

Aileron Assembly

To assembly the *Elite* Ailerons you will require the following tools:

- 1) Variable speed Hand Drill
- 2) #40 and #30 & #11 Drill Bits
- 3) Quantity of 3/32", 1/8", & 3/16" Clecos
- 4) Cleco Pliers
- 5) Deburring Tools
- 6) Felt Marker
- 7) Riveter
- 8) 1/2" Drill Bit or 1/2" Template and Round File
- 9) 4 Spring Clamps
- 10) Dimple Tool

One left and one right are required for the *Elite*

7.1 End Plate Install

- 1) Using the Iso-View, layout all the parts required to build one Aileron. **NOTE:** In order to prevent damage, do not handle the skin until necessary.
- 2) Cleco an End Plate (AIL-24) to a Leading Edge Rib (AIL-22R). The two #11 tooling holes in the Rib will match the #11 holes in the End Plate. Mark along the edge of the Leading Edge Rib using a black felt pen. Remove the End Plate. Figure 7.1.1.

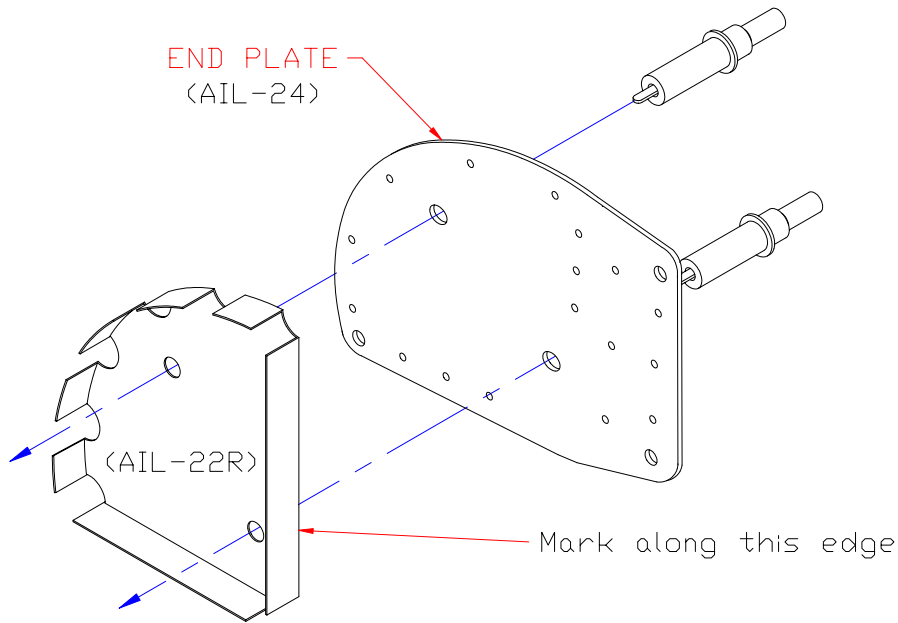


Figure 7.1.1

- 3) Measure inboard 1/8" from the marked line on the End Plate (AIL-24) and draw another line. Trim the part. Radius corners and debur. Figure 7.1.2.

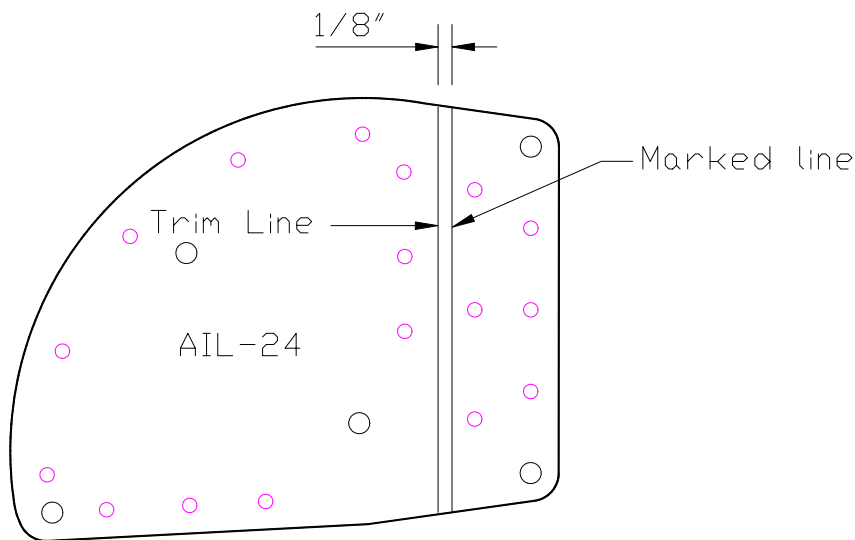


Figure 7.1.2

- 4) Cleco the End Plate (AIL-24) back onto the Leading Edge Rib. Figure 7.1.3.

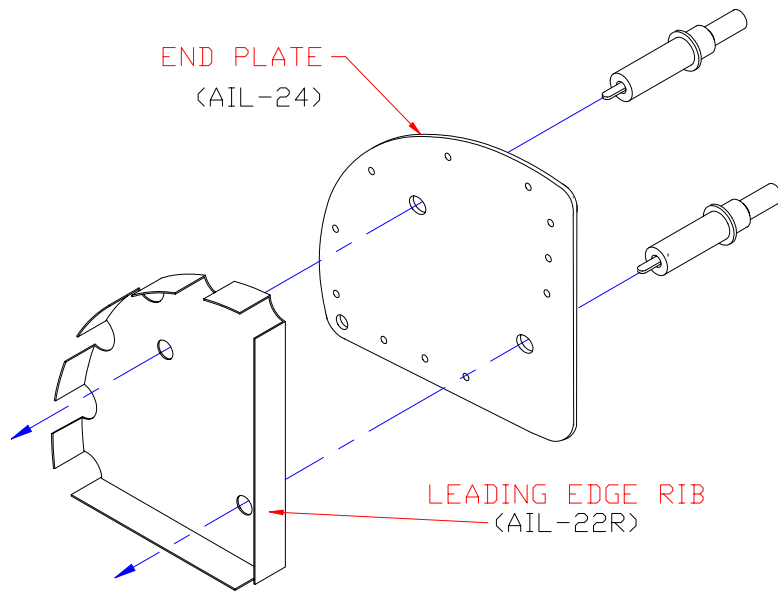


Figure 7.1.3

- 5) Using the Plate as a drill guide drill #30 rivet holes into the rib. Cleco as you go.
- 6) Remove the cleco from the bottom corner position hole. Drill this hole out to 1/2" in both the End Plate and the Leading Edge Rib. If you do not have a 1/2" drill, use a 1/2" circle template to mark out, rough cut the material and then use a small round file to clean it up. Figure 7.1.4.

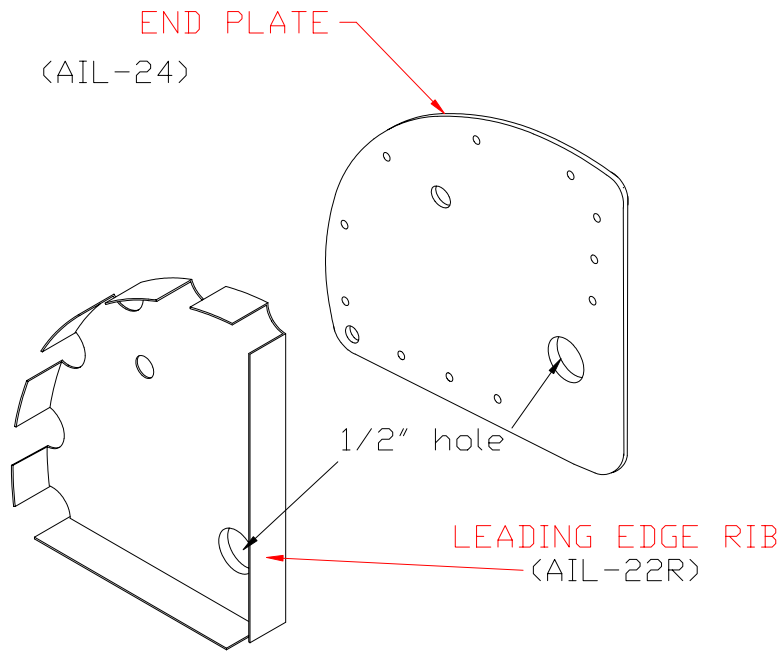


Figure 7.1.4

- 7) Drill and countersink three Brass Bushings (AIL-27) as shown in Figure 7.1.5. **NOTE:** A 1/2" drill bit ground to the proper angle works well for countersinking the holes.

