# CHAPTER 6
# REVISION LIST

The following list of revisions will allow you to update the Lancair IV construction manual chapter listed above.

Under the "Action" column, "R&R" directs you to remove and replace the pages affected by the revision. "Add" directs you to insert the pages shown and "R" to remove the pages.

| Page(s) affected | Current Rev.# | Action | Description |
|---|---|---|---|
| 6-1 thru 6-7 | 0 or 1 | None | Either Rev. # is correct |
| 6-8 thru 6-10 | 7 | R&R | Changed Steps A1 & A2.<br>Changed Figure 6:A:1.<br>Changed Step A4. |
| 6-11 thru 6-12 | 1 | R&R | Added third note after Step A4.<br>Added new Figure 6:A:2 to 6:A:3. |
| 6-13 thru 6-14 | 5 | R&R | Corrected Figure 6:A:3.<br>Corrected Step A15. |
| 6-29 | 3 | R&R | Changed Step D2. |
| 6-30 thru 6-36 | 1 | R&R | Added Step E12.<br>Added Figure 6:E:3. |
| 6-37 thru 6-38 | 7 | R&R | Changed Step F9.<br>Changed Figure 6:F:2. |
| 6-39 & 6-40 | 1 | R&R | |
| 6-41 thru 6-47 | A15 | R&R | Replaced Fuel Probe Section. |
| 6-48 thru 6-49 | 1 | R&R | |
| 6-50 thru 6-51 | A14 | R&R | Changed Fig. 6:H:8 and edited H24. |
| 6-52 thru 6-55 | 1 | R&R | |
| 6--56 | 4 | R&R | Corrected Figure 6:J:2. |
| 6-57 thru 6-69 | 1 | R&R | Corrected Step M4.<br>Corrected Step 6:M:3.<br>Corrected Step N.<br>Corrected Step N1. |
| 6-70 | 4 | R&R | Corrected Step 0. |
| 6-71 thru 6-73 | 1 | R&R | Replaced for expansion. |
| 6-74 thru 6-81 | 1 | Add | Chapter was expanded for revisions. |

# CHAPTER 6
# WING CONSTRUCTION

**REVISIONS**

From time to time, revisions to this assembly manual may be deemed necessary. When such revisions are made, you should immediately replace all outdated pages with the revised pages. Discard the out dated pages. Note that on the lower right corner of each page is a "revision date". Initial printings will have the number "0" printed and the printing date. All subsequent revisions will have the revision number followed by the date of that revision. When such revisions are made, a "table of revisions" page will also be issued. This page (or pages) should be inserted in front of the opening page (this page) of each affected chapter. A new "table of revisions" page will accompany any revision made to a chapter.

**Arrows**

Most drawings will have arrows to show which direction the parts are facing, unless the drawing itself makes that very obvious. **"A/C UP"** refers to the direction that would be up if the part were installed in a plane sitting in the upright position. In most cases the part shown will be oriented in the same position as the part itself will be placed during that particular assembly step. However, time goes on and changes are made, so careful attention should be paid to the orientation arrows. That old cartoon of the guy agonizing over the plans for his canoe, built one end up, one end down, should not happen in real life. Especially to you.

## CONTENTS

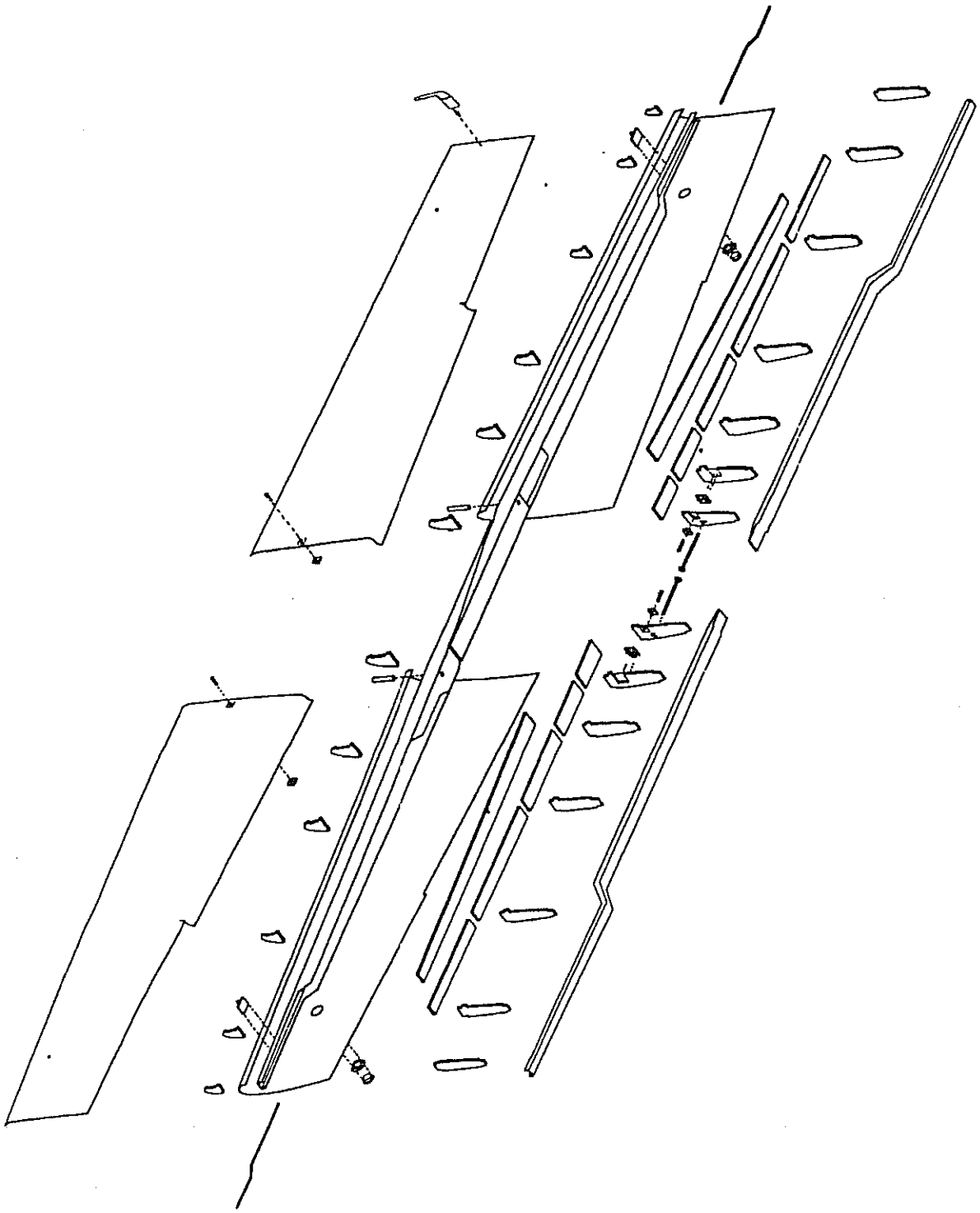
## 1. INTRODUCTION

In this chapter we will install the wing ribs and fuel bay web, and perform the necessary steps to prepare the wing to carry approximately 80 gallons of fuel. We will prepare the wings to accept the bottom wing skins, by forming the ribs and web properly, and installing capstrips on them as you did for the horizontal stabilizer. Then we will install a vent in each wing for the fuel tank to 'breathe' through, and in the event of an overfill, to permit it to rid itself of the expanding fuel. We will then install a fuel crossover tube through the main wing spar, since fuel is carried both behind and in front of it, to give you the least change in CG as the fuel burns off. Then the installation of the fuel caps, followed by the installation of a slosh door or 'one-way-valve' in the inboard fuel bay so that fuel will always be near the pickup tube. We will go through the installation procedure used to install the fuel probe into your IV. Then we will perform the installation of the fuel pickup. If you are using a fuel injected engine (typical for the IV), you will then be instructed in installing the fuel return line that is required by the typical Teledyne Continental Motors injection systems. We will the go through a buildup for the aileron bellcrank mounting area, perform some preliminary steps for installing the wing electrical items and installation of the pitot tube, and provide the instructions necessary to install the wing tie-downs.

With completion of this chapter the basic wing "core" will be completed. There will still remain the areas of the wing tips, ailerons and flaps.

## Wing exploded view

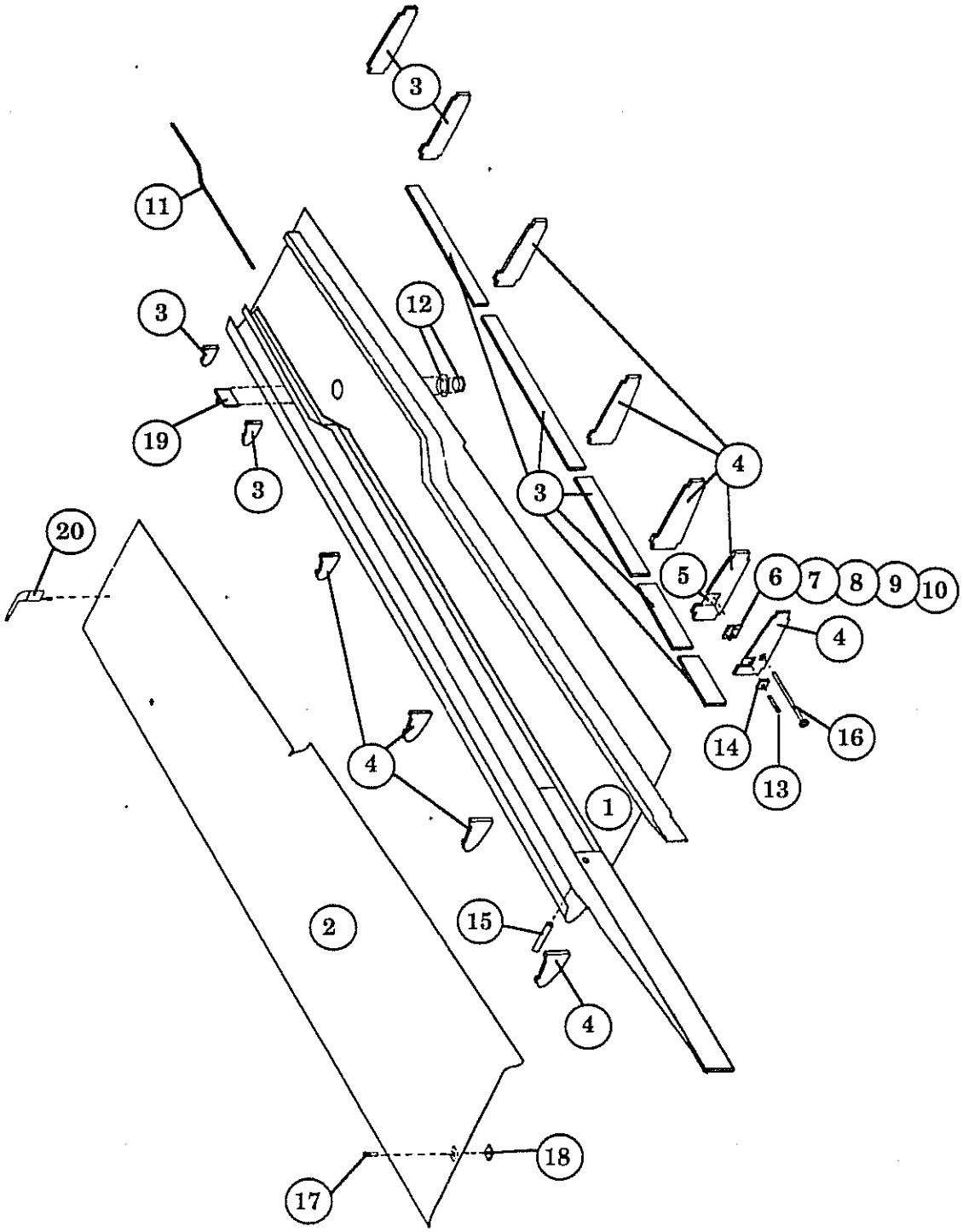
Figure 6-1



## Illustrated parts breakdown

(left wing only shown - right is the same except without pitot)

Figure 6-2



## 2. SPECIAL PARTS, TOOLS & SUPPLIES LIST

### A. PARTS LIST

| Item# | Qty* | Description |
|---|---|---|
| 1 | 1 | Left wing assembly (spar and top skin) |
| 2 | 1 | Left bottom wing skin |
| 3 | 1 | 2 ply per side prepreg sheet |
| 4 | 1 | 3 ply per side prepreg sheet |
| 5 | 2 | Fuel slosh door |
| 6 | 2 | Slosh door bracket |
| 7 | 4 | Bolt AN3-3A |
| 8 | 4 | Nutplate K1000-3 |
| 9 | 8 | Rivet AN 426A3-5 |
| 10 | 1 | Piano hinge - MS20001-5 |
| 11 | 1 | 1/4" Dia. 5052 Aluminum vent tube, 54" |
| 12 | 2 | Fuel cap assemblies |
| 13 | 2 | Fuel pickup tube (finger strainer) |
| 14 | 2 | 1-1/2" x 1-1/2" brass pickup tube block |
| 15 | 1 | 3/4" Dia. 6061 T6 aluminum tube, 11" |
| 16 | 2 | Fuel return assembly |
| 17 | 2 | Flush drain valves |
| 18 | 2 | Threaded brass drain valve insert |
| 19 | 2 | Tie down assemblies |
| 20 | 1 | Pitot tube and fittings (1 ea., 818-4D and 819-4D) |
| not shown | 1 | Right wing assembly (spar and top skin) |
| not shown | 1 | Right bottom wing skin |
| not shown | 2 | Fuel probe assembly - optional |

***Quantities include pieces required for right wing assembly (not shown).**

## B. TOOLS

Band, jig or scroll saw
Heat gun
Drill motor with bits;
- 3/8" drill bit
- 5/8" drill bit
- 3/16" drill bit
- 7/16" drill bit
- 1/16" drill bit
- 1/2" drill bit
- #40 drill bit
- #12 drill bit
- #29 drill bit
- 2 1/2" hole saw
- 4 1/2" hole saw

String line
Wire cutters
Mat knife

C. **SUPPLIES**

microballoons
flox
epoxy
brush
Sandpaper, #40 and #80 grits
MC
Clear plastic tape, 2" to 3" wide
Hysol structural adhesive
1 mil packing tape (release tape)
BID tapes

## 3. CONSTRUCTION PROCEDURE

### (A) RIB INSTALLATION

The ribs will be cut out using the drawings and the 2 and 3 ply per side prepreg supplied in the kit. They will then be custom fitted to each position and bonded into place. Some spaces will later contain fuel, and others will be dry. To attain little or no CG change from full fuel to an empty fuel situation, we have designed our wings to hold fuel in front of and behind the main spar. A web is incorporated into the wing to form the rear wall of the fuel tank. Before installing the ribs, we will mark off where this web will be placed, and then begin constructing the ribs.

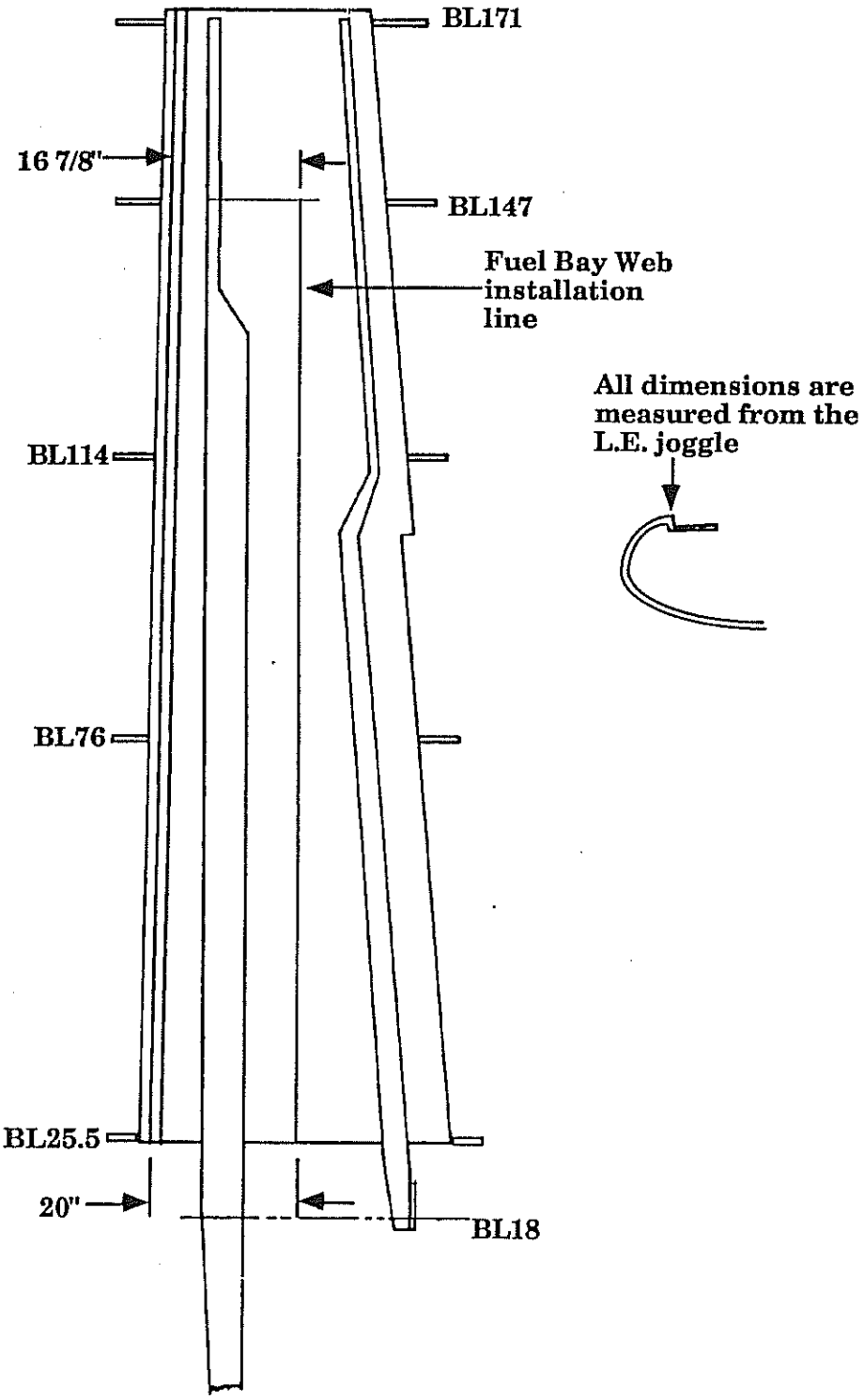
A1. Measure back from the top wing skin L.E. joggle 20" at BL 25.5 and make a mark on the inside of the top wing skin.

A2. At BL 147 measure back 16 7/8" from the L.E. joggle and make another mark.

A3. Connect these two marks with a straight line. This line is the position of the front face of the tank web you will later construct. Refer to Figure 6:A:1.

## Fuel bay web location

Figure 6:A:1



A4. Cut these ribs from 3 ply per side prepreg:
BL 25.5
BL 38
BL 52
BL 76
BL 114

Cut these ribs from 2 ply per side prepreg:
BL 147
BL 171

Cut the rib patterns from the blueprint sheets and arrange them on the 2 or 3 ply per side prepreg as per the above list. They must be cut on a 45° bias to the weave of the prepreg. The weave bias of early and later prepreg panels is different, so be sure you are cutting the ribs with the proper weave orientation. When the ribs are arranged so the least prepreg is wasted, trace the patterns onto the sheet and cut out the ribs. It is best to cut them slightly oversized so you can get the best fit. You will be installing ribs between the spars at BL 25.5, BL 38, BL 52, BL 76, BL 114 and BL 147, and one rib full chord beyond the ends of the spars at BL 171. You will also be installing nose ribs between the forward face of the main spar and the wing leading edge at positions BL 25.5, BL 52, BL 76, BL 114 and BL 147. See Figure 6:A:3.

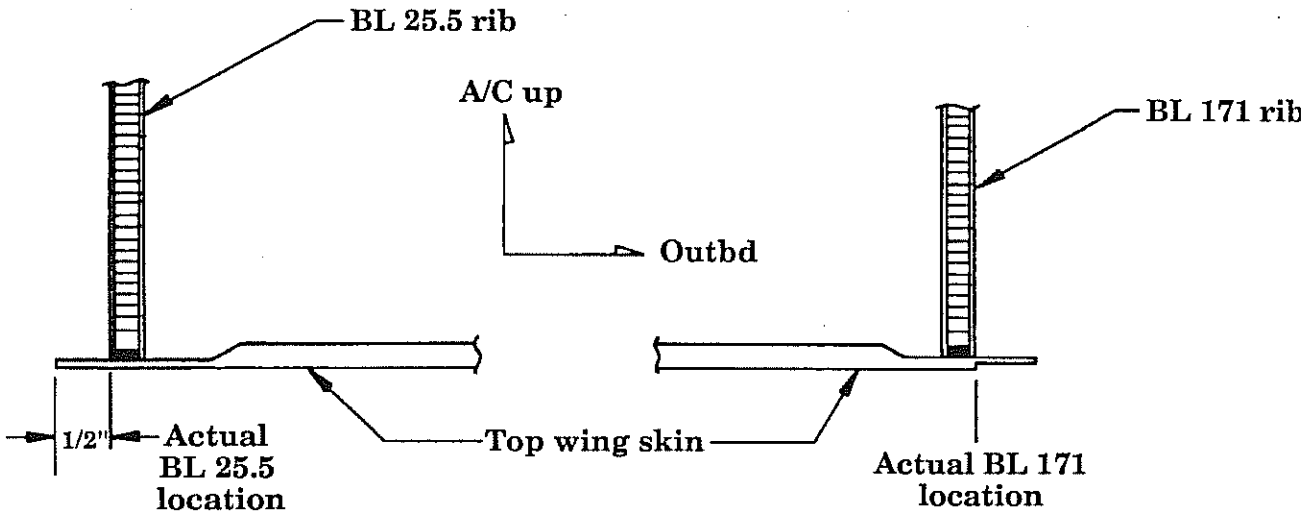
Note: Generally rib positions are considered centerline positions of the particular rib, however 1/8" either way is fully acceptable.

Note: The rib at 'BL 25.5' should actually be mounted such that it's inboard face is 1/2" outboard of the inboard edge of the wing skin. For the purposes of this text, we will refer to the rib as BL 25.5, regardless of it's exact position.

Note: Mount the BL 171 rib so it's outboard edge is located at BL 171. This will give you more flange area for later mounting of the wing tip.

## Locating BL 25.5 & BL 171 ribs

Figure 6:A:2




A5. Custom fit each rib at it's proper BL location. It is acceptable to have gaps of up to 1/8", but they should be kept to a minimum. All wing ribs are aligned perpendicular to the top wing skin except the BL 38 slosh rib, which is true vertical.

While the perpendicularity of ribs to skin is again not critical, the true vertical alignment of the BL 38 rib is important since it will house the slosh door for the fuel system.

A6. Remove the ribs and cut fuel vent and drain holes where indicated on the patterns.

A7. Grind the vent and drain holes to form smooth semicircles.

A8. Remove 1/8" of core material from the ribs where they will be bonded to the wing skin and spars, and from around the fuel vent and drain holes. We use a straight slot screwdriver to scrape the core down 1/8", which is all that is necessary for bonding.

A9. Fill the core area around the fuel drain and vent holes with a 50/50 micro flox mixture, removing any excess, and let cure.

A10. After the mixture has cured sand the holes smooth.

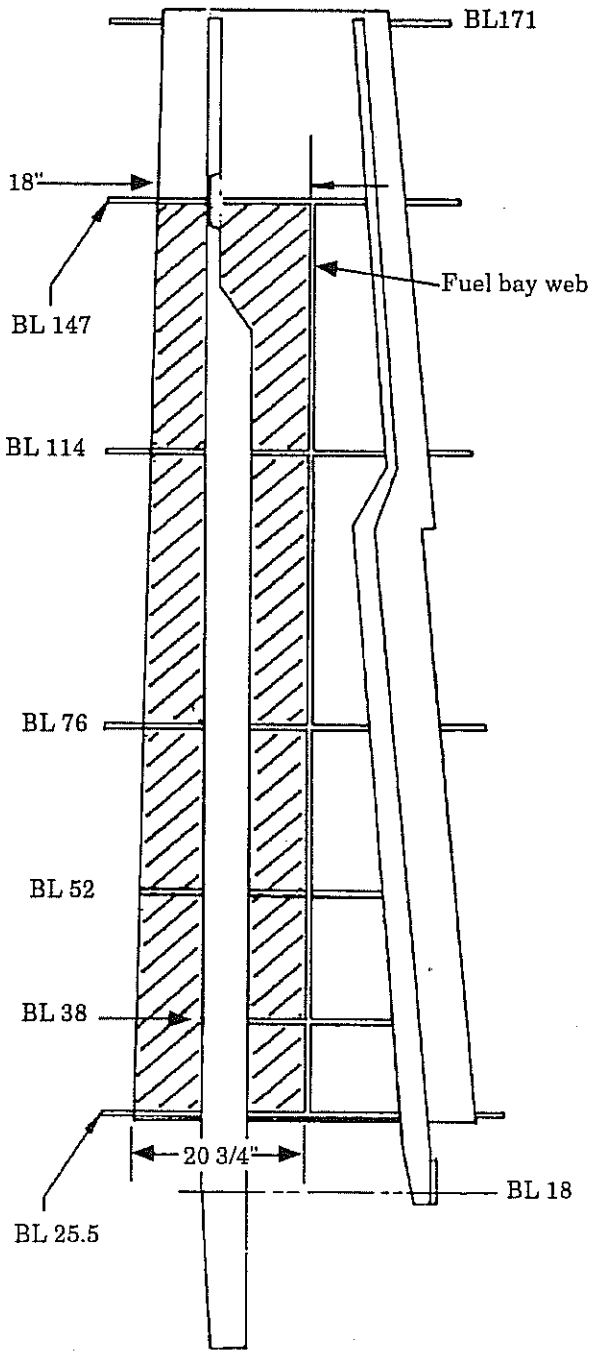
A11. Using #40 grit sandpaper, sand the areas of the wing skin and spars where the ribs will be located, just enough to dull the surface and prepare it for a good bond. Also sand the ribs where the BID tapes will be applied.

A12. Clean all surfaces with MC.

A13. Lightly coat the ribs with pure epoxy where you previously scraped the core out. Also coat the wing skin and spars where the ribs will be bonded. Don't use too much epoxy, a very light coat will do fine.

## Rib and Fuel bay web Locations

Figure 6:A:3



A14. Use micro to fill the rib edges you scraped, and to pot the ribs into position. Be sure the vent and drain holes are properly sealed so fuel can't get into the core. Remember, all of the ribs are perpendicular to the wing skin except for the BL 38 slosh rib, which is true vertical.

A15. Remove the excess micro from around ribs using a modified tongue depressor, to leave about a 1/8" micro radius between the ribs and the wing skin, that your BID tape will easily adhere to. If there is no excess, add some to get the radius. Don't throw that stick away, either. You'll need it many more times.

A16. After the ribs have cured in position, sand the areas where the BID tapes will go.

A17. Clean these areas with MC.

A18. Glass in the ribs with 2" wide BID tapes, cut on a 45° bias. Use 2 BID on the BL 147 and BL 171 ribs, and 3 BID on the rest;

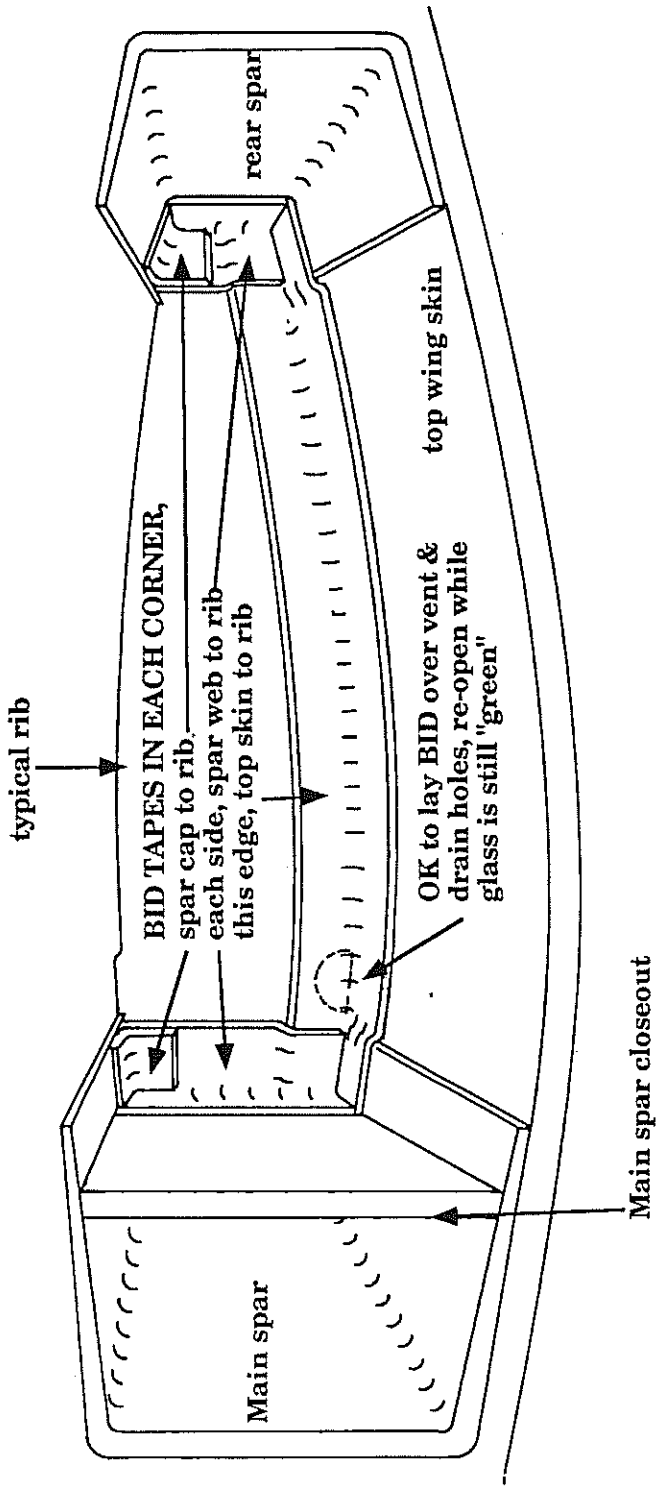
| | |
|---|---|
| BL 25.5 | 3 BID |
| BL 38 | 3 BID |
| BL 52 | 3 BID |
| BL 76 | 3 BID |
| BL 114 | 3 BID |
| | |
| BL 147 | 2 BID |
| BL 171 | 2 BID |

The BID tapes should be run on both sides of the ribs, and extend from about 1" on the rib to 1" onto the top skin and the two spars. Refer to Figure 6:A:4 for a typical rib. Rather than trying to cut and fit the BID tapes around the fuel vent and drain holes, the fuel drain and vent holes can simply be glassed over but, if possible, trim away the fiberglass from the fuel drain and vent holes while the glass is still green. This can be done using a very sharp knife or Xacto™, but be careful not to cut into the carbon-fiber material (or you!). It will be a lot easier to do this in the green state, but if you don't get to it in time, it still has to be done. DO NOT FORGET TO OPEN THESE HOLES!!

**WARNING** about clamping - whenever clamping anything to the fiberglass or fiber-composite material, always use a block of wood or similar between the metal jaws and the material of the aircraft to spread the load and prevent damage to the fibers. Never clamp any tighter than is necessary to hold items in their proper position. Never use clamps to force parts into position.

## Glassing in the ribs

Figure 6:A:4



## (B) FUEL BAY WEB INSTALLATION

Now we will use that line we drew back in step A3 as a guide for installing the web.

B1. The webs are cut from the fiberglass prepreg sheet that has 2 plies per side. Measure out and cut the webs from the prepreg, again being sure to cut them on a 45° bias to the material. Cut them slightly oversize and fit them between their respective ribs much like you fit the ribs themselves. The webs should be positioned true vertical. Refer to Figure 6:B:1.

B2. Once you have fit the webs, remove the 1/8" of core from them where they will bond to the ribs and wing skin just as you did with the ribs.

B3. Sand the webs, ribs and wing skin where the webs will be bonded, and where the BID tapes will be applied. Remember, don't sand deeply, just enough to prepare the surface, leaving a good rough "tooth" for the resin to bond to.

B4. Clean all areas to be bonded with MC.

