

## Riley Model B

### Series 18 - Stabilizer Construction

July 1, 2024

There is very little difference in the construction methods used for the stabilizer and the rudder, but since the parts are labeled differently, a separate set of instructions is needed. Obviously, there is a right and left side to the stabilizer. Both panels are symmetrical and therefore interchangeable.

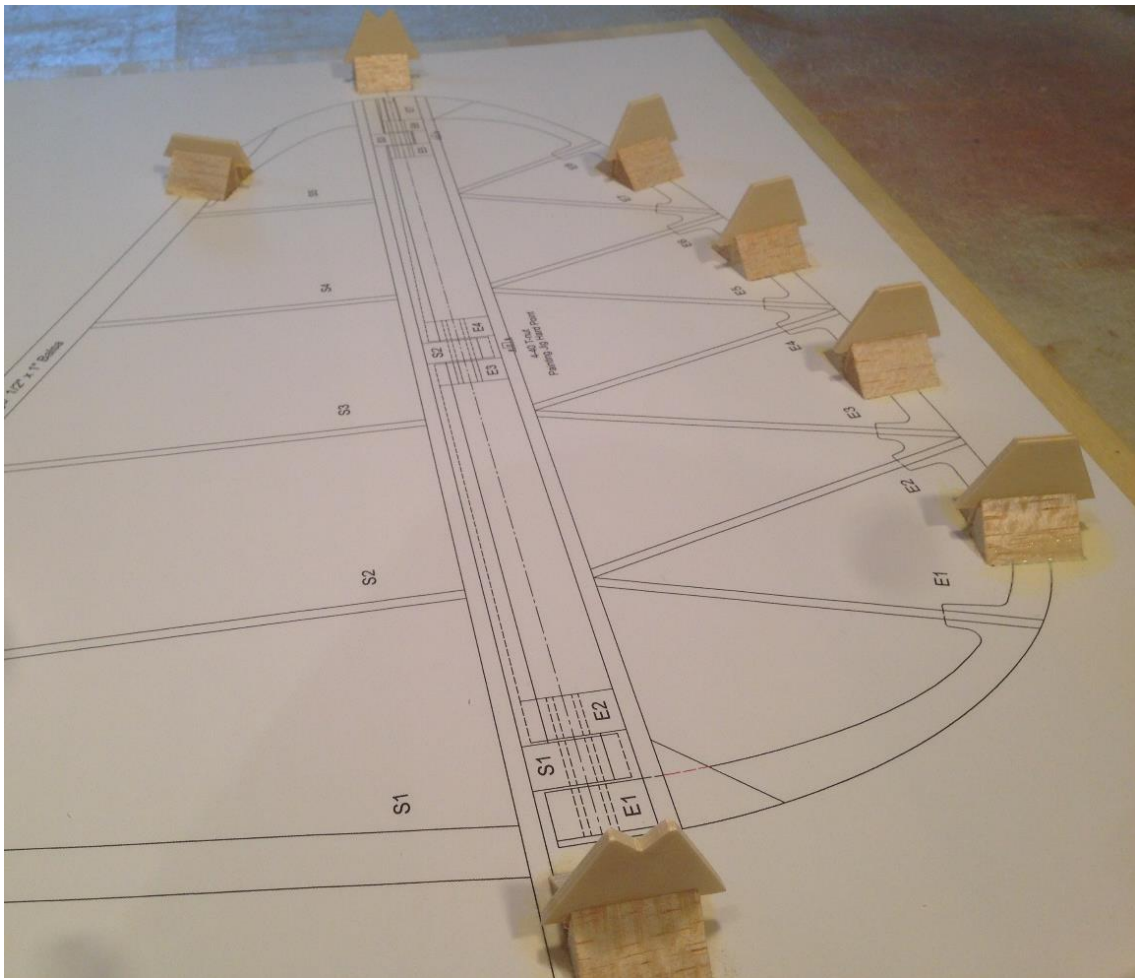
Note: Some pictures are from earlier builds and may not exactly conform to the plans or text. But the construction is the same. When in doubt follow the plans and text.



## Prepare Stabilizer Construction Jigs

Apply plan template to a *flat* building board. Spray 3M #77 or Krylon Easy-Tack adhesive onto the plan; *not* the building board. If the plan is difficult to remove after construction is completed, a lite coat of ordinary paint thinner will easily soak through the plan and allow it to lift off the building board without difficulty.

Prepare (16) 3/8" x 3/8" x 1" basswood blocks and glue all jigs to the plan. Titebond glue applied with an acid brush works well. Unlike CA glue, Titebond will not soak through the plan and risk bonding to the building board, which would make it difficult to remove. Note: The two notched hinge alignment jigs have a kerf mark which should align with the center line of the hinge.