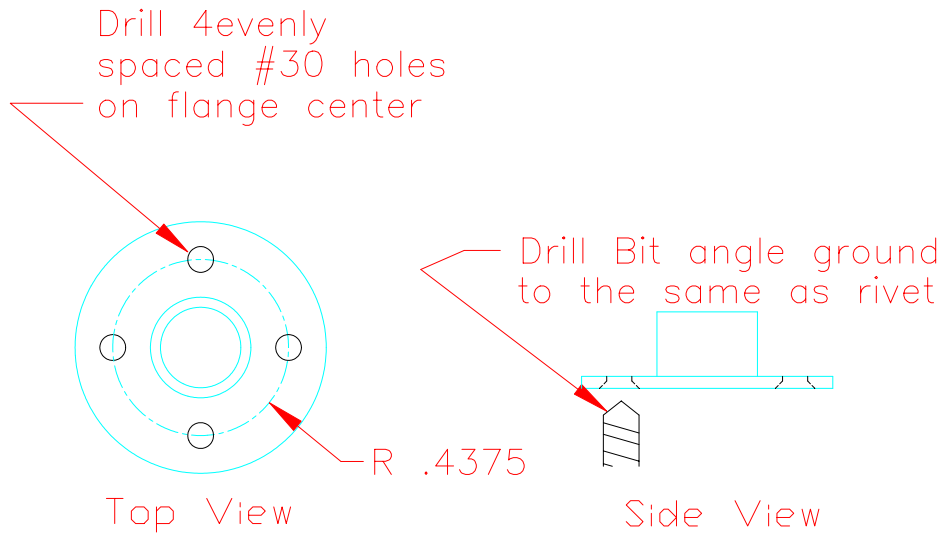


Figure 7.1.5

- 8) Insert one of the Brass Bushings into the 1/2" hole. Using the four countersunk holes in the Bushing, drill four #30 holes through the End Plate and Rib.
- 9) Disassemble, debur and chromate the mating surfaces together with 1/8" avex rivets (RV-1410). In the #11 holes, use a 3/16" avex rivet (RV-1613). In the Brass Bushing, use four 1/8" CS rivets (RV-4412). Figure 7.1.6. **NOTE:** This assembly will be used at rib station #9. Check Figure 7.2.1 for correct placement and flange direction.

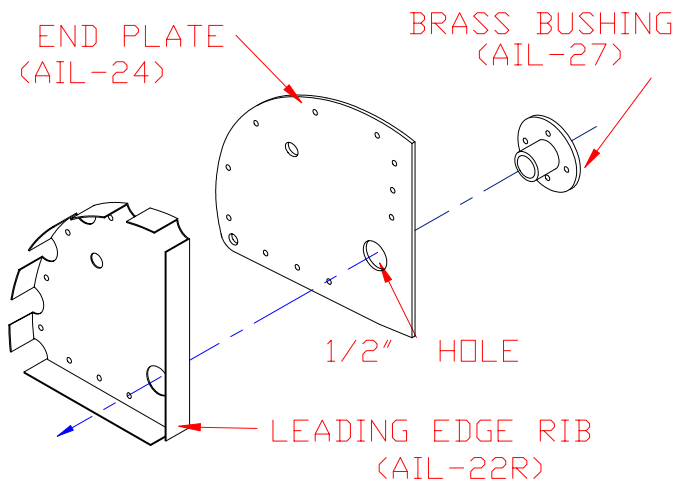


Figure 7.1.6

- 10) Prepare two left Leading Edge Ribs for bolt access at station location 5 and 10. Check Figure 7.2.1 for correct location. Cut a 1" hole centered on to the tooling hole. This can be accomplished with a 1" hole saw or a series of #30 holes and a half round file. See Figure 7.1.7.

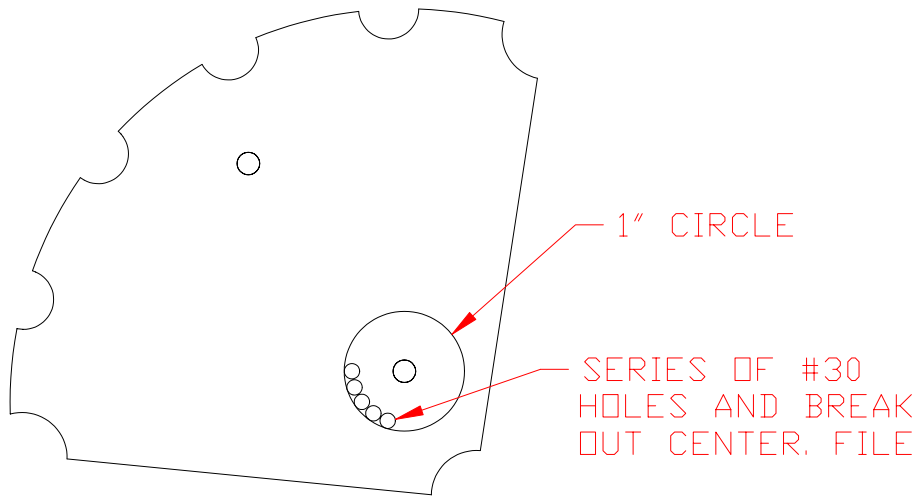


Figure 7.1.7

11) Prepare a right Leading Edge Rib for the center Bushing assembly (rib station 4). Cut a 5/8” hole centered on the tooling hole in each rib. This can be accomplished with a 5/8” drill or a 5/8” template and a round file.

NOTE: The oversized hole in this rib will allow the Hinge Doubler/bushing to move around for final adjustment.

7.2 Rib Install

1) Layout all the parts for a right Aileron as in Figure 7.2.1. Make sure the rib flanges are facing the correct direction. The Main Aileron Ribs (AIL-23) are symmetrical and therefore have no lefts and rights. The Leading Edge Ribs (AIL-22L & AIL-22R) are not symmetrical so make sure you have the correct rib facing the correct direction. The long flange of the Leading Edge Rib goes against the Spar.

