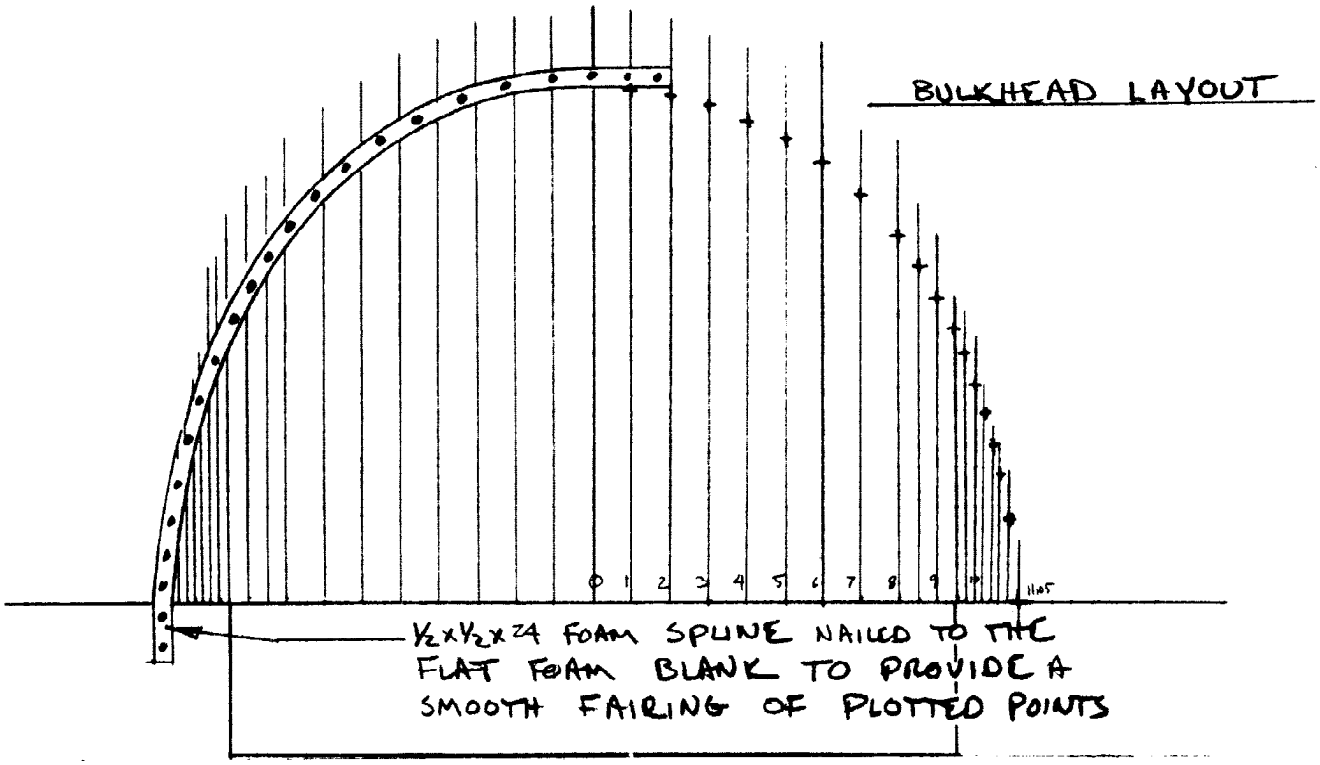
The Turtle Deck and Rear Fuel Tank

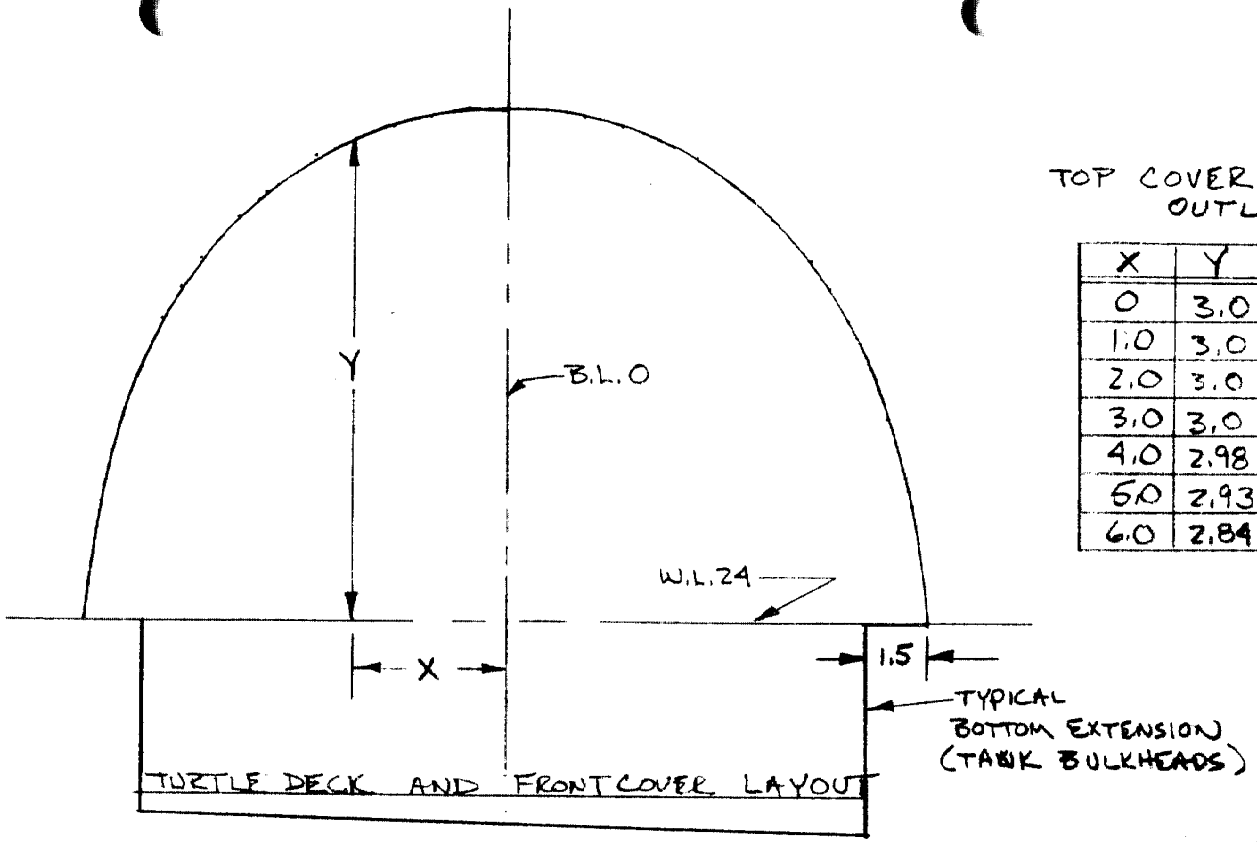
The turtle deck is composed of two sections. The aft section is simply a fairing to give the aft fuselage a reasonable shape. The forward 12 inches of the turtle deck is a fuel tank as well as your roll over structure. We will hotwire cut the aft section from 2 lbs/ft^3 styrofoam and build the forward tank area up from 6 lb/ft^3 PVC bulkheads and 2 lb/ft^3 polyurethane foam side cores.

Start by marking out the canopy bulkhead (2 lb/ft^3 styrofoam), forward turtle deck bulkhead (6 lb/ft^3 P.V.C.) on flat stock using the dimensions shown on the following page. Lay out all of the points given in bold marker and then use a 1/2 x 1/2 x 24 styrofoam strip to fair the points into a smooth curve as shown below.



Each of the two tank bulkheads gets a trapezoidal extension on its bottom edge (W.L. 24). As shown on the preceding page, the extensions start 1.5 inches inside the contour at W.L. 24. The front bulkhead is extended 4 1/2 inches on the right side and 5 1/2 on