## Making the Hinge

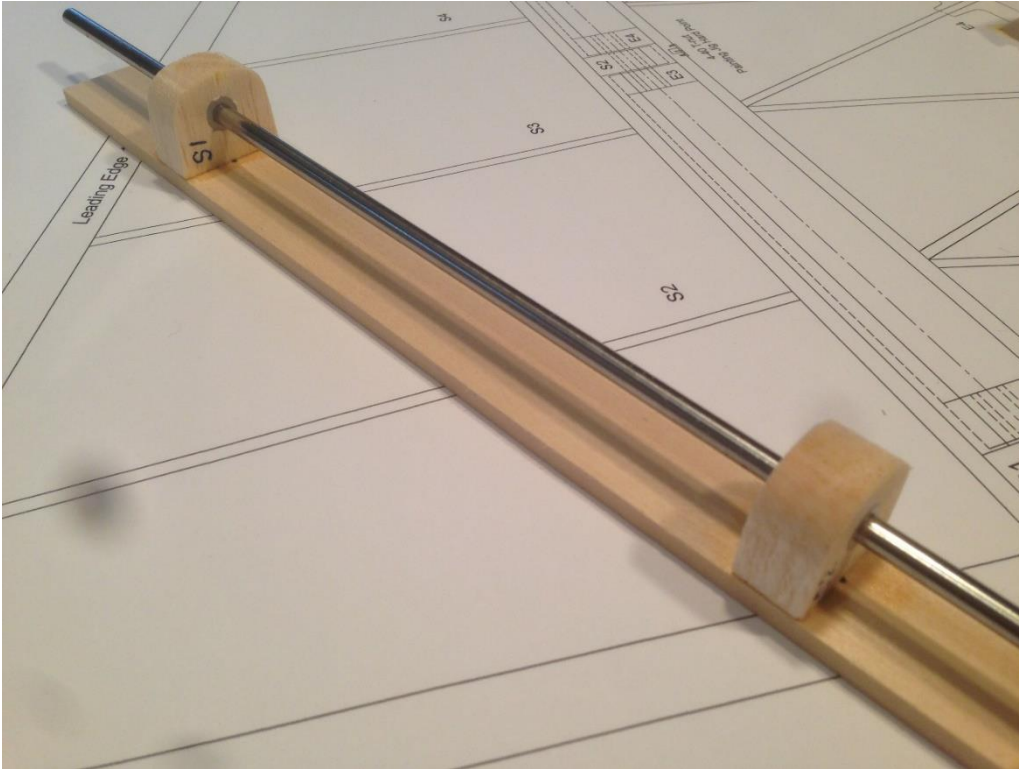
The stabilizer and rudder hinges are designed in the same way. A nylon spacer is inserted into a balsa hinge block. The nylon spacers are available from McMaster-Carr, part number 94639A355. These spacers are inserted into the 5/16" hole drilled through the balsa hinge block. Usually, you can just push them in with your finger. A better way is to chuck a short length of 3/16" dowel (metal or wood) into your drill press and using the dowel as a guide, press the spacers into the balsa hinge block. There is virtually no side force on the hinge, so just a little thin CA at each side of the hinge block is sufficient.

Cut a piece of .191" steel rod to a length of 25." Smooth the ends for easier insertion. This rod helps to create perfect hinge alignment. (Available from McMaster-Carr.)

Using the steel rod, *dry fit* the stabilizer hinge blocks S1, S2, and S3 onto the basswood stabilizer hinge spar. The sides of the hinge blocks should be located exactly "on-center" between the 1/32" holes. When the alignment is correct, glue with thin CA.



Glue balsa tip to stabilizer spar.



In like manner, *dry fit* the elevator hinge blocks E1 – E6 into the elevator hinge Spar. Insert steel rod to insure good alignment. The .191" steel rod has very little clearance as it is inserted through the nylon bearings. It may be tight. However, the 3/16" Delrin hinge should slide through effortlessly.

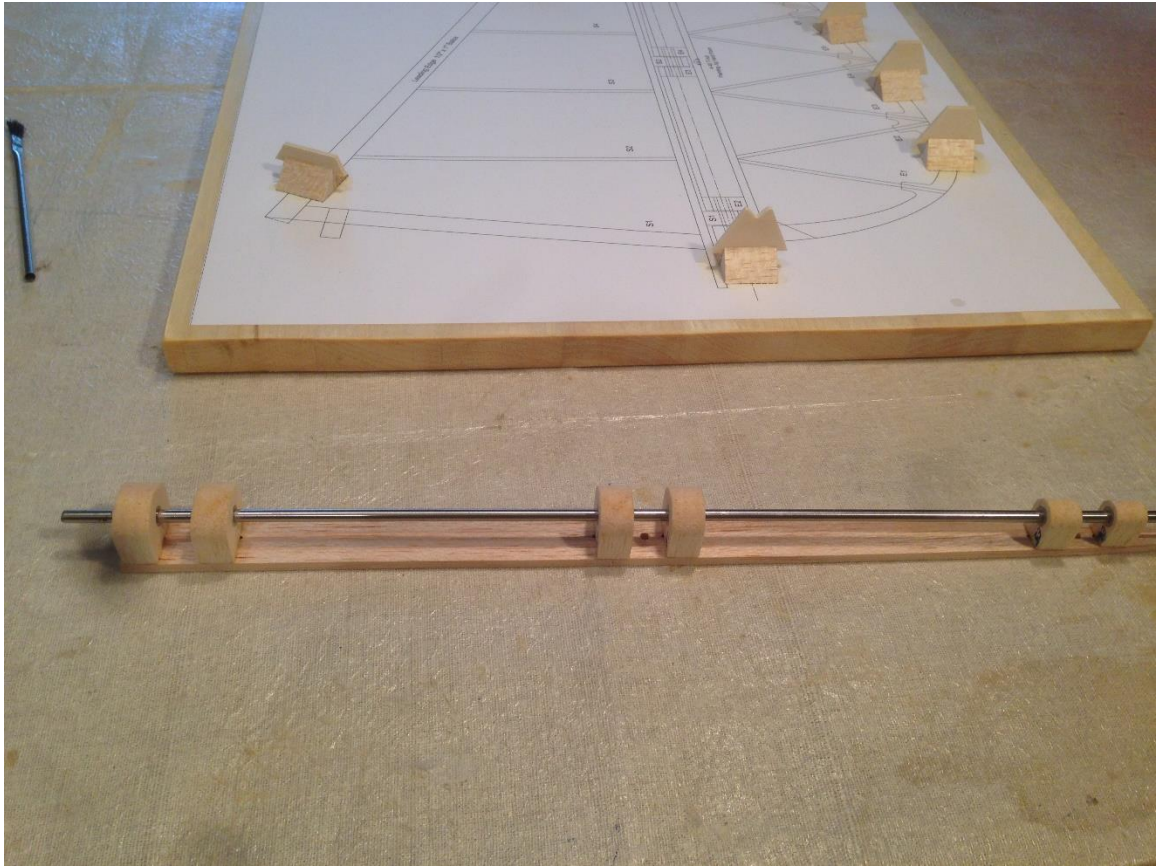
Notice that E1 has a 1/16" relief from the end of the spar. This is where the control horn will mount in a later step. Refer to plan for clarity.

