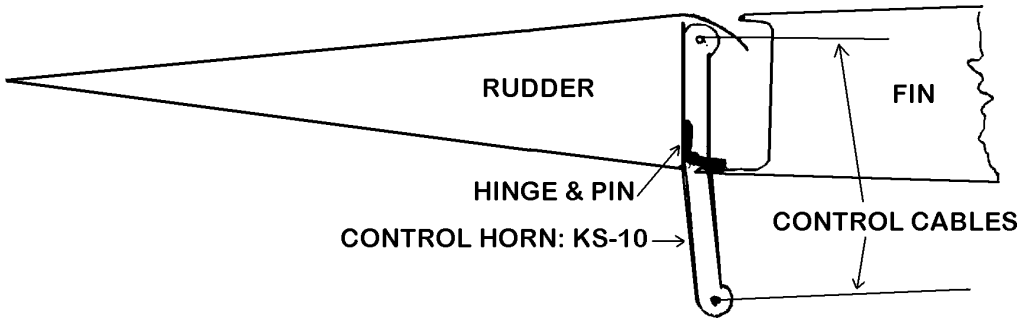
RUDDER

As with some other aircraft the rudder hinge line on the KIS is not on the center line of the aircraft. It runs down the right skin edge. Therefore the control horn to which the control cables connect extends out on the right side of the rudder but will be close to flush on the left side. Another variant on the rudder will be the hinge installation.

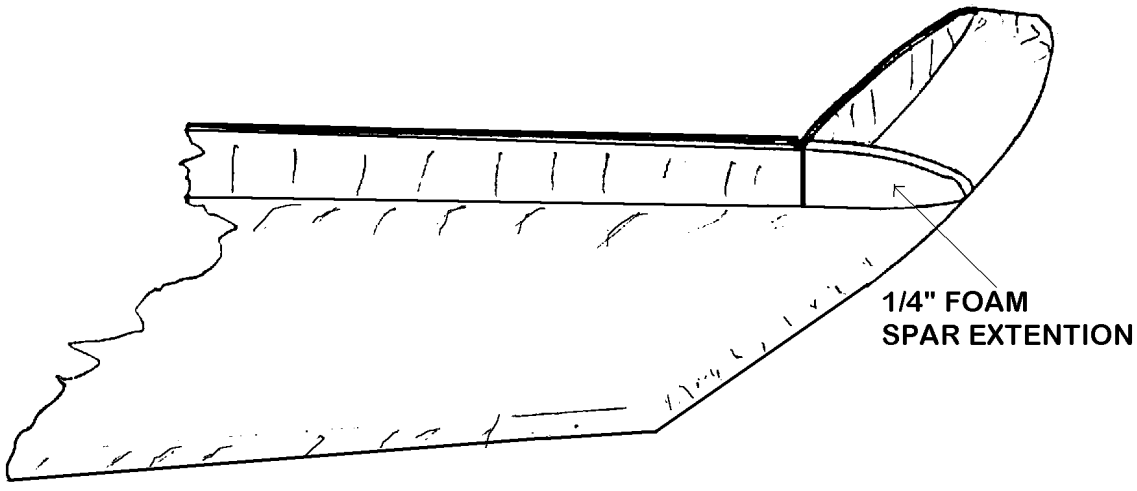


First remove the peel ply from both rudder skins. Examine the right rudder skin K07R. You will note that there is a scribe line down the spar and forward onto the balance portion. Use a hacksaw blade or other means to trim the excess off to this line. Finish by block sanding exactly to the scribe line. Place the skin outside surface down on the building table. Use bondo dabs or a hot glue gun to lightly tack it to the table.

Study the drawings in this section to determine where the right skin (and its integral spar) must be sanded for good epoxy adhesion. Sand the appropriate areas (i.e. 2 inches each side of anywhere the ribs and spar extension will be virtually the entire inner surface of the spar, and the inner surface of the balance web and balance tip.

Before going further cut all the various plastic and metal parts that are needed. Take a piece of ¼ foam and cut out the upper and lower ribs slightly oversize using the full size patterns for approximate size. At the same time cut apiece for the spar extention. (Make your own paper template first to avoid wasting foam.)

Cut two aluminum hinge mount inserts from .063 aluminum 1 x 8 inches. Cut a third piece of .063 aluminum 2 x 2½ to insert under the rudder horn attach nuts.

