

So, You Broke Your Wing

By Greg Tinius



Figure 1

It looks so ugly most of us would trash it in a heartbeat. On the other hand, you have little to loose if you try and fix it. In this case, it was a favorite plane and parts are not available.

The first thing to do is get rid of the ugly parts. Remove the necessary covering and broken bits of wood but leave as much of the spars, leading edge, trailing edge and sheeting that's still intact as you can. These will be the beginning of the re-structure process.

With all the broken bits removed it looks easier to deal with.

To help align the wing so that both pieces are level with each other you may want to use some boards with a straight edge to keep the pieces on the same level (see Figure 2). These boards have an angle cut on the edge to conform to the airfoil.

While the 2 pieces are being aligned, take measurements and compare them with the better half of the wing. Eyeball it at several angles, making sure it's as good as it can be. You can't spend too much time at this stage.

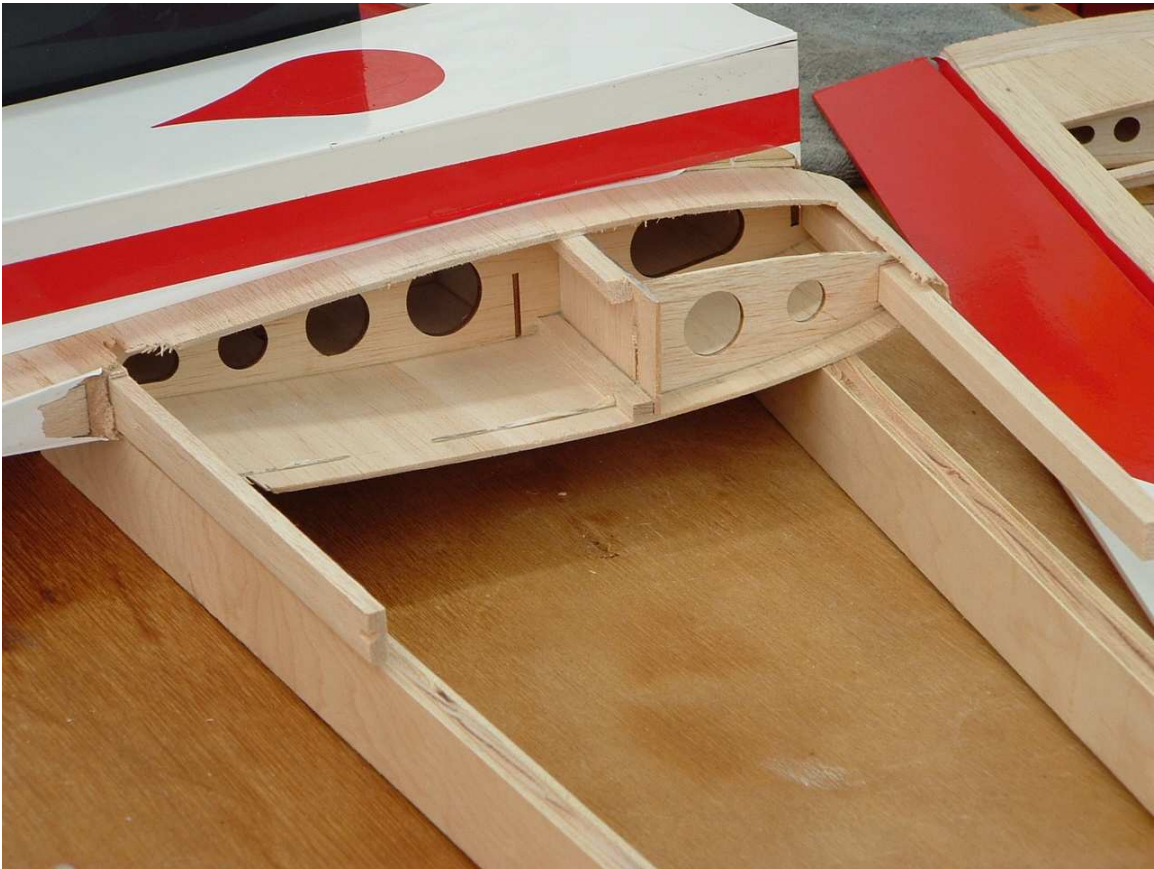


Figure 2

Next, prepare the splices for the leading and trailing edges. One splice is placed on the inside of the existing (broken) leading edge piece. The other is placed on the inside of the existing trailing edge piece (see Figure 2).

