The Cessna 185 Skywagon is a large six passenger high wing mono plane with conventional fixed gear and used a 6 cylinder Continental engine. In 1961 they started production and at the end of its production run in the mid 1980's they produced over 4,400 of this rugged aircraft which became very popular as a back country and Alaska Bush plane. This plane has a high load lifting capabilities and excellent STOL characteristics. Pilots love to fly and modify there Cessna 185 by adding huge tundra tires, floats, ski's, stall fences, vortex generators and drooped wing tips. So for all you civilian buffs, there's a lot color schemes out there. There are also some (not a lot) of military color schemes or be creative with your own scheme.

The construction of the full scale 185 is mainly of aluminum and fully skinned. All the control surfaces are sheeted in corrugated aluminum. With this model, balsa, lite ply and birch aircraft ply are used in the construction and covered in film (Monokote or UltraCote).

This 1/3 scale model has a true scale outline with no deviations in wing or tail area's, but has been designed to be more of a sport scale build. I.e. open wing and fuselage structure. The airfoil is not scale but uses a thickened Clark Y airfoil recommended by Peter Goldsmith. Thanks Pete!

The model construction is a full kit and built up. Although, this model is not a beginners build, the fuselage is fairly easy to construct following the manuals' construction steps. The majority of the fuselage is built flat on the work table. The wings are built up with traditional ribs and spars and is built in one piece flat on the work bench with the use of build tabs on the outer wing panel. The wings are finished in 1/8" thick balsa sheeting with cap strips. The wings are joined to the fuselage with an aluminum wing tube and has aluminum wing struts. The stabilizer halves and fin uses carbon fiber tubes with birch ply mounting tabs which makes it easy for removal.

Features; One piece fiberglass cowl, heavy duty two piece landing gear from 5/16" thick 6061 T6 aluminum. Functional doors and luggage door with latches and magnets. Laser cut windshields and windows. CNC routered birch ply parts for clean no charred edges. Plenty of floor strapping slots for receivers, batteries or telemetry mounting.

This model was thought up at an aero tow meet to fill the gap in large scale glider towing. Build it as a tow plane "tug", scale or a sport scale model. Thinking outside the box on this project… It wound up being a consortium design project via text messaging about ideas and what features they were looking for in a robust model that can handle the rigors of aero towing duty. Credit goes out to the three tow pilots in the North East that started it all; Kevin Kremer, Jim Dolly and Len Buffinton. Thanks guys! It was a lot of fun and new way of thinking, tinkering and designing something different.

BIGGER FLIES BETTER ! ***HAPPY BUILDING! Gunny Bumburs owner Aviation Concepts rc***

Although the construction manual covers almost every detail, you the builder are responsible for the construction, final selection of materials and airworthiness of your finished model. Read the manual, use the plans and don't leave your brain at the shop door. You, the builder, assume any and all responsibility for any error, omission or loss incurred by building or flying this kit - as in all things you construct, you are the one responsible for the use, liability or losses incurred in the process, if any.

TABLE OF CONTENTS

FUSELAGE

FIN AND RUDDER

TIPS:

Carbon fiber, G-10 and fiberglass creates dangerous dust particles when cut or sanded. Use safety goggles and a dust mask or respirator when working with these materials.

The fiberglass cowl has mold release on it. Before working with it, wash it thoroughly with luke warm soapy water.

The fuselage side view drawing 3-7 is full size. You wont be building on this drawing. It is there for your reference and may be hung on your shop wall for convenience. No cutting up of the plans should be required. Maximum plan size is 3 feet wide x 9 feet long. A pin-able building board is not needed, but if you wish to have one, then use a 4' x 8' sheet of homisote or sound board.

CAUTION! Neodymium magnets are not toys. Keep out of reach from children. These magnets can affect pacemakers, ICD's and other implanted medical devices. Magnets can affect magnetic media. Avoid placing near electronic devices. Those with nickel allergies should avoid prolonged contact.

WARNING: This product contains chemicals known to the state of California to cause cancer, or birth defects or other reproductive harm.

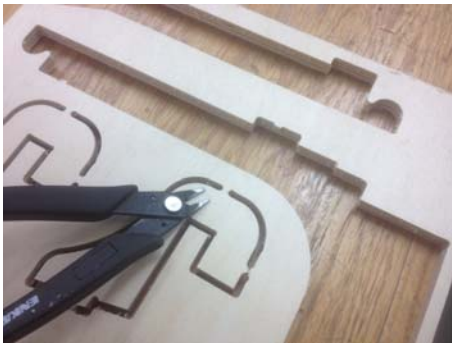
Gluing together hardwood pieces ie. Bass, spruce and birch ply. Because these pieces are very dense it is recommended that you make “Gluing Dimple Holes” by drilling (1/32” dia. drill bit) multiple tiny dimpled holes in both adjoining pieces. For general glue joints like this I like to use thick CA glue, or epoxy. Also, when gluing these pieces together with epoxy do not clamp parts so tight together that the glue squeezes out of the joint. You will have a weak bond. Where epoxy is called out with no set time, then use 5 minute. The longer set or working time of epoxy glue also can make the joints stronger in dense plywood do to the longer migration time.

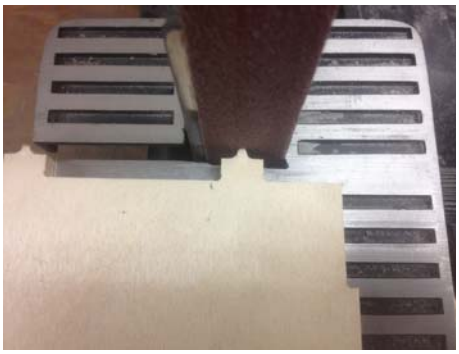
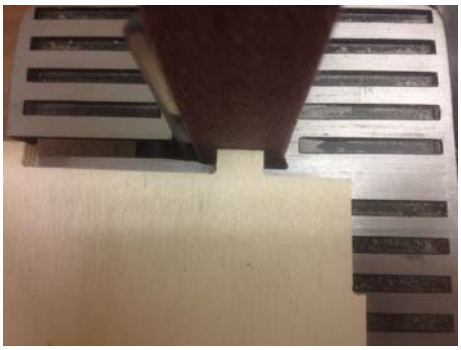
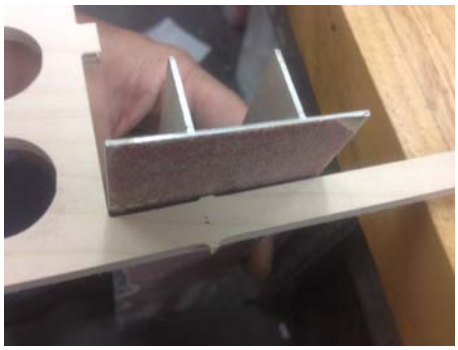
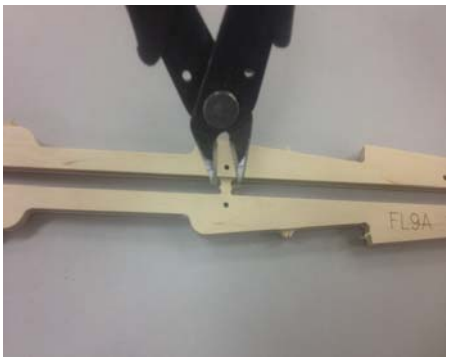
Other glues used.
If you are a fan of aliphatic wood glue then Tite Bond II is the best glue for all general construction. Except for joining wing skin sheets together and gluing on the L.E. It is hard to sand and leaves a ridge. For these I like using the aliphatic wood glue from the makers of Gorilla Glue. It dries faster and sands really easy.
For attaching the wing skins to the structure I found the foaming Gorilla Glue works best. It gives you more working time to lay down the glue onto all those ribs. Aliphatic glues skins over way too soon but this is not a fully sheeted wing so this is what I used on my prototype model.
Medium CA glue is my favorite for all other balsa general construction, while thin CA is primarily used to harden pre-threaded screw holes in wood.

Note that some of the pictures in this manual may not exactly match with your kit. Parts may have been changed or improved. Some pictures in the manual may not have good clarity. You can see the manual in PDF on our website.

Dowel alignment pegs are used to keep two parts in perfect position while gluing them together. Majority of them will be from 1/8” dia. dowels. They should be cut longer than the two joining parts, hammered in and trimmed flush unless told to do otherwise.

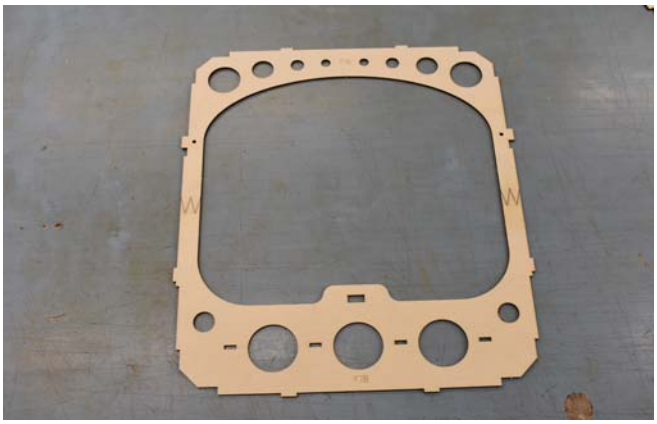
Laser cut parts can be snapped out or for cleaner removal use an x-acto knife to cut the small tabs that holds the parts to the sheet. CNC routered plywood parts have to be cut out of the sheet. You can use a saw blade, chisel, cut-off wheel or thin side cutters. The tabs have to be sanded flush. Tabs inside lightening holes can be cleaned up with a drum sander on a Dremel tool.



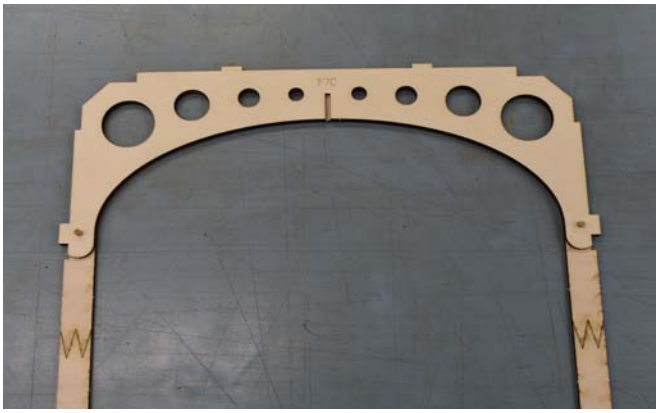





FUSELAGE: (*Former Sub Assemblies)*

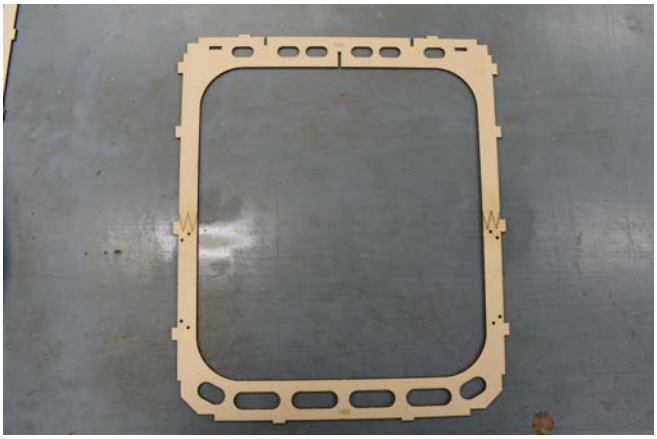
1. Glue together former **F7A** to **F7B**. Make sure both etched formers' call out part numbers are facing up towards you.



2. Glue **F7C** to **F7A** using two alignment dowel pegs. Then cut and sand the dowels flush. Make sure all etched formers' call out part numbers are facing up towards you.



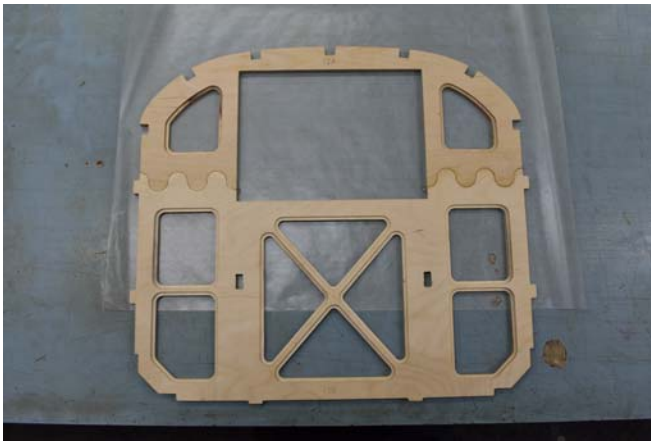
3. Glue **F6A** to **F6B**. Make sure both etched formers' call out part numbers are facing up towards you.



4. Epoxy together **F5A** to **F5B**.

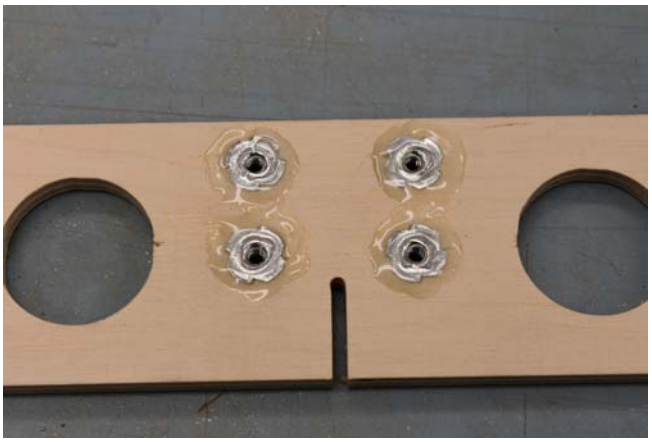
5. Epoxy together **F4A** to **F4B**.

6. Epoxy together **F2A** to **F2B**. Make sure both etched formers' call out part numbers are facing up towards you.

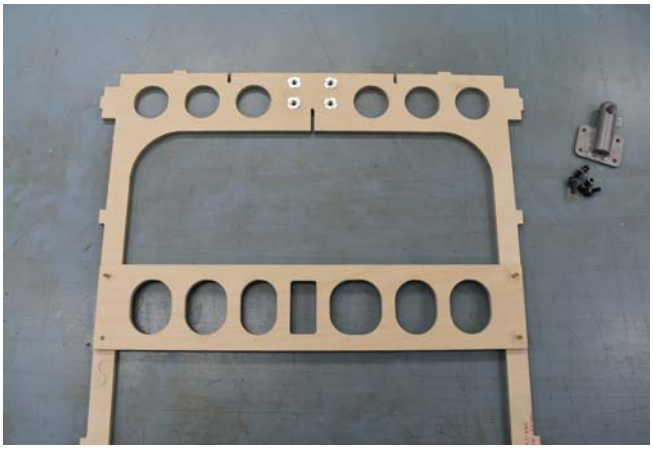


(*Tow Plane Package)*

7. If you have purchased the "Tow Plane Package," now is a good time to install the four 6-32 blind nuts to the back of former **F5A**/**F5B**. Back means that the formers' etched part call out numbers is down facing the work bench.

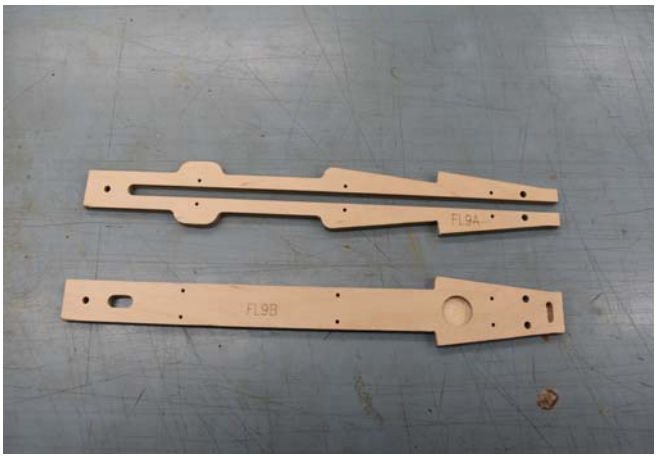


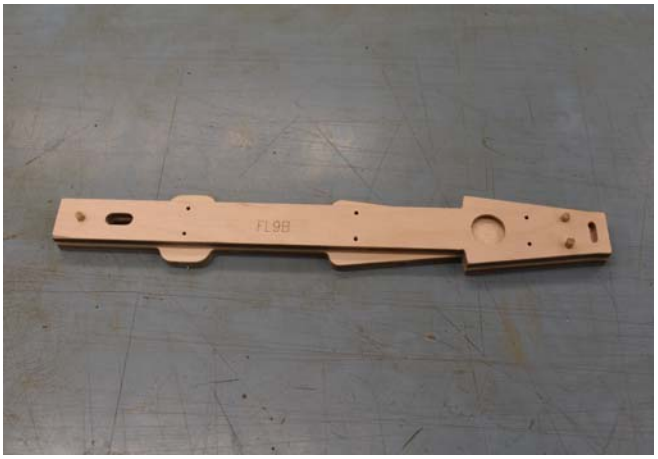
8. Continuing with the "Tow Plane Package," epoxy into position **FM4** etched part number face down using four dowel alignment pegs. When cured, cut and sand flush the dowel pegs.

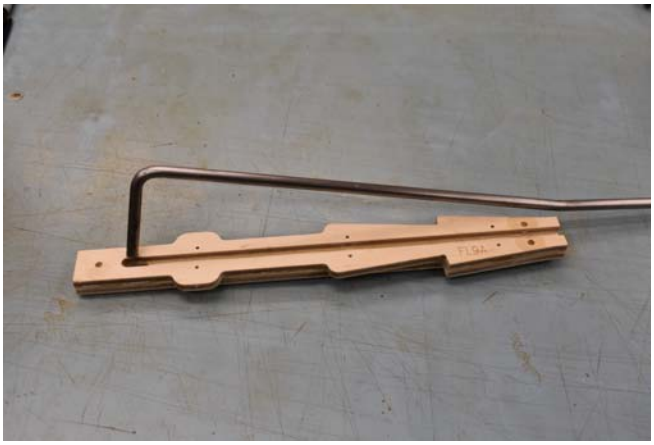


(*Tail Gear Mount Sub Assembly)*

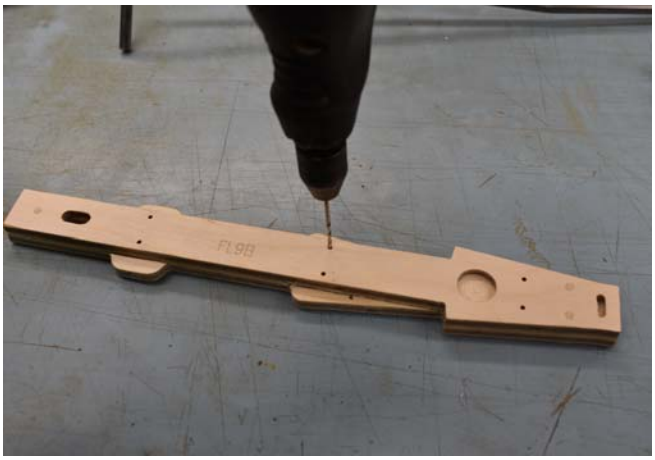
9. Epoxy together **FL9A** to **FL9B** using three alignment dowel pegs. Do not get glue into the dowel peg holes. These must be removed for later use. **FL9B** is on top of **FL9A** with the round pocket and slot facing up. Do not worry about getting glue into the 6 small holes. Before the epoxy fully hardens clean the tail gear slot and elongated hole of excess glue. Then remove the 3 dowel pegs.



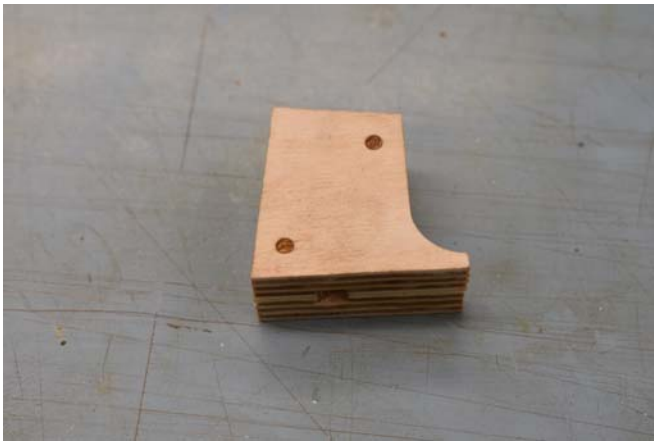


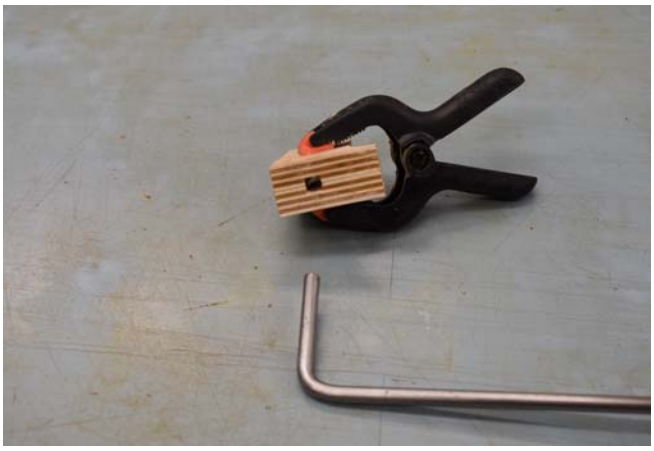


10. When the epoxy has set or cured, Use a 1/16” dia. drill bit and drill out the 6 holes.

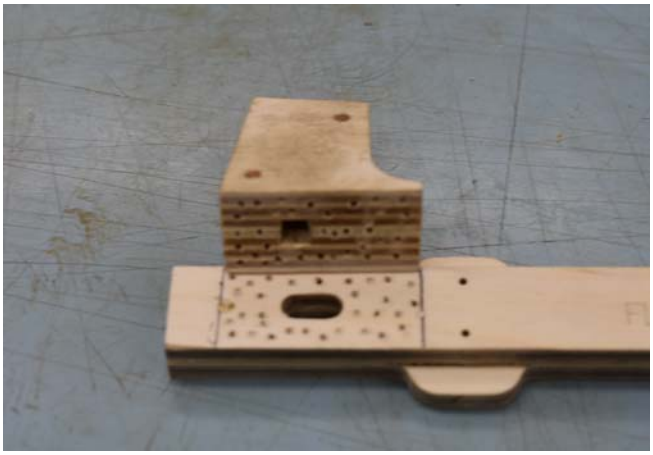


11. Epoxy together **FL10** using two dowel alignment pegs. Use the 1/16” dia. drill bit and drill a bunch of “Glue Anchor Holes” to a depth of about 1/16”. Before the glue sets up, clean out the square hole of excess glue using the tail gear wire.

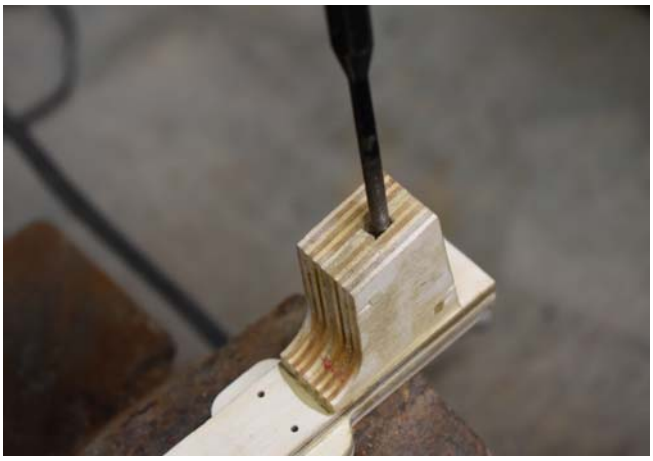




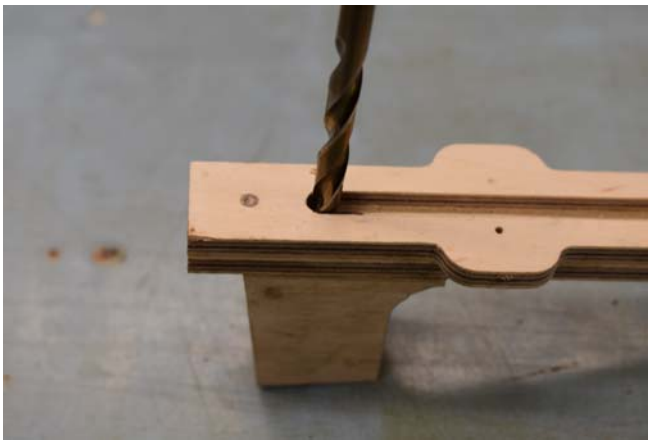
12. Epoxy **FL10** assembly onto **FL9B** using the tail gear wire as a guide. Note; the block and wire has to be pushed to the front as far as it will go. Drill dimple holes in both adjoining pieces. Coat the end of the wire with Vaseline or oil and clamp together.

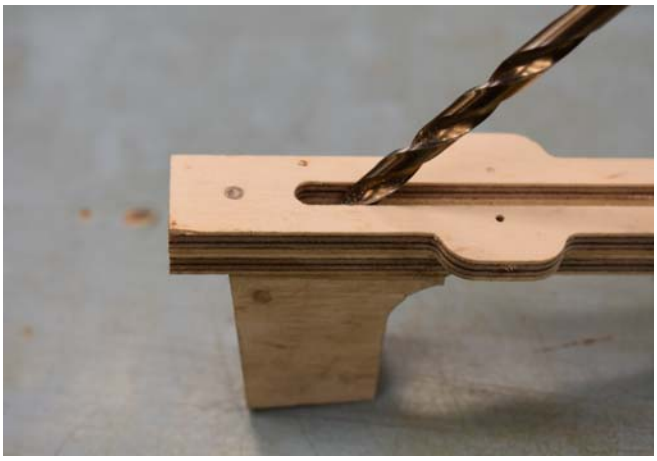


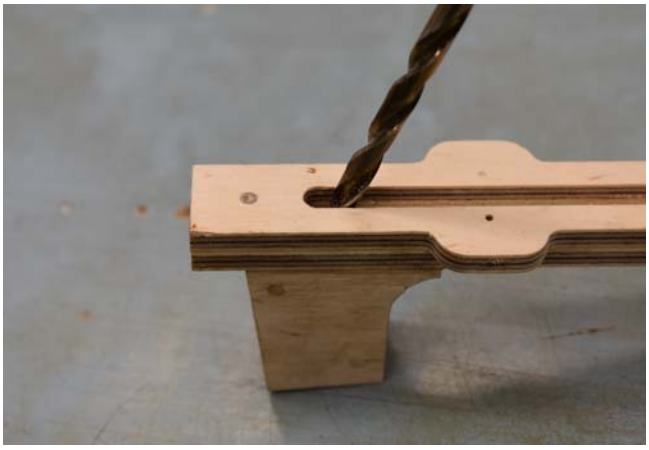
13. When the epoxy has fully cured, use a punch to pop out the wire over a vise.



14. Use a #2 drill bit to clean out the hole. Clean out the slot for the wire inside radius by starting at a shallow angle and working it forward. Test the fit of the wire. It <u>should not</u> be tight or difficult to remove.

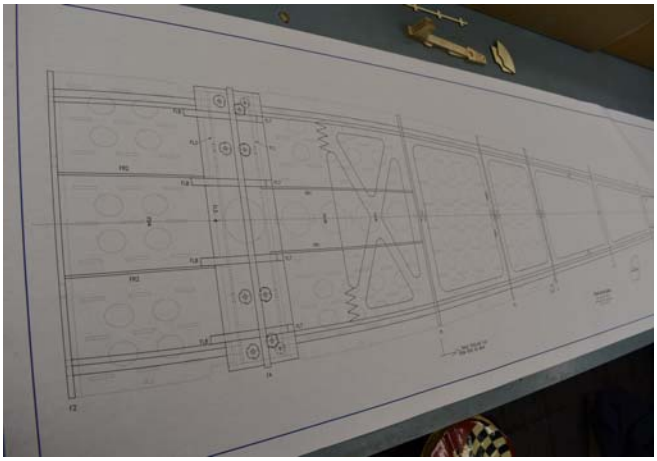


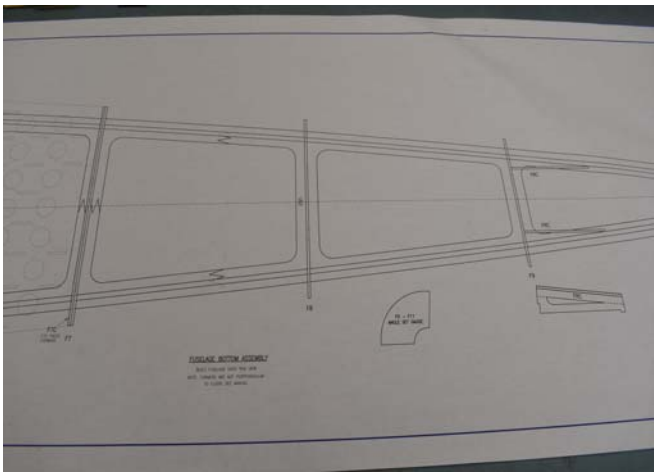




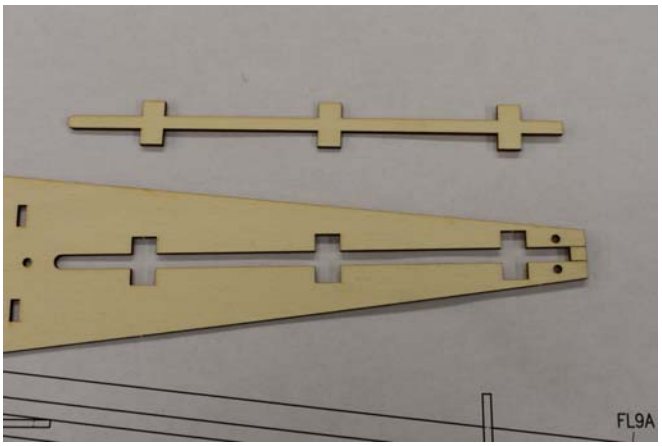
(*Fuselage Bottom Sub Assembly)*

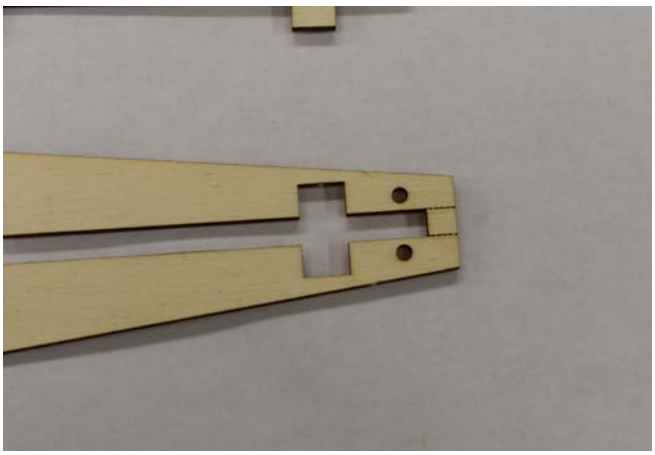
15. The fuselage is built from the bottom on up. Hang up the fuselage side view on your wall for reference. Lay down drawing 4-7 onto your clean and flat work bench.



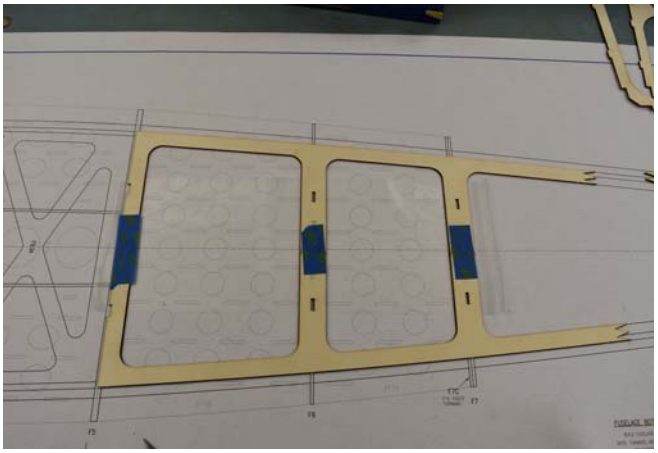


16. When removing **FB1** from the sheet be careful not to break off the temporary square brace at the end. Remove and discard the tail wire slot.



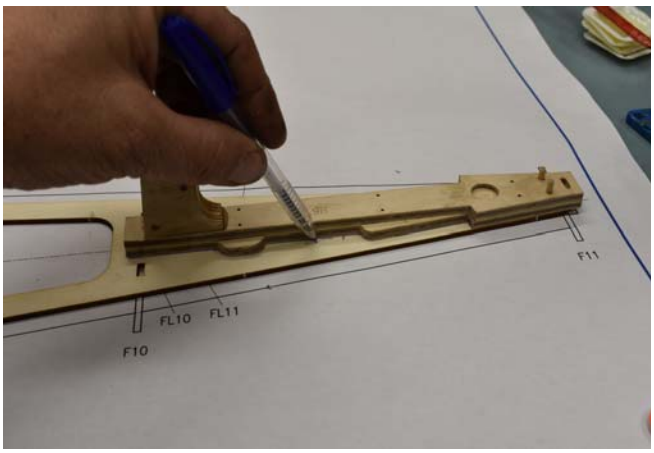


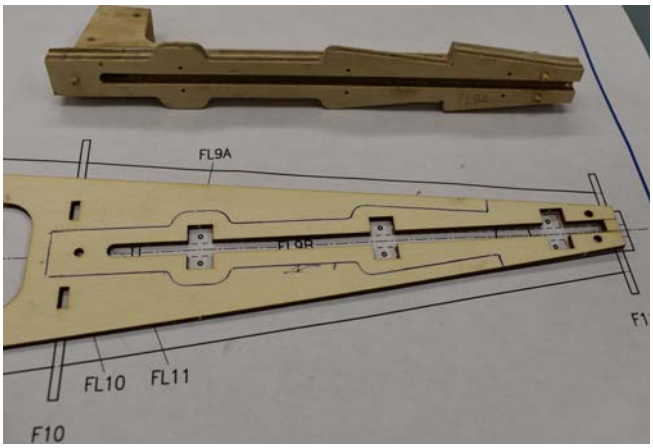
17. Glue together **FB2A** to **FB2B.**



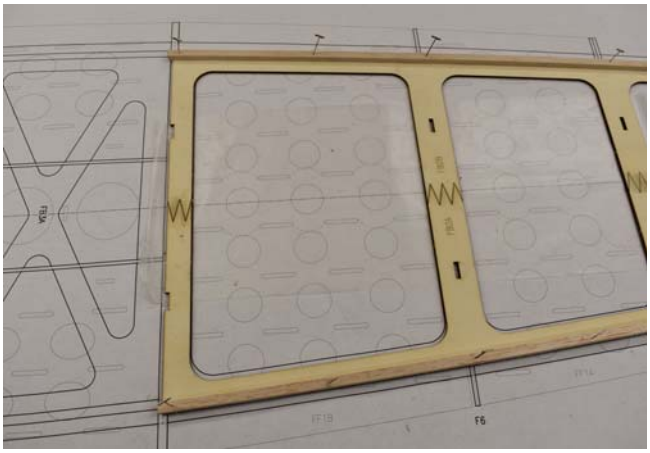
18. Glue **FB1** to **FB2** assembly.

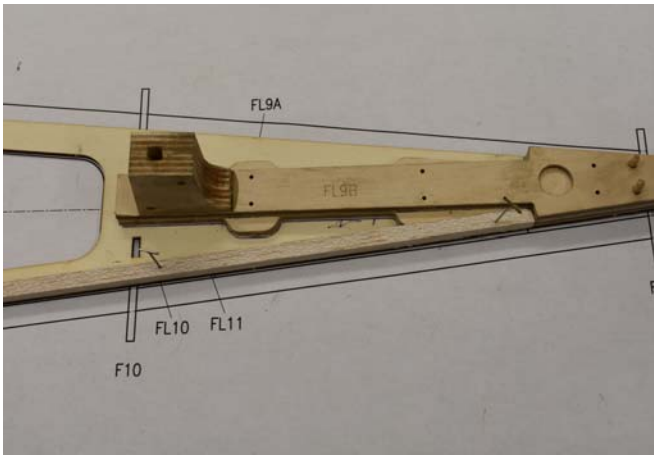
19. Using 3 alignment dowel pegs, place the **FL9** tail mount assembly onto the rear of **F1B** and trace around its perimeter. This will be glued into place at a later time. Leave in place for now.



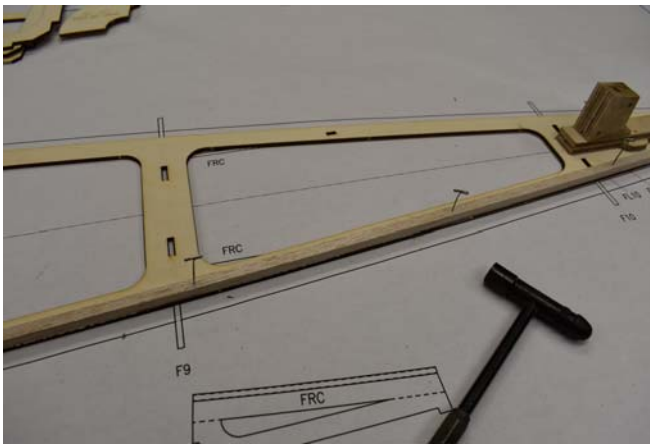


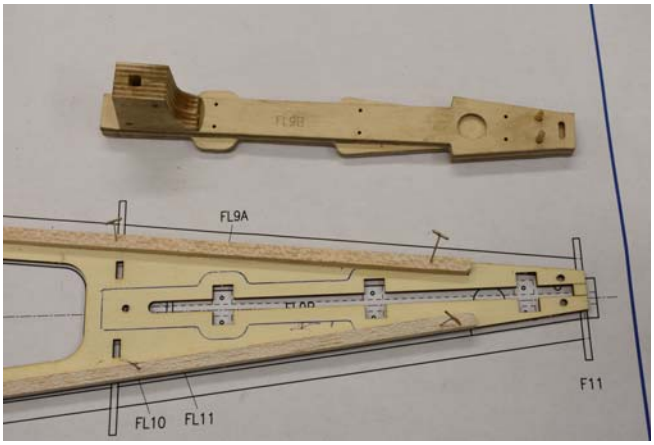
20. Glue 1/4" square balsa sticks on top of the fuselage bottom assembly along the sides (flush with the edge of the lite ply.) Use aliphatic wood glue to give you working time for positioning. Use a small hammer to tap the T pins into the lite ply to hold the sticks into position. When adding more lengths of sticks, miter the ends at a 45° angle. Tip: use a stick on the outside edge of the lite ply to help align the edge of the stick you are gluing down. Remove this stick and wipe up any excess glue that has squeezed out.

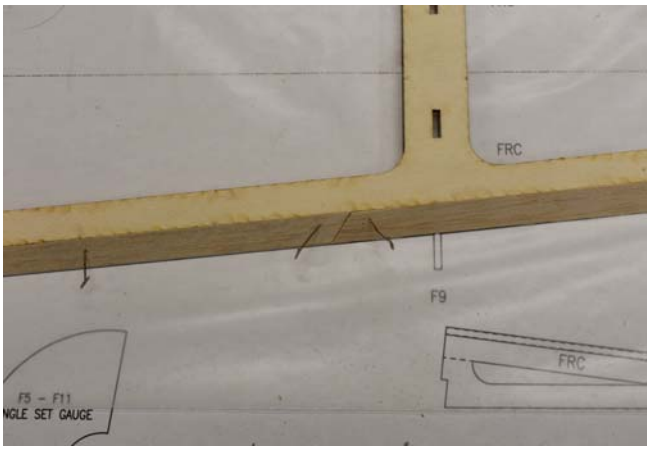




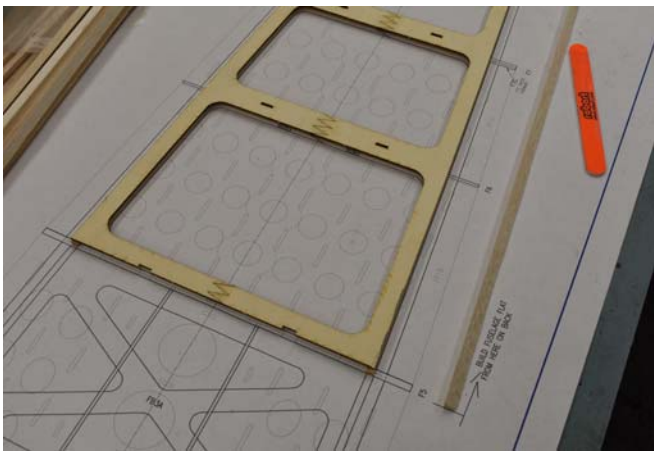
21. When the glue has dried, remove the tail gear mount assembly and sand the edges of the balsa smooth and flush with the edge of the lite ply.

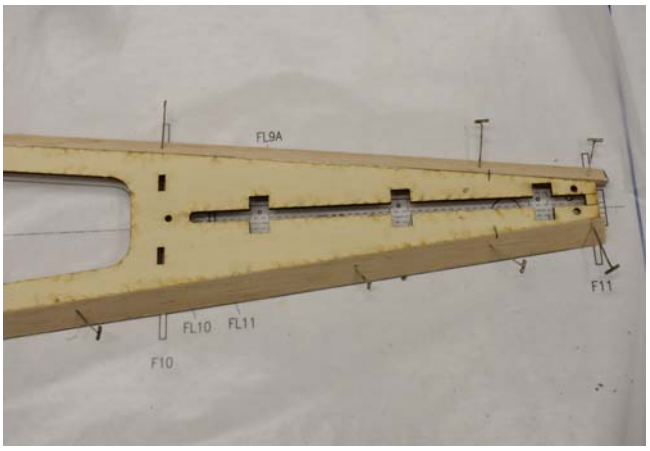




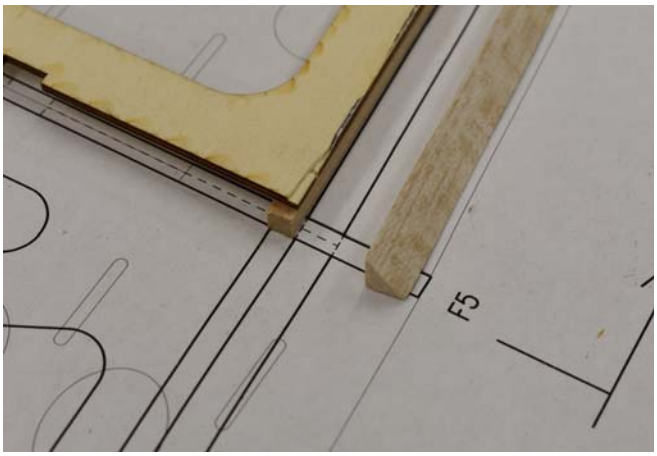


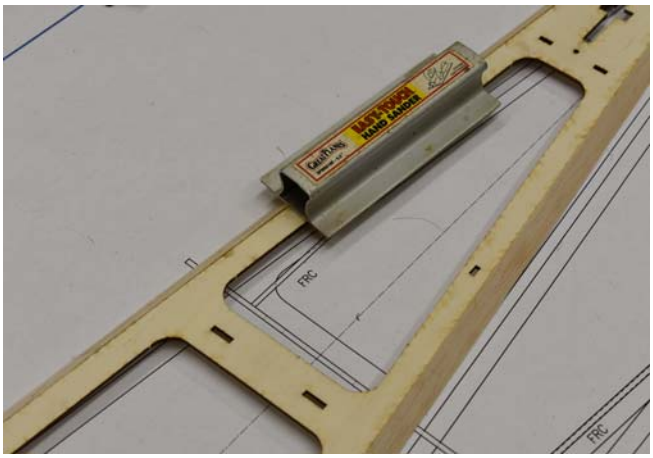
22. Place the bottom assembly balsa sticks side down and glue onto the sides 3/8” balsa triangle stock.

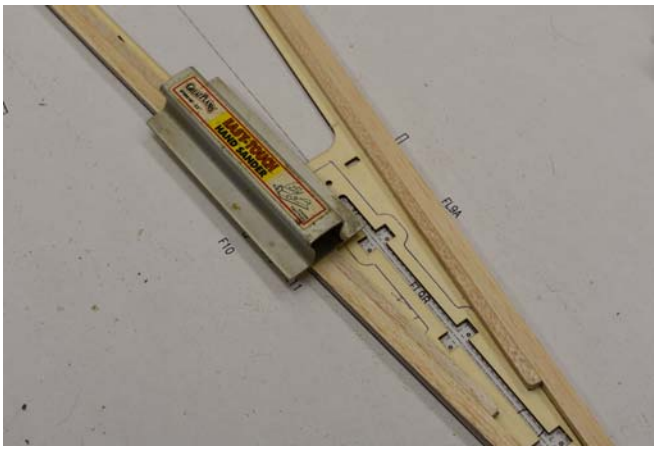




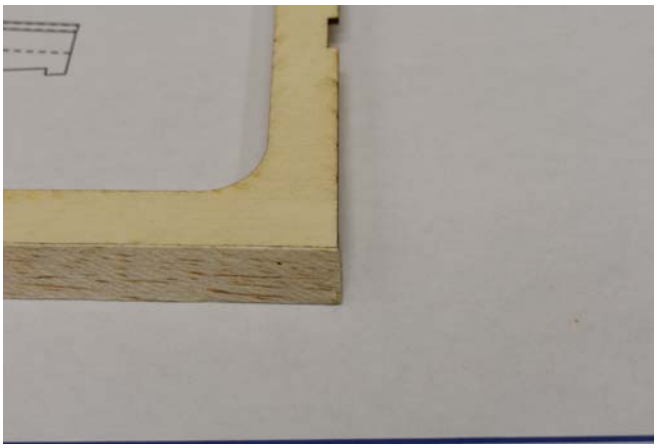
23. Sand the little bit of the balsa that protrudes above the lite ply flush. Then flip over and sand the other side even and flush.

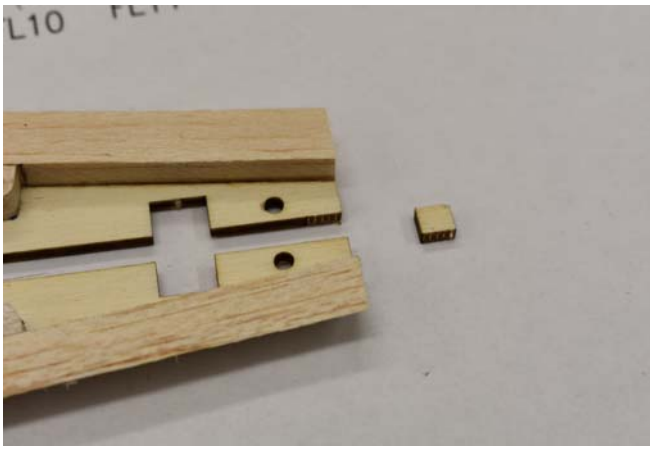




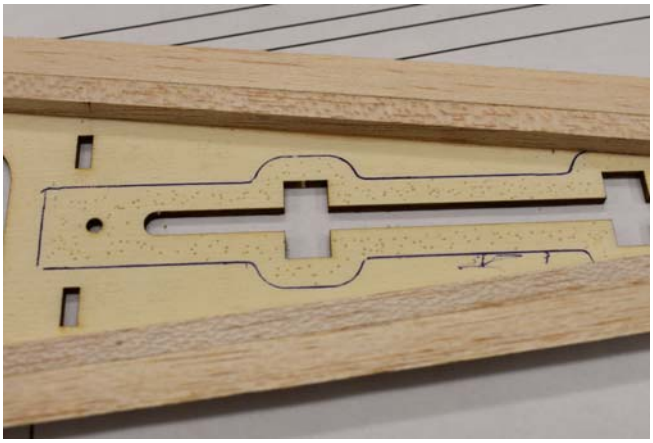


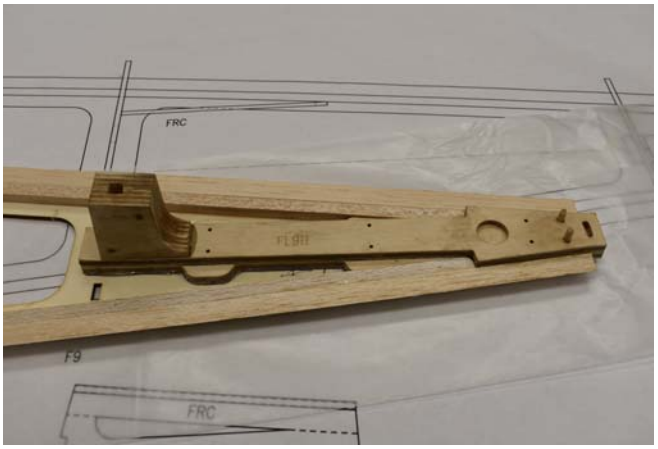
24. Trim and sand both ends flush and then remove the temporary square brace.

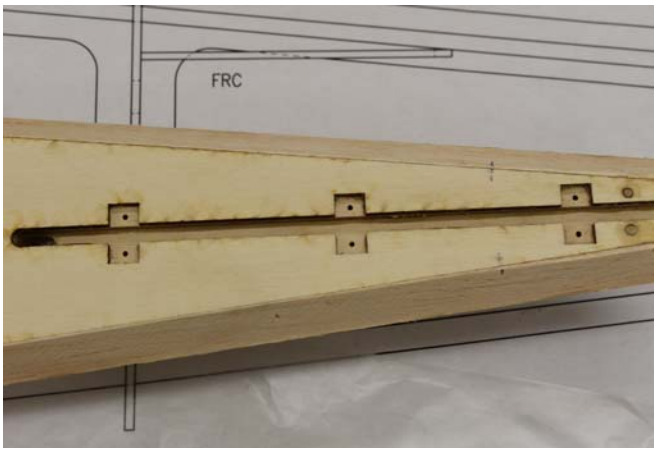




25. Epoxy in the tail gear mounting assembly using 30 minute epoxy and the 3 dowel pegs. Also add some gluing anchor dimples into the lite ply. Clean up any epoxy that might have squeezed through on the other side.

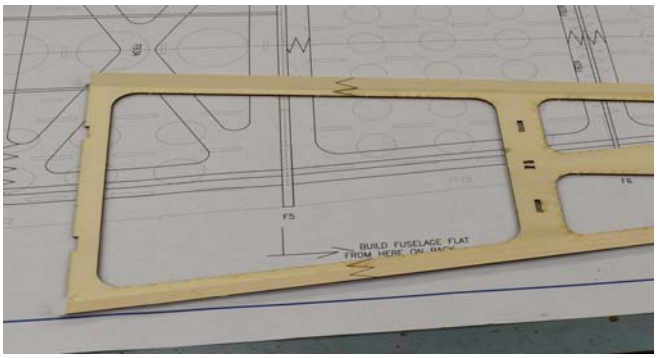




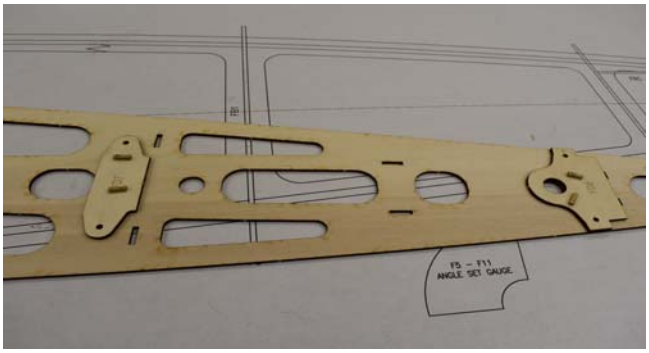


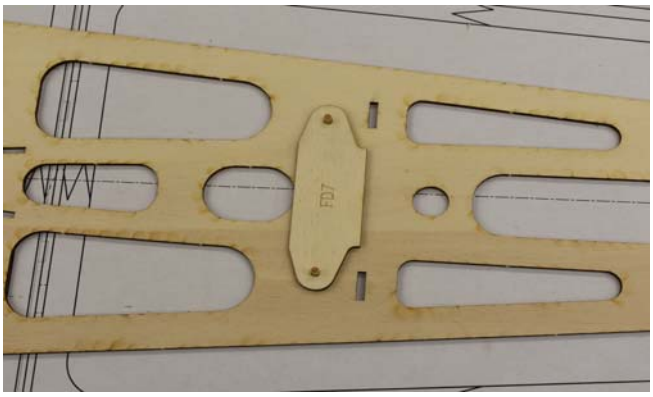
(*Top Sub Assembly)*

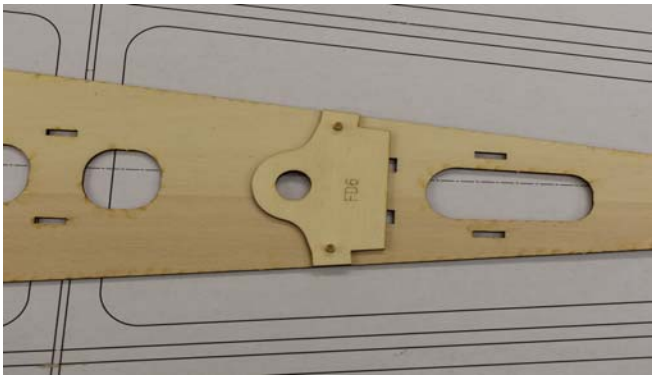
26. Glue together **FT1** to **FT2**.

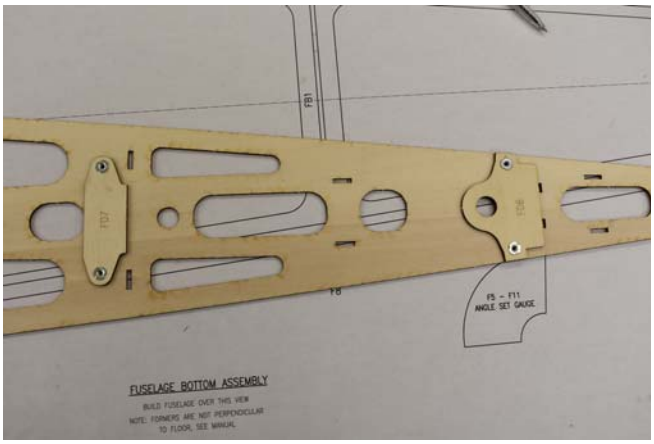


27. Glue **FD7** and **FD6** into position using alignment dowel pegs. Do not glue the pegs in. Remove the pegs and insert four 4-40 blind nuts.



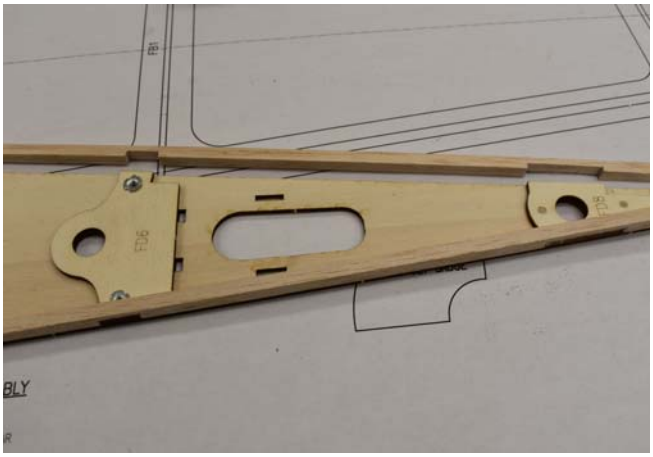


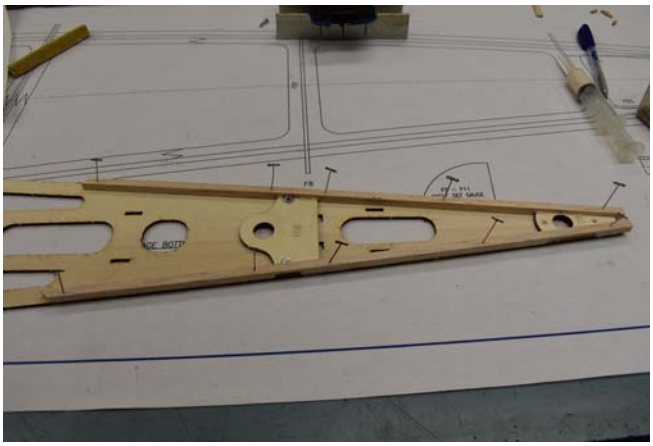


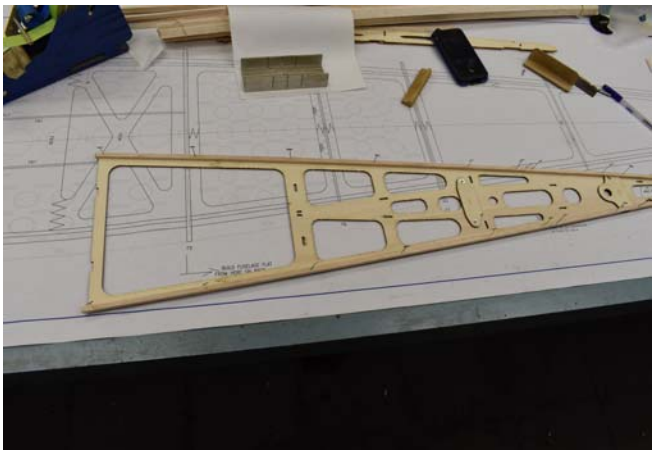


28. Glue on **FD8** using dowel pegs. Trim and sand pegs flush.

29. Glue down 1/4" square balsa sticks. Notch them to go over **FD6** and **FD8**.

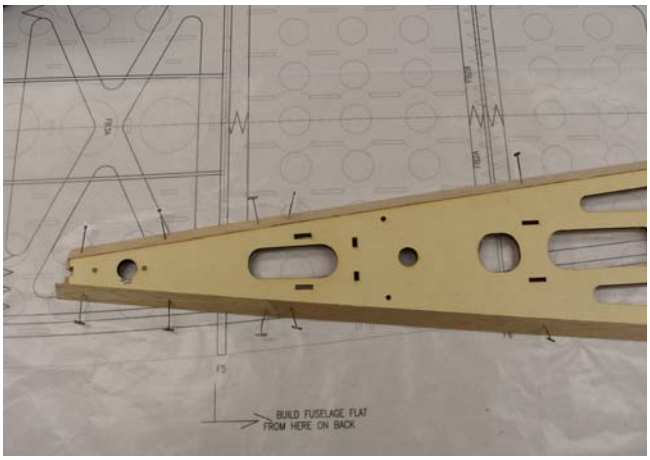


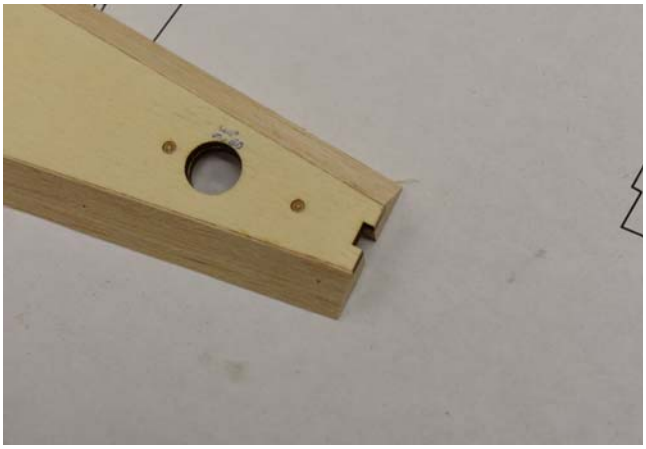




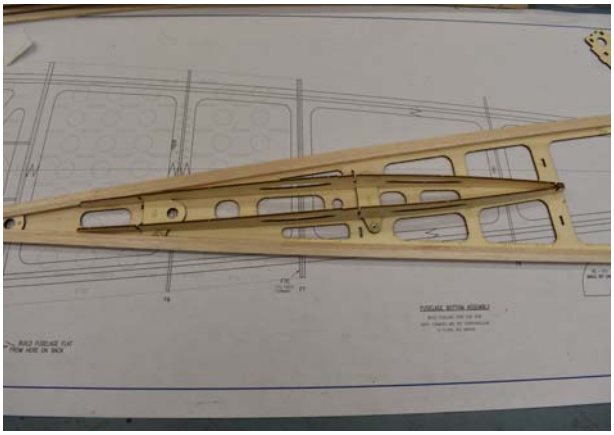
30. Add some epoxy around all the blind nuts.

31. Flip the top over and glue on the 3/8” balsa triangle stock. Trim and sand both ends flush and the top and bottom.

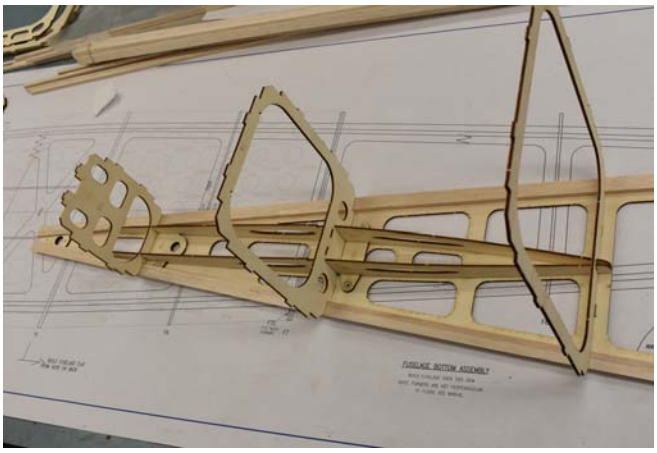




32. Glue on the two **FR3** reinforcing.

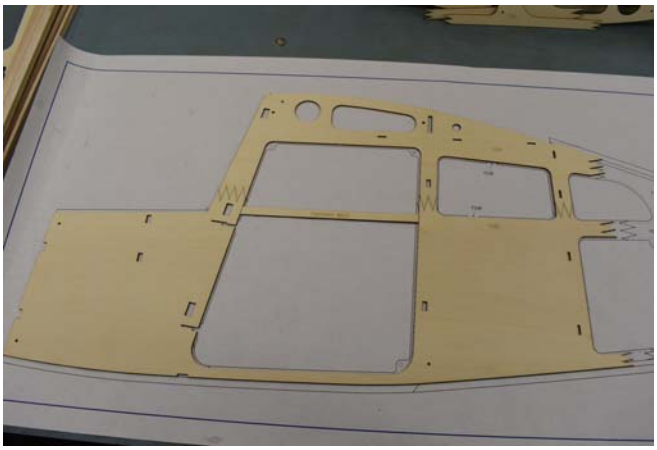


33. Test fit all the formers onto the top assembly. They must be a loose sliding fit and plug in fairly easily. Sand where necessary.

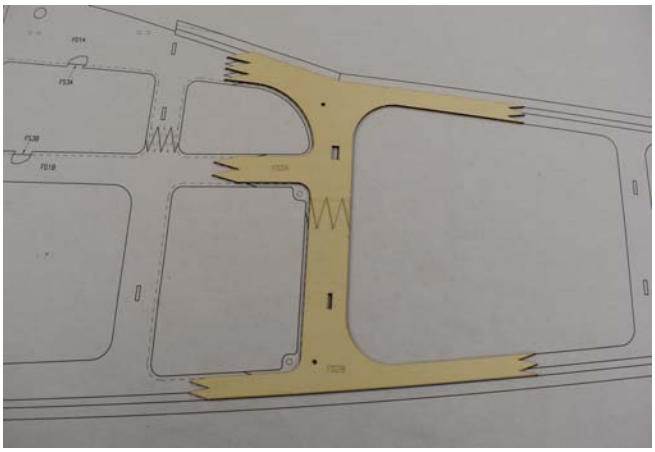


(*Side Sub Assembly)*

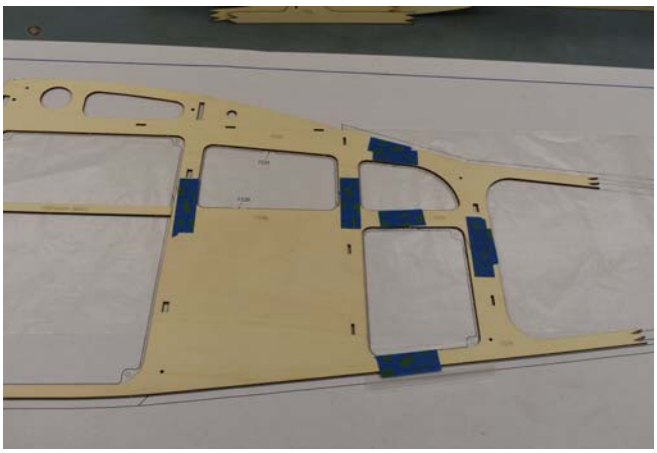
34. Glue **FS3A** to **FS3B**.



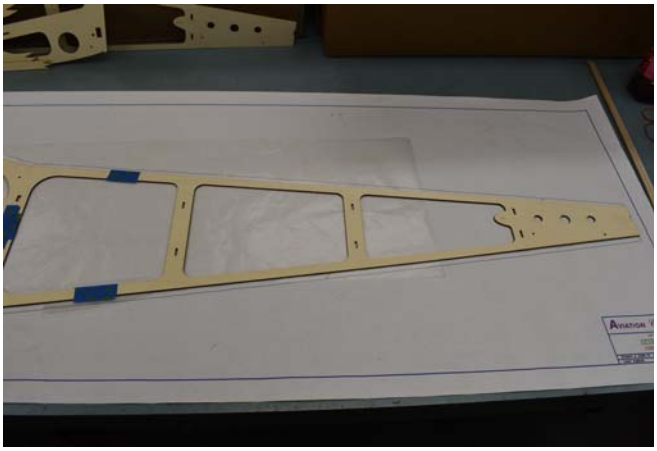
35. Glue **FS2A** to **FS2B**.



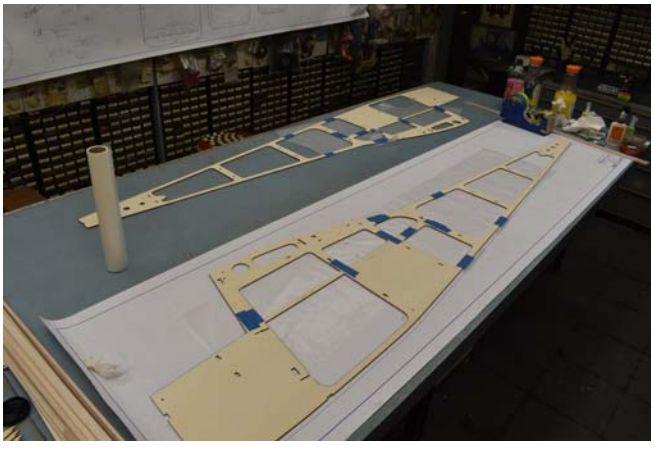
36. Now glue these two assemblies together.



37. Finally glue **FS1** into position.

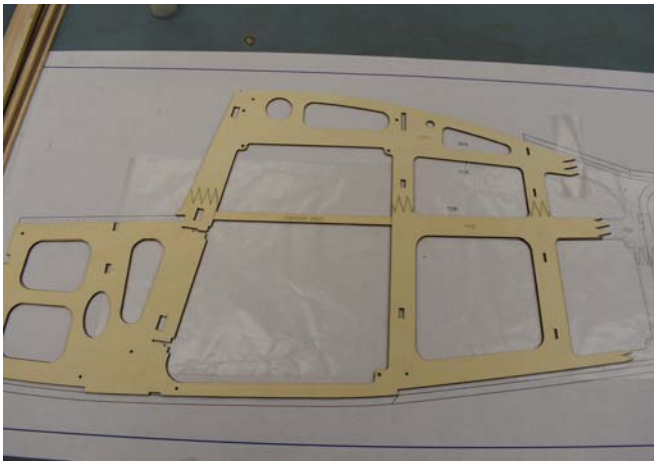


38. Repeat steps for the other side.

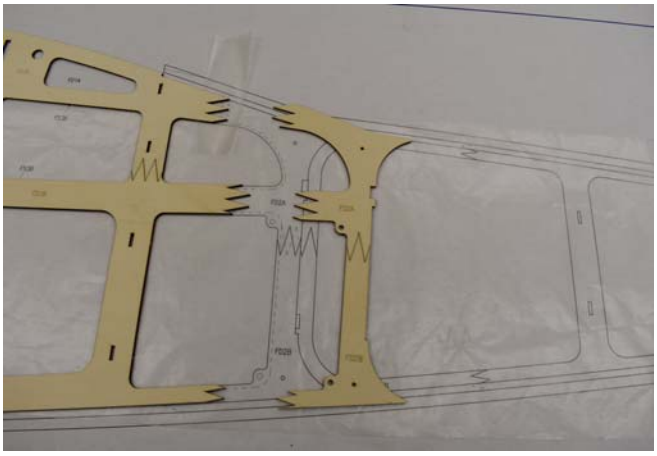


(Doubler *Sub Assembly)*

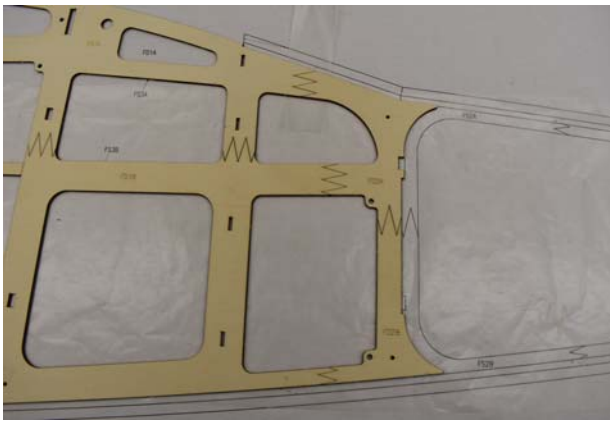
39. Glue **FD1A** to **FD1B**.



40. Glue **FD2A** to **FD2B**.



41. Now glue these two assemblies together.

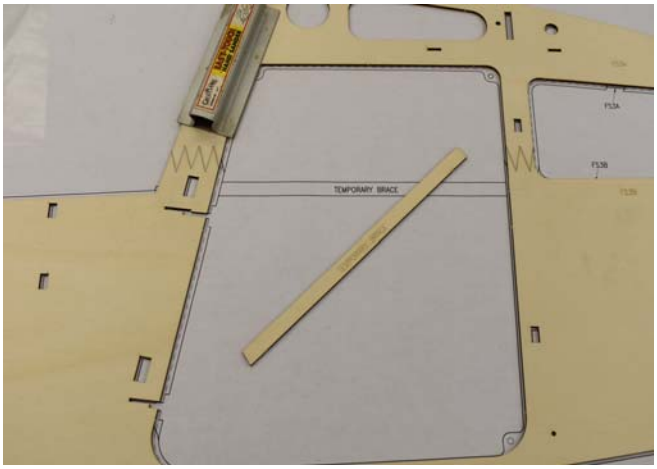


42. Repeat steps for the other doubler.

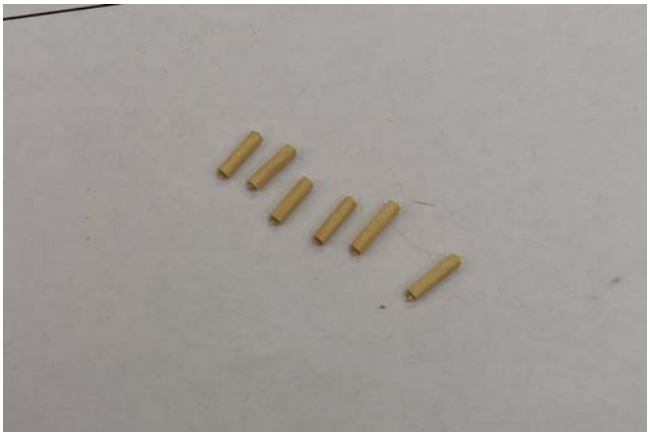
(Attaching Doubler to Side *Assembly)*

Important; You will be making a Right and Left Hand Assembly! Steps shown is Right Hand

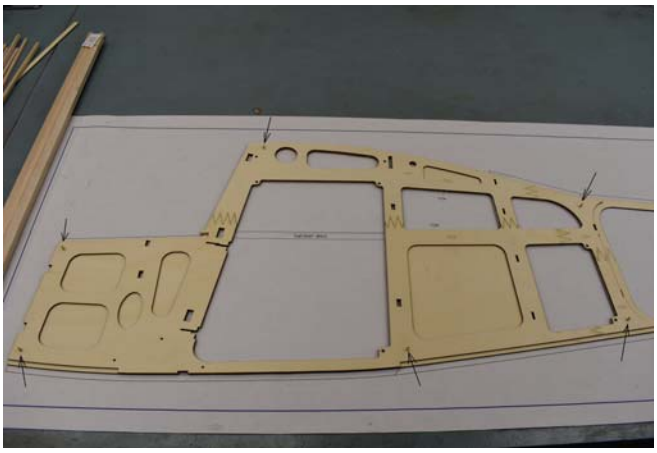
43. Sand finger joints smooth and flat. Also remove the temporary braces.



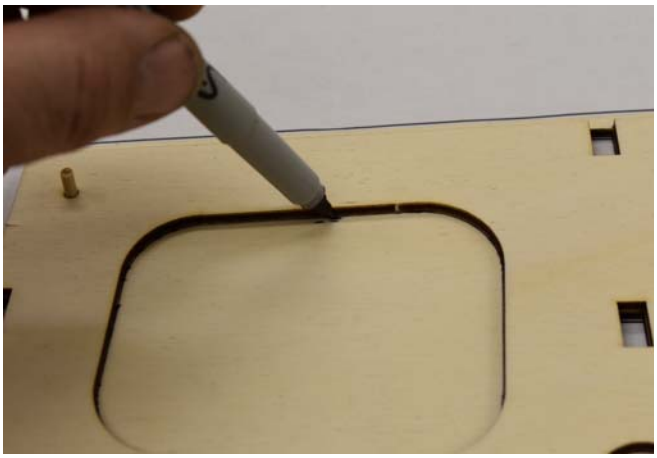
44. Cut six 1/8” dia. dowel alignment pegs.

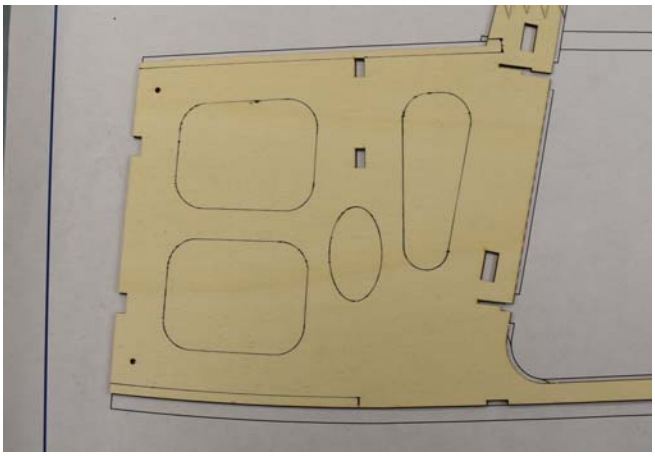


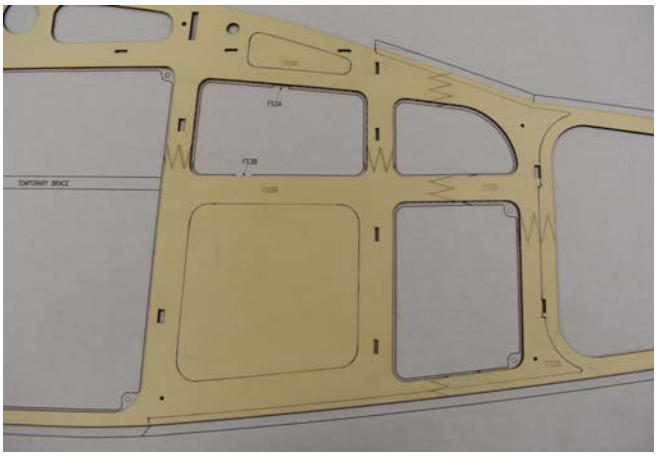
45. Lay the doubler down on top of the side aligning the six alignment holes. Insert the dowel pegs.



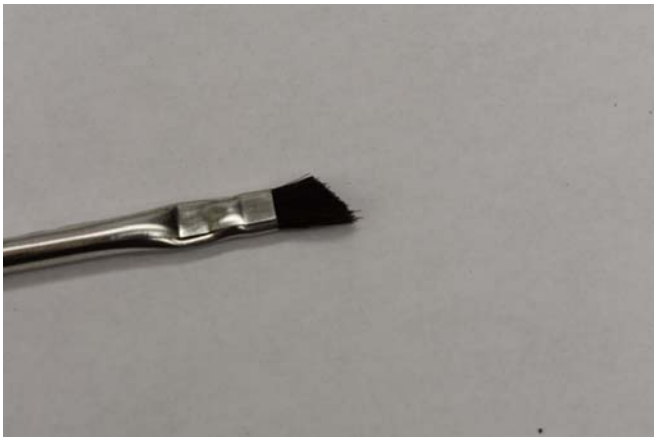
46. Trace all the edges of the doubler onto the side sheet. Then remove the doubler.