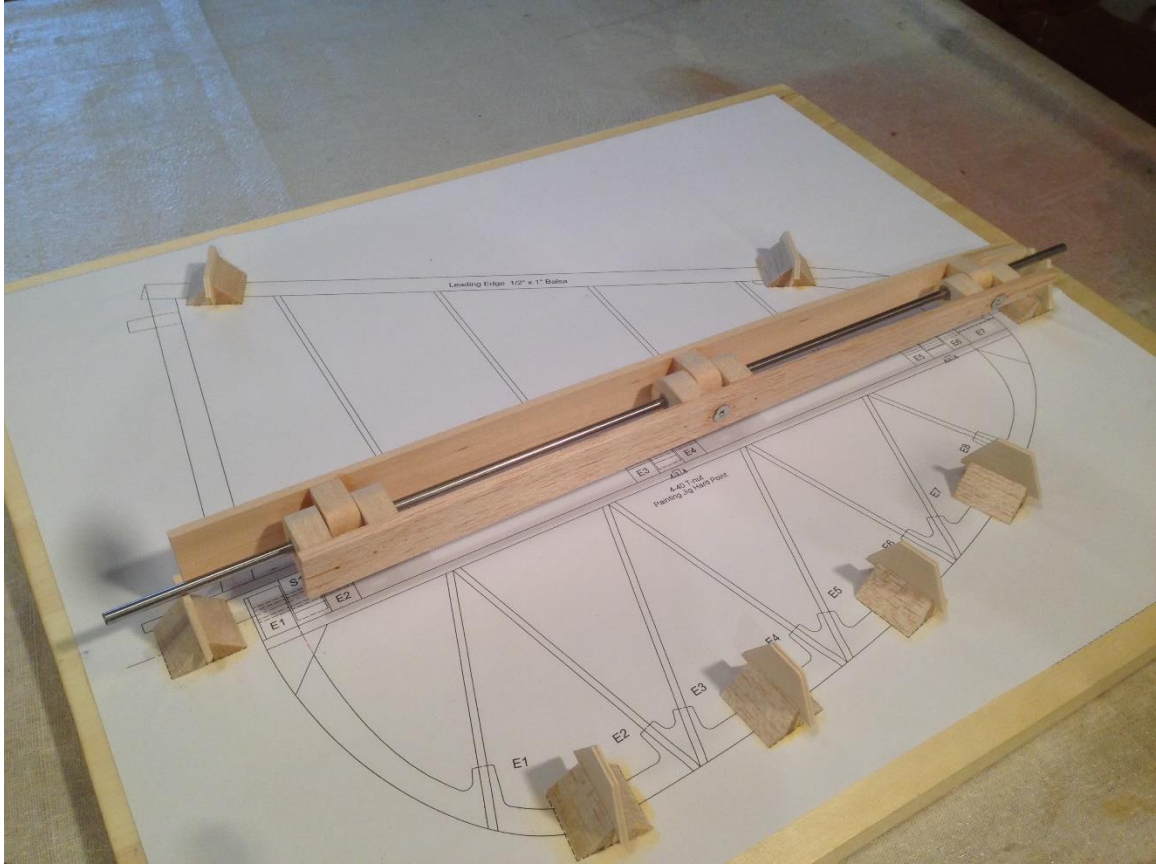
When alignment of the hinge blocks E1-E6 is correct, glue with thin CA.

Finally, glue E7 in place.



