

# PT Military Trainer Construction Notes

By Franny Brodigan



## CONTACT INFORMATION

The PT Military Trainer was designed by  
M.K. Bengtson

Manufactured and Distributed by  
Bengtson Company

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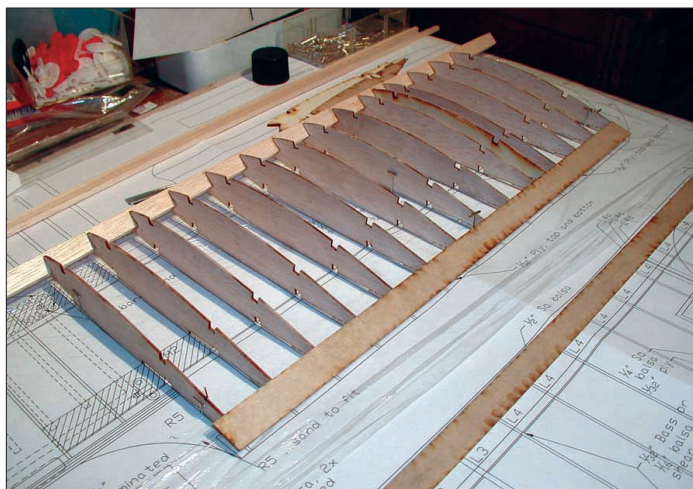
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#### TOP WING

Start by removing and laying out all the ribs. Place the center R2A on each side over the plans and pin in place. Do the same for the last R2 on each side. Make sure the ribs are perpendicular to the building board. Now place the top ply trailing edge top and line it up with the plans. Do this also with the one piece leading edge as well. When you are sure all is straight, glue both the leading edge and the trailing edge top in place forming a "box" structure. Now add and glue the rest of the R2 and R2a ribs except for the two on each side of R2c-R2b-R2c sandwich ribs. Make sure each rib is perpendicular to the building board before the glue sets. Also double check that your frame is square and that each rib's leveling tab is resting firmly on your board.

For the Rib sandwich (R2c-R2b-R2c), glue the three together being careful of their alignment. A Dubro metal strap will be inserted into the bottom of the assembly so that the hole in the strap lines up with the pre-drilled holes in the rib. Make sure you keep this area free of glue when you assemble the pieces. Do not insert the strap at this time as it will interfere with its placement in the wing. At this point place and glue the sandwich ribs and the R2 ribs on each side.

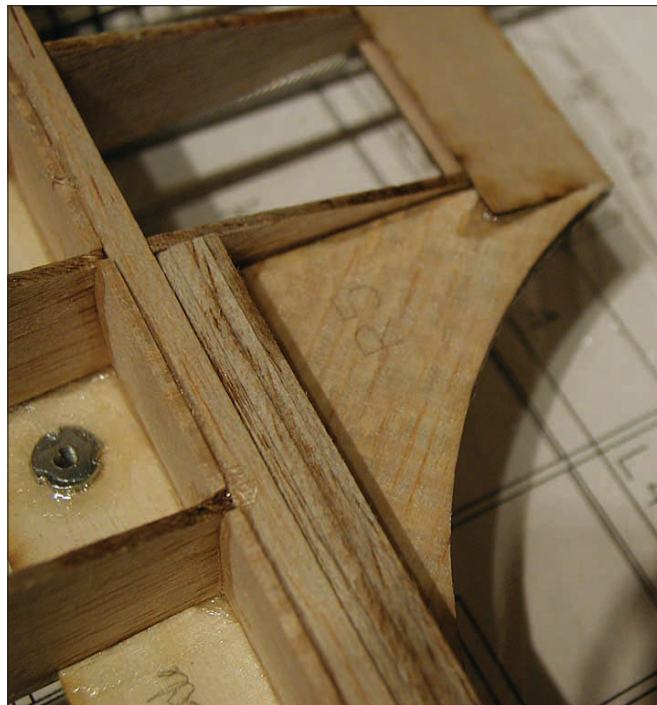


The top rear spar can now be placed and glued. It should be a nice and tight fit. Allow a bit extra to extend past the tips on each end of the wing. These pieces will be cut and re-attached angling down to the tips after the tips are attached. The tips are assembled separately and attached later.

