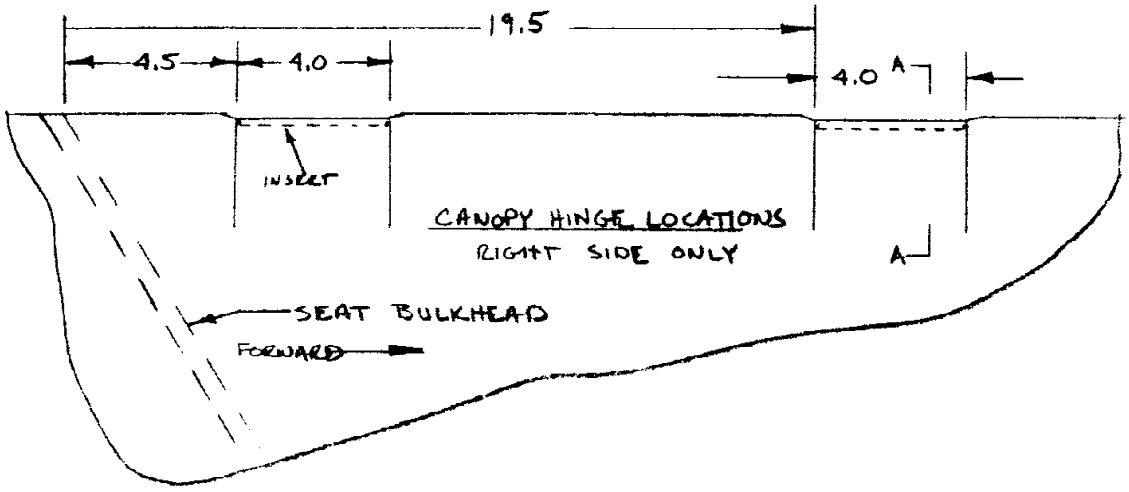
Fuselage Exterior

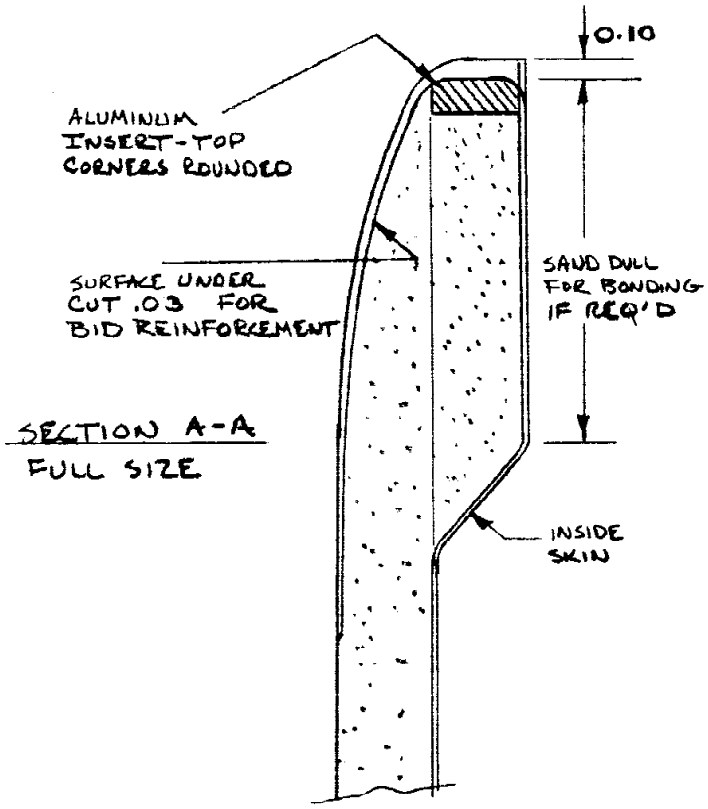
Go make the five carving templates shown on the following pages. These templates may be made from cardboard, masonite, or foam scraps. Each template is to be used as a guide for sanding the outside corners of the fuselage to its final contour. These contours are those used on the Prototype, but, they don't play a vital role in the airplane's performance or flying qualitites. If you deviate from these contours slightly (oops!) don't panic. Try to adhere reasonably well along the top edge so that the turtle deck and front cover fair in properly, several areas require a smooth transition from one contour to another (F.S. 79 to 83 top edge, F.S. 69 to F.S. 73 bottom, and F.S. 36 to F.S. 40 bottom) without any absolute guide to adhere to. Don't drive yourself crazy worrying about these, just press on and they will become obvious.

