The RCCD's
Kontrol line Kool Kat

Having had a series of very successful radio controlled project planes over the past three years, at this time, the Radio Control Club of Detroit will provide at cost to it's club members, a short kit for a control line model airplane. This plane was designed and produced specifically to re-introduce current club members and or entice new members to the joy of flying control line aircraft. Even though, as the club name may imply, the club is just not about radio control aviation, but the club covers all facets of model aviation. There is a well groomed and maintained control line flying circle at the club field. This circle is currently not being used to it's full potential and is crying for additional C/L pilots. For the potential new pilot and new club member control line flying may be the most economical way to enter model aviation. The initial investment for equipment and plane is certainly more reasonable than R/C.

This RCCD control line plane design is the combination of ideas from a number of club members with years of experience of building and flying control line planes. The object of this design is to produce a plane that is a gentle flier for the beginner and yet can be transformed into a stunt flier with just simple throw adjustments to the control surface as the pilot gains experience. Another major consideration of the design is the plane has to be simple to construct for the beginner without building experience.

The short kit contains all the wood needed to construct the plane. All the critical dimensional wood parts will be N/C laser cut to shape and size. The balance of the materials needed will be listed and would be the builders responsibility to obtain and or purchase.

As with the previous RCCD short kits provided for the radio controlled club airplanes, the build instruction manual will be posted on the club web site. Using the N/C laser cut parts in the short kit and if the instructions posted on the club web site are followed, there is no need for a full set of plans to build the plane. There are a number of experienced builders in the club that are willing to help with any questions that may arise.

Build Instructions

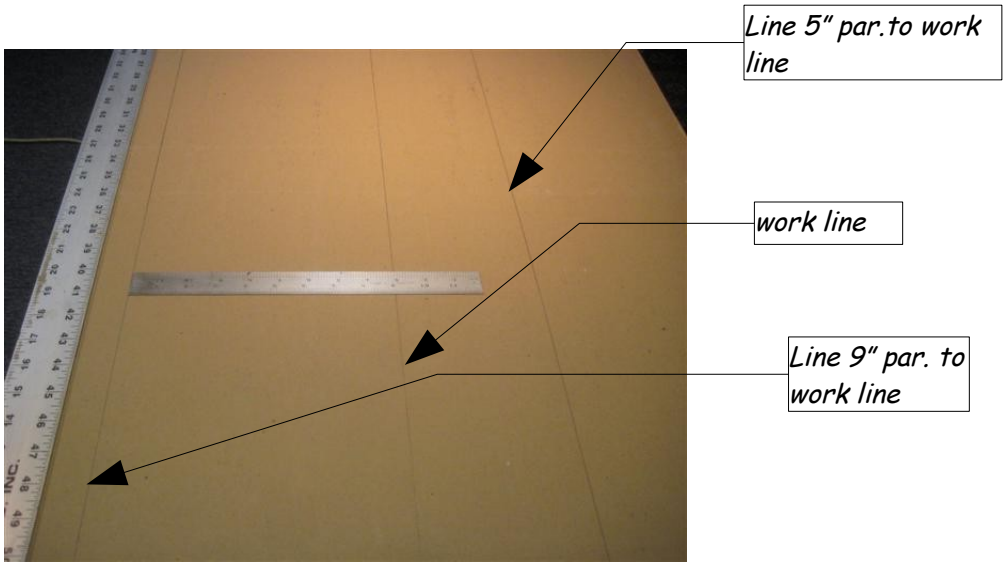
Main Wing:

Previous to starting the actual construction of the wing, your build/work surface must be prepared for the wing construction.

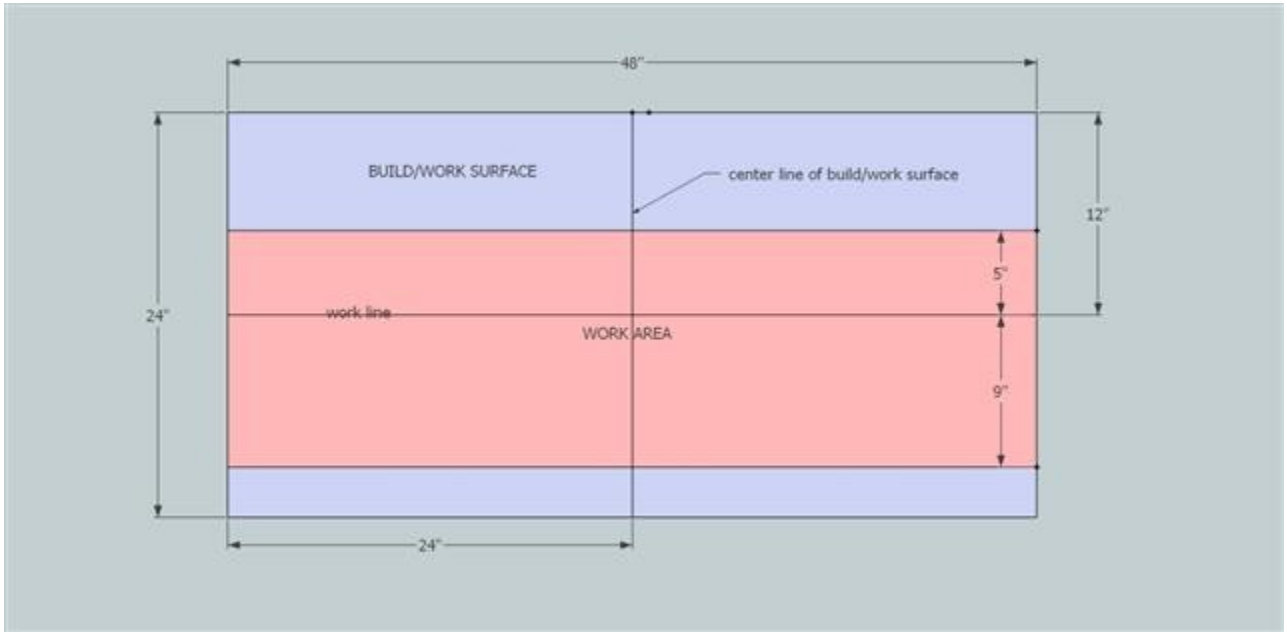
**Your build/work surface should be perfectly flat and you should be able to pin your parts to it. The trueness of the wing is only as good as your work surface.*

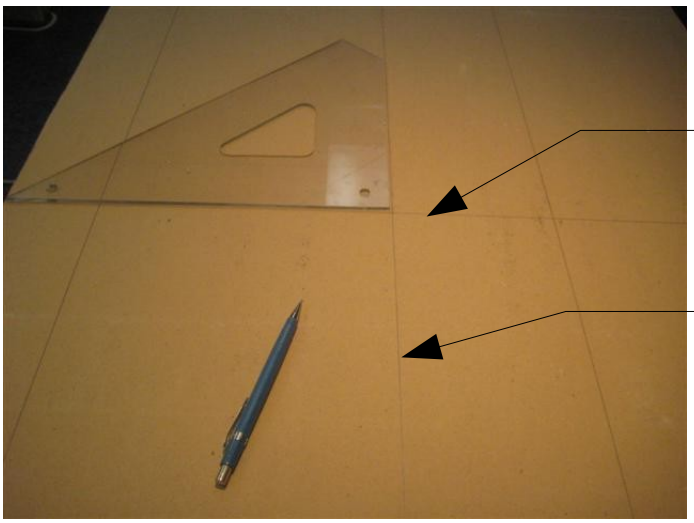
Start your build/work surface prep as follows:

**Draw a perfectly straight work line (approx. 48" long) along the length of your work surface leaving an area approx. 5" in front of and approx. 9" behind that work line to be used as the work area. See sketch and photo below.*



*Draw a line 90° to the work line. This 90° line represents the center of your build/work surface and the center line of the main wing. See sketch and picture below.



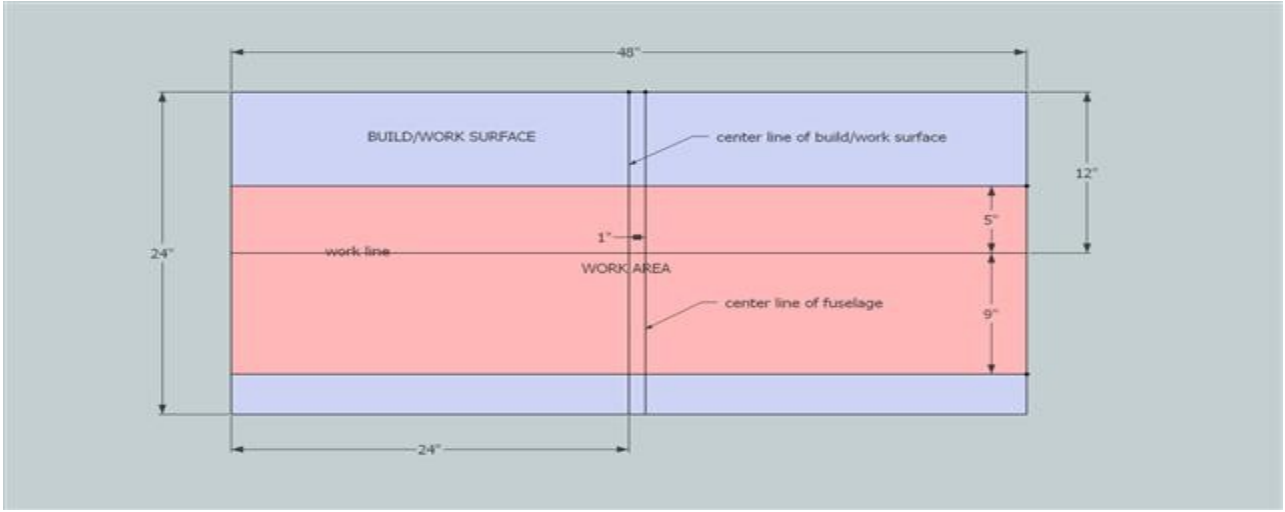


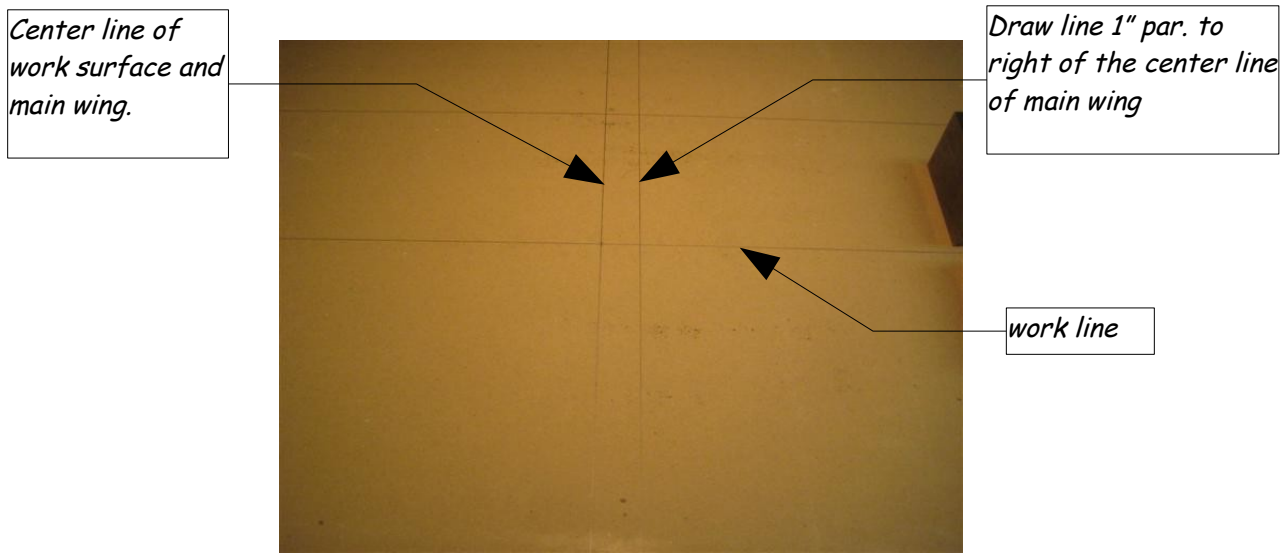
Draw line 90° to work line.
This line represents the center line of the work surface and the main wing.

