

Fuselage Assembly

In the front of the fuselage manual you will find an exploded view of the fuselage and a side view schematic. We suggest that you tape these to the wall of your workshop. Refer to them often.

NOTE: If you are building a Tricycle Gear you will be notified further along in this section when to jump ahead to section 11 to complete the Tricycle Elite..

To assemble the *Elite* Fuselage, the following tools will be required:

- 1) 3/8" Variable Speed Hand Drill
- 2) #40, #30, #11, 1/4", 5/16", 3/8", 1/2" Drill Bits
- 3) Quantity of 3/32", 1/8" and 3/16" Clecos
- 4) Cleco Pliers
- 5) Deburring Tools and File
- 6) Felt Markers
- 7) Rivet Gun or hand Riveter
- 8) Tape Measure
- 9) Level
- 10) Aviation Snips
- 11) Crimping Pliers or Stretcher-Shrinker
- 12) 3/8", 7/16", 1/2" & 9/16" Wrenches (two of each)
- 13) Dimple Tool for Countersunk Rivets
- 14) Hacksaw
- 15) Chalk Line or Long Straight Edge

9.1 Bottom Skin

IMPORTANT: Make sure your table is level for its full length before starting. If done daily, as best as possible, few alignment problems will occur.

- 1) Using a chalk line or a long straight edge, draw a line down the center of the table. Figure 9.1.1.

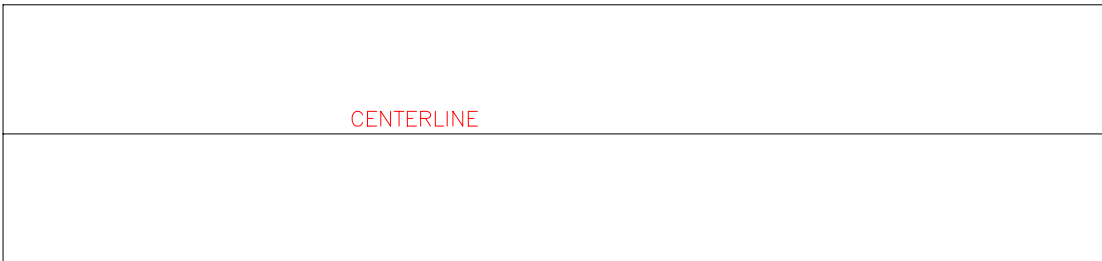


Figure 9.1.1

- 2) Center a Top/Bottom Cone Skin (FUS-404) on the centerline of the table with the flanges up as in Figure 9.1.2. **NOTE:** The top and bottom skins are the same.

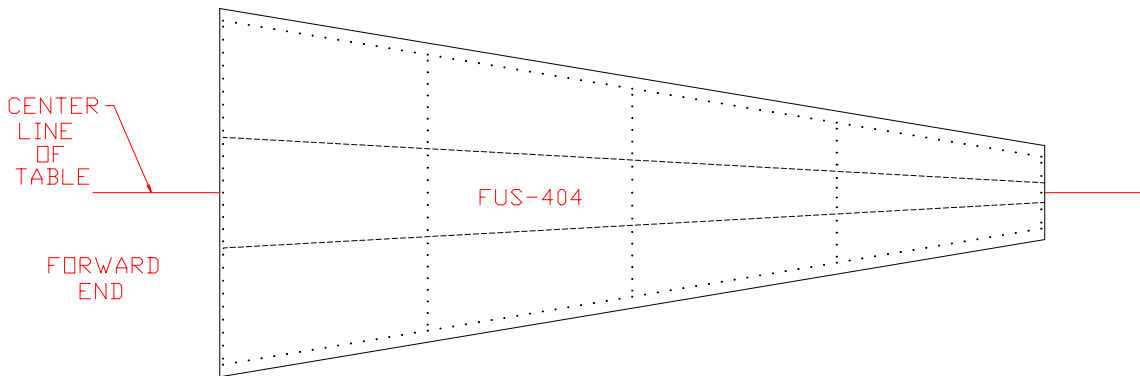


Figure 9.1.2

- 3) On the forward end of FUS-404, drill the center #40 hole into the table centerline. Figure 9.1.3.

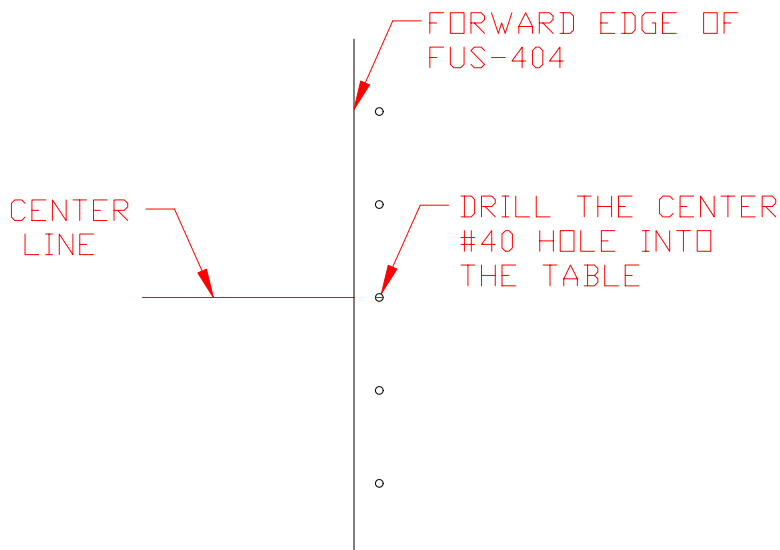
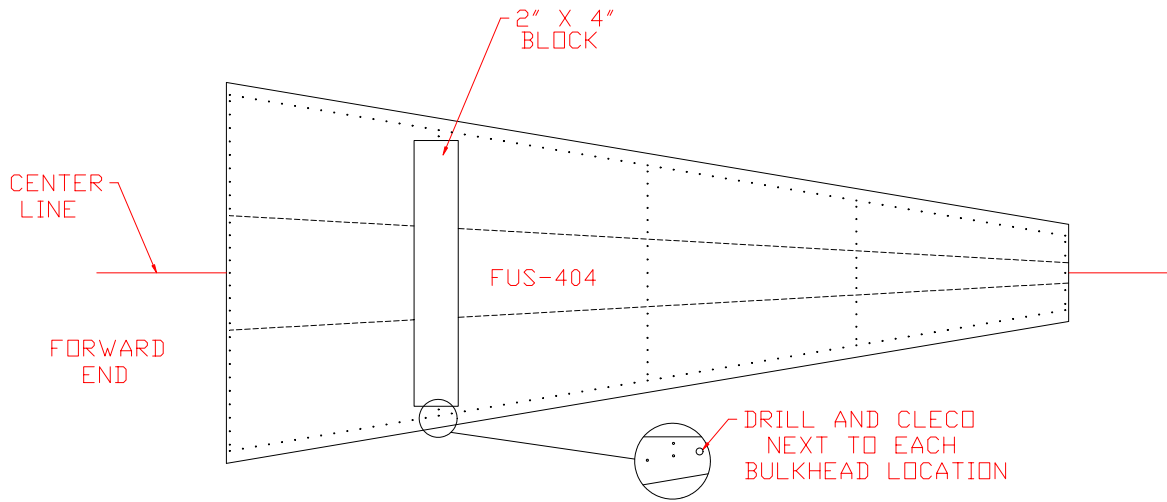


Figure 9.1.3

- 4) Repeat step for the rear end of FUS-404.
- 5) Using a short 2" x 4" or anything suitably flat, hold the skin down and drill a #40 hole into the table beside each bulkhead location as in figure 9.1.4. **NOTE:** Clean the wood chips from under the skin before clecoing to the table. Throughout building your fuselage clean the table often. A rivet head, mandrel or any small object caught between the table and the skins can cause nasty, unsightly dents and gouges in your aircraft. When drilling through the skins and into the table, hold the skin tightly against the table. This will allow the wood chips to come through the hole and prevent them from being trapped between the skins and table.



Figure

9.1.4

- 6) At each bulkhead position, drill the bulkhead aligning holes with a #40 drill. Figure 9.1.5.
- 7) From the front end of the skin, label the bulkhead positions from "A" to "E". Figure 9.1.5.

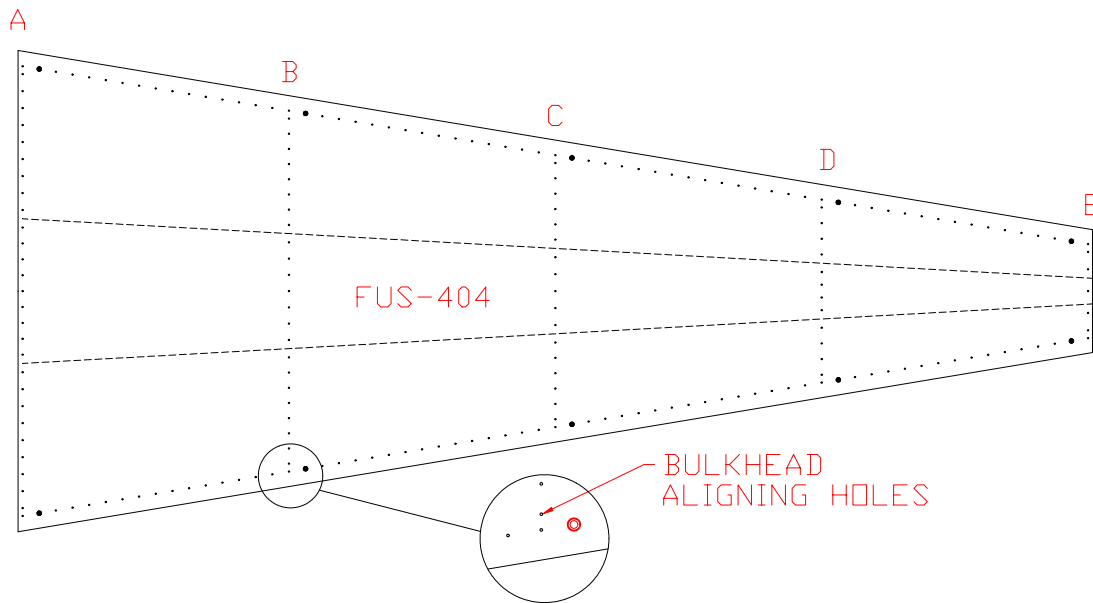


Figure 9.1.5

8) Cleco the bulkhead quarter sections to their respective places. Use the following table as a guide: **NOTE:** The Bulkheads come wrapped together and are marked as R-Bulk 2A etc. Also note that the Bulkhead location letters are not the same as the Bulkhead section letters.

| <u>Bulkhead Location</u> | <u>Bulkhead Quarter Section</u> |
|--------------------------|---------------------------------|
| A | A and / or R-Bulk 1 |
| B | A |
| C | B |
| D | C |
| E | D |

9) All the flanges face forward as in Figure 9.1.6. (Except Bulkhead location A. The flanges will face rearward).
 10) Take a bulkhead for location “E” and cleco it onto the Skin at the #40 hole you drilled into the table. Use the #40 hole on the flange of the bulkhead to locate. Figure 9.1.6.

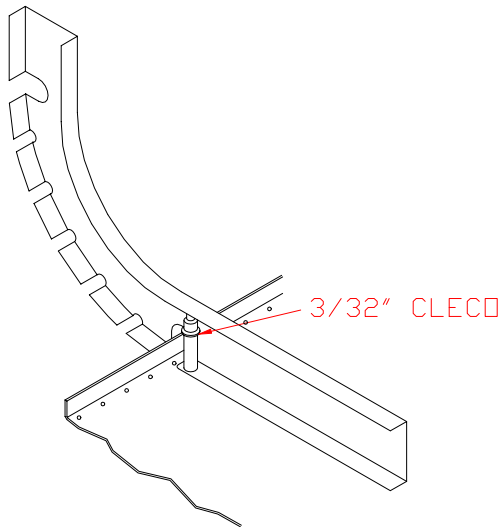


Figure 9.1.6

11) The two bulkheads at position “E” will require trimming to allow the legs to sit flat. Figure 9.1.7. **NOTE:** Only the legs against the skin should be trimmed.

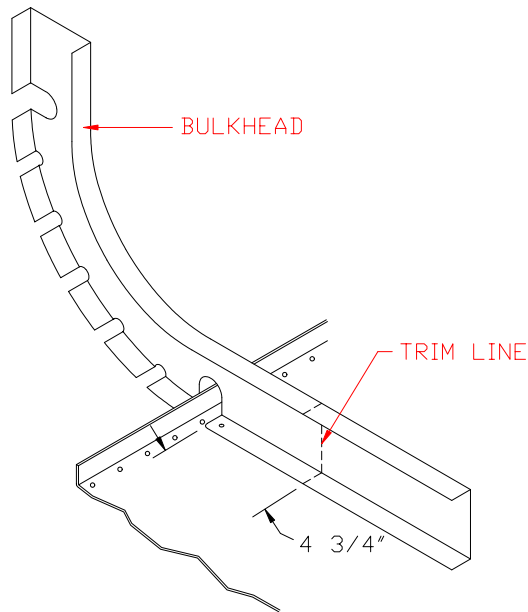


Figure 9.1.7

- 12) The leg of one quarter section will fit into the leg of the opposing quarter section.
- 13) At bulkhead positions A,B,C and D, the legs will overlap approximately 4". At position "E" the overlap will be approximately $2 \frac{5}{8}$ ".
- 14) At positions A,B,C, drill nine #30 holes through the overlaps and cleco together. At D and E ,drill only the center three holes on the lower section. The other six holes will be drilled when the pulley brackets are installed. Figure 9.1.8.

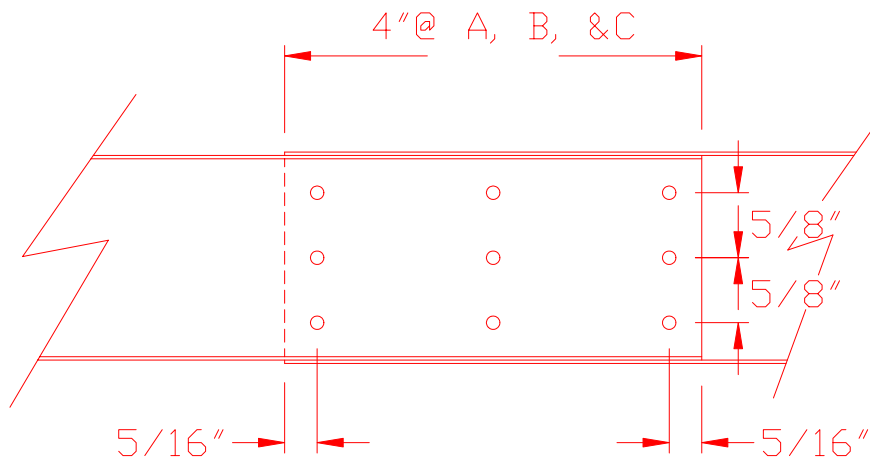


Figure 9.1.8

- 15) On the inside top flange, drill five equally spaced holes as in figure 9.1.9. The outside bottom flanges will be drilled from the skins. **NOTE:** If the inside sub floor is being installed, these holes will not be required on the bottom junctions as they will be drilled through the sub floor.

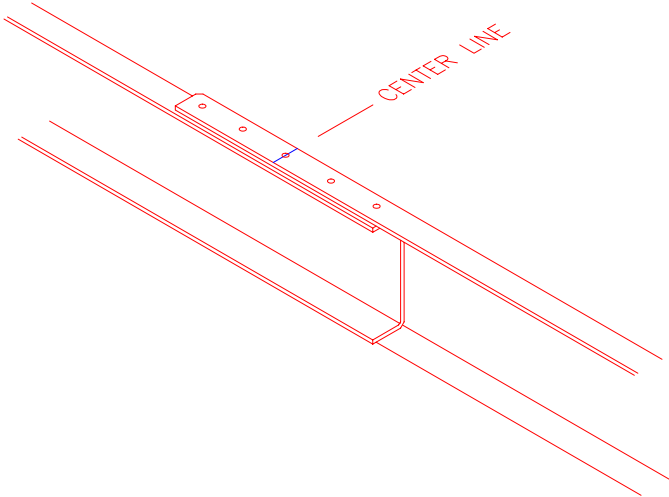
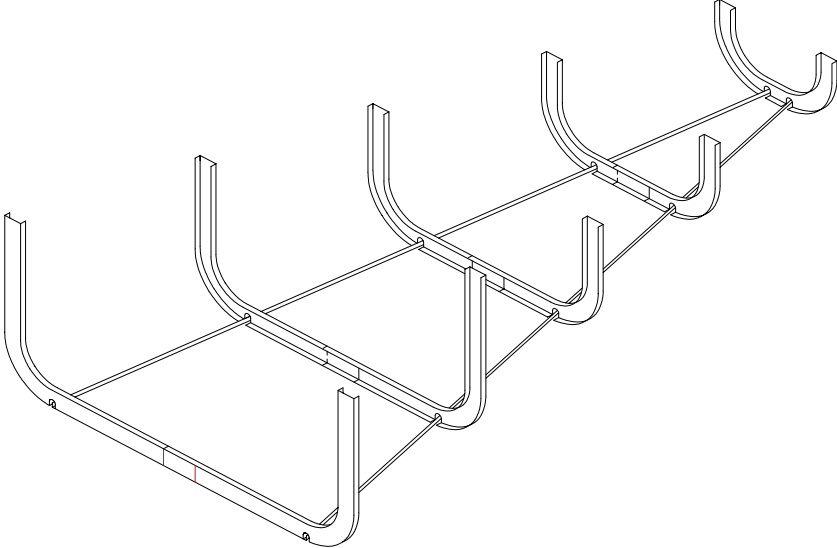


Figure 9.1.9

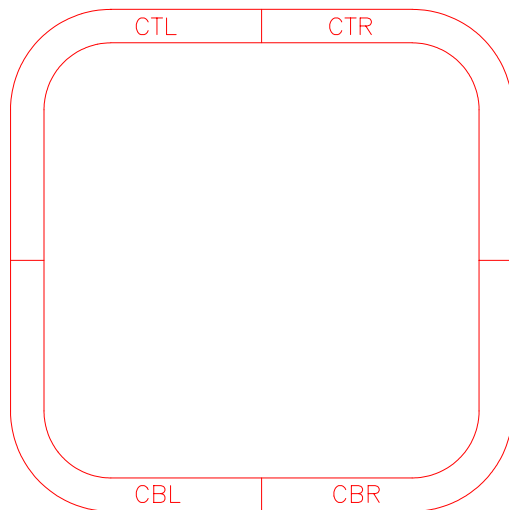
16) The bottom assembly should now look like figure 9.1.10.



BOTTOM ASSEMBLY

Figure 9.1.10

NOTE: Before disassembling, label each bulkhead for easy assembly in the future. An easy method for labeling is shown in figure 9.1.11.



(Bulkhead as seen from rear of aircraft.)

Example CTL

- The first letter "C" denote the bulkhead location
- The second letter "T" denotes a top section
- The third letter "L" denotes a left section

Figure 9.1.11

17) Disassemble and remove from the table.

9.2 Top Skin

- 1) Cleco the second Top/Bottom Cone Skin (FUS-404) to the table in the same locations as you did for the bottom skin.
- 2) The procedure for the top skin is the same as for the bottom skin with the following exceptions:
 - a) the bulkhead quarter sections for location "A" will be square cornered (R-BULK-1).
 - b) bulkhead position "D" overlap and riveting is the same as other bulkheads.
- 3) The top assembly should look like Figure 9.2.1.

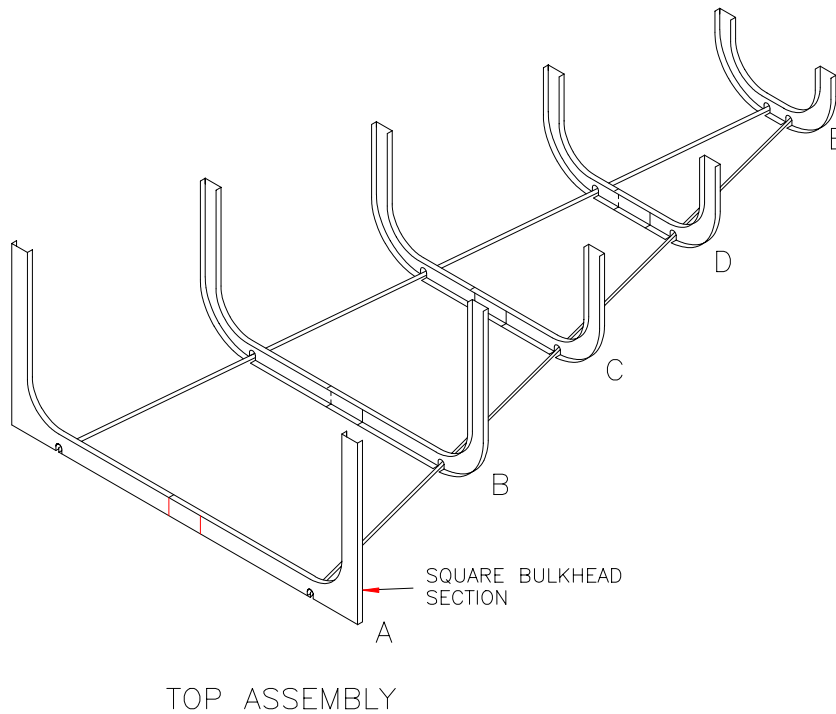
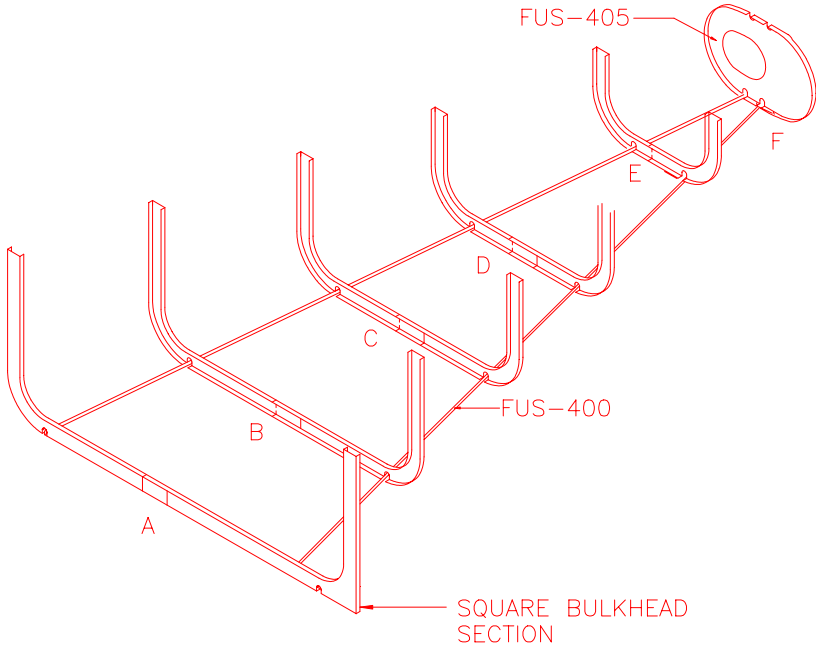


Figure 9.2.1

- 4) Disassemble and remove from the table.

9.3 Side Skins

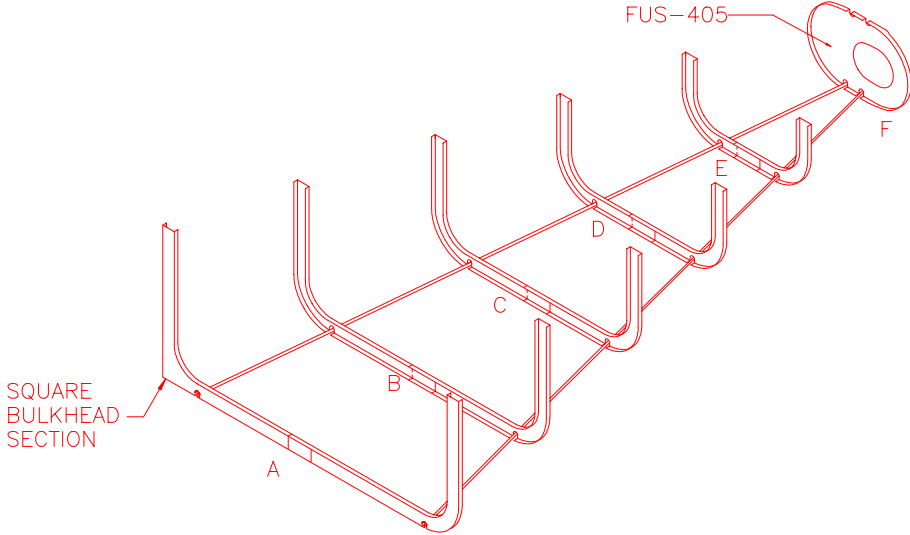
- 1) The procedure for the two Side Cone Skins (FUS-400) is similar to that used for the top and bottom.
- 2) The solid bulkhead (FUS-405) can be positioned and clecoed to the side skin at the rear end. The lightening hole in FUS-405 should be at the bottom.
- 3) The left side assembly should look similar to figure 9.3.1.



