

Please review this entire manual before beginning assembly.

By doing so it will help you better understand each step as you progress in the actual building of your kit, and you will do a better job in assembly.

INCLUDED IN THIS KIT:

- All laser cut balsa parts and plywood motor mount
- 2 push rod wires for ailerons + 1 Pushrod & Pushrod tube for elevator
- 1 Micro control horn + 2 Plywood Control horns for ailerons
- 2 Dubro Ez-connectors
- 1 Carbon fiber tube and 4 flat spars
- 12 small CA hinges

SPECIFICATION:

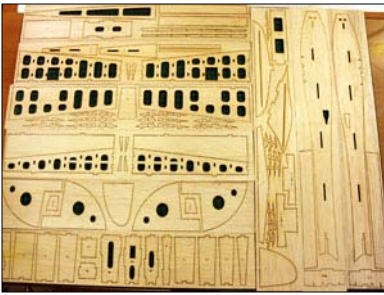
- Wing Span: 32 inches
- Length: 24 inches
- Dry weight: 13.9 oz
- Ready to Fly Weight:
19.4 oz with 1900 mAh 11.1v 45C
20.8 oz with 1900 mAh 14.8v 45C
20.8 oz with 2200 mAh 11.1v 45C
22.6 oz with 2200 mAh 14.8v 45C

NEEDED BUILDING TOOLS:

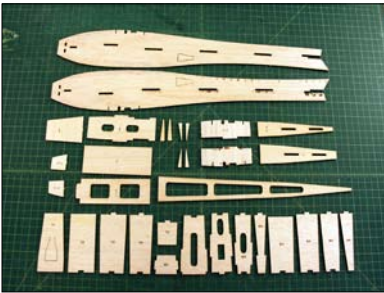
- Thick and Thin CA glue + Accelerator + Hot Glue
- 150 grit Sandpaper + 150 grit Sanding Bar + Balsa Planer + Rotary tool
- Hobby Knife + .039 dia. hand drill + Pliers + Z-bending tool
- Soldering Jig + Precision Hinge centerline marking tool
- Hex Driver 1.5mm + Ruler + Clamps + Wood Chisel tool
- 3 inches each of red & black 12 AWG wire (if using 85 Amp ESC)
- Self-tapping screws for motor mount to plywood firewall + String
- Covering material of choice + Sharpie + Scotch Tape + Masking Tape

REQUIRED EQUIPMENT:

- Programmable Transmitter + Receiver of choice
- 2 Micro Servos for Aileron (D-47 or D-60)
- 1 Micro Servo for Elevator (PowerHD 1581HB or HS-65 or D-60)
- MicroDAN 2510-2700 kv Outrunner
- ESC: 60 Amp or 85Amp, depending on number of lipo cells used for battery choice
- 3S prop selection: APC Prop: 6x4 or 5.25x6.25
- 4S prop selection: APC Prop: 5x5 or 5.5x4.5
- Prop Adapter or 30mm diameter Spinner to fit 3mm motor shaft
- Lipo Battery: 1900mAh 11.1v up to 2200mAh 14.8v 45C or higher



The wood contents of the kit.



Carefully cut out all the necessary parts or the fuselage.

Hold on to some of the left over wood. You will need some small scrap pieces later.



Lightly sand down any remaining nubs that are left over after cutting the parts out.

Lay out some wax paper to build the parts on



Start by gluing all the parts that have tabs that interlock themselves into their adjacent parts. Assemble the T's, M's and B parts as shown. Some parts that are not glued are not shown.



Locate the 2 rear fuselage top cover parts with the rudder slots.

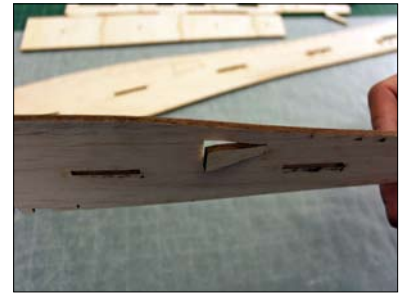
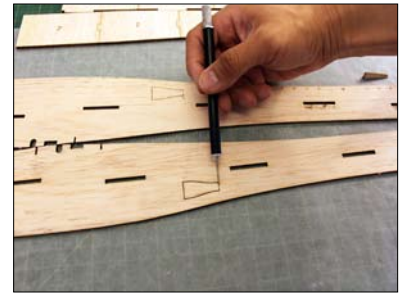


Stack them and glue them together carefully while ensuring that the rudder slots are aligned correctly.

Decide if you are going to use the side Naca vents.

If you decide to use them make a small cut but not all the way off. If you will be skipping them, simply glue them in place and skip the next few steps. Alternatively, you can cut them out completely for max cooling.

Push it our slightly as shown.



The ducts will be raised "into" the fuselage.



Find the 4 identical small triangle strips. Use a marker to "Roll" the pieces to match the curve of the Naca ducts.



Here you can see the slight curvature of the piece after rolling it.



It should make the shape of the Naca ducts.

Glue them in place.





Glue both sides carefully.



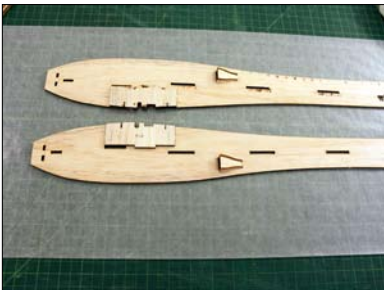
The view from the other side.



Take a file and lightly sand the duct edge to widen the exit hole a bit.



VERY carefully glue the wing saddle doubler as shown here. Pay close attention to lining this piece perfectly.



Make absolutely sure that you make a left and right side of the fuselage. Pay close attention to which side you are gluing the wing saddle doubler to.



Test fit the Middle section fuselage parts. Do NOT glue these in at this time. Just test fit that the pieces fit well.

Start by gluing the motor mount and the M-1 first fuselage part.

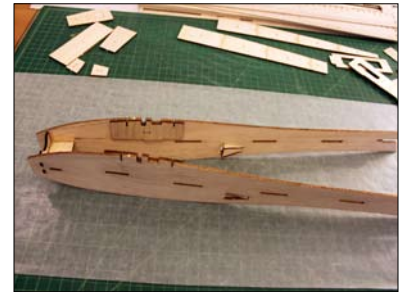
Make sure it is seated fully and squared up while gluing these parts together.



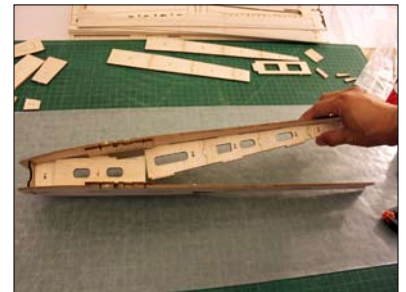
Now you will have both fuselage side pieces joined at the front only.



Lay it down flat on the table to double check that it is glued together squared up properly. Both fuselage sides should touch the tail ends on the table flat.

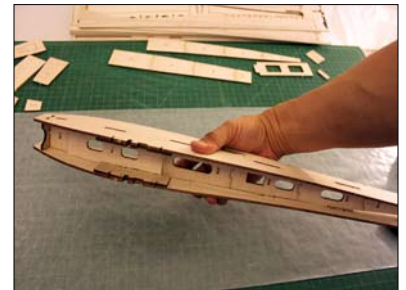


Now carefully insert the Center fuselage joiners

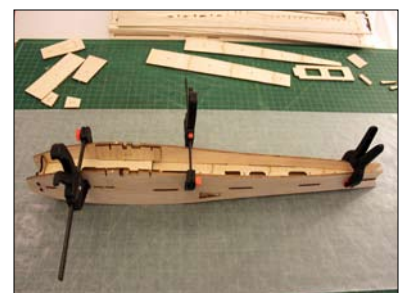


It should be fairly easy to close up the rest of the fuselage. Move slowly lining up the slots carefully while closing it.

Do NOT glue anything yet!

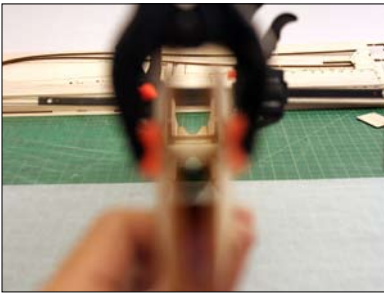


Use Clamps to hold the fuselage closed while you double check to make sure that the fuselage is NOT twisted at all. It must be squared perfectly.



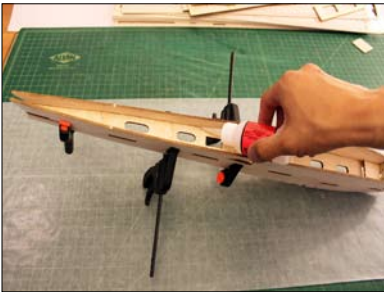


Look down the front and rear of the fuselage and check for any twisting.



Look through the fuse to see any possible twisting.

Use more clamps if necessary to hold the fuselage straight



Once you are certain it is straight go ahead and apply Thin CA glue to the fuselage.

***Tip:** do not place clamps over the slots as the will become glued on. Or use small pieces of wax paper in between the clamps and the wood



Glue 2 strips of 1/64 plywood below the elevator servo slot. This will allow the servo screws to grab onto something more significant than just balsa.



Check the fuselage alignment again. Look down the fuselage from the front and back.



Also look at the tail end carefully. Make sure that the "H" shape is squared.

Glue in the bottom front nose doublers. F-1-A and F-1-B.



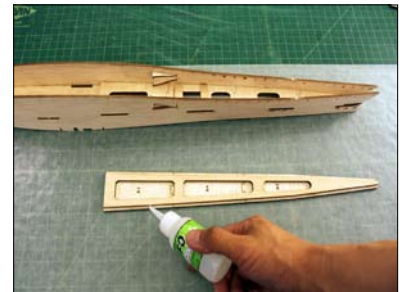
Now for the Bottom rear fuselage cover. Find the inside doubler frame + the "B" fuselage assembly.



Very carefully glue the together. Make sure the inside frame part is centered in side equally on both sides. There should be about 1/8" space on each side.



Apply glue



Glue the part in place. Make sure you line it up carefully starting at the tail end first. Use wax paper to hold in position to avoid glue on your fingers as it make squeeze out when you place the piece on.



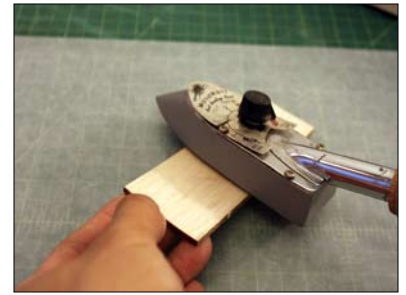
Pay attention to the curvature of the fuselage. You will have to specifically press down the wood into the fuselage in all positions especially toward the front side.





