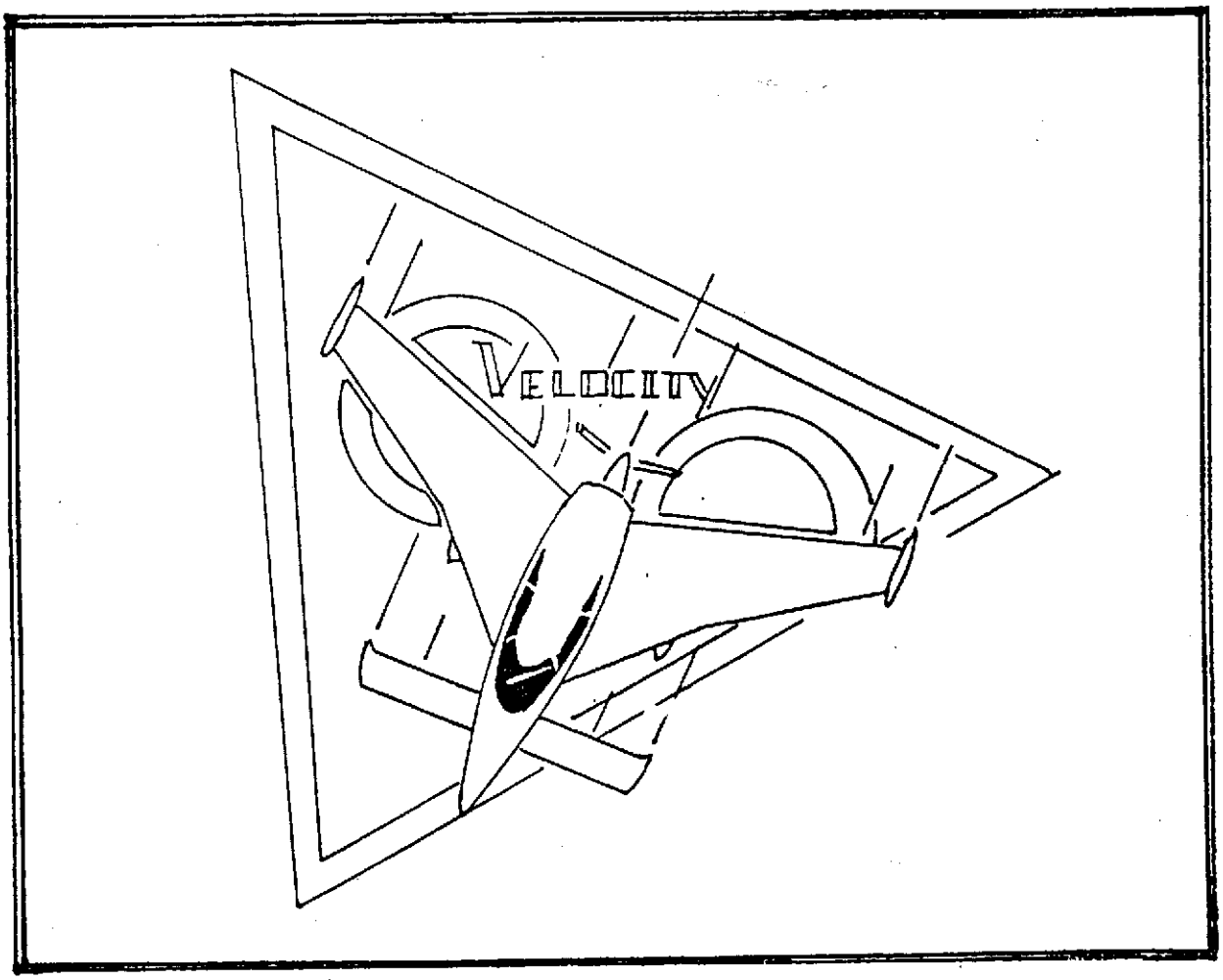
VELOCITY



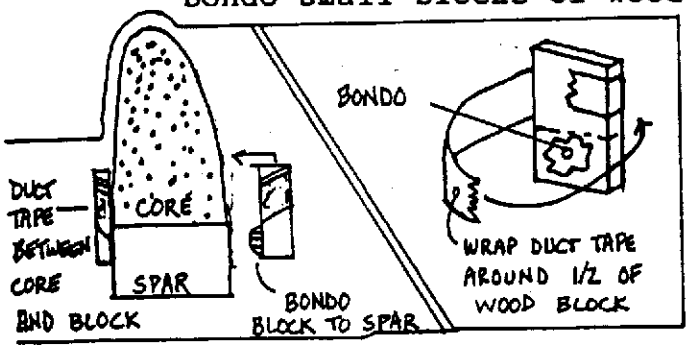
Section II

Sand all four surfaces of the wing spars using 36/40 grit sand paper. Light, but thorough, sanding is needed on the spar leading and trailing edge where the foam cores attach. More thorough sanding is needed on the spar cap surfaces where the wing skins will go.

Suspend the spars on two sawhorses with the leading edge up. Level the spar crosswise by leveling across the 2 outboard wing attach bushings.Lengthwise, leveling is not necessary.

Fit the two L.E. foam blocks into position on the spar. The root edge of the foam aligns with the spar 'knee'. The 'knee' is located 2" outboard of the centerline of the wing attach outer holes.

Bondo small blocks of wood onto the spar where the cores tend to hang over the edge. Space as many blocks as necessary to hold the foam cores properly in line with the spar surface. Using a strip of duct tape on these blocks will prevent epoxy from adhering to them when the foam cores are micro-ballooned to the spar.



The foam cores may have a curve or twist in them because of internal stresses so, make sure the foam edges align properly with the spar cap edges, i.e. centered. Shim if necessary.

Check again that the spar surface is level. Check that the water lines drawn on each end of the foam cores are plumb and straight. Use a level or plumb bob, preferrably, to assure a near plumb alignment.

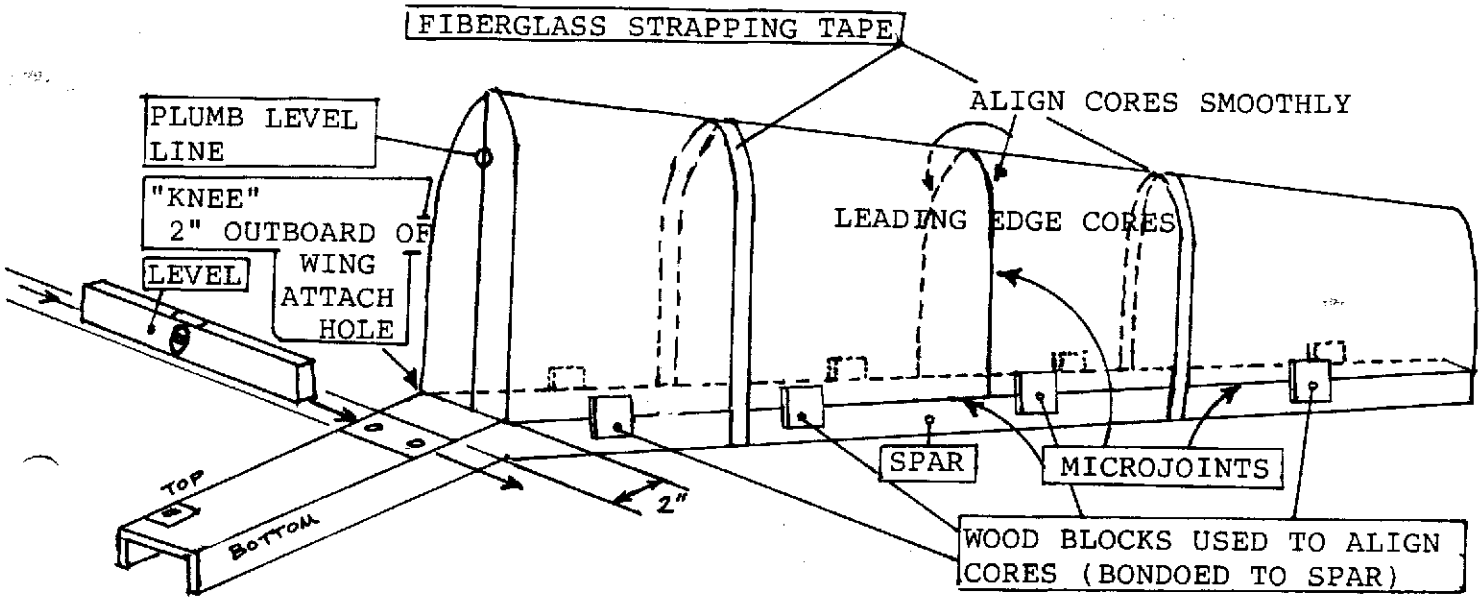
Sand the block ends to fit well together, if necessary, by placing a piece of sandpaper between them. Hold the blocks together with gentle pressure and work the sandpaper until the blocks fit flush.

Remove the foam blocks from this jig and smear a slurry (mayonnaise-like consistency) of genemid and Q-cells along the flat surfaces that join to the spar and on the surface where the two foam cores butt together. Now replace the blocks onto the spar, sliding them back and forth to spread the microspheres, until the cores make firm contact with the spar surface. Check alignment with the 'knee' and both edges of the spar along the full length .

NOTE REMOVE ANY MICROSLURRY THAT OOZES OUT WITH A PUTTY KNIFE. FILL ANY VOIDS AND REMOVE ALL EXCESS SLURRY PRIOR TO CURE.

WING CORES & SPAR

The alignment of the two foam core blocks at their joint can be held securely in line using nails pushed into the foam through the adjoining block. Several layers of masking tape (strapping tape is stronger) wrapped around the blocks and the spar at many convenient locations will hold the cores securely in their proper place. Check that the alignment blocks are secure. Check that the spar L.E. face is level. Check that the foam blocks are plumb at the root and tip. When all alignment, levels, and plumbs are correct, let it cure.



Turn the leading edge down resting the flat surface of the spar on one saw horse. Place a scrap piece of foam that came from the block that the leading edge was cut from under the tip of the wing to protect it, and rest the wing tip on another saw horse.

Place the three trailing edge (T.E.) foam cores in position on the back of the spar and check fit and alignment. The inboard edge of the inboard TE core should be flush with the inboard end of the wing spar when in the correct position. Butt the rest of the cores to fit. Sand butt lines if necessary for good fit.

Holding a level under the spar against the flat surface of the two outboard hard points, level the spar.

Use the wood blocks bondoed to the spar just as you did for the leading edge of the wing. Join all three trailing edge foam cores to the spar using microslurry and join the inboard core to the two outboard cores.

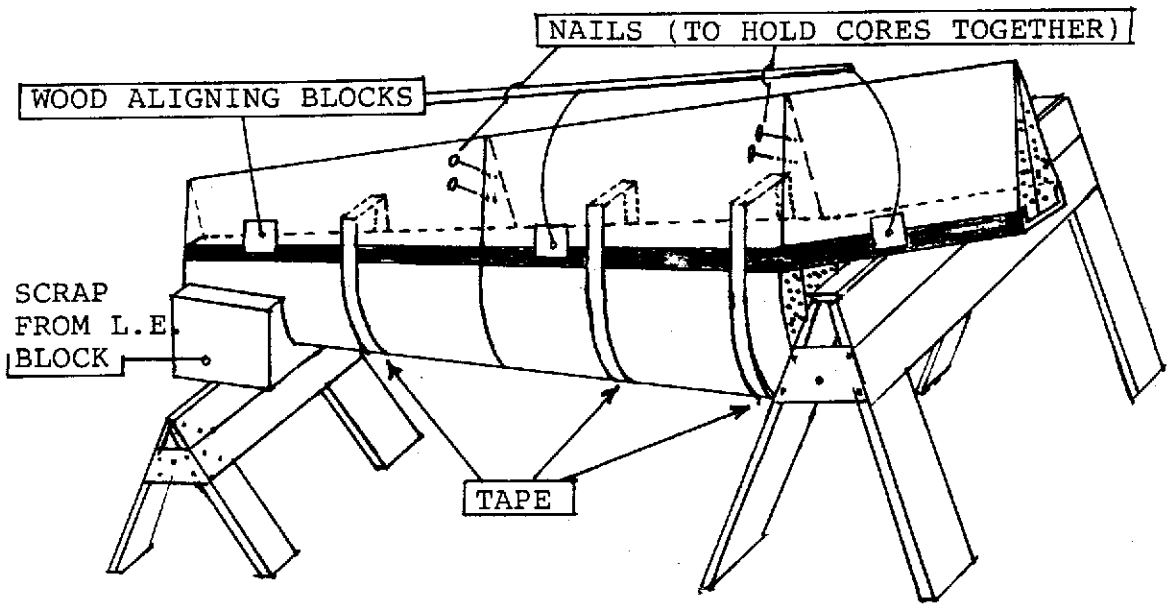
Pull the foam securely to the spar using 3/4"

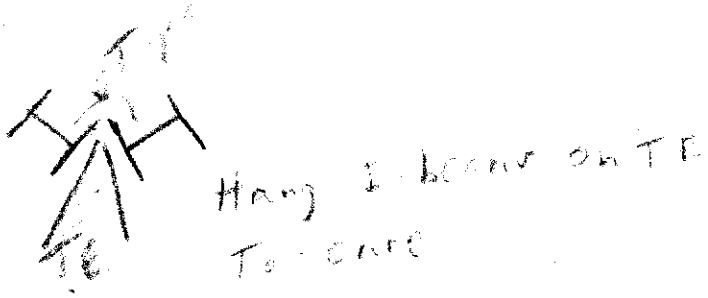
fiberglass strapping tape. Thread the tape through a slot cut in the T.E. blocks about 3" above the spar using a hack saw blade to first cut the slot then to push the tape through the slot. Wrap the tape around the leading edge cores to hold them firmly in place.

Using shims between the tape and the spar cap, the foam can be guided into proper alignment. Nails can be driven through the foam into the shear web (not the spar cap) to hold the cores in their proper place, also.

Check all level lines to be plumb. Shim as necessary.

Note: Not to worry, the T.E. may not be straight at this point, but you will make it so in the next step.

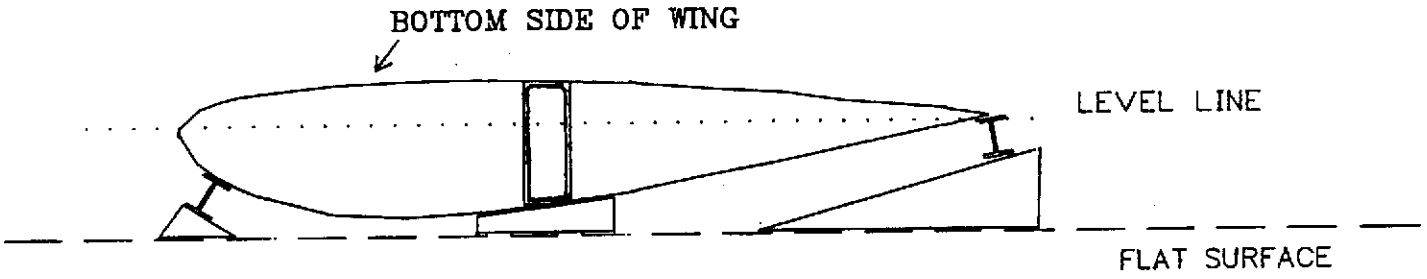




LOWER SKIN

While the wing is upside down, bond the two straightedges to the top side of your cores with 5-minute epoxy. (Use a minimal amount of 5-minute, as big dobs will take away chunks of foam when you remove the straightedge later. Any holes will need to be filled with dry micro or Pour-Foam before the upper skin is applied.) The forward straightedge should be set slightly back from the leading edge. The purpose of the straightedges is to hold the cores in place while the skin is being applied. So, rather than altering the cores, weight them down to the straight edges when bonding.

The rear straight edge gets bonded to the trailing edge with about 1/4" of the straight edge protruding out past the foam (See figure #1 - Page 203-A). Using a couple of horses, support the wing by the straight edges. Shim under the spar cap, making sure that the wing is level, and check the hardpoints to make sure that they are plumb. Also check the level lines on the cores to see that they are all level, both at the tip and root of the wing. Any difference in the angle of the level lines will warn you of twist in the wing. Sight down the TE to be sure that it is straight. Make sure there is no sag in the aluminum I-Channels

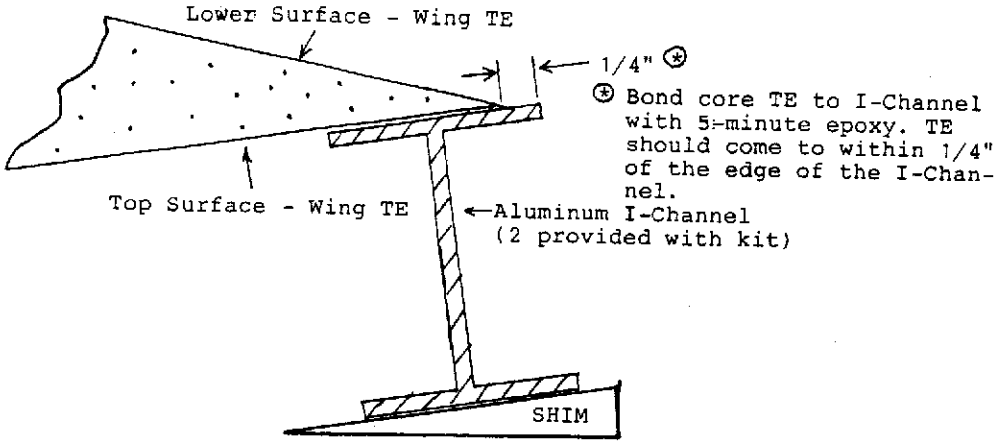


* WING SUPPORTED BY BLOCKS & I-CHANNEL STRAIGHTEDGES

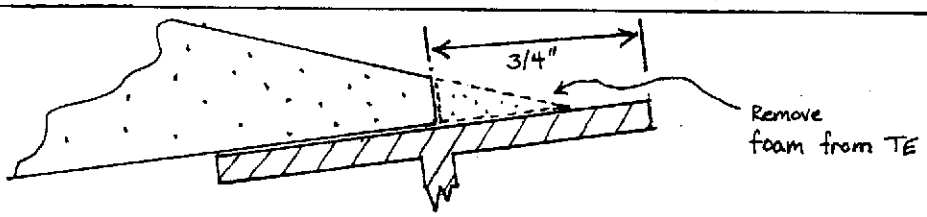
To prepare the cores for glassing, you must first remove some of the foam from the T.E. in order to provide an area for a glass-to-glass contact when the upper skin is applied. All along the T.E., remove enough foam to expose 3/4"-1 " of the aluminum straightedge (Fig #2 - Page 203-A). This should leave a TE thickness of 3/16" to 1/4". Taper this foam edge slightly (Fig #3/203A), then put a strip of duct tape on the exposed aluminum (along full length of T.E.). This will form your trailing edge and assure that it is straight.

Check the foam cores with a straightedge to find any highpoints. If any are found, remove them with a sanding block. Use dry GENEMID - Q-Cells to fill any low places, cracks, or dings. Let cure, then sand smooth before glassing. IT IS A LOT EASIER TO DO REPAIRS ON THE FOAM NOW THAN IT IS ONCE THE OUTER SKIN IS APPLIED! Measure the chord both inboard and outboard and try to make both wings the same. Record these measurements below:

LEFT WING INBOARD CHORD 26 13/16 RT WING IB CHORD 26 13
LEFT WING OUTBOARD CHORD 23 1/4" RT WING OB CHORD 23 1/4



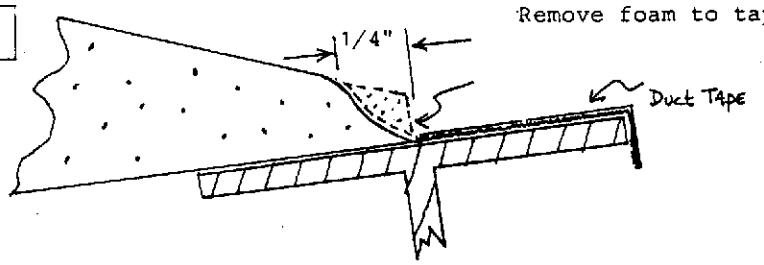
1



Once the core is bonded in place to the I-Channel, remove enough foam along the TE to expose approximately 3/4" of the aluminum. This should leave a core TE approx. 3/16" to 1/4" thick for the entire length.

2

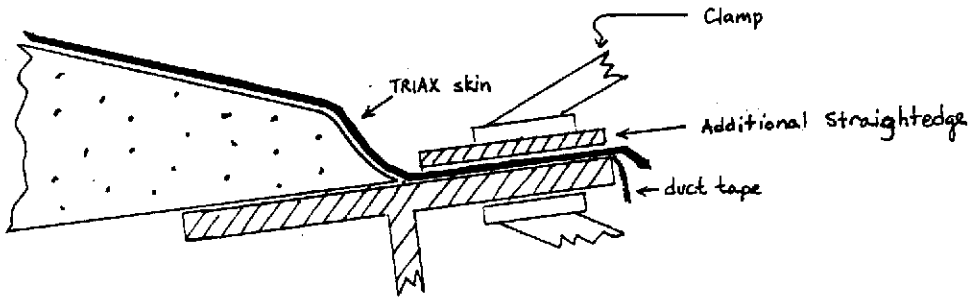
3



Use some sandpaper to taper the TE as shown above.

Cover the exposed aluminum with a length of duct tape. This will prevent the Triax skin from adhering to the aluminum.

4



When you apply the Triax skin, allow it to extend past the edge of the aluminum approx. 1/4". This will be trimmed off after cure. It would be advisable to clamp several straight edges to the TE, to hold the Triax in position against the I-Channel. This will also help adhesion to the foam curve that you formed earlier. You want to leave a minimum of 5/8" glass TE for the upper skin to bond to. When all layups are complete, you should have between 5/8" and 3/4" glass to glass for the length of the TE. 5/8" would be preferable, as it will require less filler, and subsequently weigh a bit less.

GLASSING

Check all level lines, sand spar cap thoroughly and sand the shear web area between the inner and outer hard points (as the skin laps over onto this area.) Pre-cut a piece of triaxial cloth approximately 4" longer than the overall wing. Lay it on a flat, clean surface and try to work out as many of the squiggles as you can before doing the actual layup. Don't pull so much as to distort the other fibers.

When you are satisfied with the condition of the cores, apply safetypoxy microslurry (Glass Bubbles) to the foam and wet out the spar cap and the tape on the TE straight edge with epoxy. With the unidirectional fibers (smooth side) facing up, drape the triaxial skin onto the wing with the factory edge parallel to the TE and approximately 1/4" out past the aluminum. This will be trimmed off later with a saw or a razor knife. Trim the cloth about 1" BEFORE the LE and approximately 1" past the tip and root of the wing. In the spar area, allow it to cover a little more than 1/2 of the vertical height of the shear web. Cut out in the area of the wing attach fittings. Wet out the entire wing skin using a paint brush, squeegee, or putty knife. Remove any excess resin. (Fig #4 - 203A)

After total wet-out, check the surface for bubbles or areas that do not conform. In particular, at the corner of the inside spar, use a piece of saran wrap to hold the glass in place during cure. The plastic keeps air from getting in behind the wet glass, therefore holding it to the surface. Several of our builders have clamped a second straight edge along the TE above the first straight edge to be sure that the rear of the cores have good contact with the lower straight edge. The second straight edge also serves to pinch the glass down tight against the foam. (Fig #4 - 203A)

Check all level lines and make sure eveything is level and straight. Trim all excess cloth hanging off the edges and let lay-up cure thoroughly before handling.

IMPORTANT : During the initial cure, keep checking the skin. The glass tends to bubble or wrinkle sometimes, the area of the core-to-spar intersection usually being the most affected. If bubbling or wrinkling does occur, weight down that particular area with a flat piece of wood wrapped in visqueen or saran wrap. Be careful not to apply too much weight.

Prior to installing the top skin, it will be necessary to mark trim lines. Use a straight edge to make these lines. Mark the leading edge trim line about 1" before the wing L.E.(on the lower surface of the wing). You want the top skin (not yet applied) to overlap the bottom skin 2", so make a line 2" aft of the first trim line. Knife trim or sand the T.E. to the outer edge of the straightedge. (Diagram #1 - Back of Section 2)

Cut away the excess wing skin from the L.E., T.E., root, and tip. Use a file or sanding block to taper the leading edge skin and 40 grit sandpaper to smooth and prepare for the top skin overlap.

Remove the straight edge pieces and reinstall the trailing edge piece with bondo on the bottom side of the glass skin below the TE for support. (Don't forget to do a little sanding so the bondo will stick.) Prepare the top surface with careful sanding using the long sanding board to remove minor high areas. Fill any low areas or holes with genemid dry micro, and be careful not to get any on the sparcap.

RUDDER CONDUIT INSTALLATION See diagrams: Page 205-A

With the top side up, measure and mark a point 3-1/2" aft of the spar cap at each end of the wing. Pop a chalk line on the foam surface between these points. Measure and mark a point 4" forward of the outer end trailing edge [FOR CORES SHIPPED AFTER 7/1/89] [MEASUREMENT SHOULD BE 2" FOR CORES SHIPPED PRIOR TO THAT DATE] Draw a smooth broad arc blending from the chalk line to this latter mark.

Run a small soldering iron along a straight edge to melt a shallow channel (about 3/16" wide, 1/4" deep) in the foam core the length of the wing following the chalk line and the arc at the wing tip. At the inboard end of the wing, deepen the channel for the conduit by cutting down about 2-1/4" more over a length of about 12". The conduit should extend from the root of the wing approximately 2-1/2" below the upper skin. Install the 3/16" O.D. nylon tubing. Let the tubing extend past the ends of the wing 4" inboard and outboard. Install the rudder cable conduit with dry genemid microballoon. Scrape off any excess micro and allow to cure. Sand smooth before applying glass skin.

