

## Riley Model B - Series 18 - Fuselage Construction – Part 1

July 1, 2024

Fuselage construction (ready to cover) will require about 80 hours to complete.

Note: Some of the pictures are from earlier editions. The plans and text are current.

### Prepare Work Surface

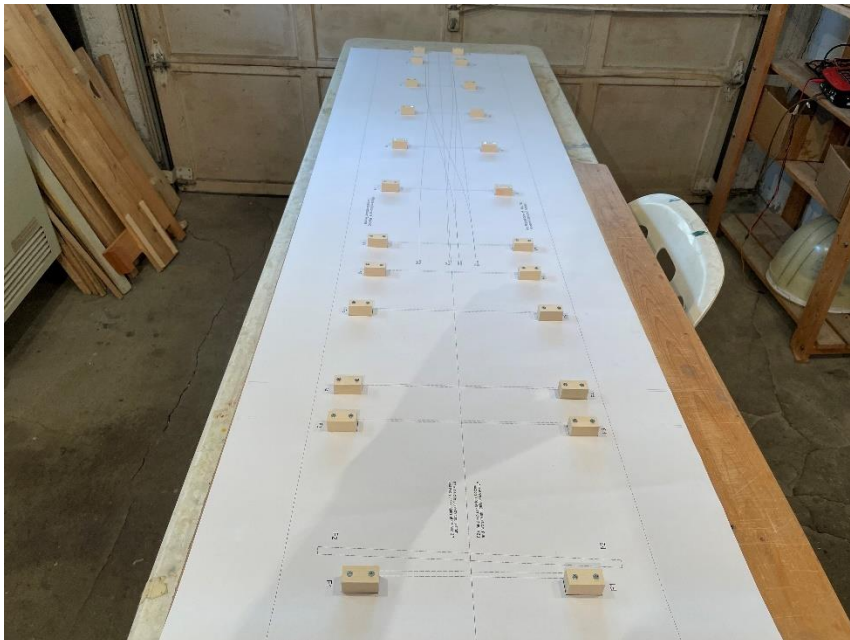
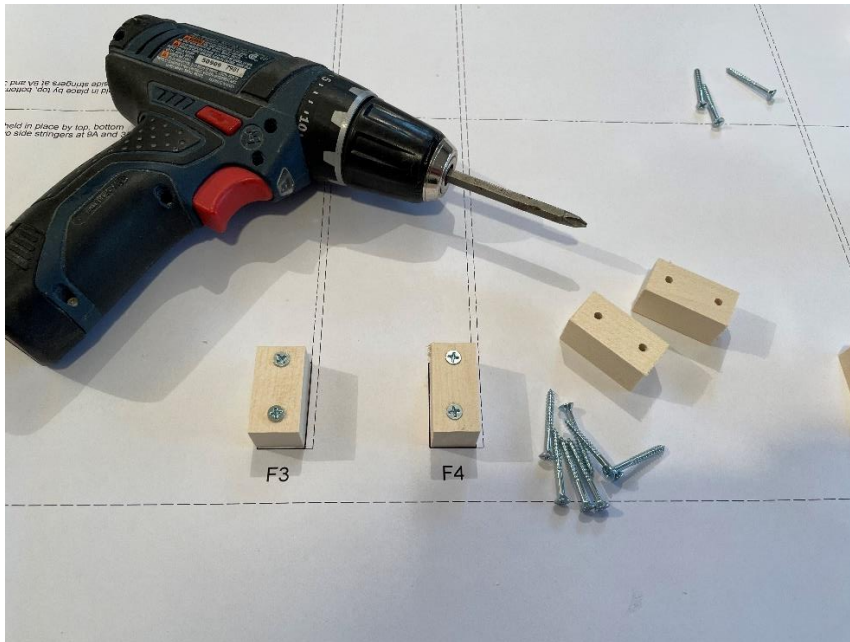
For the fuselage to be straight and true, it must be built upon a *flat* surface. A plain door panel works well. If in doubt, check for twist with a level. If the reading is the same on both ends, obviously, you have a flat building board. Ideally, the size should be 24" x 84".



## Fuselage Template

Mount the 3/4" x 3/4" x 1-1/2" basswood blocks to the template.

The best way to secure the jig blocks to the building board is with #6 x 1-1/4" Phillips head wood screws. Drill two 9/64" holes in each jig block. The paper fuselage template need not be attached with spray adhesive. Just lay it down and mount the jig blocks. A drill with a Phillips driver set at low speed will save a lot of time.



## Mounting the Formers to the Jigs – General Notes

Use clamps to secure each fuselage former to the template. Make sure to align each former laterally on-center as shown on the template.

Dry fit *all* joints! We are working with wood. Wood can swell in humidity. The wood itself (stringers, for example) may not have been precisely sanded to the specified thickness. A basswood stringer only a few thousandths of an inch oversize can make for tight fitting joints. Any number of factors can affect fit. Use a small flat file to open former notches, if needed. Make sure that the mortises in the stub wing ribs slide easily over the spars of F3, F4 and F5. Check everything and don't glue until you know every fit is right.

Although the stub wing ribs are NOT glued in place until much later in the framing process, it is good practice to make sure they fit nicely to the spars of F3, F4 and F5 early on. Check the fit of the tenons at the ends of the spars of each former with the mortises (slots) in each rib and make any necessary adjustments. But do NOT glue them now.

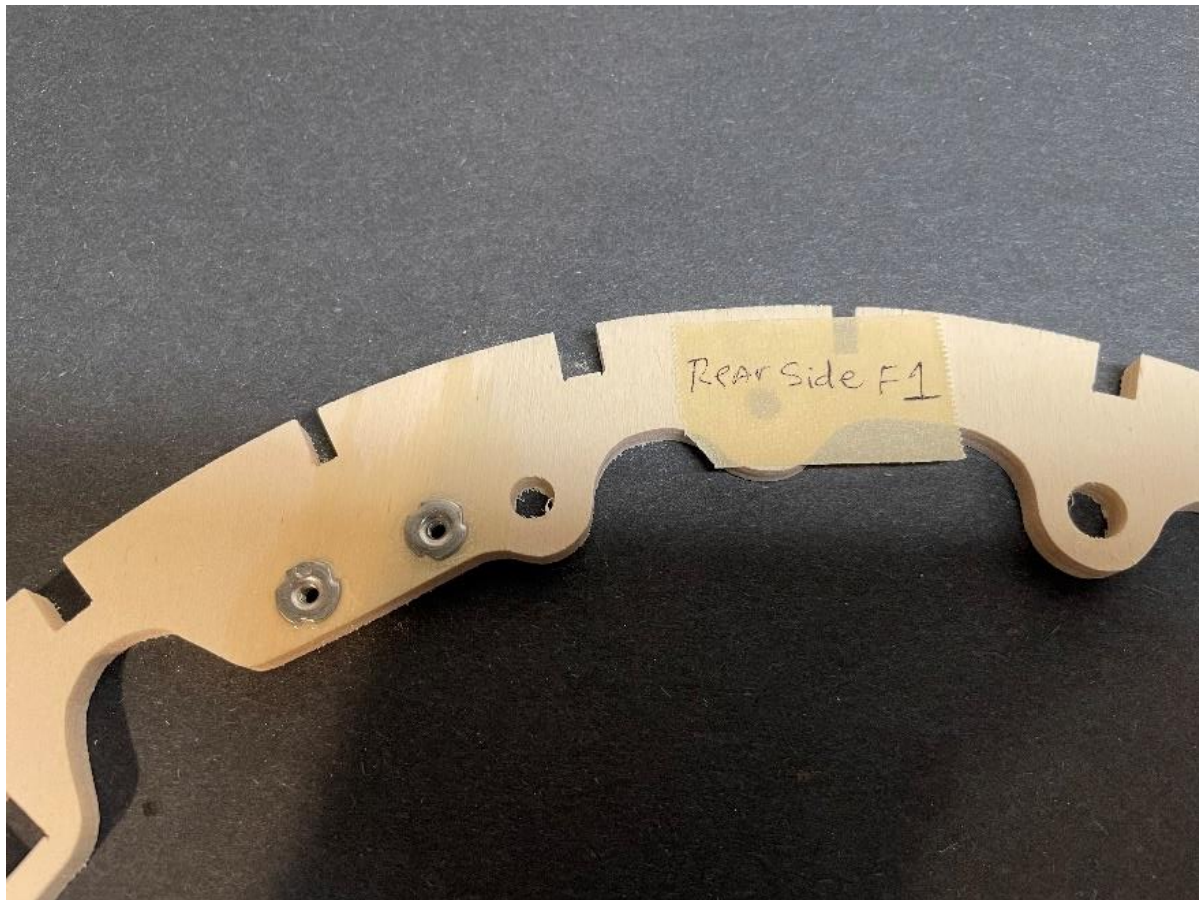
The labels on all fuselage formers face toward the *front* of the model. Unless otherwise noted, right and left are determined as if you were sitting in the cockpit facing the nose.

With two exceptions, the fuselage formers are identical for both the Valach 140 twin and the Moki 250 radial. F1 is different for each motor. And the location of F1 and F2 is different. The Moki 250 is heavier than the Valach 140 and therefore, F1 and F2 move back 2" for better balance. F2 is identical for either engine, but F1 is very different for each engine. The point is that a fuselage built for the Valach is not compatible with the Moki and vice versa for the reasons just noted. Make sure you are building the fuselage for the engine you intend to use.

If you plan to use different servos than Hitec 955TW, which may have different mounting dimensions, now is the time to make modifications to the servo tray.

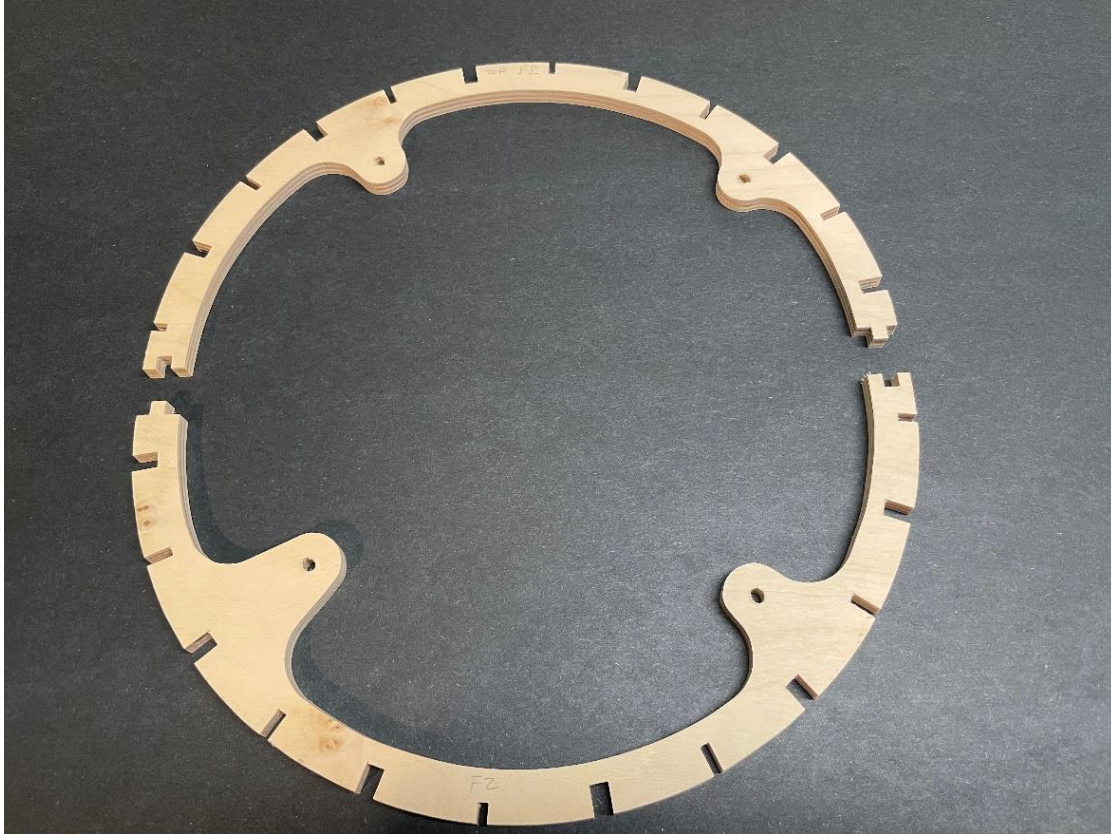
## Prepare Fuselage Former F1

F1 only requires the insertion of (2) 4-40 T-nuts on the back side to secure the PowerBox smoke pump. The front and back sides are easily determined by the angle of the bevel. The front side slopes toward the nose. Wick in a little thin CA glue to make the T-nuts secure. The smoke pump is located near the top for the Moki 250 and at the side for the Valach 140.

