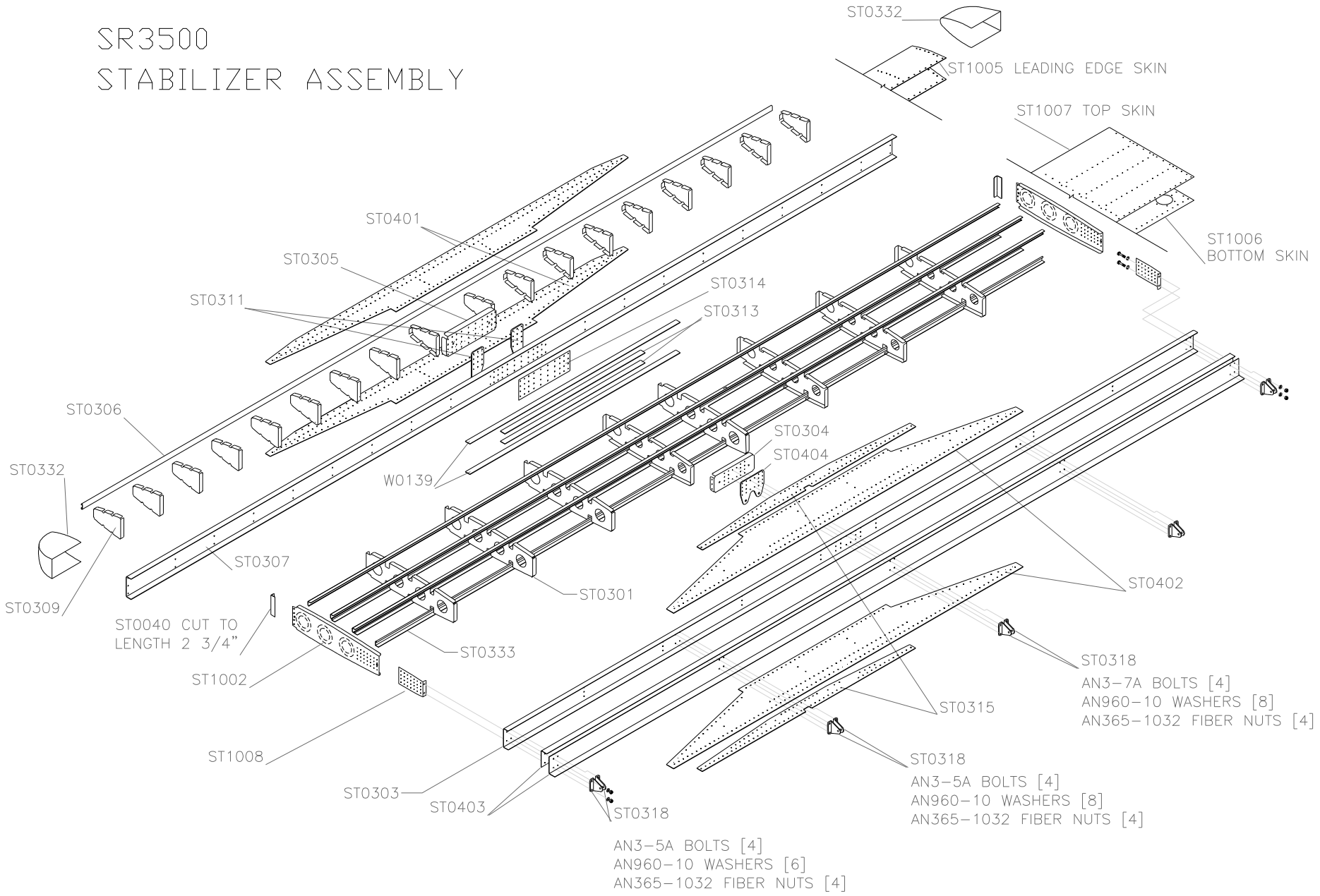
Stabilizer Assembly

Throughout this manual various styles of “bullets” will be used to convey information, as a general rule they will be used as follows:-

- Advisory information.
- Lists of facts to be adhered to, factual information or consequences.

1. Methods or processes to be followed.
    a. Sequence of steps within the Methods or processes to be followed.


SR3500
STABILIZER ASSEMBLY
ST0332
ST1005 LEADING EDGE SKIN
ST1007 TOP SKIN
ST1006
BOTTOM SKIN
ST0401
ST0305
ST0311
ST0314
ST0313
ST0306
ST0304
ST0404
W0139
ST0332
ST0307
ST0309
ST0301
ST0402
ST0040 CUT TO
LENGTH 2 3/4"
ST0333
ST1002
ST0318
AN3-7A BOLTS [4]
AN960-10 WASHERS [8]
AN365-1032 FIBER NUTS [4]
ST0315
ST1008
ST0318
AN3-5A BOLTS [4]
AN960-10 WASHERS [8]
AN365-1032 FIBER NUTS [4]
ST0303
ST0403
ST0318
AN3-5A BOLTS [4]
AN960-10 WASHERS [6]
AN365-1032 FIBER NUTS [4]