Once all ribs are in place (except R3), attach the forward spar as you did the rear spar leaving a bit at each tip.

After you glue has fully cured, the wing can be removed from the board. Add the bottom spars taking care to do so with the wing flat on your board as not to introduce a warp in the wing. Remember the little extra at the tips as you did for the top spars. With that done, now attach the bottom ply trailing edge.

While that is setting up, laminate up the (4) R7 1/16" balsa center trailing edge pieces. Then attach it to the back of the R1as and R1s, top and bottom spars. You may need to sand the ends a little to get a good fit.

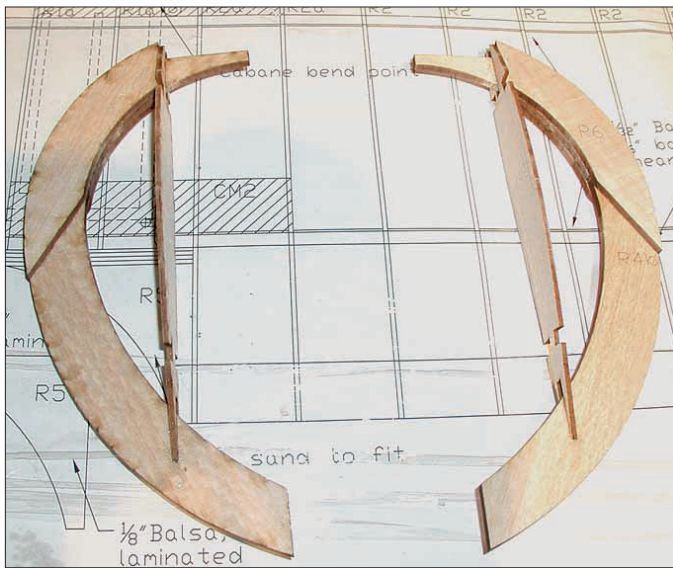


While that is setting up, laminate up (2) each 1/8" R5 Fillets. To get them to fit, you will need to sand the side with the squared off end a bit to fit inside the two ply top and bottom trailing edge pieces. Once you have a good fit flush against ribs R2a and the center laminated trailing edge, center it and glue in place.

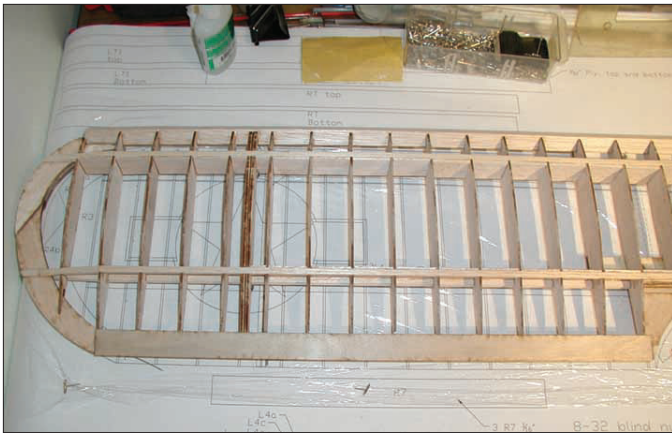


Find the ply CM1 and CM2 and study their orientation a bit before attaching them. Line them up so that the pre-drilled holes match the plans. Once they are glued in place, insert (6) 4-40 blind nuts from the top. Use a bolt and washer from the bottom to seat them completely and then add just a tad of CA around their edges to keep them from backing out. The may protrude through a bit which is fine, so use a large, thick washer (a great use for all those extra plastic prop spacers!).

## ASSEMBLING THE WING TIPS



Start by laying out R4a&b over the plans. Glue them together and then add R6 on top of them. R6 should line up with the notch at the trailing edge of R4a. When dry, remove the tip from the board and glue the second R6 to the bottom lining it up with the one on the top. Find rib R3 and slide it on R4a so that it stops at the leading edge. Keep in mind the R3's airfoil is not symmetrical and there is a top and bottom to it. Be sure as you are assembling the tips to make one left and one right. Align the tip assembly over the plans and position the trailing edge of R3. When you are happy with the alignment, glue it in place.



