

**TOTAL PERFORMANCE**  
**VAN'S AIRCRAFT**

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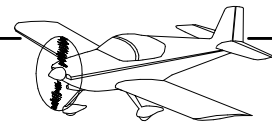
**REVISION DESCRIPTION:**

**Page: 41-08 REV 1:** In Step 4 "a minimum of 1/16 [1.6 mm] gap" was "an approximately 1/16 [1.6 mm] gap."

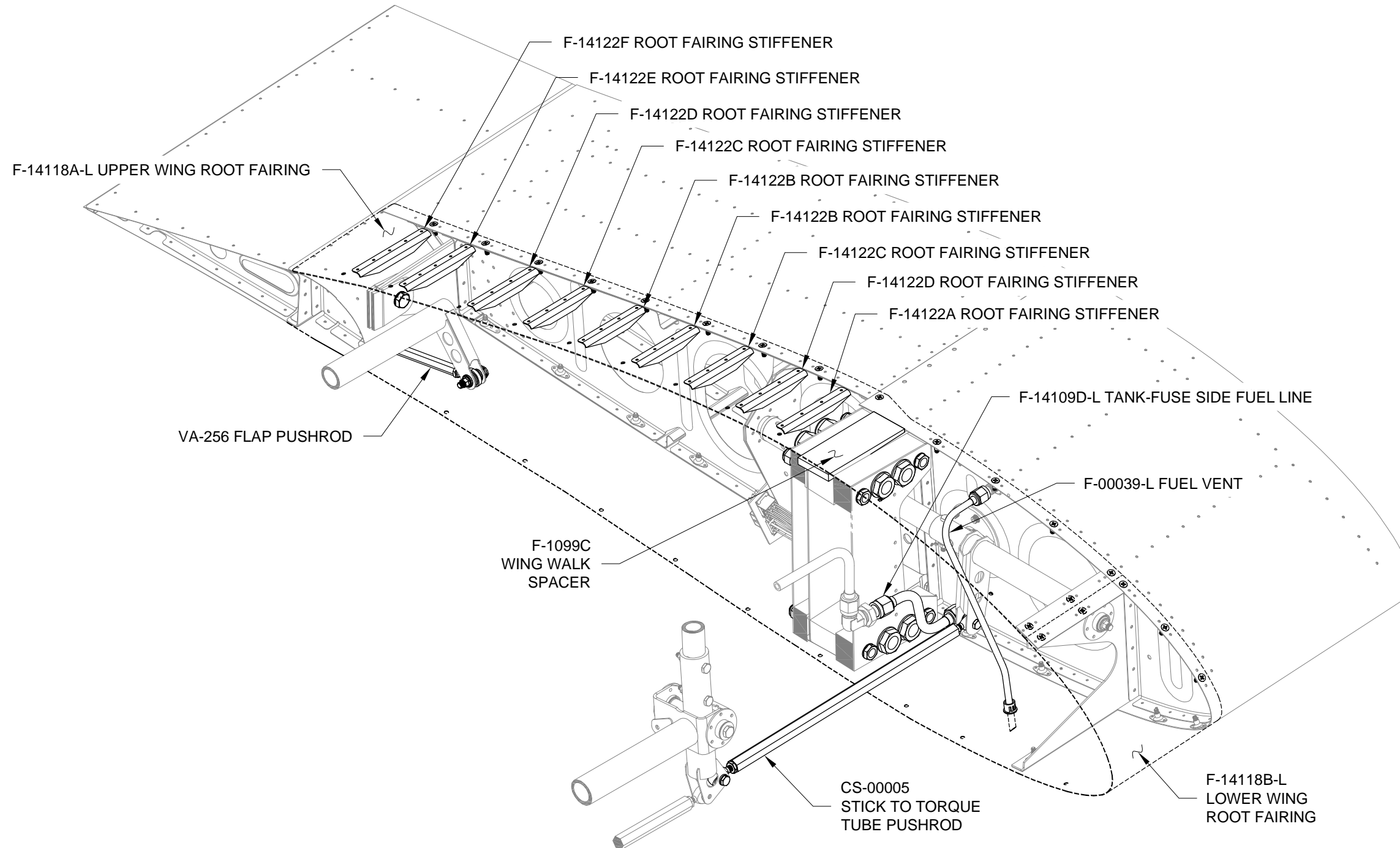
In Step 4, deleted "Substitute washers as necessary..."

Added Step 5.

In Figure 3, "MIN. 1/16 [1.6 mm]" was "1/8 [3.175 mm]"



# SECTION 41: WING ATTACHMENT



SPECIAL TOOLS REQUIRED TO COMPLETE THIS SECTION:  
4X 3/8 [9.5] BY 7 [177.8 mm] OR LONGER COMMON BOLTS,  
1 1/4 [31.8 mm] DIAMETER TUBE.

DATE OF COMPLETION:	_____		
PARTICIPANTS:	_____		
DATE: 04/15/15	REVISION: 0	RV-14	PAGE 41-01



**NOTE:** Except where separate instructions and/or figures exist for both the left and right sides of the aircraft, only the left side parts, assemblies, or installations will be shown.

It is the builder's choice as to whether to complete all steps for the left side before repeating those steps for the right side or to complete each step for both left and right sides before moving to the next step.

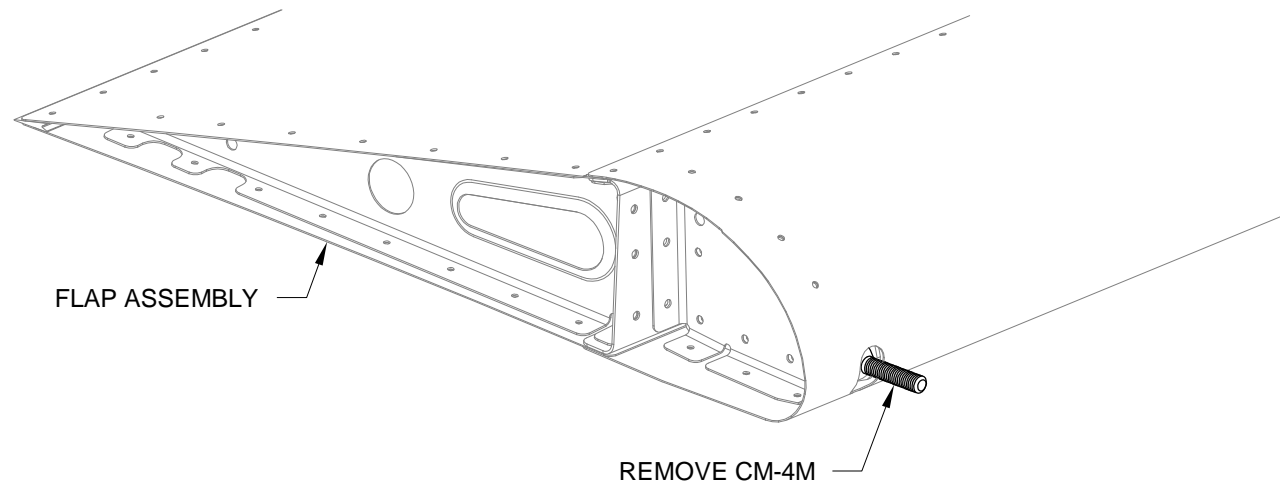
Step 1: Remove the Rod End Bearing from the Flap Assembly as shown in Figure 1.

Step 2: If necessary, install the flap as shown on Page 21-12, Figure 3.

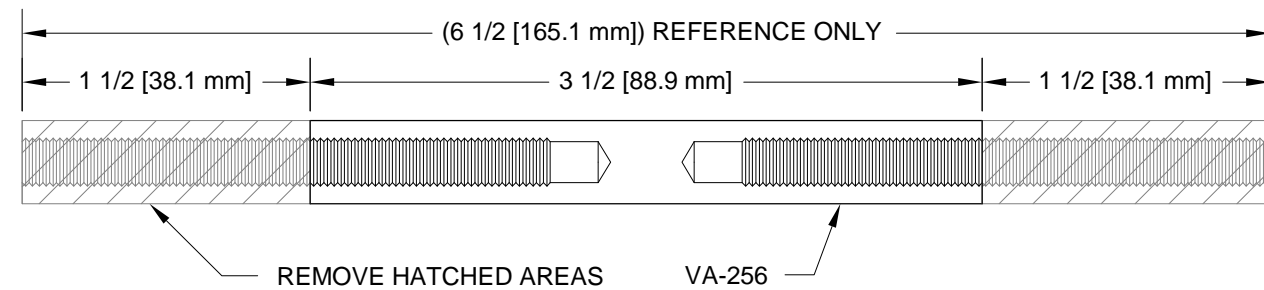
Step 3: Trim the VA-256 Flap Pushrod as shown in Figure 2.

Step 4: Assemble the Flap Pushrod Assembly as shown in Figure 4. Use the Rod End Bearing removed in Step 1.

Step 5: Install the Flap Pushrod Assembly into the Flap Assembly as shown in Figure 3.