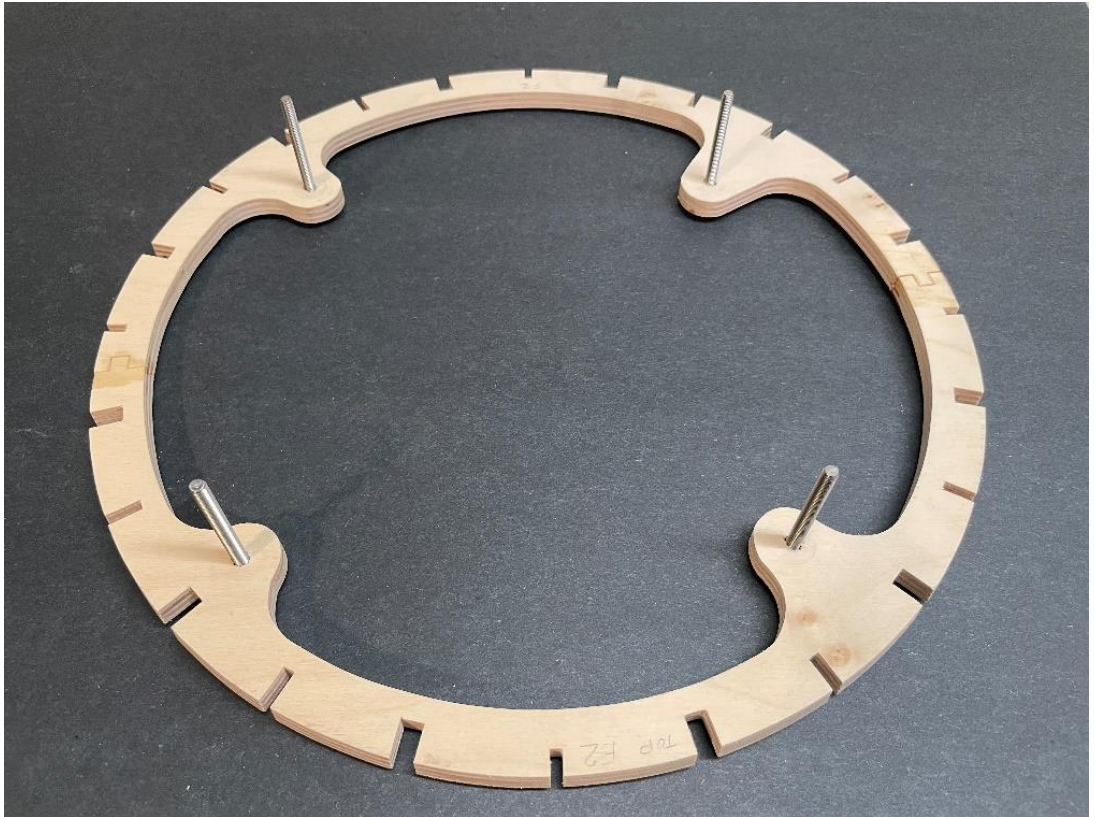
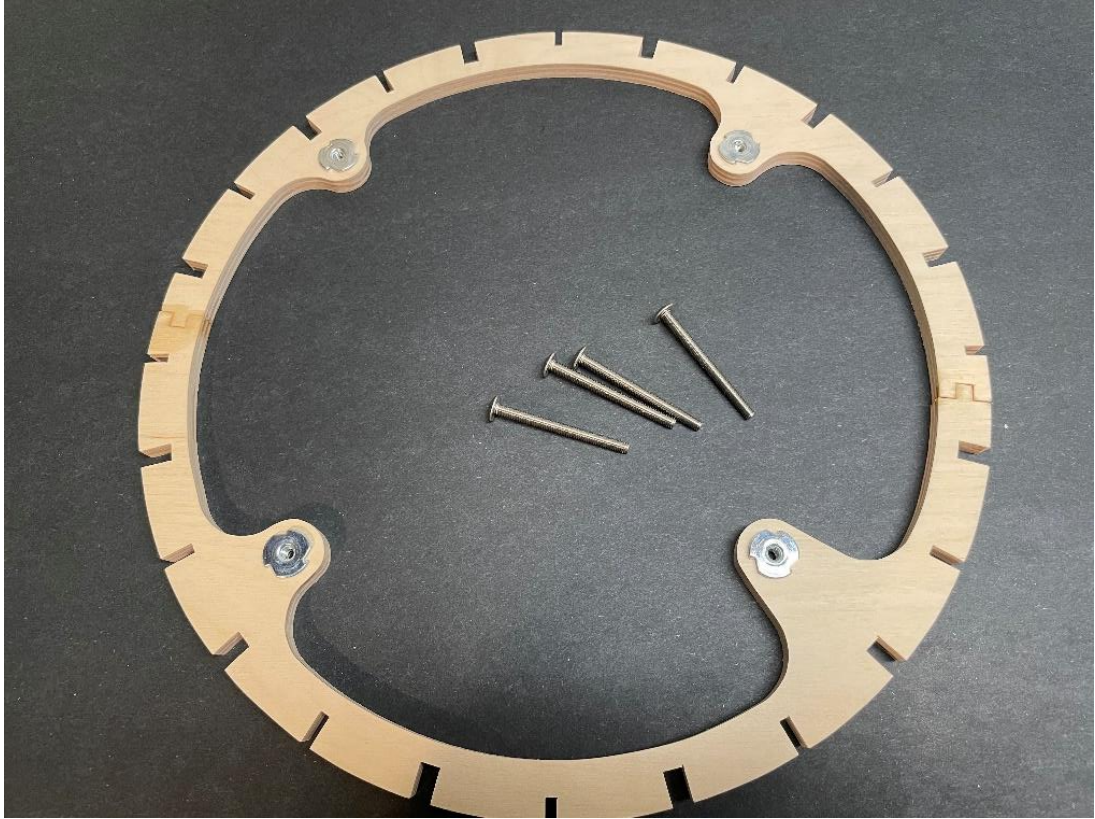


## Prepare Fuselage Former F2

Join upper and lower halves of F2.



Press four 10-32 T-nuts into the 1/4" holes through the *backside* of F2. (The T-nut flange faces the tail. The bevel slopes toward the nose.) Make sure the T-nuts are fully seated. To create the motor mount studs, insert four 10-32 x 2-1/4" Phillips truss head screws from the rear. Add a drop of thin CA to the last 1/4" from the *head*. Immediately tighten the screw all the way. The CA glue will seize very quickly and permanently lock the screws in place. The actual positioning of F2 in the fuselage will be covered in a later step.

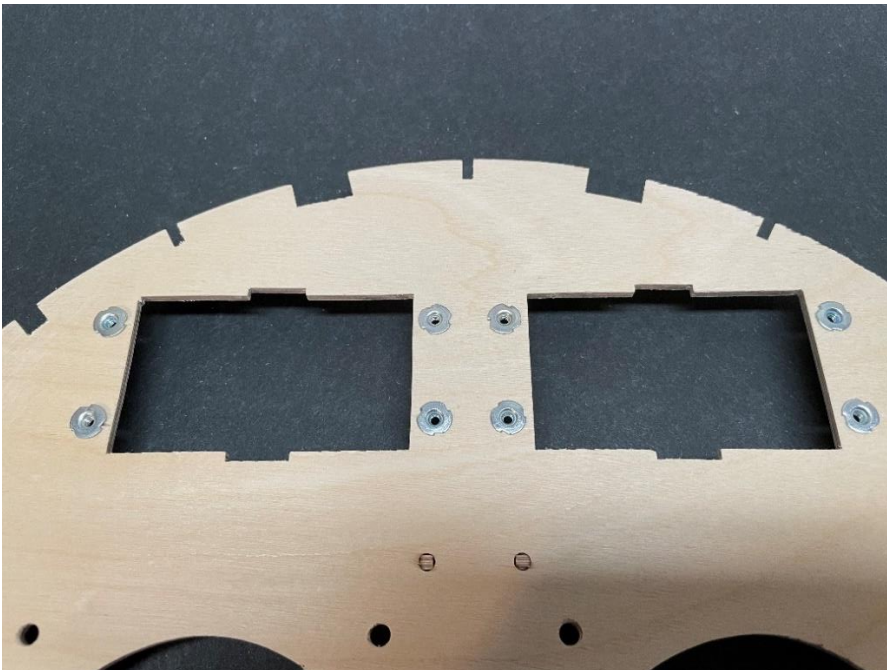


## Prepare Fuselage Former F3

Former F3 (and F4 and F5) need to be glued at the dovetail joint. Lay a piece of wax paper between the former and your worktable to prevent any glue from sticking to the table. Press the parts together. Wick thin CA into each joint. This joint will have plenty of strength.



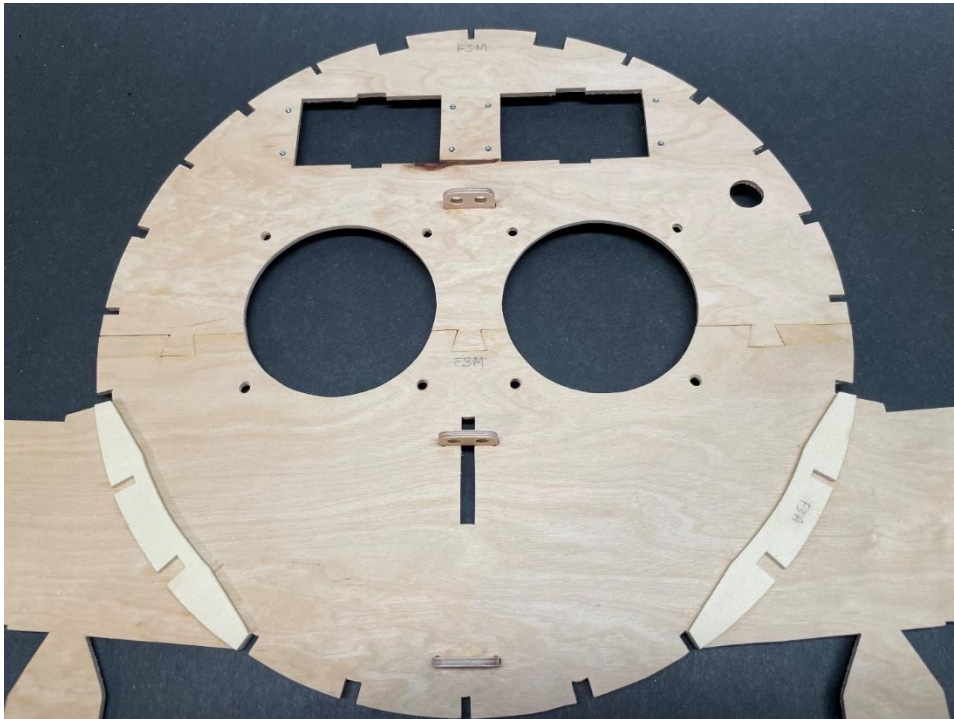
Insert 4-40 T-nuts to the rear side of F3. These secure two Jeti battery packs. Mount batteries at F3 if needed for balance.



Insert and glue fuel and smoke tank overflow tubing guides into the front face of F3.



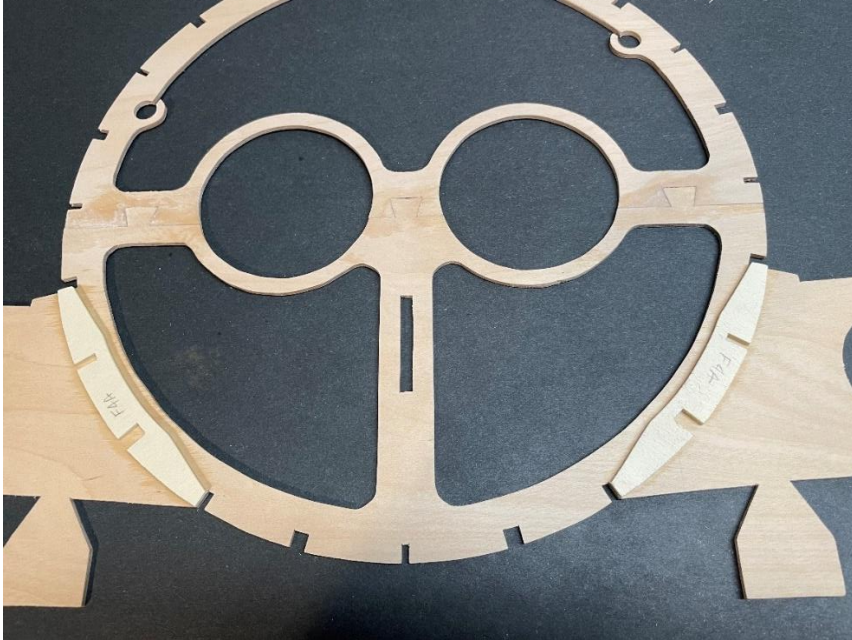
Position and glue F3A (right and left sides at stub wing spar) to the *front* of F3. Notice that the 1/4" slots are closer to the bottom.





### Prepare Fuselage Former F 4

In the same manner as F3, glue the top and bottom sections at the dovetail joint. Position and glue F4A to the *rear* side of F4.

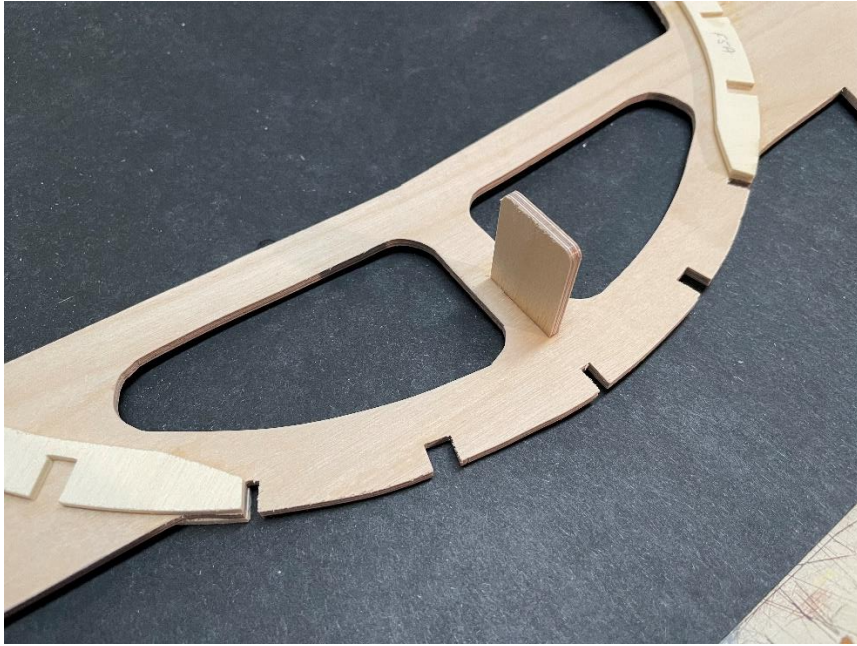


### Prepare Fuselage Former F 5

In the same manner as F3, glue the top and bottom sections at the dovetail joint. Position and glue F5A to the *Both* sides of F5.



