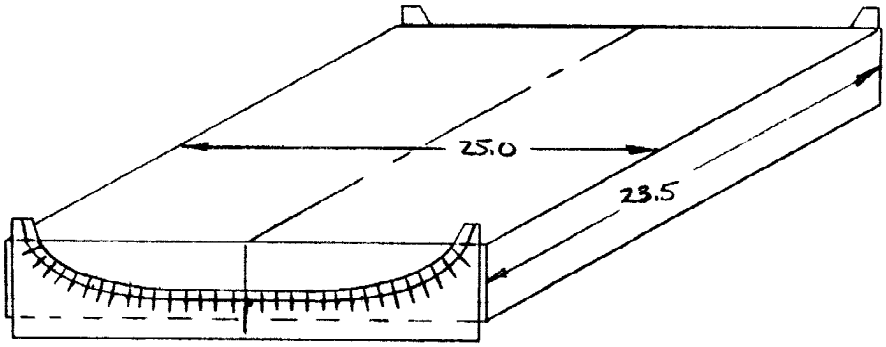
Top Forward Cover and Canopy Frame

The top forward fuselage cover is made in much the same fashion as was the aft section of the turtle deck. Two hotwire templates are used to cut first the inside contour and later the outside contour of the cover.

First, trace the outline of your firewall bulkhead from W.L. 24 (top fuselage edge) up and use it to make the forward hotwire template. Lay out the aft template using the dimensions (and method) from page 122. Mark a second, inside contour, line 1/2 inch inside of the outer contour line. Mark the templates with thirty equally spaced talking numbers. Cut a 23.5 x 25.0 inch block of 3 inch thick or 4 inch thick blue styrofoam. Check the width of your fuselage assembly 23 1/2 inches aft of the firewall bulkhead. It should be 22 inches inside but don't freak out if it is wider. If required, you can widen the aft hotwire template by spreading it at B.L.O. Fit the templates to the ends and cut the inside contour. Be sure to use the W.L. 24 marks as a foam edge mark and align the center line of the block with your template centers.



Remove the hotwire templates and fit check the foam block to your fuselage. Sand fair as required then return to your bench and lay up the inside skins. Cut one piece of UNI 75 inches long and 37 wide. Lay up two crossing plies, each 45 degrees to the center line. Peel ply the edges, knife trim, and cure.

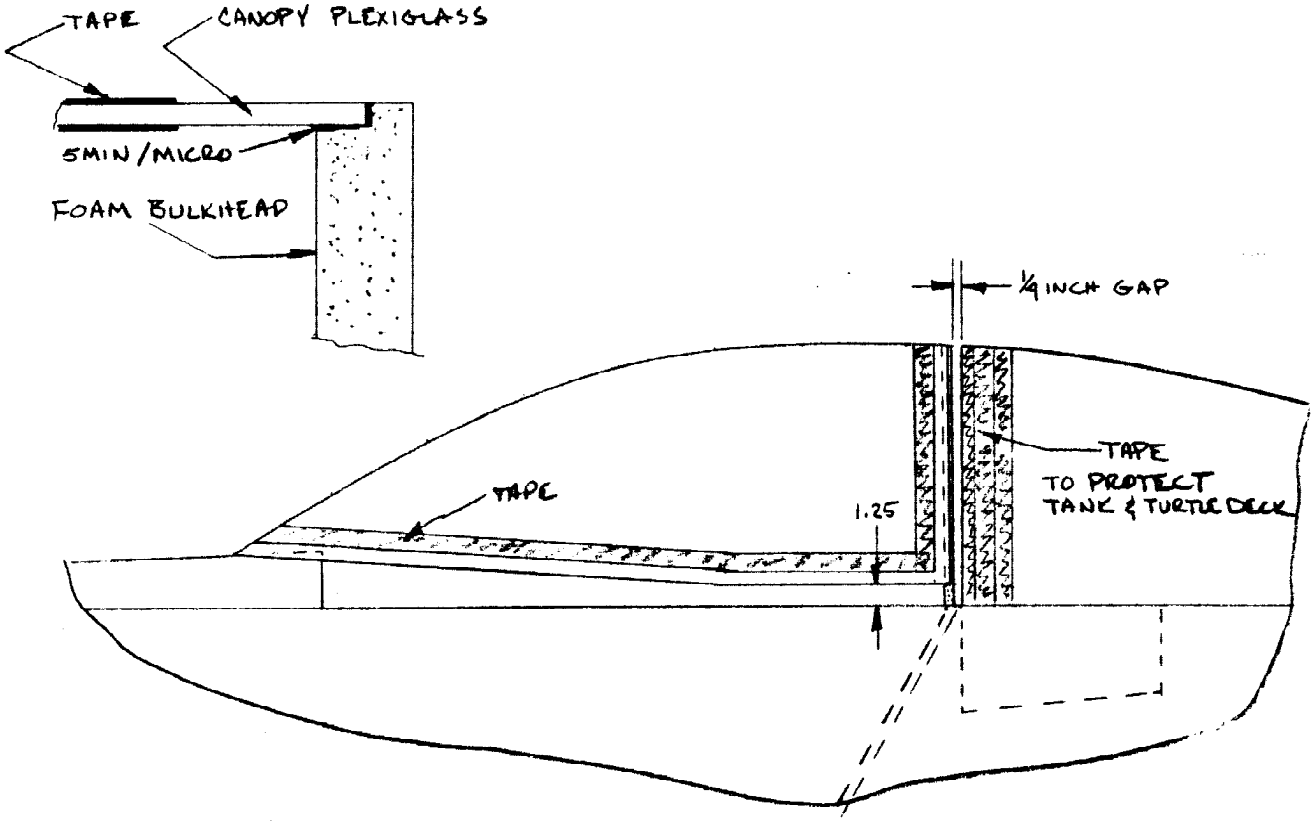
While that lay up cures, round up a foot long piece of foam and make a 2 3/8 inch O.D. cylinder of foam by sanding or hotwire cutting. Cut enough 2 inch peel ply to "barber pole" wrap (spiral) the whole length. Drag out your scrap glass cloth box and get out enough to cover the cylinder with four or five plies. Fiber orientation doesn't matter much but don't make it all UNI in the same direction. Slurry the cylinder, barber pole it with peel ply, lay up between 4 and 6 plies of glass over it. Then peel ply the outside and cure. This lay up can be sloppy wet.