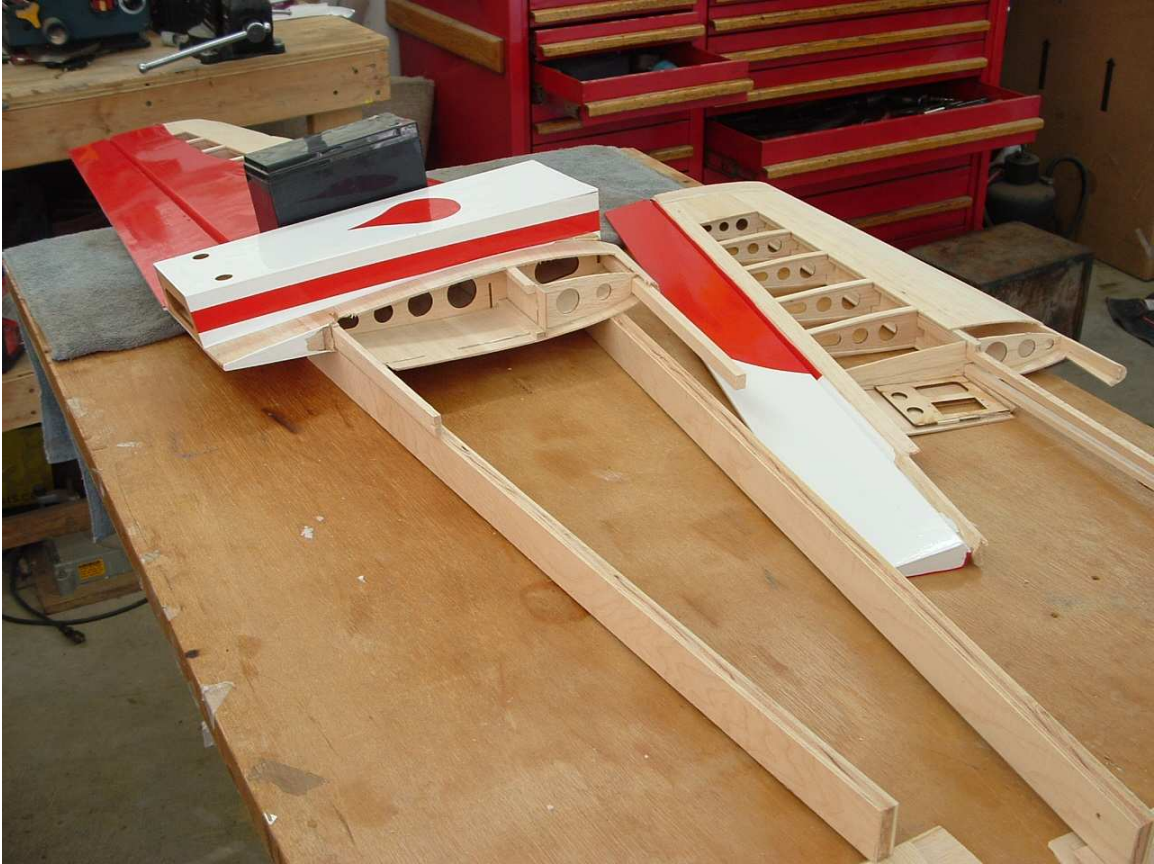


Figure 3

Before gluing, carefully check the positioning of both splices. They must exactly align with both of the wing pieces. Glue the splices to only one (the larger) of the two wing pieces (see Figure 3).