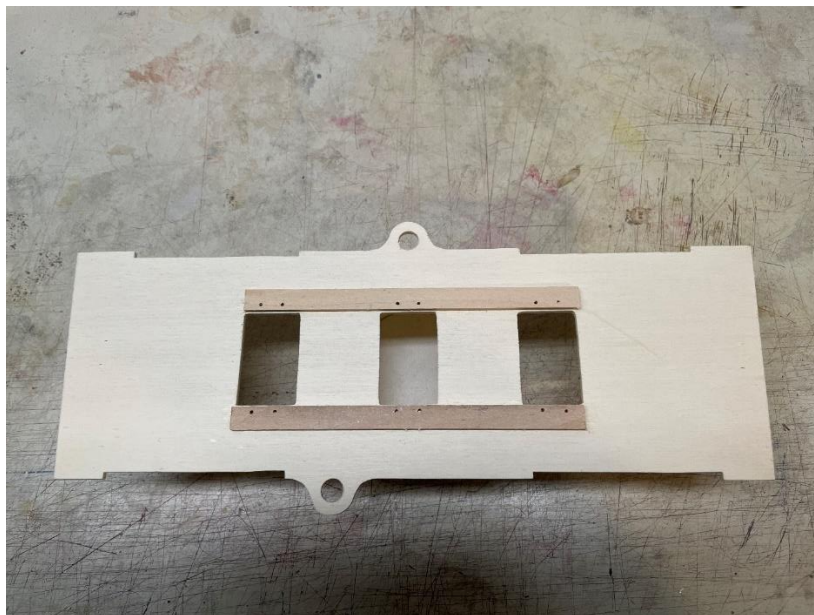
Glue the remote receiver mount to the rear side of F5.

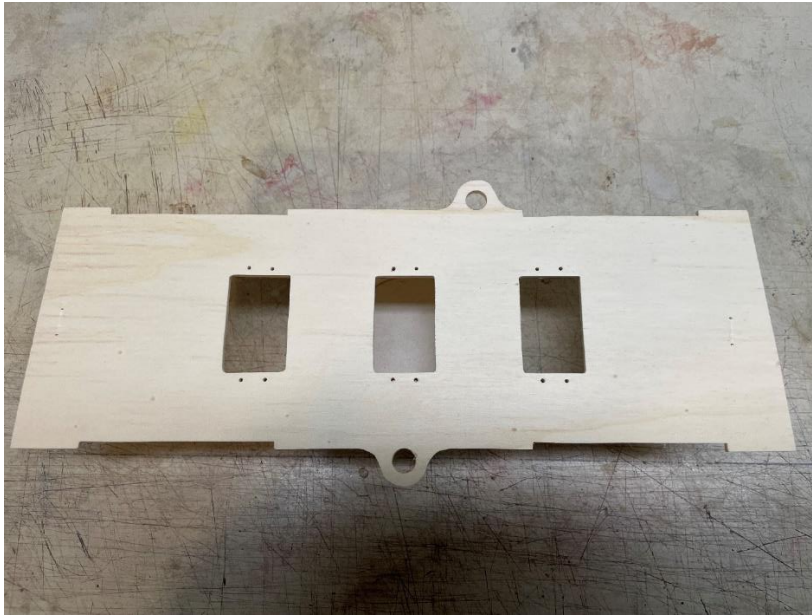


### Prepare Fuselage Formers F6 and F7

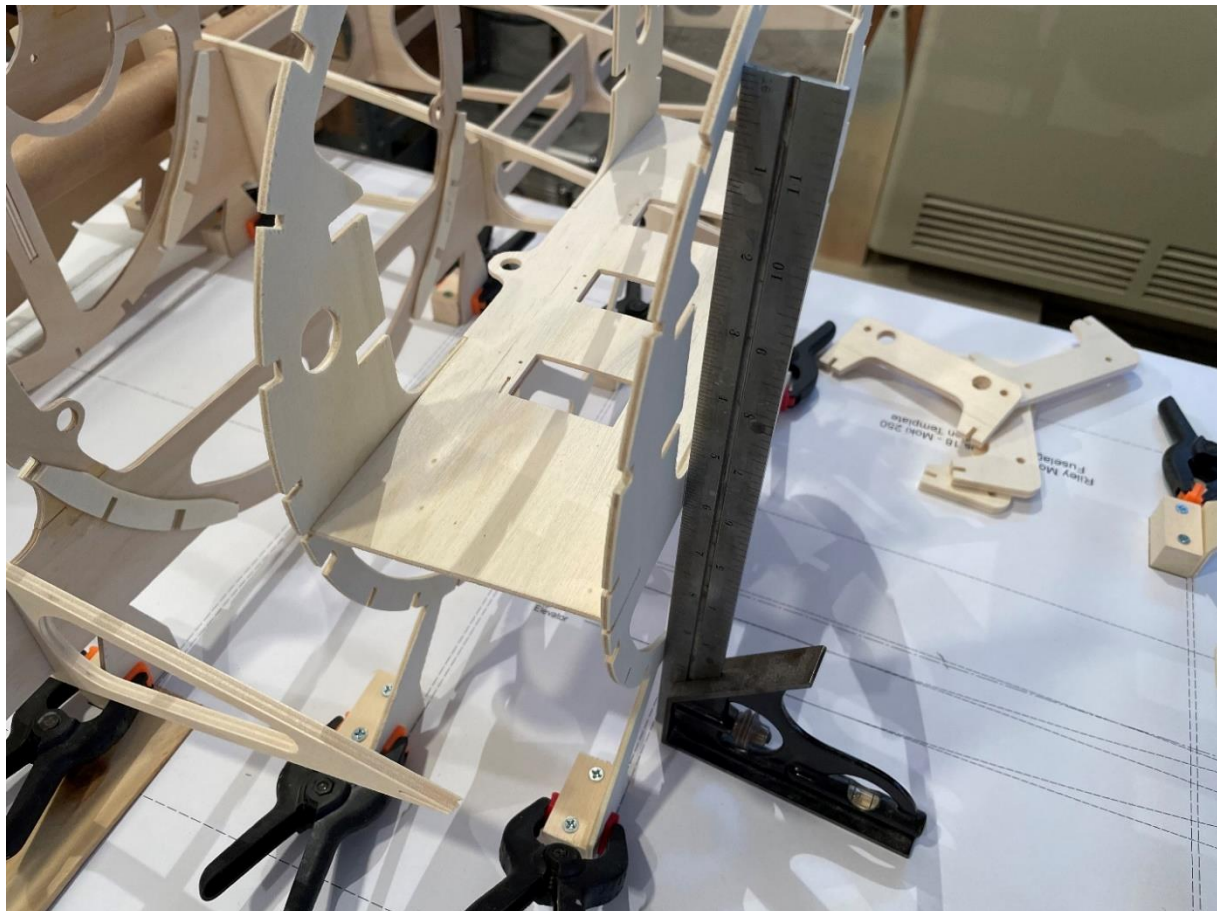
Formers F6 and F7 house the tail servos, receiver and pilot mount and should be built on the jigs to insure good alignment.

Begin by gluing 1/8 x 3/8 basswood backing rails for the servo screws on the *bottom* side. Once glued in place, re-drill 1/16" holes.

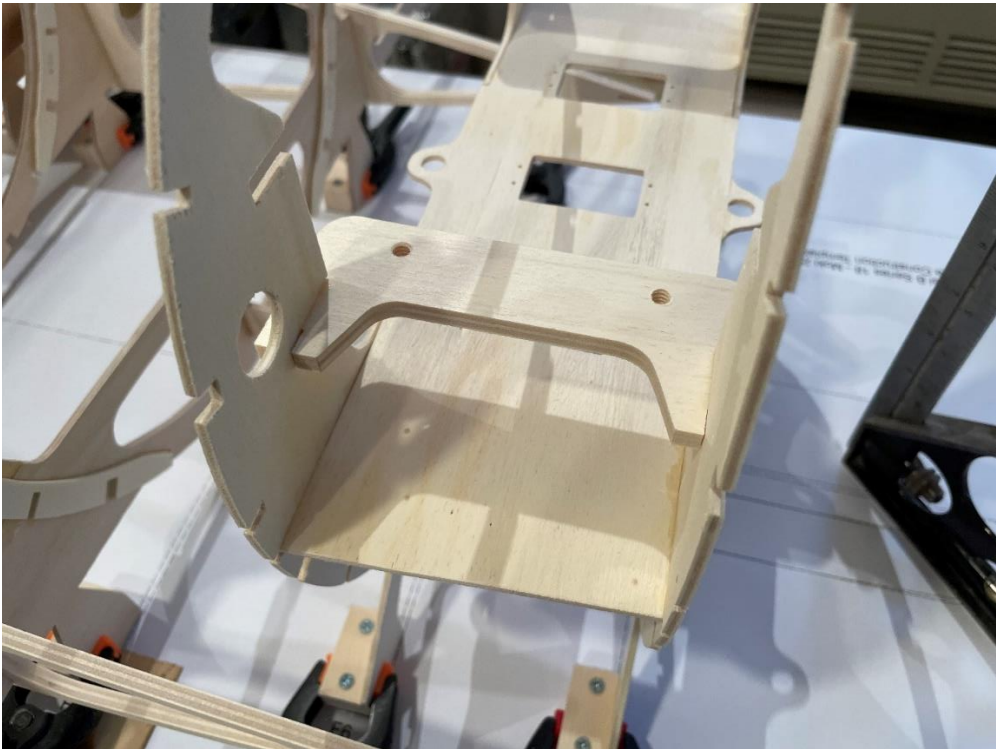




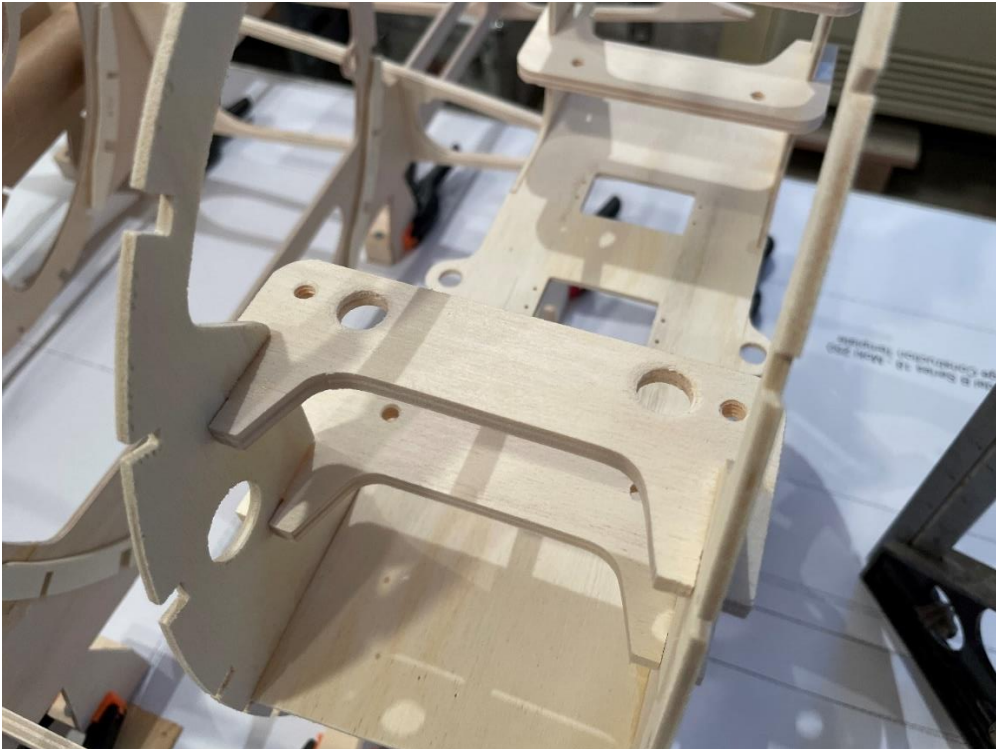
Glue the servo tray to F6 and F7. Make sure the assembly is vertical and straight. Just tack glue the joints you can get to.



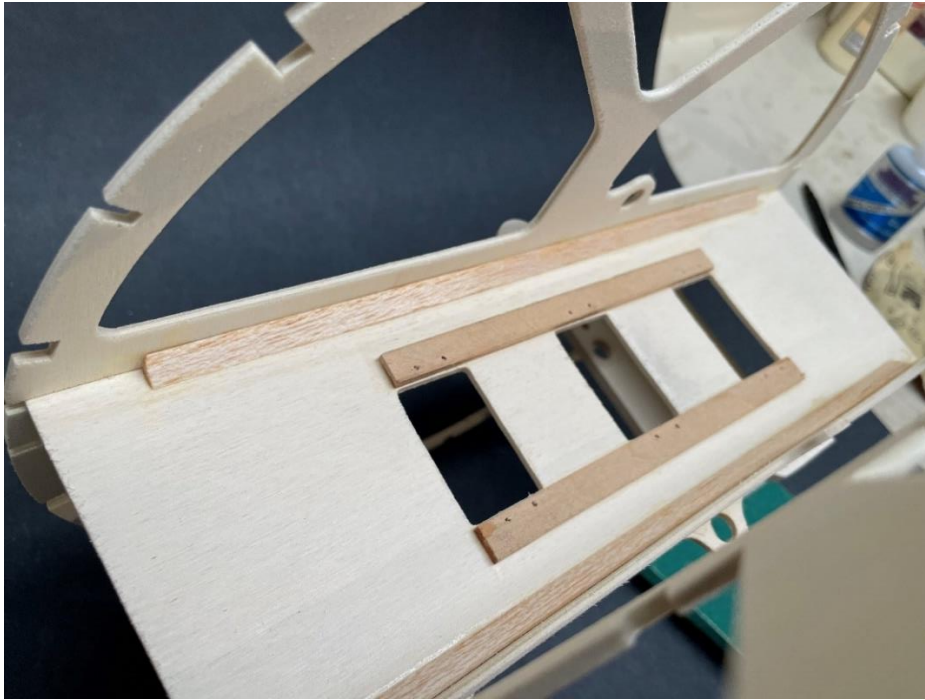
Glue the receiver tray ledgers. Make sure they are fully seated into the slots in F6 and F7.