the left (to assure proper drainage). The aft bulkhead is extended 3 1/2 on the right and 4 1/2 on the left. This will give a tank bottom which slopes forward and toward the left side as the front tank does.

Store the blue styrofoam bulkhead away for the time being. Take the rear fuel tank bulkhead and locate it on your fuselage top edges fore and aft until the front edges of the bulkhead align with the outside contour of the side panels. This should be near F.S. 94, but variations in the plan view contour of your airplane may require it to be aft of F.S. 94. Rather than limit your fuel capacity by moving the bulkhead forward of F.S. 94, carve the edges down to match the fuselage.



TOP COVER HOTWIRE OUTLINE (FS 50)

X	Y	X	Y
0	3.0	7.0	2.69
1.0	3.0	8.0	2.45
2.0	3.0	9.0	2.11
3.0	3.0	10.0	1.57
4.0	2.98	11.0	0.75
5.0	2.93	11.25	0.42
6.0	2.84	11.50	0

FRONT TURTLEDECK AND AFT CANOPY BULKHEADS

X	Y	X	Y
0	13.50	9.0	7.95
1.0	13.48	9.5	6.85
2.0	13.32	9.75	6.15
3.0	13.04	10.0	5.40
4.0	12.65	10.2	4.80
5.0	12.13	10.4	4.05
6.0	11.47	10.6	3.13
7.0	10.60	10.8	2.10
8.0	9.50	11.05	0
8.5	8.80		