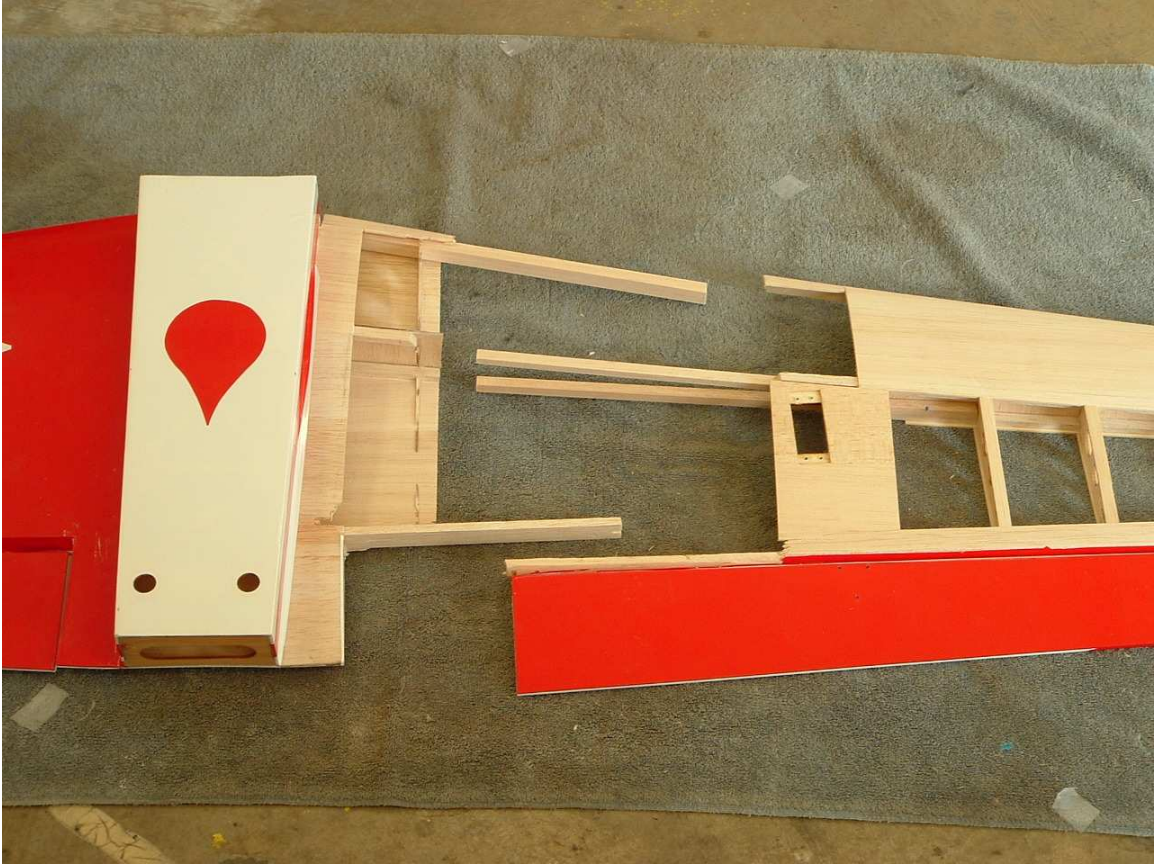


Figure 4

Next, prepare the splice pieces for the main wing spar.

The spar is shaped in the form of an I-beam with upper and lower balsa beams connected by vertical grain sheet balsa. Cut away enough of the connecting sheet balsa to expose the top and bottom beams. Position one splice piece alongside and below the exposed top beam. Place the other above the exposed bottom beam.

In Figure 4, the new spar splices have been aligned and glued to the smaller half of the wing.

