

SECTION 1:



Rudder Spar
8R2-1

Spar Doublers
8R2-2

Photo showing the rear side of the spar.

Web: the web is the flat area between the left and right flange on of the Rudder Spar.

Clamp the two doublers to the inside of the spar.

CHECK: The bottom end of the Doubler is flush with the end of the spar. Also check that there is no gap between the spar flange and the Doubler (both are bent at the same angle)



Looking at the front side of spar

Use a soft felt tip marker. Never use a scribe or sharp object to mark lines.

Trace along the edge of the spar flange to mark the Doubler.

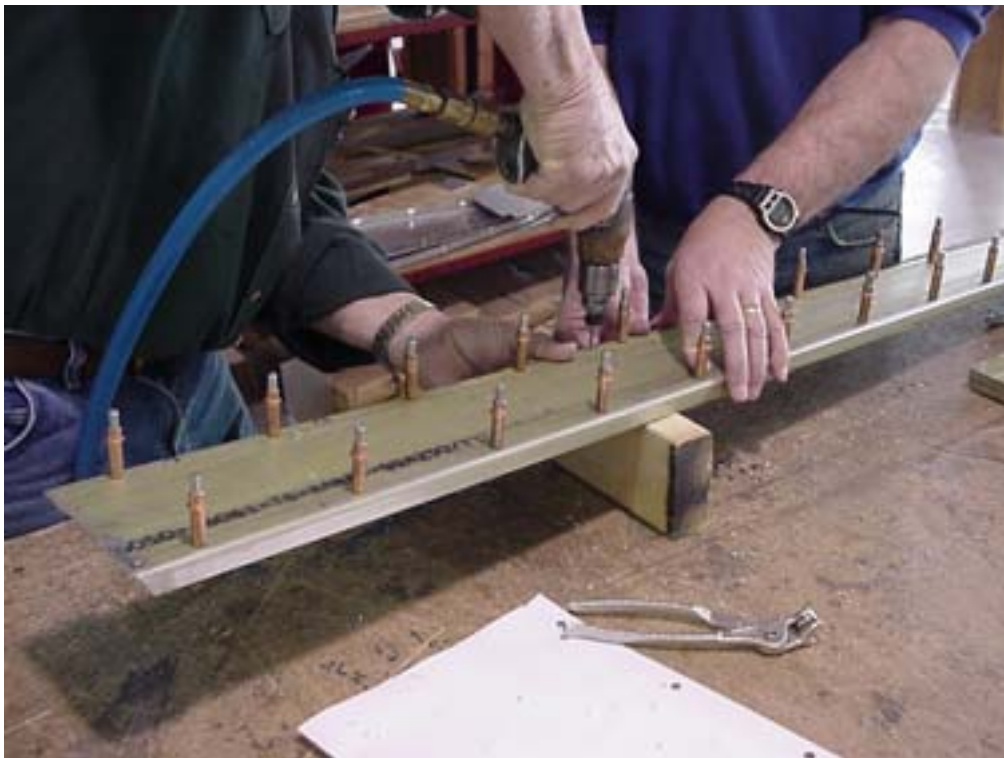


Remove the Doubler from the Spar.

Marked line on the Spar Doublers **8R2-2**

Trim the bottom corner of the Doubler along the marked line.