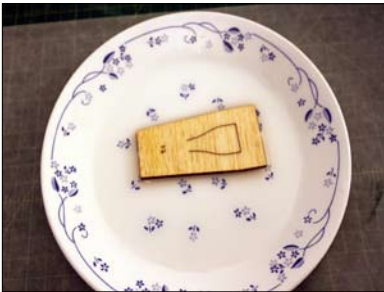
Here you can see the curvature that the part needs to follow.

And stroke down while applying pressure.



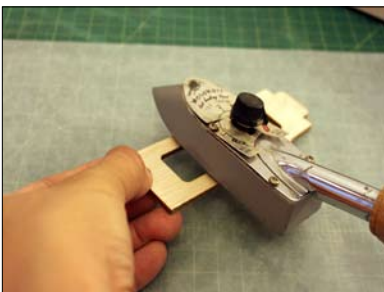
Soak the battery hatch parts in water for about 2 minutes.
Parts B-2 and B-2-B

Also apply pressure on the reverse side while drying the wood.



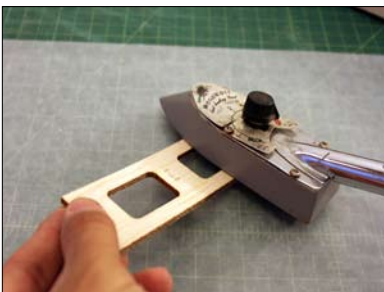
Also soak the front top fuselage part T-1

Complete all three parts. The battery hatch doesn't have to be as curved as the front T-1 part does.



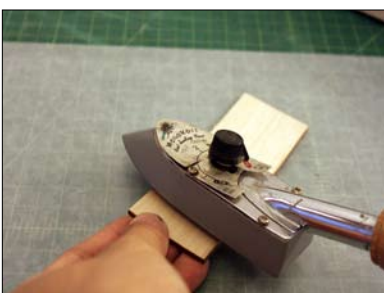
Use your covering iron to create the curve. After soaking press down with the iron and stroke the wood while pressing down. The hot iron will create steam which will allow the wood to bend.

Lay the B-2-B part over the battery hatch location on the bottom belly of the fuselage. Use a pen to mark the curvature of the fuse sides.



Stroke down over and over while applying pressure and the wood will begin bending while also drying out. You may also want to turn over and dry the wood with the iron on the other side.

Sand the corners that were marked to make the piece be able to fit inside.



Repeat this process with all the parts soaked in water.

Start at the top.

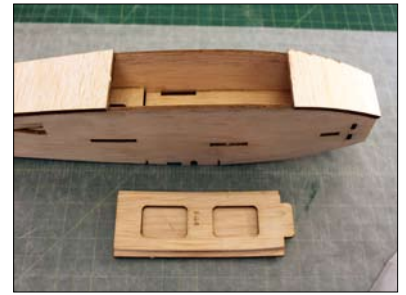
Check the curvature of the wood. If you need to curve it more you can wet it again and repeat the curving process.





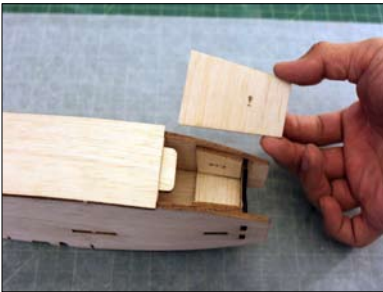
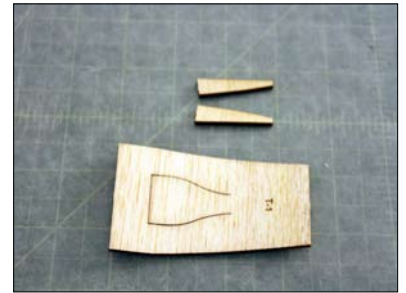
Once you are satisfied with the curvature and that it fits inside the fuselage well, then you can now glue both battery hatch parts together. Make sure it is centered well.

Now remove the battery hatch. You want to make sure you didn't let any glue squeeze onto it when attaching part B-1



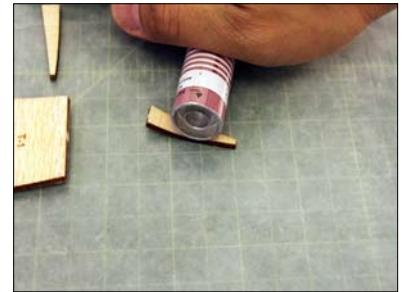
Test fit the part and leave it in position to move on to the next step.

Prepare the remaining triangle pieces to create the Naca duct on the front top fuselage cover T-1. Confirm that T-1 fits the shape of the fuselage. If it needs more curve then re-wet it and use the iron again.



Prepare to glue the front bottom cover, B-1. This part doesn't need to be curved with water and iron as it is not curved too much and should glue on easily as is.

Use the marker rolling technique to create the right curvature. Gently apply pressure while rolling the marker back and forth on the part.



Apply glue to the fuselage. Be careful to not allow glue to get on the battery hatch at all.

You should be able to create a nice curve as shown here. These pieces have a slight curved side to allow it to match the curve of the T-1 piece.



Attach cover. Again you can use wax paper to avoid the glue on your fingers.

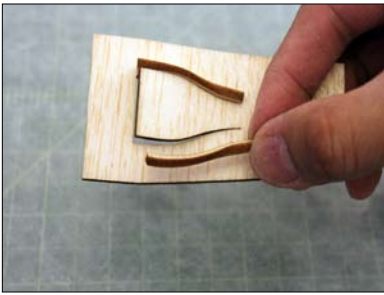
Press the Naca duct down to create about an 1/8 inch opening. Then glue on the curved side piece.



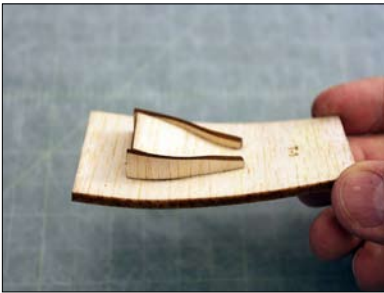
Make sure the part follows the curve of the fuselage well.

Curve the next piece with the marker again.





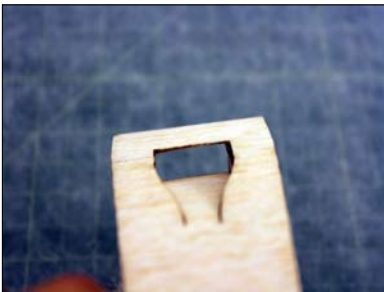
Glue the remaining side on.



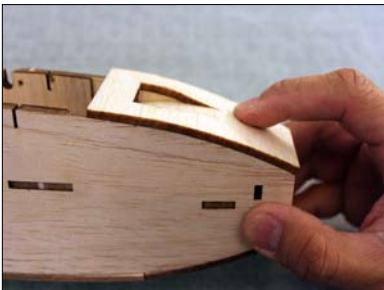
Both sides glued on shows it raised up a the lowest part. Although not pictured here, you should sand down those side walls as much as you can to allow clearance of the ESC later.



Use a file or sanding stick to widen the opening of the Naca duct.

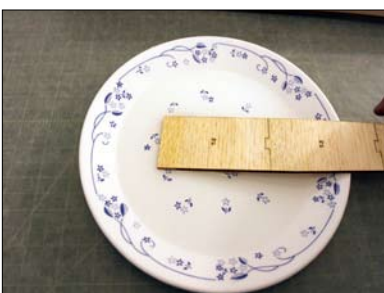


Here you can see the opening is widened and less drag due to the sharp leading edge of the duct opening.



Confirm the shape matches the fuselage.

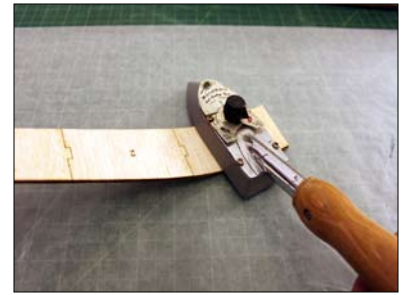
DO NOT GLUE THIS PART ON.
The entire top fuselage cover does not get glued on ever, except at the rudder.



Soak the front part of the middle top fuselage cover T-2 only.

Carefully and gently create a slight curve to match the fuselage shape.

Be gentle as it can easily break as you are curving with the grain.



The back section doesn't need to be wetted and it can still create a slight curve to match the fuselage.



Check the profile and curve as needed with the iron to match the shape.



Use the Tri-stock wood to fill the front nose corners.

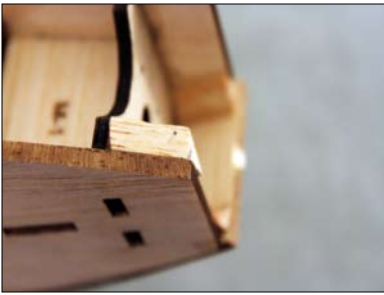


Glue the bottom corners as shown.



Draw lines on the tri-stock for the top sections of the front fuselage nose section.





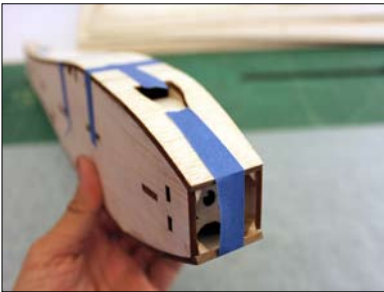
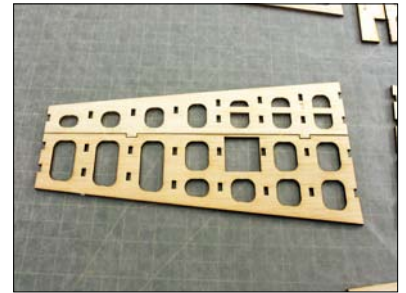
The tri-stock on the top parts will only be glued to the fuselage sides.

Carefully sand down the remaining tabs that held the parts in place.



All four corners with tri-stock. This will allow you to sand the front end rounded.

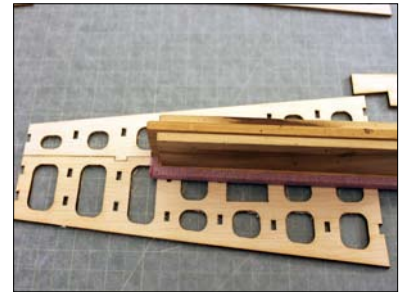
Glue the both bottom pieces together. The front and rear sections that have the slots for the ribs. Glue them flat over the wax paper.



Tape up the parts to the fuselage so that you can sand all the edges and corners rounded.

