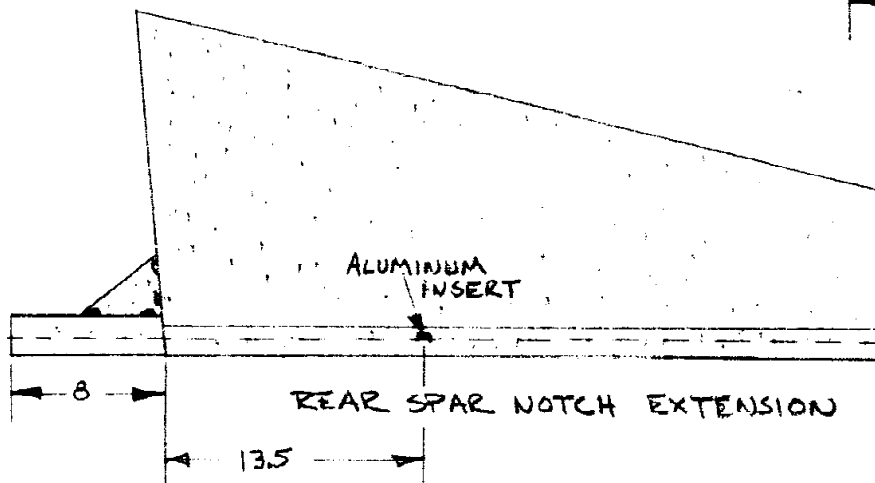
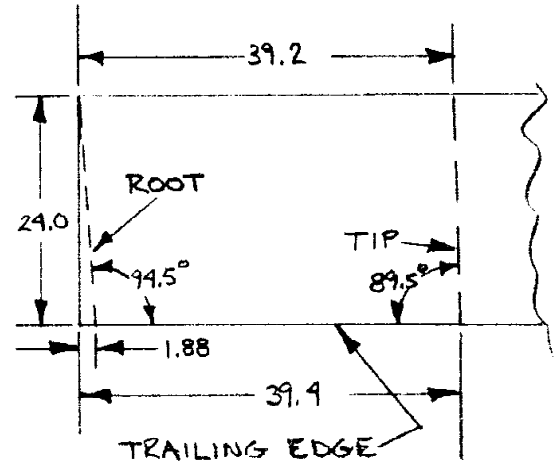


Vertical Stabilizer and Rudder

Cut the hot wire templates shown on pages to from 1/8 tempered masonite.

Trim cut a four inch thick foam block as shown in the sketch, then mount the templates and hot wire cut the stabilizer core. Save the irregular tetrahedron shaped hunk of 4 inch thick foam left over to make the rudder. Cut the rear spar notch first, then the outside contour. Round up a scrap foam block that is at least 3" wide x 8" long x 2" thick to use for an extension to the rear spar notch on the root stabilizer template and the separate spar notch extension template to cut an eight inch long spar notch in the scrap block. Jig the eight inch extension into alignment with the rear notch in the stabilizer as shown in the sketch below and 5 min/micro firmly in place. If the foam core is bowed, us a board and 5 min/micro dabs to fixture it straight (remember the wing spar?).



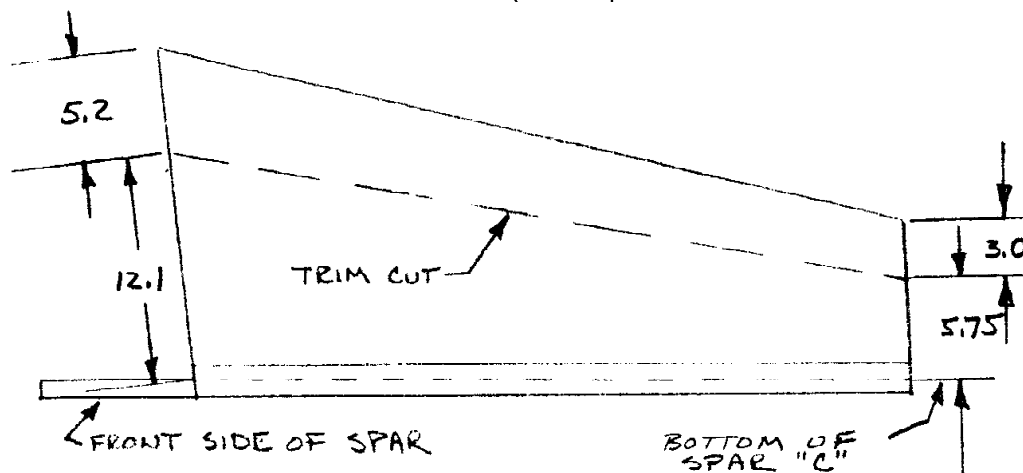
Cut a 1.5 inch piece of 1/2 x 3/16 aluminum bar stock for the mid span rudder hinge insert. Inset the aluminum piece flush with the bottom of the spar notch and centered 13.5 inches from the root airfoil cut. Brighten the aluminum insert and bond into the foam core with 5 min/micro. Cut the following glass cloth and peel ply.

