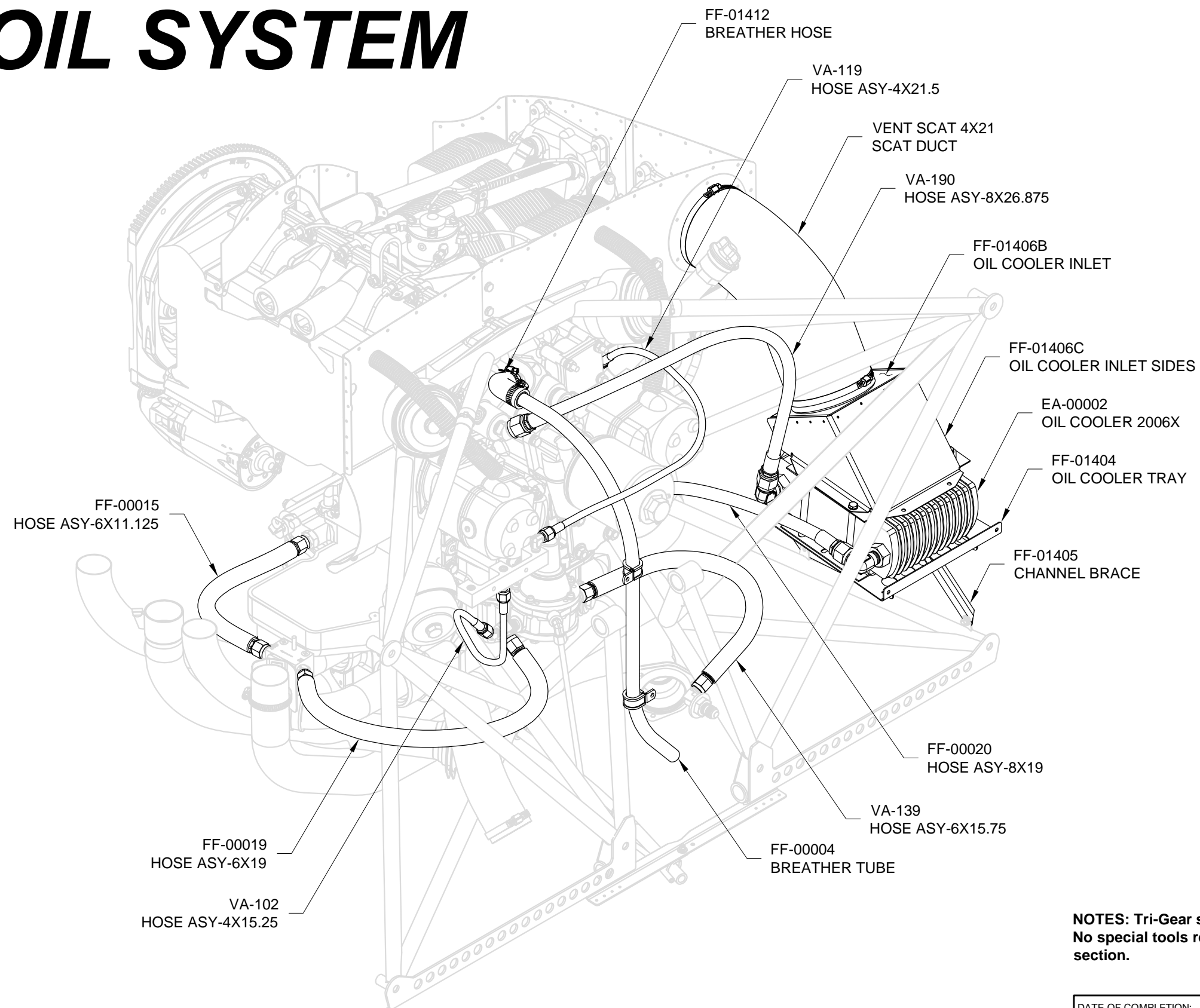
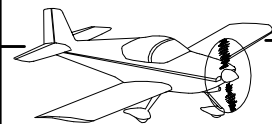


# SECTION 49:

## FUEL & OIL SYSTEM



**NOTES:** Tri-Gear shown.  
No special tools required to complete this section.



**NOTES:** This section includes instructions for both Tri-Gear and Tail Dragger aircraft models. Where necessary, separate instructions are provided for each model on a step by step basis and are labeled Tri-Gear or Tail Dragger.

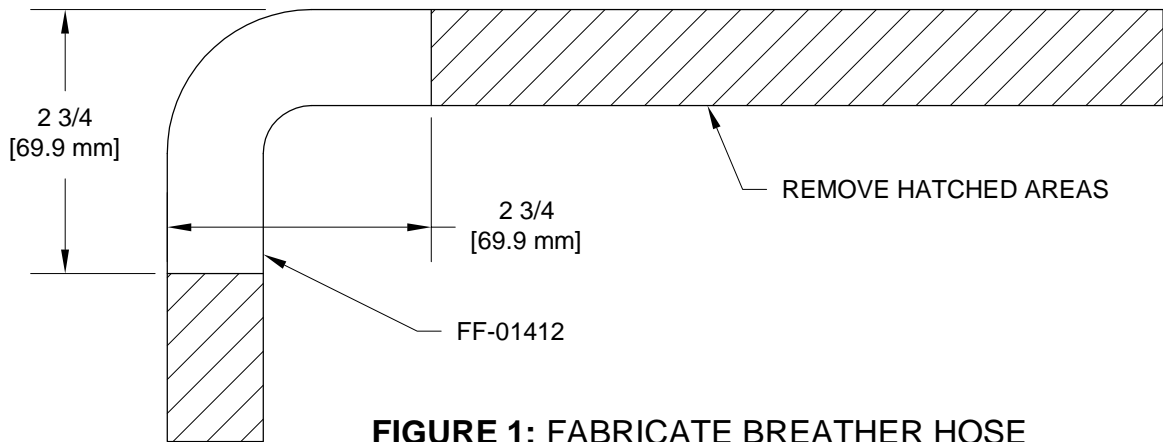
Avoid use of photographic detail for information beyond the scope of the corresponding written steps.

Refer to Section 43 Engine Installation for pre-installed fluid fittings and their clocking unless otherwise noted.

When connecting hoses to fittings always use a back-up wrench on the fitting to which the hose is being attached.

Ensure that no hoses are twisted during installation.

Step 1: Fabricate the FF-01412 Breather Hose from EA CV HOSE 9816 by trimming to the dimensions shown in Figure 1.



**FIGURE 1: FABRICATE BREATHER HOSE**

**NOTE:** Refer to Figure 2 for the remaining steps.

Step 2: Slide one hose clamp onto the FF-01412 Breather Hose.

Step 3: Push the breather hose onto the crankcase breather nipple on the accessory case.

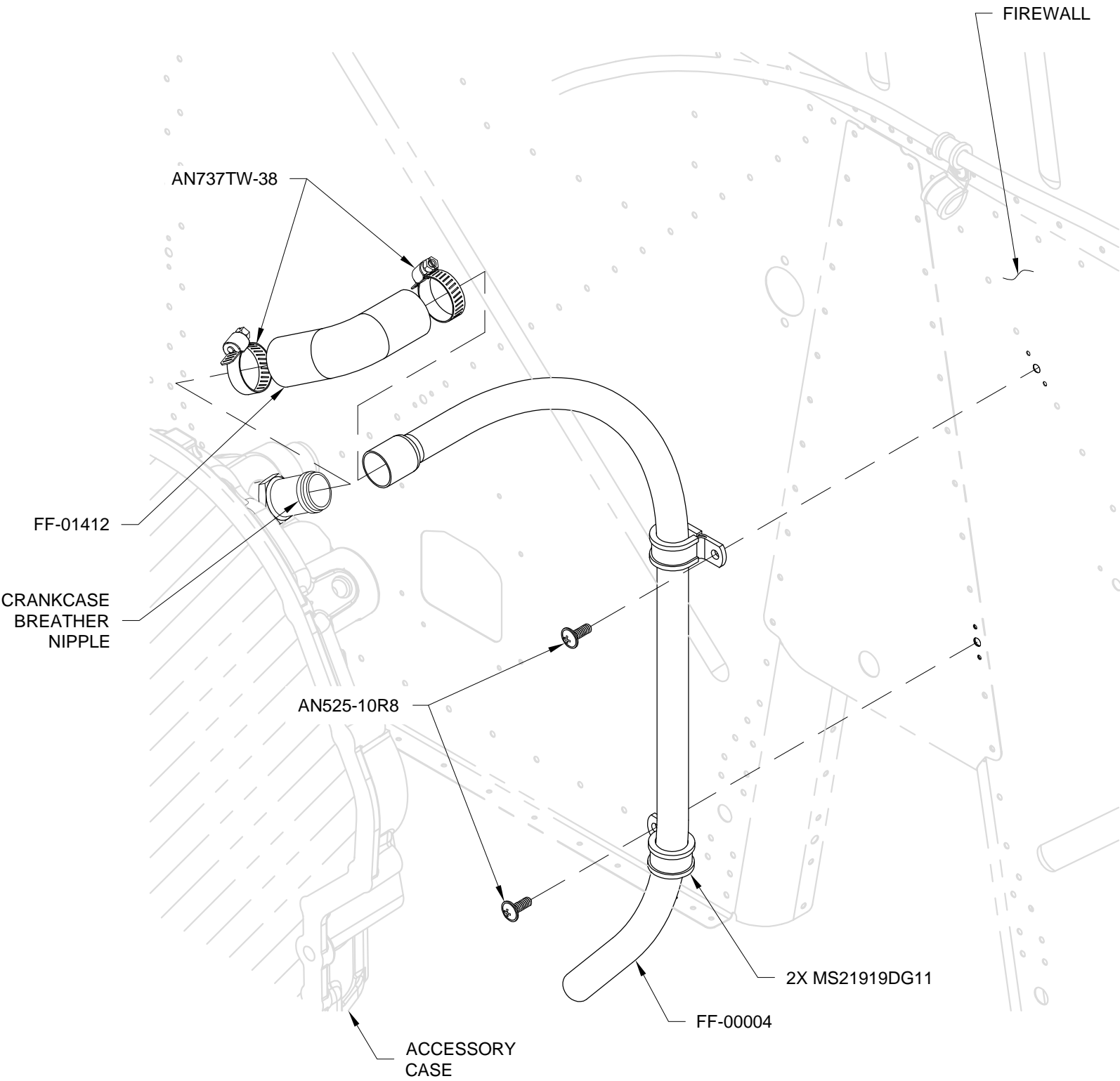
Step 4: Slide a hose clamp onto the other leg of the breather hose.

Step 5: Push the FF-00004 Breather Tube into the breather hose.

Step 6: Attach the breather tube to the firewall using the hardware called out.

Step 7: Tighten the hose clamps on the breather hose.

Step 8: Aim the breather tube over an exhaust pipe (not shown).



**FIGURE 2: BREATHER INSTALLATION**  
(SOME PARTS NOT SHOWN FOR CLARITY)

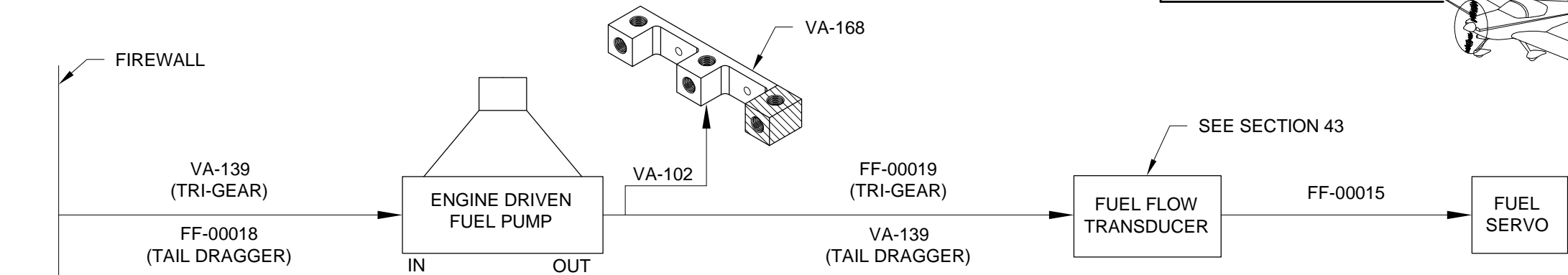
**NOTE:** Refer to Figure 1 for the fuel system schematic diagram.

For complete hose nomenclature see Table 1 and Page 49-01. The remainder of the section will use the format; "PN Hose." Example: "FF-00016 Hose."

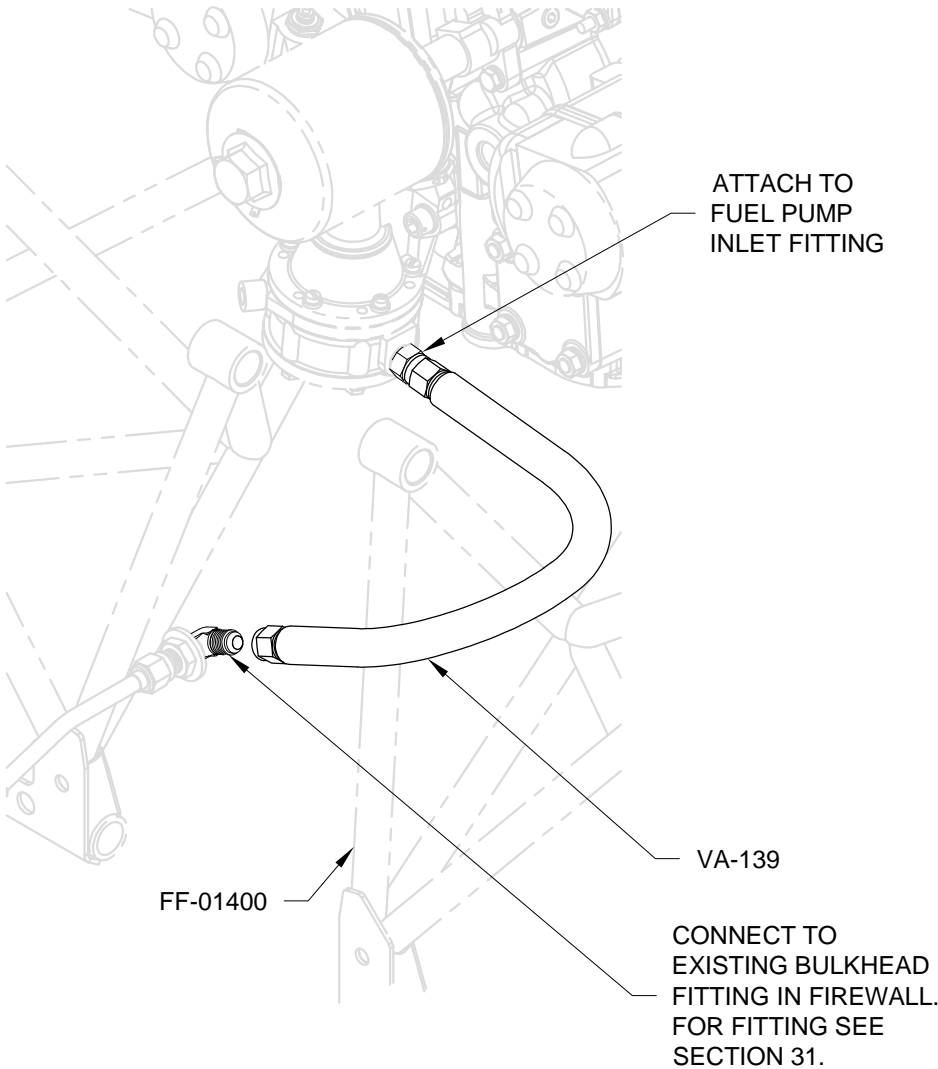
TABLE 1	
PN	NOMENCLATURE
FF-00016	HOSE ASY-8X16
FF-00017	HOSE ASY-8X19.625
FF-00018	HOSE ASY-6X12.125

Step 1: (Tri-Gear) Install the VA-139 Hose between the elbow fitting in the firewall and the fuel pump as shown in Figure 2.

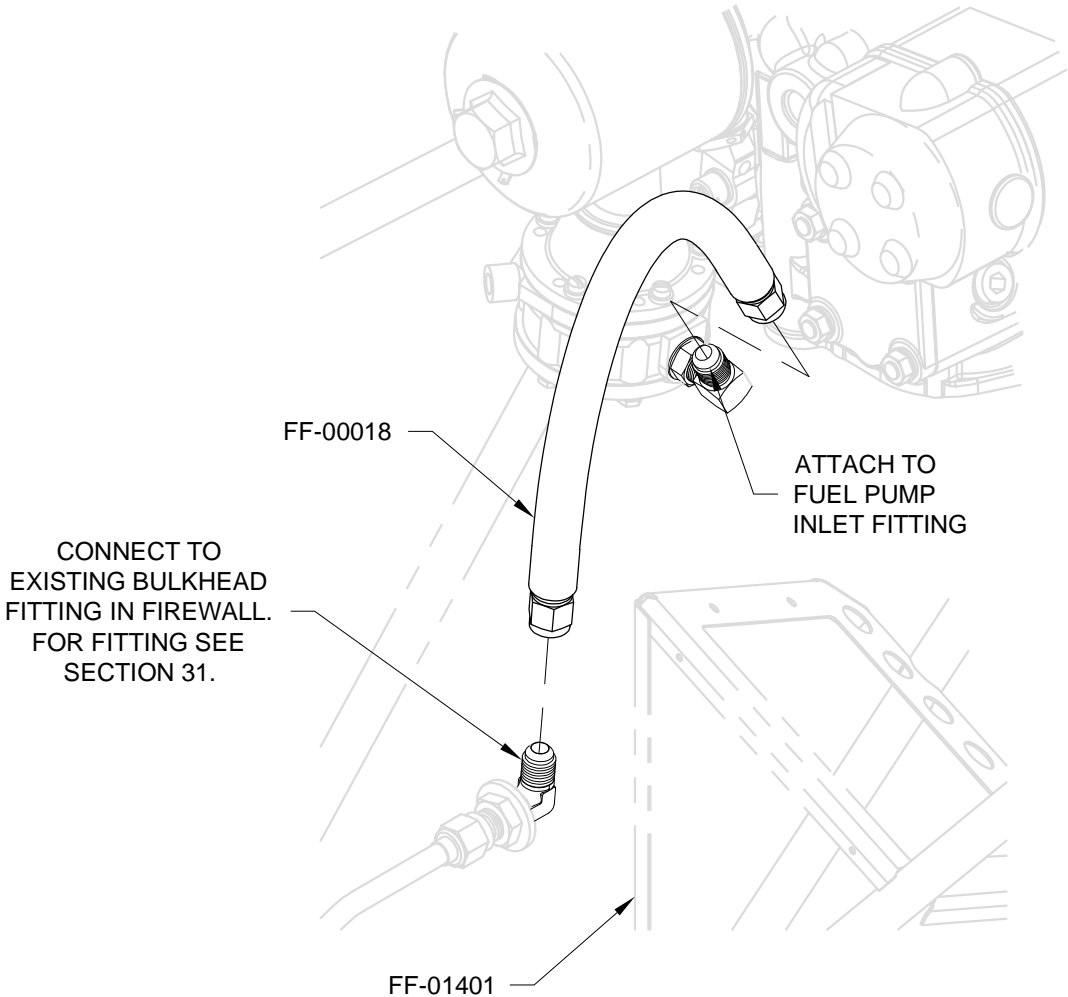
Step 1: (Tail Dragger) Install the FF-00018 Hose between the elbow fitting in the firewall and the fuel pump as shown in Figure 3.