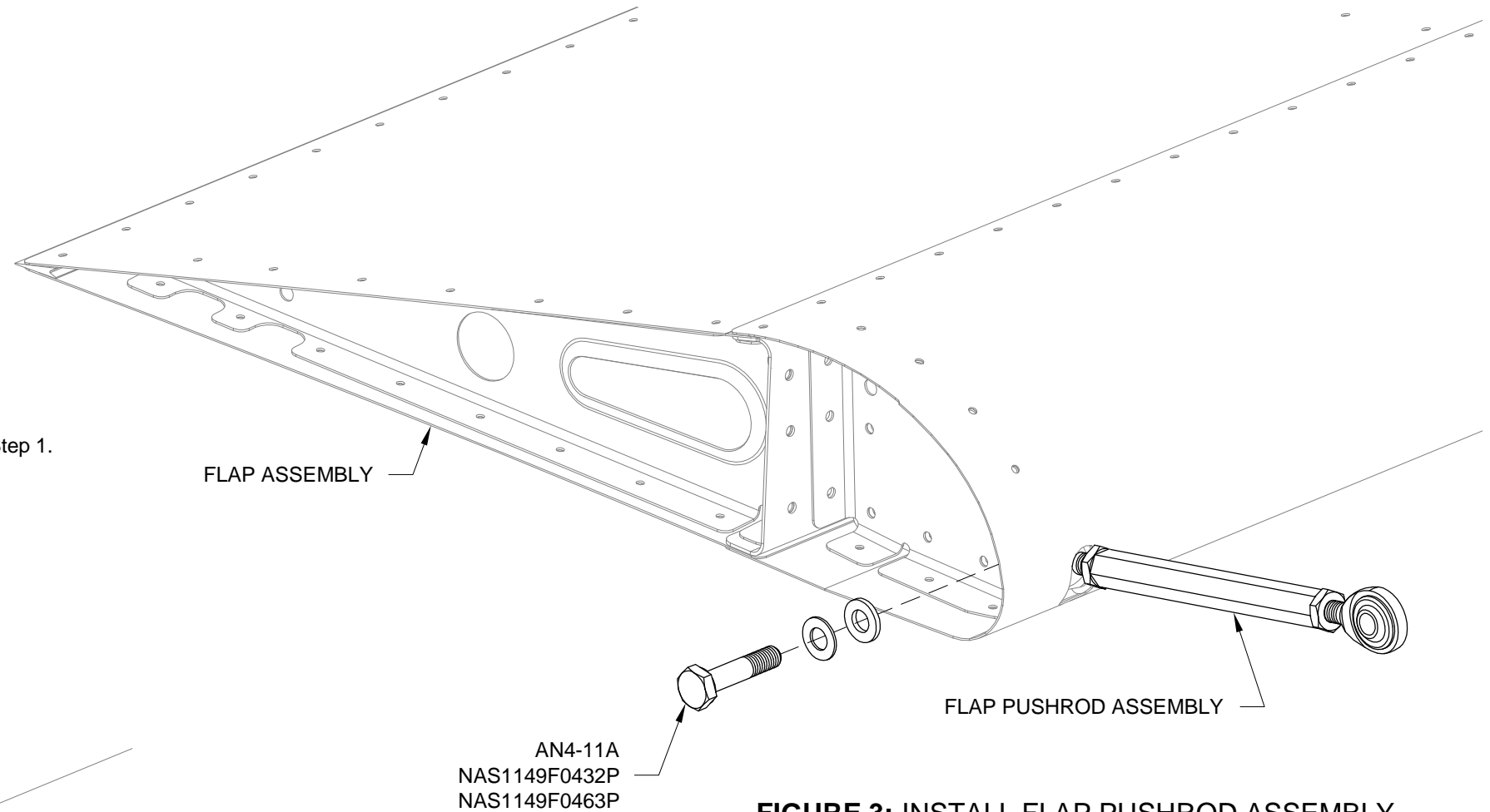


**FIGURE 1: REMOVE ROD END BEARING**

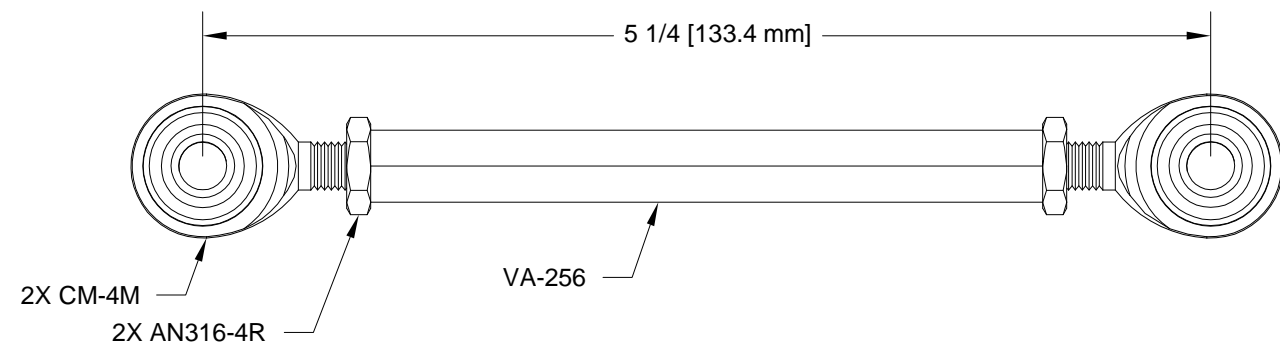


**FIGURE 2: FLAP PUSHROD TRIM TEMPLATE**

(NOTE: CHECK PRINTED SCALE 1:1 PER SECTION 3 BEFORE USING THE TEMPLATE!)



**FIGURE 3: INSTALL FLAP PUSHROD ASSEMBLY**



**FIGURE 4: FLAP PUSHROD ASSEMBLY**



**CAUTION:** Verify that the plugs are installed as shown on Page 18-09, Figure 2. It will not be possible to install the plugs after the wings are installed!

**Step 1:** Fabricate two drift pins by tapering the ends of two 3/8 [9.5 mm] diameter common hardware store bolts. The bolts must be at least 7 [177.8 mm] long. Finished pins should have at least 3 [76.2 mm] of full diameter shank and no trace of threads remaining.

**Step 2:** Lightly lubricate the drift pins prior to installation by spraying them with LPS #1, 2, 3, or a light coat of ordinary motor oil to avoid damaging the spar and bulkhead holes.

**Step 3:** Lightly lubricate the mating surfaces of the Main Spar Assembly and Bulkhead Assemblies with Boelube to ease installation. See Figure 1. The forward mating surfaces of the Main Spar and Bulkhead Assemblies are not shown in Figure 1, but correspond to the aft mating surfaces. Lightly lubricate these with Boelube as well.

**NOTE:** It is recommended that the builder have an assistant for Steps 4-9. Empty promises of food or money work well here.

**Step 4:** Slide the left wing into position. Ensure that the Main Spar Assembly is positioned between the F-01403 and F-01404 Bulkhead Assemblies, and that the Rear Spar Assembly is positioned between the two F-01405B Bulkhead Bars.

**Step 5:** Pin the wing in place by **GENTLY** driving the lubricated drift pins into the holes with a soft plastic hammer. Have an assistant gently rock the wing up and down, as well as fore and aft to aid in alignment while installing the pins.

**NOTE:** Complete Steps 6 thru 10 during the final installation of the wing.

**CAUTION:** Do not lubricate the bolt threads, doing so can result in incorrect bolt torque values.

**Step 6:** Lightly lubricate the larger diameter bolts as described in Step 2.

Install the larger diameter bolts and the associated nuts and washers as shown in Figure 1.

Do not fully torque the nuts yet.

**Step 7:** Remove the drift pins installed in Step 5.

**Step 8:** Lightly lubricate the smaller diameter bolts called out in Figure 1 as described in Step 2.

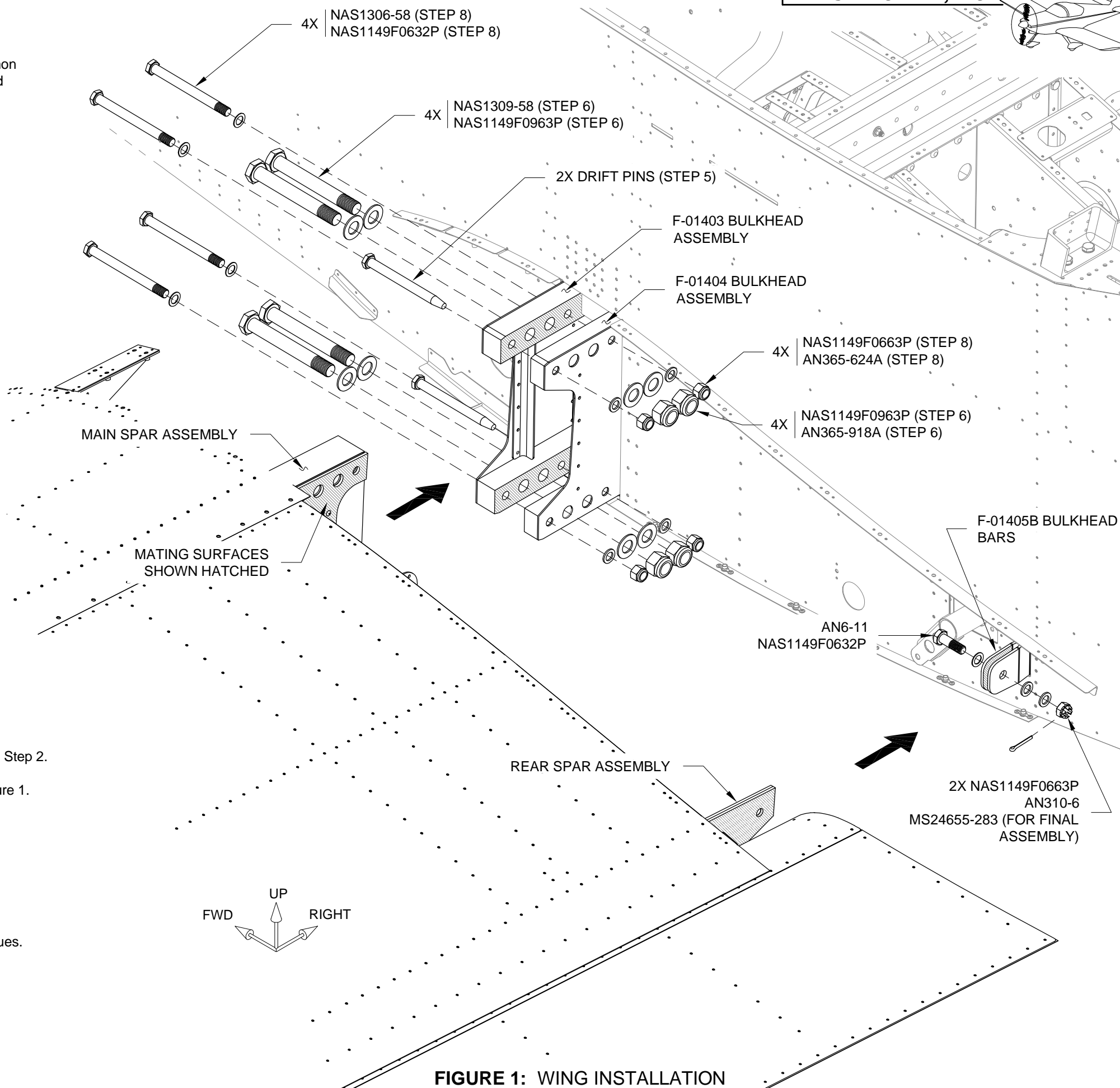
Install the smaller diameter bolts and the associated nuts and washers as shown in Figure 1.

Do not fully torque the nuts yet.

