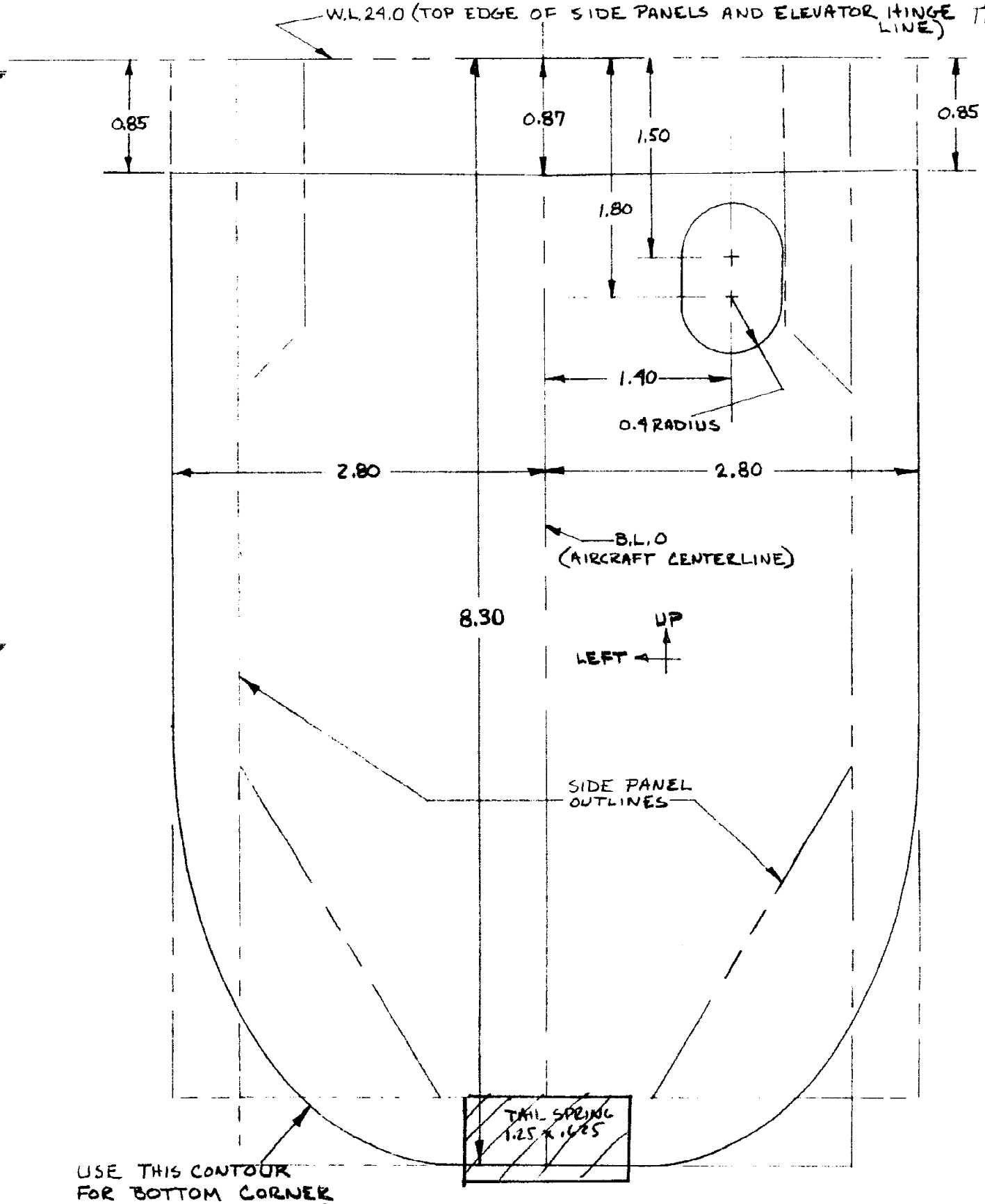
Fuselage Bulkheads

The Adventure fuselage has four bulkheads. Each bulkhead is basically a flat slab of core material with a glass cloth/epoxy skin on both sides. There are inserts buried in the foam and places where the skins (sometimes called facings or face plies) come together.