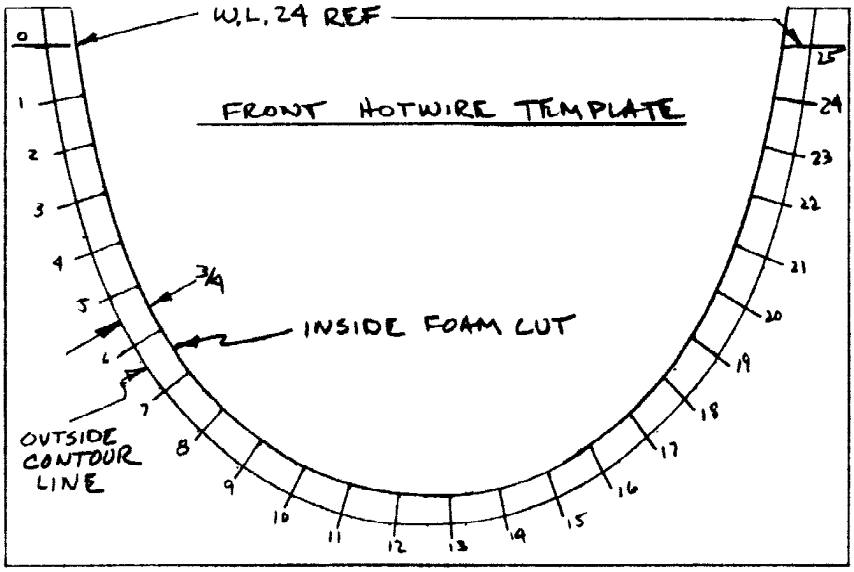
REAR FUEL TANK BULKHEAD AND FWD TURTLEDECK HOTWIRE OUTLINE (FS 94)

X	Y	X	Y
0	12.53	8.0	7.40
1.0	12.48	8.5	6.38
2.0	12.28	8.75	5.73
3.0	11.96	9.0	5.00
4.0	11.48	9.2	4.45
5.0	10.85	9.4	3.73
6.0	10.04	9.6	2.86
7.0	8.93	9.8	1.75
7.5	8.23	9.95	0

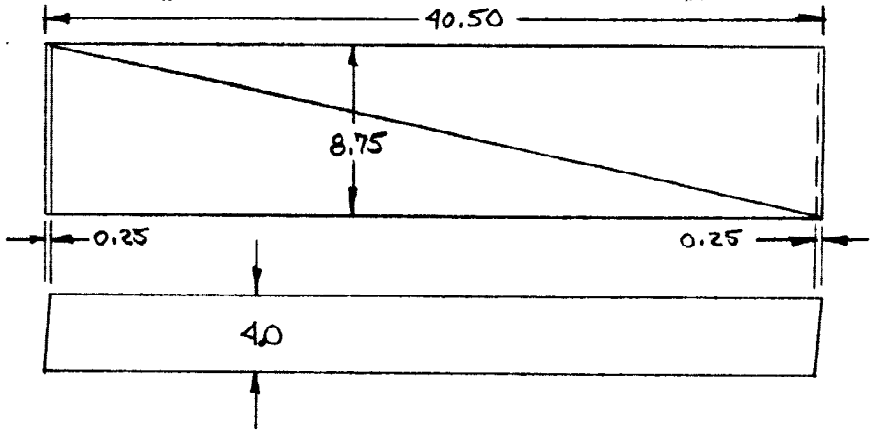
TAIL ATTACH BULKHEAD TOP CONTOUR AND AFT TURTLEDECK HOT WIRE TEMPLATE

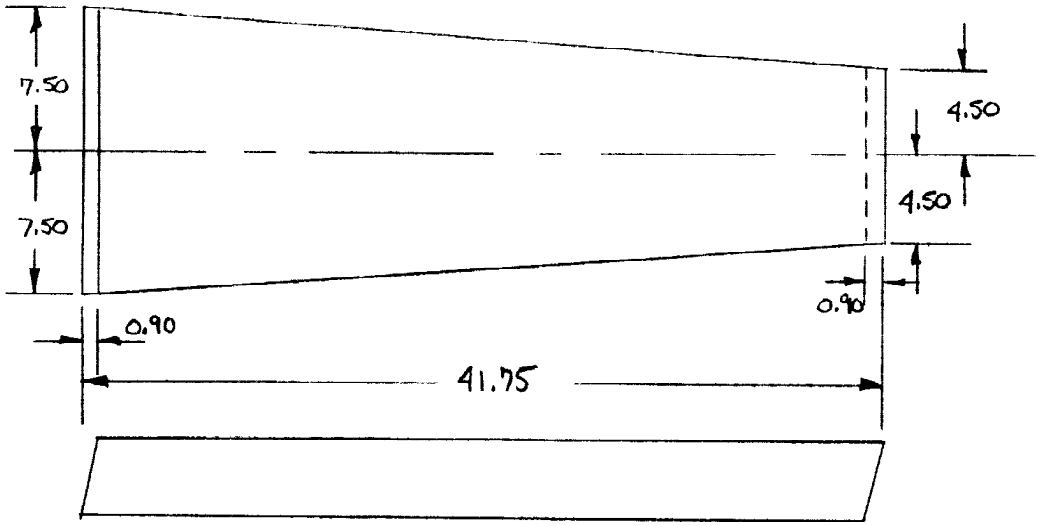
X	Y	X	Y
0	2.60	3.5	1.82
1.0	2.55	4.0	1.40
2.0	2.42	4.25	1.05
2.5	2.29	4.50	0
3.0	2.10		

