

CH 11 COCKPIT INSTALLATIONS

This section will contain all the cockpit installations and complete the control systems.

Since one installation almost always has some affect on another, it is recommended that this entire section be read before starting any work. You should know by now that this is a good practice in general anyway!

A. FWD DECK / HEADER TANK / CANOPY FRAME:

1. First fit and position the fwd deck and cleco into position with two clecos per side.
2. Position the canopy frame in its proper location along the T.E. and sides. The frame is very flexible and will simply lay over the joggle in the upper fsig receiving portion of the aft deck area.

Lay the fwd section of the canopy frame on top of the fwd deck for the time being. Note the amount of overlap by the canopy frame onto the fwd deck. The frame will require about $1/2"$ to $5/8"$ of overlap lip. It is generally ideal to allow the fwd deck to extend as far aft as possible and adjust the canopy frame to fit that dimension. (Otherwise you could get into a tight situation with regard to necessary room for the aft edge of the header tank mounting.)

3. With this aft distance marked, trim the canopy frame to size, make a nice smooth trim line as this will be a final shape for all to see!
4. Using the canopy frame as a guide, transfer the trim line onto the fwd deck and cut through the fwd deck outer skin and core material but NOT THROUGH THE FWD DECK INNER SKIN, see fig.233. Scrape away all the outer skin and core material aft of the trim line. The canopy frame should now be able to drop down into the newly created joggle. (It will drop down too far for now but that will be fixed later.)

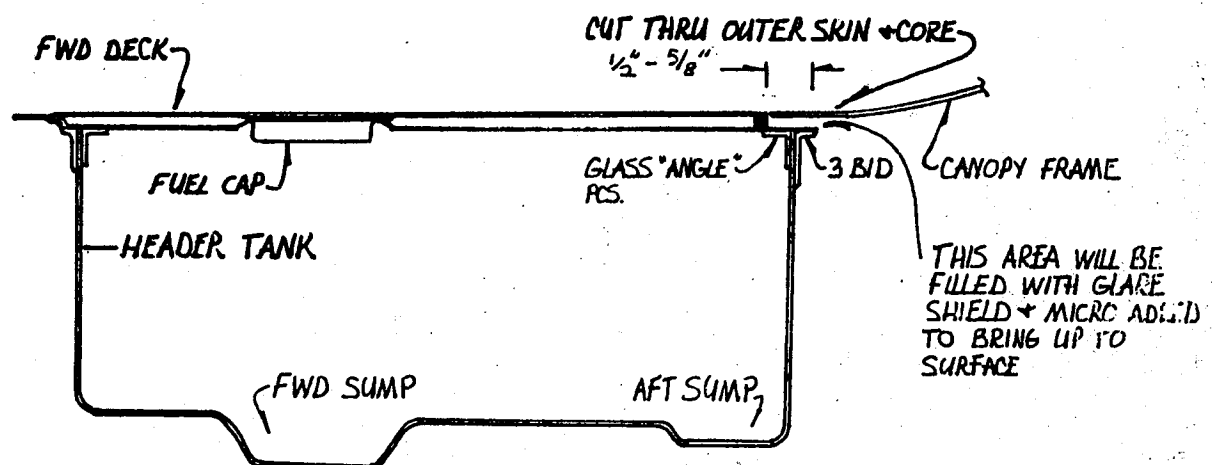


fig.233

NOTE: The fwd area of the side foam rails where the instrument panel will fit should be slightly narrower than the 1.5" dimension that exists along the aft sections. From FS-27 fwd, the dimension should be approximately 1". From FS-23.5 fwd, the side rail width need only be 1/4-3/8" wide. Make smooth transitions from one dimensional change to another. See fig. 238.

If you are using the optionally available premolded instrument panel, (highly recommended) then it can be installed or simply positioned to provide the necessary clearance information. If you are building your own instrument panel, then you will naturally have the option to make it fit around the canopy side rails but bear in mind the necessary clearances needed for the fwd canopy swing mechanism which fits just behind the instrument panel, see fig. 240.

9. Insert the .090 aluminum hard points per fig. 235-237 into the foam on the inner side before adding the BID. The aluminum hard points which fit against the premolded frame are best added after the channel has been cut into the foam.
10. Apply the 3 BID along the rail (over the foam and onto the premolded frame) per fig. 237.
11. Apply 3 BID to the aft stiffener fwd face. The aft face will receive the BID after the frame has been removed since it's a little tough to glass there at this time!
12. Make an exterior template out of particle board or similar to fit the contour of the fwd section of the canopy frame and attach it to the frame with a little bondo to temporarily hold it (and thus the canopy frame) in proper contour. The canopy frame would otherwise relax out once lifted off the fsig.
13. With the BID well cured and the fwd support brace stuck on, remove the duct tape holding the frame in position and remove the canopy frame.
14. Place the frame inverted in such a manner as to provide adequate support for it at the fwd and aft ends.
15. Add the remaining 3 BID to the aft face of the aft roll over support.
16. Using a rotary rasp in an electric drill, route out the foam in the side rails per fig. 237. Leave a little extra clearance room at the noted locations.
17. Carve out the foam and insert the outer .090" aluminum hard points per fig. 237, SEE 236 ALSO
18. Add the inner 2 BID into the channel.
19. Dig out the foam and add floc into the narrow side rail walls, add 2 BID to the aft area (on the bottom).

