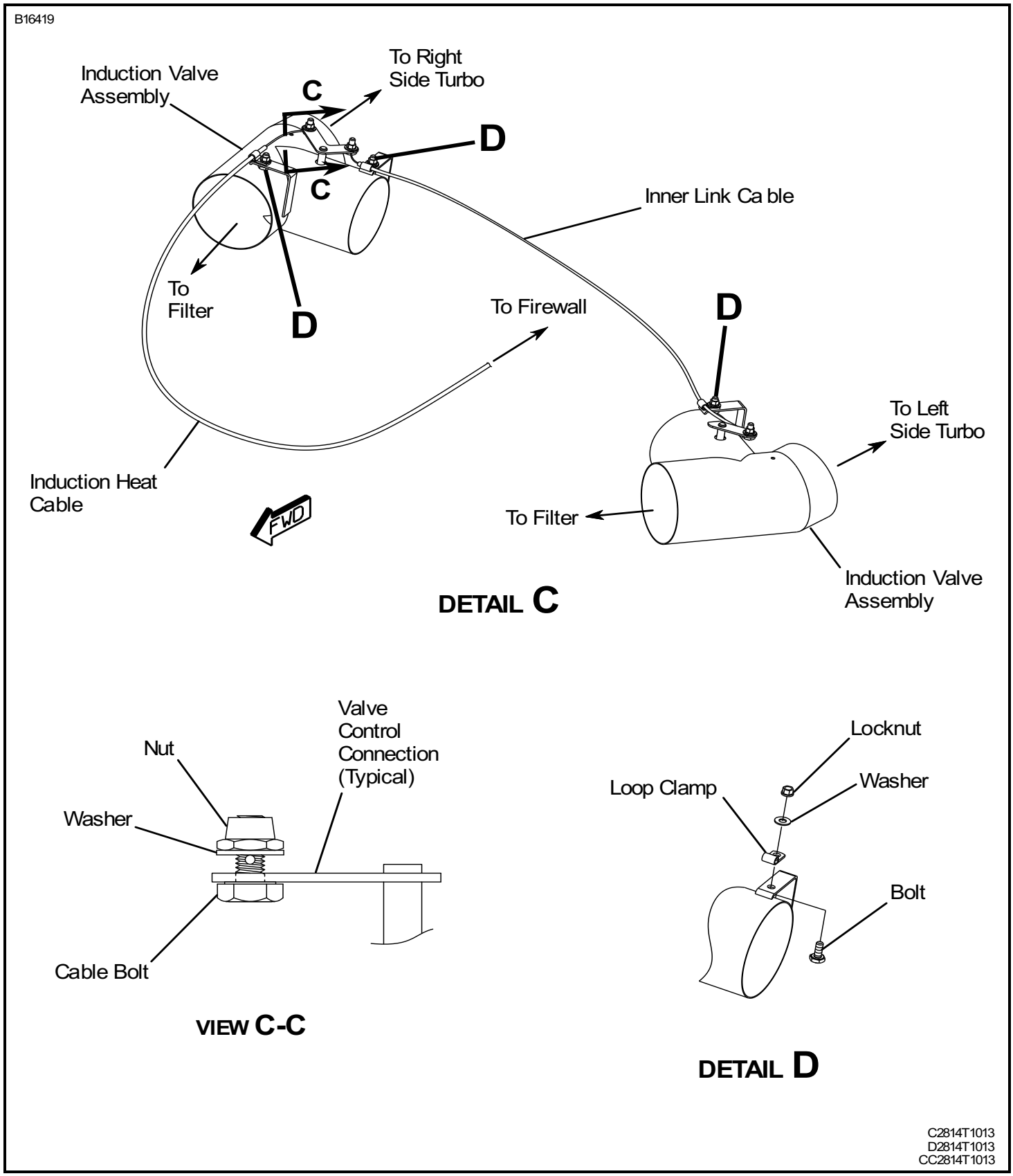


DETAIL B

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Figure 401 : Sheet 3 : Induction Heat Cable Installation



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AIRWORTHINESS LIMITATIONS

1. General

A. The Airworthiness Limitations section (Chapter 4) is FAA approved and specifies maintenance required under Sections 43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.

B. **Inspections** - This chapter contains mandatory maintenance tasks including inspections (refer to the Airframe Service Cycle Inspection section) and life-limited item replacement requirements (refer to the Life-Limited Parts section). An airframe inspection in accordance with the Airframe Service Cycle Inspection section is required every 3000 hours. This 3000-hour period is known as an Airframe Service Cycle (ASC). The tables below identify and describe the required maintenance tasks for each ASC.

NOTE: These items are in addition to the items required to maintain the continued airworthiness of the airplane.

After 25,200 TIS hours, the FAA requires a Major Airframe Inspection (MAI). The Major Airframe Inspection Checklist found in Section 04-10-00 contains the MAI items.

C. **Grace Period** - The required inspections listed above must be performed within 100 hours of the specified interval or at the next annual inspection, whichever occurs first.

D. **Airframe Service Cycle Consistency** - If work is accomplished during the grace period, then the next inspection/part replacement is due at the time in service determined by adding the required interval to the BEGINNING of the grace period. For example, if the first ASC is accomplished during the grace period at 3099 hours TIS, then the next ASC is due at 6000 hours TIS (or within the grace period following 6000 hours). If work is accomplished early, then the next inspection/part replacement is due at the time in service determined by adding the required interval to the TIS at which the work was last accomplished. For example, if the first MAI was accomplished at 24,000 hours TIS, then the next MAI is due at 49,200 hours TIS (or within the grace period following 49,200 hours).

2. Airframe Service Cycle Inspection (Every 3000 Hours)

Table 1. Fuselage and Vertical Stabilizer

INSPECTION AREA	MAINTENANCE TASK	CHAPTER NUMBER
Bonding of the two fuselage halves	**Visual inspection of the bonding seams:** Tap test seam area around fuselage halves in accordance with instructions in Section 20-90-00, Tap Testing. This test detects unbonded areas by the change in audible response when the surface is systematically tapped.	53
Aft Fuselage	Complete the Aft Fuselage Inspection in accordance with the instructions given in Chapter 53, Fuselage Components - Adjustment/Test. **NOTE:** **This inspection must be completed by a composite technician that has been trained in accordance with the requirements found in the LC-550FG Series Structural Repair Manual, Chapter 51-00-01.**	53
Ventral Fin	Visually inspect the ventral fin for visible damage and evidence of latent damage.	53
Wing Attachment	Replace the wing attachment bolts and nuts with new bolts and nuts. There are a total of 30 bolts, 15 on each side of the wing saddle, that connect the fuselage to the wing as shown in Figure 2, Section 57-10-00. The bolts vary in size from AN4-16 to AN4-20. When a bolt is removed, replace it with one that is the same size. The bolts must be replaced one at a time using a systematic process. It is recommended that the left forward bolt be removed and replaced first, and then continuing aft on the left side of the wing saddle. When the left side is complete, start on the right forward position and move aft.	53 & 57
CAUTION: **The right aft wing bolt is reversed from the other bolts. That is, the nut is on top rather than the bolt head. This is the correct method of installation and ensures clearance of the bolt from the flap actuating system.**		

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Wing Attachment (continued)	Use the following steps to remove and install the wing bolts 1. Remove carpeting and footwell panel in rear seat area, exposing area between front and rear spars. 2. Remove flap assembly panel plate under the aft wing area in the fuselage saddle, exposing area aft of rear spar. 3. Remove inspection cover in the fuel assembly panel, which is located in the left forward saddle area, exposing area forward of main spar. 4. Replace all bolts and nuts. The bolts must be removed and replaced one at a time to prevent misalignment of the wing. Refer to Chapter 57 for torque values. 5. When a bolt is removed, visually inspect the area adjacent to the bolt hole for evidence of damage, failure, and cracking. Refer to Chapter 57 regarding bolt length and torque requirements. 6. The bolts and nuts cannot be reused for any purpose. All bolts and nuts that are removed must be permanently discarded or destroyed, regardless of the time in service.	
Cockpit Frame	Leave rear seat footwell exposed for this inspection. 1. Remove front and rear seats and front floor carpeting. 2. Remove carpeting from baggage floor and shelf. 3. Inspect the exposed area for signs of cracks, delamination, and fatigue.	25
Airframe Paint	Perform a detailed inspection of the airplane's clear-coat and paint. All paint must conform to the latest FAA approved revision of Cessna Document SX512701. Contact the manufacturer for information if paint repair is necessary. **NOTE:** **The airplane paint has a clear-coat cover that provides protection from UV rays. If the clear-coat is damaged, degradation of the paint and underlying surface is possible. The airframe paint does not have a specific life-limit. Its serviceability depends on the proper care of the airplane as discussed in Section 8 of the AFM/POH and the operating environment. For example, if the airplane is washed and waxed infrequently or the airframe is subject to a hail or dust storm, erosion and/or damage to the clear-coat is possible.**	51
Transparencies	Check all transparencies for excessive crazing, UV yellowing, and evidence of cracking. Replace as required.	56
Doors	Remove left and right doors with door hinge blocks and inspect hinge block attachment holes for evidence of damage. Inspect attachment screws of dynamic hinge to the door for tightness.	52
Door Openings	Check door openings, particularly the corner of the door openings, (including baggage compartment door) for evidence of cracking. **NOTE:** **Sometimes the paint may crack around a door opening without the underlying fiberglass surface being affected. If paint cracks are observed, the painted surface must be removed by sanding to verify there are no cracks in the fiberglass.**	52

Table 2. Wings

INSPECTION AREA	MAINTENANCE TASK	CHAPTER NUMBER

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Bonding of the Top and Bottom Wing	Visually inspect the bonding seams. Tap test seam area around leading and trailing edges in accordance with Chapter 20-90-00. The tap test detects unbonded areas by the change in audible response when the surface is systematically tapped.	57
Bonding of Wing Skin to Ribs and Spars	Tap test areas where the top and bottom of the skin are bonded to the spars and ribs in accordance with Chapter 20-90-00, Tap Testing. If the skin is separated, a sponginess will be felt or a dullness in tone will be heard when tapped.	57

Table 3. Flight Control Systems & Systems

INSPECTION AREA	MAINTENANCE TASK	CHAPTER NUMBER
Wing Flaps	Visually inspect bonding seams. Tap test seam area around leading and trailing edges in accordance with Chapter 20-90-00. The tap test detects unbonded areas by the change in audible response when the surface is systematically tapped. Check for cracks on drive rib.	27
Ailerons	Visually inspect bonding seams. Tap test seam area around leading and trailing edges in accordance with Chapter 20-90-00. The tap test detects unbonded areas by the change in audible response when the surface is systematically tapped. Check for cracks and buckling in area of drive rib.	27
Rudder	Remove rudder and perform visual inspection of the bonding seams. Tap test seam area around leading and trailing edges in accordance with Chapter 20-90-00, Tap Testing. The tap test detects unbonded areas by the change in audible response when the surface is systematically tapped. Check condition of hardware for cracks, corrosion, and wear.	27
Wing Flap Actuator	Disassemble flap assembly and grease motor and gear train in accordance with the Flaps section of Chapter 27-50-00. Check hardware for cracks, corrosion, and wear.	27
Aileron Push Tubes and Hardware	Check for wear and cracks. Inspect tubes for signs of corrosion. Check bell cranks and attachment hardware for signs of cracks and corrosion.	27
Elevator Push Tubes and Hardware	Check for wear and cracks. Inspect tubes for signs of corrosion. Check bell cranks and attachment hardware for signs of cracks and corrosion.	27
Elevator Trim Tab	Remove elevator trim tab and repack servo motor in accordance with Section 27-30-00 , Elevator Trim Tab and Elevator Trim Tab Servo. Inspect hardware for cracks, corrosion, and wear.	27
Elevator	Remove elevator and inspect piano hinge for wear and corrosion.	27
Horizontal Stabilizer	Remove horizontal stabilizer and check stabilizer tube and bolts for cracks, corrosion, and wear. Replace as required.	27

Table 4. Fuel System

INSPECTION AREA	MAINTENANCE TASK	CHAPTER NUMBER
Boost Pump	Overhaul per Duke Inc. instructions included in overhaul kit, or replace the boost pump.	28

Table 5. Landing Gear

INSPECTION AREA	MAINTENANCE TASK	CHAPTER NUMBER

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Teflon Bushings In Gear Box	Remove landing gear and check Teflon bushings in gear box for each main gear leg for condition and wear. Refer to Chapter 32 for specific details about the landing gear.	32
Gear Box Attachment Bolts	Remove one attachment bolt from each side of the gear box and check for corrosion. If corrosion is noted, replace all attachment bolts in the gear box. If no corrosion is noted, replace bolts that were removed and check the torque on all bolts in the gear box in accordance with Section 32-10-00, Main Gear Assembly. Refer to Chapter 32 for specific details about the landing gear.	32
Landing Gear Alignment	Once landing gear is reinstalled, check camber and toe-in. Refer to Chapter 32 for specific details about the landing gear.	32

3. Life-Limited Parts

A. The items listed below are to be replaced with new items at the times/intervals shown.

Table 6. Life-Limited Parts

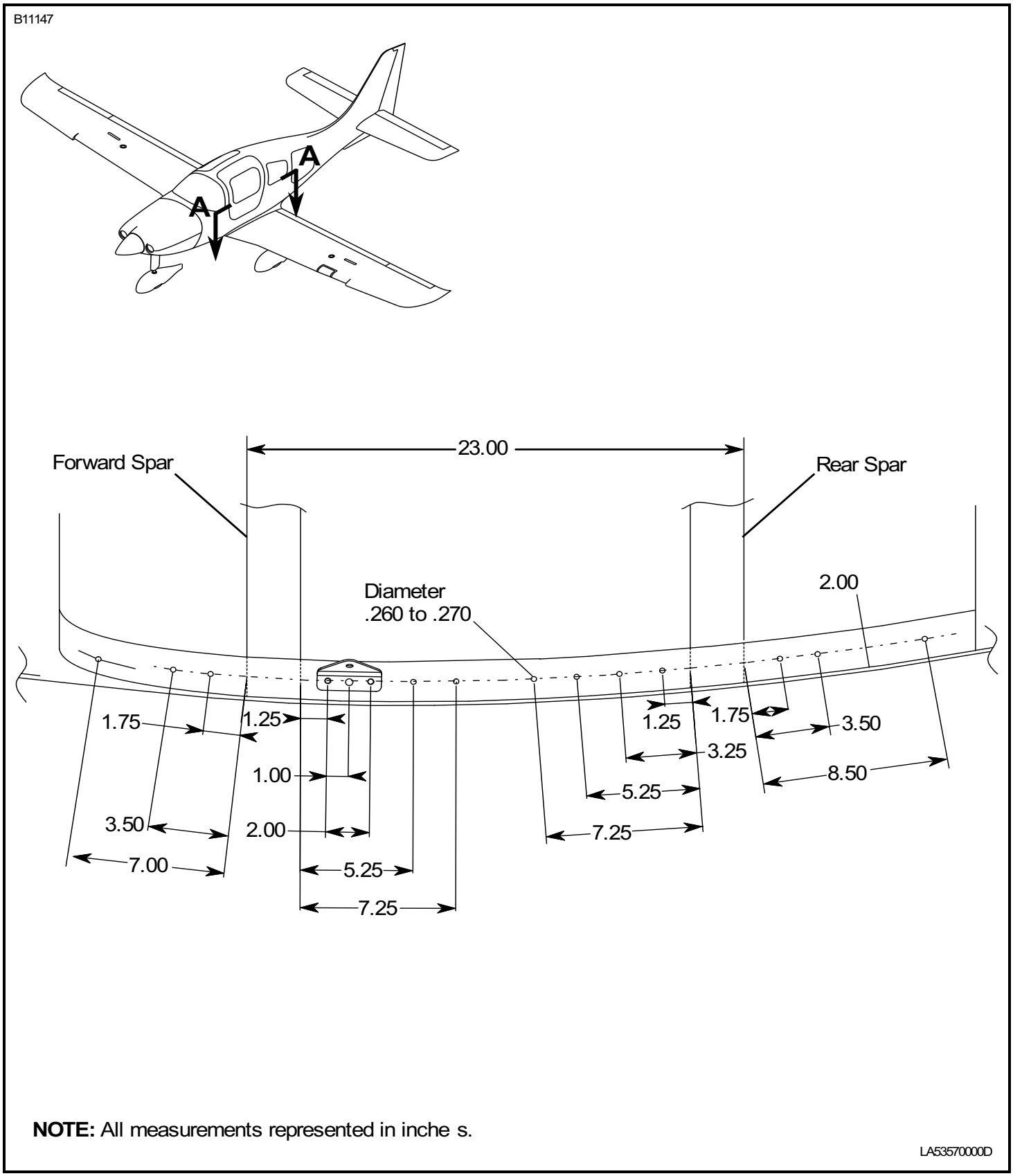
Item	Location	Replacement Time/Interval
Emergency Locator Transmitter (ELT) Battery	Aft of the baggage compartment hat rack - Refer to Chapter 25 for more information.	Every two years (Artex 200), every five years (Artex ME406), or when the battery has been used for more than one hour or 50 percent of its life.
3-volt Lithium Battery in Avidyne Multi-Function Display (MFD)	On an internal processor board inside the MFD - Refer to Chapter 34 for more information.	Every ten years or when the CMOS memory of the MFD fails to retain configuration data.
System - Dry Sealed Lead- Acid Type Battery (Two)	Underneath the hat rack on the pilot's side.	Alternate replacement every two years - First replace the left battery, after two more years replace the right battery. Alternate replacement every two years. However, if the battery fails to hold a charge, it must be replaced.
No. 1 (Right) Alternator	Just rear of the propeller on the copilot's side.	Overhaul or replace alternator every 2000 hours.
No. 2 (Left) Alternator	Just rear of the propeller on the pilot's side.	Overhaul or replace alternator every 2000 hours. Check belt condition and tension every 100 hours or annually. Belt tension range is 13 to 17 lbs.-ft. measured as described in Chapter 24. Replace the belt whenever there is cracking, fraying, or signs of excessive wear, every 5 years, or 2000 hours whichever comes first.
Front and Rear Seat Restraint Devices	At front and rear seats.	Every 3000 hours or 10 years, whichever occurs first.
Wing Attachment Bolts	Wing saddle	Every 3000 hours
SpeedBrakes	Outboard top of wing, each side.	Every 1000 hours return SpeedBrake cartridges to Precise Flight Inc. for clutch lubrication and spring replacement.
SpeedBrakes	Outboard top of wing, each side.	Every 5000 hours return SpeedBrake cartridges to Precise Flight Inc. for drive assembly replacement.

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Carbon Monoxide Detector	Mounted to the gusset on the firewall behind the Primary Flight Display (PFD).	Every 7 calendar years return to CO Guardian LLC for CO Sensor replacement and calibration.
Elevator Torque Tube, LC55273200E, installed by Mandatory Service Bulletin SB-05-005A	Attached to aft edge of the horizontal stabilizer and to the left and right halves of the elevator.	300 hours or 18 months, whichever occurs first. Additionally, this elevator torque tube can be replaced by Elevator Torque Tube, LC55273200, Rev. G or later approved revision, per Mandatory Service Bulletin SB-06-002B or SB-06- 002C. Aircraft equipped with Elevator Torque Tube, LC55273200, Rev. G or later approved revision, have no required replacement interval.
Airplane		25,200 flight hours

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Figure 202 : Sheet 1 : Wing to Fuselage Attachment Bolt Locations



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INSPECTION TIME LIMITS

1. Major Airframe Inspection Checklist (Every 25,200 Hours)

This section will contain a description of all the inspection items that must be performed on the Major Airframe Inspection. This checklist will be added to the manual as part of a revision level. There is currently a life limit on the airplane of 25,200 hours until Section 04-10-00 is completed and approved by the FAA.

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GENERAL - TIME LIMITS AND MAINTENANCE CHECKS

1. General

A. This chapter sets forth recommended scheduled maintenance checks and component overhaul/replacement time periods. These requirements are in addition to those stipulated in Chapter 4. An inspection checklist is included which should be photocopied and utilized during each scheduled inspection. The checklist includes the minimum items recommended by the manufacturer to be inspected and/or serviced. Also included is a list of special inspections and service items, which must be complied with in order to ensure the continued safe operation of this airplane.

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INSPECTION REQUIREMENTS

1. Inspection Requirements

A. **Annual Inspection** - Part 91.409 of the Federal Aviation Regulations (FARs) requires that an airplane must receive an annual inspection each 12 calendar months in accordance with part 43 of the FARs and be approved for return to service by a person authorized by the requirements of 43.7. For the purpose of the FARs, 12 calendar months extend from the particular day within the month the inspection is performed to midnight of the last day of the same month, one year later.

B. **100-Hour Inspection** - Part 91.409 of the FARs require that if an airplane is used to carry passengers for hire or give flight instruction for hire, the airplane must receive an inspection after 100 hours of time in service as specified in part 43 of the FARs The 100-hour limitation may be exceeded by not more than 10 hours while en route to reach a place where the inspection can be done. The excess time used to reach a place where the inspection can be done must be included in computing the next 100 hours of time in service.

C. **50-Hour Inspection** - It is recommended that at each 50 hours of time in service the airplane receive a 50-Hour Inspection.

D. **Unscheduled Inspections** - If the limitations of the engine or airframe are exceeded such as a hard or overweight landing, the likely affected components and systems must be inspected as indicated in this chapter. Refer to Chapter 32 for hard landing inspection details. If a situation occurs which is not covered in this chapter, consult Cessna for technical support and recommendations.

E. **Progressive Inspection** - At some point in the future the outline for a progressive maintenance program will be published and included as a revision to the Cessna Maintenance Manual.

F. **Component Inspections** - Time limits and special inspection requirements may exist for equipment manufactured by other suppliers and installed on Cessna Aircraft. These inspections and recommendations are determined by that manufacturer and should be followed to ensure continued airworthiness of that equipment and the aircraft as a whole.

2. Cessna LC41/T240 Inspection Checklists

A. The following tables list the inspection items for the required and recommended inspections described in each 50 hour, 100 hour, or annual inspection. Prior to these inspections, an engine run-up should be performed using the checklist in Figure 1. Depending on the specific types of operations, the owner or operator may need to modify and/or increase the frequency of some inspection and/or servicing items.

NOTE: All inspections and maintenance procedures must be in accordance with applicable Federal Aviation Regulations. Please refer to FAR parts 91.403, 91.207, 91.409, 91.411, and 91.413.

Table 1. Post-Runup Checks

POST-RUNUP CHECKS	Each 50 hours	Each 100 hours	Annually
1. **Engine Cowling** - Remove engine cowling.	[ ]	[ ]	[ ]
2. **Engine Oil** - Drain within 30 minutes of engine shutdown. Oil sample should be collected within 15 minutes of engine shutdown. Replenish with appropriate grade of oil. This step may be deleted from the annual inspection, if desired, to keep oil changes on regular 50-hour intervals. However, regulations require that the oil filter still be cut open for inspection.	[ ]	[ ]	[ ]
3. **Engine** - Conduct engine differential compression check. Record on checklist coversheet. (Refer to latest TCM Service Bulletin for permissible drop and differential).		[ ]	[ ]
4. **Oil Filter** - Replace and torque 16 to 18 ft-lbs. Cut open and inspect old oil filter.	[ ]	[ ]	[ ]
5. **Exterior Lights** - Check operation of taxi and landing lights, position lights, and strobe lights.	[ ]	[ ]	[ ]
6. **Pitot Mast Heater** - Check operation. **WARNING: Heater gets extremely hot!** Check within 60 seconds after switching on. Do not operate longer than 2 minutes on the ground.		[ ]	[ ]
7. **Stall Warning System** - Check operation.		[ ]	[ ]

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8. **Auxiliary Lights** - Check operation of courtesy entry lights, entry step lights, and baggage compartment light by opening one door at a time. Leave one door open to check operation of 10-minute lights-off timer.		[ ]	[ ]
9. **Interior Lights** - Check operation of instrument flood bar, panel lights, instrument lights, overhead lights, electro luminescent panels, and all dimming rheostats.		[ ]	[ ]
10. **Annunciator Lights** - Check operation.		[ ]	[ ]
11. **Aural Warning** - Check operation.		[ ]	[ ]
12. **Flight Controls** - Check for smooth operation of all flight controls with flaps in retracted and extended positions. Leave flaps in extended position when checks are completed.		[ ]	[ ]
13. **Door Seals** - Check operation of door seal air pump and inspect for air leaks in seals. **NOTE:** **Both doors must be latched for system to operate.**		[ ]	[ ]
14. **ECS Ventilation Fan** - Check operation.		[ ]	[ ]
15. **Trim Actuators** - Check operation of all actuators and accuracy of position indicators. Check switches on trim panel (Avidyne only), right of the master switches in the overhead (Garmin G1000 only), and on pilot's control stick.		[ ]	[ ]
16. **Emergency Locator Transmitter (ELT)** - Check operation of remote switch. **NOTE:** **ELT may be tested only within the first 5 minutes after each hour and should be limited to 3 aural tone sweeps.**		[ ]	[ ]
17. **Flight Controls** - Operate controls through full range of motion feeling for binding, ratcheting and sloppiness, and listening for unusual noises.		[ ]	[ ]
18. **Brakes** - Check for sponginess.	[ ]	[ ]	[ ]
19. **Aircraft Batteries** - Fully charge, clean battery exterior surfaces, and clean battery cables. Check battery box for evidence of leakage.		[ ]	[ ]
20. **Access Panels, Fairings, Seats, Carpets, Covers, Side Panels, Overhead Panel (100 Hour and annual inspection) and Spinner** - Remove for complete access for inspection. Check for missing or stripped screws. Do not remove nose wheel fairing at this point. Refer to Section 05-22-00, Table 1, for listing of the various access covers in the airplane. **WARNING: Do not remove fuel tank cover plates.**		[ ]	[ ]

Table 2. Aircraft Records

AIRCRAFT RECORDS	Each 50 hours	Each 100 hours	Annually
1. **Aircraft Logbooks** - Determine total times, times since overhaul and times since last required or recommended maintenance checks and record on Inspection Coversheet.		[ ]	[ ]
2. **Inoperative Items** - If any authorized inoperative items have been listed per FAR 91.213, inspect and maintain per FAR 91.405. Verify placard is installed per FAR 43.11. See the equipment list of required items in Section 6, Appendix A, of the AFM/POH.		[ ]	[ ]
3. **Airworthiness Directives (AD's) and Service Bulletins** - Check for new and recurring AD's which may need to be complied with during this inspection. Also, check for applicable manufacturer's Service Bulletins.		[ ]	[ ]
4. **Aircraft Records** - Check for presence and condition of aircraft federal registration form and airworthiness certificate.		[ ]	[ ]
5. **Approved Flight Manual / Pilot's Operating Handbook (AFM/POH)** - Verify that all revisions have been installed and that the Equipment List and Weight and Balance forms are current and correct.		[ ]	[ ]

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Table 3. Engine and Propeller

ENGINE AND PROPELLER (See Chapters 30, 61, and 71 for Specific Details)	Each 50 hours	Each 100 hours	Annually
1. **Cleaning** - Clean engine. Protect magneto vents and cabin fresh air intakes.		[ ]	[ ]
2. **Engine** - Inspect for obvious signs of damage, oil or fuel leakage, loose components, and chafing or deterioration of hoses, lines, and wires.	[ ]	[ ]	[ ]
3. **Cylinders, Rocker Box Covers, and Pushrod Tubes** - Inspect for cracks, broken fins, oil, fuel or exhaust leakage, and discoloration of cylinder head. Check hardware for signs of loss of torque.		[ ]	[ ]
4. **Crankcase and Sump** - Inspect for cracks, oil leakage, corrosion and signs of loss of torque of hardware. Inspect engine mount supports for condition.		[ ]	[ ]
5. **Induction System** - Inspect the induction tubes for security and condition and loose or leaking couplers. Inspect manifold pressure transducer for security of installation and condition of wires. Check operation and positions of alternate air butterfly valves.		[ ]	[ ]
6. **Induction Air Filter** - Inspect for cleanliness and condition of sealing surfaces. Service per instructions in Chapter 12.	[ ]	[ ]	[ ]
7. **Exhaust System** - Inspect entire system including turbochargers and tailpipes for damage, leaks, cracks, and security. Visual inspection required at 50 hours. Comprehensive inspection required at 100 hour or annual. Refer to Chapter 78.	[ ]	[ ]	[ ]
8. **Fuel Metering Unit** - Inspect for security and presence of fuel leakage. Check operation of throttle and mixture controls. Ensure levers hit stops before cables reach end of travel. Lube throttle lever with LPS-2.		[ ]	[ ]
9. **Fuel Manifold Valve and Distribution Lines** - Inspect for security, presence of factory seal installed on safety wire, and evidence of fuel leakage. Inspect distribution lines for security, cracks, and signs of leakage.		[ ]	[ ]
10. **Engine-Driven Fuel Pump** - Inspect for security, general condition, and evidence of fuel or oil leakage.		[ ]	[ ]
11. **Fuel Hoses** - Inspect all flexible fuel hoses for routing, chafing, security, and signs of leakage.		[ ]	[ ]
12. **Magnetos** - Inspect for security and condition. Check timing to engine and record: L ____ degrees BTDC, R ____ degrees BTDC. Timing must be within 24±1 degrees BTDC. If either magneto must be adjusted, check logbooks for previous magneto adjustments. If the same magneto has already been "bumped up" twice without being removed to check internal timing, that magneto must be removed for internal timing check.		[ ]	[ ]
13. **Spark Plugs** - Inspect firing end for condition. Clean, gap, reinspect, and test spark plugs following appropriate plug manufacturer's service manual. Reinstall with **new** gaskets and torque to specifications.		[ ]	[ ]
14. **Ignition Harness** - Inspect for routing, broken shielding, chafing, and security. Inspect spark plug ends for condition and evidence of electrical arcing.		[ ]	[ ]
15. **Left Alternator** - Inspect for security and general condition. Inspect electrical connections for security. Inspect belt for tension, fraying, and dryrot. Inspect pulleys for nicks, scratches, warpage, and alignment. Remove drive belt and turn alternator rotor to check bearings for abnormal noise or roughness.		[ ]	[ ]

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16. **Right Alternator** - Inspect for security, general condition and signs of oil leakage. Inspect electrical connections for security. Check air blast tube for obstructions. Any evidence of alternator malfunction requires removal to conduct drive gear hub slippage inspection.		[ ]	[ ]
17. **Electrical Cables, Wires, and Connectors** - Inspect for security, routing, chafing, signs of arcing, and proper termination.		[ ]	[ ]
18. **Starter and Starter Solenoid** - Inspect for security, general condition, and signs of oil leakage.		[ ]	[ ]
19. **Oil Cooler** - Inspect for security of mounting, cracks, straightness of fins, and evidence of oil leakage around base and fin area. Clean debris from fins. Inspect condition and security of oil pressure switch and temperature bulb and associated wiring.		[ ]	[ ]
20. **Engine Accessory Case** - Inspect accessory case and any additional accessories for security, condition, and evidence of leakage or loss of torque of hardware.		[ ]	[ ]
21. **Crankshaft** - Inspect for evidence of oil leakage, corrosion, pitting, cracks, discoloration, or signs of overstressing.		[ ]	[ ]
22. **Propeller Governor** - Inspect for security, evidence of oil leakage, and tightness of lever on governor shaft. Check operation of propeller control cable. Ensure high-RPM stop is hit before cable reaches end of travel.		[ ]	[ ]
23. **Spinner and Spinner Bulkhead** - Inspect for cracks, security to propeller, and security of any dynamic balance weights. Clean inside of spinner.		[ ]	[ ]
24. **Propeller Hub** - Inspect for cracks, corrosion, leakage of oil, excessive loss of grease, security of static balance weights, and security of mounting to crankshaft. Re-torque all mounting nuts if loss of torque is suspected on any nut in accordance with the instructions in Section 61-10-00,Installation of Spinner and Propeller. Service with appropriate grease.		[ ]	[ ]
25. **Propeller Blades** - Inspect for play, cracks, nicks, dents, pitting, corrosion, and leading edge erosion. Dress propeller and paint back of blade. In operational areas of high humidity, wipe the metal surface with an oily rag.	[ ]	[ ]	[ ]
26. **Propeller Heat/De-Ice System** - Inspect the propeller de-ice boots, slip ring, brushes and brush block, control switch/annunciator, control module, and wiring.		[ ]	[ ]
27. **Cooling Baffles and Seals** - Inspect for cracks, excessive gaps, and security of mounting to engine. Check intercylinder baffles for security.		[ ]	[ ]
28. **Engine Cowls** - Inspect for cracks, chafing, heat damage, delamination, evidence of exhaust leakage, condition of fastening system, presence of oil filler door placard, and condition of paint.		[ ]	[ ]
29. **ECS Air Inlet Scoop** - Inspect for obstruction of inlets and condition of scoop and screen.		[ ]	[ ]
30. **Firewall** - Inspect for cracks, buckling, unsealed holes, and other signs of damage. Although the firewall is not structural, problems here may indicate damage to the composite bulkhead underneath and should be closely checked out. Inspect all firewall-mounted accessories for security of mounting.		[ ]	[ ]
31. **Engine Mount/NLG support** - Raise NLG off of the ground and inspect for cracks, corrosion, loss of torque of mounting hardware, chafing by cables, wires, hoses, etc., and make sure that any flexing item is secured to the mount.		[ ]	[ ]
32. **Engine Isolation Mounts** - Inspect for general condition signs of loss of torque of engine mount bolts. If necessary, torque bolts in accordance with Section 71-00-00, Engine Removal, Cleaning, and Installation. Check safety wiring and security.		[ ]	[ ]
33. **Drain and Vents Lines** - Inspect for security, condition, and obstructions.		[ ]	[ ]
34. **Brake Fluid Reservoir** - Inspect for condition, security, and fluid level. Service as necessary.	[ ]	[ ]	[ ]

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35. **Bonding Ground Straps** - Inspect for condition.		[ ]	[ ]
36. **Foreign Objects** - Check engine compartment for foreign objects.	[ ]	[ ]	[ ]
37. **Fuselage Exterior Surface** - Inspect for obvious signs of damage, including cracks, holes, buckling, and rippling. Check condition of paint and cleanliness. Check drain holes for obstructions.	[ ]	[ ]	[ ]
38. **Exterior Placards** - Inspect for presence and condition. Refer to the Model T240 Illustrated Parts Catalog for the necessary exterior placards.			[ ]
39. **Windows** - Inspect for cleanliness, condition, and sealing.	[ ]	[ ]	[ ]
40. **Cabin Doors** - Inspect for security and fit. Inspect skin, hinges, gas struts, latching mechanisms, door seals, and upholstery. Lubricate hinges and all moving parts with a quality petroleum or silicone-based oil. Check that door seals inflate properly.		[ ]	[ ]
41. **Baggage Door** - Inspect for security and fit. Inspect door skin, upholstery, seal, hinge, and latching mechanism. Inspect door strut for condition and security. Lubricate hinge and all moving parts.		[ ]	[ ]
42. **Entry Assist Step** - Inspect for security and condition.		[ ]	[ ]
43. **Pitot Mast** - Check pitot heat relay for proper operation. Inspect for obstruction of pitot, signs of damage which may affect proper airflow, and security of attachment. Clear any obstructions, making sure the mast is not enlarged or damaged in any way. Do not apply compressed air to the mast. Test for proper operation after reinstallation.		[ ]	[ ]
44. **Static Port Drain** - Check static port drain for evidence of water. Remove cap from drain line and allow any water within the system to drain. Leak check after reinstallation. **CAUTION:** Do not apply compressed air to the system, since this will result in damage to the static air flight instruments.			[ ]
45. **Antennas** - Inspect for security and condition.		[ ]	[ ]
46. **Aircraft Identification Plate** - Inspect for security and legibility.			[ ]
47. **Fuselage Skin** - Perform generalized inspection of fuselage for visible damage and evidence of latent damage.		[ ]	[ ]
48. **Aft Fuselage** - Perform a visual inspection and tap test of the exterior aft fuselage skin and a visual inspection of the interior aft fuselage skin in accordance with Section 53-70-00, Aft Fuselage Inspection.		[ ]	[ ]
49. **Exterior Emergency Door Release** - Inspect exterior emergency door release system. Inspect hinge wires for corrosion, kinks, and wear. Replace as required. Inspect overhead cabling for chaffing, binding, and frayed cables. Store the few inches of excess cable in a manner that prevents kinking or binding. Inspect attachment screws of dynamic door hinge to door for tightness. See Chapter 52.		[ ]	[ ]
50. **Vertical Stabilizer** - Perform generalized inspection of vertical stabilizer for visible damage and evidence of latent damage. Inspect hinge attach points for security and condition. Ensure leading edge tape is secure.		[ ]	[ ]
51. **Rudder** - Inspect for signs of damage, looseness, play in bearings, and condition of hinge attachments and rudder cable horns. Check security of static balance weight. Check for obstruction of drain holes. Inspect bonding strap and static wicks for condition. Lubricate hinges and cable-attach points. Ensure rudder makes full contact with left and right rudder stops.		[ ]	[ ]
52. **Horizontal Stabilizer** - Perform generalized inspection of horizontal stabilizer for visible damage and evidence of latent damage. Inspect hinge attach points for security and condition. Ensure leading edge tape is secure.		[ ]	[ ]

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53. **Elevators** - Inspect for signs of surface damage, looseness or play in bearings, and condition of hinges and elevator horn. Check security of static balance weights. Inspect bonding straps and static wicks for condition. Check for obstruction of drain holes. Lubricate piano hinges only in accordance with Section 27-30-00, Elevator Servicing and Maintenance section. Ensure elevator makes full contact with up and down elevator stops.		[ ]	[ ]
54. **Elevator Trim Tab and Actuator** - Inspect for condition, corrosion, and security. If the drive rods show any signs of corrosion, replace with new rods. Lubricate hinge and clevis bolt in accordance with Section 27-30-00, Elevator Trim Tab Servicing and Maintenance section. Check trim servo for smoothness of operation; free from binding. Measure and record total trim tab play: _____ inches. **CAUTION:** Use special care to ensure trim tab friction devices are not lubricated.		[ ]	[ ]
55. **Rudder Trim** - Check for proper security.		[ ]	[ ]
56. **Ventral Fin** - Perform generalized inspection of ventral fin for visible damage and evidence of latent damage. Inspect ventral fin pad for condition and proper security.		[ ]	[ ]

Table 4. Wings

WINGS (See Chapters 22, 27, 33, 34, and 57 for Specific Details)	Each 50 hours	Each 100 hours	Annually
1. **Wing Saddle Area** - Inspect wing spar for cracks, debonding, and attachment to airframe. Check visible attaching hardware for loss of torque. If necessary, torque hardware in accordance with Chapter 57-10-00, Wing Removal section. Inspect aileron bellcranks for cracks and corrosion.		[ ]	[ ]
2. **Fuel Tanks** - Check that the airplane's fuel filler neck is grounded. Run a continuity check between each fuel filler neck and one of the exhaust stacks. Fuel cap resistance must be within 0 to 500 ohm. Also, check continuity of all static wicks or static wick attachment points to test the integrity of the lightning protection system.		[ ]	[ ]
3. **Wing Skins and Exterior** - Inspect for obvious signs of damage, including cracks, holes, buckling, and rippling. Check condition of paint and placards. Check drain holes for obstructions. Check fuel tank vents for obstructions. Ensure leading edge tape is secure.		[ ]	[ ]
4. **Landing and Taxi Light Assembly** - Inspect for cracks, security of mounting, and cleanliness and condition of lens cover. Operate taxi and landing lights in a dark area and ensure that both lights are properly aimed. If lights are not properly aimed, adjust as required. Refer to Section 33-40-00, Taxi and Landing Light Adjustment, for detailed instructions.		[ ]	[ ]
5. **Stall Warning Lift Transducer** - Inspect the wing skin around the lift transducer for indications of overheating, including discoloration, bubbled paint, or softness in the composite. Check for the correct installation (security) of the lift transducer.		[ ]	[ ]
6. **Aileron and Flap Attach Points** - Inspect for security of attachment to wing.		[ ]	[ ]
7. **Aileron (left) Servo Tab and Servo Tab Clevis** - Inspect for damage, looseness, or play in attach bearings and Belleville washers, and condition of rod end attachment. Check security of static balance weights. Inspect bonding straps and static wicks for condition. Check for obstruction of drain holes. Inspect servo tab for proper operation and condition of push-pull rod, bearings, and hinge. If the rods show any signs of corrosion, replace with new rods. Lubricate only servo tab hinge and clevis bolt in accordance with Section 27-20-00, Rudder System section. Measure and record total servo tab play: _____inches. Refer to Section 27-00-00, Table 1.		[ ]	[ ]

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8. **Aileron, Right** - Inspect for damage, looseness, or play in attach bearings and Belleville washers, and condition of rod end attachment. Check security of static balance weights. Inspect bonding straps and static wicks for condition. Check for obstruction of drain holes. Inspect trim tab and actuator for condition and security. Lubricate only trim tab hinge and clevis bolt in accordance with Section 27-20-00, Rudder System section. Record total trim tab play: _____ inches. **CAUTION:** Use special care to ensure trim tab friction devices are not lubricated.		[ ]	[ ]
9. **Aileron Trim Tab Clevis** - Inspect trim clevis and related hardware for evidence of corrosion and pitting. Check for proper security.		[ ]	[ ]
10. **Aileron Deflections** - Ensure that both ailerons seat properly on their up and down stops.		[ ]	[ ]
11. **Flaps** - Inspect skins for condition and signs of debonding. Check hinges for play and attachment to wing and flap. Check hinges for corrosion. Check flap push-pull rods and rod end bearings for condition. Inspect condition of spring.		[ ]	[ ]
12. **Flap Motor and Flap Actuators** - Clean and cycle flaps up and down to check for smooth operation.		[ ]	[ ]
13. **Flap Deflections** - Ensure that flaps extend equally on each side of the airplane in both the takeoff and landing configurations. Measure the down deflection on each side using neutral ailerons as a reference point. The difference in static deflection should not be greater than 1/4 in.			[ ]
14. **SpeedBrakes™** - Check cap strip cover screws for security; if loose, remove screws and apply Loctite 242, retorque to 8 in-lbs. Check SpeedBrake™ top attachment screws for security, if loose, remove screws and apply Loctite 242, retorque to 8 in-lbs. Check drain tubes for debris.	[ ]		
15. **SpeedBrakes™** - Remove cover plate. Clean and inspect unit for damage, corrosion, looseness & proper operation. Lubricate worm and worm gear with LUBRIPLATE. Install cover plate.			[ ]
16. **Fuel Leaks** - Check the security of the fuel tanks by inspecting the outer skin tank areas for evidence of fuel stains. Be sure to open the gascolator access panel and inspect all fuel line and fittings in this area.		[ ]	[ ]
17. **Fuel Filler and Caps** - Inspect for proper locking, condition of o-ring and receptacle, and presence and legibility of placards.		[ ]	[ ]
18. **Wing Interior** - Inspect wing spar through outer access panel for signs of cracking or debonding. Inspect visible bonded areas of ribs and other structures.		[ ]	[ ]
19. **Fuel Vent Hose** - Check for proper connection of the fuel vent hoses to the outboard inspection panels. Check the condition of the hoses.		[ ]	[ ]
20. **Flight Controls** - Inspect all push-pull rods, rod end bearings, and bellcranks for condition, play, and security of attachment. Ensure all rod end jamnuts are tight.		[ ]	[ ]
21. **Contamination Test** - Take fuel samples from both wings and fuel strainer. Inspect for contamination and proper grade of fuel. Clean strainer screen each 100 hours or annually, whichever occurs first.	[ ]	[ ]	[ ]
22. **Garmin GFC 700 Autopilot System** - Inspect for condition and function. Refer to Chapter 22.			[ ]

Table 5. Landing Gear

LANDING GEAR (See Chapter 32 for Specific Details)	Each 50 hours	Each 100 hours	Annually

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1. **Nose Gear and Shimmy Dampener** - Place nose gear on a rotating table (shallow height - sometimes referred to a “Grease Plate”) with the normal static weight of the airplane applied to the table. A firm and consistent resistance to the steering rotation should be felt through the full ±60 degrees of wheel movement.		[ ]	[ ]
2. **Lifting The Airplane** - Install jacking pads and jack aircraft until all tires clear the floor. (Refer to Chapter 7 for jacking instructions.)		[ ]	[ ]
3. **NLG** - Remove nose gear wheel cover and strut fairing. Note that the four bolts attached to the nose gear fork must be removed to remove the nose wheel fairing.		[ ]	[ ]
4. **NLG Strut** - Inspect from top to bottom for scratches, cracks, corrosion, and signs of overstress. Check for play in strut attaching brackets. Visually inspect for straightness along length of each strut.		[ ]	[ ]
5. **MLG** - Remove main landing gear wheel fairings.		[ ]	[ ]
6. **Hydraulic Brake Lines** - Inspect brake lines that are tie wrapped to the main gear strut. Check for security and evidence of chaffing. Check for leaks as evidenced by the presence of hydraulic fluid stains.		[ ]	[ ]
7. **Brake Calipers and Brake Lines** - Clean and inspect for condition, fluid leakage, and security of components. Check caliper for small amount of free-floating motion in torque plate. Clean anchor bolts and torque plate if caliper does not free-float. Do not lubricate.		[ ]	[ ]
8. **Brake Linings** - Inspect brake linings, and replace if the wear lines are not visible.		[ ]	[ ]
9. **Wheels and Brake Discs** - Inspect for cracks and corrosion. Inspect brake discs for cracks, pitting, and signs of overheating. Inspect all hardware for signs of loss of torque in accordance with Cleveland Maintenance Manual AWBCMM0001- 2/USA. Measure and record brake disc thickness: Left - _____inches, Right - _____inches.		[ ]	[ ]
10. **MLG Tires** - Inspect for flat spots, wear, splitting, and dry-rotting. Check tire pressure, and service as necessary.	[ ]	[ ]	[ ]
11. **MLG Wheel Assemblies** - Rotate and check for binding, unusual noises, excessive friction, play in bearings, and security of attachment of axles.		[ ]	[ ]
12. **NLG Assembly** - Verify operation of NLG centering lock with strut fully extended. Remove four attaching bolts from bottom of NLG strut, remove wheel and fork assembly, and remove wheel pant. Remove fairing from strut assembly.		[ ]	[ ]
13. **NLG Strut and Fairing** - Inspect for cracks, corrosion, scratches on piston, fluid leakage, and signs of overstress. Check for security of attachment of strut to engine mount. Check for presence of steering limit markings and condition of strut fairing.		[ ]	[ ]
14. **NLG Fork Assembly** - Inspect for cracks, corrosion, signs of overstress, and sideloading. Inspect towing lug assemblies for cracks, distortion, and security of attachment.		[ ]	[ ]
15. **Service Nose Strut** - Check inflation pressure of nose gear, and service as required. See Chapter 12 for servicing instructions.		[ ]	[ ]
16. **NLG Wheel Assembly** - Inspect for cracks and corrosion. Check all hardware for signs of loss of torque in accordance with Chapter 32-20-00, Nose Gear, and Nose Gear Wheel Pant and Fairing sections.		[ ]	[ ]
17. **NLG Tire** - Inspect for flat spots, wear, splitting, and dry-rotting. Check tire pressure, and service as necessary.	[ ]	[ ]	[ ]
18. **NLG Wheel Pant** - Inspect for condition. Clean interior.		[ ]	[ ]

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19. **Wheel Bearings (all)** - Clean and inspect for damage, wear, and corrosion. Inspect bearing races for wear and damage. Repack with appropriate grease in accordance with Cleveland Maintenance Manual AWBCMM0001-2/USA. **NOTE:** **Always wear rubber gloves when handling dry or repacked bearings!**		[ ]	[ ]
20. **NLG Assembly** - Reinstall strut fairing and wheel pant, then reinstall wheel and fork assembly on strut. Torque four attaching bolts 140 to 180 in-lbs., and apply torque seal.		[ ]	[ ]
21. **MLG** - Reinstall outer and inner main gear wheel covers on each wheel.		[ ]	[ ]
22. **Lowering Airplane** - Ensure all obstructions are clear from under aircraft and landing gear is ready for aircraft weight, then lower aircraft and remove jacking pads.		[ ]	[ ]

Table 6. Fuselage Interior

FUSELAGE INTERIOR (See Chapter 21, 23, 25, 27, 28, 31, 34, 35, 37, 56, 57 for Specific Details)	Each 50 hours	Each 100 hours	Annually
1. **Fire Extinguisher** - Remove fire extinguisher and inspect. Refer to Chapter 26 for instructions.		[ ]	[ ]
2. **Oxygen System** - Inspect flexible lines for security of connections, kinks, or tube discoloration. Reattach or replace lines as necessary. If the Garmin G1000 system is installed see additional procedures in Chapter 35.	[ ]		[ ]
3. **Inspection Covers** - Remove rear seat, rear seat inspection plates, ELT access cover, right and left console covers, and glare shield.		[ ]	[ ]
4. **Flight Controls** - Inspect for nicks, scratches and dents in push-pull rods, play in rod end and linear bearings, security of linear bearing mounts and rudder cable guide tubes to fuselage.		[ ]	[ ]
5. **Seats** - Inspect all seat structures for cracks, corrosion, and general condition. Check seat controls for positive locking. Inspect cushions and upholstery for condition.		[ ]	[ ]
6. **Seat Tracks and Stops** - Inspect for cracks, wear of latching holes and tracks, and security of tracks and stops.		[ ]	[ ]
7. **Restraint Systems** - Inspect belts for cuts, fraying, broken stitching, and presence of TSO tags. Check all buckles for proper locking and release. Check inertia reels for proper operation. Check attach points to structure for all belts.		[ ]	[ ]
8. **Upholstery and Trim** - Inspect for general condition, attachment, and cleanliness.		[ ]	[ ]
9. **Placards** - Inspect for presence and condition of all required interior placards. See Chapter 11 for required placards.		[ ]	[ ]
10. **Instruments** - Check security of instruments in panel and legibility of markings. Ensure that no magnetic tools are used during this procedure.		[ ]	[ ]
11. **Avionics** - Check security of radios, GPS display, indicators and controls on panel and center console, legibility of markings and operation of knobs. Ensure that no magnetic tools are used during this procedure.		[ ]	[ ]
12. **Instrument Panel, Radio Rack and Center Console** - Inspect for general condition, security of attachment, and cleanliness. Ensure that no magnetic tools are used during this procedure.		[ ]	[ ]
13. **Nav/Com Bypass (Avidyne option only)** - Check operation. Check operation of light.		[ ]	[ ]
14. **Garmin G1000 System** - Verify operation. See Chapter 34 for annual inspection procedure.			[ ]
15. **Garmin G2000 System** - Verify operation. See Chapter 34 for annual inspection procedure.			[ ]

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16. **Magnetic Compass** - Inspect for security, clarity of glass, and signs of oil leakage. Inspect compass correction card for presence and legibility of all headings. Ensure that no magnetic tools are used during this procedure.		[ ]	[ ]
17. **Fuel Selector Valve** - Operate through full range and verify that valve locks into each detent. Ensure that green LED's in fuel gauge (Basic or Avidyne option) or blue lights in the fuel gauge on the MFD (Garmin G1000 option) illuminate.		[ ]	[ ]
18. **Fuel Selector Valve** - Inspect fuel valve for evidence of fuel leakage.		[ ]	[ ]
19. **Environmental Control System (ECS) controls** - Check operation of manual controls.		[ ]	[ ]
20. **ECS Vents** - Check all vents for proper operation of manual controls.		[ ]	[ ]
21. **Instrument Panel Backside** - Remove glare shield and inspect all wires, lines, hoses, control cables, instruments, etc., for any interference, chafing, and loose or stressed connections. Inspect structure of forward bulkhead, engine mount support structures, etc., for cracks, debonding, and general condition. Inspect soundproofing material for condition and adhesion to forward bulkhead.		[ ]	[ ]
22. **Reinstall Glare Shield** - Check security of attachment and condition. The glare shield for the Garmin G1000 option has foil attached and must be grounded correctly with a"U" clip. Check pull-out shield (Avidyne option only) for freedom of movement, condition, and security.		[ ]	[ ]
23. **ECS Ducts** - Inspect for cracks, holes, routing, and chafing.		[ ]	[ ]
24. **Grounding Rails** - Inspect for cracks and security along forward length. Pay special attention to bonding straps connecting sections of rails at formers and to engine mount bolts.		[ ]	[ ]
25. **Rudder Pedals** - Inspect for security, cracks, and play. Check for leakage from brake cylinders. Lubricate rudder cable clevis bolt and brake cylinder attach points. Do not lubricate rudder pedal torque tube pillow blocks.		[ ]	[ ]
26. **Rudder Hold System** - Verify that the rudder hold system is successfully deactivated by each of the following: pulling the rudder hold circuit breaker, setting flaps down, autopilot disconnect, trim master switch, and application of force to a rudder pedal.		[ ]	[ ]
27. **Parking Brake Valve** - Inspect for security of mounting and signs of leakage.		[ ]	[ ]
28. **Seat Box Structure** - Inspect for cracks, debonding, and any signs of obvious damage.		[ ]	[ ]
29. **Wing Spar** - Inspect for cracks, debonding, and security of attachment to fuselage.		[ ]	[ ]
30. **MLG Box Support Structure** - Inspect for cracks, debonding, and security of hardware. If paint has been removed, metal is exposed, or corrosion is present, clean the surface and apply paint as needed.		[ ]	[ ]
31. **Floor and Supporting Structure** - Inspect for cracks, holes, and security of attachment.		[ ]	[ ]
32. **Flight Controls (forward fuselage through baggage compartment)** - Inspect for nicks, scratches, and dents in push-pull rods, play in rod end and linear bearings, security of linear bearing mounts, and attachment of rudder cable guide tubes to fuselage.		[ ]	[ ]
33. **Baggage Compartment Floor** - Inspect for cracks, holes, and security.		[ ]	[ ]
34. **Hat Shelf** - Inspect for cracks, holes, and security.		[ ]	[ ]
35. **Emergency Locator Transmitter (ELT)** - Remove from tray and remove battery cover. Inspect for battery corrosion and any obvious internal or external damage to housing. Verify replacement date on battery matches date on housing placard. Reinstall battery cover. Test operation of G-switch in strict accordance with instructions in Chapter 25. Record battery replacement due date:		[ ]	[ ]
36. **ELT Installation and Support Shelf** - Inspect ELT wiring and antenna cable for security, routing, and chafing. Check connectors for security of pins and proper connection. Inspect ELT tray and support shelf for cracks and security. Replace tray if any cracks are found.		[ ]	[ ]

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37. **Empennage Interior Structure** - Inspect for cracks, debonding, or other signs of damage. Verify that all drain holes are clear of debris.		[ ]	[ ]
38. **Access Panels and Fairings** - Inspect for condition. Check fasteners and receptacles for condition.		[ ]	[ ]
39. **Air Conditioning Seals** - Inspect air conditioning system bay, two evaporator bay access panels, condenser attachment, air conditioning system bay access cover, gear member, and gear box seals for condition and integrity.		[ ]	[ ]

Table 7. Inspection Wrap-Up

INSPECTION WRAP-UP	Each 50 hours	Each 100 hours	Annually
1. **Fuselage and Wings** - Verify aircraft is free of any tools, parts, and debris, and reinstall all access fairings, panels, carpeting, seats, etc. removed for this inspection.	[ ]	[ ]	[ ]
2. **Engine** - Verify oil sump is properly serviced with oil and engine compartment is free of tools, rags, and debris, and install lower cowl.	[ ]	[ ]	[ ]
3. **Engine** - Run engine for no more than two minutes at 1000 to 1200 RPM. After shutdown, check for leaks at oil filter base, fuel nozzles, and any other components removed during this inspection. If no leaks are noted, install top cowling.	[ ]	[ ]	[ ]
4. **Aircraft** - Operate engine at 1000 to 1500 RPM to warm engine. Operate all aircraft systems to verify proper operation. As engine warms, operate engine systems at appropriate engine speeds and complete all checks listed on Inspection Coversheet.	[ ]	[ ]	[ ]
5. **Aircraft Records** - Complete entries in logbooks, AD compliance lists, and any other required records and work orders.	[ ]	[ ]	[ ]

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Figure 1 : Sheet 1 : Inspection and Run-up Checklist

B11216

Reg. number	Serial number:	Owner's name:	
Date started	Date completed	Work Order #	**Inspection** 50-hr ☐ 100-hr ☐ Annual ☐
Hobbs	Eng TSN	Prop TSN	Mechanic's Name
TT	Eng TSO	Prop TSO	

ELT battery due:
Left Battery due:
Right Battery due:
Altimeter/Transponder test due:
O2 bottle hydro. test due:
Fire extinguisher insp. due:
Magneto 500-hr insp. due:
Flexible hose rplcmt. due:
Misc.:
Misc.:
Oil sample? Yes ☐ No ☐
Comments

Differential compression check:
Taken: Hot ☐ Cold ☐

6 -	/80	5 -	/80
4 -	/80	3 -	/80
2-	/80	1 -	/80

Discrepancies Noted During Runup
(Additional space available on last page)

☐ See last page for additional comments.