LEFT SIDE ASSEMBLY

Figure 9.3.1

4) The right side assembly should look like figure 9.3.2.



RIGHT SIDE ASSEMBLY

Figure 9.3.2

5) The overlaps of the legs on the side cone skins should be cut down to 4” as in figure 9.3.3.

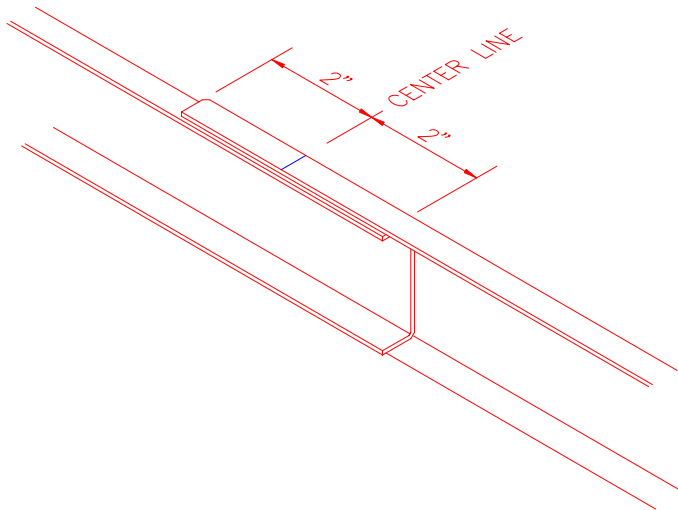
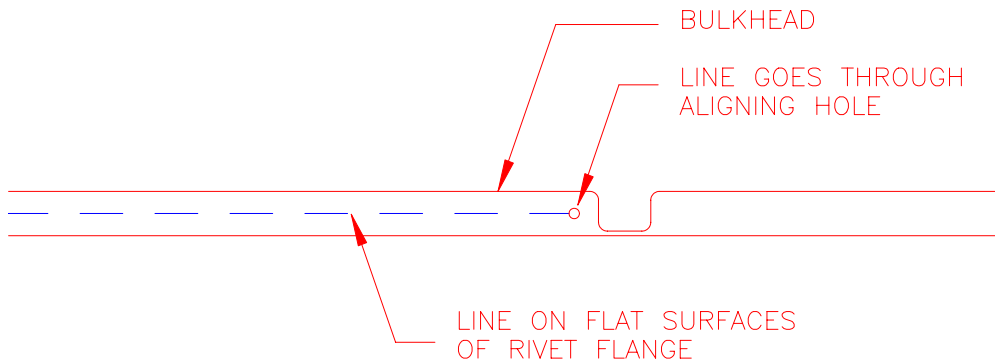


Figure 9.3.3

- 6) Disassemble and remove the assembly from the table. Debur all parts.
- 7) Assemble the five bulkheads with chromate between their mating surfaces. Rivet together the bulkheads using nine 1/8" avex rivets (RV-1410) at each overlap.
- 8) Draw center lines on the outside flanges of the Bulkhead assemblies. Figure 9.3.4.



Figure

9.3.4

- 9) Cleco the Bottom Cone Skin (FUS-404) back on the table.
- 10) Cleco the completed bulkheads to the skin. **NOTE:** As you cleco the bulkheads to the skins, it is good practice to bend the flanges of the bulkheads to match the angle of the skins. By doing this, the bulkhead will stay straight.
- 11) Cleco the side skins to the bulkheads.
- 12) Cleco the top skin in place.
- 13) The tail cone will look like figure 9.3.5.

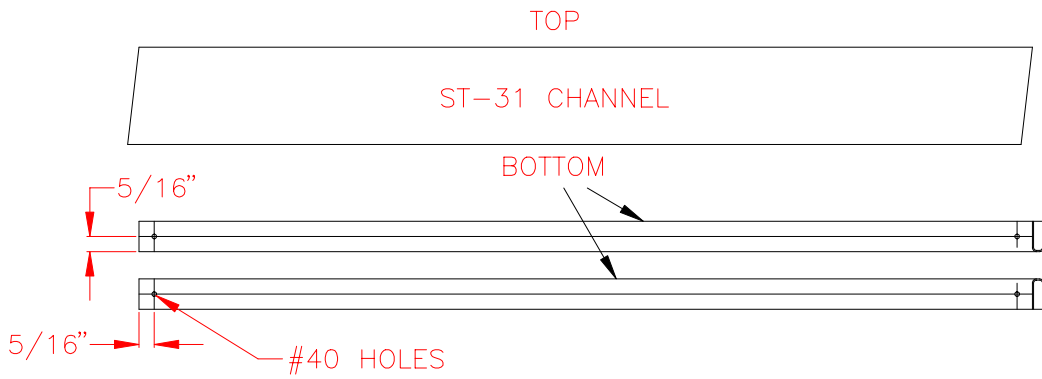


Figure 9.4.1

3) Draw a line from the center of bulkhead position D to bulkhead position E. Draw a line on either side of the center line as in figure 9.4.2.

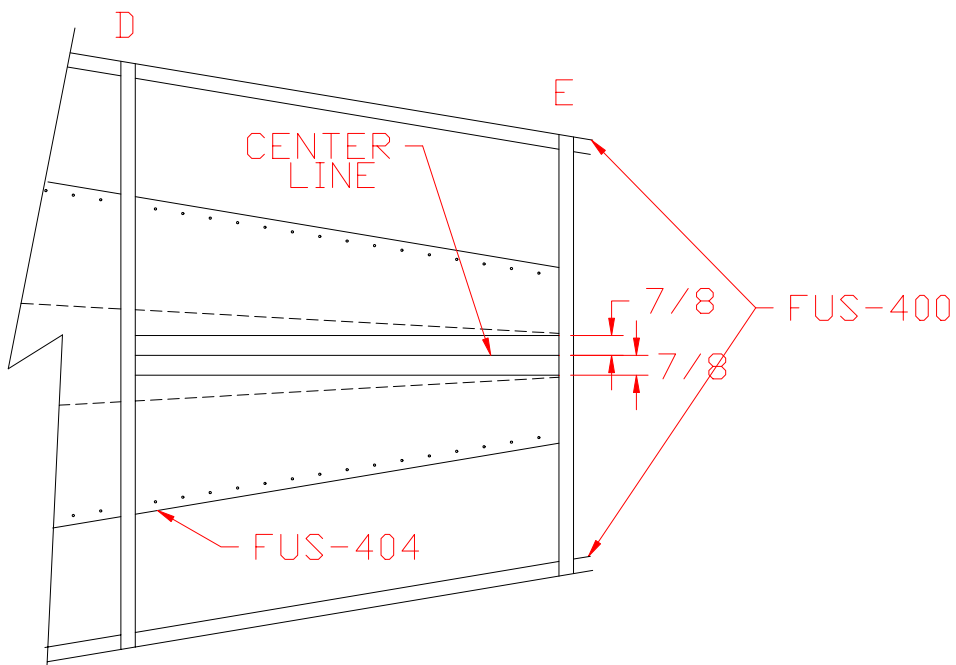


Figure 9.4.2

4) Position one of the channels, flange facing outward, over one of the outer lines. Center the channel between bulkhead positions “D” and “E”. Drill the two #40 holes into the Bottom Cone Skin along the line. Figure 9.4.3

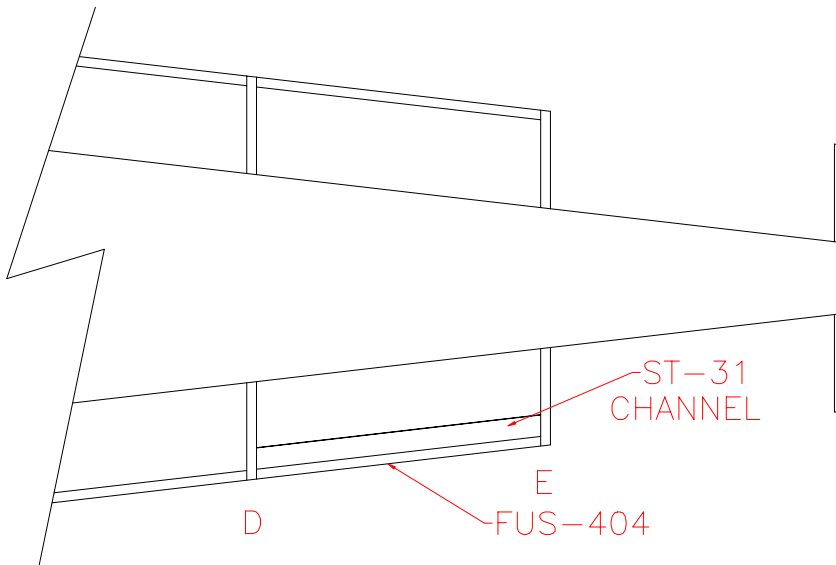


Figure 9.4.3

5) Remove the channel.

6) Locate the Lower Elevator Pulley Bracket (FUS-411) on the channel as in Figure 9.4.4. Drill the nine #30 holes into the channel. Cleco.

FRONT

REAR



Figure 9.4.4

7) Remove the FUS-411 bracket.

8) Line the two channels back to back and transfer the nine #30 holes to the second channel.

9) Debur the channels. Chromate the mating surfaces of the Channels and Lower Elevator Pulley Brackets and rivet with 1/8" avex rivets (RV-1410).

10) Bolt two BB-128 pulleys between the Lower Elevator Pulley brackets with an AN4-14 bolt, AN960-428 washer, AN310-4 Castle Nut and Cotter Pin (MS24665-132).

11) Cleco the assembly onto the Bottom Cone Skin. Line up the two #40 holes of the other channel and drill into the Bottom Cone Skin.

12) Turn the Cone Assembly onto its side.

- 13) Layout and drill a series of #40 holes at 1” spacing through FUS-404 and the ST-31 channels.
- 14) Drill the #40 holes out to #30. To tie the channels to the bulkheads make 4 clips out of ST-40 angle.
- 15) Remove the parts and debur. Chromate and rivet pulley assembly into place with 1/8” avex rivets (RV-1410).

9.5 Cabin Carrythrough Assembly

- 1) One FUS-5 will need trimming now or during corner wrap installation, as in Fig. 9.5.1. This will be the forward FUS-5.

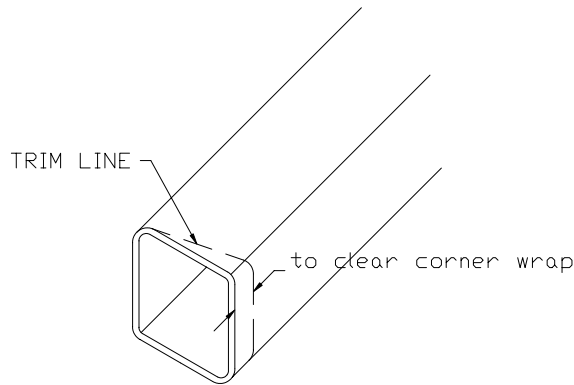


Figure 9.5.1

- 2) Cleco one FUS-424 to each end of the trimmed FUS-5. Drill all the #30 holes to #11. The center row shown. The most outboard hole of these will need countersinking to clear upright. Figure 9.5.2

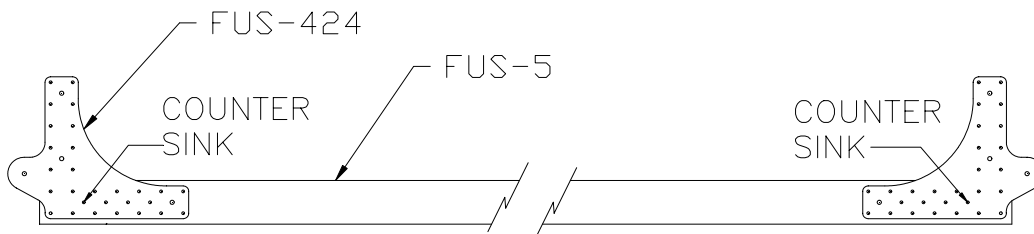


Figure 9.5.2

- 3) Disassemble, debur, chromate and rivet (RV-1619 and RV-4621). Figure 9.5.3.

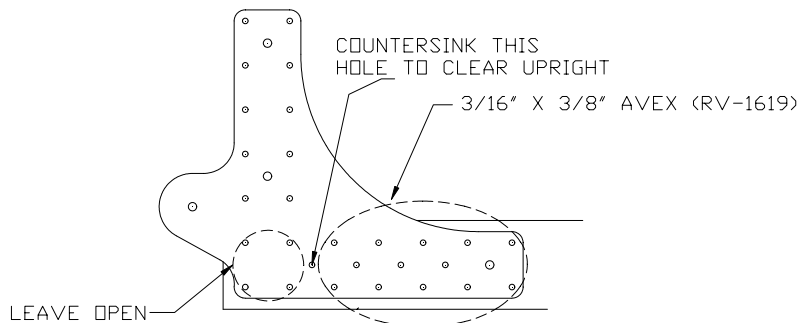


Figure 9.5.3

- 4) Repeat steps for the aft lower carry through.
- 5) Draw center lines on the outside surfaces of the two FUS-4 Fuselage Uprights and cleco them to the FUS-5 carry through assemblies.
- 6) Cleco the four (4) FUS-1 gussets and the FUS-3 carrythrough into position. Figure 9.5.4.

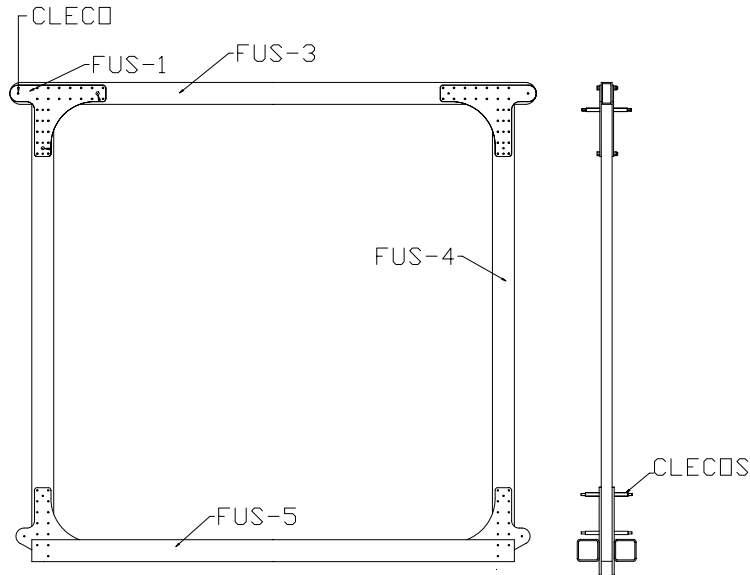


Figure 9.5.4

Use a square to check alignment before drilling.

- 7) Drill all the holes out to #11. Drill the four (4) outside holes at each end of the rear FUS-5 carry through to 7/16". These holes will allow insertion of the bolts and a 3/8" socket. Bolt and rivet together. See figure 9.5.5 to 9.5.7 for details.

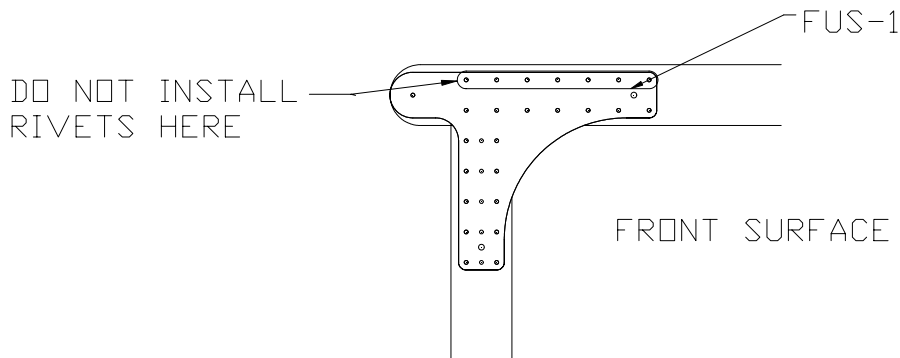


Figure 9.5.5

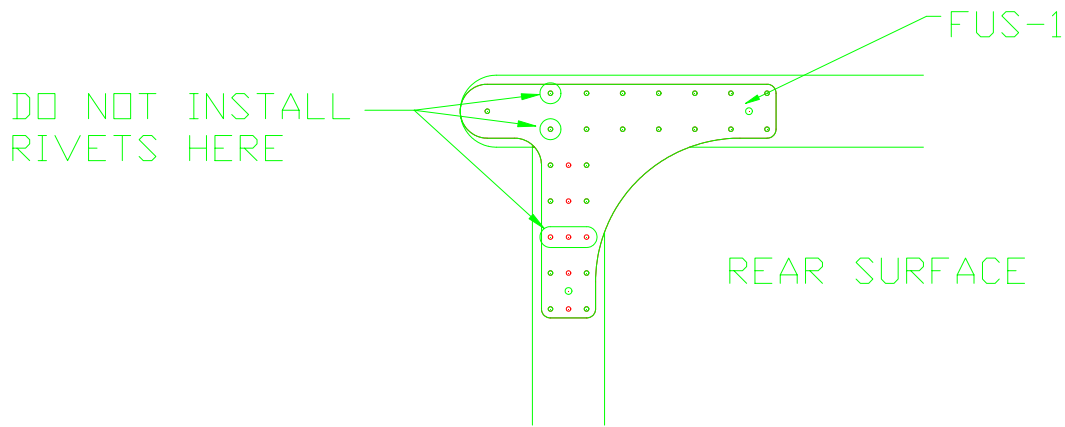


Figure 9.5.6

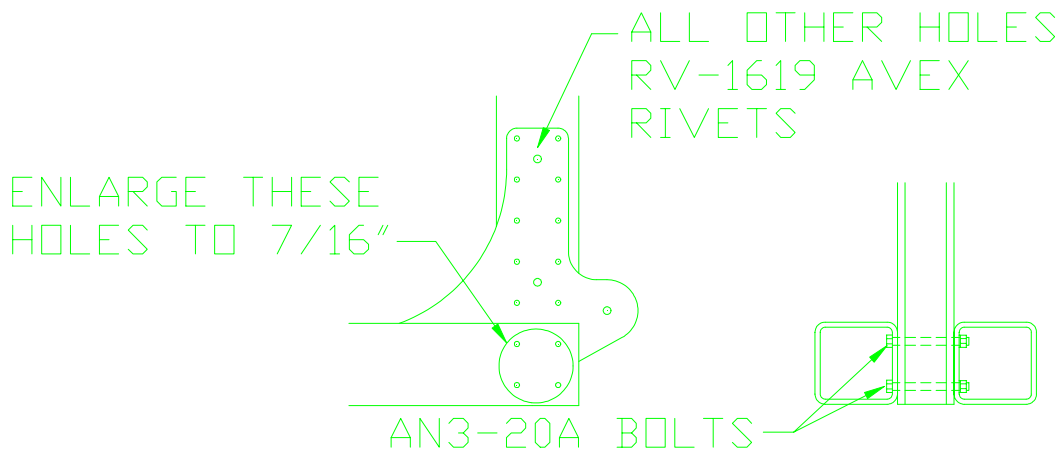


Figure 9.5.7

9.6 Cabin Bulkheads

1) Prepare an R-Bulk 1 assembly for Station 3. Draw centerlines on the outside flanges of the two R-Bulks that will make up the Bulkhead for Station 3. Cleco it into position on the floor (FUS-432). Circled rivet holes in Figure 9.6.1 indicate where the Bulkhead key holes cleco into place. **NOTE:** A bulkhead assembly goes at station 7 with the same flange direction as the rest.

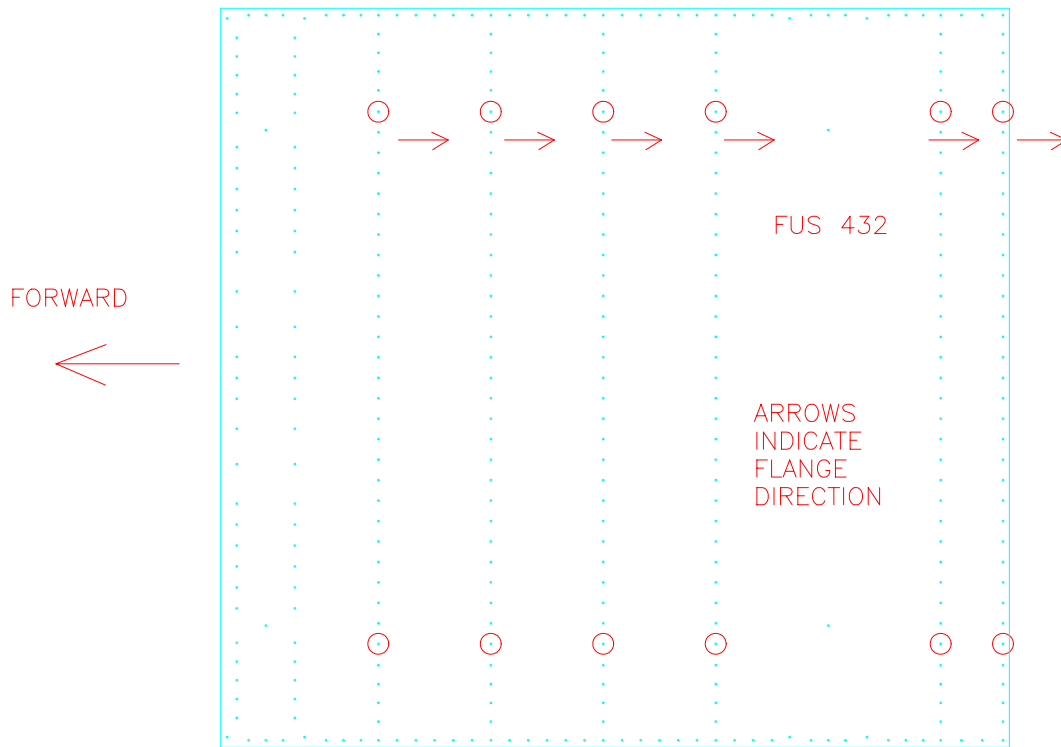


Figure 9.6.1

2) Drill and cleco the center overlap area. Drill #40 first then #30. See Figure 9.6.2 for detail.

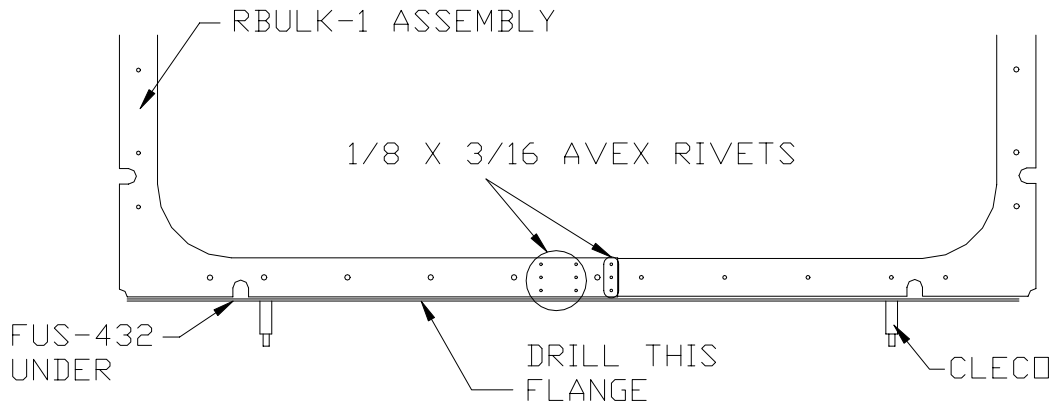


Figure 9.6.2

3) Use the FUS-432 Floor Skin as a drill guide. Drill through the Bulk Assembly. Make sure you can see the center line on the flange. Drill #40, then to #30.

4) Use the FUS-406 Sill as a trim guide. Mark and trim the Bulkhead Assembly as per Figure 9.6.3. **NOTE:** FUS-406 is tapered, so make sure it is in the proper location before marking and trimming. Each leg on the R-Bulk assembly will be a different height.