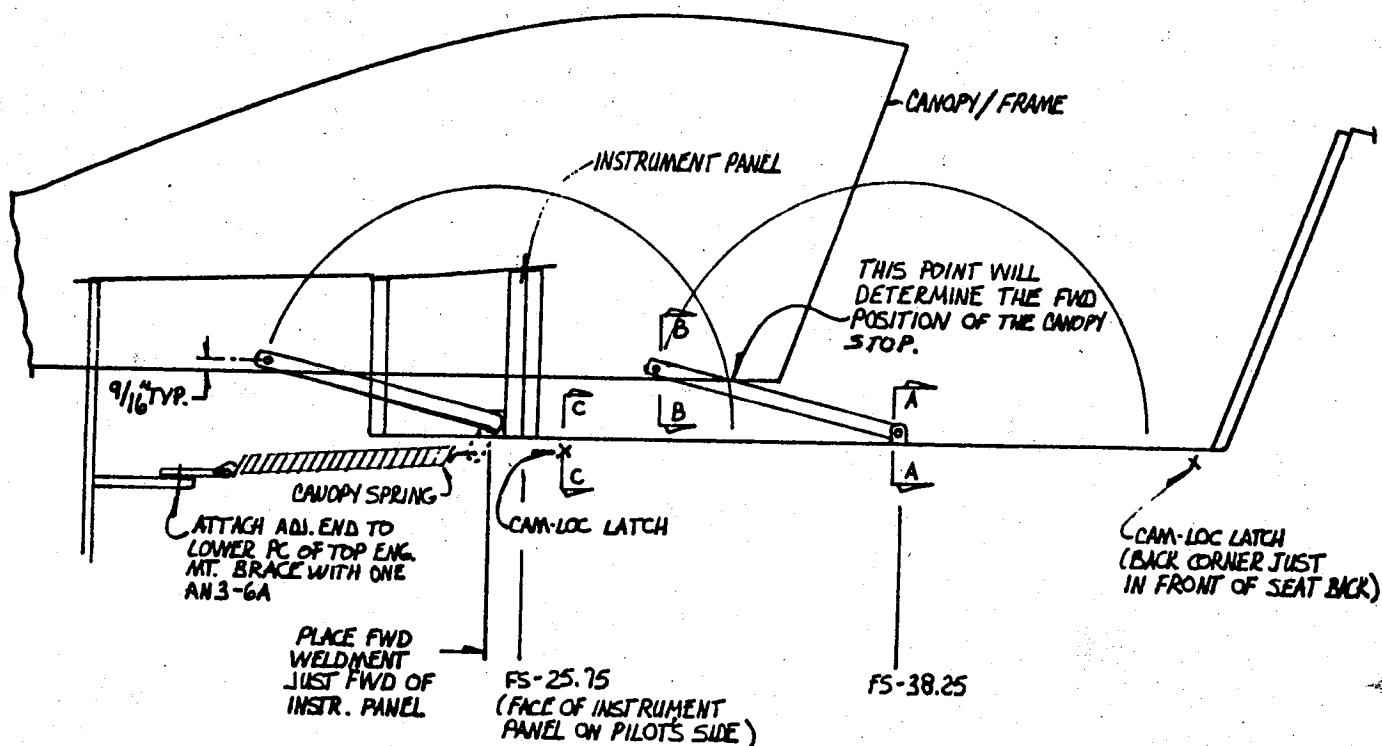


fig.235

