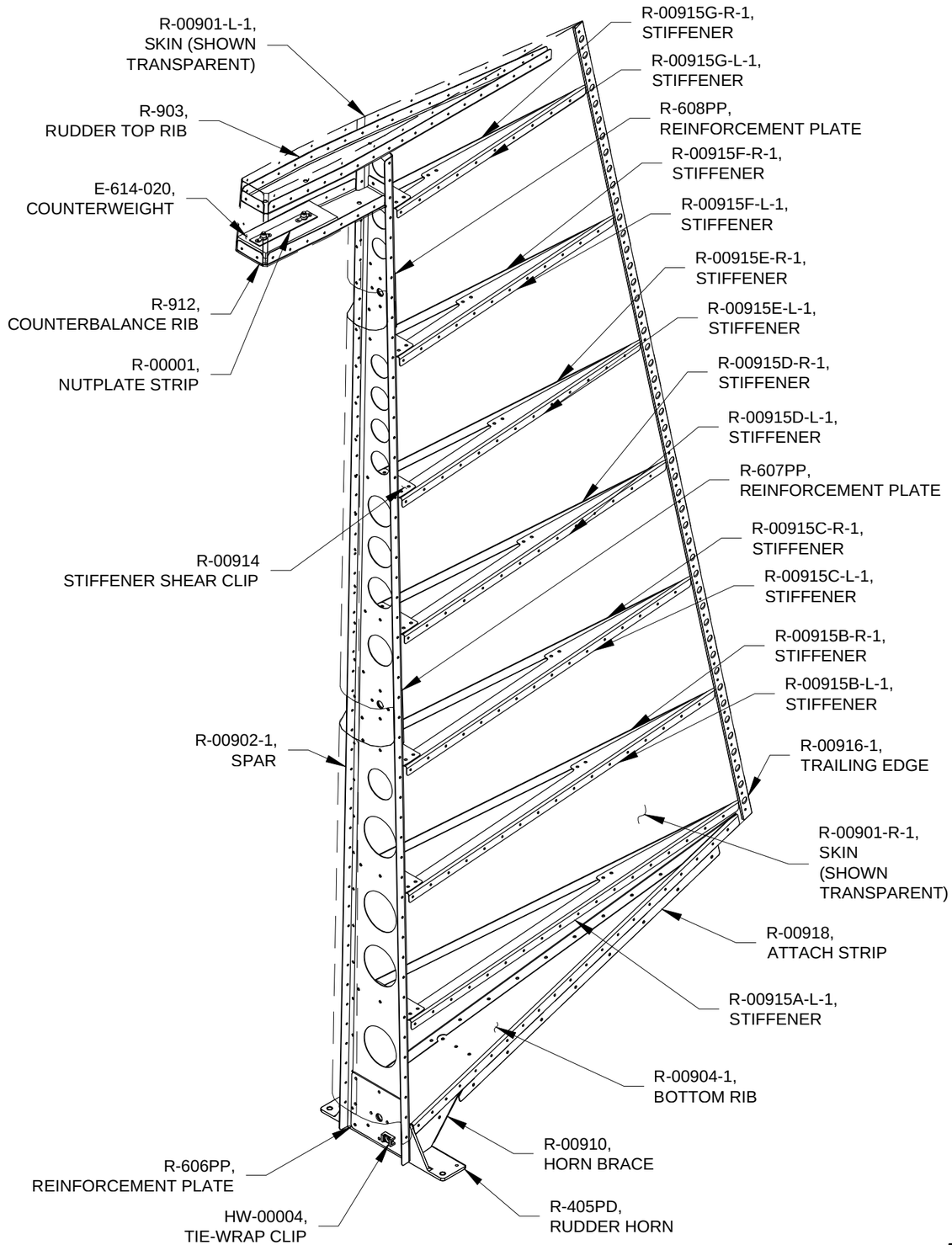
SECTION 7: RUDDER ASSEMBLY



Step 1: Separate the R-00914 Stiffener Shear Clip into individual shear clips by removing the hatched areas as shown in Figure 1. Deburr parts.

Step 2: Separate the R-00915A-1, R-00915B-1, R-00915C-1, R-00915D-1, R-00915E-1, R-00915F-1 and R-00915G-1 Stiffeners into individual left and right sections by removing the hatched areas as shown in Figure 2. Remove the hatched areas on the outer edges of parts as shown in the figure. Deburr.

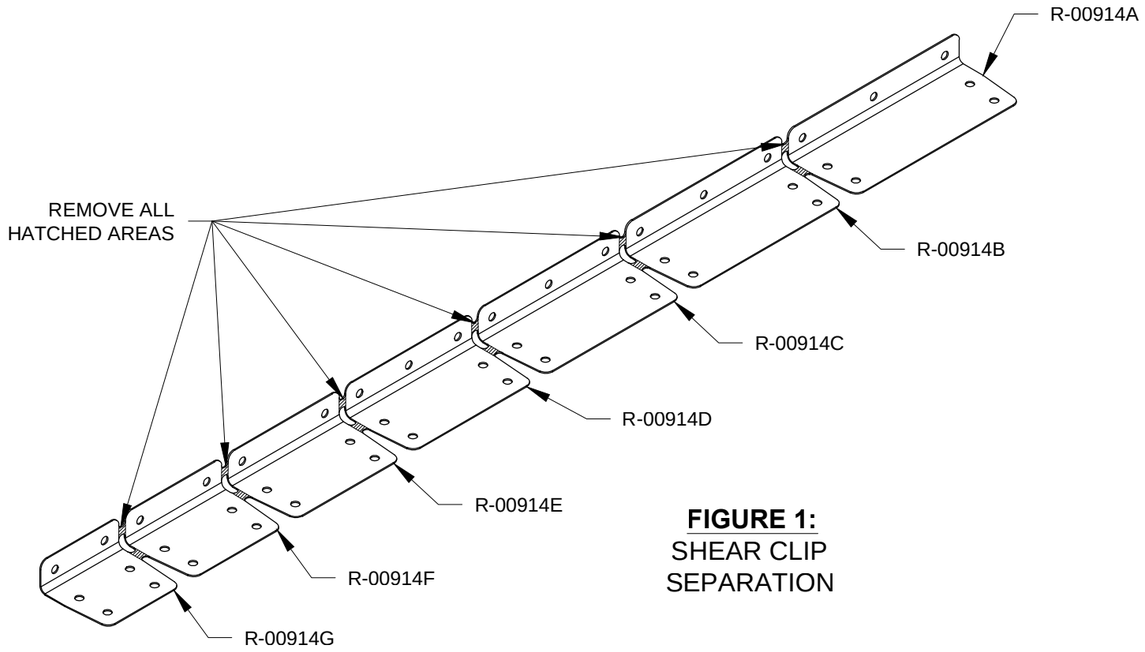


FIGURE 1: SHEAR CLIP SEPARATION

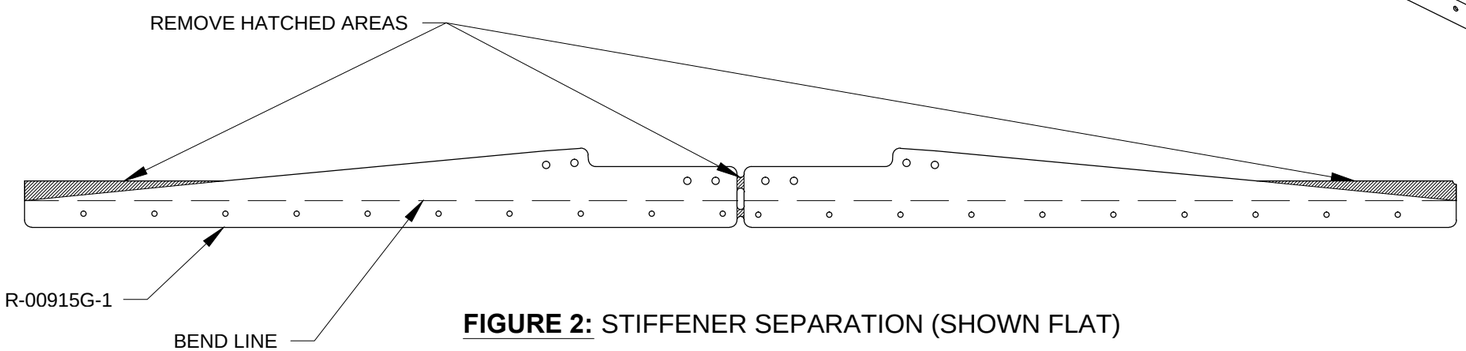


FIGURE 2: STIFFENER SEPARATION (SHOWN FLAT)

Step 3: Separate the R-00917 Shim and R-00918 Attach Strips by removing the hatched areas as shown in Figure 3. Deburr parts.

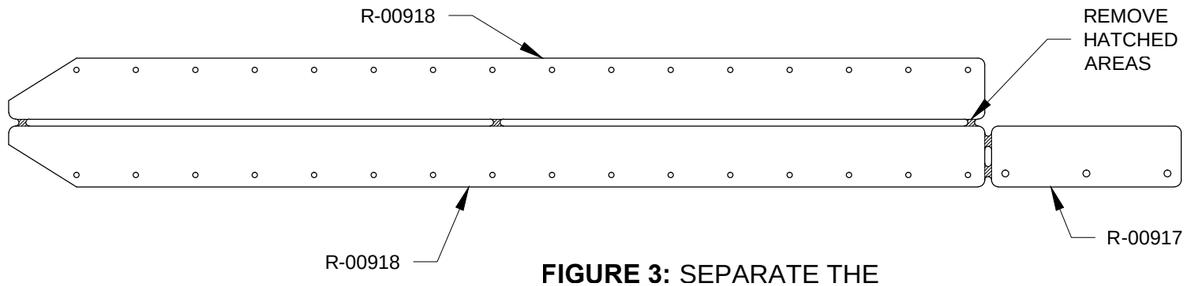


FIGURE 3: SEPARATE THE ATTACH STRIPS AND SHIM

Step 4: Remove hatched areas shown in Figure 4 from R-00910 Horn Brace. Deburr.

Step 5: Separate the R-00904-1 Bottom Rib by removing the hatched areas as shown in Figure 5 to create R-00904A-1 and R-00904B-1 parts.

Deburr parts.