RUNUP CHECKS

☐ - check boxes if okay. For all others, write actual indication.

System	Pre-inspection	Post-inspection
Boost/primer pump	☐	☐
High/Lo boost pump cut-off	☐	☐
Starter	☐	☐
Oil pressure (cool)	psi	psi
Charging system, Left (1200 RPM)	Amps volts	Amps volts
Charging system, Right (1200 RPM)	Amps volts	Amps volts
Left brake	☐	☐
Right brake	☐	☐
Parking brake	☐	☐
Comm/Nav	☐	☐
Ignition ground test (idle)	☐	☐
L. Mag drop (1700 RPM)	RPM Drop	RPM Drop
R. Mag drop (1700 RPM)	RPM Drop	RPM Drop
Prop response (1200 RPM)	☐	☐
Oil temperature	°F	°F
CAUTION: Ensure CHT and oil temp. are in the green range.		
Static RPM	RPM	RPM
Fuel flow at static RPM	gph	gph
Induct. Heat (1700 RPM)	☐	☐
Defrost	☐	☐
Cabin heat	☐	☐
Oil pressure	psi	psi
Idle RPM	RPM	RPM
CAUTION: Allow engine to cool to 300°F (CHT) before shutdown.		
All annunciator lights are off	☐	☐
Check for fuel odors in cabin	☐	☐
Check for fuel stains on underside of aircraft	☐	☐
Check fuel valve off function	☐	☐
Idle cutoff RPM rise	RPM Rise	RPM Rise

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LIST OF INSPECTION AREAS

1. List of Inspection Areas

Table 1. INSPECTION ACCESS AREAS

Area	Type of Access	Location	Inspection & Maintenance Items
Left Wing	Access Panel	Underside, inboard, below fuel tank	Fuel tank, two fuel sending units, slosh box, fuel low annunciator switch, vapor return lines
	Access Panel	Underside, middle, below fuel tank	Fuel tank, one fuel sending unit
	Access Panel	Underside, outboard	Fuel vent
	Access Panel	Underside trailing edge, near right side of aileron	Final aileron drive, mounting bolts to aileron, bellcrank assembly
	Access Panel	Underside towards leading edge, forward of inboard fuel tank access panel	Fuel lines and fuel lines to fuel tank connection fittings
	Access Panel	Aft of inboard fuel tank cover	Final drive for flap bellcranks
	Access Panel	Underside trailing edge, near middle of flaps	Aileron control rod linear bearing
Right Wing	Access Panel	Underside, inboard, below fuel tank	Fuel tank, two fuel sending units, slosh box, fuel low annunciator switch, vapor return lines
	Access Panel	Underside, middle, below fuel tank	Fuel tank, one fuel sending unit
	Access Panel	Underside, outboard	Fuel vent
	Access Panel	Underside trailing edge, near left side of aileron	Final aileron drive, mounting bolts to aileron, bell crank assembly
	Access Panel	Underside towards leading edge, forward of inboard fuel tank access panel	Fuel lines and fuel lines/fuel tank connection fittings, outside air temperature probe
	Access Panel	Aft of inboard fuel tank cover	Final drive for flap bellcranks
	Access Panel	Underside trailing edge, near middle of flaps	Aileron control rod linear bearings
Fuselage Exterior	Access Panel	Underside center near trailing edge of the flaps	Aileron bellcranks and crossover assembly, flap motor, marker beacon tuning slug
	Access Panel	Underside near left wing root	Auxiliary fuel pump, gascolator, pitot drain, wires and plugs for wing electrical (position/strobe lights, landing/taxi lights, stall horn, fuel quantity, and fuel low annunciator)
	Access Panel	Tail cone right side	Air vent, elevator push-pull rods
	Access Panel	Vertical stabilizer, left side	Antenna connection junction
	Engine Cowling – Top and Bottom	Forward of fuselage firewall	All engine and propeller parts and components.
	Access Panel	Under front seat bench	Fuel and fuel vent lines
	Access Panels (2)	Right side of center console (arm rests)	Fuel selector valve, environmental control system (ECS) heated air ducts

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Fuselage Interior	Cover Panel	Rear seat footwell	Wing attachment bolts
	Access Panels (2)	Under rear seat back	Gear box
	Access Panels (2)	Baggage compartment floor	Gear box
	Access Panel	Floor area of baggage compartment (Avionics Bay)	Special optional avionics equipment (DME, HSI slaving transmitter, remote stormscope sensor, altitude hold computer for system 30 autopilot)
	Access Panel	Floor area of baggage compartment hat rack	Power plug, pitch servo
	Access Panel	Aft bulkhead of baggage shelf	ELT, elevator push-pull rods
	Cabin, Side-Trim Panels	Pilot's side – runs from control stick to rear seat back	Aileron and elevator push-pull rods, circuit breaker panel, control stick switches wiring, fuel lines, ECS fresh air ducts
	Cabin, Side-Trim Panels	Copilot's side – runs from control stick to rear seat back	Aileron and elevator push-pull tubes, communication wiring, control stick switches wiring, common wire bundle, ECS fresh air ducts
	Passenger Footwell	Floor area aft of the pilot and copilots seats	Oxygen system cylinders, regulator/valve, over-fill/overpressure burst valve, and tubing
	Baggage Compartment Trim Panels (2)	Left and right sides of baggage compartment	Elevator push-pull rods
Controls	Access Panel	Right elevator, underside, middle CONTROLS Access Panel	Trim tab servo motor
	Access Panel	Underside, right aileron	Trim tab servo motor

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TIME LIMITS AND INSPECTIONS

1. Time Limits

A. The information in Time Limits and Special Inspection Items identifies either component time limits and/or required special inspections. These inspections must be incorporated into a 100 hour or annual inspection as applicable. If it is anticipated that the component time limit and/or special inspection will occur before the next applicable required inspection, it must be incorporated in the current required inspection.

2. Time Limits and Special Inspection Items

A. First 5 hours and every 100 hours thereafter

(1) Chapter 21

(a) Air Conditioning Compressor - Inspect belt and adjust as required to 50 to 70 lbs. tension. Refer to Chapter 21, Automatic Climate Control System (ACCS) - Maintenance Practices.

B. Every 50 hours and 100 hours or annually

(1) Chapter 78

(a) Inspect exhaust system, turbochargers, and tailpipes. Visual inspection required at 50 hours. Comprehensive inspection required at 100 hours or annually. Refer to Chapter 78, Turbocharger and Exhaust System - Maintenance Practices.

C. At first 100 hour inspection and every 300 hours thereafter

(1) Chapter 73

(a) Remove, inspect, clean, and reinstall fuel nozzles. If ultrasonic cleaning is available, it is the preferred method to use. **Do not** insert anything into fuel nozzle orifice. If cleaning will not remove internal deposits, fuel nozzle must be replaced. Refer to Chapter 73, Engine Fuel System - General.

D. Every 100 hours or annually

(1) Chapter 20

(a) Check resistance of all static wicks between the wick base and the tip. The test requires use of a megohmmeter, sometimes referred to as a Megger. A properly functioning static wick should indicate 1 to 100 megohms of resistance. Refer to Chapter 20, Lighting Protection and Static Dissipation - Maintenance Practices.

(2) Chapter 27

(a) Inspect aileron linear bearing for foreign object debris. Ensure there is no debris or adhesive attached to the aileron control rod, bearing housing, bearing race, or ball bearings. Refer to Chapter 27, Aileron Control System - Maintenance Practices.

E. Every 100 hours and at overhaul

(1) Chapter 78

(a) Conduct exhaust system pressure test. Refer to Chapter 78, Turbocharger and Exhaust System - Maintenance Practices.

F. Every 200 hours or annually

(1) Chapter 12

(a) Service nose strut. Refer to Chapter 12, Filter, Strut, Brake, and Battery - Servicing.

(2) Chapter 27

(a) Inspect elevator torque tube. Refer to Chapter 27, Elevator Control System - Maintenance Practices.

G. Every 400 hours

(1) Chapter 32

(a) Repack new wheel bearings (nose and main landing gear) after first 100 hours, then every 400 hours thereafter. This should be done more frequently if experience indicates the need based on the type of operations conducted. Refer to Chapter 32, Wheel, Tires, and Brake System - Maintenance Practices.

H. Every 500 hours

(1) Chapter 28

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(a) Check fuel gauge accuracy. Refer to Chapter 28, Fuel Indicating System - Maintenance Practices.

(2) Chapter 30

(a) Remove the power. Do a continuity check on each one of the FIKI low pressure switches individually. Make sure they show an open circuit. Refer to the applicable procedures in Chapter 30, TKS Low Pressure Switch (FIKI) - Removal/Installation, Low Pressure Switch Removal/Installation for the switch/connector location and identification.

(b) Do the Flow Transducer Check. Refer to the applicable procedures in Chapter 30, TKS Anti-Ice System (FIKI) - Inspection/Check, Flow Transducer Check.

(c) Do a High Pressure Switch Check and Low Pressure Discrete Wiring Check. Make sure that the Flow Transducer Check is completed before the Low Pressure Discrete Wiring Check is started. Refer to the applicable procedures in Chapter 30, TKS Anti-Ice System (FIKI) - Inspection/Check, High Pressure Switch Check and Low Pressure Discrete Wiring Check.

(3) Chapter 34

(a) Check the resistance of the lift transducer heaters. Examine the wing skin under the lift transducer to make sure it is serviceable. Refer to the applicable procedures in Chapter 34, Lift Transducer (Airplanes 2049 and ON) - Removal/Installation, Lift Transducer Removal/Installation.

(b) Do the Ice Mode Check. Refer to the Chapter 34, Stall Warning System (Airplanes 2049 and On) - Inspection/Check, Ice Mode Check.

(c) Do the Stall Warning Heat Mode Check. Refer to the Chapter 34, Stall Warning System (Airplanes 2049 and On) - Inspection/Check, Stall Warning Heat Mode Check.

(4) Chapter 71

(a) Disassemble magnetos and inspect in accordance with TCM Manual X42002-1. Refer to Chapter 71, Powerplant - General.

(b) Remove and inspect oil pressure relief valve in accordance with the TCM Overhaul Manual. Check plunger for scraping and nicks. Check the conical face for roughing. Check limits in accordance with TCM specifications. Replace or reface parts as required. See Chapter 18 of the *TCM Overhaul Manual*. Refer to Chapter 71, Powerplant - General.

I. **Every 500 hours or biennially**

(1) Chapter 27

(a) Inspect aileron control rods for cracking. Refer to Chapter 27, Aileron Control System - Maintenance Practices.

(b) Inspect aileron trim tab friction device for proper sliding friction. Assure device is free from oils, grease, dirt, etc.. Refer to Chapter 27, Aileron Control System - Maintenance Practices.

(c) Inspect the aileron hinges and middle hinge bonding jumper for corrosion. Refer to Chapter 20, General Aircraft Conductivity Check.

J. **At first 500 hour inspection and every 1000 hours thereafter**

(1) Chapter 28

(a) Inspect fuel selector valve. Refer to Chapter 28, Fuel Distribution - Maintenance Practices.

K. **Every 1000 hours**

(1) Chapter 20

(a) Remove front and rear seats, carpeting, and interior side panels. Inspect the four SAFE strips in the lower fuselage interior for wear, tearing, adhesion, and overall general integrity. Refer to Chapter 20, Lightning Protection and Static Dissipation - Maintenance Practices.

(2) Chapter 24

(a) Inspect the alternators to ensure the bearings operate smoothly. If the bearings do not operate smoothly replace the alternator. If the No.1 (right) alternator brushes or the Kelly alternator brushes are more than 75 percent worn, replace the alternator. If the Plane Power alternator brushes extend less than 0.25 inches from the edge of the brush holder case, replace the brush assembly. For alternator No. 1 (right), ensure the clutch resistance is 140 in-lbs or greater of torque. Refer to Chapter 24, DC Generation - Maintenance Practices.

(b) Inspect power grid. Refer to Chapter 24, Electrical Load Distribution - Maintenance Practices.

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(3) Chapter 27

(a) Check and record the control deflections on the ailerons, flaps, elevator, and rudder. Refer to Chapter 27, Flight Controls - General.

(b) Remove rudder and check hinges. Refer to Chapter 27, Rudder Control System - Maintenance Practices.

(4) Chapter 32

(a) On each main gear, remove the wheel pants, wheels, axles, strut fairings, and underside gearbox access panels. Perform detailed inspection of the landing gear legs. Look for evidence of metal fatigue, corrosion, cracks, and deformation. Pay particular attention to the area where the strut is inserted into the gearbox. Refer to Chapter 32, Main Landing Gear and Brakes - Maintenance Practices.

(5) Chapter 52

(a) Clean door seal system pump filter. Refer to Chapter 52, Door Seal System - Maintenance Practices.

L. **Every 1000 hours, 12 months, or 3 years, as applicable**

(1) Chapter 22

(a) If the Garmin GFC 700 autopilot system is installed, visually inspect the GSA 81 servos every 1000 hours or 12 months (whichever occurs first), clean and apply grease to the output gear every 1000 hours or 3 years (whichever occurs first), and inspect the GTA 82 trim adapter. Refer to Chapter 22, Garmin GFC 700 Autopilot (G1000) - Maintenance Practices.

M. **Every 1000 hours or every 5 years, whichever occurs first**

(1) Chapter 52

(a) Inspect exterior emergency door release system. Activate exterior hinge release mechanism to ensure proper operation. Inspect hinge wires for corrosion, kinks, and wear. Replace as required. Move cable up and down to ensure ease of movement. Inspect overhead cabling for chaffing, binding, and frayed cables. To rearm the system, reinsert door hinge wires, and pull both the actuating cables back to their stops. Store the few inches of excess cable in a manner that prevents kinking or binding. Refer to Chapter 52, Cabin and Baggage Door - Maintenance Practices.

N. **Every 1500 hours or every 3 years, whichever occurs first**

(1) Chapter 30

(a) Replace the TKS Anti-Ice System Filter Element. Refer to Chapter 30, TKS Anti-Ice System Filter Element (Inadvertent) - Removal and Installation.

O. **Every 3000 hours**

(1) Chapter 27

(a) Inspect and service elevator trim motor. Refer to Chapter 27, Elevator Control System - Maintenance Practices.

P. **Every 12 months**

(1) Chapter 22

(a) If Garmin GFC 700 autopilot system is installed, visually inspect each Garmin GSM 85 servo mount and verify slip clutch settings. Refer to Chapter 22, Garmin GFC 700 Autopilot (G1000) - Maintenance Practices.

Q. **Every 2 years**

(1) Chapter 34

(a) Garmin GDC 74A - The static system and altimeter must be verified in accordance with 14 CFR Section 91.411 and Appendix E of 14 CFR Part 43. Test procedure per the latest revision of the *Garmin G1000 System Maintenance Manual*, P/N 190-00577-03. Refer to Chapter 34, Pitot Static System - Maintenance Practices.

R. **Every 24 calendar months**

(1) Chapter 34

(a) Altimeter and Static System Inspection - Refer to AC 43-6B, Appendix E of 14 CFR Part 43, and 14 CFR Part 91. Refer to Chapter 34, Pitot Static System - Maintenance Practices.

(b) Automatic Pressure Altitude encoding System and Transponder inspection and test - Refer to AC 43-6B, Appendix F of 14 CFR Part 43, and 14 CFR Part 91. Refer to Chapter 34, Pitot Static System - Maintenance Practices.

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(c) Perform a compass swing. Refer to Chapter 34, Attitude and Directional System - Maintenance Practices.

S. **Every 2 years (Artex 200) or every 5 years (Artex ME406)**

(1) Chapter 35

(a) Emergency Locator Transmitter (ELT) Battery. Refer to Chapter 35, Emergency Locator Transmitter (ELT) - Maintenance Practices.

T. **Every 4 years or at engine overhaul, whichever occurs first.**

(1) Chapter 71

(a) Overhaul magnetos in accordance with TCM Manual X42002-1. Refer to Chapter 71, Powerplant - General.

U. **Every 5 years**

(1) Chapter 25

(a) Remove and send the Model 455 Carbon Monoxide Detector to CO Guardian for the CO sensor replacement and recalibration. Refer to Chapter 25, Pulse Oximeter/CO Detect (T240) - Maintenance Practices.

(2) Chapter 35

(a) Purge the oxygen system. Inspect the oxygen lines and fitting for cracks, leaks, and damage. Overhaul the regulator/valve assembly, replace O-rings, and verify the regulator pressure setting. Replace the flexible oxygen lines on the breathing stations. Overhaul the A4/A5 flowmeters. Refer to Chapter 35, Oxygen - General.

V. **Every 5 years. Every 3 years for cylinder P/N 06N2001-3SCI.**

(1) Chapter 35

(a) Oxygen Cylinder(s) – Hydrostatically test 5 years after the date stamped on each metal cylinder or on the neck of the non-metallic cylinder, and every 5 years thereafter, except oxygen cylinder P/N 026N2001-3SCI must be hydrostatically tested 3 years after the date stamped on the cylinder neck, and every 3 years thereafter. Refer to Chapter 35, Oxygen System - Maintenance Practices.

W. **After Hard Landing**

(1) Chapter 32

(a) Hard Landing Inspection - In the event of a hard landing, the aircraft should be inspected in accordance with Chapter 32-20-00, Hard Landing Inspection.

X. **After Lightning Strike**

(1) Chapter 20

(a) Lightning Strike - In the event of a lightning strike, follow inspection and repair procedures in Chapter 20-70-00, Inspection and Repair After Lightning Strike.

Y. **Periodically**

(1) Chapter 25

(a) Rosen Sunvisors - Clean the lenses and adjust the pivot tensions on the visor assemblies. Refer to Chapter 25, Rosen Sunvisor - Maintenance Practices.

3. Recommended Replacements

A. **Every 200 hours of use or every 3 years, whichever occurs first**

(1) Chapter 35

(a) Replace oxygen cannulas and/or non microphone oxygen masks. Refer to Chapter 35, Oxygen System - Maintenance Practices.

B. **Every 500 hours of use**

(1) Chapter 35

(a) Replace microphone oxygen masks. Refer to Chapter 35, Oxygen System - Maintenance Practices.

C. **Every 1200 hours**

(1) Chapter 34.

(a) Replace or rebuild the gyroscopic attitude indicator (artificial horizon). Refer to Chapter 34, Attitude and Directional System - Maintenance Practices.

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D. **Every 1800 hours**

(1) Chapter 34

(a) Replace or rebuild the turn coordinator. The turn coordinator is located on the avionics shelf and provides data to the Avidyne FlightMax Primary Flight Display (PFD). Refer to Chapter 34, Attitude and Directional System - Maintenance Practices.

E. **Every 2000 hours**

(1) Chapter 61

NOTE: The propeller governor requires a complete overhaul every 2000 hours of time in service by an authorized propeller repair facility.

(a) Overhaul the propeller governor. Refer to Chapter 61, Propeller Governor - Maintenance Practices.

(2) Chapter 71

NOTE: The TSIO-550-C engine requires a complete overhaul every 2000 hours of time in service by an authorized engine repair facility. There are also overhaul limitations on the magnetos, which is discussed in Time Limits and Special Inspection Items. Inspect the engine mount bushings for corrosion; replace the bushing(s) if corroded.

(a) Overhaul the engine. Refer to Chapter 71, Powerplant - General.

F. **Every 2400 hours**

(1) Chapter 61

NOTE: The propeller must be overhauled after 2400 hours of time in service by an authorized propeller overhaul facility. The propeller does not have a specific life limit, however, after extended use its serviceability can be diminished to the point that it cannot be overhauled, and it must be replaced.

(a) Overhaul the propeller. Refer to Chapter 61, Propeller - General.

G. **Every 14,000 hours**

(1) Chapter 33

(a) Replace the Left and Right LED Position Lights (p/n 01-0790340-03, -04, -09, -10) at 14,000 hours of airframe time in service. Refer to Chapter 33, Exterior Lighting - Maintenance Practices.

H. **Every 3 years**

(1) Chapter 35

(a) Replace the O-rings in the CPC connector assembly identified on the breathing stations. Refer to Chapter 35, Oxygen System - Maintenance Practices.

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UNSCHEDULED MAINTENANCE CHECKS

1. General

A. During operation, the airplane can have forces put on it that make completion of unscheduled maintenance necessary. This section describes the conditions or events that will result in the need to complete an unscheduled maintenance procedure.

B. When the flight or maintenance crew reports that they have experienced of any conditions listed below, you must complete the unscheduled maintenance check requirements for that condition or event.

2. Unscheduled Maintenance Checks Defined and Areas of Inspection

A. Severe vibration or oscillatory yawing motion due to excessive braking or tire skidding.

(1) If the pilot reports that the airplane experienced severe vibration or oscillatory yawing motion due to excessive braking or tire skidding, complete the Aft Fuselage Inspection procedure found in Section 53-70-00, Fuselage Components - Adjustment/Test.

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DIMENSIONS AND AREAS - GENERAL

1. Powerplant Limitations

A. Number of Engines: One (1)
B. Number of Cylinders: Six (6)
C. Engine Manufacturer: Teledyne Continental
D. Engine Model Number: TSIO-550-C
E. Maximum Power: 310 BHP at 2600 RPM
F. Maximum Manifold Pressure: 35.5 inches of Hg
G. Maximum Manifold Pressure for Idle: 15 inches of Hg
H. Maximum Cylinder Head Temperature: 460° F (238 °C)

2. Powerplant Fuel and Oil Data

A. Oil Grades Recommended for Various Average Air Temperature Ranges
   (1) Below 40° F: SAE 30, 10W-30, 15W-50, or 20W-50
   (2) Above 40° F: SAE 50, 15W-50, 20W-50
B. Oil Temperature
   (1) Maximum Allowable: 240° F (116° C)
   (2) Recommended takeoff minimum: 100° F (38° C)
   (3) Recommended flight operations: 170° F to 200° F (76.7° C to 93.3° C)
C. Oil Pressure
   (1) Normal Operations: 30-60 psi (pounds per square inch)
   (2) Idle, minimum: 10 psi
   (3) Maximum allowable (cold oil): 100 psi
D. Approved Fuel Grades
   (1) 100LL Grade Aviation Fuel (Blue)
   (2) 100 Grade Aviation Fuel (Green)
E. Fuel Flow
   (1) Normal Operations: 13 to 25 GPH (49 to 95 LPH)
   (2) Idle, minimum: 2 to 3 GPH (7 to 11 LPH)
   (3) Maximum allowable: 38.5 GPH (146 LPH)

3. Propeller Data and Limitations

A. McCauley Propeller
   (1) Number of Propellers: One
   (2) Propeller Hub and Blade Model Numbers: E-7838/C447 and D3A34C447/78MLB-0
   (3) Propeller Diameters:
      (a) Minimum: 76.5 inches (194 cm)
      (b) Maximum: 78 inches (198 cm)
   (4) Propeller Blade Angle at 30 inch Station:
      (a) Low: 14.9 degrees, +0.2 or -0.2 degrees
      (b) High: 36.5 degrees, +0.5 or -0.5 degrees

B. Hartzell Propeller
   (1) Number of Propellers: One
   (2) Propeller Hub and Blade Model Numbers: HC-H3YF-lRF and F7693DF
   (3) Propeller Diameters:
      (a) Minimum: 77 inches (196 cm)

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(b) Maximum: 78 inches (198 cm)

(4) Propeller Blade Angle at 30 inch Station:

(a) Low: 16.5 degrees, +0.2 or -0.2 degrees

(b) High: 42.0 degrees, +2.0 or -2.0 degrees

4. Powerplant Instrument Markings

A. Table 1 shows applicable color-coded ranges for the various powerplant instruments within the aircraft.

Table 1. Powerplant Instrument Markings

INSTRUMENT	RED LINE Minimum Limit	GREEN ARC Normal Operating	RED LINE Maximum Limit
Tachometer	Minimum for idle 600 RPM	2000 - 2500 RPM	3000 RPM
Manifold Pressure	N/A	15-33.5 Inches Hg. (No Placard)	35.5 inches of Hg
Oil Temperature	Minimum for takeoff 100°F (38°C)	170 – 220° F (77° C – 104° C)	250° F (121° C)
Oil Pressure	Minimum for idle 10 psi	30 - 60 psi	100 psi (Cold Oil)
Fuel Quantity	A red line below "E" or "zero" in level flight indicates the remaining four gallons (S/N 41001 to 41799), or two gallons (S/N 41800 and on), in each tank cannot be used safely in flight.	N/A	N/A
Fuel Flow	N/A	10 - 22 GPH (38 – 83 LPH)	25 GPH (106 LPH)
Cylinder Head Temperature	N/A	240 – 420°F (116° C – 216° C)	500°F (260° C)
Turbine Inlet Temperature	N/A	1000°F – 1650° F (538°C – 899° C)	1800°F (982° C) 30 sec. limit

5. Weight Limits

A. Utility Category

Maximum Ramp Weight:	3600 lbs. (1633 kg)
Maximum Empty Weight:	2708 lbs. (1228 kg)
Maximum Takeoff Weight:	3600 lbs. (1633 kg)
Maximum Landing Weight:	3420 lbs. (1551 kg)
Maximum Baggage Weight:	120 lbs. (54.4 kg)

B. Other Weight Limits (Refer to Table 2)

Table 2. Other Weight Limits

TYPE OF WEIGHT LIMITATION	FORWARD DATUM POINT AND WEIGHT	AFT DATUM POINT AND WEIGHT	VARIATION
Minimum Flying Weight	105 inches and 2600 lbs.	112 inches and 2900 lbs.	Straight Line
Maximum Zero Fuel Weight	107.2 inches and 3300 lbs.	112 inches and 3300 lbs.	Straight Line
Reference Datum: The reference datum is located at the tip of the propeller spinner. As distance from the datum increases, there is an increase in weight for each of the two limitation categories. The variation is linear or straight line from the fore to the aft positions.			

6. Center Of Gravity Limits

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A. Table 3 specifies the center of gravity limits for utility category operations. The variation along the arm between the forward and aft datum points is linear (straight line). The straight-line variation means that at any given point along the arm, an increase in moments (expressed as inch-pounds) changes directly according to the variations in weight and distance from the datum.

Table 3. Center of Gravity Limits

CATEGORY	FORWARD DATUM POINT AND WEIGHT	AFT DATUM POINT AND WEIGHT	VARIATION
Utility Category	105 inches2600 to 2900 lbs.	112 inches2900 to 3600 lbs.	Straight Line
Reference Datum: The reference datum is located at the tip of the propeller spinner. This location causes all arm distances and moments (the product of arm and weight) to be positive values.			

7. Cabin and Entry Dimensions

A. Maximum Cabin Width: 48.17 inches (122 cm)
B. Maximum Cabin Length: (Firewall to aft limit of baggage compartment): 139.6 inches (354.6 cm)
C. Maximum Cabin Height: 49 inches (124.5 cm)
D. Minimum Entry Width: 33 inches (83.8 cm)
E. Minimum Entry Height: 33 inches (83.8 cm)
F. Maximum Entry Clearance: 46 inches (116.8 cm)

8. Space and Entry Dimensions Of Baggage Compartment

A. Maximum Baggage Compartment Width: 38.5 inches (97.8 cm)
B. Maximum Baggage Compartment Length: 52 inches (132 cm) (Including Shelf)
C. Maximum Baggage Compartment Height: 34.5 inches (87.6 cm)
D. Maximum Baggage Entry Width: 28 inches (71.1 cm) (Diagonal Measurement)

9. Specific Loadings

A. Wing Loading: 25.50 lbs./sq. ft.
B. Power Loading: 11.61 lbs./hp

10. Other Specifications

A. Wing Area: 141.2 sq. ft. (13.1 m²)
B. Wing Span: 35.8 ft. (10.9 m)
C. Angle of Incidence Wing: 0 degrees
D. Angle of Incidence Horizontal Stabilizer: -2.0 degrees
E. Dihedral: 4.5 degrees
F. Aspect Ratio: 9.18
G. Mean Aerodynamic Chord: 48.582 inches
H. Fuselage Length: 25.7 ft.
I. Height of Vertical Stabilizer: 9 ft.
J. Total Horizontal Stabilizer Area: 36.4 sq. ft.
K. Stabilizer Span: 14.1 ft.
L. Vertical Stabilizer Area: 18.24 sq. ft.
M. Total Aileron Area: 5.75 sq. ft.
N. Rudder Area: 7.34 sq. ft.
O. Total Flap Area: 20.36 sq. ft.
P. Total Elevator Area: 7.88 sq. ft.

11. Landing Gear

A. Nose Strut Pressure: 250 psi (Nitrogen)
B. Landing Gear Type: Fixed (Steel)

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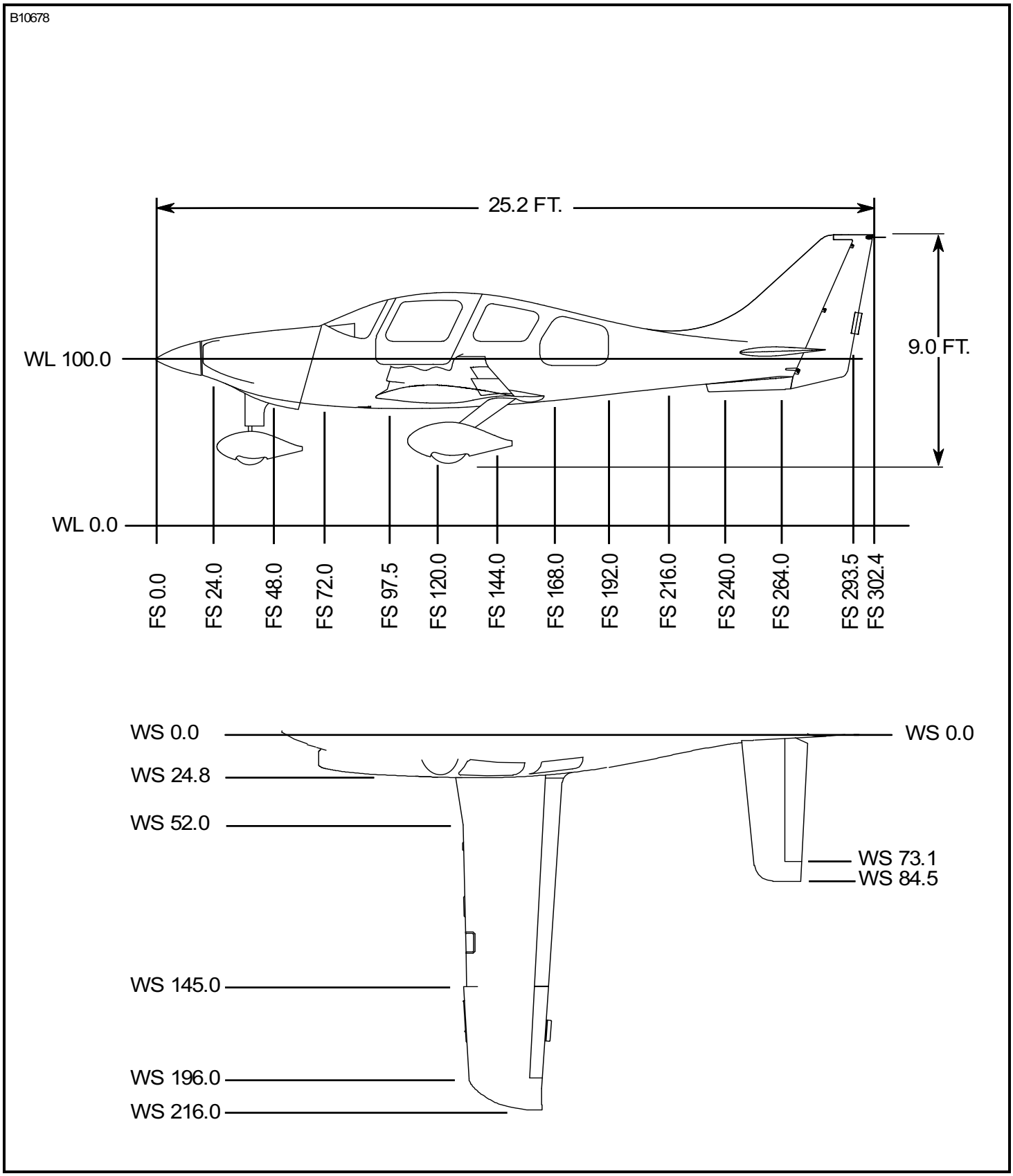
C. Landing Gear Track Width: 89.5 inches
D. Nose Tire Size: 5.00-5 (10 Ply)
E. Nose Tire Pressure: 88 psi
F. Main Gear Tire Size: 15x6.00-6 (6 Ply)
G. Main Gear Tire Pressure: 55 psi

12. Fuselage Stations

A. For Fuselage Stations, refer to Figure 1.

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Figure 1 : Sheet 1 : Fuselage and Wing Stations



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LIFTING AND SHORING - GENERAL

1. Jacking the Airplane

A. **Lifting Points** - There are two jack points under each wing proximate to the wing saddle. The points are near the center of mass of the longitudinal axis and may also be identified by the 5/16-inch holes in those areas; great care must be used when jacking the airplane. The tailskid is used as a third point of stabilization. Refer to Figure 1.

B. **Raising One Wing Only** - If only one wing is raised, as when changing a single tire, the airplane can be safely jacked by one person using the following steps:

(1) Perform operation in a level area, such as an airplane hangar.

(2) Set the parking brake and chock the nose tire and the main gear tire that is not raised.

(3) Place 50 pounds of ballast (usually sandbags) on the engine cowling, near the propeller.

(4) Place a jack under the jack point of the wing to be lifted and raise the jack up to the wing jack point. Take extra precaution to ensure the jack is properly stabilized, the base is locked in position, and the jack is lifting vertically. Be sure the raising point of the jack is properly inserted into the jack point on the wing.

(5) Slowly raise the jack until the desired ground clearance is achieved. The clearance between the bottom of the tire and lifting surface (ground or hangar floor) must not exceed three inches.

C. **Raising Both Wings** - If the airplane is simultaneously lifted by both jacks, then the procedures established below should be followed:

(1) Perform operation in a level area, such as an airplane hangar.

(2) Use a minimum of three trained individuals when jacking the airplane, one person for each jack and one observer.

(3) Because the jack points are near the airplane's center of gravity, 50 pounds of ballast must be placed on the horizontal stabilizer. Sandbags are perfect for this operation since they distribute pressure evenly and will not mar the surface.

(4) Attach the tail to a stabilizing stand.

(5) Place the sandbags or other ballast on the horizontal stabilizer as close as possible to the longitudinal axis.

(6) Place a jack under each jack point of the wing. Raise the jacks up to the wing jack point. Take extra precaution to ensure the jacks are properly stabilized, the bases are locked in position, and the jacks are lifting vertically. Be sure the raising point of the jacks are properly inserted into the jack points on the wing.

(7) Slowly raise the jacks until the desired ground clearance is achieved. The observer must ensure the jacks are lifting vertically and there is no tail wobble. As the airplane is lifted off the surface, the observer must connect the stabilizing stand to the tail.

D. **Raising with Two Jacks**

CAUTION: Several points must be considered when raising the airplane with two jacks:

(1) It is best to jack the airplane in an enclosed area. Wind gusts will destabilize the airplane and cause it to fall off the jacks.

(2) The airplane must be jacked in a level area on a concrete surface.

(3) Raise the jacks simultaneously in short increments to ensure the airplane stays as level as possible.

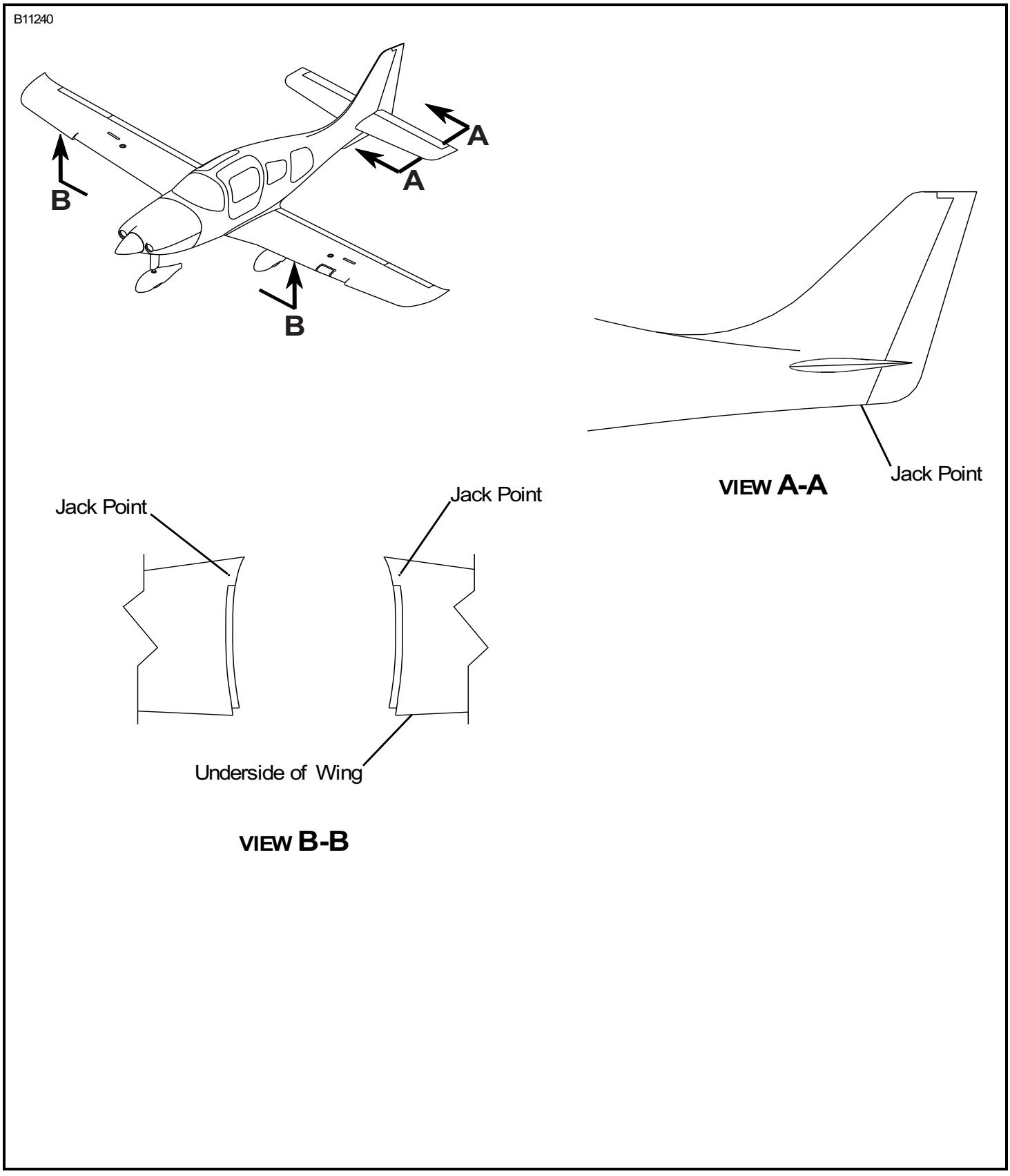
(4) If the jacks have locking pins, they must be inserted once the desired jacking height is achieved. Otherwise, the airplane must be continuously observed to ensure the jacks do not bleed off pressure. If the jack loses pressure while the tail is attached to the tail stand, damage to the tail will result.

(5) Once the airplane is on jacks, do not attempt to enter the airplane.

(6) When lowering the airplane, remove the tail stand support and bleed pressure evenly from jacks in short increments.

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Figure 1 : Sheet 1 : Jack Point Locations



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LEVELING AND WEIGHING - GENERAL

1. Scope

A. For data on airplane leveling procedures, refer to section 6 of the applicable Pilot's Operating Handbook.

B. For data on airplane weighing procedures, refer to section 6 of the applicable Pilot's Operating Handbook.

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TOWING AND TAXIING - GENERAL

1. General

A. The following pages contain instructions for towing and taxiing the airplane. It is important to remember that the airplane has a free castoring nose wheel with stops at the 60 degrees left and right positions. Personnel unfamiliar with the techniques required when taxiing an airplane with a free castoring nose wheel should be given appropriate instruction or a taxi checkout.

2. Ground Handling

CAUTION: Do not attempt to move the airplane by pushing or pulling on the propeller. This a common practice for airplanes with fixed pitch propellers, however, it is not recommended for constant speed propellers, since pressures applied to the propeller blades are transmitted to moving parts within the propeller hub. Over time, these forces could cause damage to the propeller.

A. Towing - A locking, hand-held tow bar is provided with the airplane and stored in the baggage compartment. The tow bar is inserted into two small holes in the nose wheel fairing, forward of the nose wheel axle. The tow bar must be locked in place before attempting to move the airplane. The tow bar is collapsible for storage by removing the locking pin. With the pin removed, slide the handle in and reinsert the locking pin. It is recommended that the airplane only be maneuvered during towing by use of the handheld tow bar. If it is necessary to tow with a vehicle, extreme care is required to ensure the rotation limits of the nose wheel (60 degrees left and right) are not exceeded. Since the rotation of the nose gear is limited by physical stops, rotating the gear beyond 60 degrees will damage the airplane.

B. It is a good idea to have another person serve as a spotter when towing the airplane, particularly if a vehicle is used. Remember that the airplane has vertical limitations as well as horizontal restrictions. The vertical stabilizer is frequently overlooked as an airplane is being pushed into a hanger with most of the attention directed towards the wingtips. When moving the airplane over uneven surfaces, remember that small up and down oscillations of the nose strut result in amplified movement of the vertical stabilizer. Finally, keep in mind that the height of the vertical stabilizer is affected by inflation levels of both the nose tire and strut. A flat tire or low nose strut will increase the height of the vertical stabilizer.

3. Taxiing

A. When taxiing, minimize the use of the brakes. Since the airplane has a free-castoring nose wheel, steering is accomplished with light breaking. Avoid the tendency to ride the brakes by making light steering corrections as required and then allowing the feet to slide off the brakes and the heels to touch the floor.

B. Avoid taxiing in areas of loose gravel, small rocks, etc., since it can cause abrasion and damage to the propeller. If it is necessary to taxi in these areas, maintain low propeller speeds. If taxiing from a hard surface through a small area of gravel, obtain momentum before reaching the gravel.

C. The airplane is stable on the ground. The low wing design minimizes the tipping tendency from strong winds while taxiing. Still, the proper positioning of control surfaces during taxiing will improve ground stability in high wind conditions. The following table summarizes control positions that should be maintained for a given wind component.