work line

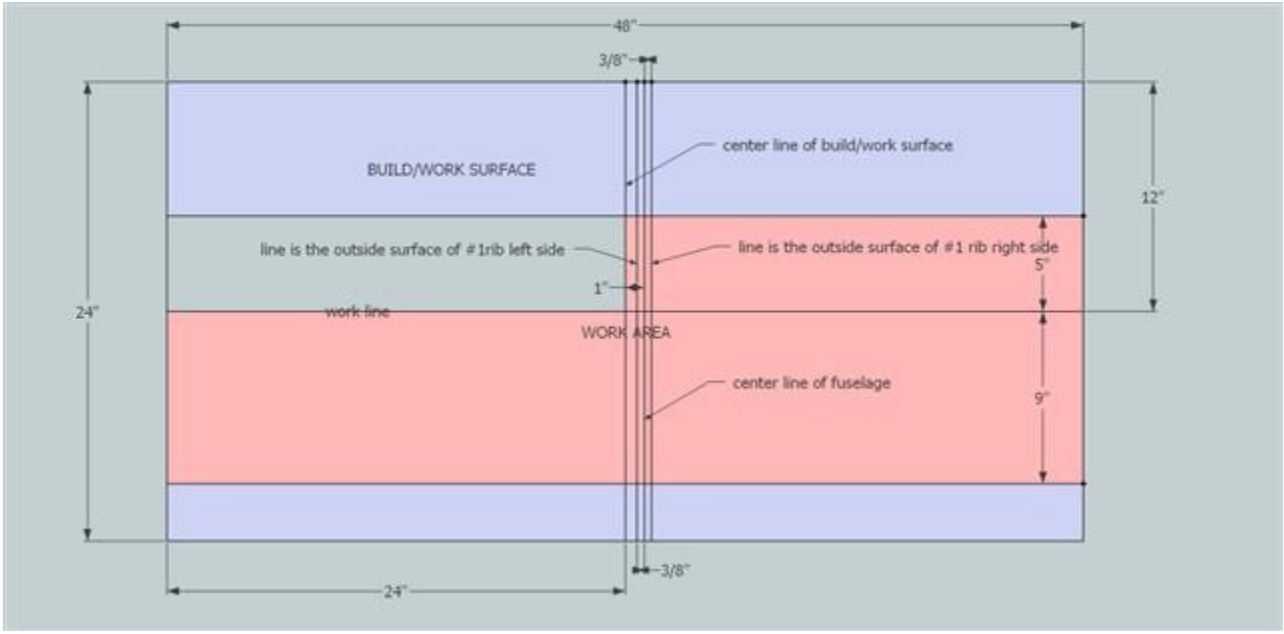
NOTE: The fuselage of the airplane is NOT centered on the main wing. The fuselage is offset 1" to the right side of the center of the main wing.

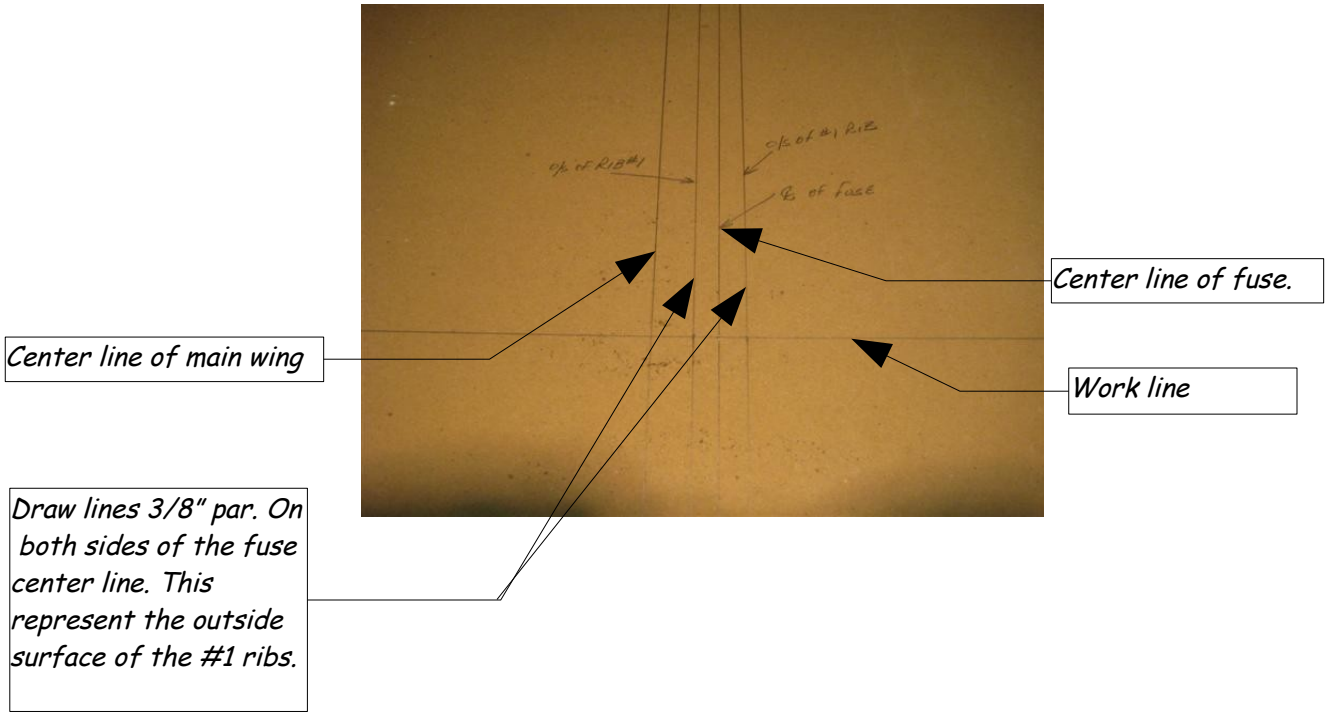
**Draw a line that is 1" parallel to the right of the center line of the build/work surface previously drawn. This line represents the center of the fuselage. See sketch and picture below.*





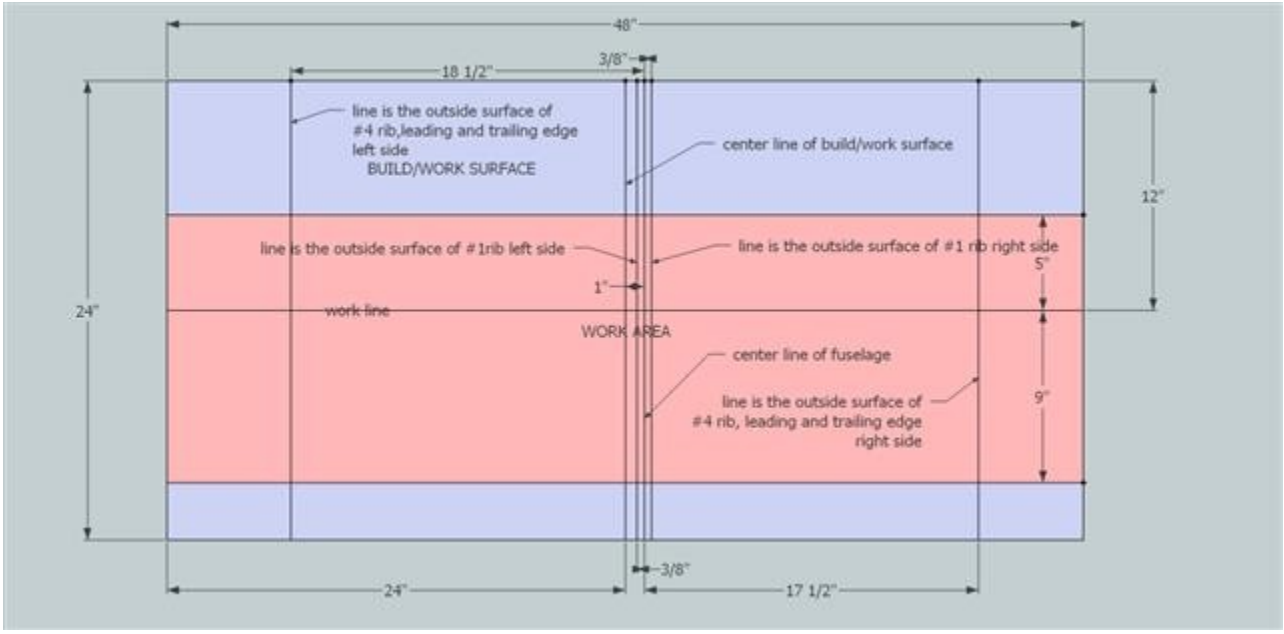
**Draw a line 3/8" parallel on each side of the fuselage center line. This line represents the outboard sides of the right and left hand # 1 ribs. See sketch and picture below.*



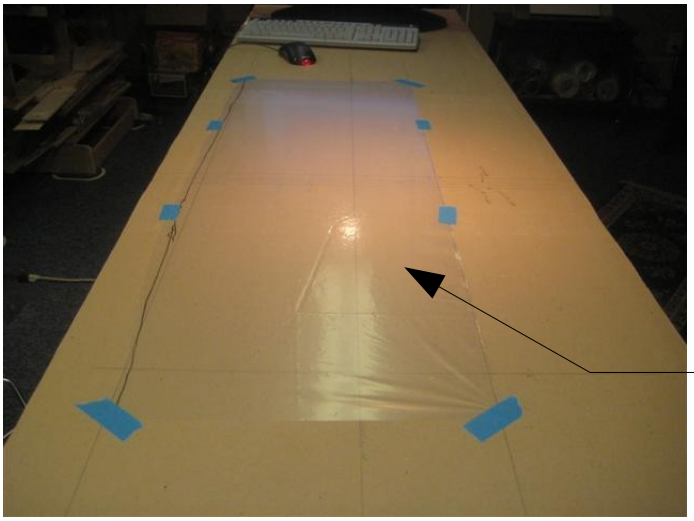


*Draw a line 17.5" parallel to the right of the center line of the fuselage, and draw a line 18.5 parallel to the left of the center line of the fuselage.These lines represent the end of the leading edge, the trailing edge, the main spars and the outside surfaces of the # 4 ribs.

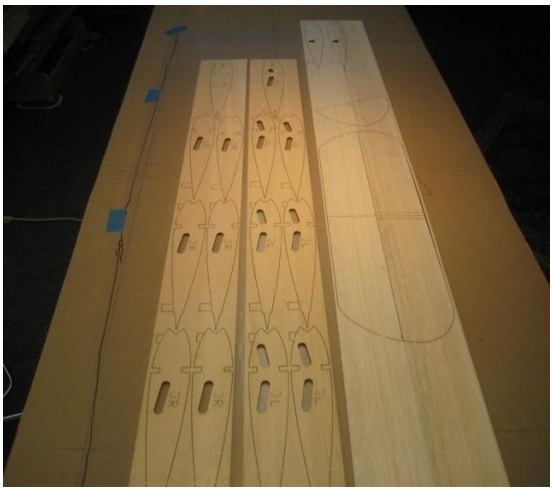
See sketch below.