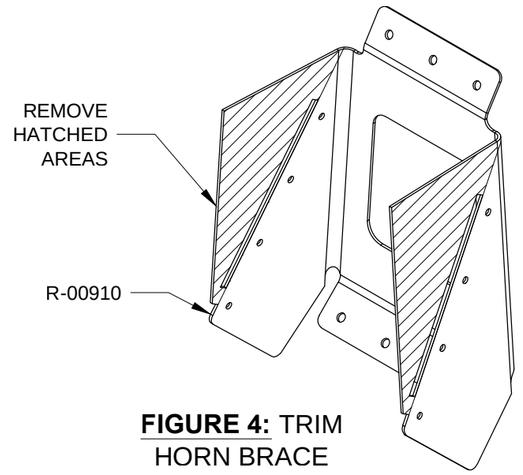


FIGURE 4: TRIM HORN BRACE

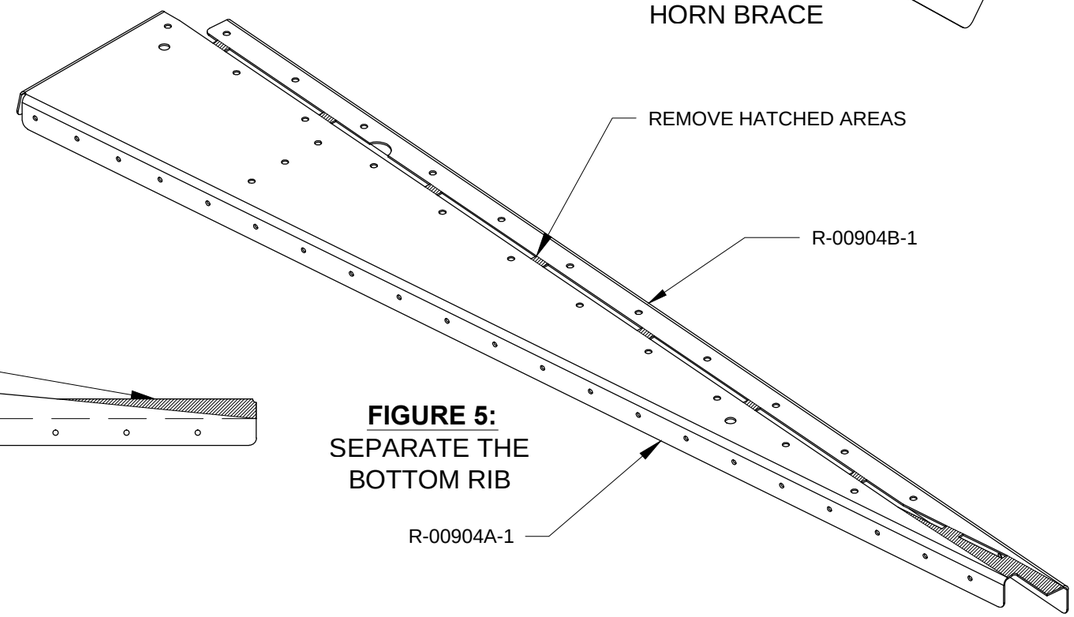


FIGURE 5: SEPARATE THE BOTTOM RIB

Step 1: Remove the sharp edge on the top flange of the R-405PD Rudder Horn as shown in Figure 1 to allow it to nest inside the bend radius of the forward flange of the R-00904A-1 Bottom Rib. See Figure 2.

Radius the 4 corners of the rudder horn as shown in Figure 1.

Step 2: Cleco the R-606PP, R-607PP, and R-608PP Reinforcement Plates to the R-00902-1 Spar as shown in Figure 2.

Cleco the R-00904A-1 Bottom Rib, R-00917 Shim, and the R-405PD Rudder Horn to the spar. The forward flange of the R-00904A-1 Bottom Rib is placed forward of the R-405PD Rudder Horn when assembled.

Step 3: Final-Drill #30 all 1/8 [3.175 mm] holes common to the parts clecoed together in Step 2.

Separate all parts. Mark the side of the reinforcement plates that contact the spar. Deburr parts as required.

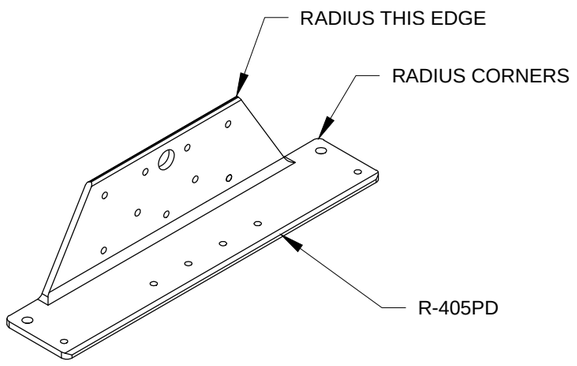


FIGURE 1: RUDDER HORN MODIFICATION

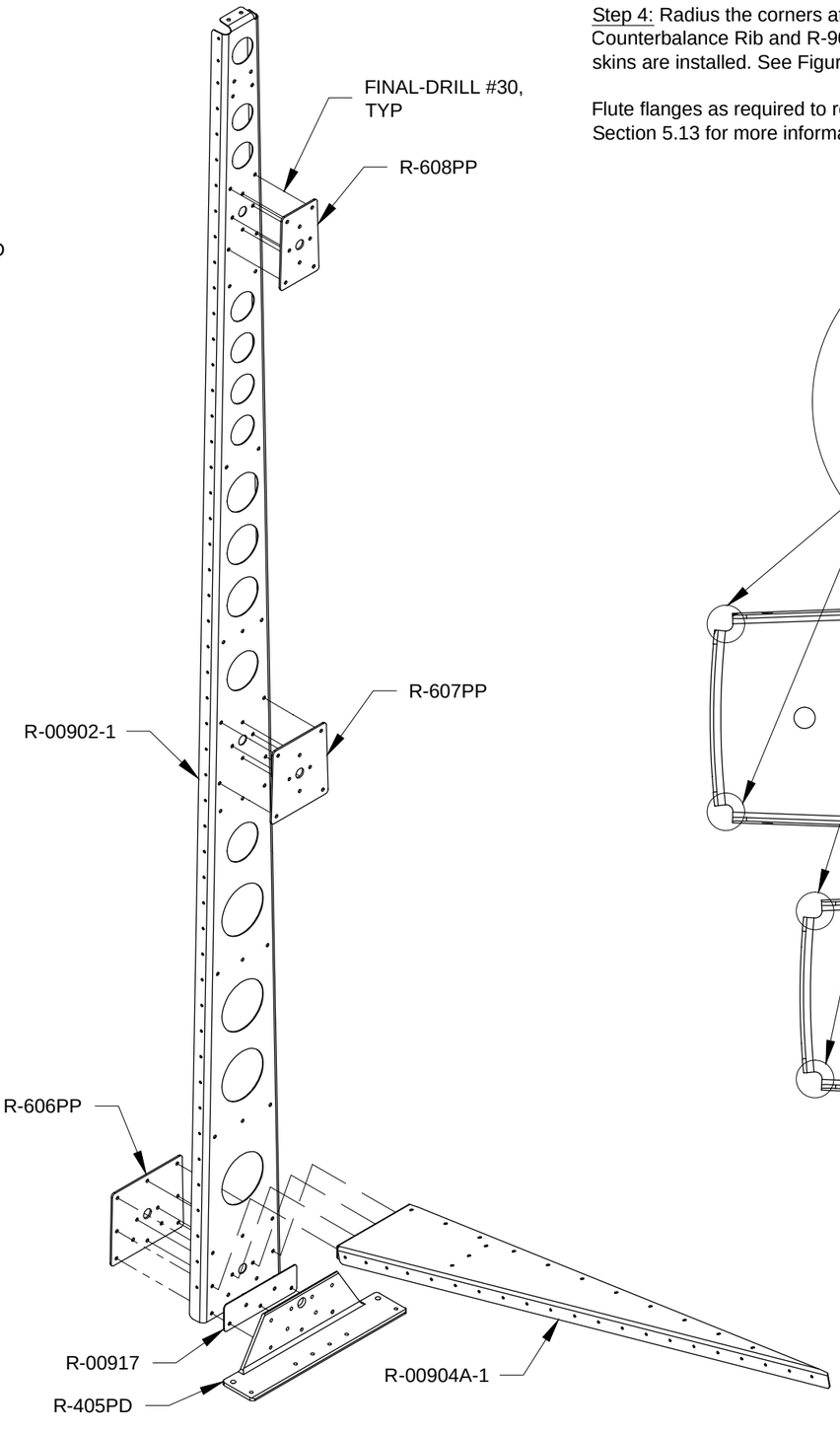


FIGURE 2: RUDDER HORN AND REINFORCEMENT PLATE

Step 4: Radius the corners at the forward end of the R-912 Counterbalance Rib and R-903 Top Rib flanges to ease fit when the skins are installed. See Figure 3.

Flute flanges as required to remove any curvature in web of ribs. See Section 5.13 for more information on fluting flanges.

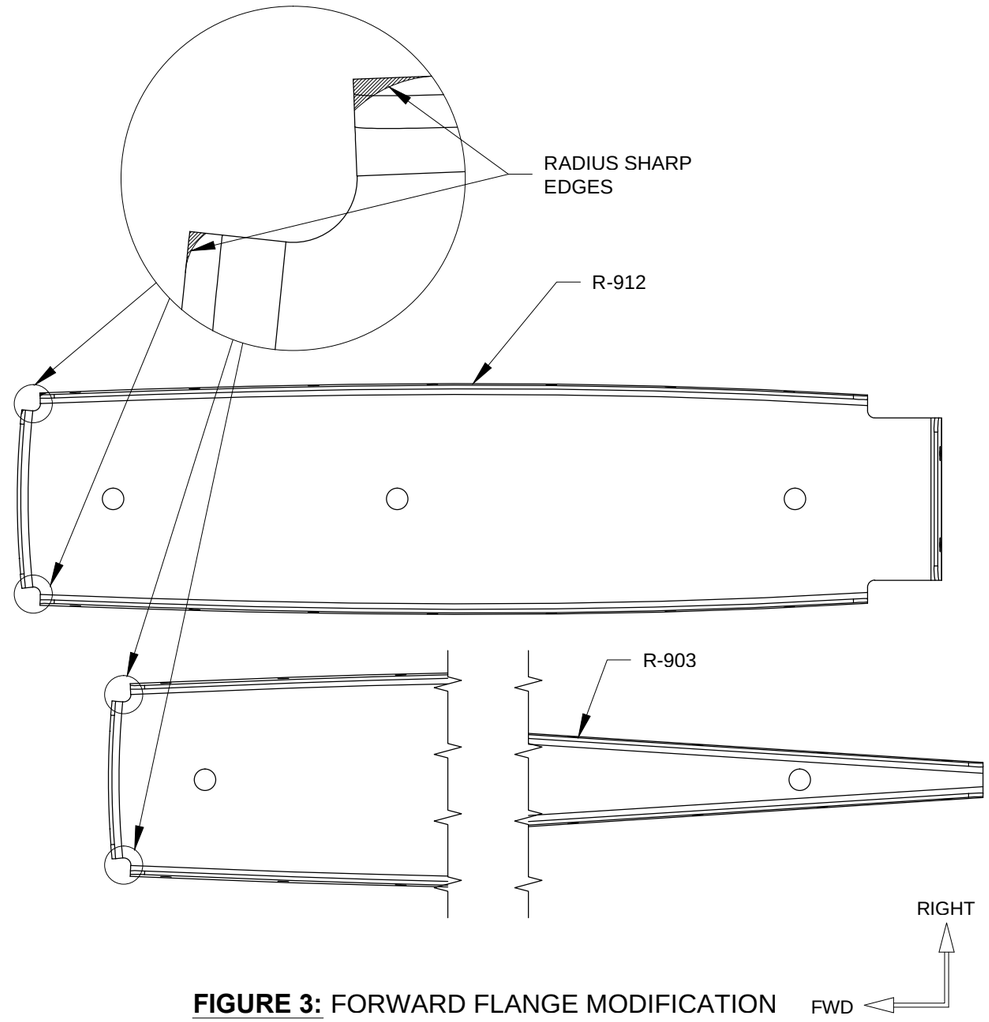


FIGURE 3: FORWARD FLANGE MODIFICATION

Step 1: Mark the R-00901-R-1 Rudder Skin as shown in Figure 1. Trim the top forward flange to the line then deburr the rudder skin edges.

