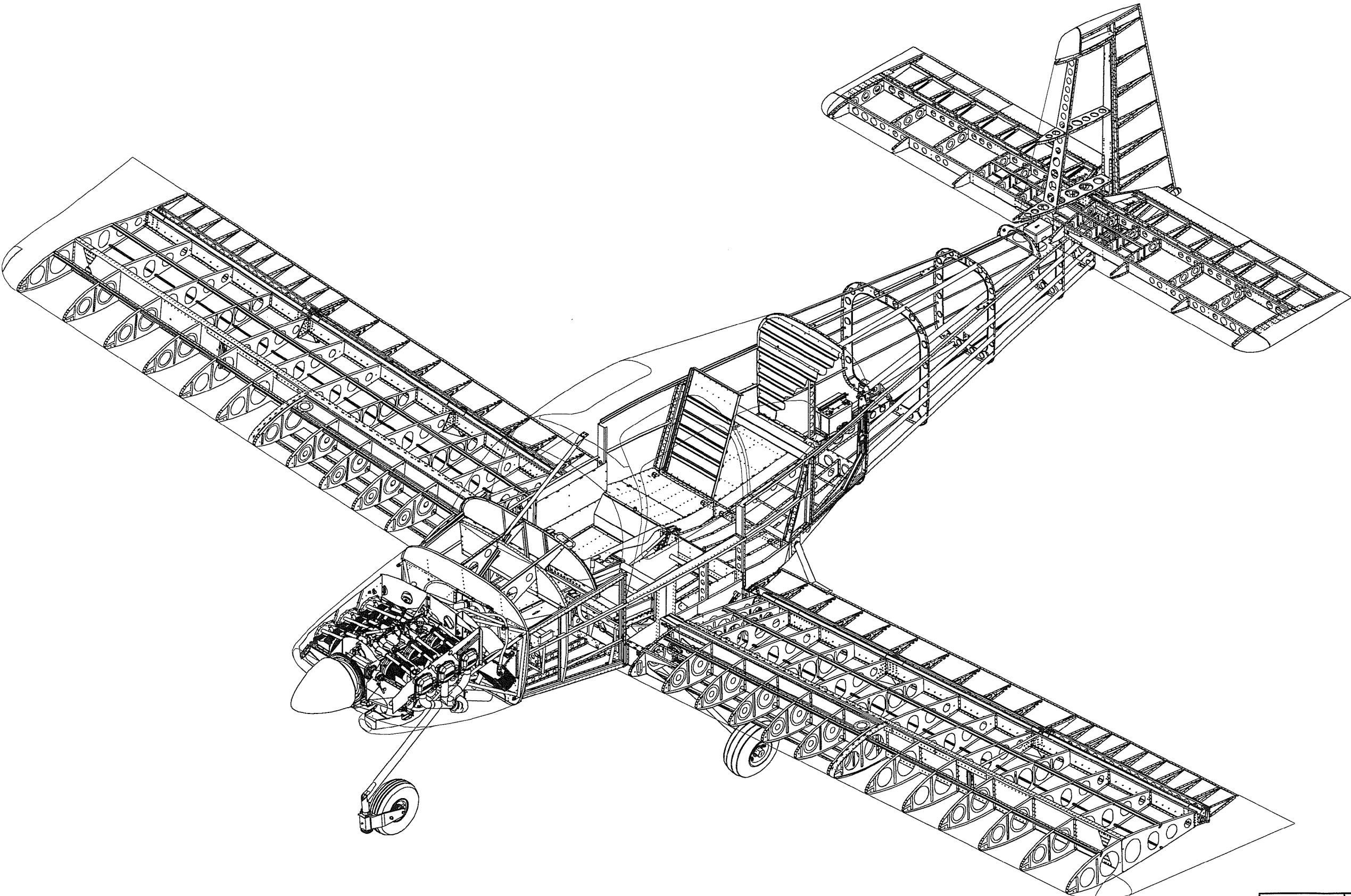


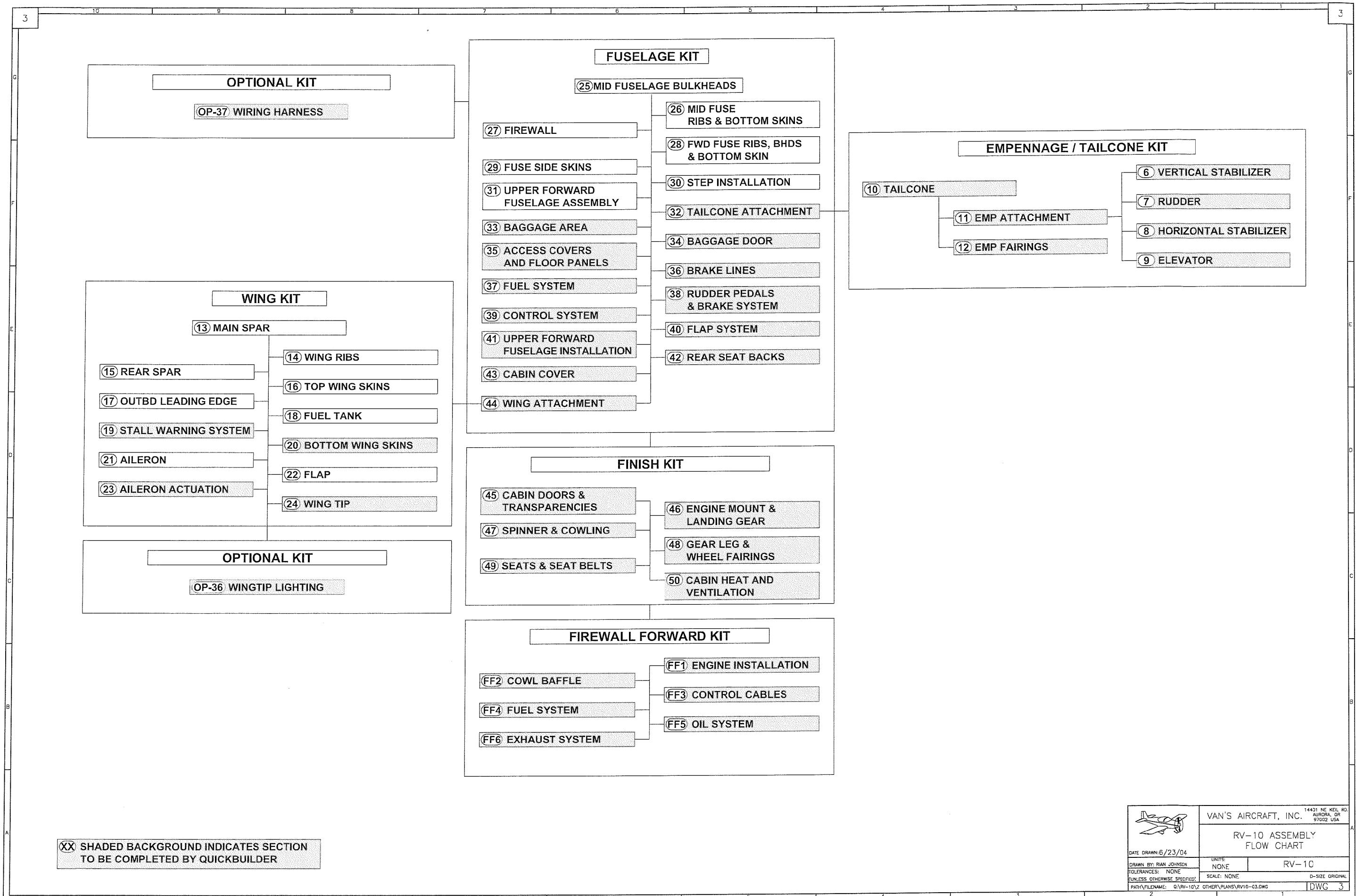
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DWG 1	





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14401 NE KEIL RD.  
AURORA, OR  
97002 USA

VAN'S AIRCRAFT, INC.

DATE DRAWN: 6/23/04

DRAWN BY: RIAN JOHNSON

TOLERANCES: NONE

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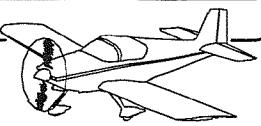
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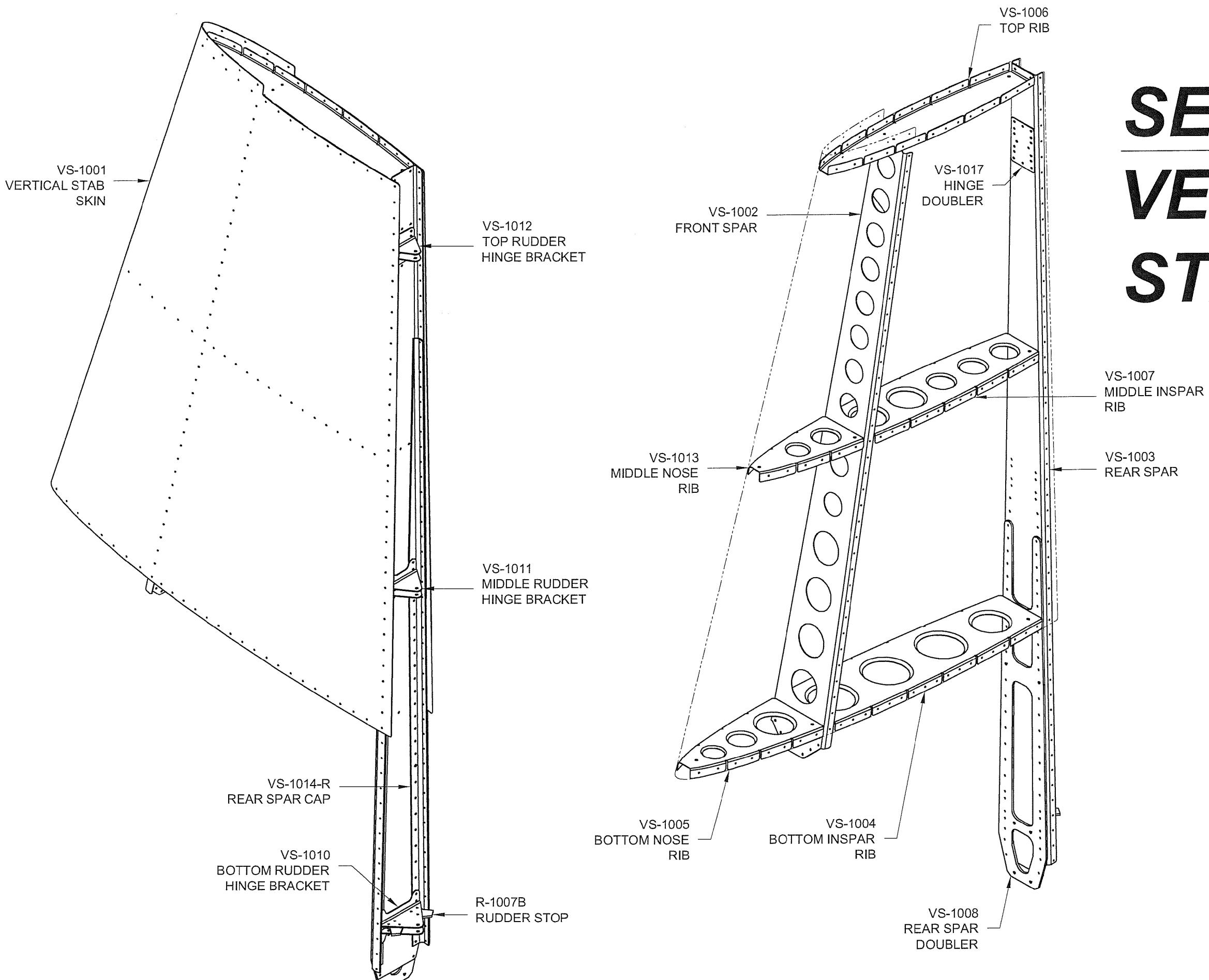
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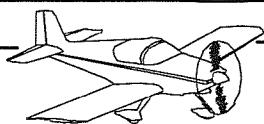
DWG 3





# SECTION 6: VERTICAL STABILIZER





Step 1: Trim flange material (shaded areas) from opposite ends of the two VS-1014 Rear Spar Caps using the dimensions (which apply to both spar caps) in Figure 1. Make sure to trim the material from the longer of the two flanges. (When marking the parts for trimming, clamp them to a table or back to back to remove the bow in the parts.) Once trimmed the spar caps become dedicated left and right parts (VS-1014-L and VS-1014-R respectively) as labeled in the figure. Deburr (Section 5B) the edges of both spar caps to prevent them from scratching mating parts.

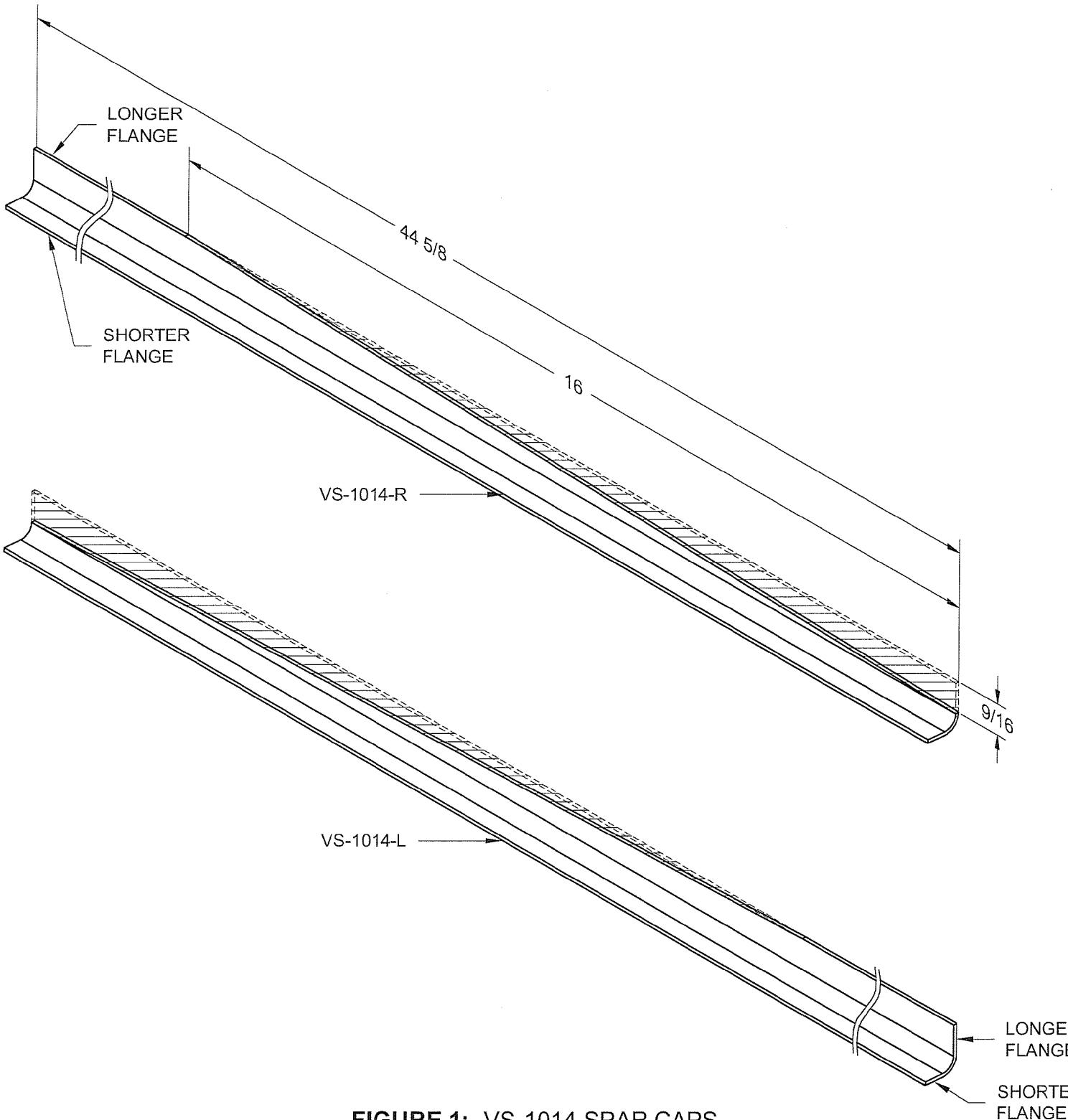


FIGURE 1: VS-1014 SPAR CAPS

Step 2: Nest the VS-1014-L & -R Rear Spar Caps into the corners of the VS-1003 Rear Spar as shown in Figure 2. Note that the trimmed flange of the rear spar caps fits against the web of the rear spar. Flush the bottom of the rear spar caps with the bottom edge of the spar flanges then clamp them in place along the spar flange.

Starting from the bottom of the spar, match-drill about every fourth hole of the rear spar web into the spar caps using a 1/8" drill (ignore the 3/16" upper attach bolt holes; these holes are drilled in Step 5). Cleco each hole as you drill and be sure to drill perpendicular to the spar web, particularly any holes common to the VS-1010 and VS-1011 Bottom and Middle Rudder Hinge Brackets. After reaching the top of the spar caps, go back with the same drill and match-drill the remaining 1/8" holes of the rear spar web into the spar caps.

Remove the spar caps and deburr the holes. Clear away any chips, then cleco the rear spar caps back in place.

Step 3: Match-Drill the flange holes of the VS-1003 Rear Spar into the VS-1014-L and -R Rear Spar Caps using a #40 drill, cleco as you go.

Once again, remove the spar caps and deburr the holes. Clear away any chips, then cleco the rear spar caps back in place.

Step 4: Deburr the edges of the VS-1008 Rear Spar Doubler. Cleco the doubler, the VS-1014-L and -R Spar Caps, the VS-1010 Bottom Rudder Hinge Brackets, and the VS-1011 Middle Rudder Hinge Brackets to the VS-1003 Rear Spar as shown in Figure 2. Cleco the VS-1012 Top Rudder Hinge Brackets and the VS-1017 Hinge Doubler in place.

With all the parts clecoed together, use a #30 drill to final-drill the holes of the top, middle, and bottom rudder hinge brackets, the hinge doubler, and all the 1/8" holes of the spar doubler and spar caps.

Step 5: Match-Drill the upper attach bolt holes of the VS-1003 Rear Spar and VS-1008 Rear Spar Doubler into the VS-1014-L and -R Spar Caps using a 3/16" drill. Don't final-drill these holes to size (#12) yet; this is done when the vertical stabilizer is fitted to the tailcone.

Step 6: Machine countersink (Section 5E) all of the #30 holes on the forward side of the VS-1008 Spar Doubler, below the upper attach bolt holes, for 1/8" flush rivets.

UPPER ATTACH BOLT HOLES:  
MACHINE CSK ALL #30 HOLES  
BELOW THESE TWO HOLES  
FLUSH ON THIS (FORWARD) SIDE.

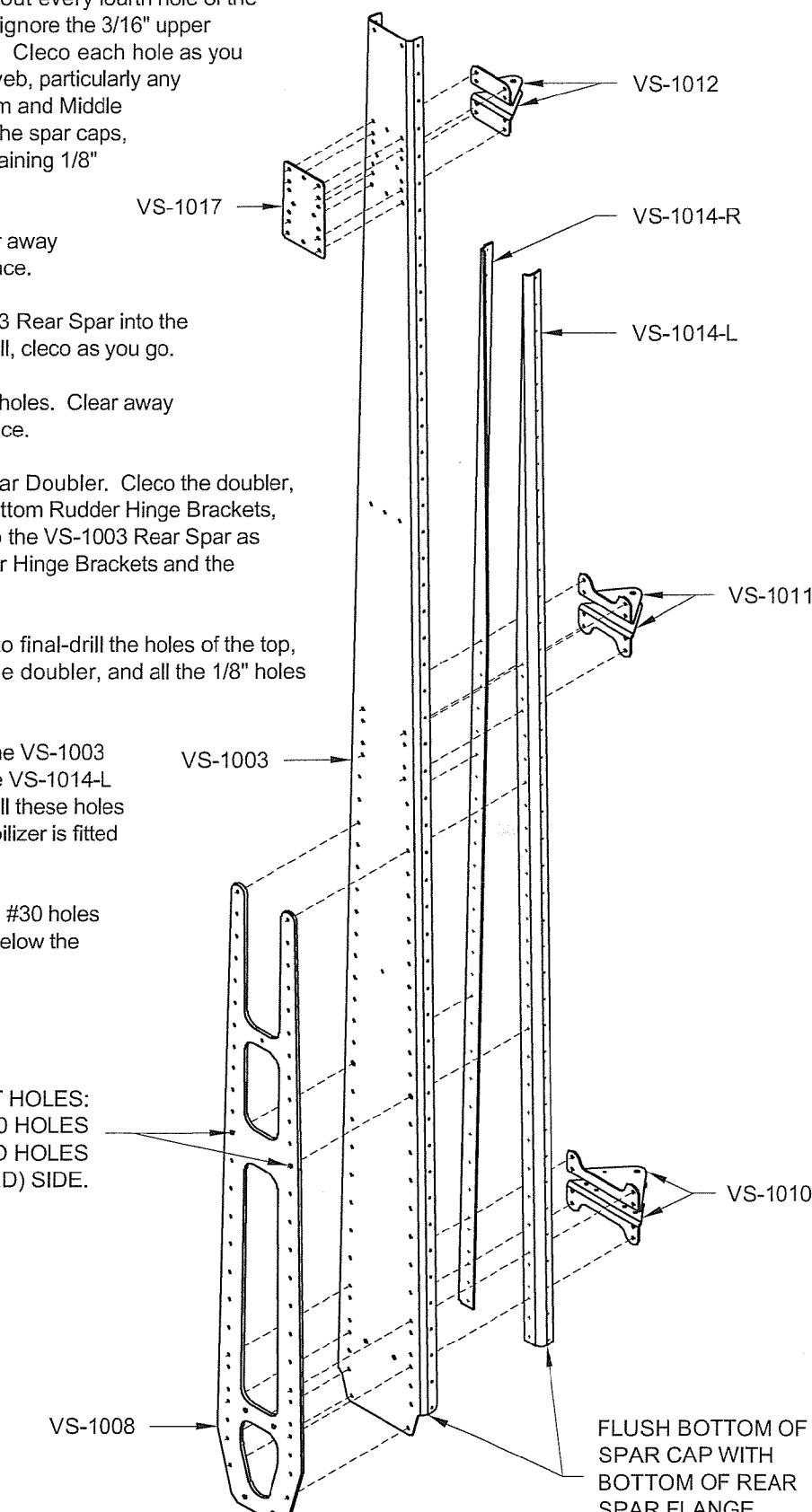
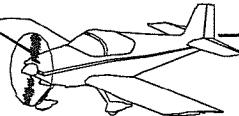


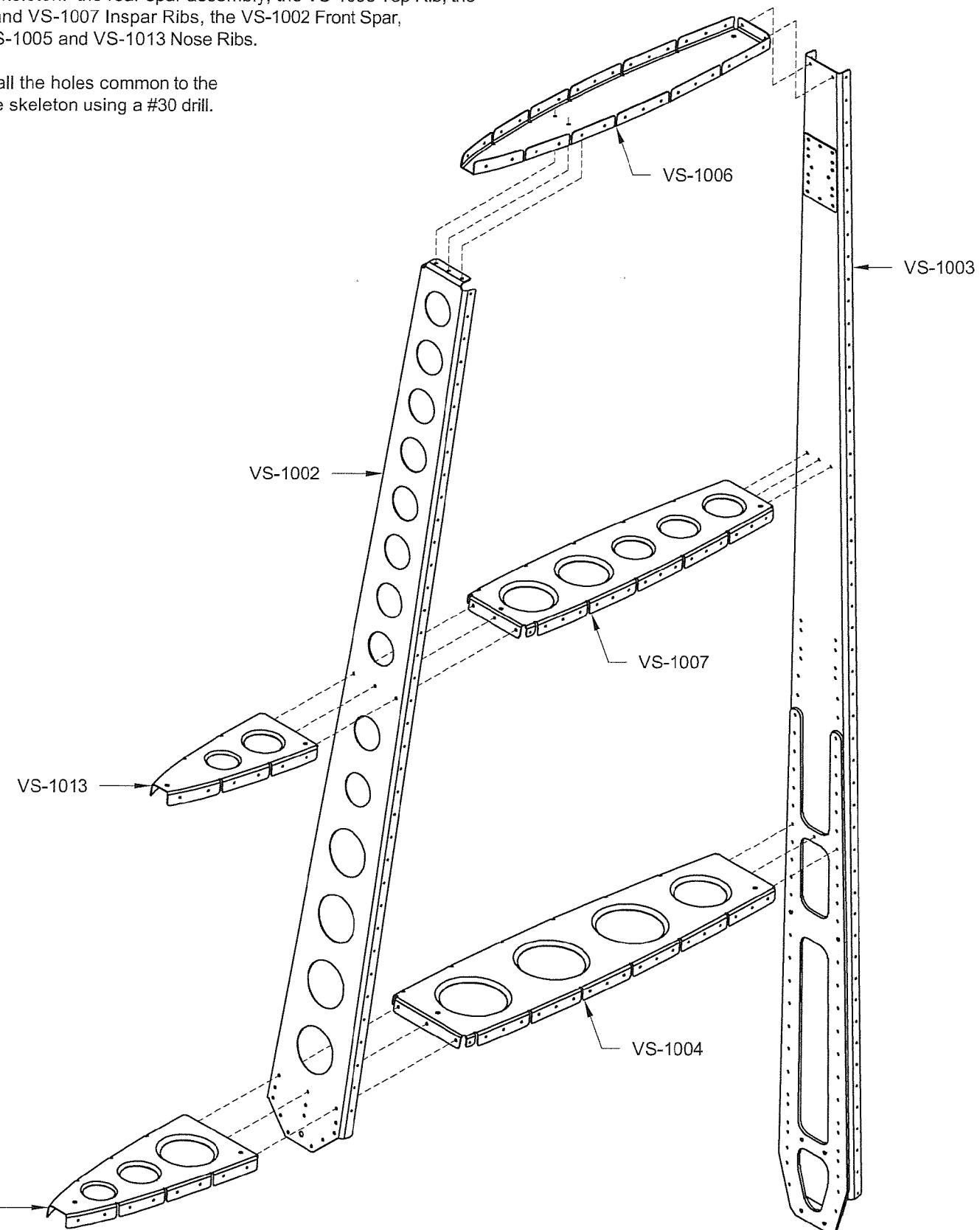
FIGURE 2: REAR SPAR ASSEMBLY



Step 1: Deburr the edges of all remaining parts to prevent scratching during fitting.

Step 2: As shown in Figure 1, cleco together all the parts of the vertical stabilizer skeleton: the rear spar assembly, the VS-1006 Top Rib, the VS-1004 and VS-1007 Inspark Ribs, the VS-1002 Front Spar, and the VS-1005 and VS-1013 Nose Ribs.

Final-Drill all the holes common to the parts in the skeleton using a #30 drill.



**FIGURE 1: SKELETON ASSEMBLY**

Step 3: Remove the vinyl from the inside surface of the VS-1001 Vertical Stab Skin then cleco it to the skeleton as shown in Figure 2.

Step 4: Final-Drill all the holes common to the skin and skeleton with a #40 drill, then remove the skin from the skeleton and deburr the holes.

Step 5: Empennage fairing screw holes are indicated on Page 6-6, Figure 1, along the bottom edge of the depicted skin. Mark the corresponding holes in the VS-1001 Vertical Stab Skin, and in the flanges of the VS-1005 Bottom Nose Rib, the VS-1004 Bottom Inspark Rib, and the VS-1003 Rear Spar.

Step 6: Dimple all the holes of the VS-1001 Vertical Stab Skin except for the following: the eight vertical stab tip fairing attachment holes at the top of the skin (see Page 6-6, Figure 1) and the holes just marked in Step 5. Depending on the vintage of your "C" frame tool, you may not be able to reach all of the holes to dimple. The unreachable holes can be dimpled with a pop rivet dimple die set available from tool suppliers.

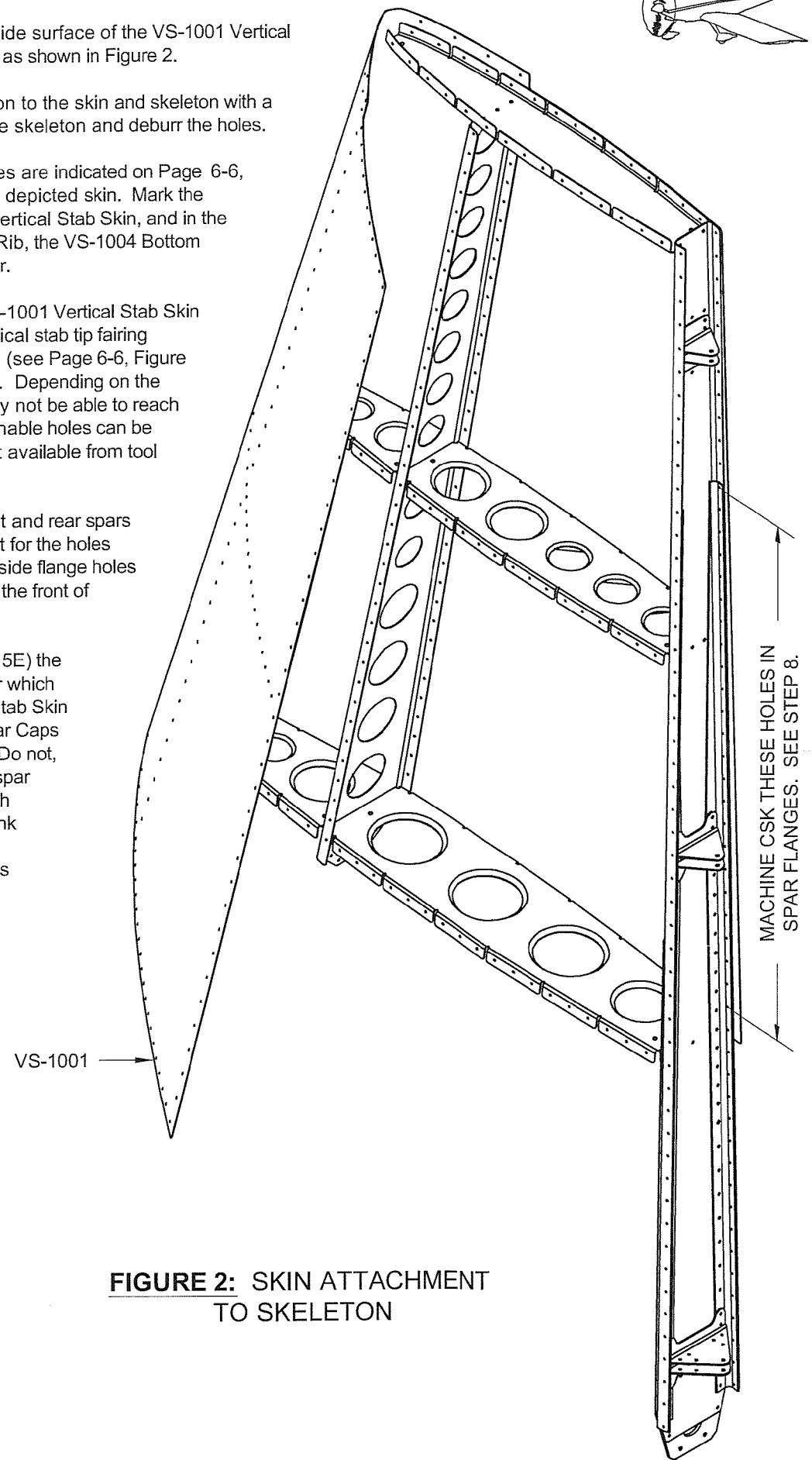
Step 7: Remove the ribs from the front and rear spars then deburr all of the rib holes. Except for the holes marked in Step 5, dimple all of the rib side flange holes (including the hole in the small tabs at the front of the VS-1004 & -1007 Inspark ribs).

Step 8: Machine countersink (Section 5E) the flange holes in the VS-1003 Rear Spar which are common to the VS-1001 Vertical Stab Skin and to the VS-1014-L and -R Rear Spar Caps (see note along the side of Figure 2). Do not, however, countersink the holes in the spar (located at the bottom of the skin) which were marked in Step 5. The countersink should be deep enough to accept the dimple of the skin. Leave the spar caps clecoed in place during this operation.

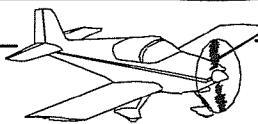
Step 9: Disassemble the rear spar assembly and deburr all holes. Be sure to mark (Section 5C) the rudder hinge brackets as they are removed so they can be reinstalled in the same position as drilled.

Step 10: Dimple the flange holes of the VS-1003 Rear Spar above the machine countersunk holes.

Step 11: Final-Drill #12 the single 3/16" hole in each of the VS-1010 Bottom, VS-1011 Middle, and VS-1012 Top Rudder Hinge Brackets. Deburr the holes.



**FIGURE 2: SKIN ATTACHMENT TO SKELETON**

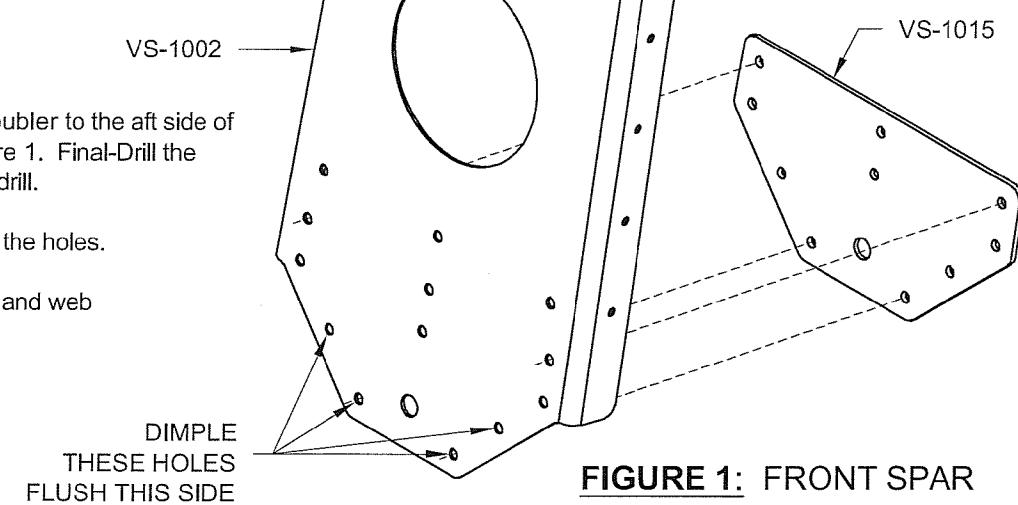


Step 1: Cleco the VS-1015 Front Spar Doubler to the aft side of the VS-1002 Front Spar as shown in Figure 1. Final-Drill the holes of the doubler and spar using a #30 drill.

Remove the front spar doubler and deburr the holes.

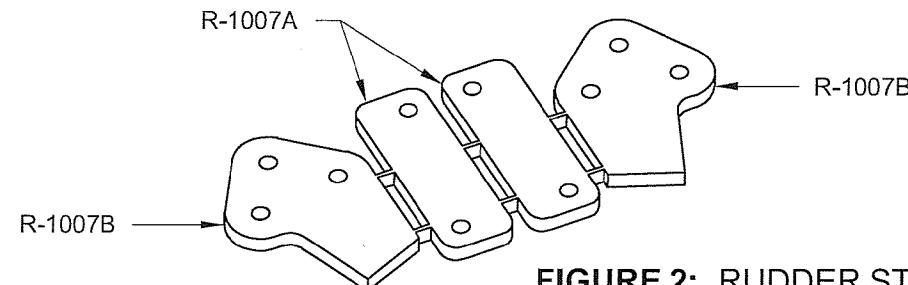
Step 2: Deburr all the holes in the flanges and web of the front spar.

Dimple the four bottom holes in the front spar (see figure) and machine countersink (Section 5E) the corresponding holes in the front spar doubler. Dimple the flange holes of the front spar for the skin.



**FIGURE 1: FRONT SPAR DOUBLER ATTACHMENT**

Step 3: Separate the R-1007 Rudder Stop parts, shown in Figure 2, into individual components; the R-1007A Striker Plates and the R-1007B Rudder Stops. File off any remaining stubs and deburr the edges. The striker plates will be used in the rudder assembly and can be set aside for now.



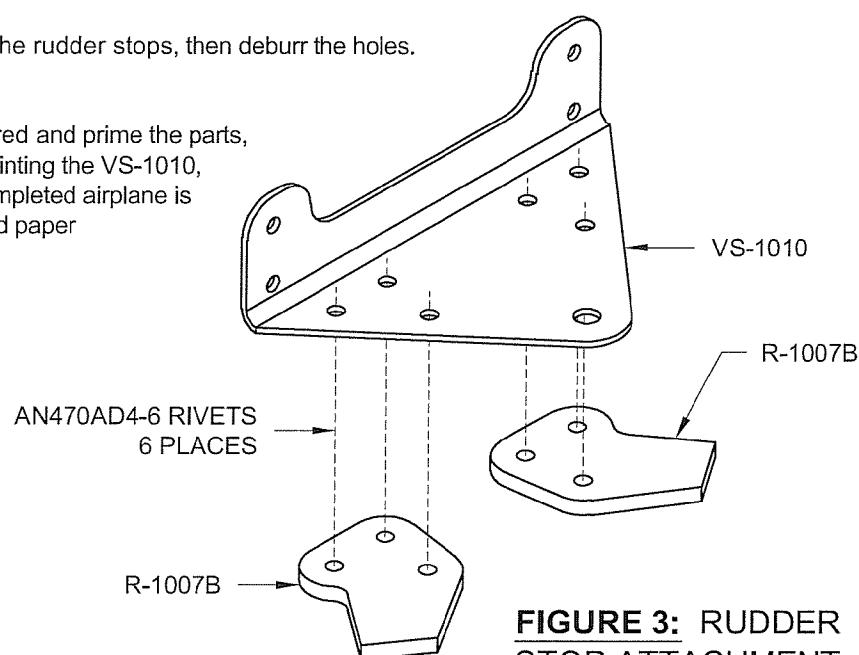
**FIGURE 2: RUDDER STOP PARTS SEPARATION**

Step 4: Cleco the R-1007B Rudder Stops to the upper of the two VS-1010 Bottom Rudder Hinge Brackets as shown in Figure 3. Be careful to cleco the rudder stops as shown, the hole pattern will allow them to be clecoed in reverse.

Final-Drill the holes with a #30 drill, mark and remove the rudder stops, then deburr the holes.

Step 5: Double check that all parts are properly deburred and prime the parts, if desired, in preparation for riveting. If you plan on painting the VS-1010, -1011, and -1012 Rudder Hinge Brackets when the completed airplane is painted, you should first scuff the powder coat with sand paper or some other type of abrasive pad.

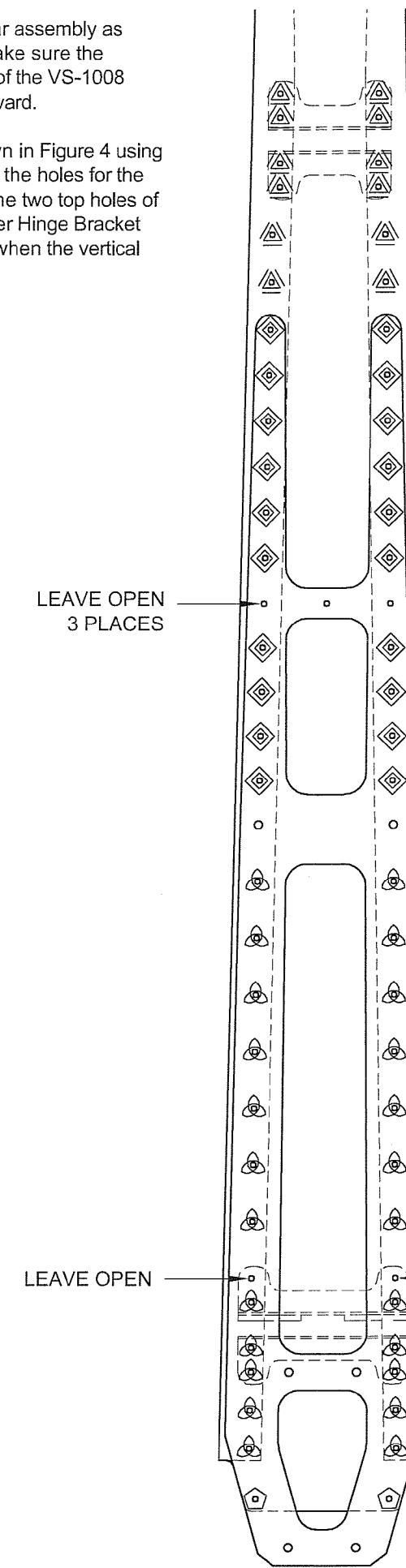
Step 6: Rivet (section 5D) the R-1007B Rudder Stops to the VS-1010 Rudder Hinge Bracket of Step 4 using the rivets called out in Figure 3.



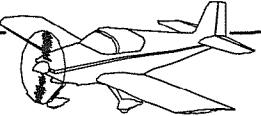
**FIGURE 3: RUDDER STOP ATTACHMENT**

Step 7: Reassemble the rear spar assembly as shown on Page 6-2, Figure 2. Make sure the countersunk holes at the bottom of the VS-1008 Rear Spar Doubler are facing forward.

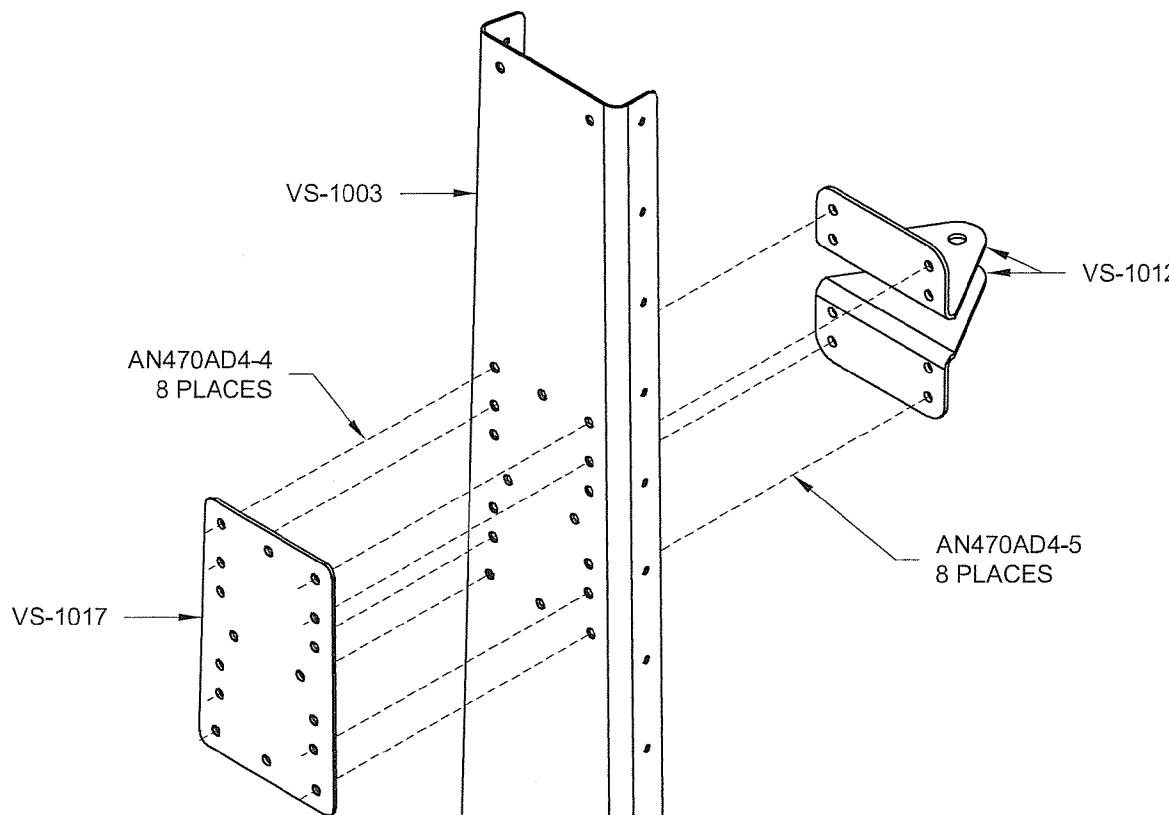
Rivet (Section 5D) the parts shown in Figure 4 using the rivets called out. Leave open the holes for the VS-1007 Middle Inspar Rib and the two top holes of the upper VS-1010 Bottom Rudder Hinge Bracket (these holes are final-drilled #12 when the vertical stabilizer is fitted to the tailcone).



**FIGURE 4: REAR SPAR RIVETS**

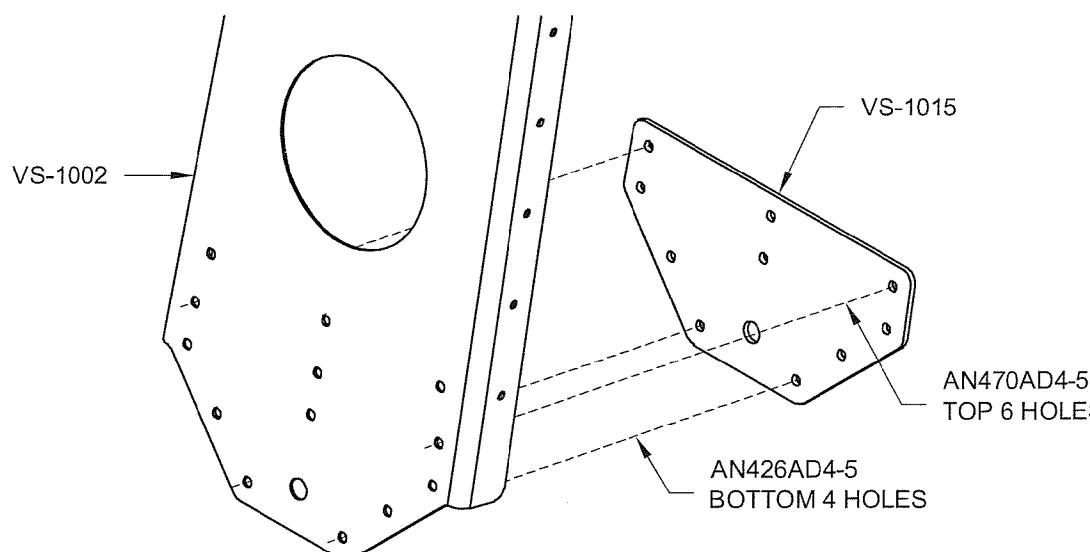


Step 1: Attach the VS-1012 Top Rudder Hinge Brackets and the VS-1017 Hinge Doubler to the VS-1003 Rear Spar using the rivets called out in Figure 1.



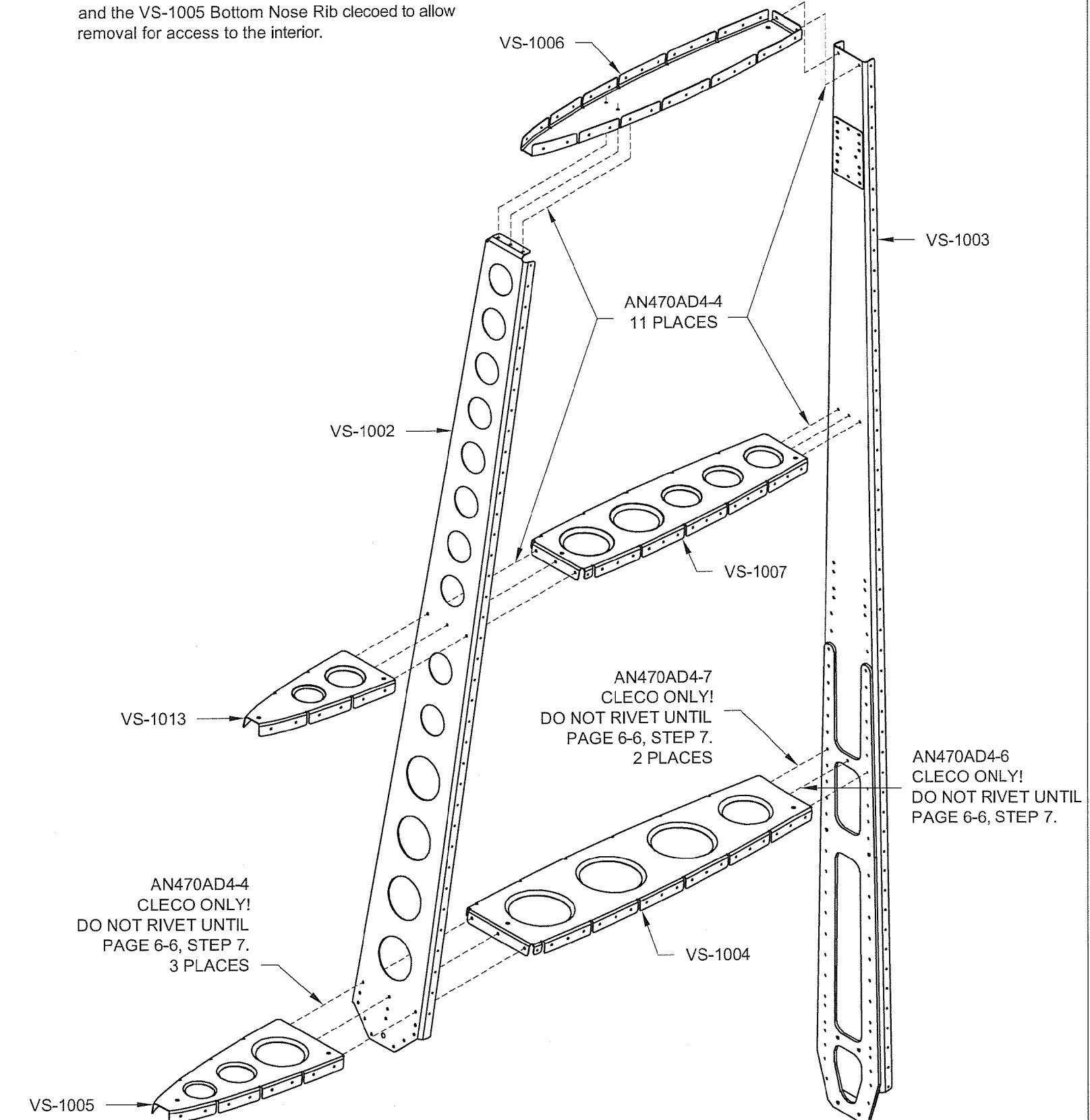
**FIGURE 1: TOP RUDDER HINGE BRACKET AND HINGE DOUBLER RIVETS**

Step 2: Attach the VS-1015 Front Spar Doubler to the VS-1002 Front Spar using the rivets called out in Figure 2.

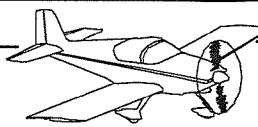


**FIGURE 2: FRONT SPAR DOUBLER RIVETS**

Step 3: Attach the parts shown in Figure 3 using the rivets called out. Leave the VS-1004 Bottom In spar Rib and the VS-1005 Bottom Nose Rib clecoed to allow removal for access to the interior.



**FIGURE 3: RIB RIVETS**



Step 1: Cleco the VS-1001 Vertical Stab Skin to the skeleton. Use plenty of clecos to keep the parts aligned while riveting. Figure 1 provides rivet sizes for the vertical stab skin.

Step 2: Remove the VS-1005 Bottom Nose Rib to gain access to the VS-1013 Middle Nose Rib. Rivet the skin to the middle nose rib starting at the VS-1002 Front Spar and moving forward on both sides.

Step 3: Rivet the VS-1006 Top Rib to the skin forward of the front spar only.

Step 4: Cleco the bottom nose rib back in place and rivet it to the skin only, not to the front spar. Do not install rivets into the holes which will be used to attach the empennage fairing.

Step 5: Rivet the skin to the front spar on both sides. The portion of the spar below the VS-1007 Middle Inspar Rib can be reached by removing the VS-1004 Bottom Inspar Rib. Make sure to capture the holes in the tabs of the middle inspar rib which are common to the front spar flanges. Since the bottom inspar rib is removed, do not rivet the bottom hole in the front spar flange. Access to the upper portion of the spar requires removing some of the clecos in the skin along the top rib and rear spar. Remove as few as possible to insure that the parts remain aligned and only uncleco one side at a time.

Step 6: Replace any clecos previously removed for access, then rivet the skin to the middle inspar rib and to the remainder of the top rib.

Step 7: Cleco the bottom inspar rib in place. Rivet the spar flanges of the bottom ribs to the spars using the rivets called out on Page 6-5, Figure 3. With the exception of the empennage fairing screw holes, rivet the skin to the bottom inspar rib.

Step 8: Rivet the skin to the rear spar leaving the bottom hole open for the empennage fairing.

Step 9: Finish riveting the VS-1014-L and -R Rear Spar Caps to the rear spar, below the skin, with AN470AD3-4 rivets.

NOTE: The VS-1009 Vertical Stabilizer Tip Fairing is installed, along with the other empennage tip fairings, in section 12.

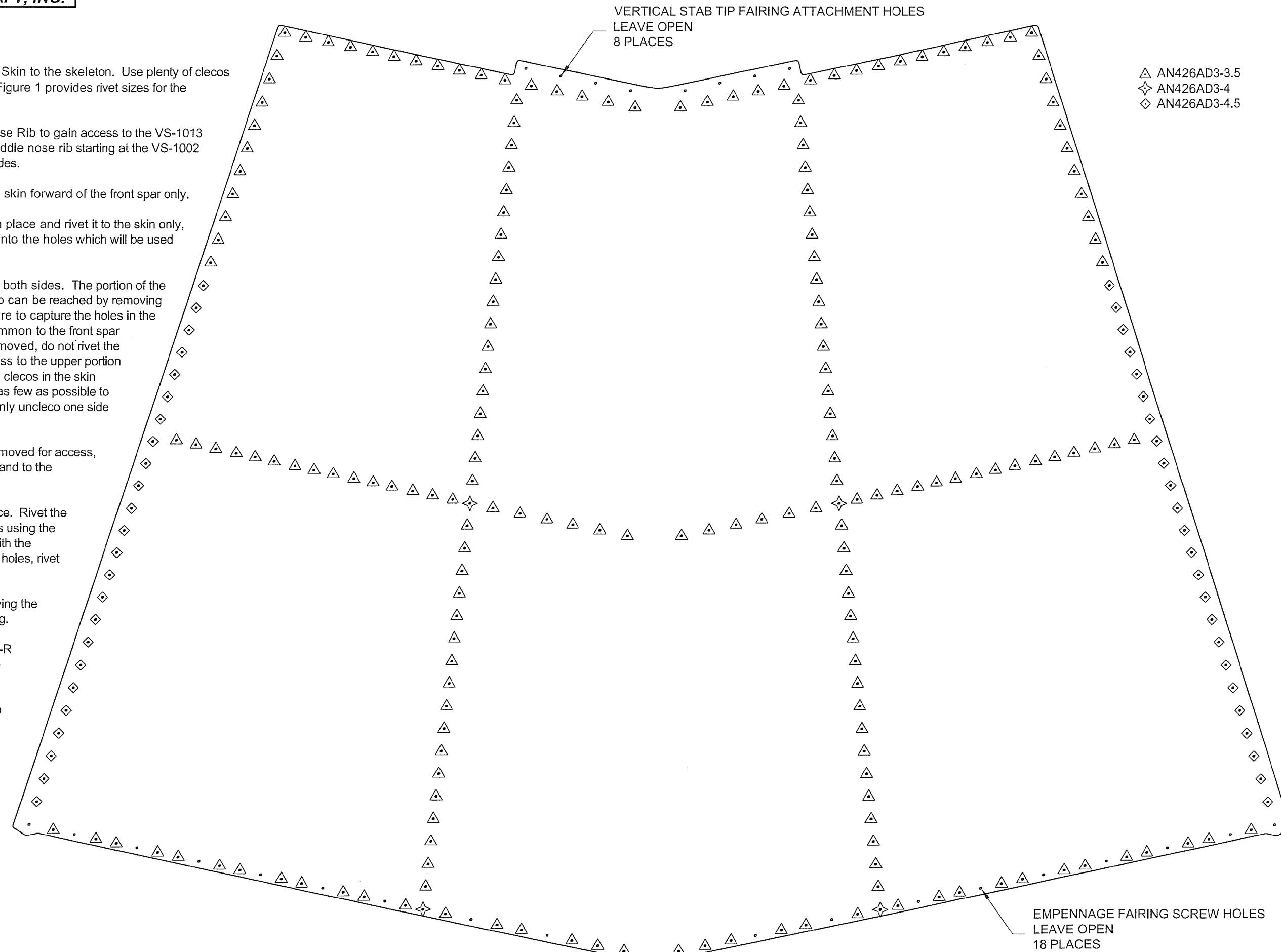
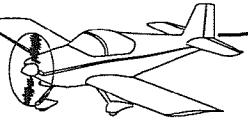
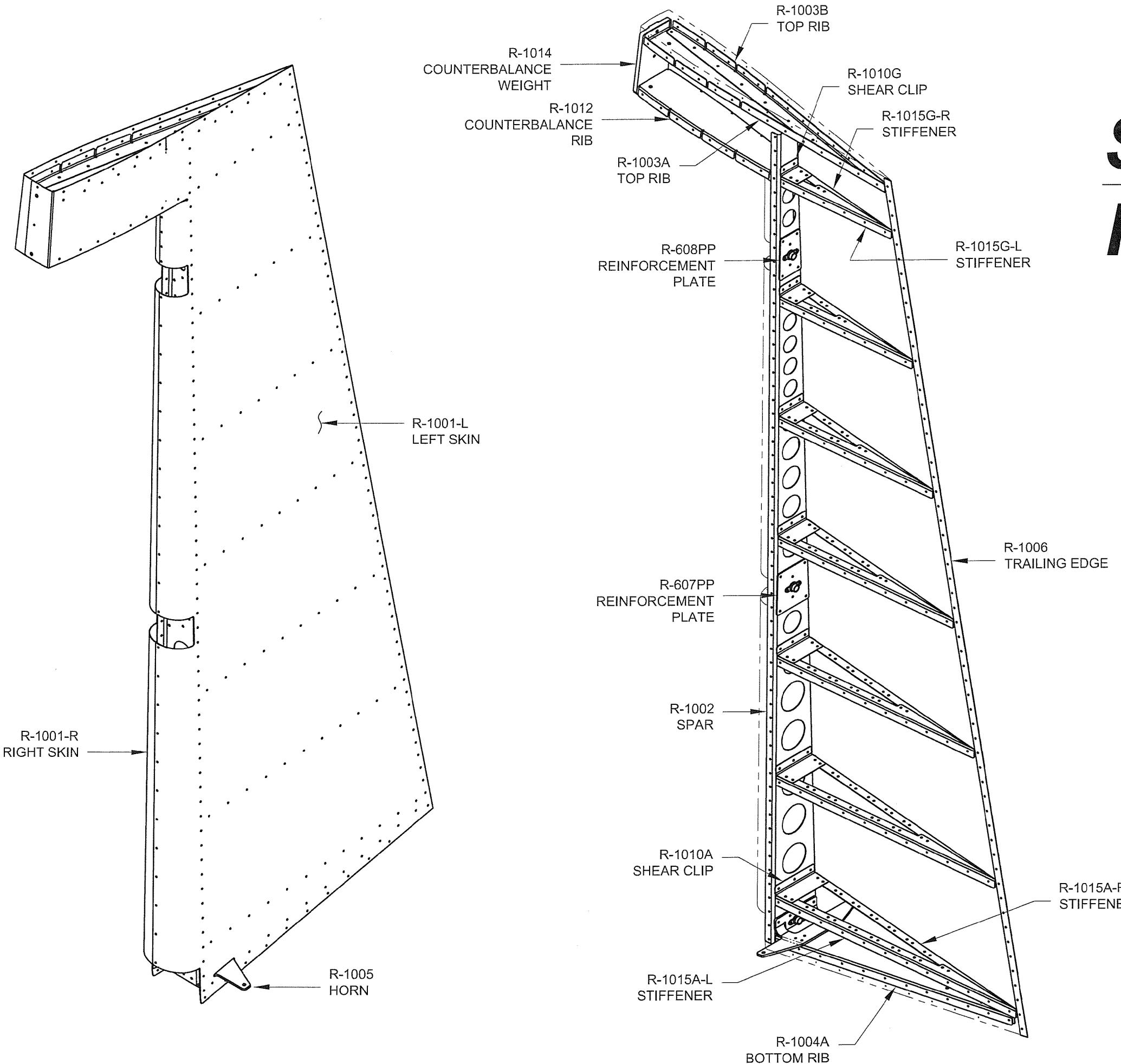
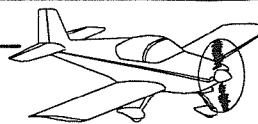


FIGURE 1: VERTICAL STABILIZER SKIN RIVETS

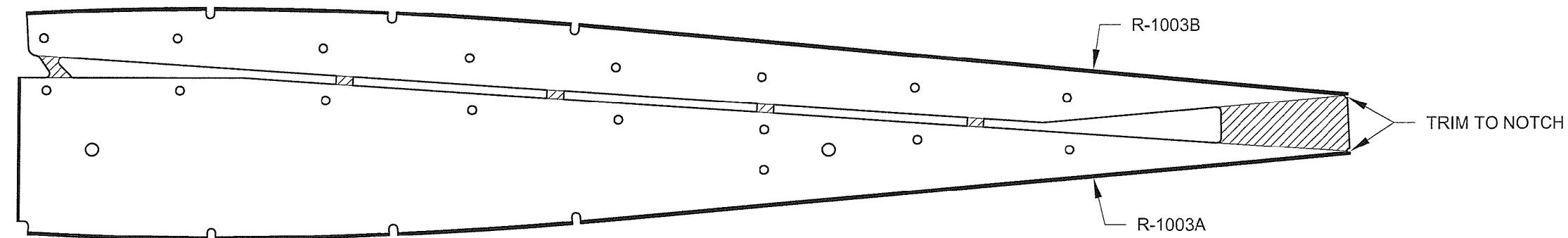


# SECTION 7: RUDDER



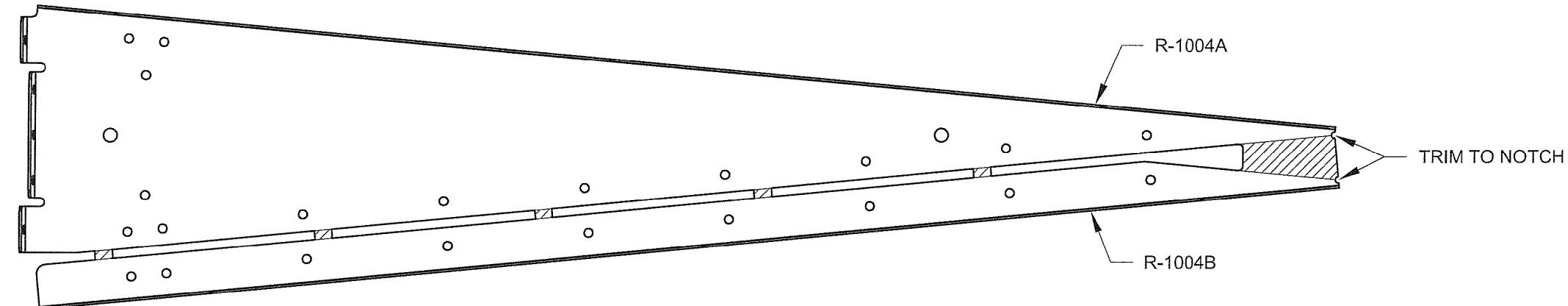


Step 1: Separate the R-1003 Top Rib parts, shown in Figure 1, into individual components: the R-1003A and R-1003B. The shaded areas shown in the figure should be completely removed. Deburr all edges to prevent scratching during fitting.



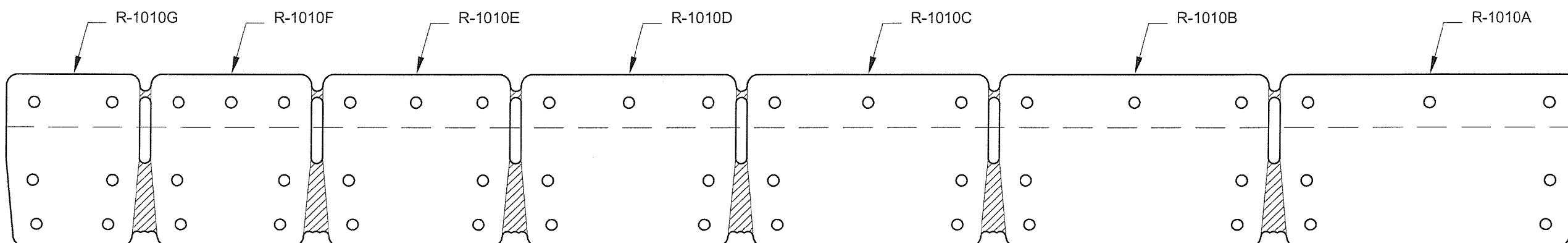
**FIGURE 1: TOP RIB PARTS SEPARATION**

Step 2: Separate the R-1004 Bottom Rib parts, shown in Figure 2, as described in Step 1.

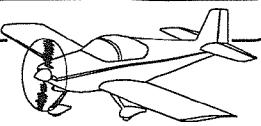


**FIGURE 2: BOTTOM RIB PARTS SEPARATION**

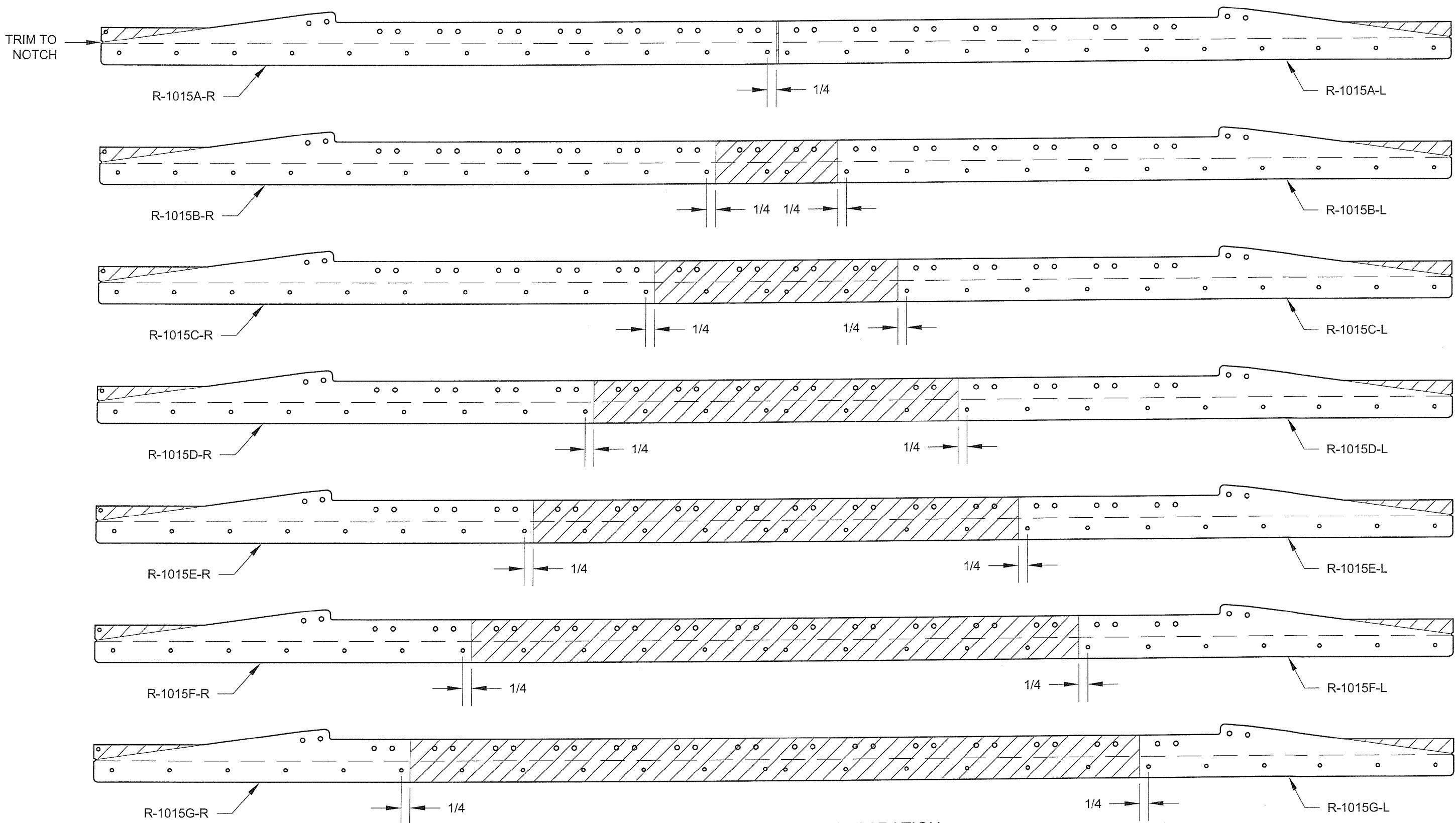
Step 3: Separate the R-1010 Shear Clip parts, shown unbent in Figure 3, as described in Step 1.



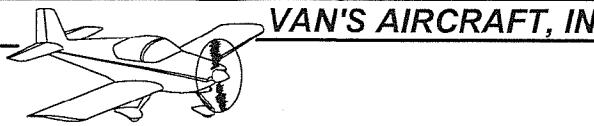
**FIGURE 3: SHEAR CLIP SEPARATION**



Step 1: Remove the shaded areas from the seven R-1015 Stiffeners (shown unbent) according to Figure 1. Each stiffener produces a left and right part when trimmed.

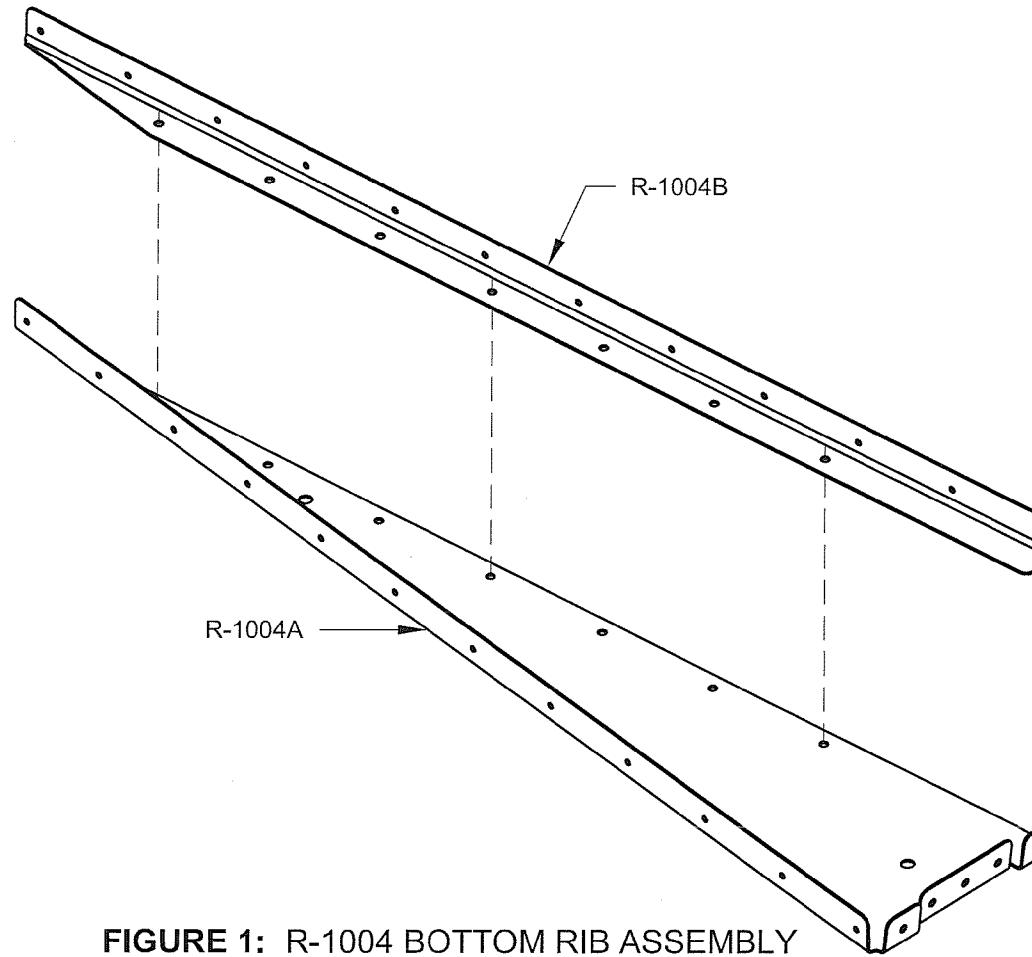


**FIGURE 1: STIFFENER SEPARATION**



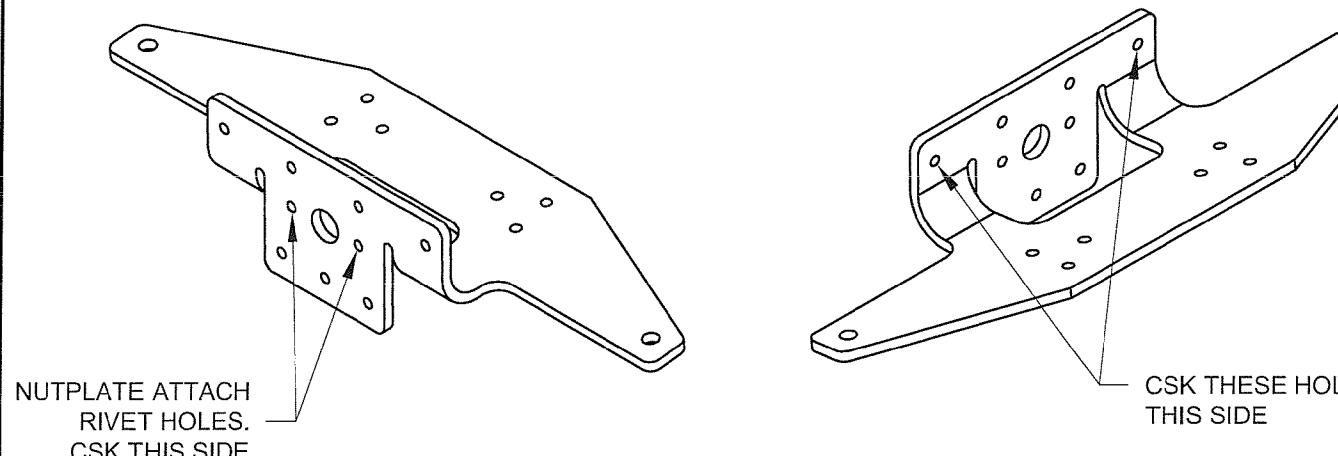
VAN'S AIRCRAFT, INC.

Step 1: Cleco the R-1004A and R-1004B Bottom Rib Halves together, as shown in Figure 1. Final-Drill the holes common to the two parts using a #30 drill.



**FIGURE 1:** R-1004 BOTTOM RIB ASSEMBLY

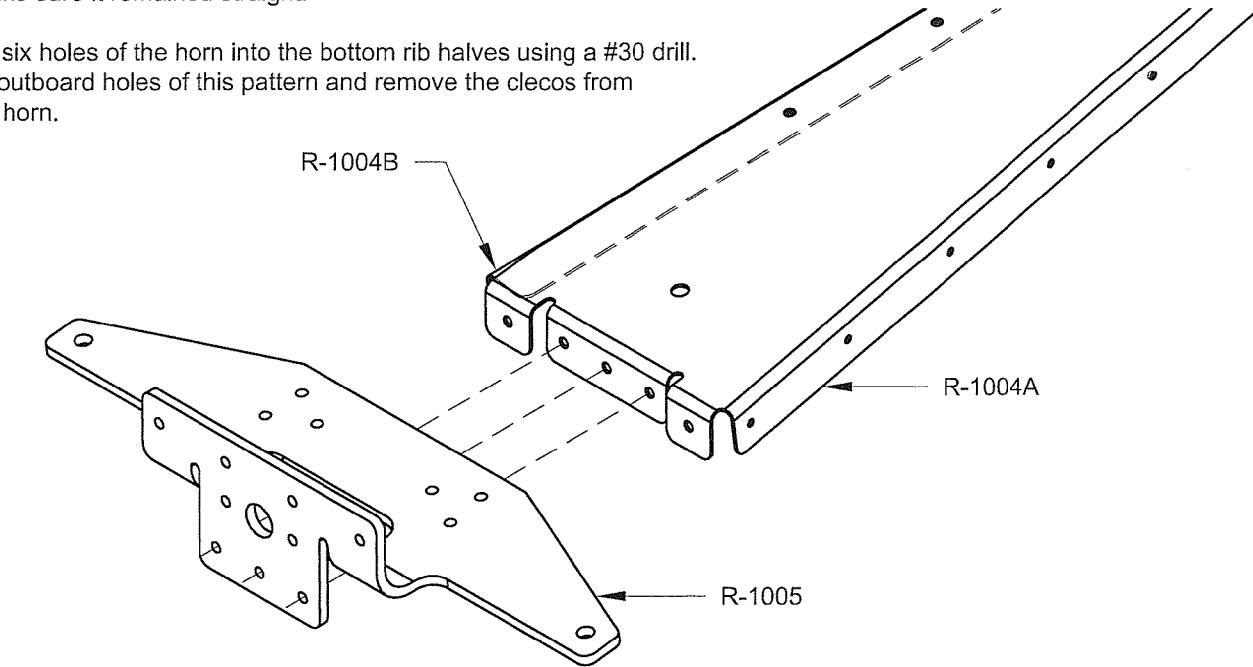
Step 2: Finish all the edges of the R-1005 Rudder Horn. Final-Drill the two nutplate attachment rivet holes, shown in Figure 2, using a #30 drill. Countersink these holes, as well as the other two holes shown in the figure, for 1/8" rivets.



**FIGURE 2:** R-1005 RUDDER HORN

Step 3: Cleco the R-1005 Rudder Horn to the R-1004A Bottom Rib Half using the three holes shown in Figure 3. The R-1004B Bottom Rib Half is unsupported forward of the last cleco which attaches it to the R-1004A. Use a "C" clamp to hold it in position with the R-1004A and the horn (make sure not to cover any of the holes on top of the horn). Lay a straight edge along the flange of the R-1004B to make sure it remained straight.

Match-Drill the six holes of the horn into the bottom rib halves using a #30 drill. Cleco the four outboard holes of this pattern and remove the clecos from the front of the horn.

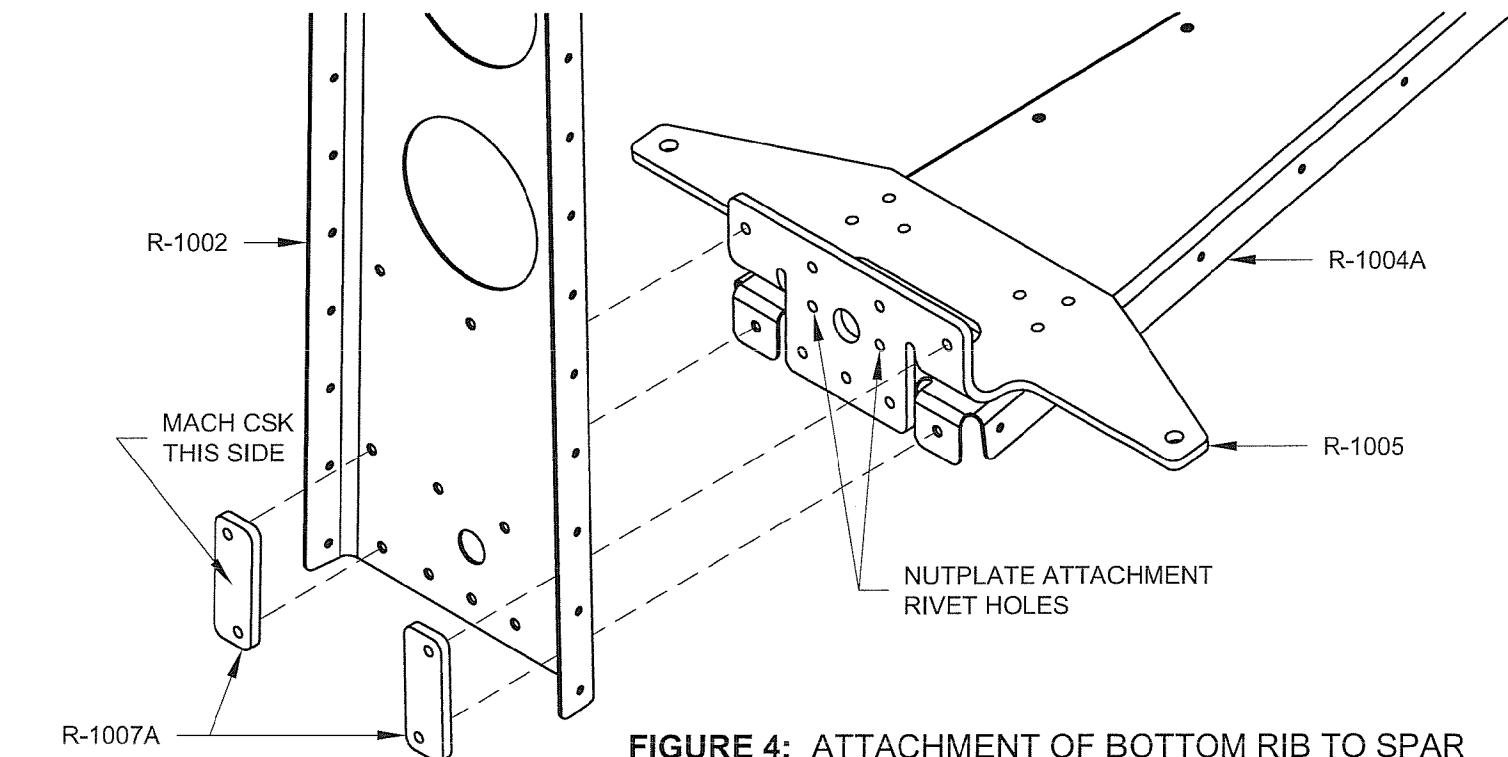


**FIGURE 3:** ATTACHMENT OF HORN TO BOTTOM RIB

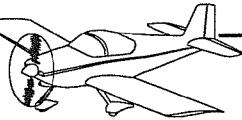
Step 4: Deburr the edges of the R-1002 Spar (including the lightening holes) and the two R-1007A Striker Plates (which were set aside in section 6), then cleco together all the parts shown in the Figure 4.

Step 5: Final-Drill all the holes common to the parts shown using a #30 drill. Note that the two nutplate attachment rivet holes in the horn do not have matching holes in the spar. The nutplate is attached, in a later step, to the horn only.

Step 6: Machine countersink the holes of the striker plates for 1/8" rivets, flush on the forward side. Make sure the holes of the striker plates are oriented as shown in the figure before countersinking or you will end up with either two left or two right striker plates.



**FIGURE 4:** ATTACHMENT OF BOTTOM RIB TO SPAR



Step 1: Cleco the R-1015A-L and -R Stiffeners to the R-1010A Shear Clip as shown in Figure 1. Make sure the aft end of the left stiffener is positioned on top of the right stiffener.

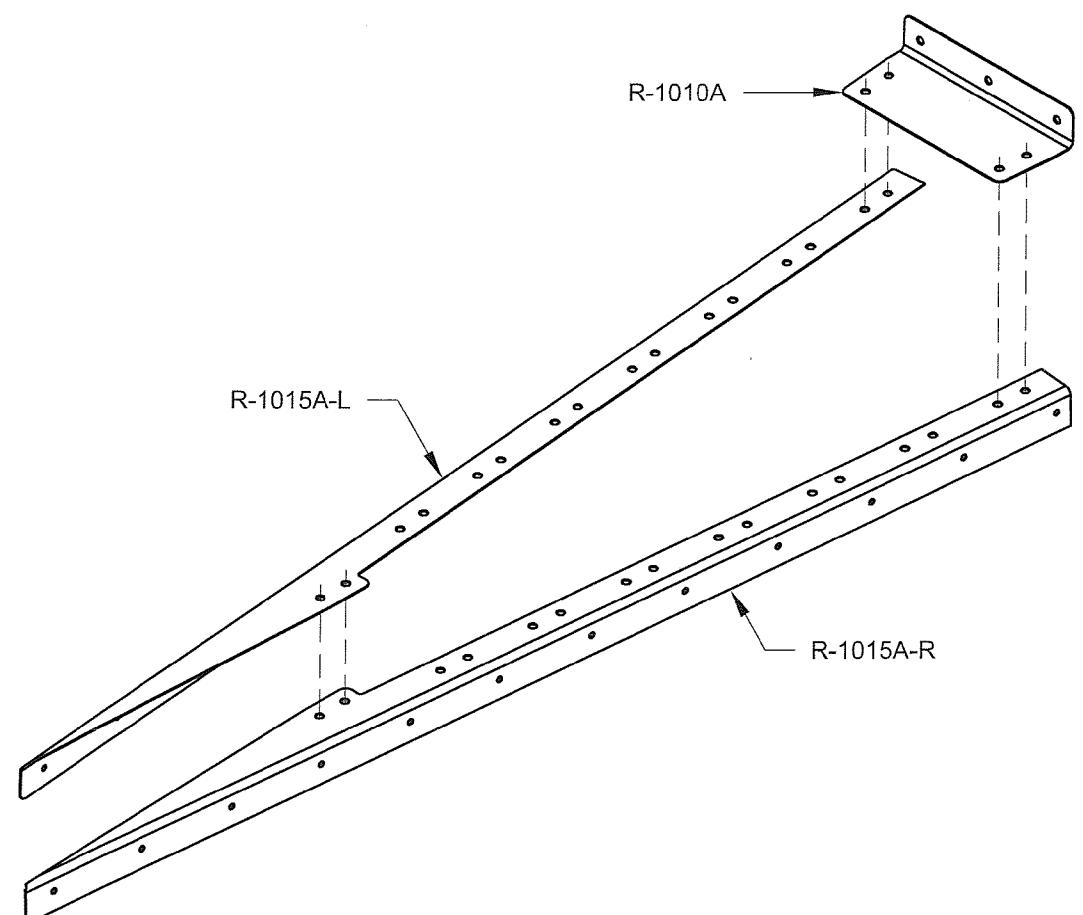
Final-Drill all the holes common to the shear clip and stiffeners . (The only purpose of the aft most hole in the stiffeners is to keep the hole in front of it aligned while it is drilled. It will not be riveted during final assembly.)

Step 2: Repeat step 1 for the rest of the R-1015 Stiffeners and R-1010 Shear Clips shown in Figure 2.

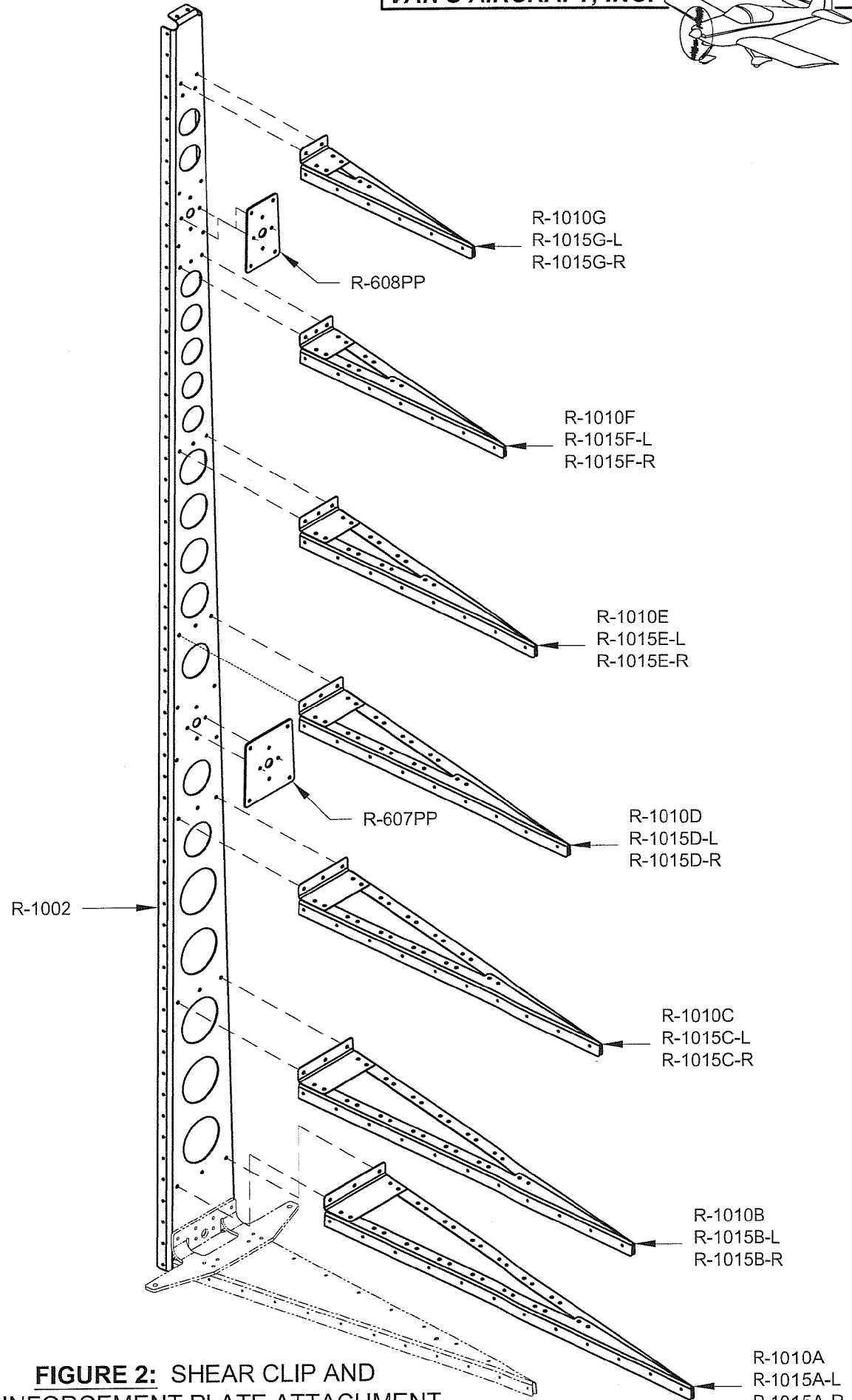
Step 3: Cleco the shear clip/ stiffener assemblies to the R-1002 Spar as shown in the figure.

Step 4: Cleco the R-607PP and R-608PP Reinforcement Plates to the R-1002 Spar as shown.

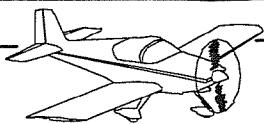
Step 5: Final-Drill all the holes of the shear clips and reinforcement plates which are common to spar web using a #30 drill.



**FIGURE 1: TYPICAL SHEAR CLIP/ STIFFENER ASSEMBLY**



**FIGURE 2: SHEAR CLIP AND REINFORCEMENT PLATE ATTACHMENT TO SPAR**



Step 1: Cleco the R-1012 Counterbalance Rib to the R-1002 Spar as shown in Figure 1. Final-Drill the two holes that attach the rib to the spar with a #30 drill. (The R-1010G Shear Clip may be temporarily removed from the spar while final-drilling these holes.)

Step 2: Cleco together the R-1003A and R-1003B to form the Top Rib, then final-drill the common holes (except for the spar attachment hole) with a #30 drill. Cleco the rib to the spar, using the holes shown in the figure, then final-drill these holes using the same drill.

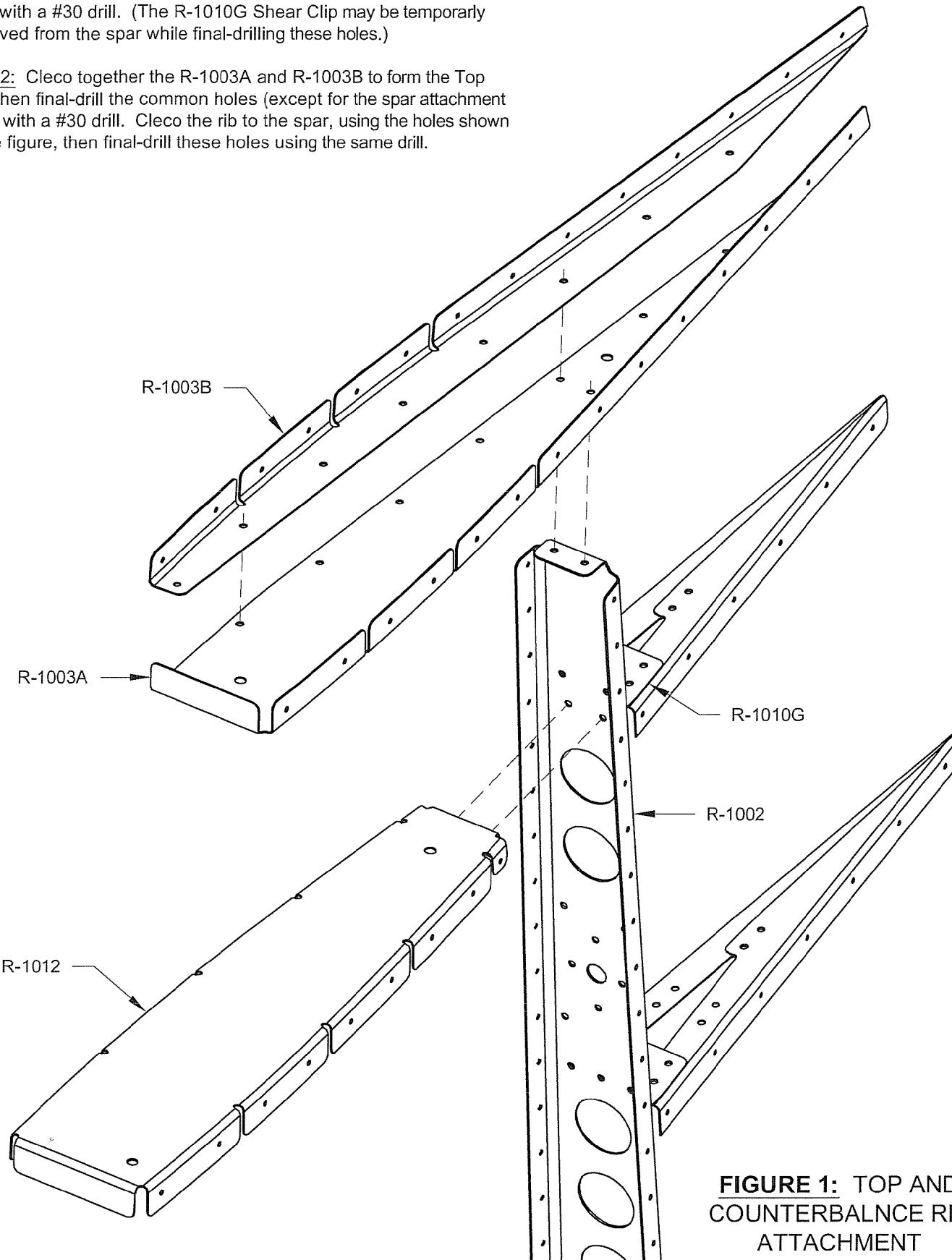


FIGURE 1: TOP AND COUNTERBALANCE RIB ATTACHMENT

Step 3: Deburr the edges of both R-1001 Skins, then cleco one of the skins to the rudder skeleton as shown in Figure 2.

Step 4: Cleco the R-1006 Trailing edge to the R-1001 Skin.

The ends of the trailing edge extend beyond the skins. Mark the locations of the skin edges on the trailing edge, then remove the trailing edge and file or sand the ends to the marks.

Cleco the trailing edge back in place with the cleco going through the skin and into the trailing edge.

Step 5: Cleco the second skin (not shown in the figure) to the skeleton and to the trailing edge.

Step 6: Final-Drill all the holes common to the R-1001 Skins and rudder skeleton with a #40 drill. When drilling the R-1002 Spar and R-1006 Trailing Edge, start at the middle of the span and work toward the ends; drill and cleco every hole. Drill the holes of the trailing edge perpendicular to the chordline of the rudder, not to the skin.

Step 7: Remove the R-1001 Skins and mark the insides as "left" or "right".

Step 8: Put a slight bend in the trailing edge of the R-1001 Skins so that they will lay down flat and tight on the R-1006 Trailing Edge after riveting (see Section 5K).

Step 9: Remove the R-607PP and R-608PP reinforcement plates and mark the sides which go against the R-1002 Spar web.

Step 10: Completely disassemble the rest of the rudder and deburr all holes and any edges that have not yet been deburred.

Step 11: Dimple the holes in the skins (make sure to dimple from the correct side!) and the corresponding holes in the flanges of the stiffeners, spar, and ribs.

Step 12: Machine countersink the holes in the R-1006 Trailing Edge (on both sides) for the 3/32" dimples in the skins. Countersink perpendicular to the trailing edge face.

Step 13: If desired, prime the parts in preparation for final riveting.

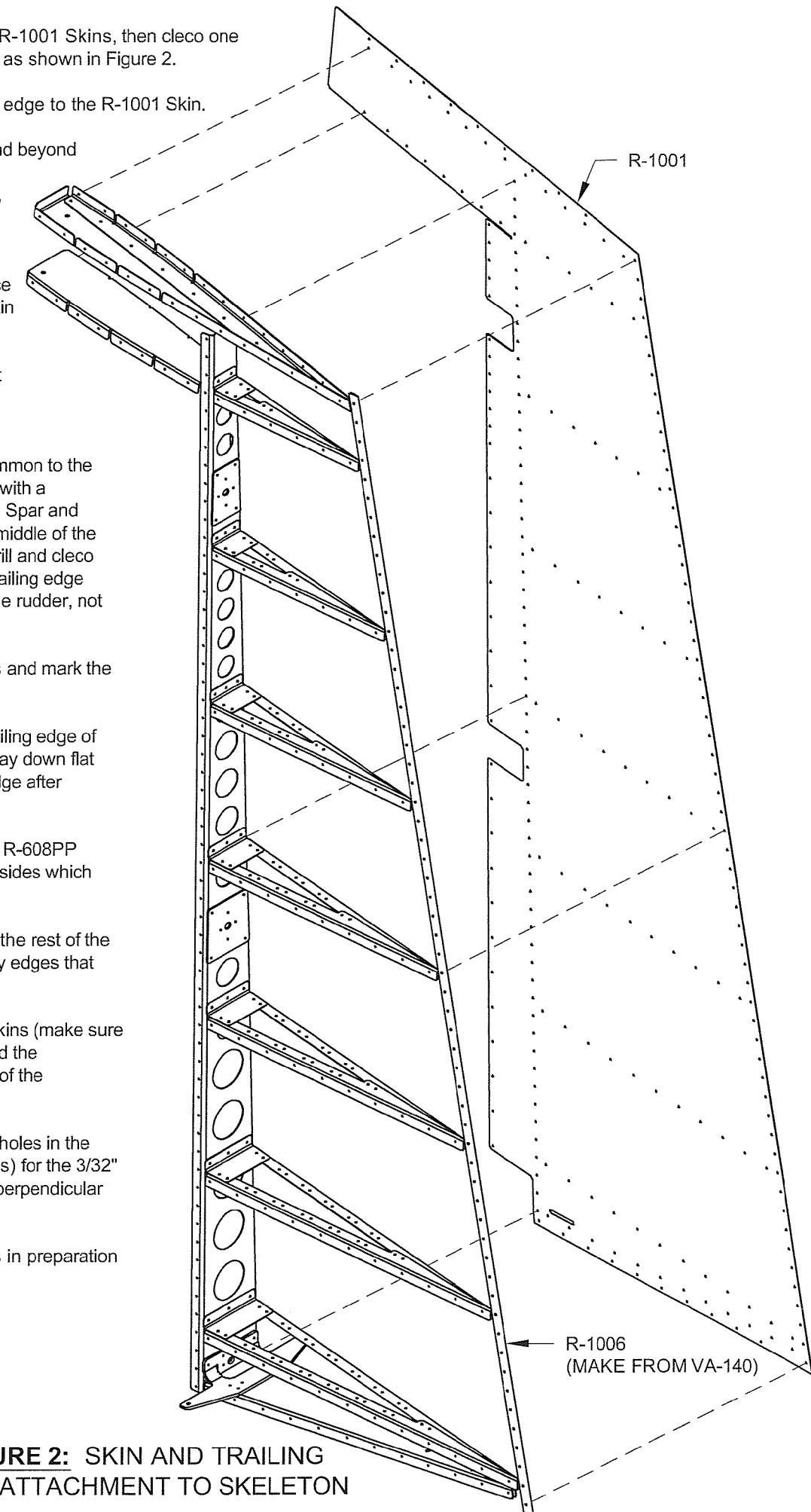
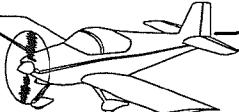


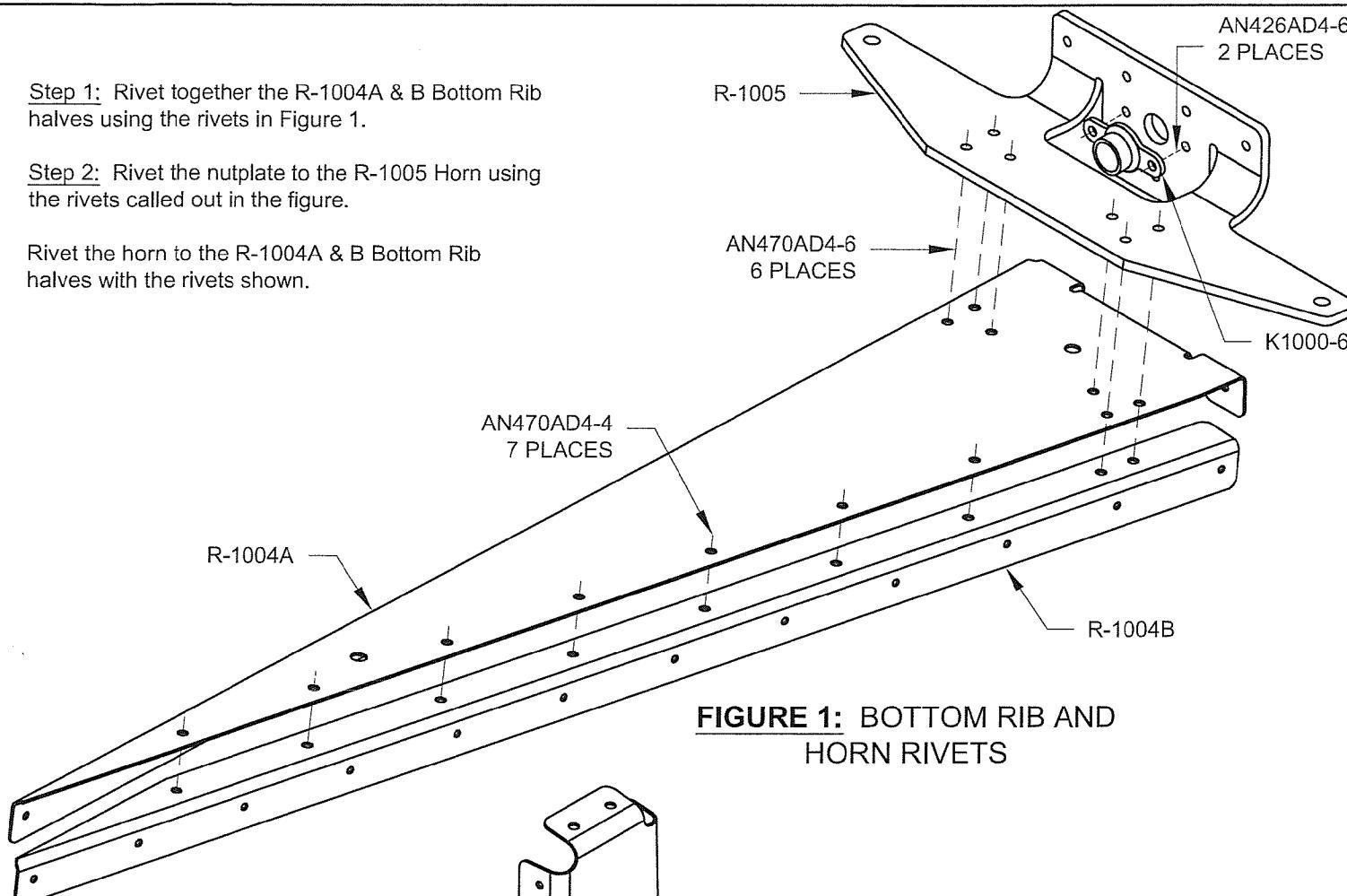
FIGURE 2: SKIN AND TRAILING EDGE ATTACHMENT TO SKELETON



Step 1: Rivet together the R-1004A & B Bottom Rib halves using the rivets in Figure 1.

Step 2: Rivet the nutplate to the R-1005 Horn using the rivets called out in the figure.

Rivet the horn to the R-1004A & B Bottom Rib halves with the rivets shown.

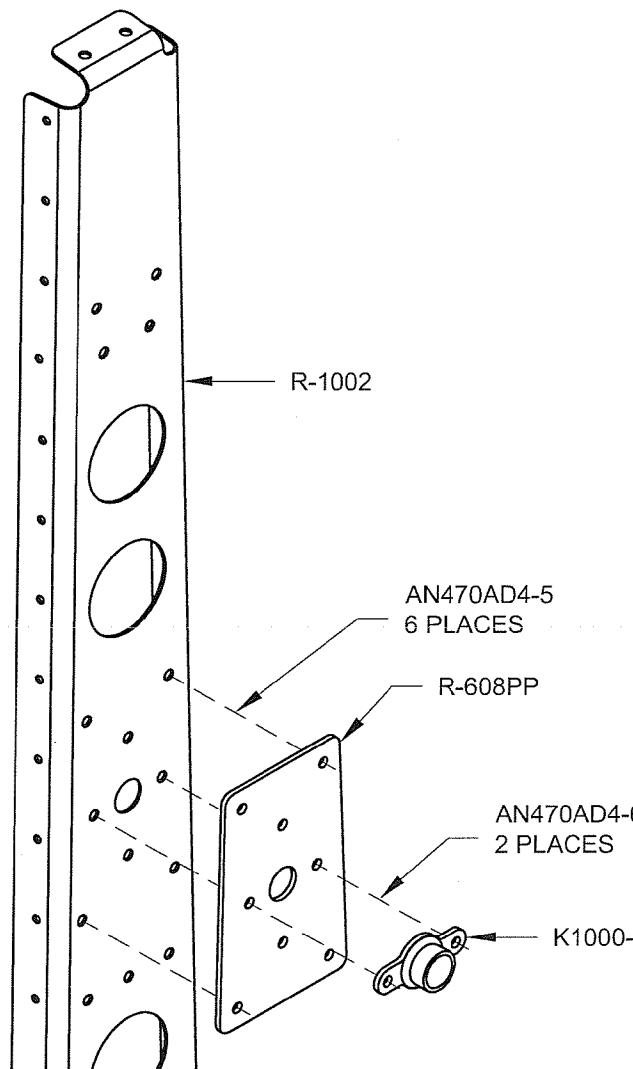


**FIGURE 1: BOTTOM RIB AND HORN RIVETS**

Step 3: Rivet the R-608PP Reinforcement Plate to the R-1002 Spar as shown in Figure 2.

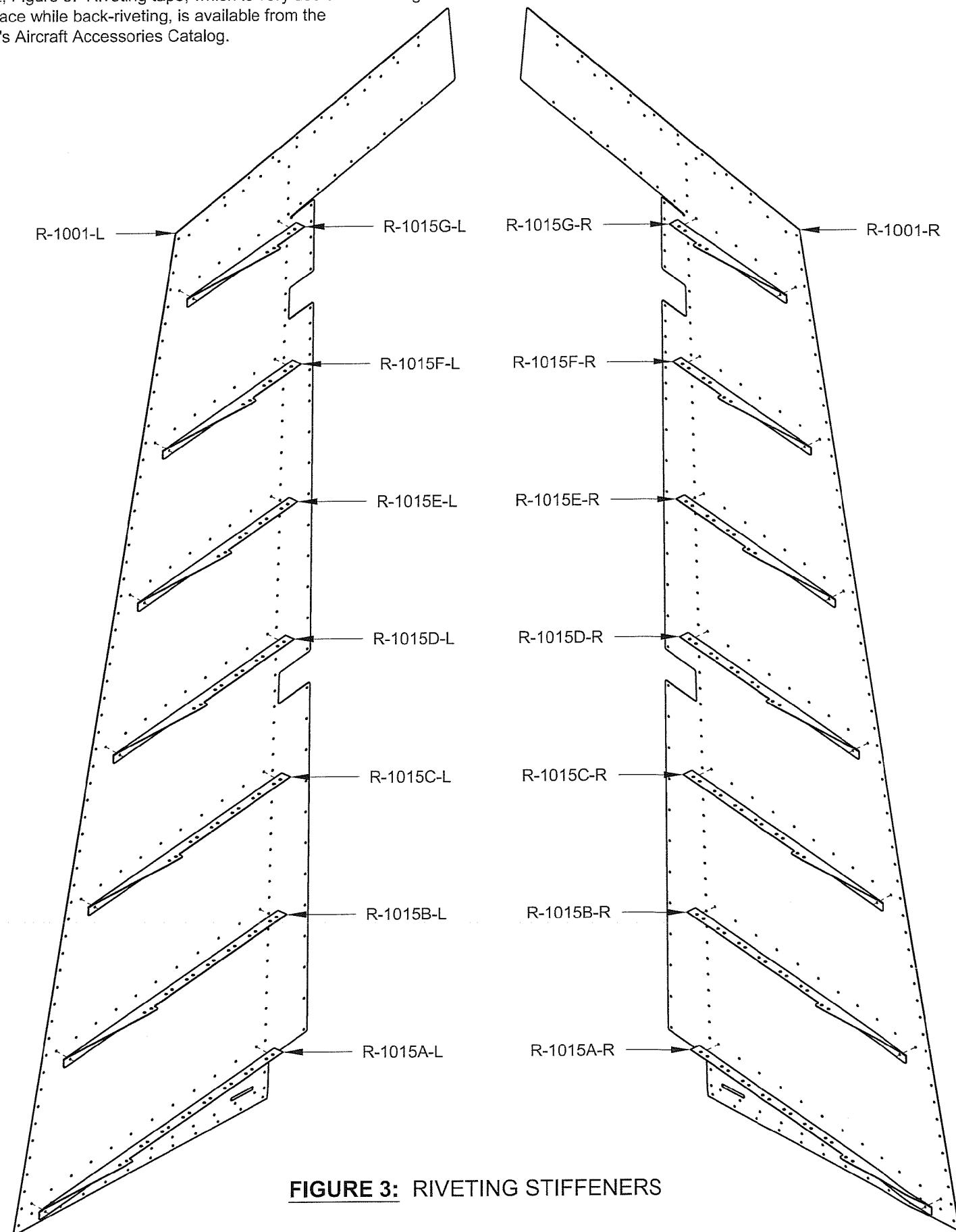
Rivet the nutplate to the reinforcement plate and spar using the rivets called out in the figure.

Step 4: Repeat step 3 for the R-607PP Reinforcement Plate (as located on Page 7-5, Figure 2) using the same rivets and an additional nutplate.