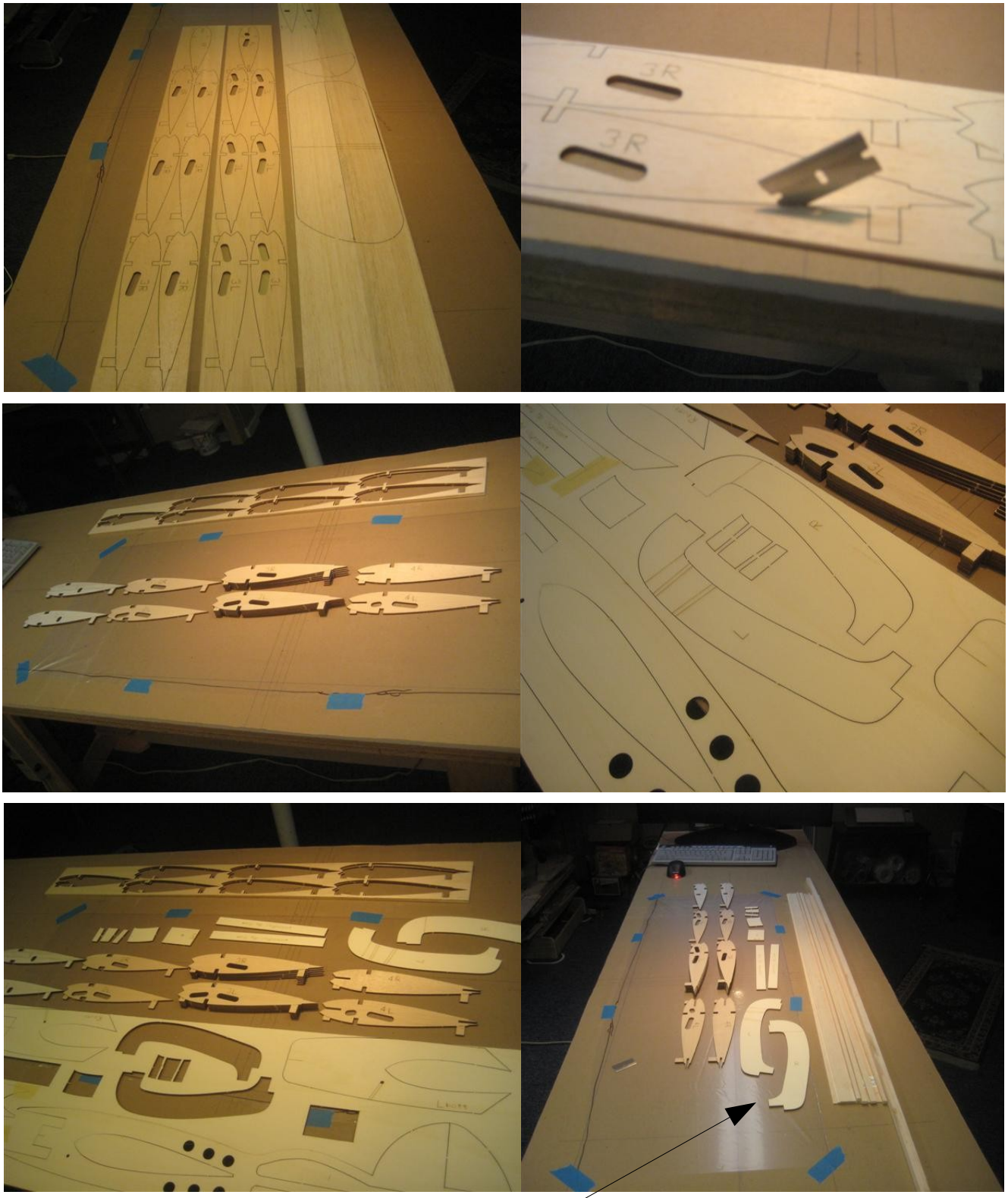


**Double check all of your drawn lines on your work surface to the sketches. If everything is correct to the sketches cover your build/work surface with with wax paper or a clear protective covering. You are now ready to build your main wing on your build/work surface.*



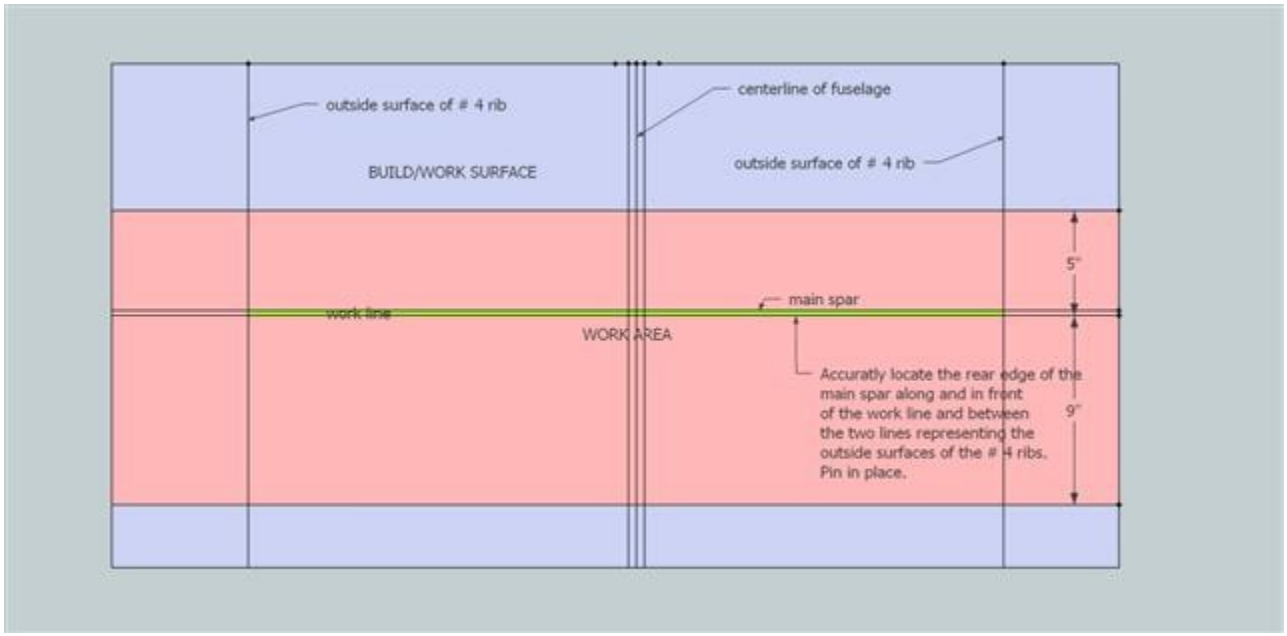
**Start the build by laying all the wood kit parts on your work surface and familiarize yourself with the build and the parts. Remove the laser cut parts from the sheet stock and organize them into the different categories main wing, fuselage, horizontal stab., etc.*

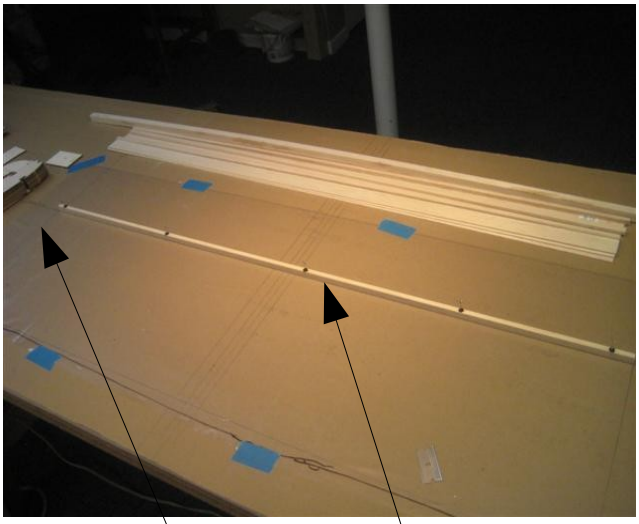


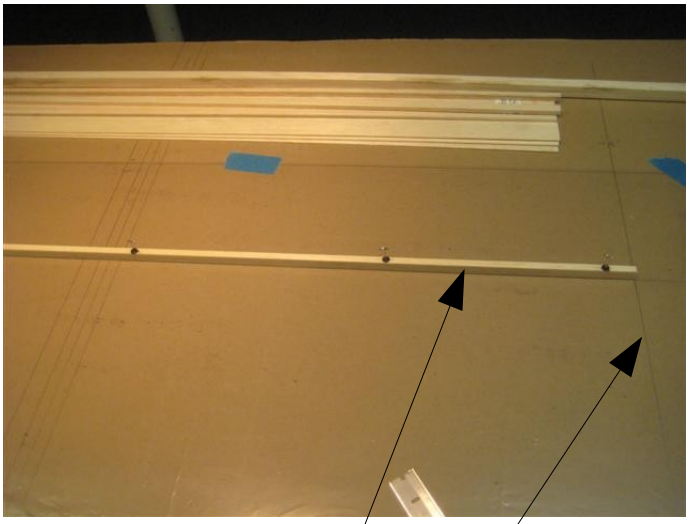


Collect all the wing components and you are ready to start the main wing assembly.

**Place the bottom 1/4x3/8" main spar on your build/work surface lining up the rear edge of the main spar to the work line and between the lines representing the outside suface of the # 4 ribs. See sketch and photo below.*



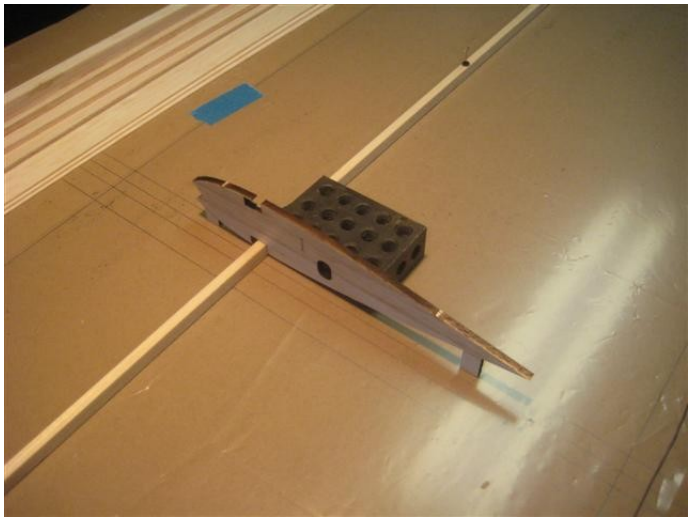




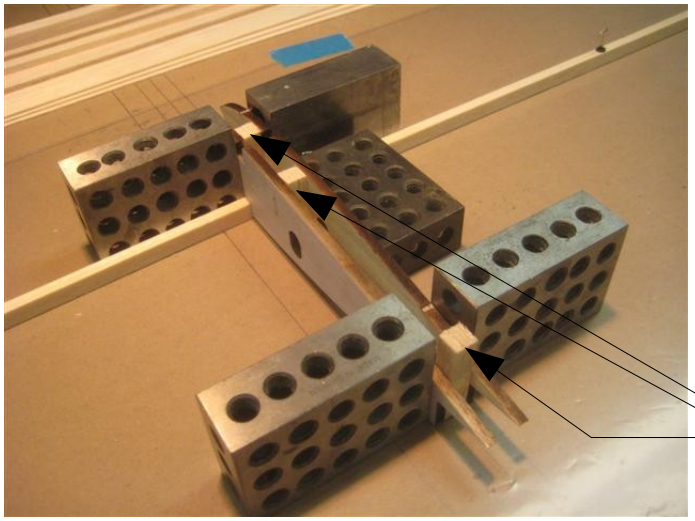
Line up the rear edge of the bottom 1/4x3/8" main spar to the work line, and between the lines representing the outboard sides of the # 4 ribs.

Lines representing the outboard surface of the #4 ribs.

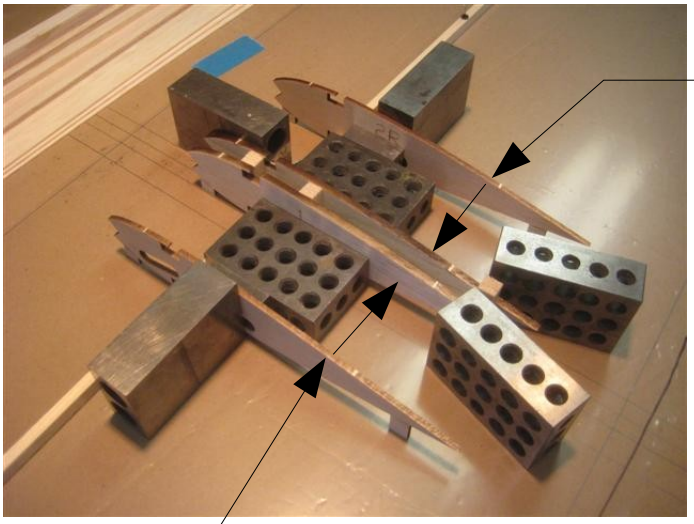
**Place the #1 R rib notch on the main spar, lining up the outside surface of the rib to the 3/8" line drawn on the work surface. Make sure the tabs are on the worksurface and the rib is 90° to the table and the main spar. Glue in place. See photo below.*



**Place the #1 L rib notch on the main spar, lining up the outside surface of the rib to the 3/8" line drawn on the work surface. Make sure the tabs are on the work surface and the rib is 90° to the table and the main spar. Glue in place. Make 1/2" spacers from scrap balsa and place them between the # 1 ribs. See photo below*



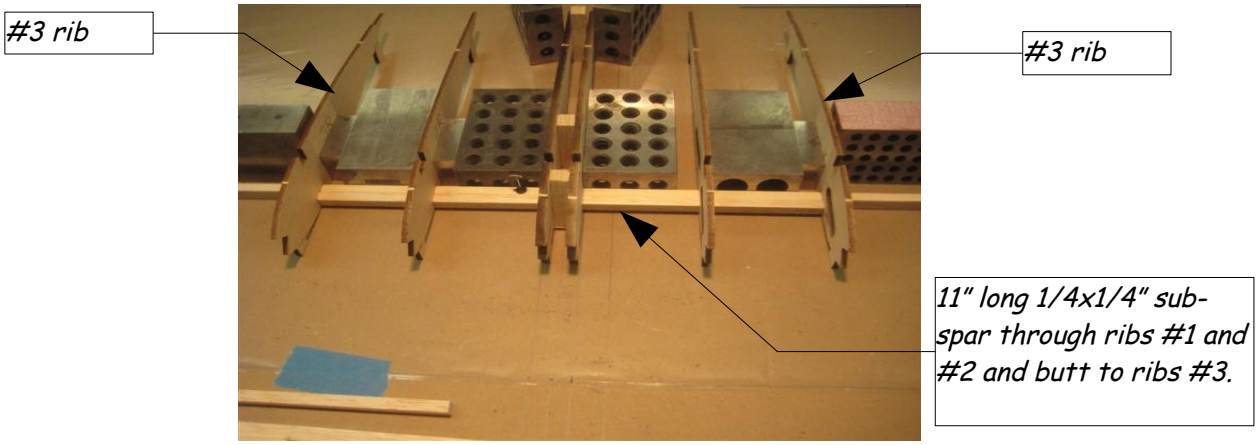
*Place the #2R and #2L rib notches on the main spar, spacing the ribs 2-1/2" outboard of the #1 rib. Make sure the tabs are on the work surface and the rib is 90° to the table and the main spar. Glue in place. See photo below.