**Step 9:** Lightly lubricate the bolts used to secure the Rear Spar Assembly to the F-01405B Bulkhead Bars.

Install the bolts and associated hardware as shown in Figure 1.

**Step 10:** Fully torque all of the wing attach bolts. See Section 5.20 for proper torque values.



**FIGURE 1: WING INSTALLATION**

**Step 1:** Final-Drill #17 all of the .161 [4.1 mm] holes in the F-14118A-L and F-14118B-L Wing Root Fairings.

**Step 2:** Break the forward and outboard edges of the F-14118A-L and F-14118B-L Upper and Lower Wing Root Fairings slightly as shown in Figure 3 and Figure 4.

**Step 3:** Mark the tangent lines onto the top side of the F-14118B-L Lower Wing Root Fairing as shown in Figure 1.

**Step 4:** Place a 1 1/4 [31.8 mm] diameter tube in a vice with at least 6 [152.4 mm] protruding.

**Step 5:** Flip the F-14118B-L Lower Wing Root Fairing over and bend it over the tube as shown in Figure 1.

**Step 6:** Temporarily place the F-14118B-L Lower Wing Root Fairing into position as shown on Page 41-05, Figure 1.

**Step 7:** Check the fit of the curvature of the lower wing root fairing.

Adjust the curvature of the lower wing root fairing to closely match the curvature of the bottom wing skin and fuel tank skin.

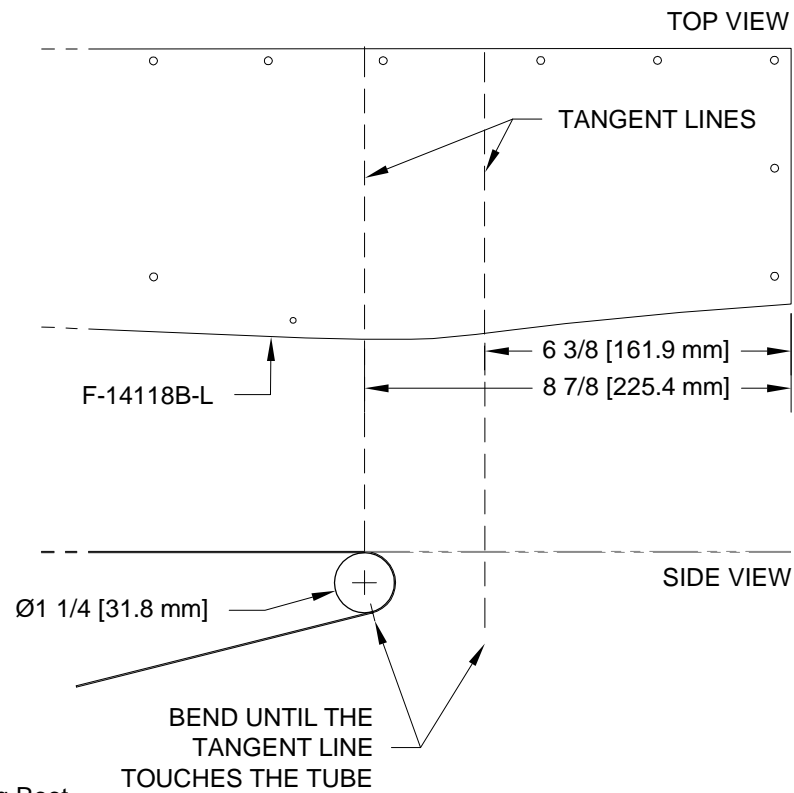
**Step 8:** Temporarily place the F-14118A-L Upper Wing Root Fairing into position as shown on Page 41-05, Figure 1.

**Step 9:** Check the fit of the curvature of the upper wing root fairing.

Adjust the curvature of the upper wing root fairing to closely match the curvature of the top wing skin and fuel tank skin.

**Step 10:** Dimple all of the holes in the F-14122 Root Fairing Stiffeners.

**Step 11:** Mark and separate the F-14122 Root Fairing Stiffeners as shown in Figure 2.

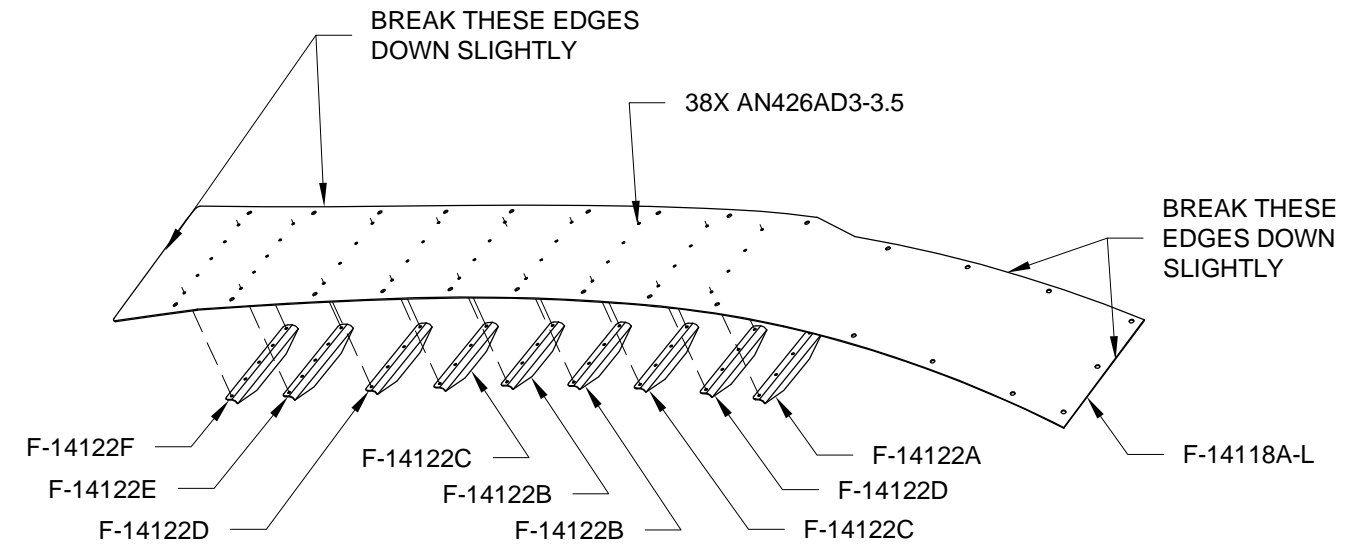


**FIGURE 1: LOWER WING ROOT FAIRING BENDING**

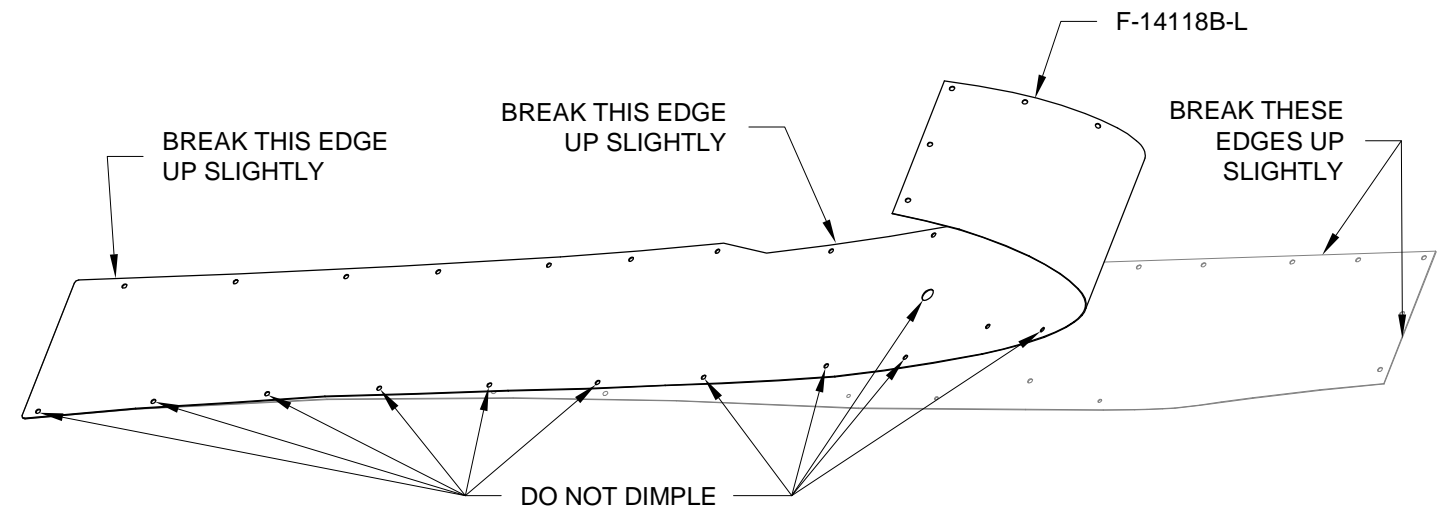
**Step 12:** Dimple all of the holes in the F-14118A-L Upper Wing Root Fairing.

**Step 13:** Rivet the F-14122 Root Fairing Stiffeners to the F-14118A-L Upper Wing Root Fairing as shown in Figure 3.

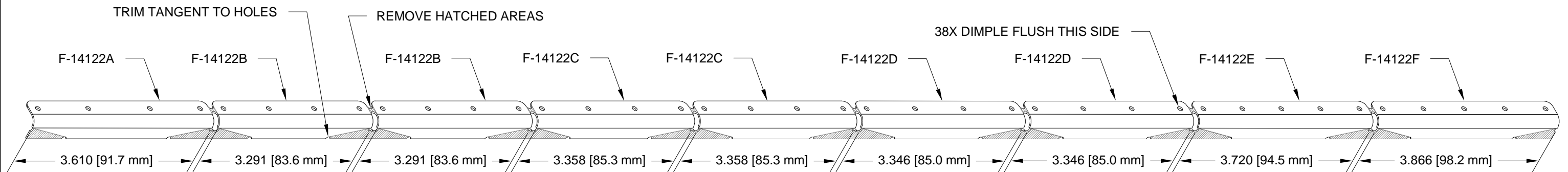
**Step 14:** Dimple all of the holes in the F-14118B-L Lower Wing Root Fairing except as shown in Figure 4.