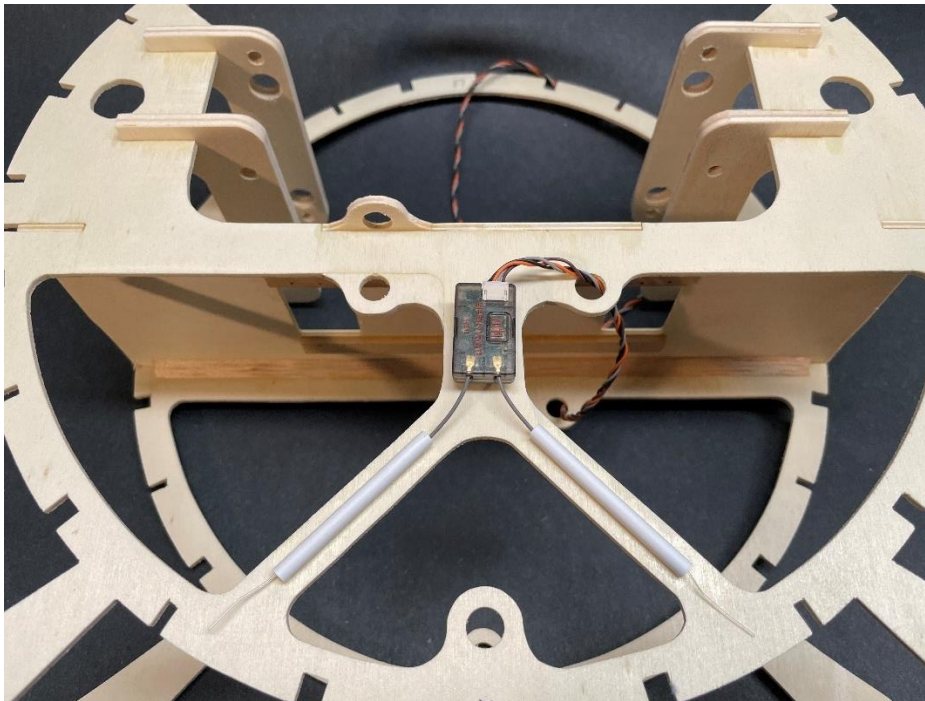
Glue the pilot tray ledgers.



Remove the F6 / F7 assembly from the fuselage jigs and complete glue up. It is a good idea to add triangle stock to the servo tray joints.



F6 is designed for the Spektrum SPM4651T remote telemetry receiver. The two antennas will insert into 3/16" Styrene tubing (Evergreen #226). Any non-conductive tubing will work.



### **Prepare Fuselage Former F8**

Glue the remote receiver mount to the tab at the bottom of F8. It is a good idea to reinforce the joint with triangle stock.



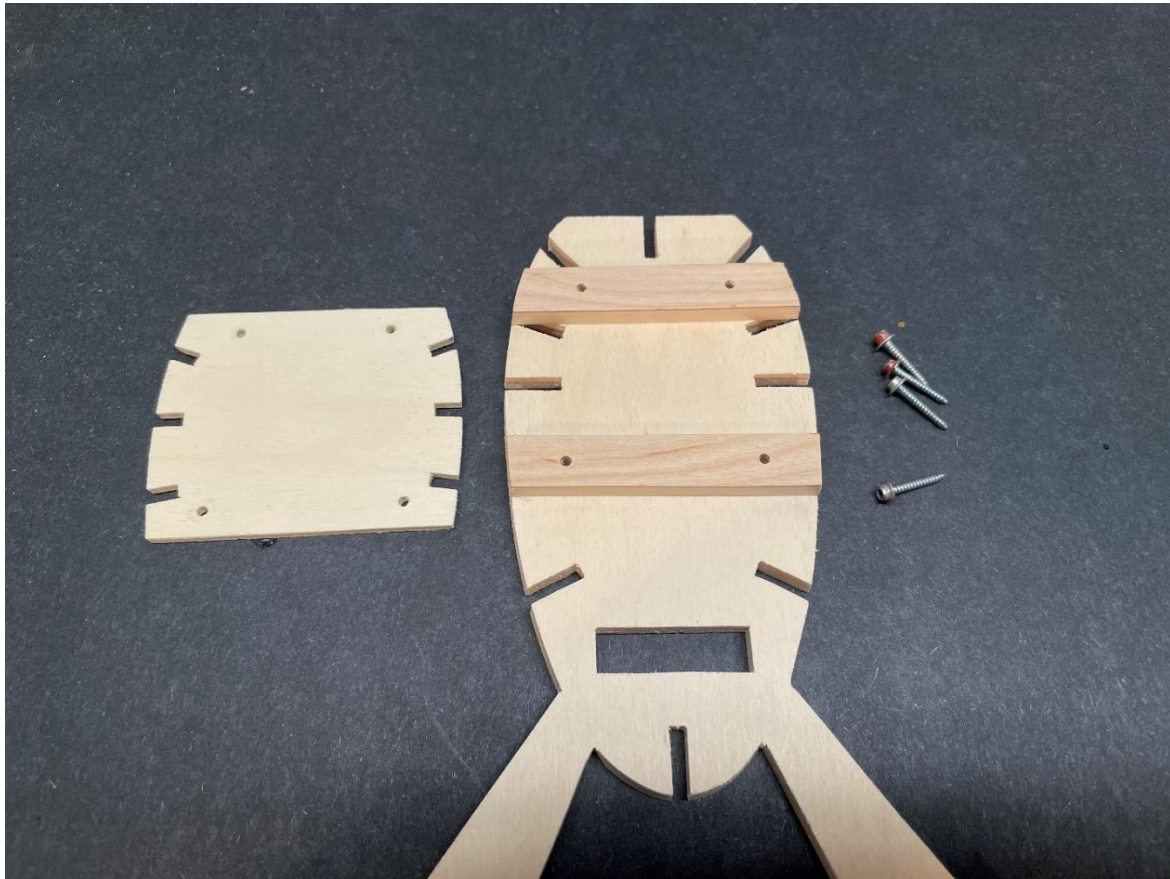
### **Prepare Fuselage Formers F9, F10 and F11**

Formers F9, F10 and F11 need no special preparation.

## Prepare Fuselage Formers F12 - F13

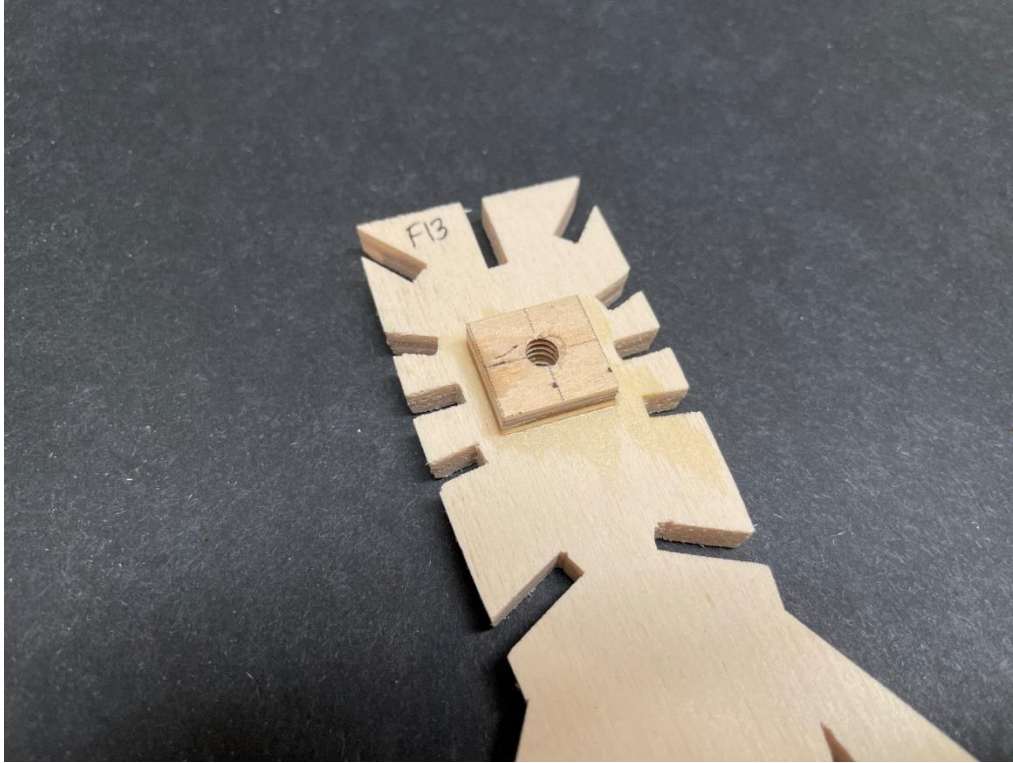
Glue stabilizer spar pocket to the *tail side* of F12. Use #2 servo screws to ensure correct alignment and provide clamping pressure while the glue sets. The “rails” should have been made from a lamination of 3/16” basswood and 1/32” ply. This combined 7/32” thickness allows the stabilizer spar to easily insert into the fuselage.

Watch the bevels. All bevels taper toward the tail. Note: the “rails” will block the upper and lower stringers notches. This is correct.

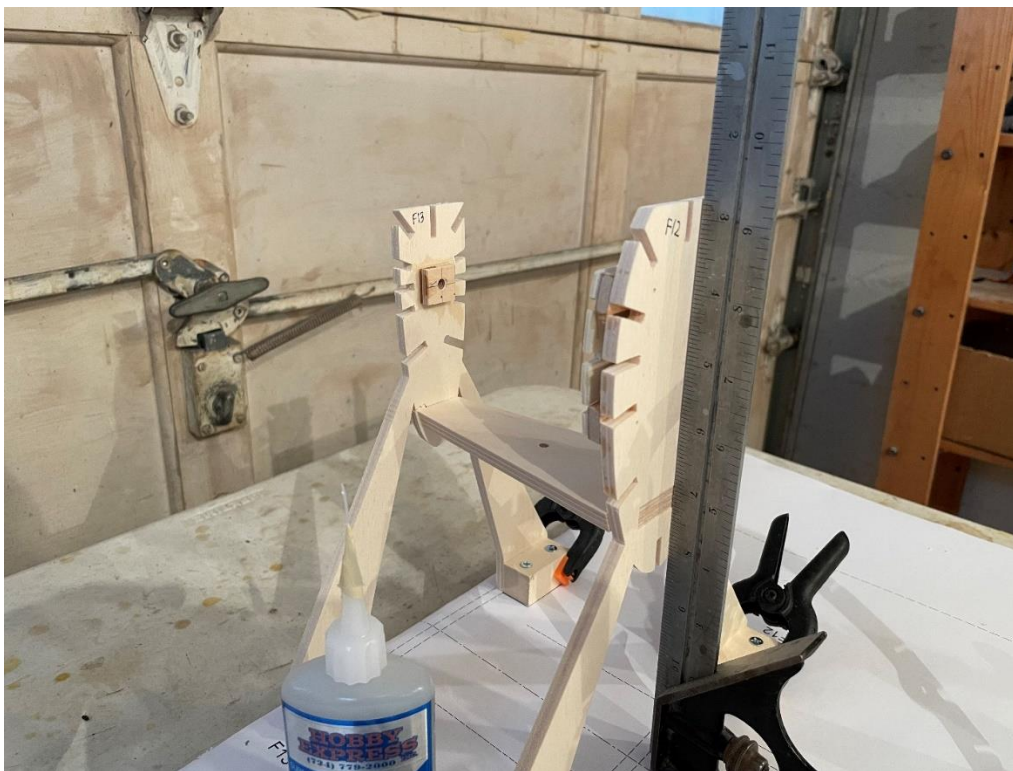


Glue 5/8” x 5/8” square cut from 3/8” seven ply with 3/16” hole to the *forward* side of F13 also aligned to the 3/16” hole in F13. After the glue sets, re-tap 1/4-20. This small block acts as a hard point for the rear rotisserie mount.

See picture below.



Glue the tail wheel mount to F12 and F13. To ensure perfect alignment, mount the assembly to the fuselage jigs and check vertical alignment with a square, then glue.