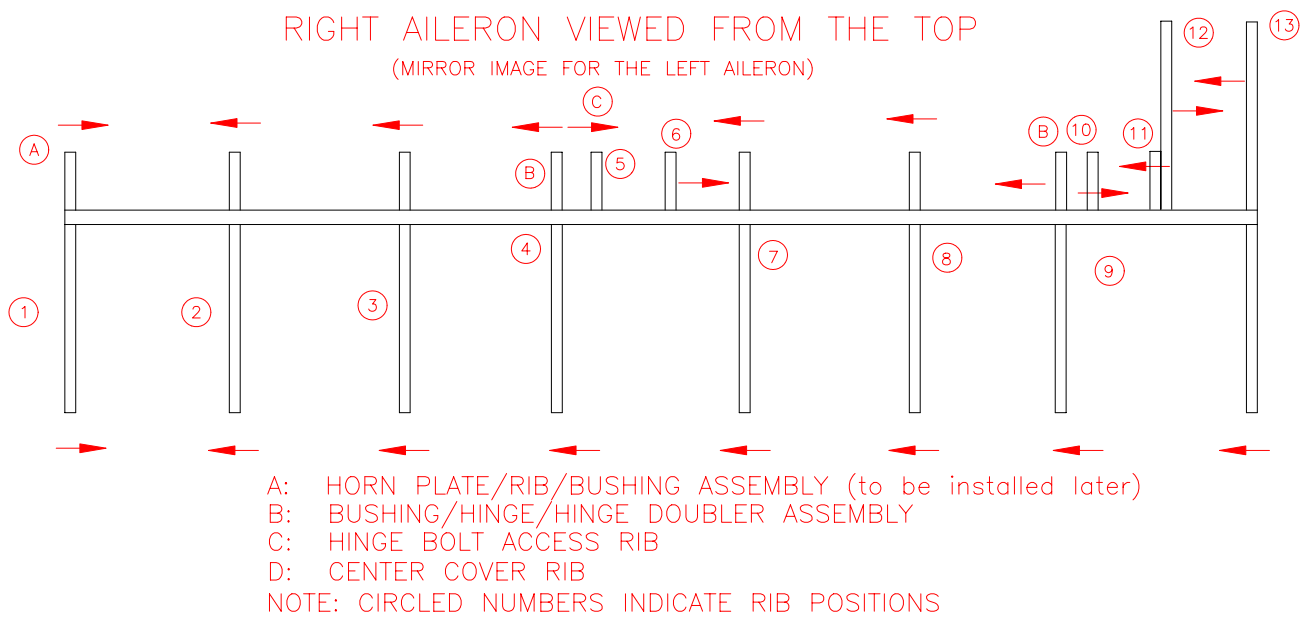


Figure 7.2.1

- 2) With a felt pen, label the ribs and rib locations on the Spar from one to thirteen. Mark a line down the center of each rib flange.
- 3) Clamp the Aileron Spar (AIL-401) to the edge of your table as in Figure 7.2.2.

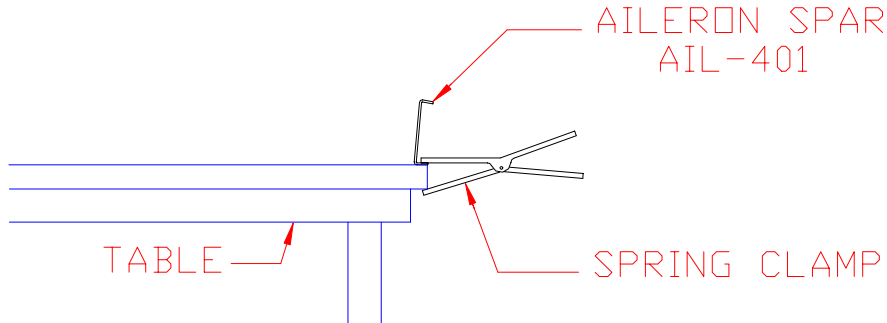


Figure 7.2.2

- 4) Place a Leading Edge Rib (AIL-22L or AIL-22R) in front of the spar. End ribs must be flush with the ends of the spar. Make sure you can see the line drawn on the rib when looking through the factory punched holes in the Aileron Spar. Figure 7.2.3.

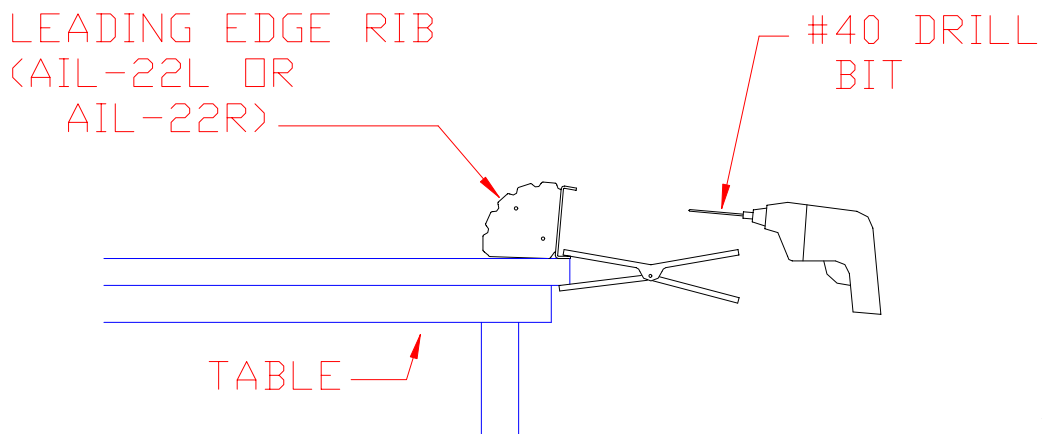


Figure 7.2.3

- 5) When you can see the line through the holes, drill the top hole with a #40 drill. Cleco, then drill the bottom hole and cleco. Drill the remaining holes in the rib. You may wish to use a small block of wood to hold the flange in place while drilling and to protect your fingers.
- 6) Repeat steps until all the Leading Edge Ribs are drilled. Ensure proper flange direction as in Figure 7.2.1.
- 7) Remove the Leading Edge Rib at location #13. Drill a series of rivet holes as shown in Figure 7.2.3.

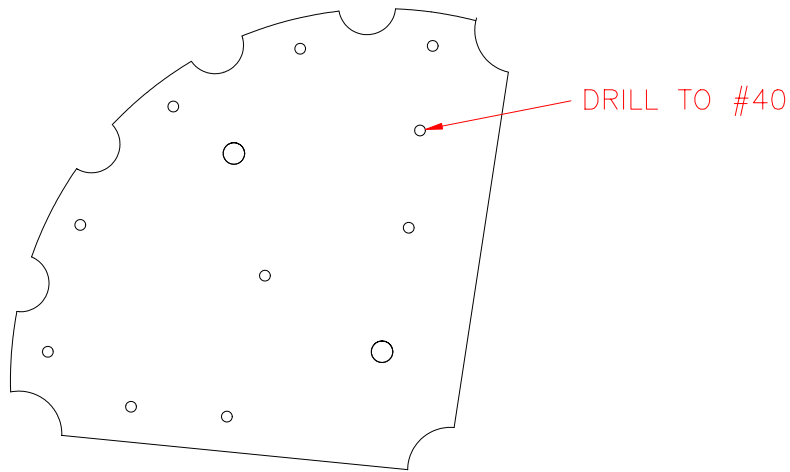


Figure 7.2.4

- 8) Locate the Aileron Spade Ribs (AIL-309). Position the Spade Rib and the Leading Edge back to back. Use the #11 tooling holes to cleco.
- 9) Back drill through the Leading Edge Rib with #40 drill.
- 10) A 1" hinge bolt access hole must be cut into the Leading Edge Rib and the Spade Rib at the tooling hole. Figure 7.2.5.

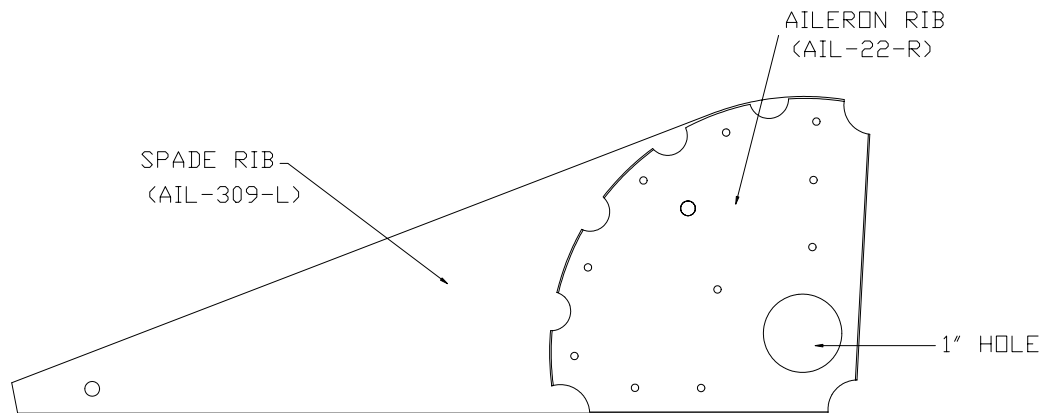


Figure 7.2.5

- 11) Put the Leading Edge Rib / Spade Rib assembly back on the Aileron Spar. Drill and cleco the spade rib through the holes in the spar, use a #40 drill.
- 12) Remove the Leading Edge Ribs and the spar from the table.
- 13) Turn the spar around and position the Main Aileron Ribs (AIL-23) and the (AIL-309) Spade Ribs in place.
- 14) The Main Aileron Ribs may need to be trimmed. Check Figure 7.2.6 for the correct dimension.
- 15) Check that you can see the lines on the ribs, then drill and cleco as you did with the Leading Edge Ribs.
- 16) Cleco the Leading Edge Ribs, the Spar, the Spade Ribs and the Main Aileron Ribs together and drill out all #40 holes to #30. It helps if you use an extra long #30 drill bit. Figure 7.2.6.