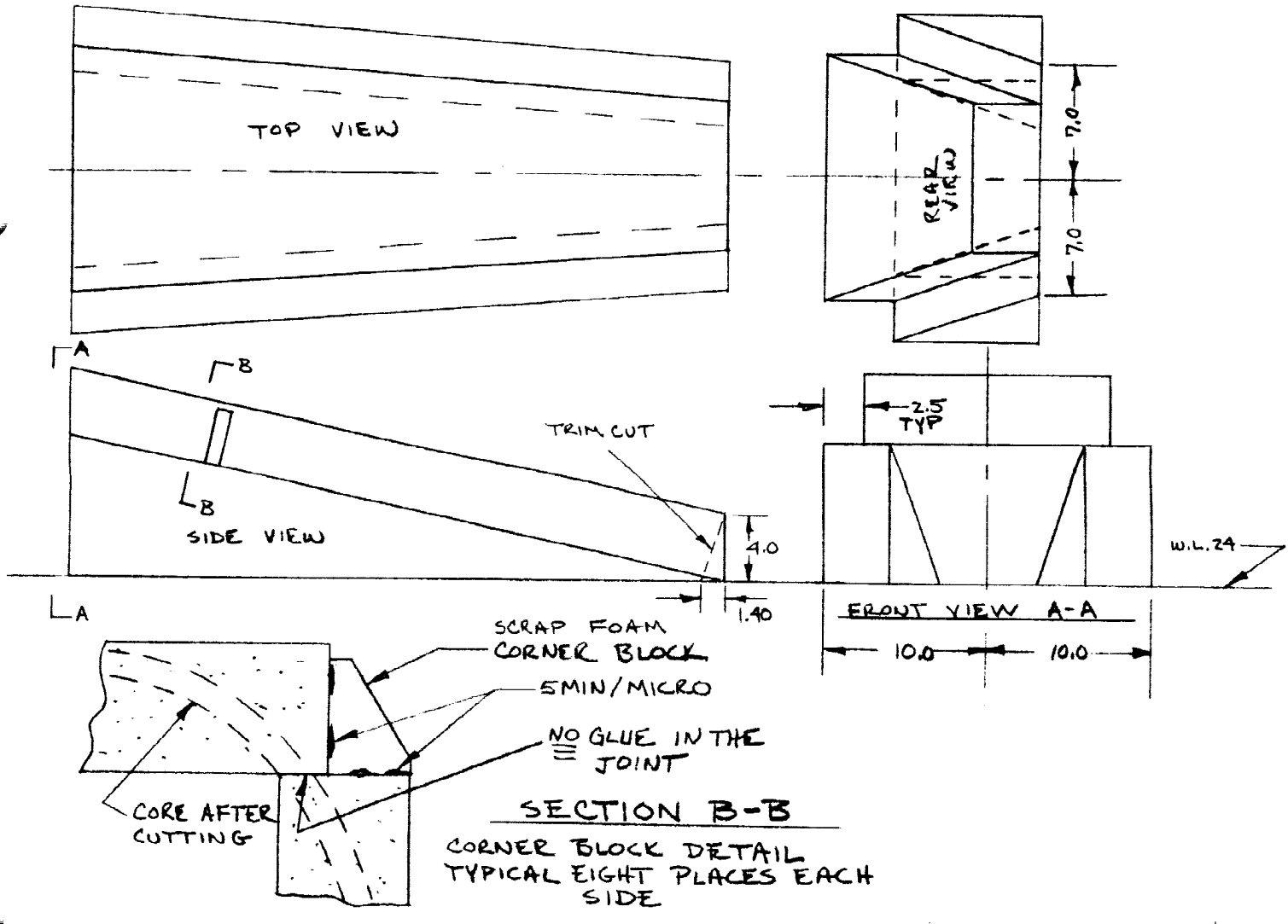
With the aft tank bulkhead in position measure the distance down aircraft centerline to the top forward edge of the tail attach bulkhead and record. This distance becomes the length of your foam blank to hotwire the aft core a few steps later. Mark the bulkhead's location on the side panels for reference later. Go lay out the two turtle deck hotwire templates shown on the preceding page. You can use your aft tank bulkhead for a pattern for the forward template. Don't cut the outside contour yet. Mark another line on your masonite which is 3/4 inch inside the layout as shown in the sketch below. Don't belabor the contour, nobody will ever see it but you. Cut the templates along the inside lines and smooth up the edges. Mark the two templates for about twenty-five evenly spaced"talking numbers" around the contour (roughly 1/2 inch spacing on the rear template and about 1.4 inch spacing on the front template.