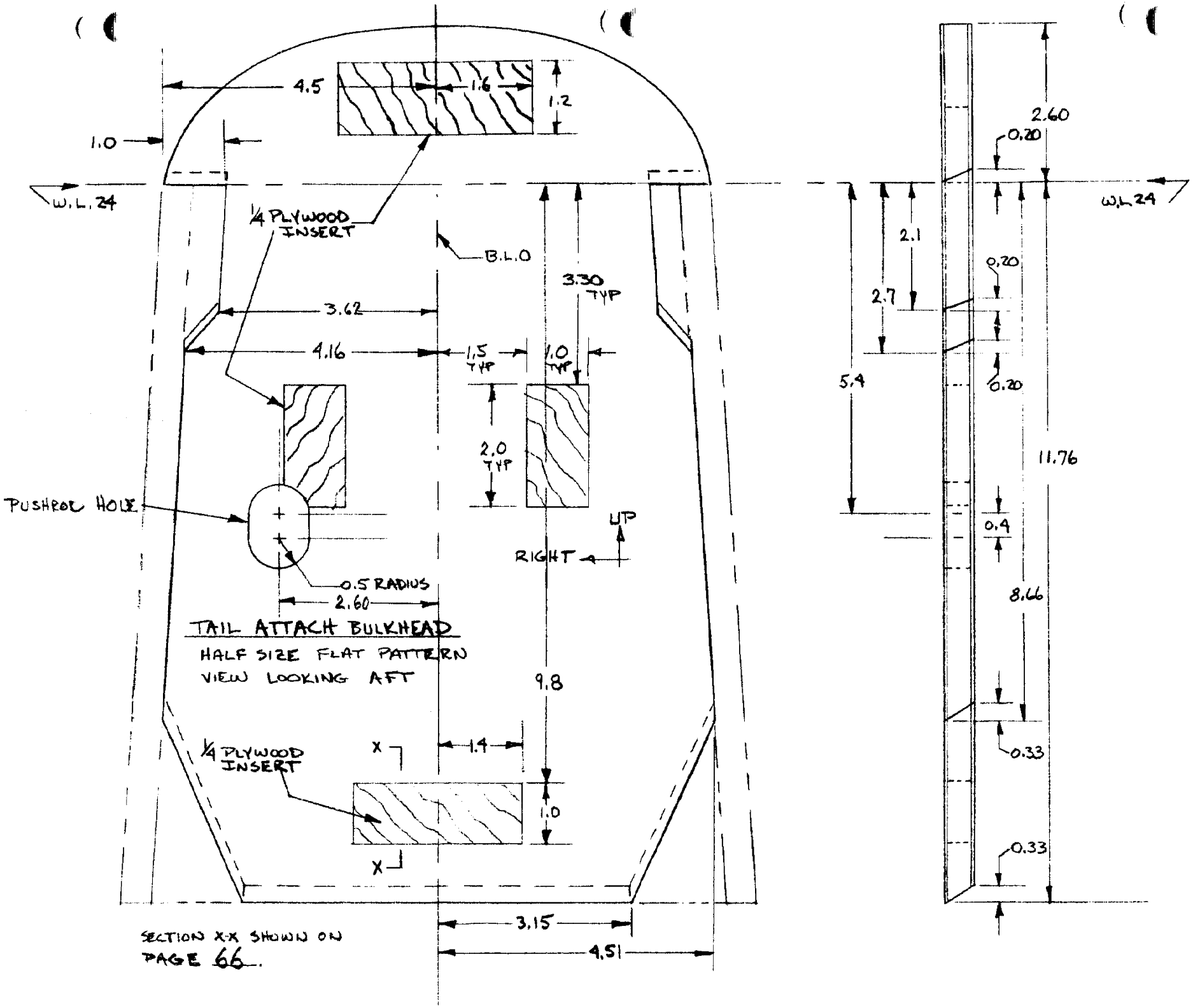
Start the bulkheads by making the small bulkhead which closes out the tail end of the airplane. The aft closeout bulkhead starts out as a 5.8 inch wide, 7.45 inch long piece of quarter inch thick marine grade plywood (aircraft plywood is OK, just more expensive). Mark the B.L. (Butt Line) 0 centerline on the plywood with a bold marker for future reference. Mark and cut the outline shown on page 62. And cut out the elevator pushrod hole. Use some care along the top edge, the dip in the center is intended to match the horizontal stabilizer. Notice the phantom lines (_____ _ _ _____ _ _). These are used to show the position of the fuselage side panels on the bulkhead for the assembly of the fuselage. Lightly sand the surface of the plywood to remove any dirt or grease before laminating. Cut 4 each 7X8 inch pieces of 45^0 BID, 4 each 7X8 inch pieces of $0\text{-}90^0$ BID, and 4 strips of 4 inch wide peel ply 6 inches long. Lay up one side of the closeout bulkhead with alternating 45^0 BID, $0\text{-}90^0$ BID, 45^0 BID, $0\text{-}90^0$ BID plies to a total of four plies (2 ea. 45^0 and 2 ea. $0\text{-}90^0$) on one side. Peel ply the whole bulkhead. Knife trim the edges and the hole. Cure until tack free (won't stick to your table). Flip over and glass the other side similarly.