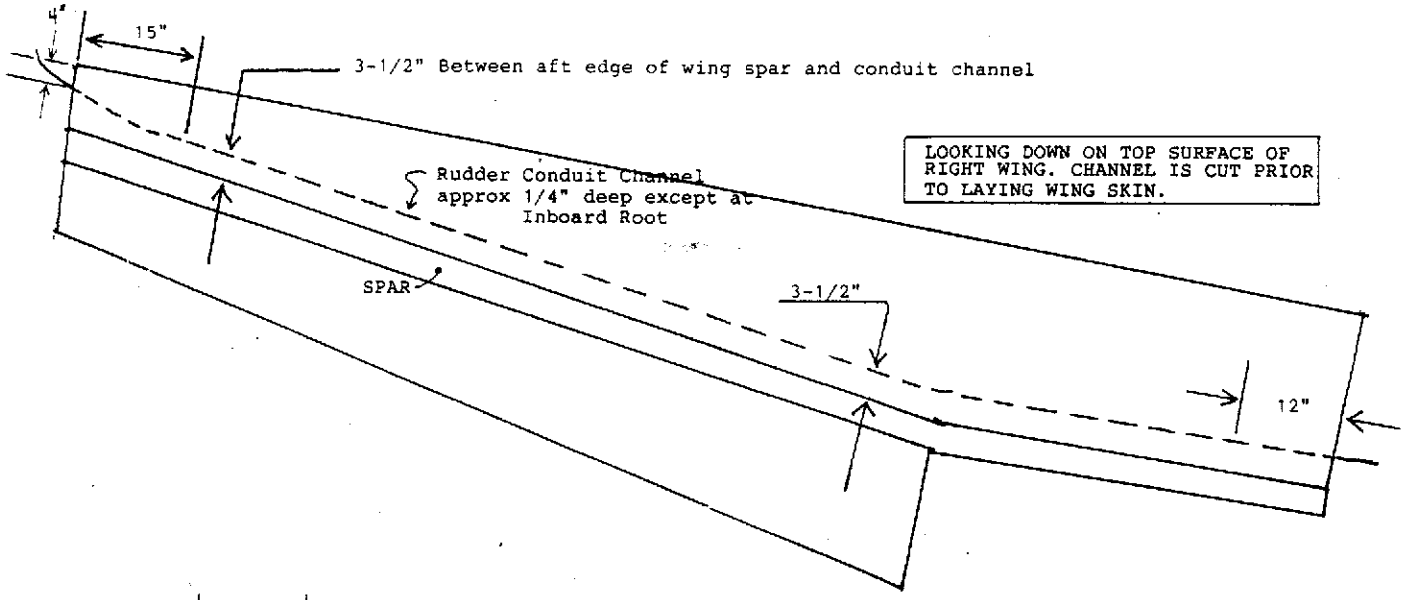
Prepare the top surface for glassing as you did on the bottom of the wing. Carefully sand the T.E. of the lower skin for a good glass-to-glass bond. Mix safetypoxy and glass bubbles (to make microslurry) to the consistency of mayonnaise. Trowel the wet microslurry on the exposed foam, filling the pores, to provide a voidless bond between the cores and skin. Again, don't let any microslurry onto the spar caps or exposed glass at the trailing edge. Remove all excess microslurry.

TIP: Take a folded strip of duct tape, (smooth side out) and drag it along the leading edge (like a shoe shine boy) to squeegee off excess wet microslurry.

3" for Ribbon Actuator

DIAGRAM #1

The conduit channel runs parallel to the spar for the entire length, except for a section beginning 15" Inboard of the wingtip. There, the channel starts to curve gently back to the TE, where it exits 4" forward of the TE. Once installed, the 3/16" conduit should extend 4" at each end of the wing.



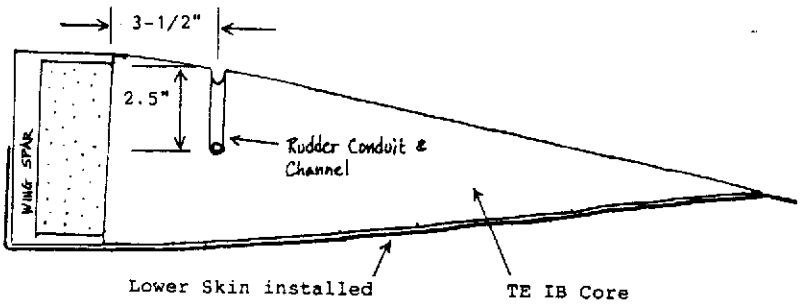
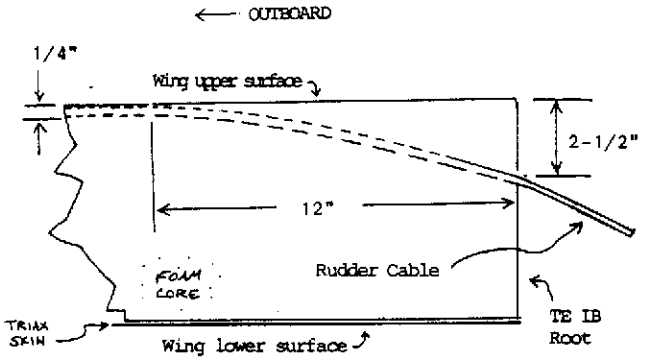


Diagram to right illustrates the gentle downward curve that the rudder conduit channel takes at the inboard end of the IB TE core. The conduit is shown extending 4" past the end of the core.



Lay on triax fiberglass cloth with the selvage edge parallel to and overlapping the T.E. slightly. Cut the cloth leaving a 1" overlap at the root and tip ends. Mark the cloth with a straight edge allowing enough overlap onto the previously prepared L.E. on the bottom skin. Pre-wet approximately 2" of the lower skin in the overlap area (L.E.).

AGAIN: Remove the trimmed cloth and pull out the 'loops'. Prewet the exposed fiberglass at the T.E. and spar cap. Level the wing using the level lines at the root and tip. Apply the safety-poxy resin as you did on the bottom skin. Prop up or weight down the leading and/or trailing edge(s) to secure these levels until cured.

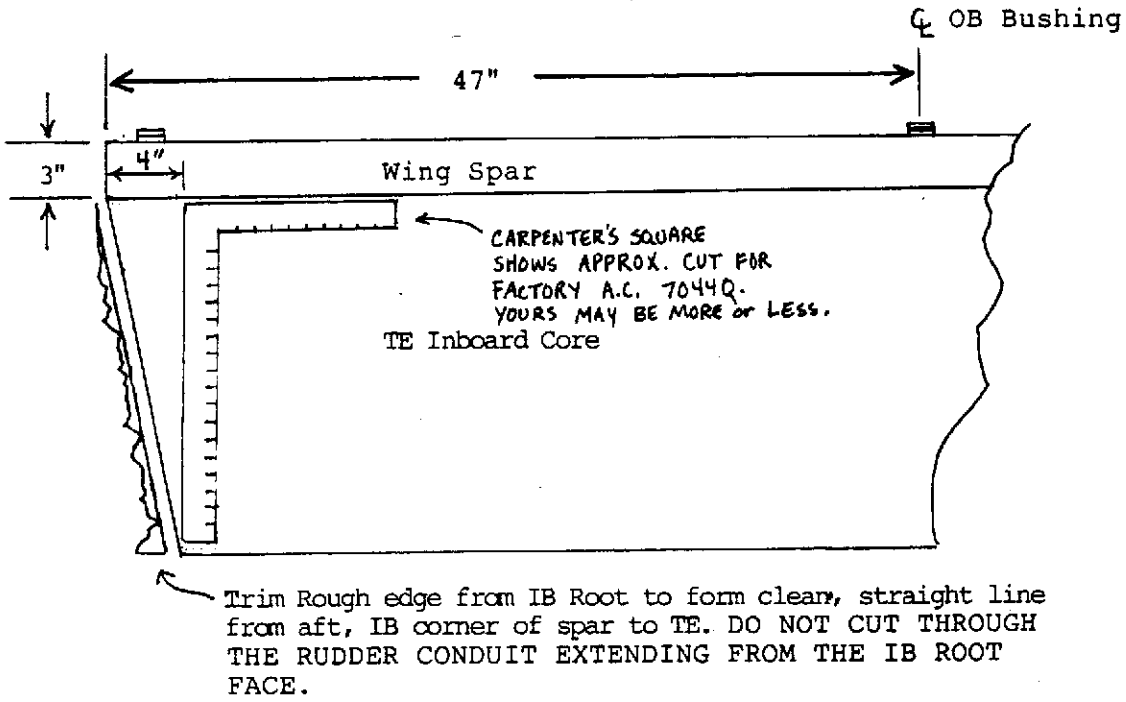
Check once more for any twist in the wing. This is your last chance to correct any twist, as the wing becomes very rigid once the upper skin has cured. Keep checking during the cure for any bubbles or ripples. Knife trimming is possible in four to six hours. Trim all edges and let thoroughly cure two to three days.

****

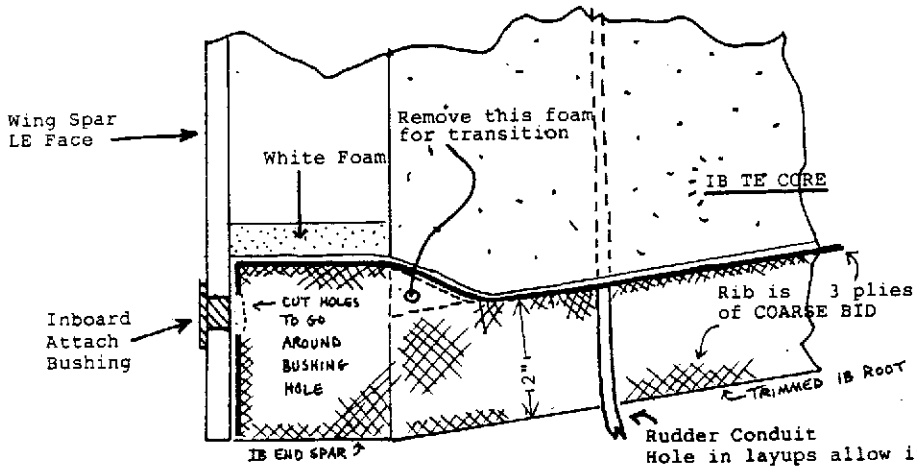
WING RIBS

The dimensions for trimming the wings for the inboard rib are taken from the center line of the outboard hardpoints. For the T.E. rib, measure in 47" on the spar face and trim the TE wing root square using a carpenter's square laid vertically on the upper spar cap as a guide. Trim both upper and lower skins parallel to each other.

Trim the IB TE root of the wing, both upper and lower skins. Make your cut from the IB TE corner of the wing spar to the TE, forming an unbroken, straight edge to the root surface. Some builders may have to remove more than others to get a straight line, there is no specific dimension that we give for this cut. Later, you will custom fit your COWLING-to-WING FLANGES to this cut line. Make both wings the same.

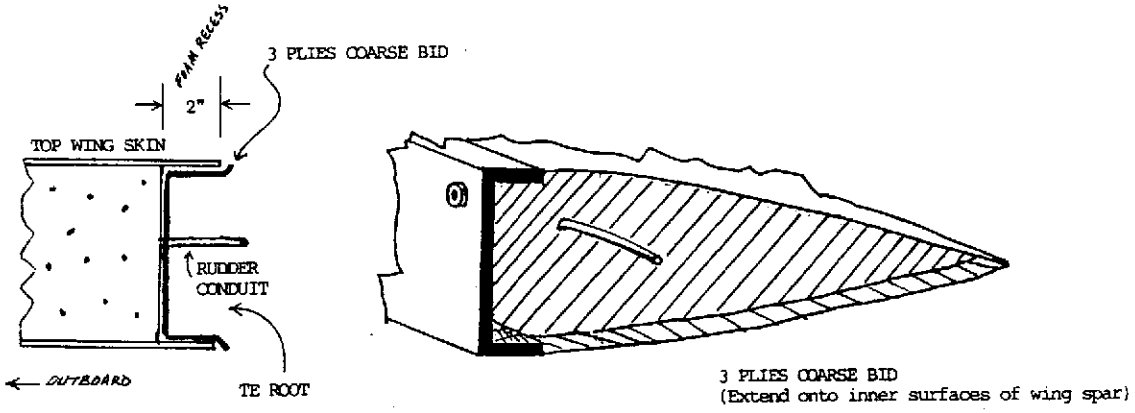


Now that you have made the TE root straight, recess the blue foam 2" at the IB TE root, exposing the inner surfaces of the upper and lower wing skins. Coarse sandpaper works quite well for this job, but take care not to damage the skin or the rudder cable tubing. Taper the LE of the IB TE core into the white foam at the IB end of the spar, as illustrated in the following diagram. The white foam starts 3" outboard of the end of the spar, and the blue foam will only be recessed 2", so you have about an inch to transition.

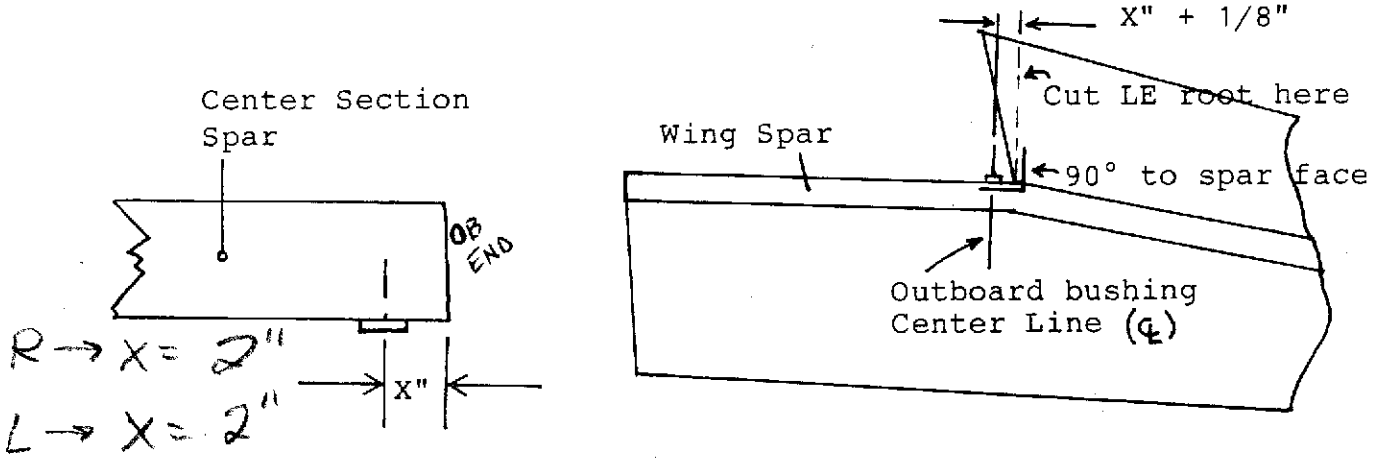


IB TE RIB COVERS THE EXPOSED BLUE FOAM, WHITE FOAM, AND LAPS TO THE IB EDGE OF THE ROOT, COVERING BOTH THE UPPER & LOWER INNER SKINS. ALSO LAP ONTO EXPOSED INNER SPAR SURFACES (LE, TOP, BOTTOM). CUT HOLES IN LAYUPS FOR RUDDER CONDUIT & BUSHING HOLE (I.B.).

Sand all exposed glass (inner surfaces of the spar, upper & lower wing skins), microslurry the foam (both blue & white), and apply 3 layers of COARSE BID. Each ply should cover all the foam, and should extend to cover all exposed inner glass surfaces. Cut holes in the glass for the wing attach bushing and the rudder conduit.



To build the LE rib, you must first square off the LE inboard foam core perpendicular to the spar. The first step is to measure the distance from the centerline of the outboard hardpoints to the outboard end of the CENTER SECTION SPAR. Add 1/8" to that dimension, and measure this distance outboard of the centerline of the hardpoints on the wing. This is where you will cut the LE inboard rib. Illustration on Page 208, top.



After this edge is squared off, remove approximately 1-1/4" of foam from the LE root, sand exposed glass, microslurry foam, and lay up 3 plies of COARSE BID. After ribs have cured, trim back to the wing skins and sand this area flush and smooth. Cut out holes in the LE rib for conduit and in the TE for the aileron torque tube.

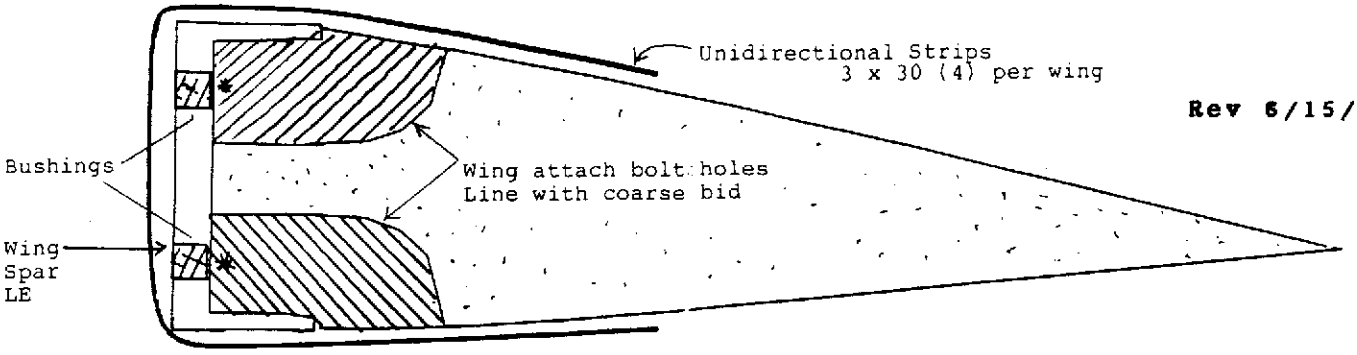
✓ WING ATTACH BOLT ACCESS HOLES [See diagrams page 208-A]

On both the top and bottom skins, measure and mark a point 2" aft of the spar (about 5" aft of the hardpoint face) on a perpendicular line aligned with the double hard point centerline.

Use a hole saw to drill a 2" hole through the skin. Angle the hole in the foam toward the spar where there is already a built in cavity behind the hardpoint. Enlarge the hole in the skin in a tear drop shape pointed toward the spar. Sand the hole smooth and line the hole with a layer of BID.

Cut eight (four per wing) 3" X 30" strips of Unidirectional cloth, axis lengthwise. Lay-up over double outboard hardpoints lapping 12" onto top and bottom wing skins. Cut holes allowing the bushings to protrude through the lay-ups. Angle the strips to just 'straddle' the wing attach holes.

Later, after finishing, cut hole covers to match the tear drop shape from thin aluminum stock approximately .013. This aluminum can be obtained from your local printing shop in the form of printing plates. At the same time, ask for a used printing blanket off a printing press. It will make excellent baffling sealing material when it comes time to install the engine. Now paint the covers and install with silicone sealer.



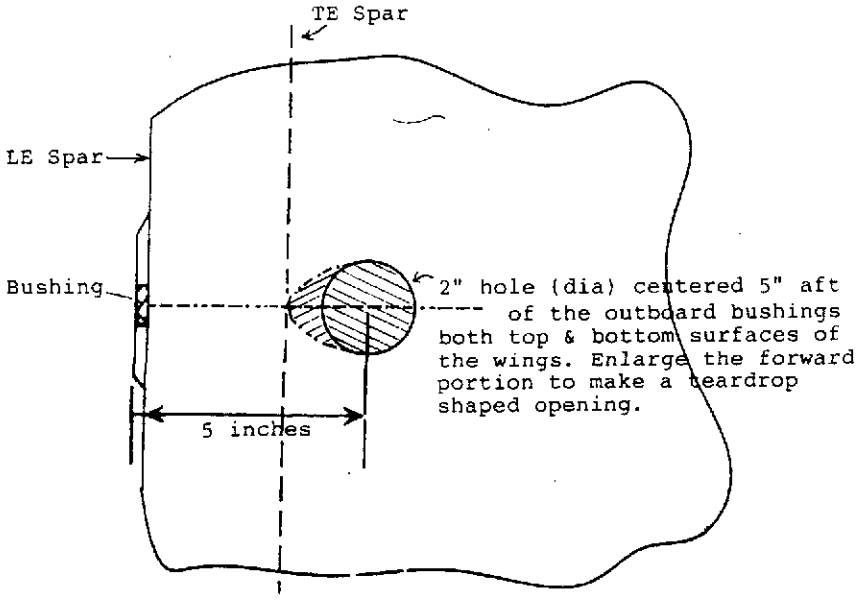
Rev 6/15/89

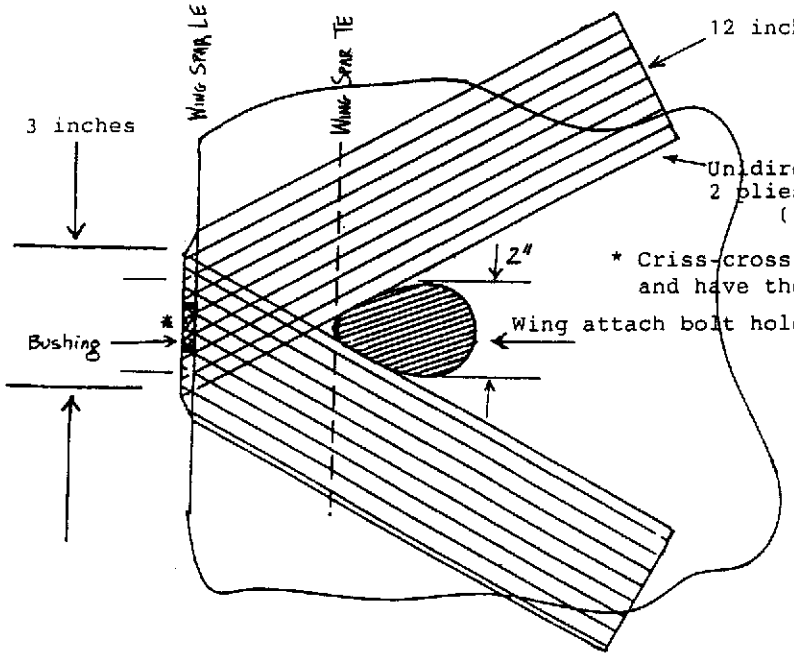
* Bushings should be ground flush with the aft face of the spar

Wing wt.

L. 66 lbs

R. 65 lbs





WINGLET

PREPARATION

Assemble the top & bottom winglet core sections on a flat surface. Bond them together with GENEMID MICROSPHERES (Remember that Safetypoxy will eat the blue foam.) Refer to diagram on page 209-A for following procedures.

Make a mark on the bottom of the winglet, 15" aft of the Leading Edge (LE). Mark up 3" at the Trailing Edge (TE). Draw a line between the two marks, and remove the foam corner.

Round and smooth all corners and joints. Gently smooth the LE for straightness, using a long sanding block.

Cut two strips of 2" wide duct tape several inches longer than the height of the winglet. Apply as an approximately 4" wide strip near the edge of your flat working surface. Position the winglet, flat side down, so that the TE rests on the duct tape strip. Using small dobs of 4-MINUTE epoxy spaced about 6" apart and some weights on the aft edge of the winglet (to hold it flat), bond the winglet to the working surface.

Measure along the top edge of the winglet, and make a mark on the duct tape, 12" aft of the LE. Measure 28" back from the LE along the bottom to top joint line, and make your mark on the duct tape. Draw a line between the two points that you just marked on the tape. Continue this line parallel to the TE of the bottom core piece. This will be the TE reference line. Now, mark a trim line 1" forward of the TE REFERENCE LINE. The trim line should fall on the foam cores themselves. Trim away the excess foam, then sand taper the TE.

For a cross check against the other winglet, place a mark on the TE Reference line, 18" down from the tip. Record the perpendicular distance from the TE to the LE at this point. Both winglets should be close.

GLASSING

Cut two layers of unidirectional cloth. The first layer will be laid up with the major axis parallel to the TE, and the second with the major axis parallel to the LE. Fit the cloth to overlap the TE, extending about 1-1/2" past the reference line, and trim to within ~1" of the center of the other winglet edges. BE SURE THAT THERE IS ENOUGH UNIDIRECTIONAL FIBER to form the TE at the bottom tip.

Using dry GENEMID MICRO, fill any voids or depressions in the foam, and sand down the high areas. Microslurry the cores, and apply the UNI skin with safetypoxy. Let cure.

Trim, file, and sand the LE, TE, top, and bottom. Be sure to sand back from the edges where the opposite skin will overlap. Sand the exposed area along the TE. It is only necessary to have 3/8" to 1/2" of glass-to-glass contact at the TE. At this point, you are set up for about 1". Mark a line about 3/8" aft of the foam TE, running parallel to the aft edge of the foam. This line will serve as your final TE on the rudder. Do not cut down to it now, just mark it.