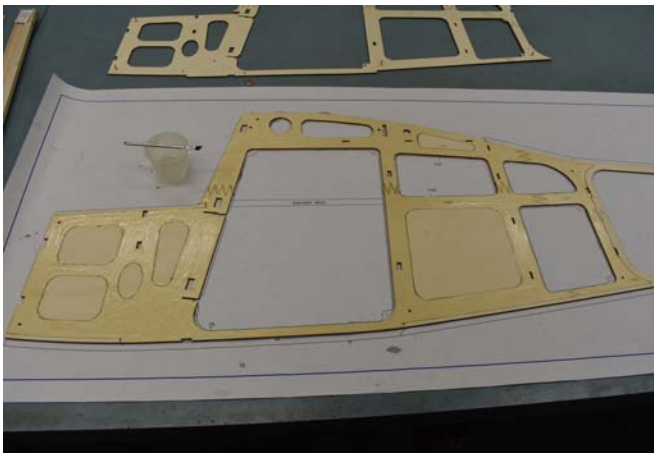


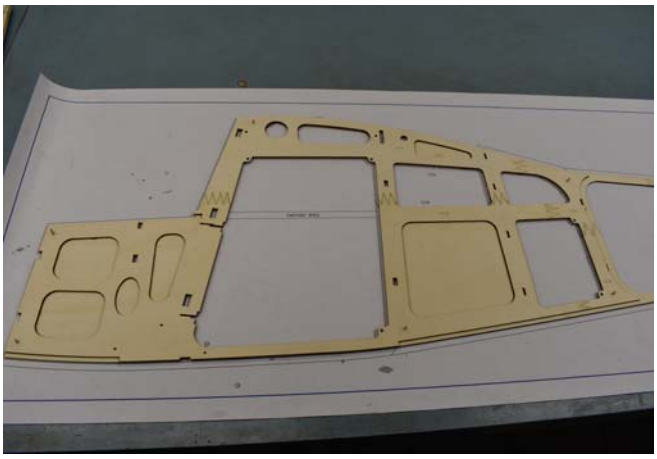


47. Cut half the length off of the bristles of an epoxy brush or a chip brush and a an angle.

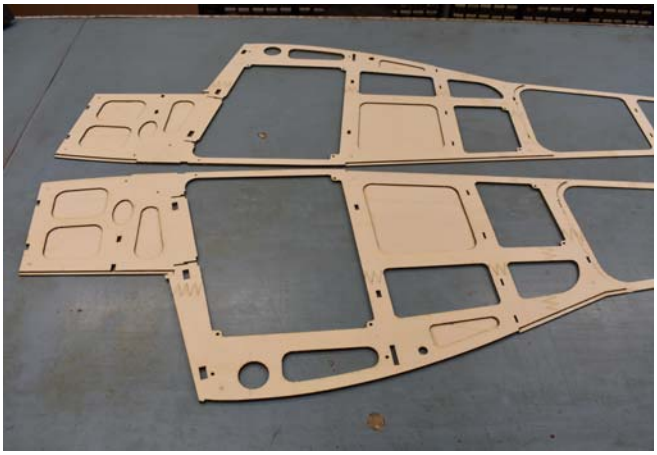


48. Use epoxy finishing resin, West System epoxy resin, or thinned epoxy glue and brush on to the fuselage side. Place the doubler onto the side aligning the dowel peg holes and insert the pegs. Weight down the assembly with sand bags or equivalent.

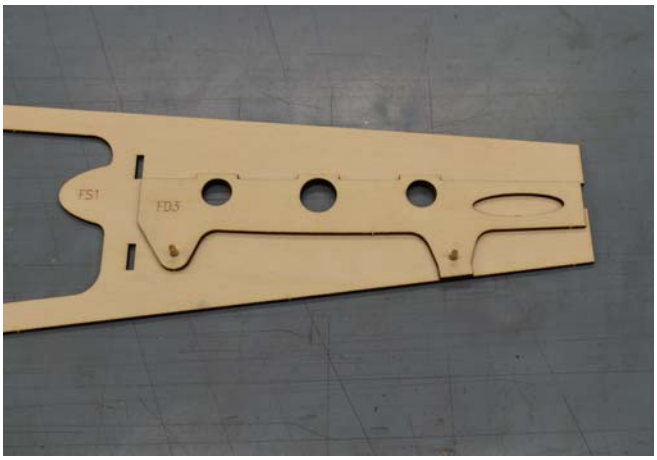




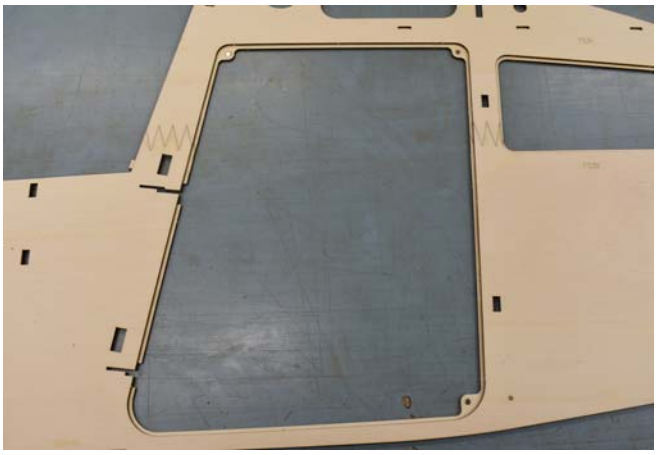
49. Repeat for Left Hand Assembly.

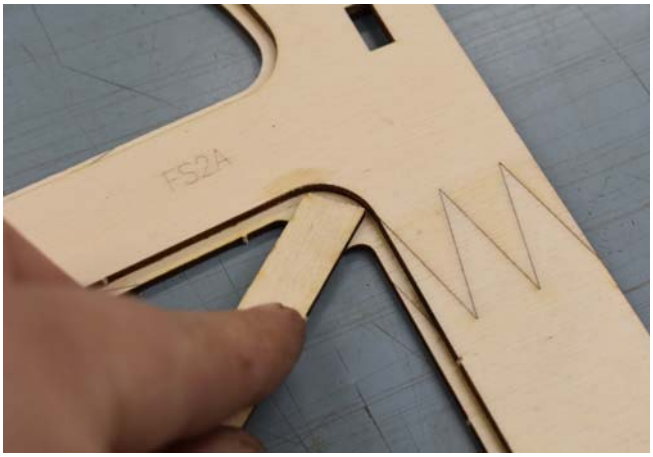


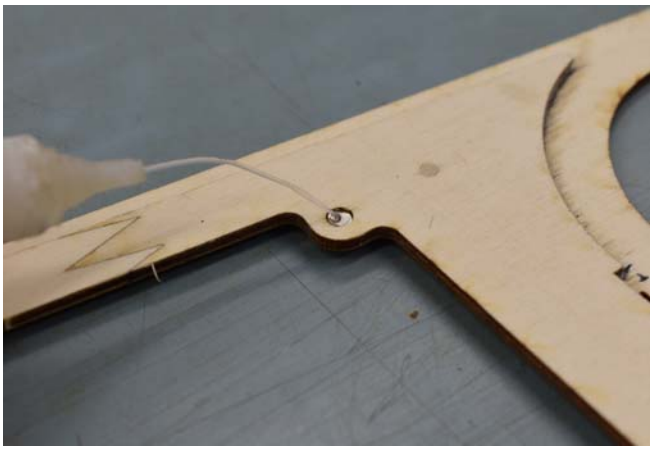
50. Glue **FD3** into position using two dowel pegs. Remove the pegs and insert two 4-40 blind nuts.



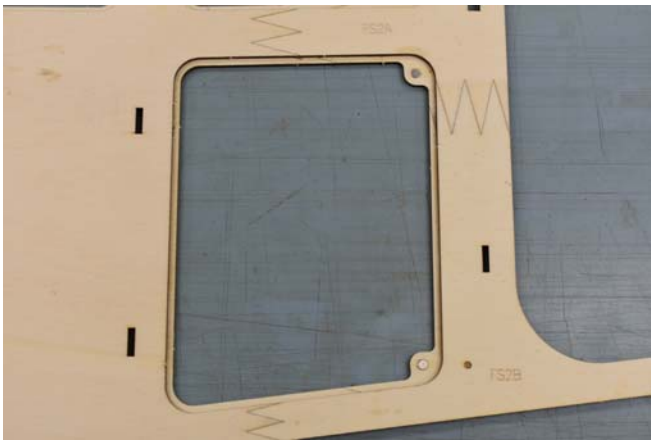
51. With the doubler side down, add three magnets to the main door, No need to be concerned about the magnets polarity at this time. Press a magnet into the hole using a scrap piece of stick until it is flush with the door jamb. Flip over the fuselage and add thin CA glue around the circumference of the magnet. Repeat for the other main fuselage main door.



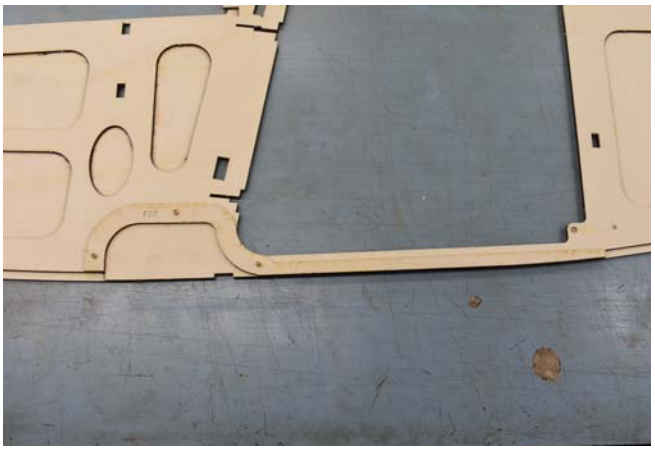


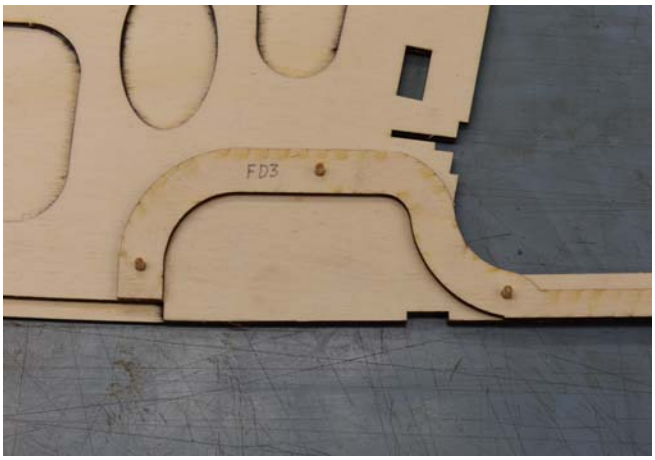


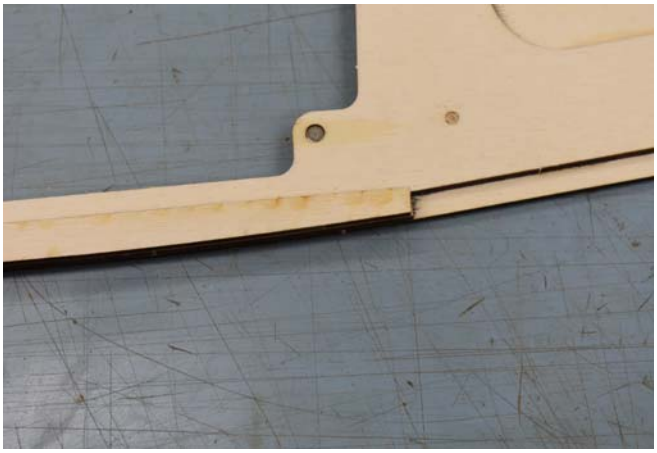
52. Using the same procedure, add two magnets to the left fuselage side luggage door. (There is no door on the opposite side.)



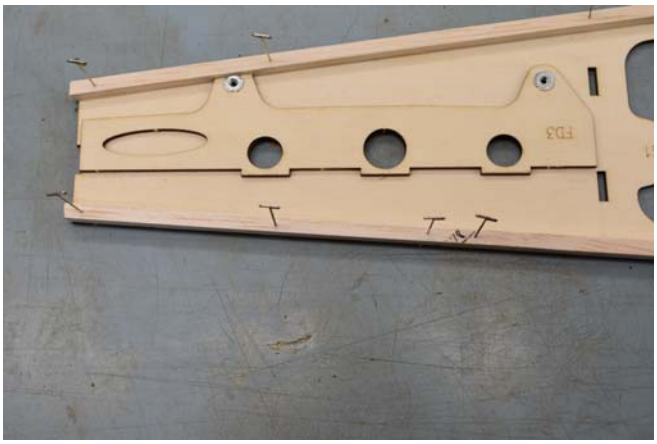
53. Glue **FD3** into position using three dowel alignment pegs. The back end is to be flush with the bottom of the fuselage. Then trim and sand the dowel pegs flush.

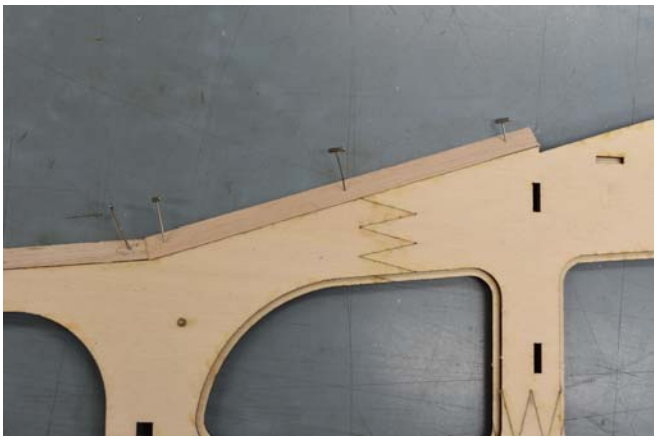


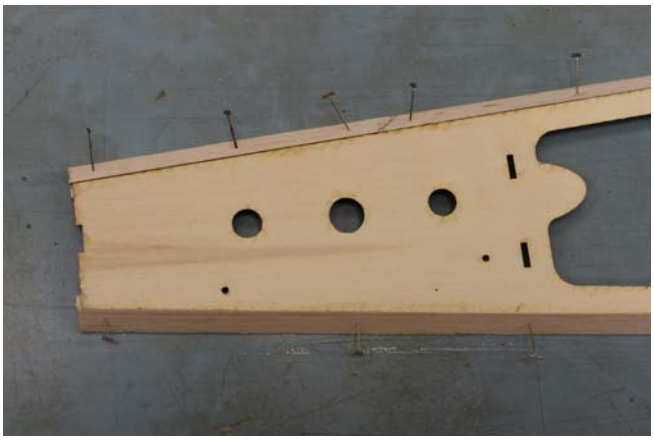




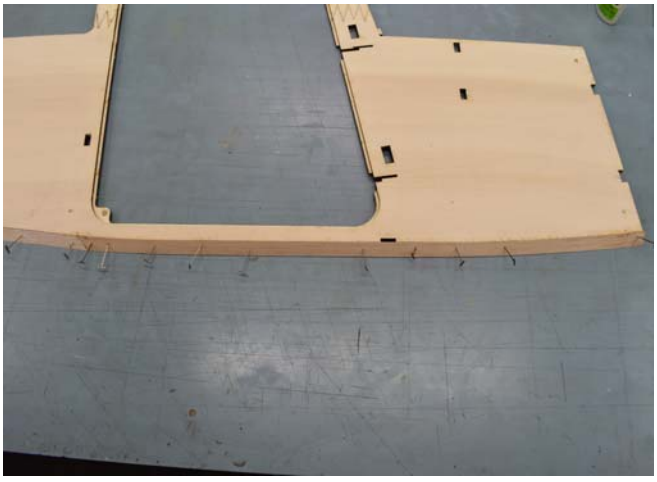
54. Glue on the 1/4” square balsa sticks. See drawing 5-7 for locations.







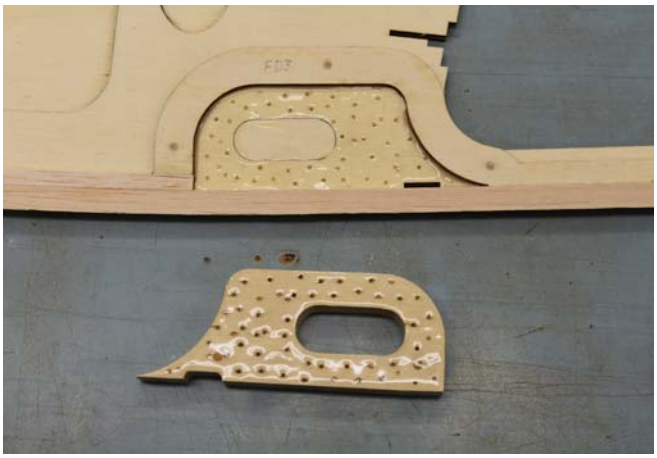
55. Glue on the 3/8” balsa triangle stock.



56. Glue on the 3/8” square balsa stick to the front top of the fuselage side.

57. Epoxy two **FL9**’s together using dowel pegs. Cut and sand pegs flush.

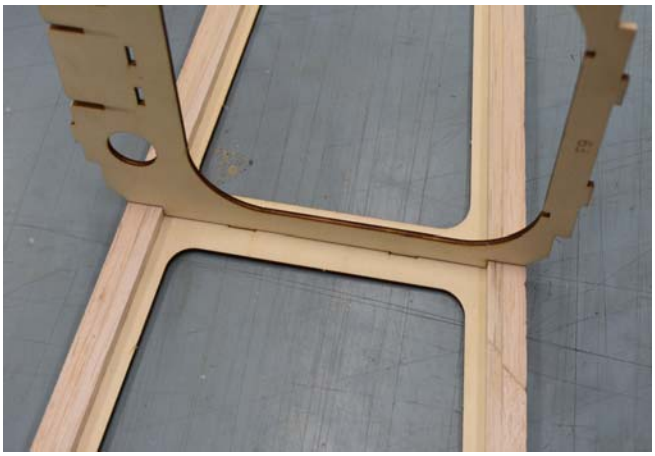
58. Drill dimple holes and epoxy **FL9** into position.



59. Add dabs of epoxy to the magnets and blind nuts.

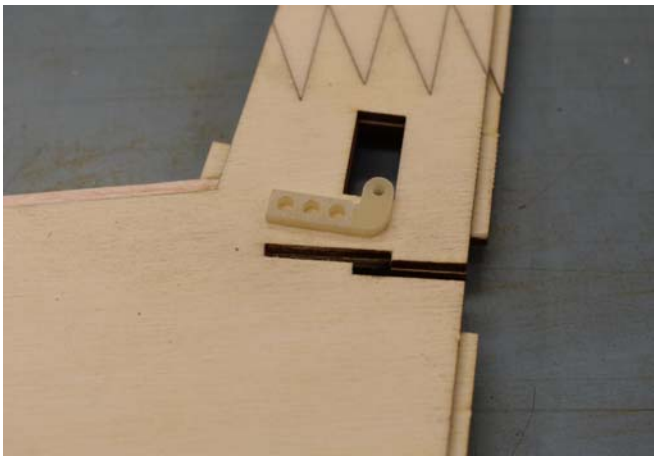
(*Test Fit of Formers)*

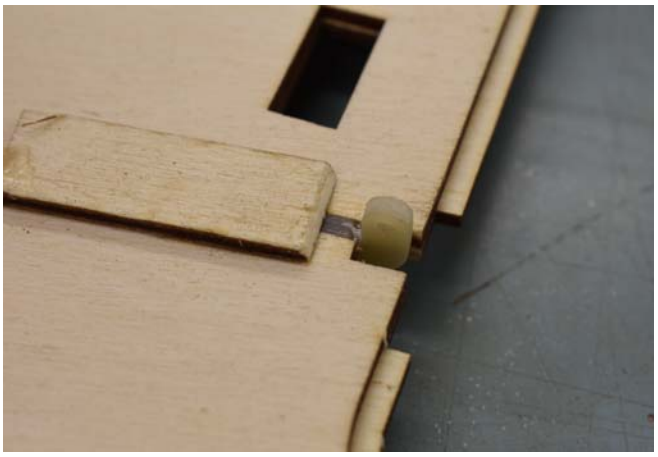
60. Test fit all the formers into both of the fuselage sides. They all face forward i.e. part numbers faces front. The fit of these do not have to be a loose sliding fit like the fuselage top. Sand where necessary to fit especially between the balsa sticks, Remove formers.



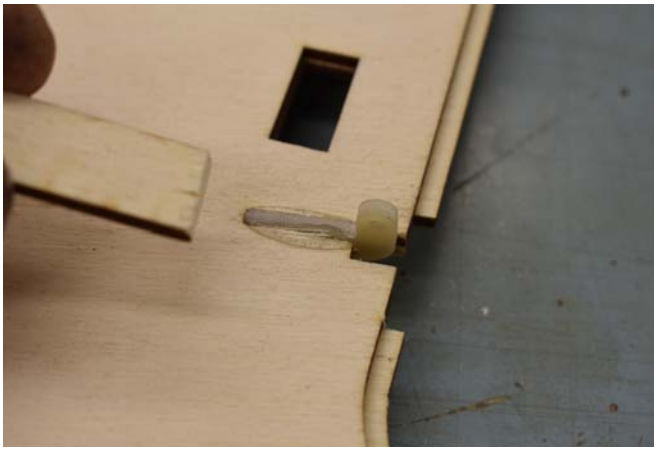
(*Door Hinges)*

61. Locate two short G-10 hinges and scuff both sides of the long legs where the three glue holes are located with a file or rough sand paper. Test fit into their respective slots. Use a file or sanding stick to widen slot if needed. Do not make the slot longer.



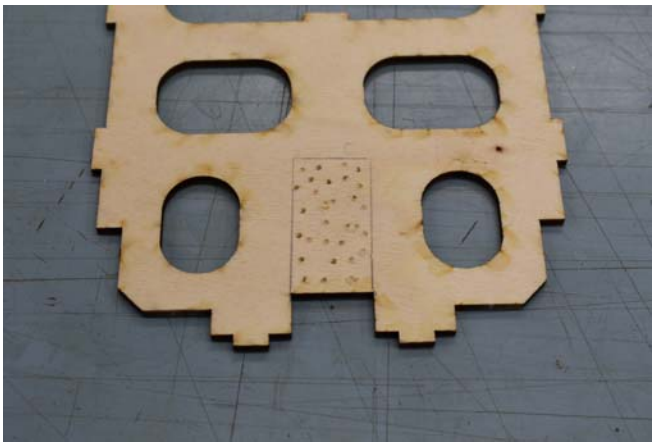


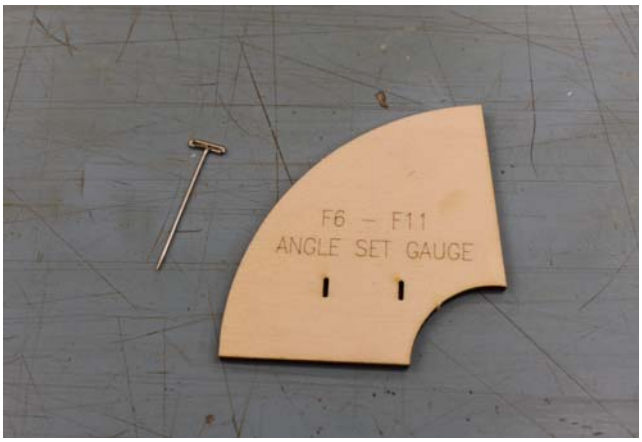
62. Add epoxy glue into the three glue holes and where it will make contact with the wood. Press the hinge into position and use a scrap stick to push the hinge down and flush with the fuselage side. Also make sure it is bottomed out (forward) in its slot. Wipe away excess glue. Repeat steps for other side of fuselage.

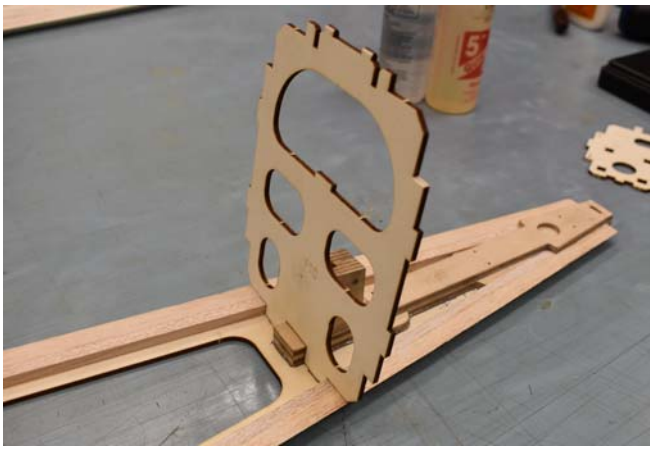


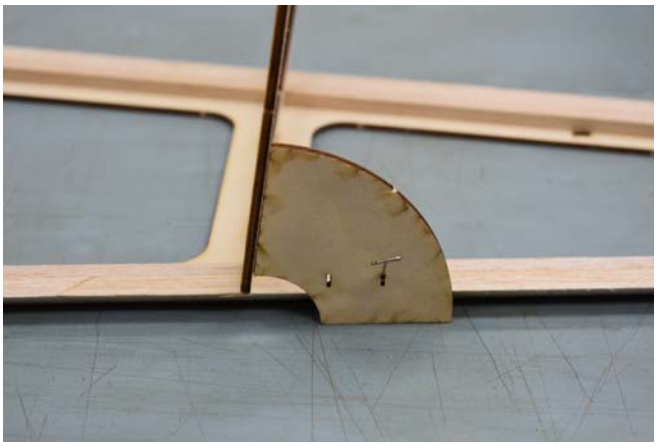
(*Gluing Formers To Fuselage Bottom)*

63. Place former **F10** into position and trace around the tail gear mounting block. Drill dimple holes and add epoxy to this area. The bottom edge of the former can be glued with regular glue.

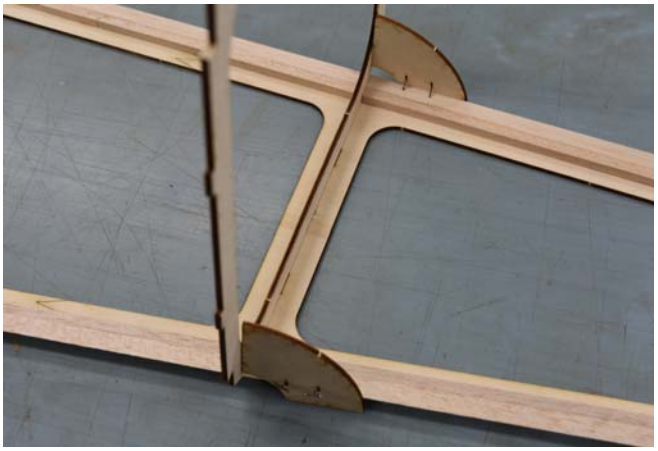


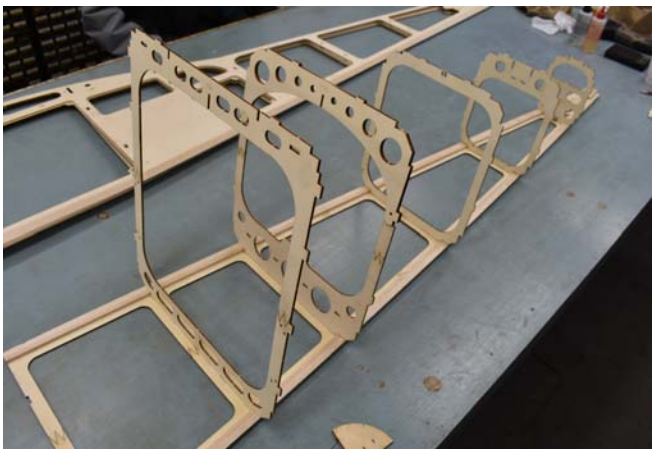






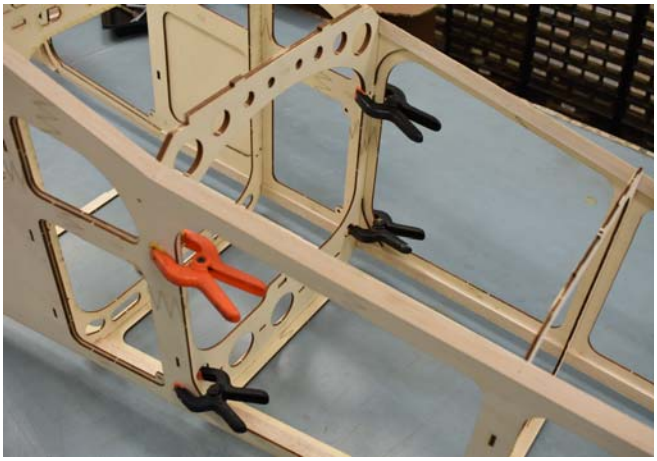
64. Glue in formers **F6** through **F9**. **F7C** (the doubler on former **F7** must face forward). Use the F6 - F11 ANGLE SET GAUGE and a T pin or two to set the correct angle of these formers. All these formers angle rearward.

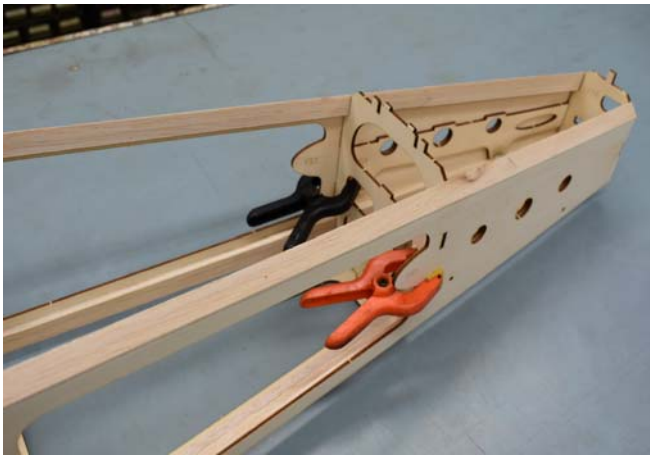


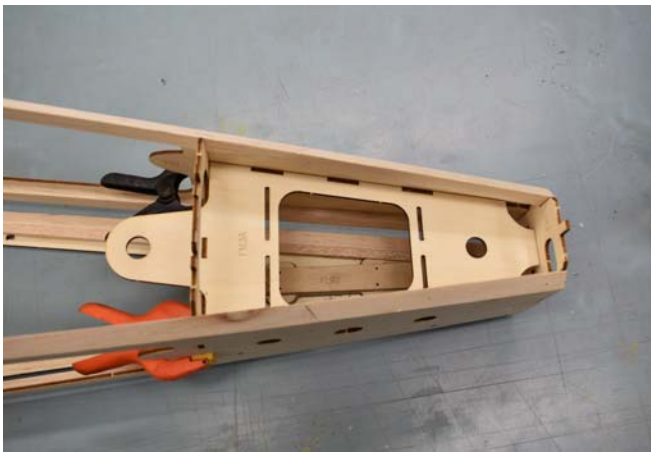


(*Test Fit Fuselage Sides and Top)*

65. Test fit the fuselage sides onto the formers. Use some clamps to hold things together, Also test fit **FM3A** and the top assembly onto the fuselage. .

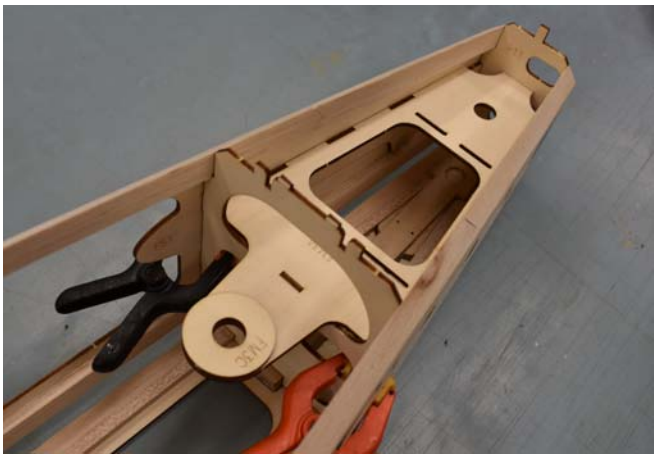


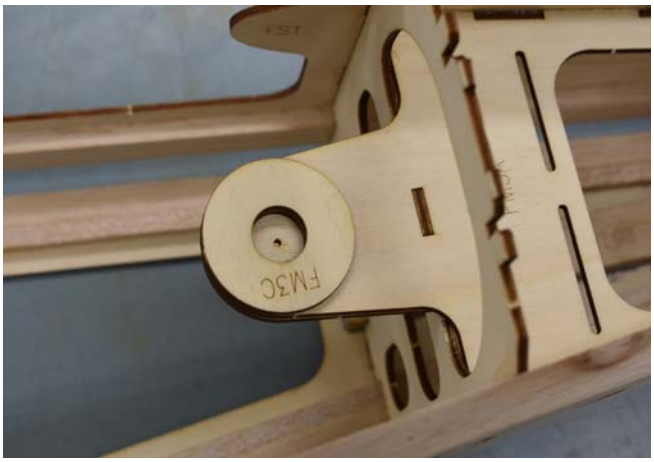




(Gluing on the Fuselage Sides)

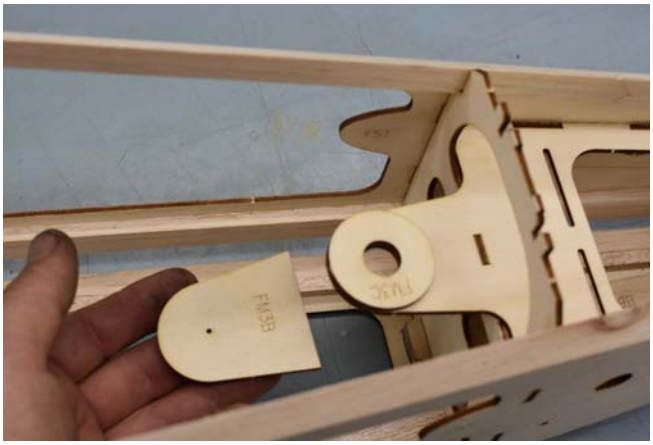
66. Glue **FM3C** on top of **FM3A**. Then glue this assembly into the rear of the fuselage.





67. Glue all these fuselage formers to the sides only. The fuselage top will be glued on at a later time.

68. Glue **FM3B** into place.

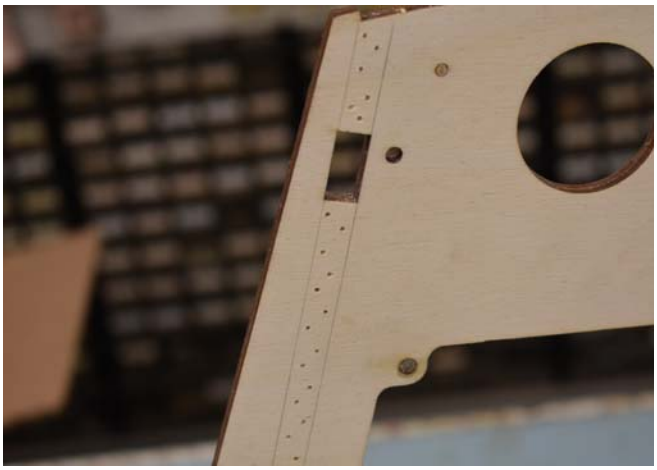


(*Glue in Remaining Fuselage Formers)*

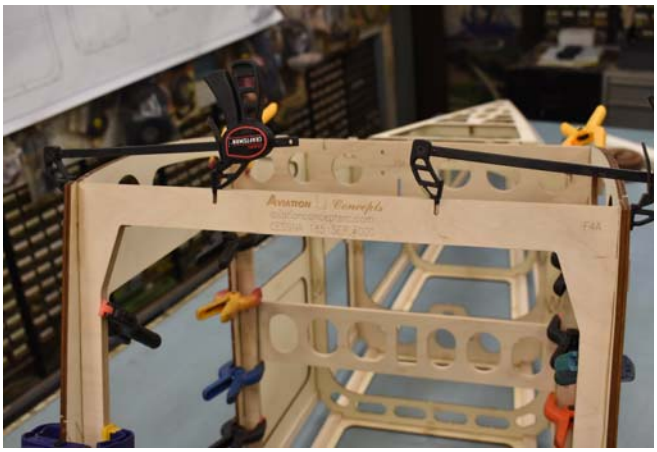
69. Test fit formers **F5**, **F4**, **F3** and **F2**.

70. Using 30 minute epoxy, glue in former **F5**.The bottom of the former can be glued to the bottom with regular glue. Before the epoxy sets up clamp into position former **F4**.

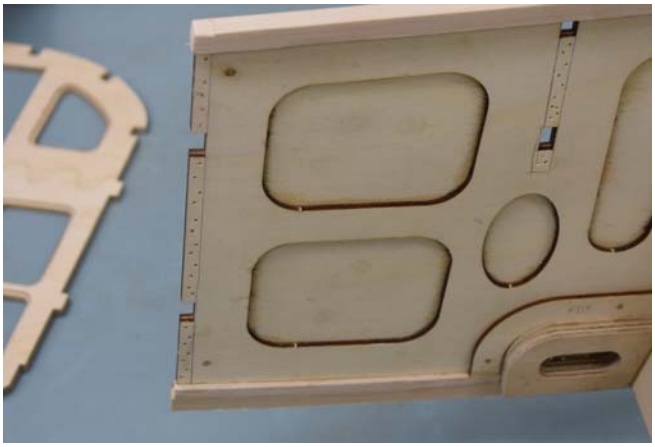
71. When the previous former has cured, trace on to the fuselage sides where former **F4** sits. Drill gluing dimples into the lite ply and the edge of the former.

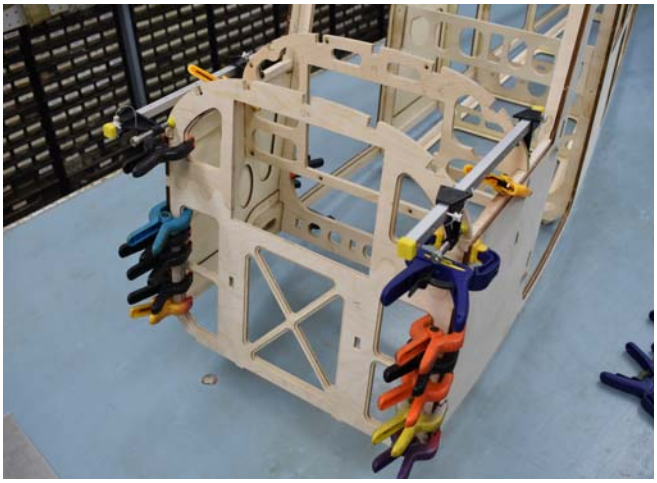


72. Use 30 minute epoxy and glue in former **F4** (Logo and serial number must face forward) using plenty of clamps. (Note the use of bar clamps at the top.) No need to pre clamp in the remaining two formers.



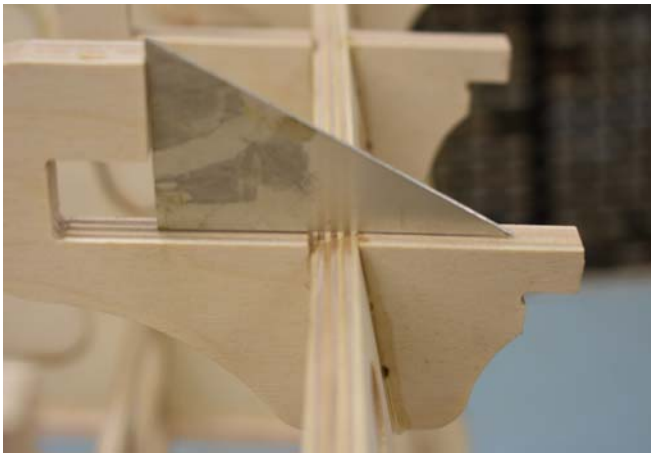
73. The remaining two formers **F3** and **F2** must be glued in at the same time. The etched part numbers must face forward, especially the recessed perimeters of the lightening holes of former **F2**. Add dimple holes in adjoining parts and use 30 minute epoxy glue with plenty of clamps. (Make sure **F2** is flush with the front of the fuselage sides.) **Important:** Before beginning this procedure, Clamp a straight edge, angle or bar stock across the bottom of former **F4** to prevent it from bending. Allow to fully cure before doing next step..



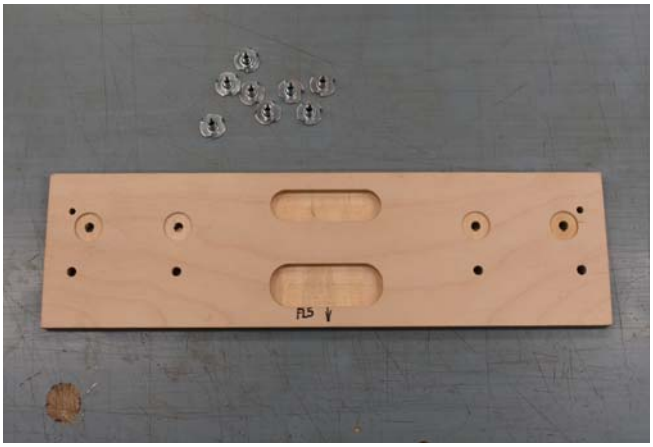


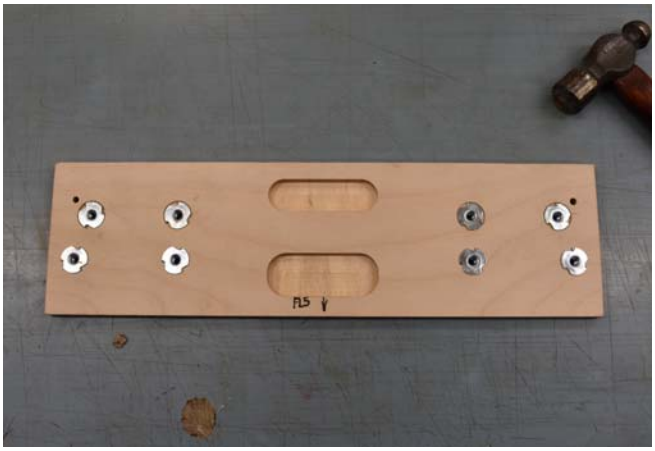
(*Landing Gear mounting structure)*

74. Flip the fuselage over (be careful of the tab on the top of the last former, or better yet, tape on the top fuselage assy.) Unclamp and remove the bar stock from the bottom of Former **F4**. Drill dimple holes in adjoining parts for **FL7** and **FL8**. Use 30 minute epoxy to glue on **FL7** first. These are flush with the back edge of the former. Next is to epoxy in **FL8**. These are on the same plane with **FL7**. Use a small straight edge to check, when satisfied tack CA glue them to hold them into position.

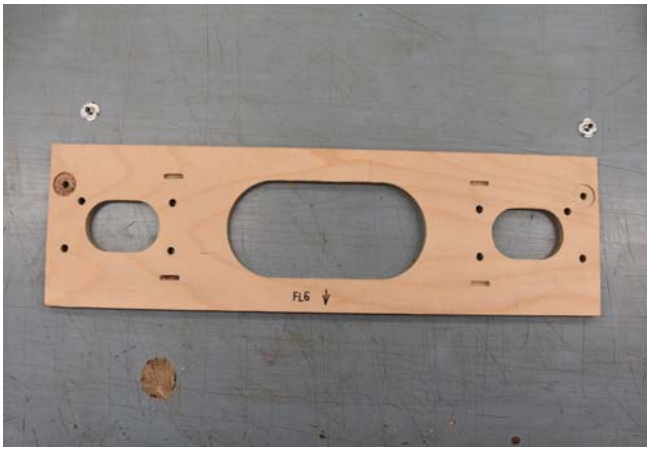


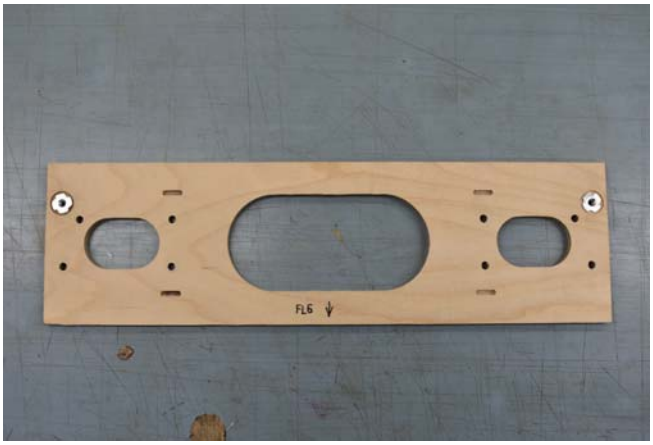
75. Hammer in eight 10-32 blind nuts into **FL5**. Four of them sit in a pocket and must not protrude above the surface. Do not lock them in place with epoxy yet.

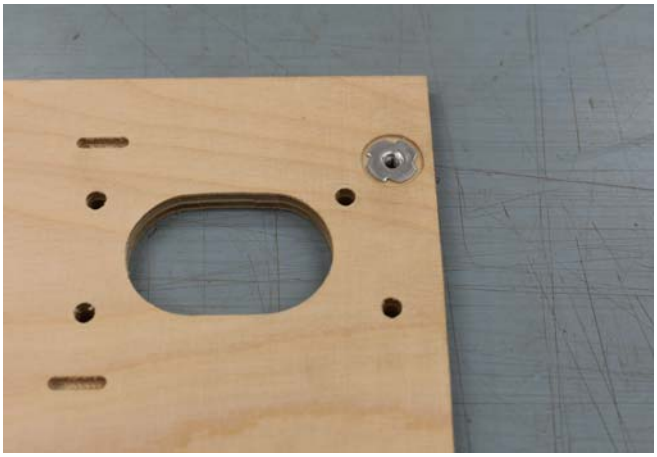




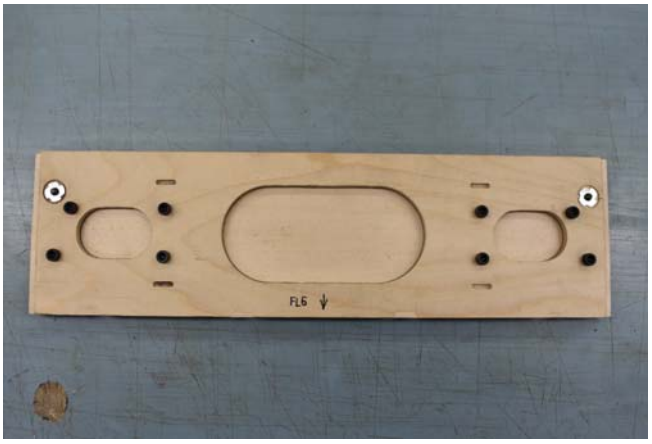
76. Hammer in two 8-32 (small 1/2" dia. flange) blind nuts into **FL6**. These also sit in a pocket and the flange must not protrude above the surface. The T-nut shank will protrude out of the other side by 1/16" so tap in over a hole in a block of wood. Do not lock them in place with epoxy yet.

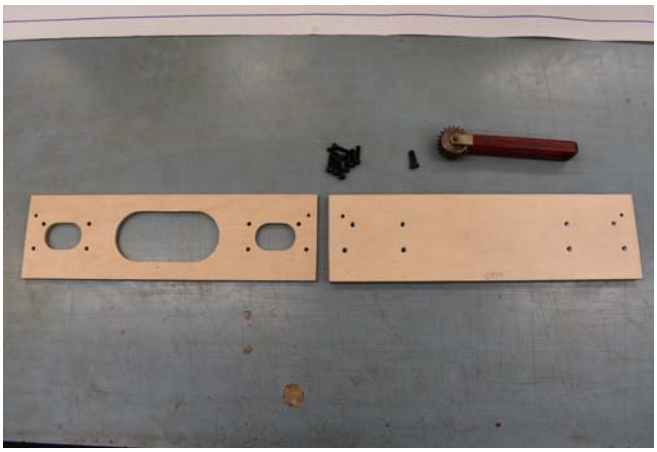


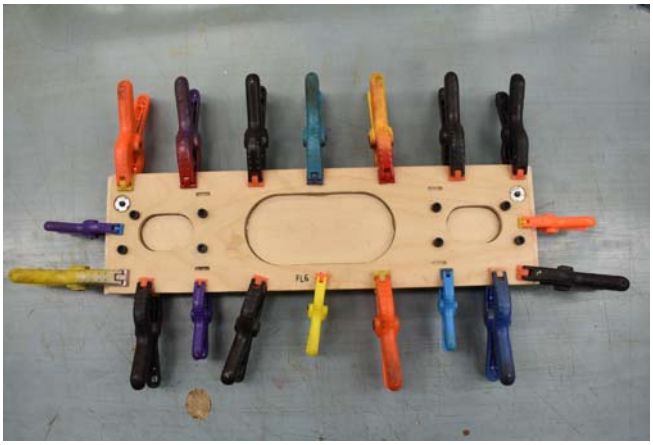




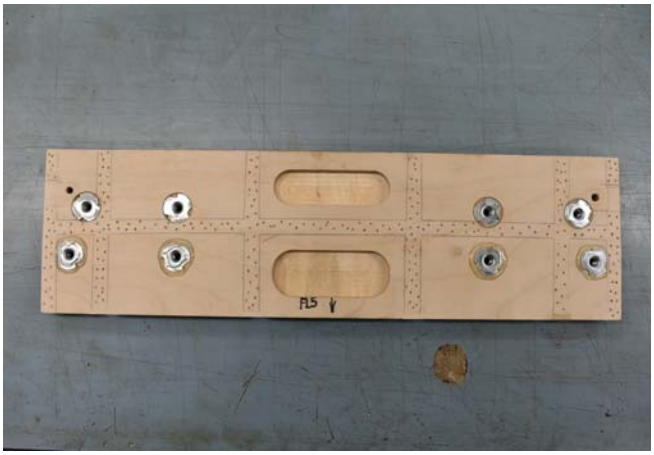
77. Test bolt together the two plywood plates with all eight 10-32 bolts and both 8-32 bolts. The arrows on these two parts will be facing the same direction, i.e. front of the fuselage. Use a wood pecker or drill dimple holes in the mating parts. Glue together with 30 minute epoxy. Coat the bolts in light oil or Vaseline and bolt together and use additional clamps around the perimeter.

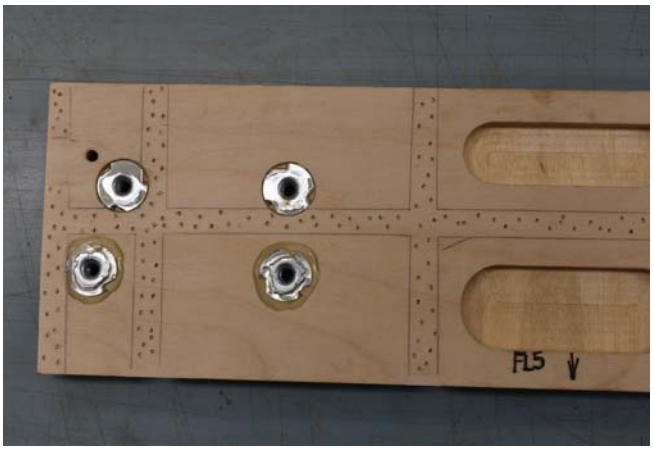




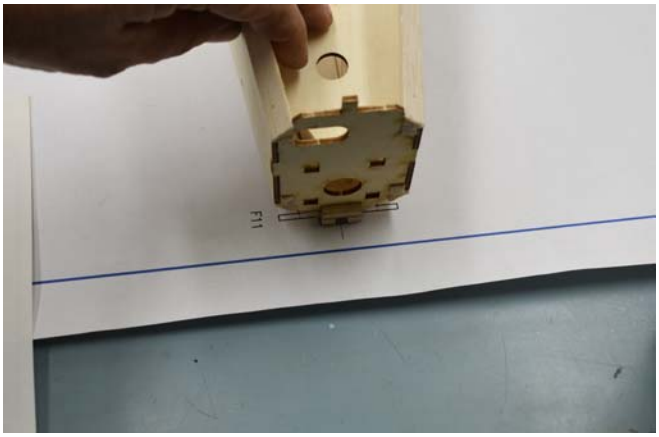


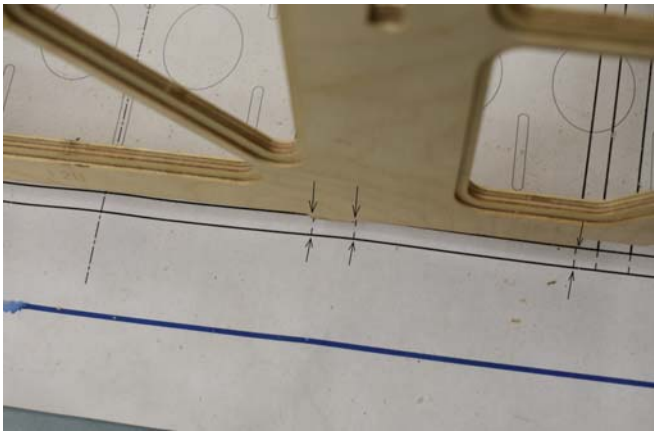
78. When cured, trim off or sand excess epoxy especially off the front edge (arrow side.) Place the landing gear plate into position (arrows facing forward) and trace the former and its gussets onto the plate. Drill dimple holes in both adjoining parts. You can now lock the blind nuts in with epoxy glue. On the recessed blind nuts, simply fill the three triangular voids.



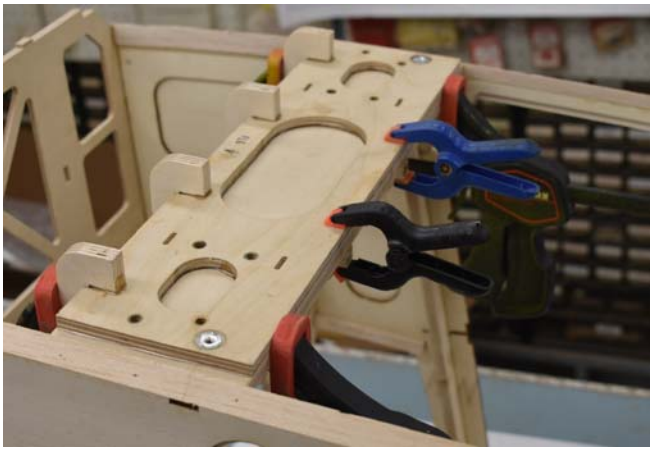


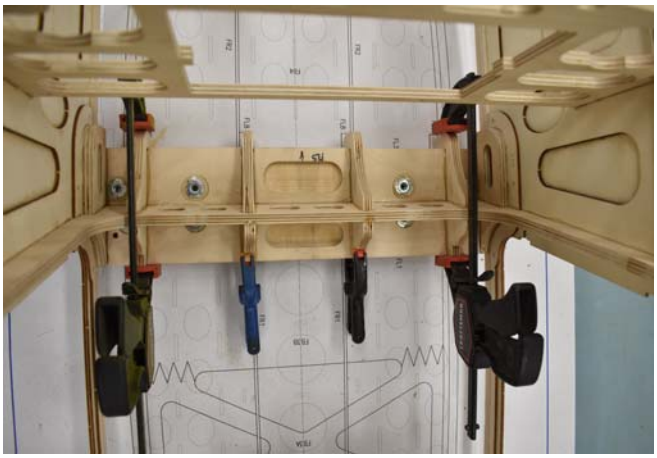
79. Place the fuselage over the plans and center the aft end of the fuselage bottom from former **F5** back. Add weights to former **F5** so the fuselage wont move. Rock the fuselage forward so **F2** is down over the plans. The tabs on the bottom of **F2** might be off with the alignment on the plans. To fix this, add a scrap stick diagonally between the corners of formers **F4** and **F5**. Pushing on the stick will shift the front end over. When satisfied, clamp or tack glue the stick into position.





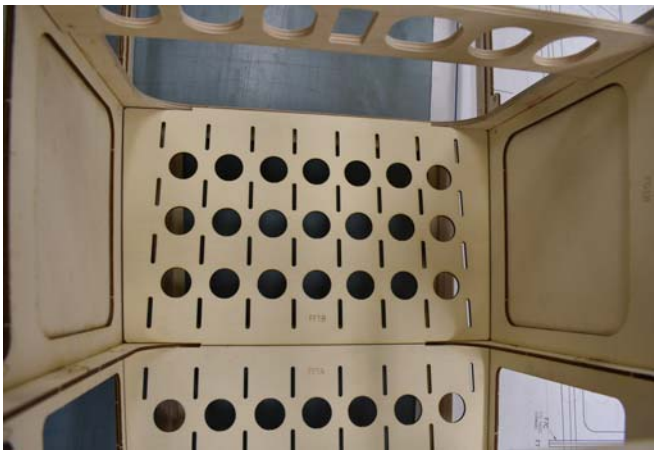
80. Familiarize yourself with this step before beginning. Use 30 minute epoxy to glue in the landing gear plate assembly. Use a couple of clamps to secure the back edge down onto the rear gussets and two bar clamps to keep the front edge in full contact with all four of the front vertical edges of those gussets. If the former has a bow arcing rearward, then the bar clamps would be on the outer two gussets. If the arc is forward, then the two bar clamps would be on the two inner gussets. Before the epoxy sets up recheck front end alignment.





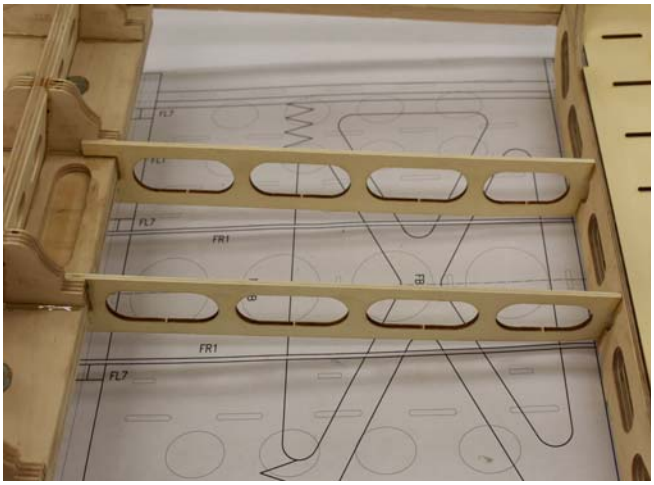
(*Internal Floor Sections)*

81. Glue in **FF1A** and then **FF1B**.

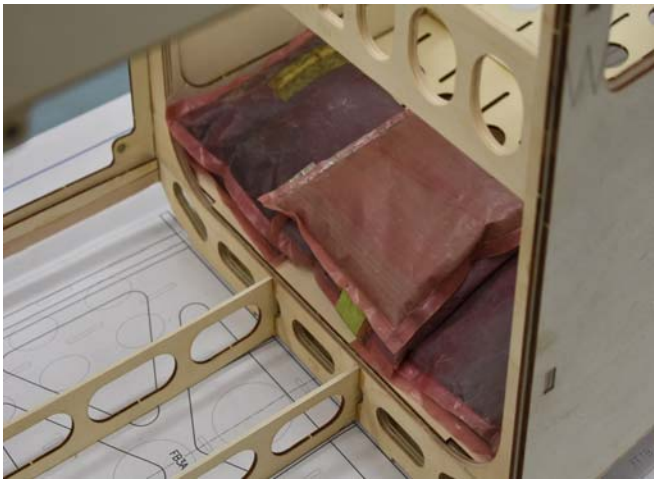


82. Flip fuselage over and glue in on center **FF1C** and **FF1D**. Arrow should face forward on **FF1D**.

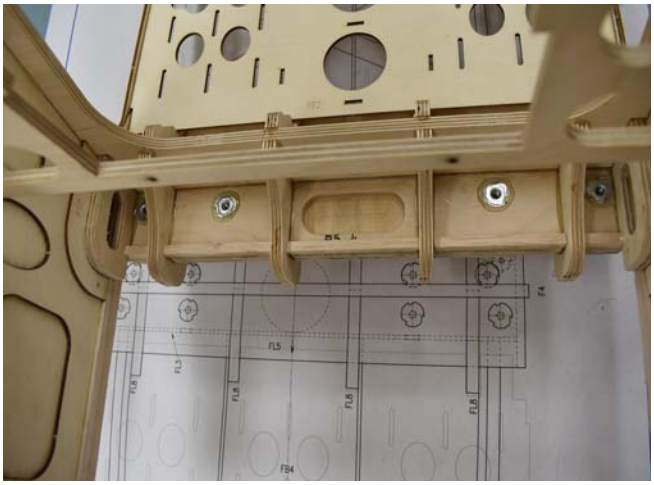
83. Glue in both **FR1**'s.The back end fits into the round hole in **F5B** and the front end is on the insides of **FL7**'s.

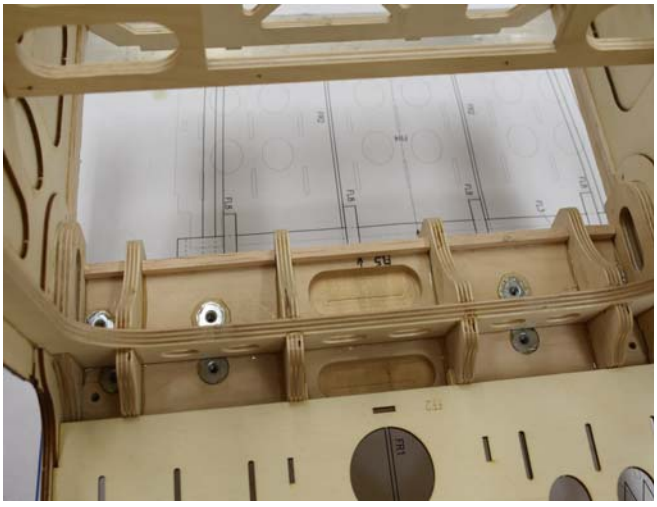


84. Check and realign the fuselage front end as you did in step **79**. Securely glue in **FF2** from the top side and bottom. This will lock in the final alignment of the fuselage front end.

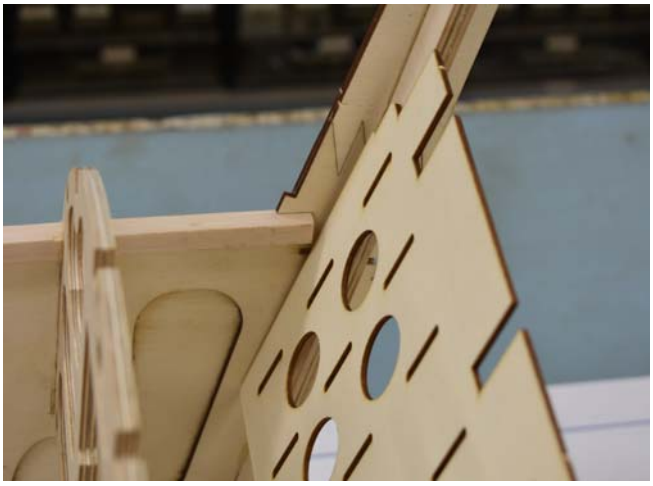


85. Cut and glue in 1/4” square balsa sticks on top of the front edge of **FL5** the landing gear mounting plate.

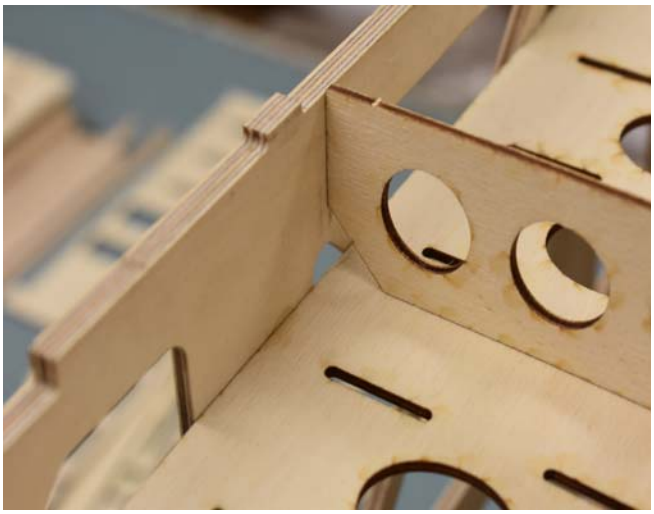




86. Slide **FF3** in place as shown and check for fit. When satisfied, glue on top of the 1/4" square balsa sticks and along both sides only.



87. Temporary clamp into position **FR2** lining up the front bottom edge with the fire wall **F2B**. Now glue the front edge of the floor to the fire wall. Unclamp and remove **FR2**.

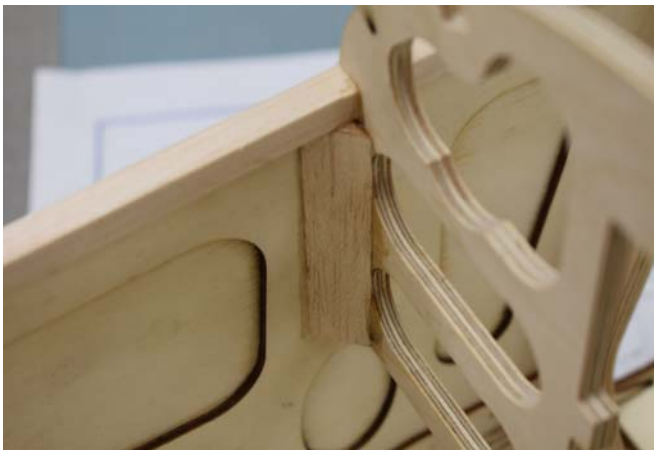


88. Epoxy in a 1/2" balsa triangle stock across the front.

89. Glue into position both **FR2**'s. The back ends are on the outside edges of **FL8**'s.

90. Cut 3/4" balsa triangle stock and use 30 minute epoxy to glue into position in both front corners. (30 minute epoxy is for the extended "soak" time needed for this joint.)

91. Cut 1/2" balsa triangle stock and use 30 minute epoxy to glue into position in front of **F3** corners only.



(*Fuselage Forward Bottom Sections)*

92. Glue **FL1** into position and use a straight edge to keep the ends straight.

93. Glue **FL3** in place.

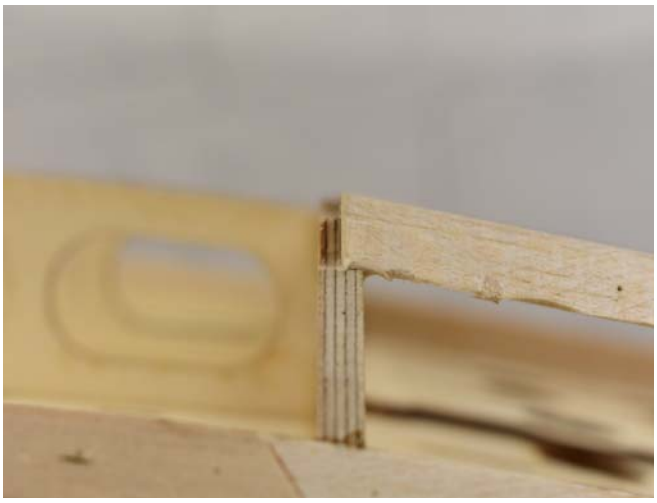
94. Glue **FB3A** to **FB3B** together.

95. Glue on 1/4” square balsa sticks.

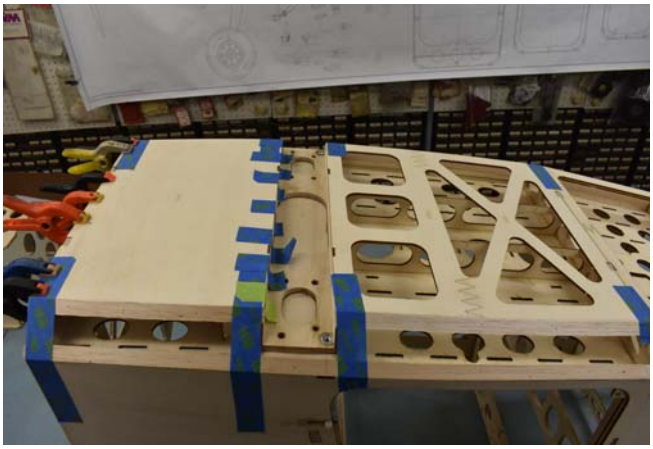
96. Glue on 1/4” square balsa sticks to **FB4**.

97. Next is to glue on the 3/8” balsa triangle stock.

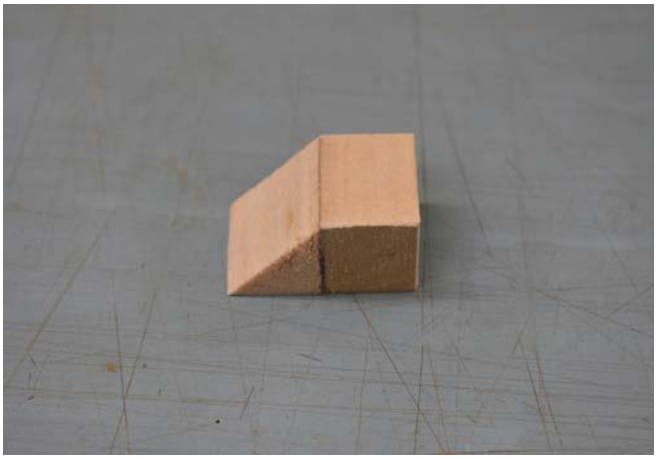
98. Trim back the balsa stick and triangle if needed at former **F5**.



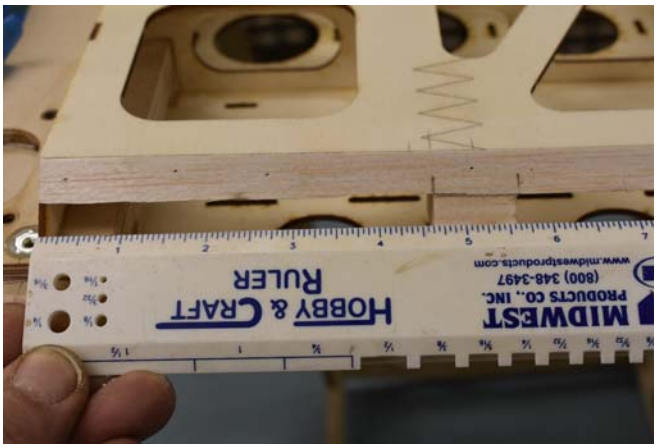
99. Glue the remaining two floor assemblies in place.

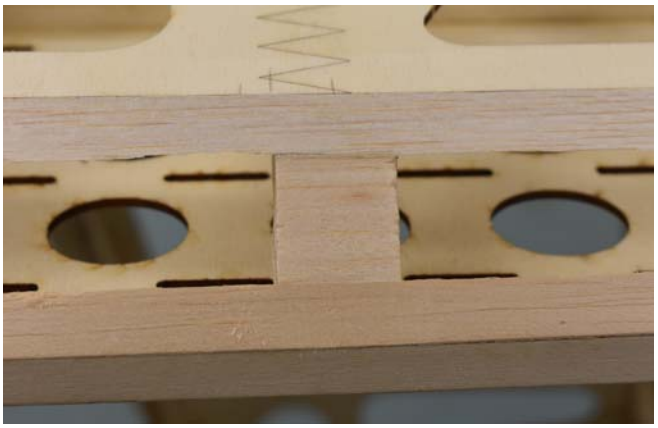


100. Cut a 3/4” balsa triangle stock to 1” long and glue to a 3/4” square basswood block.



101. Measure back 4 5/8” from the front edge of **FL1** and glue in the bass block to the underside of **FB3A**/ **FB3B**.

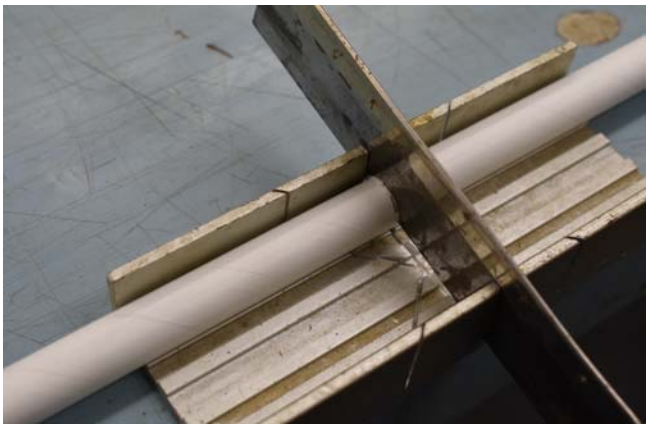


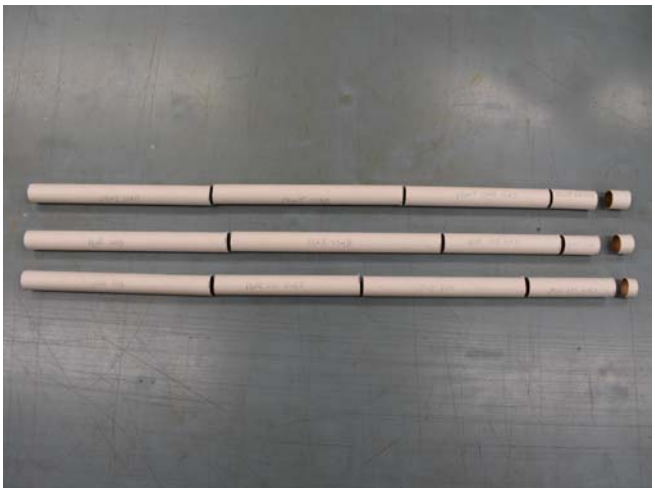


102. Cut another piece of 1“ long 3/4” balsa triangle and glue it under the previous triangle to the fuselage side. (You may have to pull up on the fuselage bottom to align the triangles.) Repeat for the other side.

(*Tail Tube Sockets)*

103. Cut all three 1/2” diameter, cardboard tube, tail sockets as shown in SKETCH-1 in the back of the manual. Label the pieces as you have cut them to length. Excess length has been included in the dimensions given. Note; the larger tubes are conduits.





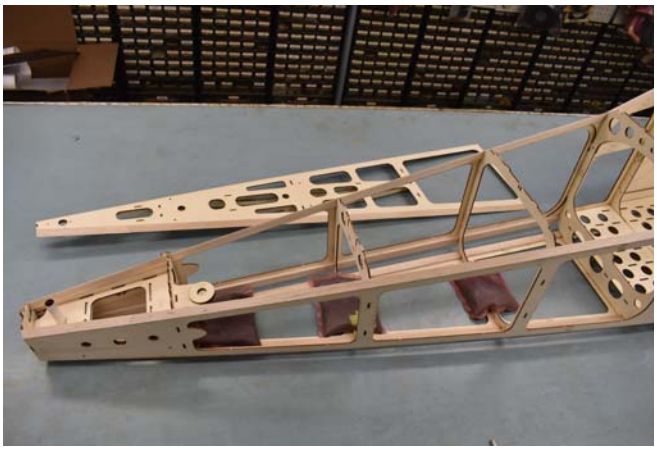
104. Insert FRONT STAB FUSE and REAR STAB FUSE and secure with glue in the gluing slots. Then coat the outside diameter of the tubes within the fuselage sides with CA glue or epoxy to stiffen them up. (They tear easy if the carbon fiber tail tubes are not installed straight).

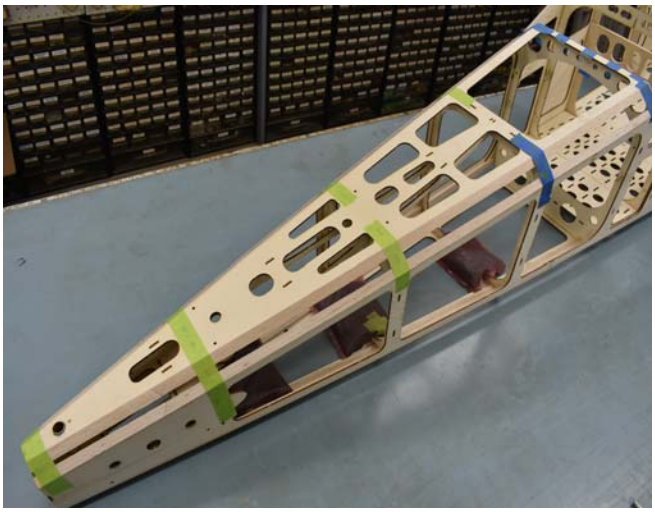
105. Trim the sockets flush with either a fine tooth saw or razor blade.

106. Glue in REAR FIN FUSE socket. Make sure it is fully seated into the pocket of the tail gear mount. CA or epoxy harden the tubes up to where the bottom of the top lite ply would sit.