- 2 strips 45° BID 4 x 45
- 1 strip 45° BID 4 x 25
- 1 strip 0° UNI 4 x 33
- 1 strip 0° UNI 4 x 27
- 1 strip 0° UNI 4 x 21
- 1 strip 0° UNI 4 x 15
- 2 strips peel ply 3/4 x 45
- 1 strip peel ply 4 x 8

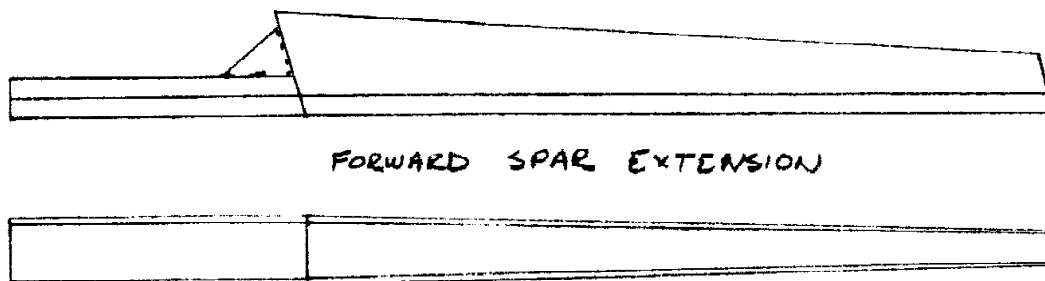
Micro slurry the rear spar notch. Lay up the 4 x 8 piece of peel ply into the notch over the spar extension area only. Lay up the peel ply strips along the legs of the "C". Try not to get the peel ply strips into the corner radius. You only want to peel ply the legs of the "C" where the foam is to be carved away and overall for the spar extension. Lay up the glass plies listed above in decending order of length. Start with two full length strips of 45° BID, then lay up the four 0° UNI plies and finish up with the short ply of 45° BID. Start each ply at the bottom of the spar extension so that the spar gets thinner near the tip and thickest at the root. Scissor trim each ply closely. Knife trim and cure 24 hours.

Clean up the cured edges of the rear spar, remove the foam bracing and the foam block used for the spar extension from the cured spar and the stabilizer root. This should leave only the "C" shaped glass spar extension sticking out of the stabilizer. Remove the peel ply from the outside of the extension.

Drag out your hot wire and trim templates. Make a trim cut which is 90° to the waterlines at both root and tip as shown in the sketch (and marked on the stabilizer hot wire templates). Mount the front spar notch templates on the leading edge foam core and hot wire cut the spar cap notches in both surfaces.



Round up another scrap foam block to make the forward spar extension. You need at least 15.5 inches length, and 3 x 2 cross-section. Trim one end of your spar extension block to allow the block to nest against the root of the leading edge and provide a straight continuation of the front spar as shown in the sketch. Use your sanding block and shurform file to shape the spar extension block. Note that the spar is constant cross-section from the stabilizer root to the end of the extension.