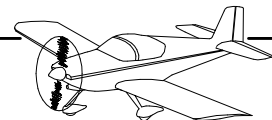
**FIGURE 3: UPPER WING ROOT FAIRING ASSEMBLY**



**FIGURE 4: LOWER WING ROOT FAIRING DIMPLING**



**FIGURE 2: WING ROOT FAIRING STIFFENERS**



**NOTE: Refer to Figure 1 for all instructions on this page.**

**Step 1:** Temporarily position the F-1099C Wing Walk Spacer as shown.

**Step 2:** Trim the inboard side of the wing walk spacer to match the fuselage side skin. The wing walk spacer should not underlap the fuel tank skin.

**Step 3:** Temporarily install the F-14118A-L Upper Wing Root Fairing and F-14118B-L Lower Wing Root Fairing as shown.

**Step 4:** Check the fit of the F-1099C Wing Walk Spacer as the F-14118A-L and F-14118B-L Upper and Lower Wing Root Fairings are fitted.

**Step 5:** Trim the wing walk spacer as necessary to allow the upper wing root fairing to lay flush over the gap between the F-14120-L and F-14119-L Root Fairing Attach Angles.

**Step 6:** With just the F-14118B-L Lower Wing Root Fairing installed, match-drill #30 and then match-drill #19 the holes in the lower wing root fairing into the F-14121B-L and F-14121A-L Root Fairing Attach Angles.

**Step 7:** Remove the lower wing root fairing.

**Step 8:** Use the screws called-out in Figure 1 to temporarily install the nutplates called out in Figure 1. Use the nutplates as templates to match-drill #40 the nutplate rivet holes into the F-14121B-L and F-14121A-L Root Fairing Attach Angles.

**Step 9:** Remove the nutplates and drill #17 the screw holes in the F-14121B-L and F-14121A-L Root Fairing Attach Angles.

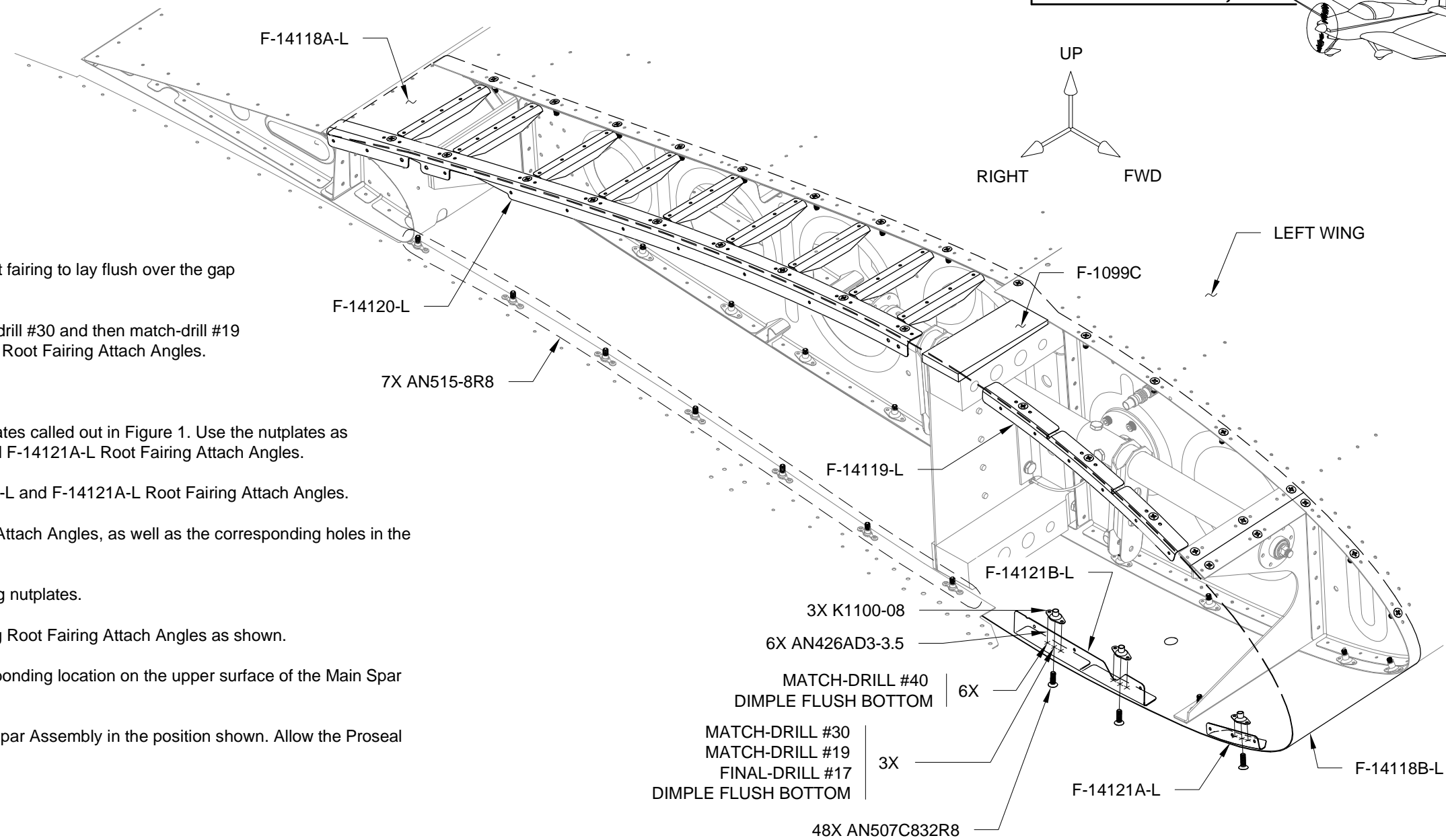
**Step 10:** Dimple the holes in the F-14121A-L and F-14121B-L Root Fairing Attach Angles, as well as the corresponding holes in the F-14118B-L Lower Wing Root Fairing.

**Step 11:** Dimple the nutplates shown. See Section 5.16 for more on dimpling nutplates.

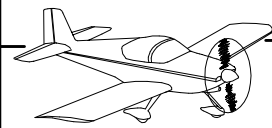
**Step 12:** Rivet the nutplates to the F-14121B-L and F-14121A-L Lower Wing Root Fairing Attach Angles as shown.

**Step 13:** Scuff the lower surface of the F-1099C Wing Walk Spacer and its bonding location on the upper surface of the Main Spar Assembly.

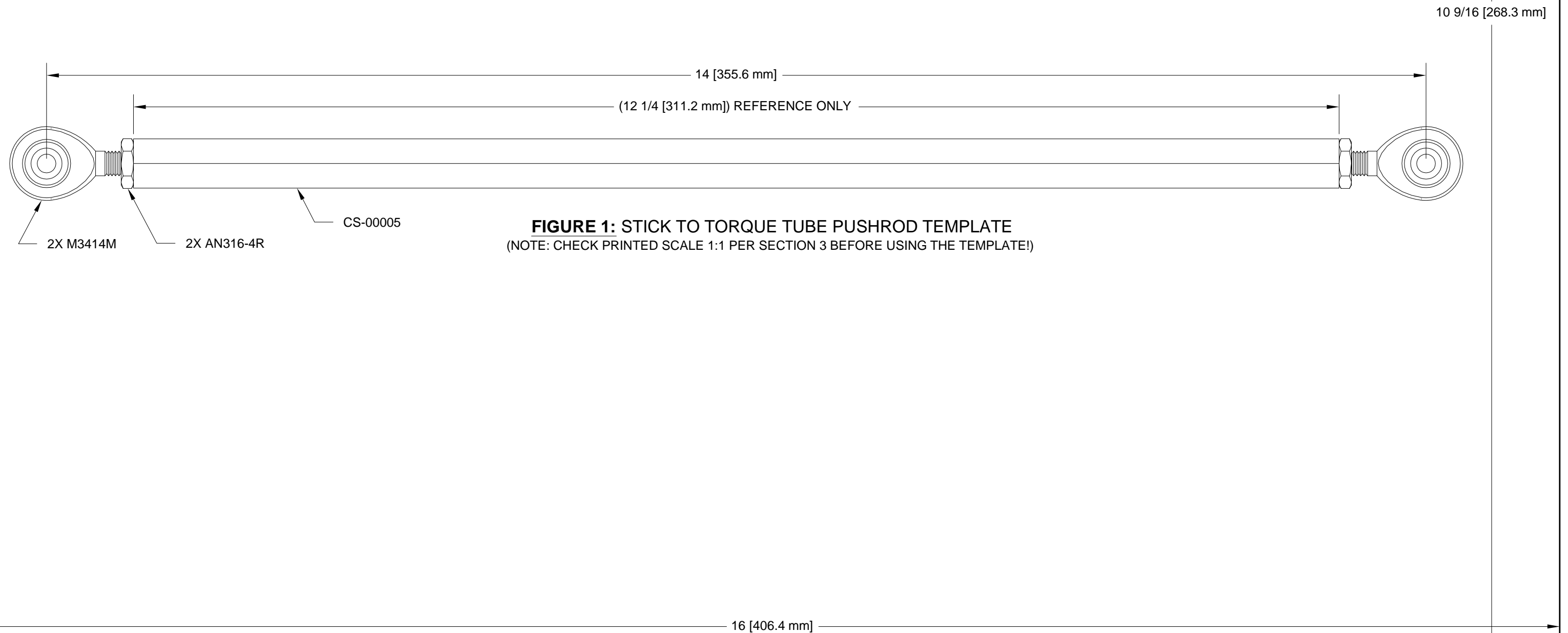
**Step 14:** Use Proseal to bond the F-1099C Wing Walk Spacer to the Main Spar Assembly in the position shown. Allow the Proseal to cure overnight.



**FIGURE 1: WING ROOT FAIRINGS**  
(FUSELAGE STRUCTURE NOT SHOWN)



Step 1: Assemble two CS-00005 Stick To Torque Tube Pushrods as shown in Figure 1.



**FIGURE 1: STICK TO TORQUE TUBE PUSHROD TEMPLATE**  
(NOTE: CHECK PRINTED SCALE 1:1 PER SECTION 3 BEFORE USING THE TEMPLATE!)



**Step 1:** Install the left CS-00005 Stick to Torque Tube Pushrod as shown in Figure 1. Note the washer installed between the aft face of the outboard bearing of the CS-00005 Stick To Torque Tube Pushrod and the CS-00009 Aileron Torque Tube. Leave the nuts loose for now.

**Step 2:** Remove the CS-00008-L Control Stick from the CS-00007-L Control Stick Base.

**Step 3:** Place a digital level flat against the top flange of the F-01438 Cover Rib and zero the level.

**Step 4:** Place the digital level on the top of the CS-00007 Control Stick Base and move it to the angle specified in Figure 1. Use tape to immobilize the pitch system. This establishes the "pitch neutral" position.

