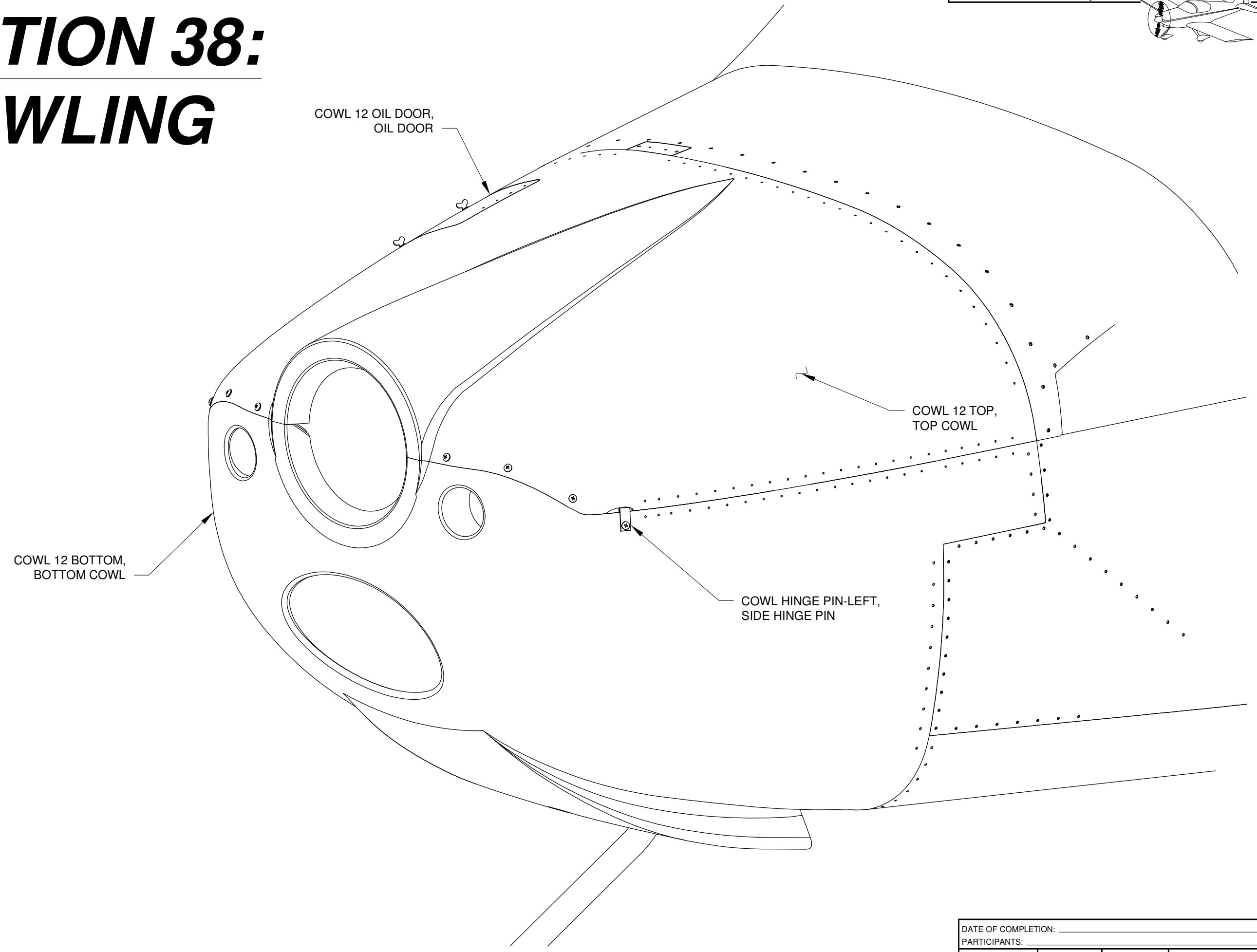
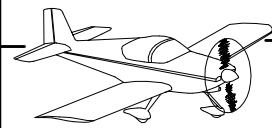


# SECTION 38: COWLING

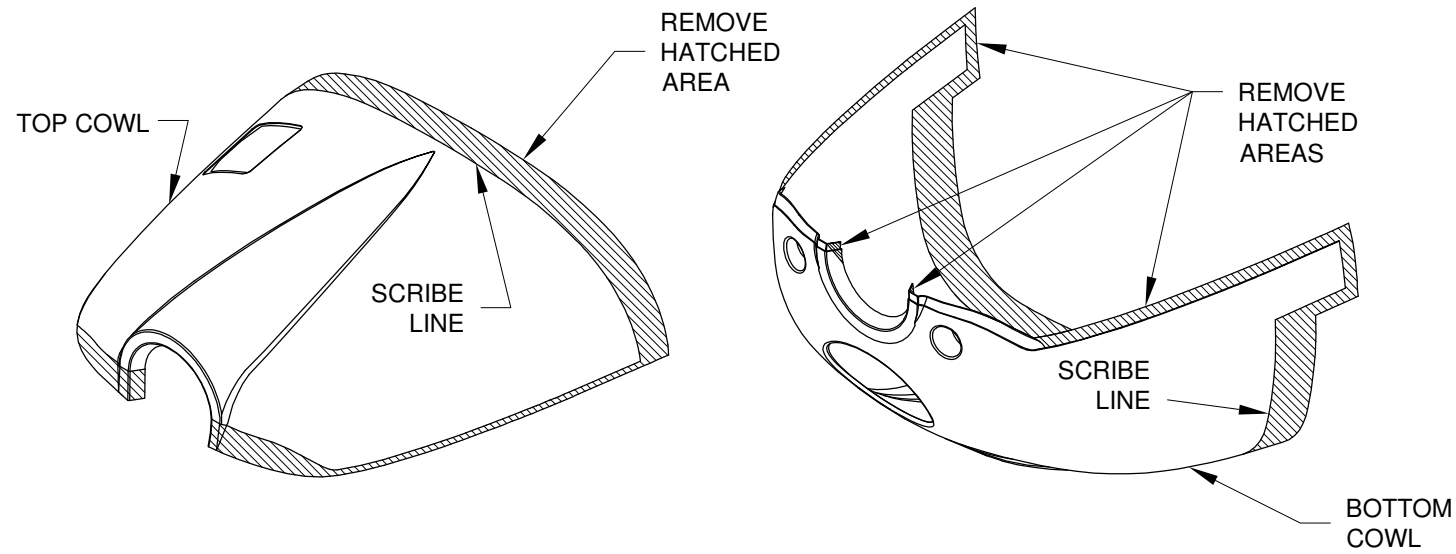




**NOTE: Do not remove material beyond the scribe lines or sand the cowl exterior.**

**NOTE: If required, refer to Section 5.18 MATCH-DRILLING OPAQUE FIBERGLASS PARTS.**

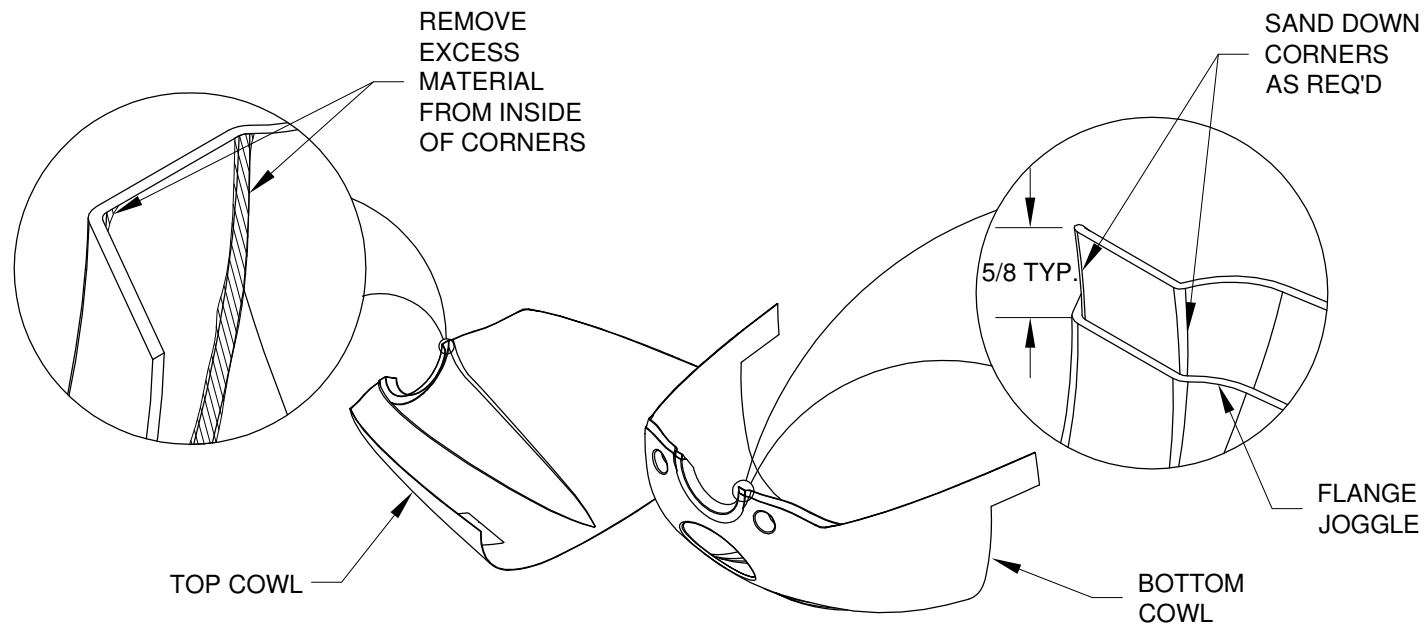
**Step 1:** Trim the top cowl and bottom cowl edges to within 1/8 inch of the scribe lines. Sand to remove the remaining material up to the scribe line as shown in Figure 1. A block with 80 grit paper works well for this.



**FIGURE 1: TRIMMING THE TOP AND BOTTOM COWL**

**Step 2:** Clean any excess resin that may have cured along the flange joggle on the bottom cowl. Remove abnormal glass and resin buildup from the inside surface of the top cowl. Sand down the corners of the flange on the bottom cowl. This will allow the top cowl and bottom cowl to fit together with little or no mismatch in their outer surfaces. See Figure 2.