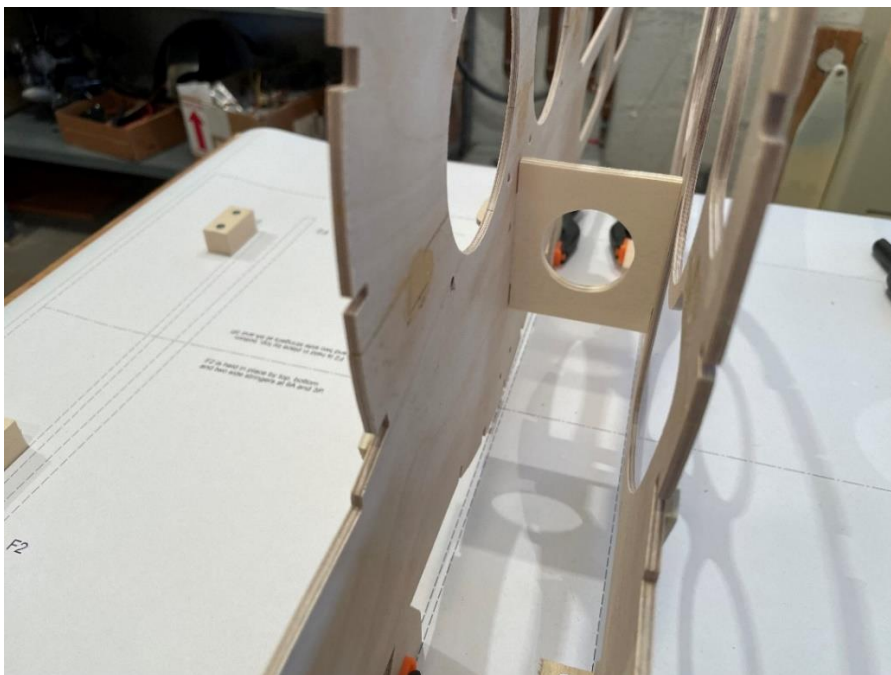


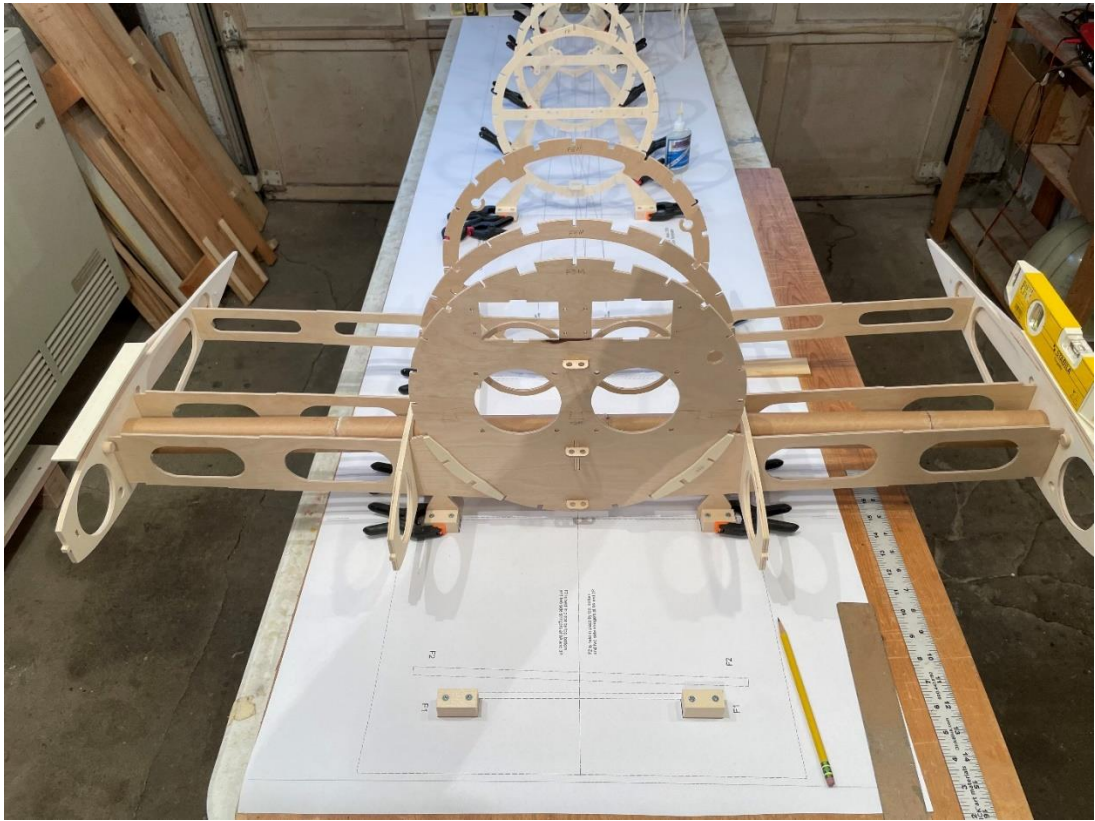
## General Notes on Formers F3, F4 and F5

The spars of formers F3, F4 and F5 control the incidence of the stub wings. If every part were perfectly cut, and the legs of the formers were perfectly seated and clamped to a perfectly flat building board, the incidence of the stub wings would be an identical  $+0.5^\circ$  on each side. But perfection is elusive and more to the point, just the process of adding stringers (and the balsa planking) has the potential to knock the spars out of perfect alignment. More likely, rough handling or bumping against your worktable can also cause misalignment. What is needed is a dependable and repeatable way to check the stub wing incidences at SW3 as work progresses.

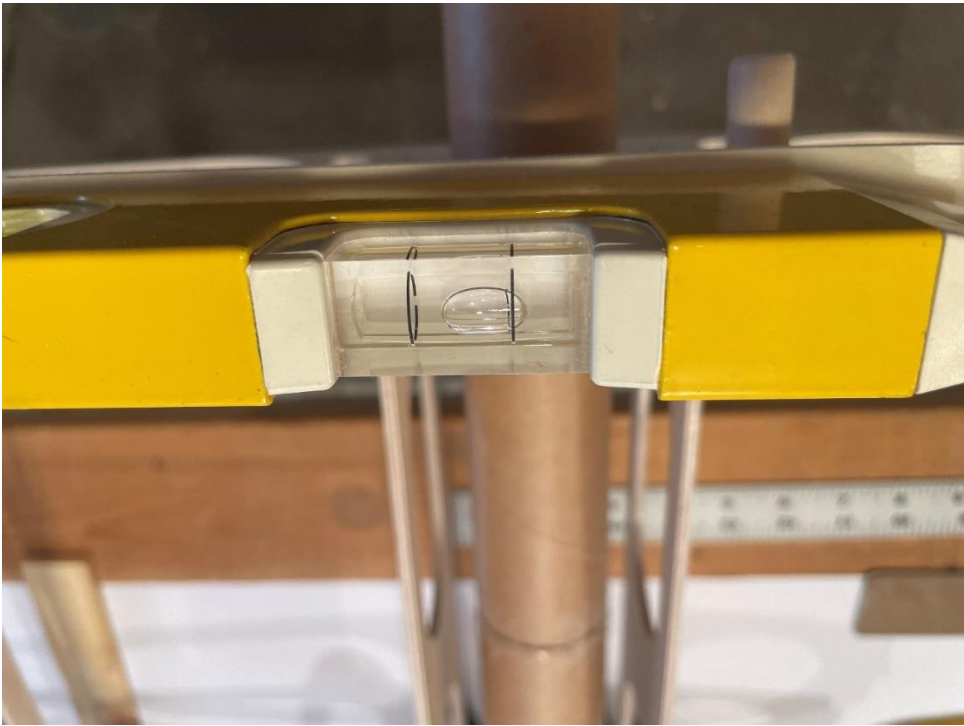
By attaching the Stub Wing Incidence jig to the right and left SW3 ribs, you can compare each rib's angle to the other side. All that is necessary is to have the level bubble for each side (each rib) the same. It is not necessary that the bubble be centered, only that the reading is identical on the right and left sides. If each rib reads the same, then the final wing incidence will be  $+0.5^\circ$ .

Clamp formers F3, F4 and F5 in their respective locations. Insert the wing tube socket piece on-center between F3 and F4 and glue. Slide ribs SW1 and SW3 into position. Carefully slide the wing tube socket into the assembly. If the wing tube socket is difficult to insert, wrap a piece of 100 grit sandpaper around a piece of 1-1/2" tubing and open up the hole. It won't take much. Do not glue! Mount the Stub Wing Incidence jigs to SW3 on the right and left sides. Use the level and compare each side. Adjust a shim under either the right or left leg of F5 until both readings are the same. Clamp formers. It shouldn't take much. In the picture below, the shim was just a little over 1/32". The Stub Wing Incidence jigs can and should be left in place throughout the framing process. Make certain that F3/F4 are vertical.





This picture shows the level and bubble on the left side.

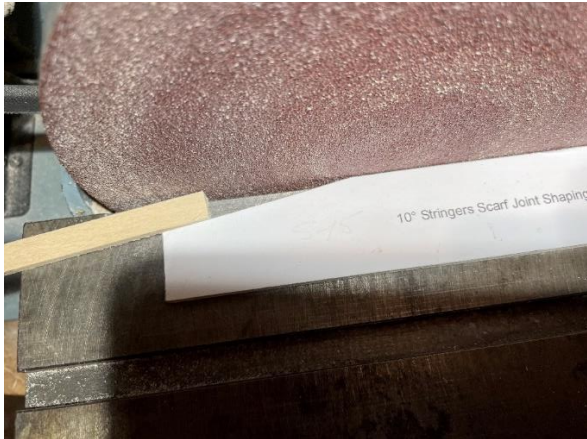


This picture shows the level and bubble on the right side. Virtually identical.



## Stringer Scarf Joints

All fuselage stringers have scarf joints between F7 and F8. It is much easier to glue the stringers to the fuselage in one piece. Good joints require a good fit. To get an exact 13° scarf on the rear stringers is to use 3M77 adhesive spray to temporarily mount the jig on a disc sander. Just push in the stringer until the sanding is complete. Glue the front cut stringers to the rear stick stringers and you are done.



## Locating F2 and Installing Fuselage Stringers

All formers, except F2, should be clamped in place and should be square to the building board.

The Series 18 has 2° right thrust and 2° down thrust angles built into the airframe. These angles are governed by the position of F2, which in turn is governed by four special cut basswood alignment stringers. When F2 is in place, with all the stringers and planking installed, you will have a very secure F2 on which to bolt the engine motor mount.

The four special alignment stringers that govern the correct position of F2 are labeled: Bottom or Right, or Top or Left. All other stringers, both basswood and balsa, are identical and interchangeable. The 1/8" in the holes in the basswood stringers are for cable ties used to dress the wiring to the engine ignition and throttle and choke servos. Left and right are determined as if you were sitting in the cockpit.

The bottom basswood stringer is installed first. This is a special F2 alignment stringer that is labeled "Bottom." Always make certain that this and all other stringers are fully seated in all the former notches. The notches in formers F12 and F13 will seem to be too deep. They are not. Seat the stringers fully; cap strips will be added later. When installed correctly, the stringers will protrude about 1/32" forward of F1 and will be sanded flush in a later step.

Glue the bottom stringer in place. It will terminate at F12. Set F2 into approximate position. Install, but do not glue, the "top" special alignment stringer in place. Do the same for the right left sides at the 9A and 3P positions.

Double check all four alignment stringers. If F2 is angling down and to the right, it is mounted correctly. Glue the right, left and top stringers to all formers F1 through F12. The top stringer will terminate at F13.

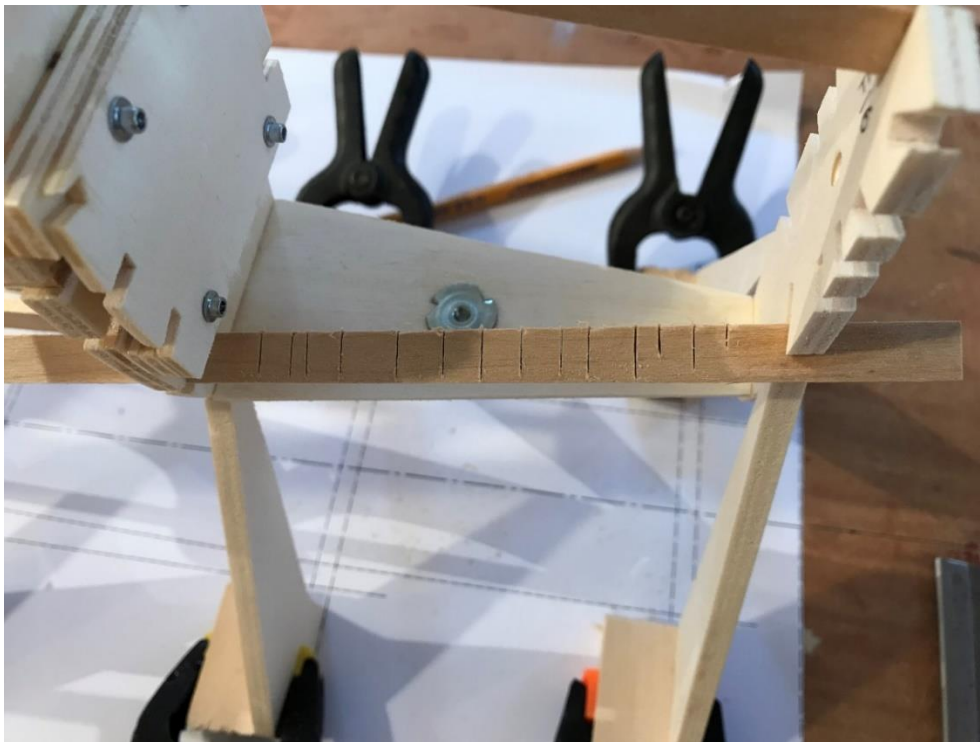
Install and glue the remaining 20 stringers. Start at the bottom and work side-to-side to the top.

You will need to cut and fit the two stringers –one basswood and one balsa –that fit into the stub wing spars (F3A, F4A & F5A). To fit, simply cut on the notch line with a razor saw. The balsa stringers that join with the landing wire hard points near the top of F3 and F4 will also need to be cut to fit.

The *balsa* stringers should terminate about 1 inch behind (toward the tail) the last former which has a 1/4" notch or kerf marks. F10 and F11 have small kerf marks near the bottom of the former. The balsa stringers should extend and be glued at this point.

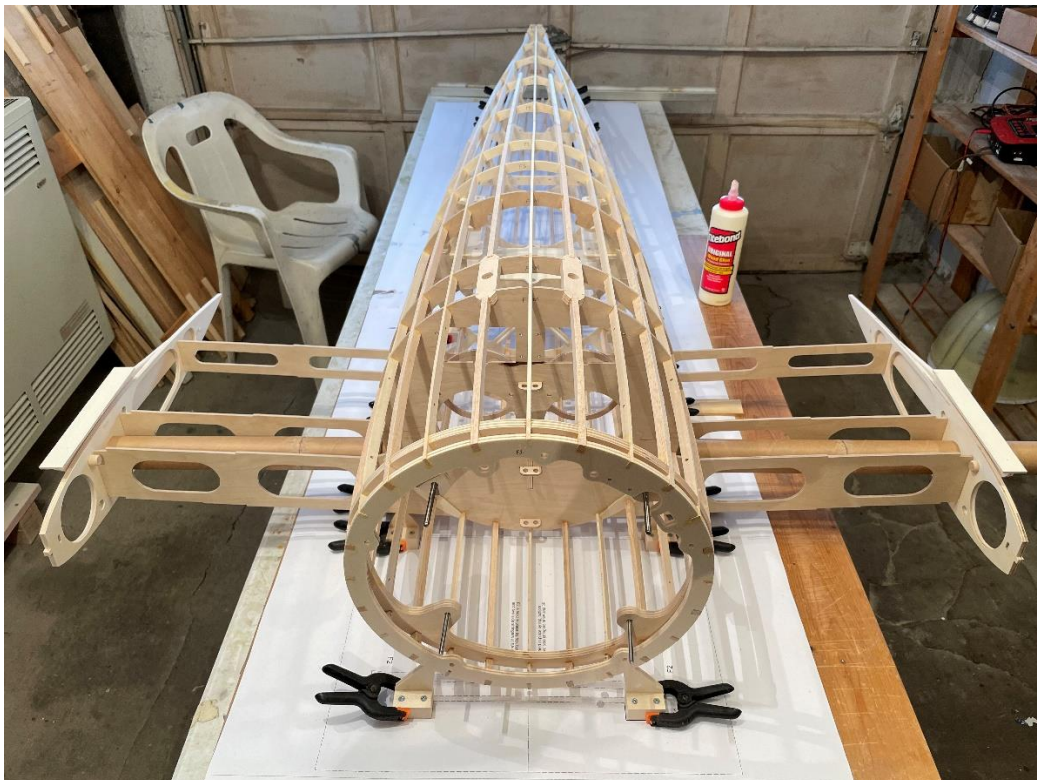
The basswood stringers at 8A, 9A and 10A and 2P, 3P and 4P should terminate at F12 so the stabilizer spar pocket is left open. No stringers should extend through the stabilizer spar

pocket. Fit three short 1/8" x 1/4" stringers from the rear side of the stabilizer spar pocket to F13. Cut stringers flush to the rear of F13.