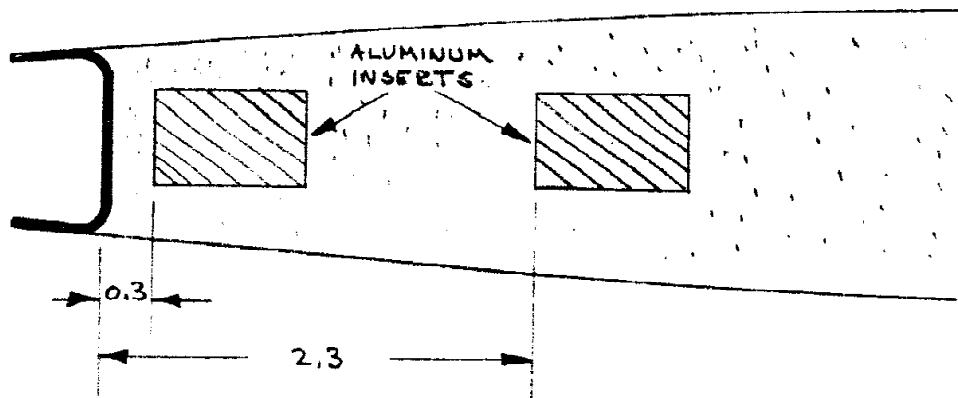
If required, jig the foam core straight with boards and 5 min. Go cut the glass and peel ply listed below for the front spar lay up.

2 pieces of 45° BID 5 x 42
 1 piece of 45° BID 5 x 30
 1 piece of 45° BID 4 x 14
 1 piece of 0° UNI 5 x 45
 1 piece of 0° UNI 5 x 35
 1 piece of 0° UNI 5 x 25
 1 piece of peel ply 2 x 56
 1 piece of peel ply 4 x 26
 1 piece of peel ply 2 x 32
 1 piece of peel ply 2 x 16
 1 piece of peel ply 4 x 16

Tape the areas adjoining the spar notch to keep over slop off. Lay up a ply of peel ply over the spar extension foam core only. Lay up one ply 45° BID full length (requires overlapping one 5 x 42 and the 4 x 14 piece), then follow with the 5 x 42 piece of 45° BID, next lay up the three 0° UNI plies, and finish up with the remaining 45° BID ply (5 x 30). Peel ply the whole spar lay up. Knife trim and cure.

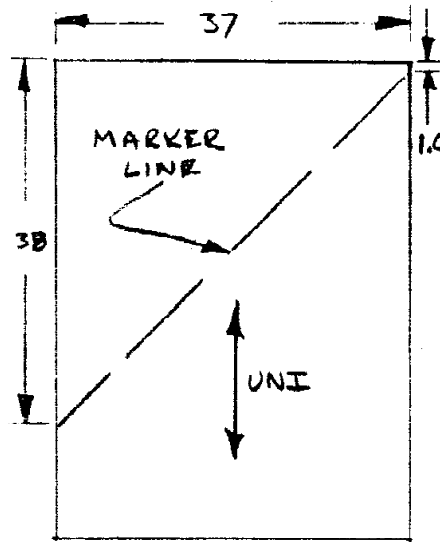
After curing 24 hours, remove the foam core from the spar extension and tear off the peel ply inside and outside. Using the mother foam block from the stabilizer foam core for a jig, fit check, then reassemble the leading and trailing edge foam cores and spars with micro slurry. Try not to contaminate the core or front spar caps with micro slurry. Cure.

Remove the trailing edge foam lumps and expose the rear spar caps by sanding and carving. Remove the peel ply strips from the rear spar caps (both sides). Sand a pleasing radius to the leading edge at the tip and along the tip edges. You may grind the spar caps away in the vicinity of the tip without any loss of strength. Cut a pair of 0.8 x 1/2 x 3/16 aluminum inserts and locate them (flush) in the foam of the tip as shown in the sketch. Brighten the inserts and bond in place with 5 min/micro.