Table 1. Control Positions for Wind Components

Wind Component	Aileron Position	Elevator Position
Left Quartering Headwind	Left Wing Aileron Up(Move Aileron Control to the Left)	Neutral(Hold Elevator Control in Neutral Position)
Right Quartering Headwind	Right Wing Aileron Up(Move Ailero Control to the Right)	Neutral (Hold Elevator Control in Neutral Position)
Left Quartering Tailwind	Left Wing Aileron Down(Move Aileron Control to the Right)	Down Elevator(Move Elevator Control Forward)
Right Quartering Tailwind	Right Wing Aileron Down(Move Aileron Control to the Left)	Down Elevator (Move Elevator Control Forward)

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PARKING, MOORING, STORAGE, AND RETURN TO SERVICE - DESCRIPTION AND OPERATION

1. Scope

A. This chapter describes and provides maintenance instructions for parking, storing, and mooring.

2. Parking

A. During parking operations, it is best to head the airplane into the wind if possible. Normally, setting the parking brake is recommended, however, there are two situations where doing so is not a good idea.

(1) If the brakes are overheated, which might result from a short field landing or extensive taxiing, it is best to not set them until they have had a sufficient cooling period. A brake pad clamped to a hot chrome disk can cause uneven cooling of the brake disc, which could potentially warp it.

(2) It is also not a good idea to set the brakes in cold weather. Accumulations of freezing rain, ice, and snow can freeze-weld the brake pad to the disk. Landing or taxiing in standing water at near freezing temperatures can cause similar problems if the brakes are set when the airplane is parked.

3. Tools, Equipment and Materials

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

NAME	NUMBER	MANUFACTURER	USE
Gust Lock		Design Research & Development Corp.	To prevent rudder movement in storage.
Pitot Tube Cover	15219	Aircraft Spruce and Speciality Co.	To prevent entry of moisture and/or foreign particles in pitot tubes.
Headset	308100-0280	Bose Corp.	For audio communication.
Fuel Sample Cup	391D	Avail Inc.	To collect fuel sample.
Tow Bar	4-Lance	Bogert Aviation	To tow airplane.

4. Securing The Airplane

A. In any event, whether the brakes are set or not set, the airplane should be chocked and the following items should be accomplished to secure the airplane.

(1) Chock the main gear tires with chocks on both sides of each tire.

(2) Attach a rope or chain to each tie-down point, and secure the rope or chain to a ramp tie-down point. There are three tie-down points, one on each wing and one on the tail. The ropes or chains should have a tensile strength of at least 750 lbs.

(3) Install the pitot tube cover.

5. Storage

A. **Overview** - The storage of an airplane mostly deals with engine related items. Very little needs to or can be done to preserve the airframe, particularly for flyable and temporary storage. The best protection for the exterior is, of course, to hangar the airplane. If the airplane cannot be hangared, then a coat of wax using the material and techniques described in Section 8 of the *Pilot's Operating Handbook* should be applied to all exterior surfaces. In addition, all typical items associated with securing the airplane should be done. These include:

(1) Installing the pitot tube cover

(2) Chocking all wheels and tying the airplane down with the parking brakes released

(3) Installing the control lock

(4) Topping off the fuel tanks

(5) Cleaning the bolts and nuts on the brakes and applying a non-stick preservative like graphite or silicone

(6) Installing other owner option protection devices

There are three types of storage categories: flyable, temporary, and indefinite. The time period and applicable storage procedure for each type is discussed below.

B. **Flyable Storage (5 to 30 days)** - If the airplane is to be maintained in flyable storage, then it should be flown for a minimum of 30 minutes every 30 days; ground running the engine is not a substitute for flying the airplane. During flyable

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storage, the propeller should be rotated by hand every seven days. This operation should include at least six complete revolutions of the engine. Stop the propeller 45 to 90 degrees from its original position. For maximum safety use the following procedures:

(1) Ensure that the ignition switch is set to the OFF position.

(2) Set the throttle to the CLOSED position.

(3) Set the mixture to IDLE CUT OFF.

(4) Set the parking brake and chock the wheels.

(5) Ensure that airplane tie-downs are secure.

(6) Open the cabin door on the pilot's side of the airplane.

(7) Always assume the propeller could start when moving it manually and use an appropriate technique for hand turning the propeller.

(8) Release the parking brake when the operation is completed.

C. **Temporary Storage (up to 90 days)** - Use the following procedures to preserve the engine for temporary storage. Refer to the Airframe Preservation for Temporary or Indefinite Storage section for airframe preservation items.

WARNING: Always assume that the engine could start when rotating the propeller by hand. Remain clear of the arc of the propeller blades at all times.

(1) Remove the top spark plug from each of the six cylinders, and apply an atomized injection of preservation oil, MIL-L-46002, Grade 1 at room temperature through the upper spark plug hole of each cylinder with the piston in approximately the bottom dead center position. Rotate the crankshaft as opposite cylinders are sprayed. Stop the crankshaft with none of the pistons at top dead center.

(2) After stopping the crankshaft with none of the pistons at dead center, re-spray each cylinder thoroughly making sure to cover all interior surfaces.

(3) Install spark plugs.

(4) Spray approximately two ounces of preservation oil through the oil filler tube.

(5) Seal all engine openings exposed to the atmosphere with suitable plugs or moisture resistant tape.

(6) Tag engine, cowling, and other appropriate areas with the statement, "Do not turn propeller, engine preserved."

D. **Indefinite Storage (Over 90 Days)** - If the airplane is to be stored for a long period, follow the procedures listed below to preserve the engine. Refer to the Airframe Preservation for Temporary or Indefinite Storage section for airframe preservation items.

(1) Drain the engine oil and refill with MIL-C-6529 Type II preservation oil. Start the engine and operate until normal temperature ranges are achieved. Fly the airplane for about 30 minutes and then allow the engine to cool to the ambient temperature.

(2) Remove the top spark plug from each of the six cylinders, and apply an atomized injection of preservation oil, MIL-L-46002, Grade 1 at room temperature through the upper spark plug hole of each cylinder with the piston in approximately the bottom dead center position. Rotate the crankshaft as opposite cylinders are sprayed. Stop the crankshaft with none of the pistons at top dead center.

(3) After stopping the crankshaft with none of the pistons at dead center, re-spray each cylinder thoroughly making sure to cover all interior surfaces.

(4) Spray approximately two ounces of preservation oil through the oil filler tube.

(5) Install dehydrator plugs MS27215-1 or -2, in each of the top spark plug holes. Ensure the dehydrator plug is blue when installed. Protect and support the spark plug leads with AN-4060 protectors.

(6) Place a bag of desiccant in the exhaust pipes and seal the openings with moisture resistant tape.

(7) Seal the induction system with moisture resistant tape.

(8) Seal the engine breather by taping a dehydrator plug, M527215-2, in the lower end. Seal the "whistle hole" vent in the breather tube with moisture resistant tape.

(9) Tag engine, cowling, and other appropriate areas with the statement, "Do not turn propeller, engine preserved."

(10) Install plugs in engine cowl inlets, wing leading edge air inlets, and all other openings. **Do not plug or seal tank vents on the bottom of each wing**.

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NOTE: During the storage period, FAA Airworthiness Directives and manufacturer's service bulletins may apply which require action based on calendar dates, not operating hours. These items must still be complied with even though the airplane is in storage.

NOTE: The dehydrator plugs must be visually checked every 30 days to verify that the color has not changed. Bad dehydrator plugs should be replaced. If more than half of the plugs change color, the bad plugs and all the desiccant bags on the engine should be replaced. Every six months the dehydrator plugs should be replaced and the cylinders re-sprayed with preservation oil. When removing the plugs, check the cylinder interior. If rust stains are noted, spray the cylinder with preservation oil, turn the prop through six revolutions, and then re-spray all cylinders.

E. **Airframe Preservation for Temporary and Indefinite Storage** - If the airplane is to be stored for over 30 days, some or all the procedures below may be applicable, depending on the anticipated storage time period.

(1) Ensure the tires are free of grease, oil, tar, and gasoline. The presence of these items accelerates the aging process. Sunlight and static electricity convert oxygen to ozone, a substance that accelerates the aging process. Special tire covers can be installed which retard the erosion process.

(2) It is best if the weight of the airplane is removed from the tires to prevent flat spots. If the airplane cannot be blocked or set on jacks, then every 30 days each wheel should be rotated about 90° to expose a new tire pressure point.

(3) If the airplane does not have a recent coat of wax, a new coat should be applied as discussed in Chapter 12 of this manual.

(4) Lubricate exposed exterior metal fittings, hinges, push rods, etc. Use plugs or moisture resistant tape to seal all openings except fuel vent holes and drain holes.

(5) Remove the battery and store in a cool, dry location. The battery may need periodic servicing and recharging depending on the storage period.

(6) Prominently tag areas where tape and plugs are installed.

6. Inspections During Temporary Storage

A. The following inspections should be performed while the airplane is in temporary storage.

(1) Check the cleanliness of the airframe as frequently as possible and remove any dust that has collected.

(2) Check the condition and durability of the protective wax coat and renew as required.

(3) Every 30 days, check the interior of at least one cylinder for evidence of corrosion.

7. Inspections During Indefinite Storage

A. The following inspections should be performed while the airplane is in indefinite storage.

(1) Check the condition of the dehydrator plugs ever 30 days to verify that the color has not changed. Bad dehydrator plugs should be replaced. If more than half of the plugs change color, the bad plugs and all the desiccant bags on the engine should be replaced.

(2) Every six months the dehydrator plugs should be replaced and the cylinders re-sprayed with preservation oil. When removing the plugs, check the cylinder interior. If rust stains are noted, spray the cylinder with preservation oil, turn the prop through six revolutions, and then re-spray all cylinders.

NOTE: When an airplane has been in storage for a long period, the date of the required annual inspection may have passed. There is no requirement to perform this inspection during the temporary or indefinite storage period. However, the inspection must be completed before the airplane is returned to service.

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SERVICING - GENERAL

1. Servicing

A. There are recommended and required servicing intervals specified in Section 05-20-00 of this maintenance manual. It is important to note that the servicing items for the recommended and required inspection intervals are based on typical operations. If the owner or operator of the airplane uses the airplane on an ongoing basis in an atypical environment, then the servicing procedures must be modified accordingly. These environmental conditions might include extremes in ambient temperature or humidity, operation in areas of high dust or sand, or unusual operating requirements, to mention a few.

B. In general, minimal servicing of the airplane is required between required maintenance inspection other than fuel, oil, and maintenance of proper tire pressures. In some instances, the nose strut may require unscheduled service, depending on how the airplane is used.

2. Refueling And Defueling the Airplane

A. The high-speed characteristics of the airplane make generation of static electricity more likely, so it is important for the airplane to be grounded to the fuel source during refueling and defueling operations. Place the fuel source grounding clamp on the right or left exhaust stack of the airplane before touching the filler neck of the fuel tanks with metal parts of the ground refueling/defueling equipment. Remember that refueling is often done at the conclusion of a flight, and the exhaust stacks may still be hot, so care must be used when attaching the clamp.

B. Some defueling is possible using the defueling feature on the delivery system of the Avgas fuel supplier. This procedure is usually adequate for removing fuel when gross takeoff weight is an issue. To completely defuel the airplane, use the following steps:

(1) Select a well-ventilated area for the defueling operation.

(2) Remove all fuel possible from the tank or tanks using the defueling feature on the Avgas delivery system.

(3) Disconnect the fuel line from the auxiliary fuel pump forward of the firewall.

(4) Connect a flexible hose to the fuel line, and direct the hose into a fuel receptacle.

(5) Set the fuel selector to either the left or right tank, depending on which tank is to be defueled.

(6) Operate the auxiliary boost in low until the tank is drained. When the pump first starts to cavitate, turn it off, and attempt no further defueling with the auxiliary boost pump.

3. Procedures For Draining The Fuel System

A. The following procedures will leave approximately three to four gallons in the fuel tank. If further draining is required to work on a fuel tank or to establish the empty weight with unusable fuel (refer to the Fuel Drains section), use the following procedure:

(1) Select a well-ventilated area for draining fuel from the tank.

(2) Create a small (2-inch diameter) dam around the wing tank drain with aluminum foil tape (sometime referred to as speed tape) or a similar substance.

(3) Place a container with a large opening under the fuel drain.

(4) Set the wing fuel drain to the locked-open position, and drain until fuel stops running.

(5) If all fuel is to be drained from the airplane, perform the above procedure for both tanks, and then drain the gascolator.

To establish the airplane's empty weight with unusable fuel, use the following procedure for each tank:

(1) Select a well-ventilated area for draining fuel from the tank.

(2) Create a small (2-inch diameter) dam around the wing tank drain with aluminum foil tape (sometime referred to as speed tape) or a similar substance.

(3) Place a container with a large opening under the fuel drain.

(4) Set the wing fuel drain to the locked-open position, and drain until fuel stops running.

(5) At this point, approximately 4 to 8 ounces of undrainable fuel will remain in each tank. and then

(a) Ensure the fuel drains are closed.

(b) Add two gallons of fuel to each tank.

4. Fuel Drains

A. The inboard section of each tank contains a fuel drain near the lowest point in each tank. The fuel drain can be opened

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intermittently for a small sample, or it can be locked open to remove a large quantity of fuel. The gascolator, or fuel strainer, is located under the fuselage, on the left side, near the wing saddle. The gascolator is a conventional drain device that operates by pushing up on the valve stem. There is an internal bypass in the strainer that routes fuel around the filter if it becomes clogged.

5. Fuel Contamination

A. To test for fuel contamination, fuel samples must be taken from each of the wing drains and from the gascolator before each flight and after the airplane is refueled. Wait approximately 10 minutes before taking a sample after refueling to allow water and other contaminates to settle to the bottom of the tank. There are three types of contaminates that can inadvertently be introduced to the fuel system:

(1) Sediment such as dirt and bacteria

(2) Water

(3) The improper grade of fuel

B. The accumulation of sediments is an inherent issue with most aircraft and can never be completely eliminated. Refueling the airplane at the conclusion of each flight and using fuel from a supplier who routinely maintains the filtration of the refueling equipment will lessen the problem somewhat. If specks are observed in the fuel sampler, continue the sampling operation until no debris is observed. Be sure the sampling device is clean before using it.

C. The two more common sources of water contamination are condensation of water from the air within a partially filled fuel tank and water-contaminated Avgas from a fuel supplier. Again, refueling after each flight and proper filtration of the fuel delivery system will mitigate water contamination. Water, which is heavier than Avgas, will collect near the bottom of the sampling device. If water is observed in the fuel sampler, take additional fuel samples until all the water is removed.

D. Aviation fuel is dyed according to its grade, and on new aircraft, like the Cessna 400 (LC41-550FG), the filler neck is sized to only accept fuel of the proper grade. Still, the color of the fuel must be verified according to the specifications listed in this paragraph, since the fuel truck might have been refilled improperly. If fuels of two different grades are mixed, the fuel sample will be clear. If an inferior, improper grade of fuel is noted, completely defuel and drain both tanks, and refuel with the proper grade of Avgas.

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REPLENISHING - SERVICING

1. General

A. This section gives maintenance personnel the service information to replenish fuel, oil, oxygen, and TKS anti-ice fluid.

2. Fuel Servicing and Recommended Fuel Grades

A. If possible and practicable, the airplane should be serviced at the conclusion of each flight. This procedure will significantly mitigate water accumulation in the fuel tanks. For the list of approved fuels refer to the applicable Model T240 POH.

3. Fuel Capacities

A. Total Capacity: 106 Gallons US (401 L)

B. Total Capacity Each Tank: 53 Gallons US (201 L)

C. Total Usable Fuel:

(1) S/N 41001 to 41799: 49 Gallons US (186 L)/tank, 98 Gallons US 371 L) Total

(2) S/N 41800 and on:

(a) Standard: 43 Gallons US (163 L)/tank, 86 Gallons US (326 L) Total

(b) Long Range: 51 Gallons US (193 L)/tank, 102 Gallons US (386 L) Total

4. Approved Fuel Additives

A. Under certain ambient conditions of temperature and humidity, water can be supported in the fuel in sufficient quantities to create restrictive ice formation along various segments of the fuel system. To alleviate the possibility of this occurring, it is permissible to add Isopropyl Alcohol to the fuel supply in quantities not to exceed 3 percent of the total. In addition, ethylene glycol monomethyl ether (EGME) and diethylene glycol monomethyl ether (DiEGME) compounds in accordance with military specification MIL-I-27686E may be added for this purpose. The EGME and DiEGME compounds must be carefully mixed with fuel concentrations not to exceed 0.15 percent by volume.

B. It is important that the approved fuel additives are mixed in correct proportions. Consideration is required to ensure the appropriate concentration levels are achieved when the tank is filled. For example, adding 40 gallons of fuel with a 0.15 percent concentration of EGME to a tank with 10 gallons of untreated fuel will produce a mixture of something less than 0.15 percent. Consideration must also be made for the unusable fuel in the tank since it will be combined with the total mixture.

C. The additives shall be added as the fuel is introduced to the fuel tank so that the mixture is properly combined. Alternatively, the additive can be mixed with a small amount of fuel in a separate container, such as a five-gallon can, and added to the fuel tank before normal fueling. Table 301 lists the number of ounces of each additive for a given fuel quantity.

WARNING: Proper mixing of EGME and DiEGME compounds is extremely important because concentrations more than 0.15 percent by volume can have a harmful effect on engine components.

Table 301. Fuel Additive Mixture Table

Fuel (Gallons)	Isopropyl Alcohol (3 percent) Fluid Ounces	EGME & Di- EGME (0.15 percent) Fluid Ounces	Fuel (Gallons)	Isopropyl Alcohol (3 percent) Fluid Ounces	EGME & DiEGME (0.15 percent) Fluid Ounces
1	3.8	0.2	27	103.7	5.2
2	7.7	0.4	28	107.5	5.4
3	11.5	0.6	29	111.4	5.6
4	15.4	0.8	30	115.2	5.8
5	19.2	1.0	31	119.0	6.0
6	23.0	1.2	32	122.9	6.1
7	26.9	1.3	33	126.7	6.3
8	30.7	1.5	34	130.6	6.5
9	34.6	1.7	35	134.4	6.7
10	38.4	1.9	36	138.2	6.9
11	42.2	2.1	37	142.1	7.1

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12	46.1	2.3	38	145.9	7.3
13	49.9	2.5	39	149.8	7.5
14	53.8	2.7	40	153.6	7.7
15	57.6	2.9	41	157.4	7.9
16	61.4	3.1	42	161.3	8.1
17	65.3	3.3	43	165.1	8.3
18	69.1	3.5	44	169.0	8.4
19	73.0	3.6	45	172.8	8.6
20	76.8	3.8	46	176.6	8.8
21	80.6	4.0	47	180.5	9.0
22	84.5	4.2	48	184.3	9.2
23	88.3	4.4	49	188.2	9.4
24	92.2	4.6	50	192.0	9.6
25	96.0	4.8	51	195.8	9.8
26	99.8	5.0	52	199.7	10.0

5. Engine Oil Capacity

A. The dipstick and oil filler cap access door are located on the top left engine cowl about two feet from the propeller hub. The engine must not be operated with less than six quarts of oil and must not be filled above eight quarts. For extended flights, the oil should be brought up to full capacity.

B. The engine drain-refill capacity is eight quarts of oil. The airplane engine holds approximately 11 quarts of oil; however, about 3 quarts are for the oil cooler, oil filter, and propeller governor and cannot be drained from the system. Before checking the oil on a hot engine, ensure sufficient time has elapsed to allow the oil to drain back into the sump.

6. Recommended Oil for Engine Break-In Period

A. During the engine break-in period, straight mineral oil must be used for the first 25 hours unless the oil consumption has not stabilized. If the oil consumption has stabilized after the first 25 hours of the airplane's time in service, the oil and oil filter must be changed and a new supply of Teledyne Continental Motors specification MHS-24 (latest revision) ashless dispersant oil must be used. At 50 hours of time in service, the oil and oil filter shall be changed and the filter and discarded oil checked for evidence of metal particles. Thereafter, the oil and oil filter must be changed at every 100 hours of time in service.

B. If after the initial 25 hour break-in period the oil consumption has not stabilized, use the following procedure.

(1) Inspect and replace the oil filter.

(2) Drain and inspect the engine oil.

(3) Install a fresh supply of approved mineral oil.

(4) Continue to monitor oil consumption.

(5) When oil consumption stabilizes, remove, inspect, and replace the oil filter. Drain and inspect the engine oil, and add a new supply of Teledyne Continental Motors (TCM) specification MHS-24 (latest revision) ashless dispersant oil.

C. In the extremely unlikely event the oil consumption has not stabilized at 50 hours of time in service, the cylinders may need deglazing or some other problem may exist. In either event the issue should be referred to TCM.

7. Oil Servicing

A. The oil grades shown below in Recommended Oil Grades are recommended after the initial engine break-in period. Only lubricant oils conforming to Teledyne Continental Motors Specification MHS-24D (latest revision) can be used. Note, the approval for use of MHS-25 synthetic oils has been removed. Each time the oil and the oil filter are changed, the discarded filter and oil must be checked for evidence of metal particles. The oil drain valve is located on the bottom of the engine oil sump.

8. Oil Filter Servicing

A. A full flow, spin-on type, 20-micron oil filter is used. As mentioned previously, the filter must be changed during the initial

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break-in period at 25 and 50 hours time in service. Thereafter, the filter must be replaced at every 50 hours time in service interval. If the airplane is predominately operated in conditions of high dust or other atmospheric debris, it is advisable to change the filter at 25 hour intervals. The oil filter is located on the back of the engine and inboard from the oil cooler. Use a TCM filter or approved equivalent.

9. Recommended Oil Grades

A. The following oil grades are recommended for the two ambient temperature ranges shown below.

(1) Below 40°F: SAE 30, 10W-30, 15W-50, or 20W-50

(2) Above 40°F: SAE 50, 15W-50, or 20W-50

10. Oxygen System Servicing

A. General safety guidelines and servicing procedures must be followed and are as indicated in Chapter 35. Use only MIL-O-27210 aviator's breathing oxygen for system recharging.

NOTE: This fixed oxygen system has a maximum bottle pressure of 2,000 psi.

WARNING: Refer to SAFETY GUIDELINES FOR SERVICING THE OXYGEN SYSTEM in Chapter 35 before attempting any servicing or maintenance of the oxygen system.

(1) Avidyne Option

(a) Open all aircraft doors to provide air circulation.

(b) Set the Left Bus switch to ON.

(c) Set the Oxygen Switch to DISP.

(d) Locate the Oxygen Fill Port in the baggage bulkhead.

(e) Remove the Oxygen Fill Port protective cap and connect the service line.

(f) Slowly fill the oxygen supply. By filling slowly, the temperature rise due to the compression of gas into the oxygen supply cylinders will be kept to a minimum.

(g) Fill the system until a pressure of 1950 ± 50 psig is achieved. This value is valid at a steady state condition after the system has cooled to 70°F from the recharging heat buildup. System pressure may be increased 3.5 psig for each degree of increase in temperature above 70°F and decreased 3.5 psig for each degree decrease in temperature below 70°F.

(h) Shut off the oxygen supply to the aircraft.

(i) Set the Oxygen Switch to ON.

(j) Ensure that the Outlet Pressure Display green indication is illuminated.

(k) Set the Oxygen Switch to OFF.

(l) Set the Left Bus switch to OFF.

(m) Disconnect the service line from the Fill Port and install the protective cap.

(2) Garmin G1000 Option

(a) Open all aircraft doors to provide air circulation.

(b) Set the Right Bus and Avionics Bus switches to ON.

(c) Turn on the MFD and access the Engine Indication System (EIS) page.

(d) Locate the Oxygen Fill Port in the baggage bulkhead.

(e) Remove the Oxygen Fill Port protective cap and connect the service line.

(f) Slowly fill the oxygen supply. By filling slowly, the temperature rise due to the compression of gas into the oxygen supply cylinders will be kept to a minimum.

(g) Fill the system until a pressure of 1950±50 psig is achieved. This value is valid at a steady state condition after the system has cooled to 70°F from the recharging heat buildup. System pressure may be increased 3.5 psig for each degree of increase in temperature above 70°F and decreased 3.5 psig for each degree decrease in temperature below 70°F.

(h) Shut off the oxygen supply to the aircraft.

(i) Set the Oxygen Switch to ON.

(j) Ensure that the Outlet Pressure and Oxygen Quantity gauges confirm oxygen supply.

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(k) Set the Oxygen Switch to OFF.

(l) Turn off the MFD.

(m) Set the Right Bus and Avionics Bus switches to OFF.

(n) Disconnect the service line from the Fill Port and install the protective cap.

11. TKS Anti-Ice Fluid

A. The Model T240 can have an inadvertent or a FIKI option anti-ice system installed. The TKS anti-ice fluid tank must be filled before takeoff for the system to be considered operational.

B. For the TKS inadvertent system installation, the fluid tank is serviced through a filler port located on the top of the left wing. (refer to Figure 301). A fluid level sensor supplies a signal to the fluid quantity gage that shows in the Muti-Function Display (MFD).

C. For the TKS FIKI system installation, the fluid tank is serviced through a filler port located on the top of the right wing (refer to Figure 301). A fluid level sensor supplies a signal to the fluid quantity gage that shows in the Muti-Function Display (MFD). A low level switch in the fluid tank supplies a discrete to the Integrated Avionics Unit 1 (UC300) that then sends a signal to the PFD that causes the CAS message A-ICE FLUID LO message to show on the display.

D. Designations and manufacturers of approved TKS anti-ice fluid are shown in the table that follows:

NOTE: Ice protection fluid must meet the AL5 (DTD406B) specifications. You can mix fluids that meet these specifications in the anti-ice fluid tank in any proportion.

WARNING: Do not use automobile anti-freeze fluids because they can contain additives that are harmful to the membranes in the porous panels or to other system components. Also, you are not permitted to use thickened deice fluid for runway or parked aircraft deicing.

Table 302. TKS Anti-Ice Fluid

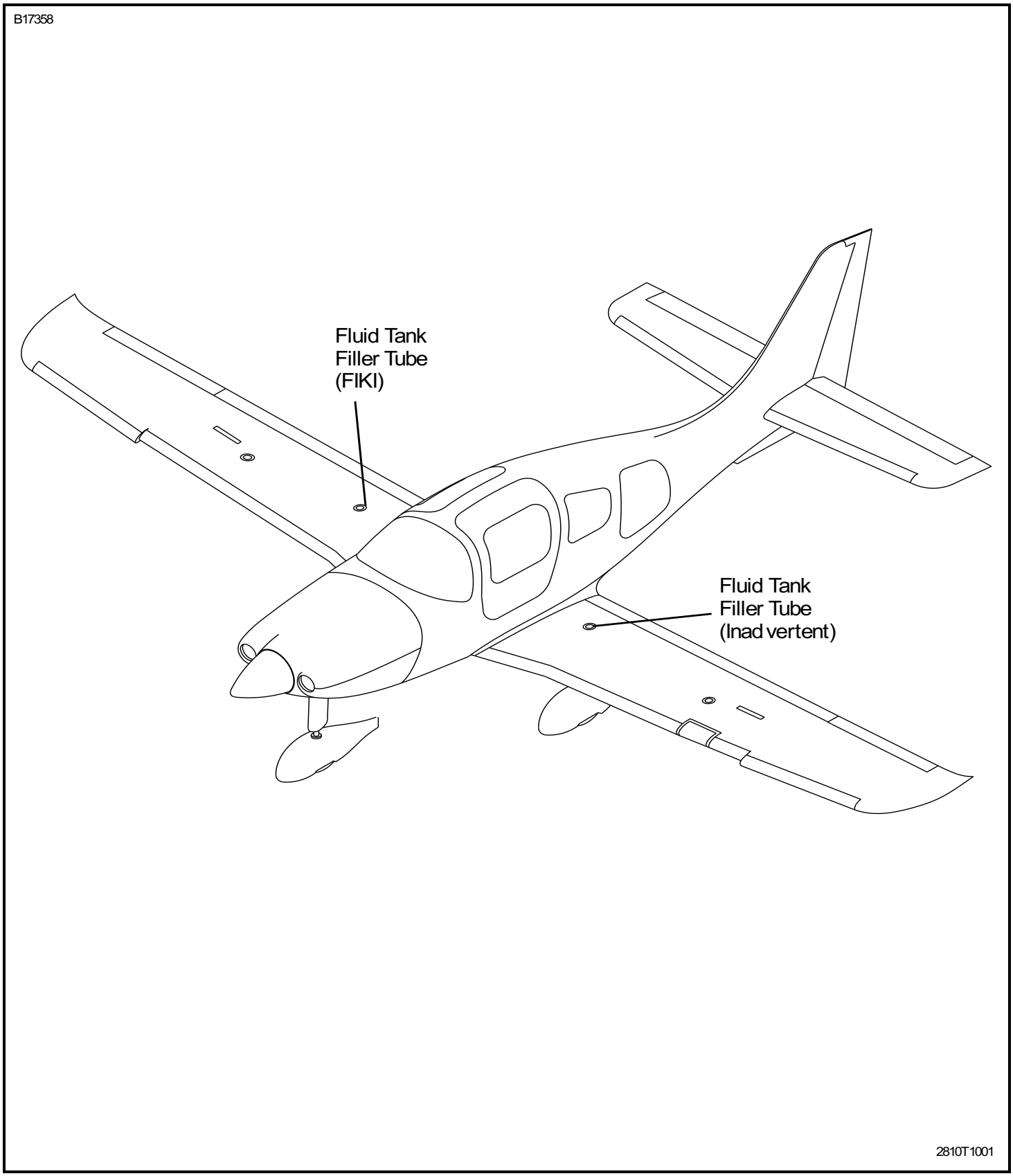
SYSTEM	U.S. GALLONS	IMPERIAL GALLONS	METRIC LITERS	NAME, NUMBER OR TYPE
Surface Reservoir (Inadvertent System)	3.1	2.58	11.731	AL 5 Canyon Industries P.O. Box 26447 Tempe, AZ 85282
				AEROSHELL COMPOUND 07 Shell Oil Company One Shell Plaza Houston, TX 77001
				BP AERO DEICING 2 BP Oil Limited BP House Victoria Street London SWIE 5NJ UK
				AVL-TKS Aviation Laboratories 5401 Mitchelldale B6 Houston, TX 77092
Windshield and Surface Reservoir (FIKI System)	10.0	8.32	37.83	AL 5
				AEROSHELL COMPOUND 07
				BP AERO DEICING 2
				AVL-TKS

NOTE 1:

All anti-icing fluids that are in accordance with British Deicing Fluid Specification DTD 406B (NATO Symbol S-745) are approved.

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Figure 301 : Sheet 1 : TKS Filler Port



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FILTER, STRUT, BRAKE AND BATTERY - SERVICING

1. Induction Filter Servicing

A. The airplane has a disposable air filter, Brackett Aircraft Company, Inc. Part No. BA-345E. The polygonal filter element is a wettant impregnated foam. The filter must be serviced annually, every 100 hours, or more frequently if operating in areas of high atmospheric debris. To service the filter, use the following procedure.

(1) Remove the air filter element from the engine per the instructions in Section 71-60-00, Engine Air Filter Removal and Replacement.

(2) Dispose of the old filter element.

B. Install a new filter element per the instructions in Section 71-60-00, Engine Air Filter Removal and Replacement.

2. Tires and Wheels Servicing

A. Ensure tires are serviced to their proper pressures. Refer to Section 06-00-00, Landing Gear. The following items must also be inspected.

CAUTION: The profile of replacement tires that are not a recommended brand should be measured precisely to ensure they are the same height and width. The use of tires that have slightly larger profiles can cause damage to the tire and to the wheel pant, particularly during landing operations.

(1) Check tires for flat spots, splitting, dry rot, cuts, and any other evidence of damage.

(2) Check valve stem slip marks for evidence of slippage.

(3) Check wheels for damage.

(4) Check wheel bearings for condition and lubrication.

B. Tire Considerations - The airplane is normally delivered with Goodyear tires. These tires have a profile that provides about 3/8 inches clearance between the tire and wheel pants. Other brands of tires with similar specifications and TSOs may have slightly larger profiles. Tires with larger profiles are not recommended since damage to the tire or wheel pant is possible, particularly during landing. If other brands of tires are used, the profile of the tire must be precisely measured and compared with the Goodyear tire.

3. Servicing the Nose Strut

A. The nose strut is normally serviced at required maintenance inspections. If less than three to four inches of chrome are visible on the nose strut or a low oil level is indicated, then unscheduled servicing is necessary. A low oil level in the nose wheel strut may be indicated by one or both of two symptoms. First, there will a general deterioration in shimmy damping of the nose strut. Second, the nose will have a tendency to bounce noticeably while taxiing. If either or both of these conditions are experienced, a low oil level in the nose strut is the most likely cause.

B. **Cessna Nose Strut** (Refer to Figure 301 and Figure 302)

CAUTION: Always wear safety goggles when releasing gas pressure.

WARNING: Removal of the AN7-6A bolt without de-pressurizing the strut could cause serious injury.

(1) Remove the nose strut from the nose gear per instructions in Chapter 32.

(2) Remove the valve cap from the strut Schrader valve. Using a small flat bladed screwdriver, gently press in on the Schrader valve core stem to slowly bleed off nitrogen gas pressure in the strut.

(3) Remove the AN7-6A bolt at the top of the strut.

(4) Pull the strut rod to its fully extended position.

(5) Inflate the strut with nitrogen gas to a pressure of 50 psi.

(6) With the strut standing vertically, add MIL-H-5606F hydraulic oil through the AN7- 6A bolt hole until the chamber is full.

(7) Create an oil bleed device composed of a flexible hose inserted into a reservoir filled with MIL-H-5606F hydraulic oil. Ensure the hose is filled with oil and attach the free end to the AN7-6A bolt hole using a sealed fitting. Cycle the strut rod up, down, left, and right through its full range of motion until all air is removed. Ensure that no air enters the strut through the bleed device.

(8) With the strut rod fully extended, remove the valve core from the Schrader valve and release the nitrogen gas pressure.

(9) Pinch shut the flexible hose on the oil bleed device and push the strut rod up 0.75 inch from its fully extended position to correctly position the internal piston.

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(10) Un-pinch the flexible hose.

(11) Ensure the valve core is free from contaminates and reinstall it into the Schrader valve. Tighten snug.

(12) Slowly pull the strut rod to its fully extended position.

(13) Remove the bleed device and add additional hydraulic oil until the chamber is filled to the top.

(14) Replace the AN7-6A bolt and tighten snug.

(15) Inflate the strut with nitrogen gas until pressure reaches 250±25 psi. Best results are obtained using the following two techniques:

(a) Apply enough physical force on the nitrogen hose chuck to ensure a tight seal on the filler valve. The volume of area being filled is small and requires a lot of physical pressure to hold the chuck on the valve.

(b) When the strut is filled, remove the air hose chuck from the filler valve as quickly as possible. A persistent low nose gear strut is frequently the result of losing 50 pounds or so of pressure when the air chuck is removed. Over-pressurization will prevent full castoring movements of the nose wheel.

(16) With the strut firmly placed on the ground, attempt to compress the strut by hand. If the strut can be compressed, repeat the above instructions until all air is removed and the strut cannot be compressed.

(17) Torque the AN7-6A bolt at the top of the strut 80 to 100 in.-lbs.

(18) Install the Schrader valve cap and torque 10 to 15 in.-lbs.

(19) Install the nose strut into the nose gear per instructions in Chapter 32.

NOTE: Persistent and frequent loss of oil is an indication of more serious problems. The oil seals may need replacement or there may be issues with the integrity of the cylinder. Refer to Chapter 32 for information.

C. **ESCO Nose Strut** (Refer to Figure 303)

(1) Remove the lower cowling, using procedures described in Chapter 71, to expose the filler valve (Schrader valve).

(2) Remove all the weight from the nose strut by placing ballast on the tail, and let the strut settle for one hour.

(3) Release the nitrogen gas from the strut by pressing on the stem of the filler valve until most of the nitrogen is released. Hold a rag over the valve stem and use the hand to release the pressure to prevent a small amount of oil from being scavenged from the main cylinder as the nitrogen is released.

(4) Partially remove the valve core to evacuate the remaining gas in the cylinder.

(5) Remove the Schrader valve.

(6) Fully extend the strut, then compress the strut until the strut rod can be freely rotated left and right.

(7) Hydraulic oil that meets MIL-H-5606F can now be added slowly with a pump action oil can. Add oil until the level in the cylinder reaches the bottom of the hole from which the Schrader valve was removed.

(8) Rotate the strut rod left and right throughout its full range of rotation (60 degrees each direction) to completely fill internal components of the strut with oil. When internal components are full of oil, resistance should be felt while rotating the strut rod. Keep adding oil while rotating until the oil drains back out of the filler valve hole and no more can be added.

(9) Refit the Schrader valve and torque 150 to 200 in.-lbs.

(10) Ensure that the strut is fully extended. Insert the air hose chuck onto the valve stem. Fill until pressure reaches 250 psi. Best results are obtained using the following two techniques.

(a) Apply enough physical force on the nitrogen hose chuck to ensure a tight seal on the filler valve. The volume of area being filled is small and requires a lot of physical pressure to hold the chuck on the valve.

(b) When the strut is filled to 250 psi, remove the air hose chuck from the filler valve as quickly as possible. A persistent low nose gear strut is frequently the result of losing 50 pounds or so of pressure when the air chuck is removed.

(11) Repeat steps (3) through (6) above and finish filling the strut with oil until oil drains back out the filler valve hole and no more can be added.

(12) Refit the Schrader valve and torque 150 to 200 in.-lbs. Service the strut with nitrogen per the above instructions , replace the Schrader valve cap and tighten snug. Over-pressurization will create a nose high attitude while taxiing and will prevent full castoring movements of the nose wheel.

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(13) Lower the nose by progressively removing ballast from the tail. Pull down on the propeller to exert downward pressure on the nose gear. Verify that three to four inches of chrome are visible on the nose strut.

(14) Replace the lower cowling per instructions in Chapter 71.

NOTE: Persistent and frequent loss of oil is an indication of more serious problems. The oil seals may need replacement or there may be issues with the integrity of the cylinder. Refer to Chapter 32 for information.

4. Brake Fluids

A. Under most conditions, the airplane will not require servicing of the hydraulic system. There is a small hydraulic reservoir mounted on the upper portion of the firewall (engine side). The reservoir contains a hex head bolt, however, this area is not normally used for servicing the airplane. If brake sponginess is experienced, this is an indication that there is air in the system. More important, it may be an indication of a hydraulic leak in the brake system, and the areas proximate to the hydraulic lines, master cylinders, and brake assembly must be inspected for evidence of hydraulic oil. If no leaking is detected, then the brakes should be bled. Chapter 32 contains instructions for bleeding the brakes. If hydraulic fluid is added, use MIL-H-5606F.

5. Battery Servicing

A. The installed batteries are Concorde RG-1215 for S/N 41002 to 41500; they are Teledyne Gill G230S, Teledyne Gill G248S, Concorde RG24-10, or Concorde RG24-16 for S/N 41501 and On. The batteries are of valve regulated lead-acid (VRLA) design. Since the batteries have no electrolyte, there is no required servicing of the unit. The posts and cables are serviced at 100-hour inspections if applicable, otherwise, they are maintained during the annual inspection. It is recommended that the batteries be replaced every four years or sooner if poor overall performance is experienced.

6. Cleaning Aircraft

A. **Exterior** - The exterior painted surfaces are cleaned by washing with mild soap and water and drying with a soft towel or chamois. When operating in salt air environments, you will need to wash the airplane more frequently. The seal coats that are applied to the painted surface, in most instances, will provide adequate protection from moisture and the sun. Some additional protection is provided by waxing the painted surface and facilitates washing the airplane since bugs and dirt will not adhere as tightly to a waxed surface. A wax with a high concentration of carnauba is recommended. There are several commercial boat waxes available that are ideal for this use. Be sure to read the label with an eye for the percentage of carnauba in the compound.

NOTE: The exterior of the airplane should not be waxed within the first 90 days of the date of delivery. This period will ensure the painted surface has adequate time to cure. The exterior paint color on the upper fuselage area and the top of the wings has a good heat reflection index. This good index is required to ensure the continued bonding and integrity of the composite material. Only approved Cessna paint colors are permitted in these areas. Care must be taken to not lay dark, heat absorbing material on the top area of the wings and fuselage.

B. **Windshield and Windows** - The proper care of the windshield and windows (sometimes referred to as transparencies) is one of the more important exterior care items on the airplane. Never do anything that will scratch the surface of the acrylic plastic. The following points for cleaning and caring for the transparencies should be observed. Refer to the Transparency Repair section of Chapter 51 for approved cleaning materials and expanded procedures.

CAUTION: Do not use anything containing ammonia, aromatic solvents like methyl n-propyl ketone, acetone, lacquer thinner, paint stripper, gasoline, benzene, alcohol, anti-ice fluid, hydraulic fluid, fire extinguisher solutions, or window cleaner on the acrylic window surfaces. The use of these substances may cause the surface to craze.

(1) First, when cleaning the windows, it is recommended that rings and watches be removed as they can cause deep scratches. Long-sleeved shirts should be turned up a few rolls to hide exposed buttons.

(2) When removing bugs and dirt, avoid touching the surface. If possible, remove most of the dirt by flushing the windows and windshield with water and a mild dish soap mixture. Allow the accumulation of dirt and/or bugs to soak for a few minutes. If rubbing is required, a bare hand is best. When all the debris on the surface of the window is loosened, apply a second water flush, and then dry with a 100 percent cotton cloth.

(3) Use a good quality, non-abrasive cleaner/polish specifically intended for acrylic windows, and apply per the manufacturer's instructions. Use up and down or side to side movements when polishing. Never use a circular movement as this can cause glare rings.

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(4) The best polishing cloth is the softest cotton available. One hundred percent cotton flannel is ideal and available in yard goods stores. **Never** use any type of paper product or synthetic material. In particular, never use shop rags or shop towels. Be sure the polishing cloth is clean and dry. Reserve polishing cloths should be stored in a plastic bag to limit dirt accumulation.

(5) Small scratches, the type that can be seen but cannot be felt with a fingernail, should be filled with a polishing compound that has scratch-filling properties. A good quality, non-abrasive cleaner/polish specifically intended for acrylic windows frequently has scratch-filling properties and is satisfactory for regular use. Some scratches cannot be filled with a scratch-filling product. While the scratches cannot be felt, they are still visible, particularly when flying into the sun. In this instance, a mildly abrasive scratch removal cream can be used per manufacturer's recommendations. Scratches of greater magnitude require the use of high abrasives and removal of some of the window's surface around the greatest depth of the scratch. This procedure requires considerable expertise and frequently makes areas where the scratch was removed more objectionable than the original scratch.

NOTE: To remove difficult substance such as tape residue, oil, and grease, the safest solvents are 100 percent mineral spirits or kerosene. Some alcohols are safe, such as isopropyl alcohol.

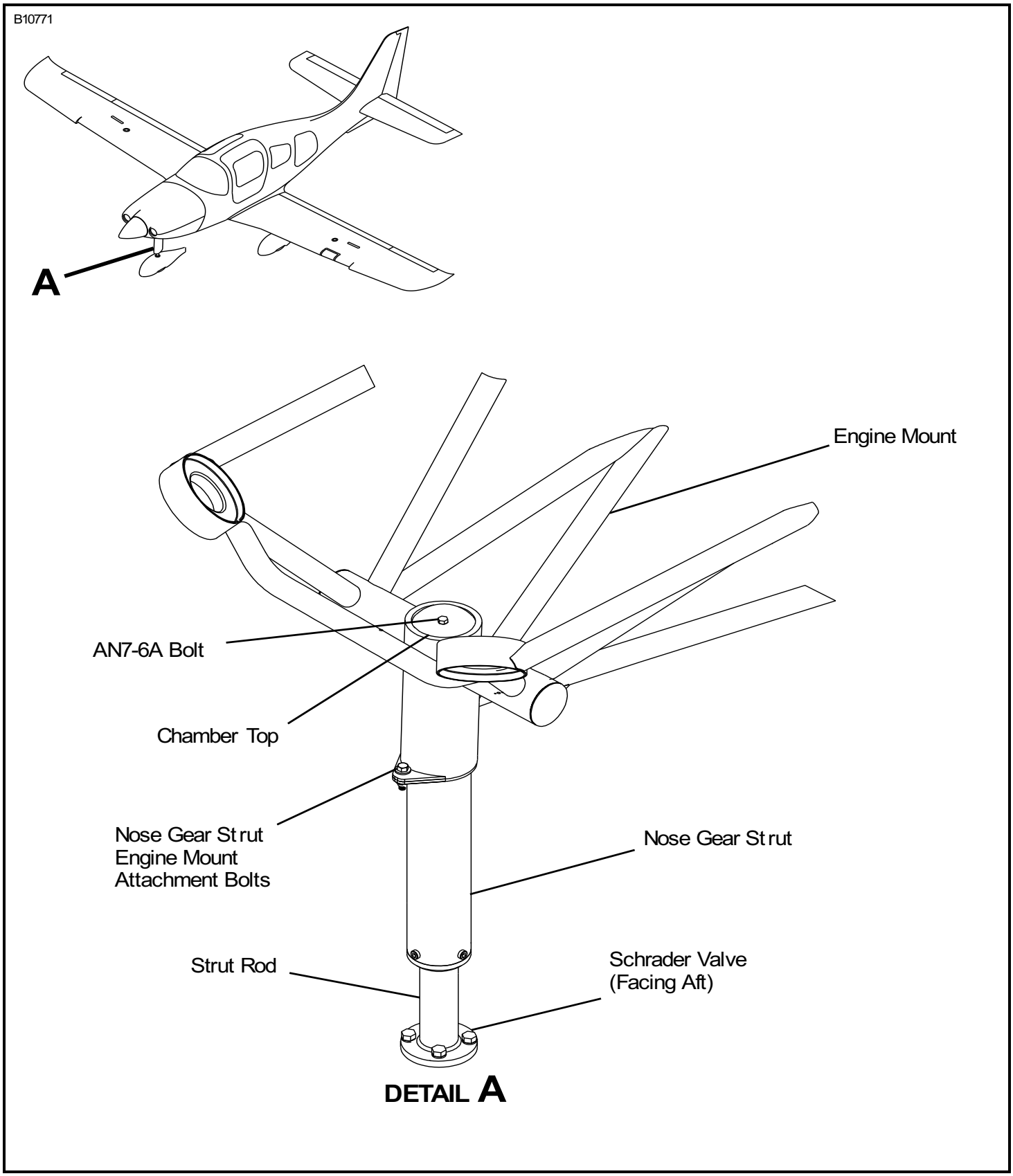
C. **Interior Cleaning and Care** - The useful life of the airplane's interior can be extended through proper care and cleaning. One of the major elements in the aging process is the interior's exposure to sunlight. If possible, the airplane should be hangared. Routine vacuuming is another item that helps extend the life of the airplane's interior, particularly the carpets. The leather seats, seatbacks, knee bolsters, glare shield and the like, should be routinely wiped with moist, soft cotton cloth. A general rule for spills is to blot the affected area with firm pressure for a few seconds. Never rub an area to remove a spill.

(1) Much of the airplane's interior is covered with high-quality leather. The leather is impregnated with polyvinyl chloride (PVC), and as treated, is impervious to most substances. The application of leather preservatives will provide little protection, and in some cases can cause problems. For difficult stains, such as an ink stain, remove with a mild soap and water. Do not use any type of chemical since these products tend to remove the impregnated PVC protection, and once removed it can never be reapplied.

(2) The carpet can be cleaned with a mild foam product, but care should be used not to over saturate the carpet. Follow the manufacturer's instructions regarding use of the foam cleaner. Small spots can be cleaned with a commercial spot remover; however, this must be done with care. Again, follow the recommended procedure of the manufacturer, and try a test application in an area of limited exposure.