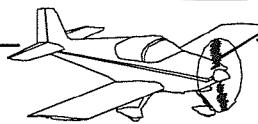


**FIGURE 2: REINFORCEMENT PLATE RIVETS**

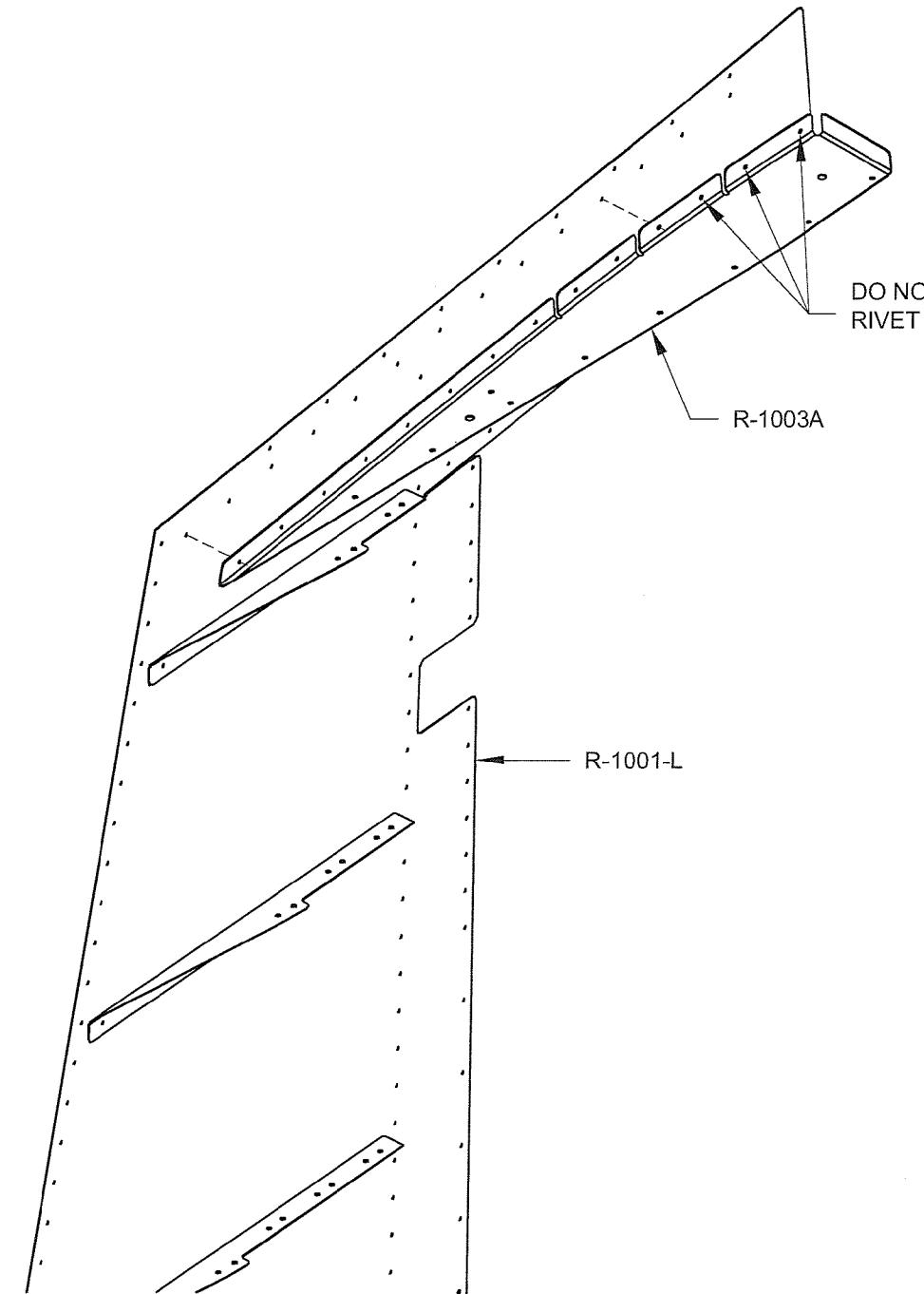
Step 5: Back rivet (see Section 5F) all the R-1015 Stiffeners to the R-1001 Skins, as shown in Figure 2, using the rivets shown on page 7-12, Figure 3. Riveting tape, which is very useful for holding rivets in place while back-riveting, is available from the Van's Aircraft Accessories Catalog.



**FIGURE 3: RIVETING STIFFENERS**

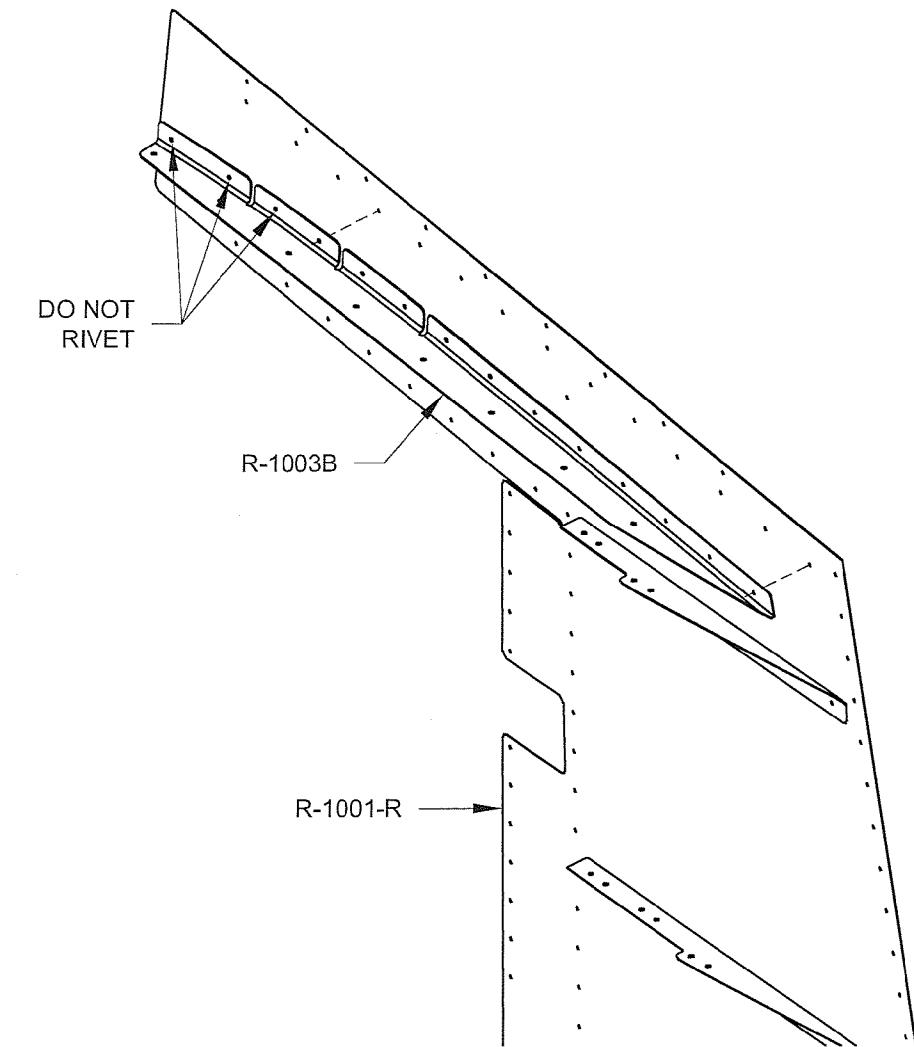


Step 1: Position the R-1003A Top Rib half on the R-1001-L Skin as shown in Figure 1. Rivet it in place using the rivets called out on page 7-12, Figure 3. However, leave open the forward three holes to allow the skin to be pulled back for access when attaching the counterbalance weight.



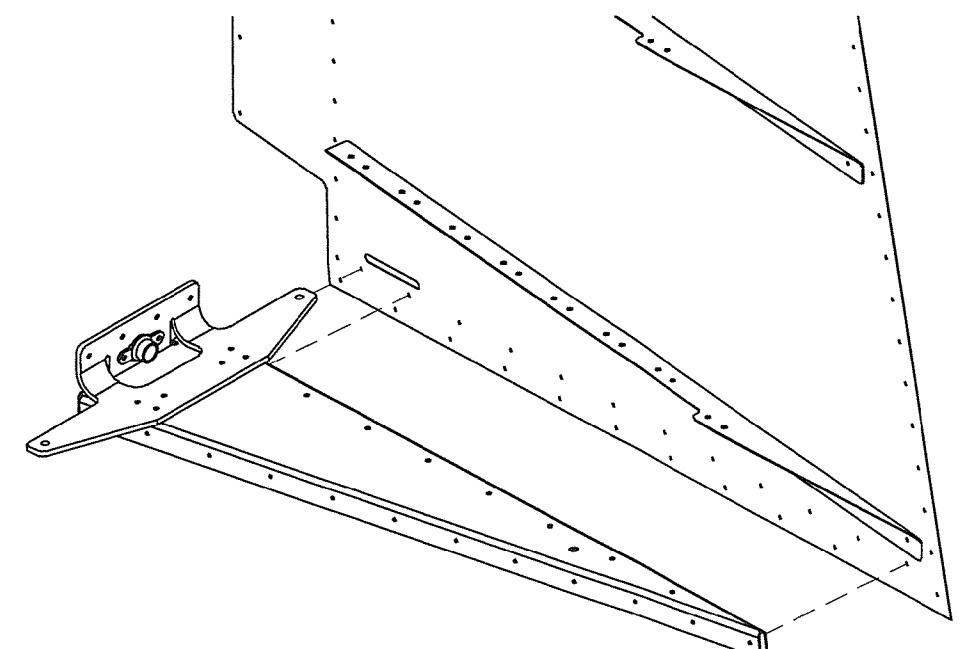
**FIGURE 1:** RIVETING THE R-1003A TOP RIB HALF

Step 2: Rivet the R-1003B Top Rib half to the R-1001-R Skin as shown in Figure 2. Use the rivets called out on Page 7-12, Figure 3 and, once again, leave the forward three holes open.

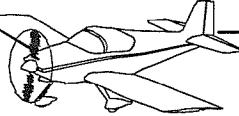


**FIGURE 2:** RIVETING THE R-1003B TOP RIB HALF

Step 3: Use the rivets called out on Page 7-12, Figure 3 to attach the R-1004 Bottom Rib to the R-1001-R Skin as positioned in Figure 3.



**FIGURE 3:** RIVETING THE R-1004 BOTTOM RIB



Step 1: Rivet the R-1010 Shear Clips to their respective stiffeners on the R-1001-R Skin using LP4-3 blind rivets as shown in Figure 1.

NOTE: The tank sealant currently sold by Van's has a working time of two hours. Steps 3 through 9 will have to be accomplished within this time.

Step 2: Mix (follow the mixing directions on the can) and apply a **THIN** coat of tank sealant to both surfaces of the R-1006 Trailing Edge.

Cleco the trailing edge to the R-1001-R skin as shown in Figure 1.

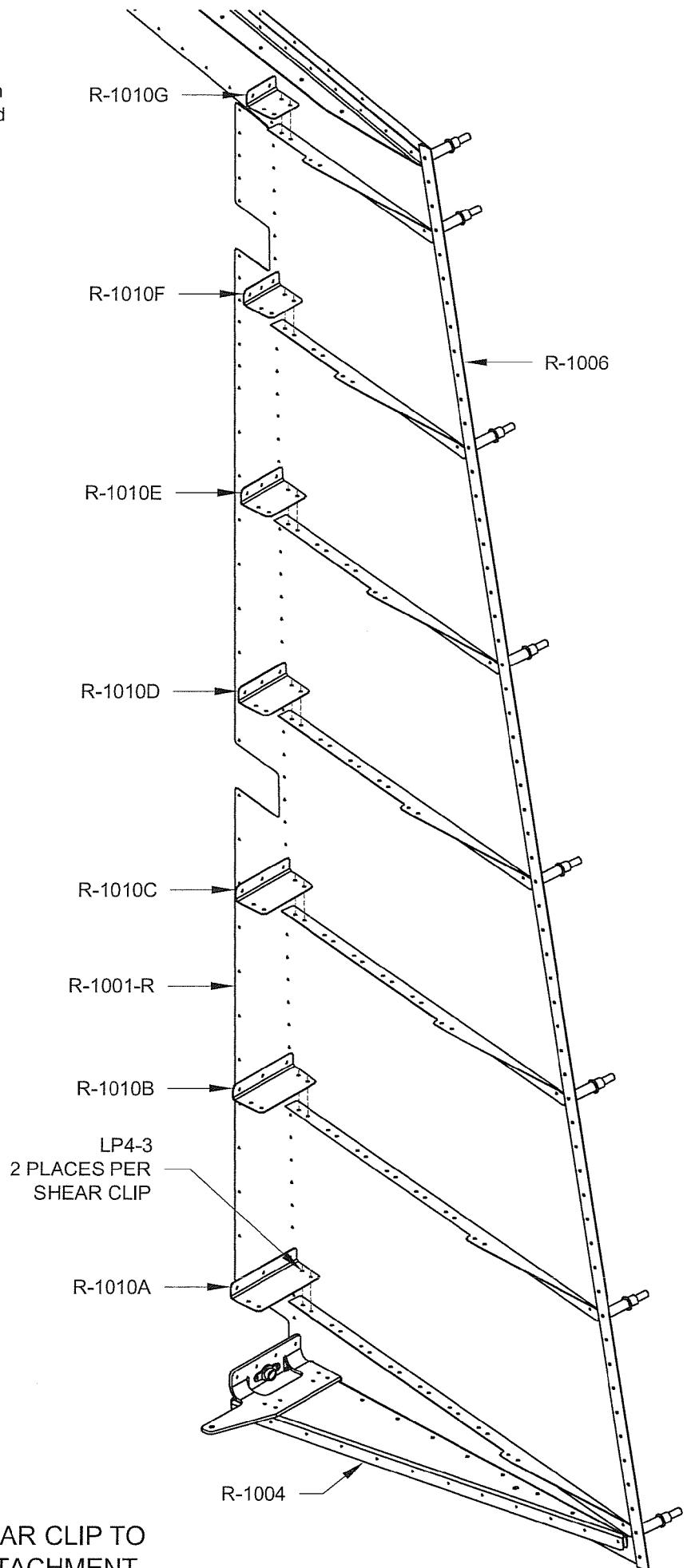


FIGURE 1: SHEAR CLIP TO STIFFENER ATTACHMENT

Step 3: Position the R-1001-L Skin on the R-1001-R Skin as shown in Figure 2. Make sure the R-1015A-L Stiffener is positioned correctly relative to the R-1015A-R Stiffener and the R-1010A Shear Clip (see Page 7-5, Figure 1), then cleco the bottom of the skin to the R-1004 Bottom Rib. Capture the left skin with the bottom cleco in the trailing edge.

Step 4: Have someone roll back the R-1001-L Skin so that the aft end of the bottom stiffeners (R-1015A) can be riveted. Of the two holes in the aft end of the stiffeners, only the forward hole is riveted. Install an LP4-3 blind rivet into this hole.

Join the forward end of the stiffener to the R-1010A Shear Clip with two blind rivets.

Step 5: Repeat Step 5 for the rest of the stiffeners and shear clips. Once again, make sure the stiffeners are positioned correctly; the aft end of the left stiffener on top of the right stiffener and the forward end of the stiffener under the shear clip. Capture the left skin with the clecos in the trailing edge as each stiffener set is riveted.

When you get to the top of the rudder, make sure the R-1003A & B Top Rib halves are oriented correctly; the R-1003B on top of the R-1003A.

Step 6: Cleco the rest of the holes in the trailing edge and wipe away any sealant that squeezes out. Make sure the parts fit tightly; there should be no globs of sealant holding the skins and trailing edge apart.

Step 7: Rivet the R-1004 Bottom Rib flange to the R-1001-L skin with the rivets called out on Page 7-12, Figure 3. The last hole in the rib flange, near the trailing edge (see Figure 2), will have to be riveted with a CCR264SS-3-2 blind rivet. There is not enough room to use a solid rivet and rivet squeezer. As the blind rivet is inserted into the hole, it will "bottom out" on the rivet in the opposite flange before the head is flush with the skin. With the rivet in the hole, squeeze the rivet slightly to create some clearance, push the rivet head flush, then finish setting the rivet.

Step 8: Lay the rudder on a flat workbench with the trailing edge clecos hanging just over the edge. Place a 3" - 4" wide board on top of the rudder, with the edge of the board resting against the clecos, and distribute enough weights along the board to hold the trailing edge flat against the workbench.

Allow the sealant to cure for a couple days before continuing.

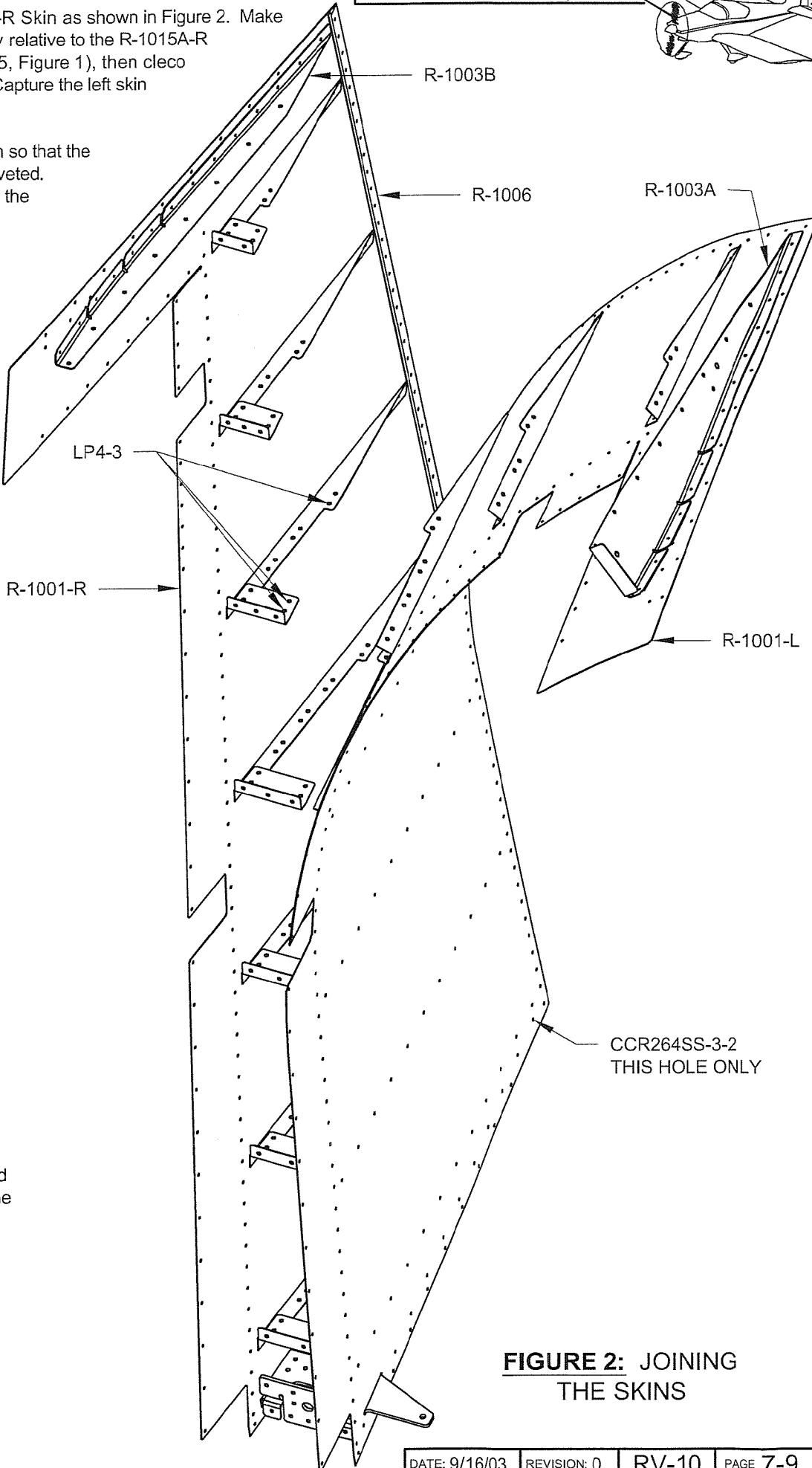
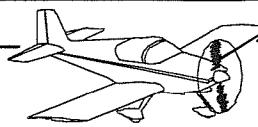
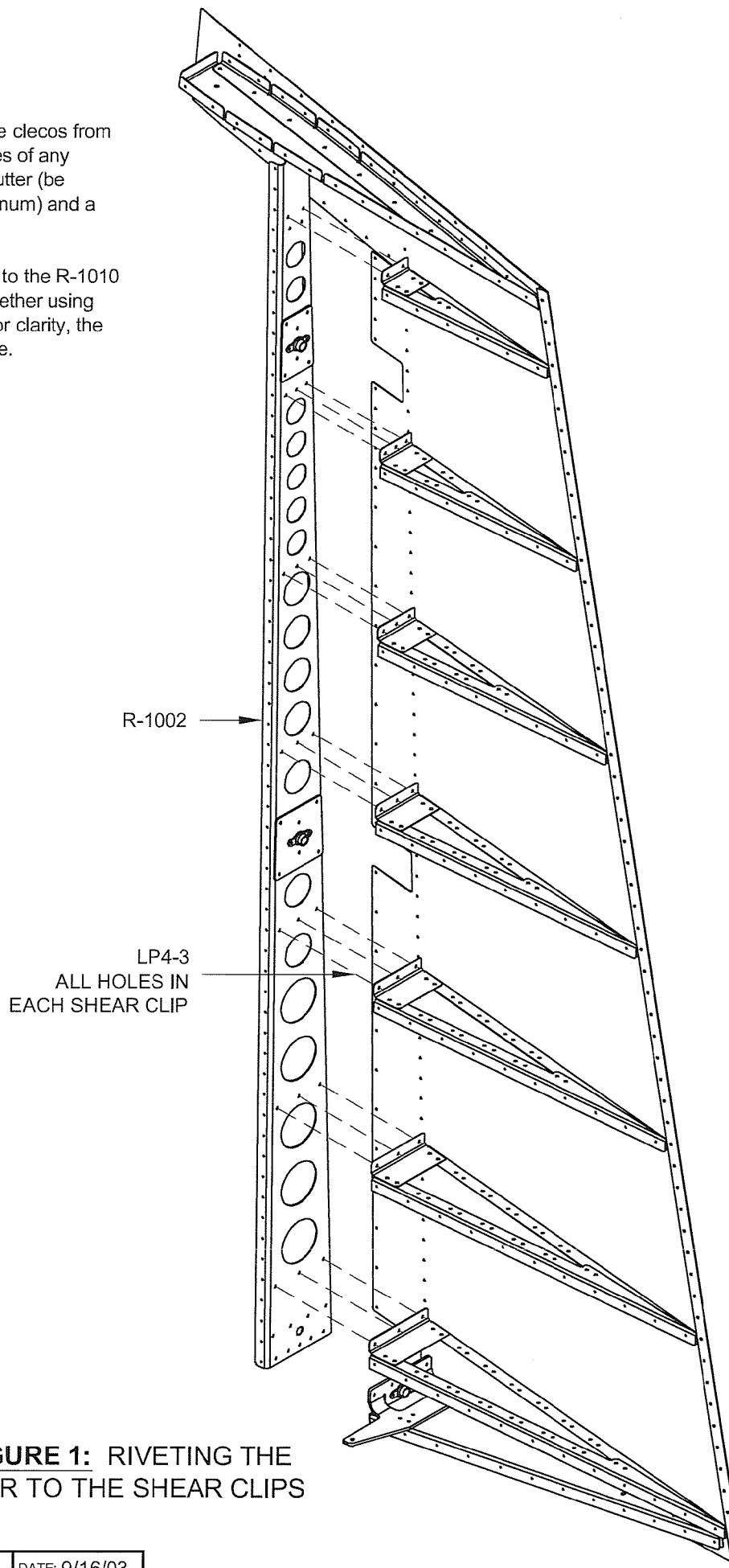


FIGURE 2: JOINING THE SKINS



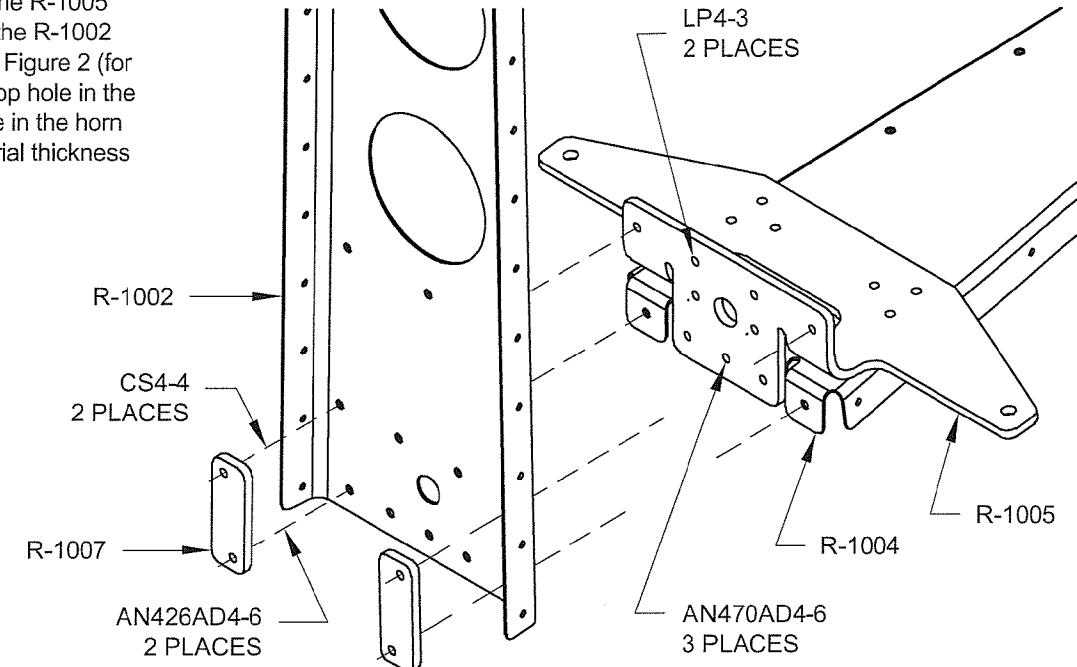
Step 1: After curing, remove the clecos from the trailing edge. Clear the holes of any sealant with a 100° deburring cutter (be careful not to remove any aluminum) and a #40 drill spun with your fingers.

Step 2: Cleco the R-1002 Spar to the R-1010 Shear Clips, then rivet them together using the rivets shown in Figure 1. For clarity, the left skin is not shown in the figure.



**FIGURE 1: RIVETING THE SPAR TO THE SHEAR CLIPS**

Step 3: Rivet the R-1004 Bottom Rib, the R-1005 Horn, and the R-1007 Striker Plates to the R-1002 Spar web using the Rivets called out in Figure 2 (for clarity, the skins are not shown). The top hole in the striker plate and the corresponding hole in the horn are both countersunk to keep the material thickness within the grip range of the blind rivet. Place the flush head of the rivet on the striker plate.



**FIGURE 2: RIVETING THE HORN AND STRIKER PLATES**

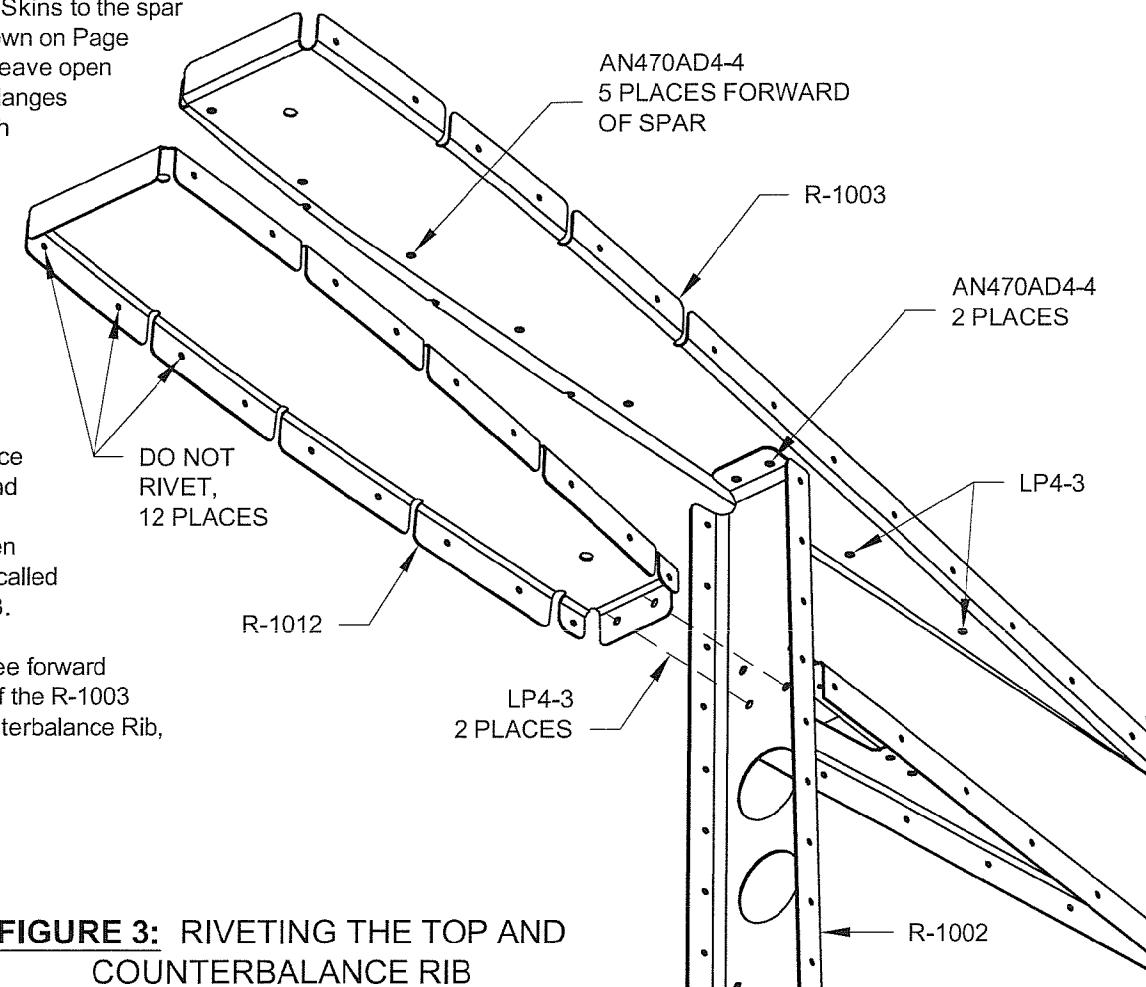
Step 4: Rivet the R-1003 Top Rib together and to the R-1002 Spar with the rivets called out in Figure 3. The R-1001 Skins are not shown.

Step 5: Rivet the R-1001 Skins to the spar flanges with the rivets shown on Page 7-12, Figure 3. For now, leave open the two holes in the spar flanges (one hole per flange) which are common to the R-1012 Counterbalance Rib.

Step 6: Rivet the R-1012 Counterbalance Rib to the R-1002 Spar with the rivets shown in Figure 3.

Now that the counterbalance rib is in place, go ahead and rivet the holes in the spar flange, which were left open in Step 5, using the rivets called out on Page 7-12, Figure 3.

Step 7: Except for the three forward holes in the side flanges of the R-1003 Top Rib and R-1012 Counterbalance Rib, rivet the skin to the rib.



**FIGURE 3: RIVETING THE TOP AND COUNTERBALANCE RIB**



**NOTE:** Trailing edges are riveted with "double-flush" rivets. These are standard rivets, but instead of setting the shop head on a flat surface, it is set in a dimple and ends up flush with the skin surface. However, a double flush rivet will not look the same on both sides. The factory flush head will set almost perfectly flat. The finished shop head will be flush with the skin, but it will not fill the dimple completely... it's been described as "an acorn sitting in a dimple." Do not fall in the trap of trying to use a longer rivet and "fill the hole." The rivet will bend over instead of setting properly.

**Step 1:** Insert the rivets shown on Page 7-12, Figure 3 into the trailing edge holes. Tape all the rivets in place and flip the rudder over. Put blocks on either side of the back-riveting plate so the rudder can stay flat as it slides over the plate. Weight the rudder down to the work surface so it remains straight while riveting.

Back-rivet about every tenth rivet just enough to lock everything in place... don't set the rivets all the way just yet.

Back-rivet the rest of the trailing edge rivets, but for now, set the rivets only about halfway. Set every fifth or sixth rivet and check constantly to see that the trailing edge is not bending one way or the other. If the rivets are set fully in only one direction it can leave a "hook" in the trailing edge. Start with the rivet set parallel to the rivet and tilt it to set the rivet flush to the skin as the rivet sets.

Flip the control surface over and set the trailing edge rivets to the final size with a mushroom set, again checking constantly. See Section 5, Figure 5-9.

A little finesse will produce a nice double flush joint, but you must constantly guard against bowing the trailing edge.

**Step 2:** Roll the leading edge of the skins according to the instructions in section 5J. However, a 1-1/4 inch diameter pipe works better for rolling the leading edge of the RV-10 rudder than the size given in Section 5J. Also, due to the size of this rudder, it is easier to roll one section of the leading edge at a time (section between hinge cutouts) versus rolling the entire leading edge as described in Section 5J. Begin by rolling the section of leading edge closest to the counterbalance rib, then roll the middle section, and finally the section closest to the horn.

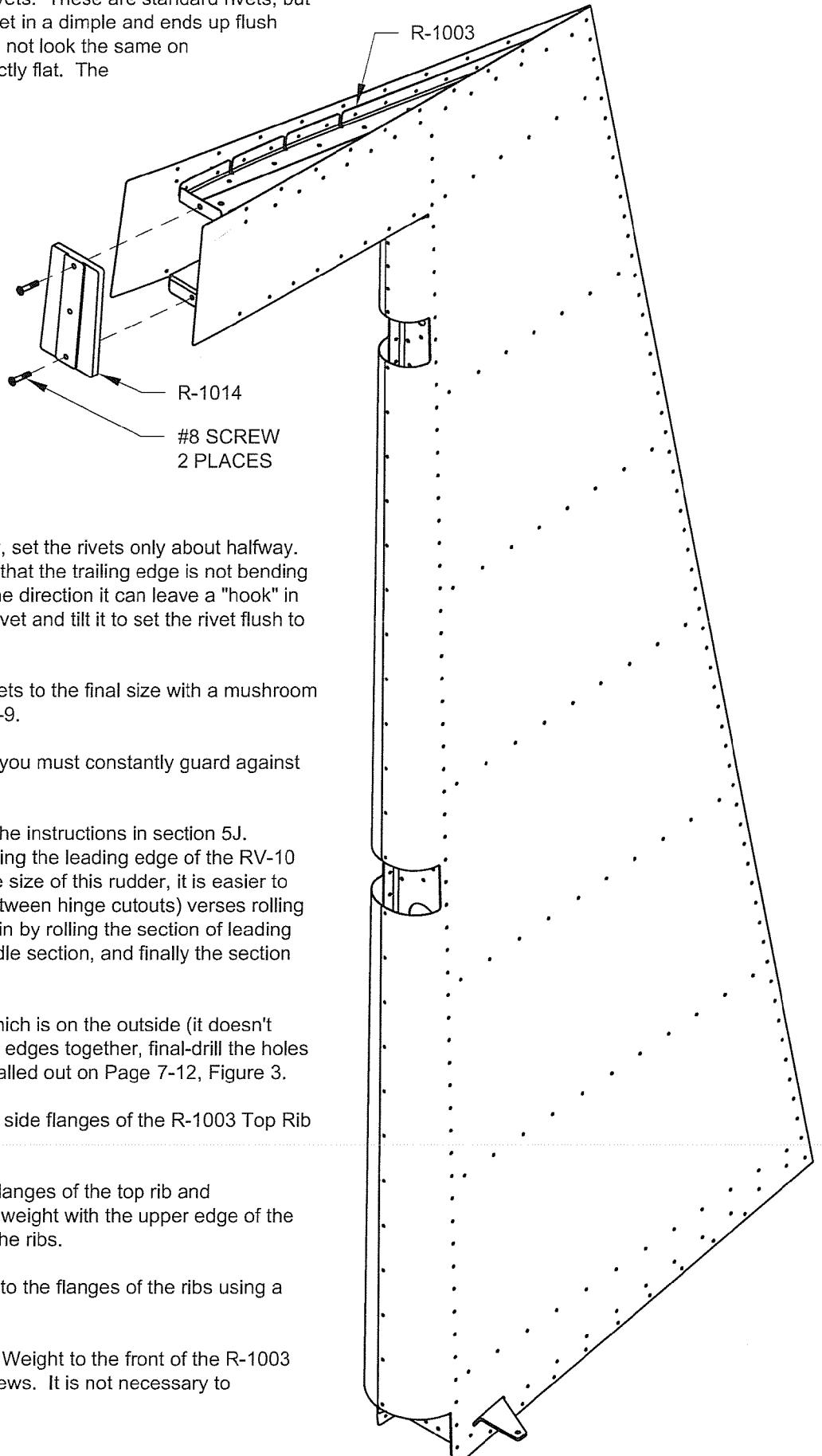
Make a slight bend along the leading edge of the skin which is on the outside (it doesn't matter which skin overlaps the other). Cleco the leading edges together, final-drill the holes with a #30 drill, then rivet them together with the rivets called out on Page 7-12, Figure 3.

**Step 3:** Cleco the skins to the three forward holes in the side flanges of the R-1003 Top Rib and R-1012 Counterbalance Rib as shown in Figure 2.

Center the R-1014 Counterbalance Weight on the front flanges of the top rib and counterbalance rib. Flush the top of the counterbalance weight with the upper edge of the top rib flange, then clamp the counterbalance weight to the ribs.

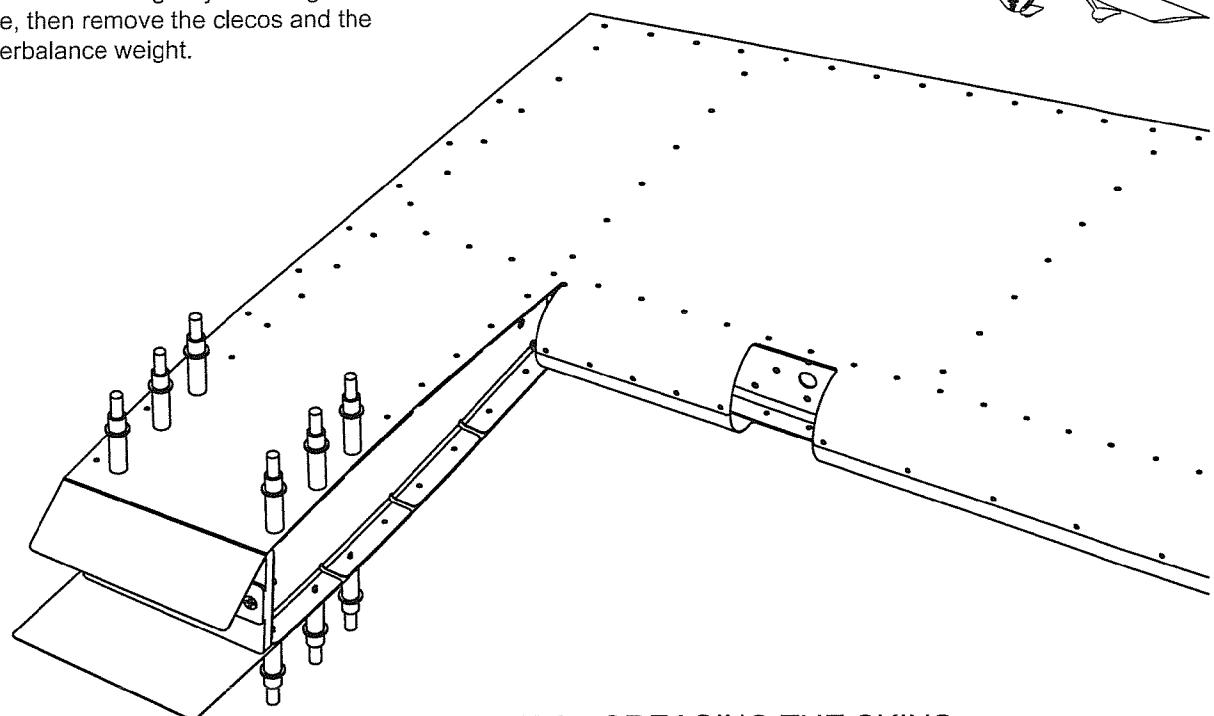
Match-Drill the two holes of the counterbalance weight into the flanges of the ribs using a #19 drill.

**Step 4:** Temporarily secure the R-1014 Counterbalance Weight to the front of the R-1003 Top Rib and the R-1012 Counterbalance Rib with #8 screws. It is not necessary to countersink the weight yet, this is done in a later step.



**FIGURE 1: RIVETING THE LEADING AND TRAILING EDGES  
AND LOCATING THE COUNTERBALANCE WEIGHT**

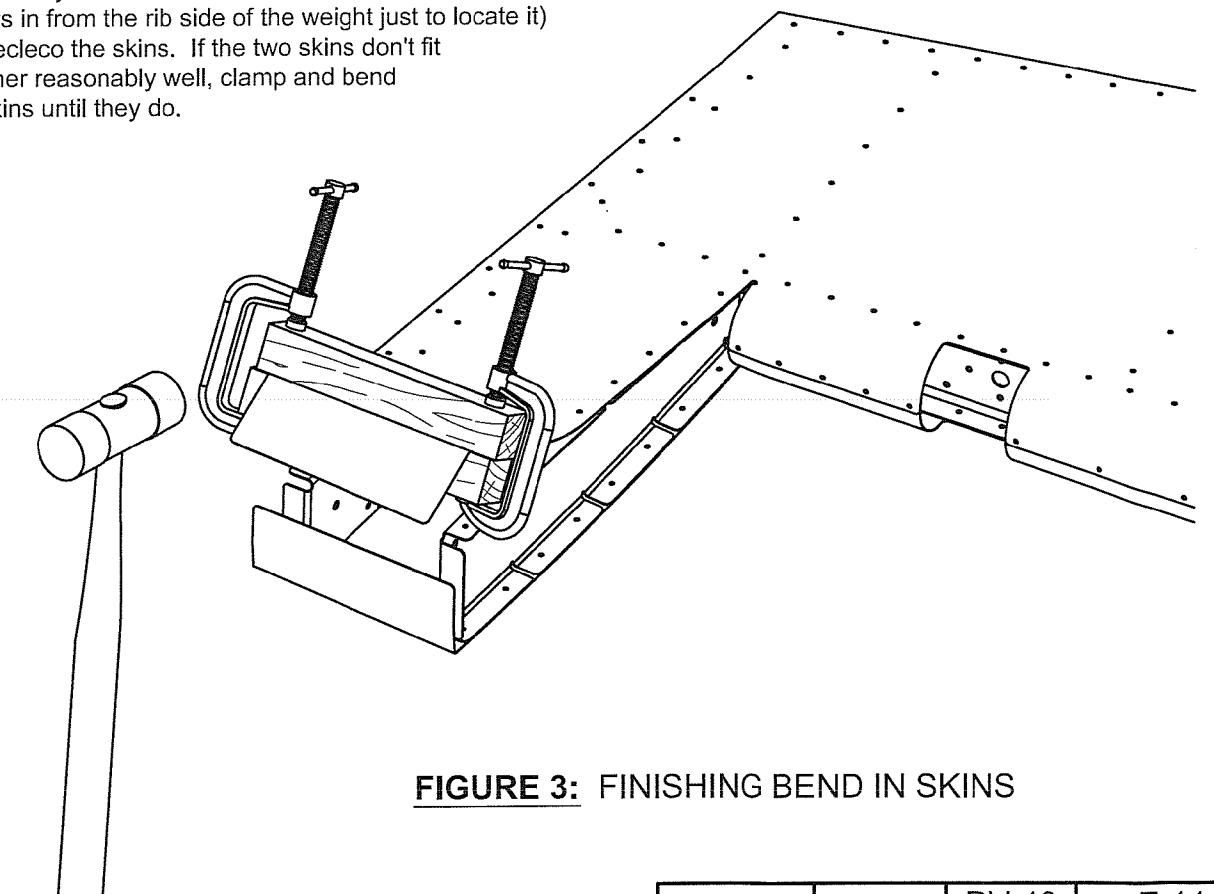
**Step 5:** With your fingers, fold the skins around the counterbalance weights just enough to leave a crease, then remove the clecos and the counterbalance weight.



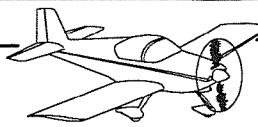
**FIGURE 2: CREASING THE SKINS**

**Step 6:** Clamp the skins, along the crease, between two pieces of wood. (Sand a very small radius along the edge of the wood to prevent cracking the skin, and drill the wood to clear any dimples in the skins.) Using a soft face hammer, bend the skins to about 85°. Hold the wood securely to prevent the hammer strikes from buckling the skins behind the wood blocks. To prevent marks on the skin, place another piece of wood over the skin and hammer on the wood instead of directly on the skin. A second set of hands is helpful.

Temporarily reinstall the R-1014 Counterbalance Weight (put the screws in from the rib side of the weight just to locate it) and recleco the skins. If the two skins don't fit together reasonably well, clamp and bend the skins until they do.



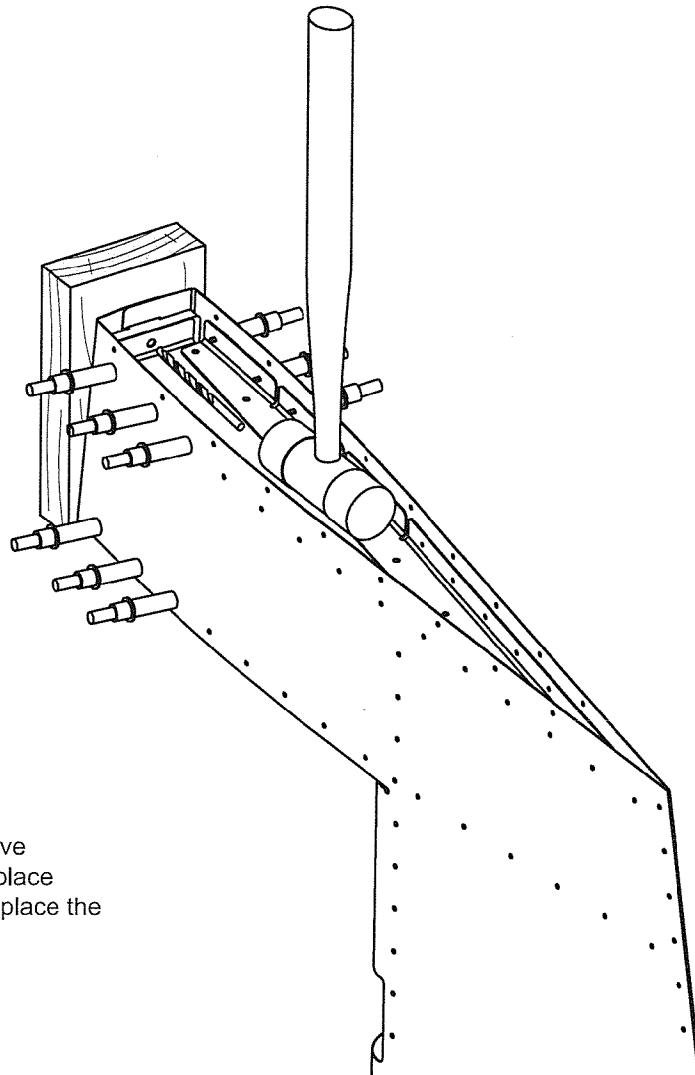
**FIGURE 3: FINISHING BEND IN SKINS**



Step 1: Once again, cleco the skins to the top and counterbalance ribs as shown in Figure 1. Tape the edge of the overlapping skin securely to the underlying skin.

Remove one of the #8 screws holding the counterbalance weight in place and insert a #19 drill bit into the hole. As shown in the figure, backup the skins with a block of wood and strike the drill bit with a hammer to leave a mark on the skin. Rotate the drill bit 90° then strike it again. Replace the screw and repeat the process for the counterbalance weight hole in the other rib.

Remove the clecos. The mark in the skin is in the form of a dimple with the concave portion of the dimple on the inside surface of the skin. Pull back the skin and drill the two dimples with a #40 drill. Cleco the skins back in place, with the drilled skin on top, re-tape to pull the skins tight, then match drill one of the holes into the unmarked skin with a #30 drill. Cleco this hole then match drill the other hole with the same drill. Now, remove one of the screws holding the counterbalance weight in place and drill through the entire assembly with a #19 drill. Replace the screw then drill the other hole.



**FIGURE 1: LOCATING THE COUNTERBALANCE WEIGHT HOLES IN THE SKINS**

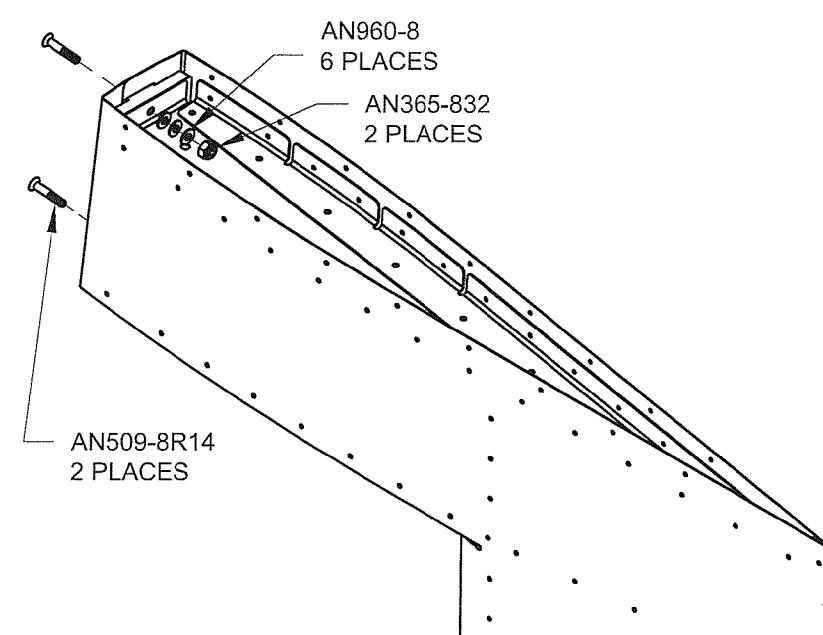
Step 2: Deburr the holes and put a light bend along the edge of the outside skin. Dimple both skins for #8 screws and machine countersink the R-1014 Counterbalance Weight to accept the dimples.

Step 3: Secure the counterbalance weight by installing the hardware shown in Figure 2.

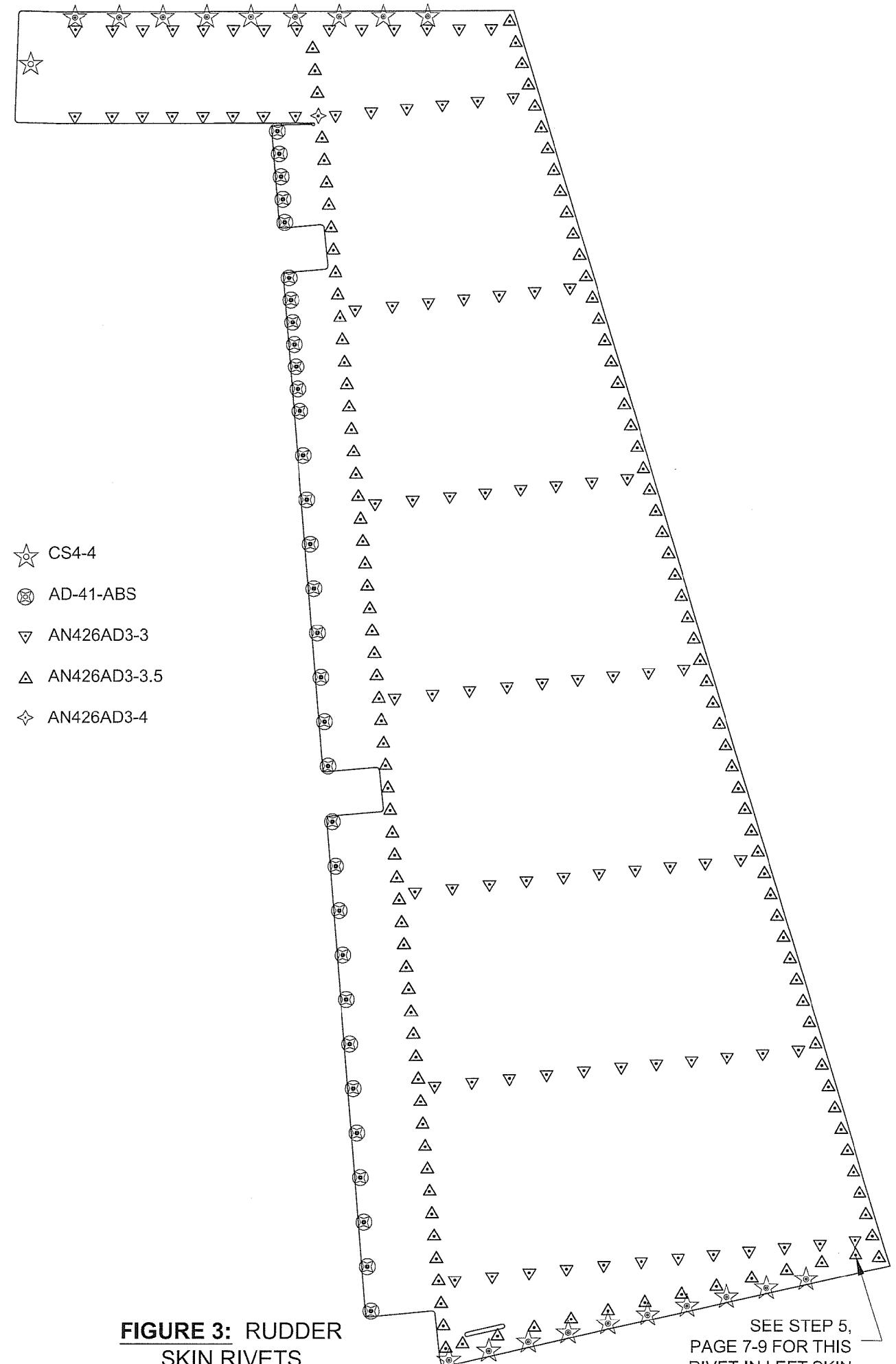
Step 4: If the skins "pillow" between the screws, drill a #30 hole directly between the two screws into the skins and the counterbalance weight. You might get lucky and hit the hole already in the weight but, if not, you have a matching hole now!

Remove the two screws and drill out the hole just drilled in the weight with a #19 drill (only the skins are riveted, the #19 hole in the weight provides clearance for the body of the rivet). Deburr the skin holes, dimple for a 1/8" flush rivet, and replace the hardware. Install a CS4-4 into the dimpled hole.

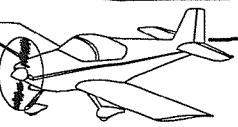
Step 5: Rivet the remaining twelve matching holes in the skins, top rib, and counterbalance rib with the rivets shown in Figure 3 to complete your rudder assembly!



**FIGURE 2: SECURING THE COUNTERBALANCE WEIGHT**

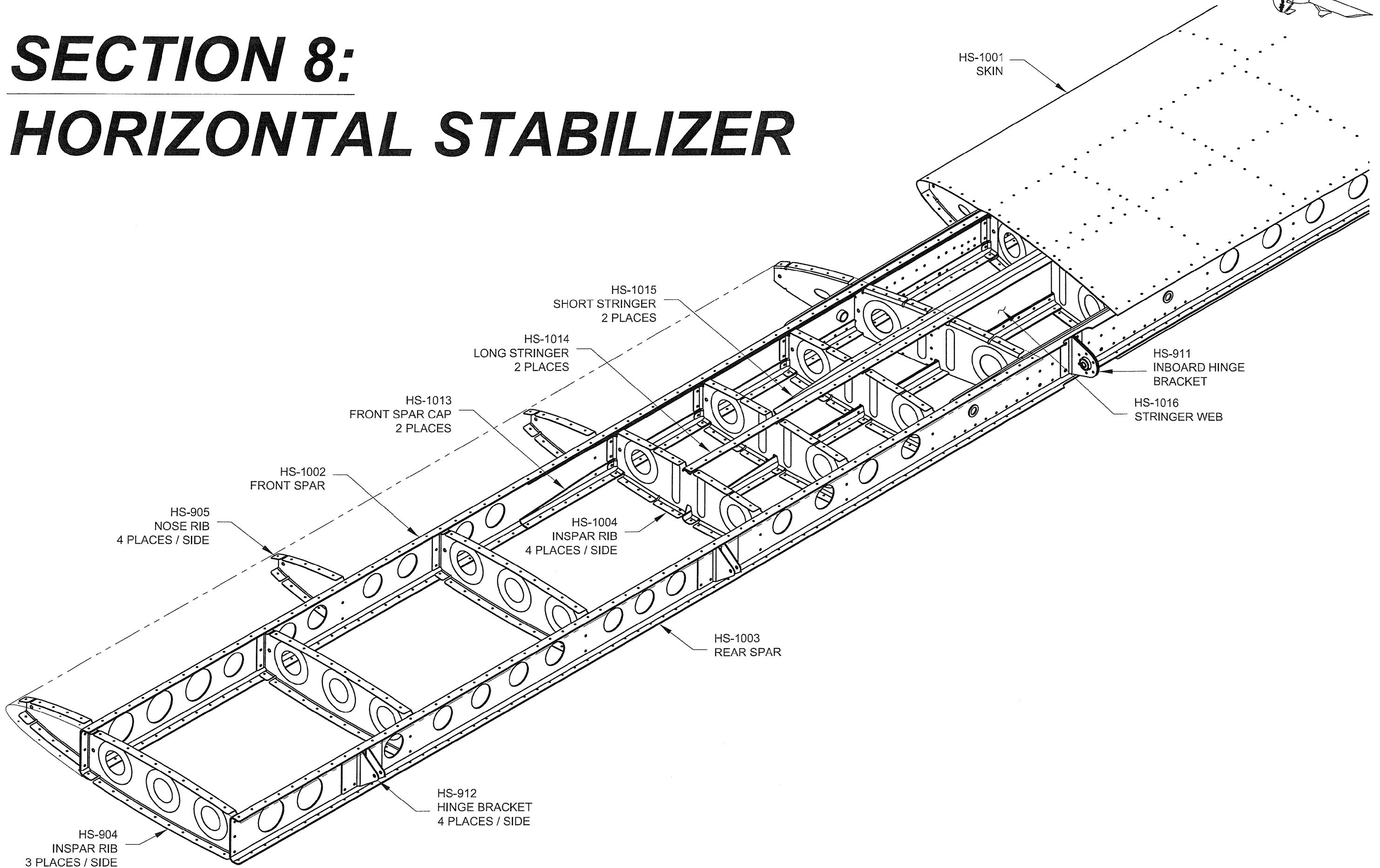


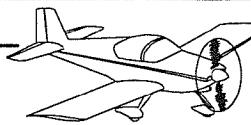
**FIGURE 3: RUDDER SKIN RIVETS**



# SECTION 8:

# HORIZONTAL STABILIZER





Step 1: Deburr the edges (including lightening holes) of all aluminum parts shown in Figure 1.

Step 2: Cleco the HS-906 Rear Spar Doubler to the HS-1003 Rear Spar as shown in the right blowup of Figure 1.

There are four holes in the spar web not present in the doubler. Match-Drill these holes (shown in the blowup) into the doubler with a #30 drill. Be sure to drill perpendicular to the web. Except for the holes indicated in the blowup, final-drill all other 1/8" holes common to the doubler and spar using a #30 drill.

Machine countersink the two indicated holes for 1/8" flush rivets. Final-Drill the four 3/16" holes (two above and two below the holes just countersunk) with a #12 drill. Drill from the spar into the doubler.

Step 3: Final-Drill the 3/16" hole in each of the eight HS-912 Hinge Brackets using a #12 drill.

Cleco the hinge brackets to the HS-1003 Rear Spar as shown in the figure. Final-Drill the holes of the brackets and spar with a #30 drill.

Step 4: Remove all the parts from the spar (marking them as they are removed), deburr the holes, then prime the aluminum parts if desired. Scuff the powder coating on the hinge brackets if you plan on painting them when the completed airplane is painted.

Step 5: Rivet the HS-906 Rear Spar Doubler to the spar using the rivets called out in the right blowup. Make sure not to put any rivets in the holes indicated (tape over the holes as a reminder).

Step 6: Rivet the HS-912 Hinge Brackets to the spar using the rivets shown in the left blowup. Place the manufactured head of the rivets on the bracket.

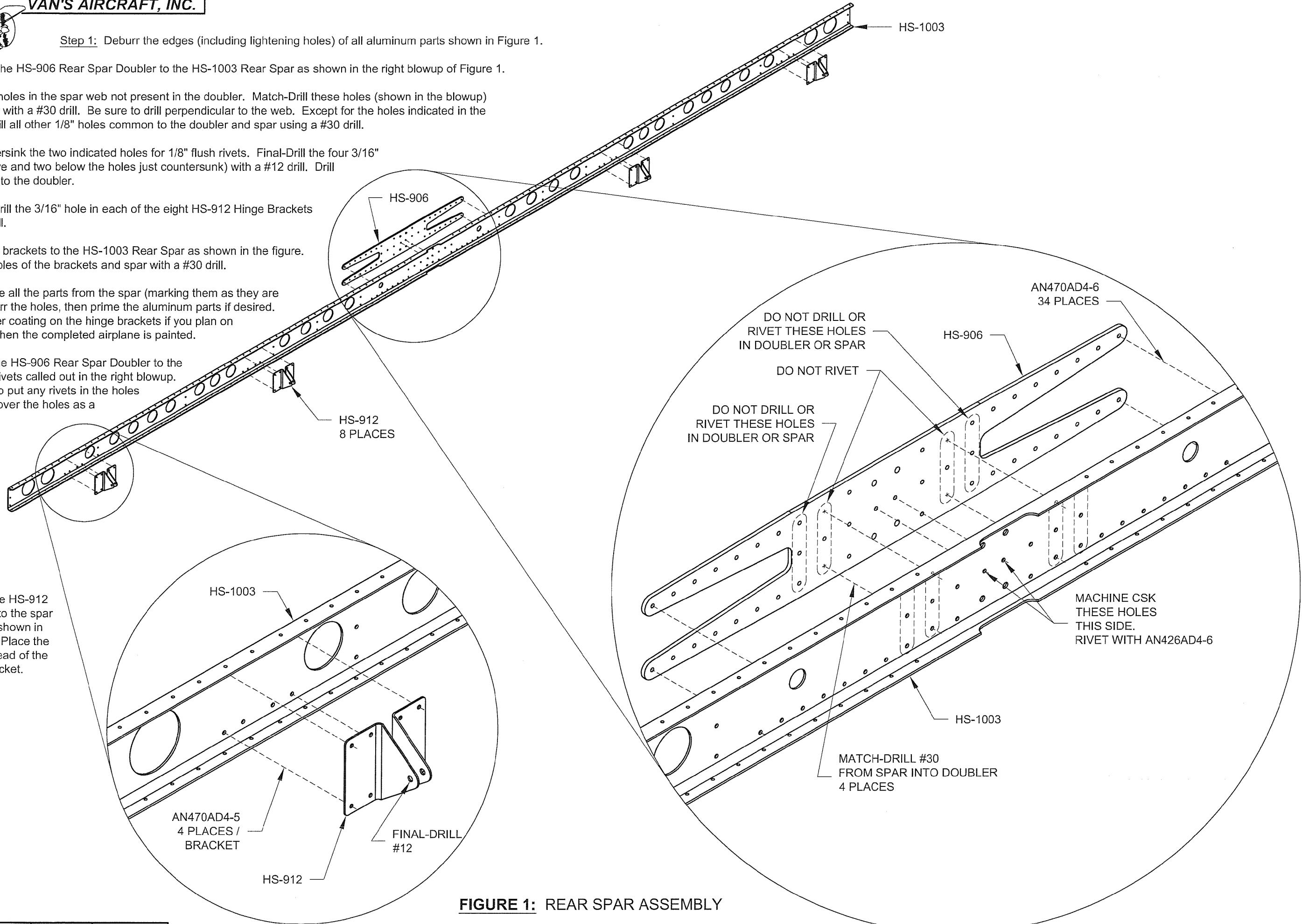
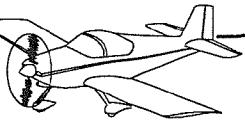


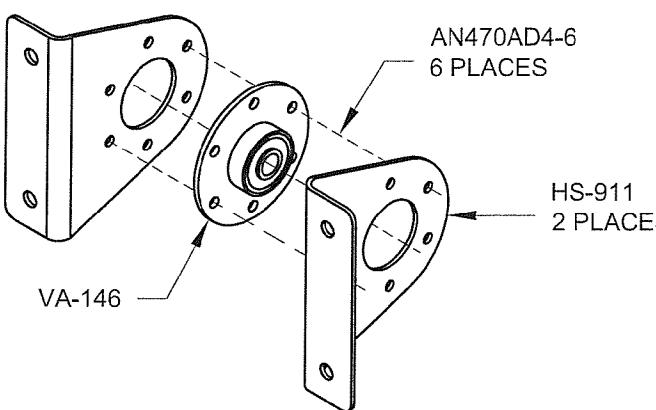
FIGURE 1: REAR SPAR ASSEMBLY



Step 1: Cleco the VA-146 Flange Bearing between the two HS-911 Inboard Hinge Brackets as shown in Figure 1. Final-Drill the six holes common to all the parts with a #30 drill and the two 3/16" holes in the flange of the hinge brackets with a #12 drill.

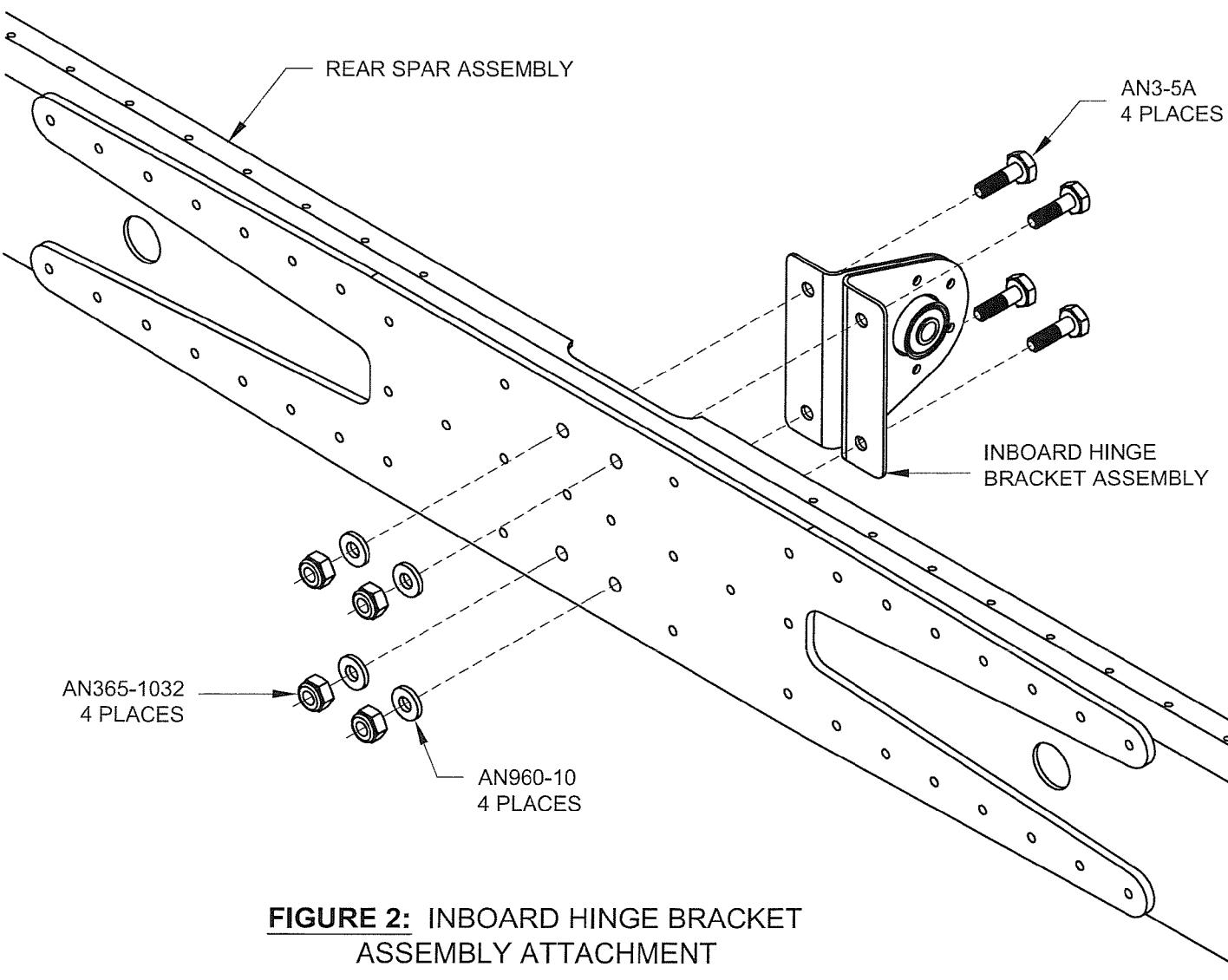
Disassemble, deburr, scuff the powder coating of the hinge brackets if desired, and reassemble.

Rivet the assembly together with the rivets shown in the figure. Clamp the flanges of the two hinge brackets to something flat to make sure that they remain square to each other while riveting.



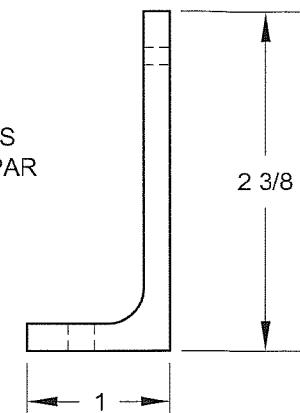
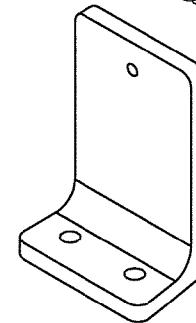
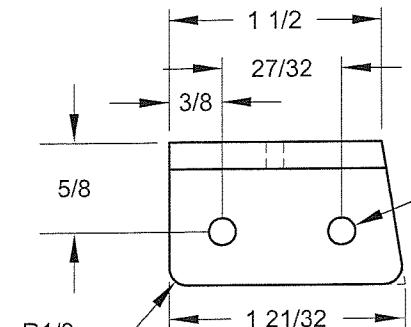
**FIGURE 1: INBOARD HINGE BRACKET ASSEMBLY RIVETS**

Step 2: Bolt the inboard hinge bracket assembly to the rear spar assembly using the hardware shown in Figure 2. Use the correct torque on the nuts per the chart in Section 5V.



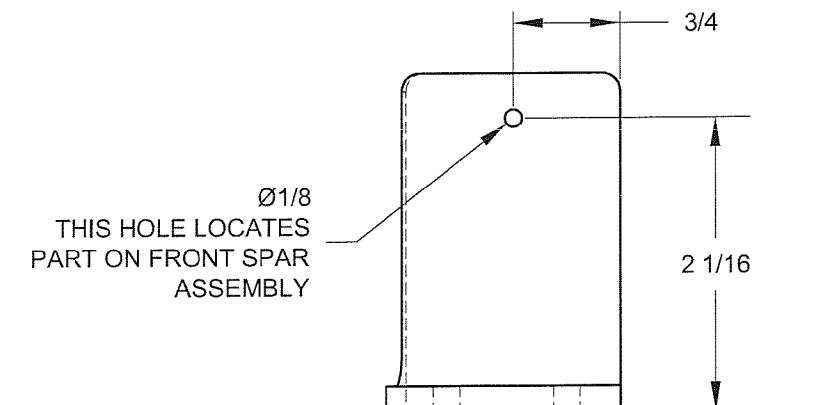
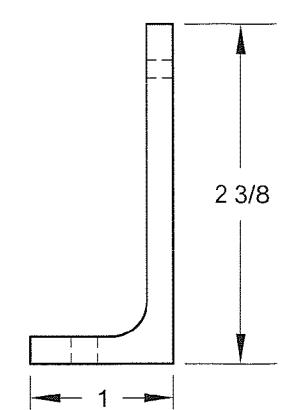
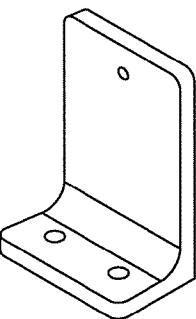
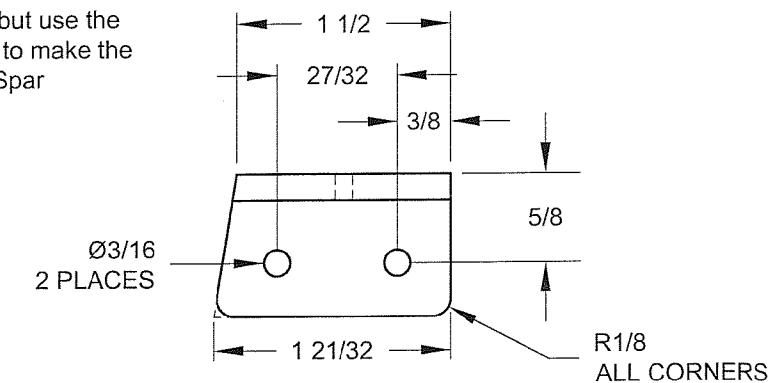
**FIGURE 2: INBOARD HINGE BRACKET ASSEMBLY ATTACHMENT**

Step 3: Using the dimensions in Figure 3, make the HS-1008-L Left Front Spar Attachment Bracket from the length of AA6-187x2x2-1/2 angle provided in the kit. Be very accurate in drilling the 1/8" hole which will be used to locate the bracket on the front spar assembly.

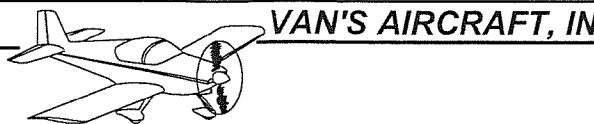


**FIGURE 3: LEFT FRONT SPAR ATTACHMENT BRACKET**

Step 4: Repeat Step 3, but use the dimensions in Figure 4, to make the HS-1008-R Right Front Spar Attachment Bracket.

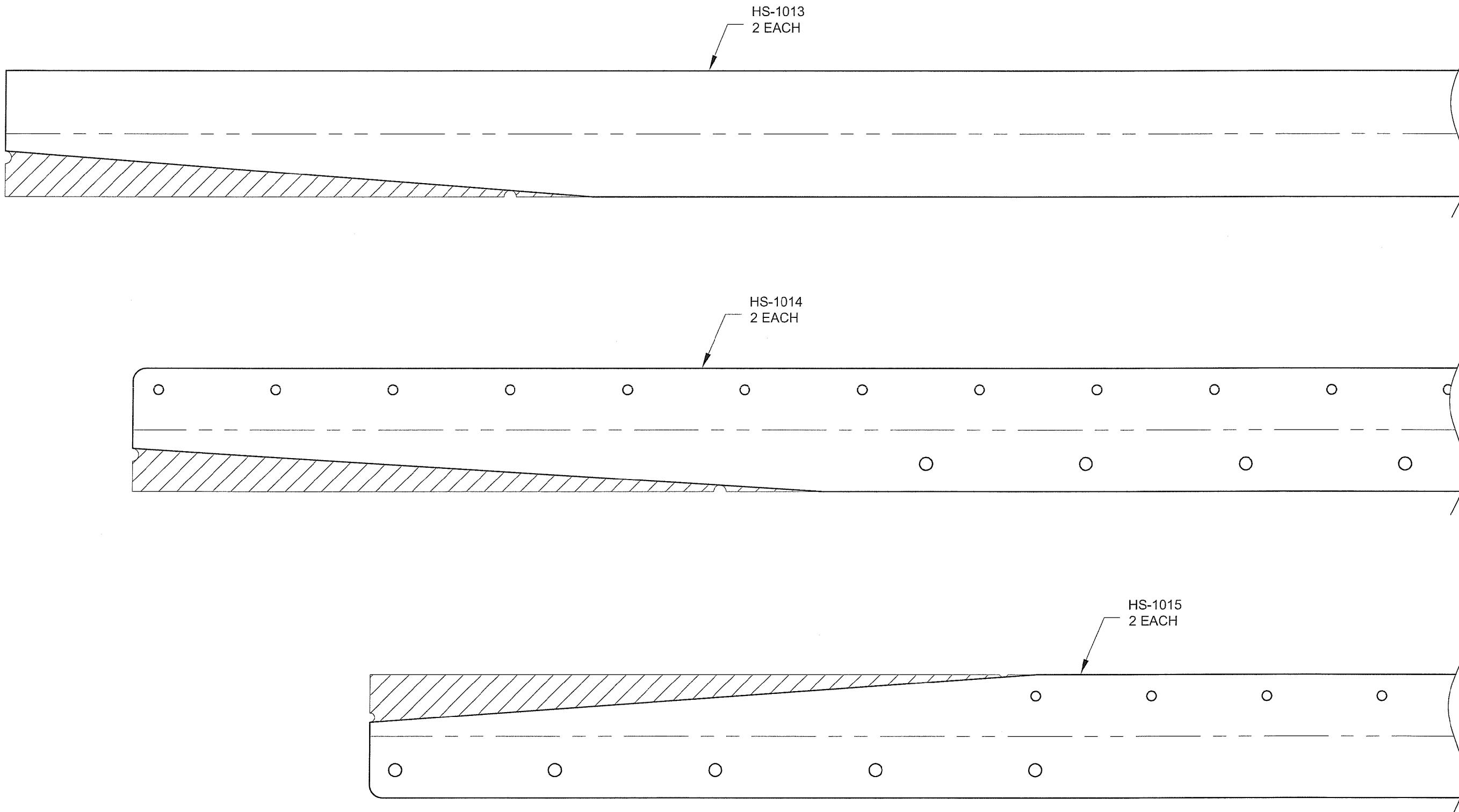


**FIGURE 4: RIGHT FRONT SPAR ATTACHMENT BRACKET**



Step 1: Trim material (shaded areas) from both ends of the two HS-1013 Front Spar Caps, the HS-1014 Long Stringer, and the HS-1015 Short Stringer as shown in Figure 1. The parts are shown unbent in the figure for clarity. Use the notches in the parts to determine the trim line and note in the figure that the trim line completely removes the notches.

Deburr and smooth all edges of the spar caps and stringers.



**FIGURE 1: SPAR CAP AND STRINGER TRIM**

Step 1: Deburr the edges (including the lightening holes) of the HS-1002 Front Spar.

Step 2: The HS-1013 Front Spar Caps are nested in the corners of the HS-1002 Front Spar with the trimmed flange of the spar cap resting against the spar web. On one of the spar caps, make a mark on the flange (the one that rests against the flange of the spar) a quarter of an inch from either end. Nest the spar cap in the spar, then, from the corresponding end of the spar, center the mark in the thirty-third flange hole. (Just for a check, make sure the other end of the spar cap covers the thirty-third hole in the other end of the spar flange.)

Clamp the spar cap in place, then match-drill the  $1/8"$  holes of the spar web into the entire length of the spar cap with a #30 drill. The spar cap is somewhat bowed as supplied, so use plenty of clamps to make sure the spar cap is tight against the spar web and flange while drilling. Remove the spar cap, deburr the holes of the spar and spar cap, then cleco the spar cap back in place. It's important to deburr and clean out any chips, otherwise the spar cap won't fit tight against the spar web when match-drilling the spar flange holes.

Clamp the spar cap to the flange of the spar, then match-drill the  $3/32"$  holes of the spar flange into the spar cap with a  $3/32"$  drill.

Repeat this step for the second spar cap.

Step 3: Deburr and smooth the edges of the HS-1007 Front Spar Doubler and the HS-1008-L and -R Front Spar Attachment Brackets, then cleco them to the HS-1002 Front Spar as shown in the figure.

Step 4: Clamp something flat to the bottom of the HS-1008-L and -R Front Spar Attachment Brackets to keep them square to each other, then match-drill the eight holes of the spar and spar doubler into the attachment brackets with a #30 drill. Cleco a few of these holes, remove the original, single cleco, and final-drill the hole with the same drill.

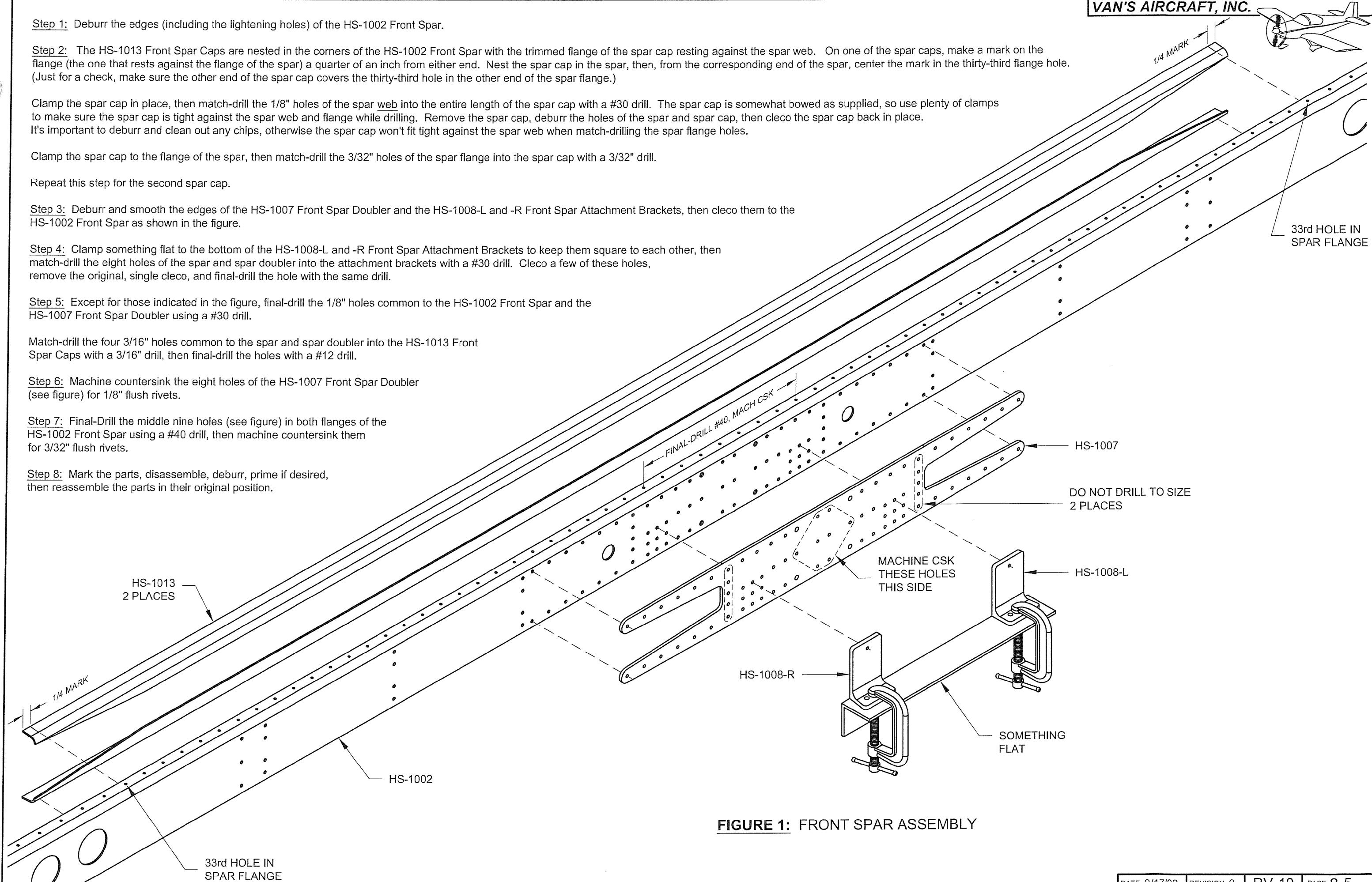
Step 5: Except for those indicated in the figure, final-drill the  $1/8"$  holes common to the HS-1002 Front Spar and the HS-1007 Front Spar Doubler using a #30 drill.

Match-drill the four  $3/16"$  holes common to the spar and spar doubler into the HS-1013 Front Spar Caps with a  $3/16"$  drill, then final-drill the holes with a #12 drill.

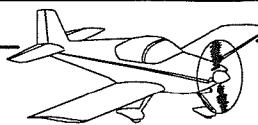
Step 6: Machine countersink the eight holes of the HS-1007 Front Spar Doubler (see figure) for  $1/8"$  flush rivets.

Step 7: Final-Drill the middle nine holes (see figure) in both flanges of the HS-1002 Front Spar using a #40 drill, then machine countersink them for  $3/32"$  flush rivets.

Step 8: Mark the parts, disassemble, deburr, prime if desired, then reassemble the parts in their original position.

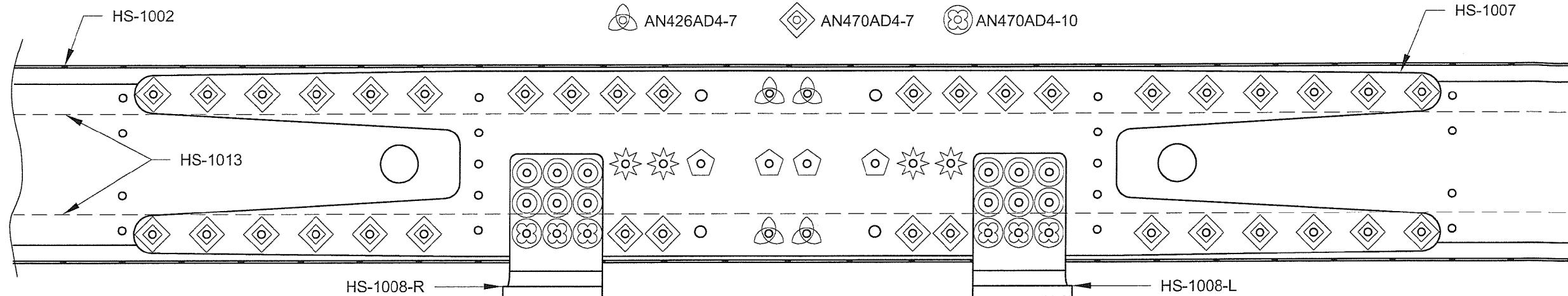


**FIGURE 1: FRONT SPAR ASSEMBLY**



Step 1: Rivet together the HS-1002 Front Spar, the HS-1007 Front Spar Doubler, the HS-1013 Front Spar Caps, and the HS-1008-L and -R Front Spar Attachment Brackets using the rivets shown in Figure 1. Install only the rivets shown in the figure. Tape over the open holes to keep yourself from accidentally riveting them.

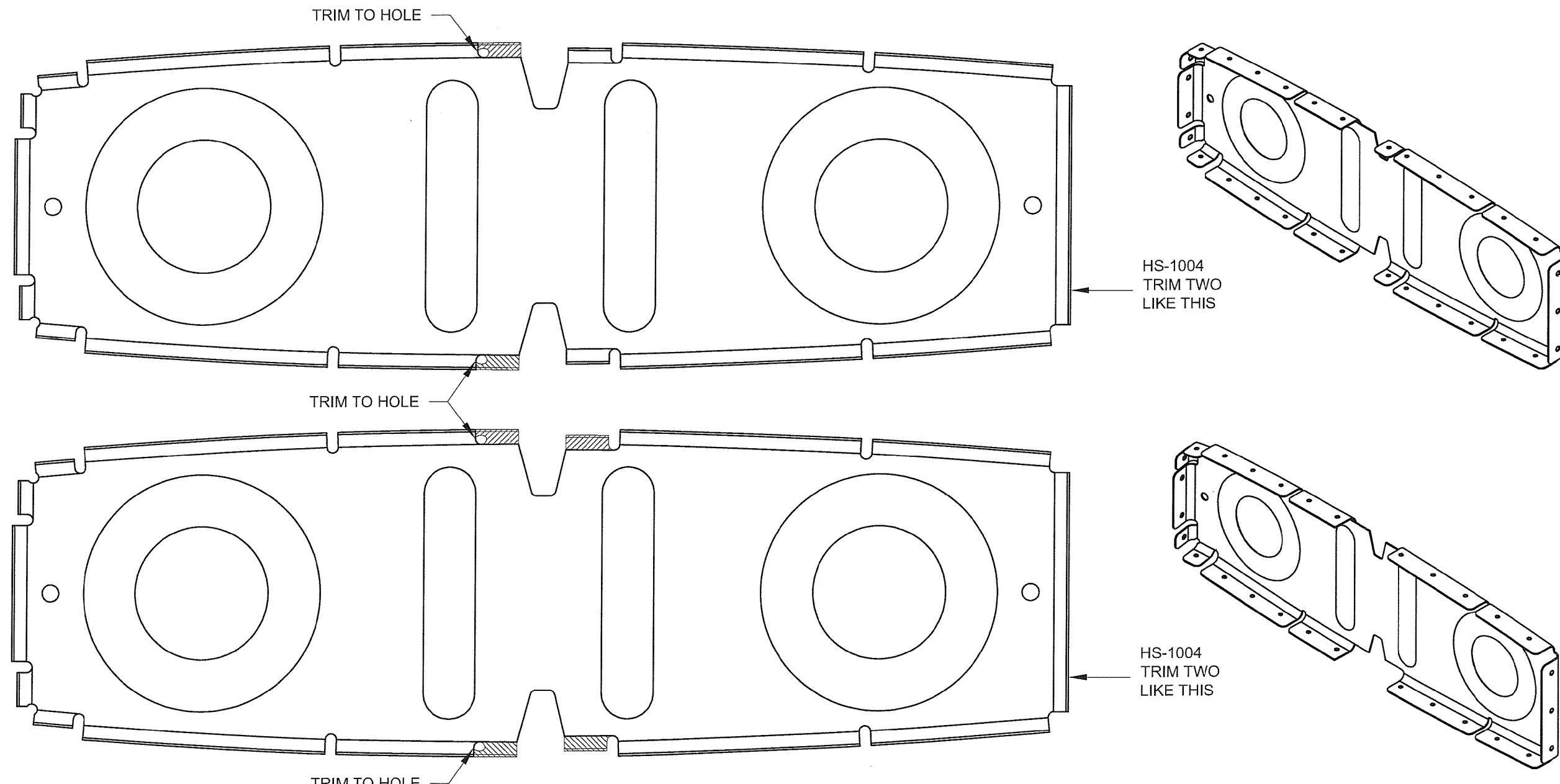
Step 2: Install AN426AD3-4.5 rivets into the nine holes in both flanges of the HS-1002 Front Spar and the HS-1013 Spar Caps. These are the holes which were machine countersunk in the spar flanges on Page 8-5, Step 7.



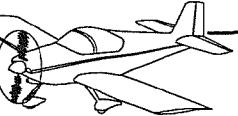
**FIGURE 1: FRONT SPAR DOUBLER RIVETS**

Step 3: Locate four of the HS-1004 Inspar Ribs. Remove the portion of the top and bottom flange, shown in the upper rib drawing of Figure 2, from all four ribs.

Step 4: Set two of the ribs from step 3 aside, then remove the small flange, shown in the lower rib drawing of Figure 2, from the remaining two ribs.

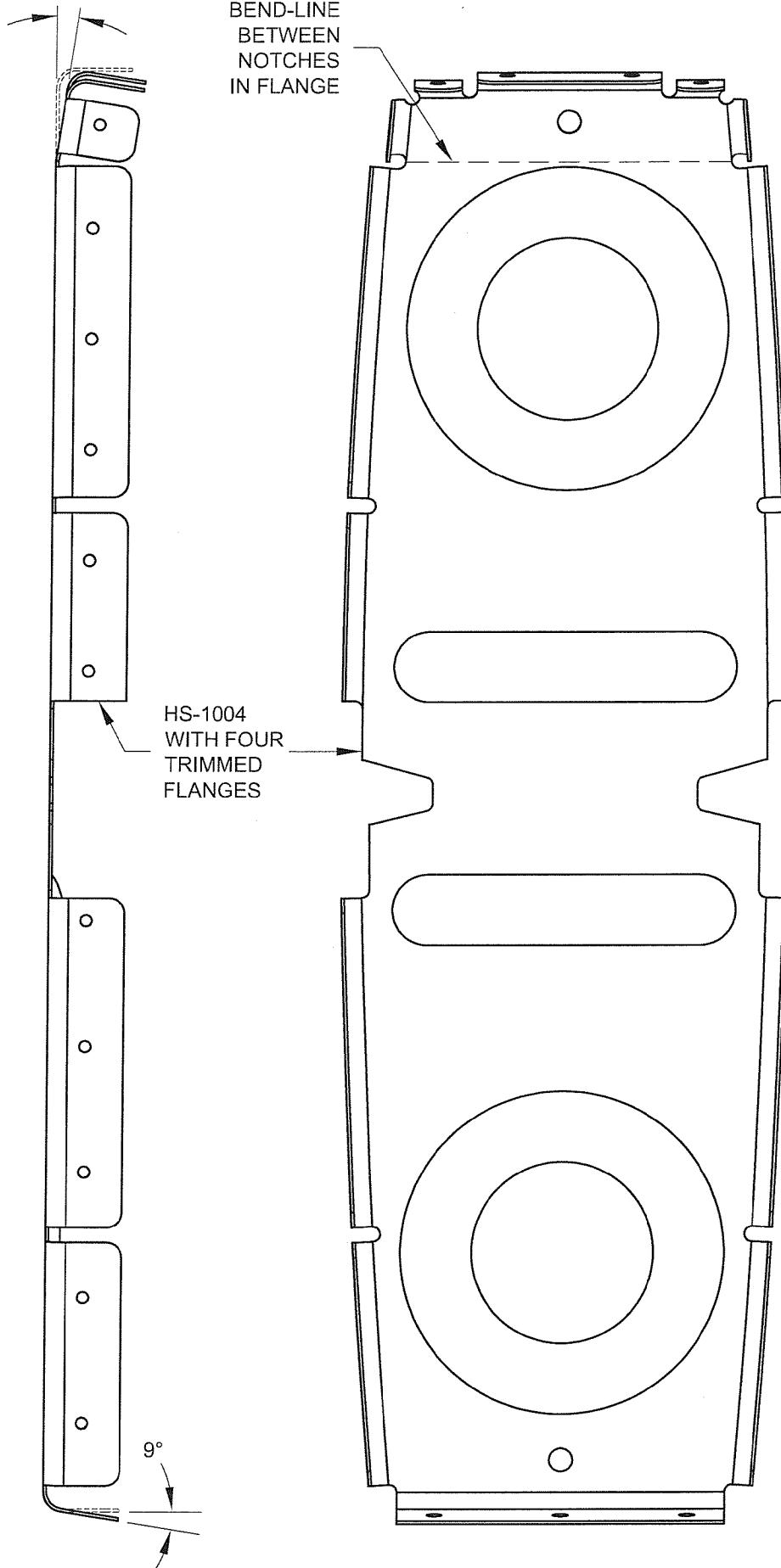


**FIGURE 2: TRIMMING RIB FLANGES**



Step 1: Deburr the edges of all HS-1004 Inspark Ribs. Flute (Section 5N), if necessary, the curved flanges of the ribs until the holes in the flanges are in a straight line.

Step 2: The two HS-1004 Inspark Ribs which had the four flanges trimmed on Page 8-6, Step 4, need to be modified further. Use a hand seamer to bend the aft flange of the ribs open by 9° as shown at the bottom of Figure 1. The forward portion of the rib must also be bent by 9° as shown at the top of the figure. This bend can be accomplished by holding the forward portion of the rib against a solid surface and pressing down along the bend-line with your fingers. The part will bend along the bend-line, between the two notches shown in the figure.



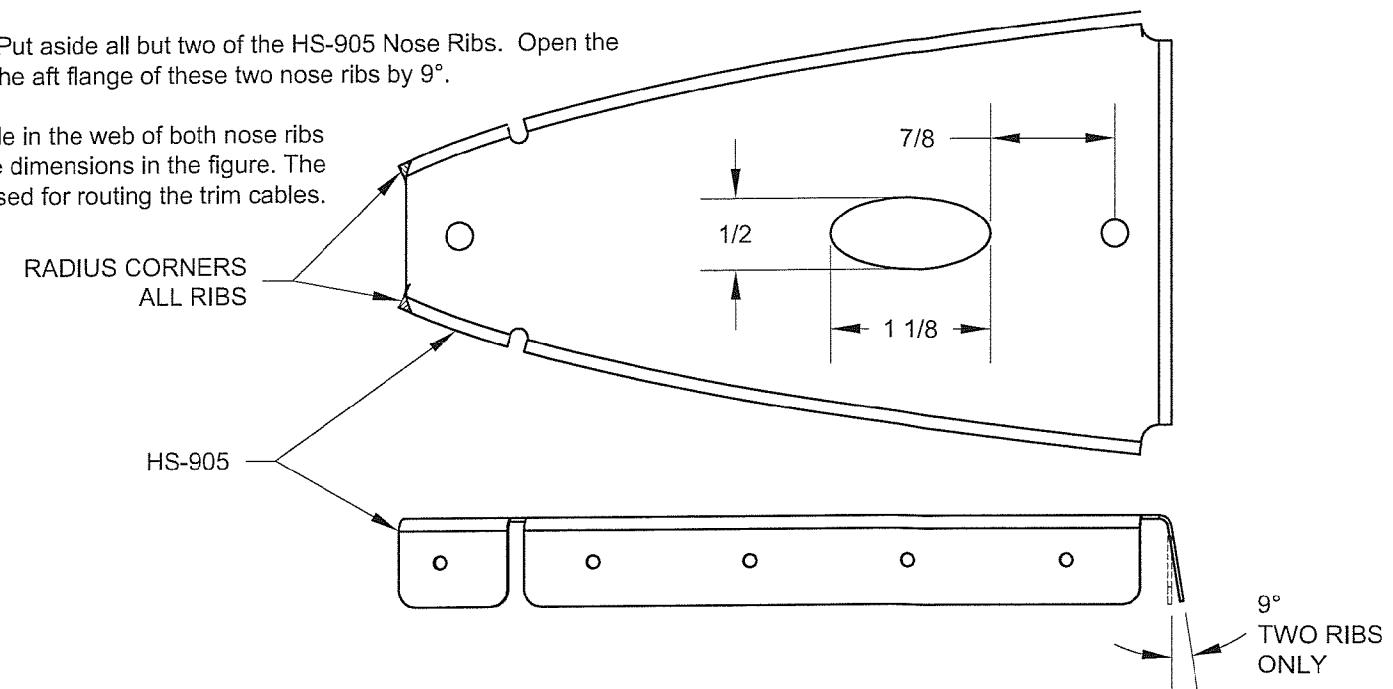
**FIGURE 1: MODIFY TRIMMED  
INSPAR RIBS**

Step 3: Deburr the edges of all the HS-905 Nose Ribs. Flute, if necessary, the curved flanges of the ribs until the holes in the flanges are in a straight line.

Radius the corners at the forward end of the nose rib flanges (see Figure 2) to prevent them from making small dents in the skins when the ribs are installed.

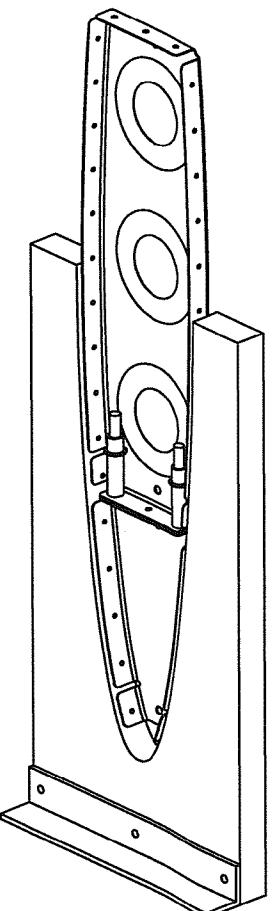
Step 4: Put aside all but two of the HS-905 Nose Ribs. Open the bend in the aft flange of these two nose ribs by 9°.

Cut a hole in the web of both nose ribs using the dimensions in the figure. The hole is used for routing the trim cables.

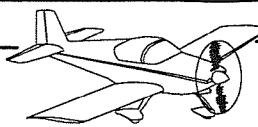


**FIGURE 2: MODIFY NOSE RIBS**

Step 5: Fabricate four cradles out of 3/8" (min) plywood to hold the horizontal stabilizer during construction. Make a template, used to trace the stabilizer's cross-section, by clecoing together a nose and inspar rib. The 3/16" tooling holes in the ribs can be used to square the ribs with the plywood. Offset the trace about an eighth inch to allow for the thickness of the skins and a duct tape liner. Don't waste time making the cradles perfect; they have no bearing on the alignment of the stabilizer.



**FIGURE 3: FABRICATE  
CRADLES**



NOTE: Only the left side of the horizontal stabilizer is fully depicted in the rest of the manual. The right side is simply a mirror image of the left.

Step 1: Cleco the two modified inboard HS-905 Nose Ribs (the ribs with the hole cut in the web) to the front spar assembly as shown in Figure 1. (Ignore the cradles and skins for now, they are introduced in a later step.) Notice that there are five holes in the spar at these two rib locations, but only three holes in the aft flange of the nose rib. Using a 1/8" drill, match-drill the two extra holes of the spar into the nose rib.

Cleco into position the two inboard HS-1004 Inspar Ribs (the ribs with four trimmed flanges) and, using the same drill, match-drill the center hole of the nose rib and spar into the inspar rib flange.

Step 2: Cleco the rest of the HS-905 Nose Ribs to the front spar assembly as shown in the figure. Note that except for the two inboard ribs, the flanges of the nose ribs are all pointed outboard. Use a #30 drill to final-drill all of the holes common to the nose ribs, spar web, and the two inboard inspar ribs.

Step 3: Cleco the rest of the HS-904 and -1004 Inspar Ribs to the front spar assembly. Once again, except for the two inboard inspar ribs, the flanges of all the ribs point outboard. Notice in the figure that the inspar ribs with two trimmed flanges are located just outboard of the inspar ribs with four trimmed flanges.

Final-Drill the holes common to the inspar ribs and the web of the front spar assembly using a #30 drill.

Step 4: Mark the nose and inspar ribs so that, once removed, they can be reassembled in the same position on the spar.

Step 5: Deburr the edges of the HS-1001 Skins. Remove the vinyl from the inside surface of the skins; the added thickness makes it difficult to install the HS-905 Nose Ribs.

Step 6: Set up the four cradles to support the HS-1001 Skins as shown in Figure 1, then clamp them to the work bench. Adjust the position of the cradles, if necessary, while the stabilizer is being clecoed together so that they don't interfere with its alignment.

Step 7: Insert the HS-1001 Skins into the cradles. The skins are symmetrical: at this point there is no top or bottom, left or right. So it doesn't matter which skin goes in which cradle. Just make sure the angled end of the skins are facing inboard.

Step 8: One at a time, remove the nose ribs from the front spar assembly and cleco them to the skins. Cleco the front spar/ inspar rib assembly to the nose ribs and the flanges of the front spar to the skins. Don't cleco the inspar ribs to the rest of the skins yet.

HS-905  
4 PLACES / SIDE

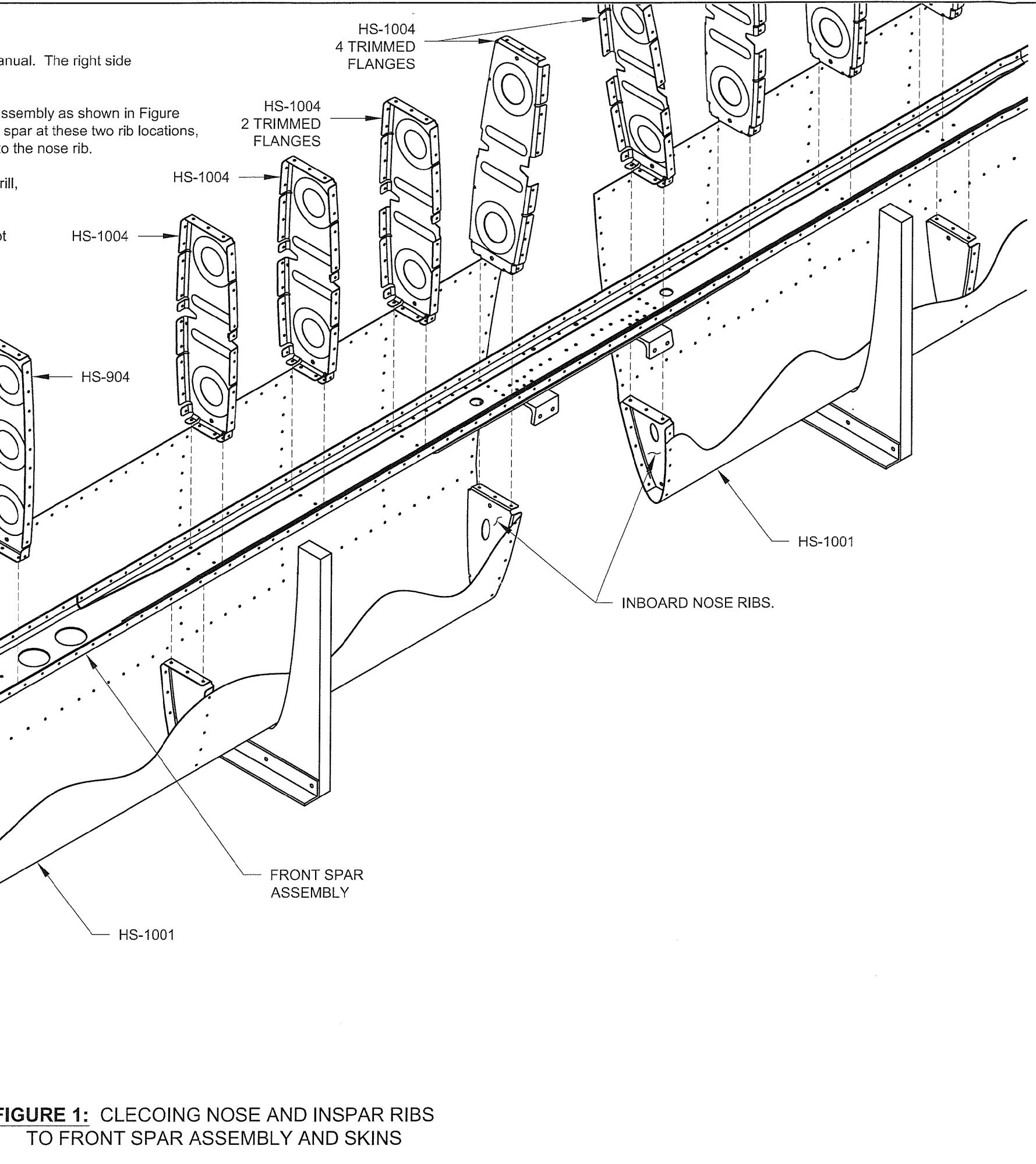
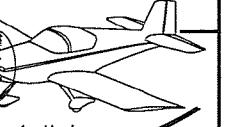


FIGURE 1: CLECOING NOSE AND INSPAR RIBS TO FRONT SPAR ASSEMBLY AND SKINS



Step 1: Cleco the HS-1014 and -1015 Long and Short Stringers together making two stringer assemblies as shown in Figure 1. With a #30 drill, final-drill the five outboard holes on each end of the stringers which are common to both stringers. Leave the eight inboard holes alone for now. Insert the two stringer assemblies into the stabilizer by pulling back the skins (not shown in the figure) and dropping them into the notches in the inspar ribs. This will require lifting the entire assembly out of the cradles slightly. Cleco the skins to all of the ribs and stringers.

Step 2: Cleco the rear spar assembly to the inspar ribs, then final-drill the holes common to the spar and ribs using a #30 drill. The rear spar assembly is symmetrical; there is no left or right.

Step 3: Cleco the HS-1016 Stringer Web to the forward side of the two stringer assemblies, then, using an angle drill, final-drill the holes common to the stringers and stringer web with a #30 drill. Match-drill the four holes in both flanges of the stringer web into the inspar ribs using the same drill.

Step 4: Final-Drill all skin holes to size with a #40 drill. Try to follow a system of drilling and moving clecos prevent missing any holes.

NOTE: The empennage fairing screw holes are indicated on Page 8-14, Figure 1 along the right side of the depicted skin. These holes correspond to holes on the top of the horizontal stabilizer (the HS-1008 Front Spar Attachment Bracket flanges are on the bottom of the horizontal).

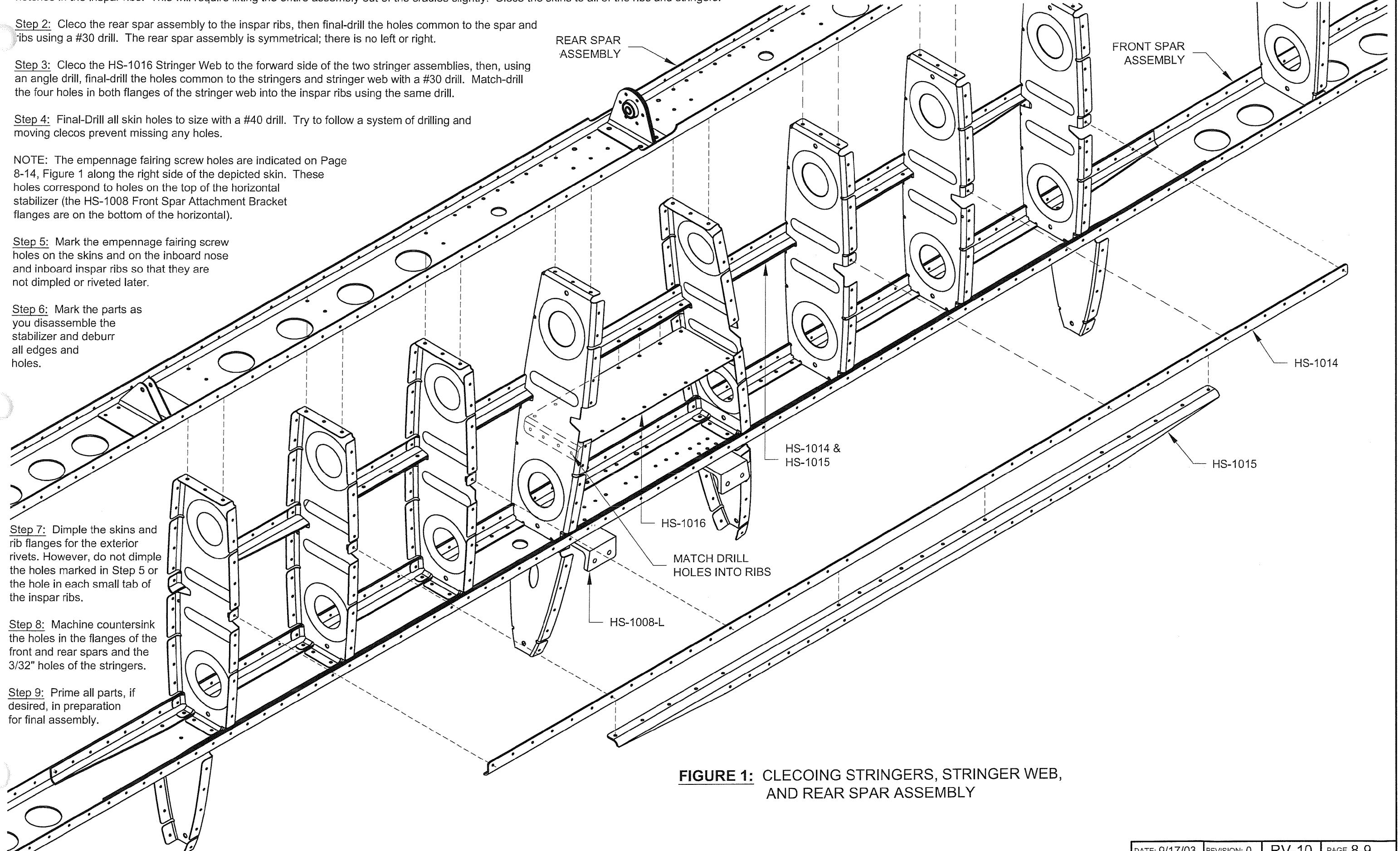
Step 5: Mark the empennage fairing screw holes on the skins and on the inboard nose and inboard inspar ribs so that they are not dimpled or riveted later.