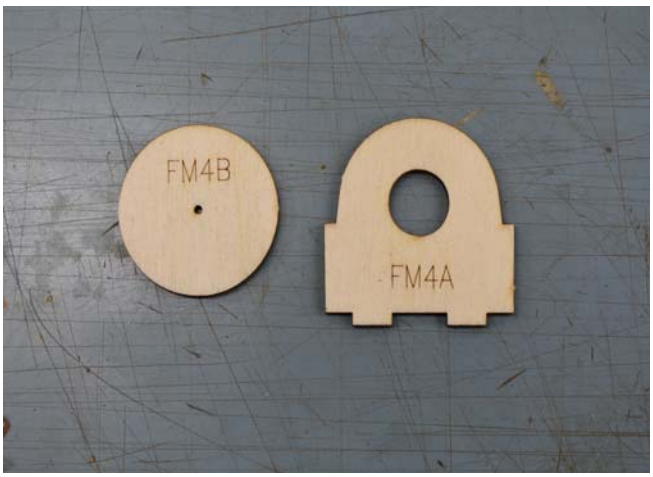
(*Fuselage Top Structure)*

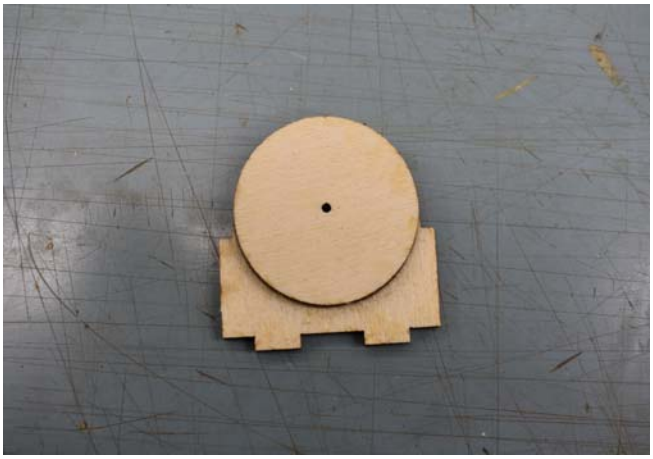
107. Add glue to the top of the fuselage formers that will make contact with the fuselage top rear section. Tape into position at the former locations.



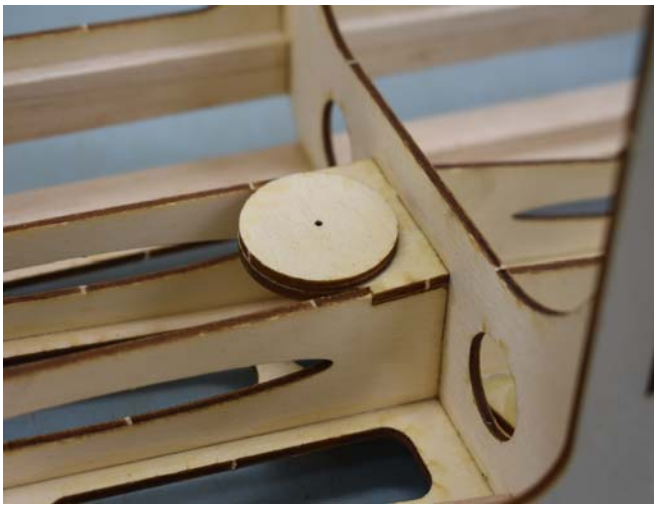


108. Glue on **FM4B** onto **FM4A**.



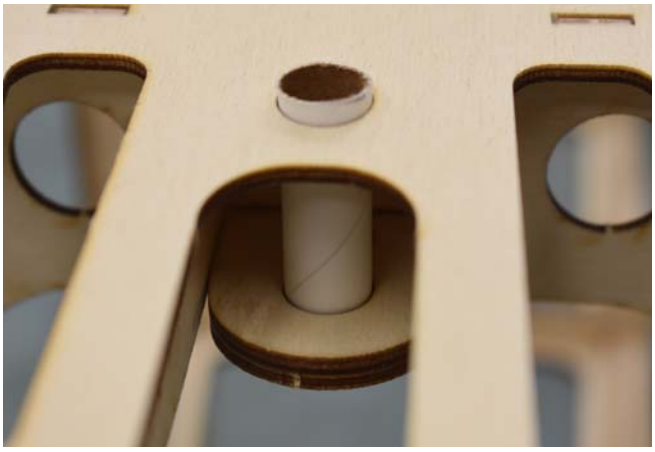


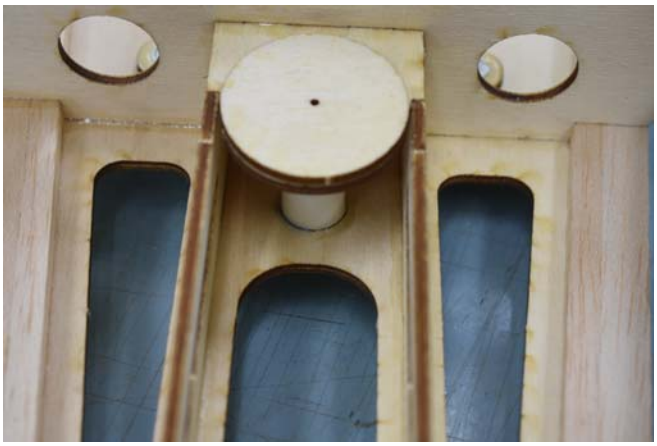
109. Glue this assembly into position behind former **F9**.



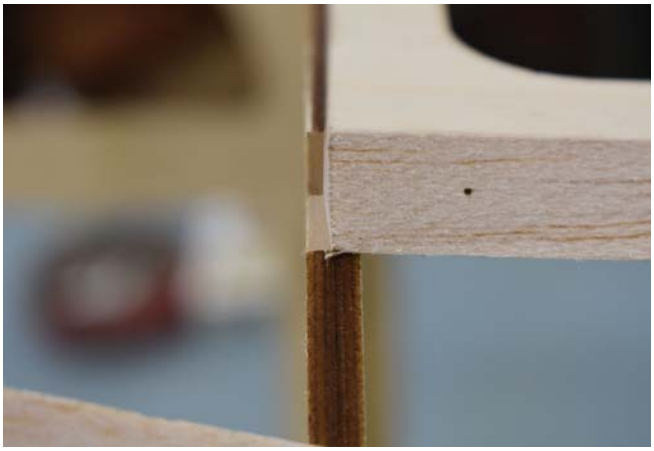
110. Glue in MID FIN FUSE socket tube.

111. Glue in FRONT FIN FUSE socket tube. Trim and sand all tubes flush. Then CA or epoxy harden these two tubes.

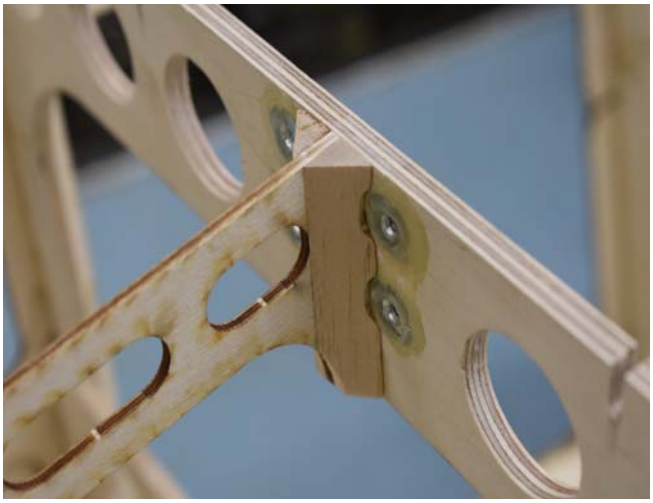




112. Trim back the balsa stick and triangle if needed at former **F7**.



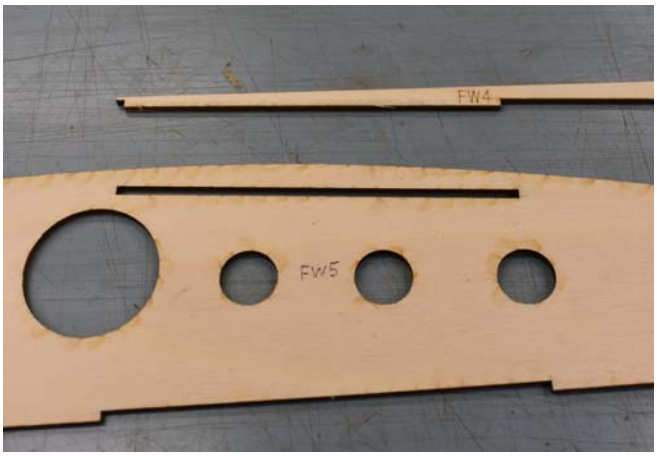
113. Glue in **FR5** and 1/2" balsa triangle stock.



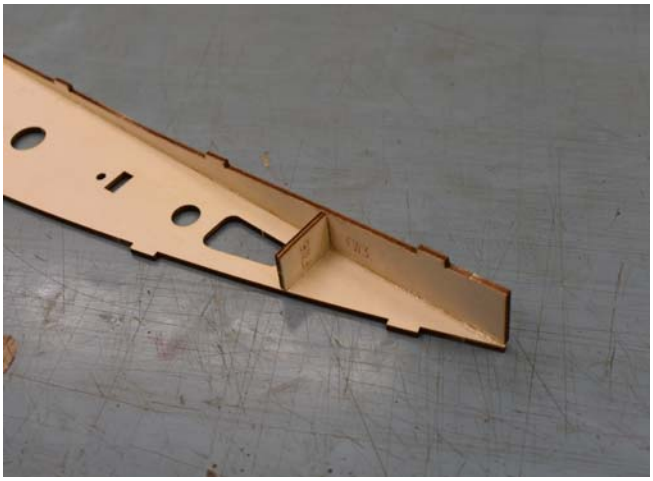
114. Glue in both **FR4**'s.

The following steps, you will be making a Left and a Right hand assembly.

115. Glue **FW4** to **FW5**.



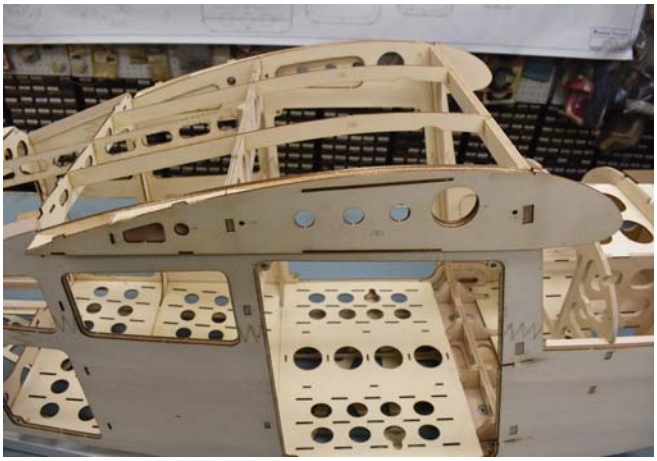
116. Glue **FW6** and **FW3** into position as shown.

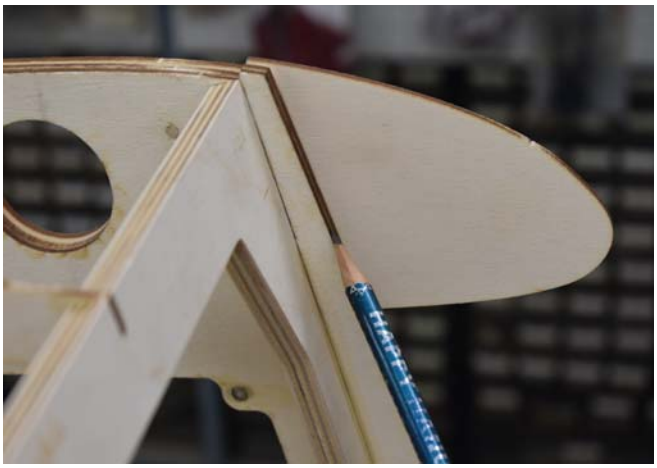


117. Glue in **FW4A**.

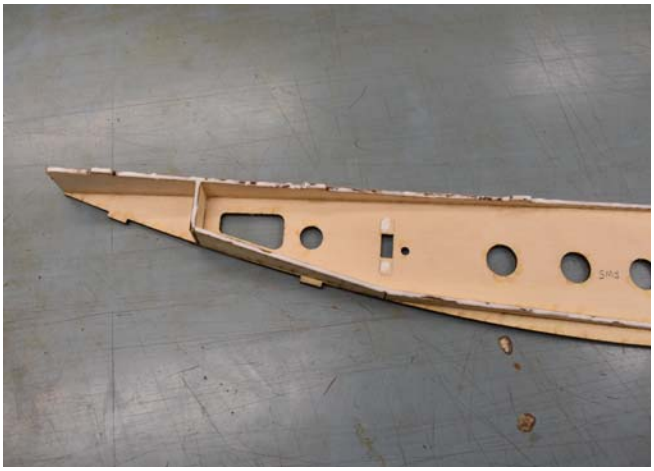
118. Repeat previous steps to make the opposite hand structure.

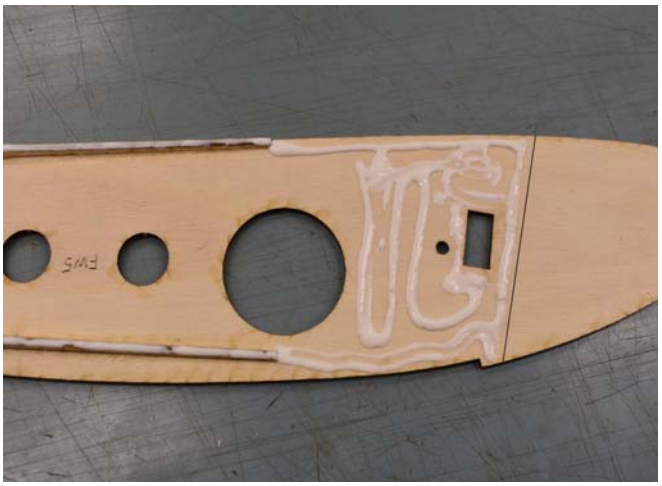
119. Test fit the assembly onto the fuselage side and mark a line as shown where it protrudes past the fuselage side.



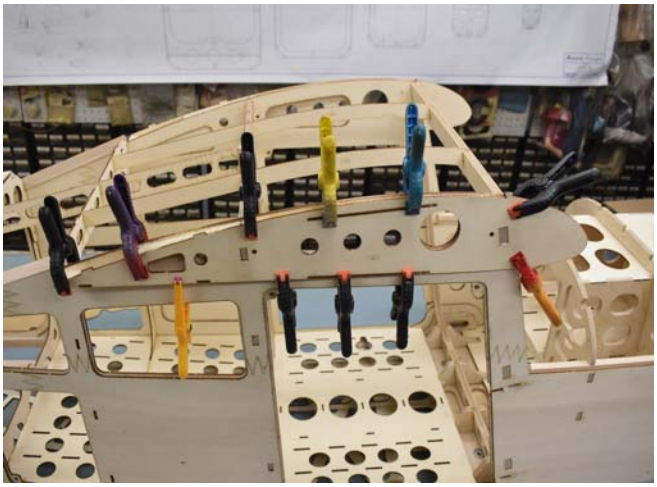


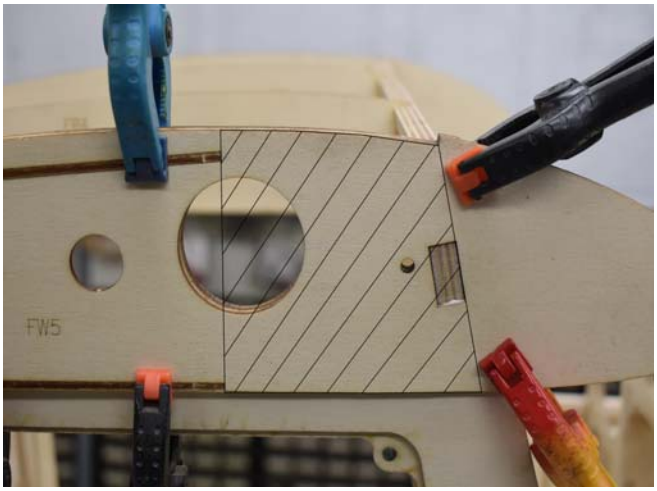
120. Familiarize the next couple of steps before beginning. Add glue to the structure that will mate up to the fuselage. Also add glue in the area between the line drawn and the wing tube hole. The glue should be applied progressively thicker as you get closer to the wing tube hole.

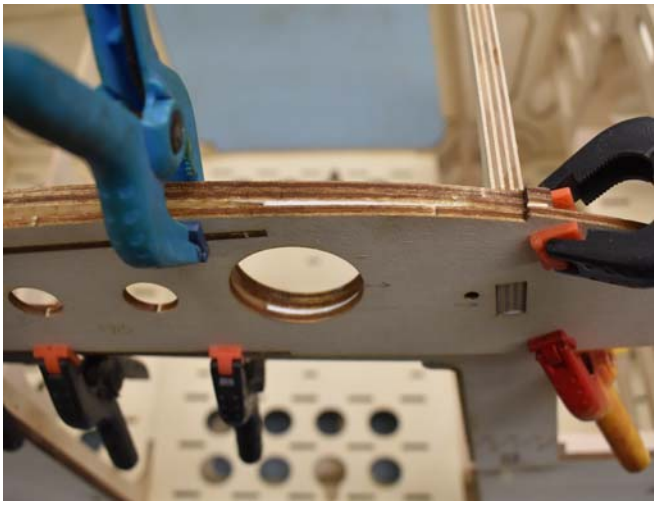


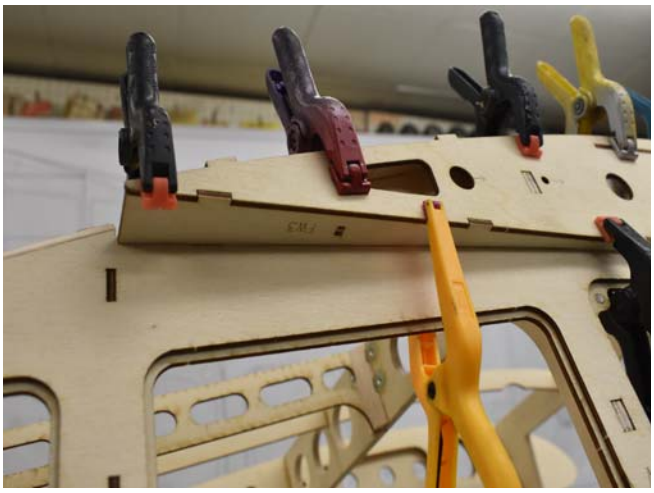


121. Clamp assembly into position. The clamps should be where there is structure behind **FW5**. Do not add any clamps in the “hatched area” as shown in the second picture.

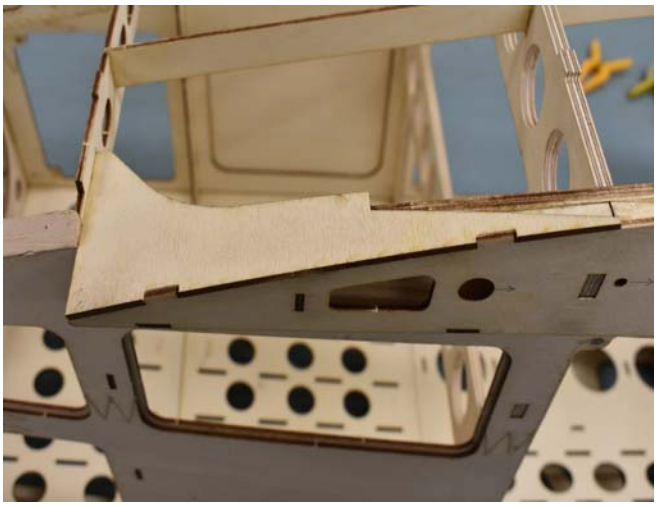




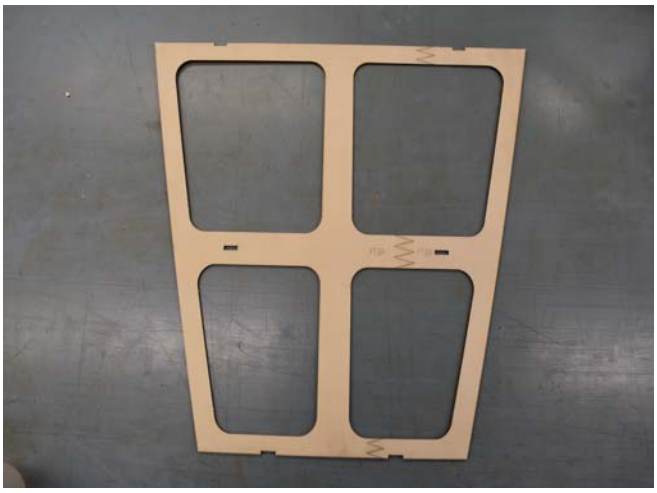




122. Glue **FW2** in place.



123. Glue **FT3A** and **FT3B** together.

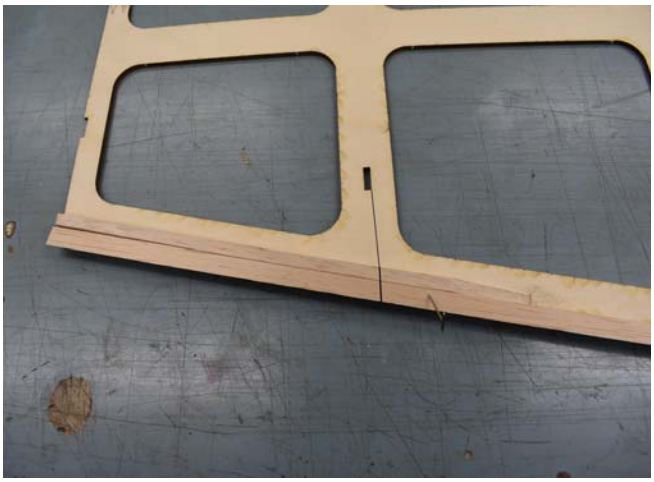


124. From the narrow end mark a line 9 3/4”.

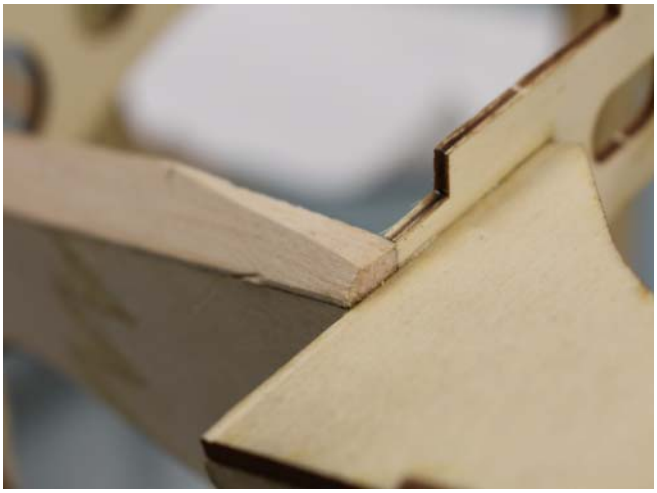
125. Cut two 1/4” square balsa stick 10” long. Then cut a diagonal 1 5/8” long off one end.

126. Glue the tapered stick end down on the mark.

127. Mark a line across the front edge of the slots onto the square sticks. Then mark the length of a 3/8” balsa triangle stock again from the narrow end and glue into position.

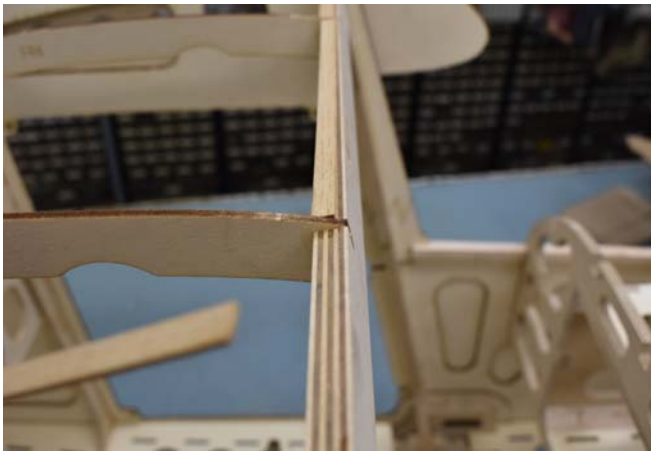


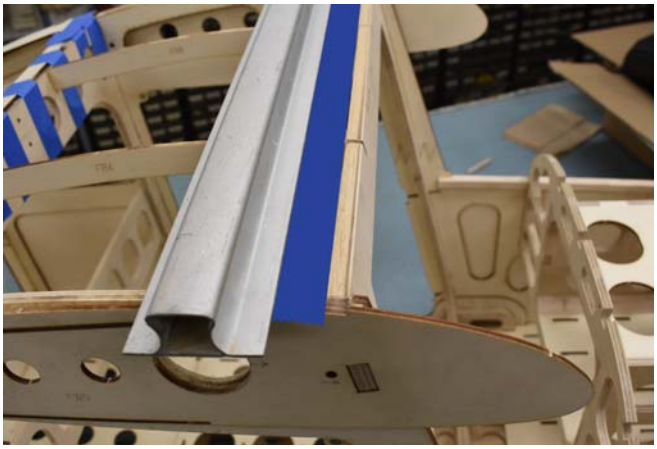
128. Trim the triangle stock behind former **F6** 2” back as shown. Test fit the top assembly on and sand or trim the end of the triangle stock that was added to the top assembly.

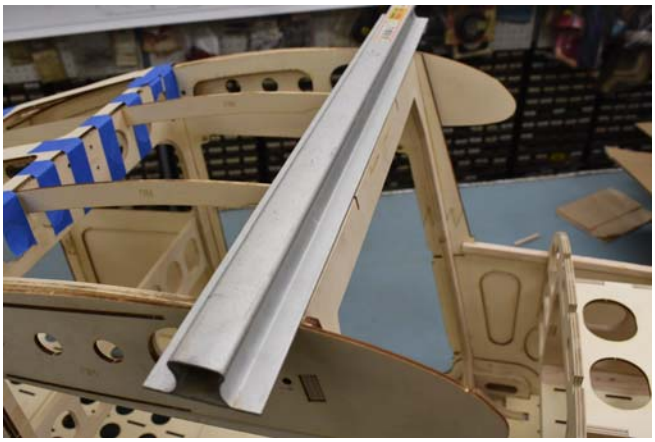


129. Glue the top assembly on.

130. Cut and glue three pieces of 1/16” X 1/4” balsa sticks onto the top of former **F4** (edge towards the rear). Add tape across the top behind the balsa as to not to accidentally sand away or change the profile of the lite ply rib structure. Sand to the taper.

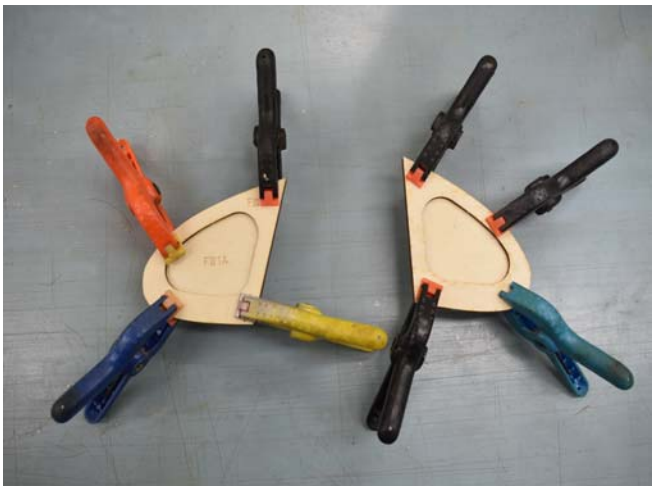






131. Sand the sides of **FW5** smooth and flat from any protruding parts or glue.

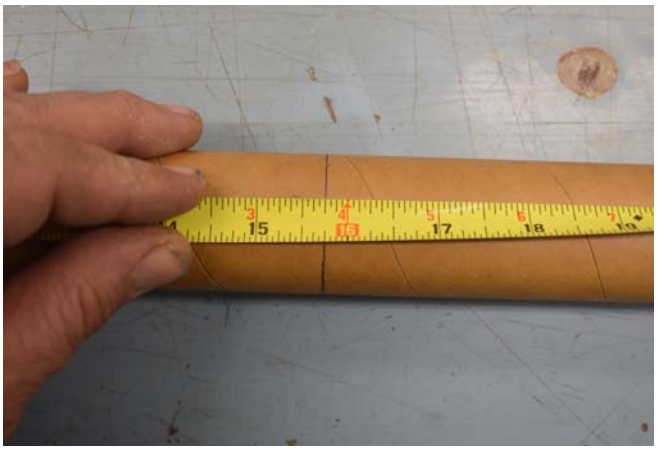
132. Glue **FW1B** onto **FW1A**. Make a left and right hand assembly.



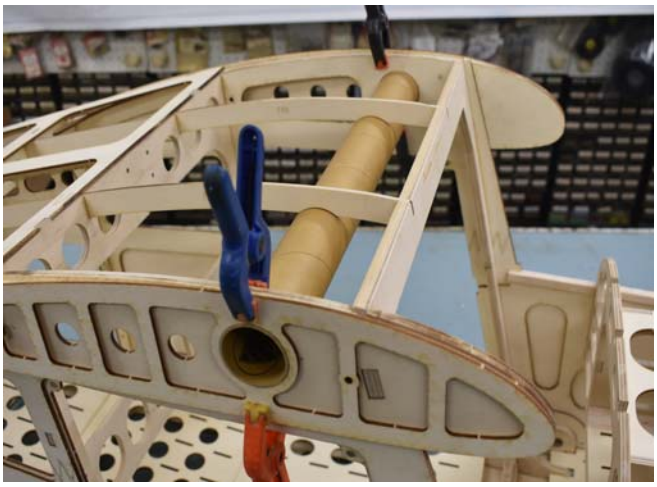
133. Clamp on a 90° angle that is straight and flat to **FW5**. (These can be purchased at your big box stores. 1” to 2” L x 1/8” thick).

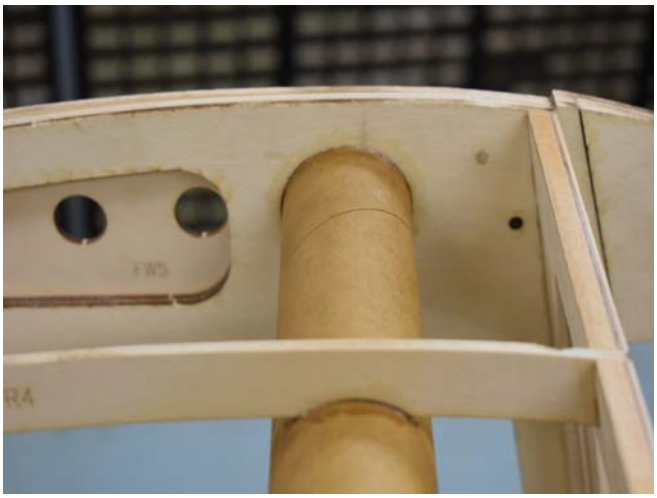
134. Mark the bottom overhang of **FW1** assy. (as to not to add glue to this area) and glue to the inside of **FW5**.

135. Cut the main wing tube socket to a length of 15 3/4" long but not more.



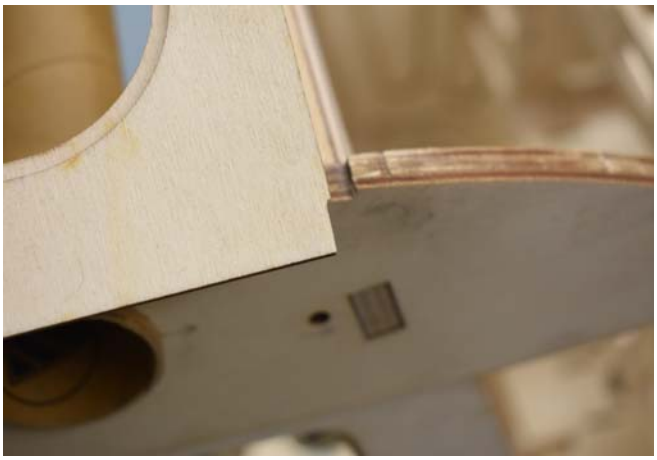
136. Clamp on both **FW7**'s, Insert and center the socket tube and glue the tube into place. Then remove **FW7**'s.



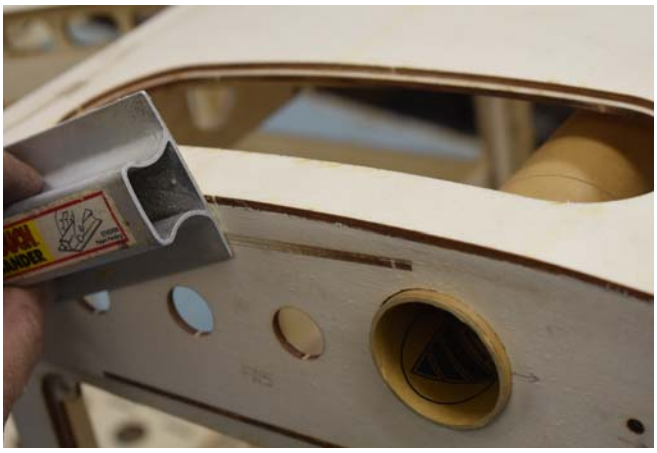


137. Place **FT4** on two 3/8" square balsa sticks as shown with weight in the center to pre form it while gluing into position both **FG2.**

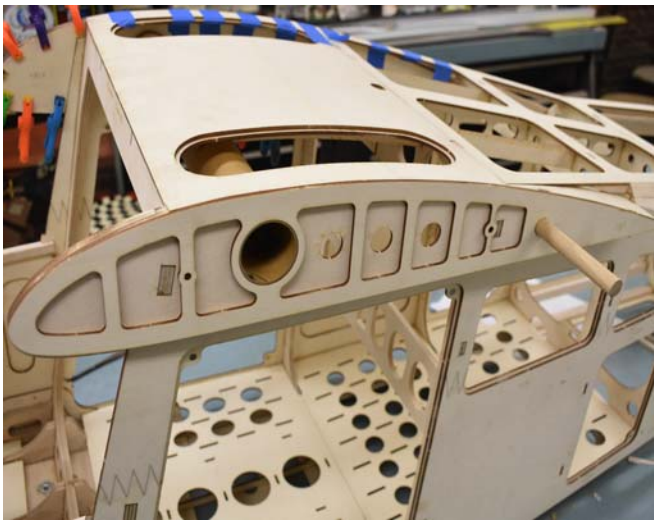
138. Test fit the top into position, If it is tight, then sand a notch into the two front corners. When satisfied with the fit, glue in place. Use plenty of tape and clamps on the back edge.

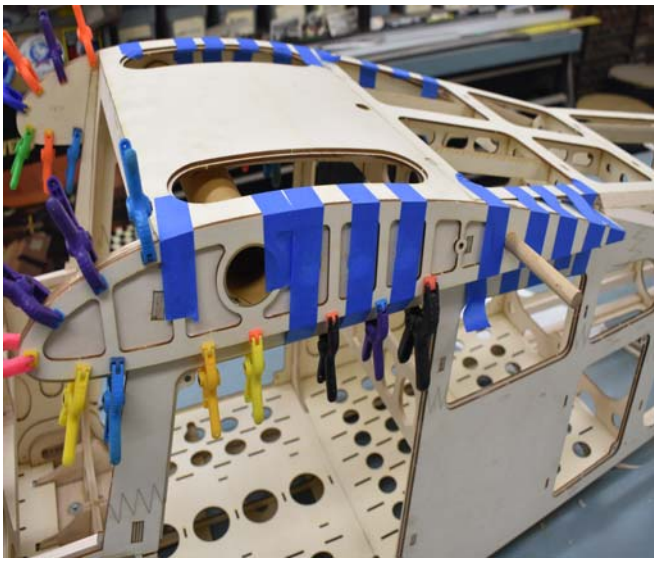


139. When cured, sand the sides of **FW5** smooth and flat from any protruding part of the top or glue.



140. Glue on both **FW7**'s, Use 1/2" diameter dowels to align the rear.

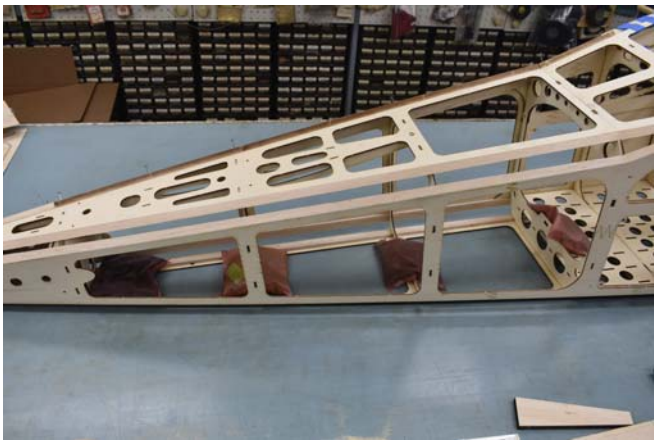




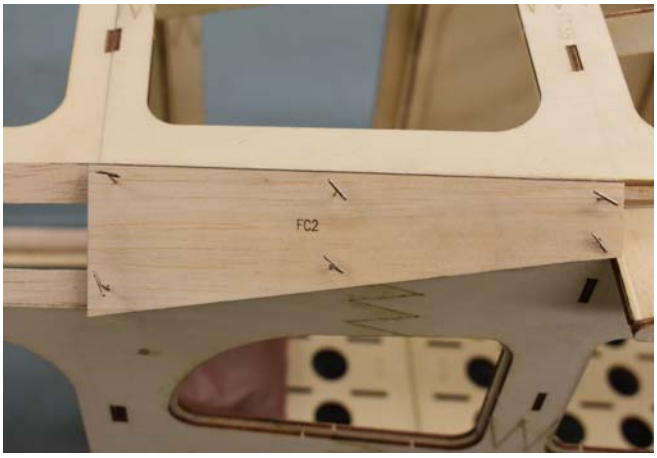
(*Fuselage Corners)*

141. Run a sanding block on the balsa triangles to ensure they are on the same plane.

142. Add weights to the aft end of the fuselage to keep everything flat and straight.



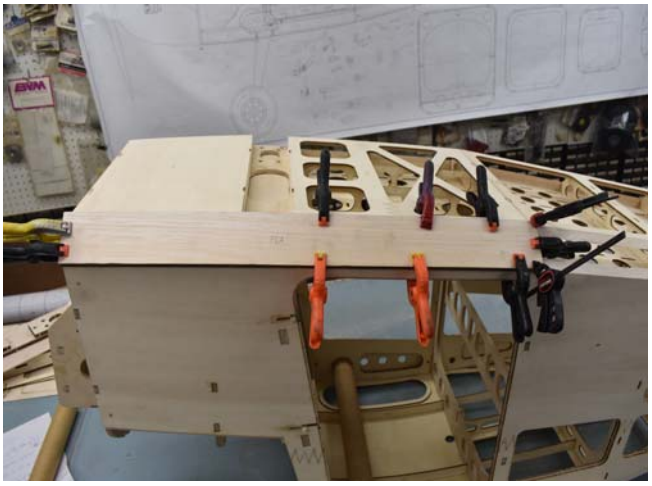
143. Glue **FC2** into position. Sand a bevel on the front end to square things up with the T.E..



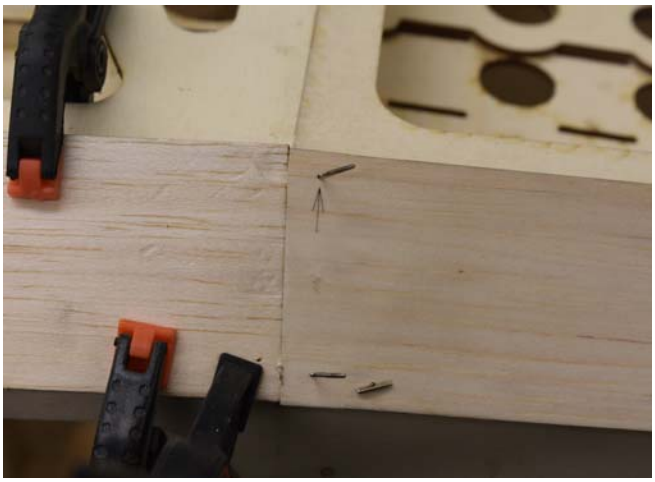
144. Next glue in **FC1A** followed by **FC1B.**

145. Glue in a long **FC3** first followed by a short **FC3**. Draw a straight line from the rear to the front and trim away excess.

146. Glue on **FC4** to the front bottom corner. The arrow faces forward. Use clamps and allow glue to cure before proceeding to next piece.

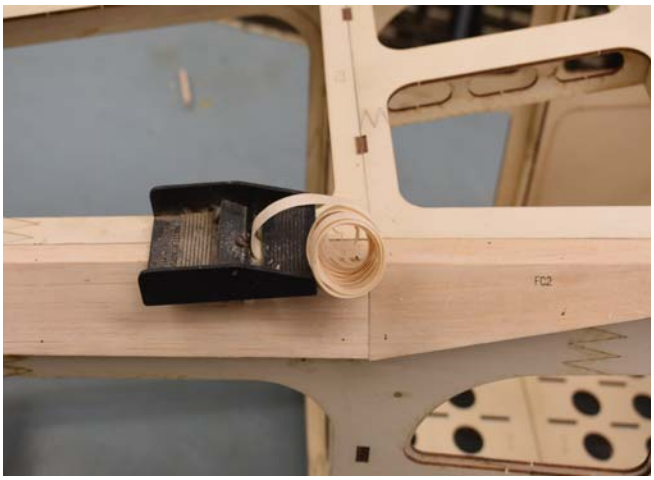


147. Glue on **FC5A**. The arrow points towards the bottom of the fuselage.

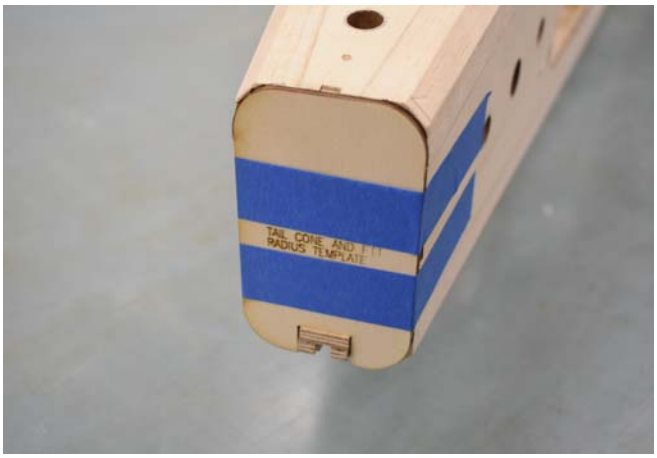


148. Then glue on **FC5B**.

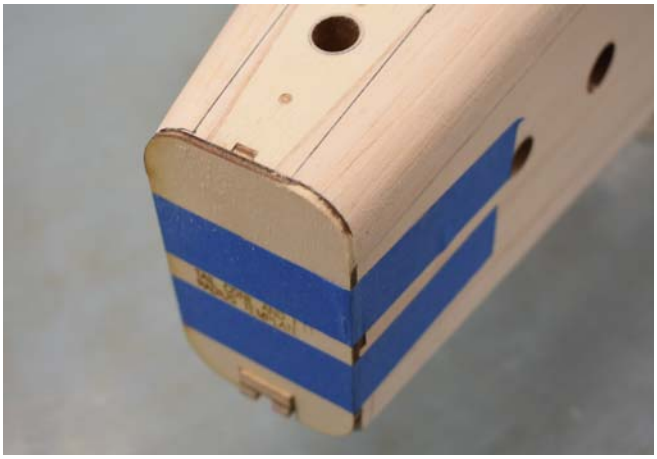
149. Plane and sand flush the balsa corners even with the top and sides first. Also trim and sand flush any overhanging balsa at the front and rear formers.

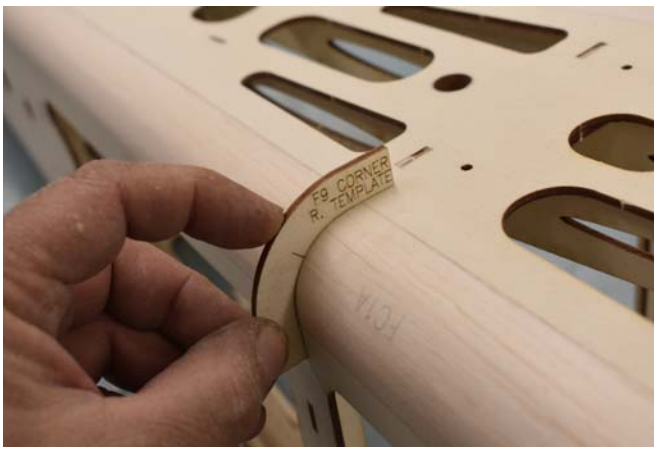


150. Tape on TAIL CONE AND F11 RADIUS TEMPLATE.

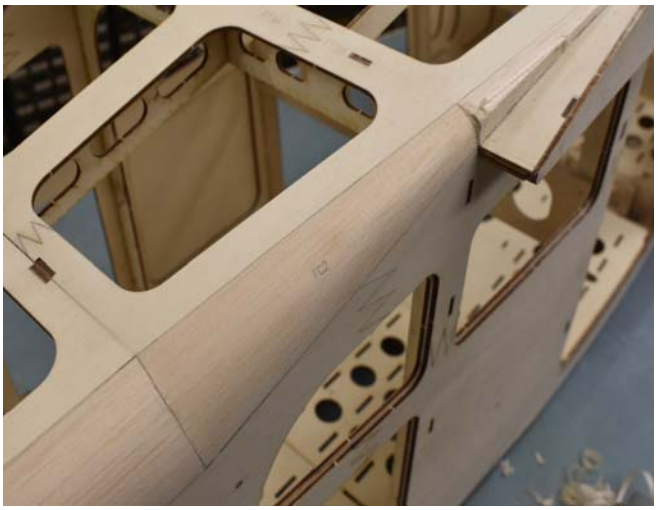


151. Starting from the top rear corners, plane and sand the balsa corners to shape. Use F9 and F7 CORNER R. TEMPLATE to check radius profile.





152. Continue rounding over **FC2**. The front is a quarter round circle.



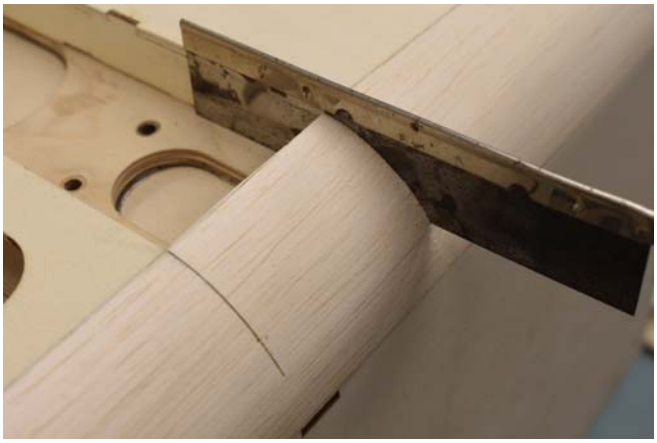
153. Finish rounding off the fillet block to a pencil point.

154. Shape and sand the bottom corners.

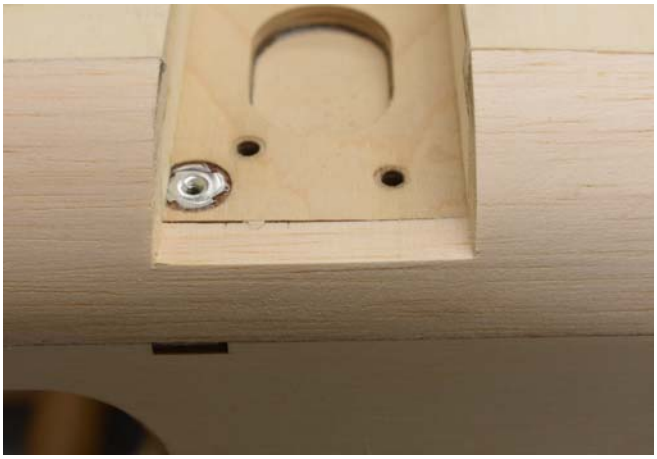
Check bottom front radius with F2B cowl radius template

(*Landing Gear Cover)*

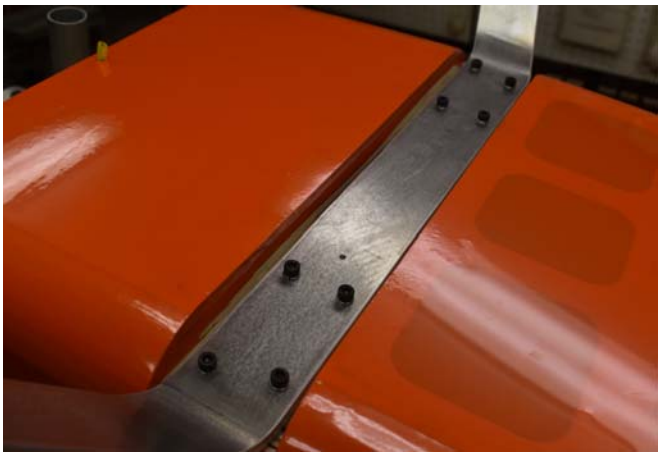
155. Cut the balsa corner away from the landing gear area by using a razor saw flush with the front and rear of the pocket. Cut down so the saw is even with the plywood mounting plate.



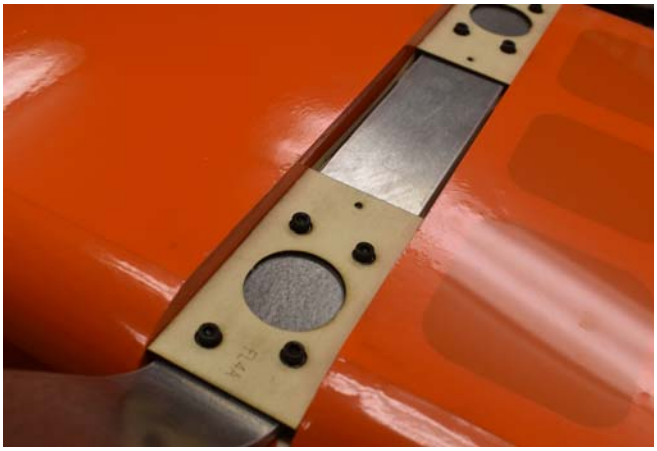
156. Mark a line between the end of the cut slots, cut, remove and sand smooth.

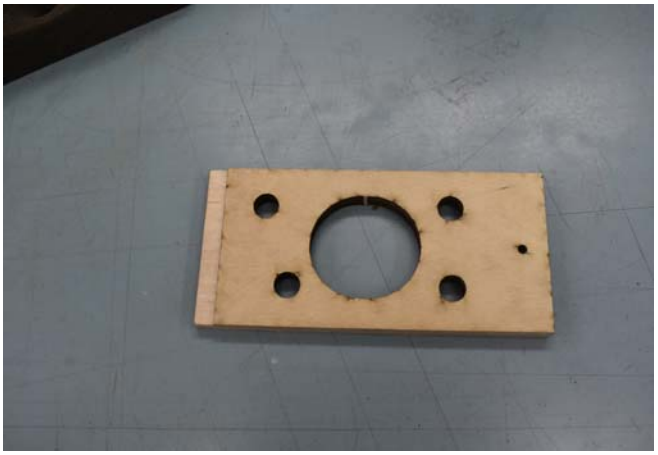


157. Bolt on the landing gear halves with 10-32 x 1" long socket head bolts and lock washers. (Pictures shows a one piece gear which is not available).

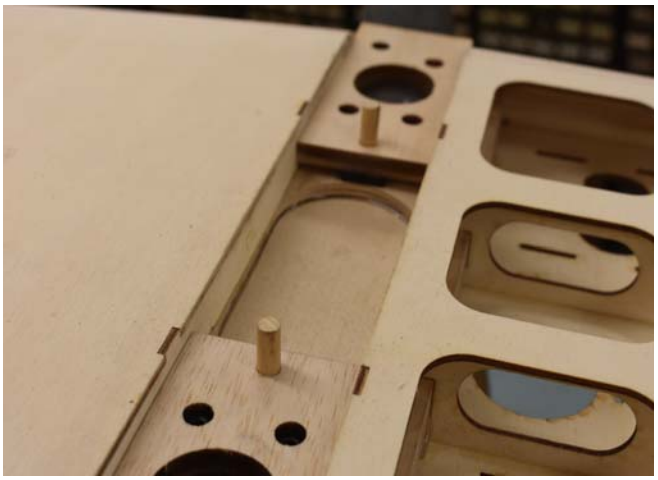


158. Lay down onto the gear **FL4A** (Holes lining up with the bolts) and then glue on **FL4B**. If necessary sand a radius to match the radius of the landing gear.

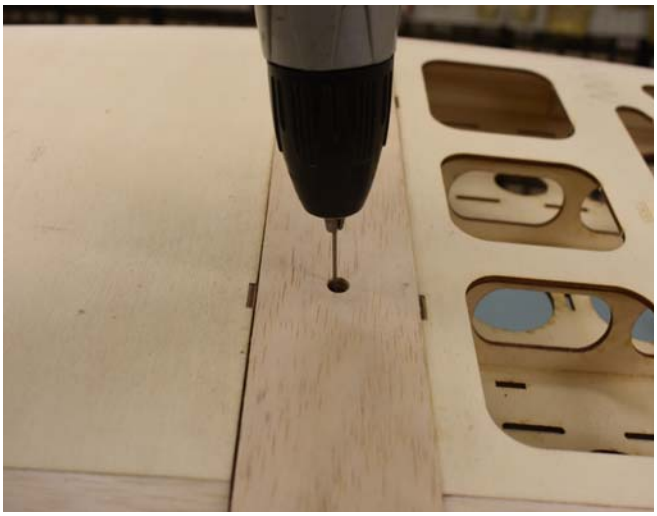


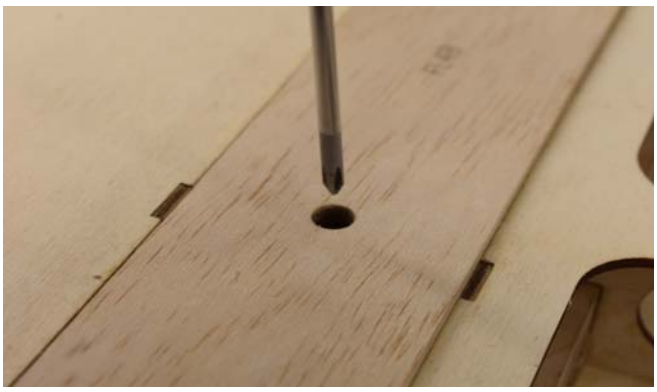


159. Place assemblies back onto the landing gear. Insert but do not glue in two 5/16" diameter dowel alignment pegs. Glue on top **FL4C** and remove dowels.

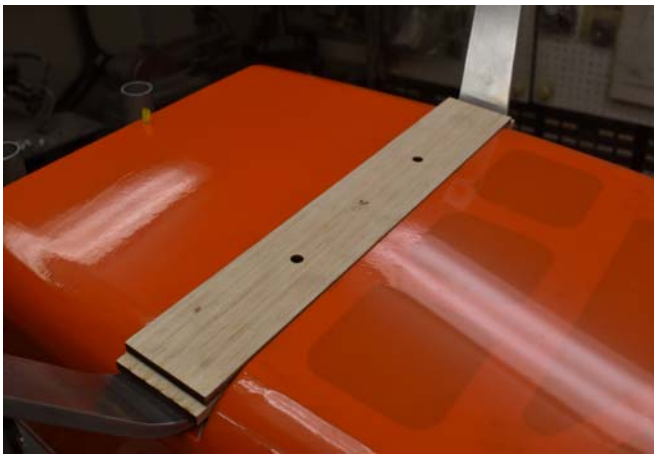


160. Drill a 5/64” diameter pilot hole into the landing gear plate and secure the cover down with two #4 x 1/2” long screws.



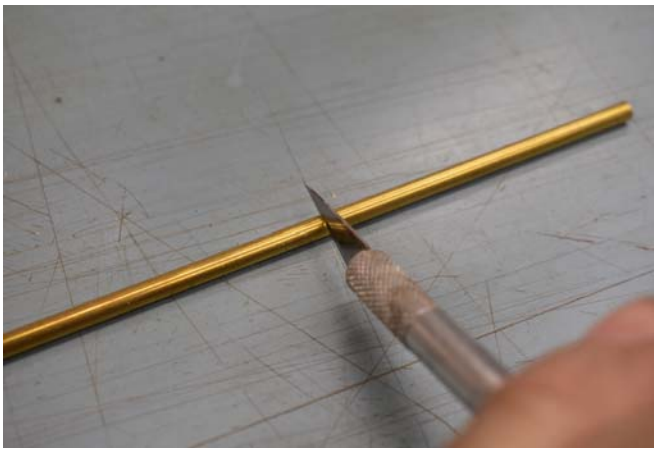


161. Carve and sand excess balsa to shape. Carefully remove and glue in FL4CS lite ply to the underside of the landing gear cover between FL4A/B assembly. (picture not shown)



(*Pull Pull Cable Exit)*

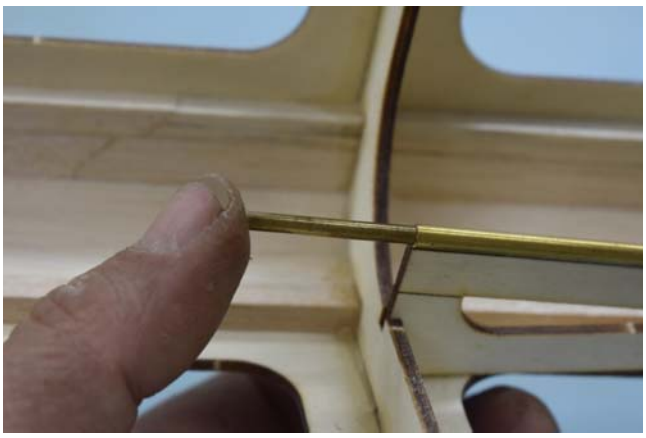
162. Retrieve the two 12” long brass tubes from the kit. Cut the bigger one 5/32” dia. in half by using an x-acto knife and rolling it on your work surface.



163. Glue the tube to **FRC** as shown and then into the notch of former **F9** and the notch in the floor.

164. On one end of the 1/8” diameter brass tube use a small “V” shaped metal needle file or maybe a thin Dremel cut off wheel and make two notches like a +. Your cutting four teeth into the end.

165. Insert the brass tube with teeth end first into one of the guide tubes.



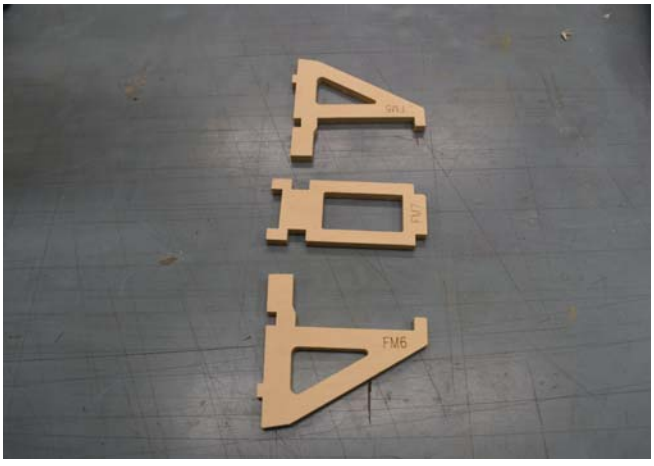
166. Hold the end down where it makes contact with the balsa so it wont ride up and spin the other end of the brass tube while applying slight pressure until it comes through. Clear the balsa core before moving onto the next guide tube.

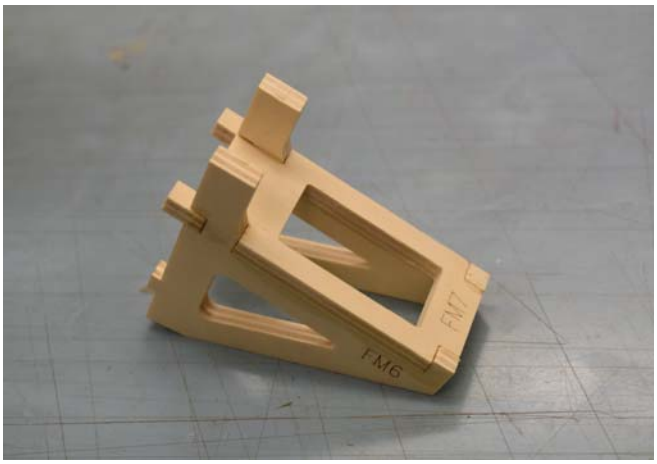
If you have difficulty drilling the hole, attach it to a drill.

167. Snap off and remove the guide tubes.

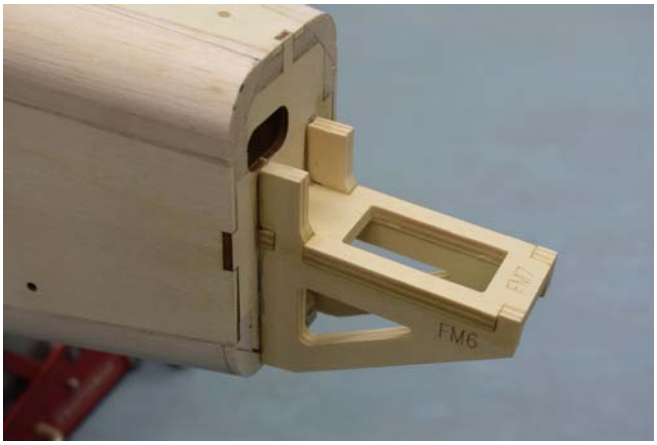
(*Rudder Servo Mount)*

168. Assemble and glue together the rudder servo mount consisting of parts **FM5**, **FM6** & **FM7**.



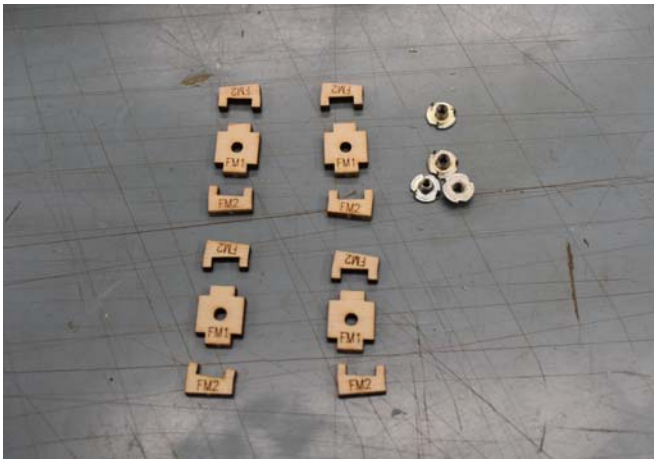


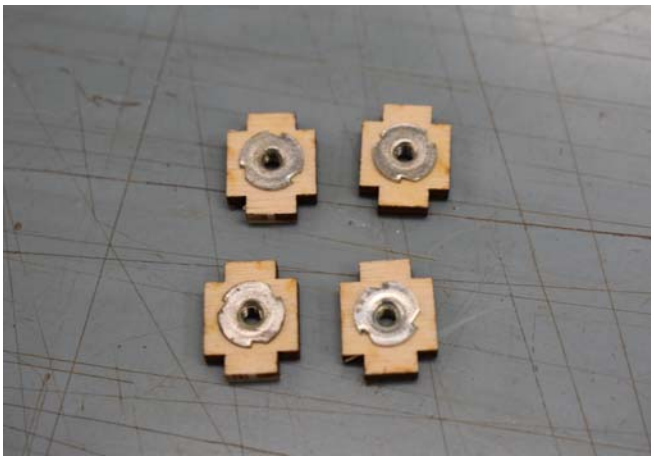
169. Epoxy into position at the rear of the fuselage.



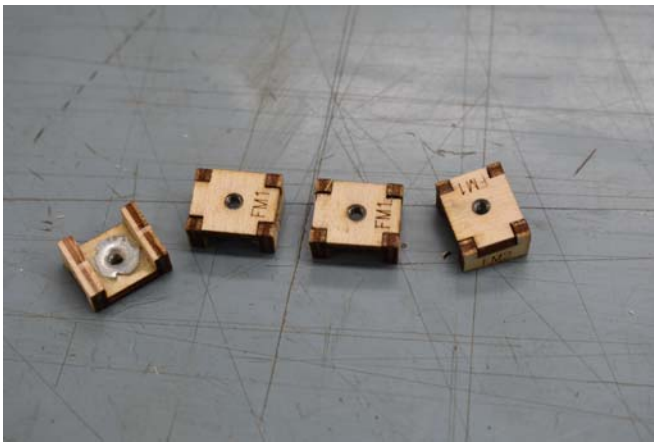
(*Tail Cone)*

170. Gather up **FM1**'s and **FM2**'s along with four 4-40 blind nuts. Hammer in the blind nuts into the **FM1**'s.



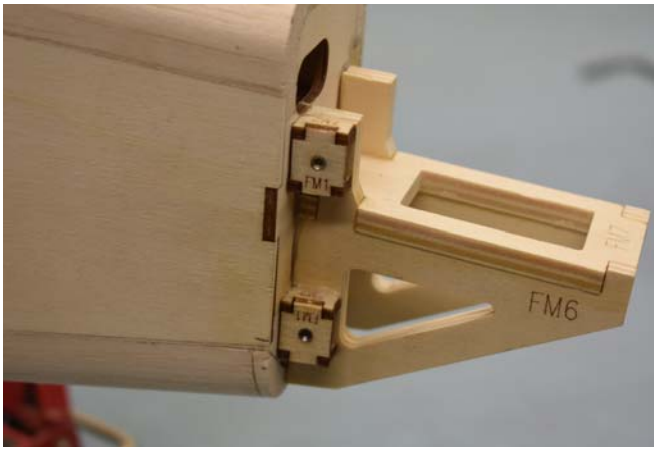


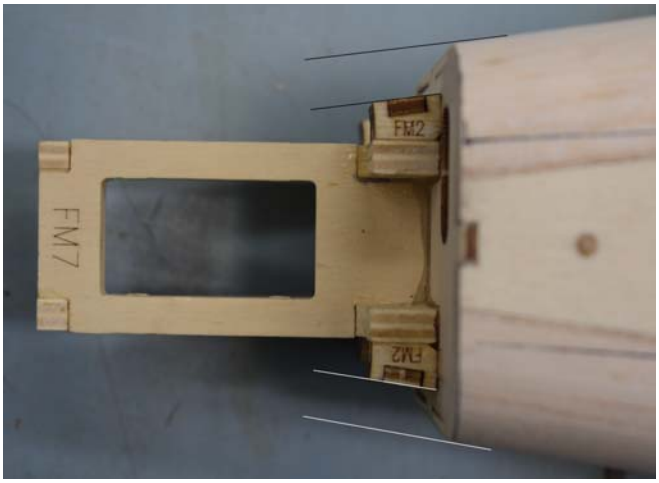
171. Glue the **FM2**'s to **FM1**'s as shown. Make sure both edges of **FM2**'s are on the same plane. I.e. angled the same way.



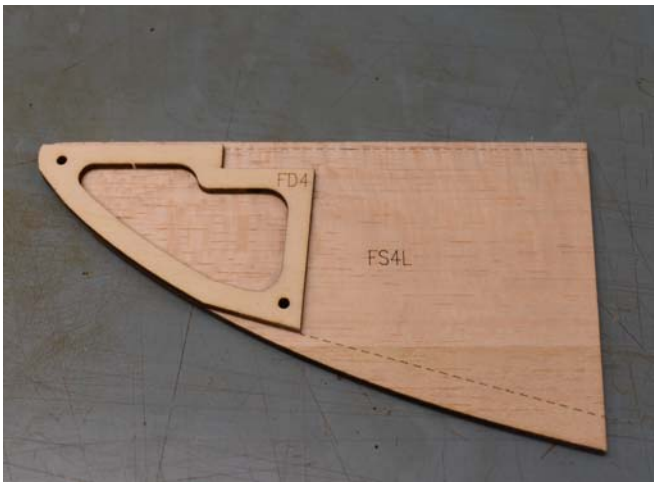
172. Measure up from the bottom of the servo mount (the front edge) 7/16" and mark a line perpendicular to the front edge. Repeat on the other side.

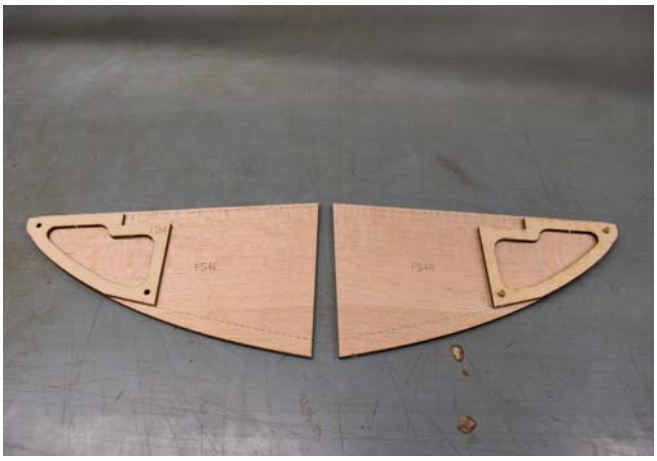
173. Glue the cone mounts into position. The bottom edge of the lower mounts are glued on or just slightly above the line. The upper ones are glued flush with the top of the servo mount. The mounts are parallel with the fuselage sides. I.e. angled towards the rear.





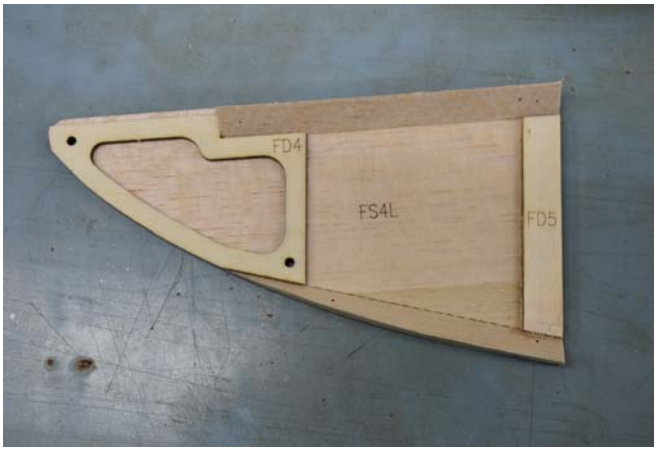
174. Glue **FD4** to **FS4L** and **FS4R** using two alignment dowel pegs. You can glue in or remove these pegs.



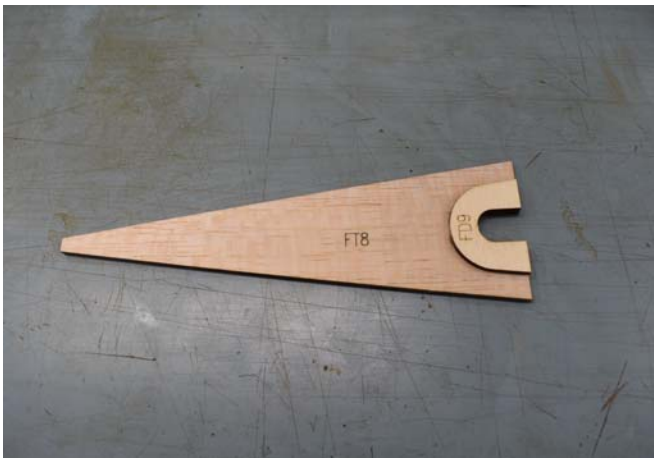


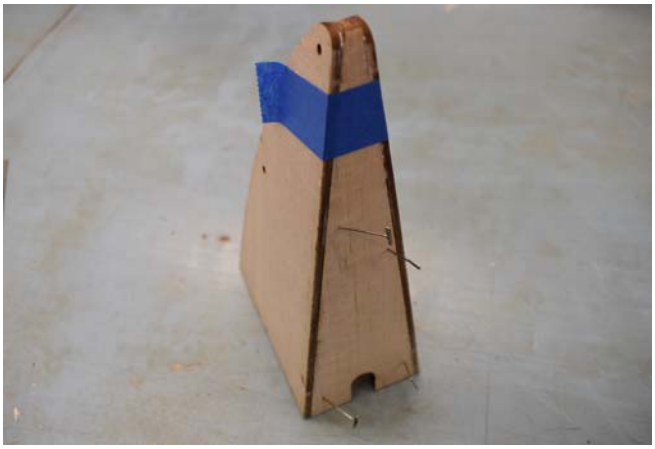
175. Glue on 3/8" balsa triangle stock as shown to the edge of the etched lines.

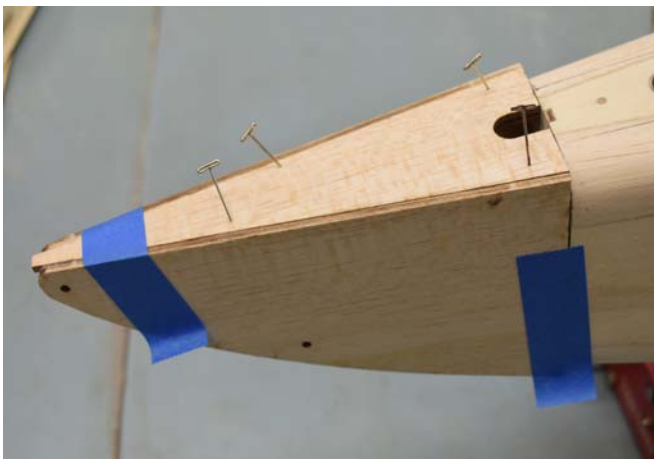
176. Glue **FD5** into position and trim the bottom balsa triangle with the balsa side.



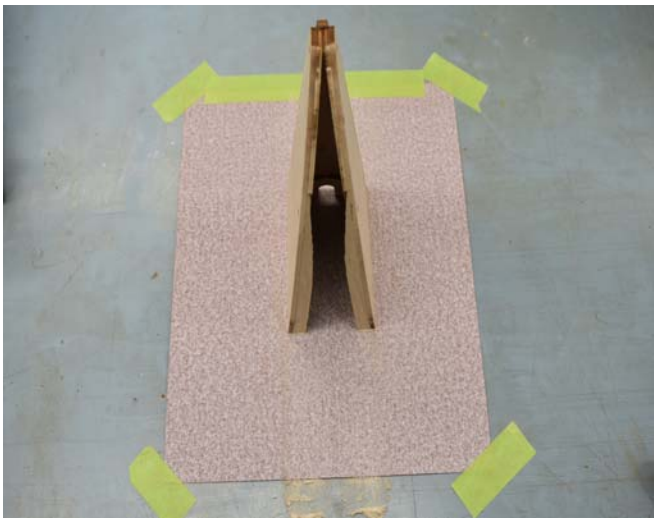
177. Glue **FD9** onto **FT8**. Then (using wood glue) glue it into the side pieces using your workbench to line up the front edges and tape onto the fuselage while the glue cures.



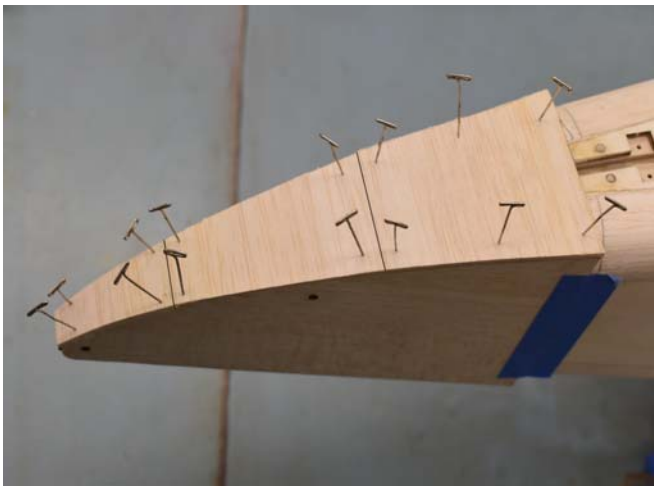




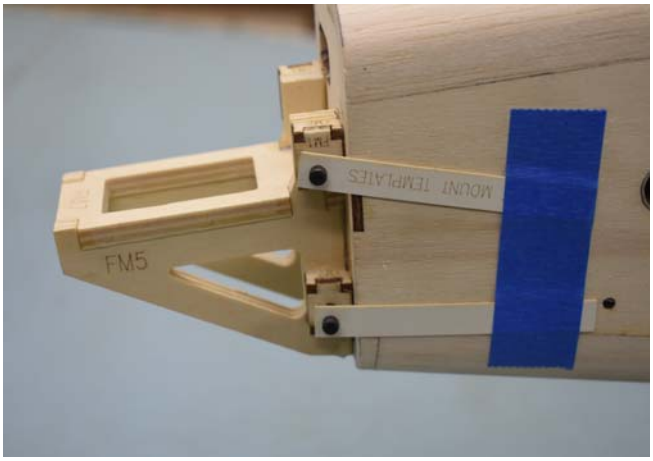
178. Once cured, square up the front edges by taping down a sheet of sandpaper and pulling it towards you a few times.