After the top cover inside lay up cures fit it to the fuselage for a clearance check. Modify your hotwire templates to the outside contour and cut the exterior surface.

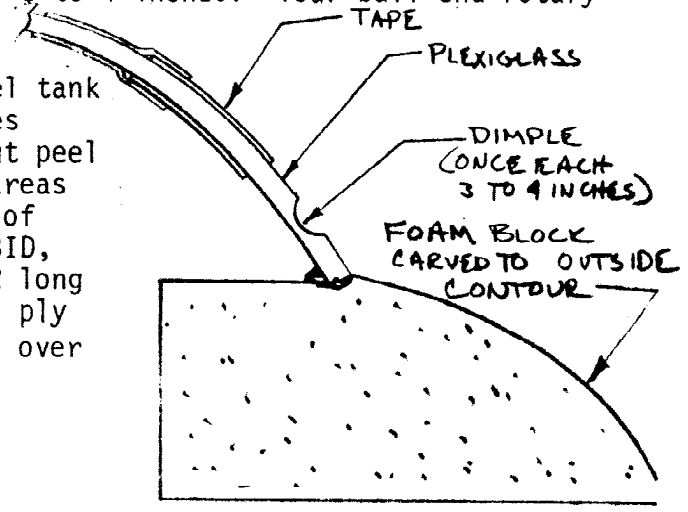
Take your canopy out of storage, strip the spray lat protective coating off of the first 1.5 inches of each edge, inside and out. Leave the bulk of the spraylat intact to protect the canopy from abrasion while you lay up the frame and attach the hardware. Use tape to protect the loose edge of the spraylat material and to define a line that is 3/4 inch in from the side edges and 1 inch from the back edge. Use coarse sandpaper to dull the 3/4 inch plexiglass edge inside and out all the way around. Replace the tape defining the edge so that it is fresh and not scarred by the sanding operation.

Add one inch wide extension blocks to the top forward edge of the firewall similar to those used before the outside of the fuselage lay up.

Find your 2 lb/ft^3 styrofoam aft canopy bulkhead and notch the forward edge all around to mate with the canopy as shown below. Form the canopy plexiglass edge firmly into the notch and use 5 min/micro in the notch to bond it in place. Position the canopy on the fuselage as shown below. Remove foam from the top cover as required to let the nose of the canopy rest on the surface of the foam.



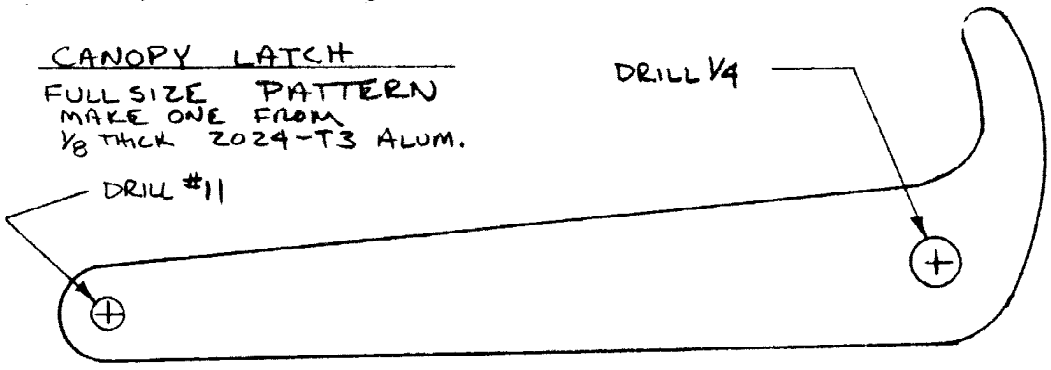
Protect the fuselage side panels, the firewall bulkhead, the forward turtle deck and tank bulkhead with tape. Fill in the open areas between the canopy plexiglass and the side panels of the fuselage with blocks of styrofoam. 5 min/micro these blocks to the plexiglass, the taped side panels, the front cover and each other. Carve to a pleasing outside contour that fairs into the fuselage side panels. Fill the 1/4 inch gap at the rear of the canopy bulkhead with styrofoam slices 5 min/micro dabbed to the canopy bulkhead. Sand fair. Use a very dull (absolutely no sharp bits!) #11 (3/16, #10, #12 or anything close) bit and high speed on your drill motor dimple the plexiglass lip (3/4 inch along the edges) once every 3 to 4 inches. Your ball end rotary file will work well also.