Step 2: Final-Drill #30 the 3/32 [2.39mm] hole in the R-00901-R-1 Rudder Skin as called out in Figure 1. Dimple for CS4 rivet flush on the surface opposite the flange bend direction.

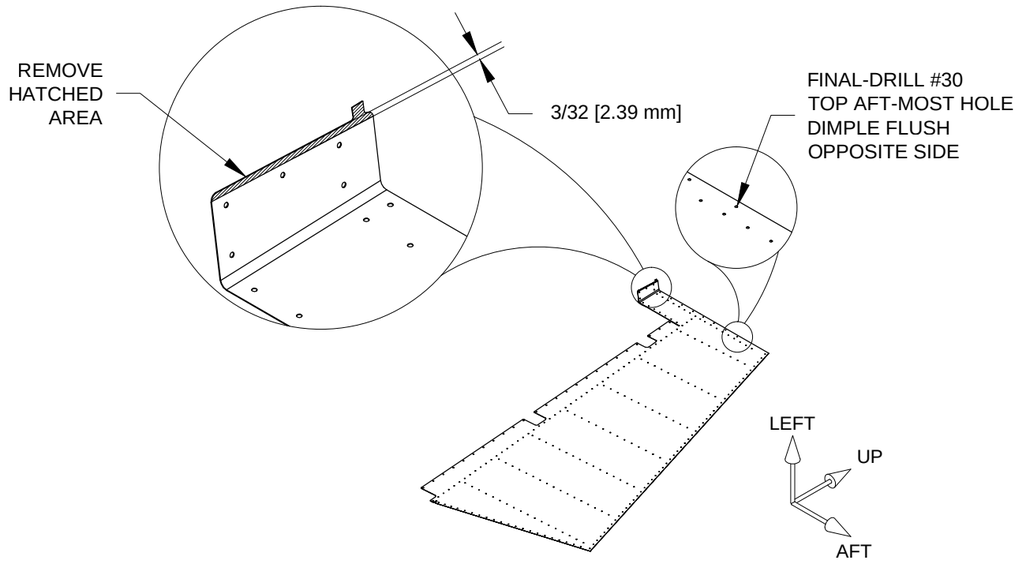


FIGURE 1: RIGHT RUDDER SKIN TRIM

Step 3: Trim the small bending tab off of the R-00901-L-1 Rudder Skin as shown in Figure 2. Deburr rudder skin edges.

Step 4: Final-Drill #30 the 3/32 [2.39mm] hole in the R-00901-L-1 Rudder Skin as called out in Figure 2. Dimple for CS4 rivet flush on the surface opposite the flange bend direction.

Step 5: Make a slight bend along the flange of the R-00901-L-1 Skin where it will overlap the R-00901-R-1 Skin flange. See Section 5.10 for information on lap joints. See Figure 2.

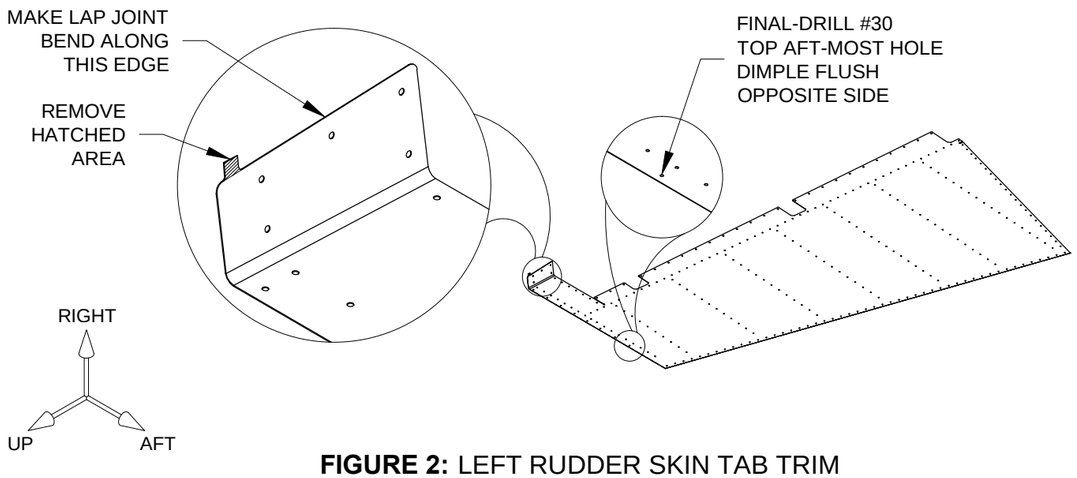


FIGURE 2: LEFT RUDDER SKIN TAB TRIM

Step 6: Cleco the R-912 Counterbalance Rib and the R-903 Top Rib to the R-00902-1 Spar. See Figure 3.

Step 7: Final-Drill #30 the R-903 Top Rib holes that attach the top rib to the R-00902-1 Spar as shown in Figure 3. Remove and deburr top rib.

Step 8: Final-Drill #30 the two holes that attach the R-912 Counterbalance Rib to the spar. Separate and deburr parts. See Figure 3.

Step 9: Final-Drill #12 the forward hole in the E-614-020 Counterweight to the R-912 Counterbalance Rib. Attach the counterweight and counterbalance rib as shown in Figure 3 using the hardware called out on Page 7-11. Match-Drill #12 the aft hole in the counterweight to the counterbalance rib. See Figure 3.

Separate and deburr parts.

Step 10: Dimple the R-912 Counterbalance Rib for the head of an AN509 countersunk screw as called out in Figure 3.

Step 11: Machine countersink the #12 holes in the E-614-020 Counterweight for the dimple of an AN509 countersunk screw.

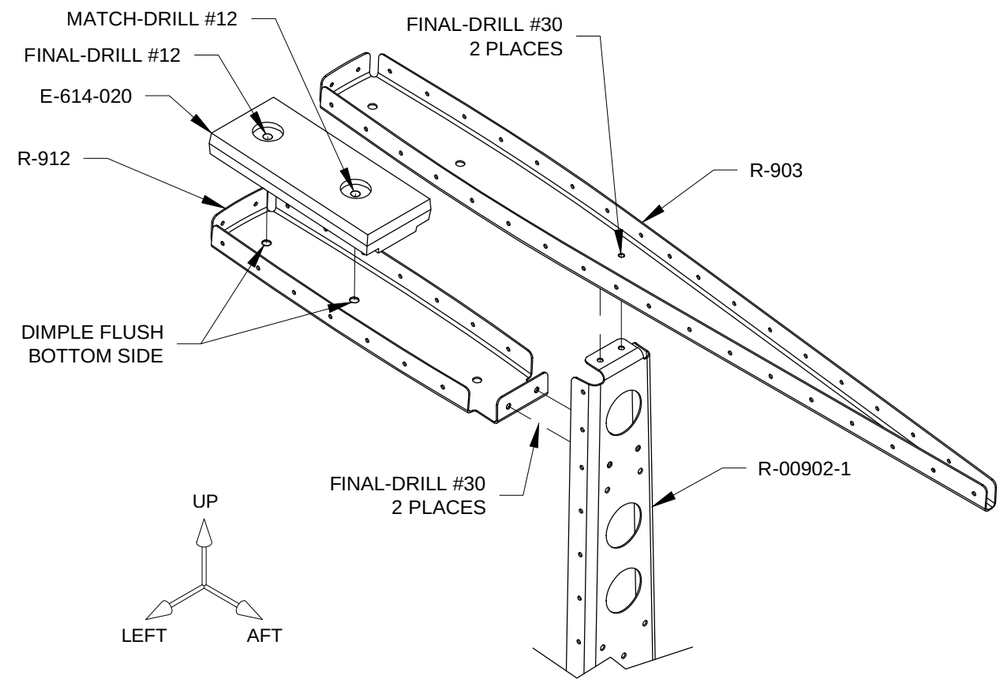


FIGURE 3: TOP AND COUNTERBALANCE RIB ATTACHMENT

Step 1: Cleco the R-606PP, R-607PP, and R-608PP Reinforcement Plates to the R-00902-1 Spar.

Cleco the R-00904A-1 Bottom Rib, R-00917 Shim and the R-405PD Rudder Horn to the spar. See Figure 1.

Step 2: Rivet the R-912 Counterbalance Rib and the R-607PP and R-608PP Reinforcement Plates to the R-00902-1 Spar. See Figure 1 for hardware call outs.

Rivet the nutplates to the reinforcement plates and spar. See Figure 1 for hardware call outs.

Step 3: Rivet the R-606PP Reinforcement Plate, R-00917 Shim, R-00904A-1 Bottom Rib and R-405PD Rudder Horn to the R-00902-1 Spar as shown in Figure 1. Note that the forward flange of the bottom rib is forward of the rudder horn. Also be sure to leave open the holes for the HW-00004 Tie-Wrap Clip installed in the next step.

Step 4: Cut a piece of double sided tape the size of the bottom of the HW-00004 Tie-Wrap Clip. Apply the tape to the bottom of the clip.

Rivet the clip to the Spar Assembly as shown in Figure 1 using the rivet called out in Figure 2.