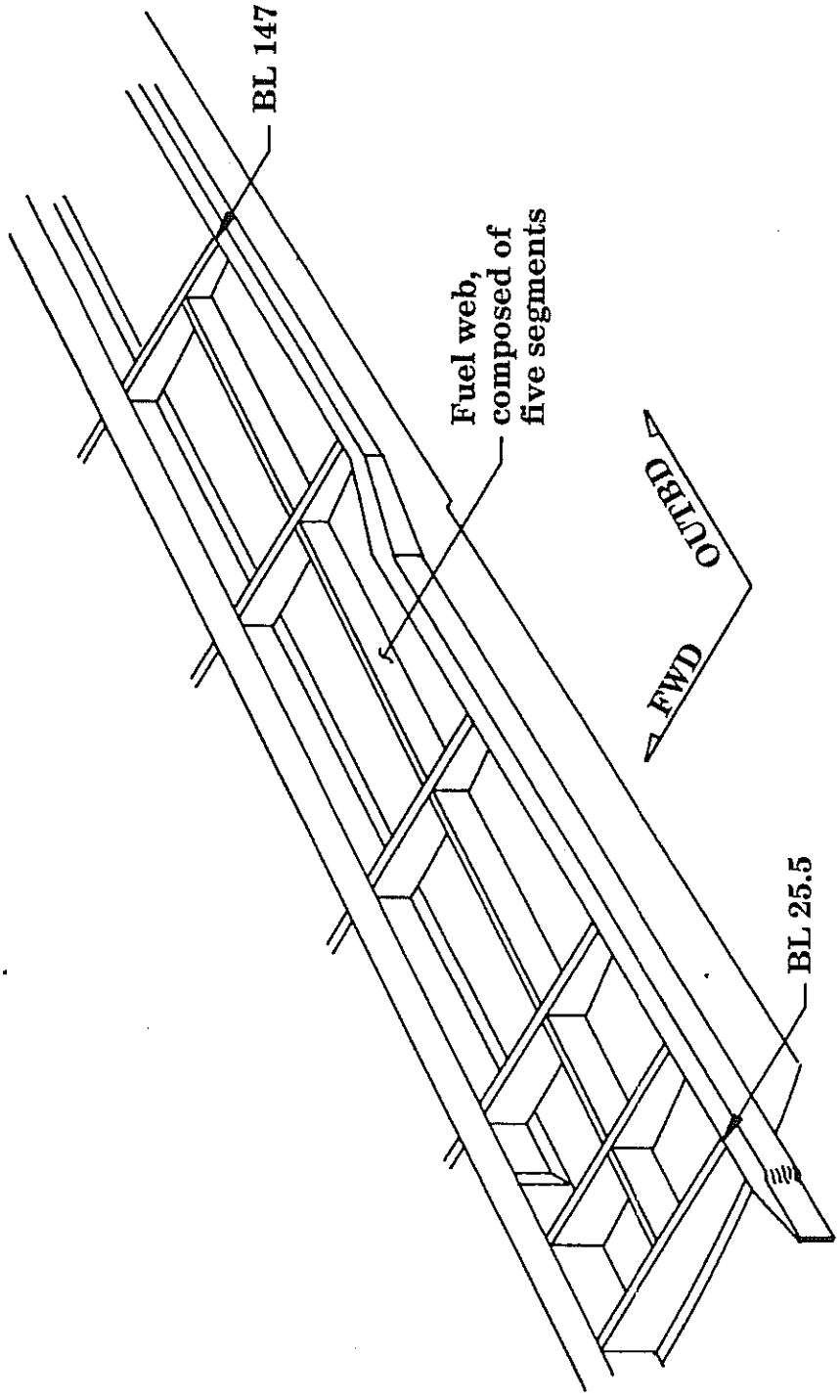
B5. Bond in the webs with micro and form a radius with that modified tongue depressor you didn't throw away earlier. Let cure.

B6. Sand the radius and re-sand the areas where the BID tapes will be applied. Clean these areas with MC.

B7. Glass in the webs with 2" wide 2 BID strips, just as you did with the ribs, extending around the three joined edges of the webs.

## Fuel web location

Figure 6:B:1



## (C) FITTING THE BOTTOM WING SKIN

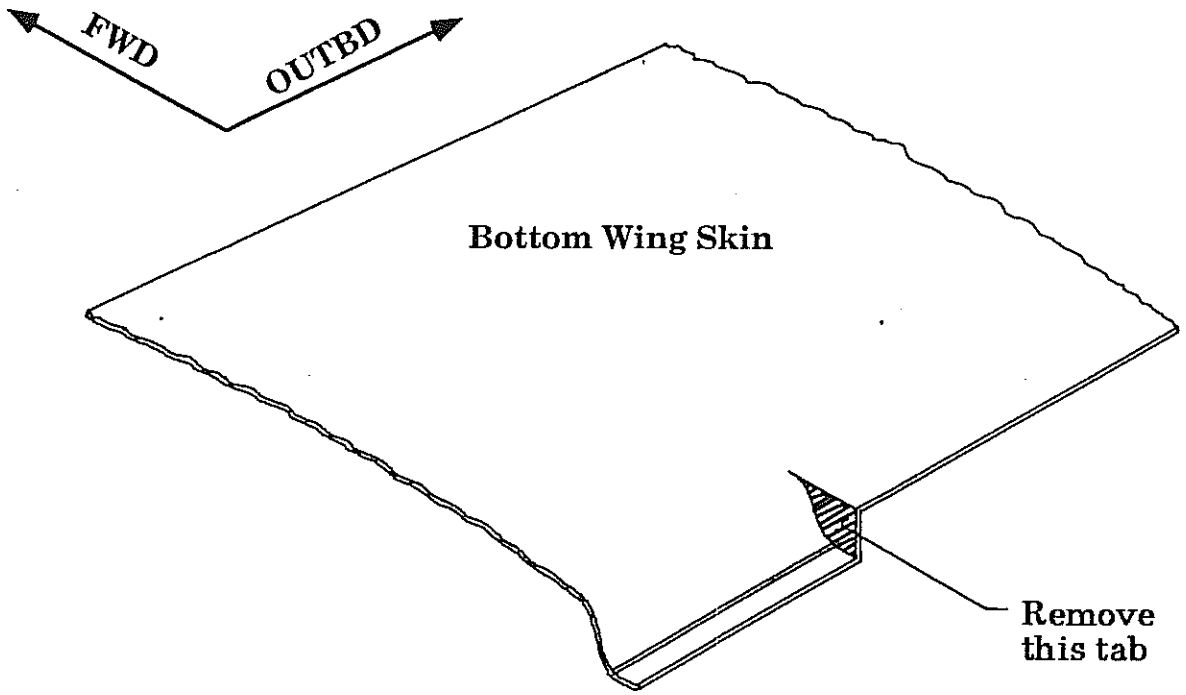
C1. Fitting the bottom wing skin to the top is surprisingly easy, but an extra pair of hands is very helpful. The ribs and fuel bay web must be sanded down until the bottom wing skin rests only on the main and rear spars and the L.E. joggle. In this condition, the wing should have the proper contour, and the skins will have the proper support.

C2. Remove the peel-ply from the bottom wing skin.

C3. Cut and sand the forward edge of the bottom skin to the trim line. If there is no trim line on your lower wing skin, then mark one and cut to it such that the joggle is 1" (minimum 7/8") wide. This will leave you the proper joggle bonding area. Take care to accurately trim to the line, because it will dictate the position of the bottom skin.

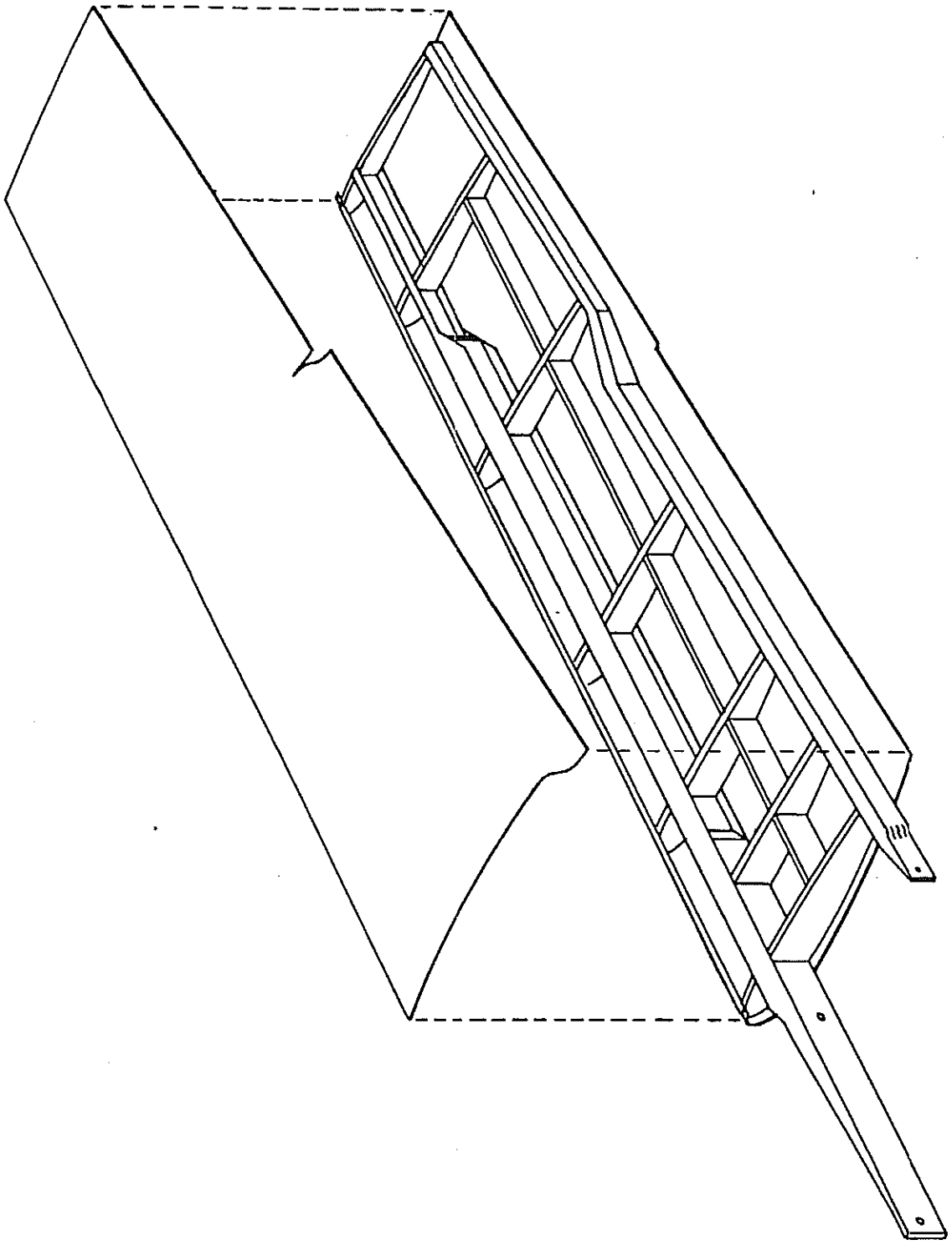
C4. Cut out the vertical section of carbon fiber on the outboard side of the flap area as shown in Figure 6:C:1.

**Removing Flap End Skin Tab**
Figure 6:C:1



## Overview - Fitting the bottom wing skin

Figure 6:C:2



C5. Place the bottom wing skin into position. The forward edge of the joggle on the bottom skin should rest straight in the top skin double joggle. Spanwise, the wingtip joggle should line up between top and bottom skins. When these two conditions are met, the bottom skin should be in position.

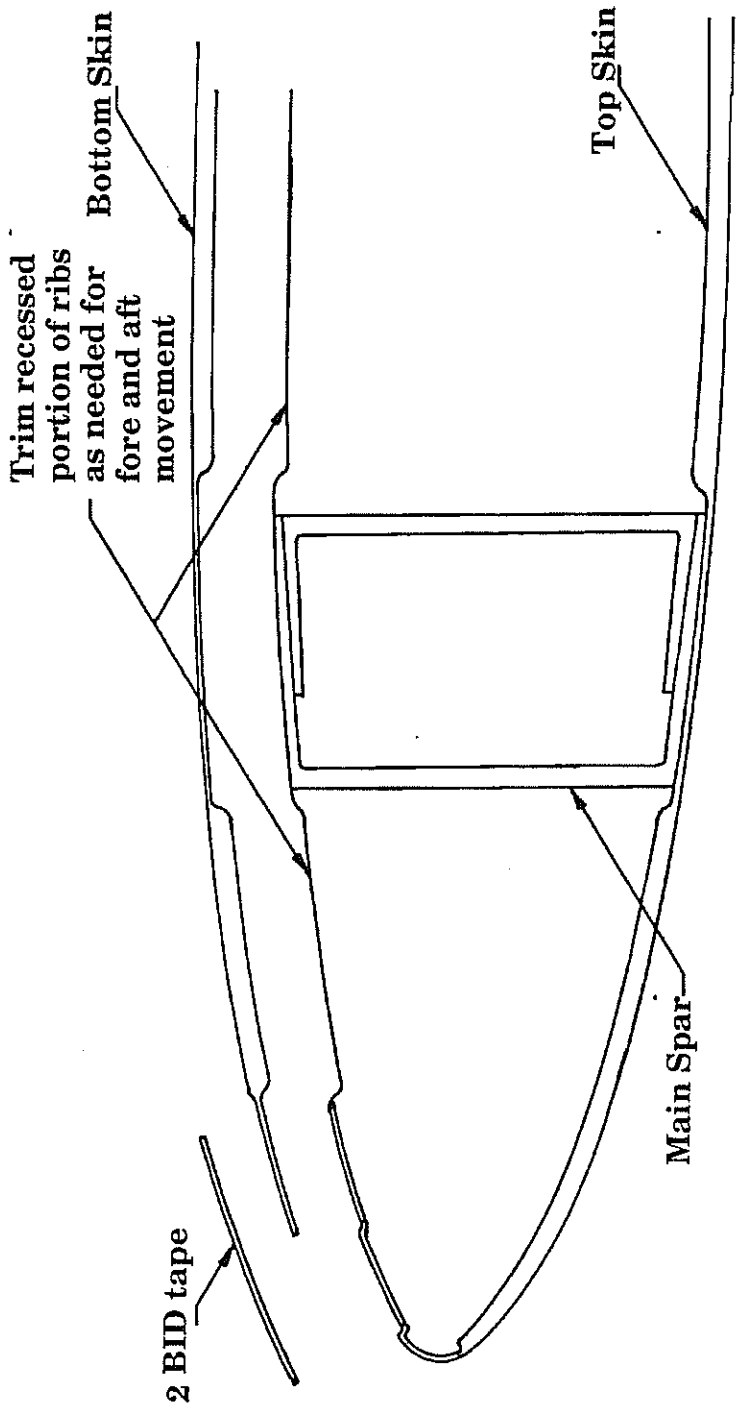
C6. If you find the bottom skin reluctant to move forward or aft enough to rest properly in the L.E. joggle, the problem might be that the recessed areas in the ribs are not cut far enough forward to accommodate the bottom skin core. If so, trim the ribs as necessary. Refer to Figure 6:C:3.

C7. Apply three layers of duct tape to the inside of the bottom wing skin where it will be bonded to the main and rear spars. The duct tape simulates the thickness of the adhesive used to close out the wing and acts as a release tape for the flox you will be adding to the bottom main spar cap.

C8. Use the top wing cradle pieces as a guide to trim the ribs to the correct height. Your ribs will probably be oversize, so trim them down (a die grinder or small belt sander works well for this job) until the rear spar contacts the duct tape spacer on the bottom wing skin and the L.E. joggle rests in the double joggle of the top wing skin. You will probably notice that when the proper airfoil height has been achieved, there is still a gap between the bottom main spar cap and the bottom wing skin. This gap will be filled in the next few steps. Remember to use the spacers (that simulated the saw cut when the cradles were separated) between top and bottom wing cradles.

## Leading edge joggle, positioning bottom skin

Figure 6:C:3

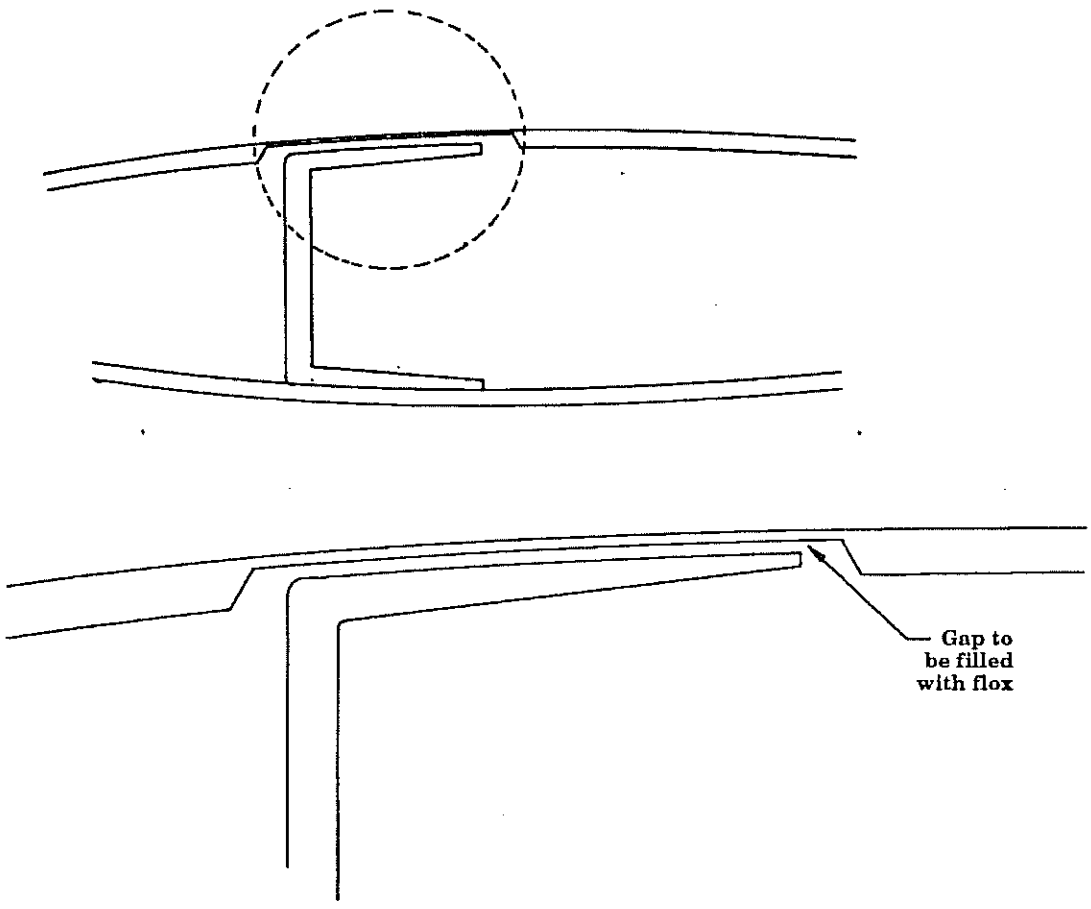


C9. With the L.E. joggle of the bottom wing skin resting on the top wing skin double joggle, and the three layer duct tape spacer resting on the rear spar, the top wing cradles should rest in position. Now look at the gap between the bottom main spar cap and the bottom wing skin (you can only see the gap at BL 25.5 and BL 171 but the gap should be roughly similar along the length of the spar). Remember the approximate size of the gap, because in the next few steps you will perform a flox release to custom fit the main spar to your wing.

NOTE: Do not simply weight down the bottom wing skin against the main spar and expect the thickness of the wing to be correct. The height of your main spars will be slightly low, sometimes as much as 1/8" low. Because of the shrinkage and expansion involved in producing the Lancair IV's main spars, we prefer to bias the parts on the small side. Otherwise, you might end up stuck with a thick wing, and grinding away the spar caps to achieve a proper airfoil can be very hazardous to your health.

**Checking the gap between main spar and bottom wing skin**

Figure 6:C:4



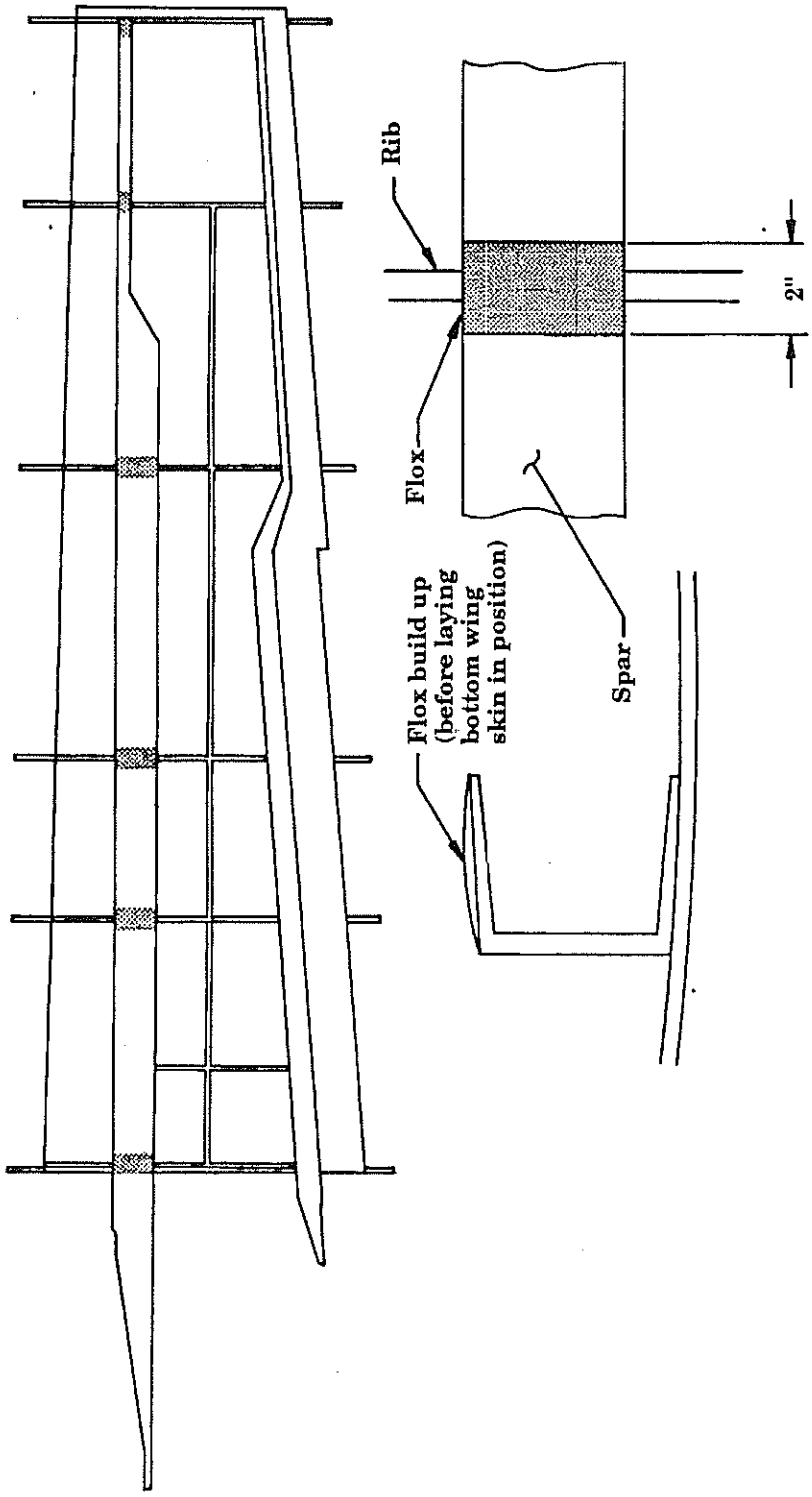
C10. Scuff up the bottom main spar cap with 40 grit.

C11. Clean the bottom main spar cap with MC.

C12. Apply an epoxy/flox mixture to the bottom main spar cap only at the top wing cradle locations, BL 25.5, BL 76, etc. A 2" wide bead of epoxy/flox at each cradle location will be sufficient for this release. Remember the height of the gap between your bottom spar cap and bottom wing skin? Keep that gap in mind when applying the flox. Thicker gap - more flox. You may want to apply a single layer of thin release tape (like 1 mil thick packing tape) to the bottom wing skin in the areas of your release to avoid wrecking the three layer duct tape spacer.

## Applying flox fill to spar at cradle locations

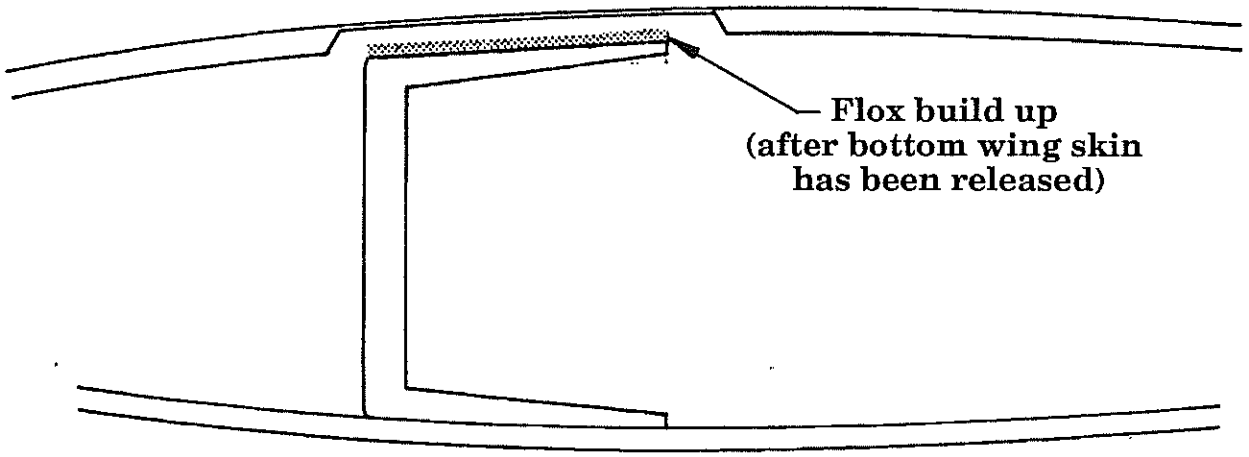
Figure 6:C:5



C13. When you are satisfied you have applied enough flox to the bottom main spar cap, place the bottom wing skin in position with the top wing cradles. Treat this procedure just like closing out the wing for good. Weight the bottom wing skin down against the rear spar and weight (or clamp) the L.E. double joggle together. Place the top wing cradles in position and check that the bottom wing skin is resting at it's proper height. Don't worry about the areas between the top wing cradles where there is no flox between the bottom wing skin and spar cap.

C14. After the flox has cured, remove the bottom wing skin. You should now have five beads of hardened flox on the bottom spar cap that are custom formed to locate the bottom wing skin at it's proper height.

**Custom formed flox pads on spar cap**
Figure 6:C:6

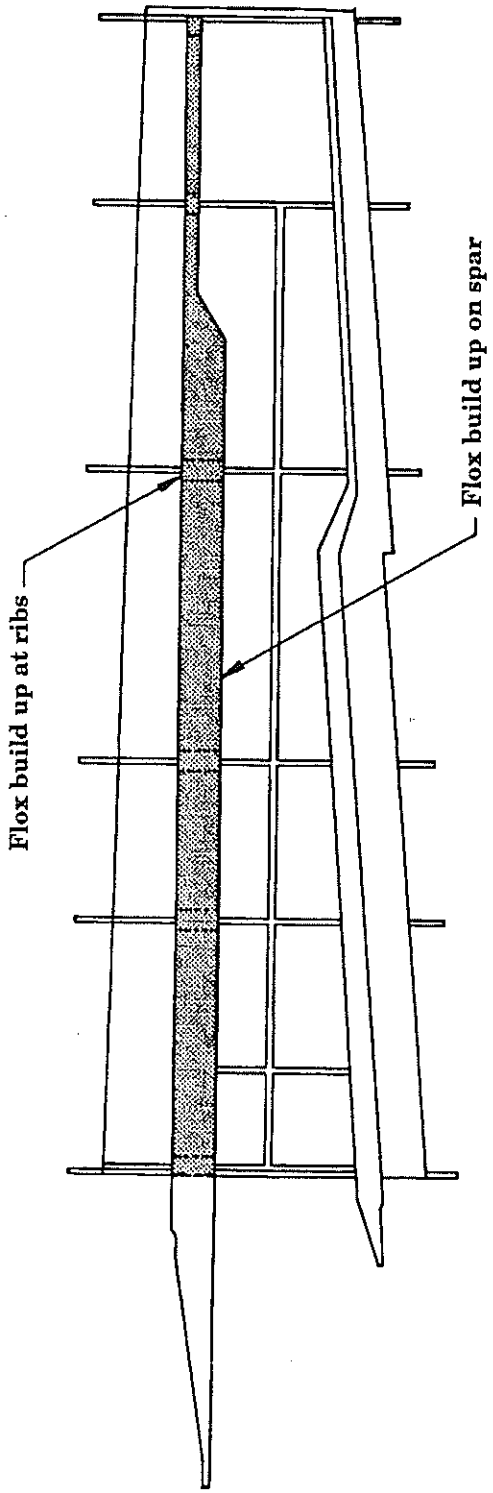



C15. Using the small flox pads as guides, you can now apply an epoxy / flox mixture to the rest of the bottom main spar cap. Be sure you have cleaned the flox fill area of the main spar cap and don't apply any more flox to the already formed areas. Your three layer duct tape release should still be intact from the previous release. Be sure the bottom wing skin is straight between the top cradle locations. If you use weight (instead of the cradles) to hold the bottom wing skin down, place the weight ONLY AT THE CRADLE LOCATIONS where the flox pads are solid. Otherwise, your bottom wing skin will bow down between the pads.

This larger release may require quite a bit of epoxy / flox mixing. As you no doubt know by now, flox accelerates the curing process of the epoxy, which means you may not have a lot of time once you start applying the mixture. I would not consider trying this release unless the temperature was under 80° F (under 70° F would be best). At the higher temperatures, the flox mixture will simply cure too fast.

## Completing flox build up of main spar cap

Figure 6:C:7



C16. After the flox has cured, carefully remove the bottom wing skin. The bottom main spar cap should now be custom fit to your individual wing. Be sure there are no voids or air bubbles in the flox filled areas of the spar cap. If there are, fill them with more flox and sand smooth to the surrounding surface. You are now ready to fit the capstrips to your wing ribs.

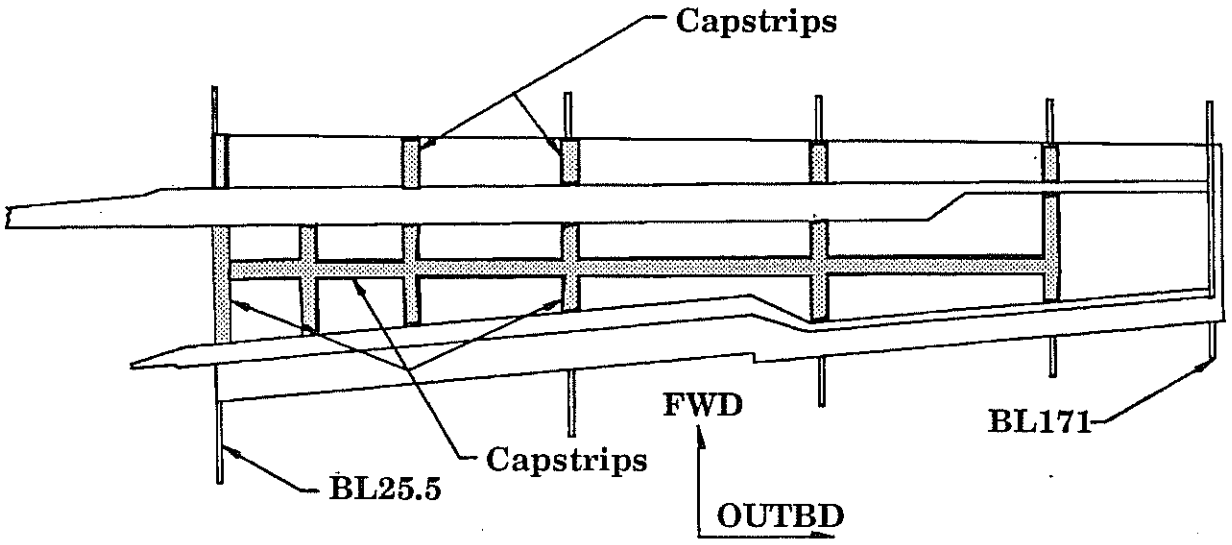
## (D) CAPSTRIP INSTALLATION

Capstrips will be installed on all ribs (except the BL 171 rib) and the fuel web. These provide extra bonding area when closing out the wing and lessen chances of any fuel leaks. The installation procedure for these capstrips is very similar to the one for the horizontal stabilizer.

Note: You don't have to do an entire wing at once. You can do it in sections, the size depending upon how much help you may have at the time. The cure time of the epoxy may not let you prepare all of the BID tapes and prep all of the ribs and webs with epoxy/micro too, so you might opt to do this one on the 'installment plan', just doing a rib or two, or half of one wing at a time.