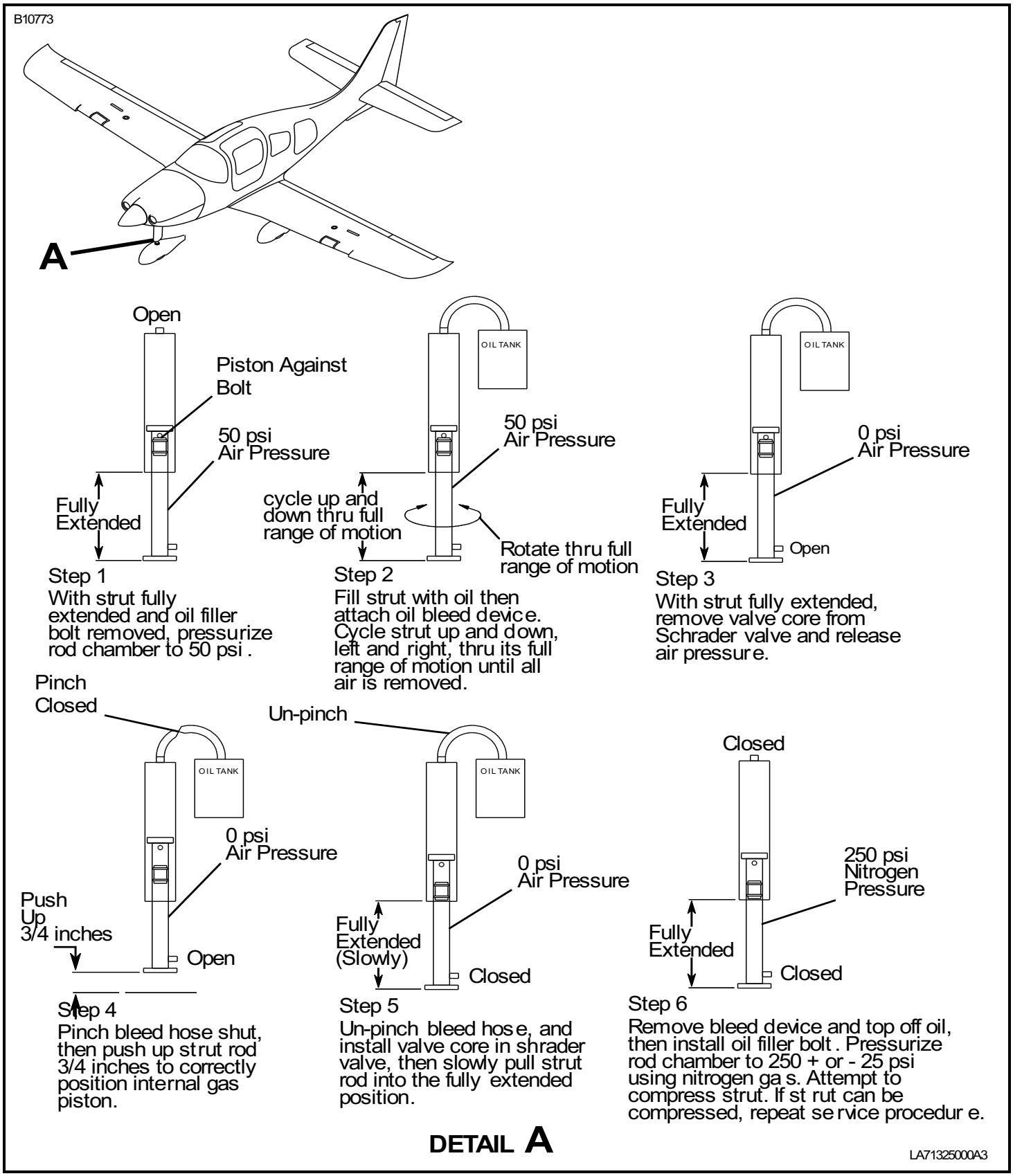
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Figure 301 : Sheet 1 : Cessna Nose Strut Assembly



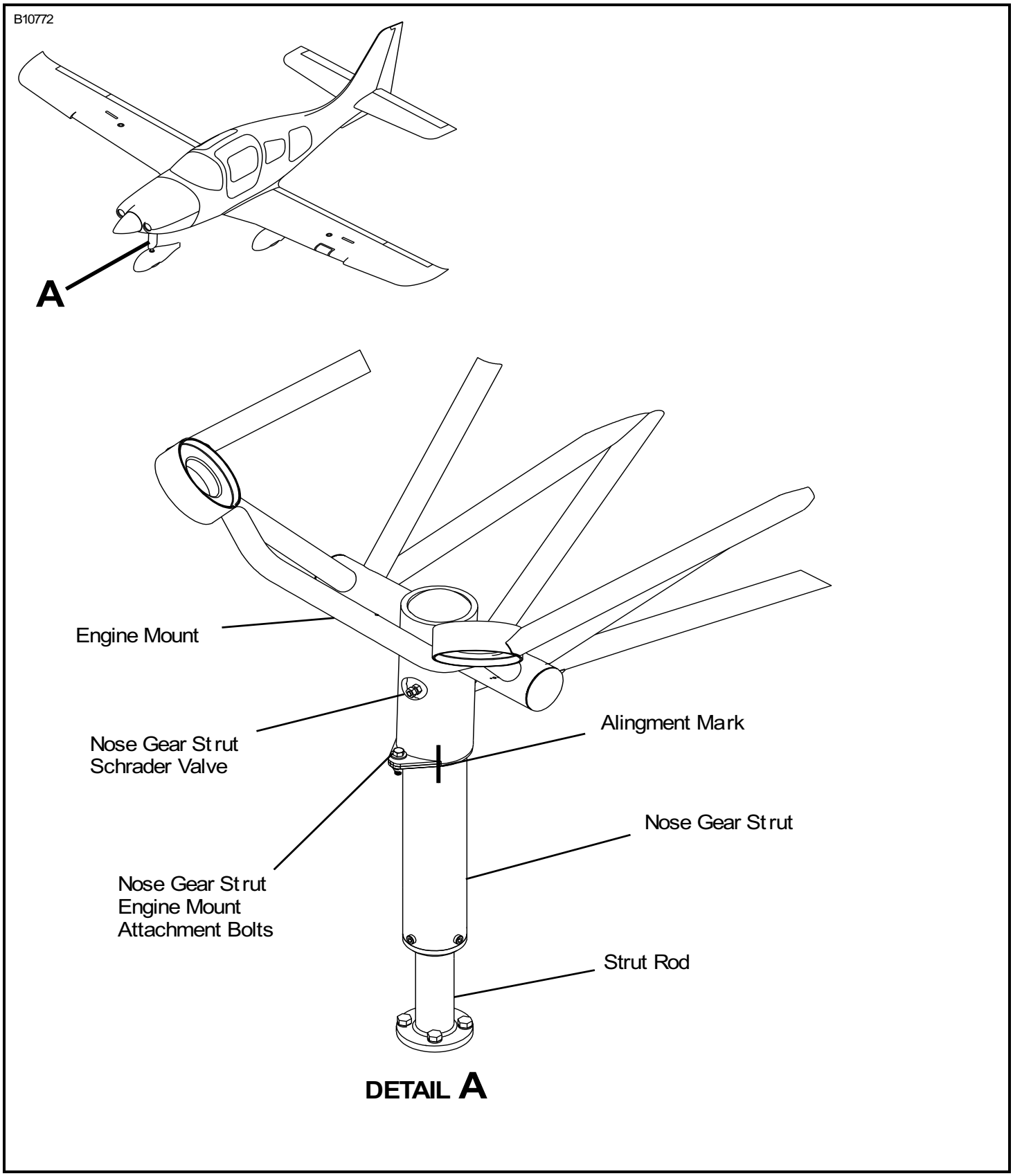
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Figure 302 : Sheet 1 : Cessna Nose Strut Service



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Figure 303 : Sheet 1 : ESCO Nose Strut Assembly



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TKS ANTI-ICE SYSTEM - SERVICING

1. General

A. The TKS anti-ice system fluid tank is serviced with approved anti-icing fluids only. The Model T240 can have a TKS Flight Into Known Icing (FIKI) or Inadvertent system option installed. For a list of approved TKS anti-icing fluids refer to Replenishing - Servicing, TKS Anti-Ice Fluid.

2. Tools and Equipment

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

3. Servicing

WARNING: Keep anti-icing fluid away from heat, sparks, and open flame. Anti-icing fluid is classified as a combustible liquid. It is also harmful or fatal if swallowed. Avoid prolonged or repeated breathing of vapors. Avoid prolonged skin contact. Do not store in open or unlabeled containers. If swallowed, induce vomiting and get medical attention immediately. If fluid comes in contact with eyes, flush with large amounts of water and get medical attention immediately.

A. Cleanliness Precautions

(1) The TKS system has filtration to protect the components against damage and blockage from particulate matter, but they are not always effective for liquid contaminants. To extend the life of the filter element and strainer, the following precautions are recommended:

(a) Where possible minimize the number of containers that you use to store and fill the airplane anti-ice fluid tank. Purchase anti-ice fluid in small (2.5 gallon) containers that you can use to pour it directly in the airplanes fluid tank.

(b) Always clean the top of the containers before you remove the cap to pour from the container.

(c) Always replace the cap on the fluid containers that you use for the transfer of the fluid.

(d) If you transfer fluid from the original container to other containers for storage, make sure that these containers are clean and of correct materials.

NOTE: Tin plated steel or similar containers that can rust are not the correct type.

(e) Keep a set of containers and implements solely for use with approved TKS anti-ice fluid.

(f) Keep the area around the airplane TKS filler clean. Keep the filler cap clean.

(g) Always replace the filler cap on the airplane immediately after you fill the tank.

B. Service the TKS Fluid Tank (Refer to Figure 301).

(1) Supply external electrical power to the airplane.

(2) Set the master BATT switches (left SW01 and right SW02) to the ON position.

(3) Set the AVIONICS MASTER switch (SW04) to the ON position.

(4) Monitor the fluid level indications on the Multifunctional Display (MFD) in the cockpit. Refer to Chapter 30, TKS Anti-Ice System (Inadvertent) - Description and Operation or TKS Anti-Ice System (FIKI) - Description and Operation.

(5) Remove the fluid tank filler cap.

(6) Fill the fluid tank and continue to monitor fluid level indications.

(7) After you service the fluid tank, install the fluid tank filler cap.

(8) Check the fluid indication in the cockpit again the make sure the tank is full.

(9) Set the AVIONICS MASTER switch to the OFF position.

(10) Set the master BATT switches to the OFF position.

(11) Remove external electrical power from the airplane.

4. TKS Anti-Ice Porous Panel Care

A. General

(1) The TKS Anti-Ice system is a durable system that requires little attention for day to day care. The basic care is cosmetic and preventive in nature, and will maintain the appearance and promote proper system operation.

B. Porous Panel Cleaning

CAUTION: Do not use the materials that follow to clean the panels: methyl ethyl ketone (MEK), acetone, paint

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thinners, paint stripper, and other types of thinners and solvents. Porous panels contain a plastic membrane that can be damaged by certain solvents. Put tape on the panels with non-porous solvent resistant material if you use solvents of this type on adjacent parts of the airplane.

CAUTION: Do not paint the outer surface of the porous panels.

CAUTION: Do not polish the surface of the porous panels when you polish painted surfaces. Wax or silicone polishes decrease the wetting qualities of the de-icing fluids and can degrade the ice protection efficiency. Repeated or intensive porous panel polishing can also block some of the pores in the panels.

(1) Clean dirt and insect debris from the panels when you clean the exterior of the airplane.

NOTE: From the functional aspect porous panels are self cleaned by the back flushing action of the de-icing fluid when the system is operated. However, additional cleaning is recommended when you clean the airplane.

(2) Operate the ice protection system for a sufficient period of time to wet the leading edge of the TKS panels with fluid before you clean them. Approved ice protection fluid has a softening effect on insect debris.

(3) Spread the fluid over the insect encrusted area with a cloth or sponge while the ice protection system operates. Stop the system and let the fluid stand for about ten minutes before you clean the porous panels.

WARNING: Take appropriate precautions to prevent fire.

CAUTION: Only use the solvents that are listed below.

- **Water (Soaps and detergents are permitted)**
- **DTD 406B Ice Protection Fluid**
- **Isopropyl Alcohol**

(4) Clean deposits of oils, greases, adhesives, paint, etc.

NOTE: The removal of the deposit can be assisted by the use of "Scotch-Brite"™ and/or careful scraping.

C. Polishing of Porous Panels

CAUTION: Do not use liquid or wax polish on the TKS porous panels.

(1) Use "Scotch-Brite"™ to restore the panels to their initial condition. Refer to Chapter 30, Ice and Rain Protection - General.

NOTE: If you use "Scotch-Brite"™ and polish the panels again and again, it can cause a blockage of some of the pores in the panel.

(a) Put low-adhesive tape on the airplane skin adjacent to the panel, where necessary, to prevent damage to the paint.

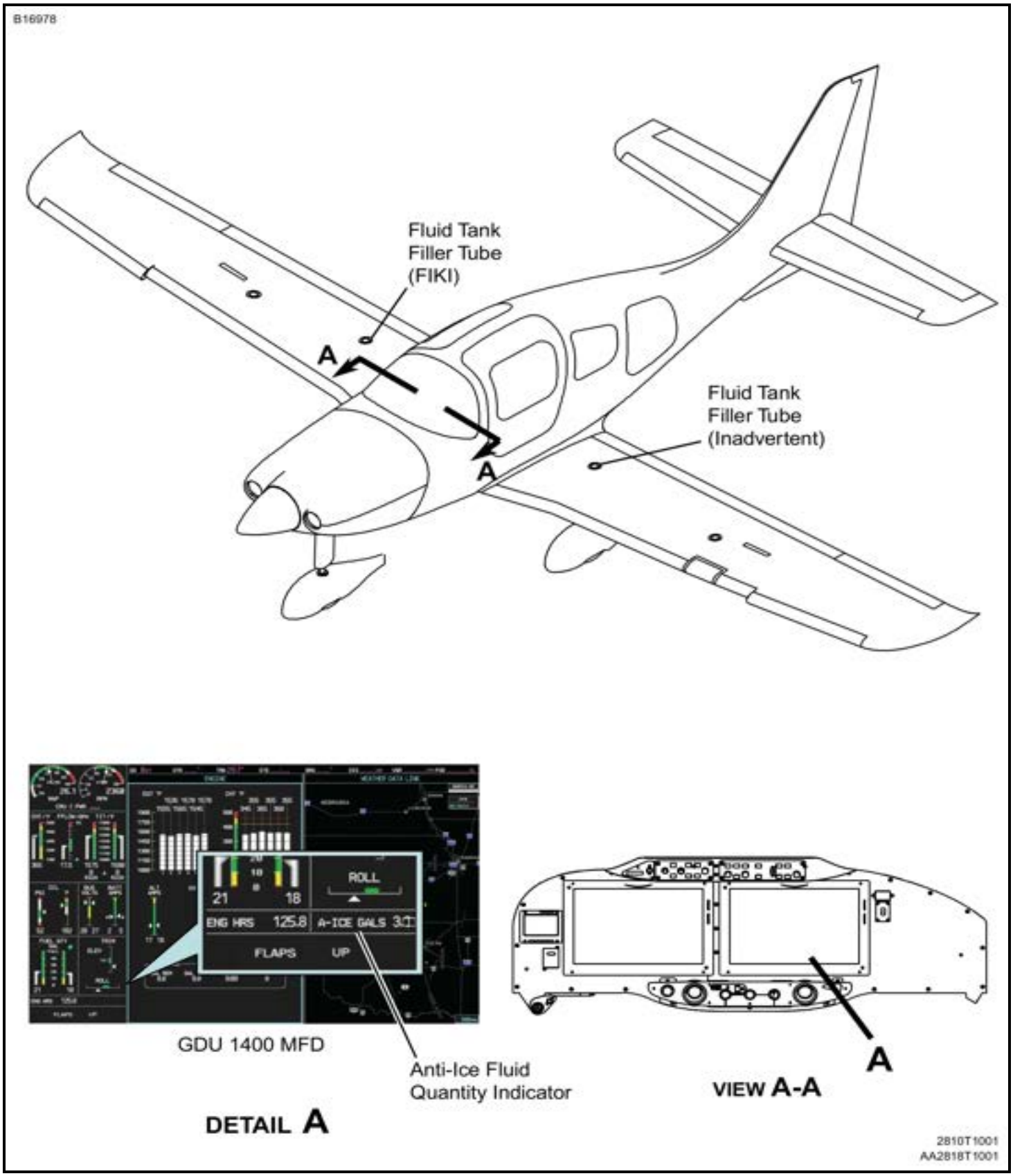
(b) Deep scores can be cleaned with heavy duty "Scotch-Brite"™ used very sparingly.

(c) Polish the porous panel with "Scotch-Brite"™ in a chordwise direction to get an initial surface texture.

(d) Clean and polish the porous panels with a very fine grade of "Scotch-Brite"™. Then clean and polish the panels with a ultra fine grade of "Scotch-Brite"™.

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Figure 301 : Sheet 1 : TKS Anti-Ice Fluid Tank Servicing



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STANDARD PRACTICES, AIRFRAME - GENERAL

1. General

A. This chapter describes the standard maintenance practices for the Cessna 400 (LC41-550FG) aircraft. The items covered are typical and apply to many areas or systems of the aircraft. Unique maintenance procedures are covered in the appropriate chapter in the maintenance manual.

NOTE: Most of this chapter is derived from FAA Advisory Circular (AC) 43.13-1B, which should be used (latest revision) as the resource for this information.

2. Material and Tool Cautions - General

A. **Mercury**

(1) Mercury can corrode and embrittle metallic structures by the amalgamation process. Complete destruction of the load carrying capability of the structure will result.

(2) No thermometers or equipment containing mercury can be used on the aircraft.

B. **Epoxy Resins**

(1) Epoxy resins, particularly the hardeners, are chemically active and can cause chemical burns, allergic reactions, and strong sensitization.

(2) Particular care should be taken to avoid contact with, or breathing, the vapors from epoxy resins.

C. **Solvents**

(1) General use solvents may include the following:

(a) Gasoline

(b) Oil

(c) Alcohol

(2) Many of these solvents are flammable.

(3) These solvents can cause injury if contact with the skin or eyes is made.

(4) Many of these solvents are poisonous.

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TORQUE DATA - MAINTENANCE PRACTICES

1. Torque Data - Maintenance Practices

WARNING: The torque values outlined in this chapter and other chapters must be used during installation and repair of components. Improper torque values may result in overstressing of components. Bolted joints in composite structures are sensitive to overload if improper over-torque is used.

A. **Torque Values** - Torque tables are listed in this section. If a component requires specific torque values, those values will be given in the applicable chapter and section of the maintenance manual. Refer to the following figures and tables for specific types of torque values:

(1) Figure 202 / Table 202 - Values for Tapped Holes and Clearance Holes

(2) Figure 203 / Table 203 - Values for Nutplates

(3) Figure 204 / Table 204 - Values for Hose and Tube Fittings

(4) Figure 205 / Table 205 - Values for Rivnuts

(5) Table 206 - Recommended Torque and Clamp Load Specifications (Applicable to Fasteners with a Minimum Tensile Strength Greater Than 74 ksi)

(6) Table 207 - Recommended Jam Nut Torque and Clamp Load Specifications (Applicable to Fasteners With a Minimum Tensile Strength Greater Than 74 ksi)

B. **Free Running Torque** - The torque values listed do not include free running torque. The free running torque is the torque value to rotate the nut on the threaded shaft before contact, pull-up, and tightening. Self-locking nuts are used in applications where they will not be removed often. Repeated removal and installation will cause the self-locking nut to lose its locking feature. They should be replaced when they are no longer capable of maintaining the minimum prevailing torque.

C. **General Torquing Notes**

(1) The values given do not apply to threaded adjustment devices such as rod ends or turnbuckles.

(2) Appropriate torque wrenches should be used. Adjustments should be made for the readings if adapters are required. Refer to specific instructions supplied with the torque wrench.

D. **Torque Adapters** - Using one or more extensions with a torque wrench can put large side loads on torqued fasteners or anything they are attached to (i.e., hoses or tubes); therefore, the operator must support the fastener assembly appropriately when needed.
When using an extended-length adapter on a torque wrench (i.e. crow's foot), apply the following equation:

Table 201. Torque Adapter Equation

$T_E = (T \times L) / (L + E)$ where,

T = Specified torque value to achieveL = Wrench length from grip center to turn center. Refer to Figure 201.E = Length, in axial direction of wrench, from wrench turn center to extension turn center. Refer to Figure 201.T_E = Torque wrench setting when using adapter

Table 202. Values for Tapped Holes and Clearance Holes

GENERAL DESIGN DATA FOR TAPPED HOLES, CLEARANCE HOLES, AND TORQUE AND LOAD VALUES										
NOTE: **Refer to diagram in Figure 202 when consulting this table.**										
		Thread Size								
Thread Size		6-32	8-32	10-32	1/4-20	1/4-28	5/16-24	3/8-24	7/16-20	1/2-20
Max. Diameter		.138	.164	.189	.249	.249	.312	.374	.437	.499
Bolt Clearance Hole Diameter and Tolerance	.005 Tol	.148	.174	.200	.260	.260	.323	.385	.448	.510
	.010Tol	.158	.184	.210	.270	.270	.333	.395	.458	.520
Tap Drill Diameter	Min.	.1040	.1300	.1560	.1960	.2110	.2670	.3300	.3830	.4460
	Max.	.1140	.1389	.1641	.2067	.2190	.2754	.3372	.3918	.4537

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Tap Drill Point Max.		.0329	.0401	.0474	.0597	.0632	.0795	.0973	.1130	.1310
2 Thread Depth		.0625	.0625	.0625	.1000	.0714	.0833	.0833	.1000	.1000
Chamfer Dia.	Min.	.138	.164	.190	.250	.250	.313	.375	.438	.500
	Max.	.158	.184	.210	.270	.270	.333	.395	.458	.520
Tensile StressArea		.00909	.0140	.0200	.0318	.0364	.0580	.0878	.1187	.1599
Non-Lubricated (Dry)Recommended Torque		10 to 12 lb.-in.	20 to 25 lb.-in.	30 to 36 lb.-in.	72 to 84 lb.-in.	72 to 84 lb.-in.	140 to 180 lb.-in.	240 to 280 lb.-in.	55 to 60 lb.-in.	80 to 85 lb.-ft.
LubircatedRecommended Torque		6 to 8 lb.-in.	12 to 15 lb.-in.	20 to 25 lb.-in.	50 to 58 lb.-in.	50 to 58 lb.-in.	95 to 125 lb.-in.	165 to 195 lb.-in.	38 to 42 lb.-in.	55 to 60 lb.-ft.
Thread Length in Aluminum	6061-T6	.145	.225	.320	.440	.440	.550	.690	.790	.930
	2024-T4	.109	.170	.240	.330	.330	.420	.530	.600	.710
Approx. Load in Pounds (Metal)		540	840	1200	2100	2100	3400	5200	7000	9600
100 DegreeChamfer	Dia. +.010/-.000	.279	.334	.387	.510	.510	.638	.755	.894	1.022
	Depth +.005/-.000	.057	.068	.080	.106	.106	.133	.159	.186	.213

Table 203. Values for Nutplates

GENERAL DESIGN DATA FOR BLIND INSTALLATION OF NUTPLATES WITH MINIMUM 2 THREAD PROJECTION PER MS33588

NOTE:

Refer to the diagram in Figure 203 when consulting this table.

For maximum possible thread use:Pre-install bolt without mounting part(s) until lightly bottomed.

CAUTION:

Do not damage threads.

Measure distance between bolt head and structure. Distance should be no more than .9 x thickness of mounting part(s). For floating-type nutplates, add .010 to bolt clearance holes.Do not use aluminum rivets through carbon materials. Use stainless pop- or pull-type rivets when passing through carbon materials.REF: Acceptable Methods, Techniques And Practices, Aircraft Inspection And Repair, AC43.13-1B

		Thread Size							
Thread Size		6-32	8-32	10-32	1/4-28	5/16-24	3/8-24	7/16-20	1/2-20
Max. Diameter of Thread		.138	.164	.189	.249	.312	.374	.437	.499
Bolt Clearance Hole Diameter and Tolerance	.005 Tol	.148	.174	.200	.260	.323	.385	.448	.510
	.010Tol	.158	.184	.210	.270	.333	.395	.458	.520
2 Thread Minimum Projection		.0625	.0625	.0625	.1000	.0714	.1111	.1250	.520
Thread Length of Nutplate Ref.		.171	.188	.188	.219	.266	.282	.328	.547
2 Thread Projection + Nutplate		.234	.251	.251	.291	.349	.365	.428	.647
Min. Number of Turns		7.5	8.0	8.0	8.25	8.5	8.75	8.75	13.0
Ref. Tensile Stress Area		.00909	.0140	.0200	.0384	.0580	.0878	.1187	.1599

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Non-Lubricated (Dry)Recommended Torque(Metal)	10 to 12 lb.-in.	20 to 25 lb.-in.	30 to 36 lb.-in.	72 to 84 lb.-in.	140 to 180 lb.-in.	240 to 280 lb.-in.	55 to 60 lb.-in.	80 to 85 lb.-ft.
LubircatedRecommended Torque (Metal)	6 to 8 lb.-in.	12 to 15 lb.-in.	20 to 25 lb.-in.	50 to 58 lb.-in.	95 to 125 lb.-in.	165 to 195 lb.-in.	38 to 42 lb.-in.	55 to 60 lb.-ft.
Approx. Load in Pounds (Metal)	540	840	1200	2100	3400	5200	7000	9600

Table 204. Values for Hose and Tube Fittings

NOTE:
Refer to the diagram in Figure 204 when consulting this table.

Size/Thread		Material and Torque Specification(Dry torque values shown, except as noted in General Notes.)		
		Hose and/or Fitting Combination(Refer to Note 1)	Inch-Pounds	Foot-Pounds
-2	5/16-24	Steel to Steel	75-120	6.3 - 10
		Brass/Aluminum/Steel	50-80	4.2 - 6.7
-3	3/8-24	Steel to Steel	95-140	7.9 - 11.7
		Brass/Aluminum/Steel	70-105	5.8 - 8.8
-4	7/16-20	Steel to Steel	135-190	11.3 - 15.8
		Brass/Aluminum/Steel	100-140	8.3 - 11.7
-5	1/2-20	Steel to Steel	170-240	14.2 - 20
		Brass/Aluminum/Steel	130-180	10.8 - 15
-6	9/16-18	Steel to Steel	215-280	17.9 - 23.3
		Brass/Aluminum/Steel	150-195	12.5 - 16.3
-8	3/4-16	Steel to Steel	470-550	39.2 - 45.8
		Brass/Aluminum/Steel	270-350	22.5 - 29.2
-10	7/8-14	Steel to Steel	620-745	51.7 - 62.1
		Brass/Aluminum/Steel	360-430	30 - 35.8
-12	1/16-12	Steel to Steel	855-1055	71.3 - 87.9
		Brass/Aluminum/Steel	460-550	38.3 - 45.8

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General Notes: Pre-Install hose onto fitting finger tight. If parts do not assemble finger tight, check for foreign material on threads and/or damaged threads. Do not force assemblies together.Maintain cleanliness of hose and fittings. Protect all fitting threads from damage and dirt contamination. When attaching stainless steel to stainless steel or stainless steel to aluminum, use MIL-T-5544 Anti-seize/lubricant on fitting threads. To prevent contamination, do not apply Anti-seize to tapered seat. Use lower torque value when Anti-seize is used.

NOTE 1:

Brass/Aluminum/Steel means any combination of brass to aluminum, brass to steel, or aluminum to steel.

Table 205. Values for Rivnuts

GENERAL DESIGN DATA FOR BLIND INSTALLATION OF RIVNUTS WITH MINIMUM 2 THREAD PROJECTION PER MS33588								
NOTE: **Refer to the diagram in Figure 205 when consulting this table.**								
For maximum possible thread use:Pre-install bolt without mounting part(s) until lightly bottomed. **CAUTION:** **Do not damage threads.** Measure distance between bolt head and structure. Distance should be no more than .9 x thickness of mounting part(s). Rivnuts are not self-locking. Do not use aluminum rivnuts through carbon materials. Use stainless rivnuts through carbon materials.REF: Acceptable Methods, Techniques And Practices, Aircraft Inspection And Repair, AC43.13-1B								
		Thread Size						
Thread Size		6-32	8-32	10-32	1/4-20	1/4-28	5/16-18	3/8-16
Max. Diameter of Thread		.138	.164	.189	.249	.249	.312	.374
Bolt Clearance Hole and Diameter	.005 Tol	.148	.174	.200	.260	.260	.323	.385
	.010Tol	.158	.184	.210	.270	.270	.333	.395
Recommended RivnutHole Dia.	Min.	.266	.266	.297	.391	.391	.531	.531
	Max.	.272	.272	.303	.397	.397	.538	.538
2 Thread Projection		.0625	.0625	.0625	.1000	.0714	.1111	.1250
Thread Length of Rivnut		.219	.188	.203			.278	
Min. Thread Projection		.281	.250	.266			.389	
Min. Number of Turns		9.0	7.0	8.5			7.0	
Head Height		0.30	.030	.030	.030	.030	.030	.030
Head Diameter Max.		.390	.390	.415	.515	.515	.685	.685
Non-Lubricated (Dry)Recommended Torque		10 to 12 lb.-in.	18 to 22 lb.-in.	30 to 36 lb.-in.	65 to 75 lb.-in.	70 to 80 lb.-in.	140 to 155 lb.-in.	230 to 270 lb.-in.
LubircatedRecommended Torque		6 to 8 lb.-in.	12 to 15 lb.-in.	20 to 25 lb.-in.	42 to 50 lb.-in.	50 to 58 lb.-in.	85 to 110 lb.-in.	160 to 190 lb.-in.
Approx. Load in Pounds		540	840	1200	2000	2100	3200	4900

Table 206. Recommended Torque and Clamp Load Specifications (Applicable to Fasteners with a Minimum Tensile Strength Greater Than 74 ksi)

Fastener Size	Nominal Diameter	Clamp Load	Torque Dry	Torque Lubed
			(Maximum Error of ±10 percent)	
	[in]	[lbs]	[in-lbs,**ft-lbs**]	[in-lbs,**ft-lbs**]
2-56	.0860	150	2.5	2.0
4-40	.1120	250	5.5	4.0
6-32	.1380	370	10	8.0

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8-32	.1640	580	19	14
10-32	.1900	830	31	24
1/4-20	.2500	1310	66	49
1/4-28	.2500	1500	75	56
5/16-18	.3125	2160	140	100
5/16-24	.3125	2390	150	110
3/8-16	.3750	3200	**20**	**15**
3/8-24	.3750	3620	**23**	**17**
7/16-20	.4375	4900	**36**	**27**
1/2-20	.5000	6600	**55**	**41**
NOTE: **Applicable for standard or self-locking types of nuts**				

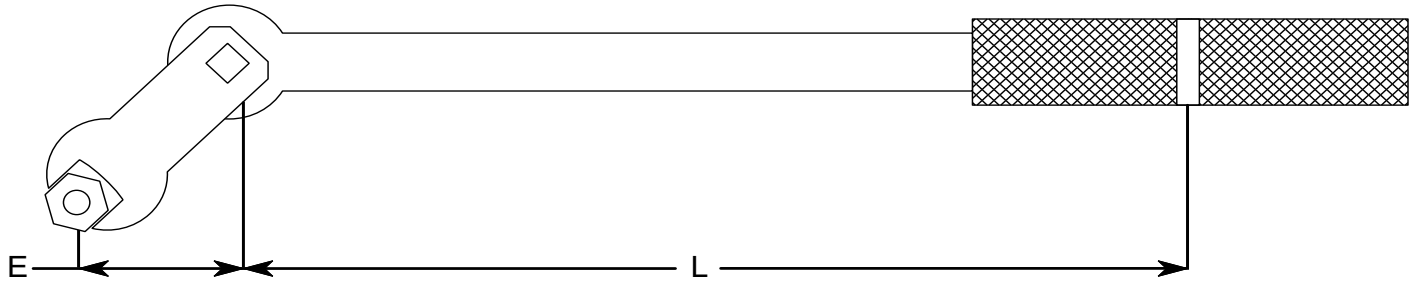
Table 207. Recommended Jam Nut Torque and Clamp Load Specifications (Applicable to Fasteners with a Minimum Tensile Strength Greater Than 74 ksi)

Fastener Size	**Nominal Diameter**	**Clamp Load**	**Torque Dry**	**Torque Lubed**
			(Maximum Error of ±10 percent)	
	[in]	[lbs]	[in-lbs,**ft-lbs**]	[in-lbs,**ft-lbs**]
2-56	.0860	62	1.0	0.8
4-40	.1120	100	2.5	1.5
6-32	.1380	150	4.0	3.0
8-32	.1640	250	8.0	6.0
10-32	.1900	360	14	10
1/4-20	.2500	550	27	20
1/4-28	.2500	730	36	27
5/16-18	.3125	800	50	37
5/16-24	.3125	1240	77	58
3/8-16	.3750	1330	100	75
3/8-24	.3750	1330	100	75
7/16-20	.4375	3120	**23**	**17**
1/2-20	.5000	3730	**31**	**23**
NOTE: **AN316 or equivalent**				

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Figure 201 : Sheet 1 : Length Variable for Torque Adapter Equation

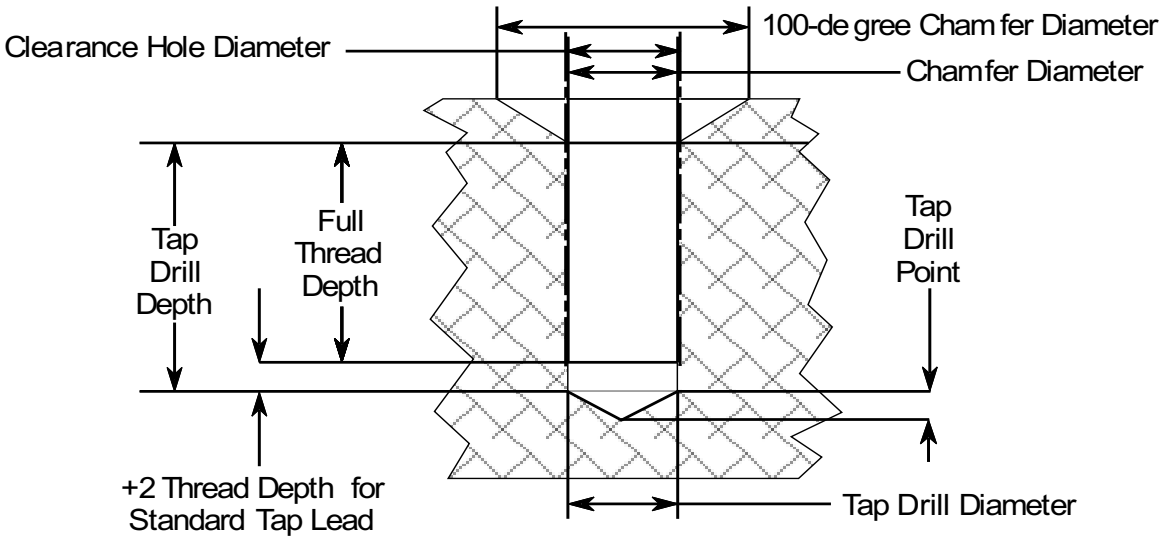
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Figure 202 : Sheet 1 : Values for Tapped Holes and Clearance Holes (Refer to Table 202)

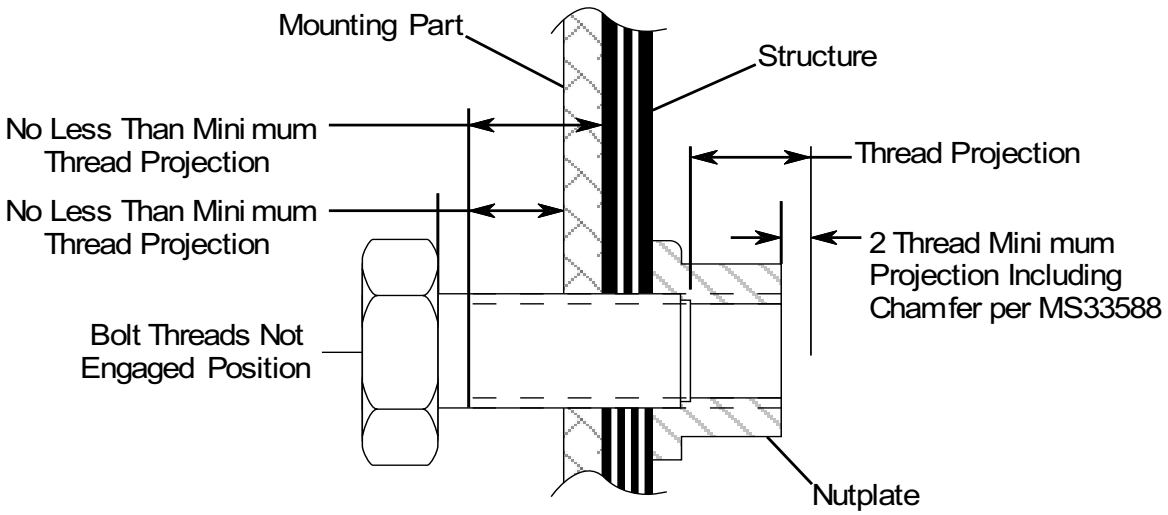
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Figure 203 : Sheet 1 : Values for Nutplates (Refer to Table 203)

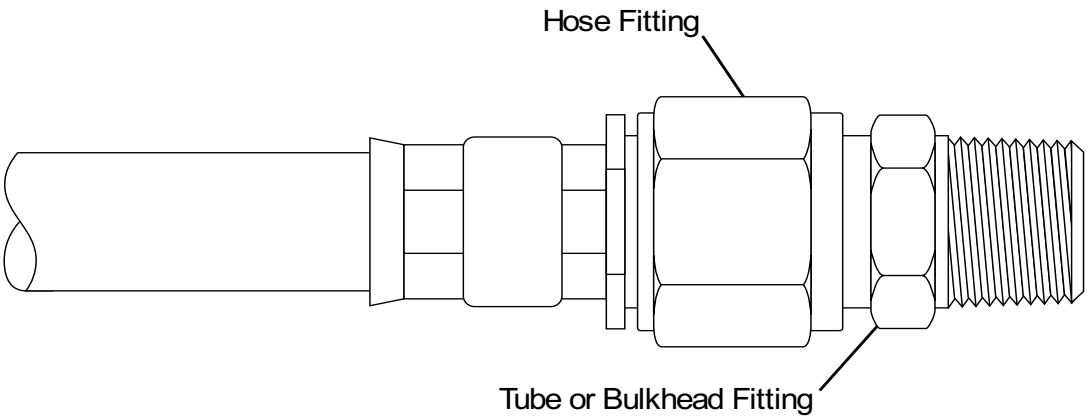
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Figure 204 : Sheet 1 : Values for Hose and Tube Fittings (Refer to Table 204)

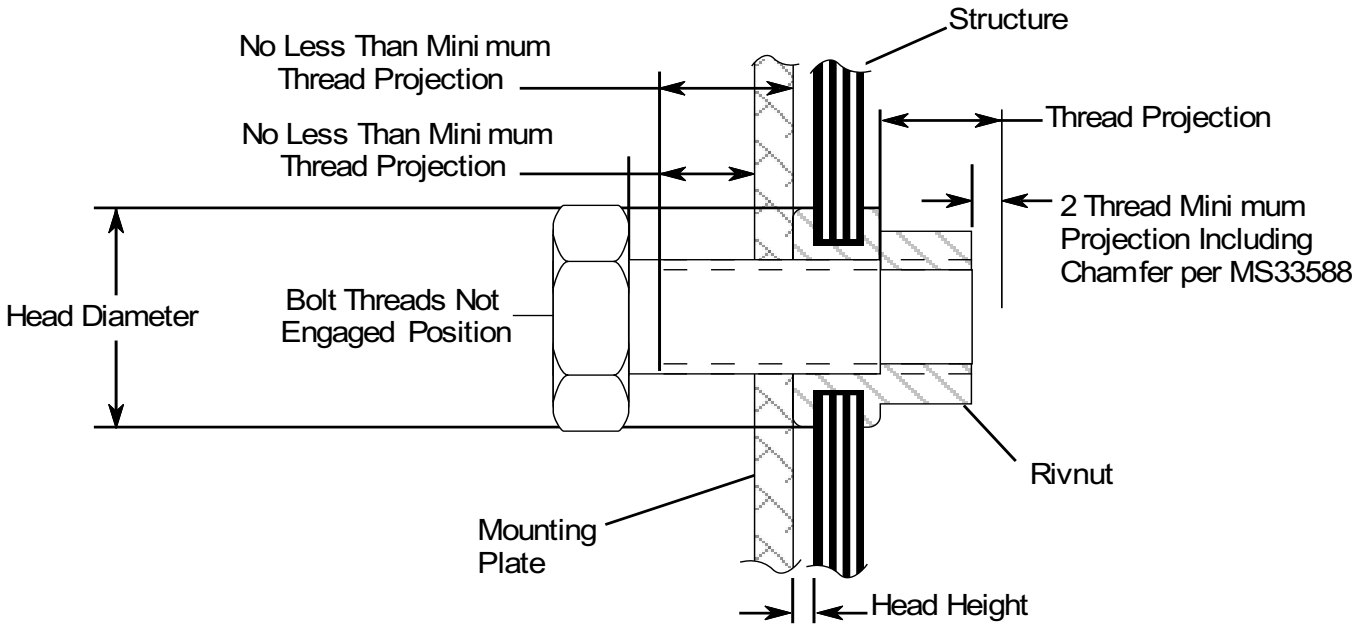
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Figure 205 : Sheet 1 : Values for Rivnuts (Refer to Table 205)

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SAFETYING - MAINTENANCE PRACTICES

1. Safetying - Maintenance Practices

A. **General** - The word safetying is a term universally used in the aircraft industry. Briefly, safetying is defined as: "Securing by various means any nut, bolt, turnbuckle etc., on the aircraft so that vibration will not cause it to loosen during operation." These practices are not a means of obtaining or maintaining torque, rather a safety device to prevent the disengagement of screws, nuts, bolts, snap rings, oil caps, drain cocks, valves, and parts. Three basic methods are used in safetying: safety-wire, cotter pins, and self-locking nuts. Retainer washers and pal nuts are also sometimes used.

(1) Wire, either soft brass or steel, is used on cylinder studs, control cable turnbuckles, and engine accessory attaching bolts.

(2) Cotter pins are used on aircraft and engine controls, landing gear, or any other point where a turning or actuating movement takes place.

B. **Safety Wire**

WARNING: Do not use stainless steel, monel, carbon steel, or aluminum alloy safety wire to secure emergency mechanisms such as switch handles, guard covering handles used on exits, fire extinguishers, emergency gear releases, or other emergency equipment. Some existing structural equipment or safety-of-flight emergency devices require copper or brass safety wire (0.020-inch diameter only). Where successful emergency operation of this equipment is dependent on shearing or breaking of the safety wire, particular care should be used to ensure that safetying does not prevent emergency operation.

CAUTION: Care should be taken not to confuse steel with aluminum wire.

(1) There are two methods of safety wiring; the double-twist method that is most commonly used, and the single-wire method used on screws, bolts, and/or nuts in a closely-spaced or closed-geometrical pattern such as a triangle, square, rectangle, or circle. The single-wire method may also be used on parts in electrical systems and in places that are difficult to reach (Refer to Figure 201).

(2) When using the double-twist method of safety wiring, 0.032 in. minimum diameter wire should be used on parts that have a hole diameter larger than 0.045 in. Safety wire of 0.020 in. diameter (double strand) may be used on parts having a nominal hole diameter between 0.045 and 0.062 in. with a spacing between parts of less than 2 in. When using the single-wire method, the largest size wire that the hole will accommodate should be used. Copper wire (0.020 in. diameter), aluminum wire (0.031 in diameter), or other similar wire called for in specific technical orders, should be used as seals on equipment such as first-aid kits, portable fire extinguishers, emergency valves, or oxygen regulators. Refer to Figure 202.

(3) A secure seal indicates that the component has not been opened. Some emergency devices require installation of brass or soft copper shear safety wire. Particular care should be exercised to ensure that the use of safety wire will not prevent emergency operation of the devices.

2. Safety Wiring Procedures

A. There are many combinations of safety wiring with certain basic rules common to all applications. These rules are as follows:

(1) When bolts, screws, or other parts are closely grouped, it is more convenient to safety wire them in series. The number of bolts, nuts, screws, etc., that may be wired together depends on the application.

(2) Drilled bolt heads and screws need not be safety wired if installed with self-locking nuts.

(3) To prevent failure due to rubbing or vibration, safety wire must be tight after installation.

(4) Safety wire must be installed in a manner that will prevent the tendency of the part to loosen.

(5) Safety wire must never be over-stressed. Safety wire will break under vibrations if twisted too tightly. Safety wire must be pulled taut when being twisted and maintain a light tension when secured.

(6) Safety-wire ends must be bent under and inward toward the part to avoid sharp or projecting ends, which might present a safety hazard.

(7) Safety wire inside a duct or tube must not cross over or obstruct a flow passage when an alternate routing can be used.

B. Check the units to be safety wired to make sure that they have been correctly torqued and that the wiring holes are properly aligned to each other. When there are two or more units, it is desirable that the holes in the units be aligned to each other.

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Never over-torque or loosen to obtain proper alignment of the holes. It should be possible to align the wiring holes when the bolts are torqued within the specified limits. Washers may be used to establish proper alignment. However, if it is impossible to obtain a proper alignment of the holes without under-torquing or over-torquing, try another bolt that will permit proper alignment within the specified torque limits.

C. To prevent mutilation of the twisted section of wire when using pliers, grasp the wires at the ends. Safety wire must not be nicked, kinked, or mutilated. Never twist the wire ends off with pliers. When cutting off ends, leave at least four to six complete turns (1/2 to 5/8 inch long) after the loop. When removing safety wire, never twist the wire off with pliers. Cut the safety wire close to the hole, exercising caution.

D. Install safety wire where practicable with the wire positioned around the head of the bolt, screw, or nut, and twisted in such a manner that the loop of the wire fits closely to the contour of the unit being safety wired.

3. Twisting With Special Tools

A. Twist the wire with a wire twister as follows:

CAUTION: When using wire twisters and the wire extends 3 inches beyond the jaws of the twisters, loosely wrap the wire around the pliers to prevent whipping and possible personal injury. Excessive twisting of the wire will weaken the wire.

(1) Grip the wire in the jaws of the wire twister, and slide the outer sleeve down with your thumb to lock the handles of the spring-loaded pin.

(2) Pull the knob to make the spiral rod spin and twist the wire.

(3) Squeeze handles together to release the wire.

4. Securing Oil Caps, Drain Cocks, and Valves

A. When securing oil caps and drain cocks, the safety wire should be anchored to an adjacent fillister-head screw. Refer to Figure 203. This method of safety wiring is applied to wing nuts, filler plugs, single-drilled head bolts, fillister-head screws, etc., that are safety wired individually. When securing valve handles in the vertical position, the wire is looped around the threads of the pipe leading into one side of the valve, double-twisted around the valve handle, and anchored around the threads of the pipe leading into the opposite side of the valve. When castle nuts are to be secured with safety wire, tighten the nut to the low side of the selected torque range, unless otherwise specified. If necessary, continue tightening until a slot lines with the hole. In blind tapped hole applications of bolts or castle nuts on studs, the safety wiring should be in accordance with the general instructions of this chapter. Hollow-head bolts are safetyed in the manner prescribed for regular bolts.

NOTE: Do not loosen or tighten properly tightened nuts to align safety-wire holes.

NOTE: Although there are numerous safety wiring techniques used to secure aircraft hardware, practically all are derived from the basic examples shown in this text.

5. Proper Securing of Fittings

A. There are several examples on how to secure fittings listed in this section.

(1) Examples 1, 2, 3, and 4 in Figure 204 apply to all types of bolts, fillister-head screws, square-head plugs, and other similar parts, which are wired so that tightening of the other part counteracts the loosening tendency of either part. The direction of twist from the second to the third unit is counterclockwise in Examples 1, 3, and 4 to keep the loop in position against the head of the bolt. The direction of twist from the second to the third unit in Example 2 is clockwise to keep the wire in position around the second unit. The wire entering the hole in the third unit will be the lower wire, except as in Example 2. By making a counterclockwise twist after it leaves the hole, the loop will be secured in place around the head of that bolt.

(2) Examples 5, 6, 7, and 8 in Figure 205 show methods for wiring various standard items. Note that wire may be wrapped over the unit rather than around it when wiring castle nuts or on other items when there is a clearance problem.

(3) Example 9 in Figure 206 shows the method for wiring bolts in different planes. Note that wire should always be applied so that tension is in the tightening direction. Hollow-head plugs shall be wired as shown with the tab bent inside the hole to avoid snags and possible injury to personnel working on the engine.

(4) Examples 12 and 13 in Figure 207 show methods for attaching lead seal to protect critical adjustments.

(5) Example 14 in Figure 208 shows bolt wired to a right-angle bracket with the wire wrapped around the bracket.

(6) Example 15 in Figure 208 shows the correct method for wiring adjustable connecting rods.

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(7) Example 16 in Figure 208 shows the correct method for wiring the coupling nut on flexible line to the straight connector brazed on rigid tube.

B. Fittings incorporating wire lugs shall be wired as shown in Examples 17 and 18 in Figure 209. Where no lock-wire lug is provided, wire should be applied as shown in Examples 19 and 20 with caution being exerted to ensure that the wire is wrapped tightly around the fitting.

C. Small size coupling nuts shall be wired by wrapping the wire around the nut and inserting it through the holes as shown in Figure 209.

D. Coupling nuts attached to straight connectors shall be wired as shown when the hex is an integral part of the connector. Coupling nuts on a tee shall be wired as shown in Figure 209 so that tension is always in the tightening direction.

6. Securing with Cotter Pins

A. Cotter pins are used to secure such items as bolts, screws, pins, and shafts. The use of cotter pins is favored because they can be removed and installed quickly. The diameter of the cotter pins selected for any application should be the largest size that will fit consistent with the diameter of the cotter pin hole and/or the slots in the nut. Cotter pins should not be re-used on aircraft.

B. To prevent injury during and after pin installation, the end of the cotter pin can be rolled and tucked as shown in Figure 210 and Figure 211.

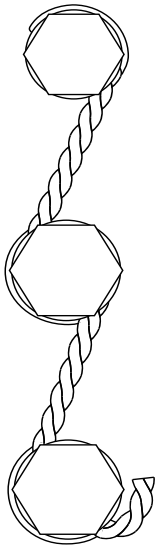
C. When tightening castellated nuts on bolts, begin by applying the minimum torque specified. If the cotter pin hole does not align with the slots in the nut, continue to tighten the nut until the next set of slots is aligned with the hole. In special cases where there is risk of the threads stripping or the bolt shearing, the maximum torque value specified may not be exceeded. For most installations, the nut may be over tightened to permit the slots to align with the hole.

NOTE: In using the method of cotter pin safetying ensure the prong, bent over the bolt, is seated firmly against the bolt shank and does not exceed bolt diameter. Also, when the prong is bent over the nut, ensure the bent prong is down and firmly flat against the nut and does not contact the surface of the washer.