**FIGURE 1: FUEL SYSTEM SCHEMATIC**  
(TRI-GEAR & TAIL DRAGGER)



**FIGURE 2: FIREWALL TO PUMP**  
(TRI-GEAR)



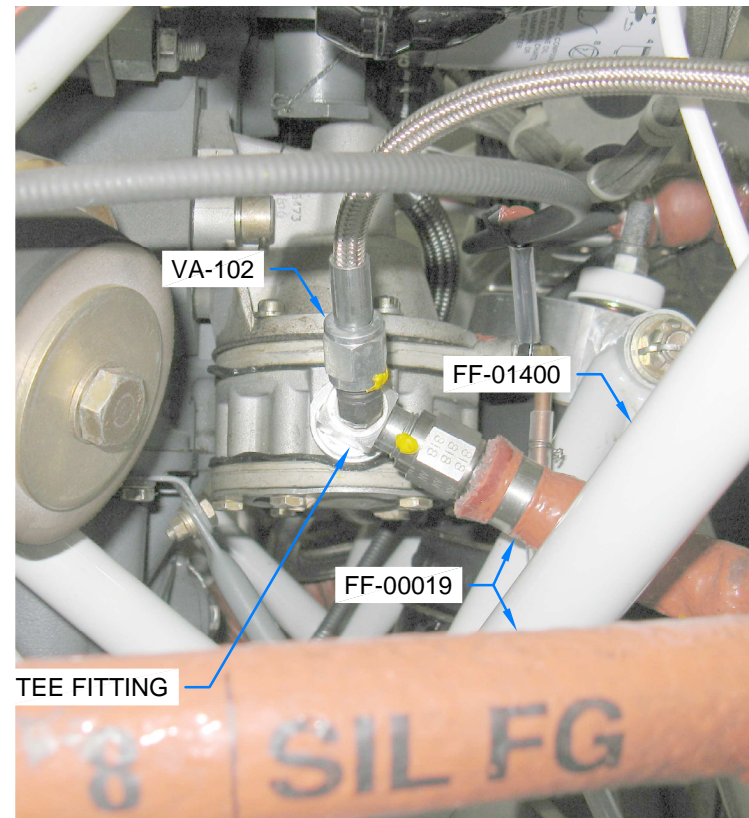
**FIGURE 3: FIREWALL TO PUMP**  
(TAIL DRAGGER)



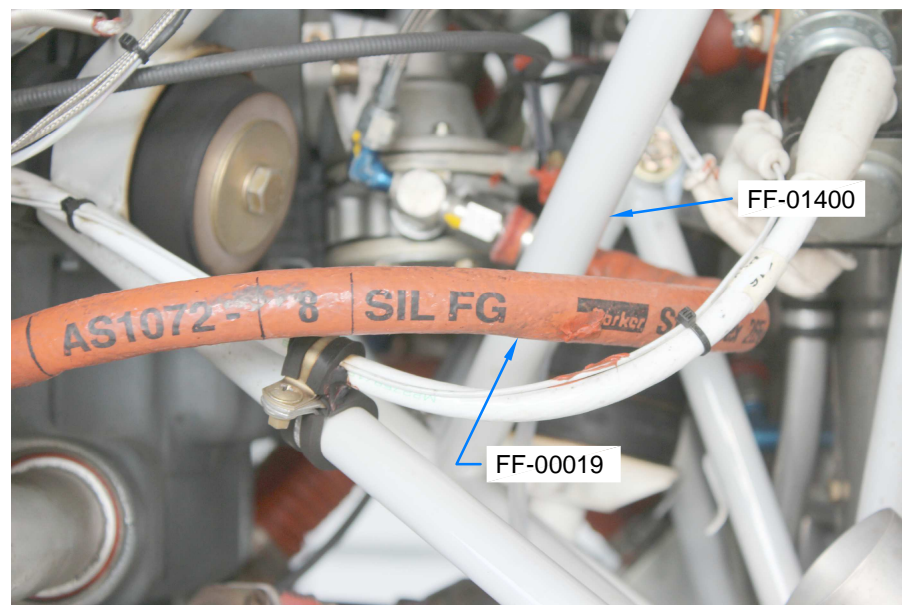


Step 1: (Tri-Gear) Install the FF-00019 Hose to the tee fitting at the fuel pump outlet as shown in Figure1.

Step 2: (Tri-Gear) Route the FF-00019 Hose through the FF-01400 Engine Mount as shown in Figures 1 and 2.

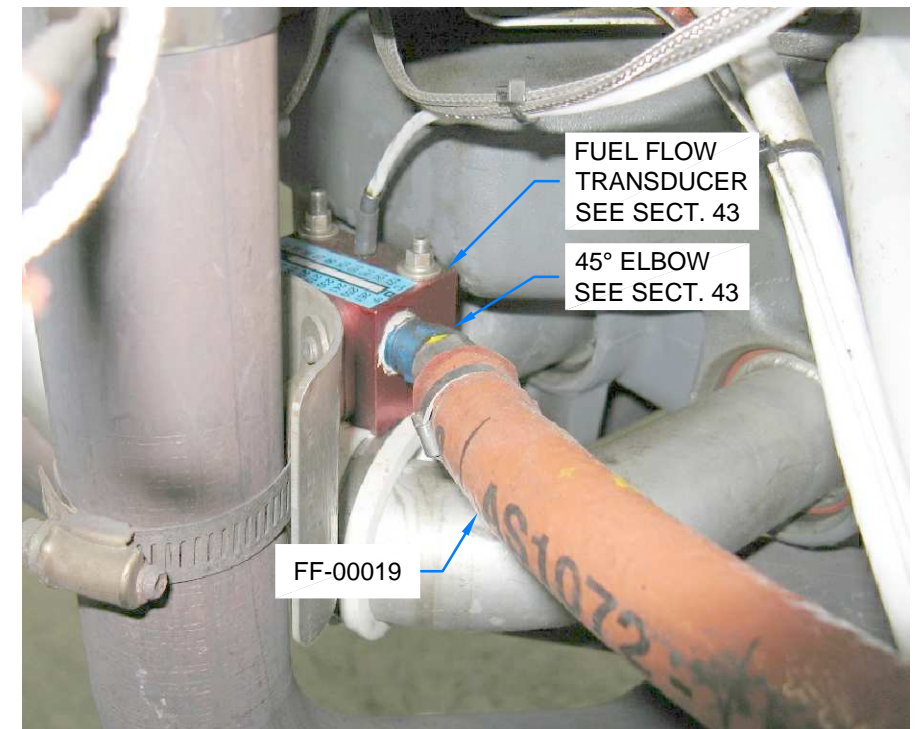


**FIGURE 1: HOSES AT FUEL PUMP**  
(TRI-GEAR - LEFT SIDE VIEW)



**FIGURE 2: FUEL HOSE ROUTING**  
(TRI-GEAR - LEFT SIDE VIEW)

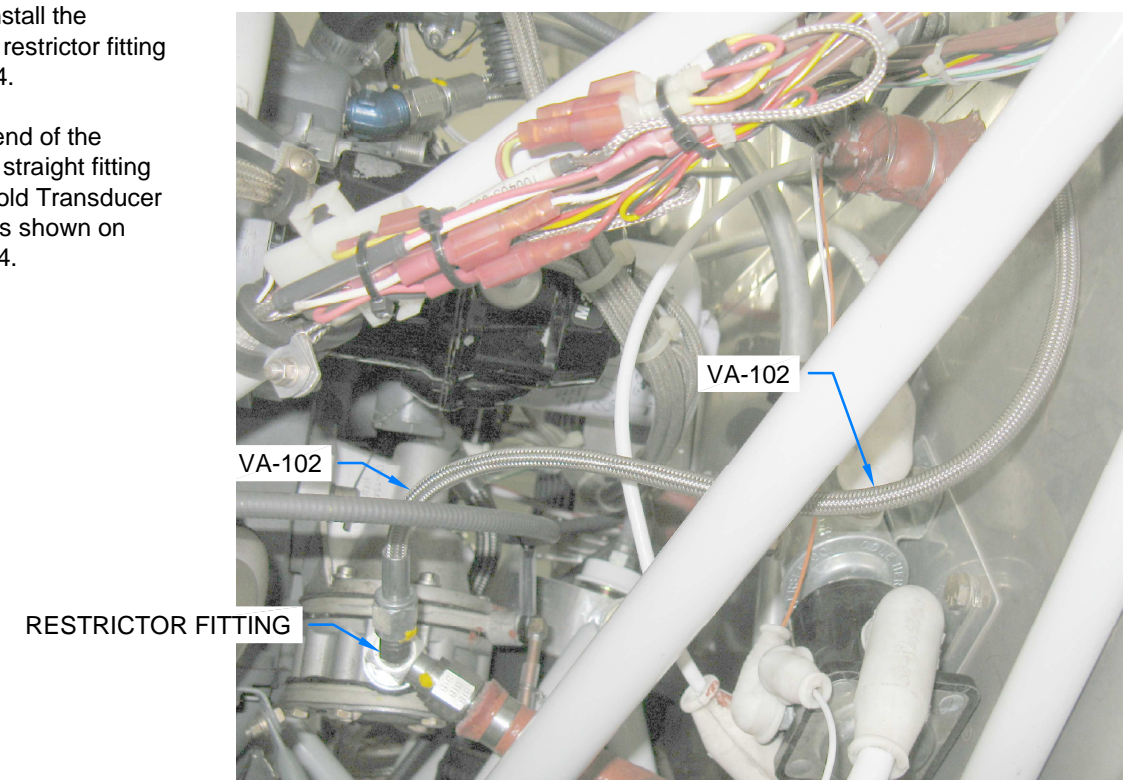
Step 3: (Tri-Gear) Attach the free end of the FF-00019 Hose to the 45 degree elbow at the aft side of the fuel flow transducer as shown in Figure 3.



**FIGURE 3: CONNECTION AT FUEL FLOW TRANSDUCER**  
(TRI-GEAR - LEFT SIDE VIEW)

Step 4: (Tri-Gear) Install the VA-102 Hose to the restrictor fitting as shown in Figure 4.

Install the opposite end of the VA-102 Hose to the straight fitting in the VA-168 Manifold Transducer bottom center port as shown on Page 49-05, Figure 4.



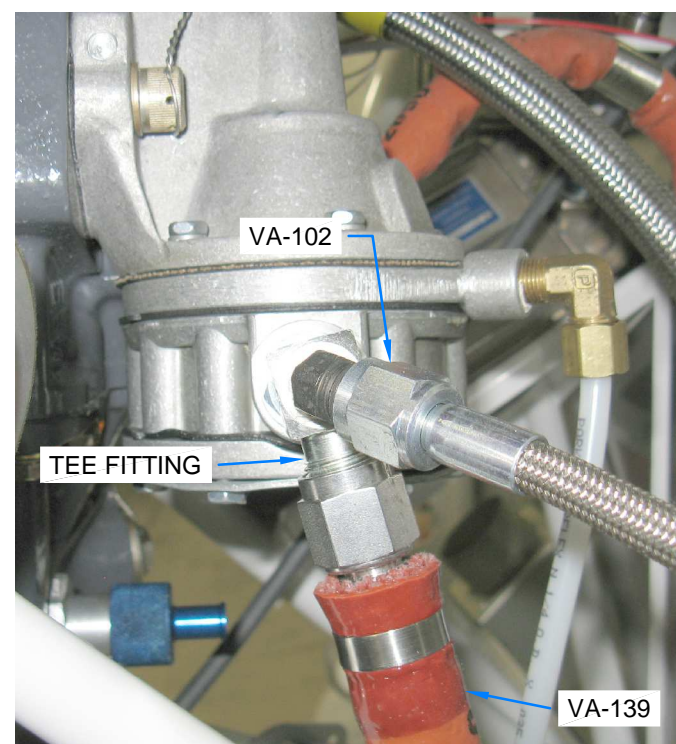
**FIGURE 4: CONNECTION AT RESTRICTOR FITTING**  
(TRI-GEAR - LEFT SIDE VIEW)





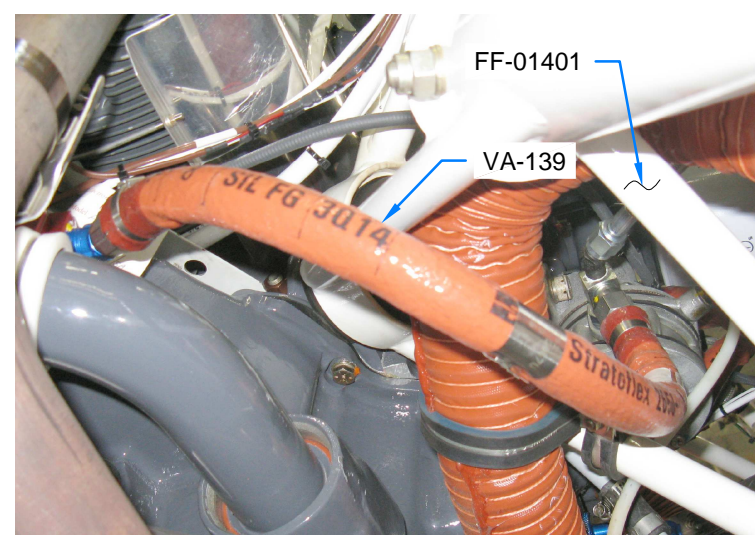
Step 3: (Tail Dragger) Attach the free end of the VA-139 Hose to the 45 degree elbow at the aft side of fuel flow transducer as shown in Figure 3.

Step 1: (Tail Dragger) Install the VA-139 Hose to the tee fitting at the fuel pump outlet as shown in Figure 1.

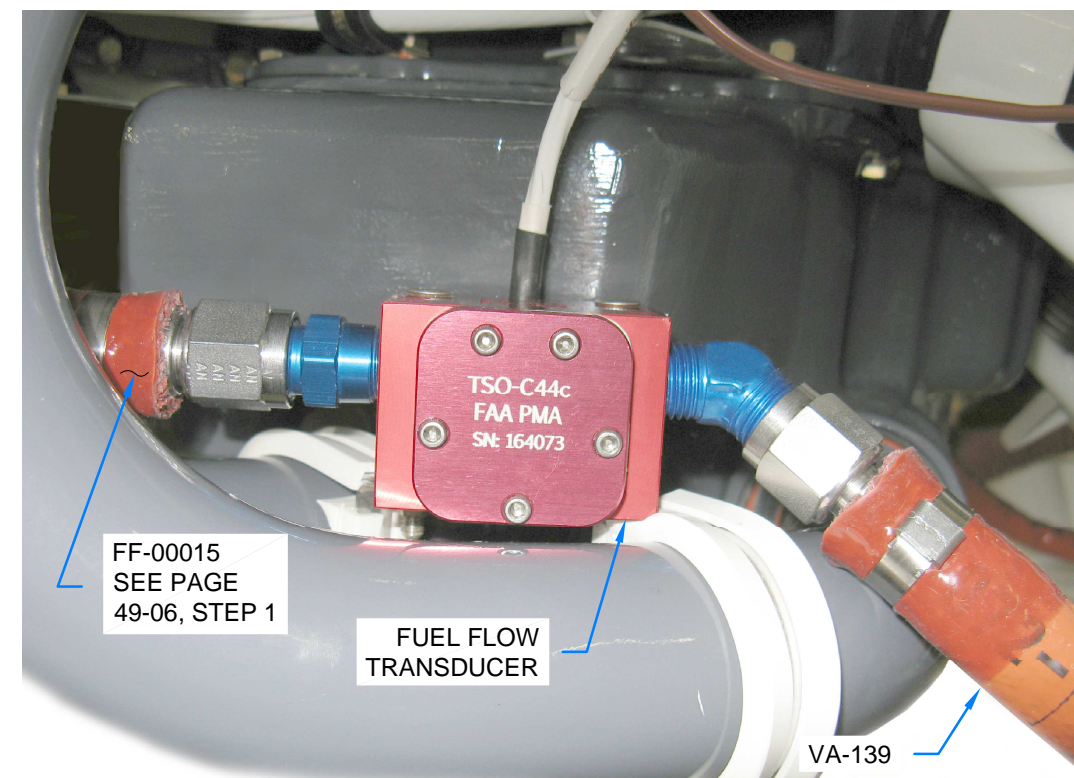


**FIGURE 1: HOSES AT FUEL PUMP**  
(TAIL DRAGGER - LEFT SIDE VIEW)

Step 2: (Tail Dragger) Route the VA-139 Hose through the FF-01401 Engine Mount as shown in Figure 2.

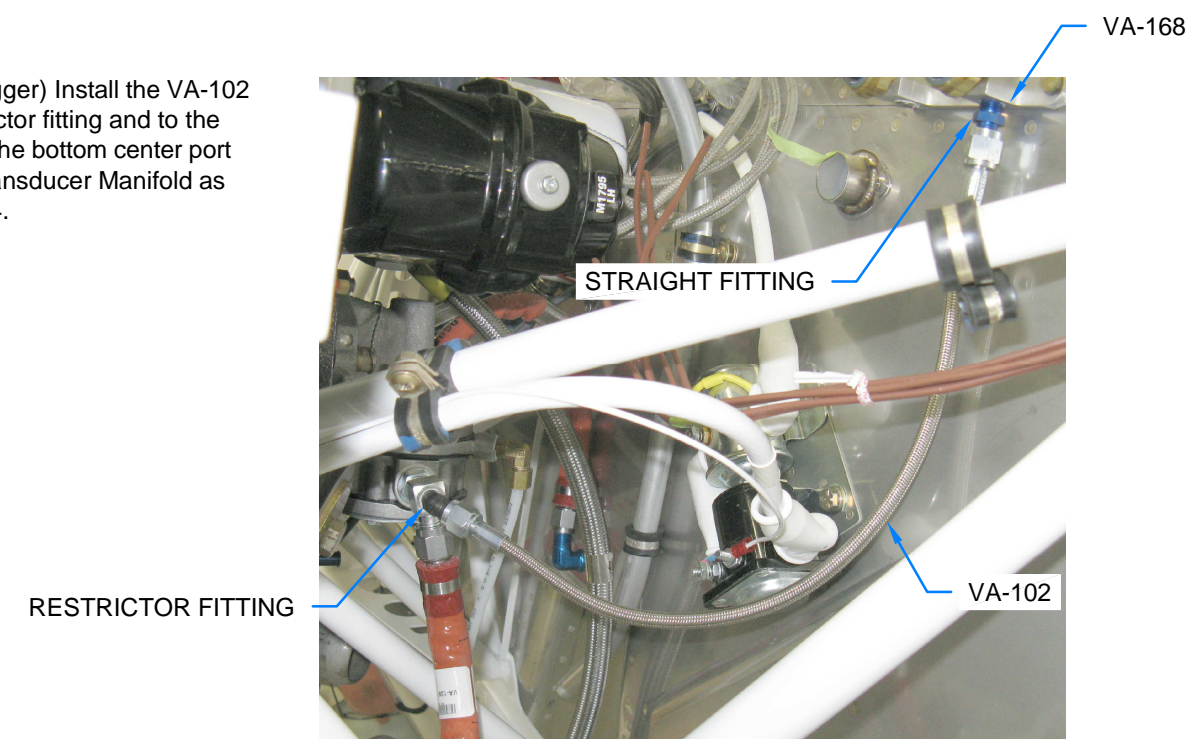


**FIGURE 2: FUEL HOSE ROUTING**  
(TAIL DRAGGER - SHOWN FROM BELOW LEFT)



**FIGURE 3: CONNECTIONS AT FUEL FLOW TRANSDUCER**  
(TAIL DRAGGER)

Step 4: (Tail Dragger) Install the VA-102 Hose to the restrictor fitting and to the straight fitting in the bottom center port of the VA-168 Transducer Manifold as shown in Figure 4.



**FIGURE 4: FUEL PRESSURE HOSE INSTALLATION**  
(TAIL DRAGGER - LEFT SIDE VIEW)



Step 1: Attach the FF-00015 Hose to the straight fitting at the forward end of the fuel flow transducer and to the fitting provided with the fuel servo. See Figure 1 and Page 49-05, Figure 3.