Step 6: Mark the parts as you disassemble the stabilizer and deburr all edges and holes.

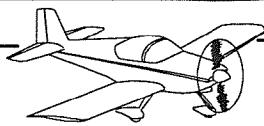
Step 7: Dimple the skins and rib flanges for the exterior rivets. However, do not dimple the holes marked in Step 5 or the hole in each small tab of the inspar ribs.

Step 8: Machine countersink the holes in the flanges of the front and rear spars and the 3/32" holes of the stringers.

Step 9: Prime all parts, if desired, in preparation for final assembly.

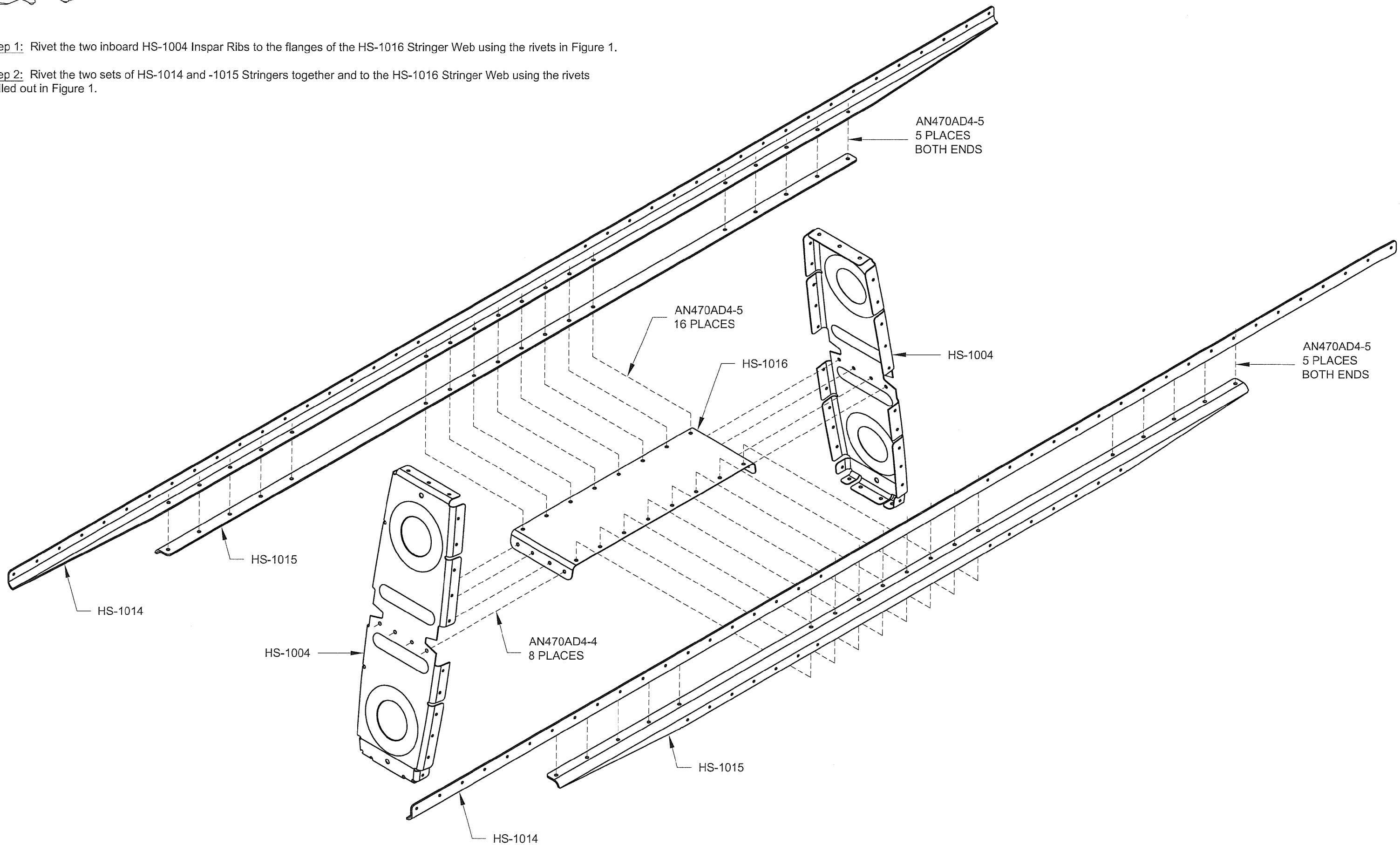


**FIGURE 1: CLECOING STRINGERS, STRINGER WEB,  
AND REAR SPAR ASSEMBLY**

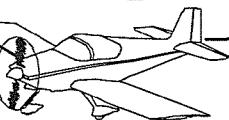


Step 1: Rivet the two inboard HS-1004 Inspar Ribs to the flanges of the HS-1016 Stringer Web using the rivets in Figure 1.

Step 2: Rivet the two sets of HS-1014 and -1015 Stringers together and to the HS-1016 Stringer Web using the rivets called out in Figure 1.



**FIGURE 1: STRINGER AND STRINGER WEB RIVETS**

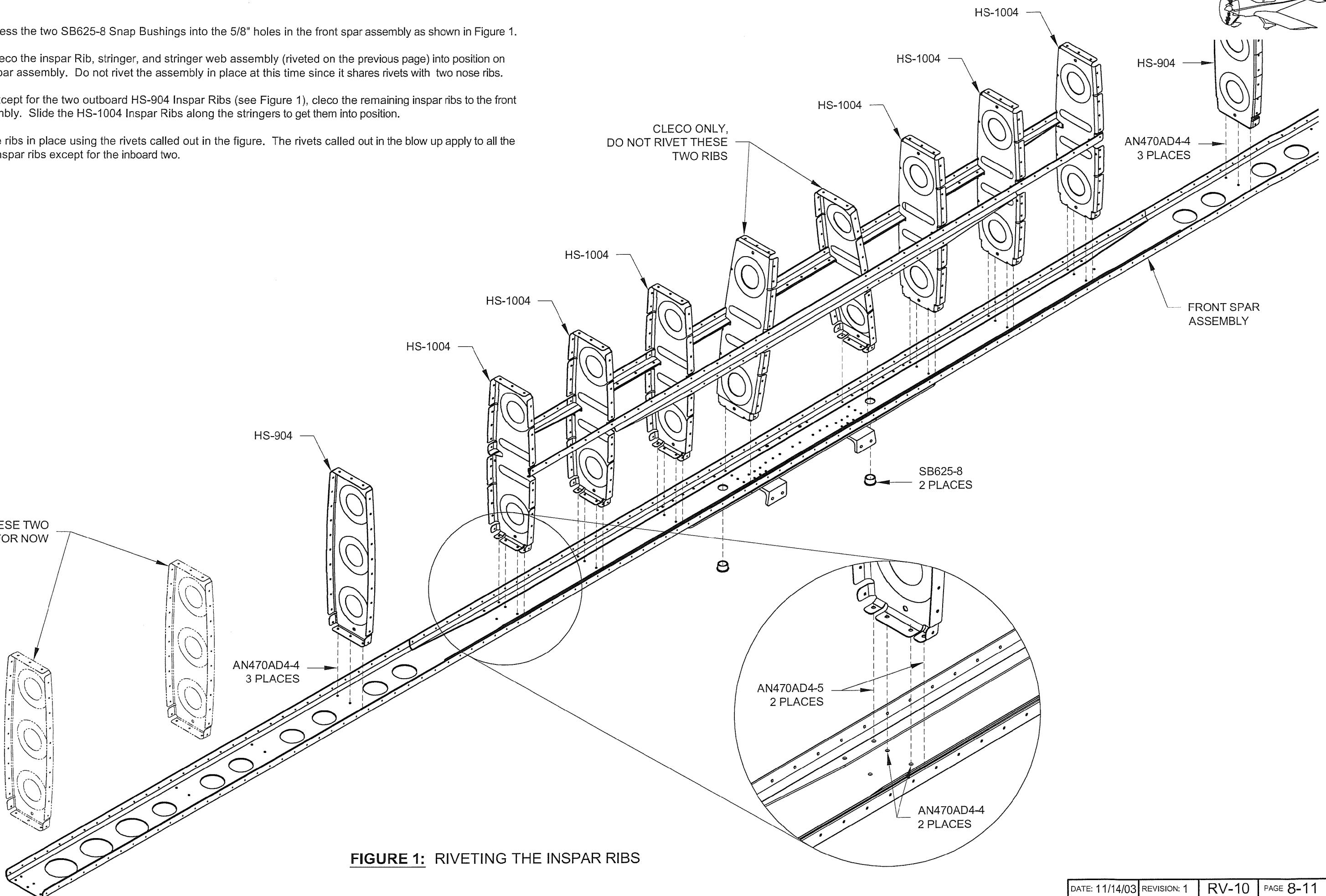


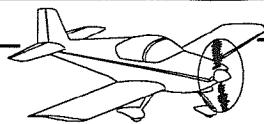
Step 1: Press the two SB625-8 Snap Bushings into the 5/8" holes in the front spar assembly as shown in Figure 1.

Step 2: Cleco the inspar Rib, stringer, and stringer web assembly (riveted on the previous page) into position on the front spar assembly. Do not rivet the assembly in place at this time since it shares rivets with two nose ribs.

Step 3: Except for the two outboard HS-904 Inspark Ribs (see Figure 1), cleco the remaining inspar ribs to the front spar assembly. Slide the HS-1004 Inspark Ribs along the stringers to get them into position.

Rivet these ribs in place using the rivets called out in the figure. The rivets called out in the blow up apply to all the HS-1004 Inspark ribs except for the inboard two.





Step 1: Put both HS-1001 Skins back in the cradles. Cleco all the HS-905 Nose Ribs in place, then rivet them to the skins using the rivets shown on Page 8-14, Figure 1.

Step 2: Insert the front spar/ inspar rib assembly into the skins and cleco it to the nose ribs and skins. Using the rivets shown in Figure 1, rivet the assembly to the nose ribs. (If access to the two inboard nose ribs is limited, making riveting difficult, they can be riveted after the rest of the horizontal's construction is completed. The horizontal can then be removed from the cradles giving better access.)

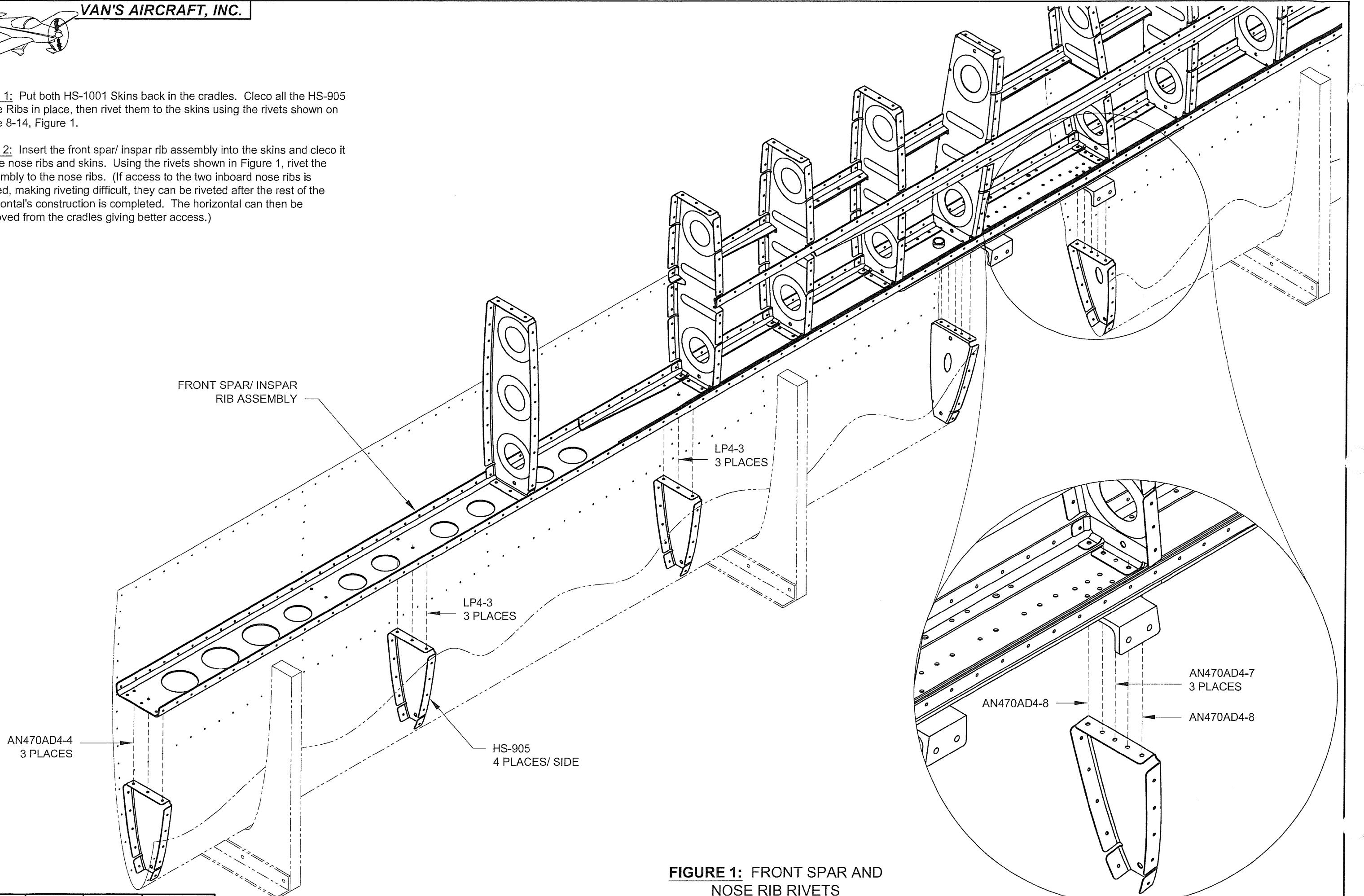


FIGURE 1: FRONT SPAR AND  
NOSE RIB RIVETS

Step 1: Using the rivets shown in Figure 1, rivet the last two HS-904 Inspark Ribs, on each side of the stabilizer, to the HS-1002 Front Spar web.

NOTE: The rivets used for the rest of the horizontal stabilizer can be found on Page 8-14, Figure 1.

Step 2: Rivet the HS-1001 Skins to the flanges of the front spar assembly. Make sure to capture the flanges of the inspar ribs where they joggle under the flanges of the front spar assembly.

Step 3: Starting from the front spar assembly, rivet the skins to the flanges of the HS-1004 Inspark ribs up to the HS-1014 and -1015 Stringers.

Step 4: Rivet the skins to the HS-1014 and -1015 Stringers.

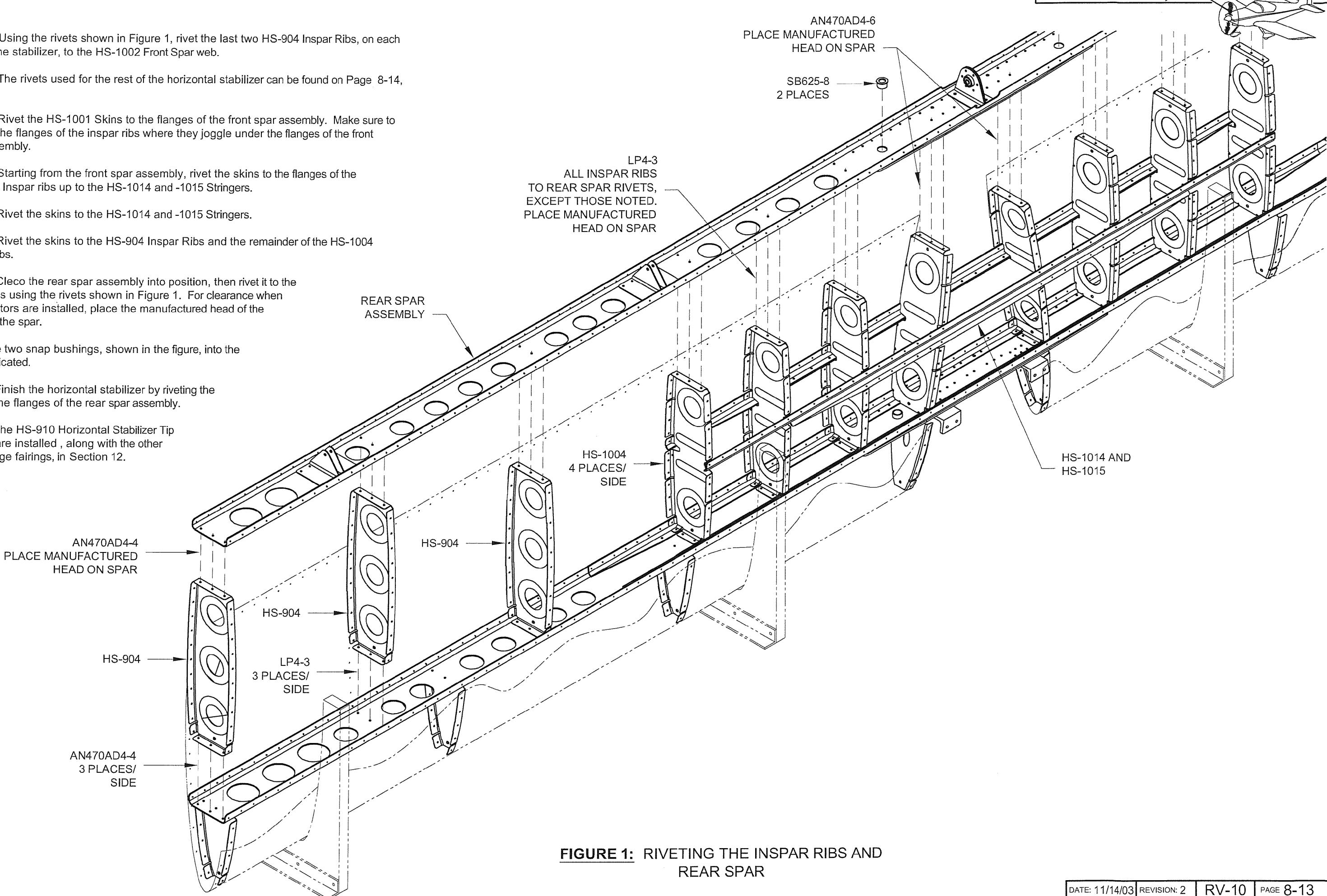
Step 5: Rivet the skins to the HS-904 Inspark Ribs and the remainder of the HS-1004 Inspark Ribs.

Step 6: Cleco the rear spar assembly into position, then rivet it to the inspar ribs using the rivets shown in Figure 1. For clearance when the elevators are installed, place the manufactured head of the rivets on the spar.

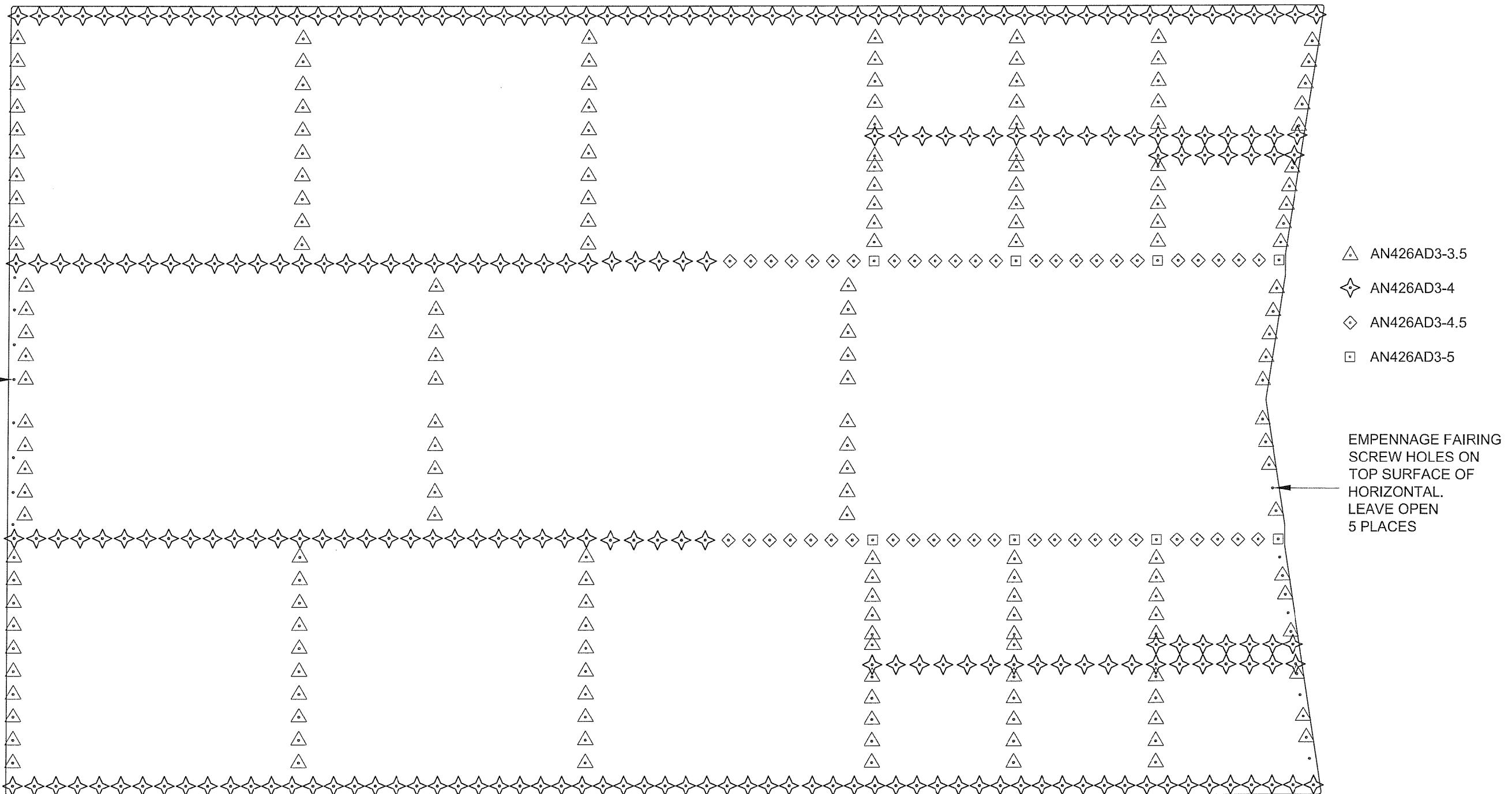
Install the two snap bushings, shown in the figure, into the holes indicated.

Step 7: Finish the horizontal stabilizer by riveting the skins to the flanges of the rear spar assembly.

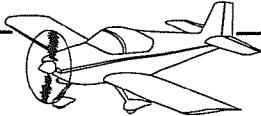
NOTE: The HS-910 Horizontal Stabilizer Tip Fairings are installed, along with the other empennage fairings, in Section 12.



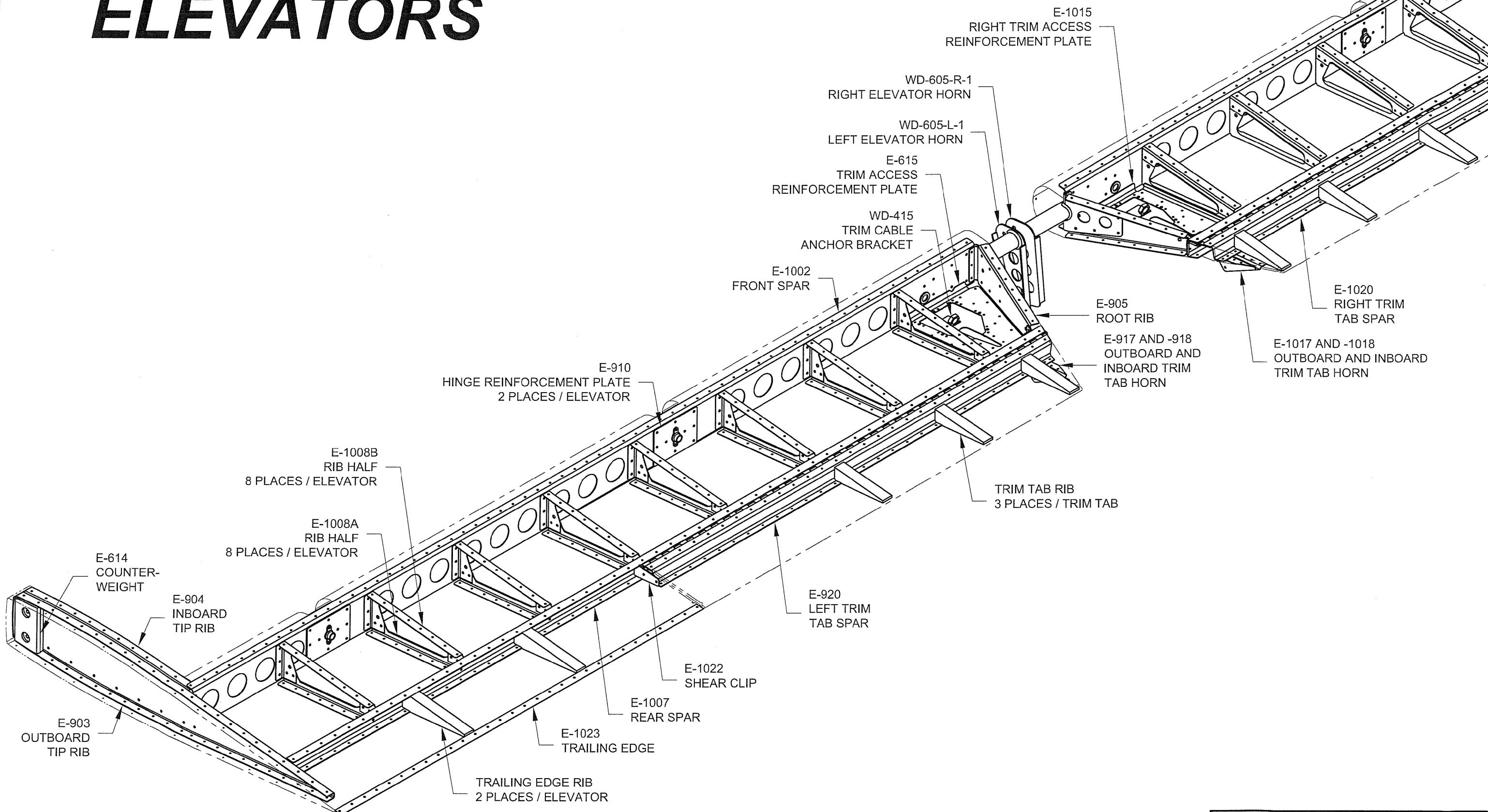
**FIGURE 1: RIVETING THE INSPAR RIBS AND REAR SPAR**

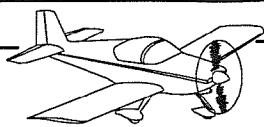


**FIGURE 1: SKIN RIVETS**



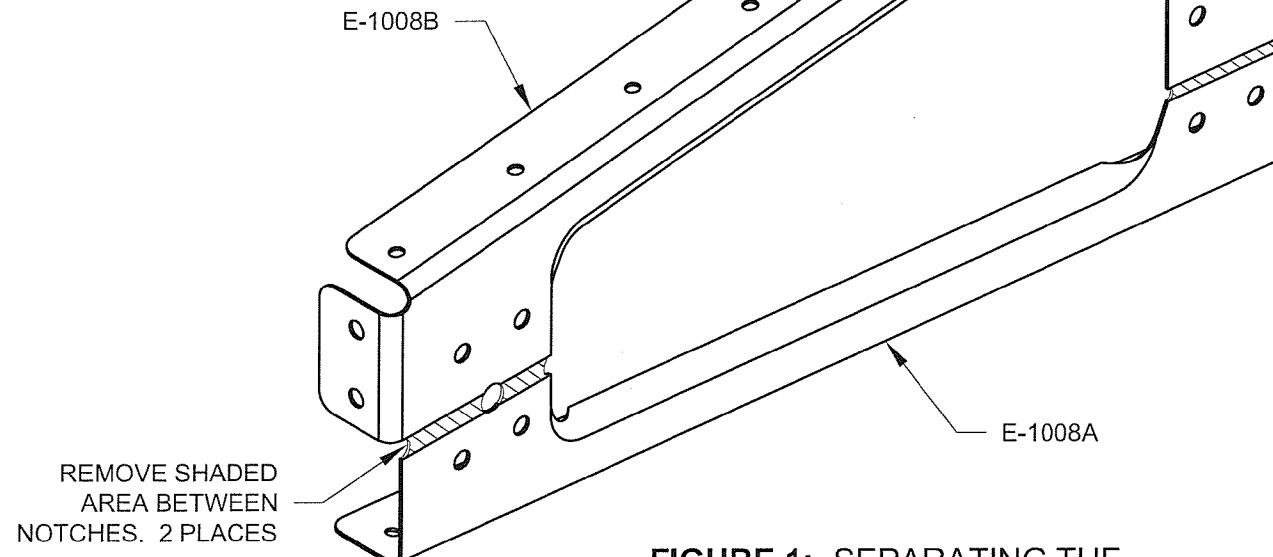
# SECTION 9: ELEVATORS





Step 1: Separate the sixteen E-1008 Elevator Ribs into individual parts by removing the material shown in Figure 1.  
Deburr all edges.

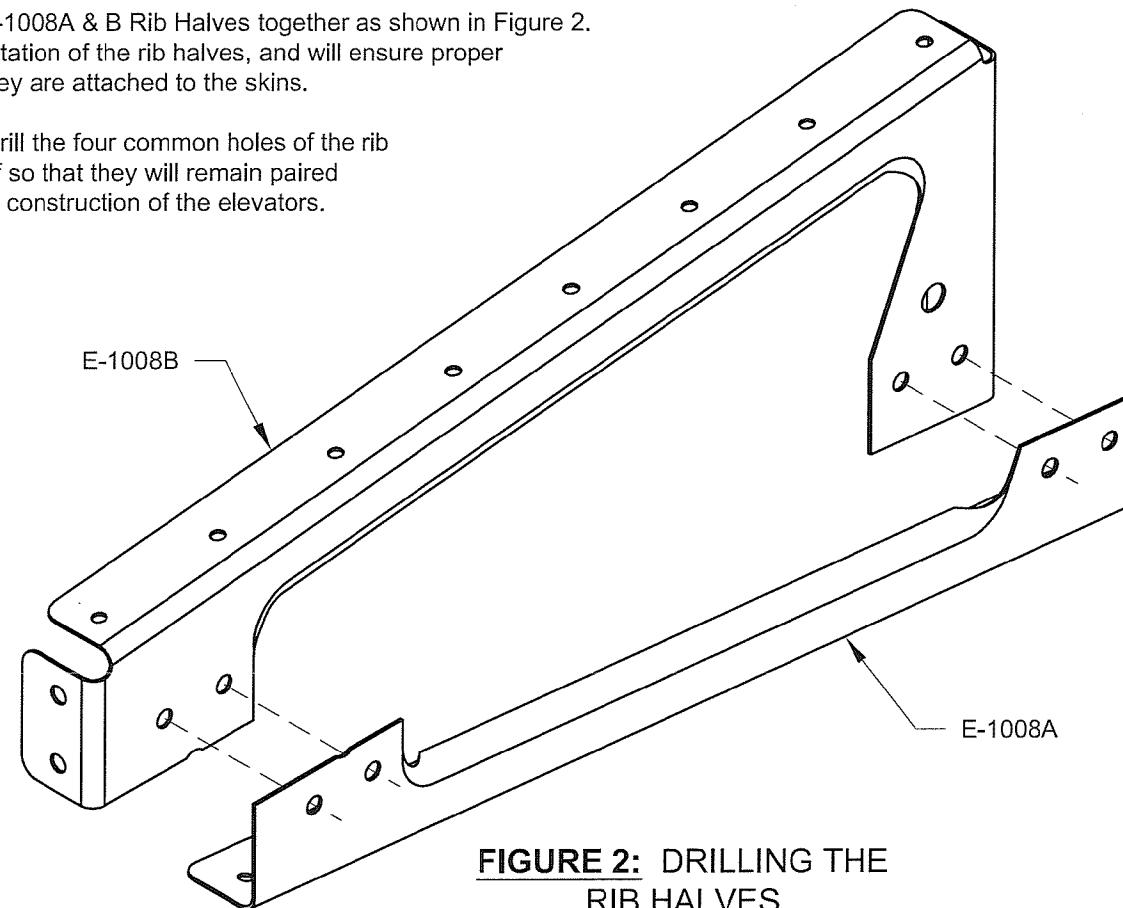
Step 2: Deburr the edges of all elevator parts.



**FIGURE 1: SEPARATING THE ELEVATOR RIBS**

Step 3: Cleco all the E-1008A & B Rib Halves together as shown in Figure 2. This is the correct orientation of the rib halves, and will ensure proper hole alignment when they are attached to the skins.

Using a #30 drill, final-drill the four common holes of the rib halves. Label each half so that they will remain paired together throughout the construction of the elevators.



**FIGURE 2: DRILLING THE RIB HALVES**

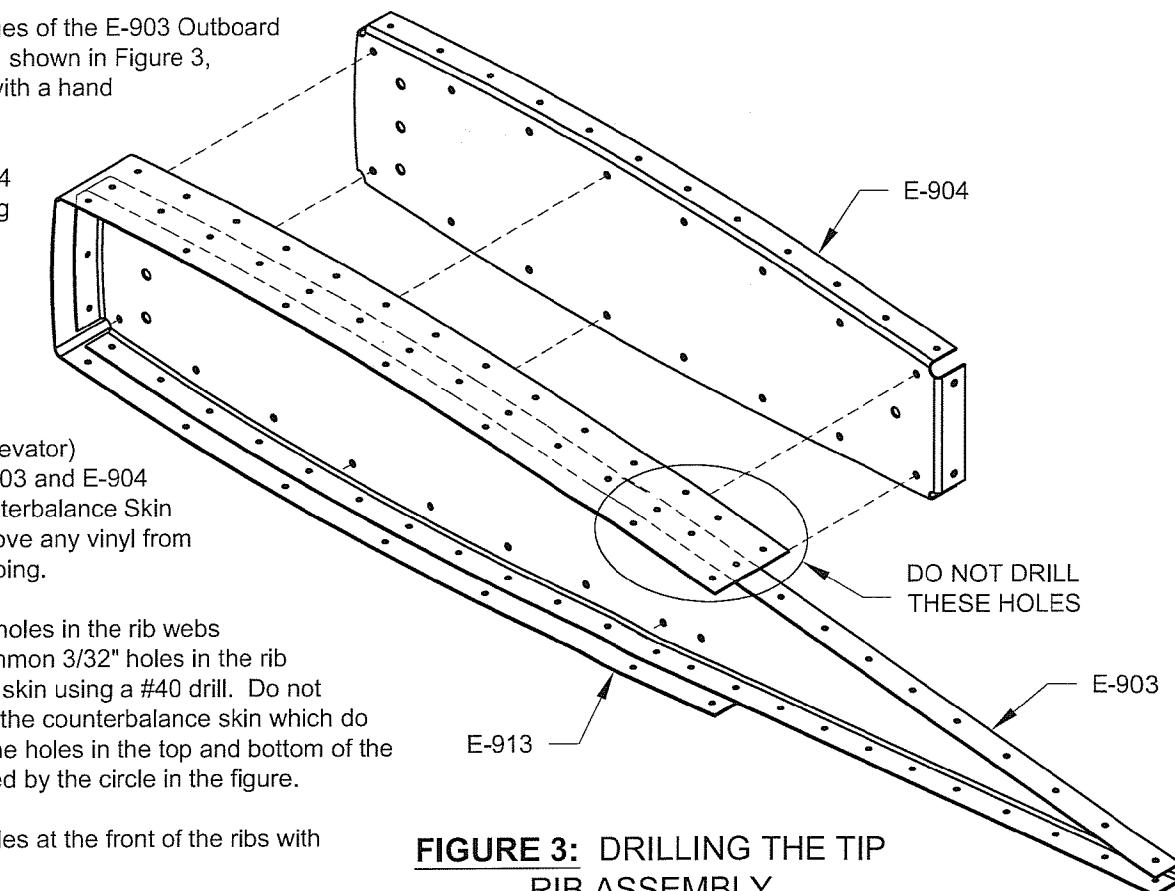
Step 4: Make sure the flanges of the E-903 Outboard and E-904 Inboard Tip Ribs, shown in Figure 3, are bent 90°. Adjust them with a hand seamer if necessary.

Step 5: Straighten the E-904 and E-903 Tip Ribs by fluting between the pre-punched holes in the flanges. Check for straightness using the matching holes in the E-913 Counterbalance Skin.

Step 6: Make two Tip Rib Assemblies (one for each elevator) by clecoing together the E-903 and E-904 Tip ribs and the E-913 Counterbalance Skin as shown in Figure 3. Remove any vinyl from mating surfaces before clecoing.

Final-Drill the common 1/8" holes in the rib webs using a #30 drill and the common 3/32" holes in the rib flanges and counterbalance skin using a #40 drill. Do not drill the line of holes around the counterbalance skin which do not match-up with a rib, or the holes in the top and bottom of the counterbalance skin indicated by the circle in the figure.

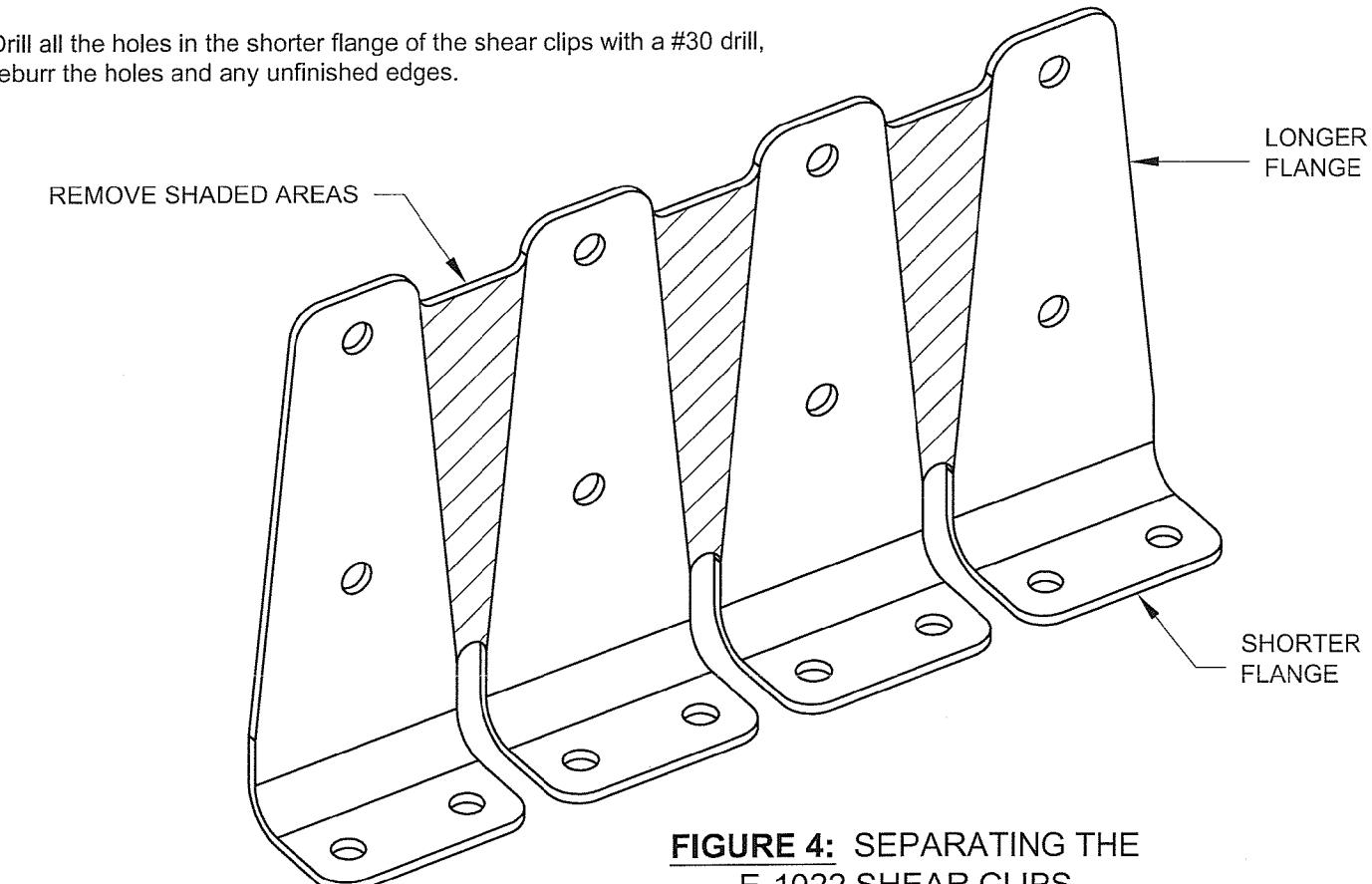
Final-Drill the three 3/16" holes at the front of the ribs with a #12 drill.



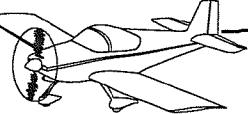
**FIGURE 3: DRILLING THE TIP RIB ASSEMBLY**

Step 7: Separate the four E-1022 Shear Clips by removing the material shown in Figure 4.

Final-Drill all the holes in the shorter flange of the shear clips with a #30 drill, then deburr the holes and any unfinished edges.

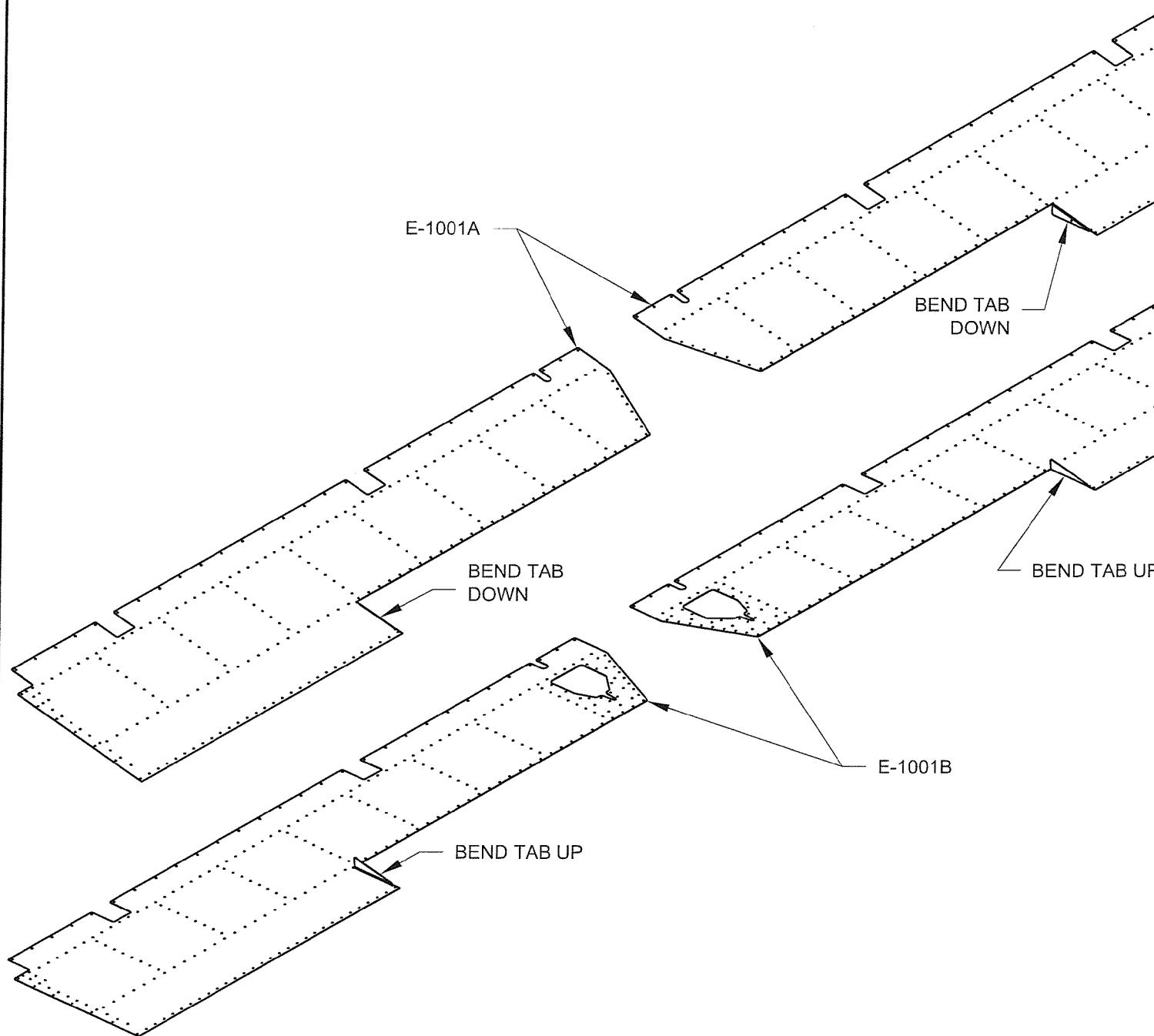


**FIGURE 4: SEPARATING THE E-1022 SHEAR CLIPS**



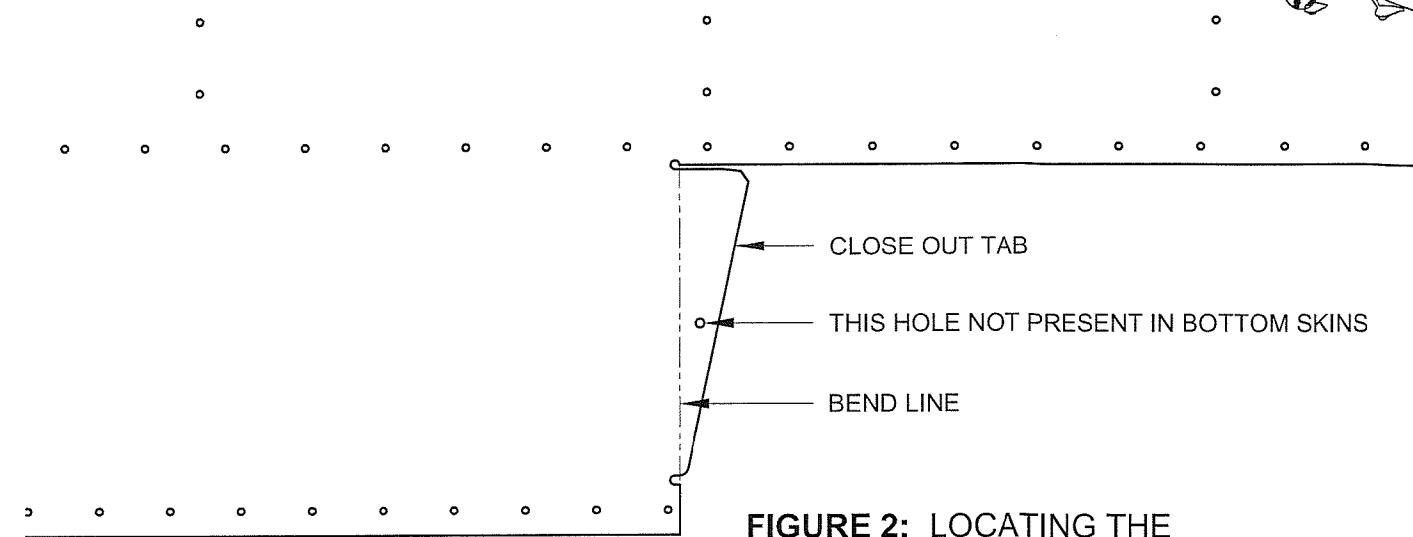
**NOTE:** There is a close out tab on the two E-1001A Top Skins and the two E-1001B Bottom Skins that must be bent prior to assembling the elevators. At this point, the top skins are identical and the bottom skins are identical. However, once the tabs are bent in the direction shown in Figure 1, the skins become dedicated left or right. The tabs will make it easier to identify the inside surface of the skins throughout the building process; they are directed toward the inside of the elevators.

Follow the steps on this page to bend the tabs on all four skins.



**FIGURE 1: CLOSE OUT TAB  
BEND DIRECTIONS**

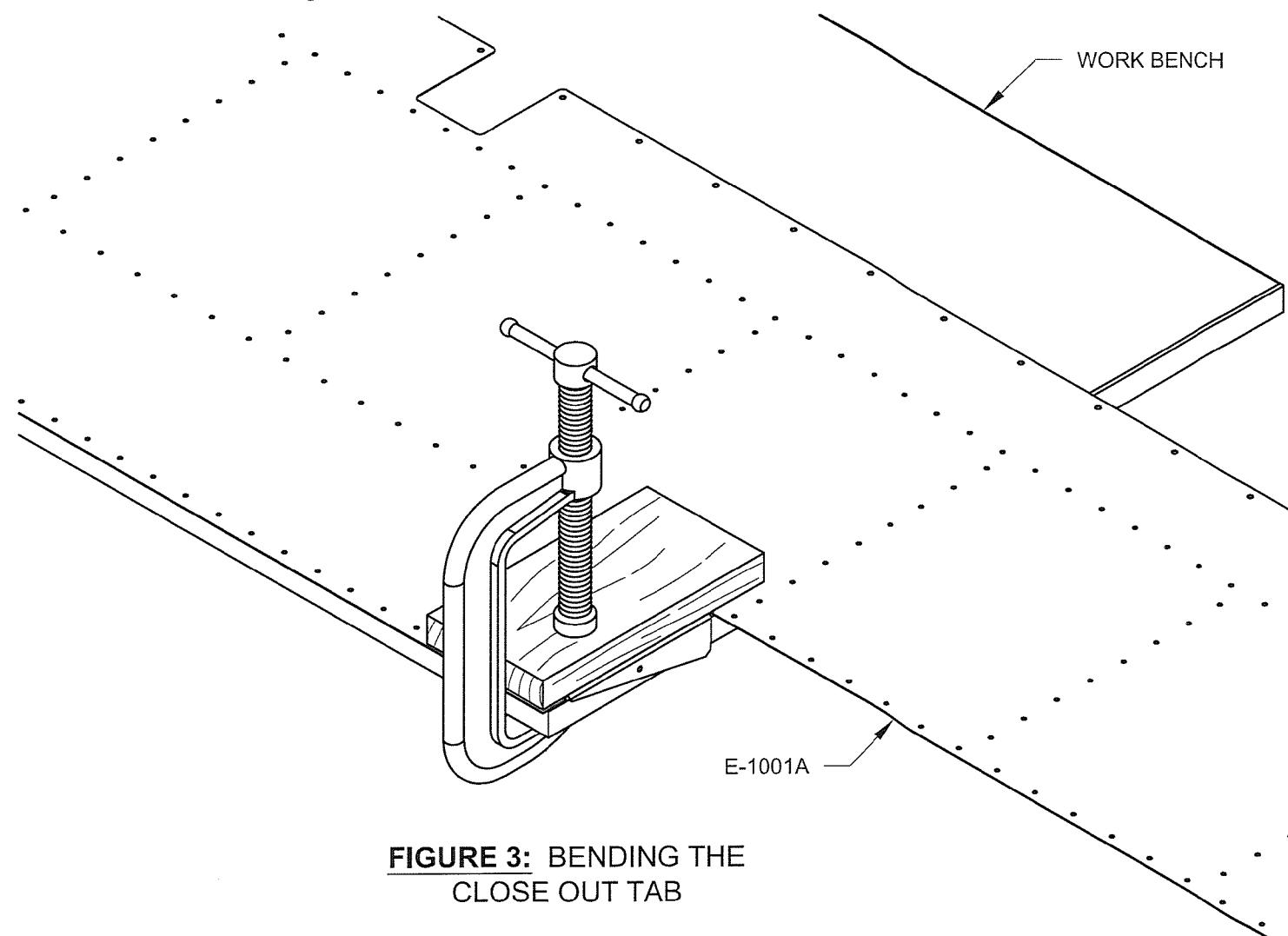
**Step 1:** Remove the vinyl from the skins in the area of the tab. Mark the bend line on the skins as shown in Figure 2.



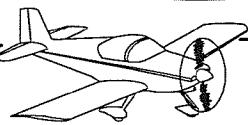
**FIGURE 2: LOCATING THE  
BEND LINE**

**Step 2:** Clamp a skin between the surface of a work bench and a piece of wood with the bend line at the edge of the workbench as shown in Figure 3.

**Step 3:** Begin forming the bend by hand using a small, wood block, then finish the bend by tapping back and forth along the tab with a flush rivet set in a rivet gun that has been turned down low. Finish the bend to 90° with a hand seamer.



**FIGURE 3: BENDING THE  
CLOSE OUT TAB**



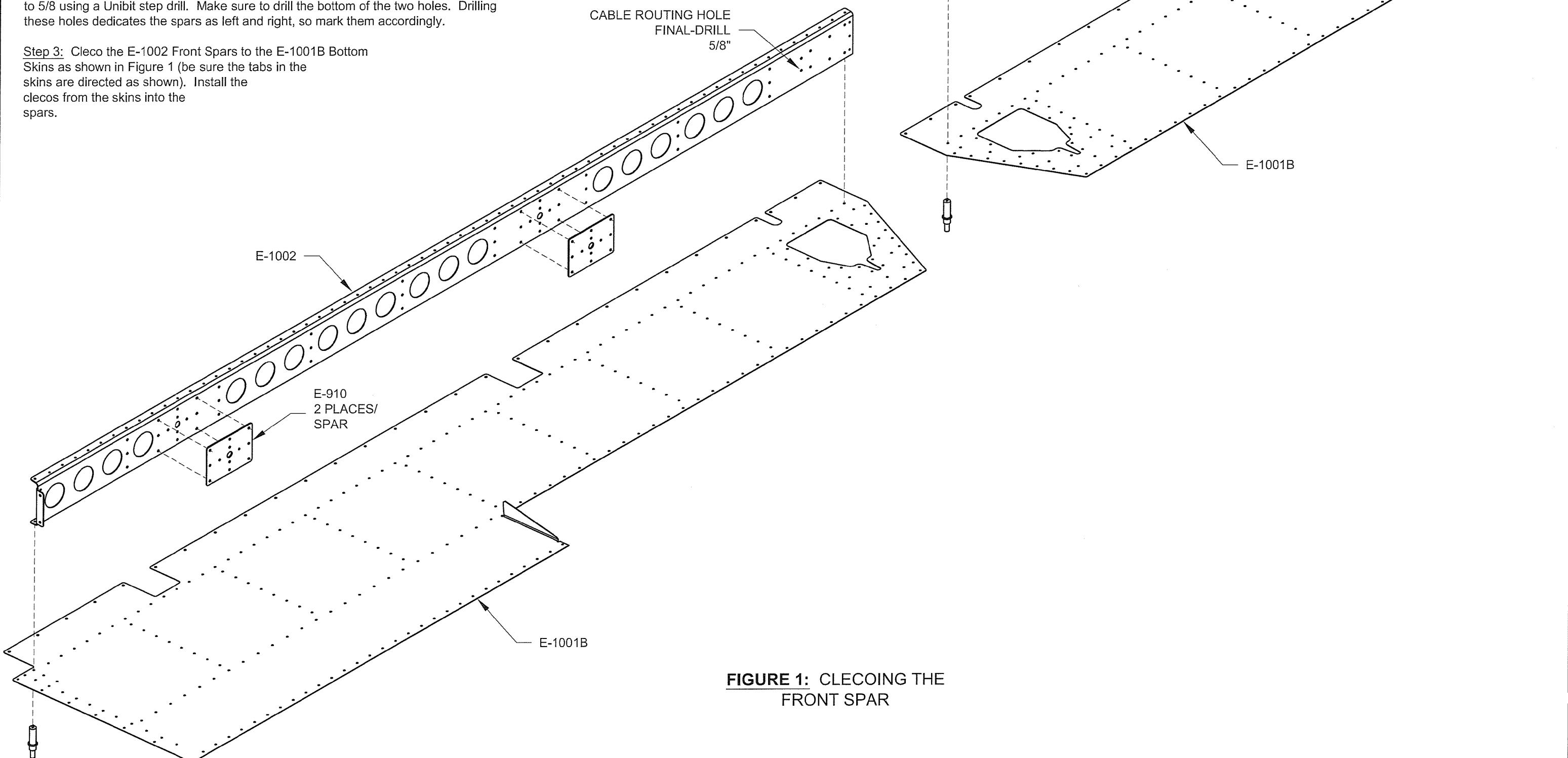
NOTE: Only the left elevator is fully depicted in the rest of the manual; the right elevator is simply the mirror image of the left. Unless otherwise specified, any instructions given for the left elevator applies to the right as well. Assemble both elevators at the same time. This will help to prevent mistakes and speed up the construction process.

Step 1: Cleco the E-910 Hinge Reinforcement Plates to both E-1002 Front Spars, as shown in Figure 1, then final-drill all the 1/8" holes common to the spars and plates using a #30 drill.

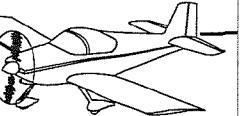
Mark the plates so that they can be reinstalled in the same position. Remove the plates from the spars and set them aside.

Step 2: Final-Drill the trim cable routing hole, indicated in Figure 1, in both E-1002 Front Spars to 5/8" using a Unibit step drill. Make sure to drill the bottom of the two holes. Drilling these holes dedicates the spars as left and right, so mark them accordingly.

Step 3: Cleco the E-1002 Front Spars to the E-1001B Bottom Skins as shown in Figure 1 (be sure the tabs in the skins are directed as shown). Install the clecos from the skins into the spars.



**FIGURE 1: CLECOING THE FRONT SPAR**

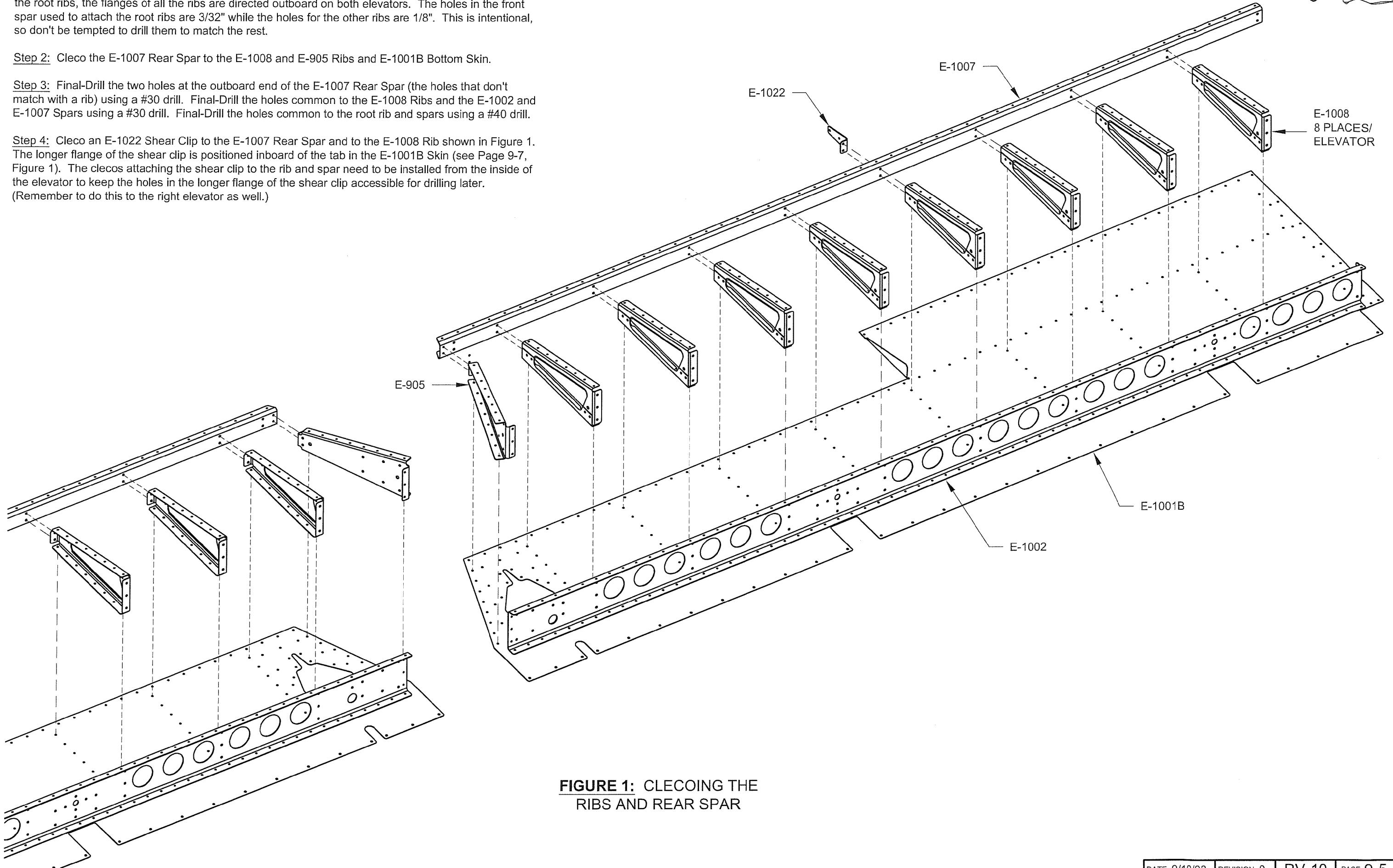


Step 1: Cleco the E-1008 Ribs (the rib halves should still be clecoed together) and the E-905 Root Rib to the E-1002 Front Spar and to the E-1001B Bottom Skin as shown in Figure 1. Note that, except for the root ribs, the flanges of all the ribs are directed outboard on both elevators. The holes in the front spar used to attach the root ribs are  $3/32"$  while the holes for the other ribs are  $1/8"$ . This is intentional, so don't be tempted to drill them to match the rest.

Step 2: Cleco the E-1007 Rear Spar to the E-1008 and E-905 Ribs and E-1001B Bottom Skin.

Step 3: Final-Drill the two holes at the outboard end of the E-1007 Rear Spar (the holes that don't match with a rib) using a #30 drill. Final-Drill the holes common to the E-1008 Ribs and the E-1002 and E-1007 Spars using a #30 drill. Final-Drill the holes common to the root rib and spars using a #40 drill.

Step 4: Cleco an E-1022 Shear Clip to the E-1007 Rear Spar and to the E-1008 Rib shown in Figure 1. The longer flange of the shear clip is positioned inboard of the tab in the E-1001B Skin (see Page 9-7, Figure 1). The clecos attaching the shear clip to the rib and spar need to be installed from the inside of the elevator to keep the holes in the longer flange of the shear clip accessible for drilling later. (Remember to do this to the right elevator as well.)



**FIGURE 1: CLECOING THE  
RIBS AND REAR SPAR**

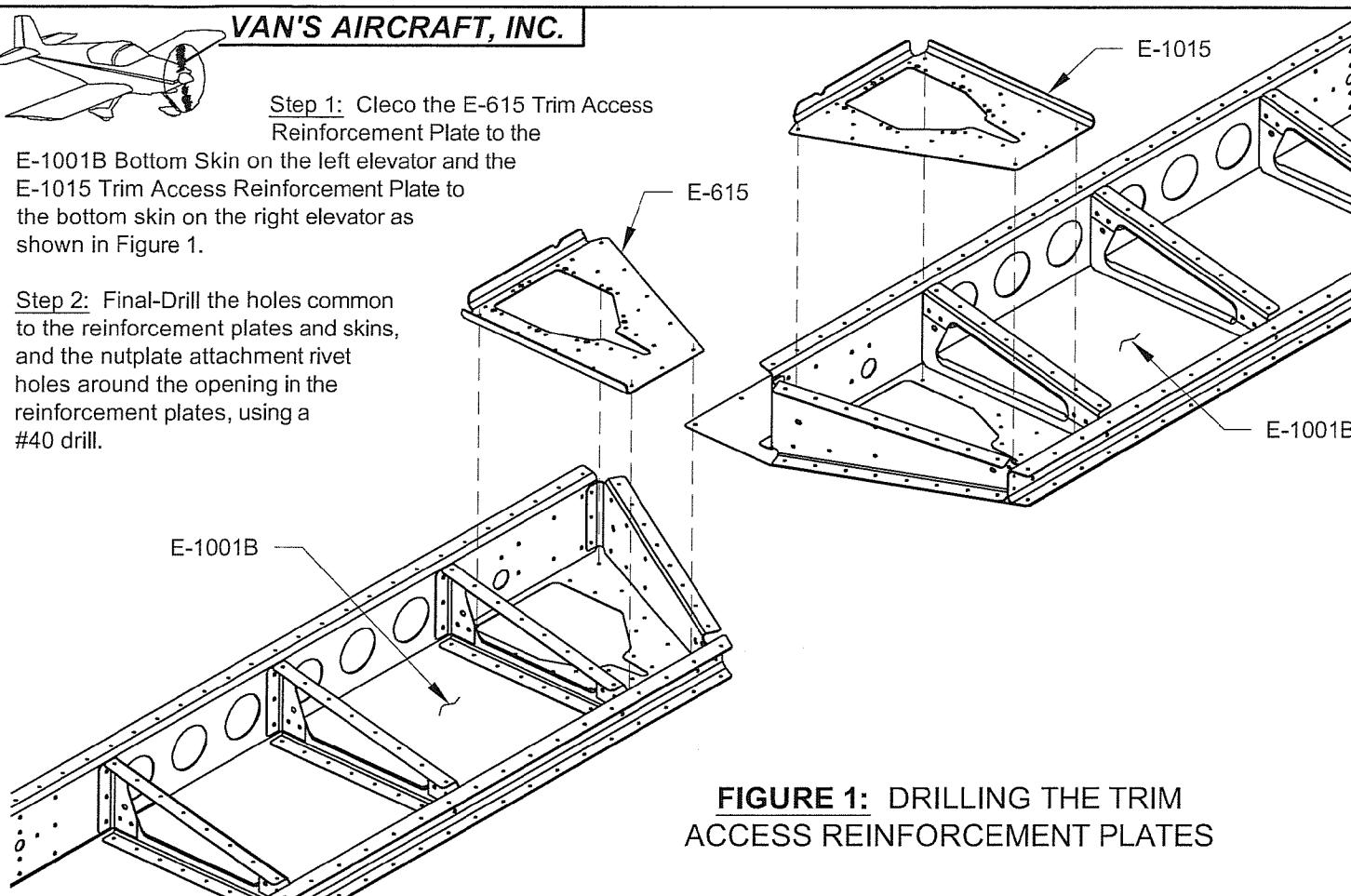
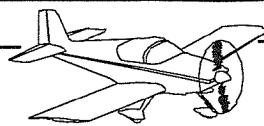


FIGURE 1: DRILLING THE TRIM ACCESS REINFORCEMENT PLATES

Step 3: Cleco the E-921 Elevator Gusset to the E-905 Root Rib and the E-1007 Rear Spar as shown in Figure 2. Adjust the angle of the gusset, if necessary, to fit the angle made by the rib and spar.

Step 4: Remove one of the clecos attaching the gusset to the rib, then final-drill the hole with a #30 drill. Install a cleco in this hole, final-drill the second hole with the same drill, and cleco.

Repeat the procedure for the attachment holes to the rear spar.

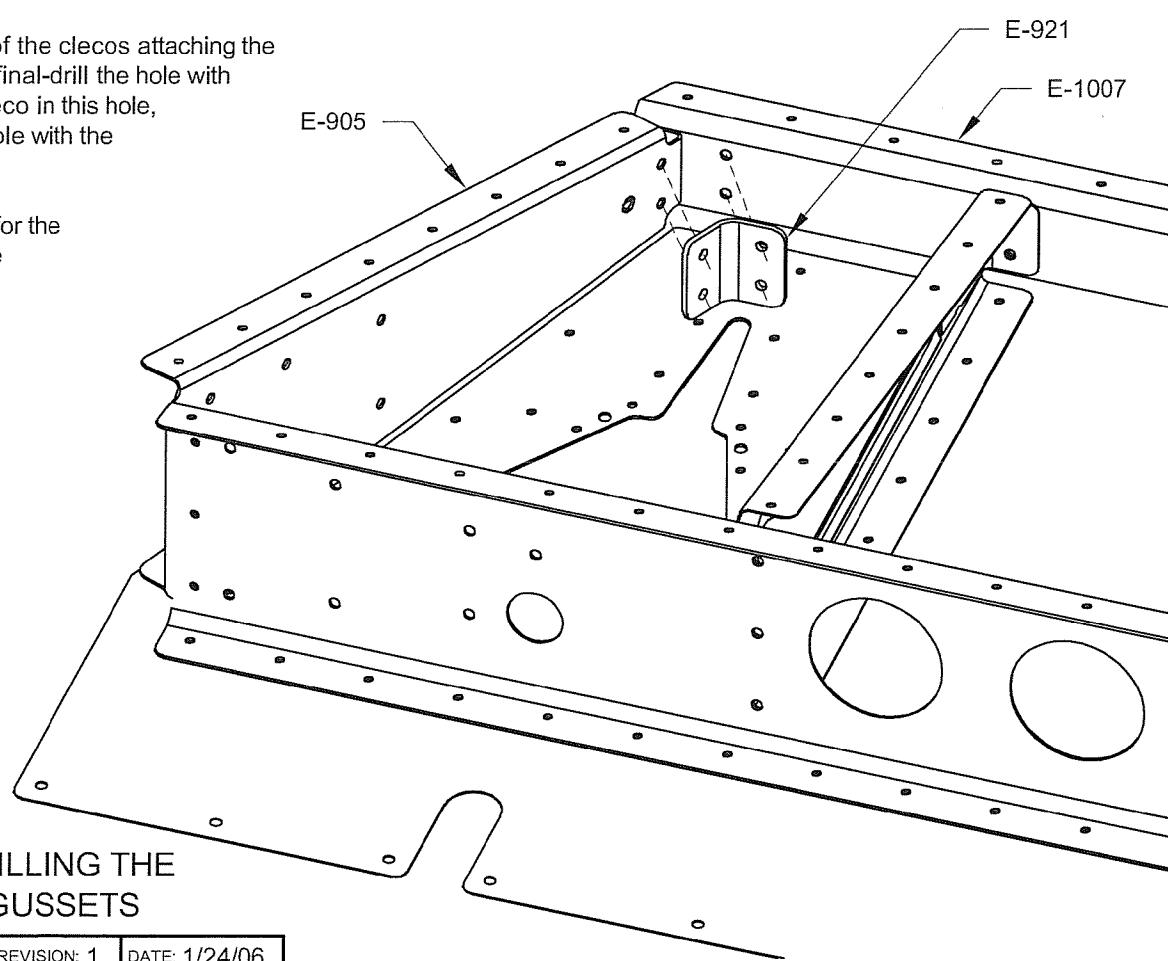


FIGURE 2: DRILLING THE ELEVATOR GUSSETS

Step 5: Cleco an E-1022 Shear Clip to the E-1007 Rear Spar as shown in Figure 3.

Step 6: Cleco the tip rib assembly (made up of the E-903 Outboard Tip Rib, the E-904 Inboard Tip Rib, and the E-913 Counterbalance Skin) to the E-1022 Shear Clip, the E-1002 Front Spar, and the E-1001B Bottom Skin. There are four holes which are used to attach the tip rib assembly to the front spar; two on the web of the outboard tip rib and two on the aft flange of the inboard tip rib.

Final-Drill the holes common to the tip rib assembly and shear clip, and the tip rib assembly and front spar using a #30 drill.

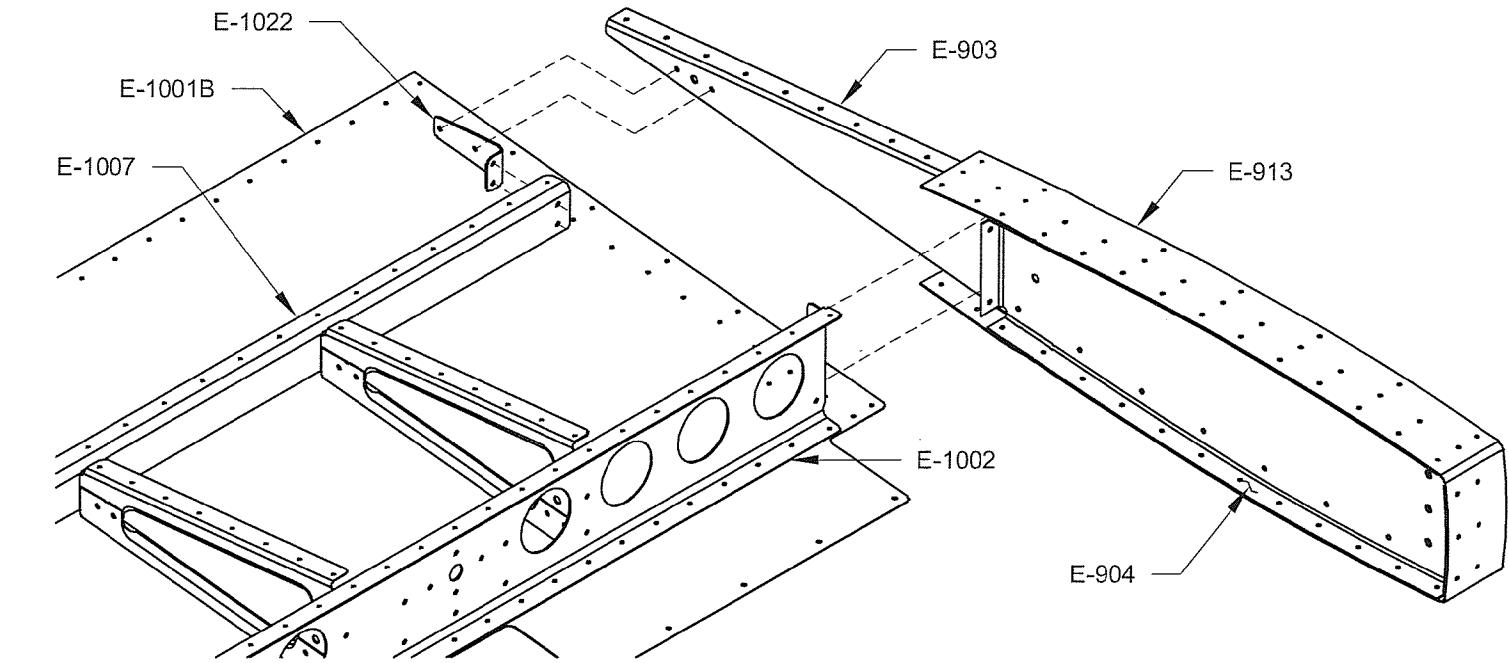


FIGURE 3: CLECOING THE TIP RIB ASSEMBLY

Step 7: Cleco the E-1001A Top Skin to the structure of the elevator as shown in Figure 4. The close out tab in the top skin is positioned between the E-1022 Shear Clip and the tab in the E-1001B Bottom Skin.

Step 8: Insert a VA-140 Trailing Edge wedge between the E-1001A Top Skin and E-1001B Bottom Skin. Align the end hole of the trailing edge wedge with the outboard hole in the trailing edge of the skins. Cleco in place, then mark the edges of one of the skins on the trailing edge wedge. Remove the trailing edge wedge, trim at the marks (it's now an E-1023), then cleco it back in place. The remaining, trimmed portion of the trailing edge wedge is used on the right elevator.

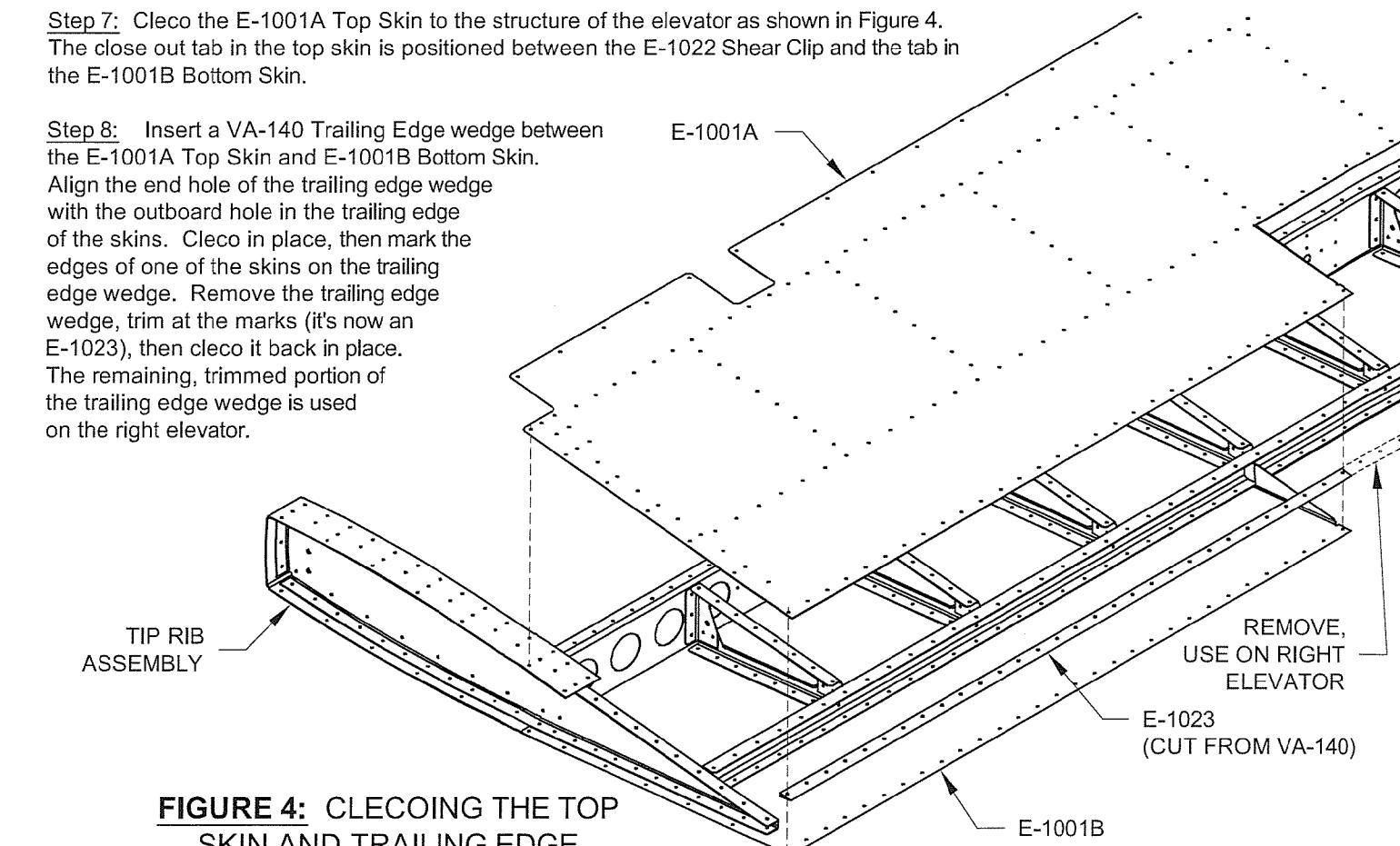
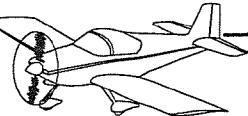
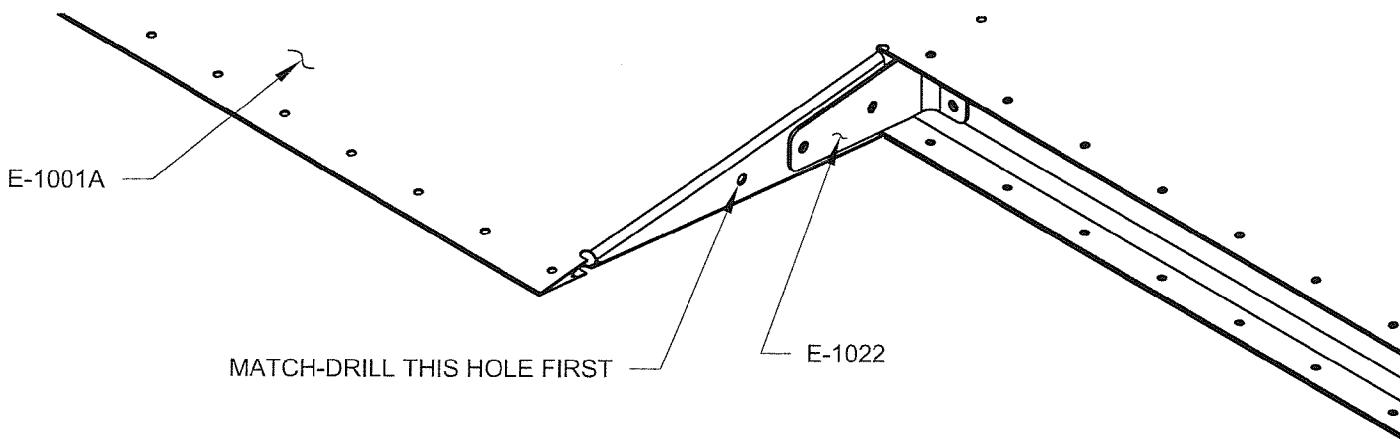


FIGURE 4: CLECOING THE TOP SKIN AND TRAILING EDGE



Step 1: Match-Drill the 1/8" hole in the close out tab of the E-1001A Top Skin into the tab of the E-1001B Bottom Skin using a #30 drill. Cleco this hole, then match-drill the two holes of the E-1022 Shear Clip into both skin tabs using the same drill.



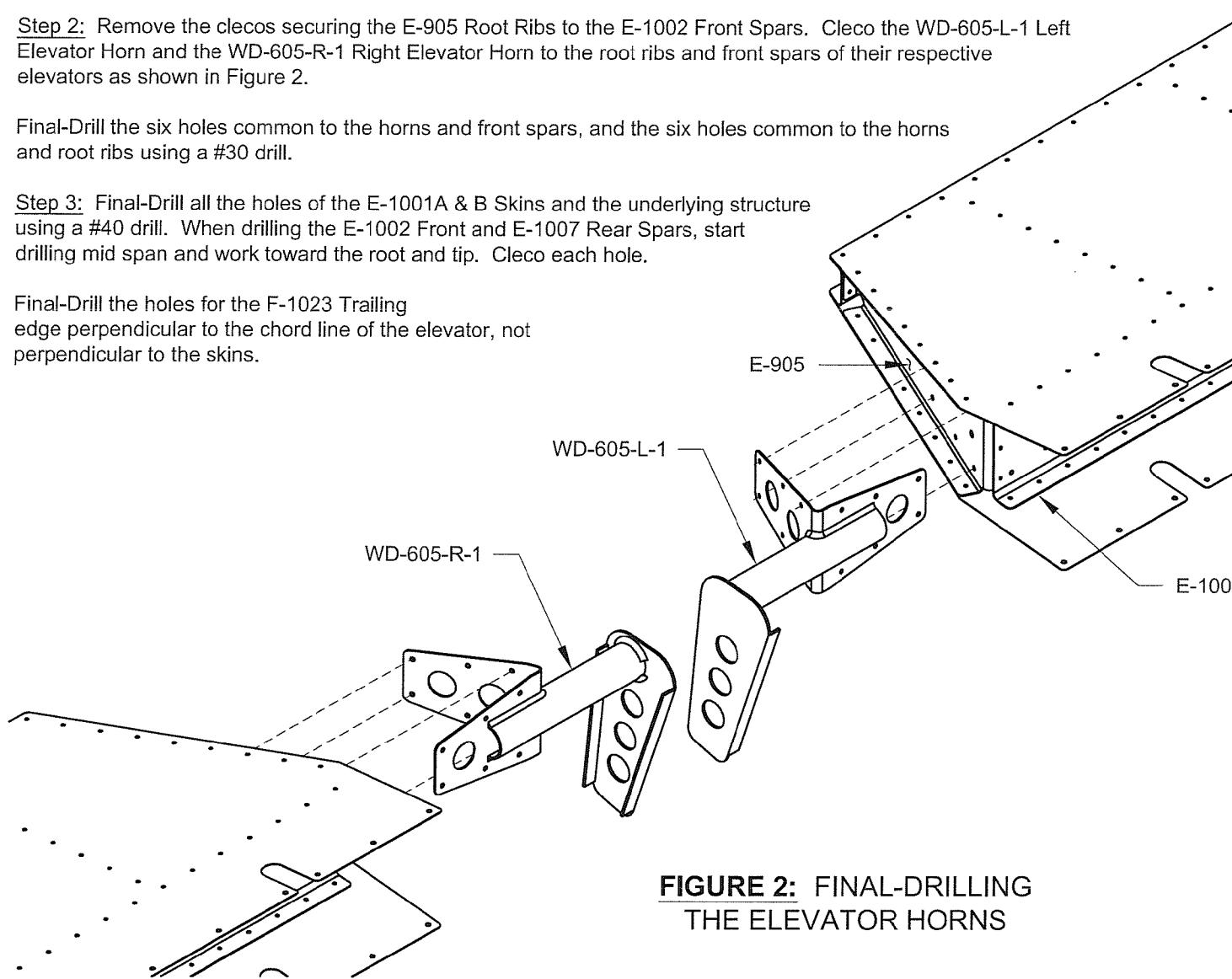
**FIGURE 1: MATCH-DRILLING THE SKIN CLOSE OUT TABS**

Step 2: Remove the clecos securing the E-905 Root Ribs to the E-1002 Front Spars. Cleco the WD-605-L-1 Left Elevator Horn and the WD-605-R-1 Right Elevator Horn to the root ribs and front spars of their respective elevators as shown in Figure 2.

Final-Drill the six holes common to the horns and front spars, and the six holes common to the horns and root ribs using a #30 drill.

Step 3: Final-Drill all the holes of the E-1001A & B Skins and the underlying structure using a #40 drill. When drilling the E-1002 Front and E-1007 Rear Spars, start drilling mid span and work toward the root and tip. Cleco each hole.

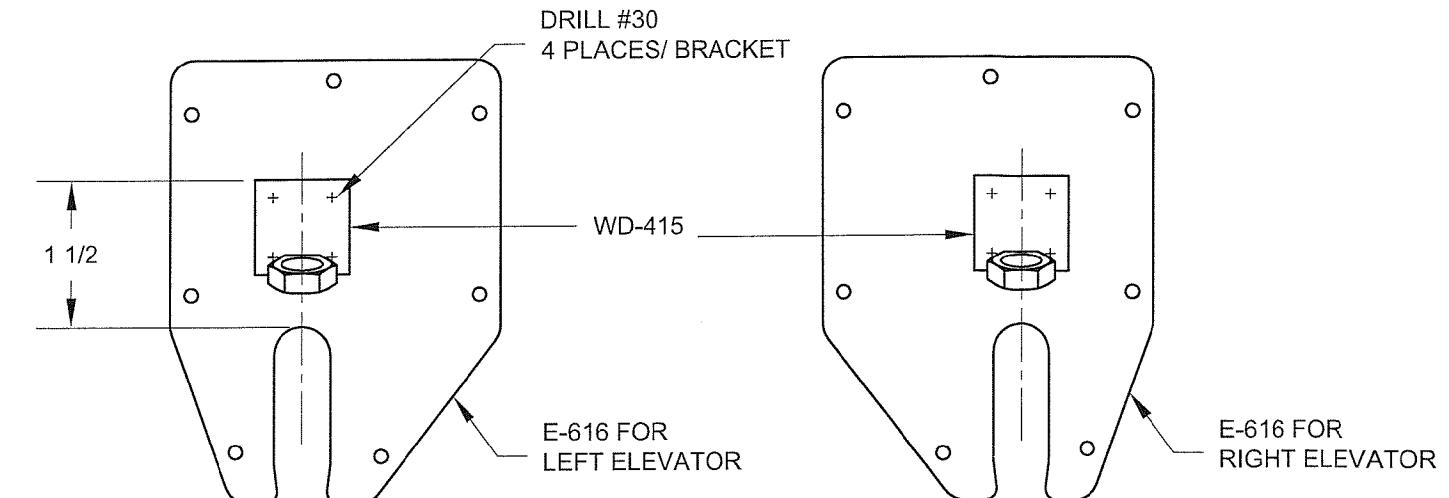
Final-Drill the holes for the F-1023 Trailing edge perpendicular to the chord line of the elevator, not perpendicular to the skins.



**FIGURE 2: FINAL-DRILLING THE ELEVATOR HORNS**

Step 4: Position the WD-415 Trim Cable Anchor Brackets on the two E-616 Cover Plates as shown in Figure 3. The brackets are located on opposite sides of the cover plates for the left and right elevators.

Drill four #30 holes, located approximately as shown, through the brackets and cover plates.



**FIGURE 3: LOCATING AND DRILLING THE TRIM CABLE ANCHOR BRACKETS**

Step 5: The attachment hardware for the E-616 Cover Plate is shown in Figure 4 for reference purposes. Dimple the cover plate for the screws and the E-615 Reinforcement Plate to accept the dimple in the cover plate.

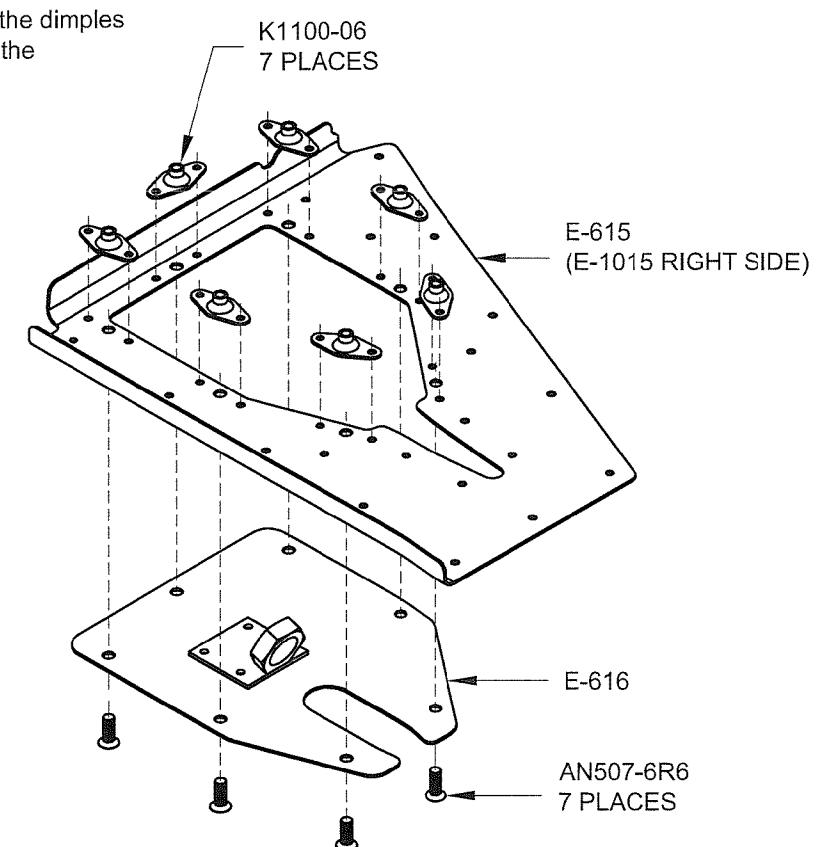
Dimple all the #40 holes in the reinforcement plate for the dimples in the skin and for the 3/32" flush rivets used to attach the nutplates. The K1100 nutplates will accommodate the dimple for the screws in the reinforcement plate, but will have to be dimpled for the nutplate attachment rivets (see Section 5R).

Step 6: Repeat Step 5 for the E-1015 Reinforcement Plate and E-616 Cover Plate on the right elevator. (The dimple is on the opposite side of the cover plate on the right elevator.)

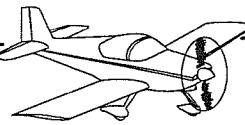
Step 7: Completely disassemble both elevators. Mark all the parts so that they can be reassembled in the same position. Make sure to mark the inside surface of the skins to prevent dimpling the holes in the wrong direction.

Step 8: Deburr all holes and any unfinished edges.

Step 9: Dimple the holes in the E-1001A & B Skins (don't forget the three holes in the close out tabs), and the E-913 Counterbalance Skin.



**FIGURE 4: DIMPLING THE COVER AND REINFORCEMENT PLATES**



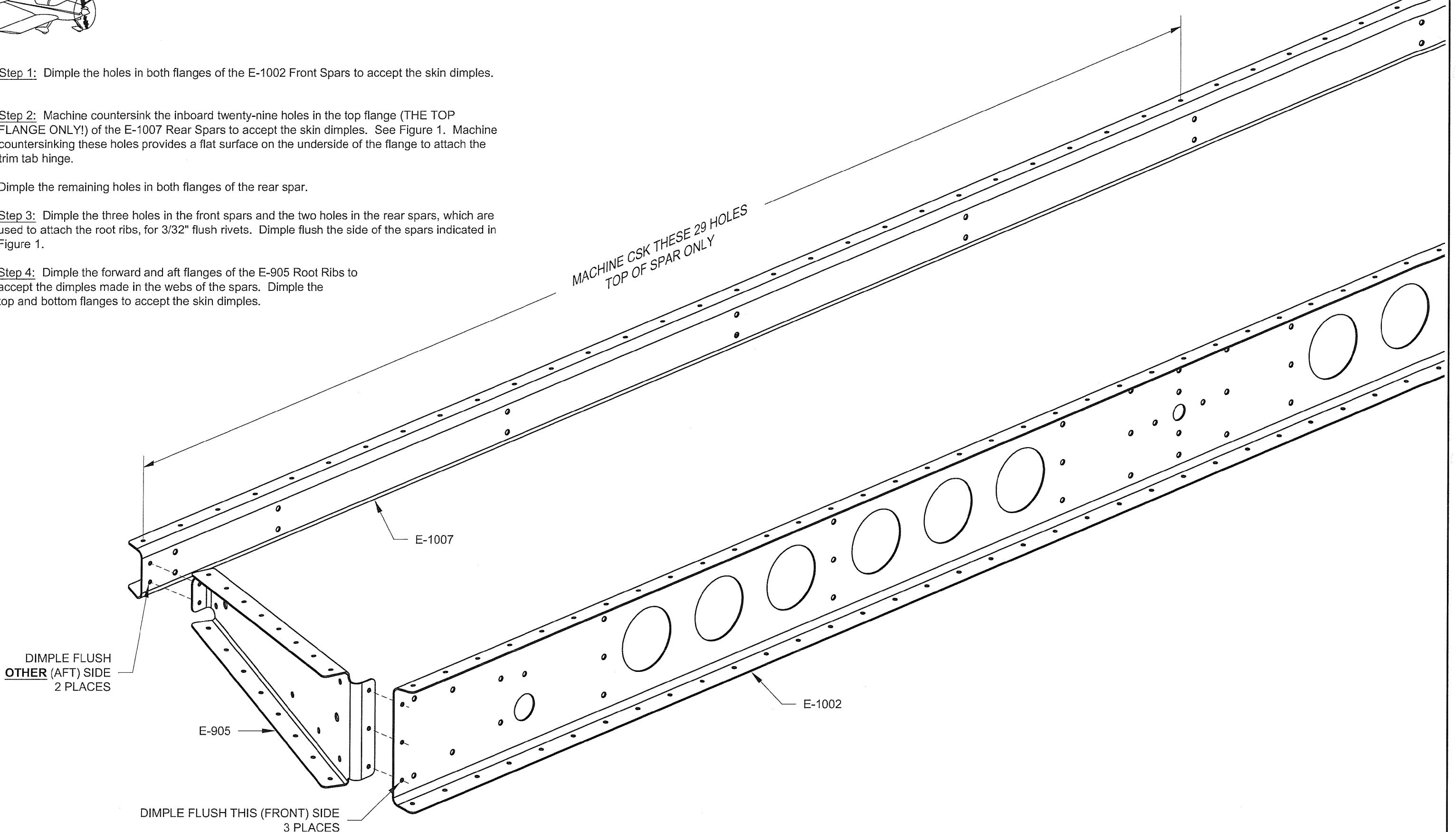
Step 1: Dimple the holes in both flanges of the E-1002 Front Spars to accept the skin dimples.

Step 2: Machine countersink the inboard twenty-nine holes in the top flange (THE TOP FLANGE ONLY!) of the E-1007 Rear Spars to accept the skin dimples. See Figure 1. Machine countersinking these holes provides a flat surface on the underside of the flange to attach the trim tab hinge.

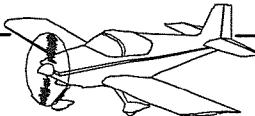
Dimple the remaining holes in both flanges of the rear spar.

Step 3: Dimple the three holes in the front spars and the two holes in the rear spars, which are used to attach the root ribs, for 3/32" flush rivets. Dimple flush the side of the spars indicated in Figure 1.

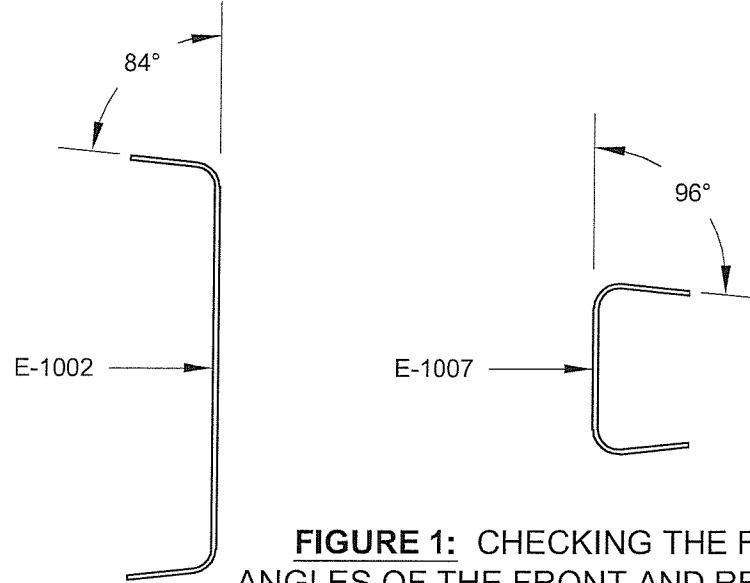
Step 4: Dimple the forward and aft flanges of the E-905 Root Ribs to accept the dimples made in the webs of the spars. Dimple the top and bottom flanges to accept the skin dimples.



**FIGURE 1: DIMPLING THE FRONT AND REAR SPARS**

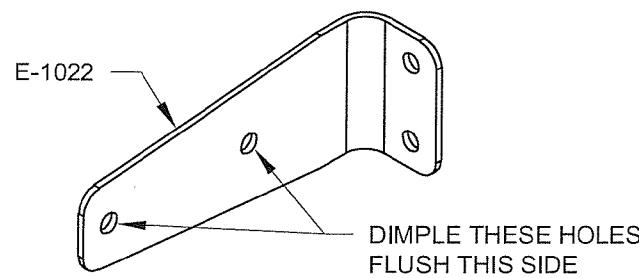


Step 1: Dimpling can cause flanges to bend slightly. Make sure the flanges of the E-1002 Front Spar and E-1007 Rear Spar are still bent at the angle indicated in Figure 1. Adjust with hand seamers if necessary.



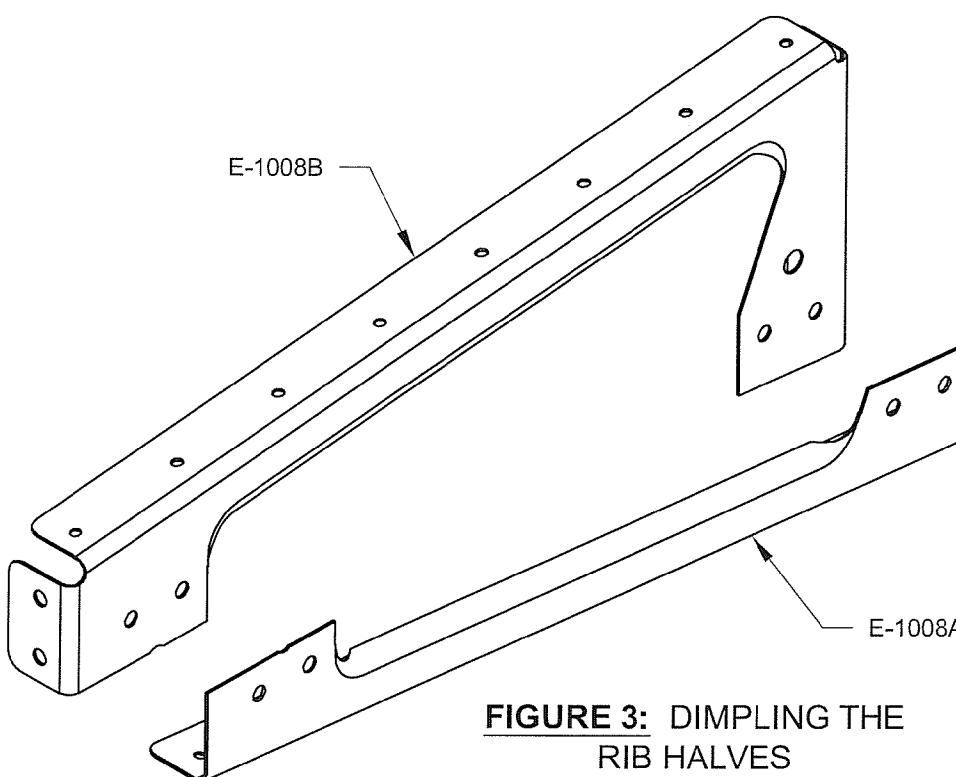
**FIGURE 1: CHECKING THE FLANGE ANGLES OF THE FRONT AND REAR SPARS**

Step 2: Dimple the holes in the long flange of the inboard E-1022 Shear Clip for 1/8" flush rivets, flush on the side shown in Figure 2. (The shear clip attached to the E-903 Outboard Tip Rib does not need to be dimpled.)



**FIGURE 2: DIMPLING THE SHEAR CLIP**

Step 3: Dimple the flanges of the E-1008A & B Rib halves, shown in Figure 3, to accept the dimples in the skins.

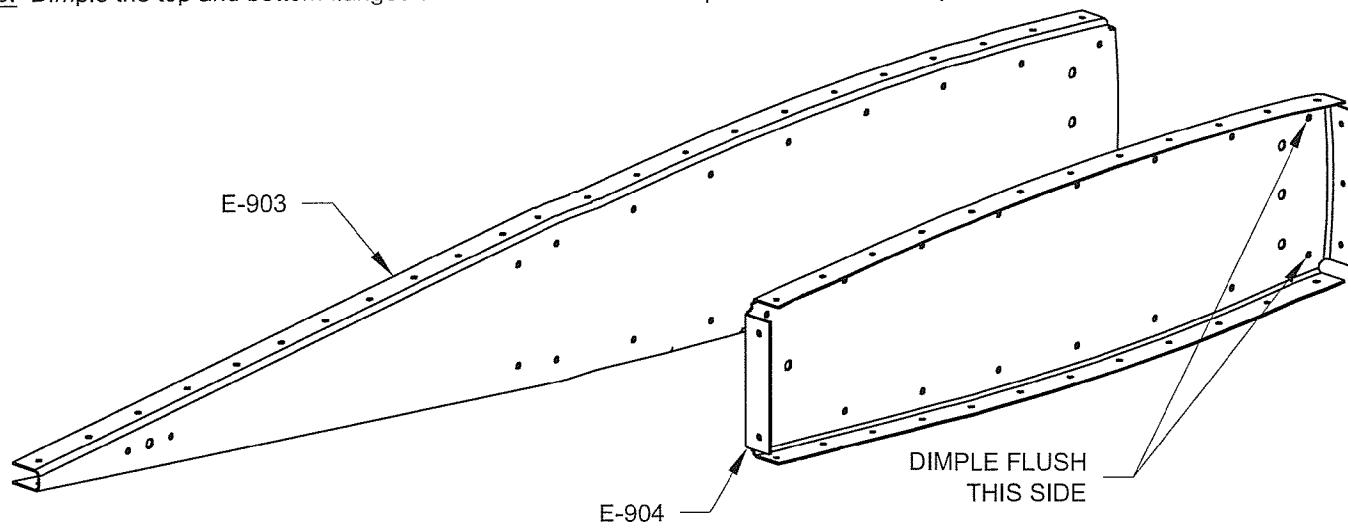


**FIGURE 3: DIMPLING THE RIB HALVES**

Step 4: Dimple the two holes, indicated in Figure 4, in the web of the E-904 Inboard Tip Rib for 1/8" flush rivets.

Dimple the corresponding holes in the E-903 Outboard Tip Rib for the dimples in the inboard tip rib.

Step 5: Dimple the top and bottom flanges of the E-903 and E-904 Tip Ribs for the skin dimples.

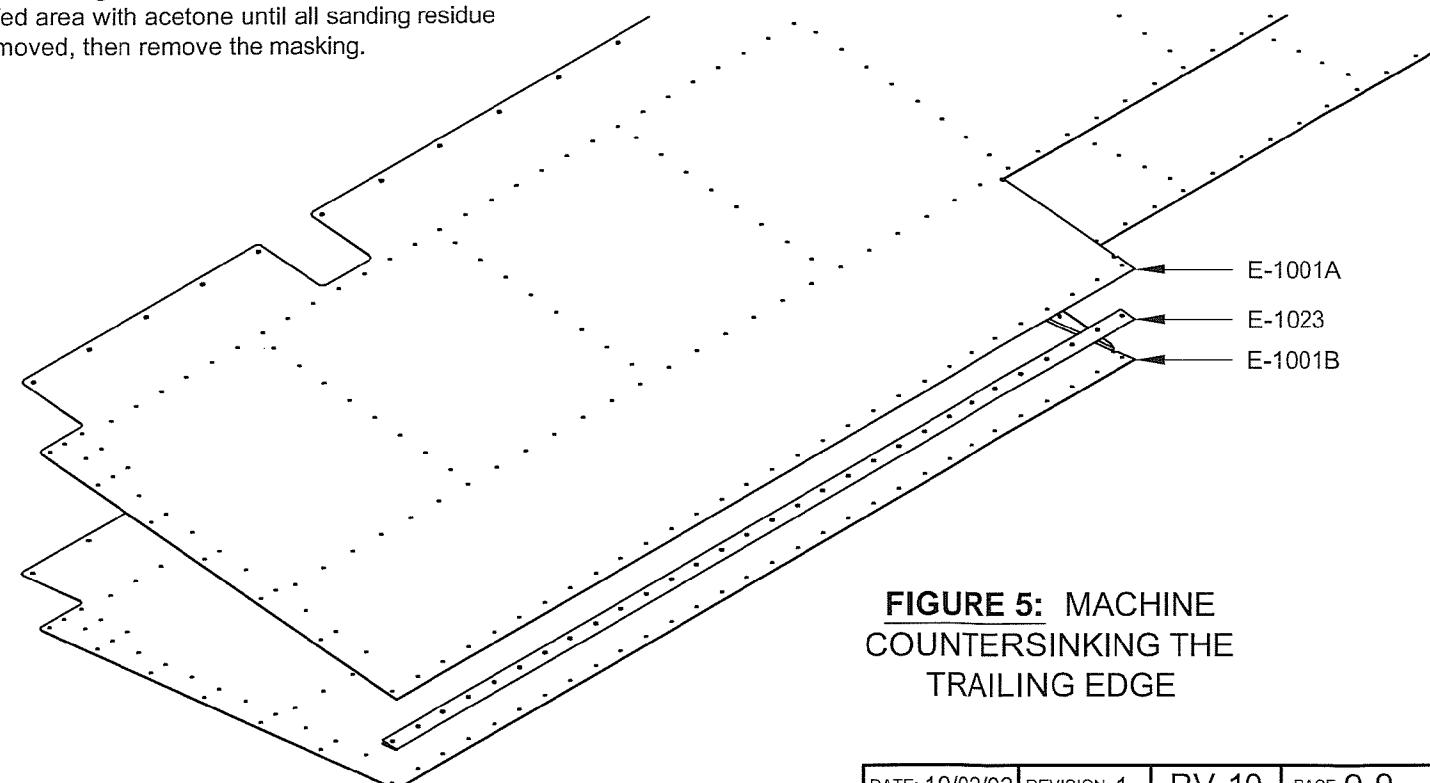


**FIGURE 4: DIMPLING THE TIP RIBS**

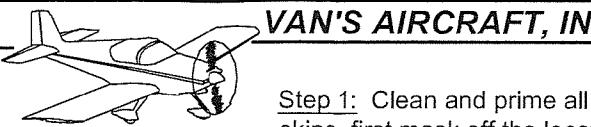
Step 6: Machine countersink the holes on both sides of the E-1023 Trailing Edge, shown in Figure 5, for the 3/32" dimples in the skins. Countersink perpendicular to the trailing edge face.

Step 7: Put a slight bend in the trailing edge of the E-1001A & B Skins so that they will lay down flat and tight on the E-1023 Trailing Edge after riveting (see Section 5K).

Step 8: Foam ribs are bonded to the trailing edge of the E-1001A & B Skins in a later step. The bonding agent (fuel tank sealant) requires a clean, scuffed surface for proper adhesion. To accomplish this, mask the inside surfaces of the E-1001A & B Skins around the locations for the trailing edge ribs. (The rib locations can be found on Page 9-14, Figure 4.) Scuff the skins in the locations of the ribs with 150 grit aluminum oxide sandpaper, clean the scuffed area with acetone until all sanding residue is removed, then remove the masking.