Mark the fuselage side panels and the fuel tank with a marker line one inch from the edges (down from WL24 and aft of bulkhead). Cut peel ply strips which will cover the overlap areas just marked. Cut two 3 x 40 inch strips of 45^0 BID, four strips of 5 x 25 inch 45^0 BID, two 30 x 15 pieces of 45^0 BID, and two 42 long x 37 wide pieces of UNI. Lay up the peel ply strips around the fuselage side overlaps, over

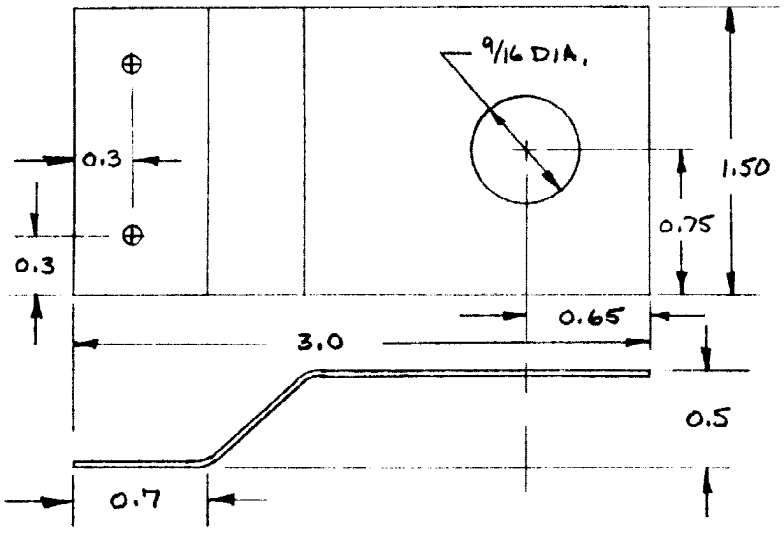
the aft fuel tank overlap, and along the firewall edge and extension block. Lay up the two UNI plies diagonally criss-crossing the front cover and firewall extension blocks and overlapping the fuselage side panels one inch to the marker lines. Scissor trim the UNI material around the canopy nose. Trowel flox into the dimples along the 3/4 inch mounting lip of the canopy edge. Start with the back end and lay up two plies of BID over the inch wide glass lip, foam bulkhead, and the peel ply on the turtle deck. Next lay up down the sides of the copy and the foam filler, overlapping the fuselage sides one inch. Use the big pieces of BID to fit around the nose of the canopy and overlap the UNI forward and BID aft. Overlap the fuselage one inch minimum all around. On the canopy, try not to overlap the tape any more than can be avoided. Butt the glass edge to the tape edge as much as possible. This gives you a two ply canopy frame and front cover outside skin. Knife trim only the fuselage overlap marker lines. Do not knife trim the canopy tape line. Cure. After an over night cure you can carefully sand or file away any overlap of the tape on the canopy.

Remove the cured canopy and front cover from the fuselage in one piece. Try not to destroy the foam material along the canopy sides when removing the frame. Pull all of the masking tape off. Set the canopy and frame aside and install the canopy latch and hinges on the fuselage. Start by making the latch, latch plate, and hinges.



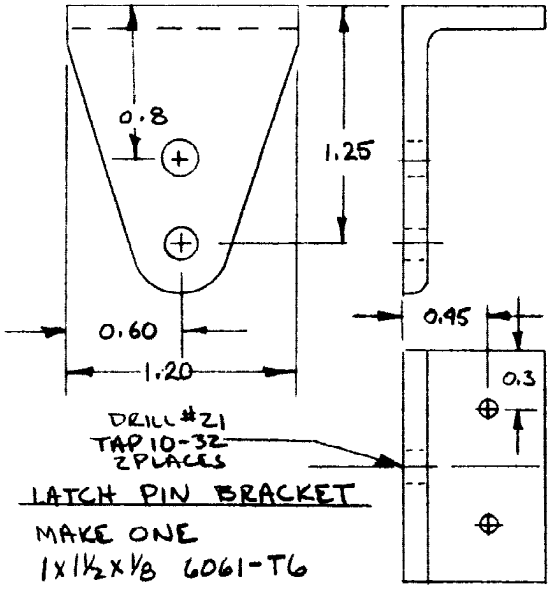
Drill a 1/4 inch hole through the fuselage left side panel at W.L. 23 and F.S. 62.25 as shown in the latch installation drawing. This hole should be centered in the 1/2 x 3/16 insert burried in the side panel. From the outside route out both the skin and foam core to allow installation of the AN4-10 bolt from the outside. Fill the hole with flox. After the flox cures, mount the latch and latch plate (this requires drilling and tapping two 10-32 holes in the latch plate insert).