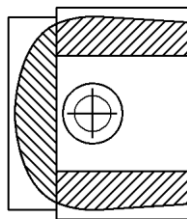




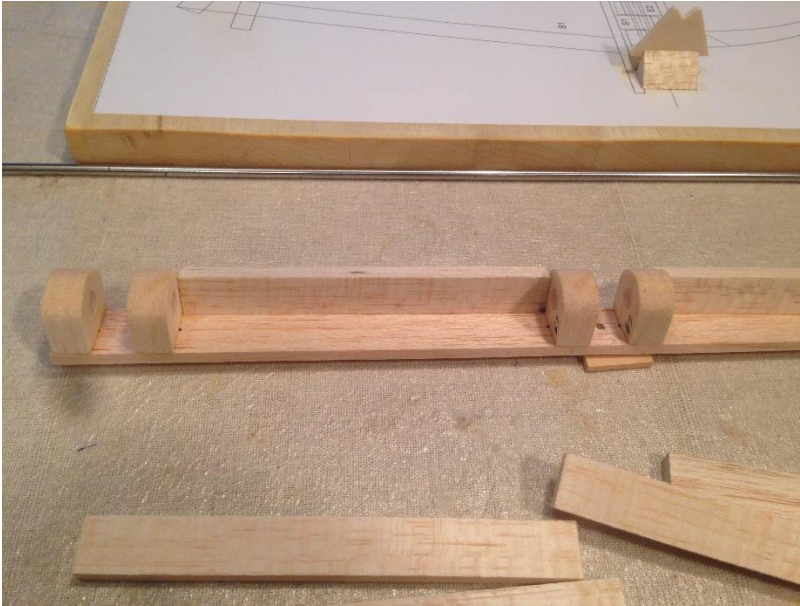


### Elevator hinge Spar – Fill Procedure

Fill elevator Spar between the hinge mounts with  $1/4'' \times 13/16''$  soft balsa on the sides and  $1/4'' \times 1-1/8''$  on the top. Mark the hinge blocks and the edge of the spar with a ball point pen to identify the shaping and sanding limits. Try to position the sides and top so that when about half the material is trimmed away, about half will remain.



Elevator Fill - Typical



Fill gaps between E1-E2, E3-E4 and E5-E6 with 5/16" balsa triangle stock. Resaw 3/8" triangle stock to make 5/16" triangle.





**CAUTION:** The next step is shaping. The elevator spar at the tip is fragile. Insert the steel rod to prevent any breakage while shaping the tip.



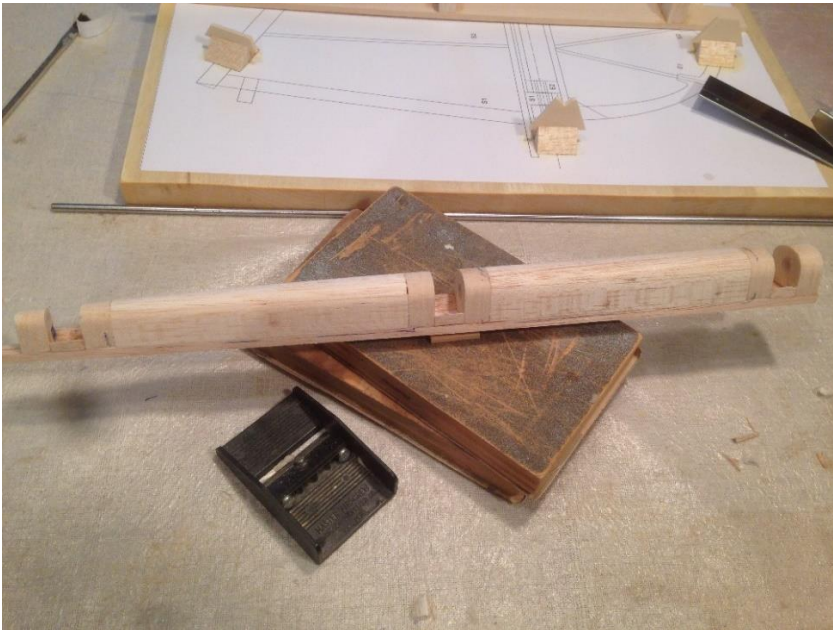
Shape elevator hinge with razor plane followed with a 40 grit sanding block and finished with 80 grit sanding block. Allow about 45 minutes. Here are a few general principles to keep in mind while shaping:

1. Work slowly. Be deliberate and patient; there's no hurry and no rush. Use a lite touch.
2. Use the plane first; then use sandpaper. The plane gives you a lot of control and makes it easier to see what you are removing.
3. Always plane down (remove) what is most obvious. Use your fingers and sense of touch to check your progress. It is best to plane down the whole part together rather than to concentrate in just one area. (I hope this makes sense.)
4. Use a ball point pen to mark any edge surface you don't want to plane or sand away.
5. Use sharp (new) 60 grit sandpaper and a large sanding block. Attach the sand paper with 3M #77 adhesive spray.

These two videos are linked to the rudder construction manual, but the shaping method is virtually *identical* for the stabilizer. Press Ctrl key and click on the link.