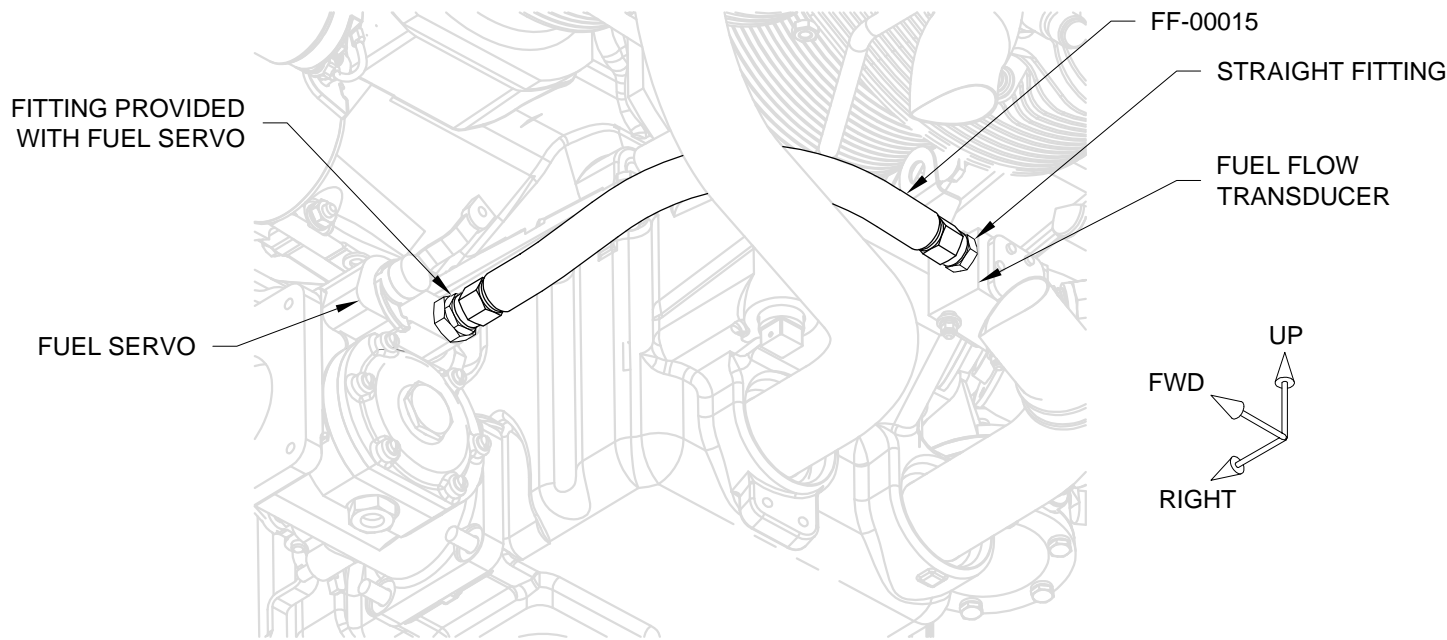


FIGURE 1: CONNECTIONS AT FUEL FLOW TRANSDUCER & FUEL SERVO  
(SOME PARTS OMITTED FOR CLARITY)

NOTE: Steps 2 through 7 require priming.

Step 2: Fabricate four FF-00077 Oil Cooler Spacers from AT6-058X5/16 Tube. See Figure 2.

Deburr and prime the spacers.

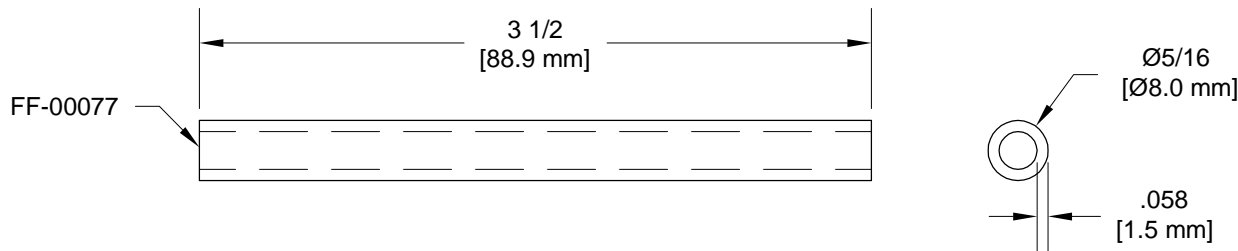


FIGURE 2: FABRICATE OIL COOLER SPACERS

Step 3: Prime the 6061-T6 duct flange portion of the FF-01406B Oil Cooler Inlet. The bent-up sheet metal portion is 5052 and needs no priming.

Step 4: Rivet together the oil cooler inlet and FF-01406C Oil Cooler Inlet Sides using the rivets called out in Figure 3.

Step 5: Clean the inside corners where gaps appear to prepare for the application of RTV.

Apply tape as a temporary backing to the outer surface at the corners. See Figure 3 call-outs.

Step 6: Apply RTV sealant to the inside surface at the taped corners to seal the gaps in the assembly. Overlap part edges adjacent to the gaps with RTV by 1/4 to 3/8 [6.4 to 9.5 mm].

Allow the sealant to cure before removing the tape.

Hereafter refer to as the Cooler Inlet Assembly.

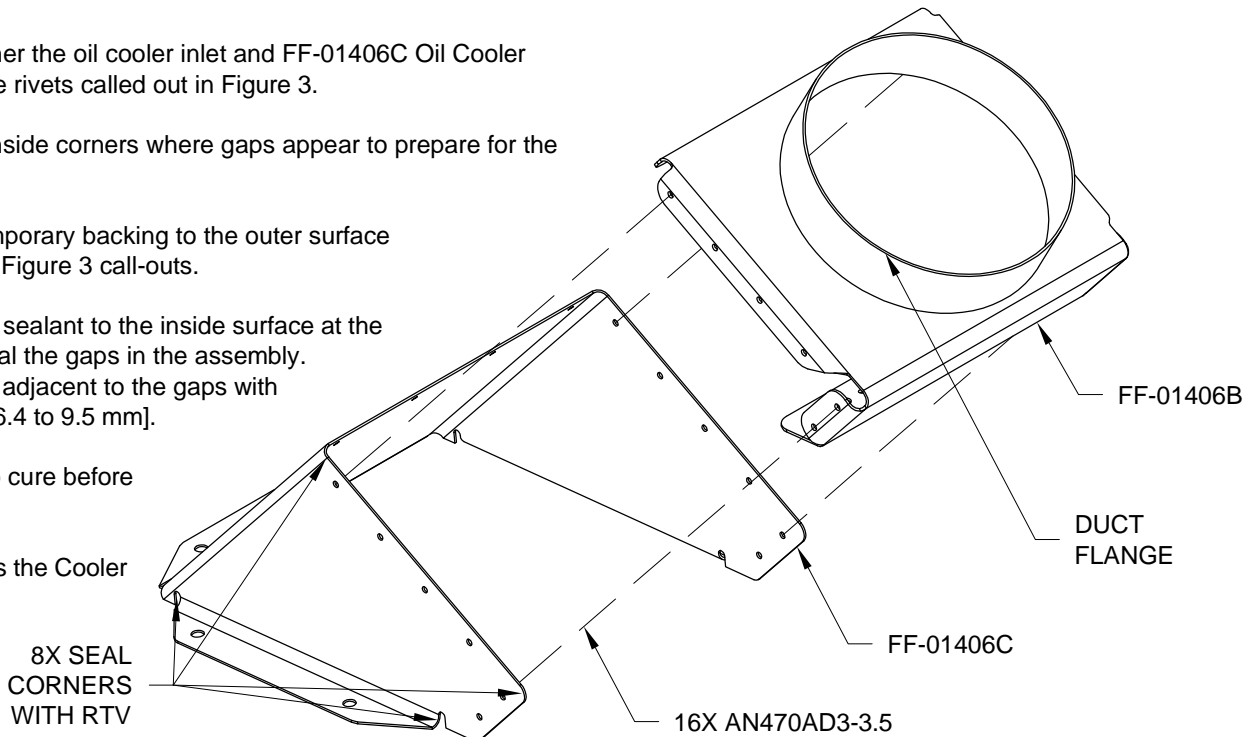


FIGURE 3: FABRICATE COOLER INLET ASSEMBLY

Step 7: (Tri-Gear) Separate the FF-01404A-L & -R Oil Cooler Tray Supports. See Figure 4.

Deburr and prime the 6061-T6 supports.

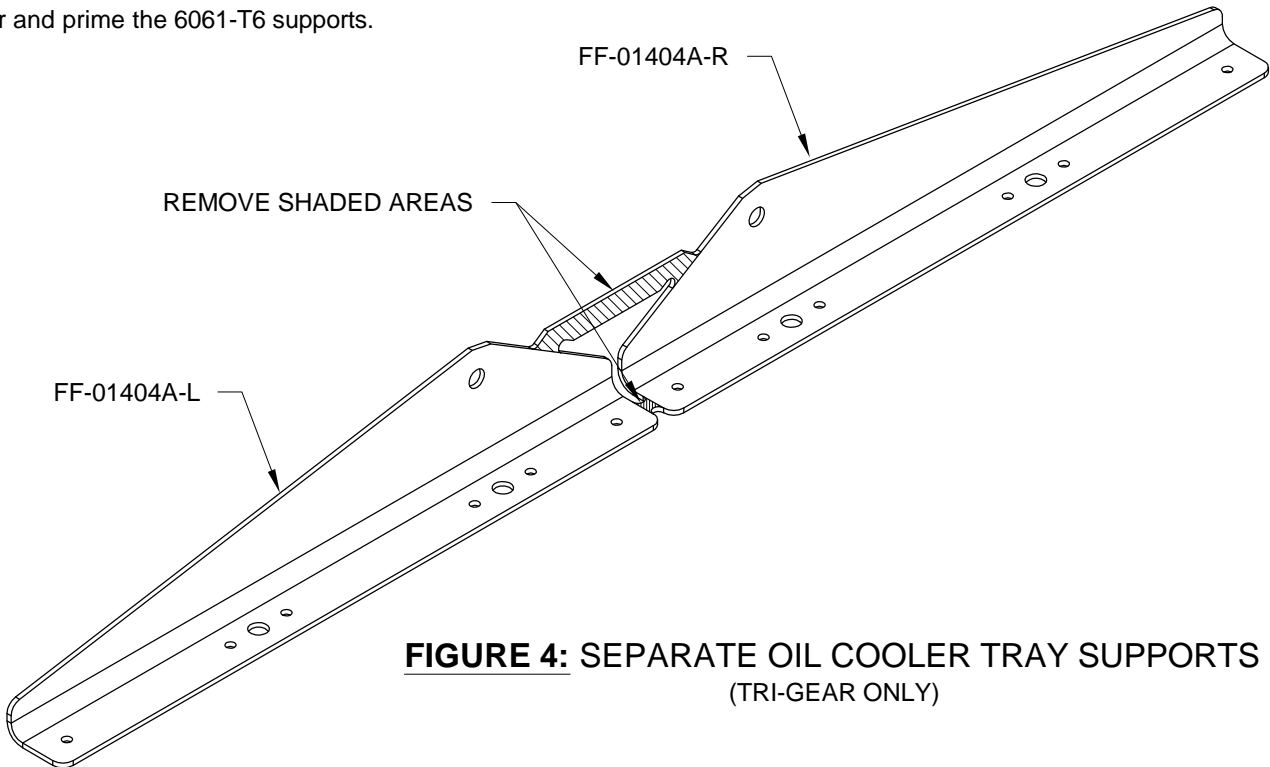


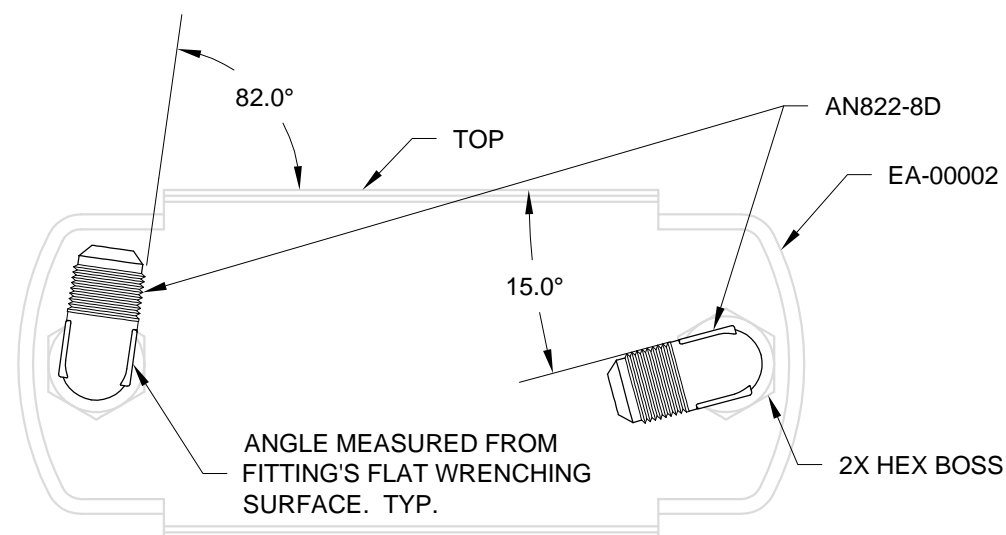
FIGURE 4: SEPARATE OIL COOLER TRAY SUPPORTS  
(TRI-GEAR ONLY)





**NOTE:** Refer to Section 5.27 Fluid Fittings for thread sealant recommendations and installation tips. Use of a back-up wrench on the oil cooler's hex bosses is recommended. The 'top' side is defined by the fluid fitting orientation since the oil cooler is symmetrical.

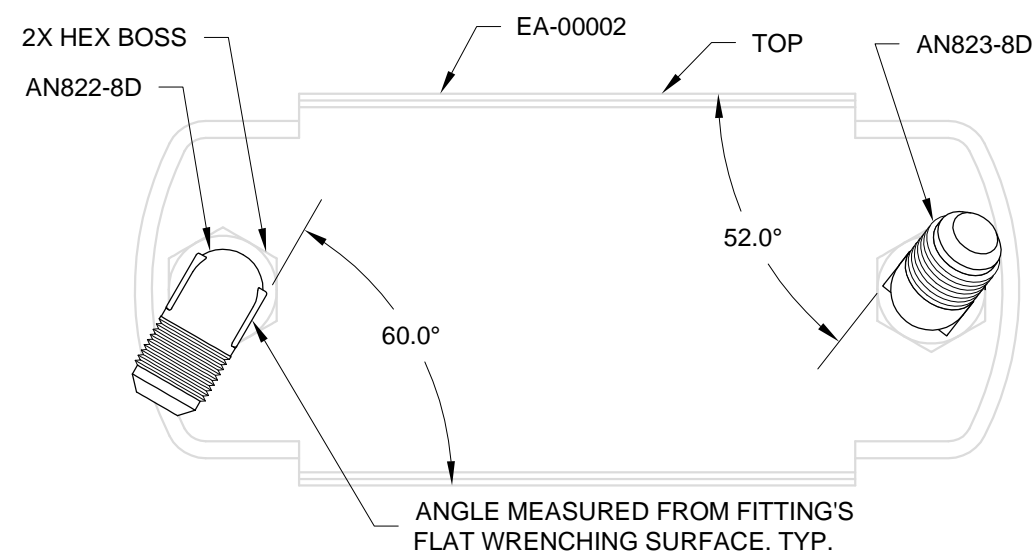
Step 1: (Tri-Gear) Install the two elbow fittings into the EA-00002 Oil Cooler 2006X as shown in Figure 1.



**FIGURE 1: OIL COOLER FITTINGS INSTALLATION**  
(TRI-GEAR)

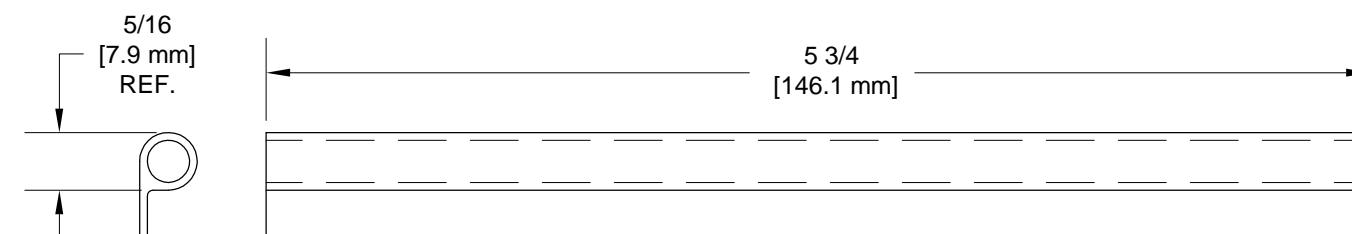
Step 1: (Tail Dragger) Install the 90° elbow into the EA-00002 Oil Cooler 2006X. See Figure 2.

Install the 45° fitting into the oil cooler. See Figure 2.



**FIGURE 2: OIL COOLER FITTINGS INSTALLATION**  
(TAIL DRAGGER)

Step 2: Fabricate two FF-00079 P Seals from SEAL-00008 by cutting to the length shown in Figure 3.



**FIGURE 3: FABRICATE P SEAL**

Step 3: Clean the oil cooler and P seal surfaces to be joined.

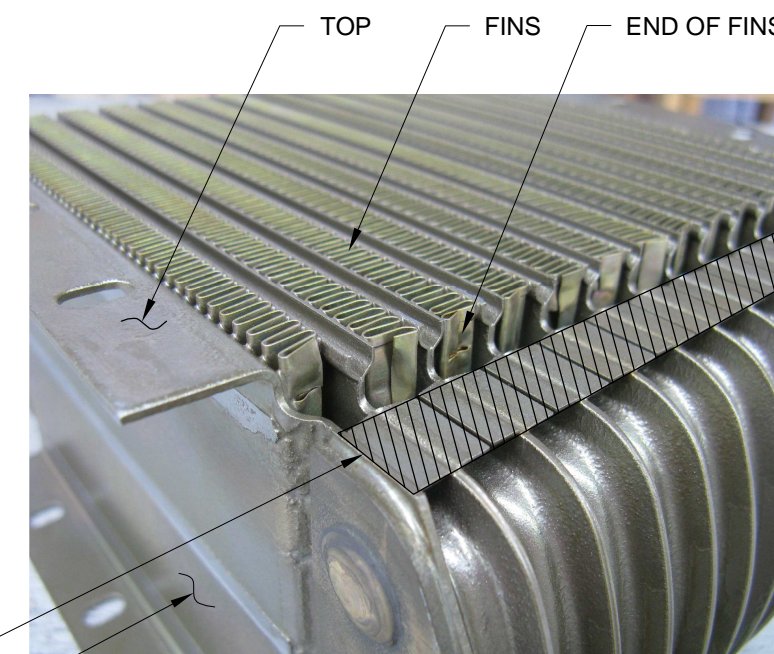
Spread a layer of clear silicone adhesive/sealant (not RTV) on the called-out horizontal fins which are on the 'top' side of the EA-00002 Oil Cooler 2006X. See Figure 4. See Figures 1 and 2 for reference to the 'top' side.

Rotate the oil cooler 90° as shown in Figure 5.