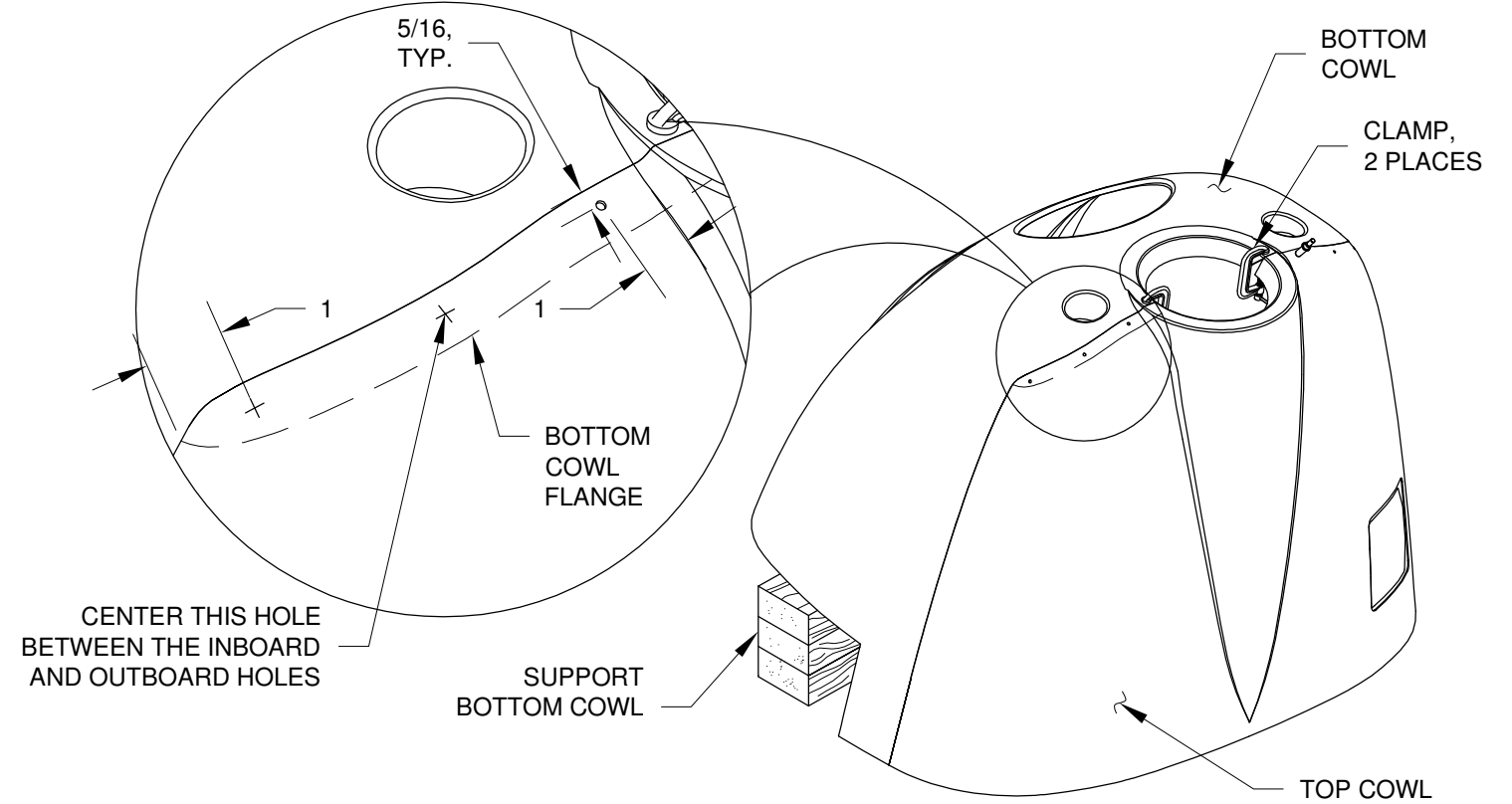
**Step 3:** Trim or sand the flange on the bottom cowl to the dimension shown in Figure 2.



**FIGURE 2: REMOVING EXCESS MATERIAL**

**NOTE: Plexi drill bits work best for drilling fiberglass. Regular bits may be modified as described in Section 12.**

**Step 4:** Clamp the top and bottom cowls together as shown in Figure 3. Mark the three hole pattern shown in Figure 3 on both sides of the top cowling. Drill #40 the most inboard hole on each side then cleco these two holes. Remove the clecos and separate the top cowl and bottom cowl.

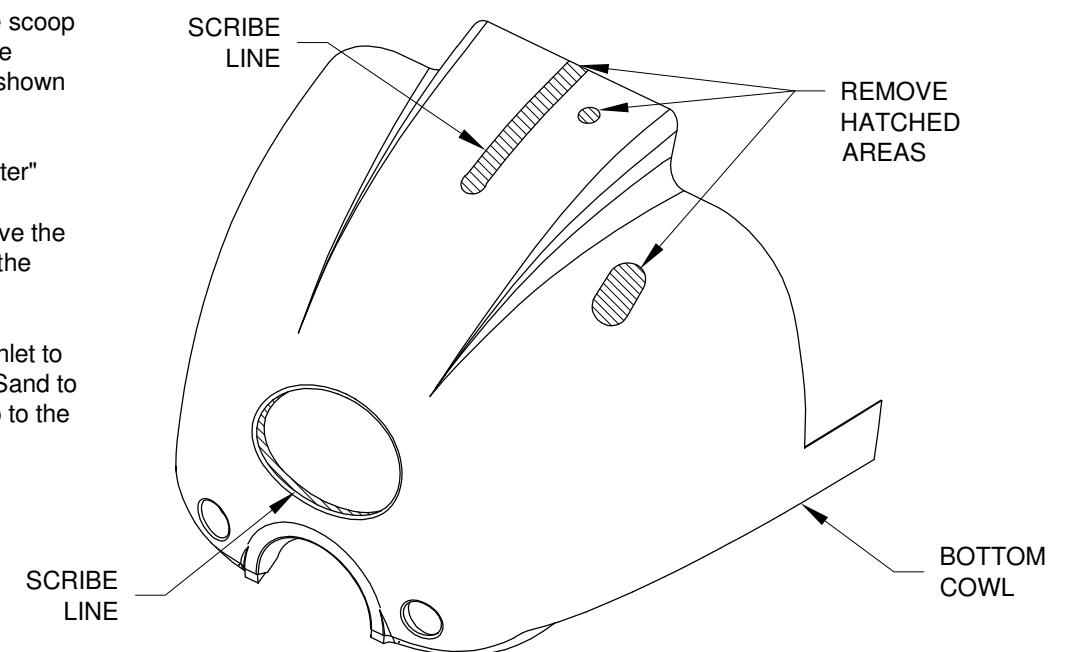


**FIGURE 3: FASTENER LOCATIONS**

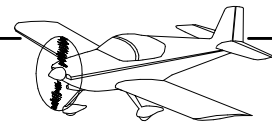
**Step 5:** Cut a slot centered on the scoop of the bottom cowl and remove the material up to the scribe lines as shown in Figure 4.

**Step 6:** Use a unibit to drill a "starter" hole large enough to get a file or sanding block inserted then remove the material up to the scribe lines for the holes shown in Figure 4.

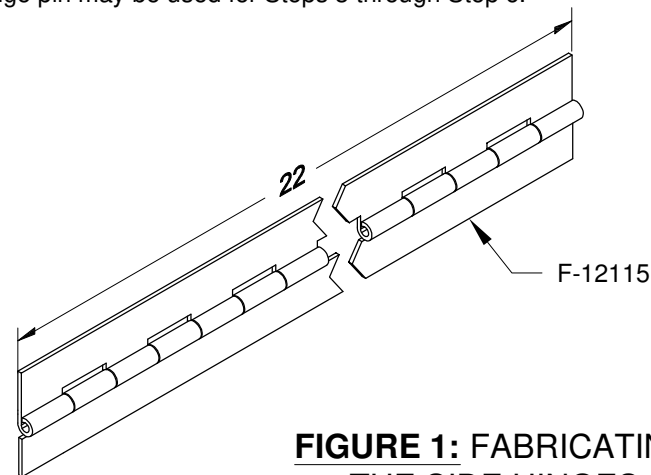
**Step 7:** Trim the bottom cowl air inlet to within 1/8 inch of the scribe line. Sand to remove the remaining material up to the scribe line as shown in Figure 4.



**FIGURE 4: MODIFYING THE BOTTOM COWL**

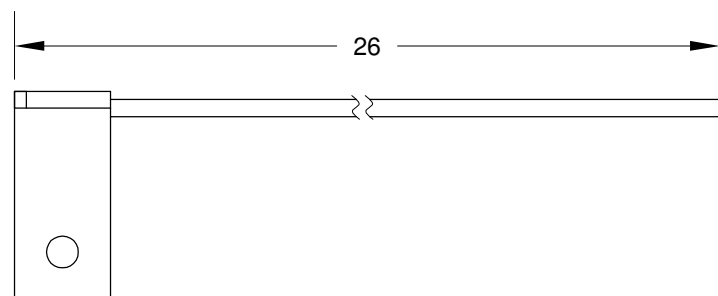


Step 1: Make the two F-12115 Side Hinges from the supplied AN257-P3 hinge by removing the hinge pin and cutting the hinge to the dimensions shown in Figure 1. The hinge pin may be used for Steps 3 through Step 6.



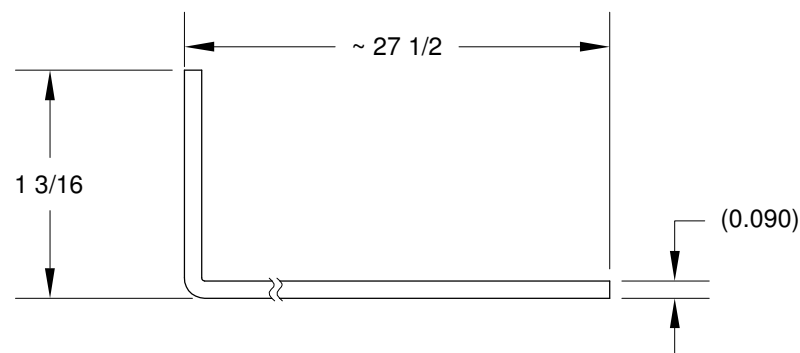
**FIGURE 1: FABRICATING THE SIDE HINGES**

Step 2: Trim the Cowl Hinge Pin-Left and Cowl Hinge Pin-Right Side Hinge Pins to the dimensions shown in Figure 2.



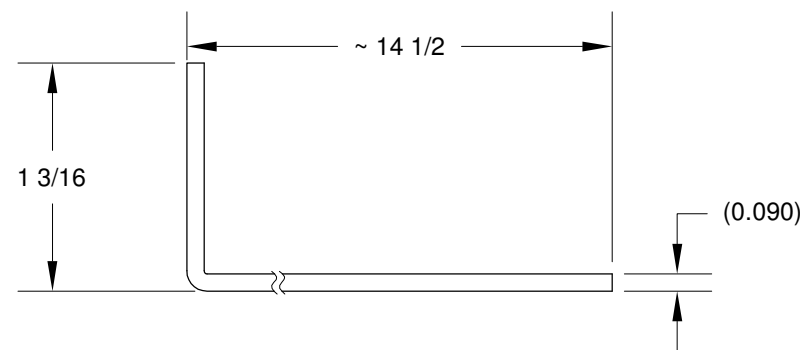
**FIGURE 2: TRIMMING THE COWL HINGE PINS (LEFT SHOWN)**

Step 3: Make the F-1201J Upper Cowl Hinge pin by cutting the reserved hinge pin (Page 29-02) to the dimensions in Figure 3. Bend one end of the hinge pin as shown in Figure 3. Bend the long portion of the upper cowl hinge pin to follow the curve of the installed upper cowl hinge as shown in 38-04 Figure 3.