### FIT THE WING TIP TO THE END OF THE WINGS.

The trailing edge of R4b needs to be shaped a bit to fit between the top and bottom trailing edge just as the R5s were. When you have it flush the last R2 at the trailing edge, place the top so that the very end of R4a contacts the leading edge of the last R2. You will need to trim the end of the square leading edge so that R3 will rest on the very end of the leading edge.

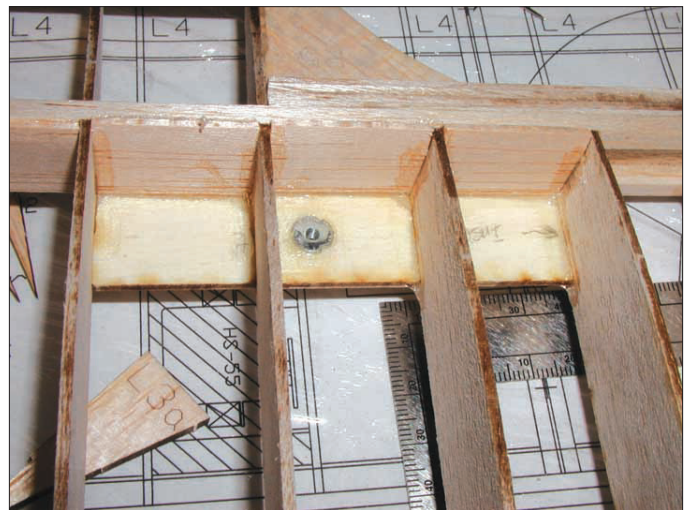
When you are happy with the fit, glue the tip being careful to align R4a along the inner edge of the leading edge and the tip is straight/level when viewed from the front. Now repeat for the other tip.

Once the tips are set, trim the spars at the end of the last R2. Then, sand an angle on the piece you cut and butt

it up against the trimmed spar end. Sand the bottom of the other end so it will rest in the spar notch of R3. The spar will then go all the way to the end of the tip and be sanded later. Do this for both tips, top and bottom.



Next cut out all the web pieces out of 1/16" balsa and glue them between the back side of the forward spars and the front side of the rear spars. Hint – cut a long piece (along the grain) 1" wide for the front spars and another 13/16" wide for the rear spars. Now use each rib bay as a template and mark and cut a piece for each bay. Try to get each piece to just slide in and contact the rib on each side.



The wing is now nearly done. Go through and augment any glue joints that need it and then remove all the little building tabs on the bottom of the ribs and sand the entire wing to shape. Finally, install the Dubro metal inner plane strut mounts in their slots in the rib sandwiches and secure them with either a 2-56 bolt and nut, or the screws that come with them adding a dab of CA to keep them from working loose.

## THE BOTTOM WING PANELS



As a starting note, the ailerons are built up after the wing is completed. The construction of the bottom wings is basically the same as the top wing. The tips have an additional rib and there are some mounting pins and attachments that are different.

Start by building the frame work with the inner most L1 rib and L3. The first L1 rib is to be placed up against the RAG 91.375 degree dihedral template. Pin the RAG in place on the plans as shown and pin L1 so that it contacts it and is held at the proper angle. Then, place the last L4 on the board over the plans and pin it in place square to the board. Align the leading edge and the ply upper trailing edge, LT1 until you have everything square. Once you are happy with the alignment, glue the leading edge and the trailing edge to the three ribs. Now glue the remaining L1 and two L2 ribs. Next fit and glue the rear top spar leaving a bit extra as you did on the top wing. Do not fit the forward spar at this time as it will be difficult to work the ribs in with it in place. Do not place the balsa trailing edge either as it needs to be centered on the L4 ribs. Now place and glue the remaining L4 ribs except for the ribs on each side of the L4a-L4c-L4a sandwich rib. The ribs will be a little difficult to place as the notch for the spar is cut at an angle. Once again, make sure all ribs are perpendicular to the building board.