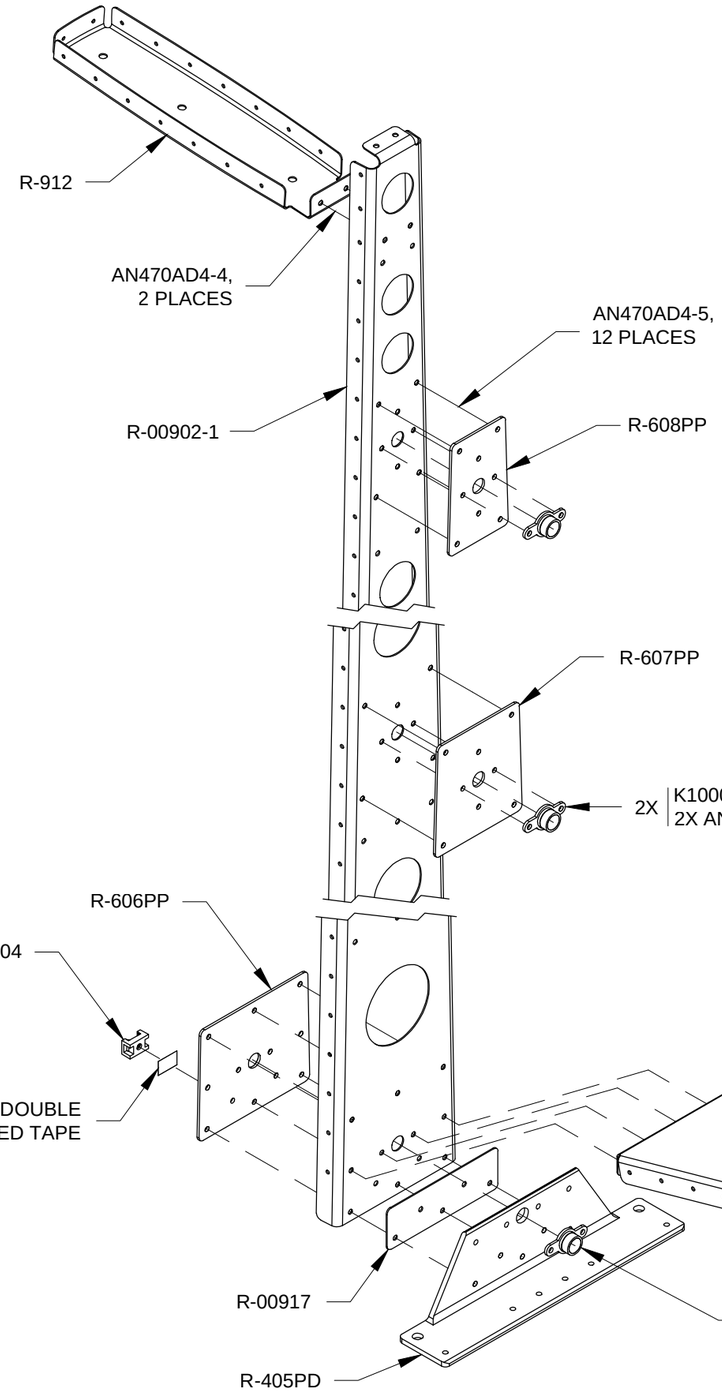


FIGURE 1: SPAR AND RUDDER HORN ASSEMBLY

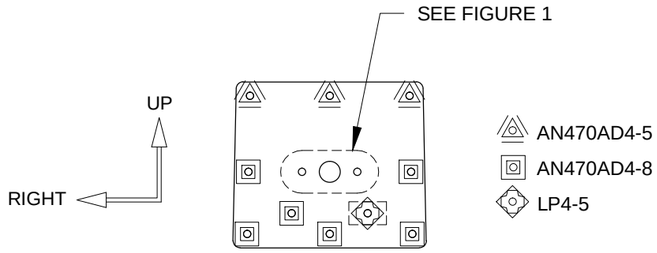


FIGURE 2: RIVETS FOR R-606PP AND ASSOCIATED PARTS

Step 1: Cleco the R-903 Rudder Tip Rib to the Rudder Skeleton Assembly.

Cleco the R-000904B-1 Bottom Rib to the rudder skeleton assembly. See Figure 1.

Step 2: Cleco the R-00914A through R-00914G Stiffener Shear Clips to the Rudder Skeleton Assembly as shown in Figure 1.

Cleco the R-00915A-L-1 and R-00915A-R-1 through R-00915G-L-1 and R-00915G-R-1 Stiffeners to the stiffener shear clips as shown in Figures 1 and 2.

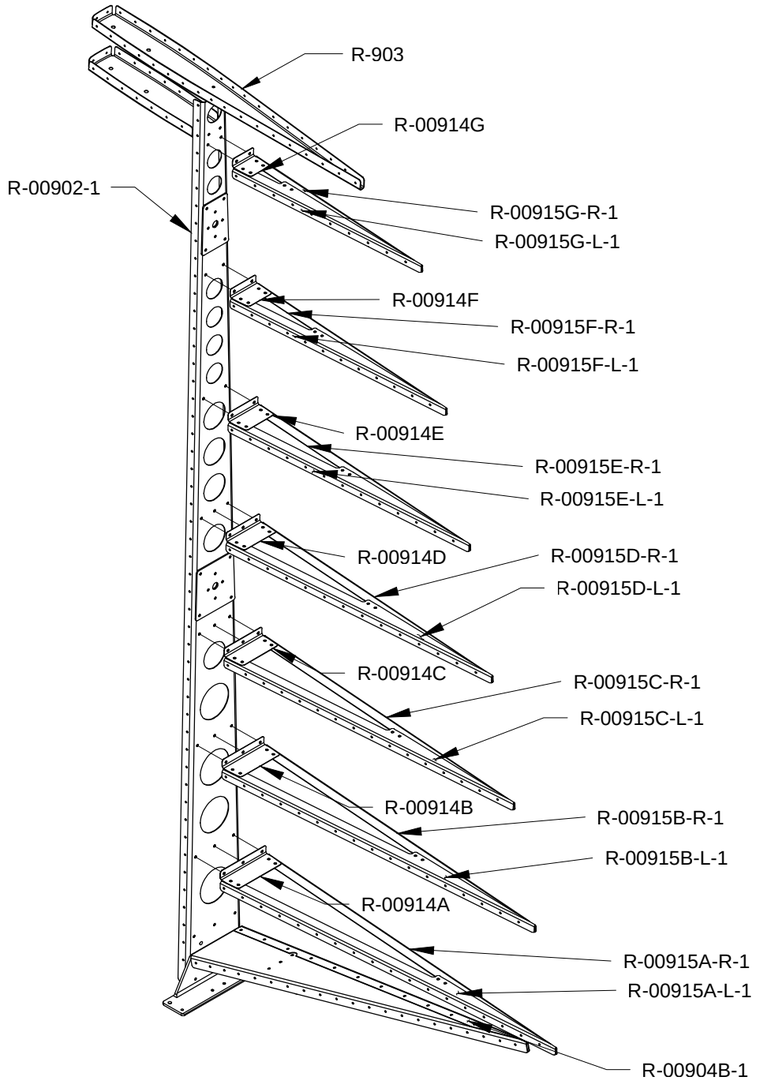


FIGURE 1: RUDDER ASSEMBLY

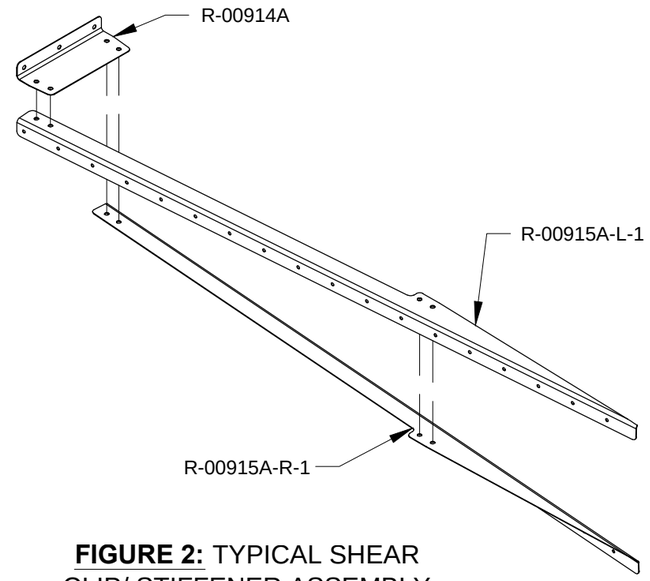
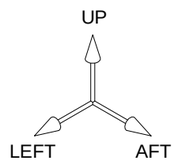


FIGURE 2: TYPICAL SHEAR CLIP/ STIFFENER ASSEMBLY



Step 1: Cleco the VA-140 Trailing Edge to the R-00901-R-1 Skin. The end of the trailing edge extends beyond the skin as shown in Figure 1.

Mark the locations of the skin edges on the trailing edge.

Make a mark along the forward edge of the trailing edge on the skin. See Figure 2.

Remove the trailing edge and trim to the marked length to make the R-00916-1 Trailing Edge.

Step 2: Cleco the R-00916-1 Trailing Edge to the R-00901-L-1 Skin and mark the location of the forward edge of the trailing edge on the skin as done in Step 1.

NOTE: Drill the holes of the R-00916-1 Trailing Edge perpendicular to the chord line of the rudder as shown in Figure 2.

Step 3: Cleco the R-00910 Rudder Horn Brace, R-00901-R-1 Skin and the right R-00918 Attach Strip to the Rudder Skeleton Assembly. See Figure 3.

Cleco the left R-000918 Attach Strip, R-00901-L-1 and attached R-00916 Trailing Edge to the rudder skeleton assembly. Lay the leading edge bend of the left skin over the outside of the right skin.

Final-Drill #40 all the holes common to the skins and trailing edge. Start drilling at the middle of the span and work toward the ends; drill and cleco every hole.

Final-Drill #40 all holes common to the skins and flanges of the R-903 Tip Rib and R-912 Counterbalance Rib.

Step 4: Match-Drill #40 the hole in the forward flange of the R-00901-L-1 Skin into the R-00901-R-1 Skin as shown in Figure 3.

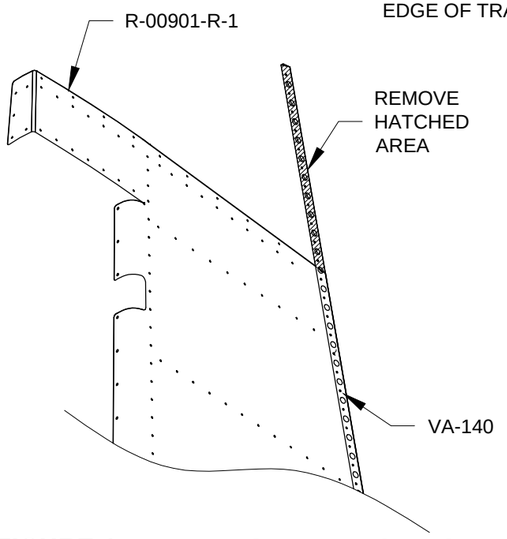


FIGURE 1: TRIMMING TRAILING EDGE

NOTE: Be very careful when deburring the holes in the R-00901-L-1 and R-00901-R-1 Rudder Skins to use minimal force. It is easy to remove too much material.