**Step 5:** Ensure that the CS-00007 Control Stick Base is also in the "roll neutral" position by verifying that the right most edge of the control stick base is parallel to the face of the F-01438 Cover Rib. This establishes the "fully neutral" position.

**Step 6:** With the control stick base in the "fully neutral" position, verify that the ailerons are approximately 1/16 [1.6 mm] above the trail position with respect to the wingtip trailing edges.

**NOTE:** Newer revisions of the W-00026 Alignment Template will have a reflex ID hole as shown on Page 23-10, Figure 2. If the template does not have the reflex ID hole, use shims to rig the trailing edge of the Aileron to protrude approximately 1/16 [1.6 mm] to ABOVE the trailing edge of the template. The Ailerons must be in this slightly reflexed position to compensate for aerodynamic loads during flight.

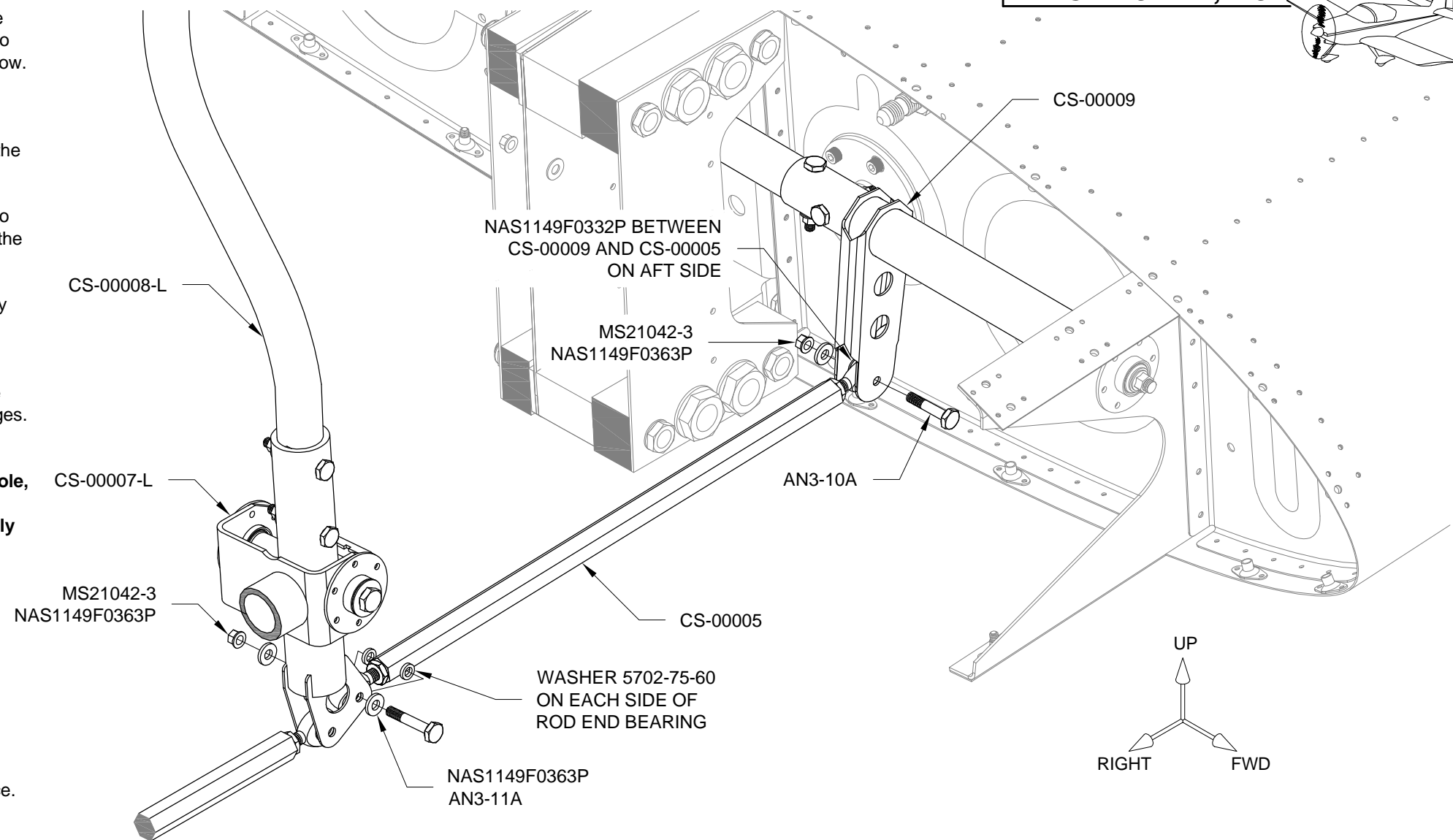
**Step 7:** If the ailerons are not aligned in the correct trail position, adjust the aileron bellcranks per the instructions on Page 23-10, Step 2 through Step 5.

**Step 8:** Verify that the control stick base is in the "fully neutral" position, and adjust the rod-end bearings in the CS-00005 Stick To Torque Tube Pushrods until the ailerons are correctly aligned in the trail position.

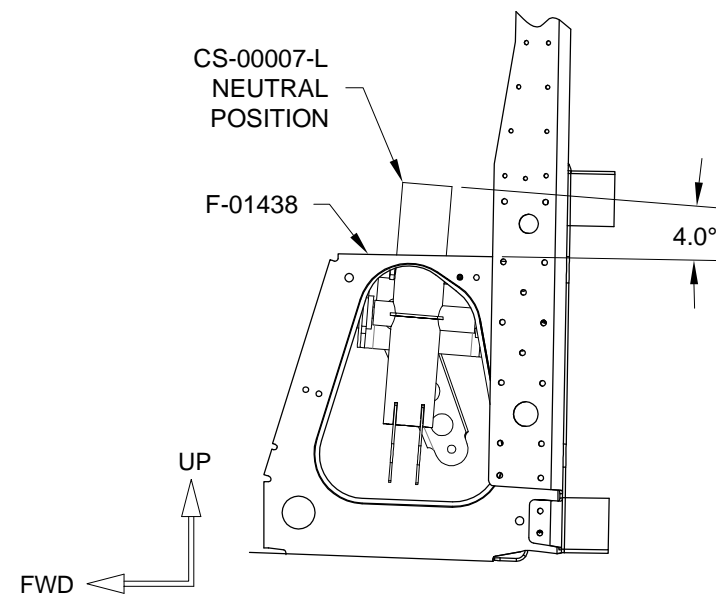
**Step 9:** Reinstall the CS-00008-L Control Stick and remove the immobilization measures.

**Step 10:** Sweep the control stick through the full range of motion and check for interference.

**Step 11:** Tighten all hardware per Section 5.20.



**FIGURE 2: STICK TO TORQUE TUBE PUSHROD INSTALLATION (FUSELAGE STRUCTURE NOT SHOWN)**



**FIGURE 1: CONTROL STICK BASE NEUTRAL POSITION**





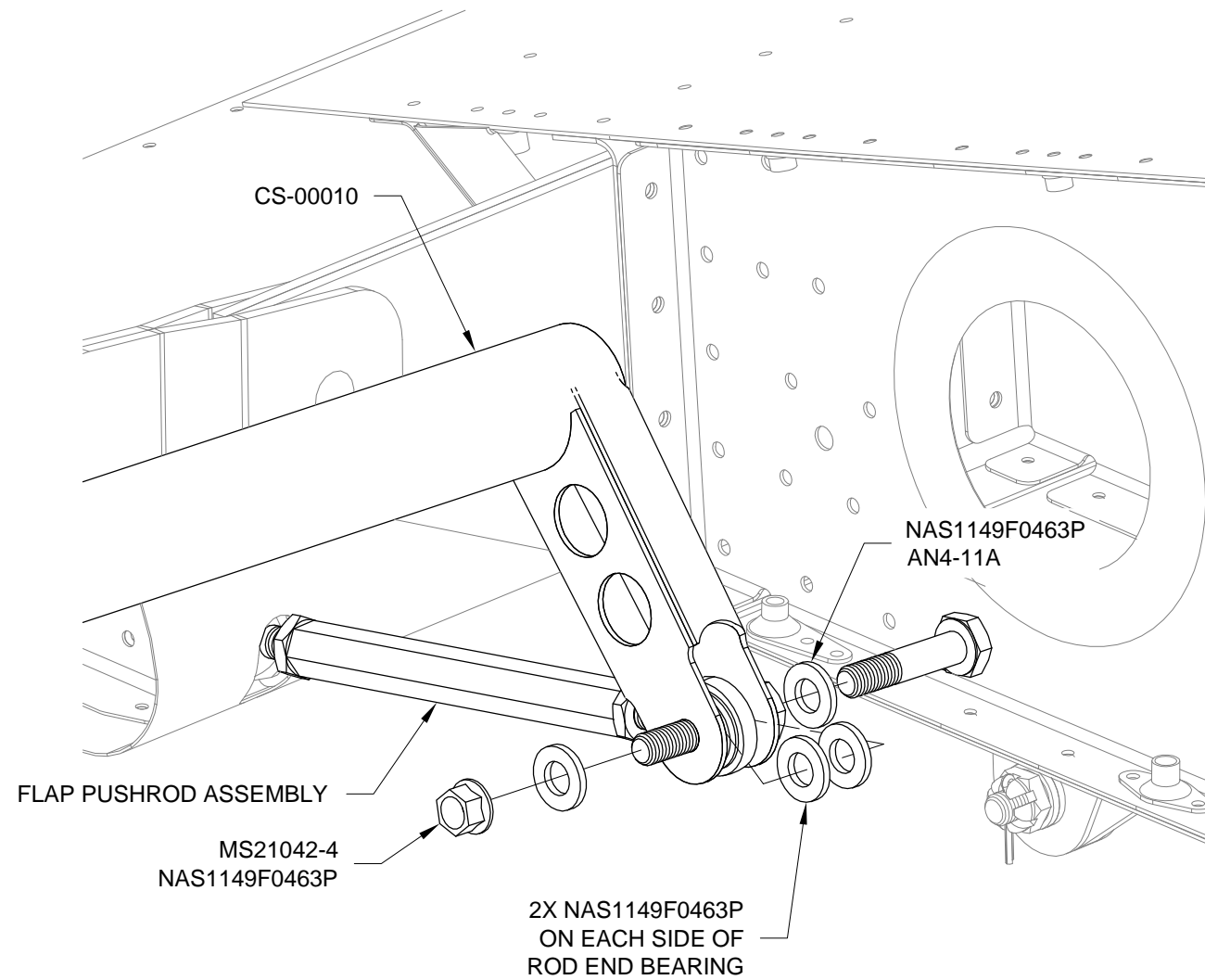
**Step 1:** Ensure the flap motor is fully retracted.