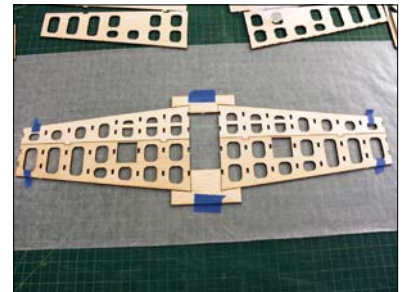
Very very lightly sand down any roughness and unevenness

Just a couple of light passes should be fine.



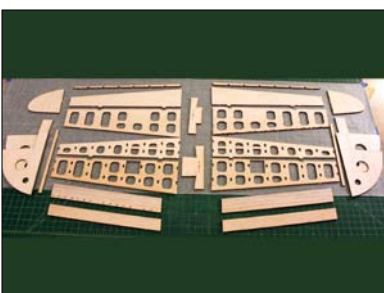
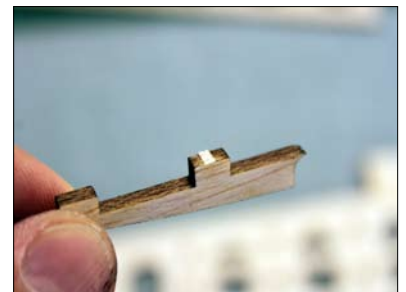
Apply masking tape as shown. This will allow the parts to be held in place while you sand the fuselage rounded. DON'T glue on any part of the top fuselage cover, it's just taped on.

Complete both left and right sides and tape them down using the front and rear wing spacing jigs.



Do not sand any part of the area between the slots for the wing mount. Tape of the area that you should avoid sanding. Put away for now and do all the sanding together later.

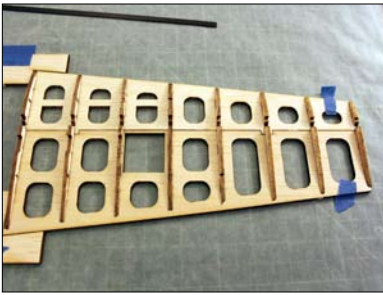
Prepare all the ribs. Handle them carefully and also sand down any remaining parts of the tabs.



Prepare all the parts related to the main wing assembly as shown.

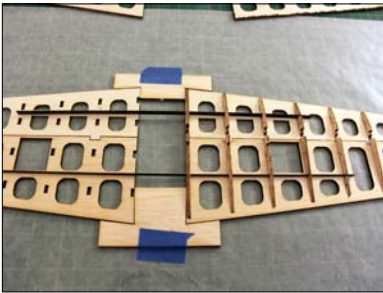
Just a few light swipes with sand paper is fine. This will allow the rib to fully seat into the wing and reduce the chance of it getting in the way of going all the way down flat into the rib slots.



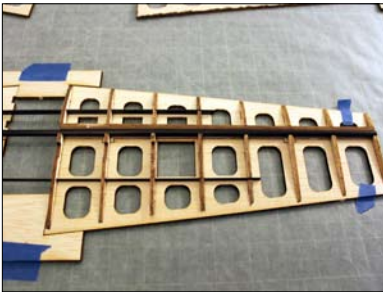


Carefully insert all the ribs of one side of the wing first. Make sure they are all fully seated.

Don't glue them in just yet....

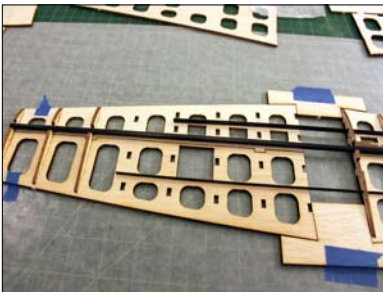


Insert the flat carbon into the rib slots of the ribs 1 thru 5. The 5 mm flat spar in the front and the 3mm flat spar toward the rear.

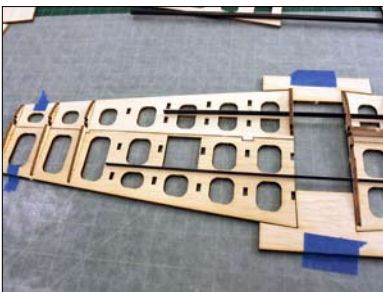


Lay down the main Carbon tube spar with the wood spar in the center of the wing.

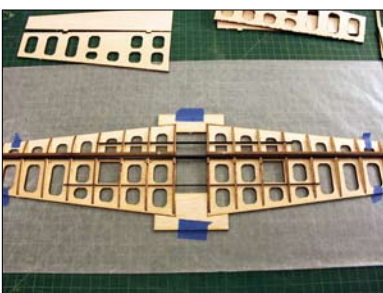
Still hold off on the glue until the whole assembly is done.



The outer wing ribs can be placed easily but the inner ribs 1 thru 5 may require you to temporarily remove the main carbon tube to place down easily.



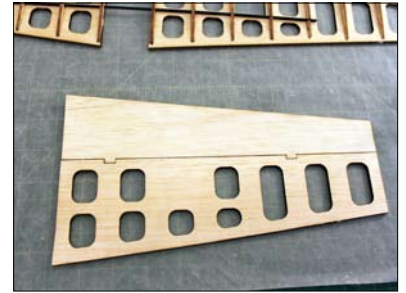
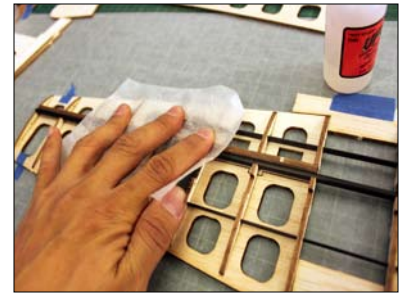
With the main carbon tube temporarily removed you can now begin placing the inner ribs 1 thru 5.



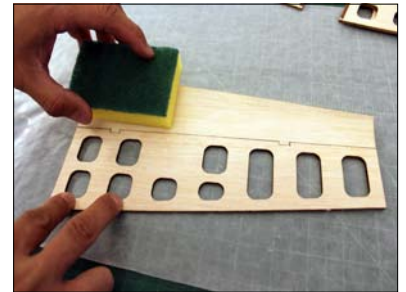
After placing all the ribs you can now place back the main carbon tube in the center.

Double check that everything is seated fully and the whole wing is flat on the table.

Now apply thin CA to all the ribs and spars. Use wax paper to press down on all the ribs and spars as you apply the glue to ensure that everything is glued in flat and all the way seated in. Afterward go over it again with Thick CA to reinforce all the glue joints for a stronger wing. Glue together the remaining top wing skins. Make sure they are flat when glued together.



Then use sponge to wet down the leading edge. Wet both sides.



Use the covering iron again to curve the wood to match the airfoil shape. It doesn't have to be perfectly matched to the airfoil, just make it easy enough to glue down to the wing.



Sweep up and down the wing and lift the back end of the wing to create the curve.

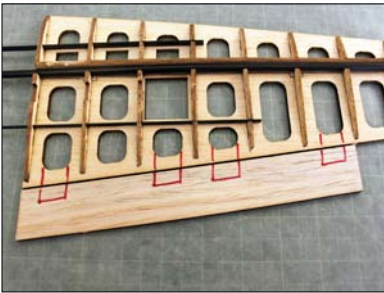


Continue that sweeping motion and curve the entire leading edge from the wing root to the wing tips. Repeat this action over until the wood dries out and is curved enough.





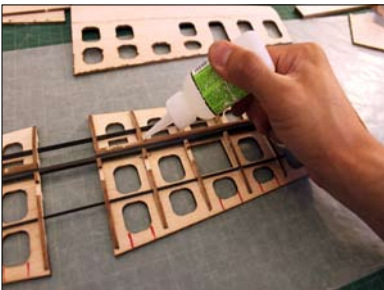
Here you can see that the curve was greater than the actual shape of the airfoil. This is okay as long as it can be easily glued on to the wing without cracking the wood due to not having enough curvature.



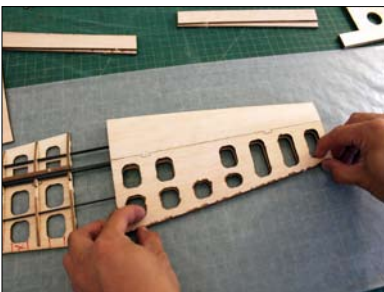
Draw out some boxes where you will be placing the CA hinges. Do not apply glue to any area in that box and later the hinges will slide right in. No need to cut the hinge slots open.



Use a file to widen and deepen the servo wire access tunnel needed to route the servo wire through the wing.



Carefully cover all the areas where the top wing skin will make contact with the wing ribs with thick CA. Skip the red boxed areas! Be very careful with the next step. You only have 1 chance to seat the wing, there are no 2nd tries. Be quick, steady and accurate!!

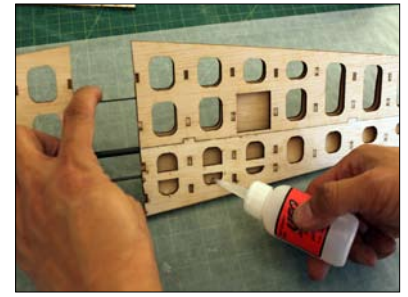


Start the attachment of the top wing skin by aligning the rear trailing edge sections with your thumb and fingers along the trailing edge and the inboard wing root and wing tips.

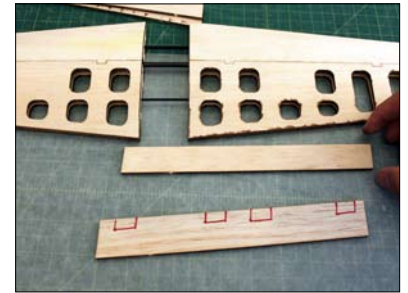


Once the trailing edge is accurately lined up go ahead and press down the remaining wing skin and apply pressure over all the wing area. Pay attention to the leading edge as well.

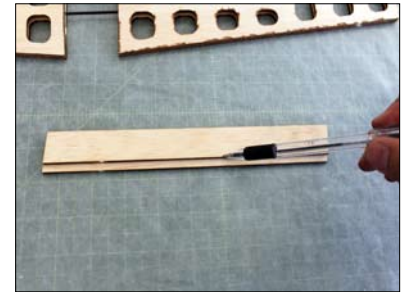
You can add additional CA glue into the holes from the bottom to reinforce all the contact points and strengthen the bond of the wing skins. Especially the leading edge areas.



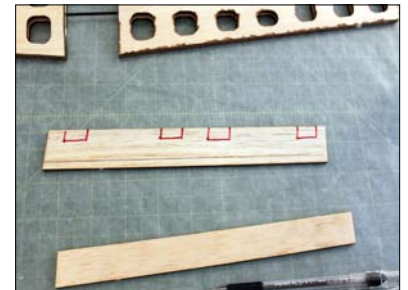
Incase you didn't know, the bottom of the aileron half is wider than the top half. This is to allow a thinner trailing edge later when sanding.