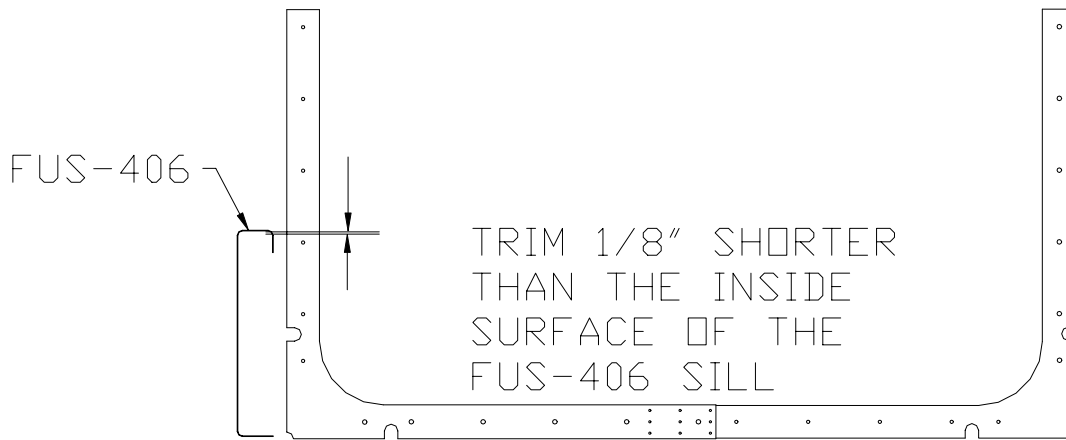


Figure 9.6.3

- 5) Repeat steps for the remaining Stations. **NOTE:** Do not cut the upright legs of the Station 9 Bulkhead assembly.
- 6) Disassemble, debur, chromate and rivet the bulkheads together where they overlap in the center. Remember to label the bulkhead.

9.7 Spring Gear Doublers

NOTE: If you are building a Tricycle Gear aircraft go to section 11. Follow those instructions also for rivet spacing and type to attach lower floor skins and spring gear doublers to the carrythroughs in both aircraft.

- 1) Drill the punched holes indicated in Figure 9.7.1 to 3/8" and #11 on the FUS-432 Floor Skin.

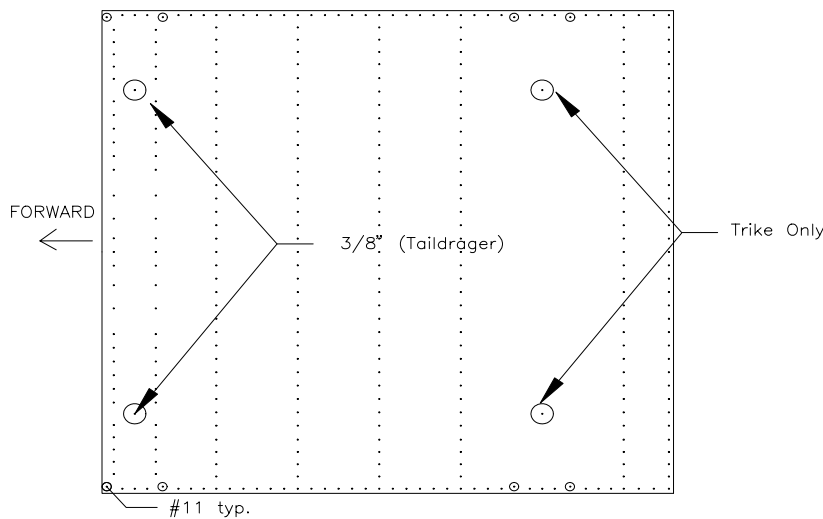


Figure 9.7.1.

2) On the bottom of the cage assembly measure from the outside edge of the cage uprights and mark a center line on the bottom of the FUS-05 lower carrythrough tubes. Now measure and mark the center of the lower skin FUS-432 and align the two marks. Use the two SG-5 landing gear blocks to center the forward cabin cage on the FUS-432 floor skin. Drill through the floor into the cage. Drill all the #40 holes common to both parts, cleco as you go. Figure 9.7.2.

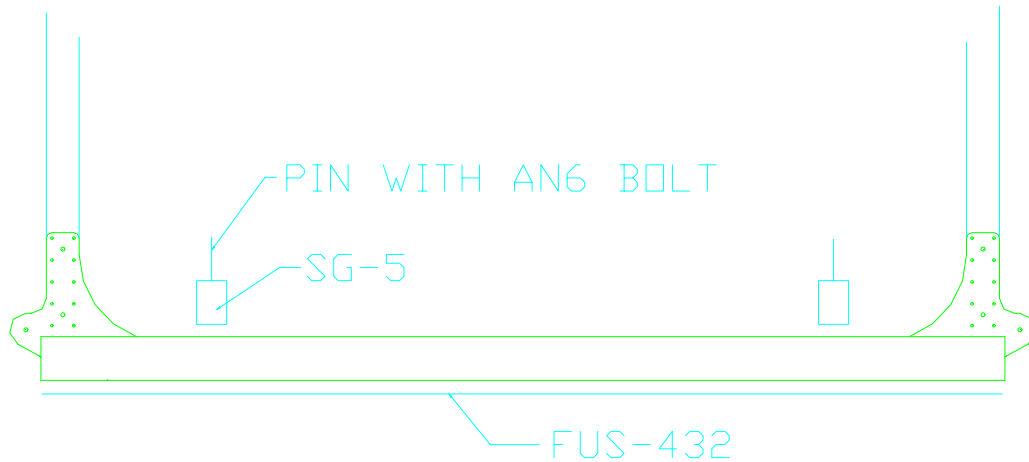


Figure 9.7.2

- 3) Remove the forward cage, cleco the floor doublers (FUS-428 and FUS-430) into place on FUS-432. Refer to the exploded view of the fuselage for positioning of the doublers.
- 4) Cleco the floor doublers and forward cage into position. Drill out #40 holes to #11.
- 5) Locate the FUS-429 and FUS-431 Floor Doublers.
- 6) Drill the inboard two #11 holes to 3/8".
- 7) Using the SG-5 blocks again for alignment, drop your AN6 bolts down through the FUS-431, FUS-429, the SG-5 blocks and the FUS-430, FUS-428 outside Floor Doublers and FUS-432 Floor Skin.
- 8) REFER TO SPRING GEAR ATTACH REINFORCEMENT SUPPLEMENT. Pilot drill the outboard #11 holes on FUS-432 through the FUS-428 & FUS-430 Doublers, FUS-5 Carrythroughs and the FUS-429 & FUS-431 top Doublers.
- 9) These four #11 holes can now be drilled out to 5/16".
- 10) The two rivet lines attaching the Doublers FUS-428 and FUS-430, FUS-432 floor skin to the FUS-5 carrythroughs will be riveted with RV-1619's.

9.8 Door Sill Install

- 1) Cleco the Station 3 to 9 bulkheads in place.
- 2) Slide the FUS-406 left and right sills into place and cleco the key holes. Refer to Figure 9.8.1.

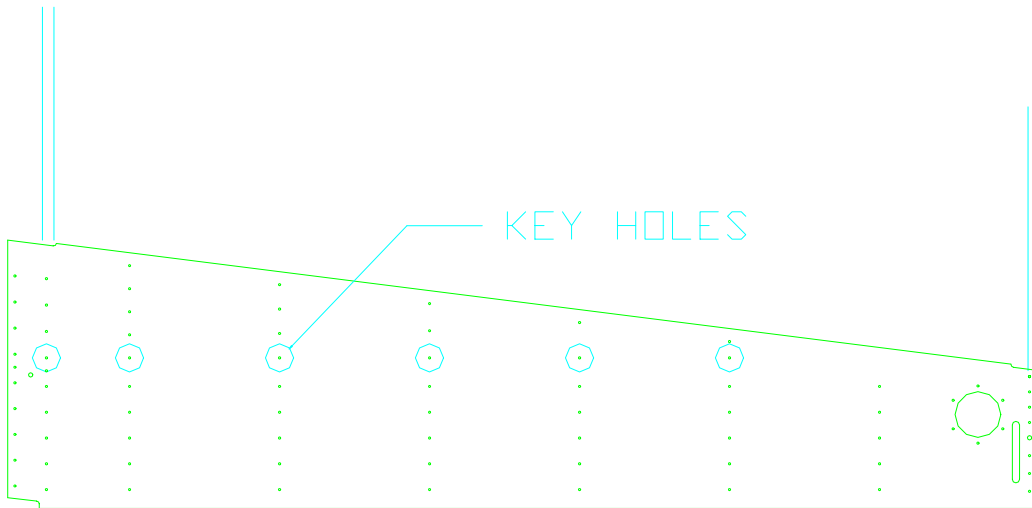
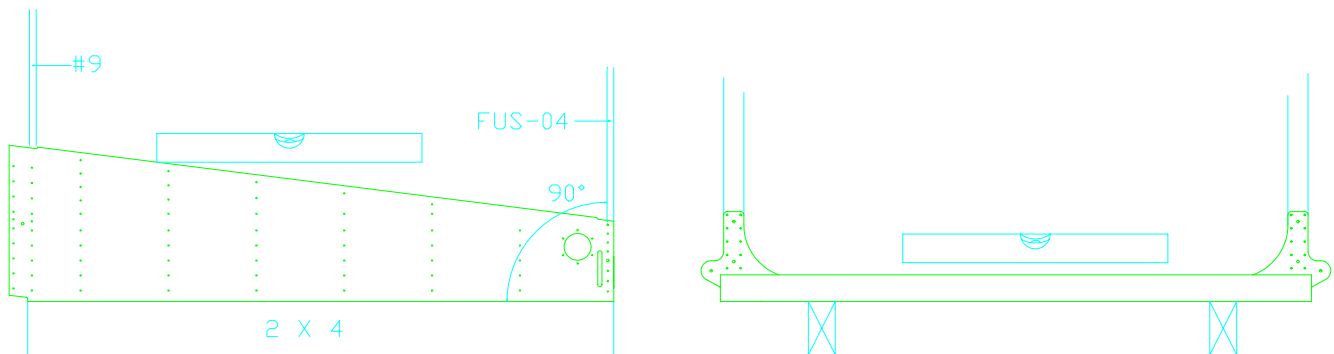


Figure 9.8.1

- 3) Using the sills as a drill guide, drill through the outside flanges of the bulkheads. Make sure the center lines on the flanges are visible through the holes in the sills. Drill #40, cleco as you go. Drill through the floor skin into the bottom sill flanges. The bulkheads and floor skin go inside the sill flange on final assembly. Drill #40.
- 4) Position the assembly upright on your building bench. Use 2x4's to clear the clecos protruding from the FUS-432 floor skin.
- 5) Level the structure from sill to sill, and fore and aft. Figure 9.8.2



View from Side

View from Front

Figure 9.8.2.

- 6) Square the front cabin cage to the bottom of the cabin. Use the FUS-406 sills as a drill guide. Drill into the FUS-04 Cage Uprights. Drill #40. Use lots of clecos.
- 7) Cleco the FUS-401 Cabin Side Skins to the sills and the Station 9 bulkhead. Figure 9.8.3.

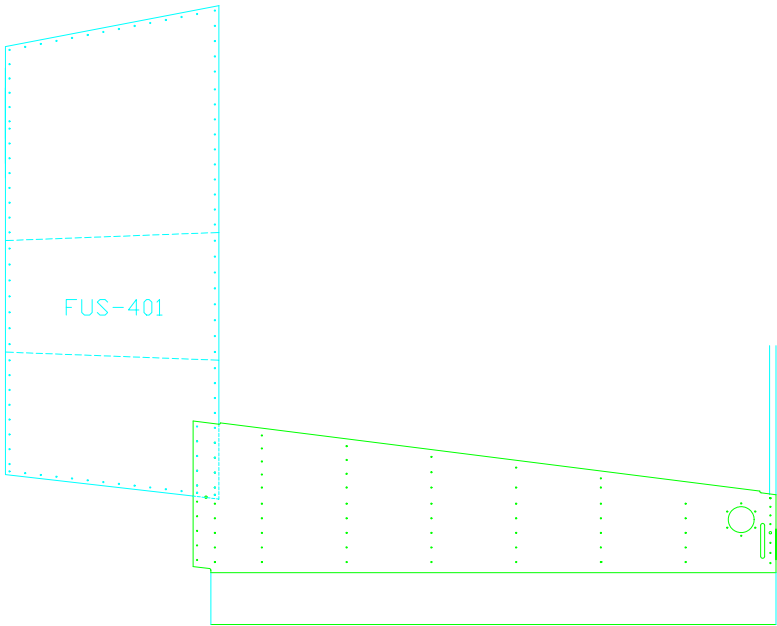


Figure 9.8.3

8) Prepare three more R-BULK 1 Assemblies. Cut angles from ST-40, position and rivet in place. Fig.9.8.4.

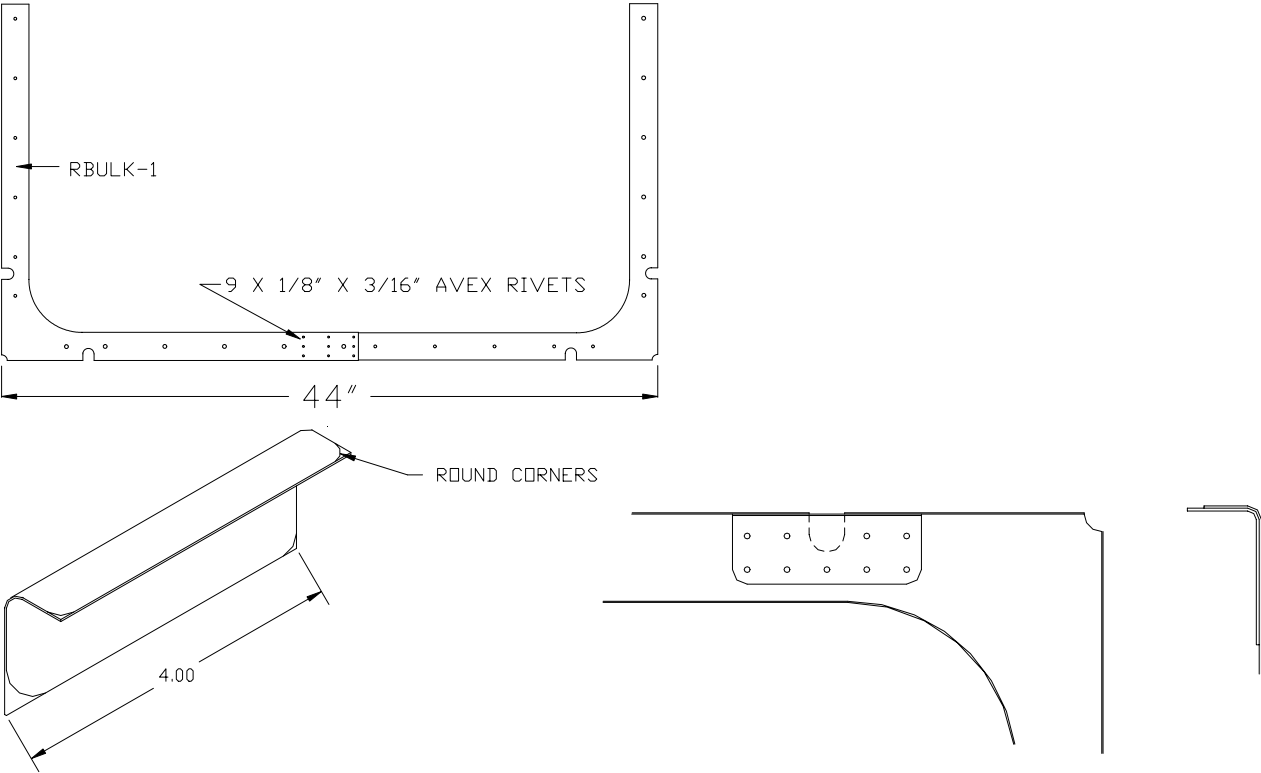


Figure 9.8.4

These angles reinforce the cut outs which are not necessary in the cabin roof.

9) Cleco one of the bulkhead assemblies into place at the top of Station 9. This will complete the Station 9 bulkhead. Key to holes in the existing bulkheads. **NOTE:** The new bulkhead assembly will slide inside the Station 9 bulkhead.

10) Join the top and bottom halves of the Station 9 bulkhead using the typical nine rivet joint. **NOTE:** Debur, chromate and rivet at this time. Figure 9.8.5.

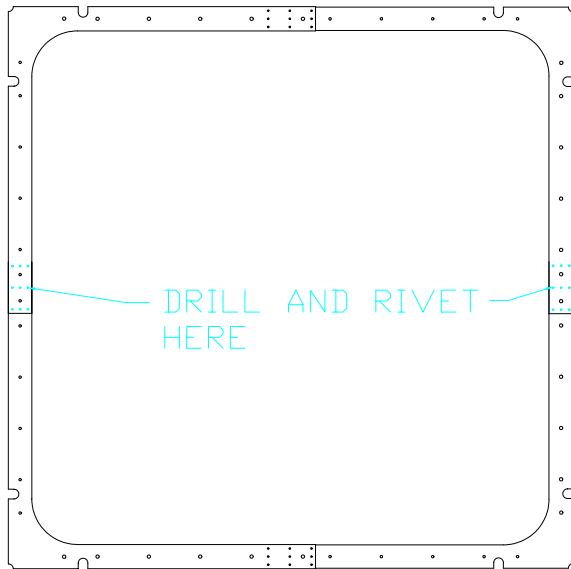


Figure 9.8.5

11) Use the FUS-401 skin as a guide. Drill into the Station 9 bulkhead. Make sure the center line you put on the outside flange of the bulkhead is visible at all times. Drill #40, use lots of clecos.

9.9 Root Rib Install

1) Trim the cabin root ribs (FUS-27 left and right) as in Figure 9.9.1.

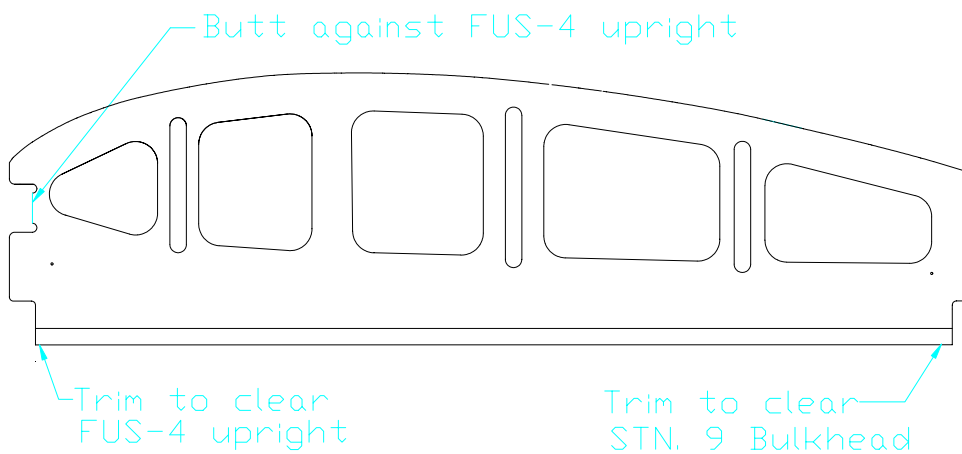


Figure 9.9.1

- 2) Straighten the top flange of both root ribs (FUS-27) so the top flanges of the ribs are 90° to the web surface. This can be done with crimping pliers, shrinker or hammer and dolly. The rib should lie flat on the table when you're done.
- 3) Position the left root rib (FUS-27) as in Figure 9.9.2.

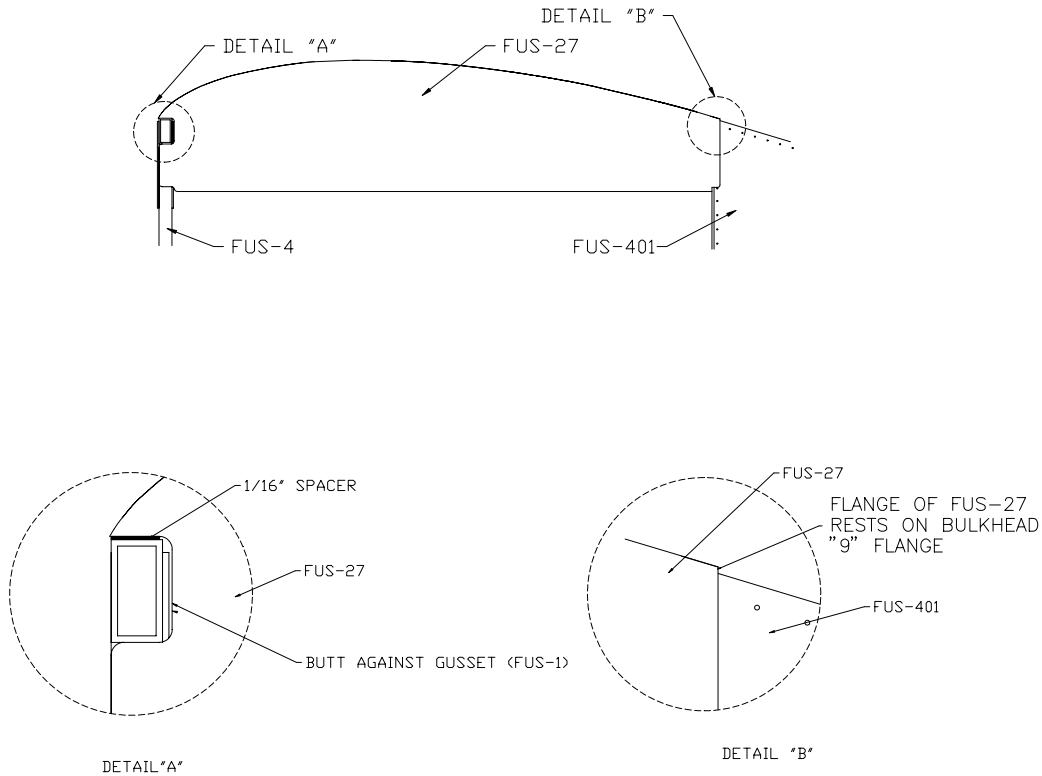


Figure 9.9.2

NOTE: Check that the forward cage is still square and the cage uprights (FUS-04) and the Station 9 Bulkheads are parallel.

- 4) Drill back through the Station 9 bulkhead into the FUS-27 root rib. Drill #40, cleco. Figure 9.9.3.

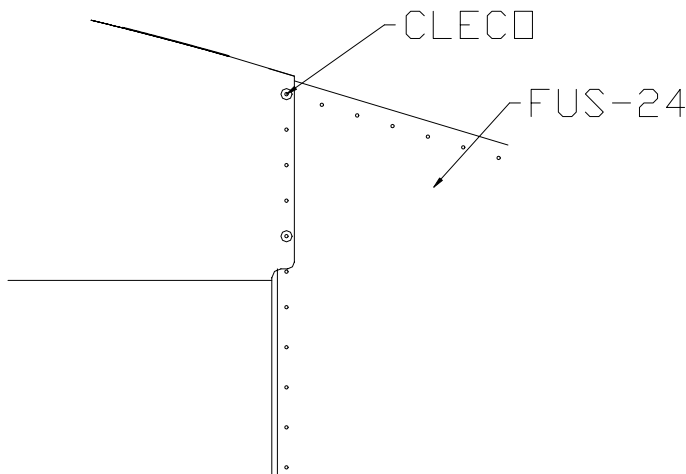


Figure 9.9.3

- 5) Drill five #40 holes through the FUS-27 root rib and the FUS-04 upright. Figure 9.9.4.

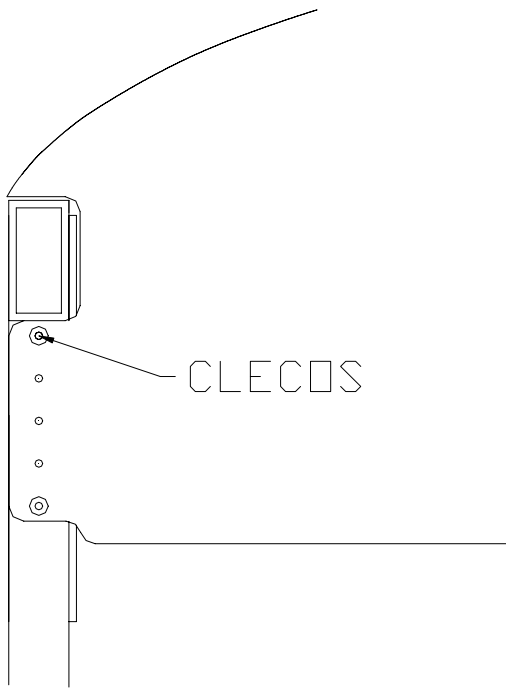


Figure 9.9.4

- 6) Repeat steps for the right side.
- 7) Re-check the cabin area for square.