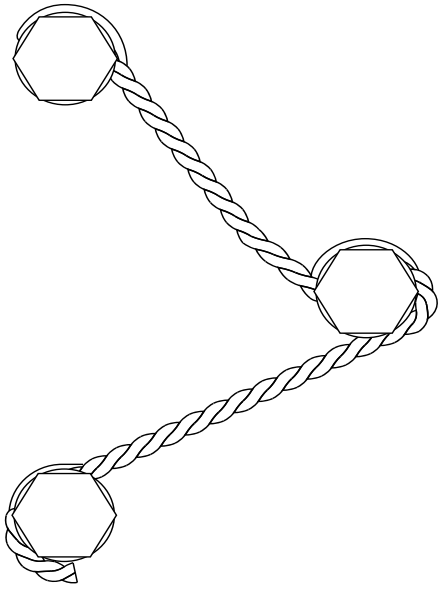
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Figure 201 : Sheet 1 : Examples of Safety Wiring "Safetying"

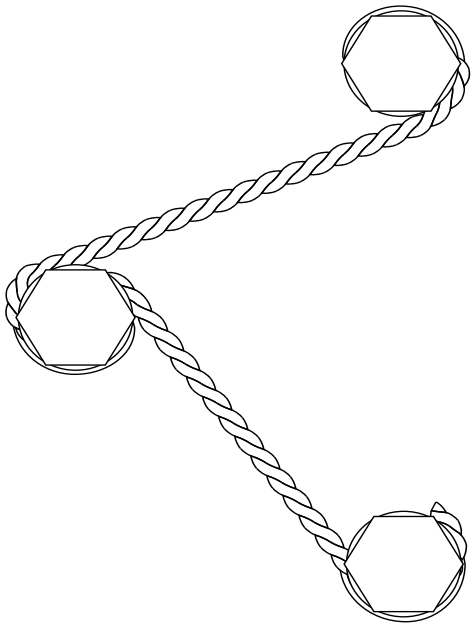
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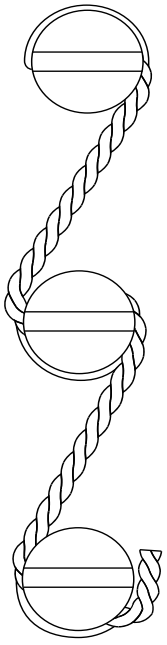
Example 1



Example 2



Example 3

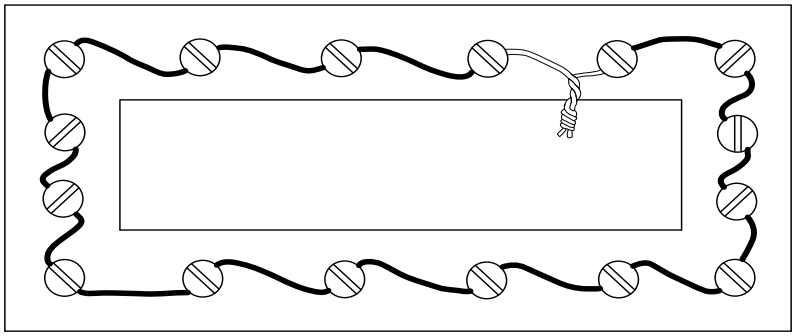


Example 4

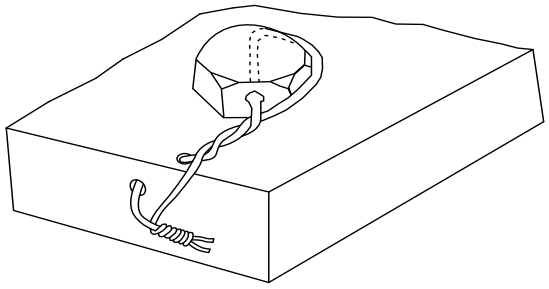
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Figure 202 : Sheet 1 : Securing Screws, Nuts, Bolts, and Snap Rings

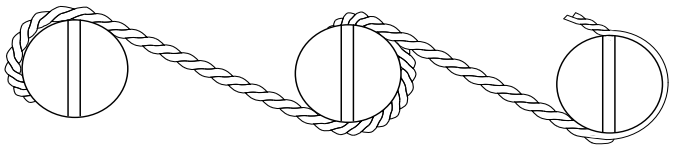
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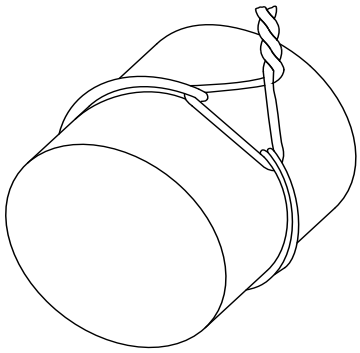
Small screws in closely spaced
Closed geometrical pattern
Single-wire method



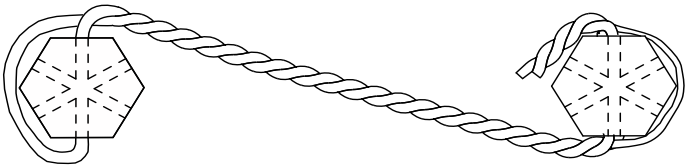
Single-Fastener Application
Double-Twist Method



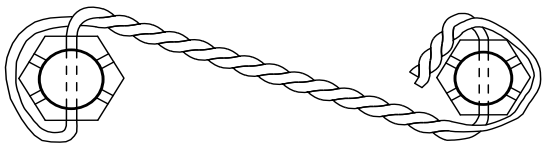
Screwheads
Double-Twist Method



External Snapring
Single-Wire Method



Boltheads



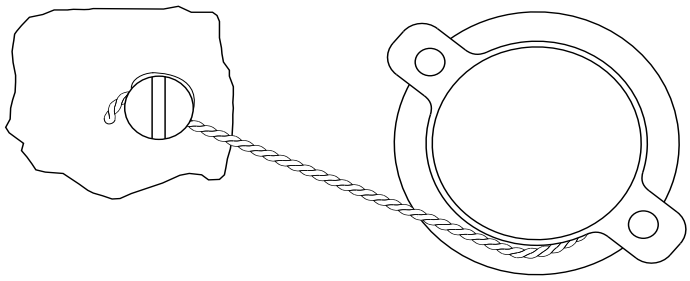
Castle Nuts

NOTE: The safety wire is shown installed for right-hand threads. The safety wire is routed in the opposite direction for left-hand threads.

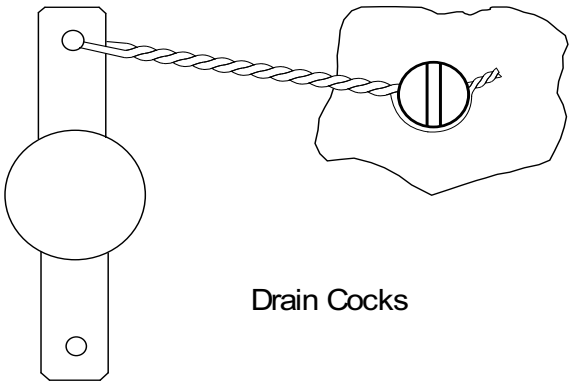
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Figure 203 : Sheet 1 : Securing Oil Caps, Drain Cocks, and Valves

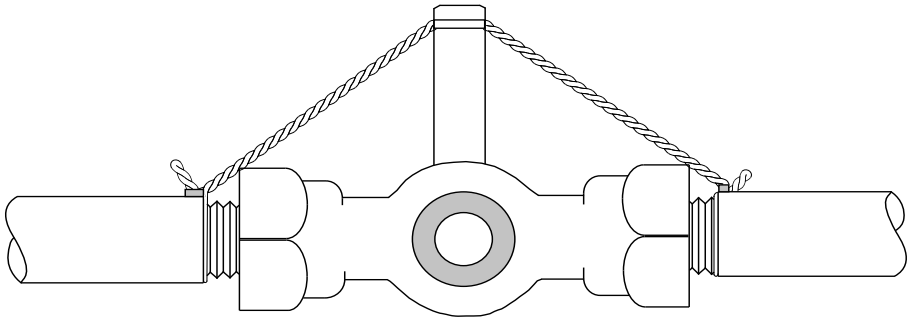
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Oil Caps



Drain Cocks



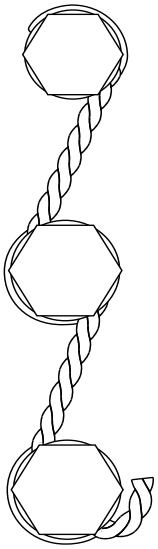
Valves

NOTE: The safety wire is shown installed for right-hand threads. The safety wire is routed in the opposite direction for left-hand threads.

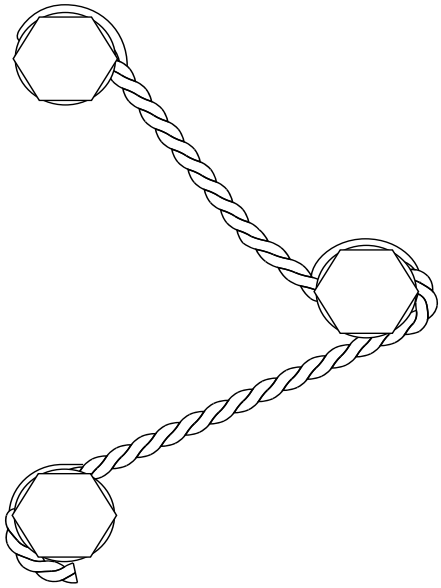
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Figure 204 : Sheet 1 : Securing Bolts, Screws, Plugs, etc.

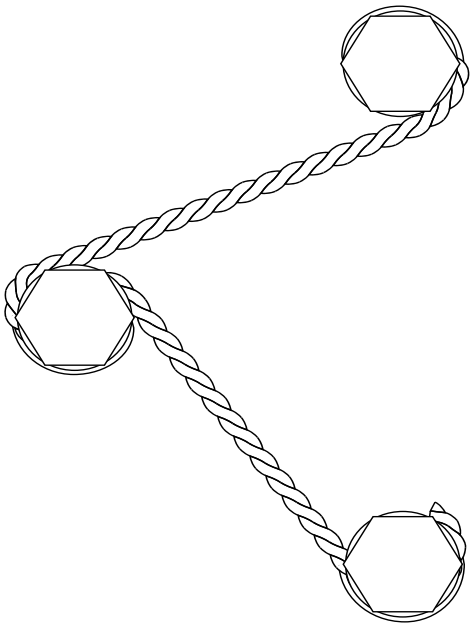
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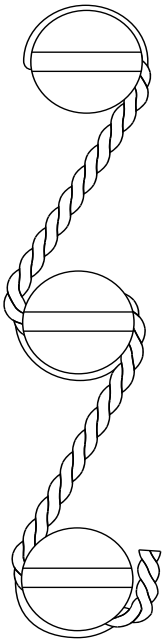
Example 1



Example 2



Example 3

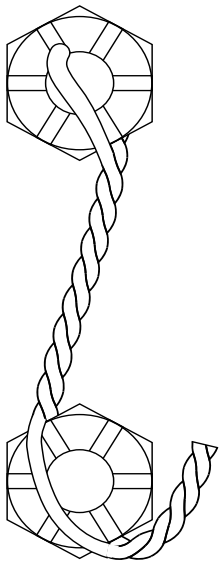


Example 4

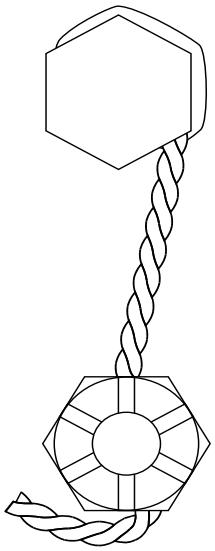
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Figure 205 : Sheet 1 : Securing Various Standard Items

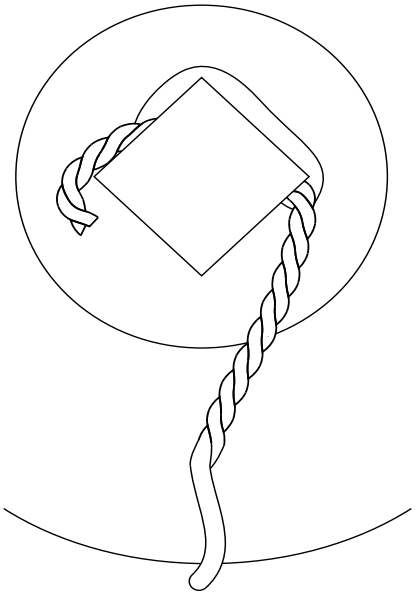
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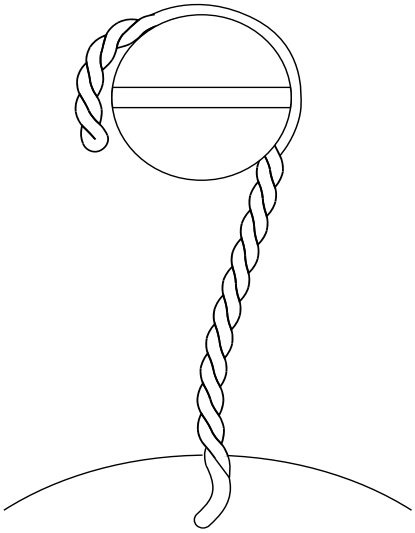
Example 5



Example 6



Example 7

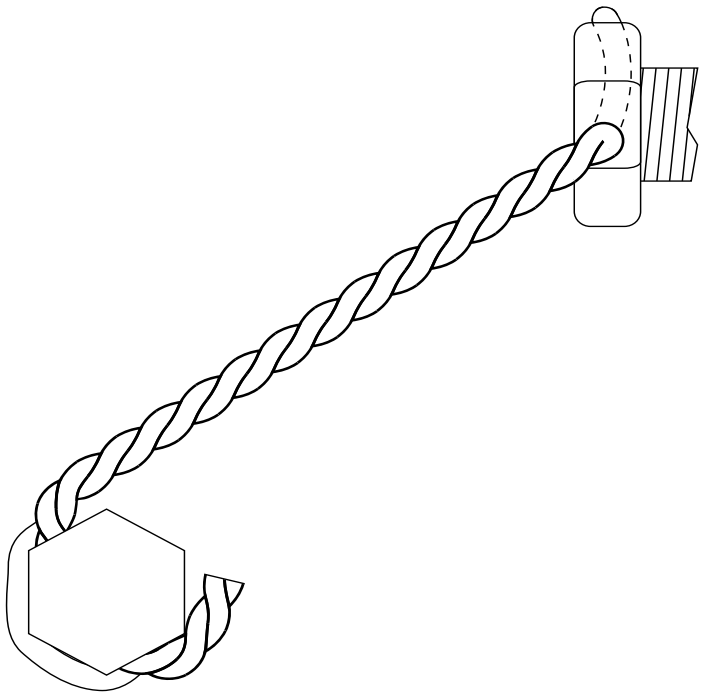


Example 8

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Figure 206 : Sheet 1 : Wiring Bolts in Different Planes

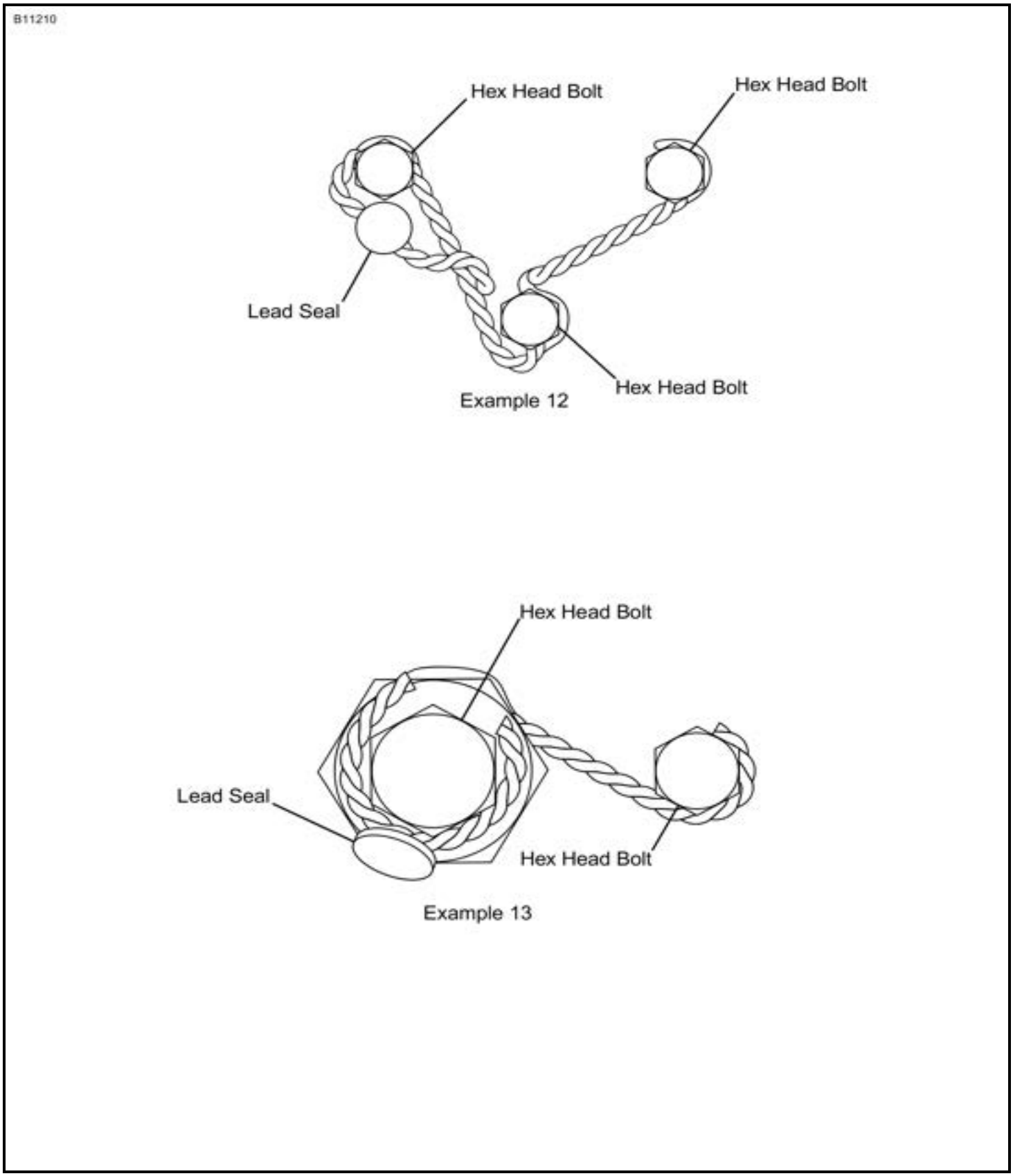
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Example 9

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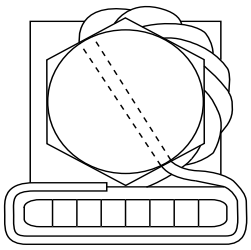
Figure 207 : Sheet 1 : Attaching Lead Seal



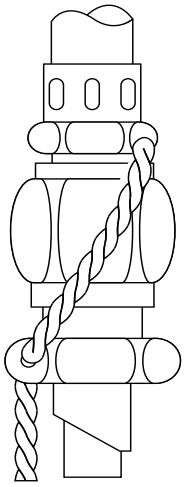
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Figure 208 : Sheet 1 : Wiring Brackets, Connecting Rods, Rigid Tubes

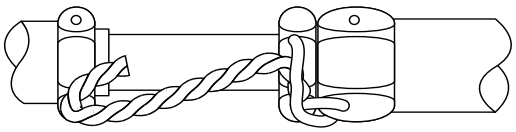
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Example 14



Example 16

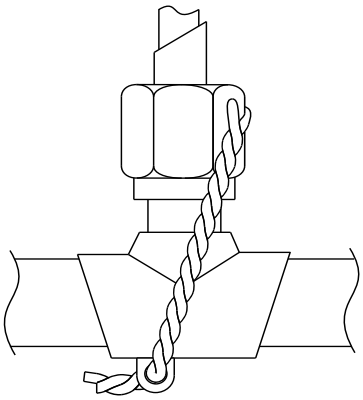


Example 15

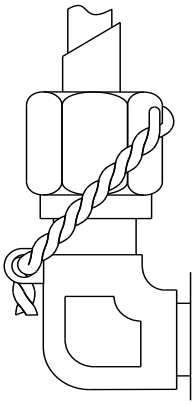
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Figure 209 : Sheet 1 : Fittings Incorporating Wire Lugs

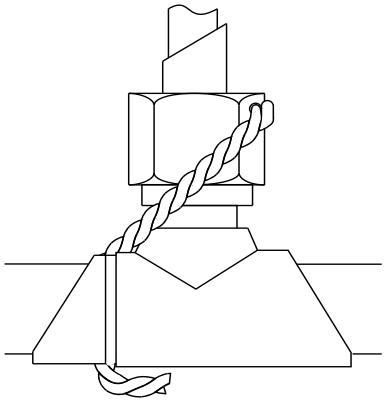
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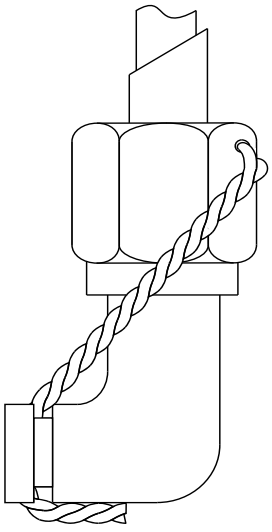
Example 17



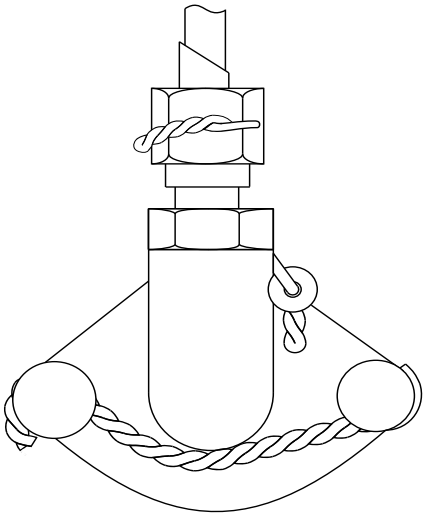
Example 18



Example 19



Example 20

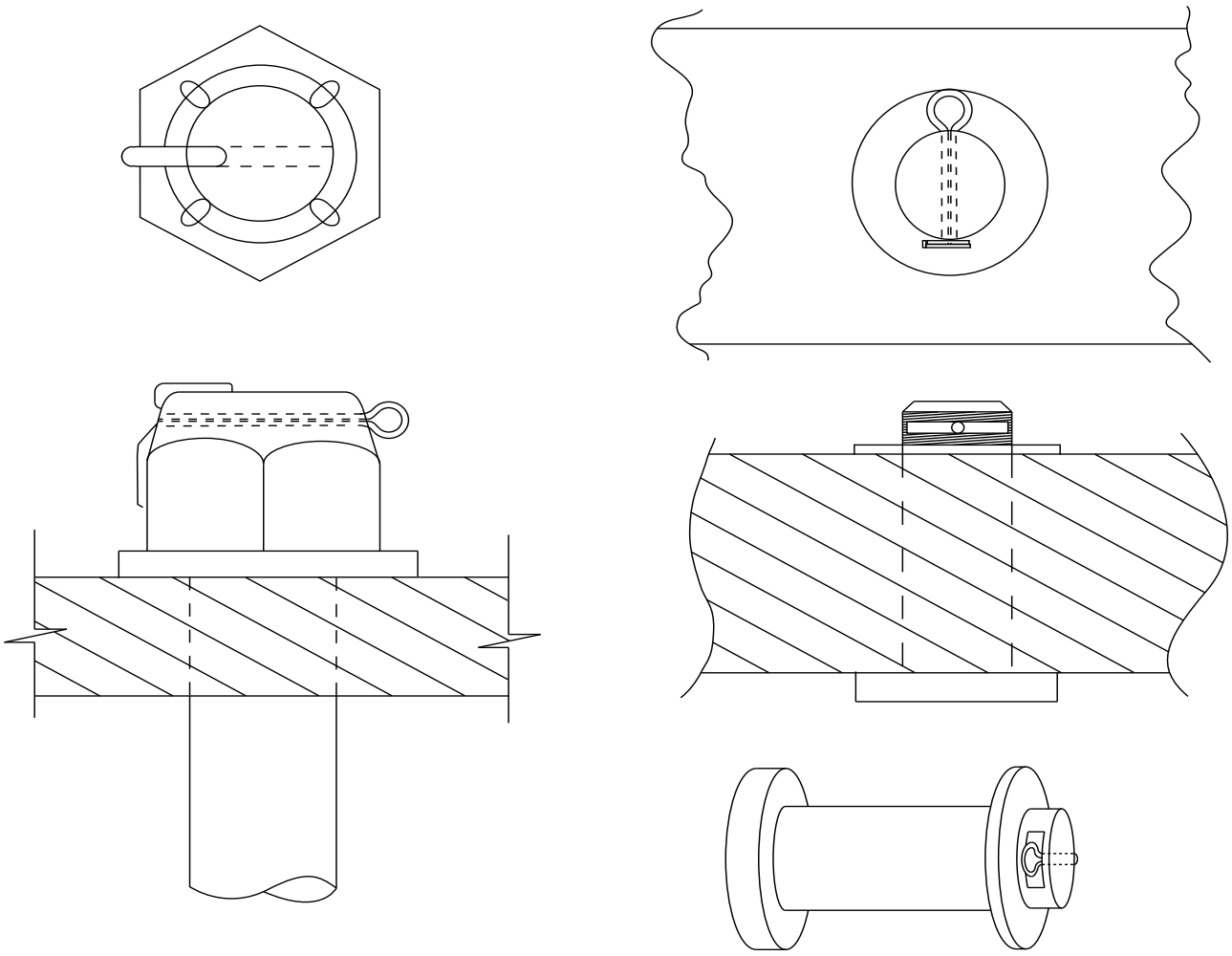


Example 21

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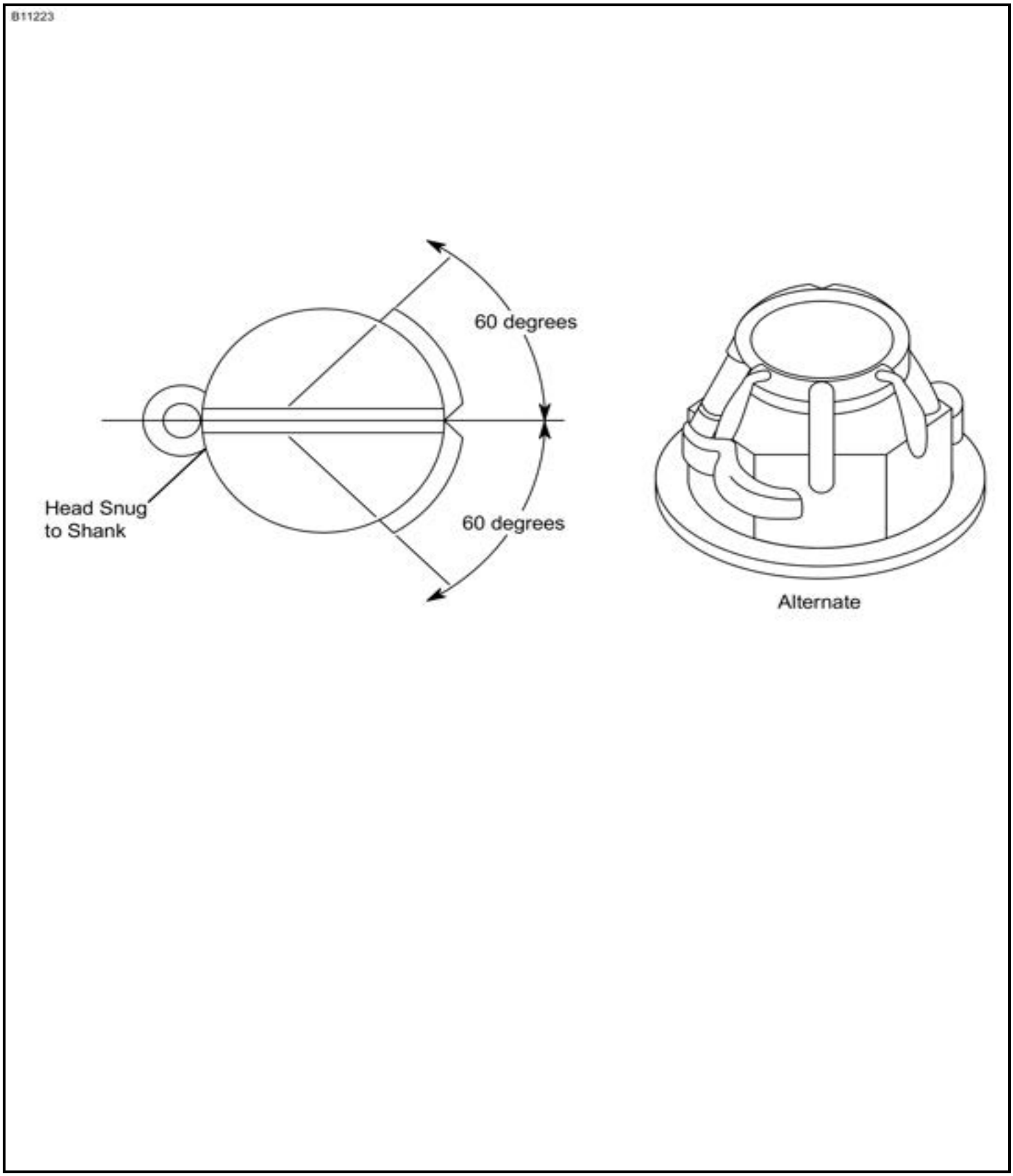
Figure 210 : Sheet 1 : Securing with Cotter Pins

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Figure 211 : Sheet 1 : Alternate Method for Securing with Cotter Pins



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CONTROL CABLES AND PULLEYS - MAINTENANCE PRACTICES

1. Control Cable Wire Breakage and Corrosion Limitations

A. Aircraft control cables in the Cessna 400 (LC41-550FG) are fabricated from corrosion-resistant steel wire of flexible-type construction. For example, 1/16-inch 7 X 7 MIL-W-83420/2 and 1/8-inch 7 X 19 MIL-W-83420 cables are used in the rudder control circuit.

B. **Cable Definitions** - The following cable components are defined in accordance with Military Specifications MIL-W-83420, MIL-C-18375, and MIL-W-87161.

(1) Wire Center - The center of all strands shall be an individual wire and shall be designated as a wire center.

(2) Strand Center or Core - A strand center is a single, straight strand made of preformed wires, similar to the other strands comprising the cable in arrangement and number of wires.

(3) Independent Wire Rope Center (IWRC) 7 by 7 - A cable or wire rope of six strands of seven wires each, twisted or laid around a strand center or core consisting of seven wires.

C. **Flexible Cables** - Flexible, preformed, corrosion-resistant, Type I, composition B cables, MIL-W-87161, MIL-W-83420, and MIL-C-18375 are manufactured from steel made by the electric-furnace process. These cables are of the 3 by 7, 7 by 7, 7 by 19, or 6 by 19 IWRC construction, according to the diameter. The 3 by 7 cable consists of three strands of seven wires each. There is no core in this construction. The 7 by 7 cable consists of six strands, of seven wires each, laid around a center strand of seven wires. The wires are laid so as to develop a cable that has the greatest bending and wearing properties. The 7 by 7 cable has a length of lay of not more than eight times or less than six times the cable diameter. The 7 by 19 cable consists of six strands laid around a center strand in a clockwise direction. The wires composing the seven individual strands are laid around a center wire in two layers. The center core strand consists of a lay of six wires laid around the central wire in a clockwise direction and a layer of 12 wires laid around this in a clockwise direction. The six outer strands of the cable consist of a layer of six wires laid around the center wire in a counterclockwise direction and a layer of 12 wires laid around this in a counterclockwise direction.

D. **Cable Replacement** - Replace control cables when they become worn, distorted, corroded, or otherwise damaged. If spare cables are not available, prepare exact duplicates of the damaged cable. Use materials of the same size and quality as the original. Standard swaged cable terminals develop the full cable strength and may be substituted for the original terminals wherever practical.

E. **Mechanically Fabricated Cable Assemblies**

(1) **Swage-Type Terminals** - Swage-type terminals, manufactured in accordance with AN, are suitable for use in civil aircraft up to, and including, maximum cable loads. When swaging tools are used, it is important that all the manufacturers' instructions, including "go and no-go" dimensions, be followed in detail to avoid defective and inferior swaging. Observance of all instructions should result in a terminal developing the full-rated strength of the cable. Critical dimensions, both before and after swaging, must be checked.

(2) When swaging terminals onto cable ends, observe the following procedures:

(a) Cut the cable to the proper length allowing for growth during swaging. Apply a preservative compound to the cable ends before insertion into the terminal barrel.

NOTE: Never solder cable ends to prevent fraying because the presence of the solder will greatly increase the tendency of the cable to pull out of the terminal.

(b) Insert the cable into the terminal approximately 1 inch and bend toward the terminal. Push the cable end entirely into the terminal barrel. The bending actions puts a kink or bend in the cable end and provides enough friction to hold the terminal in place until the swaging operation can be performed. Bending also tends to separate the strands inside the barrel, thereby reducing the strain on them.

Table 201. Straight-Shank Terminal Dimensions

(Cross reference AN to MS: AN-666 to MS 21259, AN-667 to MS 20667, AN-668 to MS 20668, AN-669 to MS 21260.)							
Key: A = Cable size (inches) B = Wire strands C = Outside diameter before swaging D = Bore diameter before swaging E = Bore length before swaging F = Swaging length before swaging G = Minimum breaking strength (pounds) after swaging H = Shank diameter after swaging (Use gauges in kit for checking diameters.)							
A	B	C	D	E	F	G	H
1/16	7X7	0.160	0.078	1.042	0.969	480	0.138

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3/32	7X7	0.218	0.109	1.261	1.188	920	0.190
1/8	7X19	0.250	0.141	1.511	1.438	2,000	0.219
5/32	7X19	0.297	0.172	1.761	1.688	2,800	0.250
3/16	7X19	0.359	0.203	2.011	1.938	4,200	0.313
7/32	7X19	0.427	0.234	2.261	2.188	5,600	0.375
1/4	7X19	0.494	0.265	2.511	2.438	7,000	0.438
9/32	7X19	0.563	0.297	2.761	2.688	8,000	0.500
5/16	7X19	0.635	0.328	3.011	2.938	9,800	0.563
3/8	7X19	0.703	0.390	3.510	3.438	14,400	0.625

(c) Accomplish the swaging operation in accordance with the instructions furnished by the manufacturer of the swaging equipment.

(d) Inspect the terminal after swaging to determine that it is free from die marks and splits and is not out-of-round. Check for cable slippage in the terminal and for cut or broken wire strands.

(e) Using a "go no-go" gauge or a micrometer, check the terminal shank diameter.

(3) **Nicopress Process** - A patented process using copper sleeves may be used up to the full rated strength of the cable when the cable is looped around a thimble. Refer to Figure 202.

(a) Before undertaking a Nicopress splice, determine the proper tool and sleeve for the cable to be used. Refer to proper references for details on sleeves, tools, and the number of presses required for the various sizes of aircraft cable. The tool must be in good working condition and properly adjusted to ensure a satisfactory splice.

(b) To compress a sleeve, have it well-centered in the tool groove with the major axis of the sleeve at right angles to the tool. If the sleeve appears to be out of line after the press is started, open the tool, re-center the sleeve, and complete the press.

(4) **Lap Splice** - Lap or running splices may also be made with copper oval sleeves. When making such splices, it is usually necessary to use two sleeves to develop the full strength of the cable. The sleeves should be positioned as shown in (B) of Figure 201, and the compressions made in the order shown. As in the case of eye splices (refer to Figure 202), it is desirable to have the cable ends extend beyond the sleeves sufficiently to allow for the increased length of the compressed sleeves.

F. **Terminal Gauge** - To make a satisfactory copper sleeve installation, it is important that the amount of sleeve pressure be kept uniform. The completed sleeves should be checked periodically with the proper gauge. Hold the gauge so that it contacts the major axis of the sleeve. The compressed portion at the center of the sleeve should enter the gauge opening with very little clearance, as shown in Figure 203. If it does not, the tool must be adjusted accordingly.

2. Cable System Inspection

A. Aircraft cable systems are subject to a variety of environmental conditions and deterioration. Wire or strand breakage is easy to visually recognize. Other kinds of deterioration such as wear, corrosion, and/or distortion are not easily seen, therefore, control cables should be removed periodically for a more detailed inspection.

(1) At each annual or 100 hour inspection, all control cables must be inspected for broken wire strands. Any cable assembly that has one broken wire strand located in a critical fatigue area must be replaced.

(2) A critical fatigue area is defined as the working length of a cable where the cable runs over, under, or around a pulley, sleeve, or through a fair-lead; or any section where the cable is flexed, rubbed, or worked in any manner; or any point within 1 ft. of a swaged-on fitting.

(3) A swaged-on fitting can be an eye, fork, ball, ball and shank, ball and double shank, threaded stud, threaded stud and turnbuckle, compression sleeve, or any hardware used as a termination or end fitting on the cable. These fittings may be attached by various swaging methods such as rotary swaging, roll swaging, hydraulic pressing, and hand swaging tools (refer to MIL-T-781). The pressures exerted on the fittings during the swaging process sometimes pinch the small wires in the cable. This can cause premature failure of the pinched wires, resulting in broken wires.

(4) Close inspection in these critical fatigue areas must be made by passing a cloth over the area that will snag on broken wires. This will clean the cable for a visual inspection, and detect broken wires if the cloth snags on the cable.

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Also, a very careful visual inspection must be made since a broken wire will not always protrude or stick out, but may lie in the strand and remain in the position of the helix as it was manufactured. Broken wires of this type may show up as a hairline crack in the wire. If a broken wire of this type is suspected, further inspection with a magnifying glass of 7 power or greater, is recommended. Figure 204 shows a cable with broken wires that was not detected by wiping, but was found during a visual inspection. The damage became readily apparent when the cable was removed and bent as shown in the figure below.

(5) Kinking of wire cable can be avoided if properly handled and installed. A cable taking a spiral shape as the result of unnatural twist causes kinking. One of the most common causes for this twist is improper unreeling and uncoiling. In a kinked cable, strands and wires are out of position, which creates unequal tension and brings excessive wear at this part of the cable. Even though the kink may be straightened so that the damage appears to be slight, the relative adjustment between the strands has been disturbed so that the cable cannot give maximum service and should be replaced. Inspect cables for a popped core or loose strands. Replace any cable that has a popped core or loose strands regardless of wear or broken wires.

(6) External wear patterns will extend along the cable equal to the distance the cable moves at that location and may occur on one side of the cable or on its entire circumference. Replace flexible and non-flexible cables when the individual wires in each strand appear to blend together (outer wires worn 40 to 50 percent)

(7) As wear is taking place on the exterior surface of a cable, the same condition is taking place internally, particularly in the sections of the cable which pass over pulleys and quadrants. This condition is not easily detected unless the strands of the cable are separated. This type of wear is a result of the relative motion between inner wire surfaces. Under certain conditions, the rate of this type of wear can be greater than that occurring on the surface.

(8) Carefully examine any cable for corrosion, when it has a broken wire in a section that is not in contact with a wear-producing airframe component, such as a pulley, fair-lead, etc. If the surface of the cable is corroded, relieve cable tension and carefully force the cable open by reverse twisting, and visually inspect the interior. Corrosion on the interior strands of the cable constitutes failure, and the cable must be replaced. If no internal corrosion is detected, remove loose external rust and corrosion with a clean, dry, coarse-weave rag, or fiber brush. Do not use metallic wool or solvents to clean installed cables. Use of metallic wool will embed dissimilar metal particles in the cables and create further corrosion problems. Solvents will remove internal cable lubricant, allowing cable strands to abrade and further corrode. After thorough cleaning, sparingly apply specification MIL-C-16173, grade 4, corrosion-preventive compound to the cable. Do not apply the material so thick that it will interfere with the operation of cables at fair-leads, pulleys, or grooved bellcrank areas.

(9) Examine cable runs for incorrect routing, fraying, twisting, or wear at fair-leads, pulleys, anti-abrasion strips, and guards. Look for interference with adjacent structure, equipment, wiring, plumbing, and other controls. Inspect cable systems for binding, full travel, and security of attaching hardware. Check for slack in the cable system. Actuate the controls, and check for friction or hard movement that are indications that excessive cable tension exists.

NOTE: If the control movement is stiff after maintenance has been performed on the control surfaces, check for parallel cables twisted around each other or cables connected in reverse.

(10) Check swaged terminal reference marks for an indication of cable slippage within the fitting. Inspect the fitting assembly for distortion and/or broken strands at the terminal. Ensure that all bearings and swivel fittings (bolted or pinned) pivot freely to prevent binding and subsequent failure. Check turnbuckles for proper thread exposure and broken or missing safety wires/clips.

(11) Inspect pulleys for roughness, sharp edges, and presence of foreign material embedded in the grooves. Examine pulley bearings to ensure proper lubrication, smooth rotation, and freedom from flat spots, dirt, and paint spray. During the inspection, rotate the pulleys, which only turn through a small arc, to provide a new bearing surface for the cable. Maintain pulley alignment to prevent the cable from riding on the flanges and chafing against guards, covers, or adjacent structure. Check all pulley brackets and guards for damage, alignment, and security.

(12) Various cable system malfunctions may be detected by analyzing pulley conditions. These include such discrepancies as too much tension, misalignment, pulley bearing problems, and size mismatches between cables and pulleys. Examples of these conditions are shown in Figure 205.

(13) Inspect fair-leads for wear, breakage, alignment, cleanliness, and security. Examine cable routing at fair-leads to ensure that deflection angles are no greater than 3 degrees maximum. Determine that all guides and anti-abrasion strips are secure and in good condition.

(14) Examine pressure seals for wear and material deterioration. Seal guards should be positioned to prevent jamming of a pulley in case the pressure seal fails and pieces slide along the cable.

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3. Corrosion and Rust Prevention

A. To ensure a satisfactory service life for aircraft control cables, use a cable lubricant to reduce internal friction and prevent corrosion.

B. Coat the cable with rust-preventive oil, and wipe off any excess. Lubrication and corrosion preventive treatment of cables may be effected simultaneously by application of compound MIL-C-16173, grade 4. MIL-C-16173 compound should be brushed, sprayed, or wiped on the cable to the extent it penetrates into the strands and adequately covers the cable surfaces. It will dry "tack free" in 24 hours at 77° F.

4. Cable Maintenance

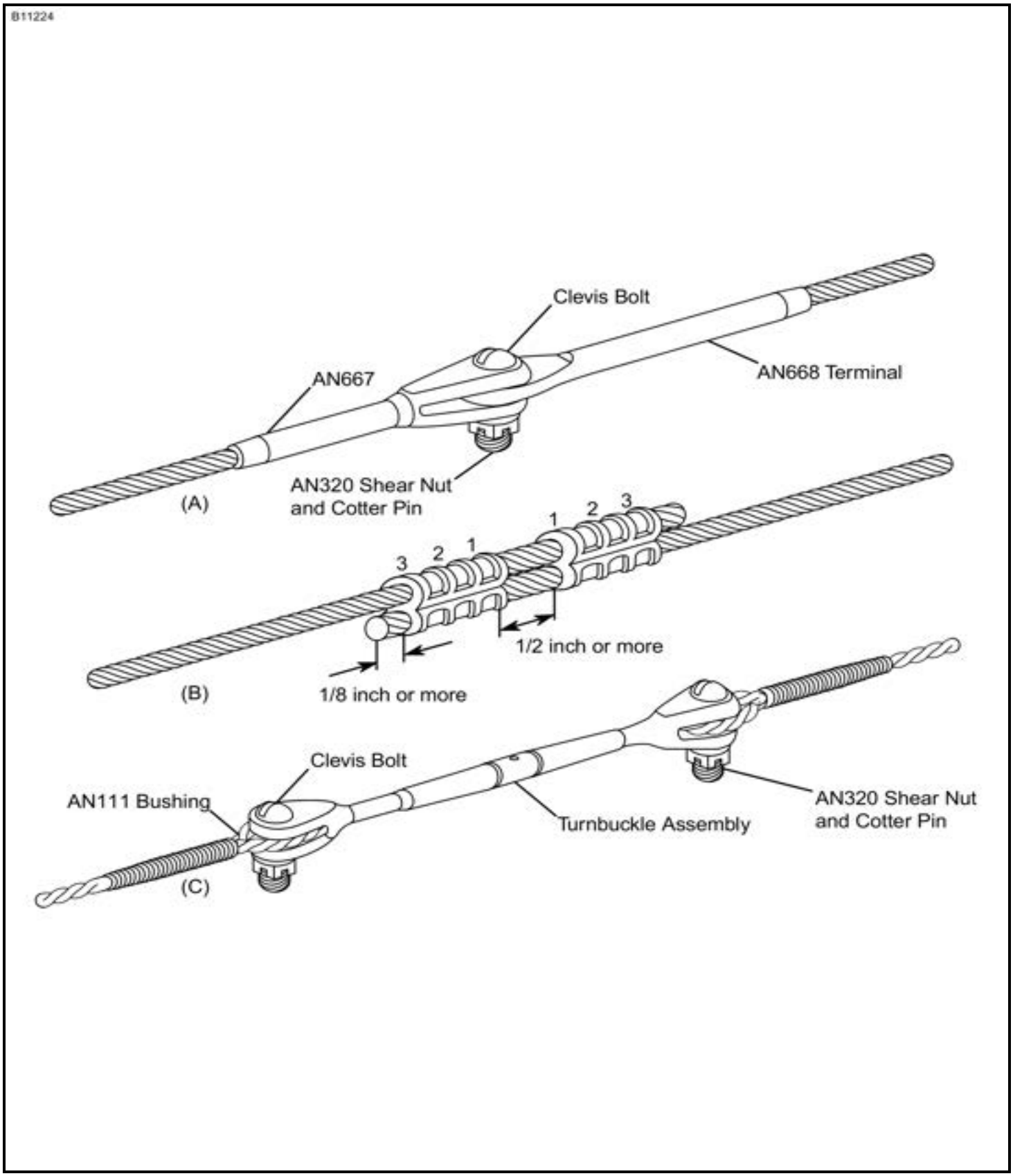
A. Frequent inspections and preservation measures such as rust-prevention treatments, will help to extend cable service life. Where cables pass through fair-leads or over pulleys, remove any accumulated heavy coatings of corrosion-prevention compound. Provide corrosion protection for these cable sections by lubricating with a light coat of grease or general-purpose, low-temperature oil.

5. Cable Tension Adjustment

A. Carefully adjust the control cable tension in accordance with the airframe requirements. If necessary, compensate for extreme surface temperature variations that may be encountered if the aircraft is operated primarily in unusual geographic or climatic conditions such as arctic, arid, or tropical locations. Use rigging pins and gust locks, as necessary, to ensure satisfactory results. At the completion of rigging operations, check turnbuckle adjustment and safetying in accordance with standard practices and information in this chapter.