Flip the winglet over, so that the flat side (outboard surface) is right side up. Measure and mark a point 4" forward of the TE line that you were instructed to draw in the previous paragraph, and 12" down from the top of the winglet. See the diagram on page 210-A. Next, measure and mark a point 20" aft of the LE along the joint line of the upper and lower cores. Draw a straight line between the two points you just drew, and extend the line to the

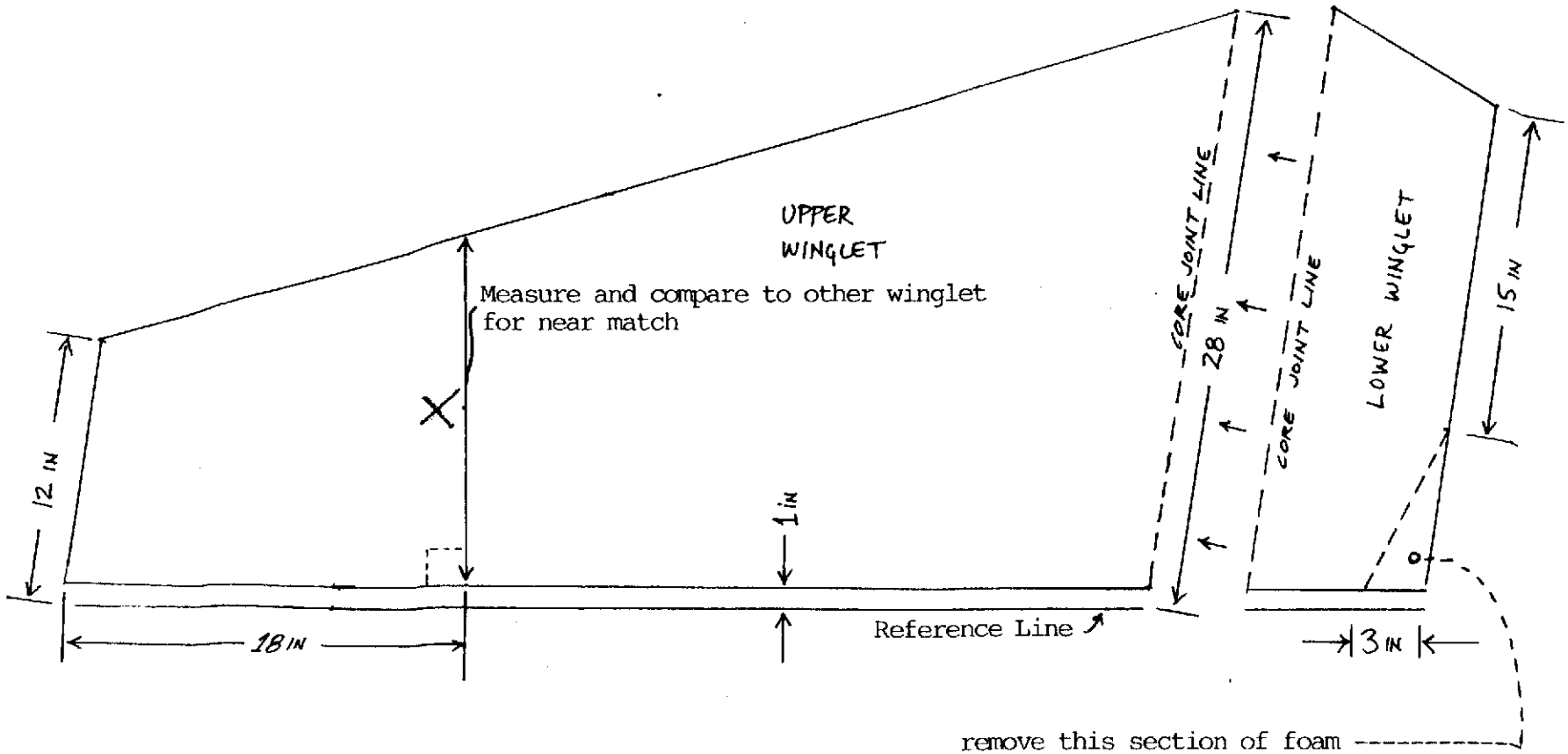
* Use 12" and 28" measurements to establish your reference line. 4" Wide strip of duct tape should extend from the top of the winglet to the bottom, centered on the reference line.

* Note Removal of foam section at bottom TE corner of winglet.

* Flat side (outboard surface) down for initial skinning procedure.

$X_R = 16\frac{3}{16}''$

$X_L = 16\frac{3}{16}''$



bottom of the winglet. This will serve as the rudder cut-out line.

COM ANTENNA Installed on outboard side, see record

Measure and mark up 23" from the bottom along the rudder line. From about 3/4" forward of the rudder line, measure and mark a line 12" long, perpendicular to the rudder line, running forward. Continue the line with a small arc, into a line paralleling the LE of the winglet, down to the joint line, and arcing forward to exit at the LE. Go back to the start of the entire line, and mark a 3" line that runs downward and parallel to the rudder line.

Use a soldering iron to burn a channel along the entire line. The channel should be able to accomodate an RG-58 cable (available at Radio Shack). Later, you will dig out the 3 inch portion of cable in front of the rudder line, and connect it to two copper strips bonded in the cavity forward of the rudder.

Your RG-58 cable should be long enough to reach the wing root, where a quick disconnect will be installed. Install the RG-58 cable in the same manner as you installed the rudder conduit in the wing.

Install a couple of 'ferroids', or ferric toroids, over the end of the cable, just before the antenna connection. It's advisable to put them on before the skin is applied. Be sure that your leads won't be cut when the rudder sections are removed.

The cable that exits from the LE of the winglet should be routed down the wiring hole that comes out at the wingtip. The hole is already cut into the wing cores for your convenience. Later, you will also route your tip strobe wires down this hole.

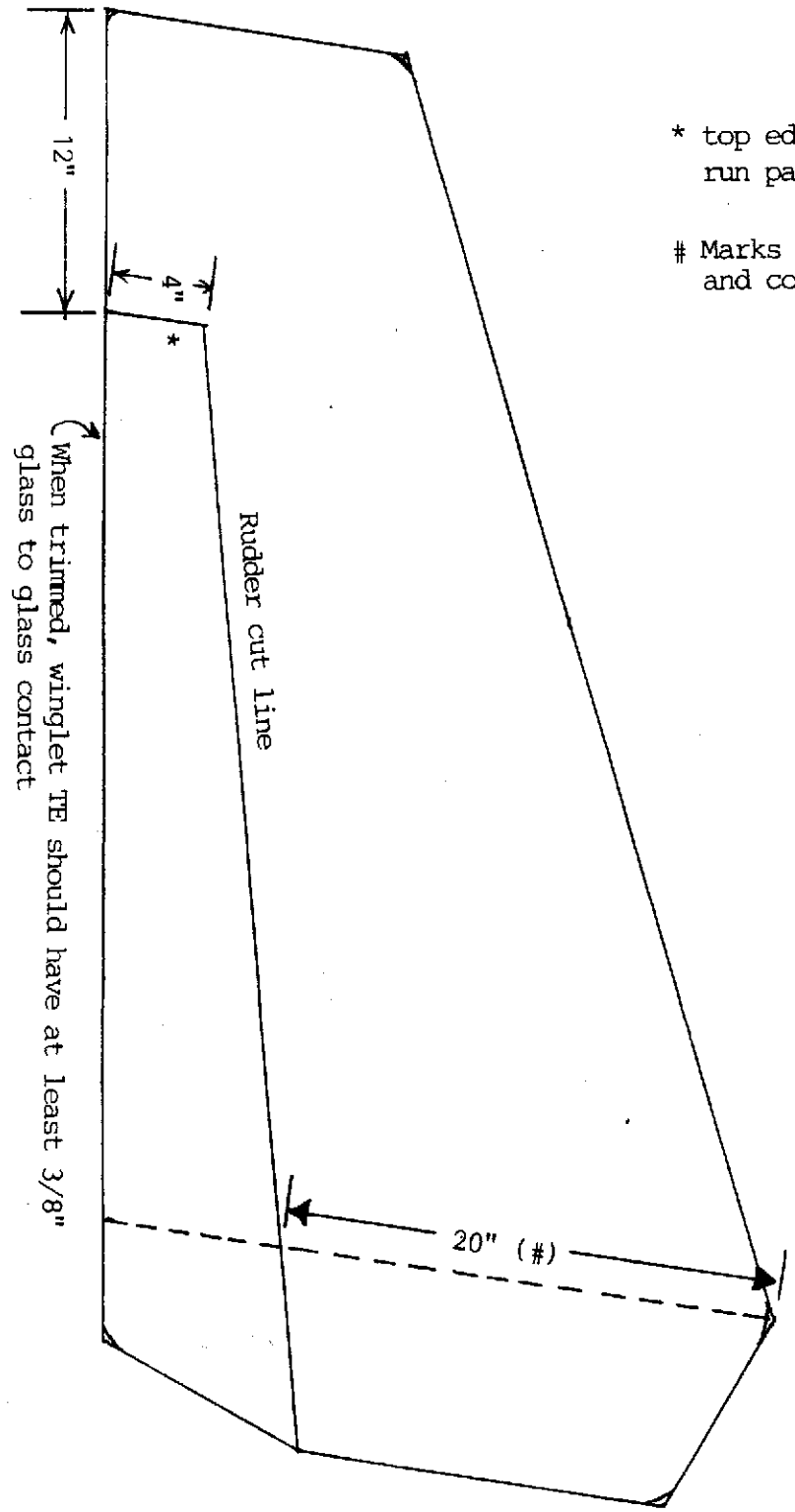
GLASSING OUTBOARD SURFACE

The outboard surface of the winglet receives the same lay-up schedule as the cambered inboard surface. The only difference is that the glass wraps around the top, bottom, and LE, overlapping the opposite skin by approximately 1". Pre-wet all the areas where the skins will overlap. Microslurry the foam, then apply one layer of UNI with the major axis parallel to the LE, and another layer running parallel to the TE.

Use the plastic wrap technique to hold the glassed cloth around the edges, wherever necessary. Cutting slits in the cloth at the tips will help. Let cure.

Remember the line that you marked 3/8" aft of the foam TE? Now's the time to cut that, giving you a glass to glass contact of AT LEAST 3/8". If you like, you can give yourself up to 1/2" of glass to glass contact, however, 3/8" will be an adequate contact surface for the glass, and will also minimize the amount of filling material used to fill the TE of the winglet.

DIAGRAM 210-A
06/07/90



* top edge of rudder cut line should run parallel to the core joint line.

Marks intersection of rudder cut line and core joint line.

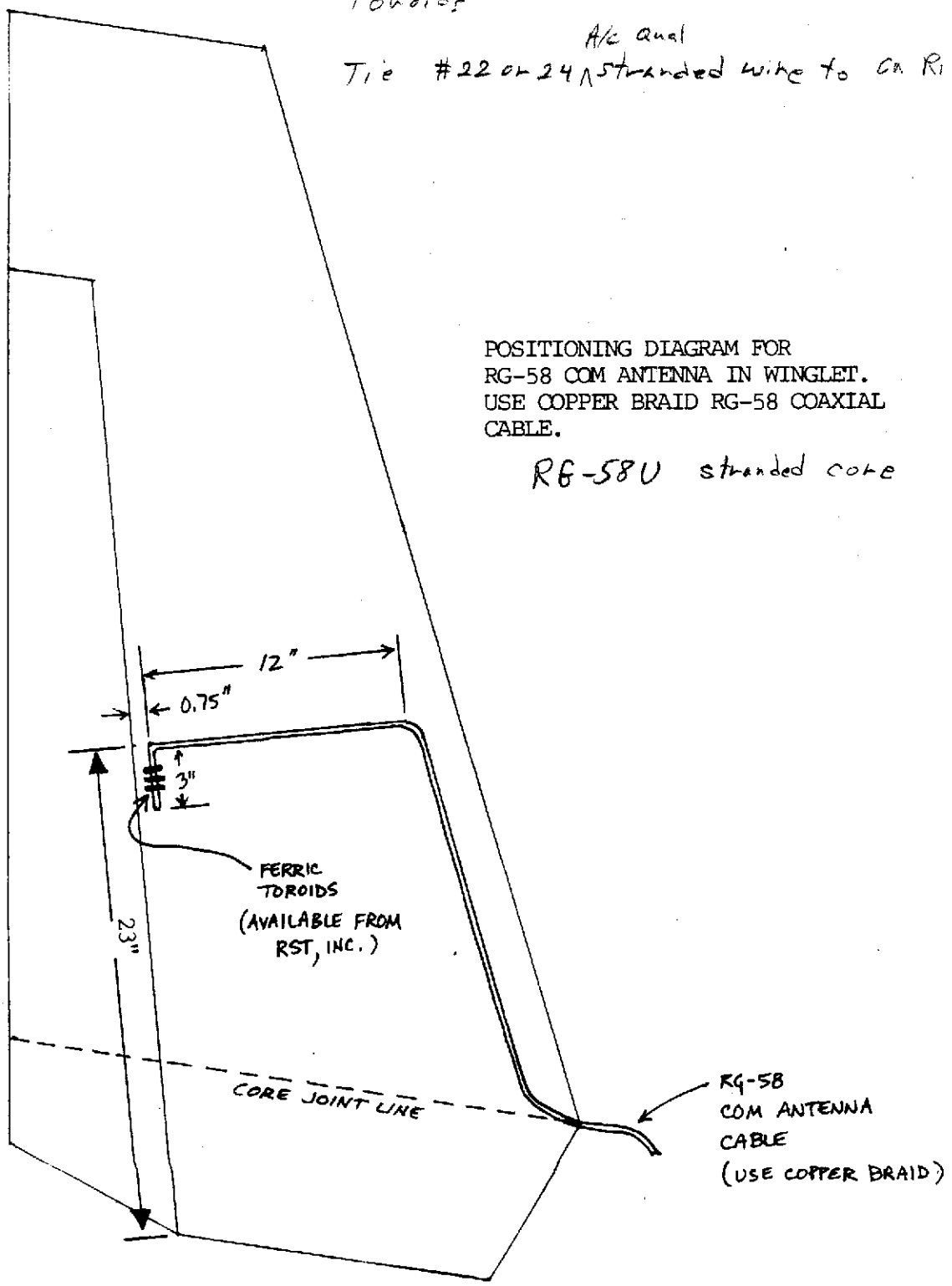
DIAGRAM 210-B
06/07/90

Coated Copper Ribbon - Electronic City

Toroids

A/c qual

Tie #22 or 24 AWG stranded wire to Cu Ribbon



POSITIONING DIAGRAM FOR RG-58 COM ANTENNA IN WINGLET. USE COPPER BRAID RG-58 COAXIAL CABLE.

RG-58U stranded core

R+ = 7 lbs

L = 7 lbs 1 oz

w/o Filler

WING PREPARATION

Using the prerecorded measurements you made of the root and tip chords (PAGE 203), mark the T.E. with a chalk line or straightedge. Trim and smooth the wing T.E. Use a long sanding block.

SEE DIAGRAM PAGE 211-A

Measure and mark a reference point on the LE of the wing spar 109" from the centerline of the double bolt hole wing attach hard point (OUTBOARD). Be consistent in your method with both wings.

Place the winglet-to-wing template on the wing top surface with the T.E.s aligned. Position the template cambered cut line to coincide with the 109" reference mark. IF ANY PORTION OF THE TEMPLATE CURVE HANGS OFF THE END OF THE WING, MOVE THE TEMPLATE IN UNTIL YOU CAN DRAW AN UNBROKEN LINE ON THE WINGTIP ALONG THE CURVE OF THE TEMPLATE. Mark the new intersection point of the template curve and the wing spar LE, then take a measurement from that intersection point to the centerline of the outboard bolt hole. Record that measurement here:

LEFT WING 106 5/8 RIGHT WING 106 5/8

Make a mark on the other wing's spar LE at the same point, and place the template there to ensure that it will not hang over the end. If all looks good, double check your measurements to be sure that the winglet cutouts will be the same distance from the outboard mounting hole centerline on each spar.

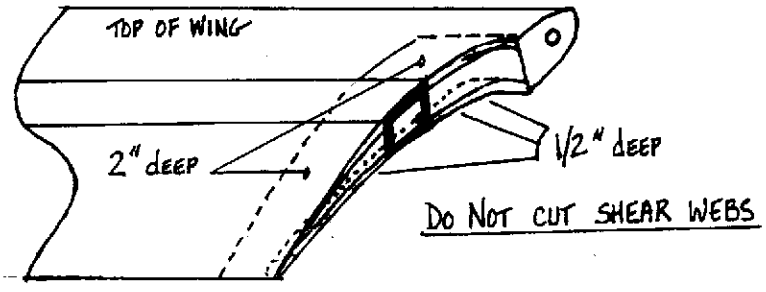
It is very important to maintain symmetry in the construction of the wings, so we want the measurement above to be the same for both wings. 108-1/2" to 109" is the optimum, with 106-1/2" being the minimum.

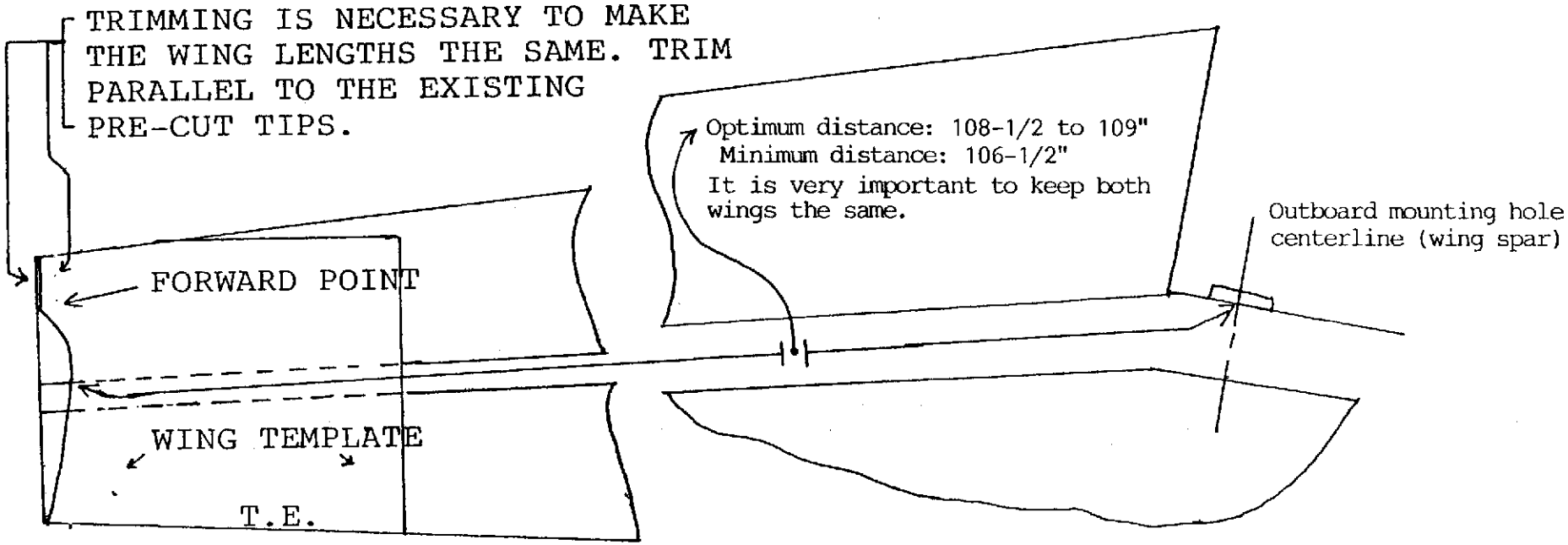
Mark the wing tip per the template. Cut off the wing tip as marked (A portion of the spar end is cut off in the process), trimming the forward tip parallel to the existing pre-cut core. DON'T CUT THROUGH THE RUDDER CABLE TUBE!

It wouldn't hurt to record another comparitive reference distance to check against the second wing, especially if you are building one at a time. Place one side of a large carpenter square on the T.E. Align the other side of the square with the wing tip cut-out. The measurement between the wing L.E. and T.E. at this point should be the same for both wings. Sand trimming to match is much easier prior to installing the winglet. Both 18 9/16"

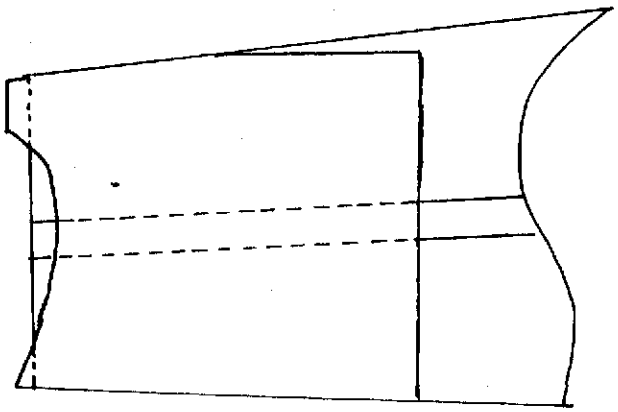
Level the wing, upright, with a level on the sparcap section inboard of the 'knee'. Level with the incidence gauge at the L.E. root.

Along the winglet-to-wing attach intersections, cut out wedges of foam 2" into the wing tip under the top skin. Do the same 1/2" deep above the bottom skin. Do not cut through the spar shear webs.





The distance referred to above is between the centerline of the outboard mounting hole of the wing spar and the intersection point of the spar LE and the curve on the template. Maximize this distance without extending the curve off the end of the wing.

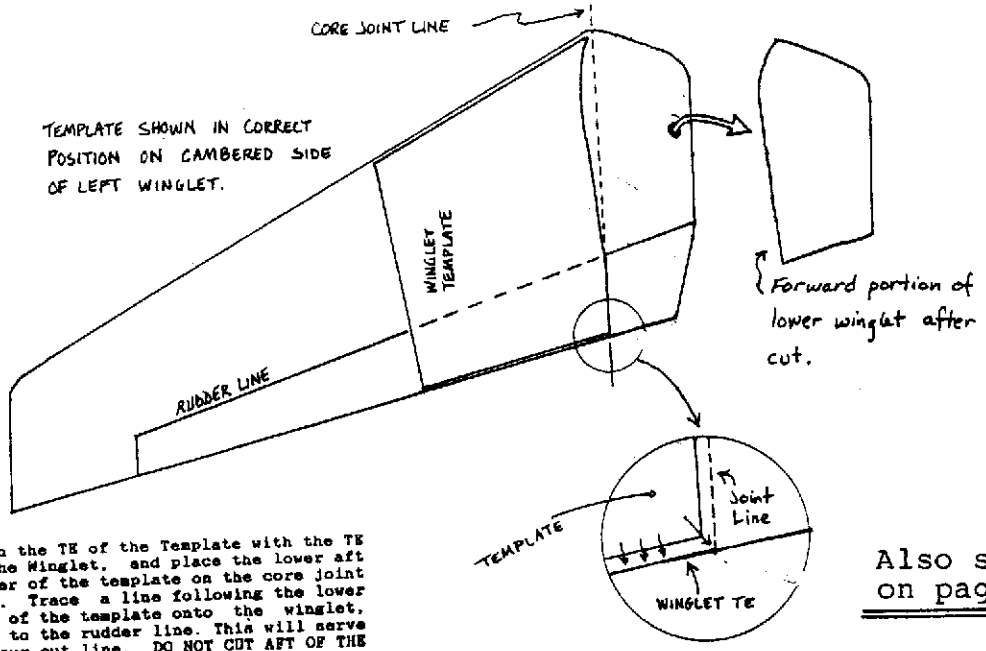


INCORRECT PLACEMENT OF TEMPLATE.
HANGS OVER END OF WING.

WINGLET PREPARATION

Place the winglet template on the cambered side of your winglet, with the Trailing Edges aligned, and the bottom aft template edge on the core joint line of the winglet. If properly placed, the bottom edge of the template should fall just a bit above the winglet core joint line towards the LE.

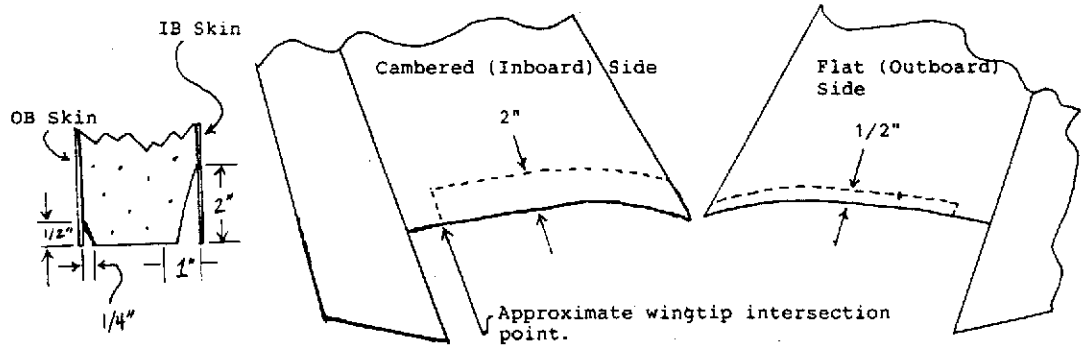
Mark both sides and cut from the L.E. back to the rudder line, then down the rudder line through the bottom of the winglet. Take care not to cut the com antenna cable. If you do damage the coaxial cable, connectors are available at Radio Shack for a couple of bucks.