<https://www.youtube.com/watch?v=U5N41eE47m4>

<https://www.youtube.com/watch?v=JUV8eWD8MgE>



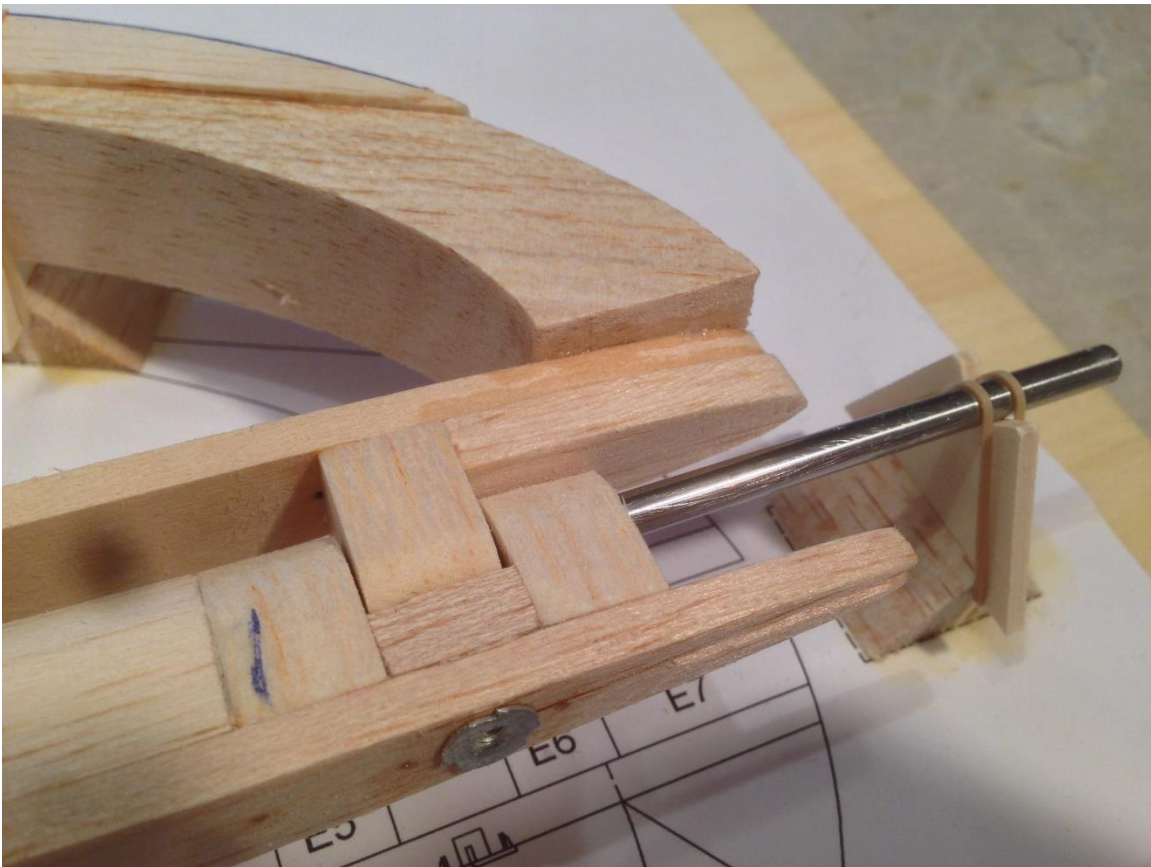
Assemble the hinge and check for adequate up and down rotation. 15° is plenty.

### Framing the Stabilizer

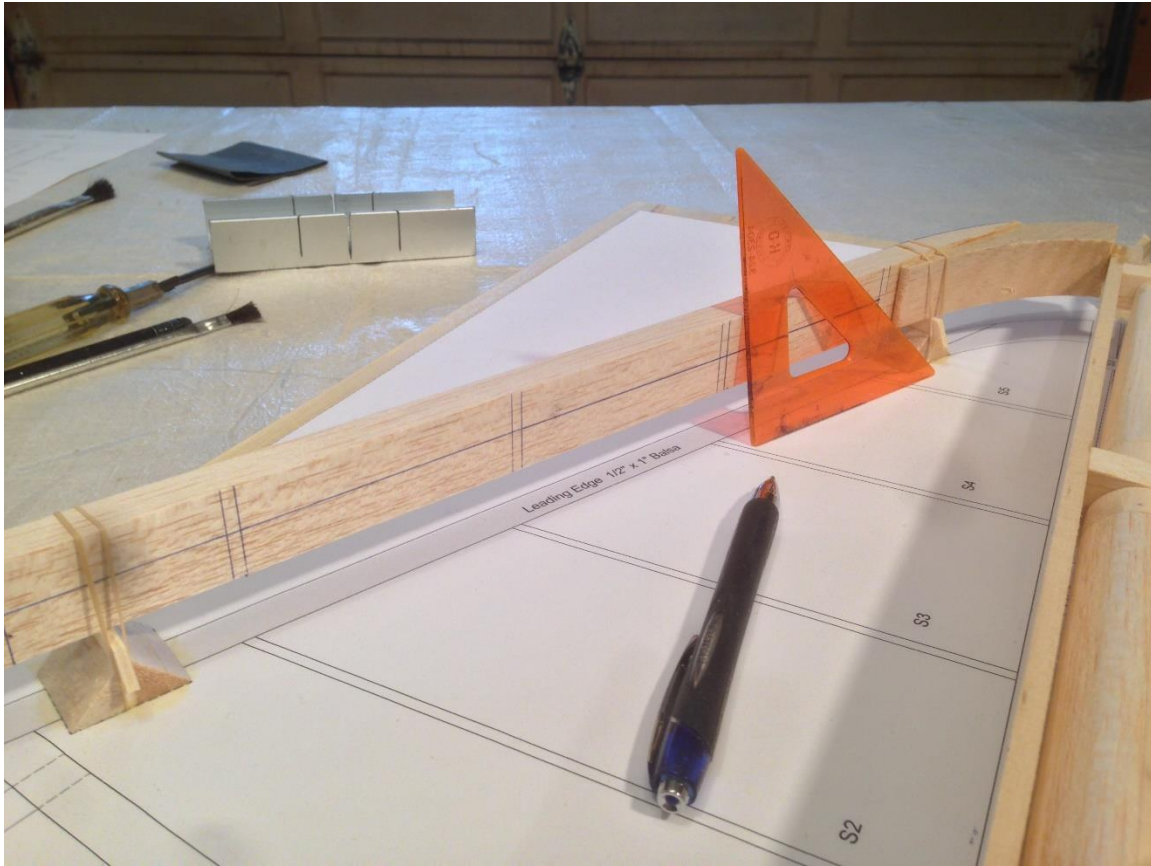
Draw the Chord Line on-center on *both* sides of the Leading Edge.