Before you start sanding you need to add some foam extension blocks to the front side of the firewall, around the bottom hole under the cockpit and around the closeout bulkhead. Use scraps or piece meal left over foam to make the extensions forward and aft. 5 min/micro the scraps to the peel ply on the bulkhead faces, then they can be sanded to contour along with the outside corners. See the sketches for more graphic detail. The hole around the cockpit area is given a 1.5 inch wide strip of 1/2 inch thick foam along the seat bulkhead and both sides. The bottom front panel provides the forward lip already. While you are working in that area, remove the peel ply from the outside of the lip.

Carve the outside to contour. A hard wood sanding block about 4 inches wide and 12 long is a good tool for rounding the corners. Use 60 or 80 grit sand paper.

Once that dusty operation is complete, lay out the canopy hinge reinforcement areas shown in the sketches below. Cut two aluminum inserts 1/2 x 3/16 x 4 inches. Brighten the inserts and bond into the side panel foam core as shown. Notice that the inside corner is rounded also. The reinforcement plies will run from the outside, over the insert, and lap onto the inside skins. The 0.1 inch notch allows the hinge to sit flush with the top edge.





Next, use your rotary file to prepare a flox corner along the top edges from the firewall aft to the tail attach bulkhead. The canopy attachment inserts don't get a flox corner.

Sand the foam around the wing/gear attach insert for a smooth transition from the full foam thickness to the insert. This should be done over a 2 inch width of foam surrounding the insert.

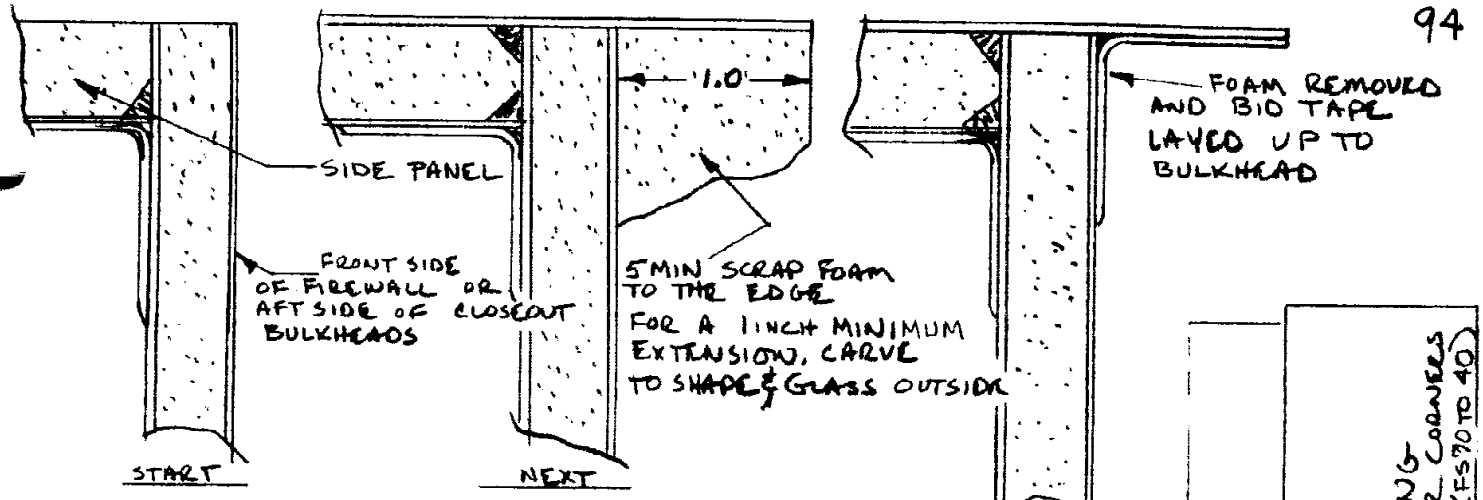
Remove the peel ply from the tailcone access hole edges and the forward bottom panel. Mark the aircraft centerline down the bottom of the airplane. Assuming that you start by glassing the airplane's right side, lay tape with the inboard edge one inch left of center down the length of the airplane. Protect the rest of the left side bottom with tape and newspaper. Call up two skilled laminating craftsmen who owe you favors and set them up for a half day's slave labor laying up the outside of the fuselage. You can't handle this lay up alone.