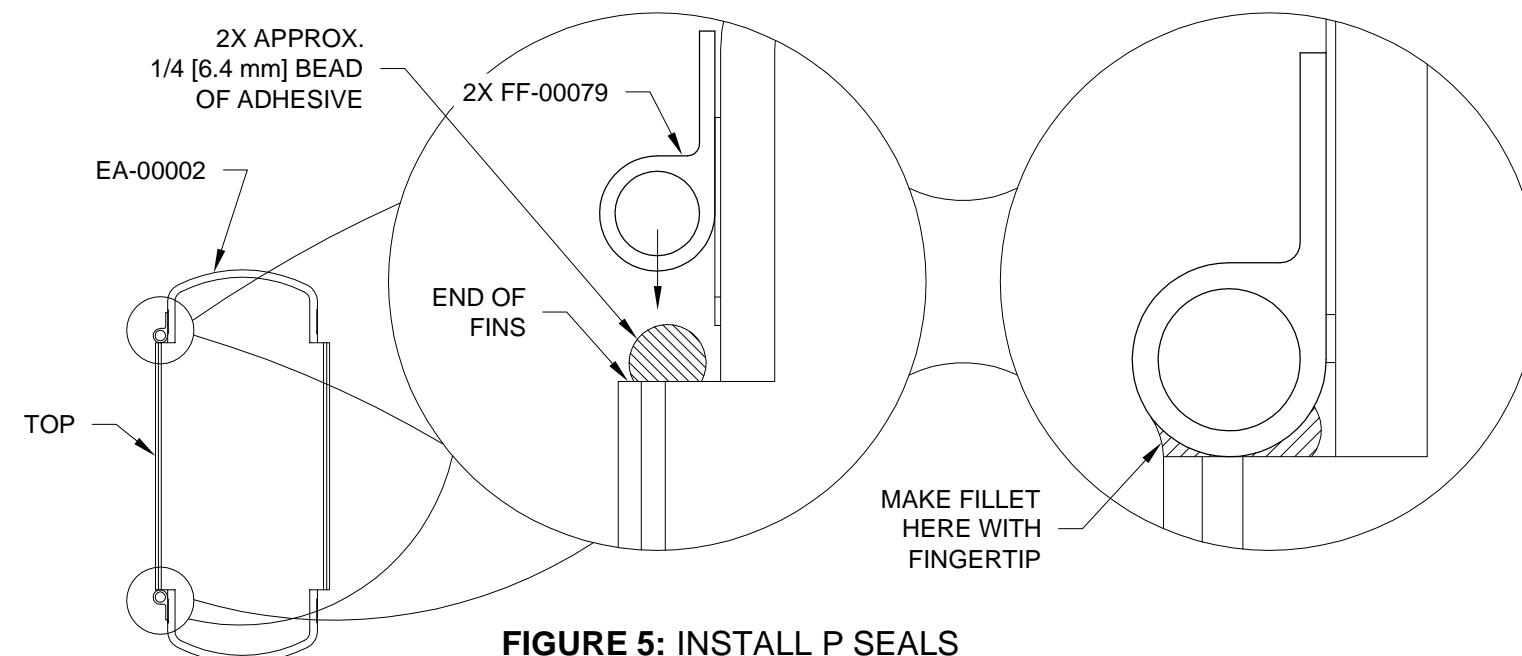
Step 4: Run a continuous bead of the clear silicone adhesive/sealant across the ends of the fins per the Figure 5 call-out. (The object here being to seal the ends and force all the air to pass through the cooler's fins.)

Step 5: Install one FF-00079 P Seal to the oil cooler as shown in Figure 5. Center the seal along the width of the oil cooler. Allow the adhesive to cure before continuing.

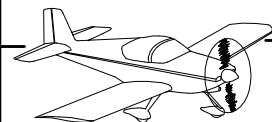
Repeat Steps 3 thru 5 to install a P seal at the oil cooler's opposite end.



**FIGURE 4: APPLY ADHESIVE**



**FIGURE 5: INSTALL P SEALS**



**NOTE:** This page refers to the Tri-Gear only.  
Refer to Figure 2 unless otherwise noted.

Step 1: Machine countersink the FF-01404 Oil Cooler Tray for the called out flush rivets.

Step 2: Rivet together the FF-01404 Oil Cooler Tray and the FF-01404A-L & -R Oil Cooler Tray Supports using the called out rivets. Hereafter refer to as the Tray Assembly.

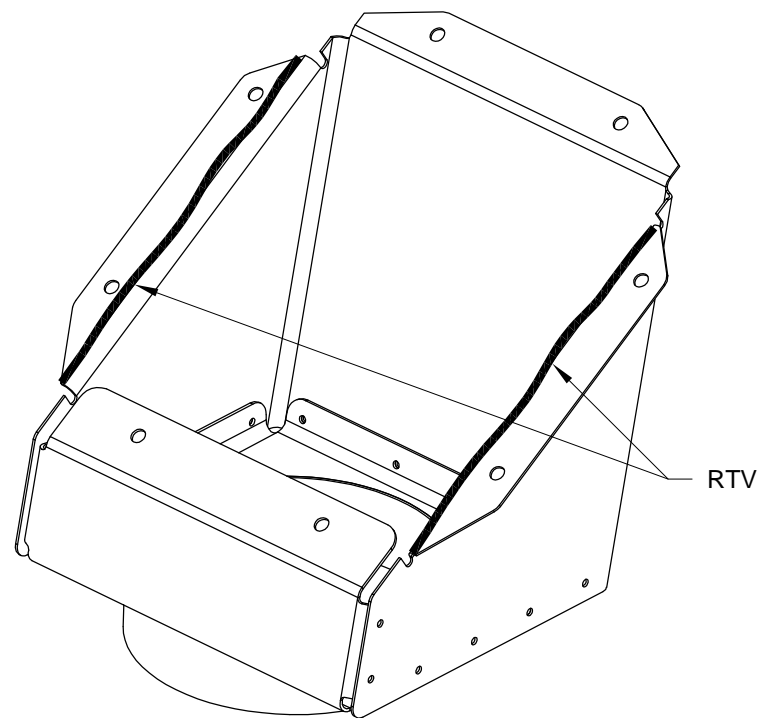
Step 3: Bolt the Tray Assembly to the Firewall and F-01400 Engine Mount using the called out hardware.

**NOTE:** Do not apply RTV to the two sides of the Cooler Inlet Assembly which contact the FF-00079 P Seal.

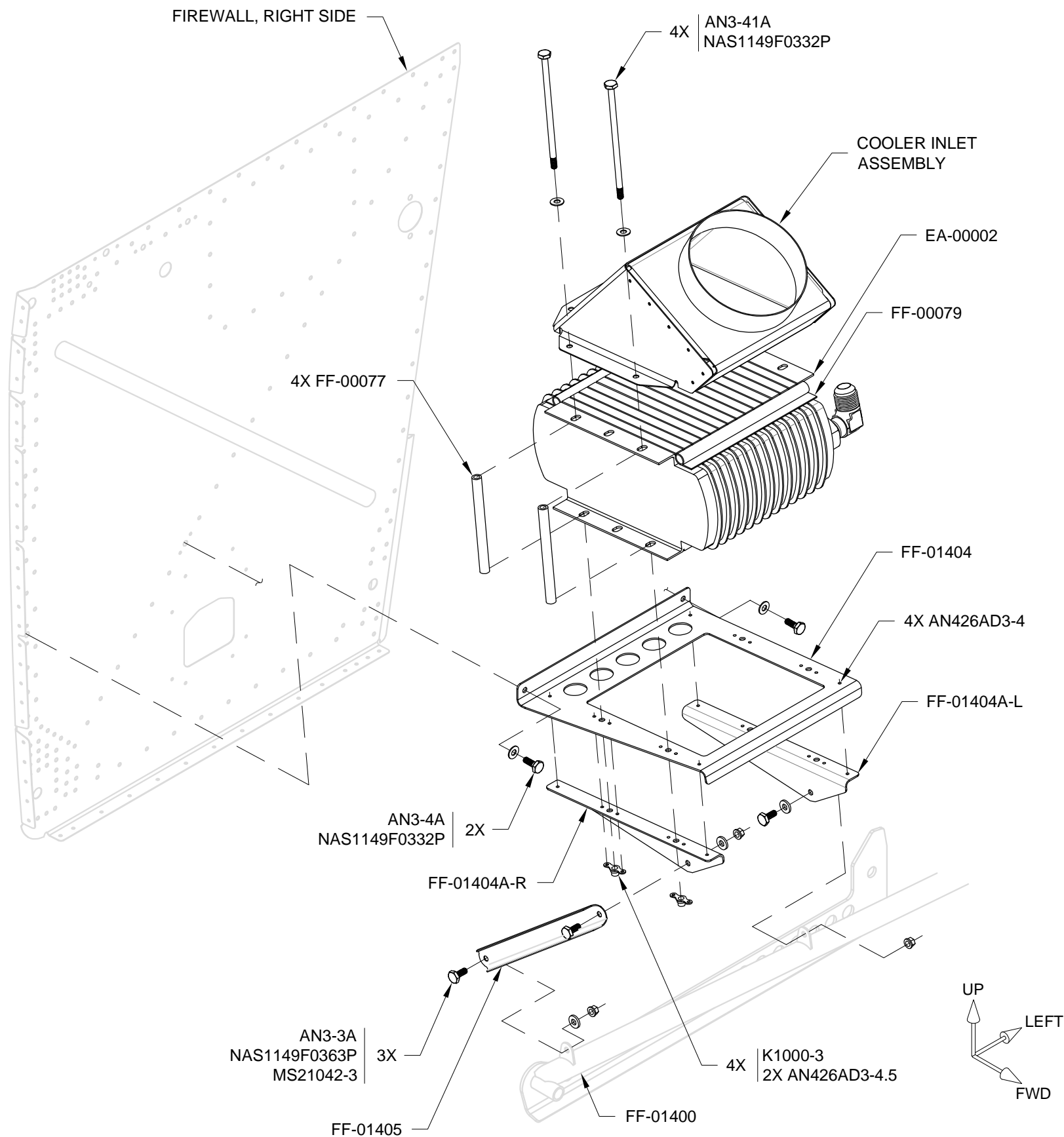
Step 4: Apply two beads of RTV to the base of the Cooler Inlet Assembly where it will contact the oil cooler's mounting plate as shown in Figure 1. Allow about 5 min for the RTV to skin over, then place it atop the oil cooler as shown in Figure 2.

Step 5: Bolt the EA-00002 Oil Cooler and Cooler Inlet Assembly to the Tray Assembly using the called out hardware.

Step 6: Apply RTV inside the Cooler Inlet Assembly to plug gaps in the corners between the Cooler Inlet Assembly flanges and the oil cooler. Use tape or small pieces of foam to temporarily back-up the gaps from the outside. Remove any back-up materials after the RTV has cured.



**FIGURE 1: COOLER INLET ASSEMBLY**  
(TRI-GEAR)



**FIGURE 2: OIL COOLER & INLET INSTALLATION**  
SOME HARDWARE OMITTED FOR CLARITY  
(TRI-GEAR)





**NOTE:** This page refers to the Tail Dragger only.

**Do not pre-attach the Cooler Inlet Assembly to the oil cooler before installation. The assembly will not pass through the engine mount as a unit.**

**Refer to Figure 2 unless otherwise noted.**

Step 1: Place the ES-00002 Oil Cooler into position atop the FF-01401 Engine Mount mounting bracket.

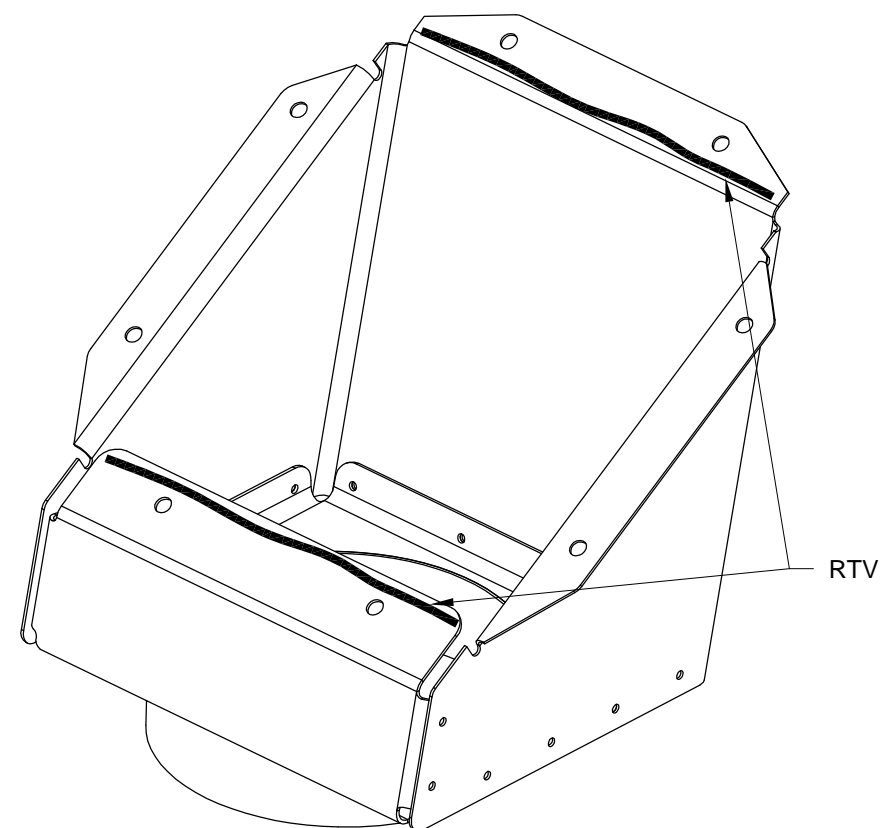
**NOTE:** Do not apply RTV to the two sides of the Cooler Inlet Assembly which contact the FF-00079 P Seal.

Step 2: Apply two beads of RTV to the base of the Cooler Inlet Assembly where it will contact the oil cooler's mounting plate as shown in Figure 1.

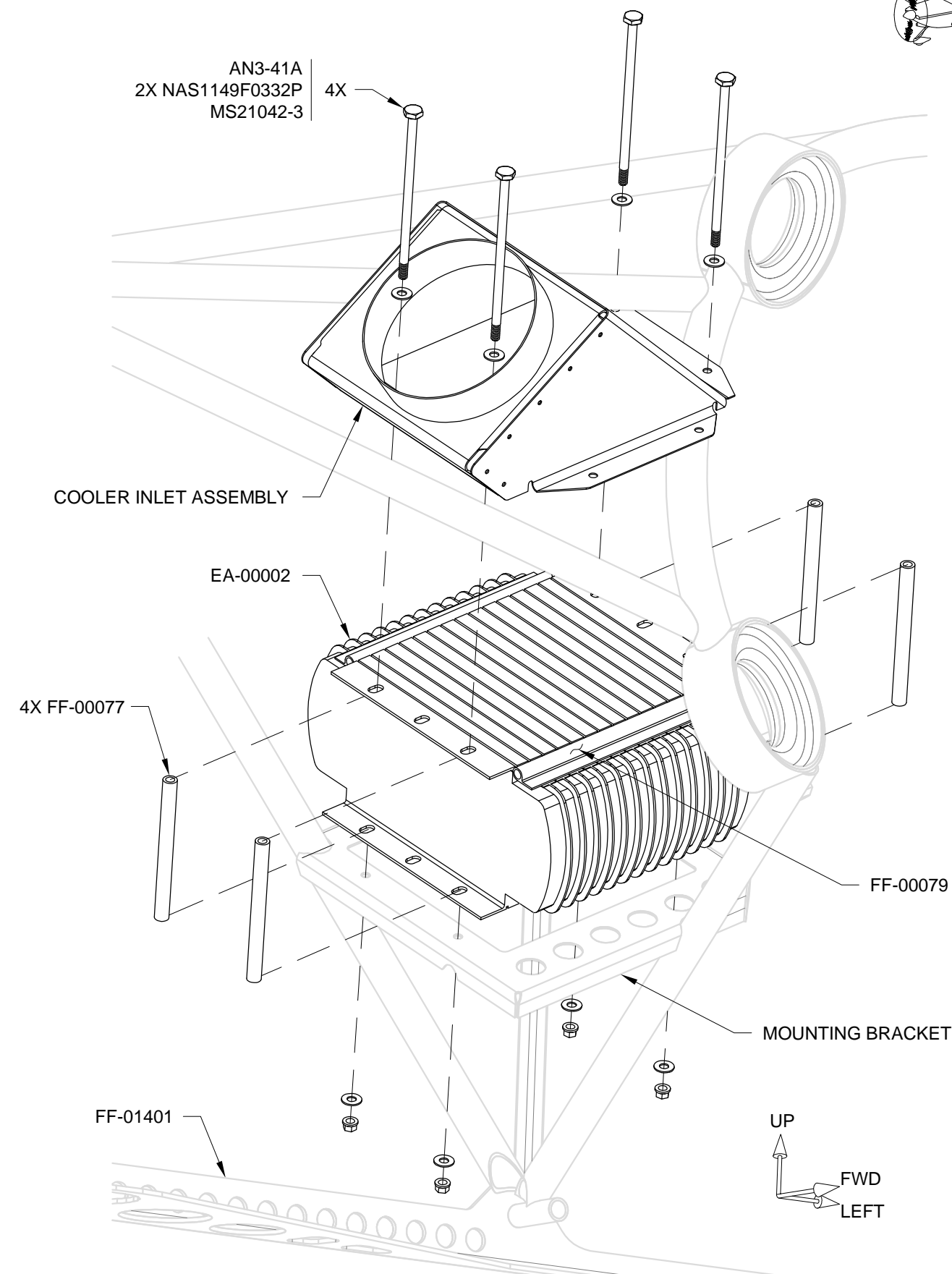
Step 3: Allow about 5 min for the RTV to skin over, then place the Cooler Inlet Assembly atop the oil cooler as shown.

Step 4: Bolt the Cooler Inlet Assembly and the EA-00002 Oil Cooler to the mounting bracket using the called out hardware.

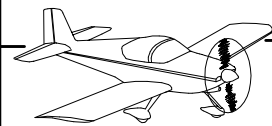
Step 5: Apply RTV inside the Cooler Inlet Assembly to plug gaps in the corners between the inlet flanges and the oil cooler. Use tape or small pieces of foam to temporarily back-up the gaps from the outside. Remove any back-up materials after the RTV has cured.