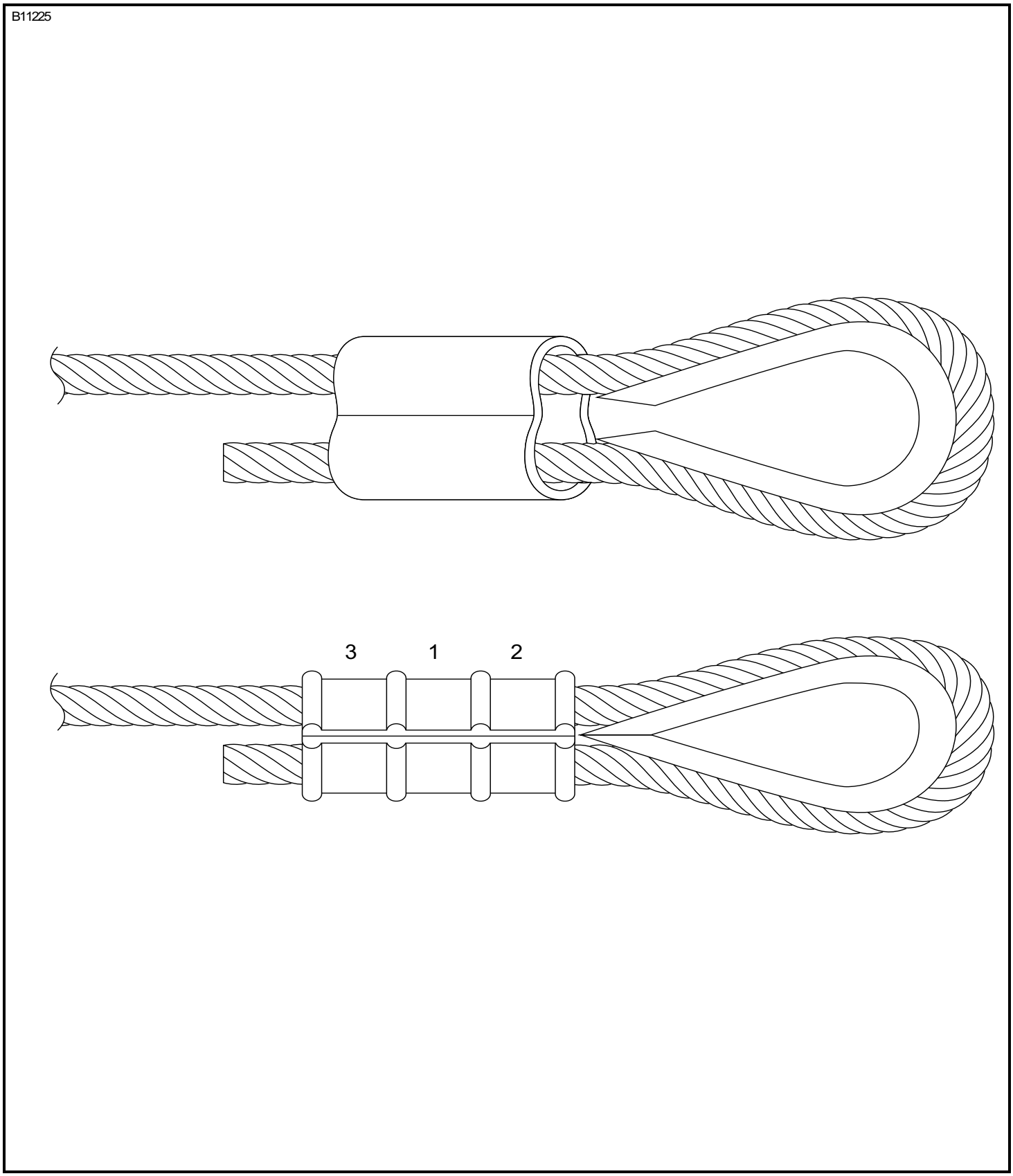
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Figure 201 : Sheet 1 : Lap Splices



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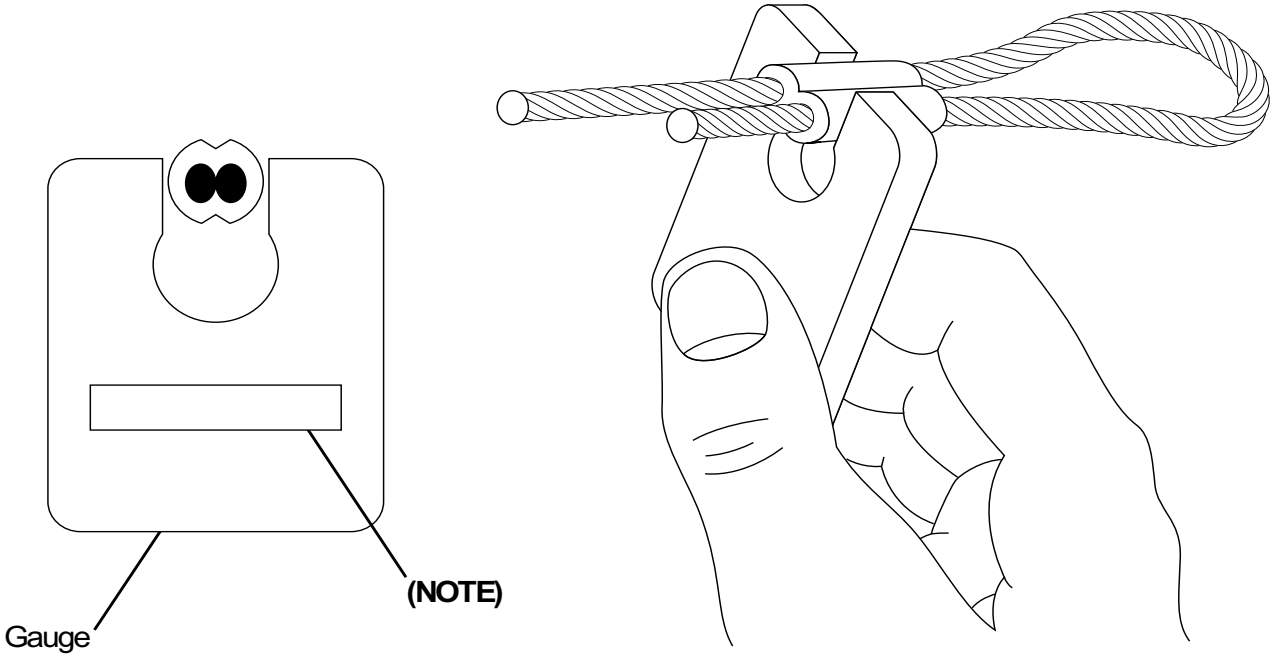
Figure 202 : Sheet 1 : Typical Thimble-Eye Splice



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Figure 203 : Sheet 1 : Typical Terminal Gauge

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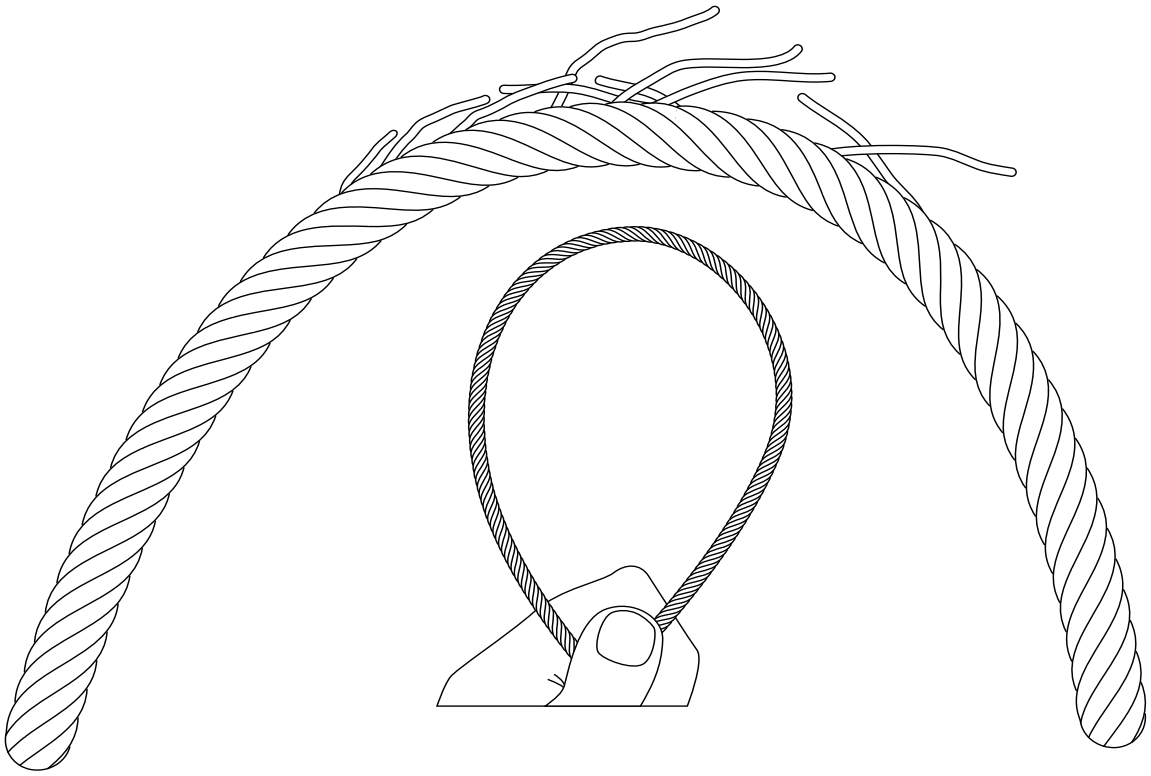


NOTE: Sleeve Stock-number is stamped here.

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Figure 204 : Sheet 1 : Cable Inspection Technique

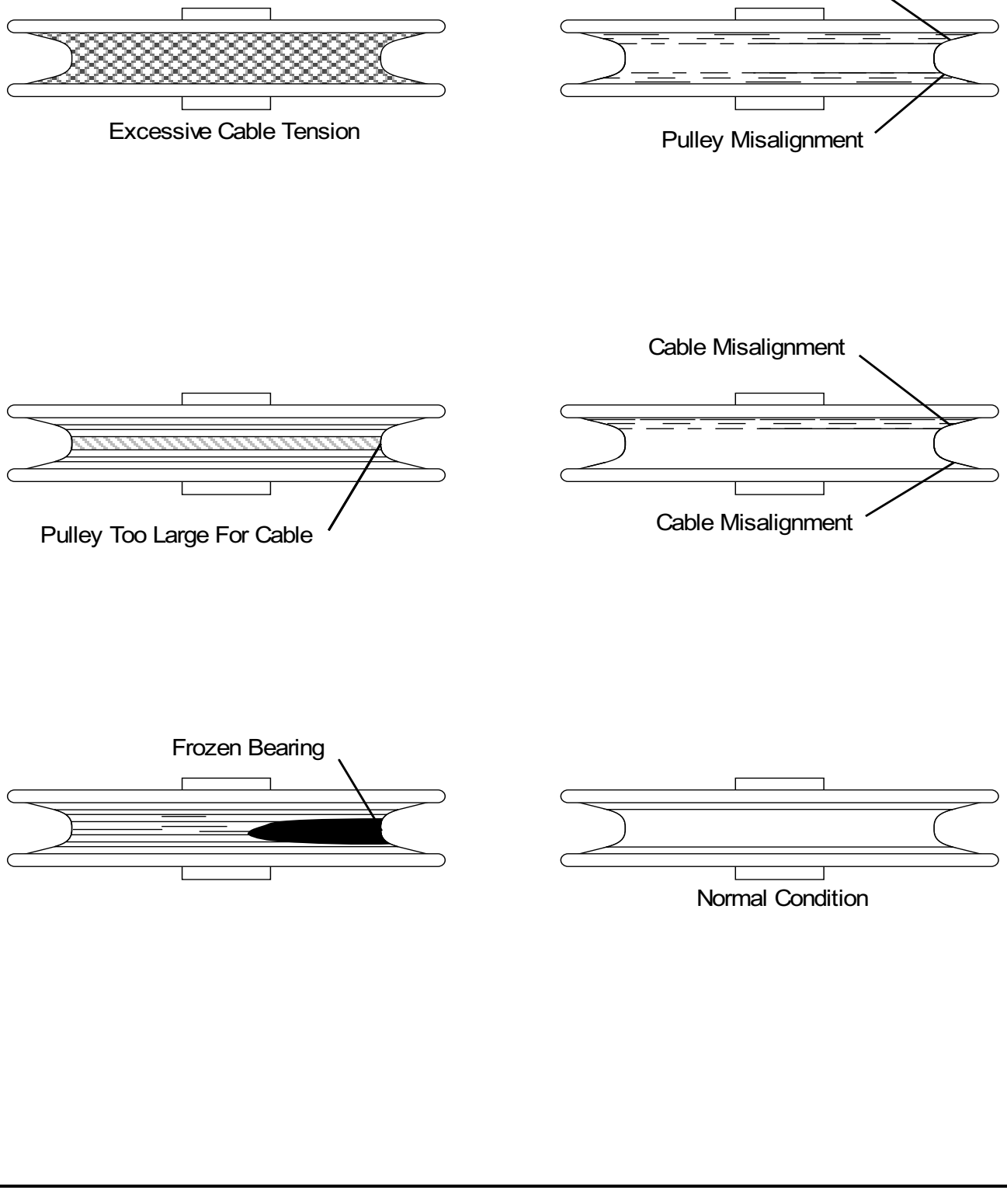
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Figure 205 : Sheet 1 : Pulley Wear Patterns

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TURNBUCKLES - MAINTENANCE PRACTICES

1. Turnbuckles

A. A turnbuckle is a device used in cable systems to provide a means of adjusting tension. Turnbuckles have barrel-shaped sleeves with internal left- and right-hand threads at opposite ends. The cables, with terminals attached, are made to such a length that, when the turnbuckle is adjusted to give the specified cable tension, a sufficient number of threads on the terminal ends are screwed into the barrel to hold the load. The clip-locking turnbuckle and its associated parts are identical to standard AN and MS parts except for a slot grooved on the interior of the barrel and the shanks of the forks, eyes, etc. The clip-locking turnbuckle parts have the following drawing numbers:

(1) MS21251, turnbuckle body

(2) MS21252, turnbuckle clevis end

(3) MS21253, turnbuckle clevis end (for bearing)

(4) NAS649 and NAS651, turnbuckle clip

(5) MS21254 and NAS648, turnbuckle eye (for pin)

(6) MS21255 and NAS647, turnbuckle eye end (for wire rope)

(7) NAS645 and NAS646, turnbuckle fork

(8) MS21256, turnbuckle barrel locking clip

(9) AN130-170, turnbuckle assemblies

(10) MS21259 and MS21260, terminal, wire rope, stud

NOTE: Turnbuckles showing signs of thread distortion or bending should be replaced.

Turnbuckle ends are designed to provide the specified cable tension on a cable system. A bent turnbuckle would place undesirable stress on the cable, impairing the function of the turnbuckle.

2. Turnbuckle Installation

A. When installing cable system turnbuckles, it is necessary to screw both threaded terminals into the turnbuckle barrel an equal amount. It is essential that turnbuckle terminals be screwed into the barrel so that not more than three threads on the terminal are exposed. On initial installation, the turnbuckle terminals should not be screwed inside the turnbuckle barrel more than four threads.

3. Witness Hole

A. Some manufacturers of turnbuckles incorporate a "witness hole" in the turnbuckle barrel to ensure that the threaded cable terminals are screwed far enough into the barrel. The "witness hole" can be inspected visually or by using a piece of safety wire as a probe.

4. Safety Methods for Turnbuckles

A. Safety all turnbuckles with safety wire using either the double or single-wrap method or with any appropriately approved special safetying device complying with the requirements of FAA Technical Standard Order TSO-C21. The swaged and unswaged turnbuckle assemblies are covered by AN standard drawings. Do not reuse safety wire. Adjust the turnbuckle to the correct cable tension so that no more than three cable threads are exposed on either side of the turnbuckle barrel.

(1) **Double-Wrap Method** - Of the methods using safety wire for safetying turnbuckles, the method described here is preferred, although either of the other methods described is satisfactory. The method of double-wrap safetying is shown in Figure 201.

(a) Use two separate lengths of wire. Run one end of the wire through the hole in the barrel of the turnbuckle, and bend the ends of the wire toward opposite ends of the turnbuckle.

(b) Pass the second length of the wire into the hole in the barrel, and bend the ends along the barrel on the side opposite the first. Spiral the two wires in opposite directions around the barrel to cross each other twice between the center hole and the ends.

(c) Pass the wires at the end of the turnbuckle in opposite directions through the hole in the turnbuckle eyes or between the jaws of the turnbuckle fork, as applicable, laying one wire along the barrel and wrapping the other at least four times around the shank of the turnbuckle and binding the laid wires in place before cutting the wrapped wire off.

(d) Wrap the remaining length of safety wire at least four turns around the shank, and cut it off. Repeat the procedure at the opposite end of the turnbuckle.

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(e) When a swaged terminal is being safety wired, pass the ends of both wires through the hole provided in the terminal for this purpose, and wrap both ends around the shank as previously described. If the hole is not large enough to allow passage of both wires, pass the wire through the hole, and loop it over the free end of the other wire, and then wrap both ends around the shank as previously described. Another satisfactory double-wrap method is similar to the previous method, except that the spiraling of the wires is omitted as shown in Figure 201.

(2) **Single-Wrap Method** - The single-wrap methods described in the following paragraphs and as illustrated in Figure 201 are acceptable but are not the equal of the double-wrap methods.

(a) **Single-Wrap (Spiral)** - Pass a single length of wire through the cable eye or fork or through the hole in the swaged terminal at either end of the turnbuckle assembly. Spiral each of the wire ends in opposite directions around the first half of the turnbuckle barrel, so as to cross each other twice. Thread both wire ends through the hole in the middle of the barrel so that the third crossing of wire ends is in the hole. Spiral the two wire ends in opposite directions around the remaining half of the turnbuckle, crossing them twice. Pass one wire end through the cable eye or fork or through the hole in the swaged terminals, in the manner previously described. Wrap both wire ends around the shank at least four turns each, cutting off excess wire. This method is shown in view (C), Figure 201.

(b) **Single-Wrap** - For the method shown in view (D), Figure 201, pass one length of wire through the center hole of the turnbuckle, and bend the wire ends toward opposite ends of the turnbuckle. Pass each wire end through the cable eye or fork or through the hole in the swaged terminal, and wrap each wire around the shank for at least four turns, cutting off excess wire. After safetying, no more than three threads of the turnbuckle threaded terminal should be exposed.

5. Secured Safety-Wired Turnbuckles

A. Before securing turnbuckles, threaded terminals should be screwed into the turnbuckle barrel until no more than three threads of either terminal are outside the barrel. After the turnbuckle has been adjusted for proper cable tension, two pieces of safety wire are inserted with half the wire length into the hole in the center of the turnbuckle barrel. The safety wires are bent so that each wire extends half the length of the turnbuckle on top and half on bottom. The ends of the wires are passed through the hole in the turnbuckle eyes or between the jaws of the turnbuckle fork, as applicable. The wires are then bent toward the center of the turnbuckle, and each wire is wrapped around the shank four times, binding the wrapping wires in place as shown in Figure 202.

B. When a swaged terminal is being secured, one wire is passed through the hole in the terminal and is looped over the free end of the other wire and both ends wrapped around the shank. All lock wire used in the safetying of turnbuckles should be carbon steel, corrosion-resistant steel, nickel-chromium iron alloy (Inconel), nickel-copper alloy (Monel), or aluminum alloy. For safety cable diameter of safety wire size and material, refer to Table 201.

C. Care should be exercised when safety wiring, particularly where corrosion will present a problem, because smaller wire sizes tend to crack when twisted.

Table 201. Turnbuckle Safetying Guide

Cable Size	Type of Wrap	Diameter of Safety Wire (inches)	Material (Annealed Condition)
1/16	Single	0.040	Copper, brass.*
3/32	Single	0.040	Copper, brass.*
1/8	Single	0.040	Stainless steel, Monel and "K" Monel.
1/8	Double	0.040	Copper, brass.*
1/8	Single	0.057 min.	Copper, brass.*
5/32 and greater	Double	0.040	Stainless steel, Monel and "K" Monel.
5/32 and greater	Single	0.057 min.	Stainless steel, Monel and "K" Monel.
5/32 and greater	Double	0.0512	Copper, brass.*
*** Galvanized or tinned steel, or soft iron wires are also acceptable.**			

6. Special Locking Devices

A. Several turnbuckle-locking devices are available for securing turnbuckle barrels such as wire-locking clips. Persons

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intending to use a special device must ensure that the turnbuckle assembly has been designed to accommodate such devices. A typical unit is shown in Figure 203. When special locking devices are not readily available, the use of safety wire is acceptable.

B. **Assembling and Securing Clip-Lock Turnbuckles** - Wire clip-locking turnbuckles are assembled and secured in the following ways (refer to Figure 204):

(1) Engage the threads of the turnbuckle barrel with the threads of the cable terminal, and turn the barrel until proper cable tension is reached.

(2) Align the slot in the barrel with the slot in the cable terminal.

(3) Hold the lock clip between the thumb and forefinger at the loop end, and insert the straight end of the clip into the opening formed by the aligned slots. Refer to Table 202.

(4) Bring the hook end of the lock clip over the hole in the center of the turnbuckle barrel, and seat the hook loop into the hole.

(5) Apply pressure to the hook shoulder to engage the hook lip in the turnbuckle barrel and complete safety locking of one end of the turnbuckle.

NOTE: Repeat the above steps to safety lock the opposite end of the turnbuckle. Either lock clips may be inserted in the same turnbuckle barrel hole or they may be inserted in opposite holes. However, do not reverse-wire locking clips.

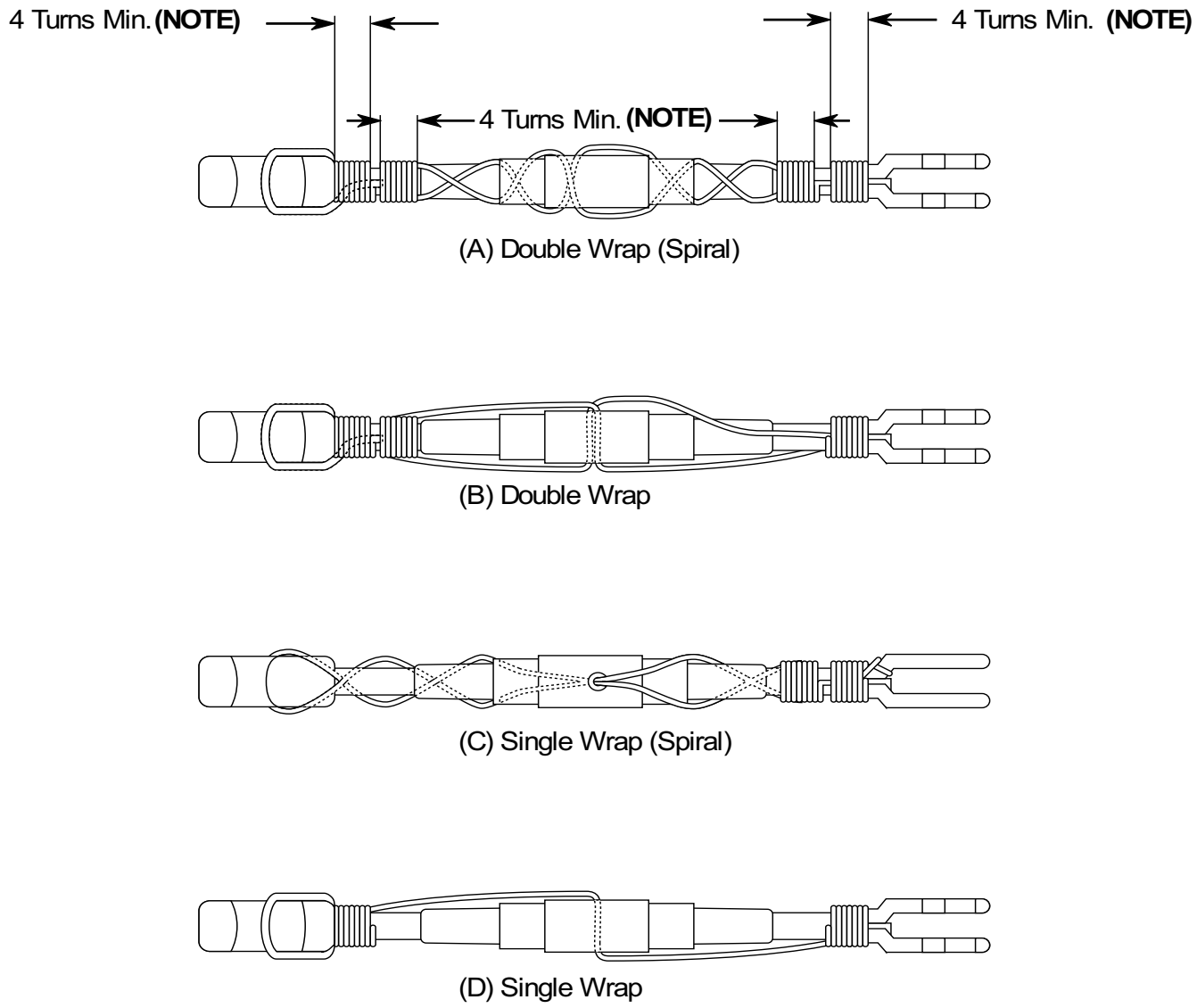
Table 202. Locking-Clip Application

Nominal Cable Diameter	Thread Unf-3	Locking Clip MS21256	Turnbuckle Body MS21251
1/16	No. 6-40	-1	-2S
1/8	1/4-28	-1	-4S
1/8	1/4-28	-2	-4L

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Figure 201 : Sheet 1 : Safetying Turnbuckles

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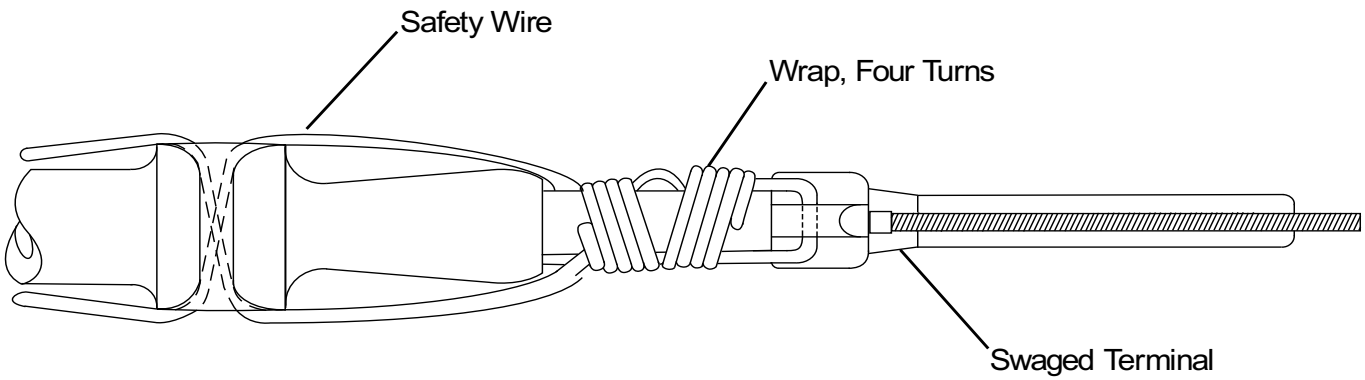


NOTE: This applies to all turnbuckle wrappings.

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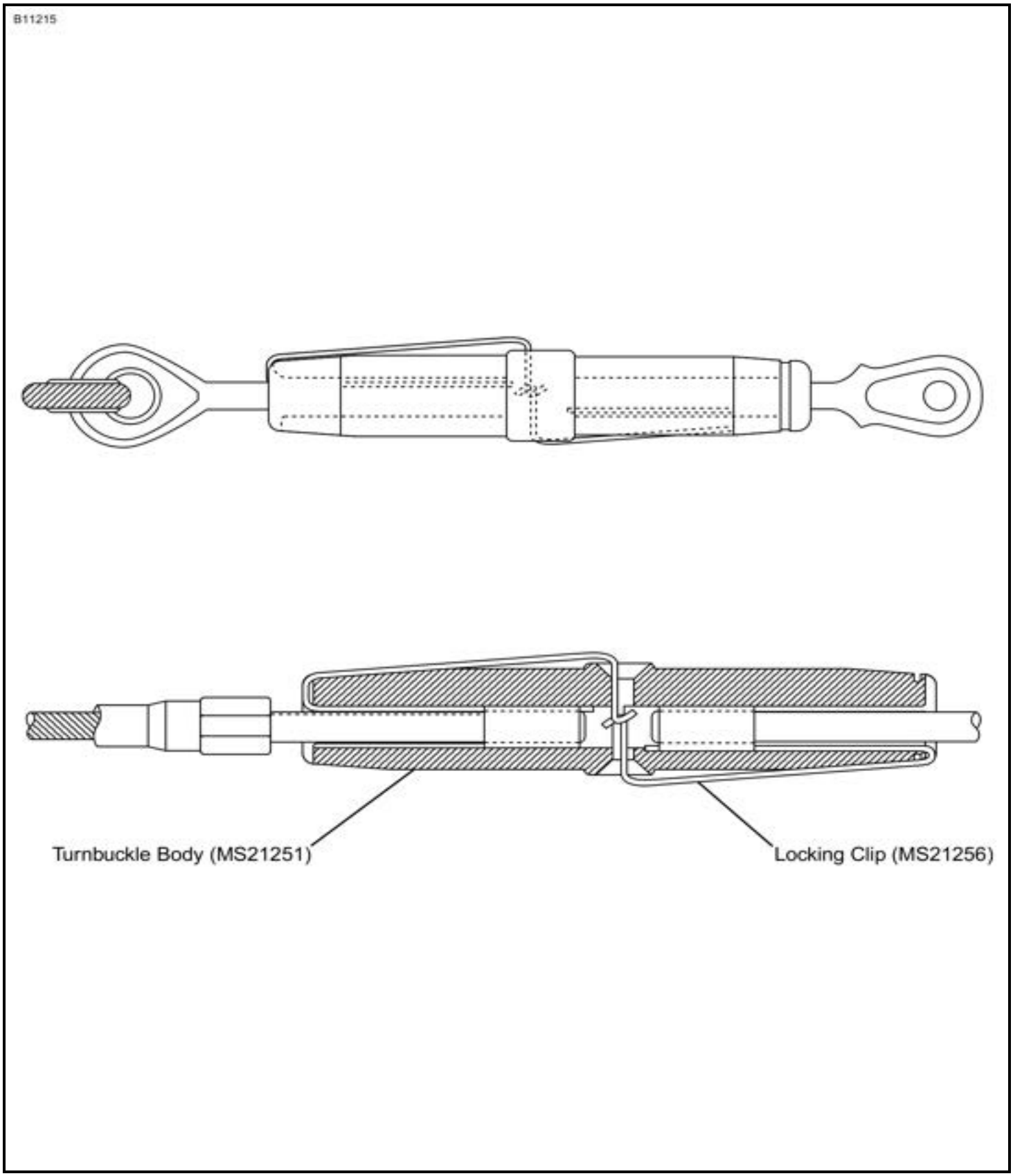
Figure 202 : Sheet 1 : Securing Turnbuckles

B11214



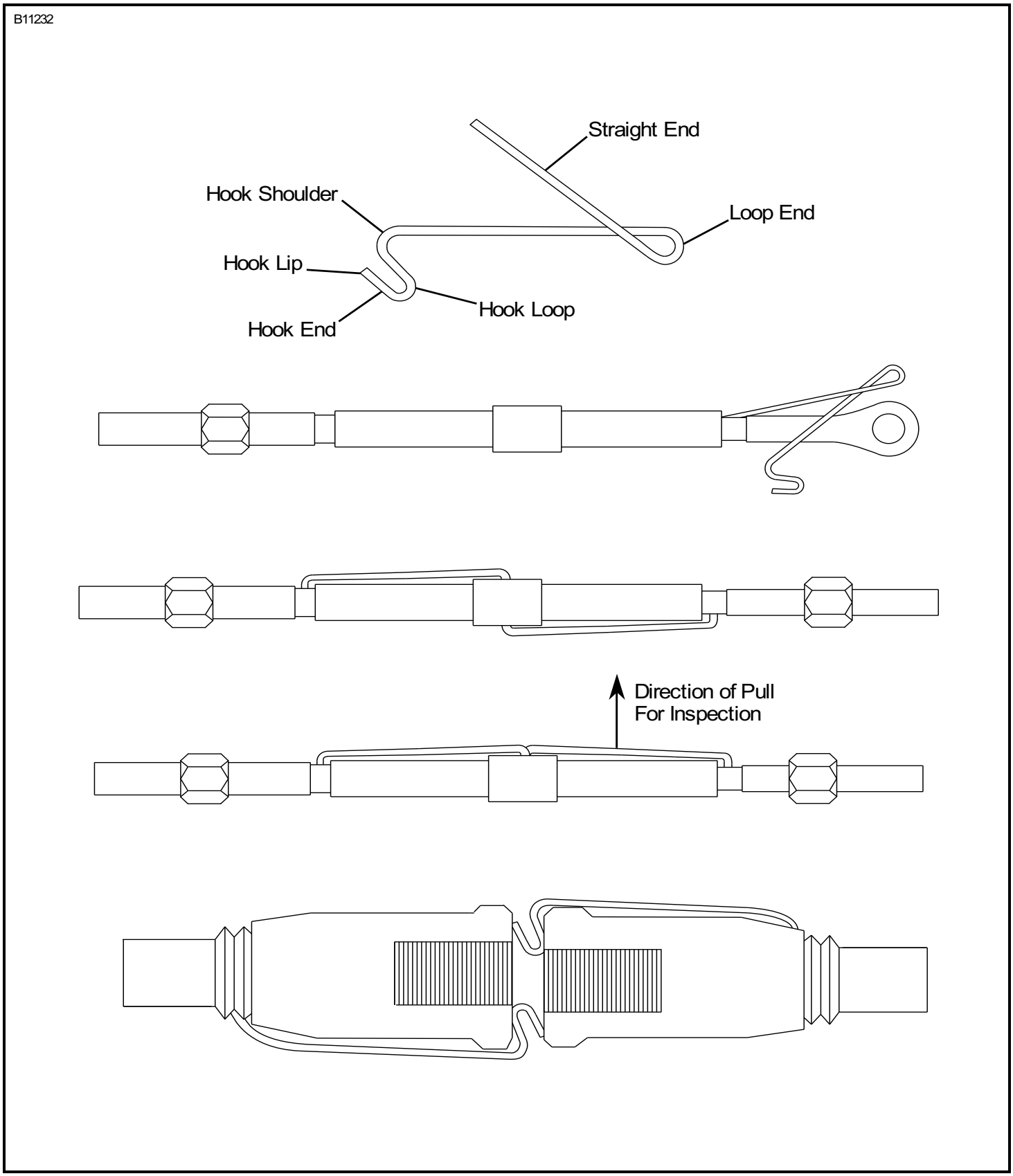
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Figure 203 : Sheet 1 : Clip-Type Locking Device



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Figure 204 : Sheet 1 : Assembling and Securing Clip-Locking Turnbuckles



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SOLVENTS, SEALANTS AND ADHESIVES - DESCRIPTION AND OPERATION

1. Solvents, Sealants, and Adhesives

A. Many general purpose solvents, sealants, and adhesives are used in the aircraft.

B. Solvents are used for thinning and cleaning. Use of solvents used for painting are covered in Chapter 51. MPK and alcohol are used for cleaning of composite parts before bonding and their specific use is described in Chapter 51.

C. Sealants are used for protection, sealing, and thread locking. These items will be specifically called out in specific maintenance manual chapters where their use is required.

D. Adhesives are used in repair and installation. Special purpose adhesives are used for composite repair, composite bonding, upholstery installation, static wick installation, and window installation. Refer to specific maintenance manual chapters for instructions, precautions, and use of these adhesives.

E. Many oils and lubricants are also used.

F. Special purpose cleaners are also listed.

G. Table 1 (Engine and General Purpose Materials) and Table 2 (Special Adhesives, Solvents, and Other Materials) list these items.

Table 1. Engine and General Purpose Materials

Part Number	Product Description of Material	Cessna Specification or Vendor
LI100	Avgas, Gasoline	
Aeroshell 2f	Break-In Oil, Engine, Mil-C-6529 Type II	Aeroshell
Aeroshell 15W50	Oil, Engine	Aeroshell
Z24E024	Oil, Red Hydraulic MIL-H-5606	Esco
	Oil, General Purpose, Lubricating MIL-L-7870	
Aeroshell 22Mobil 28	Grease, Wheel Bearing MIL-G-81322	AeroshellMobil
	Antiseize Compound MIL-T-5544	Lubtork
DC 7	Silicone Release Compound	Dow Corning
	SAE 10 Oil, Grease Seal Preparation	
Aeroshell 6	Propeller Grease	Aeroshell
	K&N Air Filter Cleaner and Solvent	K&N
	Windex, Glass Cleaner, Instruments And Moving Map Displays	
	P210 Plastic Cleaner, Windows	Sumner Labs
	Permatex #2	SX519040 or Loctite
RTV133	Silicone Rubber, Black	E.V. Roberts
RTV5818	Silicone Rubber Caulk, Clear 400° F	E.V. Roberts General Electric
440014	Sealant, High Pressure	ND Industries
PR 1428	Fuel Tank Access Panel and Fitting Sealant	PRC Courtalds
AC236	Fuel Tank Sealant	AC Tech
	Paint (Refer to Chapter 51)	SX512701
	Zinc Oxide Primer	SX513840
1522	Fire Resistant Paint (Refer to Chapter 51)	SX512701
	Zinc Chromate Primer	
	Acetone	
	Alcohol	
	MPK	

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325 Solvent UN1268	Cleaning Solvent	
RTV81409	Silicone Rubber, Red	Permatex
RTV162	Silicone Sealant, White, (Type V, Class E)	GE
14320 (47 ml cartridge) or 14385 (400 ml cartridge)	Plastic Welder I	SX513600 or ITW Devcon
14340 (47 ml cartridge) or 14390 (400 ml cartridge)	Plastic Welder II	SX513600 or ITW Devcon
1307LV	Jeffco Epoxy Resin with 3102 Hardener	SX513600 or Jeffco Epoxy Products

Table 2. Special Adhesives, Solvents and Other Materials

Part Number	Product Description of Material	Cessna Specification or Vendor
MGS418L MGS418H	Adhesive (Structural), Two Part Epoxy	SX513120
LP-89	Conductive Adhesive, Two Part Epoxy	SX518001lunar Products
EA9321	Hysol Adhesive, Two Part Epoxy	DEXTERE.V. Roberts
EA9339	Hysol Adhesive, Two Part Epoxy	DEXTERE.V. Roberts
1805	Adhesive, Window Adhesive, Two Part	SX535601Casco Than
1806	Curing Agent, Window Adhesive, Two Part	SX535601Casco Than
1821	Curing Agent, Window Adhesive, Two Part	SX535601casco Than
ADH105P	Adhesive, Upholstery	Keyston
242	Loctite Threadlocker Medium (Blue) Primer N Or T	Loctite
243	Loctite Threadlocker Medium (Blue) Primer N Or T	Loctite
262	Loctite Threadlocker (Red) Primer N or T	Loctite
542	Loctite Threadlocker (Brown) Primer N	Loctite
609	Loctite Retaining Compound (Green) Primer T	Loctite
620	Loctite Retaining Compound (Green) Primer N	Loctite
660	Loctite Retaining Compound (Silver) Primer N	Loctite
675	Loctite Retaining Compound (Green) Primer T	Loctite
N	Loctite Primer	Loctite
T	Loctite Primer	Loctite

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LIGHTNING PROTECTION AND STATIC DISSIPATION - MAINTENANCE PRACTICES

1. Lightning Protection and Static Dissipation Systems

A. The Cessna 400 (LC41-550FG/T240) airframe is protected during lightning strikes by a combination of electrical grounding and metallic mesh over the composite structure. The lightning strike event is very powerful (hundreds of thousands of amps), of short duration (acting like very high frequency electronics), and of a powerful inductive and magnetic nature that can deform very strong conductive elements. Deviations from the approved design may not provide crew or airframe protection.

B. The metallic mesh conducts the currents of a lightning strike from the attachment point to the arc exit point. The requirements of this mesh are dependent on aircraft location.

C. Chapter 51 defines mesh requirements and mesh repair procedures.

D. **SAFE Strips**

(1) The aircraft interior is specially grounded to avoid large potential differences from one point to another during a lightning strike. This protection is accomplished by grounding bars, grounding straps, and Special Aluminum Foil Edging (SAFE) strips.

(2) SAFE strips are thin self adhesive aluminum foil. They are strategically placed in the cockpit under the upholstery and seats on the composite structure. Refer to Figure 201. SAFE strips run across the fuselage from one grounding bar to the other.

(3) SAFE Strip Material Requirements:

(a) Adhesive Backed Aluminum Foil P/N 971023 from ALUMAT INC.

(b) MS20470AD4-4 Rivets

(c) AN960-4 Washers

(d) Squeegee for rubbing down SAFE strips

(e) Scissors for cutting SAFE strips

(f) Alcohol

(g) Oil-free Rags

(4) SAFE strips should be replaced or repaired when they are severed across more than one half of the existing width.

(5) SAFE strip repair foil must make contact with the existing foil. This is done by folding over the ends of the repair piece and securing the overlap area that is not secured with the self-adhesive backing of a new overlapping piece. This method is shown in Figure 202. Be sure to adhere to the overlap requirements of 1.0 inch foil-to-foil contact around the perimeter of the repair.

(6) Clean all surfaces to which SAFE strip material must be applied. Use alcohol and clean, oil-free rags. Wipe surface, turning rag to use a new surface with each wipe. Apply the self-adhesive SAFE strip material by carefully aligning material and rubbing it down with a squeegee. Work slowly and carefully to prevent wrinkles and bubbles. Small wrinkles and bubbles less than 1.0 inch across are acceptable. Large bubbles should be popped with a pin or knife prick and squeegeed down. Cutting out the offending material and replacing it with a suitable patch can repair large wrinkles or creases in the SAFE strip. Be sure to follow the repair guidelines from the previous section.

(7) SAFE strips are grounded to the grounding bars with rivets. Refer to Figure 203. This connection should be inspected. If electrical contact is not confirmed by visual inspection of contact between the washer and SAFE strip, the connection should be removed for replacement. The use of a voltmeter to check the connection will not work. If any connection exists from the SAFE strip and the grounding bar, conductivity will be indicated. The conductivity check does not substantiate the current carrying ability of the connections.

(8) Rivets are MS20470AD4-4 pop type and secure AN960-4 washers against the SAFE strips.

(9) If complete replacement of a SAFE strip is required, the material should be folded over at the ends where contact with the grounding bar is required. This procedure is shown in Figure 204. Installation of rivets and washers complete the electrical contact connection.

(10) SAFE strips run into the footwell. Inspect this SAFE strip connection by visual confirmation of aluminum foil integrity in the contact area. This detail is shown in Figure 205. Note that the SAFE strip material wraps over the edges of the footwell, from the inside surface to the outside, to make contact with the SAFE strip material on the fuselage floor.

E. **Grounding Straps** - Grounding straps and bars are more conventional conductors. They provide a high current carrying

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capability between major airframe elements. Grounding straps can be found between the engine mount and the fuselage grounding bars, flight control surfaces and wing or stabilizers, gearbox and grounding bar, instrument panel and grounding bar, engine and radio rack, and various avionics components and the radio rack and instrument panel.

(1) Braided Grounding Straps - These are located:

(a) Between the ailerons and wing (one each side)

(b) Between the rudder and vertical stabilizer

(c) Between the fuselage and elevator

(d) Between the gearbox and grounding bar (one each side)

(e) Between the instrument panel and grounding bar (one each side)

(2) Solid Strap Conductors - These are located between the grounding bars and the upper engine mount bolts, one each side.

F. **General Aircraft Conductivity Check**

(1) The aircraft has nine static wicks. These wicks dissipate the static charge the aircraft develops as it flies through the air. The static charge the aircraft develops is strongly dependent on the atmospheric conditions at the time. Snow is most likely the atmospheric condition that will create the largest static charge. Improper static wick function may show up as a crackling sound from the radio speakers.

(2) Check each static wick mounting pad (nine each) for low resistance to the nose gear or engine bonding strap. Each should measure less than 10 ohms.

NOTE: If the resistance is greater than 10 ohms, this could indicate corrosion at the hinge points.

(a) Check the aileron hinge to the nose gear or engine bonding strap for low resistance. This value should be less than 10 ohms. Refer to Chapter 27, Aileron Control System - Maintenance Practices.

(3) The aircraft fuel filler caps and mounting rings should also be grounded to the rest of the airframe. This is especially important to prevent static discharge during refueling.

(4) Check the fuel cap rings for low resistance to the nose gear or engine bonding strap. This value should be 0 to 500 ohms.

2. Inspection and Repair After Lightning Strike

A. In the event of a lightning strike, or suspected lightning strike, inspect the surface of the aircraft for evidence of damage such as bubbled or bumpy paint.

B. Remove paint and bodywork until mesh is exposed.

NOTE: If damage is noted to the composite material, evidenced by brown or darker fibers, contact Cessna Aircraft Company for further instructions.

C. Using a 10x magnifying glass isolate the entire damaged area of mesh and a 1 inch square area of damaged mesh within that, evidenced by deformed mesh strands - flat or bulbous in appearance.

D. Count the number of damaged strands in that 1 inch square area and calculate what percentage that is of the entire affected area. If it is less than 2 percent of the total area, no mesh repair is necessary; if greater than 2 percent of the total area, a mesh repair is necessary.

E. For mesh repairs, overlap affected area 1 inch beyond damaged area with replacement mesh and apply using Jeffco epoxy.

F. Upon completion of repairs or aircraft exterior inspection, bodywork and paint affected areas in accordance with Section 51-70-00, Paint Repair and Painting.

G. Inspect all hardware associated with damaged areas for magnetism. If no magnetism is noted, reuse hardware.

H. If hardware is found to be magnetized, inspection of respective hardware locations where hardware contacts mesh is required. Wing attachment hardware contacting mesh must have associated bolt holes inspected for damaged mesh. If mesh around the bolt holes is damaged, the affected holes and hardware must be increased one size to restore contact of mesh to hardware for proper lightning protection. Enlarge holes using a 5/16 tapered drill ream.

I. Actuate flight controls to ensure proper operation. If defects are noted, inspect for evidence of arcing on control surface attachments and associated hardware and replace as needed.

J. Remove the circuit breaker panel in accordance with Chapter 25. Remove and replace the avionics bus surge suppressor attached to the front side of the aft circuit breaker panel half.

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K. Reinstall the circuit breaker panel and do the electrical/avionics checkout procedures that follow for the system installation that is applicable, Avidyne Avionics system or the Garmin G1000 or G2000 system, If the systems do not function correctly, contact Cessna Aircraft Company for further instructions for repair or replacement of the equipment.

L. Verify compass card accuracy.

M. Compliance with Teledyne Continental Motors Service Bulletin No. M88-9, for power plant lightning strike inspection criteria is recommended.

3. Checkout Description

A. **Avidyne Avionics**

(1) 'Buzz Box'

(a) Connect 'Buzz Box' to aircraft MAGs connecting to:

1 Right MAG sensor wire to center post on right MAG

2 Left MAG sensor wire to center post on left MAG

3 Ground sensor wire to engine ground

NOTE: It may require the propeller to be turned clockwise until an audible click can be heard for the MAGs to work correctly.

(b) Verify ignition switch positions:

1 Left

2 Right

3 Both

4 Off

(c) Remove the Buzz Box.

WARNING: Clear the area around the propeller of personnel and equipment. To avoid the engine from starting, ensure that the spark plugs are not installed or have been disconnected.

(2) Energize the starter with only the left bus energized and verify operation and proper direction of rotation of the engine. Energize the starter with only the right bus energized and verify the operation of the starter motor. The propeller should rotate clockwise as viewed from the pilot's seat. The Starter Engaged light on the annunciator panel should be lit when the Starter relays are energized. Remove the keys from the ignition switch and stow in the proper location.

(3) Verify operation of the battery switches and essential bus feed. Turn on only the left bus and verify items on the left bus are energized. Also check that the essential bus is energized. Turn on only the right bus and verify items on the right bus are energized. Check again that the essential bus is energized.

NOTE: No ground power is applied for this test.

(4) Connect a 14 VDC (S/N 41002 to 41500) or 28 VDC (S/N 41501 and on) power supply to the ground power plug. (Maintain voltage between 13 VDC and 14 VDC (S/N 41002 to 41500) or between 26 VDC and 28 VDC (S/N 41501 and on) for this test.) Turn on the crosstie switch and verify that the left bus is energized when the crosstie switch was turned to 'ON' and that both the right and left buses are energized. Verify that the green lights on the left and right voltage regulators are illuminated when the 'ALT' switches are turned on. (Voltage regulators are located on the inside of the firewall, right hand side.) Verify the ammeter shows a charge on the corresponding battery when that battery switch is turned on and the ammeter is in the 'BATT' mode.

(5) With the right 'ALT' switch on, check for approximately 10-11 volts (S/N 41002 to 41500) or 24-26 volts (S/N 41501 and On) on the F-1 terminal of the right alternator. Terminal F-2 is grounded. With the left 'ALT' switch on check for approximately 10-11 volts (S/N 41002 to 41500) or 24-26 volts (S/N 41501 and On) on the field terminal of the left alternator. Measure the resistance from the left alternator case, to the engine block. The total resistance should be less than 1.0 ohm.

(6) With ground power turned off and using batteries, energize the avionics master switch and check for voltage on the avionics bus with only the left bus energized and also with only the right bus energized, crosstie open.

(7) Apply ground power and turn on the position lights switch. Check all 4 bulbs for illumination and proper color orientation (green right side, red left side).

(8) Turn on the strobe lights and verify 3-4 flashes per event. Ensure that the wing flashes alternate between the left and right sides.

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(9) Turn on the landing light and verify the inboard light illuminates (the one without a diffuser).

(10) Turn on the taxi light and verify the outboard light (with the diffuser) illuminates.

(11) Turn on the Vapor Suppress switch and verify low speed operation of the boost pump.

(12) Momentarily move the back-up pump switch to the arm position. Verify that the blue arm light illuminates and the boost pump operates in high speed. The fuel pump annunciator should also light.

(13) Press the primer button and verify high-speed operation of the boost pump.

(14) Verify operation of the engine gauges that can be checked without the engine running: a) fuel level gauge, b) man press, c) oil temp, and d) dual amp gauge. (Cycle the engine instrument circuit breaker to test needle movement).

(15) Door Operational Checkouts;

(a) Close and lock left, right and baggage doors.

(b) Door Open light on annunciator panel should be extinguished.

(c) Open any door and ensure that the flip lights and the step lights stays lit for approximately 10 minutes.

(d) Open the right and baggage doors and ensure that the flip lights and the step lights stays lit for approximately 10 minutes.

(e) With all doors closed and locked, turn on Door Seal Pump Switch and verify pump operation - door seals inflate and pump turns off when seals are full.

(f) Door seal pump should not cycle (on and off) for at least 30 seconds.

(g) Open left door slowly; dump valve should relieve all pressure and door opens.

(h) Again, door seal pump should not cycle (on and off) for at least 30 seconds.

(i) Open right door slowly; dump valve should relieve all pressure and door opens.

(j) Turn door seal system off, slowly open either door to verify dump valve operation.

(16) Check ELT remote switch function (leave the ELT Transmitter in the armed mode). Tune the VHF COM to 121.5 MHz, and listen through the cabin speaker or the headsets. Turn the ELT switch, located on the right hand knee bolster, to the 'ON' position.

NOTE: Per FCC regulations the ELT system should only be checked during the first five (5) minutes of the hour.

(17) Test the static and pitot systems for leak rate and for proper operation.

CAUTION: DO NOT EXCEED A RATE OF CLIMB >2000 FEET PER MINUTE.

Static system leak rate = fpm at 1000 feet above field elevation. (Maximum leak rate allowed is 100 fpm at 1000 feet above field elevation for the static system only.) Raise static system 100 feet above field elevation and hold open the alternate static valve, located on the left side knee bolster (turn to **ALT**), the system should immediately drop to field elevation. With switch still in **ALT** position, raise pitot system to 200 kts. Close the valves on the pitot static test pump, then time and observe the pitot system leak rate. Verify that the airspeed tape on the PFD and the mechanical airspeed operate correctly. Maximum leak rate allowed is 25 kts per minute. Pitot System leak rate = _____kpm. Note: Conduct the test for the next task concurrently with this test item.