Lay over the thinner aileron over the bottom aileron and draw a line.



This will allow you to know where to apply glue. Stay within the line and avoid any glue in the red boxes.

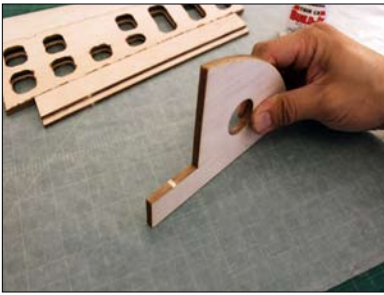


Apply glue and line the 2 pieces flat on the wax paper vertically to ensure proper positioning.



Apply glue to the 2 wing tip halves.

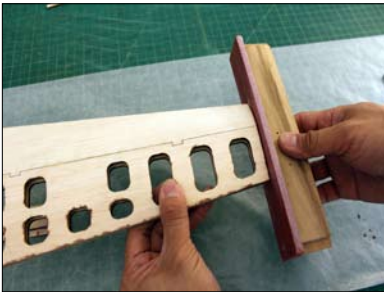




Again, line the 2 pieces up by joining them while holding them vertically on the wax paper.



Lightly sand the trailing edge of the wing.



Lightly sand the wing tip.



Lightly sand the inner part of the wing tip to join the main wing.



Test fit the alignment.

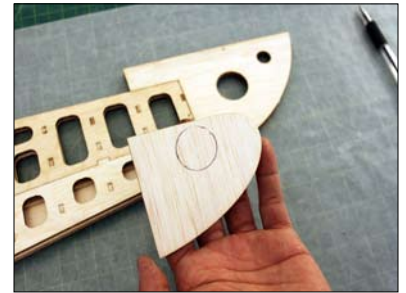


Place the top wing tip, cover over the wing tip, and hold in position temporarily.

Flip it over and draw a circle through the hole of the wing tip.



Now you will have a circle on the underside of the top wing tip cover. Simply use this to avoid applying glue within the circle.



Apply glue and attach the top wing tip cover.

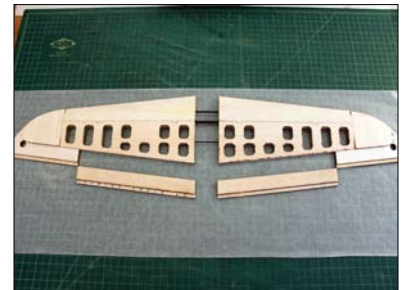
Prepare the wing tip trailing edge piece.



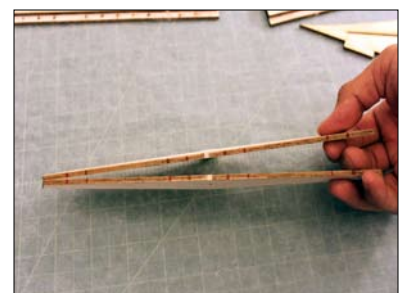
Glue the trailing edge strip on the wing tip while flat on the table.

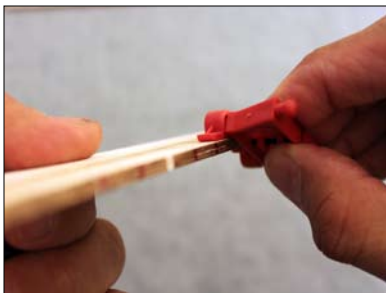


Complete both left and right sides and put away for sanding later.



Mark the CA hinge slots on the horizontal stabilizer and the elevator. Make 4 slot positions.





Use a precision centerline marking tool to scribe a line for the hinge slot.

Shown here: Great Planes Precision Hinge Marking Tool



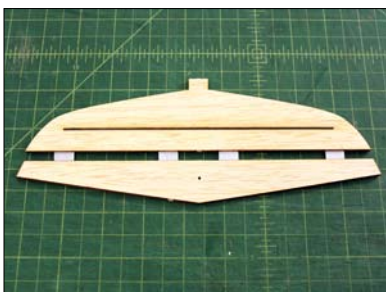
Here you can see a nice centered mark left by the hinge marking tool.



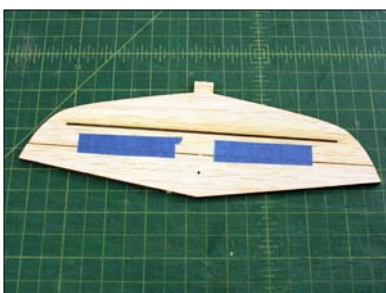
Carefully Insert a hobby knife into the horizontal stab and elevator slots. Try to insert them as squarely as possible so the knife doesn't come out one side.



Trimming the hinge corners can help the hinges slide in a bit easier.



Insert the hinges into the elevator and horizontal stab and press them in all the way.



Tape the elevator onto the horizontal stab. Leave only about 1/8 inch of tape on the elevator portion.

Flip it over and apply more tape to the bottom side as well.



Begin sanding one side first. Use a sanding block and use even full strokes instead of quick short strokes. It makes a big difference! Sand the trailing edge down to 1/16 inch on one side.



Flip the assembly over and prop in one of the main wing jigs under the leading edge area. This will allow you to let the trailing edge sit flat on the table while you sand down the remaining 1/16 inch.



Sand down the remaining 1/16th inch trailing edge to a sharp tip. Again use long smooth strokes instead of short quick ones.



Do final touch up sanding while carefully checking for evenness while looking directly at the sharp tip trailing edge.



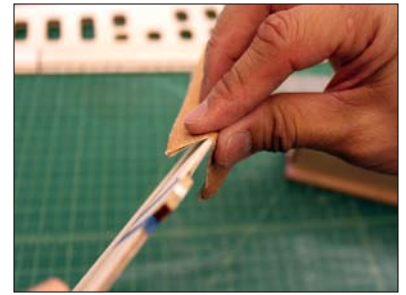
Creating a nice sharp trailing edge will allow for fastest performance and less drag.





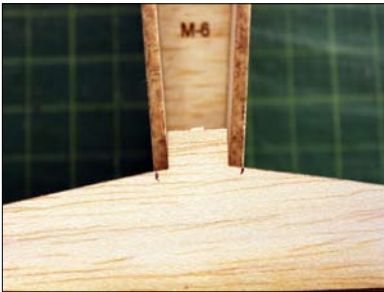
Just another look at the sharp trailing edge.

Sand the leading edge nice and softly rounded using sandpaper in your hand. Try to create an even round leading edge.



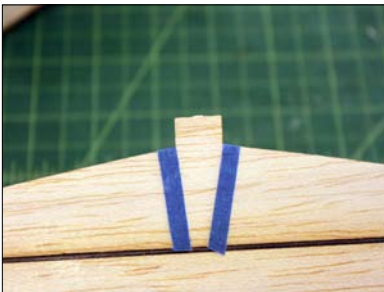
Remove the masking tape and lightly sand down any unevenness between the elevator and the horizontal stabilizer. Afterward, make a small mark to indicate the top for both pieces

Nice and smooth round leading edge.



Position the horizontal stabilizer assembly over the fuselage where it will be inserted and mark off 1/8 inch on the inside root area.

Remove the tape to show the inner area untouched. This will allow the horizontal stabilizer to full seat into its slot in the fuselage.



Trim some masking tape to 1/8 inch strips and cover.

Carefully and slowly sand the bevel for the elevator. Again use long strokes and hold the tips as well when sanding that part. Since this is thin if you only hold the center, then that will be the only part getting sanded.



Sand down the leading edge with a sanding block to remove the main squared edge. Just a light sanding is necessary. Don't over do it.

Sand down one half side first to see if you are sanding it equally.



You can see an even removal of the top half edge.

Flip over and repeat to get the bulk shape down and confirm for evenness.

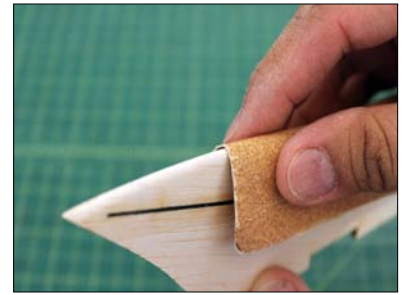
You should see only half the bevel at this point.





Flip the elevator over and sand the remaining half.

Then use the sand paper to sand a smooth round leading edge.



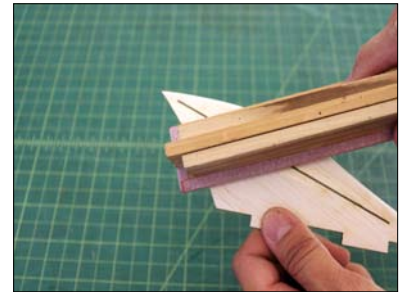
Insert the hinges again

Here you can see the smooth leading edge.



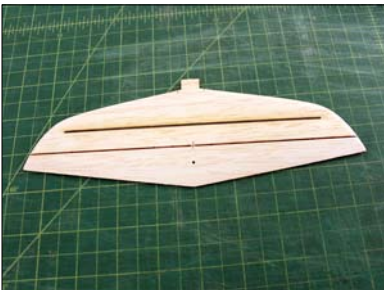
You should now see a nice even bevel on the top and bottom sides meeting to a point in the center where the hinge is inserted.

Use the sanding block to sand a sharp taper on the trailing edge of the rudder. Do both sides evenly.



Don't glue them in yet. Glue it in after covering.

Here you can see the sharp trailing edge.



Remember to reinsert it with the markings showing both the top side of the elevator and horizontal stabilizer. Note the small mark in the center. This way there should be no offset of the elevator to the horizontal stabilizer.



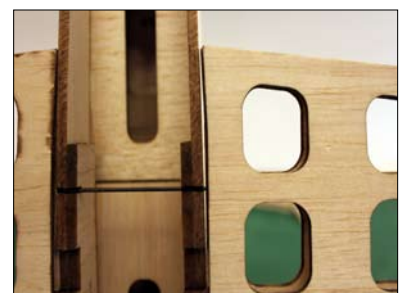
Next, Sand the Rudder.

Test fit the main wing onto the fuselage.



Like the horizontal Stabilizer, use the sanding block first to sand down the square corner of the leading edge.

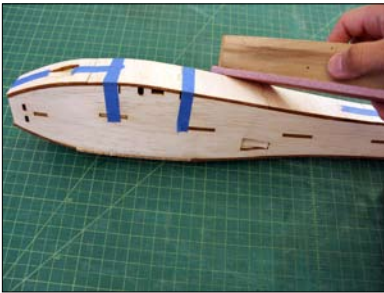
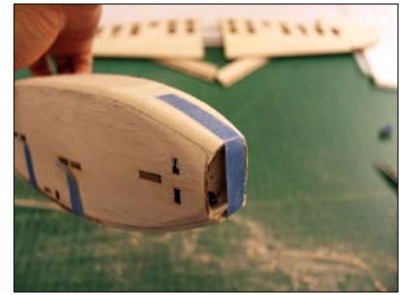
You may find some loose spots with gaps between the wing and fuselage. Don't worry, when you glue the wing on **later**, you will spread it with your fingers to make it fit when applying the glue.