**FIGURE 1: COOLER INLET ASSEMBLY**  
(TAIL DRAGGER)



**FIGURE 2: OIL COOLER INSTALLATION**  
(TAIL DRAGGER)

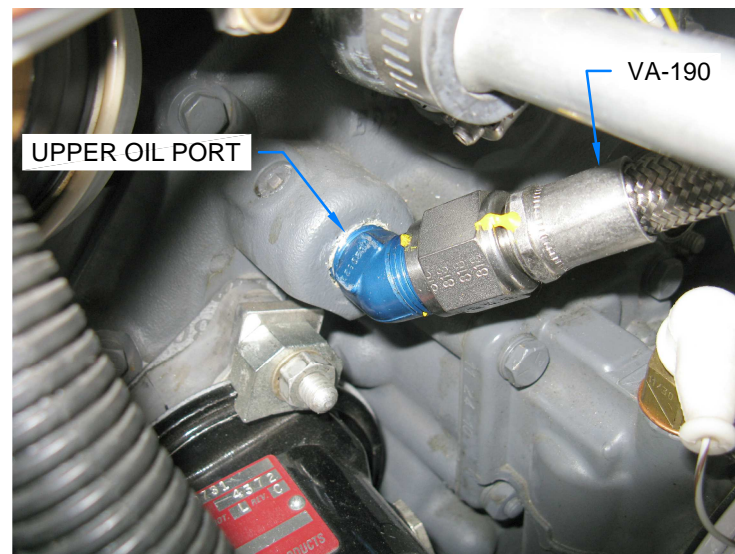


**NOTE:** This page refers to the Tri-Gear only. Also see page 49-01 for reference.

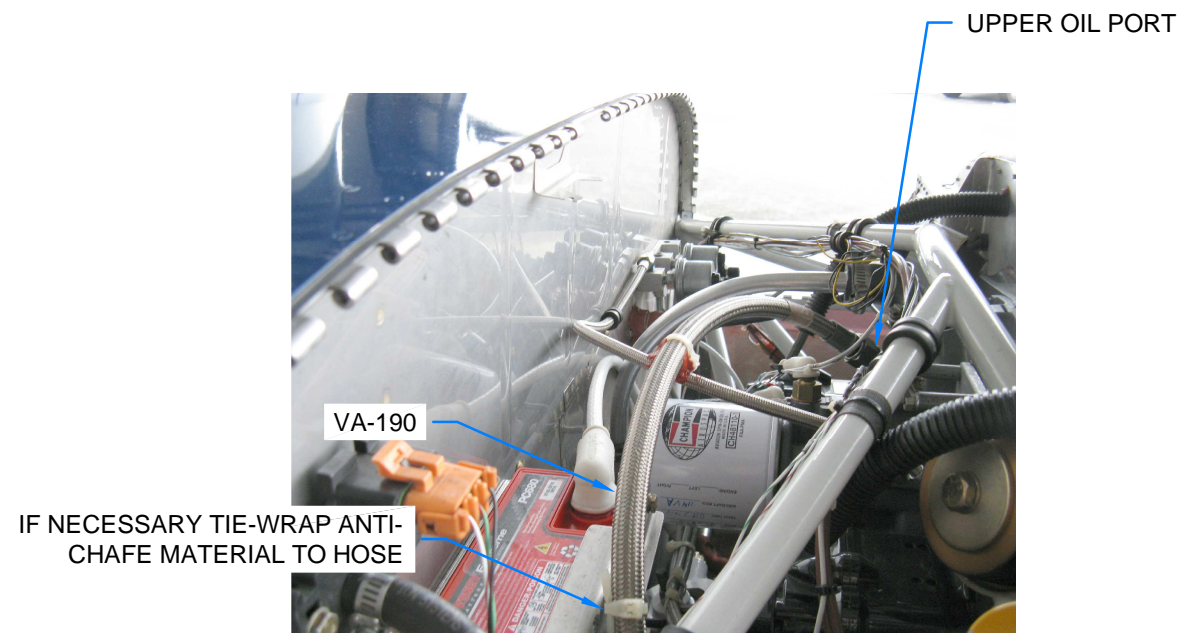
Step 1: Install the VA-190 Hose to the 45° fitting in the engine's upper oil port as shown in Figure 1.

Step 2: Route the VA-190 Hose to the oil cooler as shown in Figures 2 and 3.

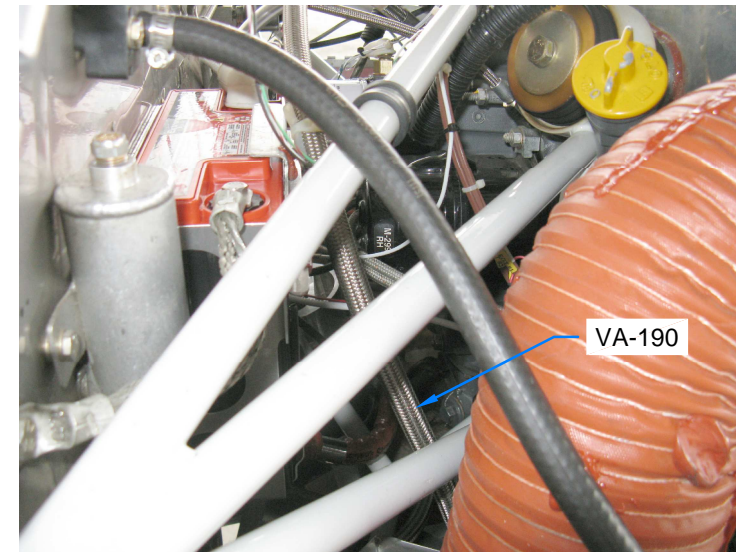
Step 3: Install the free end of the VA-190 Hose to the fwd fitting in the oil cooler as shown in Figure 4.



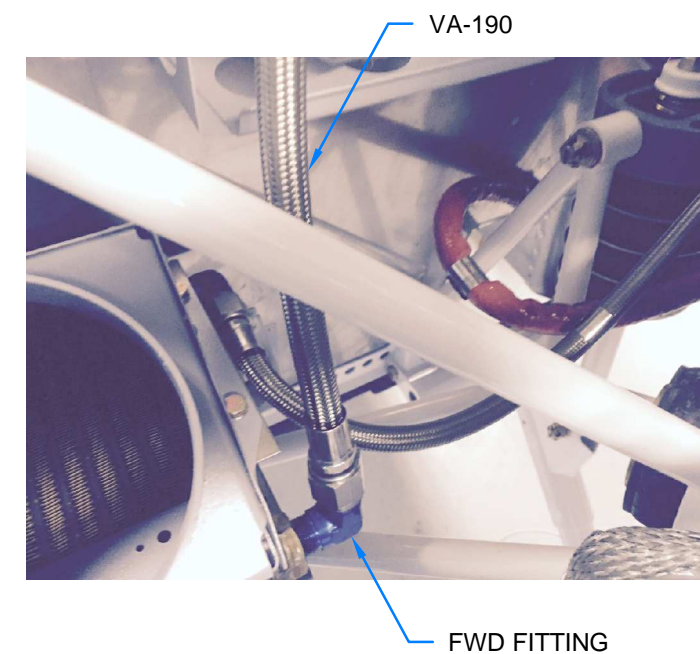
**FIGURE 1: AT UPPER OIL PORT**  
(TRI-GEAR - SHOWN FROM ABOVE LEFT)



**FIGURE 2: HOSE ROUTING**  
(TRI-GEAR - SHOWN FROM ABOVE RIGHT)



**FIGURE 3: HOSE ROUTING**  
(TRI-GEAR - SHOWN FROM ABOVE RIGHT)



**FIGURE 4: FWD OIL COOLER PORT**  
(TRI-GEAR - SHOWN FROM ABOVE RIGHT)



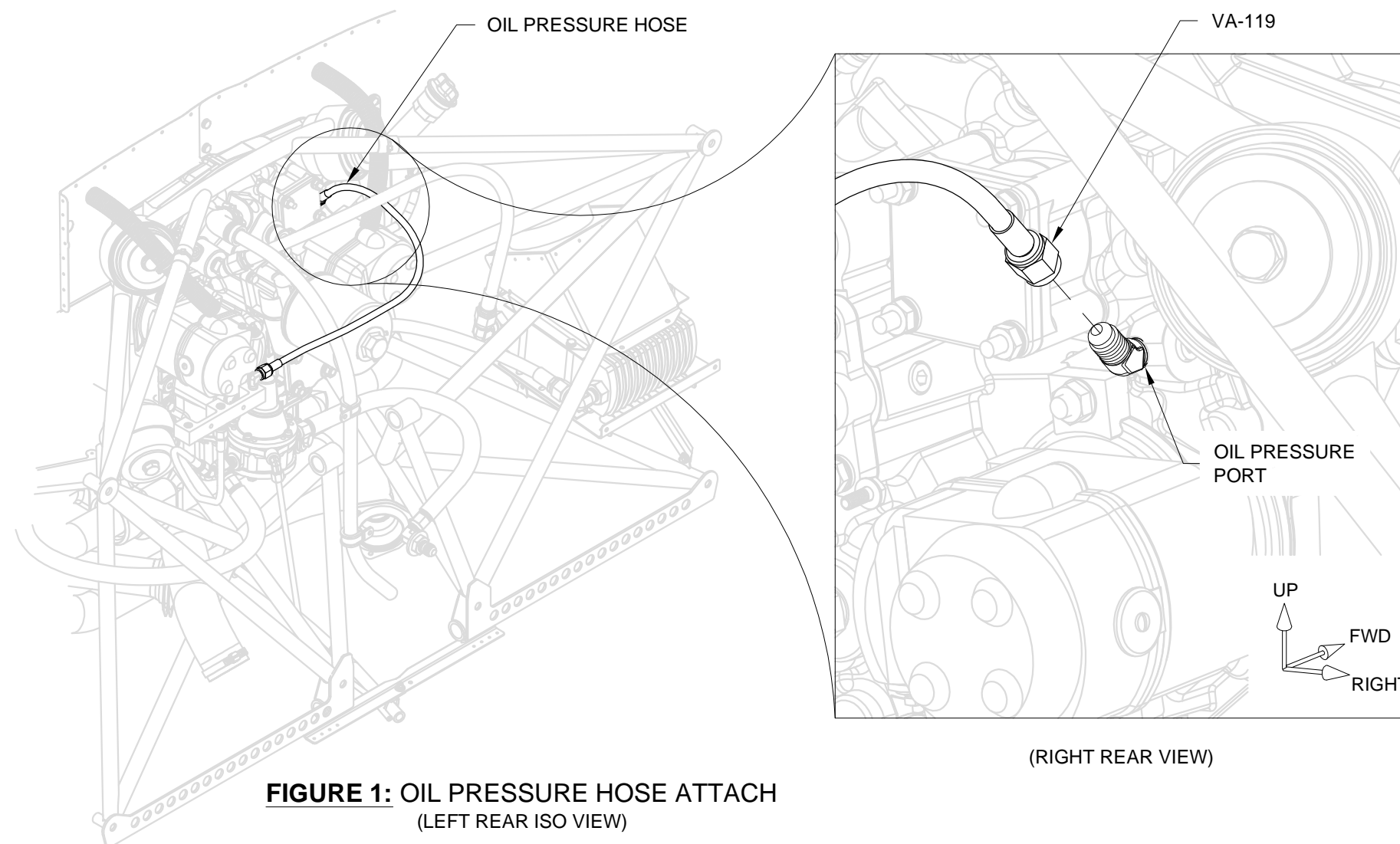


Step 1: Install the VA-119 Hose to the restrictor fitting in the right rear of the engine as shown in Figure 1.

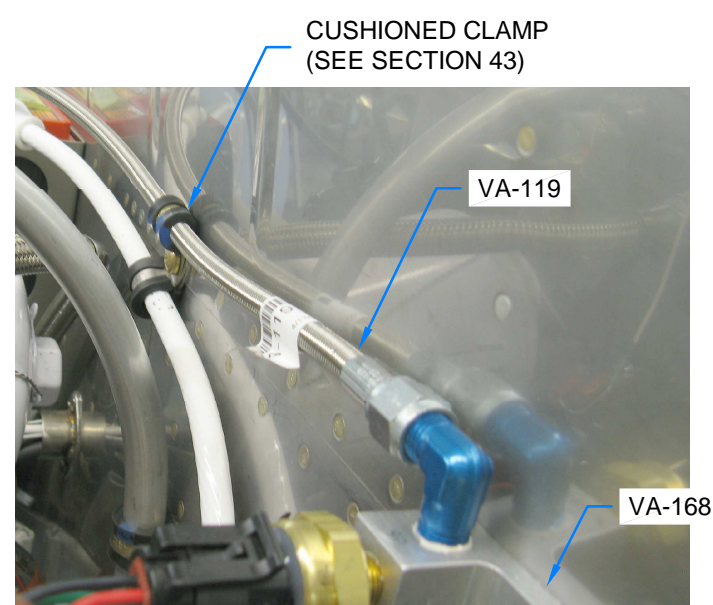
Step 2: Install the free end of the VA-119 Hose to the elbow fitting mounted in the VA-168 Transducer Manifold as shown in Figure 2.

Step 3: Install the VA-119 Hose into the cushioned clamp as shown in Figure 2.

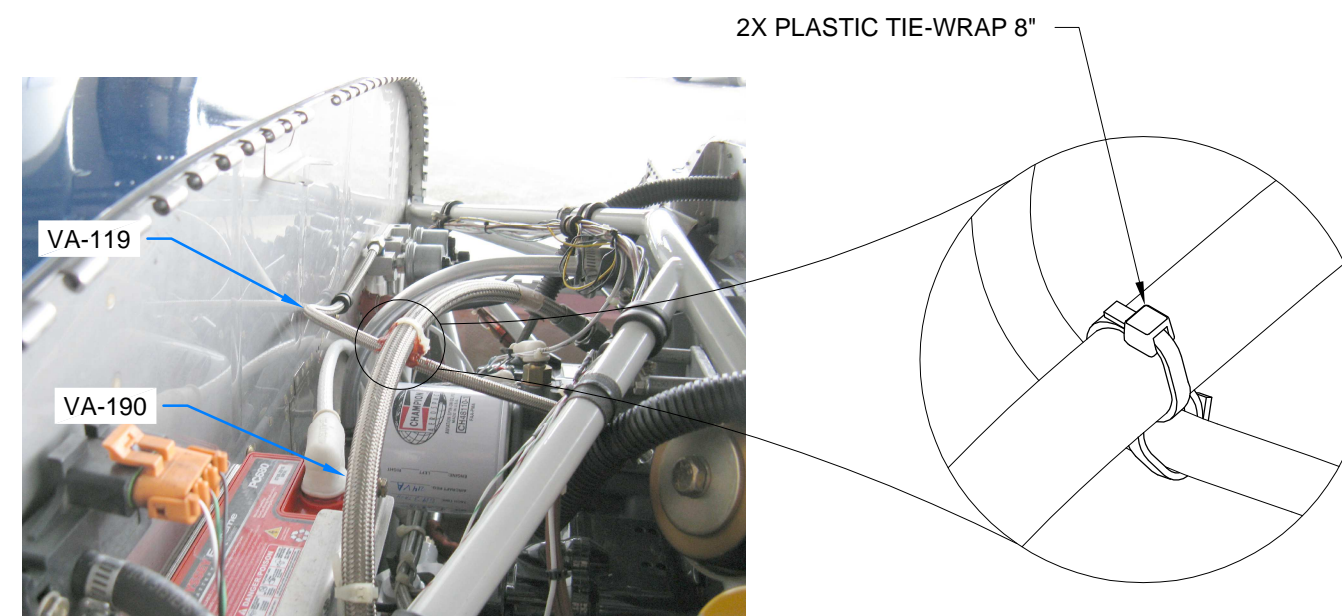
Step 4: (Tri-Gear) Attach the VA-119 Hose to the VA-190 Hose using the called out plastic tie-wraps as shown in Figure 3.



**FIGURE 1: OIL PRESSURE HOSE ATTACH**  
(LEFT REAR ISO VIEW)



**FIGURE 2: OIL PRESSURE HOSE ATTACH**

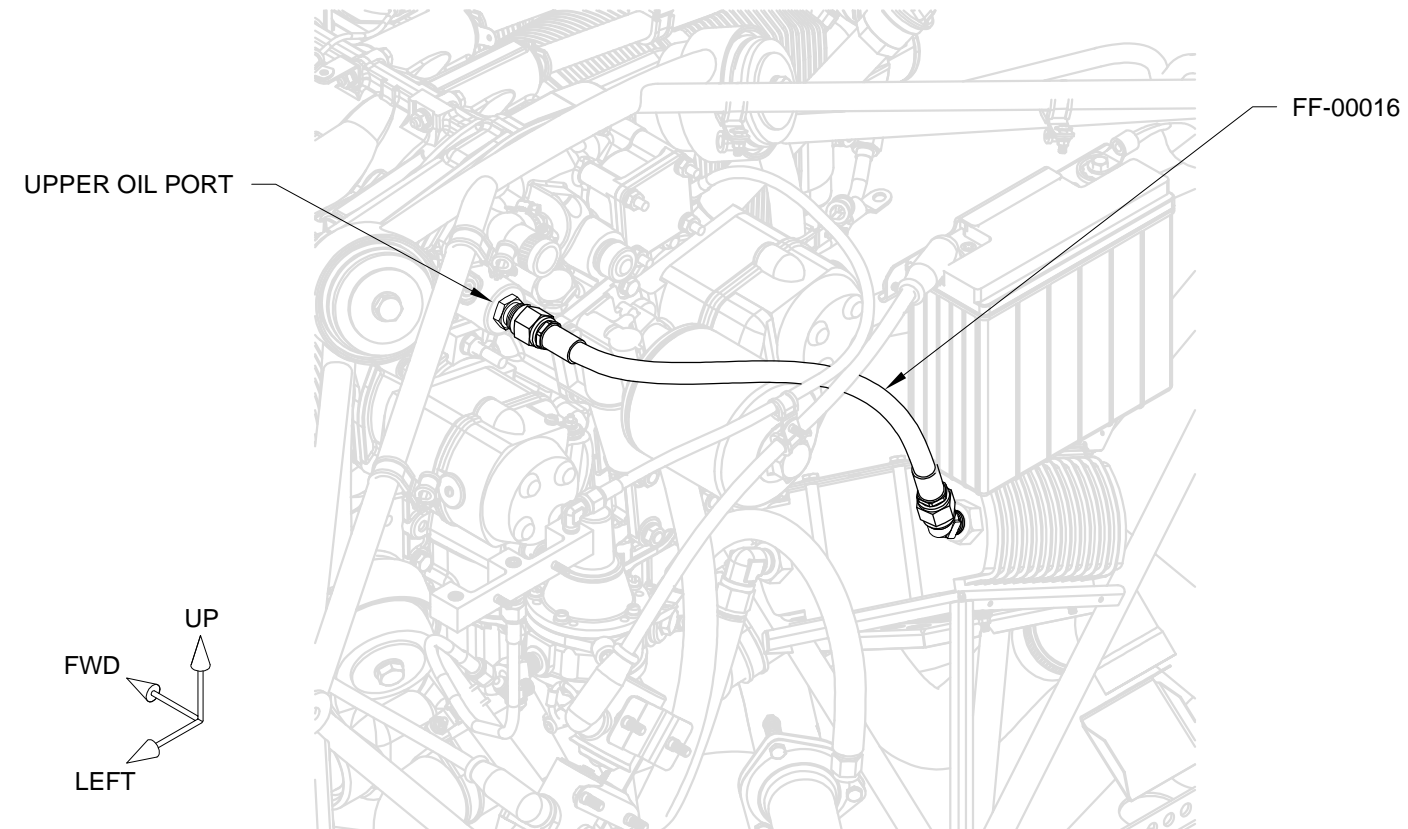


**FIGURE 3: INSTALL TIE-WRAPPS**  
(TRI-GEAR - SHOWN FROM ABOVE RIGHT)

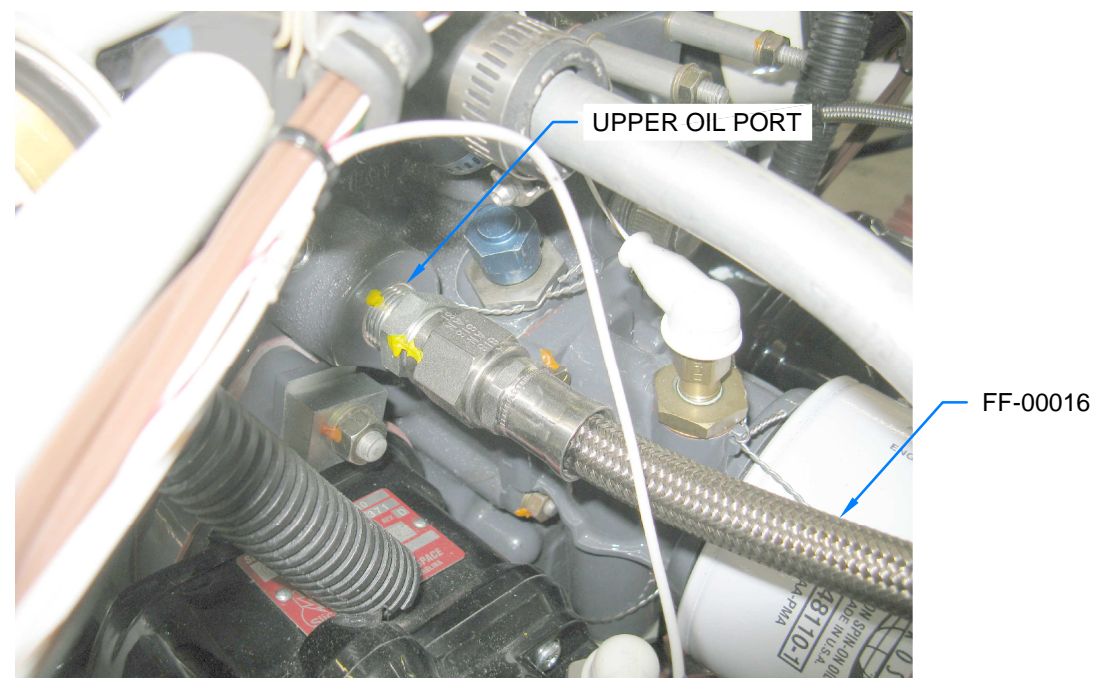




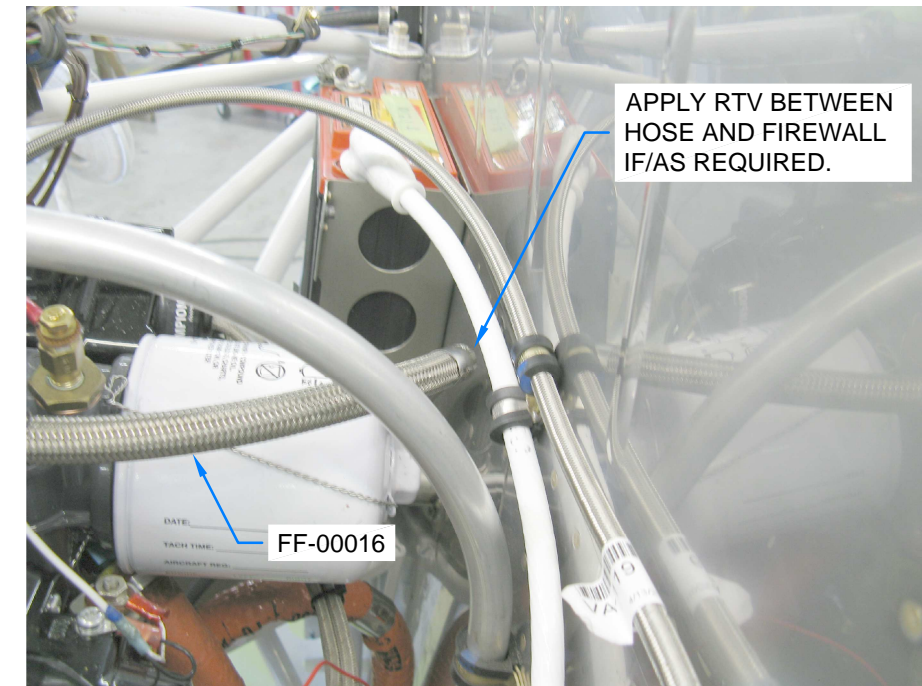
Step 1: (Tail Dragger) Install the FF-00016 Hose to the engine and oil cooler per Figures 1-4.



