Wing Blades
a construction project

Alan Halleck, during our recent visit to his home in Beaverton Oregon, demonstrated a rapid method of constructing receptacles for wing blades. We documented the construction of a generic receptacle, and with further assistance from Alan are able to present in step by step fashion the entire process for *RCSD* readers.

Steel wing blades provide far greater vertical strength than round wing rods of the same weight, and so have a distinct advantage over them. But a common problem facing builders is the construction of blade receptacles. Alan builds very strong receptacles from plywood, an easily worked material, following the procedure described here.

Begin construction by sketching the required joiner. See Figure 1. Do this by drawing a front view of your wing at the location of the joiner. The example we present involves a blade of 3/8" height and 1/16" thickness in a wing which is 3/4" thick. The blade joins the flat wing center panel and the removable wing tip. The dihedral angle is four degrees, and the joiner is six inches long. Two thicknesses of plywood will be used during construction. One piece (1/8" in thickness, or double the wing blade thickness) is used for the main portion of the assembly, while another (1/16" in thickness, or the

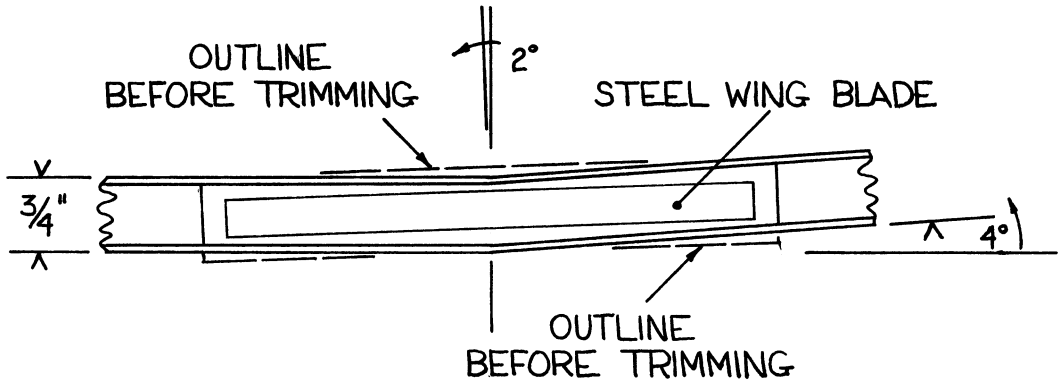

FIGURE 1

wing blade thickness) is used for the remainder. From the drawing we find the width of our plywood joiner before trimming must be at least 7/8" when the blade is centered within the structure. This width allows for some trimming of material upon completion of the basic structure, but minimizes waste. The receptacle length should be slightly longer than the steel blade to allow for end caps.

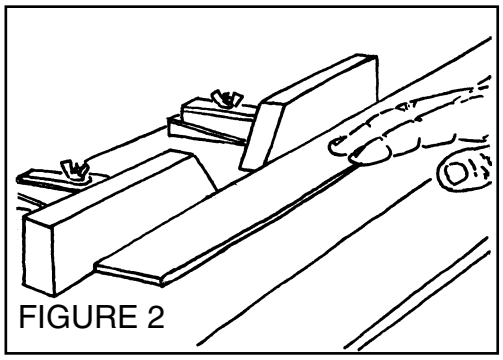
FIGURE 2

Actual construction starts with setting up the router table. See Figure 2. Use a square blade with a diameter equal to the height of the steel wing blade. (We used a 3/8" router blade to match the height of our wing blade.) Set the router fence so the plywood will be grooved at the correct distance from the edge.

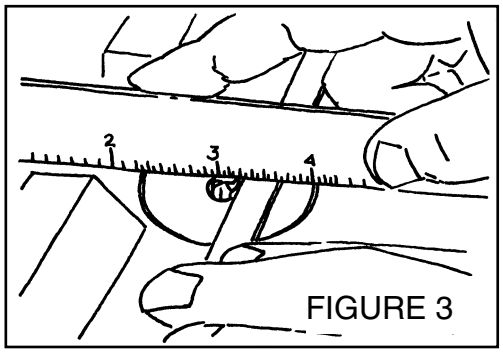

FIGURE 3

Now raise the router blade to the height of the wing blade width (in the example, 1/16"), plus just a fraction more. Use a straight edge when making the final adjustments. See Figure 3.This little bit of extra clearance prevents the wing blade from binding when inserted into the receptacle.