The wing tube socket and SW3 ribs are in place to ensure correct alignment. They are NOT glued.



## Prepare the Balsa Planking

Obviously, the planking will need to follow the curve of the fuselage. The whole process of planking is made much easier if the planking is already set with a curve.

The best way to prepare the planking is to first brush one coat of full-strength nitrate dope to what will become the inside surface. As the nitrate dope dries, it will shrink the balsa and create a nice permanent curve. If the dried nitrate dope does not create enough curve, apply warm water to the other side and wait about 10 minutes.

Note: The preparation described above only works well if your balsa is moderately soft. If you have a section that is still and hard (and heavy) or c-grain, you will not get much curve effect from the application of nitrate dope. Nevertheless, it is still a good idea to dope the inside surface of the planking to prevent the absorption of moisture.





## Planking the Fuselage

Planking the fuselage is a job that requires a lot of patience, skill, experience and about 12 hours to complete. So please, don't rush this process. In fact, it really can't be rushed. There is no fast way to plank. Planking is tedious, messy and can be frustrating. Even worse, all that fine craftsmanship you have invested so far may not look so nice once the planking is glued in place, but when filled, formed, and sanded it will look very good.

If the planking pieces are cut from the templates included with the plans, they will be very accurate. Any trimming will be minor, except possibly the last piece at the bottom. The planking is designed for a 1/4" overhang at F1, which will be trimmed flush in a later step.

Use Titebond wood glue. It has just the right amount of open time to allow positioning and clamping without rushing. It has a good grab and will set up in 30 minutes or less.

You can either apply glue to the planking or the stringers. A combination of the two works best. Apply glue to the *planking* for the stringers and apply glue to the *formers* with an acid brush. On the *glue* side of the planking, scribe a line right down the center to create a guide for the glue that will contact the basswood stringer. On each edge, apply the glue that will contact the balsa stringers. Make sure that you apply plenty of glue to F1 - F5 -especially F1 and F2.

In the process of planking, you will be forcing the balsa into compound curves. If the balsa planking has a straight grain and is relatively soft, then forming to the stringers will be fairly easy, but you *will* need plenty of clamps at F1.

Preparing and gluing the first (top) plank will take some time to do right. Be patient. You will be rewarded by not having to undo mistakes. Planking is unlikely to result in perfect seams. Fortunately, perfection is not required. If the planking is secure to the stringers, gaps shouldn't be a problem later as they will be filled with spackling and epoxy. This whole process will come out better than you think. *Do NOT fill the seam gaps with Titebond.* It will be too hard to sand. If the planking is glued to the balsa stringers, the seam gaps won't matter.

The open space between the stub wing spars F4-F5 must be filled in (planking section #5). If you don't, the vacuum created by the open cockpit will suck up grass and debris up from the wheel pants. Make sure this area is sealed!

You will need at least 100 push pins to hold the planking in place while the glue dries. Push pins work surprisingly well for clamping. You will not have a good experience with cheap plastic pins. Make sure you are using *heavy duty* pins. Use 5/8" steel point with 1/2" aluminum head.

You will also need some clamps to pull the planking down tightly against F1, and anywhere else that needs a little help. You will need at least 3 clamps for each section at F1.

All planking pieces are mounted “on-center” –meaning that the center of each plank is glued to the basswood stringer and clamped (and pinned) at the edges to the balsa stringers.

The balsa stringers are not indestructible. Take care when pushing in the pins.

When you remove the push pins you will likely have some dents in the planking. These will disappear after the planking is filled and sanded.

Mount and glue the top piece first, and then work down the sides. As long as the fuselage is set on the building surface, you can only mount the top and segments #2 and #3 on each side. After this is accomplished, the template and jigs will have served their purpose, and the fuselage can be removed, and the remaining legs cut off. Mount the fuselage on the rotisserie.

## Rotisserie

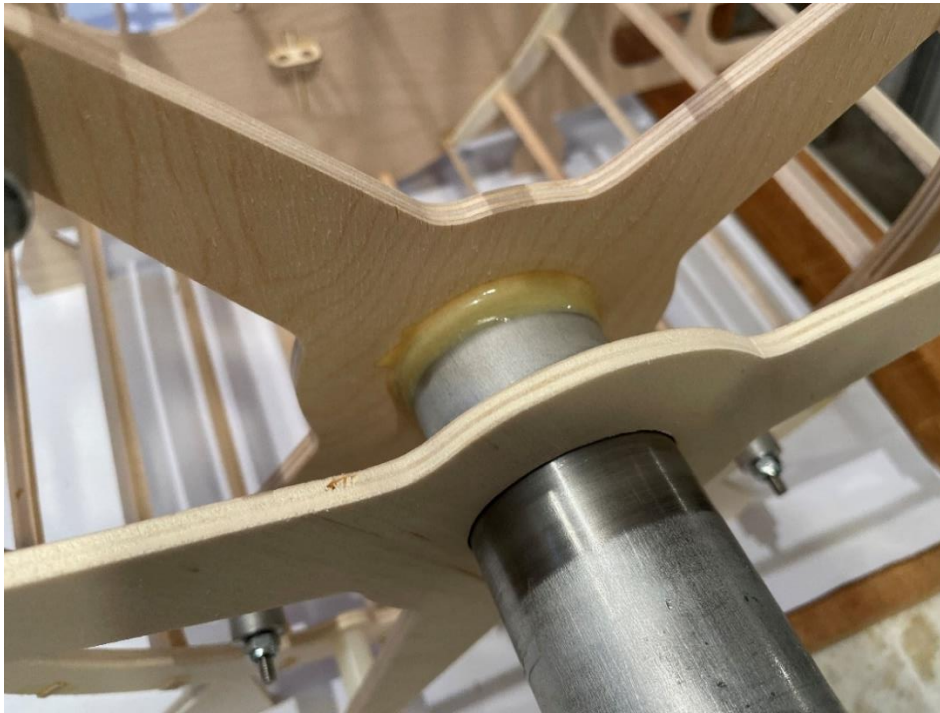
Planking, veneering, and painting the fuselage is much easier if it is mounted on a rotisserie. The front “axle” mounts to F2. The axle needs to be straight and on center with the tail, but because F2 is angled 2° down and 2° to the right, the axle needs to be supported by a jig mounted to F1 while the epoxy hardens.

Mount 1/4” 5 ply birch plywood rotisseries bracket to F2. In the picture below, spacers are temporarily used to shorten the distance the nut needs to travel.

Prepare a 2” aluminum axle approximately 10” long.



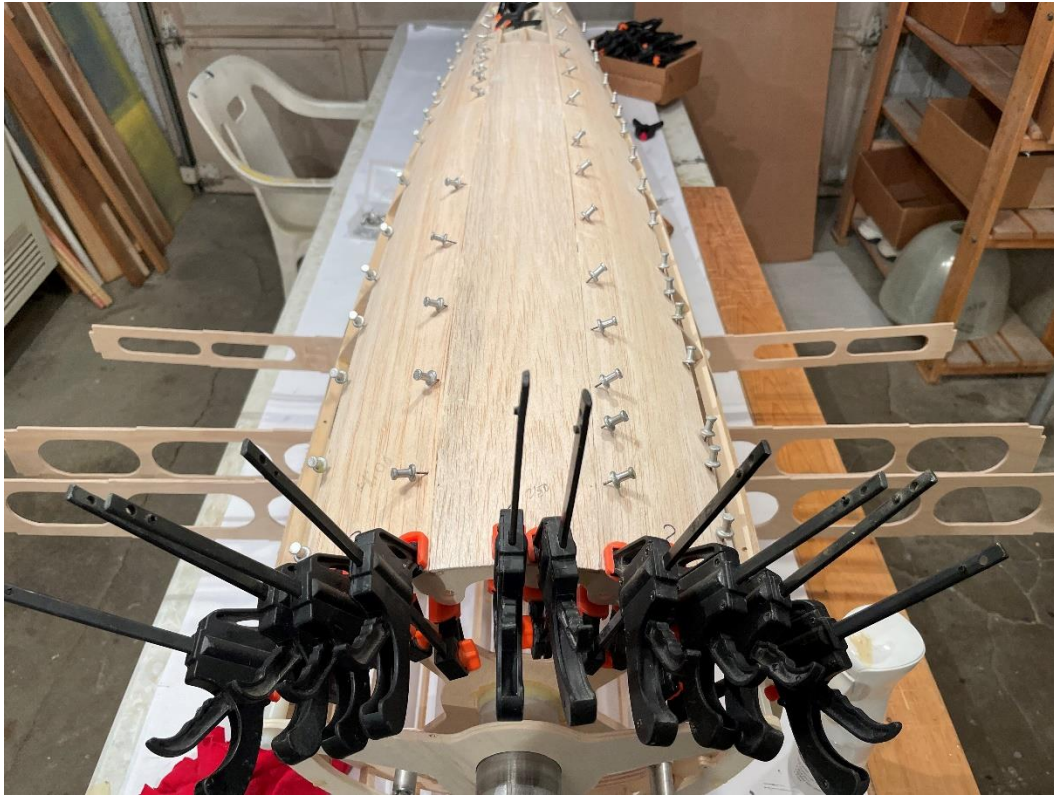
Mount rotisserie axle jig to F1. Use the motor mount spacers to make mounting easier.



Apply epoxy to one end of the aluminum tube and insert it into F2. The jig mounted to F1 will hold the axle perfectly straight while the epoxy hardens. When the epoxy is set (overnight), remove and discard the F1 axle alignment jig.

Use the F2 and F13 rotisserie jigs so you can rotate the fuselage and complete the planking.





Sometimes it is easier to mount the balsa edge first with pins and then clamp the free edge. As you can see, you will need a lot of mini clamps.





Major sections 4, 5, 6 and 7 all have (X) extensions. There is no need to glue at the joint. All the strength is in the stringers.



Make sure the fill the space between the wing spars. This is necessary for good integrity and to prevent the vacuum created at the cockpit from sucking up grass into the fuselage from the wheel pants.



### Shaping the Fuselage after Planking

The basic idea is to fill the seams, holes, and dents with lite spackle, then round the fuselage with a 40 or 50 grit sanding block. Use a *very course* sanding block with a *very light* touch. All you want to do is sand down the high spots.

The fuselage design allows for  $1/32''$  to be sanded off the balsa planking resulting in finished planking thickness of approximately  $3/32''$ . Attaining this degree of accuracy is not likely among even the most careful builders. That said,  $1/32''$  is more than enough allowance to smooth from rough to final shape. The combination of sanding the balsa high spots and filling the lower spots with lite spackle will lead to the shape you want. Even when the planking is “finished” it still is yet to be covered with veneer, fiberglass cloth and epoxy and varnished. The point is that after all these steps, you will wind up with a strong and virtually perfect fuselage shape. And it will look gorgeous.

Use an old credit card, or something like it, to spread a thin coat of lite spackle such as UGL 222 (available at paint stores), on flat areas, and all seams and dents. Allow it to dry overnight, then give the fuselage a *preliminary* sanding with a 50-grit large sanding block. Use this step mainly to knock down to worst high points of spackle.

Spray a lite mist coat (a guide coat) of fast drying primer onto the planking. Use 45-degree *light* sanding strokes. When the mist primer coat is *almost* all gone, you're done. *Don't sand excessively*. Just enough to make the fuselage smooth and nicely rounded.

At about midway through the shaping process trim and sand the "overhang" so that it is flush with F1. This area is likely to be somewhat delicate, so be gentle. Mount the cowl ring so it will serve as a sanding guide at F1. During final assembly you will find that the finished cowl and the veneered fuselage align very nicely at F1.

Finish with 80 or 100 grit. Again, with a very light touch. You may find that simply using your finger's sense of touch is the best guide. Plan on about 4 hours to shape and sand the planking.







### Seal the Balsa Planking

To create a strong surface for the veneer to bond with the balsa planking, seal the balsa with 3 oz 4HS fiberglass cloth (Style 120 available from US Composites). Use West System 105 resin and 206 slow or 207 clear, or equivalent. The best way to apply epoxy is with a 3-inch roller. Try to avoid shiny spots which means you have too much epoxy in that area.

After the epoxy hardens (overnight), wash the fuselage planking twice with plain water and dry. This is a *necessary* step to remove the amine blush, a thin wax that forms as epoxy hardens.

Give the fuselage a vigorous sanding with 180 grit. You want the base for the veneer to be as smooth as possible. Blow off the dust or wipe with a microfiber cloth.

It is important to seal the bare balsa planking with fiberglass cloth and resin. This creates superior substrate for the veneer than bare balsa alone.



### **Mahogany or Basswood Veneer**

You are now leaving the world of model airplane construction and entering the world of fine woodworking.

Veneering the Riley Model B is not the work of a day. It will require skill and a lot of patience. Plan on about 25 hours to cover the fuselage. Veneering is expensive, wasteful, messy, tedious, and can be a frustrating experience. But when varnished, it looks fantastic!

Veneer is very thin real wood; about .020" to .030" thick. There are many varieties of wood veneer, but as a practical matter, you need only consider mahogany and basswood. Mahogany is unsurpassed if you want your fuselage to have the look of a classic wooden boat.