Start the tail attach bulkhead (page 63) with a 14.5 X 9.5 inch piece of 3/8 thick slab of 6 lb/ft^3 foam. Cut to shape as shown on page 63, then make rectangular holes in the foam to accomodate the four plywood inserts. Cut four plywood inserts from ¼ marine plywood (sizes shown on page 63) and bond them into the foam with 5 minute epoxy and microsphere mixture. The inserts should be centered in the thicker foam (1/16 in from each face) and all squeezeout should be removed around the inserts. Mark the edges on the front side of the bulkhead shown (half size) on page 63 and the top contour as shown on page 122. Cut the bulkhead core out using the front face markings, then mark the backside for the chamfered edges, using the front face cuts for reference. Use a coarse file to chamfer the edges. Note that in one place on each side you have to cut to a back side dimension for the chamfer to work properly. Refer to the Section X-X on page 66 and sand the foam core to obtain a smooth transition around each plywood insert from foam to plywood. Cut out the pushrod hole. Cut eight plies of 45^0 BID 10 X 15 inches and eight pieces of BID the size of each plywood insert. Cut four strips of 4 inch wide peel ply 15 inches long and six pieces about 2 inches long. Lay up four plies of 45^0 BID covering the whole bulkhead face and then add four patches over each insert. The patches should each be slightly larger as they get closer to the surface (by ¼ inch on each edge) to fill the tapered depression.



AFT CLOSEOUT BULKHEAD

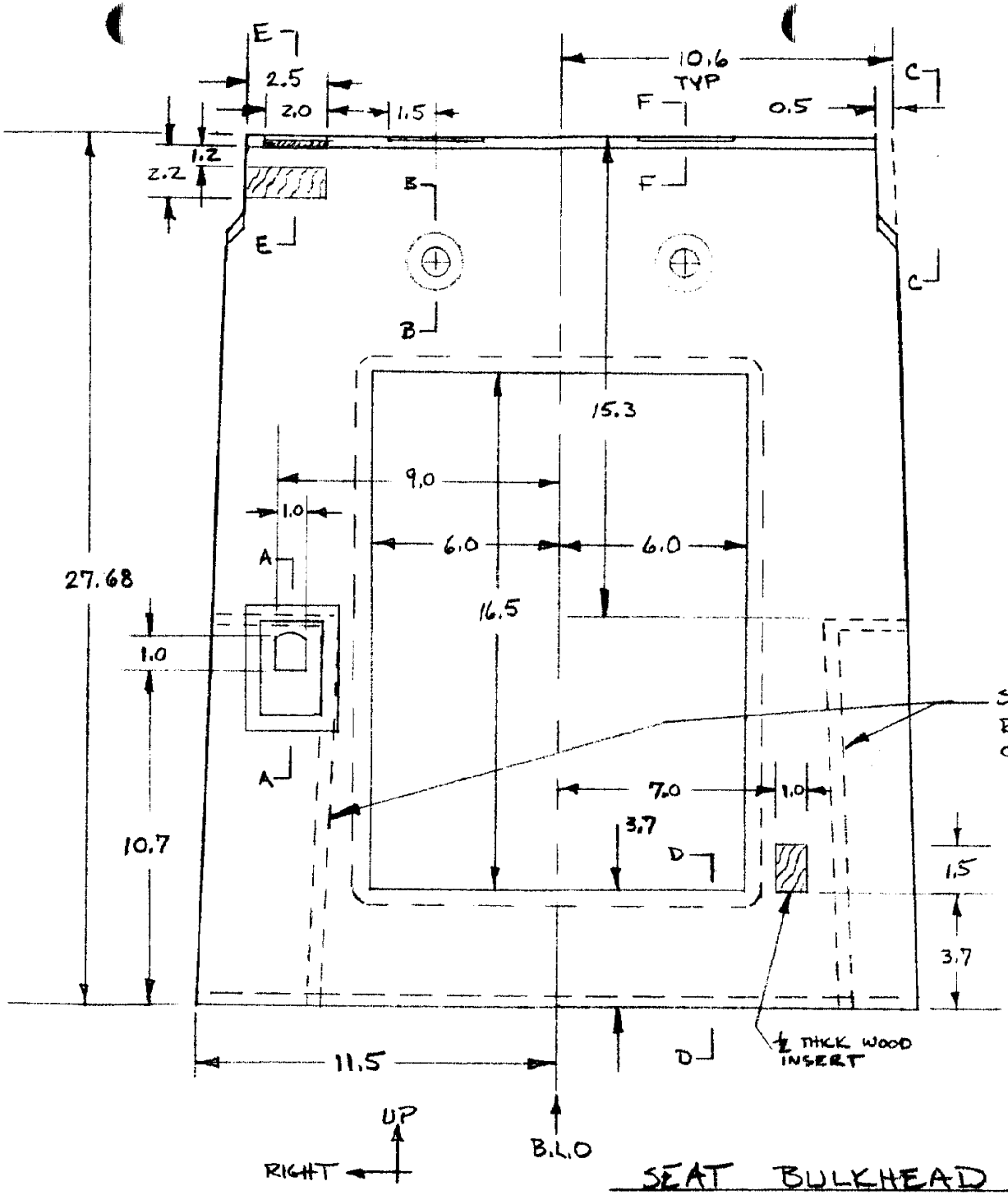
FULL SIZE (LOOKING FORWARD)
1/4 PLYWOOD CORE WITH FOUR PLY BID FACINGS (2ea 45° BID, 2ea 0-90° BID EACH SIDE)