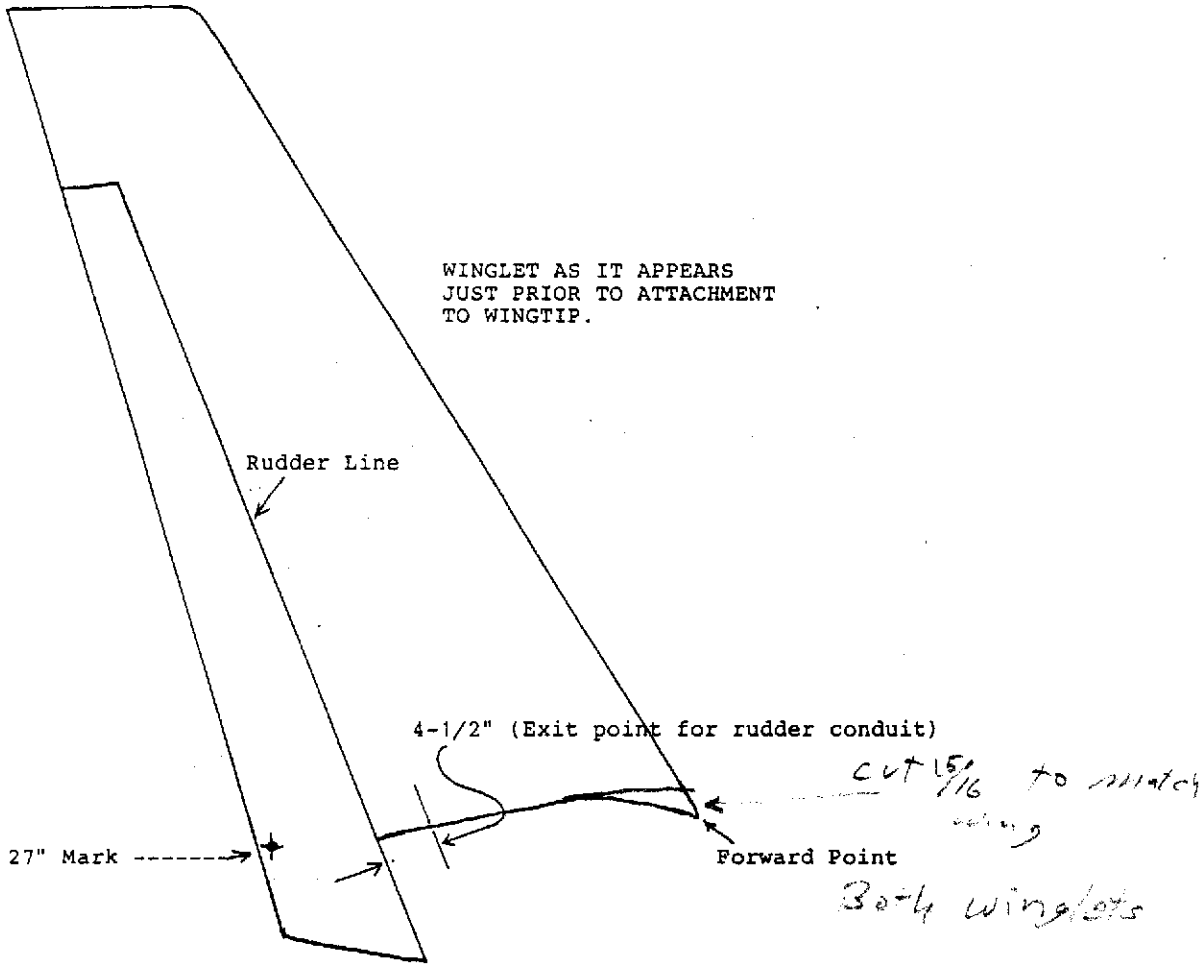


Align the TE of the Template with the TE of the Winglet, and place the lower aft corner of the template on the core joint line. Trace a line following the lower edge of the template onto the winglet, back to the rudder line. This will serve as your cut line. DO NOT CUT AFT OF THE RUDDER LINE, AND DO NOT CUT THROUGH THE COAXIAL CABLE FROM YOUR COM ANTENNA!

Also see diagram on page 212A

Cut out foam wedges 1/2" X 1/4" into the winglet against the outer side skin, and 2" X 1" wedges against the inner side skin along the winglet to wing attach intersections. It is advisable to save the foam from the deeper cut, as you will need to fill in the space after Layup A (Page 214) has been completed.





The illustration above shows how the winglet will look after you have made your cut with the template. A quick overview of the attachment process:

* Wingtip and Winglet have been trimmed using appropriate templates.
* Recess foam wedges in both wingtip & winglet. Allows for glass lay-ups running between the two assemblies.
* Initial fit of winglet to wingtip, followed by temporary attachment (using bondo, clecos, clamps, etc.) once in position.
* Lay-ups A & B (Page 214). "A" ties IB winglet to Top wing skin, from inner skin surfaces. "B", which must make glass-to-glass contact with "A" for entire length, serves as a shear web, and covers the exposed foam of the wingtip and the winglet.
* Installation of foam core, then application of lay-ups "C" & "D". Lay-up "C" ties the OB winglet skin to the Lower wing skin. "D" ties the outer IB winglet skin to the Outer top wing skin.
* Reinstallation of forward lower portion of winglet, which was removed at the initial cut-out.

SET-UP & ALIGNMENT ILLUSTRATION 213-A

Place a level along the top spar cap of the wing, and place the wing incidence jig provided with the kit in position (About 1" outboard of the LE root, and approx. 103" inboard of the TE wingtip.) Use both devices to get the wing level. A good double check is to make sure that the outboard attach bushings are plumb when the jig and the level are telling you that the wing is in position. Secure the wing once you are satisifed, and it won't hurt you to check it periodically during the winglet attachment process to be sure that you haven't accidentally moved it.

IMPORTANT MAKE FREQUENT CHECKS TO BE SURE THAT THE WING REMAINS LEVEL THROUGHOUT THE FOLLOWING PROCEDURE.

For definition, the 'forward point' is at the bottom L.E. of the winglet (after the cut-out with the winglet template). See 212-A.

Measure and mark from the 'forward point' 27" aft, around the cambered side, to the winglet cores join line.

Clamp a vertical prop to the T.E. of the winglet and to something movable on the floor, like a chair or a sawhorse.

Record the measurement from the 'forward point' of the wing tip cut-out to the outboard attach bolt centerline. We'll call this measurement "X".

Bend a couple of thin metal angles to cleco the winglet to the wing temporarily. (The winglet goes on the wing with the cambered side in, flat side out.) Place the winglet 'forward point' at the wing tip 'forward point'. One of the metal angles clecoed near the winglet L.E. and clamped to the top wing skin works well while adjusting the winglet's position.

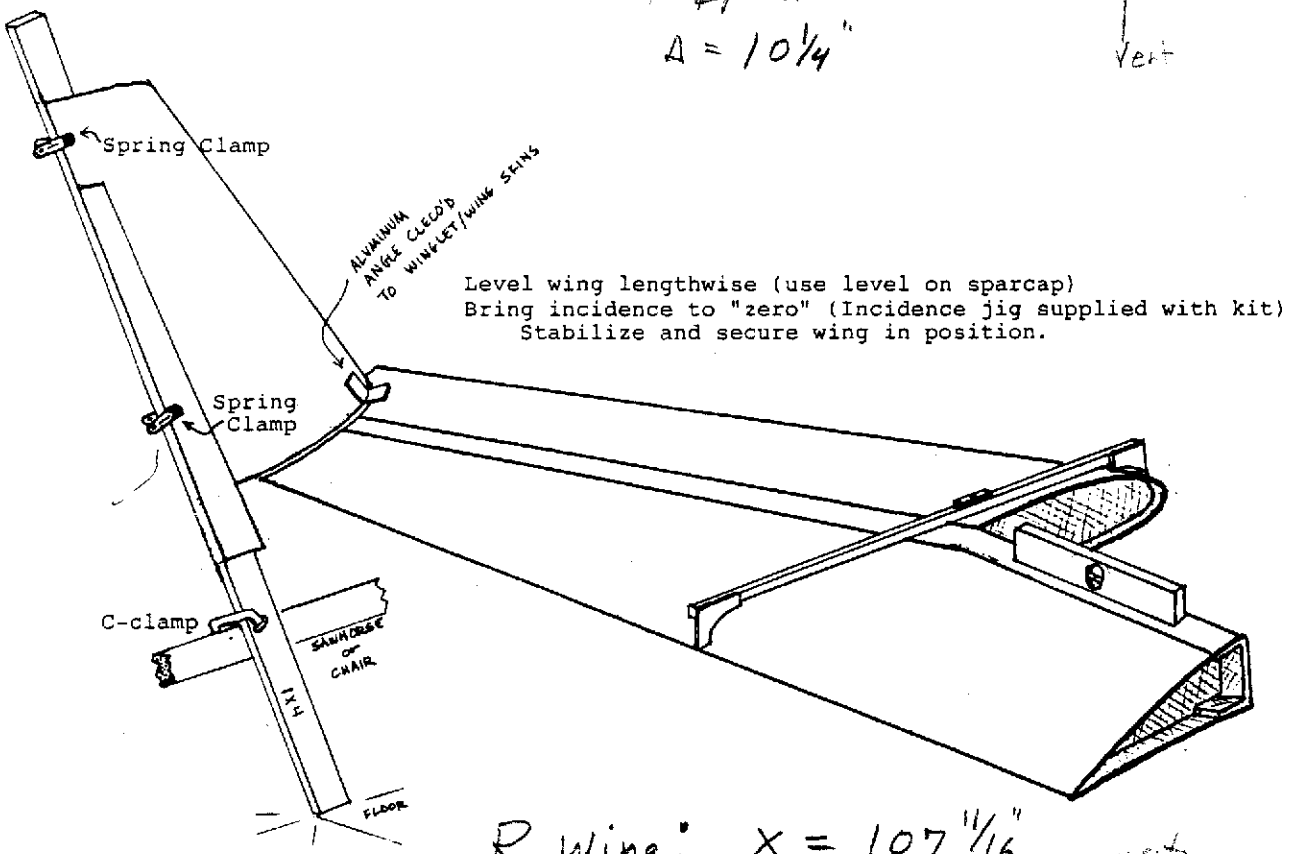
Adjust the winglet 27" reference mark so that the measurement to it from the OB attach point Centerline is 10" to 10-1/4" greater than measurement "X". This measurement is shown as "Z" in the diagram on page 213-A.

Use an inclinometer on the winglet L.E. and adjust the rake to 60 degrees (Up to 62 degrees is acceptable). Both winglet rakes are to be made the same.

If you don't have an inclinometer, measure and mark points 12" apart along the L.E., hold a level vertically with one end at the bottom point, and adjust the winglet until you measure 6" horizontally from the top point.

L. Wing: X = 107 11/16"
Z = 117 15/16"
Hardpoint 89.7°
A = 10 1/4"

Vert

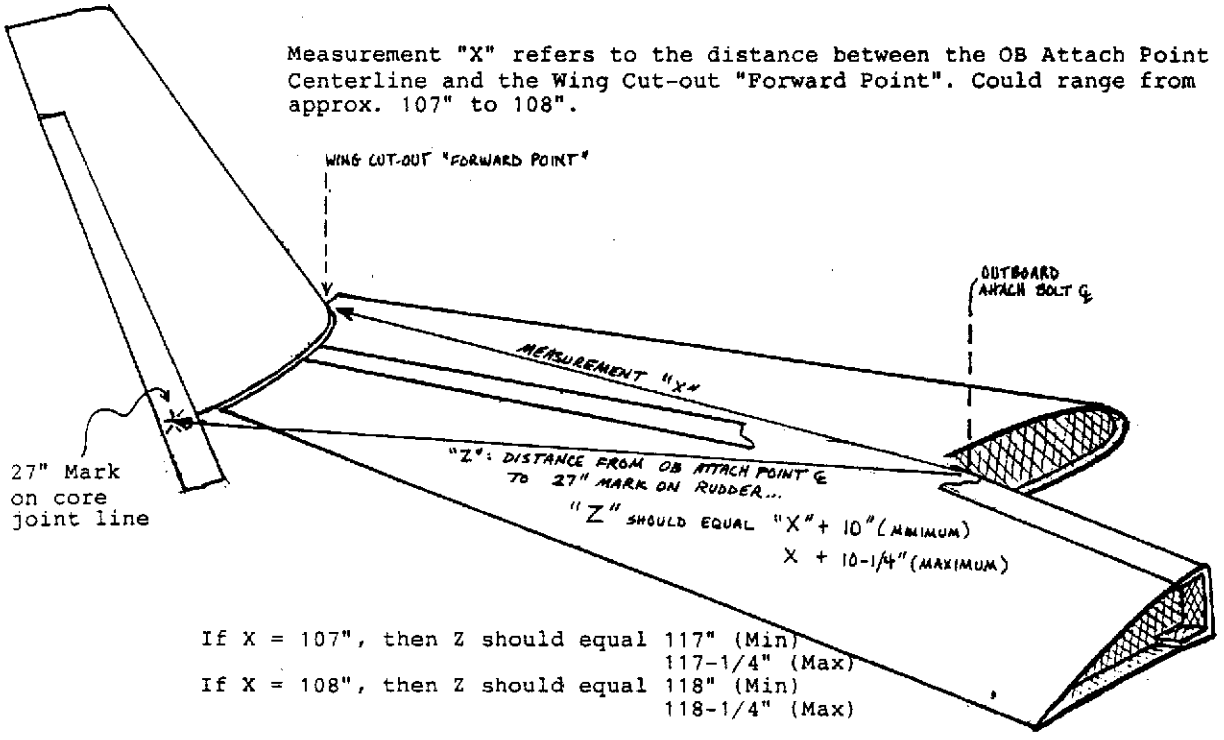


Level wing lengthwise (use level on sparcap)
Bring incidence to "zero" (Incidence jig supplied with kit)
Stabilize and secure wing in position.

R. Wing: X = 107 11/16"
Z = 117 15/16"
A = 10 1/4"

Vert
89.5°

Measurement "X" refers to the distance between the OB Attach Point Centerline and the Wing Cut-out "Forward Point". Could range from approx. 107" to 108".



If X = 107", then Z should equal 117" (Min)
117-1/4" (Max)
If X = 108", then Z should equal 118" (Min)
118-1/4" (Max)

Measure back and up from the winglet L.E. onto the outboard side where it is nice and straight and mark a common point on both winglets to compare vertical alignments. Adjust the winglet vertically to 0 degrees.

Bondo two or three supports, from high up on the winglet, to the wing. Put dabs of bondo along the winglet-to-wing junction as well.

The rudder cable tubing is to exit the outer side of the winglet 4-1/2" forward of the 'rudder line'. While the wing is level and the winglet is jigged in position, mark a level line aft of the rudder cable tubing exit point, crossing over and beyond the 'rudder line' 3". This line will locate the position of the rudder bellcrank installation later.

Route any antenna cable from the winglet through the access hole provided in the wing L.E. foam core.

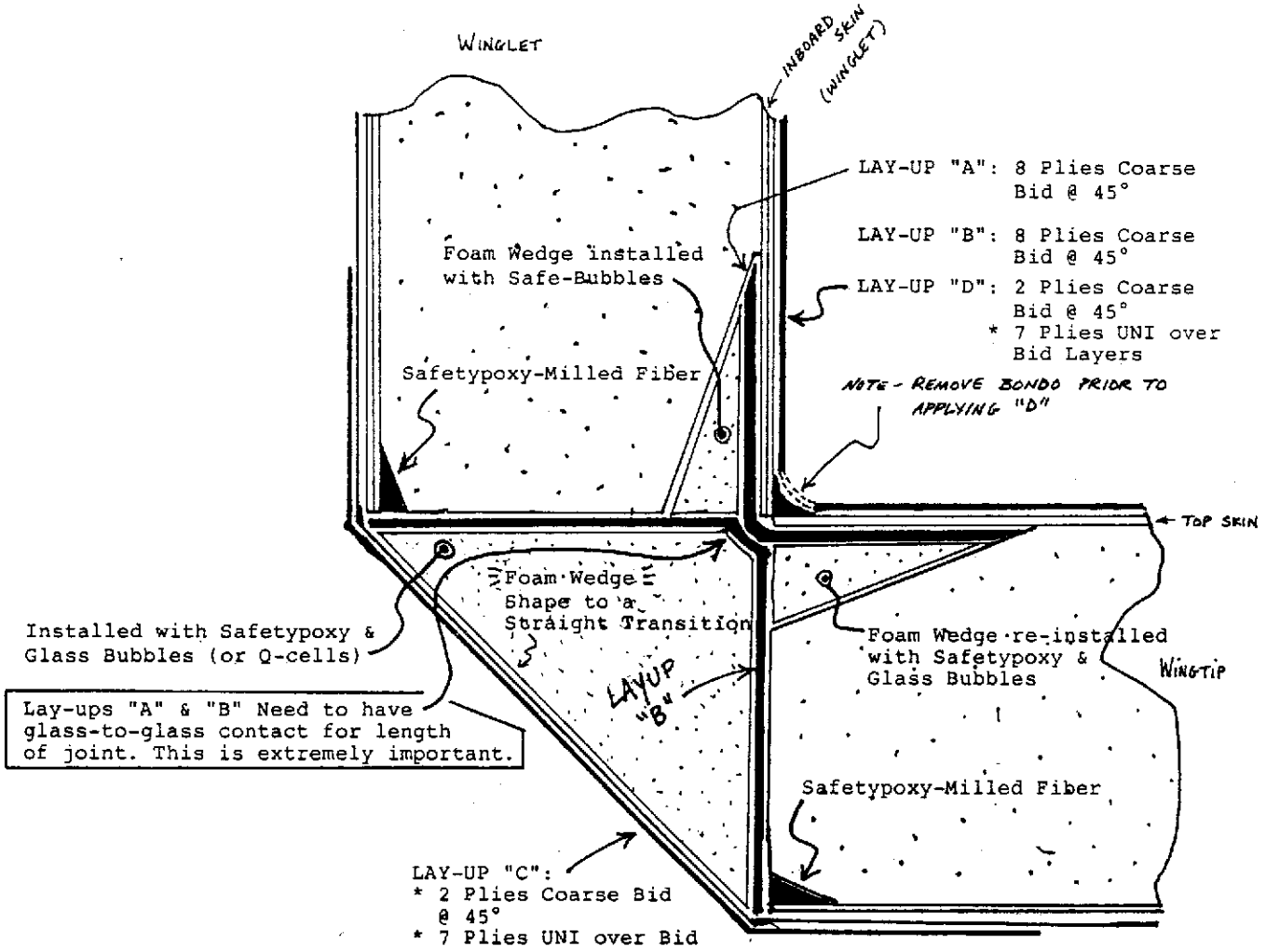
LAY-UP SCHEDULE

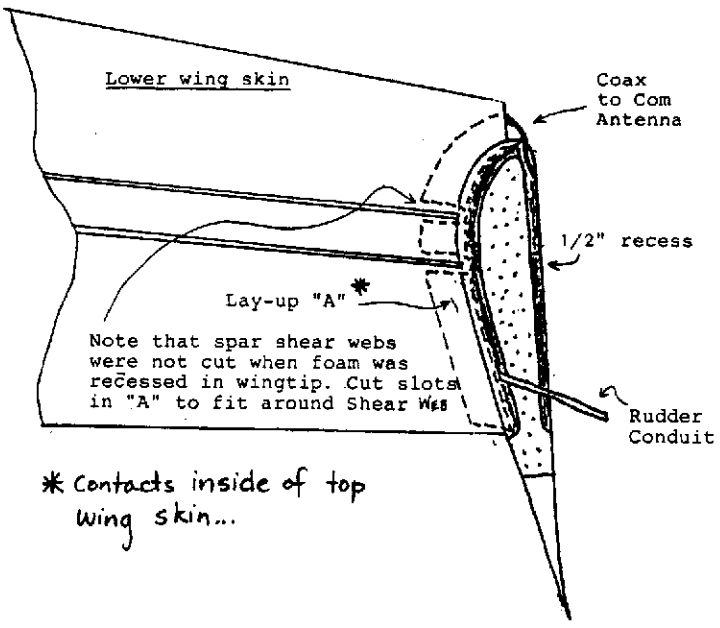
You will do four lay-ups on each winglet to complete the main attachment process. Refer to the diagram on page 214-A for a cross-sectional view of the lay-ups.

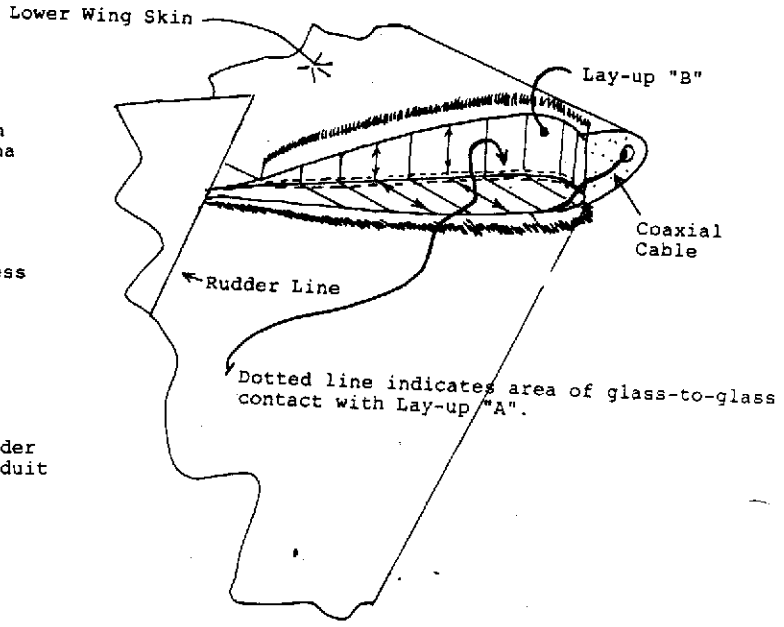
Sand areas to be glassed and cut plies of BID and UNI for each winglet-to-wing lay-up per the glass lay-up schedule below.

LAYUP A: Cut (8) plies of 4" X 12" Coarse BID (cut on a 45 degree bias). Start by inserting each ply into the 2" winglet recess (inboard side), wetting and stippling with a brush. Snip slots with scissors to straddle the wing spar shear webs and install the cloth into the 2" wing recesses (against inner top skin.) After the final ply, fill the remaining voids with the blue foam wedges that you cut out earlier, bonding them into place with SAFETYPOXY-MICROBALLOON, using the excess to fill in the smaller voids not filled by the foam wedges. Be careful not to go too fast and generate an exothermic condition that will damage the foam core.

LAYUP B: Following cure of layup "A", sand the exposed blue foam of the winglet and the wingtip to make a smooth surface for layup "B". Cover the exposed foam with a SAFETYPOXY-MICROBALLOON slurry, and fill the small 1/2" recesses in the winglet and the wingtip with SAFETYPOXY & MILLED FIBER. Cut (2) plies of 7" X 20" and (6) plies of 7" X 16" Coarse BID, all on a 45 degree bias. Apply the (2) 7 X 20 pieces first, with the glass extending from the "rudder line" forward to the winglet LE. The 7 X 16 layers will follow, extending from the rudder conduit forward to the winglet LE. These lay-ups should make an excellent glass-to-glass contact with the corner of layup "A", for the length of the winglet-to-wingtip junction. Be sure the rudder cable tubing exits the winglet 4-1/2" forward of the hinge/rudder line. Let cure, then trim off excess glass.


WINGLET
INBOARD SKIN (WINGLET)
LAY-UP "A": 8 Plies Coarse Bid @ 45°
LAY-UP "B": 8 Plies Coarse Bid @ 45°
LAY-UP "D": 2 Plies Coarse Bid @ 45°
* 7 Plies UNI over Bid Layers
Foam Wedge installed with Safe-Bubbles
Safetypoxy-Milled Fiber
NOTE - REMOVE BONDO PRIOR TO APPLYING "D"
TOP SKIN
Foam Wedge Shape to a Straight Transition
Installed with Safetypoxy & Glass Bubbles (or Q-cells)
Foam Wedge re-installed with Safetypoxy & Glass Bubbles
WINGTIP
LAYUP "B"
Lay-ups "A" & "B" Need to have glass-to-glass contact for length of joint. This is extremely important.
Safetypoxy-Milled Fiber
LAY-UP "C":
* 2 Plies Coarse Bid @ 45°
* 7 Plies UNI over Bid


Lower wing skin
Coax to Com Antenna
1/2" recess
Lay-up "A"
Note that spar shear webs were not cut when foam was recessed in wingtip. Cut slots in "A" to fit around Shear Web
Rudder Conduit
* Contacts inside of top wing skin...


Lower Wing Skin
Lay-up "B"
Coaxial Cable
Rudder Line
Dotted line indicates area of glass-to-glass contact with Lay-up "A".

Cut and fit a block of foam in the corner recess formed by lay-up "B". Bond in place with SAFETYPOXY-MICROBALLOON. Shape the outer surface to form a straight, not rounded, transition from the wing bottom to winglet outer surface. The contoured surface twists fore to aft but must be a series of straight lines from the bottom wing skin to the outer winglet skin in order to get a wrinkle free lay-up (Referring to layup "C".)

Do lay-ups (C) and (D) according to the schedule below cutting the BID on a 45 degree bias. The plies of BID are to wrap around the winglet L.E. about 1", up to about 10" above where it joins the wing. See diagram page 215-A.

GLASS LAY-UPS SCHEDULE

Cut the UNI with the major axis along the long dimensions.

Lay-up (A): 8 plies per winglet, 4" X 12", BID

Lay-up (B): 6 plies per winglet, 7" X 16", BID
2 plies per winglet, 7" X 20", BID
} Glass wt = 6.0 oz

Lay-up (C) and (D):
CUT (4) PIECES OF EACH DIMENSION LISTED BELOW, AS YOU WILL NEED (1) PLY OF EACH FOR THE FOLLOWING:

Epoxy = .55 oz/sq.ft
22 sq ft for C & D

LEFT WINGLET, LAYUP "C"
RIGHT WINGLET, LAYUP "C"
LEFT WINGLET, LAYUP "D"
RIGHT WINGLET, LAYUP "D"

* 1 ply, 34" X 20", BID
* 1 ply, 32" X 18", BID * Trim to taper down to 3" at the ends.