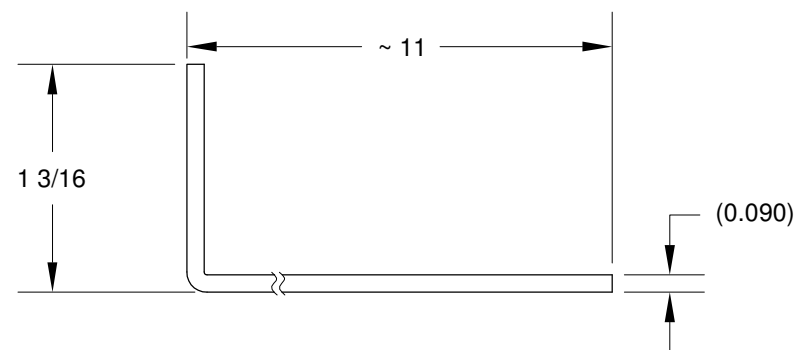
**FIGURE 3: FABRICATING THE COWL TOP LEFT HINGE PIN**

Step 4: Make the F-1201K Upper Cowl Hinge pin by cutting the reserved hinge pin (Page 29-02) to the dimensions in Figure 4. Bend one end of the hinge pin as shown in Figure 4. Bend the long portion of the upper cowl hinge pin to follow the curve of the installed upper cowl hinge as shown in 38-04 Figure 3.



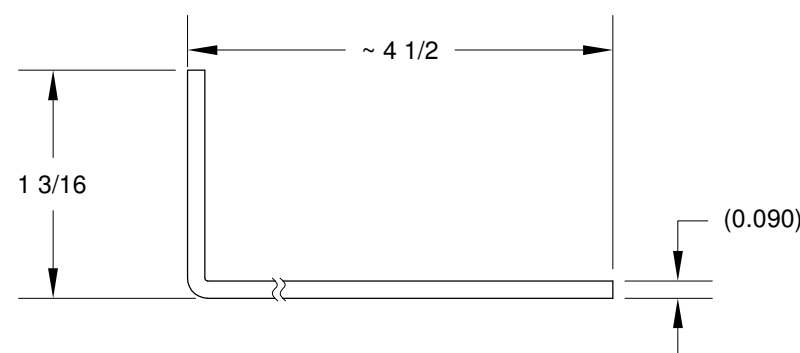
**FIGURE 4: FABRICATING THE COWL TOP RIGHT HINGE PIN**

Step 5: Make the two F-12117 Lower Cowl Hinge pins by cutting the reserved hinge pin (Page 23-08) to the dimensions shown in Figure 5. Bend one end of each hinge pin as shown in Figure 5.



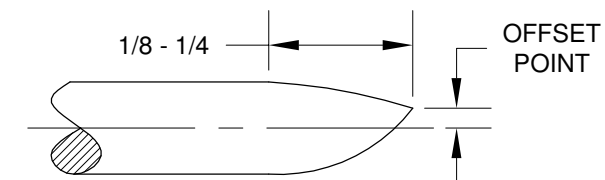
**FIGURE 5: FABRICATING THE LOWER COWL HINGE PINS**

Step 6: Make the two F-12116 Mid Cowl Hinge pins by cutting the reserved hinge pin (Page 29-02) to the dimensions shown in Figure 6. Bend one end of each hinge pin as shown in Figure 6.



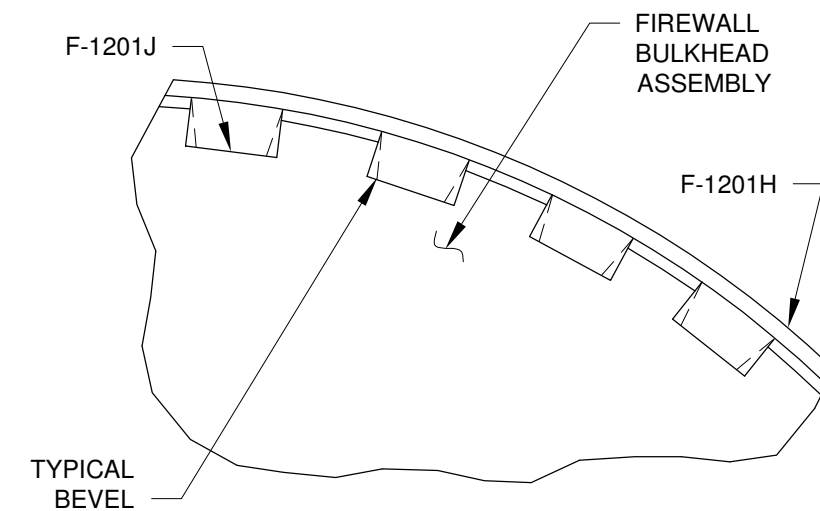
**FIGURE 6: FABRICATING THE MID COWL HINGE PINS**

Step 7: Grind the ends of the cowl pins created in Step 3 through Step 6. For Steps 3 and 4 offset the point to the inside of the hinge pins curve as installed. See Figure 7.

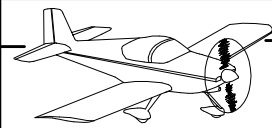


**FIGURE 7: SHAPING THE COWL PIN ENDS**

Step 8: Bevel the eyelets along the curved portion of the F-1201J and F-1201K Upper Cowl Hinges using a flat file with smooth edges. See Figure 8.

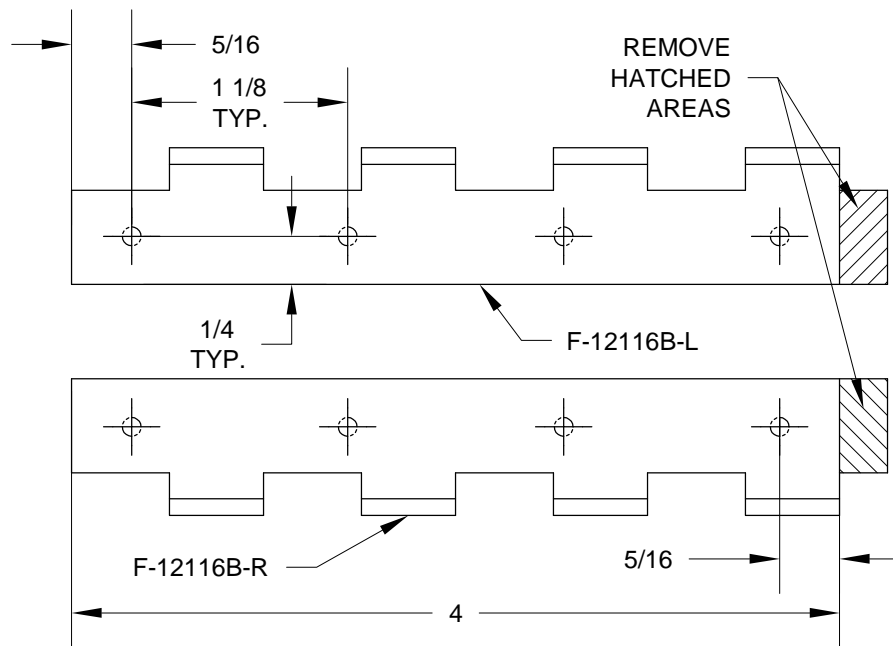


**FIGURE 8: BEVELING THE EYELETS (F-1201J SHOWN)**



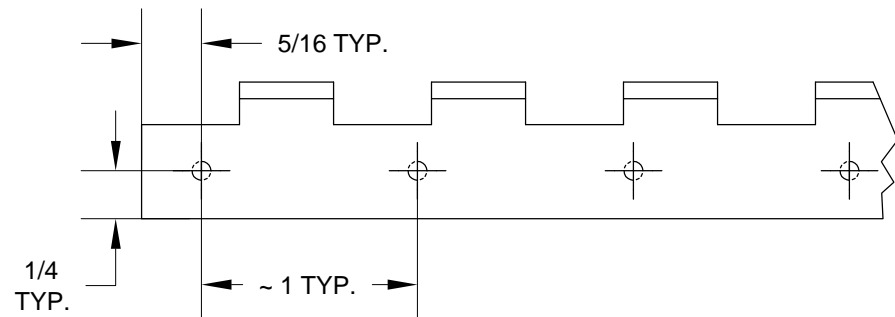
**NOTE:** Mark hole locations on the hinges so that when installed the markings will be to the outside as shown in Figure 3.

**Step 1:** Modify the hinge halves left over from making the F-12116-L and -R Side Hinges (see Page 29-02) as shown in Figure 1 to make F-12116B-L and F12116B-R Side Hinges. Mark hole locations but do not drill.



**FIGURE 1: FABRICATING MID COWL HINGES**

**Step 2:** Layout the hole pattern on the F-12115 Side Hinges, as well as the hinge halves remaining from the F-1201J Upper Cowl Hinge, F-1201K Upper Cowl Hinge, and F-12117 Lower Cowl Hinges as shown in Figure 2. Do not drill the holes at this time.

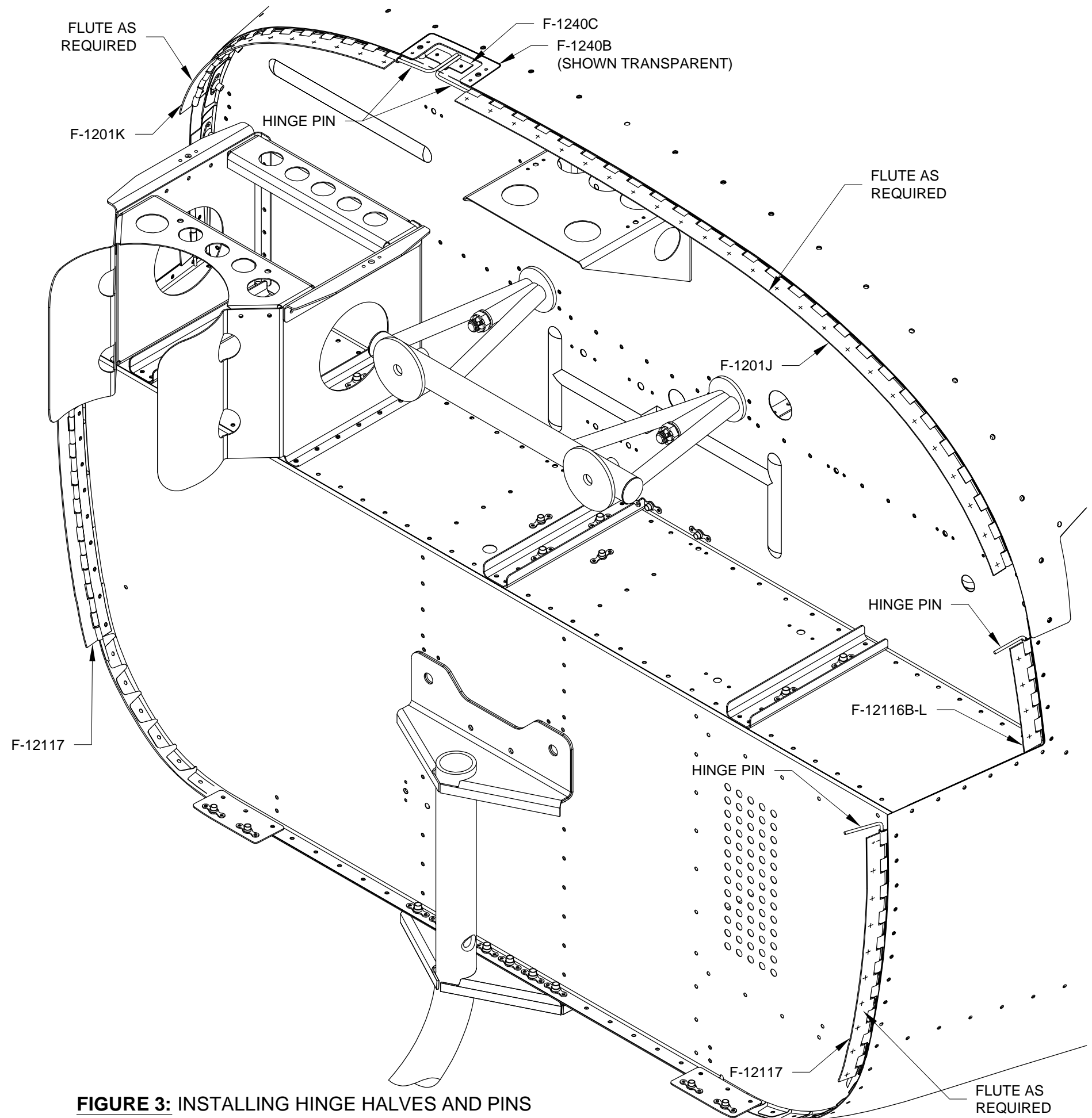


**FIGURE 2: MARKING THE ATTACHMENT LOCATIONS**

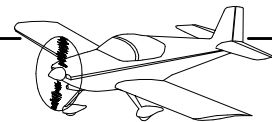
**Step 3:** Install the F-12116B-L and -R Mid Cowl Hinge halves with the mid cowl hinge pins created in Step 6 on page 38-03. Install the F-12117 Lower Cowl Hinge halves with the lower cowl hinge pins created in Step 5 on page 38-03. See Figure 3.