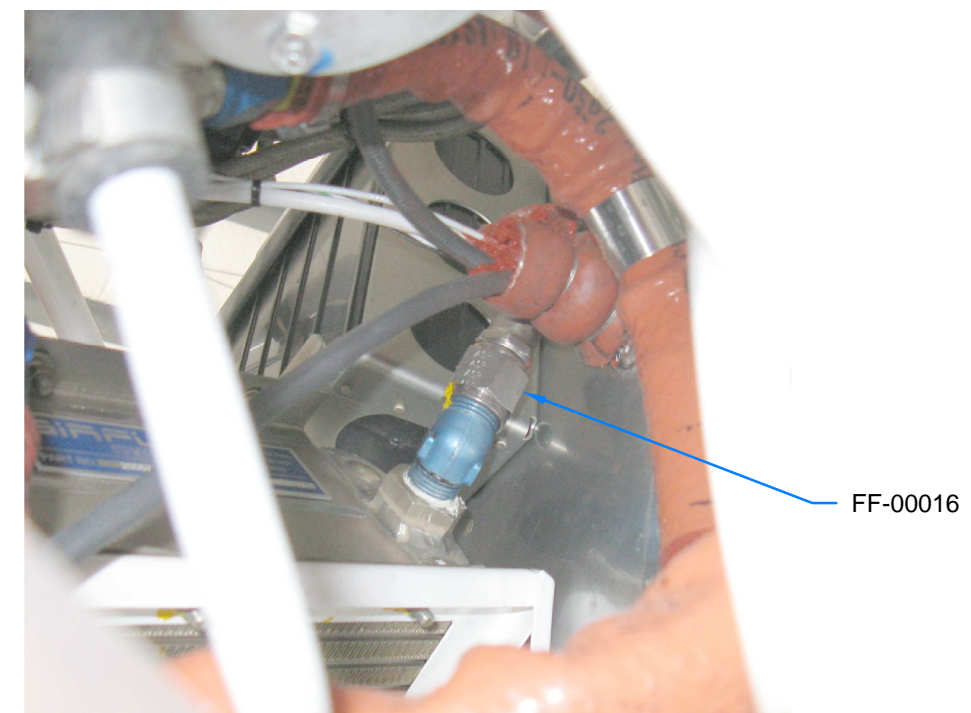
**FIGURE 1: OVERVIEW**



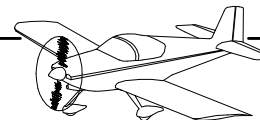
**FIGURE 2: AT UPPER OIL PORT**  
(TAIL DRAGGER - SHOWN FROM ABOVE LEFT)



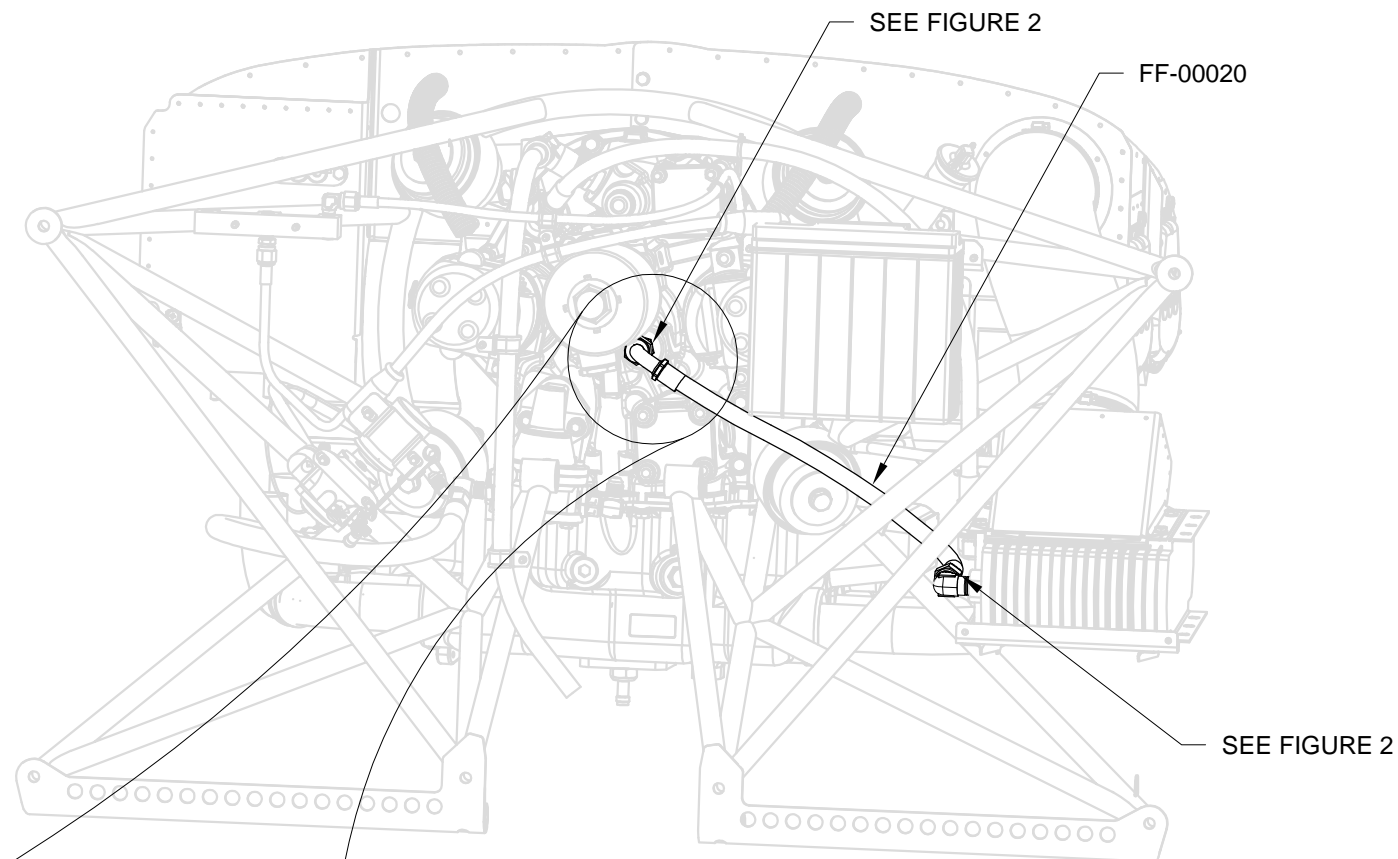
**FIGURE 3: HOSE ROUTING AFT**  
(TAIL DRAGGER - SHOWN FROM ABOVE LEFT)



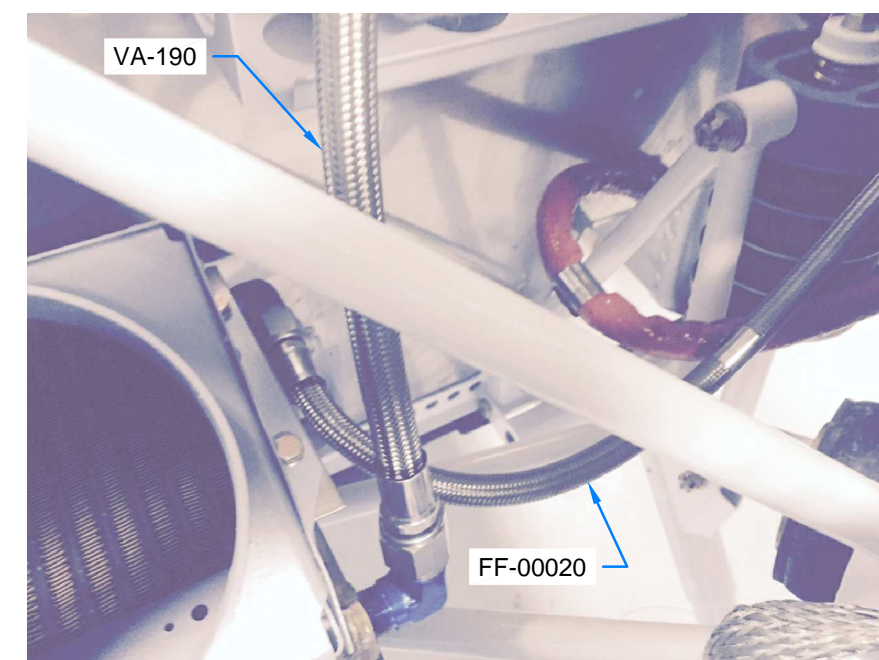
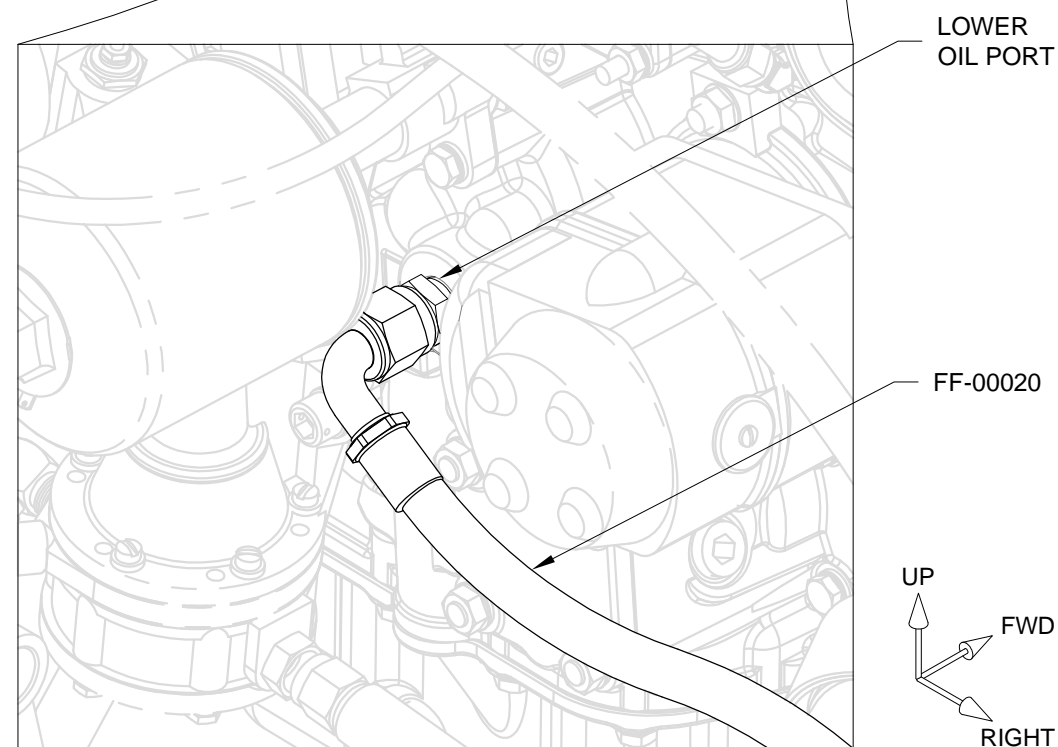
**FIGURE 4: AT OIL COOLER AFT FITTING**  
(TAIL DRAGGER - SHOWN FROM BELOW LEFT)



Step 1: (Tri-Gear) Install the FF-00020 Hose to the oil cooler and engine as shown in Figures 1 and 2.



**FIGURE 1: OIL COOLER HOSE INSTALLATION**  
(TRI-GEAR - REAR VIEW, SOME PARTS OMITTED FOR CLARITY)

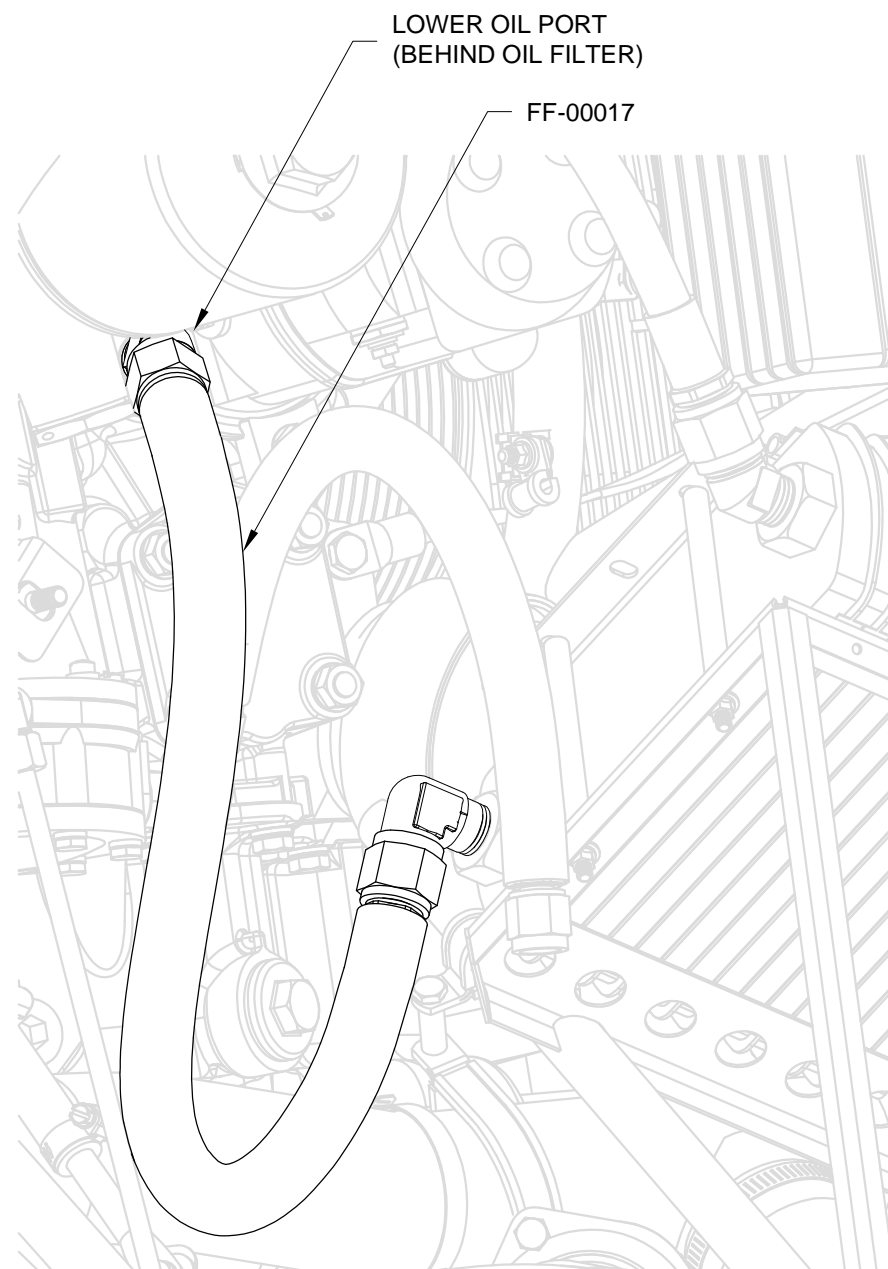


**FIGURE 2: HOSE AT OIL COOLER**  
(TRI-GEAR - LOOKING AFT FROM ABOVE LEFT)

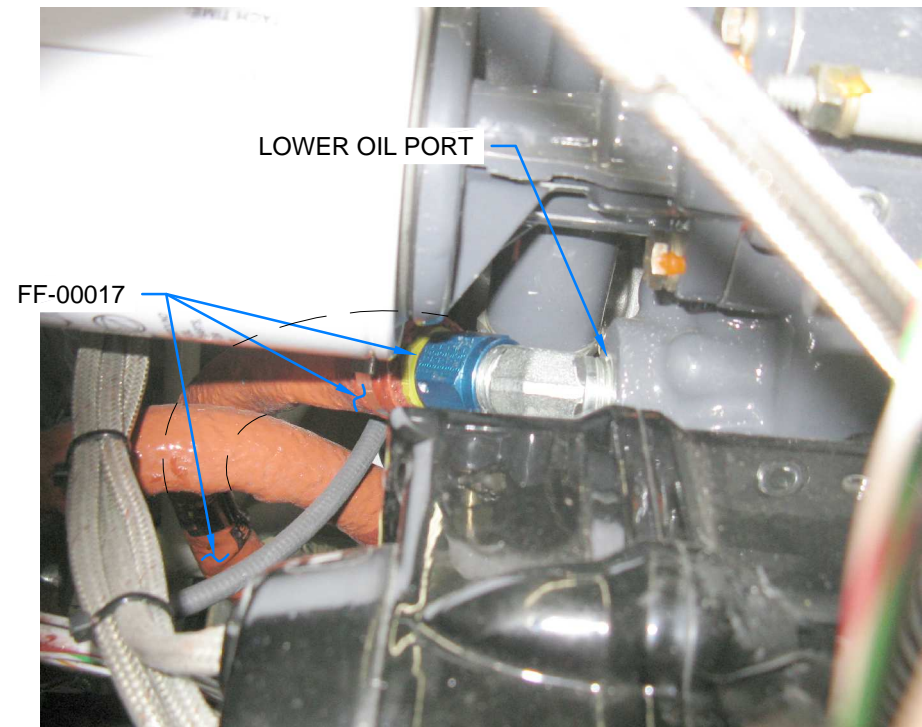




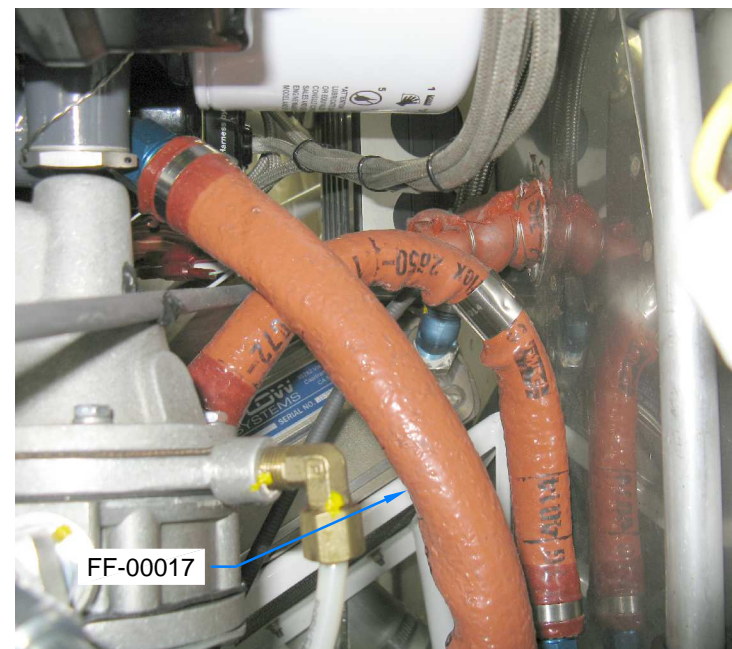
Step 1: (Tail Dragger) Install the FF-00017 Hose to the engine and oil cooler as shown in Figures 1-5.