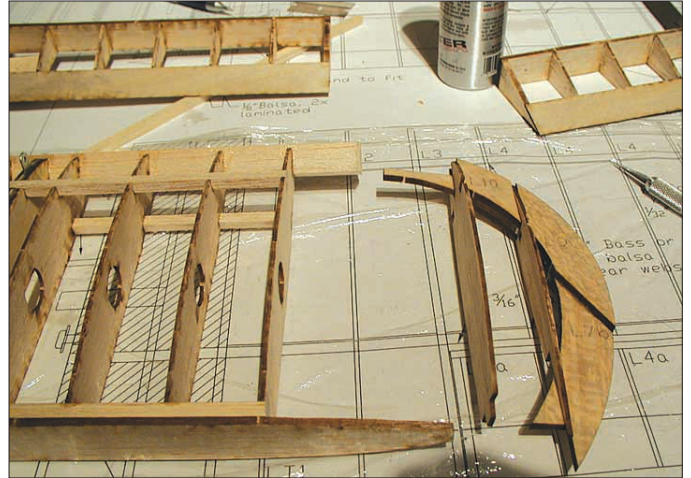
Assemble the L4a-L4c-L4a sandwich as you did for the top wing noting that now the slots for the inner plane struts are on the top of the rib. Place the sandwich rib and the surrounding ribs and glue them in place.

Once all ribs are dry, fit and glue the forward spar. Lift the wing from the board and while holding the wing upside down and flat on the board, add the bottom front and rear spars and the bottom ply LT1 trailing edge.

Next attach the balsa 3/16" WING trailing edge (there is one that is slightly smaller for the leading edge of the aileron). Be careful to butt the end against rib L3. The tapered end goes toward the tip. Center it top to bottom with the top and bottom rear spars.

The wing tips are assembled much as the top wing's were but there are two ribs in each tip; L5 and L6. Assemble the L7a and L7b over the plans and add L10 so it is flush with the

leading edge notch of L7a. Remove the tip from the plans and add the other L10 to the bottom aligning with the L10 on the top. Now fit rib L6 over L7a/b and up against L10 keeping in mind again the correct rib airfoil orientation. Next, place L9 over L7a/b and butt it up against L6. L9 is subtly different so try it both ways and one will be a better fit. Now add the remaining L9 and L10 pieces to the bottom of the tip. Now, place L5 in a similar manner as you did for R3 on the top wing so it is flush against L10 and flush at the leading edge. Once it is parallel with L6, glue both L5 and L6 in place. Repeat for the other tip making one right and one left.



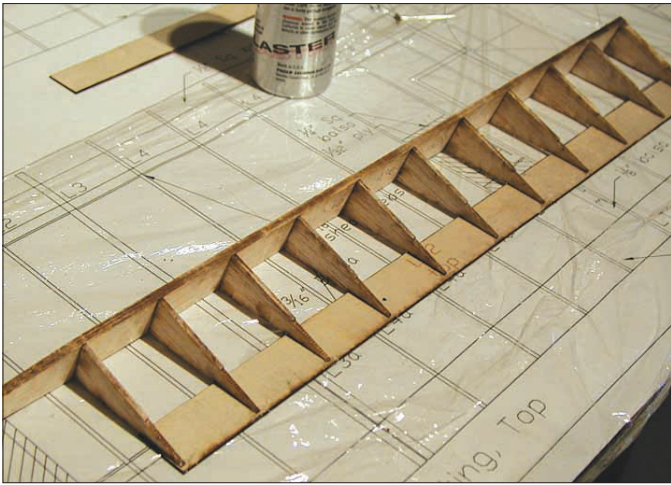
Fit and attach the tips just as you did for the top wing carefully sanding the end of the leading edge to get a good fit.

Cut the extra bit of the spars flush with the last L4 rib and sand and re-fit to follow the shape of the tapers in the trailing edge - top and bottom.