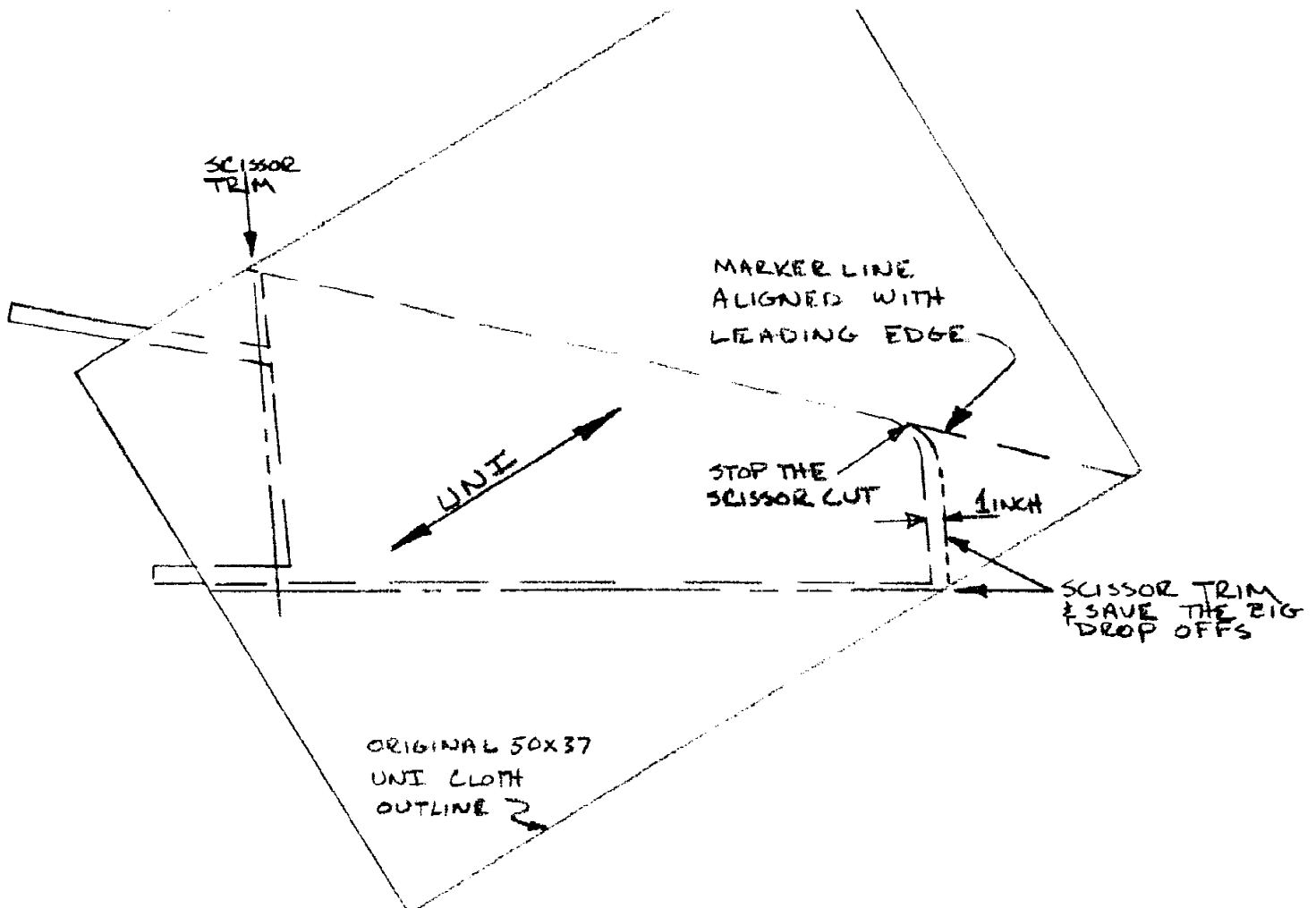


Clear off one end of your work bench near a leg so that you can position the vertical stabilizer horizontally over-hanging the table edge by clamping the spars to the top surface or leading edge up by using the table top and leg as clamping points. The vertical stab skins are both layed up in one work session. The glass cloth is continuous around the leading edge without any need to have a lap joint like the wing did.

Cut 2 pieces of UNI 37 (full width) by 50 inches. Mark a diagonal line in bold watercolor pen as shown in the sketch on both. When the skin lay up is made, the marker line is placed on the leading edge to provide proper alignment.



Clamp the stabilizer in horizontal position, micro slurry both sides foam surfaces, and paint a light coat of epoxy on the exposed spar caps. Using the leading edge and the marker line for a reference, lay the first ply of glass on the stabilizer as shown in the sketch. Wet the cloth completely and scissor trim closely along the trailing edge. Note the scissor trim indicated around the tip. This is intended to provide an overlap of the skins (1/2 to 1 inch) at the tip and along the leading edge where it is radiused.