4.5
1.6
1.2
1.0
W.L. 24
¼ PLYWOOD INSERT
B.L.0
3.30 TYP
3.62
4.16
1.5 TYP
1.0 TYP
2.0 TYP
PUSHROD HOLE
UP
RIGHT
0.5 RADIUS
2.60
TAIL ATTACH BULKHEAD
HALF SIZE FLAT PATTERN
VIEW LOOKING AFT
9.8
¼ PLYWOOD INSERT
X
1.4
1.0
X
3.15
4.51
SECTION X-X SHOWN ON PAGE 66.
2.60
0.20
W.L 24
2.1
0.20
2.7
5.4
0.20
11.76
0.4
8.66
0.33
0.33

first skin lay up cures. Repeat the glassing on the other side.

TheSeat bulkhead is next. The seat bulkhead foam core is blue styrofoam, 1/2 inch thick. Start by marking the B.L.O. centerline on a slab of foam, then draw the bulkhead's outlines using the dimensions and data from the drawing on page 65 . Mark the locations shown for the canopy retainer inserts (upper right), shoulder harness attachments (high center), elevator pushrod hole and belcrank mount area (middle right) and the step mounting insert (lower left). Cut the chamfers on top and bottom edges (sections D-D and E-E). Notch the top corners (section C-C). Cut out the 16 1/2x12 center hole, the 3x2 plug from the elevator pushrod hole area, the 1x2 1/2 plug for the retainer insert, and the 1x1 1/2 step insert plug. Bore two one inch diameter holes at the shoulder harness attach locations and sand a smooth transition to the front side of the bulkhead (see section B-B). Sand a smooth transition around the pushrod hole area (see section A-A). Locate, brighten and bond the 1/2x3/16x2 aluminum insert into the top edge as shown on page 65 and in section E-E. Cut a 1x2 1/2 chunk of 1/2 inch thick lumber (any kind) for the canopy retainer insert and bond in place using 5 min/micro. Do the same for the 1x1 1/2 step mounting insert. Cover some thin cardboard with masking tape (3 pieces:1-4x3 in. and 2-2x2 inches). Wax the masking tape with car pastewax and allow to dry. Locate the waxed surface over the back side of the 3x2 and two 1 in. diameter holes and tape securely in place. Lay the bulkhead core front face up on your work bench for laminating and go cut cloth. Cut two 40 inch long 37 inch wide pieces of 0° UNI for the basic skins. Cut six 2x2 BID patches for the shoulder harness attach beef up and two 2x3 BID patches to reinforce the step attachment. Cut one 3x2 inch and two one inch diameter peel ply patches for the shoulder harness and elevator pushrod hole areas. Cut two 30 inch strips and two 24 inch strips of 2 inch wide peel ply for the edges of the bulkhead. Cut two 16 1/2 inch long and two 12 inch long strips of 1/2 inch wide peel ply for the edges of the center hole. And finally, cut two 11 inch, one 5 inch, and one 3 1/2 inch long strips of two inch wide peel ply for the side console joint areas shown on page A-10. Slurry the foam, lay up the peel ply strips along the edges of the center hole, lay up the peel ply patches in the shoulder harness attach holes (over the waxed and taped cardboard), and in the elevator pushrod area. Lay up one ply of UNI diagonally from top right to bottom left being careful to work the cloth into the foam depressions. Lay up the second UNI skin ply from top left to bottom right. Add 3 plies of BID over each harness attach area and two plies BID locally over the step insert. Peel ply the edges of the bulkhead and over the side console joint areas. Note that the glass is layed up around the top champfer to the top of the rear surface but that the sides of the bulkhead remain bare foam, knife trim and cure 24 hrs.

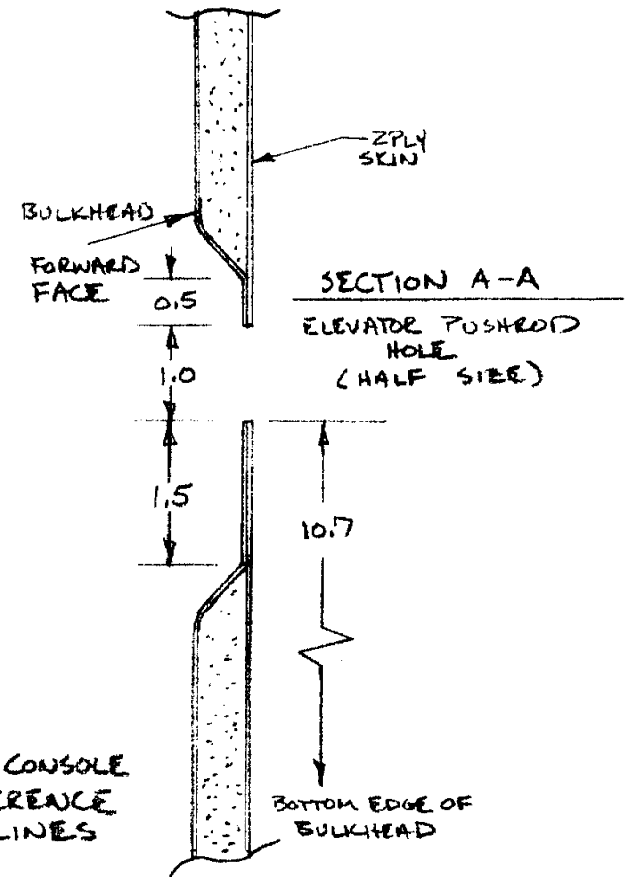
Remove the cardboard and tape from the back side of the bulkhead. Remove the peel ply from the harness attach and pushrod areas. Sand or carve away the first 1/2 inch of foam from the edges of the center hole to expose the front side glass skin. Sand a smooth transition from the front skins to the back side foam surface (see section D-D). Remove the peel ply strips from the exposed front skins around the hole. Prepare a flox corner along the top and bottom edges. Be sure to make the corners large in the two locations on the top edge where the harness notches will be carved later (section F-F). Cut two 30 inch long 37 wide