On the other hand, basswood with a natural finish (or stained) can also look very nice. Basswood is relatively inexpensive and is available from National Balsa in sheets 2 and 3 inches

wide x 1/32" thickness. Whichever wood veneer compliments your color scheme best is the one to choose.

There are only two kinds of veneer bonding methods that are practical. Both methods have their advantages.

1. Two-inch-wide edge banding comes from the factory with an adhesive backing that is heat activated. All you do is iron it on. Edge banding is available in mahogany, but not in basswood.
2. If you use paper backed veneer you will need to apply (2) liberal coats of adhesive to the veneer and (1) coat to the balsa planking. Allow it to dry, and then iron it on. Basswood must be applied this way. While not specifically formulated to be used as a heat activated adhesive, PolyTak or SuperSeam work well for veneering. You will need 1-1/2 quarts. (One quart is not enough.) Either product is available from Aircraft Spruce.

There are three primary issues to consider when applying veneer to the fuselage.

1. There are 24 sections that are needed to cover the fuselage. That means there are 48 edges that need to be carefully cut so that the seams are reasonably even.
2. Then there is the possibility of eventual delamination. How well the veneer is bonded to the substrate (the balsa planking covered with fiberglass cloth) is critical to long-term fuselage integrity.
3. It is a good idea to check the grain to see if you like what you have and perhaps to decide which pieces will look best in a certain position. A good way to do this is simply to wipe some paint thinner on the veneer. This will give you a preview of what it will look like after it is varnished.

Whatever you decide to do, get some scrap balsa and experiment so you can familiarize yourself with how these materials and adhesives handle. It's almost impossible to fix a bad veneer job. Practice on something other than your model until you have sufficient confidence.

Tools and materials needed.

1. One roll of plain adding machine paper. These rolls are 2-1/4" wide and work well for making the section templates. Even better, 3" wide thermal paper rolls are easier to handle.
2. Very sharp scissors. Cheap or dull scissors are maddening to work with. You want clean edges. Invest in a pair of quality scissors.

3. Krylon Easy Tack repositionable adhesive. There are other brands. Easy Tack works best.
4. A 60" long straight edge that will allow slight bending. You may need to get creative. A straight spruce stick is ideal. A length of thin aluminum strap will work.
5. Sharp lead pencils.
6. A nice iron set at about 300 degrees. The small irons used for covering do not transfer enough heat. A quality travel iron works very well. No steam needed.
7. Hole punch for dowels. 3/16". 1/4" will look too big.
8. Strong masking tape. 1" wide, 3M Scotch 2020 works well.
9. Cotton glove for left hand. Iron on veneer gets very hot.



### Veneer Using Edge Banding (Mahogany)

Edge banding is pre-glued and simply irons on. It comes in 2" wide, 25-foot rolls in a wide variety of woods. The total of all 24 veneer strips is almost 100 linear feet! So, you will need four 25-foot packages. Three-inch-wide veneer is easier to handle, but there is considerably more waste. [www.veneersupplies.com](http://www.veneersupplies.com).

Make sure you apply a liberal coat of PolyTak or SuperSeam to the fuselage.

The ideal look is to have a reasonably straight grain. Sections with an excessively wavy grain pattern or knots may diminish the appearance slightly. It's your call. Use less than perfect veneer edge banding for sections that will be placed on the bottom of the fuselage.

Every 10 feet or so, you *will* find finger joints in your package of edge banding. They are barely noticeable, until you varnish. Inspect carefully. Either don't use sections that contain finger joints or use them at the bottom where they won't be seen. You can't see the bottom of the model when it is on the ground. And you won't be able to see anything so minor as a finger joint when it is in the air.

### **Plain Veneer (Basswood)**

To prepare each basswood for veneering, brush on (2) liberal coats of PolyTak or SuperSeam. It is best to cover the entire sheet. That way when you attach the paper template and cut the sections, there will be plenty of adhesive right on the edges automatically. Brush (1) liberal coat of PolyTak onto all the balsa planking and let dry. Also brush a liberal coat PolyTak or SuperSeam onto the fuselage.

The veneer will bond to the balsa planking by using an iron set to about 300°.

### **Forming Veneer Sections and Bond to Fuselage**

Start at the top. Lay a straight edge exactly on-center at 12:00 o'clock and draw reference line. Draw a second line on-center of the first 1/4" balsa stringer. This step helps align the paper template and shows exactly where the first section of veneer will be applied.



Using Easy Tack, attach a length of adding machine paper to where the first section of veneer will be applied. Lay your straight on-center to the top spar and scribe a line. Use clamps or tape to keep straight edge in place.



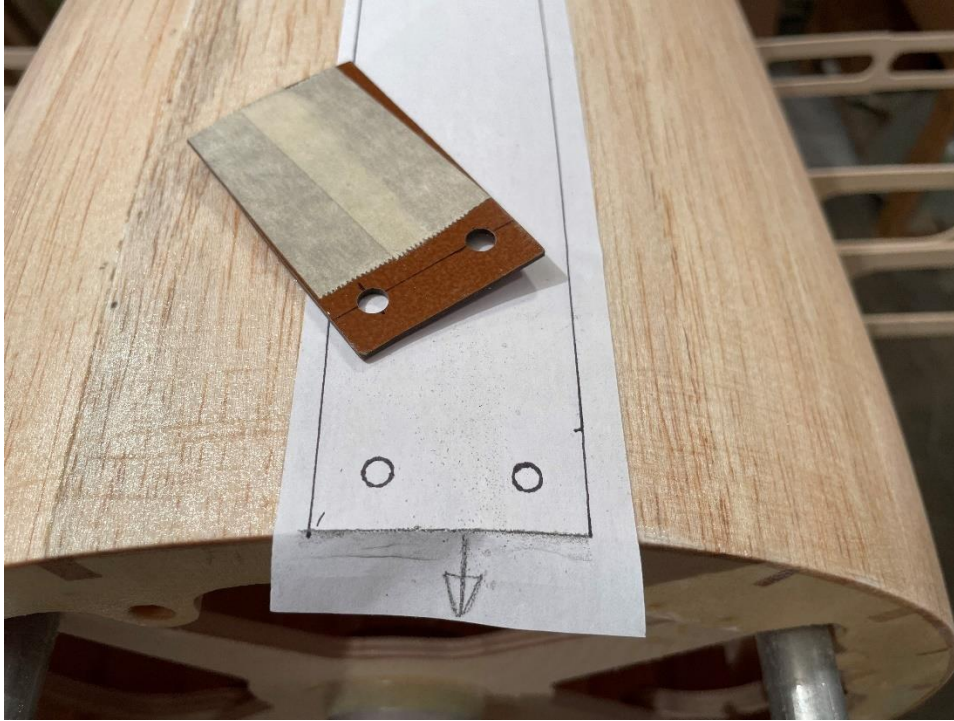
Set up the straight edge to the other side and scribe a line. This will form the basic template for the first section of veneer.



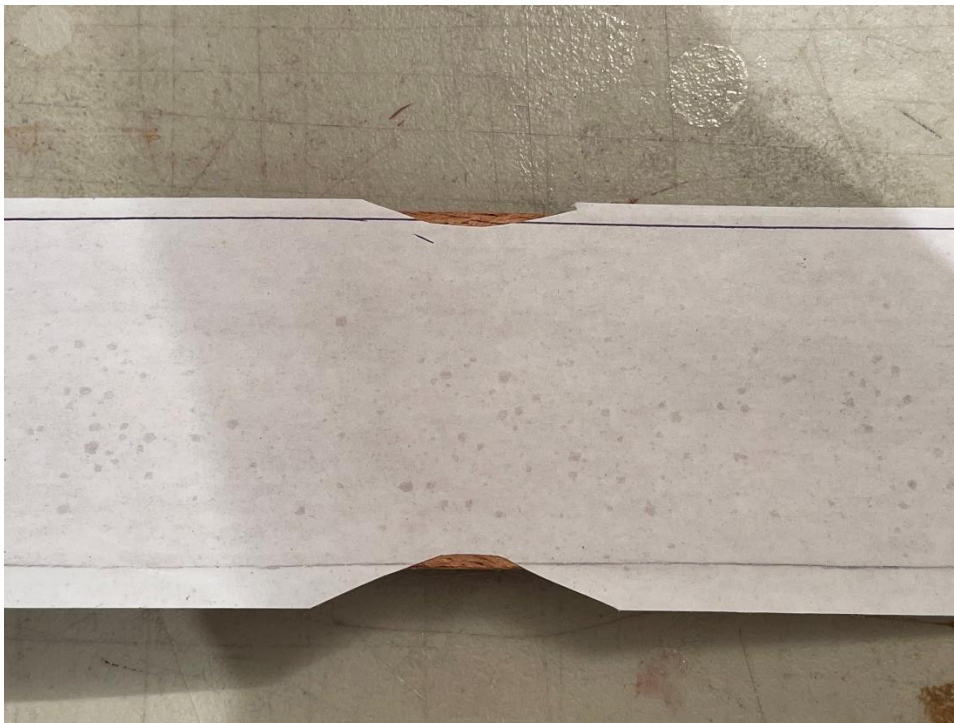
Use the edge of a pencil to indicate the front edge of the veneer.



If you plan to have simulated dowels, make a dowel template to suit.



Remove template from fuselage and apply to a length of veneer. You will probably need to reapply some Easy Tack to the template. Aligning the paper template to the veneer is much easier if you make two cuts about midway.



Although the “dowels” are hard to see in this picture, it is usually easiest if the dowel holes are plugged before ironing the veneer. Insert plugs made from the same punch that made the



holes, press them in the holes. They will bond when the veneer is ironed on. When sanded, they will look very authentic. Iron on this first section of veneer.



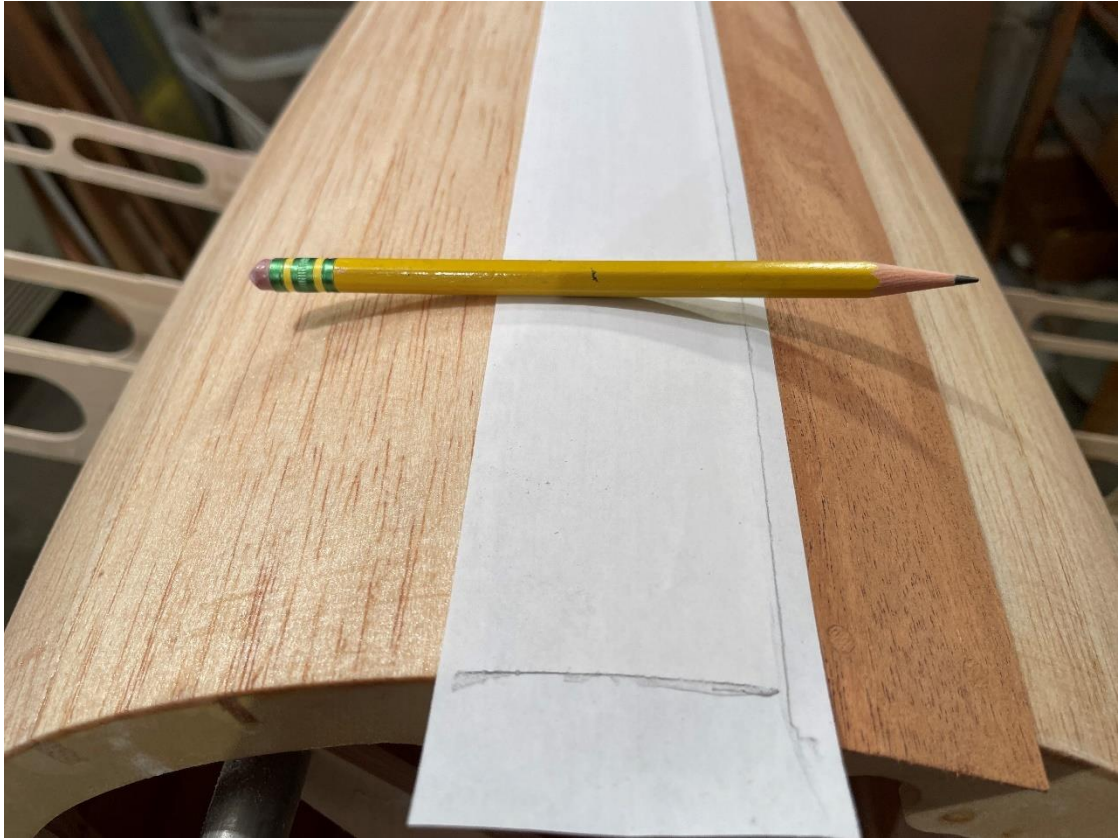
There are 24 sections of veneer.

All seams should be as close as possible to on-center with the corresponding stringer. It is advisable not to cut all sections at the same time. Cut the sections as you need them, because as you add sections, you may find that the veneer seams are drifting a little off center compared with the stringers. If you notice that the sections are drifting a little bit wide, just cut the next section a little narrower; if drifting too narrow, then cut a little wider.

It is unlikely that your seams will be perfectly even. This is less of a problem than you would think. After varnishing, all but the most uneven seams will look fine. If seams are too close place a straight edge where the seam should be widened and use a sharp awl to make the seam more even in appearance. A 12-inch ruler with a cork backing works very well. Any straight edge that won't slip will work fine. Don't use a #11 hobby blade or a saw. They have a nasty way of getting off course. A sharp awl works best. If a seam is too wide, use a lead pencil to darken the seam—the excessive width will not be too noticeable when varnished. All remaining sections are done as follows: Lay down a strip of adding machine paper. Against the previously applied veneer edge, run your fingernail to create a sharp crease. Use the side of a lead pencil

to transfer a cut line that will exactly conform to the veneer edge. On the other side, use the straight edge to draw the cut line. Add your dowel locations. Remove the template and apply it to the next section of veneer. Cut very accurately. Iron it on!







Veneer sections 8, 9 & 10 will require some trimming to fit at F3 and F5. The tail end of each section should terminate at the same place as the balsa planking.