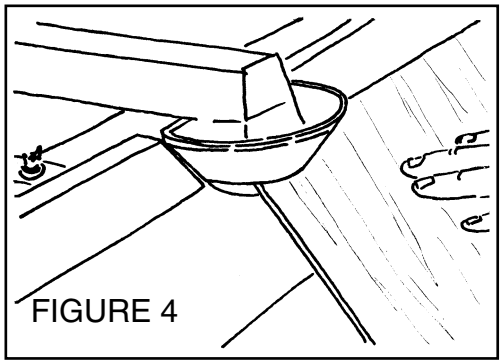
FIGURE 4

The 1/8" plywood, pre-cut at a 45° angle to the grain, is then put up against the router fence and a groove is cut into the underside of the piece. See Figure 4. In our example, the joiner blade is 1/16" thick, leaving 1/16" of the plywood to act as one joiner face.

When completed, the steel joiner blade should be placed in the groove. See Figure 5. Check the depth of the groove — it should be just noticeably deeper than the wing blade itself. Remove the steel blade. Reroute the groove a little deeper if required, otherwise go to the next step.

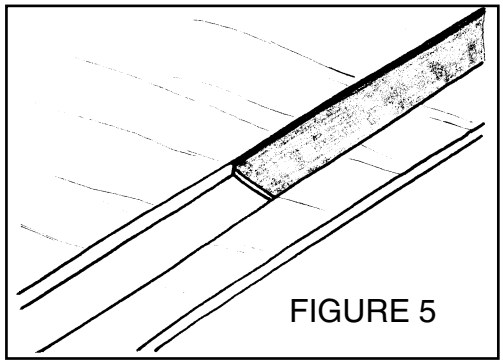
FIGURE 5

Now measure across the 1/8" plywood to the predetermined width of the untrimmed joiner assembly See Figure 6.

A band saw or table saw is then used to cut the routed strip free. See Figure 7.

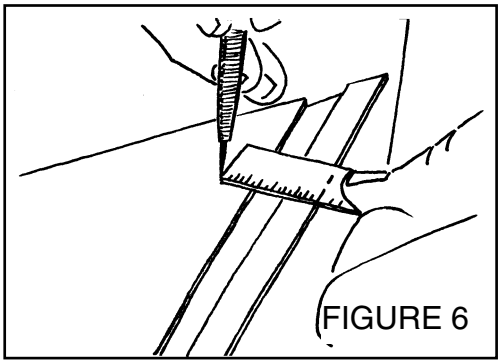
FIGURE 6

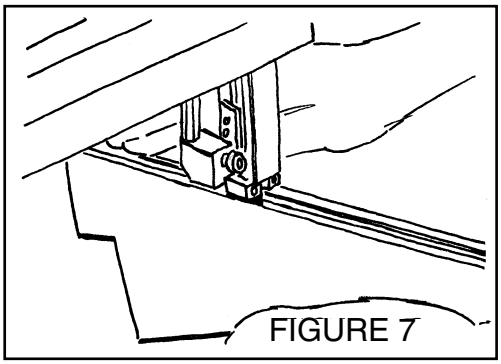
FIGURE 7

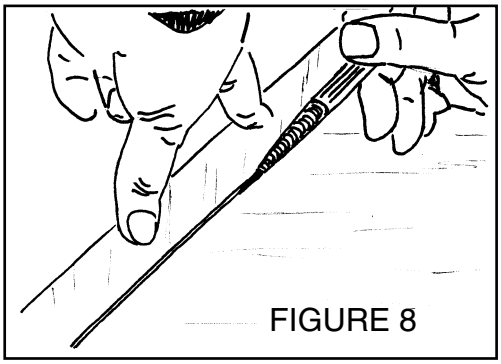
FIGURE 8

Place the completed piece on the 1/16" plywood. See Figure 8. Align the free edges and mark the 1/16" plywood using the 1/8" plywood as a straightedge. Remember, the strongest structure is obtained by orienting the grain of this face piece perpendicular to that of the routed piece.