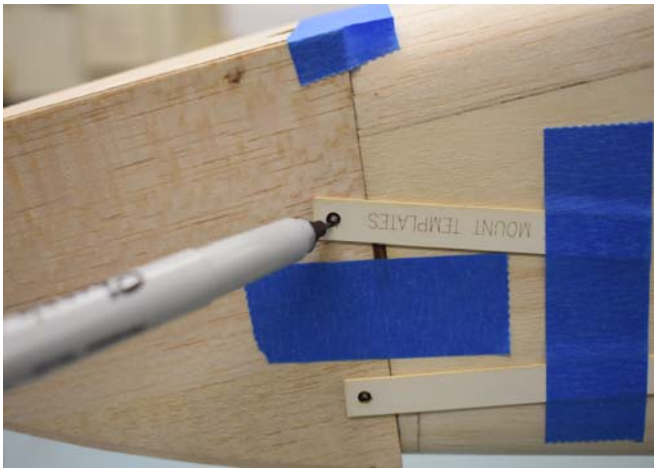


179. Tape the cone back onto the fuselage and sheet the bottom (cross grain) from 3/32” thick balsa from one 3” wide sheet.



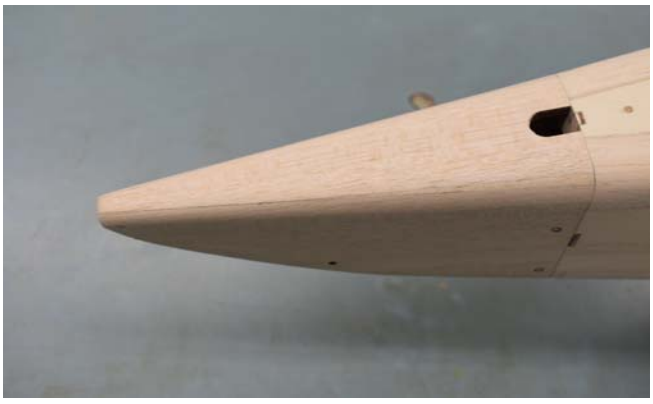
180. Install four 4-40 x 1/4” long bolts through the TAIL CONE MOUNTING TEMPLATES and the mounts. Tape them onto the fuselage. Remove bolts, tape cone into position then mark the holes.



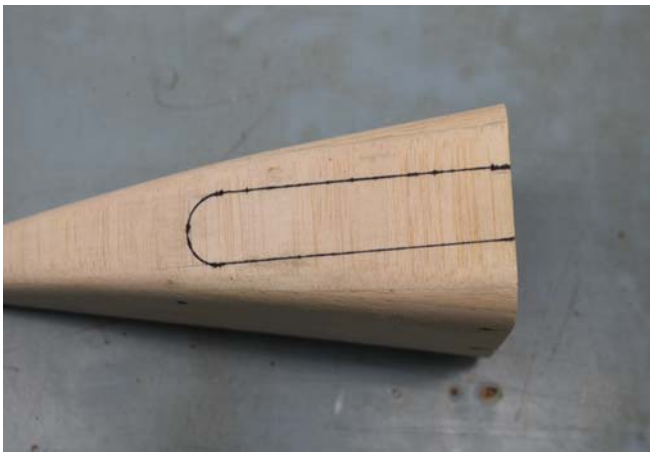


181. Use a #35 or 7/64” diameter drill bit and drill the mounting holes. Install the bolts and “sock” them home to crush the balsa so they will be recessed.

182. Carve and sand the tail cone to shape.

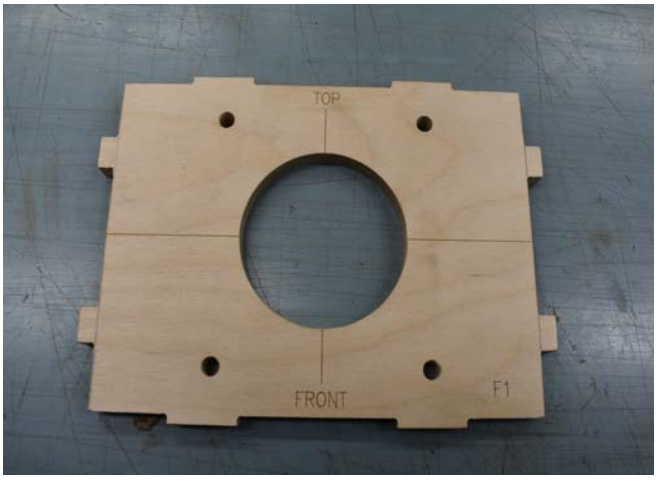


183. Cut a slot into the bottom of the tail cone by taping on the TAIL CONE AND F11 RADIUS TEMPLATE, Mark the width of the opening onto the bottom of the tail cone. Using a square, extend the lines and add a circular end. The overall length of this slotted opening is 3 3/4". Do not make it any shorter.

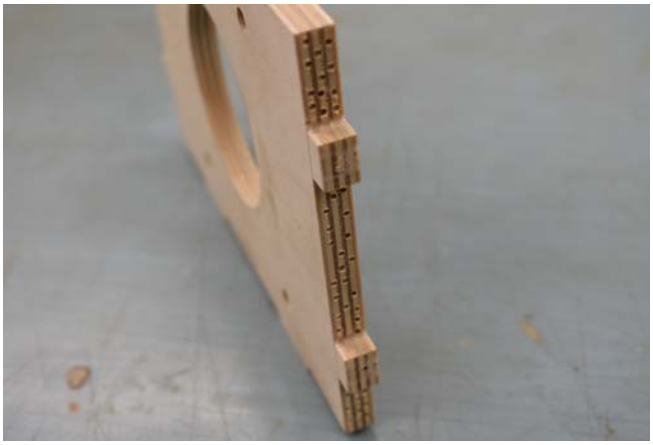


(*Engine Box)*

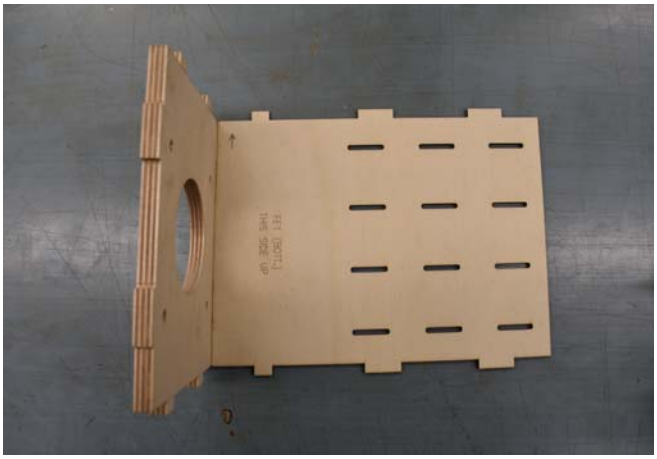
184. Drill mounting holes for your engine. The holes marked on **F1** is for a DA150 engine.

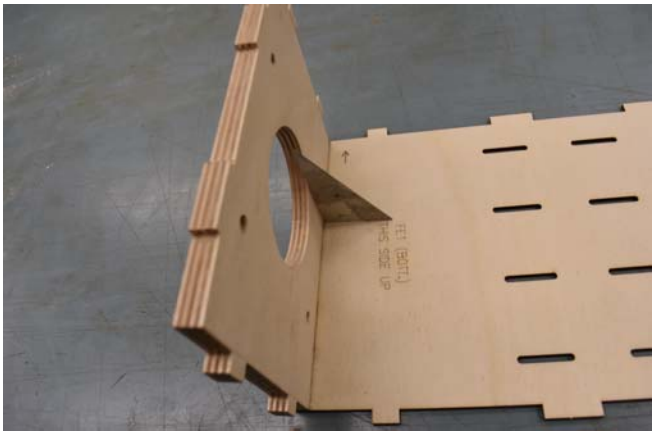


185. Drill dimple holes into the sides of **F1** and into **FE4 (RIGHT)** and **FE4 (LEFT)**.

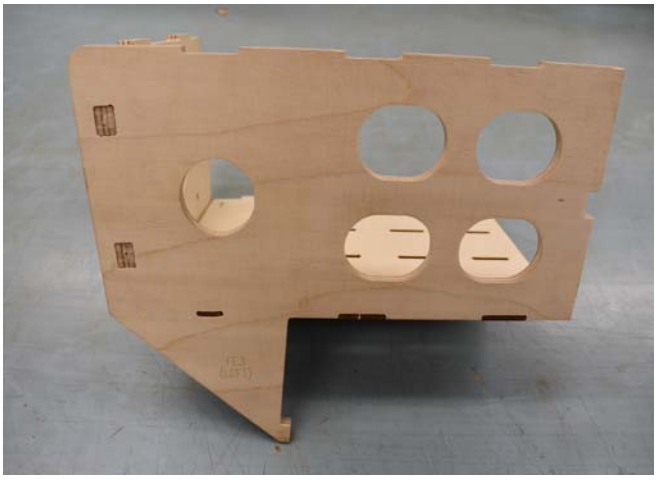


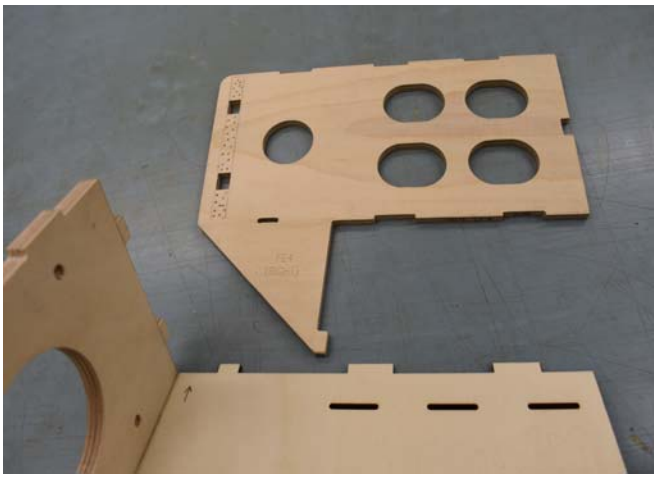
186. Lay **FE1** the (BOTTOM) of the engine box THIS SIDE UP on your work bench (arrow points to the right side of the engine box.) Glue **F1** on top of **FE1**. Make sure **F1**'s marked FRONT is facing forward (the front) and TOP is up on the top. Use a 90° square to make sure these parts are perpendicular.

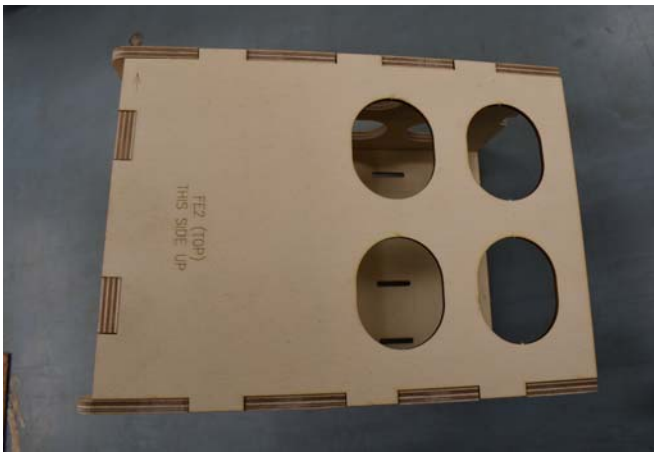




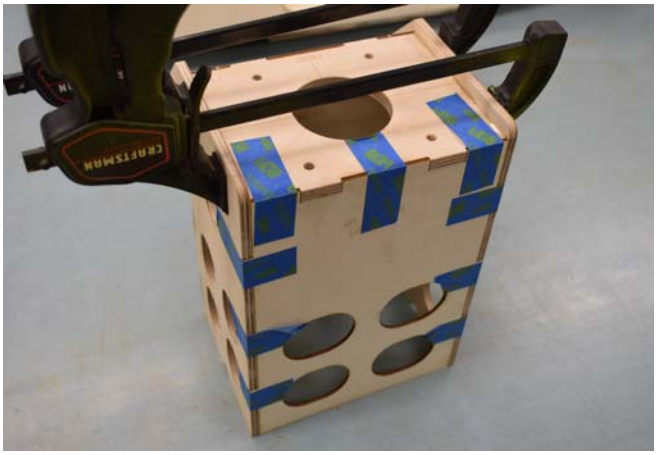
187. Using 30 minute epoxy, epoxy on the Left and Right sides onto the fire wall followed by **FE2** (TOP) again the arrow point to the Right.



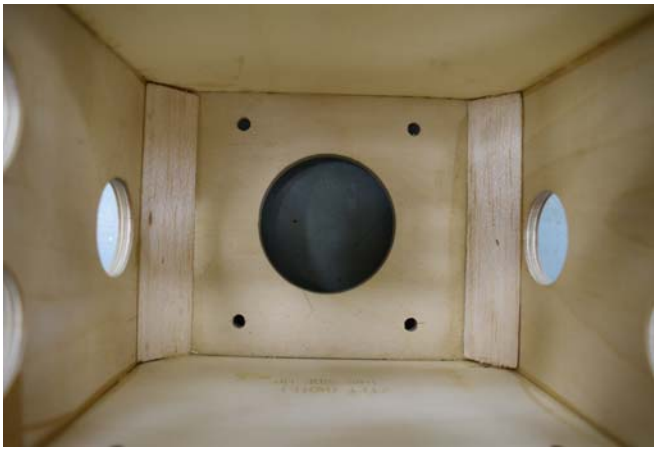




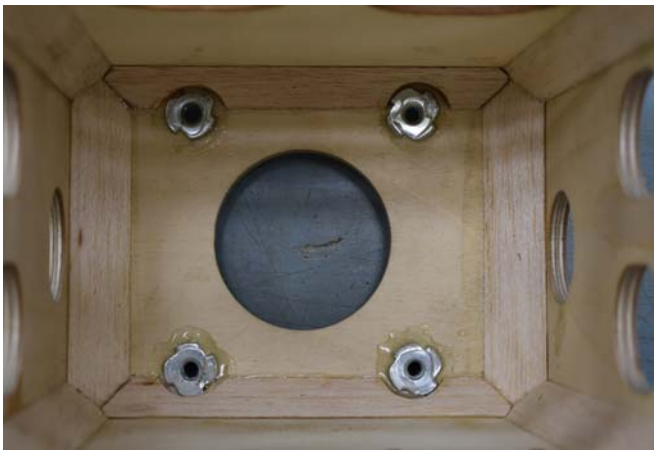
Stand it on its back edge to ensure all sides are on the same plane then clamp and tape together.



188. Epoxy (30 min.) 3/4" balsa triangle stock inside the engine box in the two vertical corners up front.

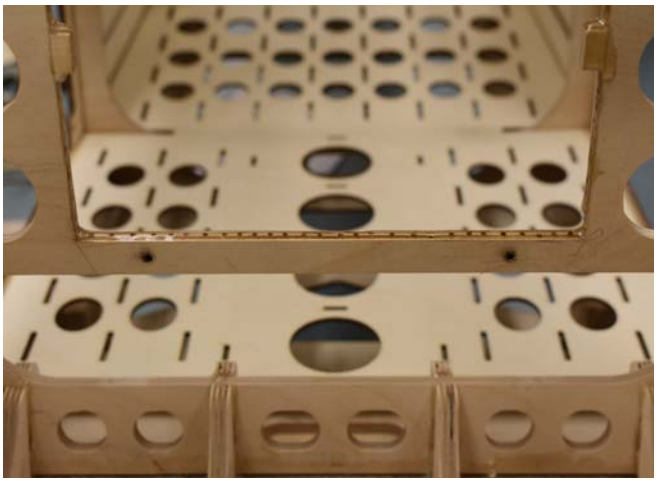


189. Install your blind nuts for your engine (1/4-20 or 6mm T nuts not included in kit). Epoxy (30 min.) 1/2" balsa triangle stock inside the remaining corners of the engine box.

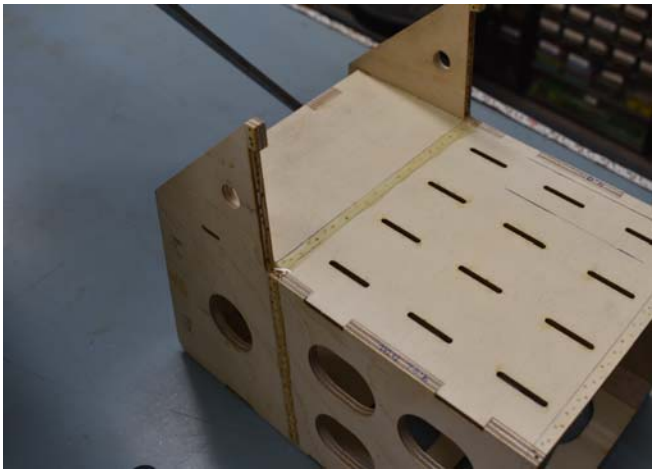


190. Test fit and insert the engine box fully and mark all around both sides of former **F2**. Drill dimple holes to all mating surfaces.

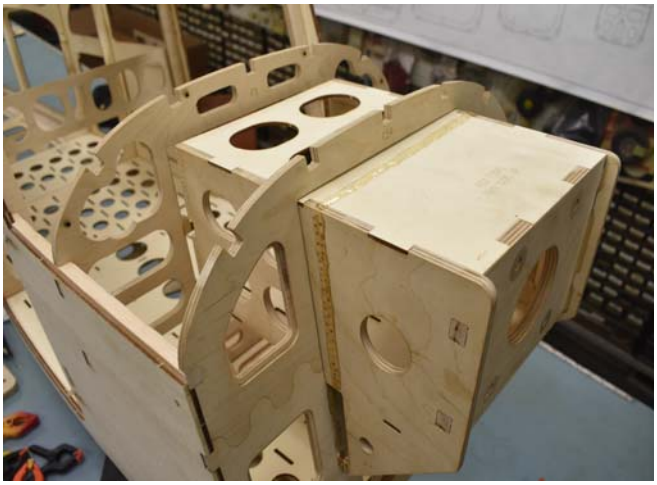
191. Epoxy the engine box into position using 30 minute epoxy. Before starting, read ahead and do a dry run first with all clamps and supplies on hand. Add epoxy to the inside perimeter of the opening on former **F3**.



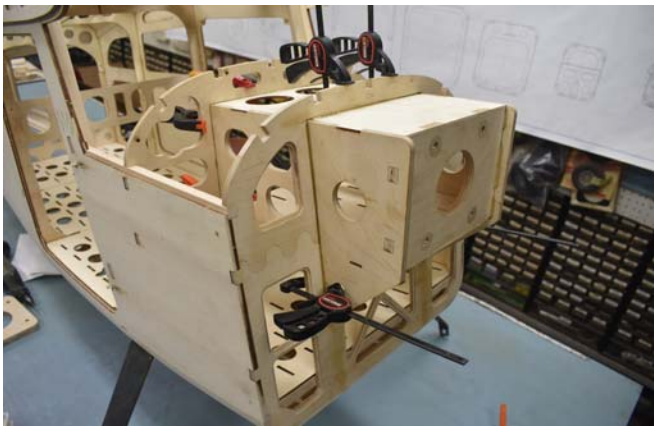
Add epoxy between the marked lines on the sides and across the bottom of the engine box. Also on the back edge of **FE4**.



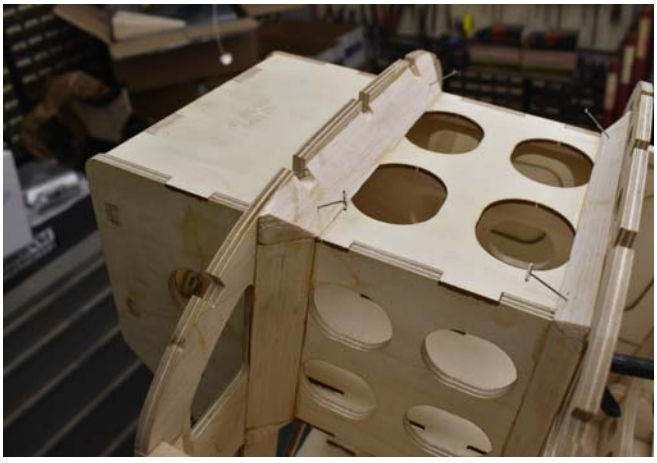
Insert the engine box stopping short and add epoxy across the top of the marked lines.



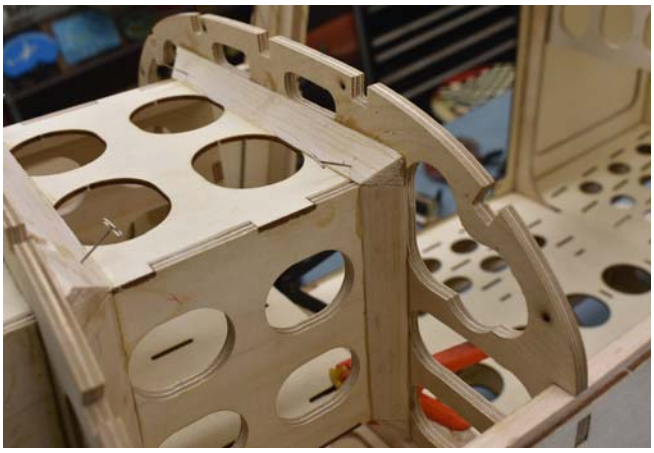
Slide engine box fully into place and use plenty of clamps.



192. Epoxy (30 min.) 3/4” balsa triangle stock around the engine box behind former **F2**.

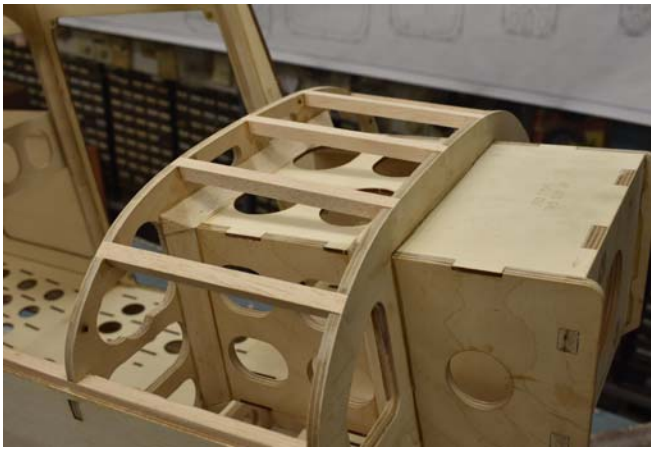


193. Epoxy (30 min.) 1/2” balsa triangle stock around the engine box at former **F3**.



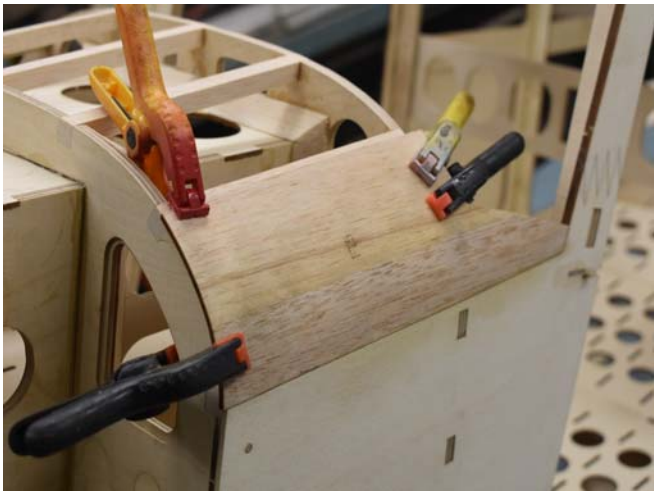
(Top Decking*)*

194. Glue in 3/8” square balsa sticks. Trim and sand both ends flush.



195. Glue balsa **FT5** on edge to the fuselage side as shown. Allow to cure before proceeding. Repeat for the other side.

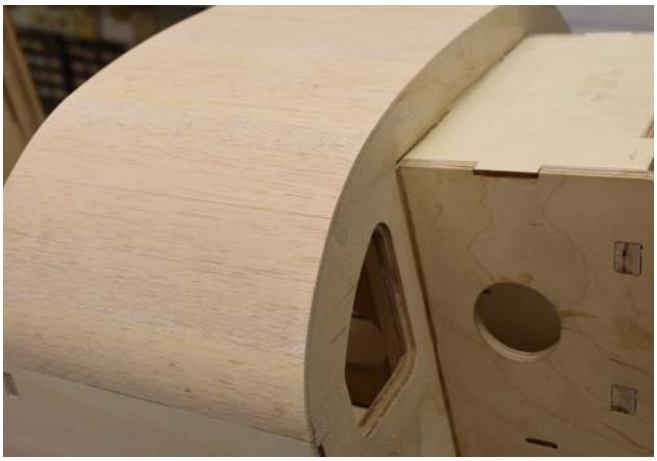
196. If needed, soak the balsa sheet with Windex or water mixed with ammonia. Add clamps and allow to dry before adding glue.



197. Glue balsa **FT6** in place aligning the back edge with the previous sheet. Arrow faces forward and text side up. Repeat on the other side.

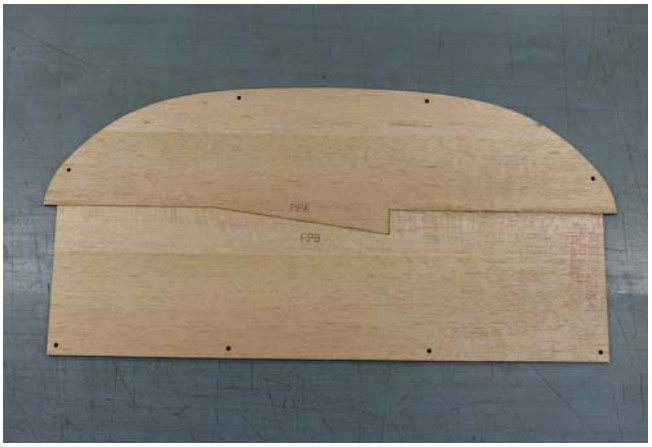
198. Glue balsa **FT7** into place. Arrow faces forward and is at the center and the text side is up. Repeat for other side.

199. Sand the deck smooth and flush with **F2** in the front. Leave the overhang inside the cockpit. Then glue on one 1/32" ply FTD over the balsa top decking same as you did in step 195. Glue this one half down. Do not press down hard between the stringers as to bow in the balsa. The other side in the center seam will need to be trimmed.



(Instrument Panel)

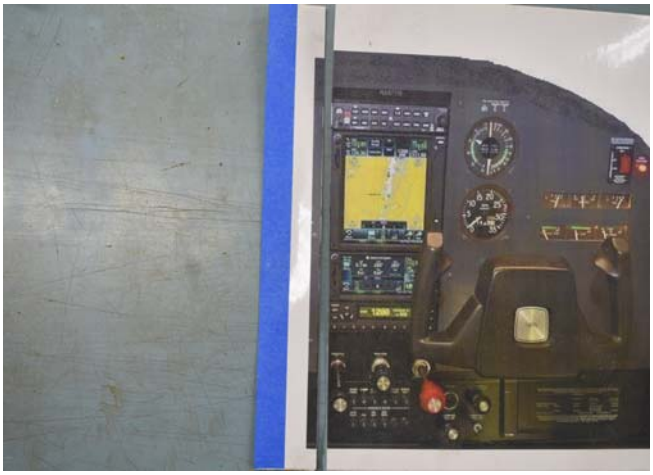
200. Glue **FIPA** to **FIPB** together. When dry sand the face smooth.



201. Remove the instrument panel decals from the back of this manual.

202. Cut out the left instrument panel decal and apply it to the balsa dash. Arrow shows alignment starting point.

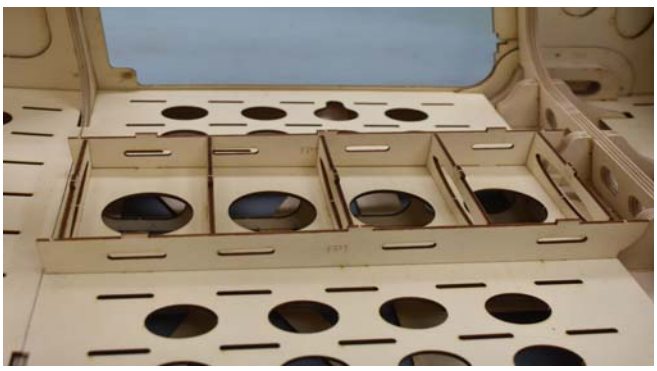
203. Cut out the right instrument panel decal. Near the left edge is a bank of instruments that align vertically. Trim on this edge and apply it to the balsa dash overlapping the left decal as needed.



204. Trim off excess overhanging decal material. Clear coat the panel with flat or satin clear and install with eight #2 x 7/16" long socket head servo screws.

(Fuel Tank Platform)

205. Dry assemble the tank parts into the airframe first. Then glue this down to the floor securely with a bead of glue on both sides of the parts. **FP1** is the sides and the front shape matches the landing gear gussets. **FP2** through **FP6** are the cross members. **FP2** starts at the rear and **FP6** ends at the front.

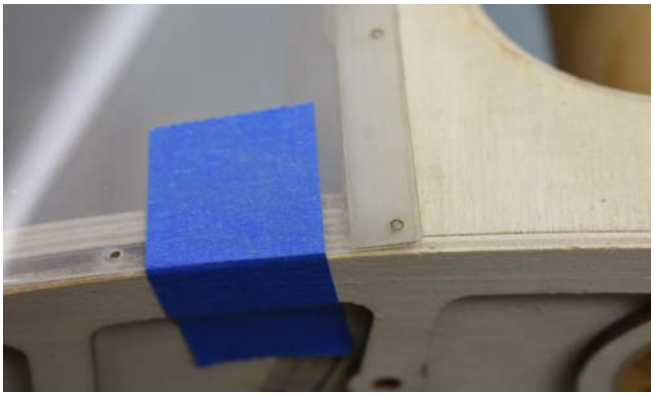


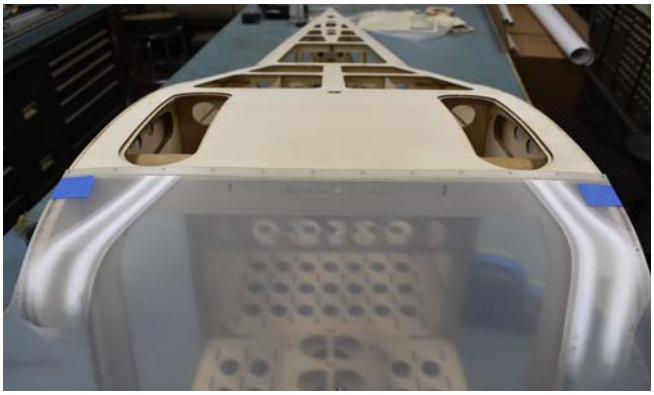
206. Glue on **FP7**. Arrow faces forward.

(Wind Shield)

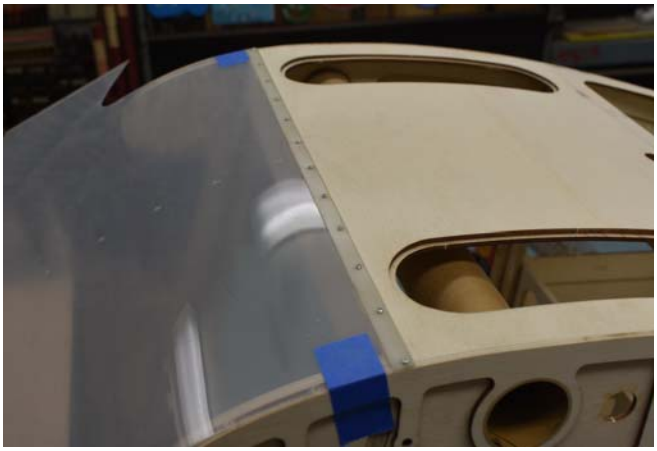
207. You can remove or leave on the protective plastic coating from the windshield during the initial installation process.

208. The G-10 frames will be on the outside.
The front edge of the **UPPER WS FRAME** lines up on the edge of the lite ply roof. Tape the windshield centered left to right as shown lining up the screw holes in the fuselage top. Tip: use a cordless Dremel tool with a #60 (.040" dia.) dill bit for pilot holes for the screws.

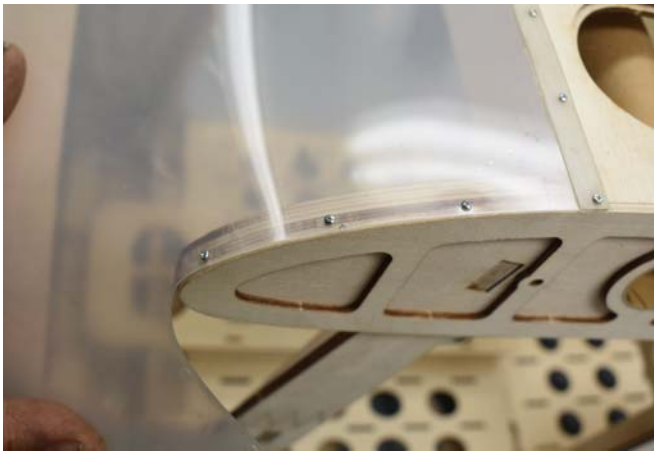




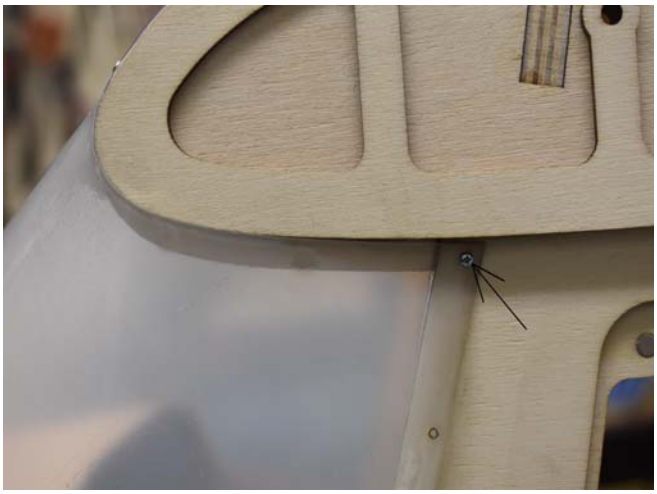
209. Using #0 x 1/4” long micro screws, install a screw in one of the holes near the center. Continue installing the screws across the top edge alternating one at a time left and right. (Basically working from center on out to the side).



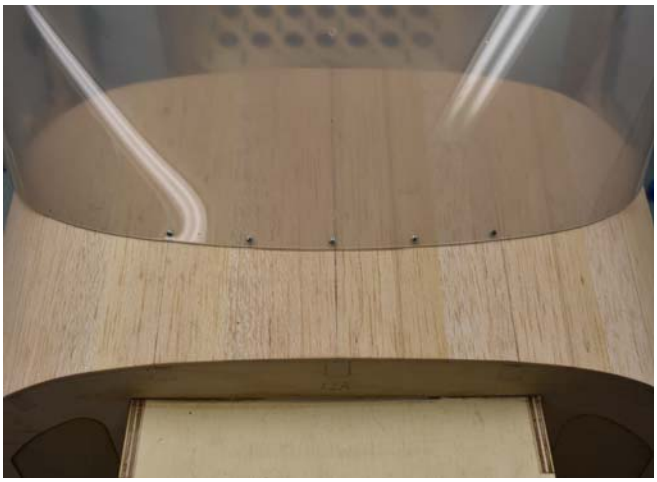
210. Working forward, install three 1/4“ long screws down along the top curved section. Repeat for the other side before proceeding.

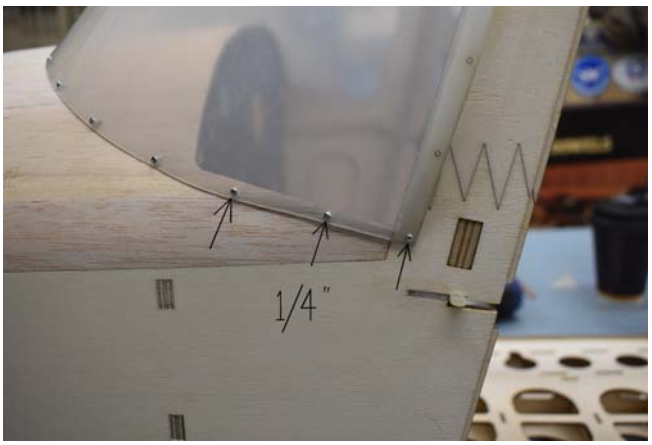


211. Fold the windshield down and around as shown and install a screw into the top corner. This is a temporary screw holding the corner,



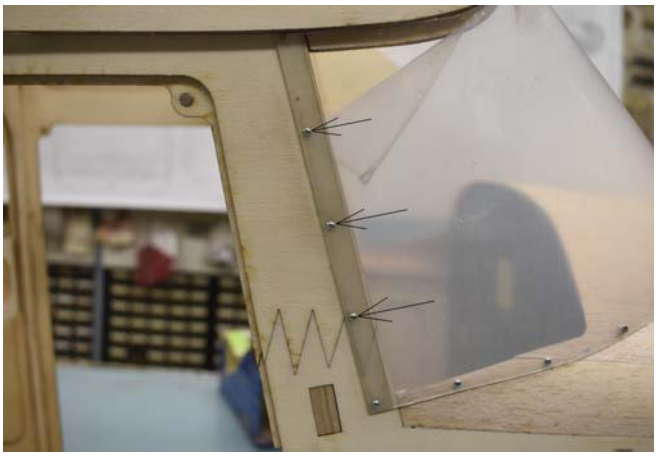
212. Push the center of the windshield down onto the balsa/ply deck and install a #0 x 3/8" long screw. Do not over tighten the screw as to strip the balsa/ply decking. Keep installing the 3/8" long screws alternating one at a time left and right. The last three screws are 1/4" long.



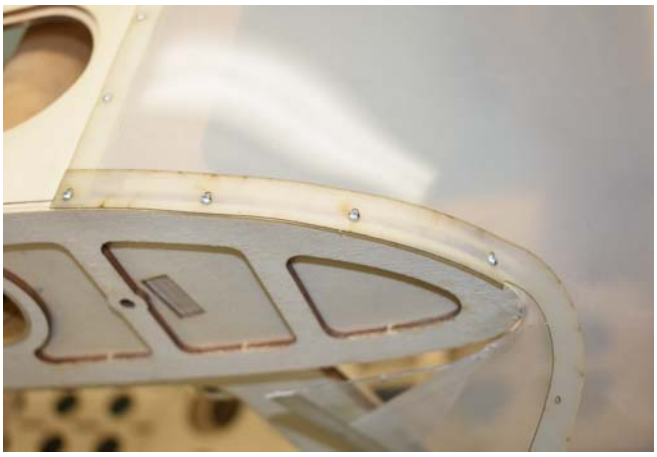


213. You will probably now have a bow along the side that needs to be "trimmed to fit". Remove the temporary screw from the upper corner and use a drum sander and/or an X-acto knife to trim the top of the plastic and G-10 frame away as needed.

214. Once satisfied with the fit, add three more 1/4" long screws up along the side.



215. Remove the top four screws from the top side curved section and install the **LE WS FRAME** tightening the screws so it can just move in its slotted holes. This part has excess length for trimming as required to suit.

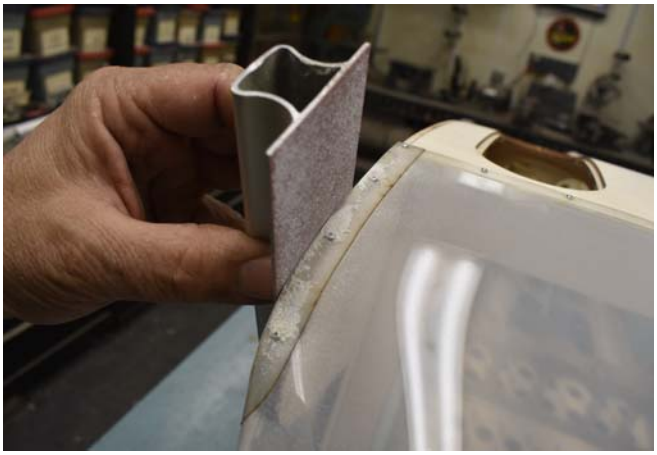


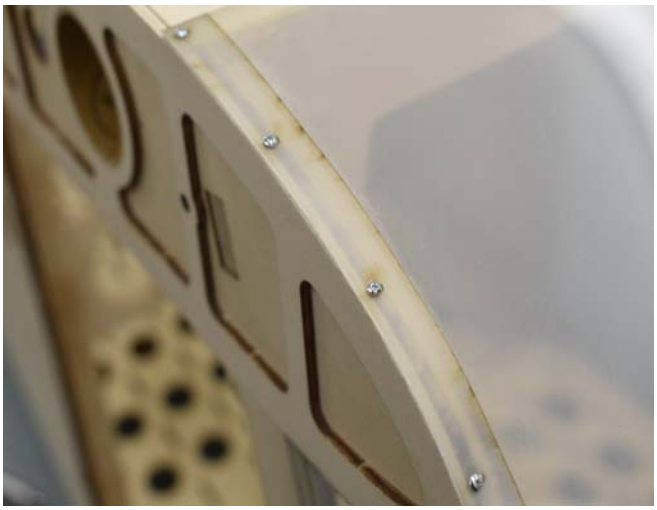
216. Wrap the **LE WS FRAME** around the leading edge root rib against the windshield. Then drill a #60 dia. pilot hole in the center of the hole that is in the G-10 frame. Screw in a 3/8" long screw. Note; this screw is not tightened all the way. Tighten just enough so the glass and frame are just below or flush with the lite ply rib.

217. Drill the next pilot hole and install a 1/4” long screw. This screw can be tightened all the way.

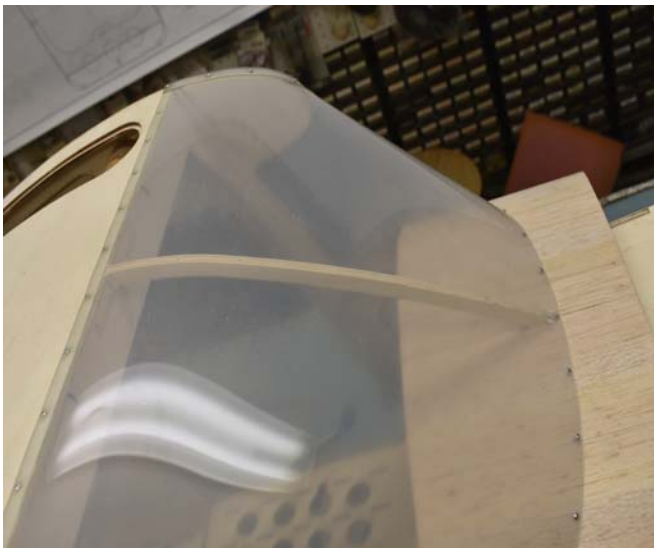
218. Finally drill a new pilot hole in the corner were the temporary screw was and install a 1/4” long screw.

219. If you haven’t done so already, tighten the four screws on the top of the **LE WS FRAME**. Sand the overhanging G-10 frame flush with the side of the lite ply rib,

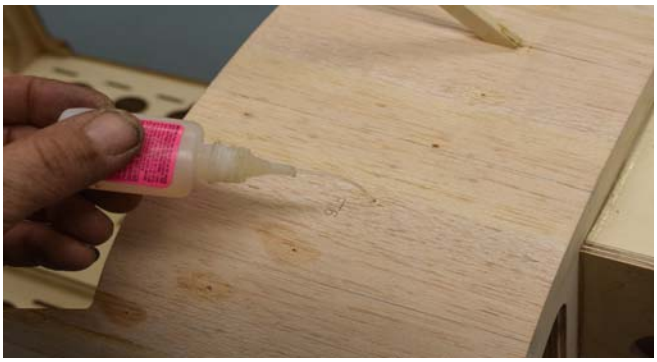




220. Fit and glue **FWS** to the top of the balsa deck and to the top of the main former centered among the row of screw holes. (It does not get glued to the windshield). Install 1/4” long screws.

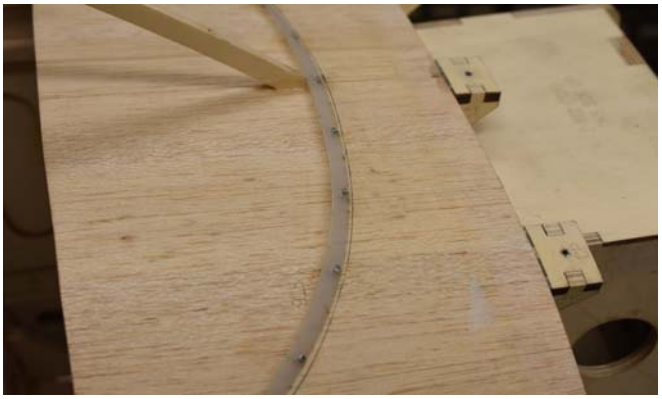


221. Remove the windshield completely and remove the protective backings if still on. With thin CA glue soak the balsa/ply screw holes in the deck. Allow the glue a minimum of 10 minutes to cure.

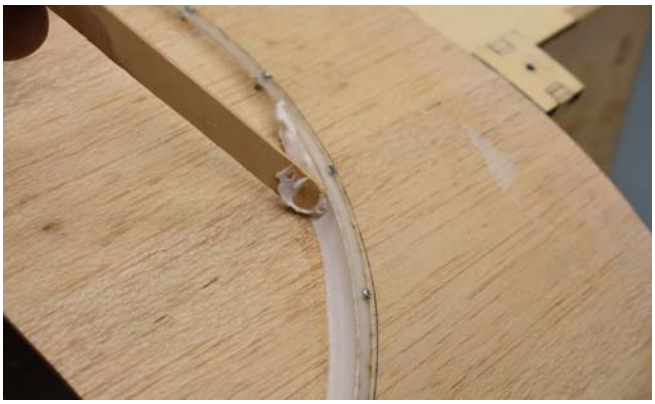


(*Windshield Mounting Fillet & Dash Hood)*

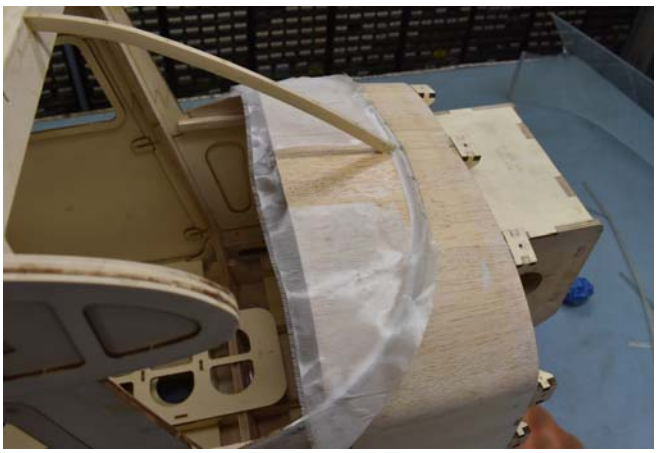
222. Spray the lower windshield screws with WD-40 or any thin lubricant and screw on the false windshield strip of plastic. Best to leave on the clear plastic coating. If you removed it, then coat it with wax or Vaseline. Do not over tighten the screws.



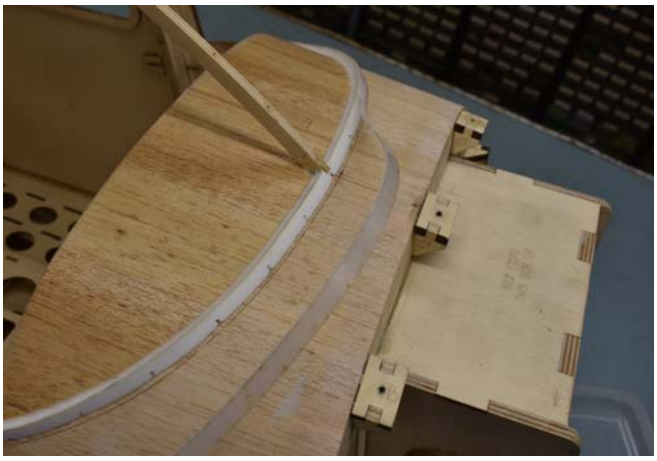
223. Mix up some epoxy finishing resin and micro balloons and using a Popsicle stick create a fillet as shown. Leave on the plastic strip for a min. of 12 hrs.



224. Once the epoxy fillet sets you can (if you wish to do so) glass the dash hood with 1/2oz to 1oz glass cloth. We used 1/2oz and did not fill the weave and painted it flat black with a paint brush. It gave it a nice texture.



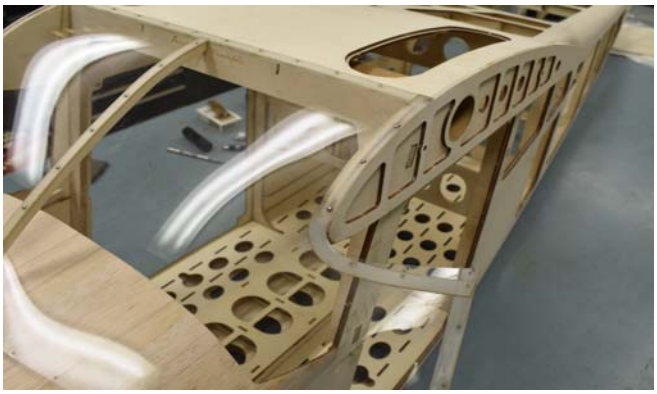
225. Once the fillet has fully cured, remove the screws and the false windshield strip of plastic.



(*Windshield Re-Installation)*

226. Add the row of short screws across the top. Then down the center with all the G-10 frames.

Next, around both the LE with its frames. (one long screw in the bottom front not too tight as shown in step 216).



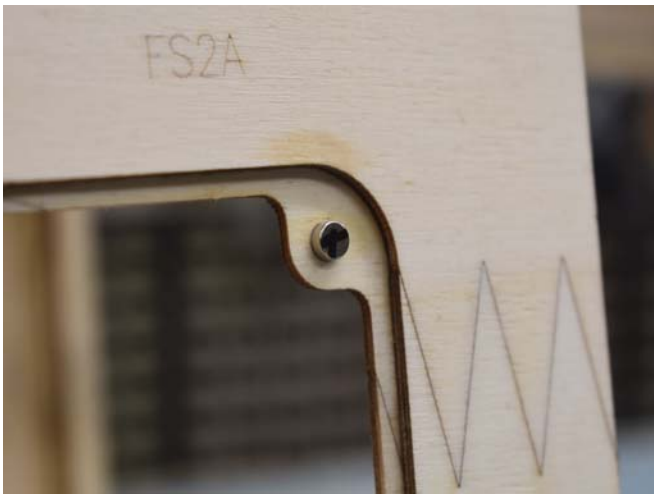
Then down along both the sides. (leave out the bottom corner screw).

Finally across the bottom working center outward with the **LOWER** G-10 frame and long screws except the last three screws to be short.

In both corners at the leading edge crazing will be present. Nothing to be alarmed about. Do not use a heat gun on the windshield. It will deform!

(*Luggage Door)* Part # **FA1**

227. Take a magnet and hold it close to the magnet that is on the fuselage. It will jump on to it with correct pole orientation. Using a marker, mark the magnet with an **X**. With the inside surface of the door panel down on your work bench insert the magnet with the **X** facing up towards you. Use a dowel and tap it down so the other side is flush.



228. From the outside, thin CA the magnet into place. Then followed by epoxy or regular CA glue.

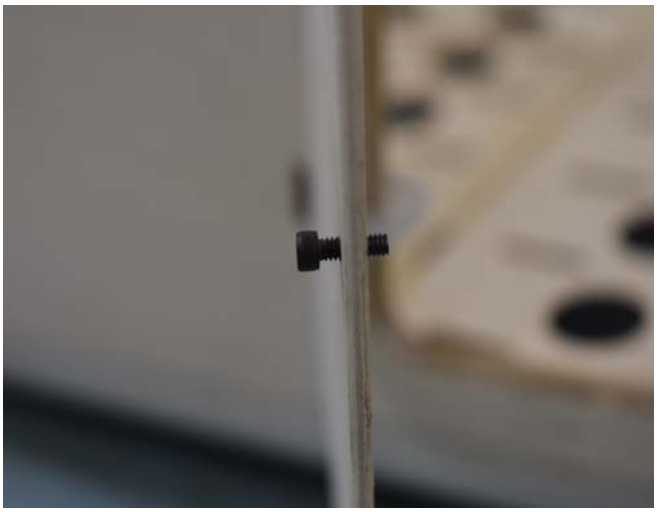
229. Sand a bevel on the inside edge at the hinge line and at the top and bottom corners.

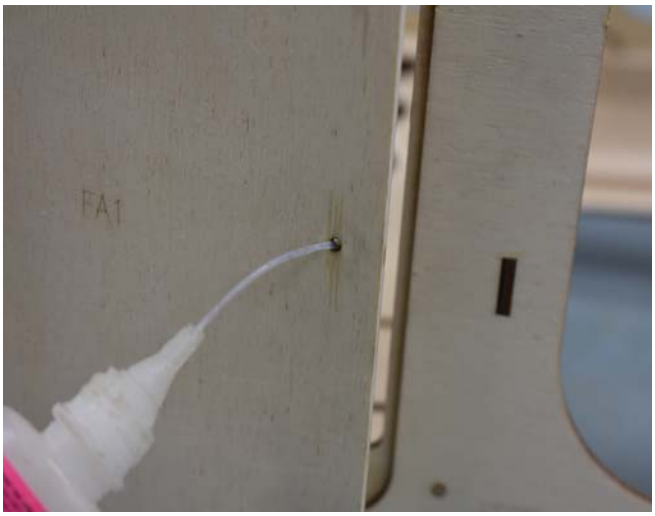
230. Bolt on the offset door hinges as shown using 4-40 x 5/16" long flat head bolts with the small pattern lock nuts.

231. Install the door and bolt to the former using four 4-40 x 3/8" long socket head bolts and the four blue aluminum lock nuts only.

232. Check the gap around the door, sand where necessary.

233. For the door handle, thread (screw in) into the center hole a 4-40 x 3/8" long socket head bolt Remove the bolt and thin CA harden the threads. Let cure for 10 minutes and insert the bolt with a #4 flat washer and small pattern lock nut on the inside.



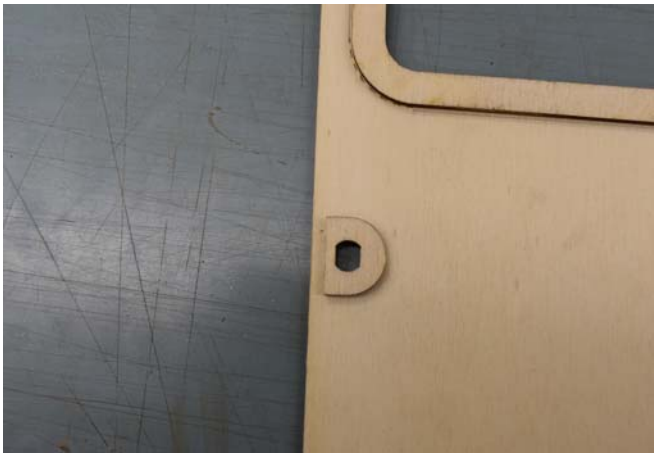


(*Main Doors)* Part # **FA4**

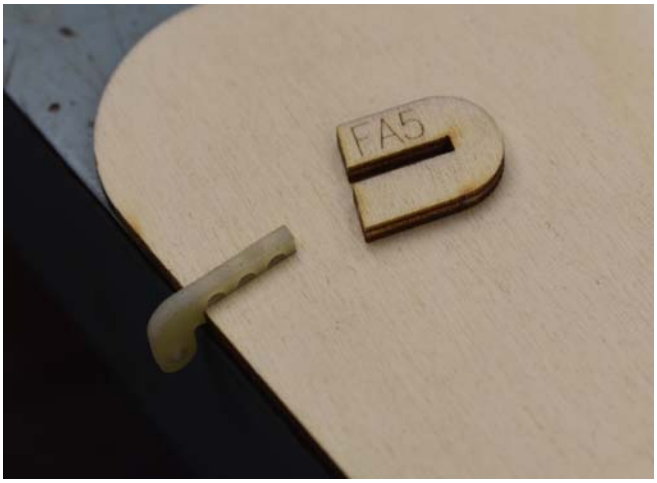
234. Install three magnets into the door like you did in steps **227** and **228**. Note; the inside surface of the doors has etched lines around the window.

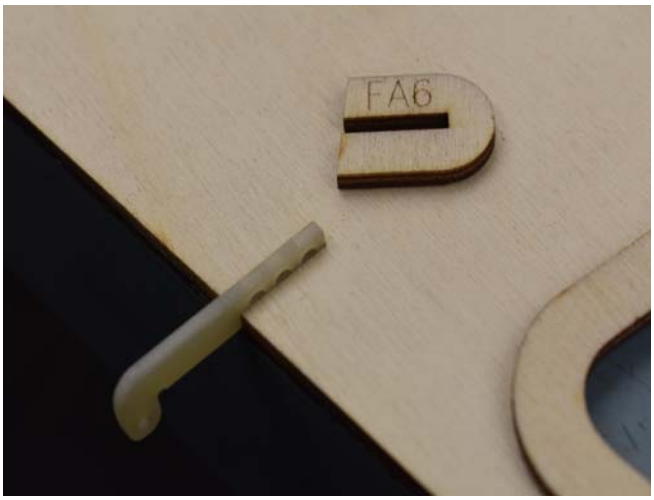
235. Glue **FG1** to the inside of the door within the etched lines.

236. Glue **FA2** into position.

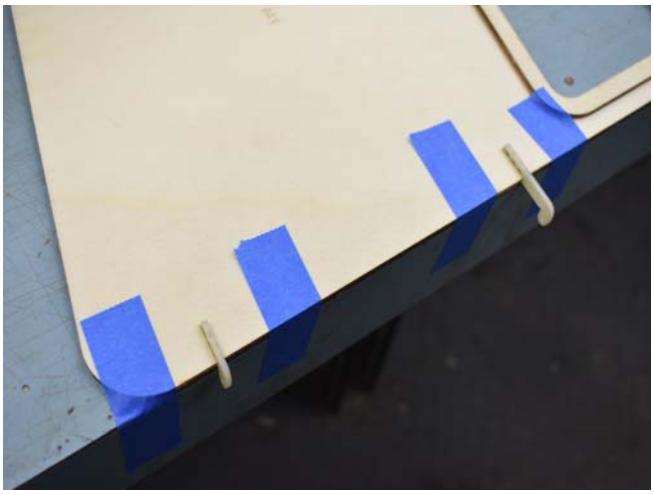


237. Locate one short and one long G-10 hinge and scuff both sides in the area of the three glue holes only with a file or rough sand paper. The longer hinge will go at the top of the door just under the window frame. The shorter one will be at the bottom of the door. Have on hand **FA5** and **FA6**. **FA5** is the bottom hinge doubler, while **FA6** is for the top hinge.

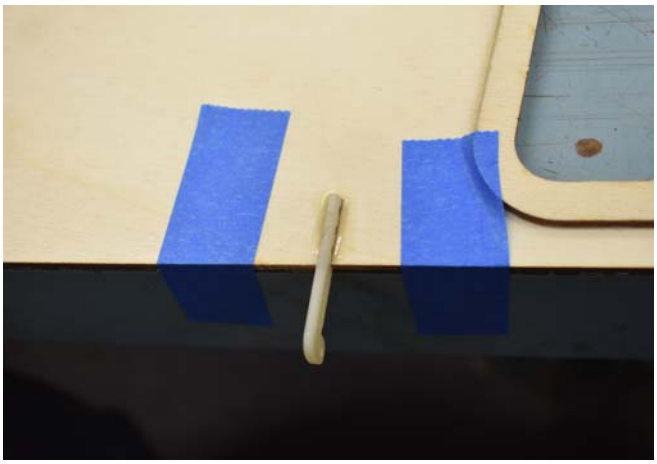


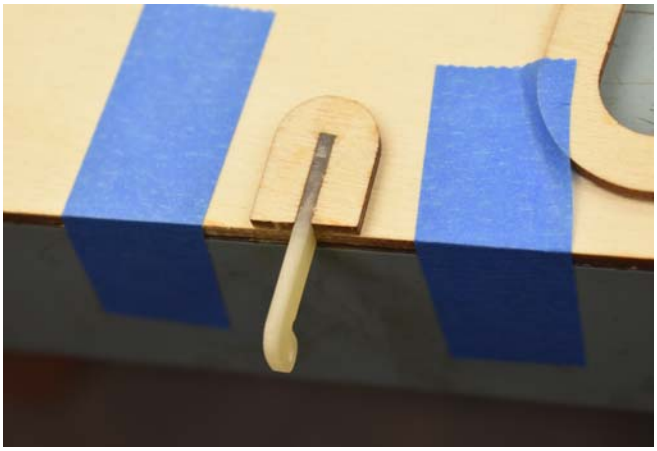


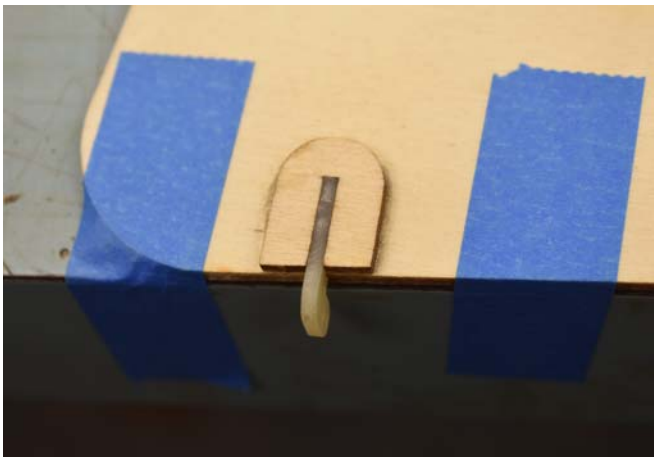
238. Tape the door to the edge of your work bench (inside facing up). Insert the hinge into the slot (pivot point “knuckle” side down). Make sure the back of the hinge is bottomed out in the slot and firmly all the way against the work bench.



239. Use either epoxy or thick CA glue and glue on the hinge cap at the same time. (Get glue into the holes).







240. The door hinge pin is a 2-56 x 3/8" long philips head bolt with a small pattern lock nut. If the top hinge has difficulty seating in or the bolt holes don't line up, then you still have epoxy present under the hinge in the fuselage against the former. Clean out the excess glue with a small Dremel bit. Check gap around door and sand where needed.

(*Door Latch)*

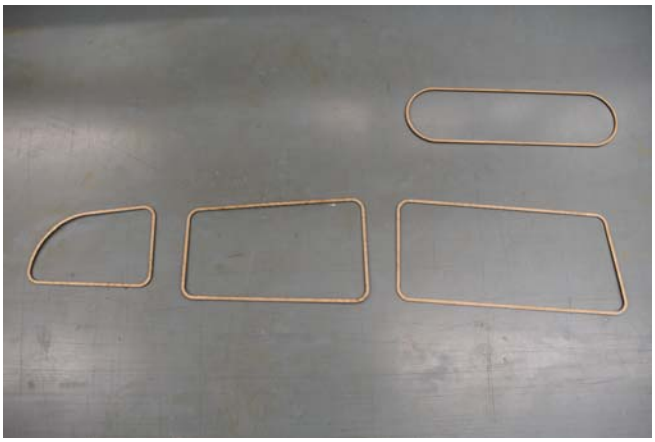
241. Locate the door latch hardware bag and insert the body through the door and secure with the large nut.

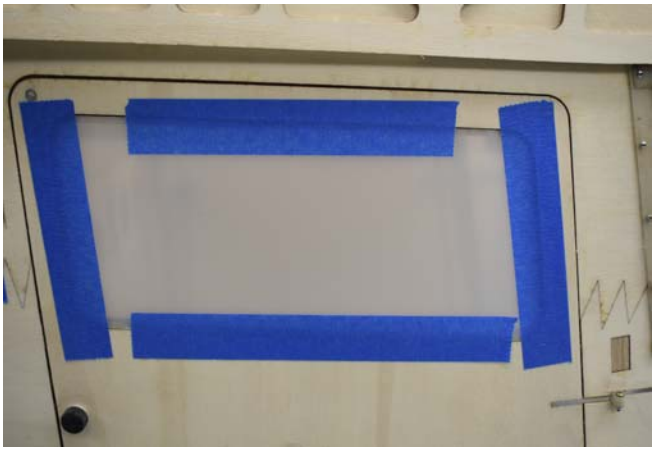
242. Install a hex nut about 1/16” from the body followed by a star washer. Then install the arm as shown followed by another star washer and nut.

243. Glue **FA3** into position as shown and adjust the nuts to achieve the desired fit. Once satisfied, cut off the excess protruding threads.

(*Window Spacer Frames)*

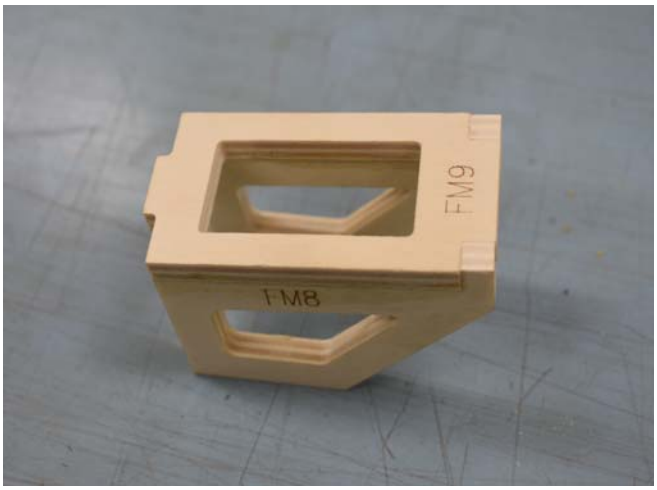
244. Glue in the 1/16” ply spacers and wipe away any excess glue. You can buy a tub of small binder clips at Staples and clamp the frames in place or use the actual glass pieces with tape to hold the frames in the fuselage while the glue cures. The protective coating must be left in place if you are doing this method. Do not glue in the windows until after the fuse. is covered.





(*Steering Servo Mount)*

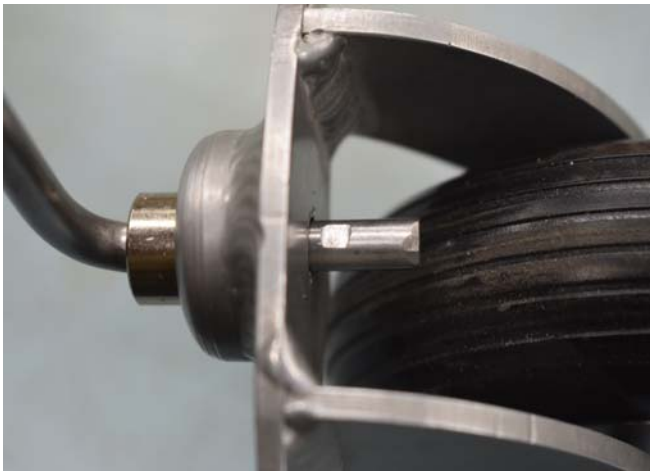
245. Glue together **FM8**’s and **FM9** and epoxy into position to the rear section of the floor and to former **F7**.



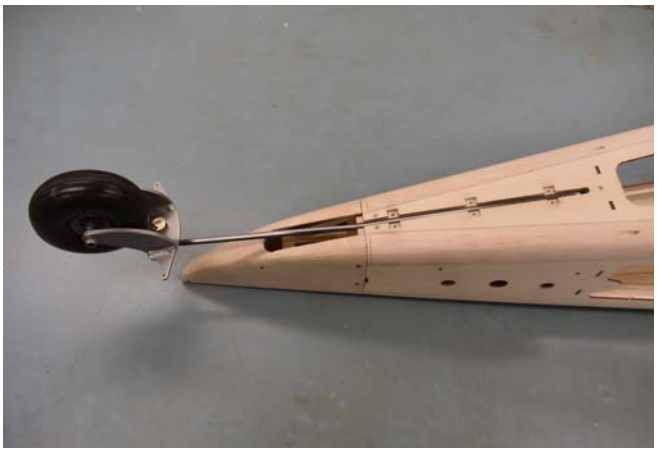
(Tail Wheel Assembly)

246. Assemble the tail wheel by inserting a 8-32 x 2" long socket head bolt, aluminum spacer, the 3 1/2" tail wheel followed by another spacer and lock nut. Tighten to achieve desired friction.

247. Insert a 7/32" diameter collar onto the tail gear wire as shown in the first photo. Then slip on a thin nylon flat washer followed by the tail wheel assembly followed by another nylon washer. Make a "flat notched pocket" for the second collar's set screw. Cut off excess wire and use blue thread locker on the set screws.



248. Install the tail gear with the three aluminum straps. Secure with #2 x 1/2" long philips head screws.



249. To aid in the removal of the tail gear wire tie a piece of string together and slip it under the wire where it goes into the fuselage and pull up.

(*Main Wheels)*

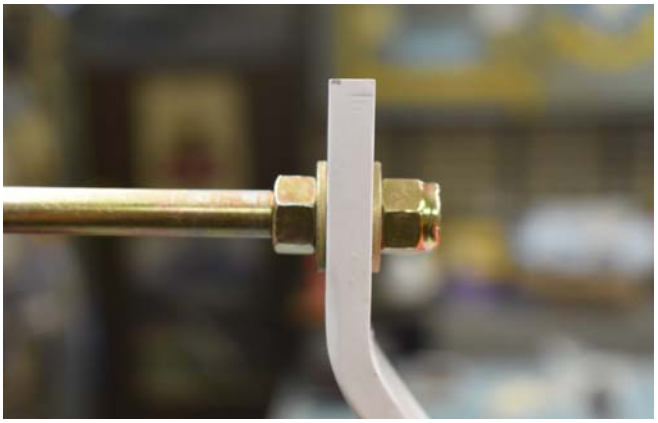
250. Install your favorite main wheels. No main wheels are included in the kit. Stock wheels out of the factory would be a 7" diameter wheel. Example would be to use the Du-Bro 7" or 8" wheels. You will have to drill out the hub to 3/8" diameter to use the axles supplied in this kit. Other wheel options are our optional 10" pneumatic wheels with hub caps, bushings and hardware. Last picture shows 11.6" diameter PR Bush Wheels. (These are no longer in production). Extreme Flight rc sells PMT bush wheels as an alternate.

Du-Bro 7" wheel

10” wheel

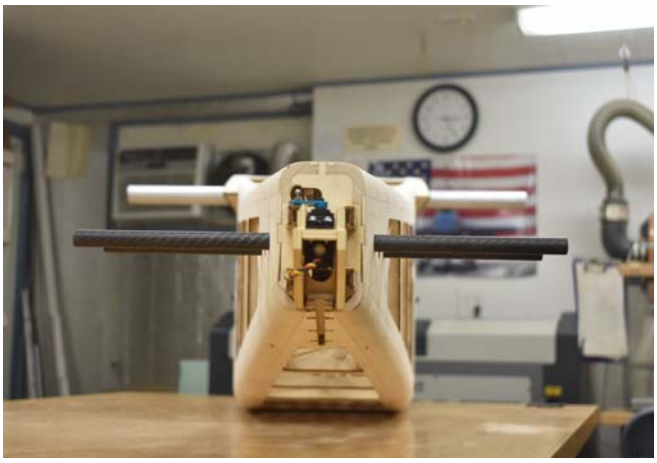
11.6” bush wheel

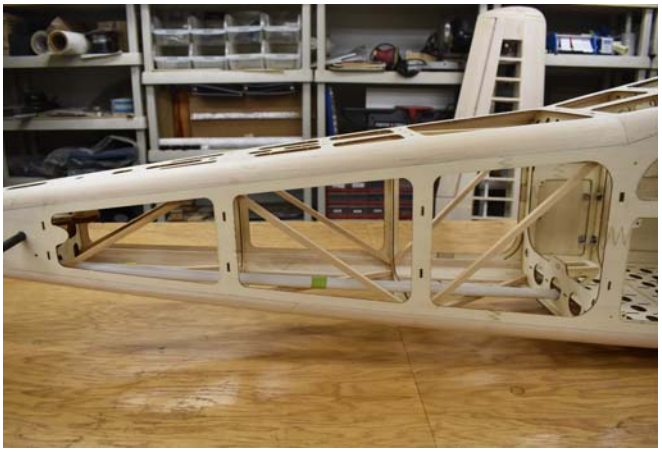
251. Assemble axles onto the landing gear. Clamp axle in vise or use vise grips and add Red Locktite onto the axle threads where it transitions to the smooth shaft. Tighten a hex nut onto axle bottoming it out onto the threads. Allow to fully cure. Add flat washers followed by the lock nut. Slip on your wheel and the wheel collar. Mark and cut down the axle. Add a flat notch (**Not** a flat spot off the end of the axle) for the collar set screw. Use blue lock-tite on the set screw.



(*Fuselage Truss Bracing)*

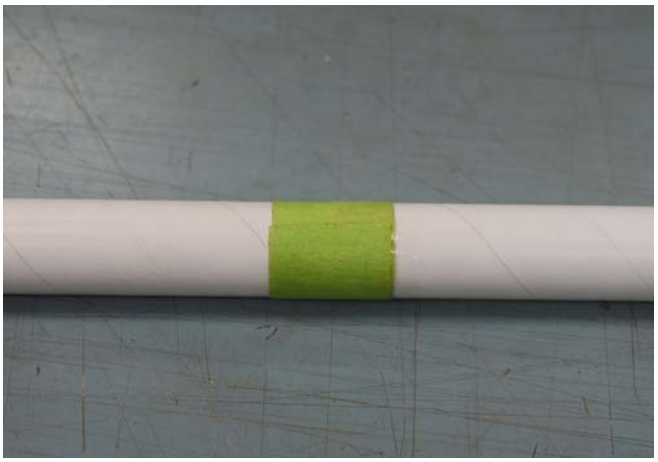
252. Cut and glue in 3/8" square balsa truss bracing on the fuselage sides, bottom and one on the top. These are glued onto the corner balsa sticks, not onto the lite ply sheets. Check wing and stab tubes for parallel alignment before gluing in the bracing. If they are not parallel you can have a helper counter twist the fuselage while gluing in one bracing member at a time.

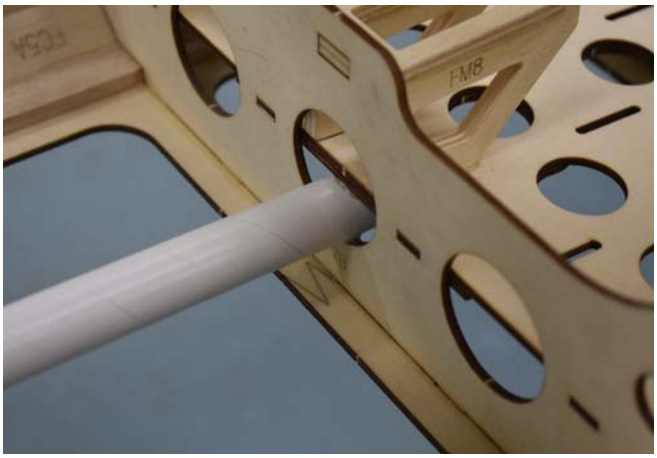


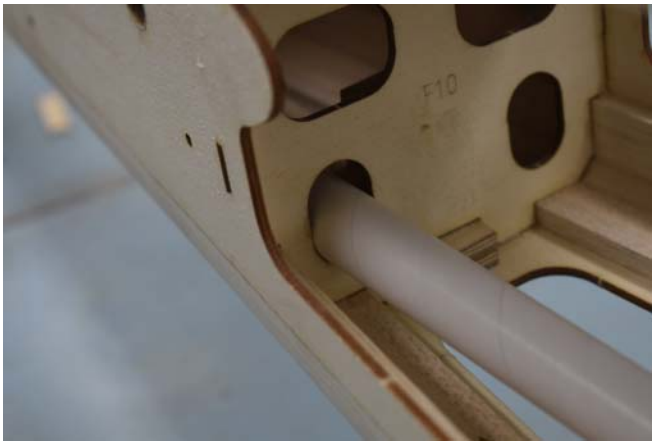


(*Fuselage Conduit Tube)*

253. Tape two conduit tubes together with masking tape. Add glue to the seam and edges of the tape. Glue the tube into the center hole of former **F7B** under the floor. Anywhere else it will interfere with the pull pull cables. The other end gets glued into the bottom right hole of former **F10**. Also glue it to the bottom of the other two formers and to the bottom diagonal bracing.