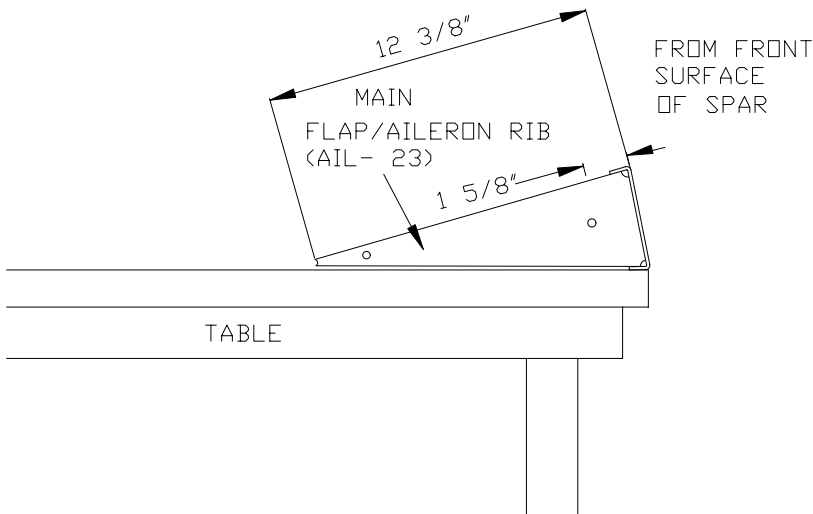


Figure 7.2.6

- 17) Disassemble and debur all parts.
- 18) Chromate all mating surfaces and rivet together with 1/8 avex rivets (RV-1410).
- 19) Both Ailerons can be taken to this stage. Be sure you build a left and a right **NOTE:** The Leading Edge Rib #5 is NOT to be riveted at this time. Secure with clecos.
- 20) Drill a #40 hole in each Main Aileron Rib of the Spar/Rib assembly. The hole should be 1 5/8" from the front surface of the Spar on the center line of the rib flange. Figure 7.2.7.

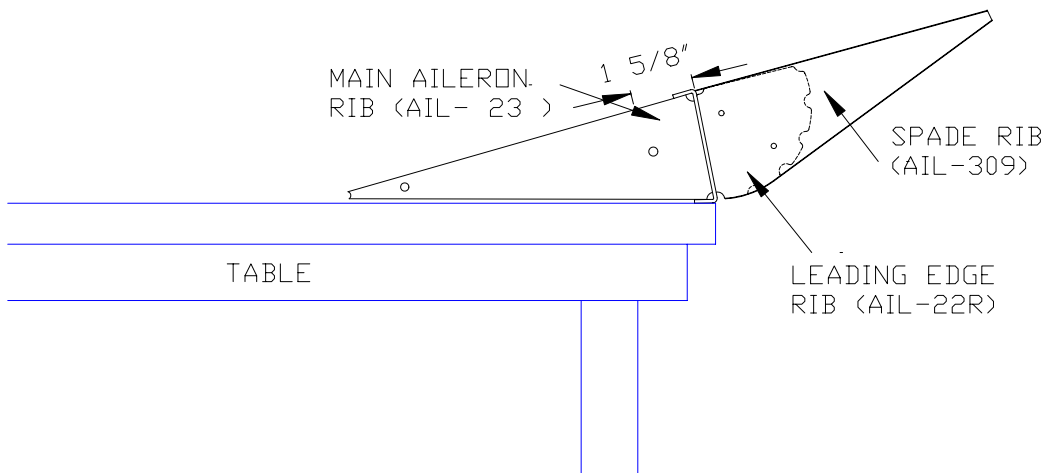


Figure 7.2.7

7.3 Hinge Cover

- 1) Before the Aileron Skin (AIL-400) can be installed, the AIL-403 center Hinge Cover must be prepared. Position the AIL-403 over the center hinge cut out on the Aileron Skin (on the outside of the skin). **NOTE:** make sure AIL-403 is centered over the cut out on the drill Aileron Skin. Using the Aileron Skin as a guide, back drill #40 through the AIL-403. Cleco as you go. Figure 7.3.1.

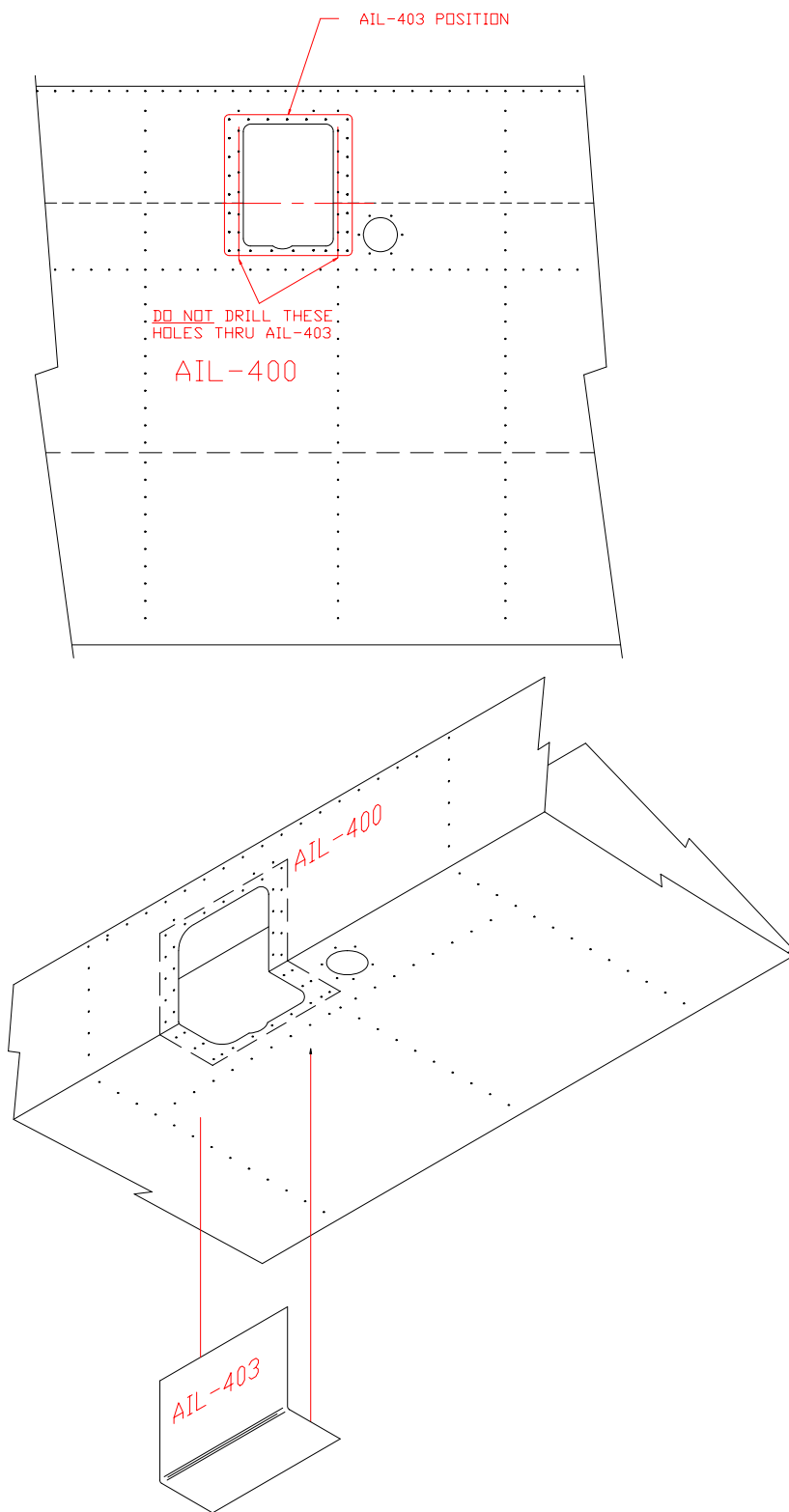


Figure 7.3.1

- 2) Remove the Center Hinge Cover (AIL-403) and trim as per Figure 7.3.2. When finished put aside for now.