Go cut the glass cloth and peel ply listed.

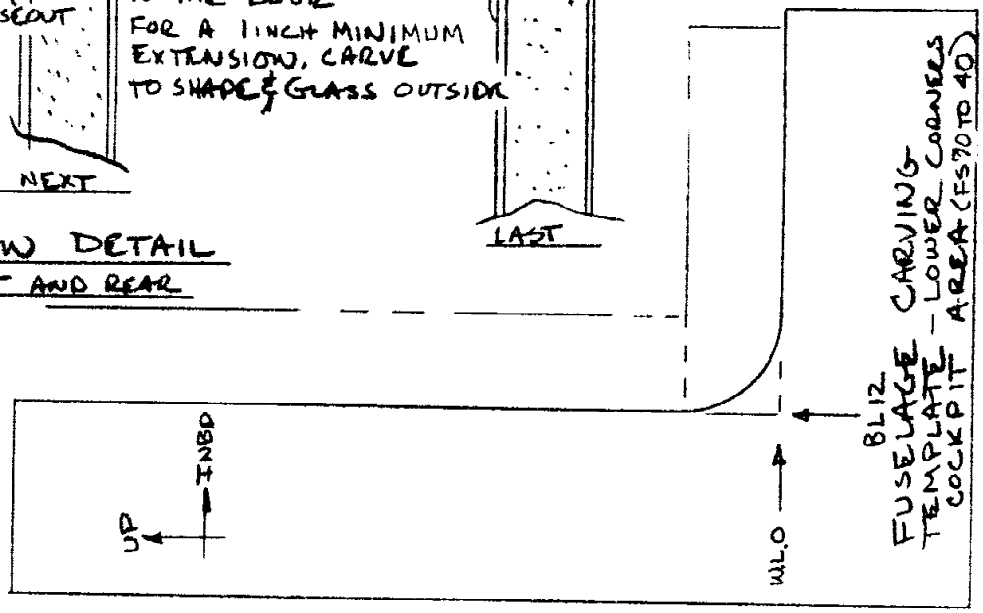
Glass Cloth			Peel Ply
45^0 BID	$0\text{-}90^0$ BID	0^0 UNI	2 inch
1 ea. 16.0 x 7.0	1 ea. 16.0 x 7.0	2 ea. 170 x 37	1 strip 78 in.
1 ea. 15.5 x 6.8	1 ea. 15.5 x 6.8		1 strip 23 in.
1 ea. 15.0 x 6.5	1 ea. 15.0 x 6.5		*1 strip 18 in.
1 ea. 14.5 x 6.3	1 ea. 14.5 x 6.3		*1 strip 5 in.
1 ea. 14.0 x 6.0	1 ea. 14.0 x 5.0		*2 strips 23 in.
2 ea. 5.5 x 4.0	1 ea. 2 in. x 6 in.(tape)		3 strips 50 in.
2 ea. 3.5 x 4.0			