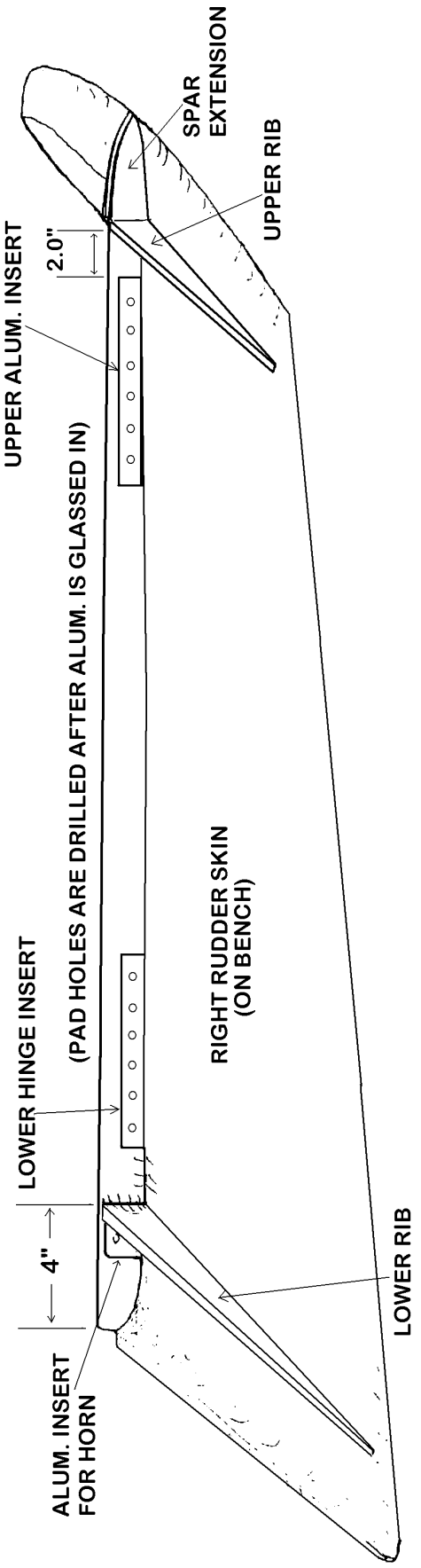


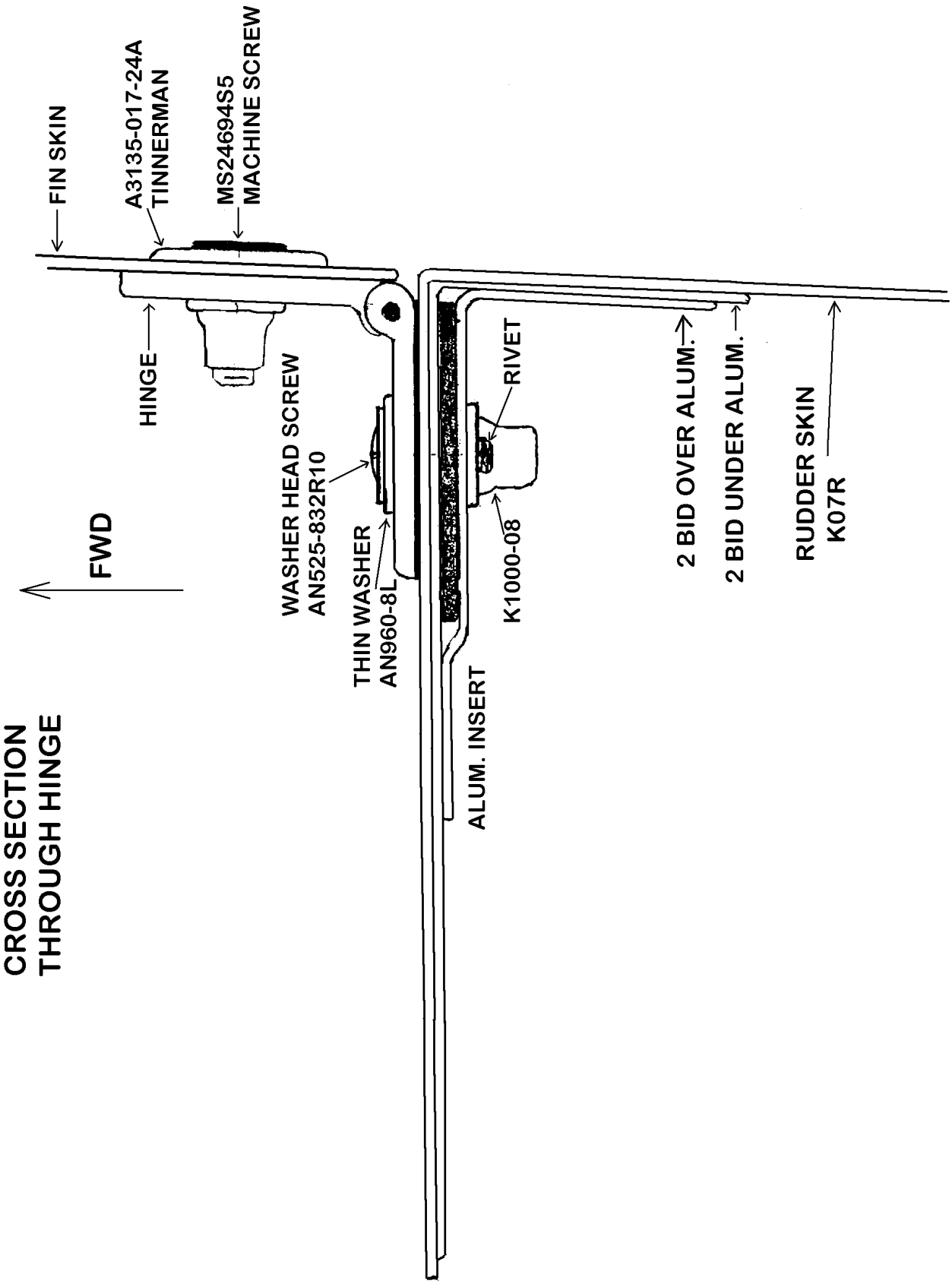
Tack glue the spar extension into place using some 5-minute epoxy. Add some micro fillets in the corners and then epoxy two layers of BID onto each side of the extention. The glass on the aft side will extend well down onto the spar and overlap about one inch onto the skin. The glass on the forward side will wrap well around onto the balance web and also overlap the skin.