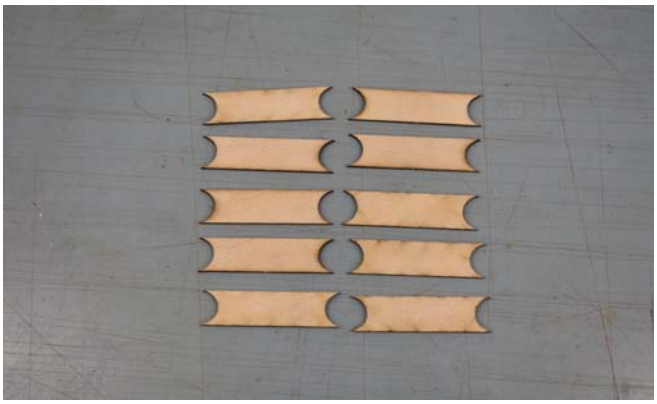




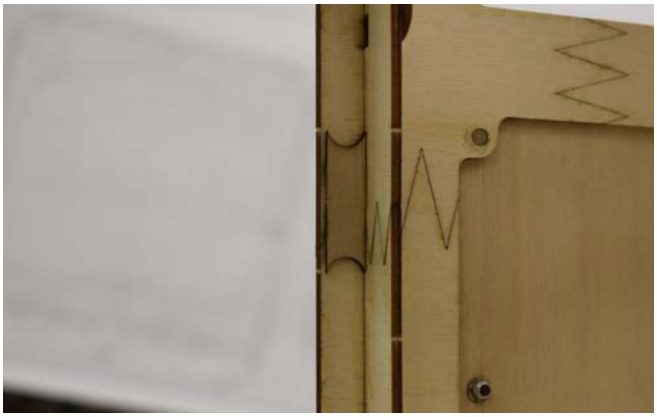


(Fuselage *Splice Reinforcing)*

254. Locate ten 1/16” ply reinforcing plates. Eight of these get glued around the inside of the fuselage between formers **F7** and **F8**.



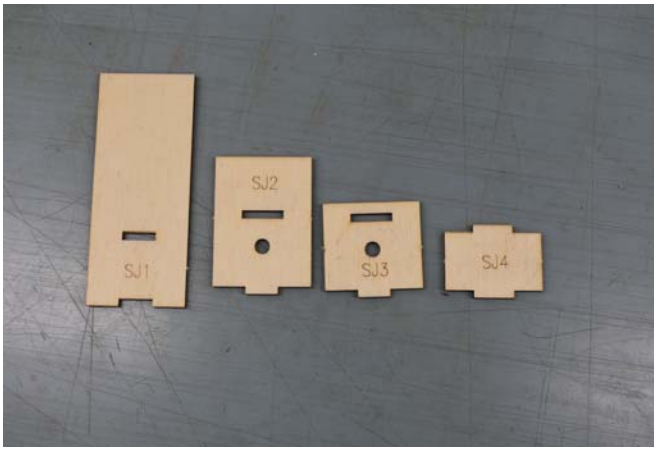
The remaining two are glued to the fuselage side behind former **F7**.

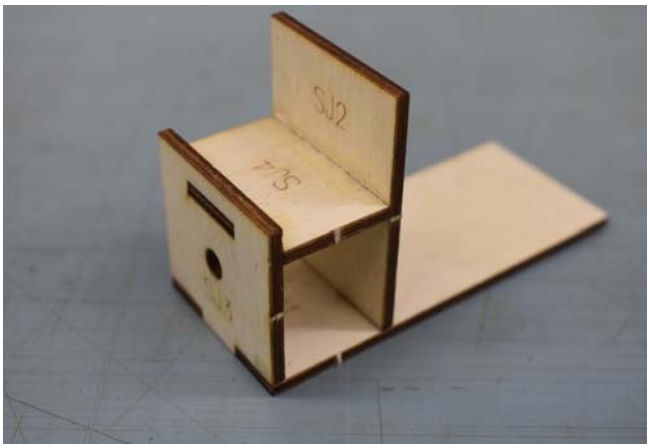


255. There are two more slightly larger splice plates that gets glued to the underside (inside) of the fuselage bottom **FB3A/FB3B**. Note; pictures show it on the outside of the fuselage for clarity but they are glued underneath.

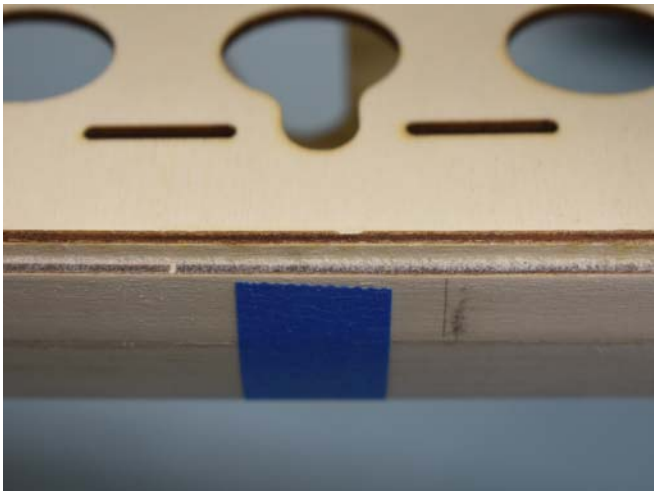
(Steps*)*

256. Locate **SJ1** through **SJ4** and glue the step drill jig together as shown.

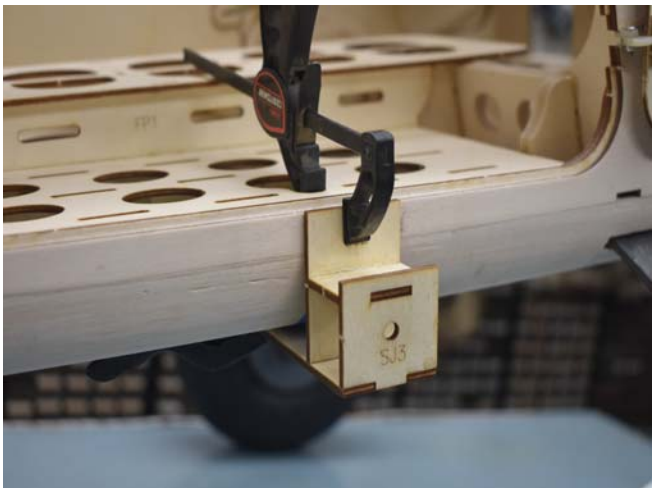




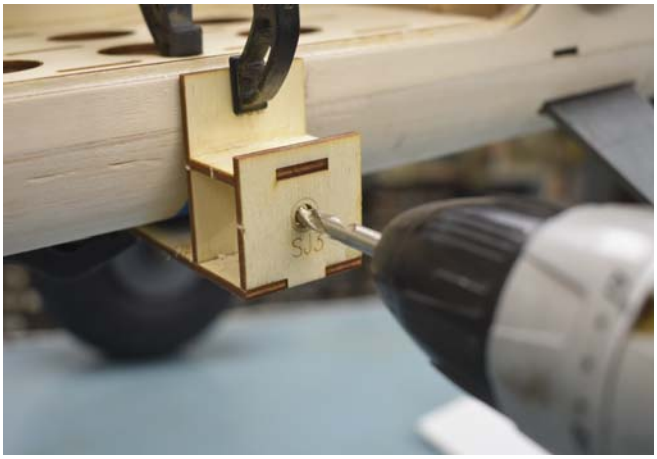
257. Add tape to the balsa corner where the bump out is on the one hole.



258. Clamp or tape the jig 4 5/16” to 4 3/8” back from the rear edge of the wing strut notch.

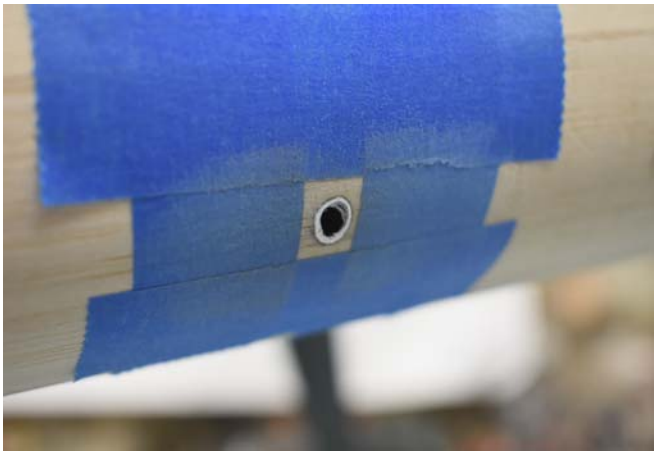


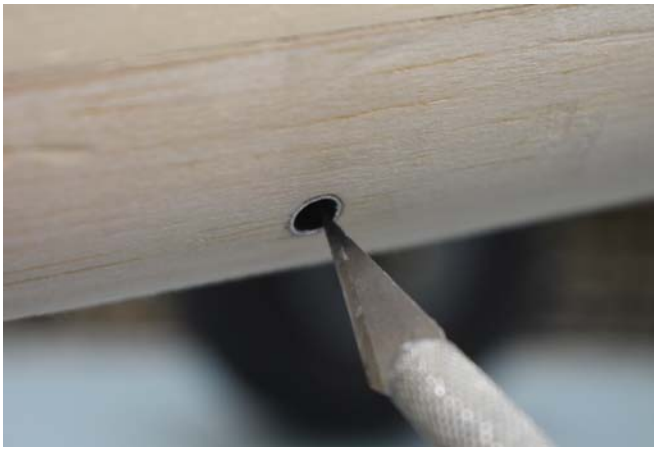
259. Using a 7/32” diameter drill bit, drill through the balsa rounded corner and all the way through the 3/4” square bass block.



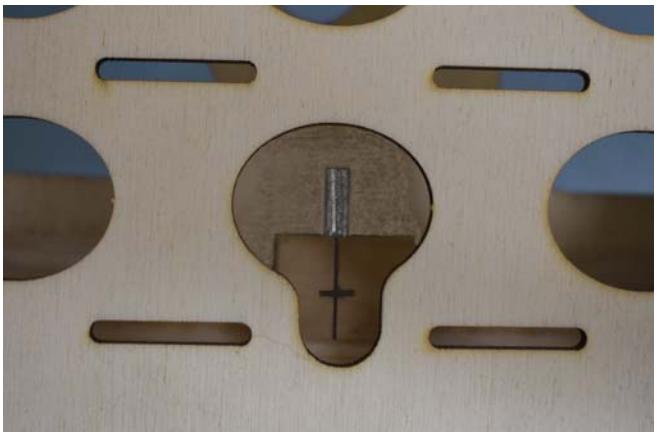
260. Insert a 7/32” O.D. x 1 1/2” long aluminum tube half way into the hole. Smear some glue on the tube and press it into the hole leaving a little bit exposed. Wipe away any excess glue.

261. Tape around the protruding tube and block sand down to the tape. Then de-burr the inside of the tube with an x-acto knife.





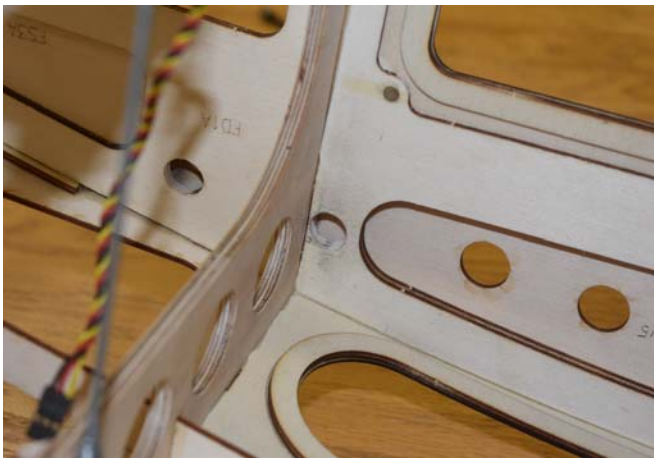
262. Insert the step fully and mark the center line of the aluminum step onto the bass block. Then draw a cross line in the middle of the block.

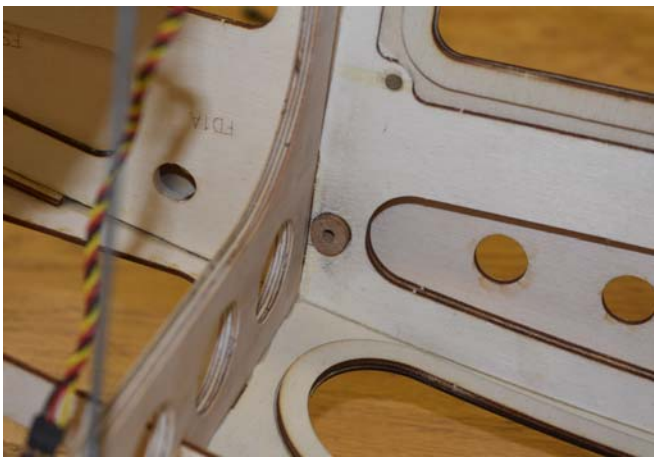


263. Remove the step and drill a #27 dia. hole through the block until you feel that your through to the other hole. Thread into the wood using an 8-32 x 1/2" long socket head bolt. Do not use a tap. Thin CA harden the threads in the hole. Wait 10 minutes before reinstalling the step and bolt. Do not file a flat spot on the step. (Reason, if the step gets bumped or caught, it will strip the threads in the wood block).

(Rear Wing Bolt Reinforcing)

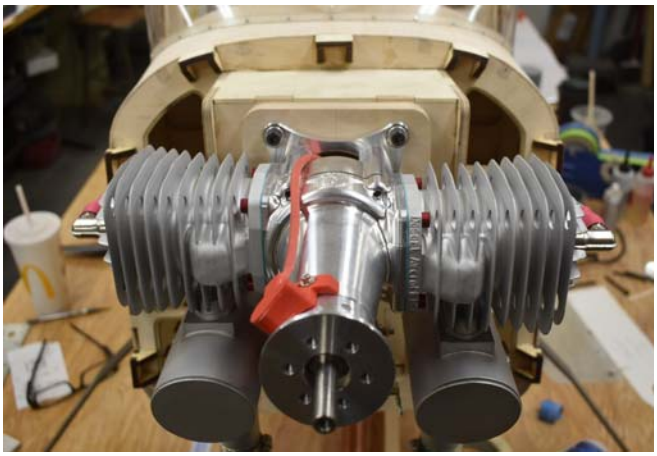
264. Locate the 1/2" diameter dowel with hole in the center and epoxy into place. Use a Vaseline coated 8-32 bolts to set the position and that the bolt is perpendicular to the outside rib cap. Repeat for the other side rear wing bolt location.



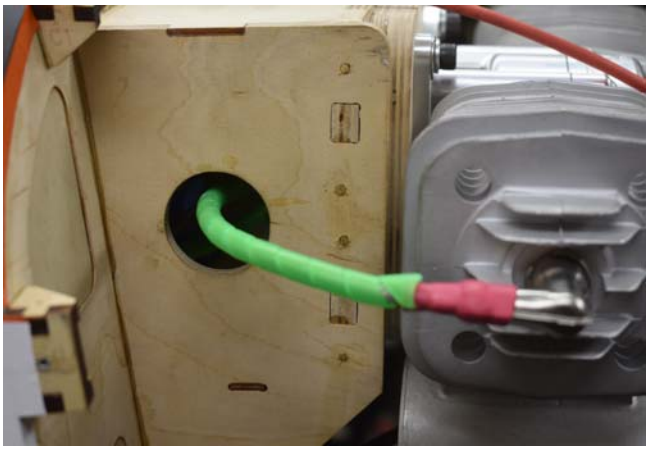


(Mounting Engine)

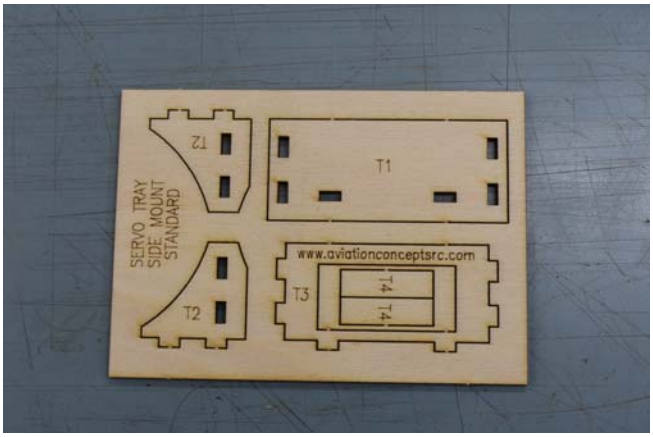
265. Use one or both of the 3/8" thick ply **FES** spacer plates or sturdy standoffs to space out your engine (8 3/8" plus or minus from back of spinner to engine box firewall). For DA 150 users epoxy together the two **FES** 3/8" thick ply spacer plates. The holes etched on these plates are for the DA 150 engine. Drill 1/4" diameter or equivalent holes for your engine.



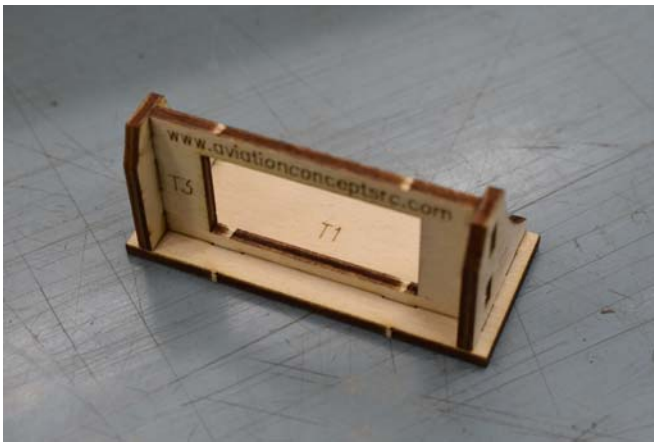
266. Drill and dowel peg the firewall with 1/8" diameter dowels by 1/2" long.

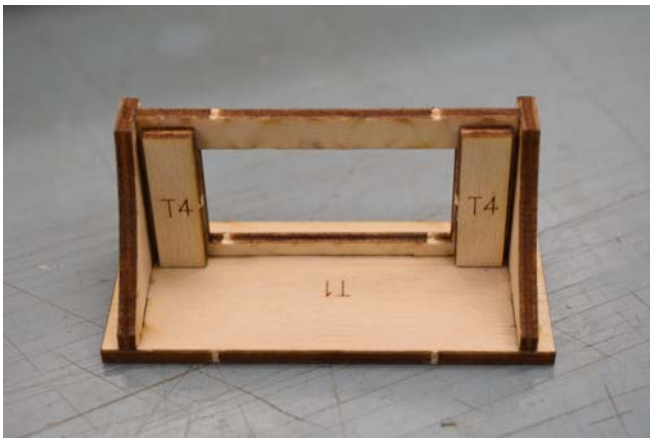


267. Locate one of the SIDE MOUNT SERVO TRAY



268. Assemble the throttle servo mount by gluing both **T2**'s onto **T3** with all the tabs facing down. Then glue the bottom **T1** on followed by both **T4**'s on the back side.



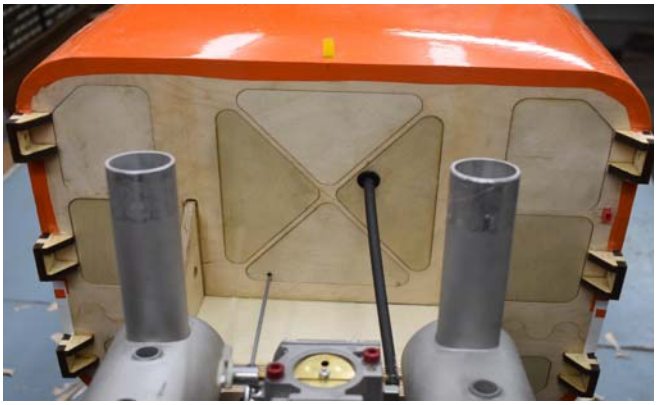


269. Locate and mount your throttle servo. An extra servo mount is included if you wish to add a choke servo to your engine.

270. We added an aftermarket arm and manual linkage for the choke.

271. Inside the engine box is plenty of room to mount your ignition module, battery and remote kill etc.

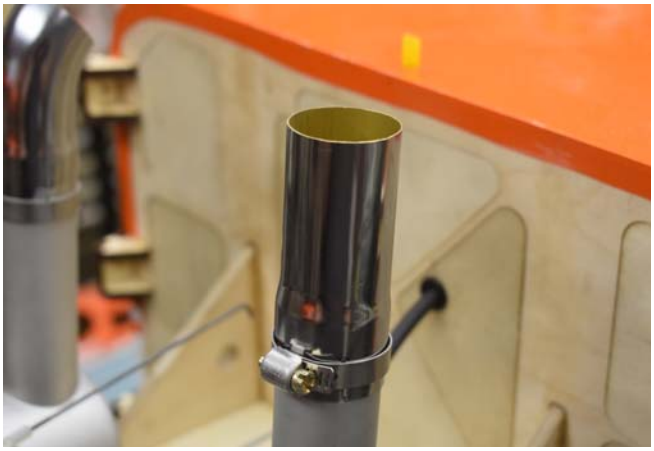
272. Glue into position the 1/16” ply firewall covers. A rubber grommet is supplied for the passage of the fuel line through the firewall cover.



(Exhaust stack extension)

Do to the tall height of the fuselage and the engine being mounted high it might be necessary to extend the exhaust stacks by 1 1/2” to 2” so it will exit out and below the bottom of the fuselage or cowl. If you need to extend it and your exhaust is close to 1 1/4” outside diameter then this might work for you. Here we are doing this on our DA 150 engine with a 1 1/4” P-Trap for a bathroom sink drain. You could also use a straight tail piece.

Straight tail piece shown.



273. Mark and cut as shown.

274. Drill four 3/32” diameter holes half way down the flared end 90° apart. Then cut four vertical slots to the holes.

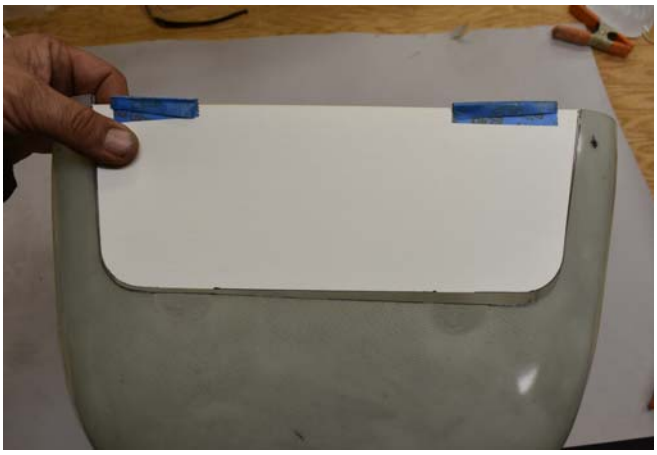
275. With the muffler removed, file a chamfer or radius on the end of the muffler stack. Clean out all the filings.

276. Use a high temp. silicone sealer (We like Permatex Ultra Copper RTV available at an auto parts store) and coat around the outside circumference of the muffler stack to a depth a little longer than the slots on the extension. Secure with a hose clamp as shown.

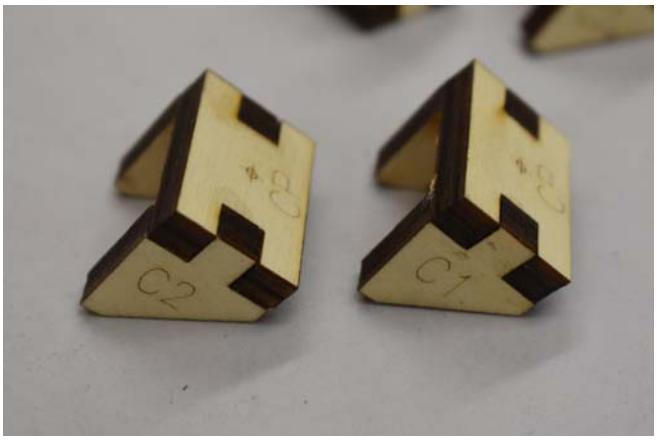
(Mounting Cowl*)*

277. Before you begin, wash the outside of the cowl in warm soapy water to remove the PVA release agent coating. Cut out and sand smooth the oval main engine cooling inlet opening. Cut out the rectangular carburetor opening leaving a 3/16" lip all around. If you will be installing landing lights, then cut these round openings out also.

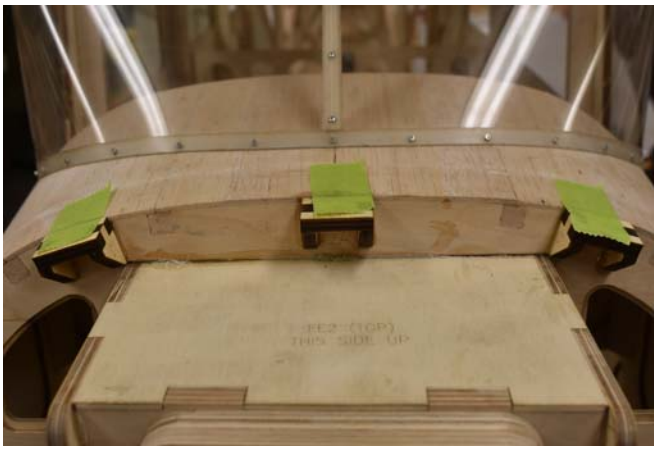
278. Center the COWL OUTLET OPENING template on the bottom of the cowl, mark and cut out.



279. Locate the 1/4" thick lite ply **C1**, **C2** and **CP** cowl mounting parts. Make <u>three</u> mounts using **C1** parts and <u>six</u> mounts using the **C2** parts. Use slow or thick CA glue and add a fillet of glue on the inside corners.



280. Epoxy on the three **C1** mounts to the fire wall as shown.

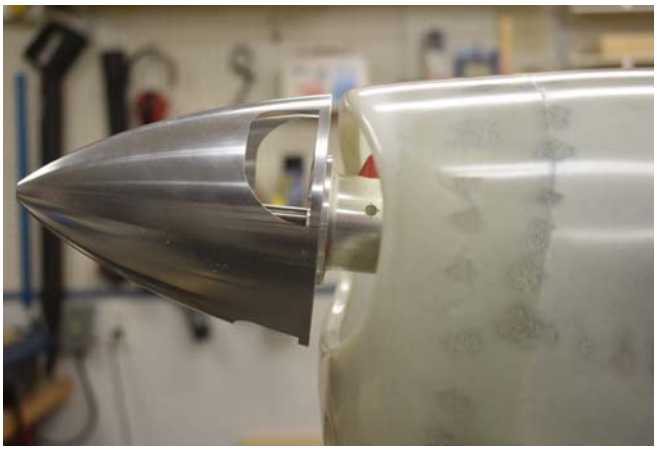


281. Epoxy the **C2** mounts to the sides as shown. Three on each side.

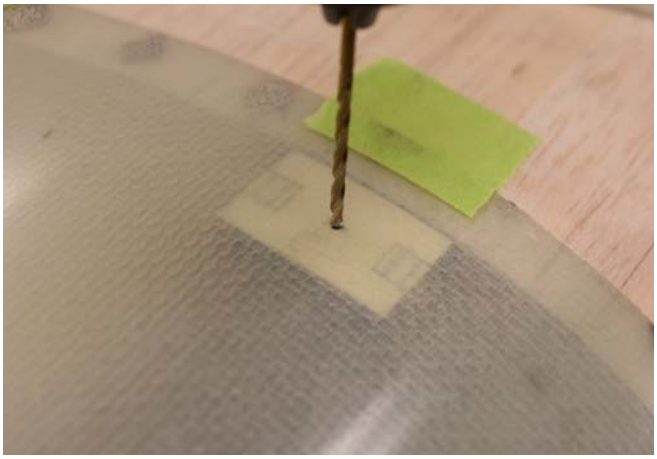
282. Sand the top three mounts to the contour of the top decking. And also check that the side mounts are flush.

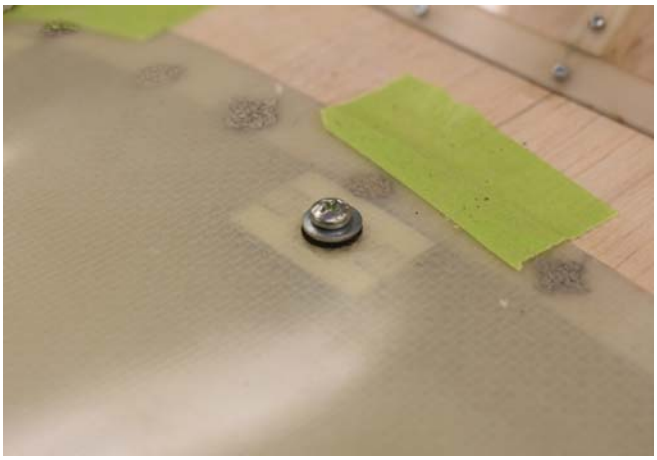
283. Using a marker, darken the center of the mount.

284. Slip on the cowl and your spinner. Once satisfied with the alignment, tape the cowl in place.



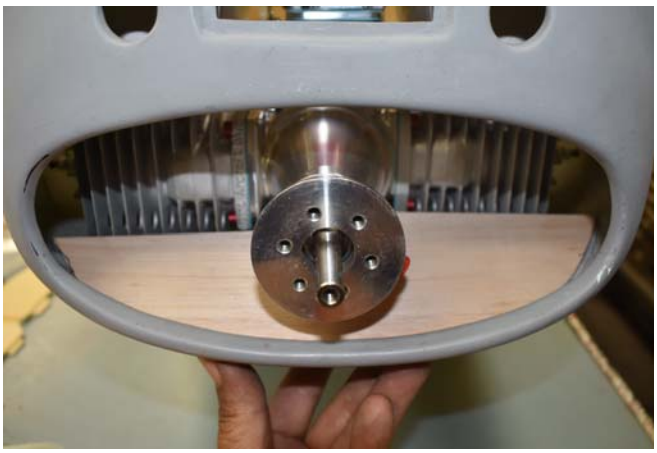
285. Drill 1/16” diameter pilot holes and install #4x1/2” long screws with bonded washers. When finished, thin CA harden the screw holes.

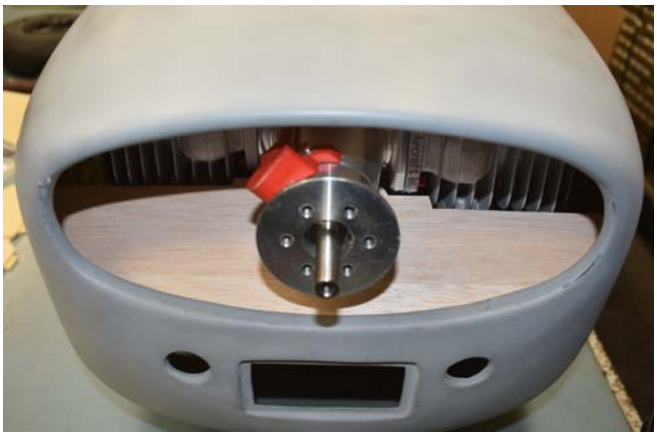


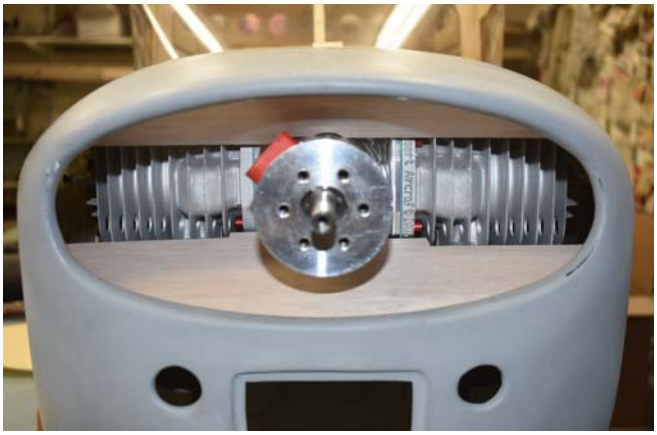


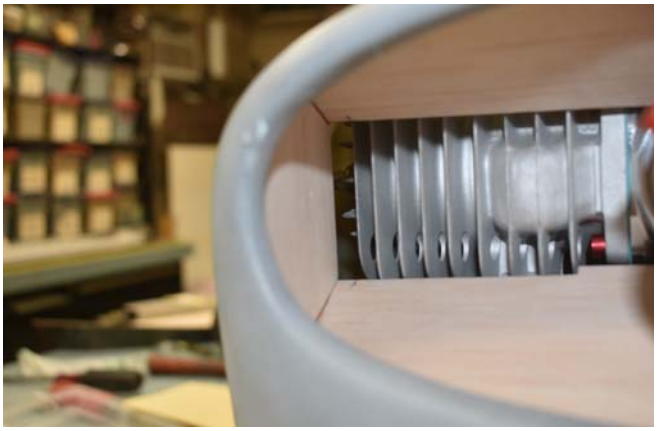
COOLING BAFFLES:

286. Cardboard templates are provided for the DA 150 engine. Modify the templates to suit your specific engine and make your cooling baffles out of 1/8” thick lite ply.



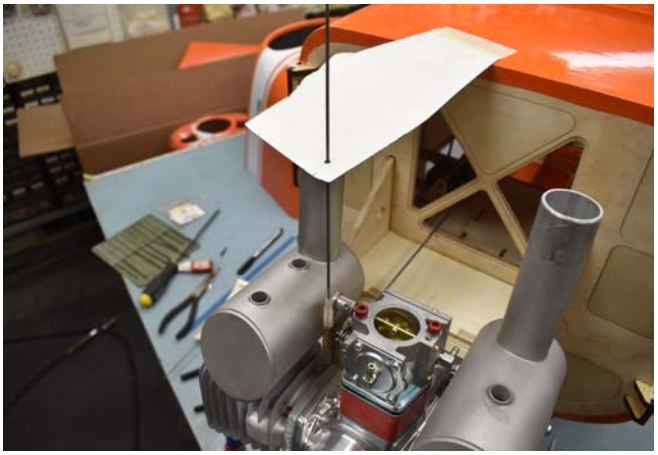


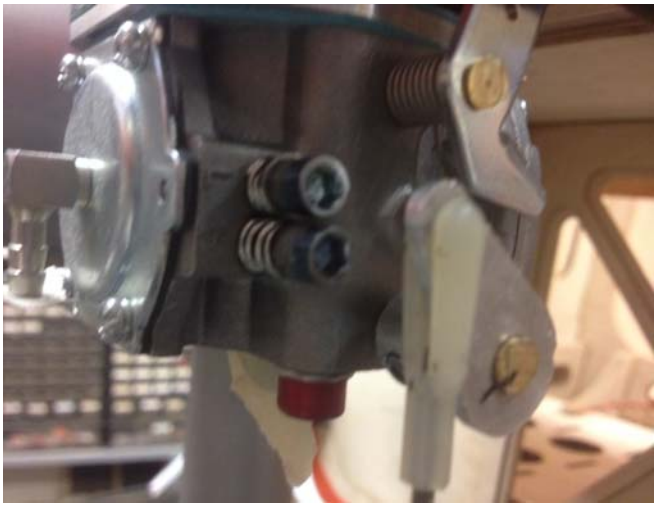




CHOKE & NEEDLE VALVE ACCESS:

287. Make openings in the cowl for your needle valve and choke wire access using scrap cardstock as guides.

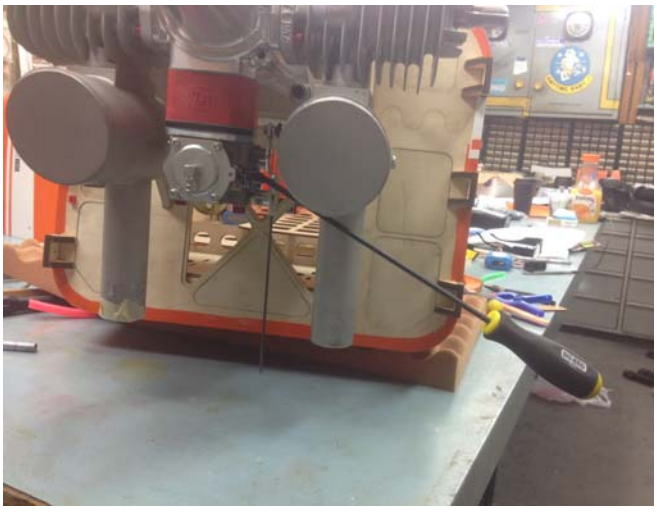




NEEDLE VALVE MODIFICATION:

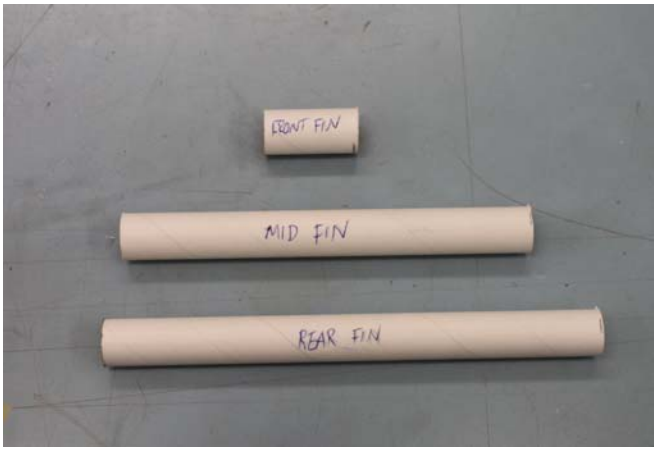
This is a modification I made on my DA 150 engine because of two reasons. The first is you would need to make a long skinny screw driver to reach the needle valves and the second is the mufflers are in the way for a straight shot to them making it difficult to engage the tool into the needle valve slotted head.

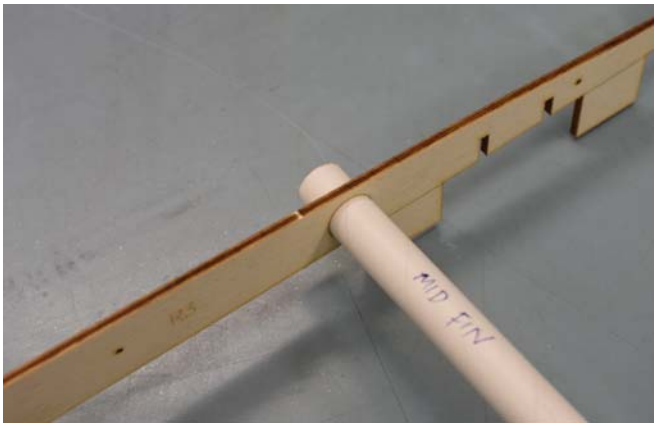
I first turned down the head diameter on a 8-32 socket head bolt on a grinder to match the diameter of the head of the needle valve. Then I cut the head off and JB welded them on. (Use the original JB Weld and not JB Quick Weld). Reason for the 8-32 socket head bolt instead of a 6-32 bolt (which wouldn't need to be turned down) is that the 6-32 ball driver would be too short to reach the needle valves.



FIN AND RUDDER ***(Tail Tube Sockets)***

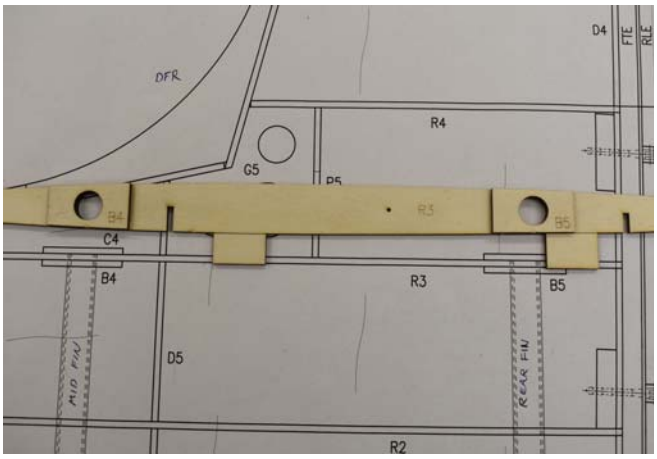
1. If you haven't cut the tail tube sockets yet, then see step **103** in the fuselage section of this manual. Gather up the FRONT FIN, MID FIN AND REAR FIN tubes and check that they fit through the fin ribs.

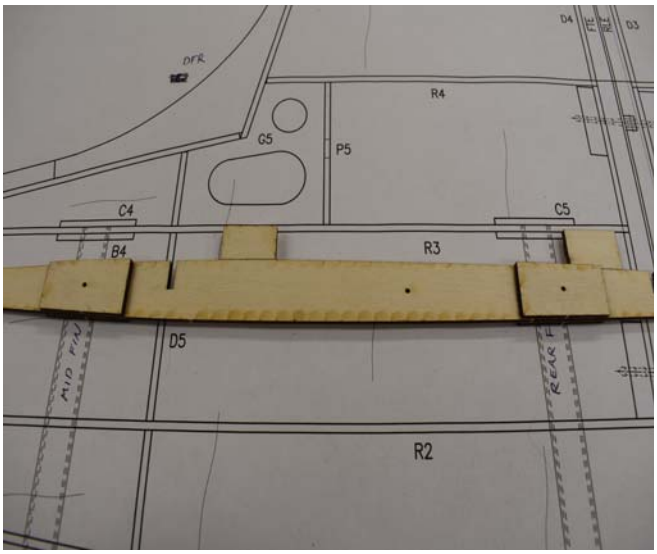




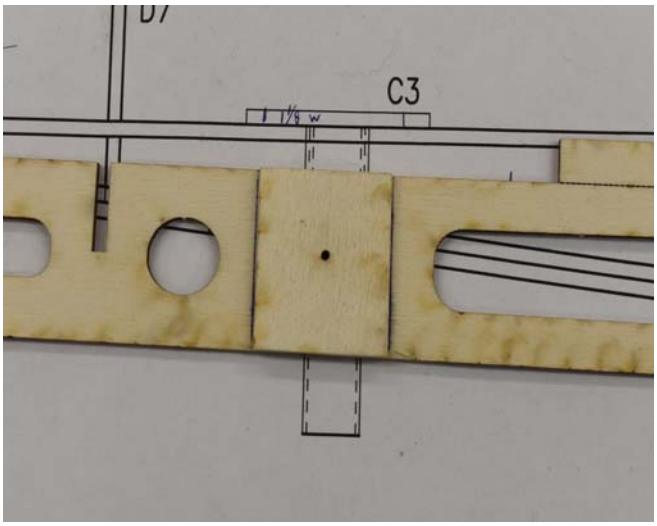
(Framing*)*

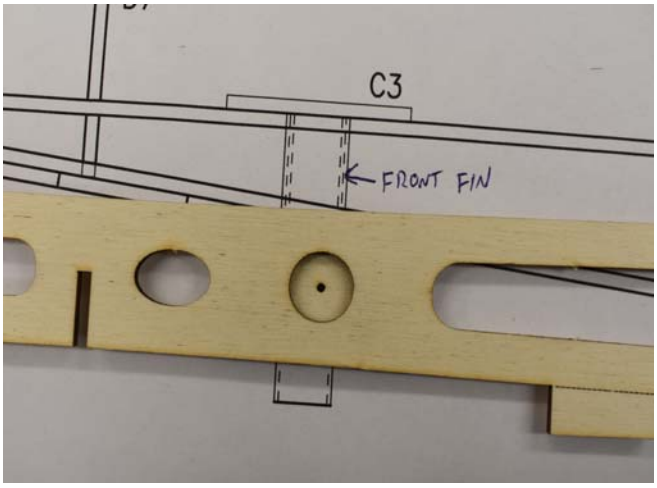
2. Glue **B4** and **B5** onto rib **R3** as shown. Then glue to the other side **C4** and **C5**.



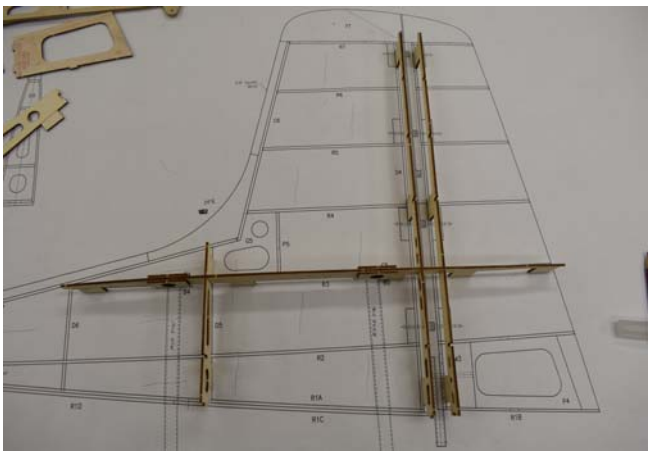


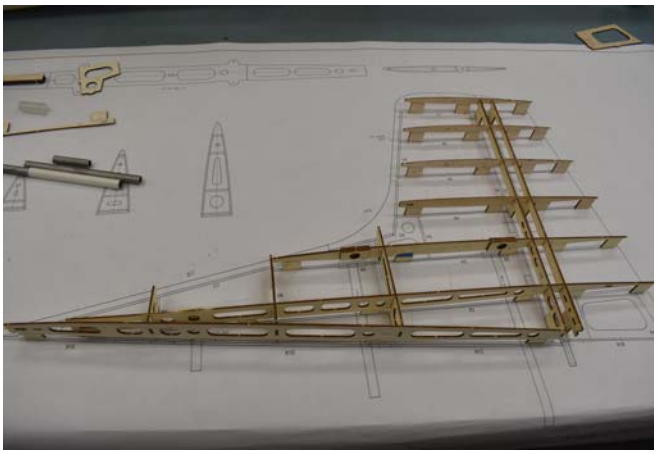
3. Glue **C3** into position on rib **R2**.



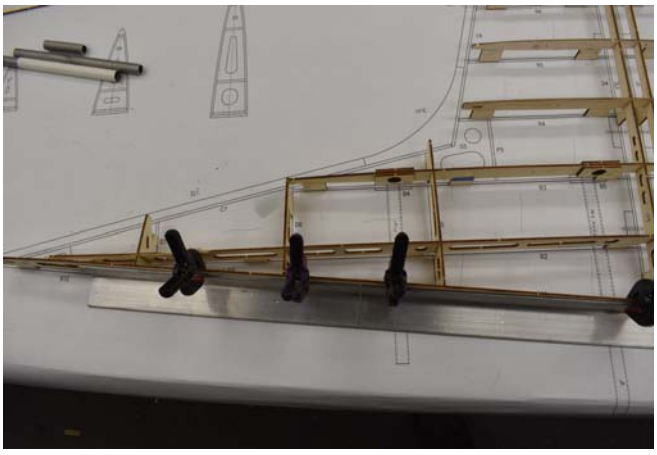


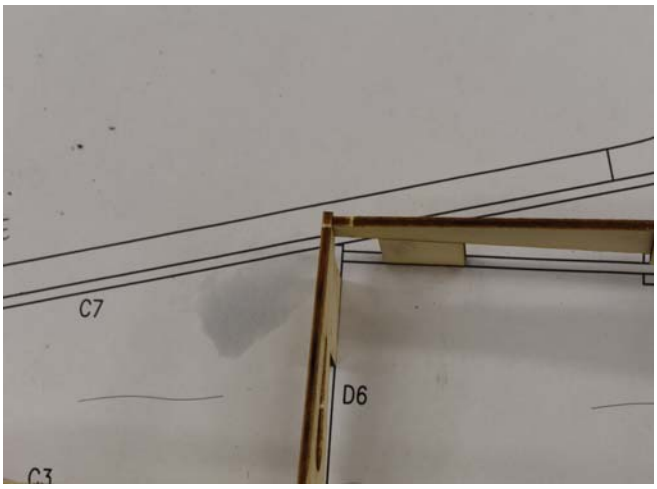
4. Dry assemble all the ribs over the plans.



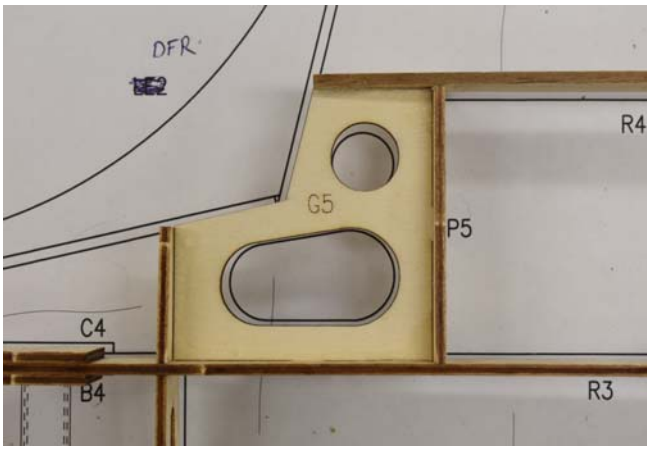


5. Clamp a 90° angle “straight edge” to the bottom rib and glue together the tips of **D6** and **R3**. Then add glue to the remaining structure.

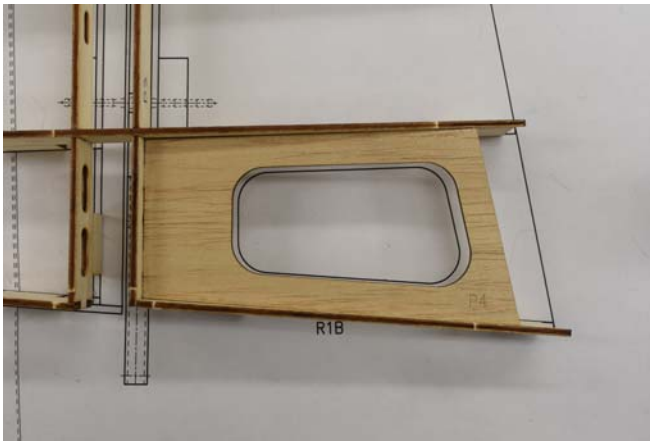




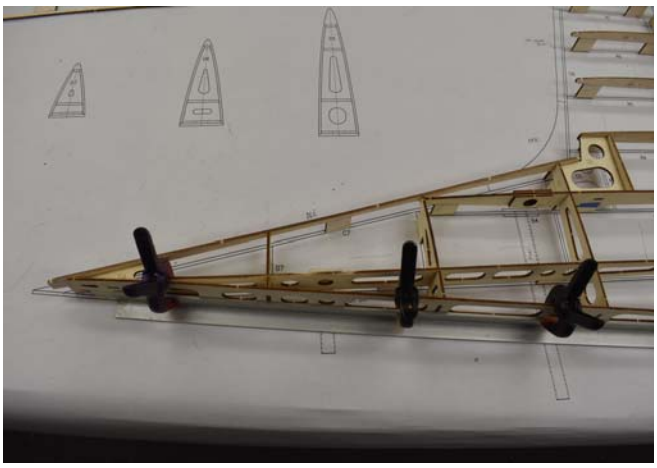
6. Glue in **G5** and **P5**.

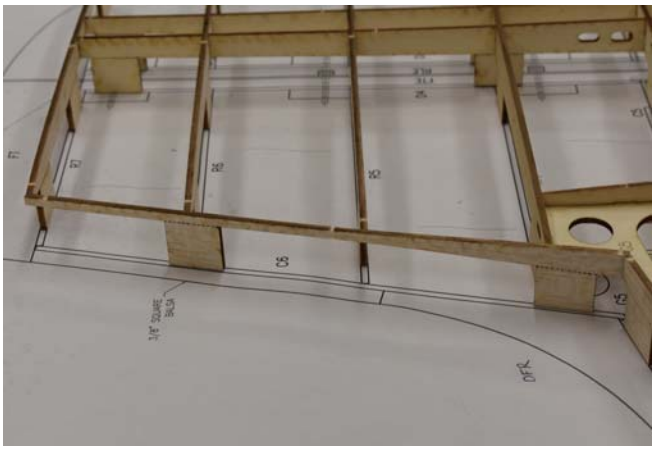


7. Glue **P4** and **R1B** into position.

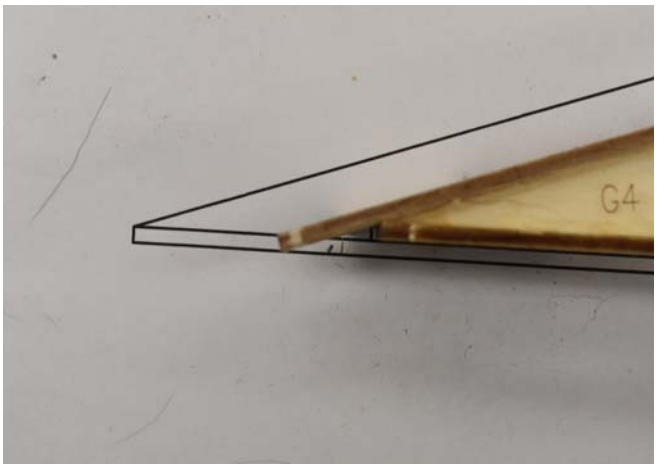


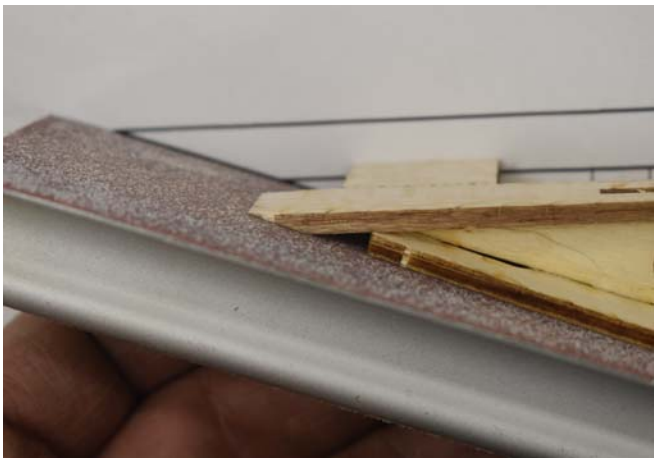
8. Glue on **C7** and **C6**.

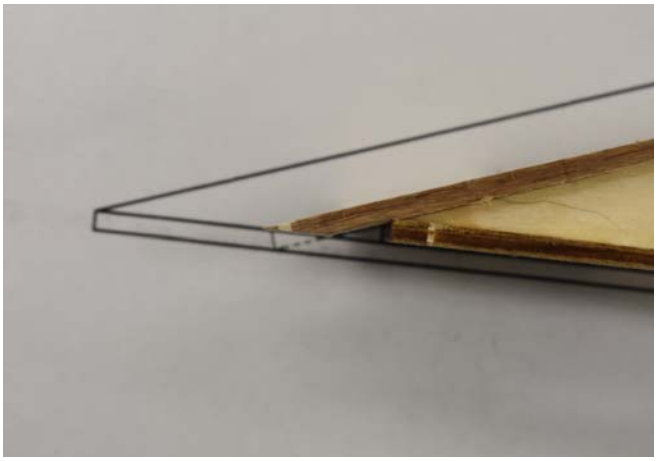




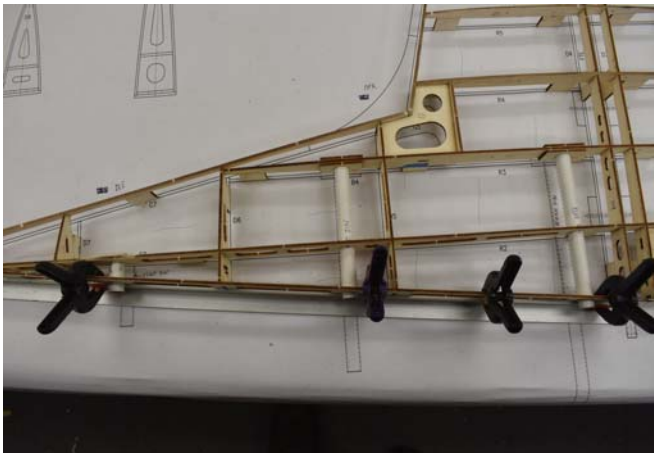
9. Sand the overhanging balsa **C7** flush with the bottom of the rib.



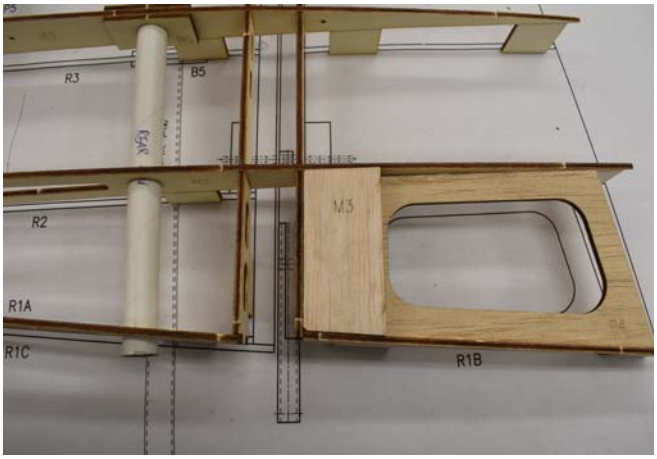


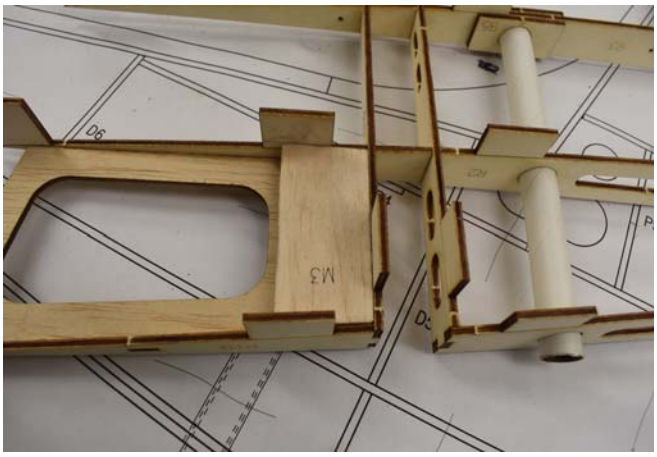


10. Glue in the cardboard socket tubes. Do not trim off the excess. CA or epoxy harden the cardboard tubes. You can also just wrap them with masking tape after they are glued in.



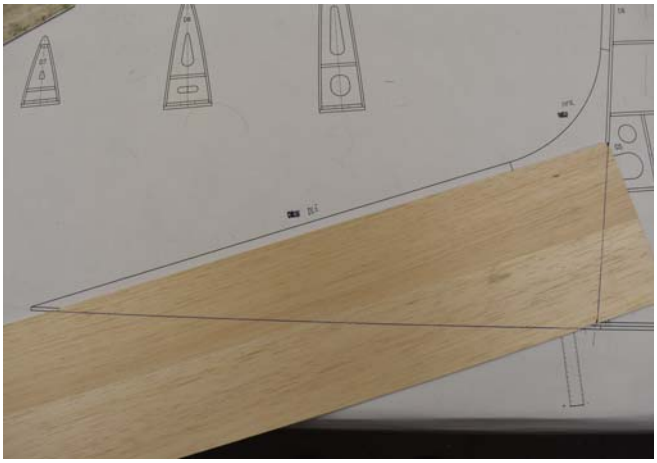
11. Glue in **M3** to both sides of **P4**. Carve and sand the one on the top side to the ribs.

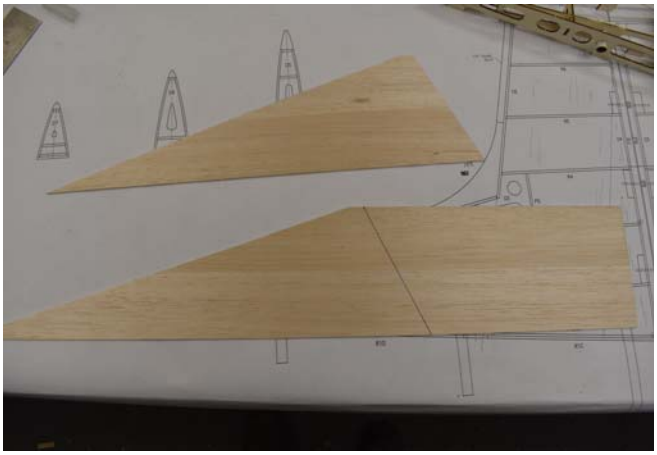




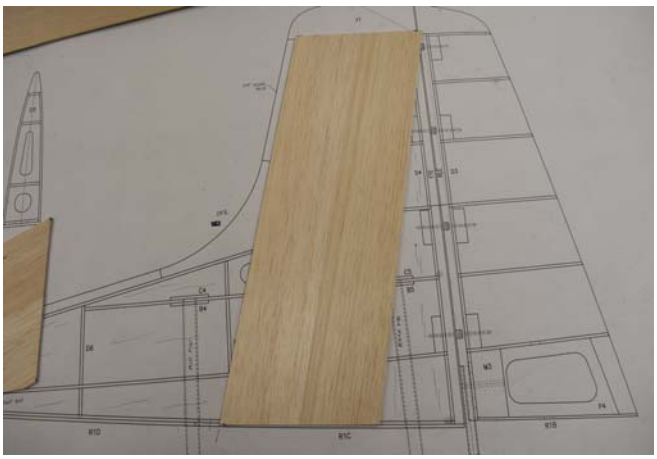
(Sheeting*)*

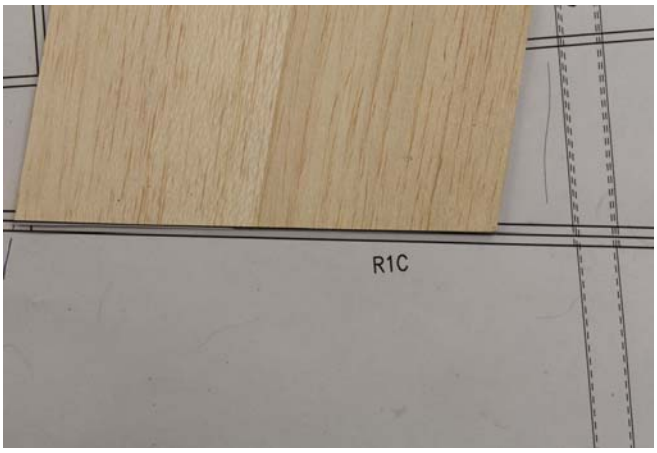
12. From a 3/32" thick 6" wide balsa sheet cut the dorsal fin sheeting. Cut the other side from the same sheet.



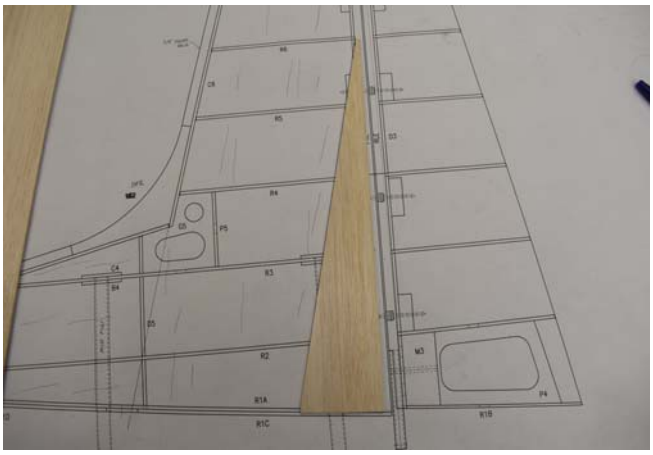


13. From another 6" wide sheet, cut the front fin sheeting. Cut this sheeting accurately so you can cut the other side from the same sheet.

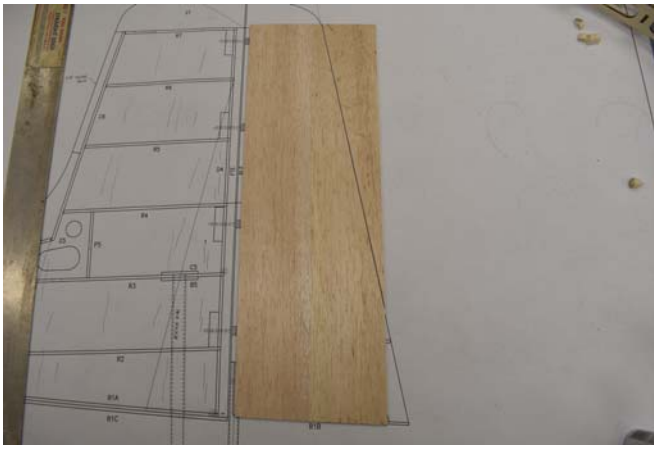




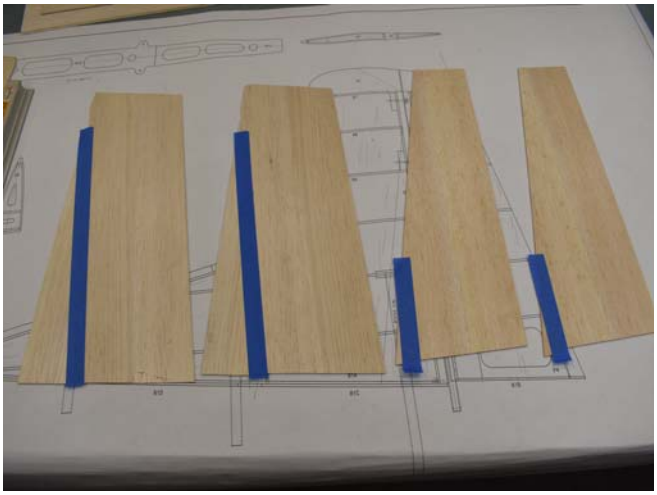
14. From a 3” wide sheet, cut the rear fin sheeting. Cut the other side from the same sheet.

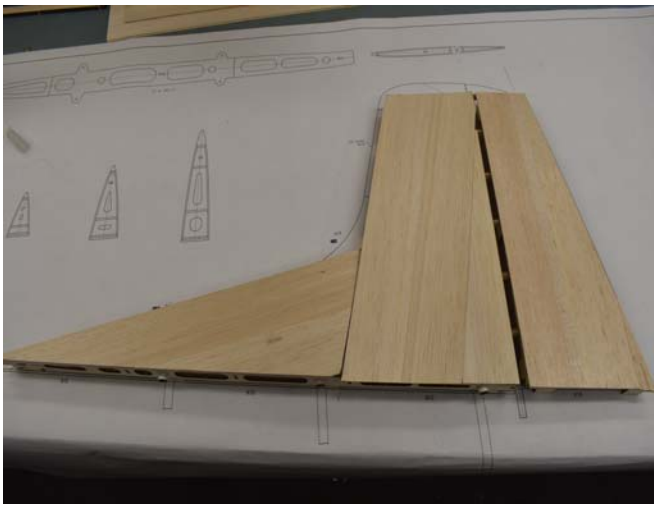


15. Cut the rudder sheeting from a 6” wide sheet. Use the scrap cut off sheet to fill in the bottom rear of the sheeting.

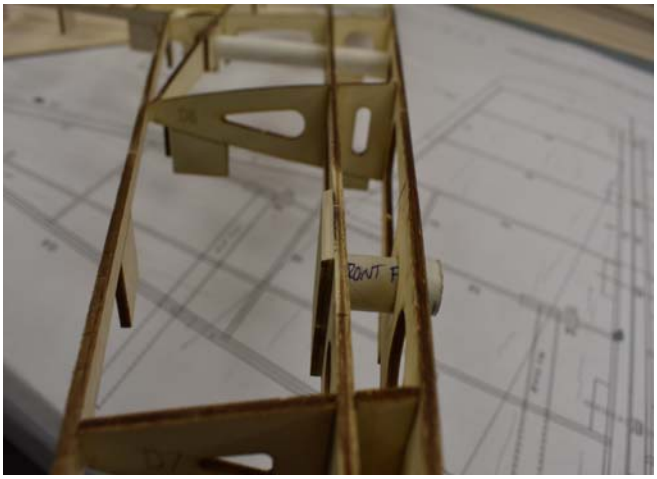


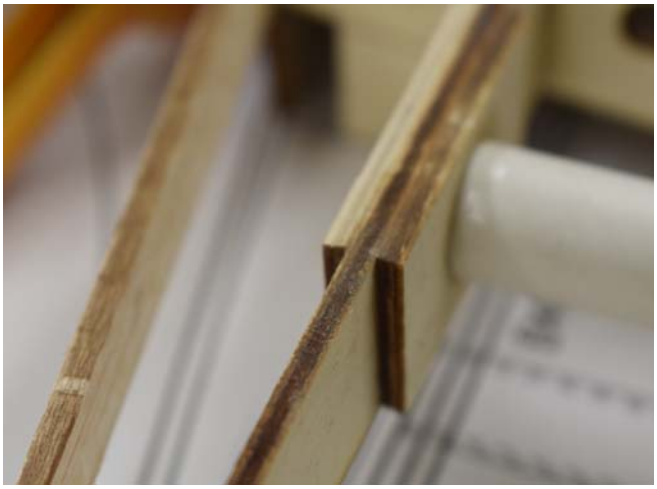
16. Glue the fin and rudder skin together.

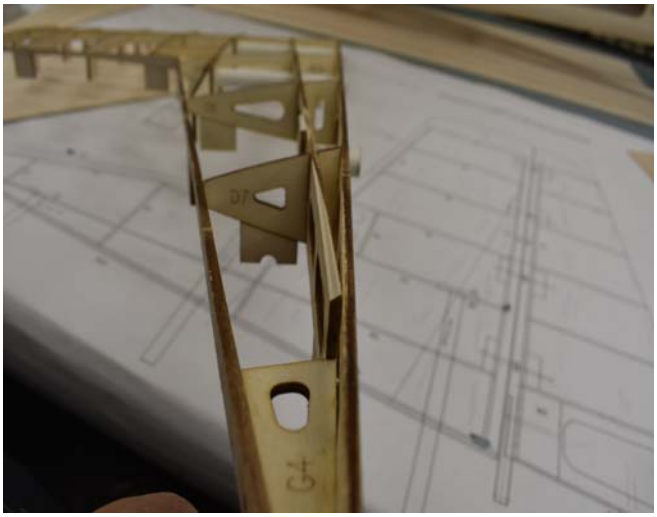




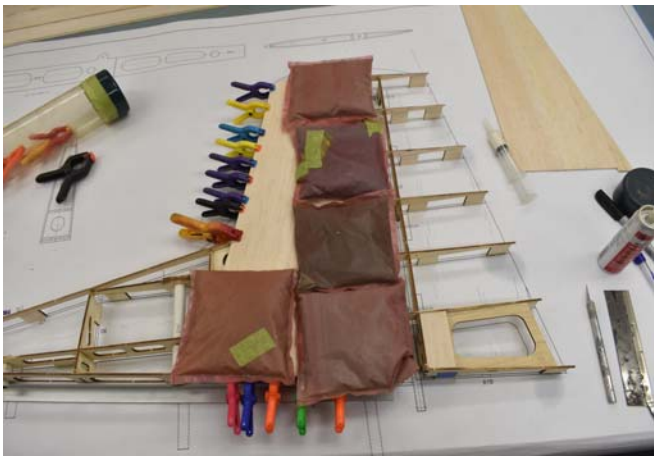
17. So there wont be “a lump” under the skins, bevel **C3** and **C4** and the front section of rib **R2**.



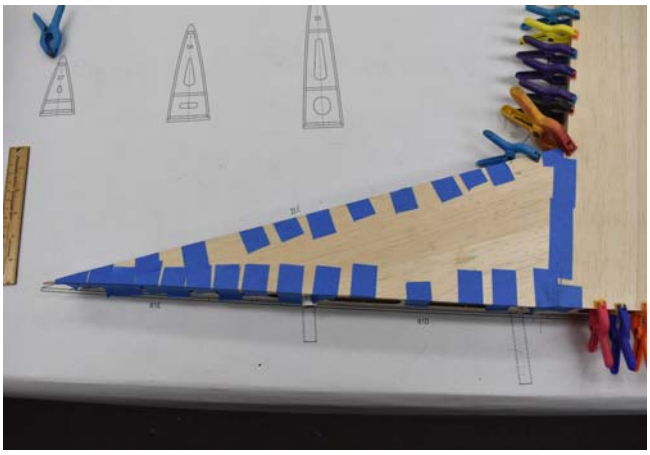


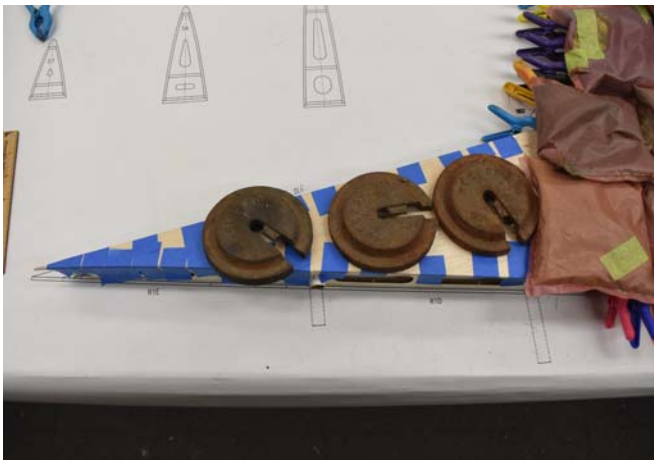


18. Glue on the fin sheeting first. Use a clamp where the dorsal meets the fin.



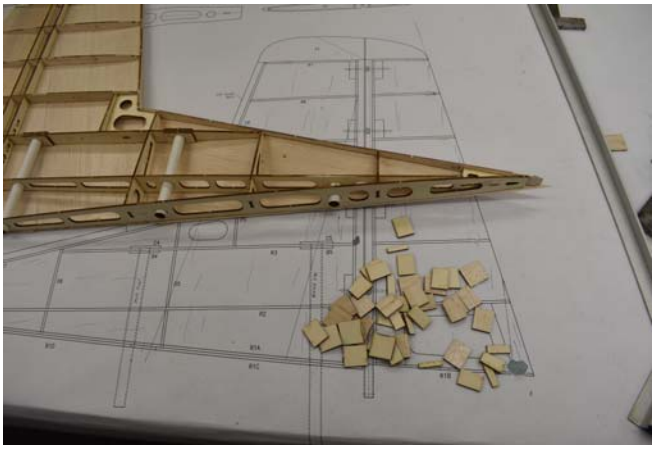
19. Glue on the dorsal fin sheeting.



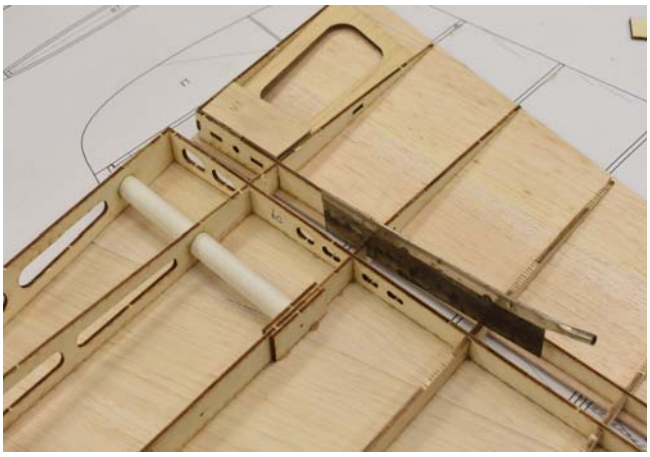


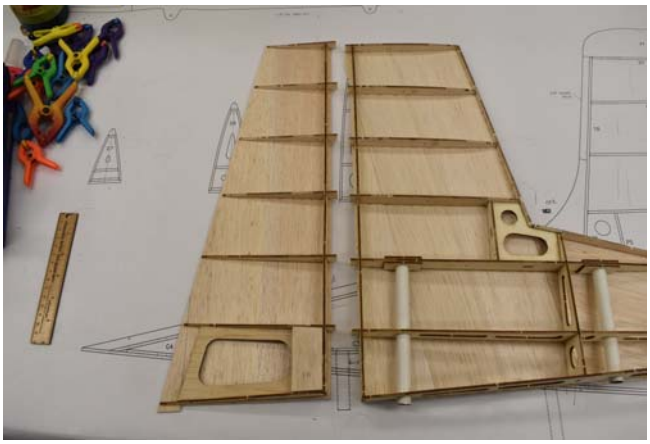
20. Glue on the rudder sheeting. Use a 1” 90° angle to keep the trailing edge straight i.e. not to create a wavy edge. Weigh down with weights.