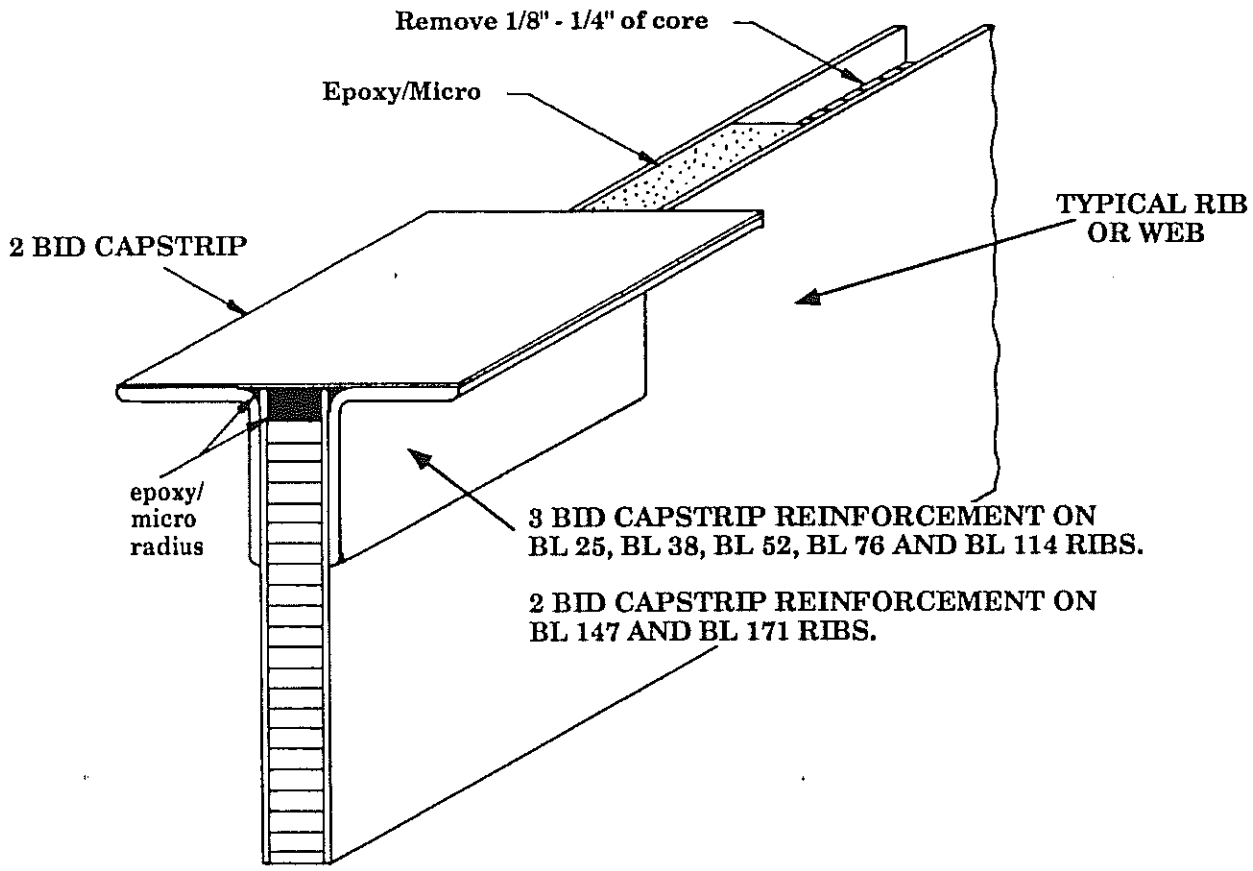
NOTE TOO: **To ease assembly of the fuel slosh doors, it is better if you complete steps K1 through K3 before fitting the capstrips.**

**Capstrip locations, top view**
Figure 6:D:1




D1. Sight under the bottom skin. Mark the rib center lines on the inside of the bottom wing skin. Measure back from the joggle and make reference marks on the inside surface of the bottom skin at the forward and rear edges of the main spar, the forward edge of the rear spar, and the centerline of the fuel web. These marks will give you the location of the capstrips. Be sure to mark these locations accurately so the capstrips will butt against the top skin joggle, main and rear spars, and be centered on the ribs and fuel web.

## Rib Preparation
Figure 6:D:2




D2. Apply 3 layers of duct tape to seal all areas of the bottom wing skin where capstrips will be placed. 3 layers will match the thickness of duct tape you added to simulate the spar adhesive thickness. The idea is not to bond the bottom skin to the top before you are ready, so be thorough with the duct tape. It will act as a release for the BID tapes that will form the top capstrips on the ribs and web. The duct tape strips should extend a good 3" on each side of the capstrips. You'll have to transfer the capstrip reference marks to the top of the duct tape.

D3. Using a straight-slot screwdriver or Dremel™ tool, etc., remove 1/8" to 1/4" of core material from the ribs and web which will be capstripped.

D4. Sand the ribs and web for 1-1/2" down each side now, so that later you can attach the 2 or 3 BID tapes under the capstrips to a good prepared surface. It is easier to do this now rather than after the capstrips are applied.

D5. Clean all areas with MC.

D6. Wet the trough area you cleared at the top of the ribs/webs with a light coat of resin. Coat only the ones you are going to capstrip at this time.

D7. Mix up some epoxy/micro (a bit thick - if it is too thin a mix, it will simply run out instead of mounding up properly) and apply it onto the tops of the ribs and web (remember, just put it on the ones you are going to do at this time). Although this is not a particularly large amount of work, you should move swiftly and have your plan together since the resin will not wait for you. Better yet, have someone else do this step while you prepare the BID tapes you will need. You want to fill the troughs, and just a bit more. The bit more depends on the fit of the skin. If you have a real close fit, just a little extra micro will be needed. If you have a 'looser' fit, then a larger mound atop the ribs/webs will be necessary to achieve a good contact with the capstrips.

D8. Measure your ribs and web, and prepare your BID tapes on a 45° bias (2 ply x 2-1/2" wide) using the plastic sandwich method of wetting out the glass. Cut enough 2-1/2" wide glass strips to complete all the capstrips with 2 BID. Do not overlap the BID tapes where they meet, just butt them together as you did on the horizontal stabilizer.

D9. When the BID tapes are ready and the fresh epoxy/micro has been applied to the ribs and web, peel one side of the plastic off and place the BID tape (exposed side, of course) against the lower wing skin, aligning the tapes with their respective positions on the plastic tape. Press them down smoothly onto the inner contour.

Remember, nothing is to lap onto the spars. Be careful not to spill or brush epoxy/micro onto them, it will be hard to clean up later, and could interfere with the fit we are trying to achieve.

D10. Peel the remaining piece of plastic from each BID tape. The skin is now ready to lower into place.

D11. Carefully hold the bottom wing skin in position just above the wing structure. Do not let the bottom skin come in contact with the ribs and fuel web until you are sure it's in the proper position. The capstrips can be deformed or stick to something they shouldn't, and you could end up with a big mess. Lower the bottom wing skin into place and carefully weight it only on the spar areas (if you weight the skin in an unsupported area your capstrips won't have the proper shape). Use the top profiles to be sure of the correct airfoil shape.

D12. After cure, remove the bottom wing skin. Repeat the procedure until all ribs and fuel web are capstripped.

D13. After cure, trim the capstrips to 2" in width (± 3/8") and centered on the ribs and fuel web. A sharp knife and heat gun will make short work of this step.

D14. Inspect for any micro that squeezed out that may interfere with the BID tapes that will secure the capstrips to the sides of the webs/ribs. Sand any excess micro to a nice radius. We use a Dremel tool with a ball head bit to make this step faster & easier.

D15. Lightly sand the underside of the capstrips to prepare the surface, then clean with MC.

D16. Using a mix of epoxy/micro, fill in any voids you may have between the capstrips and the ribs/webs, and add enough so you can use that well-worn special tongue depressor to give you a good radius everywhere BID tapes will be added. Be sure to keep the radius small in the areas of the slosh doors.

D17. Apply 2 BID (2" wide) tapes under the capstrips on the BL 147 rib to make a strong "T" on the rib and web. Use a 3 BID reinforcement on the BL 25.5, BL 38, BL 52, BL 76, and BL 114 ribs. Refer back to Figure 6:D:2.

## (E) WING AREA FUEL SYSTEM - FUEL TANK VENT INSTALLATION

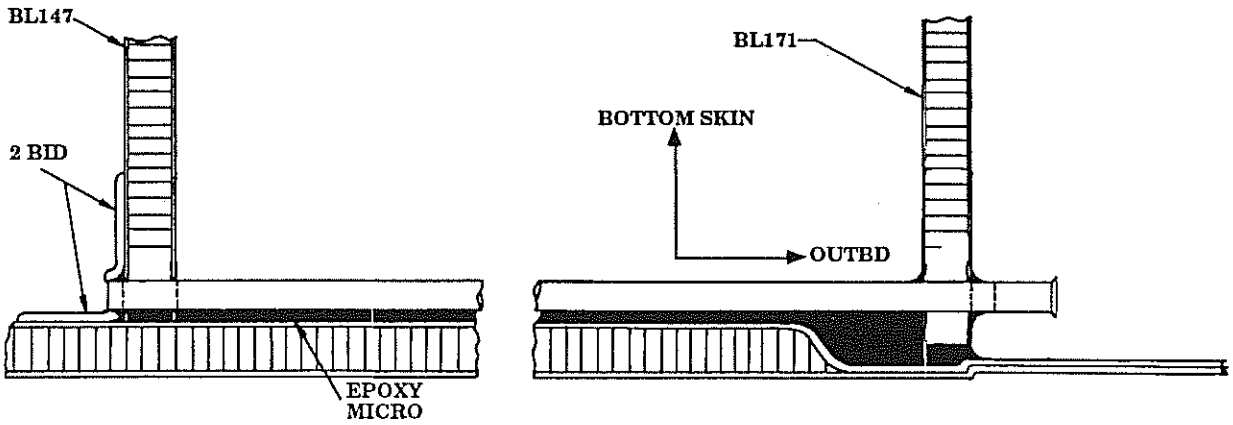
The fuel vent consists of a single 1/4" aluminum tube potted into the BL 147 rib, extending out past the BL 171 rib. The vent line will be connected to a small NACA duct in the wing tip.

E1. Cut two 27" pieces of 1/4" diameter 5052 aluminum tubing. This is enough for both wing vents, so if you are building only half a wing at a time, place the extra piece aside.

E2. Measure back from the aft face of the main spar 7" at the BL 147 rib, 8" at the BL 171 rib and make a mark on each of the ribs just above the top skin. Drill a 3/8" hole through each of these ribs at the marks, the bottom of the hole being about .050" (one tongue depressor thickness) above the top skin. The aluminum tube will be potted in position with Hysol just above the top skin to avoid any reaction problems between the aluminum tube and carbon fiber. See Figure 6:E:1.

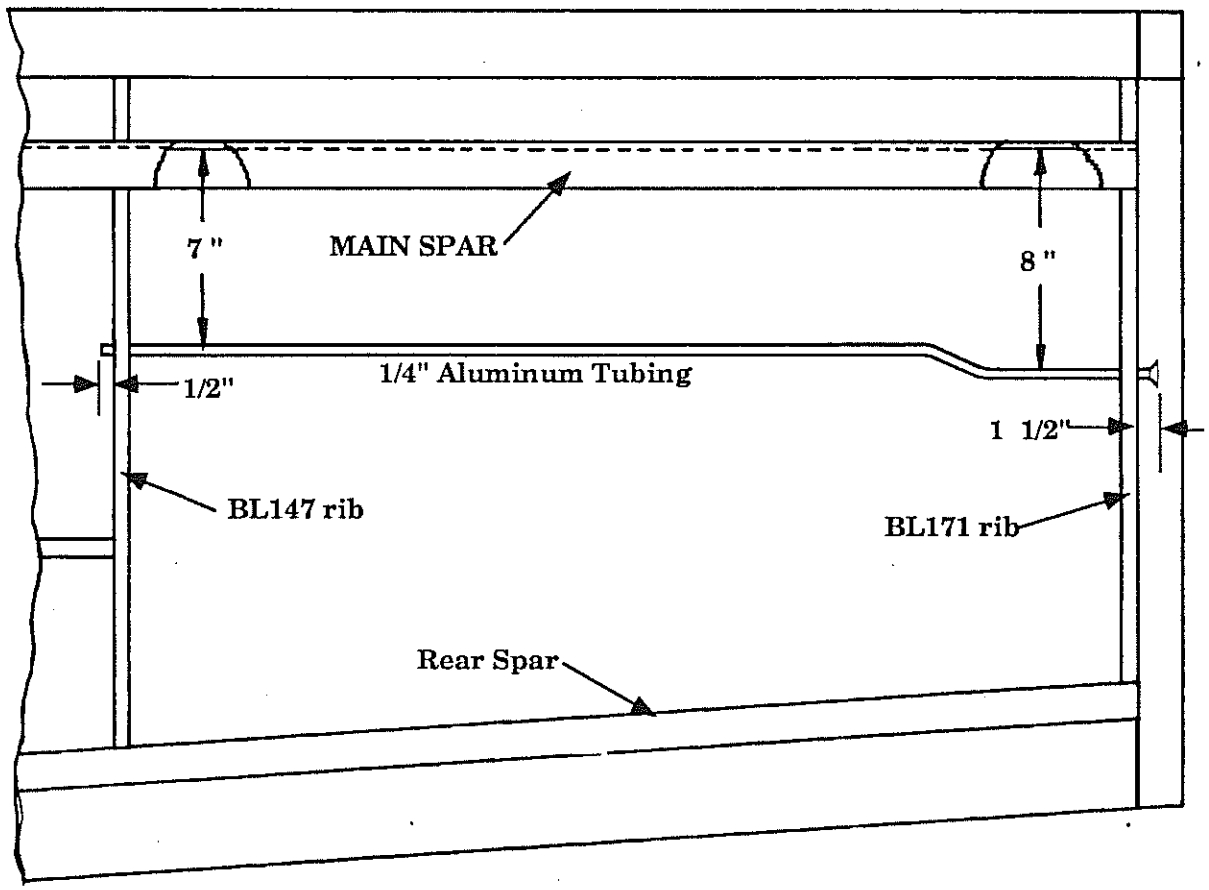
**Fuel vent tube profile**

Figure 6:E:1



E3. Bend a 1" joggle into the vent tube midway between the BL 147 and 171 ribs (this joggle is only necessary if you plan on putting a power pack in your wing tip for navigation and strobe lights). Flare the outboard end of the vent tube as shown in Figure 6:E:1. See Figure 6:E:2.

**Fuel vent, top view**
Figure 6:E:2




E4. Slip the tube through the ribs into position. The outboard end of the vent tube should be 1 1/2" outboard of the BL 171 rib. In this position, cut the tube so it extends 1/2" inboard of the BL 147 rib. Deburr the tube to ensure good airflow and no debris. Mark the tube on both sides of the BL 147 and BL 171 ribs.

E5. Remove the tube and rough sand it with 40 grit paper.

E6. Sand the top wing skin in the areas that will be under the vent tube, and sand the area on each side of the ribs where the tube will pass through them.

E7. Clean the tube and the sanded areas with MC.

E8. Insert the tube into position and place tongue depressors under the tube to keep it from touching the carbon fiber wing skin.

E9. Pot the vent tube into position by running a fillet of Hysol™ between the tube and the ribs at the holes, sealing the holes (and the core material) from both sides.

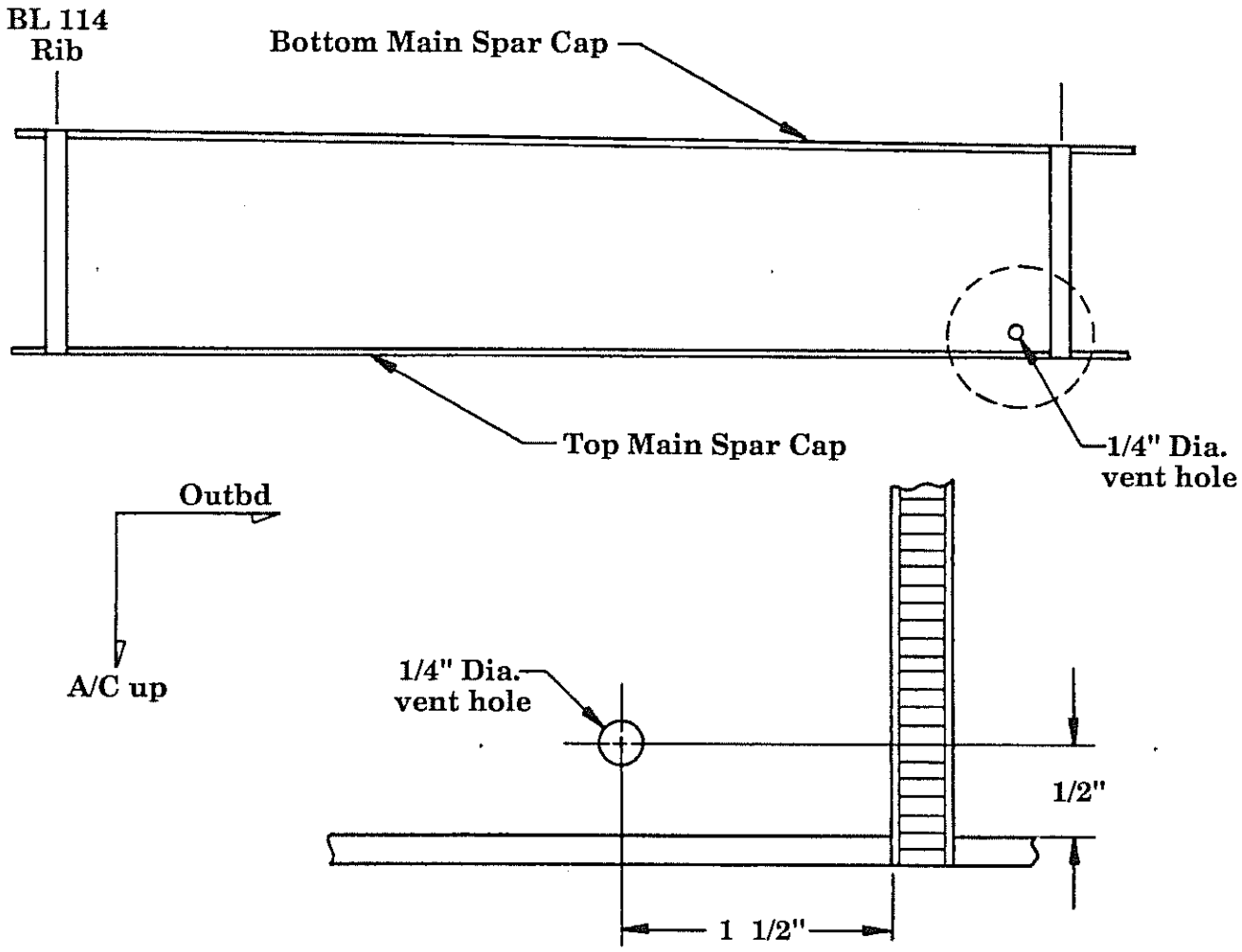
E10. Cut two 2" x 2" pieces of glass cloth and cut a small hole in their centers. The pieces will be used to seal and reinforce the area of the vent tube/rib on the inboard side of the BL 147 rib. Without waiting for the Hysol to cure, slide the cloth pieces one at a time onto the BL 147 rib and wet them out over the Hysol and surrounding area. Don't be too light on the resin as this is a fuel area but again, use caution not to get anything into the tube that could present a problem later. If you do not install the glass while the Hysol is still 'wet', you will have to let it cure enough to sand it a bit, then apply the 2 BID.

E11. When the Hysol has cured sufficiently to hold the tube in it's position, you can remove the tongue depressors and mix a thick batch of micro. Run a bead of this micro between the vent tube and the wing skin. Radius the micro with an unmodified tongue depressor.

E12. To vent the outboard L.E. rib bay, grind a 1/4" dia. hole through the main spar web at the location shown in Figure 6:E:3.

## Venting Outbd L.E. fuel bay

Figure 6:E:3



## (F) FUEL CROSSOVER TUBE INSTALLATION

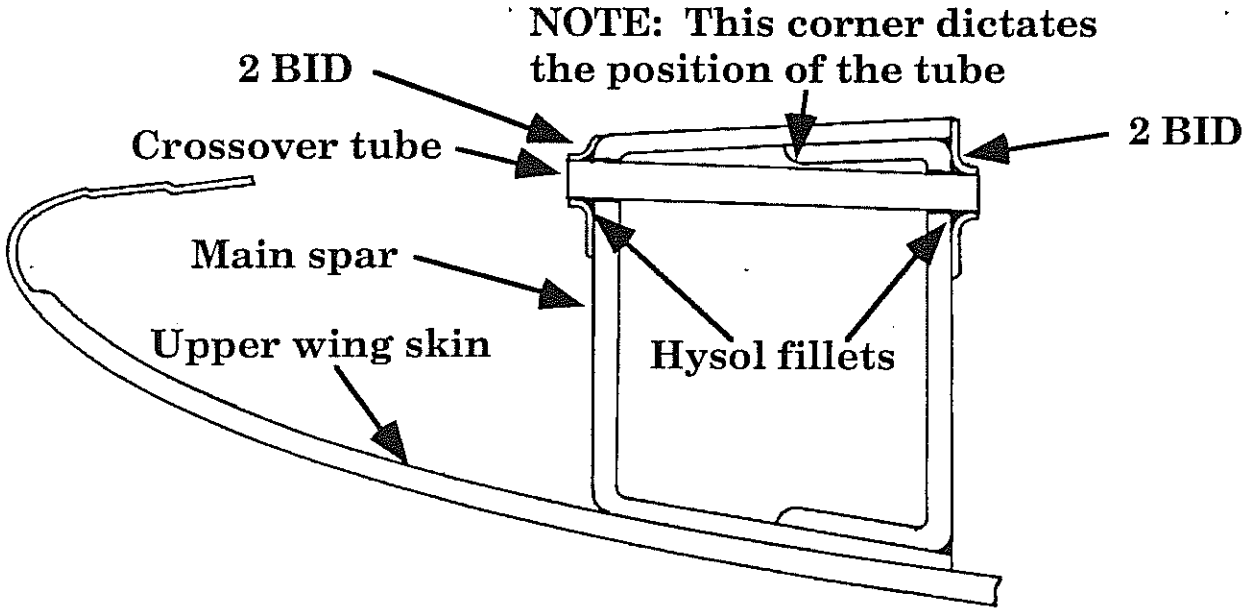
Since fuel is carried on both sides of the spar, a tube must be added at the bottom of the tank to provide fuel flow to and from the area in front of the spar.

NOTE: Cutting the holes in the main spar webs should be done with great care, to prevent damage to the spar caps.

F1. Cut two 5-1/2" pieces of 3/4" diameter 6061 T6 aluminum tubing. Again, if you're only building one wing at a time, set aside one tube for later use.

F2. To find the center of the hole on the aft face of the main spar, measure outboard 1" from the BL 25.5 rib and down 1-1/2" from the top of the spar (actually the bottom of the lower spar cap - we're inverted, right?). Drill or grind a small hole through the inboard spar closeout/web at this point. Slowly enlarge the hole to fit the aluminum tube. DON'T CUT INTO THE BOTTOM SPAR CAP! If you must extend the hole downward to fit the tube and avoid the spar cap, do so. A loose fit is perfectly acceptable if it means saving the spar's structural integrity.

**Fuel crossover tube installation**
Figure 6:F:1



F3. To find the center of the hole in the front spar web, measure 1" outboard of the BL 25.5 nose rib and 1 1/8" down from the top of the spar. Use the same method of grinding a small hole first, then progressively expanding the hole to avoid the spar cap. You might notice the rear spar insert extends only halfway forward along the spar cap. The lower forward corner of the rear insert will likely gauge the final position of the tube. You can raise the hole in the front spar web until either the tube rests against the bottom spar cap or the rear insert. This will give you the maximum usable fuel out of the nose section of the tank.

F4. When the final position is decided, remove the tube and sand it's ends where they will be bonded, and deburr the tube ends.

F5. Sand the spar web about 2" all the way around the area where the tube will mount.

F6. Clean the tube and the spar mounting area with MC and let dry.

F7. Bond the tube in position with Hysol, forming a seal between the tube and the spar web, and making a 1/8" radius.

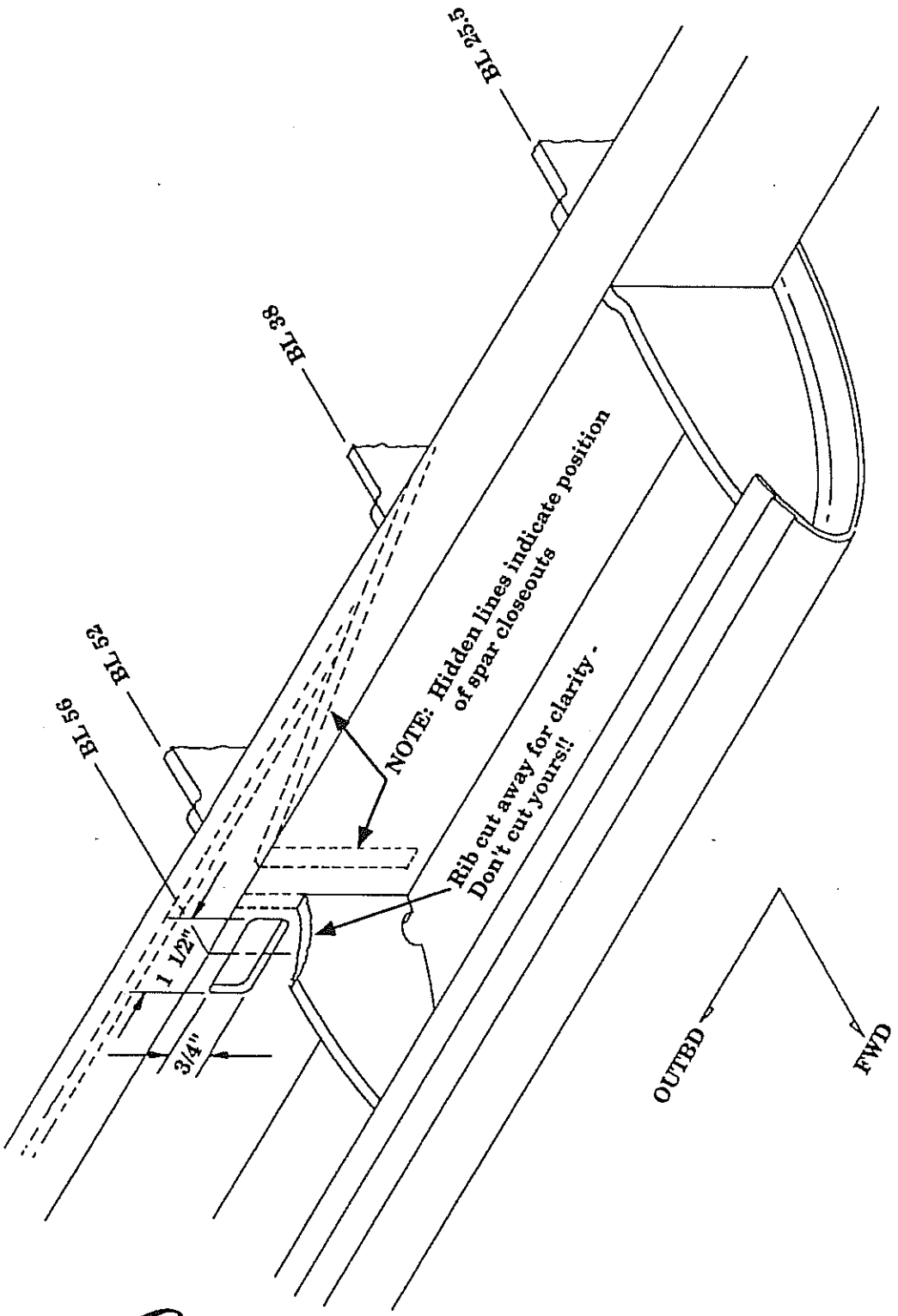
F8. Lay 1 BID of cloth around the ends of the tube (much like you did with the vent tube). If you wait for the Hysol to dry, you will have to re-prep by sanding. Put the 1 BID on while the Hysol is still fresh to save some time and get a better bond. Put a light coat of epoxy around the tube and the web, lay the BID on, and wet it out as you did for the vent tube. Be sure to trim away the excess BID when cured.

F9. This is a good time to grind the fuel drain hole in the main spar forward web. Center the drain hole at BL 56 (on earlier kits, you can bias this hole inboard further, but be sure not to cut into the inboard closeout). The hole will be 1 1/2" long and 3/4" high, and will allow fuel to drain from the tank area forward of the main spar into the outboard closeout area (the area you've already sealed off for fuel). It is important to remember when grinding out the hole to locate the hole as low as possible **without damaging the bottom spar cap**, and inboard to within 1" of the BL 52 nose rib. Grind a small hole to begin with to make sure you're not cutting into the factory installed inboard closeout. Hold a vacuum next to the hole when grinding so your fuel sealer in the closeout area will be kept clean.

F10. Push the core of the spar web back 1/4" where you cut the drain hole and fill the trough with epoxy/micro. See figure 6:F:2.

## Fuel passage

Figure 6:F:2

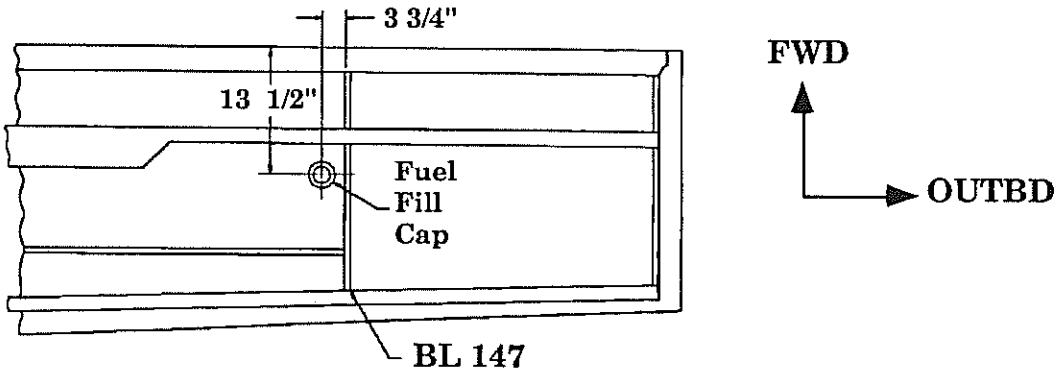


## (G) FUEL CAP INSTALLATION

With the wing being built upside down, this is a good time to install the fuel caps (or cap, if you are just working on one wing). Your kit is supplied with two (2) filler caps, one for each wing.

G1. Measure back 13-1/2" from the leading edge of the wing at the BL 147 rib. You will notice that this is roughly the same chord position as the fuel vent tube. At this point measure inboard of the BL 147 rib 3 3/4". This will give you the position of the center of the fuel cap. Per Figure 6:G:1, mark the location for the filler cap in the wing skin.

**Fuel cap location**
Figure 6:G:1



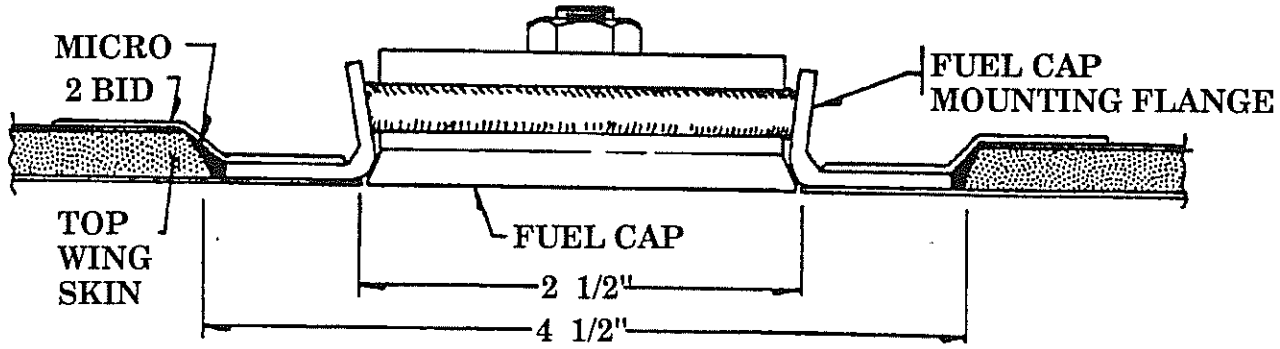

G2*. Make a circular cut completely through the inner skin, core and outer skin. This diameter should be 2 1/2". Use a hole saw in a drill or equivalent.

G3*. Next cut a 4 1/2" diameter on the inside skin so that it is concentric with the existing hole. This cut should be made with a rotary type tool and ONLY made through the inner wing skin ply and the core material. See Figure 6:G:2.

*Note: If you have both a 4 1/2" and a 2 1/2" hole saw, you can **carefully** (DO NOT GO INTO THE UPPER WING SKIN) drill through the inner wing skin ply and core material with the 4 1/2" hole saw, then use the 2 1/2" hole saw and the centering hole from the 4 1/2" saw to drill the rest of the way through the upper wing skin.