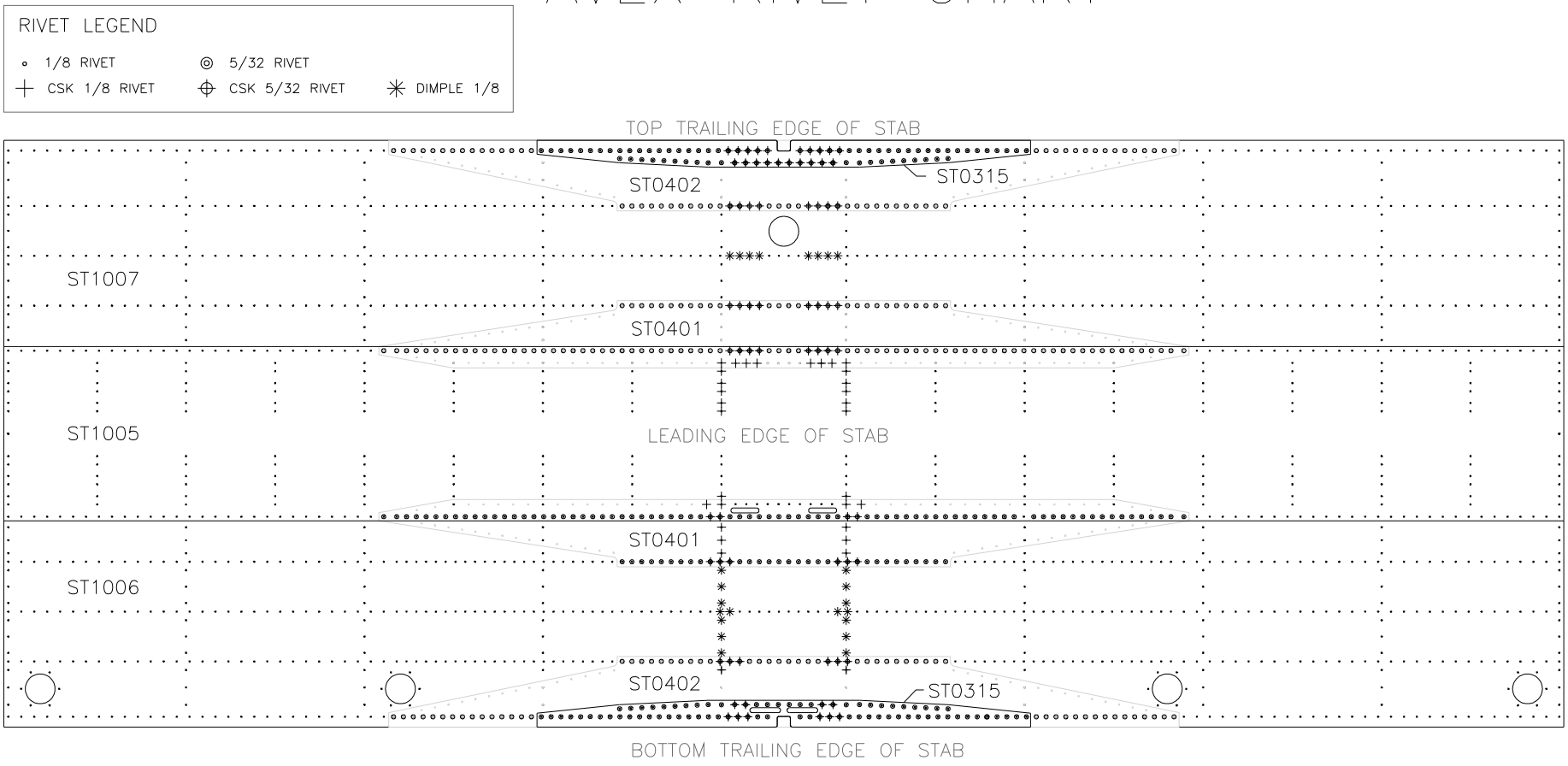
2.1 Parts List

PART NUMBER	DESCRIPTION	QUANTITY
ST0306	SPAR, FRONT	1
ST0309	RIB, STABILIZER FIN, LEADING EDGE	18
ST0332	TIP, STABILIZER	2
ST0305	DOUBLER, FRONT	1
ST0311	BRACKET, FORWARD ATTACH	2
ST0307	SPAR, MAIN	1
ST0314	TRIPLER, MAIN SPAR	1
W0139	CAP, MAIN SPAR	4
ST0313	CAP, SPAR [NOTE:- 2 MADE FROM W0139]	0 [SEE NOTE]
ST0333	STRINGER, STABILIZER	6
ST0301	RIB, MAIN	8
ST1002	RIB, STABILISER MAIN TIP	2
ST1008	DOUBLER, STABILIZER HINGE	2
ST0304	DOUBLER, REAR CENTER	1
ST0404	BRACKET, REAR ATTACH	1
ST0303	SPAR, REAR	1
ST0318	HINGE	10
ST0401	DOUBLER, SKIN	2
ST0402	DOUBLER, SKIN	2
ST0403	DOUBLER, REAR SPAR	2
ST0315	DOUBLER, EXTERNAL	2
AN3-7A	BOLT	4
AN3-5A	BOLT	16
AN365-1032	FIBER NUT	20
AN960-10	WASHER	36
ST0040	RAW STOCK -CUT TO LENGTH 2 ¾”	2

PARTS NOT SHOWN

ST0317	COVERS, INSPECTION	4
RV1613	3/16” X 1/4” AVEX RIVET	40
RV1410	1/8” X 3/16” AVEX RIVET	1900
RV4412	1/8” X 1/4” COUNTERSUNK AVEX RIVET	30
RV1619	3/16” X 7/16” AVEX RIVET	16
# 6	PAN HEAD SCREW	32

AVEX RIVET CHART



2.2 Tool requirement

- Variable Speed Drill
- #11, #21, #30, and #40 Drill Bits
- 3/8” Wrenches
- Deburring Tools
- Straight Edge
- Felt Pen
- Tape Measure
- Files
- Aviation Snips
- Hacksaw or suitable cutting tool
- Level
- Riveter
- 3/32”, 1/8”, 3/16” Clecos
- Dimple Tool

2.3 Before you start assembling the Stabiliser

- Study the exploded view of the stabilizer construction shown at the beginning of this chapter.
    - Note for clarity, the skins are not fully shown.
- Lay all the stabilizer parts out on the work table in the order they are shown and fully familiarise yourself with the parts, names and part numbers, where they go and very importantly, their orientation.
- Read the section completely to get a full understanding of the task ahead and method of assembly necessary.
- The Stabilizer Skins are delicate and **very** easily damaged, it is recommended that you **only** handle it when required to fit.

2.4 Front Spar

1. Locate Front Spar [ST0306] and draw a centerline down the full length. Cut the Front Spar to 118".
2. Drill a # 40 hole 5/16" from one end.
3. Cleco Main Spar [ST0307] to the front spar through this hole and one of the end pre-drilled holes in the main spar center.
4. Align the main spar center holes to the center line on the front spar and clamp together. Using the main spar as a template, drill #40 holes through the remaining 17 holes in the front spar. This makes the eighteen nose rib attach holes in the front spar.
5. Separate the parts.

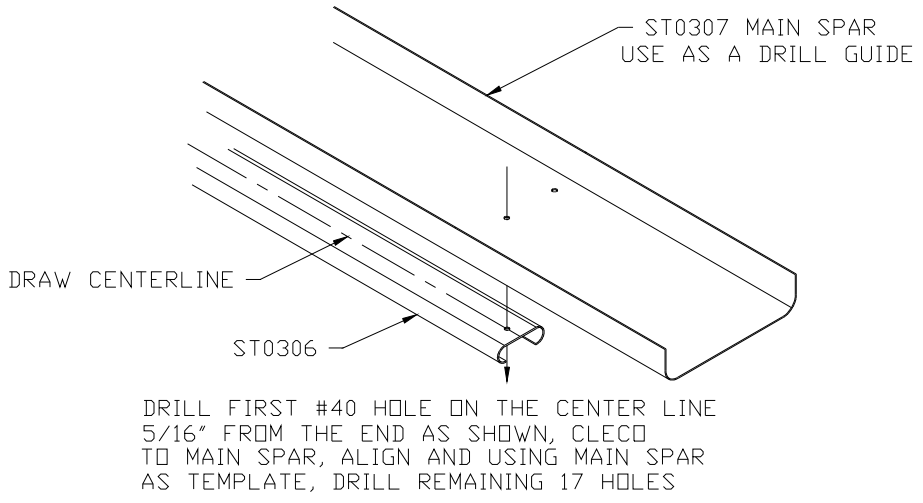


Figure 2.4.1

2.5 Center Doublers

1. Cleco the Front Center Doubler [ST0305], the two Forward Attach Brackets [ST0311] and Main Spar Tripler [ST0314] to the Main Spar [ST0307] orientated as shown in Figure 2.5.1.