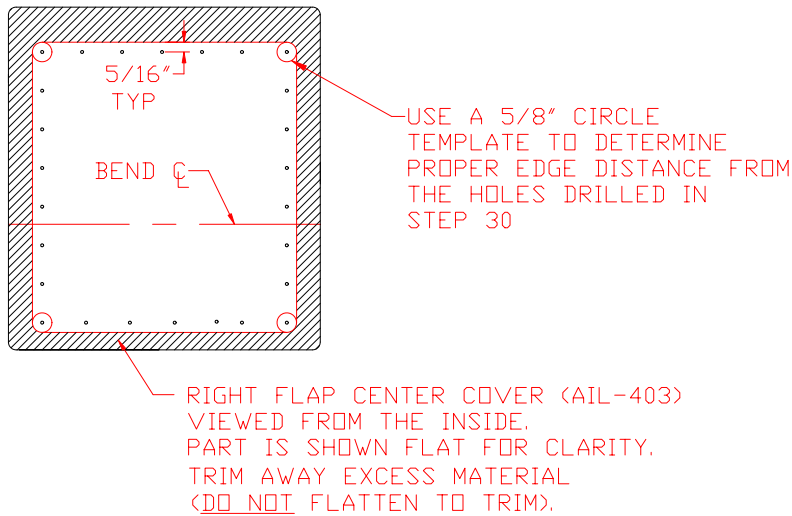


Figure 7.3.2

7.4 Skin Install

1) Slip the Spar/Rib assembly into the Aileron Skin (AIL-400) and cleco the #1 Main Aileron Rib hole in the skin into the hole drilled earlier. Be sure the center lines on the rib flanges are visible through the pre-punched holes in the Aileron Skin. Figure 7.4.1.

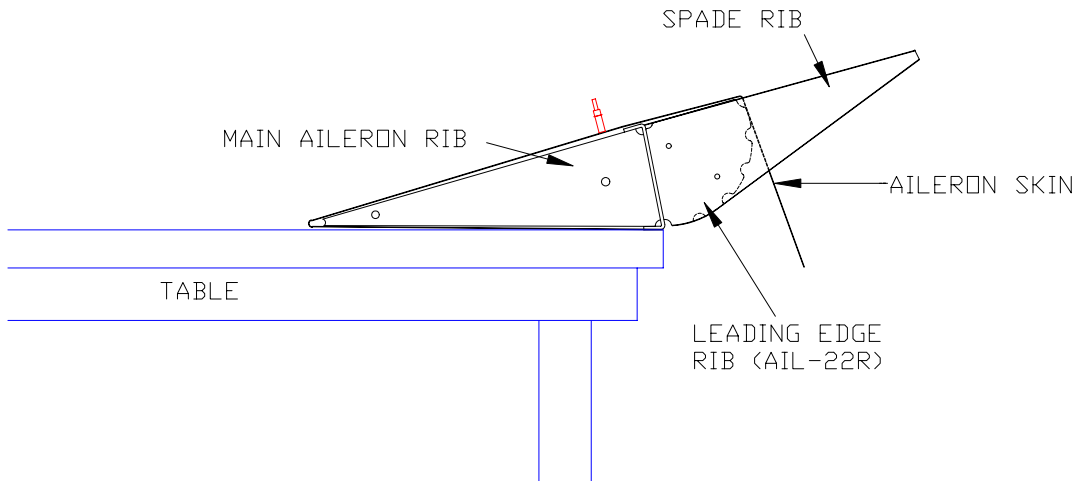
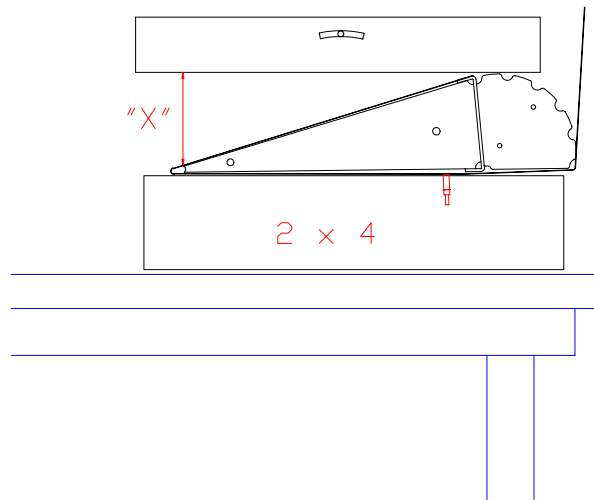


Figure 7.4.1

2) Working from the center of the Aileron to each end, and from the #1 rib hole to the Trailing Edge, drill and cleco the Skin to the Main Aileron Ribs through the pre-punched holes in the skin (use #40 drill). Through the pre-punched holes in the skin, drill the Spar rivet line into the Spar. Work from the center out to each end, drilling every sixth hole, cleco as you go. When finished, drill remaining holes with a #40 drill. **Important:** Be sure the center lines on the rib flanges are visible through the pre-punched holes in the Aileron Skin.

3) Position the Leading Edge Ribs by locating the rib center line through the pre-punched holes in the skin. From the center, work out to the ends, and from the Spar to the Leading Edge drill and cleco the skin to the Leading Edge ribs.

4) Prepare the work surface for the remainder of the assembly by positioning 2 X 4's to support the Aileron assembly. Figure 7.4.2.



"X" SHOULD BE THE SAME AT EACH
END OF THE FLAP

Figure 7.4.2

5) Lay the Aileron assembly right side up on the 2 x 4 supports. Make sure there are no clecos where the Aileron is supported. Weigh the Aileron down at the support locations (paint cans, milk jugs work well) and level the structure. "X" should be the same at each end of the Aileron. Figure 7.4.2.

6) Through the pre-punched holes in the Skin, attach the Spar/Rib assembly to the Skin. Make sure the center line on the rib flanges are visible through the holes in the Skin. Working from the center of the Aileron out to each end and from the Trailing Edge to the Aileron Spar, drill and cleco. Use a #40 drill.

7) Attach the Leading Edge Ribs to the Aileron Skin, working from the center towards each end, and from the bottom of the nose to the Aileron Spar. Drill and cleco as you go. Masking tape or packing tape may be used to assist in pulling the Skin around the Leading Edge Ribs. The center lines on the ribs should be visible through the holes in the Skin. Use a #40 drill. Use a sharp drill bit and press lightly, the rib tabs tend to bend easily. Figure 7.4.3.

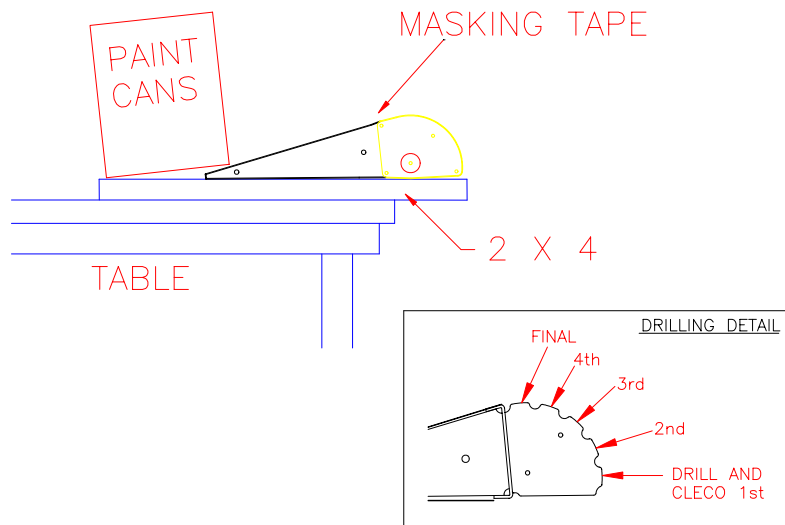


Figure 7.4.3

- 8) Double check the Aileron for any twist. Make sure it is weighed down. From the center, working out to each end of the Aileron, drill the top flange of the Spar through the pre-punched holes in the Skin. Drill every sixth hole, cleco as you go. Drill through the rest of the holes. Use a #40 drill.
- 9) Cleco the Center Hinge Cover (AIL-430) into position through the Leading Edge rivet holes. Drill all the #40 holes to #30.
- 10) Remove the Center Cover and drill the hidden #40 holes out to #30.
- 11) Disassemble and debur. The three Leading Edge Rib holes closest to the Aileron Spar must be flush riveted. Carefully dimple the skin at each rib location and each Leading Edge Rib. Figure 7.4.4.