G4. Scrape away the core and sand a slight bevel into the resultant edge. Be sure to sand away thoroughly all the core from against the outer skin plies.

**Fuel cap installation, side view**
Figure 6:G:2
(Shown upside down, as installed)




G5. Using 80 grit sandpaper, scuff up the mounting flange on the fuel cap assembly. Note that there is a slight bevel to this flange. Rotate the circular flange until the best curvature alignment is made with respect to the curvature of the upper wing skin itself. Mark this alignment with a pencil on both the flange and skin.

G6. Mix up a small batch of Hysol adhesive to bond the cap to the inside of the skin.

G7. Place plastic tape around the edge of the inner cap and insert the cap in it's assembled position. It should be almost flush with the flange (0.030" above is perfect).

G8. Spread the adhesive onto both bonding surfaces and insert the assembly into the skin.

NOTE: The clamping pressure is very important. It is best to make a curved styrofoam block or equiv. to fit to the outside contour of the wing skin and support it there. Place some weight on the inner side, against the fuel cap assembly, to hold it snug against the skin during cure. Use about 10 lbs.

G9. With proper weight, and pressing against a well contoured foam block, the cap will end up flush with the surface of the wing. Some Hysol could ooze out, which is why the cap is covered with plastic tape as a release. Otherwise it might get bonded into the mounting ring.

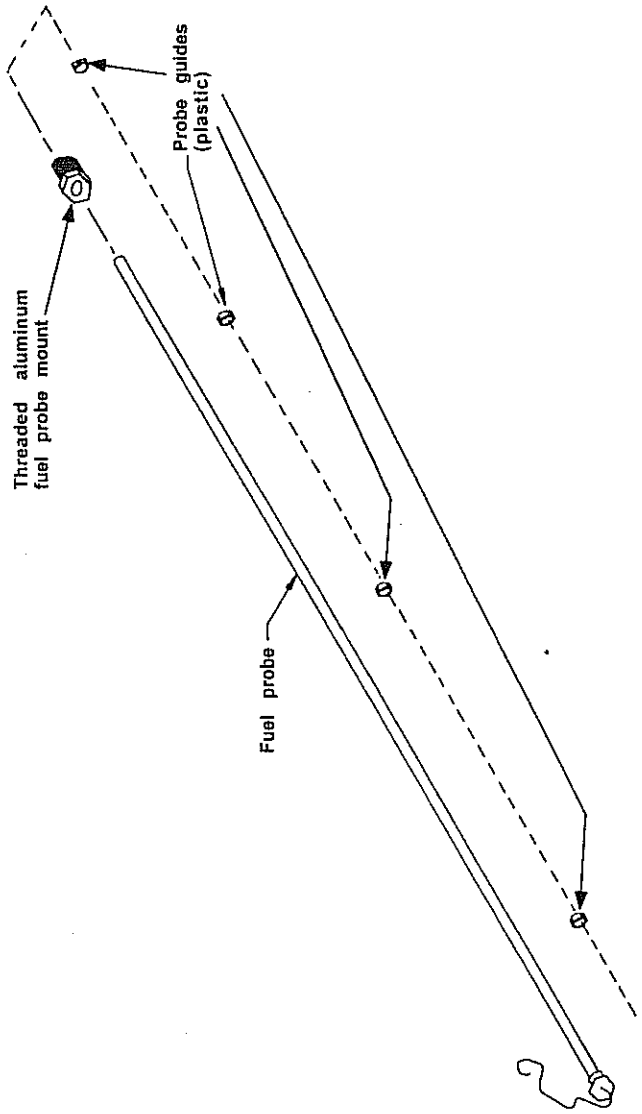
G10. After cure, add 2 BID around the inner flange, extending the glass up over the bevel and onto the original skin by at least 1".

## H. FUEL PROBE INSTALLATION

This section deals with the installation of the fuel probes. These are capacitance type probes running from near the bottom of the fuel tank inboard, to near the top of the tank outboard. Some fuel will remain when the gauge reads "Empty". A small amount of this fuel will be unusable, because the fuel pickup location is slightly above the bottom of the tank. Installation instructions are given for a standard fuel probe, mounted from the inboard end of the wing, and an 11' 4" extended fuel probe, mounted from the outboard end of the wing.

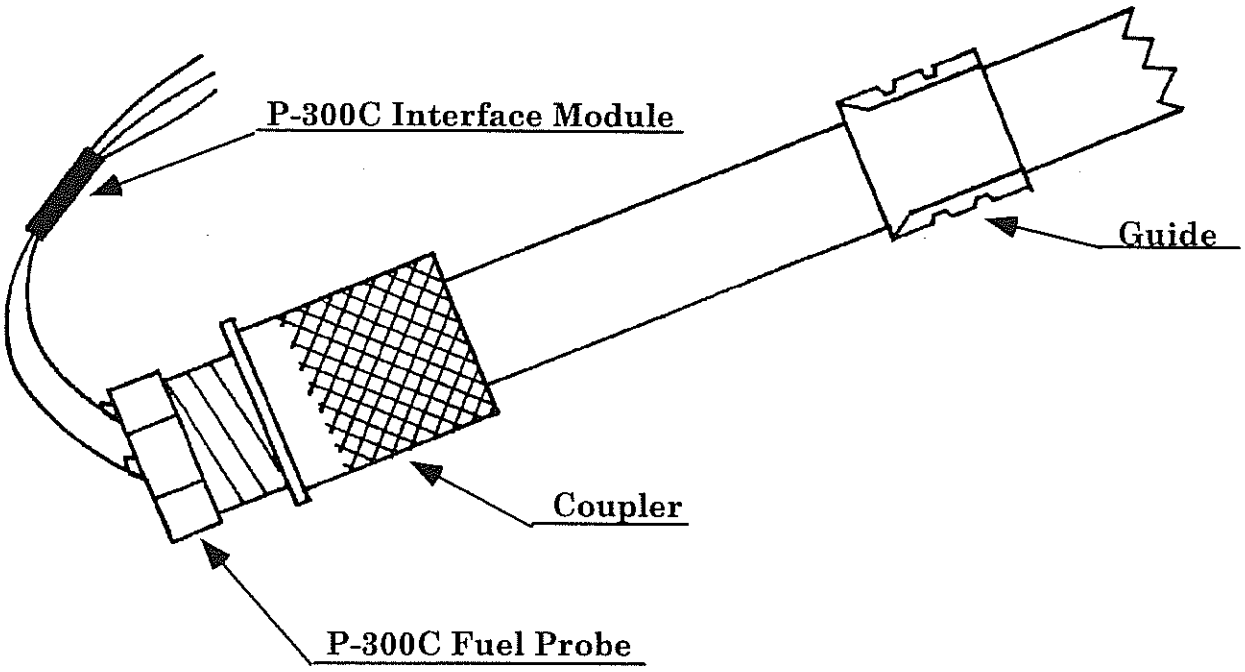
**Vision Micro Systems Fuel Probe**

Figure H:1



# P-300C Fuel Probe
# IMPORTANT INFORMATION!

Figure H:1:A




*Notes:*

1. When temporarily fitting the Probe to the Coupler, use oil on both fittings. Otherwise, the threads will seize even if the connection is only finger tight.

2 When permanently connecting the Probe to the Coupler, **use teflon tape or paste.**

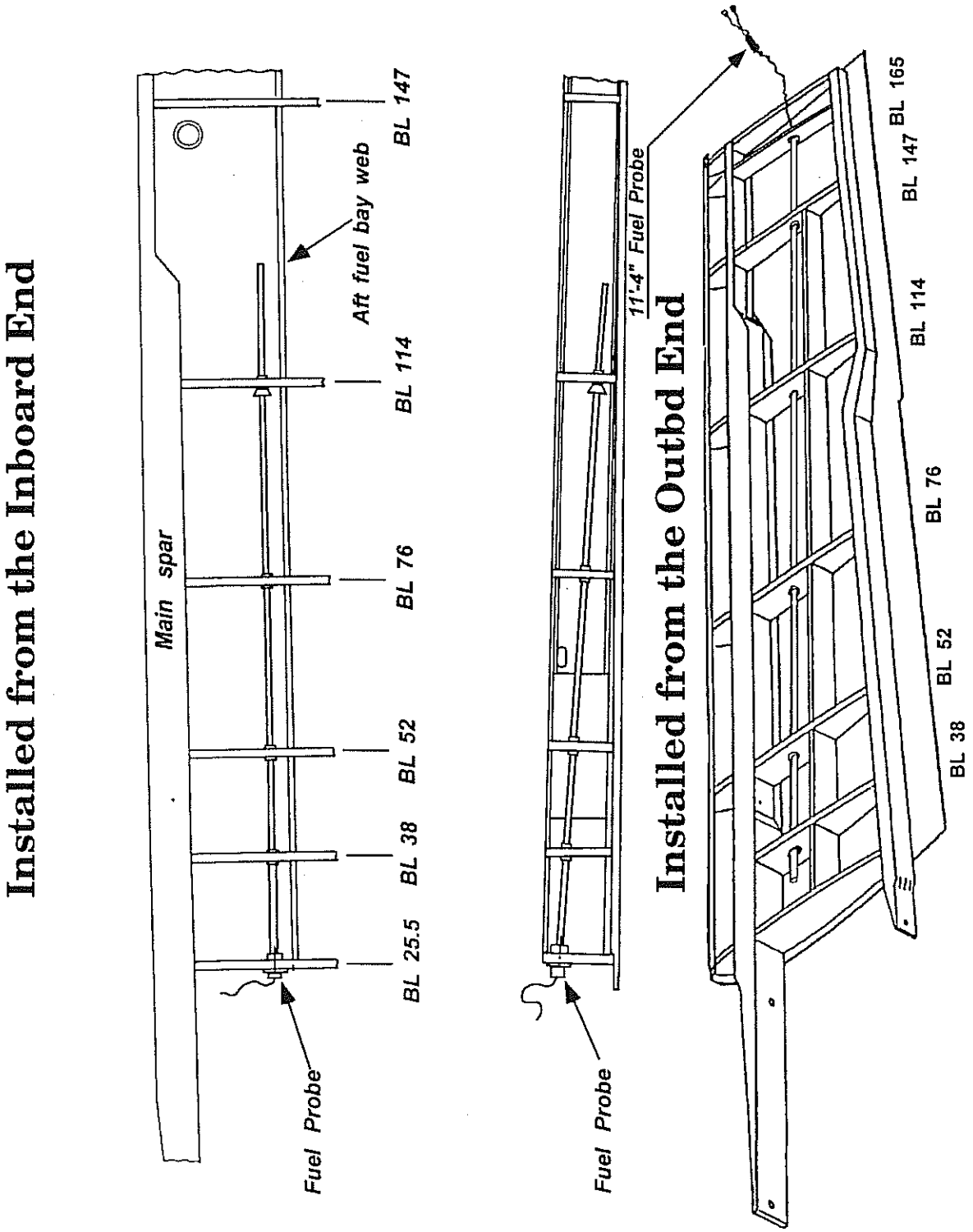
3. Do not over tighten the screws attaching the P-300C Interface Module to the Probe.

4. The Guides should be installed with the beveled end facing the Coupler.

5. Know that the advantage to the 11' 4" fuel probe, for extended tanks, (which is mounted from the outboard end of the wing) is that only the wing tip will need to be removed to reach the Probe. Just remember to move the mounting bushing to BL 165.

## Fuel Probe Installation

Figure H:2



H1. Begin by marking on the ribs where to make circle cuts to mount the probe guides. Each cut will be located 1 1/2" forward of the fuel bay web, so draw vertical reference marks on ribs BL 25.5, 38, 52, 76 and 114 if the fuel probe is being installed from the inboard side of the wing. Draw reference marks on the ribs BL 165, 147, 114, 76, 52 and 38 if installing the fuel probe from the end of the wing. Make a locator tool out of tongue depressors. Weight the tool with lead fishing weights and hang it on a line running the length of the wing. See Figure H:3.

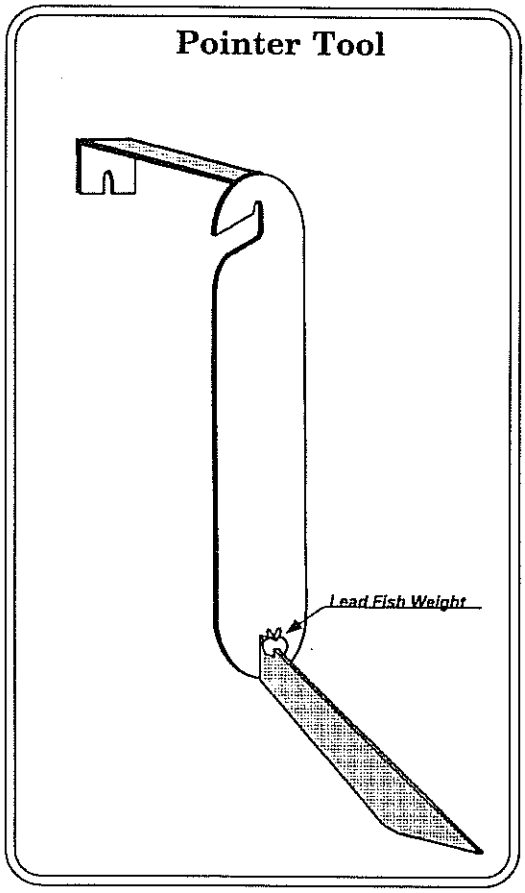
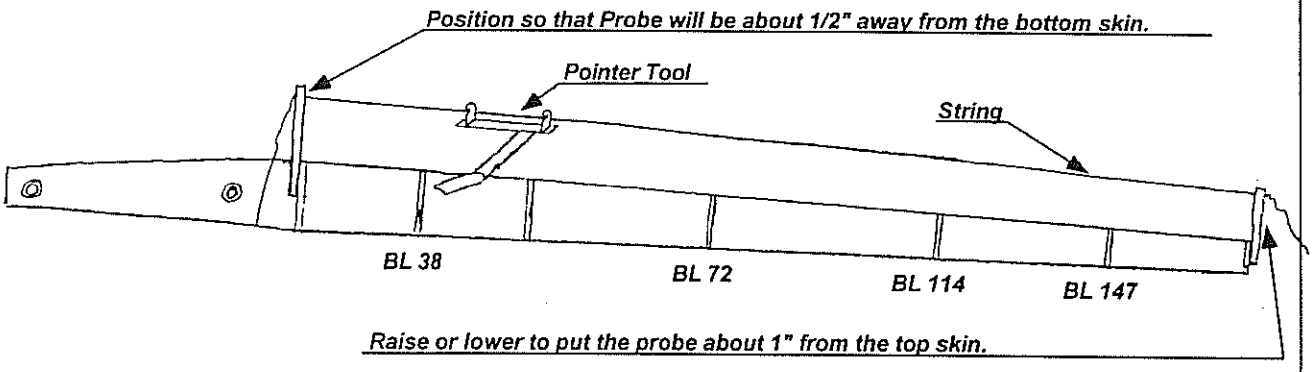


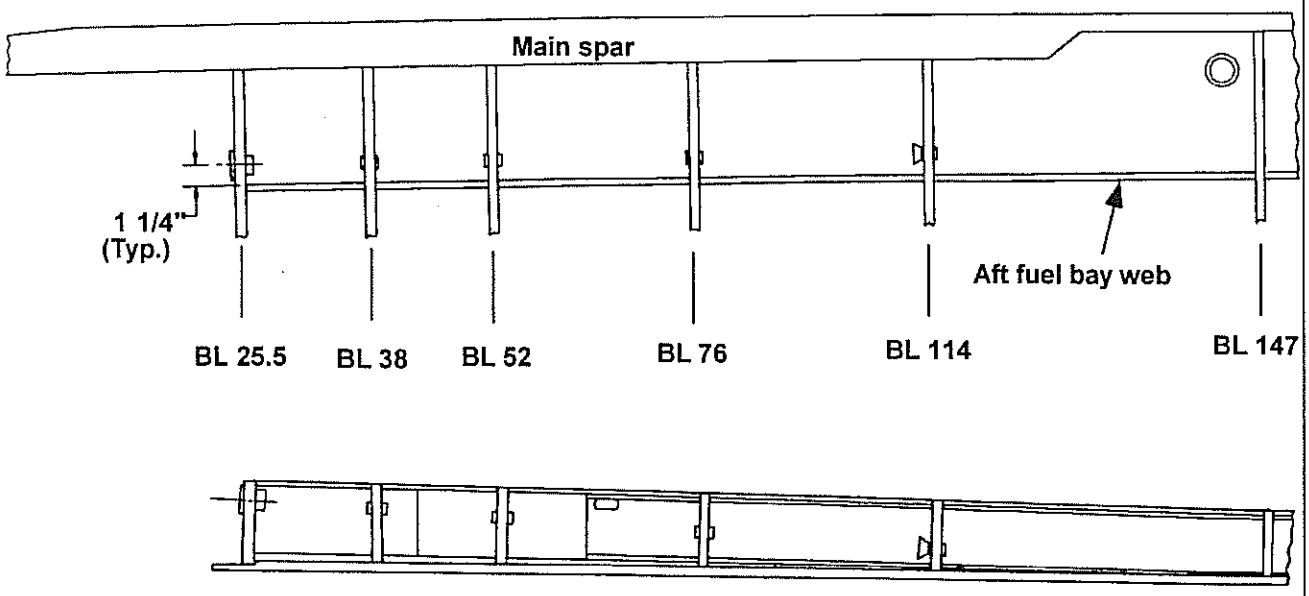

**Figure H:3**




H2. Mark the necessary ribs (see paragraph H1) at the location that the pointer hits.

## Fuel Guide Top and Profile Views (Inboard Installation)

Figure H:4




H3. Drill small holes through each rib at these locations. Don't drill the ribs out to the full circumference yet.

H4. To check the alignment of the holes, pull a string through the ribs from BL 25.5 to BL 114 (inboard installation) or from BL 165 to BL 38 (outboard installation). Grind the holes in each rib so the string runs through the center of each. Be sure to use the center of the BL 25.5 and BL 114 holes (inboard installation) or the center of the BL 165 and BL 38 holes (outboard installation) as a guide to center the rest. Plan for the end of the probe to be between 1/8" and 1/4" from the inner surface of the top wing skin. If the probe tip is too close, it could vibrate against the skin and cause wear or give incorrect readings.

H5. Grind out the holes in the ribs so the probe guides and threaded aluminum probe mount can slide into position. The BL 25.5 rib (inboard installation) or the BL 165 rib (outboard installation) will require a larger hole for the threaded aluminum probe mount.

H6. Remove the probe guides and sand them with #40 grit in preparation for bonding. The threaded aluminum probe mount is cast with a rough surface where it will be bonded into the rib.

H7. Clean the probe guides and probe mount with solvent or alcohol, but don't use acetone or MC as they will as they may damage the guides.

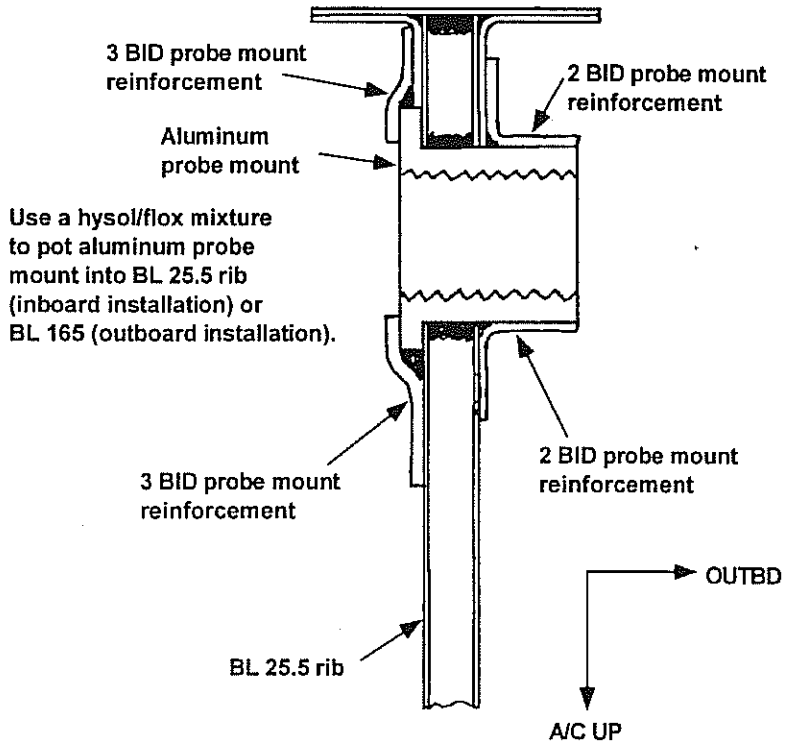
H8. Remove about 1/8" of core material around the circumference of the probe guide holes in the ribs. Also form a core trough where the threaded aluminum mount will be located.

H9. Sand the ribs around the holes for about 1/2", and clean with MC.

H10. Mix a batch of flox and fill the 1/8" troughs in the ribs. Carefully slide the probe guides and the threaded probe mount into position. To maintain proper alignment while the flox cures, slide the fuel probe into position and screw it into it's threaded mount (one or two threads is all that's required for alignment here). Pack more flox around the areas where the probe guides and threaded mount pass through the ribs, forming a fillet around each one. Allow to cure.

H11. Sand the bonding surface and apply the 3 BID laminate to reinforce the bond between the threaded aluminum probe mount and the inboard face of the BL 25.5 (inboard installation) or the outboard face of the BL 165 (outboard installation) rib. Only 2 BID is required on the opposite face of the rib. See Figure H:5.

**Reinforcing aluminum probe mount**
Figure H:5



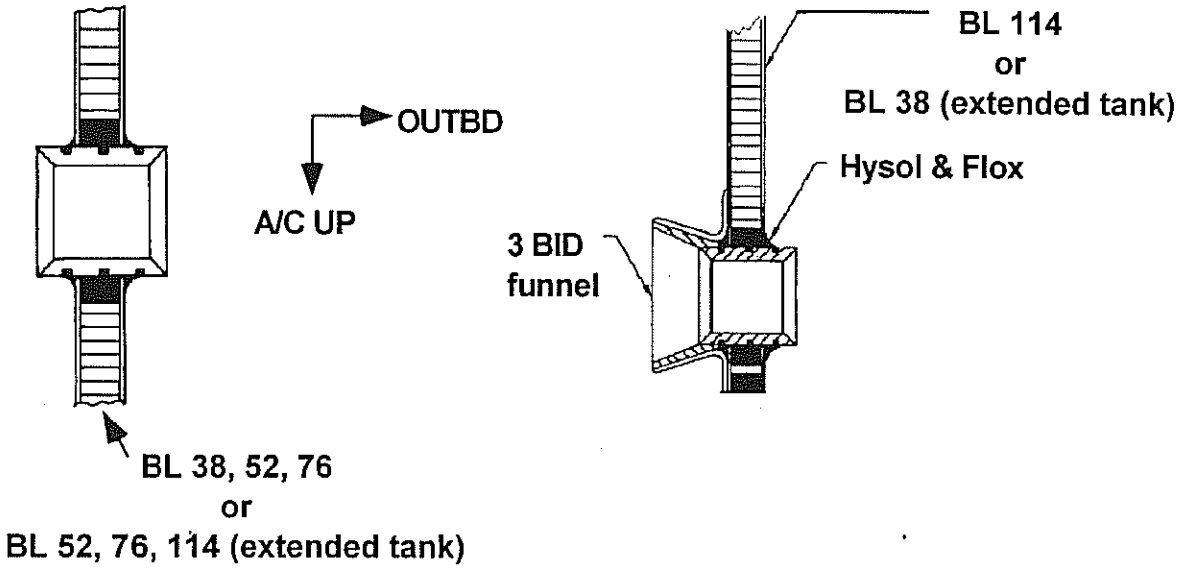
H12. A probe guide extension is helpful on the BL 114 (inboard installation) or the BL 38 (outboard installation) rib. The guide is shaped like a funnel and will be very useful if you ever have to take the probe out after the wing has been closed. Form the guide extension by applying release tape to a small plastic funnel. Use 3 BID to form the guide on the funnel.

H13. When the 3 BID has cured, pop the guide extension loose from the funnel and trim as necessary so the extension will fit flush with the plastic guide in BL 114 or BL 38. See Figure H:6.

H14. Bond the guide extension to the guide and the proper rib with 2 BID. Be sure that there is a smooth transition from the inside of the guide extension to the plastic guide.

**Probe Guide Extension**

Figure H:6




*NOTES:*

1. Make sure the bottom skin is placed so that it does not interfere with the fuel pick up, strainer or drain.

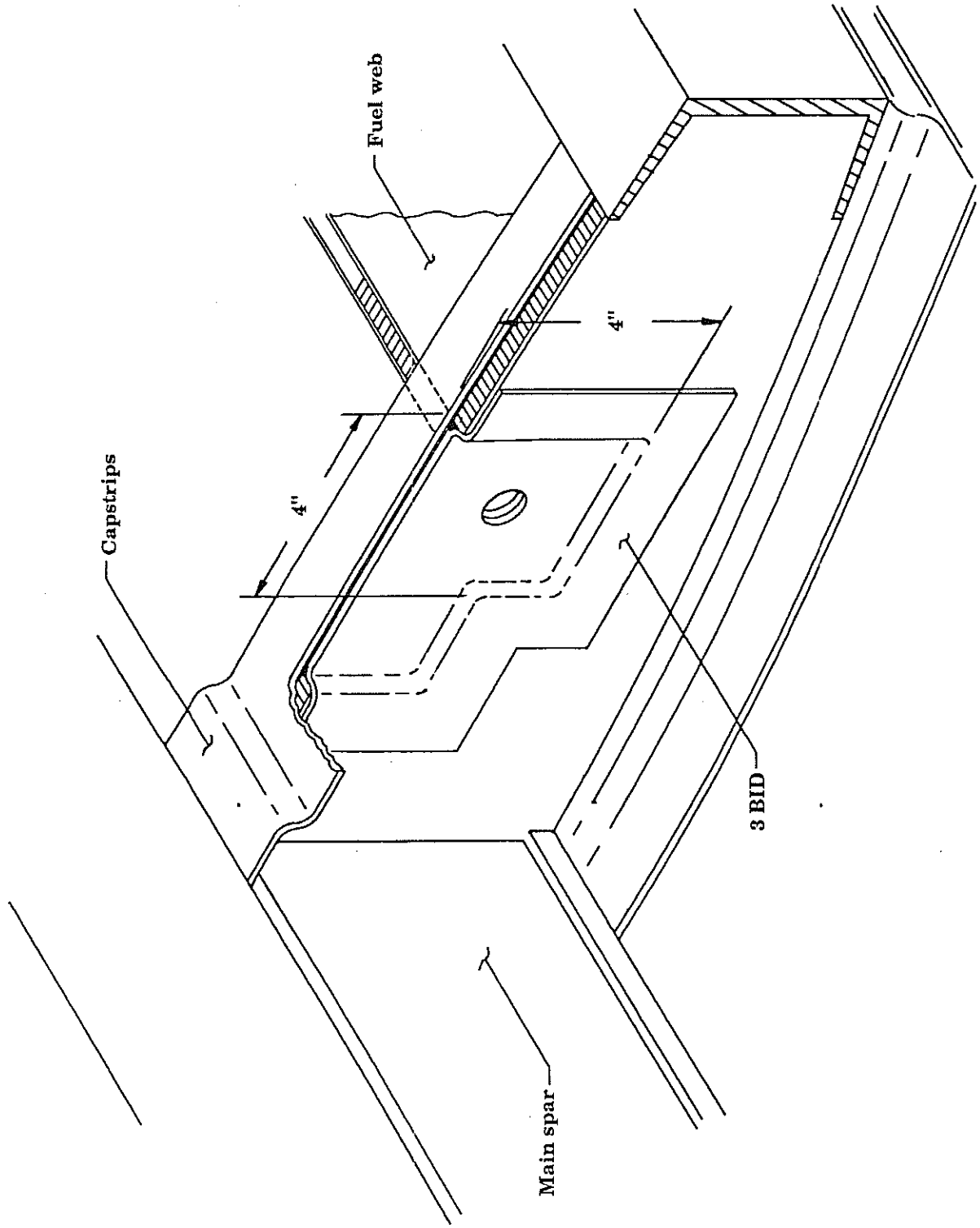
2. Use the probe to install all plastic sleeves.

3. Slide the sleeves and mounting bushing on the probe and bond into each rib with hysol.

4. Cut the hole for the sleeve larger on outboard rib skin.

## Coreless area on BL 25.5 rib

Figure 6:H:7



H17. Apply the 3 BID laminate to the coreless areas of the BL 25.5 rib, overlapping by 1" onto the original laminates.

H18. After the 3 BID has cured, trim around the clearance hole you had ground through the BL 25.5 rib for the fuel probe.

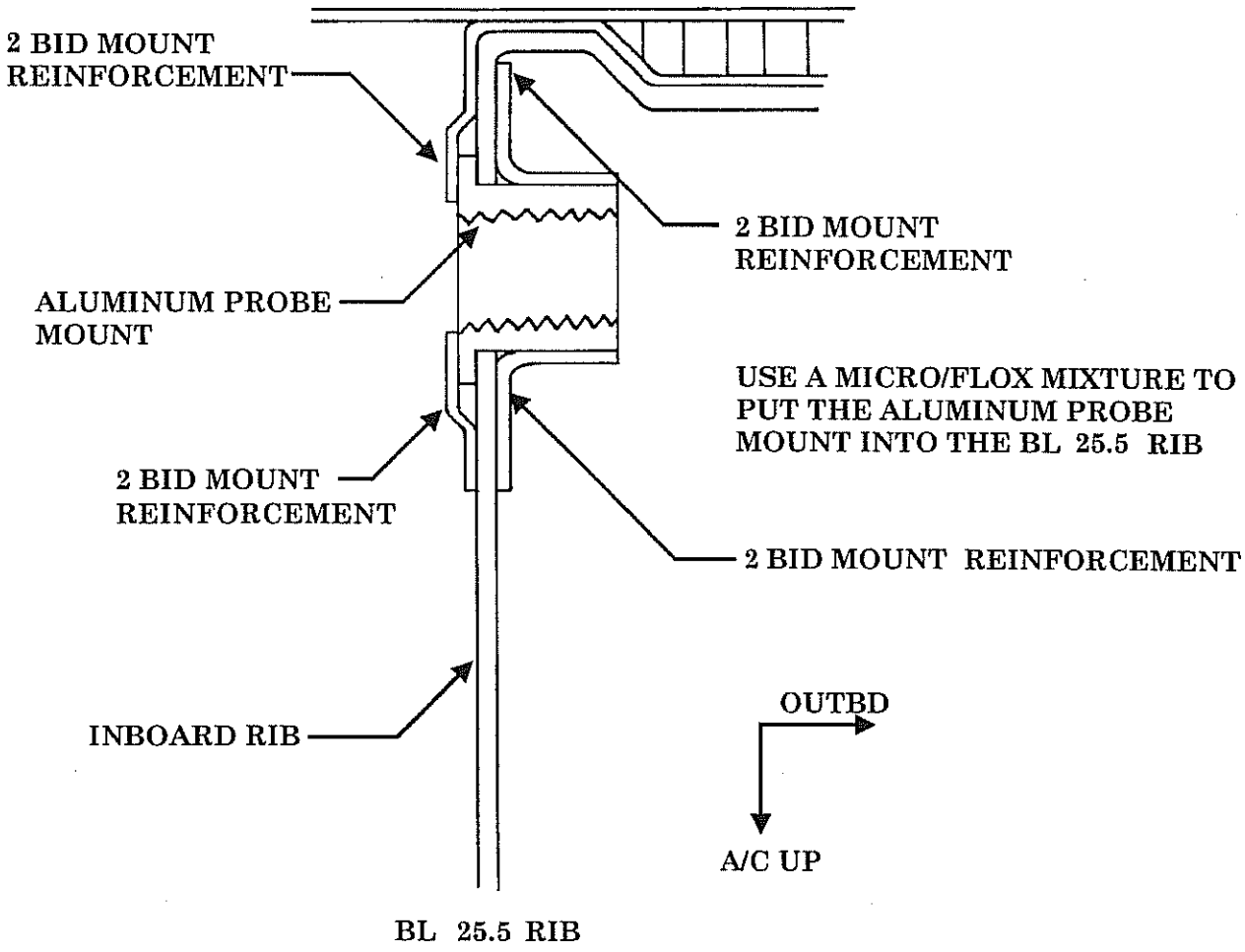
H19. Slide the fuel probe into the PVC guide with the aluminum mounting plate installed. You'll have to clearance the hole in the BL 25.5 rib till the fuel probe hub has a flat surface to rest against. If the nylon spacers are too tight of a fit in the guide tube, simply file the diameter of the spacer down until an easy slip fit is attained.

Note: You will have to bend the fuel probe slightly for the hub to rest flat against the BL 25.5 rib. It doesn't take much of a bend to accomplish this task, so BE CAREFUL, do not overstress the probe.

Refer to Figure 6:H:8.