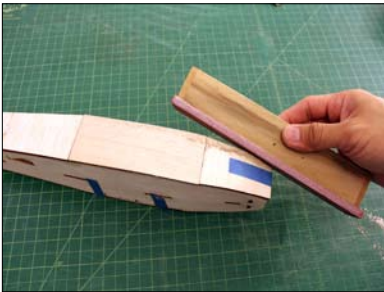
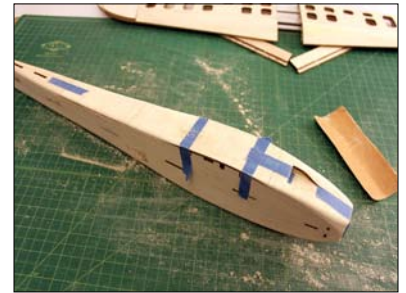
Here is another shot of a gap in the spacing on the other side of the wing. Again don't worry.

Another shot showing the rounded nose.



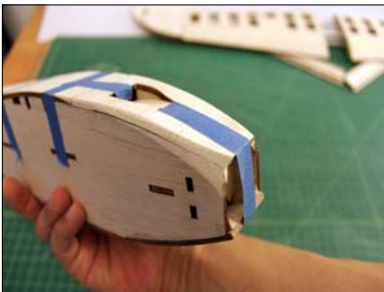
Back to the fuselage, Start sanding the edges with the sanding block to get rid of bulk, then use the sand paper to soften the corners. Don't Sand the wing saddle area between the tape shown here.

Smooth out the whole fuselage, again except in between the tape in the wing saddle area.



Don't be afraid to sand the front nose corners down significantly. That's why there is the tri-stock in the corners.

The rear top cover where the rudder is glued into is NOT glued it at this point, it is just pressure fit in there to sand the shape.



Sand down a good portion of the corner on all 4 corners. Be careful and hold down the top cover when sanding that part.

A close up of the wing saddle area.



Use the sand paper to soften the edges now.

A close up of the front nose.



Nice smooth front nose corner.

After removing the tape you may find that you need to do more sanding to eliminate any tape spot that the sanding left over. Just sand a bit more to smooth out with the tape off.





The bottom showing the tape spot that will need more sanding down to smooth out.



The front nose will need sanding down.



Carefully sand down the front nose to a flat surface. Be careful not to break the top front cover while sanding. And hold it in position tight while sanding so it doesn't slip around.



A nice flat front end.

**** Please disregard the fact that these next photos show the fuselage covered already.***

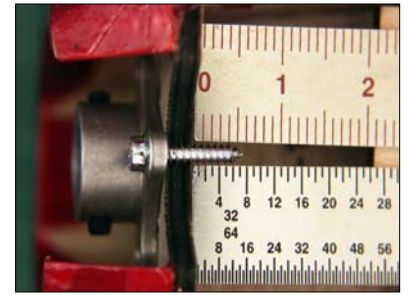


Insert and screw in the motor mount screws in order to widen the holes before we cut down the screws to shorten them.

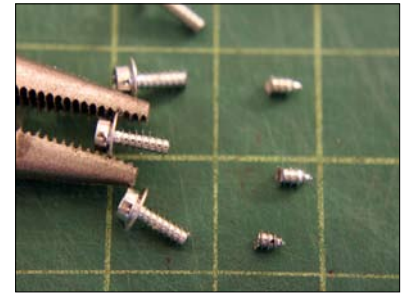


You can see that the hole remains wider after inserting and screwing in and removing the motor mount screws.

As shown here the screws will stick out almost 1/4 inch out the back of the firewall. This is dangerous for the lipo and equipment and should be cut off.



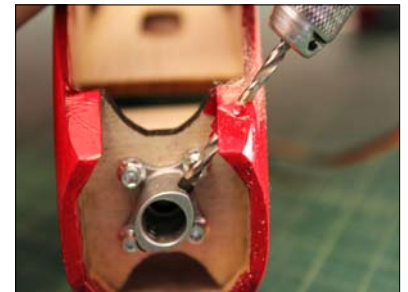
Hold the screws tight with pliers that have teeth on them and use a Dremel tool to cut off the tips. (Use safety goggles) Or simply cut the tips off with snipping cutter or similar tool.



To access the grub screws on the motor tube mount you will have to drill out the hole to access it. Start with a small drill to get the angle and position right.



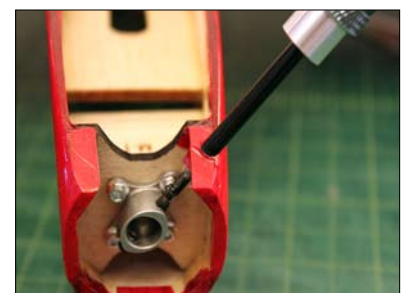
Then use a larger drill to widen it

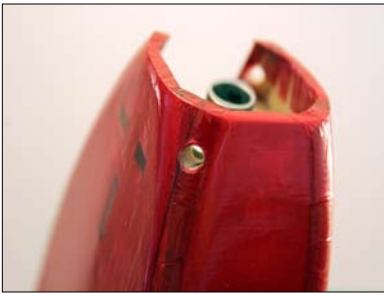


The hole is now wide enough for a hex driver to access the grub screw.

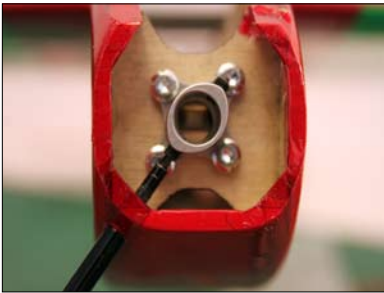


The hex driver is lined up right to the grub screw and is able to torque it down good and strong. Thin allen wrenches may not be strong enough to get a good grip and may not be good enough to use.





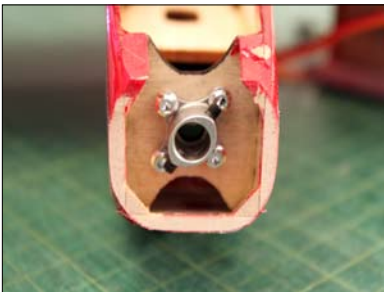
Repeat that process for the bottom grub screw.



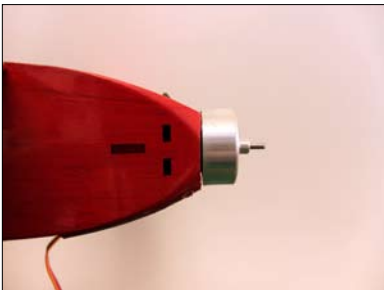
Here you can see the 2nd grub screw is on the bottom side opposite the first grub screw.



Test fit your motor. You can see here that the bottom is touching the motor.



Sand the front end down again to make sure the motor can clear the fuselage sides. Although not shown here you can also sand down the front roundness more to match the shape of the motor better.

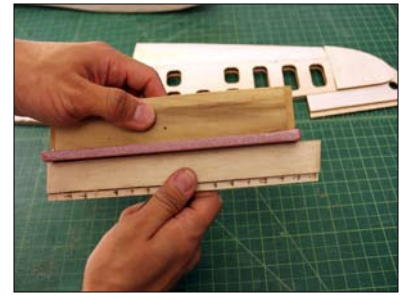


After proper adjustments, you should have a nice even small gap about 1/32 to 1/16 inch from the fuselage to the motor.

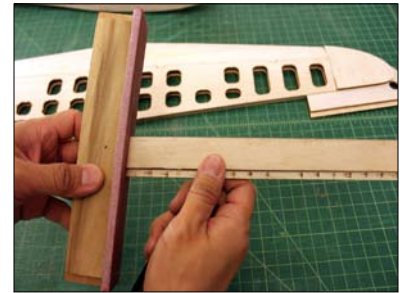


Now all the fuselage and tail feather parts should be completely sanded.

Lightly sand down the ailerons.



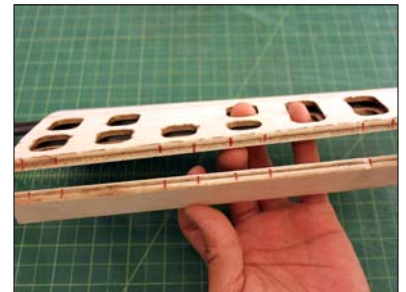
Lightly sand both edges as well.



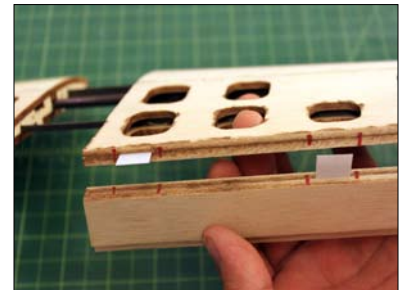
Lightly sand down the inside edge of the wing too.



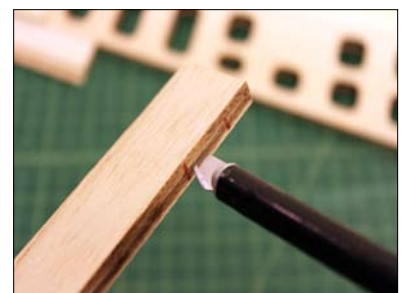
Position and mark the locations where the CA hinges will be inserted.

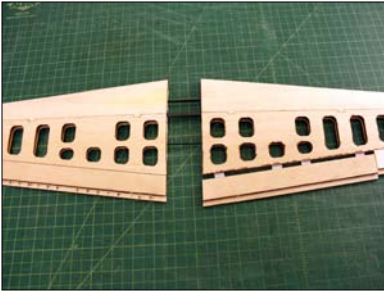


Test fit the hinges. If done right with no glue in the red boxes they should slide right in.



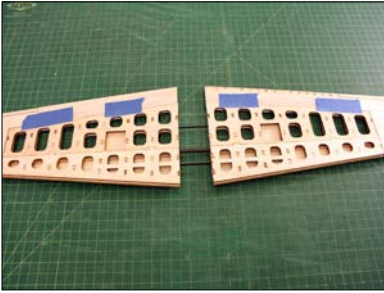
On the ailerons, you may have to insert your hobby knife to widen the slot just enough to get the hinge in easily.





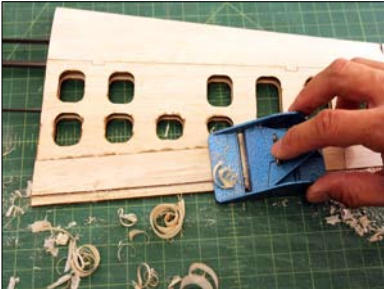
Insert all the hinges and insert the ailerons into the wings.