21. Snap all the build tabs off from the other side.

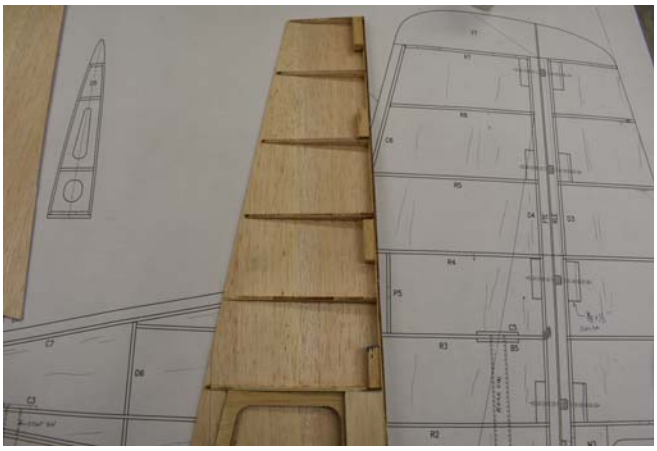


22. Cut and separate the fin from the rudder using a razor saw.

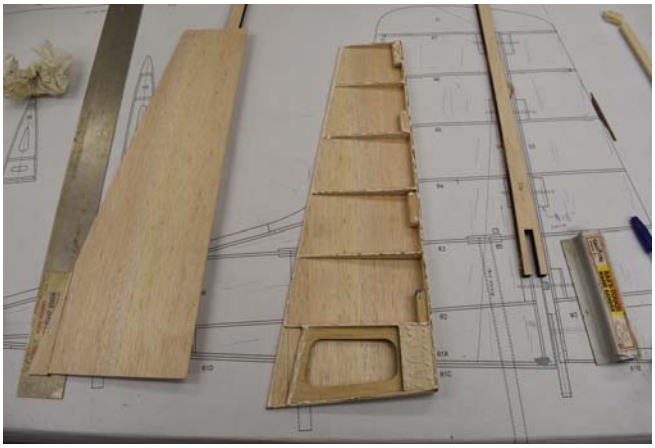




23. Cut and glue in the hinge blocks from 3/8” x 1/2” balsa stock. Then plane and sand to the rib contour **M3** and any protruding hinge blocks.

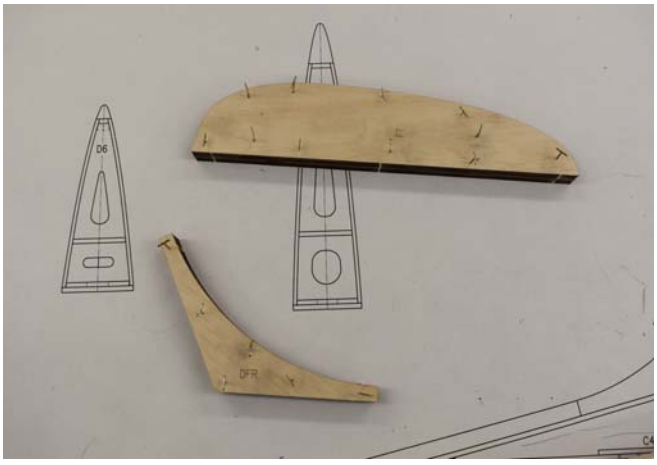


24. Glue on the skins to the other side. **IMPORTANT**! Do not use any weights on this side or you may warp the L.E. of the rudder or T.E. of the fin. (It has a slight concave shape). Instead, use plenty of clamps and tape.

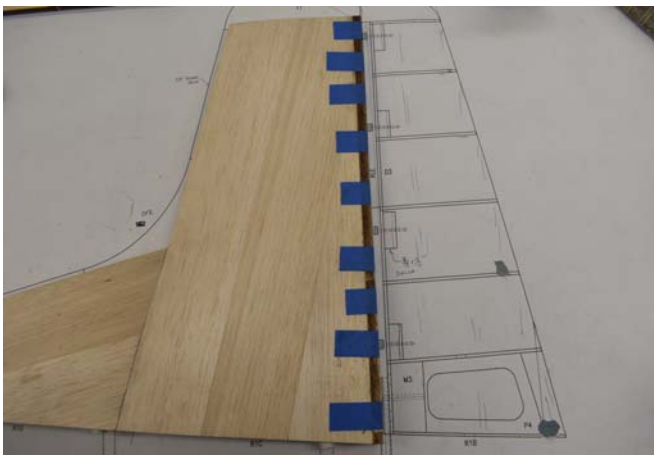


(Tips, Leading and Trailing Edges)

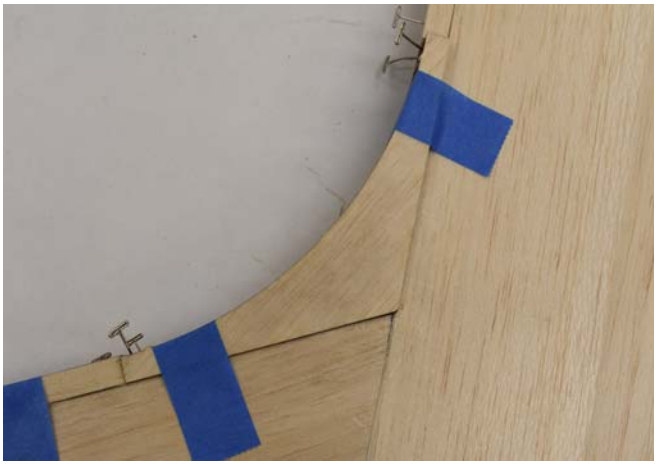
25. Glue together the two **DFR**'s and **FT**'s.



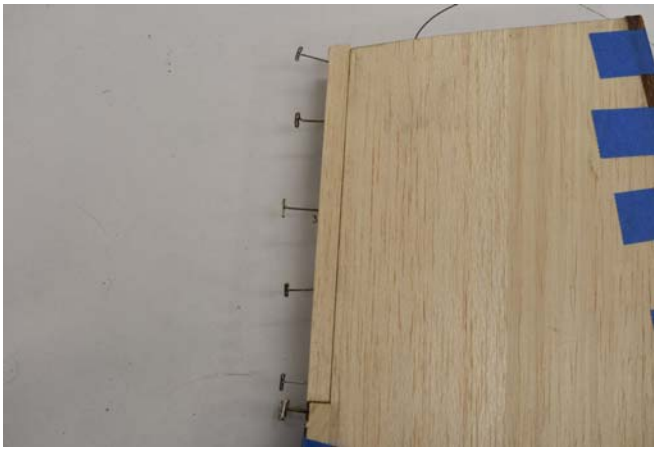
26. Glue on **FTE** to the back of the fin.



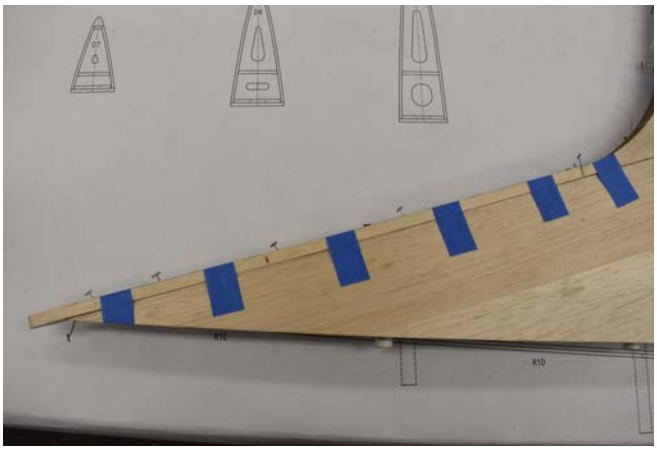
27. Glue on **DFR**.

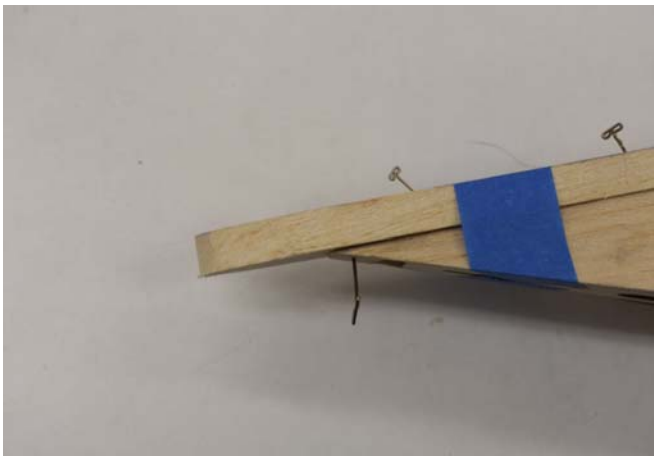


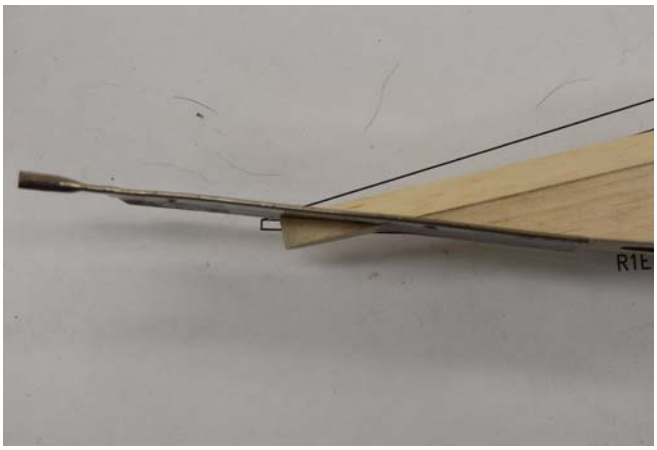
28. Cut and glue on a 3/8" square balsa L.E.



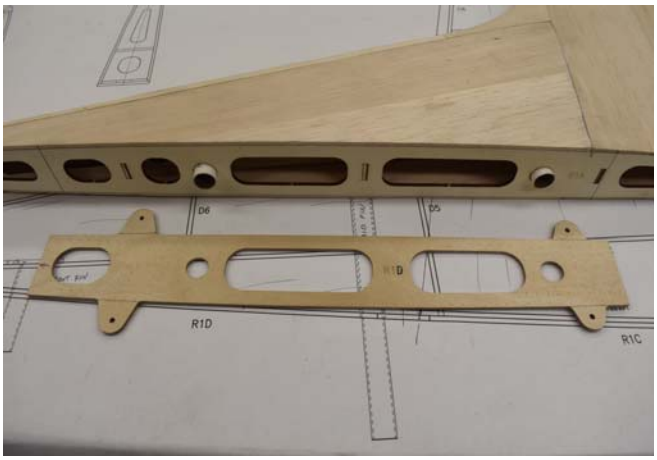
29. Glue on **DLE**. Then cut and sand the overhanging piece flush with the bottom of the rib.

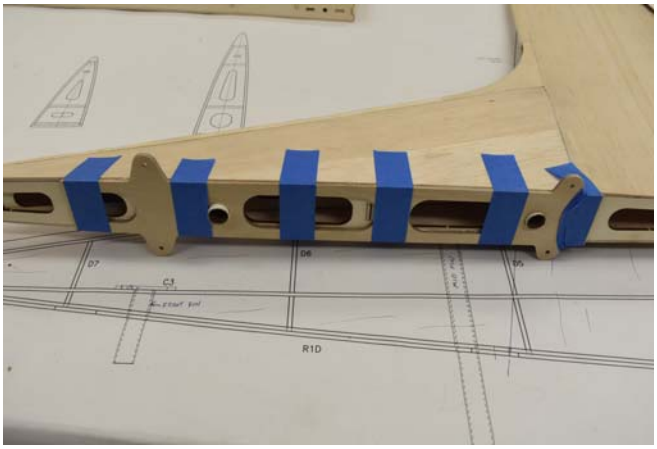




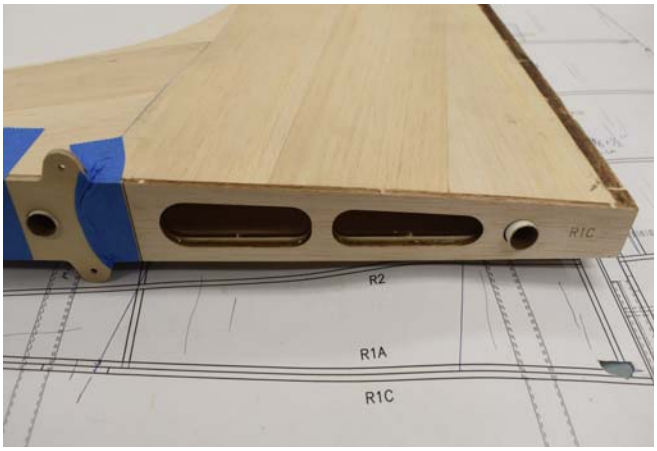


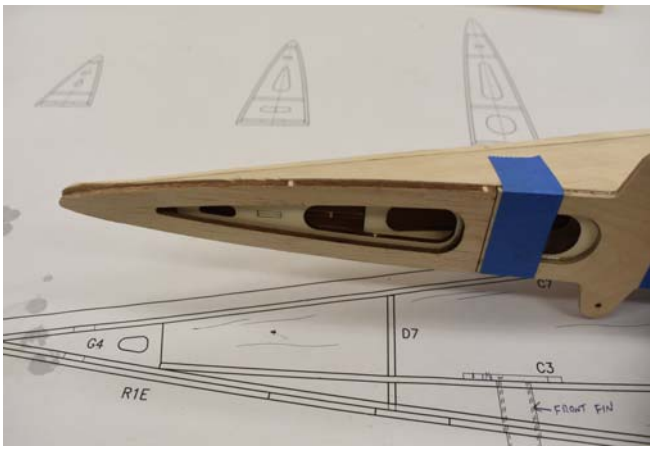
30. Epoxy (15 to 30 min.) **R1D** to the bottom of the fin. Arrow faces towards the front.



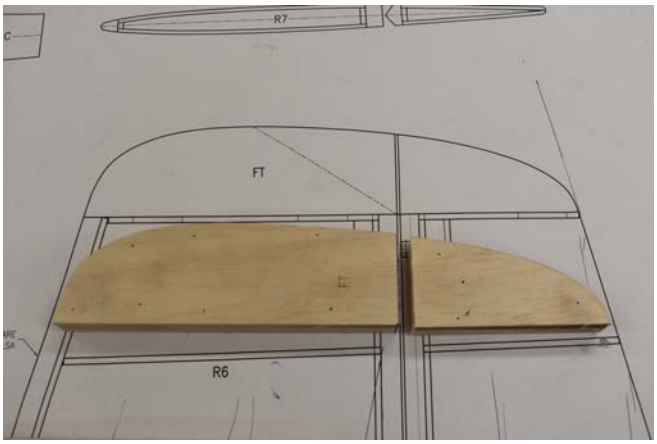


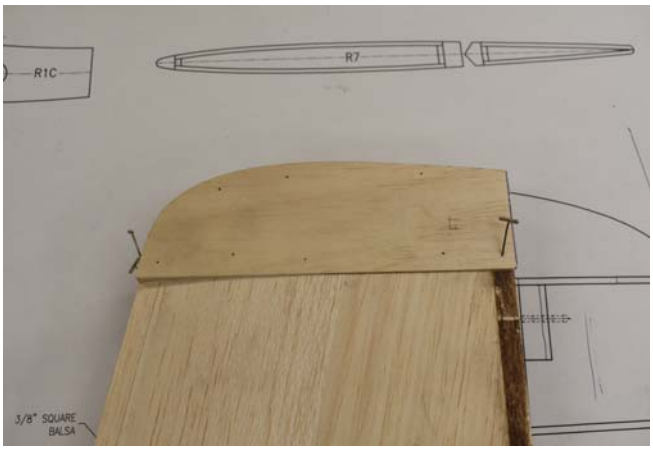
31. Glue on **R1C** and **R1E**.



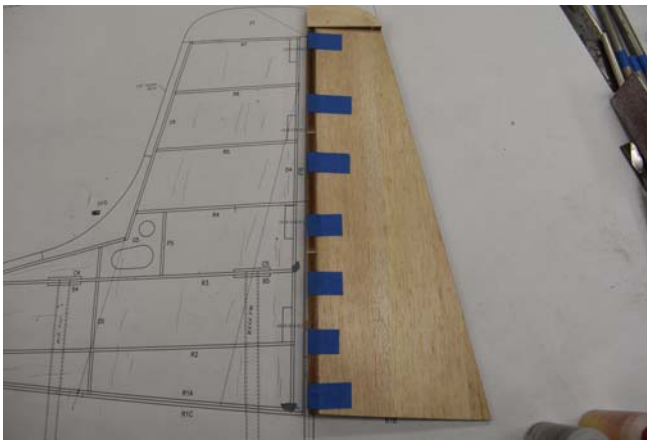


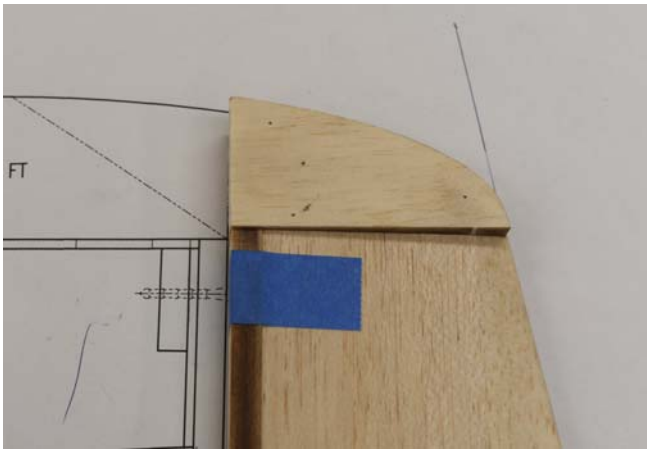
32. Cut the fin tip **FT** to your choosing. The slanted forward “balance” line is scale. For use as a dedicated tow plane, cut the block on the hinge line.





33. Glue **RLE** on to the leading edge of the rudder followed by the top tip block.





34. Trim the three cardboard socket tubes flush. Sand the two balsa bottom pieces flush with the ply bottom **R1D** with a long sanding bar.

(Carving, shaping & sanding*)*

35. Carve and shape the leading edge of the fin first followed by the top block. Then do the dorsal fin leaving the **DFR** dorsal fin radius last.

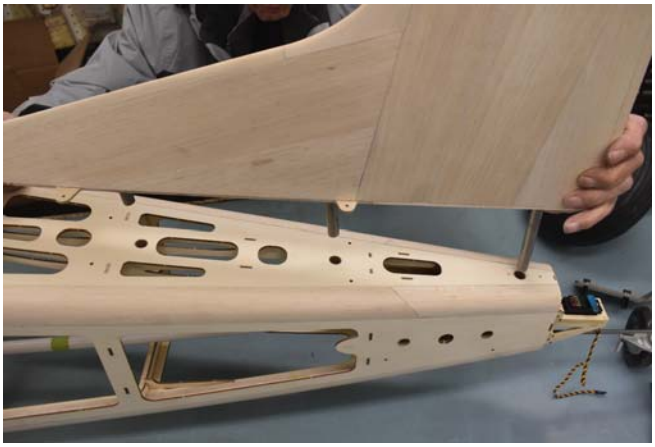
(Hinging*)*

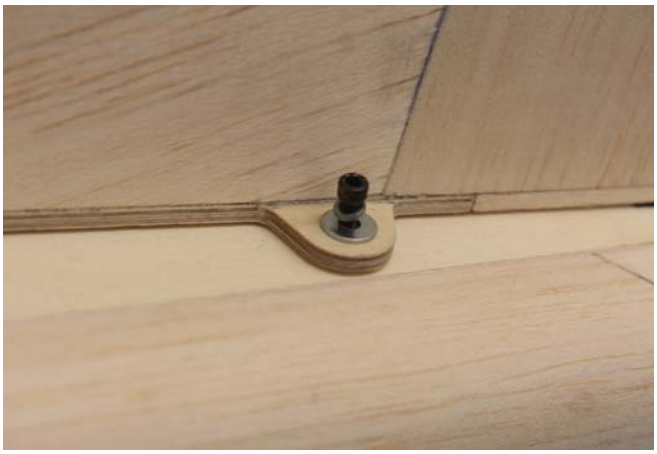
36. Mark the hinge point locations and drill 3/16" diameter holes. Bevel the leading edge of the rudder and dry hinge the rudder to the fin.

(Mounting Fin*)*

37. Cut the 1/2" carbon fiber tubing as shown in SKETCH-2 in the back of this manual. Wrap a layer of masking tape around the tube before cutting them to length to prevent fraying. (Pictures shows aluminum tubing). Then sand a small chamfer (no greater than 1/16") onto each end.

38. Lower the fin onto the fuselage and if it is not sitting all the way down, then one or more of the tubes are just a little too long. Remove the tube in question. Check it without the tube in place to verify. Adjust length of tube as needed. Once everything fits good and flush, secure the fin to the fuselage with four 4-40 x 1/2" long socket head bolts with lock and flat washers.



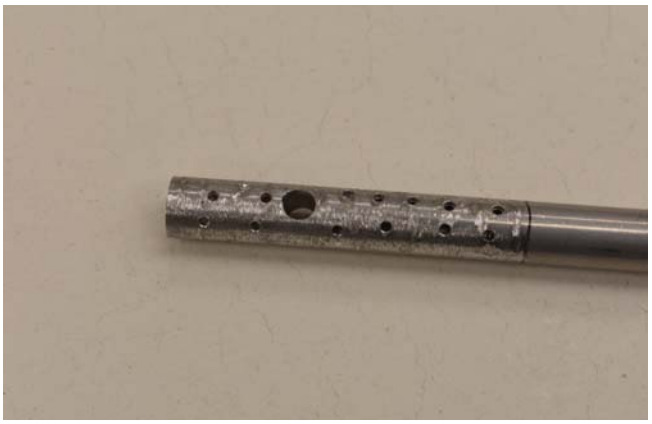


(Torque Tube)

39. Locate the 3/8" O.D. x 3 1/2" long aluminum tube and measure down from one end 3/4" and drill a 3/16" diameter hole through it for the 3/16" diameter x 1 3/4" long aluminum rod. Then measure up from the opposite end 1/4" and drill a #35 dia. hole 90° from the first hole. All holes are drilled completely through the tube.

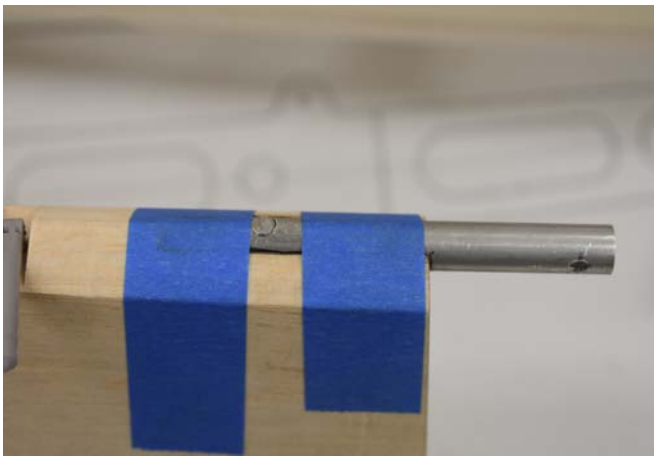
40. Using a 3/16” dia. drill bit, drill through the balsa blocks that is glued into the base of the rudder. Then drill a few 1/16” dia. glue dimple holes.

41. Roughen up the aluminum tube where it will be making contact in the rudder slot with a file and/or Dremel cut off wheel and drill a couple of rows of 1/16” dia. glue dimple holes.



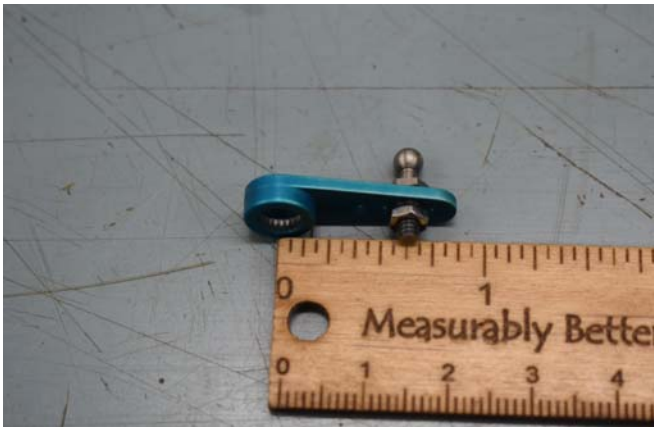
42. Roughen up the aluminum rod with a file and/or Dremel cut off wheel.

43. Using 30 min. epoxy, thoroughly glue the rod into the tube and the toque tube assembly into place.

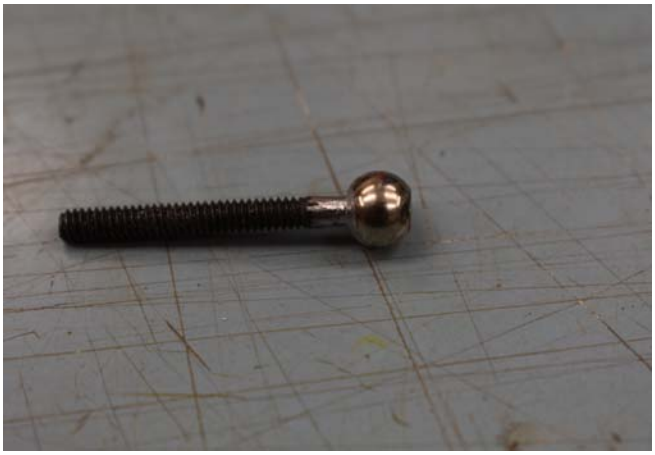


44. Mount you rudder servo with the output shaft towards the rear and close to the right side in the mount.

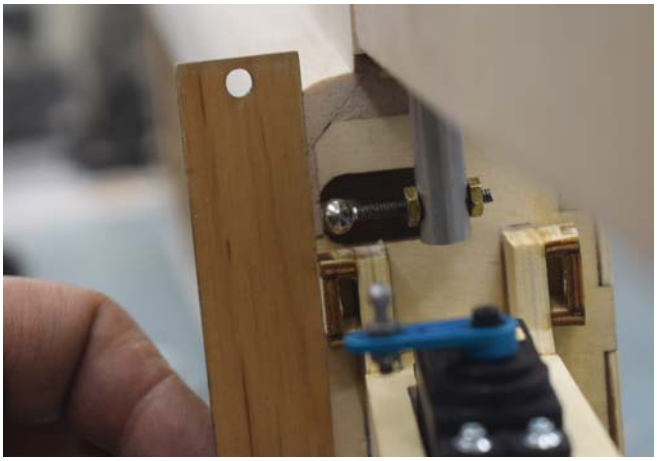
45. From the included Sullivan quick release ball link, mount the ball post to your servo arm 5/8” from the center. Use blue thread locker on the nuts.



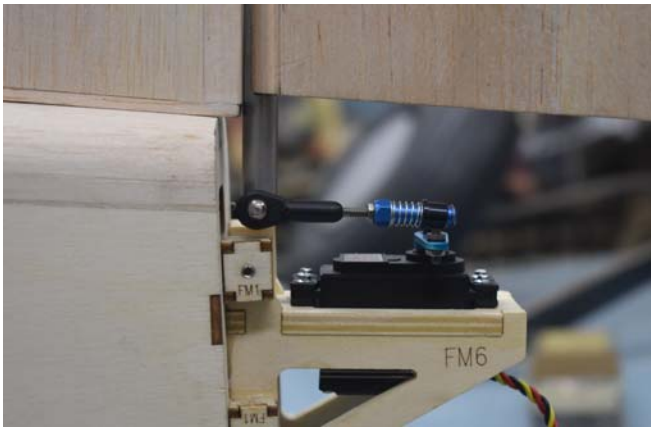
46. Cut the head off of a 4-40 x 1 1/4" long socket head bolt and file black oxide off the end. Silver solder the ball onto the end. The stud is clamped gently in a vise at one side with the ball on top. Use flux, warm up the ball first then move your flame to the bottom side heating up the stud bolt and ball. Let the solder flow down until it works down past the ball. Allow to cool and clean with acetone. File away excess solder below the ball.



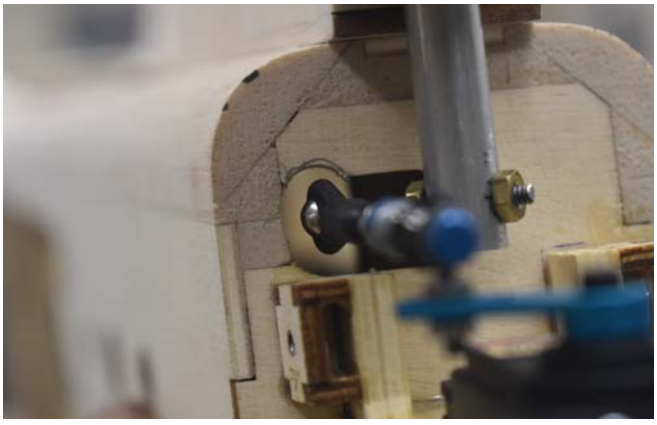
47. Mount this to the tube using two 4-40 hex nuts and blue thread locker so its 1/16" inside of the tail cone mounts.



48. Thread into the black ball link the 4-40 x 1" long stud bolt followed by a small pattern jam nut and then the Sullivan quick release ball link. Adjust pushrod length and use thread locker on jam nut.

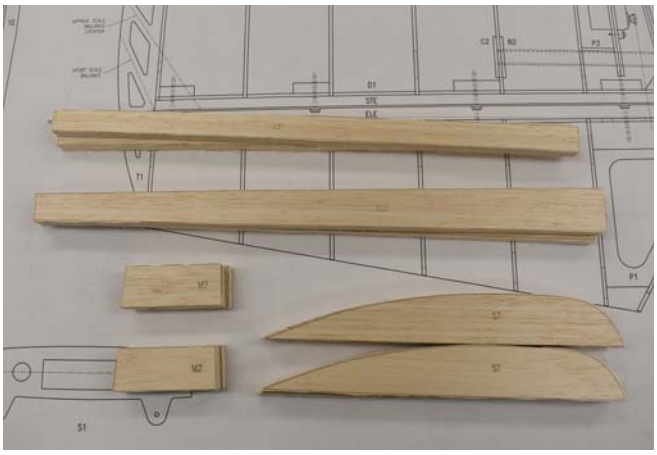


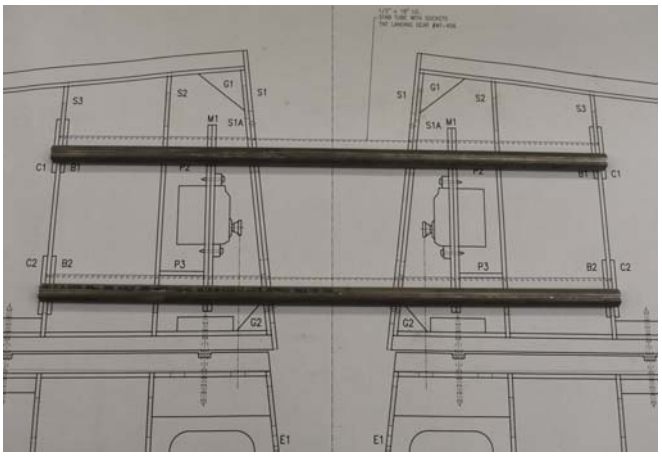
49. Enlarge opening in rear former as needed for 1/16" clearance.



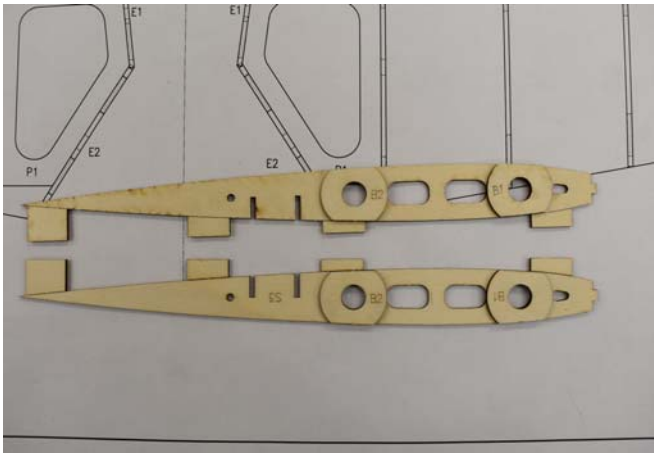
STABILIZER AND ELEVATOR

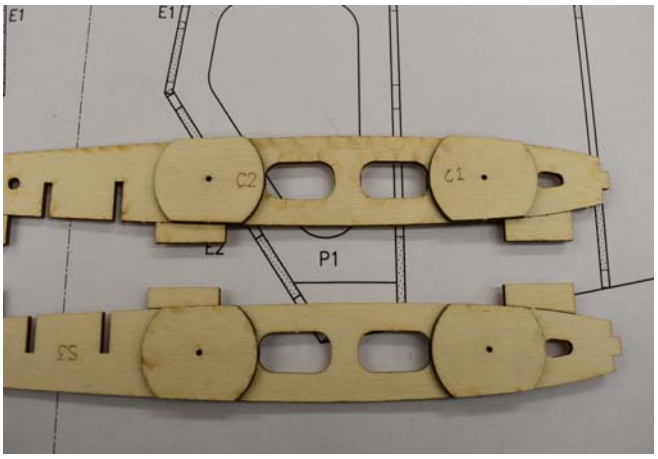
1. Cut out the parts from the three 1/2" balsa sheets and the stabilizer joiner tubes to length.



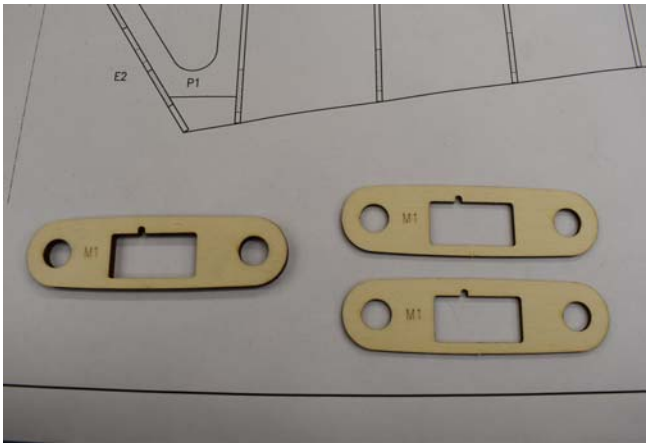


2. Glue **B1** and **B2** onto rib **S3** as shown. Then **C1** and **C2** on the back sides. (Make a left and right hand).

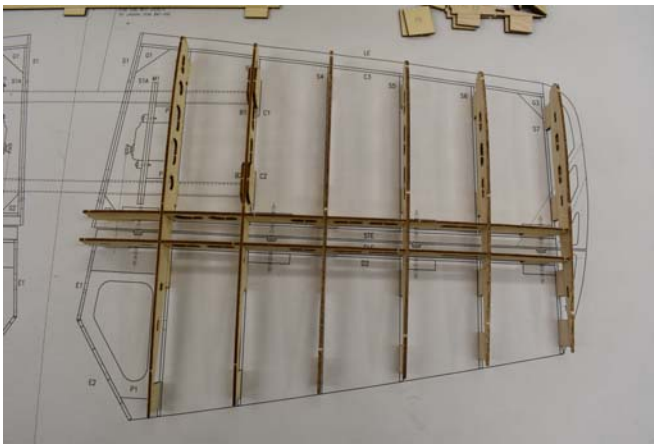




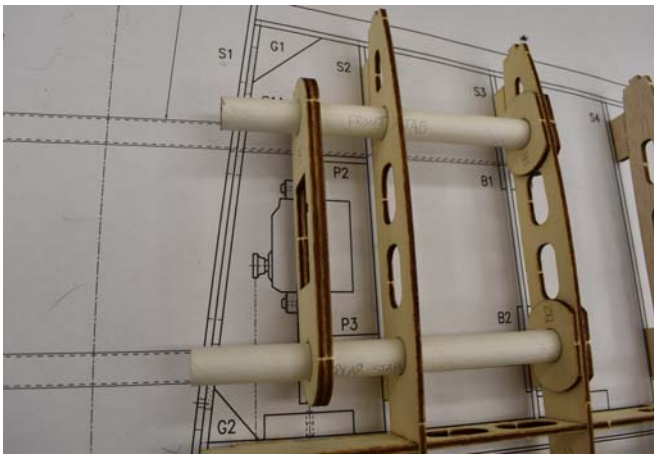
3. Glue two **M1**'s together.



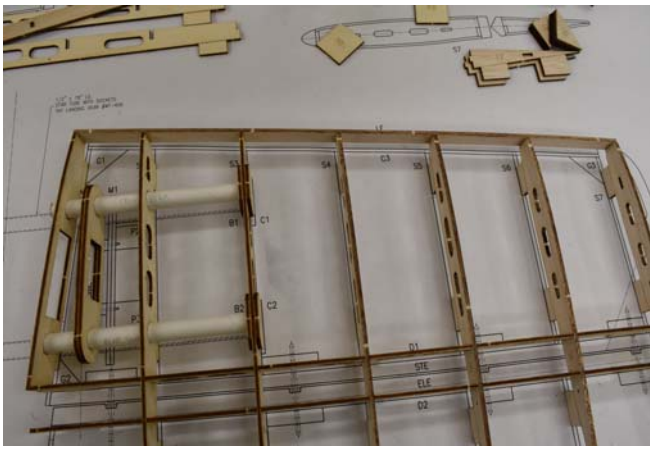
4. Assemble ribs **S2** through **S7** onto **D1** and **D2**.



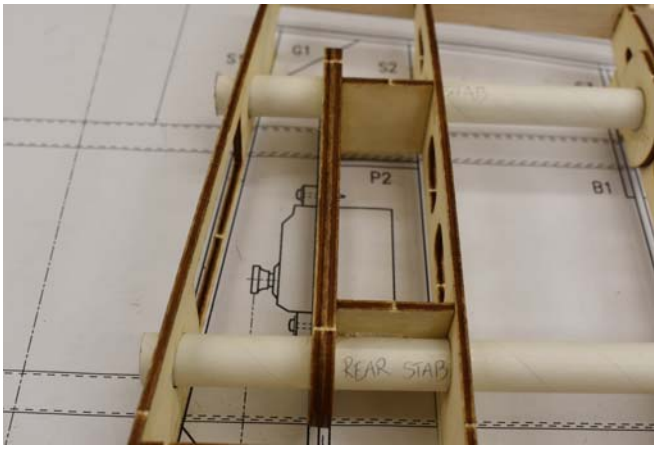
5. Insert the rear and front cardboard stab tubes into place followed by the **M1**, The arrow faces forward on **M1** and the servo wire notch is on top. Do not glue yet.



6. Glue on balsa part **C3** and slip on rib **S1A**. Glue the rib to **D1** and **C3** only at this time. Do not glue it to the tubes yet.

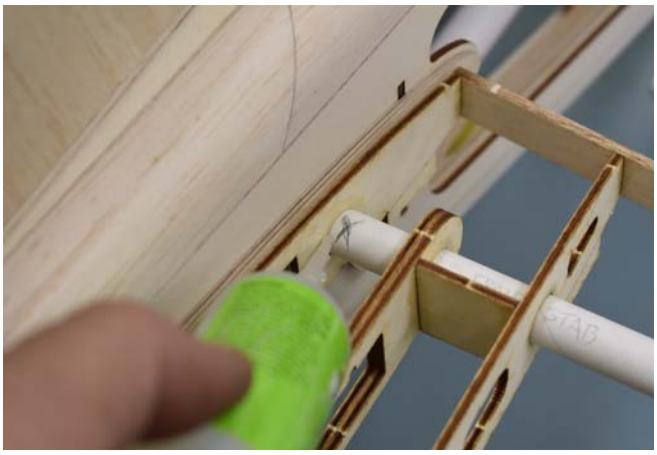


7. Glue **P2** and **P3** into position. Arrow points to **M1**. Then glue **M1** in place.



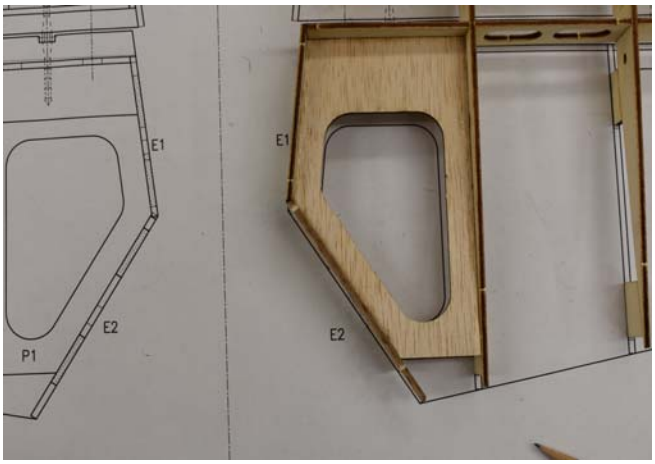
8. Clamp on **S1** (do not glue on) and trim the socket tubes flush.

9. Remove the clamps leaving on **S1** and insert the stabilizer onto the fuselage using the carbon fiber joiner tubes. Hold **S1/S1A** ribs up against the fuselage and glue the tubes to rib **S1A**.

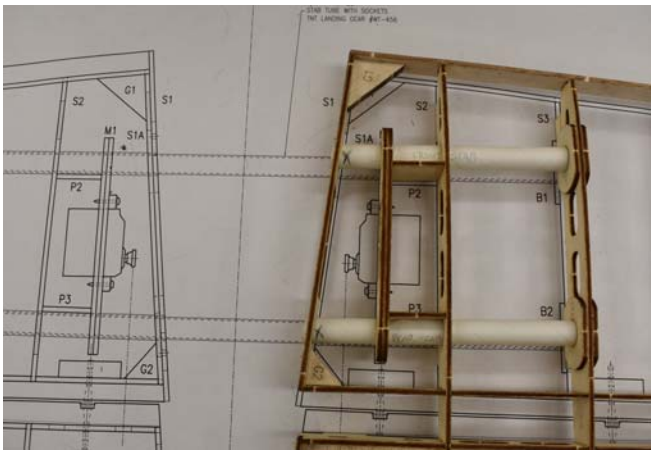


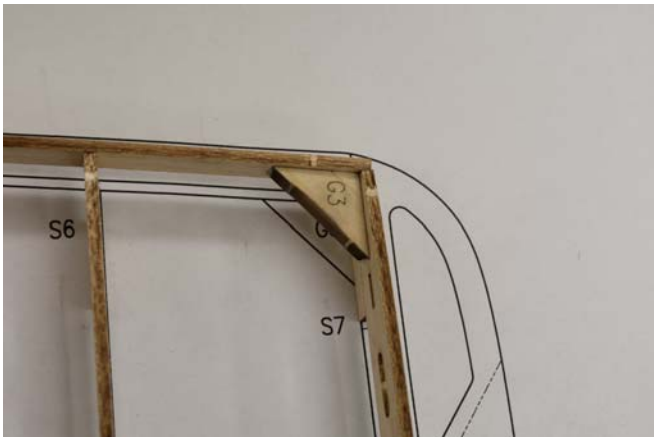
Once done, remove plywood rib **S1**.

10. Glue in **P1** followed by ribs **E1** and **E2**.

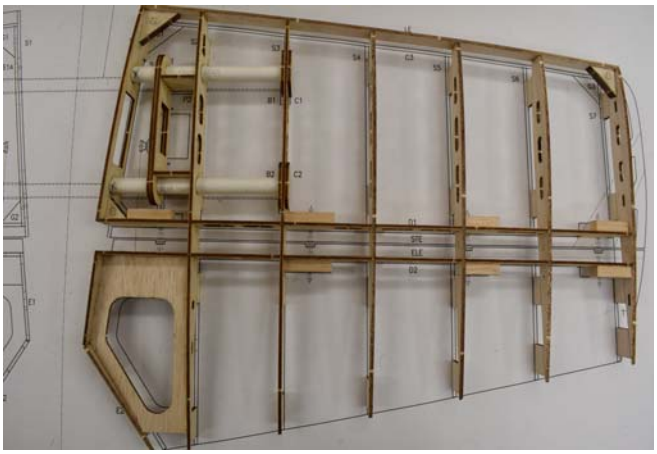


11. Glue in gussets **G1**, **G2** and **G3**. CA or epoxy harden the cardboard tubes or better yet, wrap them with masking tape especially between the root rib and servo tray.



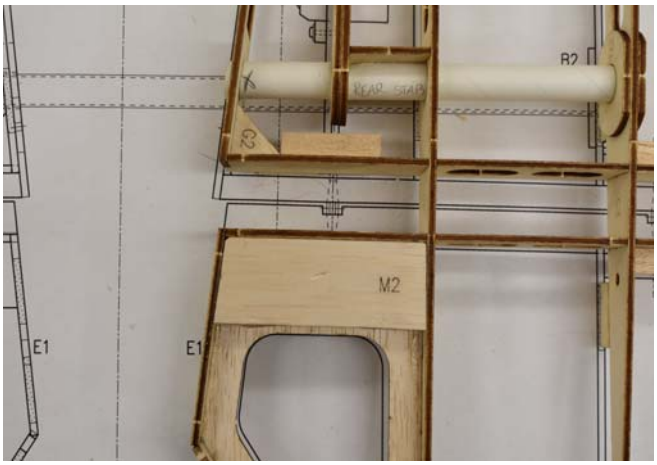


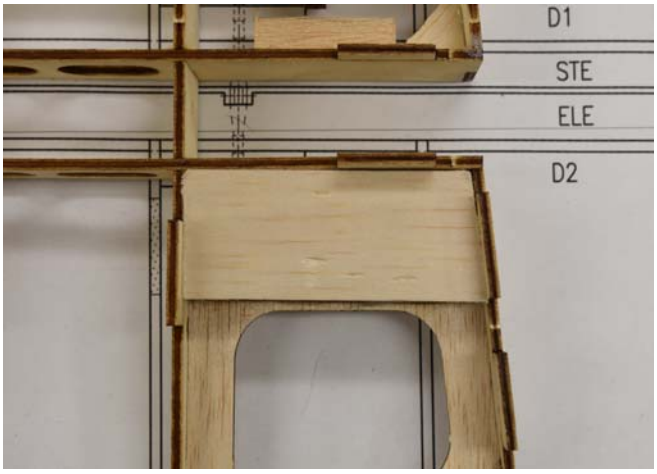
12. Cut and glue on the hinge blocks from 1/2” x 3/8” balsa sticks. If you are going to do the scale elevator balance, then glue the last two hinge blocks to rib S6.



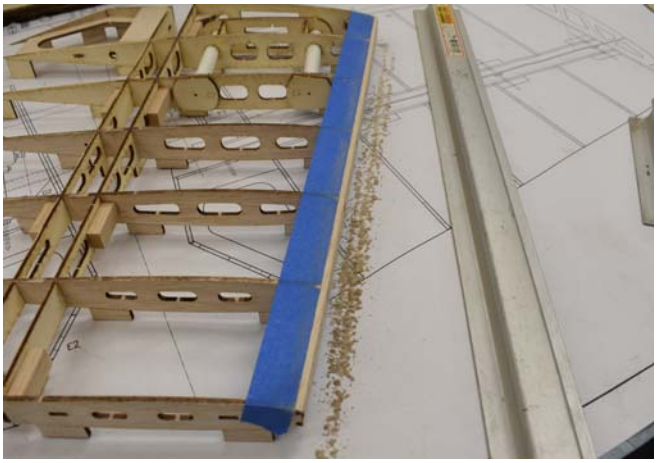
Picture shown is going to be for the tow plane version.

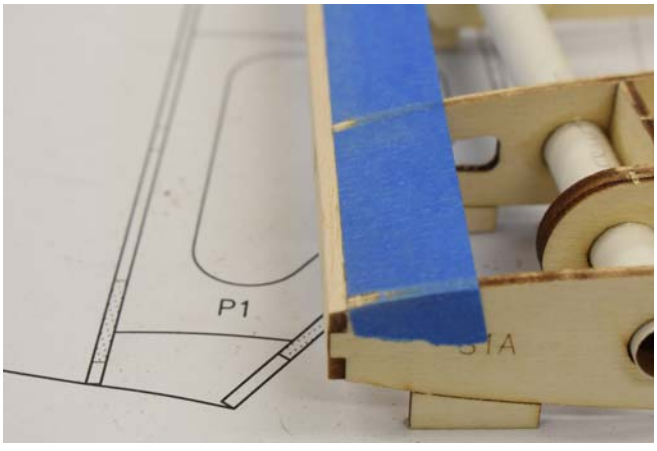
13. Glue **M2** in place on both top and bottom of **P1**. Carve and sand the top block flush with the ribs. The bottom will be done later.





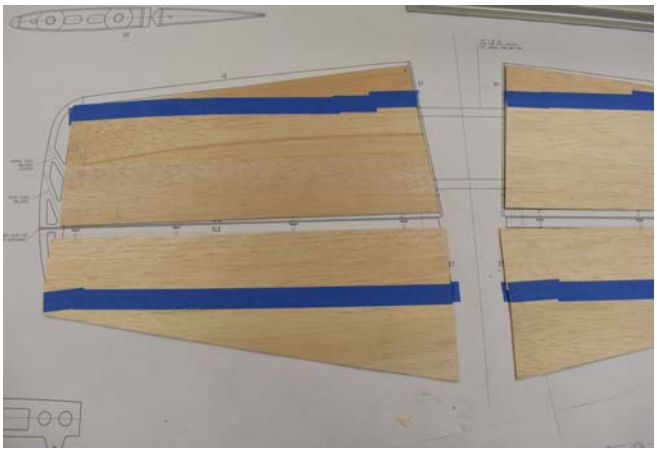
14. Lay a strip of tape down over the ribs and sand **C3** to the contour of the ribs. The bottom will be done later.



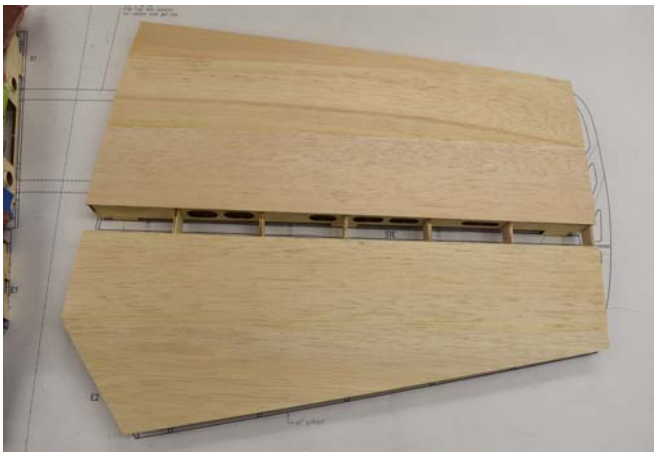


(Top Sheeting)

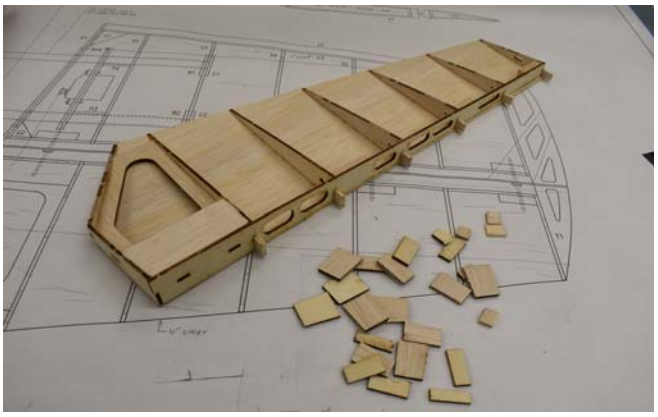
15. Make up the 3/32” thick balsa skins. See SKETCH-3 in the back of this manual.

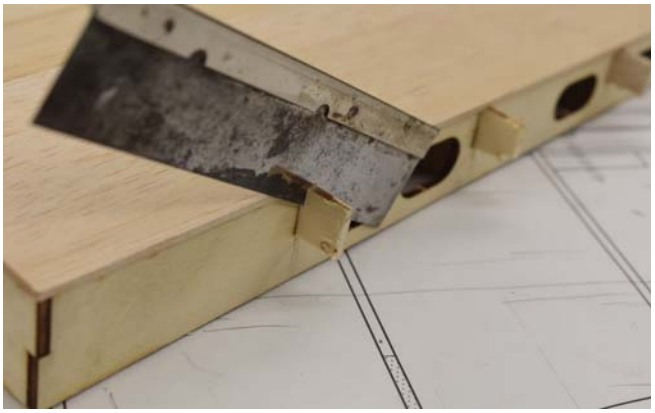


16. Glue on the skins using tape and weights.



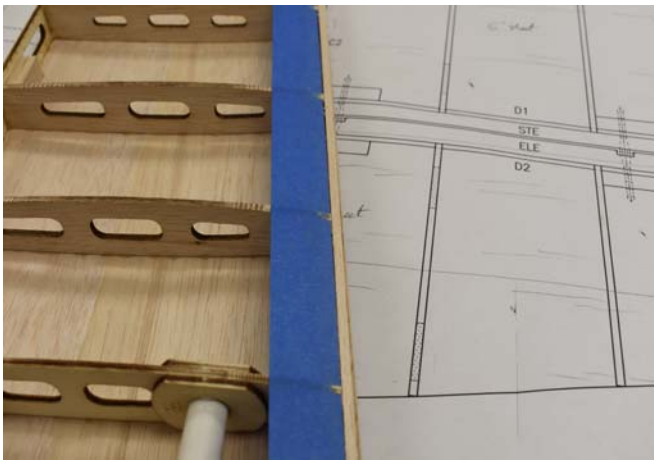
17. Cut the elevator from the stabilizer using a razor saw. Break off the tabs and trim remaining rib pieces flush.





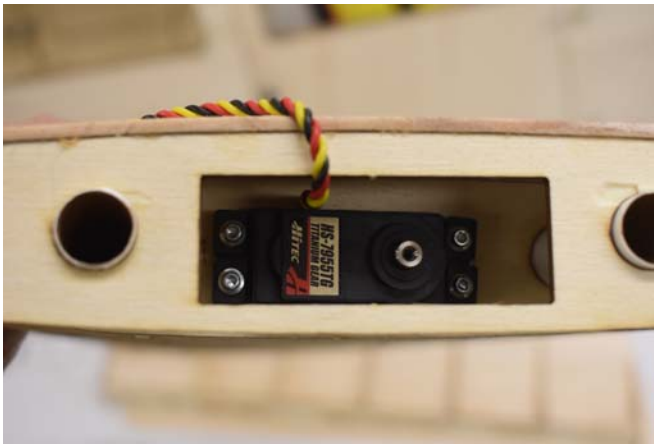
18. Carve and sand **M1** flush with the ribs.

19. Lay a strip of tape down over the ribs and sand **C3** to the contour of the ribs

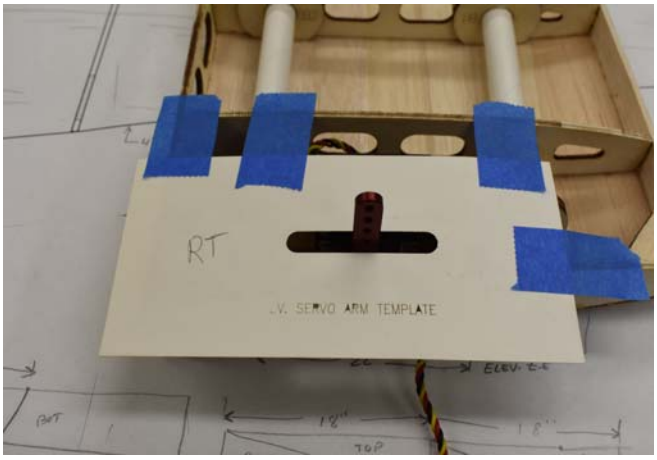


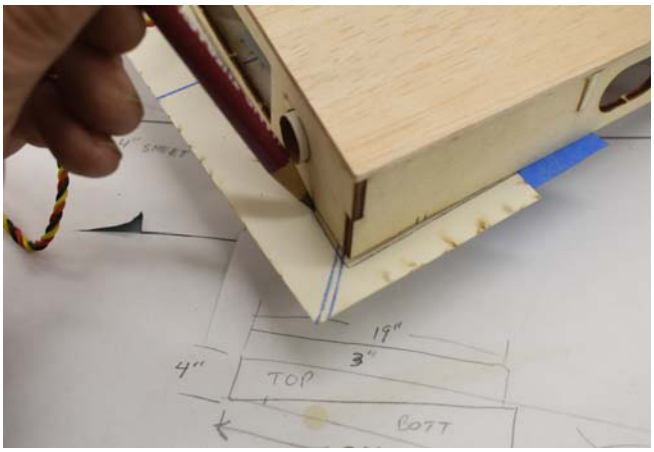
(Mounting Servo)

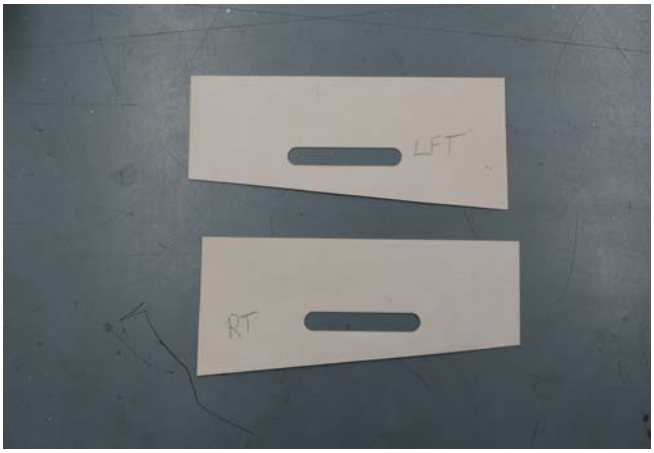
20. Mount your elevator servo. Output shaft is towards the rear.



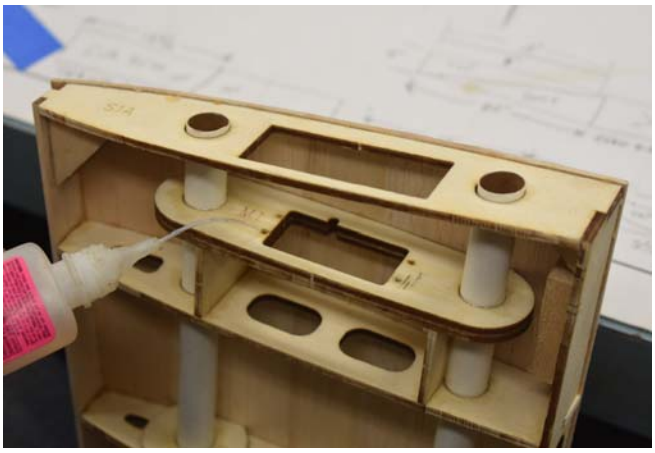
21. Install your servo arm onto the servo. Center the opening of the cardboard ELV. SERVO ARM TEMPLATE and tape onto the ribs. Mark left or right onto the template. Flip over and trace the side and back edge of the stab onto the template. Cut on traced lines and set template aside.





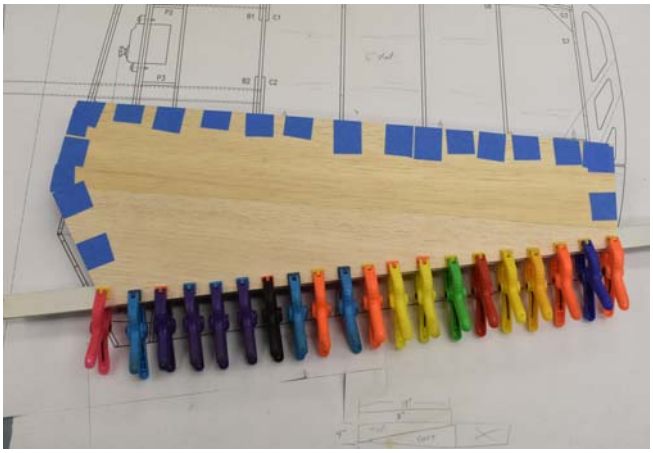


22. Remove the servo and thin CA harden the mounting holes.

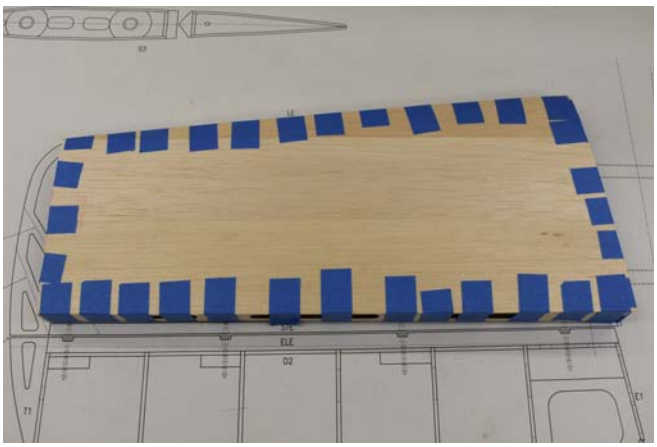


(Bottom Sheeting)

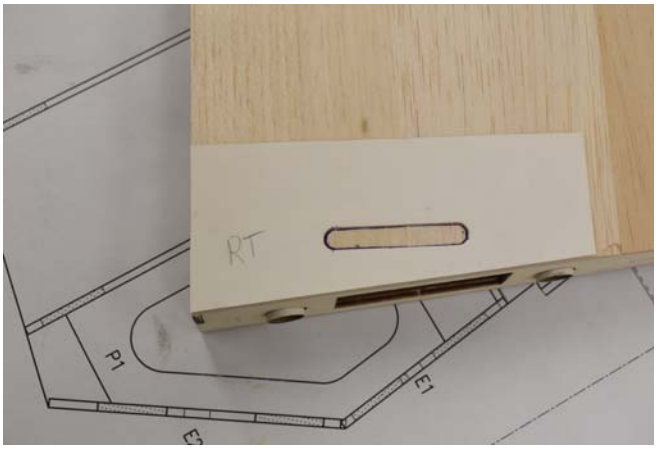
23. Skin the bottom of the elevator using tape at the sides and leading edge. To keep the trailing edge straight and true, use two 90° angles and clamps or one angle and a stiff strip of wood or metal on the other side as not to get wavy spots between the ribs.

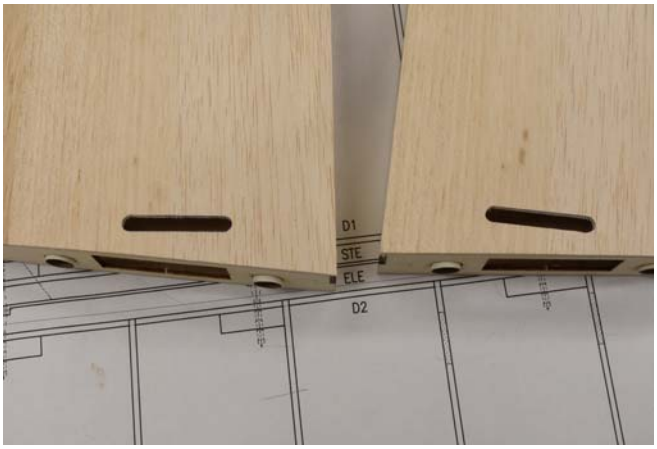


24. Skin the bottom of the stabilizer using tape only.

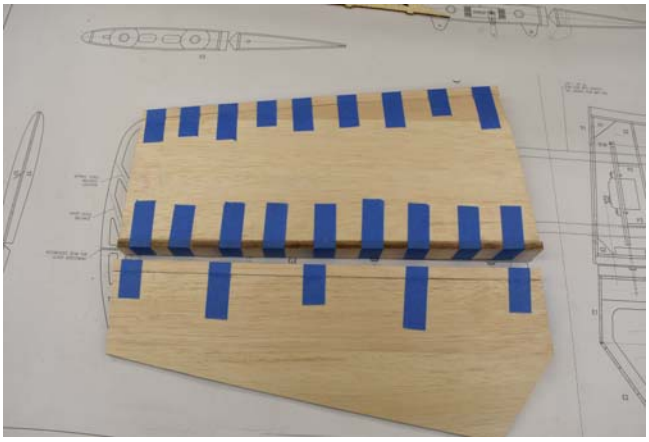


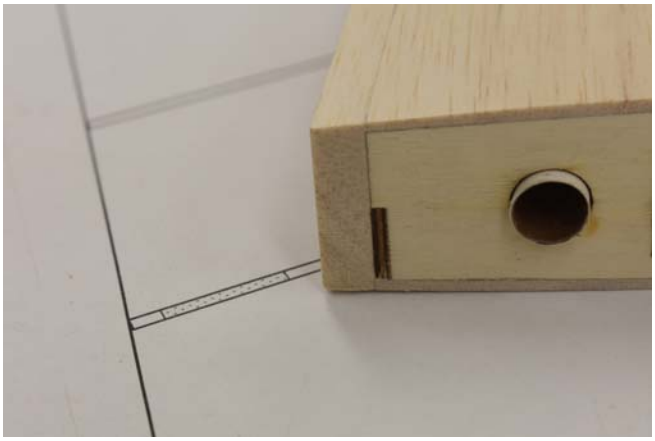
25. Use the templates and cut the servo arm exits from the <u>bottom</u> of the stabilizers.





26. Glue on the balsa leading and trailing edges and plane and sand them to the skins' contour. Do not round the L.E. or bevel the elevators yet.

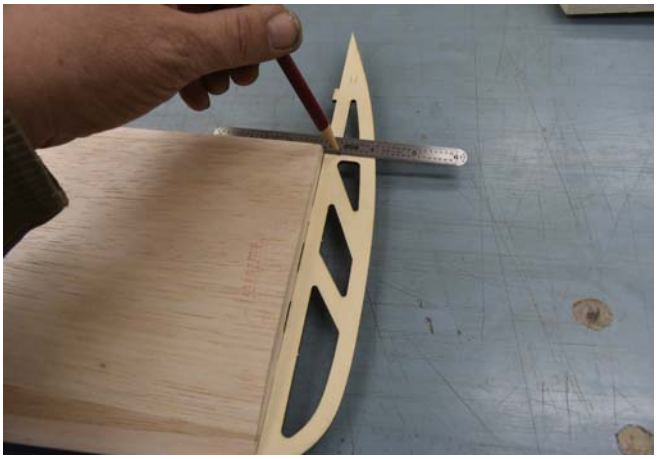




27. Epoxy on **S1** to the root of the stab.

(Tip Blocks)

28. Cut **T1** and the tip blocks to your choosing. I.e. Scale or sport balance. Pictures from here on forward is for the tow plane version.



29. Glue the stab tip assembly together and to the stab and elev. Carve and shape to the skins.

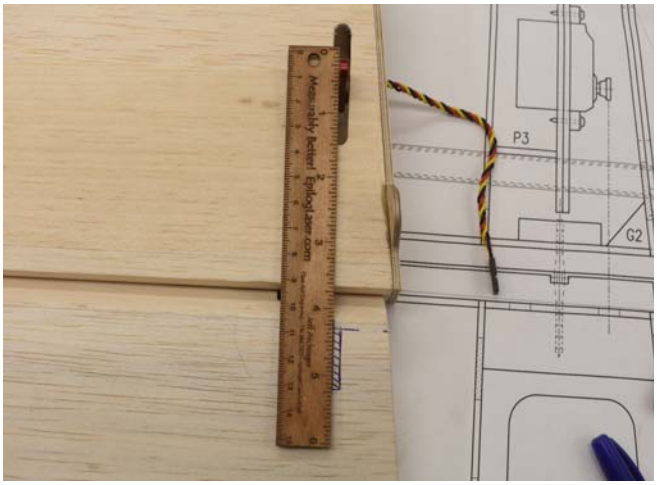
(Hinging)

30. Mark the hinge point locations and drill 3/16” dia. holes. Bevel the leading edge of the elevators.

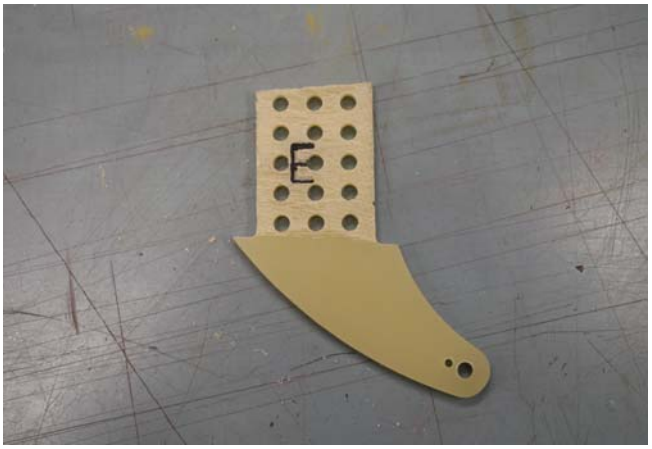
31. Round over the stab. tips, leading and trailing edges.

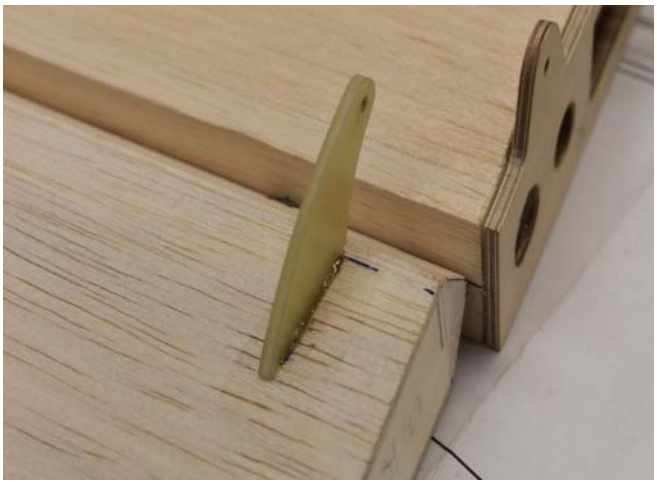
(Horn and Pushrod)

32. Reinstall your servo and arm. Mark the location for the elevator G-10 control horn. It has an engraved letter "**E**" on it. Cut the slot in the elev. behind the **D2** lite ply.

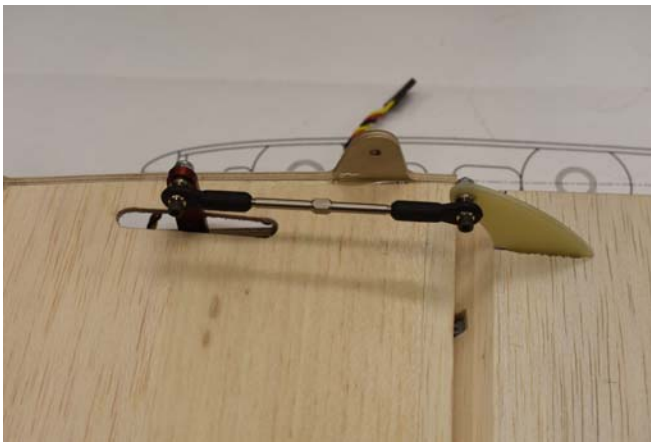


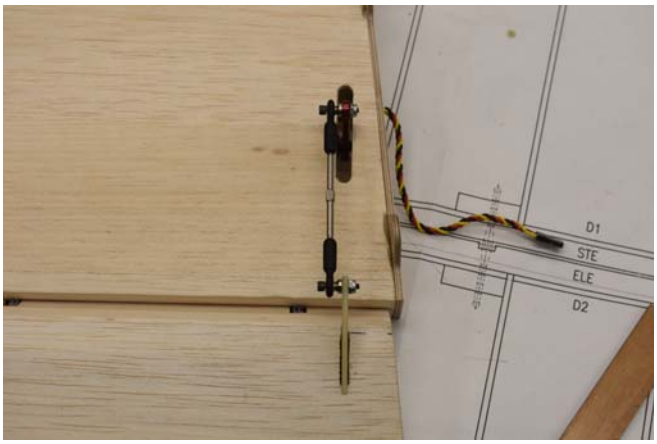
33. If you are going to use ball links on the G-10 horn, then drill out one of the clevis holes with a #35 drill bit. Roughen up the horn and epoxy into position.





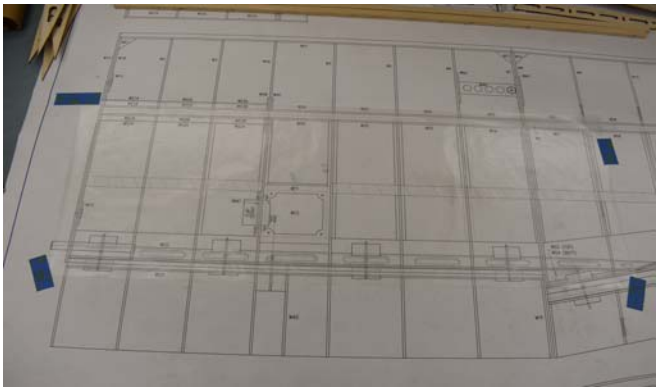
34. We like using heavy duty 4-40 ball links and titanium rods. See page 168 for additional items needed.





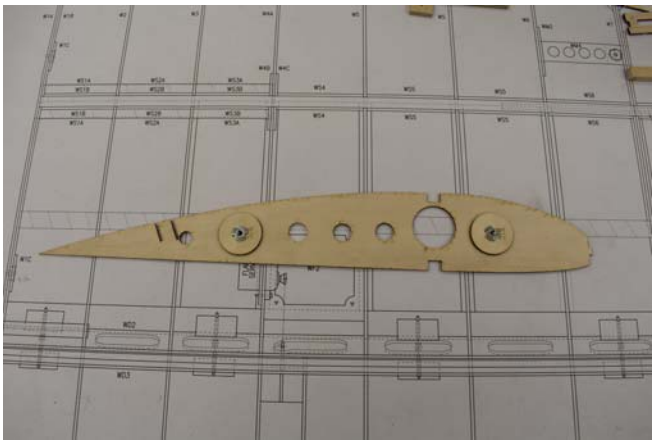
RIGHT WING

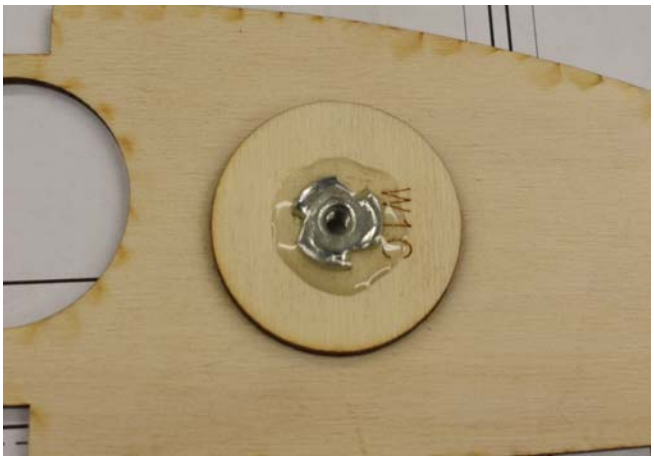
1. A pin-able work board is not necessary. Lay down the right wing sheet and tape wax paper over the inboard panel covering the main spar and drag spar.



2. Cut the wing tube socket in half. About 10 1/8". It will be about 1/16" too short and this is okay.

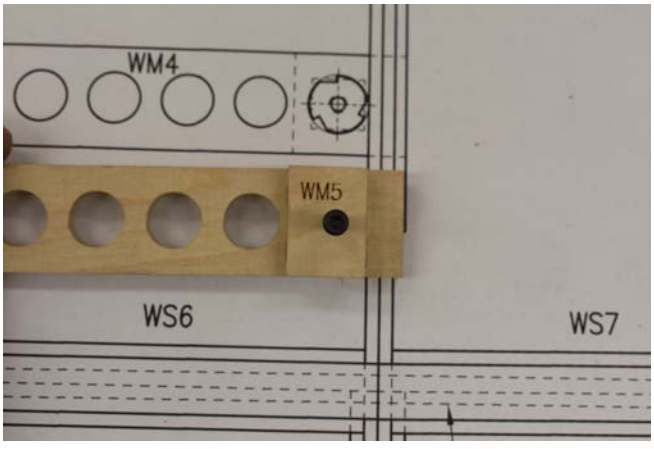
3. Glue **W1C**'s to the inside of rib **W1B**. Install two 8-32 (large 11/16" - 3/4" dia. flange) blind nuts and secure with epoxy. (Mirror image for Left Wing) Note; picture is not showing the larger flange T-nut. Make sure to use the larger flange T-nut.