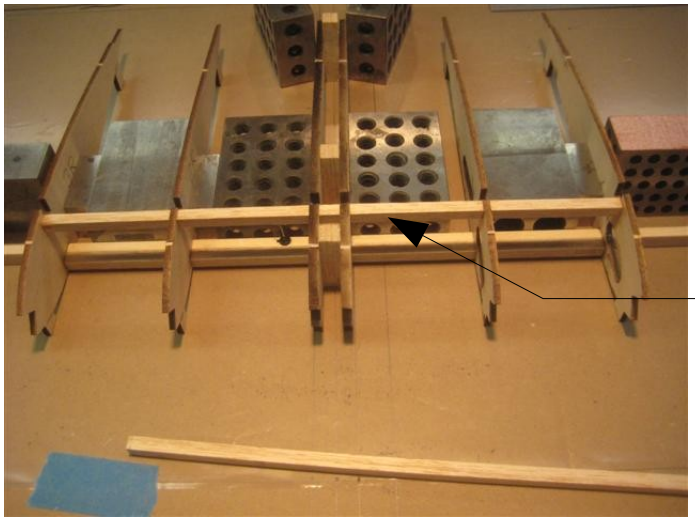
*Cut two pieces of 1/4x1/4" balsa sticks exactly 11" long to form two sub-spars.

*Carefully insert one sub-spar through the openings in all the ribs #1 and #2 and in front of the main spars leaving the end 2-1/2" length of the sub-spar on each side of the outside surface of ribs #2. Glue in place.

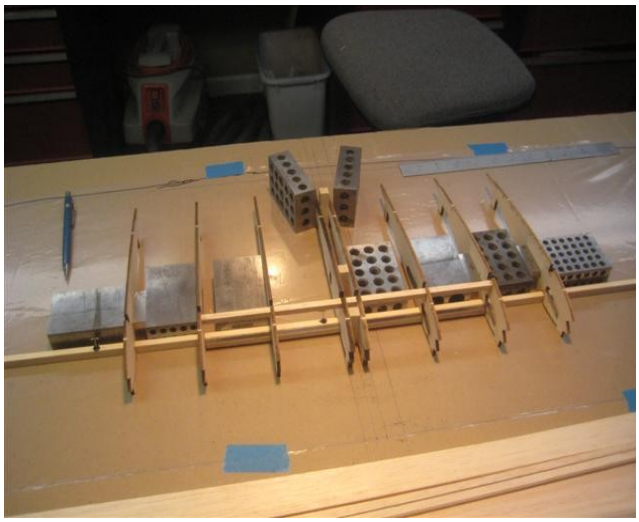
*Place the #3R and #3L rib notches on the main spar, spacing the ribs 2-1/2" outboard of the #2 rib. Make sure the tabs are on the worksurface and the rib is 90° to the table and the main spar. Glue in place. See photo.

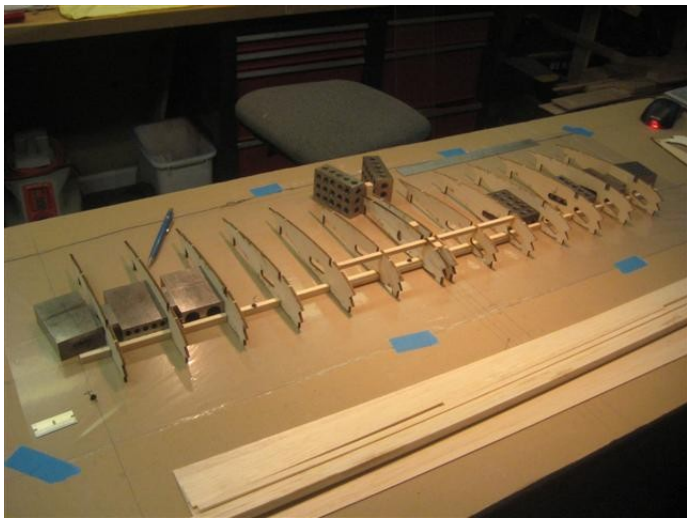


**Carefully insert the upper sub-spar through the openings in all the ribs #1 and #2 and in front of the main spar notch leaving the end 2-1/2" length of the sub-spar on each side of the outside surface of ribs #2 and butt to ribs # 3. Glue in place.*

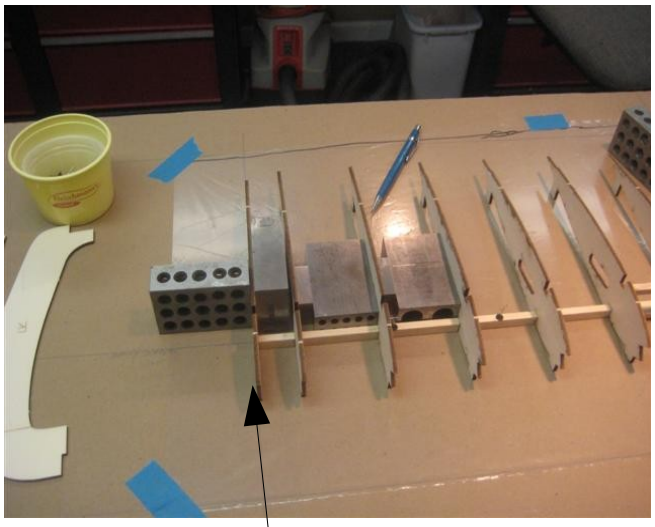


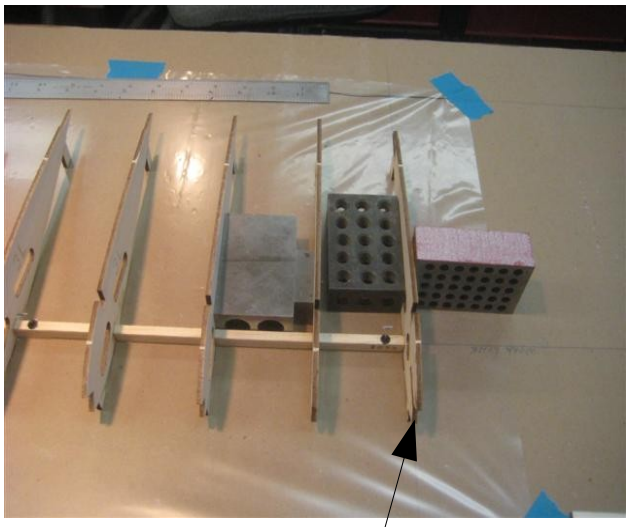
**Continue placing the #3R and #3L rib notches on the lower main spar, spacing the these ribs 2-1/2" outboard of the previous #3 ribs. Make sure the tabs are on the work surface and the rib is 90° to the table and the main spar. Glue in place. See photos below.*





**Place the #4R and #4L rib notches on the lower main spar, lining the outside surfaces of these ribs to the lines drawn on the work surface 17-1/2" (right side of fuse center line) and 18-1/2" (left side of fuse center line). Make sure the tabs are on the work surface and the rib is 90° to the table and the main spar. Glue in place. See photos below.*

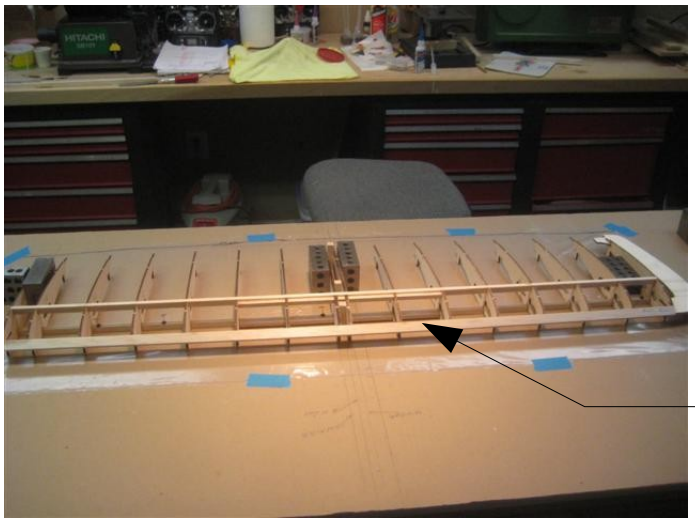




Outside surface of #4R rib lined up to 17-1/2" from the center line of fuse.

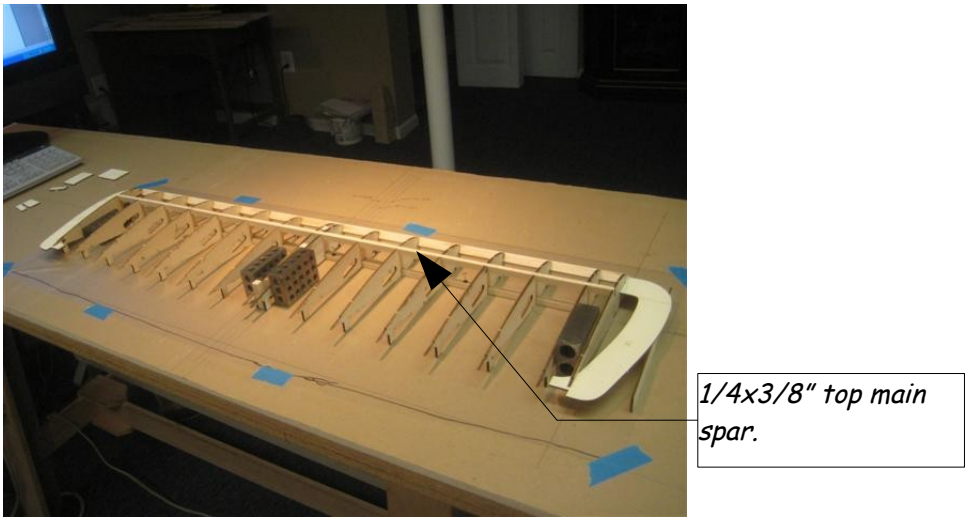
Outside surface of #4L rib lined up to 18-1/2" from the center line of fuse

**Place the 1/2x1/2" balsa leading edge in the front "V" notches in all the ribs. Glue in place. See photo below.*

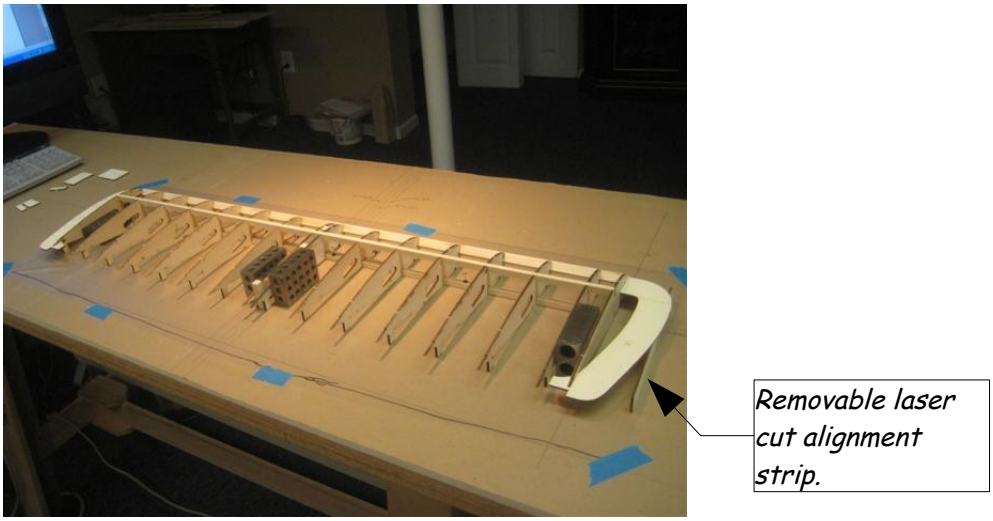


1/2x1/2" Leading edge.