**Step 2:** Connect the Flap Pushrod Assembly to the CS-00010 Flap Torque Arm as shown in Figure 1. Note the washers positioned between the Flap Pushrod Assembly and the CS-00010 Flap Torque Arm.

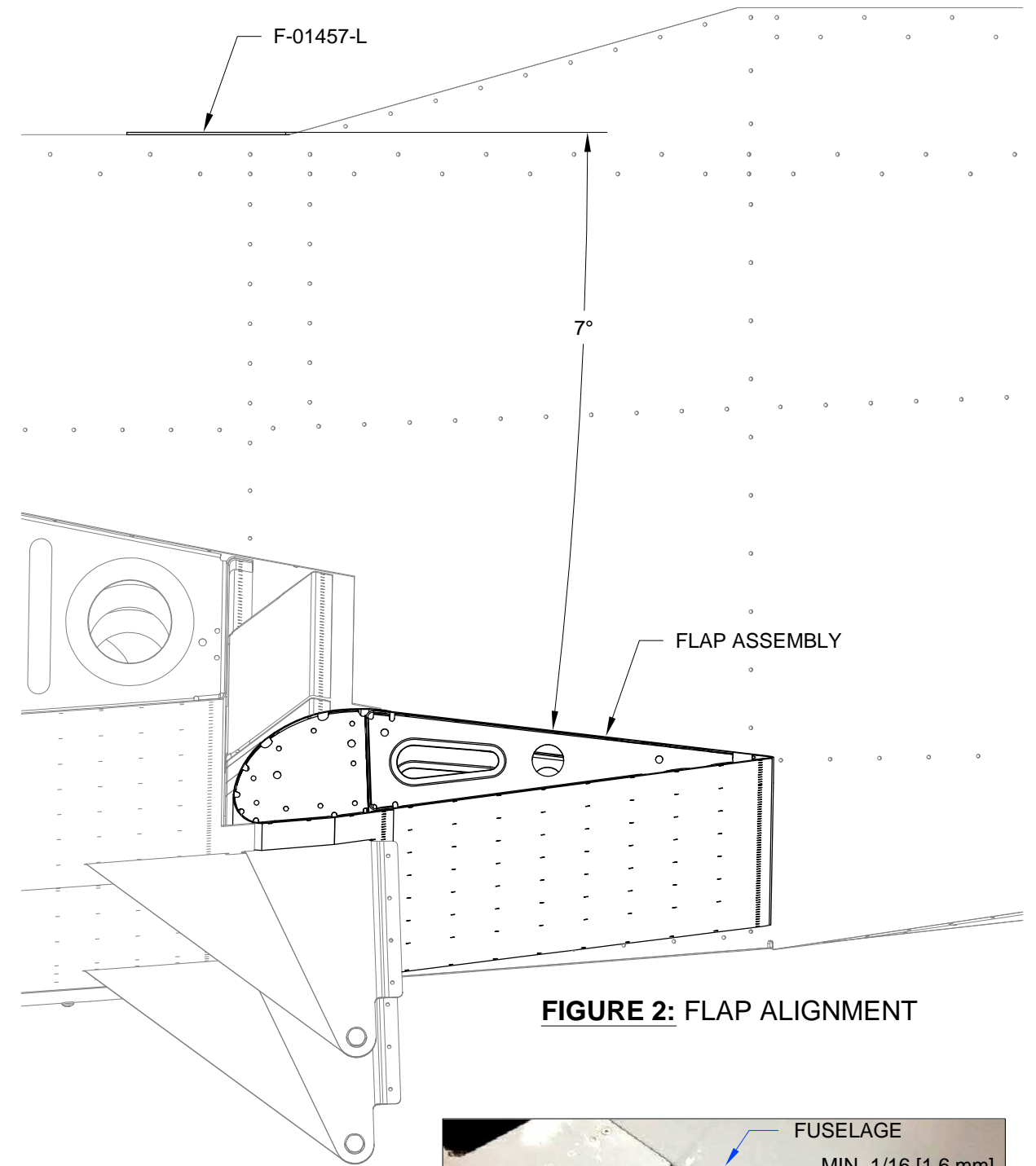
**Step 3:** Use a digital level to check the the Flap Assembly for correct alignment when fully retracted as shown in Figure 2. Adjust the length of the Flap Pushrod Assembly as necessary.

**Step 4:** Verify that there is an adequate gap between the fuselage and Flap Assembly throughout the full range of motion. There should be a minimum of 1/16 [1.6 mm] gap between the fuselage and FL-00002A Top Skin when the flap motor is fully retracted. See Figure 3.

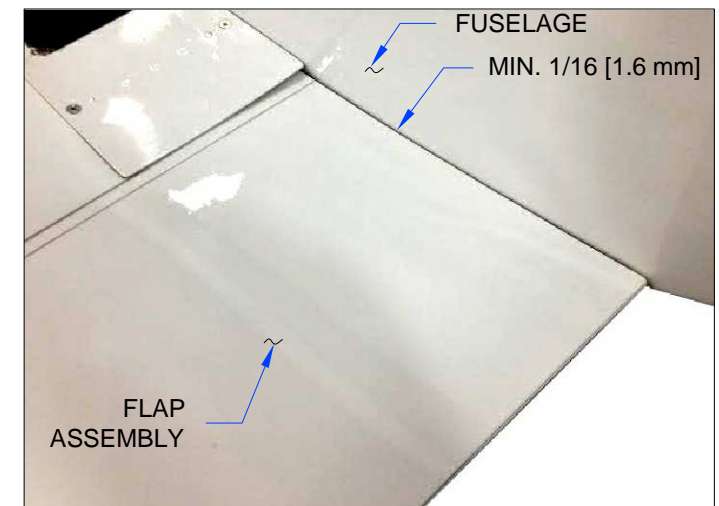
**Step 5:** File the inboard edges of the Flap Assembly as required to obtain a sufficient gap as described in Step 4.



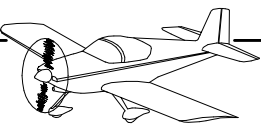
**FIGURE 1: CONNECT FLAP PUSHROD ASSEMBLY**