Continue immediately by tacking the two ribs into place with 5-minute epoxy. Again put some small micro fillets in the corners. Glass these ribs on both sides with two layers of BID; the glass should of course tie onto the spar and skin. When covering the bottom of the upper rib and the top of the bottom rib the BID should actually be about 11 or 12 inches longer than the rib so that it can run the length of the rib and then up (or down) the spar to make a reinforced pad areas for the aluminum inserts to sit on. The same BID should extend about 1 inch onto the skin near the rib and onto the skin near the spar thereby tying everything together.

Take the three aluminum inserts and prepare to install them in their proper positions. Note that the upper edge of the lower insert is 1 inch below the lower rib that should be 4 inches above the bottom of the rudder. (The rudder hinge bolts will go through this pad.) The bottom edge of the lower hinge insert sits 8 inches above the bottom of the rudder. (The lower hinge bolts go through this insert.) The upper edge of the upper insert sits 2 inches down from the upper rib. (The upper hinge bolts go through this pad.) All inserts butt into the corner formed by the skin and spar.

Sand both sides of the aluminum inserts. Install them with a. little thin flox mixture on both sides of the metal.

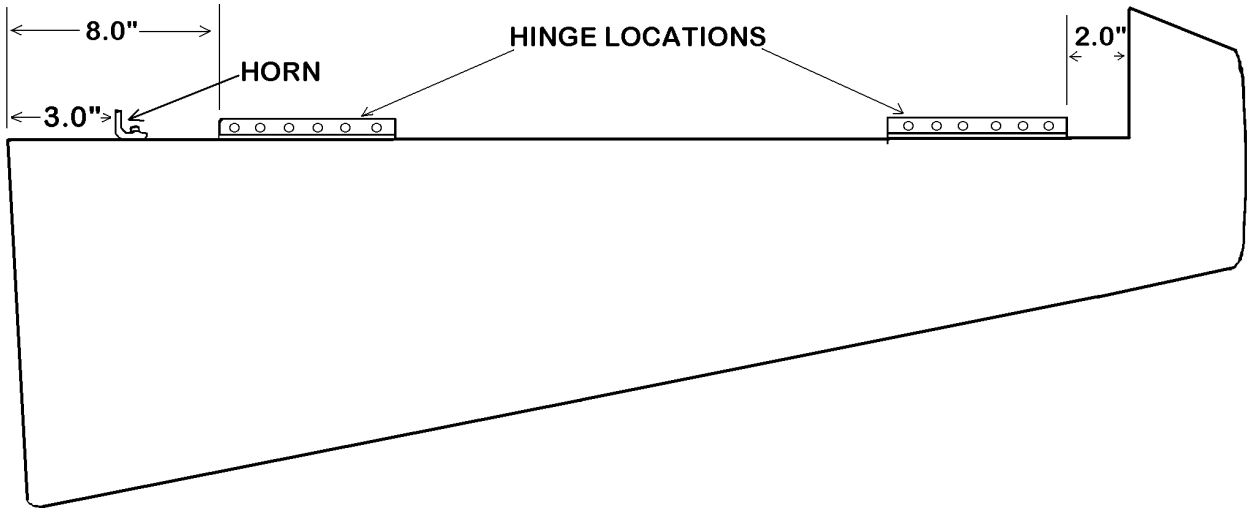

SPAR EXTENSION
UPPER RIB
2.0"
UPPER ALUM. INSERT
(PAD HOLES ARE DRILLED AFTER ALUM. IS GLASSED IN)
RIGHT RUDDER SKIN (ON BENCH)
LOWER HINGE INSERT
4"
ALUM. INSERT FOR HORN
LOWER RIB



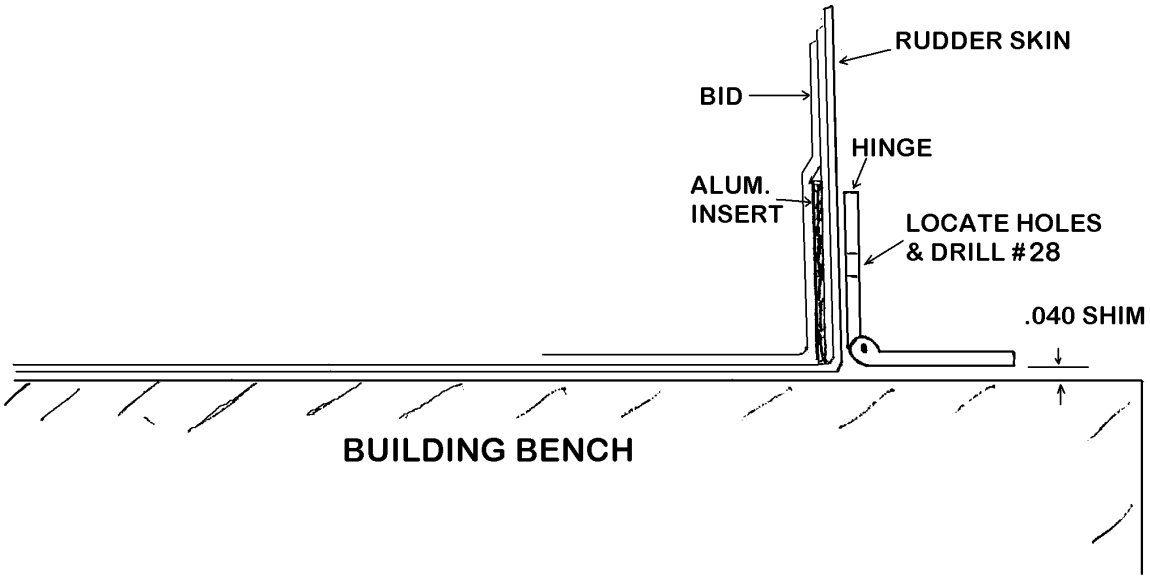
CROSS SECTION
THROUGH HINGE

Continue without allowing the epoxy to cure. Cut more BID and apply two layers over both inserts extending about 2 inches onto surrounding structure. If there is any tendency for the pieces to delaminate prior to cure then clamp some plastic bag covered blocks to keep pressure on the total hinge pad laminate. This will hold the laminates in close contact with the spar. Let everything cure.

The hinges will now be mounted so that they fall over the aluminum inserts and so that they will interface properly with the fin skin. The rudder horn will also be mounted.



First place the right skin assembly about 2 inches in from the edge of the bench. Note that the hinges must be shimmed up 0.040 inches above the bench before locating hole centers. A few layers of tape or paper temporarily glued to one leg of the hinge will facilitate this. Locate the holes and jig drill #19 holes for the hinge screws.