Cut this marked strip free using a band saw or table saw. See Figure 9.

Spread out a piece of waxed paper or similar material to protect your work surface. Alan used a piece of Crown Freezer Paper ™. This material consists of a plastic film with a paper backing. Alan placed the plastic side up. Apply a thin coat of grease or some other releasing mechanism to the joiner blade and place it in the routed groove. Make sure one end protrudes from the eventual structure sufficiently for pliers to get a good grip on the end. Brush five minute epoxy on either side of the routed groove, see Figure 10, then place the 1/16" plywood strip on it. That's right, the wing blade should be inside the assembly during the curing process!

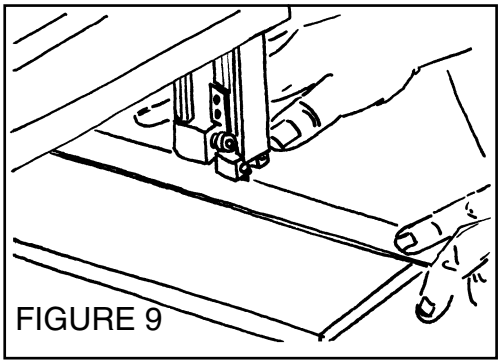
FIGURE 9

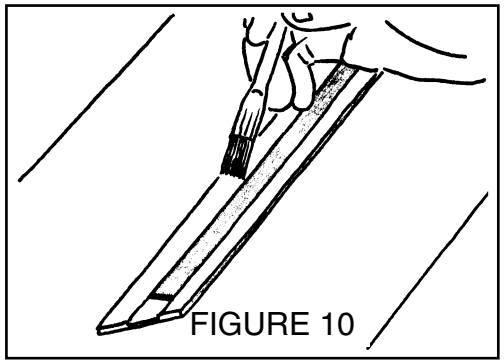
FIGURE 10

Align the assembly carefully and weight it for a good bond. Refer to the cutaway sketch, Figure 11, and the end view, Figure 12. When the epoxy is cured, grasp the free end of the steel wing blade with pliers and pull it out of the plywood assembly.

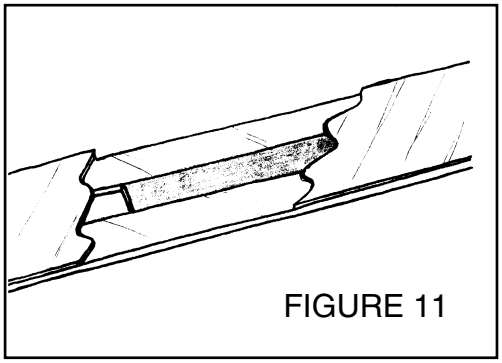
FIGURE 11

A tool, made from a piece of the steel blade material, can be used to scrape out any epoxy which interferes with the blade's insertion into the receptacle. See Figure 13.

Trim the finished assembly to the size and shape required, referring to your original sketches. See Figure 14. Don't forget to epoxy small pieces of plywood into the open ends of the enclosed channel. This will prevent the steel wing blade from penetrating the wing's foam core or the spar webbing.

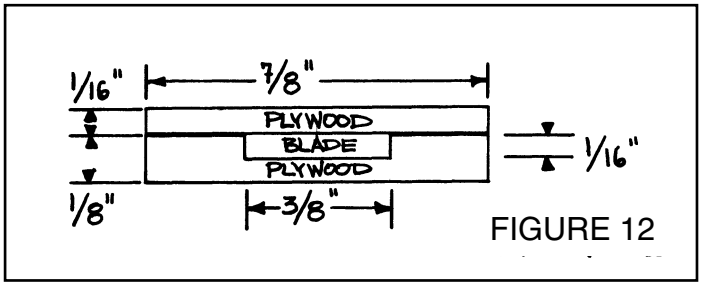

FIGURE 12

Wrap the entire assembly with two layers of Kevlar™ or Dacron™ thread. These wrappings should be closer together at the ends and middle of the joiner, where the plywood is thinnest and the blade might poke through. Add a filler to smooth.