Now drag out a 4 inch thick block of styrofoam (blue). Cut it up into the blocks shown below. Start by cutting out a rectangular 40.5 x 8.75 chunk. Then trim cut the end faces with a 0.25 bevel. Last cut the block diagonally to make two triangular blocks. Set these aside for a moment. Cut a trapezoidal block 41.75 inches long as shown below. Trim cut the 0.9 inch bevel on each end. Now assemble these blocks into the turtle deck block shown below. Use foam scraps to join the blocks securely as shown in the detail sketch. Don't get 5 min in the corners.







SECTION B-B

CORNER BLOCK DETAIL
TYPICAL EIGHT PLACES EACH SIDE

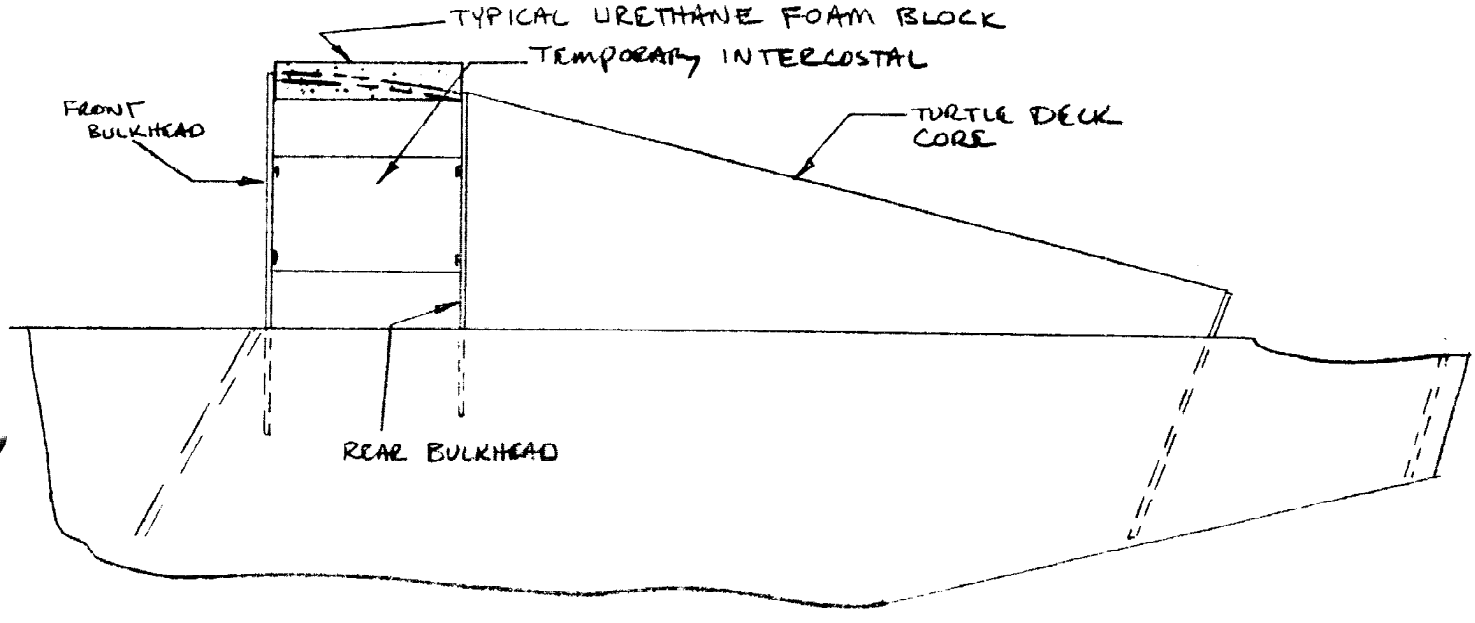
Make a trim cut on the rear end of the core block to set the slant angle of the tail attach bulkhead. Align hotwire template waterline 24 marks with the bottom edges of the foam and nail into position. Center each template on the core block and mark their outlines with bold marker lines. Invert the core block and hotwire cut the inside surface.