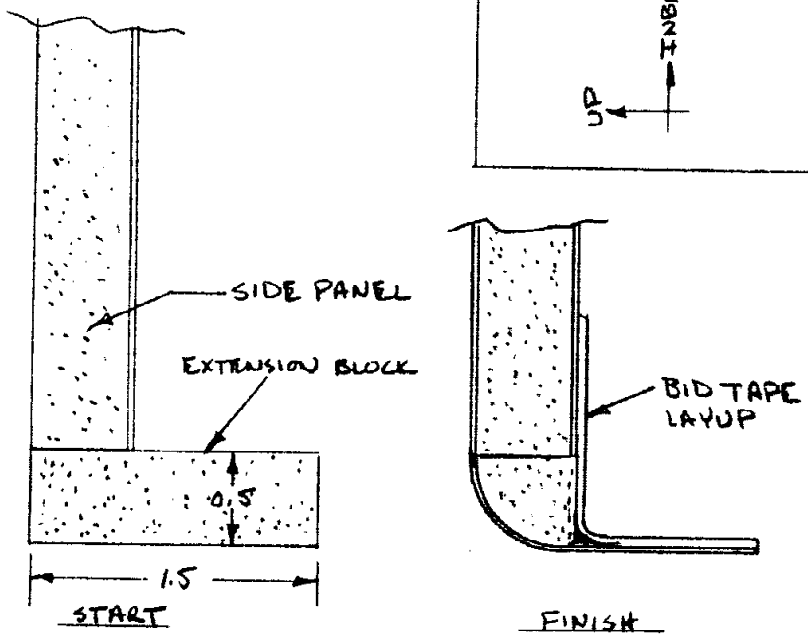
* split into two one inch strips

Position some cardboard boxes or low saw horses in such a manner as to allow you to lay the fuselage assembly right side panel up or bottom up and be able to switch positions during the outside skin lay up. Sturdy cardboard boxes worked well on the prototype by supporting the fuselage at the top edge of the