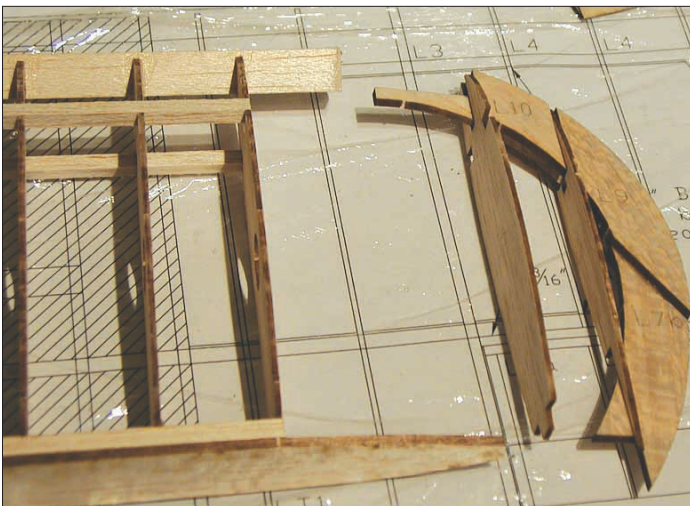
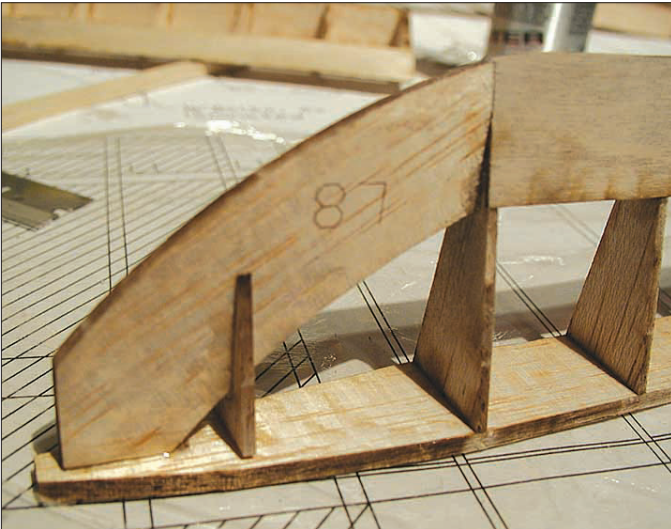
## ASSEMBLE THE AILERONS



Start by laying the "Leading Edge Aileron" on the plans just above the wing trailing edge lining it up with the L3 rib on the plans. We will build it perpendicular to the plans using the rib locations as a guide. Once again, there is a top and bottom to each riblet... Begin with the L3a flush against the end of the aileron leading edge making sure it is square. Then add each subsequent L4a riblet matching the location on the plans. Next, glue in place the ply LT2 aileron trailing edge top. Remove it from the board and add the bottom ply trailing edge.



Now, hold the aileron in place in the wing and fit L8 so that it is centered on the trailing edge on the last L4a AND with the trailing edge of the wing tip. Glue L8 in place. Finally, fit the little riblet L5a according to its location on the plans and glue it in place. It will not be centered on the aileron leading edge and will be sanded with the final sanding. Add any additional balsa pieces to the tip trailing edge as needed.



Place and glue the little ply control horn guides "M" in place according to the plans flush with the bottom of the aileron. Do not glue in the control horns at this

time. That will be done after the covering is completed.

Next build the aileron servo mount rails as specified on the plans with  $\frac{1}{4}$ " square stock. Be sure not to mount them quite flush with the bottom of the wing to allow the little  $\frac{1}{32}$ " ply cover to be mounted flush over the rails. Next build servo mounts out of laminated scrap lite-ply so as to locate the servos as shown. Do not permanently secure them in the wing until after the wing has been sanded and covered.



Add the spar webs as you did on the top wing to both the forward and rear spars as detailed on the plans.

Finally, decide how you want to have your ailerons hinged. They can either be hinged close to the top of the wing or midway between the top and bottom. I recommend hinging closer to the top so as to add a little built in "differential" into the aileron movement meaning that the throw up will be greater than the throw down. This will help to reduce the adverse yaw created from the additional lift generated by downward aileron deflection. What ever you decide, it can be difficult to get the hinges aligned just so. Her is a tip - locate your hinge line on the wing and then stick a few pins through on you line so they go all the way through. Then hold your aileron into its location making sure it is level at both ends of the trailing edge and reinsert your pins from the inside of the wing into the holes you made and then continue until you pierce the aileron trailing edge. This will give you the correct alignment location on the ailerons for your hinges. Now that you have your two hinge lines, cut the slots for your hinges. Insert the hinges and make sure that your aileron is aligned properly, then remove the hinges. They will be permanently attached after the wings are covered. Finally, sand a clearance above and below your hinge line to allow the hinge to actually move with the minimum gap possible.