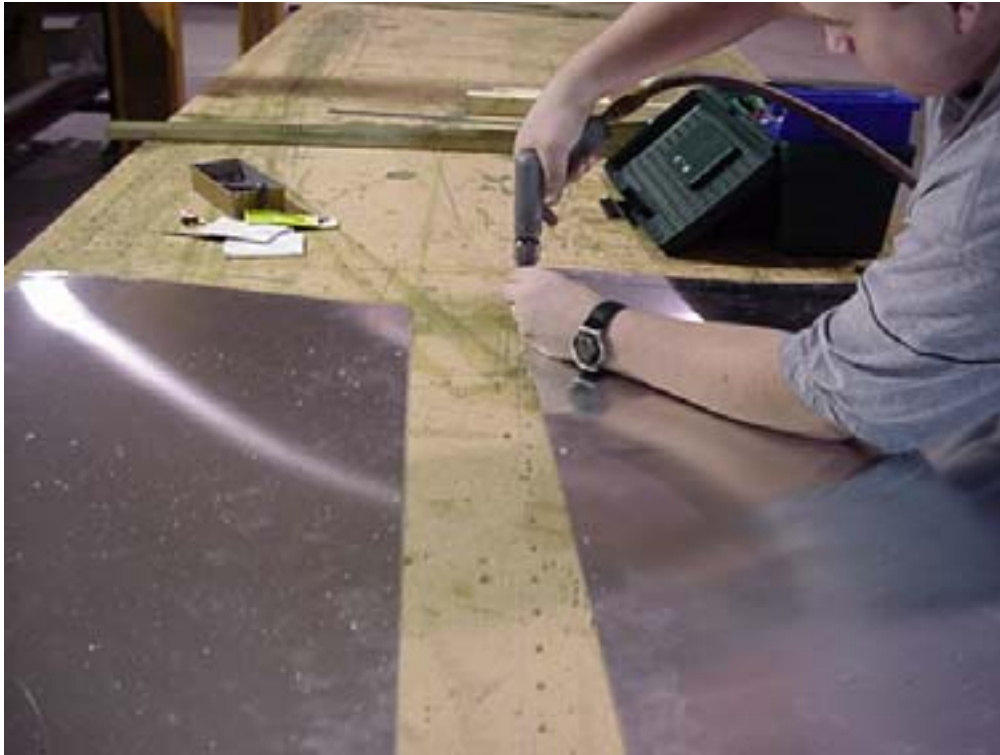
COMMENT: The hand snips are color-coded red or green handles.
Photo of the Green (right) snips.



TIP: It is not necessary to drill with pilot holes #40. Drill into the Doubler through the pre-drilled pilot holes in the spar with a #30 drill bit.

CLECO: Insert a cleco in the drilled hole before drilling the next hole. Drill and Cleco every third holes, then go back and drill the hole in between the cleco, at this point it is not required to add additional clecos when drill between the clecos.

Clamp the Doubler inside the spar flush with the bottom of the spar. Turn the assembly over to drill and Cleco through the pre-drilled pilot holes.



Drilling:

Keep the drill square to the work piece.

With your other hand, guide the drill bit to the next hole.

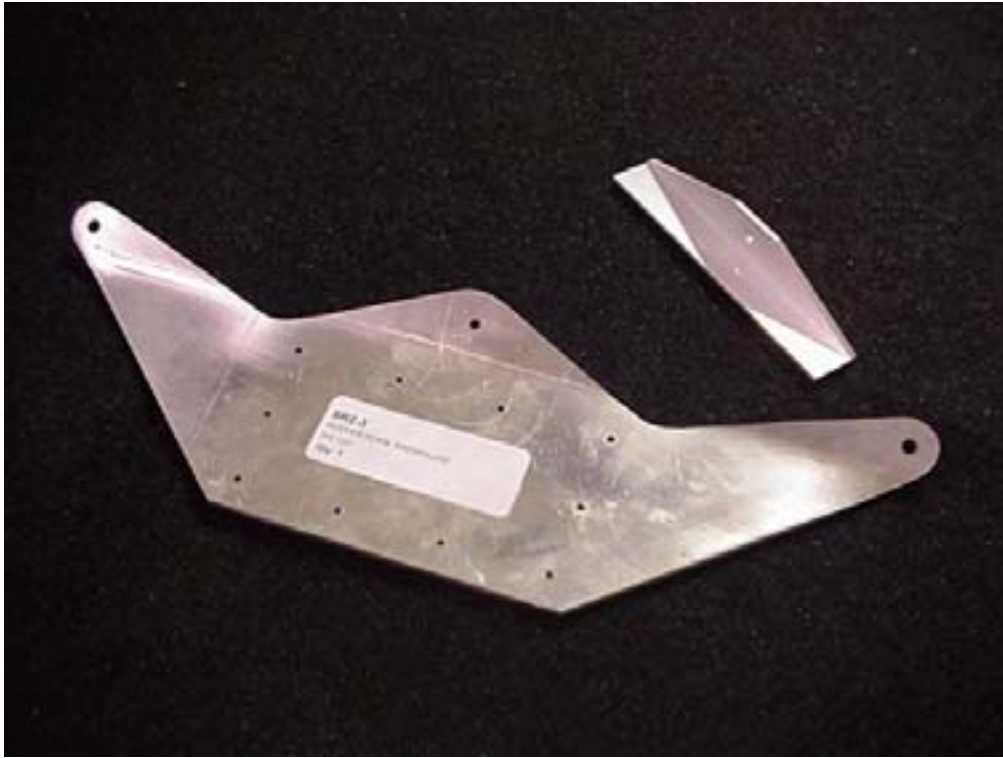
First apply a short power burst of the trigger to make sure the drill bit is properly centered in the hole, then prepare to drill through: squeeze the trigger for max RPM.