Shape the inside foam surface of the canopy frame to provide a 1/2 inch thick foam core generally. Provide a smooth transition from the full half-inch foam depth to the canopy plexiglass edges. Grind away the inside of the front cover as required to achieve this. Refer to the installation sketches for the canopy hinges and latch, and make provision for the attachment (insert and foam undercuts). Note that along the left side of the canopy (from tank bulkhead forward 32 inches) the foam is sanded back 1/10 inch generally (and more for the latch pin bracket). Dimple the inside of the plexiglass mount lip every 3 to 4 inches as you did the outside.



LATCH PLATE

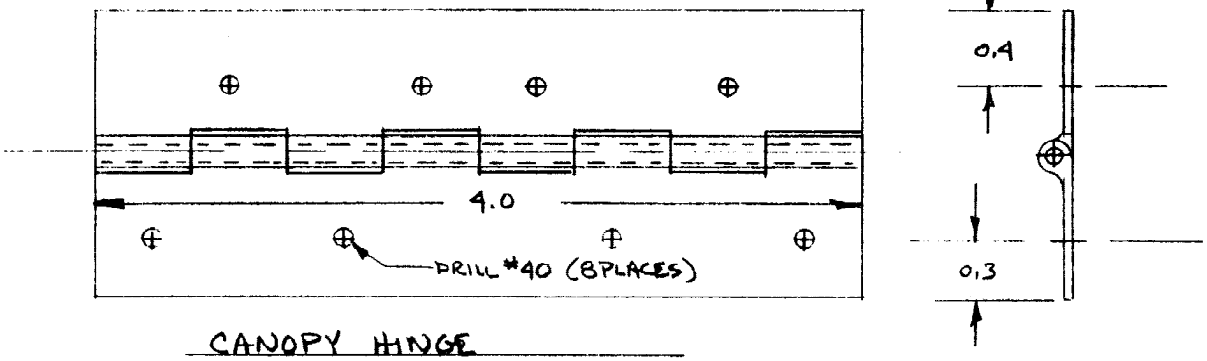
MAKE ONE .032 2024-T3



LATCH PIN BRACKET

MAKE ONE

1 X 1½ X ⅛ 6061-T6

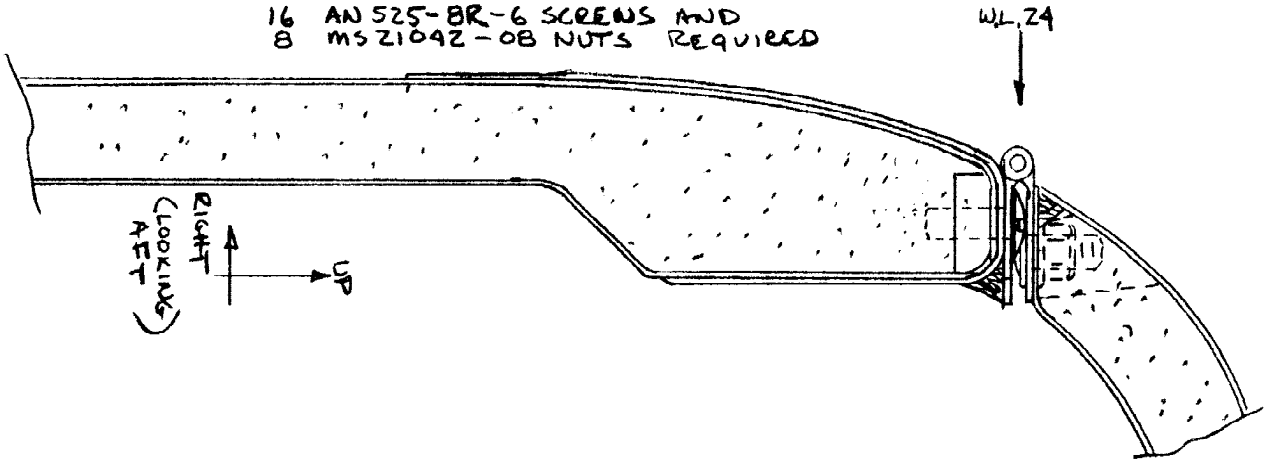


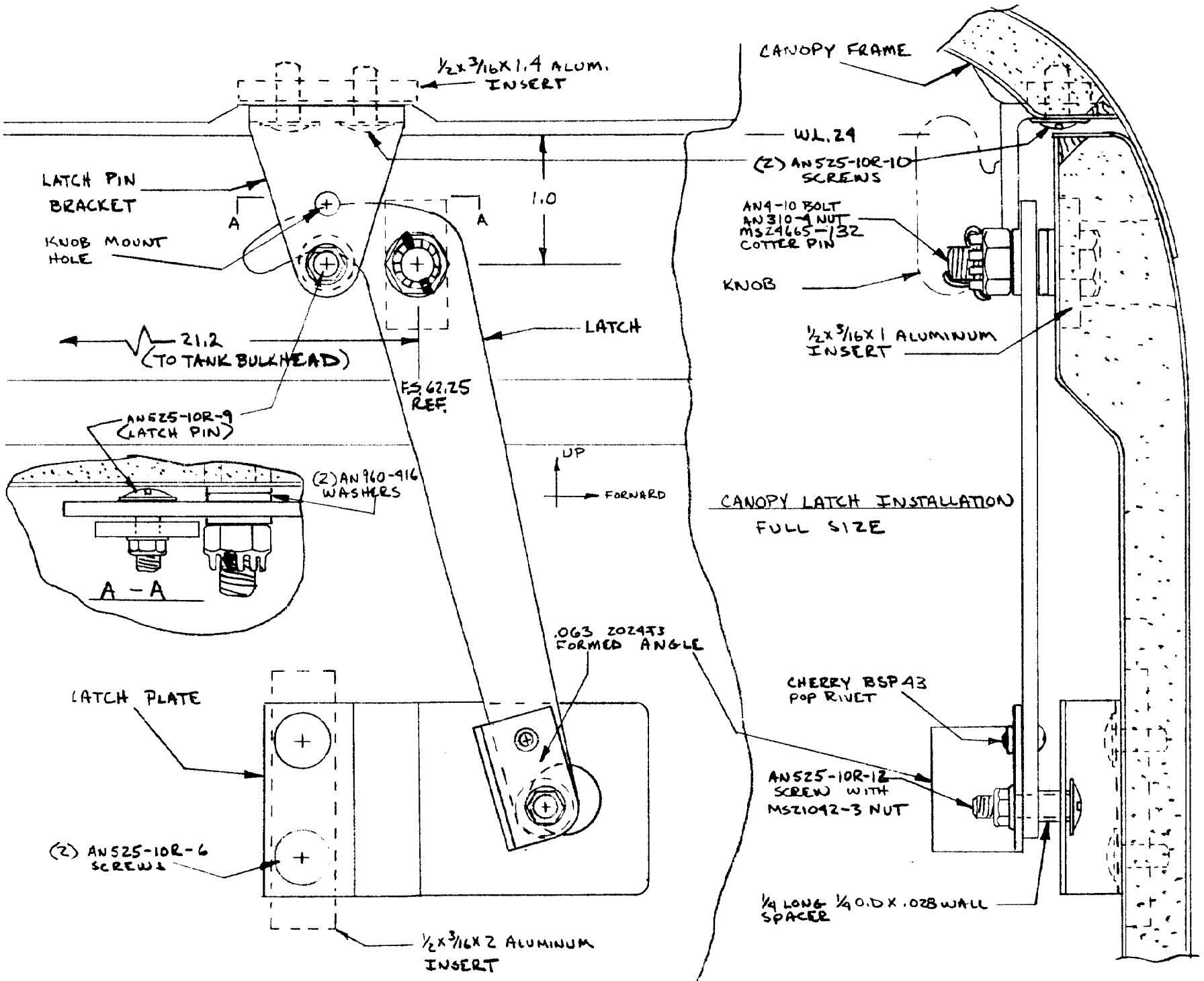
CANOPY HINGE

MAKE TWO MS20001-P4 HINGE

CANOPY HINGE INSTALLATION

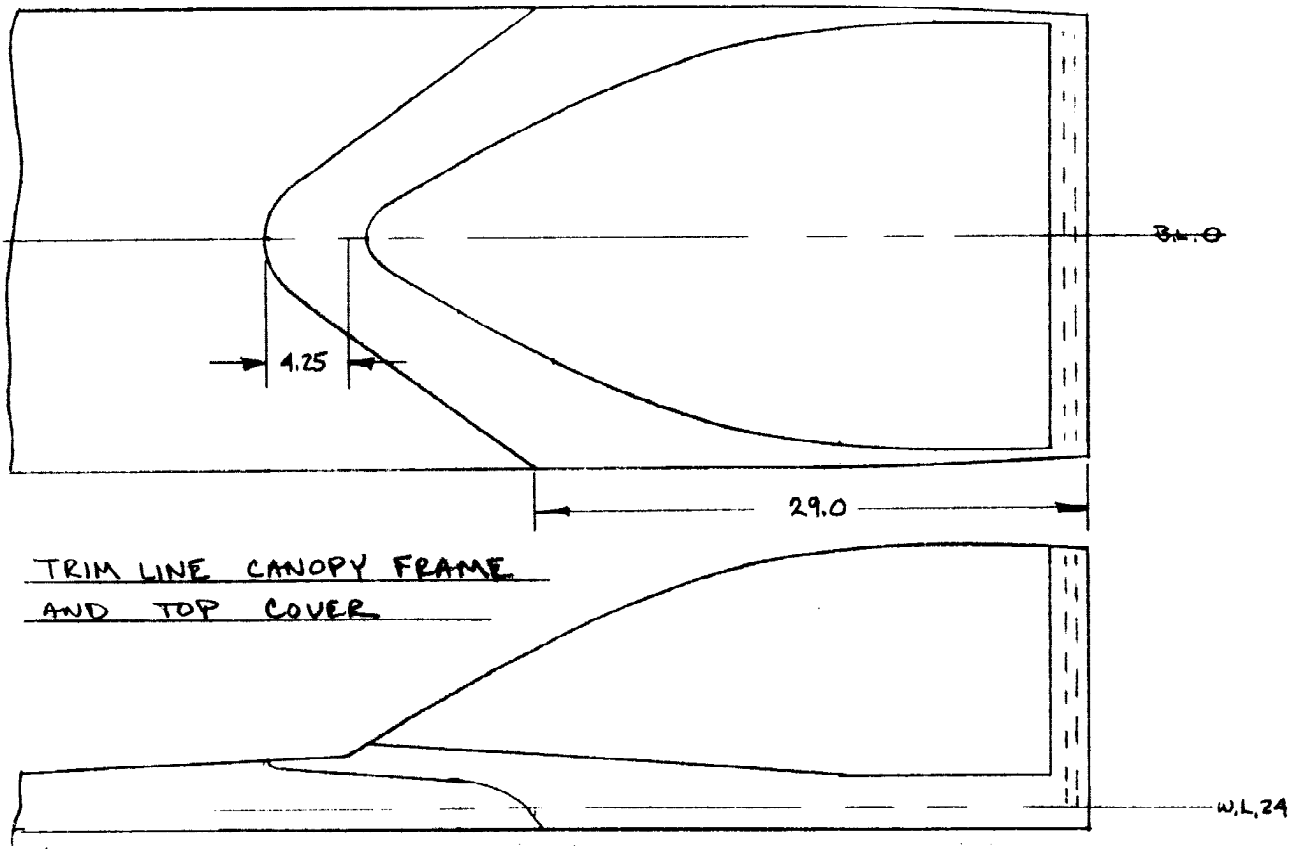
16 AN525-8R-6 SCREWS AND
8 MS21042-08 NUTS REQUIRED