Step 5: Remove the R-00901-L-1 Skin and R-00901-R-1 Skin from the Rudder Skeleton Assembly. Remove the R-00916-1 Trailing Edge. Scuff the marked areas on both skins (where the trailing edge and skins contact each other) with a scotchbrite pad.

Put a slight break in the trailing edge of both skins so that they will lay down flat on the R-00916-1 Trailing Edge after riveting. See Section 5.10.

Step 6: Disassemble the remaining clecoed parts and deburr all holes and edges that have not yet been deburred.

NOTE: Do not dimple the holes called out in Figure 3 at the top of the R-00901-L-1 and R-00901-R-1 Skins. These will be drilled and dimpled in a later section. Tape over holes to avoid dimpling. See Section 5.5 for more information on dimpling parts.

Step 7: Dimple the holes in the R-00901-L-1 and R-00901-R-1 Skins (make sure to dimple from the correct side!) and the corresponding holes in the flanges of the R-00915 Stiffeners, R-00902-1 Spar, R-903, R-912 and R-00904A-1 and R-00904B-1 Ribs, R-00918 Attach Strips, and R-00910 Horn Brace. See Page 07-12, Figure 2 for rivet locations.

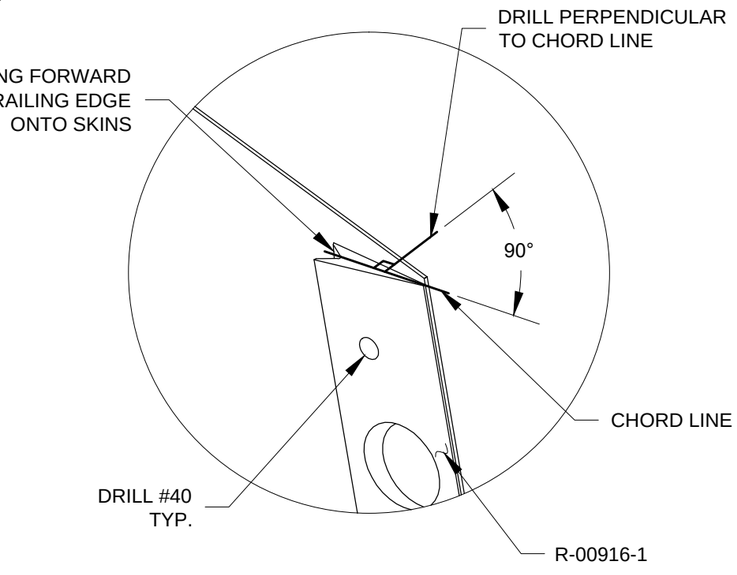


FIGURE 2: TRAILING EDGE MODIFICATION

Step 8: Machine countersink the holes in the R-00916-1 Trailing Edge (on both sides) for the 3/32 [2.38 mm] dimples in the skins. Countersink perpendicular to the trailing edge face.

Step 9: If desired, prime the parts in preparation for final riveting. Avoid priming the scuffed areas from Step 5.

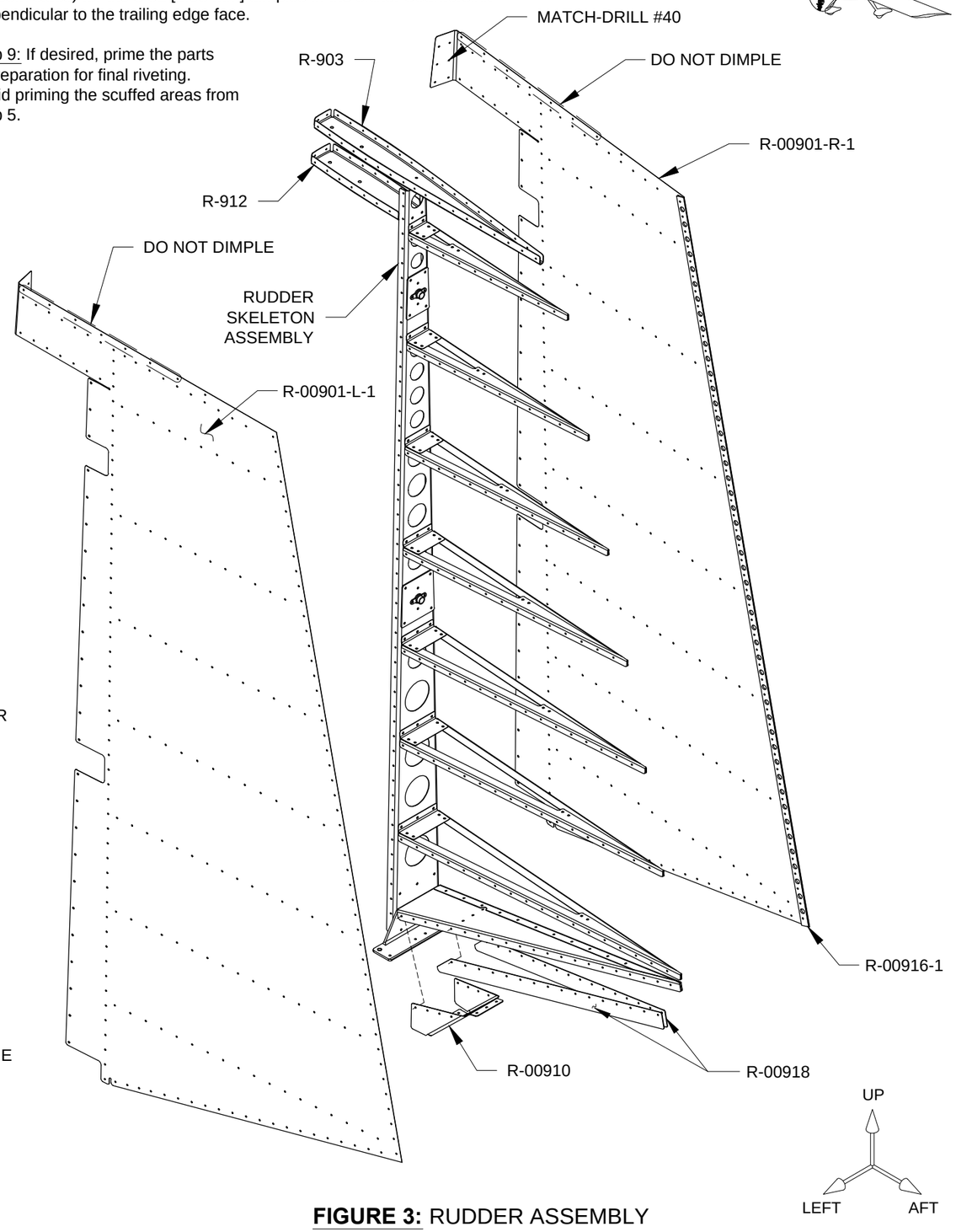


FIGURE 3: RUDDER ASSEMBLY

NOTE: Take care to leave open the rivet locations indicated in Figure 1.

Riveting tape, which is useful for holding rivets in place while back-riveting, is available from the Van's Aircraft Accessories Catalog.

Step 1: Back rivet (see Section 5.6) all the R-00915-1 Stiffeners to the R-901-1-L and R-901-1-R Skins, as shown in Figure 1, using the rivets shown on Page 07-12, Figure 2.

Step 2: Back rivet the R-00904B-1 Bottom Rib and the R-00918 Attach Strip to the R-901-R-1 Skin as shown in Figure 1. Take care to leave open the rivet locations called out in Figure 1. The bottom rib is located between the skin and the attach strip as shown in Figure 1 and 2.

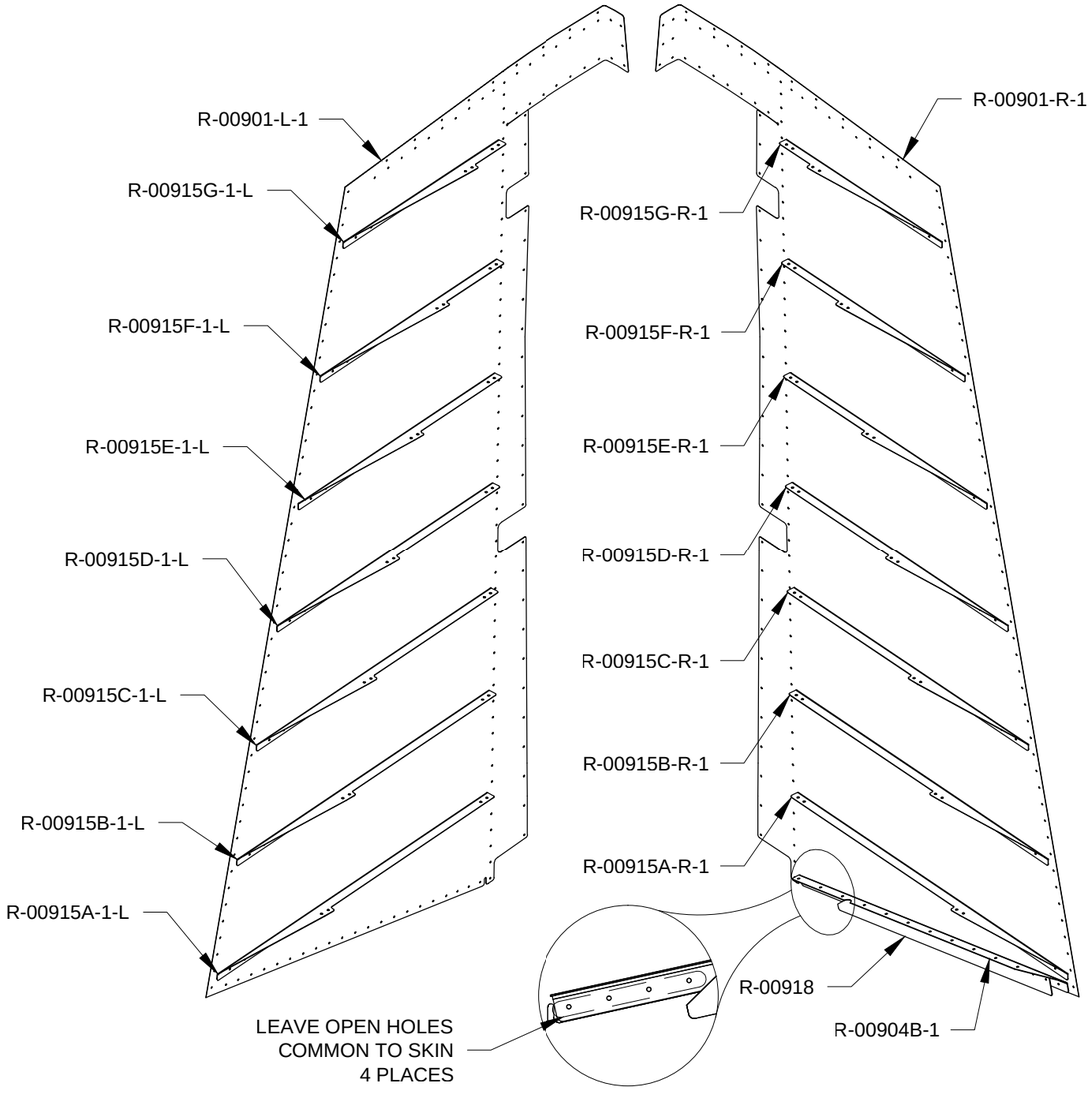


FIGURE 1: RIVETING STIFFENERS

Step 3: Rivet the R-00914 Shear Clips to the corresponding R-00914 Stiffeners as shown in Figure 2.