NOTE: No, there are no Match drilled holes: when two or more parts are joined, the pre-drilled holes only appear in one part; either the spar or the skins are supplied with #40 pilot holes.



Cleco Pliers

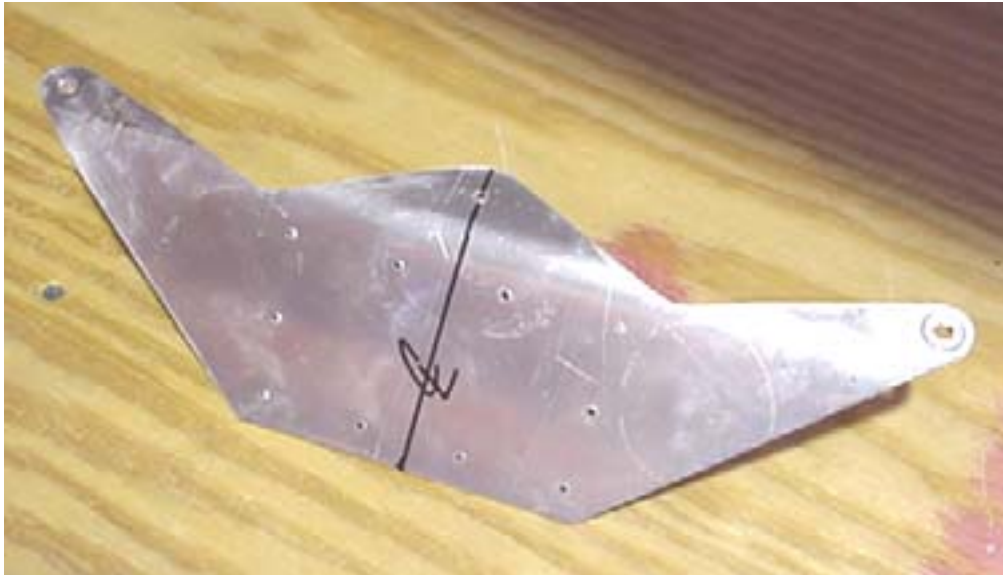
To remove clecoes, support your other hand between the work piece and the cleco plies to help push the plies up with your fingers.



Upper Hinge Angle
8R2-4

Rudder Horn
8R2-3

Parts supplied with pre-drilled holes, the horn is routed to shape



Looking at the bottom side of the horn, the bend is towards the top of the rudder.

Use a square along the aft edge of the Horn to mark the aircraft center through the pre-drilled center hinge hole.