SEAT BULKHEAD

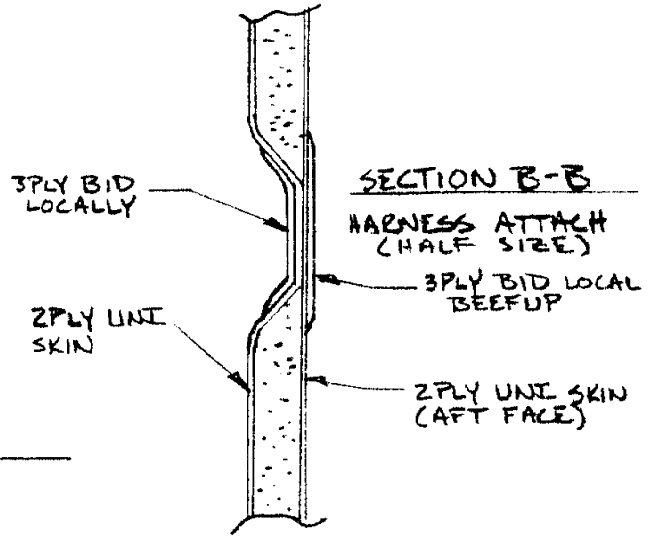
SCALE 1 INCH = 5 INCHES

(VIEW LOOKING AFT)



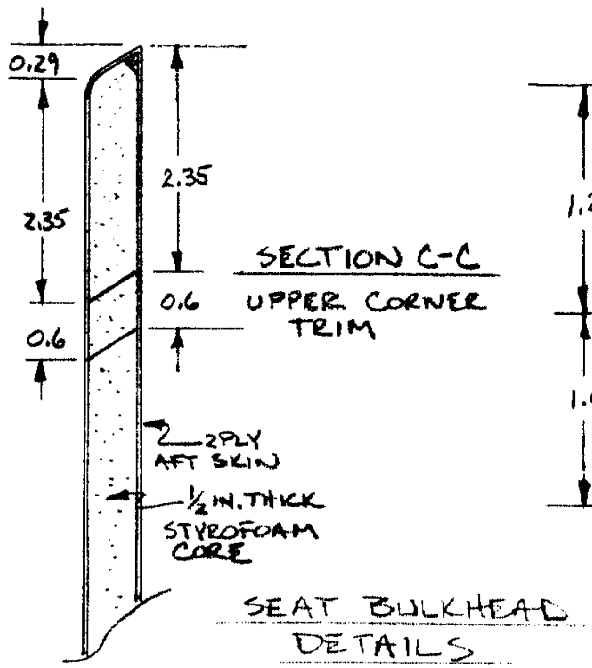
SECTION A-A

ELEVATOR PUSHROD HOLE (HALF SIZE)



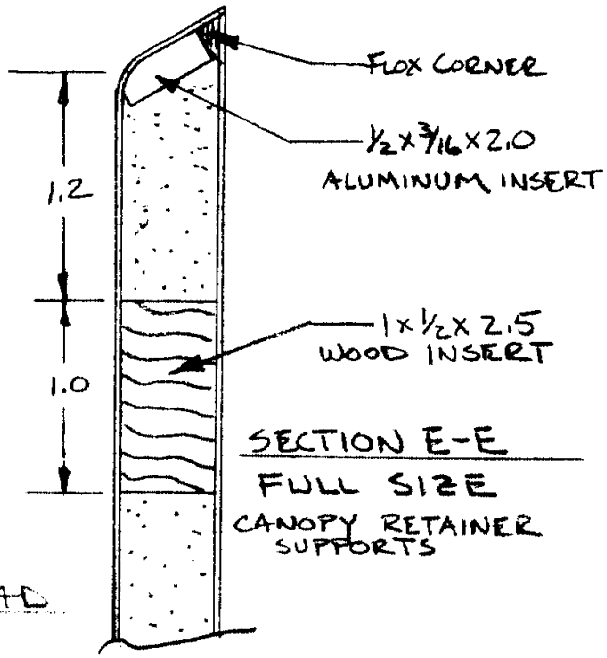
SECTION B-B

HARNESS ATTACH (HALF SIZE)