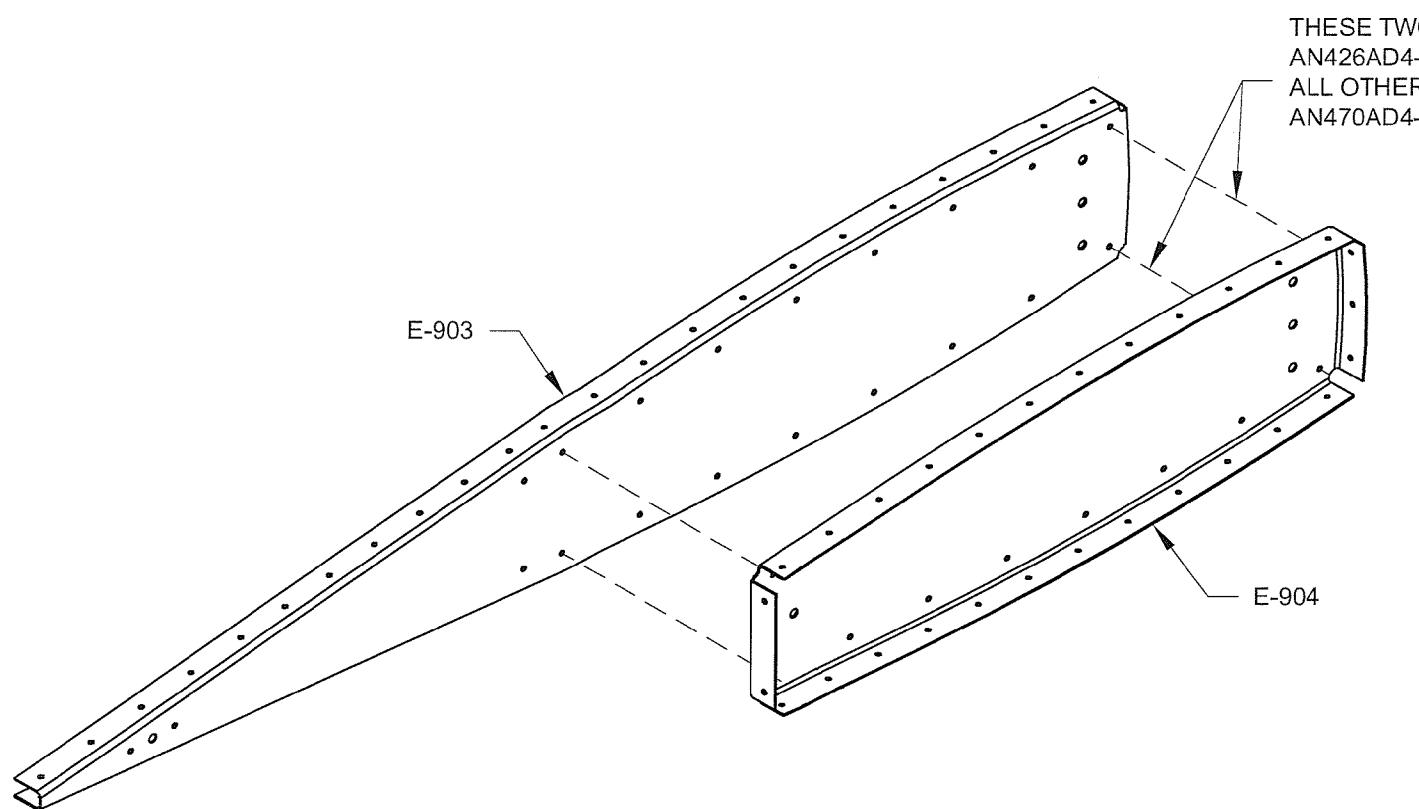
**FIGURE 5: MACHINE COUNTERSINKING THE TRAILING EDGE**



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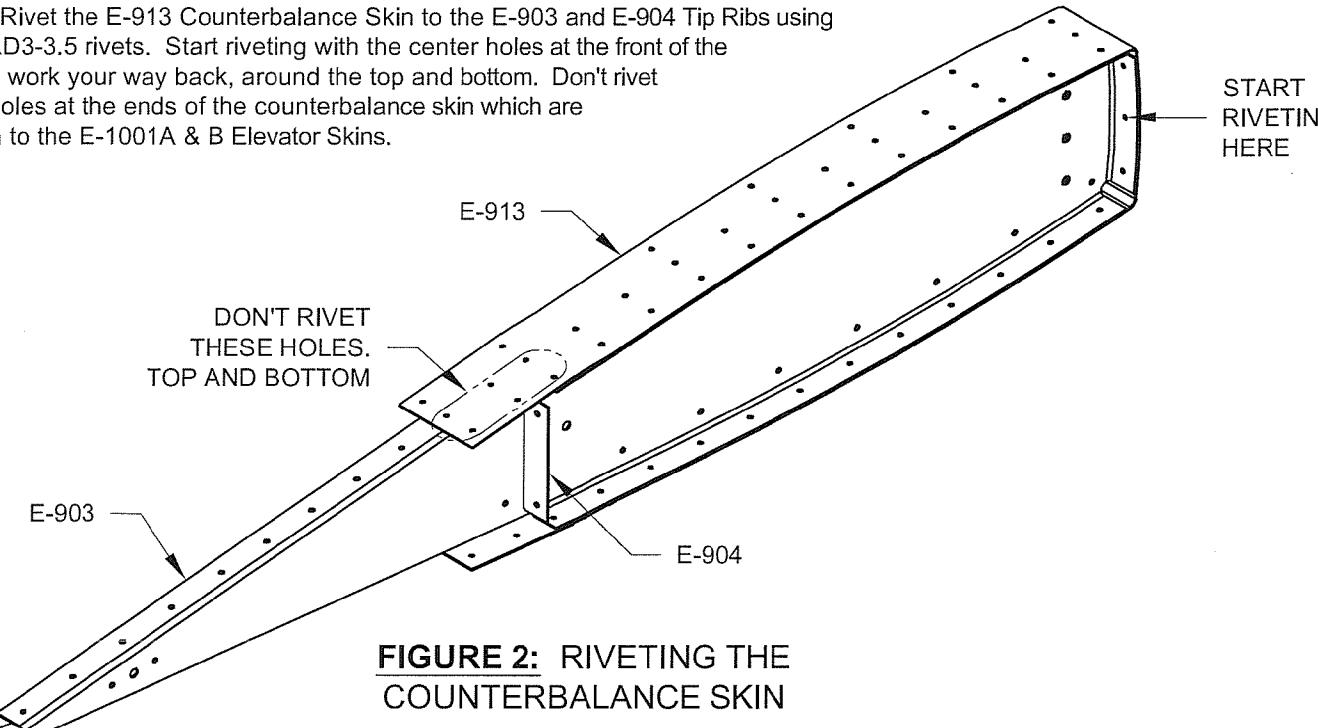
Step 1: Clean and prime all parts as desired. If priming the interior surface of the elevator skins, first mask off the locations of the trailing edge foam ribs so that they will be bonded to bare aluminum.

Step 2: Rivet all the common 1/8" holes of the E-903 and E-904 Tip Ribs using the rivets called out in Figure 1.



**FIGURE 1:** RIVETING THE TIP RIBS

Step 3: Rivet the E-913 Counterbalance Skin to the E-903 and E-904 Tip Ribs using AN426AD3-3.5 rivets. Start riveting with the center holes at the front of the skin and work your way back, around the top and bottom. Don't rivet the six holes at the ends of the counterbalance skin which are common to the E-1001A & B Elevator Skins.

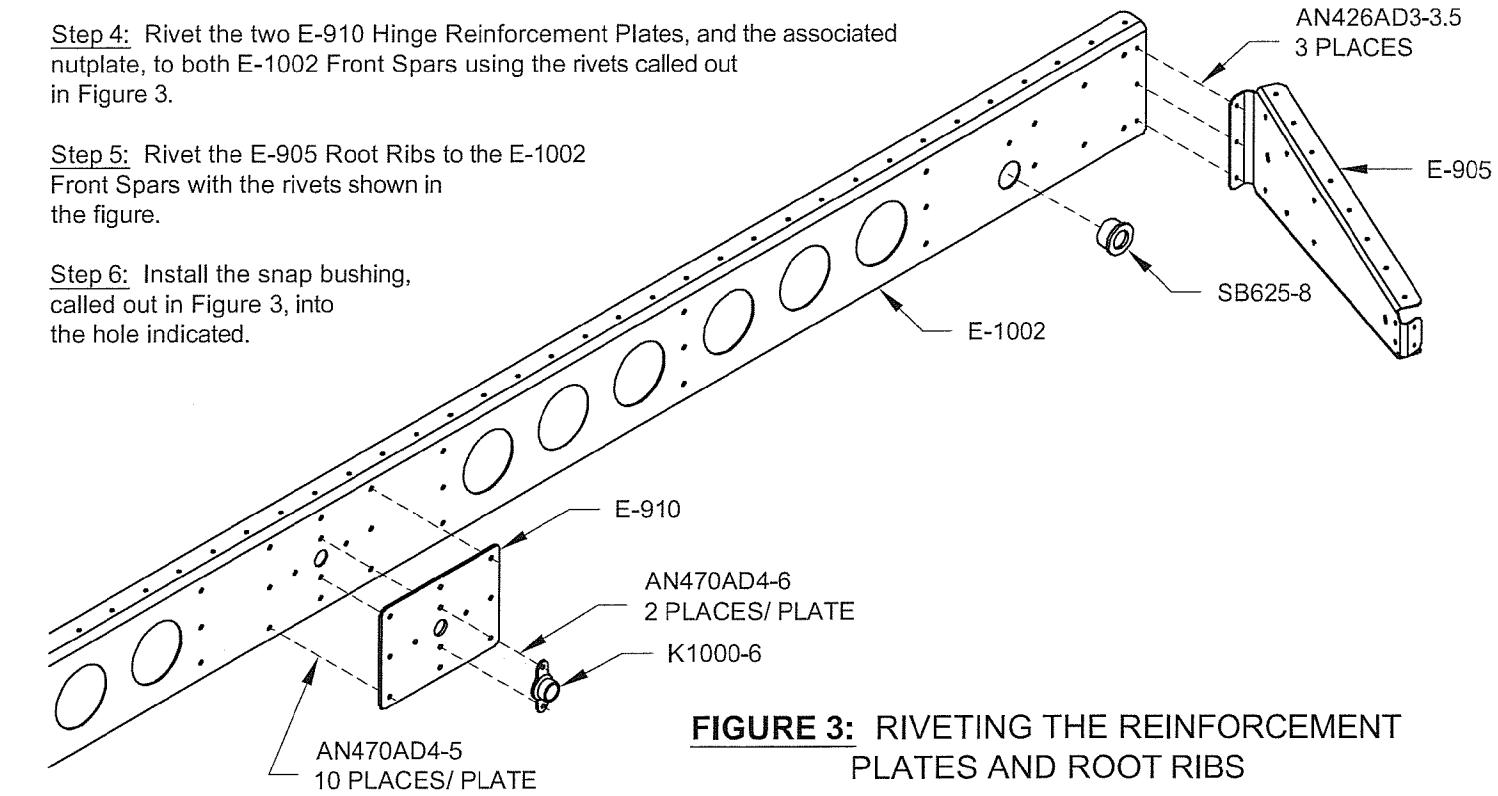


**FIGURE 2:** RIVETING THE COUNTERBALANCE SKIN

Step 4: Rivet the two E-910 Hinge Reinforcement Plates, and the associated nutplate, to both E-1002 Front Spars using the rivets called out in Figure 3.

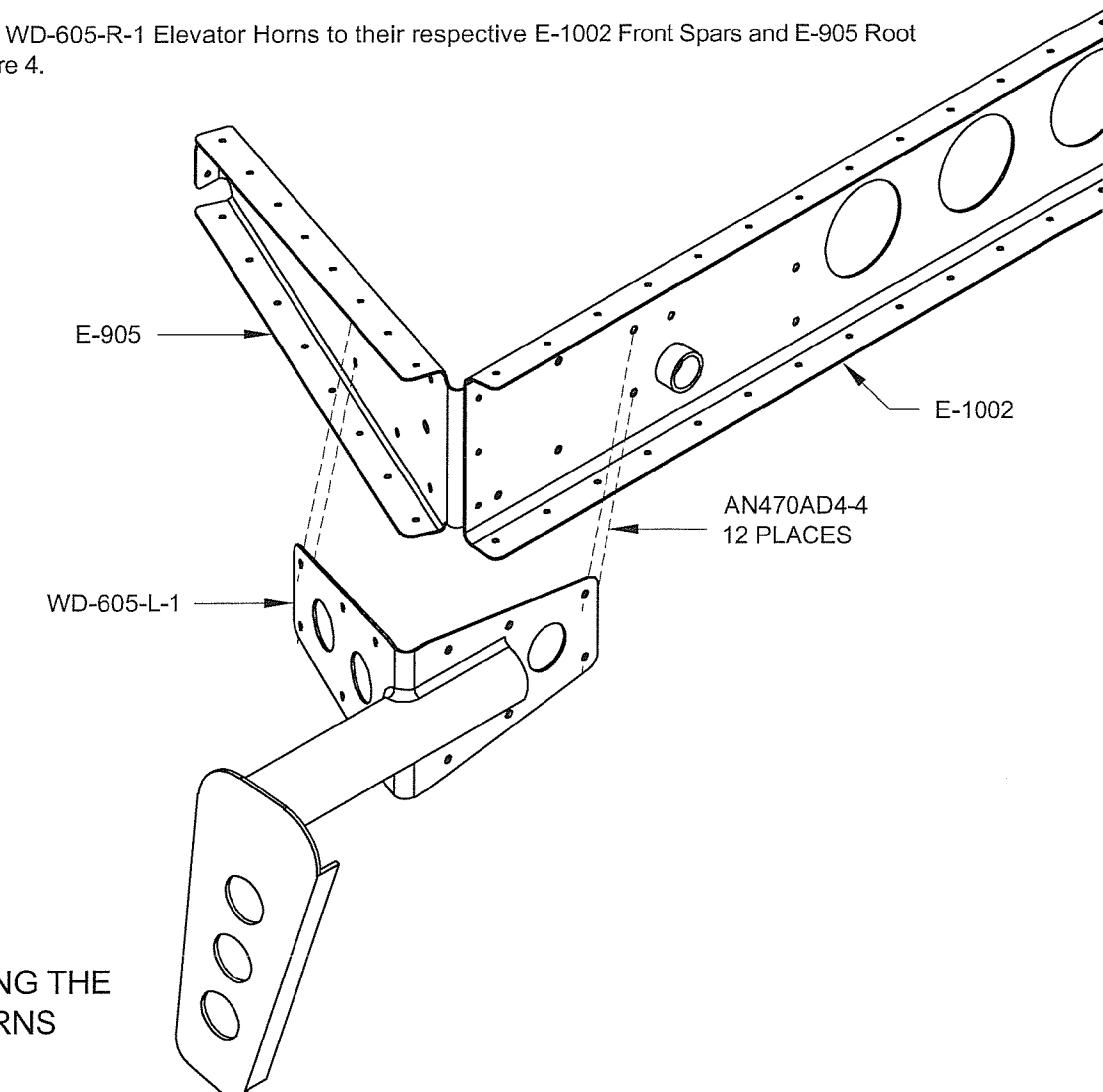
Step 5: Rivet the E-905 Root Ribs to the E-1002 Front Spars with the rivets shown in the figure.

Step 6: Install the snap bushing, called out in Figure 3, into the hole indicated.

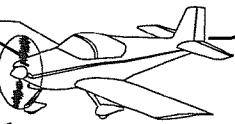


**FIGURE 3:** RIVETING THE REINFORCEMENT PLATES AND ROOT RIBS

Step 7: Rivet the WD-605-L-1 and WD-605-R-1 Elevator Horns to their respective E-1002 Front Spars and E-905 Root Ribs using the rivets shown in Figure 4.



**FIGURE 4:** RIVETING THE ELEVATOR HORNS



Step 1: Rivet the nutplates to the E-615 and E-1015 Reinforcement Plates using the rivets called out on Page 9-20, Figure 2.

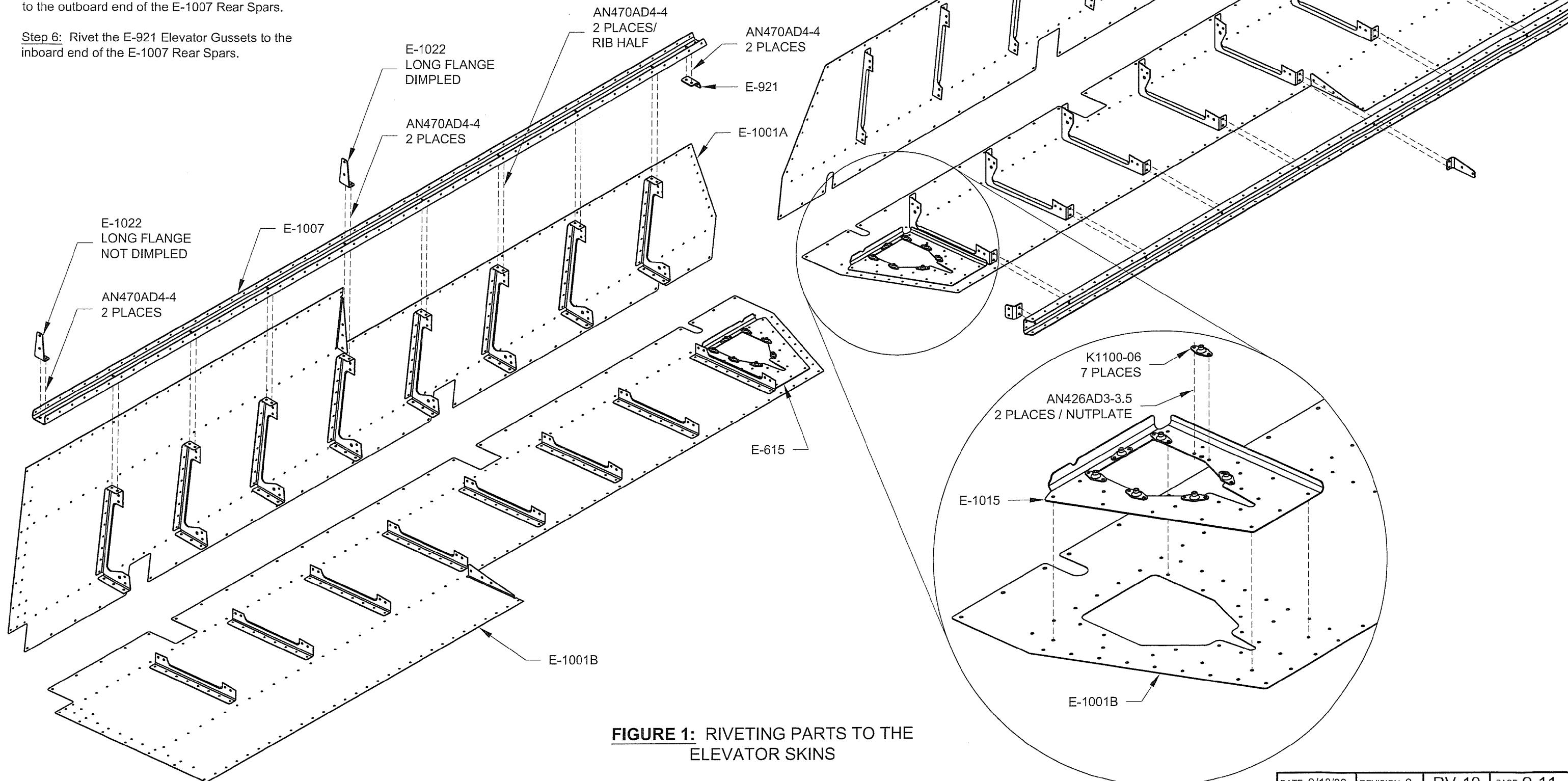
Step 2: Back rivet the E-615 and E-1015 Reinforcement Plates to the E-1001B Skins using the rivets called out in the blowup of Figure 1.

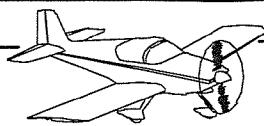
Step 3: Back rivet all the E-1008 Rib halves to the E-1001 Skins using the rivets called out on Page 9-20, Figures 1 & 2. The correct position of the rib halves on the skins is shown in Figure 1.

Step 4: Rivet the E-1007 Rear Spars to the aft flanges of the E-1008B Rib halves using the rivets shown in the figure. Include the two E-1022 Shear Clips, which share holes with the aft flange of the ribs, when riveting the spars. The spars are riveted to the skins on the next page.

Step 5: Rivet the remaining E-1022 Shear Clips to the outboard end of the E-1007 Rear Spars.

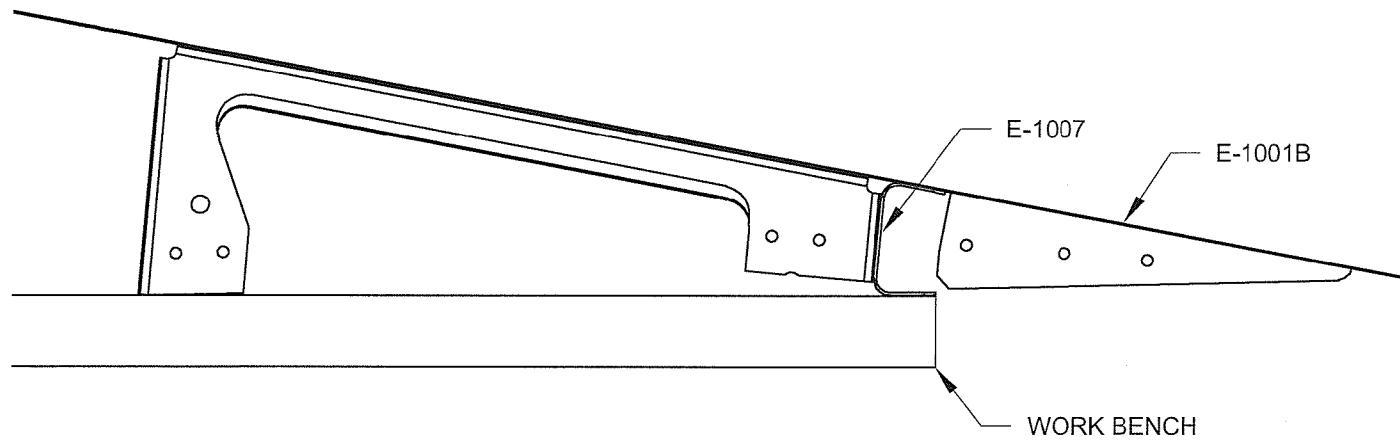
Step 6: Rivet the E-921 Elevator Gussets to the inboard end of the E-1007 Rear Spars.





Step 1: Rivet the E-1007 Rear Spar to the E-1001B Bottom Skin on the right elevator (see Page 9-11 for part reference) using the rivets called out on Page 9-20, Figure 2. The portion of the rear spar along the trim tab cut-out (the area that doesn't have the skin hanging beyond the spar) can easily be riveted with a rivet squeezer. Riveting the rest of the spar requires some set-up work. Turn the elevator over on a work bench, align the edge of the rear spar flange with the edge of the bench, then spring clamp the spar flange to the work bench (see Figure 1). You can then reach under the skin with a bucking bar and rivet the spar.

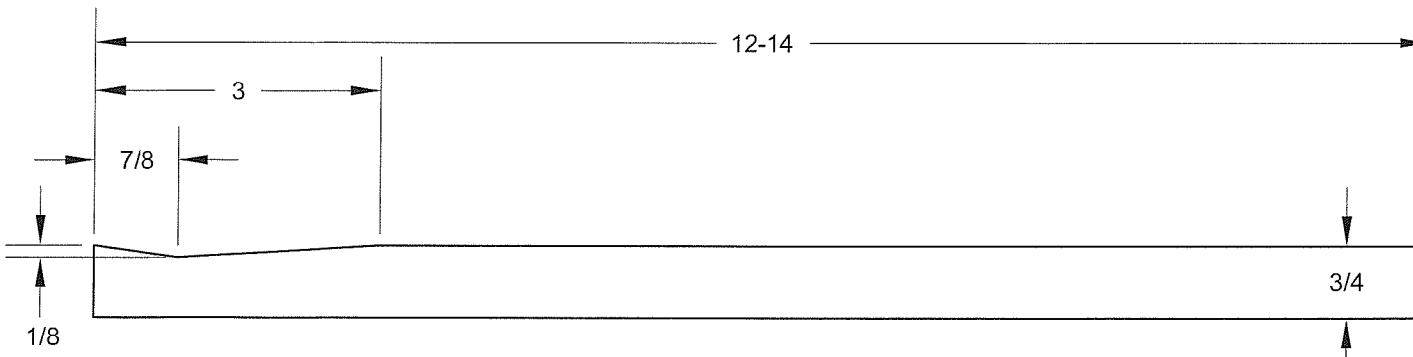
Step 2: Similarly, on the left elevator, rivet the E-1007 Rear Spar to the E-1001A Top Skin using the rivets called out on Page 9-20, Figure 1. Here, however, don't install the squeezed rivets along the spar in the area of the trim tab cut-out. This is the portion of the spar to which the trim tab hinge is attached later.



**FIGURE 1: RIVETING THE RIGHT ELEVATOR REAR SPAR TO SKIN**

NOTE: Riveting the second skin to the elevator rear spar (Steps 3-5) requires making a special bucking bar. If you prefer not to make the bucking bar, it is acceptable to substitute MK-319 blind rivets for the solid rivets. The blind rivets are not supplied in the kit, but can be purchased through Van's Aircraft.

Step 3: Make the bucking bar shown in Figure 2. It should be at least one inch wide.

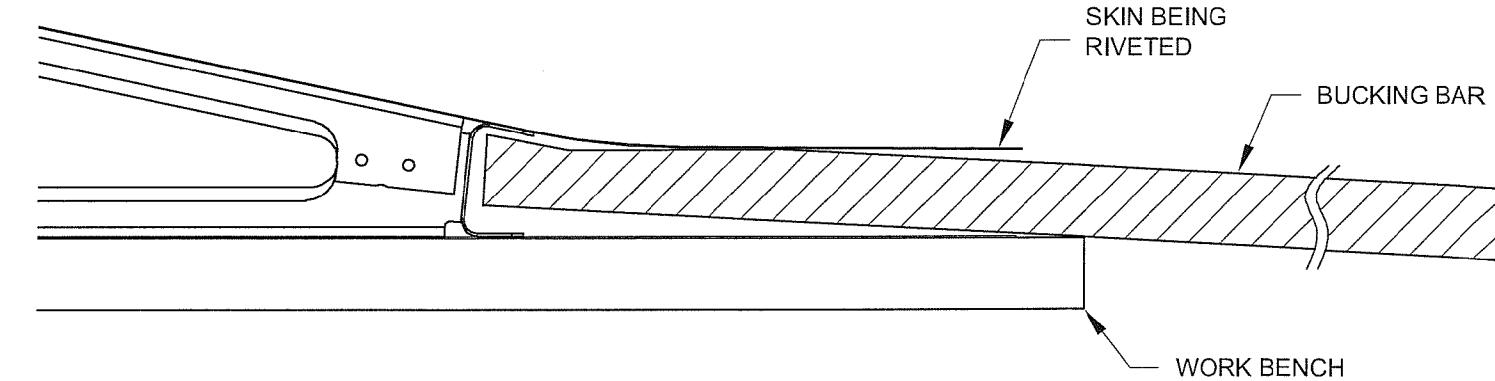


**FIGURE 2: BUCKING BAR DIMENSIONS**

Step 4: Position the second E-1001 Skin in place on both elevators. Make sure the E-1008 Rib halves are positioned as shown in Figure 4, then cleco the skin to the E-1007 Rear Spar and cleco the rib halves to each other.

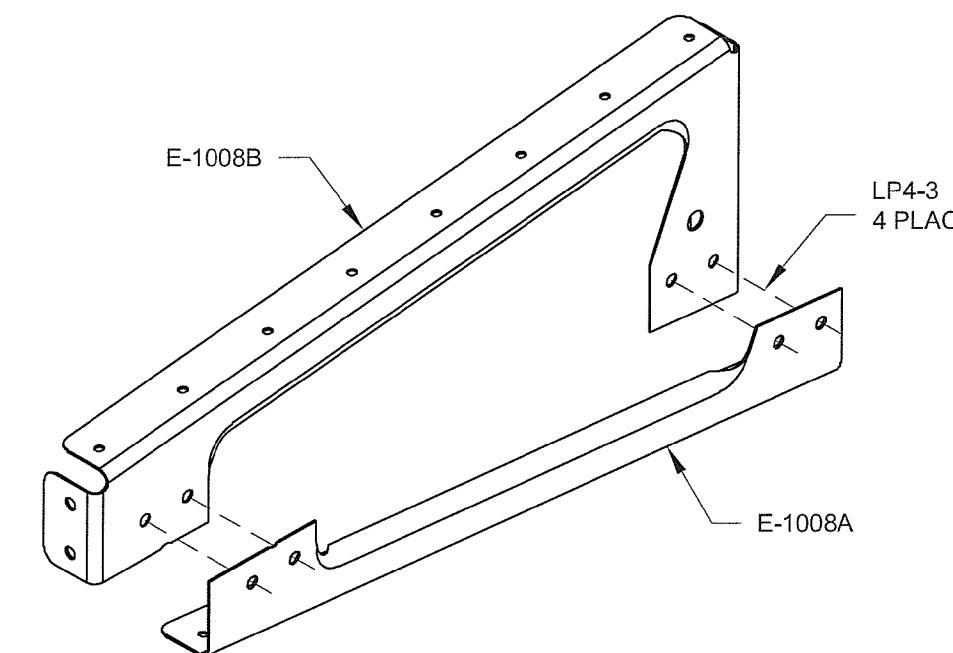
Step 5: Rivet the second flange of the E-1007 Rear Spar to the E-1001B Bottom Skin of the left elevator. (Rivet the skin of the left elevator first to give you some practice before riveting the more visible top skin on the right elevator.) Position the elevator on the work bench, as shown in Figure 3, with the edge of the work bench extending slightly beyond the elevator trailing edge. Insert the bucking bar made in Step 3 between the skins, and, with the bar resting on the edge of the work bench, rivet the spar to the skin using the rivets called out on Page 9-20, Figure 2.

Repeat Step 5 (using the rivets called out on Page 9-20, Figure 1) for the second flange of the rear spar and the E-1001A Top Skin of the right elevator.

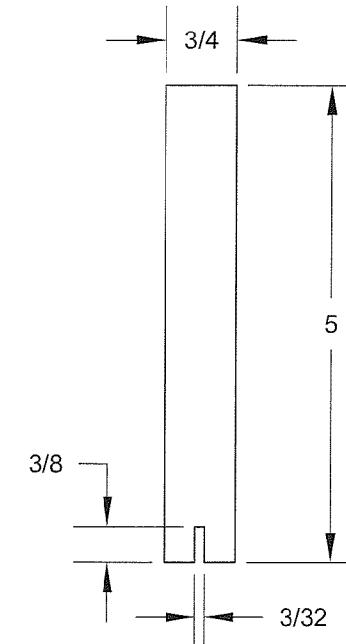


**FIGURE 3: RIVETING THE REAR SPARS TO THE SKINS**

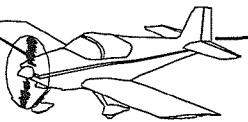
Step 6: Rivet the E-1008 Rib halves together, with blind rivets, through the four holes common to each rib set as shown in Figure 4. If you have very large hands you may find installing the aft two rivets in each rib set challenging. You can either enlist a helper that has smaller hands, or use tubes or pipes slipped on the rivet tool's handles to extend them. Occasionally the rivet doesn't fully set with one stroke of the handles. Because it is very difficult to reposition the tool when setting the aft two rivets, you can use a small tool made from .063 scrap, shown in Figure 5, as a spacer. To finish setting the rivet, release the handles, slip the tool between the rivet puller and the rivet's head, and finish squeezing.



**FIGURE 4: RIVETING THE RIB HALVES**



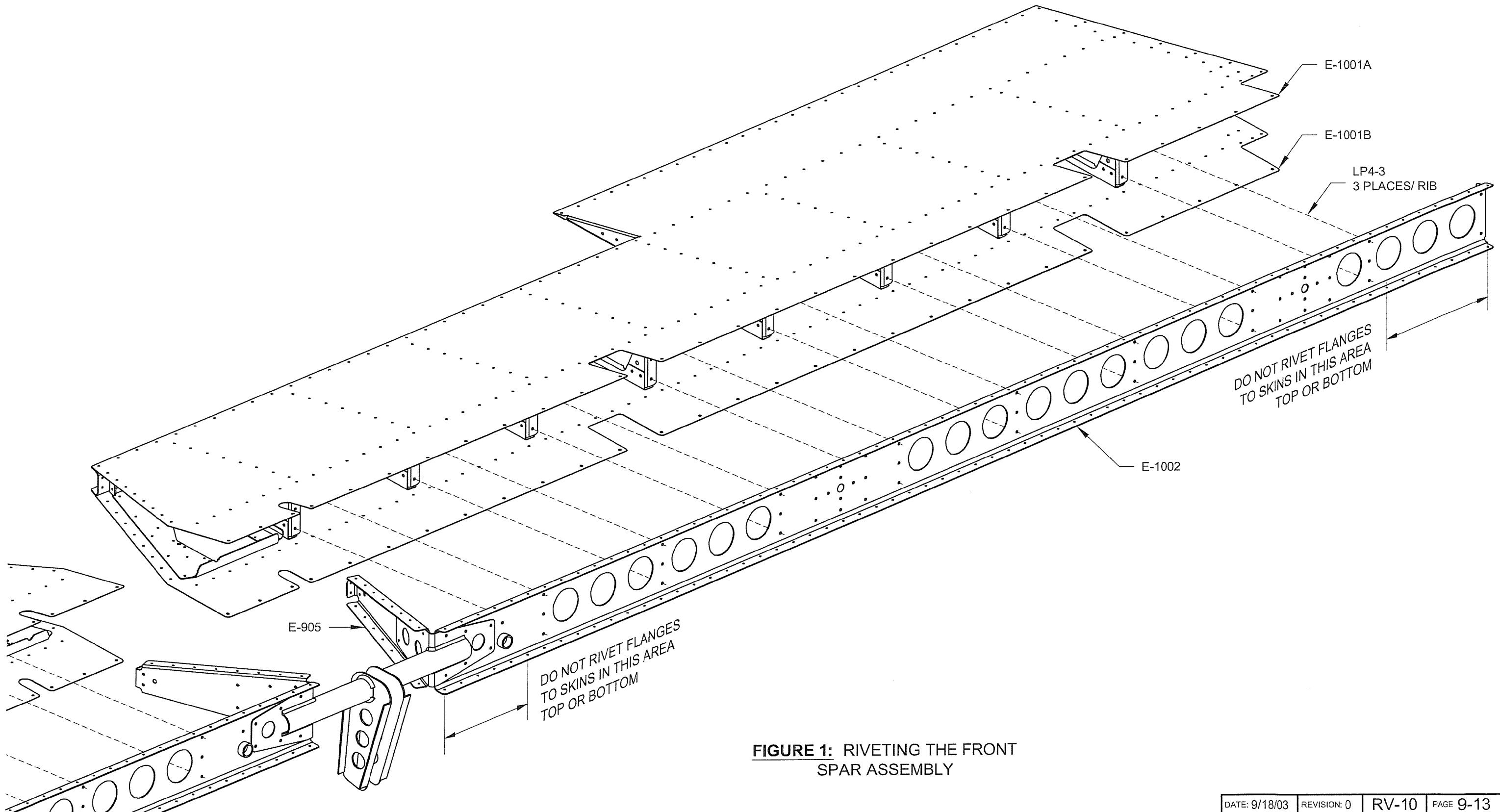
**FIGURE 5: SPACING TOOL**



Step 1: Cleco the left and right front spar assemblies to the E-1008 Ribs and E-1001 Skins as shown in Figure 1.

Step 2: Rivet the E-1002 Front Spar to the forward E-1008 Rib flanges using the rivets called out in the figure.

Step 3: Place the elevators on a flat work surface with the clecos securing the E-1001 Skins to the E-1002 Front Spars hanging over the edge. Rivet the skins to the spars using the rivets shown on Page 9-20, Figures 1 & 2. For the time being, however, leave out the rivets in the spar flanges outboard of the outboard most E-1008 Rib and inboard of the inboard most rib. Not installing these rivets leaves the outboard and inboard sections of the elevators accessible for riveting the E-903 and E-904 Tip Ribs and the E-921 Elevator Gusset.



**FIGURE 1: RIVETING THE FRONT SPAR ASSEMBLY**

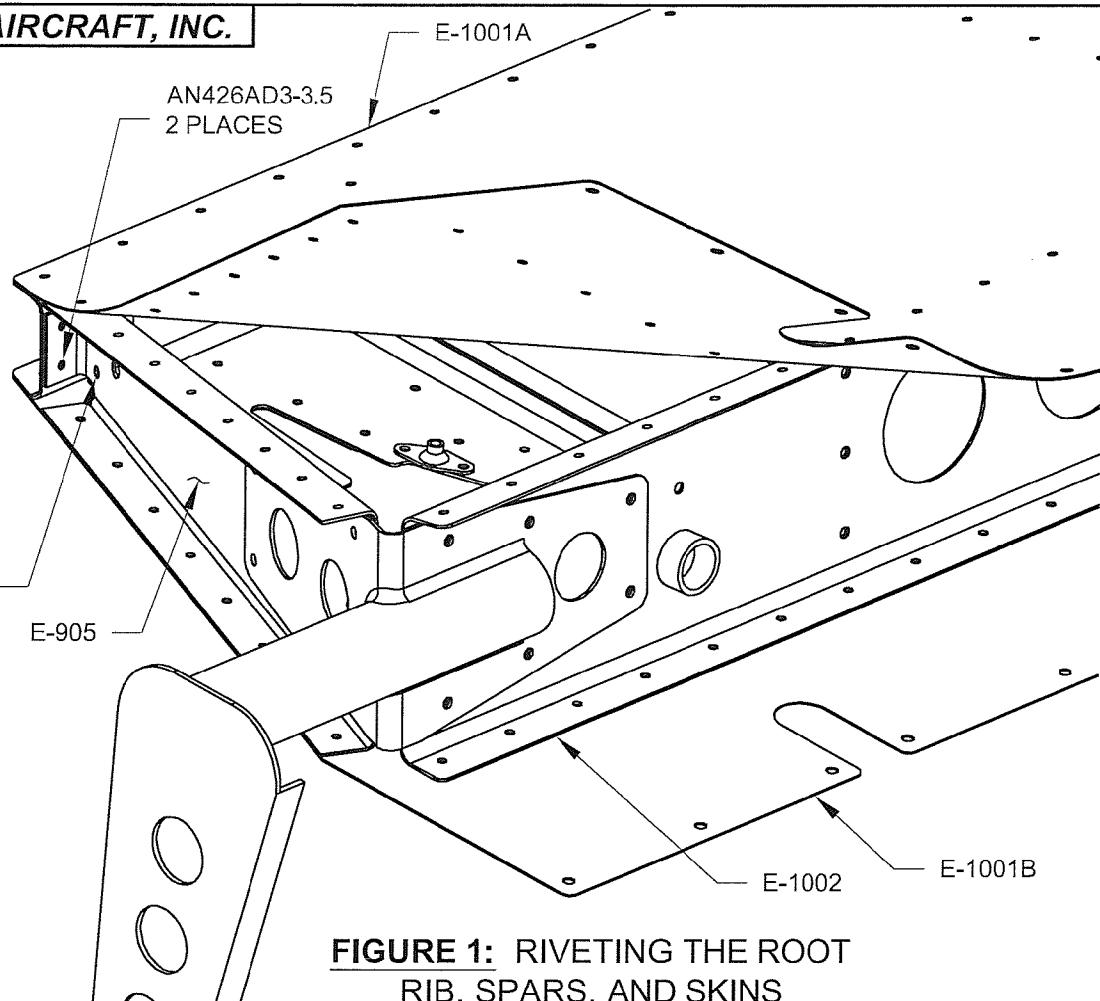


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Step 1: Rivet the aft flange of the E-905 Root Rib to the E-1007 Rear Spar using the rivets shown in Figure 1.

Step 2: Remove clecos and lift the corner of one of the E-1001 Skins to gain access to the E-921 Elevator Gusset (not visible in the figure). Using the rivets shown, rivet the gusset to the root rib web.

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2 PLACES



Step 3: On this end of the elevator, rivet the E-1001 Skins to the flanges of the E-905 Root Rib and E-1002 Front Spar using the rivets shown on Page 9-20, Figures 1 & 2.

**FIGURE 1: RIVETING THE ROOT RIB, SPARS, AND SKINS**

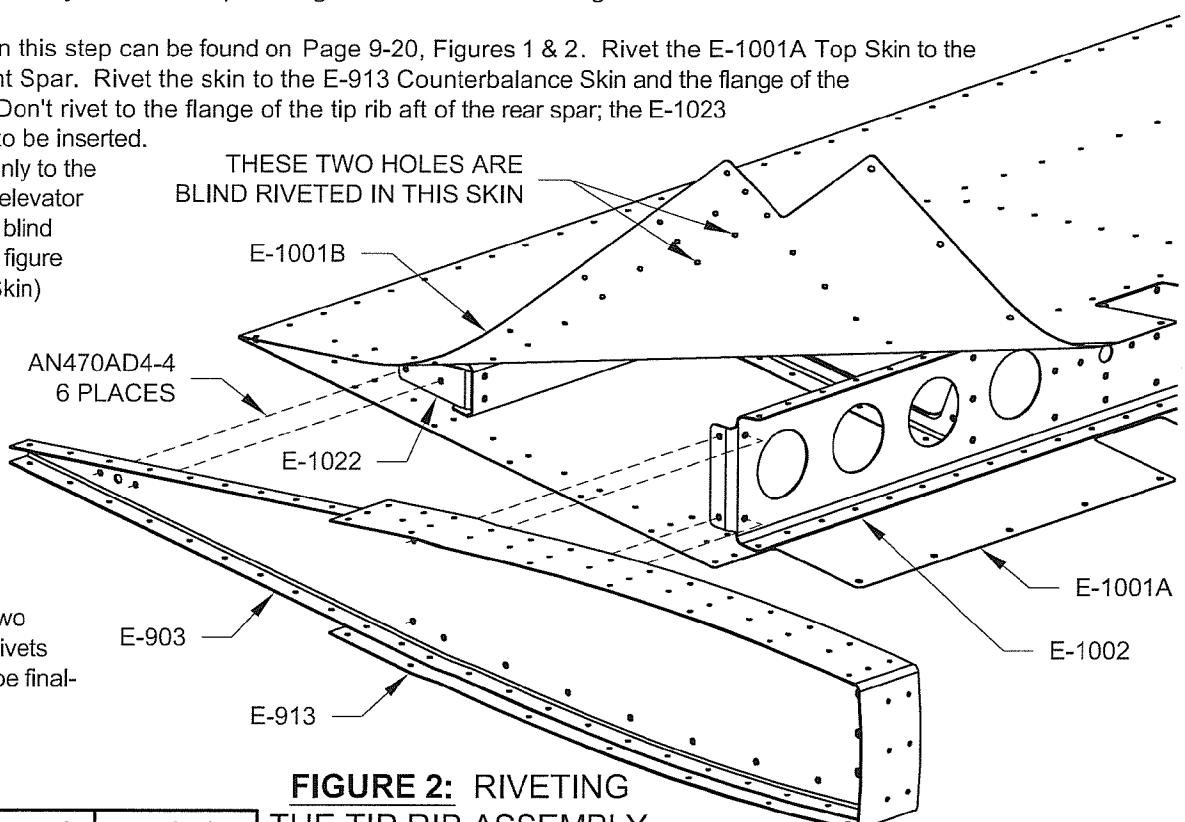
Step 4: The elevator is shown upside down in Figure 2. Cleco the tip rib assembly to the elevator, then rivet the assembly to the E-1022 Shear Clip using the rivets called out in the figure. Access to the clip can be gained from between the skins at the trailing edge.

Step 5: Remove the clecos required to lift the corner of the E-1001B Bottom Skin to gain access to the back of the E-1002 Front Spar. Rivet the tip rib assembly to the front spar using the rivets shown in the figure.

Step 6: The rivets used in this step can be found on Page 9-20, Figures 1 & 2. Rivet the E-1001A Top Skin to the flange of the E-1002 Front Spar. Rivet the skin to the E-913 Counterbalance Skin and the flange of the E-903 Outboard Tip rib. Don't rivet to the flange of the tip rib aft of the rear spar; the E-1023 Trailing Edge still needs to be inserted.

The two holes common only to the counterbalance skin and elevator skin (the same holes that blind rivets are called for in the figure for the E-1001B Bottom Skin) can be accessed in the E-1001 Top Skin for solid riveting at this point.

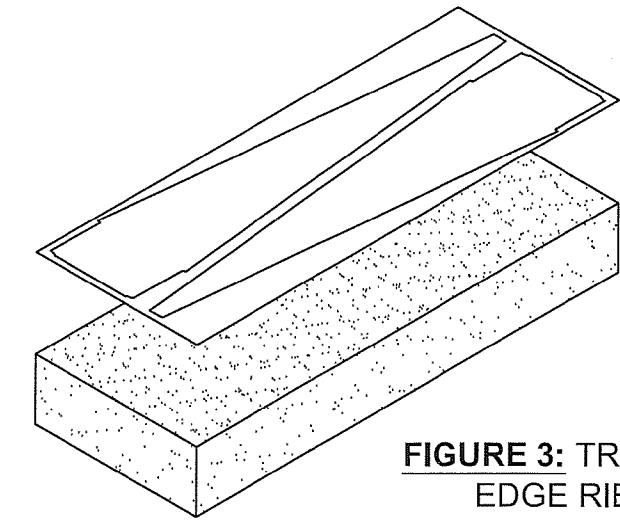
Repeat this step for riveting the E-1001B Bottom Skin to the front spar and tip rib assembly. Remember not to rivet the skin to the outboard tip rib aft of the rear spar. The two holes which call for blind rivets in the figure, will need to be final-drilled with a 7/64" drill.



**FIGURE 2: RIVETING THE TIP RIB ASSEMBLY**

NOTE: The trailing edge of the elevators will be bonded and riveted like the rudder trailing edge in Section 7, except that the two foam ribs are bonded in place as well.

Step 7: Cut four trailing edge ribs from the two PVC-750 X 2 X 5.25 blocks supplied in the kit. Glue the templates, found on the last page of this section, onto the foam blocks using a spray adhesive. Cut the ribs from the blocks (a band saw works well here), then use a sanding block to finish the edges exactly to the template lines.



**FIGURE 3: TRAILING EDGE RIBS**

Step 8: Apply a thin (no more than 1/32") coat of tank sealant (mix by follow the directions on the can) to the surfaces of the trailing edge ribs that contact the skins and rear spar. Insert the ribs in place between the skins.

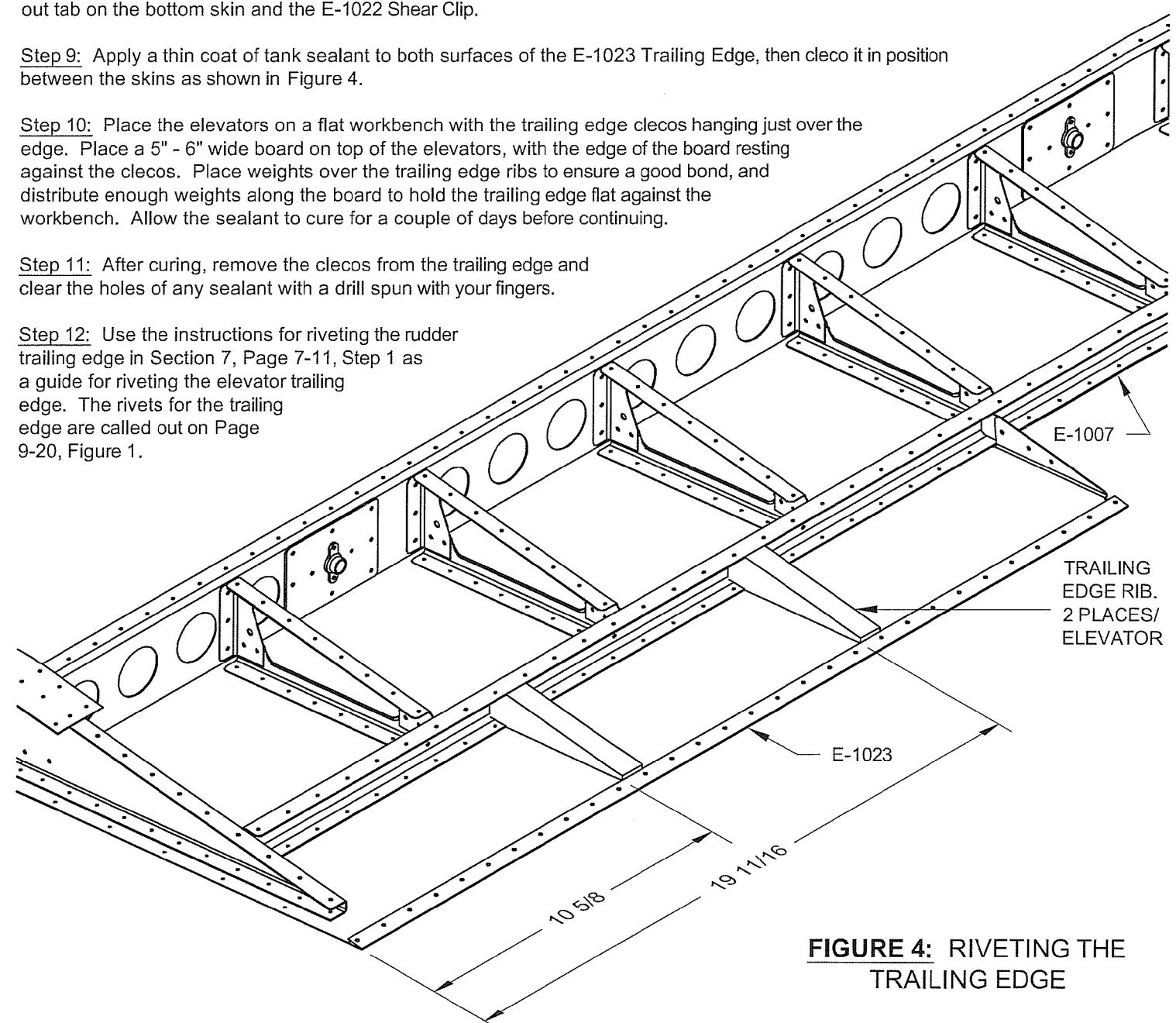
The skins will no longer be separated, so make sure the close out tab on the top skin is "sandwiched" between the close out tab on the bottom skin and the E-1022 Shear Clip.

Step 9: Apply a thin coat of tank sealant to both surfaces of the E-1023 Trailing Edge, then cleco it in position between the skins as shown in Figure 4.

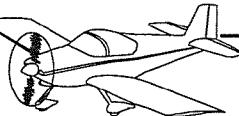
Step 10: Place the elevators on a flat workbench with the trailing edge clecos hanging just over the edge. Place a 5" - 6" wide board on top of the elevators, with the edge of the board resting against the clecos. Place weights over the trailing edge ribs to ensure a good bond, and distribute enough weights along the board to hold the trailing edge flat against the workbench. Allow the sealant to cure for a couple of days before continuing.

Step 11: After curing, remove the clecos from the trailing edge and clear the holes of any sealant with a drill spun with your fingers.

Step 12: Use the instructions for riveting the rudder trailing edge in Section 7, Page 7-11, Step 1 as a guide for riveting the elevator trailing edge. The rivets for the trailing edge are called out on Page 9-20, Figure 1.



**FIGURE 4: RIVETING THE TRAILING EDGE**



Step 1: Finish riveting the E-1001 Skins to the flanges of the E-903 Outboard Tip Rib, aft of the rear spar, using the rivets called out on Page 9-20, Figure 1 & 2.

Step 2: Rivet the E-1022 Shear Clip to the close out tabs in the E-1001 Skins using the rivets shown in Figure 1. Install a blind rivet in the remaining hole in the close out tabs aft of the shear clip.

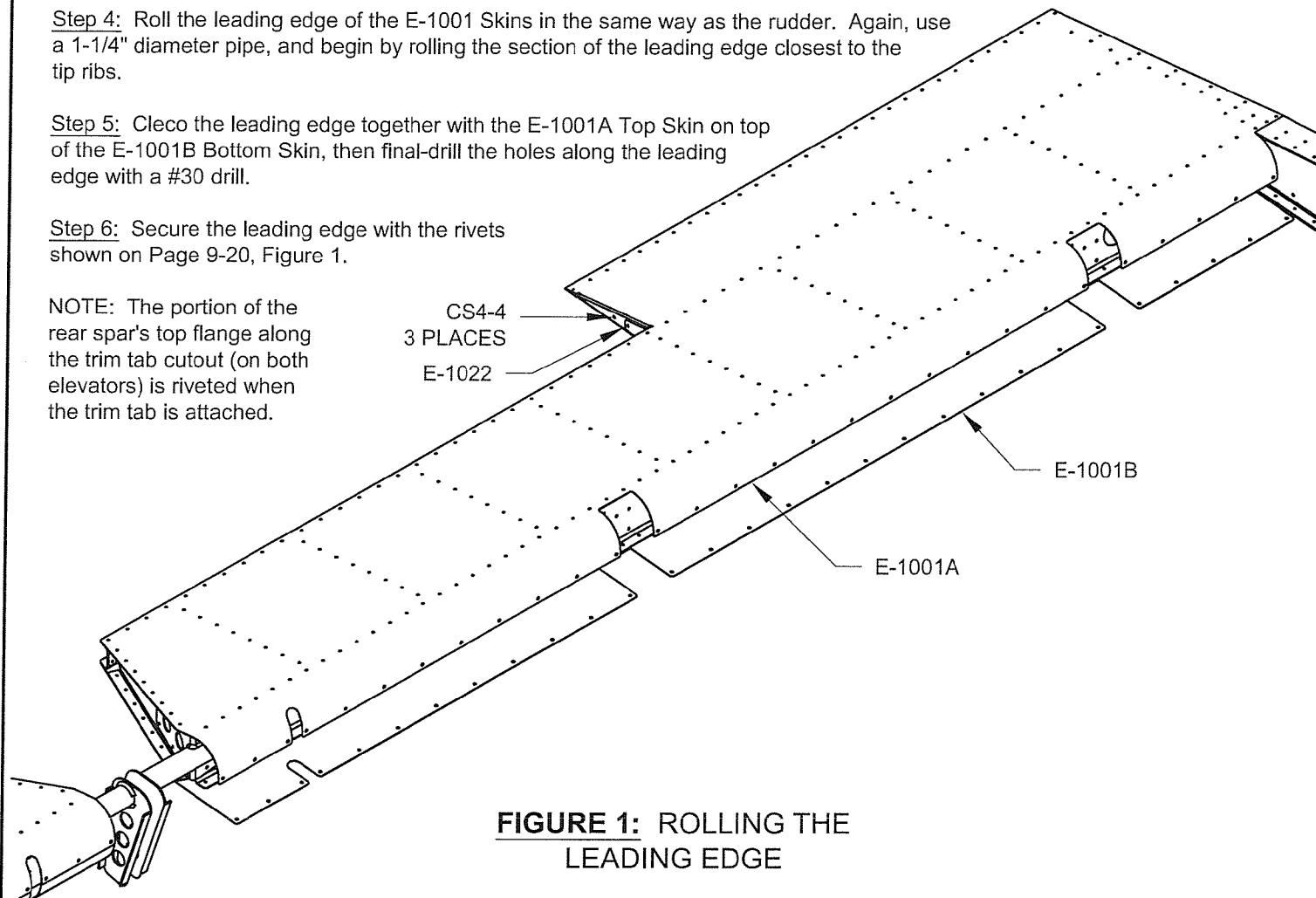
Step 3: Make a slight bend along the leading edge of the E-1001A Top Skin so it lays flush on the E-1001B Bottom Skin after rolling and riveting.

Step 4: Roll the leading edge of the E-1001 Skins in the same way as the rudder. Again, use a 1-1/4" diameter pipe, and begin by rolling the section of the leading edge closest to the tip ribs.

Step 5: Cleco the leading edge together with the E-1001A Top Skin on top of the E-1001B Bottom Skin, then final-drill the holes along the leading edge with a #30 drill.

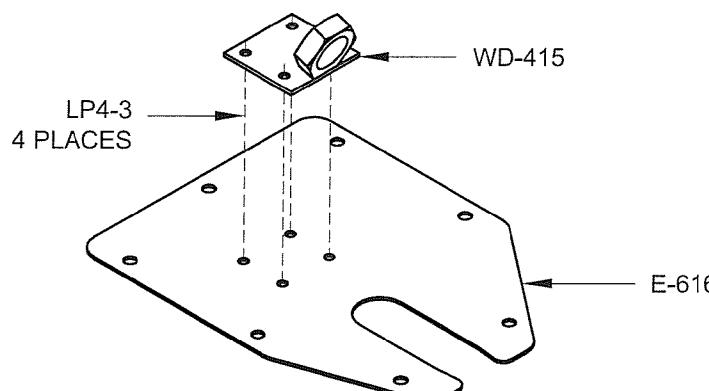
Step 6: Secure the leading edge with the rivets shown on Page 9-20, Figure 1.

NOTE: The portion of the rear spar's top flange along the trim tab cutout (on both elevators) is riveted when the trim tab is attached.



**FIGURE 1: ROLLING THE LEADING EDGE**

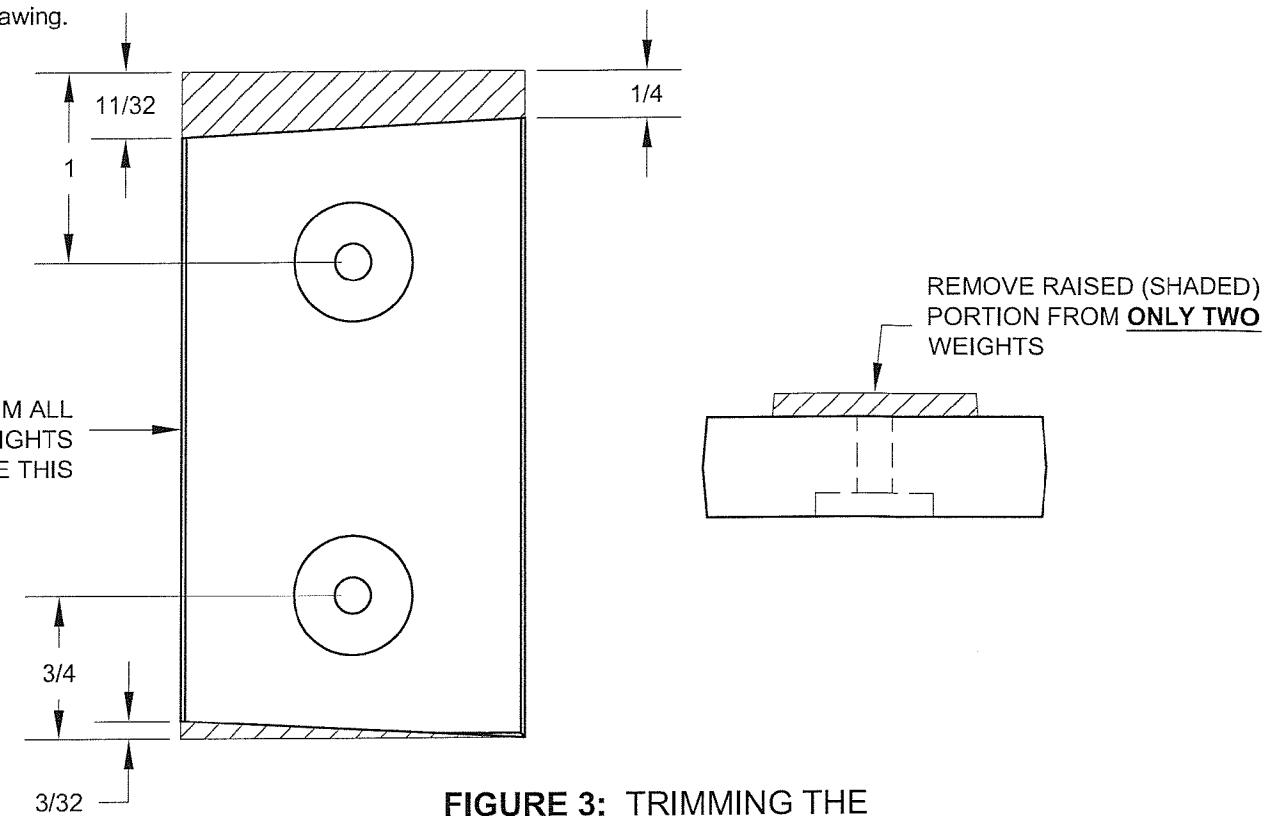
Step 7: Rivet the two WD-415 Trim Cable Attachment Brackets to their corresponding E-616 Cover Plates using the blind rivets called out in Figure 2. Place the head of the rivet on the cover plate.



**FIGURE 2: RIVETING THE TRIM CABLE ANCHOR BRACKETS**

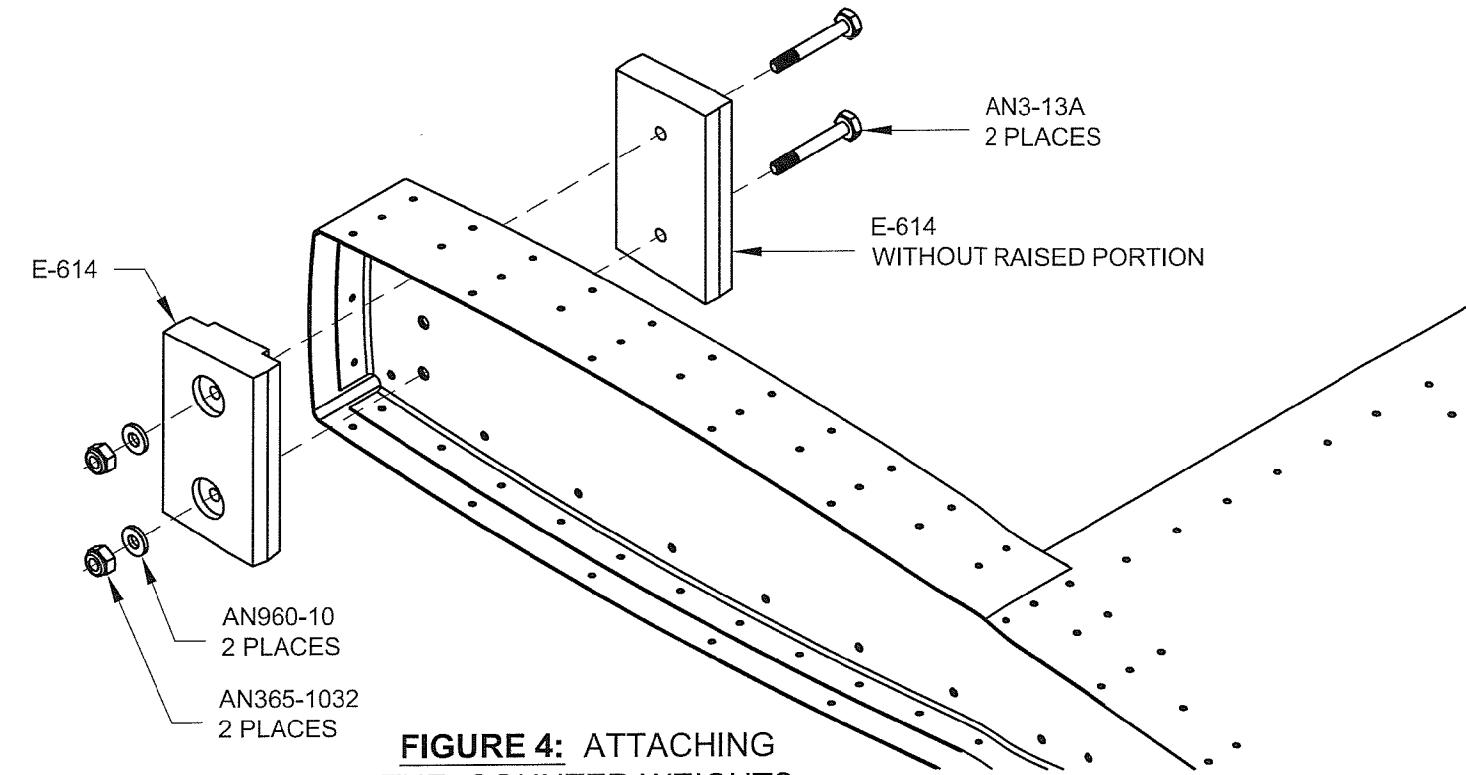
Step 8: Remove the material indicated by the shaded areas in the left drawing of Figure 3 from all four E-614 Counterweights. Notice that the two holes are closer to the bottom edge in the drawing, so be sure to trim the weight accordingly.

Remove the raised portion on the back side of ONLY TWO of the counter weights. This portion is indicated by the shaded area in the right drawing.

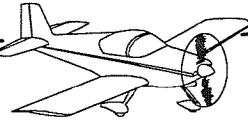


**FIGURE 3: TRIMMING THE E-614 COUNTER WEIGHTS**

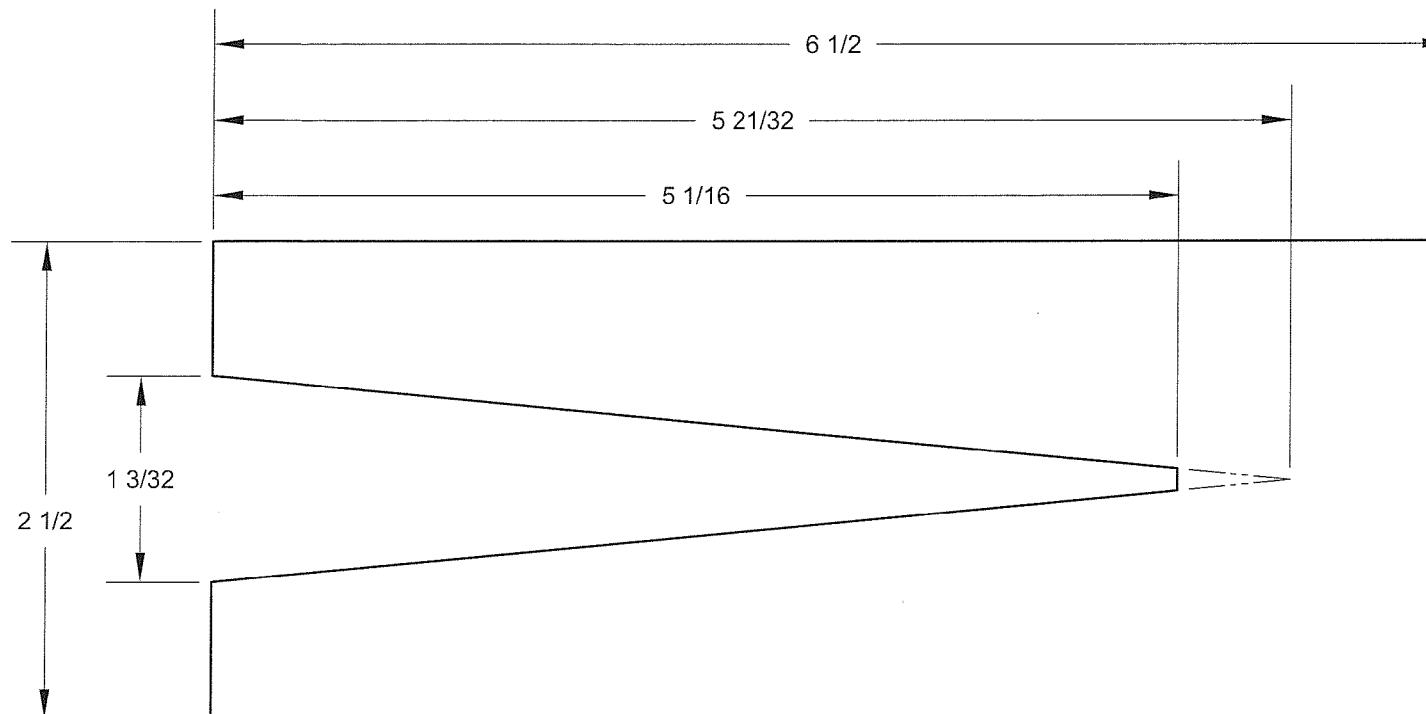
Step 9: Attach the E-614 Counter Weights to the tip ribs using the hardware in Figure 4. Notice that the counter weight without the raised portion is attached to the inboard side of the ribs. This weight is thin enough to completely nest within the overhanging E-913 Counterbalance Skin, thereby maintaining the required clearance with the horizontal stabilizer when the elevator is attached to it.



**FIGURE 4: ATTACHING THE COUNTER WEIGHTS**

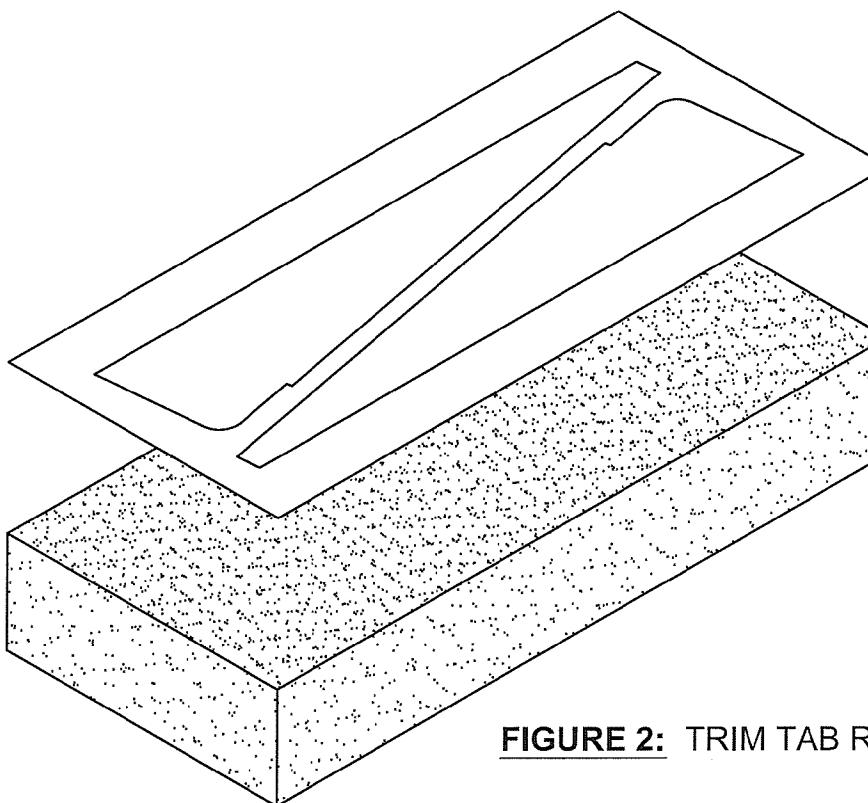


Step 1: Make six trim tab clamping blocks out of a 3/4" thick wood board using the dimensions in Figure 1.



**FIGURE 1: TRIM TAB CLAMP BLOCKS**

Step 2: Make six trim tab ribs from the three PVC-750 x 2 x 4.5 foam blocks supplied in the kit. Using the templates found on the last page of this section, cut out the ribs as you did with the trailing edge ribs earlier.

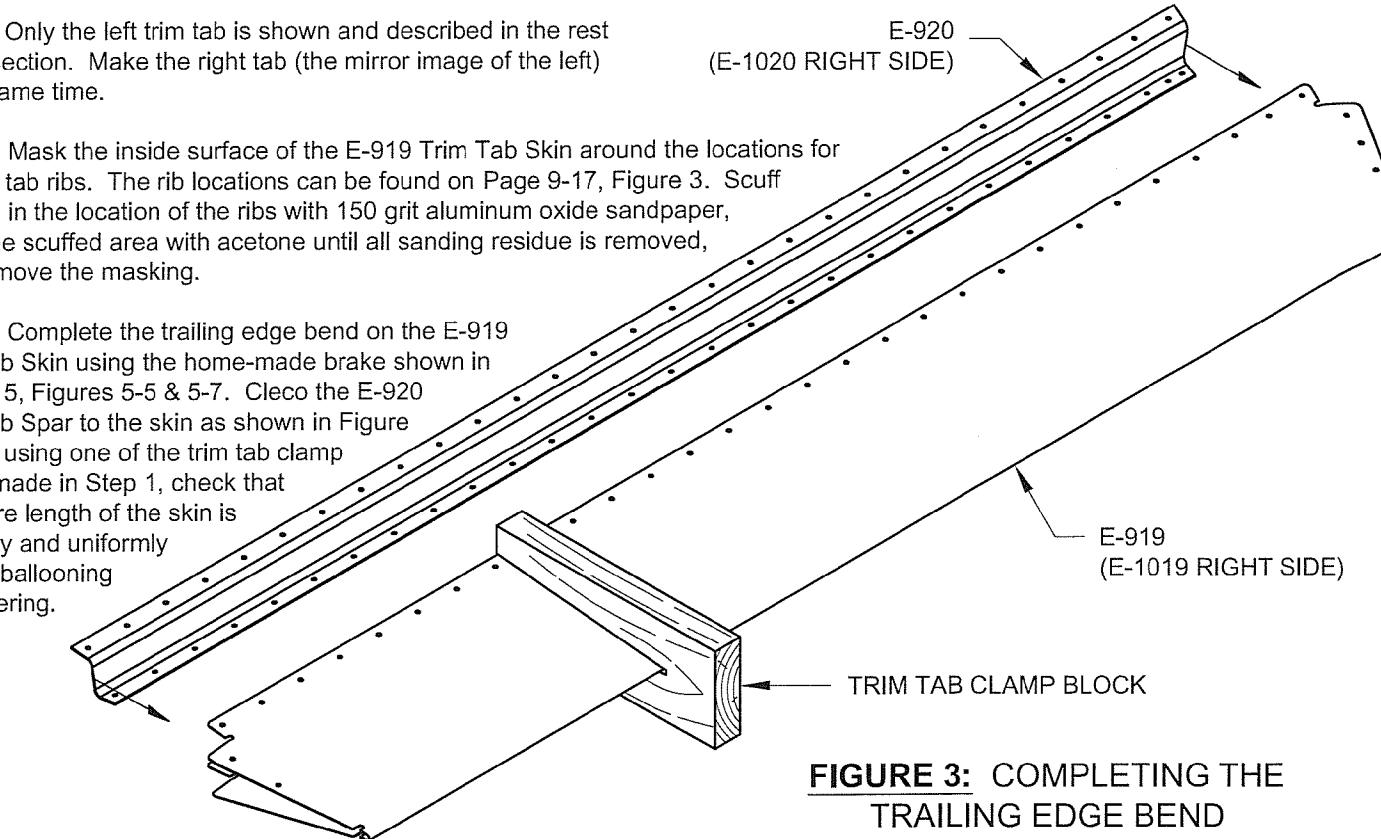


**FIGURE 2: TRIM TAB RIBS**

NOTE: Only the left trim tab is shown and described in the rest of this section. Make the right tab (the mirror image of the left) at the same time.

Step 3: Mask the inside surface of the E-919 Trim Tab Skin around the locations for the trim tab ribs. The rib locations can be found on Page 9-17, Figure 3. Scuff the skin in the location of the ribs with 150 grit aluminum oxide sandpaper, clean the scuffed area with acetone until all sanding residue is removed, then remove the masking.

Step 4: Complete the trailing edge bend on the E-919 Trim Tab Skin using the home-made brake shown in Section 5, Figures 5-5 & 5-7. Cleco the E-920 Trim Tab Spar to the skin as shown in Figure 3, then, using one of the trim tab clamp blocks made in Step 1, check that the entire length of the skin is bent fully and uniformly with no ballooning or puckering.

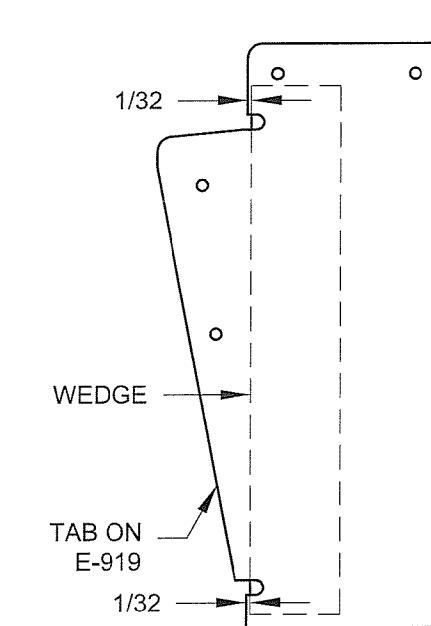


**FIGURE 3: COMPLETING THE TRAILING EDGE BEND**

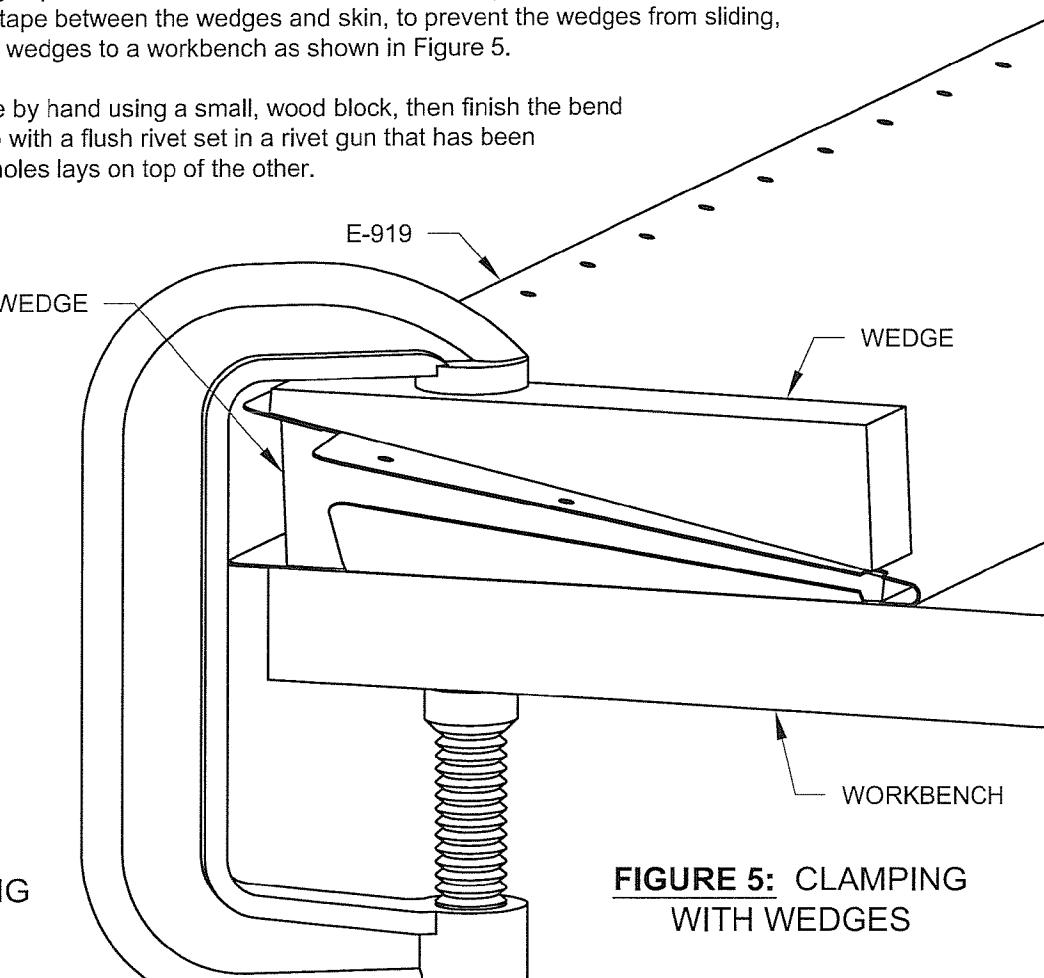
Step 5: Bend the two tabs on both ends of the E-919 (E-1019 right side) Trim Tab Skins. To accomplish this, make two wood wedges having the same geometry as the cutout in the trim tab clamp blocks made in Step 1 (you may be able to use the wedges cut from the clamp blocks if they are in good shape). Radius the edges a 1/32" to prevent cracking the skin.

As shown in Figure 4, position the wedges parallel to, but offset 1/32" from, the straight portion of the skin forward and aft of the tab. Place double sticky-back tape between the wedges and skin, to prevent the wedges from sliding, then clamp the trim tab skin and the two wedges to a workbench as shown in Figure 5.

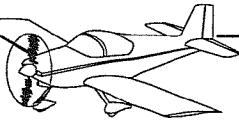
Begin bending the tab around the wedge by hand using a small, wood block, then finish the bend by tapping back and fourth along the tab with a flush rivet set in a rivet gun that has been turned down low. The tab with the two holes lays on top of the other.



**FIGURE 4: LOCATING THE WEDGES**

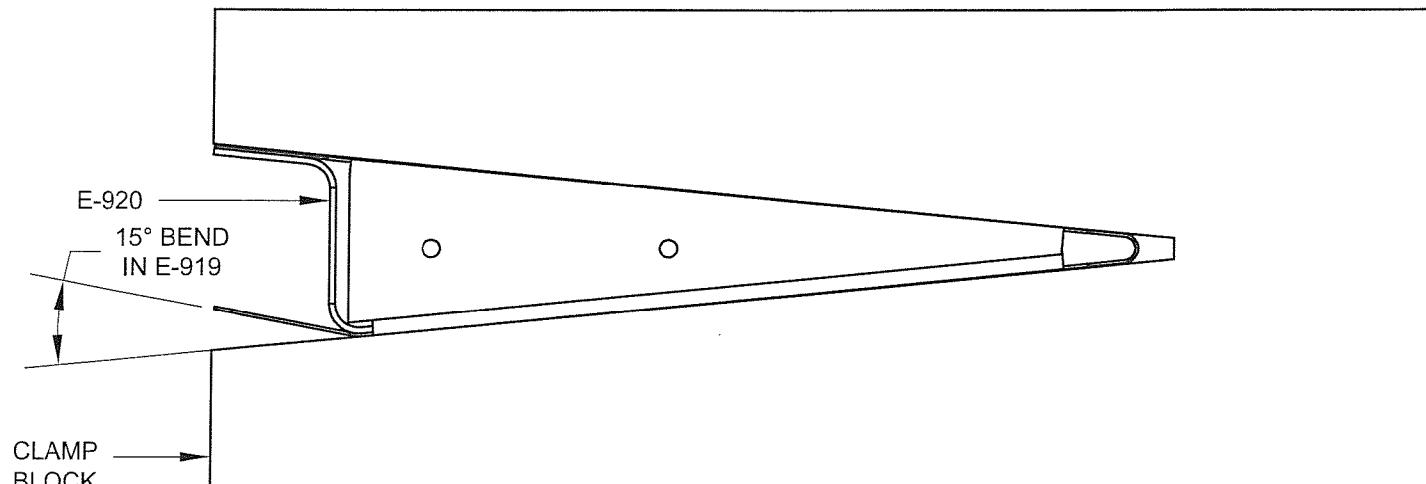


**FIGURE 5: CLAMPING WITH WEDGES**



**Step 1:** Once again, cleco the E-920 Trim Tab Spar to the E-919 Trim Tab Skin. Slip the clamp blocks over both ends of the skin to hold the skin in the proper shape as shown in Figure 1. Match-Drill the holes of the outer tabs into the inner tabs using a #30 drill.

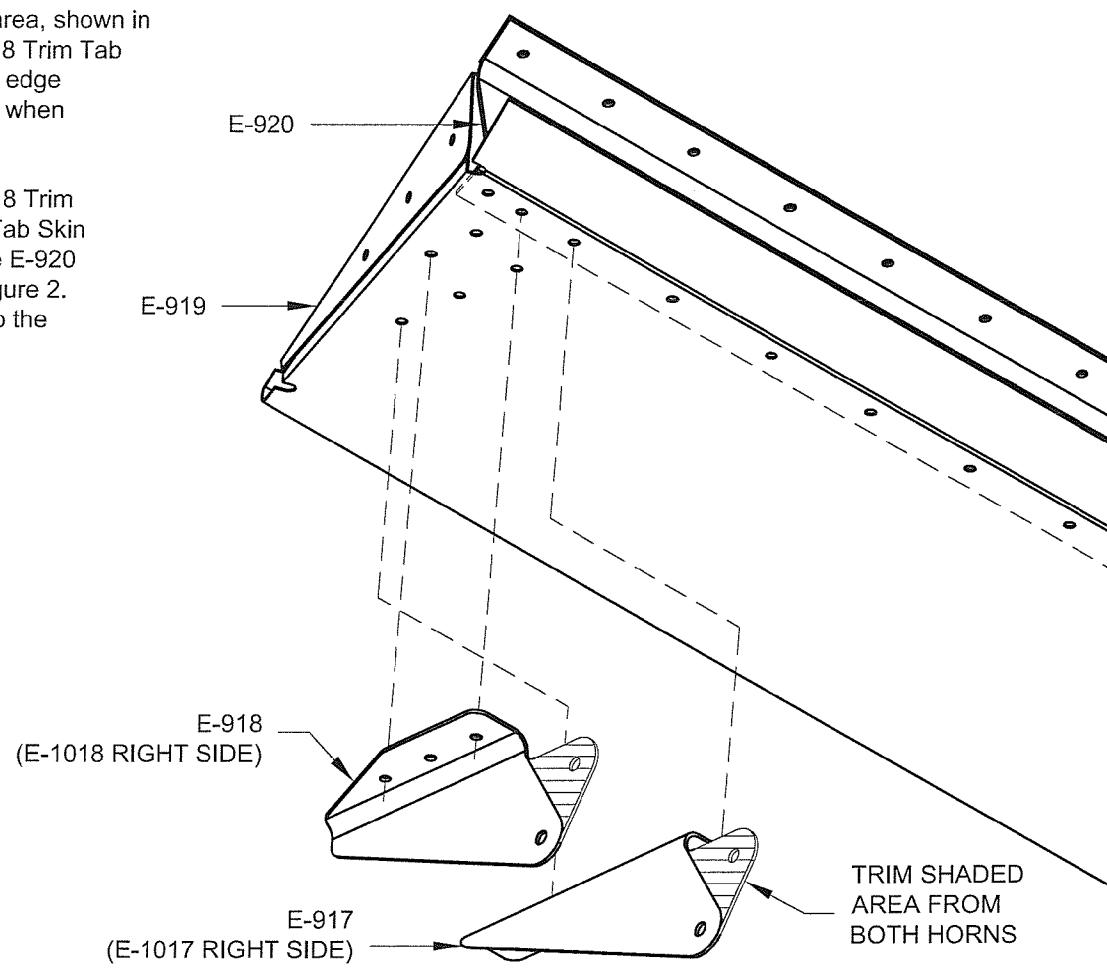
**Step 2:** Remove the clamp blocks, then mark the lower surface of the skin at the web of the E-920 Trim Tab Spar for the 15° bend shown in Figure 1. Remove the spar, make the bend, then replace the spar.



**FIGURE 1: DRILLING AND BENDING THE SKIN**

**Step 3:** Remove the shaded area, shown in Figure 2, from the E-917 & -918 Trim Tab Horns. Make sure to keep the edge distance of the remaining hole when trimming.

**Step 4:** Cleco the E-917 & -918 Trim Tab Horns to the E-919 Trim Tab Skin and to the bottom flange of the E-920 Trim Tab Spar as shown in Figure 2. Final-Drill the holes common to the horns, skin, and spar using a #40 drill.



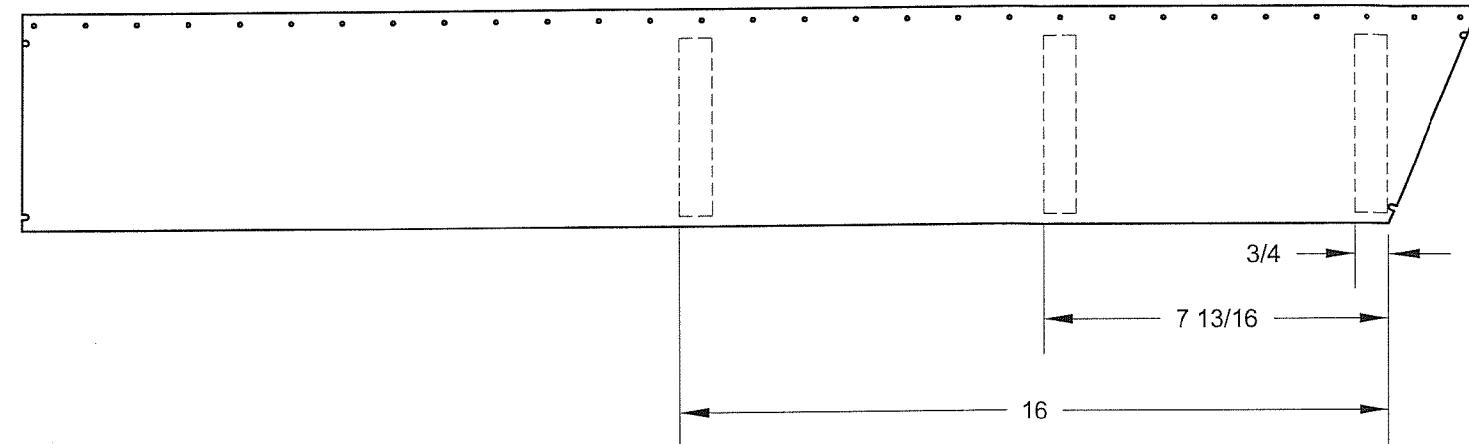
**FIGURE 2: TRIMMING AND DRILLING THE TRIM TAB HORNS**

**Step 5:** Disassemble and deburr all parts.

**Step 6:** Dimple all the holes in the E-919 Trim Tab Skin and the #40 holes (which were drilled in Step 3) in the E-917 & -918 Trim Tab Horns.

Dimple the holes in the bottom flange of the E-920 Trim Tab Spar. Machine countersink the holes in the top flange to leave a smooth surface for mounting the trim tab hinge.

**Step 7:** Mask the inside of the skin for the foam ribs at the locations shown in Figure 3, then prime all the parts in preparation for final assembly.



**FIGURE 3: TRIM TAB RIB LOCATIONS**

**Step 8:** Rivet the E-917 & -918 Trim Tab Horns and the bottom flange (bottom flange only!) of the E-920 Trim Tab Spar to the E-919 Trim Tab Skin with the rivets called out on Page 9-19, Figure 2.

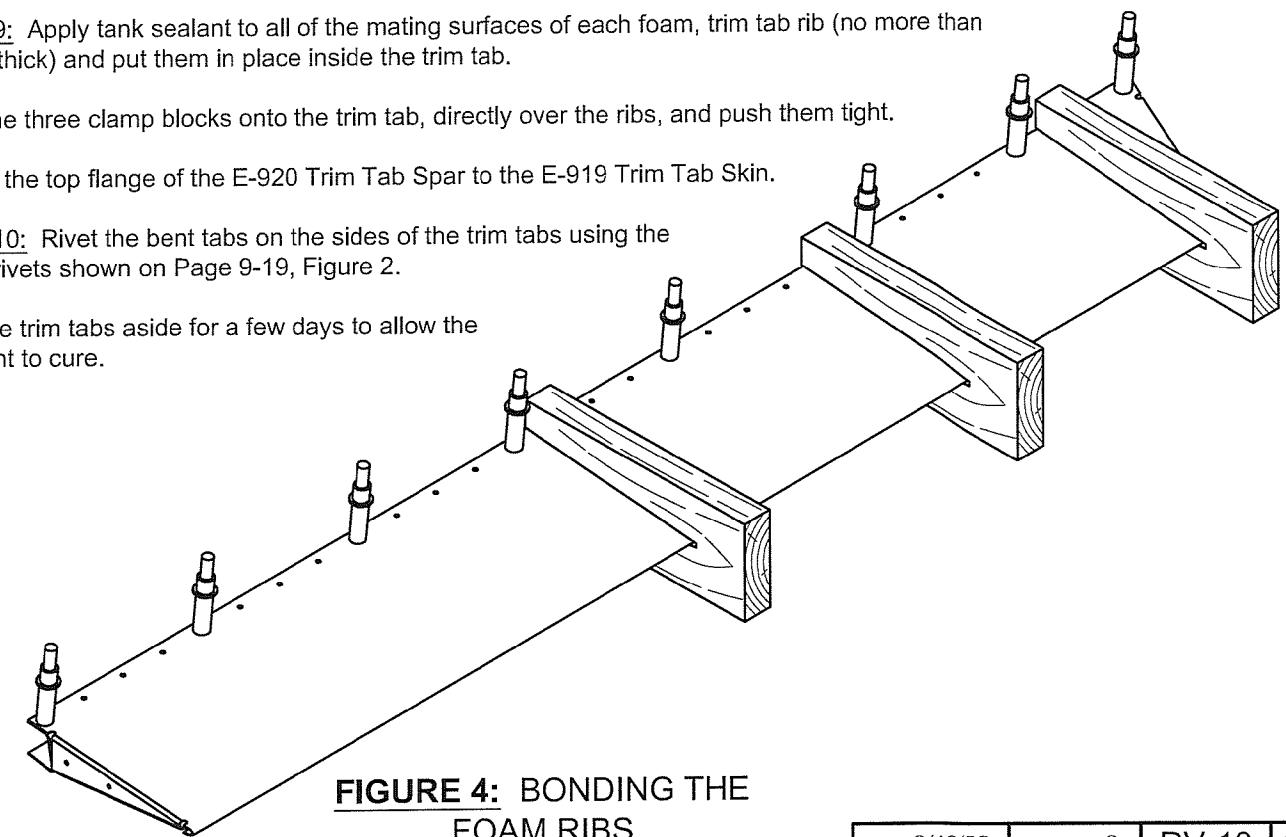
**Step 9:** Apply tank sealant to all of the mating surfaces of each foam, trim tab rib (no more than 1/32" thick) and put them in place inside the trim tab.

Slip the three clamp blocks onto the trim tab, directly over the ribs, and push them tight.

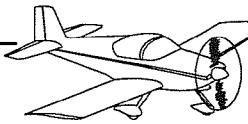
Cleco the top flange of the E-920 Trim Tab Spar to the E-919 Trim Tab Skin.

**Step 10:** Rivet the bent tabs on the sides of the trim tabs using the blind rivets shown on Page 9-19, Figure 2.

Set the trim tabs aside for a few days to allow the sealant to cure.

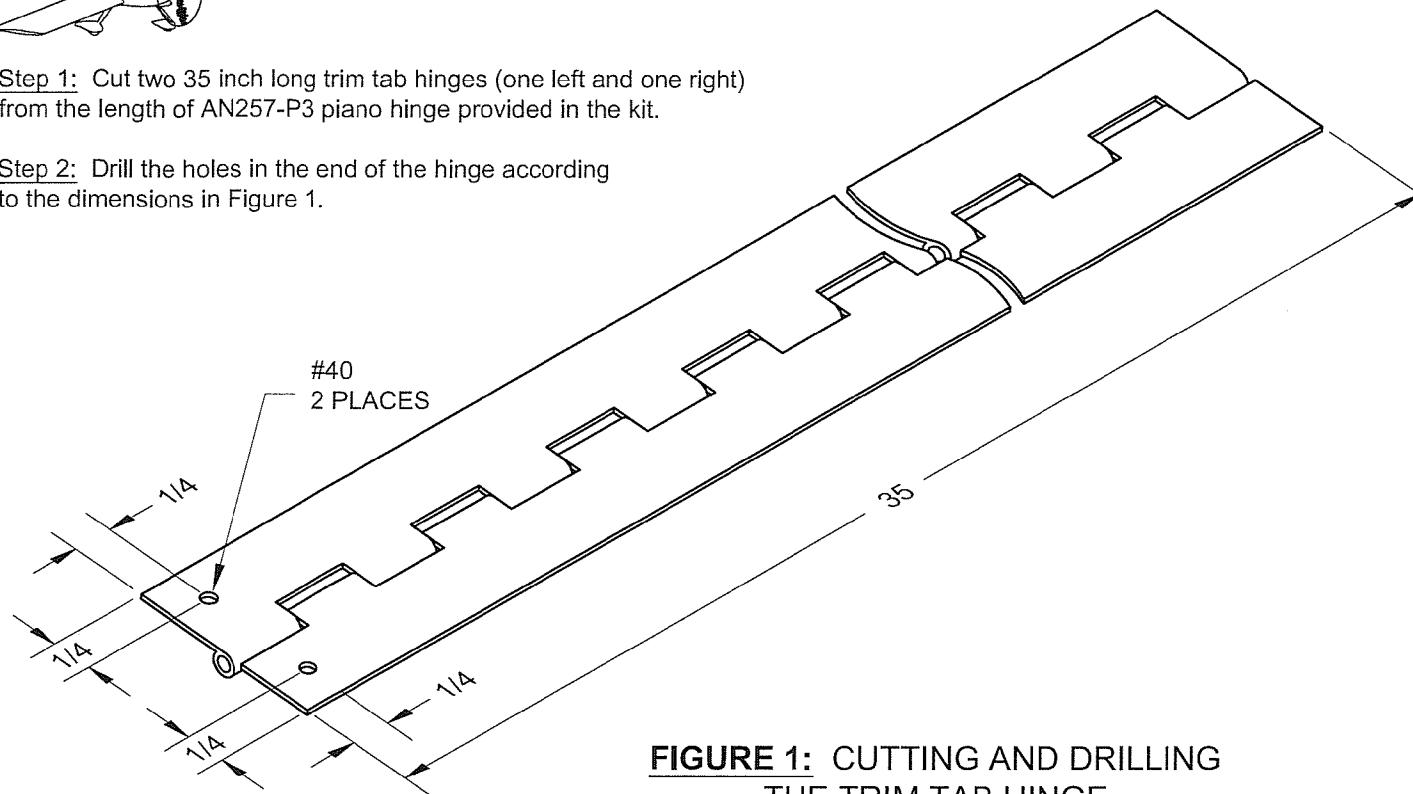


**FIGURE 4: BONDING THE FOAM RIBS**



Step 1: Cut two 35 inch long trim tab hinges (one left and one right) from the length of AN257-P3 piano hinge provided in the kit.

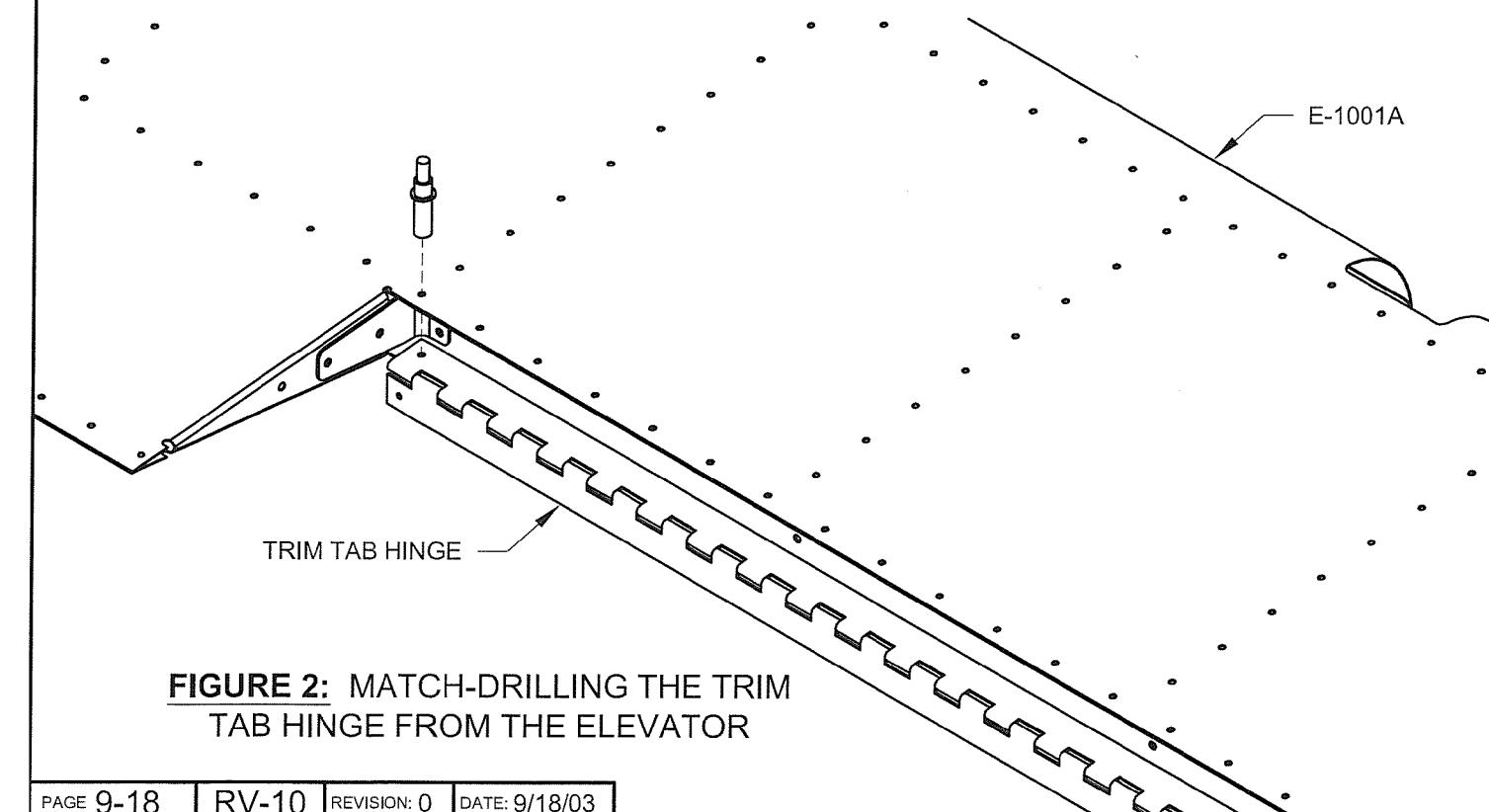
Step 2: Drill the holes in the end of the hinge according to the dimensions in Figure 1.



**FIGURE 1: CUTTING AND DRILLING THE TRIM TAB HINGE**

Step 3: Using one of the holes just drilled in the trim tab hinge, cleco the hinge to the elevator as shown in Figure 2.

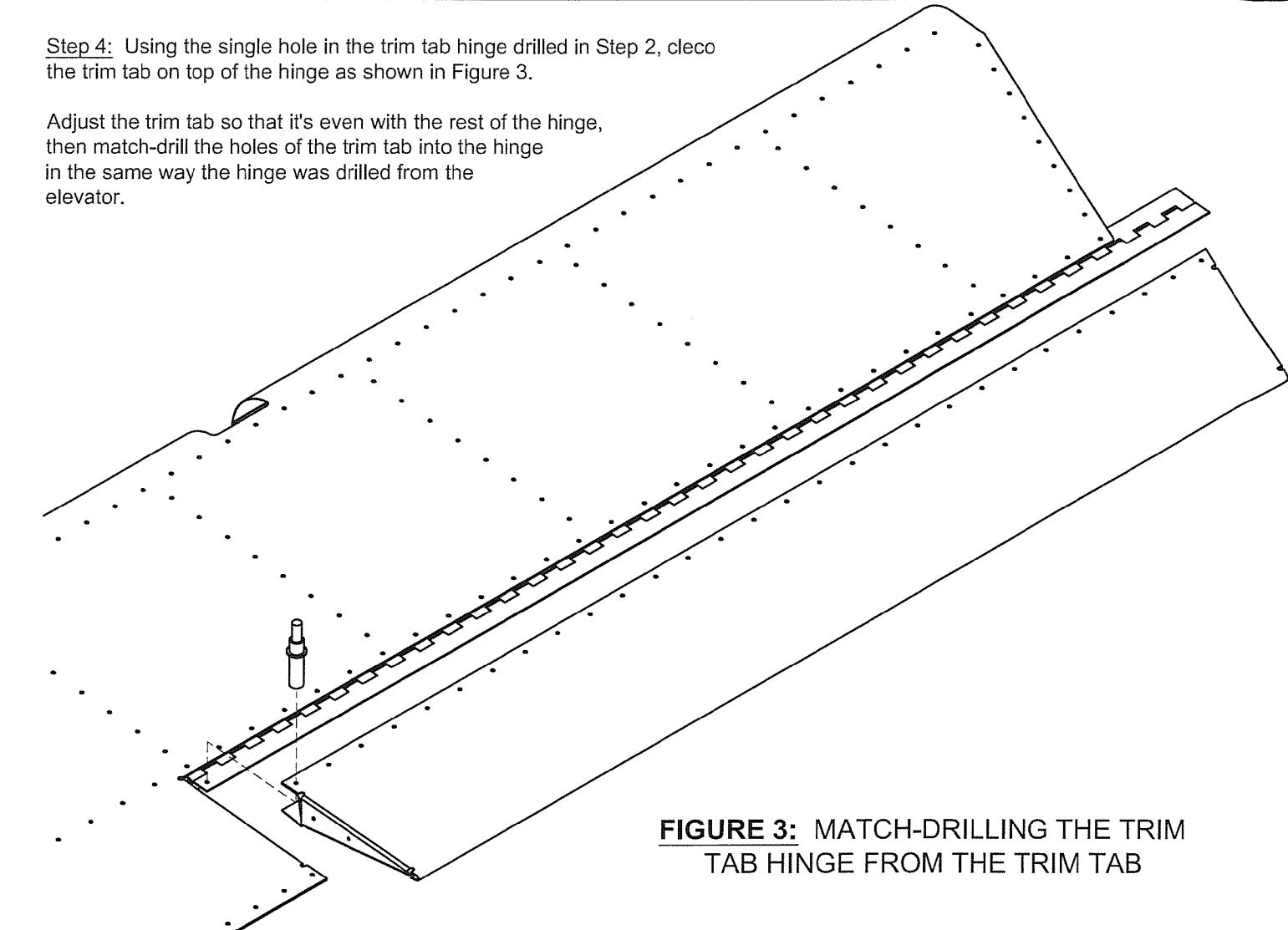
Adjust the rest of the hinge so that it's even with the edge of the E-1001A Top Elevator Skin and the top flange of the E-1007 Rear Spar. Using a #40 drill, match-drill the inboard most hole in the elevator and rear spar into the hinge, cleco the hole, then match-drill and cleco one of the holes near the middle of the hinge. Now match-drill the remaining holes.



**FIGURE 2: MATCH-DRILLING THE TRIM TAB HINGE FROM THE ELEVATOR**

Step 4: Using the single hole in the trim tab hinge drilled in Step 2, cleco the trim tab on top of the hinge as shown in Figure 3.

Adjust the trim tab so that it's even with the rest of the hinge, then match-drill the holes of the trim tab into the hinge in the same way the hinge was drilled from the elevator.



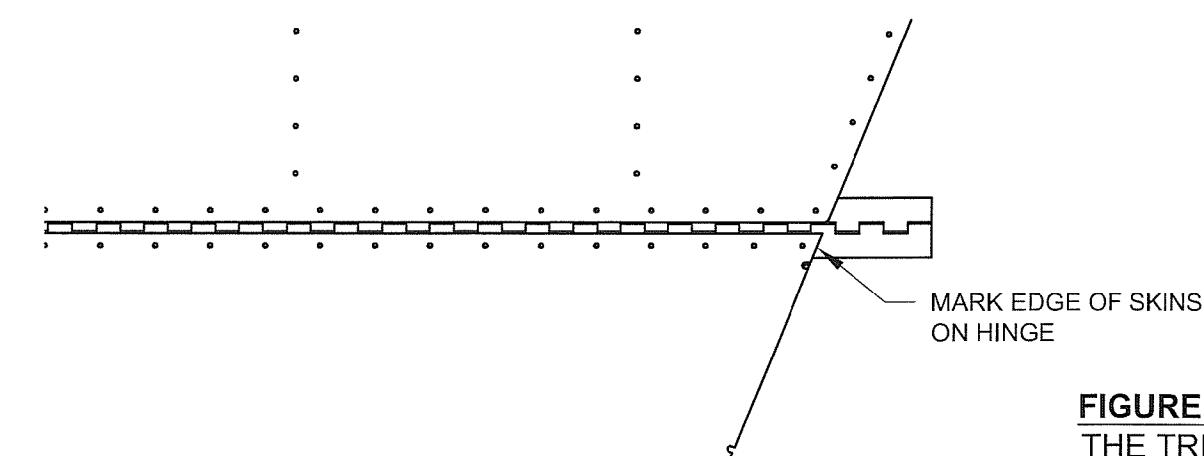
**FIGURE 3: MATCH-DRILLING THE TRIM TAB HINGE FROM THE TRIM TAB**

Step 5: Mark the inboard end of the hinge so that it can be trimmed even with the elevator and trim tab.

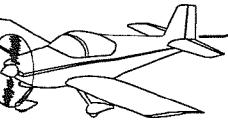
Step 6: Remove the hinge from the elevator and trim tab, then remove the pin from the hinge. Trim the hinge halves at the marks made in Step 5. (The pin is left long so that it can be bent and secured to the elevator. This prevents the pin from sliding out of the hinge in service.)

Step 7: Rivet the hinge halves to the elevator using the rivets called out on Page 9-20, Figure 1, and to the trim tab using the rivets called out on Page 9-19, Figure 2.

Step 8: Attach the trim tab to the elevator by sliding the hinge pin back into the hinge halves.



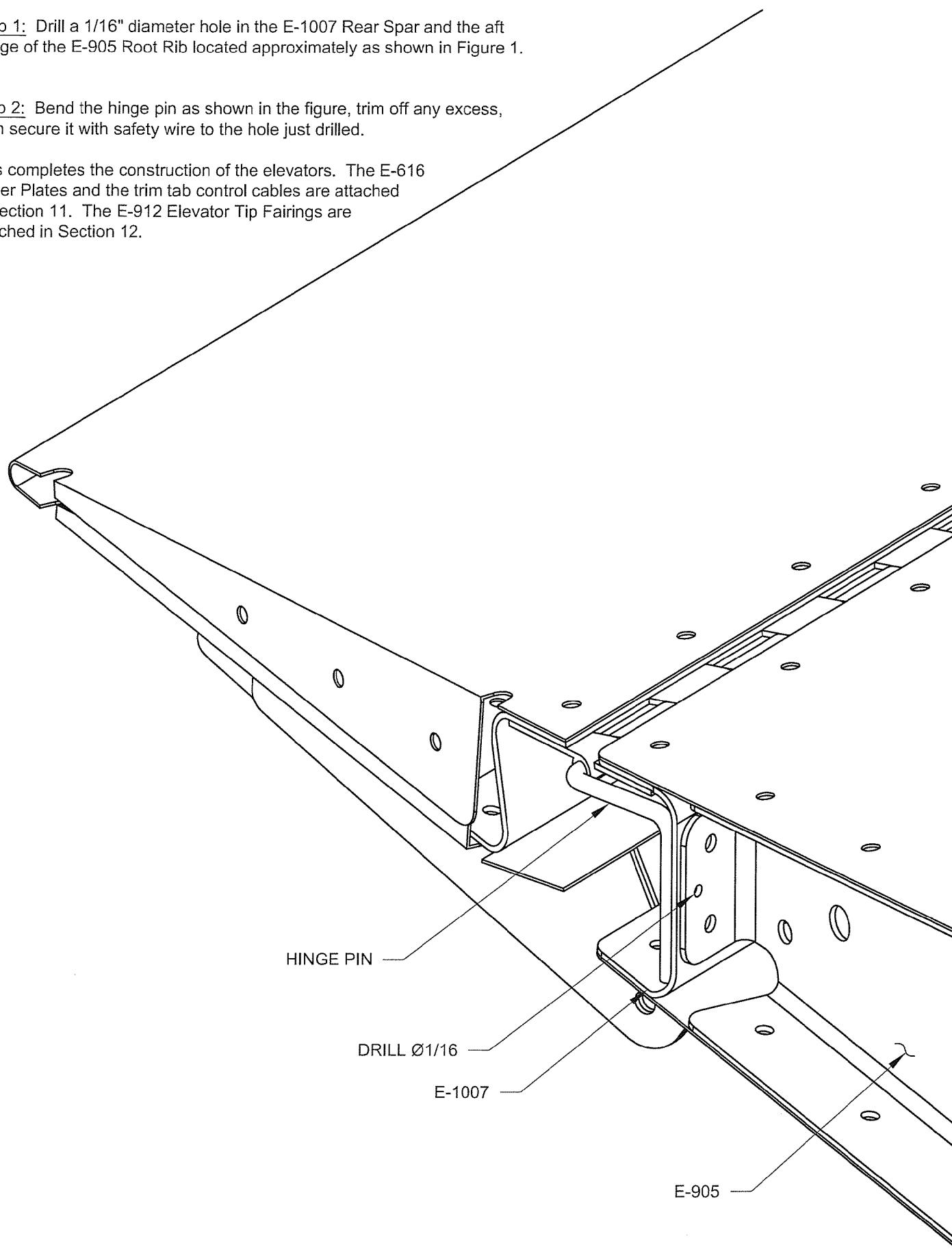
**FIGURE 4: TRIMMING THE TRIM TAB HINGE**



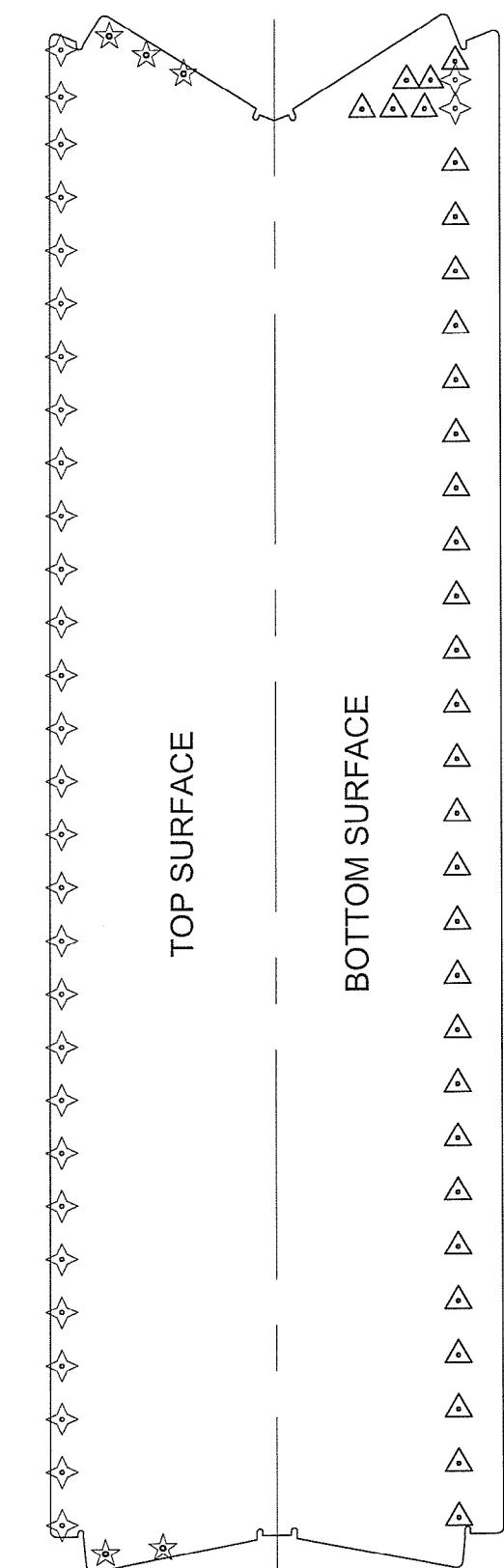
Step 1: Drill a 1/16" diameter hole in the E-1007 Rear Spar and the aft flange of the E-905 Root Rib located approximately as shown in Figure 1.