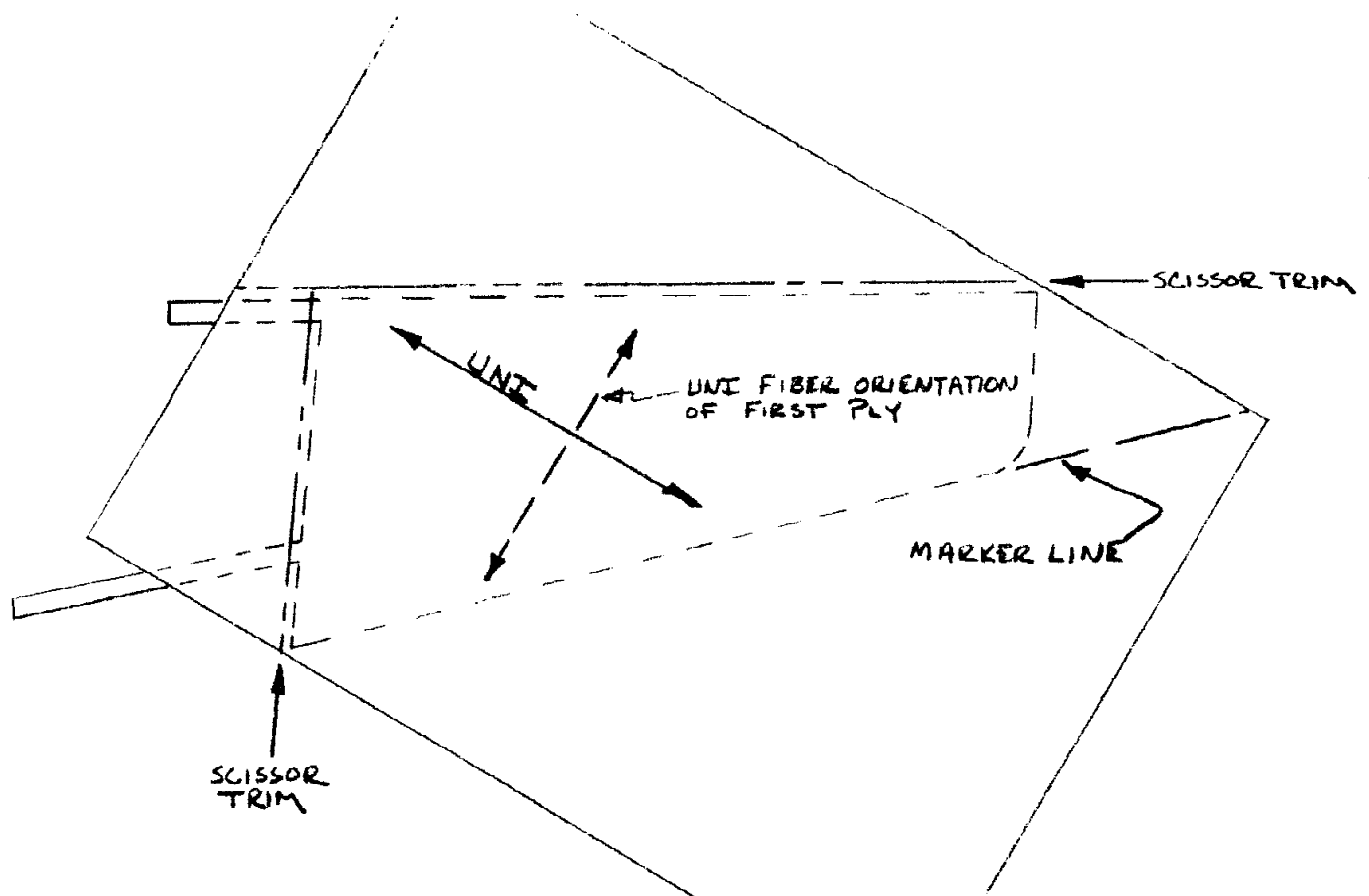


Let the excess cloth hang down from the leading edge while you wet out the horizontal surfaces. Wet out the tip areas completely and trim the glass around the radiused leading edge at the tip as required to transition smoothly from overlapping cloth to continuous cloth around the leading edge. Don't neglect the scissor trim at the root and trailing edges. Any excess dry cloth overhanging these edges will pull the wetted cloth away from the foam core when you turn it over to lay up the other side.