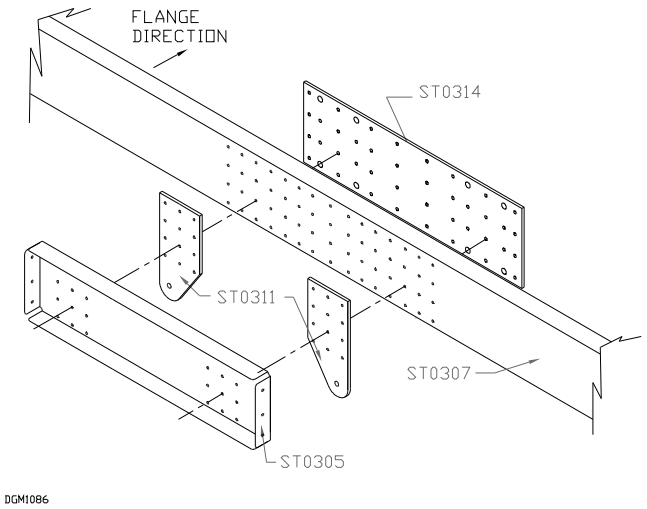


Figure 2.5.1

2. Drill the two sets of twelve holes that are common to all four parts to #11. See Figure 2.5.2.

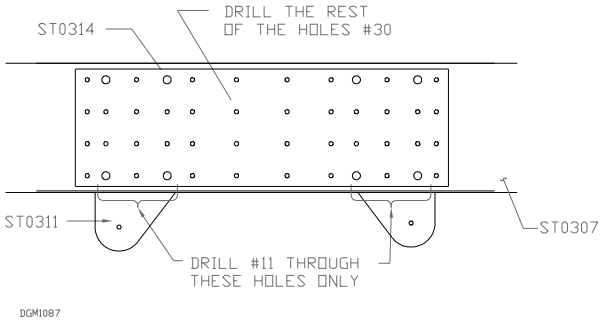


Figure 2.5.2

3. Remove the Front Center Doubler [ST0305], the two Forward Attach Brackets [ST0311].
4. Drill the remaining #40 holes that are common to Main Spar Tripler [ST0314] to the Main Spar [ST0307] to #30. Figure 2.5.2.
5. Disassemble all parts and deburr holes and edges, then radius all square corners on ST0307, ST0305, ST0311 and ST0314.

6. Chromate all mating surfaces of the above parts.
7. Using 1/8" (RV-1410) Avex rivets installed from the Main Spar [ST0307] side, rivet Main Spar Tripler [ST0314] to the Main Spar [ST0307] through the #30 holes.
8. Rivet the two ST0311 and ST0305 with 3/16" using Avex rivets (RV-1613).
9. Put the Main Spar assembly safely aside for now.

2.6 Rear Spar

1. Take the Rear Spar [ST0303] and nest the two Rear Spar Doublers [ST0403] into it. Fig 2.6.1 Note the orientation of the doublers. Ensure the ends are flush and clamp to secure.

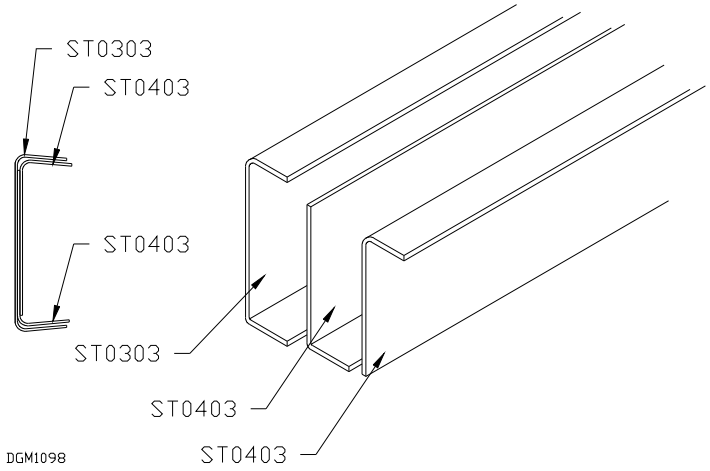
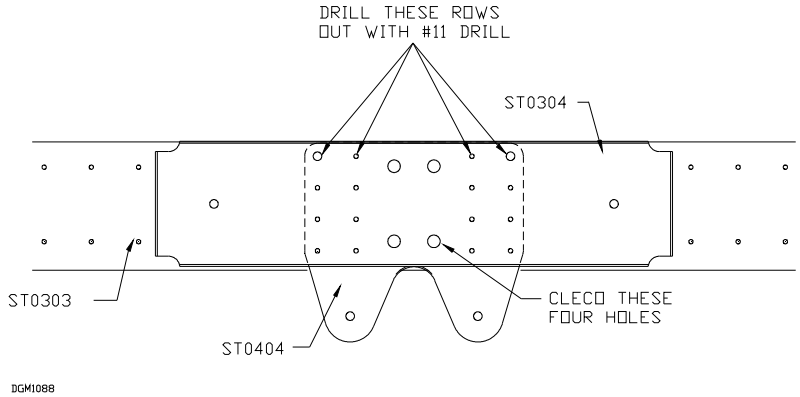


Fig 2.6.1

2. Backdrill all holes through the rear spar into the doublers. Cleco each in place as you go.
3. Cleco together the Rear Spar, Rear Spar Doublers, a Rear Attach Bracket ST0404 and a Rear Center Doubler ST0304 as in Figure 2.6.2



. Figure 2.6.2

4. Drill the fourteen #40 and two #11 holes out to #11 as in Figure 2.6.2.
5. Separate the parts. Deburr holes, edges.
6. Chromate mating surfaces on all the parts and re-Cleco together.
7. Chromate the mating surfaces of all hinges ST0318.

8. Bolt the center hinges through the Rear Spar [ST0303], Doublers [ST0403], a Rear Attach Bracket [ST0404] and a Rear Center Doubler [ST0304] using four AN3-7A bolts. Figure 2.6.3.