Step 2: Bend the hinge pin as shown in the figure, trim off any excess, then secure it with safety wire to the hole just drilled.

This completes the construction of the elevators. The E-616 Cover Plates and the trim tab control cables are attached in Section 11. The E-912 Elevator Tip Fairings are attached in Section 12.

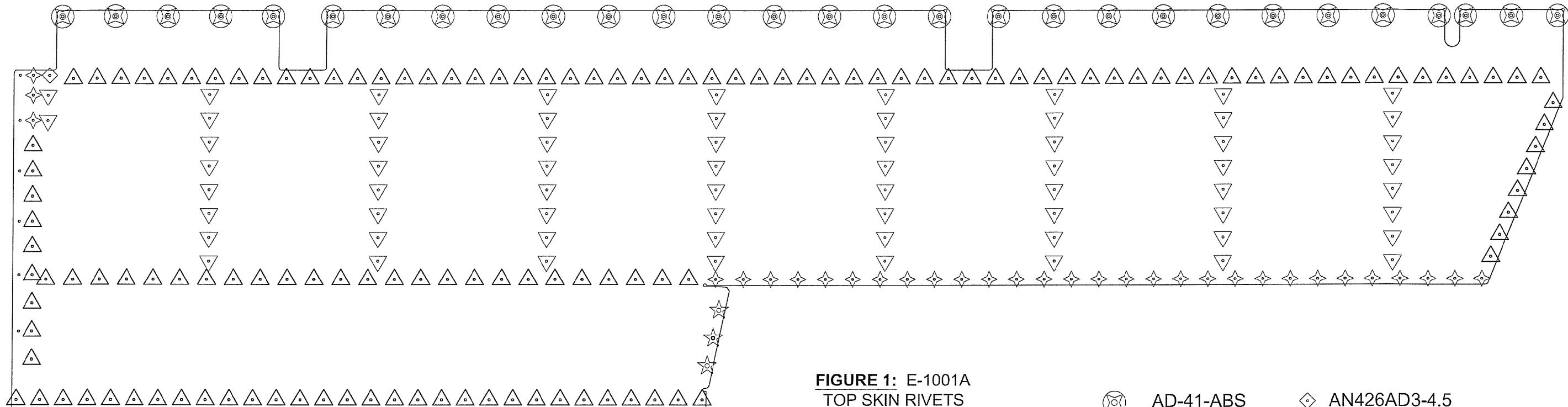
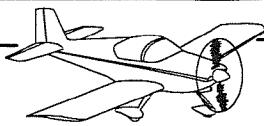


**FIGURE 1:** BENDING AND SECURING THE HINGE PIN



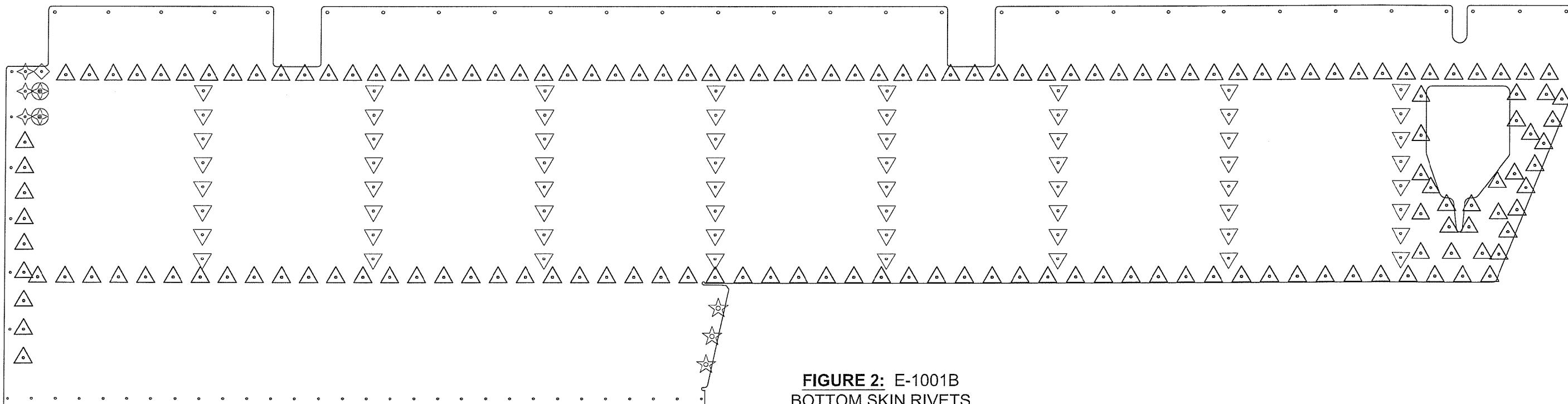
- △ AN426AD3-3.5
- ◊ AN426AD3-4
- ☆ CS4-4

**FIGURE 2:** TRIM TAB SKIN RIVETS

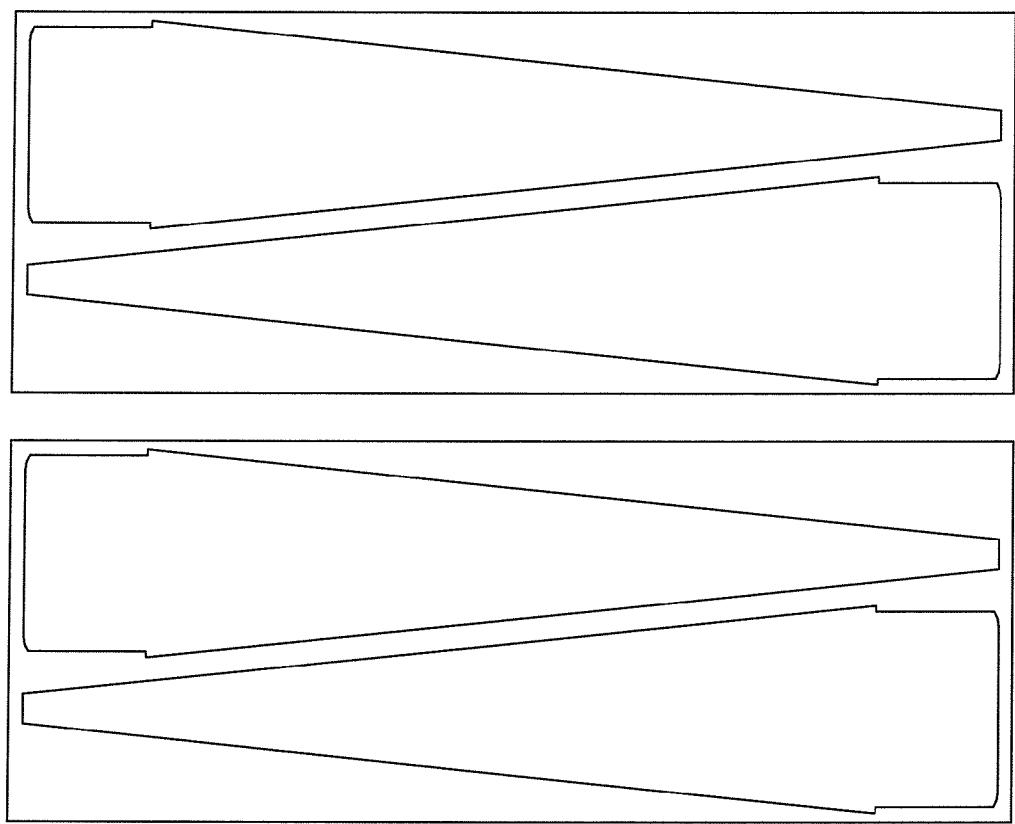


**FIGURE 1: E-1001A  
TOP SKIN RIVETS**

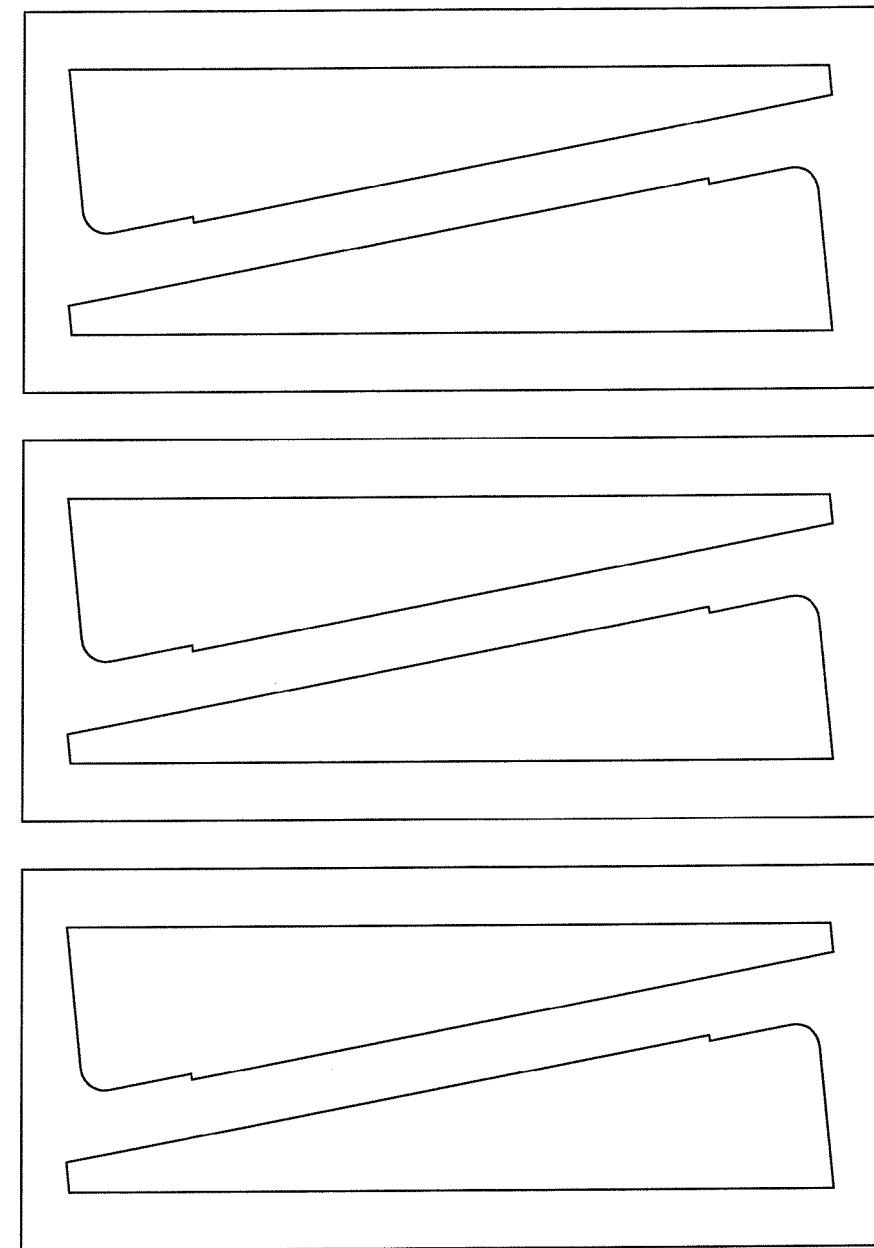
- |    |              |    |              |
|----|--------------|----|--------------|
| ○● | AD-41-ABS    | ◇  | AN426AD3-4.5 |
| ▽  | AN426AD3-3   | ★  | CS4-4        |
| △  | AN426AD3-3.5 | ○○ | MK-319-BS    |
| ◇  | AN426AD3-4   |    |              |



**FIGURE 2: E-1001B  
BOTTOM SKIN RIVETS**

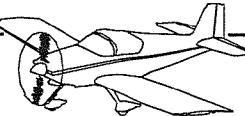


TRAILING EDGE RIB TEMPLATES



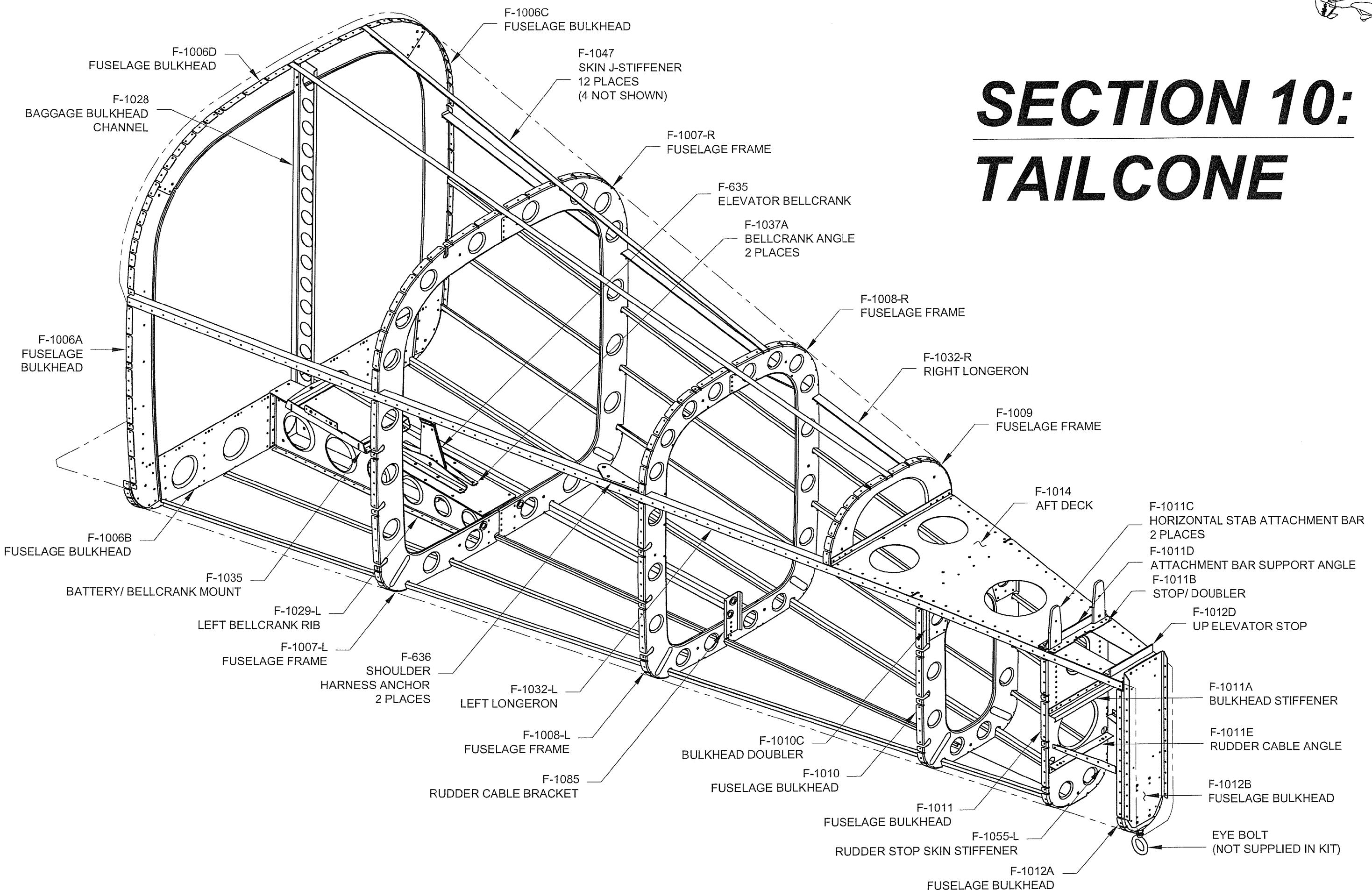
TRIM TAB RIB TEMPLATES

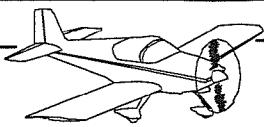
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# SECTION 10:

## TAILCONE





Step 1: Make the F-1012E Tie Down Bar from the length of AEX TIE DOWN X 7.500 provided in the kit. Trim to size, then tap as shown in Figure 1.

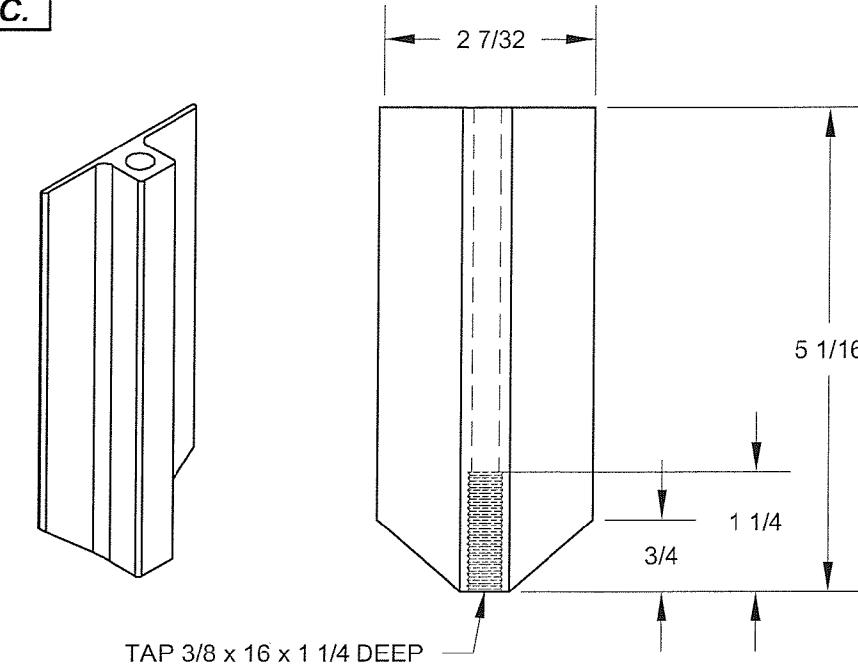


FIGURE 1: F-1012E TIE DOWN BAR

Step 2: Remove the vinyl from the F-1012A & B Fuselage Bulkheads, deburr, then cleco them together as shown in Figure 2. However, don't install any clecos in the holes that are associated with the F-1012E Tie Down Bar.

Step 3: Draw lines along the top and side of the aft face of the F-1012E Tie Down Bar using the dimensions in Figure 2.

Center these lines in the appropriate holes in the F-1012A & B Fuselage Bulkheads then clamp the tie down bar into position.

Match-Drill the four 3/32" holes of the bulkheads into the tie down bar with a #30 drill, cleco these holes, then match-drill the 3/16" holes with a 3/16" drill.

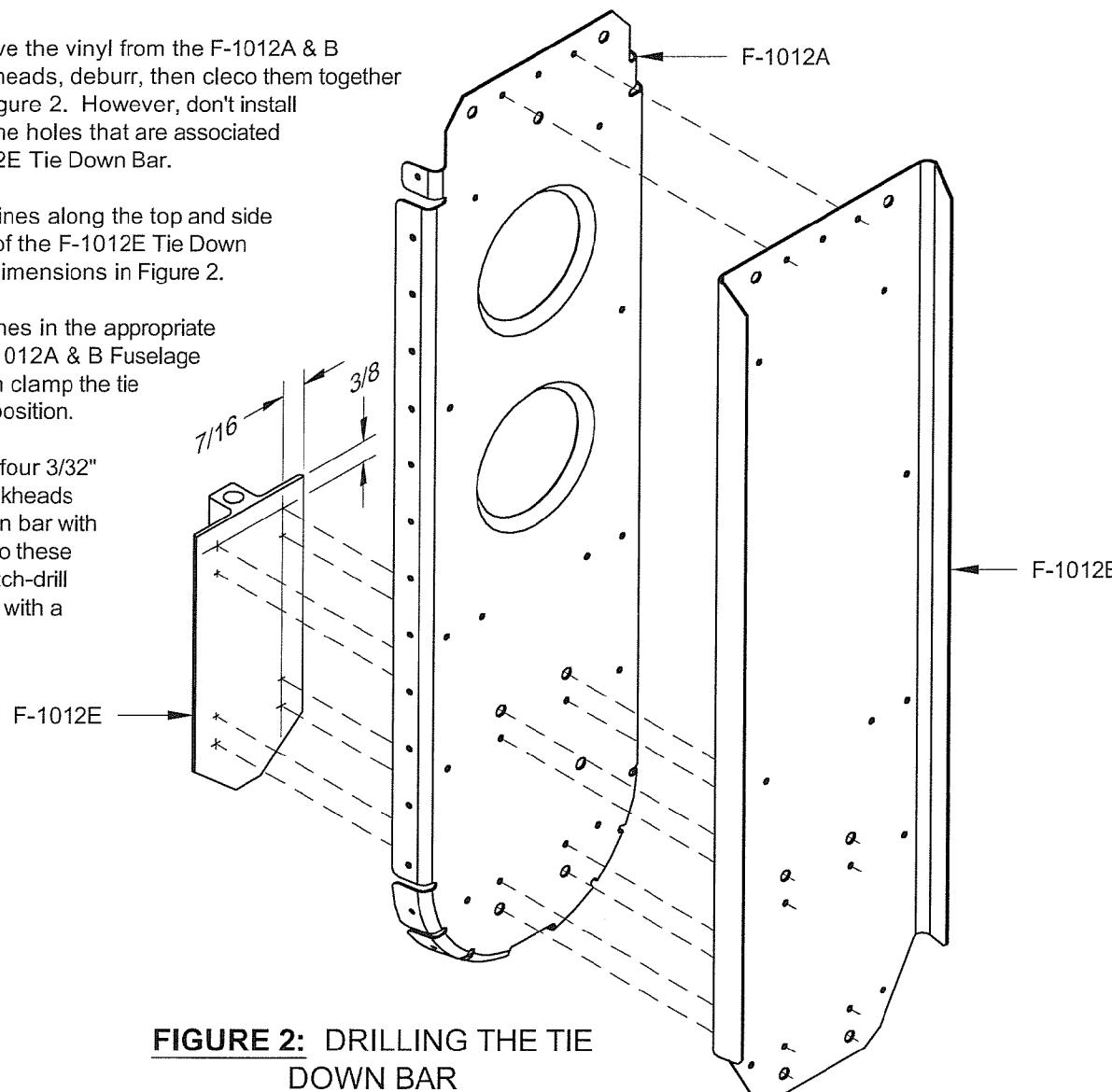


FIGURE 2: DRILLING THE TIE DOWN BAR

Step 4: Make the F-1011E Rudder Cable Angle, as shown in Figure 3, from the length of AA6-063 x 3/4 x 3/4 provided in the kit.

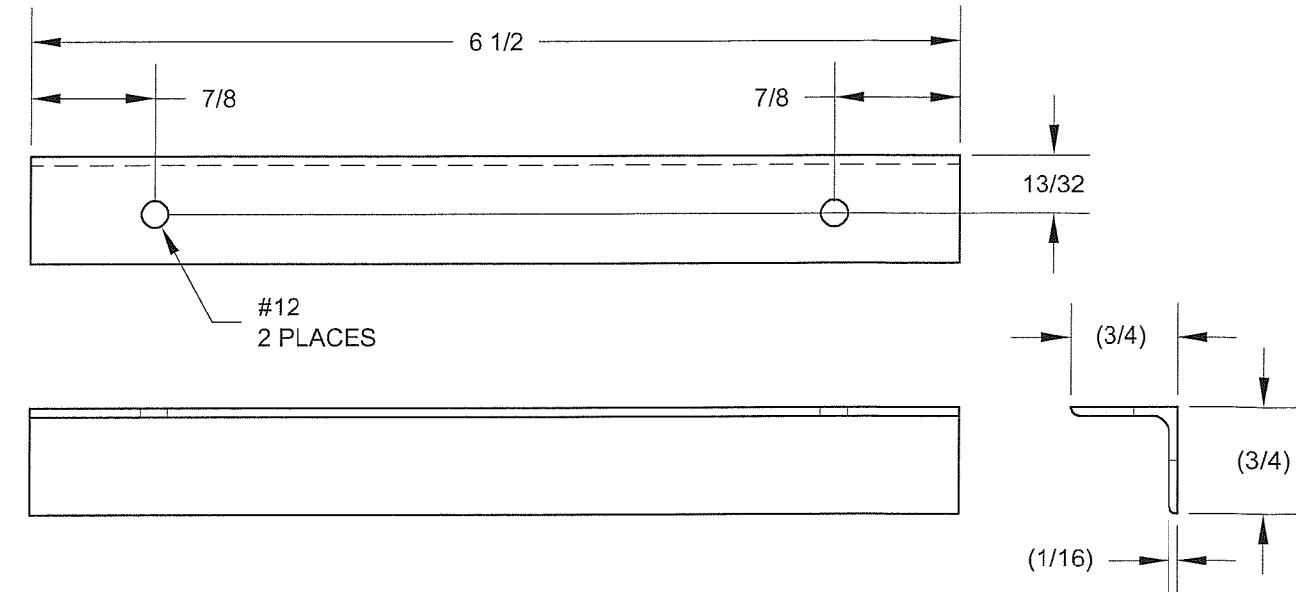


FIGURE 3: F-1011E RUDDER CABLE ANGLE

Step 5: Match-Drill the nutplate rivet holes into the F-1011E Rudder Cable Angle as shown in Figure 4. The nutplates can be temporarily held in place with AN3 bolts while the holes are drilled. Match-Drill one rivet hole and cleco it before drilling the second. This will prevent the nutplate from rotating before the second hole is match-drilled.

Machine countersink the rivet holes in the rudder cable angle for 3/32" flush rivets. Do not rivet the nutplates into place yet.

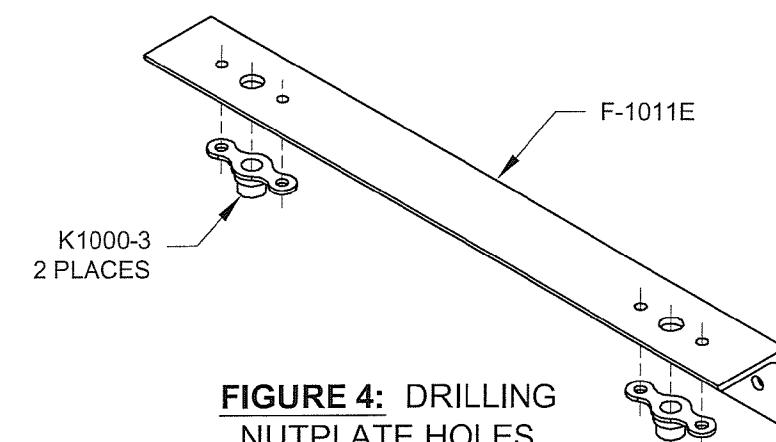


FIGURE 4: DRILLING NUTPLATE HOLES

Step 6: Cut the F-1011A Bulkhead Stiffener, using the dimension shown in Figure 5, from one of the six foot lengths of J-channel provided in the kit. Deburr the edges.

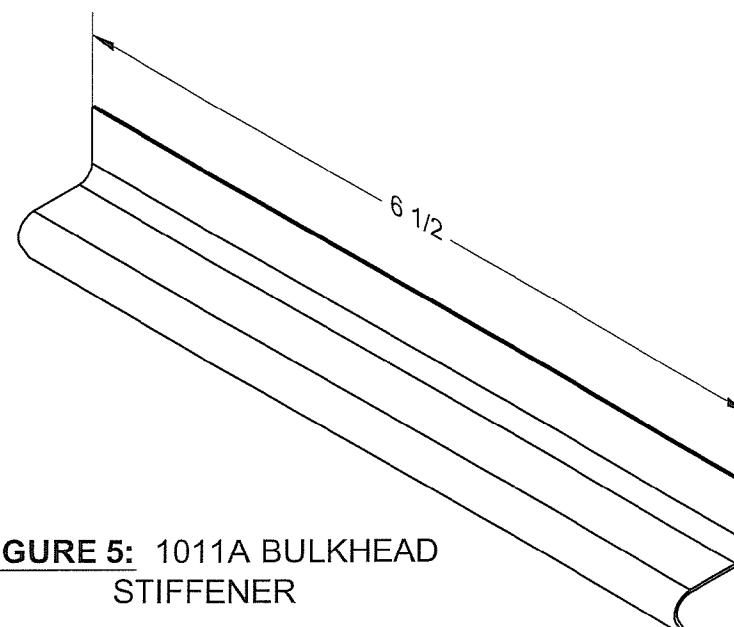
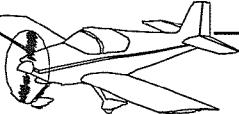
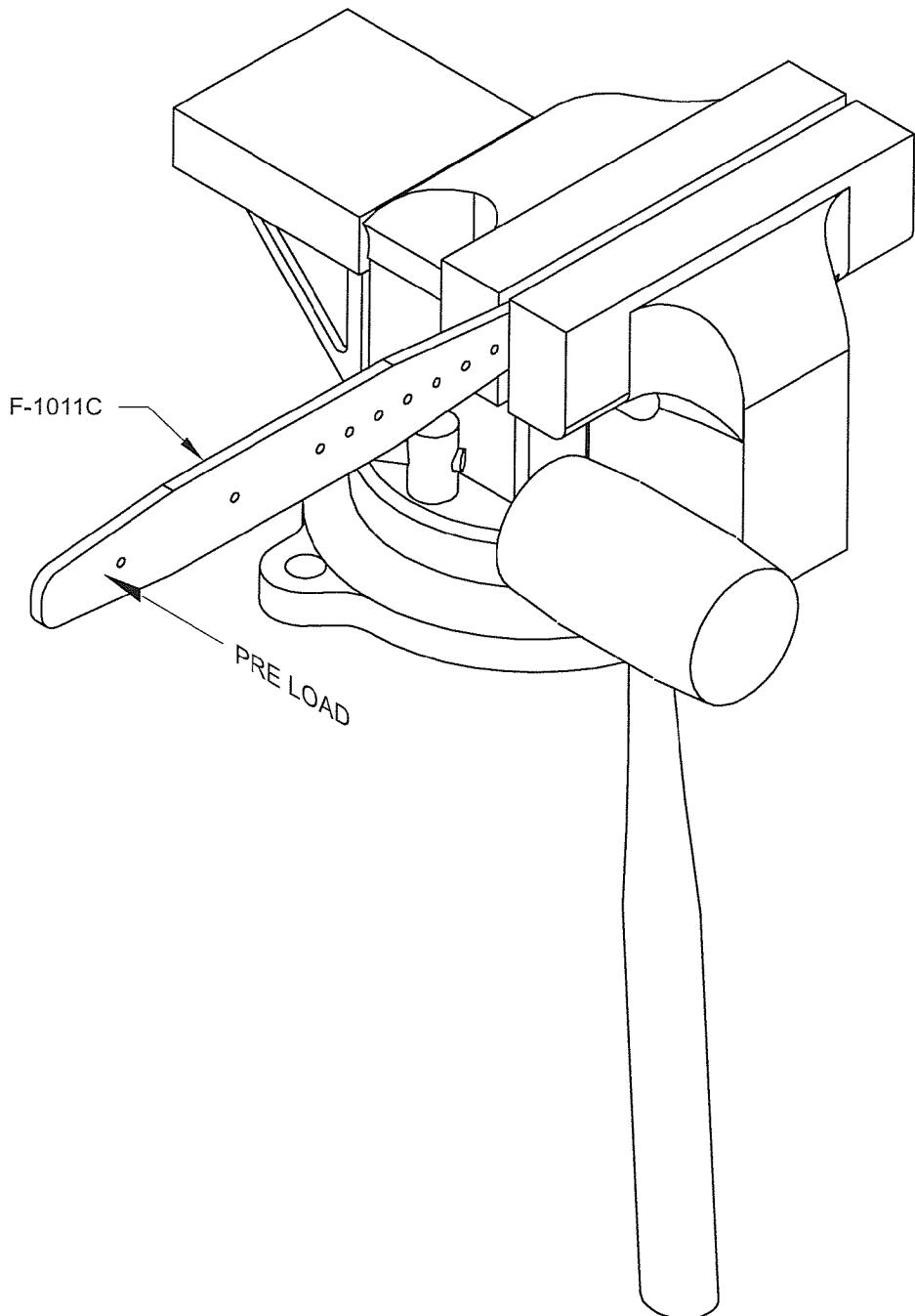


FIGURE 5: 1011A BULKHEAD STIFFENER



**NOTE:** The two F-1011C Horizontal Stabilizer Attachment Bars are most likely bowed due to the punching operation used during their manufacture. This bow will have to be removed.

**Step 1:** Place one of the F-1011C Horizontal Stabilizer Attachment Bars in a padded vice (padded with wood, aluminum, plastic, ...) near one of the ends. Pre load the free end of the attachment bar in the direction required to straighten it and, using a rubber mallet, firmly strike the bar one time near the vice. Slide the bar further into the vice, pre load, and strike the bar again. Repeat this sequence until the bar is straight within a  $1/16"$  along its entire length.

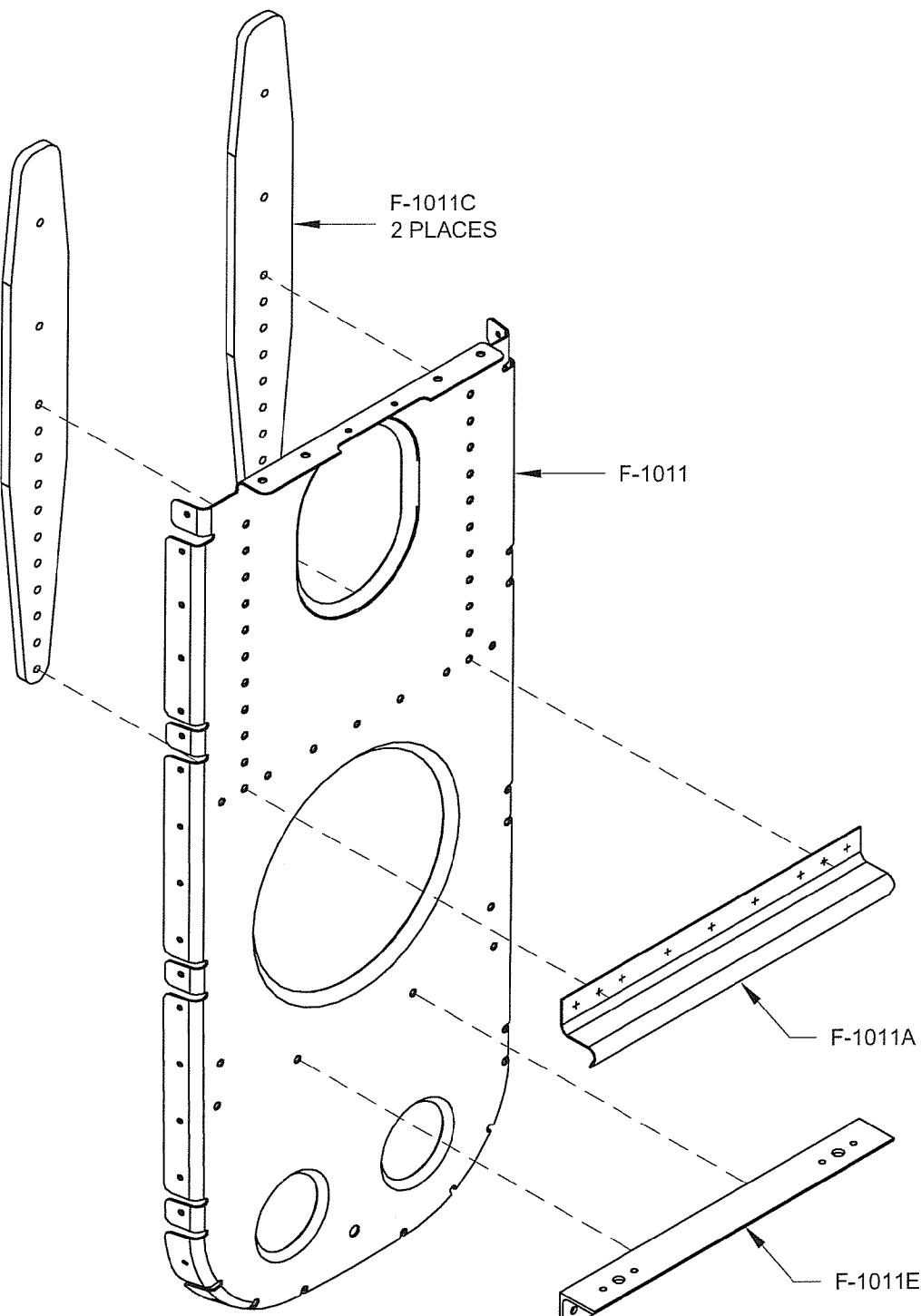


**FIGURE 1:** STRAIGHTENING THE HORIZONTAL STABILIZER ATTACHMENT BARS

**Step 2:** Finish the edges of the two F-1011C Horizontal Stabilizer Attachment Bars, then cleco them to the front of the F-1011 Bulkhead as shown in Figure 2. Except for the bottom hole in each attachment bar (the hole shared with the F-1011A Bulkhead Stiffener), final-drill the holes common to the attachment bar and bulkhead using a #30 drill.

**Step 3:** Place the F-1011A Bulkhead Stiffener on the back of the F-1011 Bulkhead as shown in Figure 2. Center the stiffener between the sides of the bulkhead with the top of the stiffener flange a quarter inch above the holes in the bulkhead as depicted in Figure 3.

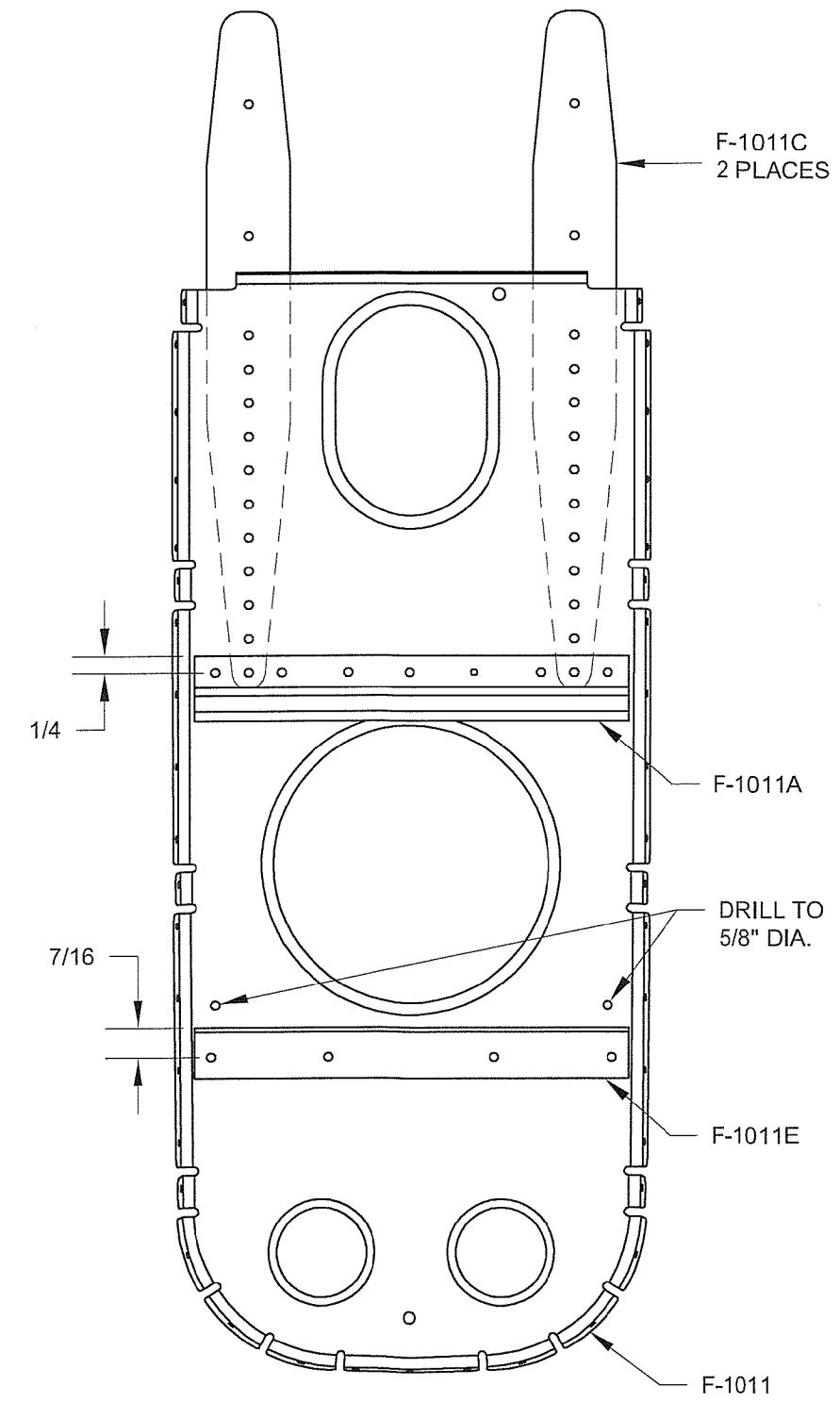
Clamp the stiffener in place, then match-drill the holes of the bulkhead (and the bottom hole in the F-1011C Attachment Bars) into the stiffener with a #30 drill. Install clecos while drilling.



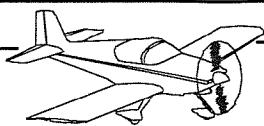
**FIGURE 2:**  
POSITIONING F-1011 BULKHEAD PARTS

**Step 4:** Drill the two  $1/8"$  holes indicated in Figure 3 to  $5/8"$ " using a Unibit step drill.

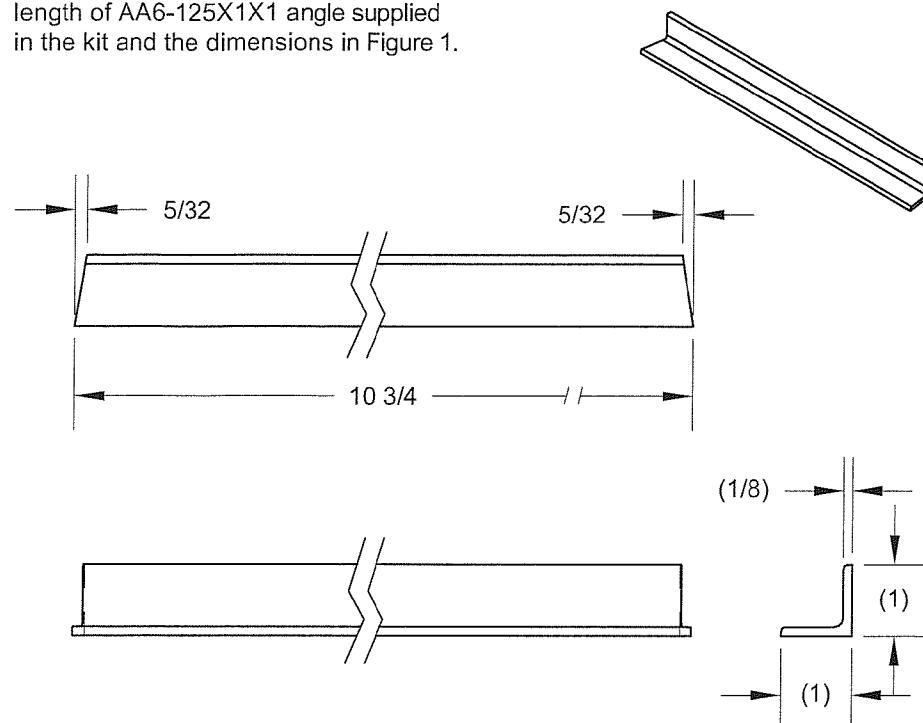
**Step 5:** Repeat Step 3 for locating and drilling the four holes used to attach the F-1011E Rudder Cable Angle. The top of the rudder cable angle is located  $7/16"$ " above the holes in the F-1011 Bulkhead as shown in Figure 3.



**FIGURE 3:** POSITIONING F-1011 BULKHEAD PARTS

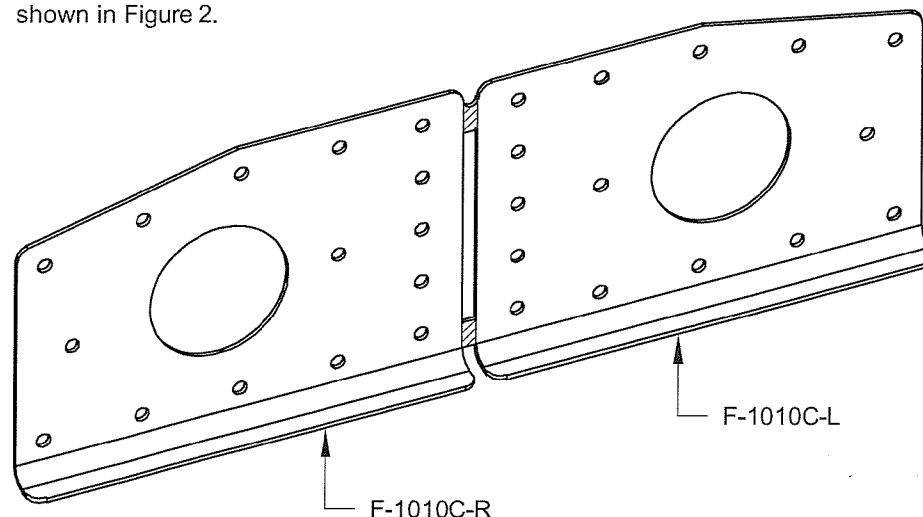


Step 1: Make the F-1010A Horizontal Stabilizer Attachment Angle from the length of AA6-125X1X1 angle supplied in the kit and the dimensions in Figure 1.



**FIGURE 1:** F-1010A HORIZONTAL STABILIZER ATTACHMENT ANGLE

Step 2: Separate the F-1010C Bulkhead Doubler into left and right parts by removing the shaded areas shown in Figure 2.



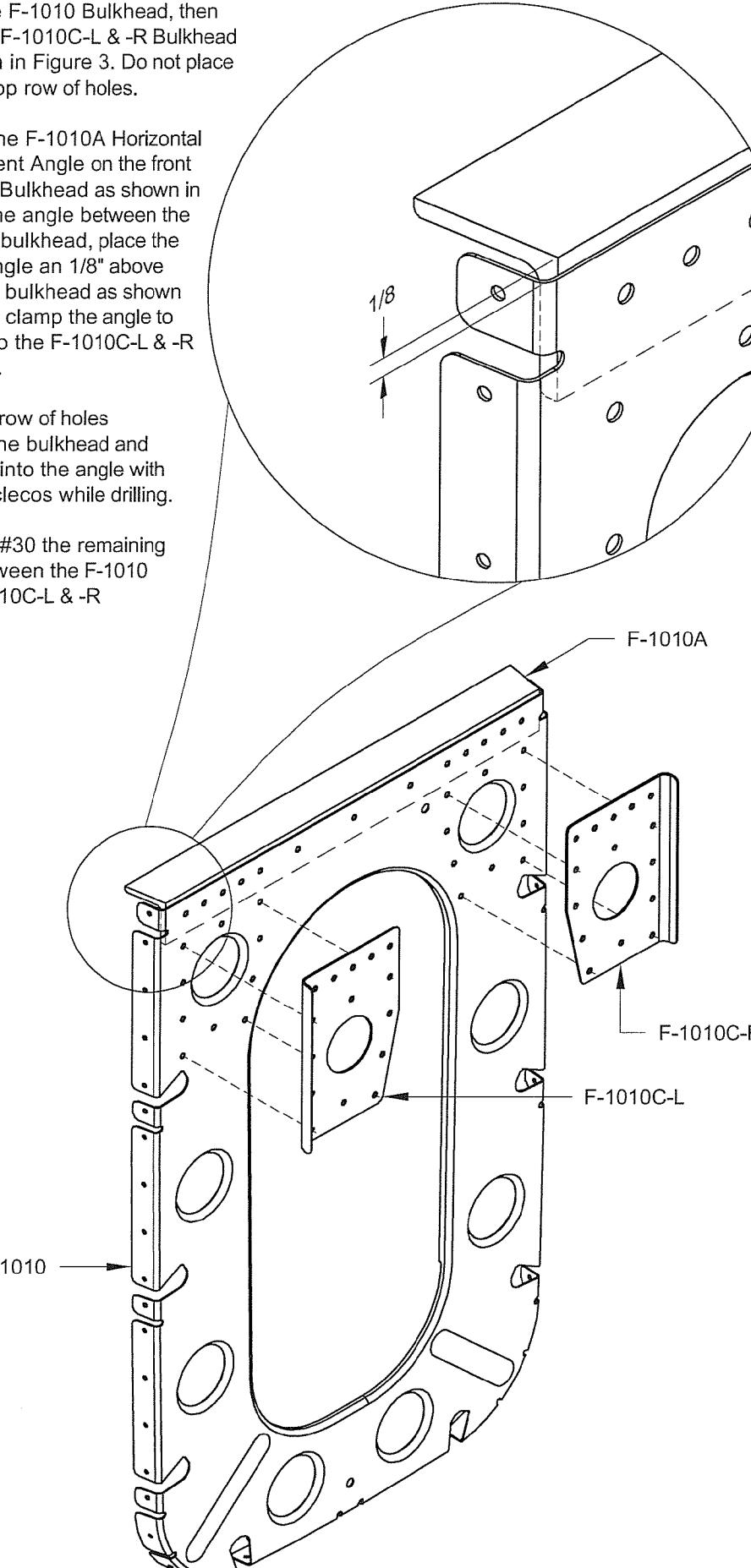
**FIGURE 2:** SEPARATING THE F-1010C BULKHEAD DOUBLER

Step 3: Deburr the F-1010 Bulkhead, then cleco in place the F-1010C-L & -R Bulkhead Doublers as shown in Figure 3. Do not place any clecos in the top row of holes.

Step 4: Position the F-1010A Horizontal Stabilizer Attachment Angle on the front side of the F-1010 Bulkhead as shown in Figure 3. Center the angle between the side flanges of the bulkhead, place the top flange of the angle an 1/8" above the top edge of the bulkhead as shown in the blowup, then clamp the angle to the bulkhead and to the F-1010C-L & -R Bulkhead Doublers.

Match-Drill the top row of holes (thirteen holes) in the bulkhead and bulkhead doublers into the angle with a #30 drill. Install clecos while drilling.

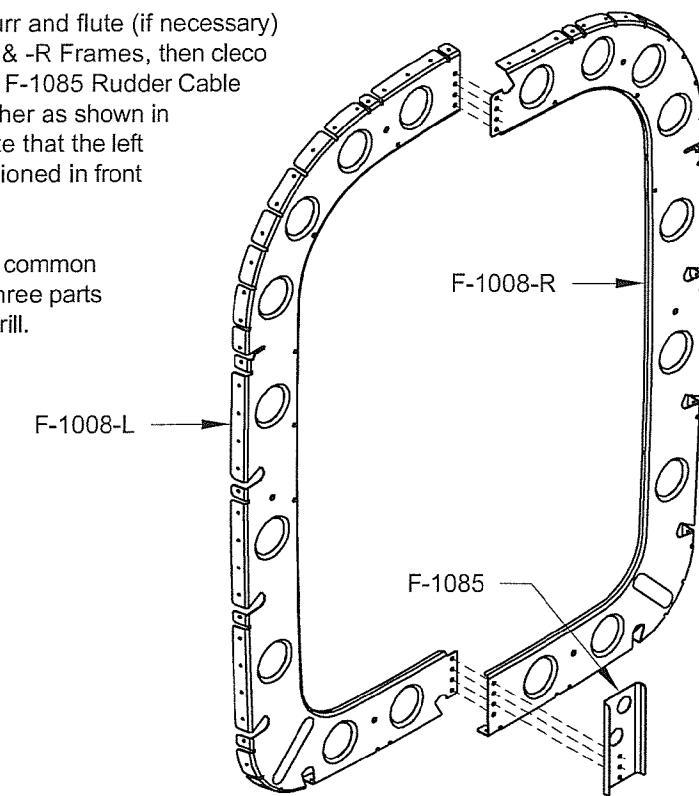
Step 5: Final-Drill #30 the remaining holes common between the F-1010 Bulkhead and F-1010C-L & -R Bulkhead Doublers.



**FIGURE 3:** DRILLING THE HORIZONTAL STABILIZER ATTACHMENT ANGLE

Step 3: Deburr and flute (if necessary) the F-1008-L & -R Frames, then cleco them and the F-1085 Rudder Cable Bracket together as shown in Figure 3. Note that the left frame is positioned in front of the right.

Final-Drill the common holes of the three parts using a #30 drill.

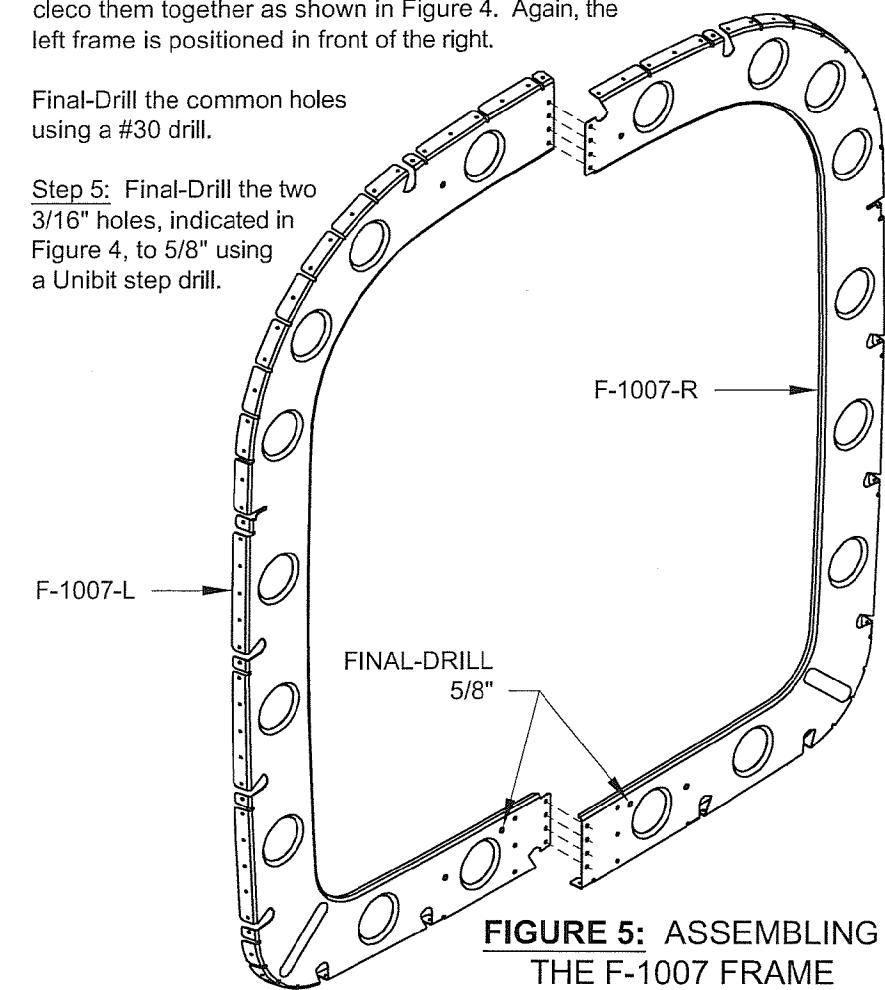


**FIGURE 4:** ASSEMBLING THE F-1008 FRAME

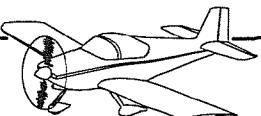
Step 4: Deburr and flute the F-1007-L & -R Frames, then cleco them together as shown in Figure 4. Again, the left frame is positioned in front of the right.

Final-Drill the common holes using a #30 drill.

Step 5: Final-Drill the two 3/16" holes, indicated in Figure 4, to 5/8" using a Unibit step drill.



**FIGURE 5:** ASSEMBLING THE F-1007 FRAME



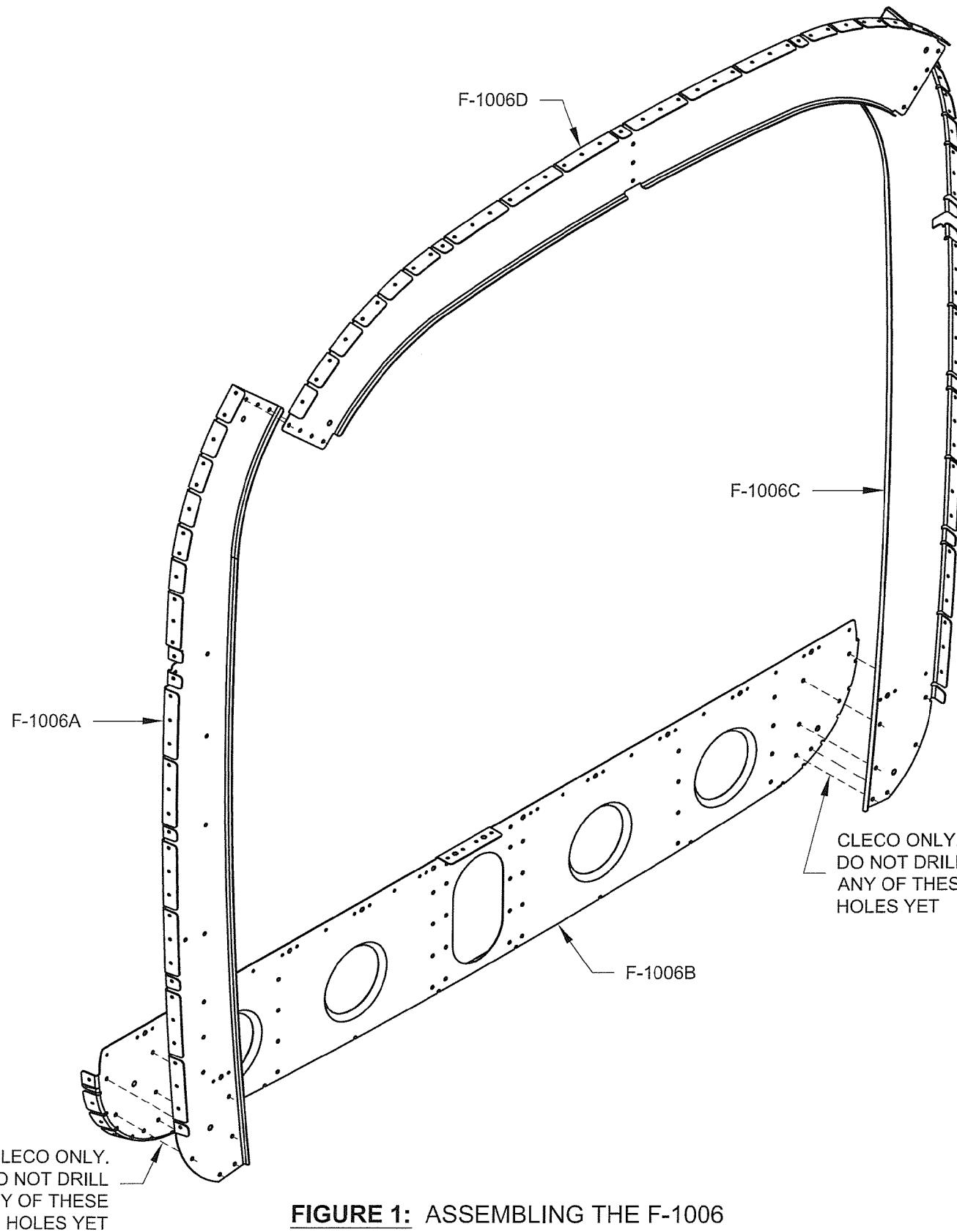
Step 1: Deburr and, if necessary, flute the F-1006A, B, C, and D Bulkheads, then cleco them together as shown in Figure 1.

Final-Drill the holes common to only the F-1006A, C, and D Frames using a #30 drill.

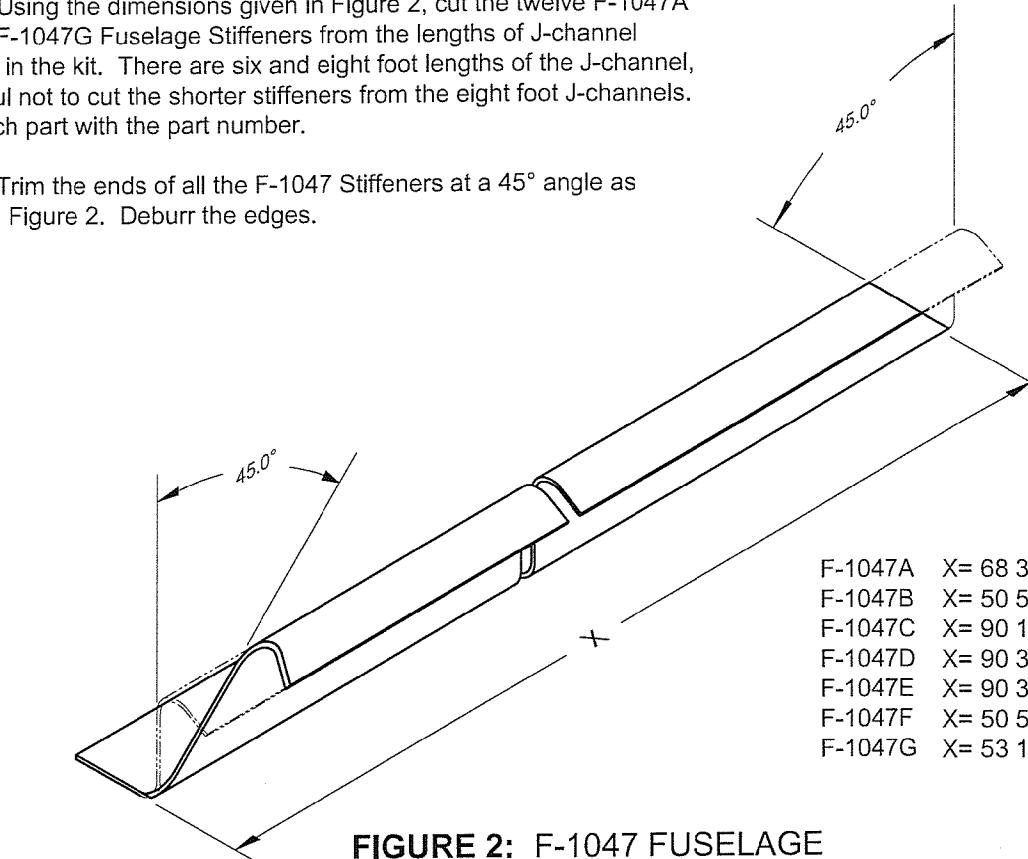
Do not drill any holes common to the F-1006B Frame at this time.

Step 2: Using the dimensions given in Figure 2, cut the twelve F-1047A through F-1047G Fuselage Stiffeners from the lengths of J-channel provided in the kit. There are six and eight foot lengths of the J-channel, be careful not to cut the shorter stiffeners from the eight foot J-channels. Mark each part with the part number.

Step 3: Trim the ends of all the F-1047 Stiffeners at a 45° angle as shown in Figure 2. Deburr the edges.



**FIGURE 1:** ASSEMBLING THE F-1006 BULKHEAD

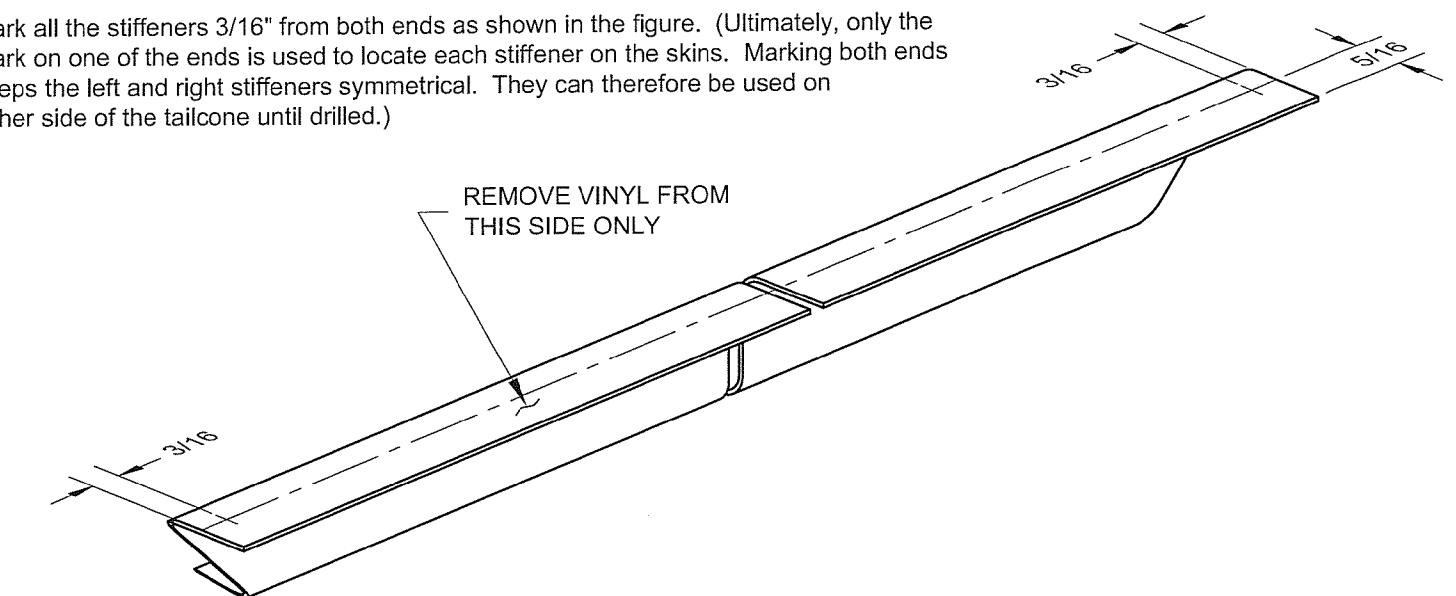


**FIGURE 2:** F-1047 FUSELAGE STIFFENERS

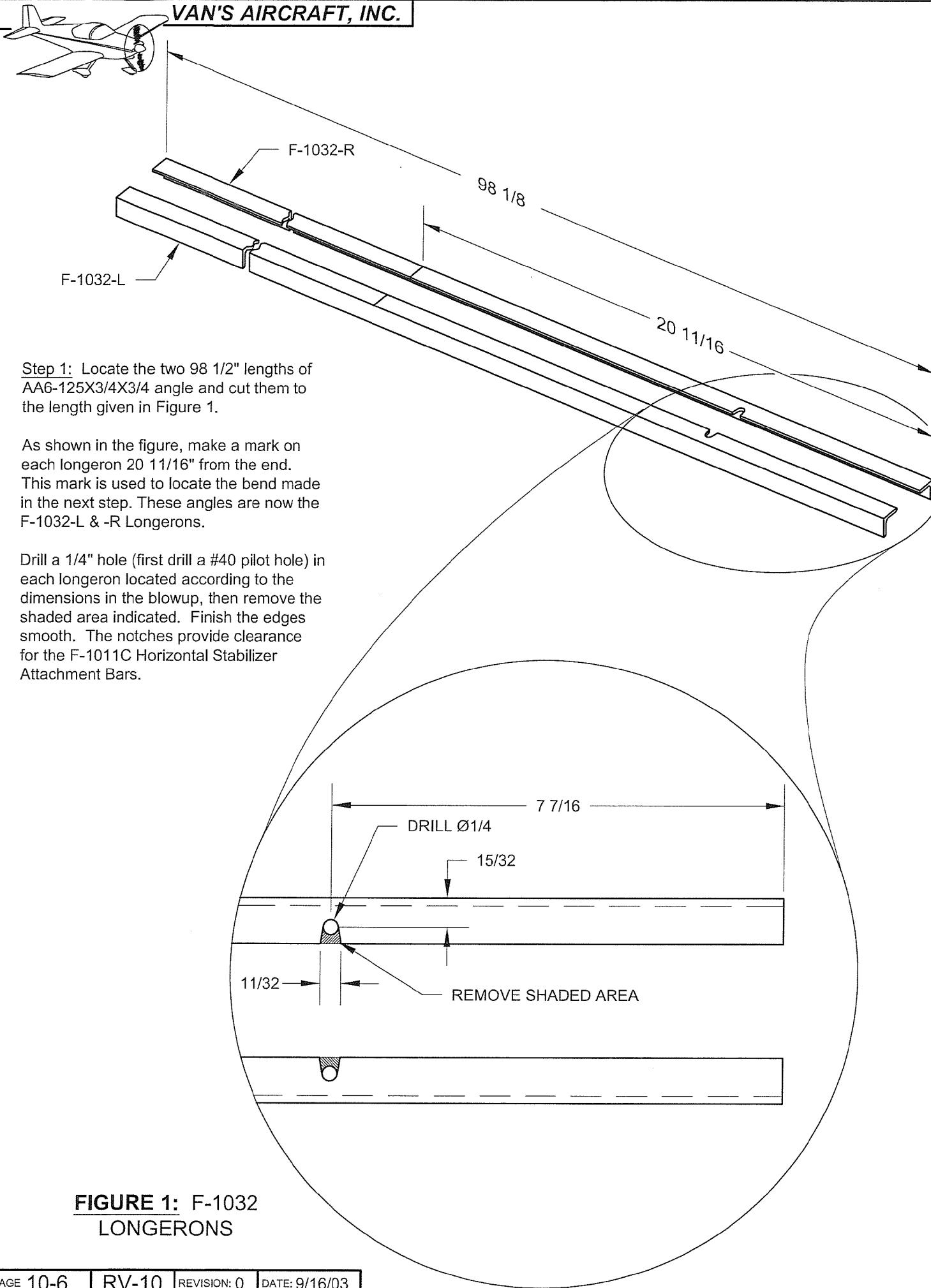
Step 4: Remove the vinyl from the side of the F-1047 Fuselage Stiffeners which will rest against the skins as shown in Figure 3. (Leave the vinyl on the other side; it will make it easier to slide the stiffeners through the bulkheads and frames later.)

Draw a rivet hole centerline along the entire length of each stiffener 5/16" from the edge as shown in the Figure 3.

Mark all the stiffeners 3/16" from both ends as shown in the figure. (Ultimately, only the mark on one of the ends is used to locate each stiffener on the skins. Marking both ends keeps the left and right stiffeners symmetrical. They can therefore be used on either side of the tailcone until drilled.)



**FIGURE 3:** MARKING THE FUSELAGE STIFFENERS



Step 1: Locate the two 98 1/2" lengths of AA6-125X3/4X3/4 angle and cut them to the length given in Figure 1.

As shown in the figure, make a mark on each longeron 20 11/16" from the end. This mark is used to locate the bend made in the next step. These angles are now the F-1032-L & -R Longerons.

Drill a 1/4" hole (first drill a #40 pilot hole) in each longeron located according to the dimensions in the blowup, then remove the shaded area indicated. Finish the edges smooth. The notches provide clearance for the F-1011C Horizontal Stabilizer Attachment Bars.

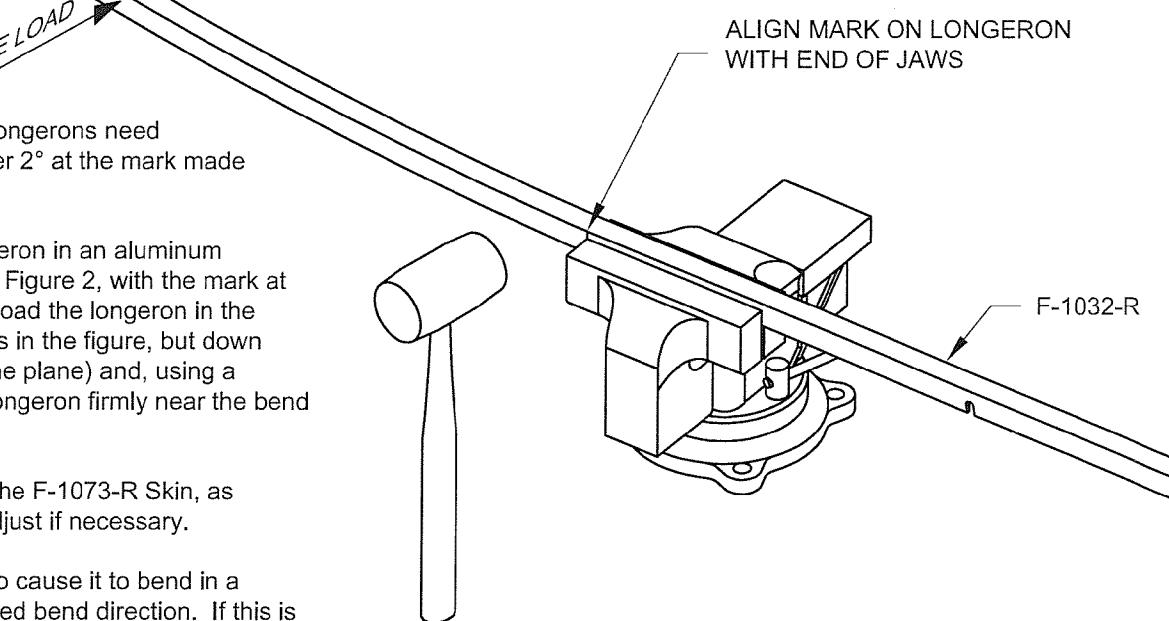
**Step 2:** The front of the longerons need to be bent down just under 2° at the mark made in step 1.

Place the F-1032-R Longerons in an aluminum padded vice, as shown in Figure 2, with the mark at the end of the jaws. Pre load the longeron in the direction shown (sideways in the figure, but down when the longeron is in the plane) and, using a rubber mallet, strike the longeron firmly near the bend mark.

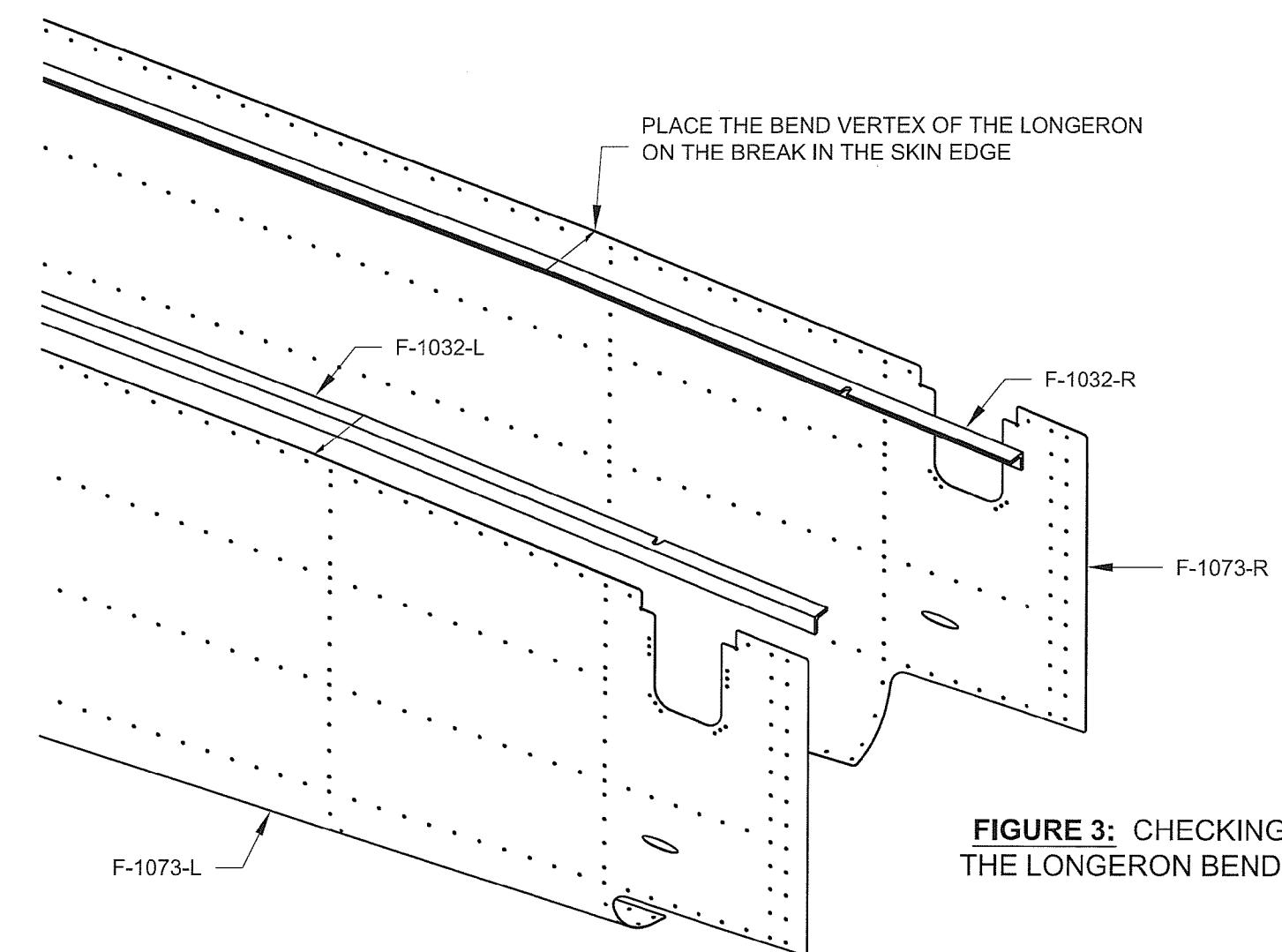
Check the angle against the F-1073-R Skin, as shown in Figure 3, and adjust if necessary.

Bending an angle can also cause it to bend in a direction 90° to the intended bend direction. If this is the case for the longeron, place it back in the vice and straighten out the unwanted bend. Make sure the intended bend angle hasn't changed.

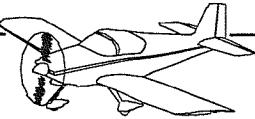
**Step 3:** Repeat Step 2 for the F-1032-L Longerons, and make sure to bend it in the correct direction. Check it against the F-1073-L Skin as shown in Figure 3.



**FIGURE 2: BENDING THE LONGERONS**



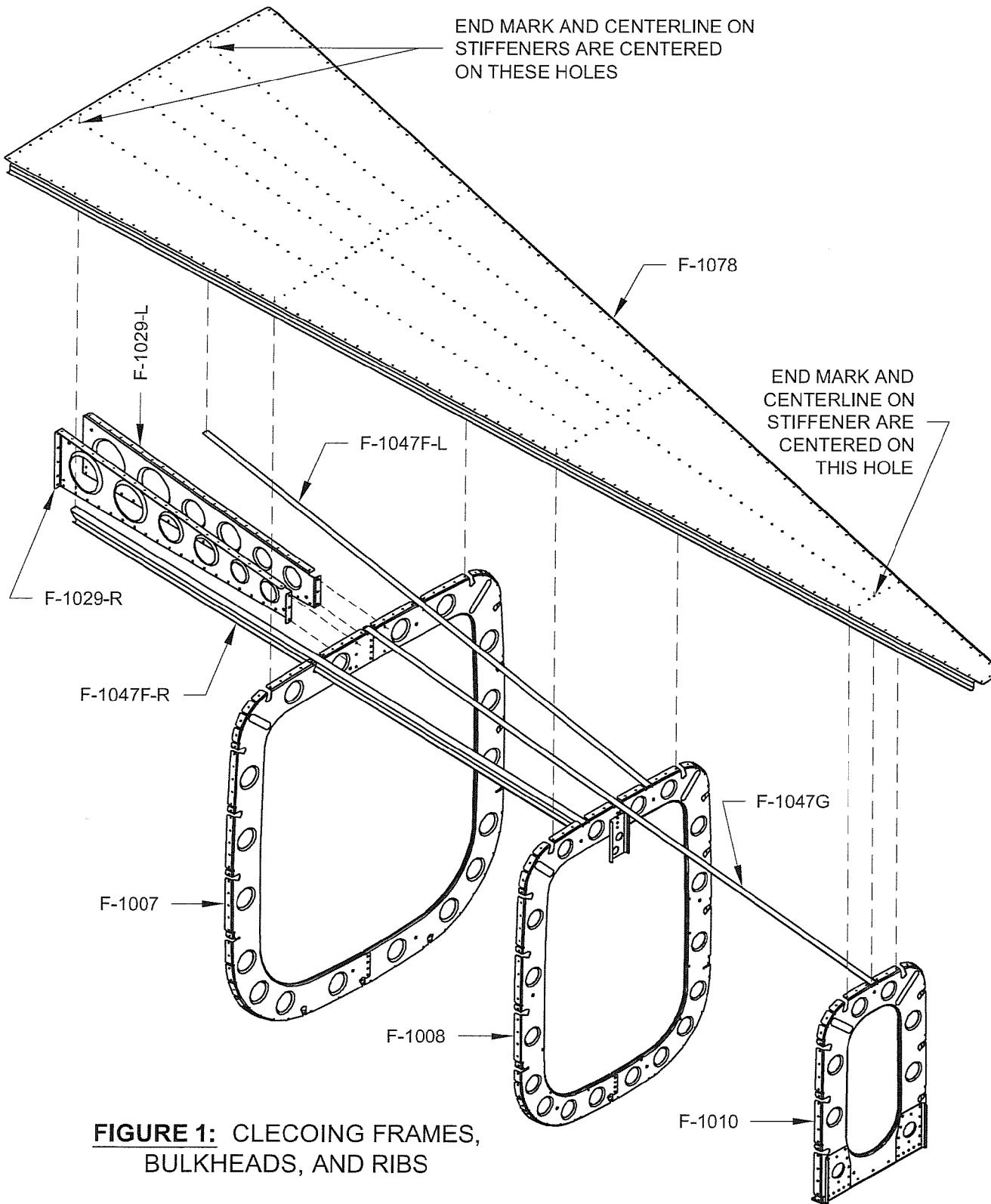
**FIGURE 3: CHECKING THE LONGERON BENDS**



Step 1: Place the F-1078 Forward Bottom Skin upside down across two sawhorses which are at least 38" tall. As shown in Figure 1, cleco the F-1007 and F-1008 Frames and the F-1010 Bulkhead to the skin. If the stiffeners formed along the side edges of the forward bottom skin interfere with notches in the frames, either the stiffeners can be bent or the notches in the frames can be enlarged slightly until the stiffeners clear. Locate the forward sawhorse just aft of the F-1007 Frame.

Step 2: Slide the two F-1047F Stiffeners through the notches in the frames as shown in Figure 1. The aft end of the stiffeners should be captured between the F-1008 Frame tabs and the F-1078 Forward Bottom Skin.

Center the forward end marks and the rivet hole centerlines (see Page 10-5, Step 3) of both stiffeners in the indicated holes in the F-1078 Forward Bottom Skin, then match-drill the holes into the stiffeners using a #40 drill. Keeping the rivet hole centerline visible through the holes in the skin, match-drill the remaining holes into the stiffeners using the same drill. Once drilled, the stiffeners become dedicated left and right parts.



**FIGURE 1: CLECOING FRAMES,  
BULKHEADS, AND RIBS**

Step 3: Slide the F-1047G Stiffener through the notches in the frames as shown in Figure 1. The ends of the stiffener should be captured between the frame tabs and F-1078 Forward Bottom Skin.

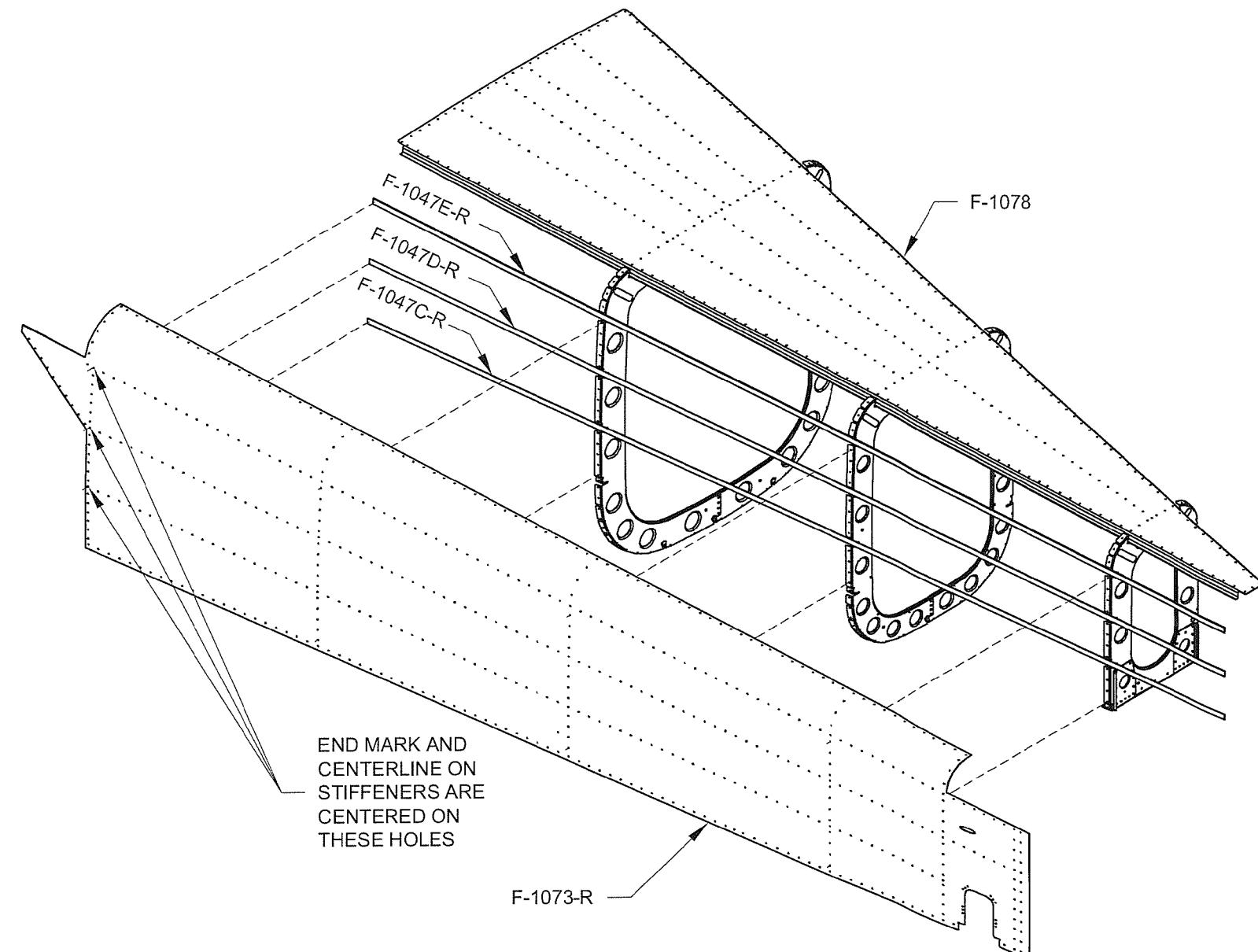
Center the aft end mark and the rivet hole centerline of the stiffener on the indicated hole in the forward bottom skin. Match-Drill the skin holes into the stiffener in the same manner as the F-1047F Stiffeners were drilled.

Step 4: Cleco the F-1029-L & -R Bellcrank Ribs to the F-1078 Forward Bottom Skin and to the F-1007 Frame, as shown in Figure 1, then final-drill #30 the six holes common to the bellcrank ribs and frame.

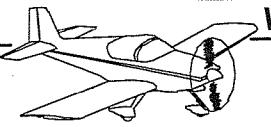
Step 5: Slide the assembly to the left side of the sawhorses, then position one of the two F-1047C, D, and E Stiffeners in the frame and bulkhead notches as shown in Figure 2.

Step 6: Cleco the F-1073-R Side Skin to the frames and bulkheads and to the F-1078 Forward Bottom Skin.

Step 7: Center the forward end marks and the rivet hole centerlines of the F-1047C, D, and E Stiffeners on the indicated holes in the F-1073-R Side Skin. Match-Drill #40 the skin holes into the stiffeners in the same manner as the previous stiffeners. These stiffeners are now dedicated right parts.



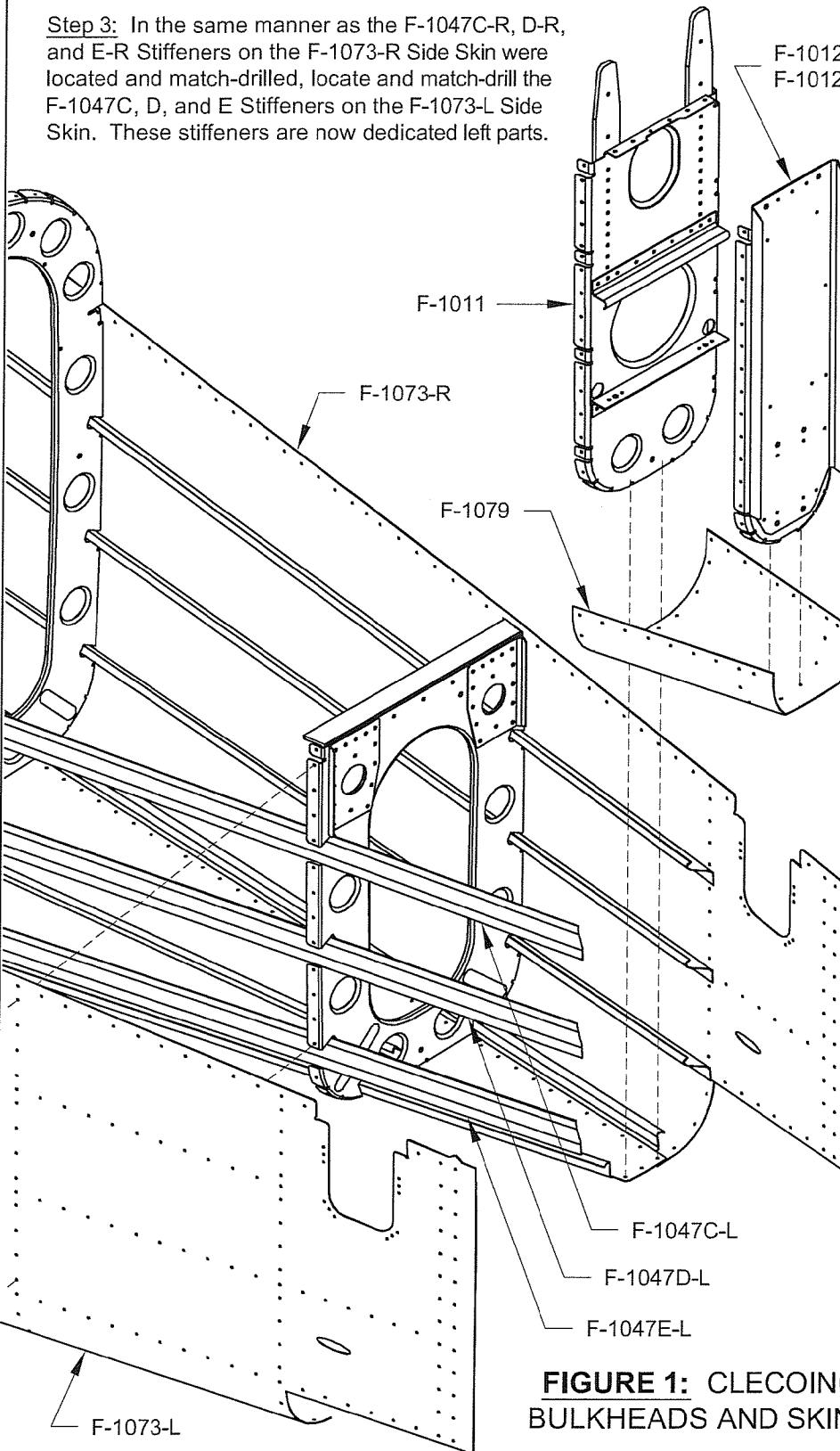
**FIGURE 2: CLECOING THE  
RIGHT SIDE SKIN**



Step 1: Flip the tailcone over on the sawhorses. Cleco the F-1011 Bulkhead and the F-1079 Aft Bottom Skin to the F-1078 Forward Bottom Skin and the F-1073-R Side Skin as shown in Figure 1. Cleco the F-1012A & B Bulkheads to the aft bottom skin and the side skin.

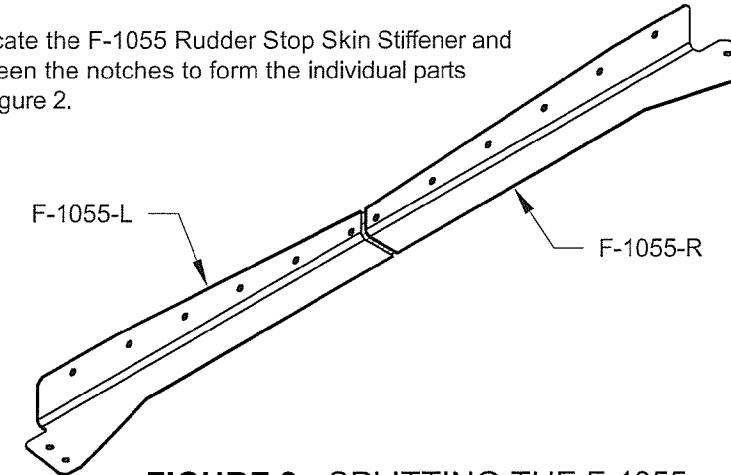
Step 2: Position the remaining F-1047C, D, and E Stiffeners in the notches of the frames and bulkheads, then cleco the F-1073-L Side Skin to the frames and bulkheads, to the F-1078 Forward Bottom Skin, and to the F-1079 Aft Bottom Skin.

Step 3: In the same manner as the F-1047C-R, D-R, and E-R Stiffeners on the F-1073-R Side Skin were located and match-drilled, locate and match-drill the F-1047C, D, and E Stiffeners on the F-1073-L Side Skin. These stiffeners are now dedicated left parts.



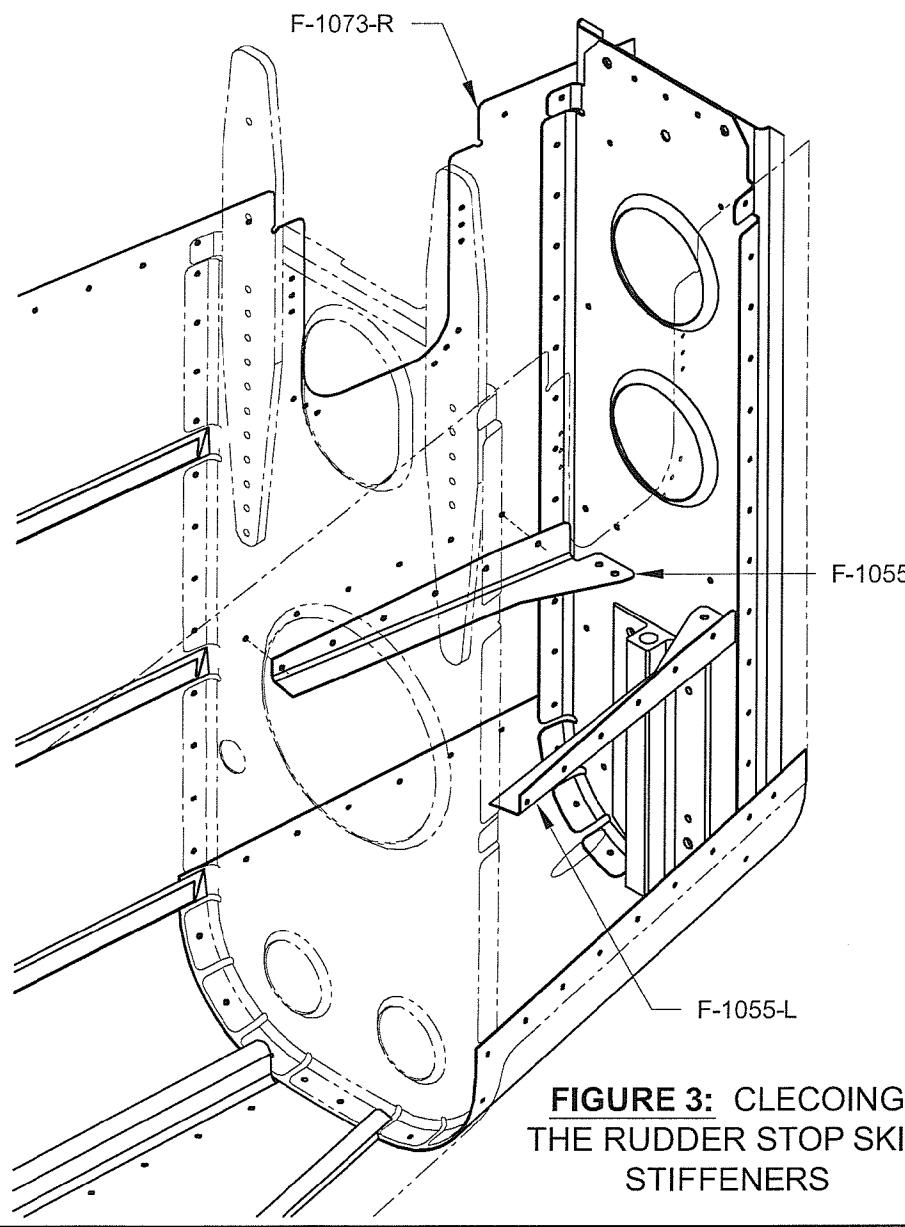
**FIGURE 1: CLECOING BULKHEADS AND SKINS**

Step 4: Locate the F-1055 Rudder Stop Skin Stiffener and split it between the notches to form the individual parts shown in Figure 2.



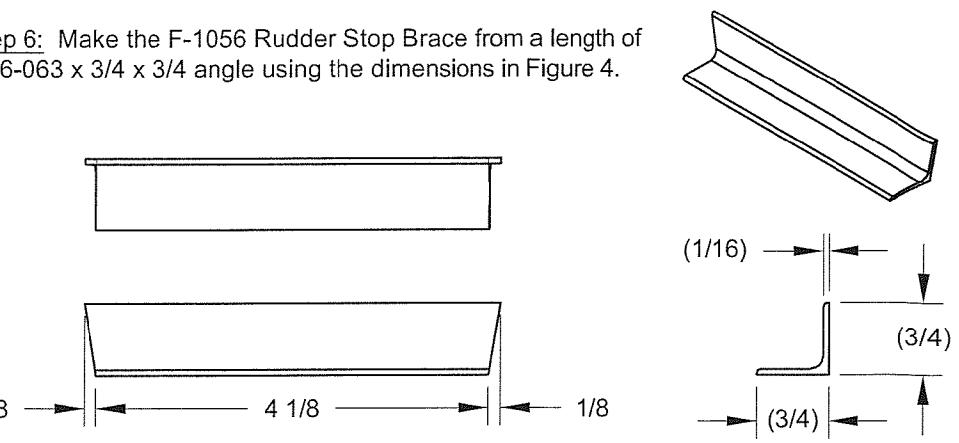
**FIGURE 2: SPLITTING THE F-1055 RUDDER STOP SKIN STIFFENER**

Step 5: Cleco the F-1055-R & -L Rudder Stop Skin Stiffeners to the F-1073-R & -L Side Skins respectively as shown in Figure 3.



**FIGURE 3: CLECOING THE RUDDER STOP SKIN STIFFENERS**

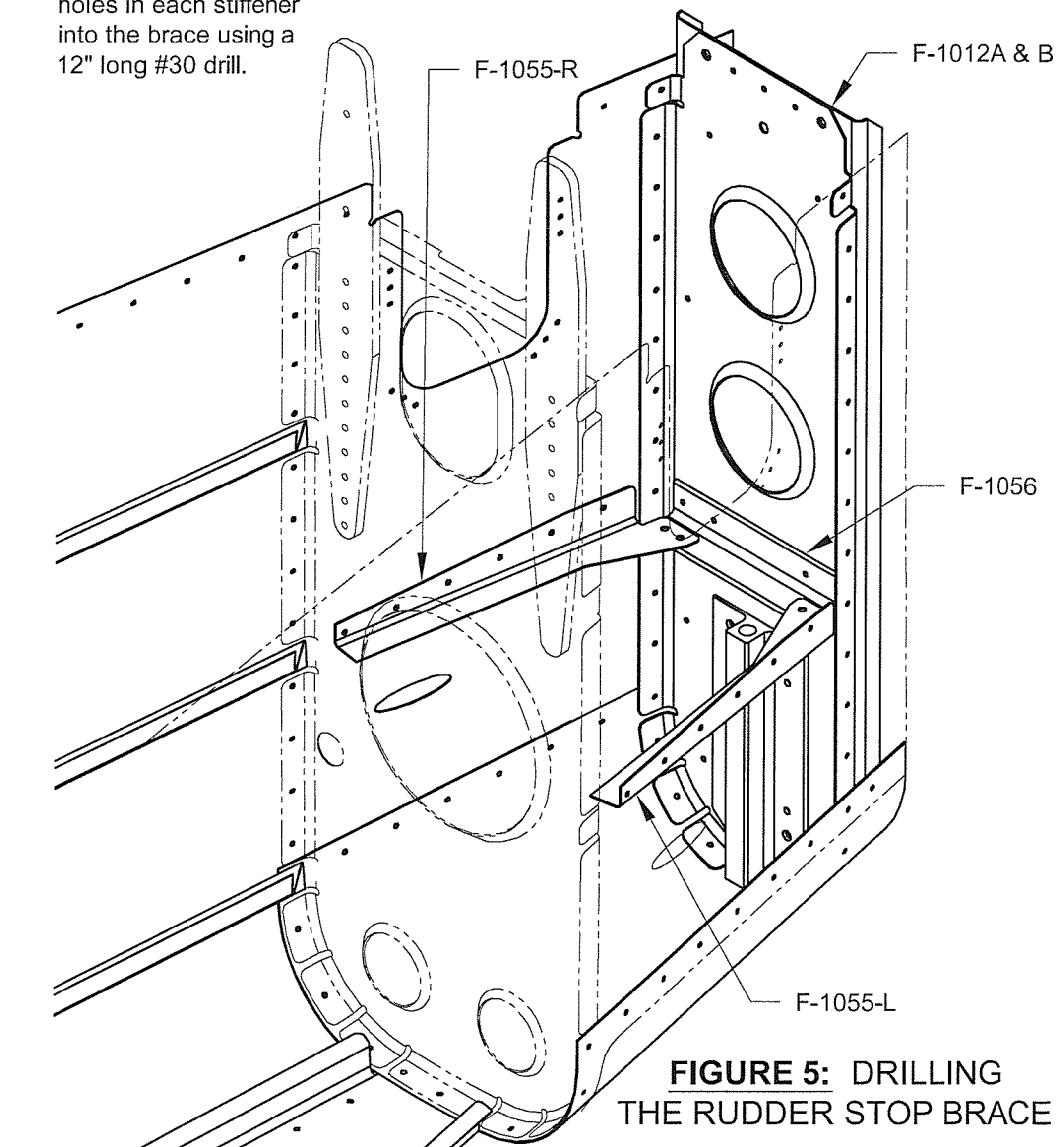
Step 6: Make the F-1056 Rudder Stop Brace from a length of AA6-063 x 3/4 x 3/4 angle using the dimensions in Figure 4.



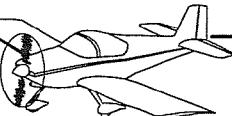
**FIGURE 4: F-1056 RUDDER STOP BRACE**

Step 7: Position the F-1056 Rudder Stop Brace against the F-1012A Bulkhead web, centered between the two F-1055 Rudder Stop Skin Stiffeners as shown in Figure 5. The angled flange of the brace rests under the flanges of the stiffeners.

Make sure the tailcone is not twisted by placing a level across the top of the F-1073 Side skins in two places (near the front of the side skins and at the F-1012 Bulkhead), then clamp the brace to the stiffeners. Hold the brace against the bulkhead, then match-drill the four holes of the bulkhead into the brace (watch your fingers!) using a #40 drill. Cleco as you drill. Remove the brace, deburr the holes and clear away any chips, then cleco the brace back into position. Match-Drill the two holes in each stiffener into the brace using a 12" long #30 drill.



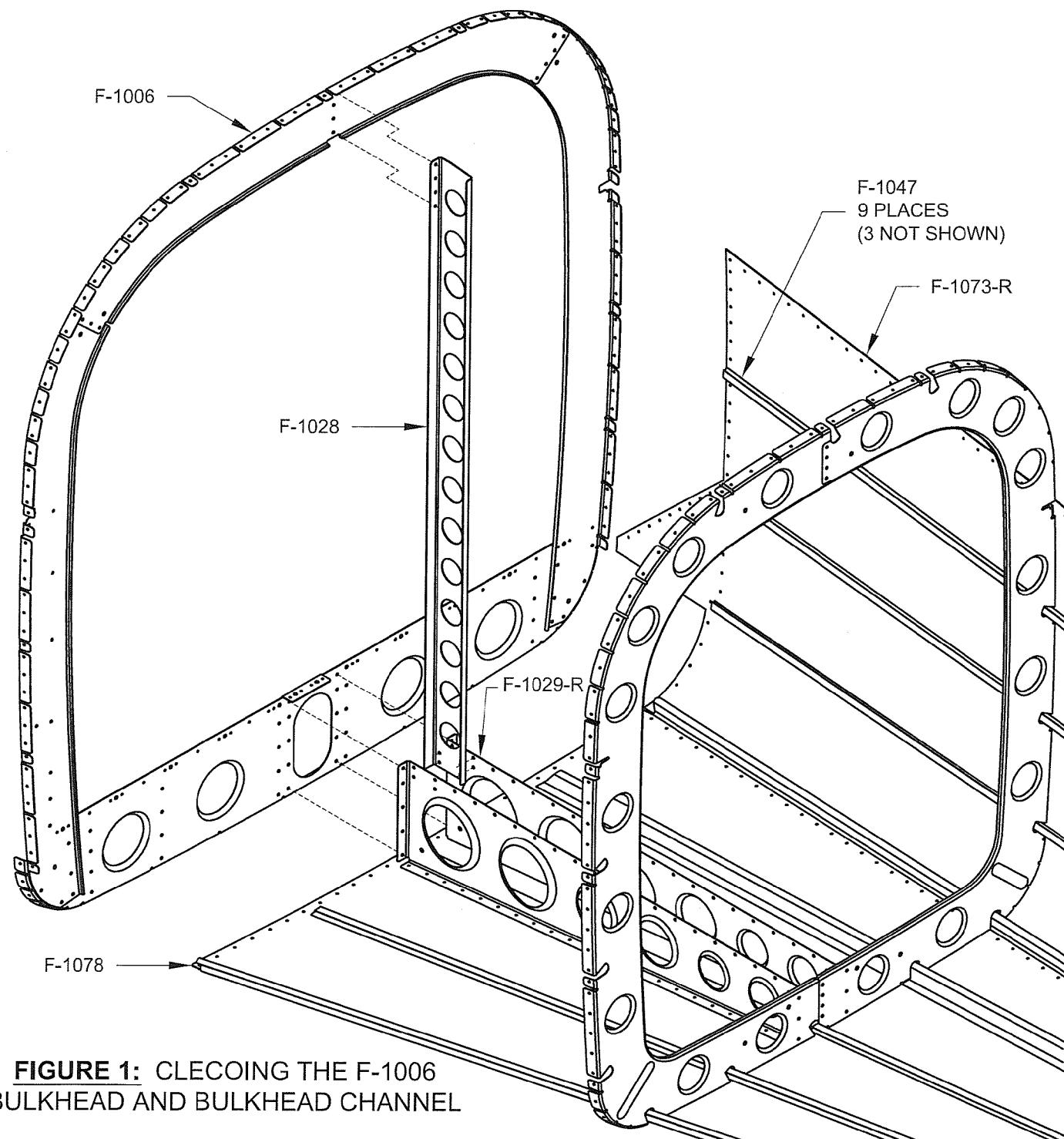
**FIGURE 5: DRILLING THE RUDDER STOP BRACE**



Step 1: Cleco the F-1006 Bulkhead to the F-1073-L, F-1073-R, and F-1078 Skins and to the F-1029-L & -R Bellcrank Ribs as shown in Figure 1. The F-1032 Longerons, the F-1073-L Side Skin, and the F-1047 Stiffeners attached to the side skin are not shown for clarity.

Final-Drill the holes common to the bulkhead and bellcrank ribs using a #30 drill. DO NOT drill any holes common to the bulkhead and skins; these are drilled when the tailcone is joined to the forward fuselage.

Step 2: Cleco the F-1028 Baggage Bulkhead Channel to the F-1029-R Bellcrank Rib and to the F-1006 Bulkhead, then final-drill the top holes, which are common to the bulkhead, with a #30 drill. The four bottom holes, which are common to the bellcrank rib, are drilled later.