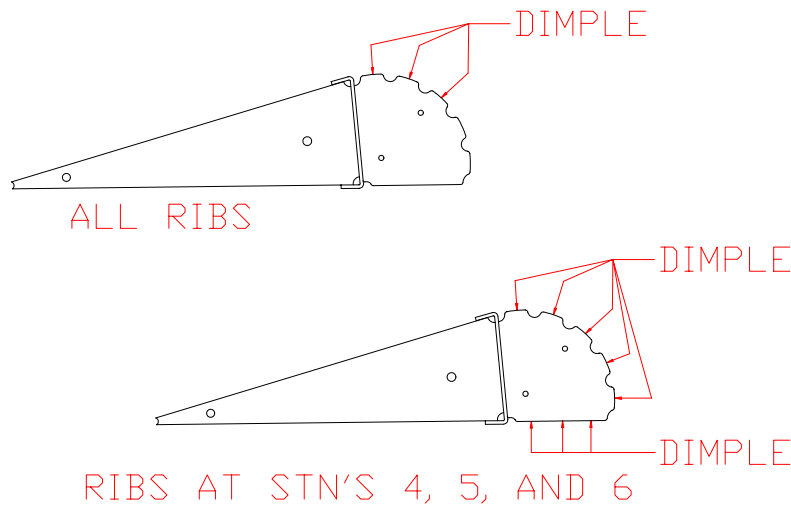
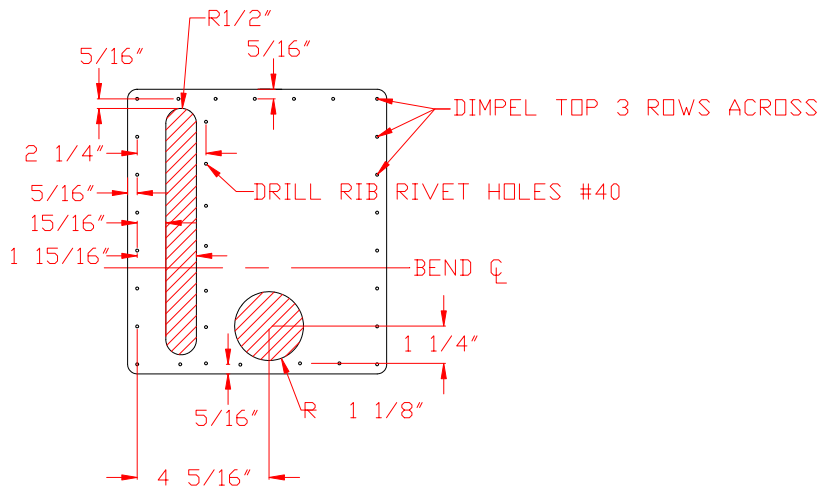


Figure 7.4.4

- 12) Chromate all mating surfaces and reassemble the Aileron and rivet together using RV-1410 & RV-4412 avex rivets. Remember to leave the rivet holes open for the midpoint Hinge Cover area. **NOTE:** Do not rivet the station #4 and #5 rib to the skin at this time.

13) Cut a hinge slot and an access hole into the AIL-403 Hinge Center Cover. See Figure 7.4.5 for dimension details. **NOTE:** The Center Hinge Cover will not be installed at this time. It will be installed after the Aileron has been fitted to the Wing.

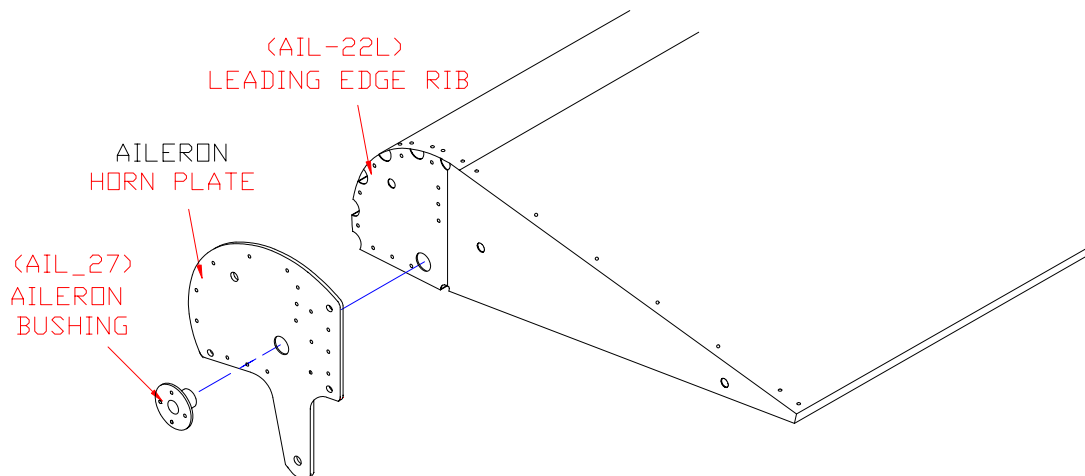


VIEW OF RIGHT AILERON/FLAP CENTER COVER
(AIL-403) FROM THE INSIDE
PART IS SHOWN FLAT FOR CLARITY
DO NOT FLATTEN
CUT OUT AS SHOWN

Figure 7.4.5

7.5 Horn Plate

1) Cleco a Horn Plate (AIL-25) to the root Leading Edge Rib using the #11 tooling holes (Rib Station #1). Figure 7.5.1.



Figure

7.5.1

- 2) Using the Horn Plate as a drill guide, drill the #30 rivet holes into the Rib. With a #11 drill bit, drill through the two tooling holes near the rear of the Plate and cleco solidly in place.
- 3) Remove the cleco from the pivot hole position. Drill this hole out to 1/2".

- 4) Insert a Brass Bushing (previously drilled and counter sunk earlier) into the 1/2" hole. Figure 7.5.1.
- 5) Disassemble, debur, chromate the mating surfaces and rivet together with 1/8" avex rivets (RV-1410). In the four #11 holes, use 3/16" avex rivets (RV-1613). In the brass bushing use three 1/8" CS rivets (RV-4412).

7.6 Spade Ribs

- 1) Draw a center line on the top and bottom flanges of the Spade Ribs. Also a line that continues the Spar rivet line top and bottom. Figure 7.6.1.

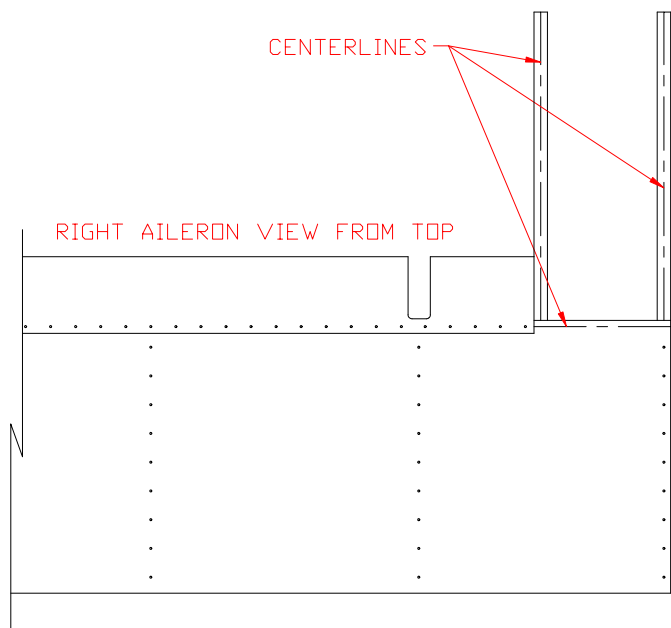


Figure 7.6.1

- 2) Locate the Spade Skin (AIL-307). Layout and drill #40 holes as per figure 7.6.2. Trim and debur.