When all the veneer sections have been glued in place, you can give the fuselage a cautious light sanding. Veneer, especially edge banding, is very thin. You don't have much to work with, so be careful. There is no suitable fix if you sand through the veneer. Don't be concerned with minor high or low spots. After the entire fuselage has been fiber glassed and varnished, everything will smooth out nicely.

## Fiberglass the Fuselage

You are now leaving the world of fine woodworking and entering the world of finishing a cedar strip canoe, or for you Beach Boy fans, finishing a surfboard.

If you wish to stain or get creative with the veneer, NOW is the time to do it. Veneer looks great if it is simply left natural. However, now is the time to stain the veneer, if desired.

Cover all fuselage veneer with 3 oz 4HS fiberglass cloth (Style 120 available for US Composites). This cloth lays flat and has low print through. If you prefer another style of weave, just select a cloth 4 oz or less. One layer of fiberglass will be plenty strong. When saturated with epoxy resin, the cloth will become invisible.

Use West System 105 Resin and 207 Clear Hardener, or equivalent. West System 207 is the ideal product for this step. It is completely clear and has UV protection. What you want to do is saturate the fiberglass cloth but no more. By far, the best way to apply resin is to use a 3- or 4-inch-wide roller.

Note: the pictures of the prototype show only one coat of epoxy. Although it is more work, a second coat of epoxy will completely fill the weave and require less coats of varnish.





Wrap the fuselage and smooth out all wrinkles. Make a nice seam at the bottom overlapped about 1 inch. Use Easy-Tack to hold the cloth in position. It doesn't take much. Allow plenty of time to get everything nicely wrapped. It will make the application of resin much, much easier.



## Cut All Fuselage Openings

- Trim veneer flush at F1.
- Cut open the bottom of fuselage at engine bay.
- Make cockpit opening.
- Holes for the Camloc fasteners.
- Cut and trim all scallops at rear.

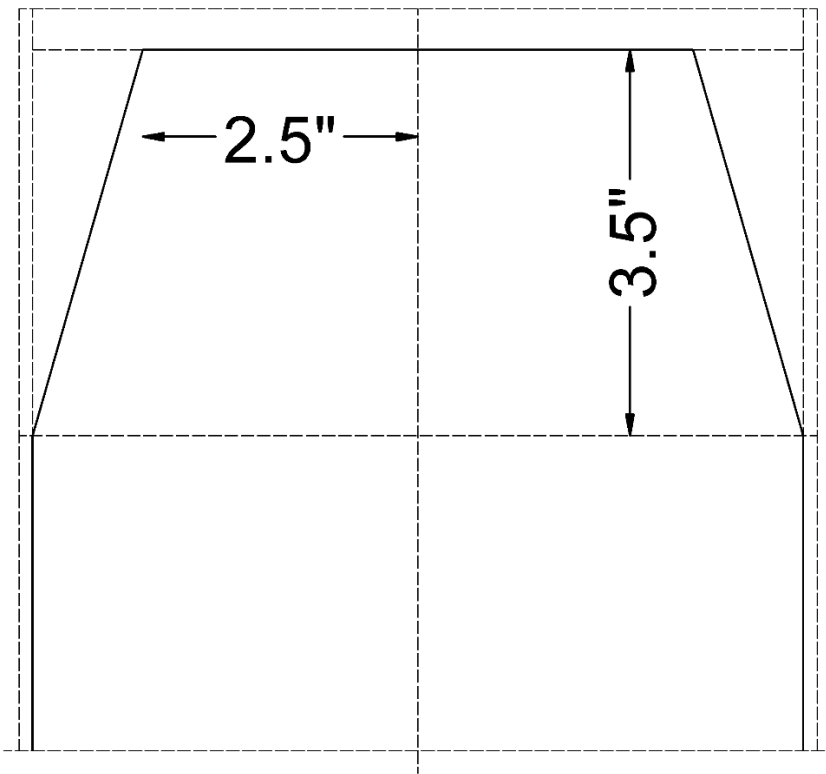
Make rough cuts first, followed by finish cuts and then sand to finish. In most cases, the use of hand tools will be the best method. Use a 32 tpi mini hacksaw blade to cut out the cockpit. For the scallops, a Dremel tool with a wood burr works well. Perma-Grit hand tools can't be beat for versatility. They make shaping the scallop curves (almost) a pleasure.



The veneer may be somewhat delicate at F1, so use care when trimming. Use a razor saw first, then sand flush with 100 grit sanding block.

The purpose of the engine bay opening is to exhaust hot air from the engine. Most engine manufacturers recommend that the opening be two times the opening area for the cylinders. In other words, make it as large as is practical. Keeping the center (bottom) stringer uncut adds

a little strength, but also makes the side view look a little better. So that the stub wing rib fairing will have a fuselage surface to mount to, shape the cutout as shown below. The rear cut is on-center with the balsa stringer and about midway between F3 and F2.





Use paper template from plans for cockpit opening. Cut out with a mini hack saw blade and finish with a curved Perma Grit tool. Note: This picture is from an earlier build and has been revised. Position the template as labeled.



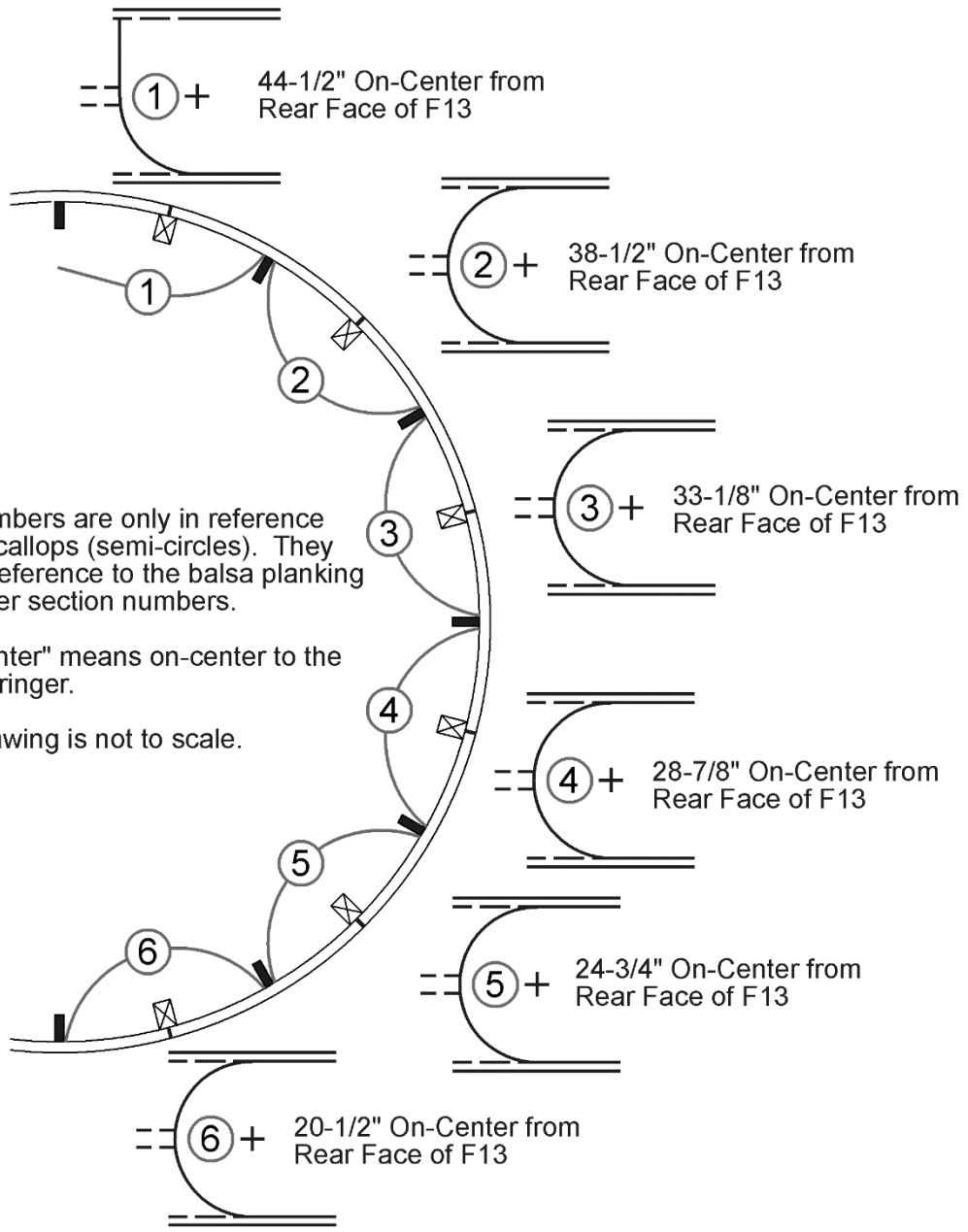


The landing wire mounting holes are located 10-5/16" back from the face of F1 and on center with the stringers (Moki 250). If building the Valach 140 version, then drill 12-5/16 back from the face of F1. Drill a 3/16" starter hole, then open the hole with a regular #11 blade or a tapered reamer. The finished hole should be 1/2" diameter. Use the Camloc receptacle as guide to drill the 5/64" holes on either side. Secure receptacle with #4 x 3/4" socket head sheet metal screws (Dubro 383).



## Cutting the Scallops

Cutting away the scallops is not difficult but very time consuming. Make rough cuts first then finish with careful sanding. All the scallops are measured on-center from the rear face of F13. Use the paper templates found in the fuselage parts sheet. There will be a lot of excess planking to cut away, including the *balsa* stringers. All scallops are cut *between* the *basswood* stringers. Even though the radius of the templates is accurate, you will still want to be very careful to "sneak up" on to the edge as you cut. The purpose of this design is to make the transition from the planked fuselage to the rear covered section look as nice as possible. The exact shape of the scallops is not critical.





Mount the paper templates from the fuselage parts sheet in position on the fuselage. Use 3M77 spray mount to secure in place.





The cutouts were rough cut with a Dremel tool and a 3/32 carbide burr.



And trimmed with a curved Permagrafit tool.



## Glue Rings to Fuel and Smoke Tanks

Because the 3W fuel and smoke tanks are made from type 4 low density polyethylene, a special treatment is necessary for glue to stick. Scuff the tank with 80 grit sandpaper where the mount will be glued. Apply accelerator to the plywood mount and the tank. Wick in thin CA glue. After mounting, the tank mounting brackets should be coated with epoxy. Mount the rings square with the tanks 4-1/4" from the bottom (Moki 250). If building for the Valach 140, then mount the rings 3-13/16" from the tank bottom. The plywood rings will mount to F3 with 1/4-20 x 5/8" nylon socket head screws. Do not mount the tanks permanently until final assembly.

## Paint Engine Bay with Epoxy

It is inevitable that gas, oil, and dirt will find its way into the engine compartment. If it soaks into the wood, you will not only have a mess, but it is virtually impossible to remove – a very distressing situation. Allow about two hours to “paint” all the inside surfaces F1-F3 and the fuel and smoke tank rings with epoxy. Do not use varnish, dope, hobby paints, or even two-part urethanes, use epoxy. Use a 1 inch throw away chip brush and work the epoxy into every crack, seam, and corner. Epoxy does not flow like paint, so just brush it on liberally any way you can. Then, when you are certain that all wood surfaces are coated, use a rag and wipe off all the excess epoxy. When the epoxy hardens it will look pretty good and will prevent any oil or gas from seeping into the wood. There are a lot of 4-40 T-nuts and 1/4" threads in F1 and F3. You don't want any epoxy to get into these threads. Plug up these openings any way you can. The best way is to sacrifice some 4-40 and 1/4-20 screws. Use a pipe cleaner to clean epoxy out of the holes in the basswood stringers. Also cover the motor mount threads with either masking tape or tubing! West System 105 resin and 206 slow hardener, or similar, is recommended. 207 Clear hardener also works just fine. Thin the epoxy slightly (15%) with alcohol to make it brush easier. The alcohol will evaporate fairly fast, leaving the epoxy to harden.

## Shape and Mount Gas Cap Base

Lay a sheet of 60 grit sandpaper on the top of the fuselage. Sand the bottom side of the base to create a nice fit, then round the edges to suit. Mount to the fuselage with Titebond. The hole in the base should be about 4" from the face of F1.





## Add Cap Strips

Glue 1/8" x 1/8" basswood cap strips to the rear stringers from the scallops to F12 or F13. The purpose of the cap strips is to create a consistent stringer height (or transition) from the scallops to the rear of the fuselage. Neither the stringers nor the cap strips should pass through the stabilizer pocket.



### Tail Wheel Balsa Fill and Tail Wheel Mount

Glue parts in place, then shape and sand to conform to taper and curves of the fuselage. Using long Philips screwdriver, insert a 10-32 x 1-3/4" truss head screw into the tail wheel mount. When only about 1/4" of threads remain, add a couple of drops of thin CA and screw in the rest of the way until snug.



### Pull-Pull Control Cable Tube Exits

There are 3 pull-pull cable tube exit points on each side of the fuselage. The installation procedure is the same for top elevators, bottom elevators and rudder. Installing, forming, and finishing the cable tube exits is somewhat challenging. We're dealing with compound curves and twisting stringers. You may not get perfect seams. What you will get is control cables that exit the fuselage at exactly the right place and line up perfectly with the elevator and rudder horns.

The height for each part, *when finished*, should be flat to the edge of the *cap strips*, just like the covering will be flat between the stringers.

When the balsa mounts are glued in place, shaped, and sanded flat to the cap strips, pull the tubing through the corresponding slots, and scuff the ends with sandpaper. Terminate the tubing about 1/4" from the end of the slot. Add some CA accelerator to the tube. Before you glue, make certain all tubes pass through F8 in the proper position. The tubes are glued at the exit points only, not at F8.

The best way to ensure perfect alignment of the tubes is to use the Cable Tubing Alignment Jig and a 1/8" rod.



Use lite spackle to fill the slots and form a nice filet around the tubes. It will probably take two sessions to get the filets to form the way you want them. Use any curved scraper with about a 1/4" radius. Alternately, the fileting step can be done after the fuselage is covered.



Make sure the tubing goes to the right place!