Set Leading Edge on jigs and secure with rubber bands. Use a small square; make absolutely sure that the Leading Edge is perfectly aligned to the plan.

Assemble the hinge. Install into the jigs as shown on the plan. Glue stabilizer spar at the tip to the leading edge. Make *sure* that the spar is *square* to the building board.

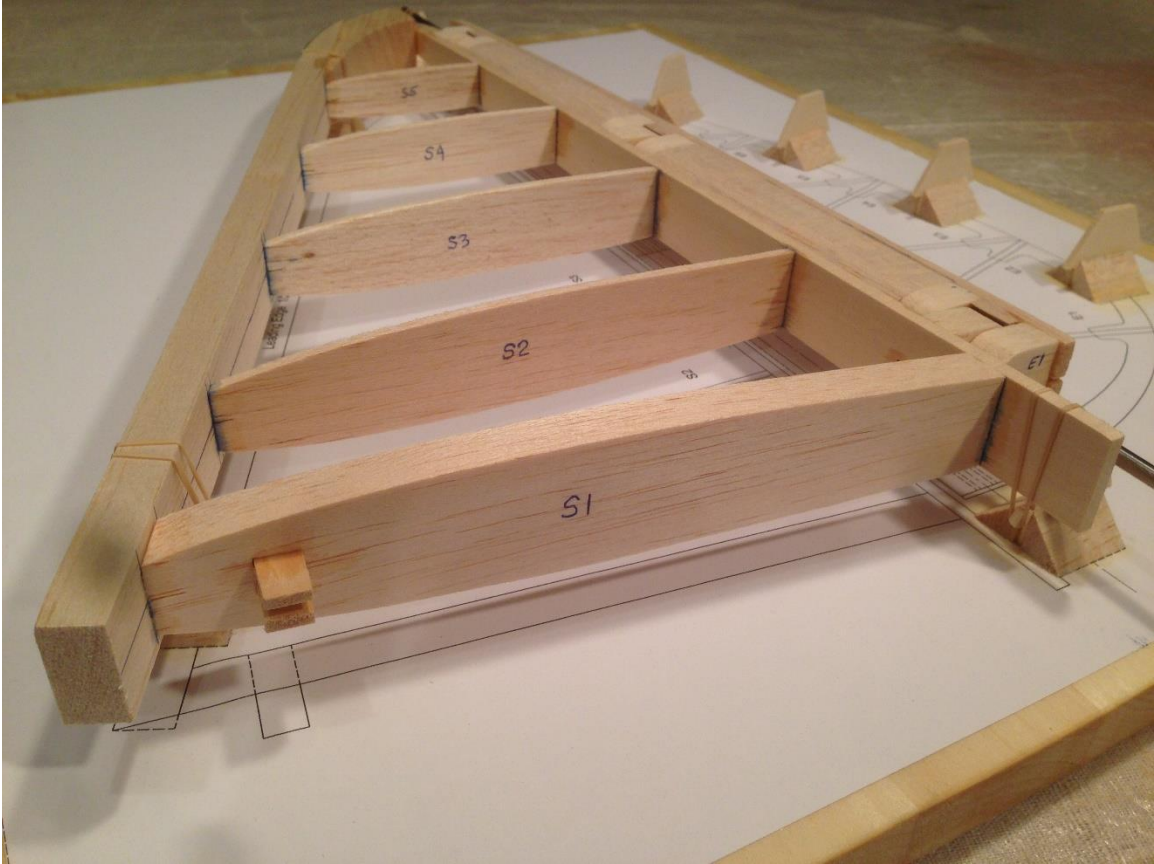


Use a small square and mark location of all ribs on the leading edge and the stabilizer spar.



Glue (2) 1/8" x 3/8" x 1" basswood "stubs" into S1 as shown on the plan. Make certain that they protrude toward the fuselage. See plan.

Beginning with S5, install and glue S4, S3, S2 and S1 in place. Make sure to align all rib kerf marks to the centerline of the leading edge. After S5 is glued in place, check the leading edge rubber bands to relieve any stress. It is usually easiest to tack glue the ribs in place. Additional glue may be added, if needed, in a later step.