## Fuel Probe Mounting

Figure 6:H:8




H20. Be sure the aluminum mounting plate rests flat on the rib surface and make reference marks around the aluminum plate. Remove the probe and aluminum mounting plate. Sand the plate's surfaces and the area on the rib where it will be bonded with #40 grit. Clean the plate and rib surface with MC.

H21. Bond the aluminum mounting flange to the rib with a thin flox mixture. Be sure to keep the flox out of the threads tapped in the mounting plate.

H22. Apply 2 BID over the aluminum plate and overlap onto the surrounding surface by 1".

H23. Trim away the 2 BID from the threaded holes in the aluminum mount and the hole for the probe itself.

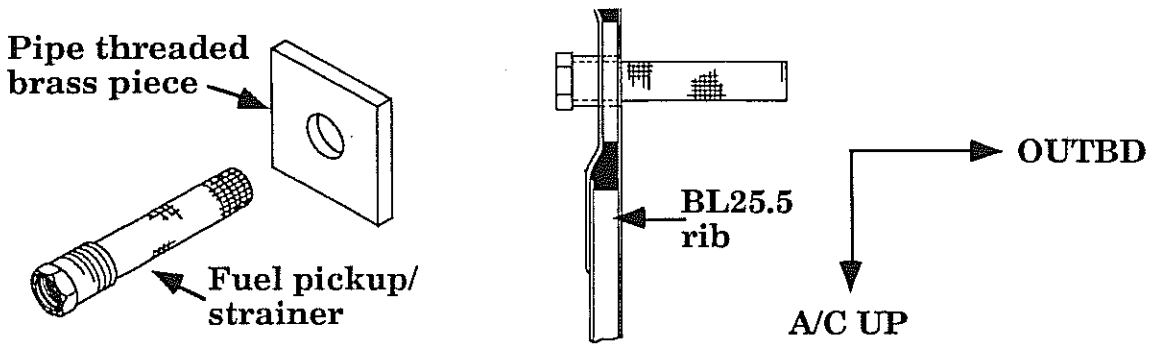
NOTE: Do not put fuel sealant around the fuel probe hub at this time. Wait until the wing is closed and sealed before installing the probe for the final time.

H24. When you are ready to install the probe for the last time, put Teflon pipe dope on the threads of the probe and install.

## (I) FUEL PICKUP INSTALLATION

The fuel pickup is threaded into a 1 1/2" x 1 1/2" brass piece which is potted onto the inboard surface of the BL 25.5 rib. The inboard core material is removed in this area. Refer to Figure 6:I:1.

**Fuel pickup assembly**
Figure 6:I:1




I1. Measure back 3 1/4" from the aft face of the main spar, and 6 3/8" up from top skin. This is the center of the fuel pickup. See Figure 6:J:1 (in the next section).

I2. Drill a 5/8" hole through the rib at the center mark.

I3. Using this hole as a center, cut out the inboard laminate and core in a 2 1/2" x 2 1/2" square area.

I4. Sand the exposed laminate and the surrounding area with 40 grit. Also sand the threaded brass piece on both faces and edges.

I5. Clean the brass piece and the rib area with MC and let dry.

I6. Examine the threaded hole of the brass piece. This is a pipe thread, and it must be put in the proper direction or you will not be able to get the finger strainer into it. The larger end of the threaded hole faces inboard. Put a mark, such as a little x, on the inboard face.

I7. Squeeze micro into the exposed core, put a thin layer onto the inner face of the rib and, observing your mark, pot in the threaded brass piece. Be sure the threads are not contaminated with micro. Form the micro to a smooth radius around the brass piece.

I8. On the inboard face of the BL 25.5 rib, apply a 3 BID layup to the fuel pickup fitting. Overlap the original laminates by 1".

## (J) FUEL RETURN LINE INSTALLATION (Fuel Injected Engines Only)

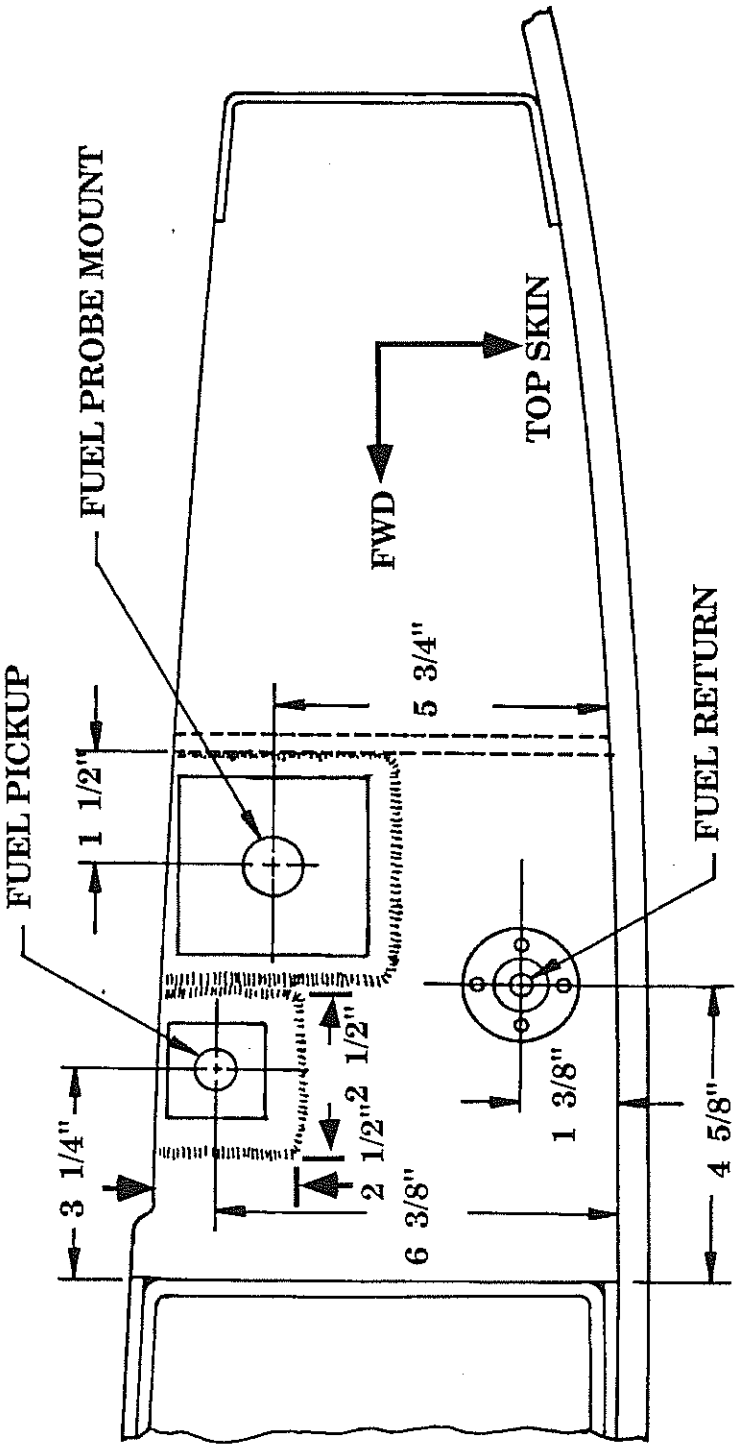
The last assembly you must pot into the BL 25.5 rib is the fuel return assembly. Most engines that use fuel injection must have a line from the engine to return unused fuel to the tank. Refer to Figure 6:J:1.

J1. The center of the return line is located 4 5/8" back of the aft face of the main spar and 1 3/8" up from the top skin. Make a center mark and drill a 7/16" hole at this location. The return line is 3/8" diameter so this will give you some extra room for micro.

J2. Slide the return assembly through the BL 25.5 rib and mark where the 3/8" line hits the BL 38 rib. Drill another 7/16" hole at this location.

J3. There is no need for a glass to glass area for mounting the fuel return assembly, so simply remove the core 1/4" around the hole you have drilled.

**BL 25.5 Rib**
Figure 6:J:1



J4. Scuff up the bonding surfaces of the return assembly with 40 grit. Also sand the areas of the BL 25.5 and BL 38 ribs around the 7/16" holes.

J5. Clean all areas and the return assembly with MC.

J6. Bond in the return assembly using micro. Be careful not to push micro into the 3/8" line when inserting the assembly.

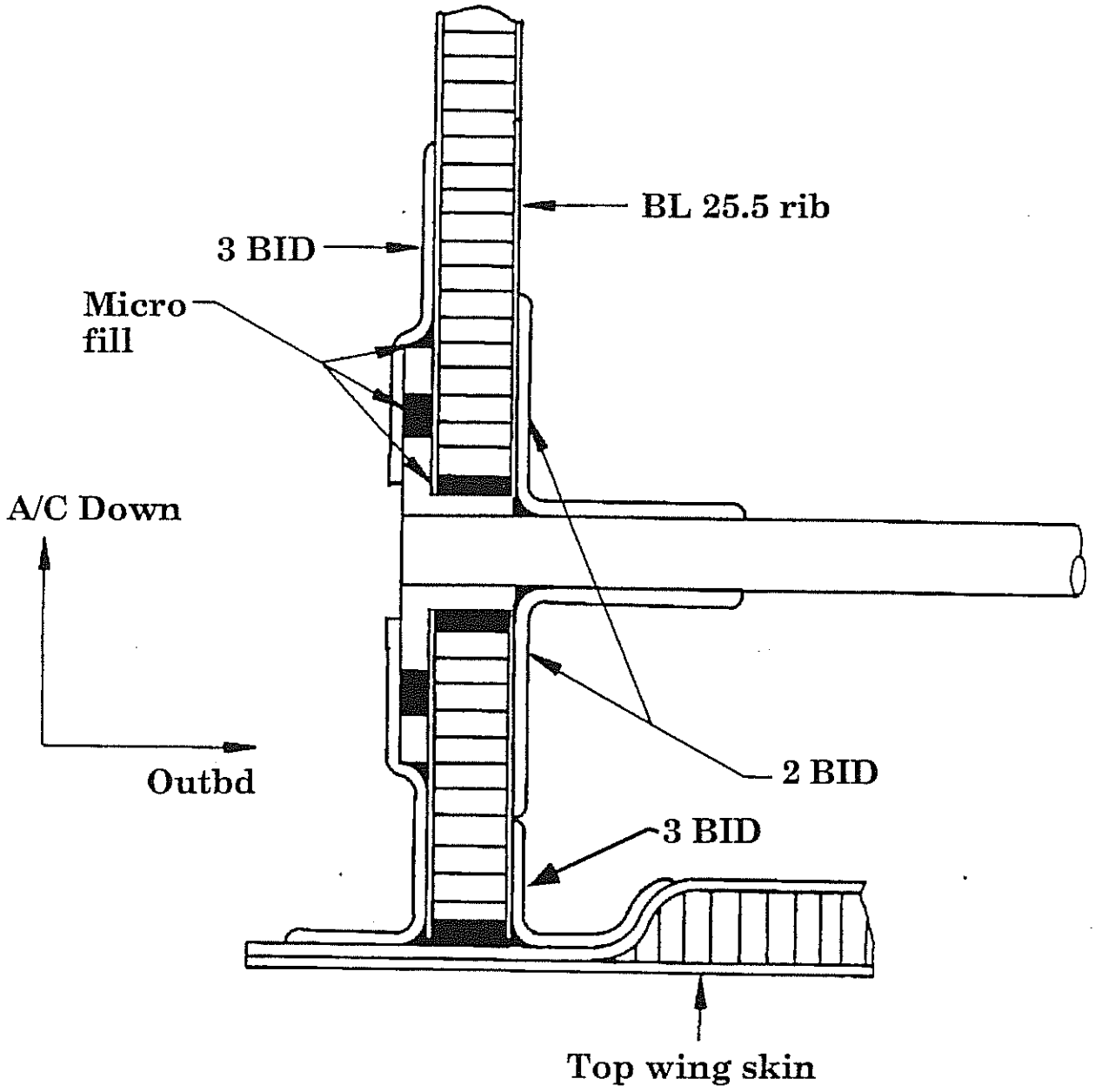
J7. Remove any excess micro and form radii around the assembly's edges.

J8. Lay 2 BID around the 3/8" line on the outboard face of the BL 25.5 rib, overlapping the line and rib by 1/2".

J9. Lay 3 BID on the inboard flange of the return, overlapping onto the rib by 1".

## BL 25.5 Fuel return installation

Figure 6:J:2



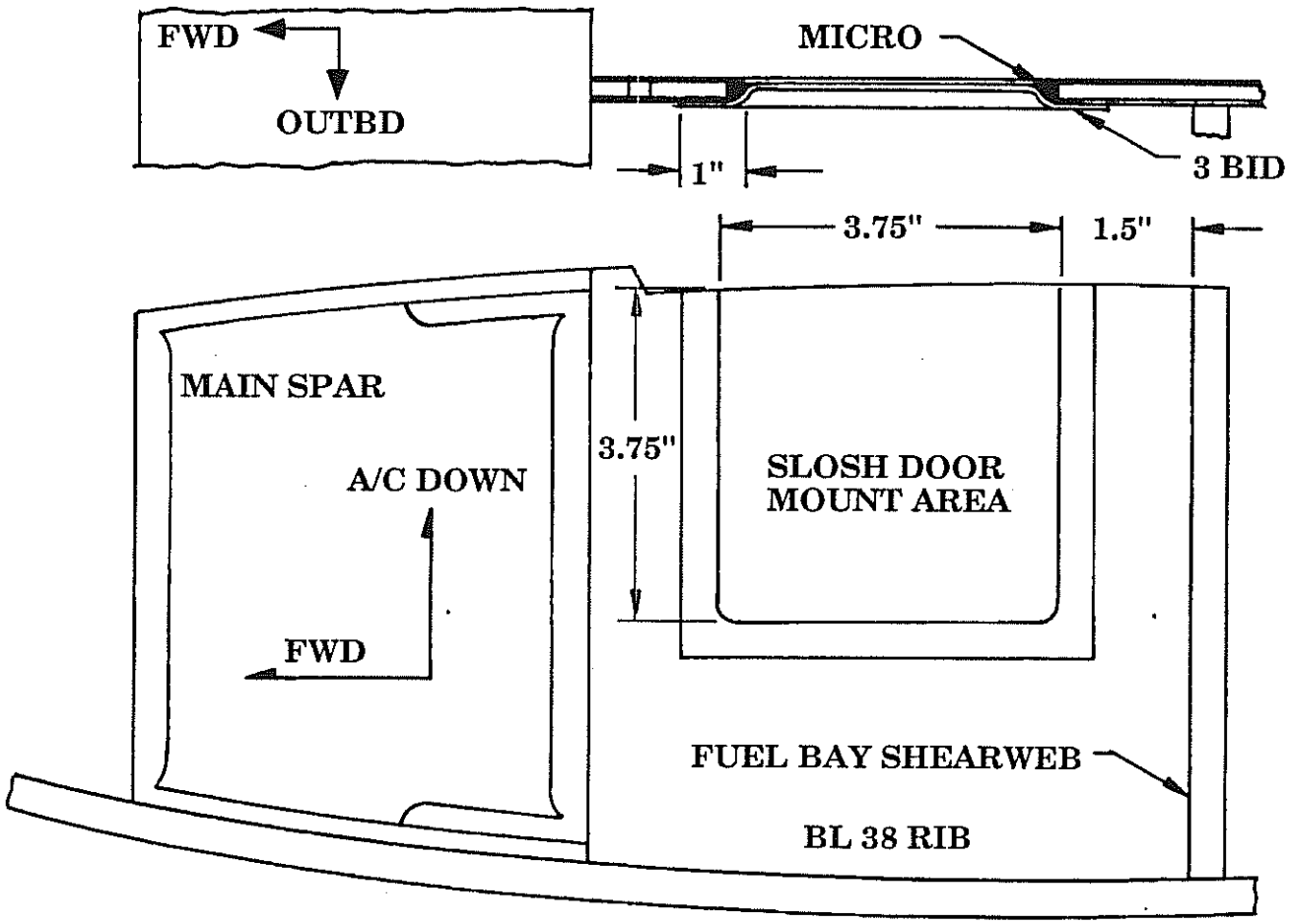
## (K) FUEL SLOSH DOORS - SLOSH DOOR MOUNTING AREAS

To reduce fuel sloshing during uncoordinated maneuvering, a one-way slosh door is mounted in the BL 38 ribs. The core must be removed so the area on which the door will mount will be glass to glass. This should have been done at the time the ribs were installed but if not, proceed with steps K1 and K2. If they have already been modified, proceed to step K3.

K1. Use the dimensions in Figure 6:K:1 to mark the areas on the outboard surfaces of the BL 38 ribs where the core will be removed. Cut the outboard laminates and remove the core.

**BL 38 rib slosh door cutout**

Figure 6:K:1



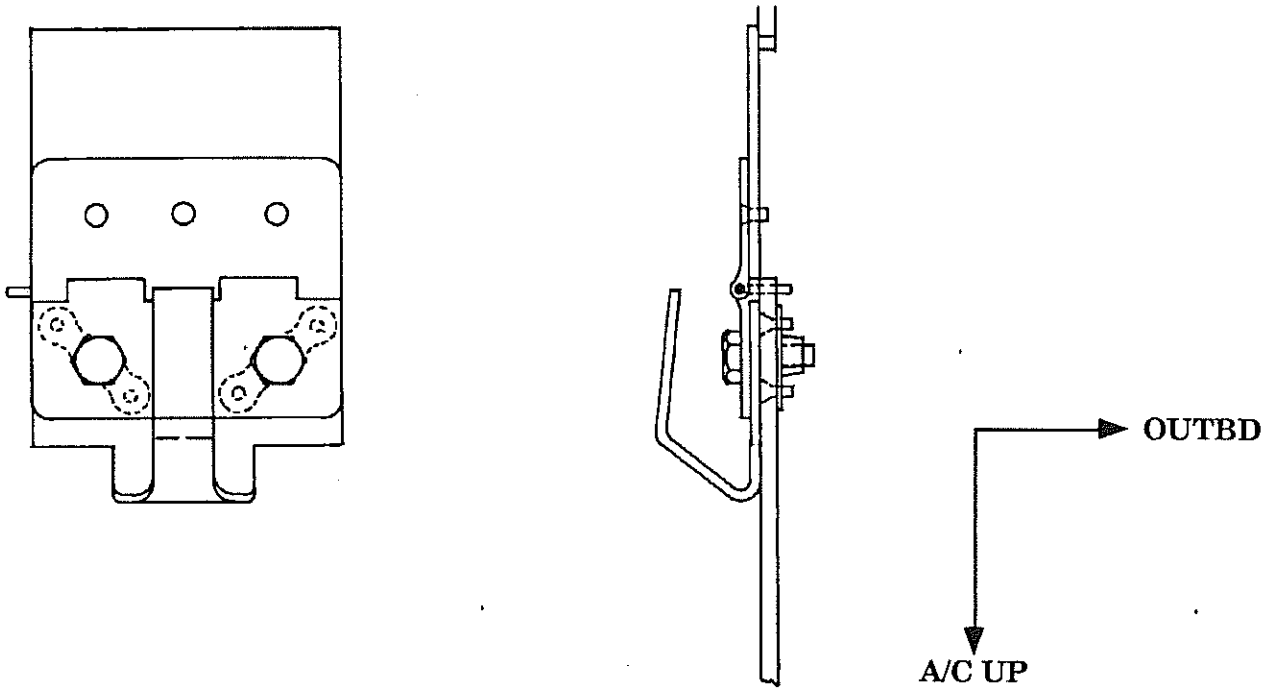
K2. Sand these areas to remove all core material and prepare a good bonding surface with 40 grit and bevel the edges.

K3. Squeeze micro into the exposed core material to form a smooth fillet and lay 3 BID into the cutouts and up onto the original laminates.

K4. The fuel slosh doors can be attached in position where you made glass to glass areas on the BL 38 ribs.

K5. Cut two pieces of piano hinge 2" long, as shown in Figure 6:K:2. It is much easier to cut the hinge if you remove the hinge wire.

**Slosh door assembly**
Figure 6:K:2




K6. Cut the hinge wire 1/2" longer than the actual hinge. Bend 3/8" of each wire 90 degrees at one end.

K7. Drill two #12 holes through one half of the hinge and bracket 1 3/16" apart. Be sure the bracket ends just short of but does not cross the hinge line.

K8. Align the door so it lies 1/16" from the bracket and does not cross the hinge line.

K9. Drill three #40 holes through the hinge and door. Countersink the hinge and secure the door and hinge together with AN426A3-5 rivets.

K10. Align the slosh door assemblies in the respective glass to glass areas and adjust their position so that the door just rides up onto the capstrip fillet. If you have done your capstrip fillets correctly, the micro radius will be small and the slosh door can come very close to the bottom of the fuel tank.

K11. When satisfied with the fit of the slosh door, use the hinge and bracket as a guide to drill two #12 holes through the rib.

K12. Cut through the rib to give the slosh door 1/8" of flange to seal against.

K13. Mount two nut plates on the outboard face of each rib. This means countersinking for the rivets on the inboard face of the rib, under the bracket.

K14. Drill a 1/16" hole through the rib for the bent hinge wire to slide through, thus securing it's position.

K15. Before you permanently mount the slosh door assembly, a good seal must be achieved between door and rib. Cover the outboard surface of the door with packing tape to function as a release. Tighten the slosh door assembly in position and apply a small amount of micro to the flange area under the slosh door. Close the slosh door against the micro and leave till cured. Be sure you have not permanently closed the slosh door with excess micro.

K16. After cure, remove the release tape from the slosh door and clean up any sharp micro edges.

K17. The slosh door assembly should now be permanently installed in position.

## (L) FUEL DRAIN VALVE INSTALLATION

L1. The fuel drain valve is located 1" outboard of the BL 25.5 rib and 2" forward of the fuel bay web. The valve mounts in a 1/4" thick, threaded brass insert, provided in the kit. Mark where the drain valve will be located on the inside of the bottom wing skin. By now you should know where to locate the bottom skin accurately. Center the brass insert over the reference mark. Mark around the brass insert.

L2. Remove the inner laminate and core where the brass insert will be potted into the skin. See Figure 6:L:1.

L3. With 40 grit, sand the area 1" around where the insert will be located. Also sand the inside of the outer laminate where the core has been removed. While you're at it, scuff up the surface of the brass insert.

L4. Set the insert into it's recessed area and again mark the center of the hole on the inside of the outer skin laminate. Remove the insert and drill a 1/2" hole at this location.

L5. Clean all bonding areas with MC and pot the insert into position with Hysol. Try to remove excess Hysol from the 1/2" hole area, especially in the threads.

L6. Lay 3 BID over the insert and 1" onto the surrounding surface. After cure, trim the BID away from the threaded hole.

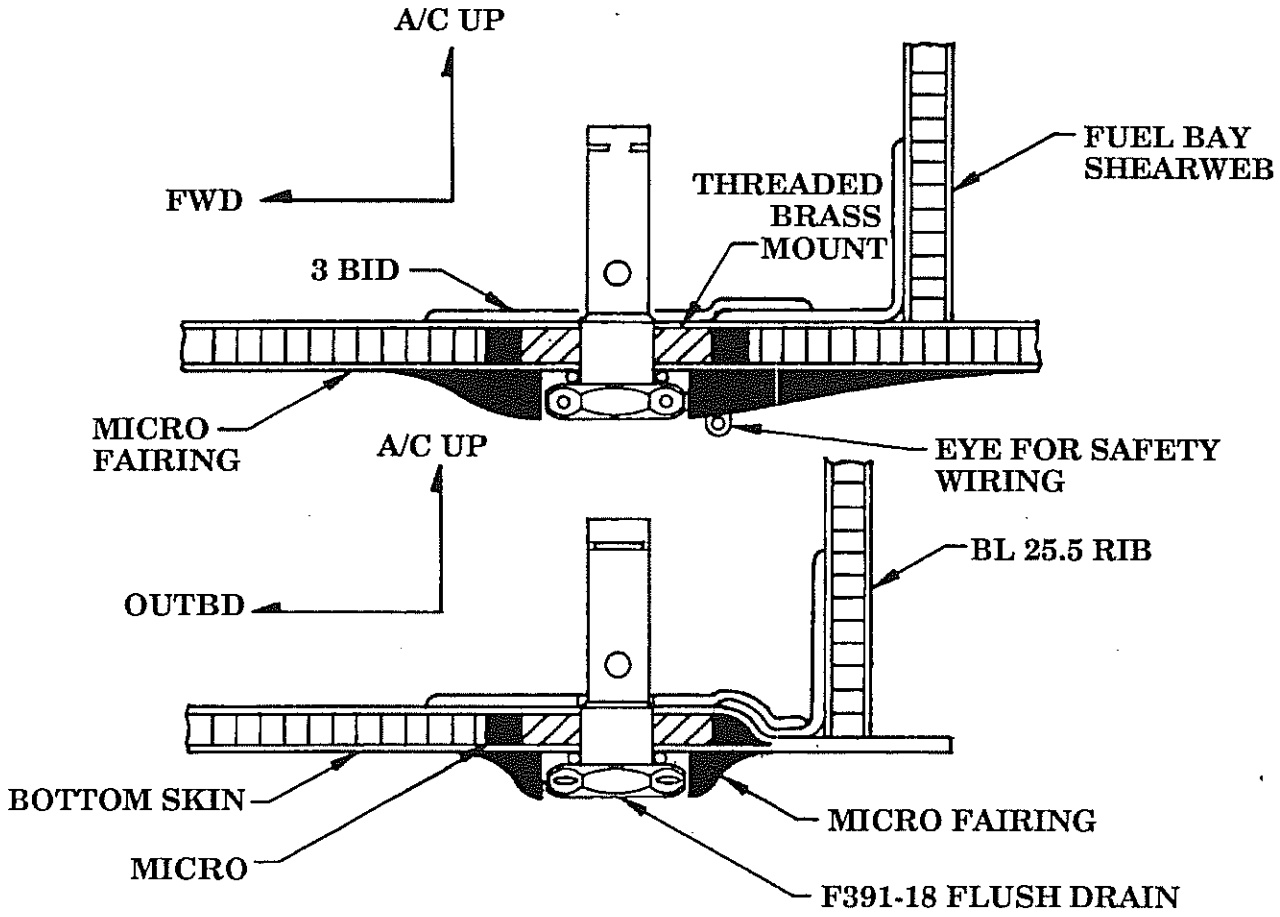
L7. The flush type drain valve supplied in the kit isn't exactly flush, so a micro fairing is built up around it. Thread the valve into the insert. Cover the outside of a socket with release tape and place the socket over the valve. This will allow a similar size socket to be used to remove and install the valve later. Scuff the area where the fairing will be built up and clean with MC.

L8. Mix a small batch of thick micro and build up a fairing around the socket.

L9. After cure, remove the socket and sand the micro to a smooth fairing around the valve head.

## Drain valve installation

Figure 6:L:1



## (M). WING ELECTRICAL

Tubing has been provided in the kit to route the wing electrical wires. The tubing is coiled and tends to hold this shape. You can remedy this by pulling the tubing straight and heating it with a heat gun or just setting it out in the sun.

M1. Cut a piece of tubing long enough to run from 12" inboard of the BL 25.5 rib to 6" outboard of the BL 171 rib.

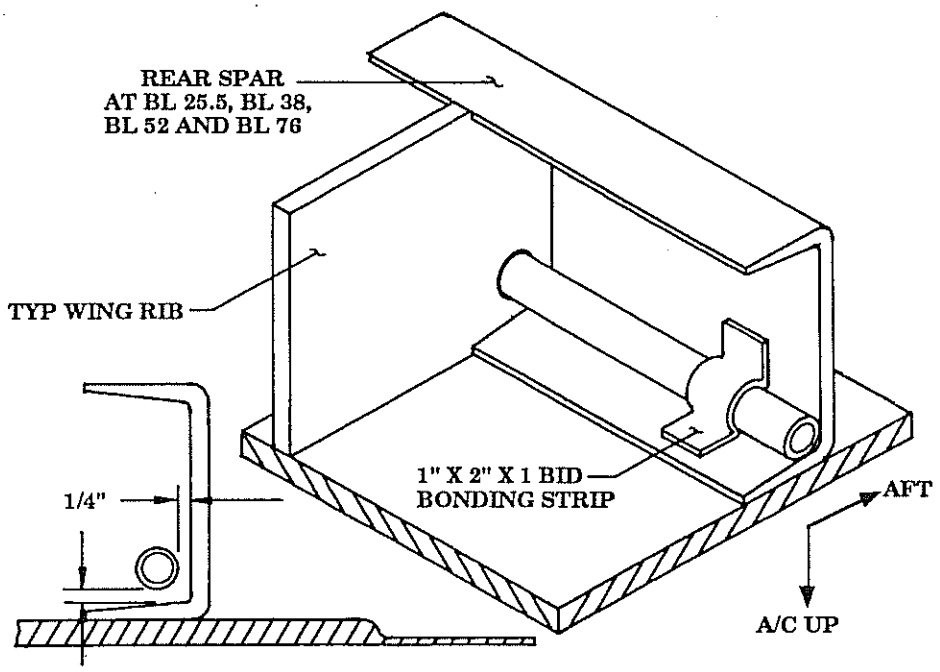
M2. Sand the outside surface of the tubing with 40 grit sandpaper to provide for good bonding.

M3. Clean the tube with MC.

M4. Inboard of the BL 114 rib the tubing will be routed just forward of the rear spar and just below the top skin (remember, we're building the wing upside down, so you'll actually be grinding the holes just above the inside of the top skin). When grinding, stay away from the spar cap and rear spar web by at least 1/4". See Figure 6:M:1. At the BL 114 rib, however, the tubing must be routed just forward of the aileron bellcrank bracket. This is a critical area as improper tubing placement could result in interference with the aileron pushrod. Outboard of the BL 114 rib the tubing is run in the corner where the fuel web meets the top skin. From there, the tubing runs straight through the BL 147 and BL 171 ribs. Refer to Figure 6:M:3.