At this point, you should have a nice smoothed out trailing edge all along the wing from root to tip. The trailing edge should be about $\frac{3}{32}$ inch thick



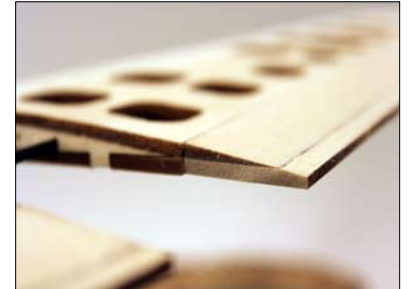
Flip over the wing and tape up the ailerons on the bottom side only for now.

Here is a shot of the trailing edge



Flip the wing back over and use a Balsa planner to remove bulk volume of balsa on the trailing edge of the aileron and wing tips. First just remove the top trailing edge of the aileron.

A closer shot showing the top sheet has been sanded down significantly only at the trailing edge.



Then work on the top trailing edge of the wing tips.

Use your fingers to feel for unevenness along the aileron and the main wing. It should feel as one piece.



You can save a lot of sanding time by using a balsa planner first.

Feel the wing tip also and sand down until smooth, and it feels like one piece of wood.



Next, start sanding it down further using a sanding block. Use smooth consistent long strokes. Good sanding habits make for a much better sanding job.

A close up shot of the trailing edge down to $\frac{3}{32}$ inch.

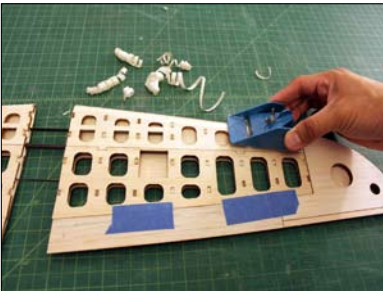




The front leading edge before sanding it rounded.



The top sheet will overhang by about 1/16 to 1/8 inch. Do NOT sand this away or cut it off. It is vital to the airfoil shape.



Flip over the wing and work on the bottom leading edge first.

Here you are removing the bottom of the leading edge to sweep up.



Next, sand down the bottom sheets leading edge all the way up the tip of the top sheet. Sand away about 1/8 inch of the material.

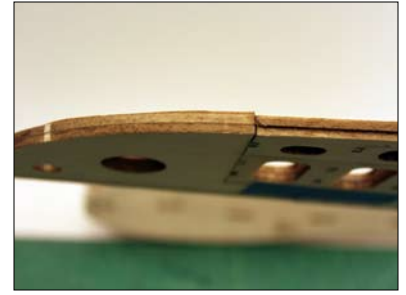


You can see the bottom leading edge is being created into a semi symmetrical shape airfoil instead of simply flat bottom with rounded leading edge. [Click here for Airfoil Diagram](#)

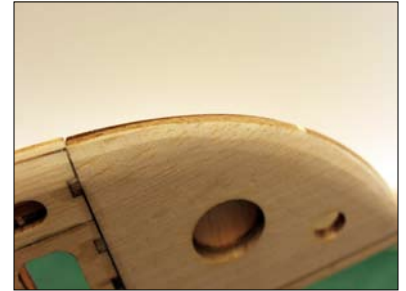


Sand the bottom all the way up until the top sheet is showing about 1/16 inch leading edge unsanded. Sand the bottom leading edge at least 1/2 inch or more toward the rear. Try to get a sharp leading edge vs rounded.

Notice the wing tips are 1/4 inch thick at the base, not including the top wing tip cover. Two sheets of 1/8 inch wing tips + the top cover.



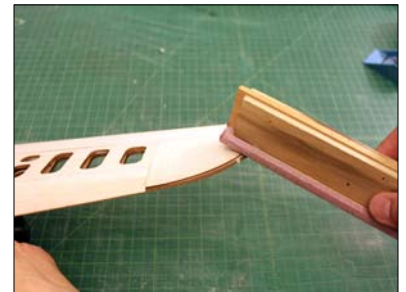
Still working on the bottom of the wing tips, sand away the bottom 1/8 inch leading edge to follow the main wing section you just sanded the bottom on. Don't sand into the top 1/8 inch sheet.



Just another shot showing the bottom half leading edge sanded up. The very top part is showing the partially sanded top wing tip cover.



Now sand down the top wing tip down to make the wing tip leading edge sharp. You may notice a difference in thickness of the wing tips and the main wing. You can sand it down to match later.

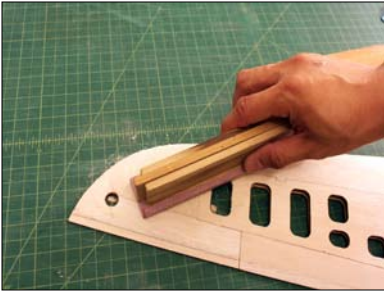


Leave about 1/16 inch sharp leading edge for now.



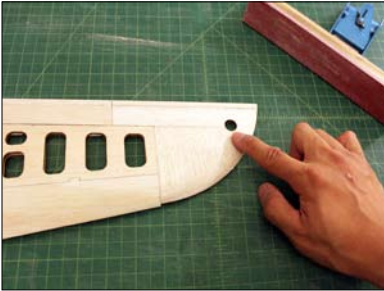
Place the wing on the table again and use the sanding block and sand the wing tips some more in a curving sweeping motion to make a consistent leading edge tip that follows the same line as the main leading edge on the wing.





Now you can address the difference in the height of the wing tip compared to the main wing. Simply sand it down to match the wing tips while maintaining the airfoil shape.

Now very very lightly just round off the sharp leading edge. No need to over do it here.



Sand down the top wing tip covers enough that you can't feel the edges with your fingers. Make it nice and smooth.

You can now see a nice profile of a good SEMI-SYMMETRICAL airfoil.

[Click here for Airfoil Diagram](#)



Feel the section where the wing tip joins the main wing and sand down smooth and follow the airfoil shape.

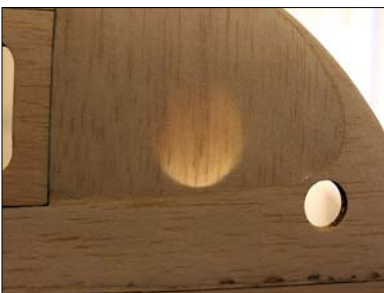
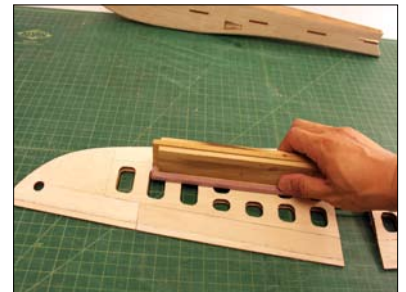
The Wing tips should follow the same center line of the airfoil following the line from the main wing to the tips.



A close up shot of the wing tip area.

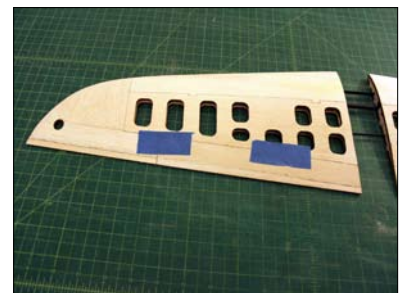
Lightly touch up any unevenness on the main wing top side now and smooth it out all around.

Repeat the whole process on the right wing.

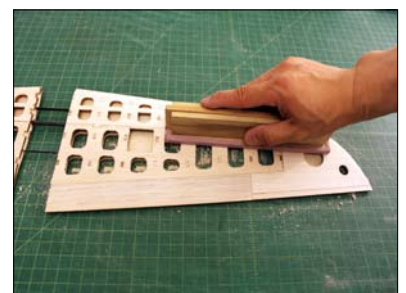


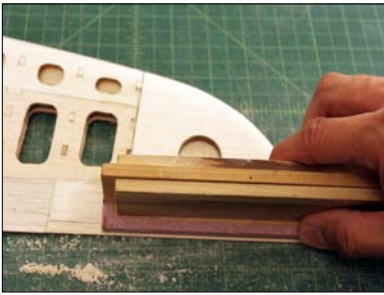
If you hold up the wing tip to the light you can see the some light coming through the hole underneath. This is good way to determine if you sanded each wing time the same amount. Here you can see that the other wing tip is showing less light through. Be careful about this and use your judgement as some wood densities may differ and throw you off. If you sand too much and the hole beneath opens up don't worry it's okay. Just do the same on both sides.

When satisfied that the top is completely sanded go ahead and put masking tape over the ailerons on the top side.



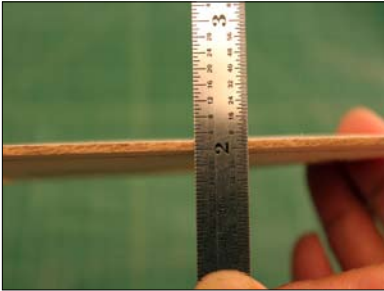
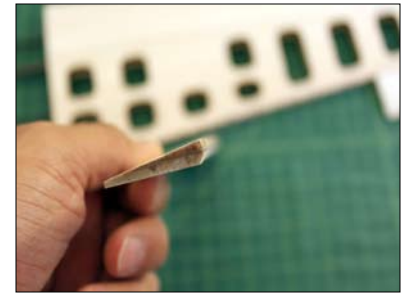
Flip over the wing, remove the tape that was on the ailerons on the bottom and now lightly sand down the whole bottom wing smooth.





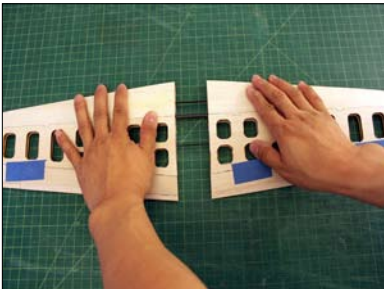
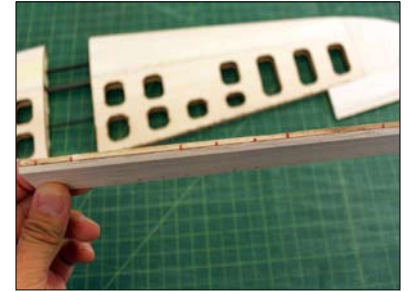
Next sand in wash out by sanding the “bottom” wing tips trailing edge down to 1/16 inch or less. This will create washout for added stability.

Here you can see that one side is sanded up to the center line.