Fit the core block over the fuselage. Center the core properly on the fuselage assembly and anchor it temporarily. Sand the inside edges of the core for a smooth transition to the inside edges of the side panels. Remove the core block and lay up one ply of 0-90^{0} BID over the whole inside surface. Add one ply of 2 inch wide 0-90^{0} BID tape over the edges at each end and down the sides. Knife trim and cure 24 hours. While the lay up cures get your hotwire templates and cut them out to the outside contour lines.

After the cure reattach the hotwire templates to the core block in the same locations as for the inside cut. Cut the outside contour. Prepare a flox corner along all of the edges of the inside lay up with oneexception. No flox at the top of the tail attach bulkhead where the vertical stabilizer spar mates to the bulkhead (1.5 inches either side of B.L.O.). Remove the peel ply from the tail attach bulkhead (if any) and the inside and outside of the side panel top edges. Sand as required and bond the turtle deck core to the fuselage assembly and tail attach bulkhead. Cure.

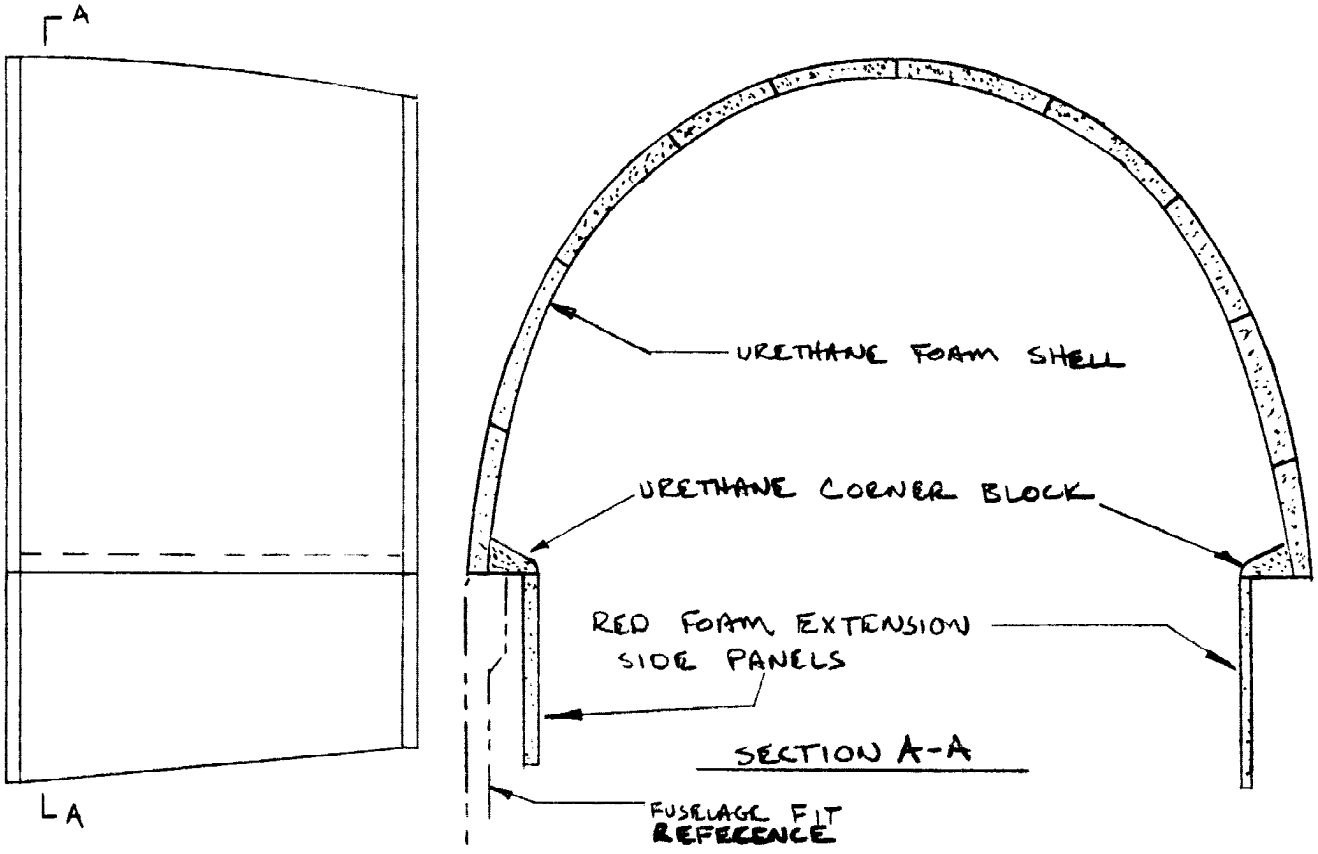
While the turtle deck is curing you can lay up the fuel tank bulkheads. Dig through your glass scraps and find enough UNI material to lay up two plies of UNI over the bulkheads which cross B.L.O. at plus and minus 30 degrees. In addition, lay up a single UNI ply parallel to B.L.O. on the front bulkhead. Peel ply the edges all around with 2 inch wide peel ply. The inside (aft face) of the forward tank bulkhead also gets a strip of peel ply diagonally from the top center to the bottom left corner. Make the inside surfaces of the tank bulkheads very wet lay ups. Knife trim, cure, flip and repeat on the other sides.