**Step 4:** Bend the F-1201J and F-1201K Upper Cowl Hinges to match the curve of the upper fuselage. Install the upper cowl hinges with the upper cowl hinge pins created in Steps 3 and 4 on page 38-03. The ends of the hinge pins are inserted into the F-1240C Clip as shown in Figure 3.

**Step 5:** The cowl hinges should be a continuation of the surface of the adjacent skins. Flute the hinges as needed, particularly those on a curve, to bring them into alignment. See Figure 3.



**FIGURE 3: INSTALLING HINGE HALVES AND PINS**

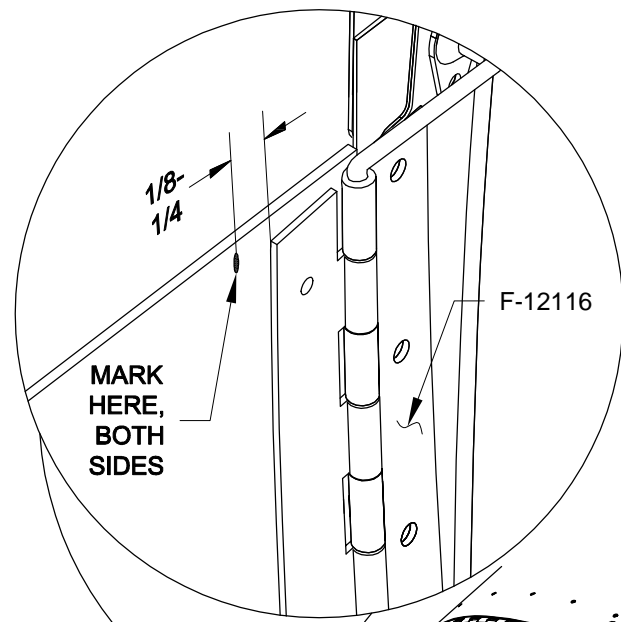


**NOTE:** Avoid forcing the top cowl and/or bottom cowl into alignment by pushing or pulling. Pushing or pulling on the cowling to align it in one location may cause misalignment in another location. Spinner clearance issues could result if the cowling is forced out of its natural alignment. The natural shape of the cowling should follow the curves in the fuselage. Adjustments to the fit can be made by trimming/sanding material from the edges of the cowl. Holes drilled in the cowling may also be elongated to adjust the fit.

**Step 4:** Clamp the lower half of both F-12115 Side Hinges to the upper edge of the bottom cowl. See Figure 2. The aft edge of the side hinges should be flush with the marks made on the bottom cowl in Step 3. See Figure 1 and Figure 2.

**NOTE:** Periodically check and clean out any debris between the hinges and the cowl while drilling!

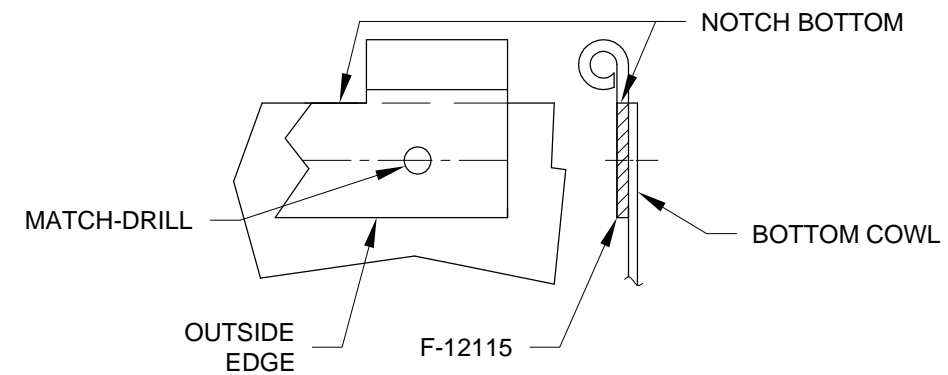
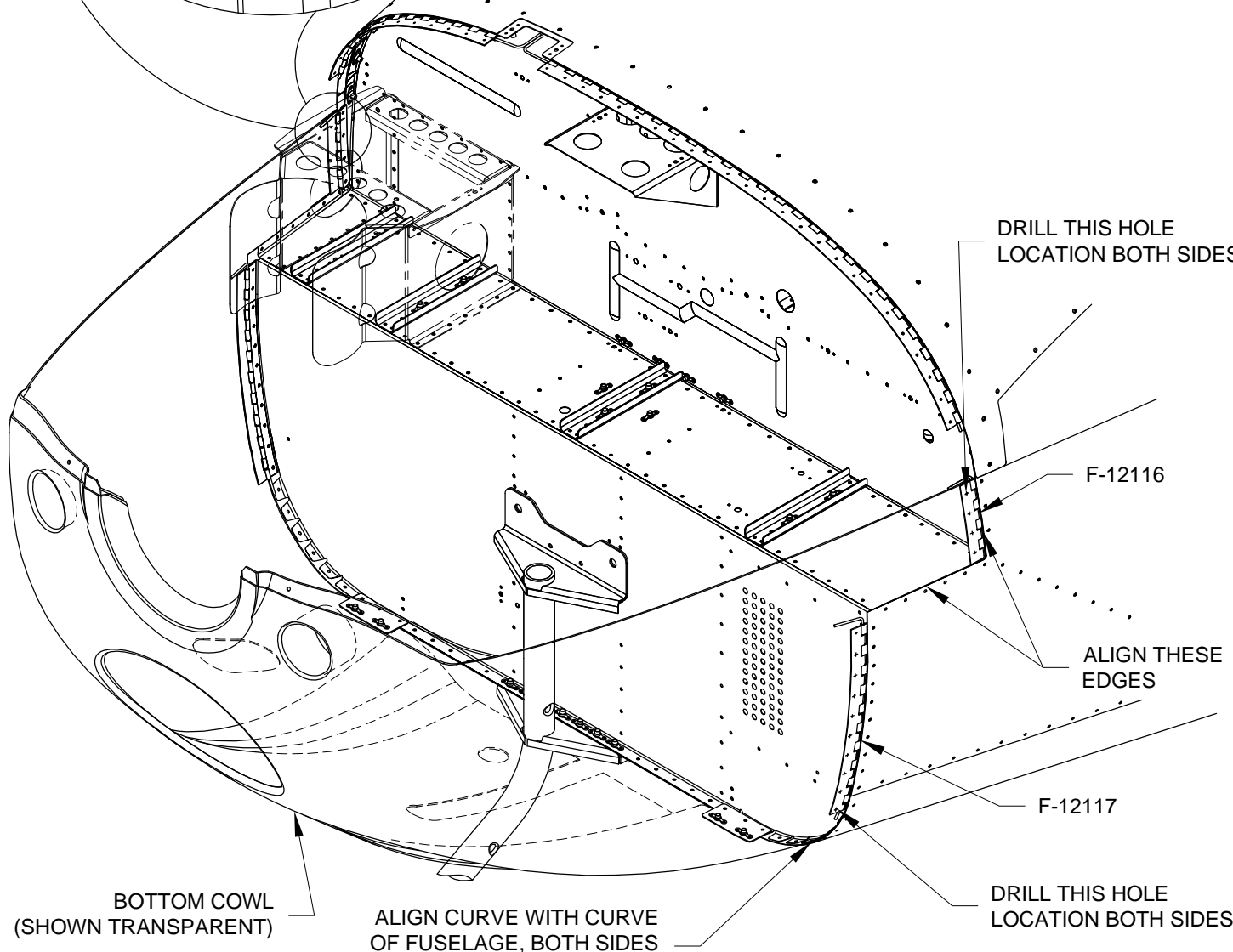
**Step 5:** Drill #40 the rivet pattern laid out in 38-04 Step 2 into the bottom cowl and F-12115 Side Hinges and cleco in place.



**Step 1:** Slide the bottom cowl over the hinges and clamp to the F-12116 Mid Cowl Hinges so that the notch in the cowl bottom aligns with the notch in the F-1270 Fuselage Side Skin. Drill #40 the top hole location through the bottom cowl and the mid cowl hinges then cleco. See Figure 1.

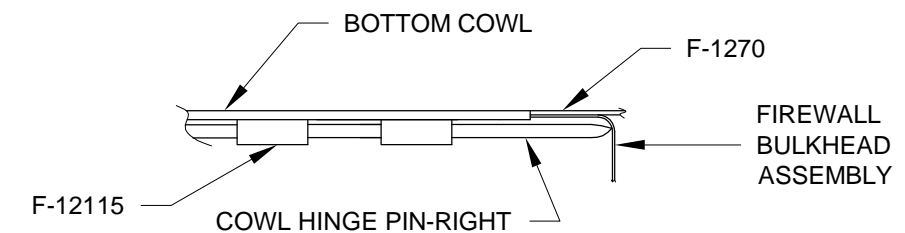
**Step 2:** The bottom cowl may flex out of the desired shape if care is not taken to align it properly. Carefully check that the bottom cowl aligns with the fuselage skins, especially along the bottom curve as shown in Figure 1. Drill #40 the bottom hole location through the bottom cowl and the F-12117 Lower Cowl Hinges then cleco. See Figure 1.

**Step 3:** Mark the offset distance from the F-12116 Mid Cowl Hinge on the inside of the bottom cowl as shown in Figure 1.



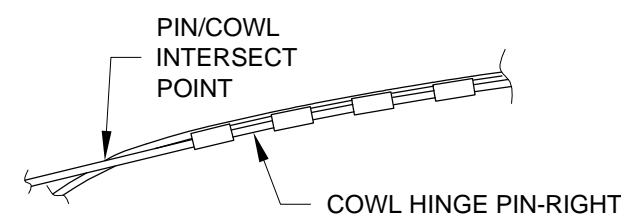
**FIGURE 2: ALIGNING SIDE HINGES**

**Step 6:** Using the Cowl Hinge Pin-Left and -Right, attach the upper half of the F-12115 Side Hinges to the lower half already clecoed to the bottom cowl. Insert the pin until it contacts the Firewall Bulkhead Assembly. See Figure 3. Mark the pin/cowl intersect point on the bottom cowl as shown in Figure 4.