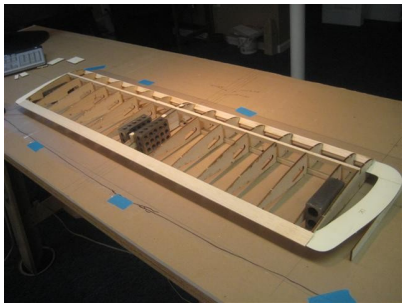
**Place the top main spar in the notches in all the ribs. Glue in place. See photo below.*

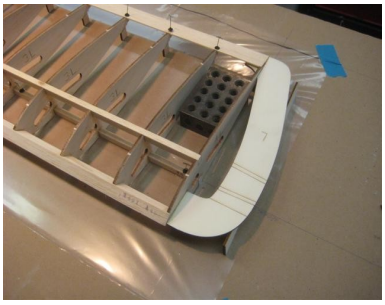


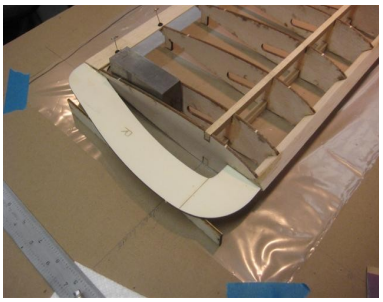
**Place both wing tips in the slots laser cut into the #4 ribs making sure the Right and Left wing tips are on the correct side. Support the wing tip by placing the removable laser cut "wing tip alignment strips" on the work surface and under the wing tip. Glue wing tips in place. See photo below.*



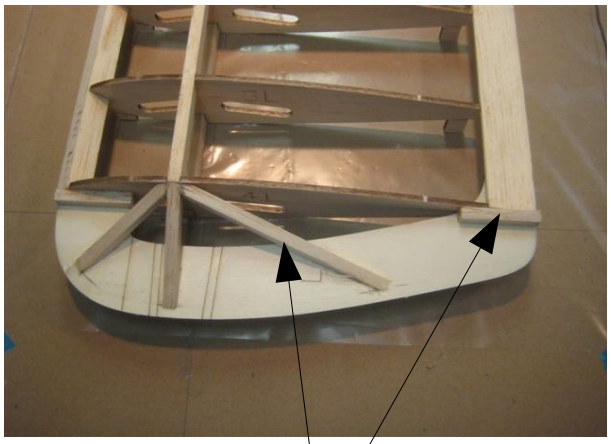
Place the top rear 1/16x1x36" balsa sheeting in the rear offset and up to the front edge of the offset along all the ribs. The sheeting should end at the outside surface of the #4 ribs. Glue in place. See the photos below.



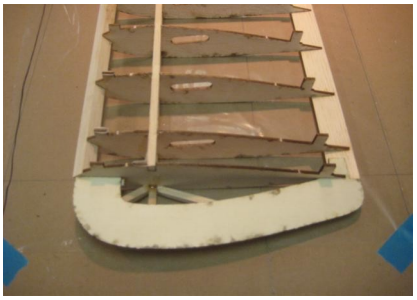




Cut, fit and glue in place 1/4x1/4 stick balsa pieces as show in the photos below to reinforce the top of the wing tips. Make sure the tops of the sticks will be below the finished covering material.



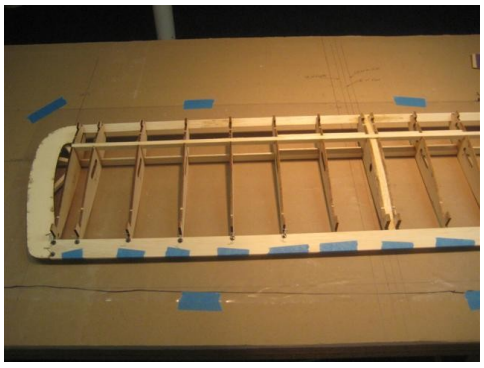
The wing is now ready to be removed from the work surface and turned over to work on the rest of the wing construction.

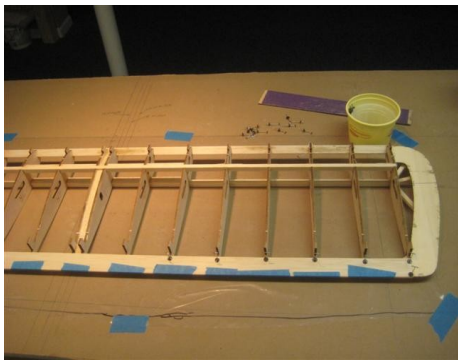


**Cut, fit and glue in place 1/2x1/2" balsa sticks or remnants between the #1 ribs keeping the sticks just below the edges of the ribs. See the photo below.*

1/2x1/2" balsa sticks cut to fit just below the edges of the #1 ribs on the top and bottom of the wing.

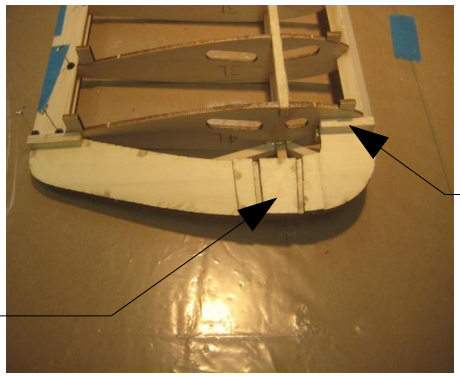
**Place the bottom rear 1/16x1x36" balsa sheeting in the rear offset and up to the front edge of the offset along all the ribs. The sheeting should end at the outside surface of the #4 ribs. Glue in place. See the photos below.*





*cut, fit and glue in place 1/4x1/4" balsa sticks as shown in the photo to reinforce the wing tips to the outside surface of the #4 ribs and the trailing edge.

*Transfer the laser scribed lead out locations from the top surface of the wing tip to the bottom side of the wing tip. Glue in place the three laser cut 1/8" lite ply pieces located to the transferred lines on the bottom of the wing tips. See photo below.

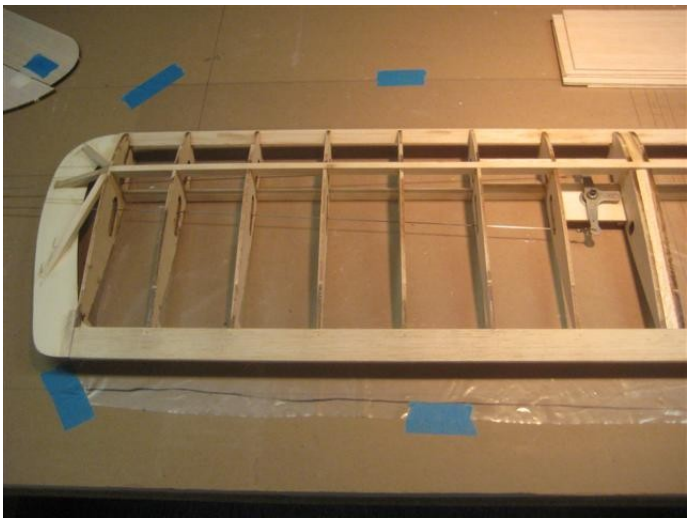


*Partially pre-assemble the purchased bell crank per the manufacturer's instructions. Bend/fabricate and permanently attach the two wire lead outs to the bell crank leaving the opposite ends of the lead outs extra long so they stick out beyond the wing tip by approx. 4".

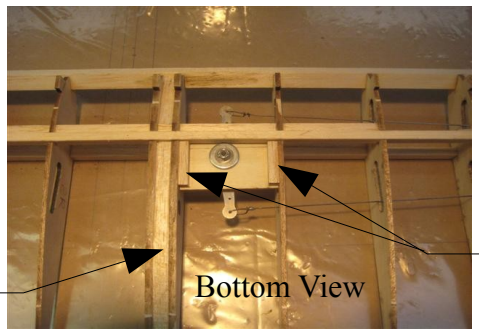
*Drill the laser cut lite ply bell crank mounting plate using the bell crank manufacturer's drill size. Use the location as laser scribed on the surface of the mounting plate.

*Locate in place the bell crank mounting plate between the #1 and the #2L rib (left wing) lining it to the front edge of the sub-spar and on top of the sub-spar and the main spar. As reference, the mounting hole for the bell crank should be about 1/2" rear of the main spar. Glue in place.

*Guide the lead out wires through the openings in the ribs and install the bell crank permanently to the mounting plate. See photo below.



Cut, fit and glue in place 1/4x1/4" balsa stick corner reinforcements to the bottom side of the bell crank mounting plate and to the adjacent ribs. See photo below.

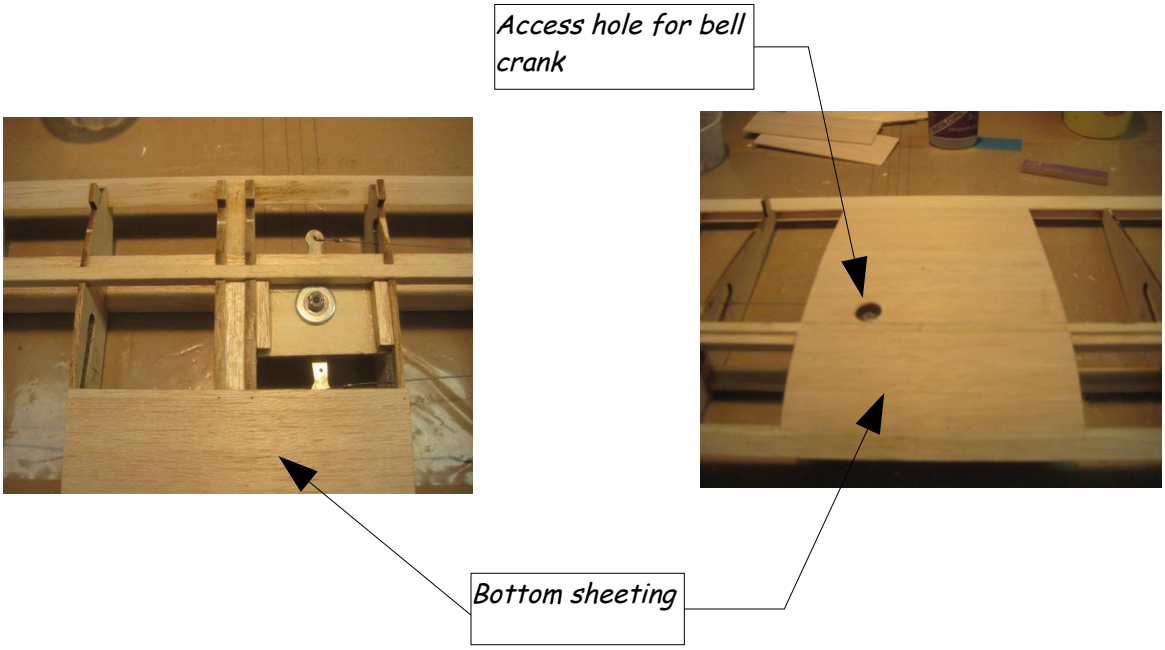


*Remove the build tabs from the bottom of the #1, #2 ribs.