Prop the aft tank bulkhead in position on the fuselage against the front face of the styrofoam turtle deck. Position the forward tank bulkhead on the fuselage assembly against the aft top edge of the seat bulkhead. A temporary masonite intercostal can be used to fixture the two bulkheads to each other using 5 min/micro dabs. Remove the peel ply from the inside edges of the fuel tank bulkheads. Fill in the space between the front and rear bulkheads with 2 inch thick urethane foam blocks (2 lb/ft^{3} upjohn CPR type foam). The urethane blocks should allow enough material to shape the compound curve of the tanks outside shape and leave a 1/2 inch thick core for the tank's wall.



Piece the urethane blocks together using 5 min/micro to bond the blocks to the bulkheads. Try to confine your 5 min to within 1/2 inch of bulkhead edge. Once all of the blocks are in place and the last gap filled you can start shaping the outside contour. The styrofoam turtle deck core will require some shaping at the fuselage sides and tail attach bulkhead also.

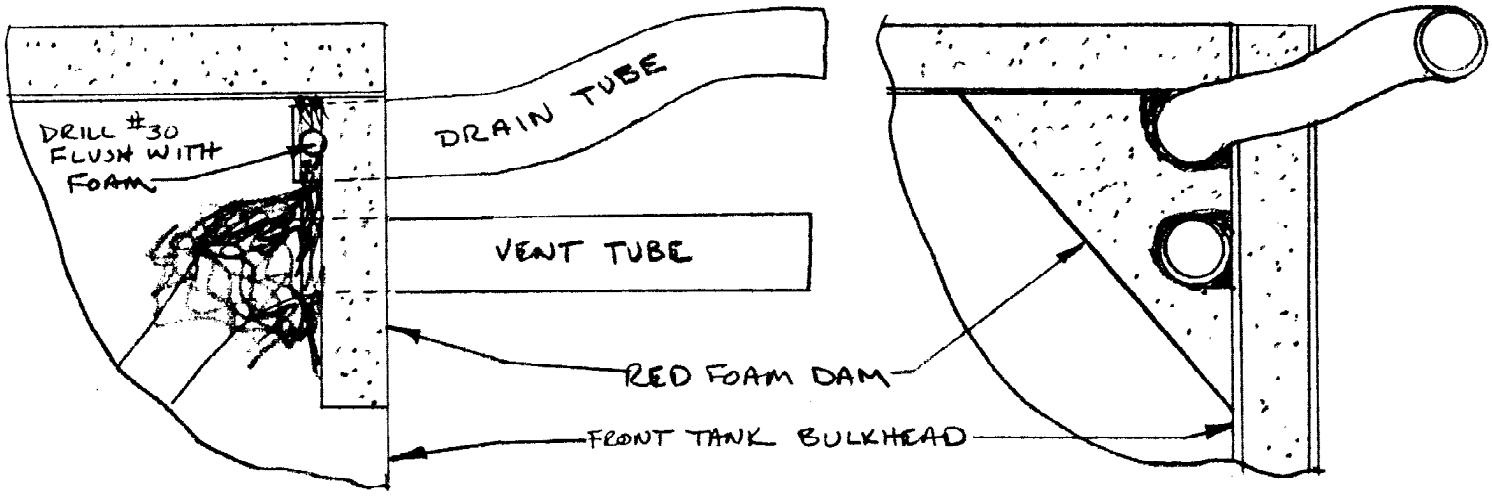
Once you have the outside shaped to your satisfaction, carefully remove the two bulkheads and the attaching urethane foam from the fuselage. Carefully carve and sand the inside of the foam blocks to a reasonable approximation of a uniform 1/2 inch thick core. Sand away any 5 min/micro blobs that went astray. Add a urethane foam block to the corners over lapping the side panels as shown in the sketch. Also add 9mm 6 lb/ft^3 PVC side panels to the bulkhead extensions.



Go cut two pieces of 3/8 O.D. soft aluminum tubing, one 23 inches long and one 4 inches long, brighten them both for bonding. Cut four pieces of 45^0 BID 13 x 26 inches and two 2 x 12 strips of peel ply. Slurry the inside foam surfaces thoroughly and lay up two plies of BID over the inside foam surfaces overlapping at least one inch onto the fulkheads fore and aft. Peel ply the bottom edges. Flip the tank up on the front bulkhead and lay the long piece of tubing diagonally from the top center of the bulkhead to the lower left hand corner. Pot the tube securely with wet micro and add a short glass patch over the tube and micro near the top and again near the bottom. The top end of the tube should be about 1/4 inch below the top of the tank. Also pot the short piece of tubing into the lower left corner so that the mouth of the tube is sticking up into the tank about 1/2 inch only. Make sure that the potting material is reasonably smooth near the bottom of the tank. It will be sanded for bonding later on and a rough surface is more difficult. Knife trim and cure.