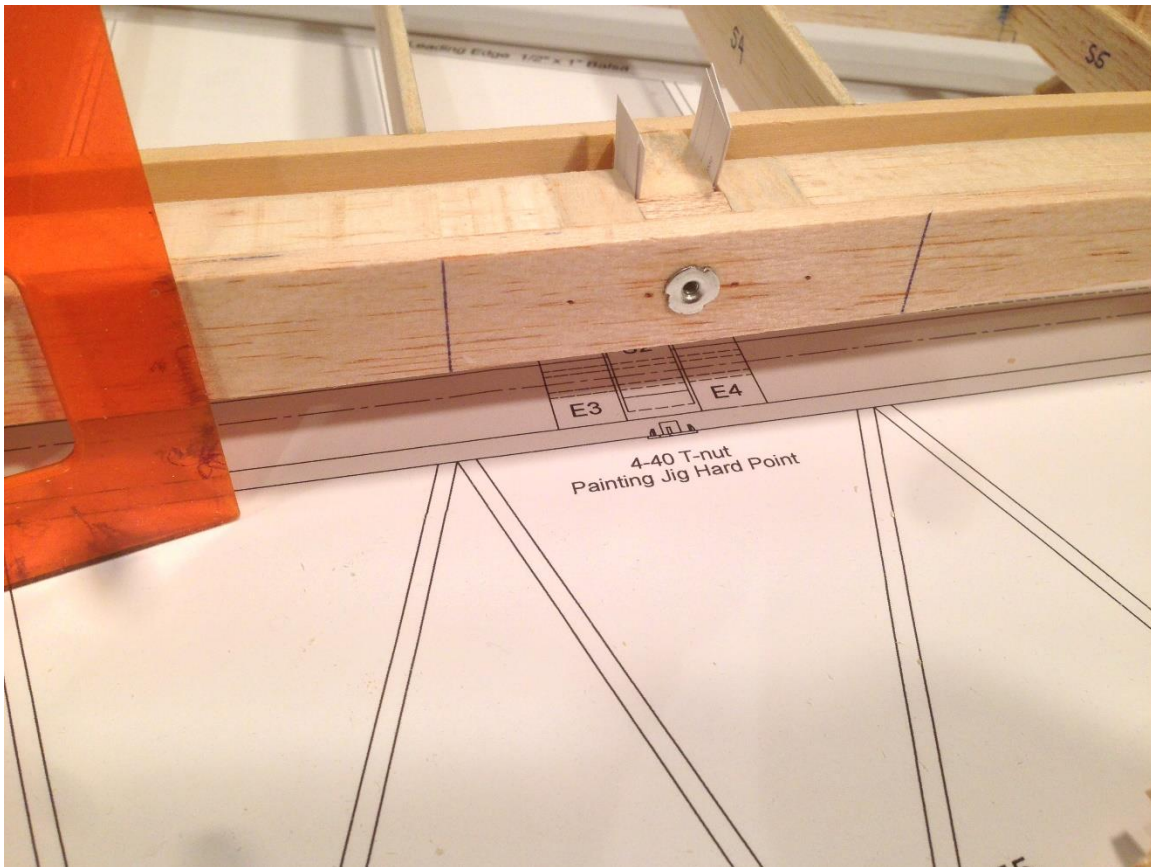


## Framing the Elevator

Align elevator spar to stabilizer spar so that (ideally) there is a  $1/32''$  gap between E3-S2 and S2-E4. It may help to wedge in a couple of pieces of cardboard or  $1/32''$  scrap ply.

Mark the vertical location of the elevator Ribs on the elevator Spar.

Disregard the T-Nut in the picture. This method for securing painting jigs has been revised to use  $1/4-20$  tapped holes. Jigs shown on last page.



Place elevator trailing edge with accelerator then place on jigs with rubber bands. Glue trailing edge to elevator hinge spar at both ends. Make sure that the ends are fully seated into the spar.

Beginning with E1, and *proceeding in numerical order*, set in place and glue all elevator ribs. Note: Every other rib will be labeled upside down, but since the airfoil is symmetrical, it makes no difference. What does matter is that you correctly orient the rib so that the bevel fits nicely with the spar.



### **Remove Stabilizer and Elevator from Plan**

At this point all jigs have served their purpose. The stabilizer/elevator may be removed.

Remove hinge Pin and separate the stabilizer from the elevator.

Go over stabilizer and elevator to check for any joints that are loose and need more glue.

## Shape and Finish Elevator

Add balsa gussets at the top and bottom of elevator spar.

When you sand E7 to the final shape the balsa will get very thin. Just cut away as shown in the picture below and harden with thin CA. After painting and final assembly, the Delrin hinge pin will be permanently inserted and terminate about 1" inside from the tip. The hinge pin is secured with the insertion of a 3/16" x 3/4" dowel glued in place and finished with spackle and touch up paint.



Plane and sand elevator ribs so they taper to zero at trailing edge. The trailing edge itself should remain 1/16" thick. Shape the tip also. Use razor plane and 60 grit sanding block to shape.

These two videos below are linked to the rudder construction manual, but the shaping method is virtually identical for the elevator. Press Ctrl key and click on the link.

<https://www.youtube.com/watch?v=YqS7HNSdpXU>

<https://www.youtube.com/watch?v=IjVhwa9HGvc>

### **Stabilizer Spar – Fill Procedure**

Fill gaps between S1 and S2, and S3 and S4 with 5/16" balsa triangle stock. The top edge of the triangle should be at the same height as the surface of the hinge block. This should create a small (about 1/64") "relief" from the edge of the spar. This relief will be filled with lite spackle at a later step.

### **Shaping the Leading Edge**

Shape the leading edge. When almost finished, join the stabilizer and elevator and insert the hinge pin. You may need to do some additional shaping and sanding at the tip. Use a razor plane and 60 grit-sanding block to shape. Final sand with 100 grit. Allow at least 30 minutes to do a nice job.

These two videos are linked to the rudder construction manual, but the shaping method is virtually identical for the stabilizer. Press Ctrl key and click on the link.