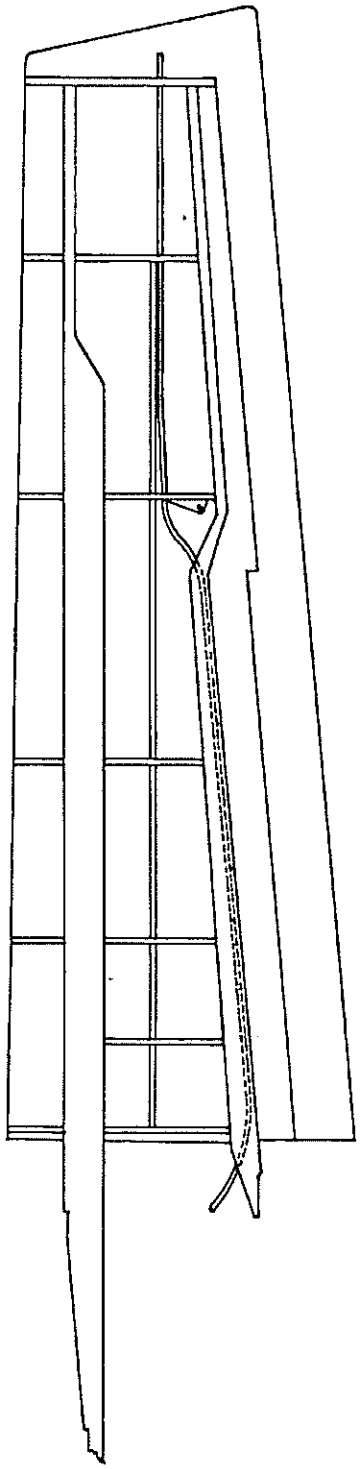
## Routing and securing the electrical tubing

Figure 6:M:1



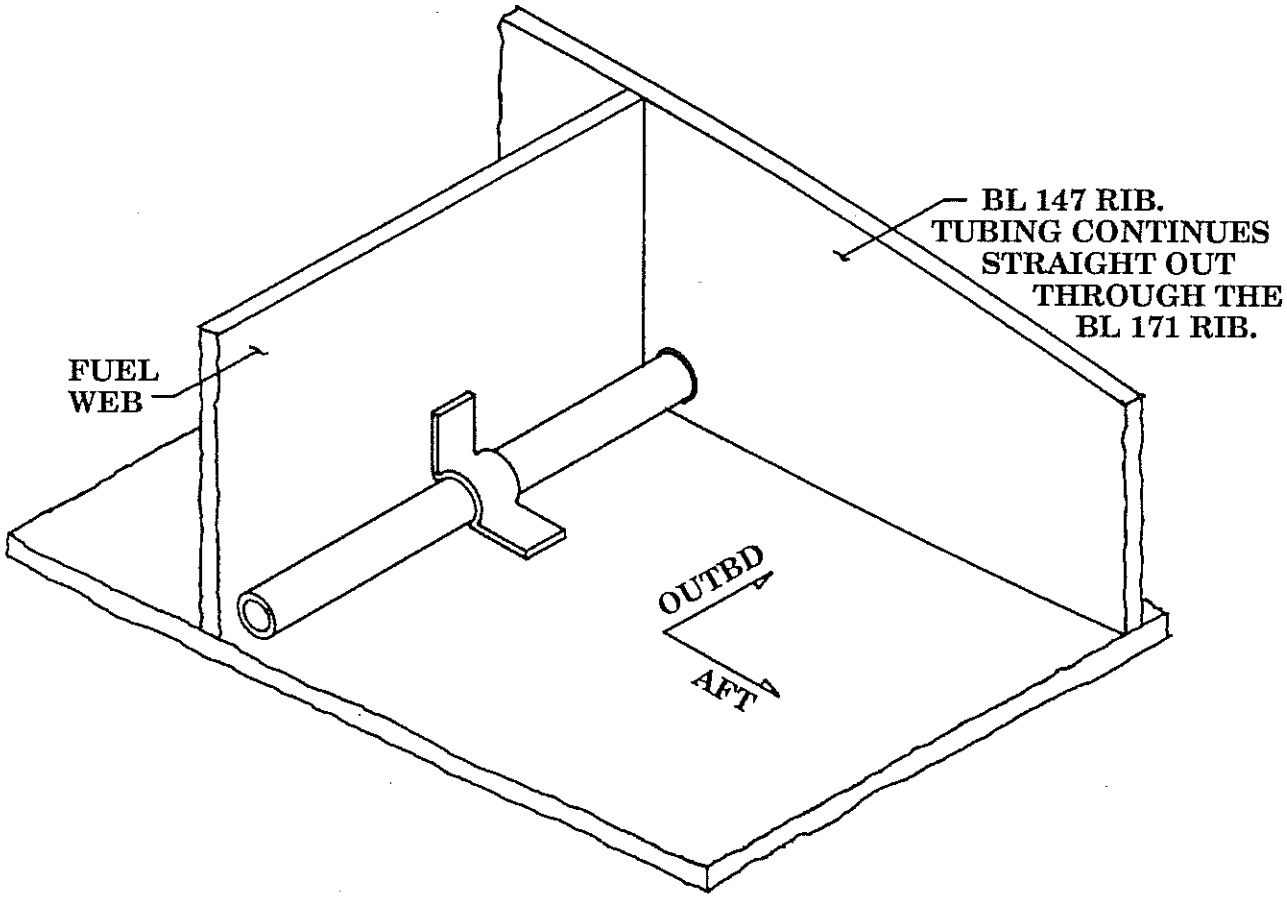
## Wing electric tube routing

Figure 6:M:2



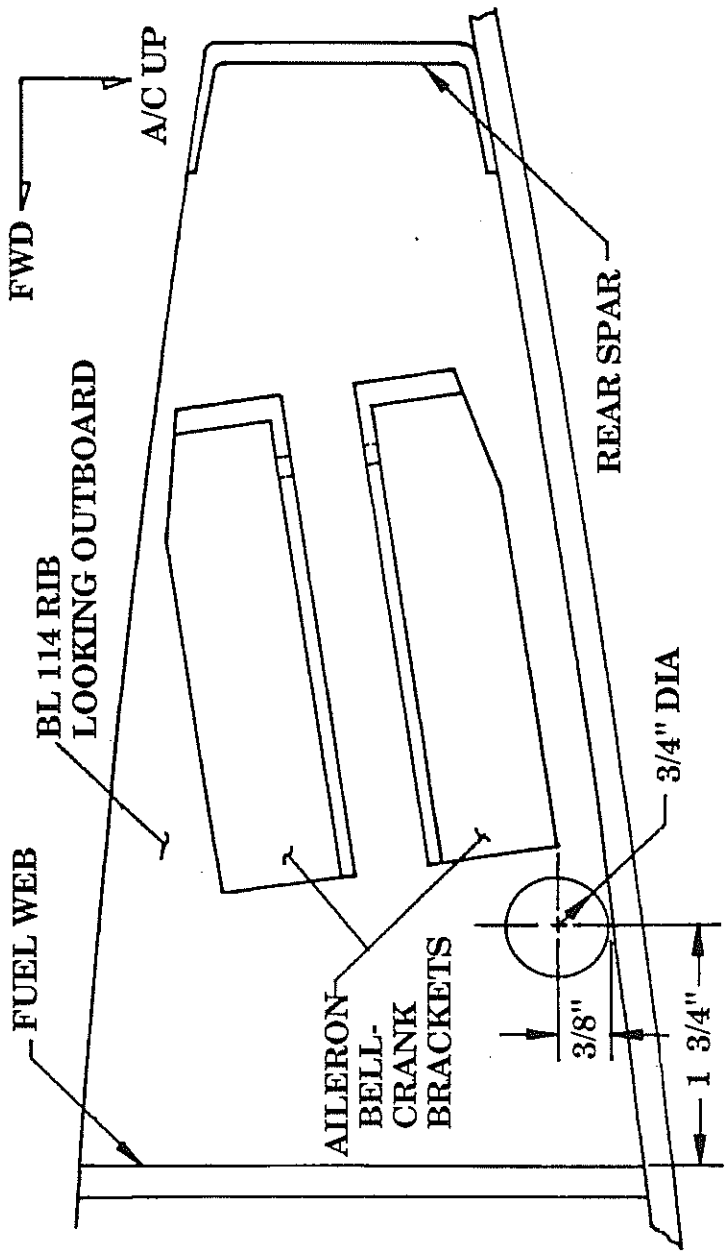
## Routing and securing the electrical tubing

Figure 6:M:3



## BL 114 rib (looking outboard)

Figure 6:M:4



M5. Push the tubing through the holes you've just made in the ribs. Adjust the tubing position if necessary so that you are absolutely sure that the electrical tubing will not interfere with any flap or aileron control.

M6. Bond the tubing to the ribs with a small radius of epoxy/flox. Between the ribs, the tube should be bonded to the nearest skin or spar web every 8-10" with a similar mix of epoxy/flox. As always, sand the areas you are bonding and clean thoroughly. Lay 1" x 2", 1 BID strips over the areas that you've just bonded for reinforcement.

## (N) WING TIEDOWN INSTALLATION

The tiedown assemblies are located just outboard of the BL 147 rib. They are secured to the front faces of the main spars with 4 BID.

N1. Locate the center of the tie down assembly 2" outboard of the BL 147 rib, on the front face of the main spar. Position the assembly just above the inside of the top skin so it doesn't ride up on the radius. Double check this height adjustment by inserting the tie down shaft onto the assembly. Sometimes the tie down shaft will protrude lower than the assembly, hitting the bottom skin in the process, so adjust the assembly as necessary. Mark around the edges of the assembly for easy repositioning.

N2. With 40 grit, sand the area where the tie down assembly will be bonded, and for 2" surrounding this area.

N3. Drill numerous 3/16" holes through the tie down where it will lie against the spar, and deburr the holes.

N4. Sand the assembly with 40 grit.

N5. Clean the assembly and spar with MC.

N6. Bond the tie down assembly to the spar with Hysol.

N7. With some planning, you can be ready and apply the 4 BID when the Hysol has just cured enough to hold the tie down assembly in place. This way you won't have to sand the assembly again in preparation for the BID. If you don't catch it in time, no big deal, just sand the area again.

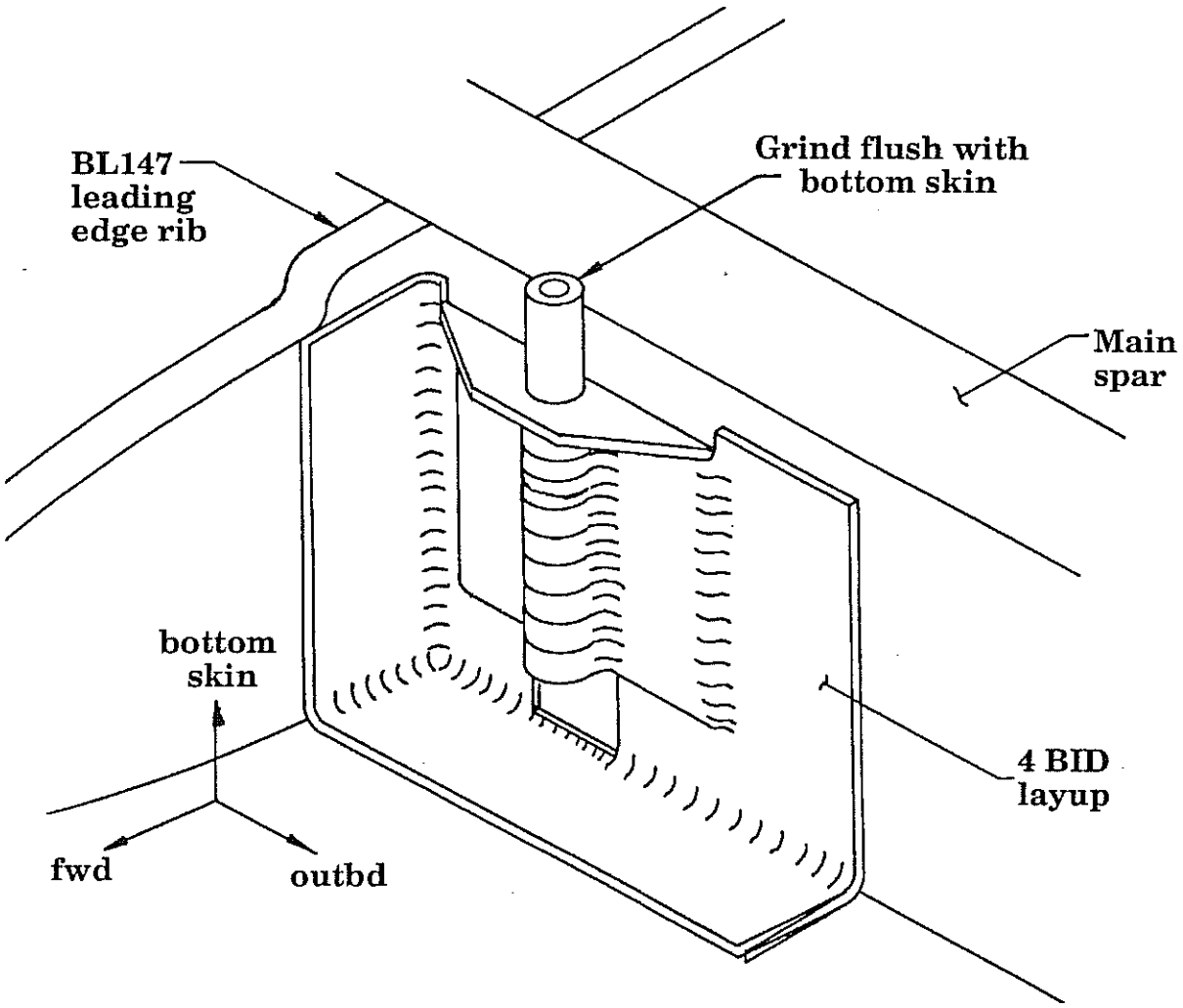
N8. Use an epoxy/flox mixture to form fillets where necessary so the 4 BID will lie nicely against it.

N9. Apply 4 BID over the tie down assembly, overlapping 2" onto the surrounding structure. The 2" minimum overlap is important for load distribution. Don't block the tie down shaft so the pin won't grab.

N10. You will have to grind a hole in the bottom wing skin for the tie down assembly tube, but this hole is actually a good guide for quickly locating the skin in the future. This tube is intentionally left long so you can file it flush to your individual bottom wing skin.

## Tie down assembly

Figure 6:N:1



## O. AILERON BELLCRANK MOUNTING AREA

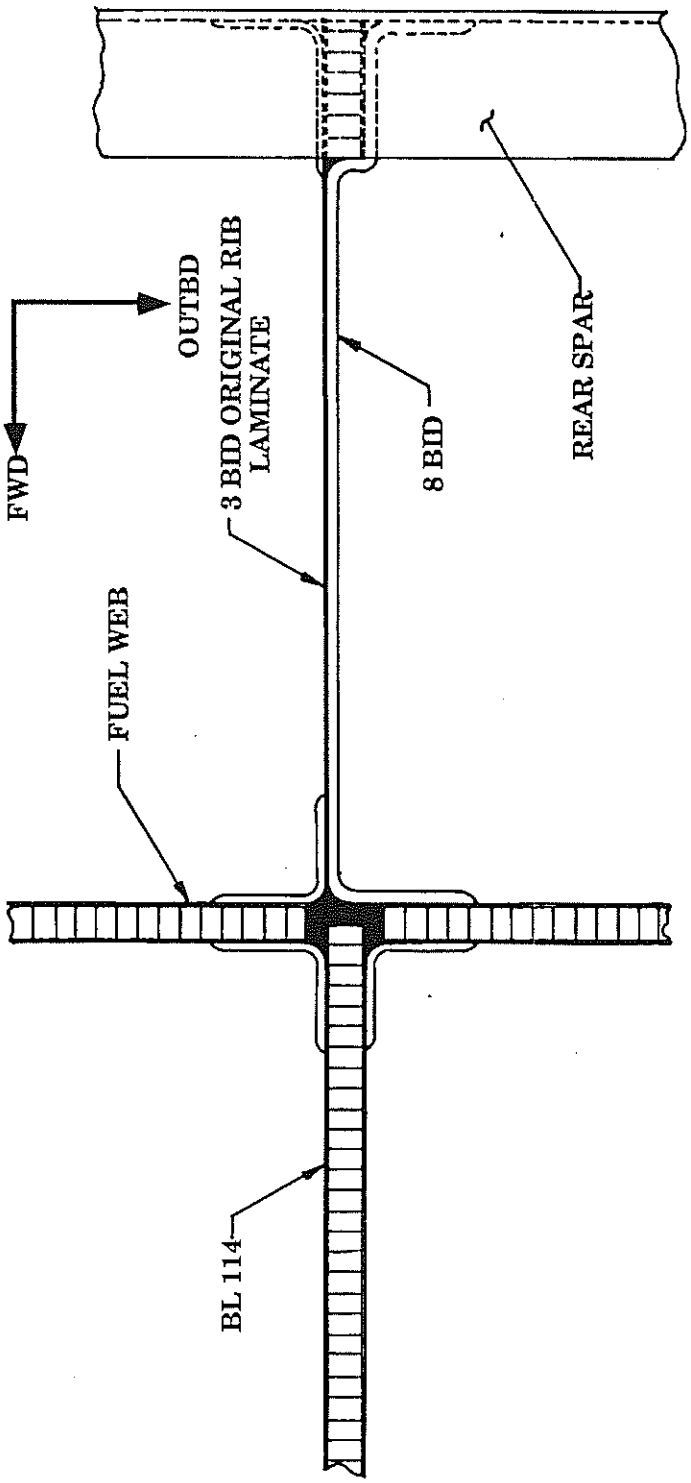
The aileron bellcrank is mounted on the inboard face of the BL 114 rib. The core in this area must be removed and the rib reinforced with an 8 BID layup.

O1. Remove the outboard laminate and core of the BL 114 rib, aft of the fuel bay web and forward of the rear spar. Remove the core all the way down to the top skin.

O2. Sand the area with 40 grit where the core has been removed and the surrounding 1" of the fuel bay web, top skin, rear spar, and capstrip. You will notice that the inboard laminate of the BL 114 rib, now unsupported by core, is not very strong, so be careful when sanding. This laminate will be stable enough to hold the 8 BID layup straight.

## Aileron bellcrank mounting area

Figure 6:O:1



O3. Cut a paper pattern that covers the area of the rib where the core has been removed and overlaps 1" onto the fuel bay web, top skin, rear spar, and capstrip.

O4. Use the pattern to cut enough glass for the 8 BID layup. Cut the glass on a 45° bias.

O5. Clean the area of the rib which will be reinforced with MC.

O6. Form microballoon radii where the rib joins the fuel bay web, top skin, rear spar, and capstrips.

O7. Wet out the glass using the plastic sandwich method.

Note: Two 4 BID layups are much easier to work with than one 8 BID layup, and can be applied one over the other when both are still wet.

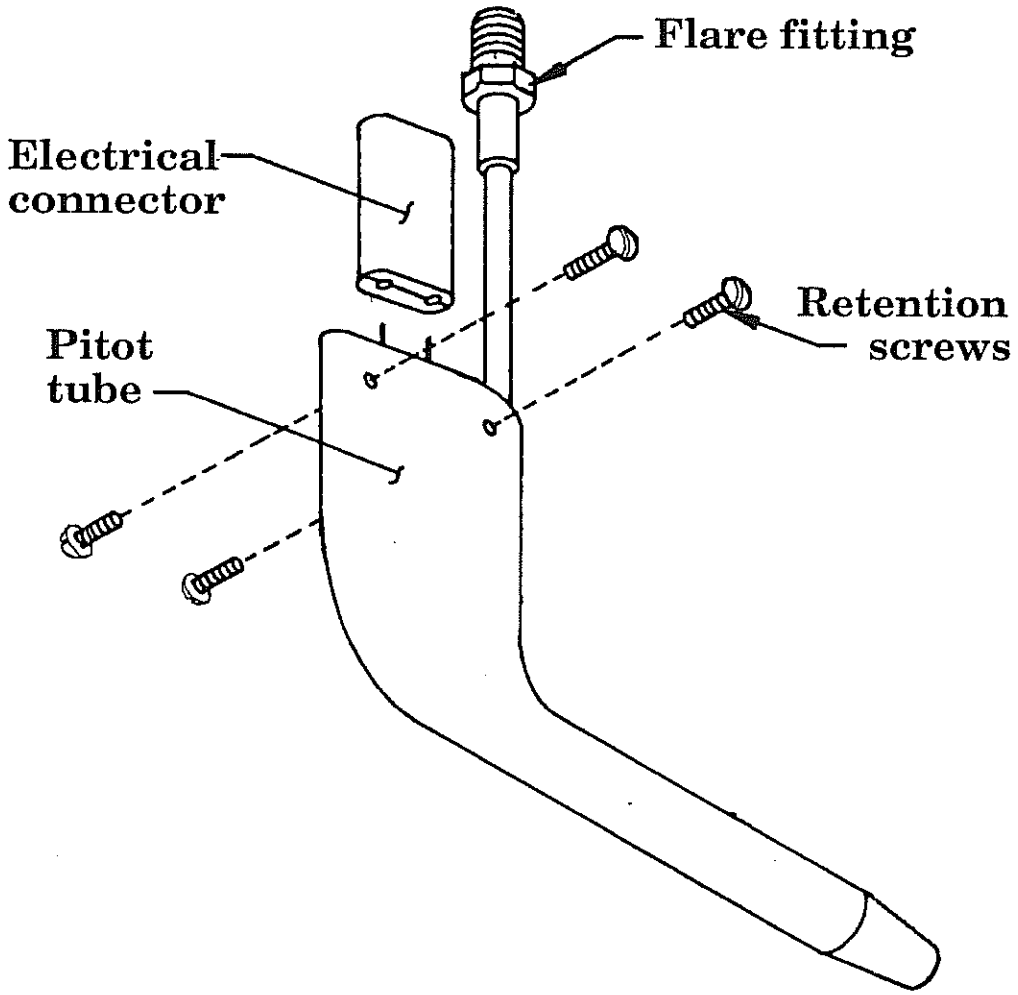
O8. Apply the laminates to the BL 114 rib. Be sure to get a good overlap on the surrounding surfaces.

O9. The aileron bellcrank will be mounted later in construction.

## P. PITOT TUBE INSTALLATION

Included in your kit is a heated pitot tube (see Figure 6:P:1). The pitot is electrically heated and requires 12 volts. The static source for your pitot system will be located on the fuselage. The hardware for the static source will be included in the fuselage kit.

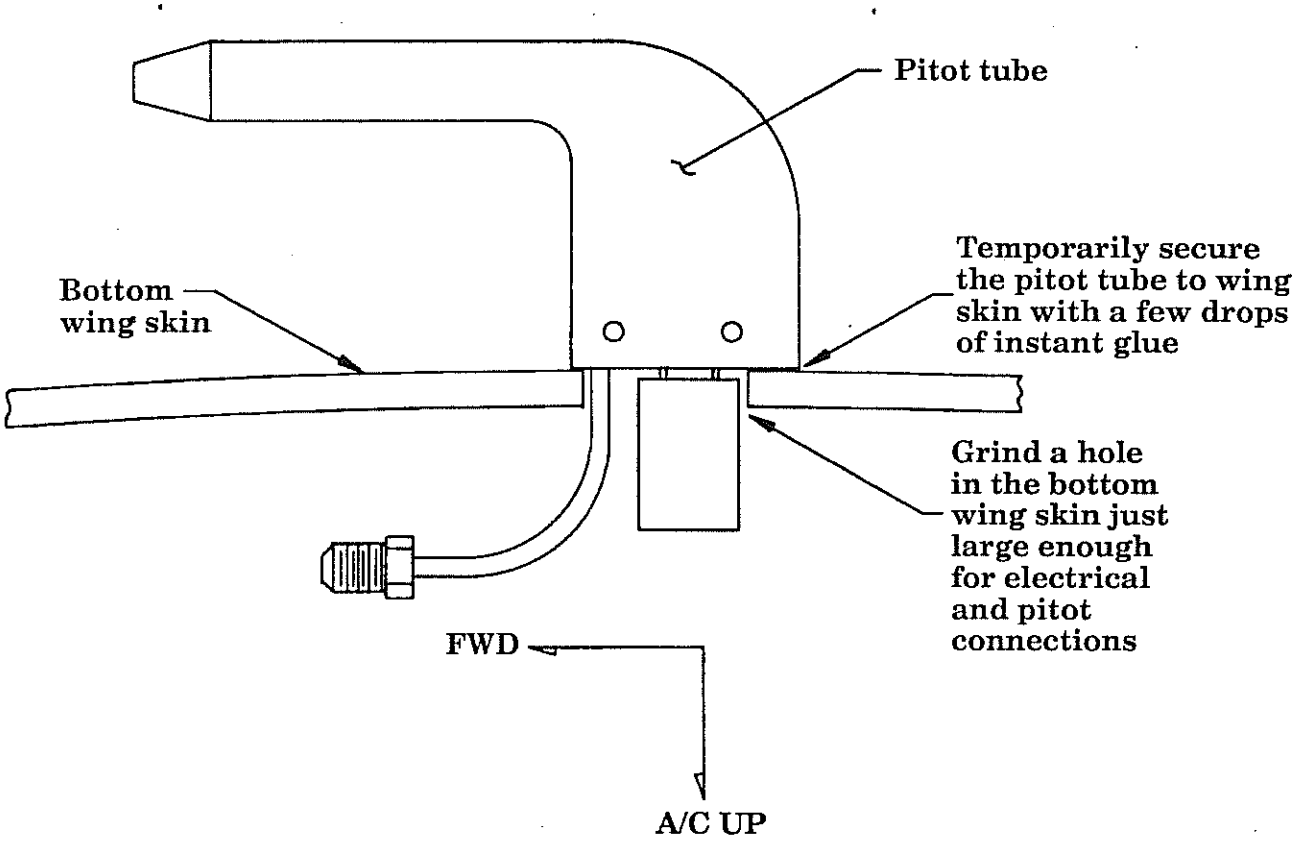
**Pitot tube assembly**
Figure 6:P:1




P1. Locate the center of the streamlined pitot tube base 1 1/4" inboard of the BL 171 rib and 10" aft of the L.E. of the wing (see Figure 6:P:2). Grind a hole in the bottom wing skin large enough for the pitot tube and electrical heater connections. Sand the area 2" around this hole on the bottom surface of the bottom wing skin and clean with MC.

## Positioning the pitot mounting tube

Figure 6:P:2




P2. Apply release tape (no thicker than 1 mil packing tape) to the streamlined base of the pitot tube.

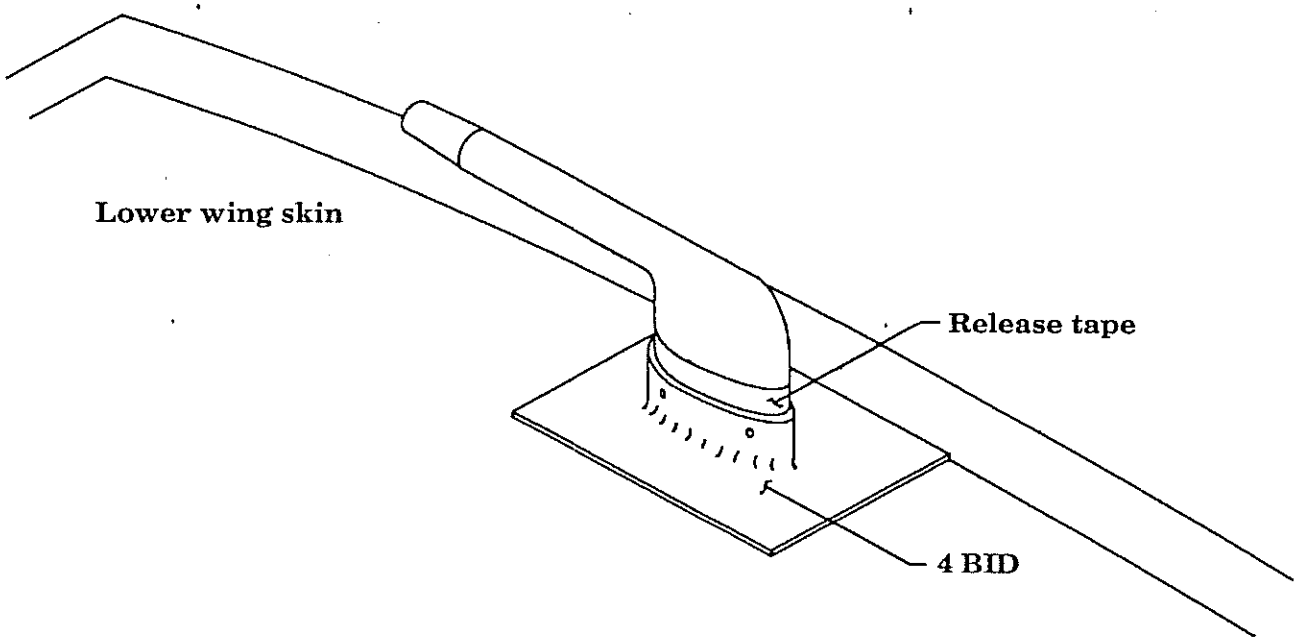
P3. Locate the pitot tube in the bottom wing skin again, just as you would for final installation. The narrow, round part of the pitot that points forward should be level and parallel to the direction of flight. The streamlined base of the pitot tube should rest against the skin. At this point, temporarily secure the base of the pitot tube to the bottom wing skin with a few drops of instant glue.

P4. Apply 4 BID to the top 5/8" of the pitot tube base. Overlap the BID onto the bottom wing skin by 1 1/2". See Figure 6:P:3.

Note: Since you haven't yet closed out the wing, it is advisable to weight the bottom wing skin in position while applying the 4 BID flange, since the bottom skin contour may change slightly. This will allow the flange to cure with the proper wing contour.

## Forming the pitot flange

Figure 6:P:3




P5. When the 4 BID has cured, pull the pitot tube from it's fiberglass flange. Gently but firmly rocking the pitot fore and aft will help break it loose from the flange.

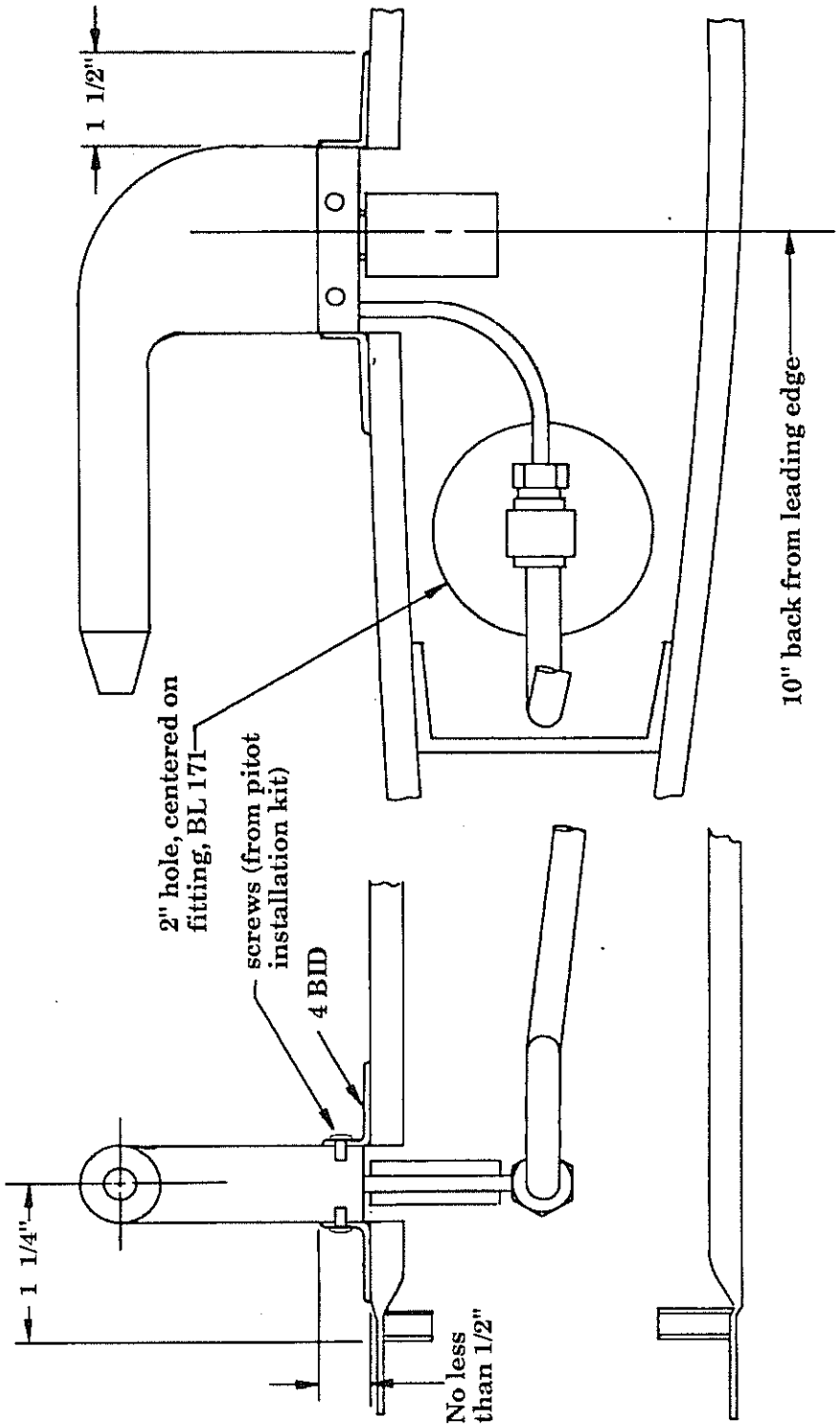
P6. Trim the flange flat but leave no less than 1/2" of flange above the wing skin.

P7. Drill #29 holes through the fiberglass pitot flange for the four mounting screws included with the pitot.

P8. Use 1/4" dia. 5052 aluminum tubing to route the pitot line through the wing. Grind 5/16" holes through the ribs for the pitot line. See Figure 6:P:6, 6:P:7 and 6:P:8 for details and dimensions for routing the line. Exact positioning of the pitot line is not important as long as it doesn't interfere with the aileron bellcrank and pushrod. (You may want to wait on installing the pitot line until after aileron completion).

## Pitot line clearance hole in BL 171 rib

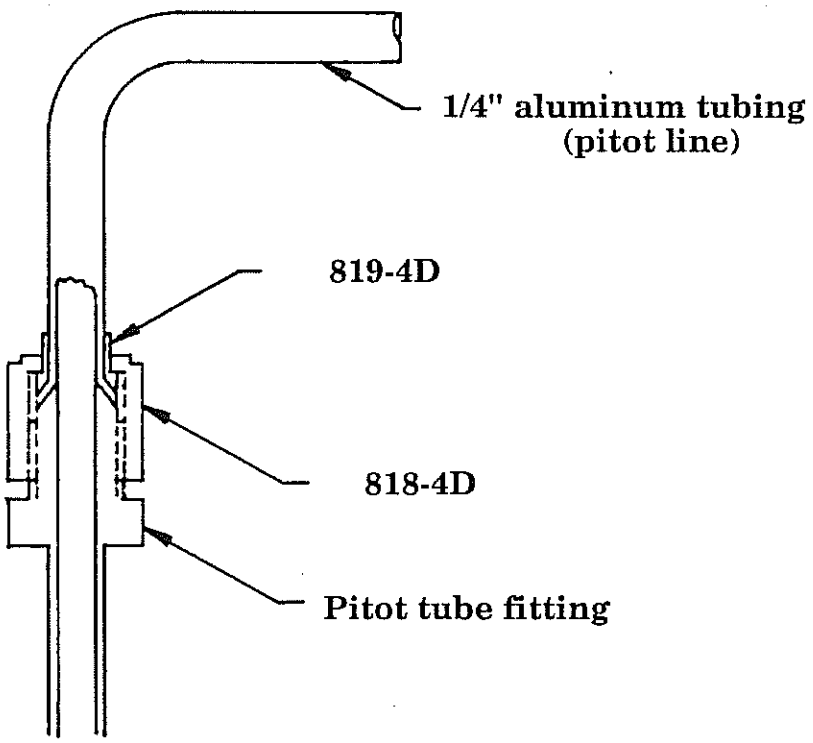
Figure 6:P:4



P9. Insert plastic grommets in the ribs to protect the aluminum pitot line from vibration and wear.