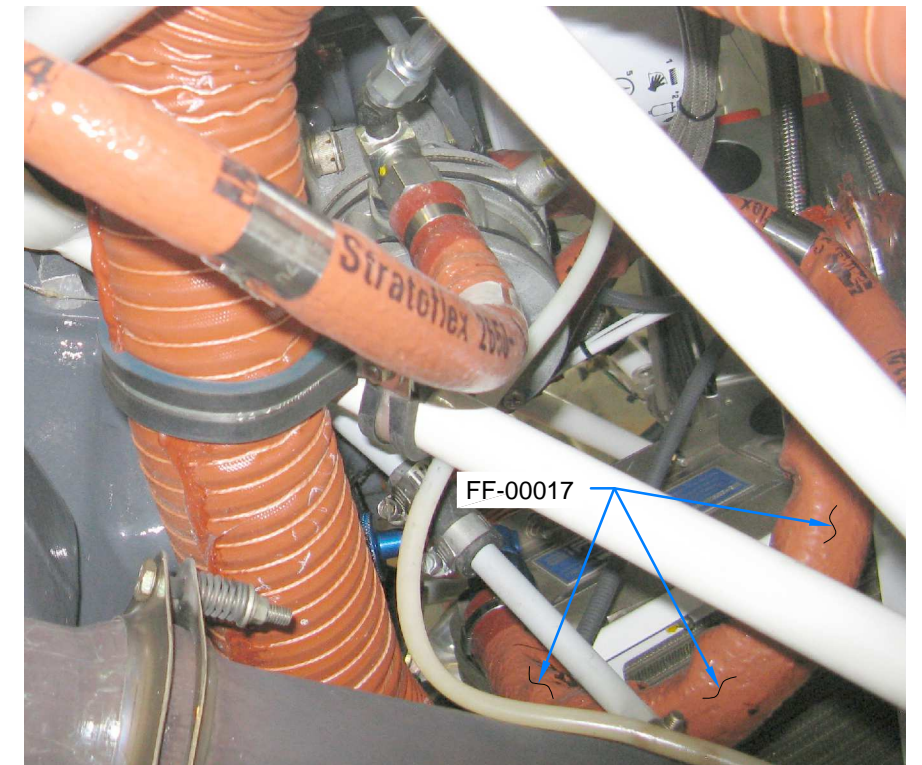
**FIGURE 1: OVERVIEW & CONNECTION AT COOLER**  
(TAIL DRAGGER - REAR ISO VIEW. SOME PARTS NOT SHOWN FOR CLARITY)



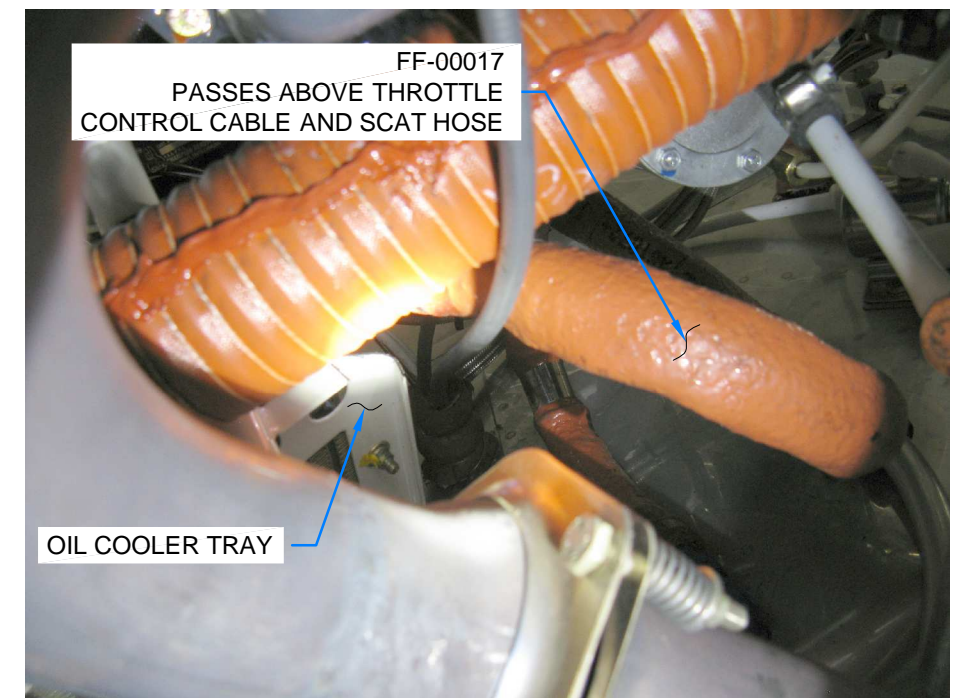
**FIGURE 2: AT LOWER OIL PORT**  
(TAIL DRAGGER - SHOWN FROM ABOVE RIGHT)



**FIGURE 3: HOSE ROUTING**  
(TAIL DRAGGER - LEFT SIDE VIEW)



**FIGURE 4: HOSE ROUTING**  
(TAIL DRAGGER - SHOWN FROM BELOW LEFT)



**FIGURE 5: HOSE ROUTING**  
(TAIL DRAGGER - SHOWN FROM BELOW FRONT)



**NOTE: Refer to Section 48 for scat hose/duct preparation instructions.**

Step 1: Add a stabilizing bead of RTV to the VENT SCAT 4X21 and allow to cure.

Step 2: (Tail Dragger) Slide the two hose clamps called out in Figure 2 onto the VENT SCAT 4X21 Scat Duct.

Slide the scat duct onto the Cooler Inlet Assembly and VA-187 4" Flanged Duct flanges as shown in Figure 2.

Step 2: (Tri-Gear) Fabricate FF-00085 Scat Duct from VENT SCAT 4X21 by cutting to the dimension shown in Figure 1.

Slide the two hose clamps onto the scat duct.

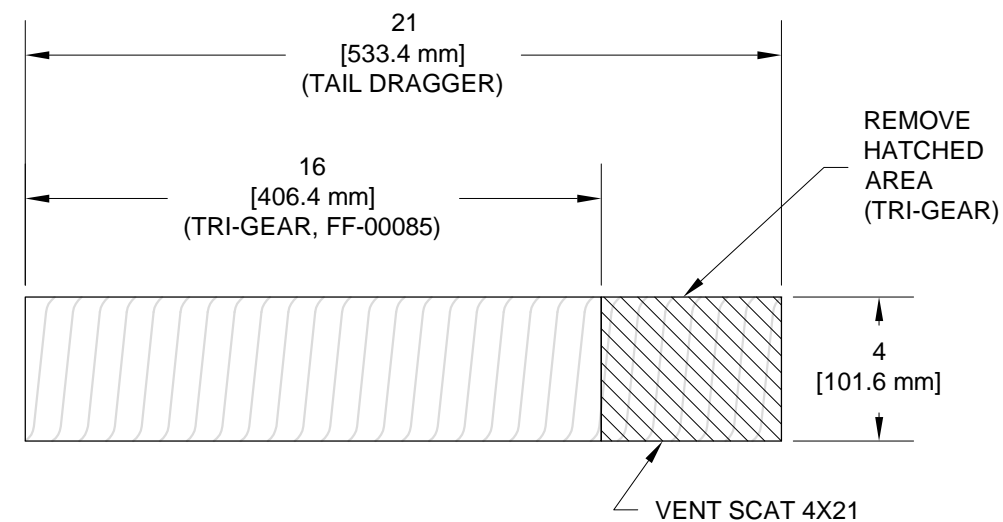
Slide the scat duct onto the Cooler Inlet Assembly and VA-187 4" Flanged Duct flanges as shown in Figure 3.

Step 3: Slide one hose clamp into position and tighten per Figure 2 or 3.

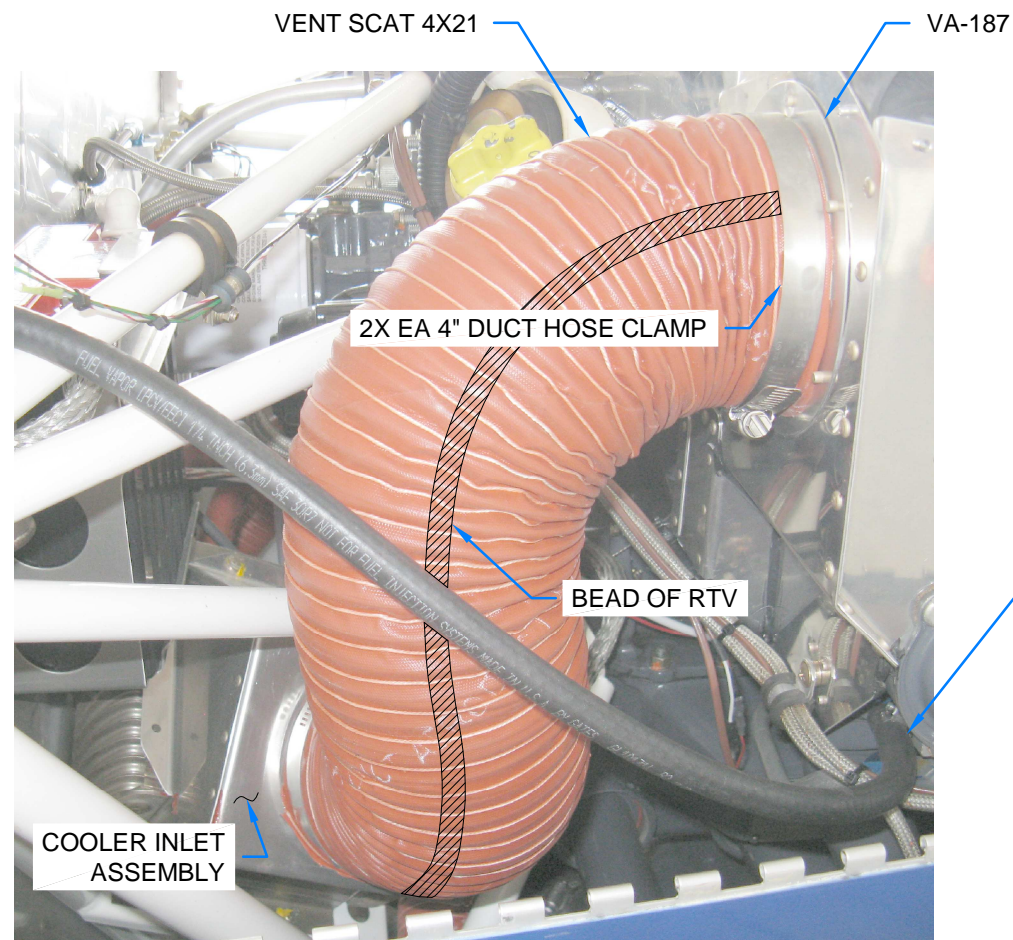
Step 4: Eliminate contact between the engine mount and scat duct, if necessary, by twisting the scat duct along its length until there is at least 1/4 in. [6.4 mm] of clearance.

Tighten the second hose clamp.

Step 5: Add RTV to contacting surfaces such as the manifold pressure hose (if applicable).



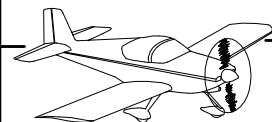
**FIGURE 1: SCAT DUCT**



**FIGURE 2: CONNECT SCAT DUCT**  
(TAIL DRAGGER - RIGHT SIDE VIEW)



**FIGURE 3: CONNECT SCAT DUCT**  
(TRI-GEAR - RIGHT SIDE VIEW)



**NOTE:** Parts and hardware called out on this page are included in the sensor kit which is unique to each avionics package and are therefore not included in the Powerplant Kit.

**Steps on this page are intended for use following manifold pressure sensor installation.**

Step 1: (AFS-Dynon Sensor Kit) Locate the EA Hose H175 hose. Hereafter refer to this hose as the FF-00008 Manifold Pressure Hose.

Slide one spring clamp onto the manifold pressure hose as shown in Figure 1.

Slide the manifold pressure hose onto the sensor's barbed fitting and install the clamp. See Figure 1.

Slide a spring clamp onto the barbed fitting at the engine as shown in Figure 2.

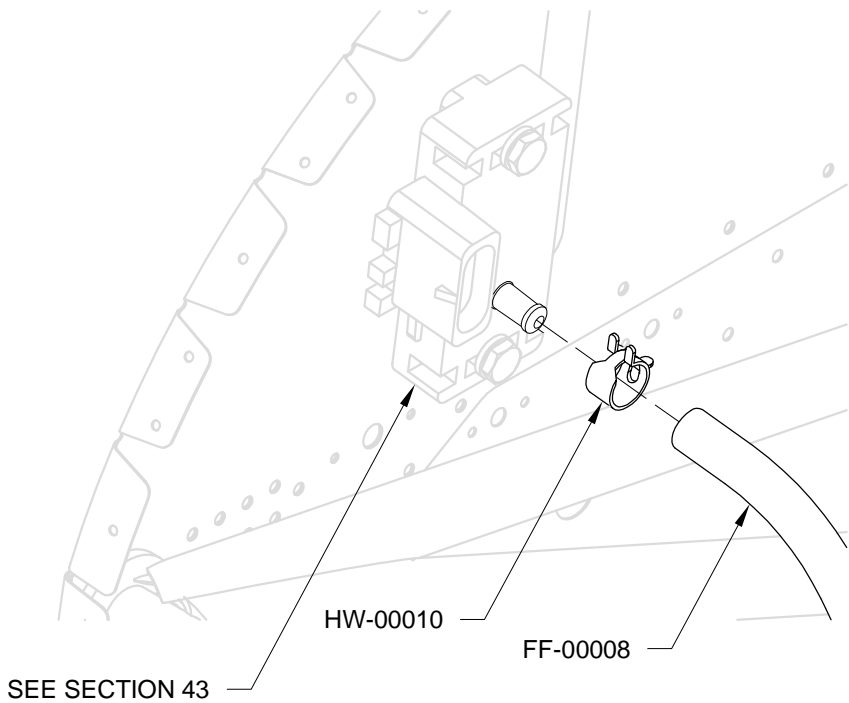
Slide the manifold pressure hose onto the barbed fitting.

Slide the clamp over the manifold pressure hose.

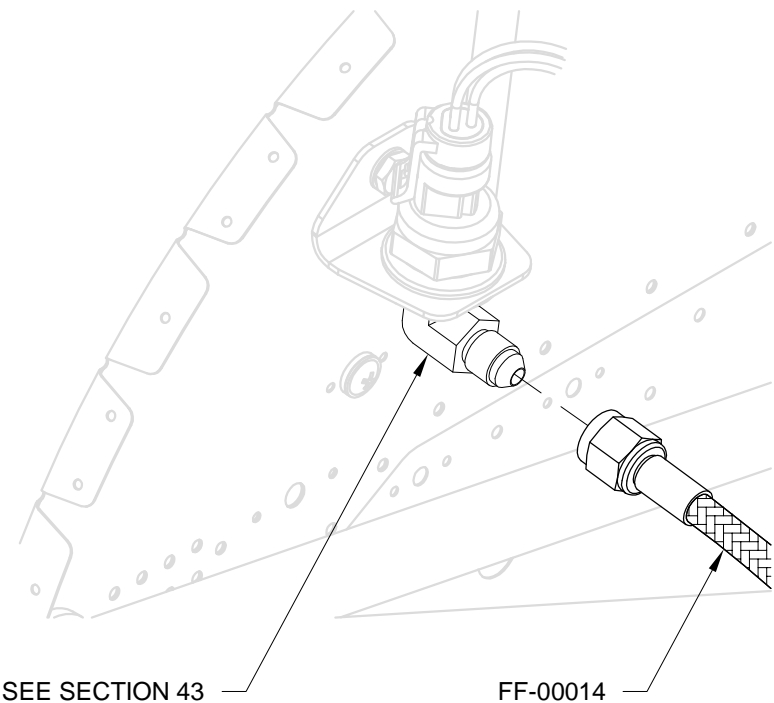
Position the spring clamps between the barb and the end of the hose with the clamp biased toward the barb.

Step 1: (Garmin Sensor Kit) Attach the FF-00014 Hose to the fluid fitting in the Garmin sensor as shown in Figure 3.

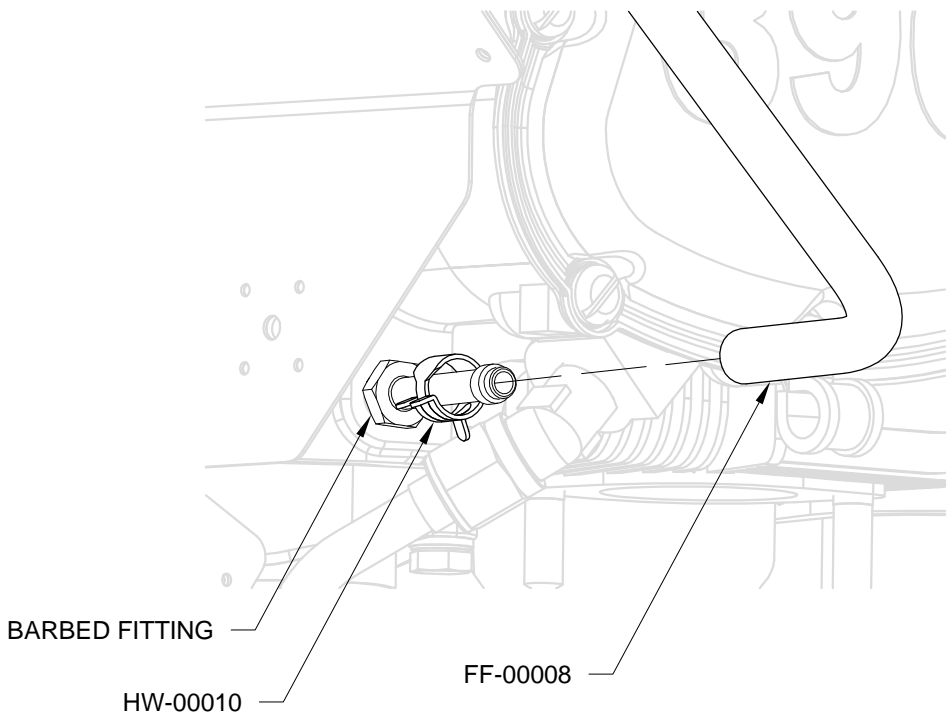
Attach the other end of the FF-00014 Hose to the fitting in the engine case as shown in Figure 4.