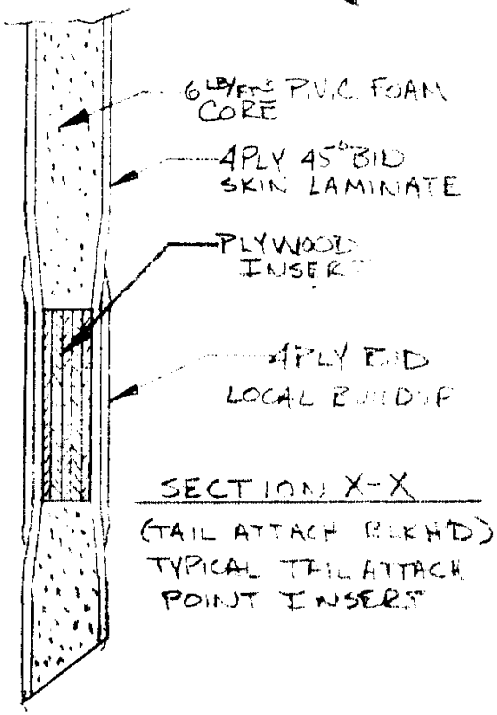


SECTION C-C
UPPER CORNER TRIM

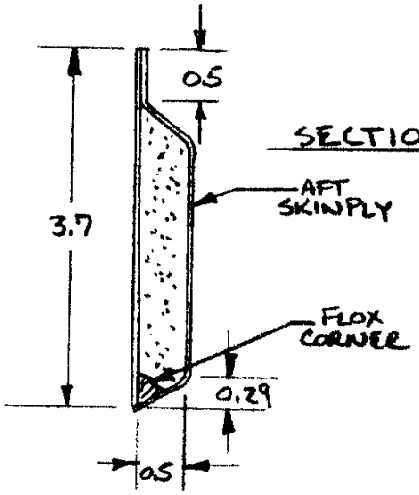
SEAT BULKHEAD DETAILS



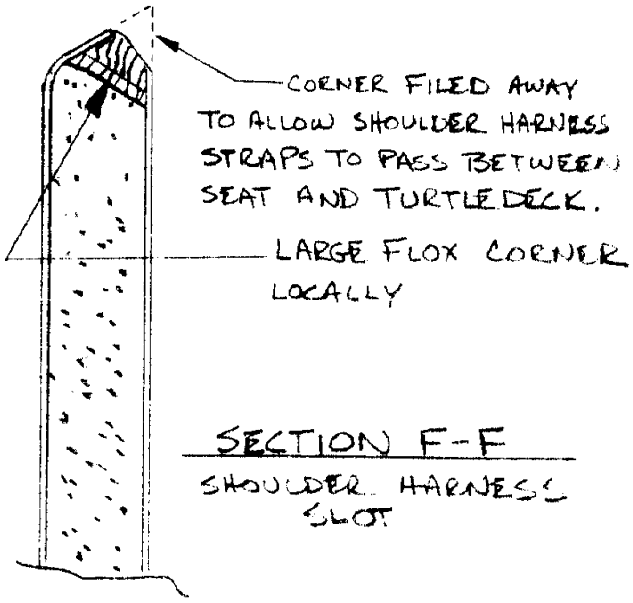
SECTION E-E
FULL SIZE
CANOPY RETAINER SUPPORTS