P10. Slip an AN819-4D sleeve and AN818-4D nut onto the pitot line and flare the outboard end of the line. See Figure 6:P:5.

**Connecting the pitot line**
Figure 6:P:5



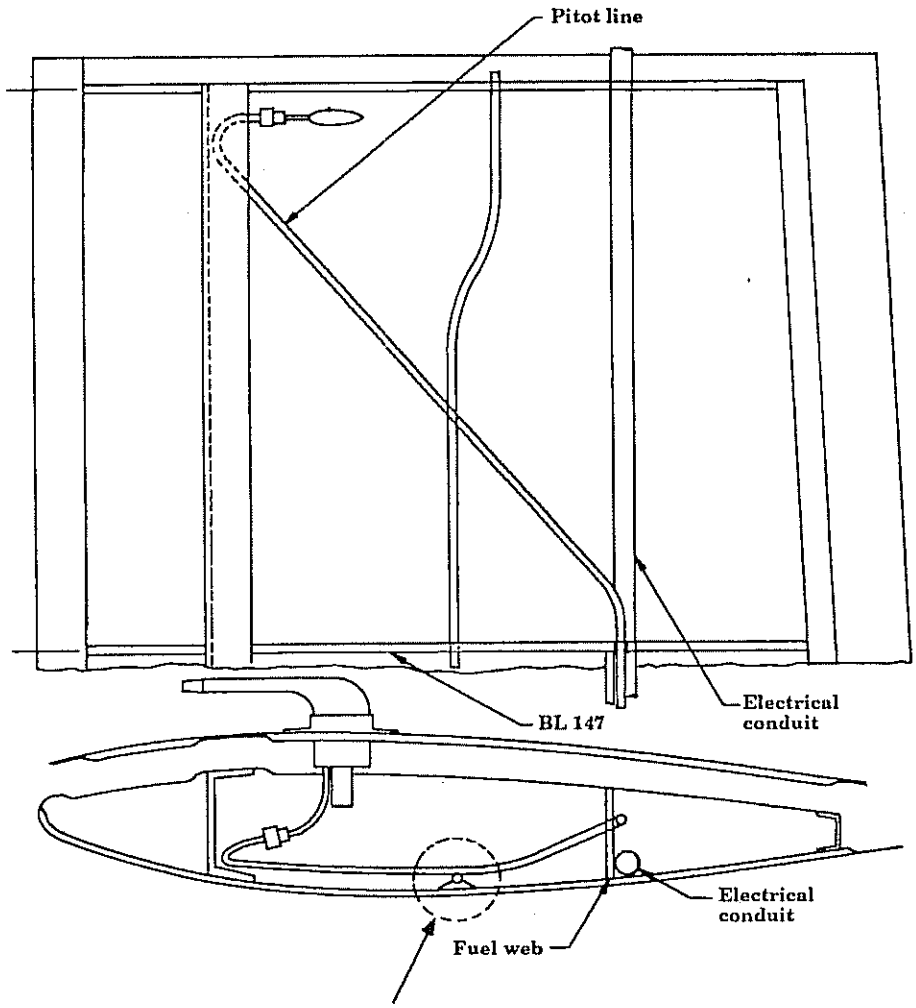

P11. The pitot line is glassed to the inside of the top wing skin at only one point, where it crosses the fuel vent line. Secure the line at this location with micro and a 1" x 2", 2 BID patch. See Figure 6:P:6.

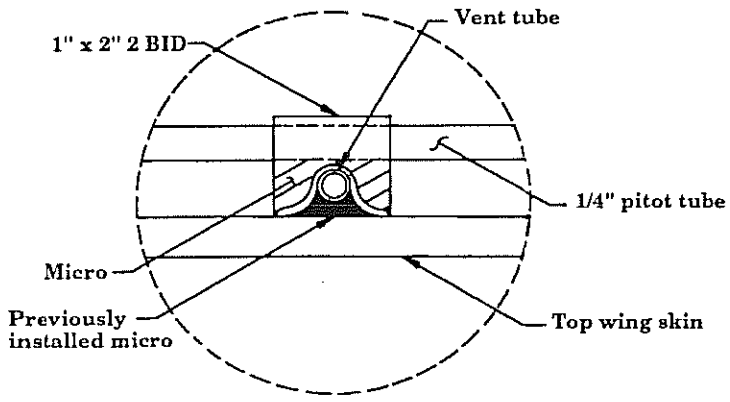
P12. Flare the inboard end of the pitot line. A plastic pitot line will be connected to this end later in construction.

P13. Grind a 2" diameter access hole in the BL 171 rib for later installation and removal of the pitot tube. The pitot heat wiring is run out this access hole and back to the wing root through the electrical tube. Be sure to cut the access hole so you can get a wrench on the pitot line/tube fittings.

## Routing pitot line

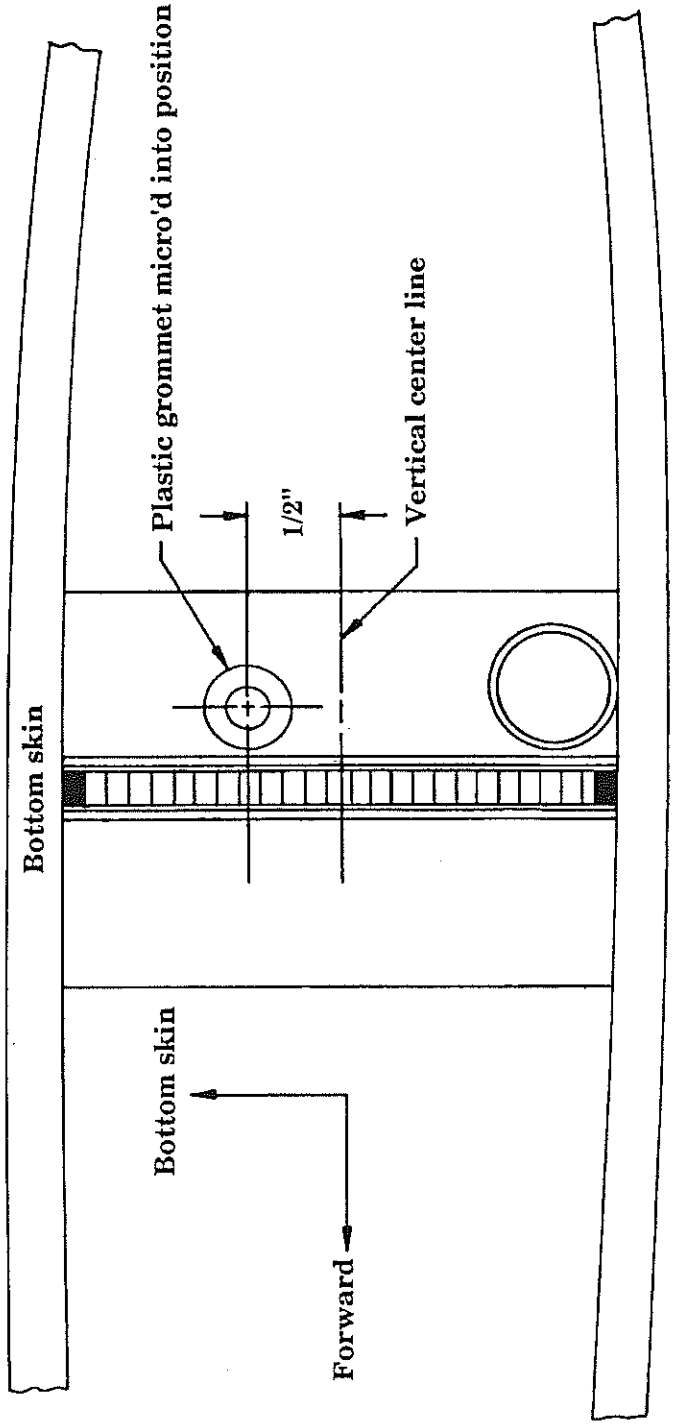
Figure 6:P:6



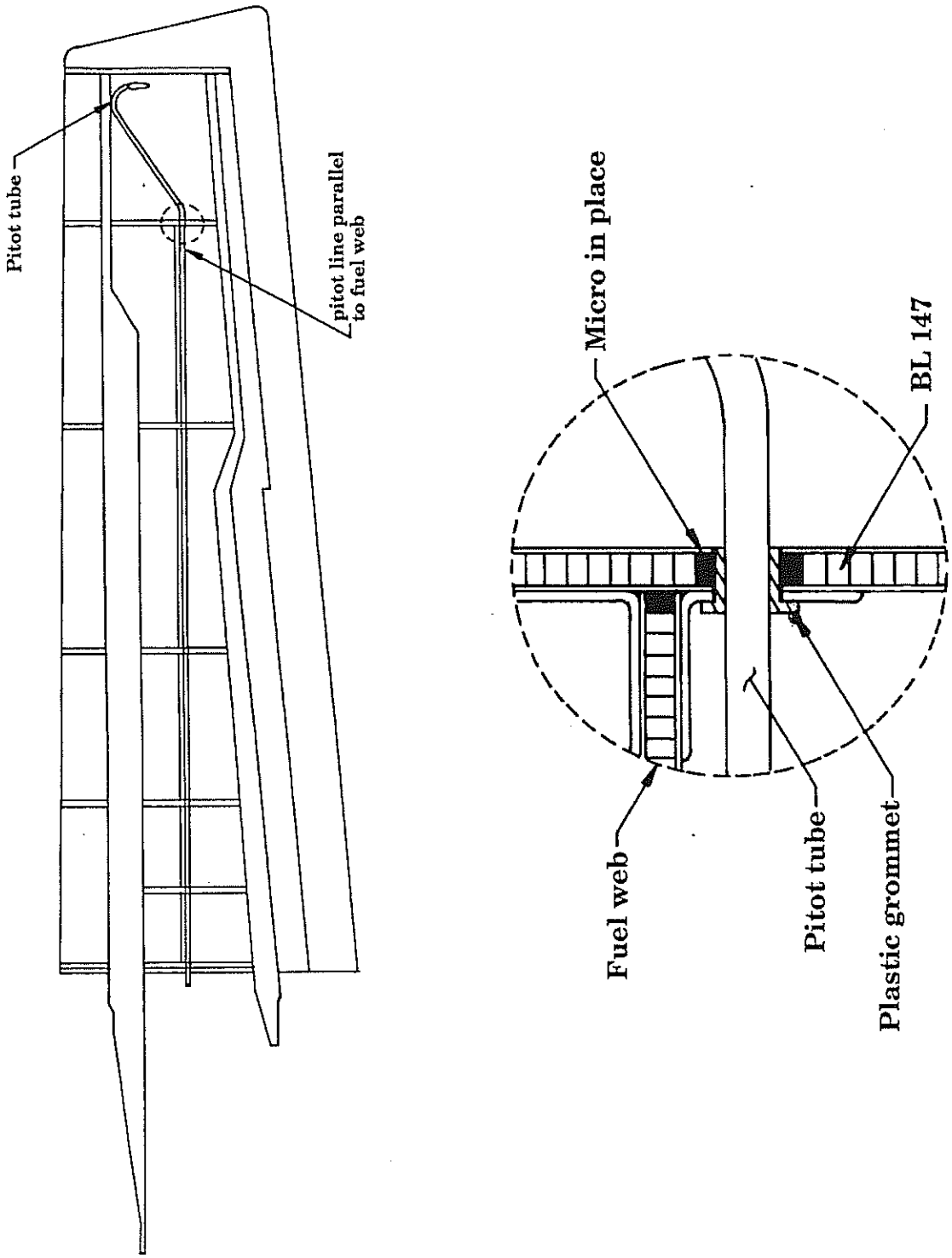
## Typical rib profile

Figure 6:P:7

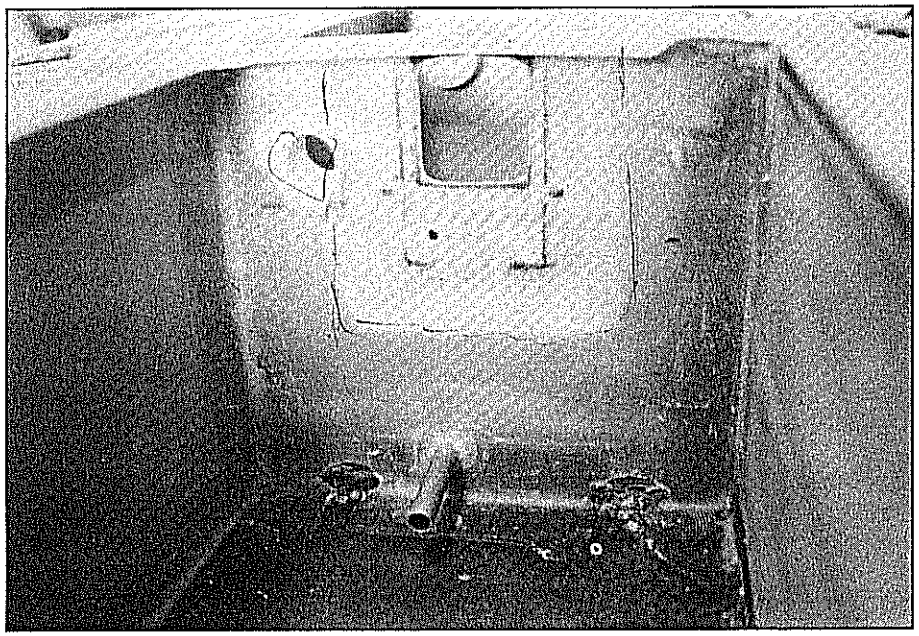


## Routing pitot line next to fuel web

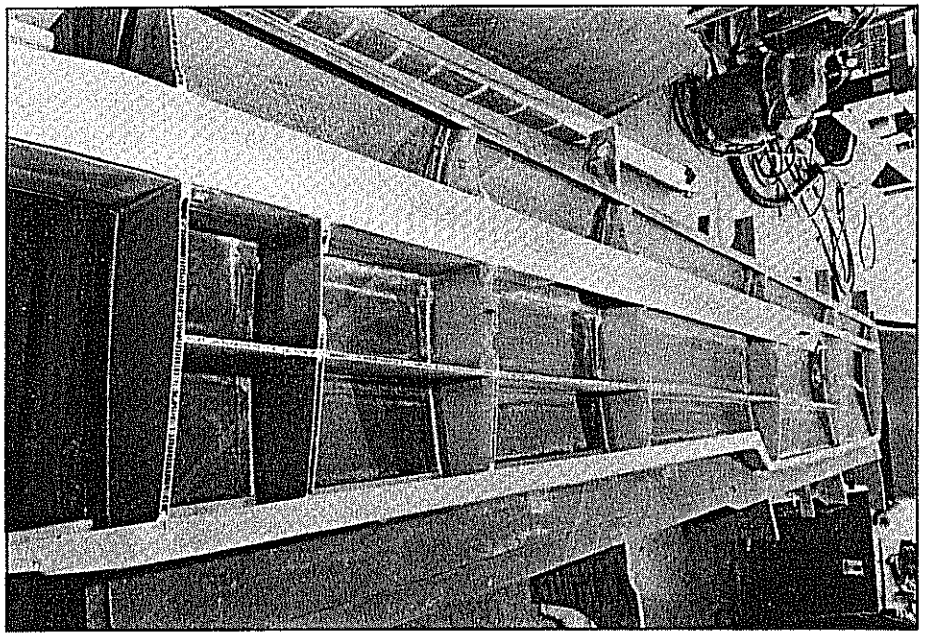
Figure 6:P:8



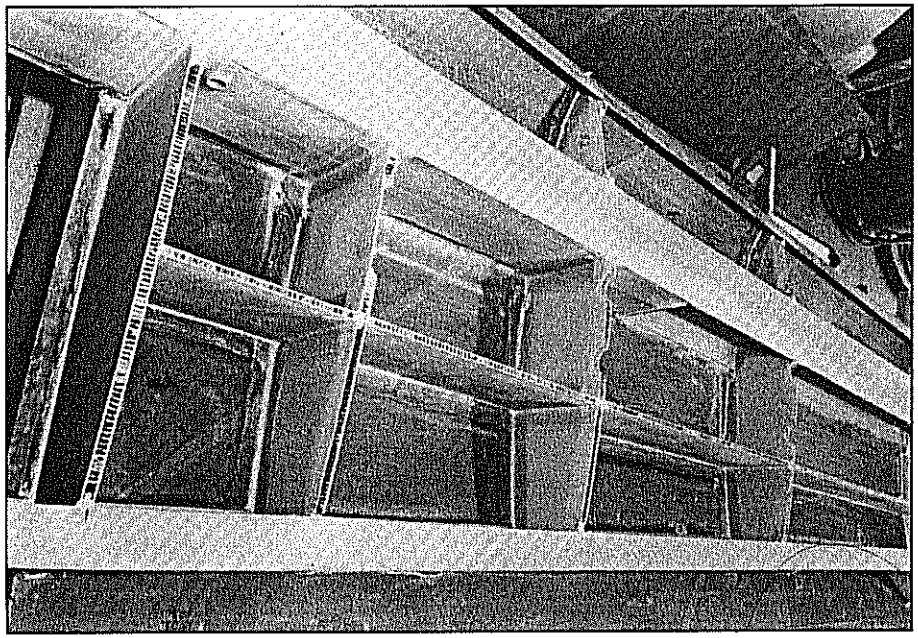
## 4. PHOTO PAGES



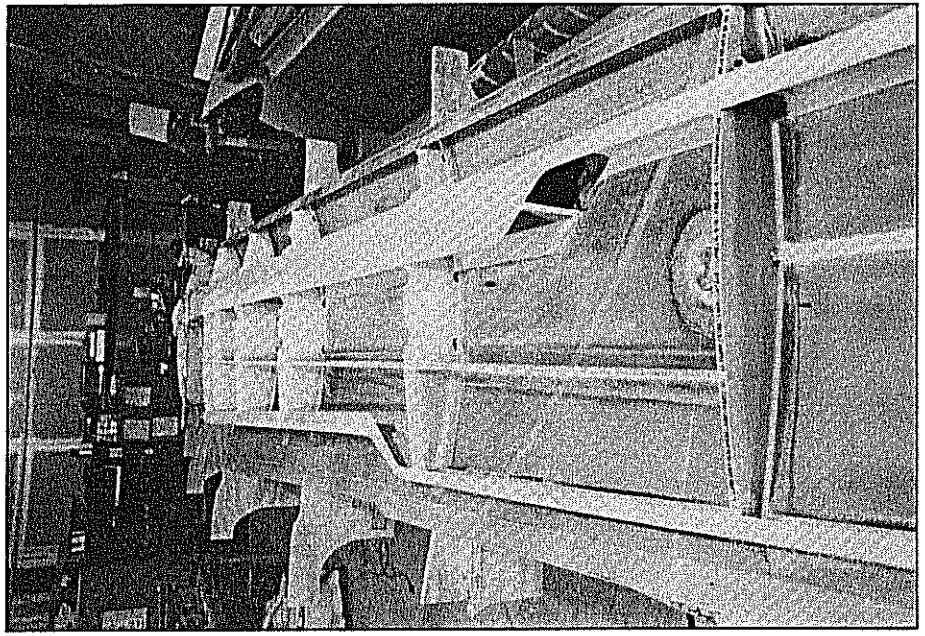
The fuel return line extends outboard just past the BL38 rib. Also in this shot you can see the slosh door opening and mounting bolt holes.



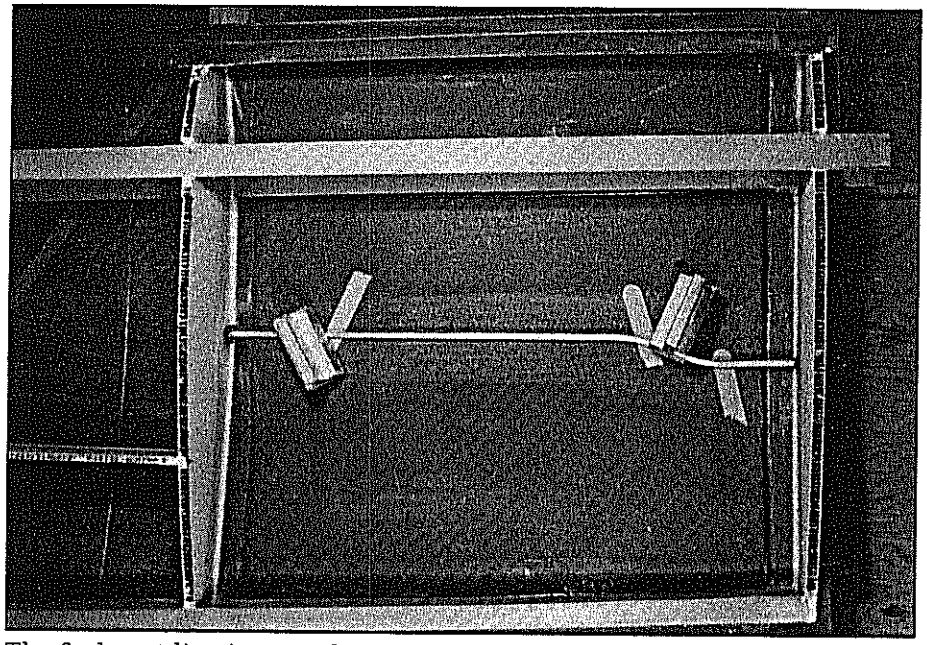
Like a big model airplane wing, building the ribs and fuel shearweb is simply a matter of cut, fit, micro, and glass. Unlike this wing, your inboard main spar closeout will end between the BL38 & 52 ribs.



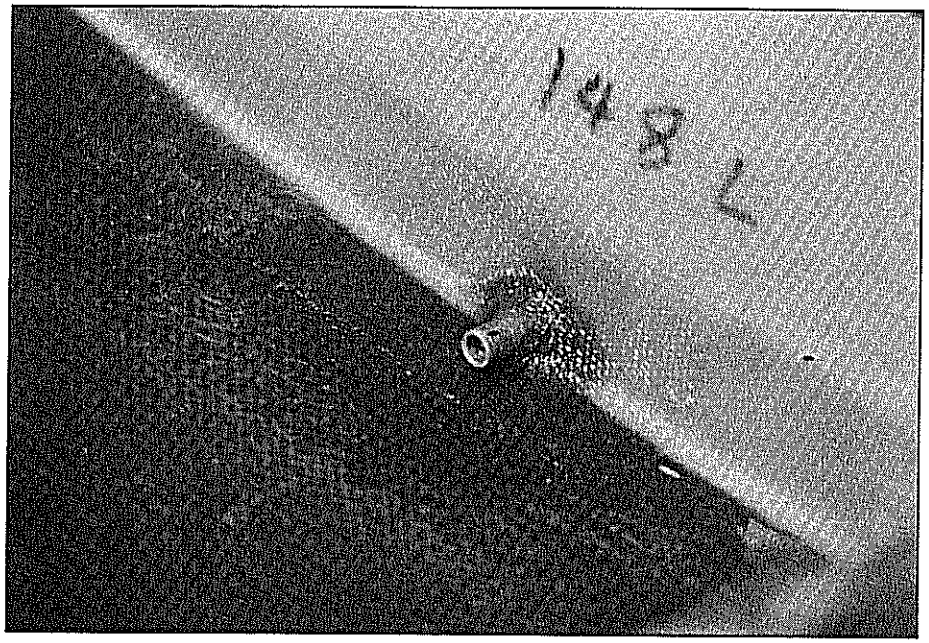
You'll get real tired of applying 2" wide BID tapes but at least it's easy work. Remember the small half circle cutouts (the fuel vents), are on the top of the ribs but the wing's upside down. Don't mistake vents for drains.



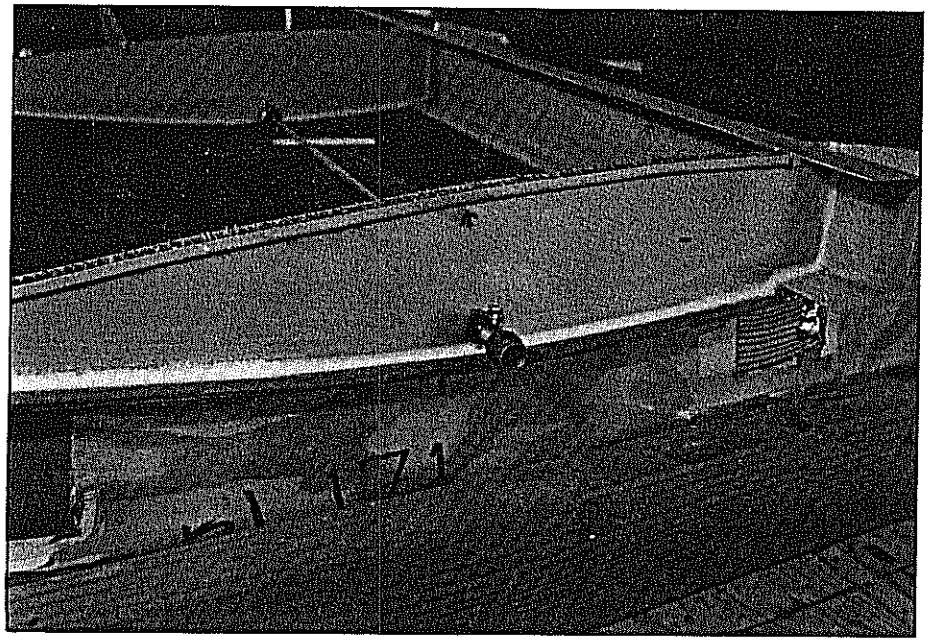
Please remember to seal the spar for fuel BEFORE bonding in the outboard main spar closeout. It would be quite a trick to seal it afterwards.



The fuel vent line is spaced away from the inside top wing skin with tongue depressors while the Hysol cures in the BL147 & 171 ribs. The two small weights are enough to hold the line in place.

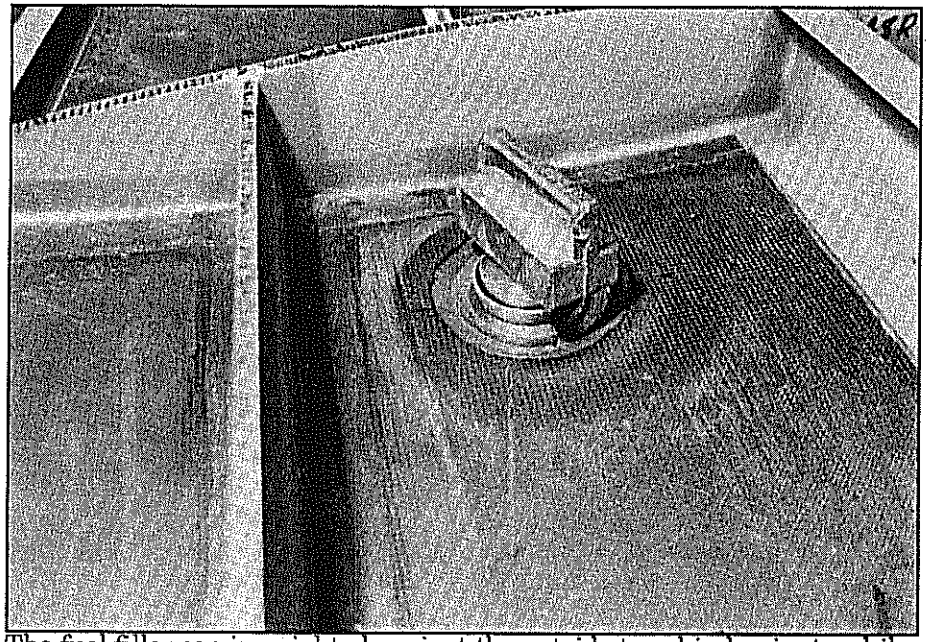


The vent is sealed and reinforced with 2 BID where it enters the tank area just inboard of the BL147 rib. Yes, the rib should be located at BL147, not 148 as we have done. Notice the small micro radii and straight BID tapes.

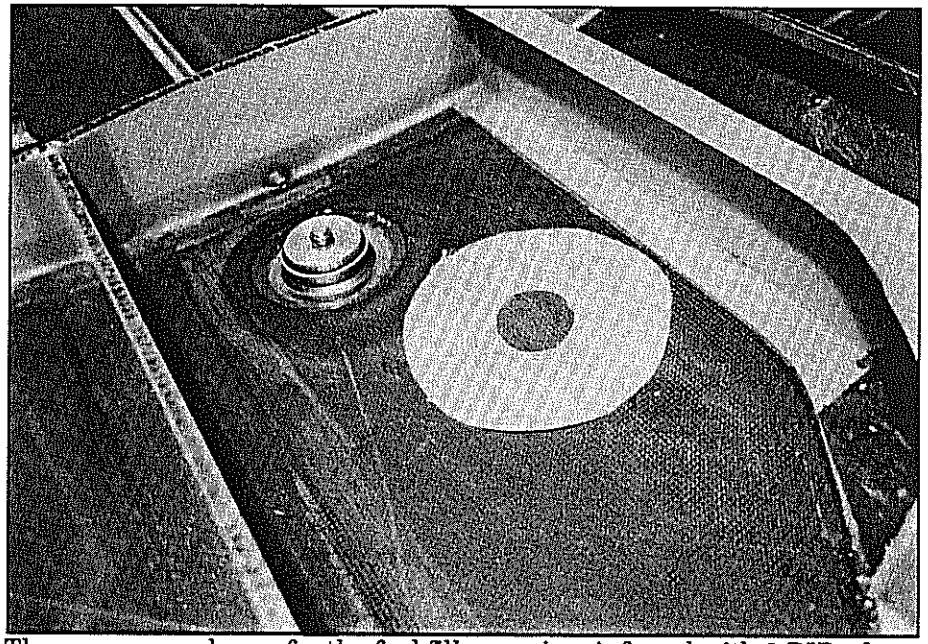


We capped the vent tube with an AN819-4D sleeve and AN818-4D nut but you will simply flare the end of the tube to receive the wing tip vent line. The main spar should be trimmed flush to the BL171 rib.

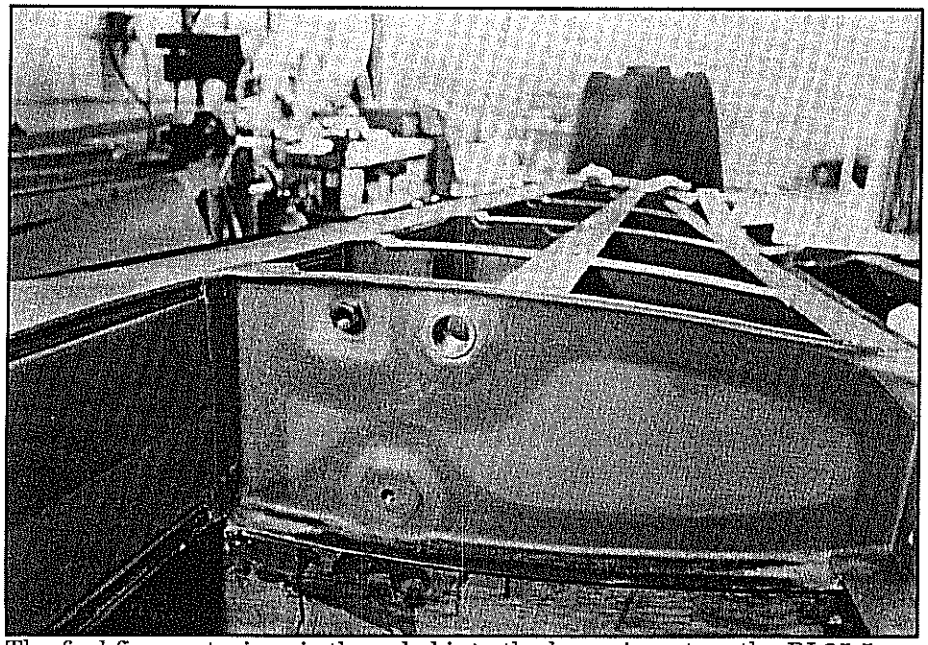
The vent tube is potted to the inside top wing skin with micro. Be sure to prepare the skin underneath the tube with 40 grit and MC.