1/2 x 3/16 X 1.4 ALUM. INSERT
LATCH PIN BRACKET
KNOB MOUNT HOLE
A
A
1.0
21.2 (TO TANK BULKHEAD)
LATCH
F.S. 62.25 REF.
AN525-10R-9 (LATCH PIN)
(2) AN960-416 WASHERS
UP
FORWARD
A - A
.063 2024T3 FORMED ANGLE
LATCH PLATE
(2) AN525-10R-6 SCREWS
1/2 x 3/16 X 2 ALUMINUM INSERT
CANOPY FRAME
WL. 29
(2) AN525-10R-10 SCREWS
AN4-10 BOLT
AN310-4 NUT
MS24665-132 COTTER PIN
KNOB
1/2 x 3/16 X 1 ALUMINUM INSERT
CANOPY LATCH INSTALLATION
FULL SIZE
CHERRY BSP43 POP RIVET
AN525-10R-12 SCREW WITH MS21042-3 NUT
1/4 LONG 1/4 O.D X .028 WALL SPACER

Cut 2 pieces of 45° BID 22 x 13 1/2, 2 pieces of 0-90° BID tape 2 x 40, 4 pieces 45° BID 5 x 25, 2 pieces 45° BID 30 x 15, one strip of peel ply 1 x 22, and two 1 x 5 pieces of 45° BID. Prepare a flox corner at the outside skin from rear of the top cover aft to the canopy bulkhead on each side. Lay up the strip of peel ply along the bottom front edge of the canopy bulkhead, lay up two plies 45° BID over the bulkhead only, then use the 2 inch wide glass tape to overlap the bulkhead and butt against the protective tape (3/4 inch in from the plexiglass edge). Lay up two plies of 45° BID over the remaining inside surfaces similarly. The peel ply at the rear edge of the top cover should have been removed and the area adjoining the canopy nose sanded for bonding. The peel ply along the canopy sides should also have been removed. Add one of the little 1 x 5 BID patches over each hinge attach point. Knife trim the bulkhead bottom edge and along the sides (flox corners only, no overlap allowed). Cure.