SECTION X-X
(TAIL ATTACH BULKHD)
TYPICAL TAIL ATTACH POINT INSERT



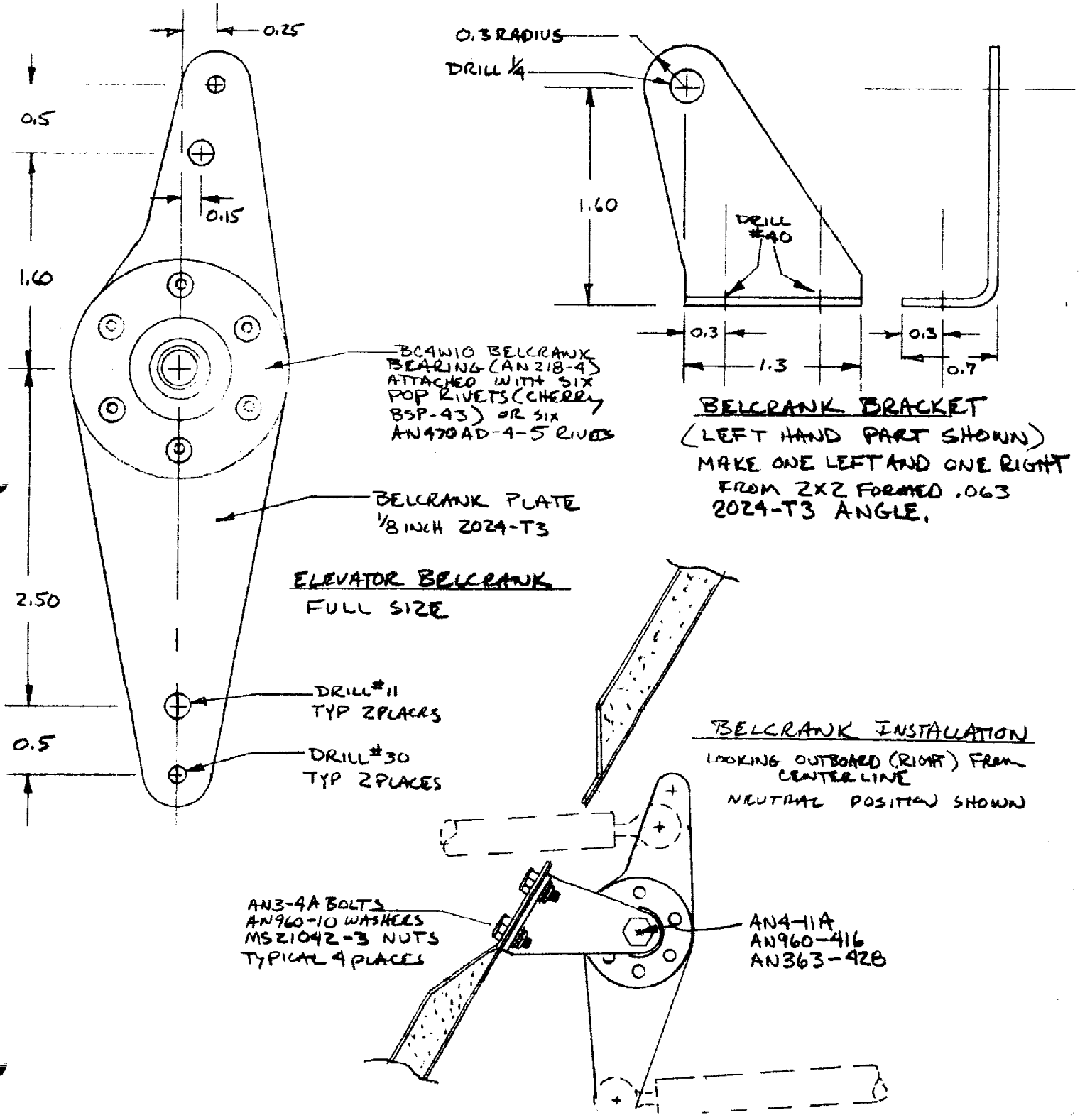
SECTION D-D



SECTION F-F
SHOULDER HARNESS SLOT

pieces of 0° UNI, six 2x2 BID patches, and two 2x3 BID patches. Cut two 30 inch and two 24 inch strips of 2 inch wide peel ply. Lay up as before but peel plying the bulkhead sides, top, and bottom edges only. Knife trim and curve.

After curing, cut out the elevator pushrod hole. Make the elevator belcrank and brackets shown below. Locate and install as shown in the sketches.