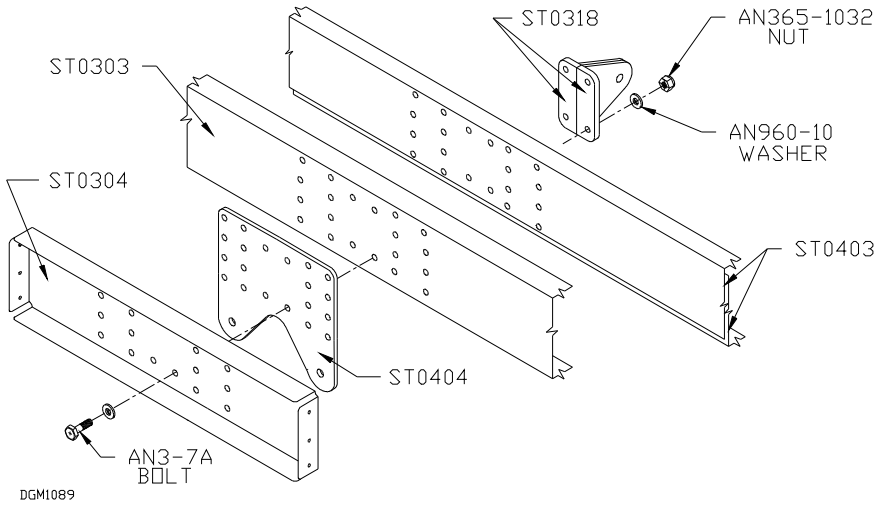


Figure 2.6.3

9. Rivet the other sixteen holes with 3/16" Avex rivets [RV-1619]. Note: Rivet heads to the rear of the aircraft in this area.
10. Rivet the spar doublers to the spar with RV-1410 Avex rivets.
11. Bolt the mid span Hinges [ST0318] to the pre-punched holes using AN3-5A bolts.
12. At each end of the Rear Spar, bolt the two Hinges [ST0318], the Rib Attach Bracket [ST1008] [remembering to chromate mating surfaces] using AN3-5A in the configuration shown in Figure 2.6.4.

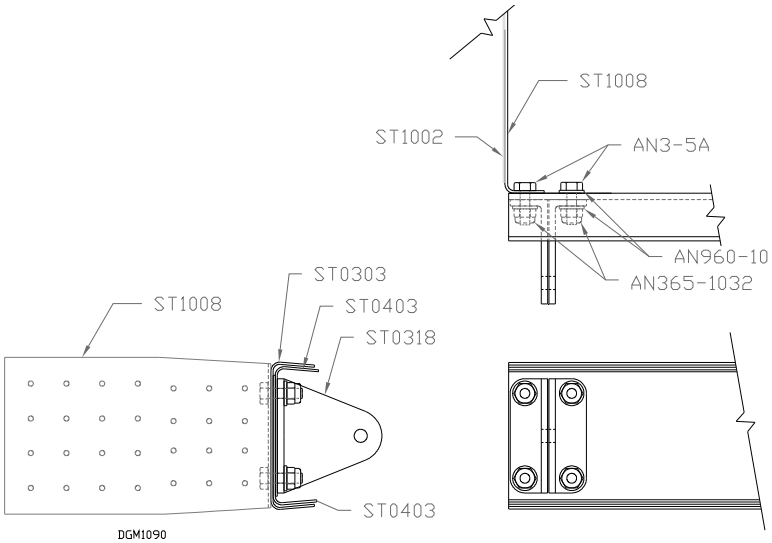


Figure 2.6.4

2.7 Rib Install

1. Cleco the eighteen Leading Edge Ribs (ST0309) and eight Main Ribs (ST0301) to the Main Spar. Use two Clecos on each. See Figure 2.7.1 for flange orientation and rib locations.

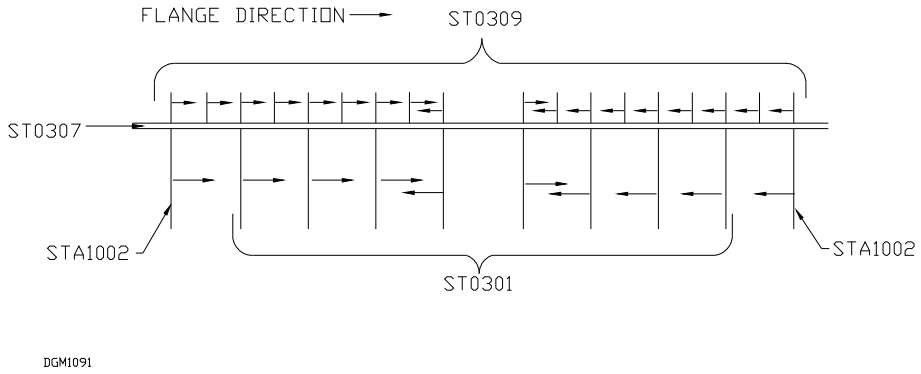


Figure 2.7.1

2. Using a long drill bit, back drill through the Center Doubler ST0305 side flanges into the two center Leading Edge Ribs ST0309 and Cleco.
3. Drill all #40 holes to #30.
4. Cleco the Leading Edge Spar to the Leading Edge Ribs. Drill the #40 holes to #30.
5. Locate raw stock angle ST0040 from the kit and cut 2 pieces 2 ¾" long. These will be used to attach the front end of the Tip Rib to the Main Spar.
6. Draw a line on the outer face of the short arm 9/32" from the bend.
7. Align line drawn on the short arm of the angle with the pre-drilled holes in the Main spar. Back drill from the spar # 40. Cleco in position.
8. Align Tip Rib ST1002 to the angle ST0040 and the Rear Spar Attach Bracket ST1008.
9. Back drill #40 from Rib to ST0040 and Cleco in position.
10. Back drill from ST1008 to Tip Rib #30. Cleco in position
11. Disassemble ribs;
    - NOTE: Label the parts to ensure parts are replaced later in their original positions and orientation.
12. Countersink or dimple the rivet holes on the outer faces of the Tip Ribs [ST1002] for Avex flush rivets.
13. Countersink or dimple the angle ST0040 and the Rear Spar Attach Brackets ST1008 to suit.
14. Deburr all drilled holes.
15. Reassemble and rivet together with 1/8" Avex rivets (RV-1410). [NOT TIP RIBS]

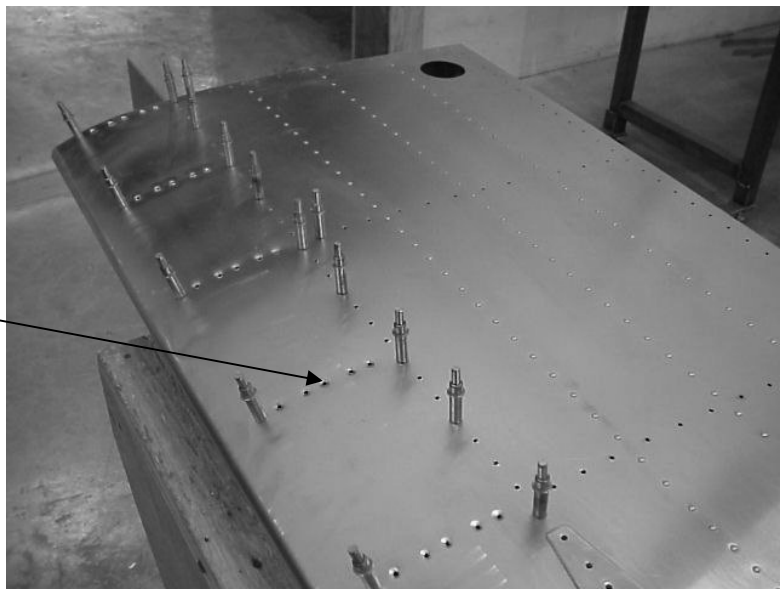
- Leading Edge Ribs and Main Ribs to Main Spar [do not rivet Tip Ribs at this stage, however, the two ST0040 sections can be riveted to the Main Spar].
- Leading Edge Spar to Leading Edge Ribs
- Main Ribs to Rear Spar [except for the Tip Ribs]

2.8 Stringer Install

Bear in mind the Stabilizer Skin is delicate and **very** easily damaged. Place the Stabilizer Skin [ST0316] on a clean flat work surface.