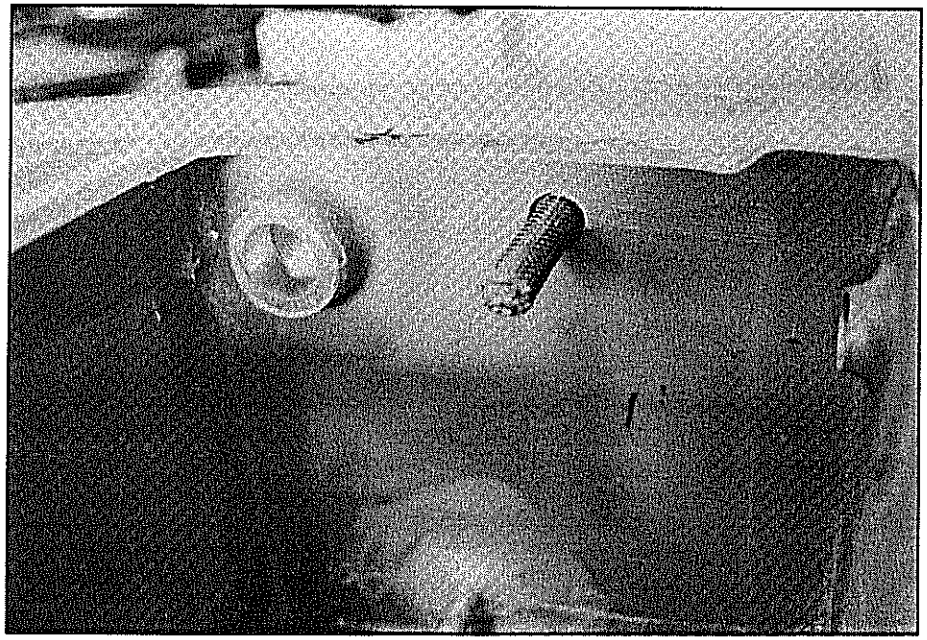
The fuel filler cap is weighted against the outside top skin laminate while the Hysol cures. The weight shown is 2 1/2 pounds. Don't use any more weight than this.



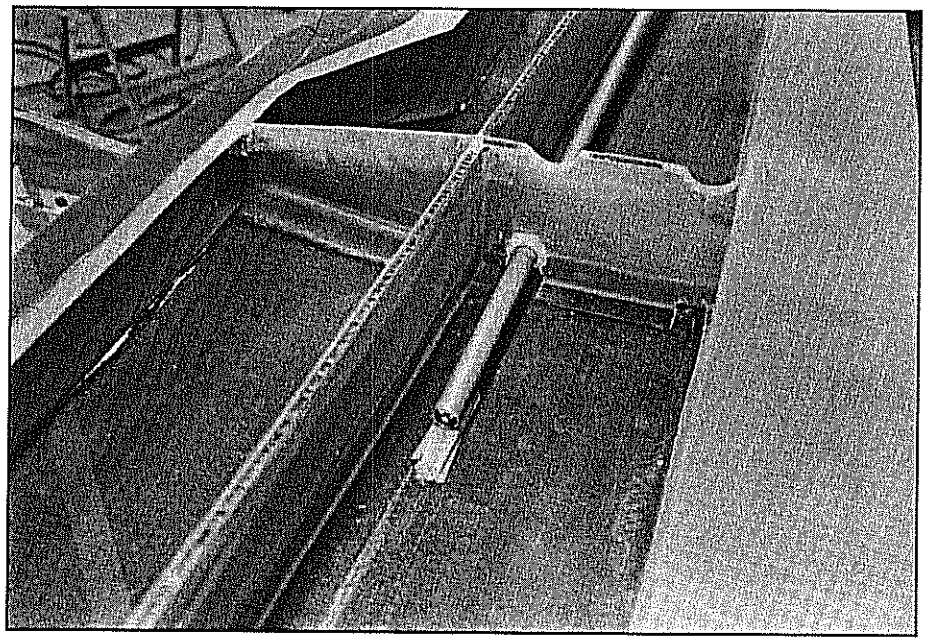
The core removal area for the fuel filler cap is reinforced with 2 BID after the Hysol has cured. Be sure to sand the area good with 40 grit before sanding. Notice the fuel sealer already applied behind the spar closeout.



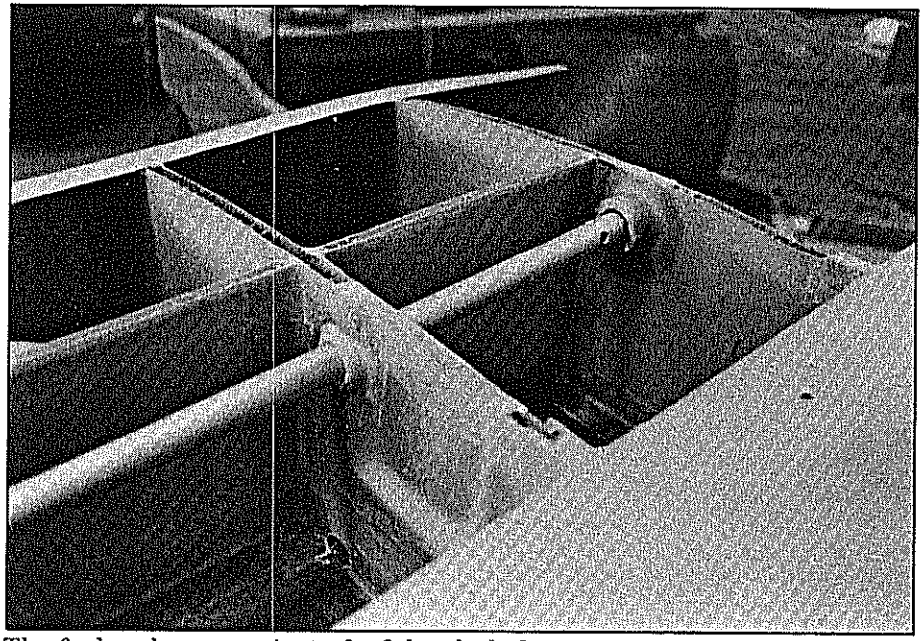
The fuel finger strainer is threaded into the brass insert on the BL25.5 rib. We used the same 3 BID capstrip reinforcement to lay over the brass insert, aluminum probe mount, and fuel return.



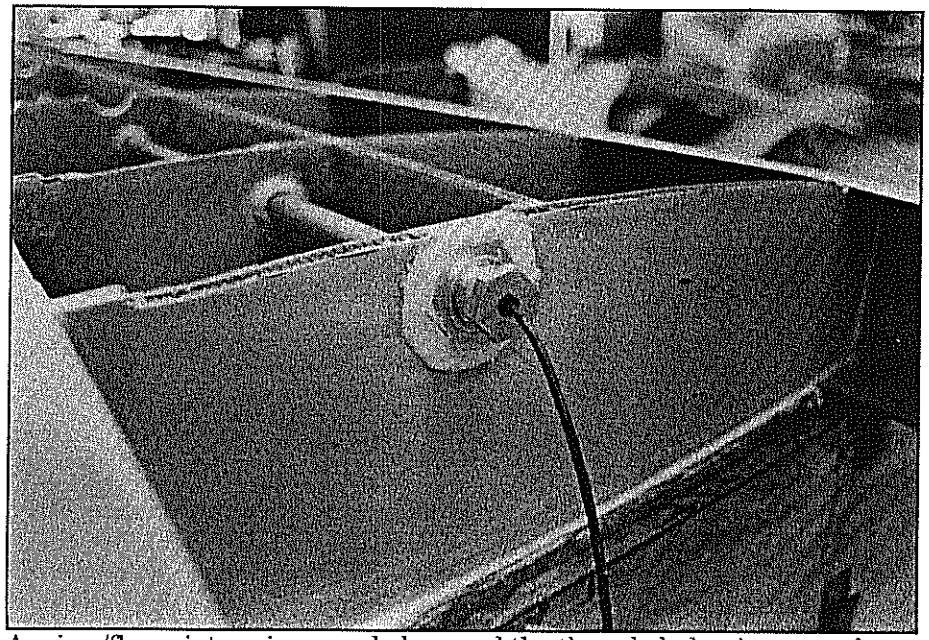
In this view, you can see the orientation of the finger strainer, aluminum fuel probe mount, fuel return (bottom of picture), and fuel transfer tube.



The outboard tip of the Vision Micro Systems fuel probe is raised off the inside top wing skin with three tongue depressors while the probe guides cure in position.

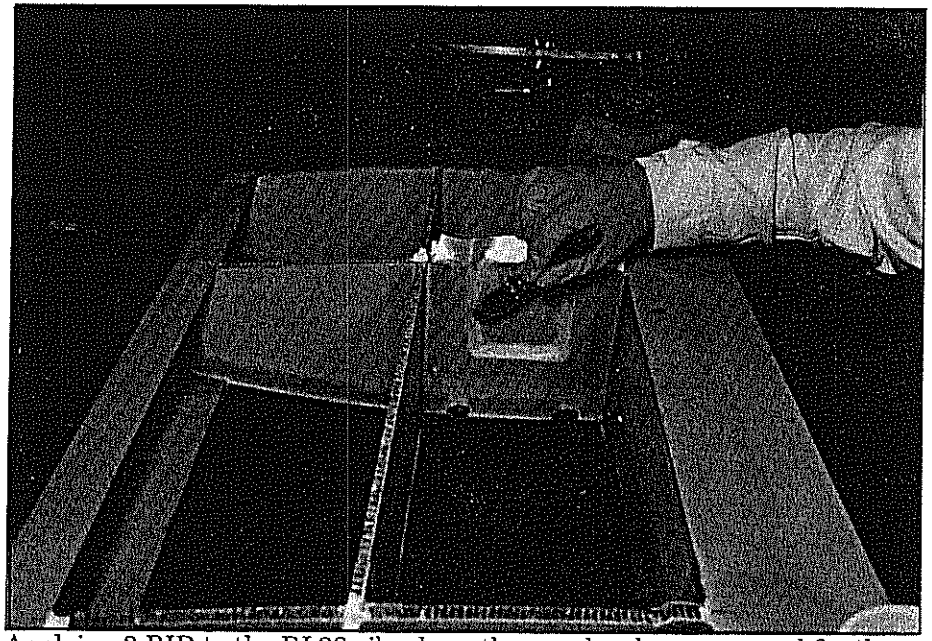


The fuel probe passes just aft of the slosh door cutout in the BL38 rib. The threaded aluminum probe mount is reinforced with 2 BID on the outboard face of the BL25.5 rib.

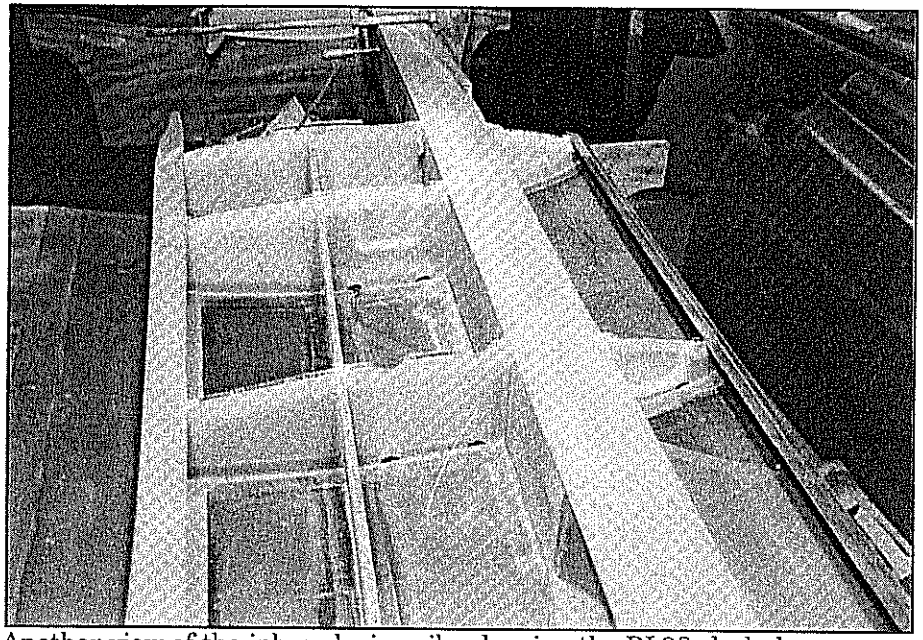


A micro/flox mixture is mounded around the threaded aluminum probe mount to keep it from spinning in the rib. The pipe threaded probe can then be easily installed and removed from the wing.

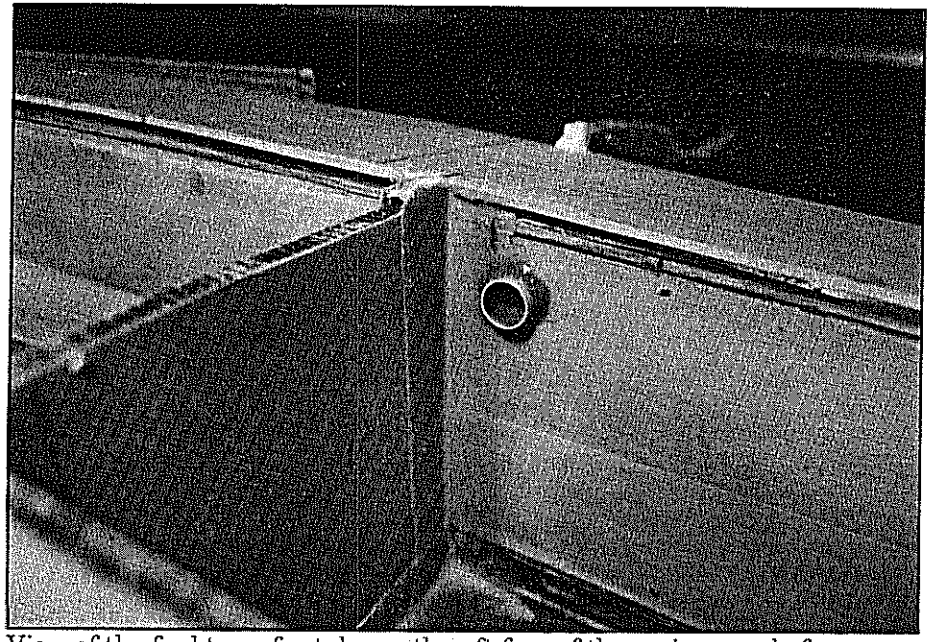
A close up view of where the probe and it's guide passes through the BL38 rib. Notice the capstrip that has just been added. The sanded area is where the 3 BID will tie the capstrip to the rib, typical of all ribs.



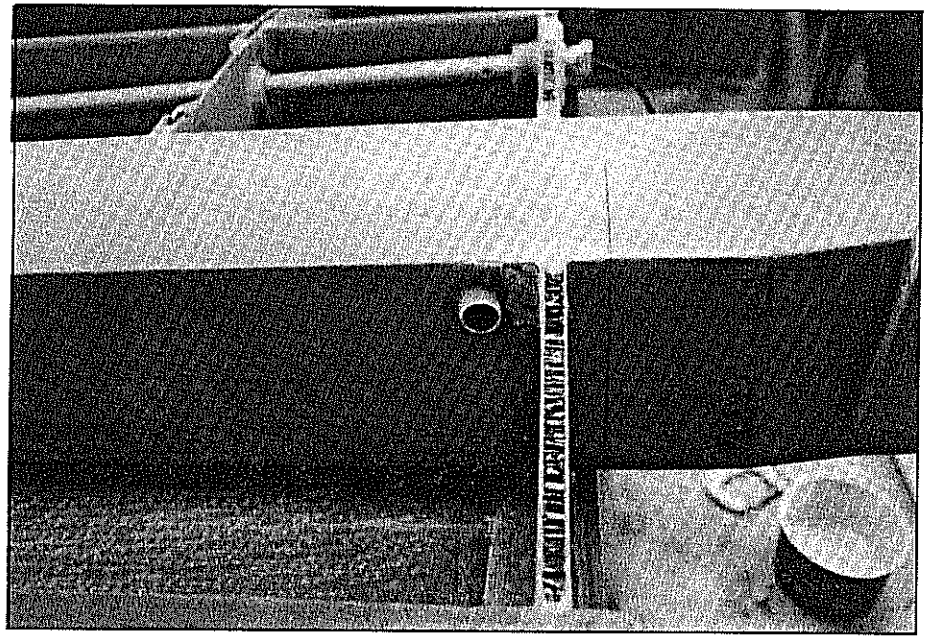
Applying 3 BID to the BL38 rib where the core has been removed for the slosh door. Notice the micro that has been pushed into the core and radiused.



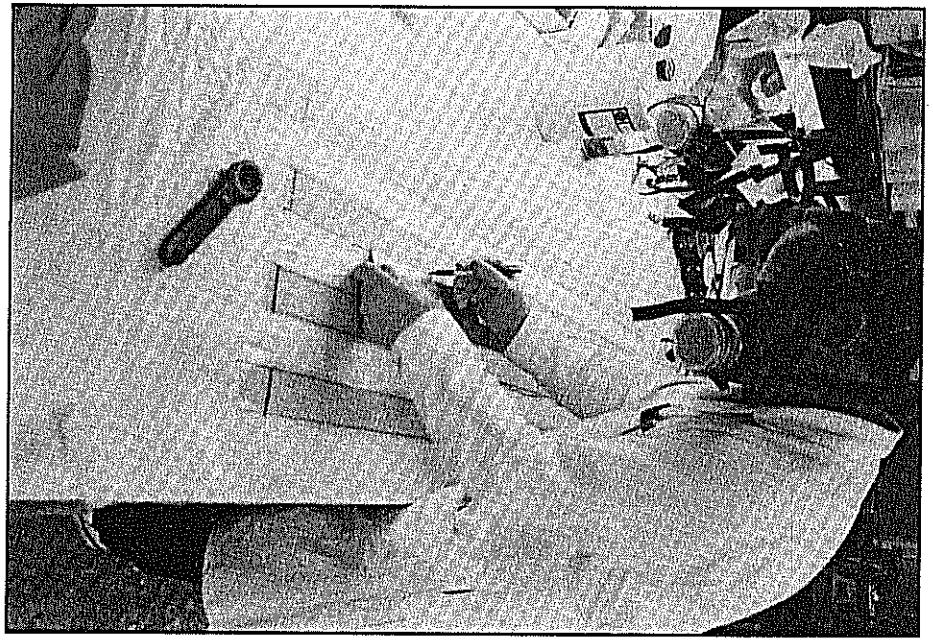
Another view of the inboard wing ribs showing the BL38 slosh door cutout. Notice we also have a slosh door in the BL52 nose rib. This door is no longer needed because the inboard spar closeout has been shortened.



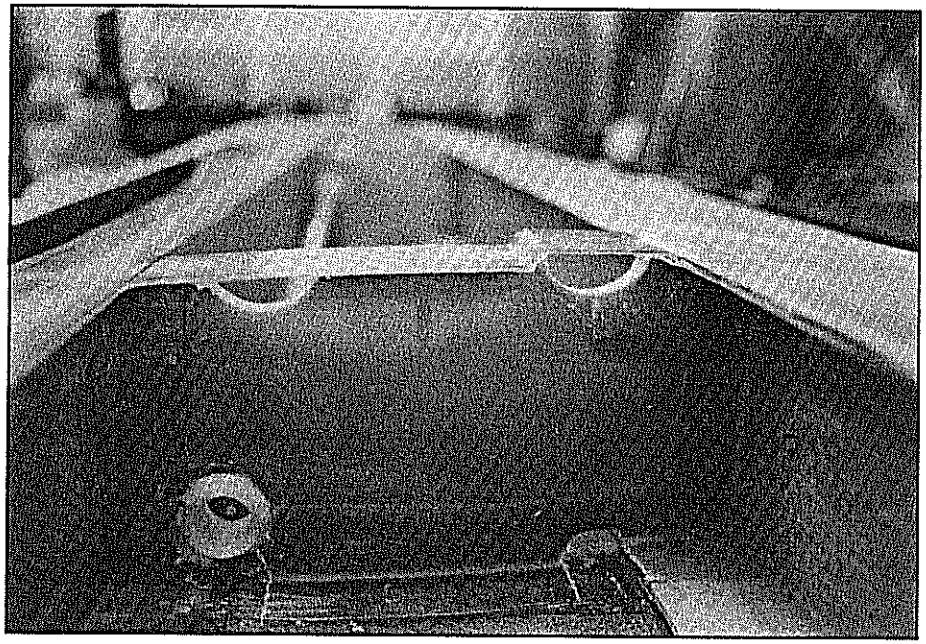
View of the fuel transfer tube on the aft face of the main spar, before adding the 1 BID. Notice that the tube is not at the lowest point of the spar because that would require trimming through the lower closeout cap.



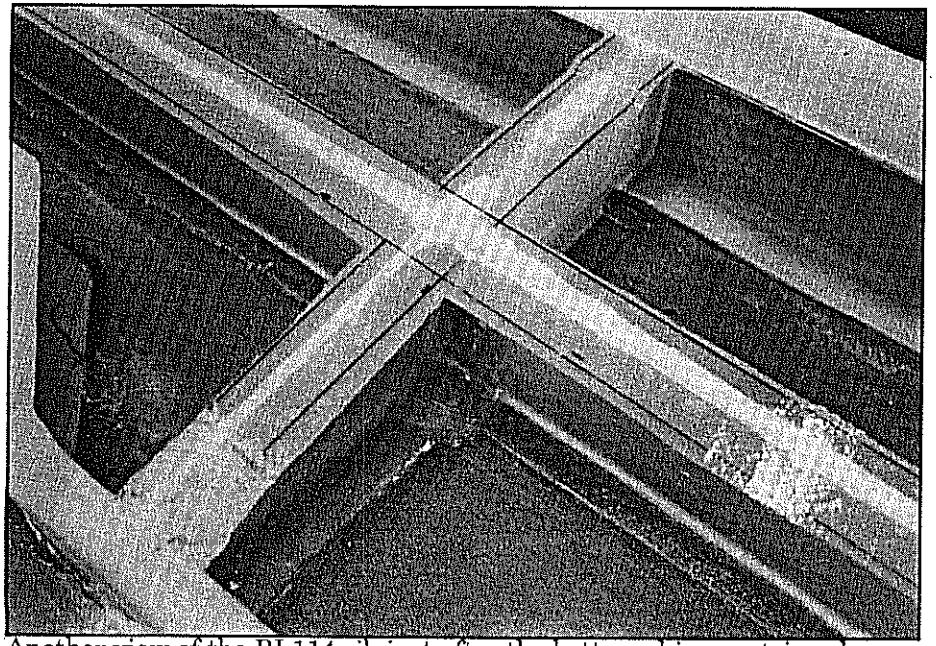
View of the fuel transfer tube on the front face of the main spar. The tube has already been glassed with 1 BID.



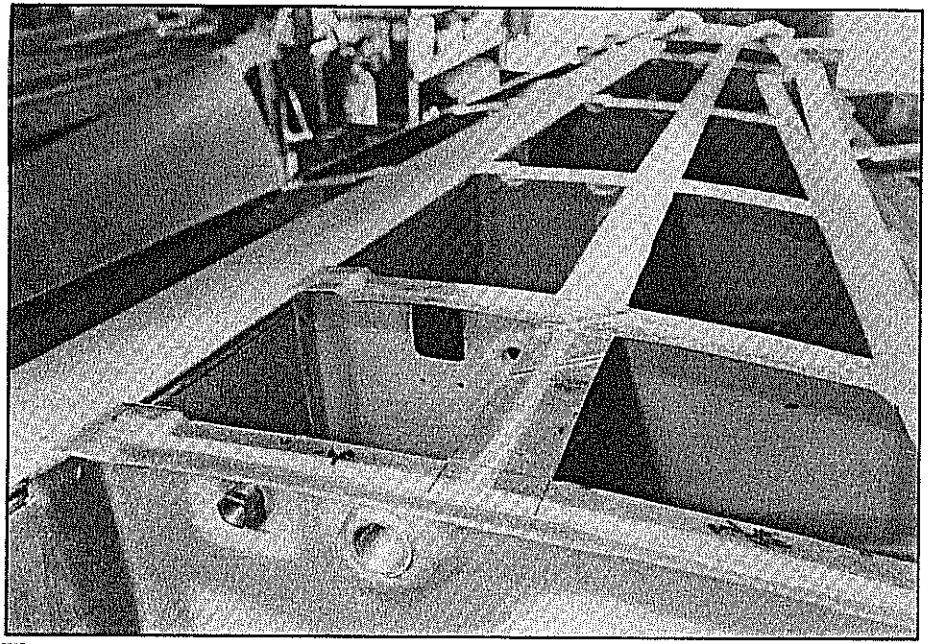
Cutting 2" wide, 2 BID capstrips, already wetted out using the plastic sandwich method. A good respirator and gloves are mandatory. The shop coat is a vain attempt to convince people that we know what we're doing.



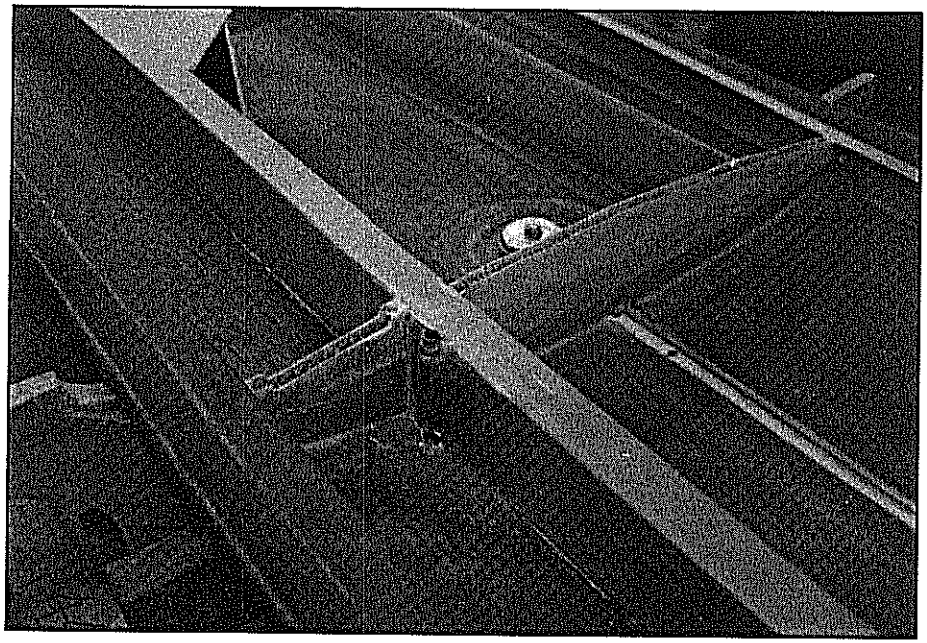
BL114 rib just after the bottom skin capstrip release. The BID tapes that secure the capstrip have not been applied yet, but the areas where they will be laid are sanded before the release. Notice the fuel probe guide.



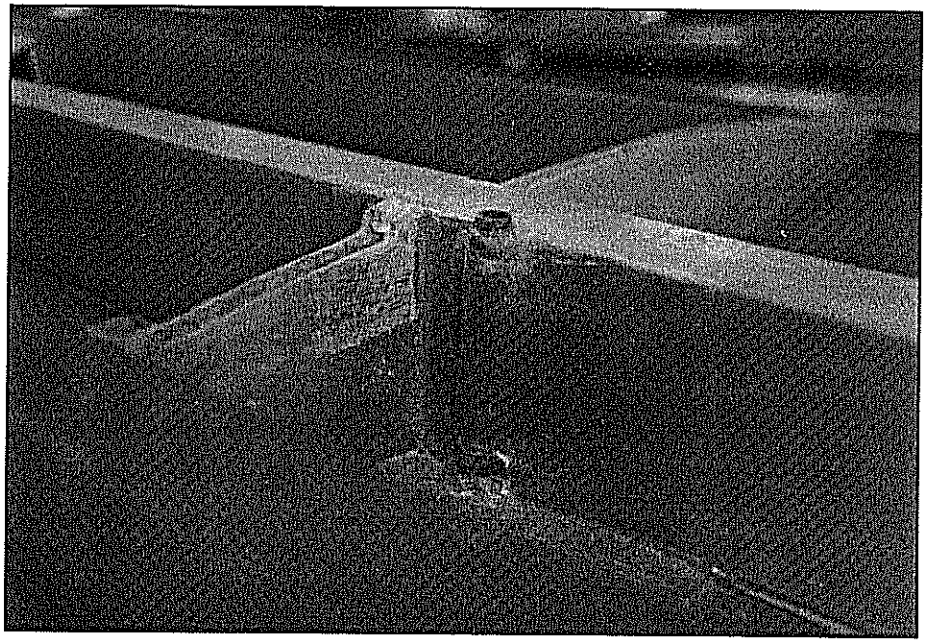
Another view of the BL114 rib just after the bottom skin capstrip release. The capstrips should be 2" wide but need not be perfectly centered. Notice the glass to glass aileron bellcrank mounting area.



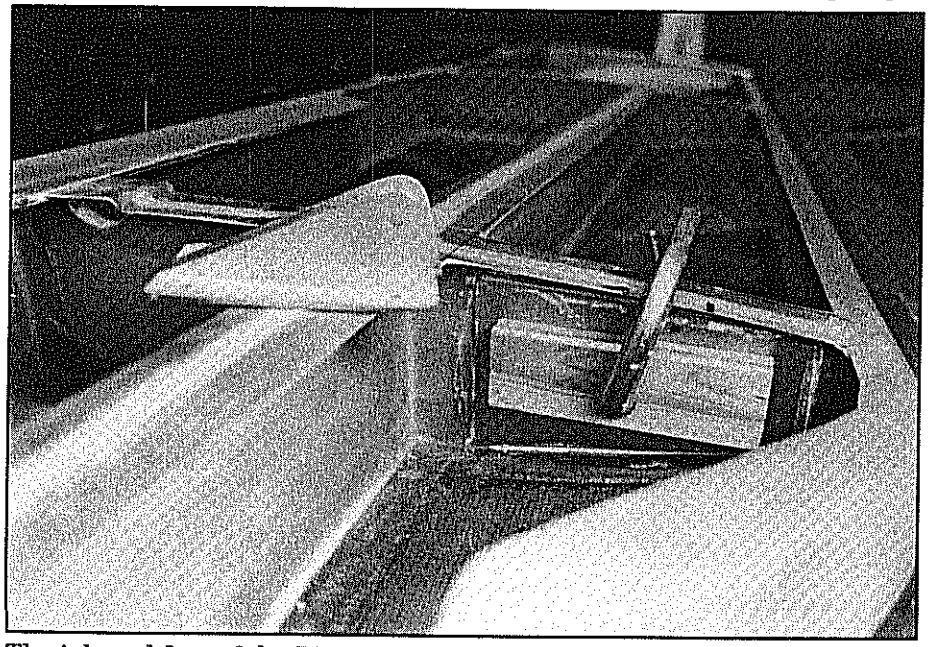
The capstrips after being secured to the ribs with 3 BID. Notice the slosh door opening, aluminum fuel probe mount, and brass finger strainer insert.



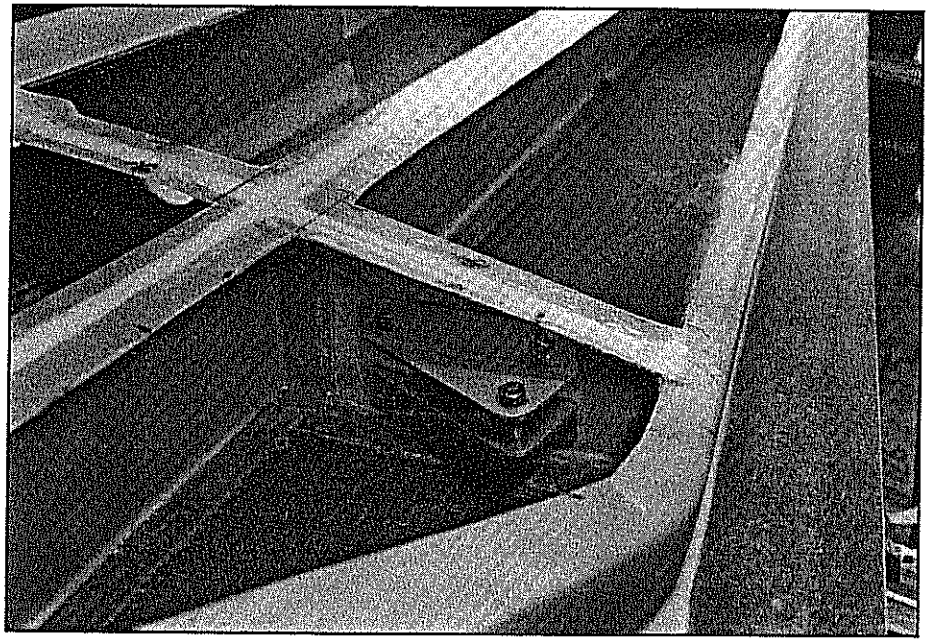
The tie down assembly is located just outboard of the BL147 rib. Notice that the vent tube has a micro fillet to keep it away from the carbon fiber and the ribs have already been fitted, troughed, and sanded for capstrips.



When applying the 4 BID to attach the tie down assembly to the spar, remember to overlap the BID onto the surrounding structure by 2". Notice that we've trimmed the BID away from where the tie down shaft will lock.



The inboard face of the BL 147 rib should be flat so the bellcrank will not bind when bolted up to it. A 1/8" aluminum piece with release tape applied is clamped to the rib with epoxy/flox underneath, instant flat surface.



The aileron bellcrank bracket is angled nine degrees off horizontal. Be sure to angle it the correct way, so the small aileron pushrod will exit the BOTTOM of the wing.