### WING MOUNTS AND ALIGNMENT PINS

The Wings are aligned with the aid of two 3/8" birch dowels and secured with two 8-32 nylon bolts that are anchored in the L1 rib on the end. You might find that your 8-32 blind nut's threaded section is a bit longer than the thickness of the web. If this is the case, laminate a couple scrap pieces together and attach them on the INSIDE of the first L1 just over the small 8-32 pre-drilled holes. Then re drill out the holes and set your blind nuts as you did for the top wing. Don't forget to add a dab of CA to each to keep them in place. Next cut four 2 3/4" lengths of the 3/8" dowels and round one end of each a bit. Insert the other end onto the large holes in the L1s until they are flush to the inside of the inner most L1. Glue in place.



Sheet the first three rib bays with 1/16 balsa with the grain running lengthwise down the wing. This is done in three sections and butts up against the first L4 rib.



Finally, sand the entire wing to shape and smooth.

### HORIZONTAL AND VERTICAL TAIL:

The horizontal stabilizer and vertical fin are straightforward in their construction and the various parts are detailed well on the plans. One possible modification would be to notch the training edge and cut the stringers just a bit longer to fit into the notches. This will increase strength without adding any weight. As designed, the stabilizer and fin (and elevator and rudder) are flat. Another possible modification would be to add a slight bit of symmetrical airfoil to add scale realism and to improve stall characteristics as slow airspeeds. To do this you will have to lay out the frame of each of the four surfaces and then add slightly wider (1/8") "ribs". You will have to add a small riser on each side of the rudder fin slot in the horizontal stab so you have something to attach the covering to as well as a thin balsa strip to the top and bottom of the Stabilizer trailing edge and the elevator leading edge to increase the thickness to accommodate the new airfoil cross section. Do this for the fin trailing edge and rudder leading edge (both sides) as well. After the control surfaces have been hinged, or tack-glued together, sand a symmetrical airfoil shape to the upper and lower sides while tapering the over thickness out to the tips or top of vertical fin/rudder. All this will had a slight bit of weight, but should not be too difficult to balance with battery placement in the nose and can add an additional degree of scale look.

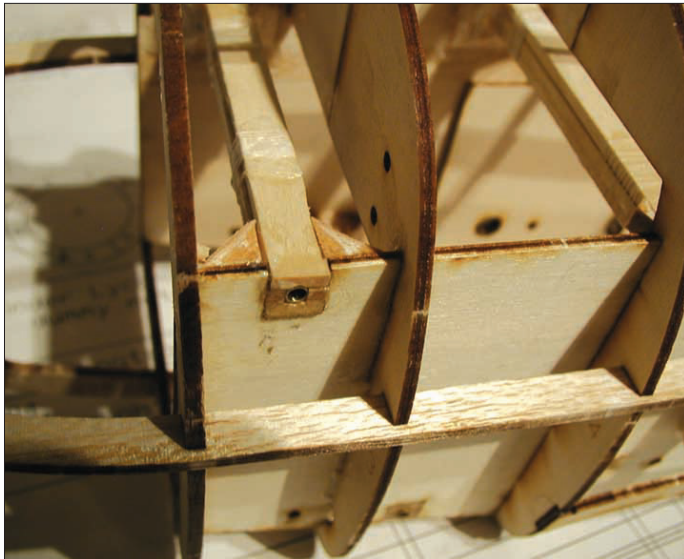




## FUSELAGE

The Fuse is assembled closely to the printed manual. When you get the fuselage finished, there are still a couple things to address.

The Cabane strut and landing gear mount tube boxes are constructed out of basswood. Start by cutting the four pieces as shown in the detail on the plans to length. Then, groove the top and bottom piece to accept your copper tube. Test fit your box and trim the pieces so they are flush with the outside of the doublers. Next, cut your copper tube to this length and glue the sandwich together. After the glue has wet, wrap with several winds of thread on each end in about a  $\frac{1}{2}$ " and soak the thread with thin CA. Finally, glue in the boxes and add triangle stock to strengthen the joint.