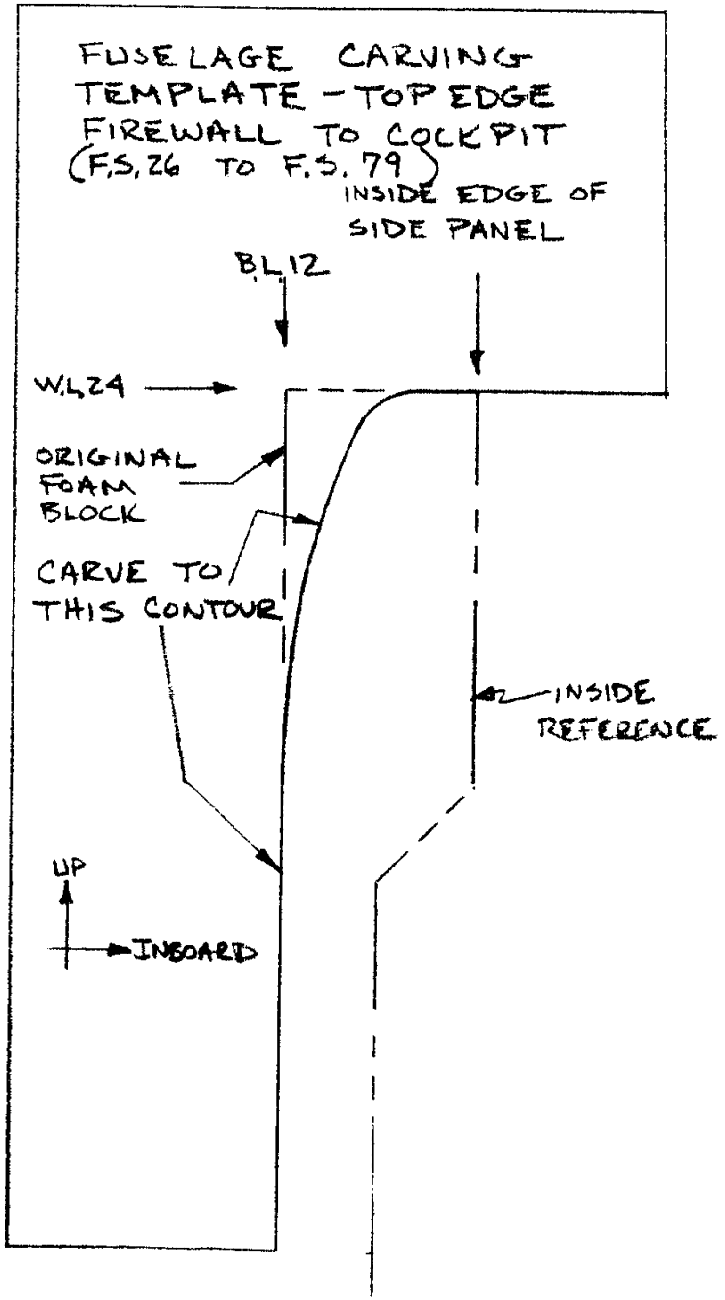


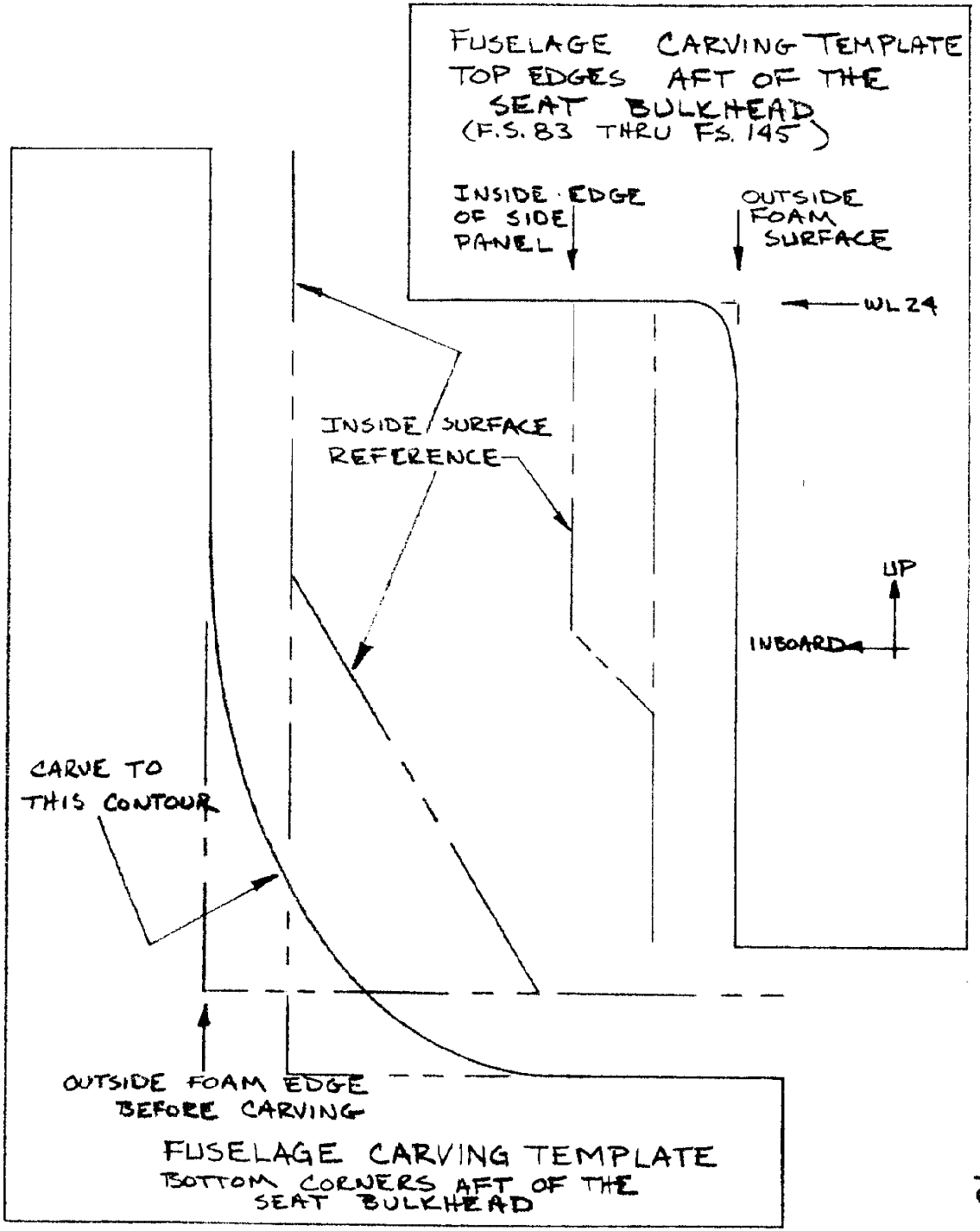
SKIN EXTENSION DETAIL
TYPICAL FRONT AND REAR