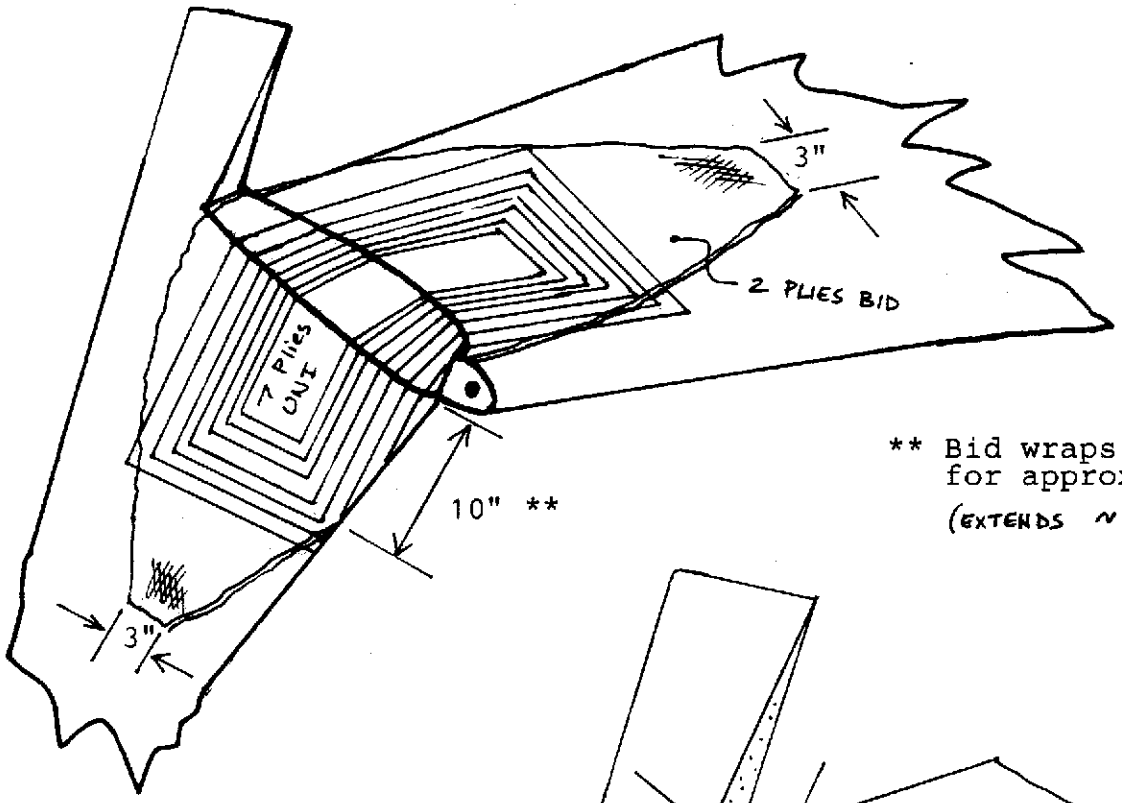
1 ply, 28" X 15", UND
1 ply, 26" X 14", UND
1 ply, 24" X 13", UND
1 ply, 20" x 11", UND
1 ply, 18" x 10", UND
1 ply, 16" x 8", UND
1 ply, 14" x 7", UND

9 layers Glass
14 oz

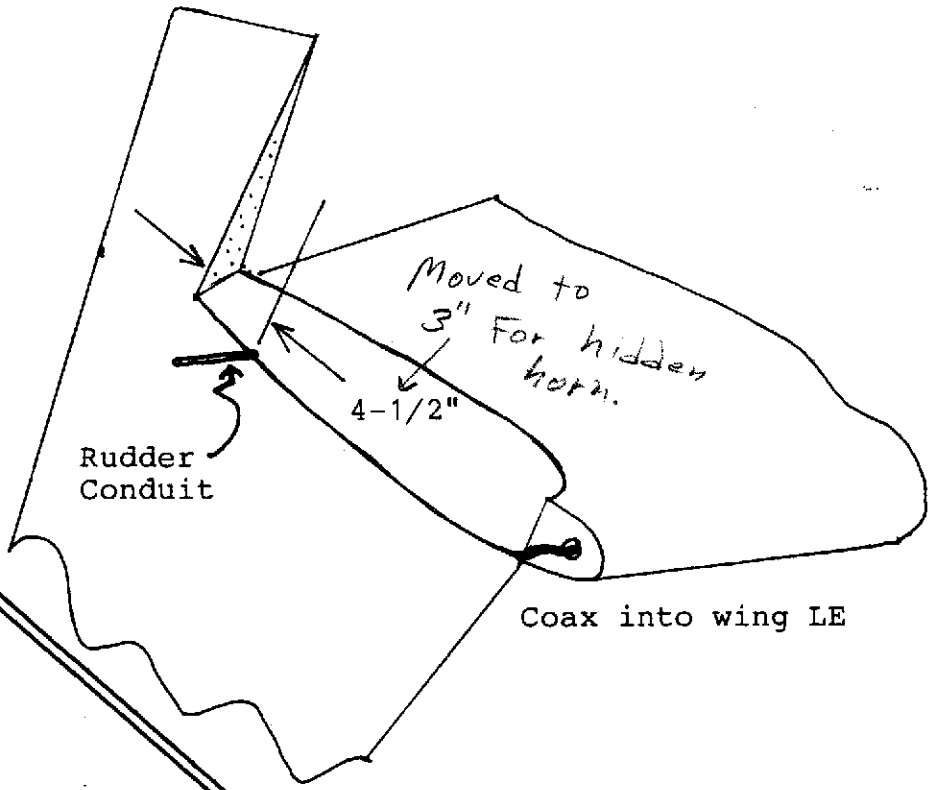
Contour the bottom piece you cut off the winglet so that it fits aligned in its original place. Drill a couple of holes for nails to hold this piece in position while bonding with micro-spheres. Apply a single layer of fine BID, axis 45 degrees, around the horizontal join line. DO NOT GLASS THE RUDDER CUT LINE.

Omit 216

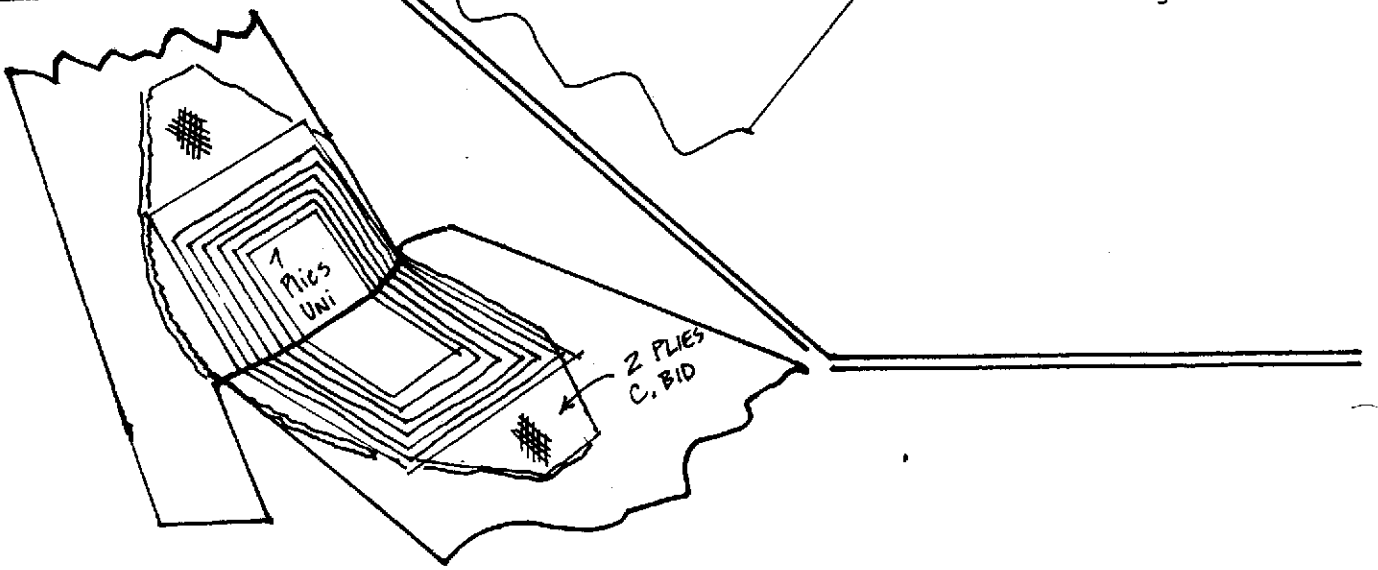
Lay-up "C"



** Bid wraps around winglet LE for approx 10"
(EXTENDS ~1" AROUND LE)



Lay-up "D"



RUDDER CUT-OUTS

Cut out the rudders along the previous markings that were made earlier in this section during the winglet construction.

RUDDER & RUDDER WELLS

Beginning 5-1/2" from the top of the rudder and rudder well, measure and mark the hinge center positions 17-1/2" apart (outboard side). They are all 3" hinges. DIAGRAM 217-A shows the hinge locations. The rudders will hinge at the outboard surface of the winglet (the flat side).

Remove 1-1/4" foam from the winglet rudder wells and rudders. Recess the top well end foam 3/4" for a small rib.

Sand the exposed inner skins, microslurry the exposed foam, wet the glass areas, and lay-up 3 plies of 4" X 50" BID, and small pieces for the rudder well end rib.

At each hinge location (both in the winglet well and the rudder well), apply three plies of 2-1/2" X 5" COARSE BID cut at a 45 degree bias. The pieces should fit as shown in DIAGRAM 217-A, extending across the bottom of the well and up the inner surface of the outboard skin to the rudder cut line. Let cure, then trim and sand flush with the cut line.

HINGE INSTALLATION

See diagram bottom of page 219

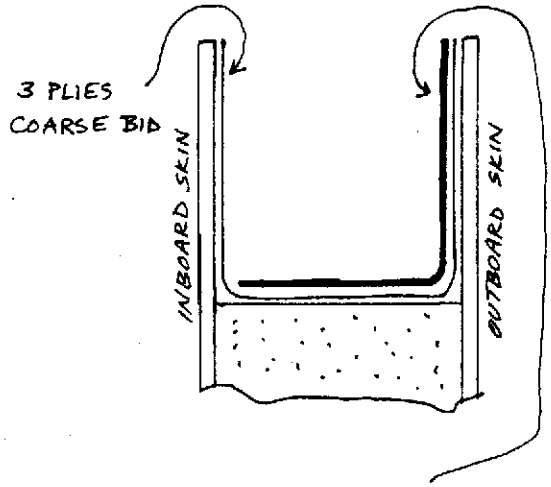
Sand all edges straight. Cut 3/16" notches at the hinge locations on the winglet and slightly chamfer the inside edges. Use a straight edge as a guide to align the notches. Make trial fits and sand or file away interferences.

Cut 6 hinges 3" long. Do not reverse halves. Pre-drill 2-3/16" holes centered and approximately 3/4" from each end of the winglet leg of each hinge. Clamp or bondo rudder leg of hinges to a straight edge to ensure proper pin alignment and locate hinges in notches cut into the winglet. Drill 3/16 holes through the skin of the winglet, and install hinges with AN525-10R8 screws, AN960-10L washers, and MS21042-3 nuts. Remove the straightedge.

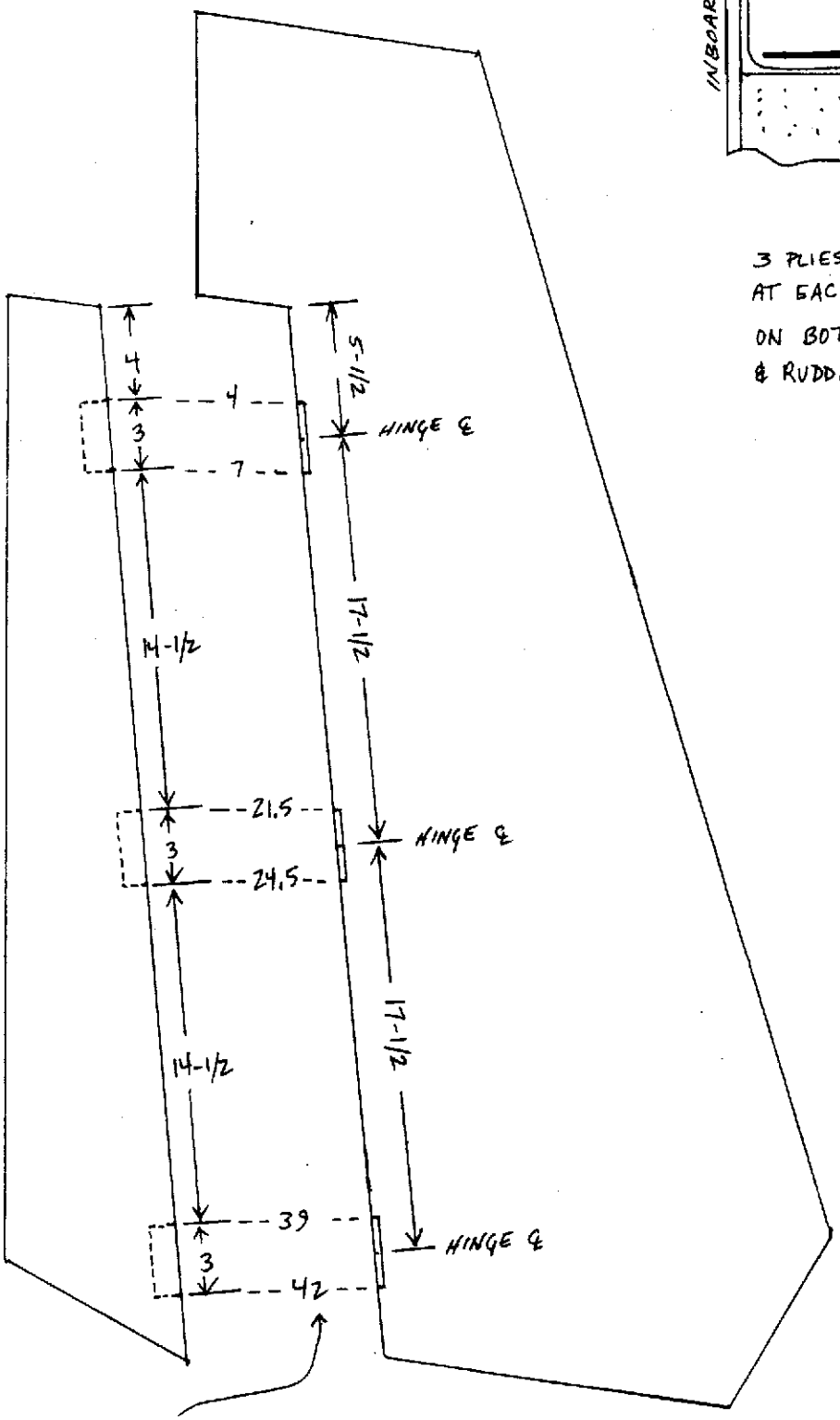
Put sponge rubber in the rudder well behind each hinge to apply outward pressure on the loose hinge halves. Put dabs of 5 minute epoxy on the loose hinge halves and clamp the rudder in place.

After cure, remove the screws and rudder with attached (epoxied) hinges. Drill through the hinges and skin and countersink the outer skin for 1/8" flush head pop rivets. Detach hinges, clean off the epoxy and sand the hinges and mounting areas for bonding.

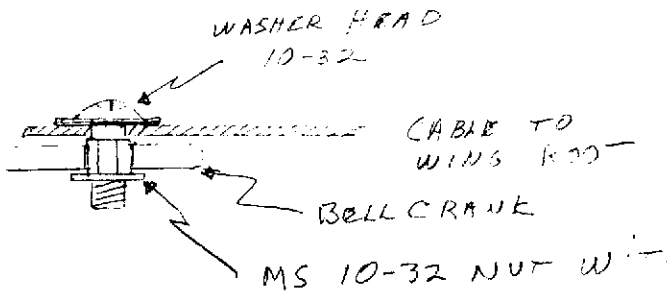
Apply GENEMID MICROGLASS to the hinges and mounting areas on the rudder and pop rivet the hinges to the rudder. Use 5 rivets, staggered on each hinge. Let cure.



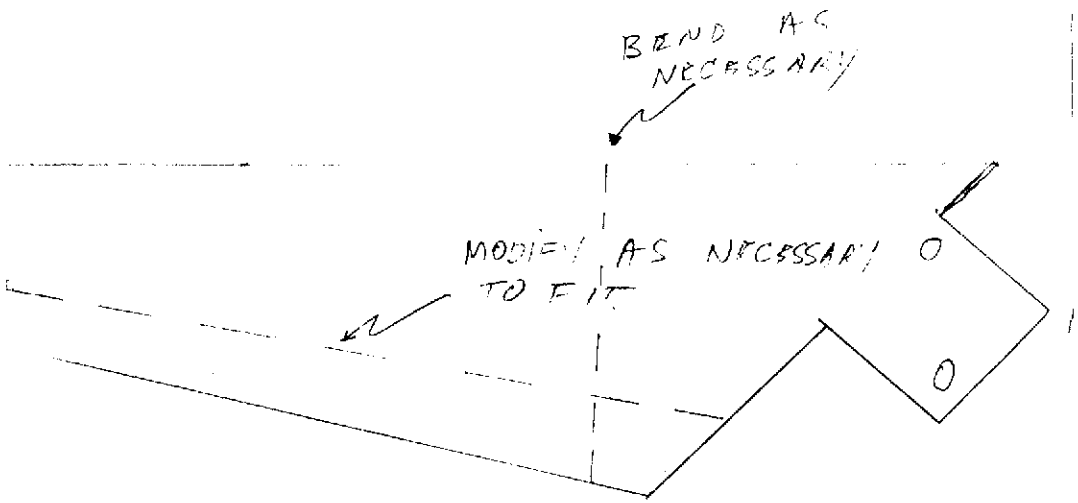
3 PLIES COARSE BID (2-1/2 x 5)
AT EACH HINGE LOCATION
ON BOTH THE WINGLET WELL
& RUDDER WELL

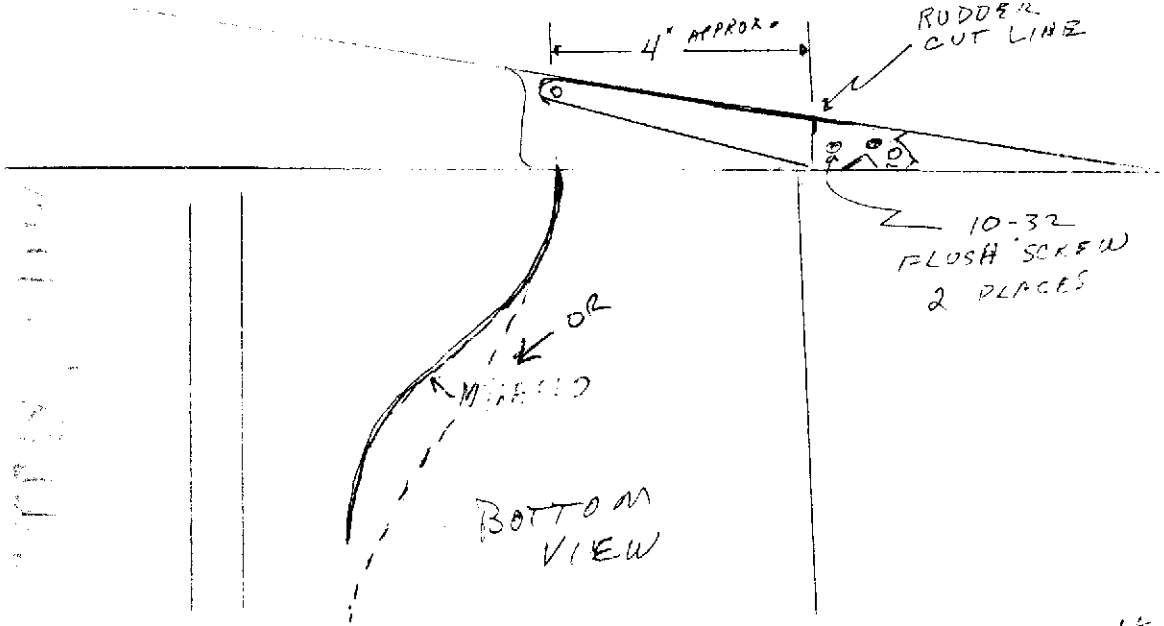


TAPE MEASURE
READINGS FROM
TOP OF RUDDER



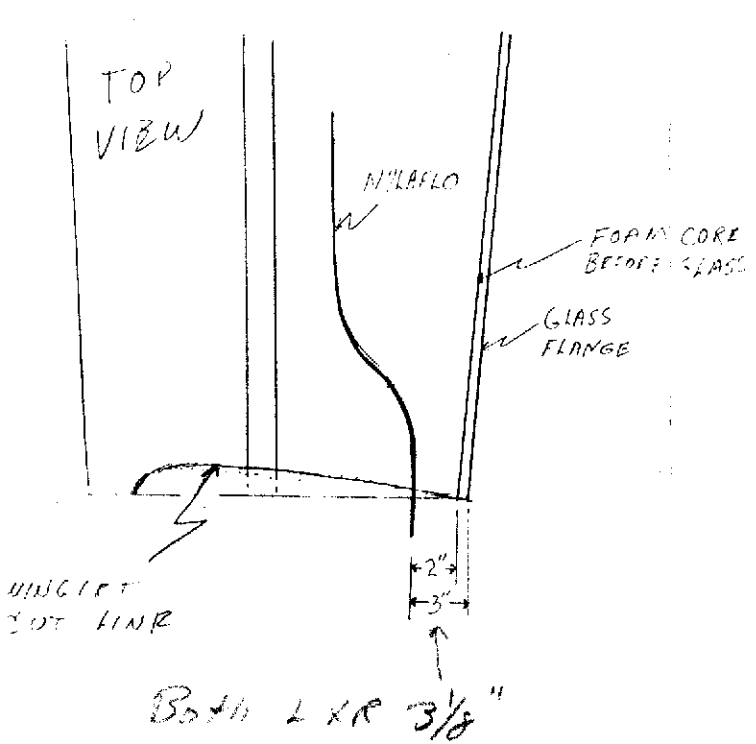
WE ARE USING THIS SYSTEM TO ELIMINATE THE VIBRATION SLEEVES. WE DON'T HAVE ENOUGH ROOM FOR THE VIBRATION.

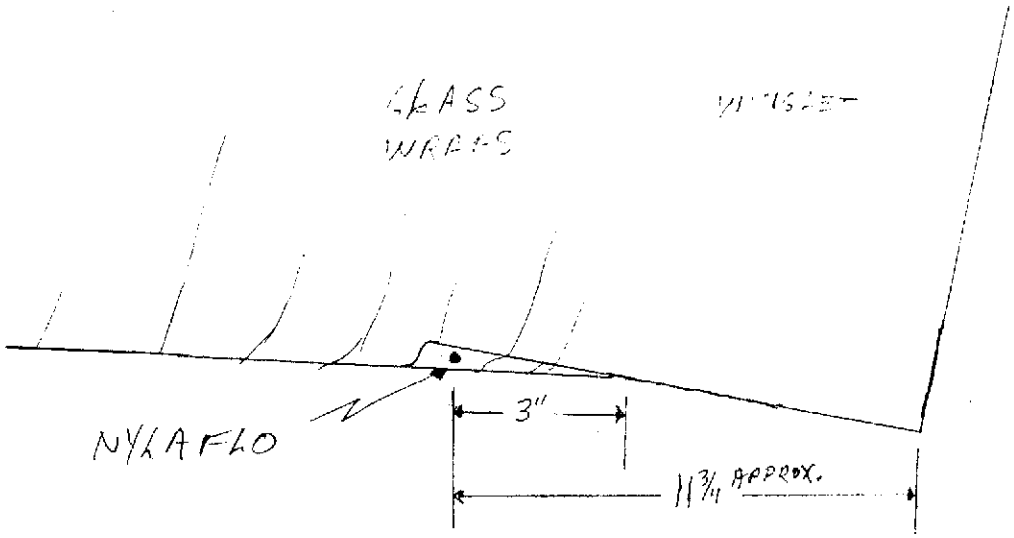


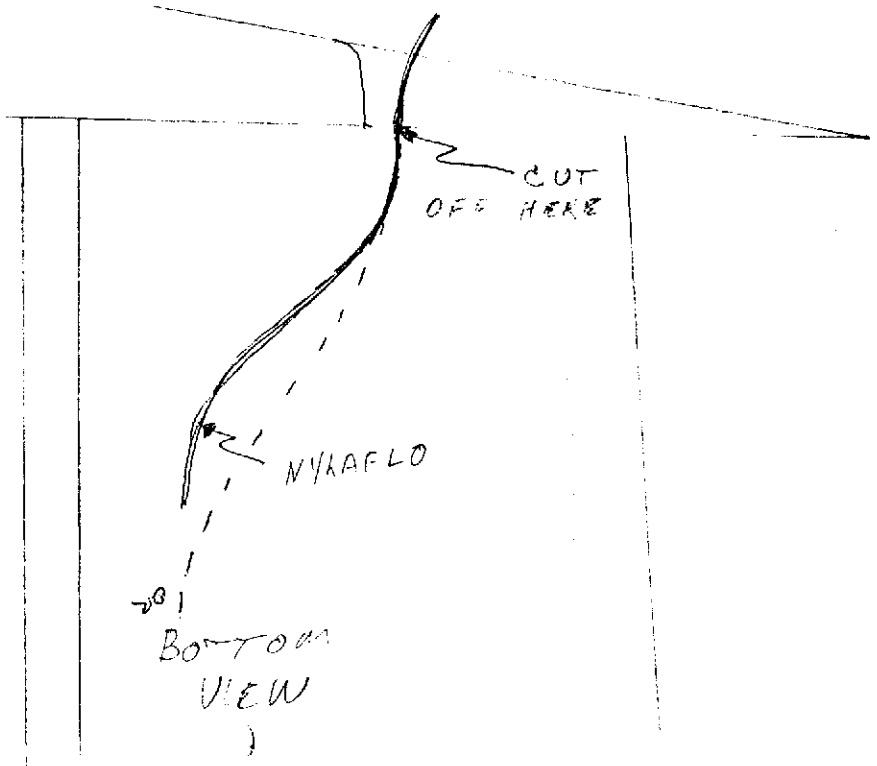


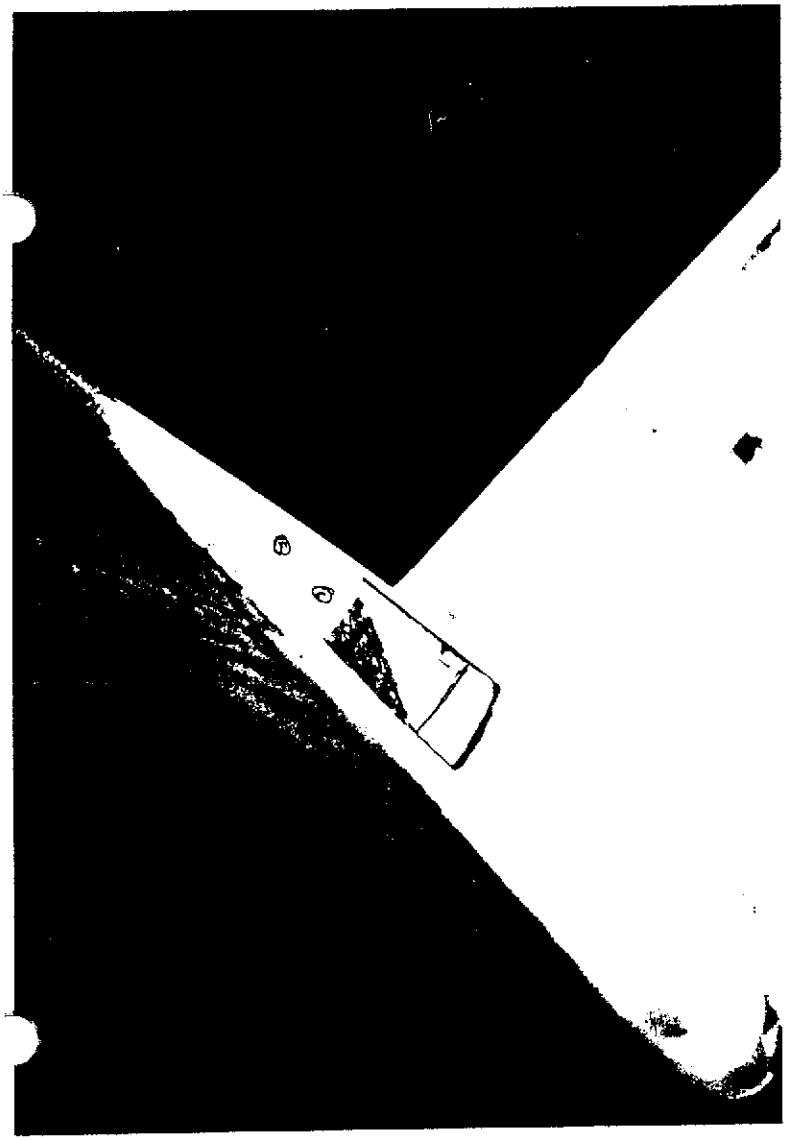
AFTER BOTTOM CAP IS MADE, THE BELLCRANK SHOULD BE DRILLED & TAPPED FOR A 10-32 FLUSH SCREW AND ATTACHED TO THE BOTTOM CAP. BOTTOM CAP SHOULD BE REINFORCED WITH 3 BID LAYERS. BELLCRANK WILL NEED TO BE BENT FOR PROPER FIT.