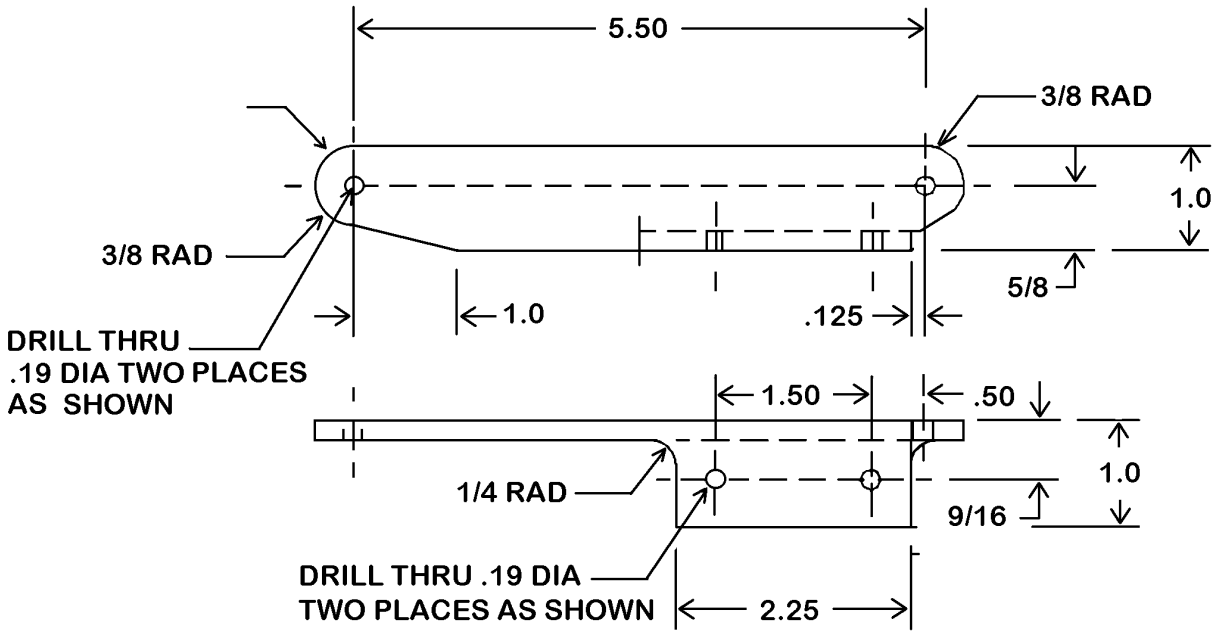
After the hinge holes are drilled in the spar attach the K000-08 anchor nuts on the inside with rivets. Mount each hinge with six AN525-832R10 washer head screws. Thin (AN960-8L) washers will probably have to be used under the screws for spacing.

Fabricate a rudder control horn per the drawing on page 7. Establish the proper position for the horn. It should be located vertically about 3 inches from the bottom of the rudder. It must be placed laterally so that

the two control cable attach holes are equally spaced from the hinge pin. The left arm of the horn should be just inside the skin line. Drill two #12 or 3/16 holes for the AN3-4A bolts that mount the rudder control horn. Secure the K 1000-3 anchor nuts with rivets. Bolt the horn in place.