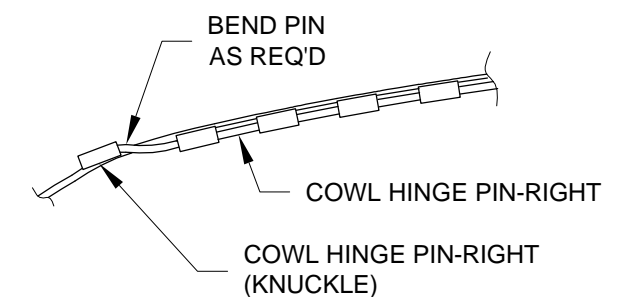


**FIGURE 3: SETTING THE PIN LENGTH (RIGHT SHOWN)**

**Step 7:** Trim the Cowl Hinge Pin-Left and -Right Side Hinge Pins until the aft edge of the knuckles lines up with the pin-cowl intersect point. Bend the knuckles parallel with the side of the bottom cowl. See Figure 5. Remove the side hinge pins and shape the ends per 38-03 Step 7.



**FIGURE 4: KNUCKLE LOCATION**



**FIGURE 5: KNUCKLE BEND**

**FIGURE 1: ALIGNING THE BOTTOM COWL (SOME PARTS NOT SHOWN FOR CLARITY)**



**NOTE: Duct tape may be used to maintain alignment of the top cowl and bottom cowl.**

**Step 1:** Install the top cowl and cleco it to the bottom cowl as shown in Figure 1. Check that the contours of the top cowl match those of the adjacent fuselage skins and adjust as required. The bottom and aft edges of the top cowl should align with the bottom cowl and the fuselage skins.

**Step 2:** Drill #40 through the top cowl and the F-1201J and F-1201K Upper Cowl Hinges the most inboard hole as shown in Figure 1 and cleco in place.

**Step 3:** Mark the location of the Cowl Hinge Pin-Left and -Right knuckles on the top cowl and the bottom cowl. Remove the top cowl and create a notch for the knuckle. The notch should be sized to allow the Cowl Hinge Pin-Left and -Right to be slipped out without catching on the top cowl or bottom cowl. See Figure 1. Reinstall the top cowl.

**Step 4:** Drill #40 then cleco the two remaining forward hole locations on each side of the top and bottom cowl as shown in 38-02 Figure 3.

**Step 5:** Drill #40 then cleco the remaining holes through the top cowl and the F-1201J and F-1201K Upper Cowl Hinges starting at the inboard holes and working out.

**Step 6:** Hold the forward portion of the F-12115 Side Hinges tightly against the top cowl. Drill #40 then cleco the forward most hole location and work aft, drilling all top cowl to side hinge rivet hole locations.

**Step 7:** Starting from the top drill #40 and cleco the remaining hole locations through the F-12116-L and -R Mid Cowl Hinges and the bottom cowl.

**Step 8:** Starting from the bottom drill #40 and cleco the remaining hole locations through the F-12117-L and -R Lower Cowl Hinges and the bottom cowl.

Check the fit of the top cowl and make any required adjustments.

**NOTE: Machine countersinks into fiberglass that are up to .005 too shallow are acceptable, even preferable, to countersinks which are too deep.**

**Step 9:** Machine countersink all #40 drilled holes on the top cowl and on the bottom cowl except those holes drilled on the front of the top cowl and the bottom cowl.

**Step 10:** Remove the F-12115 Side Hinges, the F-1201J and F-1201K Upper Cowl Hinges, the F-12116-L and -R Mid Cowl Hinges, and the F-12117 Lower Cowl Hinges from the top cowl and the bottom cowl. Deburr all hinges.

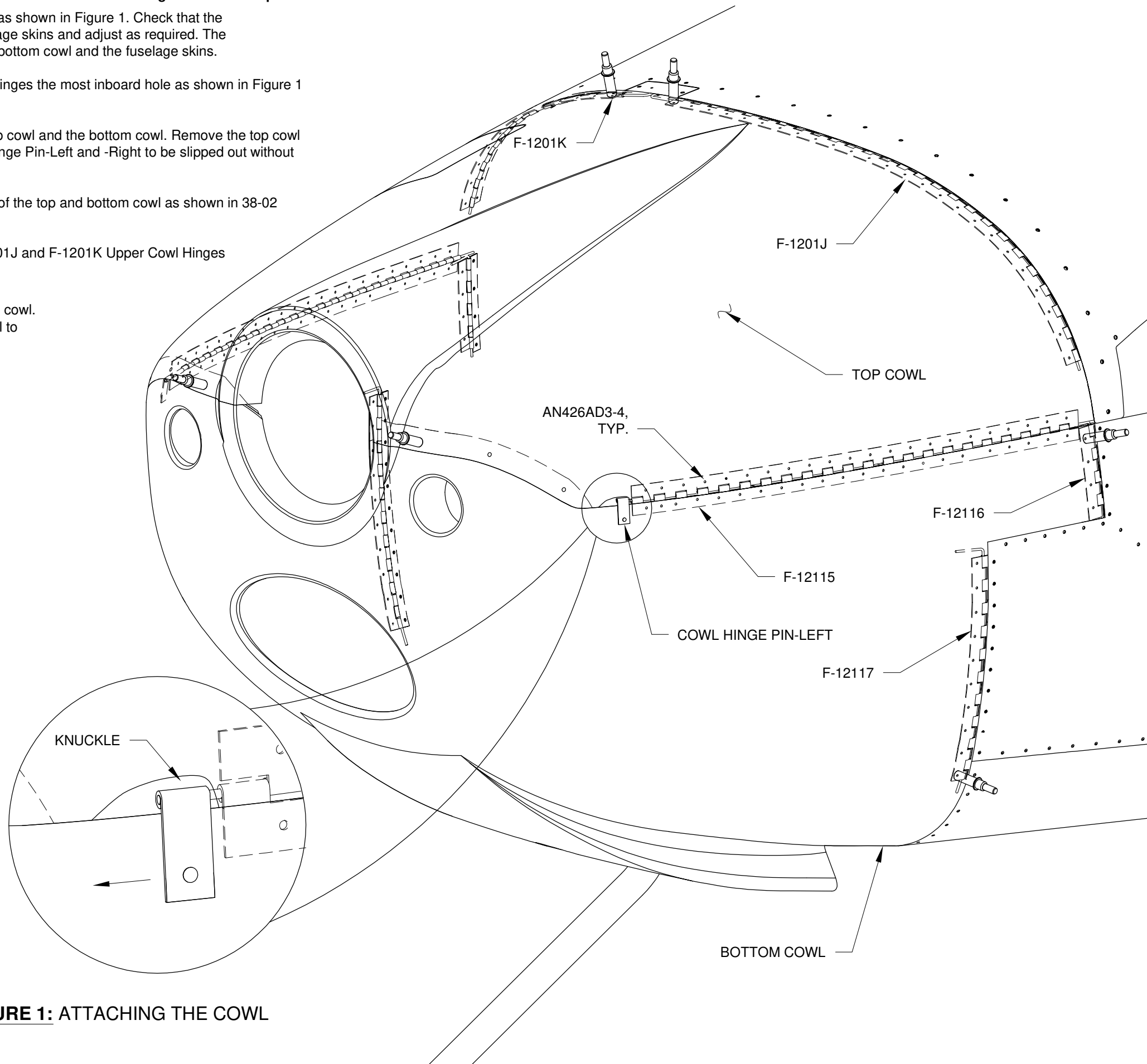
**NOTE: Slightly under set rivets where installed into the fiberglass of the top cowl and the bottom cowl.**

**Step 11:** Cleco then rivet the lower half of the F-12115 Side Hinges to the bottom cowl per the call outs in Figure 1.

**Step 12:** Cleco then rivet the top half of the F-12115 Side Hinges to the top cowl per the call outs in Figure 1.

**Step 13:** Cleco then rivet the F-12116 Mid Cowl Hinges and F-12117 Lower Cowl Hinges to the bottom cowl per the call outs in Figure 1.

**Step 14:** Cleco then rivet the F-1201J and F-1201K Upper Cowl Hinges to the the top cowl per the call outs in Figure 1.



**FIGURE 1: ATTACHING THE COWL**

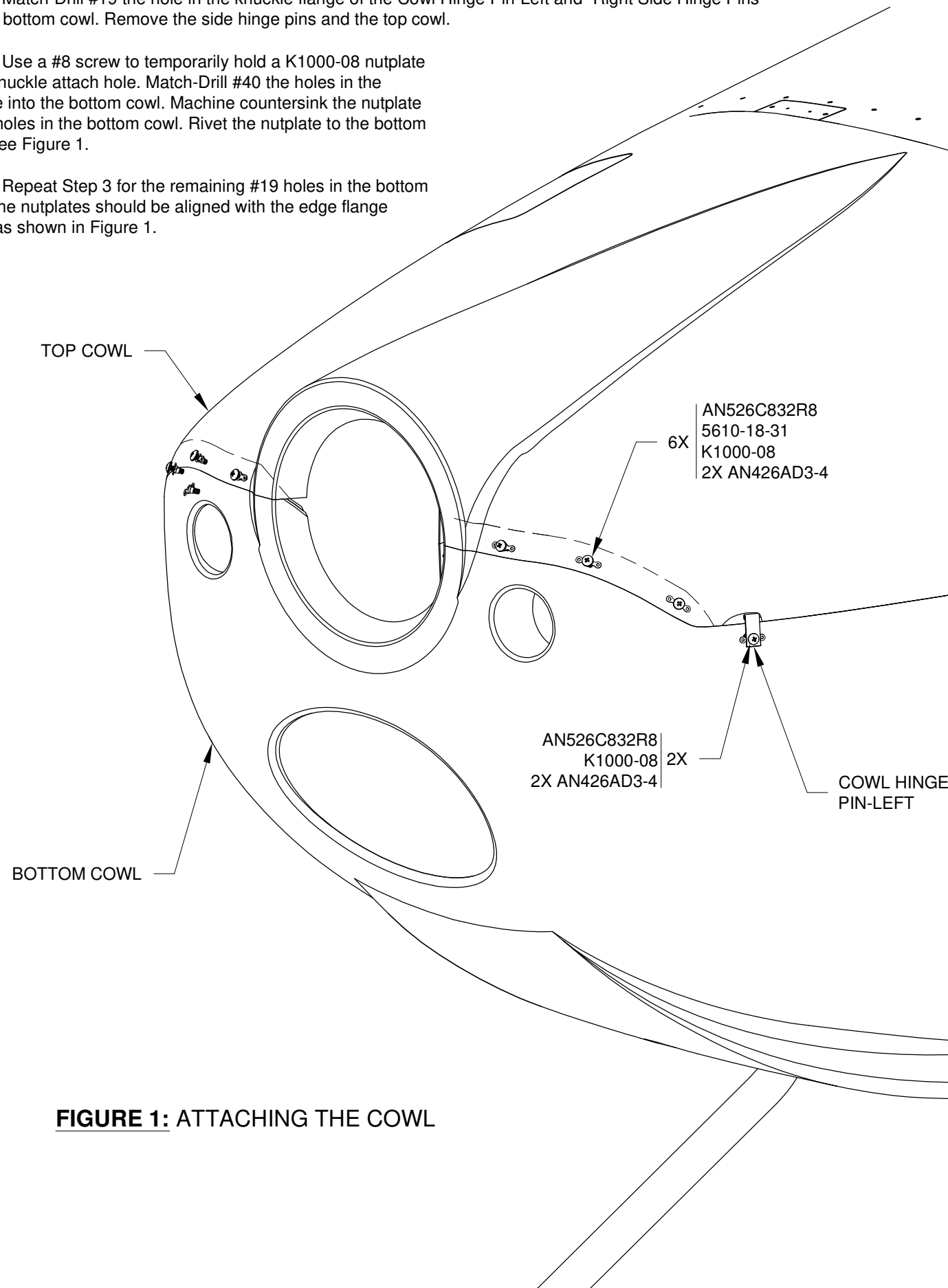


**Step 1:** Install the bottom cowl and the top cowl and final drill #19 the six screw hole locations as shown in Figure 1.