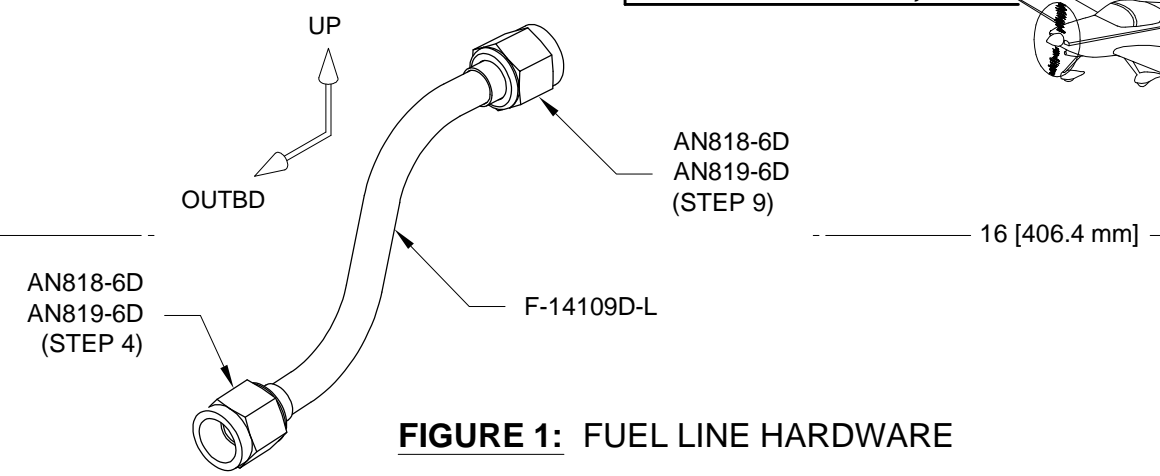
**FIGURE 2: FLAP ALIGNMENT**



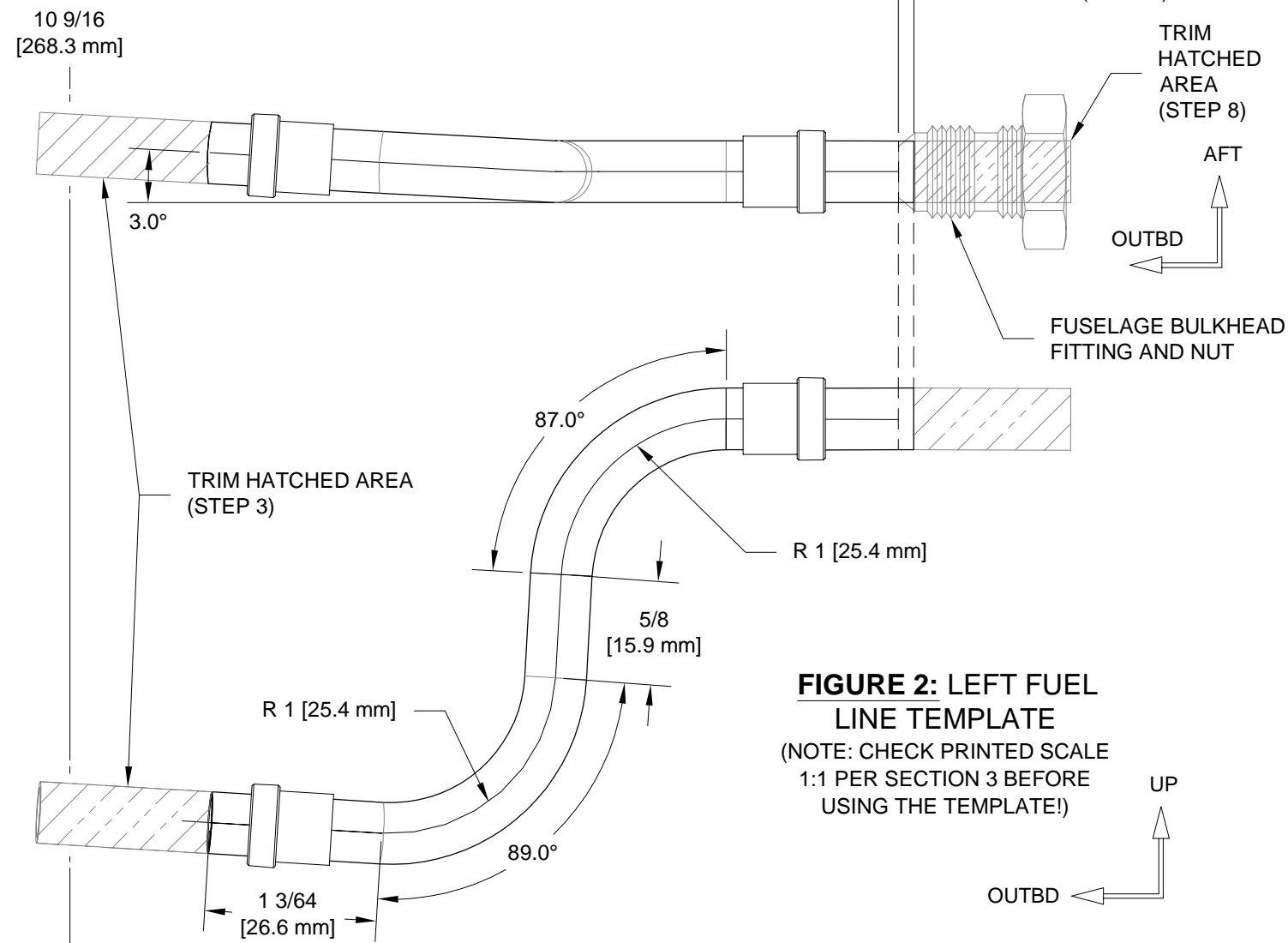
**FIGURE 3: FLAP GAP**



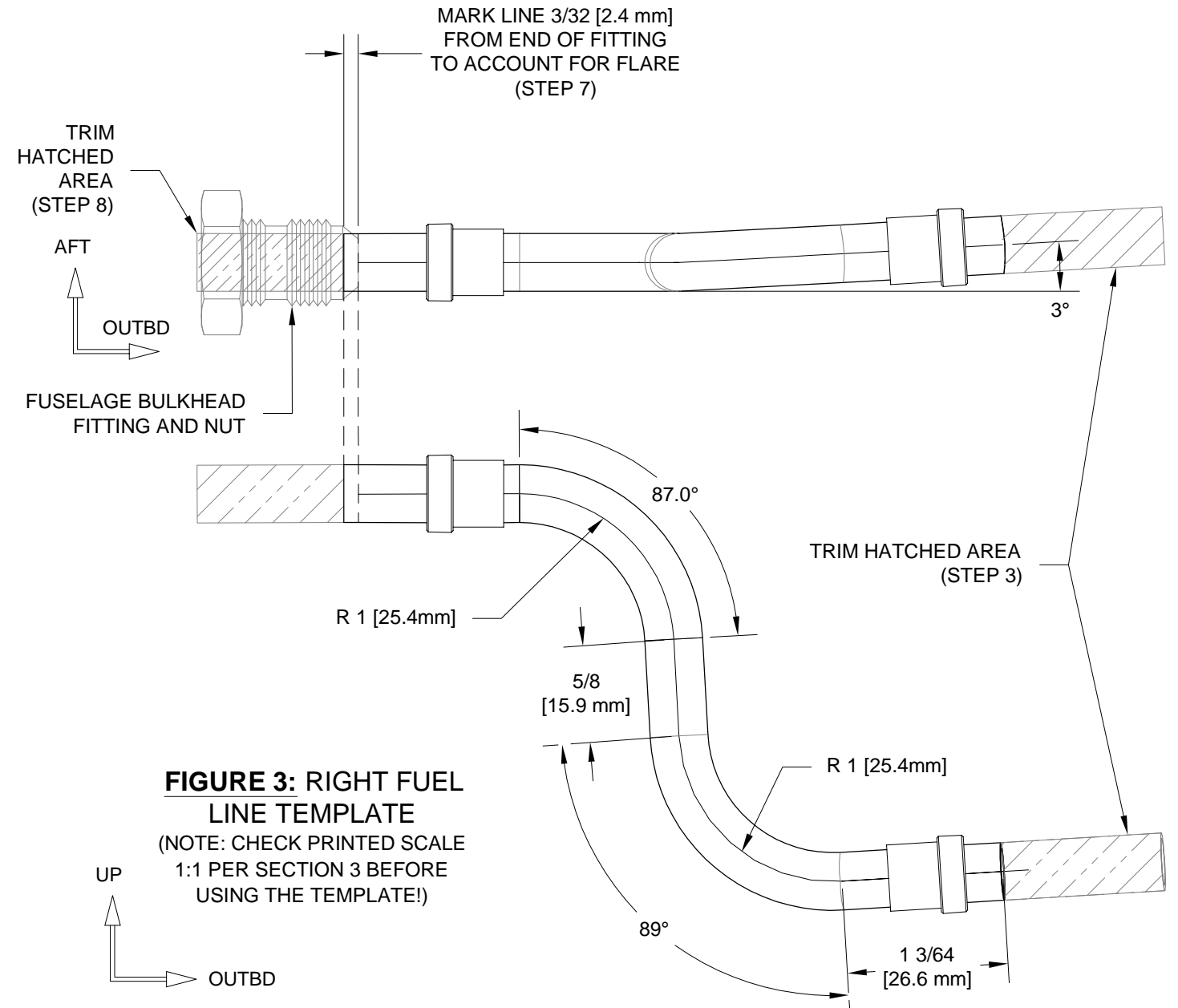
- Step 1: Begin fabricating the F-14109D-L & -R Tank-Fuse Side Fuel Lines by cutting two 8 [203.2 mm] lengths of AT0-035X3/8 aluminum tube. See Section 5.14 for more information on aluminum tubing.
- Step 2: Bend the tubes as shown in Figure 2 and Figure 3.
- Step 3: Trim the outboard end of the fuel lines as shown in Figure 2 and Figure 3.
- Step 4: Install the outboard hardware as shown in Figure 1.
- Step 5: Flare the outboard ends of the fuel lines.
- Step 6: Ensure that the fluid fittings in the fuel tanks are fully torqued and attach the fuel lines to the fuel tanks as shown on Page 41-11, Figure 1.
- Step 7: Mark the inboard end of the fuel lines as shown in Figure 2 and Figure 3. Ensure that sufficient length remains to use a flaring tool to flare the inboard end of the tube. If necessary, adjust the bends to provide sufficient length to use a flaring tool.
- Step 8: Trim the inboard end of the fuel lines.
- Step 9: Install the inboard hardware as shown in Figure 1 and flare the inboard ends of the fuel lines.
- Step 10: Inspect the flares for acceptable finish per Section 5.14 and ensure the fuel lines are clean and deburred inside and out.
- Step 11: Loosen the nut holding the fuselage bulkhead fitting as necessary to ease installation of the fuel lines.
- Step 12: Install the fuel lines as shown on Page 41-11, Figure 1. Ensure the flares fit tightly against the fittings prior to tightening the nuts. Never use the nuts to draw the flared lines into contact with the fitting.



**FIGURE 1: FUEL LINE HARDWARE**



**FIGURE 2: LEFT FUEL LINE TEMPLATE**  
(NOTE: CHECK PRINTED SCALE 1:1 PER SECTION 3 BEFORE USING THE TEMPLATE!)



**FIGURE 3: RIGHT FUEL LINE TEMPLATE**  
(NOTE: CHECK PRINTED SCALE 1:1 PER SECTION 3 BEFORE USING THE TEMPLATE!)



**NOTE: Refer to Figures 1 and 2 for the following steps:**

**Step 1:** Begin fabricating the F-00039-L & -R Fuel Vents by cutting two 12 [304.8 mm] lengths of AT0-032X1/4 aluminum tube.

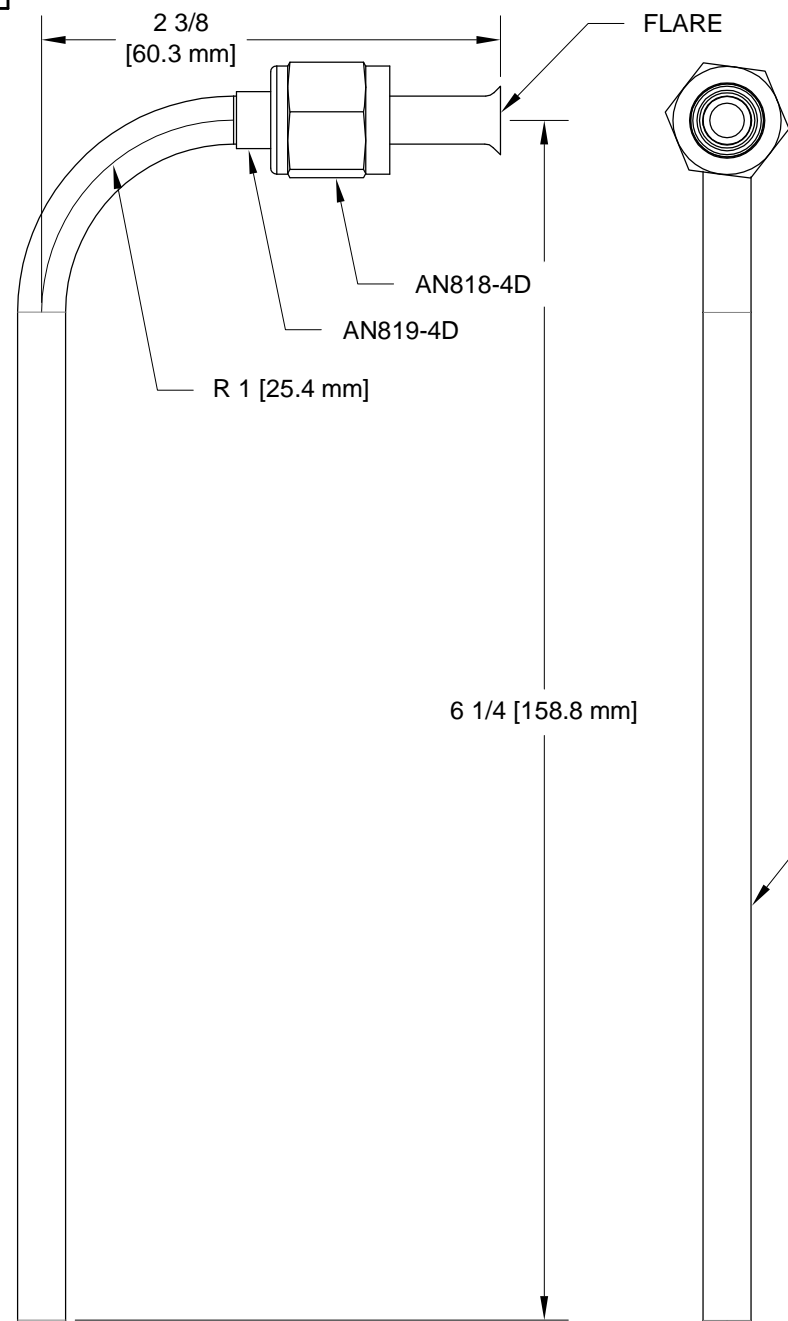
**Step 2:** Bend the tubes to match the upper radii as shown.