COCKPIT BOTTOM LIP BUILDUP


FUSELAGE CARVING TEMPLATE - TOP EDGE FIREWALL TO COCKPIT (F.S. 26 TO F.S. 79)
INSIDE EDGE OF SIDE PANEL
B.L. 12
W.L. 24
ORIGINAL FOAM BLOCK
CARVE TO THIS CONTOUR
INSIDE REFERENCE
UP
INBOARD


FUSELAGE CARVING TEMPLATE TOP EDGES AFT OF THE SEAT BULKHEAD (F.S. 83 THRU F.S. 145)
INSIDE EDGE OF SIDE PANEL
OUTSIDE FOAM SURFACE
W.L. 24
INSIDE SURFACE REFERENCE
UP
INBOARD
CARVE TO THIS CONTOUR
OUTSIDE FOAM EDGE BEFORE CARVING
FUSELAGE CARVING TEMPLATE BOTTOM CORNERS AFT OF THE SEAT BULKHEAD

firewall bulkhead and tail attach bulkheads (belly up position) or on the left side. Start with the right side up.

Before you start laminating get the basic mission straight with your help. You want to end up with 2 plies of glass from the right side top inside edge around to the tape (one inch left of center) on the bottom. Each ply of skin is UNI. The fibers of the first ply slant forward from top to bottom 45^0 to the top edge. The second ply fibers slant aft from top to bottom at 45^0 to the top edge. On top of the skins add two reinforcement patches over the canopy hinge attachments, 10 plies over the wing/gear insert, and one ply around the closeout bulkhead.

Fill the flox corner at the top edge from the tail attach bulkhead to the seat bulkhead. Slurry the back half of the foam surfaces. There is a lot of area to laminate so flox corner and slurry the surface in two segments. Lay up one inch peel ply strips over the extension (only the extension!) foam blocks and lip (bottom center) edges before the skins are layed up. Starting at the rear end lay up the first, forward slanting, section. The cloth can be held straight by your helpers while you determine proper fiber orientation, smooth the cloth over the side around the corner and onto the bottom. Scissor trim so that the cloth overlaps the tape slightly (0 to 1 inch). The length of the fuselage requires a minimum of 3 butt joints per ply to cover the length. Lay the first section up and wet the cloth completely before starting the second piece of cloth. If you can't manage to keep your cloth edges straight enough for good tight butt joints, don't panic. An overlap is a bit harder to finish but nothing important will be effected adversely.

Work your way to the front end in this fashion, then reverse the process and lay up the aft slanting second ply in the same way. On the right side add a staggered two ply 45^0 BID reinforcement over the canopy hinge inserts (one 4 x 5 1/2 and one 4 x 3 1/2). These plys wrap over the insert and bond to the inside glass surface. Lay up the 10 ply BID reinforcement over the wing/gear insert area as you did on the inside surface. Start with the largest pieces and end with the smallest, alternate $45^0$with $0\text{-}90^0$ plies. Add a one ply $0\text{-}90^0$ BID tape around the rear end. Peel ply the top edge and the bottom center along the joint. Knife trim the tape edge on bottom center and edges elsewhere. Cure 24 hours.

The left side is layed up exactly as was the right. Except for the reinforcements. The left side upper edge gets an extra 2 inch strip of BID from the seat bulkhead forward 30 inches to provide a bit of wear protection where you climb over the side. A one ply BID patch (2 in. x 2 in.) is added over the step location on the side. The canopy hinge reinforcement isn't required for the left side lay up.

After the last lay up has cured 24 hours, remove the foam extension blocks from the forward and aft ends of the fuselage. Remove the peel ply from the skins inside surface and the adjoining bulkheads, lay up a two ply 45^0 BID corner tape on both ends. Carve foam away from the lip on the bottom hole (see sketch on page 94) to form a one inch glass lip all around the hole. Remove peel ply from the lip adjoining bulkheads and side panels. Sand as required for bonding and then lay up a two ply joint tape all around using the woven $0\text{-}90^0$ BID tape (2 inches wide).

Make a cover plate for the tailcone access hole from .020 thick 2024-T3 aluminum. Drill six evenly spaced #21 holes around the edges for AN526-832R-6 screws. Install six K1000-08 nutplates to the inside of the lip around the hole (12 ea. AN426A-3-3 rivets required).