**Step 2:** Match-Drill #19 the hole in the knuckle flange of the Cowl Hinge Pin-Left and -Right Side Hinge Pins into the bottom cowl. Remove the side hinge pins and the top cowl.

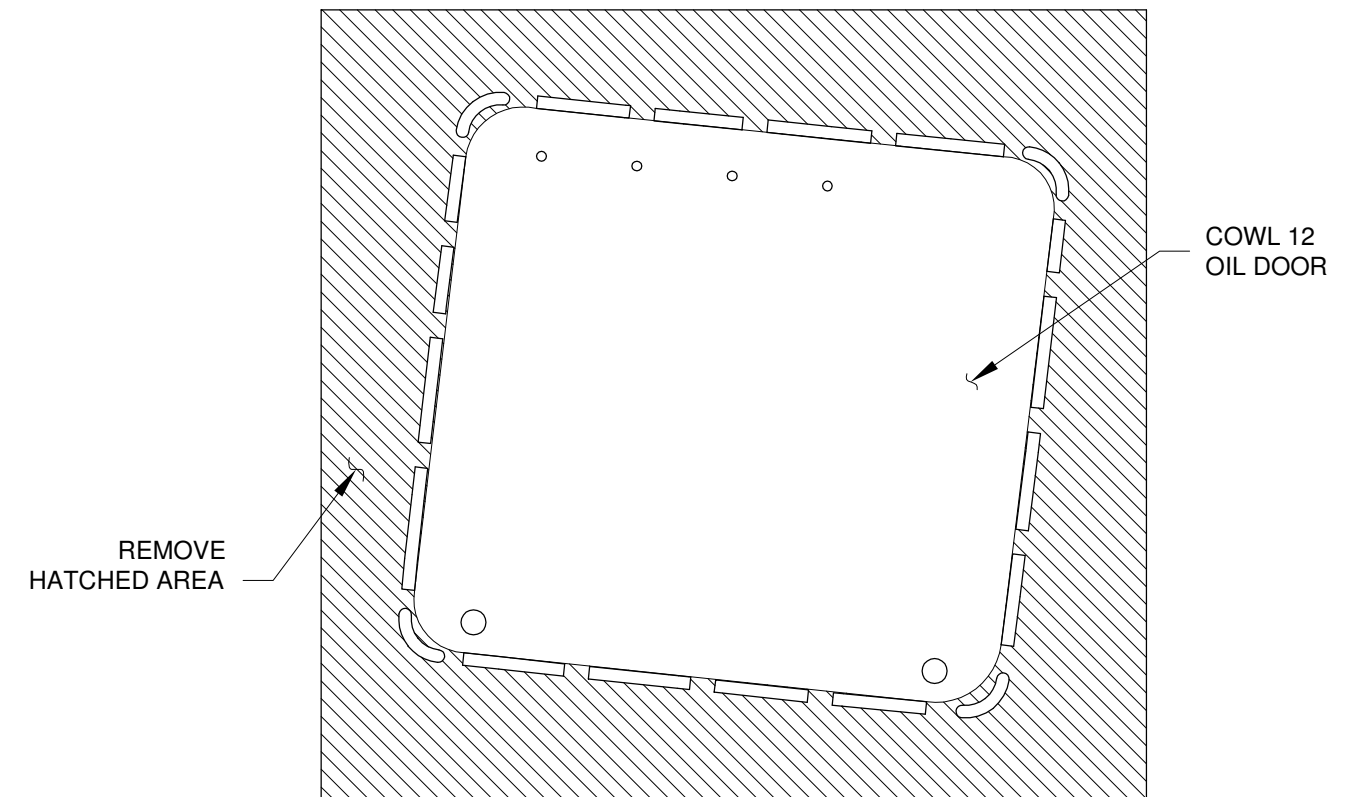
**Step 3:** Use a #8 screw to temporarily hold a K1000-08 nutplate in the knuckle attach hole. Match-Drill #40 the holes in the nutplate into the bottom cowl. Machine countersink the nutplate attach holes in the bottom cowl. Rivet the nutplate to the bottom cowl. See Figure 1.

**Step 4:** Repeat Step 3 for the remaining #19 holes in the bottom cowl. The nutplates should be aligned with the edge flange joggle as shown in Figure 1.



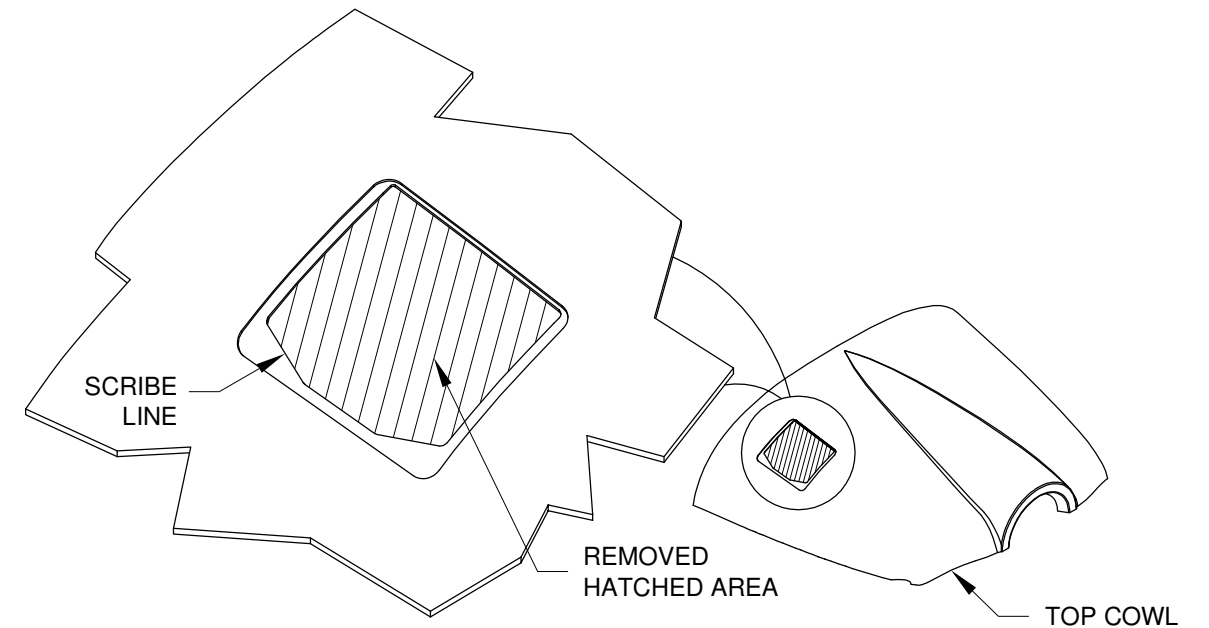
**FIGURE 1: ATTACHING THE COWL**

**Step 5:** Trim the material from the outside of the Cowl 12 Oil Door. The oil door is formed to fit over the access hole created in Step 6. Cut away the excess material and test fit the oil door. The corner radii will need to be adjusted to follow the radii of the oil door recess on the top cowl. Deburr. See Figure 2 and Figure 3.



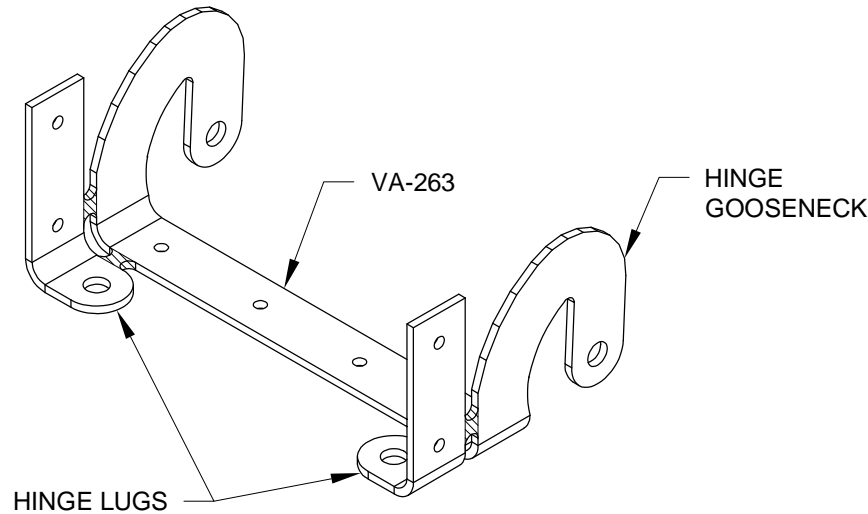
**FIGURE 2: OIL DOOR MODIFICATION**

**Step 6:** Use a unibit to drill "starter" holes large enough to get metal snips inserted then remove the hatched area up to within 1/8 inch of the scribe line as shown in Figure 3. Finish up to the scribe line with a file or sanding block.



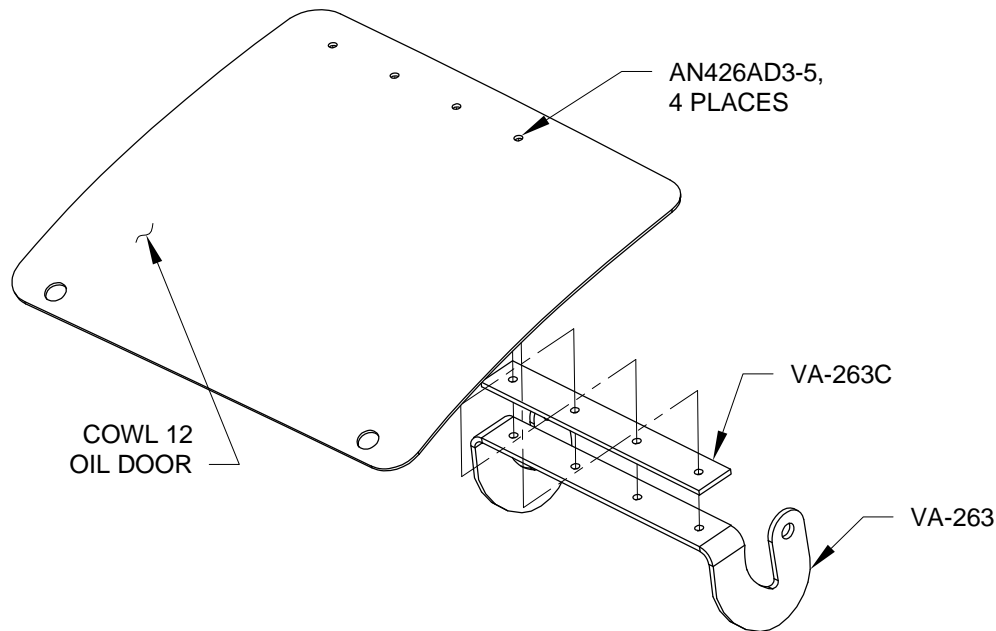
**FIGURE 3: TOP COWL OIL DOOR OPENING**

Step 1: Separate the VA-263 Oil Door Hinge into the VA-263 Oil Door Hinge Gooseneck and Hinge Lugs as shown in Figure 1. Deburr.