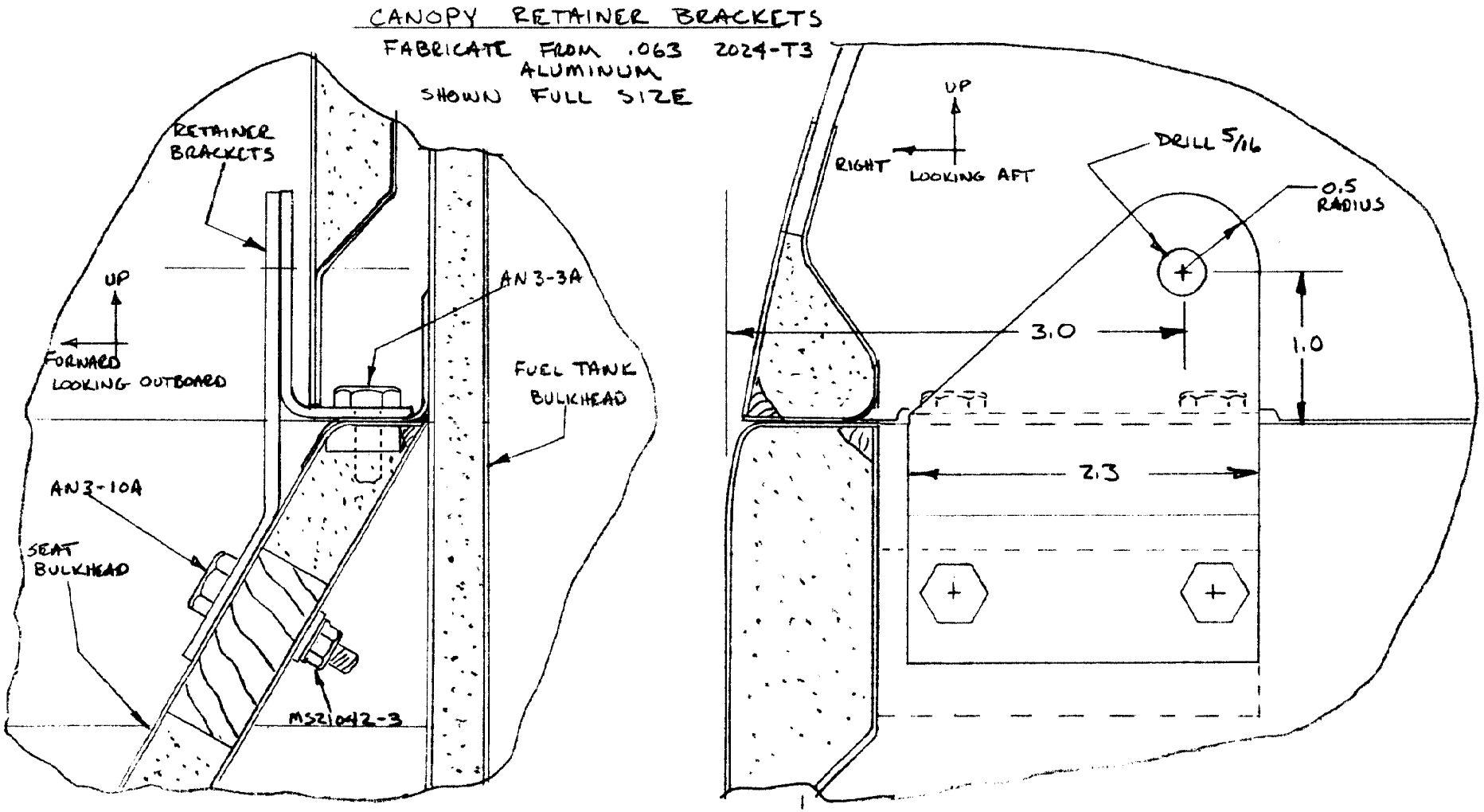
Align the hinges on the fuselage side panel, drill and tap for 8-32 screws (AN525-8R-6 screws, tap drill #30). Remember the hinge centers must be in line to function freely.



Mark and cut the cured canopy frame free from the front cover (and extensions) as shown below. Prepare flox corners on the front cover cut edge and lay up one ply BID over the cut surface. Wait for a while on the canopy side. Sand away all of the 1/4 thick slices of foam around the aft edge of the canopy bulkhead remove the peel ply from the rear edge. Sand the bottom edge of the rear bulkhead foam core away along the bottom 1 inch of bulkhead. Remove the peel ply. Additionally, sand out an area two inches in diameter centered 9.3 inches inboard of the right side outer contour and up one inch from the edge. Also, sand another area one inch in diameter which is 3 inches in from

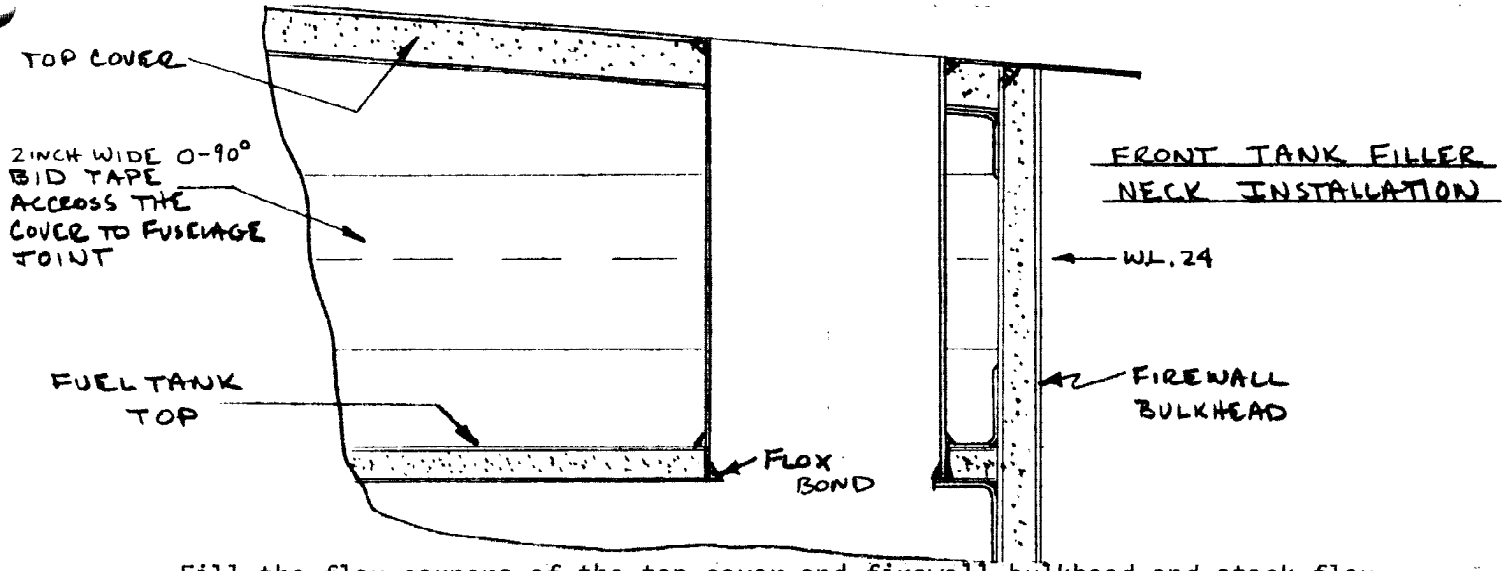
the right side and one inch up from the edge. Cut one ply of 45° BID 26 x 16 and one 22 x 13. Also cut four additional reinforcement patches 3 x 3, 2 1/2 x 2 1/2, 2 x 2, and 1 1/2 x 1 1/2 of 45° BID for the 2 inch areas reinforcement. Lay up one ply of BID which overlaps the rear outside skins and one covering only the bulkhead and the corner with the outside skins. Add the four ply reinforcement over the 2 inch diameter canopy retainer attach point. Knife trim and cure.