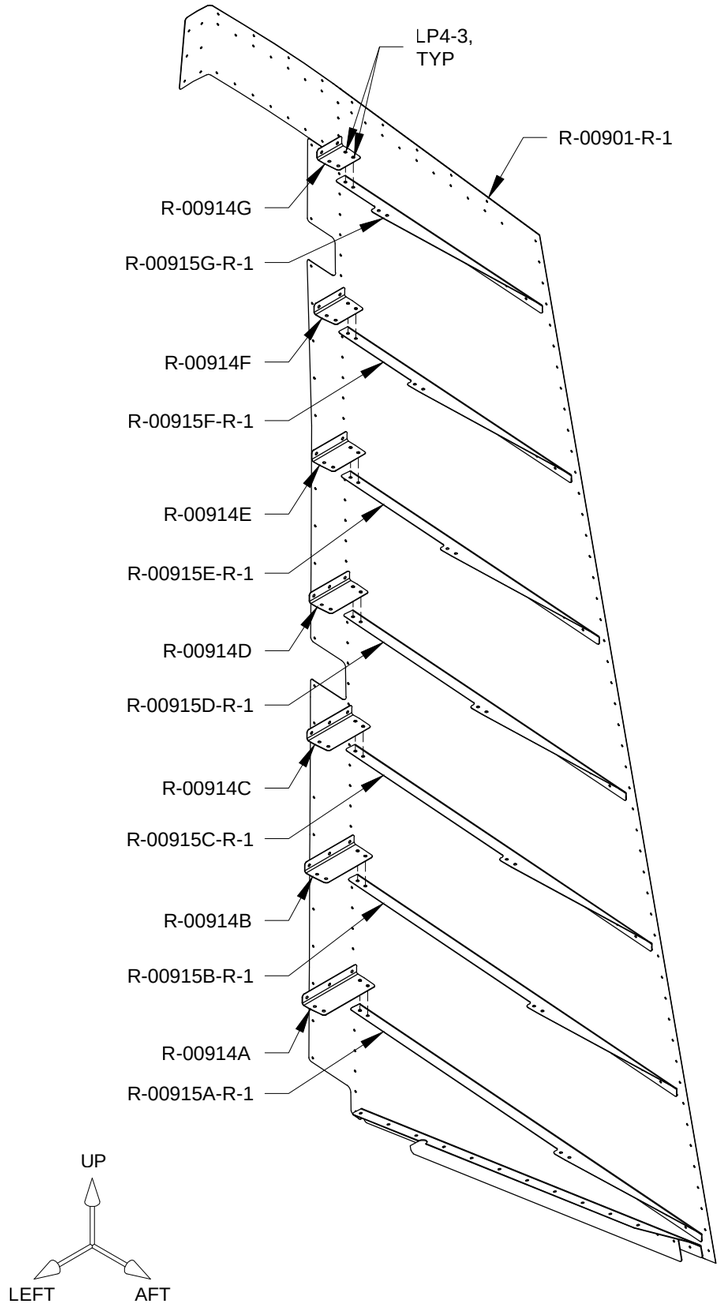


FIGURE 2: SHEAR CLIP TO STIFFENER ATTACHMENT

NOTE: Read Section 5.7 for detailed information on riveting trailing edge assemblies.

Step 1: Use adhesive and assembly instructions as described in Section 5.7 to adhere R-00916-1 Trailing Edge to the R-00901-R-1 Skin. Cleco to secure. See Figure 1.

Step 2: Position the R-00901-L-1 Skin opposite the R-00901-R-1 Skin as shown in Figure 1.

Use adhesive and assembly instructions as described in Section 5.7 to adhere R-00916-1 Trailing Edge to the left skin.

The aft end of the stiffeners which are attached to the left skin sit above the right side stiffeners. The forward end of all stiffeners are below the shear clips as shown in Figure 1 and on Page 07-06 Figure 2.

Capture the left skin with the bottom cleco in the trailing edge. See Figure 1.

Step 3: Have someone roll back the R-00901-L-1 Skin so that the aft end of the R-00915A-1 Bottom Stiffeners can be riveted. Rivet only the forward of the two holes in the aft end of the stiffeners. Use the blind rivets shown in Figure 1.

Join the forward end of the stiffener to the R-00914A Shear Clip with two blind rivets shown in Figure 1.

Step 4: Repeat Step 3 for the rest of the R-00915-1 Stiffeners and R-00914 Shear Clips. Place the aft end of the left stiffener on top of the right stiffener and the forward end of the stiffener below the shear clip as shown in Figure 1 and on Page 07-06 Figure 2.

Capture the left skin with clecos in the trailing edge as each stiffener set is riveted.

Step 5: Cleco the rest of the holes in the trailing edge. Make sure the parts fit tightly; there shouldn't be anything holding the skins and trailing edge apart.

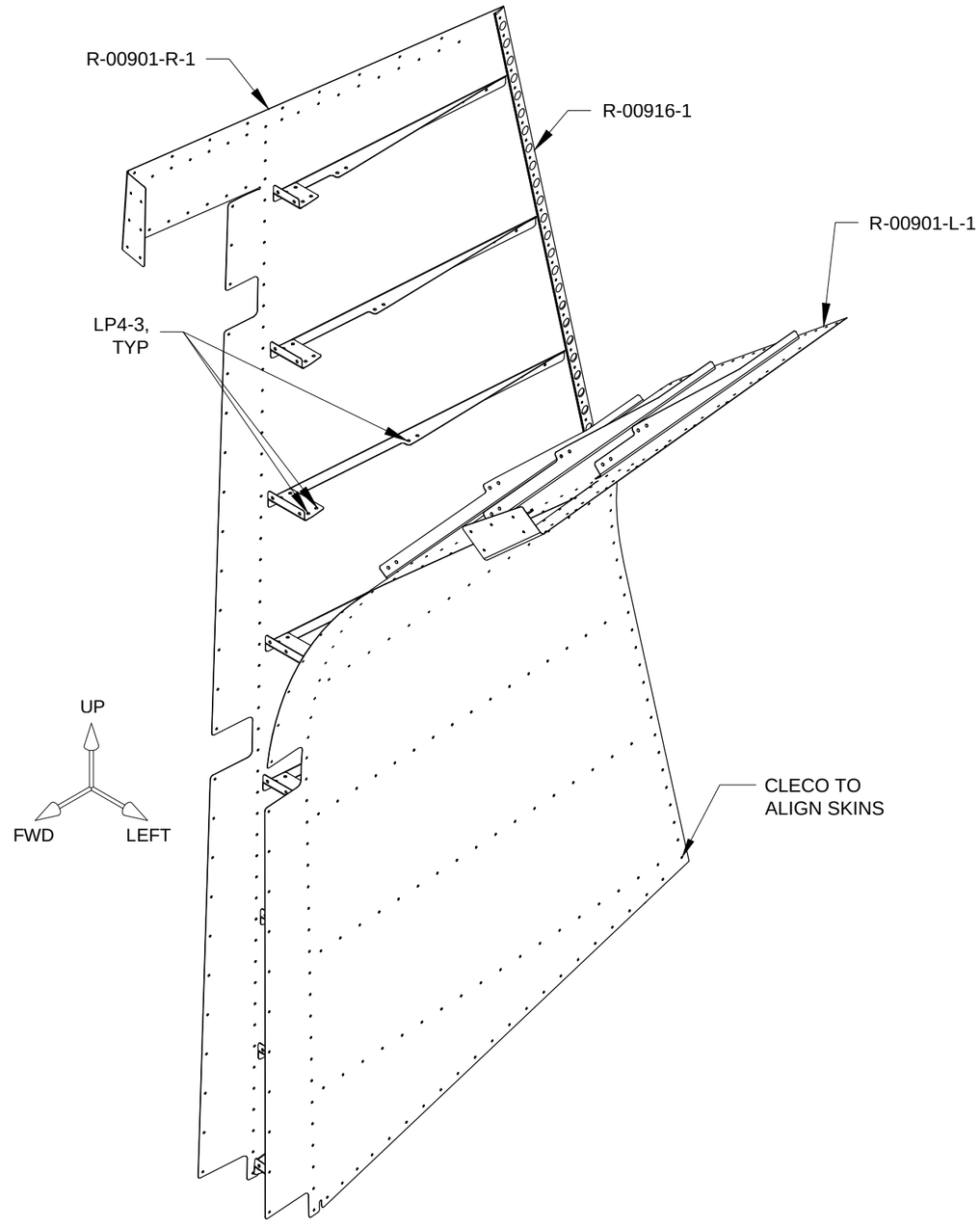


FIGURE 1: JOINING THE SKINS

Step 1: Insert the Spar Assembly into the Skin Assembly. Verify that the R-00904B-1 Bottom Rib is positioned above the R-904A-1Bottom Rib.

Cleco then rivet the spar assembly to the R-00914 Shear Clips using the rivets called out in Figure 1.

Step 2: Cleco the R-00918 Attach Strip to the inside of the R-00904A-1 Bottom Rib flange and Rudder Skin Assembly. See Figure 1.

Rivet the aft eight holes common to the bottom rib, rudder skin assembly and the attach strip. See Figure 1 and Page 07-12 Figure 2.

The trailing edge will have to be peeled slightly apart to access the aft two rivets.

Step 3: Use the blind rivets called out in Figure 1 to attach R-00904A-1 Bottom Rib to the R-00904B-1 Bottom Rib.

Step 4: Rivet the R-00910 Horn Brace to the Rudder Assembly as shown in Figure 2.

Step 5: Rivet the remaining holes in lower edges of R-00901-L-1 and R-00901-R-1 Skins common to R-918 Attach Strips and R-00910 Horn Brace using the rivets called out in Page 07-12 Figure 2.