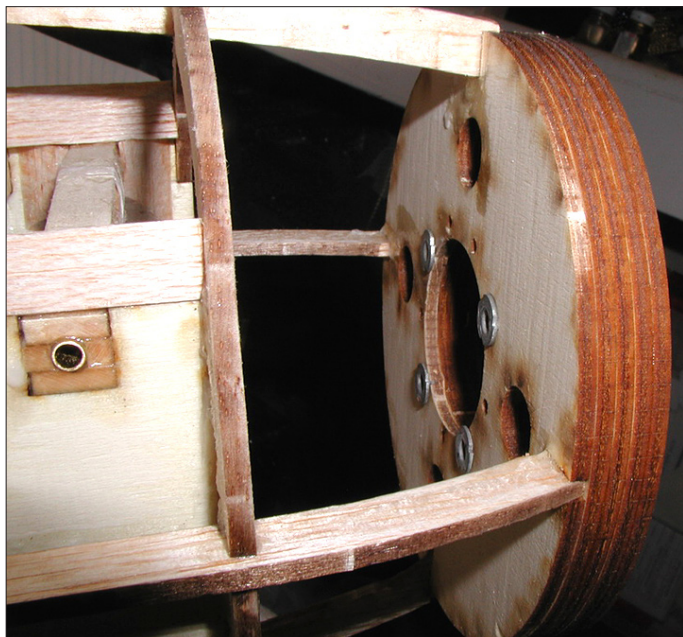
Next, we fashion the hatch on the bottom of the fuselage to allow access to the battery compartment. It is a large area between the bottom wings and the larger the hatch size, the easier it will be to get the battery in and out and get to the two servos in there. The easiest way to attach the hatch is with a tongue in the front and a couple of "rare earth" magnets in the back to hold it in. Also,

this is a good place to bore out a couple or more 1" dia holes for cooling and to act as finger holes to remove the hatch. Use  $\frac{1}{8}$ " or  $\frac{3}{16}$ " balsa and strengthen in between the holes on the inside with strips of light ply. Add shelf rails on the inside edge of the fuselage opening to allow



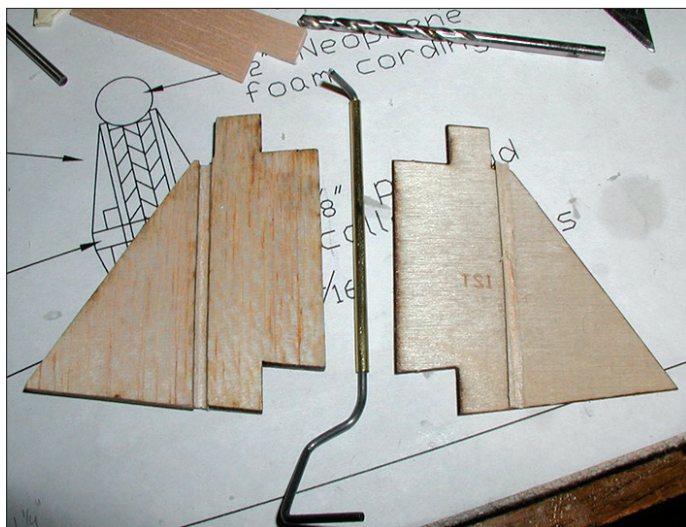
your hatch to sit up slightly to allow contour sanding.

Next we need to add fairings around the bottom of the bottom wings. Attach the bottom wings to the fuselage and take a pencil and draw the outline of the root rib on the Fuse doublers. Now remove the wing and using strips of wetted balsa about 1/2" wide, start laminating along the outline you drew on the doubler. Continue to laminate enough pieces until you have enough material to sand away to form the fairing.



Now place you hatch in place and sand the bottom couter.