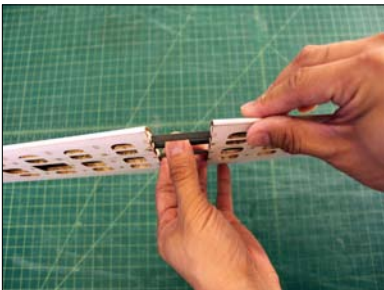
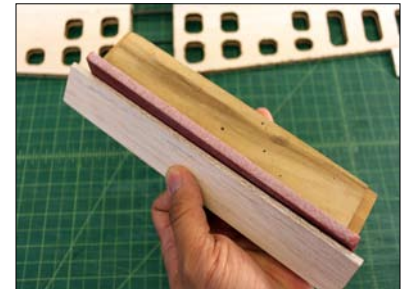
The trailing edge at the wing tips are now 1/16 inch thick or less and the bottom shape is raised just a little higher than the ailerons. This creates “washout”

Another angle showing the half bevelled.



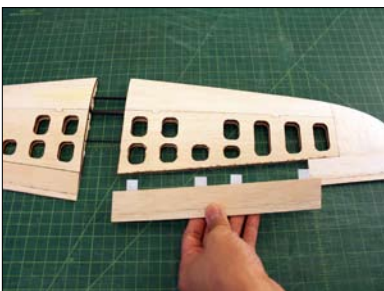
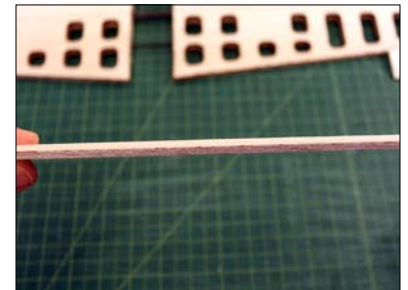
Run your hands and fingers over the whole wing and inspect it carefully for imperfections and unevenness. Both wings must be as equal to each other as possible.

Flip it over and sand the other half now



The leading edge is very important. Inspect both sides and make sure they are the same shape on each side. Also use your fingers to feel for evenness.

Sand it to a sharp tip



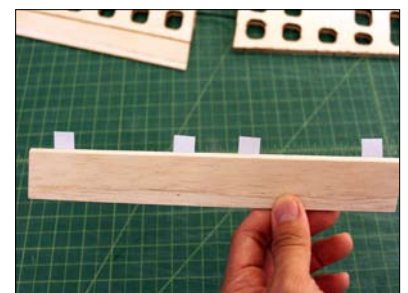
Now it's time to remove the tape on the ailerons and remove them to sand the bevel.

You can see the aileron bevelled to sharp tip where the hinge line is.



Sand one side first.

Insert the hinges.





Insert the aileron again and you might see the hinge sticking out in one of the openings on the main wing.



You can decide to take the extra time to trim it if desired.

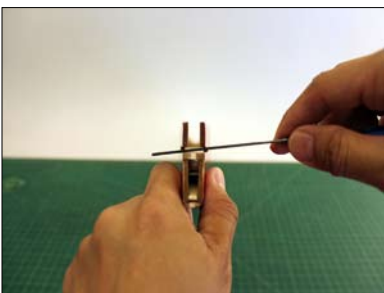
Don't Glue them in yet. Glue them in after covering the wing.



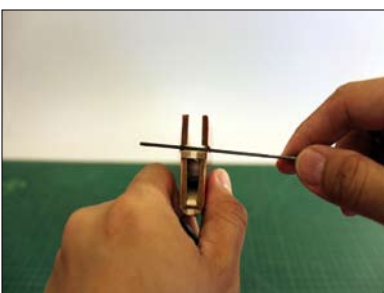
Insert the main wing on the fuselage again. Also insert the horizontal stabilizer



Also insert the rudder along with the top rear cover. Don't glue the top rear cover on, just pressure fit it.

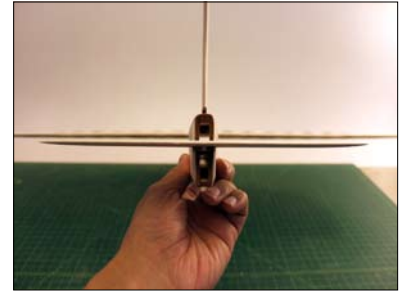


You may or may not need to file or sand down the horizontal stabilizer slot in order to make it squared up evenly with the main wing. If you have to, then lightly sand or file one side down as needed.

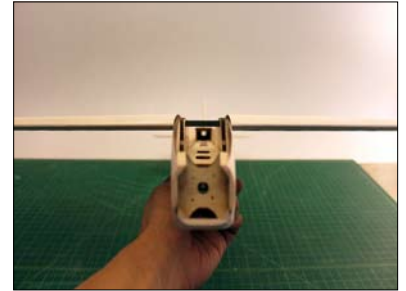


Either to the left or right as needed. These photos are showing extreme angles to explain the concept, but if you have to do this, it would be at far less angles.

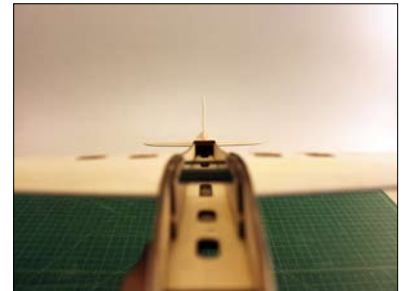
Check for even wings and a squared rudder while looking down the back.



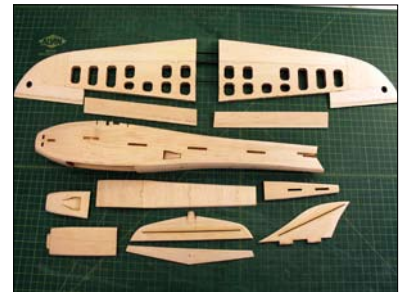
Also check from the front view.



And again check various angles to be sure everything is squared and true.



Now all the parts are ready to be covered.



However, do NOT cover this part until instructed to do so AFTER installing the elevator servo and setting up the elevator control pushrod.

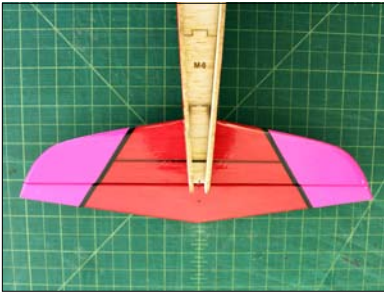


If you are experienced in covering an airplane on your own you can proceed with the instructions here after covering all the parts individually that are shown above.

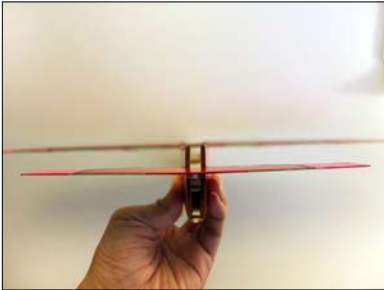
Otherwise you can download the "Covering Instructions" from the Speed Shark page or [click here to download](#) now.



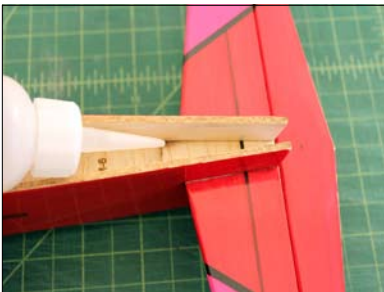
Insert the covered horizontal stabilizer and line it up over your grid cutting board, if you have one. Line up the lines and check your elevator line to confirm if it is squared to the fuselage.



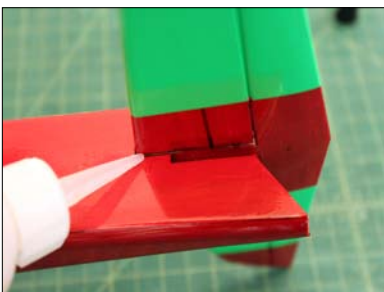
Flip it over and check it again. This must be squared to the fuselage when looking from the top and from the bottom to be sure.



Then one more confirmation that the main wing and horizontal stab are aligned and parallel.



Use thin CA to glue it in once confirmed that it is aligned and squared up properly.

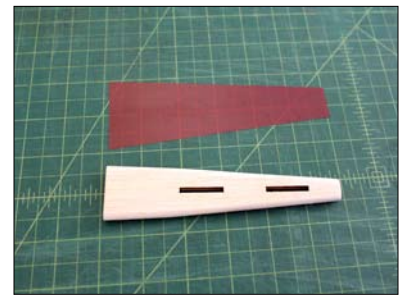


Use thin CA on the bottom to allow the glue to penetrate into the slot.



Temporarily seat the top rear cover again to make sure you didn't accidentally squeeze the fuselage sides too close together when gluing on the horizontal stabilizer.

Trim some covering material to cover the top cover. Make it sized just slightly larger than the part itself about 1/4 inch over the sides



Here you can see it is a bit over sized.



Install the Elevator servo. Make sure it is centered.



Trim off the top 2 holes off the elevator control horn.



Insert it inside the hole and trim the material off the base area.

Use a sharp NEW knife to minimize the damage to the wood.



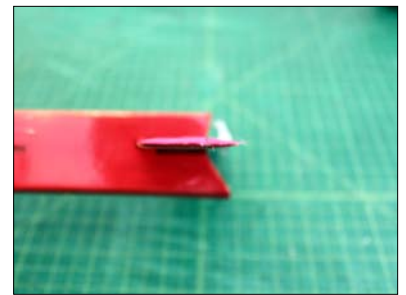
Remove the covering material carefully.





Apply a drop of glue on the hole and insert the control horn and apply more glue around it.

Double check that it is in true neutral position.



Insert the elevator push rod into the control horn.

Lay the pushrod over the servo control arm while it is still attached to the elevator control horn. Use a Sharpie to mark the location over the hole on the servo arm.

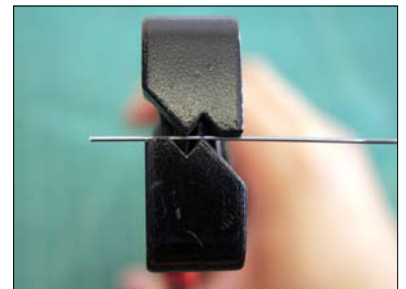


Prepare some scrap pieces from the remaining wood after the parts were removed from them.

Make them about 3 inches long.

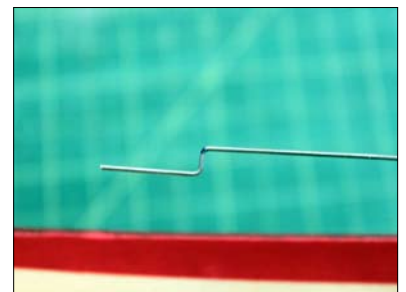
Make a Z-bend right on the mark just made.

Pay attention to the direction of the Z-bend so that it should go in over the top.