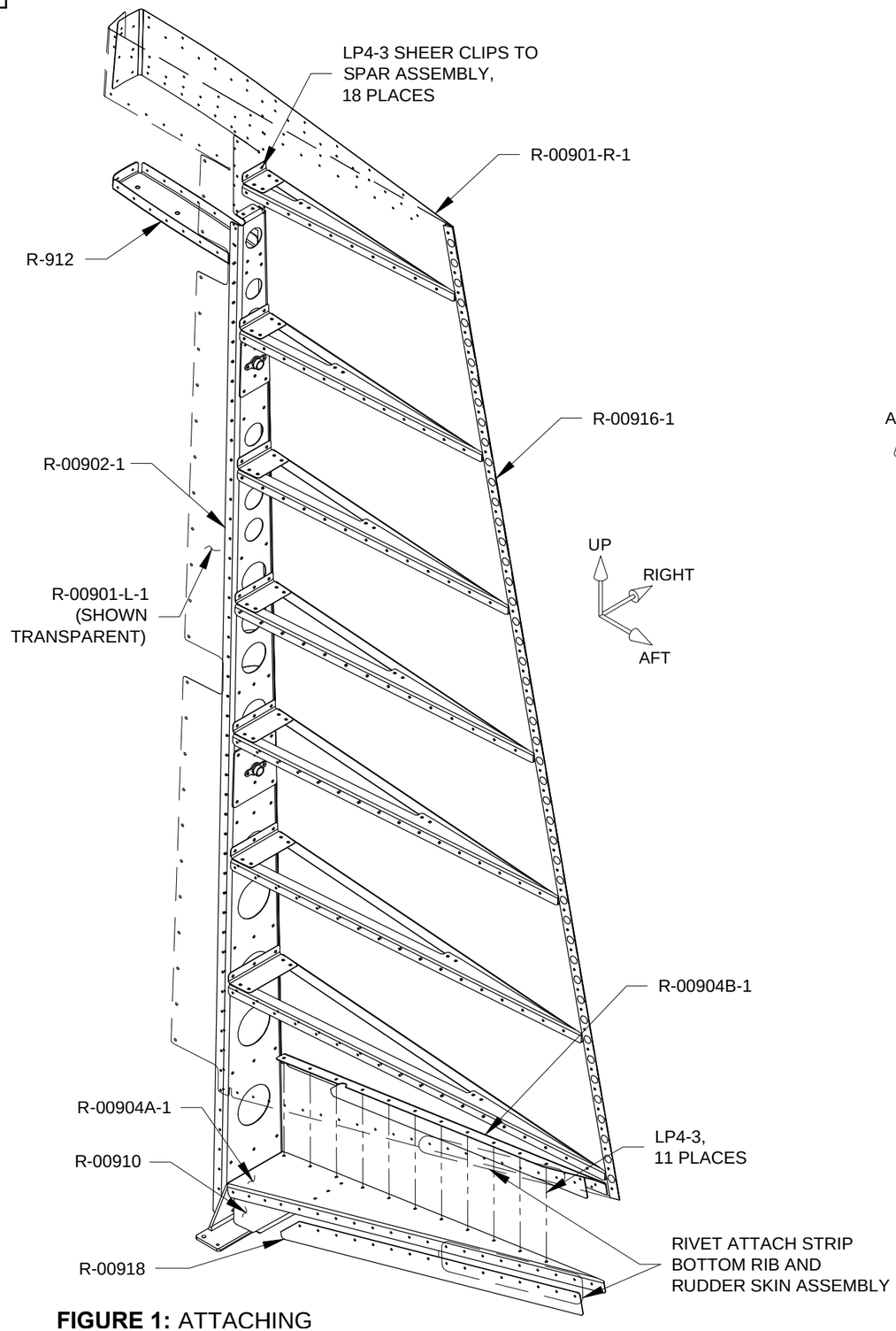


FIGURE 1: ATTACHING BOTTOM AND TOP RIBS

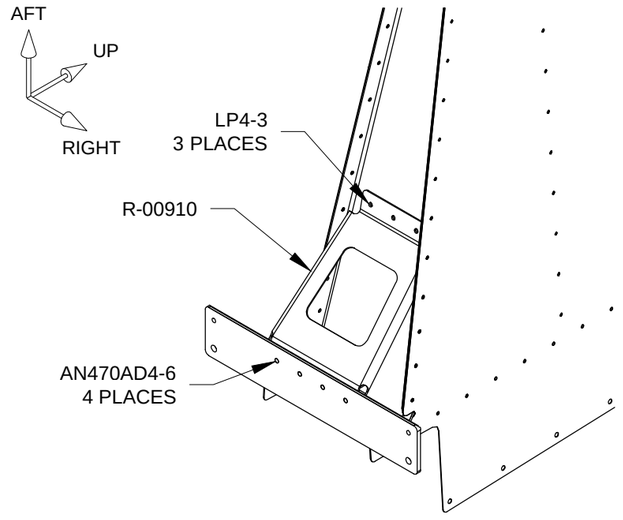


FIGURE 2: ATTACHING HORN BRACE

Step 1: Rivet the R-901-1 Rudder Skins to the R-912 Counterbalance Rib using the rivets called out Page 07-12 Figure 2.

NOTE: Trim E-614-020 Counterweight to clear shop heads as required.

Step 2: Countersink the R-00001 Nutplate Strip for the flush rivets called out in Figure 1. Install the nutplates to the Nutplate Strip as shown in Figure 1.

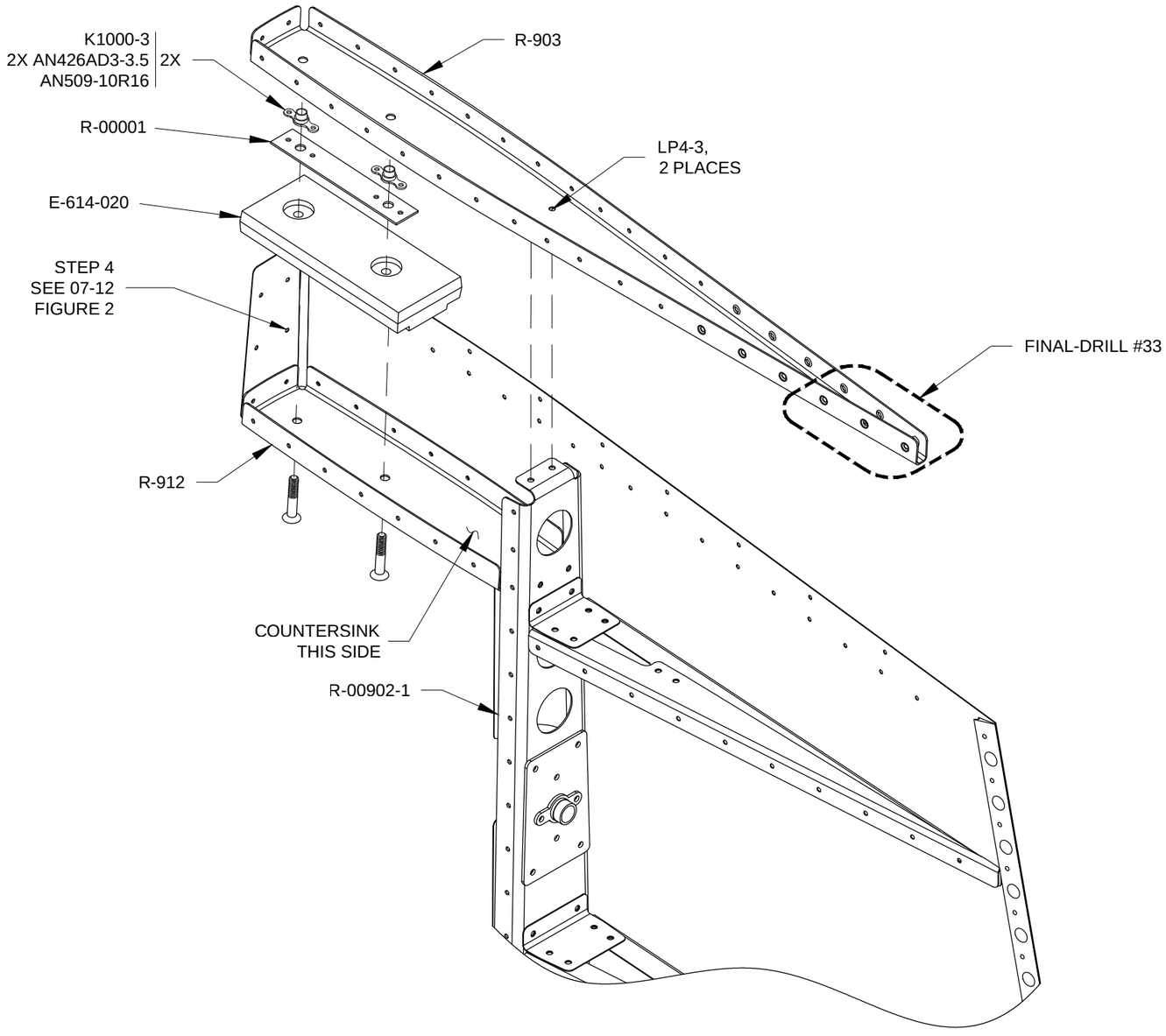
Step 3: Install the E-614-020 Counterweight on the R-912 Counterbalance Rib using the nutplate strip and hardware called out in Figure 1.

Step 4: Rivet the R-901-1 Rudder Skins to the R-00902-1 Spar using the hardware called out on Page 07-12 Figure 2.

Step 5: Install the remaining rivet in the forward flange of the R-00901-L-1 Skin where it overlaps the R-00901-R-1 Skin. See Page 07-12 Figure 2 for rivet call-out.

Step 6: Final-Drill #33 the six aft-most holes in the R-903 Top Rib. See Figure 1.

Step 7: Cleco then rivet the R-903 Top Rib to the R-00902-1 Spar and R-901-1 Rudder Skins. See Figure 1 and Page 07-12 Figure 2 for hardware callouts.



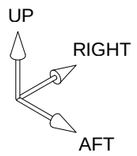


FIGURE 1: ATTACHING COUNTERBALANCE RIB
(LEFT SKIN HIDDEN FOR CLARITY)

NOTE: See Sections 5.6 Back Riveting, 5.8 Riveted Trailing Edges, 5.9 Rolled Leading Edges, and 5.10 Lap Joints for detailed instructions to complete the steps on this page.

CAUTION: The sides of the rudder are not flat. Weighting the entire side of the rudder as the trailing edge is riveted can introduce twist. Use a narrow weighted board on only the trailing edge while riveting.

Step 1: Rivet the trailing edge of the Rudder Assembly using the method outlined in Section 5.6 and 5.8. See Figure 2 for rivet type.

Step 2: Make a slight bend along the leading edge of the R-00901-L-1 Skin where it will overlap the R-00901-R-1 Skin. See Section 5.10 for information on forming lap joints.