Make a bottom panel for the fuel tank from 9mm (.35 inch) 6 lb/ft^3 PVC foam. The bottom panel should simply plop down over the bottom of the tank. Cut out the corner for a tight fit around the two aluminum tubes. True up the bottom edges of the tank so that the bottom panel fits well without any big gaps. Glass the inside surface of the bottom panel with two plies of BID. Use scraps if possible, overlapping where necessary to obtain full coverage, peel ply the edges. Knife trim and cure.

After curing the inside lay up, flip the panel over and sand a generous radius on all of the foam edges. Prepare a dam of 6 lb/ft^3 foam in the corner around the aluminum tubes as shown in the sketch. Sand the corners and potting material around the tubes dull for bonding, remove all remaining peel ply from inside of the tank, bond the foam dam to the corner and tubes with 5 min/flox. Drill the fuel outlet tube as shown in the sketch to assure that the last drop of fuel is able to drain.



Prepare a flox corner to the inside skins of the fuel tank all around the bottom edge. Remove the peel ply from the bottom panel. Mix wet flox and load the bottom tank edges with a good bead of flox all around and on the dam around the vent and drain tubes. Paint the edges of the bottom panel with epoxy and squash it into position. Clean off any squeeze-out and allow it to cure.

Round the corners and foam edges of the bottom panel. Remove the peel ply from the bulkhead faces fore and aft. Cut two pieces of 45^0 BID 13 x 33. Prepare flox corners along the extension side edges of both bulkheads and along the 1.5 inch wide mounting ledge of each bulkhead. Lay up two plies of 45^0 BID over the tank bottom, the extension side panels and the W.L. 24 mounting ledge. Overlap the glass onto the front and rear bulkheads at the bottom edges only the extension sides and the mounting ledge get flox corners. Peel ply the mounting ledge. Knife trim carefully along the outside contour at W.L. 24 and along the ledge and extension sides. Cure.

Make sure that you have notched the seat bulkhead adequately to install your shoulder harness before bonding the rear tank in place. The shoulder harness end fittings are bolted to the back side of the seat bulkhead and the straps go up and over the top edge before coming forward. The aft fuel tank butts up against the top rear edge of the bulkhead turning these notches in the seat into slots.

Fit check the fuel tank assembly to the fuselage, clear any interference, and then remove. Remove the peel ply from the top edge of the seat bulkhead, the tank mounting ledge, and the sides of the fuselage. Sand any glossy areas dull for bonding. Prep the front edge of the turtle deck's inside glass skin for a flox corner. Remove any remaining peel ply from the fuel tank bulkheads and sand a strip along the front tank bulkhead where it mates to the seat bulkhead for bonding. Mix flox and spread a generous bead along the fuselage side panel top edges and load the flox corner around the turtle deck edge. Paint a coat of epoxy on the mating fuel tank surfaces and squash the tank into position. Clean off any squeeze-out. Wipe a small flox radius into the corner formed by the tank and the seat bulkhead then lay up 2 ply BID tape in the corner (except over the slots for your harness). Cure.

Cut out a hole in the aft edge of the turtle deck to allow the vertical stabilizer spar to pass through (approximately 3 x 1 centered on B.L.O.). Sand any areas of the fuselage side (top two inches) dull that have been exposed to flox squeeze-out or other contaminates. Final check your shaping job for defects, then cut glass for the turtle deck and tank outside skin lay up. Cut two full width pieces of UNI 70 inches long and one piece of 0^{o} UNI 10 inches wide and 44 long. Prepare flox corners around both fuel tank bulkheads to both bulkhead skins and along the exposed edges of the tail attach bulkhead. Protect the fuselage side panels from over slop and runs with tape and newsprint below the overlap area. The side panels should be prepared for a one inch overlap of the turtle deck and fuel tank skins.

Lay up one ply of UNI over the fuel tank and bulkheads which has its fibers parallel to the bulkhead faces (10 x 44) overlap the fuselage sides one inch.

Next lay up two plies of UNI over the whole turtle deck each of which is oriented at 45^{o} to the aircraft centerline (one left and one right) to provide two crossing skin plies. Knife trim the tape edges on both sides as well as the front tank bulkhead, tail attach bulkhead and vertical stab spar hole. Cure.

Leak check your aft tank using your altimeter as you did the front tank.