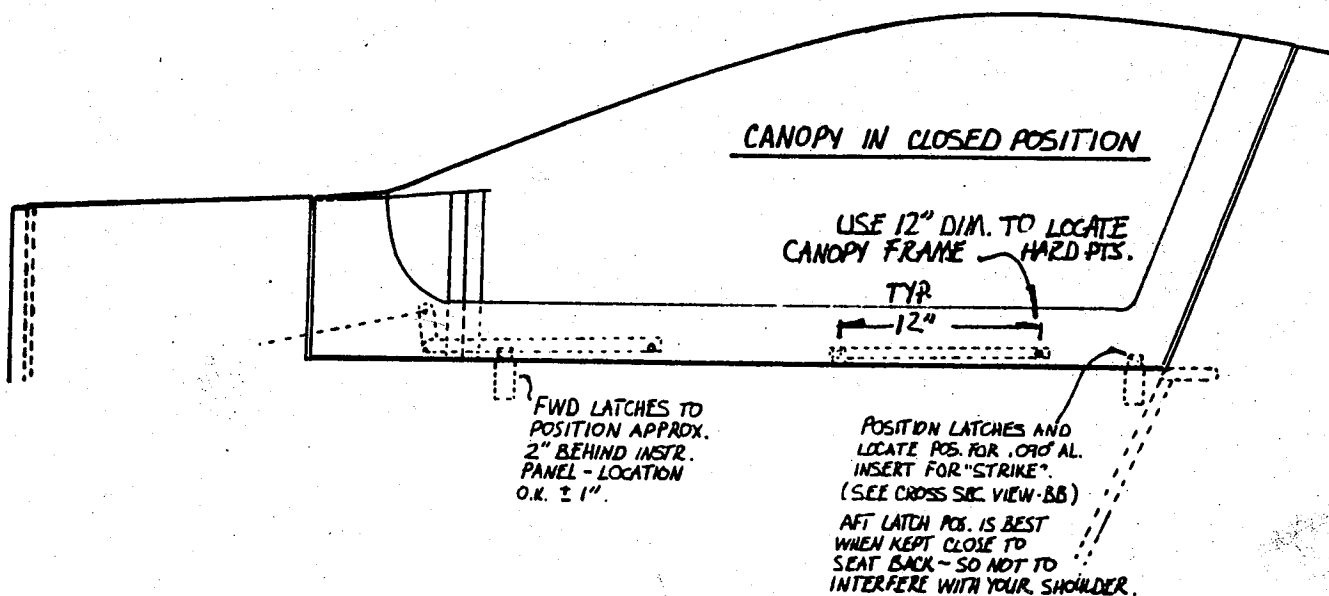
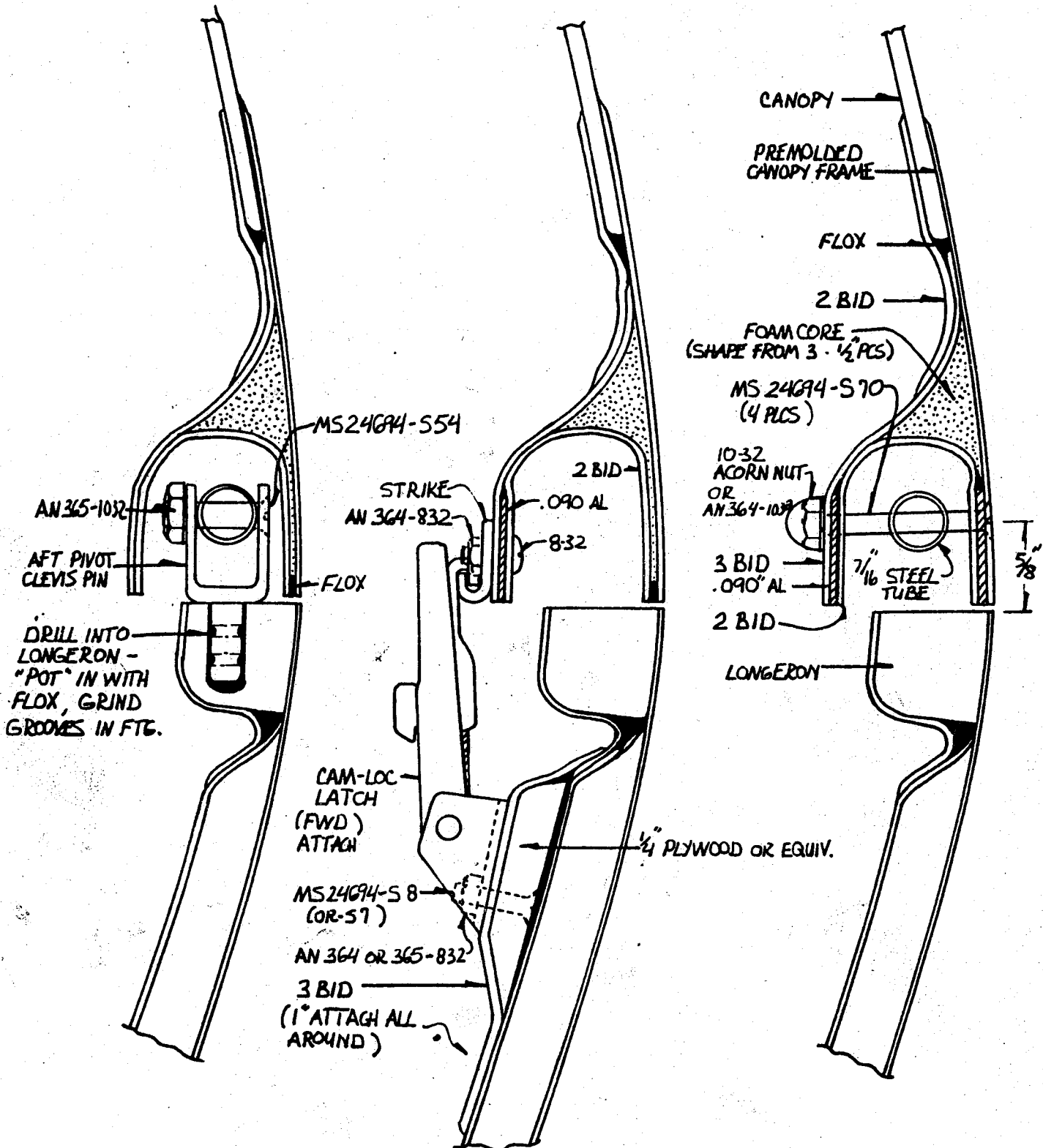