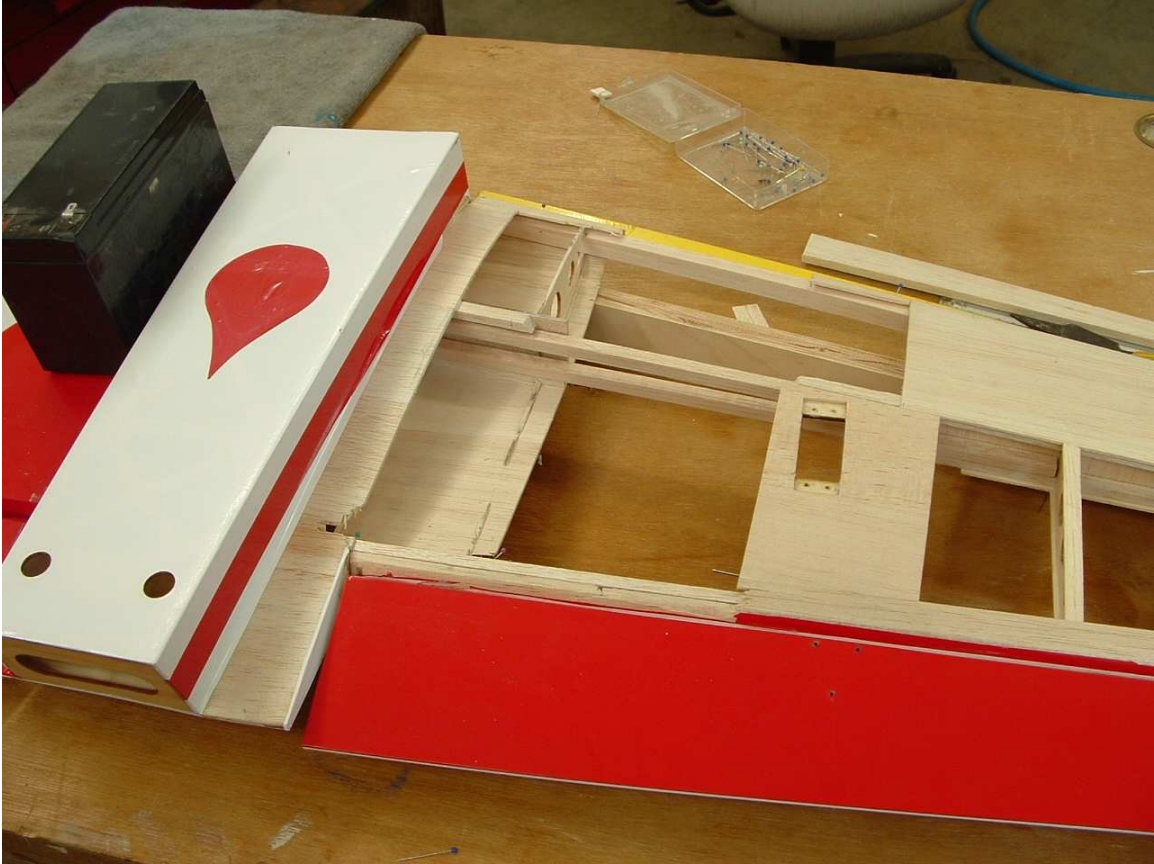


Figure 5

The two wing halves are now ready for joining.

In Figure 5, notice how the leading edge, trailing edge and main spar splices are lined up with what remains of the original.

Now is a good time to verify that the two wing pieces are lined up correctly. At this point you can pin the wing together and turn it over to check the alignment. Check for twisting. Make pencil marks to help you align it when gluing.

If you need a few minutes to align glued parts, use wood glue and pins. If you feel lucky, you can use medium CA. Avoid applying new glue onto old glue as it won't hold very well.

After the glue set, the aileron was re-hinged near the root using CA hinges. From inside the wing, a slot was cut all the way through the trailing edge and into the aileron. The hinge was then fed through the wing's trailing edge, into the aileron, and glued in place