**FIGURE 1: SEPARATING THE OIL DOOR HINGE**

Step 2: Machine countersink the rivet holes in the Cowl 12 Oil Door as shown in Figure 2. Rivet the VA-263 Oil Door Hinge Gooseneck and VA-263C Oil Door Hinge Doubler to the Cowl 12 Oil Door as shown in Figure 2.



**FIGURE 2: ATTACHING THE OIL DOOR HINGE GOOSENECK**

Step 3: Use a step drill to match-drill 1/4" the two holes in the Cowl 12 Oil Door into the oil door recess. Center an HW 212-12 camlock receptacle on one of the 1/4" holes in the oil door recess using an HW 2600-3W camlock fastener. Align the camlock fastener parallel to the edge of the oil door opening as shown in Figure 3. Match-Drill #40 the two camlock receptacle attachment rivet holes into the oil door recess. Repeat for the second receptacle.

Step 4: Final-Drill the 1/4" holes of the oil door recess (only the oil door recess, NOT the oil door) to 1/2" using a step drill.

Step 5: Machine countersink the rivet attach holes in the top cowl then rivet the HW 212-12 camlock receptacles to the top cowl using the rivets called-out in Figure 3.

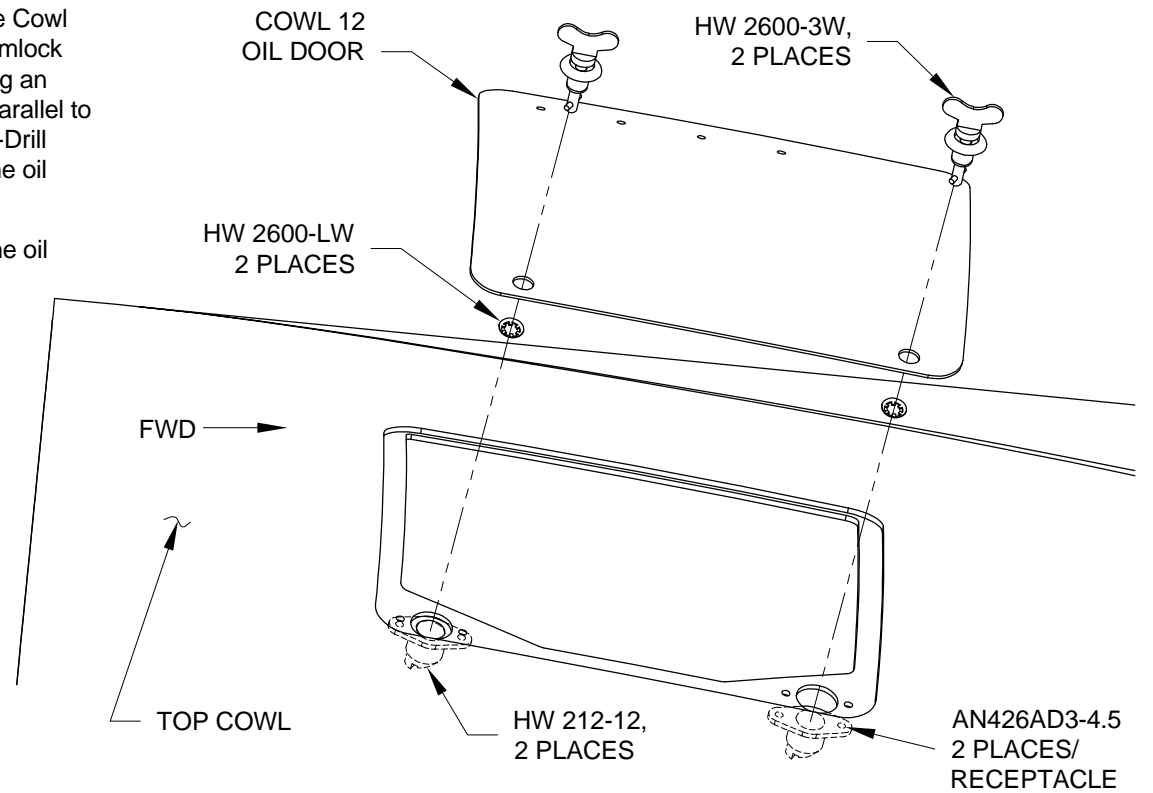
Secure the HW 2600-3W camlock fasteners to the Cowl 12 Oil Door using HW 2600-LW camlock washers.

Step 6: Secure the VA-263 Oil Door Hinge Lugs to the Cowl 12 Oil Door Assembly temporarily as shown in Figure 4. Trim BUSHING TFI-0304-04 to 3/16" total length using a file.

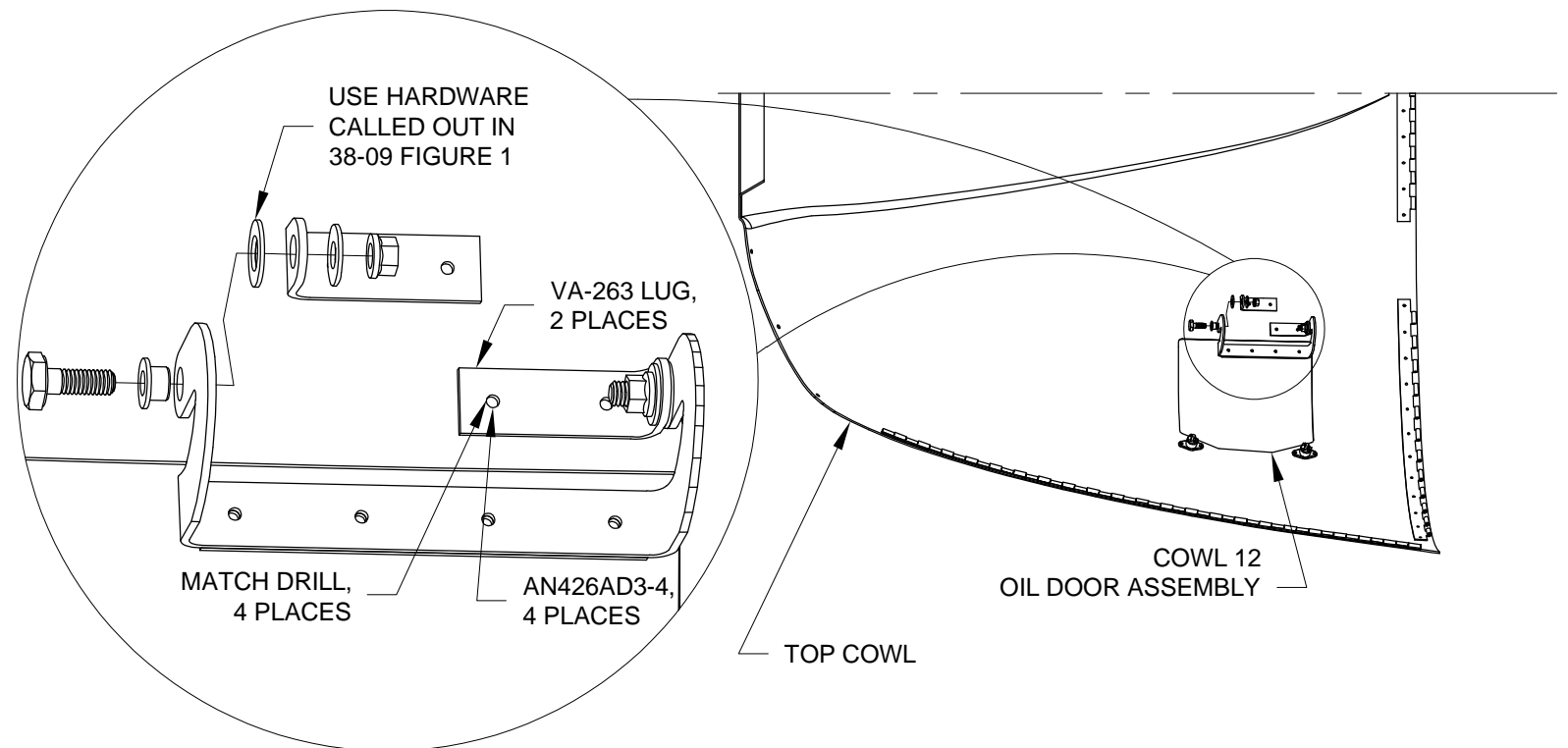
Step 7: Attach the Cowl Oil Door Assembly to the top cowl using the camlock fasteners and invert the top cowl. Rotate the VA-263 Oil Door Hinge Lugs so that they are in contact with the top cowl and match-drill #40 the rivet hole locations in each as shown in Figure 4.

Step 8: Remove the Cowl 12 Oil Door Assembly and detach the VA-263 Oil Door Hinge Lugs. Machine countersink the 4 rivet holes in the top cowl.

Step 9: Cleco then rivet the VA-263 Oil Door Hinge Lugs to the top cowl using the hardware called out in Figure 4.

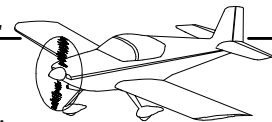


**FIGURE 3: INSTALLING THE OIL DOOR CAMLOCKS**



**FIGURE 4: INSTALLING THE OIL DOOR HINGE LUGS**





**Step 1:** Reattach the Cowl 12 Oil Door Assembly to the oil door hinge lugs using the hardware called out in Figure 1. Tighten the nuts until the play is gone and the door will stay open on its own. Close the oil door and secure the camlocks.