fig.236

VIEW AA

VIEW CC

VIEW BB



CANOPY FRAME CROSS SEC.'S

fig.237

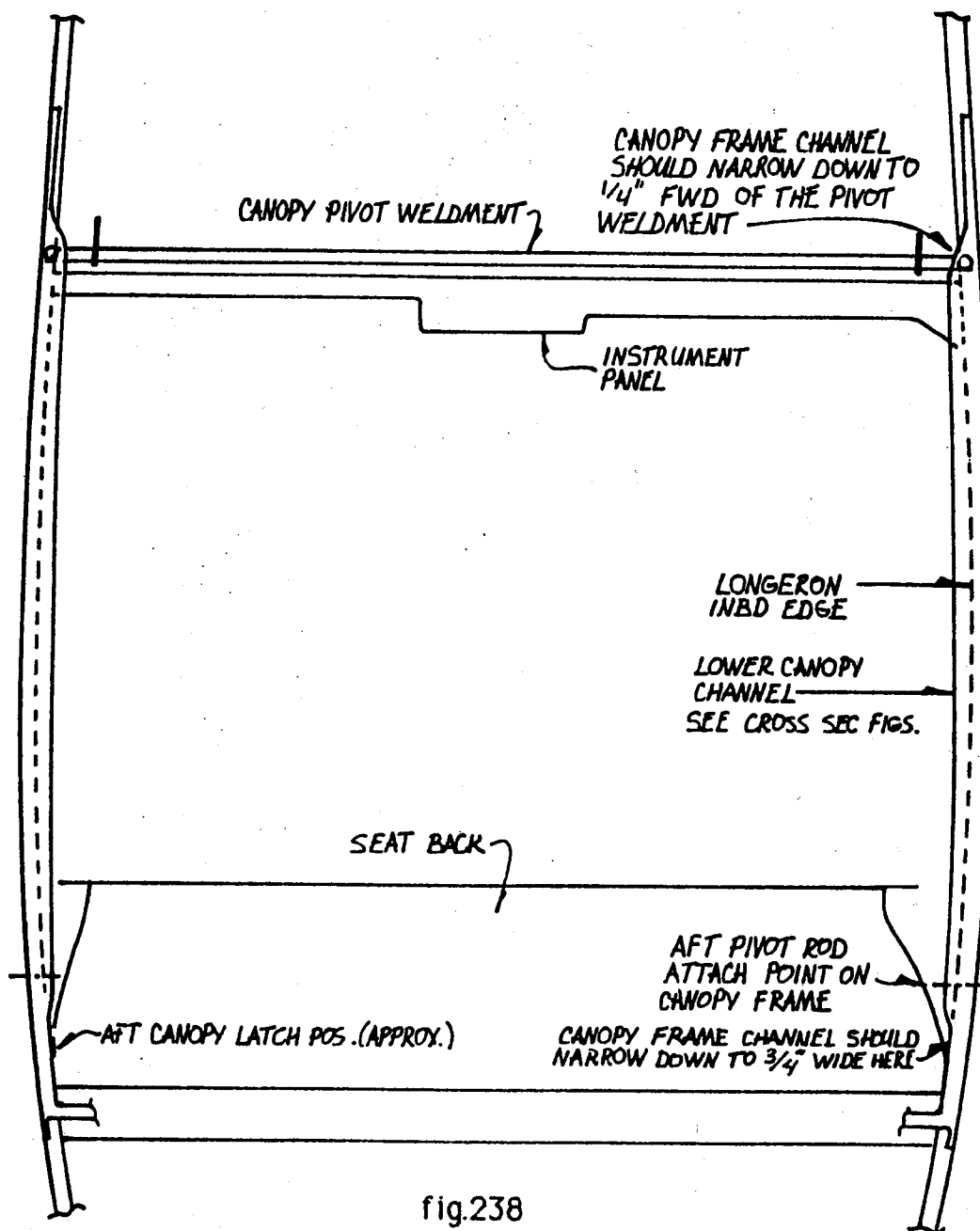


fig.238

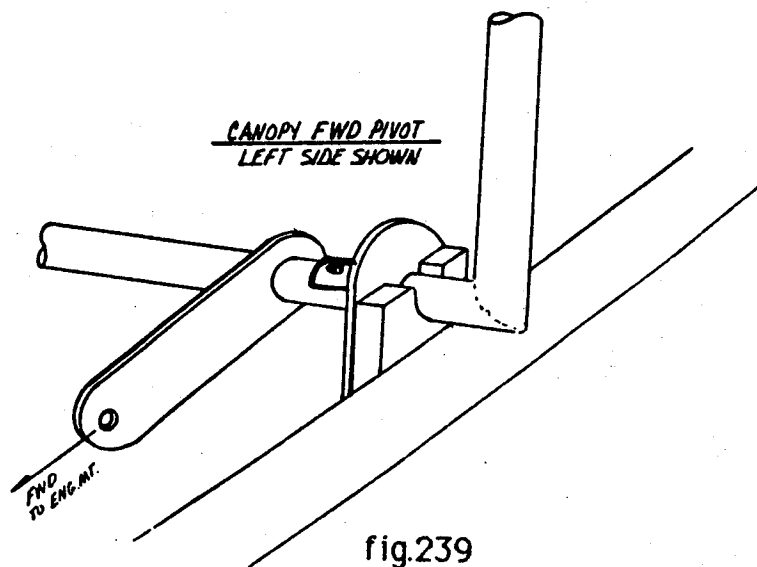


fig.239

20. Place the canopy into the frame and check for fit, if necessary, trim the canopy to fit within the frame area. A bandsaw will work nicely for trimming the canopy. This will take two people to hold the canopy steady and slowly push it through for the cut. A sabre saw with a fine tooth blade can also work but due to its up and down motion, it is a bit more risky. You must cut very slowly with a sabre saw and hold the canopy very tightly so that it can not start to jump with the motion of the sabre saw blade, that will result in a crack potential.
The canopy should have about 1/2" to 3/4" contact around the frame.