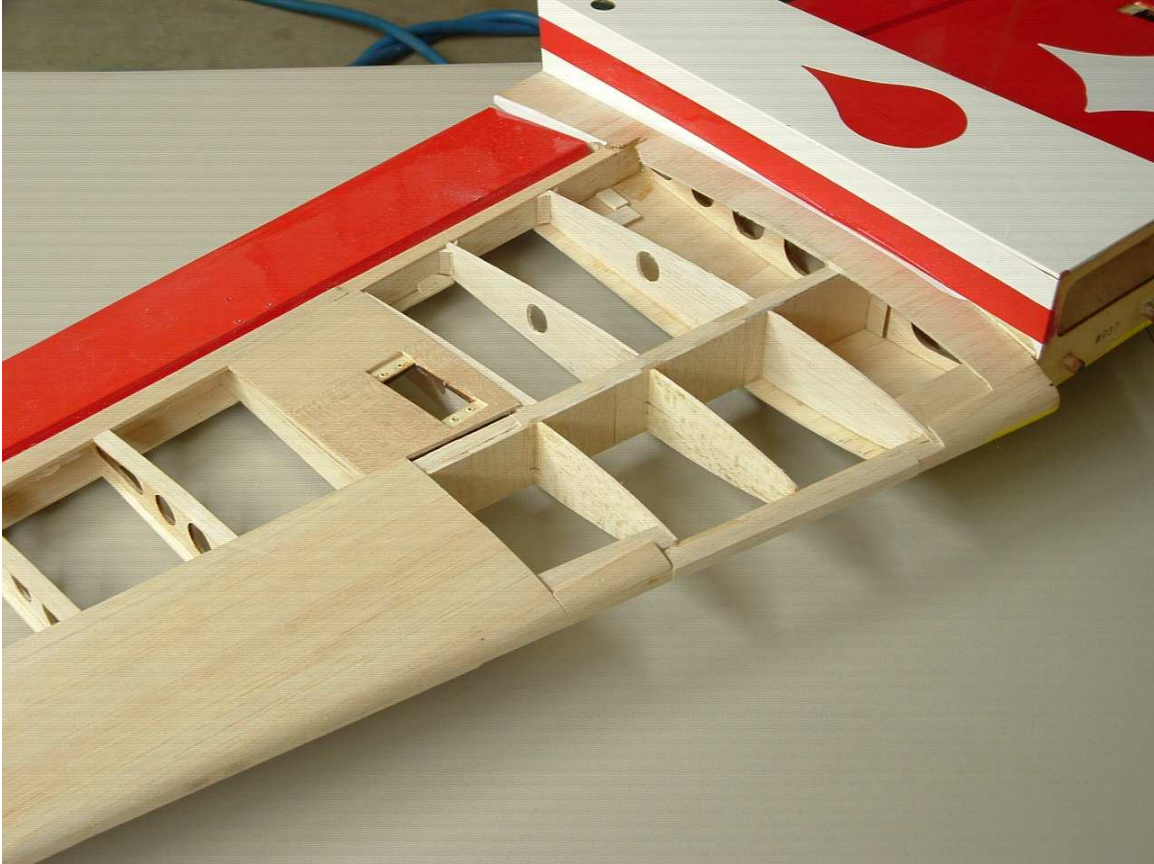


Figure 6

If you compare Figure 5 with Figure 6, you can see where a filler piece has been added between the spar splice pieces to fill the gap. The upper and lower splices have been strengthened by connecting them with sheet balsa with the grain going up and down, just as in the original spar. This is normal procedure for most all types of wings.

Ribs can be made by copying leftover broken ribs. Make the new ones a bit larger and then trim them to fit. You can put a straight edge across the existing sheeting to help determine the shape it has to be. The ribs on this wing are all slightly different shapes and lengths. It can take about 30 minutes to make each piece if you don't have to start over too many times. Ribs are not so much a structural part as much as they are there to maintain the shape of the airfoil.



Figure 7

Even if I plan to re-cover the whole wing, I like to leave most of the old covering on to help protect from scratches and dents while doing the repair (see Figure 7).

The only covering reused on this wing was on portions of the aileron.



Figure 8

Now we'll move to another part of the damage, which will also help show how the first part was completed.



Figure 9

Again, clean off the covering and broken bits. Leave some sheeting extending from the unbroken ribs. You may want to leave some of the stubs of broken ribs to have something to glue onto (see Figure 9).



Figure 10

In figure 10, note the strips of balsa glued to the underside of the original sheeting. Using a straight edge between these pieces will help you make the shape of new ribs.

Also, when it is time to sheet the repaired portion, these strips will give the new piece of sheeting a glue surface that is aligned with the original sheeting. Strips were also used under the front portion of the spar to create a ledge for the sheeting to be glued to.

Always use wood glue held with pins on the exterior surfaces rather than CA. The wood glue can be sanded where CA cannot.

Take your time cutting the new piece of sheeting to fit well. If your sheeting requires a lot of curve, you can wet it with Windex, bend & pin it into place and let it dry overnight. It will hold most of the curve, making it easier to glue down without breaking.

Test fit the part a few times so there are no surprises when gluing it down. Use pins to hold it until the glue is set, about 5 hours. Overnight is better.



Figure 11

This is a good time to look over the rest of the wing and make repairs to other dents and dings that may have happened in the past. Most dents in balsa will puff out by themselves if you add water to the area and let it dry. Scratches will need filling.