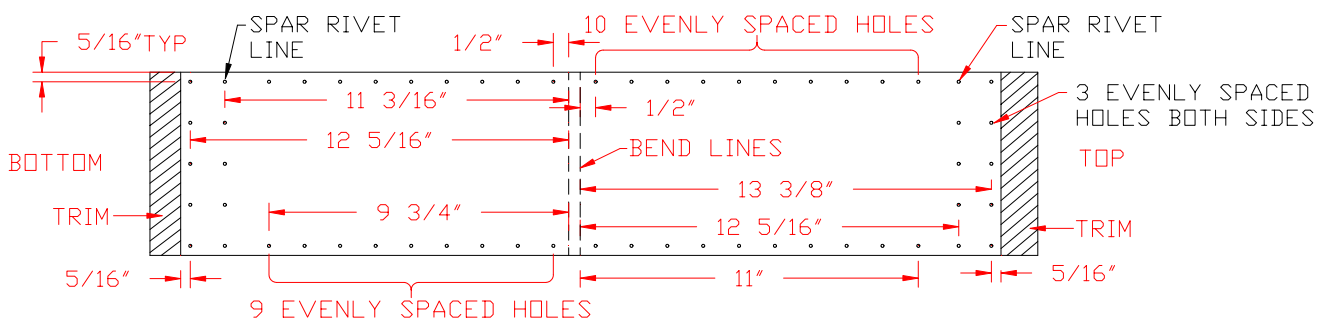


Figure 7.6.2

NOTE: The skin is shown flat in figure 7.6.2 for clarity. **Do not** flatten AIL-307. Place a piece of 3/8" plywood between the folds when drilling. Figure 7.6.3.

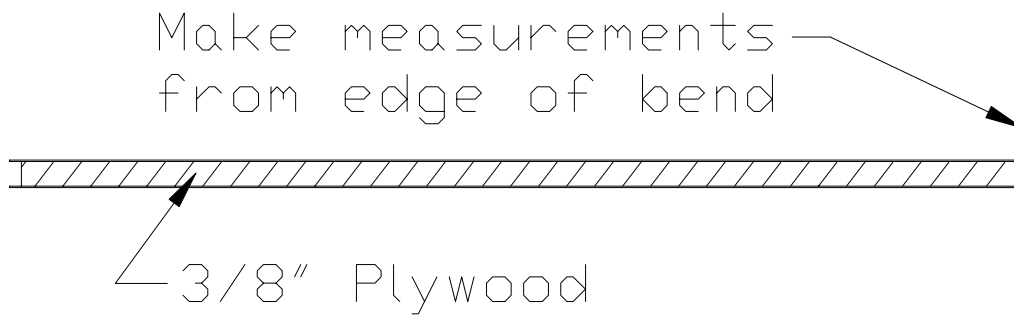


Figure 7.6.3

- 3) Slide the Spade Skin (AIL-307) over the Spade Rib until the spar rivet line is visible through the Spar holes you just drilled in the Spade Skin. Check that the center lines of the ribs are visible through the pre-punched holes in the skin. Also that the spade ribs are 90° to the Aileron Spar.
- 4) Satisfied that things are aligned and square, drill and cleco the Skin to the ribs. Start on the bottom at the Leading Edge and work toward the Aileron Spar. Cleco as you go.
- 5) At this time check the Spade for any twist using a long straight edge. Rest the straight edge on the Spade and visually check from the front of the Leading Edge. Figure 7.6.4. If the spade is slightly out of alignment now is the time to true it. Lay the Aileron upside down on the work bench.

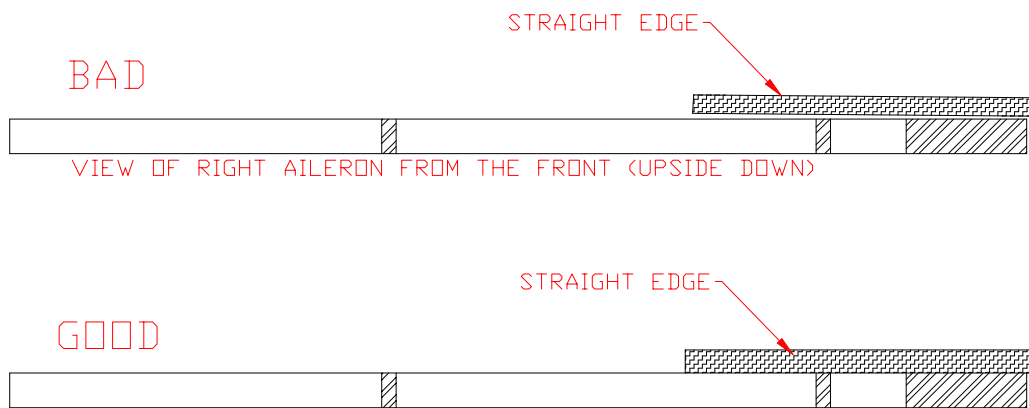


Figure 7.6.4

- 6) Put a 2 x 4 between the Leading Edge of the spade and the bench. Put a weight on the bottom surface of the Spade. Figure 7.6.5.

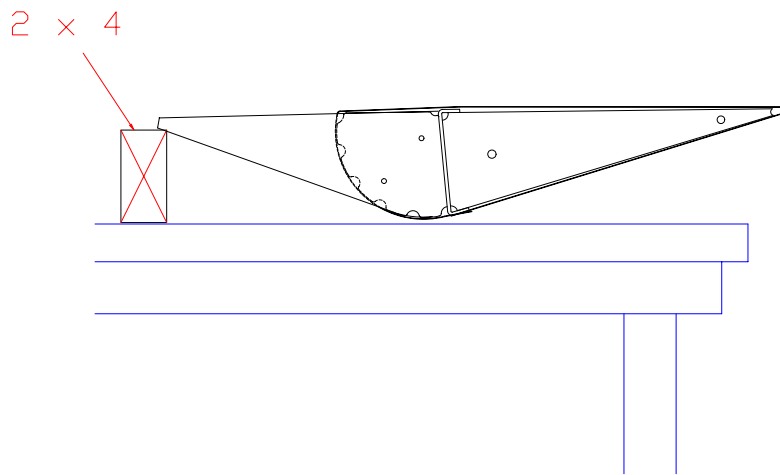


Figure 7.6.5

- 7) Drill through the main Aileron Skin and the Spar using the Spade Skin as a drill guide. Use a #40 drill, cleco as you go.
- 8) Flip the Aileron over. Drill and cleco the Skin to the Spade Ribs. The Spade should have no twists in it at this stage, but double check.
- 9) Drill #40 through the Aileron skin and the Spar using the Spade Skin as a guide.
- 10) Drill all #40 holes out to #30. Remove the Spade Skin, debur and dimple the top three Spade rivet holes and the matching holes in the Skin. Reassemble.
- 11) Rivet the Spade Skin to the bottom of the ribs and the bottom flange of the Spar.
- 12) Find the AIL- 405 Aileron Balance Weight and slide it into the nose of the Aileron Spade. Mark it's location on the outside of the Spade skin. Remove the weight. Figure 7.6.6.