You will need an assistant to help flip the stabilizer over. Unclamp the spars from the table and carefully turn the stabilizer leading edge up. Smooth the cloth over the foam core and straighten the fibers as required. Trim the excess cloth at the trailing edge and save the drop off to cover the root of the stabilizer. Wet out the leading edge and tip overlap areas. Then lay the stabilizer horizontally to work on the dry side. Use the drop off from the trailing edge scissor trim to make a butt joint in the skin ply (no overlap but no gaps) and cover the base of the stabilizer. Wet out the cloth completely and again scissor trim the edges closely. Verify that the first side glass cloth is still attached to the foam and not dangling off of the leading edge.

If you discover any tendency for the cloth to try and drop away from the bottom side (first laminated), then stand the stabilizer up vertically (leading edge up), clamp in position, and stipple or squeegee the glass to the foam core. You can allow the first ply to stand for 20 to 30 minutes like this before starting the second skin ply. Take a break, wash up, and rest a few moments. . .

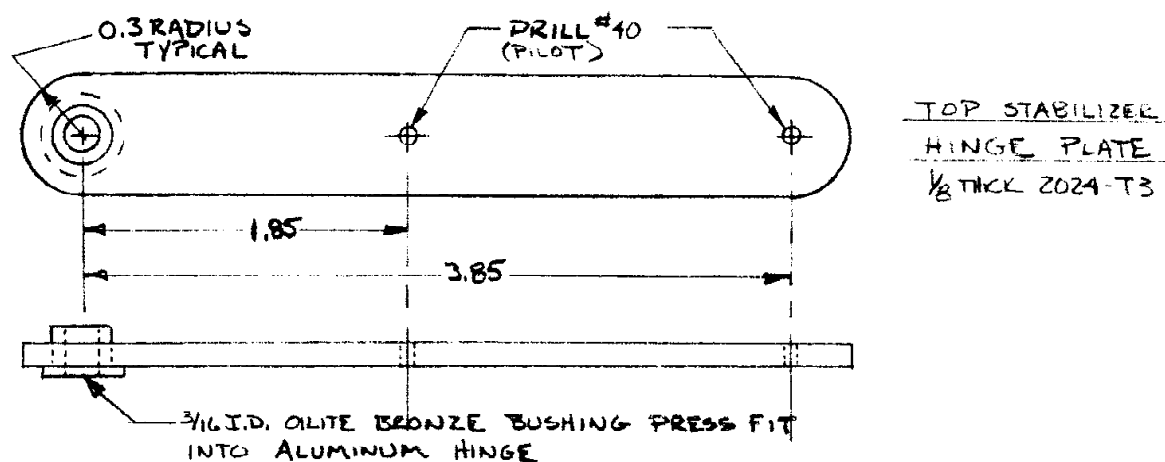
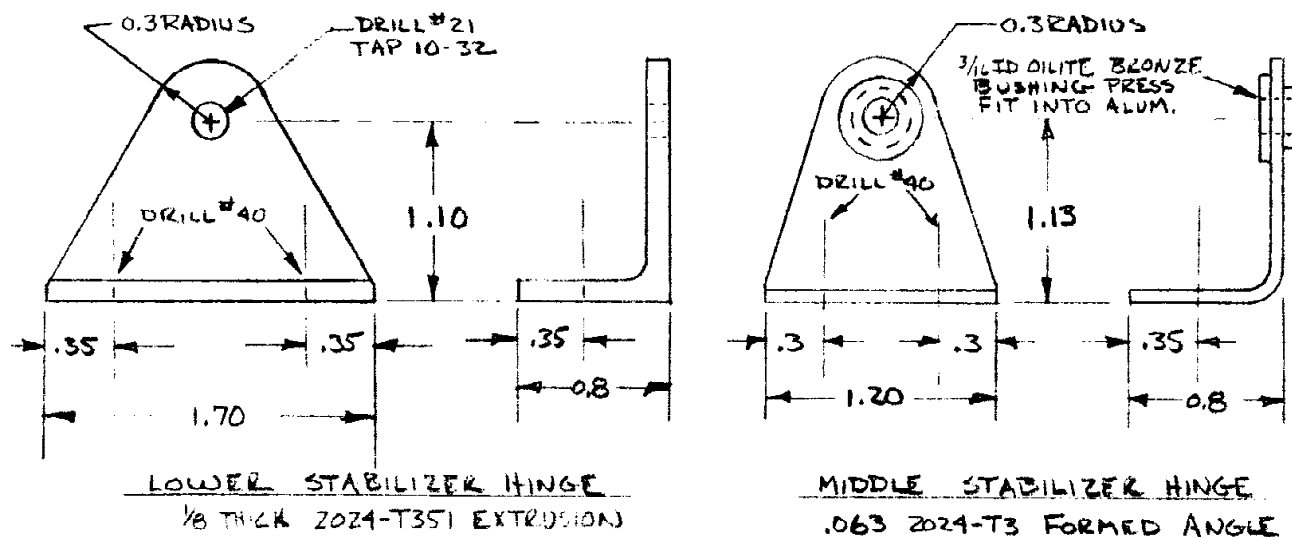
Back to work! Position the stabilizer horizontally again with the second side laminated up. Start the skin lay up just as before (see sketch) but in mirror image to provide a two ply skin on both sides. The mirror image bit is to provide crossing fibers in the skins which are roughly 45° to each other