While that lay up cures make the canopy retainer hardware shown below and install it on the seat bulkhead.



Take your front cover, sand any glass adjoining W.L. 24 dull for bonding and prepare a flox corner along the inside skin edges. Remove any remaining peel ply from the firewall bulkhead's aft face and along the inside and outside of the side panels. Prepare a flox corner along the top edge of the firewall bulkhead. Remove the peel ply from the extension glass lip and side overlap areas of the top cover.

Go borrow a 2 1/4 diameter and a 2 1/2 inch diameter hole saw. If you really get desperate you can buy them from Sears, Wards and other such places. These hole saws have a mandrel with a 1/4 inch drill as a centering pilot. Drill a quarter inch hole through the top cover and the top of the front fuel tank. This hole should be on B.L.O. and 2.25 inches aft of the firewall bulkhead. Use these holes as the pilot for your hole saw. Cut a 2 1/2 inch hole through the top cover. Cut the outside skin of the fuel tank and most of the foam core with the 2 1/2 inch hole saw but stop short of the inside skin. Change to the 2,1/4 diameter saw (a 2 inch will do if it means borrowing instead of buying) and cut all the way through. Remove two foam and glass plugs, then use your rotary file to clean up the 1/4 inch glass lip around the inside wall of the tank and prepare it for a flox corner. Vacuum every last speck of crud out of your gas tank. Cut the glass tube that you made so one end fits into the hole in the gas tank against the inside lip and the other end is flush with the outside of the top cover. Chip all of the foam out of the tube, get an edge of the"barber poled" peel ply loose and rip the peel ply out. Remove the outside peel ply also. Bond the bottom end to the fuel tank with wet flox.



Fill the flox corners of the top cover and firewall bulkhead and stack flox along the top edge of the fuselage. Spread some flox over the mating surfaces at the fuselage sides and bond the top cover in place. Use the canopy to verify the cover's position. Climb inside and lay up a 2 ply 0-90^0 BID tape over the W.L. 24 joint. Lay up a two ply corner tape (2 inches wide 0-90^0 BID tape) between the firewall forward face and the extension of the outside skin. Knife trim and cure.

Brighten the upper half of the hinges and sand the mating canopy frame surfaces for bonding. Shim the hinge leaf so that it mates to the canopy frame properly when the canopy is lowered on to it. Climb inside and have your assistant stand by outside. Mix 5 min/flox and spread on to the hinge leaves, lower the canopy into position. Have your assistant double check the alignment outside while you clean off the squeeze out inside. Cure 10 minutes, then remove the canopy with the hinge halves attached. Drill the eight #21 holes for AN525-8R-6 screws from the inside, then bore holes in the outside skin to mount the MS21042-08 nuts. Fill the holes with dry micro.

Brighten the canopy mating surface of your latch pin bracket, and sand the canopy frame to match. Take your 5 min and flox, climb inside, shut the lid and bond the latch pin bracket to the canopy frame with the latch and latch plate hardware all set in the closed and locked position. Let the 5 min/flox cure for 10 minutes, then open the canopy, drill and tap the two 10-32 mounting holes through the bracket. Install two AN525-10R-10 screws with flox on the threads to safety.

Put the canopy back on the fuselage and install the hinge pins. Climb inside with your scale and marker, close the lid, and mark a hole centerline which is 6.5 inches inboard and below the retainer mount bracket hole. This hole should be 1/2 inch above the edge of the canopy bulkhead. Open the canopy and drill a 5/16 diameter hole in the location marked. Install your gas spring retainer between the bracket and bulkhead. Put the cylinder end on the bracket and the rod end on the canopy bulkhead. Cut a notch in the canopy bulkhead to clear the retainer attaching nut and stud on the rear side of the bracket.

Prepare the front edge of the canopy frame for a micro fill of the first 1/4 inch by routing out the foam and preparing the glass for bonding similar to a flox corner. Protect the front cover's mating surfaces with masking tape and automobile paste wax. Trowel the canopy frame edge full of dry micro, slightly over filled, and close the canopy to cure.