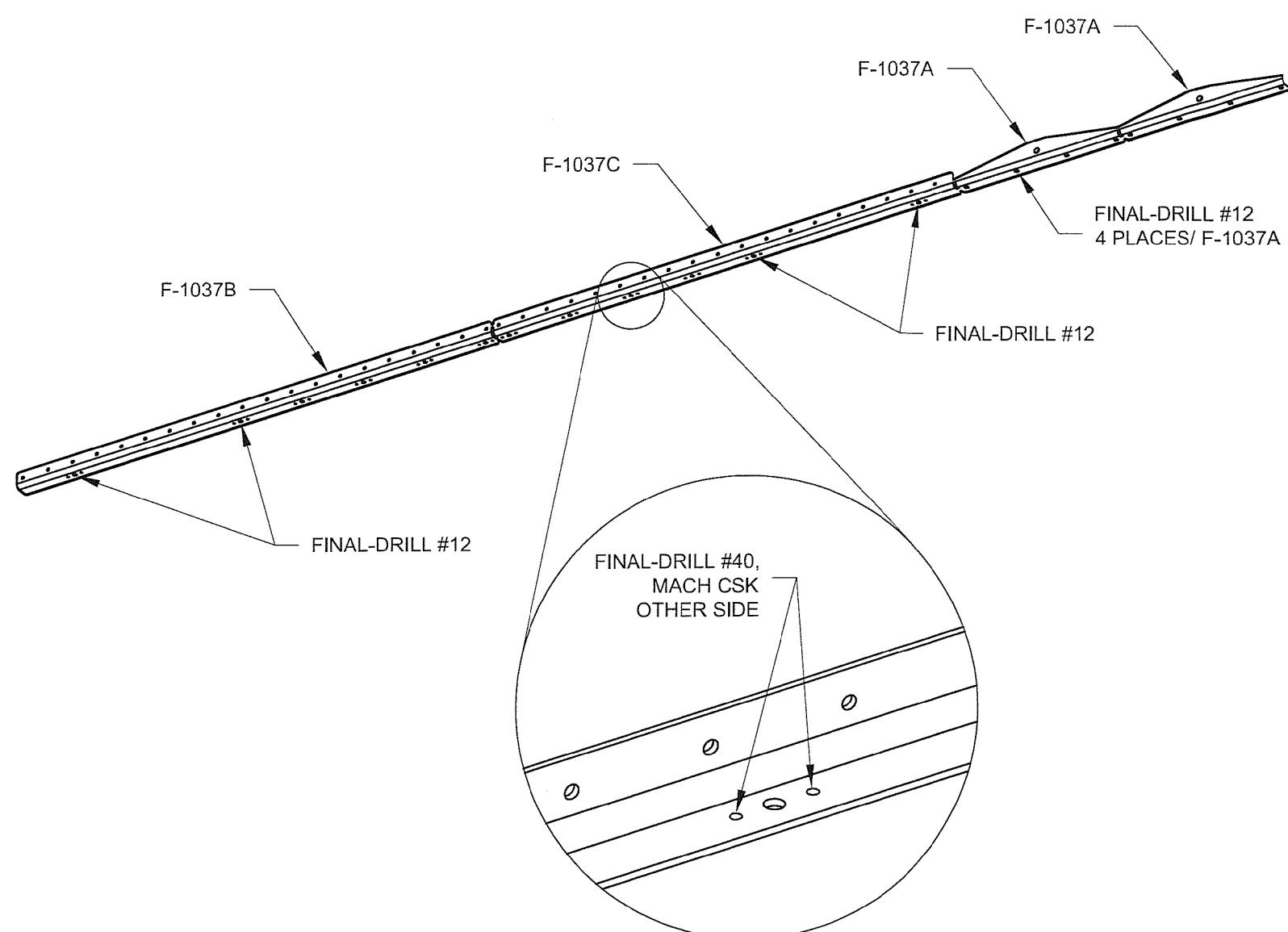


**FIGURE 1: CLECOING THE F-1006  
BULKHEAD AND BULKHEAD CHANNEL**

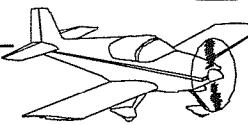
Step 3: Separate the F-1037 Bellcrank Rib Angle into the individual parts shown in Figure 2.

Step 4: Final-Drill the 3/32" nutplate attachment rivet holes in both the F-1037B & C Bellcrank Rib Angles using a #40 drill. Machine countersink these holes flush for 3/32" rivets on the side indicated in the blowup of Figure 2.

Step 5: Final-Drill the four 3/16" holes in both F-1037A Bellcrank Rib Angles and the two indicated 3/16" holes in the F-1037B & C Bellcrank Rib Angles using a #12 drill.

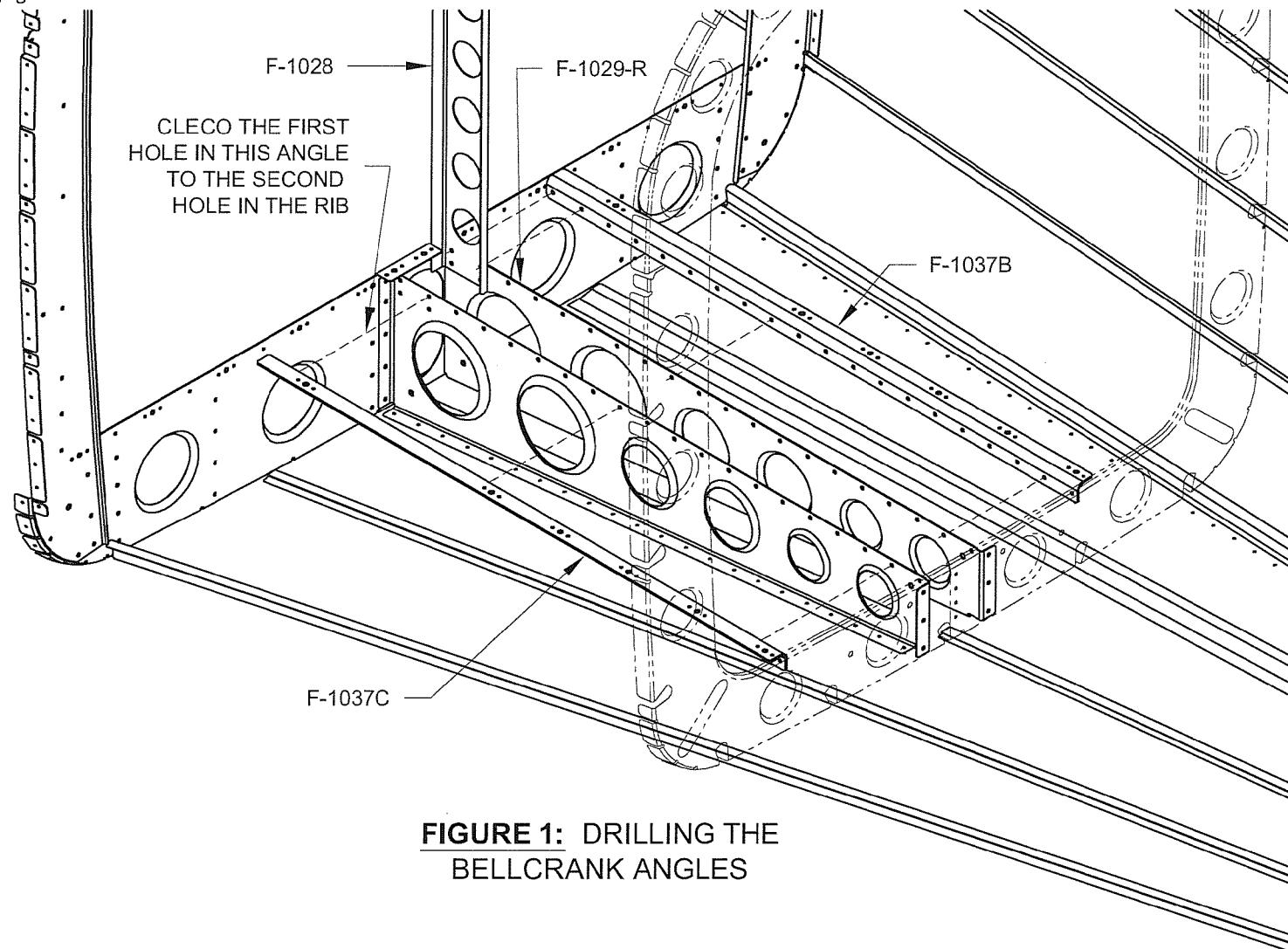


**FIGURE 2: F-1037  
BELLCRANK RIB ANGLES**



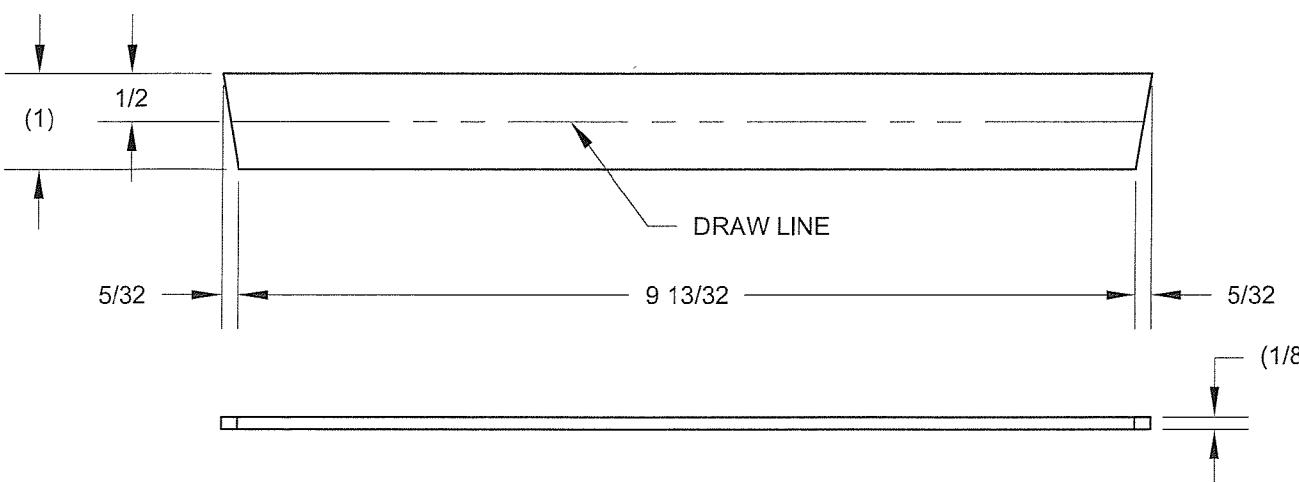
Step 1: Cleco the F-1037B and F-1037C Bellcrank Angles to the F-1029-L & -R Bellcrank Ribs as shown in Figure 1. The first hole in the F-1037C Bellcrank Angle (this angle is a little shorter than the right angle) is clecoed to the second hole in the F-1029-L Bellcrank Rib (see figure). Once again, for clarity, the F-1073-L Skin and the F-1047 Stiffeners attached to it are not shown.

Step 2: Finish-Drill #30 all the holes common to the F-1037 Bellcrank Angles and F-1029 Bellcrank Ribs and the four holes of the F-1028 Baggage Bulkhead Channel.



**FIGURE 1: DRILLING THE  
BELLCRANK ANGLES**

Step 3: Make the F-1010B Spacer out of a piece of AS3-125 x 1.000 using the dimensions in Figure 2. Draw a line down the middle of the part as shown in the Figure 2.

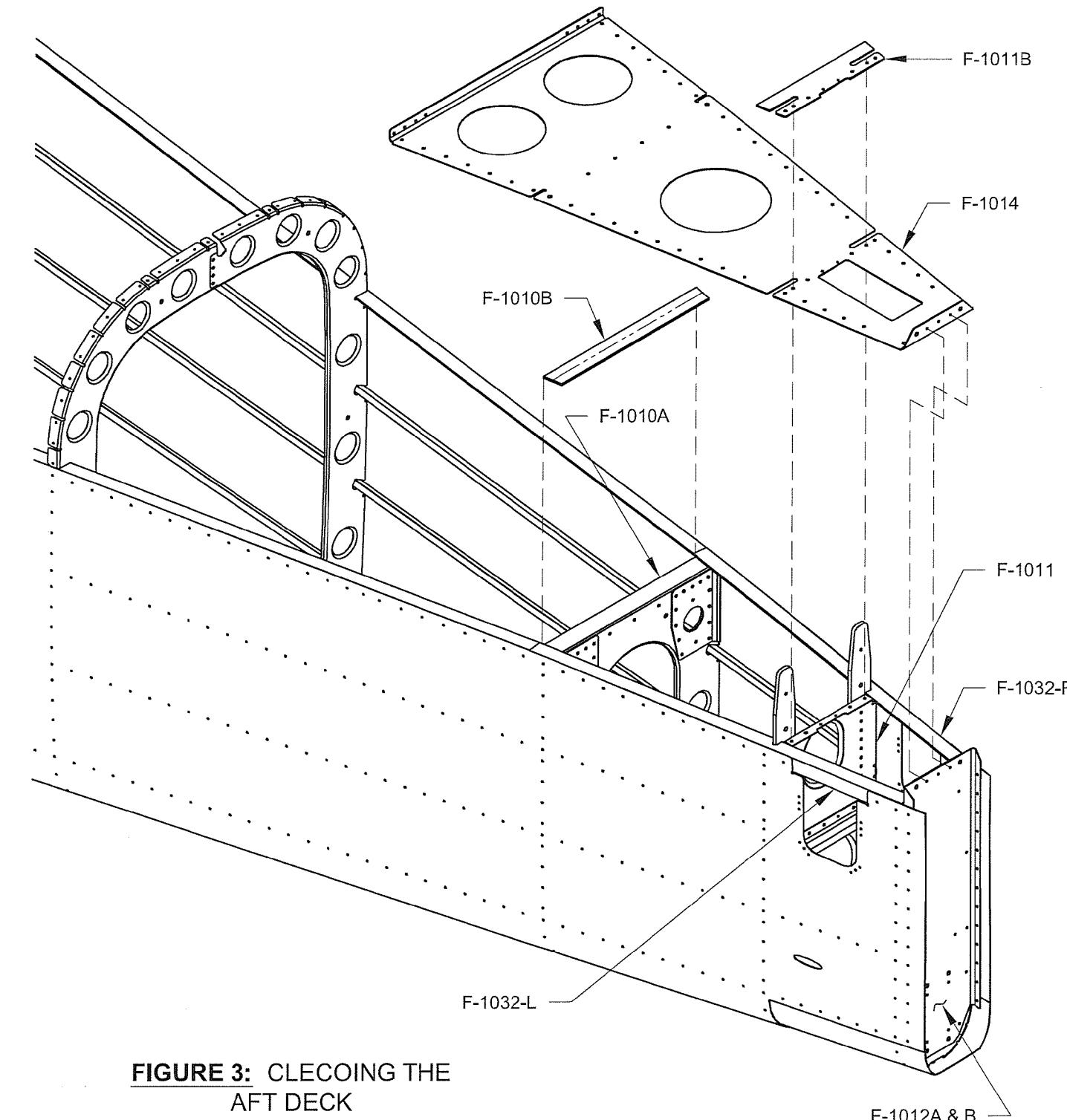


**FIGURE 2: F-1010B SPACER**

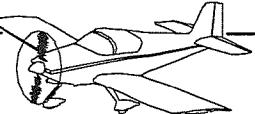
Step 4: Uncleco the F-1073-L & -R Side Skins enough to insert the F-1032-L & -R Longerons into the notches of the frames and bulkheads as shown in Figure 3. The bend in the longerons should be located at the break in the side skin edges, and the aft end of the longerons should be very close to touching the web of the F-1012A Bulkhead. If the longerons don't fit into the notches in the sides of the F-1007 & -1008 Frames, the notches can be filed slightly until the longerons do fit.

Step 5: Center the F-1010B Spacer on the F-1010A Horizontal Stabilizer Attachment Angle as shown in Figure 3. Temporarily secure the spacer to the angle with carpet tape (thin double sticky-back tape that can be picked up at almost any hardware store).

Step 6: Cleco the F-1014 Aft Deck and the F-1011B Stop/ Doubler to the F-1011 Bulkhead, then cleco the aft end of the deck to the F-1012A & B Bulkheads as shown in the figure.

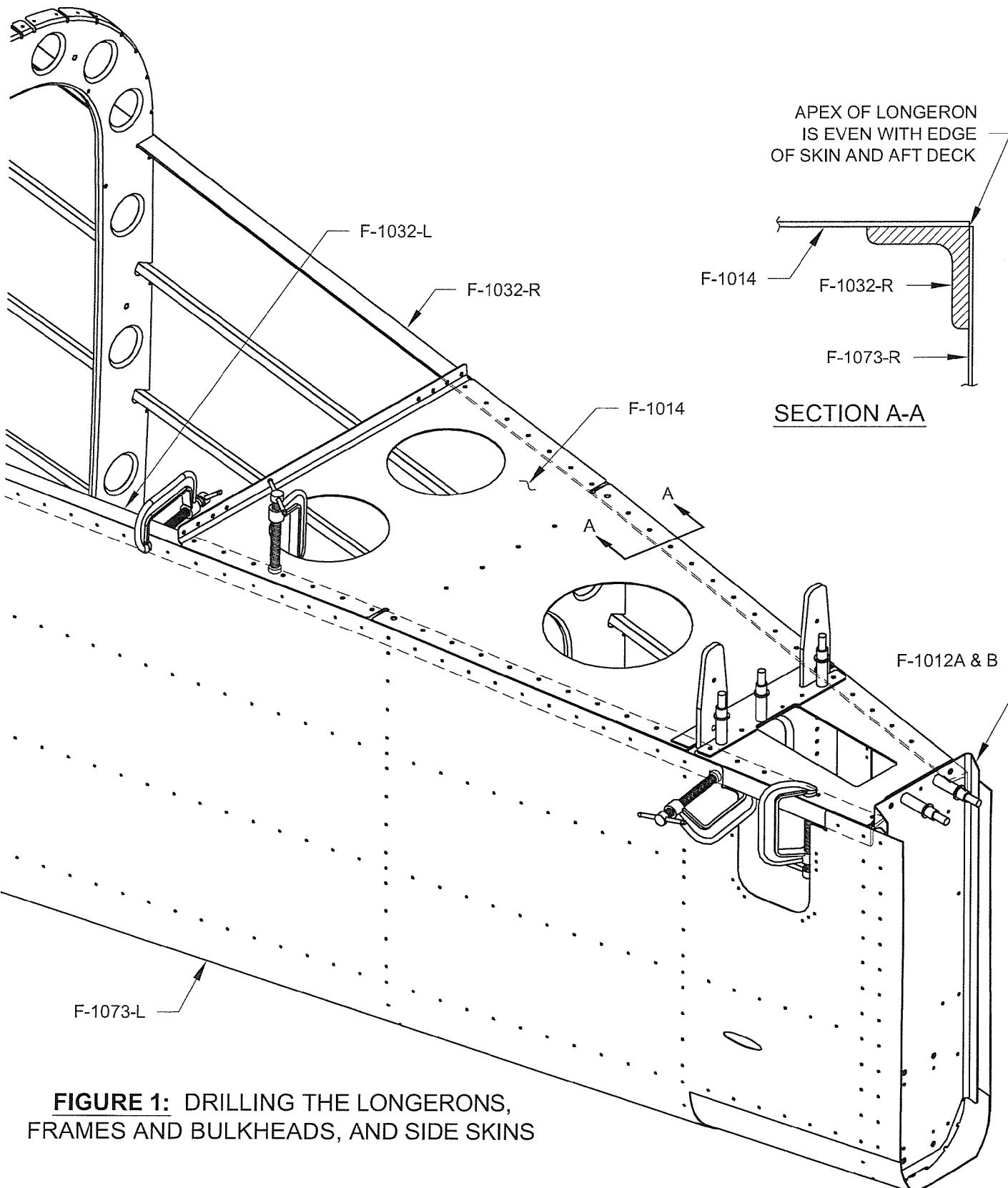


**FIGURE 3: CLECOING THE  
AFT DECK**



Step 1: Make sure the bend in the F-1032 Longerons is still located at the break in the F-1073 Side Skins, then clamp the longerons to the F-1014 Aft Deck and the side skins as shown in Figure 1 (only one side is shown clamped). For proper alignment, the apex (corner) of the longerons must be clamped even with the edges of the skins over their entire length. They must also be clamped even with the side edges of the F-1014 Aft Deck. See section A-A in Figure 1.

Step 2: Match-Drill all the common holes of the F-1073 Side Skins into the F-1032 Longerons using a 3/32" drill. Since the longerons are relatively thick, be sure to drill square to the skins (use the reflection of the drill in the skins as a guide). An angled hole will cause the rivets to "lean over" when installed, and will make it more difficult to hit the blind, punched hole in the frame and bulkhead tabs behind the longerons. DO NOT match-drill any holes of the F-1014 Aft Deck into the longerons at this time.



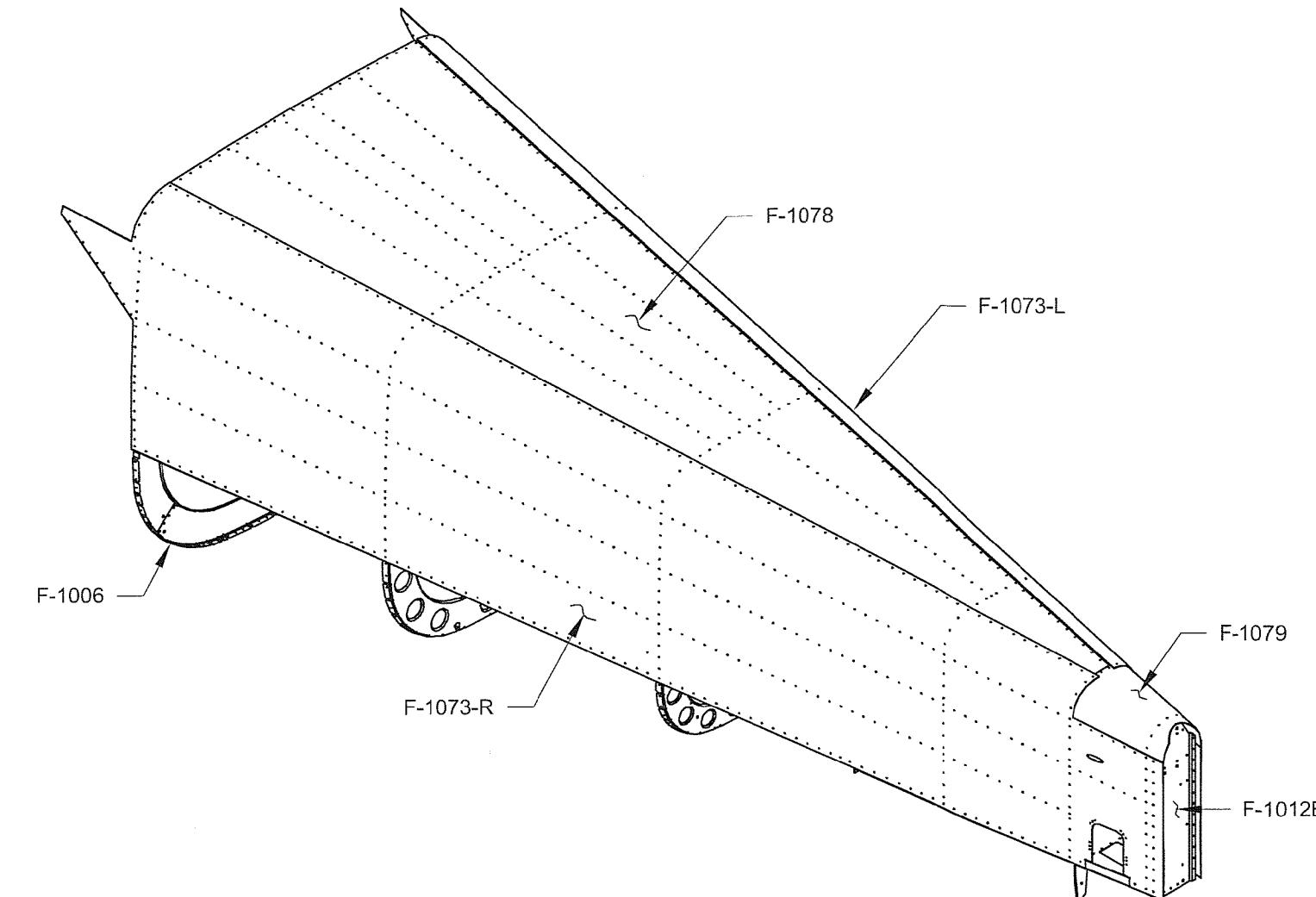
**FIGURE 1: DRILLING THE LONGERONS,  
FRAMES AND BULKHEADS, AND SIDE SKINS**

Step 3: Match-Drill #40 the holes of the F-1073-L & -R Side Skins into the flanges of the F-1012B Bulkhead, then final-drill #40 all the remaining skin to frame and skin to bulkhead holes on each side of the tailcone. Again, DO NOT drill any holes associated with the F-1006 Bulkhead.

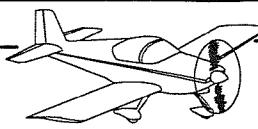
Step 4: Final-Drill #40 all the 3/32" holes which are common to the F-1012A & B Bulkhead webs and the three holes at the top of the bulkhead webs which are common to the F-1014 Aft Deck.

Step 5: Final-drill all the skin to frame and bulkhead holes (except the F-1006 Bulkhead) on the bottom of the tailcone using a #40 drill.

Using the same drill, final-drill the common holes along the edges of the F-1073 Side Skins and the F-1078 and F-1079 Bottom Skins.



**FIGURE 2: DRILLING THE BOTTOM SKINS,  
SIDE SKINS, AND FRAMES AND BULKHEADS**



Step 1: Separate the narrow strip from the F-1074 Forward Top Skin, then finish the edges of both parts. Set the strip aside; It will be used when the tailcone is joined to the forward fuselage.

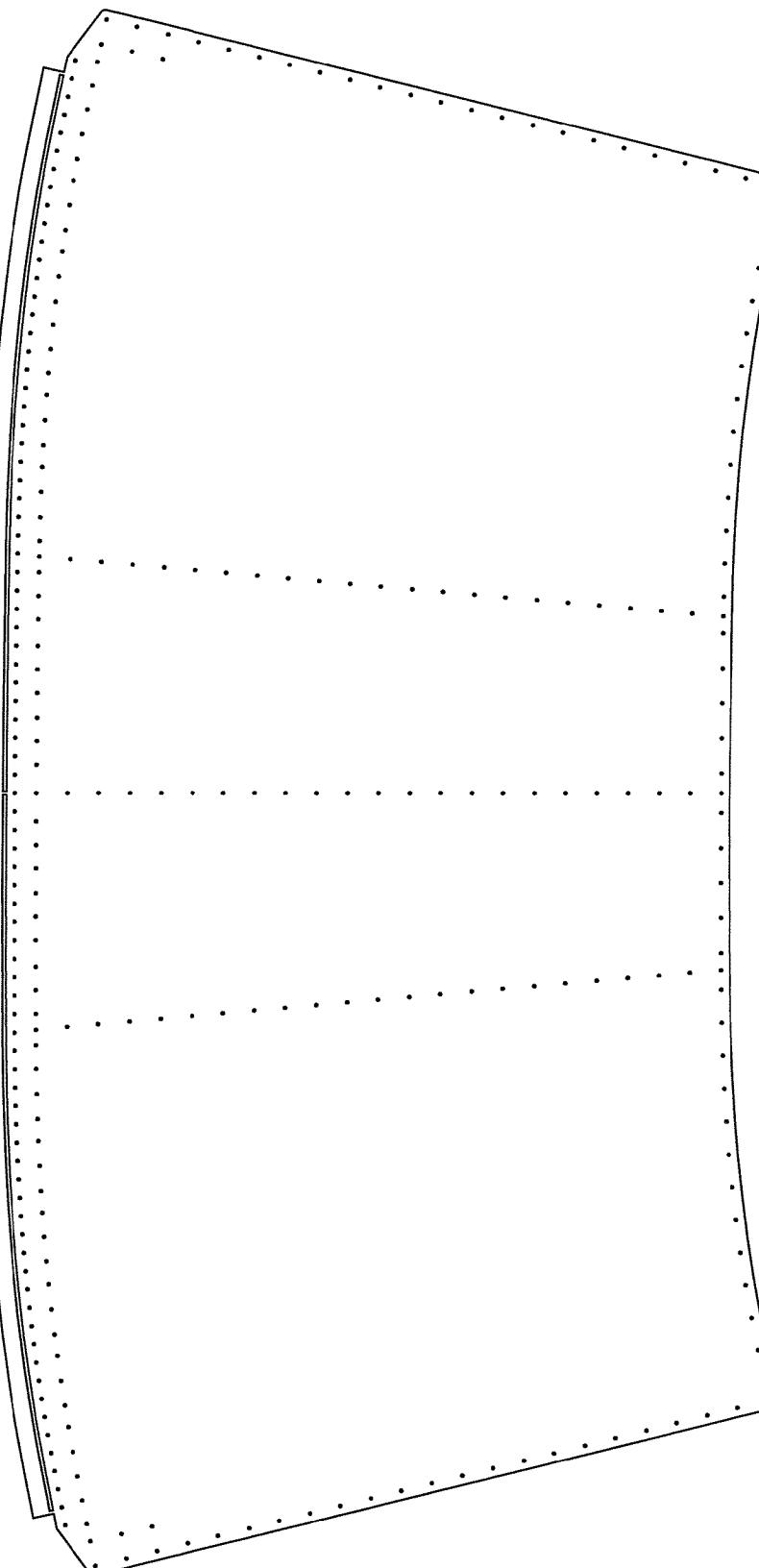


FIGURE 1: F-1074 FORWARD TOP SKIN

Step 2: Flip the tailcone over, then cleco the F-1009 Frame to the forward end of the F-1014 Aft Deck as shown in Figure 2. (For clarity, the F-1073-R Side Skin, the F-1047 Stiffeners that are attached to it, and the F-1032-R Longerons are not shown.)

Final-Drill the eight holes common to the F-1014 Aft Deck and the F-1009 Bulkhead using a #30 drill.

Step 3: The flange along the top of the F-1006 Bulkhead and the F-1007, -1008, and -1009 Frames is comprised of tabs with either one, two, or three punched holes. In preparation for clecoing on the F-1074 & -1075 Top Skins, heavily flute the tabs of the bulkhead and frames which have two punched holes.

Step 4: Insert the F-1047A and the two F-1047B Stiffeners into the notches of the frames and bulkheads as shown in Figure 2.

Step 5: Cleco the F-1075 Aft Top Skin to the F-1007, F-1008, and F-1009 Fuselage Frames and the F-1073 Side Skins. Start clecoing at the top center of the skin, then work toward the sides.

Step 6: Center the aft end marks and the rivet hole centerlines of the F-1047A and the two F-1047B Stiffeners in the indicated holes in the F-1075 Aft Top Skin, then match-drill all of the skin stiffener holes into the stiffeners using a #40 drill.

Step 7: Cleco the F-1074 Forward Top Skin to the F-1006 Bulkhead, the F-1007 Frame, the F-1075 Aft Top Skin, the F-1073 Side Skins, and the F-1032 Longerons.

Step 8: Match-Drill the holes of the F-1074 Forward Top Skin into the F-1047 Stiffeners using a #40 drill.

Step 9: Final-Drill #40 the rest of the holes associated with the F-1074 and F-1075 Top Skins (including the holes along the side skins and the emp fairing attach nutplate holes in the aft top skin, see figure). DO NOT, however, drill any holes associated with the F-1006 Bulkhead or the line of holes along the forward edge of the forward top skin.

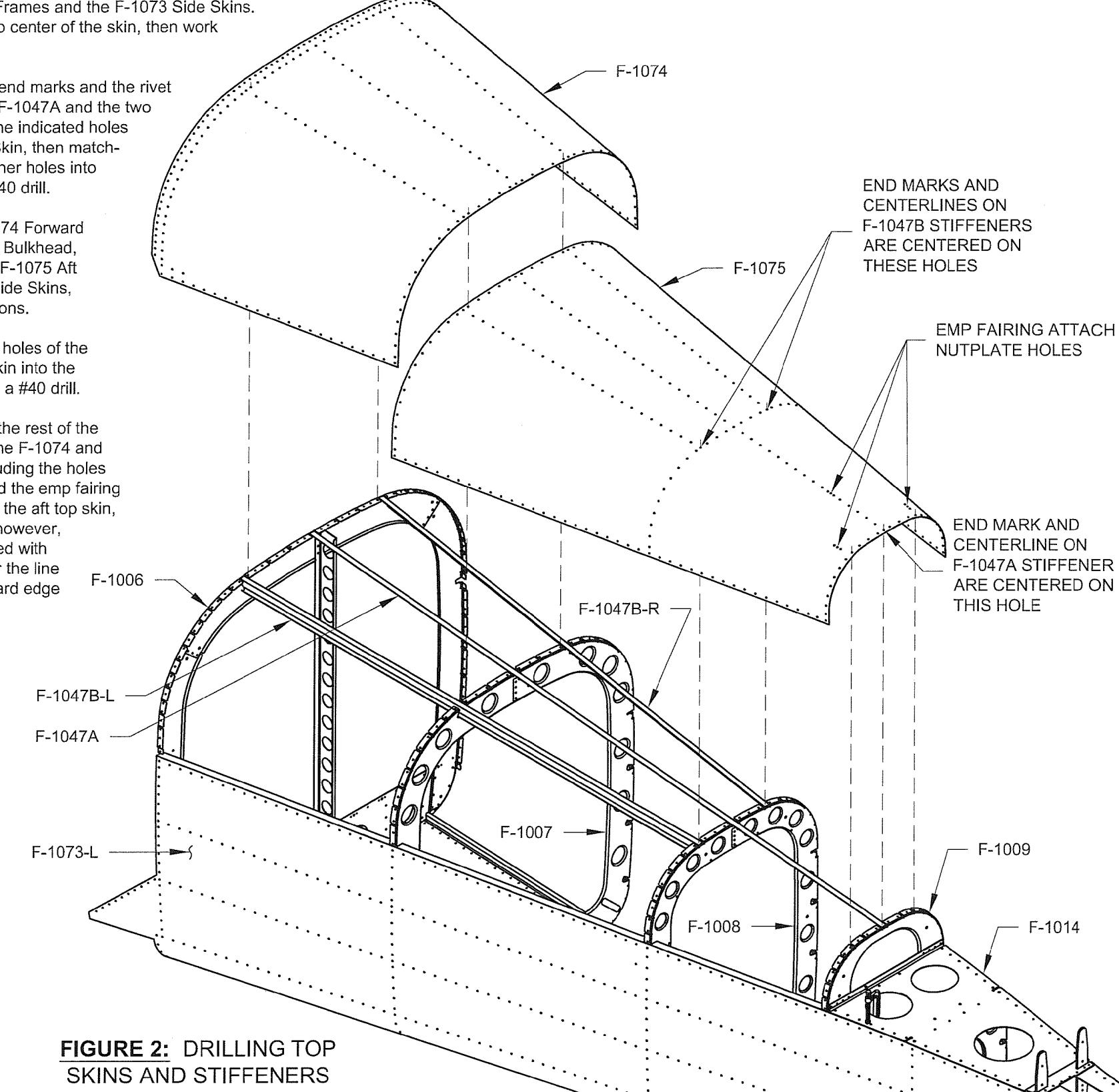
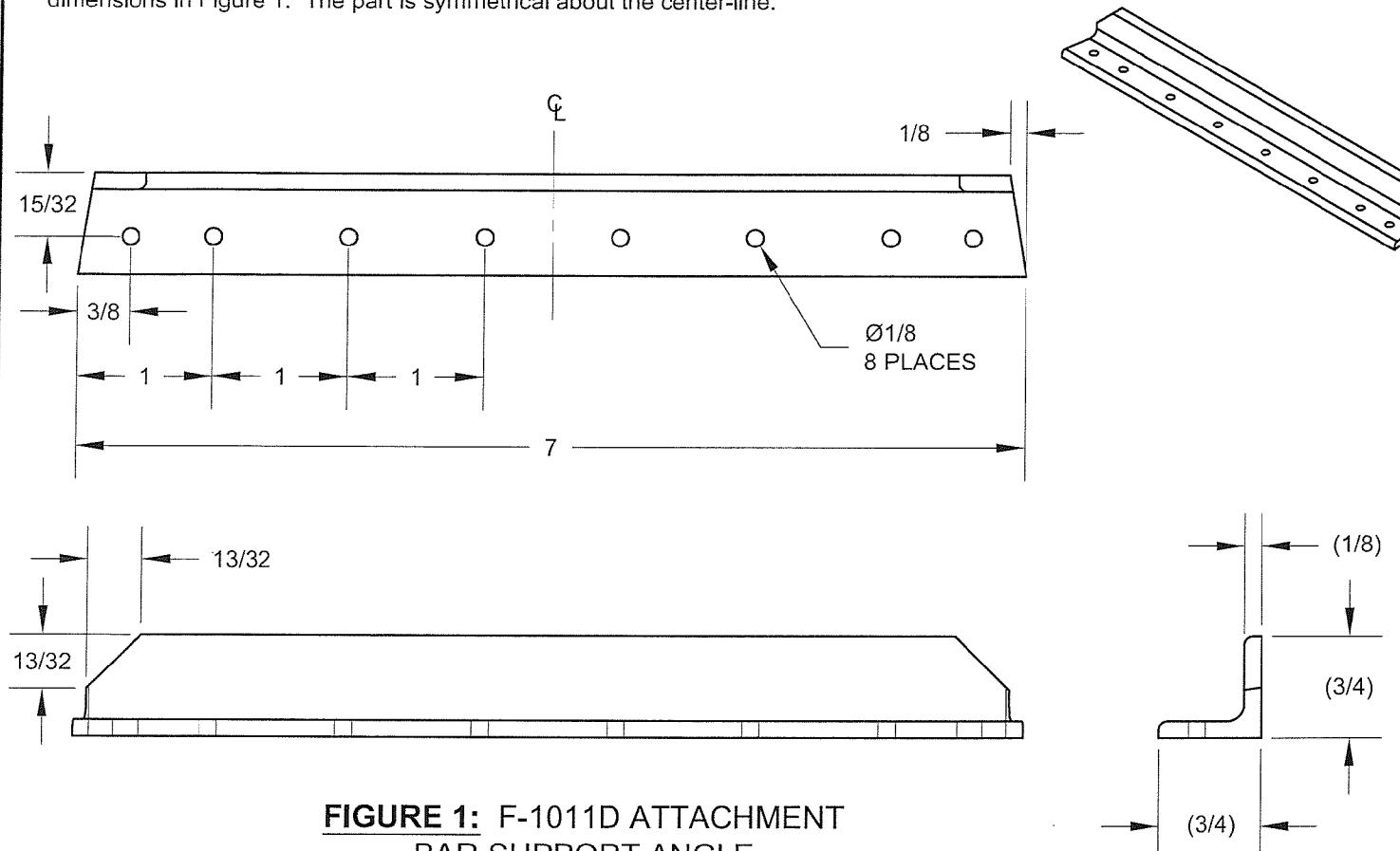


FIGURE 2: DRILLING TOP SKINS AND STIFFENERS

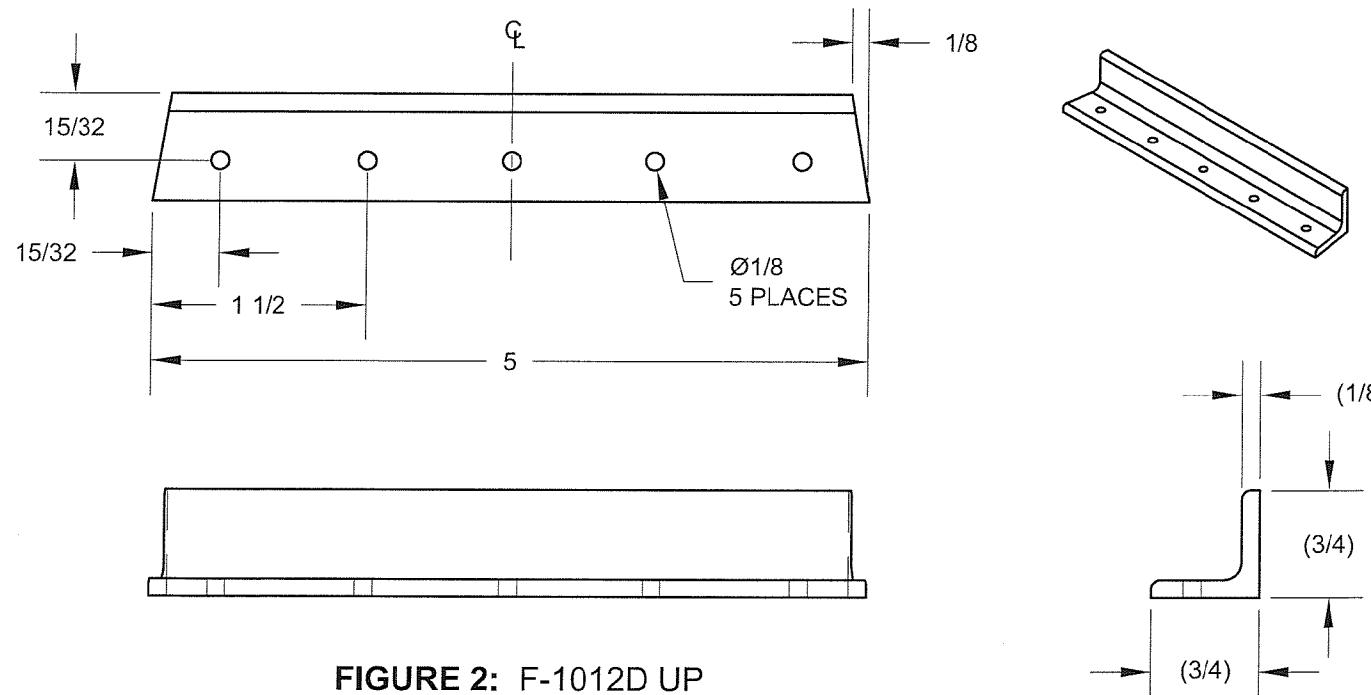


Step 1: Make the F-1011D Horizontal Stabilizer Attachment Bar Support Angle from a length of AA6-125X3/4X3/4 angle using the dimensions in Figure 1. The part is symmetrical about the center-line.



**FIGURE 1:** F-1011D ATTACHMENT BAR SUPPORT ANGLE

Step 2: Make the F-1012D Up Elevator Stop from a length of AA6-125X3/4X3/4 angle using the dimensions in Figure 2. The part is symmetrical about the center-line.



**FIGURE 2:** F-1012D UP ELEVATOR STOP

**NOTE:** With the top skins in position, the tailcone is torsionally rigid.

It is now safe to drill the F-1014 Aft Deck to the underlying structure. The F-1075 Aft Top Skin will tend to pull the F-1032 Longerons outward, therefore, make sure the clamps have kept the apex of the longerons even with the edge of the aft deck. If not, loosen the clamps and reposition the longerons.

Step 3: Make sure that the line drawn on the F-1010B Spacer (see Page 10-10, Step 3) is centered in the holes in the F-1014 Aft Deck, then match-drill the four holes of the aft deck into the spacer and the F-1010A Horizontal Stabilizer Attachment Angle using a #30 drill. Be sure to cleco.

Step 4: Match-Drill all the side holes of the F-1014 Aft Deck (including the outboard holes in the F-1011B Stop/ Doubler) into the F-1032 Longerons with a #30 drill. Drill square to the aft deck.

Final-Drill the two holes (see figure) common to the aft deck, longerons, and F-1010A Horizontal Stabilizer Attachment Angle using a #12 drill.

Step 5: Final-drill the four 1/8" holes of the F-1011B Stop/ Doubler (common to the F-1014 Aft Deck and F-1011 Bulkhead) with a #30 drill, and the middle two 3/32" holes with a #40 drill.

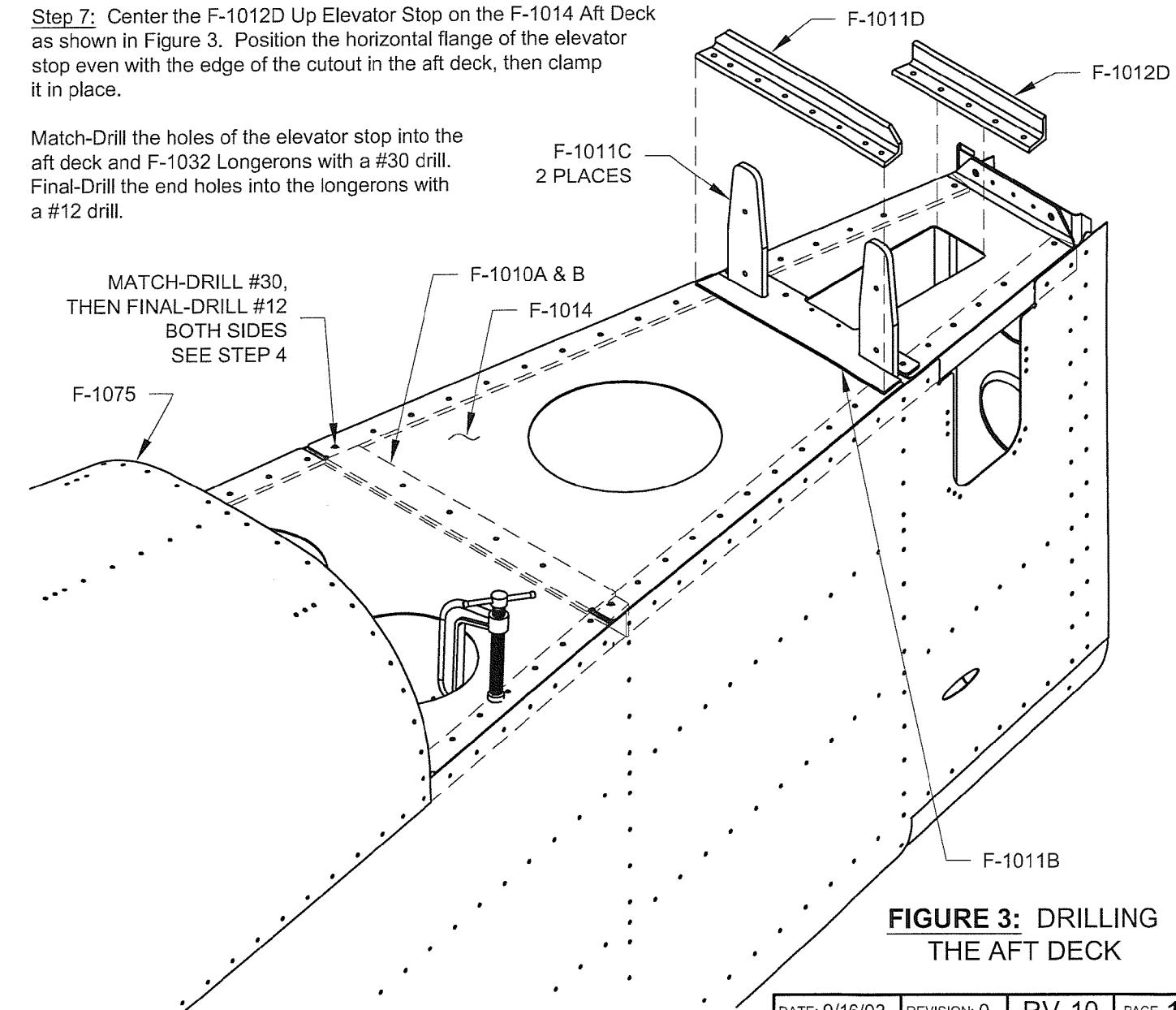
Step 6: Center the F-1011D Attachment Bar Support Angle on the F-1011B Stop/ Doubler as shown in Figure 3, then clamp it to the two F-1011C Attachment Bars.

Match-Drill the holes of the support angle into F-1014 Aft Deck, the stop/ doubler, and the F-1032 Longerons with a #30 drill. Final-Drill the end holes into the longerons using a #12 drill.

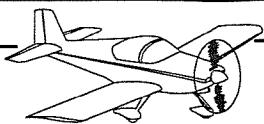
Step 7: Center the F-1012D Up Elevator Stop on the F-1014 Aft Deck as shown in Figure 3. Position the horizontal flange of the elevator stop even with the edge of the cutout in the aft deck, then clamp it in place.

Match-Drill the holes of the elevator stop into the aft deck and F-1032 Longerons with a #30 drill. Final-Drill the end holes into the longerons with a #12 drill.

MATCH-DRILL #30,  
THEN FINAL-DRILL #12  
BOTH SIDES  
SEE STEP 4



**FIGURE 3:** DRILLING THE AFT DECK

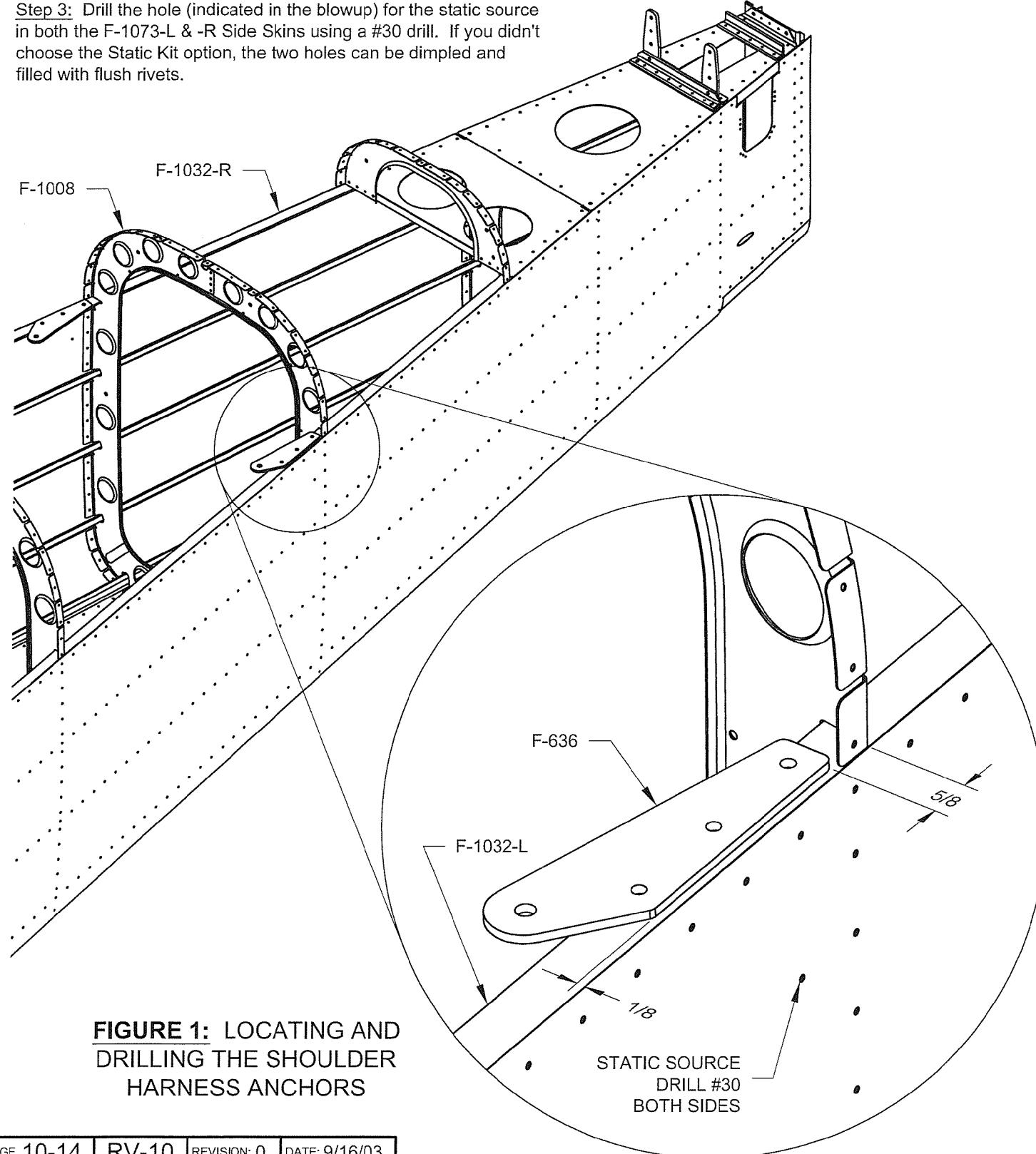


Step 1: Remove the F-1074 and F-1075 Top skins and the F-1047 Stiffeners which are attached to them.

Step 2: Position one of the two F-636 Shoulder Harness Anchors on the F-1032-L Longerons (just forward of the F-1008 Frame) using the dimensions in the blowup of Figure 1. Clamp the anchor into position, then, using a #12 drill, match-drill the three holes of the anchor into the longerons.

Repeat this step for the second anchor on the F-1032-R Longerons.

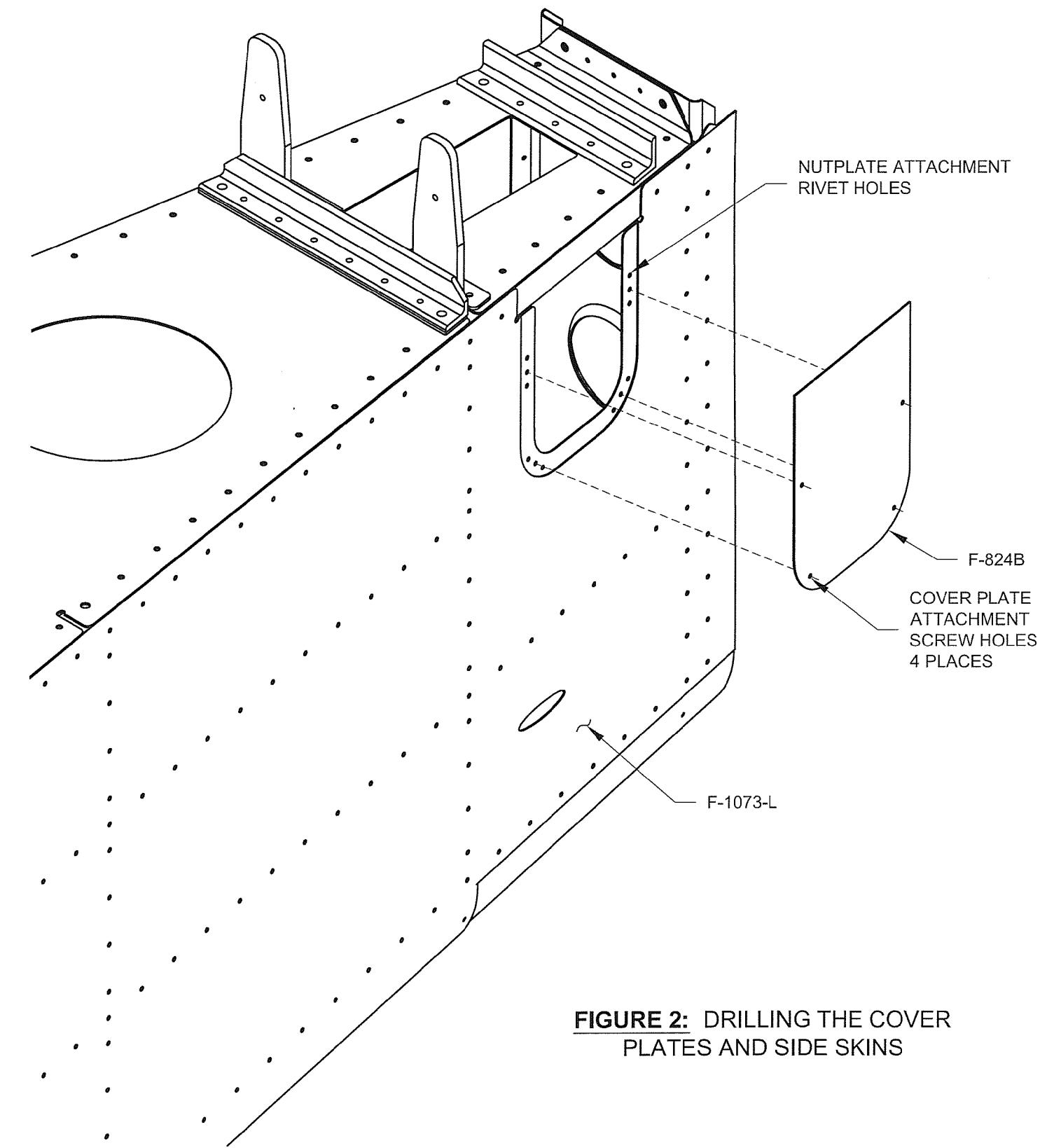
Step 3: Drill the hole (indicated in the blowup) for the static source in both the F-1073-L & -R Side Skins using a #30 drill. If you didn't choose the Static Kit option, the two holes can be dimpled and filled with flush rivets.



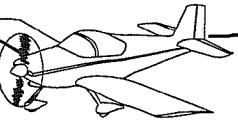
**FIGURE 1: LOCATING AND DRILLING THE SHOULDER HARNESS ANCHORS**

Step 4: Final-Drill the four attachment holes, shown in Figure 2, in the two F-824B Cover Plates and the corresponding holes in the F-1073 Side Skins using a #28 drill.

Step 5: Final-Drill the eight nutplate attachment rivet holes (see figure) in both F-1073 Side Skins using a #40 drill.



**FIGURE 2: DRILLING THE COVER PLATES AND SIDE SKINS**



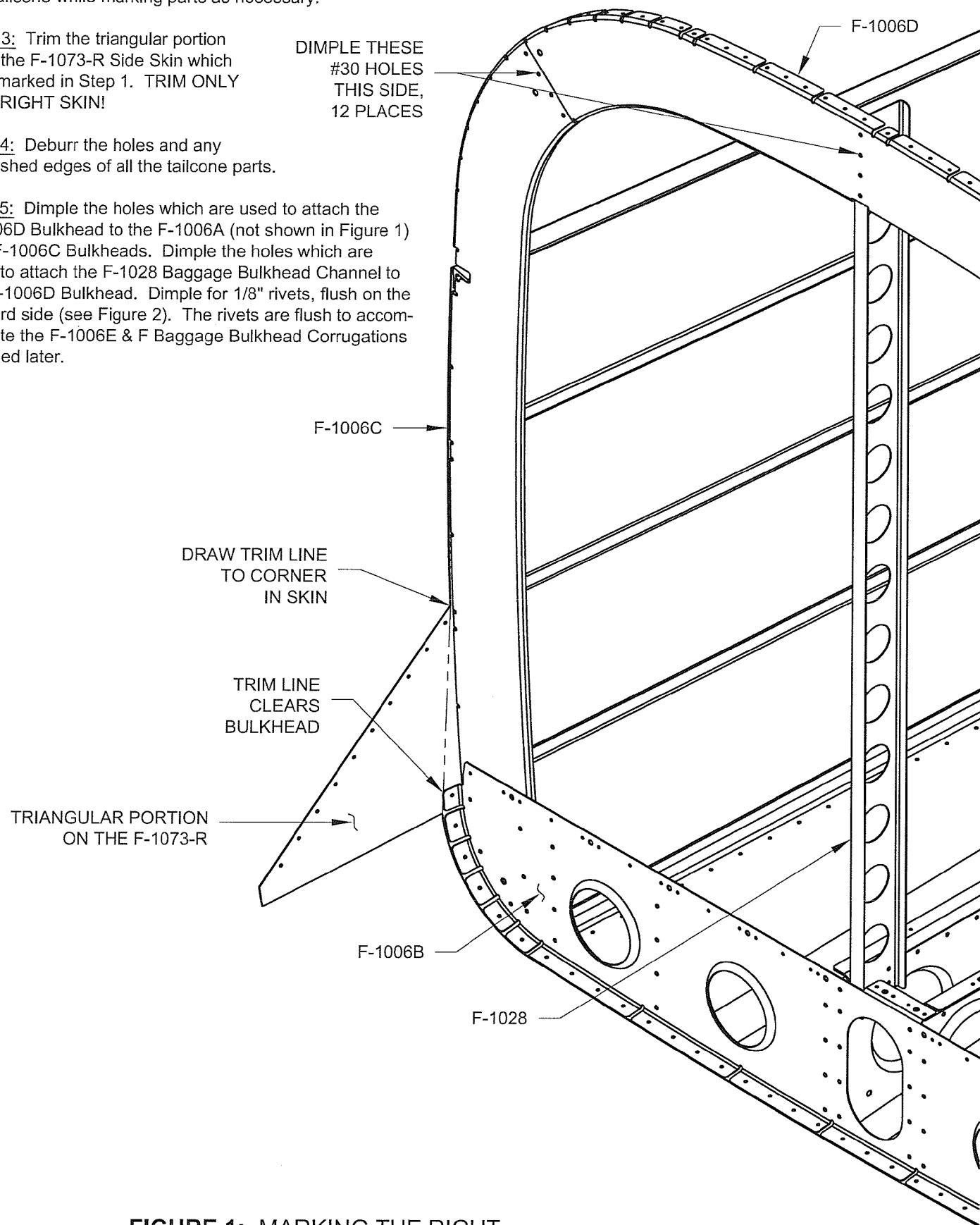
Step 1: The triangular portion on the forward end of the F-1073-R Side Skin needs to be trimmed in Step 3. At this point, draw a trim line on the side skin as shown in Figure 2. Make sure the trim line clears the F-1006B Bulkhead flange.

Step 2: Completely disassemble the remainder of the tailcone while marking parts as necessary.

Step 3: Trim the triangular portion from the F-1073-R Side Skin which was marked in Step 1. TRIM ONLY THE RIGHT SKIN!

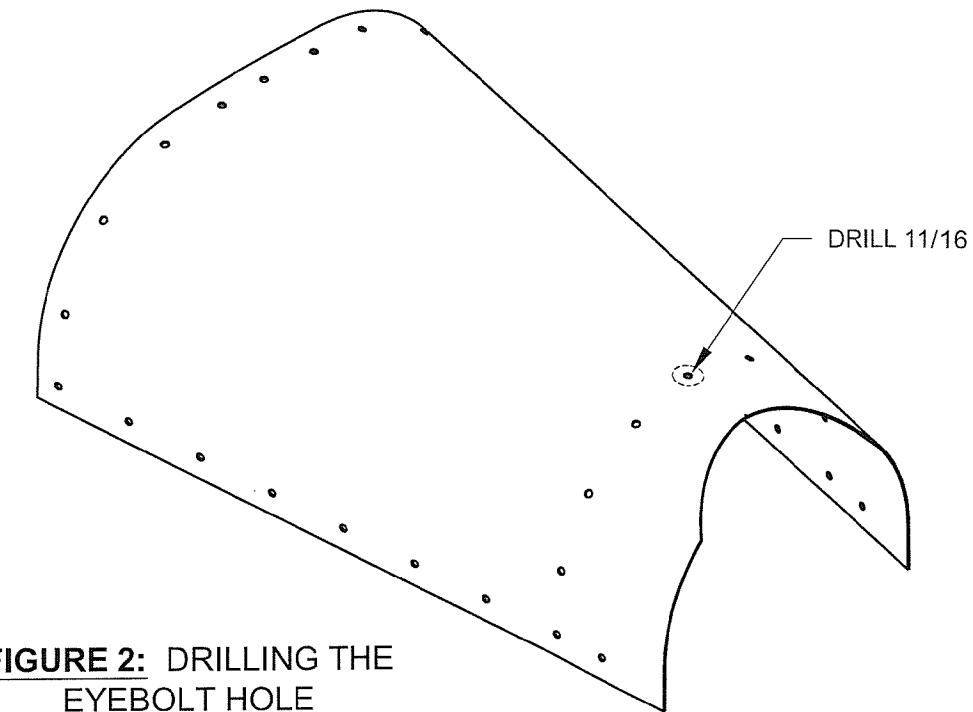
Step 4: Deburr the holes and any unfinished edges of all the tailcone parts.

Step 5: Dimple the holes which are used to attach the F-1006D Bulkhead to the F-1006A (not shown in Figure 1) and F-1006C Bulkheads. Dimple the holes which are used to attach the F-1028 Baggage Bulkhead Channel to the F-1006D Bulkhead. Dimple for 1/8" rivets, flush on the forward side (see Figure 2). The rivets are flush to accommodate the F-1006E & F Baggage Bulkhead Corrugations installed later.



**FIGURE 1: MARKING THE RIGHT SIDE SKIN FOR TRIMMING**

Step 6: Final-Drill the hole indicated in Figure 2 to 11/16 using a Unibit step drill. This hole provides clearance for the tie down eyebolt.



**FIGURE 2: DRILLING THE EYEBOLT HOLE**

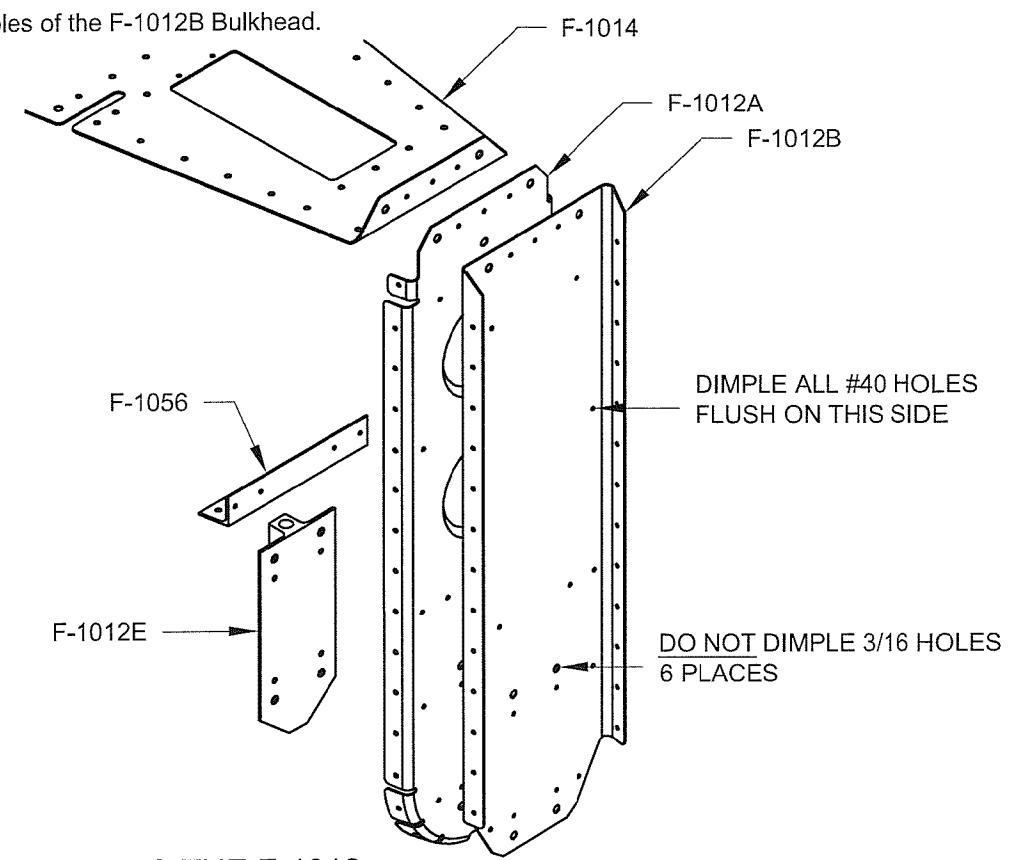
Step 7: Dimple all the #40 holes in the F-1012B Bulkhead for 3/32" flush rivets and the four #30 holes (common to the F-1012E Tie Down Bar) for 1/8" flush rivets. The rivets are flush on the aft side of the bulkhead as shown in Figure 3. DO NOT dimple the six 3/16" holes.

Dimple the F-1012A Bulkhead for the dimples of the F-1012B Bulkhead.

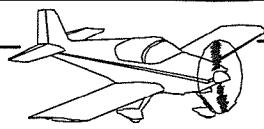
Dimple the three holes in the flange of the F-1014 Aft Deck for the dimples of the F-1012A Bulkhead.

Step 8: Machine countersink the four #40 holes in the F-1056 Rudder Stop Brace and the four #30 holes in the F-1012E Tie Down Bar deep enough for the dimples in the F-1012A Bulkhead.

Step 9: Dimple the six #40 holes in the flange of the F-1055 Rudder Stop Skin Stiffeners (see Page 10-8, Figure 3).



**FIGURE 3: DIMPLING THE F-1012 BULKHEAD AND RELATED PARTS**



**NOTE:** Steps 1-4 describe dimpling and countersinking the holes of the longerons, skins, frames and bulkheads, and stiffeners. Tape over the holes indicated in these steps which do not require dimpling or countersinking.

**Step 1:** Machine countersink all the skin holes in the F-1032 Longerons except for the holes in the aft end of the longerons which are used to secure the F-1094 Empennage Gap Cover. These holes are indicated on Page 10-25, Figure 1.

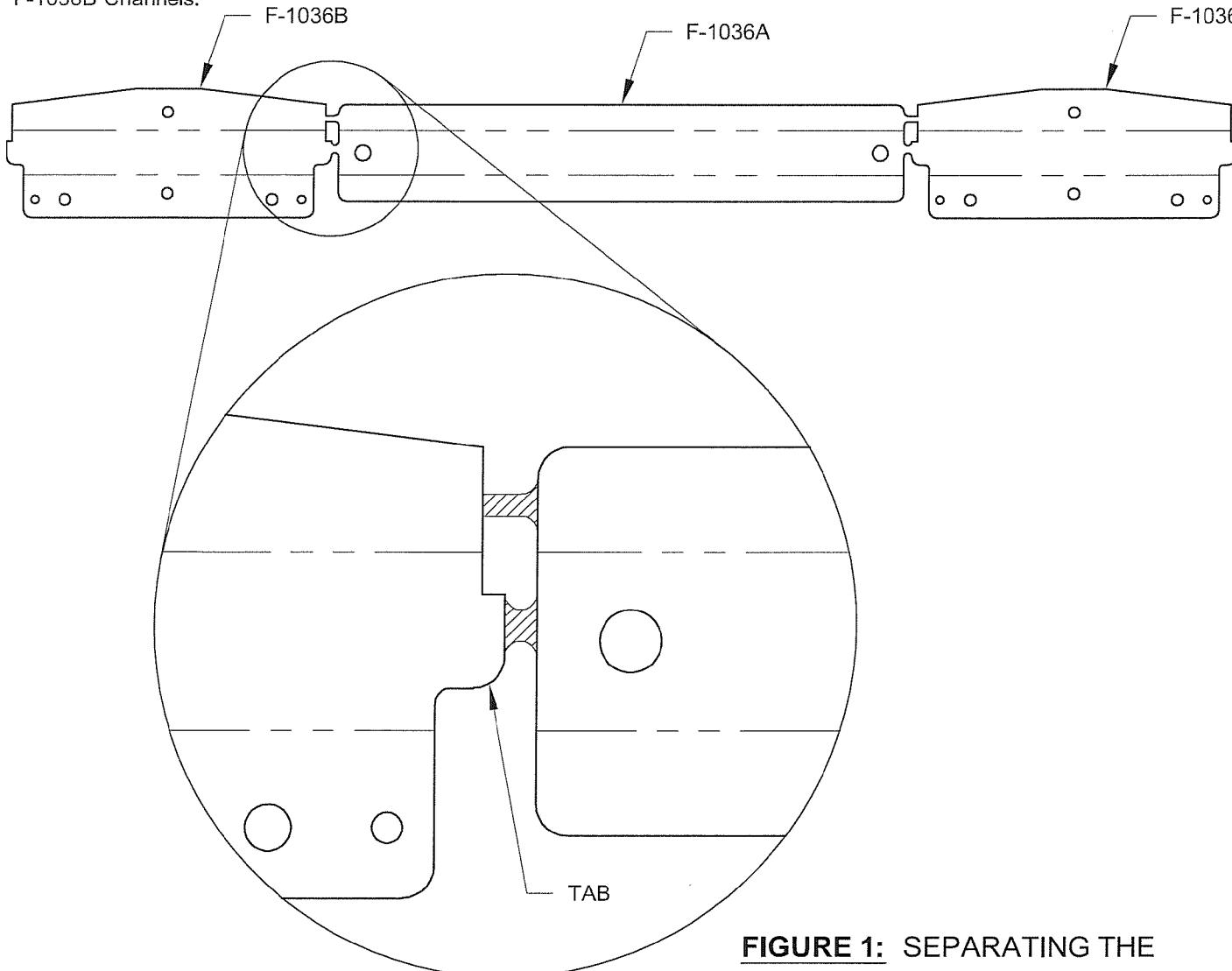
**Step 2:** Dimple the holes in the two F-824B Cover Plates (see Page 10-14, Figure 2) for #6 screws. Dimple the corresponding holes in the F-1073 Side Skins for the dimples in the cover plates.

**Step 3:** Dimple all the #40 holes in the skins except for the following: the holes used to secure the F-1094A & B Empennage Gap Covers and Fairing (see Page 10-25, Figure 1); the holes associated with the F-1006 Bulkhead; the holes in the triangular portion of the F-1073-L Side Skin; the 1/8" holes in both side skins which are used for the static source (see Page 10-14, Figure 1); and the center (screw) hole of the three sets of empennage fairing attachment nutplate holes in the F-1075 Aft Top Skin (see Page 10-12, Figure 2).

**Step 4:** Dimple the #40 holes in the flanges of all the frames and bulkheads except for the following: any of the holes in the flanges of the F-1006 Bulkhead; the single hole in the tabs of the frames or bulkheads which lie behind the F-1032 Longerons (the longerons are machine countersunk); the top hole in both flanges of the F-1012B Bulkhead (used to attach the empennage fairing); and the holes in the flange of the F-1011 Bulkhead which supports the F-1014 Aft Deck.

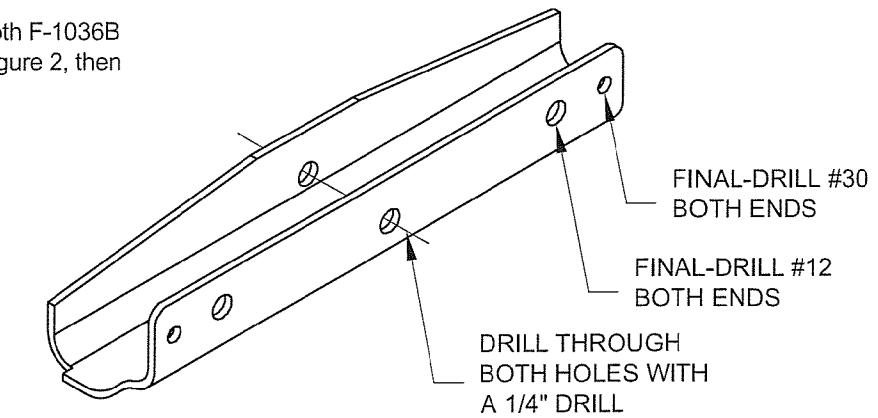
**Step 5:** Dimple the #40 holes in all of the F-1047 Stiffeners. However, do not dimple the center (screw) hole of the empennage fairing attachment nutplate holes in the F-1047A Stiffener (see Page 10-12, Figure 2).

**Step 6:** Separate the F-1036 Battery Channel (shown unbent for clarity) into the parts indicated in Figure 1. The blowup in the figure shows the material which needs to be removed to separate the parts. Be careful not to remove the small tab on both sides of the F-1036 Channels.



**FIGURE 1: SEPARATING THE F-1036 BATTERY CHANNEL**

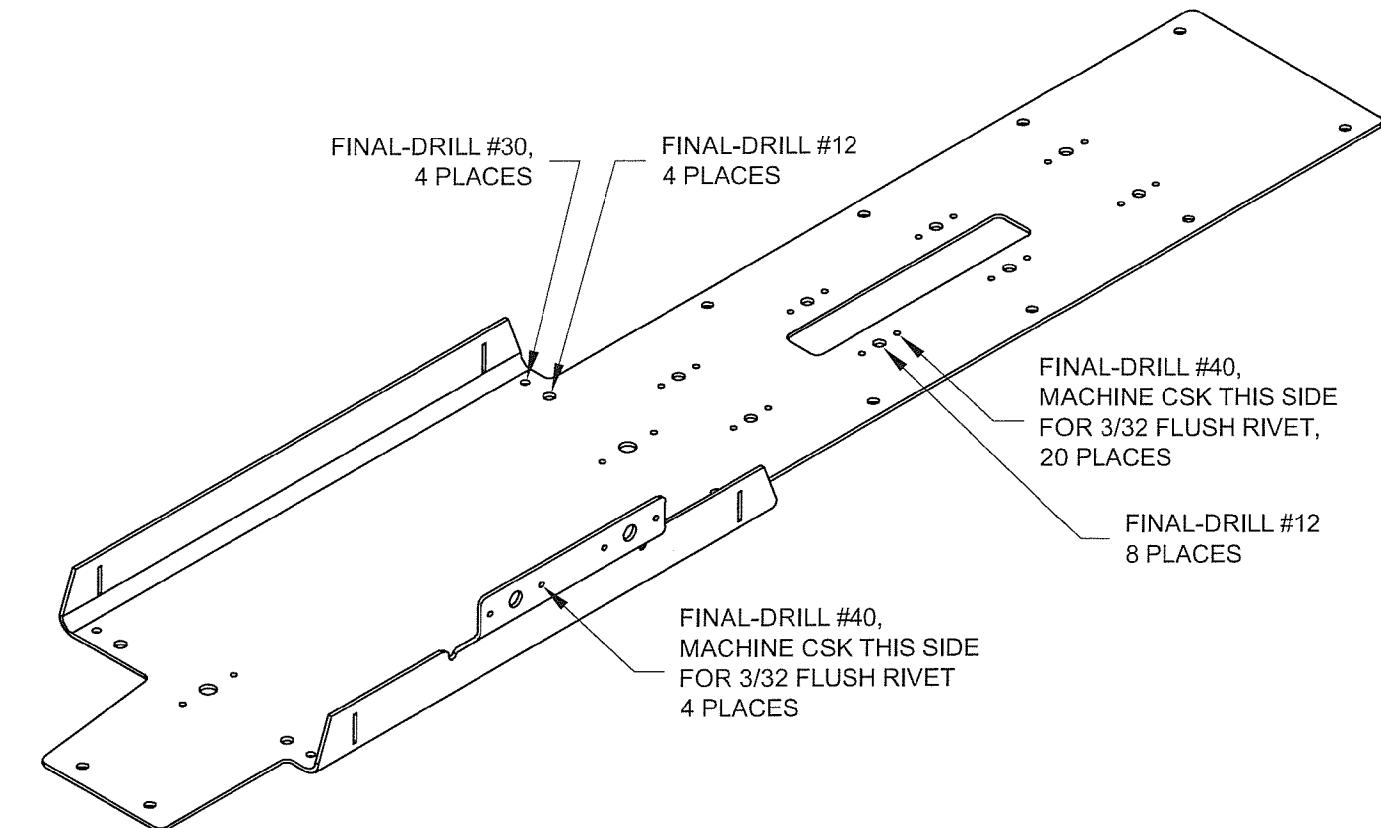
**Step 7:** Final-Drill the holes of both F-1036B Battery Channels according to Figure 2, then deburr the holes and edges.



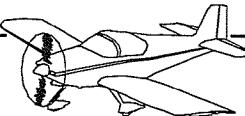
**FIGURE 2: FINAL-DRILLING THE F-1036B BATTERY CHANNELS**

**Step 8:** Final-Drill the 3/32, 1/8, and 3/16 holes of the F-1035 Battery/ Bellcrank Mount with a #40, #30, and #12 drill respectively as shown in Figure 3. The #19 holes along the sides and at the front of the mount and the four 1/4 holes do not need drilling. Machine countersink the #40 holes flush on the sides indicated.

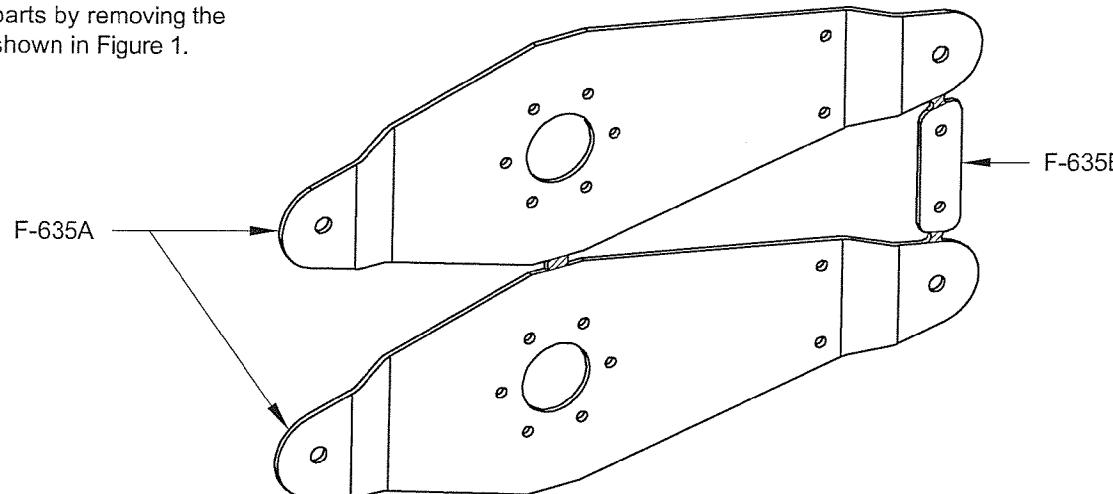
Deburr the holes and finish all edges.



**FIGURE 3: FINAL-DRILLING THE F-1035 BATTERY/ BELLCRANK MOUNT**



Step 1: Separate the F-635 Bellcrank into individual parts by removing the shaded areas shown in Figure 1.

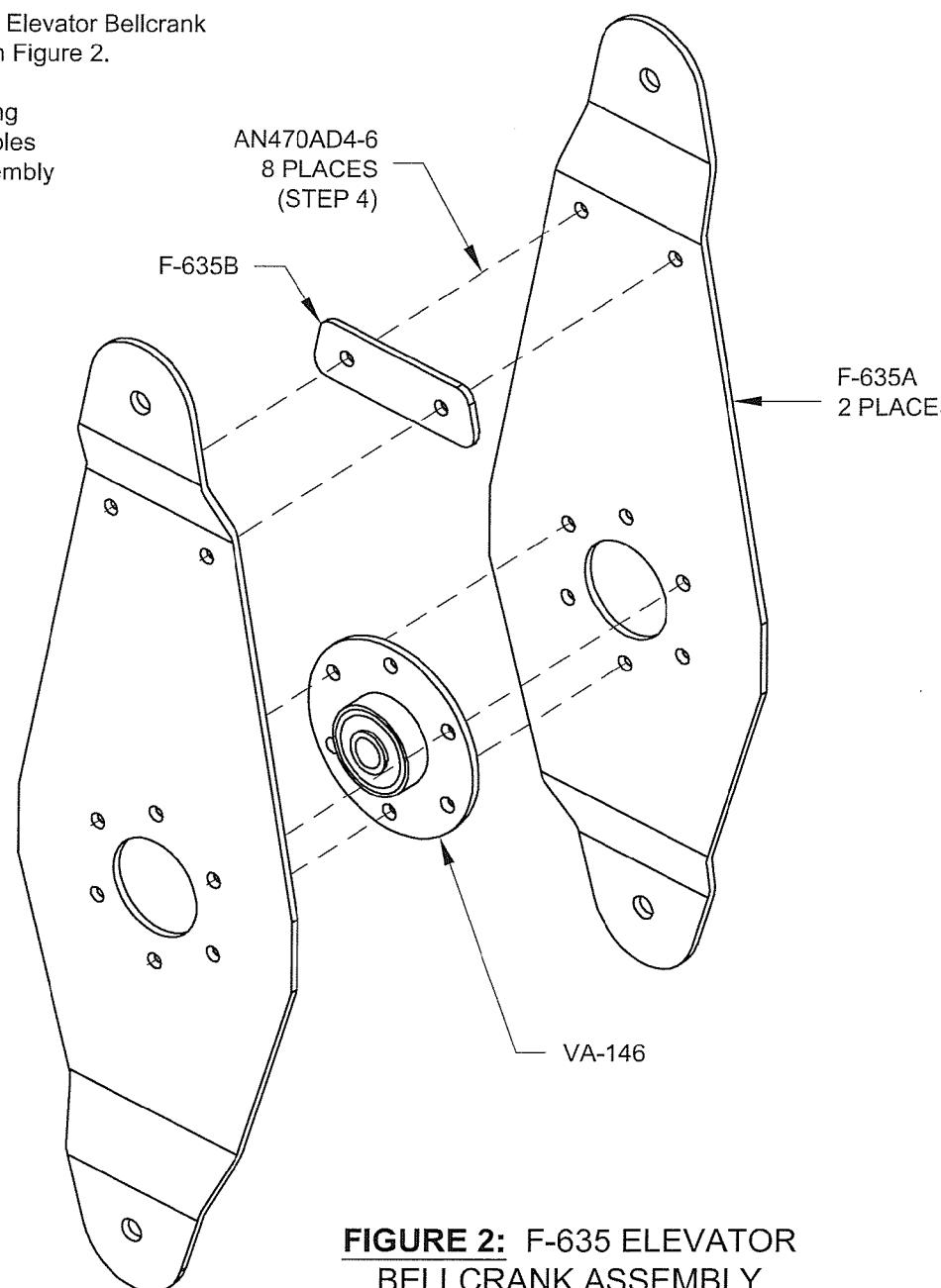


**FIGURE 1: SEPARATING THE F-635 BELLCRANK**

Step 2: Cleco together the F-635 Elevator Bellcrank Assembly from the parts shown in Figure 2.

Final-Drill all of the 1/8" holes using a #30 drill. Final-Drill the 3/16" holes at both ends of the bellcrank assembly with a #12 drill.

Disassemble, then deburr the holes and edges.



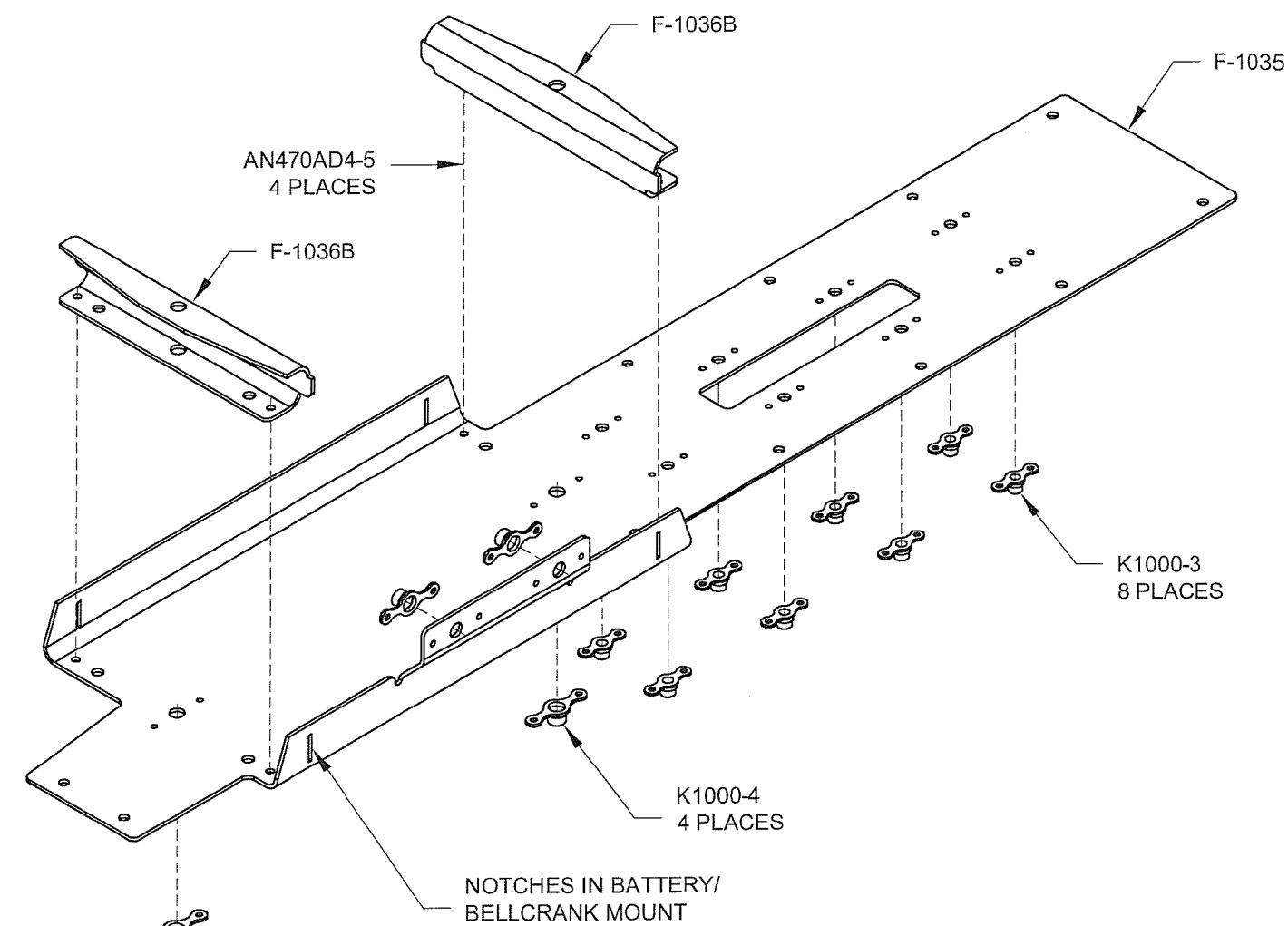
**FIGURE 2: F-635 ELEVATOR BELLCRANK ASSEMBLY**

Step 3: Prime the tailcone parts, if desired, in preparation for final assembly.

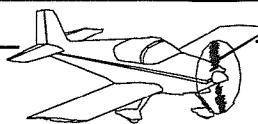
Step 4: Rivet together the F-635 Elevator Bellcrank Assembly using the rivets called out in Figure 2.

Step 5: Rivet all the nutplates shown in Figure 3 using AN426AD3-4 flush rivets.

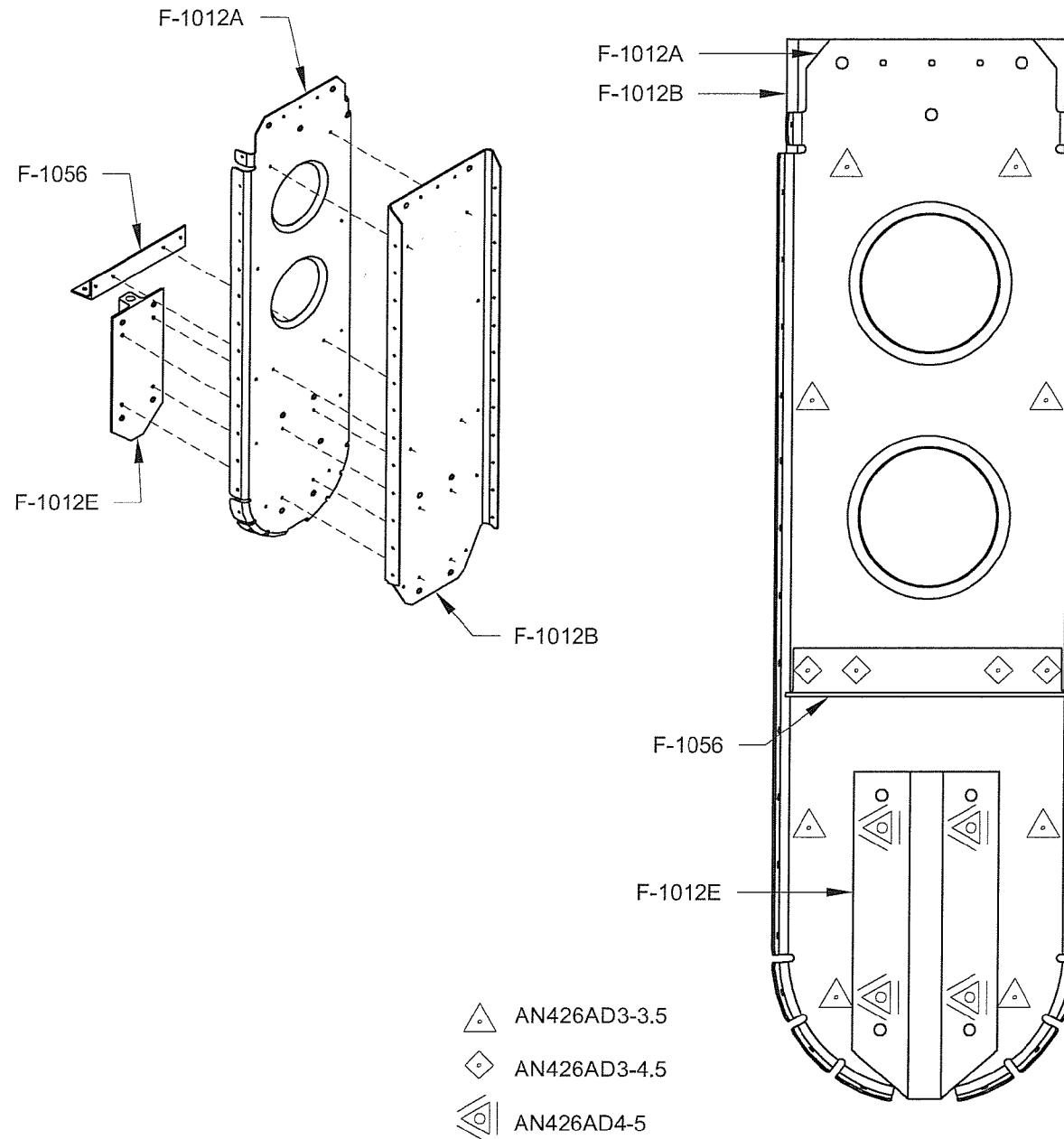
Step 6: Snap the tabs of the F-1036B Battery Channels into the notches of the F-1035 Battery/ Bellcrank Mount, then rivet the channels in place using the rivets called out in Figure 3.



**FIGURE 3: RIVETING THE BATTERY/BELLCRANK MOUNT**



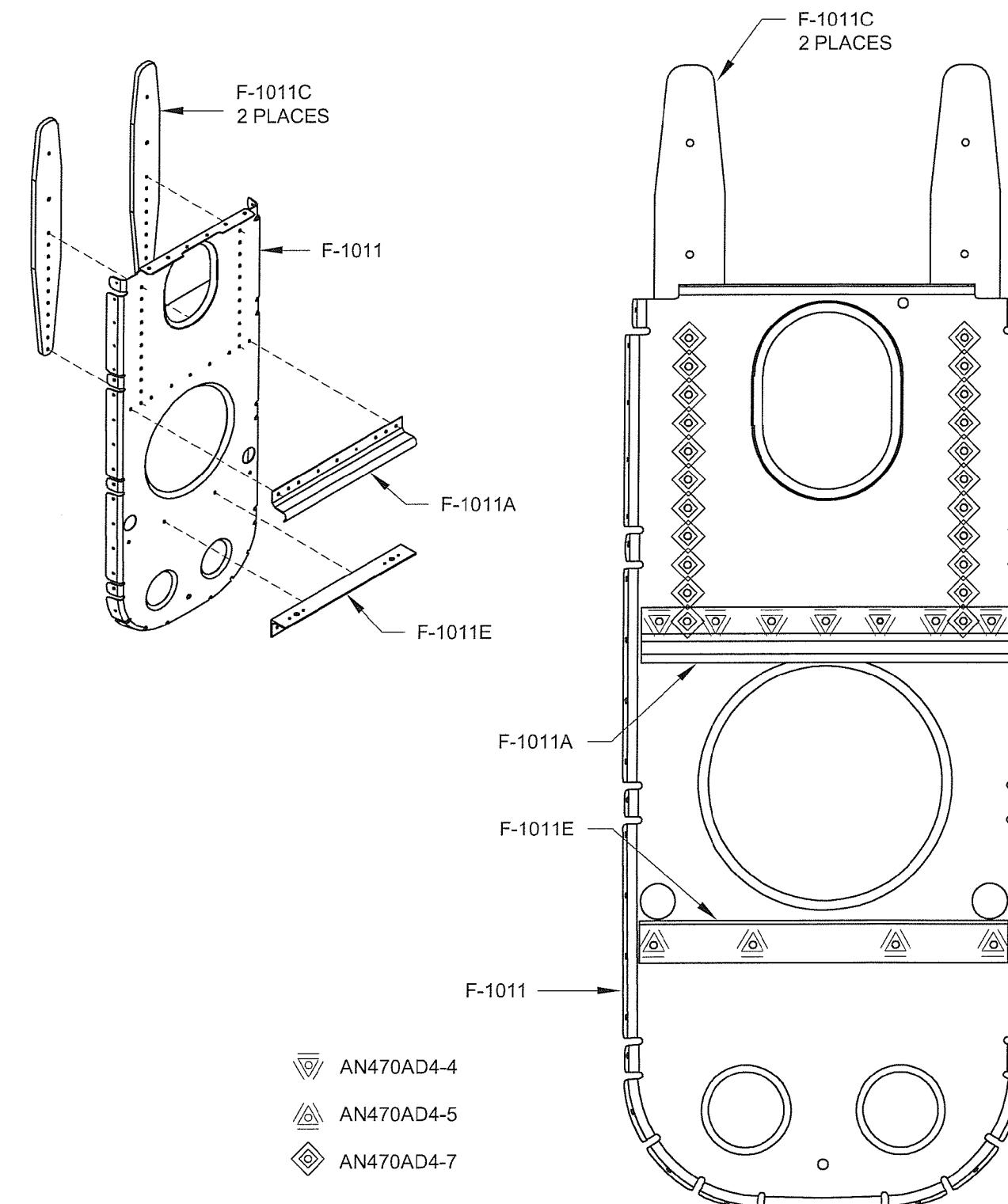
Step 1: Rivet the F-1012A & B Bulkheads, the F-1056 Rudder Stop Brace, and the F-1012E Tie Down Bar using the rivets called out in Figure 1.



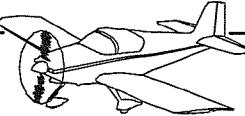
**FIGURE 1: RIVETING THE F-1012  
BULKHEAD AND PARTS**

Step 2: Rivet the F-1011 Bulkhead, the F-1011A Bulkhead Stiffener, the F-1011C Horizontal Stabilizer Attachment Bars, and the F-1011E Rudder Cable Angle using the rivets called out in Figure 2.

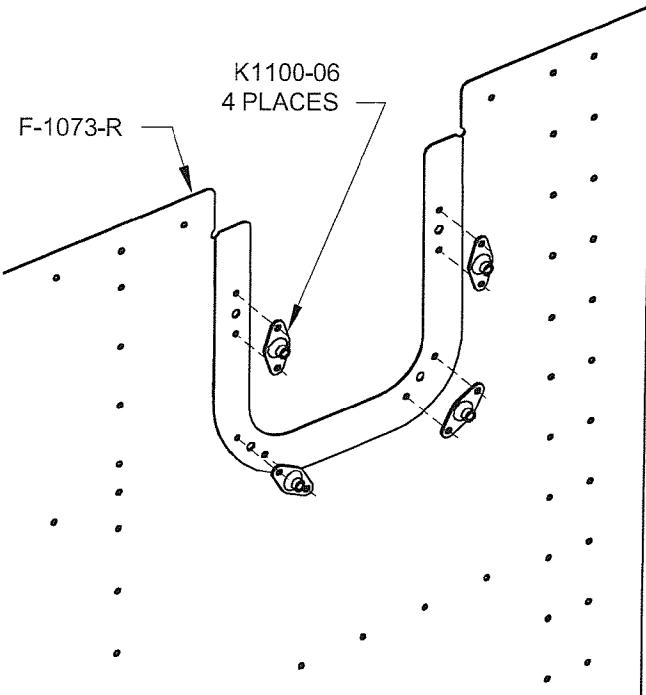
Step 3: Rivet the nutplates shown on Page 10-2, Figure 4 to the F-1011E Rudder Cable Angle using AN426AD3-4 rivets.



**FIGURE 2: RIVETING THE F-1011  
BULKHEAD AND PARTS**

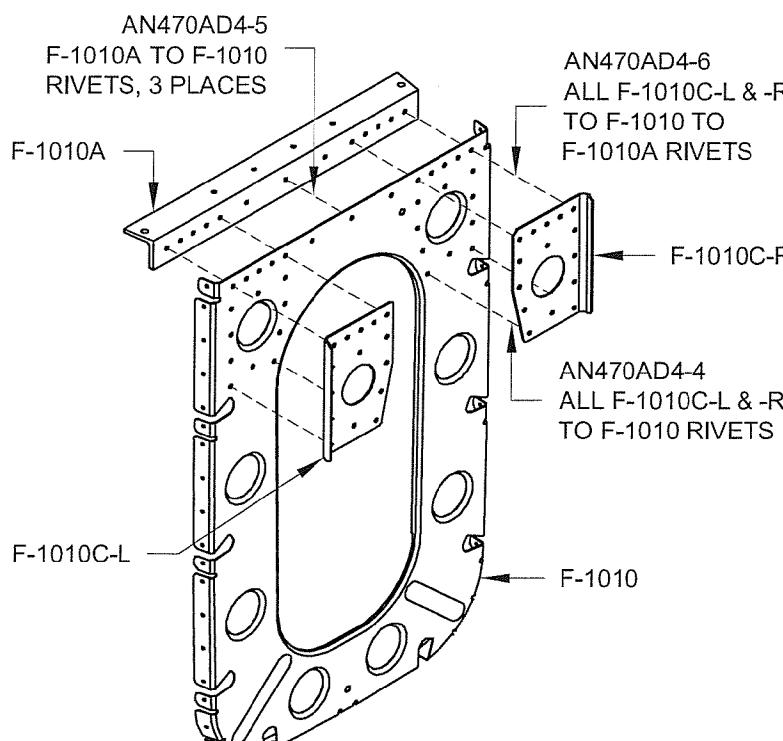


Step 1: Rivet the nutplates (used to attach the F-824B Cover Plates) called out in Figure 1 to both F-1073 Side Skins.



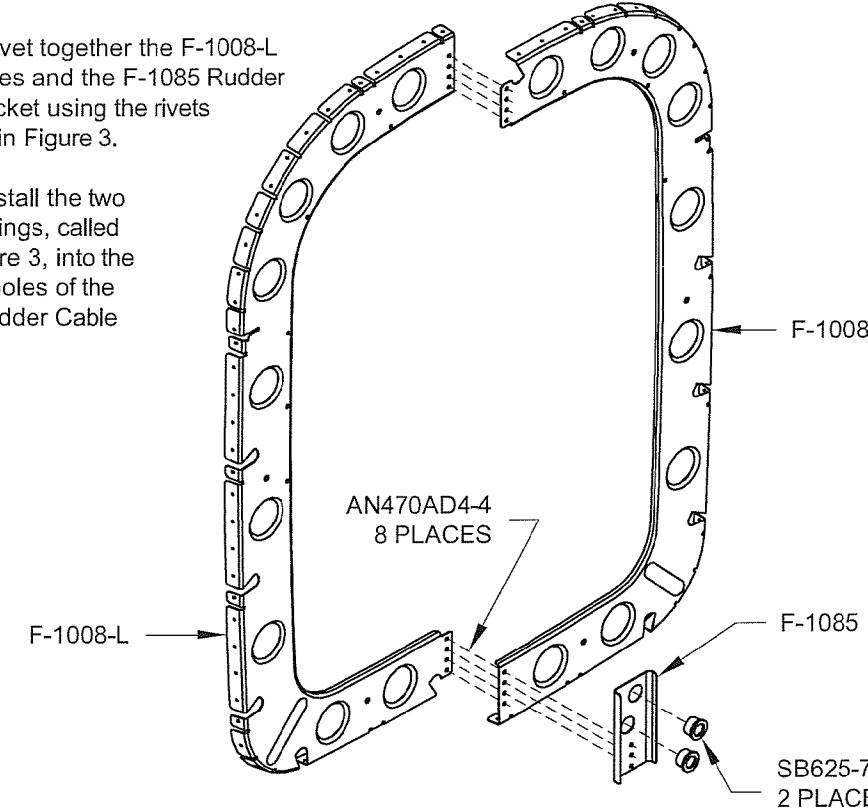
**FIGURE 1: RIVETING THE COVER PLATE NUTPLATES**

Step 2: Rivet the F-1010A Horizontal Stabilizer Attachment Angle and the F-1010C-L & -R Bulkhead Doublers to the F-1010 Bulkhead using the rivets called out in Figure 2.



**FIGURE 2: RIVETING THE F-1010 BULKHEAD**

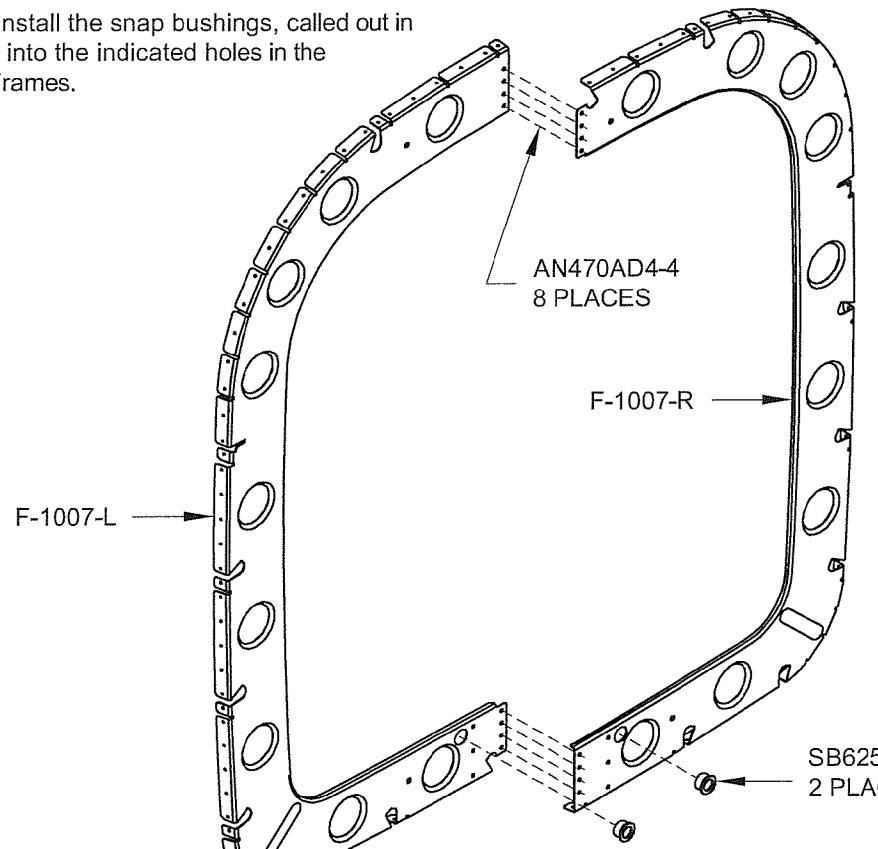
Step 3: Rivet together the F-1008-L & -R Frames and the F-1085 Rudder Cable Bracket using the rivets called out in Figure 3.



**FIGURE 3: RIVETING THE F-1008 FRAMES**

Step 5: Rivet the F-1007 Frames together using the rivets called out in Figure 4.

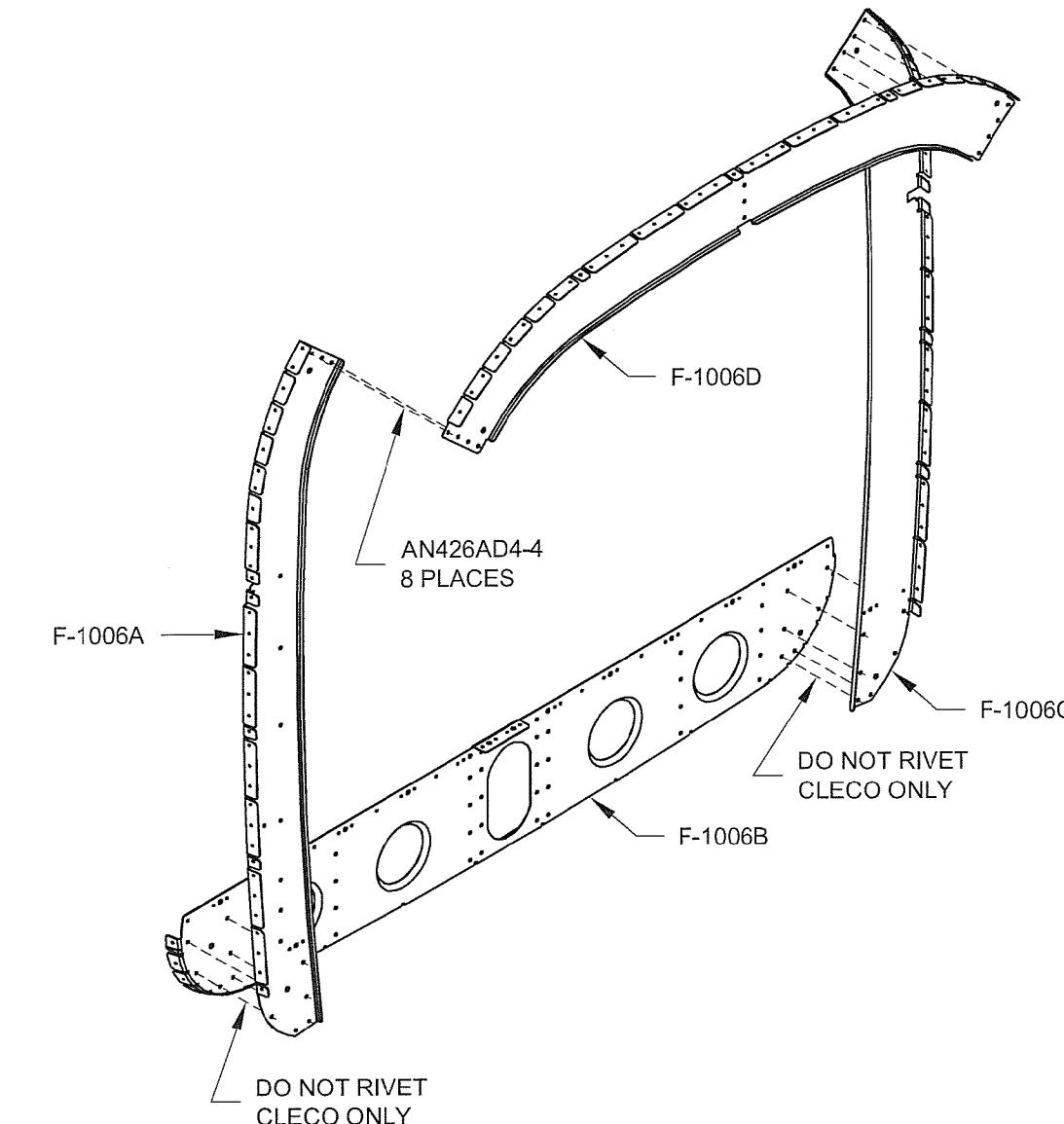
Step 6: Install the snap bushings, called out in Figure 4, into the indicated holes in the F-1007 Frames.



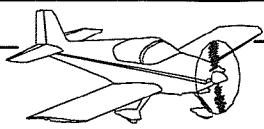
**FIGURE 4: RIVETING THE F-1007 FRAMES**

Step 7: Rivet the F-1006D Bulkhead to the F-1006A & C Bulkheads using the rivets called out in Figure 5.

Cleco the F-1006B Bulkhead to the F-1006A & C Bulkheads. The F-1006B Bulkhead is riveted when the tailcone is attached to the forward fuselage.



**FIGURE 5: RIVETING THE F-1006 BULKHEAD**



Step 1: As described on Pages 10-7 through 10-9, cleco together the portion of the tailcone shown in Figure 1 (for clarity, the F-1073-L Side Skin and the F-1047 Stiffeners attached to it are not shown). However, for now, don't cleco in place the F-1028 Baggage Bulkhead Channel or the F-1029 Bellcrank Ribs. (Leaving the bellcrank ribs out improves access to the F-1007 Frame when riveting it to the F-1078 Forward Bottom Skin.) Cleco both F-1032 Longerons to the skins, frames, and bulkheads.