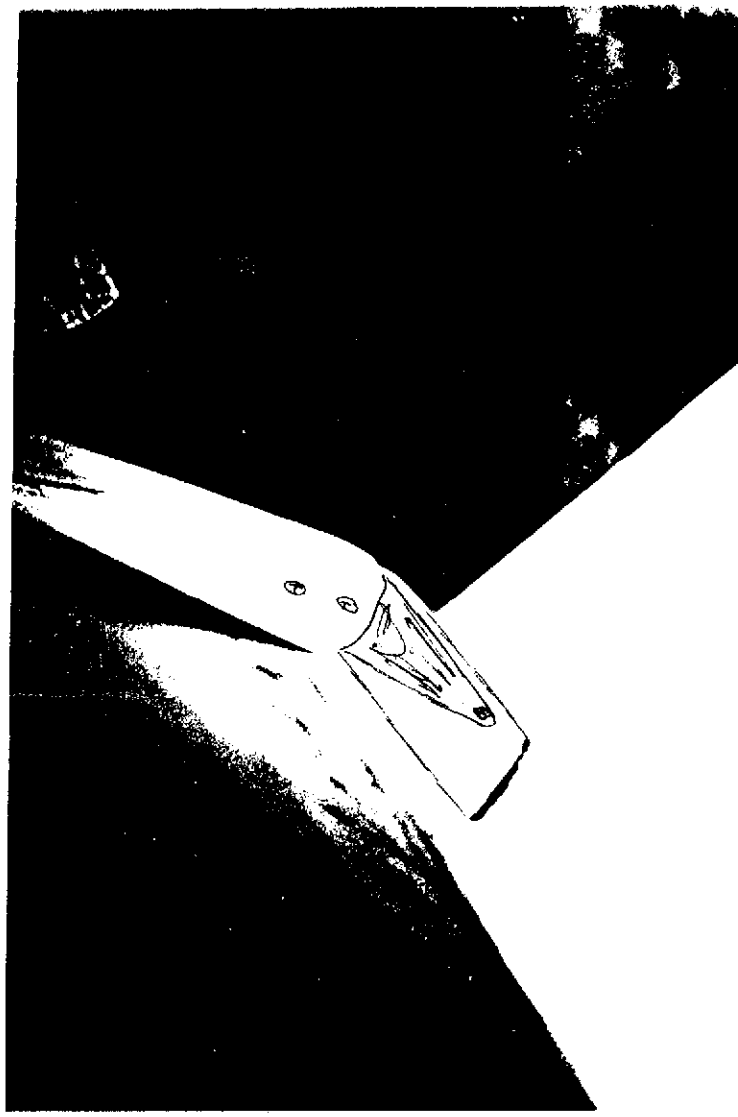
AFTER EVERYTHING IS FIT PROPERLY, BELLCRANK SHOULD BE MICROBALLOONED IN PLACE WITH SCREWS HOLDING EVERYTHING IN ALIGNMENT,

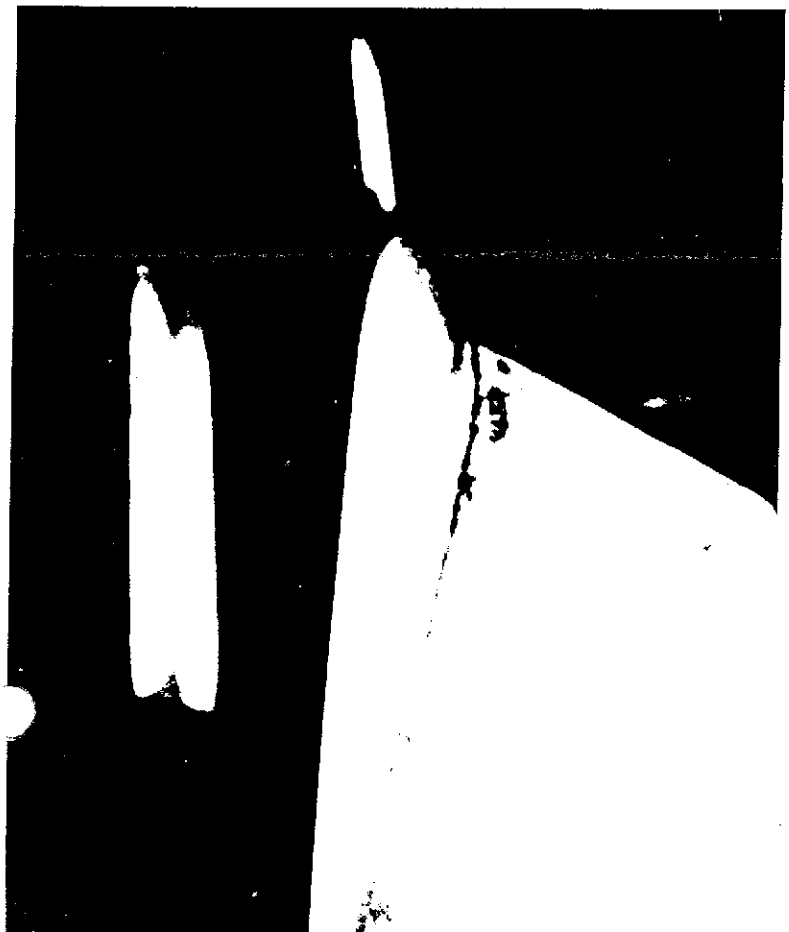

TOP VIEW
NYLAFLO
FOAM CORE BEFORE GLASS
GLASS FLANGE
2"
3"

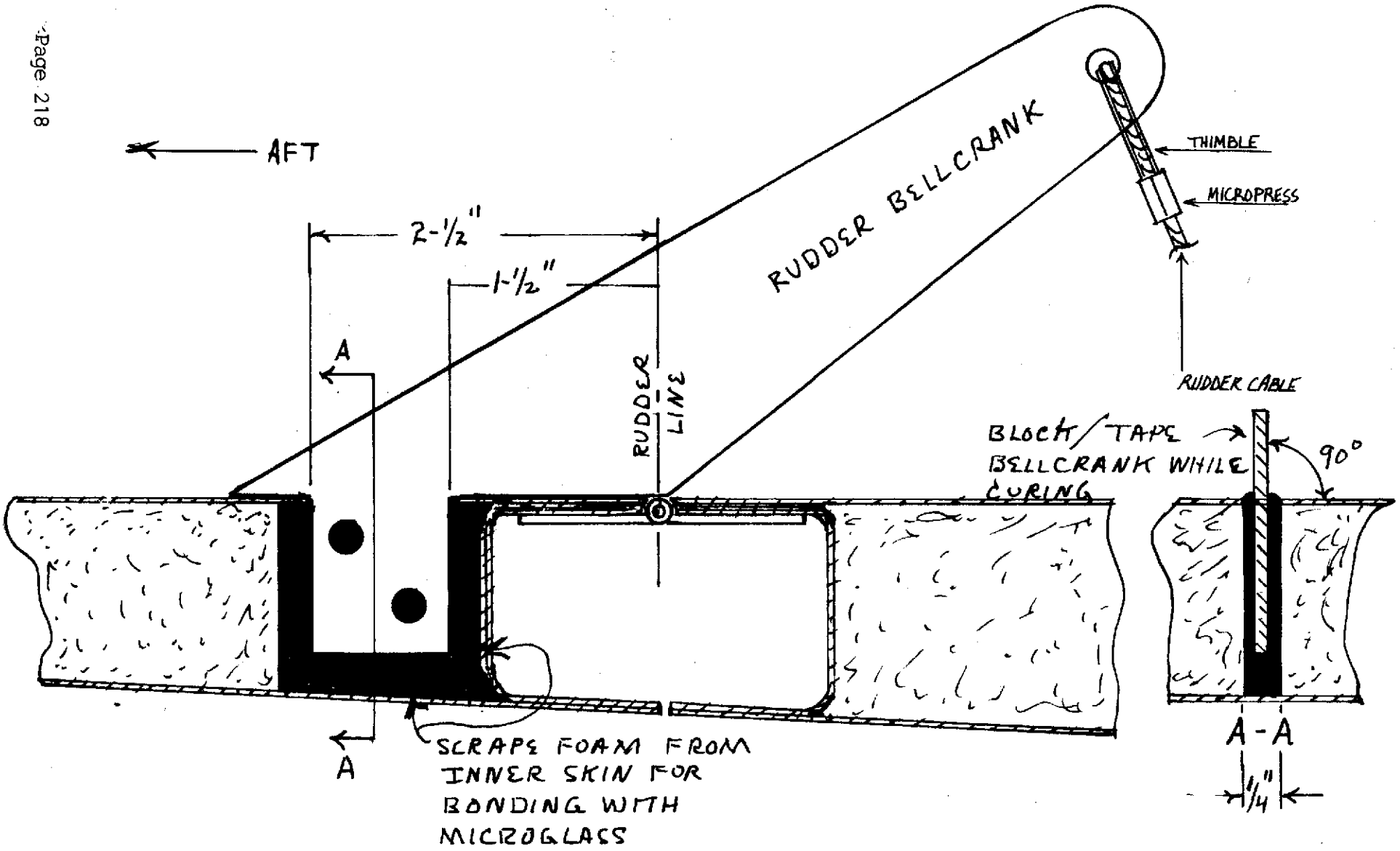

GLASS
NYLAFLO
3"
APPROX.


CUT OFF HERE
NYLAFLO
BOTTOM VIEW









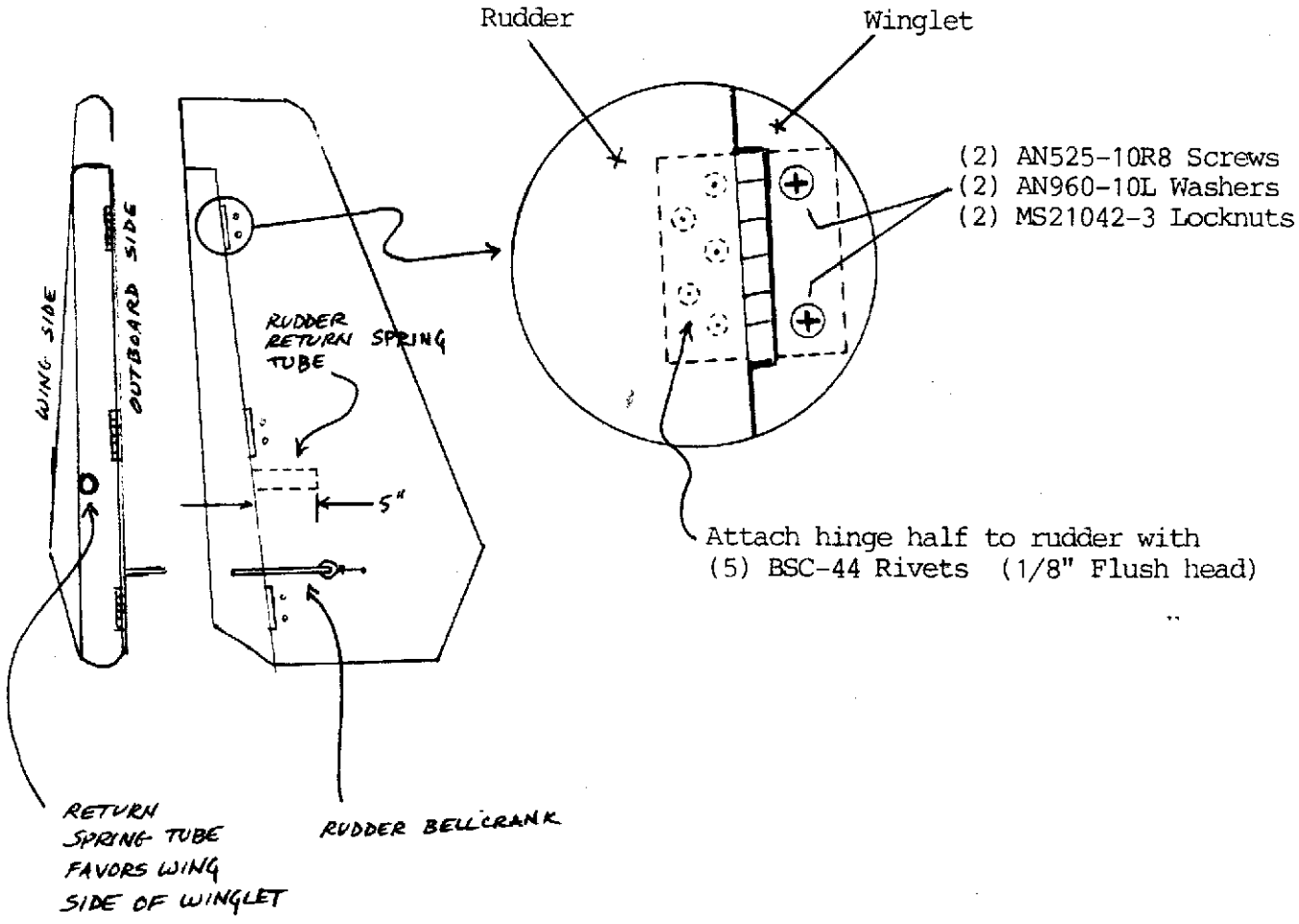
* It helps to make a wooden copy of the bellcrank (without the anchor tab), and use it to locate exactly where you should cut the actual slot for the bellcrank assembly.

BELLCRANK INSTALLATION SKETCH OPPOSITE PAGE

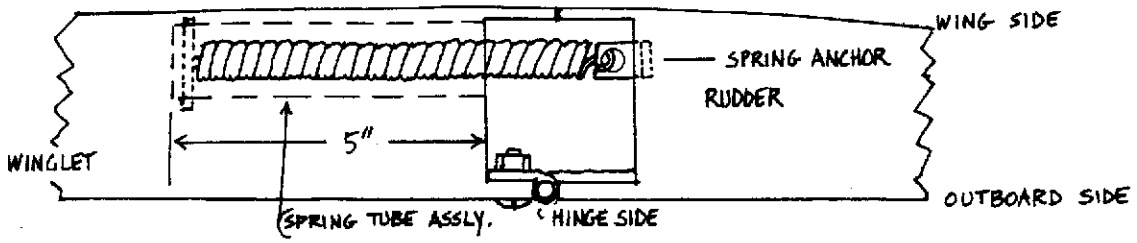
Cut a 1/4" wide slot between 1-1/2" and 2-1/2" aft of the 'rudder line', centered along the horizontal line drawn from the rudder cable exit point.

Gouge out some foam about 1/4" larger than the slot and through to the opposite skin. Scrape the inner skins as best you can for bonding.

Sand the rudder bellcrank tab, pre-wet with **GENEMID EPOXY**, and pack the slot with **GENEMID MICROGLASS**. Install the bell crank tab into the slot, block, tape, or otherwise hold the bellcrank in position perpendicular to the rudder and in line with the pre-marked level line. Let cure.



RUDDER RETURN SPRING

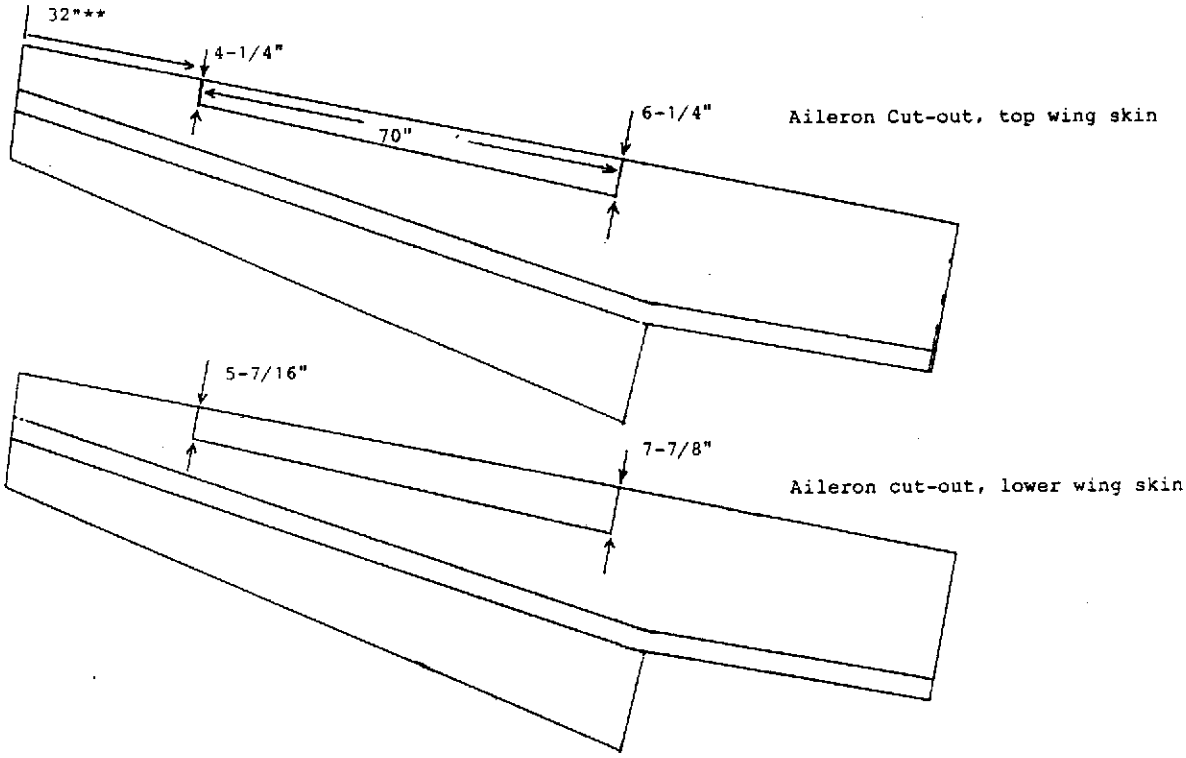


Drill a 1" hole approximately 18" up from the bottom of the winglet inside the winglet rudder well. The hole should favor the wing side skin of the winglet (opposite the hinge side). Put your hole saw on a 1/4" rod and drill out foam to 5" deep. Install the spring tube assembly with GENEMID MICROBALLOON. In the rudder itself, directly opposite the hole you just bored, cut out a small slit in the web to accept the spring anchor. This also favors the wing-side skin of the rudder. Clear out a bit of foam and install the anchor with GENEMID MICROBALLOON. The exposed end of the spring must be cut to form a hook to loop over the anchor.

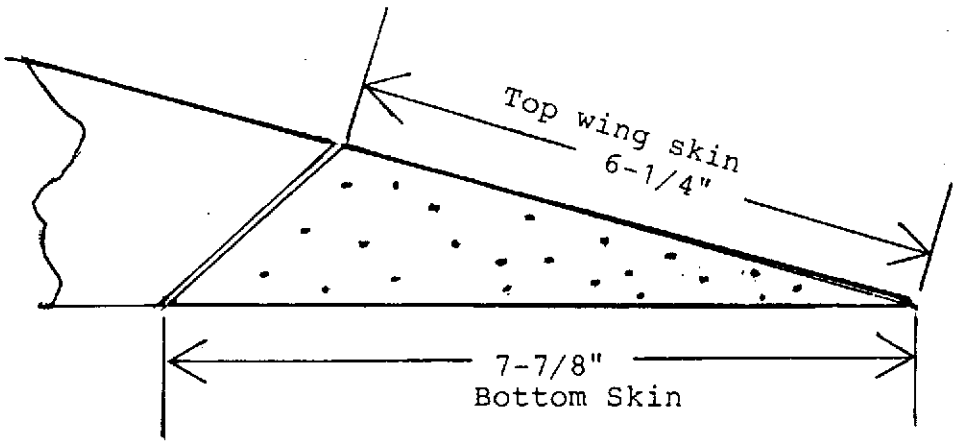
Ailerons

AILERON CUT-OUTS Starting at the wingtip TE (where it meets the winglet), measure 32" inboard along the wing TE and make a mark. Make another mark on the TE 70" inboard of the first mark (102" from your starting point.) From the 32" mark, draw a line 4-1/4" long on the top surface of the wing, running perpendicular to the wing TE. From the same 32" mark, draw a line 5-7/16" long on the bottom surface of the wing, again perpendicular to the wing TE. At the inboard mark on the TE, draw a line 6-1/4" long on the top surface of the wing, and one 7-7/8" long on the bottom. Both should run perpendicular to the wing TE. Connect the endpoints of the two lines on the top surface, and then connect the endpoints of the lines you drew on the bottom surface. These form the aileron cutout lines.

** Cut-outs are made perpendicular to the T.E. of the wing.
32" measurement originates at the junction of the wing TE and the inboard surface of the winglet.

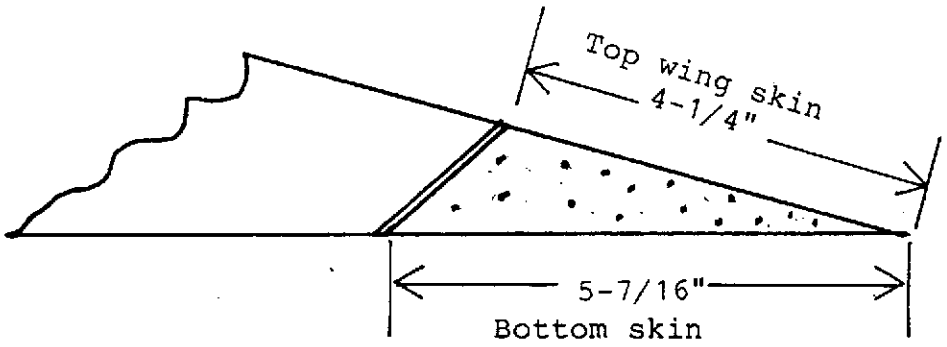


With a dremel cutting wheel, cut through the skins along the aileron cut-out lines. Use a knife or hacksaw blade to cut the foam at each aileron end. From the top side, cut the foam down to the bottom skin (not through it), angled slightly forward to leave more foam in the aileron. From the bottom, cut the foam back toward the T.E. until the aileron is free. See diagram 221-A.