1. Cleco the external spar doublers ST0401 and ST0402 in place top and bottom.
2. Mark around these with felt tip pen onto the skin to show their position.
3. Remove doublers.
4. Dimple rivet holes in the skin for the leading edge ribs.
5. Dimple the holes in the flanges of the leading edge ribs to match skin.

Positions of leading edge skin dimpled rivet holes. Repeat top and bottom. [Note: - Picture, for position only, shows later stage with skin partially assembled]



6. Cut six pieces of stringer material (ST0333) at 117 $^{15/16}$" long.
7. Radius corners and deburr edges.
8. All rivet locations for the stringers have been pre-punched in the skins, it is possible to mark the center of each stringer rivet flange and drill back through the skin as you go. **However,** it is easier and there is less chance to damage the skins if the following procedure is used.
   a. Prepare two strips of wood, preferably plywood 5/8" thick, 3 ½" and length of 10' long, does not have to be one piece continuous length.
   b. On one of the lengths chamfer the full length to clear the stringer return, see fig 2.8.1.

c. Drill for countersink screws and screw to the workbench. Ensure all fasteners are below the top of the wood, fasteners proud of the wood **will** damage your skin.

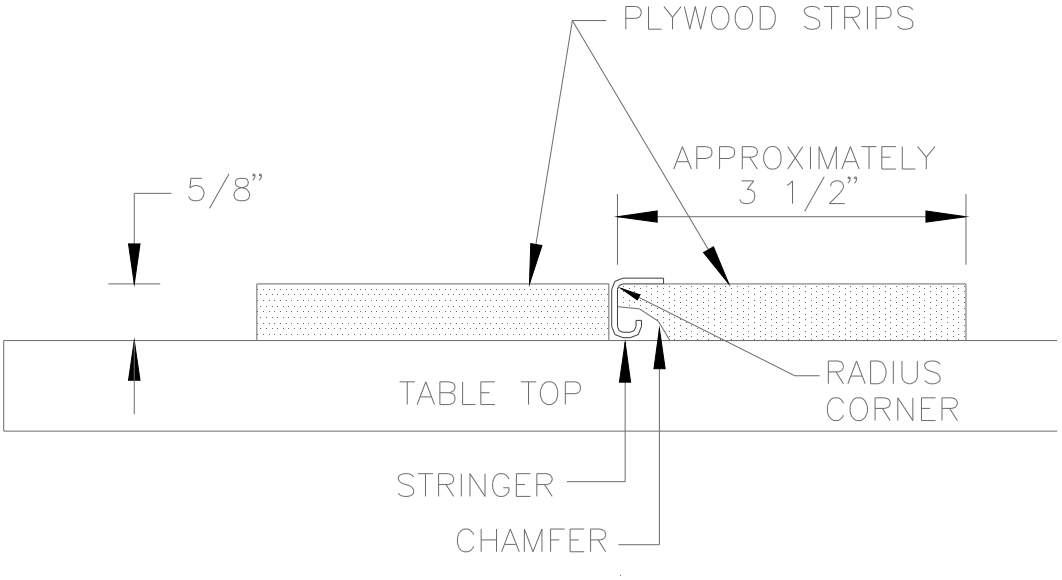


Figure 2.8.1

9. Slide the stringer between the plywood strips.
10. Draw a line down the center of a stringer.
11. Carefully position a skin over the stringer, ensuring equal overhang at each end. See Figure 2.8.2 for stringer orientation. When the line is visible through the center of the pre-punched holes drill each hole out to #40. Cleco as you go. Figure 2.8.2.

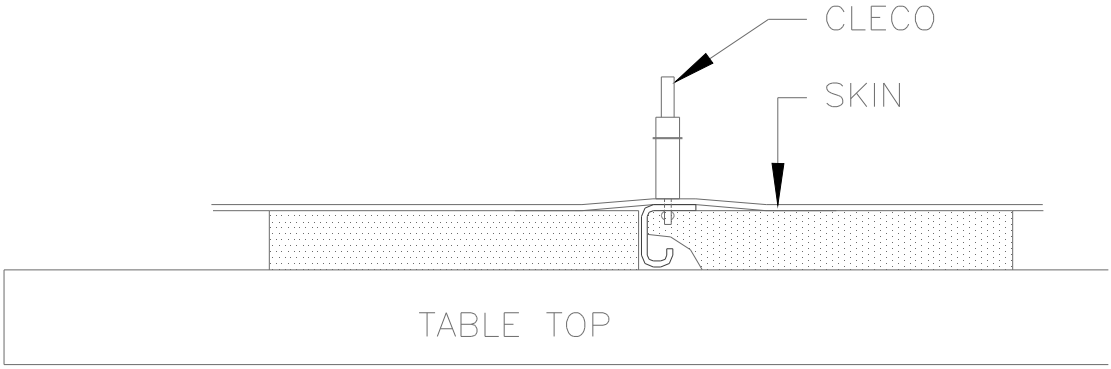


Figure 2.8.2

12. Drill to #30, deburr, chromate mating surfaces.
13. Rivet with 1/8" Avex rivets (RV-1410) EXCEPT in the areas where the spar doublers will be installed (marked in step 2, this section), and the last 2 holes at the tip ends of the stringers/skin. The main tip ribs will be slid in later with their flanges between the skin and the stringers.
14. Remember you will have to slide the assembly out of the wood to one side, it cannot be lifted up and out because of the shape of the stringer.
15. Repeat this process [handling skin carefully to avoid damage or creasing] until all 6 stringers are attached to the skin. See fig 2.8.3

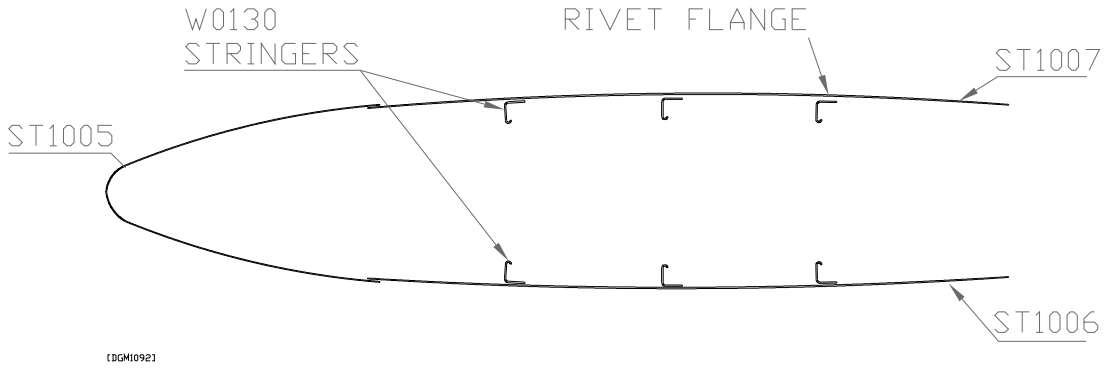


Figure 2.8.3

16. Remove the stringer attach wooden strips from your table and retain, you will require these at a later stage of your aircraft build.
17. Cut two pieces of 2" x 4" x approximately 30". Place on edge [i.e. 4" high] so that they fit across the table.
18. Carefully place the Stabilizer Spar and Rib assembly on top of the 2" x 4"s with the Stabilizer Attach Brackets facing upwards.