21. Peel the protective covering off from both sides of the canopy just far enough to access the bond area and a little extra for room. Use plastic electrical tape (black) to mask off the areas to be bonded on inside and outside. The electrical tape will fit around the contour easily and makes for an excellent protector when sanding.
22. Sand the bonding area of the canopy with 80 grit, sand any burrs off from the edges also.
23. Clean the canopy frame and bond the canopy into permanent position with either 2216 adhesive or epoxy/flox. Weight the canopy down and apply a little clamping pressure across the frame during cure to assure a tight bond.
24. When cured, remove the clamps, clean up the bonding areas and add the 2 BID all around the canopy to canopy frame juncture area. The fwd juncture area should have 3 BID there with a flox fillet under the portion of the canopy that tends to stick out a little. This will help to stiffen the fwd area.

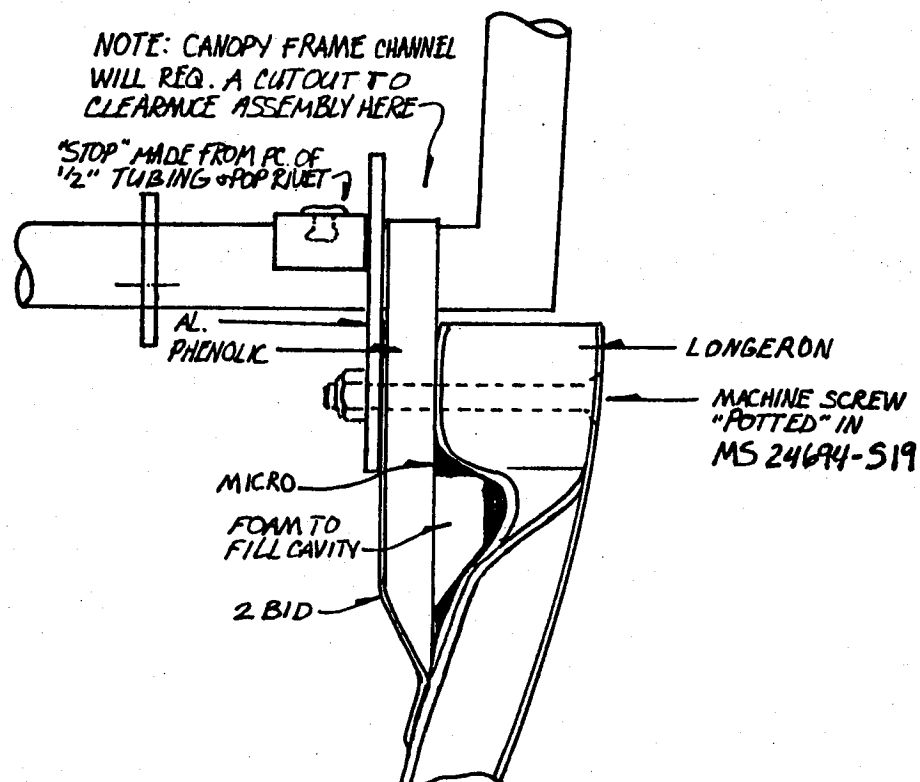
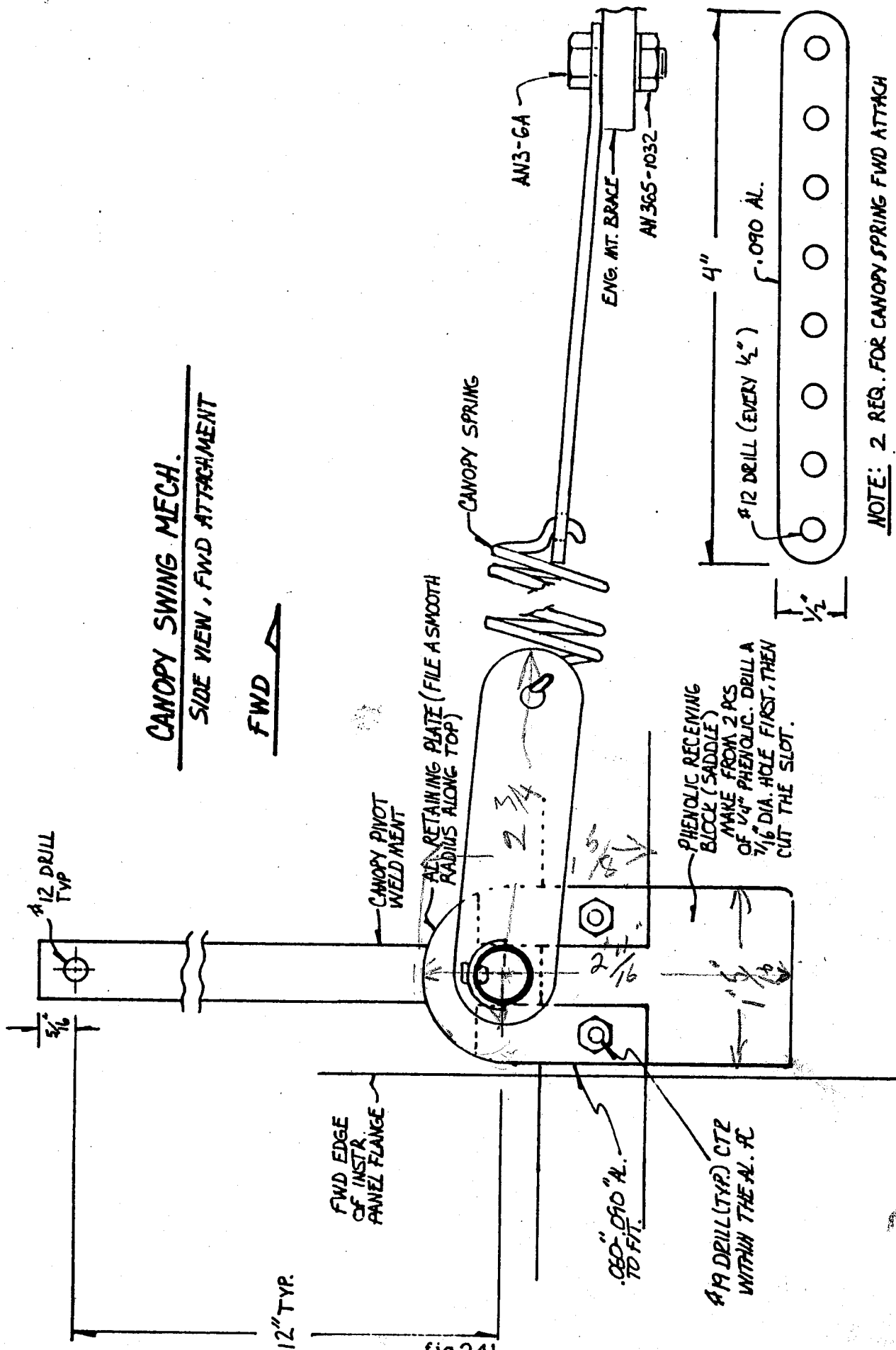