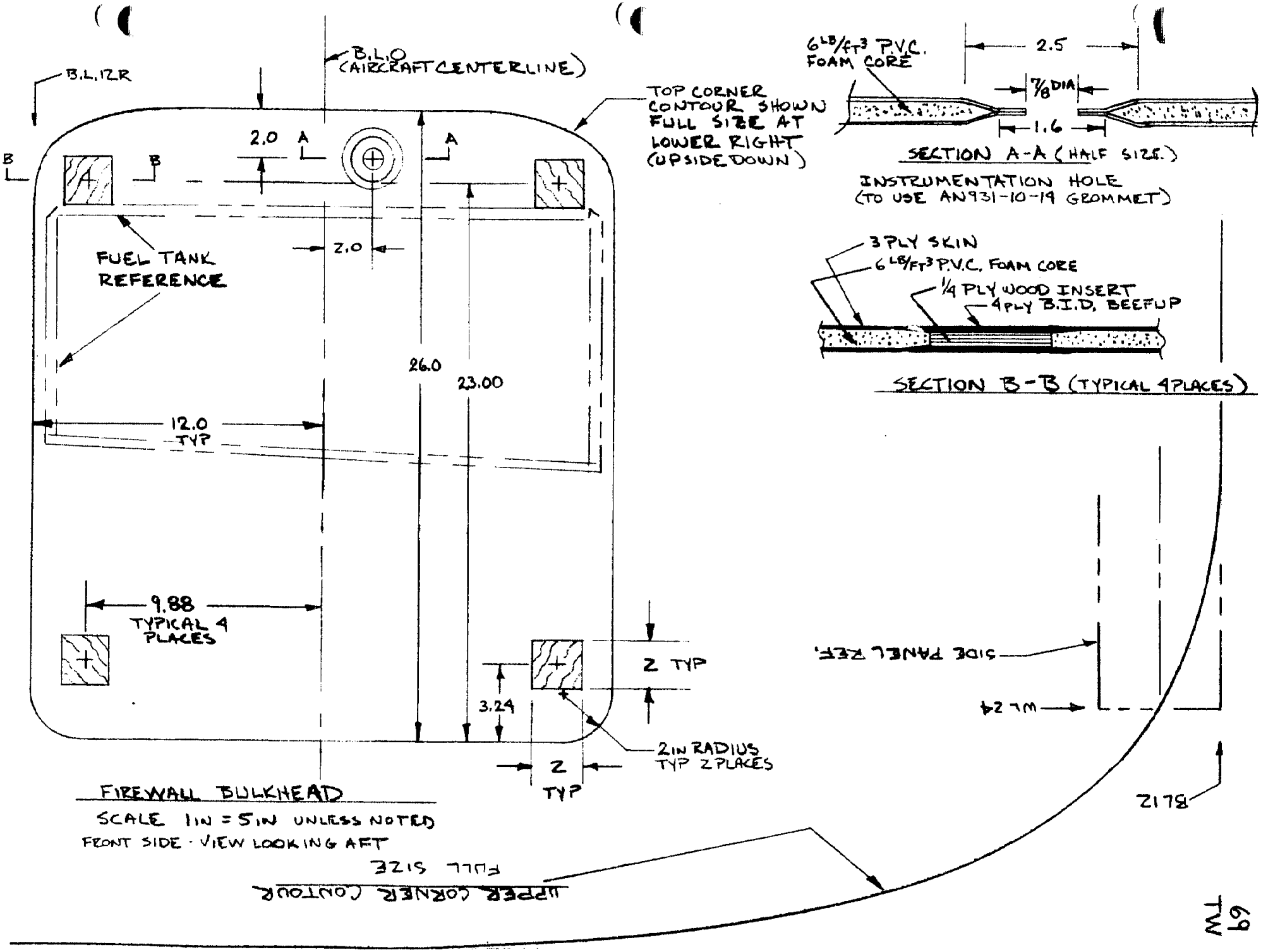


The last bulkhead to build is the firewall bulkhead shown on page 69 . The whole process for the firewall is similar to the seat bulkhead. Start with a flat slab of 6 lb/ft^3 ridgid PVC foam 26 inches by 24 inches and 9mm (.35 inch) thick. Cut the six 1/4 plywood inserts shown in the drawing (4 ea. 2x2, 1 ea. 3.2x8.5, and 1 ea. 1.5x2.5), inset them into the red foam core (see section B-B), and bond in place with 5 min/micro. Sand around them for a smooth transition from foam to plywood. Sand a 1.6 inch diameter circle about halfway through the foam thickness in the area shown for the instrumentation hole and section A-A. Cut two 35x37 inch pieces of 0° UNI and one 37x25 inch piece of 0-90° BID. Cut 12 45° BID patches 3x3 inches, 4 45° BID patches 5.5x5.5 inches. Cut 4 strips of 4 inch peel ply 24 inches long and one strip 9 inches long. Slurry the foam and lay a peel ply patch 1.6 in. diameter in the instrumentation hole depression. Lay up the two plies of UNI diagonally criss-crossing the bulkhead (top right to lower left, th top left to lower right), then one 0-90° BID ply on top. Over the center 8 1/2x3.2 plywood insert add four beef up plies of 45° BID. Cut each successive patch about 1/8 inch smaller on each side (start with 9x4 and finish with 8 1/4x3 1/4). Repeat this 4 ply buildup over each of the engine mount inserts, using the 5 1/2x5 1/2 pieces to make the odd "L" shaped patches to cover both inserts in the bottom right corner. Peel ply the edges with 4 inch peel ply and add one additional strip over the low center nose gear insert. Knife trim the edges and cure.

Here again, you can fixture the bulkhead foam core flat to your work bench with 5 min/micro dabs if required.

After a 24 hour cure, pull the bulkhead loose from the table and start on the rear side. Sand the foam away from the back side of the instrumentation hole area exposing the front side laminate over the 1.6 inch diameter area peel plied earlier. Remove the peel ply patch and sand a smooth transition into the surrounding foam. Cut the same glass and peel ply as for the front face and two additional 22 inch strips of 2 inch wide peel ply. Lay up the three skin plies and 20 BID reinforcements as before. Peel ply the edges and nose gear insert as before and then add two strips of 2 inch wide peel ply centered up on the top and bottom fuel tank reference lines. Knife trim and cure.

After curing, bore a 7/8 diameter hole in the center of the instrumentation hole pad. The 7/8 diameter hole mates up with an AN 931-10-14 Rubber Grommet which will protect your mag wiring, oil temp, oil pressure, CHT and EGT wiring from chafing against the raw fiberglass edge of the hole.



FIREWALL BULKHEAD

SCALE 1 IN = 5 IN UNLESS NOTED

FRONT SIDE - VIEW LOOKING AFT