2.9 Skin Install

- *Tip: - To aid location of rib pre-punched holes and align them with holes in the skin in readiness to Cleco, use a fine point instrument in the nearest hole and gently manoeuvre skin/rib until the holes to Cleco align. Take care not to damage skin around the hole.*

1. Position the Stabilizer Skin over the Stabilizer Spar and Rib assembly.
2. Ensure all stringers are seated correctly in the slots in the Main Ribs.
3. On the Main Ribs and Leading Edge Ribs, there are aligning holes already punched on the flanges. Line up the punched holes on the Stabilizer Skin with these holes and Cleco the skin in place.
4. Also, align and Cleco the Doublers ST0315, 2 x ST0401 and 2 x ST0402 in place. Figure 2.9.1.

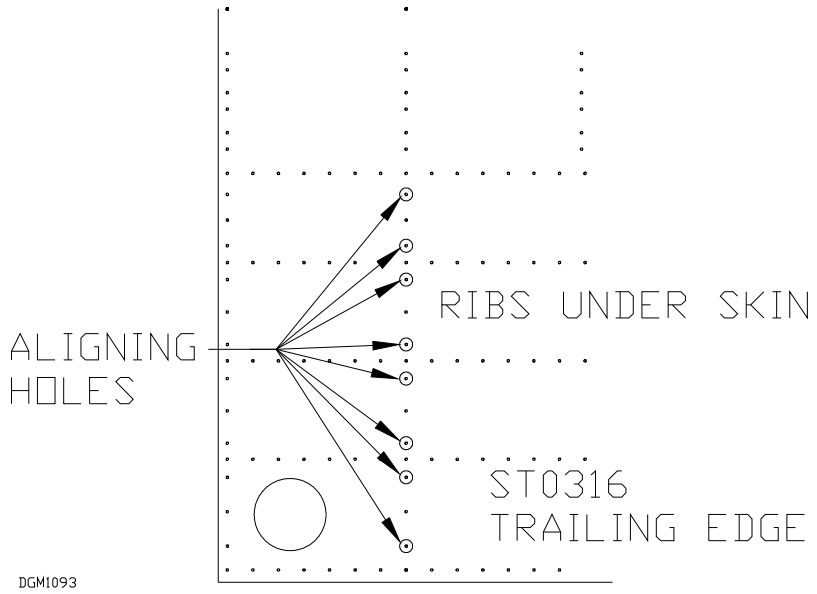


Figure 2.9.1

5. Cleco the Leading Edge ribs onto the Stabilizer Skin.
6. Level the assembly with wedges or shims on the 2 X 4's.
7. Carefully place weights to ensure the assembly doesn't move [improvise with small sand bags or milk jugs filled with water if you do not have weights to hand but remember to protect the skin surface and do not overweight and deform]. Figure 2.9.2.

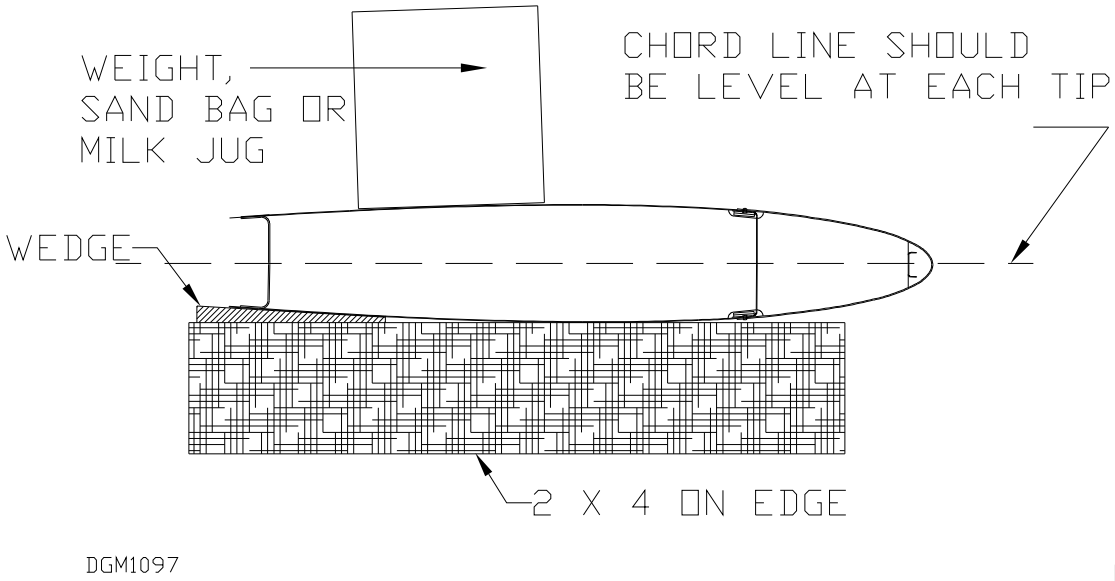


Figure 2.9.2

8. Drill through the skin into the Main and Rear Spars. Start from the center and work outboard each way drill only every 8th hole. Cleco every one as you go.