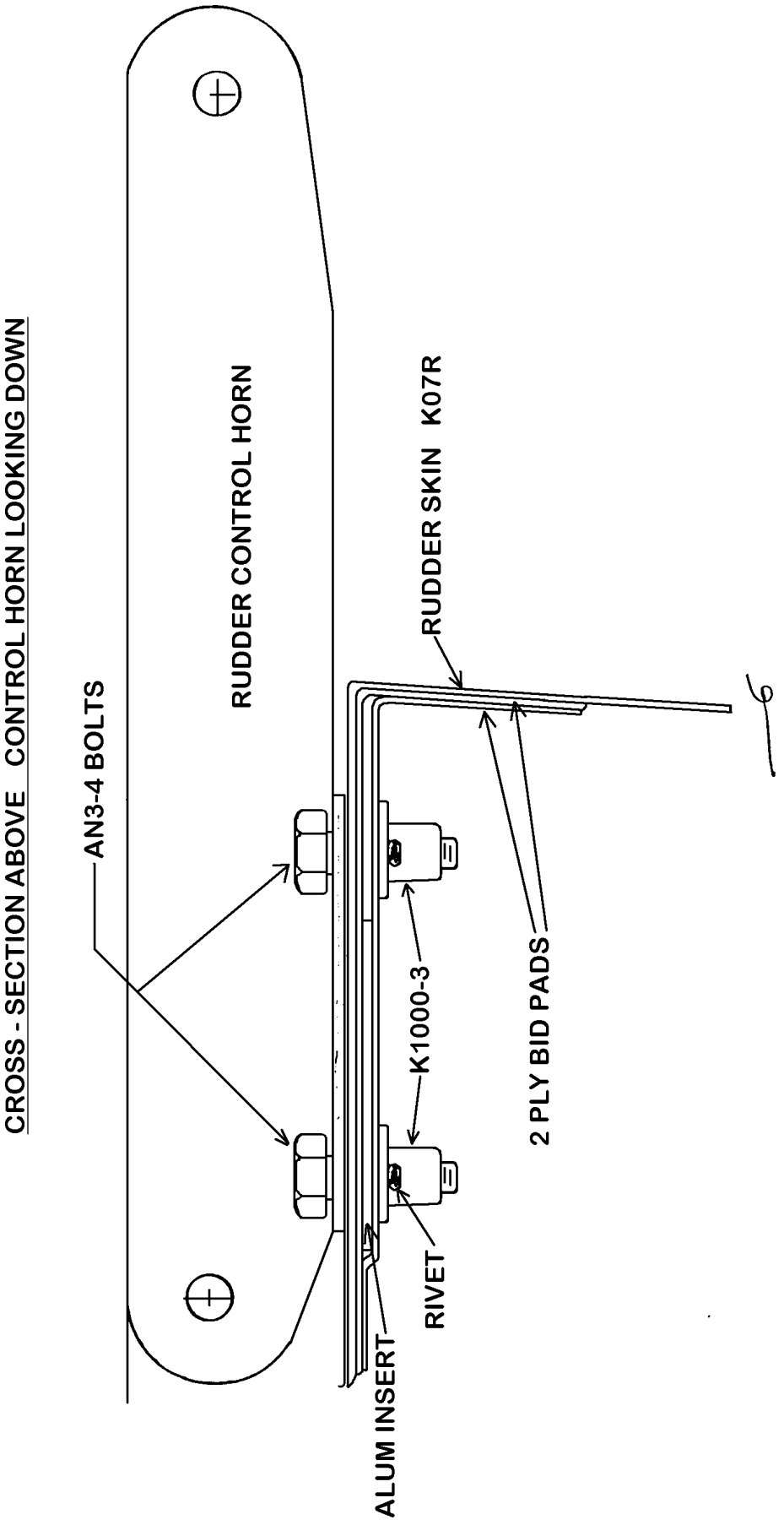
Lay the left skin K07L in place. Check to see if all the parts mate properly. The trailing edges should mate, the spar on the right skin should butt against the left skin and so forth. Trim the ribs and other mating pieces to fit properly. When the fit looks okay, tape the left skin in place with masking tape.

Hold the rudder assembly in place on the fin so as to locate the hinge mount holes positions on the fin trailing edge. As with the other surfaces the hinges mount on the inside of the fin trailing edge. Drill the holes and bolt the rudder into place using MS24694-55 screws, A3135-017-24A Tinnerman washers, and AN365-08 elastic stop nuts.



REVISED RUDDER HORN - FABRICATE FROM 1 x 1 x 3/16 6061 ANGLE PROVIDED

TRI-R TECHNOLOGIES 1114 E 5TH. ST. OXNARD CA. 93030 (805) 385-3680	
TITLE KIS RUDDER HORN	
	NOV 1993
	AUTOCAD FILE NAME KSRDRHRN