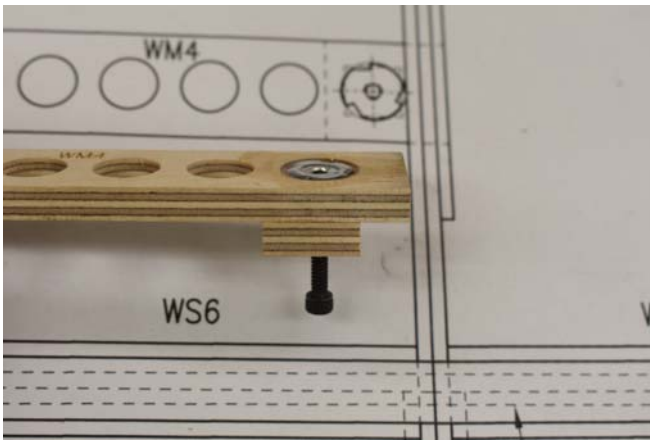


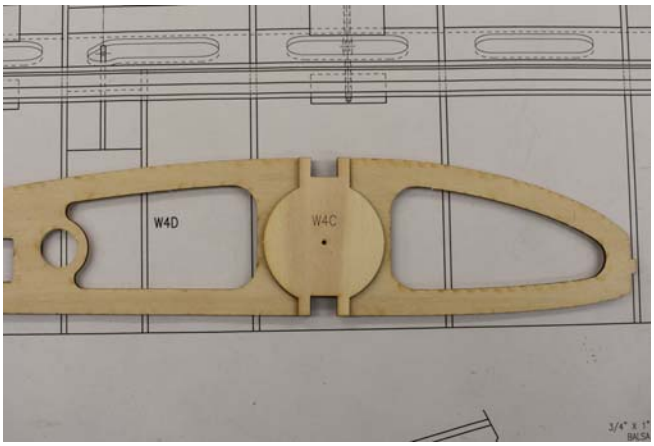


4. Install a 8-32 (smaller 1/2" dia. flange) blind nut into the recessed pocket of **WM4** and secure with epoxy. The T-nut shank will protrude out of the other side by 1/16" so tap in over a hole in a block of wood.

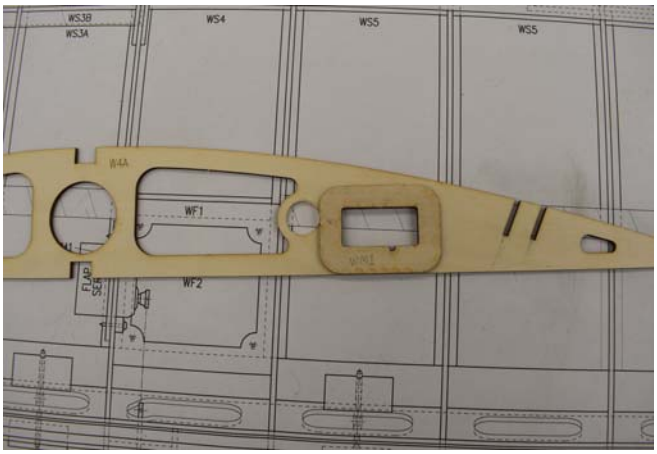
5. Glue **WM5** onto **WM4**. **WM5** has a small pocket to fit over the protruding shank of the T-nut. Use 8-32 bolt for alignment. Note short offset side of hole is closest to the end of **WM4**.



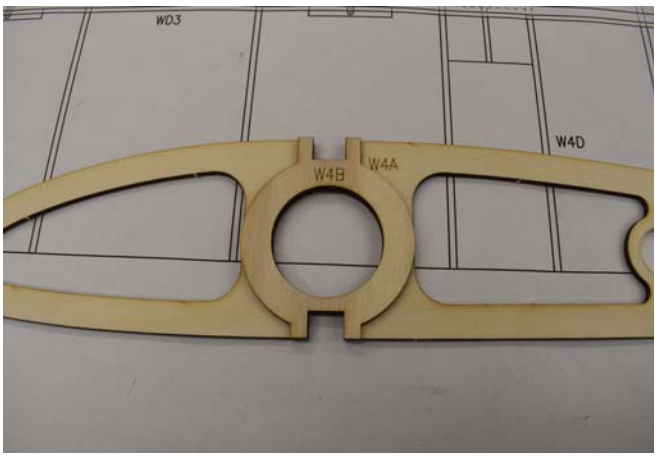




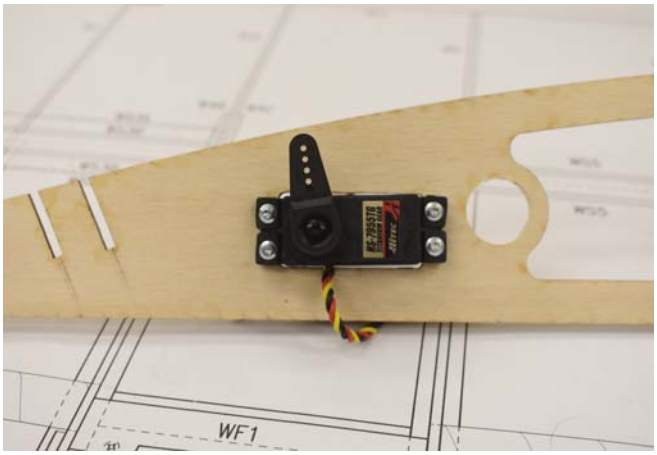
6. Glue **WM1** to rib **W4A**. (Mirror image for Left Wing)

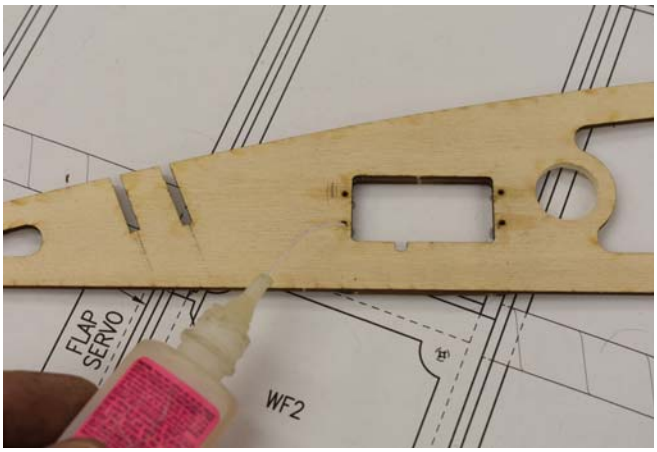


7. Glue **W4B** and **W4C** to rib **W4A**. (Mirror image for Left Wing)



8. Pre mount your flap servo now and thin CA harden the servo mounting holes. (Mirror image for Left Wing)



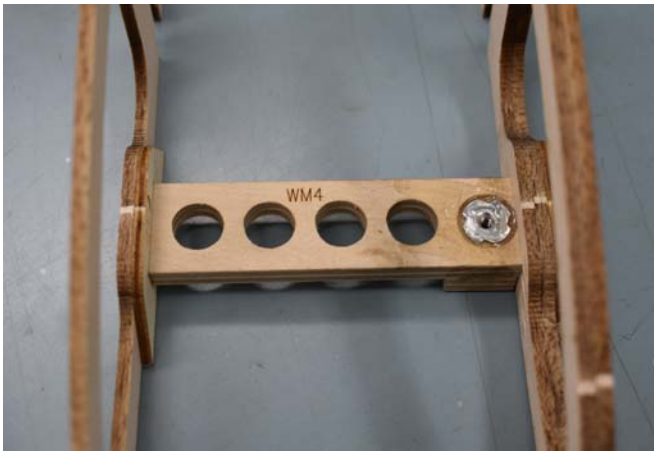


9. Glue **WM2** to rib **W6**. (Mirror image for Left Wing)

10. Glue rib **W7** to rib **W8**. Second picture, Do not add glue in this area. It will be removed later as shown in step 89. (Mirror image for Left Wing)

11. Glue **WM3** to rib **W8**. (Mirror image for Left Wing)

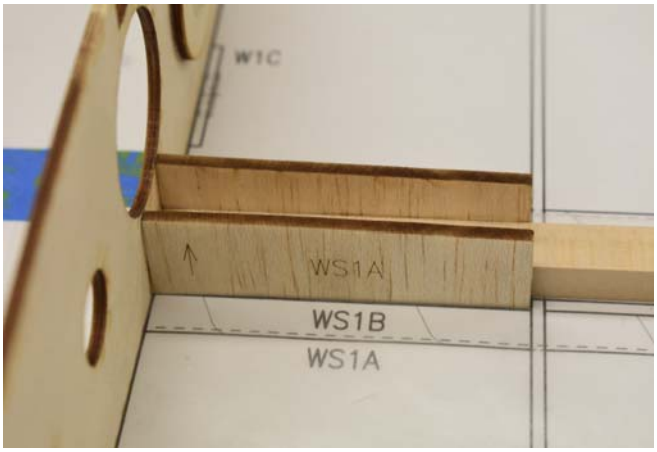
12. Slip on rib **W6** and **W7**/**W8** onto **WM4**/**WM5** assembly. Do not glue at this time. (Old rib picture shown).



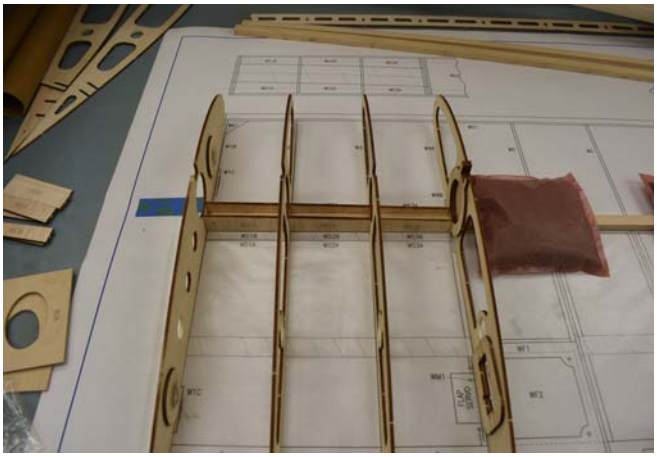
13. Cut to length or slightly longer at the root a 3/8" x 1/2" bass spar and weigh down over the plans on the inboard wing panel.

14. Glue rib **W1B** to the spar using the **W1B ANGLE SET GAUGE**. All remaining ribs out to the tip will be perpendicular to the work surface.

15. Glue **WS1A** sheer webs to the spar and the first rib. The arrow is towards the root rib and points up.

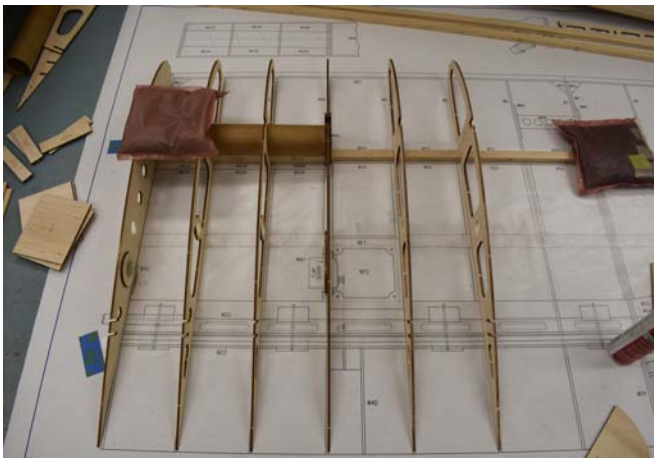


16. Glue in ribs **W2**, **W3** and **W4A** along with sheer webs **W2A**'s and **W3A**'s.

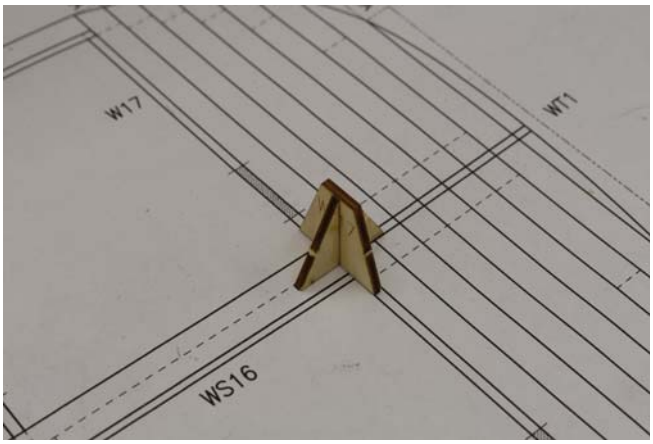


17. Slip in the wing tube socket but do not glue to the ribs at this time. Also do not trim it flush with the root rib.

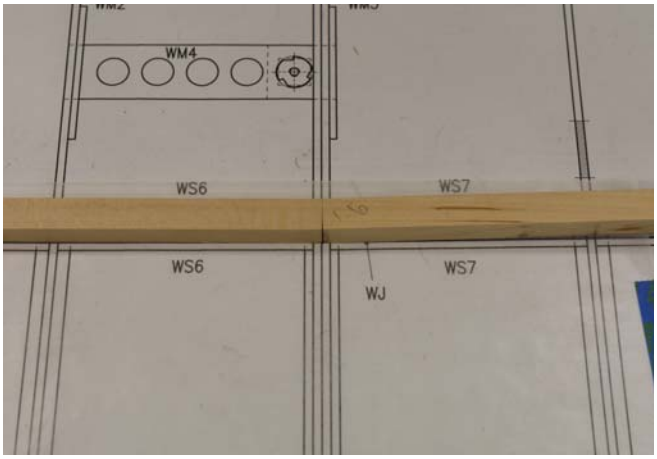
18. Glue in the two **W5** ribs.

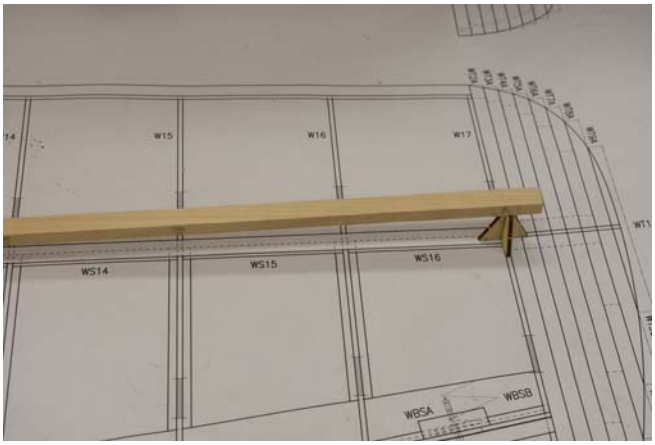


19. Glue the two **WJ17**'s together and place it onto the plans on rib **W17** and the spar. (Arrow towards L.E.)

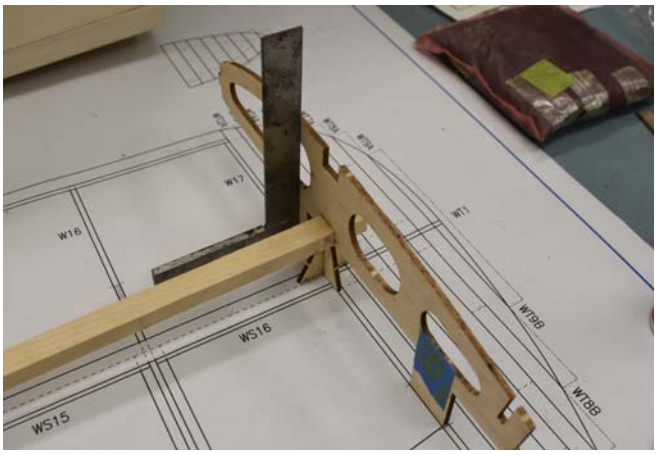


20. Lay down the outer panel bass spar against the end of the inboard spar and up on the **WJ17**. The spar ends will be glued together later.

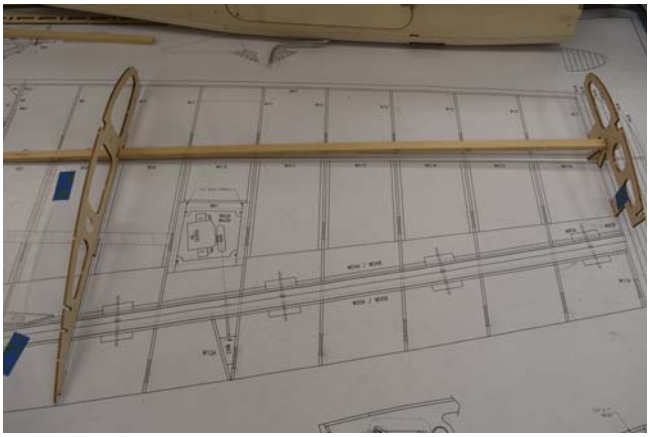




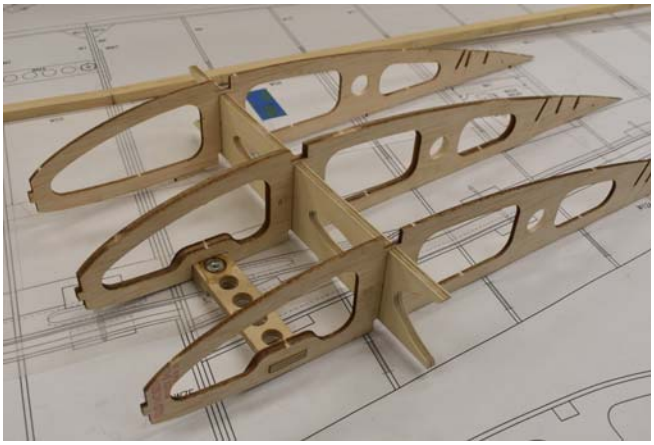
21. Glue on rib **W17** to the spar perpendicular to your work surface. Line up the tab marks on the plans.

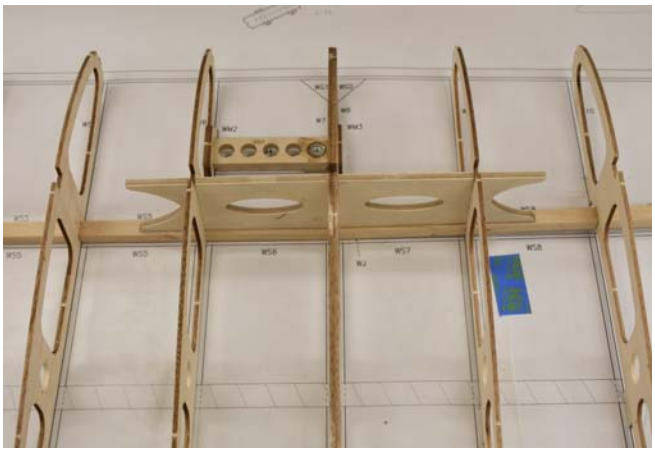


22. Glue on rib **W10**.

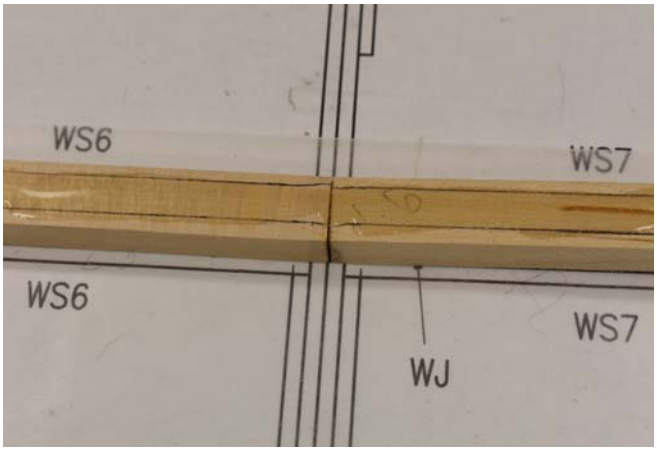


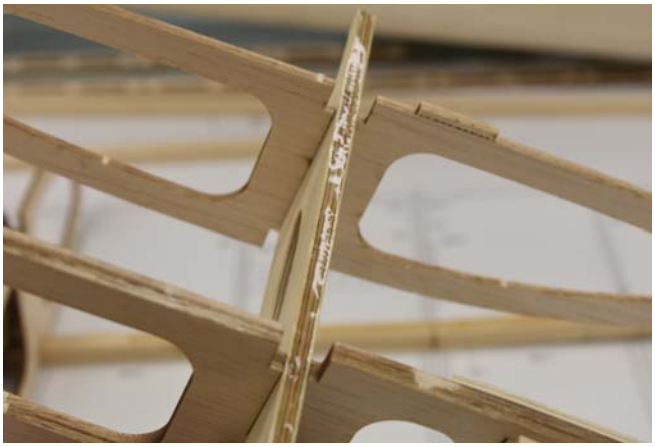
23. Dry assemble / test fit ribs **W6** through **W9** onto **WJ** and onto the spars. (Old rib picture shown).

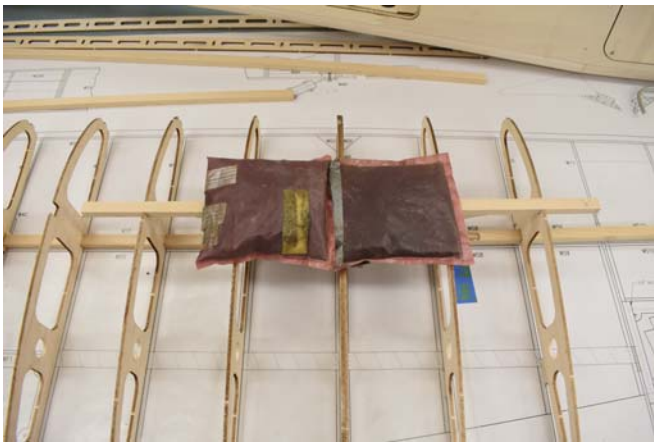




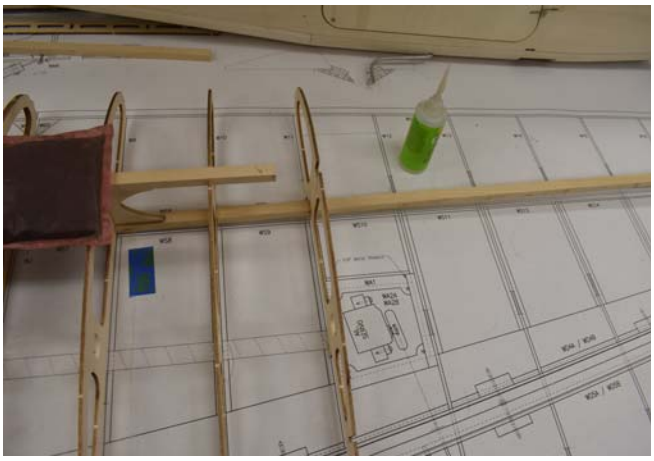
24. Using 30 minute epoxy, add a little epoxy glue between the spar ends and glue the **WJ** assembly down onto the spars. Place the scrap spar piece that was cut from the inboard panel and place it into the top spar rib notches for alignment. Add a couple of weights onto the top spar. (Do not glue **WM4** assembly yet to the ribs). After the epoxy sets up or dries, you can glue the ribs to **WJ**.



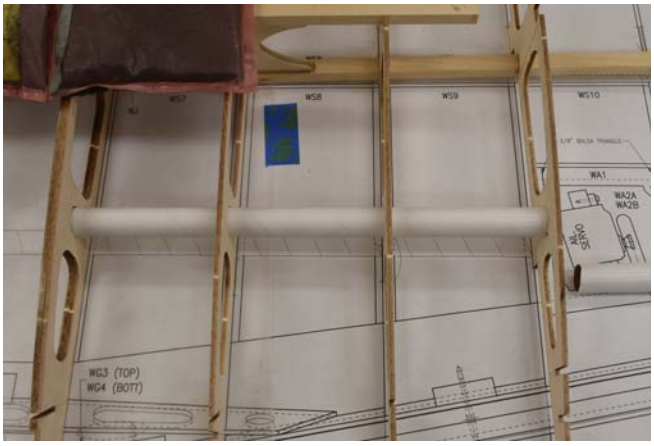




25. Glue on rib **W11**.

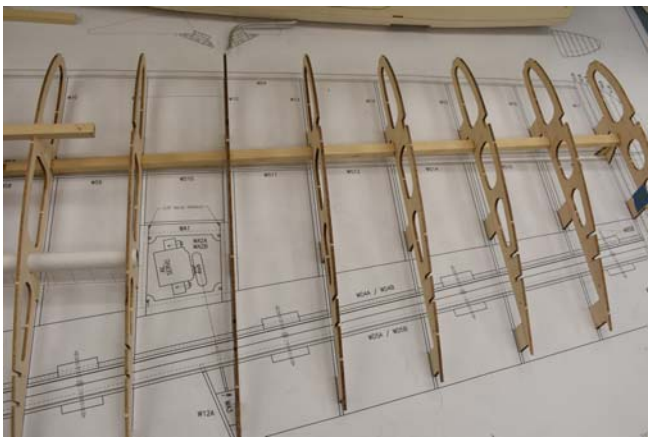


26. Using two conduit tubes per wing, slide in one from rib **W11** to **W8** and another one from rib **W5** to **W7**. Cut and save the two excess pieces.

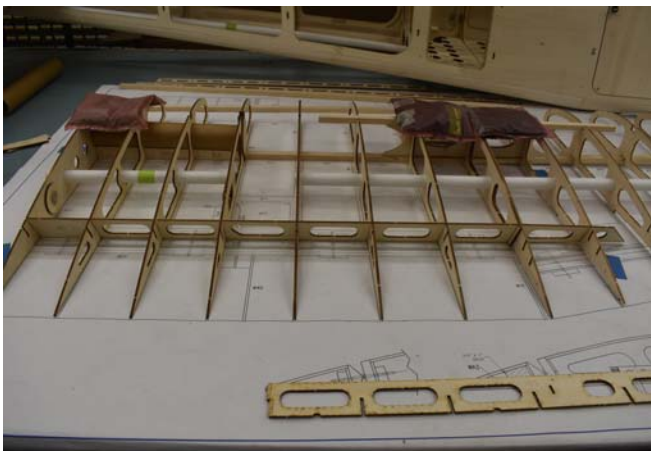


27. Insert and then seam the two left over pieces with tape and glue from **W2** to **W4A**. Coat the edges of the tape with glue also. Do not glue conduit tube to **W1B** at this time.

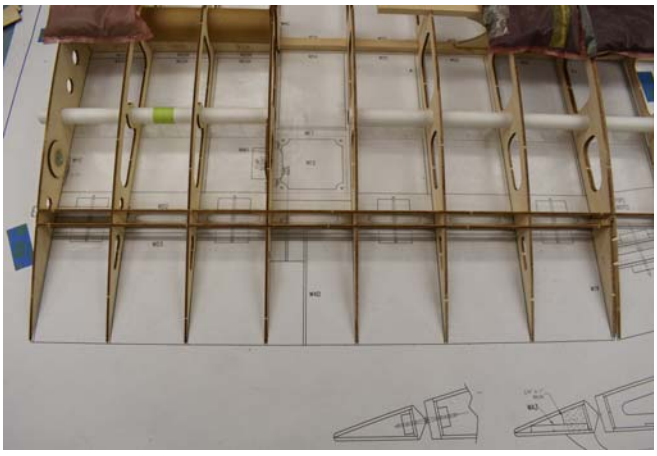
28. Glue in the remaining ribs **W12** through **W16**.



29. Glue in **WD2**. Do not glue to **W1B** at this time.



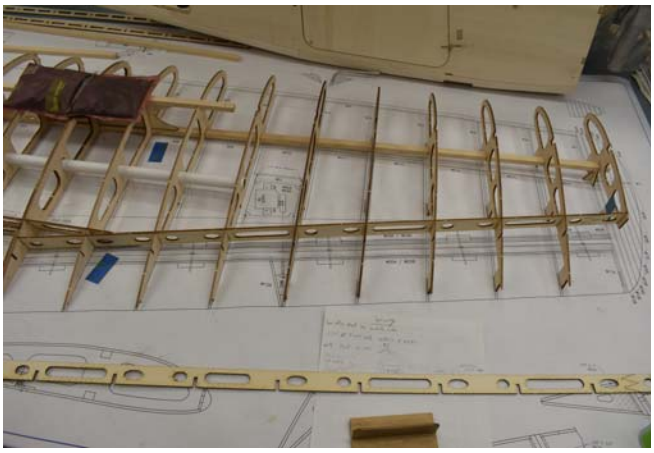
30. Slip on **W7F** onto **WD3** and then glue **WD3** into position. Do not glue **W7F** to the wing rib and the other end to **W1B** at this time.



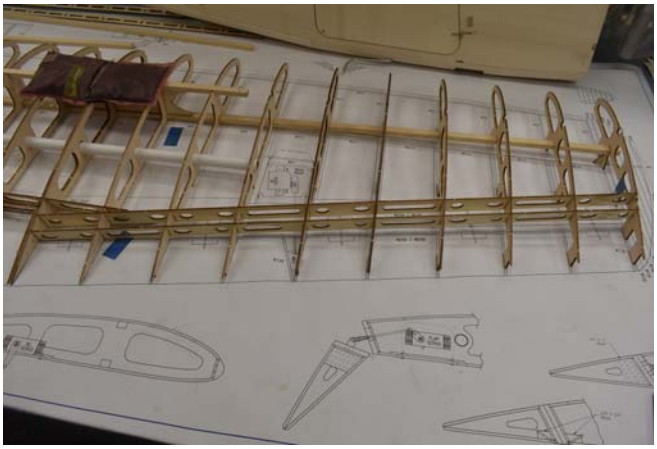
31. Use the **W1B ANGLE SET GAUGE** to now glue the rib to the conduit tube and to **WD2** and **WD3**.

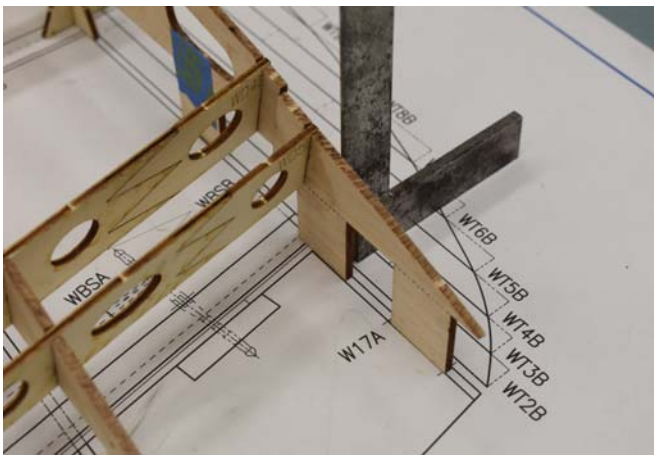
32. Glue together **WD4A** to **WD4B** and **WD5A** to **WD5B**. Rib notches to face the same direction.

33. Install **WD4A**/**WD4B** into position but do not glue in yet.



34. Install **WD5A**/**WD5B** into position. Glue aileron rib **W17A** in place to **WD5B** only. Now glue to all the ribs.

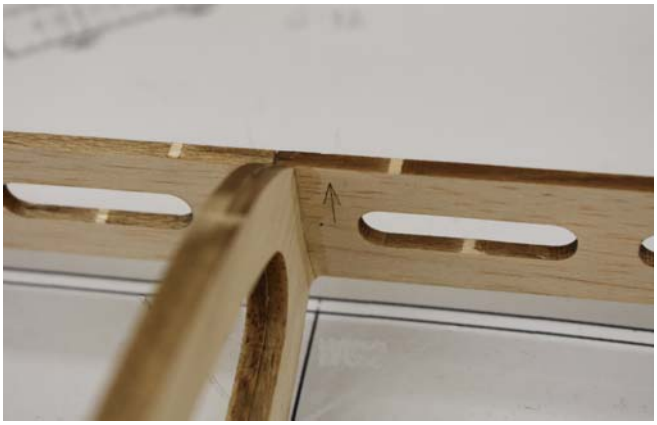




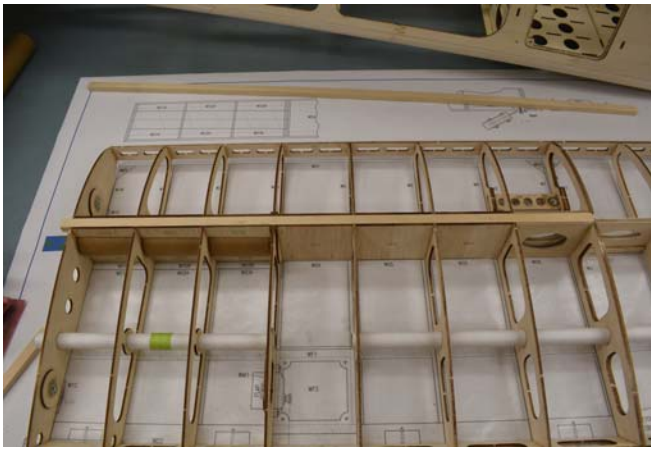
35. Glue in **WD1**. Arrow is towards the root and points up.

36. Now glue **WM4** assembly to the ribs.

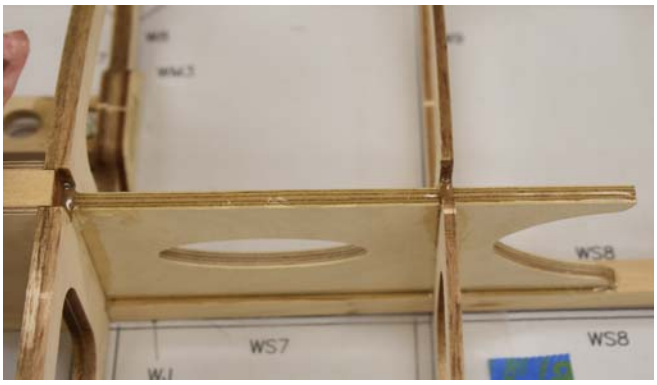
37. Glue in **WD4**. Arrow is towards the root and points up.



38. Cut to length or slightly longer at the root the inboard top bass spar and glue into position. Use 30 minute epoxy where it mates on top of **WJ**. Also epoxy **WS6** on both sides of the spar. Glue in the remaining sheer webs on the inboard wing panel. Note, **SW1B** the arrow is towards the root rib and points up.



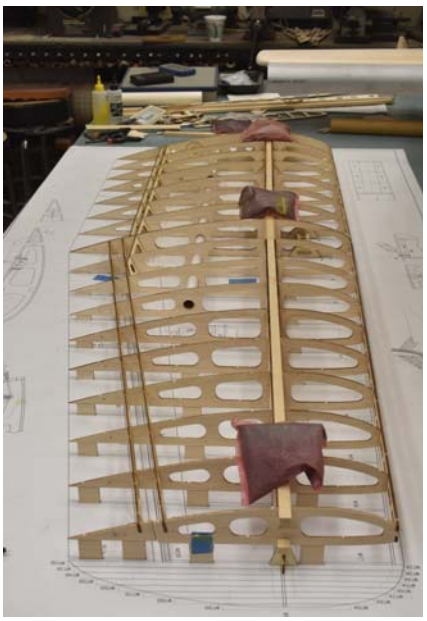
39. Glue into position the outboard top bass spar again using 30 minute epoxy where it mates on top of **WJ**. Also epoxy **WS7** on both sides of the spar. Glue in the remaining sheer webs on the outboard wing panel.



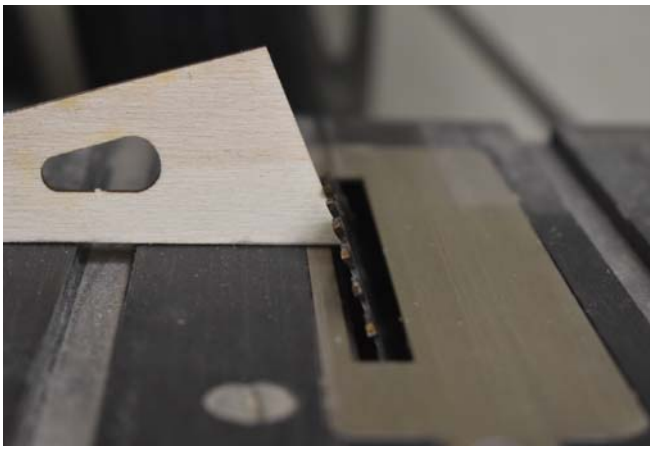
40. Trim and sand flush with the rib the top and bottom spars at both ends of the wing. Do not trim or sand flush the wing joiner socket tube, but you can trim and sand flush the servo wire conduit tube.

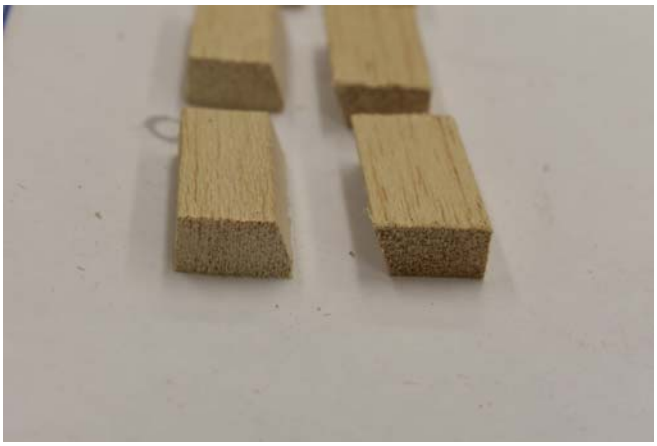
41. At one end add a bevel around the 1/2” diameter dowel and glue into position.

42. Lift the wing off your building board and thoroughly glue all your joints.

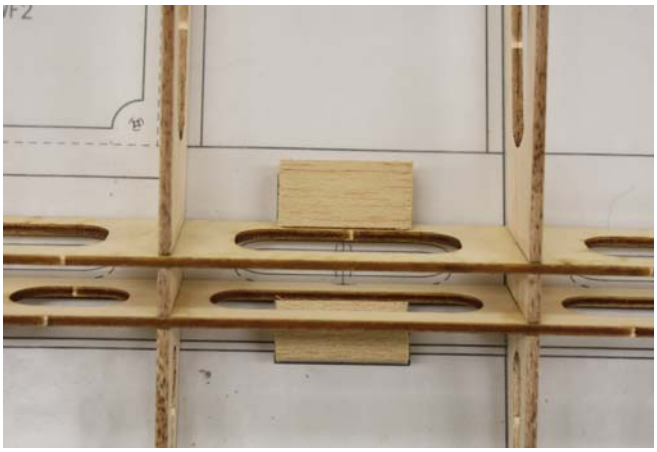


43. Cut 8 flap hinge blocks from 3/8” x 3/4” balsa stick. Use flap rib **W4D** to set the angle of your hobby table saw (if you have one) and run the stick through the saw to cut the edge to an angle. Then cut them to their individual lengths. 4 of them flipped over is on the wing.

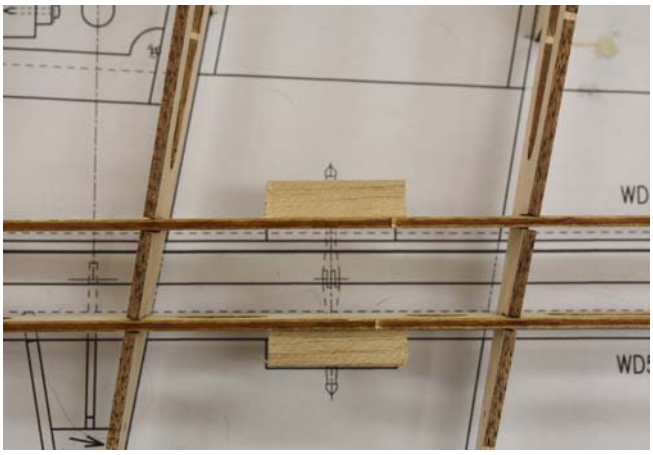




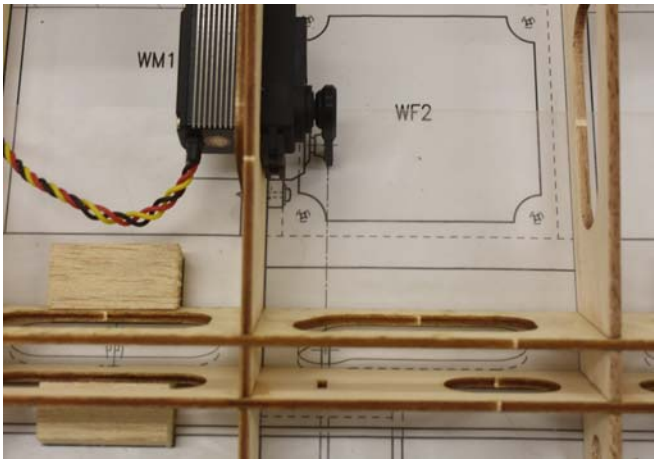
44. Place the wing back down onto the plans and glue them to the drag spars as shown.



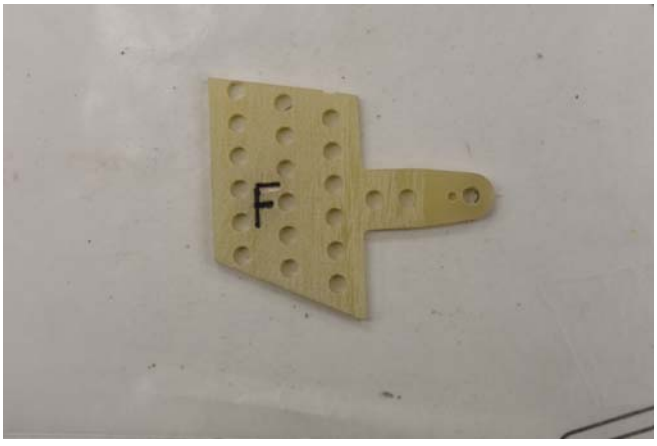
45. Cut 10 aileron hinge blocks from 3/8” x 3/4” balsa stick and glue into position centered top to bottom on the drag spars.



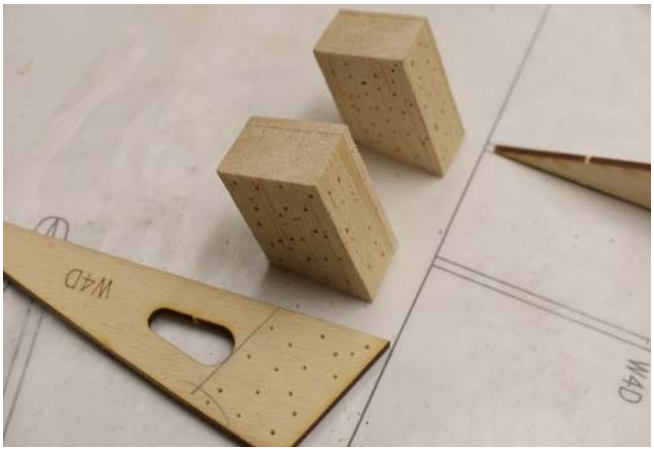
46. Slip the flap servo into position and note where the servo arm falls. Mark the plans if required so the flap horn can be adjusted for its proper location in the next step.

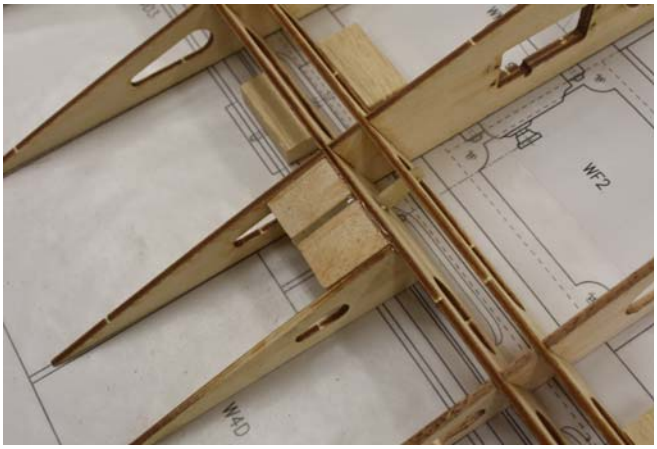


47. Roughen up the G-10 flap horn (embossed with a letter “F”) If you are going to use 4-40 HD ball links on this connection then drill out the hole with a #35 drill bit.



48. Cut to shape two blocks from 3/4” x 1” balsa pieces to sandwich the horn. Remove or add material to the pieces to adjust the location of the flap horn. Then epoxy the blocks, horn and **W4D** into place.

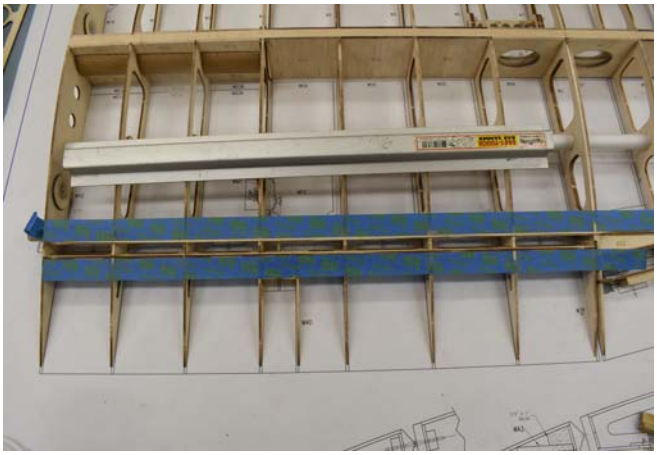


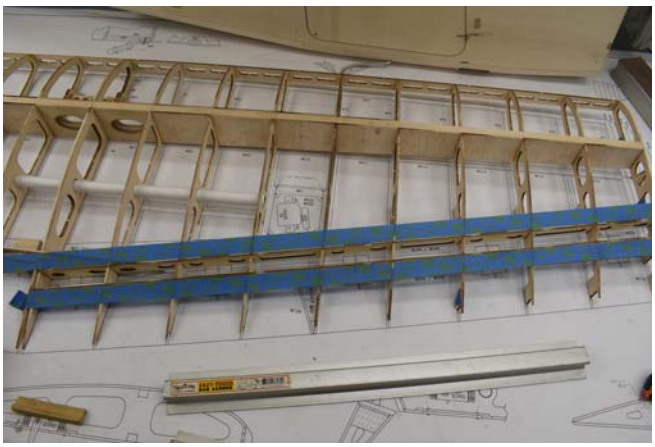


49. Glue in gusset **WG3** below the top edges of the two overlapping drag spars.

50. Glue in gusset **WG4** below the bottom edges of the two overlapping drag spars.

51. If you need to clean up the drag spars lay strips of tape down on the ribs to protect them. Use of a long sanding bar is best.

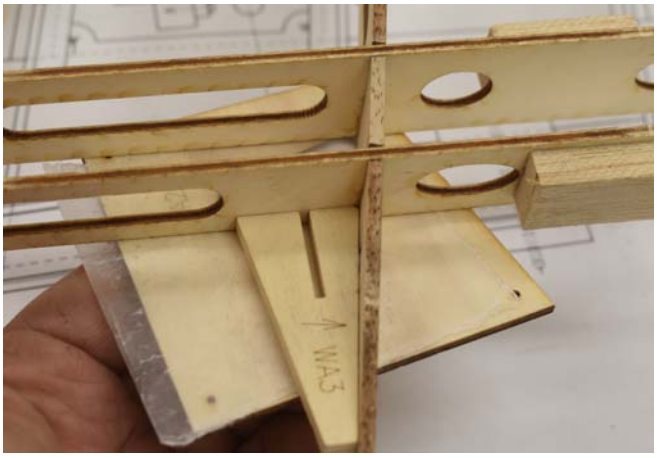




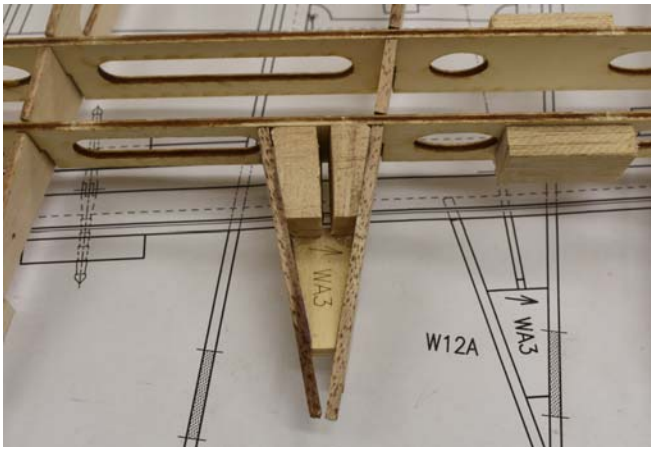
52. Clean up any protruding sheer webs.

53. Carve and sand the top of the balsa leading edge cap to the contour of the ribs. Protect the ribs with tape.

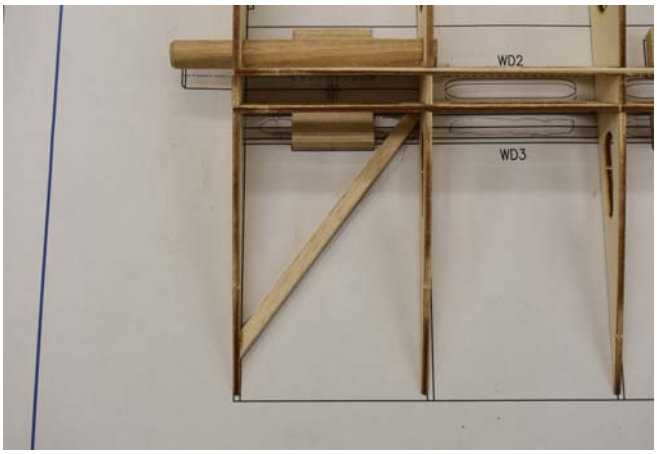
54. Add a piece of wax paper onto a scrap piece of lite ply or the aileron servo hatch and hold this flat up against the bottom of the drag spars and rib **W12**. Glue **WA3** into position. Arrow points to **W12** rib. Then glue in **W12A**.

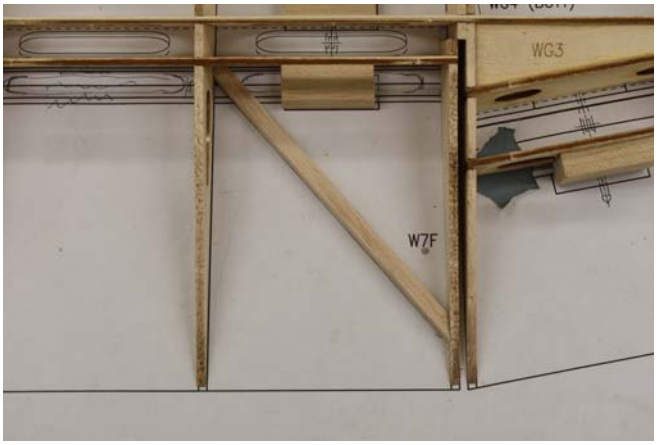


55. Cut balsa blocks to sandwich the aileron G-10 horn from 3/4" x 1" balsa. Trim and sand flush with the top of the ribs. Do not glue in the G-10 aileron horn at this time.

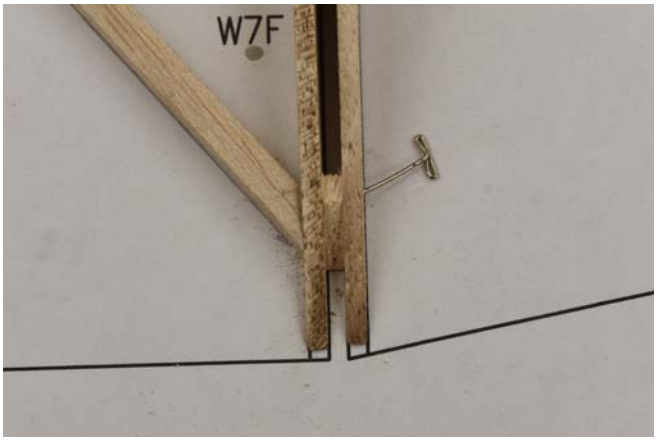


56. Add 1/4" square balsa stick to keep the flap rib ends aligned with the plans.

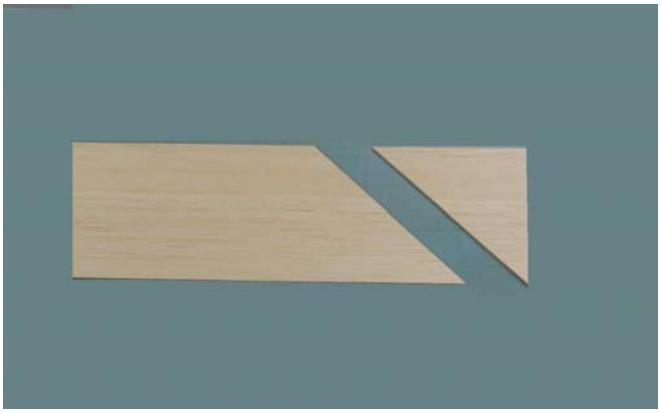




57. Add a 1/8” thick scrap balsa between the aileron and flap rib. The balsa and T pin has to be below the top edge of the ribs.

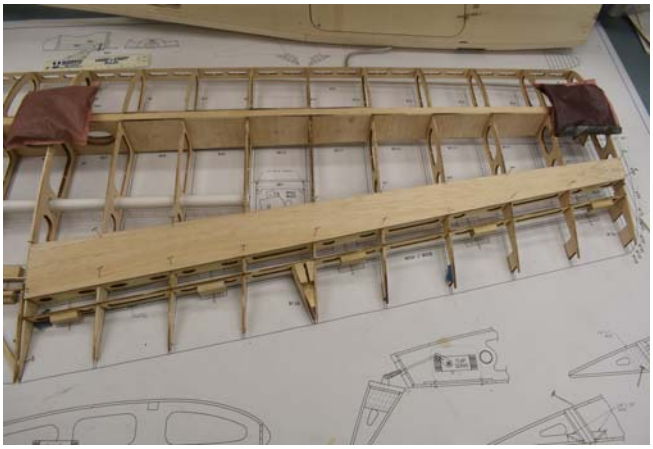


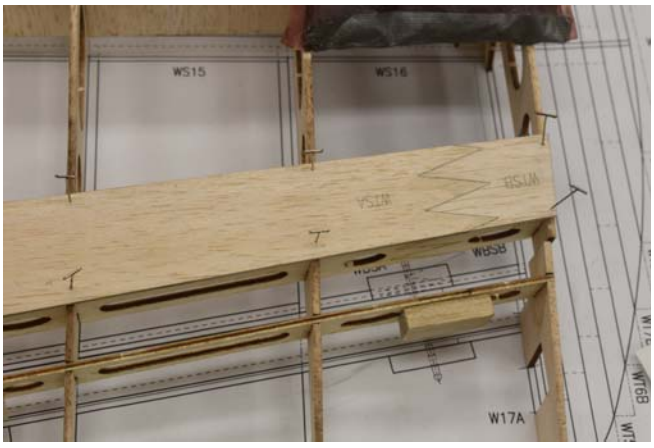
58. See SKETCH 4 for the wing sheeting layout and make the wings top leading edge sheeting. Select the best pieces of wood for this. I.e. grain and weight. Save the 45° cut off pieces for the aileron sheeting extensions.



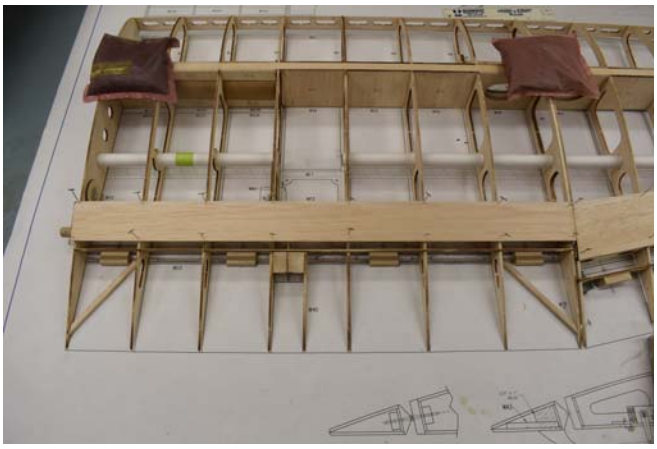
59. Glue **WTSB** to **WTSA**. When dry sand the joint smooth.

60. Glue this to the trailing edge of the outboard wing panel. Position it so it overhangs the drag spar by about 1/16”.

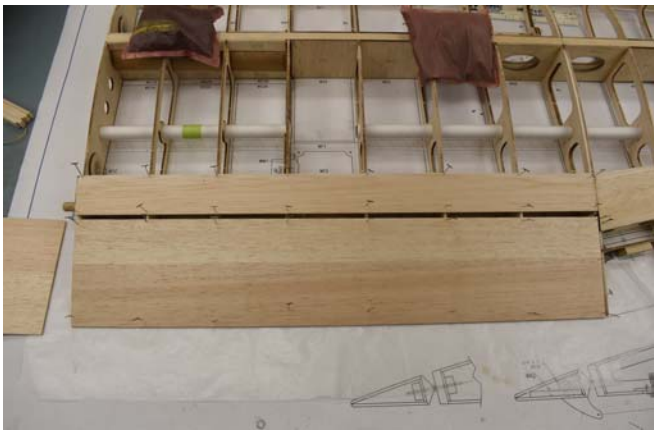




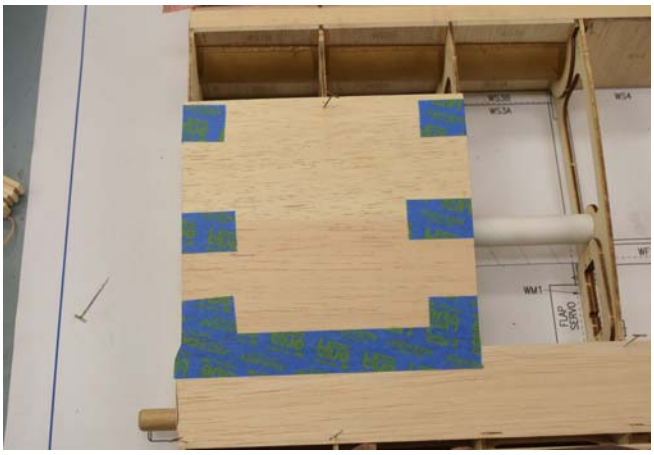
61. Cut to length 1/8” thick by 2” wide balsa sheeting and glue this to the trailing edge of the inboard wing panel. Position it so the front corner edge is even with the previous sheeting installed.



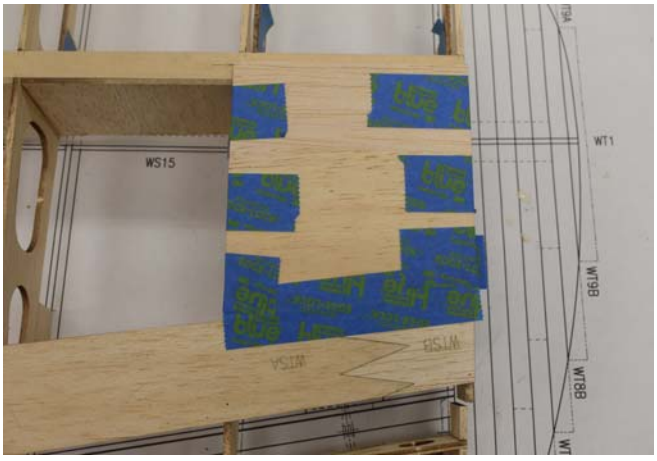
62. Cut to length 1/8” thick by 6” wide balsa sheeting and then trim to 5” wide and glue this to the flap. Line up the back edge (T.E.) of the sheeting to the plans.



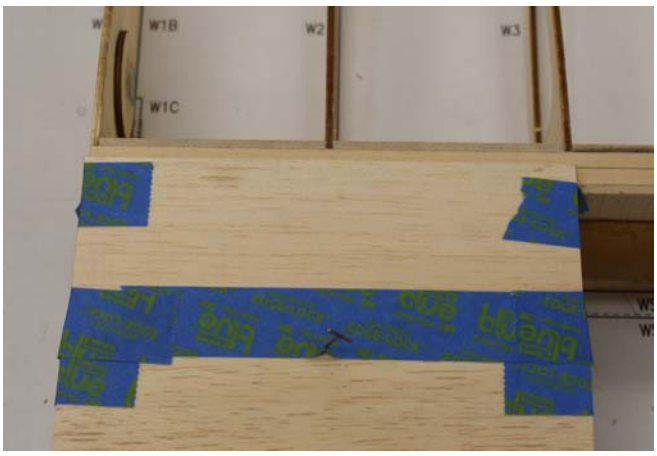
63. Cut to length the scrap sheeting left over from the flap and glue it to the first two rib bays at the root.



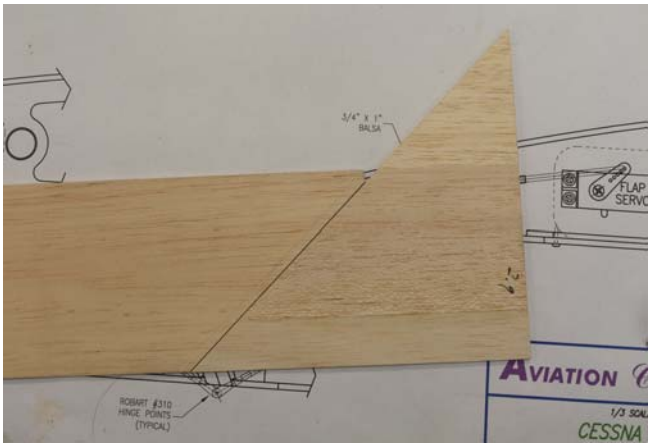
64. Use one 1/8” x 6” dedicated sheet to sheet the last rib bay out at the wing tip. Trim the front edge so it is on half the spar width.



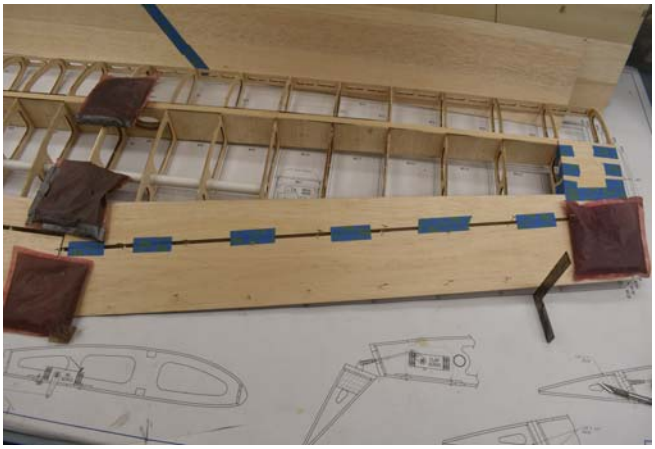
65. From the 3” wide piece sheet the root ribs. Trim the front edge so it is on half the spar width.



66. Use the left over 45° leading edge scrap piece to make and extend the aileron top sheeting. The aileron sheeting is from a 4” wide balsa sheet.



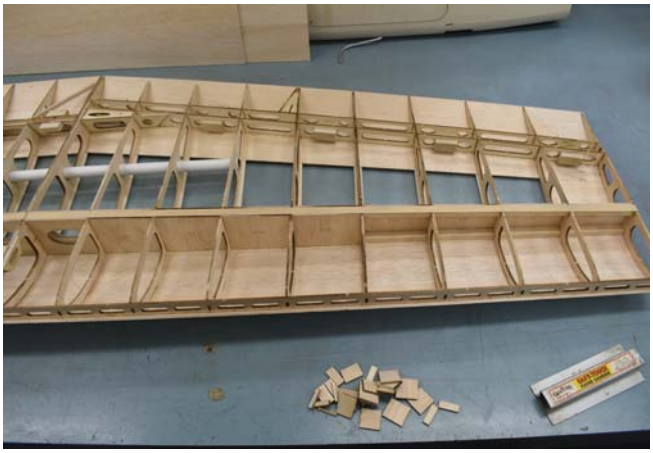
67. Glue on the top aileron sheeting. Use tape, weights and pins. Also, use a square to line up the trailing edge of the sheeting to the plans.



68. Trim to size and pre soak the leading edge top sheeting with Windex and dry clamp it to the wing so it can conform to the curvature. When dry, glue on the top sheeting. Tip; Harbor Freight Tools has a tube of the smaller spring clamps that will help clamp down the leading edge. Flip out the bottom pad and it will hook into the lightening slotted holes in the balsa L.E. cap.

69. Cut and glue on the 1/8” x 1/2” wide top cap strips centered on the ribs.

70. Flip the wing over and break off the build tabs. Sand the bottom where needed as you did in steps 51 and 52.



71. Carve and sand the balsa leading edge cap to the contour of the ribs. Protect the ribs with tape.

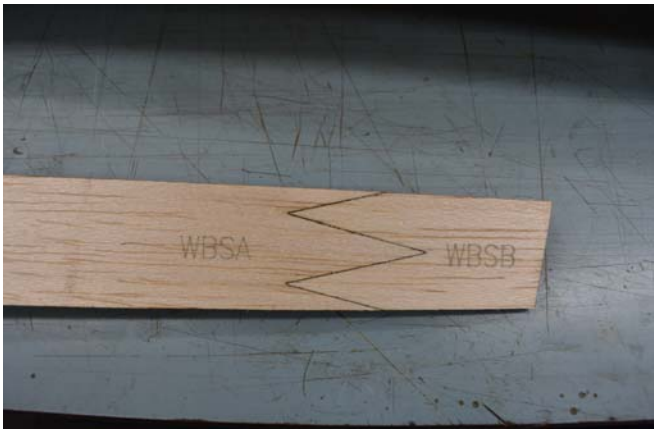
72. This step has been deleted.

Full scale

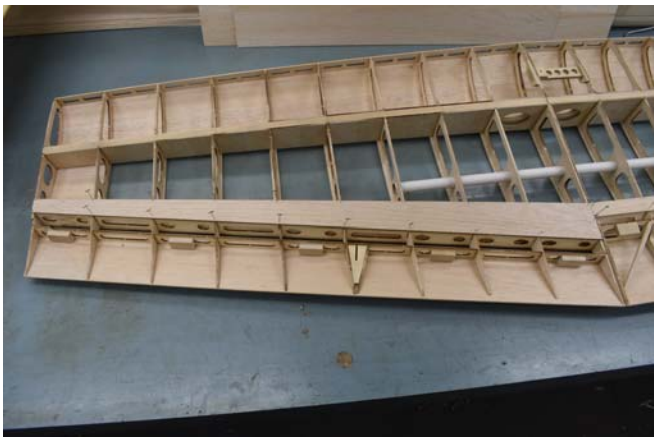
Model

73. Cut to length 1/8” thick by 1” wide balsa sheeting and glue this to the trailing edge of the inboard wing panel. Position it so it overhangs the drag spar by about 1/16”.

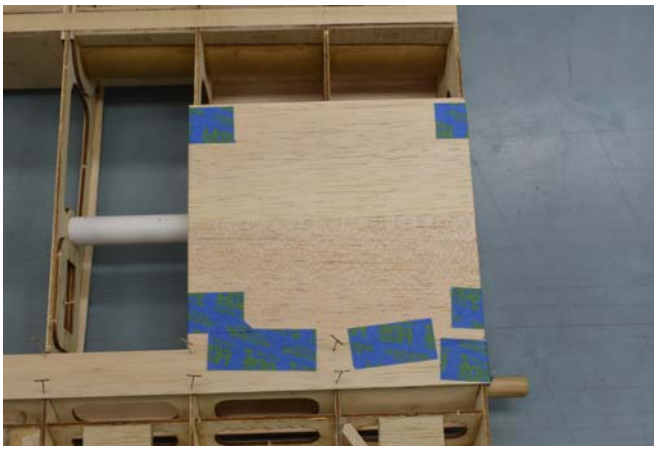
74. Glue **WBSB** to **WBSA**. When dry sand the joint smooth.



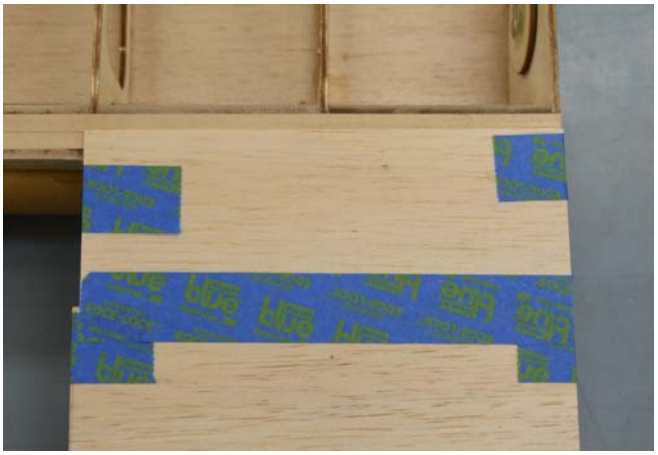
75. Glue this to the trailing edge of the outboard wing panel. Position it so the front corner edge is even with the previous sheeting installed.



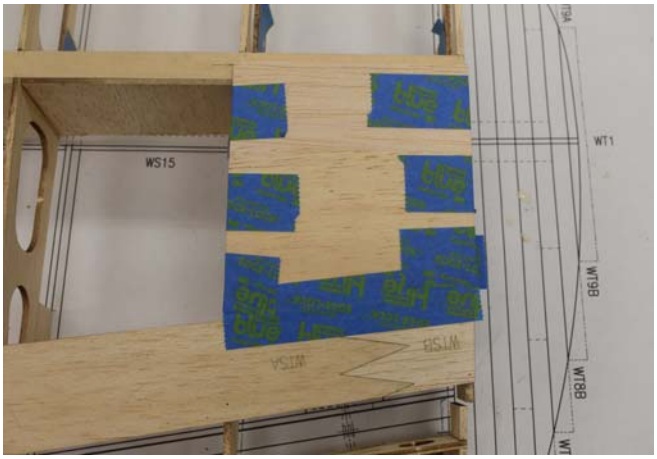
76. Cut to length from the 6” wide dedicated sheeting and glue it to the first two rib bays at the root.



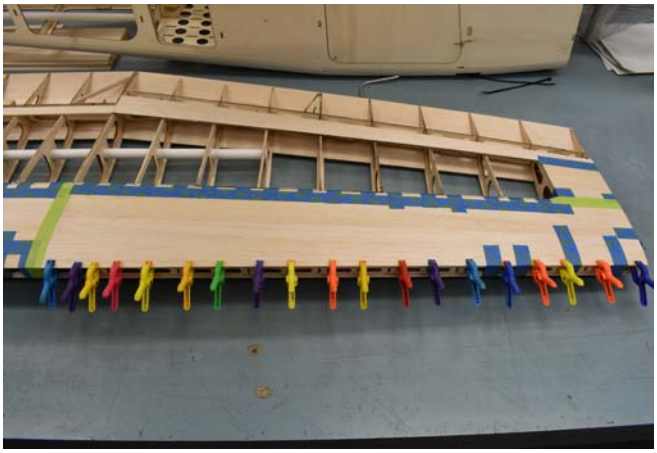
77. Use the 3” wide sheeting to finish sheeting the root ribs. Trim the front edge so it is on half the spar width.



78. Sheet the last rib bay out at the wing tip from the 6“ wide dedicated sheet. Trim the front edge so it is on half the spar width.

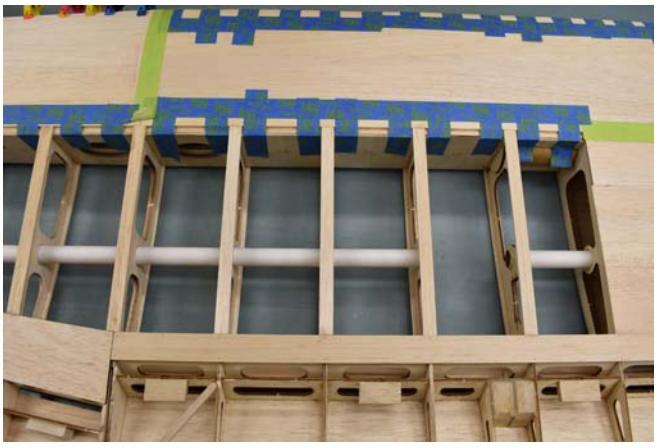


79. See SKETCH 5 for making the wings bottom leading edge sheeting. Select the best pieces of wood for this. I.e. grain and weight.

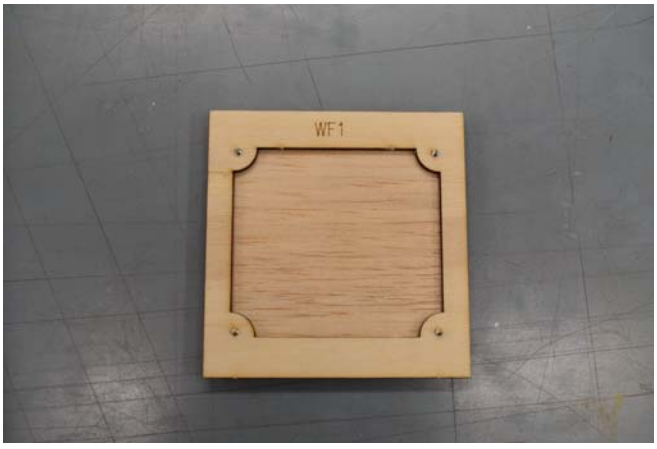


80. Reinforce the bottom 1” wide sheeting where the flap hinge blocks are located by using 1/8” thick x 1/2” wide balsa. See FLAP HINGE DETAIL on the wing drawings.

81. Cut and glue on the 1/8” x 1/2” wide bottom cap strips centered on the ribs. Use the flap and aileron servo covers to set the spacing in these areas.



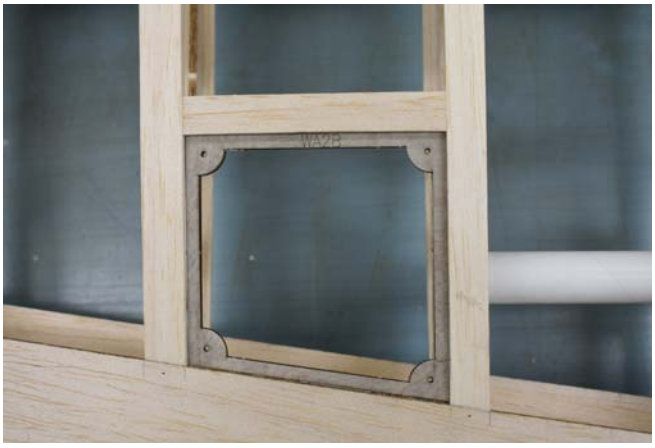
82. Screw the flap balsa hatch **WF2** to **WF1** using #2 x 1/2" long screws. Glue this into the wing but don't accidentally glue the hatch in.



83. Glue a cap strip across the front and remove the hatch and thin CA harden the screw holes.

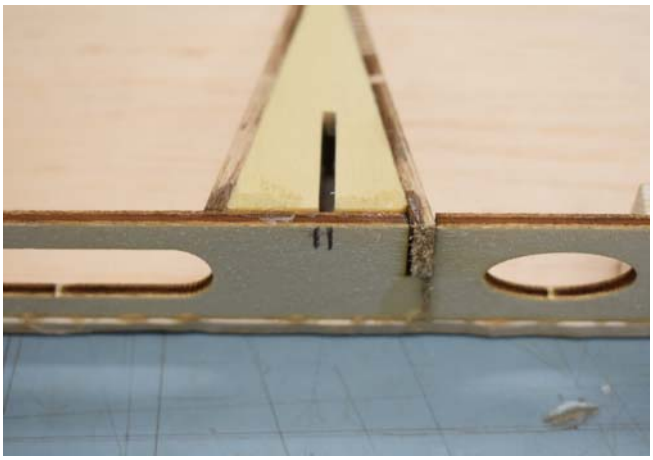
84. Screw the aileron lite ply hatch **WA2A** to **WA1** using #2 x 1/2" long screws. Glue this into the wing but don't accidentally glue the hatch in. Then glue a cap strip across the front and remove the hatch and thin CA harden the screw holes. (Mirror image for Left Wing)

85. Glue in 1/64" thick ply shim **WA2B**.

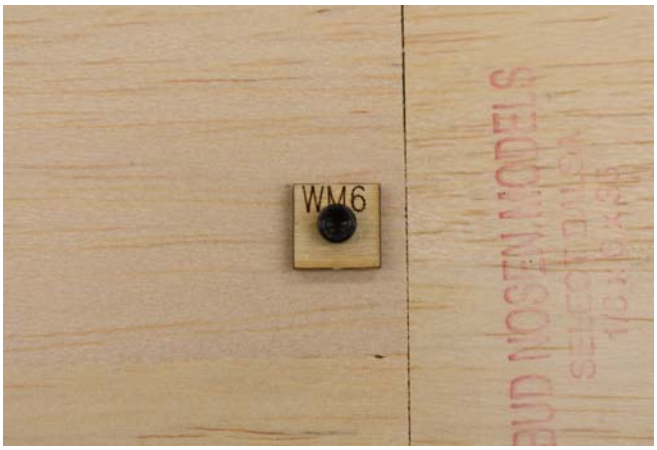


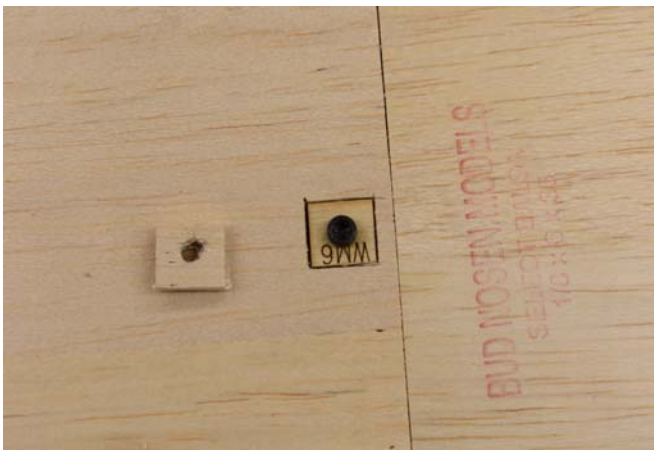
86. Glue in 3/8" balsa triangle stock to both sides of the aileron bay.