INBOARD AILERON CUTOUT

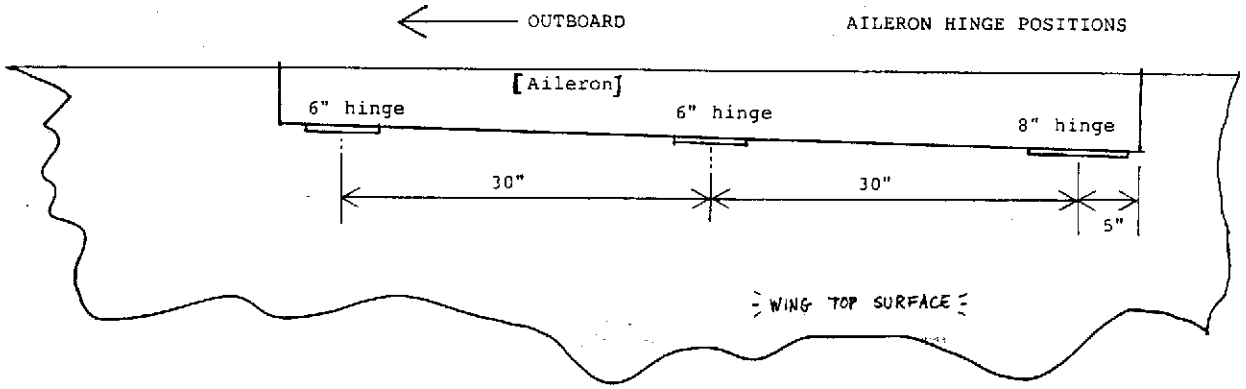
DIAGRAM 221-A



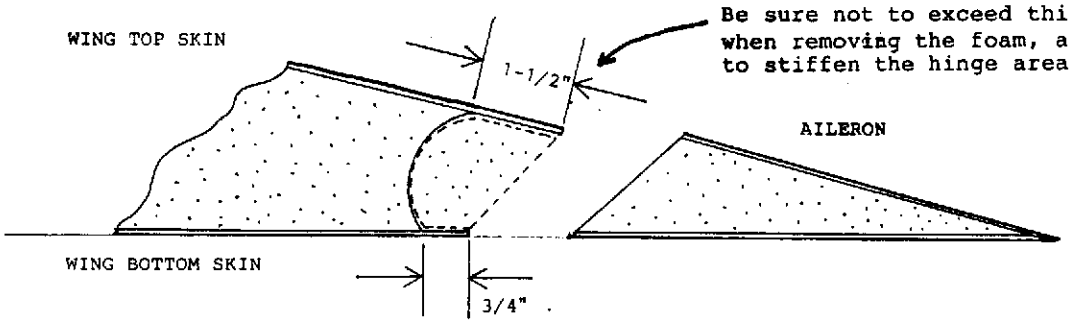
OUTBOARD AILERON CUT-OUT

The above diagrams are cross-sectonal views of the wing TE at 32" IB from the wingtip and 102" IB from the wingtip TE.

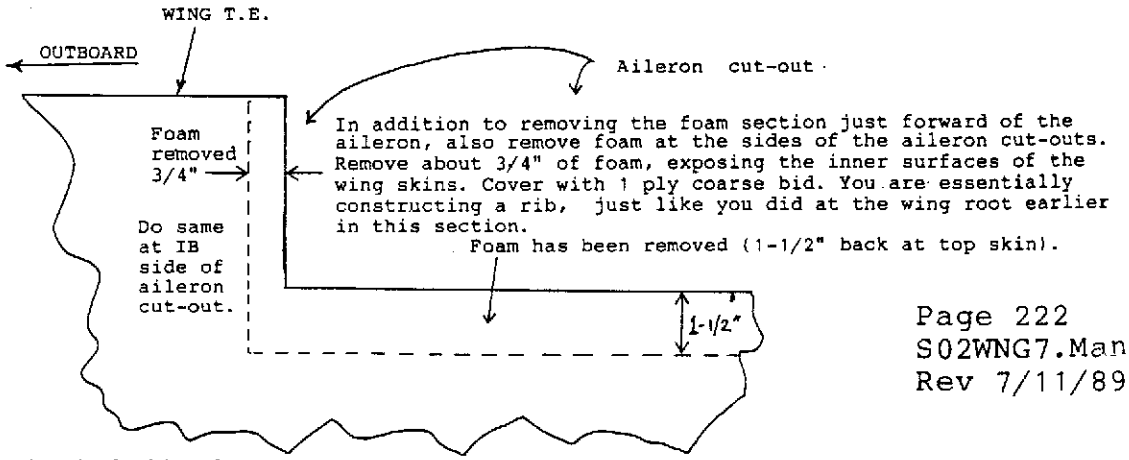
AILERON WELLS Beginning 5" from the inboard end of the aileron and aileron well, measure and mark the hinge center positions 30" apart (top of wing). There is one 8" hinge inboard and two 6" hinges outboard.



Remove foam from the aileron cut-out. Recess the cut-out ends 3/4" to form small ribs. You may use tubing with coarse sandpaper to achieve the final configuration of the well which is to be a concave cavity. Expose 1-1/2" of upper inner skin, and 3/4" of lower inner skin for the length of the aileron cutout.



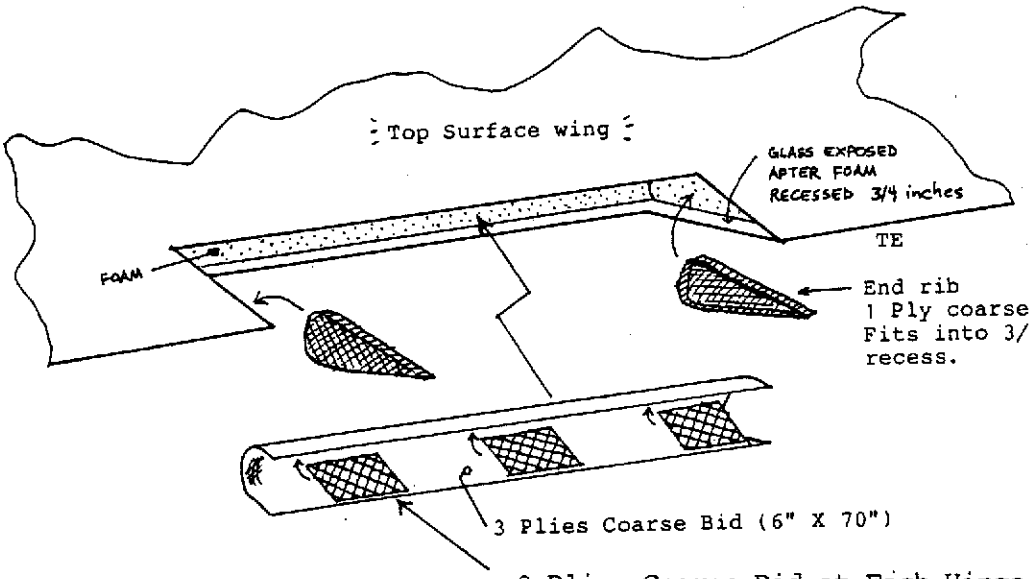
Remove this section of foam, forming a concave cavity between the IB and OB edges of the aileron. Be sure that there is room for adequate aileron travel.



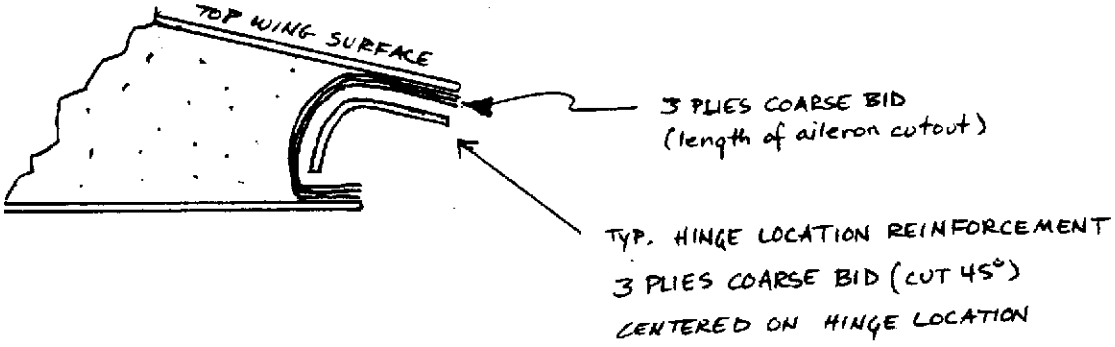
View is looking down on top surface of the wing (RT)

GLASSING AILERON WELL & RIBS Sand the exposed inner skins, microslurry the exposed foam, wet the glass areas, and lay-up 3 plies of 6" X 70" BID, and small pieces for the aileron well end ribs.

Cut (6) pieces of 4" X 10" COARSE BID, and (12) pieces of 4" X 8" COARSE BID, all on a 45 degree bias. Apply three plies of the 4 X 10 Bid at each of the 8" hinge locations, and three plies of the 4 X 8 Bid at the 6" hinge locations. These layups will serve as reinforcements, and are shown in the diagram at the bottom of the page.



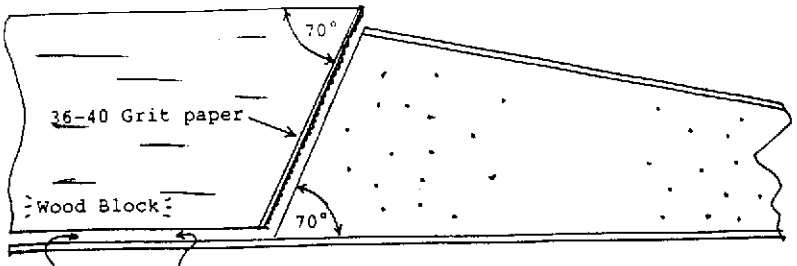
3 Plies Coarse Bid at Each Hinge location
Bid is cut on a 45° bias.
Cut pieces 4" X 10" for the 8" hinge positions
Cut pieces 4" X 8" for the 6" hinge positions
Center layups on hinge locations



ATTENTION BUILDER

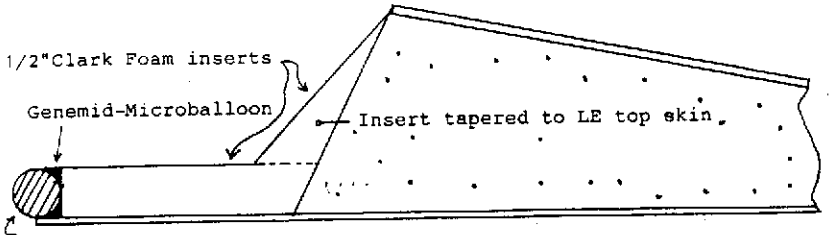
Due to a recent change in procedure, the factory has added a new part to the kit; separate foam cores for the aileron construction. We did this to keep the weight down on the ailerons, and to subsequently make them easier to balance. Unbalanced ailerons can lead to flutter, which as you know is extremely dangerous. The following four pages [A-1,A-2,A-3,& A-4] will carry you through the aileron construction procedure with the new cores, but it will still be necessary to refer to the previous plans for dimensions, etc. That material is covered in pages 221-A through 229. Please read those pages first, then begin your construction using the supplemental pages.

If you have constructed your ailerons using the old plans, and they are under the 8-1/2 lb. limit, it will be OK to use them, and ignore the supplements.

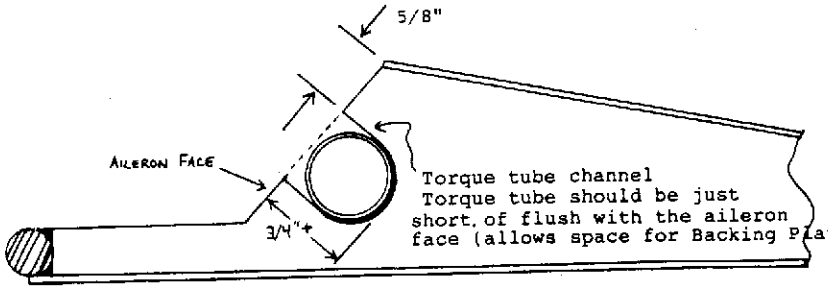


Blue Foam has been removed for this portion of the inner bottom skin.

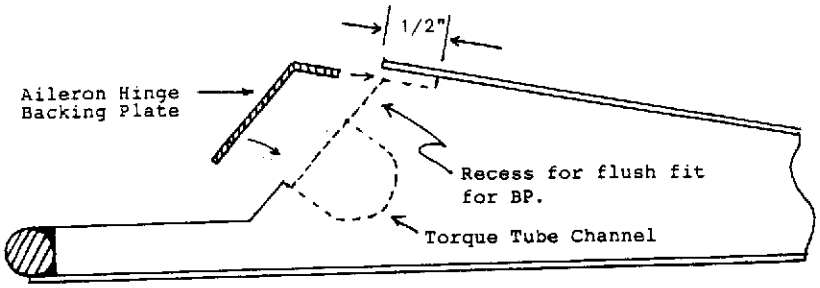
1) Without cutting into the skins, trim the foam as shown in the adjacent diagram.



2) Install the aileron counterweight, using 5-minute epoxy to bond it to the inner bottom skin. Cut and attach the 1/2" CLARK FOAM inserts as shown, tapering the upper one to meet the top skin LE. Bond Foam in place with Genemid-Microballoon.



3) The torque tube channel extends 9" into the aileron from the IB end. 1-1/2" of the tube should extend from the end of the aileron when correctly installed. Channe should be cut just a bit deeper than 3/4", so that the torque tube is about 1/16" short of being flush with the aileron face. This allows for the Backing Plate to be flush with the face.

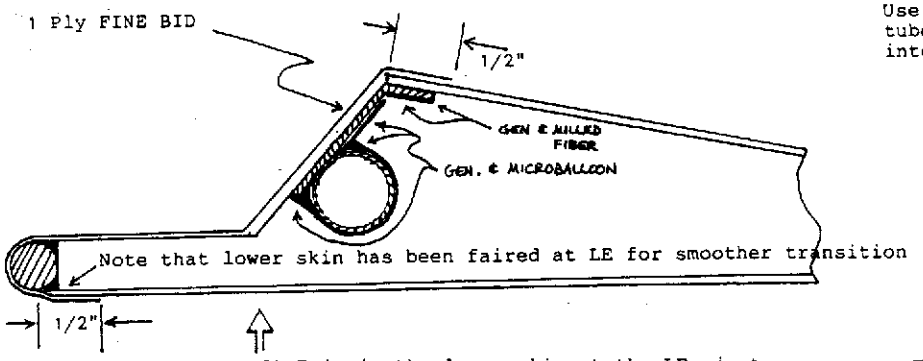


4) At the hinge locations, cut 1/2" slots under the top skin to accomodate the short flange of the hinge Backing Plates. Recess the Clark Foam on the face just enough to let the BP sit flush with the face. Drill some holes in the short BP flange to make for better bonding when installed.

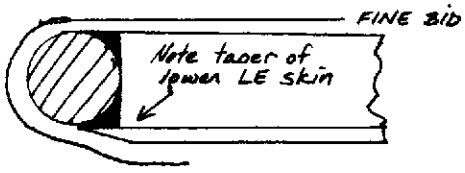
NOTE: Use the following to install the Torque Tube & Backing Plates.

Genemid & Milled Fiber: Use only in the slot that you cut under the upper skin, for the short flange.

Use GEN-Microballoon to bond the torque tube & long flange of the Backing Plate into place.



5) Fair in the lower skin at the LE, just beneath the aileron counterweight. This will make for a smooth transition area for the next lay-up. Slurry the foam surfaces, and apply 1 ply of FINE BID as shown, for the length of the aileron. This layer should extend 1/2" onto the upper skin, and 1/2" onto the bottom skin (around the counterweight). Let cure.



REPLACEMENT AILERON CONSTRUCTION

It has come to our attention that some builders are having difficulty when it comes to balancing and meeting the weight restrictions that we have placed on the Velocity ailerons (8-1/2 lbs each). The next segment of text will outline an alternate way of constructing the ailerons, which if followed carefully, will allow you to construct properly balanced ailerons that weigh less than 7 lbs each (after finish coat of paint). The reasons for our concern in the area of aileron weight/balance are:

1] The CG of the ailerons is at station 180, which is approximately 60" aft of the aircraft's in-flight CG. Overweight ailerons are detrimental to the overall CG of the aircraft.

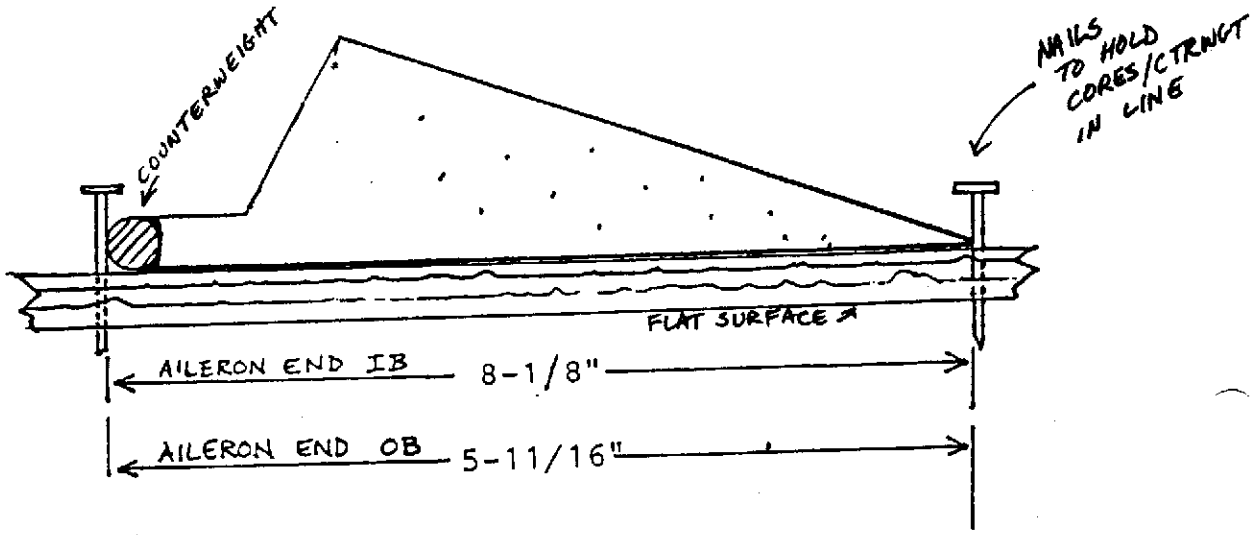
2] Overweight ailerons definitely affect the aircraft's aerodynamic resistance to flutter, even though the ailerons are in balance. The excessive weight of the ailerons could induce twisting in the wings under certain gust loading conditions, due to the mass concentrated at the trailing edge wing panel.

3] Out of balance ailerons WILL FLUTTER, and can cause flutter in the airframe, which is usually catastrophic. THE AILERONS MUST BE BALANCED!

If you have already built your ailerons, you must first remove the hinges, counterweight, and torque tube. Drill out the rivets with a 1/8" bit, and soften the epoxy with a hair dryer or heat gun. Be careful not to bend the hinges. Clean up the hinges with sandpaper.

AILERON CONSTRUCTION

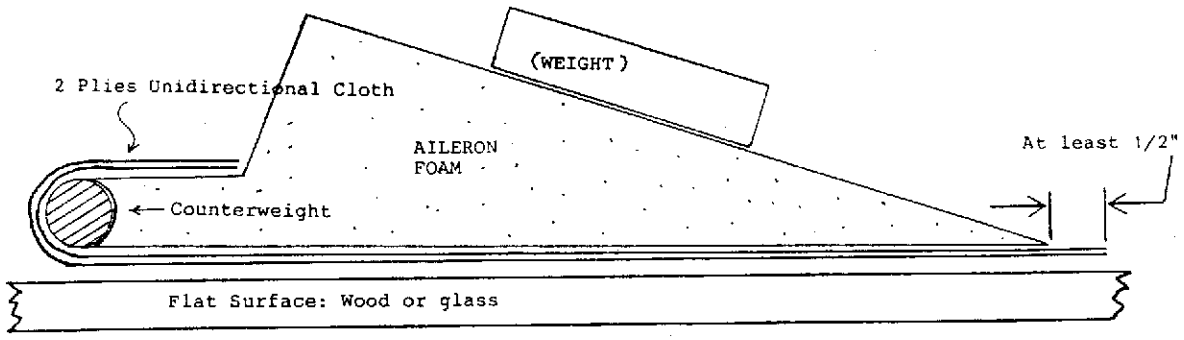
The aileron cores come slightly oversize, the excess being on the outboard end. Each side (left and right), will come in two pieces, and will need to be bonded at the middle with Genedmid & Q-Cells (or Glass Bubbles). Once the foam cores are together, shorten the lower leading edge to accept the counterweight. The proper dimensions are shown in the diagram below:



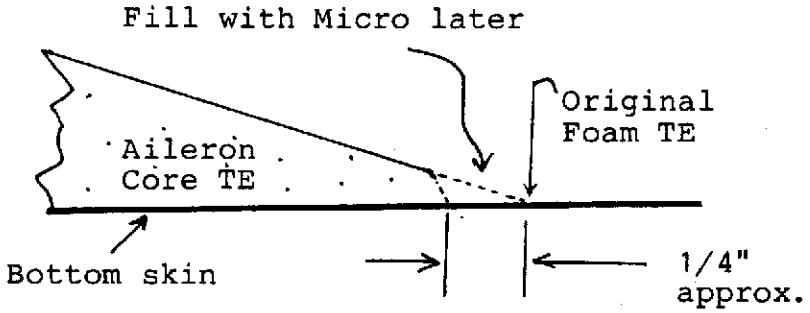
Support the cores and the counterweight on a very flat surface, so that the cores/counterweight are as flush on the bottom as you can make them. Glue the counterweight to the core LE with Genemid & Q-cells (Glass bubbles). The counterweight should be positioned as far INBOARD as practical, rather than OUTBOARD. Let cure.

Following cure, clean up the excess micro and check your dimensions again. Cut (6) pieces of 9-1/2" wide Unidirectional cloth at a 45 degree bias for the full width of the roll. REMEMBER THAT THE 9-1/2" WIDTH IS NOT AT THE SELVAGE EDGE OF THE CLOTH, BUT AT 45 DEGREES TO IT. THE DISTANCE BETWEEN CUTS AT THE SELVAGE EDGE WILL BE APPROXIMATELY 13-1/2" You will need approximately 4 yards of Uni to build your ailerons.

Appropriate a flat sheet of glass, or some other clean, flat surface, with minimum dimensions of 1' X 6-1/2'. You will use this to lay up your aileron. Unless your flat surface is glass, it must be covered with plastic sheet or duct tape so that your assembly will release from it. The smoother your surface, the better, as it will dramatically reduce the need for any filler on the bottom aileron surface later. Lay up 2 plies of Uni on a 45 degree bias to each other on the flat surface. Butt the ends of the cloth, taking care not to OVERLAP them. Apply a thin coat of Safetypoxy-microslurry to the lower surface of the aileron core, and place it on top of the wetted cloth on the flat surface. Leave enough cloth to wrap around the counterweight at the LE of the aileron. Leave 1/2" of cloth extending aft of the aileron TE to form a glass-to-glass with the next glass application. Slurry the foam just aft of the counterweight, and wrap the cloth around the LE, back to the forward face of the aileron. Weight the aileron in place and allow to cure.



Following cure, carefully remove the aileron from the flat surface. DO NOT DELAMINATE THE GLASS FROM THE FOAM. Trial fit your aileron to the finished wing. The wing must be completely filled and finished to contour to ensure accurate aileron contour. Cut the aileron to length, allowing approximately 1/8" of clearance at each end. Support the aileron so that its bottom skin fairs perfectly with the lower wing skin in the area of the aileron cutout. Sand the upper surface of the core to match the upper surface of the wing. At this time, you will probably notice that there is a slight twist to the wing, and that the aileron will have to be shimmed slightly when the upper skin is attached. Get the upper foam surface of the aileron as smooth as possible, in order to avoid having to use filler later. Cut the foam back approximately 1/4" at the TE of the aileron for a glass to glass bond.

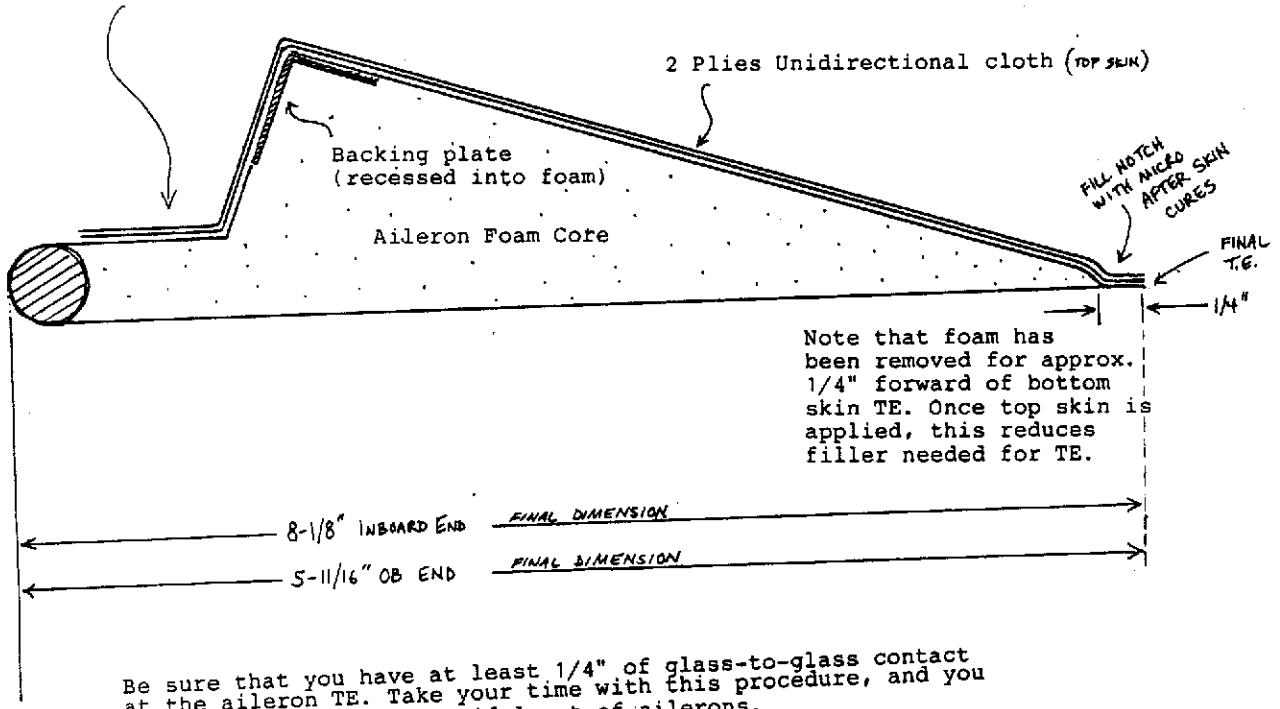


Once proper contour and size is achieved, take note of how much the outboard rear corner must be shimmed up to fit properly. Remove the aileron from the wing, and bond it to a flat surface with some BONDO under the counterweight and the INBOARD end. Shim up the OUTBOARD aft corner to compensate for the twist in the wing.