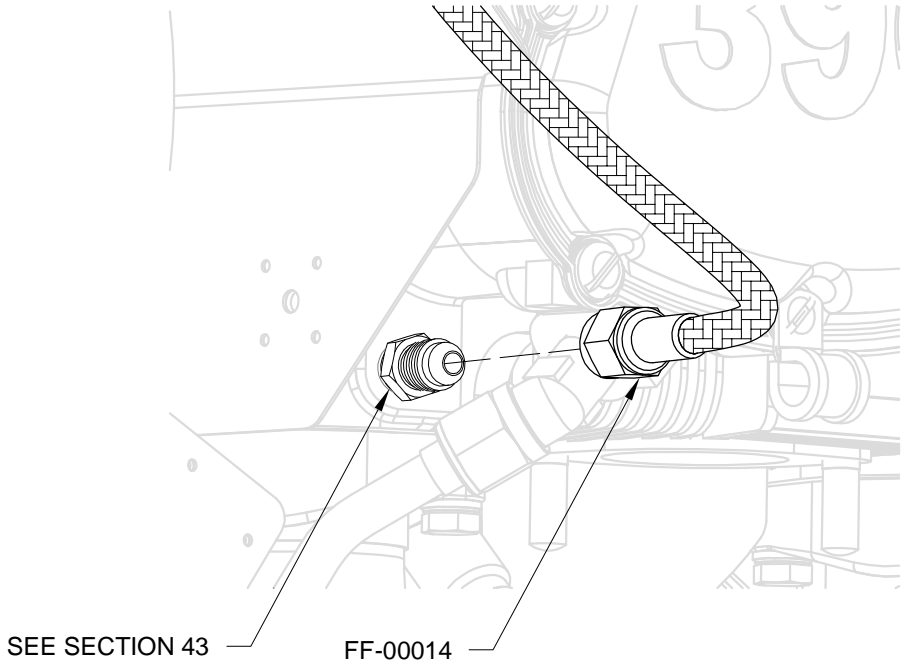
**FIGURE 1: INSTALL RUBBER HOSE**  
(AFS-DYNON SENSOR KIT ONLY)



**FIGURE 3: INSTALL HOSE ASSEMBLY**  
(GARMIN SENSOR KIT ONLY)



**FIGURE 2: INSTALL RUBBER HOSE**  
(AFS-DYNON SENSOR KIT ONLY)



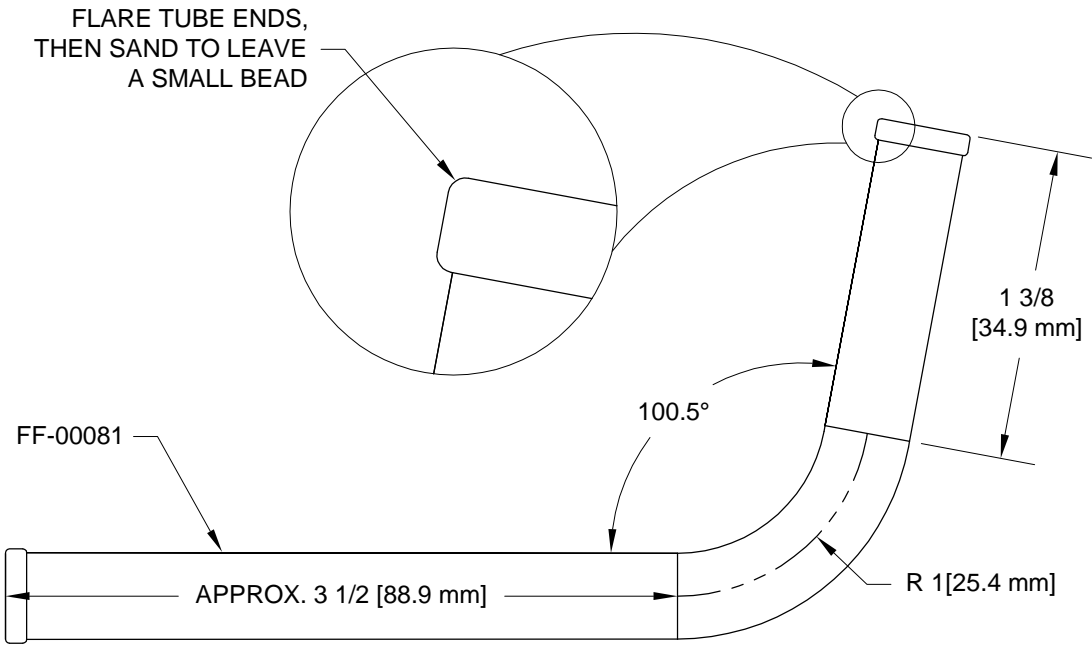
**FIGURE 4: INSTALL HOSE ASSEMBLY**  
(GARMIN SENSOR KIT ONLY)

Step 1: Cut lengths of EA HOSE H177 in the lengths shown below.

Part Number	Dimension	Qty.
FF-00080	1 1/2 [38.1 mm]	1
FF-00082A (Tri-Gear only)	11 1/4 [234.95 mm]	1
FF-00082B (Tail Dragger only)	10 1/4 [260.35 mm]	1

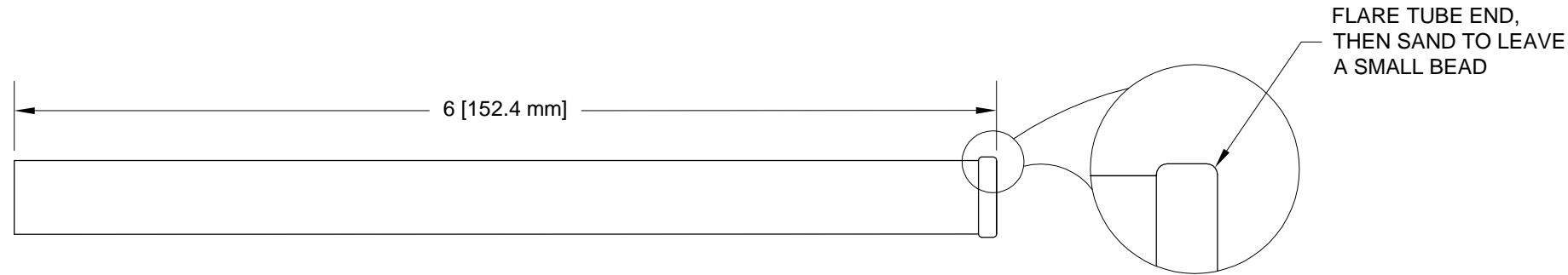
Step 2: Cut a 6 1/2 in. [165.1 mm] length of AT0-035X3/8 aluminum tube.

Step 3: As shown in Figure 1, fabricate the FF-00081 Sniffle Line from the aluminum tube cut in Step 2.



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

Step 4: (Tri-Gear only) Fabricate the FF-00083 Sniffle Line Extension from AT0-035X3/8 aluminum tube as shown in Figure 2.



**FIGURE 2: SNIFFLE LINE EXTENSION TEMPLATE**  
(TRI-GEAR ONLY)  
(NOTE: CHECK PRINTED SCALE 1:1 PER SECTION 3 BEFORE USING THE TEMPLATE!)

10 9/16  
[268.3 mm]

16 [406.4 mm]





**Step 1:** (Tri-Gear Only) If necessary, drill a #12 hole in the FF-00003B Bottom Cowl Support Bracket as shown in Figure 1.

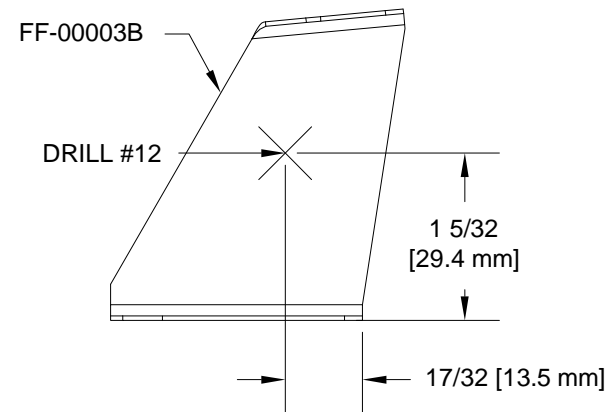
**Step 2:** If necessary, use a #12 drill bit to enlarge the hole in the FF-00076 Sniffle Line Bracket.

**Step 3:** Use a #12 drill bit to enlarge the single hole in the F-14132 Tunnel Angle called out in Figure 2.

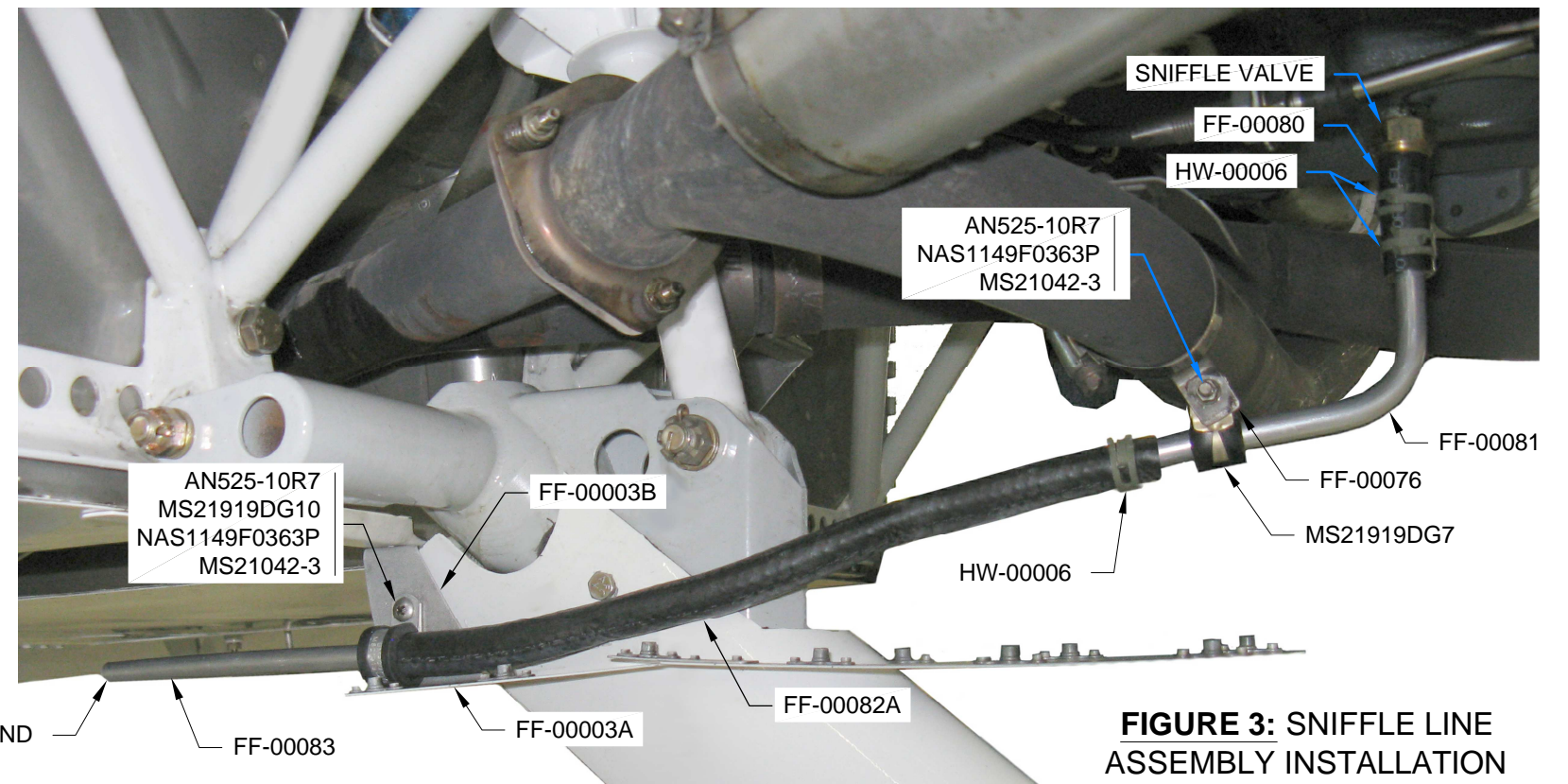
**Step 4:** Install the Sniffle Line Assembly as shown in Figure 2 or Figure 3. Gently bend the FF-00081 Sniffle Line as required.

**Step 5:** (Tail Dragger Only) Route and secure the FF-00013 Fuel Pump Overflow Tube as shown in Figure 2.

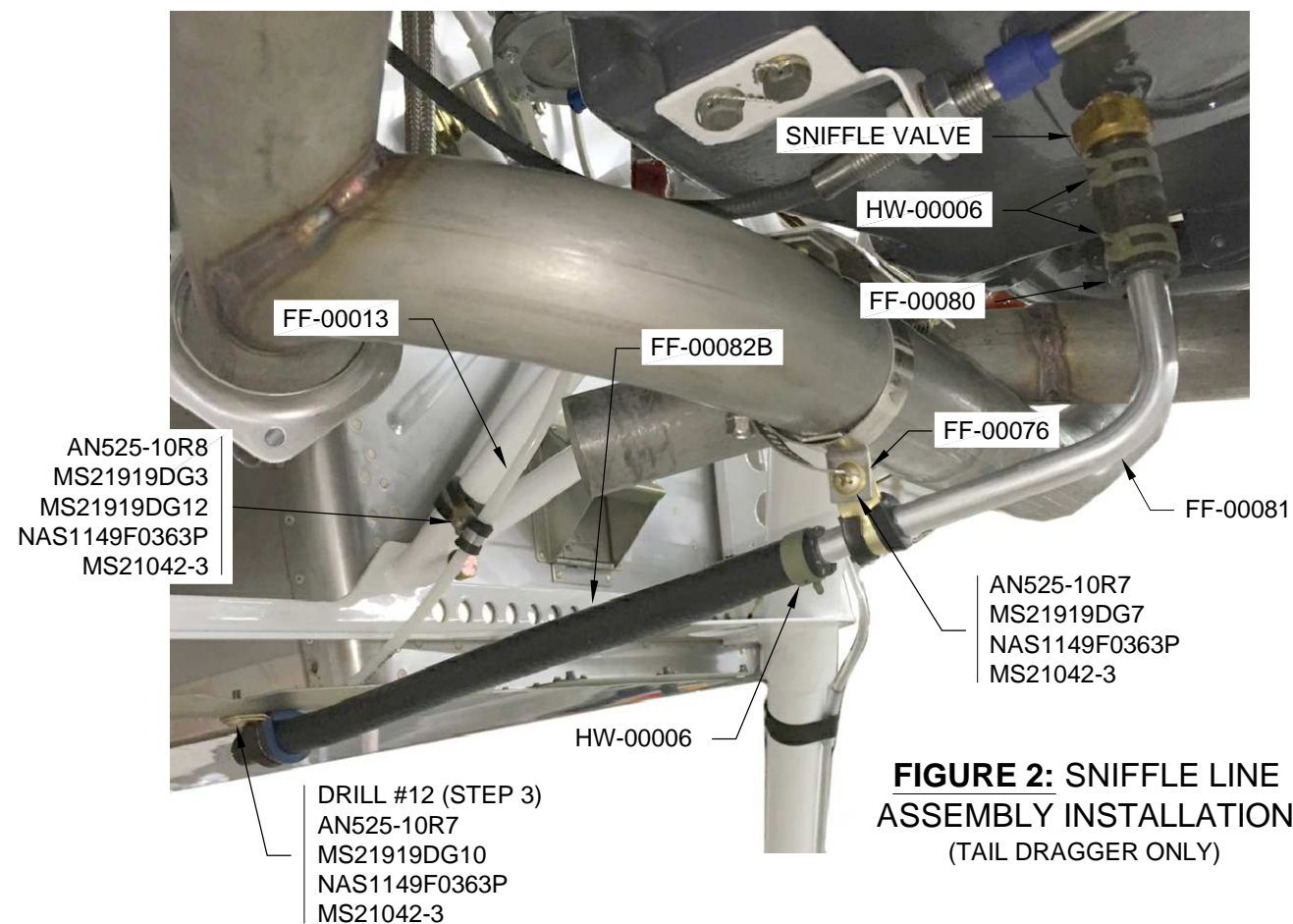
**Step 6:** (Tri-Gear Only) Route the FF-00013 Fuel Pump Overflow Tube behind the U-01406 Nose Gear Leg as shown in Figure 4.



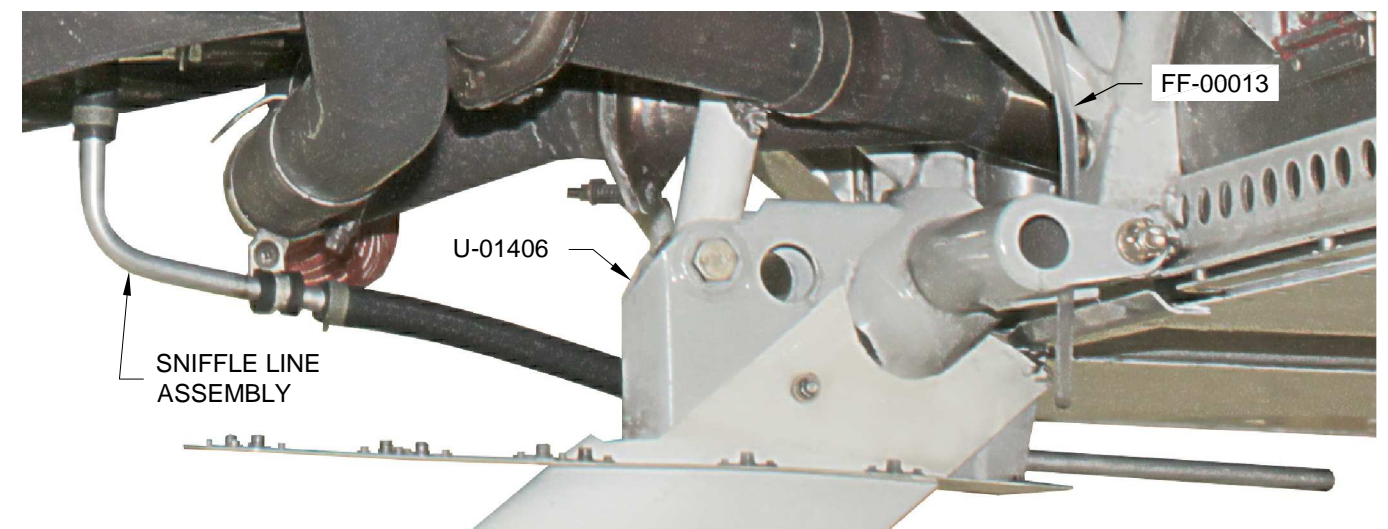
**FIGURE 1: DRILL BOTTOM COWL SUPPORT BRACKET**



**FIGURE 3: SNIFFLE LINE ASSEMBLY INSTALLATION (TRI-GEAR ONLY)**



**FIGURE 2: SNIFFLE LINE ASSEMBLY INSTALLATION (TAIL DRAGGER ONLY)**



**FIGURE 4: SNIFFLE LINE ASSEMBLY INSTALLATION (TRI-GEAR ONLY)**