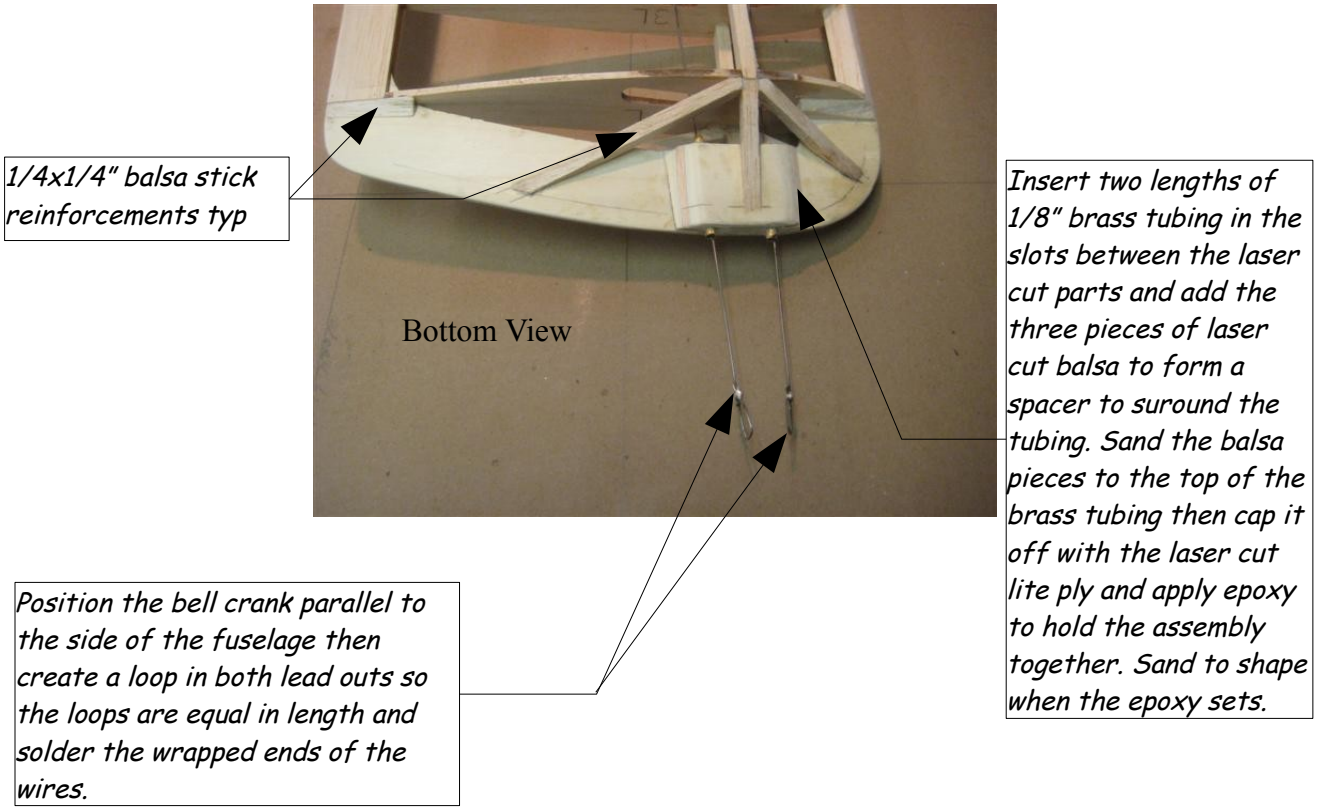
*Cut, fit and glue in place the 1/16" balsa bottom sheeting from the leading edge to the trailing edge, from the #2L rib and the #2R rib.

*Cut in a round access hole in the bottom sheeting in line with the bell crank mounting hole.

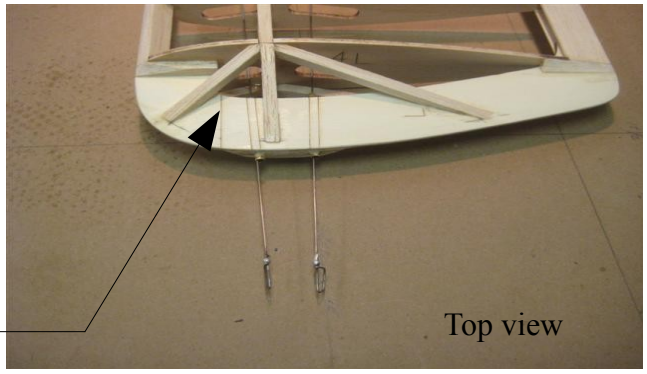
See the photos below.



**Continue with the reinforcement of the wing tips and the bracing for the lead out wires.*



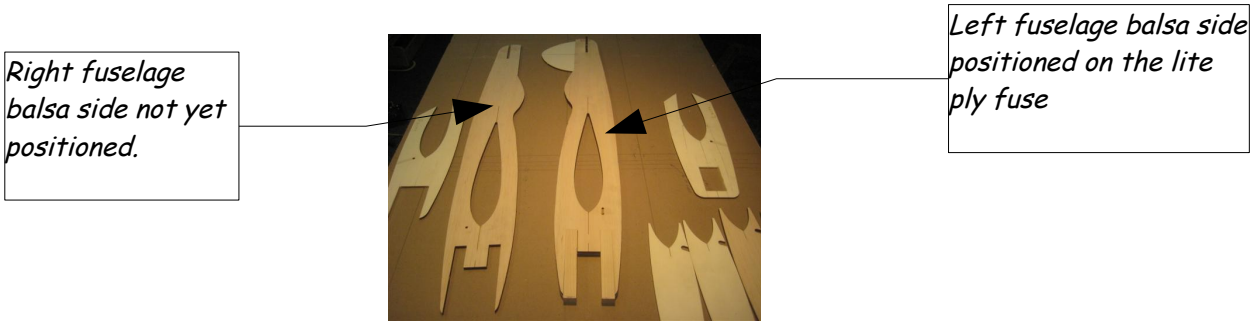
NOTE: the laser scribed line shown on both wing tips is the 17% point of the main wing cord length indicating the CG balance point of the airplane. Make a note of this location before covering the wing.



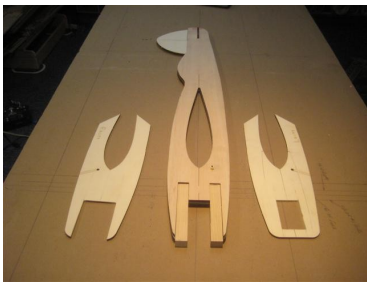
****At this point in the main wing construction, set the main wing aside and start the fuselage construction.*

**Start the fuselage construction by collecting all the component parts and organize them and familiarize yourself with the the directions. See photo below.*

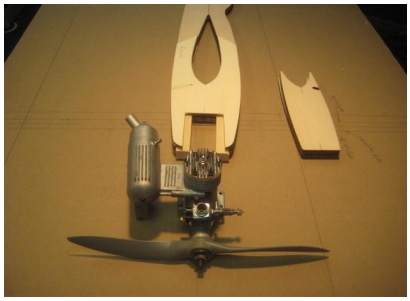
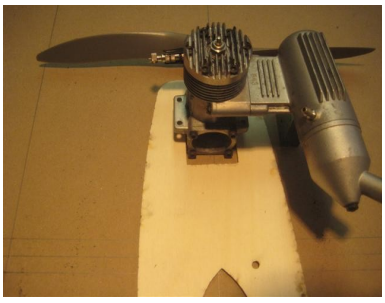
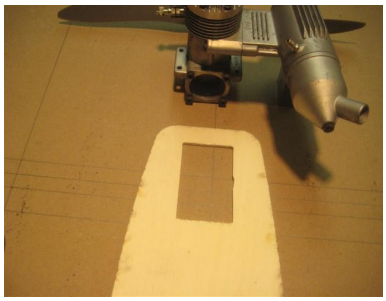
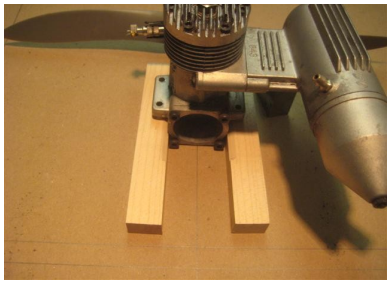
**Dry stack the three main fuselage parts (the laser cut 1/8" lite ply fuse, vertical fin and rudder sandwiched between the right and left balsa wood fuse sides). Line up the periphery of all the components and check for fit.*



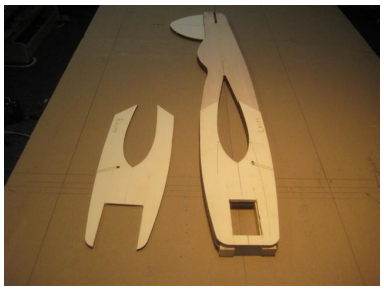
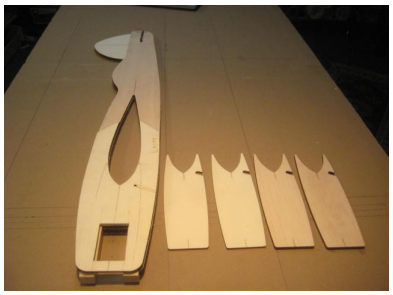
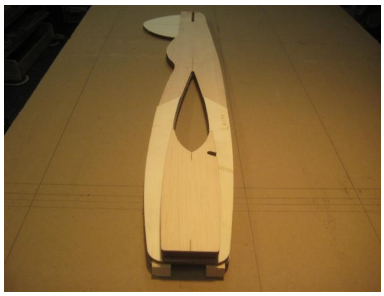
**Position the hardwood motor mounts in position in the dry stacked fuselage components.*



**Note, the engine area in the fuselage in the short kit was designed to a generic condition and will have to be adjusted to suit the needs of your particular engine. Roughly position your engine in location and modify the engine mounts and fuselage components as needed. See photos below.*

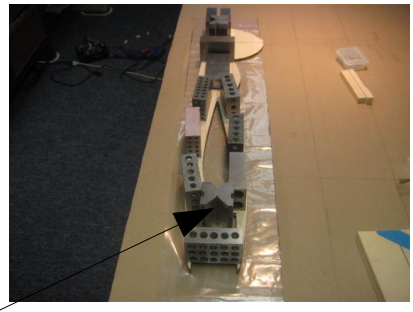






**Once your have all the engine mounting alterations complete, continue to dry fit the rest of the components for fit and function. See photos below.*

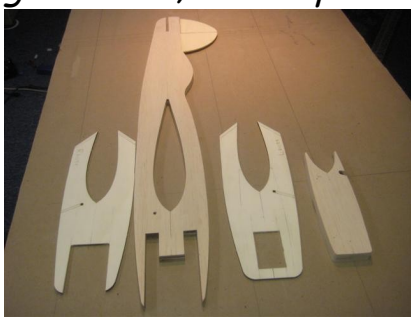




**Dis-assemble the stacked fuse components and then glue the three main fuse components making sure the periphery of the pieces line up. See photos below*

Add weight to hold components flat to the table while the glue sets

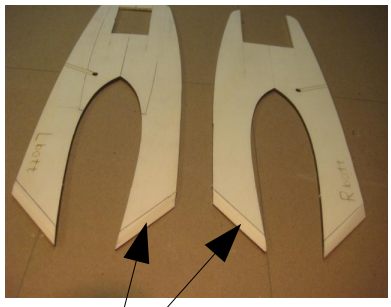


**After the glue dries, clean up the glue around the parts. See photo below*

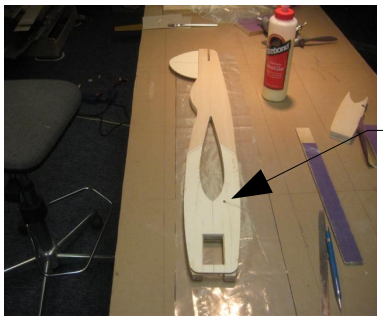


**Glue the motor mounts in the assembled fuse components. See photos below*

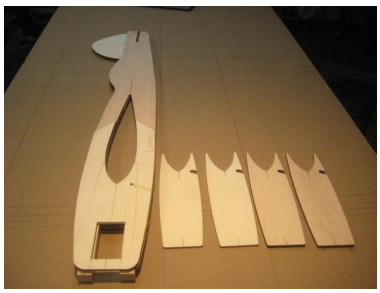
*Bevel the rear edges of the laser cut 1/8" lite ply fuse side doublers. See photo below.