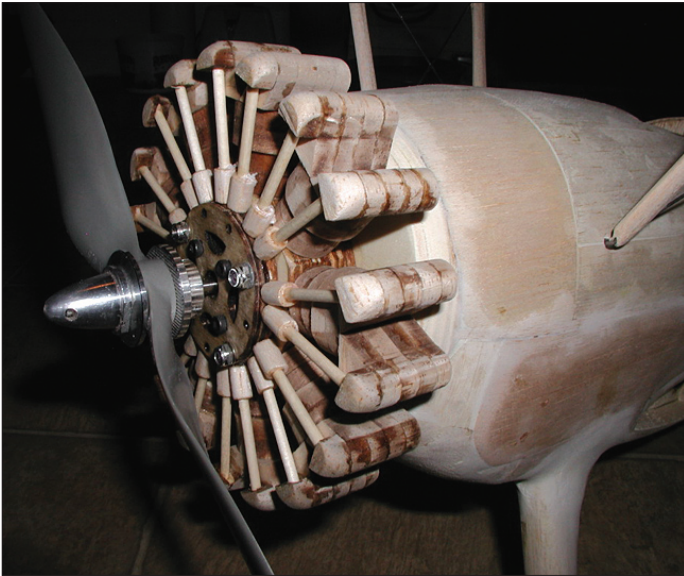
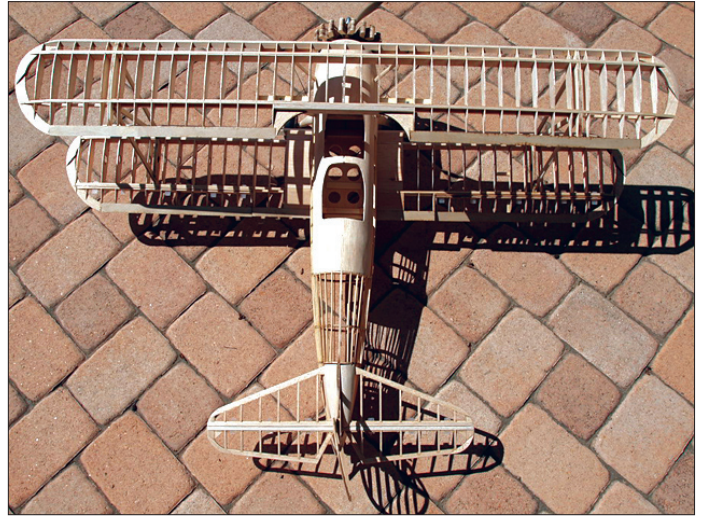
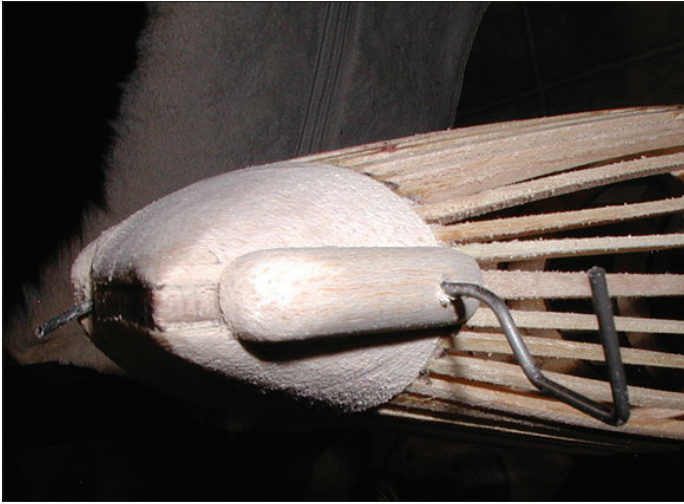
If you are a little concerned with the strength of the firewall placed on the end of the fuselage keels, another modification you can perform is to take three 1" wide soft ply planks and attach two of them to the inside of the ply doublers extending to the back of the firewall. The third can be mounted to the upper cabane strut mount box and backed



up to the ply former just aft of it. Use triangle stock to brace the butt joints. This will strengthen the firewall considerably.

There are an additional four soft ply firewall "rings" that need to be laminated to the firewall. It is important that they are carefully aligned and the easiest way is to install the four 4-40 studs in the firewall with their blind nuts and laminate each ring one at a time using the studs to insure perfect alignment. This process is also used to construct the dummy engine crankcase.





### DUMMY ENGINE

Assemble the dummy engine as per the plans. Expect to spend a few nights assembling those cylinders! If you like, you can bore out a rectangular slot on the floor of the inside of circular motor cutout for the three motor wires. Then add a piece of thin ply to cover the channel and protect the motor wires. This will also hide them from view.