NOTE: Now begins the task of riveting the skins. Any rivets associated with the skins can be found on Pages 10-25 and 10-26. DO NOT RIVET anything to the F-1006 Bulkhead while completing the remainder of this section. The F-1006 Bulkhead is riveted when the tailcone is attached to the forward fuselage in a later section.

Step 2: Rivet the F-1047 Stiffeners to the F-1073 Side Skins and to the F-1078 Forward Bottom Skin. When riveting the stiffeners to the skins, rivet the tabs of the frames and bulkheads which lie behind the stiffeners as well.

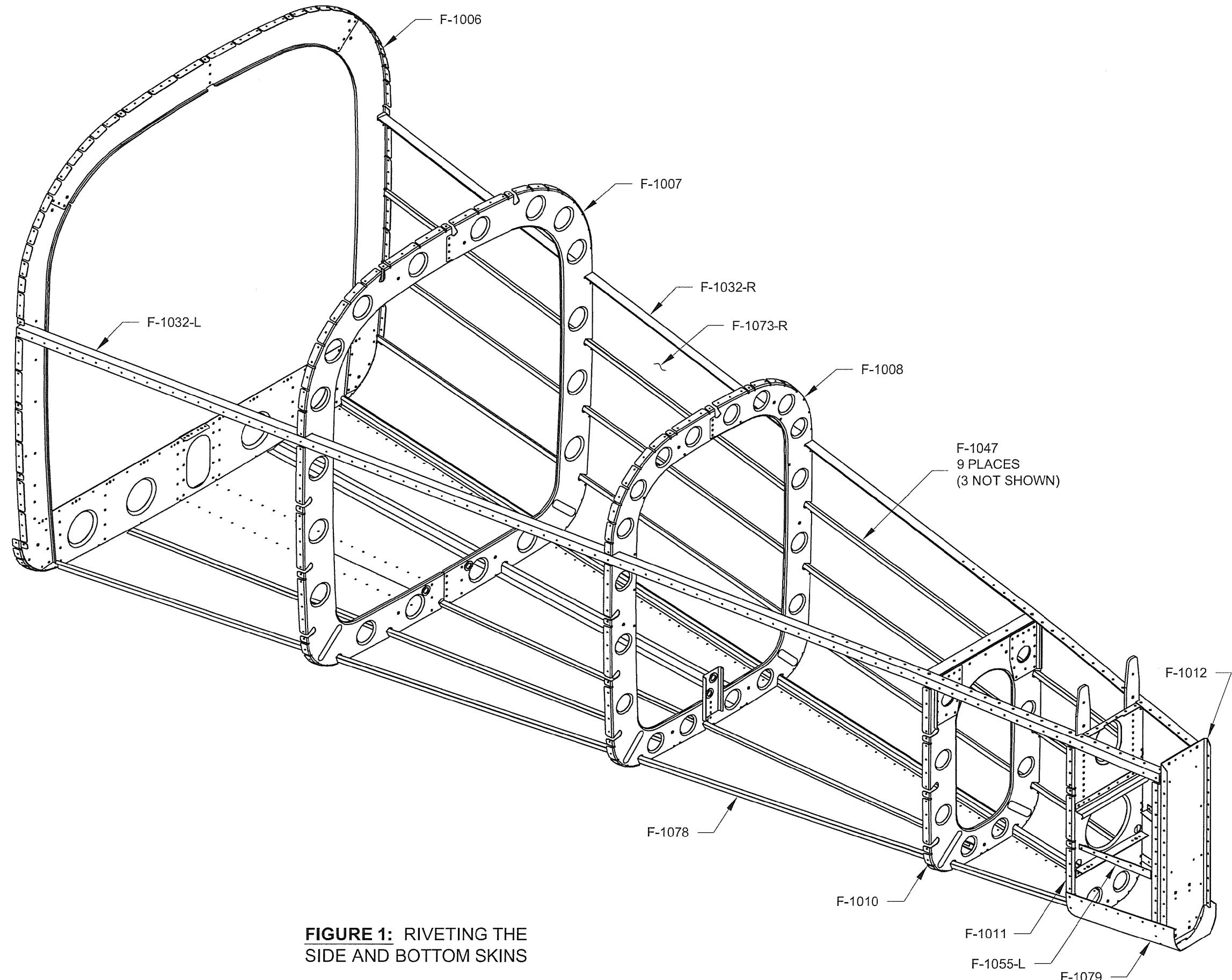
Step 3: Rivet both F-1073 Side Skins to the frames and bulkheads. Start riveting at the top of the skins (don't rivet the F-1032 Longerons), then work down and around the bottom radius of the skins.

Step 4: Rivet the F-1078 Forward Bottom Skin to the frames and bulkheads.

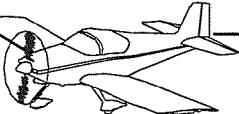
Step 5: Rivet the bottom edges of the F-1073 Side Skins to the F-1078 Forward Bottom Skin.

Step 6: Rivet the F-1079 Aft Bottom Skin to the F-1011 & -1012 Bulkheads, the F-1073 Side Skins, and to the F-1078 Forward Bottom Skin.

Step 7: Rivet the F-1055-L & -R Rudder Stop Skin Stiffeners to the F-1073 Side Skins. Rivet the stiffeners to the F-1056 Rudder Stop Brace using AN470AD4-4 rivets

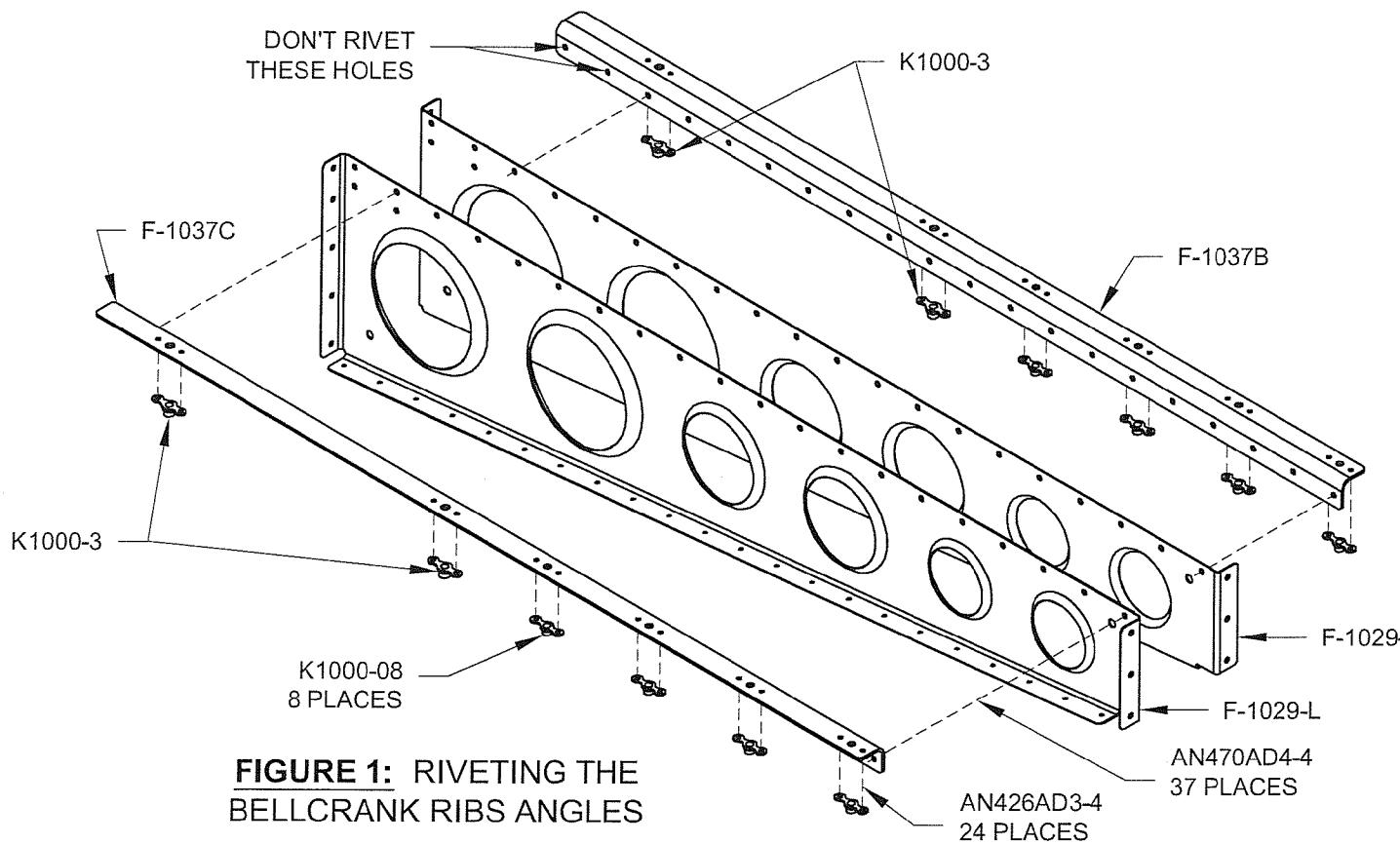


**FIGURE 1: RIVETING THE SIDE AND BOTTOM SKINS**



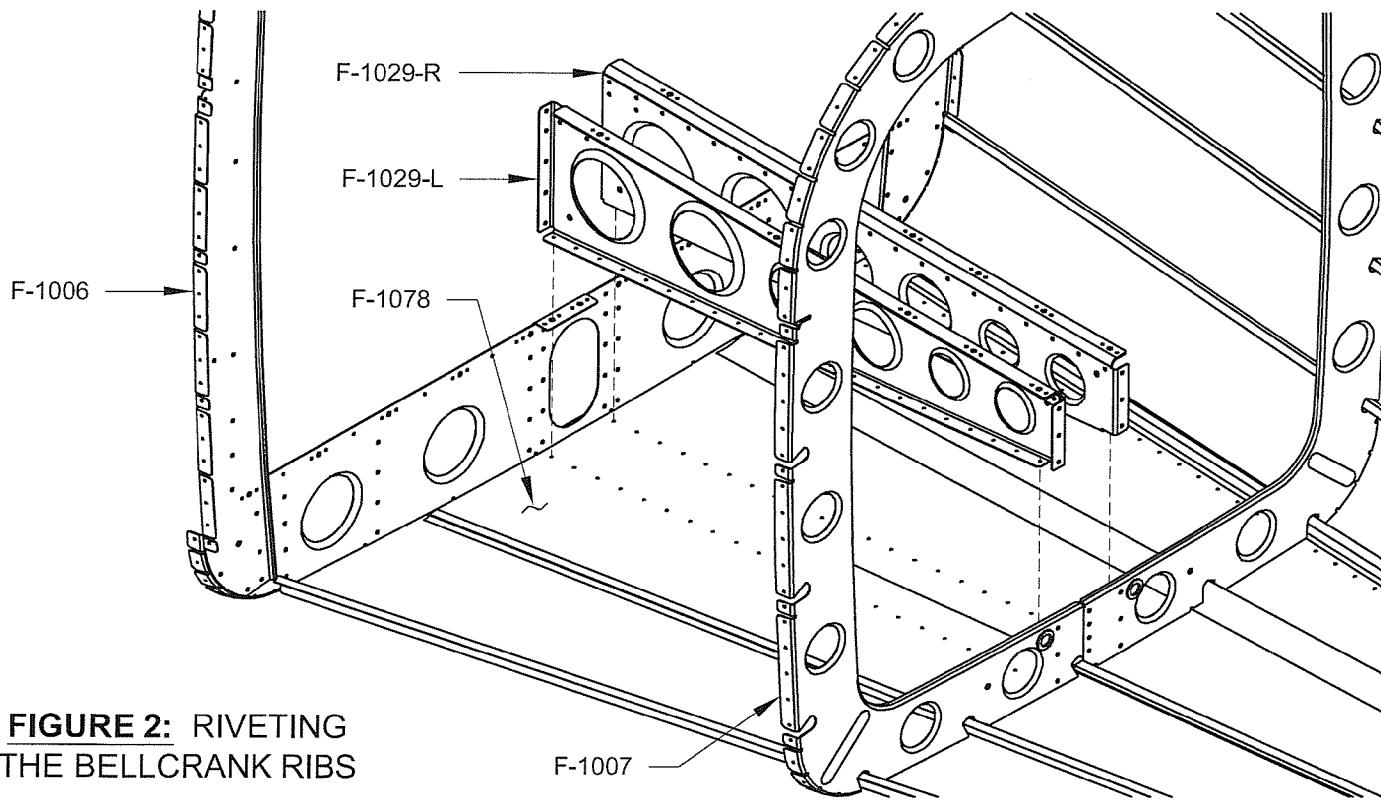
Step 1: Rivet the nutplates shown in Figure 1 to the F-1037B & C Bellcrank Rib Angles using the rivets called out.

Step 2: Rivet the F-1037B & C Bellcrank Rib Angles to the F-1029-R & -L Bellcrank Ribs respectively using the rivets called out in Figure 1. Don't install rivets into the two forward holes of the F-1037B Bellcrank Rib Angle (see figure).



**FIGURE 1: RIVETING THE  
BELLCRANK RIBS ANGLES**

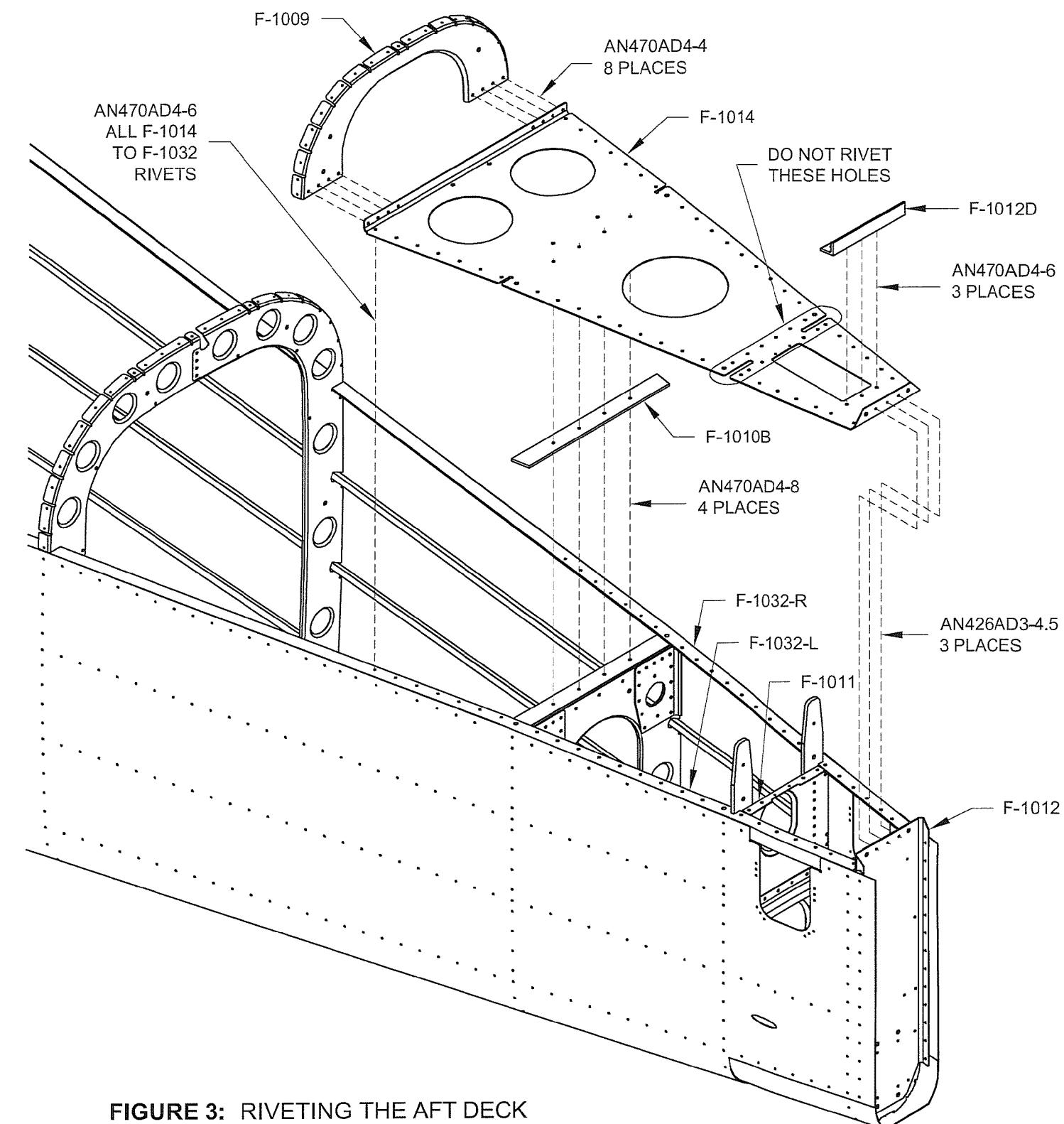
Step 3: Cleco the F-1029 Bellcrank Ribs to the F-1078 Forward Bottom Skin, the F-1006 Bulkhead, and the F-1007 Frame. Rivet the bellcrank ribs to the skin using the rivets called out on Page 10-25, Figure 1. Rivet the bellcrank ribs to the F-1007 Frame using AN470AD4-4 rivets. Do not rivet to the F-1006 Bulkhead.



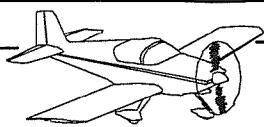
**FIGURE 2: RIVETING  
THE BELLCRANK RIBS**

Step 4: Using the rivets called out on Page 10-25, Figure 1, rivet the F-1073 Side Skins to the portion of the F-1032 Longerons under the F-1014 Aft Deck. The figure also points out the empennage fairing attachment screw holes; make sure not to install any rivets in these holes.

Step 5: Cleco the parts shown in Figure 3, then, using the rivets called out, rivet them together. Leave the F-1009 Frame for last so it's not in the way while riveting the rest of the parts. As indicated in the figure, don't install any rivets in the F-1014 Aft Deck in the area of the F-1011 Bulkhead.



**FIGURE 3: RIVETING THE AFT DECK**



Step 1: Rivet the F-1011B Stop /Doubler to the F-1014 Aft Deck and the flange of the F-1011 Bulkhead using the rivets called out in Figure 1.

Step 2: Temporarily bolt the F-1011D Attachment Bar Support Angle to the F-1011B Stop /Doubler, the F-1014 Aft Deck, and the F-1032 Longerons using the hardware shown in Figure 2. (For clarity, the F-1073-L Side Skin is not shown in Figure 2.)

Match-Drill the two holes indicated in Figure 2 into the attachment bar support angle from the F-1011C Horizontal Stab Attachment Bar using a #30 drill. Final-Drill the holes using a #12 drill.

Remove the support angle, then deburr the holes in the support angle and the horizontal stab attachment bar.

Rivet the support angel to the stop /doubler and aft deck using the rivets called out in Figure 1.

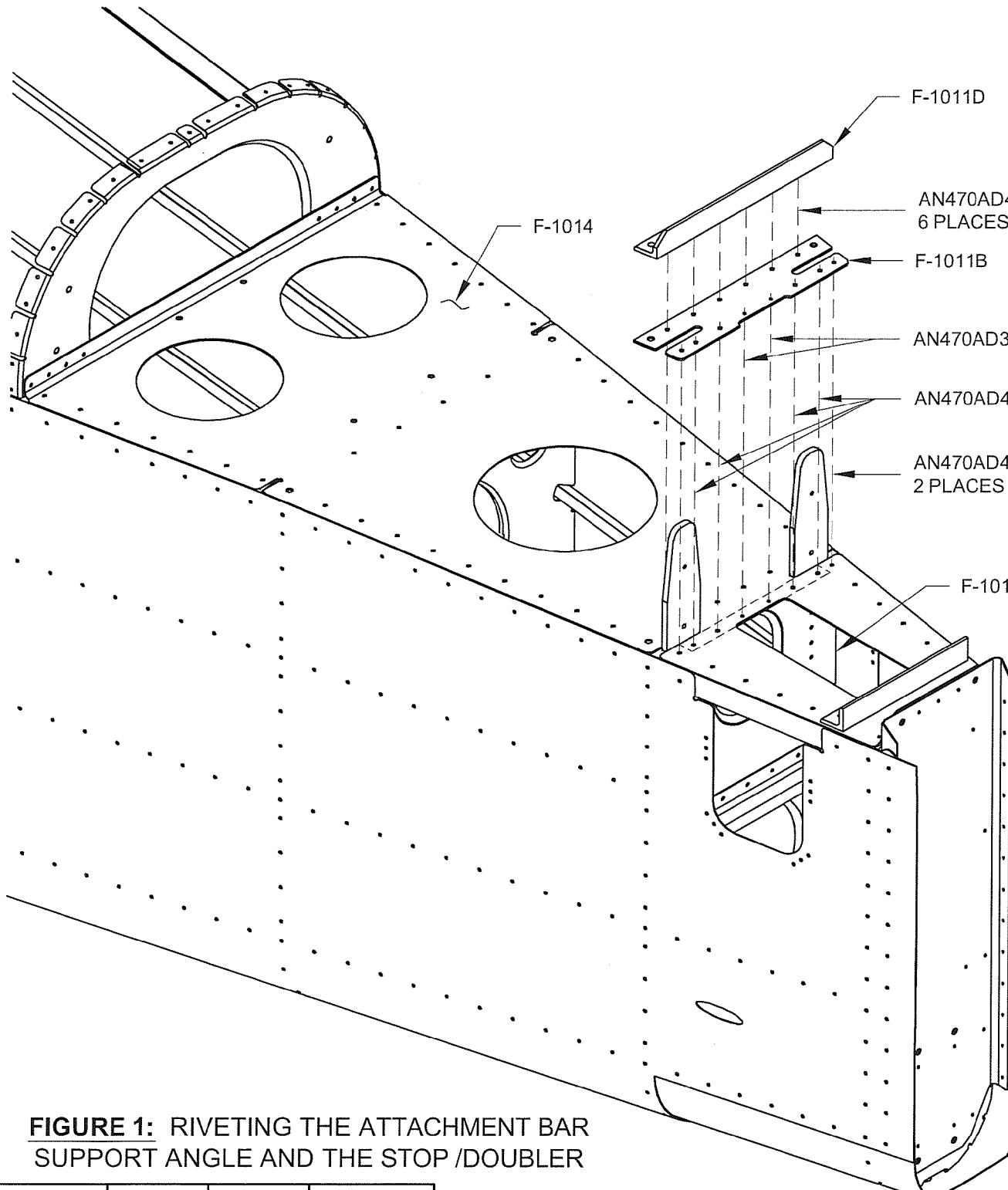


FIGURE 1: RIVETING THE ATTACHMENT BAR SUPPORT ANGLE AND THE STOP /DOUBLER

Step 3: Install the hardware shown in Figure 2. The optional eye bolt, which is screwed into the F-1012E Tie Down Bar, is not supplied in the kit, but can be purchased through Van's Aircraft.

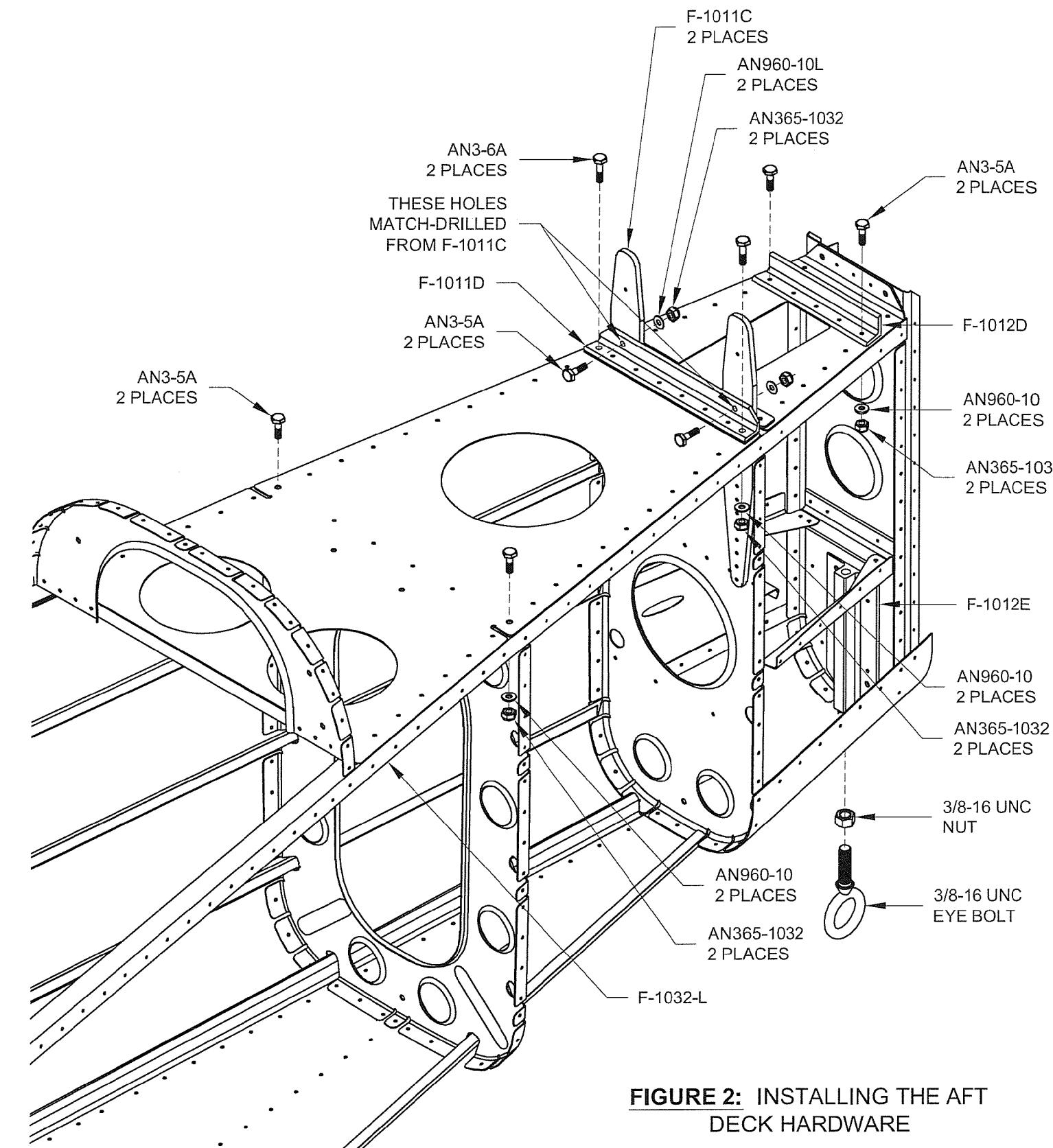
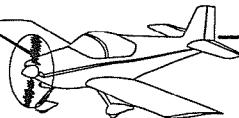


FIGURE 2: INSTALLING THE AFT DECK HARDWARE

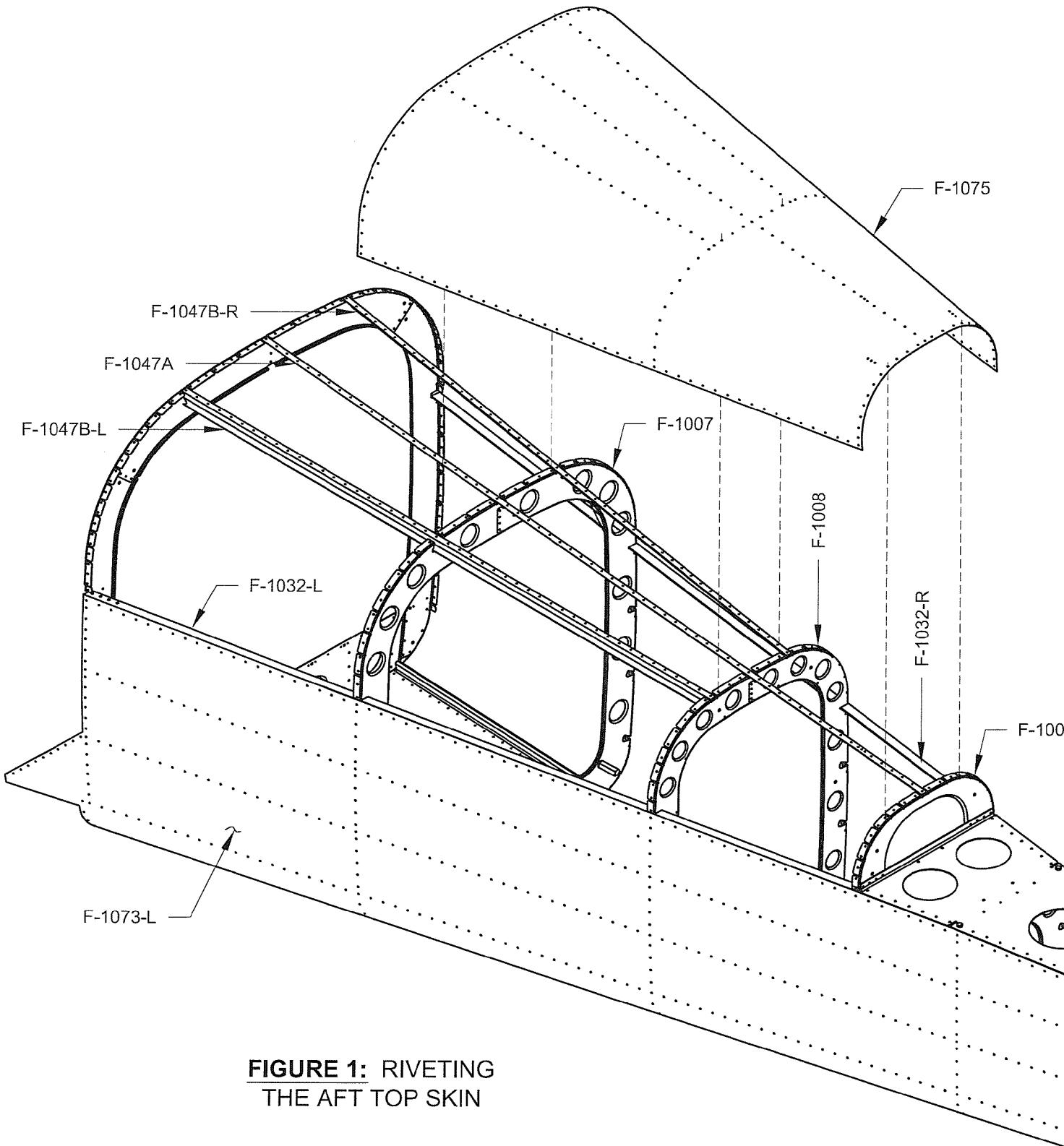


Step 1: Lay the F-1047A, -1047B-L, and -1047B-R J-Stiffeners back in place in the notches of the frames and bulkheads as shown in Figure 1.

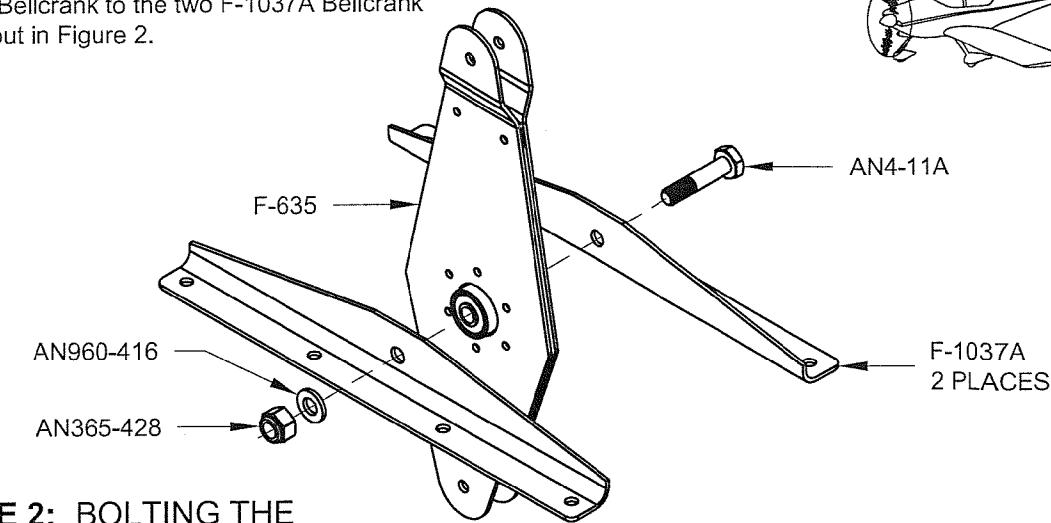
Step 2: Cleco the F-1075 Aft Top Skin in place.

Using the rivets called out on Page 10-26, Figure 1, rivet the aft top skin to the three F-1047 J-Stiffeners and to the F-1008 & -1009 Frames. When riveting to the frames, rivet from the center of the skins out to the sides. DO NOT rivet the skin to the F-1007 Frame. It will be riveted to the frame, along with the F-1074 Forward Top Skin, when the tailcone is attached to the forward fuselage.

Rivet the sides of the aft top skin to the F-1073 Side Skins and the underlying F-1032 Longerons using the rivets called out on Page 10-25, Figure 1. Do not rivet the front corner holes in the aft top skin which are common to the F-1007 Frame.



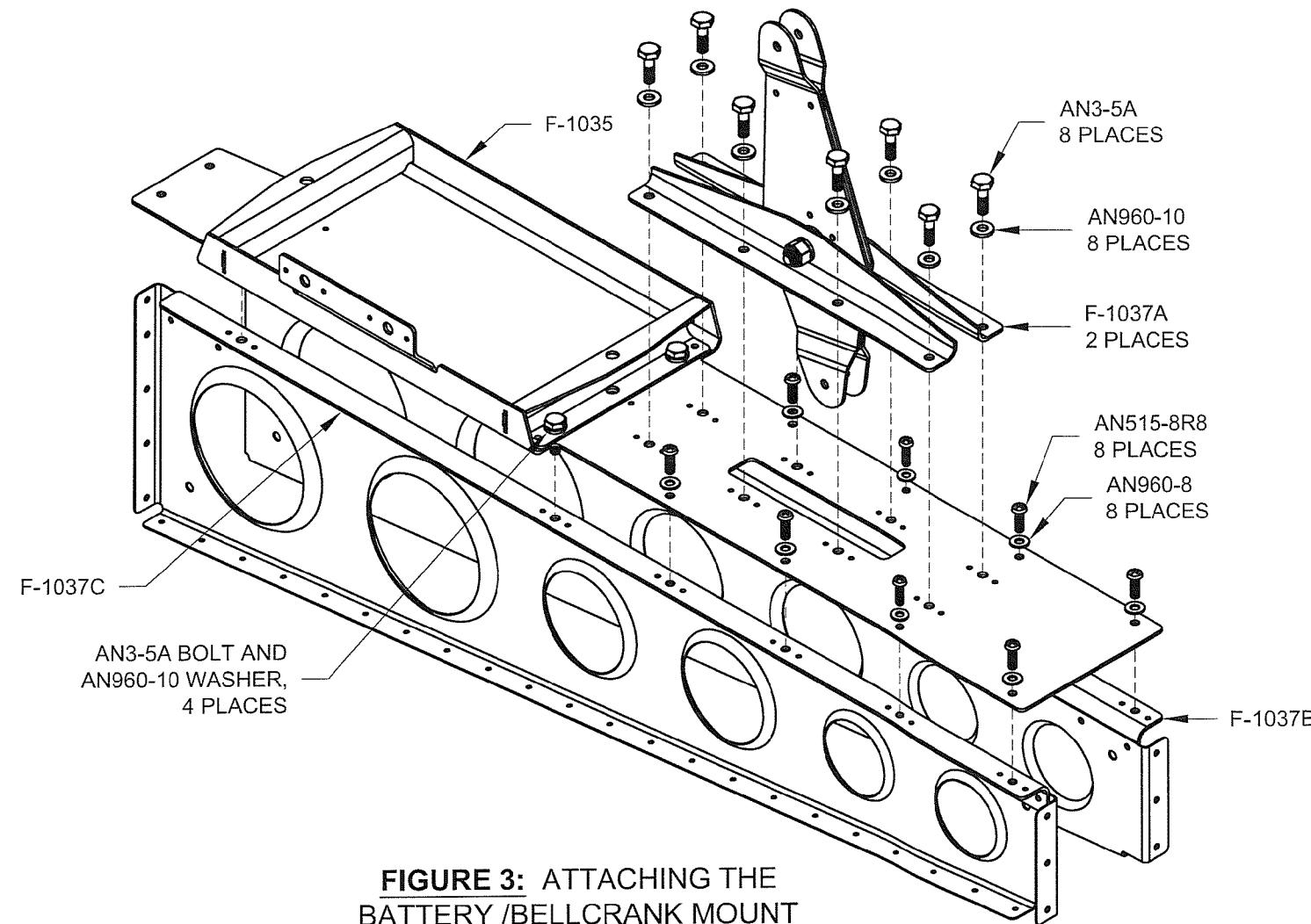
Step 3: Attach the F-635 Elevator Bellcrank to the two F-1037A Bellcrank Angles using the hardware called out in Figure 2.



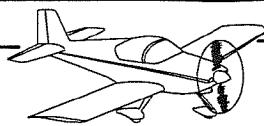
**FIGURE 2: BOLTING THE ELEVATOR BELLCRANK**

Step 4: Bolt the two F-1037A Bellcrank Angles to the F-1035 Battery /Bellcrank Mount using the hardware shown in Figure 3.

Step 5: Attach the F-1035 Battery /Bellcrank Mount to the F-1037B & C Bellcrank Rib Angles using the hardware shown in the Figure 3. Do not secure the fasteners in this step completely; the battery /bellcrank mount will have to be removed later.



**FIGURE 3: ATTACHING THE BATTERY /BELLCRANK MOUNT**



Step 1: Secure the Concord Battery to the F-1035 Battery /Bellcrank Mount using the F-1036A Battery Channel and the hardware shown in Figure 1. The top hole in each F-1036B Battery Channel may be enlarged if it is difficult to install the bolts.

Step 2: Secure the ES 24115 Master Relay to the F-1035 Battery /Bellcrank Mount using the hardware shown in Figure 1.

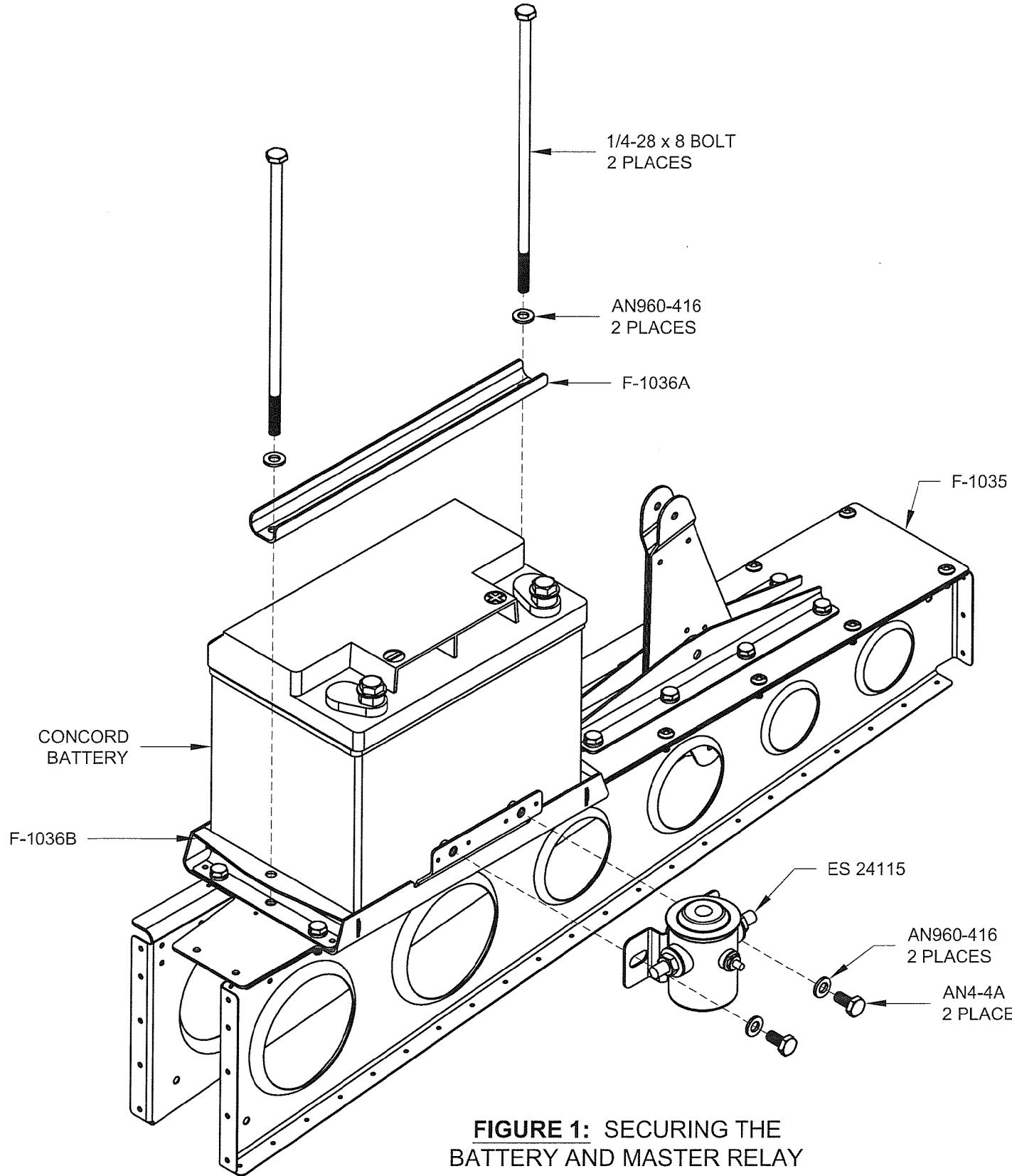


FIGURE 1: SECURING THE  
BATTERY AND MASTER RELAY

Step 3: Bolt the F-636 Shoulder Harness Anchors to the F-1032 Longerons using the hardware shown in Figure 2.

This completes the construction of the tailcone. The F-1028 Baggage Bulkhead Channel, the F-1074 Forward Top Skin, and the F-1006 Bulkhead are riveted after the tailcone is attached to the forward fuselage.

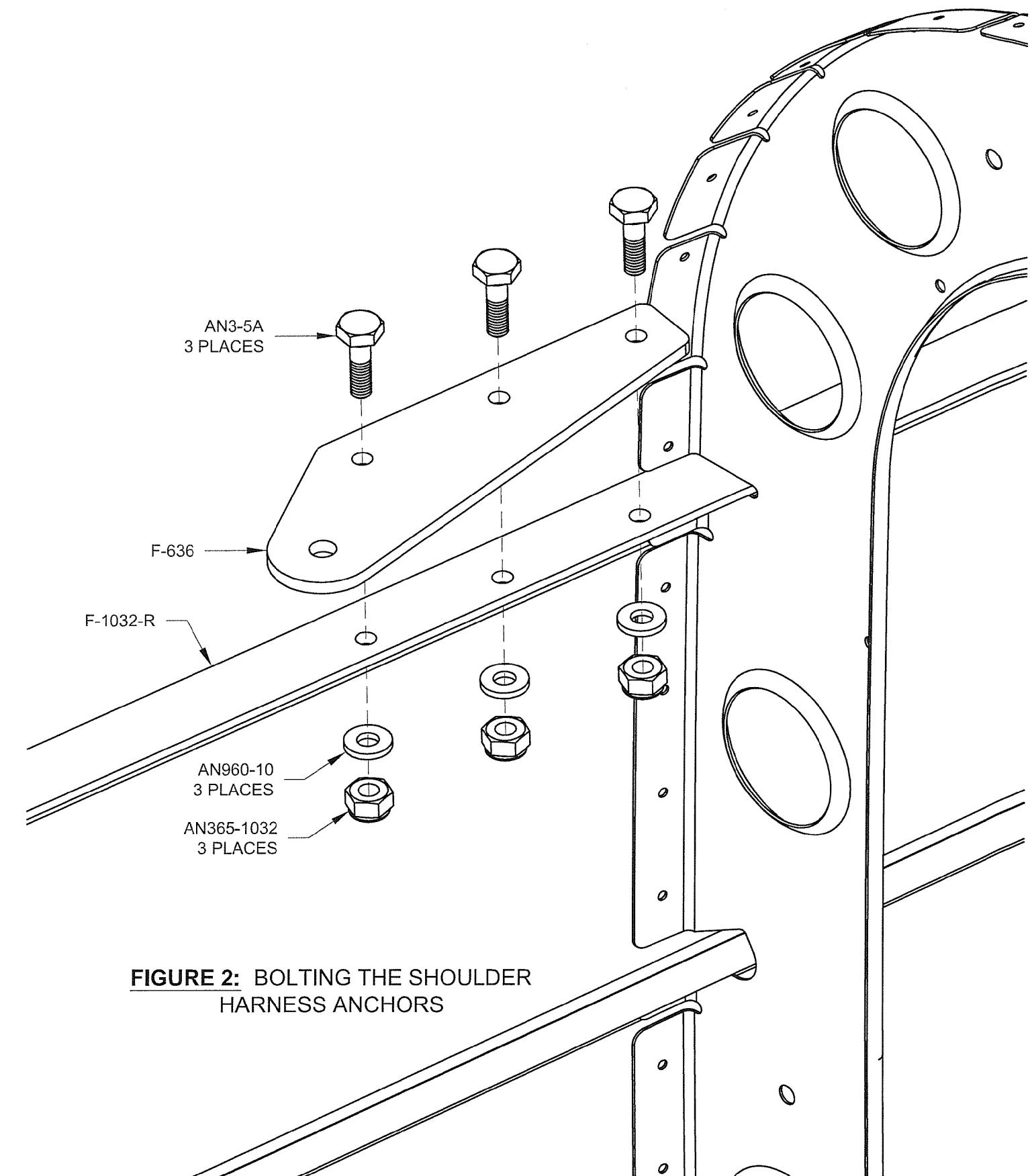
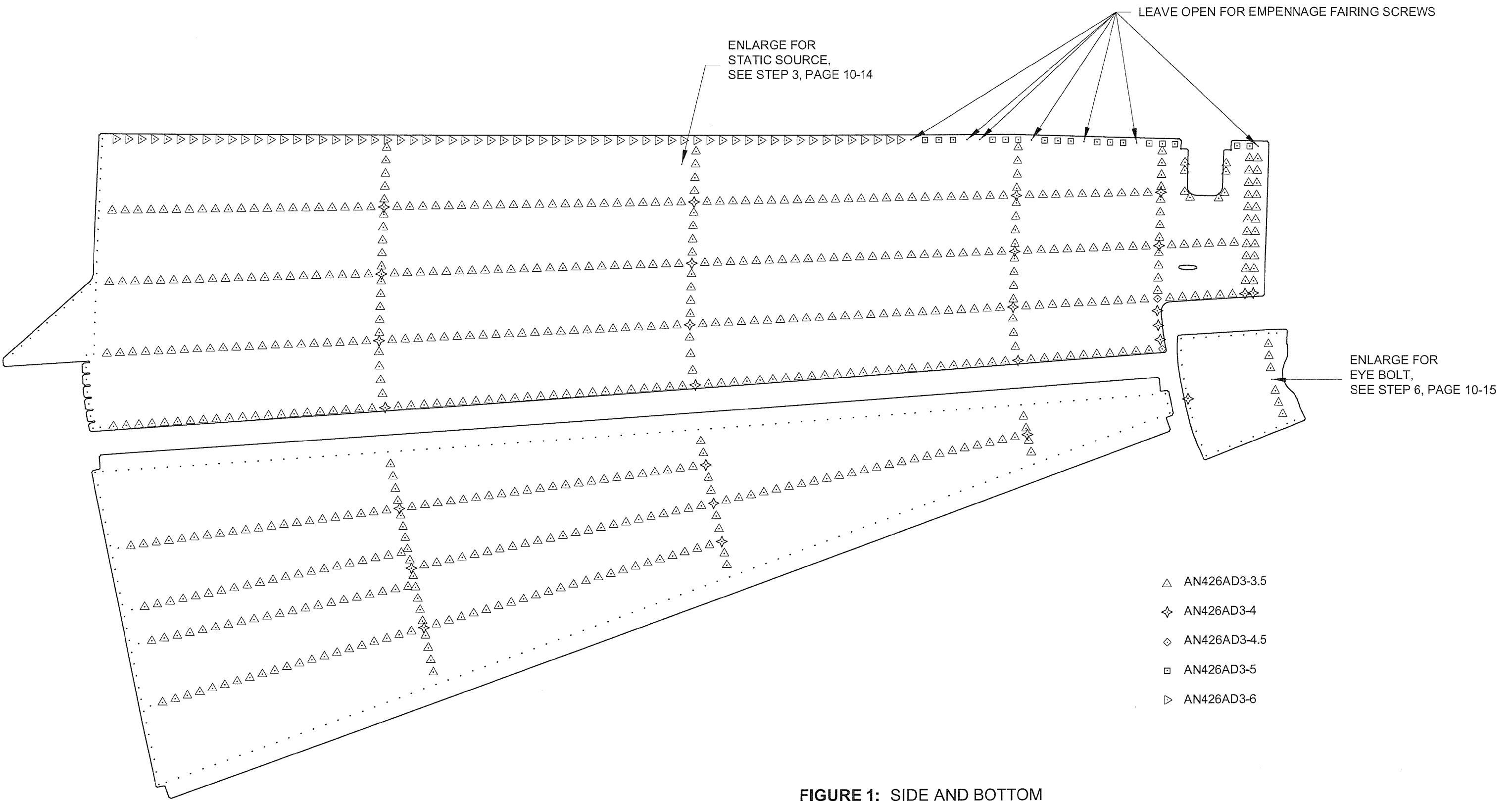
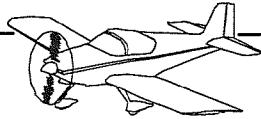
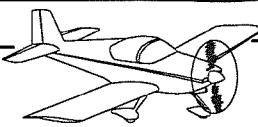


FIGURE 2: BOLTING THE SHOULDER  
HARNESS ANCHORS

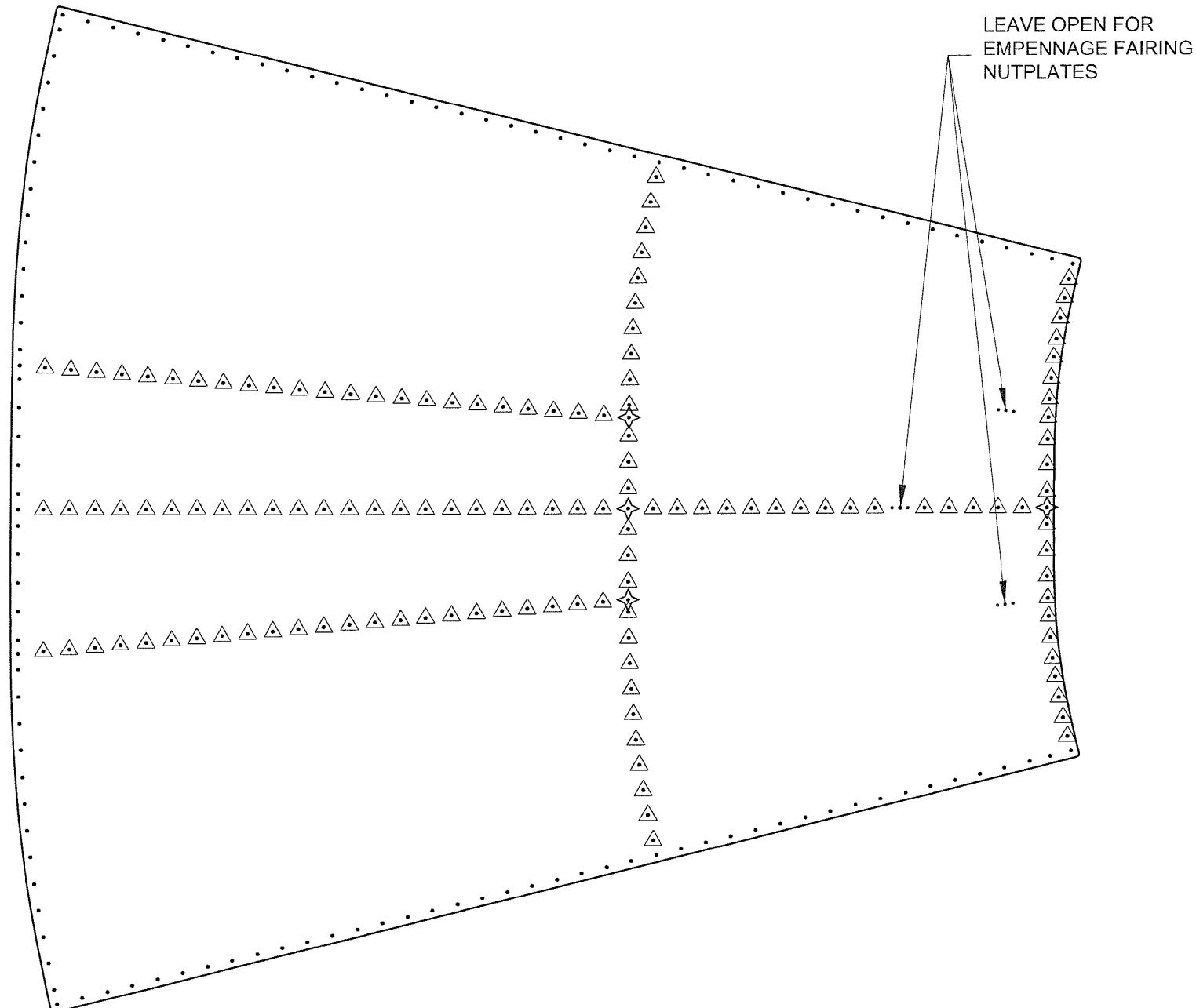


**FIGURE 1: SIDE AND BOTTOM  
SKIN RIVETS**

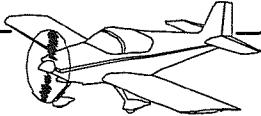


△ AN426AD3-3.5

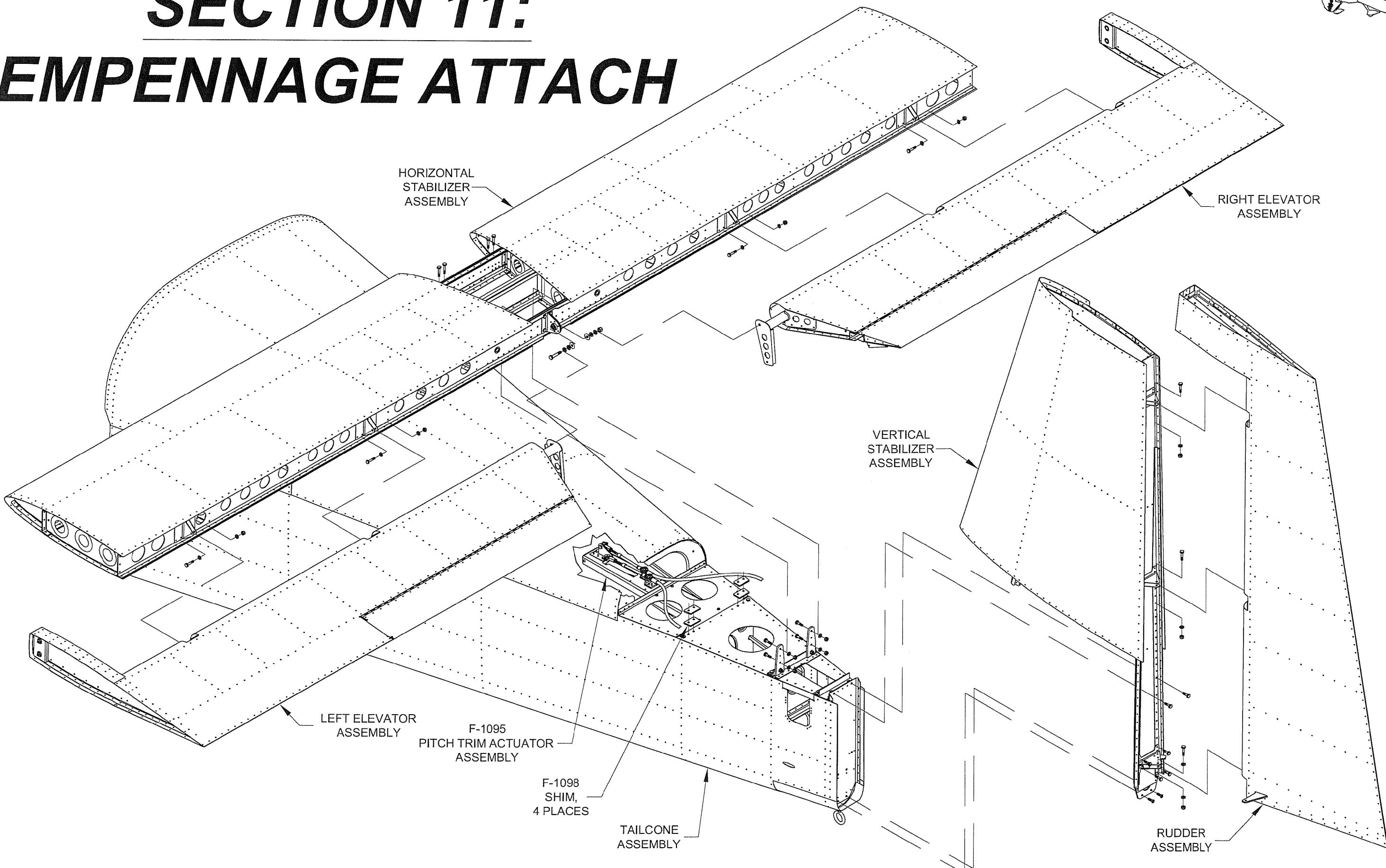
◆ AN426AD3-4

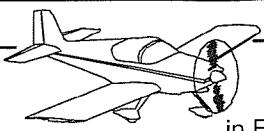


**FIGURE 1: TOP SKIN RIVETS**



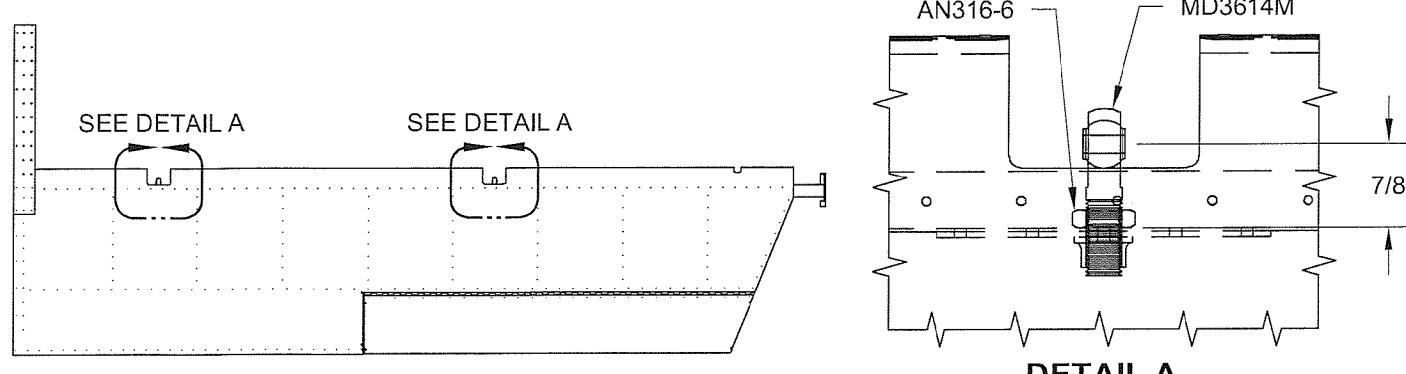
# SECTION 11: EMPPENNAGE ATTACH





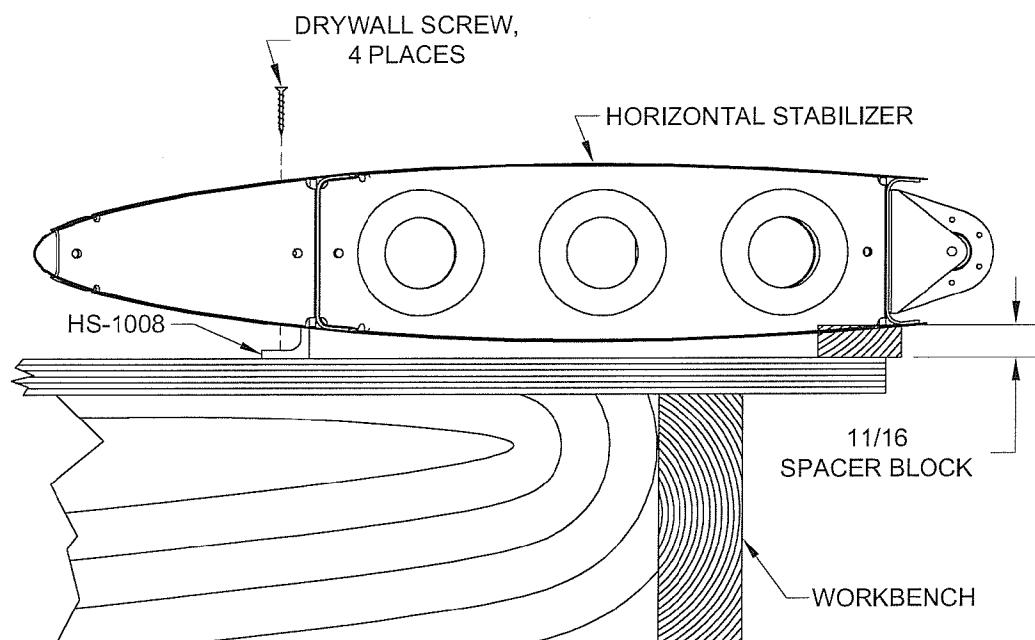
**VAN'S AIRCRAFT, INC.**

Step 1: Install MD3614M Rod End Bearings and AN316-6 Jam Nuts into both elevators as shown in Figure 1. Tighten jam nuts after achieving the rod end bearing engagement called for in Figure 1, Detail A.



**FIGURE 1: ROD END BEARING ATTACH**

Step 2: Attach the horizontal stabilizer to the workbench using four "drywall" type screws as shown in Figure 2. Position the stabilizer on the workbench such that the tips hang over the edges of the workbench. The overhang is necessary so that the elevator counterbalance arms will clear. See Figure 4. The screws are installed through the holes in the HS-1008 Horizontal Stabilizer Front Spar Attachment Brackets into the surface of the workbench. Rest the rear spar of the horizontal stabilizer on a spacer block as shown in Figure 2 to hold the horizontal stabilizer in its correct orientation.



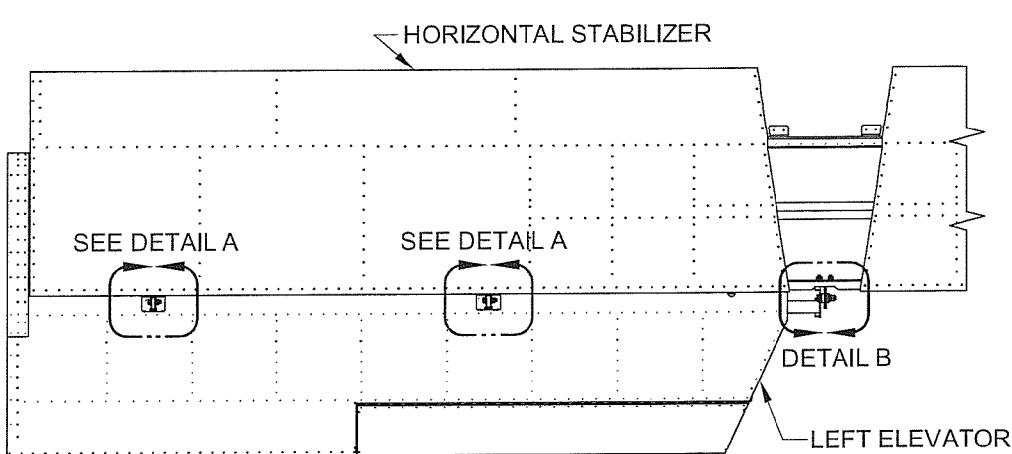
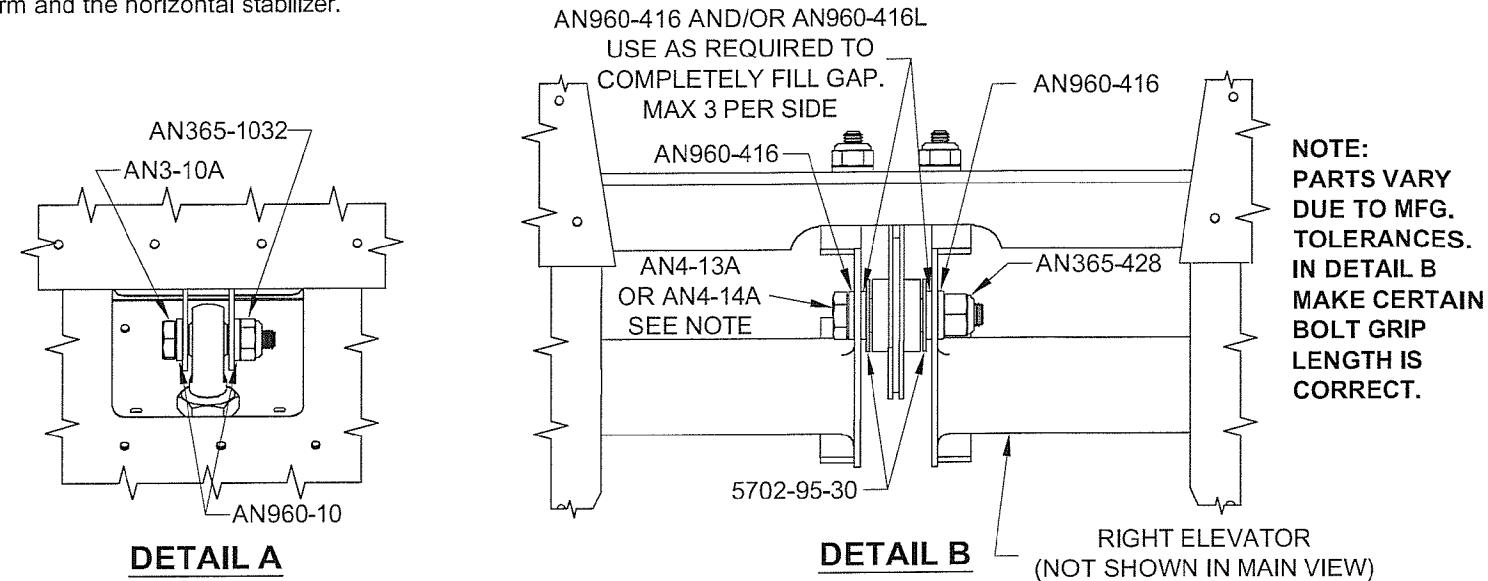
**FIGURE 2: HORIZONTAL STABILIZER SETUP**

Step 3: Temporarily install the left elevator to the horizontal stabilizer as shown in Figure 3. Elevator attach hardware is shown in Figure 3, Detail A. Not completely filling the gap between the elevator horn and the VA-146 with washers and then tightening the bolt to remove the gap will cause slight binding in the rod end bearings.

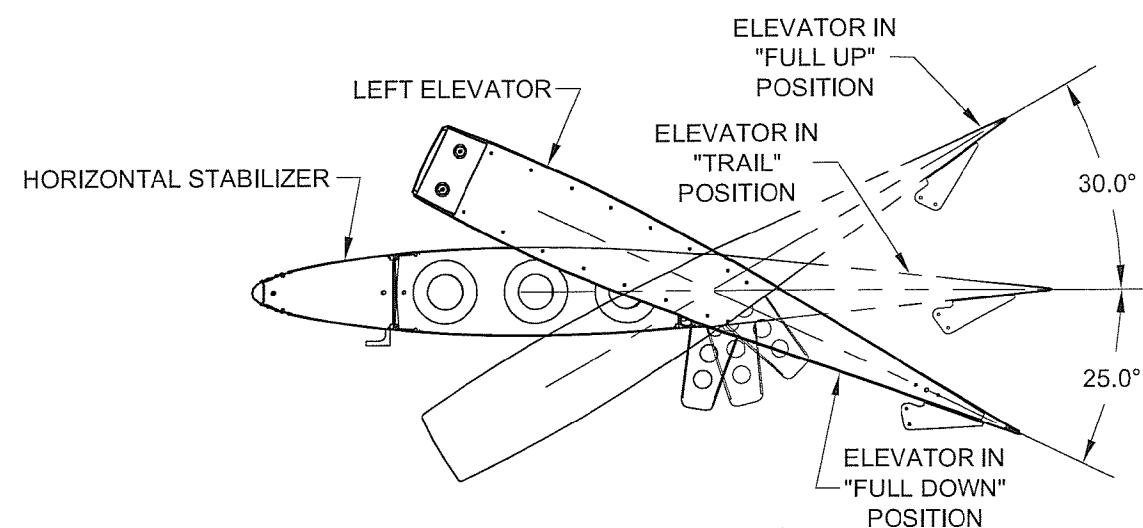
Perform an initial check to see that the elevator rotates freely and with no interference. The elevator should not come in contact with the upper or lower flanges of the horizontal stabilizer. There should be 1/8 inch gap between the outboard edge of the horizontal stabilizer and the inboard edge of the elevator counterbalance arm. Tighten the jam nuts after completing the adjustments.

Step 3: (continued) Final check for 30° "UP" elevator travel and 25° "DOWN" elevator travel as shown in Figure 4. Elevator travel is best measured using a protractor or an electronic "smart level".

Step 4: Secure the elevator in the "trail" position by placing strips of duct tape over the gap between the elevator counterbalance arm and the horizontal stabilizer.



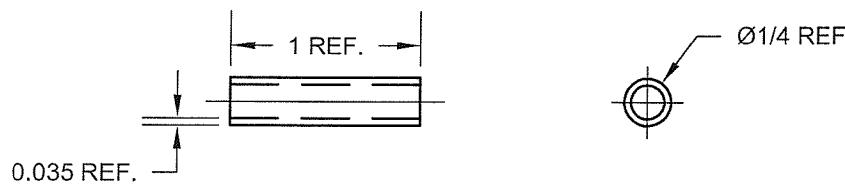
**FIGURE 3: ELEVATOR INSTALLATION**



**FIGURE 4: ELEVATOR TRAVEL**

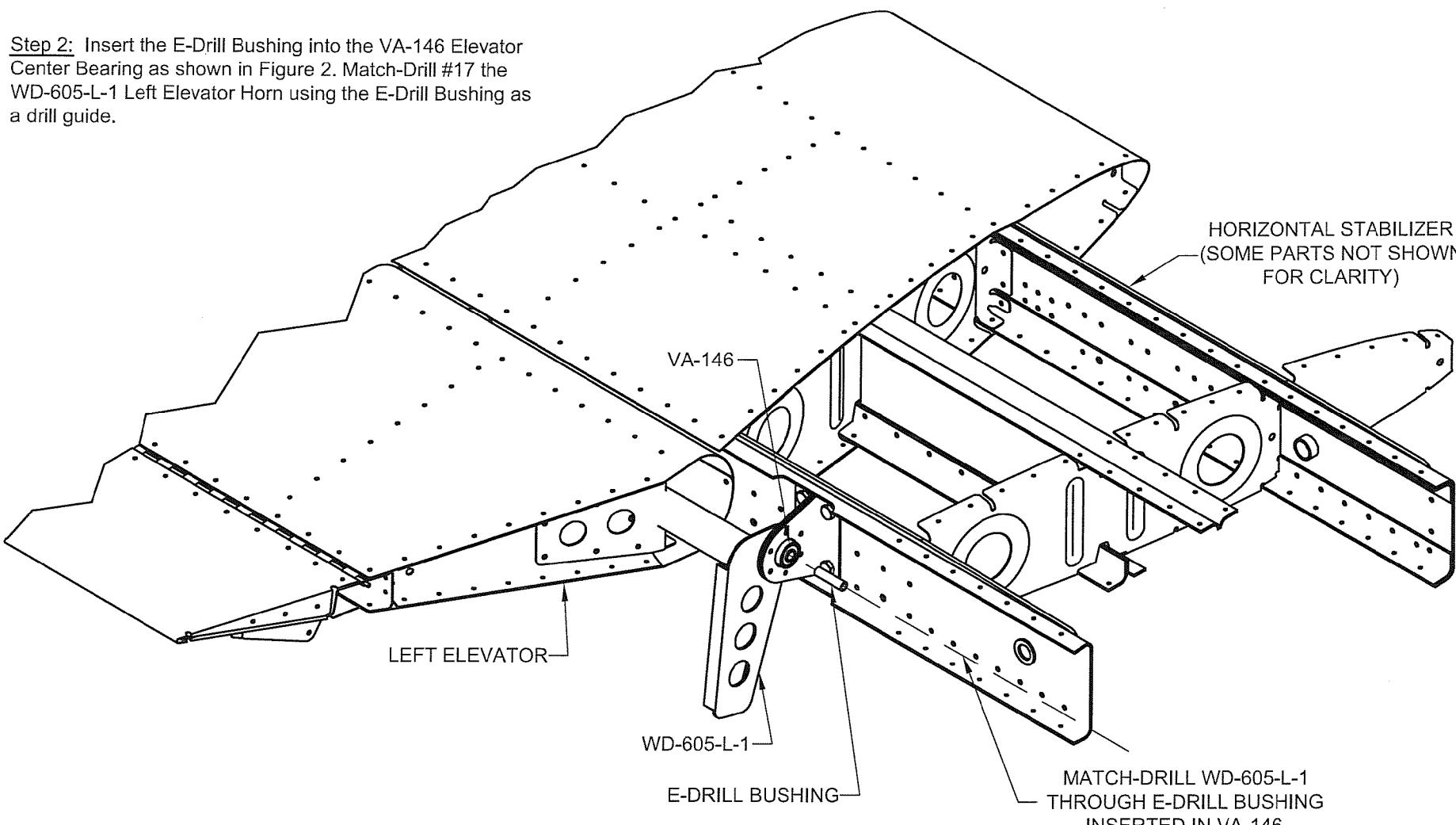


Step 1: Locate the steel E-Drill Bushing provided in the kit and shown in Figure 1 below. The drill bushing will be used to protect the hinge bearing from the drill bit when match-drilling the elevator horns to the inboard elevator hinge point. It may be necessary to reduce the diameter of the tube to get it to fit inside the bearing. Mount the tube in a drill press then hold a file to it until the diameter measures 0.250.



**FIGURE 1: ELEVATOR HORN DRILL BUSHING**

Step 2: Insert the E-Drill Bushing into the VA-146 Elevator Center Bearing as shown in Figure 2. Match-Drill #17 the WD-605-L-1 Left Elevator Horn using the E-Drill Bushing as a drill guide.



**FIGURE 2: MATCH-DRILL ELEVATOR HORN**

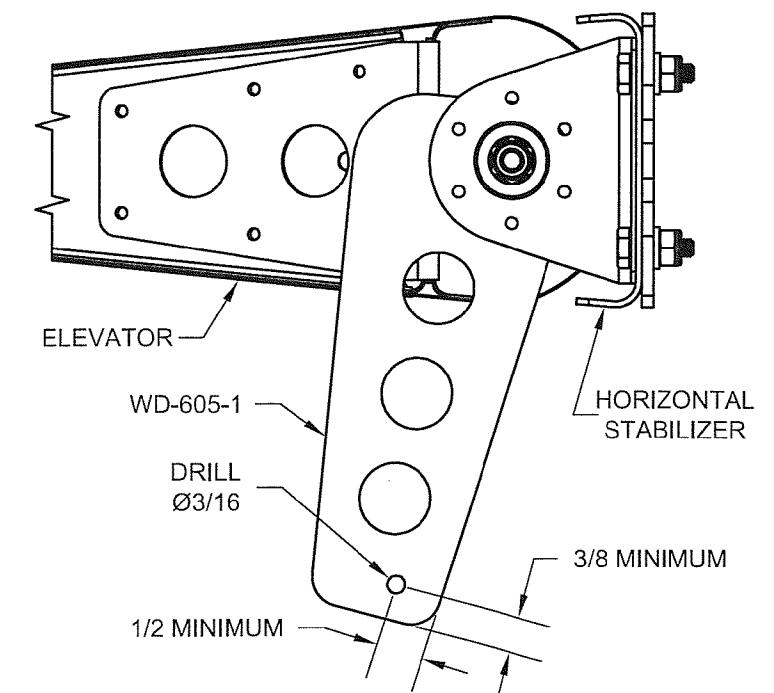
Step 3: Remove the left elevator from the horizontal stabilizer. Final-Drill the hole in the WD-605-L-1 Elevator Horn to 1/4 inch and deburr the hole.

Step 4: Repeat Page 11-2, Steps 3 and 4 and Steps 1 through 3 for the right elevator.

Step 5: Install both right and left elevators to the horizontal stabilizer. See Page 11-2, Figure 3 for hardware call-out. Secure both elevators in the "trail" position by placing strips of duct tape over the gap between the elevator counterbalance arm and the horizontal stabilizer.

Step 6: With both elevators in the "trail" position there will most likely be a mismatch in position between the bottom end of the WD-605-L-1 Elevator Horn and the bottom end of the WD-605-R-1 Elevator Horn. Identify which of the two elevator horns is the most aft.

Step 7: In the most aft WD-605-1 Elevator horn, locate and drill a 3/16 inch hole as shown in Figure 3.



**FIGURE 3: ELEVATOR PUSHROD BOLT HOLE**

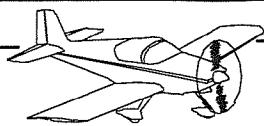
Step 8: Measure the spanwise distance between the WD-605-L-1 and WD-605-R-1 Elevator Horns.

Step 9: Make or find or otherwise acquire a block of wood/plastic/metal that is the same thickness or up to 1/32 inch less than the distance measured in Step 8. The block should be 3/4 to 1 1/4 inch wide and 2 to 3 inches long. This Drill Guide Block will be used to keep the bit perpendicular when drilling from one elevator horn to the other. A stack up of blocks is acceptable if a single block the correct thickness is not available. Use a drill press to drill a 3/16 inch diameter hole in the block(s) 1/2 inch from one end. The hole must be perpendicular to the drill guide block.

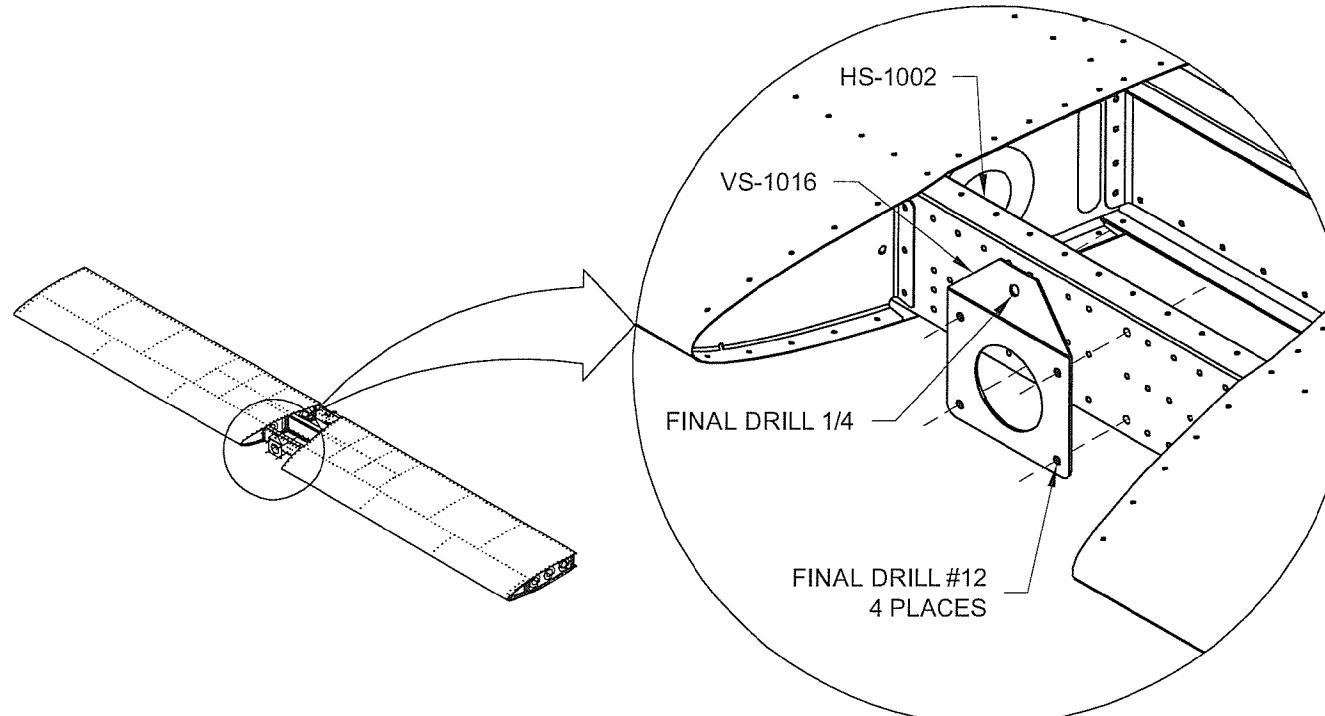
Step 10: Insert a 3/16 bolt through the hole drilled per Step 7 in the WD-605-1 Elevator Horn. Place the Drill Guide Block against the elevator horn with the bolt passing through the hole drilled per Step 9. Clamp both elevator horns together with the drill guide block between them then double-check that both elevators are aligned in trail.

Step 11: Remove the 3/16 bolt from the WD-605-1 Elevator Horn and Drill Guide Block. Match-Drill #12 a hole in the elevator horn using the elevator horn and drill guide block to aid alignment. Drill the hole as straight and as square as humanly possible.

Step 12: Remove the clamp and Drill Guide Block from the WD-605-1 Elevator Horns and then remove the elevators from the horizontal stabilizer. Reinstall the elevator attach hardware finger tight in the horizontal stabilizer hinge brackets so that it won't get lost. Deburr the holes in the elevator horns and set the elevators safely aside.

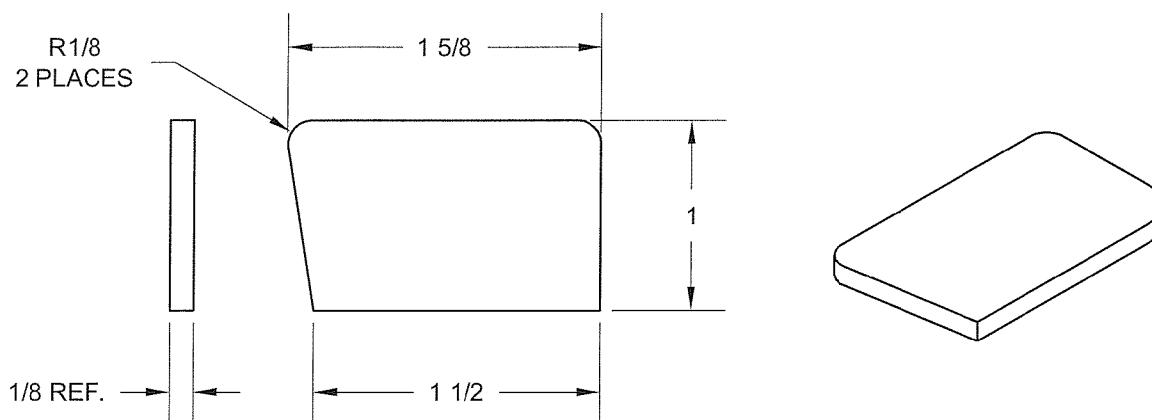


Step 1: Final-drill 1/4" the vertical stabilizer attach hole in the VS-1016 Vertical Stabilizer Front Spar Attach Bracket as shown in Figure 1. Final-Drill #12 the four holes common to the vertical stabilizer front spar attach bracket and the HS-1002 Front Spar. Deburr the holes and set the bracket aside for now.



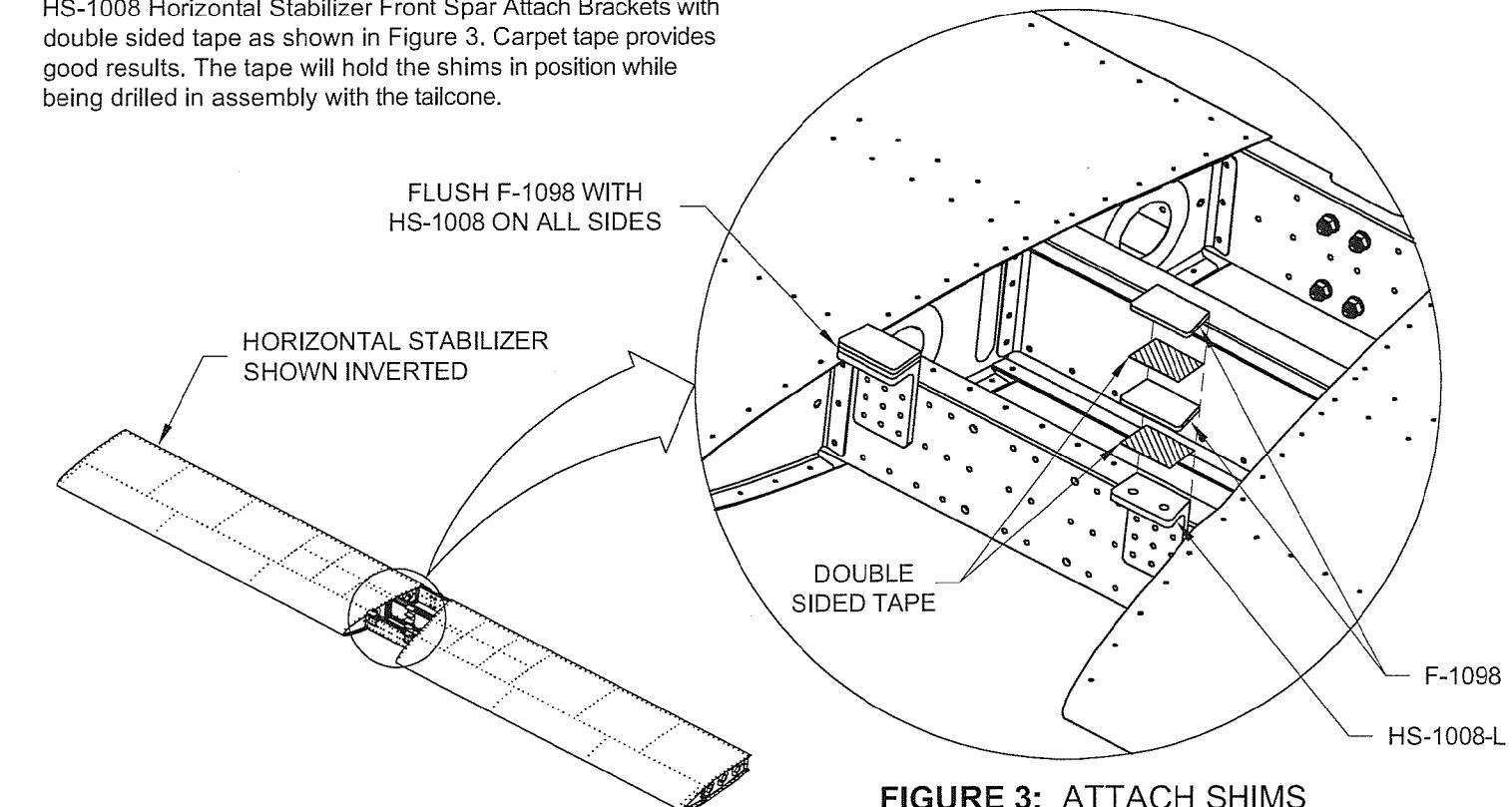
**FIGURE 1: DRILLING VERTICAL STABILIZER FRONT SPAR ATTACH BRACKET WITH SPAR**

Step 2: Fabricate four F-1098 Shims as shown in Figure 2 from AB4-125X1 1/2 aluminum bar.



**FIGURE 2: FABRICATE SHIMS**

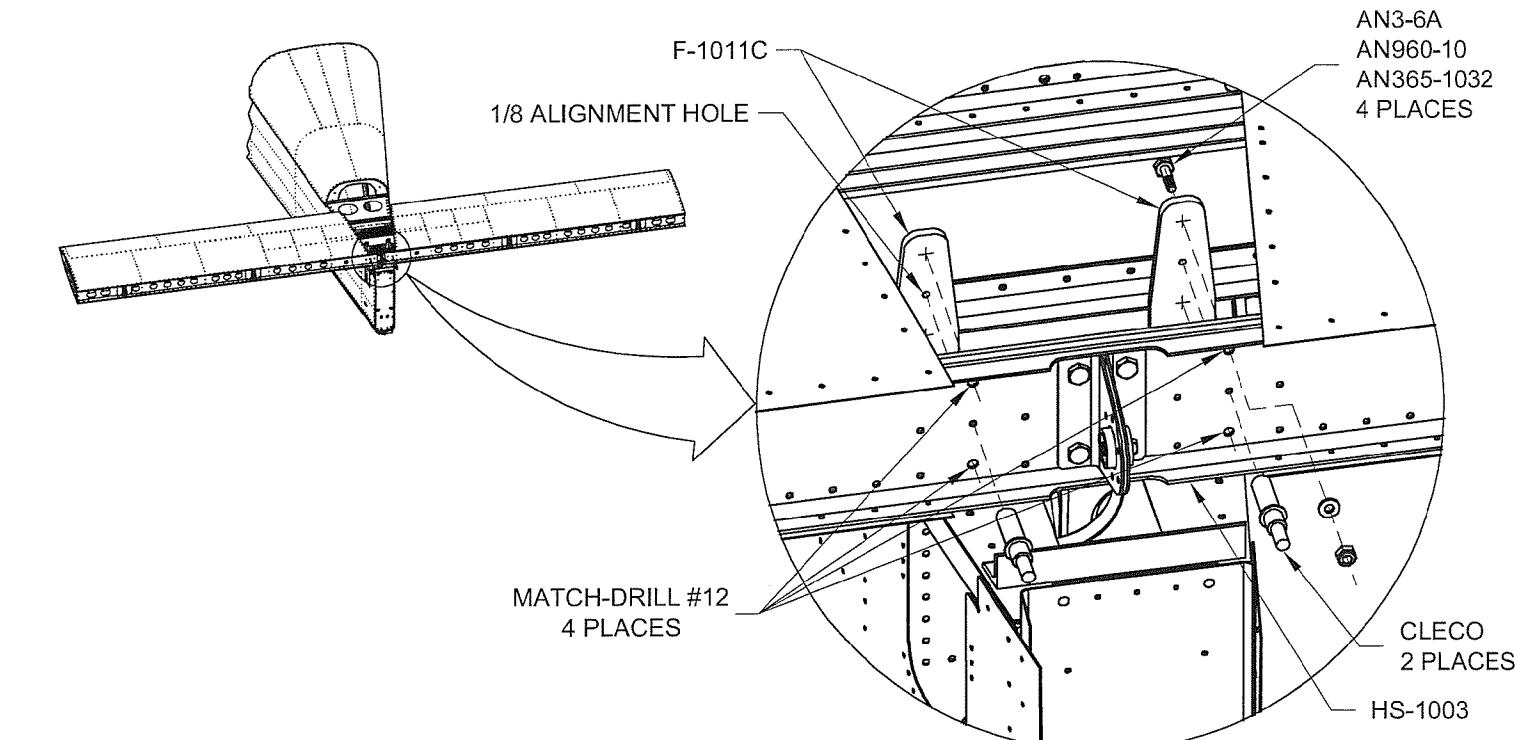
Step 3: Attach the F-1098 Shims to the underside of the HS-1008 Horizontal Stabilizer Front Spar Attach Brackets with double sided tape as shown in Figure 3. Carpet tape provides good results. The tape will hold the shims in position while being drilled in assembly with the tailcone.



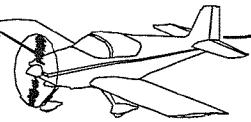
**FIGURE 3: ATTACH SHIMS**

Step 4: Lower the horizontal stabilizer onto the tailcone so that the HS-1003 Rear Spar is aft of the F-1011C Horizontal Stabilizer Attach Bars protruding from the aft fuselage as shown in Figure 4. Cleco the horizontal stabilizer to the horizontal stabilizer attach bars using the two #30 alignment holes in the horizontal stab and the two 1/8 inch holes in the bars.

Match-Drill #12 four holes in the horizontal stabilizer attach bars using the rear spar web as a drill guide. After each hole is drilled insert the hardware shown in Figure 4.

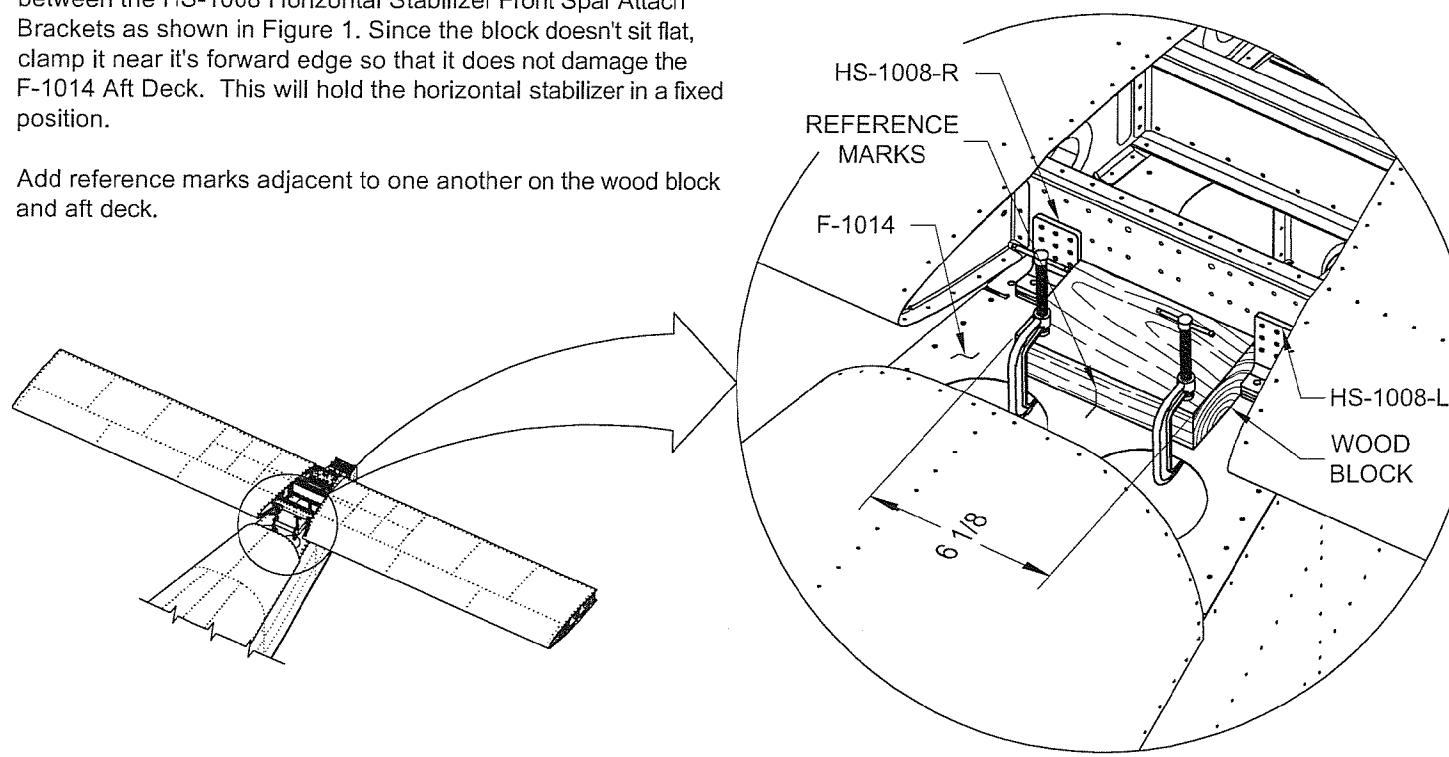


**FIGURE 4: CLECO AND DRILL ATTACH BARS**



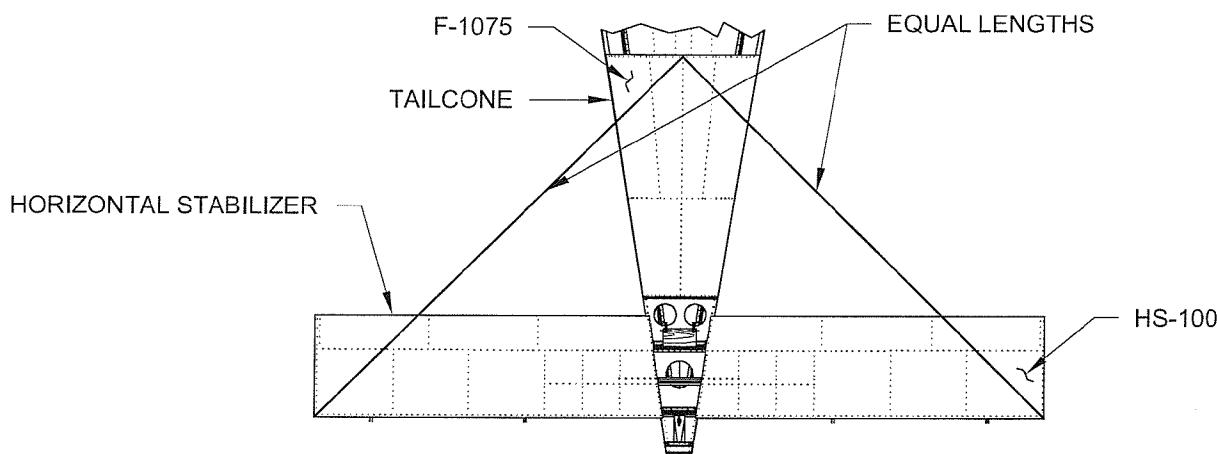
**Step 1:** Cut a 2x4 wood block to length so it nests snug between the HS-1008 Horizontal Stabilizer Front Spar Attach Brackets as shown in Figure 1. Since the block doesn't sit flat, clamp it near its forward edge so that it does not damage the F-1014 Aft Deck. This will hold the horizontal stabilizer in a fixed position.

Add reference marks adjacent to one another on the wood block and aft deck.



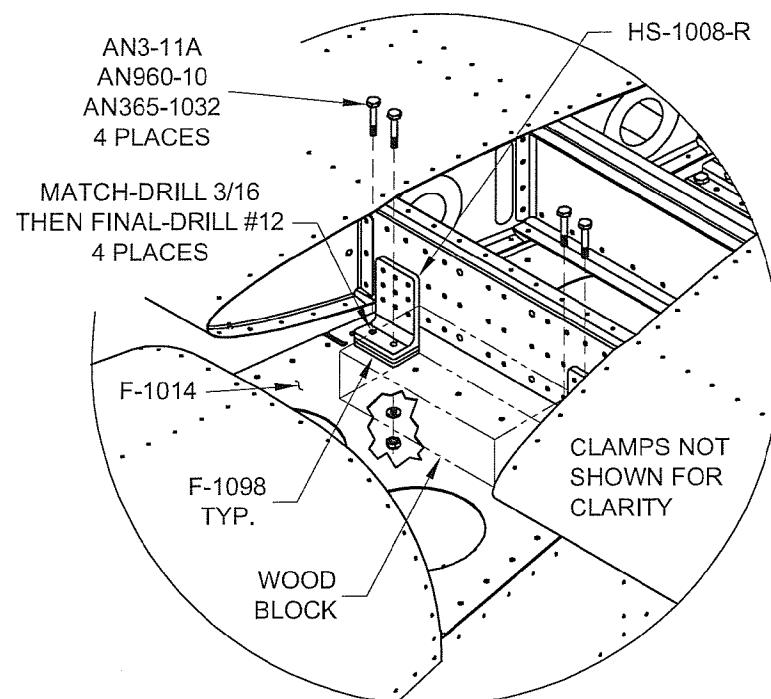
**FIGURE 1: CLAMP BLOCK TO AFT DECK**

**Step 2:** Measure from the aft outboard corners of the HS-1001 Skins to a common rivet hole on the centerline of the F-1075 Tailcone Aft Top Skin as shown in Figure 2 to check that the horizontal stabilizer is square to the tailcone. If the two measurements are equal the stabilizer is properly positioned. Proceed to the next step. If the measurements differ loosen the clamps holding the block of wood, slightly rotate the stabilizer, tighten the clamps and recheck the measurements. Repeat this until the lengths are equal.



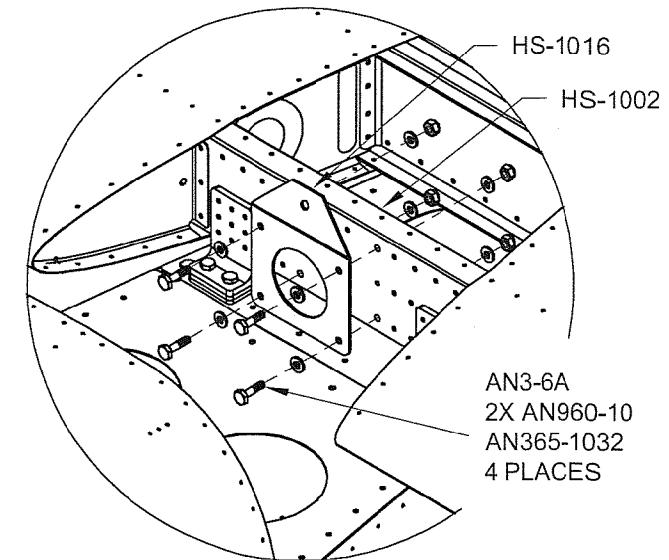
**FIGURE 2: SQUARE HORIZONTAL STABILIZER WITH TAILCONE**

**Step 3:** Match-Drill #12 the F-1098 Shims, F-1014 Aft Deck, F-1010B Spacer and F-1010A Angle using the four holes in the HS-1008 Horizontal Stabilizer Front Spar Attach Brackets as drill guides as shown in Figure 3. It may be necessary to use at least a 6 inch long extended drill bit. The F-1010B Spacer and F-1010A Angle are not shown. Remove the horizontal stabilizer. Deburr and prime if/as desired. Bolt the horizontal stabilizer to the tailcone using the hardware shown in Figure 3 and Page 4, Figure 4.



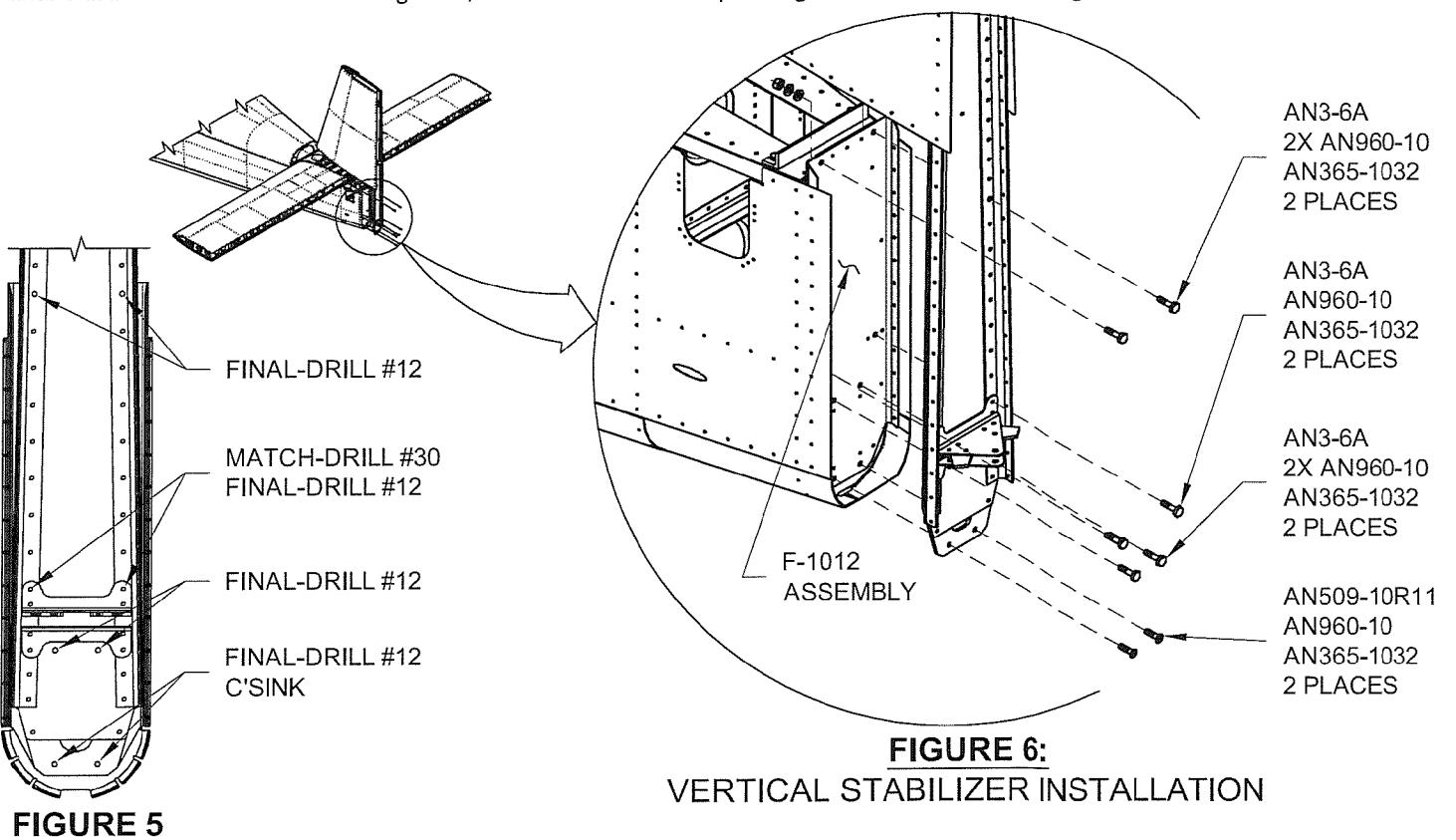
**FIGURE 3: MATCH-DRILL SPACERS AND TAILCONE**

**Step 4:** Bolt the VS-1016 Vertical Stabilizer Attach Bracket to the HS-1002 Front Spar as shown in Figure 4.



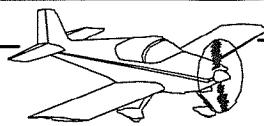
**FIGURE 4: ATTACH VS-1016**

**Step 5:** Final-Drill #12 the top two 3/16 holes in the rear spar doubler as shown in Figure 5. Bolt the vertical stabilizer to the F-1012 Aft Fuselage Bulkhead Assembly using the upper two AN3 bolts called out in Figure 6. Final-Drill #12 the four remaining 3/16 holes as shown in Figure 5 then machine countersink the two bottom holes. Install the hardware shown in Figure 6. Match-Drill #30 and final-drill #12 where called out in Figure 5, then install the corresponding hardware called out in Figure 6.

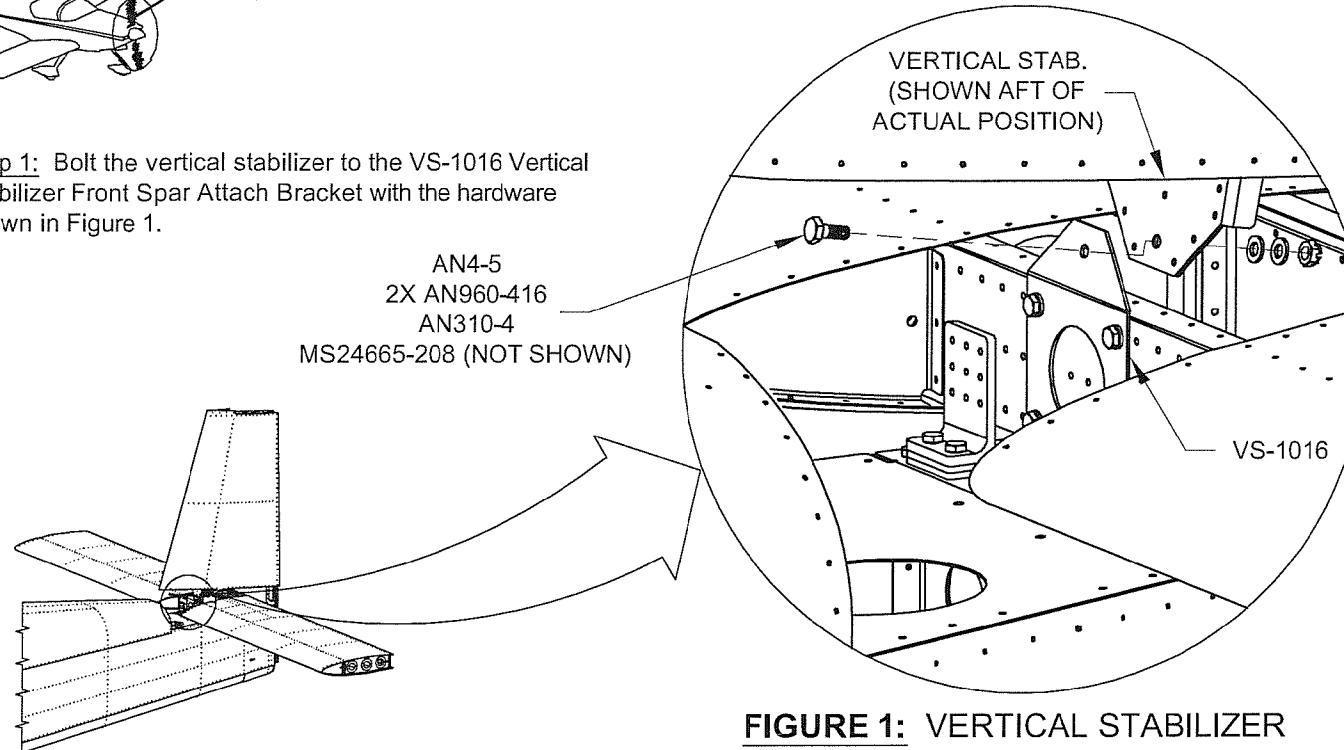


**FIGURE 5**

**FIGURE 6:  
VERTICAL STABILIZER INSTALLATION**



Step 1: Bolt the vertical stabilizer to the VS-1016 Vertical Stabilizer Front Spar Attach Bracket with the hardware shown in Figure 1.