87. Cut and separate the flap and aileron from the wing. Mark the location of the horn slot in the aileron and sheet the bottom of these control surfaces flat on your work bench. Sheet the bottom of the aileron as you did in step 66.

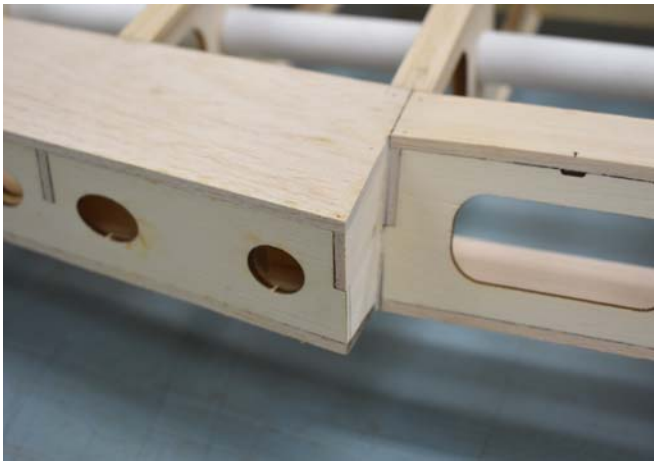


88. Locate the wing strut mounting bolt hole. Cut the balsa skin away to fit the lite ply **WM6**. Glue this in and the 1/64” ply shim square.

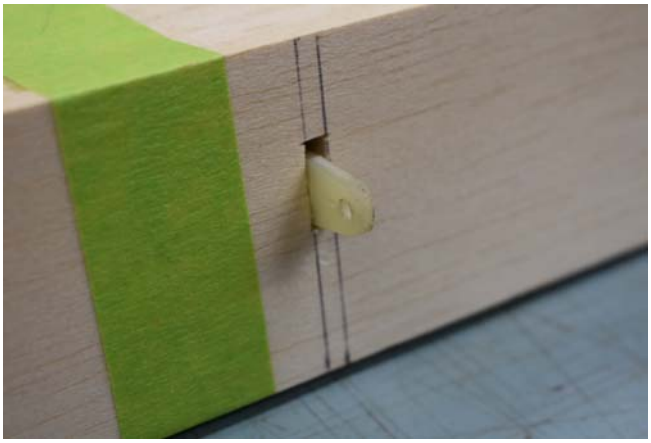




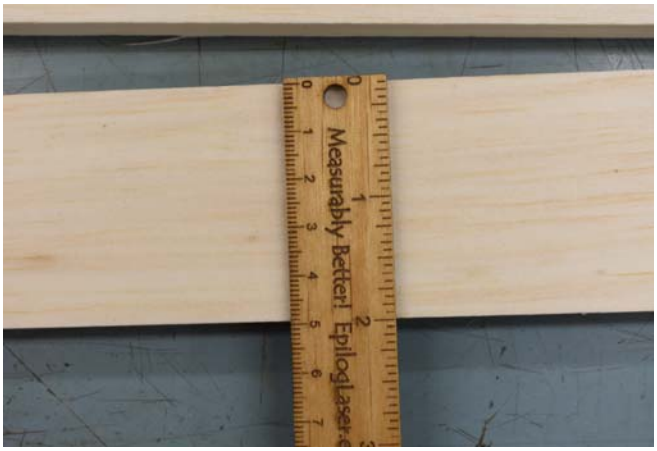
89. Sand the perimeter of the wing, aileron and flap. Cut and remove the protruding **W7** rib extension, Mark the location of the flap hinges on the wing.



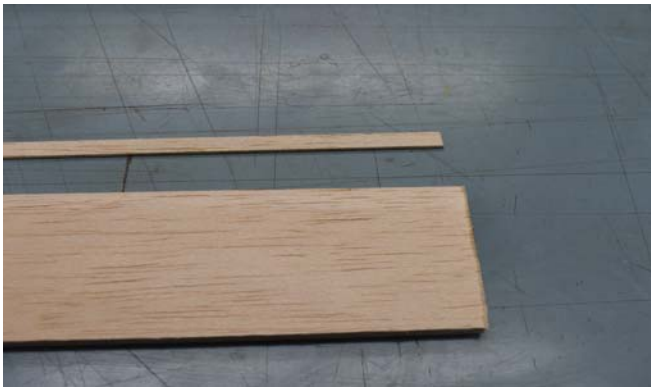
90. Face the leading edge of the flap with 1/4” thick x 2“ wide balsa sheet. Cut a notch to fit over the extension of the flap horn.



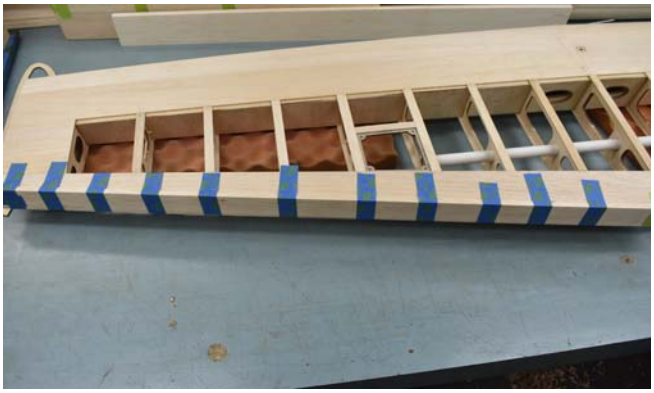
91. Trim a 1/2” thick x 3” wide balsa to a width of 2” and face the leading edge of the aileron. Glue a scrap piece to the end as the length is a little short.

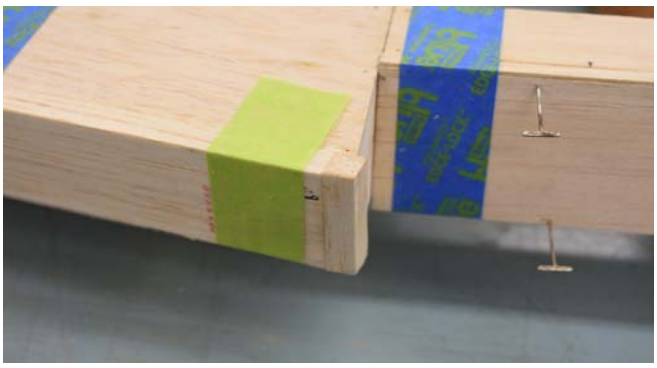


92. Glue on a 1/16” x 1/4” balsa stick to a 1/4” thick x 2“ wide balsa sheet. Face off the trailing edge of the wing in the flap area.

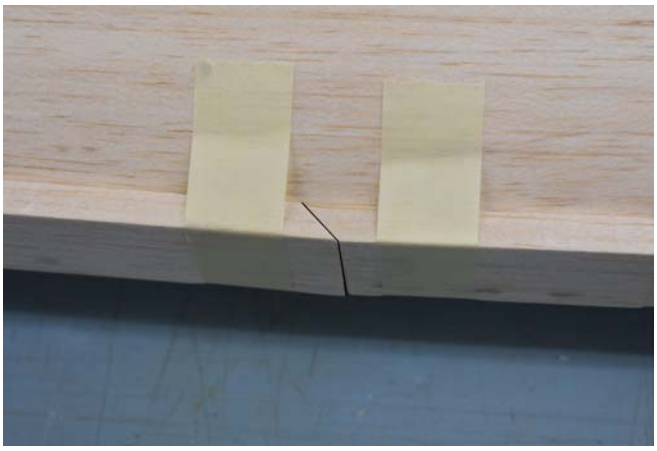


93. Face off the trailing edge of the wing for the aileron using a 3/8“ x 2“ wide balsa sheet. Glue on a scrap piece to the end as the length is a little short. .

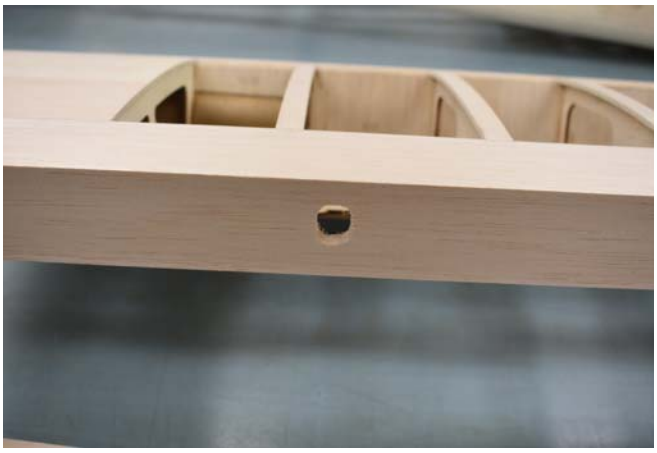




94. Cut a 3/8” thick x 3” wide balsa sheet in half length wise and glue onto the leading edge of the wing. Note the 45° overlap at the wing break.



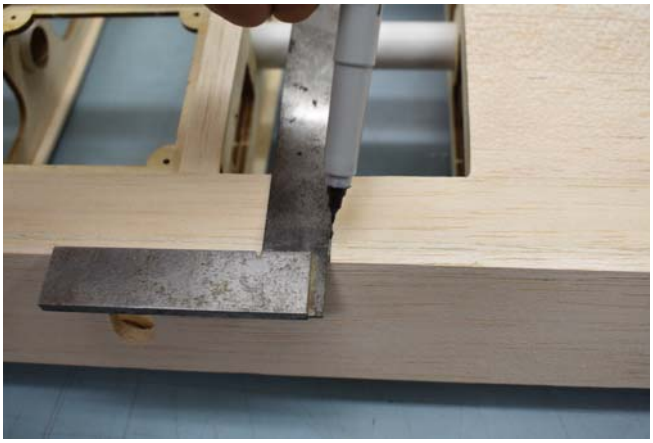
95. Make a hole in the trailing edge for the flap horn to pass through.



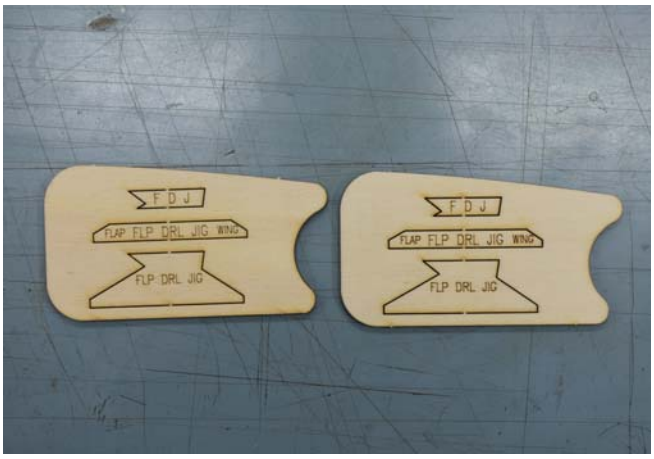
96. Sand the mating top surfaces of the flap and ailerons with the wing.

(Flap Hinging)

97. Re mark the flap hinge point locations square with the hinge line (T.E. of wing). Tape the flap into position and extend the lines onto the flap.



98. Locate the two Flap Drill Jig pieces as shown in first picture. Glue one of long narrow pieces onto one of the **FLP DRL JIG** (tall side) piece flush with the bottom and flush on the sides. Orientation as shown in 3rd picture.

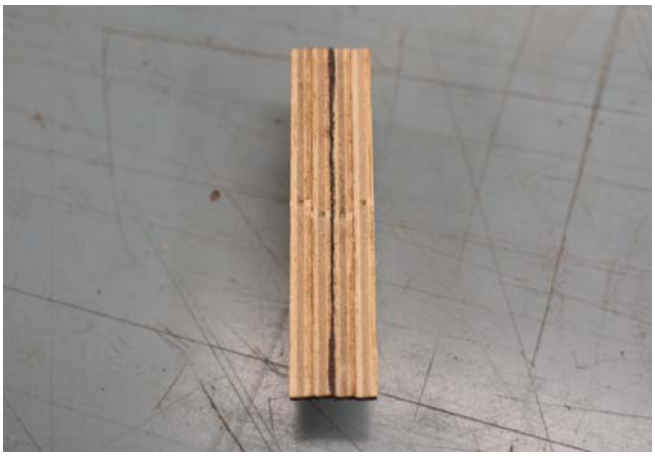


99. Glue in the 3/16” I.D. brass tube. The tube must be within the tall side piece and not be overhanging. Then glue on one of the short narrow pieces as shown.

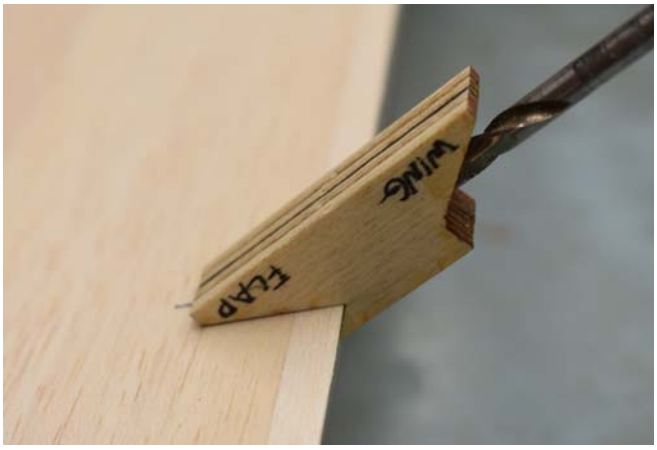
100. Glue on the second layer of the short and long narrow pieces.

101. Glue on the last tall side piece.

102. Mark a line down the center of the bottom of the drill jig.

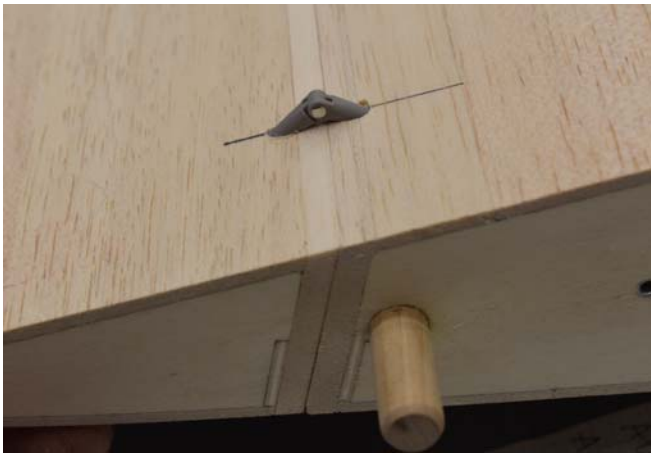


103. Center the drill jig onto the flap “marked” hinge line. (FLAP of the jig is against the flap). Use a 3/16” dia. drill bit and drill all the holes on the flap side.



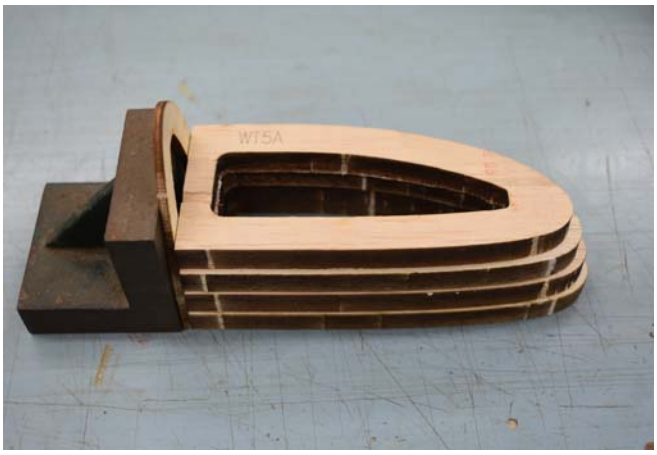
104. Repeat for the wing side. (WING of the jig is against the wing).

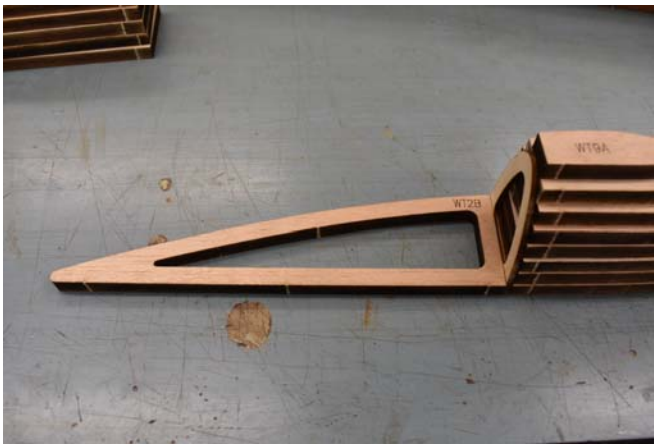
105. Dry test fit all the flap hinges.



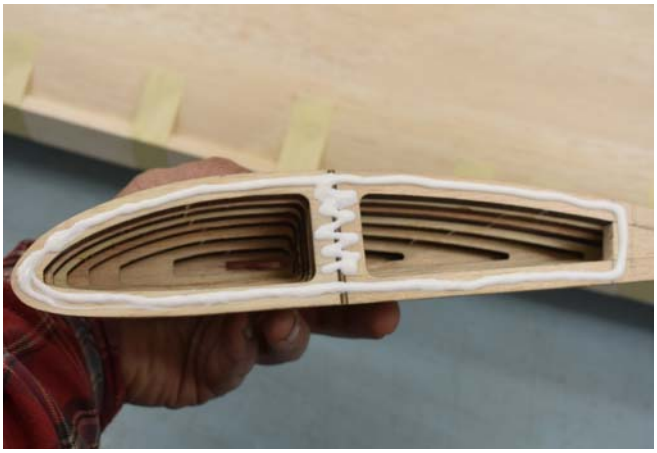
(Wing Tips)

106. Stack and glue **WT2A** through **WT9A** to **WT1**. Then stack and glue **WT2B** through **WT9B** into position. Pictures shown are for the right wing tip. (Mirror image for Left Wing)

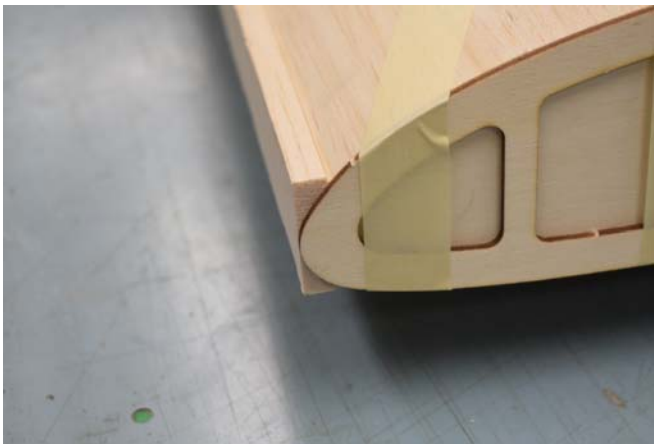


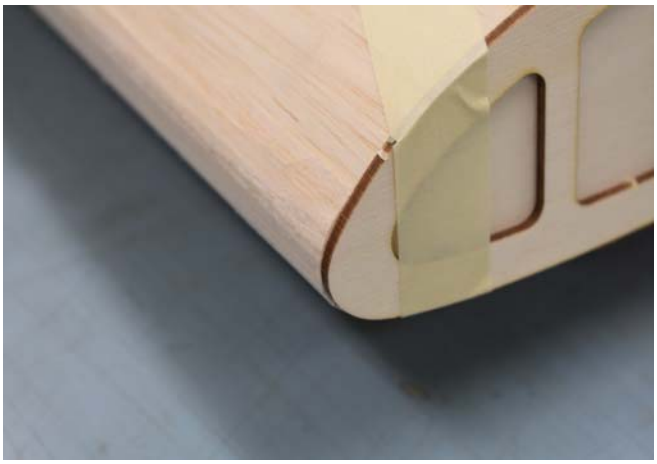


107. Rough shape and sand the wing tip and glue on with the aileron taped into position.



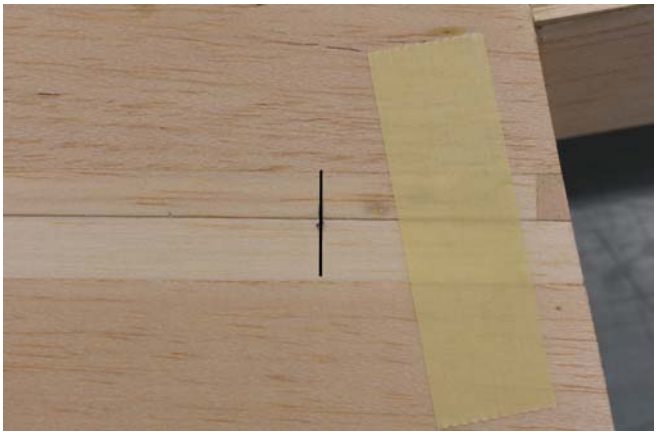
108. Temporary tape on **W1A** and shape the leading edge.





(Aileron Hinging)

109. With the aileron still taped to the wing, mark the hinge locations. Mark your centerlines with the HINGE CL TOOL (1/16” ply located on 185 FUES. SHEET-21) and drill 3/16” diameter holes for the hinge points.



110. Trace the root and tips with the **AILERON BEVEL GUIDE**. Bevel the ailerons only and dry fit with hinges to the wing.

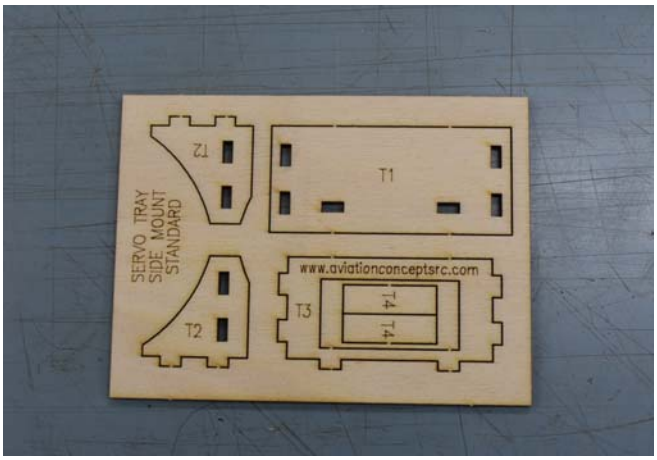
111. Locate the aileron horn pocket and cut away the skin.

112. Locate the G-10 aileron horn. It has an engraved letter "**A**" on it. If you are going to use ball links on the horn, then drill out one of the clevis holes with a #35 drill bit. Roughen up the horn and epoxy into position.

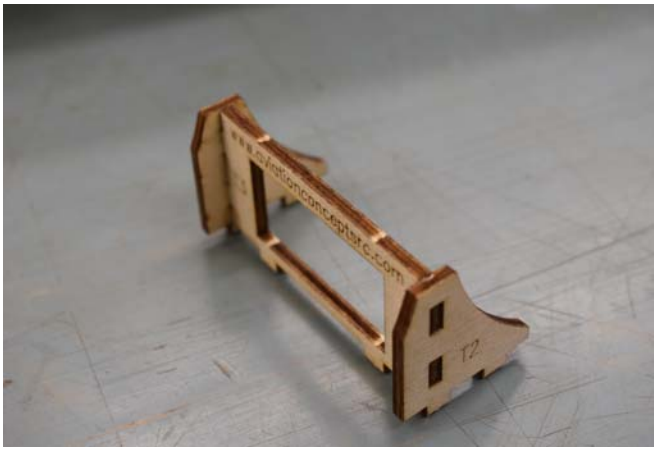
113. Deflect the aileron to its full down position. Now lower the flap slightly. You'll notice the bottom edge of the aileron gets closer to the flap. Mark a parallel line on the aileron to give a 1/16" clearance. Sand a bevel into the bottom half of the aileron to this line. See SECTION D-D on the wing drawing.

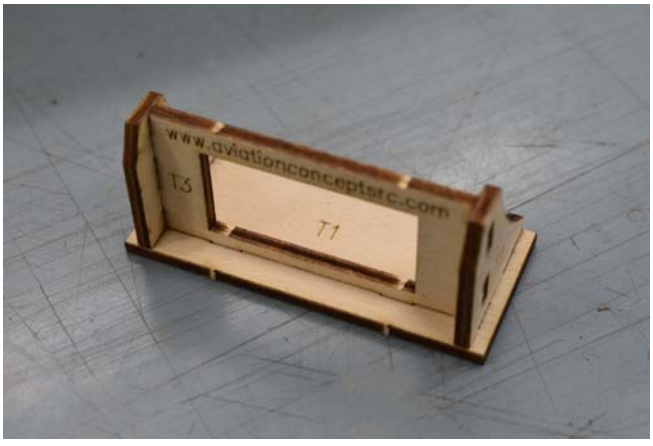
(Aileron Servo Tray)

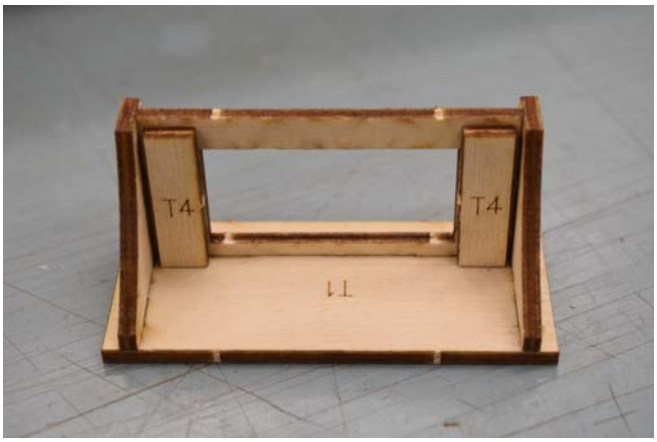
114. Locate one of the SIDE MOUNT SERVO TRAY.



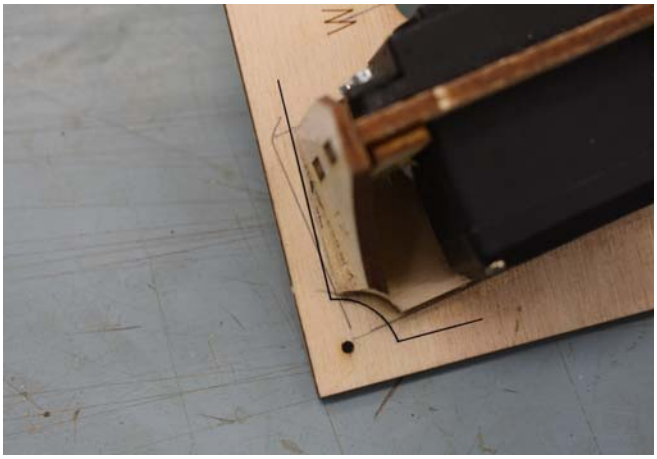
115. Assemble the aileron servo mount by gluing both **T2**'s onto **T3** with all the tabs facing down. Then glue the bottom **T1** on followed by both **T4**'s on the back side.

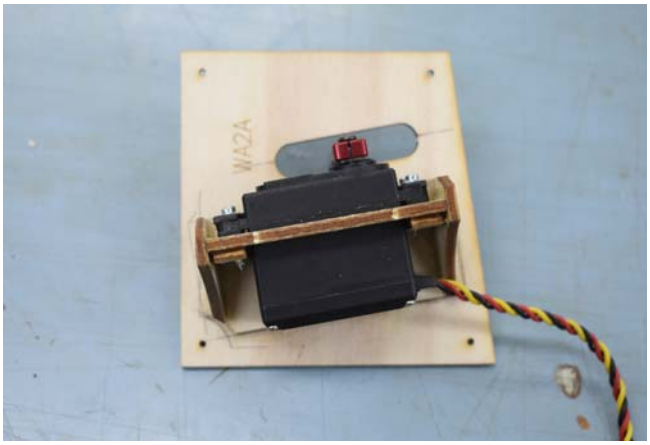






116. Trace the aileron mounting rail onto the aileron servo cover. Install your servo into the tray and mark its position. Trim the servo mount where necessary and glue into position.



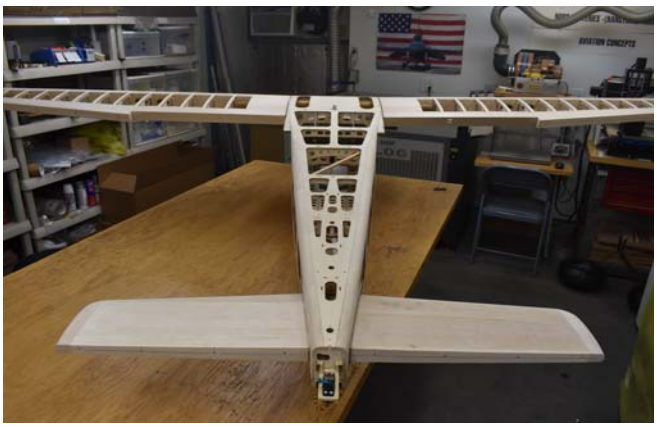


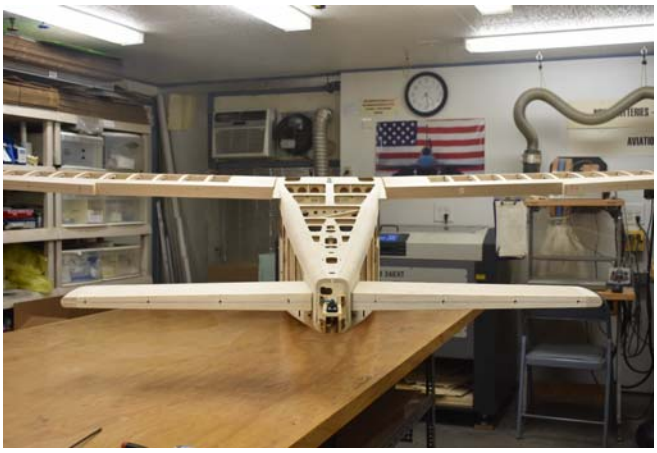
WING STRUTS:

1. Remove the ailerons and flaps from the wings and slip on the root end caps. (Do not glue them on at this time). Also check that the wing tube socket does not protrude past the root end cap.

2. Slip in the wing tube and bolt the wings on using 8-32 socket head bolts with lock and flat washers. The front bolt is 1 1/4" long while the rear bolt is 1 1/2" long.

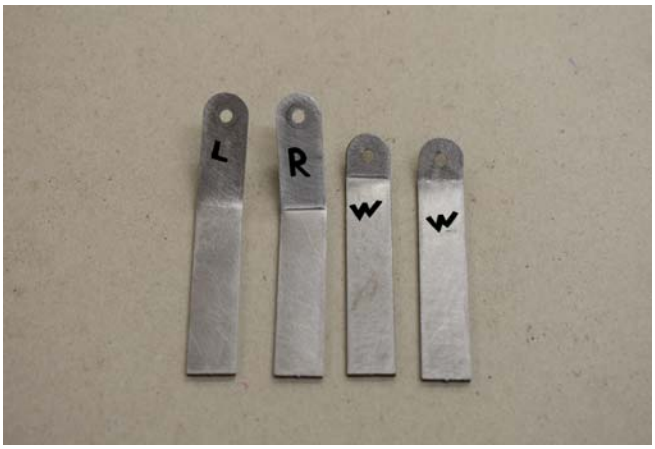
3. Check the wings alignment and that they are parallel to the stabilizers. If they are not parallel, then an adjustment can be made using one wing strut.

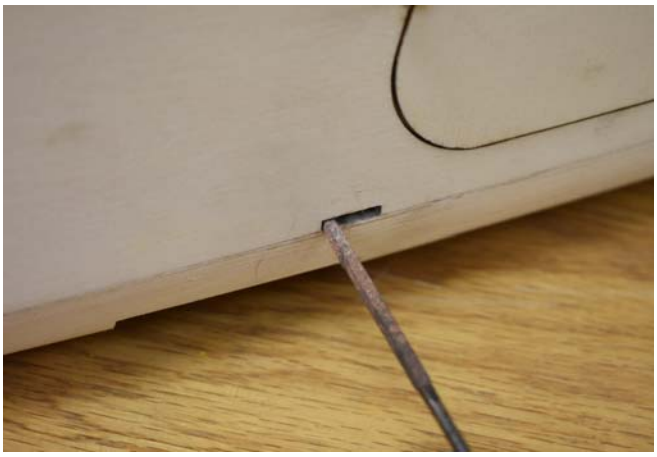




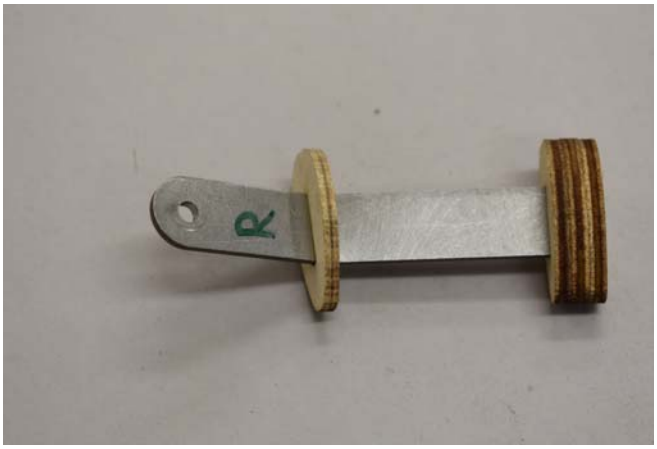
4. Make up the wing strut mounting bolts by retrieving two 8-32 x 1 1/4" long socket head bolts and four 8-32 nuts. These need to be double nutted and RED lock tited at a distance of 5/8" to 11/16" from the end of the threads. These bolts will be for attaching the struts into the fuselage. The long head on these two bolts is so you can grab them and remove them out of their recessed spot. The strut attachment out on the wings are 8-32 x 3/4" long socket head bolts with lock and flat washers.

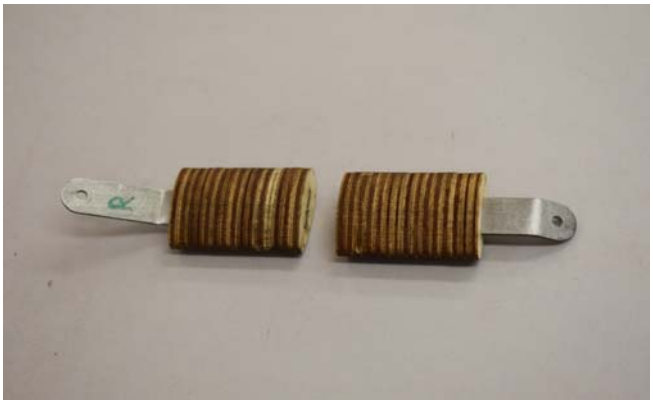
5. Locate the strut attachment straps. They are labeled **L**, **R** and **W**'s. **L** strap is left side at the fuselage, **R** strap is right side at the fuselage and the **W** straps are out on the wings. Test fit the fuselage straps into the slots on the fuselage. If they don't go in, then file out the excess epoxy that may be hindering installation.



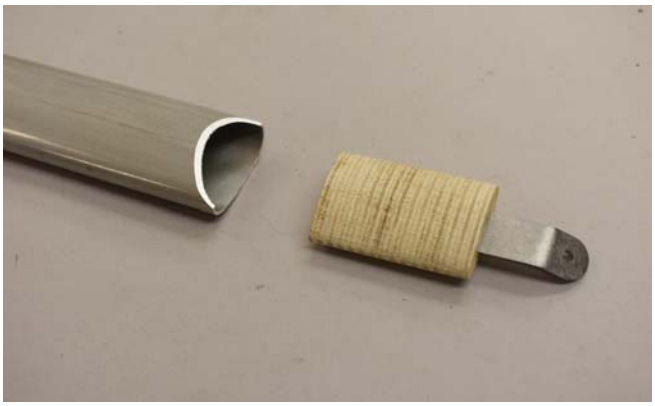


6. Locate the bag of strut airfoil pieces and count out 15 for each strut strap. Familiarize yourself with the direction of the airfoil pieces before gluing them onto the straps. You'll be making a right and left set. Glue one airfoil piece flush with the end of the strap followed by the remaining pieces. (Following 5 pictures shown is for the right strut).



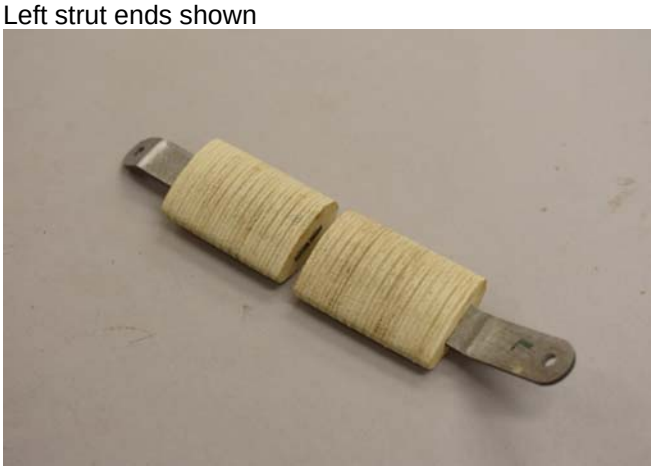


7. Sand smooth and test fit them into the wing struts. They should slide easily.



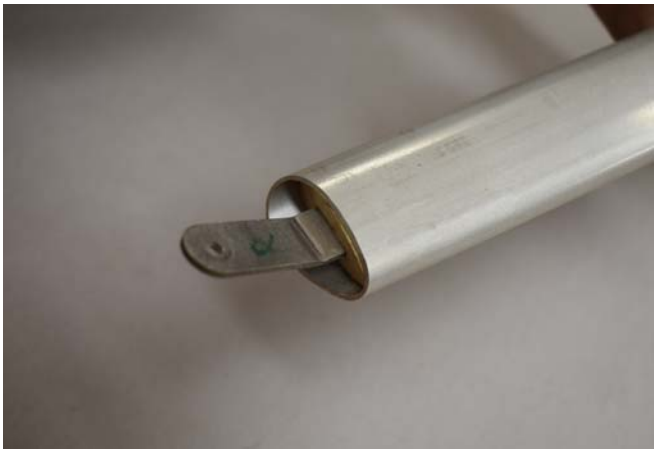
Left and Right strut ends shown

Left strut ends shown



Right strut ends shown

8. Slip in the Right strut end into the Right wing strut. This end of the strut has a full height single bevel cut.



9. Slip in the appropriate **W** (wing side) strap into the opposite end. This end of the strut has a half height single bevel cut.

10. Repeat last two steps for the Left wing strut.

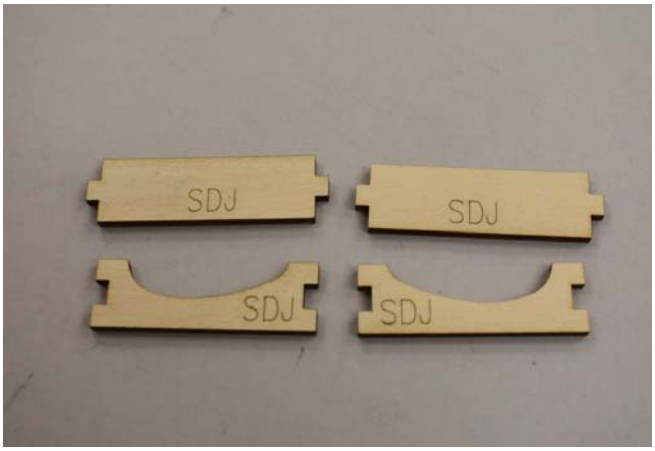
11. Doing a dry run, bolt on the wing struts. Tape a 1/32” thick ply spacer between the fuselage and wing strut.

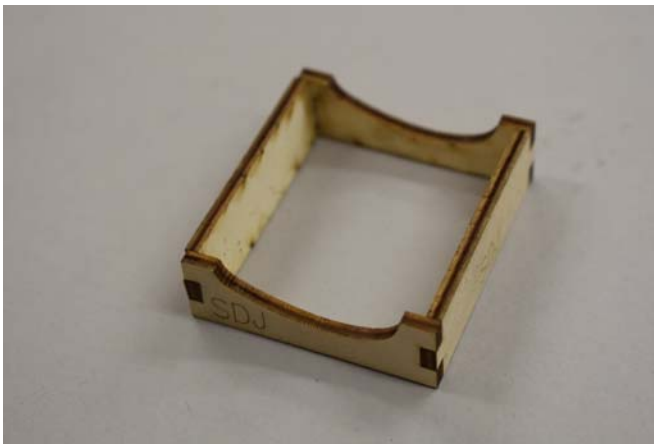
12. Check that the wings are parallel to the stabilizers. If one wing needs to be raised you can simply add shims between the aluminum strut and wing.

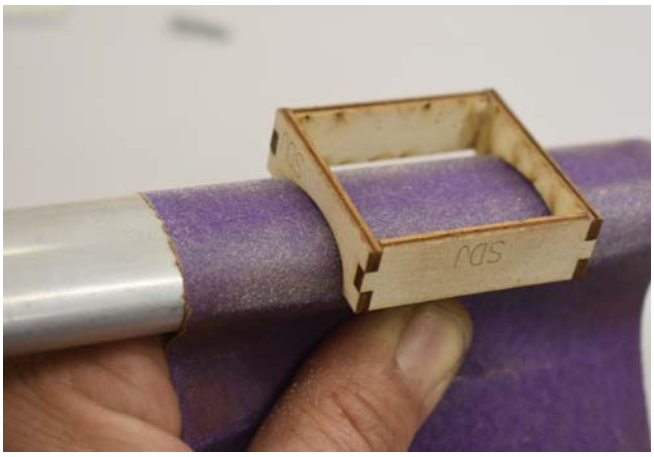
13. When satisfied, remove the struts and roughen up the inside of the wing struts. Epoxy in the strap ends using 30 minute epoxy and bolt the struts back on with any shims that was needed.

14. Once the epoxy has cured. Remove them and mark the ends for drilling holes. The first mark is 3/8” from the edge and then 1” from the first mark.

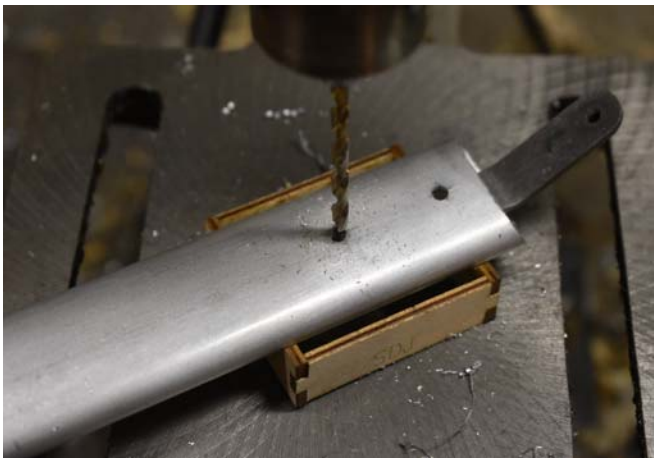
15. Glue together **SDJ** cradle and wrap sandpaper around the strut and sand the cradle seat for better seating.





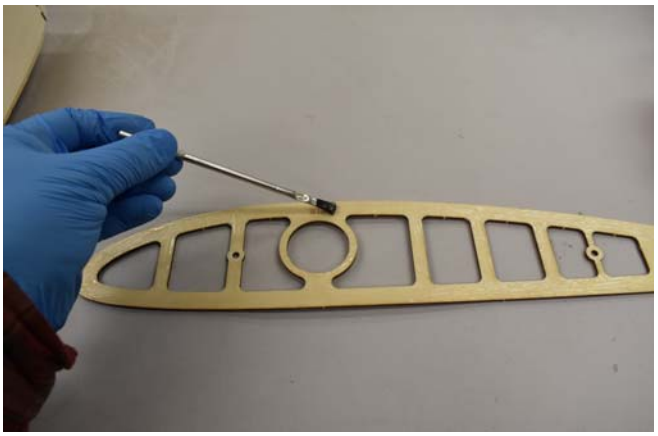


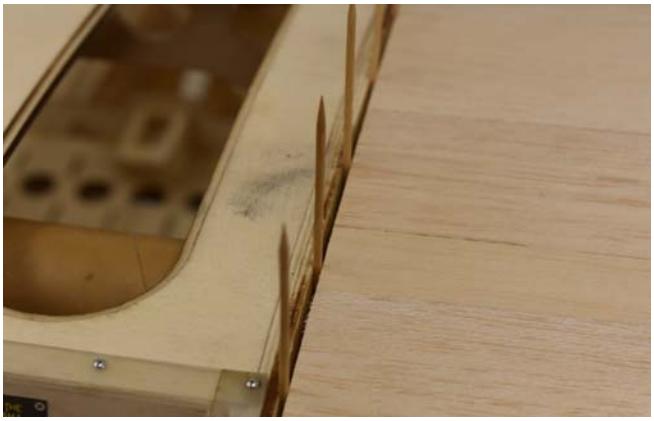
16. Drill holes on your drill press using a 9/64” diameter drill bit.



17. Insert 6-32 x 3/4” long pan head bolts and lock tite on the hex nuts.

A look at the finished strut ends.





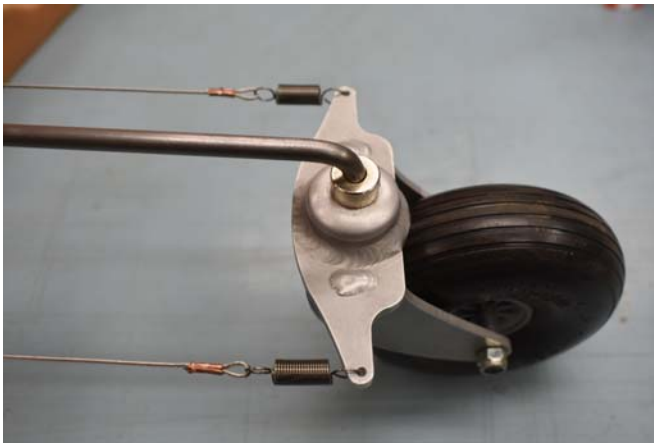
18. The last thing to do is to glue on the root end cap. A thickened mixture of epoxy is brushed onto the end cap and set into place. (You can thicken it with cabosil, micro balloons or thixotropic silica). Bolt on both wings and the wing struts and place tapered tooth picks where needed between the rib and end cap as to seat the end cap up against the fuselage. Then a glue syringe with thickened epoxy is injected into the gaps. When this is all cured, cut or break off the toothpicks and add a little balsa filler. Sand smooth and you will have a perfectly mated wing connection.

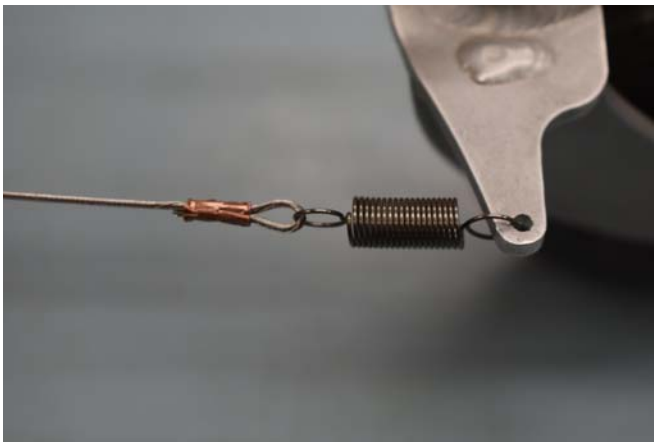
FINISHING:

1. Prep the model for finishing.

2. Cover the bottom of the fuselage first then glue in the two yellow pull pull exit guides for the tail wheel steering.

3. While the fuselage sides are still open it would be easier to make up the steering cables now.





4. You can now remove the tail wheel assembly to continue with finishing the covering. Tip; to make it easier to remove the tail gear wire, use a strong string and make a loop and slip it over the wire and pull up.

Finish covering.

Cooling baffles painted flat black and screen added to air inlet. Screen is glued in from the inside of the cowl.

Windshield and frames installed.

Fuselage almost finished.

Tail installed.

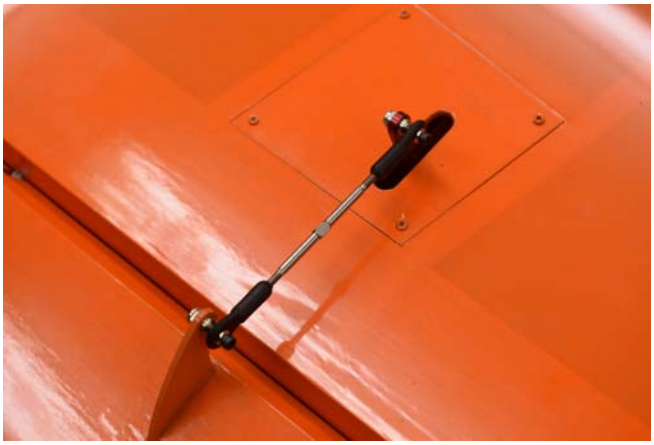
Door latches installed. (these decals not included)

Paint the thin G-10 door hinge caps. The very short ones glue onto the fuselage in front of the hinge knuckle. The longest hinge caps are glued onto the top door hinge. Do not accidentally glue them onto the fuselage or the door wont open. The medium length hinge cap is on the bottom door hinge.

Glue in the top and side windows using RC-56 or clear canopy glue. G-10 top oval window frames and additional screws are provided.

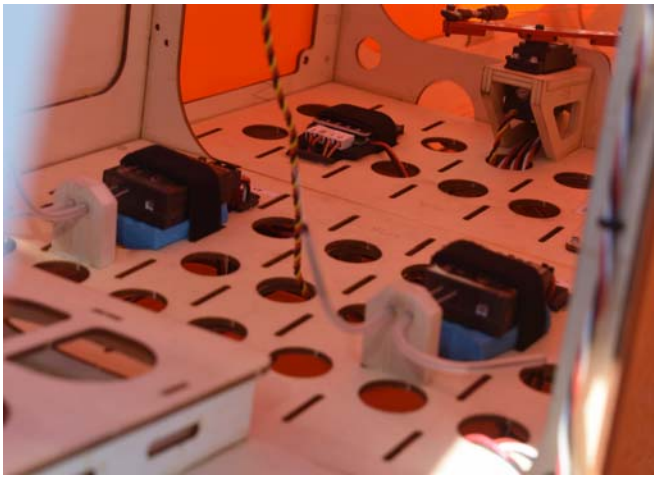
The luggage door on the left side behind the wing is an excellent place to mount and access your receiver switches.

Install your pushrods. (rods, clevises or ball links etc. not supplied in kit.)



Landing gear and cover mounted.

Plenty of places to strap down receivers and batteries.



BALANCING:

1. With the model finished, locate the two CG BALANCE TOOL and slip it onto the wing tube. Install the wings and bolt on the wing struts out at the wings only.

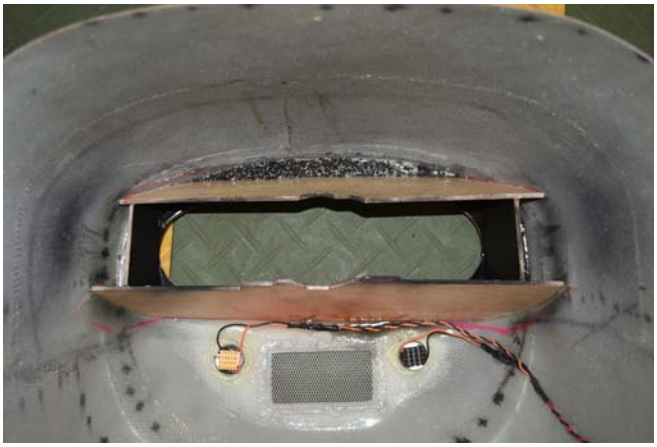
2. Make a bridal from rope or cord with 2 loops at each end about 36" long. Use S hooks to connect rope to balance tool. The two holes defines the CG range.

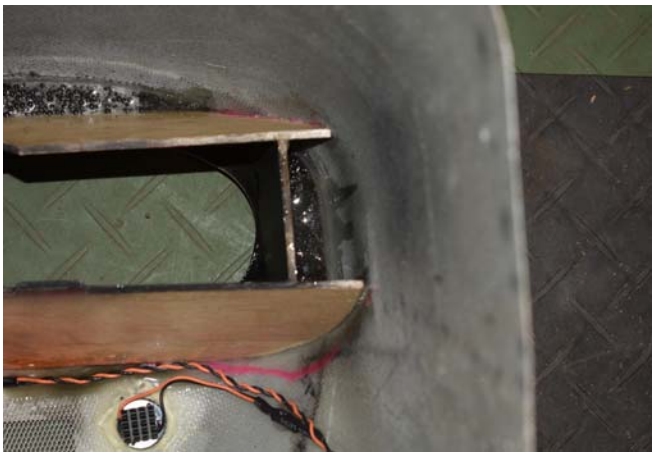
3. Raise the model off the floor using a pulley and rope system etc. Add weights on top of the cowl in the location of the engine box.

Almost there!

4. Screw the weights onto the sides of the engine box. Here we have about a pound screwed on. These removable weights are for fine tuning the CG.

5. To help balance the model further a pound of lead shot can be glued into the cowl in the top and side of the baffles using thickened epoxy.





CG right on with 10" utility wheels.

And still OK with Du-Bro 7" wheels.

6. Balance the model laterally. Make sure the lifting rope is centered on the bridal rope. Lift the model off the floor. Add weights to the lighter wing tip or aileron servo bay pocket depending upon the mass (weight) difference between the two wing panels.

CONTROL THROWS:

Control throws are measured at the widest part of the control surfaces.

CONTROL	HIGH RATE	LOW RATE	EXPO
AILERONS	1 3/4" UP	1 1/2" UP	30%
	1 1/2" DOWN	1 1/4" DOWN	
ELEVATOR	3 5/8" UP	3 1/4" UP	40%
	3 5/8" DOWN	3 1/4" DOWN	
RUDDER	3 3/8" RIGHT	2 3/4" RIGHT	45%
	3 3/8" LEFT	2 3/4" LEFT	

	HALF	FULL
FLAPS	20° DOWN	50° DOWN
ELEV MIX	3/16" DOWN	7/16" DOWN

To set the flap angles, use the lite ply FLAP ANGLE SET GAUGES. (See wing drawings 6-7 and 7-7)

FLYING:

Test fly your model with the wind pretty much down the runway. Cross winds are more difficult on landings due to the tall fuselage and large fin/dorsal area especially with the CG on the aft end. Nothing different or unusual about this bird in the air. She is a docile flyer. Ground handling is good due to the forward rake of the landing gear which plants down the tail gear firmly on the ground. The tail comes up nicely on its own. Depending on engine and prop combo very little or no right rudder is needed on the take off roll or climb out. Coordinated rudder and aileron turns makes it turn very scale like. Full flap landings really slow the plane down to a walk with the aft CG setting. Expert flyers can later push the flaps down to 60°. Be gentle and get acquainted with her on the first few flights. Make adjustments to the CG, control throws and flaps (small adjustments at a time) to your liking and flying style. Knife edge and inverted flight requires down elevator input. Stall turns are crisp and beautiful to watch. Upright spins are more like gentle spirals while inverted spins are crazy wicked looking. Side slips pretty much impossible again due to large fin and dorsal area. Full 3 point stall landing are capable with the CG on the aft setting. Do not fly the model without the wing struts, they only take 3 minutes to install.

Send or e-mail a picture of your finished model, we would love to see it.

Thanks, Enjoy and happy flying. Gunny Bumburs

ADDITIONAL ITEMS NEEDED:

Gas engine: 85cc to 120cc for scale or sport flying. 150cc to 200cc for aero towing gliders. We used a DA 150 for all around sport and aero towing with a Mejzlik 28,5 x 12 S carbon fiber 3 bladed prop.

Spinner: 4 ½" spinner. Either P-51 or Ultimate style. Back plate spinner lightening holes not needed. Stock out of the factory the Cessna 185 used a parabolic (P-51 style) spinner with a 2 bladed prop. Bush pilots like to use a 3 bladed prop with the long Ultimate style spinner.

Wheels: 7" to 8" diameter. Stock out of the factory the main wheels would be 7" in diameter. These wheels will have to be drilled out for the 3/8" dia. axles. You could also use our 10" diameter pneumatic wheels. They weigh about 5 lbs per pair but are still lighter than steel or aluminum wheels. We used plastic hub wheels with ribbed tires. Tail wheel is included.

Servos: 9 - 11 high torque digital metal gear servos. 2 aileron servos, 2 elevator servos, 2 flap servos, 1 rudder servo, 1 steering servo, 1 throttle servo. 1 for optional choke and 1 for optional tow release.
We used Hitec HS-7955TG (333 inch/oz) for all the control surfaces and Hitec HS-5645MG (168 inch/oz) for the throttle, tow release, tail wheel steering and or choke. For scale flying you could use the Hitec HS-5645MG for the rudder and ailerons.

Pushrods, clevises and/or ball links: We like using the Titanium 4-40 pushrods with heavy duty ball links.
Elevator pushrod (2) 2 1/2" long.
Aileron pushrod (2) 3" long.
Flap pushrod (2) 2" long.
Pull pull steering cable included with swages.

Servo arms: We like the HD 4-40 aluminum ones.
Elevator (2) 1 1/2" long.
Aileron (2) 1 1/2" long.
Flap (2) 1" long.
Tail wheel steering (1) 4" double arm.

Covering: 10 standard size rolls of ultracote used.

Other items: Can't list everything… Fuel tank, fuel lines, fuel dot, servo wire extensions, Velcro straps etc. etc.

Lighting system: The main pkg. that I started with is the uniLIGHT PRO MEDIUM set (UNL-SETPRO-M2)

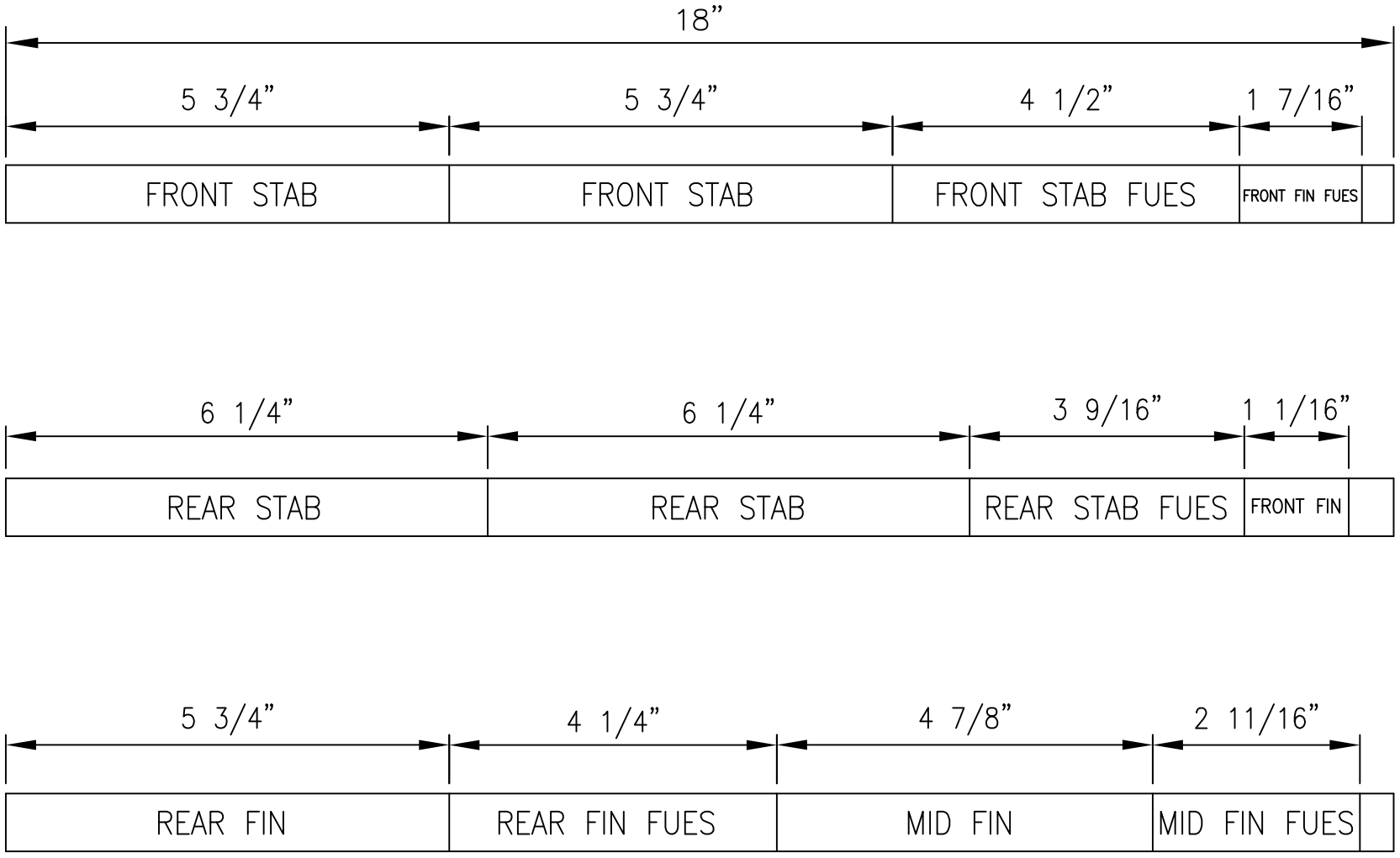
Unfortunately it comes with 1 landing light. So you need to purchase an additional one. You'll need to order the set and see which one comes in your set, or have them open the box and verify what's in there and add a duplicate one. It could be anyone of these;
(SPOT 22-040-WE) which is a pure white.
(SPOT 22-040-WWE) which is a warm white or
(SPOT224).

I did not use the red beacon that came in the set because it was too large in diameter for the top of the fin. Instead I purchased a 4W PURE LIGHT RED (UNL-PURE040R). The beacon function is controlled by the 4 channel controller included in the main pkg.

I added a pure white tail cone light which is spliced into the nav lights. Here I purchased a 4W PURE LIGHT WHITE (UNL-PURE040W)

To cap off the beacon and tail cone lights I purchased extra clear lighting covers. (UNL-CAPSPRO)

Everything here was purchased from DREAMWORKSRC dreamworks model products LLC.

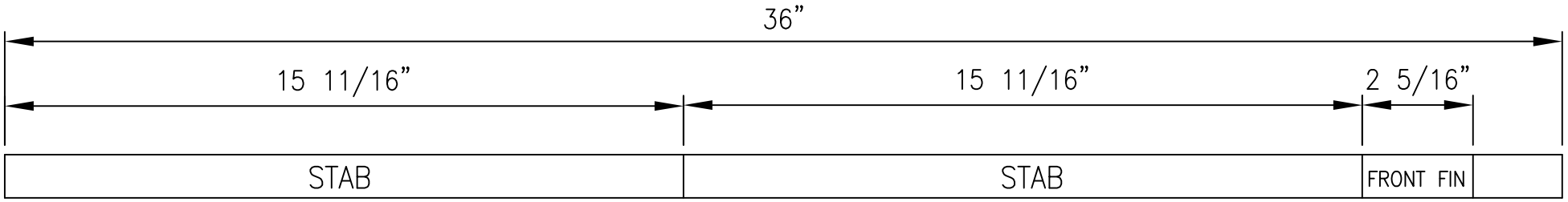


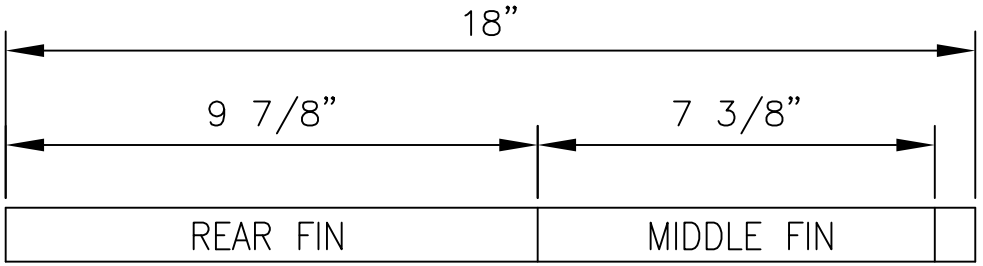
1/2" DIA. CARDBOARD
TAIL TUBE SOCKETS

NOT TO SCALE

SKETCH 1

CUTTING TAIL TUBE SOCKETS TO LENGTH



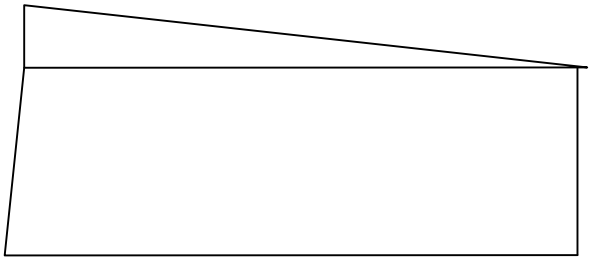


1/2" DIA. CARBON
FIBER TAIL TUBES

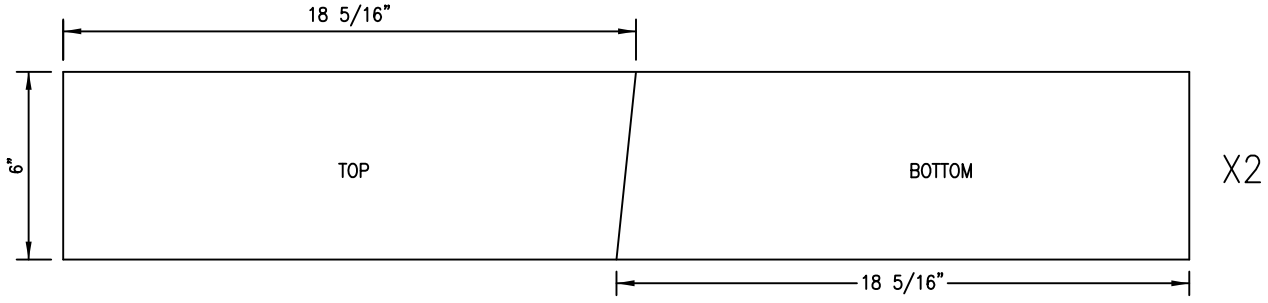
NOT TO SCALE

SKETCH 2

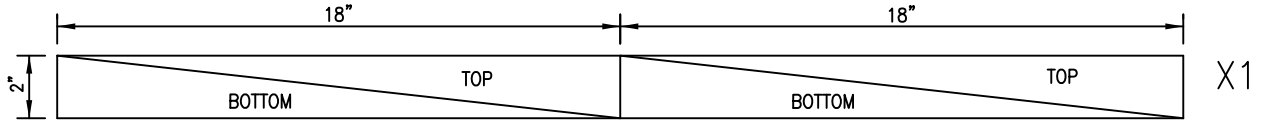
CUTTING TAIL TUBES TO LENGTH



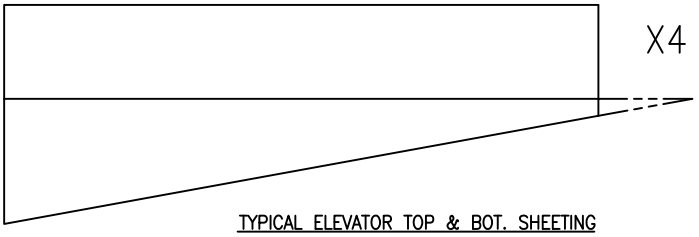
TYPICAL STABILIZER TOP & BOT. SHEETING



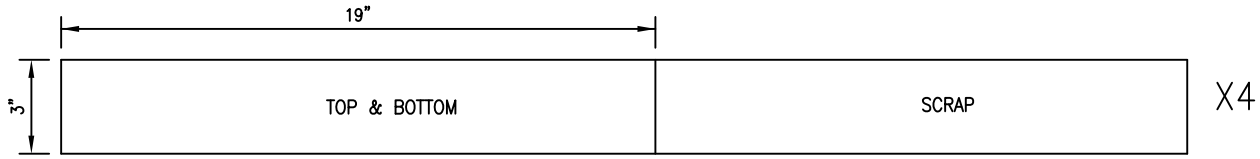
STABILIZER TRAILING EDGE
3/32" THICK BALSA



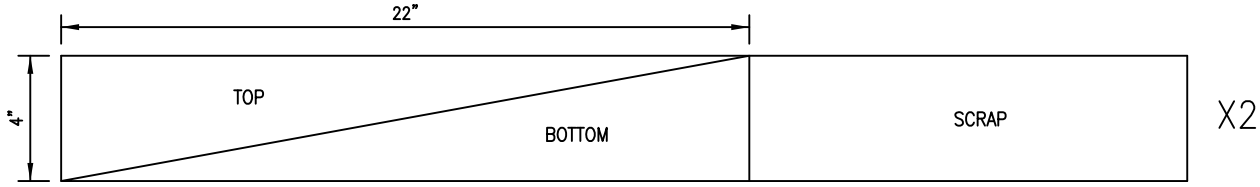
STABILIZER LEADING EDGE
3/32" THICK BALSA



TYPICAL ELEVATOR TOP & BOT. SHEETING



ELEVATOR LEADING EDGE
3/32" THICK BALSA

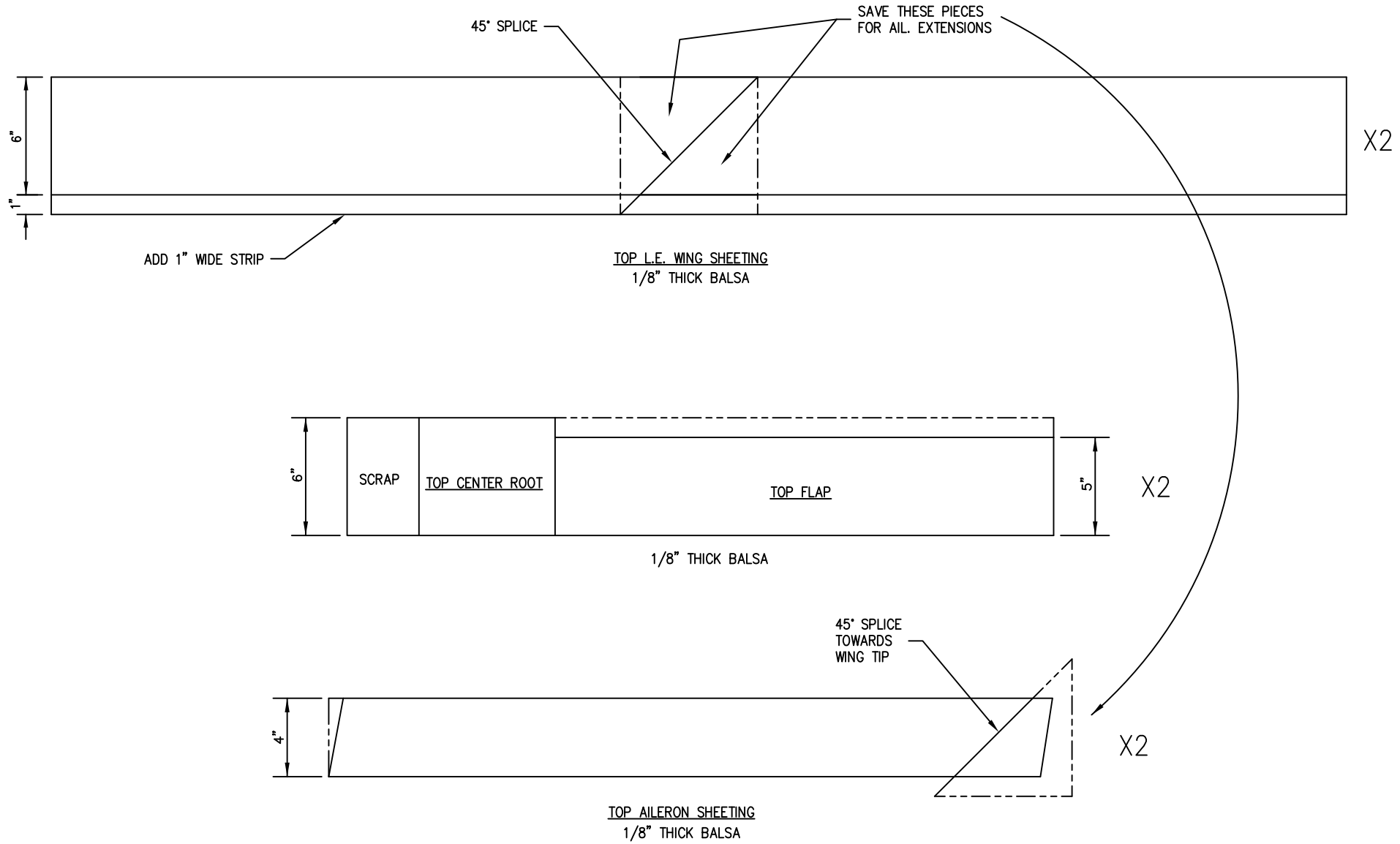


ELEVATOR TRAILING EDGE
3/32" THICK BALSA

NOT TO SCALE

SKETCH 3

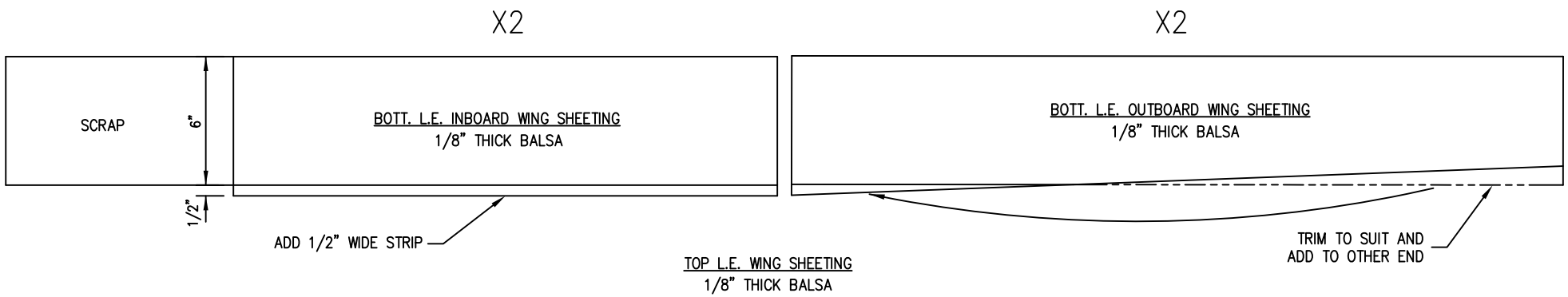
ELEVATOR SHEETING

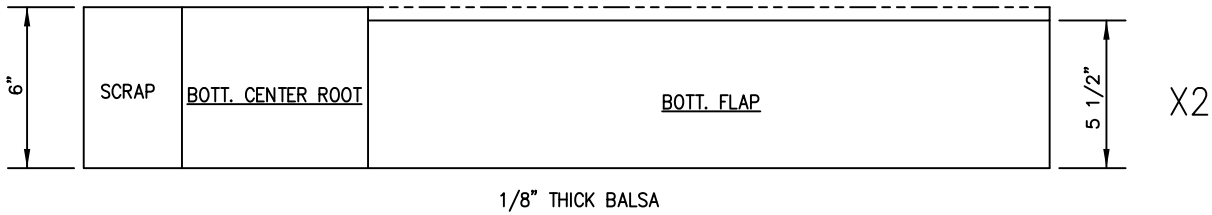


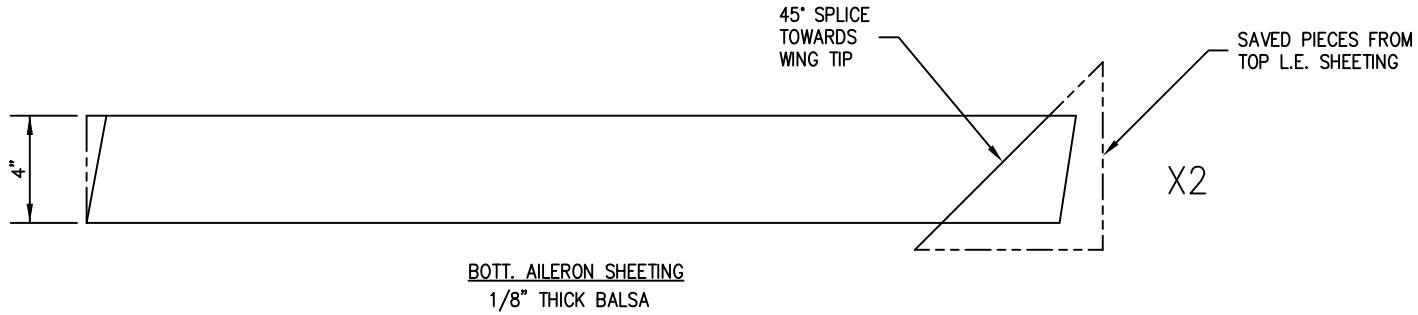
NOT TO SCALE

SKETCH 4

TOP WING SHEETING







NOT TO SCALE

SKETCH 5

BOTTOM WING SHEETING