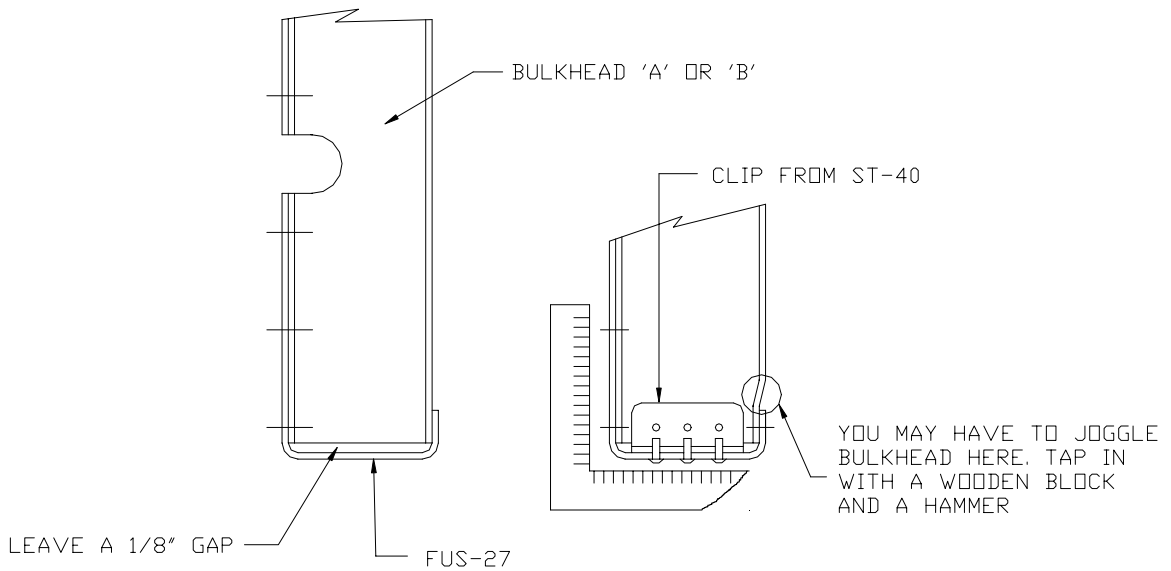


Figure 9.9.5

- 8) The two R-BULK 1 assemblies (referred to as “A” and “B” in Fig. 9.9.5.) prepared earlier are to be installed between the two FUS-27 root ribs. Figure 9.9.6. The bulkheads must be tied into the FUS-27’s as in Fig 9.9.5.

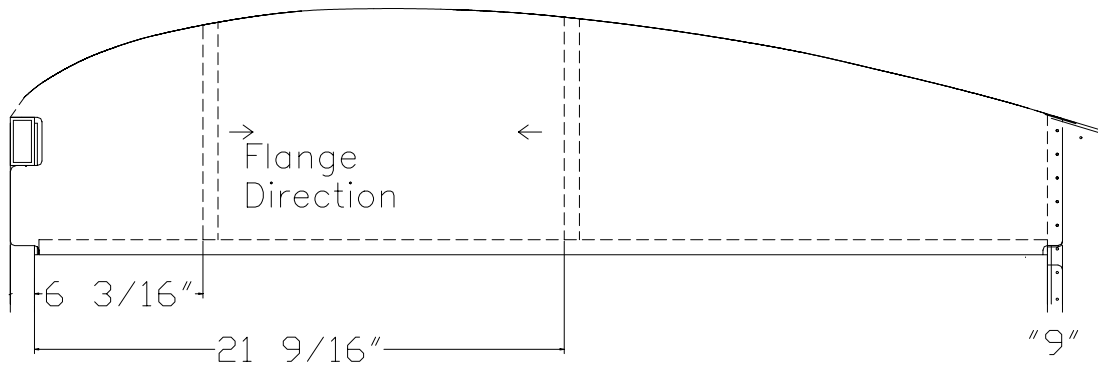


Figure 9.9.6

- 9) Drill #40 rivet lines (nine equally spaced holes allowing for bulkhead cutout) in the FUS-27 root ribs. Fig. 9.9.6.
- 10) Trim and fit the forward bulkhead between the two FUS-27's. Be sure the top flange of the bulkhead is tight against the top flange of the FUS-27 root rib.
- 11) Drill #40 through the FUS-27 into the Bulkhead and cleco into position.
- 12) Install the aft root bulkhead in the same manner as you did the forward bulkhead.
- 13) Drill all #40 holes to #30 except for the ones identified in Figure 9.9.7. **NOTE:** Also leave the forward and aft rows at #40 on the bottom skin (FUS-432).

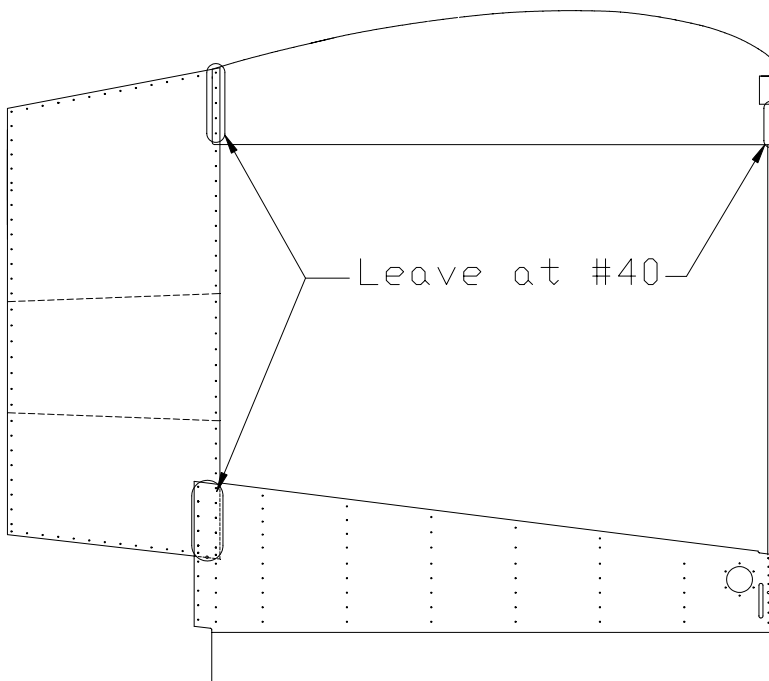


Figure 9.9.7

- 14) Carefully label all your parts. Disassemble, debur, chromate and rivet.

9.10 Mating the Tailcone

- 1) Mate the tail cone and cabin together by first clecoing the tail cone side skins to the FUS-401 skins.
- 2) Cleco the bottom skin (FUS-435) between the tail cone and the FUS-432 bottom skin. **NOTE:** You will notice a rivet line running across the skin near the center. This is for the installation of a ST-31 Stiffener.
- 3) Solidly block up the tail cone at each bulkhead location. Use wood of varying heights to keep the cabin area flat on the table.
- 4) Cut a two part temporary floor from ½” plywood (rough both sides). These will allow you to crawl around inside the fuselage. Use drywall screws to hold the two pieces together. Figure 9.10.1.

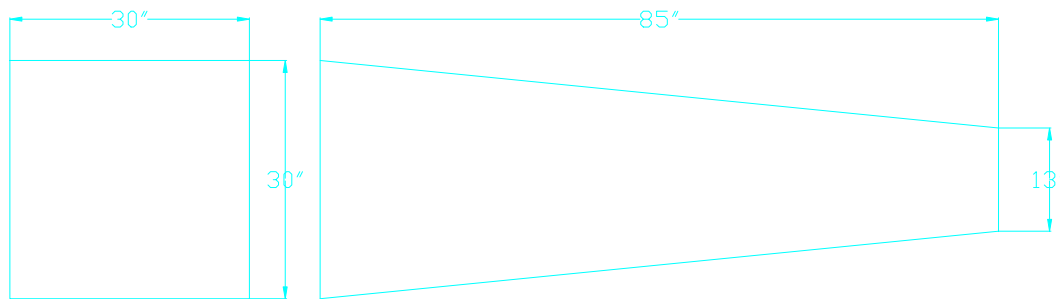
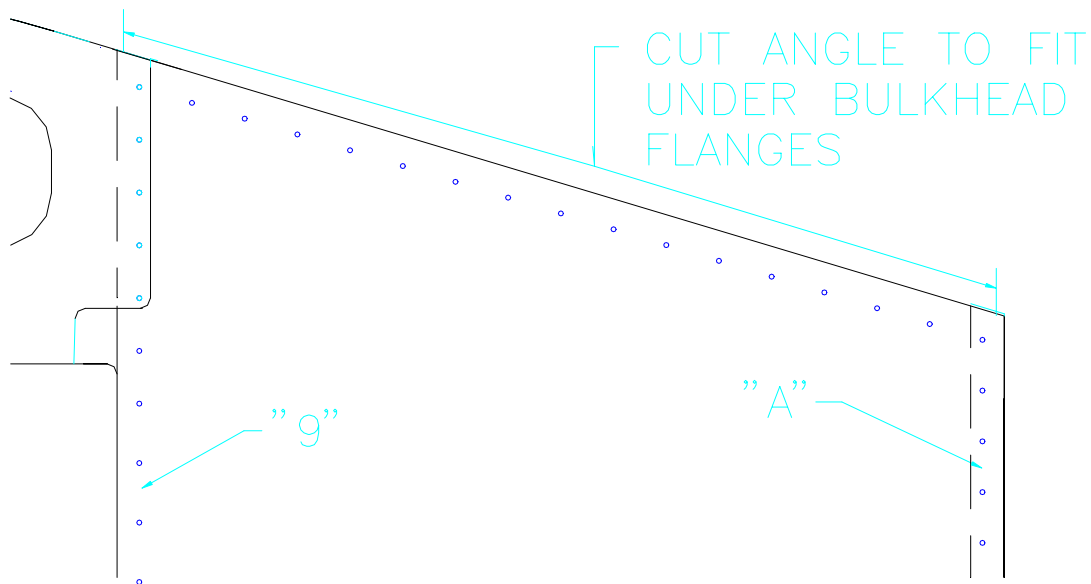


Figure 9.10.1

- 5) Check the fuselage for any twists. Now is the time to get rid of any misalignment.

9.11 Roof Skin Install

- 1) Tape the FUS-28 roof skin firmly in place. Trace the location of the roof bulkheads and their prepunched holes. **NOTE:** FUS-28 is wider than the Cabin. It will have to be trimmed to fit the top of the Cabin.
NOTE: The roof skin goes between the FUS-1 carrythrough gussets and the FUS-03 carry through.
- 2) Remove the roof skin and drill #40 the rivet holes you marked. Between these Bulkhead rivet holes, layout and drill a 1 ¼” nominal rivet pattern.
- 3) Re-install the roof skin. Tape it securely.
- 4) Use the roof skin as a drill guide. Drill through the roof bulkheads and the two FUS-27 root ribs. Drill #40. Cleco as you go. Drill back through the top row of holes in the FUS-1 with a #11 drill bit. Drill a row of #30 holes at 1 ¼” spacing, avoiding the crease in FUS-28, along FUS-03 between the FUS-1 gussets.
- 5) From the inside drill through the “A” bulkhead into the roof skin. Drill #40.
- 6) Drill all the holes common to the Tail Cone and Cabin to #40.
- 7) Cut two angles from stock material (FUS-35) to fit between the Station 9 bulkhead and Station “A” bulkhead. Figure 9.11.1.



Figure

9.11.1

- 8) Drill through the roof skin and the FUS-401 side skins into the FUS-35 angles. Drill #40. Use lots of clecos.
- 9) Drill all the #40 holes that mate the cabin to the tail cone to #30.
- 10) Drill all the roof skin holes to #30.
- 11) Disassemble-assemble, debur, chromate and rivet the tail cone to the cabin. Use RV-1410 rivets.
- 12) Rivet the roof skin to the top of the cabin except where FUS-10's will attach, use RV-1410 Avex rivets. Rivet the remaining 3/16" holes through the FUS-1 and FUS-04, use RV-1613.
- 13) Rivet the FUS-35 angles using RV-1410 rivets.

9.12 Corner Wraps

- 1) Prepare two R-BULK-1 bulkhead quarters by drawing center lines on the outside flanges and clecoing into position (Station 10).
- 2) Back drill #40 through the sills, FUS-401 side skins and the floor bottom tail cone skin.
- 3) Drill #40 the R-BULK-1 overlap area with the typical nine hole rivet pattern.
- 4) Drill all #40 holes to #30.
- 5) Remove the bulkhead section and rivet the two halves together.
- 6) Trim the vertical legs of the Station 10 bulkhead 5/16" above the highest rivet hole.
- 7) Cleco the STN 10 Bulkhead into position. Use the sills and floor bottom as a drill guide to drill into the STN 10 Bulkhead. Drill #40 then out to #30.

- 8) Trace the outline of a round Bulkhead section on a piece of 1/2" or thicker plywood. Figure 9.12.1.

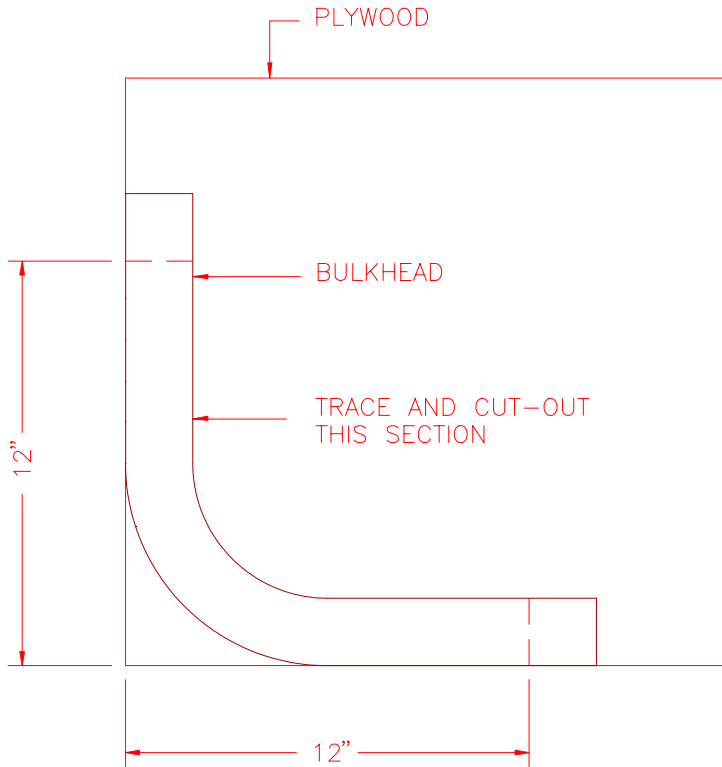


Figure 9.12.1

- 9) Cut two traced sections out leaving the legs approximately 12" long.
NOTE: Now is a good time to install the temporary plywood floor.
- 10) Clamp these wood sections to the flat sides of the round corners of bulkhead "A". Figure 9.12.2.

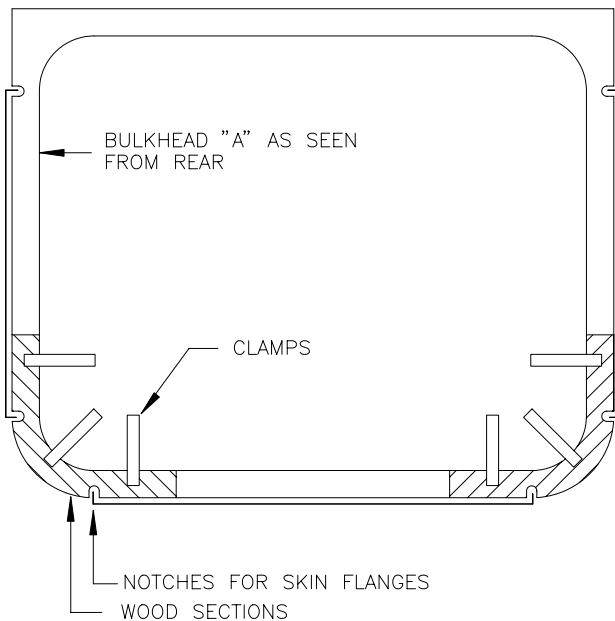


Figure 9.12.2

NOTE: The wood sections will help hold the rib square while putting on the rolled corners (FUS-33).

NOTE: FUS-463, Cabin Corner Wrap, will be used on the inside of the cabin, next to the pilot and passenger seats. Label these accordingly and set aside for use when installing wraps in this area.

- 11) On one of the Rolled Corners (FUS-33) draw a line $5/16$ " from the edge on the inside. Figure 9.12.3.

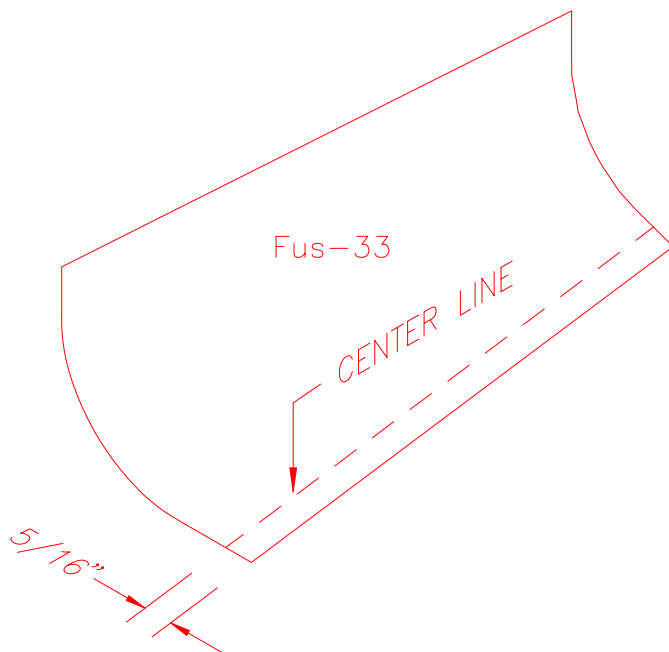
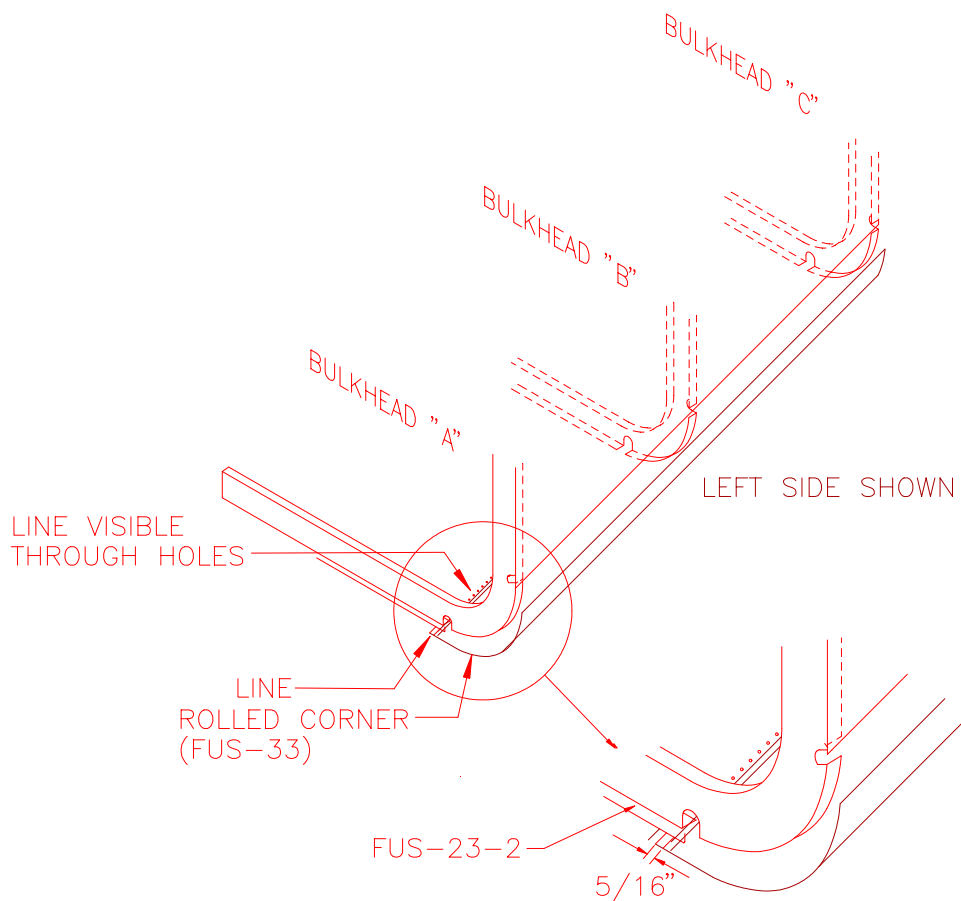


Figure 9.12.3

- 12) Tape the rolled corner under the Bottom Cone Skin (FUS-404) so the line is visible through the holes on the edge of the skin. Figure 9.12.4.

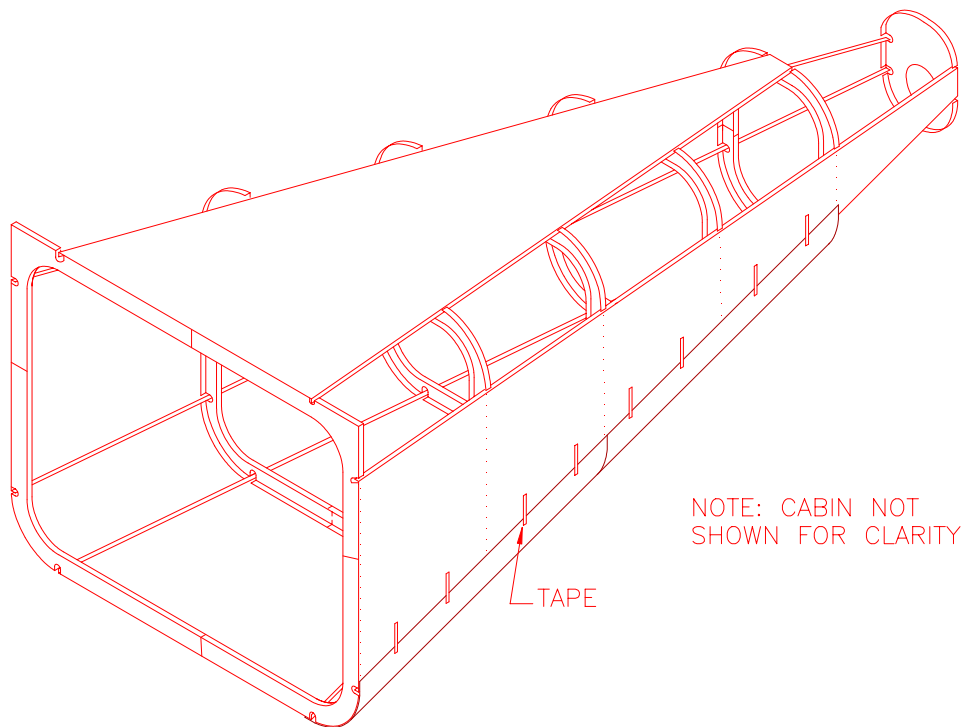


Figure

9.12.4

- 13) Ensure the rolled edge sticks out past bulkhead "A" enough to be trimmed flush later.
- 14) Ensuring you can see the line through the holes, drill out all the holes through the rolled corners with #40 drill.

NOTE: If you are building the aircraft without the inner floor, you can drill directly with a #30 bit. When drilling, start with the ends of the rolled corners, then the center. Continue drilling by dividing the space between holes in half until all are drilled. Cleco often.
- 15) Mark another rolled corner and insert between bulkhead "C" and previously installed rolled corner, keeping a 5/8" overlap.
- 16) Drill and cleco as you did earlier using existing holes as a guide.
- 17) Attach six or more pieces of tape (filament tape works best) to rolled corners and then pull corners snugly up against the side skin. Figure 9.12.5.



Figure

9.12.5

- 18) Drill back through the side skin with a #40 drill as before. Again if you are not installing the inner floor, you can drill directly with a #30 drill.
- 19) With a long #30 bit, drill back through the pre-drilled holes in the bulkhead corners. Ensure the bulkheads are straight.
- 20) Using the bulkheads as guides, mark the trimmed position of each rolled corner.
- 21) Remove the rolled corners and trim. **NOTE:** Ensure 5/16" from center of the holes to the edge of the sheet.
- 22) If you are **NOT** installing the inner floor, chromate the mating surfaces and rivet the rolled corners in place with 1/8" avex rivets (RV-1410). If you **ARE** going to install the inner floor, reinstall with clecos only.
- 23) Follow the previous steps for the right side.
- 24) Remove the two wood sections from the bottom of bulkhead "A" and clamp to the top corners of bulkhead "B".
- 25) The procedure for the top corners is the same and the bottom except the round corners start at bulkhead "B". The rear top corner will only span two bulkheads. Ensure that bulkhead "A" is flat and straight.
- 26) Remove, trim and debur the rolled corners.

- 27) Chromate the mating surfaces and rivet the top corners in place with 1/8" avex rivets (RV-1410).
- 28) Position a Tapered Corner Panel (FUS-10) in an upper corner between bulkheads "A" and "B".
Ensure that the corner overlaps the cabin top and FUS-24 by at least 3/4". Tape or have someone hold securely.
- 29) Reach inside and draw a line along bulkhead "B".
- 30) Trim the corner wrap as in Figure 9.12.6.