fig.240

CANOPY SWING MECH. SIDE VIEW, FWD ATTACHMENT

FWD 



NOTE: 2 REQ. FOR CANOPY SPRING FWD ATTACH
 4 REQ. FOR RUDDER CABLE FWD ATTACH

fig.241

NOTE: Measure the fslg width at several locations along the canopy frame area and check that the frame is not being pushed out wider than the fslg due to the weights and clamping pressure. If it is being pushed out wider, add some restrainers (clamps holding the outside contour in position).

NOTE: As a general note, it is quite possible to "adjust" the shape of a wet layup should it be found to be slightly out of contour once cured. Since the wet layup has cured at room temperature, simply apply an adjustment force and heat the wet layup with either a heat gun or hair dryer. Hold in proper position until the pc returns to room temperature. This will provide a post cure and allow the wet layup to readjust to the proper contour. You'll generally only get one shot at this since it will then have a post cure and reheating will have little effect. (That's also why our 250° cured prepreg parts are so strong and much more stable than typical wet layed up parts.)

Reposition the canopy and check the fit you've just finished. A little micro here and there is often required so don't feel bad if you do need some, but it's not too difficult to get a good fit.

NOTE: It is best to store the canopy/frame where it can remain flat on the floor or table, standing it up against the wall can generate a bow after time.

CANOPY MOVEMENT AND LATCHING

25. From fig ~~235~~ 237, position the aft canopy pivot rods into the longerons. These clevis pins will require grinding down to approximately 1/4"-5/16" in diameter. They should also have several "grooves" in them to help hold them into the longeron. Position them inbd on the longeron as far as possible to aid the geometry of movement, they must also fit inside the channel on the canopy frame when the canopy is closed. Countersink (100°) the outbd side before potting into position. Use epoxy/flox to pot them into the longerons.
26. Select, cut and drill the two pivot arms, these are 7/16" steel. It is best to be accurate about the hole locations (which determine the length of rod from hole ctr to ctr). If both side are equal, then the canopy will swing uniformly. If the geometry is slightly different from one side to the other, then the canopy will have a rather strange movement when opened since one side would then be opening at a different rate through an arc of a different dimension-- not good! Measure carefully here so everyone at the airports won't ask why your canopy moves so strangely.

Also position and mount the fwd canopy pivot weldment. This weldment will span the longerons and must mount approx. 5/16" inbd from the outbd edge of the longerons. Adjust the position of this weldment fwd or aft along the longerons until the 5/16" dimension is achieved. If you can not achieve this dimension, the weldment may be cut in half in the mid span area and a tube sleeve slipped over which can be bolted to one or both sides (one side could be welded if you have access to a welder). The fwd to aft positioning of this weldment along the longerons is not critical, its spanwise positioning is critical (to within about 1/8").

This weldment will run behind the instrument panel and just above the longerons (1/16" is sufficient). Its purpose is to make the parallelogram mechanism of the canopy operate smoothly by providing a rigid connection from one side to the other and also providing a spring load (assist) to take the weight off during operation.