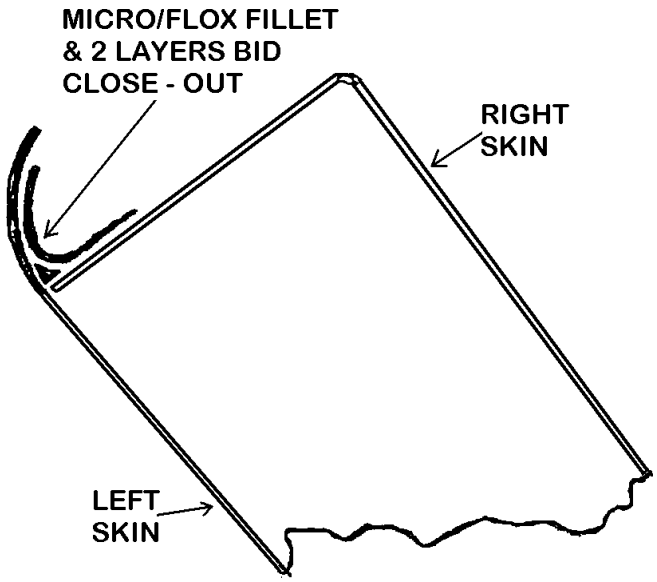

CROSS - SECTION ABOVE CONTROL HORN LOOKING DOWN
AN3-4 BOLTS
RUDDER CONTROL HORN
RUDDER SKIN K07R
K1000-3
2 PLY BID PADS
RIVET
ALUM INSERT

Swing the rudder back and forth to assure there will be no interface problems. It must be free to travel at least 25 degrees left and 30 degrees right. Correct any problems and assure that the rudder can be permanently closed.

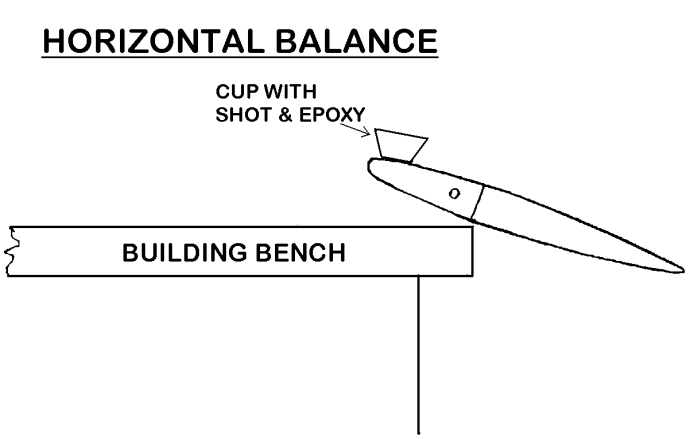
Remove the rudder from the fin by removing the rudder hinge screws vice fin hinge screws. Remove the control horn. Remove the left skin. Fill the hinge and horn mount holes and anchor nut threads with clay.

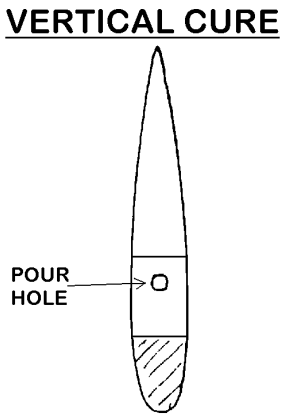
Prepare the left skin by sanding it wherever BID will be applied (i.e. within two inches of the ribs, spar, and trailing edge). Place the right skin face down on the bench. Remove about ¼ inch of foam from the ribs to form micro/flox channels. Fill the rib channels leaving excess micro/flox piled high on the ribs. Put some micro/flox along the trailing edge but avoid excess weight back there. (Make the flox ½ to ¾ wide and about ¼ high to fill the "V" formed in the trailing edge. Close the structure by placing the left skin into exact position. Make sure the surfaces are aligned. Use small weights or tapes as required to keep everything in place during cure.

After cure, trim off the little lips at the bottom of the skins. Add a two inch 2 ply tape of BID in the joggled areas around the top and around the bottom. Add a 2 ply tape about 3 inches wide to the inside channel to tie the vertical web to the left skin. A small flox fillet in the corner notch will help if applied prior to adding the cloth.



It is now time to balance the rudder. This is done in the same manner as done with the elevators. Clamp or screw the hinges to the edge of the building board. Place lead shot in a cup until it almost balances the surface when placed out on the balance section.





Cut a hole about one inch in diameter in the bottom of the balance web about 4 inches back from the tip of the leading edge. Add some epoxy and flox to the lead shot in the cup. Check the balance with the cup in place again. Add or subtract as appropriate and pour the mixture into the balance cavity through the hole. Allow to cure nose down so that the lead is in the very tip of the balance. Check after cure for correct balance. The result should be that the rudder should be very slightly overbalanced to allow for paint. More lead/epoxy/flox can be added or drilled out if necessary. Close the hole with a piece of BID.

Construction of the rudder is complete.