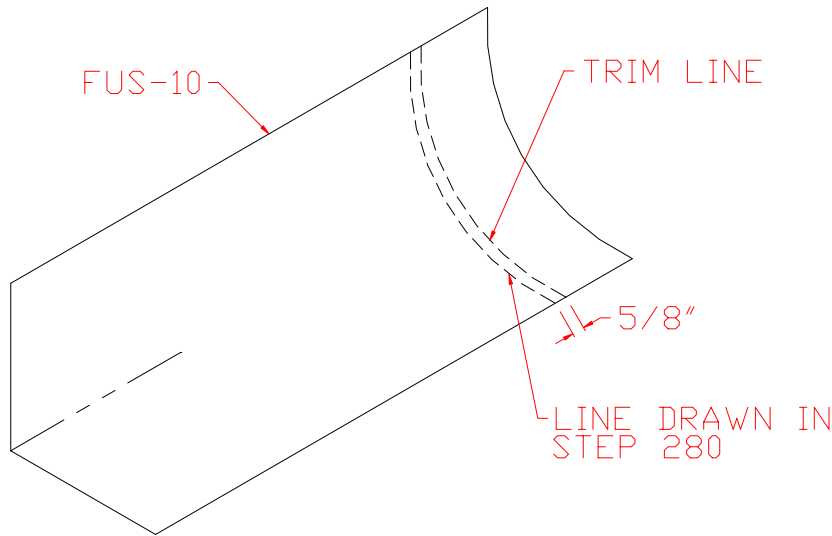


Figure 9.12.6

- 31) You can install the corner panel as it is but you will get a better fit by doing the following:
- 32) Cut a quarter moon on a piece of 1/2" - 3/4" plywood with a radius of 5 1/2". Figure 9.12.7.

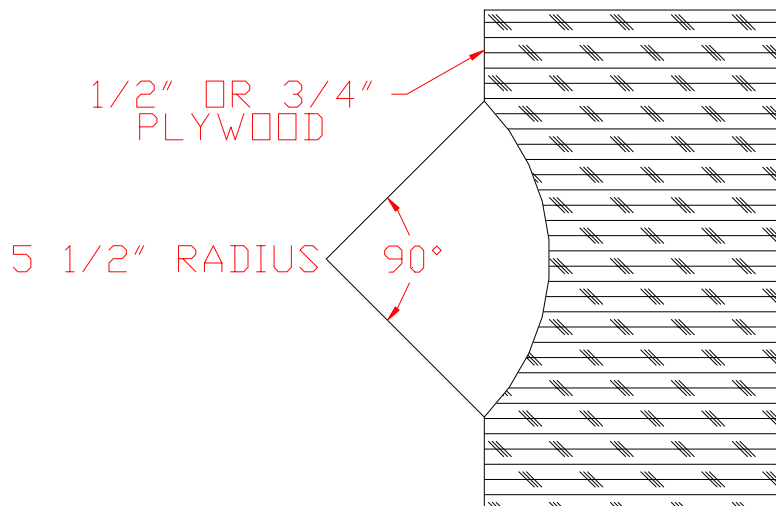


Figure 9.12.7

- 33) With a file or sandpaper shape the cutout so it fits the corner of the fuselage when held 90° to the centerline.
- 34) Place the plywood in a vise.
- 35) Hold the corner panel in the cutout portion with 5/8" hanging out one end. Figure 9.12.8.

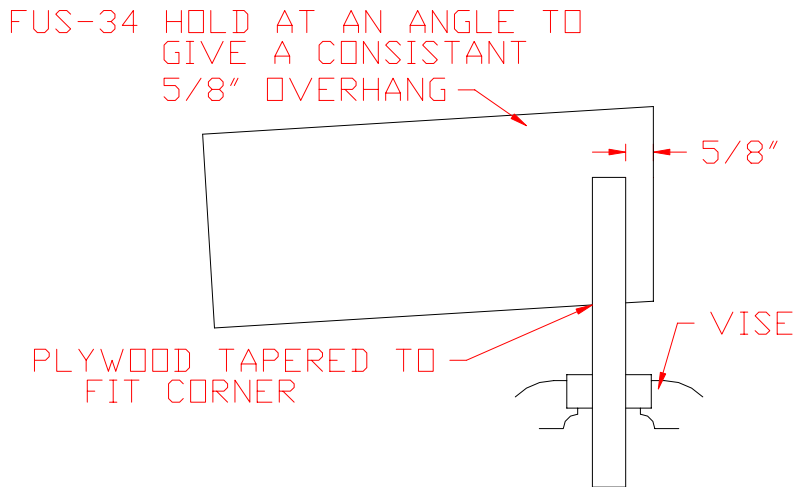


Figure 9.12.8

- 36) Use a steel bar, heavy wood dowel, baseball bat, etc. to hammer the edge down for a perfect fit. While forming, make trial fittings often.
- 37) After forming, tape securely in place.
- 38) Back drill from the inside with a #30 bit.
- 39) Mark the sides for trimming even with the edges of the adjacent corner panel.
- 40) Mark the end for trimming to have 5/16" clearance from the center of the holes.
- 41) Remove and trim.
- 42) Deburr all holes and edges. Chromate mating surfaces. Insert the front edges under the sides (FUS-401) and cabin top. Rivet in place with 1/8" avex rivets (RV 1410), except in area of outer gusset.
- 43) Repeat for the other side.
- 44) Position and drill to #40 the two lower corner panels between bulkheads at position 10 and "A".
- 45) Mark for trimming.

- 46) Remove and trim.
- 47) Re-install corner panels and cleco securely.

9.13 Rear Attach Brackets

- 1) Cut two square bulkhead sections to fit in front of the bulkhead at station 9. The flange will face the front. Figure 9.13.1.

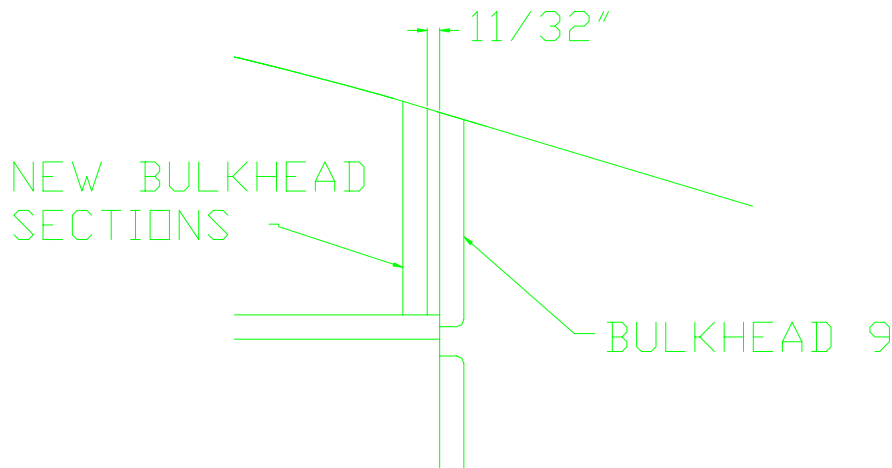


Figure 9.13.1

NOTE: There should be a space of $11/32$ " between the bulkheads. You can use four rear wing attach brackets (FUS-69) sandwiched together between the bulkheads at each side to ensure the correct spacing. Bend the top flanges of the new bulkhead sections up against the cabin roof.

- 2) From inside the fuselage drill out the cabin top and fuselage root ribs. Use the same spacing as in the Bulkhead at station 9.
- 3) Mark and trim the legs of the new bulkhead sections for 4" of overlap and drill the nine #30 holes in the overlap section as you did for each of the other bulkheads.
- 4) Install angle brackets as you did with the other bulkheads in roof section.
- 5) Call the new bulkhead sections 9A.
- 6) Cleco four rear wing attach brackets (FUS-69) together. Figure 9.13.2.
- 7) Layout and drill two new #30 holes as in Figure 9.13.2.

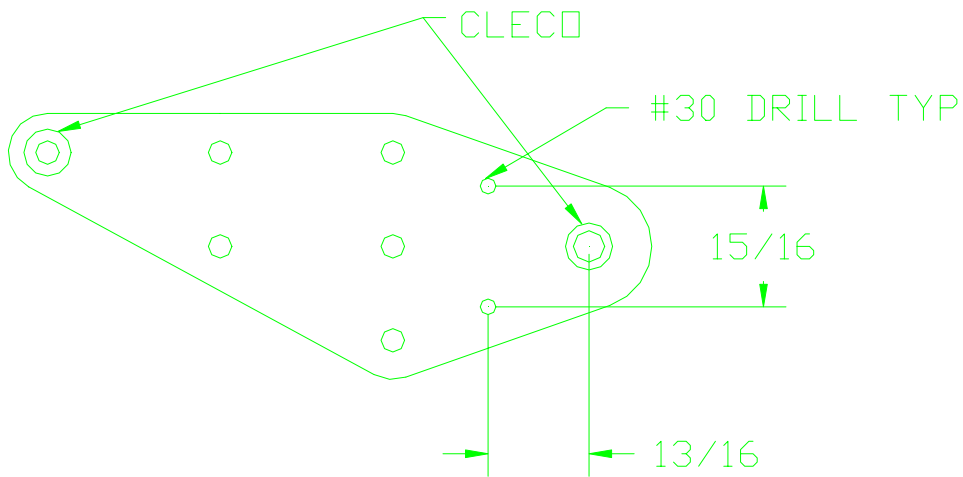


Figure 9.13.2

- 8) Disassemble and debur.
- 9) On the two inner fittings mark and trim as in Figure 9.13.3.

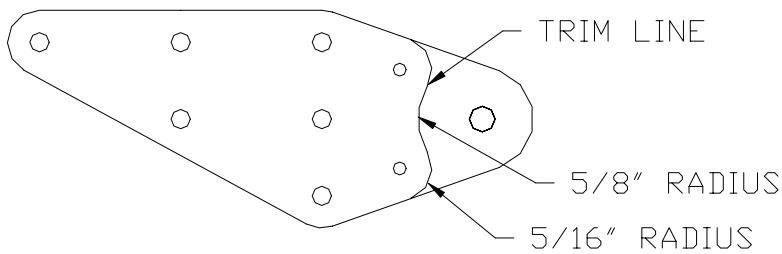


Figure 9.13.3

- 10) Cleco the four fittings together using the #30 holes just drilled.
- 11) On the left wing find the distance from the top skin to the attachment hole in the rear spar fittings (W-124). Figure 9.13.4.

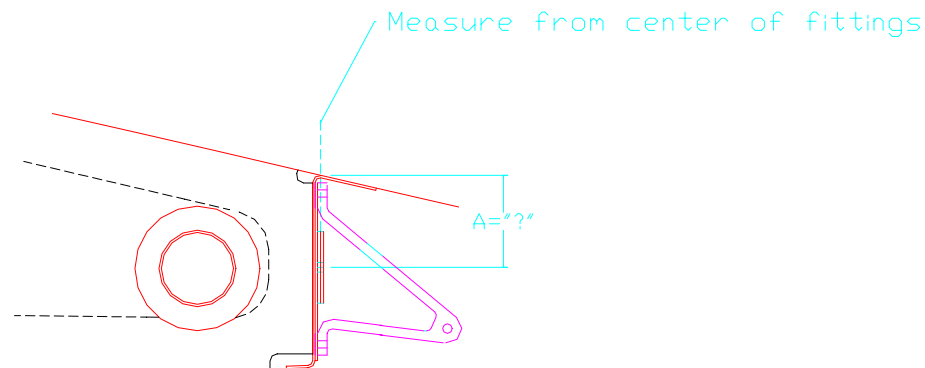


Figure 9.13.4

- 12) Draw a line down the center of the space between bulkheads 9 and 9A. Figure 9.13.5.

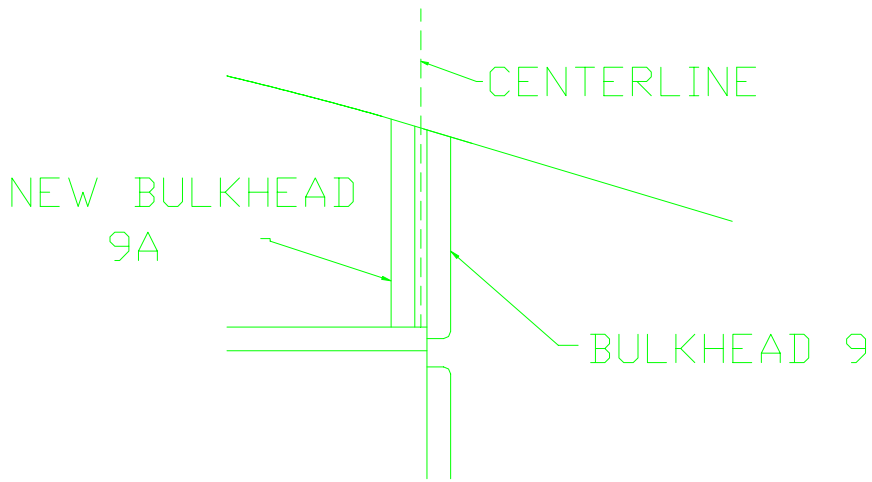


Figure 9.13.5

- 13) On the centerline and from the top of the fuselage mark the distance measured in figure 9.13.4. See Figure 9.13.6.
- 14) Mark and cut out a slot between the two bulkheads as in Figure 9.13.6.

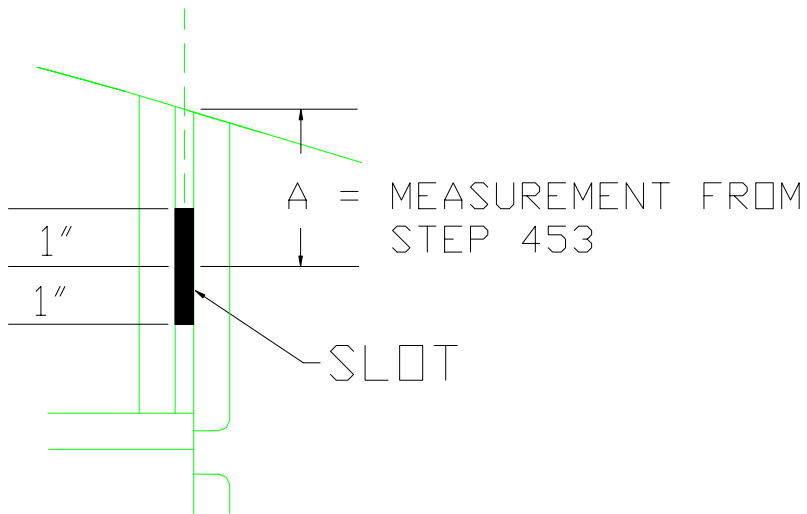


Figure 9.13.6

- 15) Remove bulkhead 9A.
- 16) Insert the four rear attach brackets (FUS-69) into the slot. Figure 9.13.7.

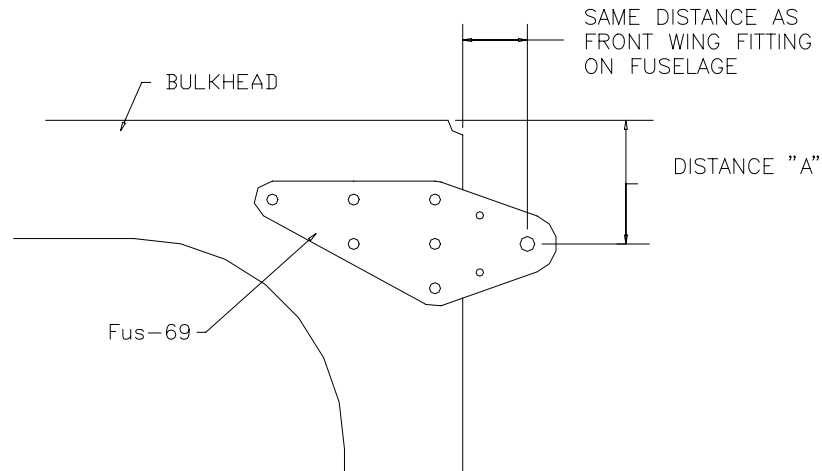


Figure 9.13.7

- 17) Ensure the wing attach hole in the rear attach brackets (FUS-69) is in the correct location as in Figure 9.13.7. Drill the five attach holes back through the fitting and into bulkhead 9 with a #30 drill.
- 18) Repeat steps for the right side.
- 19) Replace bulkhead 9A.
- 20) Back drill to #30 through bulkhead 9 and the rear attach brackets into bulkhead 9A. Cleco as you go.
NOTE: Do not drill out the two new #30 holes you put in the FUS-69.
- 21) Drill the #30 holes out to #11.
- 22) Remove and deburr all holes and edges.
- 23) Install the reinforcing angles (FUS-35).
- 24) Chromate mating surfaces.
- 25) Rivet bulkhead 9A in place with 1/8" avex rivets (RV-1410).
- 26) Bolt rear attach brackets in place with AN3-6A bolts.
- 27) Measure the distance from the edge of one flange to the edge of the other. Figure 9.13.8.

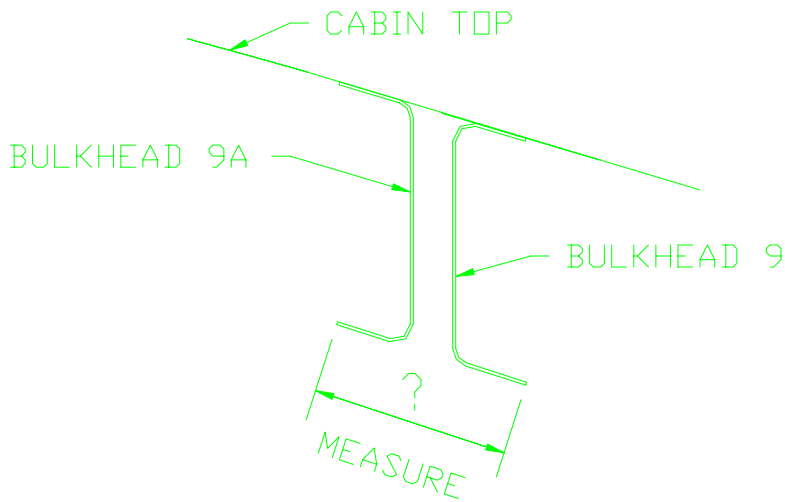


Figure 9.13.8

- 28) From raw stock (FUS-62) cut a strip the width measured in previous step and 48" long.
- 29) Center and clamp the strip to the two bulkheads.
- 30) Drill with the same spacing as the cabin top to #30.
NOTE: You will notice that as the strip approaches the rounded corners it will no longer fit the flanges. Do not drill in the corners.
- 31) Cut two short strips approximately 1" wider than the measured distance and long enough to go around the corner.
- 32) Position one short strip and drill at 1" spacing to #30.
NOTE: The short strip and the long strip should overlap so that four holes will be common in each.

Figure 9.13.9.

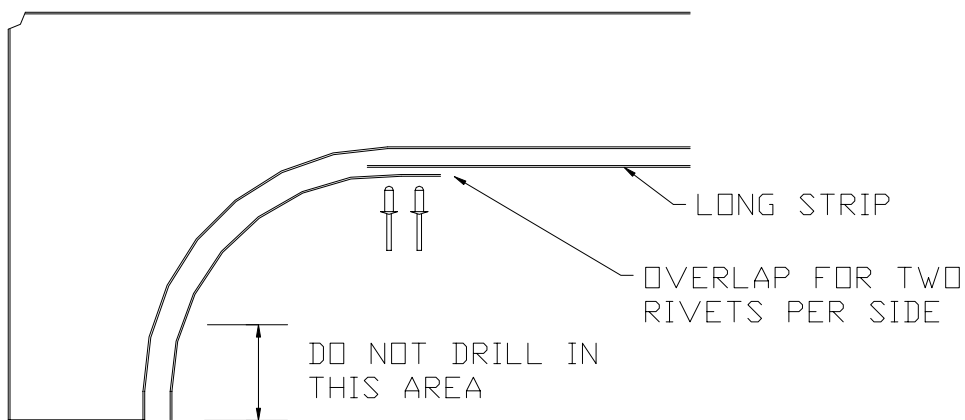


Figure 9.13.9

- 33) Mark and trim the excess width off the short strip.
- 34) Trim the excess length off the long strip.
- 35) Repeat for the other side.
- 36) Deburr all holes and edges. Chromate mating surfaces. Rivet with 1/8" avex rivets.

9.14 Outer Fuselage Gussets

- 1) From Stock material 0.032" (W-143) cut and form two outer fuselage gussets (FUS-51) as in Figure 9.14.1.

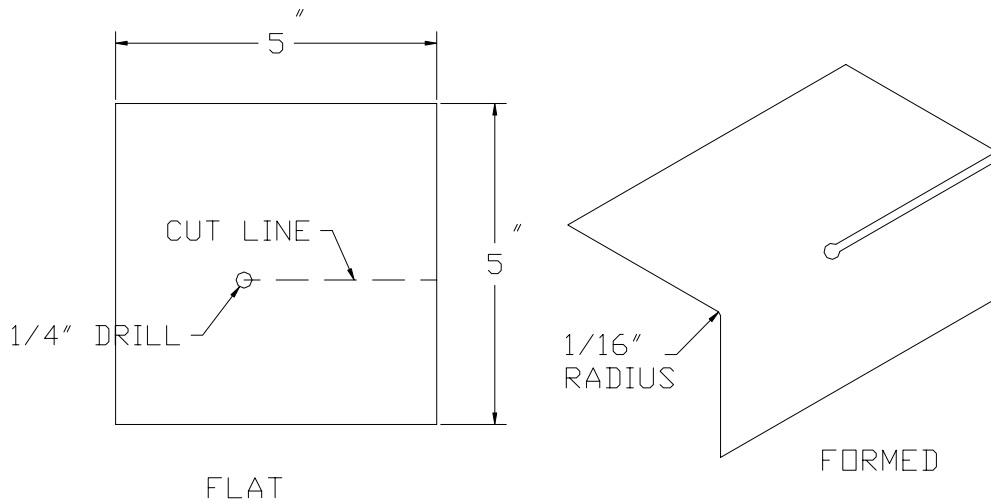


Figure 9.14.1

- 2) Position one gusset at bulkhead "A" position as in figure 9.14.2.

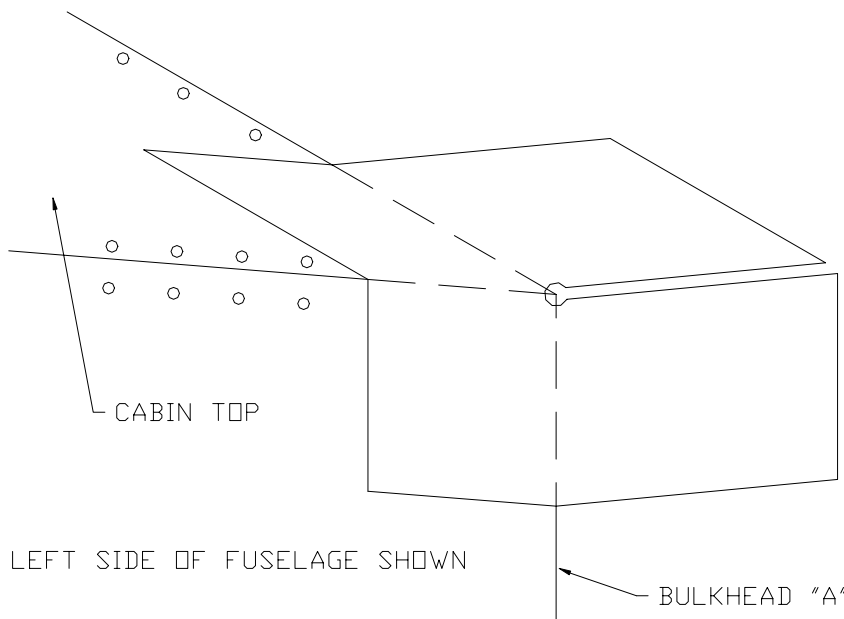


Figure 9.14.2

- 3) In the forward half of the gusset drill back through the fuselage skins into the gusset with a #30 drill bit. **NOTE:** You may inter-pitch the existing rivet holes to get the desired number of rivets on the part.
- 4) In the rear section of the gusset drill three holes in the top and three in the side. Figure 9.14.3.

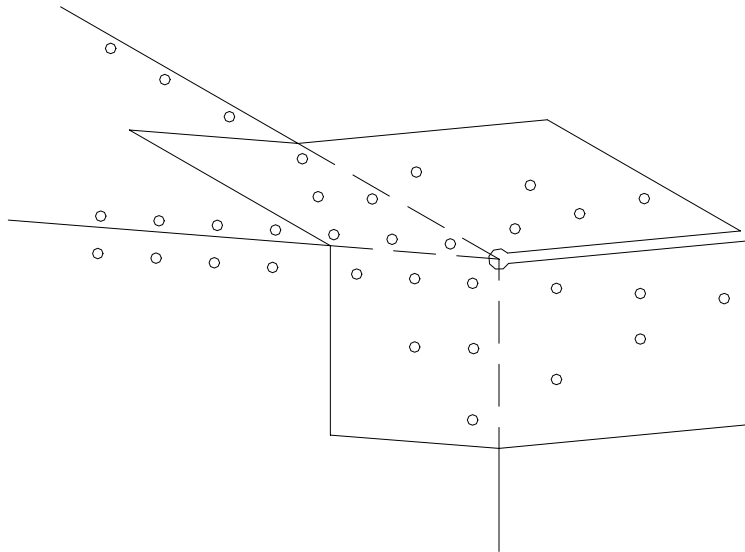


Figure 9.14.3

- 5) Draw a 5/8" circle around the rivet hole at each corner.
- 6) Join the circles and trim. Figure 9.14.4.