27. Make the phenolic receiving blocks (or saddle) per fig. 240 and bond them into position just under the longerons using epoxy/flox. Clamp and allow to cure.
28. Drill the two #19 holes through the aluminum retaining plates per fig. 241. Use these two holes as a guide and drill (#19) matching holes through the phenolic blocks and continue drilling all the way through the longerons. (Position a pc of 7/16" tubing into the "saddle" to set the vertical position of the aluminum retaining plate prior to drilling through the phenolic saddle and longeron.
29. Grind a large "flat" on the side of the machine screws that will be "potted" into the longeron from the outbd side thus forming "studs" protruding on the inside. See fig. 242. The "flat" is to prevent the machine screws from possibly spinning when the lock nuts are screwed on.

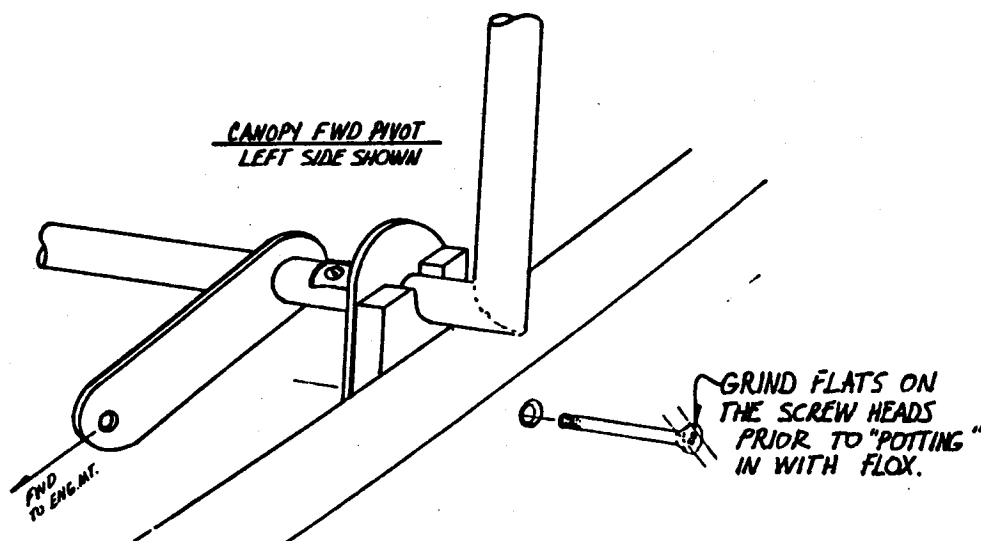


fig.242

30. Attach all the pivot arms and lay them down facing aft along the longerons. Transfer a vertical reference mark down onto the longeron (and onto the fsig outbd sides) where the canopy attach location is, see fig. 236.
31. The fwd weldment will require a small retainer to prevent it from sliding left or right during operation. Use a small section of 1/2" tubing, cut in half, as a stop on the inside (against the aluminum retaining plate) on each side. Use one pop rivet to hold this pc onto the weldment.
32. Position the canopy/frame onto the airframe and transfer these above reference lines up and onto the canopy frame. Measure up from the longeron per fig. 237(18) and drill the (4) *12 holes through the canopy frame. Be careful to drill straight through (as closely perpendicular to the canopy frame as possible). Drill completely through both sides of the channel. Inspect and verify that you did in fact drill through the .090" aluminum inserts positioned earlier into the canopy frame.
33. Position the (4) machine screws through the canopy frame thus attaching the pivot arms. Now, with a little luck, the canopy should open and swing fwd! (It will be rather heavy and much less "solid" now because the springs are not attached so don't worry about that now.)

NOTE: The fwd "stop" for the canopy opening action is generally that formed by the contact of the aft pivot arms contacting the aft edge of the canopy channel. It is advisable to prevent the canopy from swinging too far fwd (and thus too far down) since the possibility of hitting the fwd deck during operation by heavy handed airport groupies would exist. The aft canopy channel can be adjusted as necessary to provide the proper "stop" should it not yet be correct. If you were to get really fancy, you could provide a small beveled pad covered with a spot of nylon or rubber to contact the aft pivot rods, but that's not really necessary.
34. Attach the canopy springs to the attach arms (one on each side of the fwd canopy weldment). These springs are the big ones. The proper tension for these springs is about a 4" pull from the at rest position (measured while the arms of the weldment are vertical (thus the shortest dimension for the springs).

Drill a *12 hole through the aft edge of the lower top engine mount support brace to accept the spring attach end.
35. Make a small aluminum (.090") attach end for the spring. You may wish to make it adjustable by placing several *12 holes through a somewhat longer pc. This will then provide a means for adjusting the spring tension of the canopy movement. Using the spring itself as a guide, make the attach end pc of sufficient length to place about a 4" pull on the spring. Attach the springs and check the movement. (A pair of vise-grip pliers will work well for setting the springs.) You'll note that the

springs will have a tendency to hold the fwd section of the canopy frame up and off the deck unless the canopy is latched down. This actually works out to a sizable benefit... it allows for good ventilation when taxiing on hot days.

36. Adjust the spring tension so that there is just enough for smooth operation. Too much tension will cause the aft end of the canopy to smack down onto the aft fslg area while the fwd section of the canopy is still up too high. Too little tension will simply make the canopy difficult to open from only one side. When the tension is right, a slight lifting force placed about mid way between the canopy pivot attach screws will smoothly pop the canopy up, over and down in front.
37. It is a good idea to mount a very small "lift" tab on the side of the canopy frame at longeron line. A pc of .032" aluminum works well. Bend a tab up and slip it into the outbd side of the canopy channel wall, flush it into the bottom line of the canopy. It need not protrude more than about 1/2".