9. Drill #40 through the Front and Rear Spar Doubler. Figure 2.9.3.

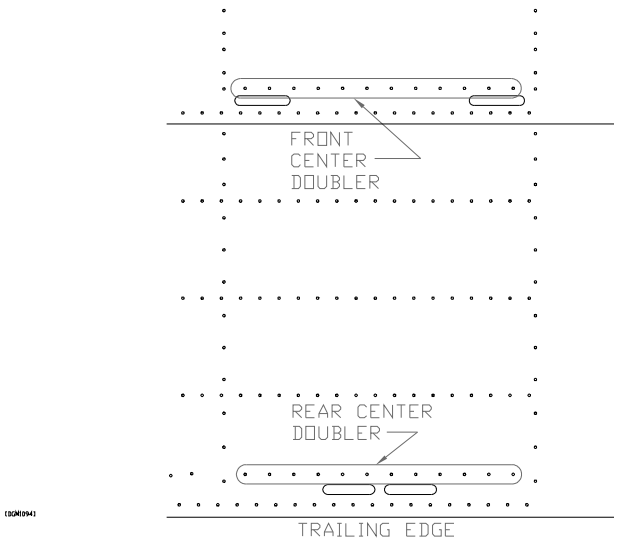


Figure 2.9.3

10. Drill out every hole through the Spars and Ribs to #40. Cleco as required to maintain position.
11. Flip the assembly over and re-level.
12. Manoeuvre skin until you can get a Cleco through the forward hole in each of the Leading Edge Ribs. Start at one end and work across to the other end.
13. Cleco skin to the Main Ribs in the same manor, working from the opposite direction.
14. Double check for level and drill through the Main and Rear Spars using the same procedure as used on the other side.
15. Drill all the holes in the Ribs and Spar to #40.
16. Take the End Tip Ribs ST1002, ensuring the correct orientation, ease the flanges over the stringers and under the skin [the flanges are therefore sandwiched between the stringers and the skin].
17. Align the previously drilled and countersunk holes with the 2 pieces of ST0040 and the Rear Spar Attach Brackets STA1008 Cleco in position.
18. Drill #40 through the holes in the skin into the flanges of the Tip Ribs and Stringers. Cleco as required to maintain position.
19. Turn assembly over, re-level and repeat step 18.
20. Disassemble and deburr.

2.10 Doublers & Spar Caps

1. Round the corners of the External Doublers [ST0315, ST0401 AND ST0402] and Cleco them in place on the Stabilizer Skin. Figure 2.10.1.

2. The same parts are used for the top and bottom. You will have to cut the slots out for the Stab Attach Brackets on the bottom doublers.

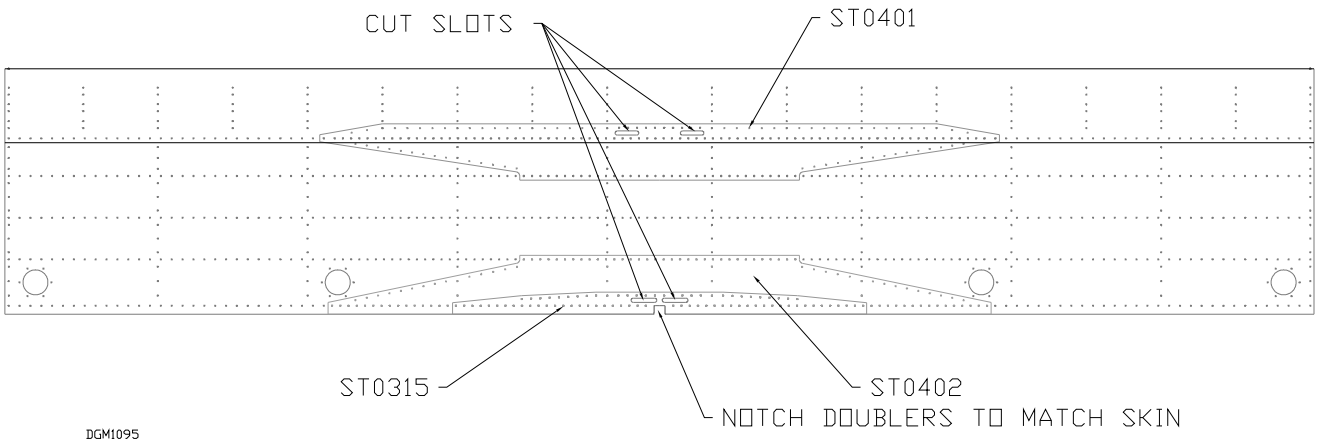
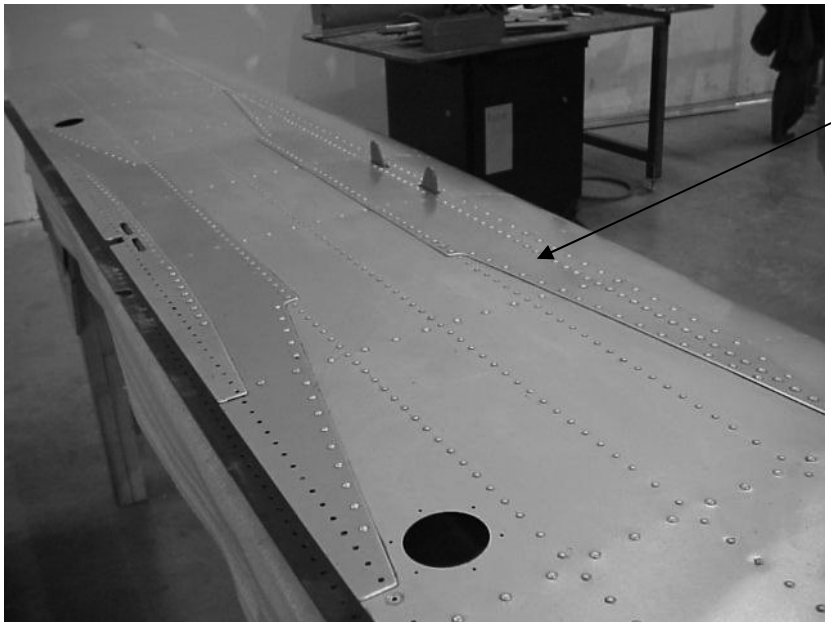


Figure 2.10.1



Photograph shows the doublers in position.
Note: - this is at a later stage and the doublers are riveted.

3. Cut two of the four Spar Caps, W0139 to a length of 24” .These will become Spar Caps ST0313. The other two W0139 remain 36” long. Mark the center of all four Spar Caps.

4. Center and clamp a 36” Spar Cap and a 24” Spar Cap to the underside of the top flange on the Main Spar. Figure 2.7.2.

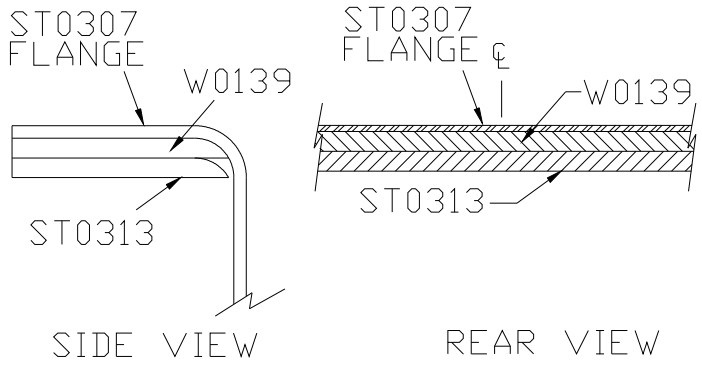


Figure 2.10.2

5. Drill #40 holes through the existing holes on the Main Spar flange into the two Spar Caps. Cleco as you go.
6. Remove the Spar Caps and deburr.
7. Repeat steps 4 to 6 for the two Spar Caps on the inside of the bottom flange on the Main Spar.
8. Cleco the Stabilizer Skin, Spar and Rib assembly, Main Spar Caps and External Doublers together.
9. Drill all #40 holes to #30.
10. Drill stringer and spar rivet lines in the external doublers out to #21.
11. Disassemble and deburr.
12. Dimple the two outboard Leading Edge Ribs. Dimple the corresponding holes in the Stabilizer Skin.
13. Starting on the bottom of the Stabilizer assembly, chromate all mating surfaces.
14. Put the Stabilizer Skin back on and Cleco it in place. ‘Proseal’ the External Doublers and Cleco in place.
15. Rivet together:
    a. Stabilizer Skin to Ribs, Spar Caps and Spars-1/8” Avex rivets RV-1410.
    b. Outboard Leading Edge Ribs to Skin 1/8” CS (RV-4412)
    c. Spar and stringer lines within external doublers 5/32’ Avex RV-1512.
16. Turn the Stabilizer over.
17. Repeat steps 12 to 15 for the bottom.
18. Re-locate the end Tip Ribs ensuring the correct orientation, ease the flanges over the stringers and under the skin.
19. Align the previously drilled holes in tip rib and skin and Cleco.