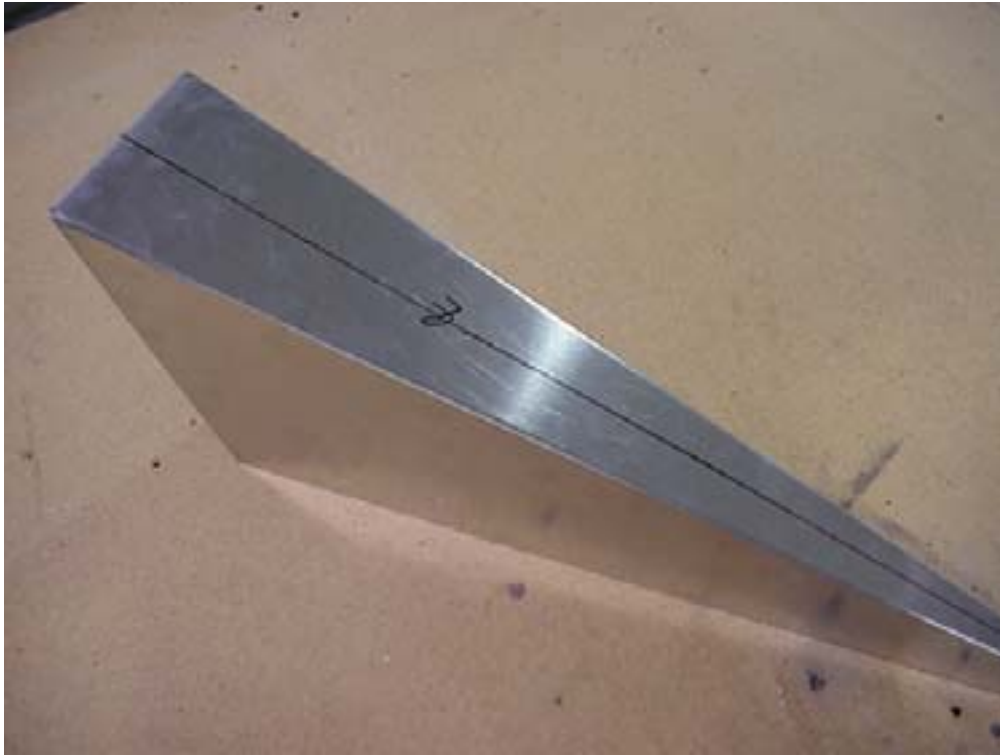
Looking at the top side of the horn

Cleco the Extrusion Angle to the Horn. CHECK: Measure each end of the Angle to check that it is parallel with the back edge of the Horn. If necessary adjust the Angle parallel with the horn.



Toggle clamp

Clamp the hinge angle parallel to the bend (aft edge of the horn)



Lower Rear Rib #1
8R1-1

Mark a centerline on the bottom side of the rib.



Looking at the bottom
side of the Rib #1

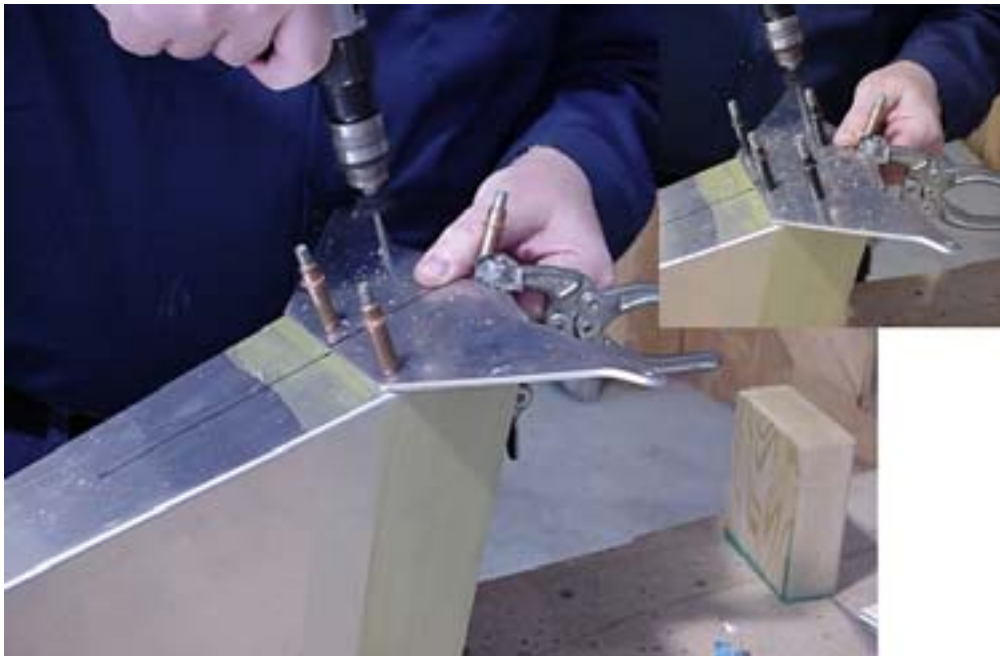
Line up the rudder horn assembly with the centerline on the Bottom Rib.