Continue the lay up exactly like the first ply was done, wet the first side and scissor trim, turn leading edge up and position the cloth, wet out the leading edge and tip, lay flat and finish laminating. Cure with the stabilizer positioned leading edge up. Knife trim.

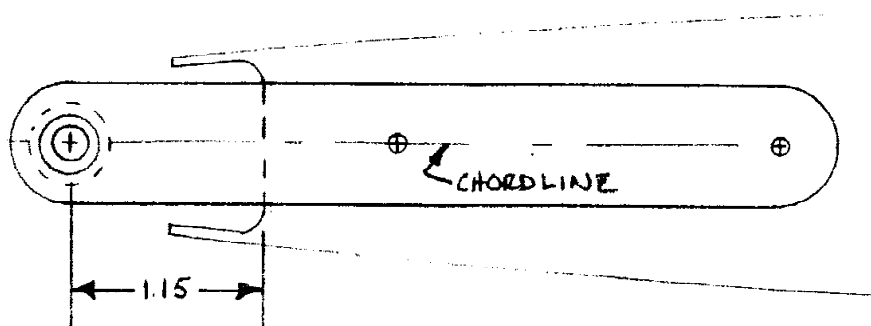
Closing out the root of the stabilizer requires a fit check with the horizontal stabilizer and fuselage, so we'll wait a while.

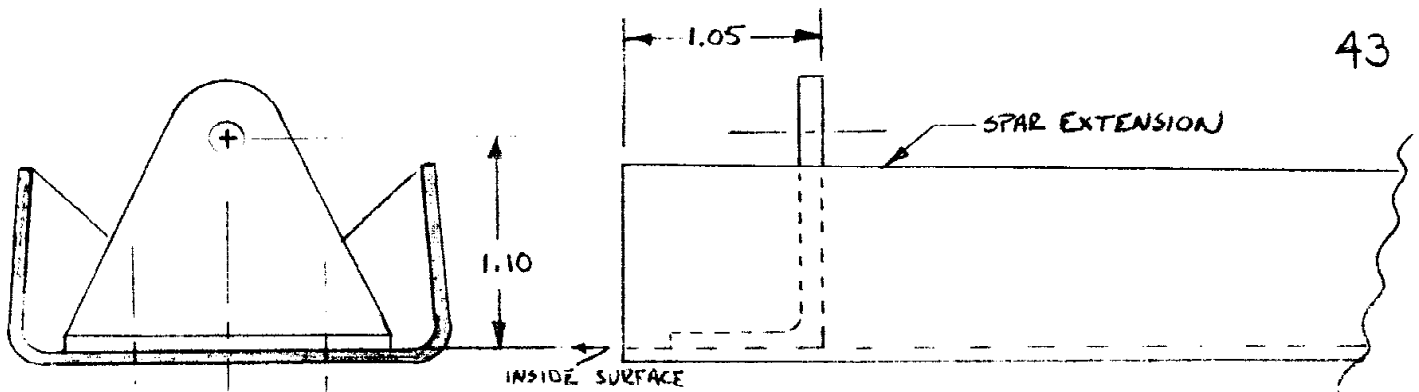
Go make the stabilizer hinge hardware shown below.