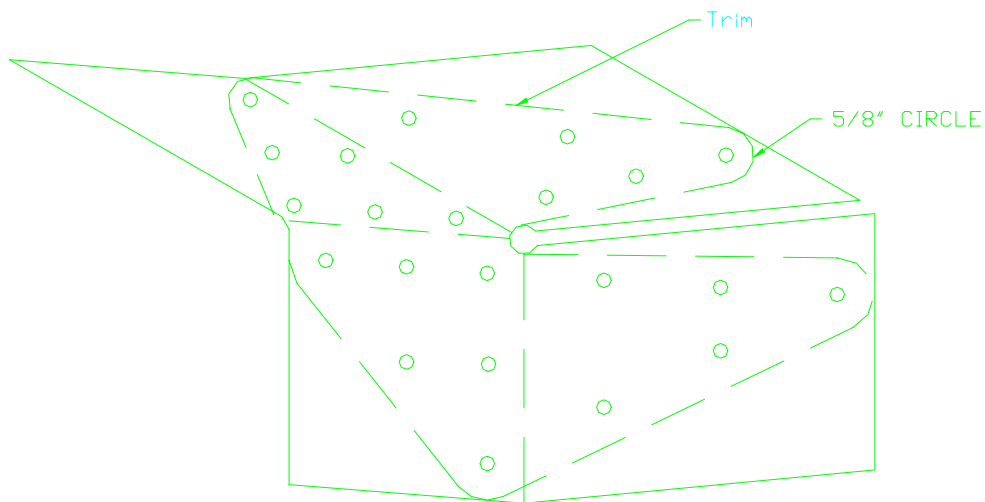


Figure 9.14.4

- 7) Deburr all holes and edges.
- 8) Chromate mating surfaces and rivet in place with 1/8" avex rivets (RV-1410).
- 9) Cut a channel from ST-31 to fit between bulkheads 9 and "A" as in Figure 9.14.5. Use angle brackets made from ST-40 material to install the channels.

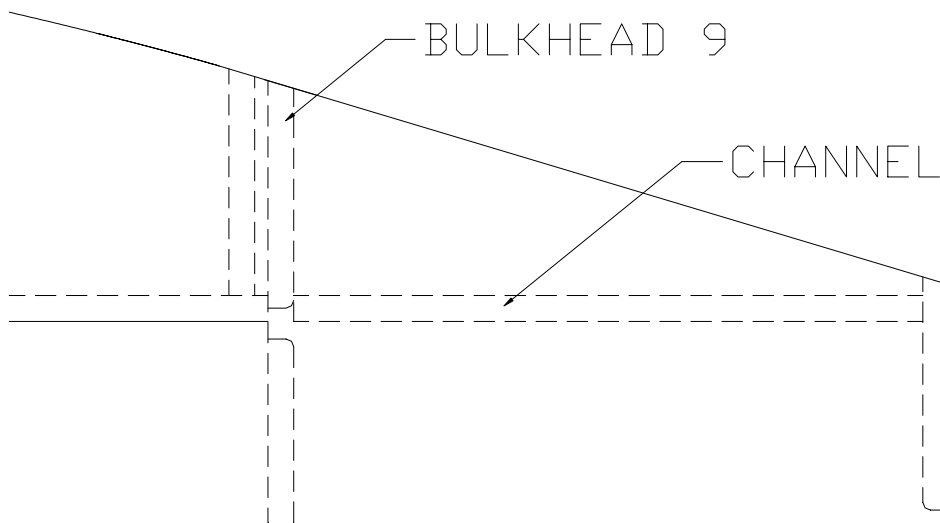


Figure 9.14.5

10) Next, mount the wing on the fuselage. You will now make and install the two fairing spacer boxes.

NOTE: If you have not completed the Wing yet you can still make the boxes. Just set them aside.

9.15 Wing Fairing Boxes

1) Mark and cut two strips of .020 material (from FUS-62) as in Figure 9.15.1. The width should be measured as the distance from the outside of the fuselage to the wing plus $\frac{3}{4}$ " for overlap on the roof.

NOTE: Remember to make opposite side fairing boxes, one for the left side of the fuselage and one for the right. All illustrations are for the left side.

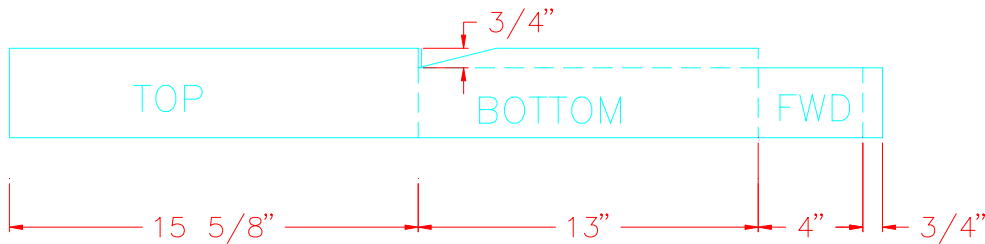
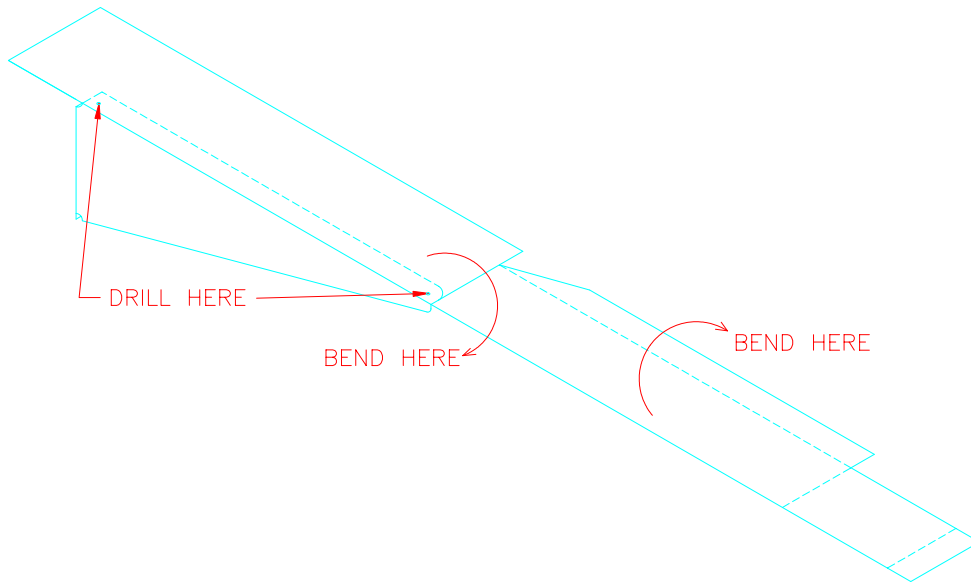


Figure 9.15.1

- 2) Mark the bending lines as shown on the drawing and mark and cut out the $\frac{3}{4}$ " bend relief of the bottom flange. Deburr all edges.
- 3) Using the first bend line as a guide, align the outboard edge of the fairing strip flush with the edge of an aileron rib (AIL-23) as in figure 9.15.2.



Figure

9.15.2

- 4) Drill a #40 hole through the .020 skin and the aileron rib at the top front corner. Cleco in place as in figure 9.15.2. Drill a hole at the top rear corner.
- 5) Make a 90° bend in the 3/4" bottom flange which has the relief cut out of it.
- 6) Bend the fairing strip at the first bend line to match the shape of the aileron rib.
- 7) Cleco the aileron rib in place using the top flange holes. Drill similar #40 holes through the strip into the ends of the bottom flange of the aileron rib. Cleco at the new holes. Figure 9.15.3.

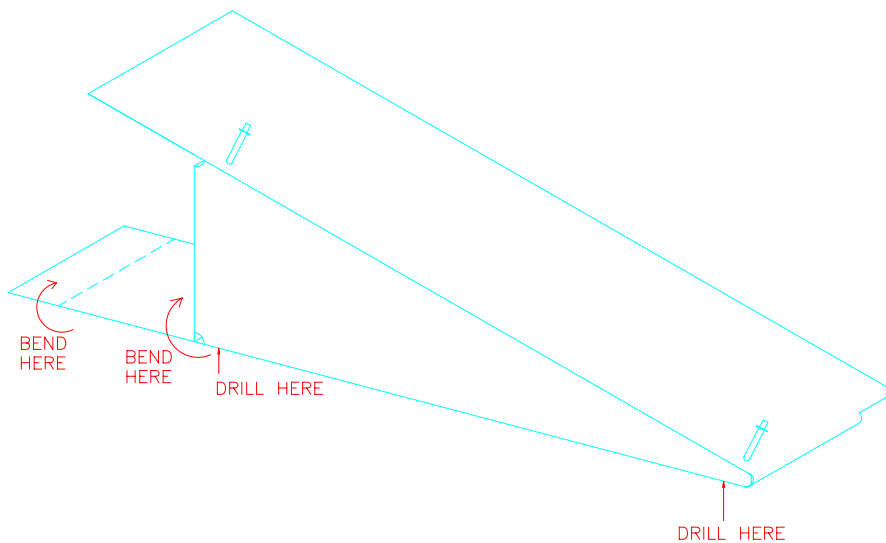
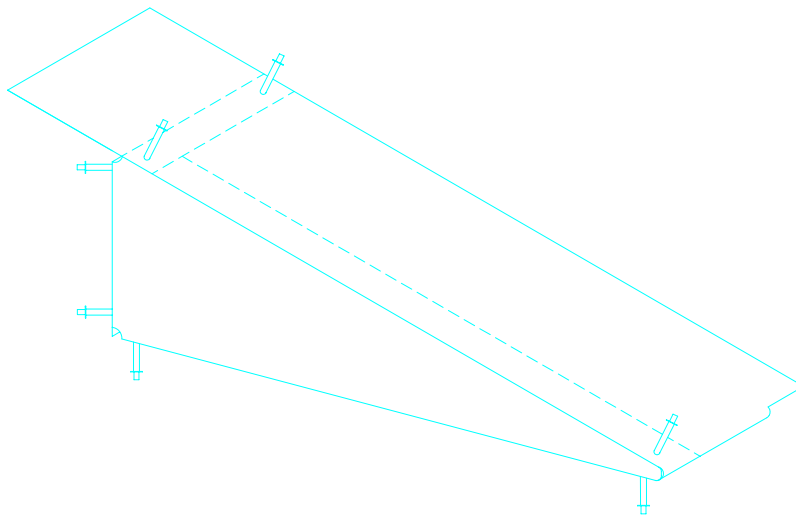


Figure 9.15.3

- 8) Make a 90° bend in the strip at the end of the forward portion, then bend up the forward portion of the strip to match the front of the aileron rib. **NOTE:** One cleco will have to be removed for the top

so the flange can now fit, sandwiched, between the top side of the strip and the aileron rib as in figure 9.15.4.



Figure

9.15.4

- 9) Drill a #40 hole through the top of the fairing into the flange which is now sandwiched and clecoed together.
- 10) Drill #30 holes at 1-1/2" nominal spacing between the clecoed holes.
- 11) Place the fairing box against the fuselage with the flange overlapping onto the roof skin and align the trailing edge with the trailing edge of the flap. **NOTE:** Be sure that the Flaps are in retracted position. The wing may be removed after this step if preferred. Figure 9.15.5.

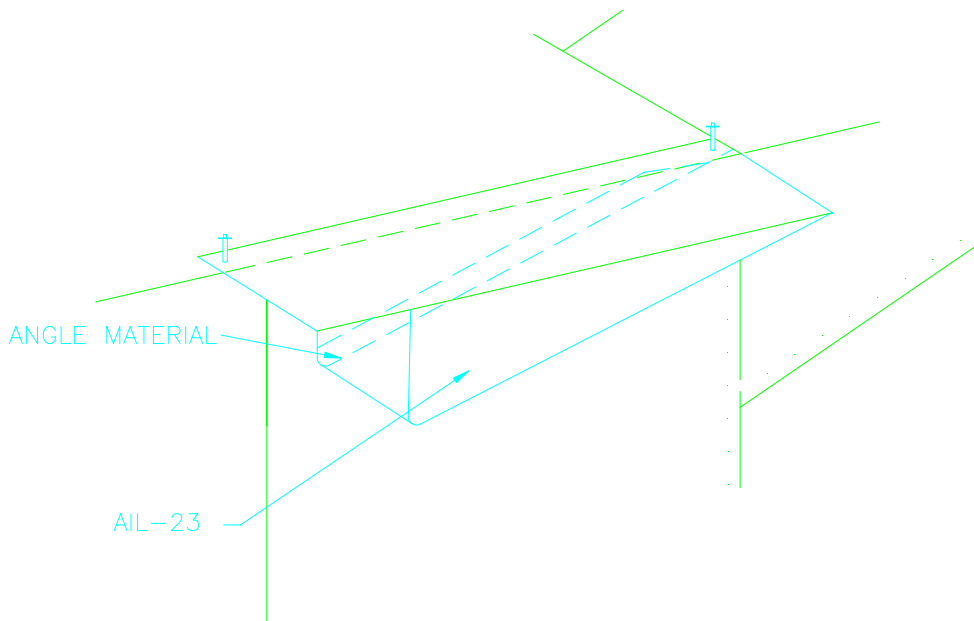


Figure 9.15.5

- 12) Drill #30 holes through the ends of the overlapping flange into the roof skins and the flange of the FUS-27 fuselage rib and cleco.
- 13) Drill #30 holes at 1 ½” nominal spacing between the end holes.
- 14) Using a felt pen, mark a line along the bottom of the box onto the side of the fuselage. Also mark lines at the ends of the bottom flange along this line.
- 15) Remove the fairing box from the side of the fuselage.
- 16) Mark a line 3/8” above the line marked earlier. Drill #30 holes 5/16” from each end of the line as marked earlier.
- 17) Drill #30 holes at 1 ½” nominal spacing between the end holes.
- 18) Cleco the fairing box back onto the side of the fuselage using the top holes. From inside the cabin, back drill through the holes into the bottom flange of the fairing box.
- 19) Remove the box and disassemble it. Deburr all holes and edges including those on the fuselage.
- 20) Reassemble the box and attach it to the fuselage using 1/8” avex rivets (RV-1410).
- 21) Repeat for the other side.

9.16 Optional Float Hard Point

- 1) Locate bulkhead “A”, (the second bulkhead back from the rear of the door), and mark a line from the center of the radius onto the outside skin. Mark a box 1” x 5/16” as shown in figure 9.16.1.

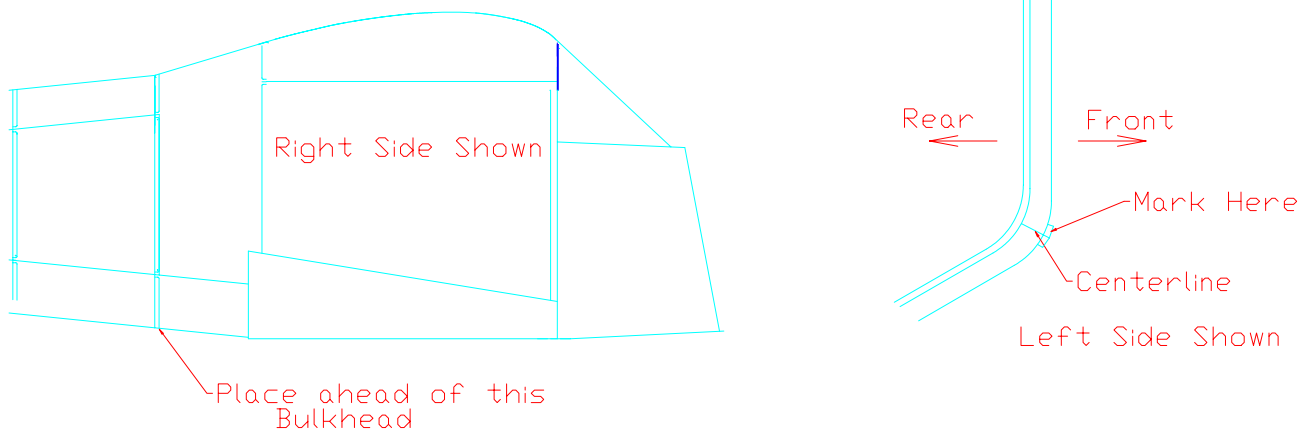


Figure 9.16.1

- 2) Drill a 5/16” hole through the outer skin directly in front of the bulkhead, in the marked area.
- 3) Using aviation snips, cut out the marked area for the bracket lug.
- 4) File all sharp edges on the hole.
- 5) Cleco a bulkhead doubler (FUS-448) to the 3/16” tooling holes on the outside of the “A” bulkhead. Transfer the center line you drew on the Bulkhead onto the Doubler.
- 6) Put a Float Hard Point (FUS-42-1) bracket into place with the lug sticking out through the hole you just cut. Center the part so the line you drew on the bulkhead Doubler is visible through the holes on the FUS-42-1 bracket.
- 7) Carefully back drill through the bracket (FUS-42-1) into the bulkhead and doubler using a #30 drill bit. Cleco as you go. Drill all of the holes out to #11 as per figure 9.16.2. Cleco as you go. Remove the doubler and bracket.

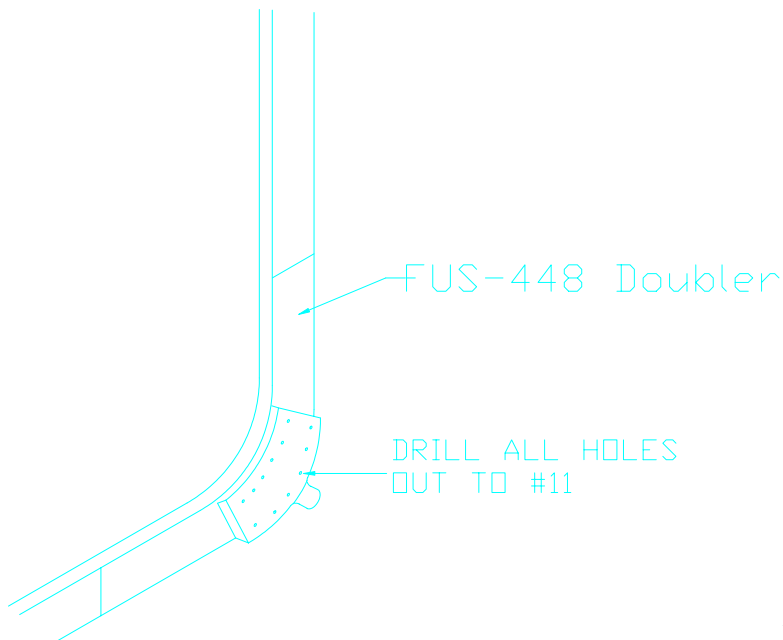


Figure 9.16.2

- 8) Layout and drill a series of rivet holes with a 1” spacing through the FUS-448 doubler. Drill #30 and debur. See figure 9.16.3 for details.

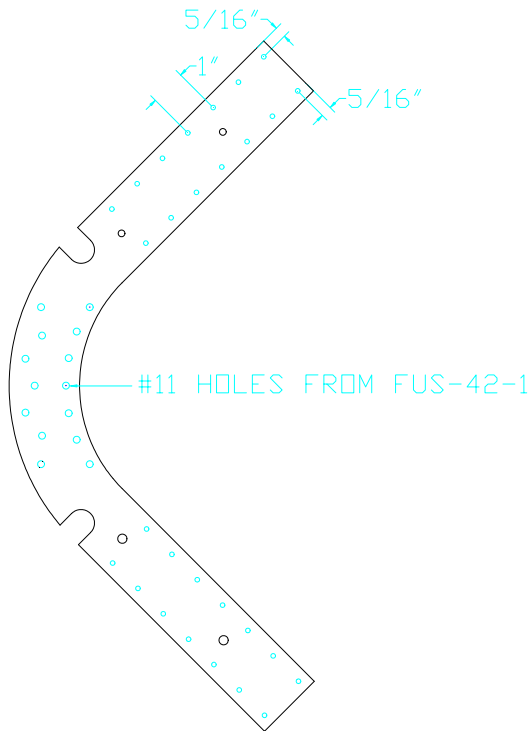


Figure 9.16.3

- 9) Repeat for the left side of the Fuselage.
- 10) Clamp two additional bulkheads and doublers in place back to back with the original bulkheads.

Figure 9.16.4.

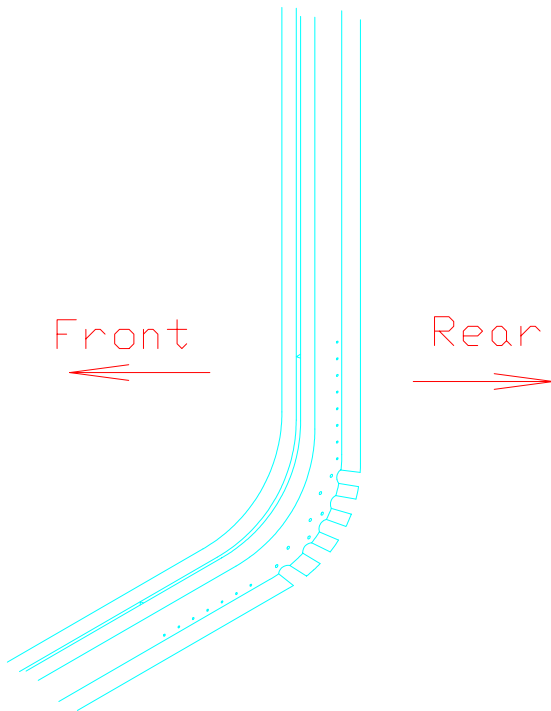


Figure 9.16.4

- 11) The bulkheads should be nested, marked, trimmed and attached to each other, same as the other bulkheads. **NOTE:** These new bulkheads are not connected to the original bulkheads.

- 12) Clamp the new bulkheads and doublers in place and drill back through the #11 bracket holes and the #30 doubler holes into the new bulkheads. Cleco as you go.
- 13) Remove the doublers and brackets and debur all the holes.
- 14) Put the brackets back in place and cleco together with the bulkheads and doublers on each side. As in figure 9.16.5. Also place a 1/4" spacer on the floor between the bulkheads.

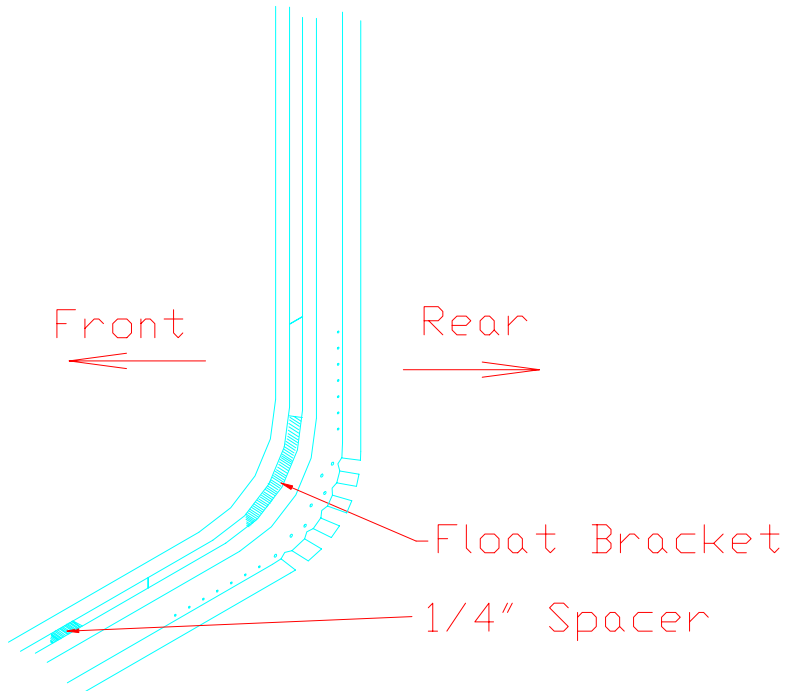


Figure 9.16.5

- 15) Drill the remaining holes in the bracket to #11, the doubler holes stay at #30.
- 16) Attach the brackets and doublers using 3/16" avex rivets (RV-1619) and RV-1410 1/8" avex rivets.
- 17) At the top of the bulkheads, drill through the nine attachment holes from the forward bulkhead to the aft bulkhead. Bulkheads are back to back at the top as in Figure 9.16.6.