Position the Extrusion Angle against the front flange of Rib #1

NOTE: The angle between the Horn and the front flange of the Rib is 90 degrees.

With the parts clamped together, turn the Rib over to check that the centerlines are still in line.

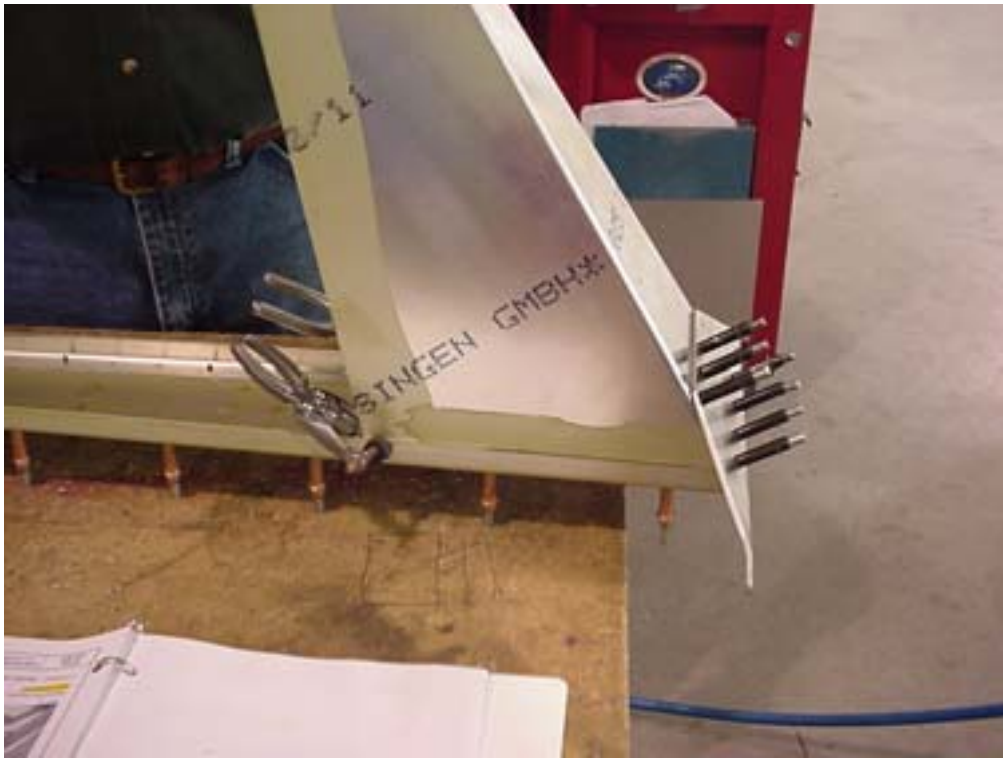


After drilling and clecoing the 4 corner holes, drill the middle holes, no additional clecos are required.

#20 HOLES FOR
10 RIVETS A5

1/8" (#30) = Copper cleco
5/32" (#20) = Black cleco

SUGGESTION: First drill and cleco with #30 undersize holes. Then change drill bits and drill and cleco for #20 holes.



Remove 8R2-4 from rear rib #1.

Insert the sides of the bottom rib to overlap on the inside flange of the Doubler. The top surface of the horn is flush with the bottom of the spar.

Clamp the top of the rib flange to the spar flange.