(18) Verify that the PFD is properly configured. While testing the pitot system, run the PFD and mechanical airspeed indicator high enough to verify that the following airspeed limitation markings are correct:

(a) White Range, 60 - 117 kias

(b) Green Range, 73 - 181 kias

(c) Yellow Range, 181 - 230 kias

(d) Red Range, above 230 kias

(19) **Pitot Heat Test**

CAUTION: Use care when touching the hot pitot mast. Do not operate pitot heat for more than one minute.

(a) Turn on the pitot heat switch on the rocker switch panel. Note that the current draw on the amp meter increases. Carefully feel with the back of your hand for actual heating at the pitot tube.

(b) Turn off the pitot heat. **Only leave the pitot heat on long enough to verify the operation of the heating element.**

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(20) Ensure the flags of the turn coordinator located on the avionics shelf, and attitude gyro located on the instrument panel, are not displayed. Listen for the rotor of the gyros to spin up.

(21) Operate the flap switch and verify that the LED in the knob flashes while the flaps are in transition. Check all three positions. Verify the flashing light goes out once the flaps reach the position indicated on the handle.

(22) **Trim Panel Adjustment**

(a) Verify operation of trim servos (two axis) for travel, direction of travel, and run them from stop to stop. Verify the operation of the on/off switch.

(b) Verify that the pilot's trim switch on the control stick (left side) overrides the copilot trim switch on the control stick (right side). Test both the pitch and the aileron trim.

(c) Ensure the trim panel indications agree with the external position of the tabs for the aileron and elevator trim and that the display properly indicates stop to stop.

(d) If trim panel adjustment is required contact Cessna Aircraft Company for instructions. If adjustments are made, re-verify operation of trim servos (two axis) for travel, direction of travel, and run them from stop to stop. Re-verify the operation of the on/off switch as well.

(23) Turn on the Autopilot Computer with the audio panel on at the same time. Engage and then disconnect the autopilot, while listening for the audio level of the AP DISC through the aircraft speaker. Turn off the autopilot computer, and remove from its tray. Adjust the Autopilot Disconnect Volume adjustment pot, located on the right side of the computer, just forward of the bezel, until the AP DISC Volume is set to a comfortable audio level. Take care not to adjust the AP DISC volume too low. Test the computer once completed.

(24) Perform Initial Set-Up Procedures for the Cessna 400 Avionics, as equipped.

(25) **Avionics Tests**

(a) Turn on the Avionics Master Switch and verify the operation of:

1 Comm 1 and 2 - Refer to Table 201.

2 GPS 1 and 2 - Refer to Table 202.

3 PFD - Refer to Table 203.

4 MFD - Refer to Table 204.

5 Audio System - Refer to Table 205.

6 Marker Beacon (NAV-401AP) - Refer to Table 206.

7 NAV (NAV-401AP) - Refer to Table 207.

8 ILS (NAV-401AP) - Refer to Table 208.

9 Autopilot (NAV-401AP) - Refer to Table 209.

10 Flight Director - Refer to Table 210.

11 Auto Trim - Refer to Table 211.

Table 201. Avionics Test - Comm 1/2

Comm1/2:

[ ]	[ ]	TX/RX 123.225
[ ]	[ ]	T/R QUALITY
[ ]	[ ]	SIDE TONE
[ ]	[ ]	MAN SQUELCH
[ ]	[ ]	PILOT'S PTT
[ ]	[ ]	COPILOT'S PTT

Table 202. Avionics Test - GPS 1/2

GPS 1/2:

[ ]	[ ]	Self Test: PFD EHSI agrees with self test data:(Conduct AP GPSS testing during GPS self test)
[ ]	[ ]	Sat Lock

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[ ] [ ] Setup per procedure
[ ] [ ] Encoder Altitude
[ ] [ ] TIS traffic data
[ ] [ ] DX to PFD, MFD
[ ] [ ] DX from PFD
[ ] [ ] S/W and data cards revisions match
[ ] [ ] Cross fill
[ ] [ ] S/W and data cards revisions match
[ ] [ ] KRDM as WPT (10.1 nm)

Table 203. Avionics Test - PFD

PFD:

[ ] [ ] Proper Setup for Cessna 400
[ ] [ ] RX valid GPS position data from GPS 1,2
[ ] [ ] GPSS, Nav, HDG and ALT info to autopilot
[ ] [ ] Knob operation
[ ] [ ] Air Data operation
[ ] [ ] Autopilot Annunciator

Table 204. Avionics Test - MFD

MFD:

[ ] [ ] Proper setup for aircraft type
[ ] [ ] RX valid GPS position data from GPS 1,2
[ ] [ ] Receives HDG and OAT data from PFD
[ ] [ ] Receives Stormscope or WX data as installed
[ ] [ ] Engine instrumentation data present and valid
[ ] [ ] Oil temp turned on
[ ] [ ] Receives and displays traffic information, if installed

Table 205. Avionics Test - Audio System

Audio System:

[ ] [ ] Pilot's ICS
[ ] [ ] Co-Pilot's ICS
[ ] [ ] Pass 1,2 ICS
[ ] [ ] ISO/CREW functions
[ ] [ ] Pilots/Co-pilots side tone quality and level
[ ] [ ] Emergency TX on Comm 1 with audio panel off
[ ] [ ] Nav 1, 2 Audio
[ ] [ ] Bose Headsets**REPEAT ALL AUDIO SYSTEM CHECKS**

Conduct the following tests using the NAV-401AP test set.

Table 206. Avionics Test - Marker Beacon (NAV-401AP)

Marker Beacon:

[ ] [ ] Outer Marker - 400hz tone, Blue Light
[ ] [ ] Middle Marker - 1300 Hz tone, Amber light
[ ] [ ] Inner Marker - 3Khz tone, White Light

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[ ] [ ] Remote Display

[ ] [ ] Hi/Lo sensitivity tests, Hi/ Lo Split

Table 207. Avionics Test - Navigation Systems 1,2 - NAV (NAV-401AP)

Navigation Systems 1,2 :

NAV:

[ ] [ ] Receive 112.80

[ ] [ ] Flags Out of view

[ ] [ ] CDI (Left / Center / Right)

[ ] [ ] To/From operation

[ ] [ ] 30 degree accuracy checks

Table 208. Avionics Test - Navigation Systems 1,2 - ILS (NAV-401AP)

ILS:

[ ] [ ] Receive 108.1

[ ] [ ] Localizer (Left / Center / Right)

[ ] [ ] Localizer flag pulled

[ ] [ ] Glide slope bars (Up / Center / Down)

[ ] [ ] Glide slope valid

[ ] [ ] Autopilot coupling and tracking checks in Nav Mode, testing above functions

[ ] [ ] Nav Audio

[ ] [ ] ILS sensitivity

Table 209. Avionics Test - Navigation Systems 1,2 - Autopilot (NAV-401AP)

Autopilot:

[ ] Master switch operation

[ ] Turn Coord. Valid

[ ] HDG bug operation

[ ] NAV (Tracks D-BAR)

[ ] CRS (Tracks Course Datum Pointer, No signal applied)

[ ] APR mode engaged on ILS freq.

[ ] Localizer Left Right (Stick Tracks)

[ ] Glide Slope soft capture

[ ] G/S bars up/down, stick tracks to glide slope bars

[ ] ALT hold mode engages and holds

[ ] ALT PRESELECT engages and tracks from PFD

[ ] VS engages and tracks from PFD controls

[ ] AP Disconnect (Both positions on switch)

[ ] Disconnect sona-lert

[ ] Disconnect audio

[ ] Remote Annunciator on PFD

Table 210. Avionics Test - Navigation Systems 1,2 - Flight Director (NAV-401AP)

Flight Director:

[ ] Command Bars engage, and track in Autopilot pitch mode

[ ] AP FD mode, Command bars tracks with autopilot

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[ ] FD mode; Command Bars track, Servo clutches disengage

Table 211. Avionics Test - Navigation Systems 1,2 - Auto Trim (NAV-401AP)

Auto Trim:

[ ] Manual Pitch trim disconnects autopilot. (Pitch UP and DN, from both stick grips.)

[ ] Stick back - Trims DN

[ ] Stick Forward - Trims UP

[ ] Stick Back - Trim Annunciator on autopilot indicates DN

[ ] Stick Forward - Trim Annunciator on autopilot indicates UP

[ ] Trim Annunciator lights with Auto Trim off

(26) Physically verify the security of the BNC connections on the NAV signal splitter, and the back of the radios.

(27) Check the speaker for operation.

(28) Check ELT remote switch function (leave the ELT Transmitter in the armed mode). Tune the VHF COM to 121.5 MHz, and listen through the cabin speaker or the headsets. Turn the ELT switch, located on the right hand knee bolster, to the 'ON' position.

NOTE: Per FCC regulations the ELT system should only be checked during the first five (5) minutes of the hour.

(29) **Transponder Test** Perform the transponder test and checkout using the ATC 600A or ATC 601-2 test set. The ATC-600A Transponder/DME test set is to be used for testing Garmin AT model SL 70 or Garmin model GTX 327 Mode A/C transponders. The ATC 600A **is not to be used** for testing of the Garmin model GTX 330 mode S transponder. The ATC-601-2 Mode S Transponder test set is required for testing Garmin model GTX 330 Mode S transponder, and may also be used for testing Garmin model GTX 327 Mode C transponder.

NOTE: A DI or Q inspector must witness the transponder test.

Record the model and serial number of the transponder below.

Make/Model_____/_____ **Serial Number**_____

(30) Insert the entertainment device test cable with a portable walkman-style stereo attached to the music input jack, located inside of the pencil box. Verify that both the left and right audio channels of the entertainment input can be heard through the headsets in the airplane. Verify that the music input mutes to a non-perceptible level when the aircraft comm radios are transmitting and receiving, or when the intercom audio is active.

(31) Activate the Nav/Com Bypass Switch with the aircraft power off and ground power disconnected. The switch should illuminate and the No. 1 GPS, Com, and Nav should turn on The pilot's headset should receive and transmit on the No. 1 Com. Turn off the Nav/Com Bypass Switch and the GPS, Com and Nav should turn off.

(32) Check the dual ammeter for proper operation. The ammeter should power up in the "BATT" mode, pressing the button in the lower right should change the mode to "ALT". It should show a corresponding discharge when a load is applied to the appropriate bus in the "BATT" mode.

CAUTION: Checking grounds with aircraft power, or ground power applied will distort resistance reading.

(33) Turn aircraft power OFF and check the fuel cap rings for low resistance to the nose gear or engine bonding strap (0 to 500 ohms).

(34) Remove all power from the aircraft. Check each static wick or mounting pad (9 each), for low resistance to the nose gear or engine bonding strap, (less than 10 ohms).

(35) Turn on the cabin fan and check for airflow through the selected vents, defroster and floor.

(36) Verify the bus labels on the circuit breaker panel are correct. The top 2 rows are left bus, row 3 is right bus, row 4 is essential bus and the bottom row is avionics.

(37) Activate the hot-cold control on the heater panel and verify the firewall shut-off servo works.

(38) Verify operation of the avionics fan.

(39) Check the annunciator and aural warning system for operation without ground power connected. To simulate the engine running disconnect oil pressure switch connector (aft left side of engine) and short pins A and B together on connector.

(a) The left Alt switch turned on, no light or aural warning heard over speakers or headset.

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1 Turn left alt switch to off. L ALT OFF light is illuminated on annunciator panel. After 2 seconds, "alternator off" is heard over headsets and speaker.

2 Press ACK button and aural warning is canceled. The right alt switch turned on, no light or aural warning heard over speakers or headset.

3 Turn right alt switch to off. R ALT OFF light is illuminated on annunciator panel. After 2 seconds "alternator off" is heard over headsets and speaker.

4 Press ACK button and aural warning is canceled.

(b) On the center console, select left fuel tank.

1 No light on annunciator panel or aural warning is heard over speakers or headset. Fuel level gage illuminates green LED for tank selected.

2 Turn fuel selector to off. FUEL VALVE light is illuminated on annunciator panel. After two seconds "fuel valve" is heard over headsets and speaker. No LED is lit on fuel level gauge.

3 Press ACK button and aural warning is canceled.

4 Repeat previous three steps for the right fuel tank selection.

(c) Check that L LOW FUEL, R LOW FUEL, and DOOR OPEN lights are illuminated on annunciator panel.

(d) Check that OIL light on annunciator panel is off.

(40) Adjust the volume adjustment on the back of the Aural warning unit, until the volume is at a sufficient and comfortable level.

(41) Remove the jumper on the oil pressure switch and reconnect the connector. The OIL light on the annunciator panel illuminates once the oil pressure switch is reconnected.

(42) **Speed Brake Operational Checks:**

WARNING: Clear the left and right wings of personnel and equipment.

(a) Ensure the rudder pedals are aligned evenly and external power is applied > 12.4 VDC (S/N 41002 to 41500), or 26 VDC (S/N 41501 and on).

(b) Deploy Speed Brake by pressing the SPDBRK switch located between the Throttle and Prop levers to the up position.

(c) Speed Brake should deploy, and SPDBRK light on annunciator panel illuminates.

(d) Reposition the SPDBRK switch to the down position.

(e) Redeploy the Speed Brakes and move the stall vane lift detector to the stall position full up. The Speed Brake should not retract.

(f) Reposition the SPDBRK switch to the down position.

(43) Check the test switch on the trim panel to operate the following:

(a) Annunciator panel, all LEDs light.

(b) All trim LEDs light.

(c) Flap switch LED blinks.

(d) Both fuel level gauge LEDs illuminate.

(e) Nav/Com Bypass Switch illuminates.

(44) Turn on the position lights and verify that the following devices dim: fuel level gauge LEDs, trim panel, flap switch LED.

(45) Operate the flip lights, front and rear, with the power off and verify correct operation.

(46) Verify all four (4) channels of the dimmer, one (1) channel at a time:

(a) **UPPER PNL** (panel) lights; Verify Engine and Flight instruments have (2) bulbs illuminated per instrument. MFD, PFD (or clock) lights and compass light are illuminated and no other lights are on.

(b) **LOWER PNL** (panel) lights; Verify Master switch panel, Heater control panel, Trim panel, and autopilot computer lights and the circuit breaker panel lights are illuminated and no other lights are on.

(c) **FLOOD** lights; Verify glare shield lights are illuminated and no other lights are on.

(d) **SPOT** lights; Verify overhead spotlights are illuminated and no other lights are on.

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(e) With the position light switch on, the backlighting on the Flap panel should illuminate.

(47) Visually check the integrity of all fuses (4) on the power grid located in the aft avionics compartment.

(48) Pull all circuit breakers and ensure the labeling agrees with the circuit it supplies by pushing in the circuit breaker. Ensure positive latching of the circuit breaker.

(49) Check the power point for voltage and verify polarity.

(50) Check for painted or plastic coated screws in the instruments panels, and clean instrument dials.

(51) Verify security and quality of the switches on the stick grip.

(52) Verify the cooling hose is securely fastened and in place behind the instrument panel and the radio rack.

(53) Perform IRU calibration on the PFD.

(54) Check wire runs and attachments of all wires and coax cables for abrasion potential support, and wire tying:

(a) Along sides of fuselage

(b) Behind the stick grips

(c) Behind the instrument panel

(d) All flight controls and fluid lines

(e) Behind the radio stack

(f) Ensure wiring bundles are free and clear of rudder cables on the right side and free and clear of the circuit breaker panel on the left side.

B. **Garmin G1000 or G2000 System**

(1) 'Buzz Box'

(a) Connect 'Buzz Box' to aircraft MAGs connecting to:

1 Right MAG sensor wire to center post on right MAG

2 Left MAG sensor wire to center post on left MAG

3 Ground sensor wire to engine ground

NOTE: It may require the propeller to be turned clockwise until an audible click can be heard for the MAGs to work correctly.

(b) Verify ignition switch positions:

1 Left

2 Right

3 Both

4 Off

(c) Remove the Buzz Box.

WARNING: Clear the area around the propeller of personnel and equipment. To avoid the engine from starting, ensure that the spark plugs are not installed or have been disconnected.

(2) Perform the following tests with the cross tie open: Energize the starter with only the left bus energized and verify the starter does not engage. Energize the starter with only the right bus energized and verify the operation of the starter motor. The propeller should rotate clockwise as viewed from the pilot's seat. The Starter Engaged annunciation on the PFD should illuminate when the Starter relays are energized. Remove the keys from the ignition switch and stow in the proper location.

(3) Verify operation of the battery switches and essential bus feed. Turn on only the left bus and verify items on the left bus are energized. Also check that the essential bus is energized. Turn on only the right bus and verify items on the right bus are energized. Check again that the essential bus is energized.

NOTE: No ground power is applied for this test.

(4) Connect a 28 VDC power supply to the ground power plug. (Maintain voltage between 26 VDC and 28 VDC for this test.) Turn on the crosstie switch and verify that the left bus is energized when the crosstie switch was turned to 'ON' and that both the right and left buses are energized. Verify that the green lights on the left and right voltage regulators are illuminated when the "ALT" switches are turned on. (Voltage regulators are located on the inside of the firewall, right hand side.) Verify the ammeter shows a charge on the corresponding battery when that battery switch is turned

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on.

(5) With the right 'ALT' switch on, check for approximately 24-26 volts on the F-1 terminal of the right alternator. Terminal F-2 is grounded. With the left 'ALT' switch on check for approximately 24-26 volts on the field terminal of the left alternator. Measure the resistance from the left alternator case, to the engine block. The total resistance should be less than 1.0 ohm.

(6) With ground power turned off and using batteries, energize the avionics master switch and check for voltage on the avionics bus with only the left bus energized and also with only the right bus energized, crosstie open.

(7) Apply ground power and turn on the position lights switch. Check all 4 bulbs for illumination and proper color orientation (green right side, red left side).

(8) Turn on the strobe lights and verify 3-4 flashes per event. Ensure that the wing flashes alternate between the left and right sides.

(9) Turn on the landing light and verify the inboard light illuminates (the one without a diffuser).

(10) Turn on the taxi light and verify the outboard light (with the diffuser) illuminates.

(11) Turn on the Vapor Suppress switch and verify low speed operation of the boost pump.

(12) Momentarily move the back-up pump switch to the arm position. Verify that the blue arm light illuminates and the boost pump operates in high speed.

(13) Press the primer button and verify high-speed operation of the boost pump.

(14) Verify operation of the engine gages that can be checked without the engine running: a) fuel level gage, b) man press, c) oil temp, d) dual amp gage, e) bus voltage gage, and f) engine temperatures. (Cycle the engine instrument circuit breaker to test needle movement).

(15) **Door Operational Checkouts**

(a) Close and lock left, right and baggage doors.

(b) Door Open annunciation on the PFD should be extinguished.

(c) Open any door and ensure that the flip lights and the step lights stay lit for approximately 10 minutes.

(d) Open the right and baggage doors and ensure that the flip lights and the step lights stay lit for approximately 10 minutes.

(e) With all doors closed and locked, turn on Door Seal Pump Switch, verify pump operation- door seals inflate and pump turns off when seals are full.

(f) Door seal pump should not cycle (on and off) for at least 30 seconds.

(g) Open left door slowly, dump value should relieve all pressure and door opens.

(h) Close door and repeat steps 6 & 7 above for the right side door.

(i) Turn door seal system off, and then slowly open either door to verify dump valve operation.

(16) Test the static and pitot systems for leak rate and for proper operation.

CAUTION: Do not exceed a rate of climb >2000 feet per minute.

Static system leak rate = _____fpm @ 1000' above field elevation. (Maximum leak rate allowed is 100 fpm @ 1000' above field elevation for the static system only.)Raise static system 100' above field elevation and hold open the alternate static valve, located on the left side knee bolster (turn to **ALT**), the system should immediately drop to field elevation.With switch still in **ALT** position, raise pitot system to 200 kts. Close the valves on the pitot static test pump, then time and observe the pitot system leak rate. Verify that the airspeed tape on the PFD and the mechanical airspeed operate correctly. Maximum leak rate allowed is 25 kts per minute.Pitot System leak rate = _____kpm.

NOTE: Conduct the test for the next task concurrently with this test item.

(17) Verify that the PFD is properly configured. While testing the pitot system, run the PFD and mechanical airspeed indicator high enough to verify that the following airspeed limitation markings are correct:

(a) White Range, 60 - 117 KIAS

(b) Green Range, 73 - 181 KIAS

(c) Yellow Range, 181 - 230 KIAS

(d) Red Range, above 230 KIAS

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(18) Check the resistors on the autopilot 485 lines and verify their resistance per the manufacturer specifications.

(19) Replace the TVS diodes on the PFD, GIA, AHRS and standby ADI.

(20) Replace the zener diodes on the oxygen system.

(21) **Pitot Heat Test**

CAUTION: Use care when touching the hot pitot mast. Do not operate pitot heat for more than one minute.

(a) Turn on the pitot heat switch on the rocker switch panel. Note that the current draw on the amp meter increases. Carefully feel with the back of your hand for actual heating at the pitot tube.

(b) Turn off the pitot heat. **Only leave the pitot heat on long enough to verify the operation of the heating element.**

(22) Ensure the flag of the standby attitude gyro located on the instrument panel, is not displayed. Listen for the rotor of the gyros to spin-up.

(23) Operate the flap switch and verify that the LED in the knob flashes while the flaps are in transition. Check all three positions. Verify the flashing light goes out once the flaps reach the position indicated on the handle.

(24) **Trim Indicators Adjustment**

(a) Verify operation of trim servos (two axis) for travel, direction of travel, and run them from stop to stop. Verify the operation of the on/off switch.

(b) Ensure the trim panel indications agree with the external position of the tabs for the aileron and elevator trim and that the display properly indicates stop to stop.

(c) If trim panel adjustment is required contact Cessna Aircraft Company for instructions. If adjustments are made, re-verify operation of trim servos (two axis) for travel, direction of travel, and run them from stop to stop. Re-verify the operation of the on/off switch as well.

(25) Engage the Autopilot with the audio panel on at the same time. Disconnect the autopilot while listening for the audio level of the AP DISC through the aircraft speaker.

(26) Do the initial configuration procedures for the Cessna 400/T240 Avionics systems that are installed.

NOTE: The avionics systems installed can be the Avidyne, Garmin G1000 or Garmin G2000 systems.

(27) **Avionics Tests**

(a) Turn on the Avionics Master Switch and verify the operation of:

1 Comm 1 and 2 - Refer to Table 212.

2 GPS 1 and 2 - Refer to Table 213.

3 PFD - Refer to Table 214.

4 MFD - Refer to Table 215.

5 Audio System - Refer to Table 216.

6 Marker Beacon (NAV-401AP) - Refer to Table 217.

7 MFD (NAV-401AP) - Refer to Table 218.

8 Audio System (NAV-401AP) - Refer to Table 219.

9 Navigation Systems 1 and 2 - NAV (NAV-401AP) - Refer to Table 220.

10 Navigation Systems 1 and 2 - ILS (NAV-401AP) - Refer to Table 221.

11 Navigation Systems 1 and 2 - Autopilot (NAV-401AP) - Refer to Table 222.

12 Navigation Systems 1 and 2 - Flight Director (NAV-401AP) - Refer to Table 223.

13 Navigation Systems 1 and 2 - Auto Trim (NAV-401AP) - Refer to Table 224.

Table 212. Avionics Test - Comm 1/2

Comm 1/2:

[ ] [ ] TX/RX 123.225

[ ] [ ] T/R QUALITY

[ ] [ ] SIDE TONE

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[ ] [ ] MAN SQUELCH
[ ] [ ] PILOT'S PTT
[ ] [ ] COPILOT'S PTT

Table 213. Avionics Test - GPS 1/2

GPS 1/2:

[ ] [ ] Verify that GPS 1 and GPS 2 are receiving a signal
[ ] [ ] Sat Lock
[ ] [ ] Setup per procedure
[ ] [ ] TIS traffic data
[ ] [ ] DX to PFD, MFD
[ ] [ ] DX from PFD
[ ] [ ] S/W and data cards revisions match
[ ] [ ] Select a waypoint and confirm distance

Table 214. Avionics Test - PFD

PFD:

[ ] [ ] Proper Setup for Cessna 400
[ ] [ ] RX valid GPS position data from GPS 1,2
[ ] [ ] Knob operation
[ ] [ ] Air Data operation
[ ] [ ] Autopilot Annunciator
[ ] [ ] Valid AHRS
[ ] [ ] Cross talk with MFD

Table 215. Avionics Test - MFD

MFD:

[ ] [ ] Proper setup for aircraft type
[ ] [ ] RX valid GPS position data from GPS 1,2
[ ] [ ] Cross talk with PFD
[ ] [ ] Receives Stormscope or WX data as installed
[ ] [ ] Engine instrumentation data present and valid
[ ] [ ] Receives and displays traffic information, if installed

Table 216. Avionics Test - Audio System

Audio Systems:

[ ] [ ] Pilot's ICS
[ ] [ ] Co-Pilot's ICS
[ ] [ ] Pass 1,2 ICS
[ ] [ ] ISO/CREW functions
[ ] [ ] Pilot's/Co-pilot's side tone quality and level
[ ] [ ] Emer. TX on Comm 1 with audio panel off
[ ] [ ] Nav 1, 2 Audio
[ ] [ ] Bose Headsets**REPEAT ALL AUDIO SYSTEM CHECKS**

Conduct the following tests using the NAV-401AP test set.

Table 217. Avionics Test - Marker Beacon (NAV-401AP)

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Marker Beacon:

[ ] [ ] Outer Marker - 400 Hz tone, Blue Light
[ ] [ ] Middle Marker - 1300 Hz tone, Amber light
[ ] [ ] Inner Marker - 3 Khz tone, White Light
[ ] [ ] Remote Display
[ ] [ ] Hi/Lo sensitivity tests, Hi/Lo Split

Table 218. Avionics Test - MFD (NAV-401AP)

MFD:

[ ] [ ] Proper setup for aircraft type
[ ] [ ] RX valid GPS position data from GPS 1,2
[ ] [ ] Cross talk with PFD
[ ] [ ] Receives Stormscope or WX data as installed
[ ] [ ] Engine instrumentation data present and valid
[ ] [ ] Receives and displays traffic information, if installed

Table 219. Avionics Test - Audio System (NAV-401AP)

Audio Systems:

[ ] [ ] Pilot's ICS
[ ] [ ] Co-Pilot's ICS
[ ] [ ] Pass 1,2 ICS
[ ] [ ] ISO/CREW functions
[ ] [ ] Pilot's/Co-pilot's side tone quality and level
[ ] [ ] Emergency TX on Comm 1 with audio panel off
[ ] [ ] Nav 1, 2 Audio
[ ] [ ] Bose Headsets**REPEAT ALL AUDIO SYSTEM CHECKS**

Table 220. Avionics Test - Navigation Systems 1/2 - NAV (NAV-401AP)

Navigation Systems 1,2 :

NAV:

[ ] [ ] Receive 112.80
[ ] [ ] Flags Out of view
[ ] [ ] CDI (Left / Center / Right)
[ ] [ ] To/From operation
[ ] [ ] 30 degree accuracy checks

Table 221. Avionics Test - Navigation Systems 1/2 - ILS (NAV-401AP)

ILS:

[ ] [ ] Receive 108.1
[ ] [ ] Localizer (Left / Center / Right)
[ ] [ ] Localizer flag pulled
[ ] [ ] Glide slope bars (Up / Center / Down)
[ ] [ ] Glide slope valid
[ ] [ ] Autopilot coupling and tracking checks in Nav Mode, testing above functions
[ ] [ ] Nav Audio
[ ] [ ] ILS sensitivity

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Table 222. Avionics Test - Navigation Systems 1/2 - Autopilot (NAV-401AP)

Autopilot:

[ ]	[ ]	Master switch operation
[ ]	[ ]	HDG bug operation
[ ]	[ ]	NAV (Tracks D-BAR)
[ ]	[ ]	CRS (Tracks Course Datum Pointer, No signal applied)
[ ]	[ ]	APR mode engaged on ILS freq.
[ ]	[ ]	Localizer Left Right (Stick Tracks)
[ ]	[ ]	Glide Slope soft capture
[ ]	[ ]	G/S bars up/down, stick tracks to glide slope bars
[ ]	[ ]	ALT hold mode engages and holds
[ ]	[ ]	ALT PRESELECT engages and tracks from PFD
[ ]	[ ]	VS engages and tracks from PFD controls
[ ]	[ ]	AP Disconnect (Both positions on switch)
[ ]	[ ]	Disconnect audio
[ ]	[ ]	Remote Annunciator on PFD

Table 223. Avionics Test - Navigation Systems 1/2 - Flight Director (NAV-401AP)

Flight Director:

[ ]	[ ]	Command Bars engage, and track in Autopilot pitch mode
[ ]	[ ]	AP FD mode, Command bars tracks with autopilot
[ ]	[ ]	FD mode; Command Bars track, Servo clutches disengage

Table 224. Avionics Test - Navigation Systems 1/2 - Auto Trim (NAV-401AP)

Auto Trim:

[ ]	[ ]	Manual Pitch trim disconnects autopilot. (Pitch UP and DN, from both stick grips.)
[ ]	[ ]	Stick back - Trims DN
[ ]	[ ]	Stick Forward - Trims UP
[ ]	[ ]	Stick Back - Trim Annunciator on autopilot indicates DN
[ ]	[ ]	Stick Forward - Trim Annunciator on autopilot indicates UP
[ ]	[ ]	Trim Annunciator lights with Auto trim off

(28) Physically verify the security of the BNC connections on the NAV signal splitter, and the back of the radios.

(29) Check the speaker for operation.

(30) Check ELT remote switch function (leave the ELT Transmitter in the armed mode). Tune the VHF COM to 121.5 MHz, and listen through the cabin speaker or the headsets. Turn the ELT switch, located on the right hand knee bolster, to the 'ON' position.

NOTE: Per FCC regulations the ELT system should only be checked during the first five (5) minutes of the hour.

(31) **Transponder Test** Perform the transponder test and checkout using the ATC 600A or ATC 601-2 test set. The ATC-600A Transponder/DME test set is to be used for testing Garmin AT model SL 70 or Garmin model GTX 327 Mode A/C transponders. The ATC 600A **Is not to be used** for testing of the Garmin model GTX 330 mode S transponder. The ATC-601-2 Mode S Transponder test set is required for testing Garmin model GTX 33 Mode S transponder, and may also be used for testing Garmin model GTX 327 Mode C transponder.

NOTE: A DI or Q inspector must witness the transponder test.

Record the model and serial number of the transponder below.

Make/Model_____/_____ **Serial Number**_____

CAUTION: Checking grounds with aircraft power, or ground power applied will distort resistance reading.

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(32) Turn aircraft power OFF and check the fuel cap rings for low resistance to the nose gear or engine bonding strap (0 to 500 ohms).

(33) Remove all power from the aircraft. Check each static wick or mounting pad (9 ea.), for low resistance to the nose gear or engine bonding strap (less than 10 ohms).

(34) Turn on the cabin fan and check for airflow through the selected vents, defroster and floor.

(35) Verify the bus labels on the circuit breaker panel are correct. The top 2 rows are essential bus, row 3 is left bus, row 4 is right bus and the bottom row is avionics.

(36) Activate the hot-cold control on the heater panel and verify the firewall shut-off servo works.

(37) Verify operation of the avionics fan.

(38) Check the annunciator and aural warning system for operation without ground power connected. Start the engine.

(a) The left Alt switch turned on, no light or aural warning heard over speakers or headset.

1 Turn left alt switch to off, L ALT OUT annunciation on the PFD. After 2 seconds, "alternator off" is heard over headsets and speaker.

2 Press Alert button and aural warning is canceled. The left alt switch turned on, no light or aural warning heard over speakers or headset.

3 Turn right alt switch to off, R ALT OUT annunciation on the PFD. After 2 seconds "right alternator out" is heard over headsets and speaker.

4 Press Alert button and aural warning is canceled.

5 Turn the right alt switch to ON.

6 Shut down the engine.

(b) On the center console, select left fuel tank.

1 No annunciations or aural warning is heard over speakers or headset. Fuel level gage illuminates blue indication for tank selected.

2 Turn fuel selector to off, FUEL VALVE annunciation on the PFD.

a After two seconds "fuel valve" is heard over headsets and speaker.

b No indication next to the fuel level gauge.

3 Press Alert button and aural warning is canceled.

4 Repeat the previous three steps for the right fuel tank.

(c) Check that DOOR OPEN annunciates on the PFD when one of the three doors are open.

(39) **Speed Brake Operational Checks:**

WARNING: CLEAR THE LEFT AND RIGHT WINGS OF PERSONNEL AND EQUIPMENT.

(a) Apply external power > 26 VDC.

(b) Deploy Speed Brake by pressing the **SPDBRK** switch located between the Throttle and Prop levers to the up position.

(c) Speed Brake should deploy, and "SPEED BRAKES" annunciates on the PFD..

(d) Reposition the **SPDBRK** switch to the down position.

(e) Redeploy the Speed Brakes and move the stall vane lift detector to the stall position full up, the S/B should not retract.

(f) Reposition the **SPDBRK** switch to the down position.

(40) Check the test switch on the trim panel to operate the following:

(a) 5 pack switches on instrument panel illuminate.

(b) Flap panel switches illuminate.

(c) Flap switch LED blinks.

(41) Turn on the position lights and verify that the following devices dim: fuel level gauge LEDs, trim panel, flap switch LED.

(42) Operate the flip lights, front and rear, with the power off and verify correct operation.

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(43) Verify all four (4) channels of the dimmer, one (1) channel at a time:

(a) **UPPER PNL** (panel) lights; Verify Engine and Flight instruments have (2) bulbs illuminated per instrument. MFD, PFD (or clock) lights and compass light are illuminated and no other lights are on.

(b) **LOWER PNL** (panel) lights; Verify Master switch panel, Heater control panel, Trim panel, and autopilot computer lights and the circuit breaker panel lights are illuminated and no other lights are on.

(c) **FLOOD** lights; Verify glare shield lights are illuminated and no other lights are on.

(d) **SPOT** lights; Verify overhead spotlights are illuminated and no other lights are on.

(e) With the position light switch on, the backlighting on the Flap panel should illuminate.

(44) Visually check the integrity of all fuses (4) on the power grid located in the aft avionics compartment.

(45) Pull all circuit breakers and ensure the labeling agrees with the circuit it supplies by pushing in the circuit breaker. Ensure positive latching of the circuit breaker.

(46) Check the power point for voltage and verify polarity.

(47) Check for painted or plastic coated screws in the instruments panels, and clean instrument dials.

(48) Verify security and quality of the switches on the stick grip.

(49) Verify the cooling hose is securely fastened and in place behind the instrument panel and the radio rack.

(50) Verify AHRS calibration and perform AHRS calibration on the PFD if necessary.

(51) Check wire runs and attachments of all wires and coax cables for abrasion potential support, and wire tying:

[ ] Along sides of fuselage

[ ] Behind the stick grips

[ ] Behind the instrument panel

[ ] All flight controls and fluid lines

[ ] Behind the radio stack

[ ] Ensure wiring bundles are free and clear of rudder cables on the right side and free and clear of the circuit breaker panel on the left side

4. Repair Of Static Wicks

A. The nine static wicks on the aircraft are located at the tips of the wings, horizontal, outboard trailing edge of the ailerons, outboard trailing edge of the elevator, and the top of the rudder. The rudder static wick is mounted on a threaded stud and bonded electrically and mechanically to the aluminum counterweight at the top of the rudder. The other static wicks are mounted on static wick pads. These pads are bonded electrically and mechanically to the structure, and the static wick is attached with screws to this pad.

B. If the required conductivity is not achieved, these components must be replaced or re-bonded with conductive adhesive.

(1) Conductive Adhesive Material Requirements

(a) Equipment:

1 Respirator mask - Commercial

2 Rubber gloves - Commercial

3 Sandpaper, 120 and 400 grit - Commercial

4 Applicator spatula - Commercial

5 18 oz. mixing container - Commercial

6 Shop towel - Commercial

(b) Materials:

1 Conductive Adhesive - SX518001

2 Acetone, MPK, or Ethyl Acetates - Commercial

C. **Bonding Process** - The following process describes mounting pad and thread rod styles of the static wick mount installations. Follow the steps in the order presented:

(1) Mounting Pad Static Wick Procedure

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(a) Mark the location of retainers on the aircraft skin per the corresponding drawing. Do not exceed 1/8 in. between the aft end of the mounting pad and the trailing edge of the appropriate control surface.

(b) Remove paint and primer, if any, from area to be bonded using 120 grit sandpaper. Expose the lightning protection mesh without sanding through the mesh material.

(c) Degrease the aircraft surface and bottom of the retainer with a grease free solvent, such as acetone, MPK, or ethyl acetate. Do not contaminate the cleaned area.

(d) Use either approved conductive adhesive per SX518001:

1 Mix one part LP-89 Part A Resin with one equal part LP-89 Part B Paste Catalyst. Mix thoroughly until a smooth, creamy consistency is reached. Pot life is 30 minutes at 70° F after mixing.

2 Take a premixed cartridge of Eccobond 64C A/B from the freezer. Allow it to thaw at room temperature. Work life is approximately 30 minutes from when the adhesive is removed from the freezer.

(e) Abrade the clean, dry aircraft surface and the bonding surface of the static wick retainer with 200 to 600 grit paper. Do not abrade through the lightning protection mesh of the aircraft. Remove all oxide from the retainer. Dry thoroughly and wipe the surface with a clean towel to remove loose particles.

(f) After removing the oxide, immediately apply a coat of adhesive to the retainer. The time between completion of the sanding process and the application must not exceed 5 minutes.

(g) Upon completion of the previous step, immediately apply the retainer to the aircraft surface. Slightly twist the retainer while applying light pressure, to ensure thorough wetting and to squeeze out excessive adhesive. Once the retainer is in place, do not disturb the bond further. Movement will increase the bond resistance and may weaken the mechanical strength.

(h) Remove excessive adhesive, leaving a fillet of adhesive around the entire edge of the retainer.

(i) Use masking tape to temporarily secure the mounting pad during curing.

(j) Cure the adhesive for a minimum of 24 hours at 70° F. Cure may be accelerated by applying 150° F for one hour.

(k) Ensure that all retainers are secure, with no evidence of cracks in the adhesive fillet between the retainer and the aircraft surface.

(l) After the mounting pad has cured, check the electrical resistance to the lightning mesh with a digital voltmeter as close to the mount pad as possible. The resistance should be 0 to 2.0 ohms.

(2) Rudder Threaded Rod Static Wick Procedure

(a) Locate the static wick installation position in the vertical stabilizer counterweight.

(b) Degrease the threaded rod, receptor threads in the rudder counterweight, and the receptor treads in the static wick with a grease-free solvent such as acetone, MPK, or ethyl acetate. Do not contaminate the cleaned area.

(c) Use either approved conductive adhesive per SX518001:

1 Mix one part LP-89 Part A Resin with one equal part LP-89 Part B Paste Catalyst. Mix thoroughly until a smooth, creamy consistency is reached. Pot life is 30 minutes at 70° F after mixing.

2 Take a premixed cartridge of Eccobond 64C A/B from the freezer. Allow it to thaw at room temperature. Work life is approximately 30 minutes from when the adhesive is removed from the freezer.

(d) Place a small amount of adhesive on 0.5 in. of one end of the threaded rod. Install the threaded rod into the stabilizer counterweight, adhesive end first, to a depth of approximately 0.5 in. to the mechanical stop.

(e) After the threaded rod has cured, check the electrical resistance to the counterweight material as close to the threaded rod as possible. Resistance should be 0 to 2.0 ohms.

(f) After the aircraft has been painted, install the static wick as described below. Ensure that the threaded rod is masked for the aircraft paint process.

(g) With a wooden applicator, place adhesive on the first 0.1 inch of the threaded rod above its base, to allow a removable bond to the tip of the static wick.

(h) Insert the static wick onto the threaded rod, and ensure that it threads on the full length to its mechanical stop, allowing contact with the 0.1 inch of adhesive.

(i) Cure the adhesive for a minimum of 24 hours at 70° F. Cure may be accelerated by applying 150° F for 1 hour.

(j) Ensure that the static wick is secure.

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D. **Inspection Procedures** - Visually inspect all retainer installations thoroughly. Ensure that the retainer has no evidence of cracks in the adhesive fillet between the retainer and the aircraft surface. Ensure that all static wicks are secure.

E. **Rework** - If a mounting pad has evidence of cracks in the adhesive fillet that exceed the maximum length criteria, the static wick mounting pad must be removed and re-installed. If the threaded rod-style static wick is not secure, remove, clean, and re-install the static wick threaded rod as per procedure.

F. **Acceptance Criteria**

(1) ADHESIVE - The adhesive application shall be acceptable if there is a smooth surface fillet between the retainer and the aircraft surface, with no evidence of cracks or unbonded areas in the adhesive of over 0.1 inch in length.

(2) IMPROPER CURE - The adhesive application shall be acceptable if there is no evidence of tackiness in the adhesive after the proper cure time.

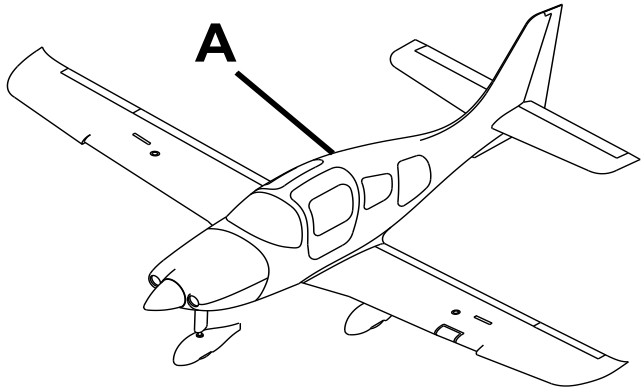
(3) SECURE INSTALLATION - The static wick mount installation shall be acceptable if there is no evidence of improper bonding of the static wick pad or threaded rod allowing any movement of the static wick or evidence of cracking and tackiness of the adhesive.

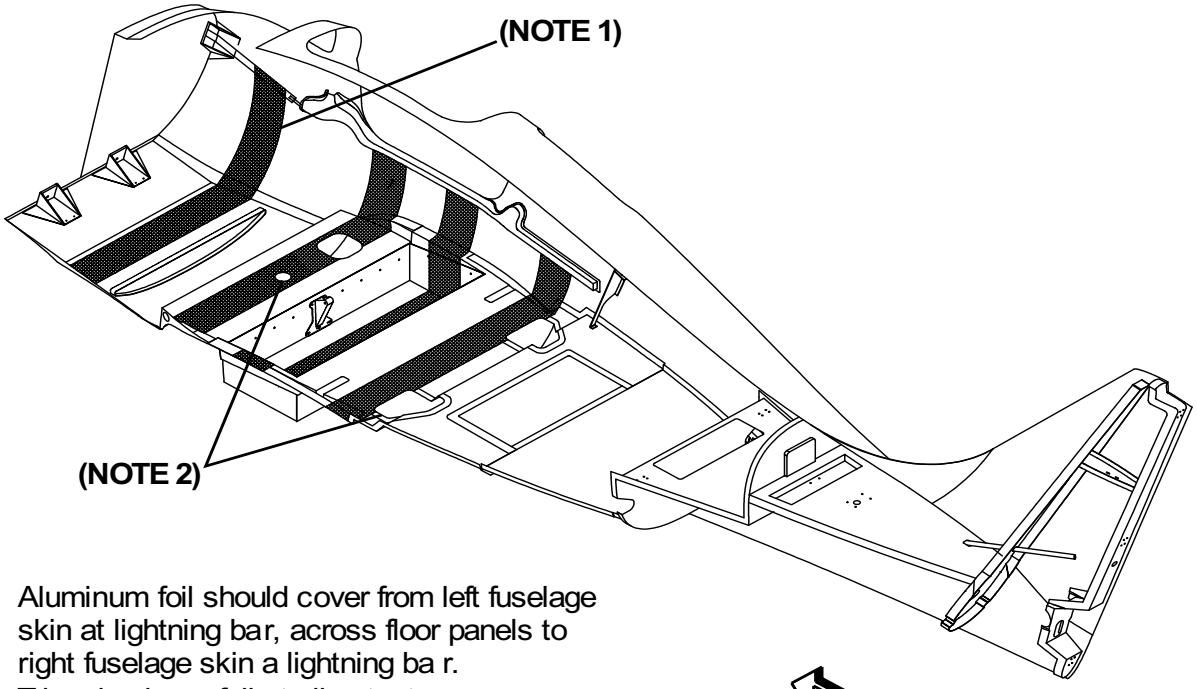
(4) ELECTRICAL RESISTANCE - The static wick mount installation shall be acceptable if the electrical resistance of the mounting connection is no more than 2.0 ohms, as measured from the mount to the lightning mesh or counterweight.

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Figure 201 : Sheet 1 : Placement of SAFE Strips

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NOTE 1: Aluminum foil should cover from left fuselage skin at lightning bar, across floor panels to right fuselage skin a lightning ba r.

NOTE 2: Trim aluminum foil at all cutouts.

DETAIL A

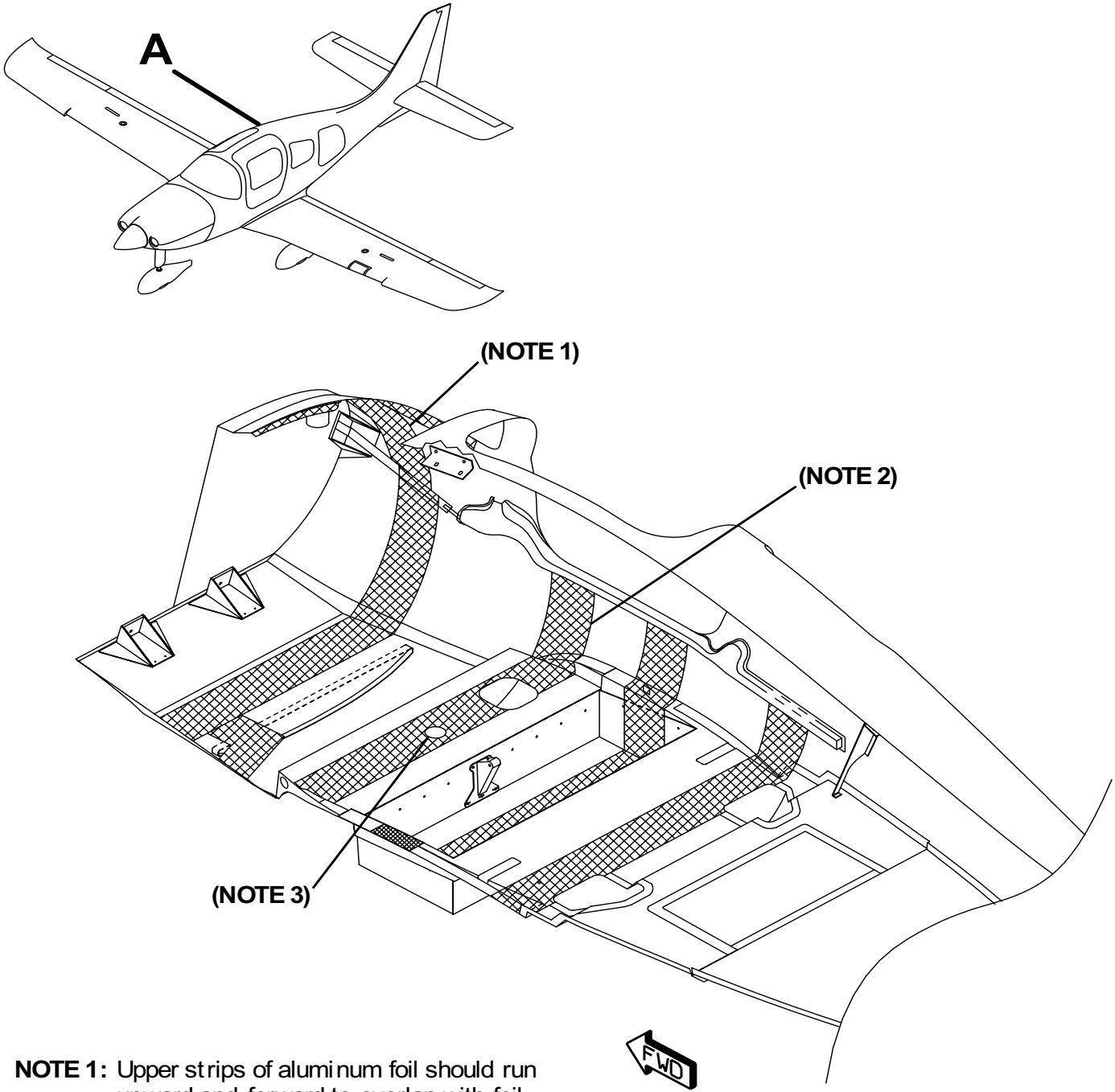
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Figure 201 : Sheet 2 : Placement of SAFE Strips

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NOTE 1: Upper strips of aluminum foil should run upward and forward to overlap with foil from covered defrost duct on both sides.

NOTE 2: Aluminum foil should cover from left fuselage skin at lightning bar, across floor panels, to right fuselage skin at lightning bar.

NOTE 3: Trim aluminum foil at all cutouts.