This is a good idea since although you know how and where to open the canopy, no one else will and if your plane is anything like ours, it can be a full time job just keeping spectators from trying to see how it opens.

NOTE: A canopy seal will obviously be needed. We use a "P" strip material with a self adhesive stick which works very well. This material, and many others as well, will require about 3/32" clearance when fully compressed. Thus the canopy side rails should be about that same distance up from the longerons when the canopy is locked down. Since the longeron is a good flat reference, adjust the canopy rails to fit. The aft side will have the seal material squeezed against the overlap section on the fslg, the fwd area will seal on the glare shield.

CANOPY LATCHES

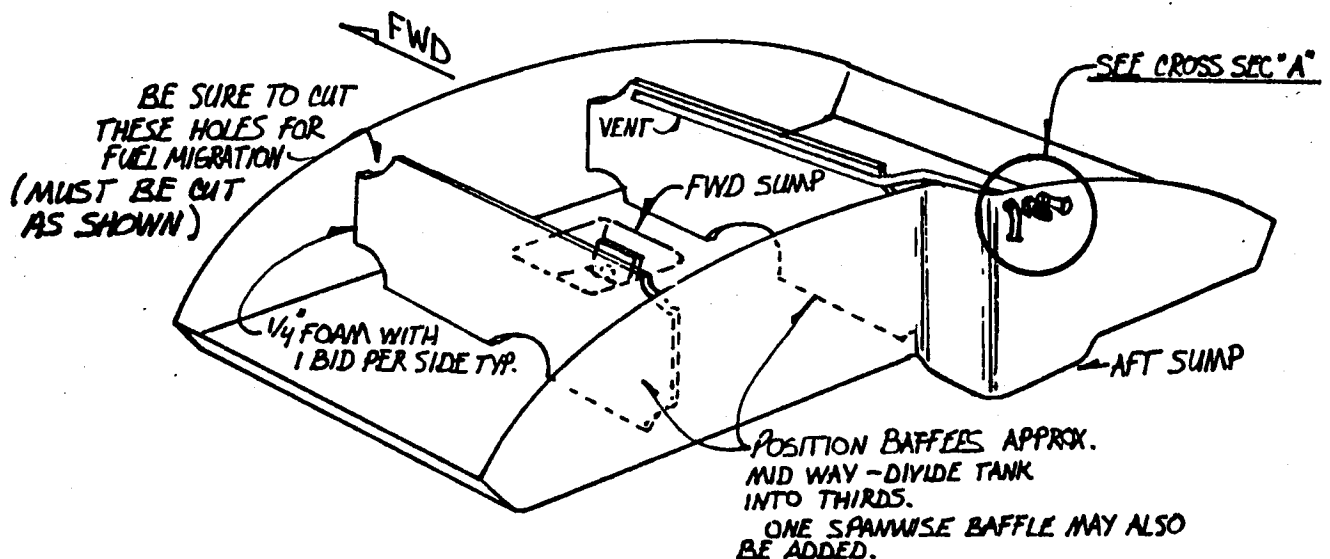
38. The standard approach is to latch all four corners down with cam-loc over center safety latches. See fig. 235. The latches are mounted just under the longerons with the "strikes" mounted to the inner canopy channel sides.
39. Locate the aluminum in the canopy channels and position the latches below them.
40. Get into the cockpit and close the canopy, with the latch closed (and adjusted to the middle area on itself), place the "strike" first on the side channel, mark its location. Then place the latch in proper position and mark the area both fwd to aft and vertically where it must mount. (It will typically mount down somewhat from the longeron due to its length.) Also note that the fwd latches will need to be positioned inbd from the longerons to align with the canopy inner channel sides. This will likely require additional wood or phenolic "shim stock" against the fslg side wall.

41. Make a small block of either 1/4" phenolic or plywood and pot the two attach screws in from the back side. Thus forming "studs" onto which the latch can be mounted. See fig. 237(cc)
42. Use epoxy/flox to mount the above assemblies under the longerons. And cover with 3 BID contacting at least 1" onto the fslg. Keep this area smooth and nicely faired into the fslg and longeron since it will be visible for all to see.
43. Attach the "strikes" with two machine screws per "strike". For clearance purposes, it is necessary to position the screws from the inside and attach the nuts from the outside. See fig. 237(cc)
 The canopy and latching system should be complete. (NOTE: IT MAY BE POSSIBLE TO MOUNT THE "STRIKE" ATTACH SCREWS WITH NUTS ON INSIDE OF CHANNEL.)

HEADER TANK

44. Temporarily position the header tank and check fit. Note that it will not fit tightly against the firewall since the fwd sump would interfere (usually, that is). The tank is a tight fit onto the fwd deck particularly along the right aft side.

Install the aluminum blocks into the tank per fig. 244-246 Use either epoxy/flox or 2216 adhesive to first bond them into position. Add the 3 BID over them with generous flox fillets so there will be NO air bubbles formed (that's a place for a leak). BE SURE THE PIPE THREADS ARE POINTING THE CORRECT WAY, IT'S EASY TO GOOF.



HEADER TANK

fig.243

45. Install the baffles per fig. 243