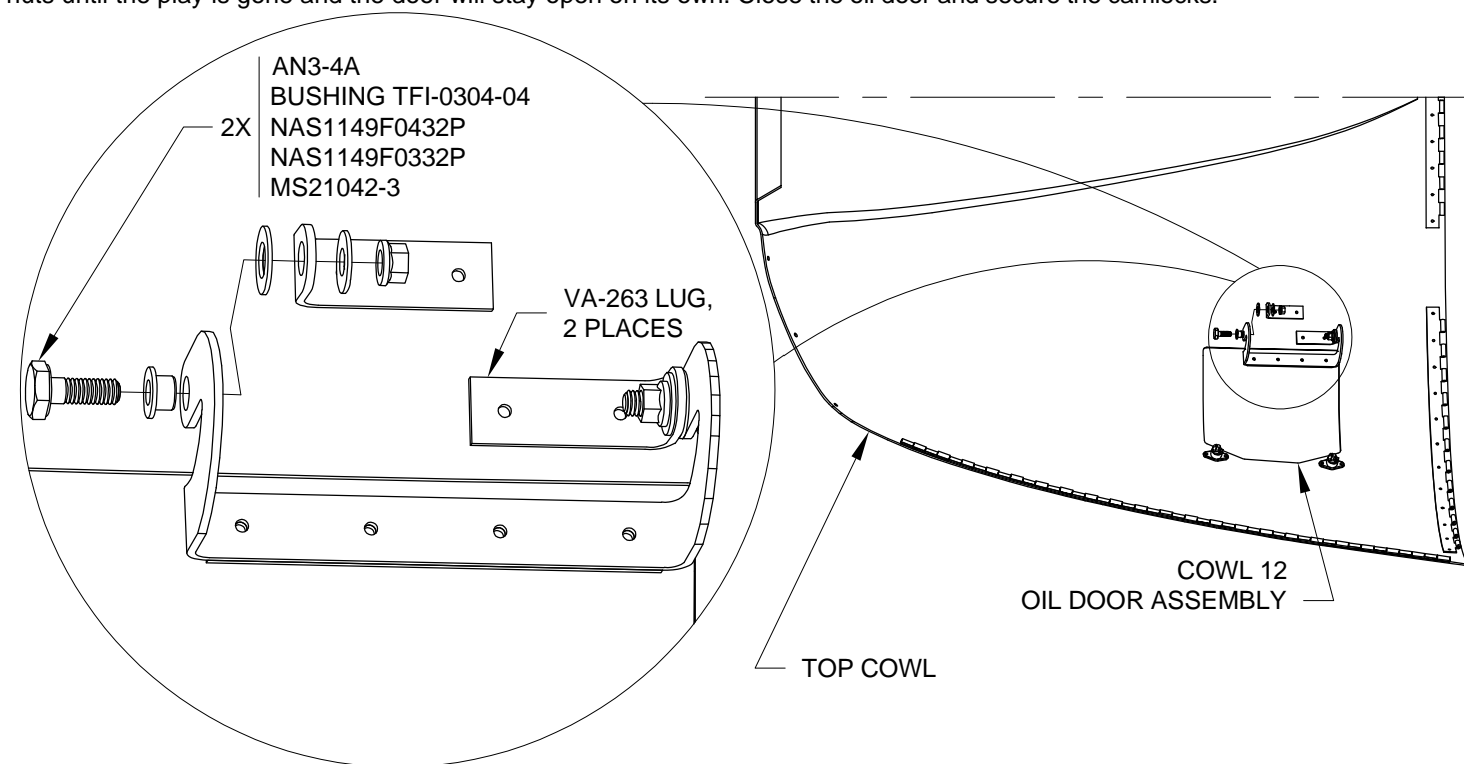
**Step 7:** Install the F-1285 Cowl Bottom Close-out and attach the bottom cowl to the close-out using the hardware called out in Figure 3. Use a sanding block to remove the excess fiberglass if the aft edge of the cowl extends beyond the aft edge of the F-1285 Cowl Bottom Close-out.

**Step 8:** Drill #30 a pilot hole through each of the nutplates on the F-12118 Cowl Attach Plates into the bottom cowl. Remove the cowl and final-drill #19 the four pilot holes. See Figure 3.

**Step 9:** Install the bottom cowl and attach the hardware called out in Figure 3. Install the top cowl and secure with the hinge pins.

**Step 10:** When installed there should be a minimum 1/32 gap on all cowl edges and between the cowl and fuselage to allow for paint. Use a sanding block to remove additional material from the top cowl and bottom cowl as required.

**NOTE:** Do not sand or finish the outside surface of the cowl at this time, translucency will be required for duct installation.



**FIGURE 1: OIL DOOR ASSEMBLY INSTALLATION**

**Step 2:** Remove the middle nose gear attach bolt indicated in Figure 2.

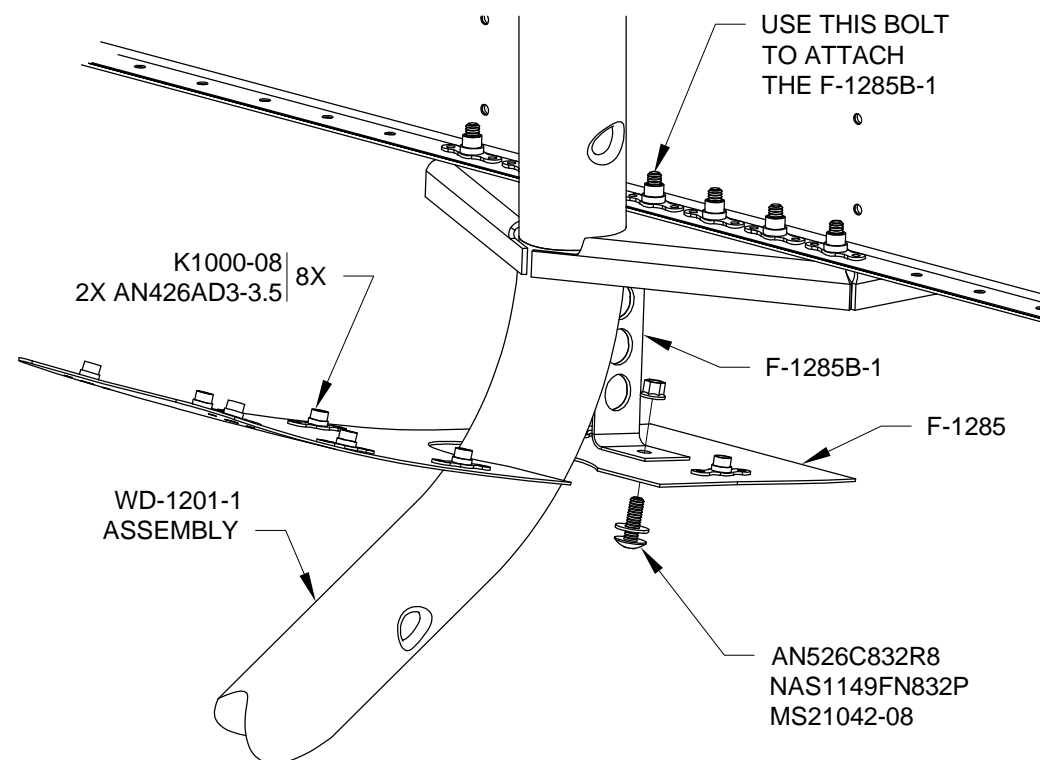
**Step 3:** Slip the middle nose gear attach bolt through the F-1285B-1 Cowl Close-out Bracket so that the bracket is perpendicular to the bottom of the aircraft with the angled flange sweeping up towards the front. See Figure 2.

**Step 4:** Bend the F-1285 Cowl Bottom Close-out to fit the curve of the bottom cowl. Slip the cowl bottom close-out around the WD-1201-1 Nose Gear Assembly and inside the bottom cowl.

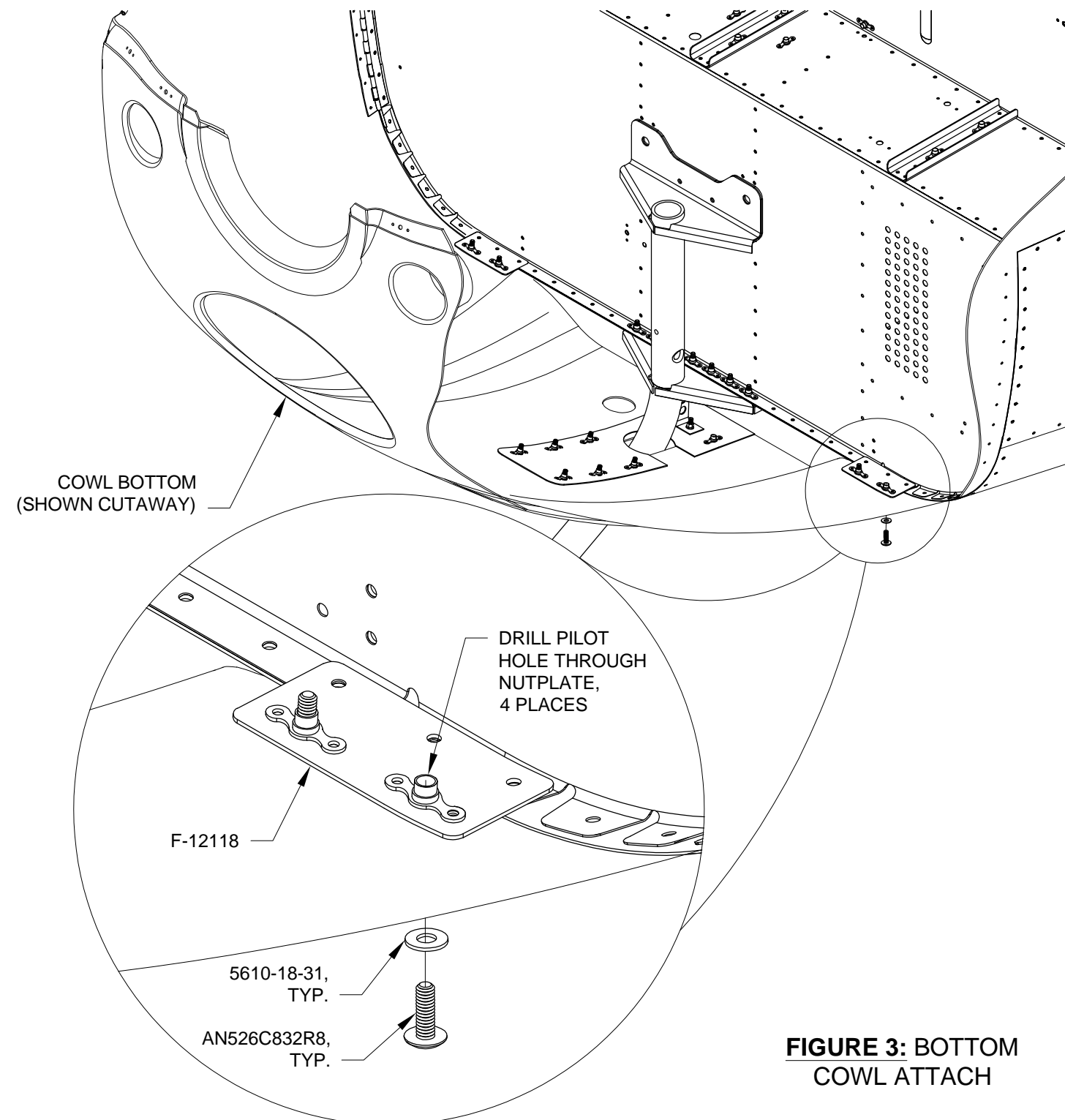
Attach the cowl bottom close-out to the F-1285B-1 Cowl Close-out Bracket using the hardware called out in Figure 2. Align the edges of the cowl bottom close-out with the edges of the slot in the bottom of the bottom cowl. Clamp the cowl bottom close-out to the bottom cowl.

**Step 5:** Match-Drill #19 the nutplate screw holes into the cowl bottom. Insert a screw in the top of each hole to maintain alignment while drilling.

**Step 6:** Remove the F-1285 Cowl Bottom Close-out. Dimple the nutplate rivet holes in the cowl bottom close-out and the rivet holes in the corresponding nutplates. See Figure 2. Rivet the nutplates to the cowl bottom close-out as shown in Figure 2.



**FIGURE 2: CLOSEOUT BRACKET ATTACH**



**FIGURE 3: BOTTOM COWL ATTACH**



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