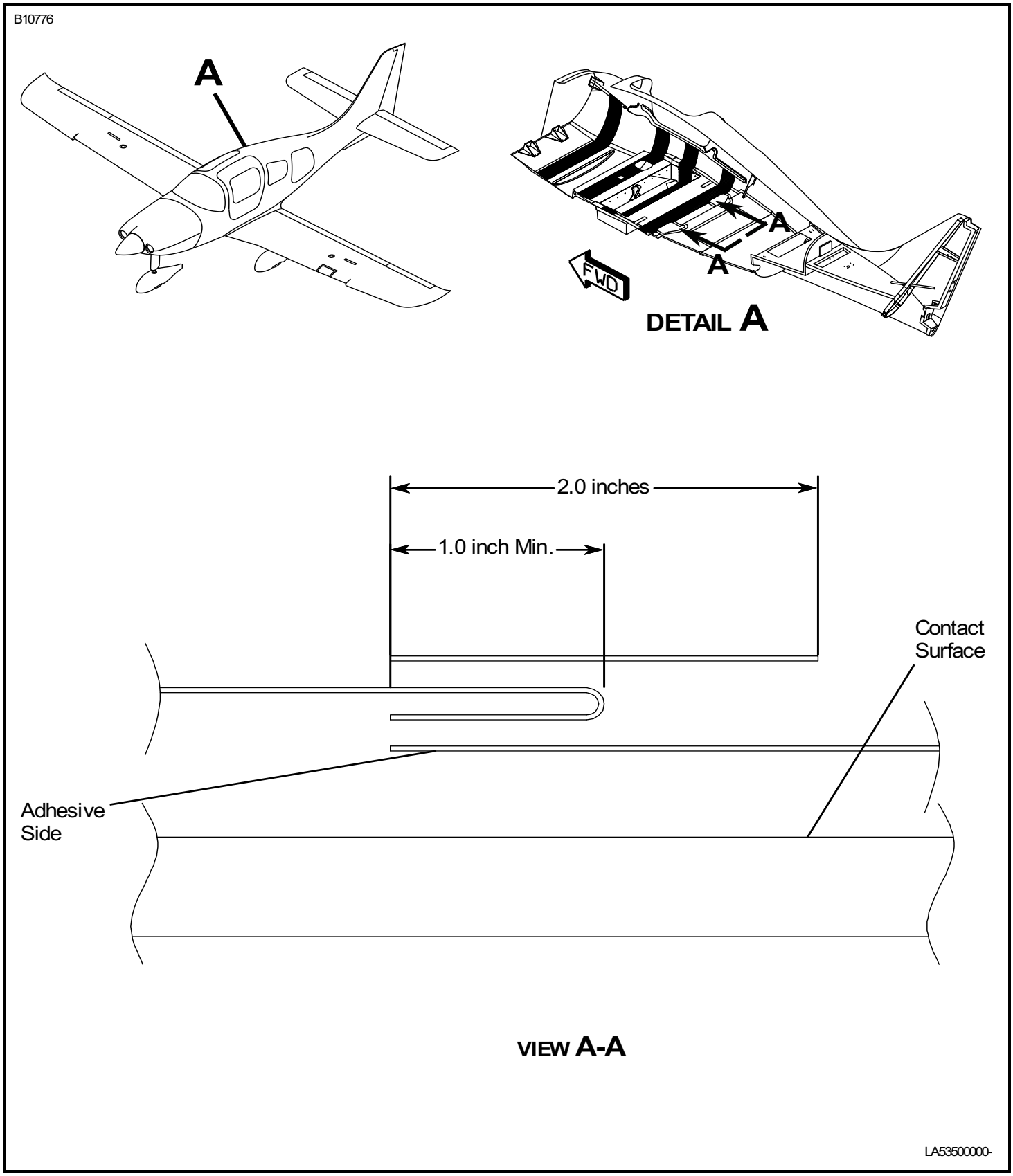
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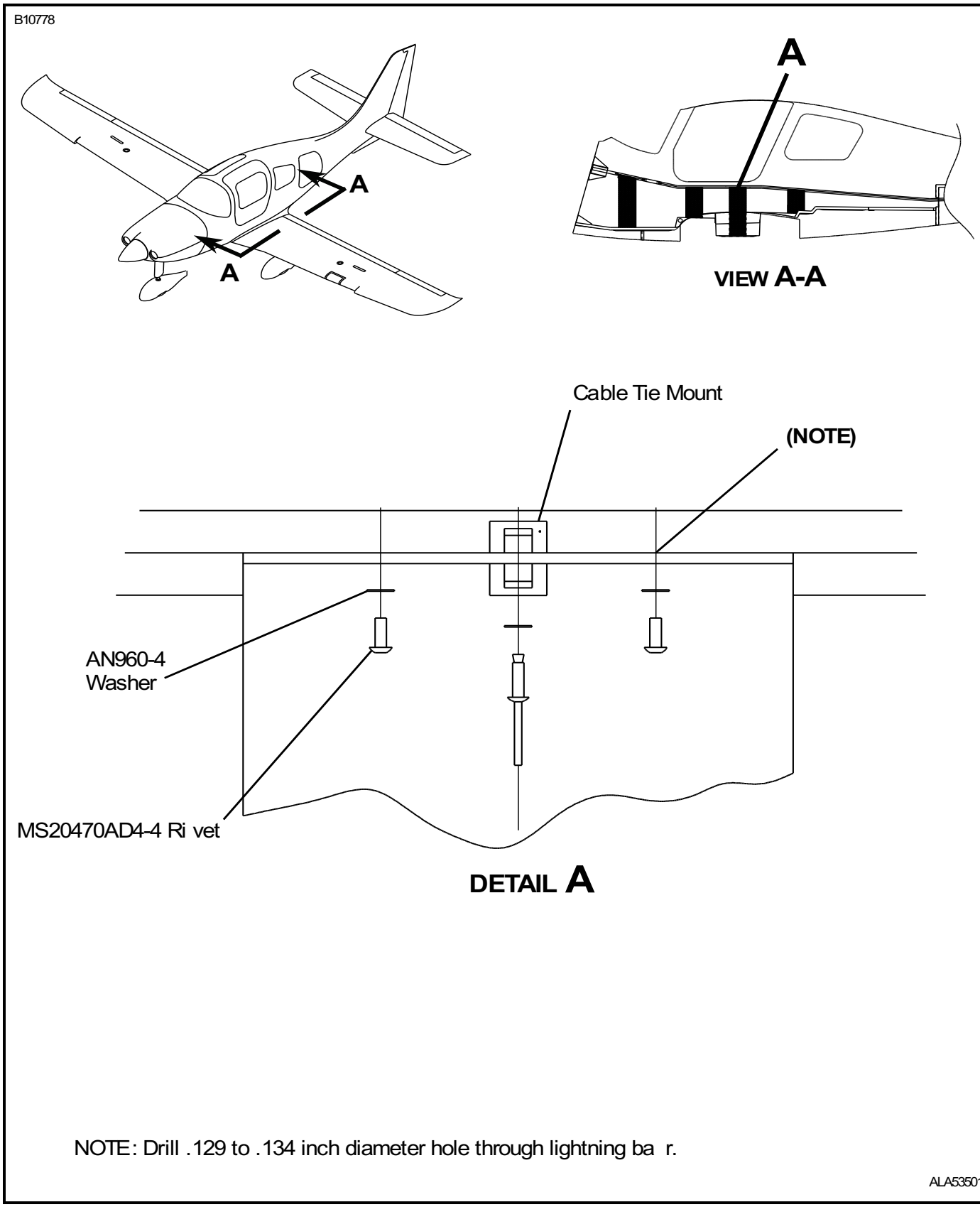
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Figure 202 : Sheet 1 : Folding SAFE Strip



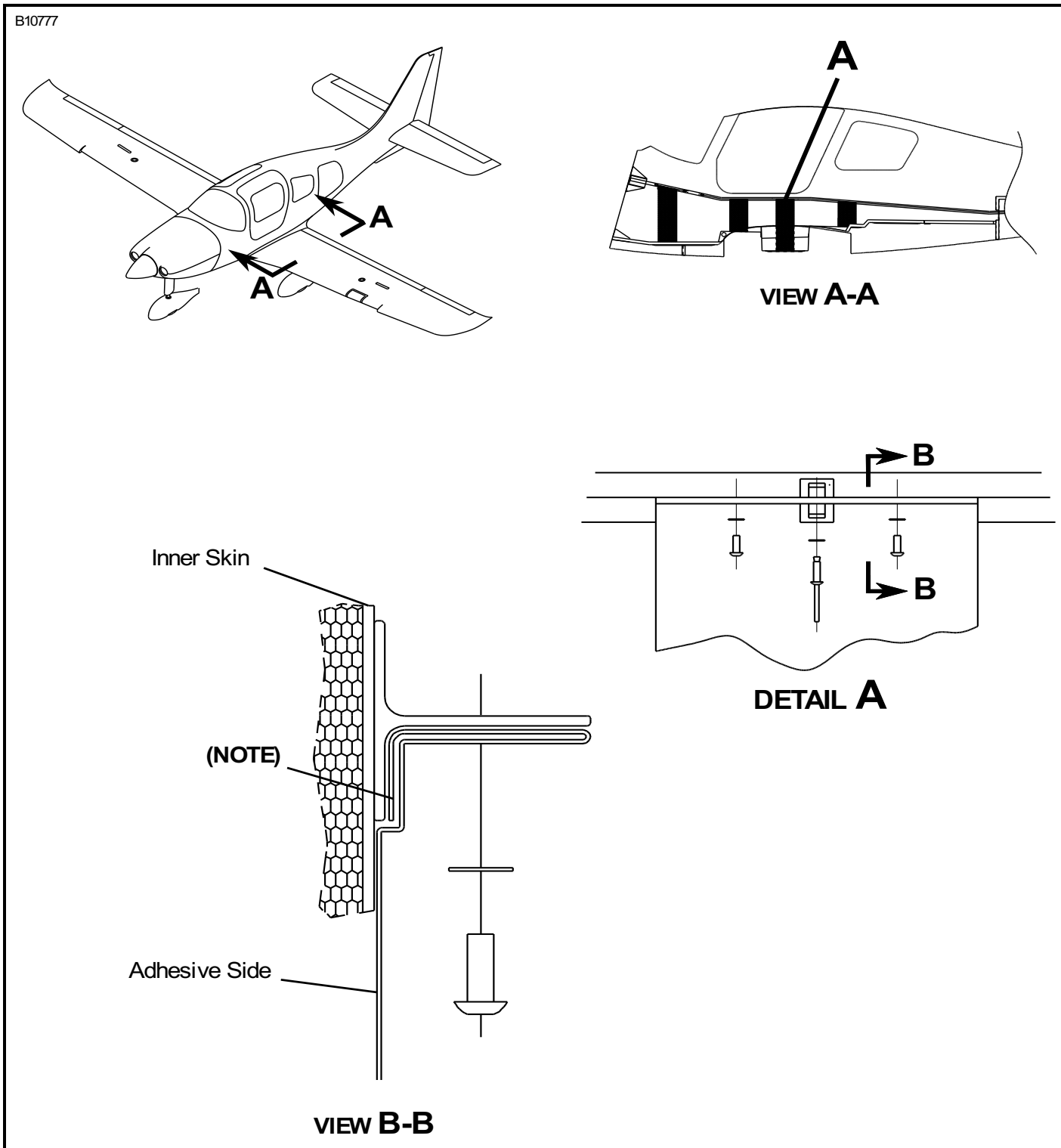
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Figure 203 : Sheet 1 : Grounding SAFE Strip to Grounding Bar



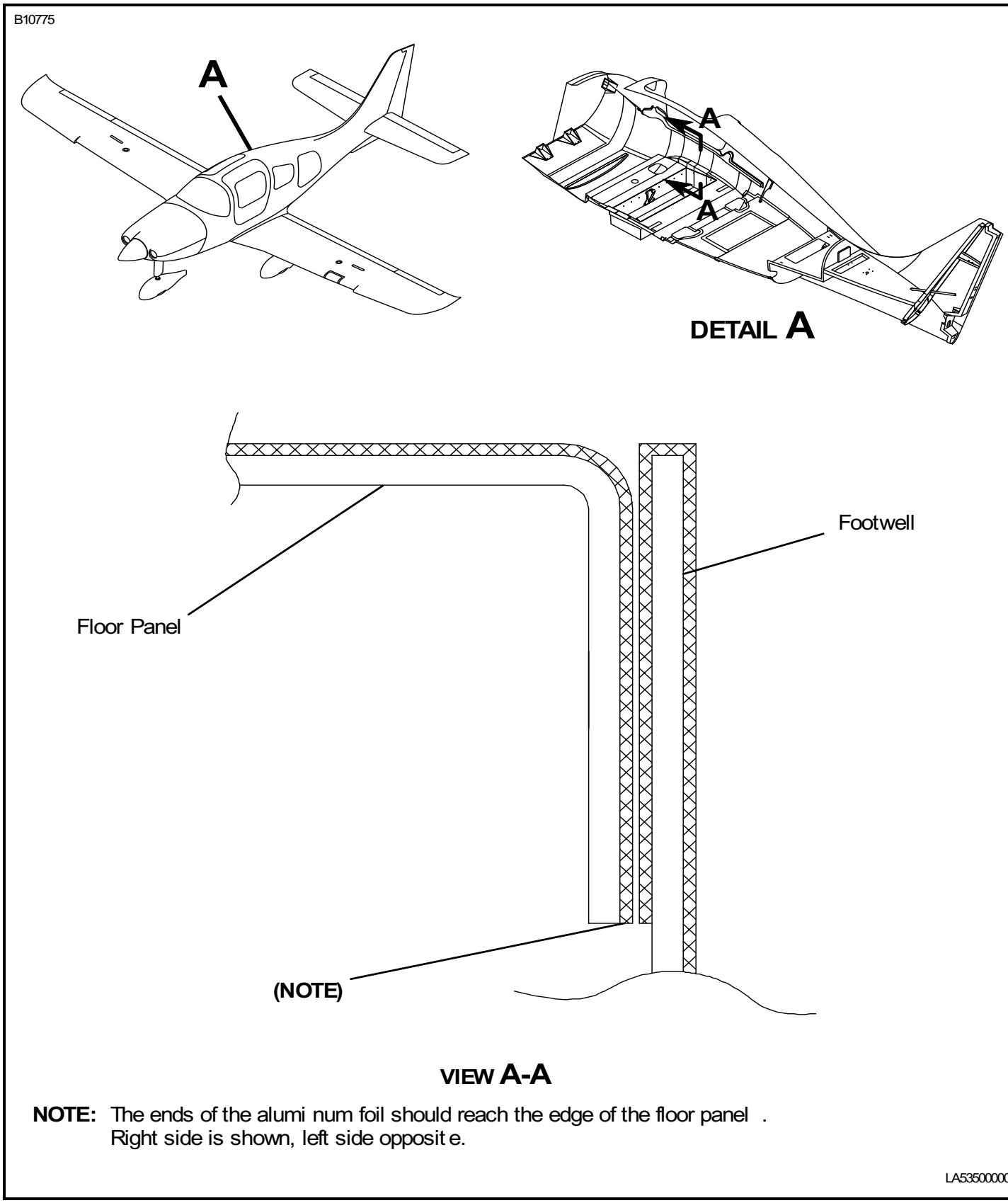
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Figure 204 : Sheet 1 : Complete Replacement of SAFE Strip



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Figure 205 : Sheet 1 : Installing SAFE Strip in Footwell



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REPAIR OF CLICKBOND NUTPLATES - MAINTENANCE PRACTICES

1. Repair of Clickbond Nutplates

A. Clickbond nutplates are a special type of nutplate that is bonded to the surface rather than being riveted to the structure. If a Clickbond nutplate should fail, it can be replaced with another Clickbond nutplate or a riveted nutplate under certain conditions as specified in Table 201. This repair procedure can be used in lieu of specific factory instructions.

Table 201. Permitted Areas of Clickbond or Riveted Nutplate Repair

Clickbond Part Number	Application	Assembly Drawing Number
CB6009CR4-1P	Baggage Net Installation	LB53255000
CB6014CR3-1P	Baggage Net Installation	LB53255000
	Cowling	LA53600000
	Instrument Panel Installation	LB53310000
CB6014CR08-1P	Access Panel Installation, Fuselage	LB53650000

B. **Defect Scenarios**

(1) The nut in the Clickbond nutplate is stripped or damaged.

(2) The bonding of the Clickbond to the surface has failed.

C. **Repair Procedure No. 1** - Bond a new Clickbond of the same type as a replacement for the one that failed.

(1) Remove the old Clickbond nutplate by prying it off.

(2) Sand the substrate to prepare a smooth surface using 150 grit sandpaper.

(3) Clean the surface with a dry-wipe or clean, pressurized air.

(4) Bond on a new nutplate. Use Clickbond adhesive kit CB92 or adhesive Hysol 9321. Follow manufacturer's instructions.

D. **Repair Procedure No. 2** - Replace the Clickbond with riveted nutplate.

(1) Sand the adhesive residue down to create an even surface for the nutplate. Take care not to damage the structural material below.

(2) Use a nutplate from Table 202 to determine the proper riveted nutplate replacement.

Table 202. MS Nutplate Replacements for Clickbonds

Clickbond Nutplate	MS Nutplate	Drill Diameter Rivet Holes (inches)	Rivet Hole Spacing From Center Hole (inches)
CB6009CR4-1P	MS21075-4	0.098	0.281
CB6014CR3-1P	MS21075-3	0.098	0.250
CB6014CR08-1P	MS21075-08	0.098	0.234

NOTE: The old Clickbond nutplate can be reused if the nut still has sufficient self-locking friction. Clean and sand the surface on the Clickbond nutplate for good adhesion, and follow the procedures discussed in Repair Procedure No. 1.

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TAP TESTING - DESCRIPTION AND OPERATION

1. General

A. This section contains information needed to complete tap testing procedures on the airplane. Information required to complete inspections of specific locations on the airplane can be found in the applicable section for that area of structure.

2. Inspection Requirements

A. Before the tap test inspection is started, you must comply with the following requirements:

(1) You must have a blunt-ended tap hammer (or equivalent) that weighs 1.0 ounce, +0.3 or -0.3 ounce.

(2) The inspector must be capable of distinguishing and differentiating audible pitch changes produced during the tap test.

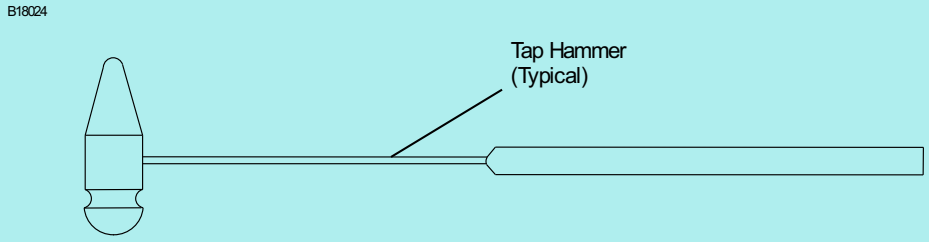
(3) The airplane must be moved to an area free from loud noise produced by traffic, power equipment, aircraft or any other source that would require raised voices for normal conversation.

3. Tap Testing

A. Complete a Tap Test of the applicable structure.

(1) Thoroughly clean and dry the inspection surface to remove any loose dirt, contaminates and grease.

(2) Complete the tap test with the use of a blunt-ended tap hammer or equivalent with a head that weighs 1.0 ounce, +0.3 or -0.3 ounce.



CAUTION: Do not use excessive or aggressive force or a hammer with a sharp edge to strike the surface of the airplane. Structural damage will occur if too much force or a sharp-edged hammer is used to complete the tap test.

(3) Use gentle and consistent force with the tap hammer to lightly tap the surface in each 1-inch^2 area throughout the inspection zone.

(4) Compare similar structures within the inspection zone for changes in the acoustic response pitch.

NOTE: Areas of the fuselage that have structure behind them will have a higher response pitch than areas that do not have structure behind them.

(5) A "flat" or "dead" response pitch is considered unacceptable.

(6) Larger areas that are disbonded or delaminated can cause the tap hammer to rebound to a lower height than it would on intact structure.

(7) Use moderate pressure from your hand or several fingers to push on an area of structure.

(a) A faint "crackling" sound can often be heard if the area has core damage.

(8) Put a mark on damaged areas to indicate the location and size of the area where the damage is found.

(9) Put a mark on any areas where you are uncertain whether damage exists to indicate that the area is suspect. Additional Nondestructive Inspection (NDI) procedures must be completed to evaluate the area more closely.

(10) Cessna recommends that maintenance personnel that complete tap tests be composite repair technicians trained in accordance with SRM standards or certified NDI technicians.

4. Required Chapter 4 Inspection Areas

A. The inspections listed in Chapter 4 require that tap testing be completed in some areas.

(1) Complete tap testing in the following areas:

(a) **Fuselage bonding seams** - The fuselage halves are split into left and right symmetrical sides and include the areas from the firewall back to and including the vertical stabilizer. The seam extends from centerline to 2 inches

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on the right side of centerline. The seam tapers to 1.75 inches at approximately FS 240 and tapers again to 1.5 inches at approximately FS 261.5. The upper fuselage bond seam from the top of the windshield to a point 48 inches aft of the top of the windshield is an area of extremely thick ply buildup and can not be effectively tap tested. This area is only to be visually inspected.

(b) **Wing skin leading edge and trailing edge seams** - The wing skin seams are at the leading and trailing edges of the wing. The leading edge seam is 2 in. wide and centered about the leading edge. The trailing edge should be tap tested on the top and bottom of the edge from the edge to 2 inches inboard.

(c) **Wing skin to ribs and spars** - The location of each rib and spar is shown in Section 57-10-00, Main Wing Structure. The top and bottom wing skin at the areas of the ribs and spars should be tap tested.

(d) **Wing flaps leading and trailing edge seams** - The flap seams are at the leading and trailing edges of the flap. The leading edge is 1 inch wide and extends 1 inch up from the leading edge chord plane of the flap. Because the bond extends onto core, as shown in Figure 1, tap testing is only valid for the first 0.5 inches of the bond. The trailing edge should be tap tested on the top and bottom of the edge from the edge to 1.5 inches forward.

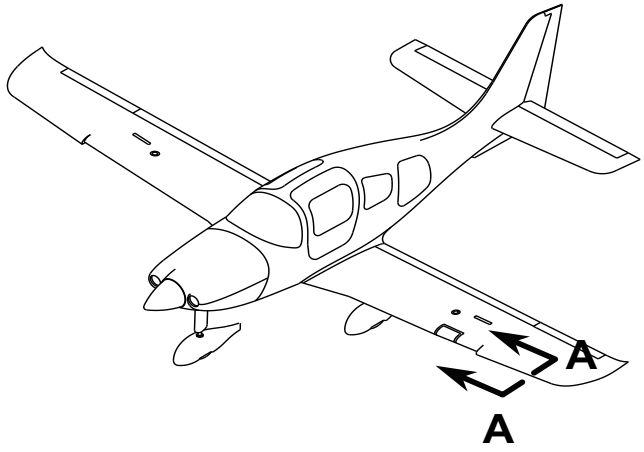
(e) **Aileron leading and trailing edge seams** - The aileron seams are at the leading and trailing edges of the ailerons. The leading edge seam is 1.0 inch wide starting 1 inch along the surface from the leading edge of the aileron. In the area around the drive hinge attachment pocket, tap test approximately 1.0 inch from the edge of the part to verify the bonding surface. The trailing edge should be tap tested on the top and bottom of the trailing edge from approximately 0.90 inches from the edge to approximately 2.0 inches from the trailing edge as shown in Figure 2

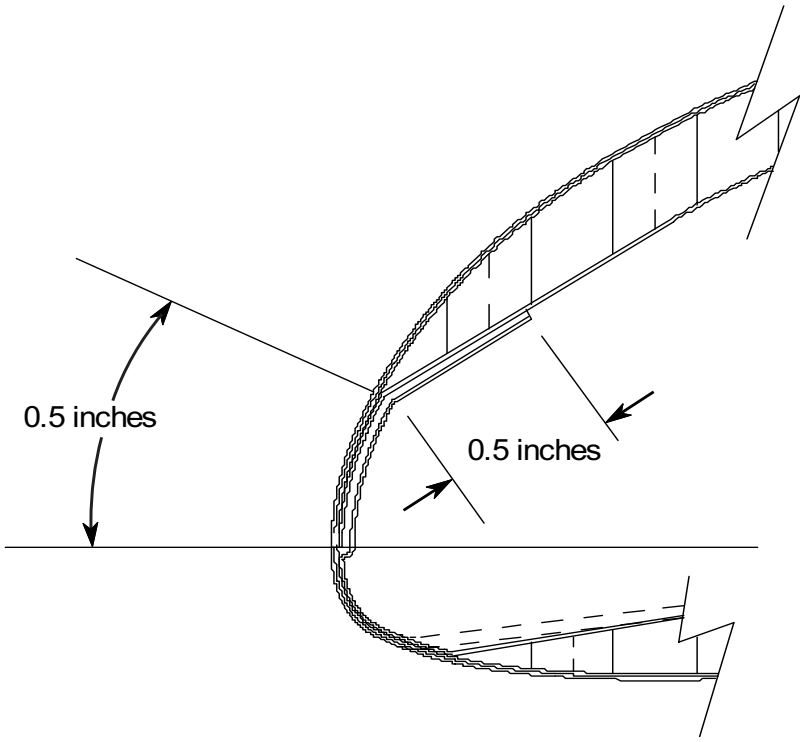
(f) **Rudder leading and trailing edge seams** - The rudder seams are at the leading and trailing edges of the rudder. The leading edge seam is 0.50 inches wide starting centerline at the edge of the rudder. The trailing edge should be tap tested on the left and right side of the trailing edge from the edge to approximately 1 inch from the trailing edge. Refer to Figure 3 for areas of tap testing.

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Figure 1 : Sheet 1 : Tap Testing Area

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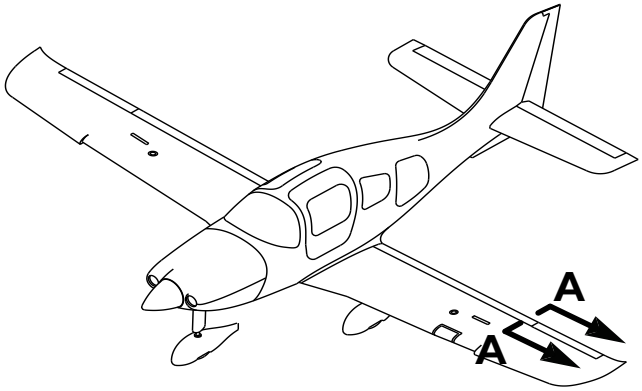


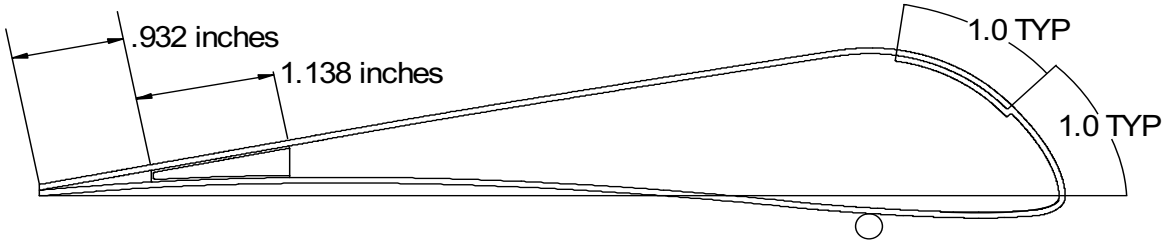
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Figure 2 : Sheet 1 : Aileron Tap Test Areas

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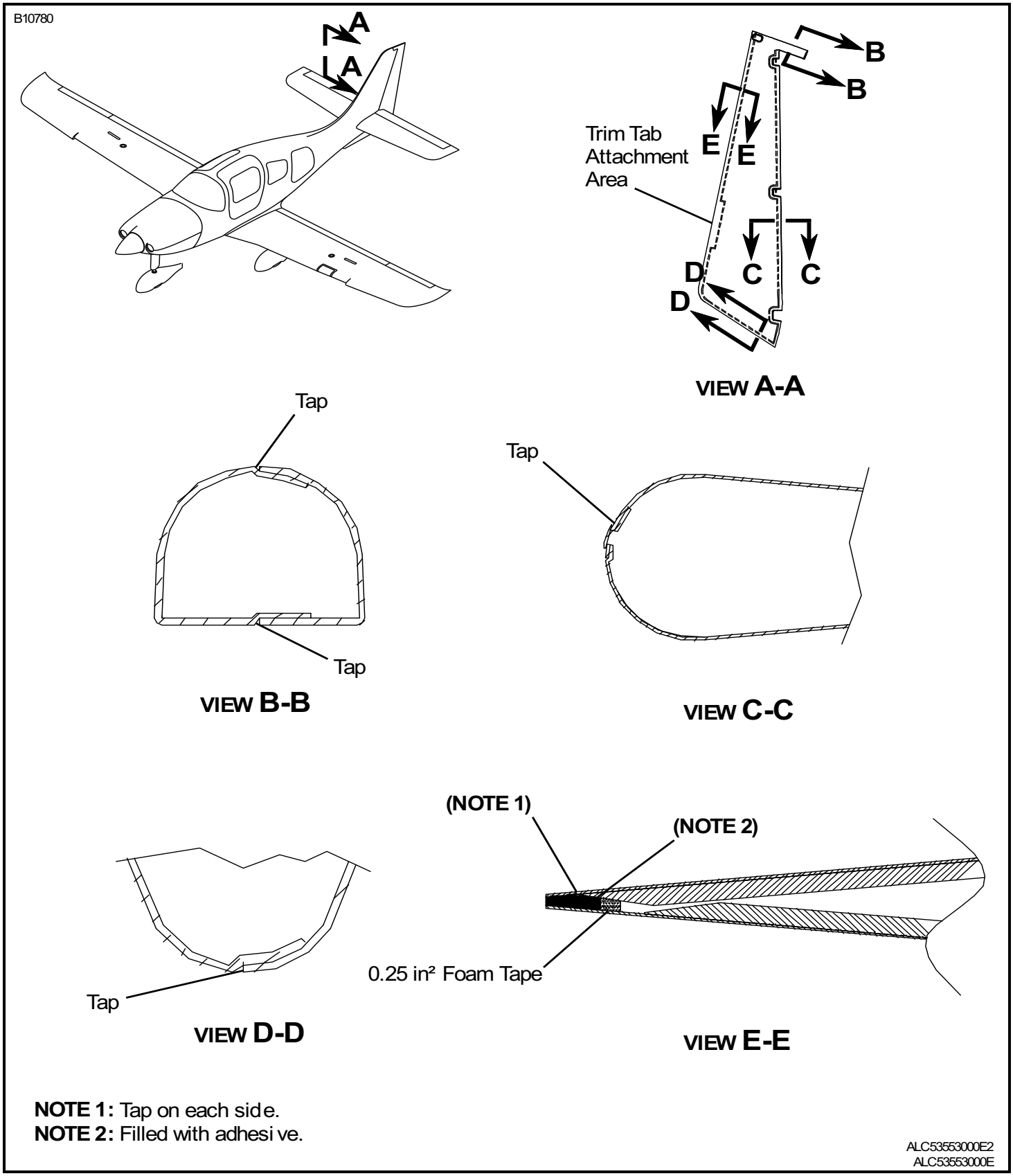




VIEW A-A

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Figure 3 : Sheet 1 : Rudder Tap Test Areas



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STRUCTURAL INSPECTIONS - DESCRIPTION AND OPERATION

1. General

A. This section contains information needed to complete inspections on the structure of the airplane. The procedures given here are the general requirements that must be followed to correctly complete inspections. More specific information relating to the area that is to be inspected can be found in the inspection procedure for each component or area of the airplane.

2. Visual Inspections

A. Equipment.

(1) The following equipment can be used to complete required visual inspections. Not all equipment is required for each inspection and additional tools or equipment can be required for inspections of specific areas of the airplane:

- Flashlight or other light source capable of producing 100 foot-candles at the inspection surface
- Inspection mirror
- Borescope
- Camera or camcorder

B. Personnel.

(1) The following are requirements that the inspector must meet to complete visual inspections of the airplane structure and components:

- Near Vision of 20/25 (Snellen) at 16 inches +1 or -1 inch or equivalent, in at least one eye, natural or corrected
- Capable of distinguishing and differentiating colors
- Familiar with the appearance of visible damage and have training and experience on visual inspection of aircraft structure

C. Access Requirements.

(1) Direct visual examination must be used whenever possible. For areas that are not accessible, the use of a borescope or digital camera or camcorder attached to a pole is recommended.

(2) The examination must be completed at a distance of not more than 24 inches from the surface of the component that is to be inspected.

(3) The examination must be completed at an angle that is within 30 degrees of perpendicular to the surface that is to be inspected.

D. Visual Inspection Procedure.

(1) Clean the inspection surfaces thoroughly to remove all loose materials, dirt, contamination and grease.

(2) Use a towel to dry the inspection surface.

(3) Use a light source held approximately perpendicular to the inspection surface to examine the structure or component.

(4) Use a light source held and an angle of approximately 15 degrees of parallel with the inspection surface to examine the structure or component.

(5) Examine the structure or components for the following:

- Paint that is blistered, swollen, cracked, deformed or missing
- Security of parts or attached components
- Discoloration
- Bucking
- Bulging
- Dents
- Oil-canning
- Wrinkles
- Chafing
- Foreign objects
- Fluid leaks.

(6) Put a mark on any damaged areas that shows the location and type of damage found.

(7) Put a mark on any areas where you are uncertain whether damage exists to indicate that the area is suspect.

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ENVIRONMENTAL CONTROL SYSTEM - GENERAL

1. GENERAL-SCOPE AND DEFINITION

A. Environmental control in the Cessna 400 is accomplished with either an Environmental Control System (ECS) or the optional air conditioning system also known as the Automatic Climate Control System (ACCS). For maintenance data applicable to the ACCS, refer to Automatic Climate Control System (ACCS). The ECS controls temperature throughout the front and rear cabin area. For the Avidyne and Garmin G1000 ECS installations refer to, Figure 1. For the Avidyne and Garmin G1000 ECS electrical system refer to Figure 3. For the Garmin G2000 ECS installation refer to, Figure 2.

B. The ECS incorporates the use of an air bleed nozzle off each intercooler, ram intake air, and an electric fan to distribute heated and outside air to various outlets within the cabin. The ECS consists of two subsystems, heated air and fresh air. Heated air is sent to the floor vent system and the defroster, and fresh air is ducted through the eyeball vents. Ram air enters through a duct on the right side of the engine cowling and flows through the fresh air manifold to the ECS control valve and to the front and rear eyeball vents. Air from the intercooler air bleed nozzles, depending on the control settings, is mixed with outside air in the ECS control valve. The air next passes through a fan unit before entering the distribution system. Operating the single speed fan will increase the airflow through the system (not including the eyeball vents).

C. At the windshield area, there is a defrost plenum directly built into the fuselage. This will allow the pilot or copilot to defrost the windshield during cold weather conditions and supply fresh air to that location during periods of high ambient temperature.

D. Located in the instrument panel are adjustable eyeball vents, one each for the pilot and copilot. These vents supply only fresh air to the front seat positions and may be manually directed to a desired location.

E. Near the pilot and copilot's feet is a floor vent tube. Like the defrost plenum, this tube can direct hot, fresh, or mixed air to the lower front cabin area.

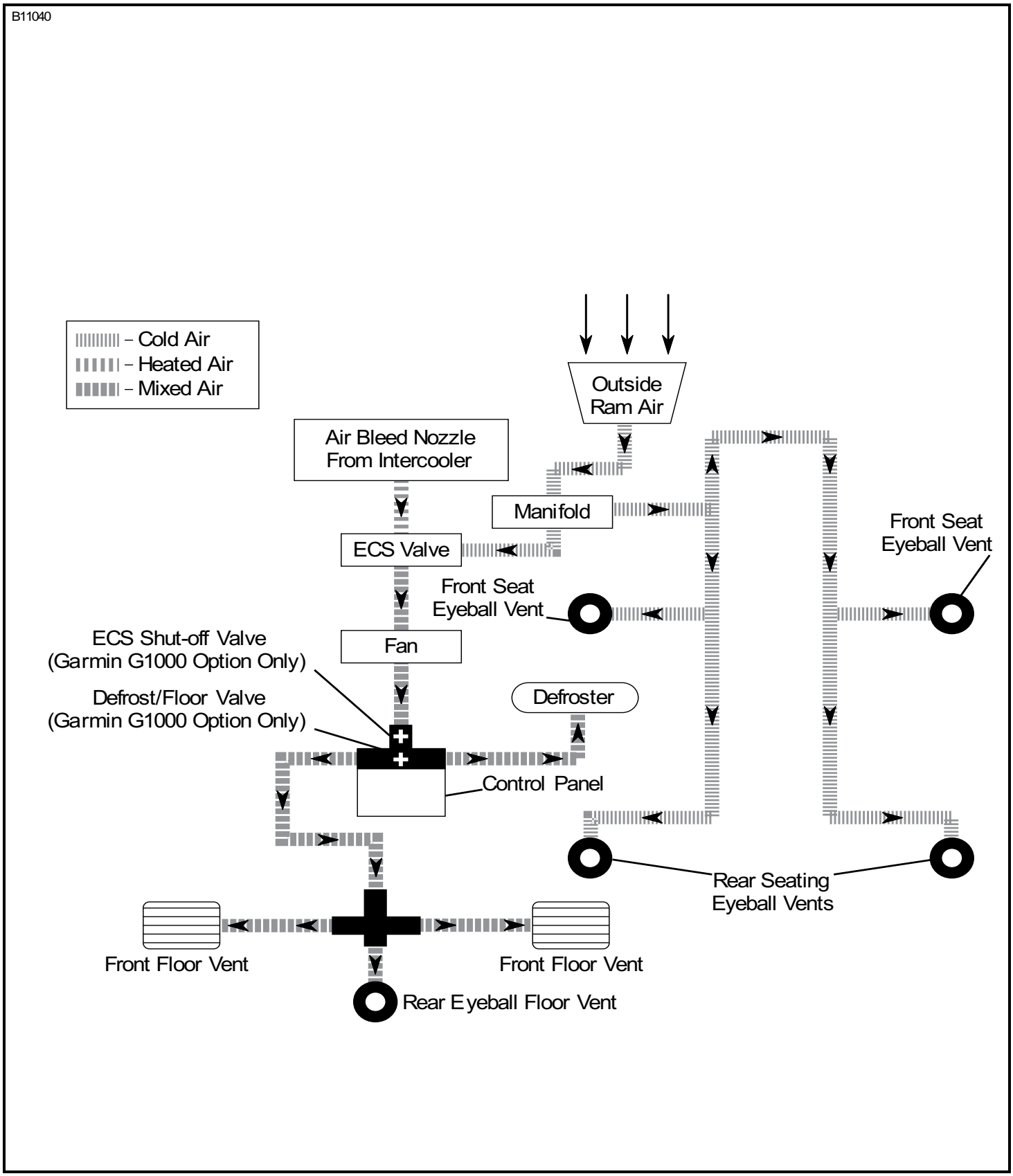
F. Directly tied into the floor vent tube and located at the aft end of the center console is an adjustable eyeball vent. This vent supplies the rear passengers the same air temperature as the floor and defrost vents but with the ability to be manually turned off independently or directed to a desired location.

G. Just to the outside of each rear passenger and located on the interior side panel is a fresh air eyeball vent. These vents supply only fresh air and may be manually adjusted or directed to a desired location.

H. An electrically controlled fan can be turned on while on the ground or during flight to supply cooler fresh air through the defrost plenum, floor tube, and rear passenger center console eyeball vent during the summer or aid in deicing the windshield before and after takeoff during the winter months.

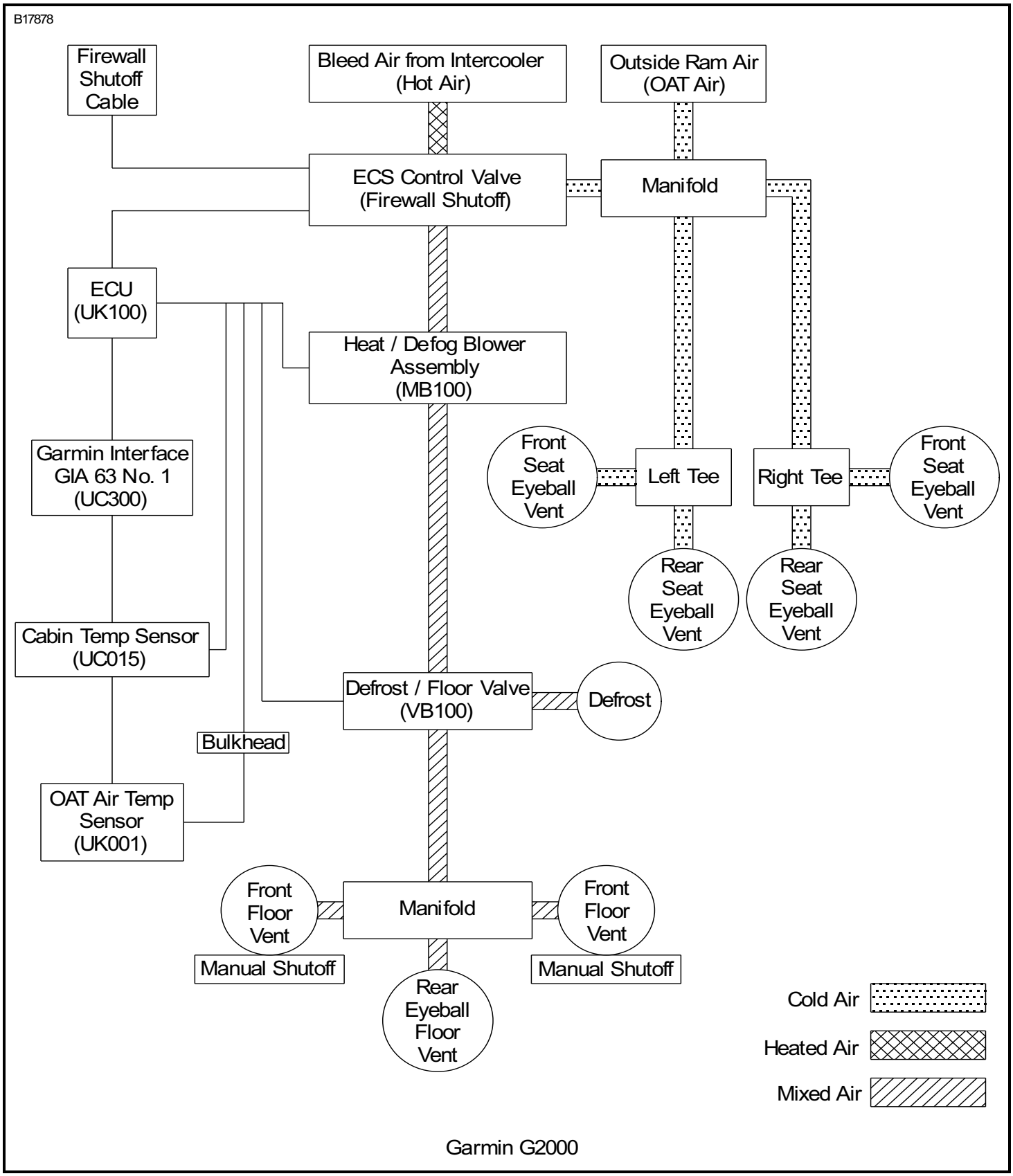
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Figure 1 : Sheet 1 : Avidyne and Garmin G1000 ECS Diagram



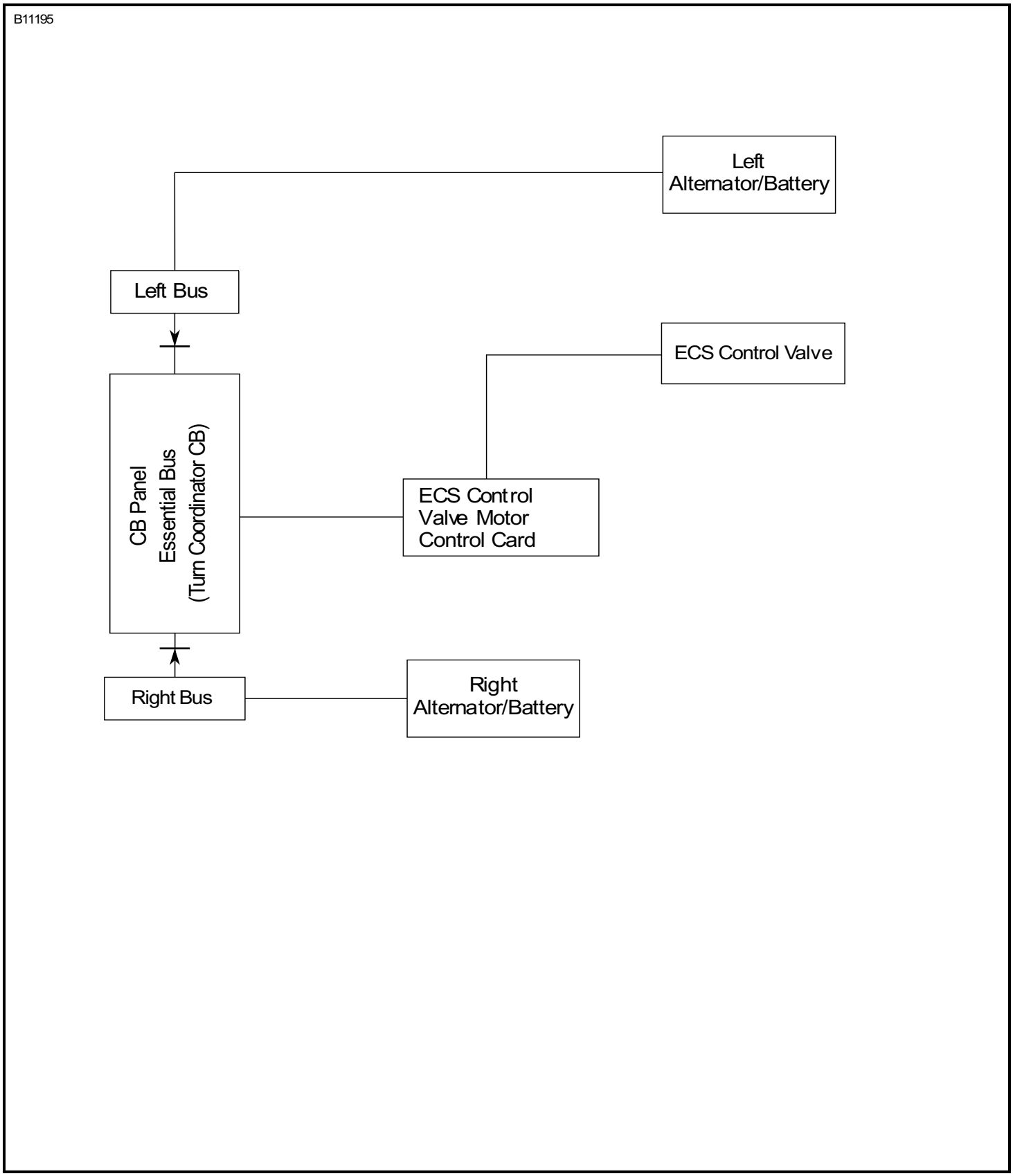
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Figure 2 : Sheet 1 : Garmin G2000 ECS Diagram



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Figure 3 : Sheet 1 : Schematic of ECS Electrical System Connection



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ENVIRONMENTAL CONTROL SYSTEM COMPONENTS (T240) - TROUBLESHOOTING

1. General

A. This section gives the troubleshooting procedures for the Environmental Control System (ECS), cabin fan, servo motor, defrost floor valve, firewall shutoff valve, cabin temperature sensor, air temperature sensor, and evaporator temperature sensor. For a general description of the Model T240 Garmin G2000 ECS control system, refer to Temperature and Air Control (T240) - Description and Operation.

B. Use the Model T240 Wiring Diagram Manual with the procedures in this section.

2. Tools and Equipment

A. No special tools or equipment are necessary to do the procedures in this section.

3. Servo Motor and Firewall Shutoff Valve Troubleshooting

A. The Firewall Shutoff Valve does not change position when the Touch Screen Controller 570 (UI405) (GTC 570) touchkeys are operated in each of the two settings, to increase or decrease temperature. Do the steps that follow:

(1) Make sure that the ECS and the ECS CTRL DOOR SEAL circuit breakers found on the cockpit circuit breaker panel, are engaged, .

(a) If one or each of the two circuit breakers are not engaged, engage the circuit breaker(s) and check the firewall shutoff valve operation again.

(2) If the fault continues:

(a) Select the GTC 570 ECS diagnostic page and record the fault text message(s) and the firewall shutoff valve (mixing valve) position. Refer to Temperature and Air Control (T240) - Description and Operation.

(3) If a fault(s) show on the diagnostic page not applicable to the servo motor:

(a) Troubleshoot and repair the fault. Refer to the applicable chapter/section of the maintenance manual.

(4) If the fault continues do the steps that follow:

(a) If a faults show on the diagnostic page that is applicable to the servo motor, or no faults show, operate the firewall shutoff valve cable.

1 Make sure that the firewall shut off valve moves freely.

(5) If the firewall shutoff valve does not operate freely:

(a) Check the route and installation of the firewall shut off cable.

1 If necessary, correct the cable installation. Refer to Firewall Shutoff Valve - Removal/Installation

(b) Replace the valve. Refer to Firewall Shutoff Valve - Removal/Installation

(c) Check the operation again.

(6) If the fault continues do the steps that follow:

(a) Set the firewall shutoff valve cable to its initial position

(b) Remove external electrical power from the airplane

(c) Make sure that the master BATT switches (left SW01 and right SW02) and the AVIONICS MASTER switch (SW04) are in the OFF position.

(d) Remove the copilot's seat. Refer to Chapter 25, Airplane Seats - Maintenance Practices, Removal, Installation and Adjustment of the Front Seats

(e) Disconnect the electrical connector (P56) from electrical connector (J320) at the firewall shutoff valve assembly (UB100)

(f) Visually inspect the connectors to make sure that there are no bent or damaged pins.

1 Repair any damage.

(7) Check the wiring for continuity between electrical connector (J320) to electrical connector (J310) at the ECU/Blower module assembly (UK100) and the electrical connector (P610) at the small parts module (UI006).

(a) Repair any wiring faults

(b) Check the operation again.

(8) If the fault continues, replace the servo motor (UB100). Refer to Servo Motor - Removal/Installation.

(a) Check the operation again.

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