If you have dents under covering, use a pin to make a hole or two through the covering over the dent. Use a fine needle on a syringe to inject water into the dent and let it dry. Wave a covering iron over it a few times to finish it.

For shallow dents, use some tape and pull to un-stick the covering from the dent. Then shrink the covering without pressing down so the covering doesn't follow the dent.

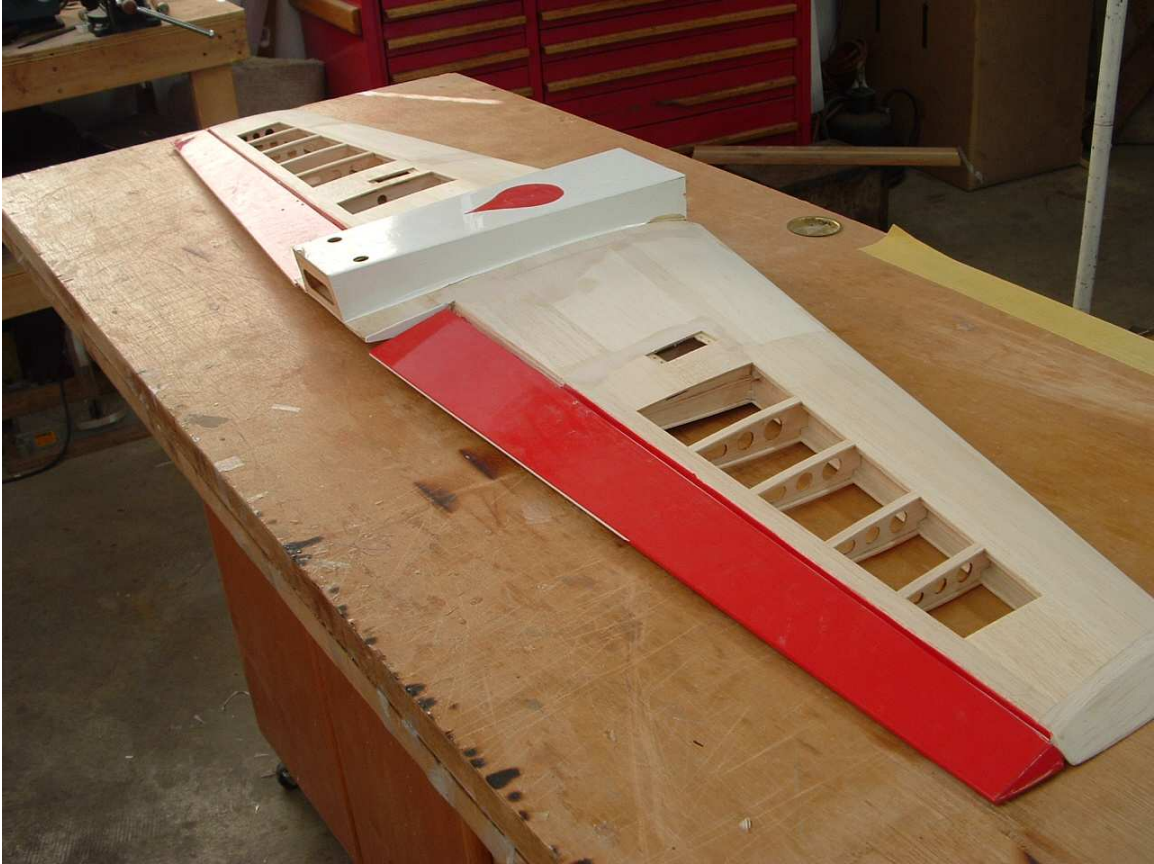


Figure 12

Use a sanding block to even out the repaired area. Start with 150 grit and go to 320. Go easy; balsa wood goes away fast. Fill with balsa filler as needed.

Sand, fill, sand, fill, and sand until your satisfied then you can start covering the repaired wing.



Figure 13

Finally we have a completed wing. The top looks as good as new, and ...



Figure 14

so does the bottom! Even with close inspection it's hard to tell the wing was ever damaged.

Cost of the balsa and covering..., about \$36.00.

Satisfaction of the challenge..., priceless!