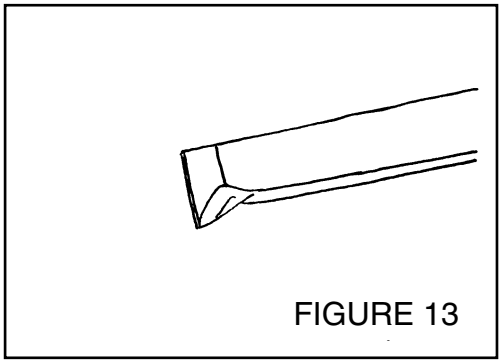
FIGURE 13

Slightly rounding the end of the steel blade will prevent the blade from scraping the inside of the plywood assembly and eventually loosening the desired snug fit.

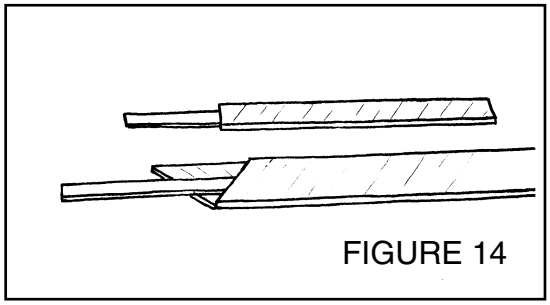
FIGURE 14

The last step is cutting the receptacle into the two pieces required. This should be done along the angle of the wing's end caps at

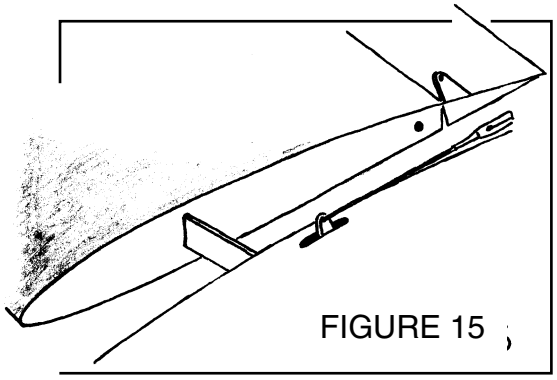

FIGURE 15

the separation point. Needless to say, the steel wing blade should not be inside the receptacle for this procedure.

Assembly of the completed wing at the flying field consists of sliding the wing halves together with the steel blade inserted in one half. See Figure 15. A small music wire pin near the trailing edge assure alignment, and a strip of tape seals the gap and serves to hold the wing halves together under normal flight loads.

When installed, a steel wing blade provide a large amount of vertical strength. On the other hand, the blade is weak in the fore and aft directions. This is of benefit, for when the wing swings forward, as during a hard landing, the blade bends and slides out of the receptacle, rather than the joiner assembly splitting open and destroying the integrity of the spar system.

Our sincere thanks to Alan for sharing this construction process with us, and particularly for his “slow motion” demonstration which gave us the time to get all of the essentials photographed and written down. Readers of *RCSD* should be able to put this information to good use.

Alan’s source of spring steel wing blades is: Pacific Machinery & Tool Steel Co., 3445 NW Luzon St., Portland OR 97210-1694; (503) 226-7656. The material used is blue tempered steel. This is available in thickness of 1/32", and 1/16", in widths of 1/4", 3/8", and 1/2". The cost of Alan’s eight foot length of 3/8" x 1/16" was $17.00. If you cannot find a local source, we recommend you call or write the above mentioned supplier for an up to date price and availability list.

Less is more.

— Mies Van Der Rohe