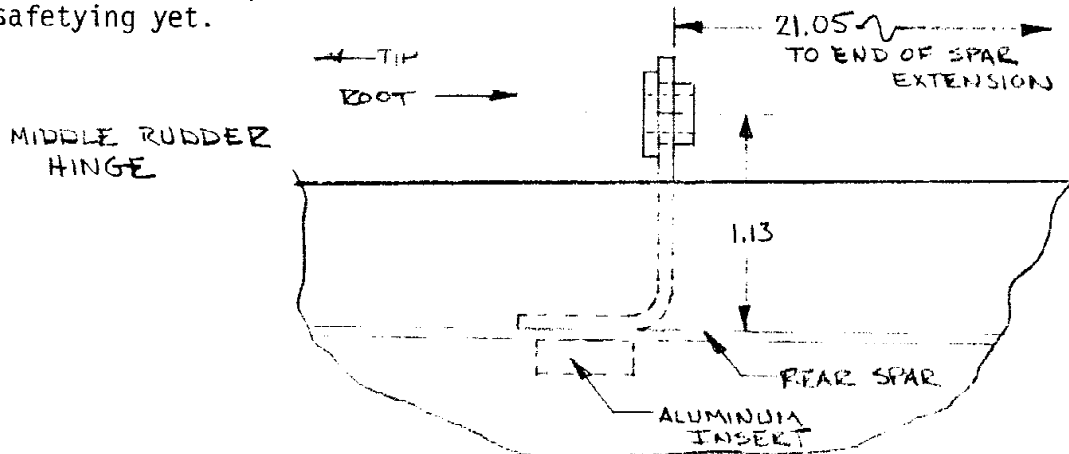
Position the top stabilizer hinge plate on the stabilizer tip as shown in the sketch. Temporarily attach it to the stabilizer with a 5 min/micro dabs then drill two #40 pilot holes into the stabilizer through the aluminum inserts and cleco. Note that the flange of the oilite bushing goes next to the rudder tip (down).

Next locate the lower stabilizer hinge on the spar extension as shown below. Drill the two #40 pilot holes through the spar, and cleco in position.





Drag out your alignment string (remember the flap hinges?) string it through the three hinges and stretch it tight between the top and lower hinge centers. Locate the middle hinge in position as shown in the sketch. Shim as required to align the center with the string and bond in place on the stabilizer with 5 min/flox. Let the 5 min cure for 25 minutes or so and then drill the pilot holes through the spar and insert. Size the pilots up to #21 (tap drill for 10-32). Then drill the hinge fitting and spar glass only (not the insert!) up to #11 (3/16). Tap the insert 10-32 UNF and install two AN525-10R-7 screws (5 min/flox on threads to safety). The pilot holes in the top stabilizer hinge can be drilled and tapped 10-32 in similar fashion. Use AN525-10R-8 screws in the tip but don't flox the threads. These screws aren't ready for safetying yet.



Drag out your rudder hot wire templates and the foam block left over from the stabilizer core. Trim the left over as shown in the sketch. Align the templates on each end of the foam block, nail in place, and hot wire cut. Sand off any hot wire defects and fixture the core to your work bench with a couple of small dabs of 5 min/micro. Cut two pieces of 45° BID as shown in the sketch and six reinforcement patches of 45° BID as shown. Cut enough peel ply to cover the entire rudder and 38 inches of 3/4 wide strip for the trailing edge. Make a marker line down the leading edge of the rudder to use as a knife trim reference and tape the area below it to keep the overslop off (standard leading edge treatment).