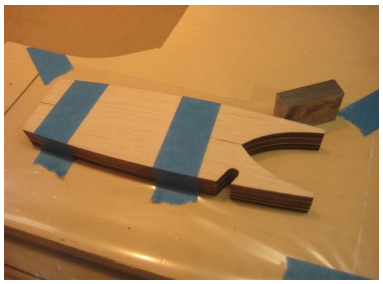


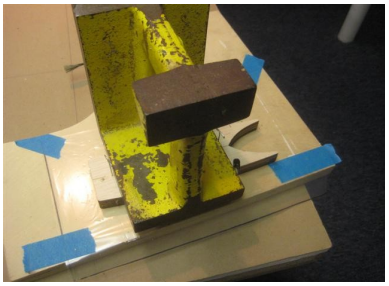
*Glue both right and left side laser cut 1/8" lite ply fuse doublers to the fuse. Insert a 3/4" length of 1/8" ID brass tubing for the landing gear through the laser cut holes in all the fuselage part. See photo below



*Stack and line up the periphery of the laser cut cowl cheek components (two lite ply and two balsa wood) and glue them together. This is for the left side of the fuselage only. See photos below

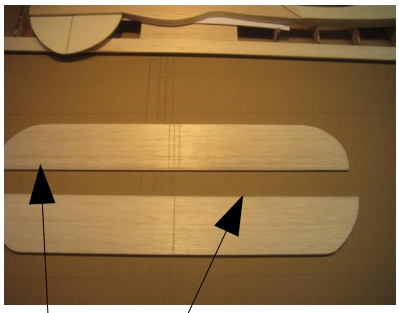




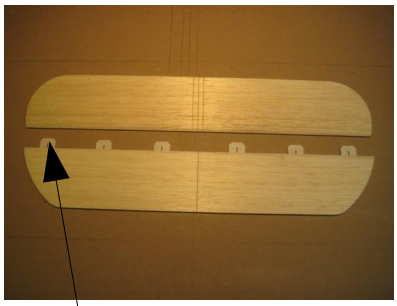


*When the cowl cheek glue dries clean up the periphery and sand a airfoil shape in the top view of the of the part. Set the part aside. See photos below

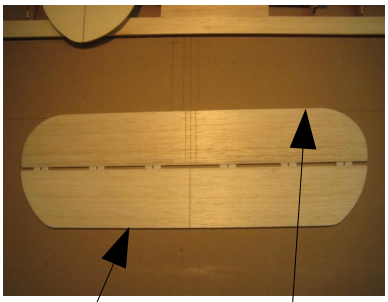
*Prepare the laser cut 3/16" balsa wood horizontal stab and elevator by cutting slots for six CA hinges along the joint between the parts. Bevel that joint on both parts to create a clearance for the movement of the elevator control surface. After the hinges are installed (dry), sand a radius around the periphery of the entire edge of the elevator and horizontal stab. See photos below



Bevel the edges for clearance for the movement of the elevator.



Six CA hinges



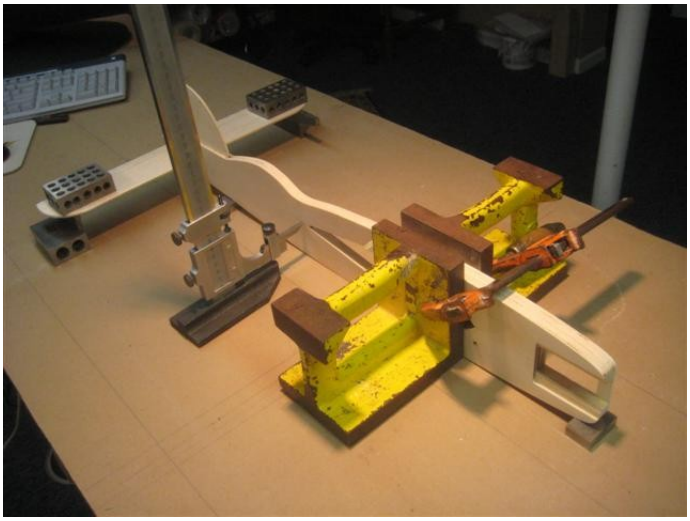
Sand a radius around the entire periphery of the parts.

Set this assembly aside at this point.

*Prepare for the assembly of the major parts of the airplane by setting the fuselage on it's bottom edge and balance the laser scribed line on the side of the fuselage parallel to the table. Hold the fuselage 90 degrees to the table.

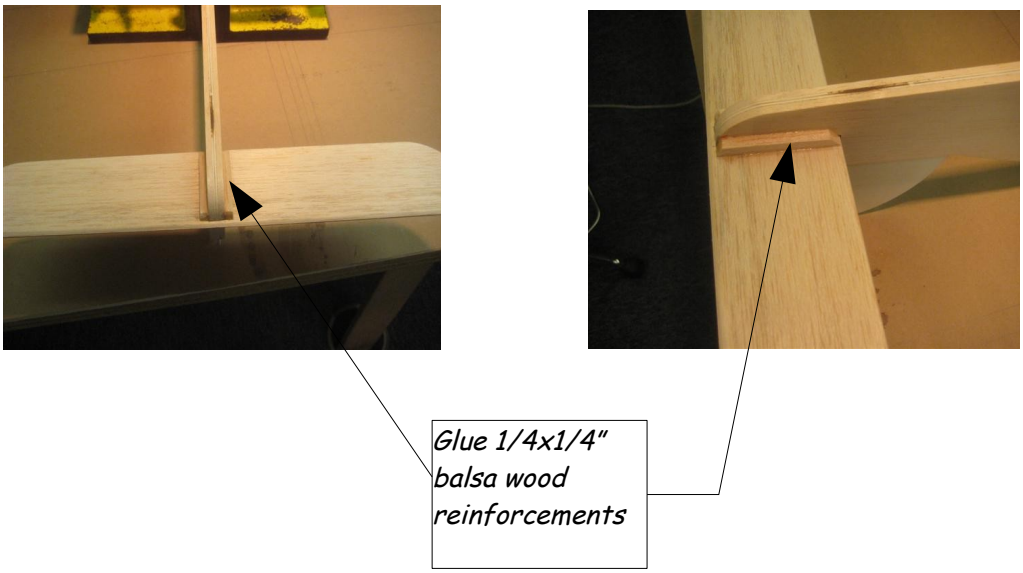
*Insert the horizontal stab in the laser cut slot in the fuselage and hold it parallel to the table by using shims or blocks underneath the stab.

See the photo below.

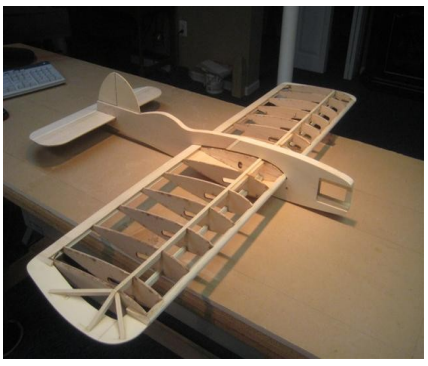


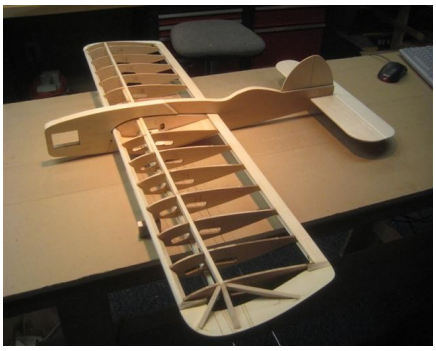
*Line up the horizontal stab using the laser scribed lines representing the fuselage sides and double check it's position for 90 degrees to the fuselage by measuring from the rear corner of the stab to a point on the center line of the fuselage. That distance should be the same from side to side. Glue in place when satisfied with the location. See photo below

**Glue 1/4x1/4" balsa reinforcement sticks in the corners of the horizontal stab and the fuselage on both sides. See photos below*



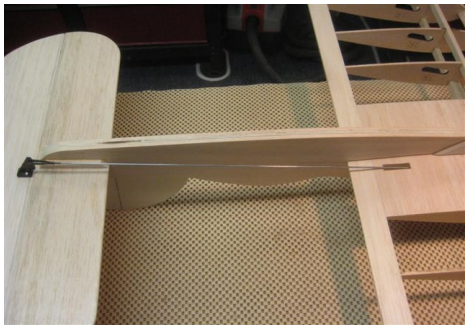
**Remove the remaining build tabs from the bottom of all the ribs. Trial fit the wing through the main wing opening in the fuselage without the top sheeting. Position the main wing by lining up outside surface of the #1 ribs flush to the sides of the fuselage doubler. The outside of the #4 R rib should measure 17-1/8" to the fuselage doubler and the outside surface of the #4 L rib should measure 18-1/8" to the fuselage doubler. Double check the 90 degree angle of the wing to the fuselage. Mark a line along the sides of the fuselage on the bottom surface of the sheeting. Temporary fasten or pin the wing in place.*





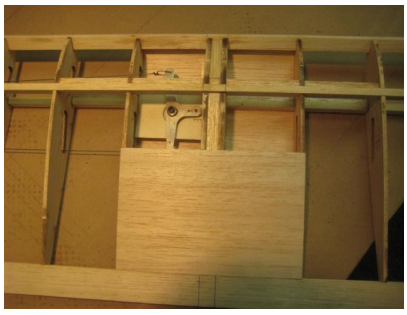
Install the elevator in place (dry) to the horizontal stab. Install the control horn on the elevator. Trial cut an opening in the bottom sheeting of the main wing and trial fit a push rod from the bell crank to the elevator control horn. Enlarge the opening in the bottom sheeting to clear the push rod when it goes through it's entire movement cycle. See photos below.

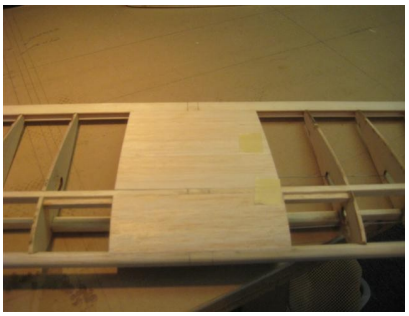
Install the push rod in the hole closest to the bell crank mounting screw for a less sensitive elevator.



*Disconnect the push rod from the elevator control horn, then remove the wing from the fuselage. Cut, fit and glue in place the 1/16" balsa top sheeting from the leading edge to the trailing edge, from the #2L rib and the #2 R rib.

See the photos below

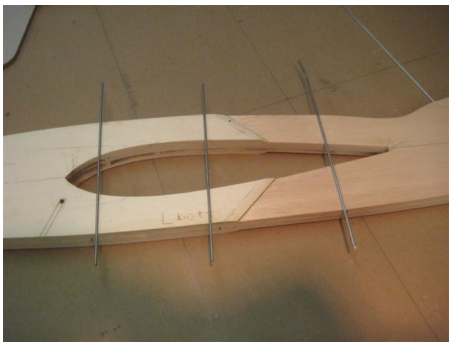




*Sand a constant radius along the leading edge and sand smooth the periphery of the complete wing. Lightly sand the sheeting, the ribs, trailing edge sheeting and the main spars.