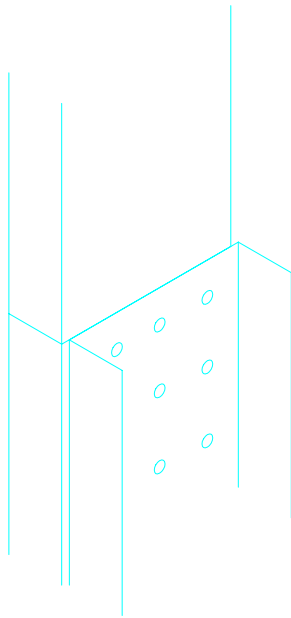


Figure 9.16.6

- 18) Attach bulkheads at this point using 1/8" avex rivets (RV-1410).
- 19) On the outside of the floor skin, mark a line along the center of the new bulkhead flange. Drill, debur and rivet the bulkhead through the floor at the same spacing as the other bulkheads. Use RV-1410.
- 20) Repeat step for the side skins.
- 21) Remove the 1/4" spacers.
- 22) Rivet the bulkhead to the outer corner wrap (FUS-10) using RV-1410 rivets.
- 23) Cut a strip of .032 gusset material wide enough to cover the gap between the bulkheads forming a sealed beam. The strip should cover from the top end of the new bulkhead to about 4" into the floor.

Figure 9.16.7.

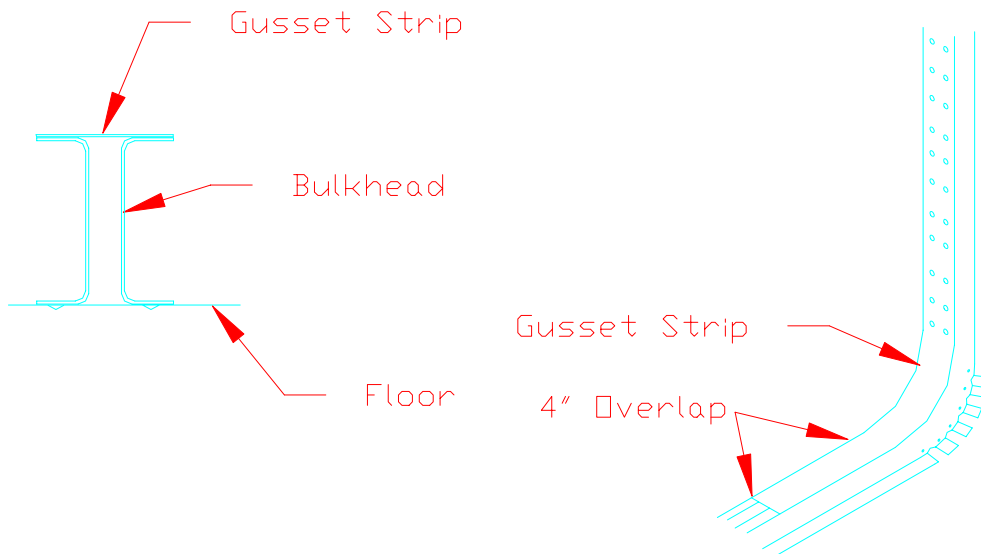


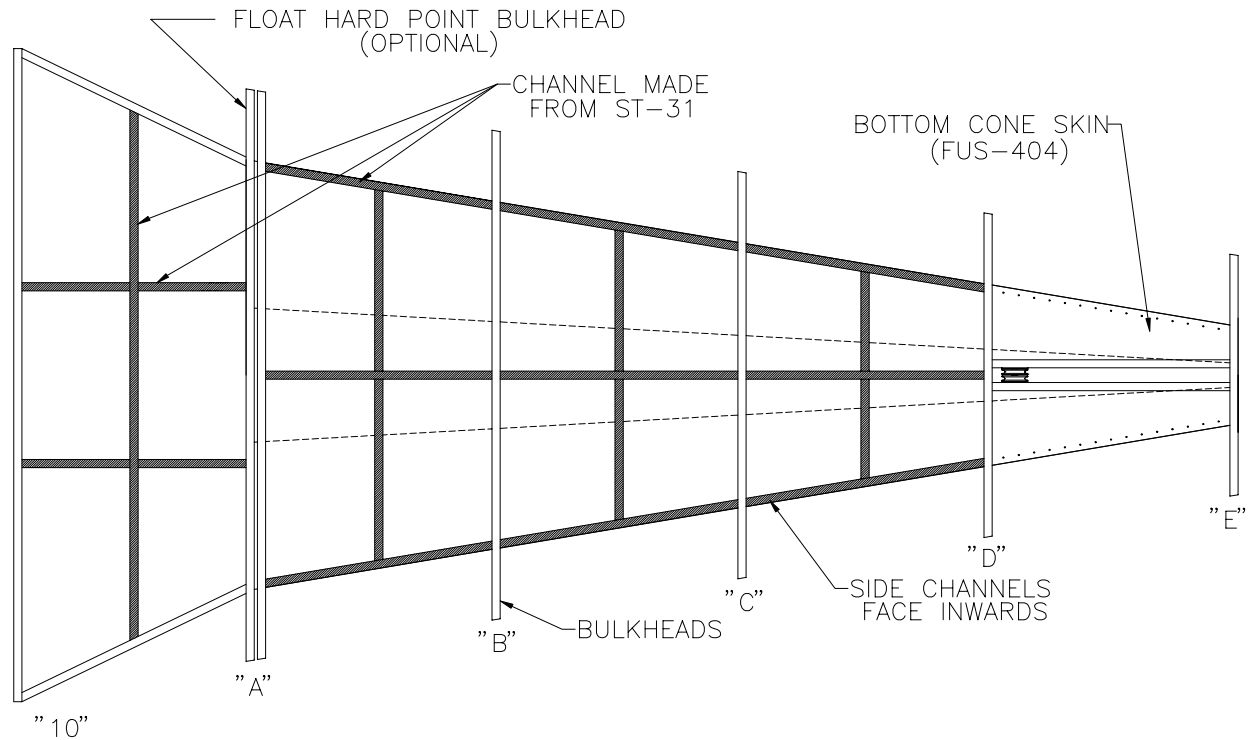
Figure 9.16.7

24) Drill and rivet into the flanges of the bulkheads along the vertical and around the radius at the bottom.

Rivet with the same spacing as on the outside flanges of the bulkheads.

NOTE: The 4" overlap should not be drilled or riveted until the inner floor is installed.

9.17 Inner Floor Channel Installation



The inner floor will add approximately 6 ½ - 7 lbs to the *ELITE* in its bare state.

Figure 9.17.1.

1) Cut channels from stock material (ST-31) for each of the locations shown in figure 9.17.1.

NOTE: There should be approximately 1/16" clearance at both ends of each channel. The bulkheads are at an angle to the bottom skin of approximately 6° and it is necessary to cut the ends of the channels at this angle. Use angle brackets to attach all the channel to each bulkhead, including the two holding the pulleys. Figure 9.17.2. The channels at the sides should face inwards and butt up to the flanges of FUS-404. Figure 9.17.3.

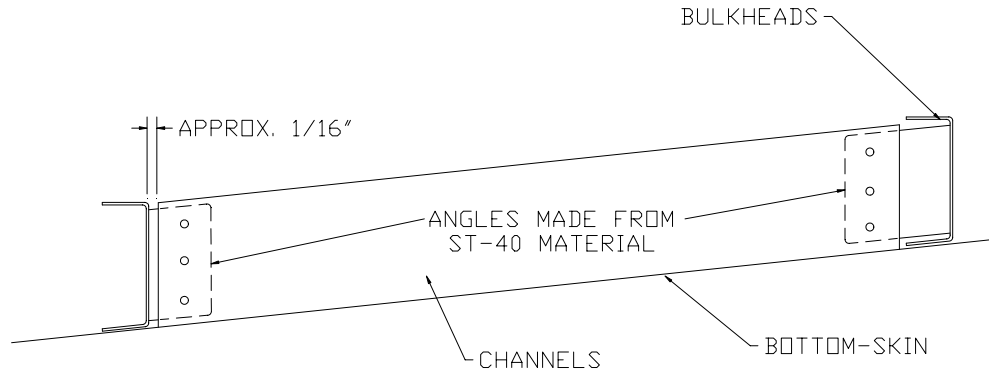


Figure 9.17.2

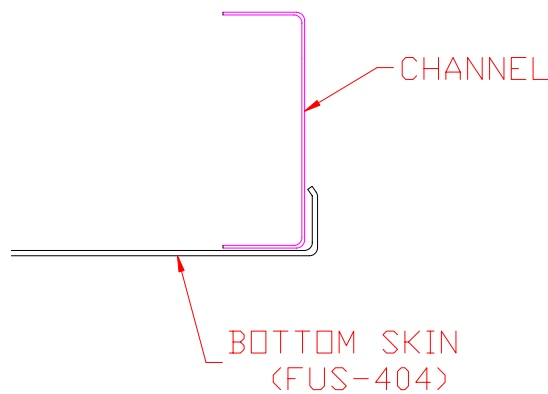


Figure 9.17.3

- 2) Cut channels from stock material (ST-31) for the side skins. The angle between the bulkheads and side skins is approximately 10°. **NOTE:** The channels on the side skins should have the flanges facing downward. Figure 9.17.4.

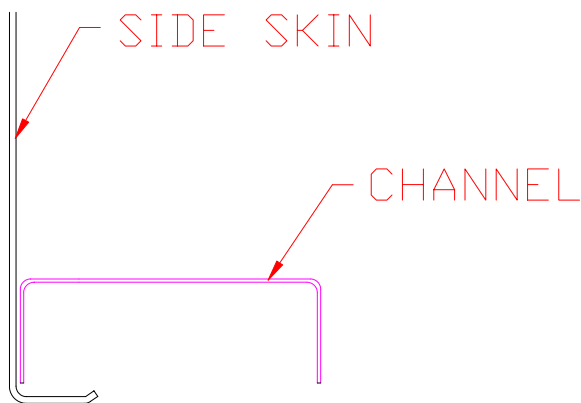


Figure 9.17.4

- 3) Mark the centerlines on the bottom Cone Skin for the longitudinal center channels and the cross channels. Figure 9.17.5.

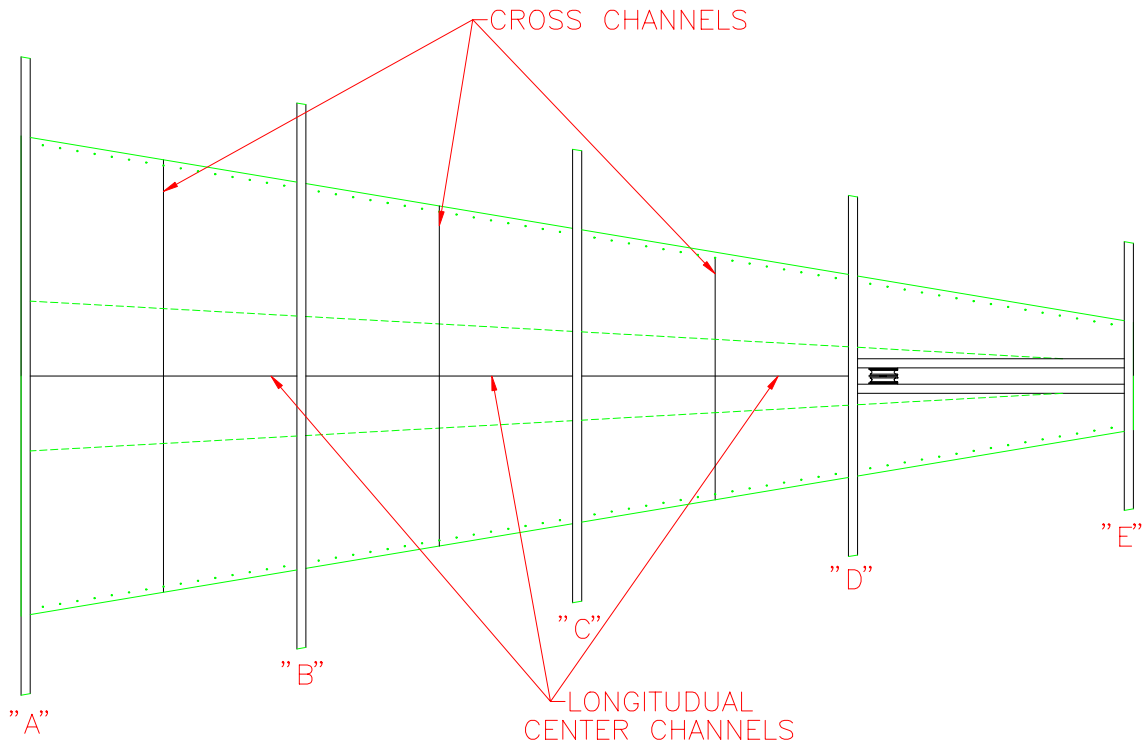


Figure 9.17.5

- 4) Drill #40 holes on the centerlines at approximately 1 ¼" spacing. **NOTE:** The end holes for each channel should have 5/16" minimum edge distance.
- 5) Position any channel and drill one hole at each end. Cleco.
- 6) Repeat for each channel. Finish drilling all the holes in the channels.
NOTE: On the center longitudinal channels and cross channels you can drill directly with a #30 drill bit. On the side channels, drill with a #40 drill bit. These will be drilled out to final size with the rolled corners.
- 7) Disassemble and debur. **NOTE:** Ensure the edges of all channels are free of burrs.
- 8) Chromate only the center and cross channels mating surfaces. Rivet in place with 1/8" (RV-1410) avex rivets.
- 9) Turn the fuselage upright and drill out the channels for the sides to #40. **NOTE:** The side channels need to be back slightly from the inside radius of the side skin. Figure 9.17.4.
- 10) Replace and cleco the rolled corners in place with the channels and drill out all the holes to #30.
- 11) Disassemble and debur.
- 12) Chromate the mating surfaces and rivet together the rolled corners and channels with 1/8" avex rivets (RV-1410). **DO NOT** rivet the ends at bulkhead "A" and "E".

Helpful Hint: When installing the inside Corner Wraps, it has been found that a piece of clear Lexan or similar material, cut to match the Corner Wraps, allows the builder to see the bulkheads and make accurate drilling patterns. This then can be transferred to the actual parts.

- 13) Mark center lines along the top of the channels and bulkheads.
- 14) Position the Rear Inner Cone Skin (FUS-412) so that the center line can be seen through the holes.

Figure 9.17.6.

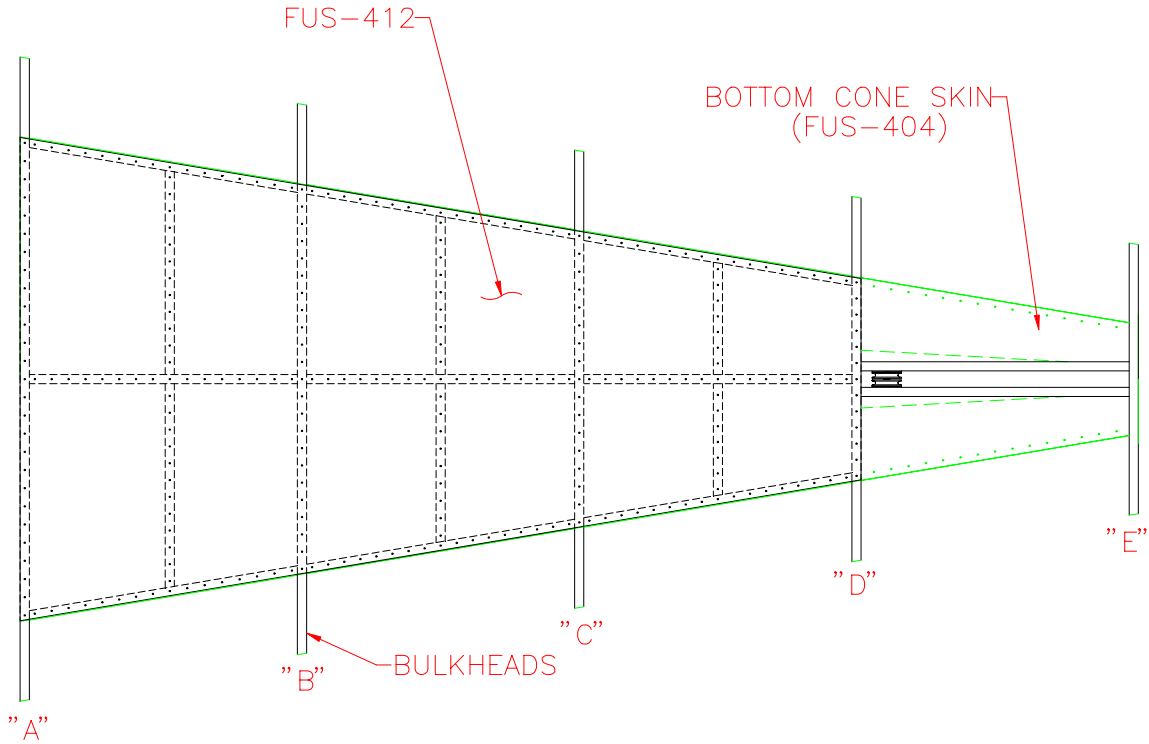
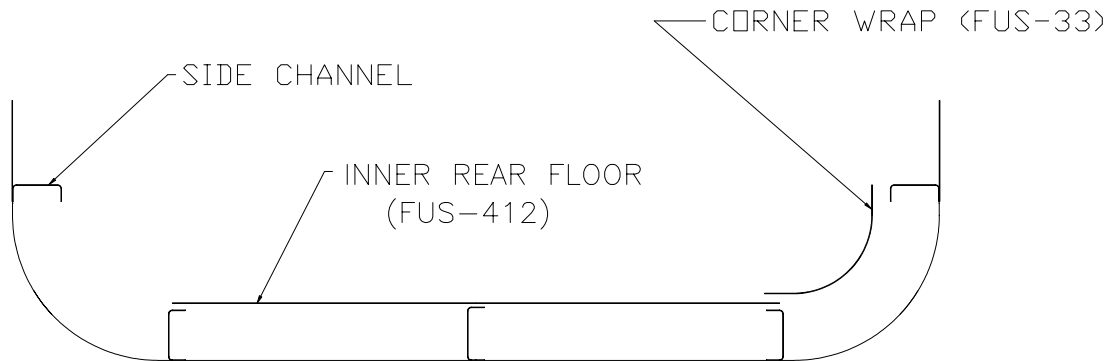


Figure 9.17.6

Fig

- 15) Starting at center channel behind bulkhead “A”, drill #40 holes using FUS-412 as a guide into the bulkheads and channels. Cleco often.
- 16) Position a Corner Wrap (FUS-33) between bulkhead “C” and “D”. Figure 9.17.7. **NOTE:** The corner wrap will be on top of the floor (FUS-412) upon final assembly.



Figure

9.17.7

- 17) Ensure the corner wrap is tight against the bulkhead. Drill #40 holes with a nominal spacing of $1 \frac{1}{4}$ " into the side channels and bulkhead. Use plenty of clecos.
- 18) Drill into the bulkhead but leave the front bulkhead of each wrap undrilled until the next corner wrap is in place. Continue adding corner wraps until bulkhead “A” is reached.
- 19) Trim the ends and side of the corner wraps so the edge distance to the center of the rivet hole is $\frac{5}{16}$ ".
- 20) Remove the parts and debur.
- 21) Replace with clecos.

9.18 Cabin Forward to Firewall

- 1) Mark the FUS-04 Uprights $20 \frac{3}{4}$ " down from the bottom surface of the FUS-03 Carrythrough. This is where the bottom of your instrument panel will be. Figure 9.18.1.

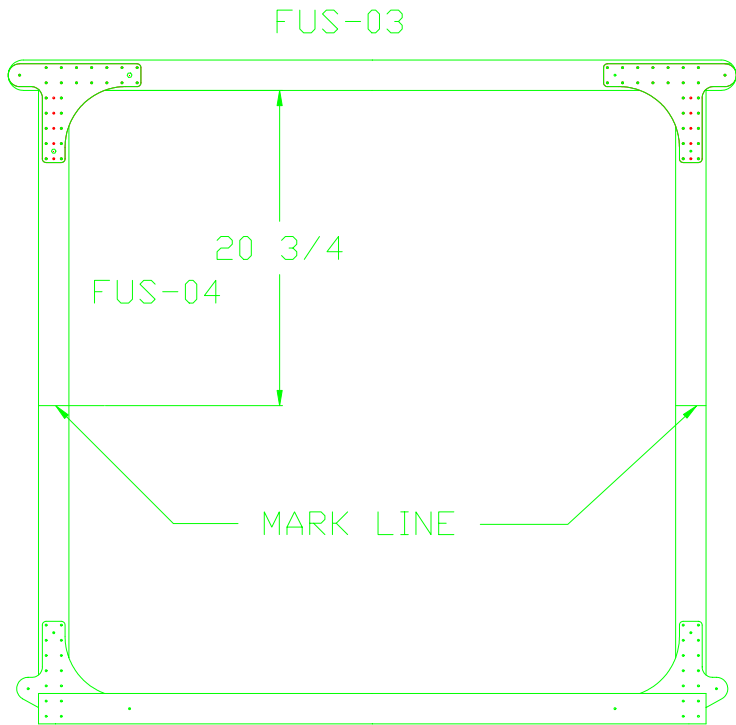


Figure 9.18.1

- 2) Clamp the FUS-427 Instrument Panel between the Uprights so the bottom flange on the panel is even with the lines made. Figure 9.18.2.

NOTE: The panel is clamped to the inside surfaces of the FUS-04

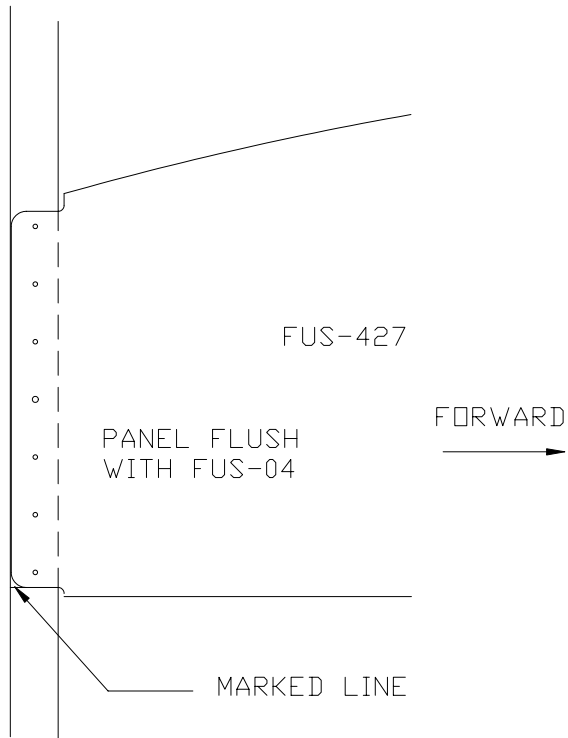


Figure 9.18.2

- 3) Drill the Uprights using the Instrument Panel as a drilling guide. Drill #40, cleco as you go.

- 4) Prepare the FUS-425L and FUS-425R Side Panels by first fabricating two doublers. Use raw stock FUS-456. Place it behind the Side Panels and drill all the #40 holes in the area of the doubler as in Figure 9.18.3.

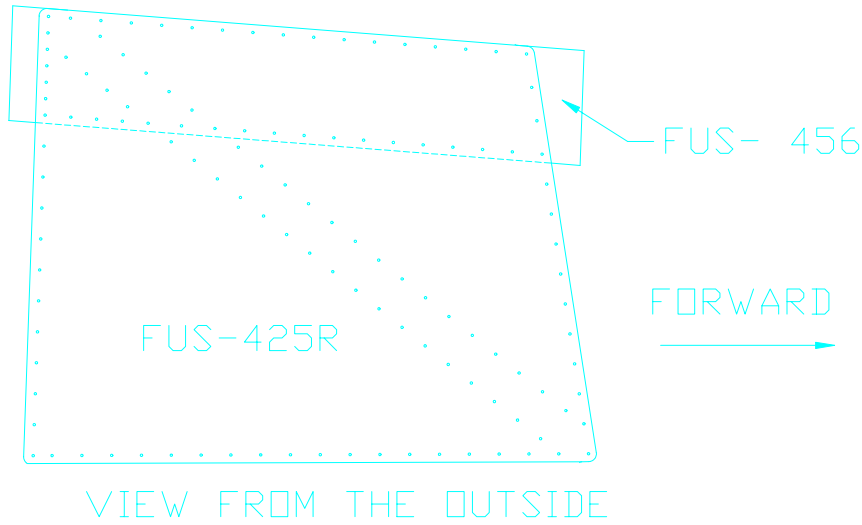


Figure 9.18.3

- 5) Remove the doubler, trim and reinstall. **NOTE:** Both left and right sides have this doubler.
- 6) Cut two lengths of FUS-12 Witches Hat to fit the forward panels. Figure 9.18.4.