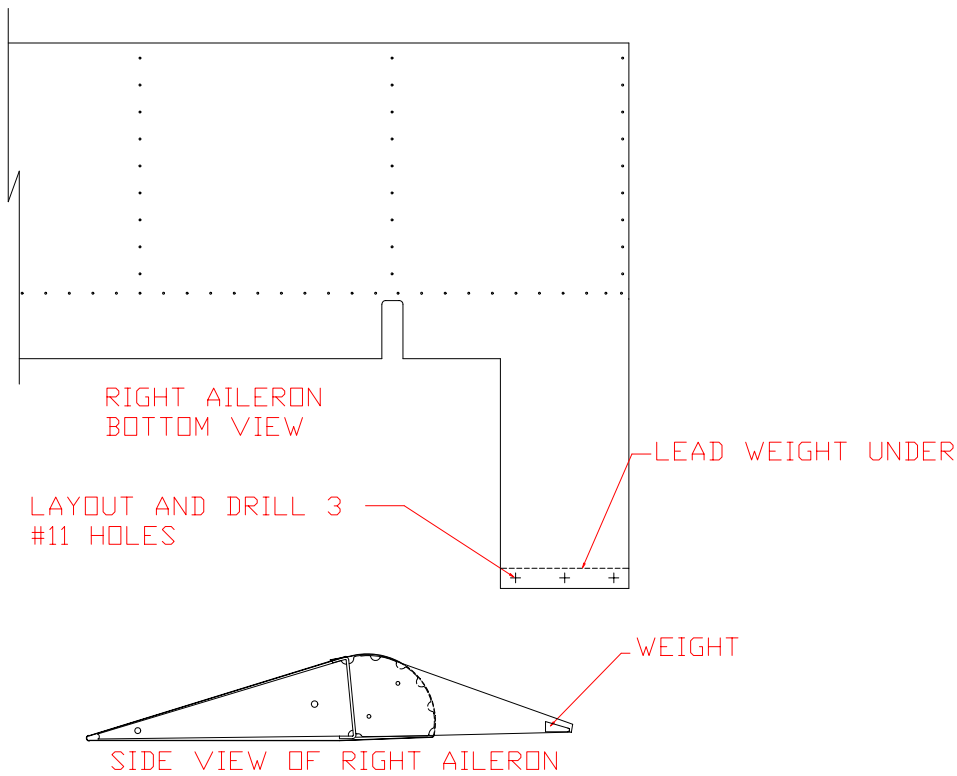


Figure 7.6.6

13) Layout three evenly spaced holes on the Spade skin (figure 7.6.6) and drill #11 holes through the bottom of the Spade Skin only. Put the weight back in the Spade Skin and transfer the three holes into the weight. Remove the weight again and drill the three #11 holes through the weight. Deburr the weight and the Spade skin. Put the weight back into the Spade Skin and rivet in place using 3/16" avex rivets (RV 1613). Figure 7.6.7.

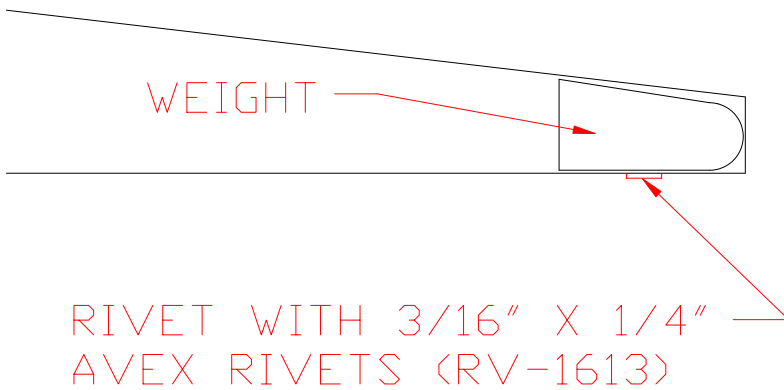


Figure 7.6.7

14) Rivet the top of the Spade Skin closed using 1/8" (RV-1410) rivets.

15) The left Aileron is built in the same manner as the right Aileron. **NOTE:** If you have not previously built the wings, stop here until such time as the wing is completed. A finished wing is necessary for the following steps.

7.7 End Doubler

- 1) Prepare an End Doubler for the mid-point Hinge (station #4) by drilling the #11 pivot hole to 1/2". Trim the Doubler the same way as you did earlier in this section. Figure 7.7.1.

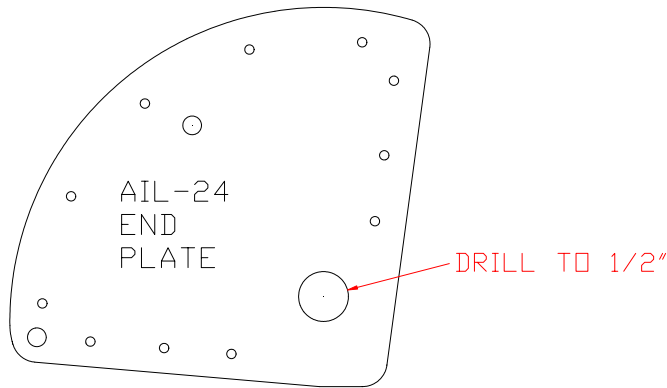
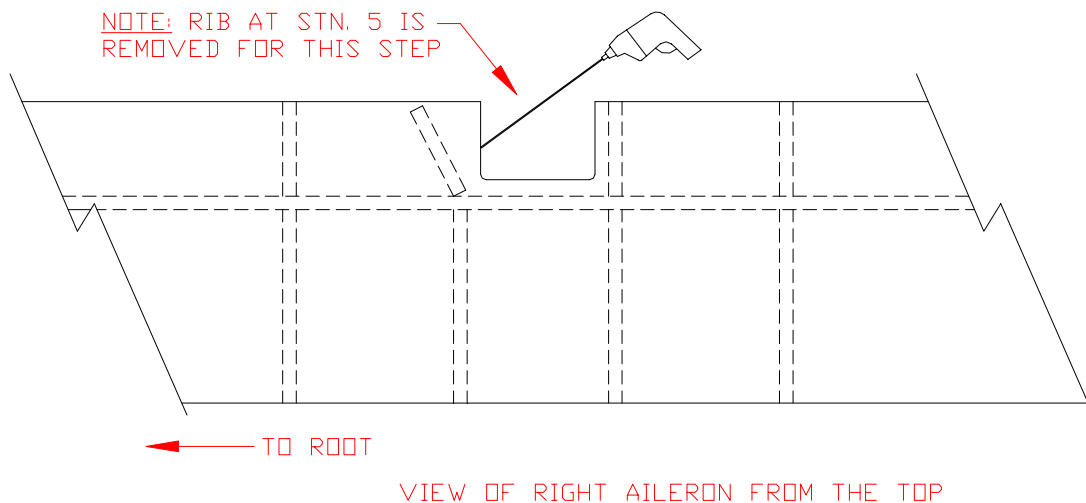


Figure 7.7.1

- 2) With the Center Cover removed from the Aileron assembly (but the trimmed End Plate and the Brass Bushing (AIL-27) are in place) temporarily install the Aileron to the Wing. At this point the Wing should be upside down.
- 3) Install the outboard Hinge bolts and the (AIL-26) Bushings.
- 4) Install the Center Hinge bolt and the Bushing. The End Plate is free floating and will find its own center.
- 5) Press the End Plate against the Leading Edge Rib.
- 6) Drill and cleco as many of the holes in the AIL-24 End Plate as you can reach (2 or 3 is OK). Use a long #40 drill bit.
- 7) Remove the Aileron from the Wing, bend the Bushing/End Plate/Rib assembly into the Aileron far enough to allow drilling and riveting the End Plate and Bushing. Drill the remaining holes to #40. Drill the Bushing holes out to #30, then drill all the remaining holes out to #30. Figure 7.7.2.



Figure

7.7.2

- 8) Disassemble, debur parts, Chromate and then rivet together using 1/8" (RV-1410) rivets in the End Plate and Rib and 1/8" (RV-4412) CS rivets through the Brass Bushing.
- 9) Rivet the position #5 Rib to the Spar using RV-1410 rivets
- 10) Rivet the Center Hinge Cover to the Aileron using RV-1410 rivets.
- 11) The left Aileron is built in the same manner as the right.