[https://www.youtube.com/watch?v=wmmY9t\\_nnc](https://www.youtube.com/watch?v=wmmY9t_nnc)

<https://www.youtube.com/watch?v=vaznFHRkeVQ>

Trim off excess leading edge at S1



## Install Control Horn

The elevator pull-pull horn mounts flush with the bottom (side) of E1. Lightly sand the horn and swab with CA accelerator. Sand the horn all over to promote good adhesion for dope or paint, the swab with CA accelerator where it will mount to the elevator.

Glue elevator pull-pull Horn in place with thin CA.

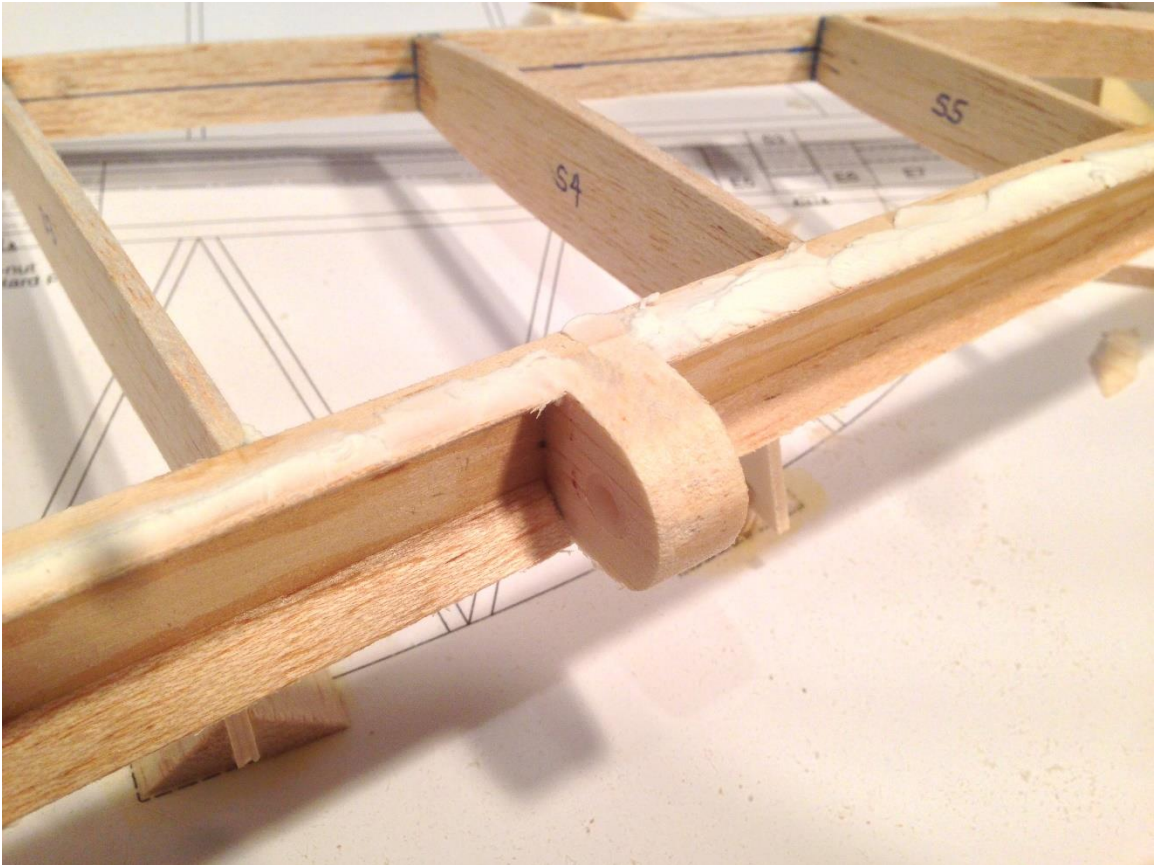


## Delrin hinge Pin

Cut a piece of 1/8" Delrin tubing to a length of 22." After covering and painting, the tube will be shortened again so that it fits about 3/4" inside the tip. The tube will be secured (semi-permanently) by gluing a 3/16" x 3/4" piece of wood dowel, then packed with spackle, patched and painted. It will probably never be necessary, but if the elevator should ever need to be removed, which will require the hinge pin to be removed, you can do so by removing the patch, insert a #6 wood screw, twist and pull out.

## Complete stabilizer Construction

Fill cracks and dings with spackle. After the spackle is fully dry, sand with 100 grit.



With lots of love, gently give it a final sanding with 100 paper.

## Weight – Complete – Ready to Cover

5 oz. (each half)



### **Make Jigs for Painting Elevator Halves**

It is virtually impossible to paint the elevator halves without some method to hold them while you paint. That is why there are 1/4-20 tapped holes in the elevator spars. To make these jigs cut pieces of 3/8" dowel to a length of about 9" inches. Disk sand the ends so they are flat and square. Sand the heads of 1/4-20 x 3/8" nylon socket head screws by scraping across 100 grit paper on a flat surface such as your sanding block. Apply CA accelerator to the wood dowel only. Hole the nylon screw to the end of the dowel and wick in thin CA around the perimeter. When the glue sets, the jigs will have plenty of strength. When the jigs are in place for painting insert the plane ends into any suitable block of wood drilled with 3/8" holes.

See pictures next page.