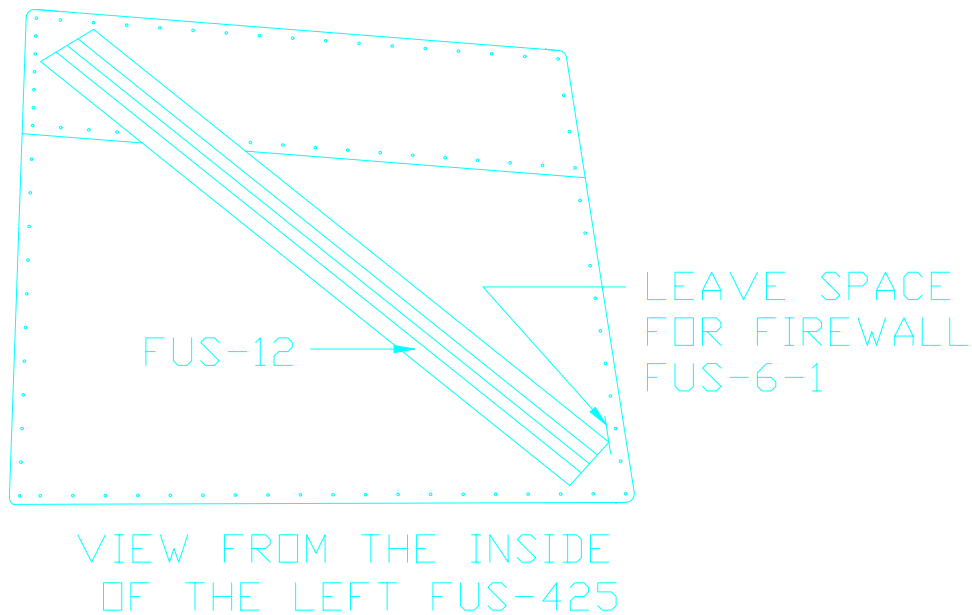


Figure 9.18.4

- 7) Draw two marks on a small scrap of aluminum. Make them 1-1/2" apart, center the scrap over the two flanges of the Witches Hat and mark for rivet lines. Figure 9.18.5.

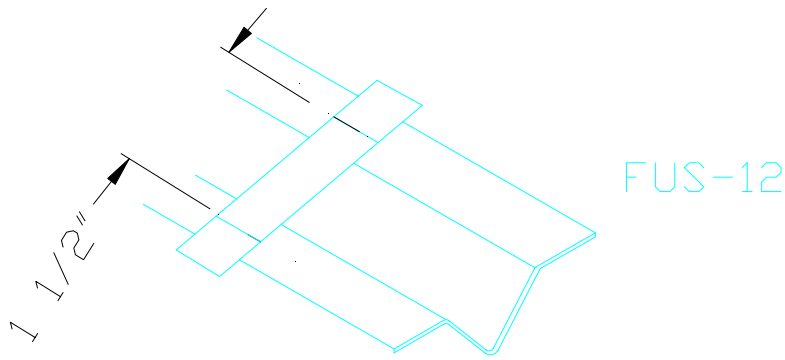
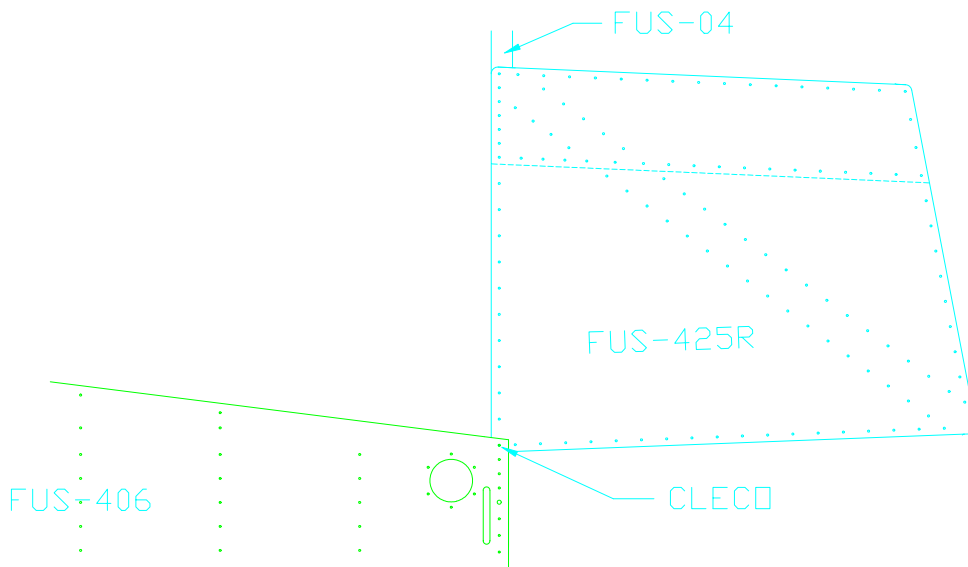


Figure 9.18.5

- 8) Draw lines the full length of the flanges.
- 9) Place the Witches Hat on the inside surface of the FUS-425 so that the flange center lines are visible through the pre-punched rivet holes.
- 10) Drill to #40. Cleco as you go.
- 11) Cleco the right FUS-425 into place. The aft bottom hole is keyed to the forward top hole of the FUS-406. Figure 9.18.6.



Figure

9.18.6

- 12) The center line on the FUS-04 Upright should be visible through the pre-punched rivet holes. Drill these holes #40 and cleco as you go. Leave this line unriveted until the door hinge is installed.
- 13) Install the left skin in the same manner as the right.

9.19 Firewall Install

- 1) Draw a center line on the FUS-6-1 Firewall. Draw two lines that intersect the center line, one line 6-1/8" down from the Firewall's top flange, the other 7-1/2" down. Figure 9.19.1. Firewall is tapered, make sure it is correctly orientated. It is wider at the top.

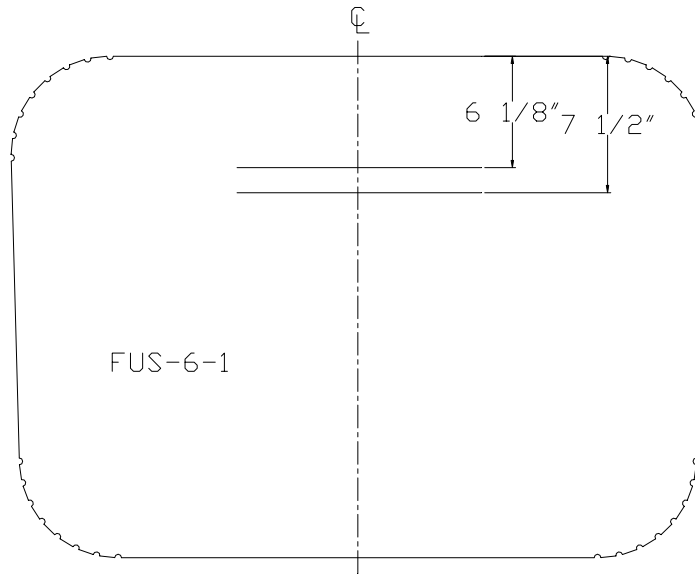


Figure 9.19.1

- 2) Mark these horizontal lines 5-1/2" long. There should be 2-3/4" on each side of the center line. Drill 7 evenly spaced #40 rivet holes along these lines. Keep the drill speed low. Figure 9.19.2.

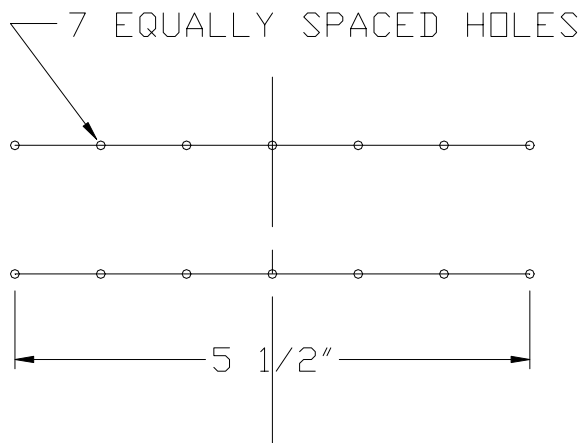
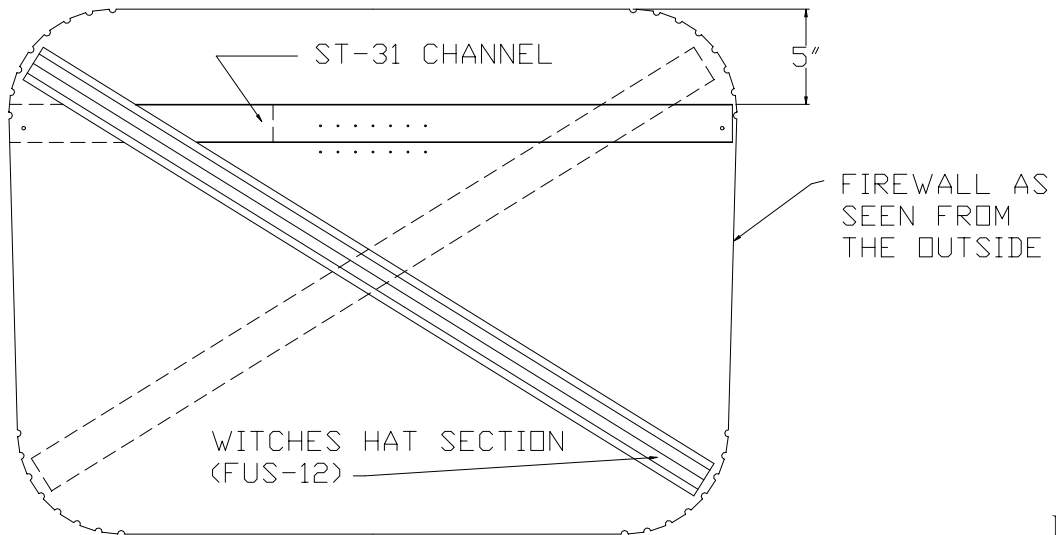


Figure 9.19.2

- 3) Cut two more lengths of FUS-12 Witches Hat to fit the Firewall. Figure 9.19.3. **NOTE:** It does not matter which piece goes on the front or back.
- 4) Cut a piece of ST-31 channel to tie the top engine mounts together. Put the large length on the front and the small piece on the back with a 6" overlap. Layout and drill a 1" nominal double rivet line. Figure 9.19.3.

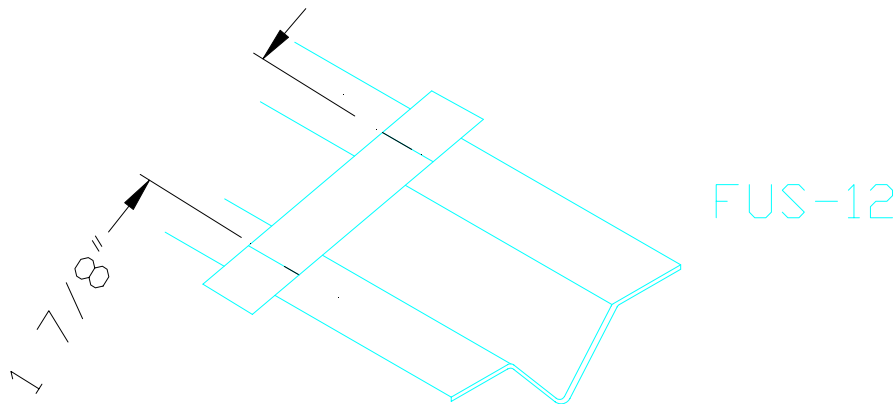


Figure

9.19.3

NOTE: For those of you that are installing the Tricycle Gear, place the two FUS-Vertical Firewall Uprights in their proper locations along the vertical two rows of holes. (Go ahead to the Tricycle Gear section of the manual to find their proper locations). With the FUS-449 located you can install the witches hat and ST-31 channel. Both witches hat can be located on the back side of the Firewall. The ST-31 channel can be placed on the front and tied into the FUS-449 uprights.

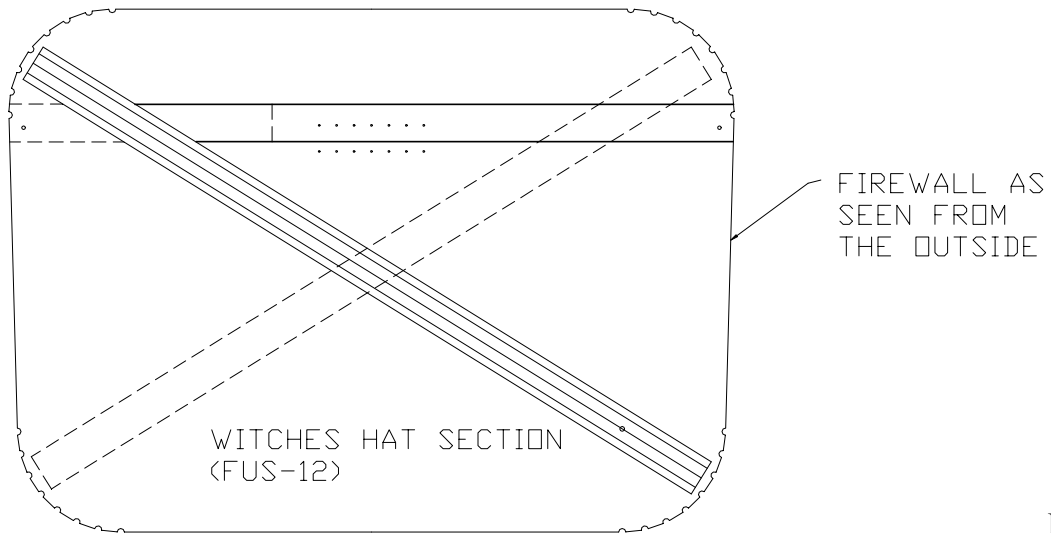
- 5) Draw two marks on a small scrap 1-7/8" apart. Center this over the flanges of the Witches Hat sections and mark them as in Figure 9.19.4.



Figure

9.19.4

- 6) Draw lines full length of the flanges
- 7) Place a Witches Hat on the front surface of the Firewall. **Note:** The flanges face forward on the Firewall. Drill through the punched holes from the backside. Make certain the flange lines are visible through the holes. Drill #40. Cleco.
- 8) Install the second Witches Hat on the back side. Figure 9.19.5.



Figure

9.19.5

- 9) Draw a center line on the outside surface of the four straight flanges of the Firewall and cleco it to the forward side skins. Figure 9.19.6. Note: all holes in the firewall flanges must be dimpled, and the final assemblies riveted to these flanges with RV-4412 flush rivets. This is to allow fitting of the cowling.

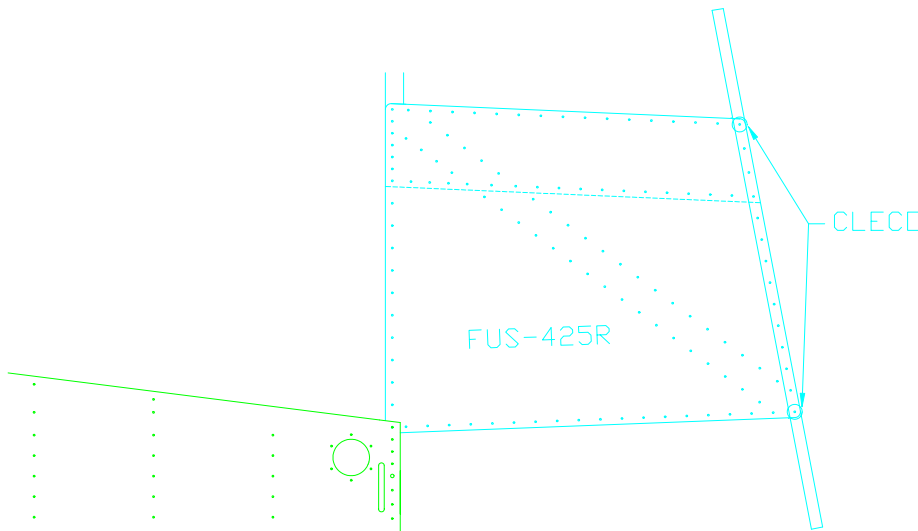


Figure 9.19.6

- 10) Drill the Firewall using the Side Skins as a drill guide. Drill #40 and cleco as you go.
- 11) Cleco the Top Panel FUS-433 and the Front Bottom Skin FUS-420 into place. You will probably have to make room between the fuselage and bench at this time.
- 12) Drill the Firewall and the Instrument Panel using the Top Skin FUS-433 as a guide. Drill #40, cleco as you go. **NOTE:** Make sure the Instrument Panel is sitting square in the cabin. Figure 9.19.7.

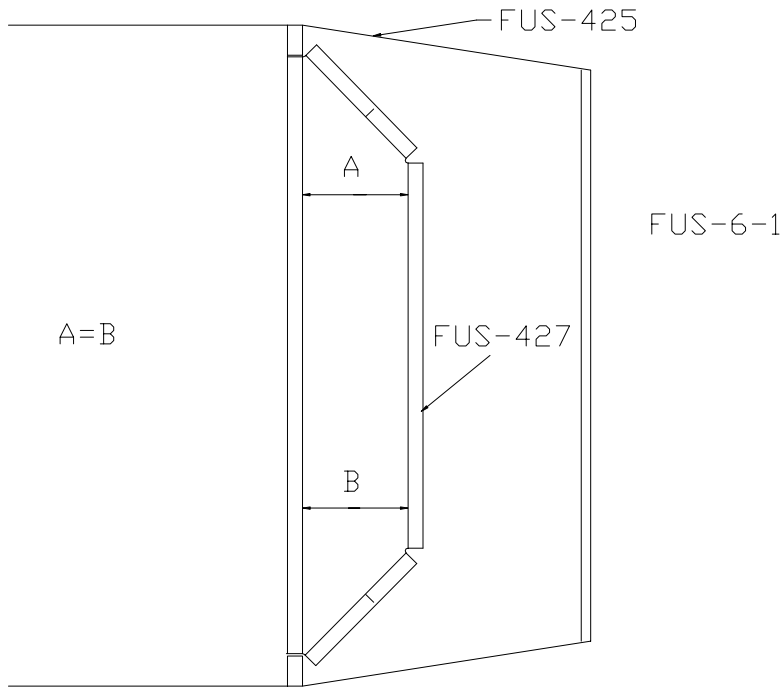


Figure 9.19.7

- 13) Cleco the Lower Floor Panel (FUS-420) into place.
- 14) Drill through the Firewall and Front Bottom Skin using the Lower Floor Panel FUS-420 as a guide.
Drill #40

9.20 Tapered Corner Wrap

- 1) Prepare a Tapered Corner Wrap for the right hand top corner of the nose by notching it to clear the FUS-04 Upright. Figure 9.20.1.

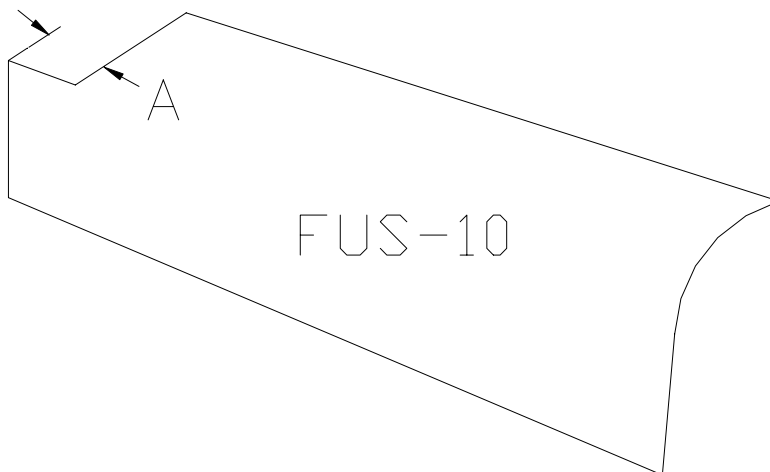


Figure 9.20.1

NOTE: The depth of the notch (A) depends on how you fit the wrap. Fit and trim, fit and trim.

- 2) Make certain there is lots of material covering the FUS-433 Top Panel and FUS-425 Side Panel.

3) Tape the FUS-10 into place. Figure 9.20.2.

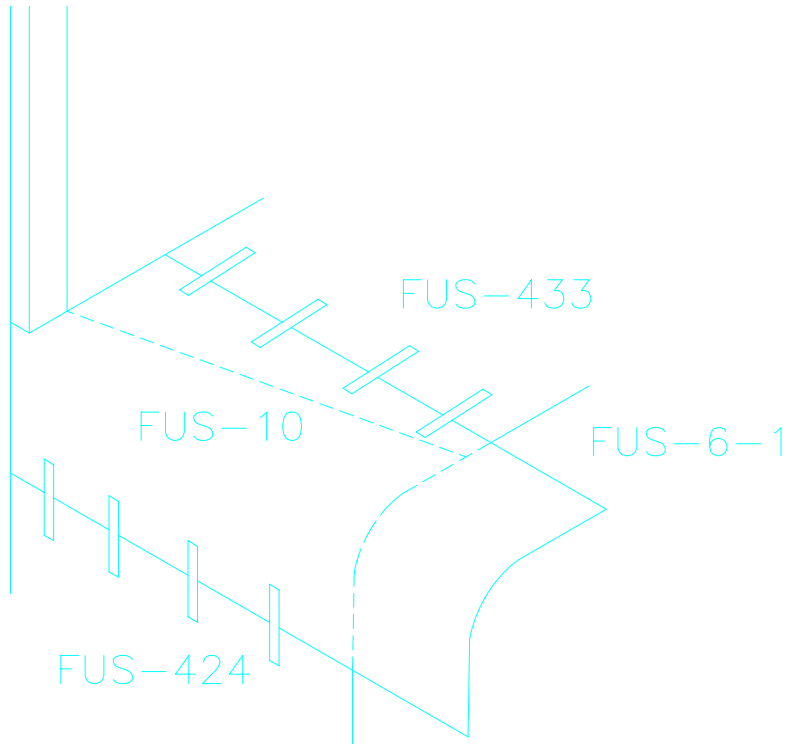


Figure 9.20.2

4) A helper is most handy for the drilling process. When drilling from the inside, have your helper press on the Corner Wrap from the outside with a block of wood (to protect their fingers). Drill #40 with a long drill bit. Figure 9.20.3.

NOTE: Make certain your helper keeps their hands and body clear of the drilling area.

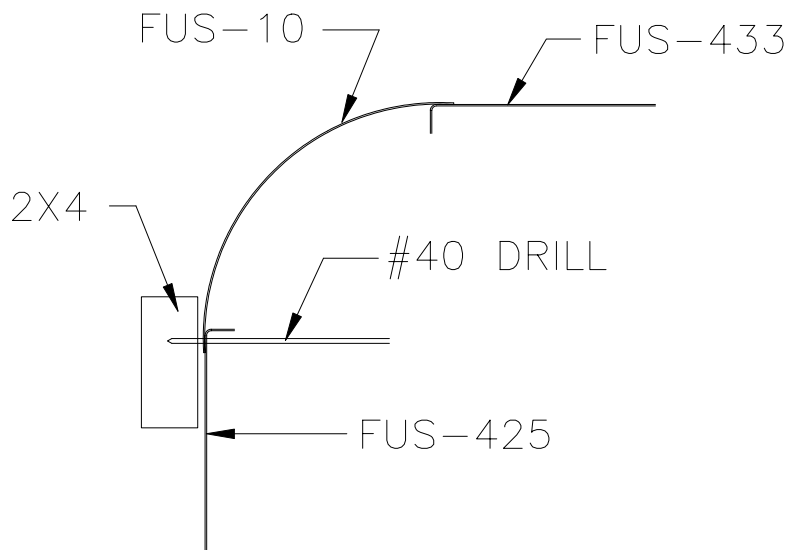


Figure 9.20.3

5) Drill through the FUS-433, the FUS-425 and the Firewall. Remove the FUS-10 and trim.

9.21 Door Post Brace

- 1) The FUS-9-1R should be marked and trimmed for installation. First notch the top to clear the FUS-03 Carry Through. Figure 9.21.1.

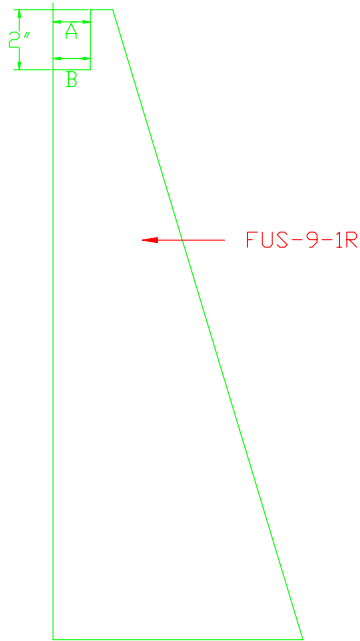


Figure 9.21.1

- 2) Trial fit the trimmed part. The crease in the part should line up with the crease in the Side Skin. Figure 9.21.2.