**Step 3:** Slide the hardware onto the tubes as shown.

**Step 4:** Flare the ends of the tubes for the fuel vents as shown.

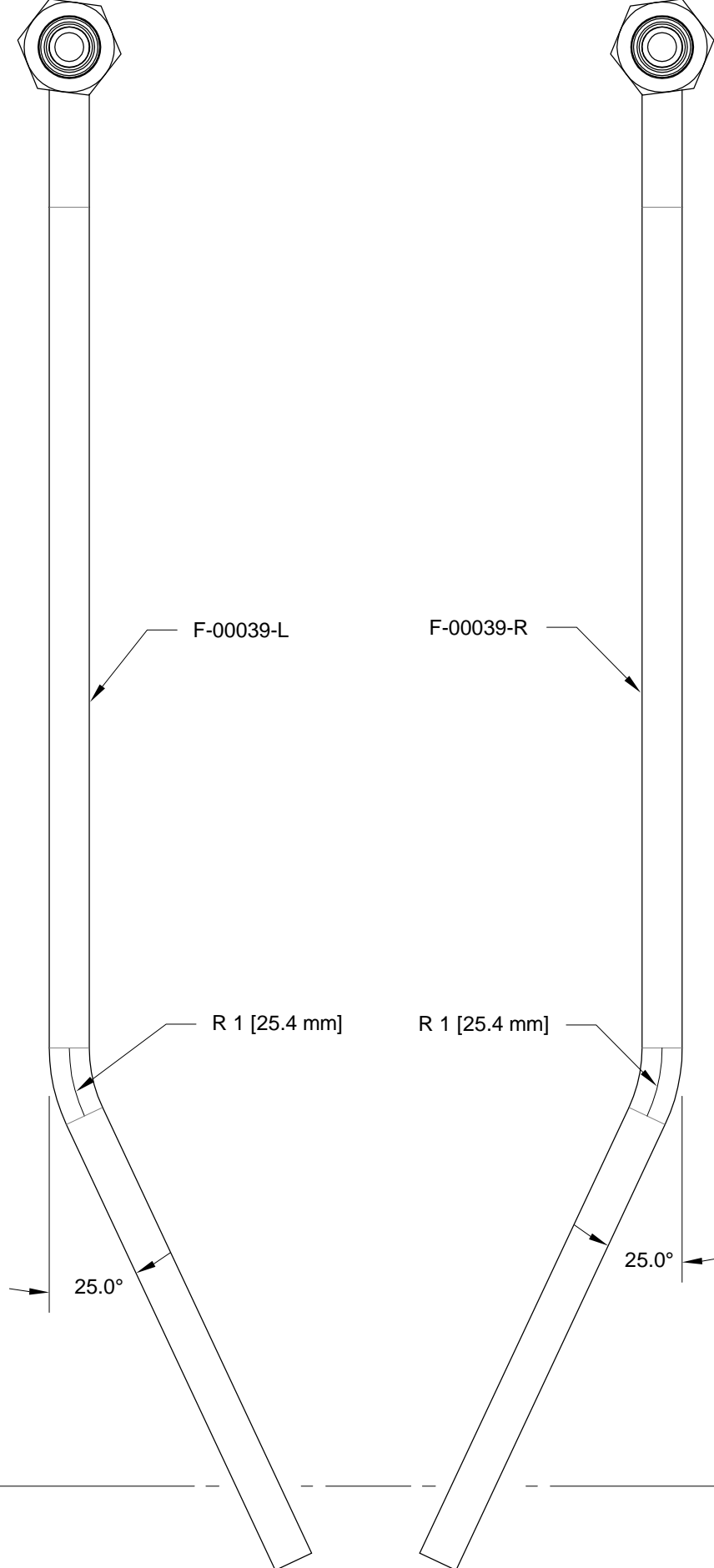
**Step 5:** Bend the lower part of the tubes to match the templates as shown.

**Step 6:** Inspect the flares for acceptable finish per Section 5.14 and ensure the fuel vents are clean and deburred inside and out.



**FIGURE 1: LEFT FUEL VENT TEMPLATE**  
 (NOTE: CHECK PRINTED SCALE 1:1 PER SECTION 3 BEFORE USING THE TEMPLATE!)

REMAINING LENGTH TRIMMED DURING INSTALLATION



**FIGURE 2: RIGHT FUEL VENT TEMPLATE**  
 (NOTE: CHECK PRINTED SCALE 1:1 PER SECTION 3 BEFORE USING THE TEMPLATE!)

REMAINING LENGTH TRIMMED DURING INSTALLATION

16 [406.4 mm]

10 9/16 [268.3 mm]



**NOTE: Refer to Figure 1 for the following steps:**

**Step 1:** Install the snap bushing into the F-14118B-L Lower Wing Root Fairing as shown in Figure 1.

**Step 2:** Install the F-14118B-L Lower Wing Root Fairing as shown on Page 41-05, Figure 1.

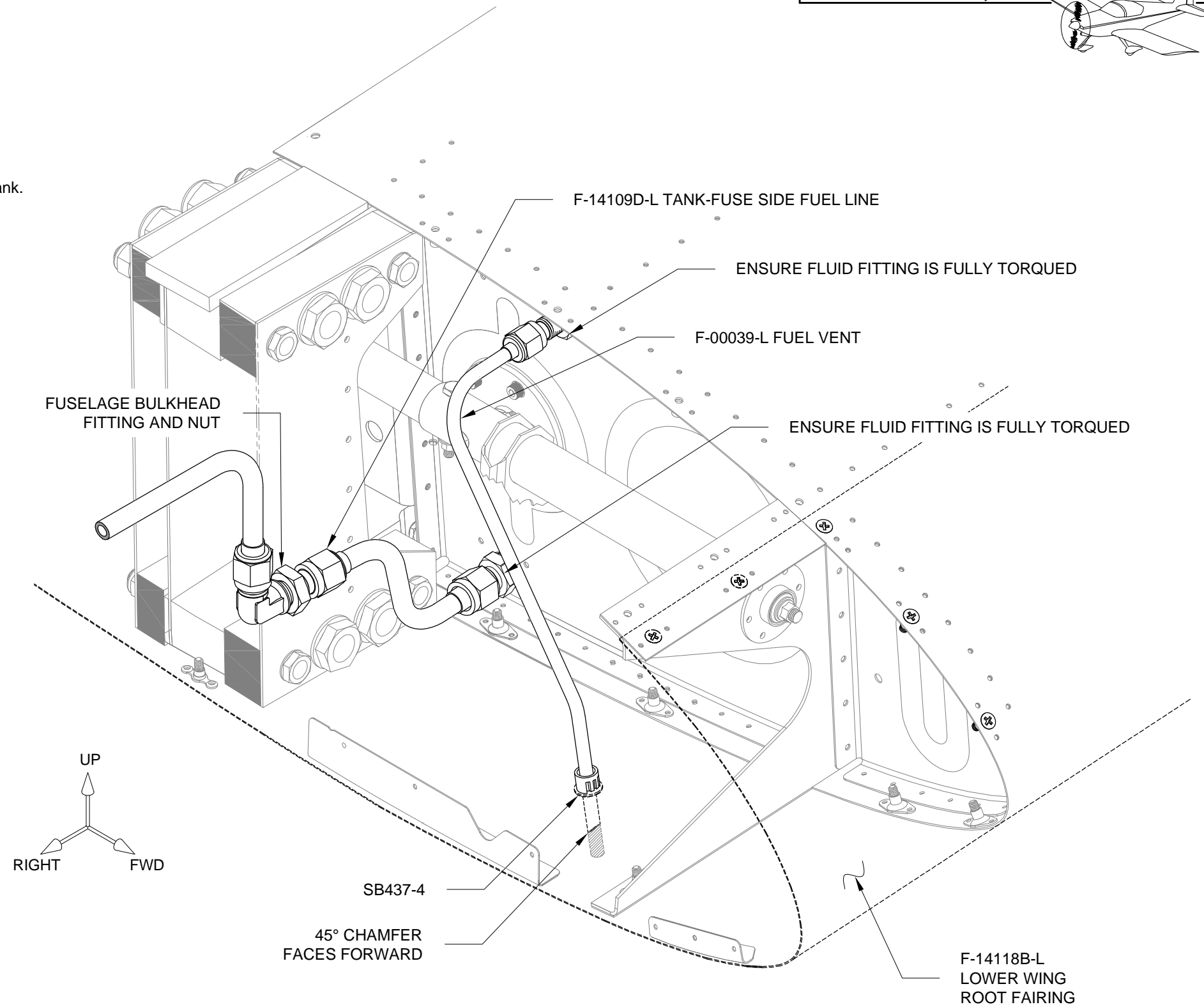
**Step 3:** Install the F-00039-L Fuel Vent as shown. Ensure the flare fits tightly against the fitting prior to tightening the nut. Never use the nut to draw the flared line into contact with the fitting.

**Step 4:** Mark the F-00039-L Fuel Vent approximately 1 [25.4 mm] below the bottom skin of the fuel tank.

**Step 5:** Remove the F-00039-L Fuel Vent and trim to the mark made in the previous step.

**Step 6:** Chamfer the F-00039-L Fuel Vent as shown.

**Step 7:** Reinstall the F-00039-L Fuel Vent as shown.



**FIGURE 1: FUEL VENT AND FUEL LINE INSTALLATION**



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