20. Align the countersunk holes with the 2 pieces of ST0040 and the Rear Spar Attach Brackets ST1008. Cleco in position
21. Rivet together:
    a. Stabilizer Skin to Tip Ribs and stringers-1/8" Avex rivets RV-1410.
    b. Tip Ribs to ST0040 and the Rear Spar Attach Brackets ST1008. Cleco in position and rivet using -1/8" X 1/4" Countersunk Avex Rivet RV4412
22. On the trailing edge of the Stabilizer skin, cut out the notch pattern as per the External Doublers.

    NOTE: The notch is in the External Doublers, above the center Hinges on the Rear Spar and allows clearance for the Elevator Horn. Round all corners and deburr the edges on the slot.

23. Position four ST0317 Inspection Covers over the holes in the skin. Secure in place using Pan Head Screws (#6).

2.11 Stab End Tips

The following steps deal with the installation of the stabilizer tips. To ensure a good fit between the stabilizer and the elevator we recommend that the installation of the stabilizer tips be done after the elevator assembly has been attached.

1. At the outer two Leading Edge ribs draw lines connecting the rivets.
2. Fit the Stabilizer Tips ST0332 onto the end of the Leading Edge.
3. Using a straight edge, draw the rivet line from the spar and outboard rib, onto the Stabilizer Tip. Figure 2.11.1.

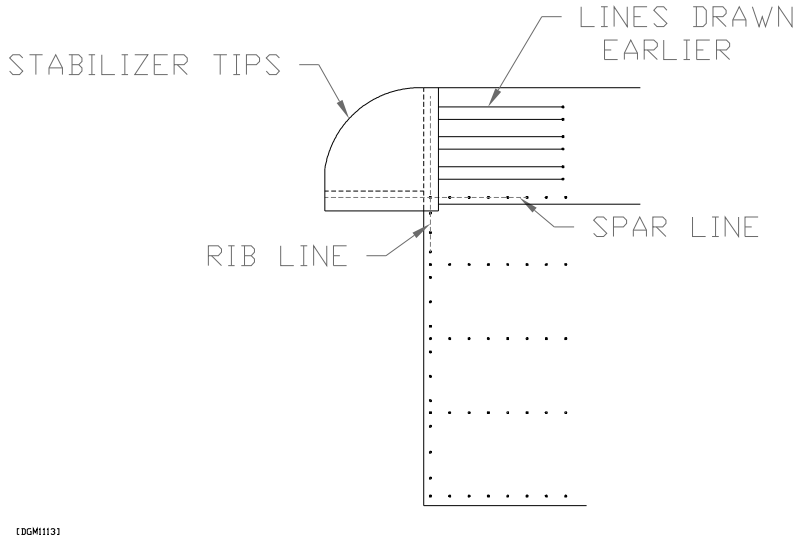


Figure 2.11.1

4. Along the spar line, space #30 holes at 1" intervals. Cleco.
    - Ensure that there is 5/16" edge distance from the end of the spar.

5. Drill #30 holes between each pair of lines drawn earlier into the Stabilizer Tip along the rib line. Figure 2.8.2.

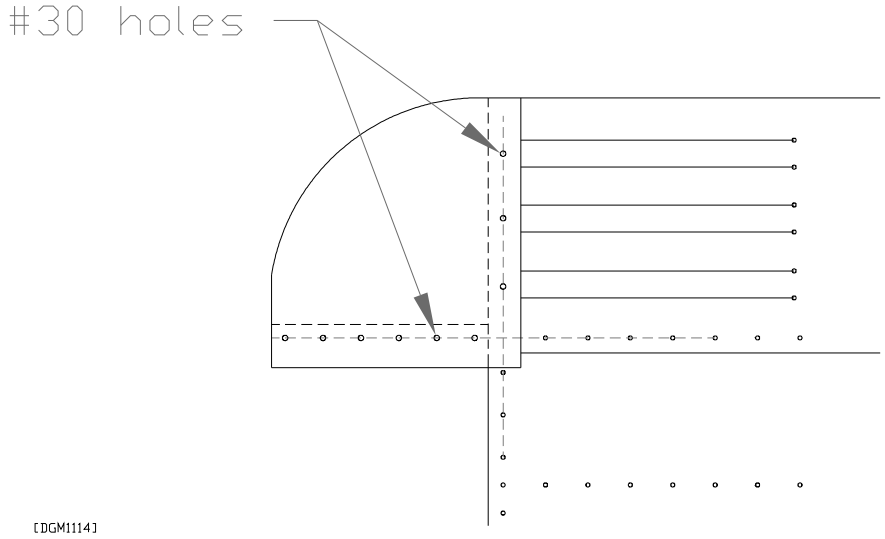


Figure 2.11.2

6. Turn the Stabilizer over and repeat for the bottom side.
7. Remove Stabilizer Tip and sand edges smooth.
8. Deburr the holes in the Stabilizer.
9. Measure 5/16” from the holes in the Stabilizer Tip, drawing a line for trimming. Figure 2.8.3. Trim the tips.

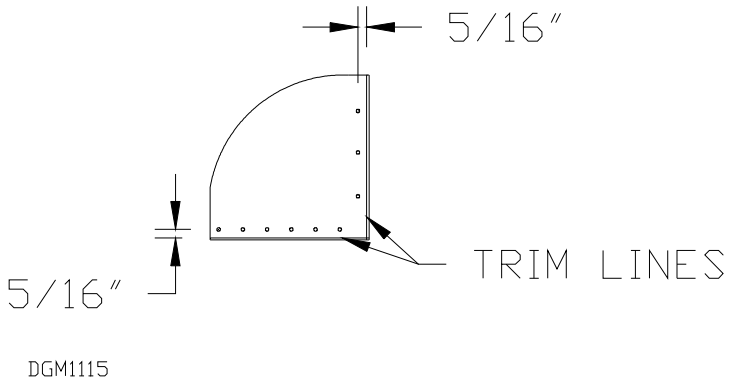


Figure 2.11.3

10. Rivet the Stabilizer Tips to the Stabilizer with 1/8” avex rivets (RV-1410).
11. Repeat steps for the other end.