**FIGURE 1: VERTICAL STABILIZER FORWARD ATTACH POINT**

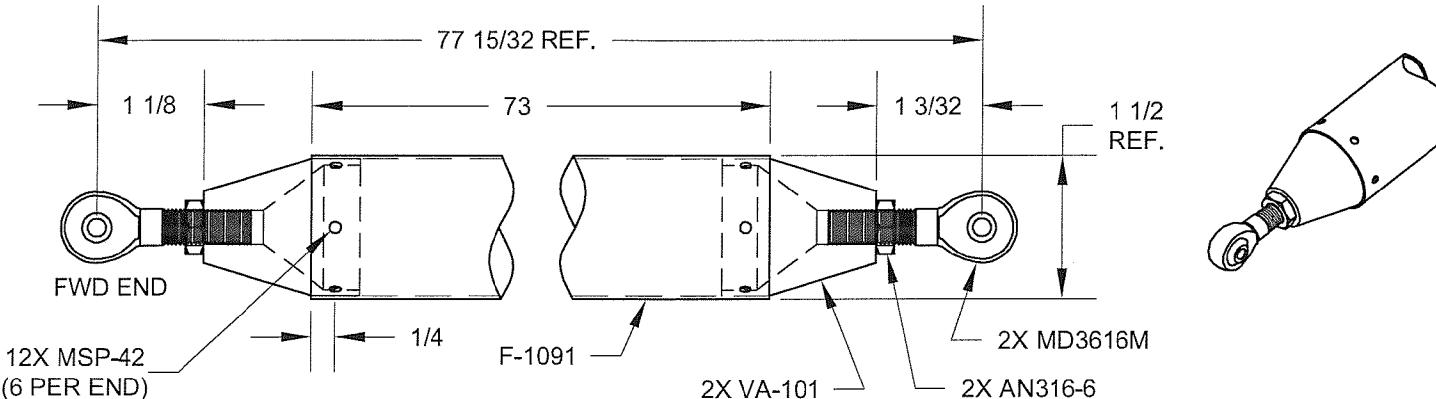
Step 2: Bolt the elevators to the horizontal stabilizer. They should swing freely with no resistance. See Page 11-2, Figure 3.

Step 3: Cut the F-1091 Pushrod to length from AT6-035 X 1 1/2 aluminum tube as shown in Figure 2.

Step 4: Install the VA-101 Threaded Insert into the F-1091 Elevator Pushrod. In order to accurately mark the locations of the threaded insert attach holes onto the pushrod make a simple template from a strip of stiff paper. Wrap the 1/2 X 2 in. strip around the outside of the pushrod, trim it until the ends just meet, then flatten it out and mark the pattern of six evenly spaced holes. Wrap it around the pushrod again and transfer the spacing to the pushrod. Drill # 30. Disassemble, deburr and prime the pushrod ends.

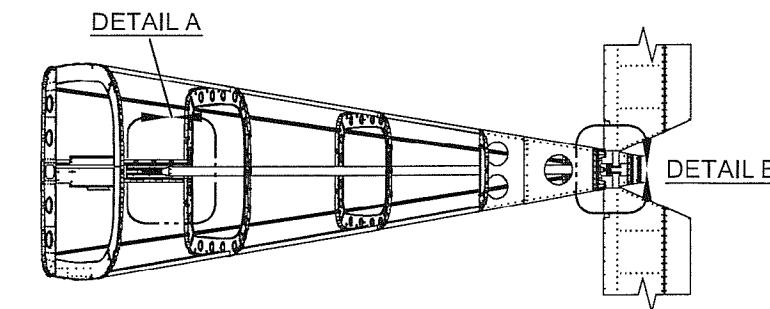
Because the pushrod effectively becomes an enclosed unit with no practical possibility of internal inspection we recommend priming the inside of the pushrod. Pour liquid primer into one end and swirl it toward the other, coating the entire inside of the pushrod. An alternative method is to spray primer into one end of the pushrod, then turn the pushrod around and spray into the other end. Let the primer cure thoroughly before continuing. The primer must be dry before installing the rod end bearings. We have seen wet primer migrate into the rod end bearing and freeze the bearing.

Reinstall the threaded insert and rivet as called out in Figure 2. Thread the jam nuts onto the rod end bearing shanks then thread the rod end bearings into both ends of the pushrod. Leave the jam nuts finger tight for now.



**FIGURE 2: PUSHROD ASSEMBLY**

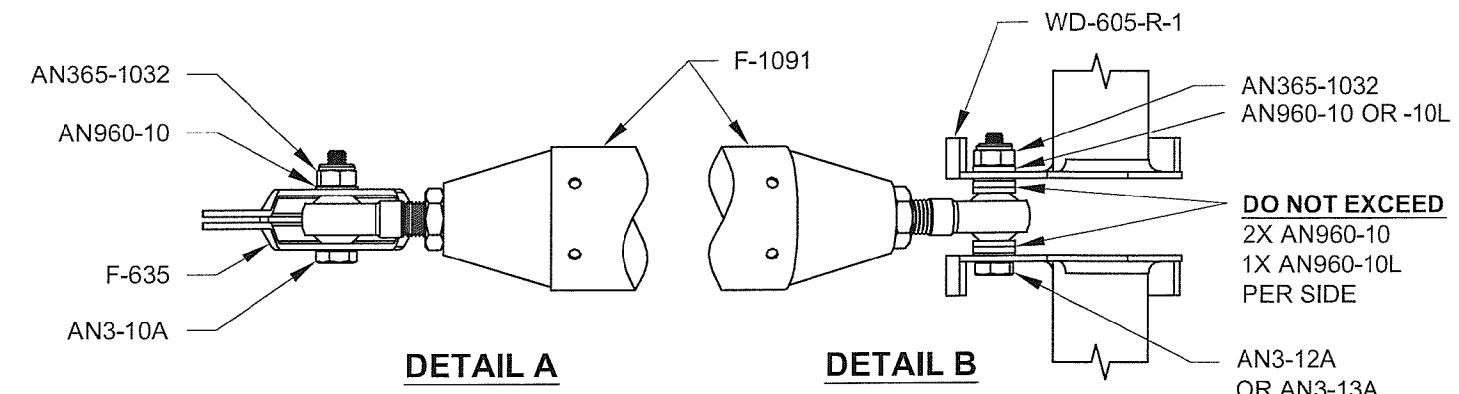
Step 5: Install the F-1091 Elevator Pushrod bolting it to the WD-605-L-1 and WD-605-R-1 Elevator Horns and to the F-635 Bellcrank Assembly using the hardware shown in Figure 3, Details A and B.



**FIGURE 3: PUSHROD INSTALLATION**

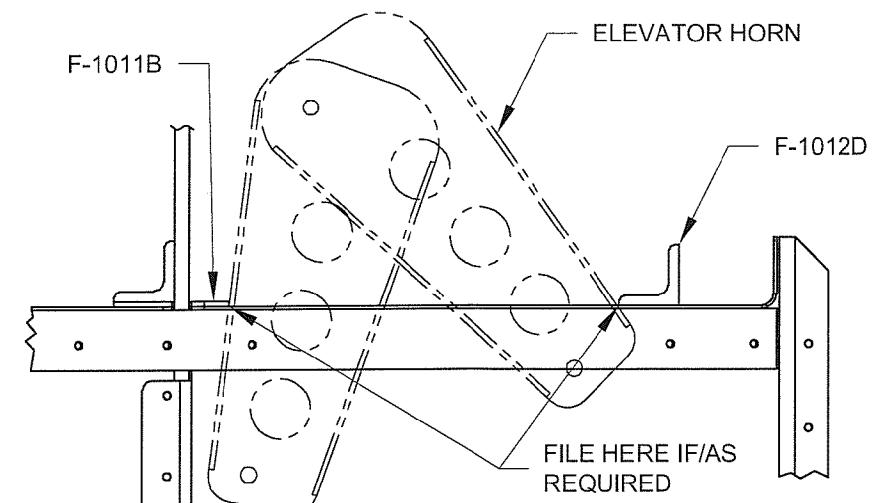
**NOTE:** Parts vary due to manufacturing tolerances. In Detail B make certain bolt grip length is correct. If gap exists after using maximum number of washers, tighten nut and bolt to eliminate gap.

**WARNING:** Do not exceed the maximum number of washers shown in Detail B.

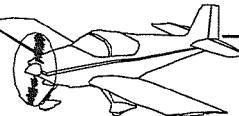


**DETAIL A**

**DETAIL B**



**FIGURE 4: ELEVATOR STOP ADJUSTMENT**



Step 1: Secure the elevator in the "trail" position by placing strips of duct tape over the gap between the elevator counterbalance arm and the horizontal stabilizer.

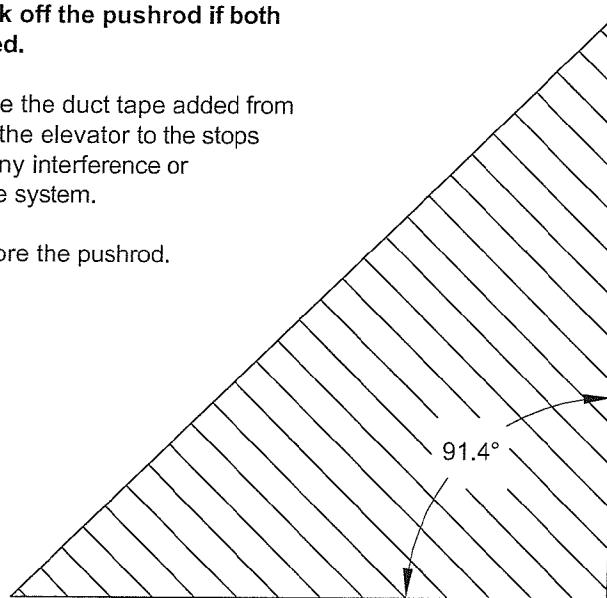
Step 2: Transfer the template shown in Figure 1 to a piece of stiff cardboard or wood. (To avoid cutting up your plans centerpunch through the paper just at the 3 corners.) Adjust the rod end bearings on the F-1091 Elevator Pushrod until the angle of the F-635 Bellcrank Assembly matches that of the template as shown in Figure 2.

Step 3: Tighten the jam nuts against the threaded inserts.

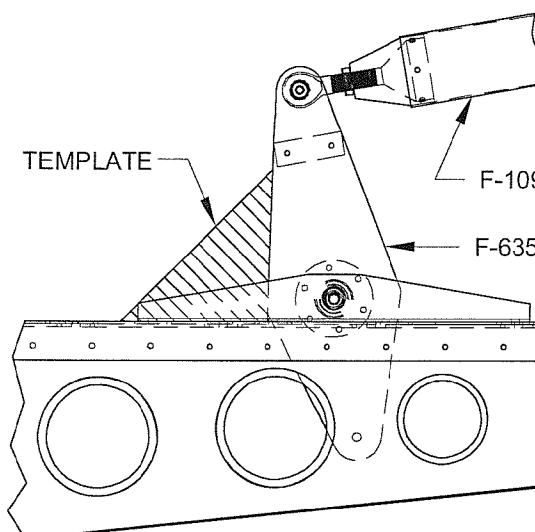
**WARNING:** In the final installation both rod ends must have over half the thread engaged making it impossible for a bearing to back off the pushrod if both ends are pinned.

Step 4: Remove the duct tape added from Step 1. Deflect the elevator to the stops and check for any interference or resistance in the system.

Remove and store the pushrod.

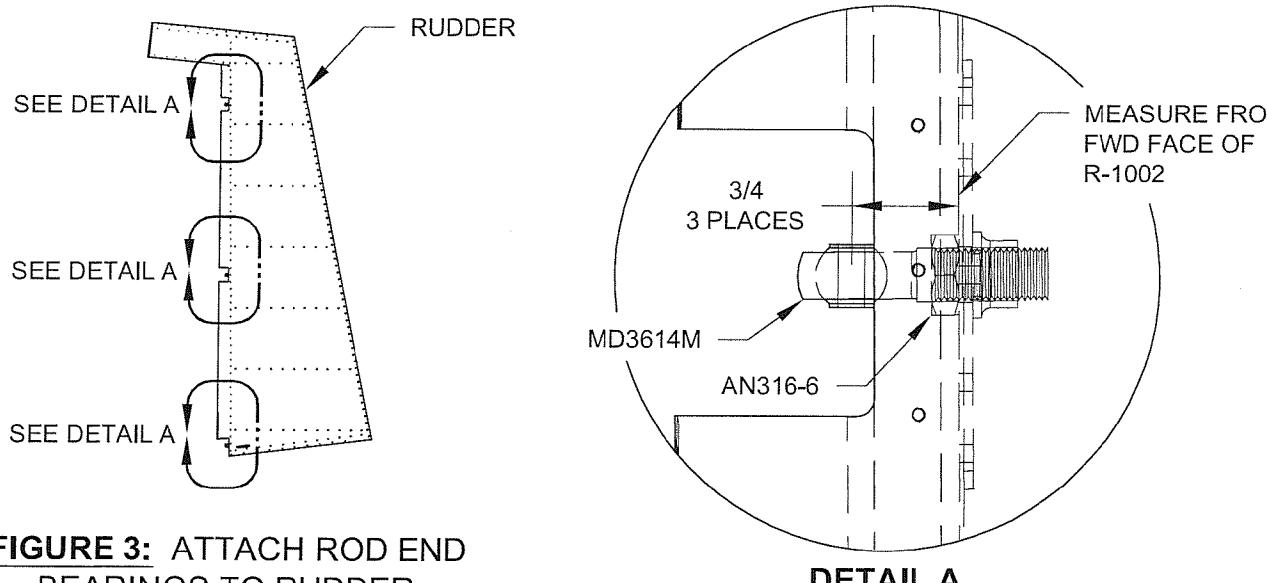


**FIGURE 1: TEMPLATE**



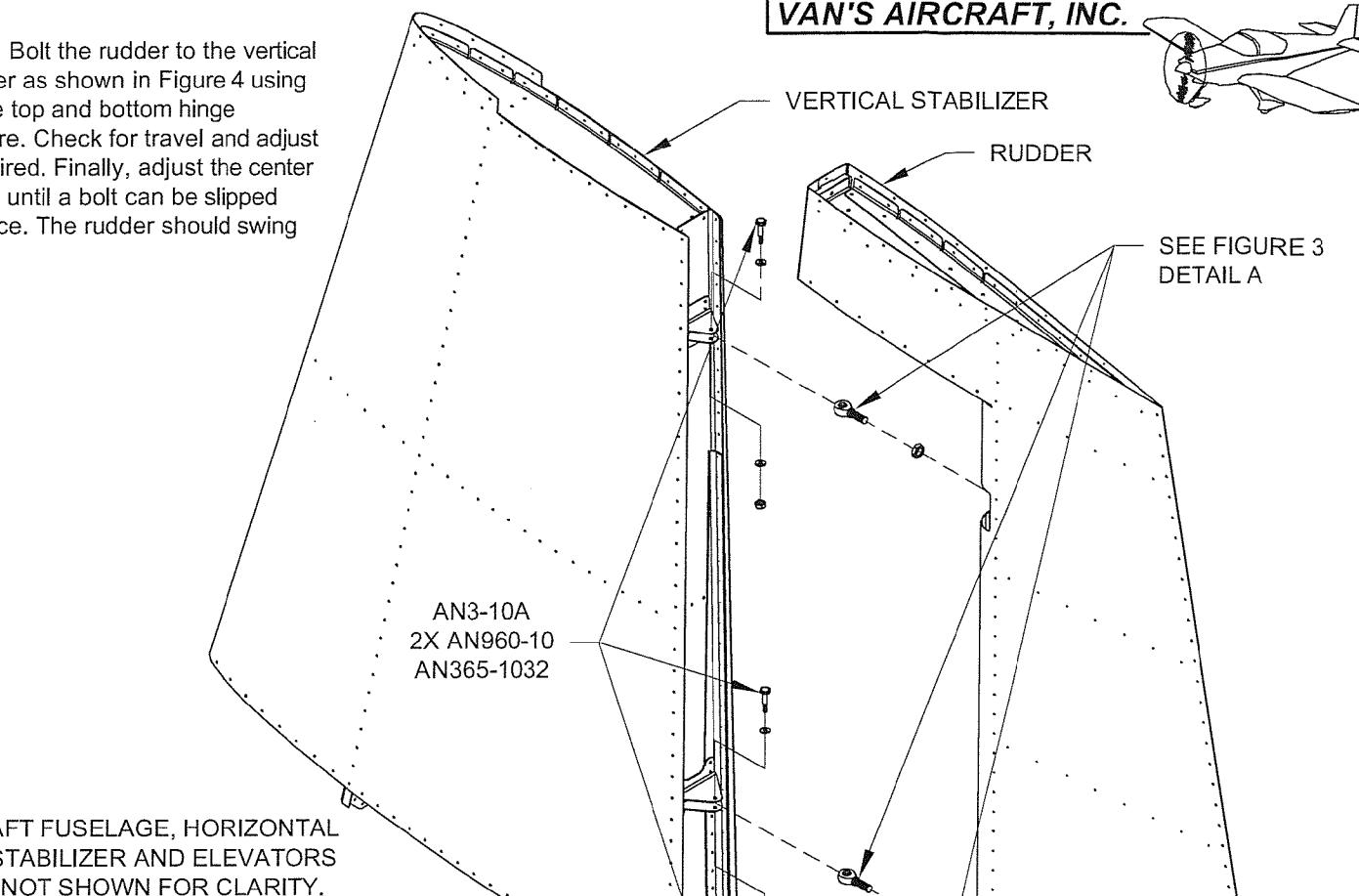
**FIGURE 2: TEMPLATE PLACEMENT**

Step 5: Thread the AN316-6 jam nuts onto the MD3614M rod end bearings and thread the rod end bearings into the R-1002 Rudder Spar as shown in Figure 3, Detail A. Measure from the center of the pivot bolt hole to the forward face of the rudder spar. As a starting point use the dimension shown in Figure 3, Detail A.

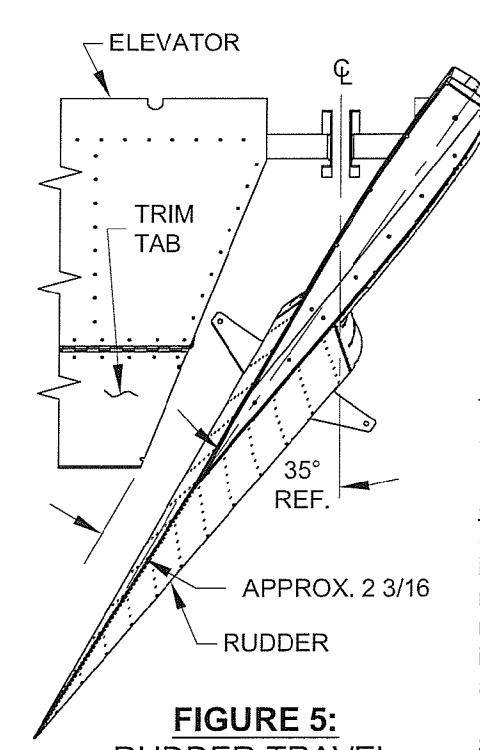


**FIGURE 3: ATTACH ROD END BEARINGS TO RUDDER**

Step 6: Bolt the rudder to the vertical stabilizer as shown in Figure 4 using only the top and bottom hinge hardware. Check for travel and adjust as required. Finally, adjust the center rod end until a bolt can be slipped into place. The rudder should swing freely.



**FIGURE 4: ATTACH RUDDER TO VERTICAL STABILIZER**

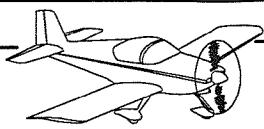


**FIGURE 5: RUDDER TRAVEL**

Step 7: Check to see that the rudder travels 35°. Do this by fixing the elevators in the "trail" position (See Step 1), taping the trim tabs in the neutral position, and then fully deflecting the rudder.

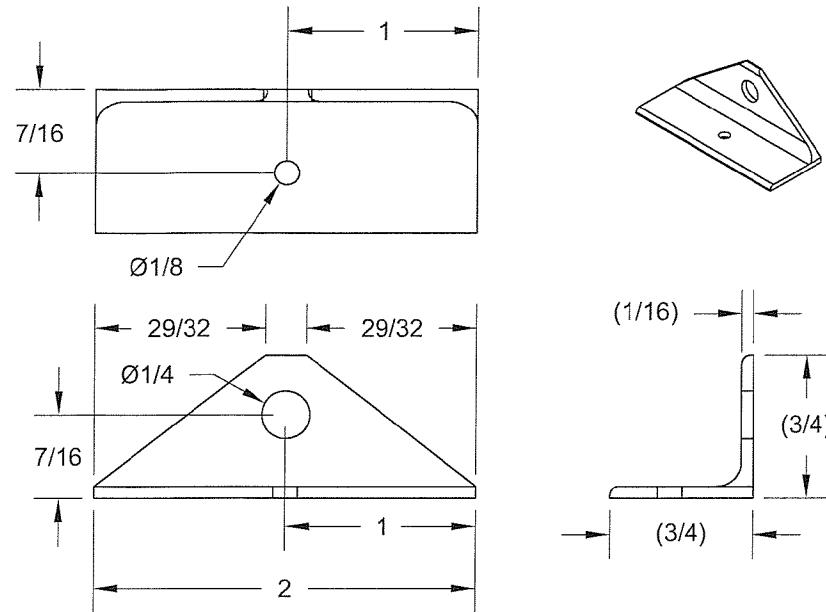
Step 8: Measure the clearance between the inboard trailing edge of the trim tab and the adjacent rudder skin as shown in Figure 5. When this dimension is approximately 2 3/16 inches the rudder travel is 35° and the R-1007B Rudder Stop is properly adjusted. The rudder stops were designed to allow 35° of travel so a very small adjustment should be necessary. If more travel is needed file the rudder stops (See Figure 4) if/as required. If there is too much travel shorten the bottom rod end. Tighten the jam nuts when the adjustments are complete.

Step 9: Remove and store the rudder and vertical stabilizer.



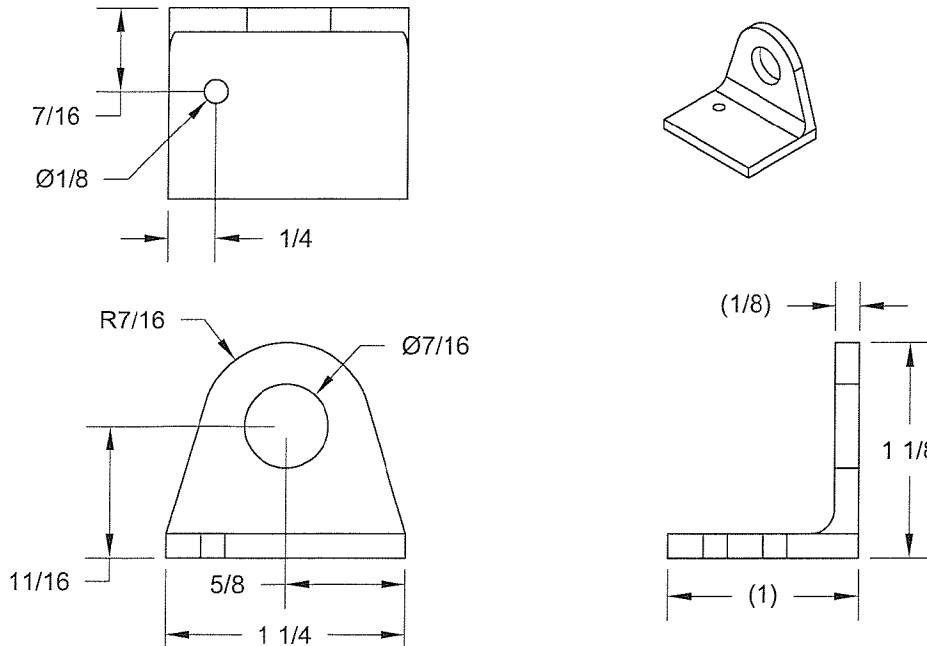
Step 1: Fabricate two F-1095C Trim Bellcrank Brackets from AA6-063X3/4X3/4 Aluminum Angle as shown in Figure 1.

It is critical that the 1/4 inch diameter hole and the 1/8 inch diameter hole are exactly in line with each other.



**FIGURE 1:**  
TRIM BELLCRANK BRACKET

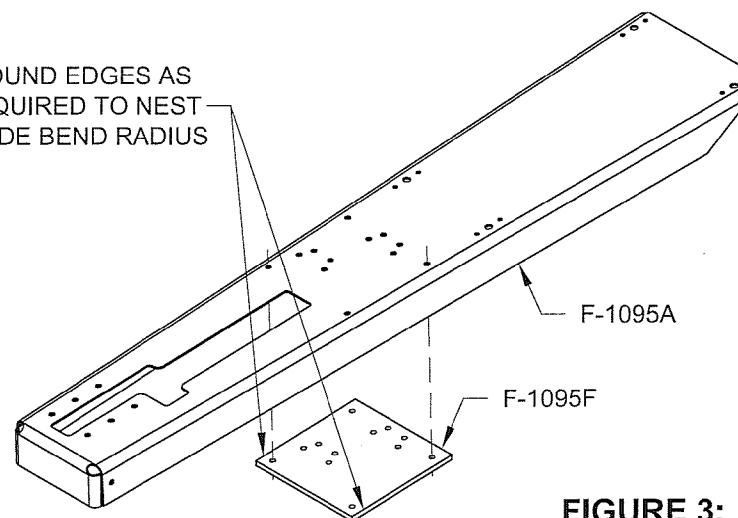
Step 2: Fabricate two F-1095G Trim Cable Anchor Brackets from AA6-125X1X1 1/4 Aluminum Angle as shown in Figure 2.



**FIGURE 2:**  
TRIM CABLE ANCHOR BRACKET

Step 3: Fit the F-1095F Trim Servo Spacer to the underside of F-1095A Trim Mount Bracket as shown in Figure 3.

The upper forward edges of the trim servo spacer must be rounded to nest inside the bend radius of the trim mount bracket. The upper surface of the trim servo spacer must fully contact the lower surface of the trim mount bracket.

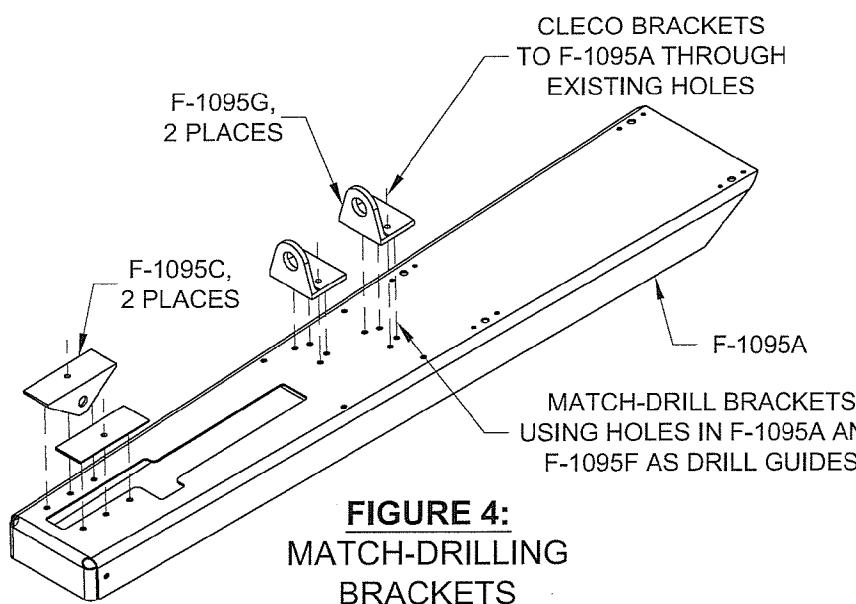


**FIGURE 3:**  
FITTING TRIM SERVO SPACER  
TO TRIM MOUNT BRACKET

Step 4: Cleco the F-1095F Trim Servo Spacer to the F-1095A Trim Mount Bracket as shown in Figure 3. Cleco through the four corner holes in the trim servo spacer.

Cleco the F-1095C Trim Bellcrank Brackets and F-1095G Trim Cable Anchor Brackets to the trim mount bracket as shown in Figure 4.

Match-Drill #30 the trim bellcrank brackets and trim cable anchor brackets using the holes in the trim mount bracket and trim servo spacer as drill guides. Double-check that the pairs of brackets are parallel to each other and to the edges of the cut-out in the trim mount bracket when match-drilling.



**FIGURE 4:**  
MATCH-DRILLING  
BRACKETS

Step 5: Cleco the F-1095F Trim Servo Spacer to the F-1095A Trim Mount Bracket as shown in Figure 3. Cleco through F-1095G Trim Cable Anchor Bracket attach holes leaving open the four corner holes in the trim servo spacer.

Final-Drill #28 the four corner holes in the trim servo spacer.

Remove the trim servo spacer from the trim mount bracket.

Machine countersink the eight #30 holes in the trim servo spacer for AN426AD4 rivets. Countersink the LOWER SURFACE of the trim servo spacer. See Figure 3.

Step 6: Run a #40 drill through the eight 3/32 inch diameter nutplate attach holes in the F-1095A Trim Mount Bracket.

Machine countersink the eight #40 holes in the trim mount bracket for AN426AD3 rivets. Countersink the UPPER SURFACE of the trim mount bracket. See Figure 3.

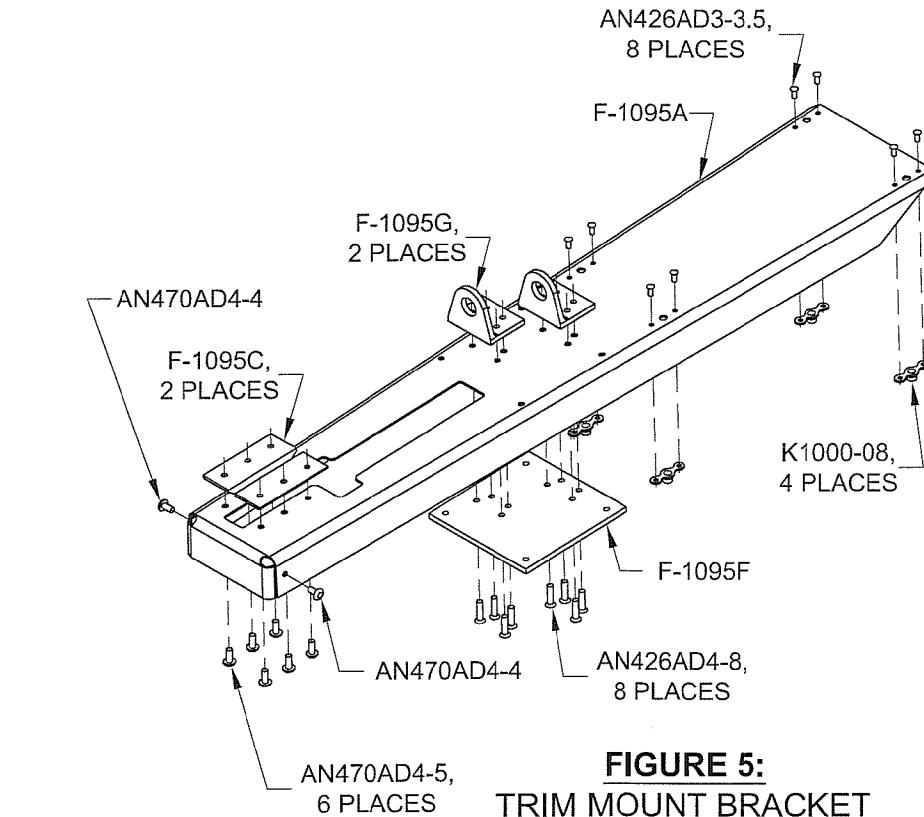
Run a #30 drill through the 1/8 inch diameter holes in the close-out flanges in the trim mount bracket.

Step 7: Deburr all holes and edges of the F-1095A Trim Mount Bracket, F-1095C Trim Bellcrank Brackets, F-1095F Trim Servo Spacer, and F-1095G Trim Cable Anchor Brackets.

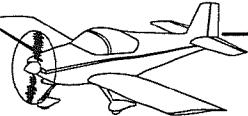
Prime the trim bellcrank brackets and trim cable anchor brackets. All other F-1095 Assembly parts are made from alclad material and may be primed if/as desired.

Step 8: Rivet the F-1095C Trim Bellcrank Brackets, F-1095F Trim Servo Spacer, F-1095G Trim Cable Anchor Brackets, and K1000-08 Nutplates to the F-1095A Trim Mount Bracket as shown in Figure 5.

Install rivets through the holes in the close-out flanges in the trim mount bracket as shown in Figure 5.



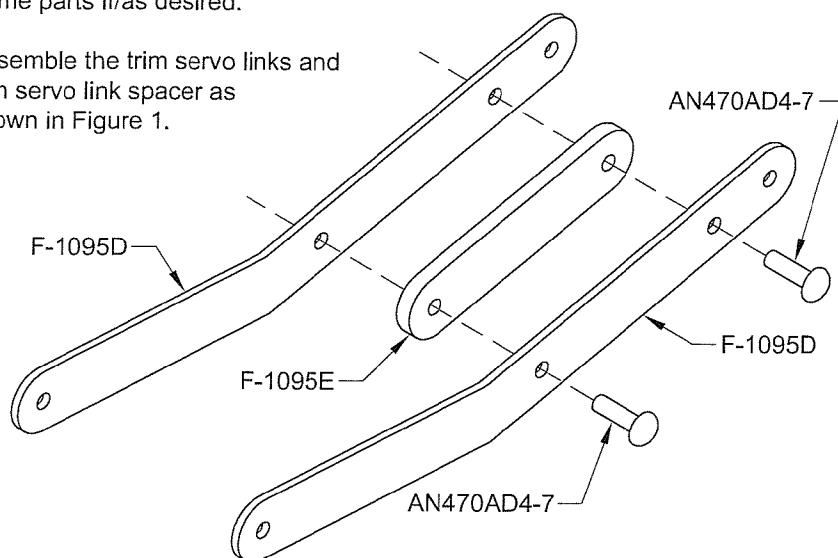
**FIGURE 5:**  
TRIM MOUNT BRACKET  
ASSEMBLY DETAIL



**Step 1:** Run a #30 drill through all holes in the two F-1095D Trim Servo Links and the F-1095E Trim Servo Link Spacer.

Deburr all holes and edges of the trim servo links and trim servo link spacer. Prime parts if/as desired.

Assemble the trim servo links and trim servo link spacer as shown in Figure 1.

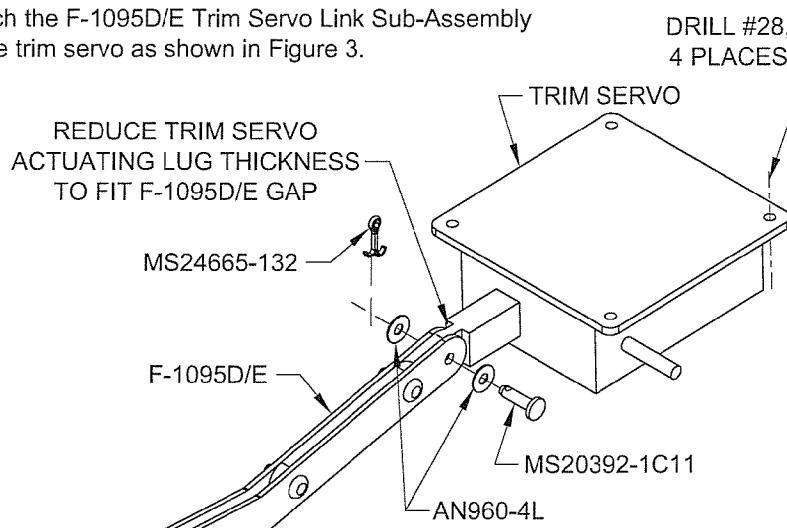


**FIGURE 1:**  
TRIM SERVO LINK AND TRIM  
SERVO LINK SPACER ASSEMBLY

**Step 3:** Enlarge the four mounting holes in the Trim Servo by drilling #28. See Figure 3.

Using a file, reduce the thickness of the actuating lug on the trim servo until it fits the gap of the F-1095D/E Trim Servo Link Subassembly. See Figure 3.

Attach the F-1095D/E Trim Servo Link Sub-Assembly to the trim servo as shown in Figure 3.



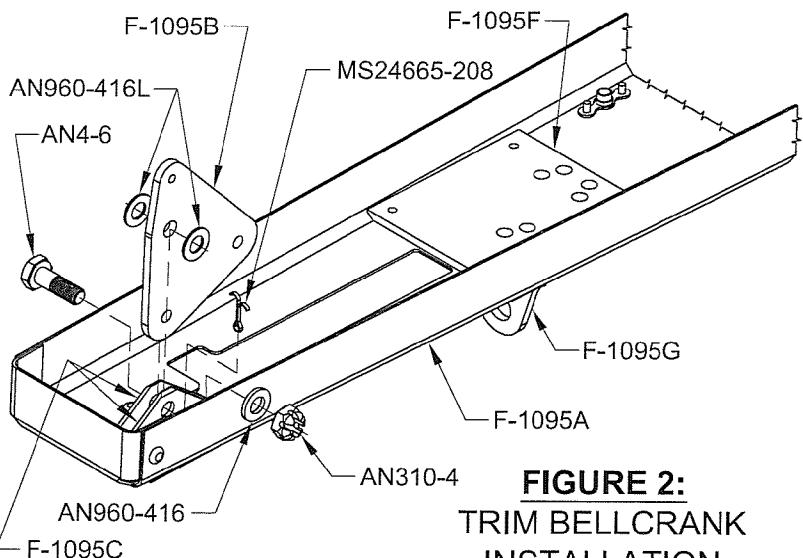
**FIGURE 3:**  
ATTACH SERVO LINK  
TO SERVO

**Step 2:** Study Figure 2 until you understand the proper installation of the F-1095B Trim Bellcrank between the F-1095C Trim Bellcrank Brackets. Pay particular attention to the orientation of the trim bellcrank. Note that two thin washers are used as spacers between the trim bellcrank and the trim bellcrank brackets.

The holes in the trim bellcrank are slightly undersize; run #30, #12, and 1/4" drills through the appropriate holes to bring them to full size. Deburr the holes.

Temporarily install the trim bellcrank between the trim bellcrank brackets. Check for free rotation of the trim bellcrank with minimum side-play. The spacer washers may be reduced in thickness if there is rotational binding. The spacer washers may be replaced with thicker washers if there is excessive side-play.

Permanently install the trim bellcrank as shown in Figure 2.



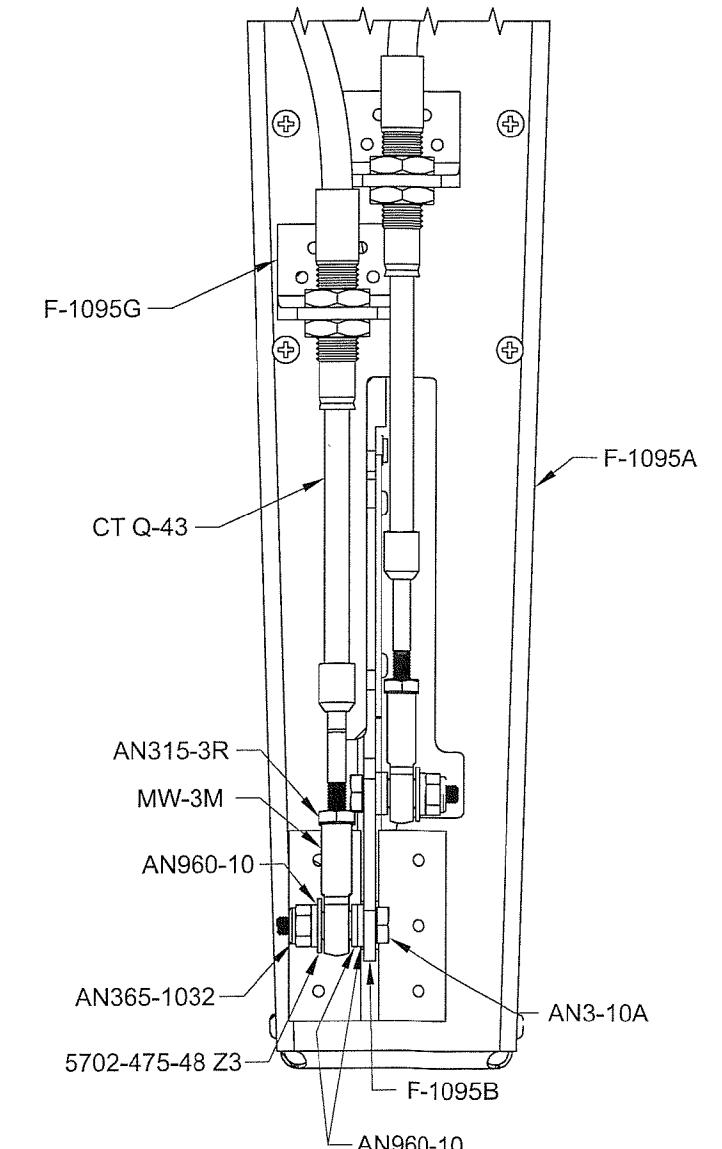
**FIGURE 2:**  
TRIM BELLCRANK  
INSTALLATION

**Step 5:** Install the two CT Q-43 Elevator Trim Cables through the F-1095G Trim Cable Anchor Brackets as shown in Figure 5.

Adjust the trim cable jam nuts so as to center the threaded portion of the trim cable on the trim cable anchor brackets.

**Step 6:** Study Figure 5 until you understand the attachment of the threaded ends of the two CT Q-43 Elevator Trim Cables to the F-1095B Trim Bellcrank. Pay particular attention to the orientation of the bolts and the placement of the various washers.

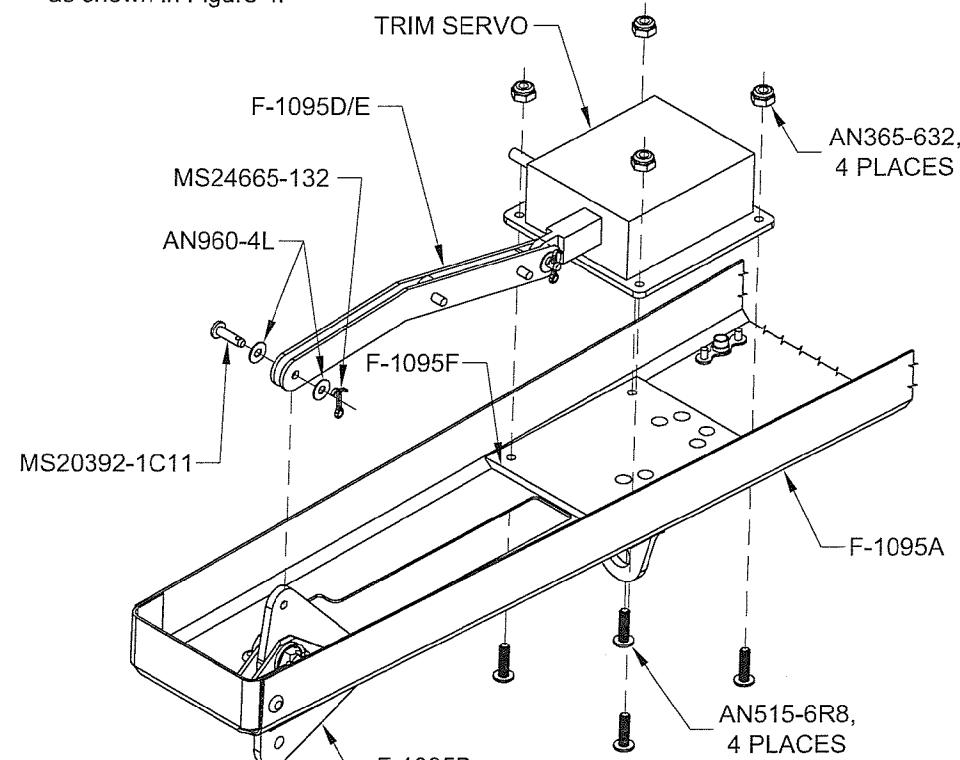
Attach the threaded ends of the two CT Q-43 Elevator Trim Cables to the F-1095B Trim Bellcrank using the hardware called-out in Figure 5. Leave the trim cable jam nuts finger tight.



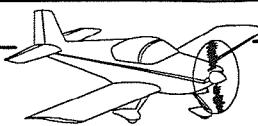
**FIGURE 5:**  
ELEVATOR TRIM CABLE ATTACH DETAIL

**Step 4:** Install the Trim Servo to the F-1095A Trim Mount Bracket and F-1095F Trim Servo Spacer as shown in Figure 4.

Attach the F-1095D/E Trim Servo Link Sub-Assembly to the F-1095B Trim Bellcrank as shown in Figure 4.



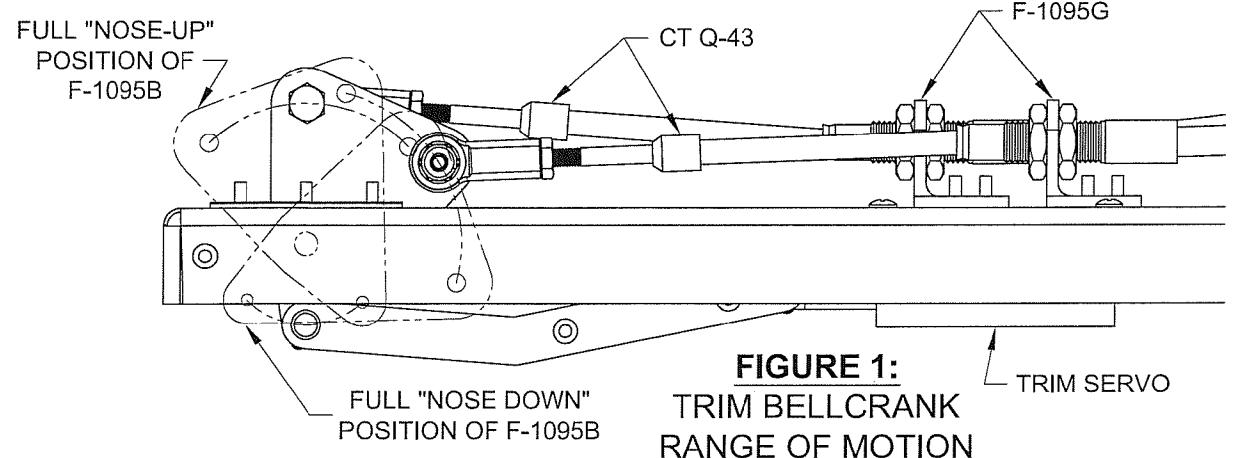
**FIGURE 4:**  
TRIM SERVO INSTALLATION



## VAN'S AIRCRAFT, INC.

Step 1: Run the Trim servo to its full retracted position. Adjust the engagement of the rod end bearings and the elevator trim cable position on the F-1095G Trim Cable Anchor Brackets so that both cables are fully extended. Tighten the trim cable jam nuts.

Run the trim servo through its full range of motion and verify that the F-1095B Trim Bellcrank motion matches that shown in Figure 1. There must be no binding or interference of parts as the trim servo runs through its full range of motion.



**FIGURE 1:**  
TRIM BELLCRANK  
RANGE OF MOTION

Step 2: Remove the E-616PP Cover Plate - Elevator Trim/WD-415 Elevator Trim Cable Anchor Bracket Sub-Assemblies from the bottoms of both Elevator Assemblies.

Loosely place the F-1095 Elevator Trim Actuator Sub-Assembly in the aft fuselage.

Route the CT Q-43 Elevator Trim Cables through the holes in the Horizontal Stabilizer Inboard Nose Ribs, then through the snap bushings installed in the Horizontal Stabilizer Front Spar and Horizontal Stabilizer Rear Spar, through the Elevator Leading Edges, then through the snap bushings installed in the Elevator Front Spars, and finally through the openings in the bottoms of the elevators. See Figure 2.

Progressively move the elevator trim actuator sub-assembly into final position while routing the elevator trim cables.

After the elevator trim cables have been routed, attach the elevator trim actuator sub-assembly to the underside of the F-1014 Fuselage Aft Deck through holes pre-punched in the fuselage aft deck using the screws called-out in Figure 2.

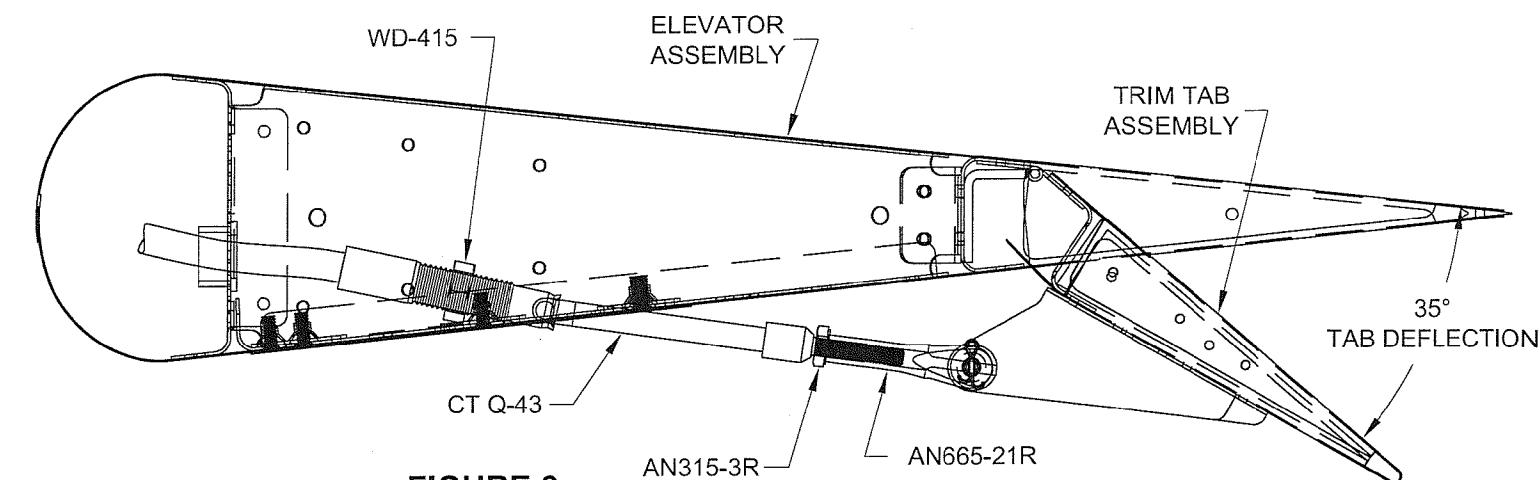
Step 3: Thread the E-616PP Cover Plate - Elevator Trim/WD-415 Elevator Trim Cable Anchor Bracket Sub-Assemblies on to the CT Q-43 Elevator Trim Cables. Adjust so that the elevator trim cable anchor brackets are centered on the 7/16 threaded portion of the elevator trim cable anchor points. Attach the cover plates to the bottoms of the elevators.

Run the Trim Servo to the "FULL NOSE UP" position.

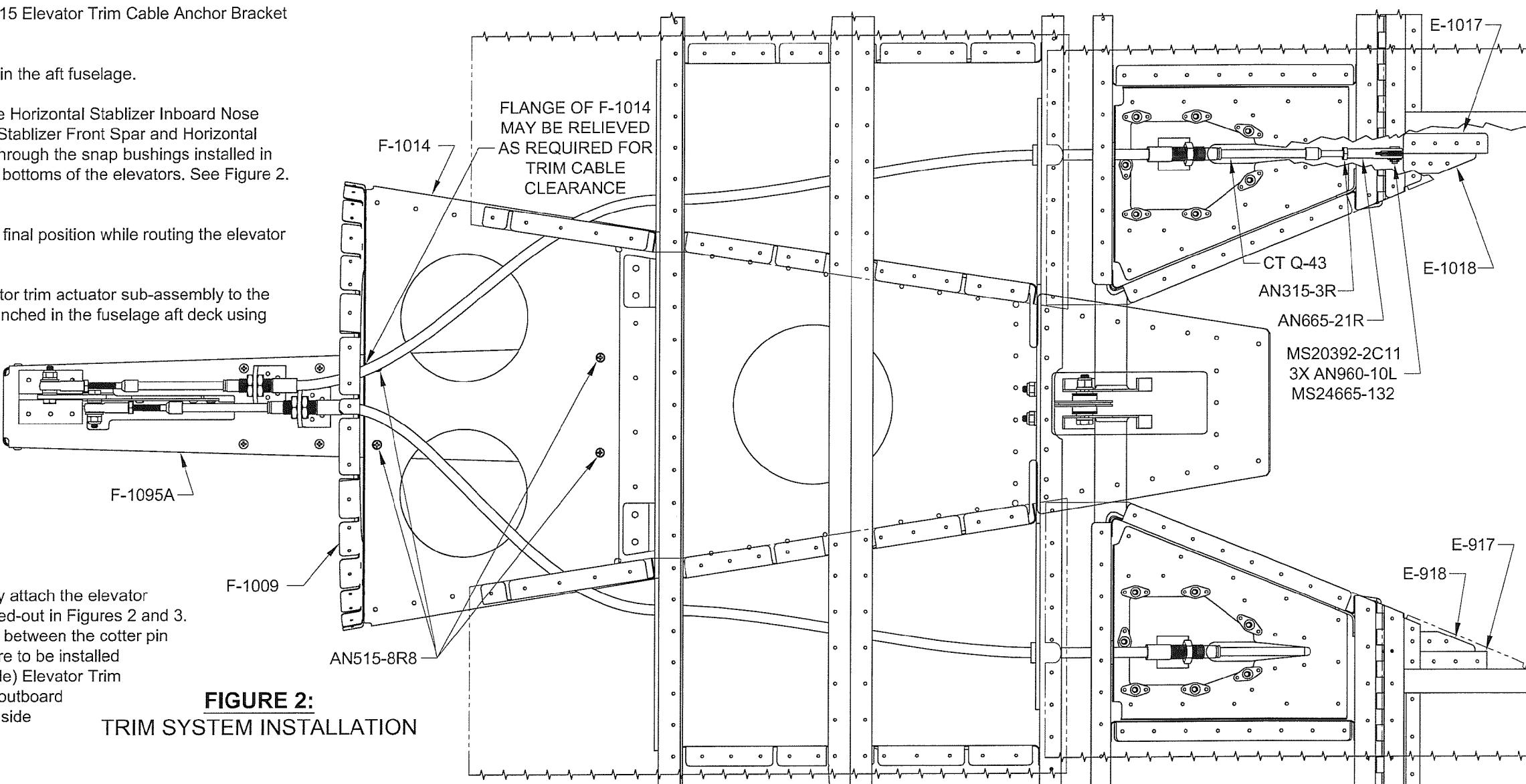
Enlarge the hole in each trim tab horn by drilling #12. Temporarily attach the elevator trim cables to the elevator trim tab horns using the hardware called-out in Figures 2 and 3. Of the three washers called-out in Figure 2, one is to be installed between the cotter pin and the outer surface of the clevis while the other two washers are to be installed between the E-917/E-918 (left side) and E-1017/E-1018 (right side) Elevator Trim Tab Horn and the inner surface of the clevis; one washer on the outboard side of the elevator trim tab horn and one washer on the inboard side of the elevator trim tab horn.

Step 3: (continued) Adjust the engagement of the jam nut and clevis onto the trim cable so that the tabs are in the 35 degrees TAB DOWN position as shown in Figure 3.

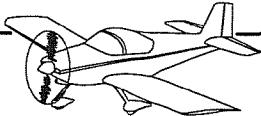
Permanently attach the clevis to the trim tab horn using the hardware called-out in Figures 2 and 3. (This step may be delayed until final assembly.)



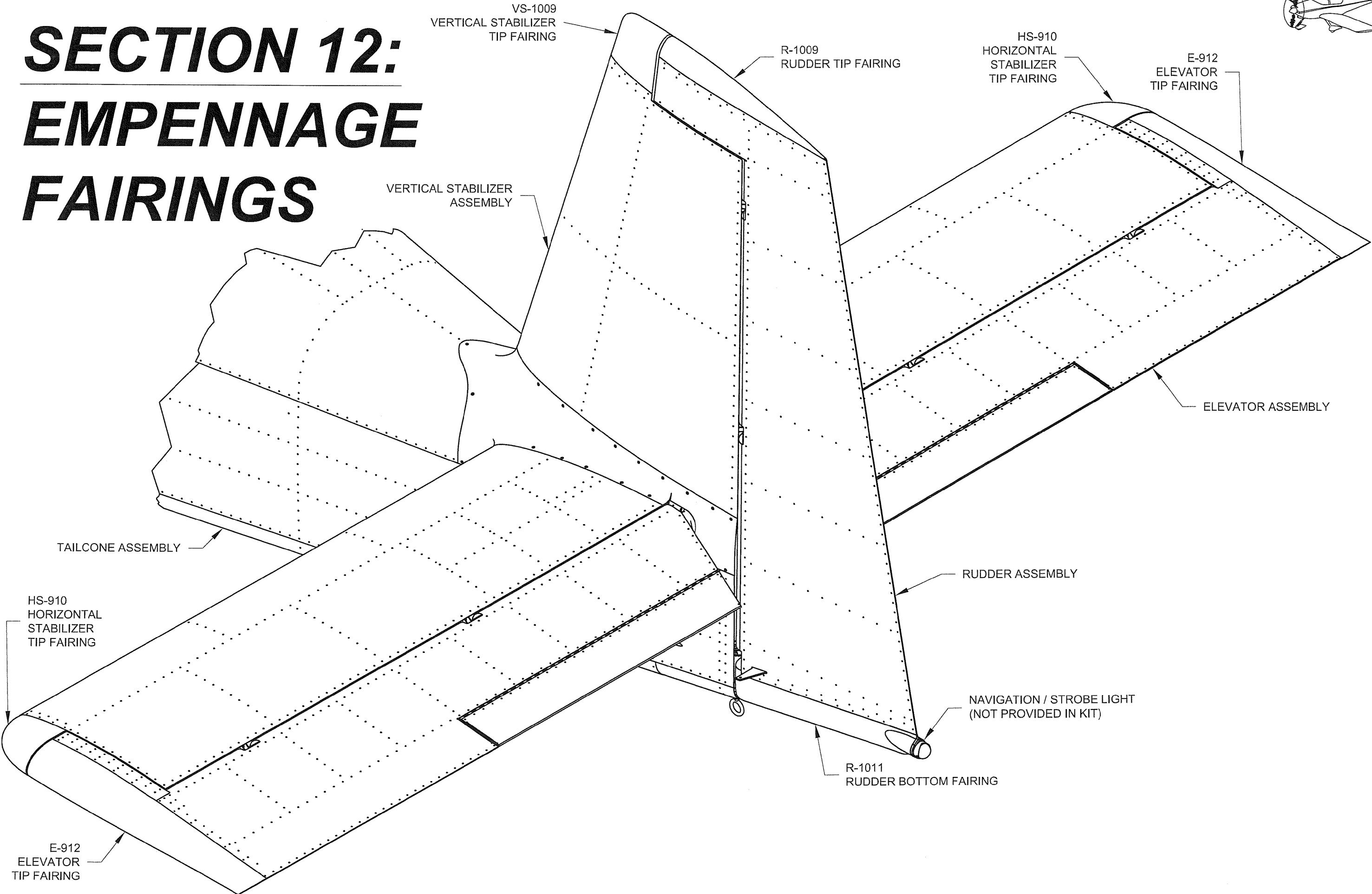
**FIGURE 3:**  
TRIM TAB DEFLECTION

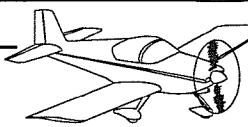


**FIGURE 2:**  
TRIM SYSTEM INSTALLATION



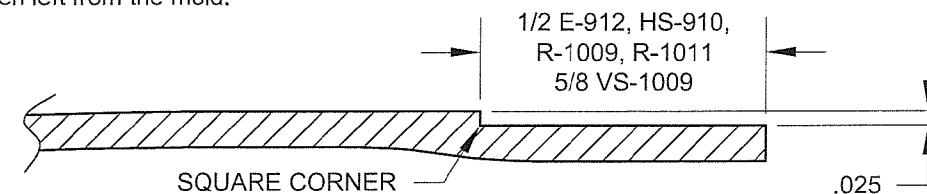
# SECTION 12: EMPENNAGE FAIRINGS





**NOTE:** Tools will dull rapidly when used on fiberglass. Set aside a specific set of tools for use on fiberglass only. See Section 5T for more information on working with fiberglass.

Step 1: Ensure that the molded recess on all the tip fairings is square as shown in Figure 1. Use a razor blade or file to remove any material that may have been left from the mold.



**FIGURE 1: CROSS SECTION OF A TYPICAL TIP FAIRING MOLDED FLANGE**

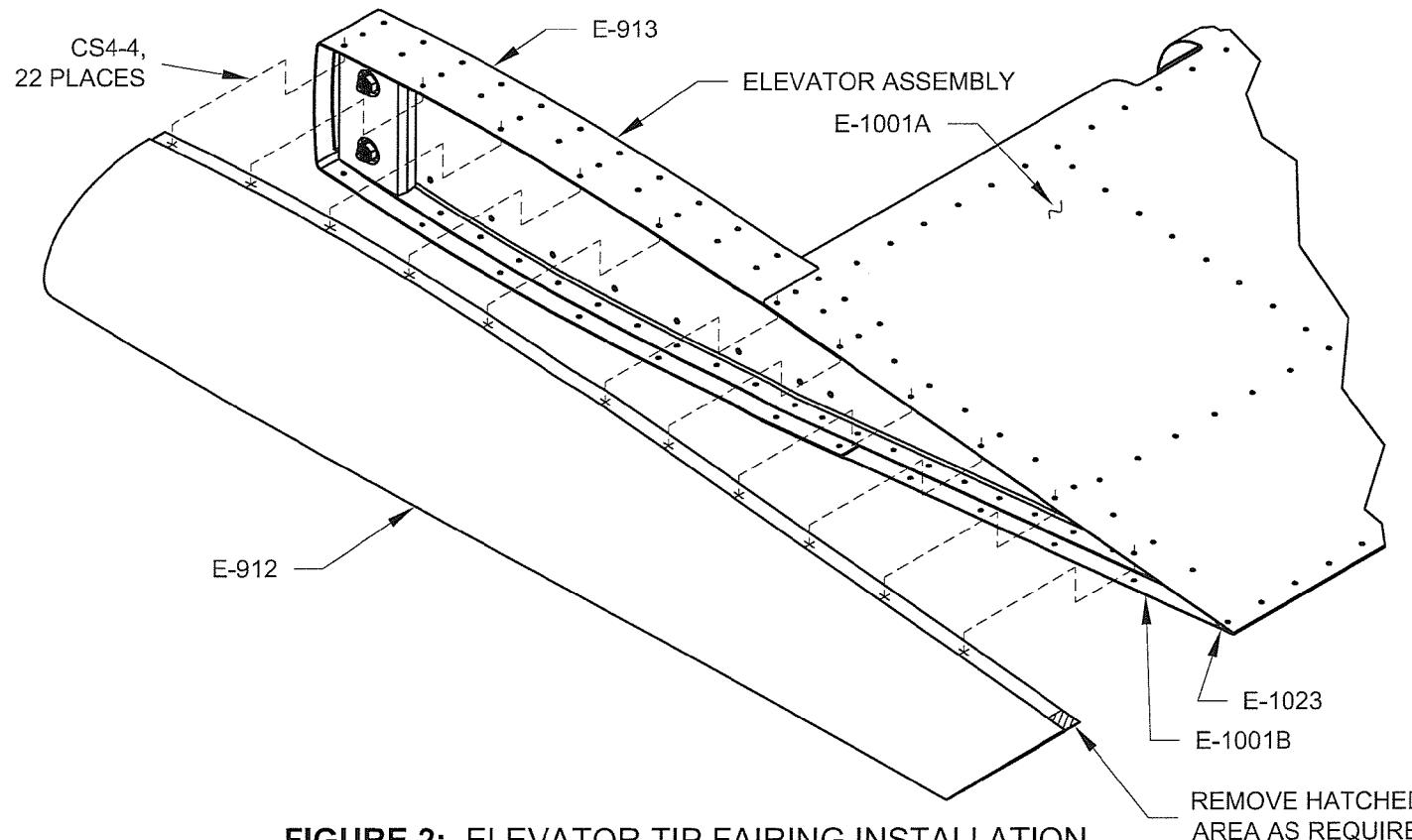
**NOTE:** Complete steps 2-5 for both the right and left elevator assemblies. E-912 Elevator Tip Fairing Installation for the left side is shown.

Step 2: Trim the aft edge of the flange on the E-912 Elevator Tip Fairing as shown in Figure 2 to remove interference between the flange and the E-1023 Elevator Trailing Edge and allow the tip to be fully inserted into the end of the elevator. Trimming the width of the molded flange may also be required. See Figure 1 for the correct width.

Step 3: Insert the E-912 Elevator Tip Fairing into the end of the elevator. Push the fairing tightly towards the front and check that the aft end is aligned with the trailing edge of the elevator then match-drill #40 and cleco the elevator tip fairing using the holes in the E-1001A Top Elevator Skin, E-1001B Bottom Elevator Skin and E-913 Elevator Counterbalance Skin as a drill guides. Final-Drill the holes #30. Work from the front towards the trailing edge.

Step 4: Remove the E-912 Elevator Tip Fairing from the elevator assembly. Deburr and dimple the elevator tip attach holes in the E-1001A Top Elevator Skin, E-1001B Bottom Elevator Skin and E-913 Elevator Counterbalance Skin for a CS4-4 blind rivet. Machine countersink the holes in the elevator tip fairing for the dimples in the elevator skins.

Step 5: Cleco and rivet the E-912 Elevator Tip Fairing onto the elevator assembly per the callouts in Figure 2.



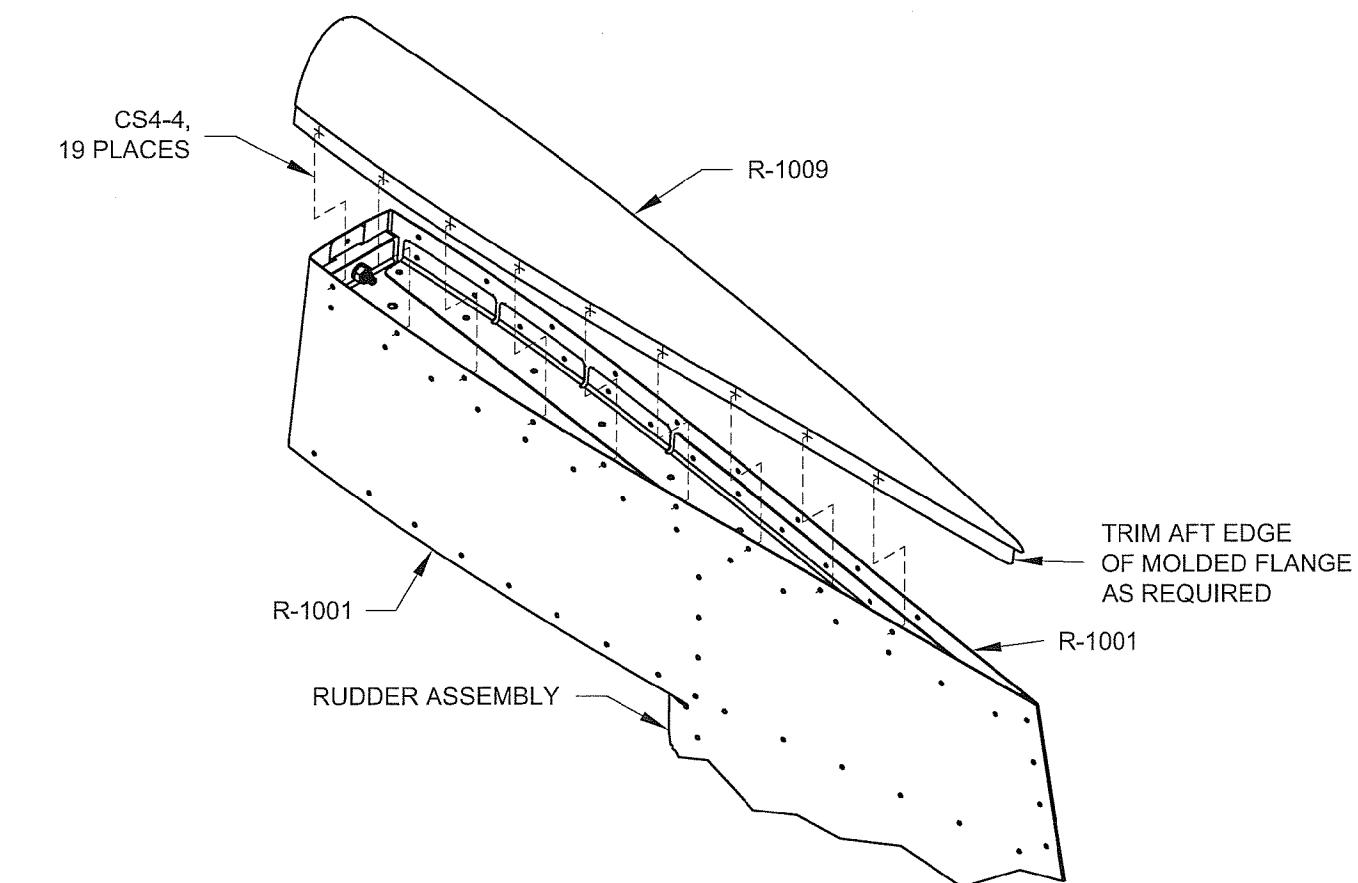
**FIGURE 2: ELEVATOR TIP FAIRING INSTALLATION**

Step 6: Trim the aft edge of the flange on the R-1009 Rudder Tip Fairing as shown in Figure 3 to remove interference between the flange and the R-1006 Rudder Trailing Edge and allow the tip to be fully inserted into the end of the rudder. Trimming the width of the molded flange may also be required. See Figure 1 for correct width.

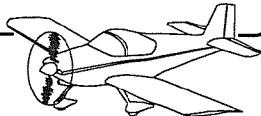
Step 7: Insert the R-1009 Rudder Tip Fairing into the end of the rudder assembly. Push the fairing tightly towards the front and check that the aft end is aligned with the trailing edge of the rudder then match-drill #40 and cleco the rudder tip fairing using the holes in the R-1001 Rudder Skins as a drill guides. Final-Drill the holes #30. Work from front towards the trailing edge.

Step 8: Remove the R-1009 Rudder Tip Fairing from the rudder assembly. Deburr and dimple the rudder tip attach holes in the R-1001 Rudder Skins for a CS4-4 blind rivet. Machine countersink the holes in the rudder tip fairing for the dimples in the rudder skins.

Step 9: Cleco and rivet the R-1009 Rudder Tip Fairing onto the rudder assembly per the callouts in Figure 3.



**FIGURE 3: RUDDER TIP FAIRING INSTALLATION**



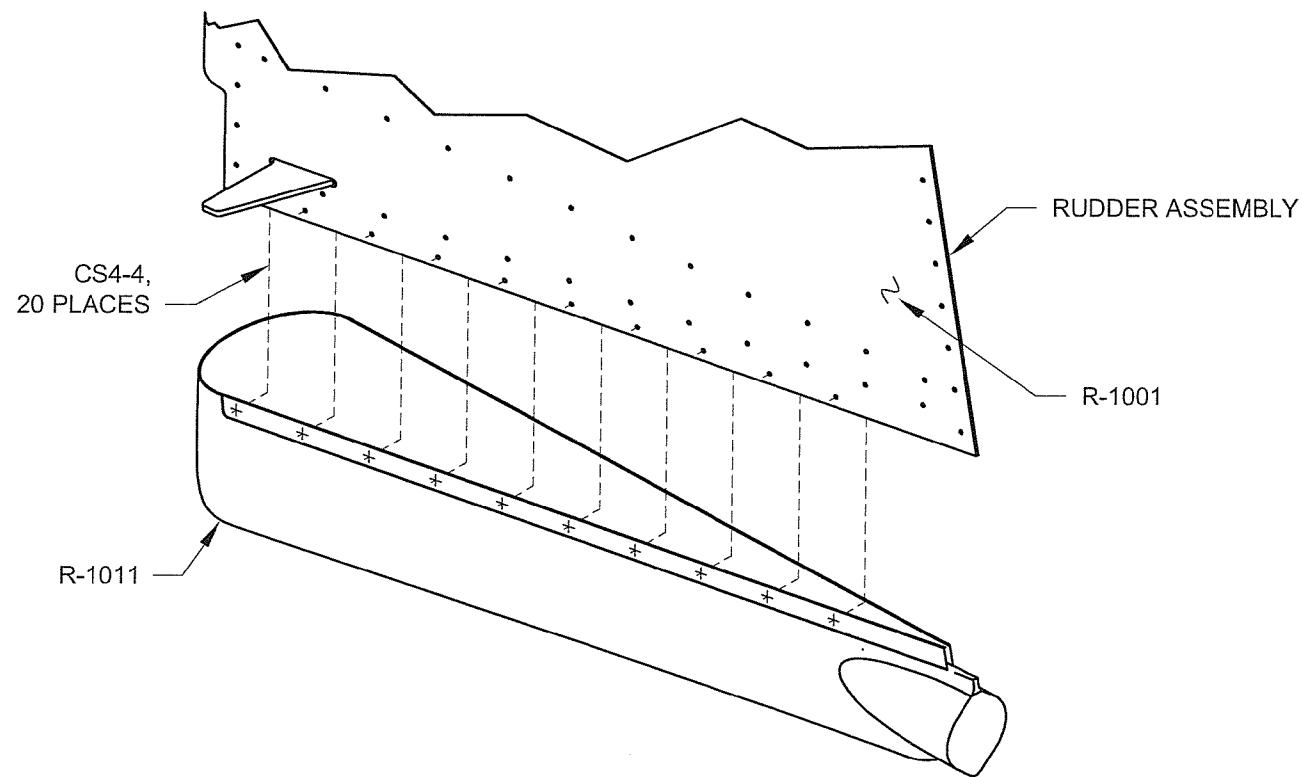
**NOTE:** If installing a lighting system do not permanently install the R-1011 Rudder Bottom Fairing until installation of the light in the fairing is complete. It is the builder option to purchase a lighting system now or wait until later in construction. Lighting systems are available in the VAN'S AIRCRAFT ACCESSORIES CATALOG. Van's Aircraft recommends lighting system 6, part number LN SYS6.

**Step 1:** Trim the aft edge of the flange on the R-1011 Rudder Bottom Fairing as shown in Figure 1 to remove interference between the flange and the R-1006 Rudder Trailing Edge and allow the fairing to be fully inserted into the bottom of the rudder. Trimming the width of the molded flange may also be required. See Page 12-2, Figure 1 for the correct width.

**Step 2:** Match-Drill #30 and cleco the R-1011 Rudder Bottom Fairing using the holes in the R-1001 Rudder Skins as a drill guides. Work from front towards the trailing edge.

**Step 3:** Remove the R-1011 Rudder Bottom Fairing from the rudder assembly. Deburr and dimple the rudder bottom attach holes in the R-1001 Rudder Skins for a CS4-4 blind rivet. Machine countersink the holes in the rudder tip fairing for the dimples in the rudder skins.

**Step 4:** Cleco and rivet the R-1011 Rudder Bottom Fairing onto the rudder assembly per the callouts in Figure 1.

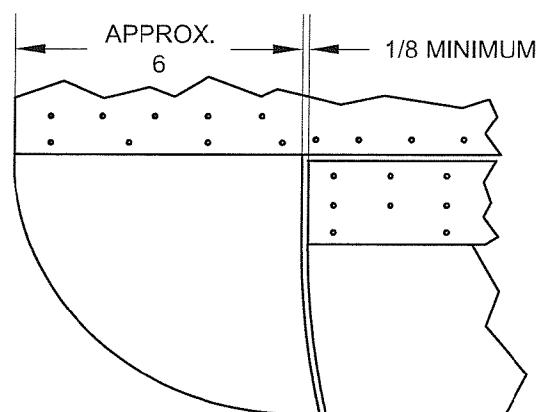


**FIGURE 1: INSTALLING THE R-1011 RUDDER BOTTOM FAIRING**

**NOTE:** Complete steps 5 through 12 for both sides of the horizontal stabilizer assembly.

**Step 5:** Trim the width of the molded flange on the HS-910 Horizontal Stabilizer Tip Fairing if required to meet the dimensions given on Page 12-2, Figure 1. Progressively trim away the aft edge of the horizontal stabilizer tip fairing to leave a minimum 1/8 inch gap between the aft edge of the tip fairing and the forward face of the elevator counterbalance arm. See Figure 2. It will be necessary to temporarily attach the elevator to the horizontal stabilizer assembly, see Page 11-2, Step 3.

**Step 6:** Match-Drill the HS-910 Horizontal Stabilizer Tip Fairing to the HS-1001 Horizontal Stabilizer Skin in a similar manner as the elevator and rudder. See Page 12-2, Step 3 and Step 7.



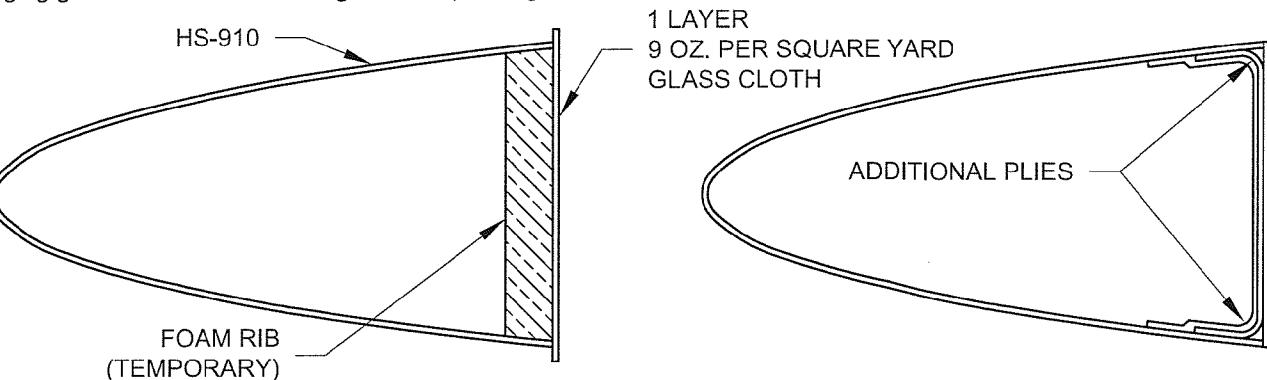
**FIGURE 2: CREATING GAP**

**Step 7:** Temporarily fit a foam rib into the opening in the HS-910 Horizontal Stabilizer Tip Fairing as shown in Figure 3. Bond this rib in place with small spots of Bondo or resin.

**Step 8:** Trim a single layer of glass fabric to fit over the temporary rib and the aft edge of the HS-910 Horizontal Stabilizer Tip Fairing. Lay up this layer of glass over the temporary foam rib using either epoxy or polyester resin. See Figure 3.

**Step 9:** After the glass has cured, remove the HS-910 Horizontal Stabilizer Tip Fairing from the horizontal stabilizer assembly, then carefully remove the temporary foam rib.

**Step 10:** Lay up additional layers of glass fabric reinforcement plies to the inner face and edges as shown in Figure 4. Cleco the HS-910 Horizontal Stabilizer Tip fairing back onto the Horizontal Stabilizer while it cures. After the glass has cured trim off the extra overhanging glass even with the aft edge of the tip fairing.

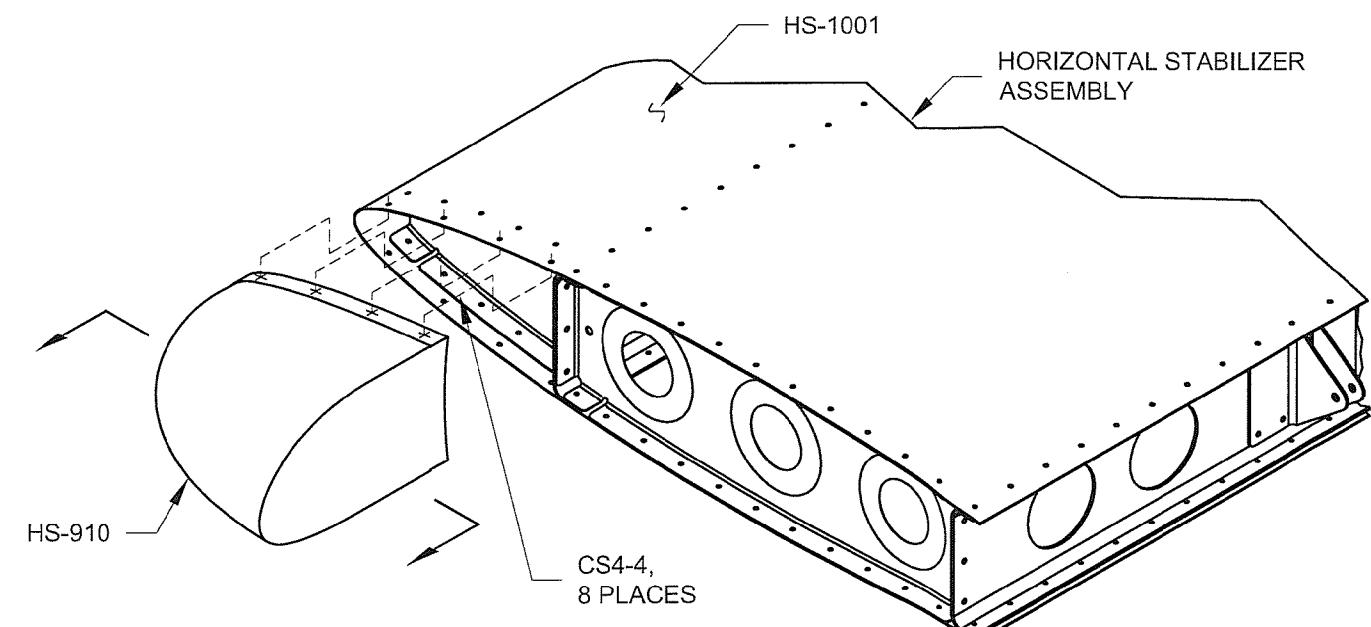


**FIGURE 3: TEMPORARY RIB**

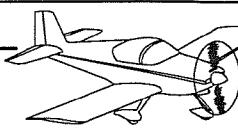
**FIGURE 4: FINAL LAY-UP**

**Step 11:** Deburr and dimple the horizontal stabilizer tip attach holes in the HS-1001 Horizontal Stabilizer Skin for a CS4-4 blind rivet. Machine countersink the holes in the horizontal stabilizer tip fairing for the dimples in the horizontal stabilizer skins.

**Step 12:** Cleco and rivet the HS-910 Horizontal Stabilizer Tip Fairing onto the horizontal stabilizer assembly per the callouts in Figure 5.



**FIGURE 5: HORIZONTAL STABILIZER TIP FAIRING INSTALLATION**



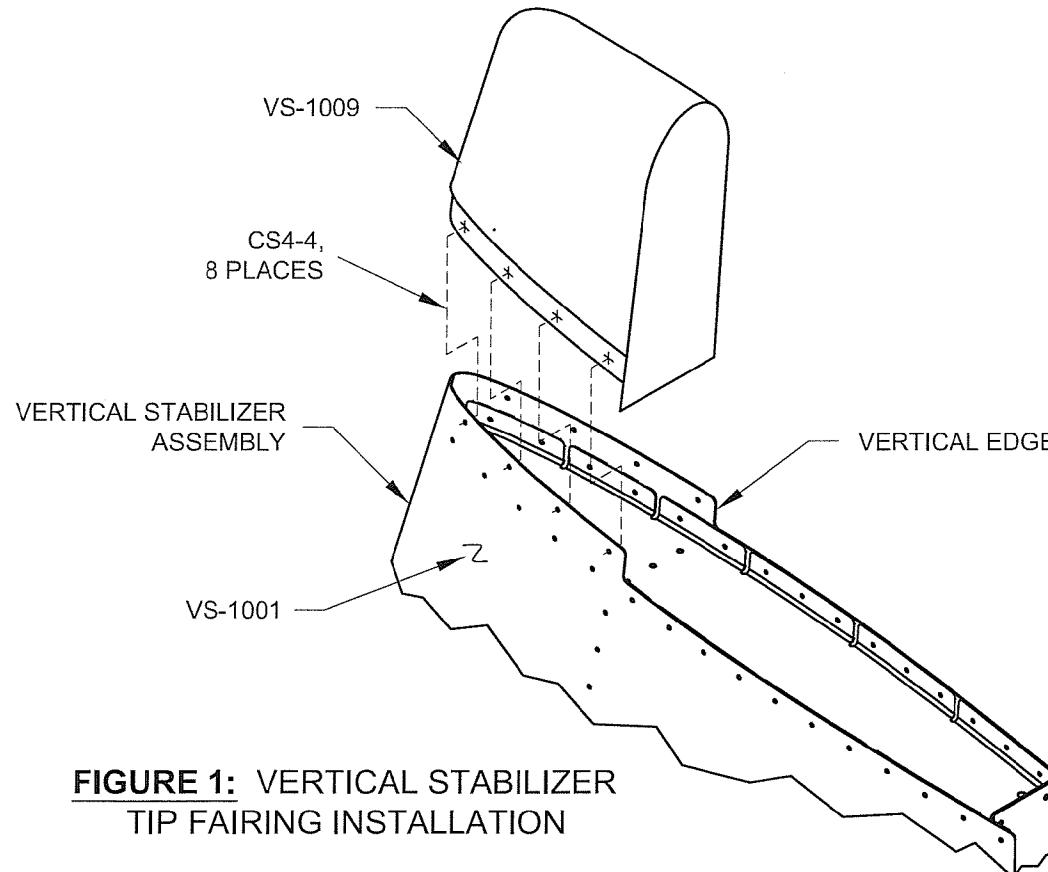
Step 1: Trim the width of the molded flange on the VS-1009 Vertical Stabilizer Tip Fairing if required to meet the dimensions given on Page 12-2, Figure 1. Trim away the aft edge of the vertical stabilizer tip fairing so the aft edge is parallel and flush with the vertical edge on the VS-1001 Skin as indicated in Figure 1. This will provide a minimum 1/8 inch gap between the aft face of the vertical stabilizer tip fairing and the forward face of the rudder counterbalance arm.

Step 2: Match-Drill #30 and cleco the VS-1009 Vertical Stabilizer Tip Fairing using the holes in the VS-1001 Vertical Stabilizer Skin as a drill guide. Work from front towards the trailing edge.

Step 3: Close in the aft facing opening of the VS-1009 Vertical Stabilizer Tip Fairing in a similar manner as presented on Page 12-3, steps 7-10 and Page 12-3, Figure 3 and Figure 4.

Step 4: Deburr and dimple the VS-1009 Vertical Stabilizer Tip Fairing attach holes in the VS-1001 Vertical Stabilizer Skin for a CS4-4 blind rivet. Machine countersink the holes in the vertical stabilizer tip fairing for the dimples in the vertical stabilizer skin.

Step 5: Cleco and rivet the VS-1009 Vertical Stabilizer Tip Fairing onto the vertical stabilizer assembly per the callouts in Figure 1.

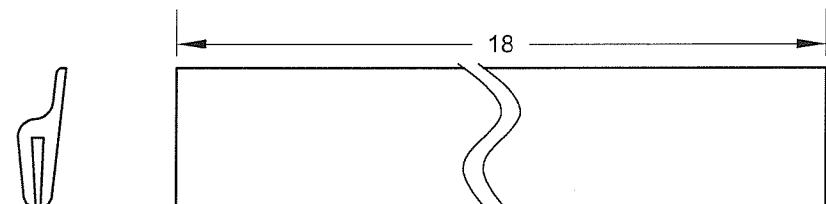


**FIGURE 1: VERTICAL STABILIZER TIP FAIRING INSTALLATION**

**NOTE:** Steps 6-10 are for the left side only. The right side installation is a mirror of the left. Repeat steps 6-10 for the right side of the aircraft.

**NOTE:** Gap Seal material is not provided in Empennage/Tailcone kit but will be provided in a subsequent kit.

Step 6: Cut and install a piece of Rubber Channel to create the F-1094C Gap Seal as shown in Figure 2. This will allow extra material to account for material shrinkage over time and allow extra material so the ends can be trimmed to match the F-1094A Empennage Gap Cover.

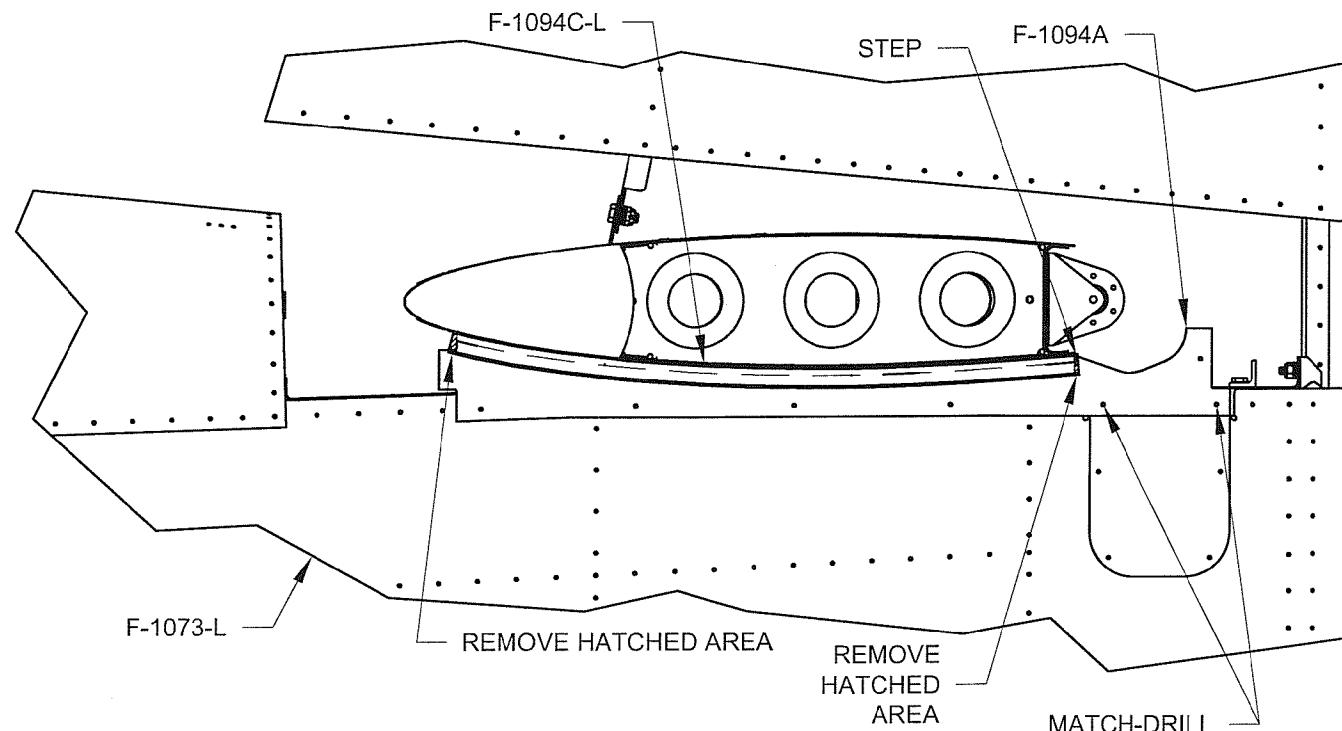


**FIGURE 2: CREATING THE GAP SEAL**

Step 7: Mark and trim the aft edge of the F-1094C Gap Seal parallel with the step (see Figure 3) in the F-1094A Empennage Gap Cover. The F-1094C Gap Seal has been created oversize to account for material shrinkage over time. Compress the gap seal onto the F-1094A Empennage Gap Cover as shown in Figure 3 leaving just enough material to properly trim the forward end of the gap seal. Mark and trim the forward edge of the gap seal as shown in Figure 3. This will create F-1094C-L.

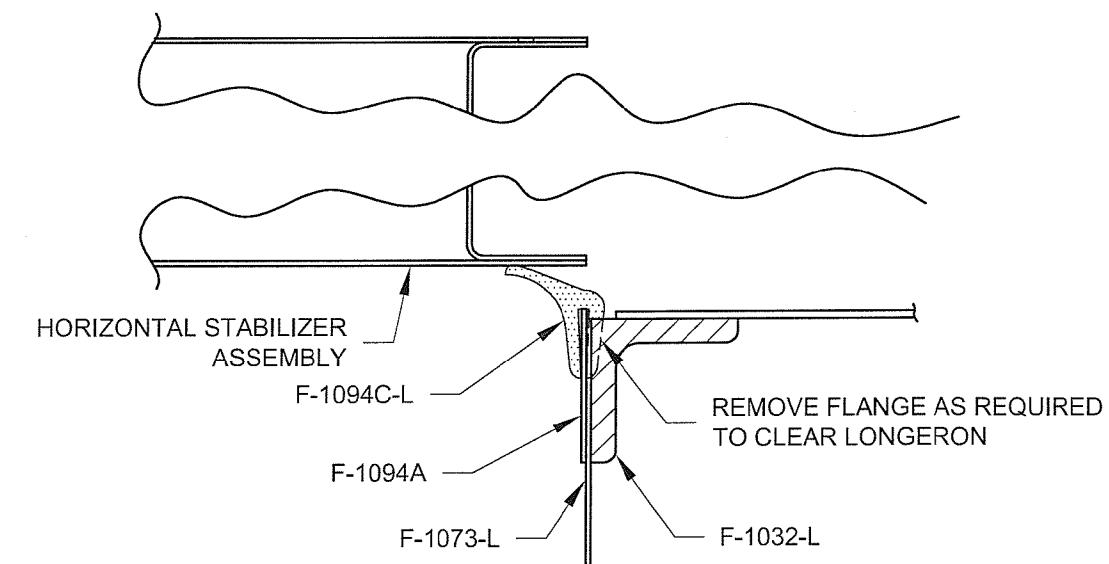
Step 8: Install the F-824B Cover Plate on the tailcone assembly, using at least two of the four lower attach holes. Cleco the F-1094A Gap Cover to the tailcone assembly (the holes were left open in the Section 10 Tailcone Assembly). See Figure 3.

Step 9: Match-Drill #40 the aft two lower holes indicated in Figure 3 in the F-1094A Empennage Gap Cover into the F-824PP Cover Plate and F-1032-L Tailcone Longerons Left.

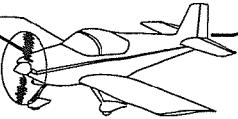


**FIGURE 3: FITTING THE GAP SEAL AND GAP FAIRING**

Step 10: Install the F-1094C-L Gap Seal onto the F-1094A Empennage Gap Cover. Trial fit this subassembly onto the tailcone assembly and trim away the lower inboard flange of the gap seal to clear the F-1032-L Tailcone Longerons Left, see Figure 4.



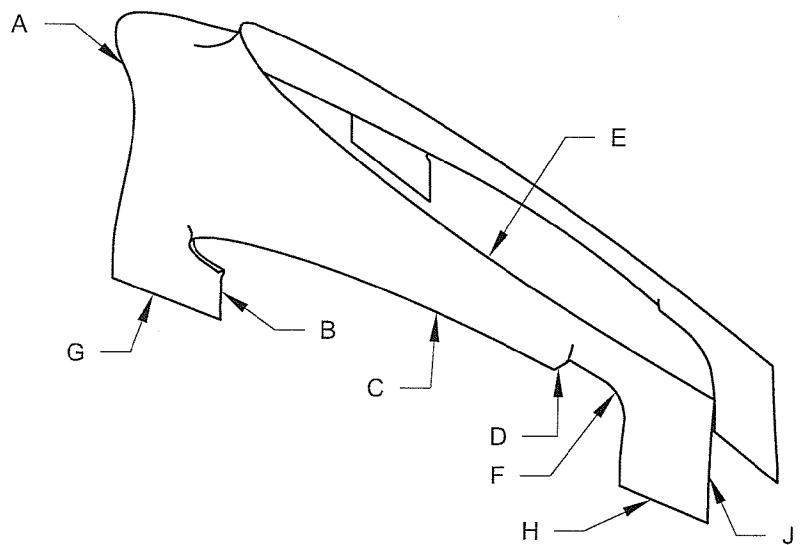
**FIGURE 4: GAP SEAL TRIM**



**NOTE:** The F-1094B Empennage Fairing is not provided in the Empennage/Tailcone kit but will be provided in a subsequent kit.

**NOTE:** Use a slow turning drill when blind drilling to prevent the bit from wandering. Press fairing tightly against metal surface before drilling.

Step 1: Place the F-1094B Empennage Fairing on the tailcone/empennage assembly. Once properly positioned, clamp the fairing at the trailing edge of the horizontal and vertical stabilizer assemblies. Three fasteners attach the empennage fairing to the F-1075 Tailcone Aft Top Skin. The holes for the screws and nutplate attach points have been left open and are visible through the empennage fairing. Use a light placed inside the empennage fairing/tailcone assembly to make the holes more visible. Blind-Drill #40 through the translucent empennage fairing into the screw holes in the tailcone aft top skin at all three locations.



**FIGURE 1: EMPENNAGE FAIRING TRIM**

Step 2: Trim the F-1094B Empennage Fairing, edge A as shown in Figure 1 to meet the scribe line in the part for this edge.

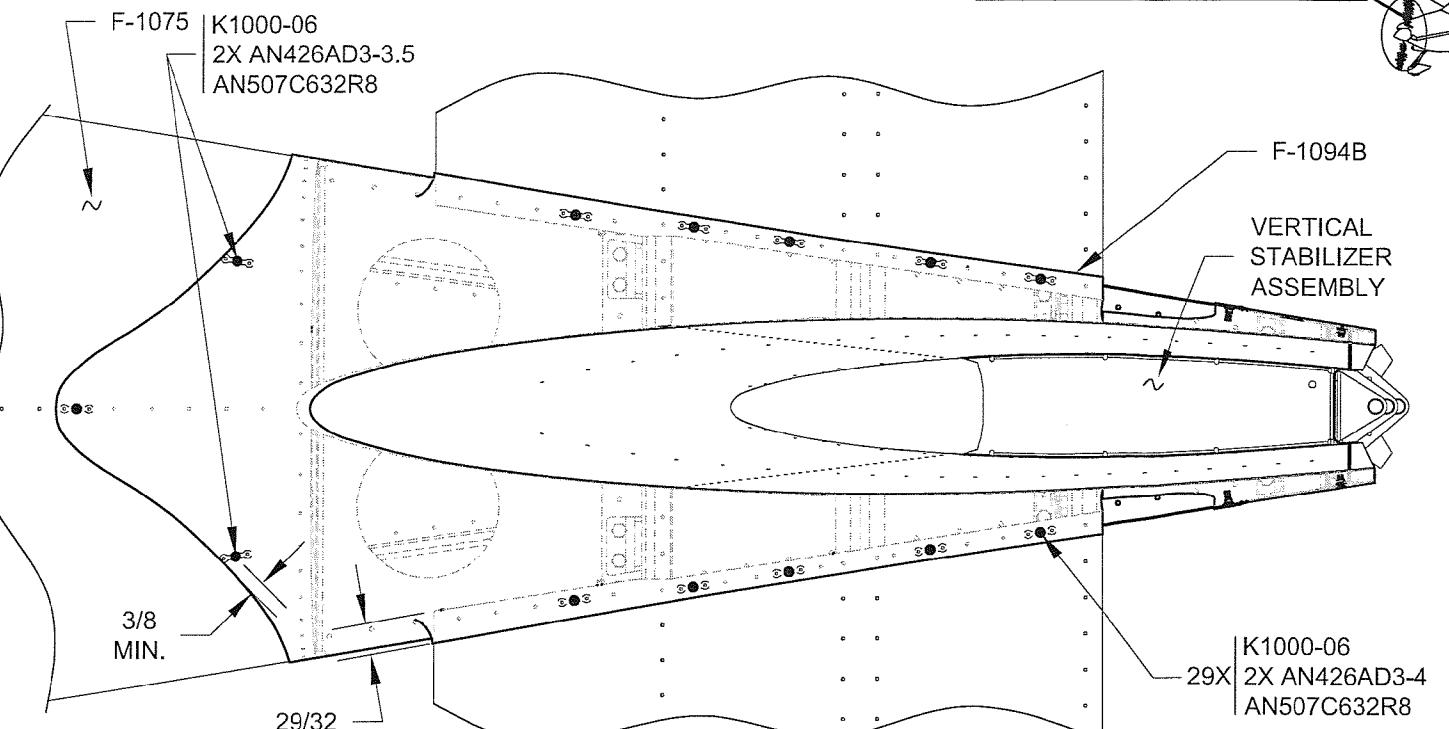
Step 3: Cleco the F-1094B Empennage Fairing onto the tailcone/empennage assembly, and reclamp the aft end per Step 1. The remaining holes that attach the empennage fairing have been left open and can be drilled using the same method used in Step 1. Blind-Drill and cleco the remaining fastener locations #40. Work from the front towards the aft, alternating from the left to the right sides of the assembly.

Step 4: Mark the F-1094B Empennage Fairing for trimming. See Figure 1 for edge callouts. Mark edge B flush with the front edge of the F-1094A Empennage Gap Cover. Edge C is indicated by a scribe line, check that this line will provide enough screw hole edge distance and remark the line if necessary. Edge C is parallel to the inboard edge of the HS-1001 Horizontal Stabilizer Skin but different widths at the forward and aft edges. Mark edge D flush with the aft top edge of the horizontal stabilizer skin. Edge E is indicated by a scribe line, check that this line will provide enough edge distance and remark the line if necessary. Edge E should parallel the aft lower edge of the VS-1001 Vertical Stabilizer Skin and then curve upwards towards leading edge of the vertical stabilizer assembly. Mark edge F as shown in Figure 3 to provide a minimum 1/4 clearance between edge F and the WD-605-L/R Elevator Horns with the elevator assembly rotated through its full range of motion. Mark edges G and H even and parallel with the lower edge of the F-1075 Tailcone Aft Top Skin and empennage gap cover. See Figure 3. Mark edge J even with the aft edge of the F-1073 Side Skins and vertical stabilizer skin.

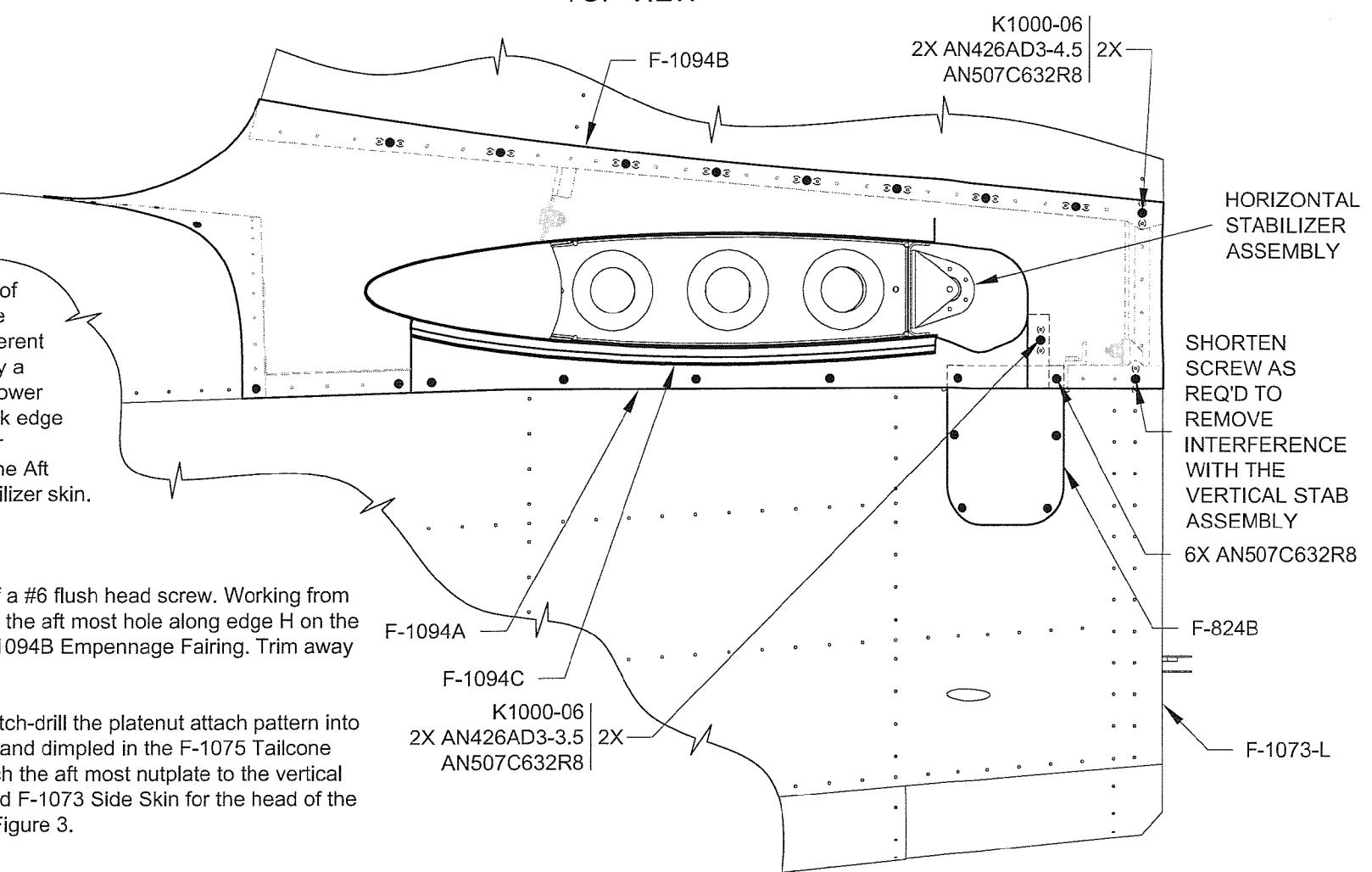
**WARNING!** Do not enlarge any holes in the F-1032-L and -R Tailcone Longerons to #27 until Page 12-6.

Step 5: Machine countersink the four holes (two per side) along edge G (see Figure 1) on each side of the aircraft, for the head of a #6 flush head screw. Working from the aft towards the front final-drill #27 and **carefully** machine countersink all holes in the empennage fairing along edges C and E, the aft most hole along edge H on the right and left sides of the aircraft and the three most forward fastener locations, for the head of a #6 flush head screw. Remove F-1094B Empennage Fairing. Trim away excess material.

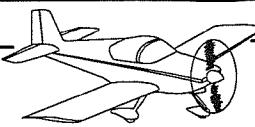
Step 6: The locations just drilled #27 require nutplates. Use a K1000-06 nutplate (aligned with a #6 screw) as a drill guide and match-drill the platenut attach pattern into the F-1094A Empennage Gap Cover, horizontal and vertical assemblies (note the nutplate pattern has already been pre-punched and dimpled in the F-1075 Tailcone Aft Top Skin). Orient the platenut attach patterns as shown in Figure 2 and Figure 3. Machine countersink the rivet holes that attach the aft most nutplate to the vertical stabilizer assembly. Dimple the remaining locations on the HS-1001 Horizontal Stabilizer Skin, VS-1001 Vertical Stabilizer Skin and F-1073 Side Skin for the head of the nutplate attach rivets. Dimple then rivet the nutplates to the tailcone, horizontal and vertical assemblies as shown in Figure 2 and Figure 3.



**FIGURE 2: EMPENNAGE FAIRING INSTALLATION TOP VIEW**



**FIGURE 3: EMPENNAGE FAIRING INSTALLATION SIDE VIEW**



**NOTE: Steps 1-6 are for the left side only. The right side installation is a mirror of the left. Repeat steps 1-6 for the right side of the aircraft.**

Step 1: Remove the horizontal and vertical stabilizer assemblies.

Step 2: Final-Drill #36 all the F-1094A Empennage Gap Cover attach holes to the F-1073-L Tailcone Side Skin Left and F-1032-L Tailcone Longeron Left.

See Figure 1. Final-Drill #36 the lower two aft empennage gap cover holes to the F-824B Cover Plate and tailcone longeron left. Final-Drill #36 the four holes (two per side) along edge G on Page 12-5, Figure 1 on each side of the aircraft.

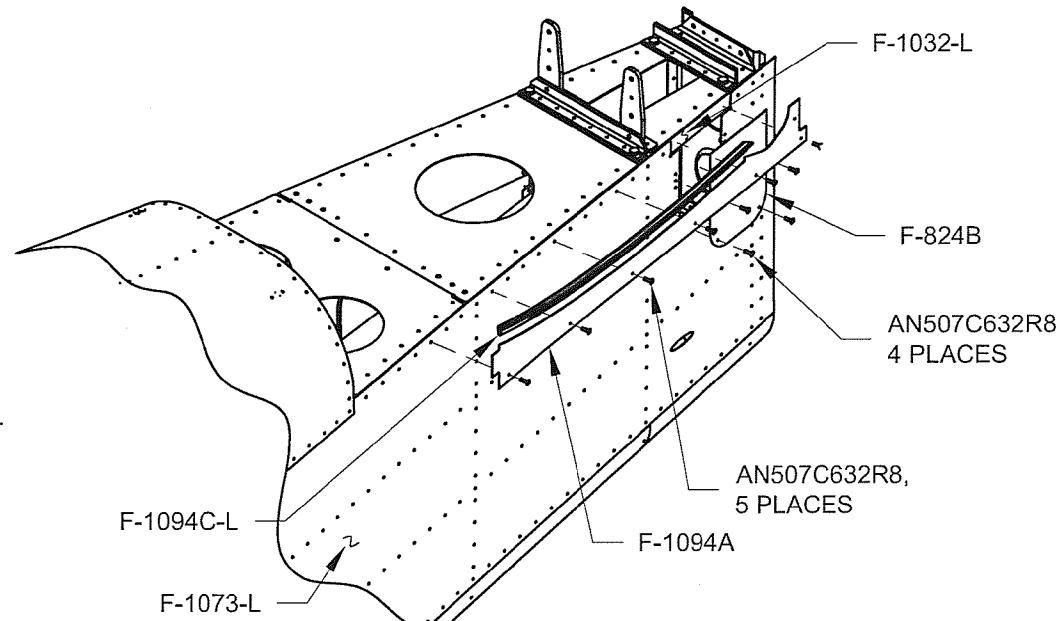
Step 3: Remove the F-824B Cover Plate and F-1094A Empennage Gap Cover.

Step 4: Deburr the holes in the tailcone assembly that were drilled #36 in Step 2.

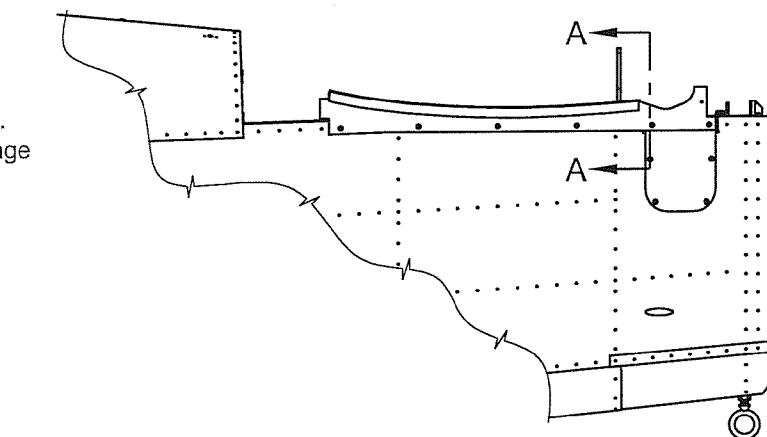
Step 5: Final-Drill #27 and deburr all but the aft most upper hole in the F-1094A Empennage Gap Cover (this hole was already final-drilled #27, see Page 12-5, Step 5). Final-Drill #27 the upper two attach holes in the F-824B Cover Plate. Dimple the forward upper hole in the cover plate and all but the two aft most holes in the empennage gap cover for a #6 flush head screw.

Step 6: Machine countersink the F-1073-L Tailcone Side Skin Left and F-1032-L Tailcone Longeron Left to accept the dimples in the F-1094A Empennage Gap Cover and F-824B Cover Plate, **except the aft most hole which does not need to be dimpled since the empennage fairing is machine countersunk for the screw head already in this location, see Page 12-5, Figure 3.** See Figure 2, Section A-A.

Step 7: Tap the holes that were drilled #36 in Step 2 for a 6-32 screw.



**FIGURE 1: EMPENNAGE GAP COVER AND COVER PLATE INSTALLATION**



**FIGURE 2: EMPENNAGE GAP COVER AND COVER PLATE INSTALLATION  
SIDE VIEW AND SECTION CUTS**