Using as little GENEMID-MICRO as possible (to minimize filler weight) install the torque tube and hinge backing plates as called for in the manual. Be sure to recess the foam slightly to accomodate the backing plates. Rough up the glass on the top of the aileron with some sandpaper. Slurry the exposed foam with dry Safetypoxy-Micro. If any repairs are to be made to the foam, do so with VERY DRY GENEMID MICRO. Cut (6) more pieces of Unidirectional cloth on a 45 degree bias, full width of the roll, 9-1/2" wide (AGAIN, THIS IS NOT ALONG THE SELVAGE EDGE OF THE CLOTH!) Apply the lay-up in the same way that you did the bottom (2 plies, at 45 degrees to each other, ends butting, not overlapping), to the top of the aileron, extending aft from the counterweight, over the TE. Take some time, and squeegee out the excess resin.

After cure, check the fit, and install the hinges according to the manual text. Finish out the ailerons with dry Genemid micro , and keep weight to a minimum. These ailerons should weigh approximately 7 to 7-1/4 lbs when the final coat of paint is applied. Cover ends with 1 ply fine bid.

Layup overlaps first (bottom skin) layup by at least 1/2"



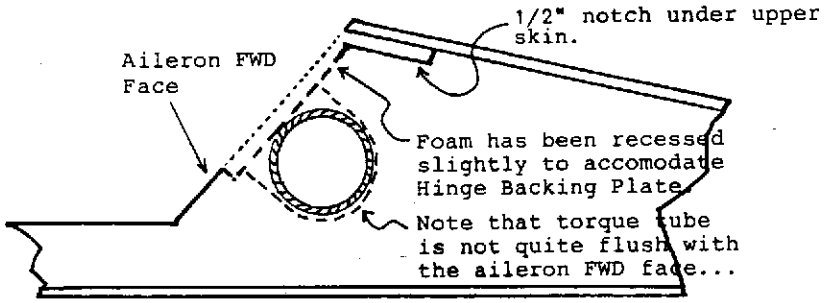
Be sure that you have at least 1/4" of glass-to-glass contact at the aileron TE. Take your time with this procedure, and you will come up with a beautiful set of ailerons.

AILERON COMPLETION Make a sanding block according to the sketch. With this block, sand away the excess exposed foam even with the top L.E. down to the inner bottom skin. The remaining foam forms an angle of about 70 degrees with the bottom skin. Be careful not to sand away any L.E. glass skin. [FIG #1-PAGE 223]

[Refer to diagram - page 225] Cut (2) 70" sections of aileron counterweight rod. Install each section on the bottom L.E. of the aileron, half on and half off, with 5 minute epoxy. Cut, fit, and GENEMID MICROBALLOON 1/2" Clark foam between the rod and blue foam, onto the exposed inner bottom skin. Cut, fit, and MICROSPHERE 1/2" Clark foam onto the remaining exposed blue foam. Use nails to hold in position. Taper this last piece back to the top L.E. [FIG #2-PAGE 223]

IMPORTANT NOTE: The finished length between the counterweight L.E. (with one ply of BID applied) and the aileron T.E. must not exceed 5-11/16" at the outboard end nor 8-1/8" at the inboard end. The maximum counterweight protrusion into the airstream after installation must not exceed 7/16" at the outboard end nor 11/16" at the inboard end.

Carve a 3/4"+ channel 5/8" down, 9" long, parallel to the top skin at the inboard end of the aileron. The torque tube is 3/4" X 10-1/2" so that 1-1/2" extend beyond the aileron. The torque tube should fit just short of flush with the forward face of the aileron, allowing for the thickness of the inboard position hinge backing plate. [FIG #3-PAGE 224 & BELOW]



Cut a 1/2" deep slot under the top skin at each hinge location to accommodate the short bent portion of the hinge backing plate. Check the fit of the backing plate in the slot, then recess the Clark Foam just a bit so that the plate fits flush with the forward face of the aileron [FIG #4-PAGE 223 & ABOVE] A slight modification to the bend in the BP may be necessary to get it to conform to the rest of the aileron face. You want the bend in the plate as close to the Upper LE as possible, but still want the plate to be flush with the forward face of the aileron. Drill holes in the short flange of the backing plate to allow penetration of the Genemid microglass for better bonding.

If you have already microballooned your wings, sand micro down to the glass about 1/2" back from the top and bottom L.E.s for bonding. Also sand the torque tube and angular backing plates.

Before getting into the next step, taper the lower skin LE into the counterweight, as shown in FIG #5-Page 223. This will make for

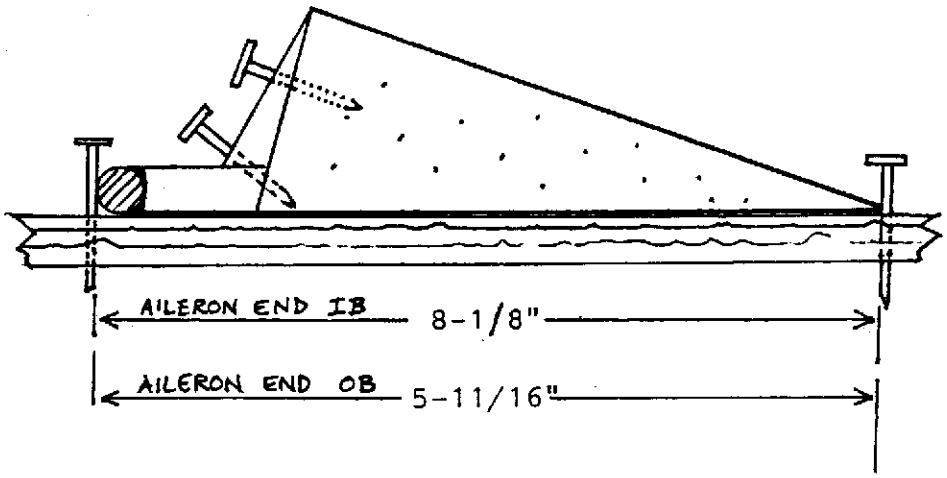
a smoother transition when you apply the lay-up at the end of this paragraph. Install the torque tube with Genemid-Microballoon, keeping it parallel to the top skin and ALMOST flush with the forward face of the aileron. The backing plates for the hinges are installed with two different fillers. The short flange, which fits into the 1/2" slot next to the upper skin is installed with GENEMID-MILLED FIBER, whereas the bond between the long flange and the foam is made with GENEMID-MICROBALLOON. Slurry the exposed foam with Safetypoxy-Microballoon, then apply 1 ply of FINE BID in the following manner. The lay-up should extend the length of the aileron, and should be cut as usual at a 45 degree bias. The cloth should be applied as shown in FIG #5, overlapping the top skin LE by 1/2", forward around the counterweight, and overlapping the bottom skin by 1/2".

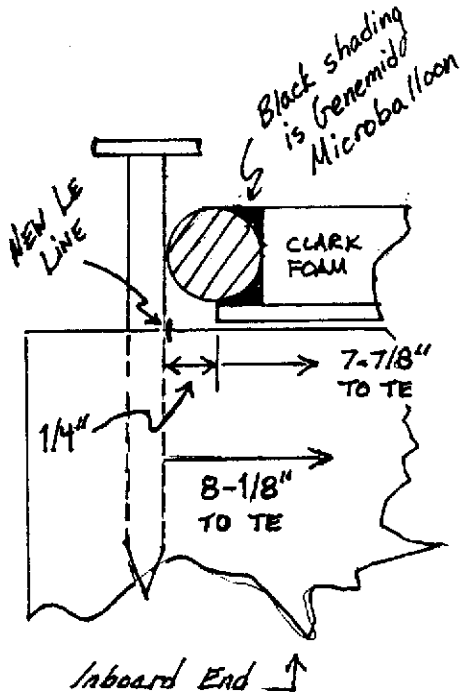
* NOTE: Cover the IB & OB ends of the aileron with one ply FINE BID.

DIAGRAM 1/PAGE 225
On a flat wood surface, such as an interior levan door, draw the outline of the aileron as it lies flat. At the IB end of the aileron drawing, project the 7-7/8" line forward 1/4", and make a mark (8-1/8" forward of the TE). At the outboard end, project the 5-7/16" line forward 1/4", making a mark 5-11/16" forward of the TE. Draw a line between the two marks that you just made. If you place the aileron in position in the outline, there should be a 1/4" space between the lower skin LE and the line you just drew. The line represents the LE of the lower aileron once the counterweight and BID layer are installed. The aileron LE cannot extend beyond this line.

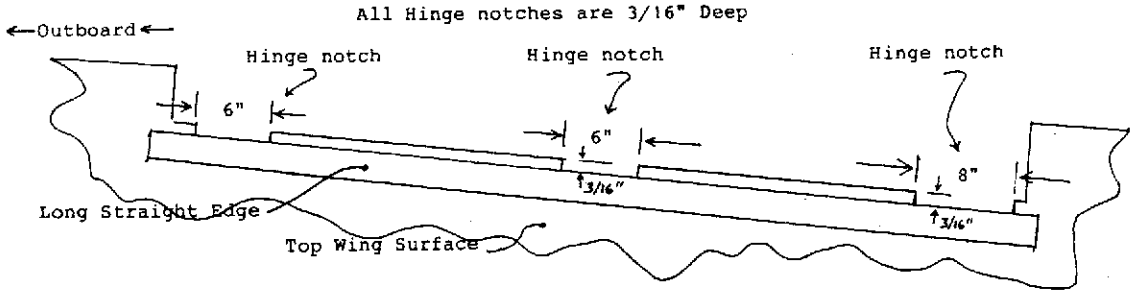
Drive several nails into the wood, just touching the boundary lines, so that you can lay the aileron back into the outline, install the CLARK Foam inserts & the Aileron counterweight without having any part of the aileron fall outside the boundary lines. The nails will serve as stable support for the counterweight while the 5 minute epoxy and Genemid-Microballoon is curing.

Note that we also show nails driven through the Clark Foam into the blue foam. This helps to steady everything during cure.



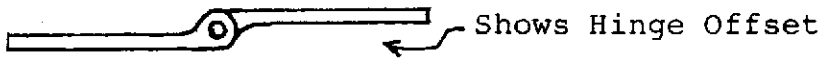


HINGE INSTALLATION Cut or sand another 1/4" from the lower wing cut-out T.E. for future clearances of counterweight. Sand all edges straight. Cut 3/16" notches from the upper wing cut-out T.E. at the hinge locations. Slightly chamfer the inside edges. Use a straight edge as a guide to align the notches.

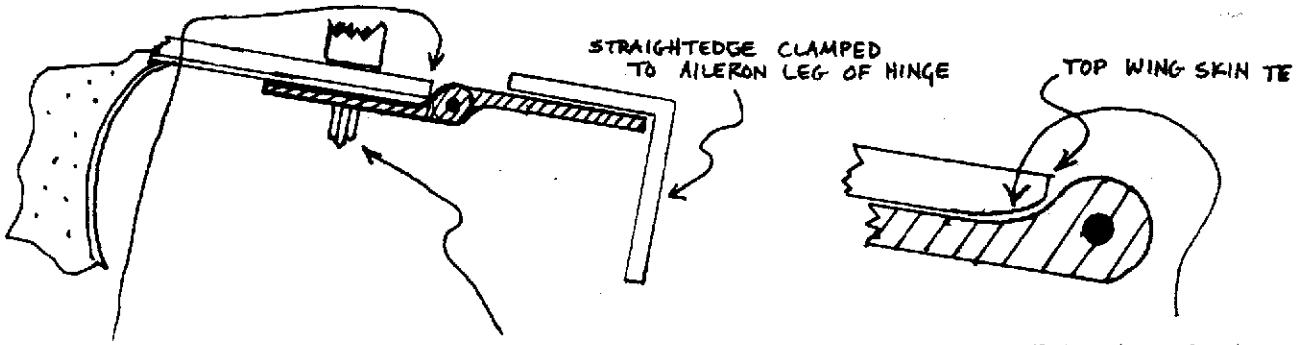


Make trial fits and sand or file away interferences so that the aileron installs back into the cut-out properly. Slight misfits may be corrected with micro-sphere filling and sanding later.

Find the 6' section of aileron hinge provided with the kit. REMOVE THE HINGE PIN, REVERSE THE HALVES TO OFFSET THE HINGE AS SHOWN BELOW, AND REPLACE THE PIN. Cut four hinges 6" long and 2 hinges 8" long. The remainder will be used for the rudder hinges, which are NOT OFFSET.



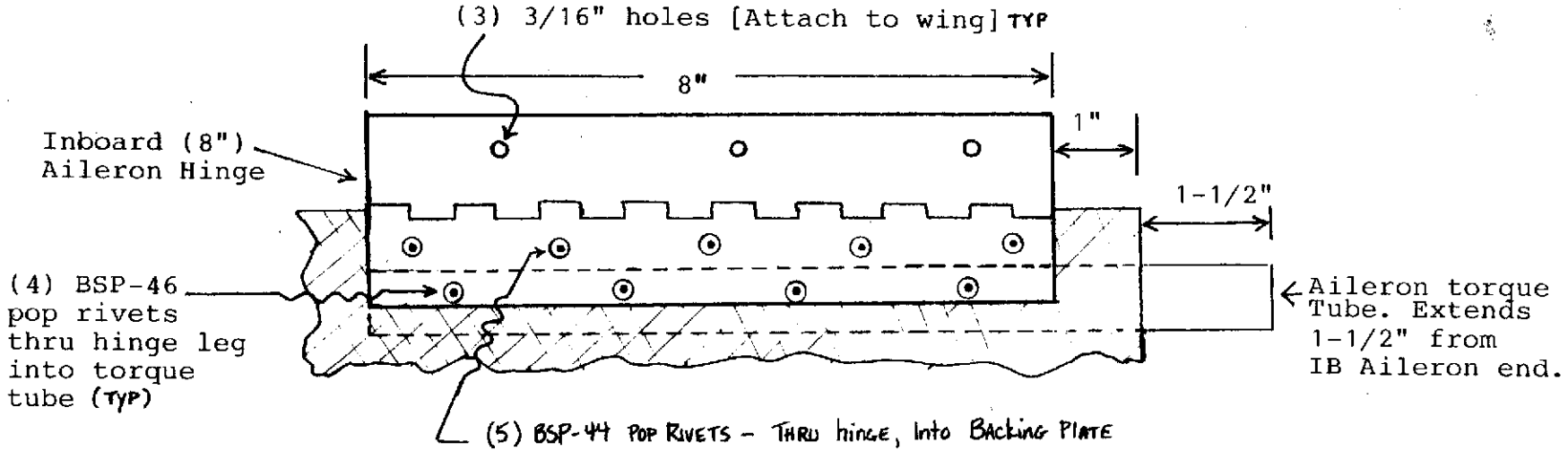
Pre-drill (2) 3/16" mounting holes in the wing leg of each 6" hinge, and (3) 3/16" holes in the wing leg of each 8" hinge. Place the hinges on the wing in their proper positions and clamp the aileron leg of the hinge to a straight edge long enough to hold all three hinge pins in a straight line. When you are satisfied with the hinge locations and alignment, drill mounting holes through the upper skin and fasten in place with 525-10R8 screws, AN960-10L washers, and MS21042-3 nuts. Rotate the straight edge up and down to check for any binding. If any misalignment occurs, the holes in the hinges can be slotted slightly (within reason).

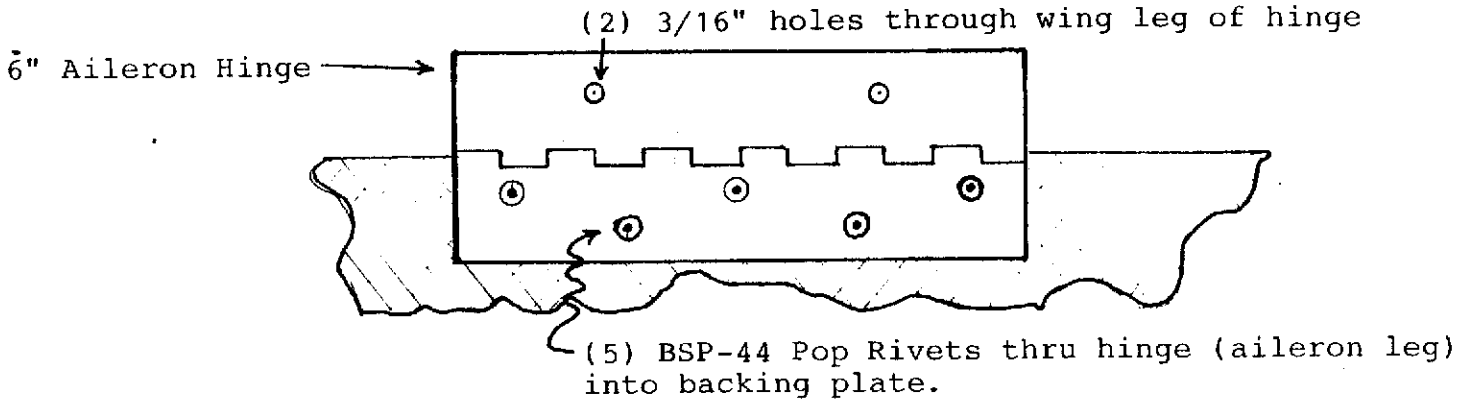


Top skin TE (In aileron cut-out)

Cleco wing leg of hinge in place through 3/16" holes. Clamp straightedge to aileron leg of hinges, for length of aileron, to keep hinges in line during installation to wing. An L-shaped straightedge will have superior stiffness compared to a flat bar.

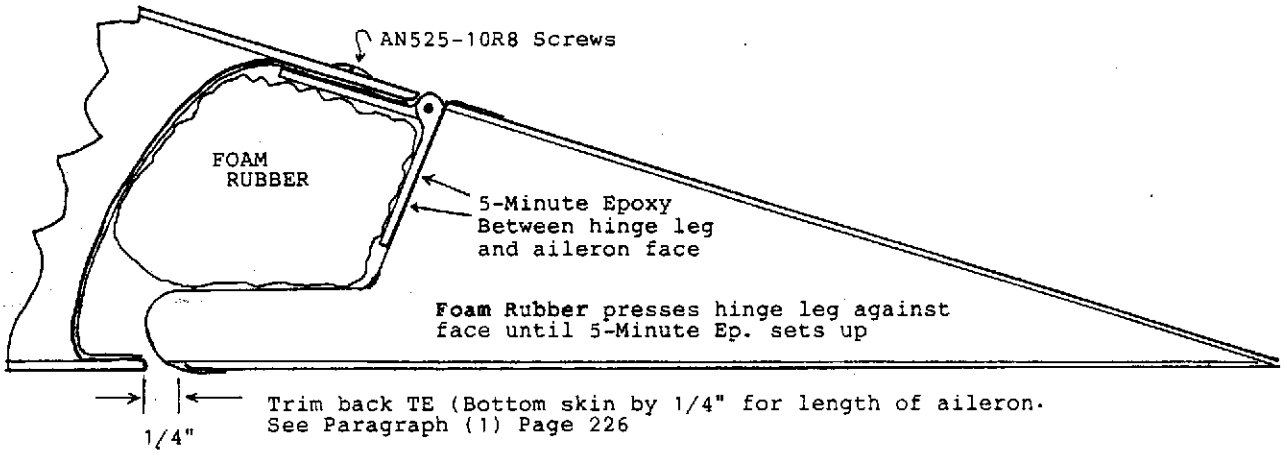
Note that the inner skin of this hinge notch has been tapered to allow the top of the hinge to be flush with the wing top skin. The importance of this will be explained on the next pages.





* Hinges are sanded and bonded permanently with GENEMID-MICROGLASS.

NOTE By looking at the diagram, you will see that the top of the hinge pivot protrudes just a bit above the surface of the wing. Subsequently, the aileron leg of the hinge is about as high as it can go in relation to the aileron. This is important, as the higher the hinge leg goes on the aileron, the further back it moves the balance point, which is advantageous to you, the builder and pilot. If you do not take care, and the hinge pivot is lower on the aileron face, the pivot point for aileron balancing will be moved forward. UNDER OPTIMUM CONDITIONS, THE TOP OF THE HINGE SHOULD BE FLUSH WITH THE FINISHED UPPER SKIN OF THE WING.



ATTACH HINGE TO AILERON Put sponge rubber in the aileron well behind each hinge to apply outward pressure on the loose hinge halves. Put dabs of 5 minute epoxy on the loose hinge halves and clamp or hold the aileron in place until cure. If any mismatch in thickness occurs, concentrate on keeping the bottom skin flush with the skin on the aileron.

After cure, remove the screws from the wing TE, and pull the aileron with attached hinges. Drill through the hinges and backing plates for 1/8" pop rivets (BSP-44 & -46). Detach hinges, clean off the 5-Minute epoxy and sand the hinges and mounting areas for bonding.

Apply GENEMID MICROGLASS to the hinges and mounting areas and pop rivet the hinges to the ailerons. BE CAREFUL NOT TO GET EPOXY IN THE PIN AREA OF THE HINGE. Be careful to not get epoxy in the pin area of the hinge. Use 5 rivets, staggered on each 6" hinge. Use 9 rivets staggered with 4 long rivets (BSP-46) through the torque tube. See diagram on page 227.

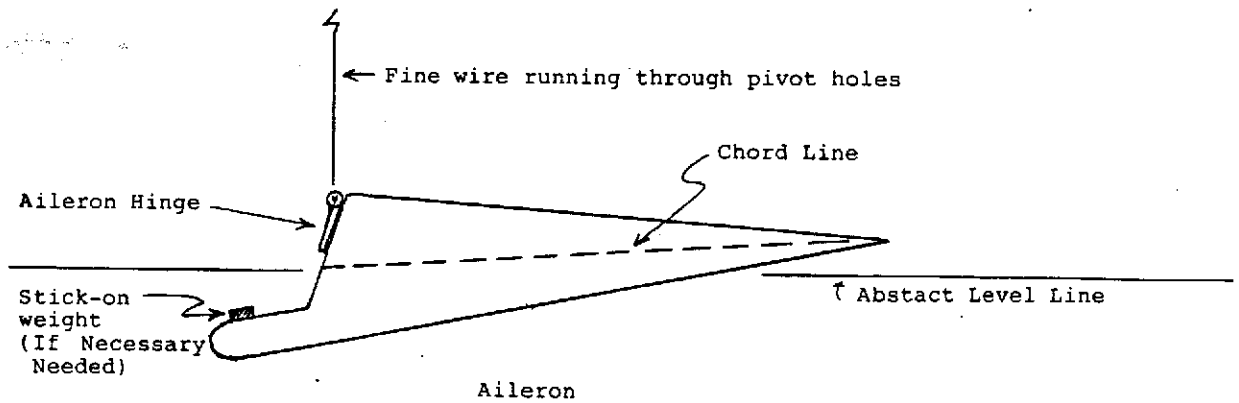
BALANCING THE AILERONS THIS IS CRITICAL TO SAFE OPERATION OF YOUR AIRCRAFT. PROPER BALANCING OF THE AILERONS IS DIRECTLY RELATED TO YOUR AIRCRAFT'S VNE. IF THE AILERONS ARE NOT PROPERLY BALANCED, FLUTTER CAN OCCUR AT ANY AIRSPEED, WITH CATASTROPHIC RESULTS.

When the ailerons are completed (excluding the finish coat of paint), run a wire through the pivot holes on the hinges, then suspend the aileron by the wire, which is extending from each end of the aileron. The aileron should balance such that a chord line (from the TE, projecting forward through the center of the front of the aileron) will be slightly nose down. It is better to reach the balance point by removing material from the aileron surface aft of the pivot point, than to add weight in the counterweight area. BE AWARE THAT FINISH COAT WILL ADD SOME WEIGHT TO THE AFT PORTION OF THE AILERON, AND THE ASSEMBLY WILL NEED TO BE RE-BALANCED FOLLOWING APPLICATION OF THE FINISH COAT.

Once you have shot your finish coat, you will need to re-balance your ailerons. Use the same method as described above. Two things must hold true for you to use this set of ailerons.

1) The total weight of each aileron must not exceed 8-1/2 lbs. In the case that they are too heavy, and you have removed all the material that you feel you can, notify us. We will supply you with new aileron cores, as well as directions for a new procedure that we have used here at the factory to construct lighter units. As the ailerons sit at about station 180, there is an advantage CG-wise in decreasing the total weight of the assembly.

2) The ailerons must still balance with the chord line still slightly nose down.



Aileron