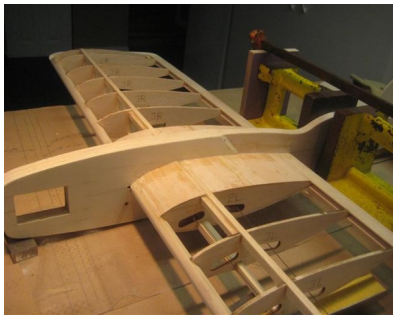
*To reinforce the glue joint between the main wing and the fuselage, install pins or dowels to strengthen that joint. The following is one option:

Drill three 1/16" dia pilot holes through the wing opening area along the center line of the fuselage using a drill press. See photos below



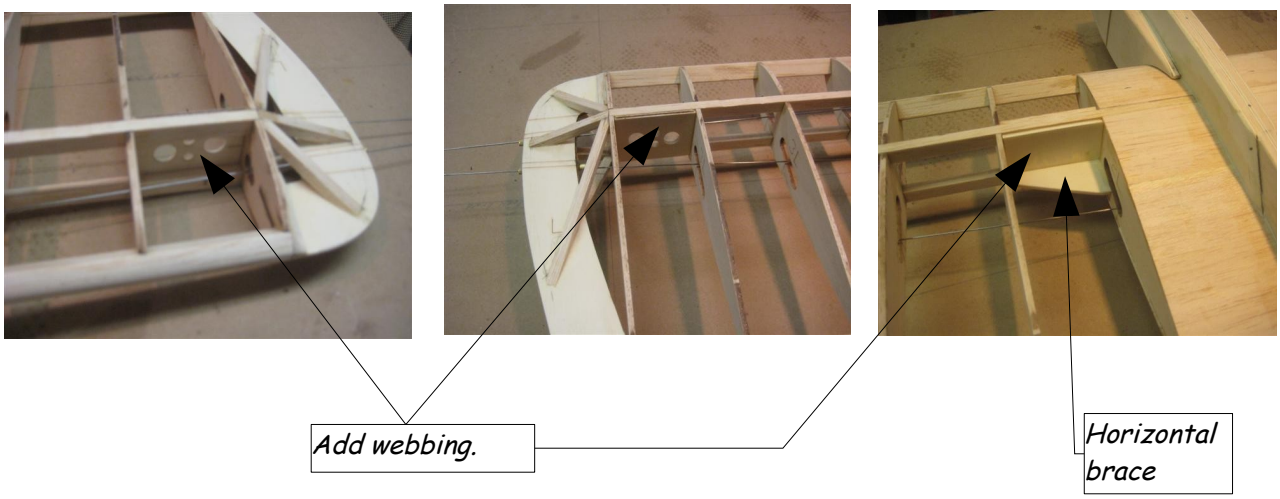
*extend the holes completely through the center of the fuselage with a drill motor using an extended jobber drill. Drilling through the center layer of the lite ply will keep the drill from wandering.

*Re-install the main wing through the fuselage opening lining up the previously drawn lines on the bottom sheeting to the sides of the fuselage.

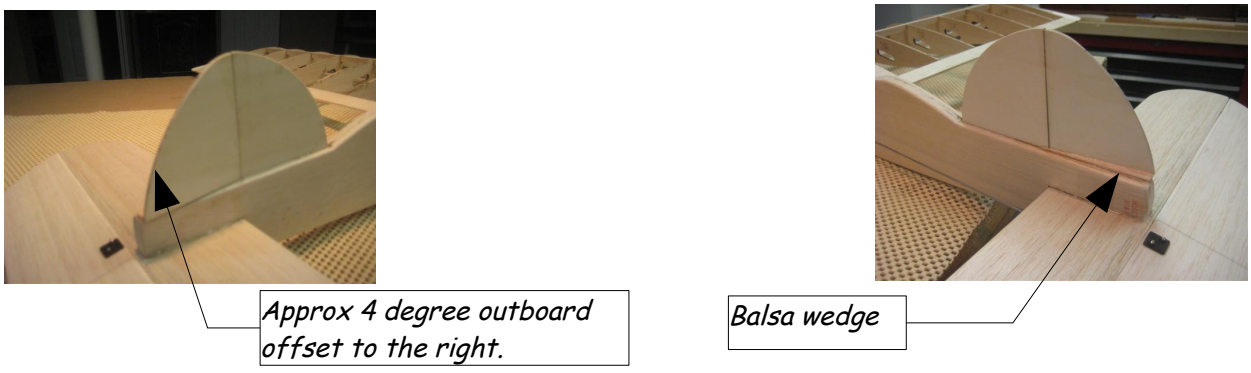


Double check the 90 degree angle of the wing to the fuselage. Make sure the wing is also parallel to the horizontal stab, some minor shimming might be needed, then glue the wing to the fuselage using thicken epoxy. When the epoxy sets, re-drill through the previous holes in the center of the fuselage and now through the main wing. Install metal dowel made from remnants of push rod stock or wire stock. See photos above.

Add webbing against the upper and lower spars on the left wing to reinforce the rib area in the last bay between the #3L and #4 L rib and the #3 L rib just outside the sheeted area. Make and glue in place a horizontal brace from that web and the #2L rib to reinforce the bell crank mounting plate. See photos below

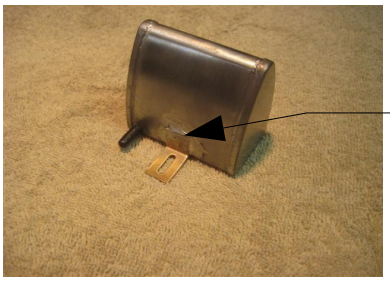


Separate the rudder from the vertical fin and reposition it with an approx. 4 degree outboard offset to the right and glue in place. Make a balsa wedge to reinforce the bottom edge of the rudder and glue it in place. See the photos below.

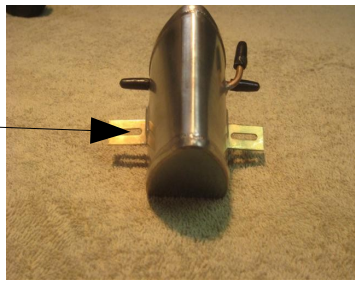


***There are a variety of methods to mount a fuel tank, the following is just one way.*

**Prep the fuel tank by soldering purchased brackets to the tank. See photos below.*

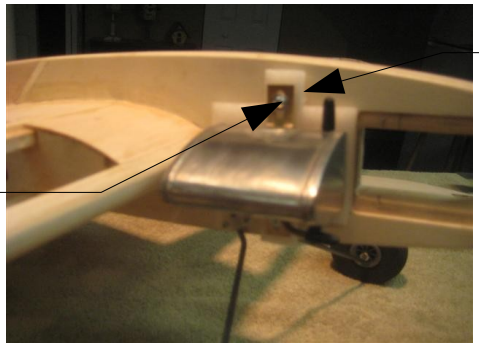


Purchased brass brackets soldered to tank.



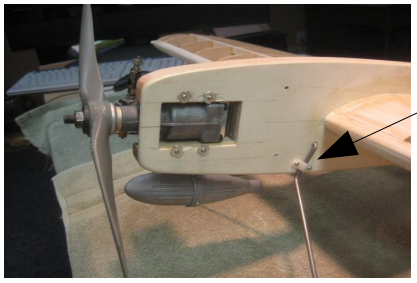
**Cut out a fuel proof foam pad to shape and place it between the fuel tank and the fuselage. Position the fuel tank against the fuselage and the center of the tank in line with the center of the leading edge of the main wing. Drill two mounting holes for the tank in the center of both brackets and through the fuse install blind nuts on the other side of the fuselage. This allows for an up and down adjustment of the tank. See the photo below.*

Mounting screws centered in the brackets and blind nuts on the other side of the fuselage.



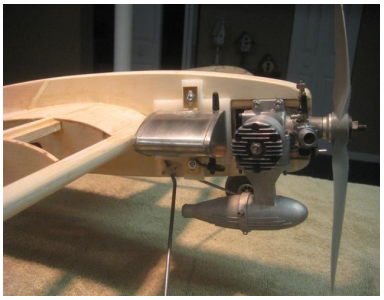
Fuel proof foam pad.

**Place the two piece main landing gear- one in each end of the 1/8" dia brass tube previously installed through the fuselage and line them up with the laser scribed lines. Position the landing gear straps, one on each side, and drill though the fuselage and fasten them to the fuselage with nuts and bolts. See the photo below.*



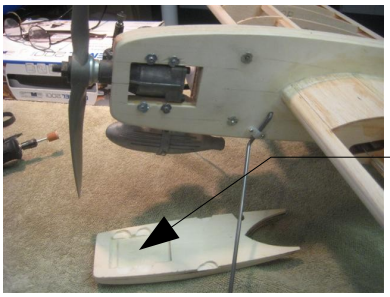
Landing gear straps bolted together with bolts going through the fuselage

*Install the engine in place. See photo below.



Note: make sure you clear the lite ply fuselage doubler away from the blind nuts so the points of the blind nuts dig in the hardwood engine mounts. Clearance not shown in this picture.

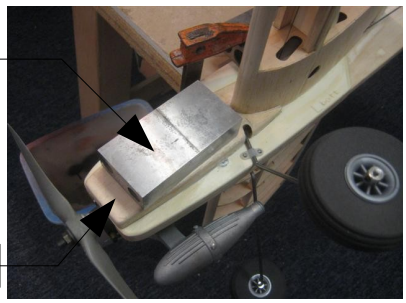
*Make sure the all the interferences are cleared away so the cowl cheek can be glued to the fuselage side. Glue in place. See photo below.



Removable metal weight to hold cowl cheek in place during gluing.

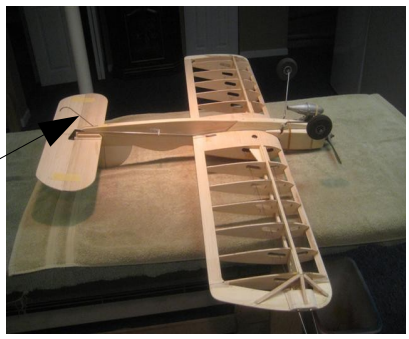
Add clearances as needed to the cowl cheek.

Glue in place



*Make a tail skid from a piece of .078 music wire bent to shape and fasten it to the bottom rear of the fuselage. See photo below.

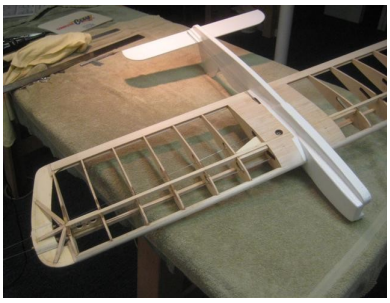
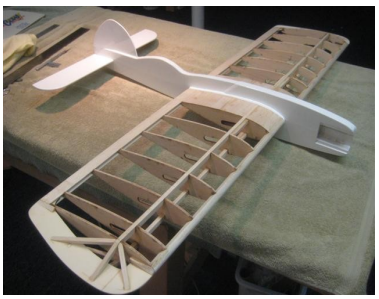
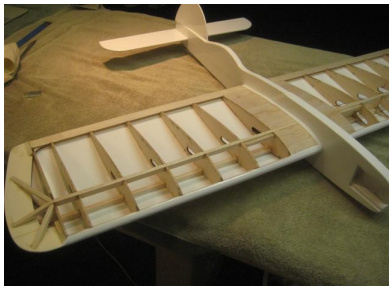
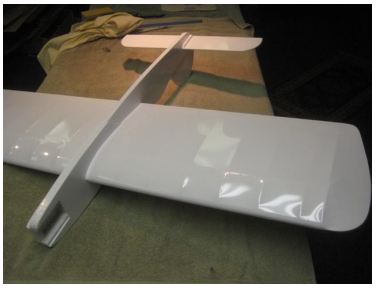
Make a tail skid from .078 music wire. Drill a hole in the bottom edge of the fuse and insert and glue the tail skid in place.

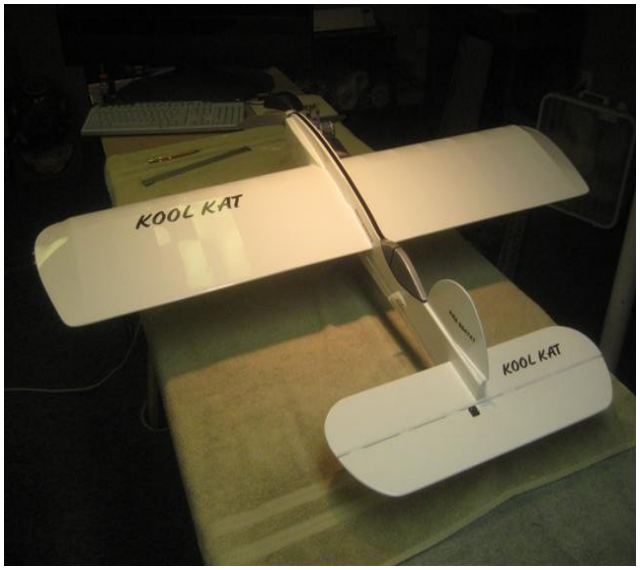


*The basic construction of the plane is complete and ready to prep for covering.

**Remove the engine, fuel tank and any easily removable hardware before covering. Sand a radius along the fuselage edges and lightly sand all the plane. Repair any surface defects.*

**The covering, color and trim is the builder's choice. See the manufacturer's instructions for the covering of choice.*



**Once the covering is complete, reinstall all the hardware that was removed for covering. The plane should be balanced to a CG balance point of 17% of the wing cord length back from the leading edge of the main wing. As a reference, the laser scribed lines on the top surface of the wing tips represent the CG.*

The Kompleted Kool Kat

Pete M.....Rattlesnake