Step 3: Roll the leading edge of the R-00901-L-1 and R-00901-R-1 Skins according to the instructions in Section 5.9. See Figure 1. Use the templates found on Page 07-13 at the locations indicated in Figure 1 to correctly form the final shape.

Step 4: Cleco then rivet the leading edges together with the rivets called out in Figure 2.

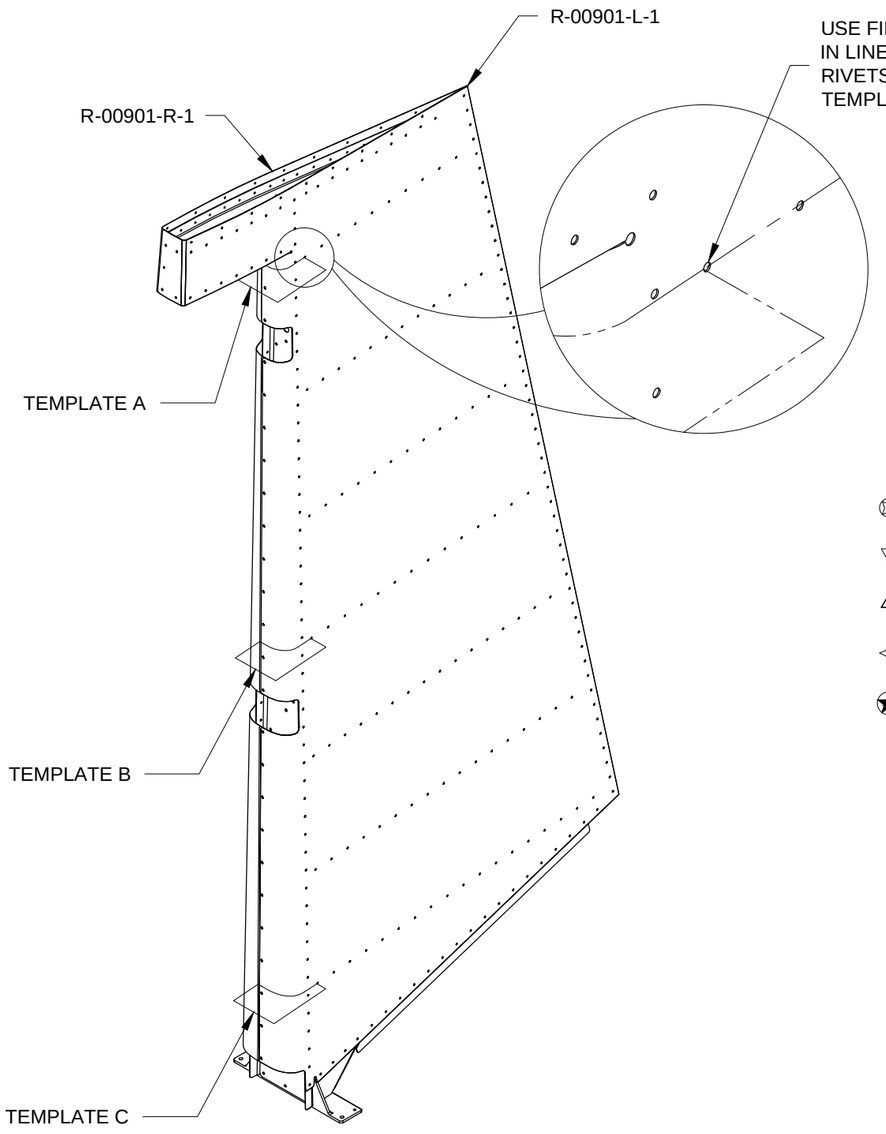


FIGURE 1: RIVETING THE LEADING AND TRAILING EDGES

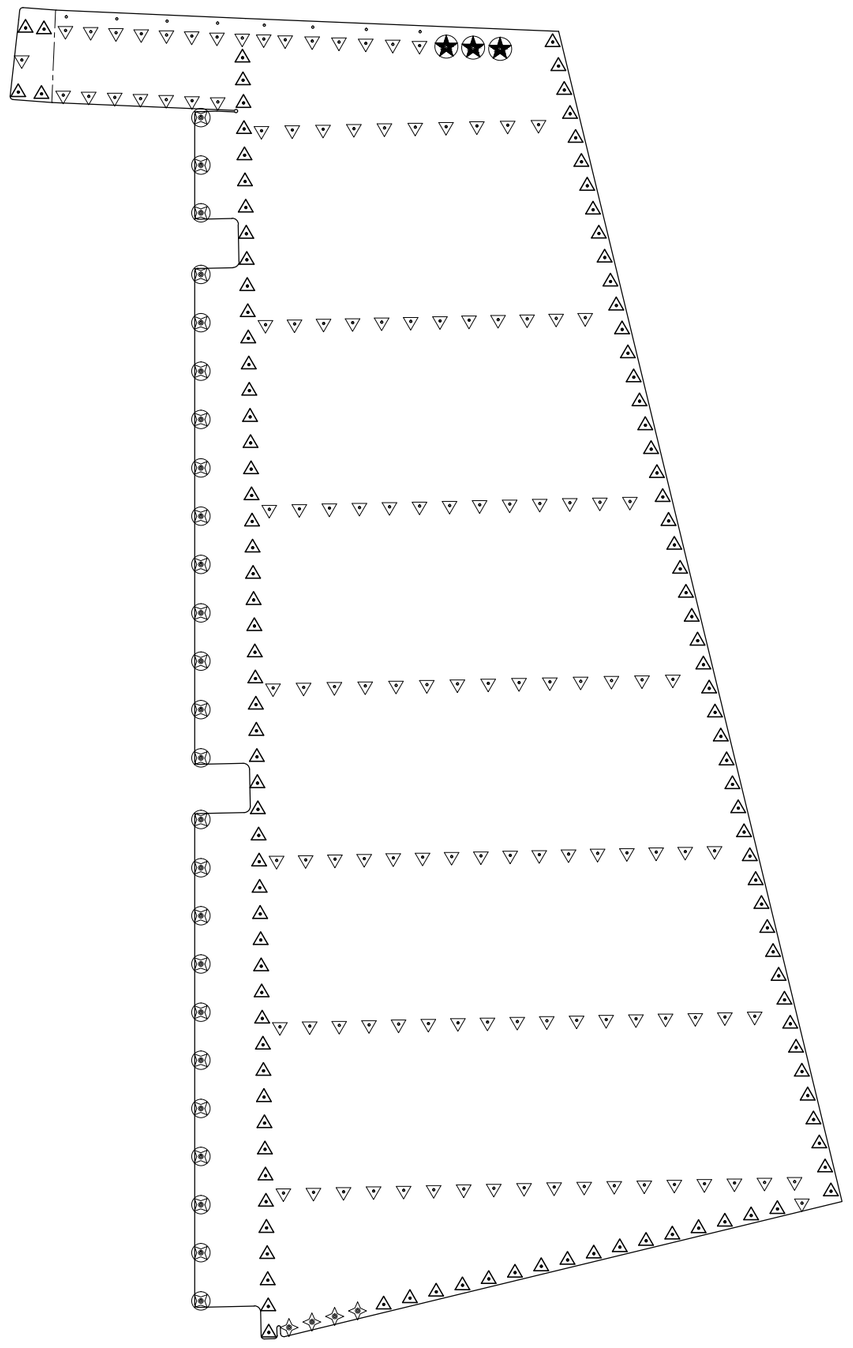
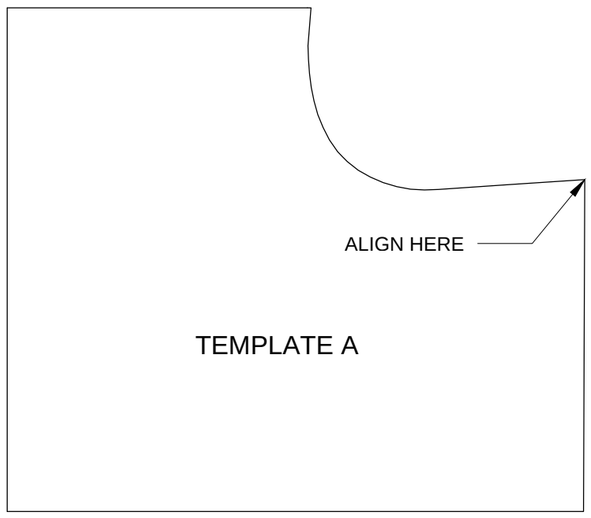
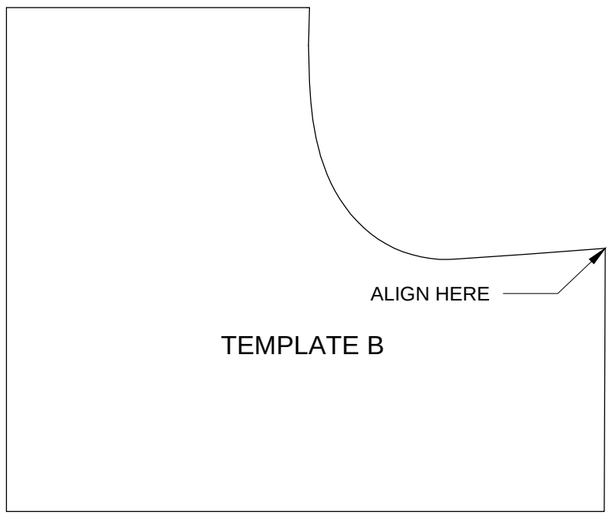
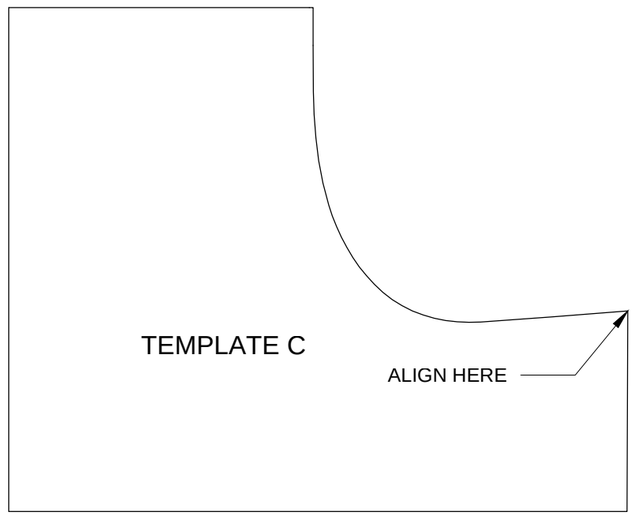


FIGURE 2: RUDDER SKIN RIVETS
(SHOWN FLAT)

10 9/16 [268.3]







16 [406.4]

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