CHECK: Before drilling check that the bottom of the spar is against the horn (to keep the bottom of the rib parallel with the bottom of the spar)

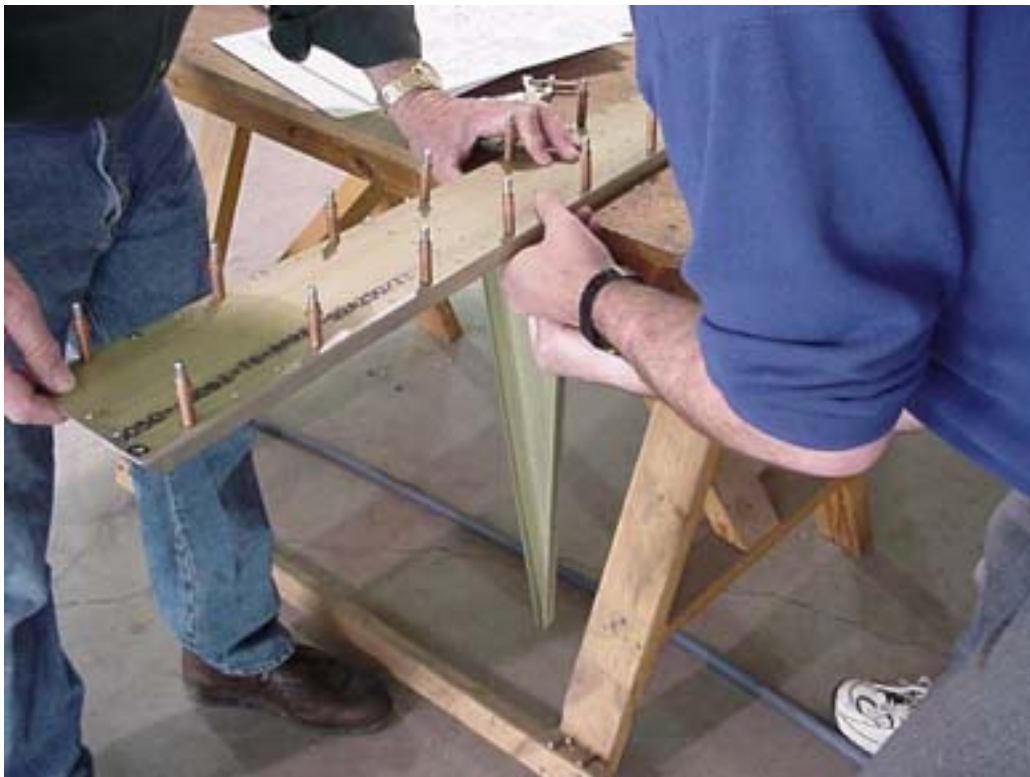
Drill and Cleco (the two end holes first, then the middle holes) with #20 drill bit.



Using a straight edge is not necessary. Use your second and third finger as a guide to mark the rivet line 10mm from the edge.

COMMENT: Use a soft felt tip marker. The thick line drawn by the marker is slightly narrower than the diameter of the #40 pilot hole drilled in the skin. Too thin a line will make it more difficult to see the line through the pre-drilled holes in the skin.

Mark the **rivet line** on each flange, don't forget the spar flange (the flange that will be drilled to the spar web).



DRILLING: Avoid drilling elongated holes. The best way to avoid elongated holes is to assure that the parts do not move or shift while drilling. Before drilling move the assembly or support the work pieces on a solid surface.

Drill and cleco rear ribs #2 - #5 – all rib flanges face downward.

Position the Rear Rib inside the Doublers. Clamp the rib to the spar when the rib flange rivet line is visible through the pre-drilled holes in the spar web.



Wood blocks are used to support the Rudder assembly. Note that the Clecos do not touch the workbench – in general it is not good practice not to have anything sit on top of clecos!

Rear ribs on spar.



Lay the spar on its side to drill the rear ribs.

BACK SUPPORT:
When drilling the ribs hold a small wood block in the corner of the rib flange, do not hold the flange with your fingers – Use the support block to protect your fingers.