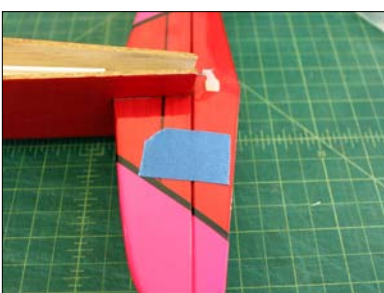
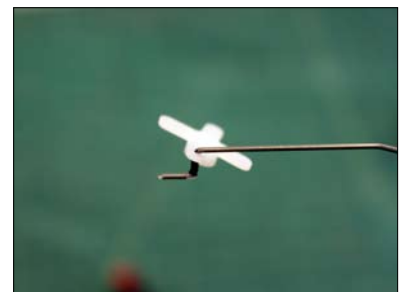
Stack three pieces together to make a support beam for the elevator push rod.

Your Z-bend should look like this.



The three pieces stacked up will reach the push rod tube which will allow the pushrod to be secured without bending.

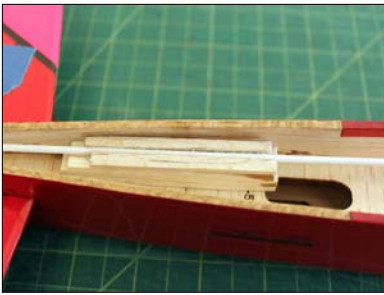
Remove the servo arm and insert the Z-bend. Cut off the excess length and Use a small piece of 0.5mm shrink tube and/or drop of glue to lock in the Z-bend from having any slop on the servo arm.



Put some masking tape on the elevator to lock it in neutral position.

Re-insert the servo arm into the servo.





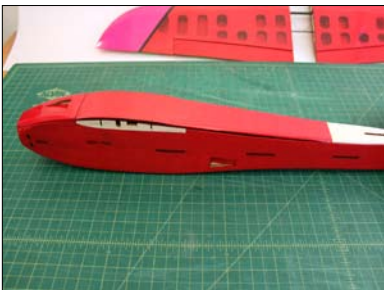
Now use 2 thin strips to secure the pushrod tube in place and glue it in.



If you made the first set of pieces of wood long enough you wouldn't need to add the extra piece shown here.



The support of the pushrod tube needs to be nearly as long as the tube itself to reduce and flexing of the pushrod. But leave at least 1 inch near the rear section closest to the elevator.



Now Glue the rear top cover in place over the elevator pushrod assembly.

Next test fit the top cover to confirm that the lengths will fit properly.

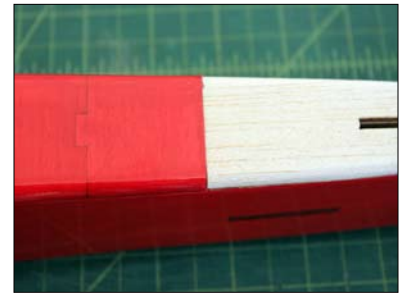


If you notice that the front end is sticking out like it is here then you may need to sand it shorter somewhere to accommodate this.

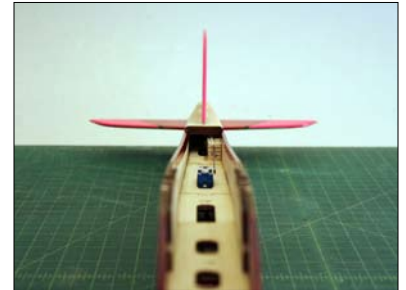


Sanding the rear section would allow it to fit without being unsightly.

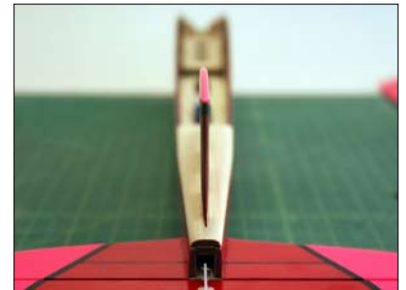
Sand it flat to fit up against the rear top cover.



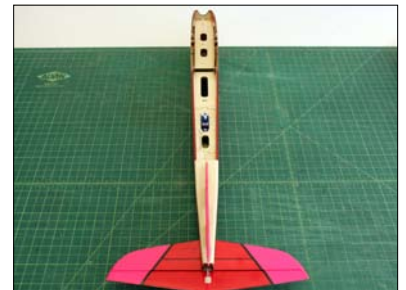
This is the last chance to double check that the rudder is straight and true. Not only in relation to the elevator but in its angle in relation to the fuselage.



If there is any slight right or left offset then you flight may suffer from tendency to drift or pull to either side depending on the direction of offset.



Back up a bit and check the over all angle of the rudder in relation to the fuselage. If you need to adjust it use a file and sand the slots to adjust and fill with glue later once the rudder is glued on.

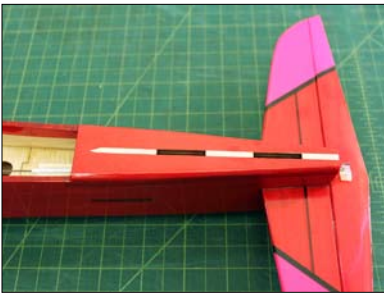


Now lightly tack on the top cover in the correct position with the sides overhanging.



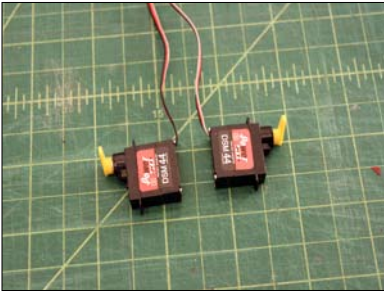
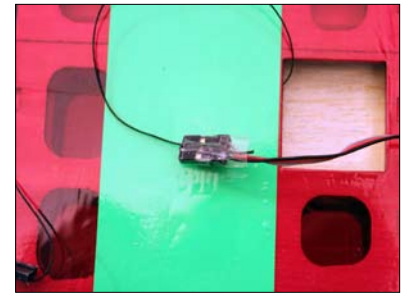
Trim the center line to allow the rudder to glue on wood to wood.





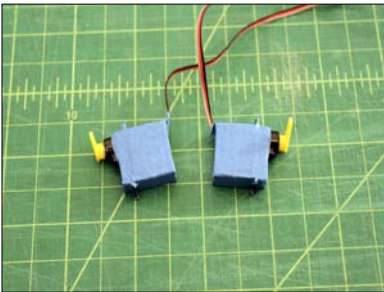
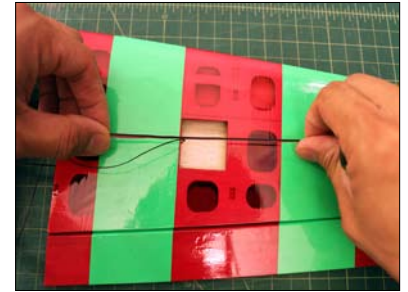
Cover the rest of the rear top section. The overhang will wrap around the fuselage nicely.

Wrap the string with a piece of scotch tape to make sure the string doesn't slide off while inside the wing.



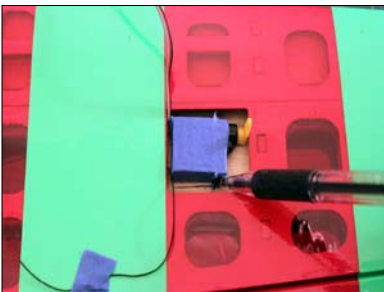
Prepare two wing servos. Center the arms and make a left and right side. Double check that they are centered properly and that your trims and or flap switch is not on if you are using your radio to center them.

Straighten the servo wire to facilitate easier routing through the wing.



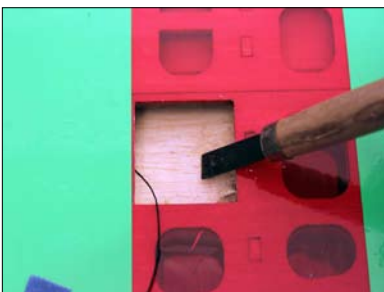
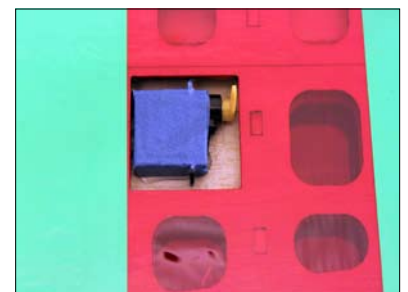
Wrap the servos with masking tape as they will be glued in. Later if you need to replace the servo it will be easier to remove them by cutting the tape.

Route the wire all the way through the wing.



Test fit the servo and mark with a pen the inside location.

Once the wire is fully routed glue the servo in with thick CA. Be careful not to get glue on or near the servo arm.



Use a wood chisel tool and scrap away about 1/32 of an inch over the rearward section where the pen mark was. Scrap away just enough to remove the pen mark. That should be enough to allow the servo to sit completely flush inside the servo bay.

Prepare 2 control horns for the ailerons.

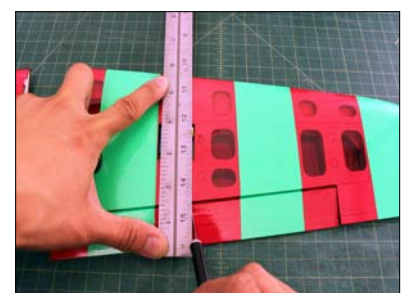
Widen the holes to fit the mini-ez connectors.

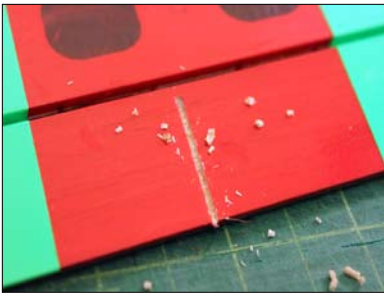


Tie the end of the string around the servo plug length wise as shown.

Use a ruler to cut the slots for the control horns in the ailerons.

Make 2 cuts 1/16 inch apart the length of the control horns on the aileron.





Create a slot by digging out the wood between the two cuts. The resulting slot should be about 1/16 inch wide and about 1/16 inch deep.



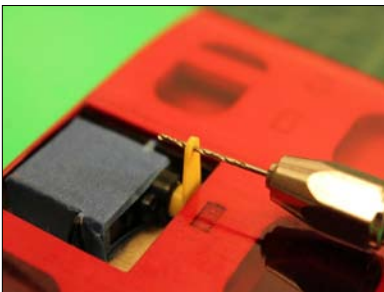
Draw a line on the control horn so you can see if it seated in fully in the aileron.

Test fit it into the aileron before applying glue.



You can know that the control horn is fully seated into the aileron if you cannot see the line anymore.

Now that you are sure it fits properly remove it and apply plenty of glue then re-seat it into the slot fully.



You may need to slightly enlarge the servo arm hole to accommodate the aileron pushrod wire.

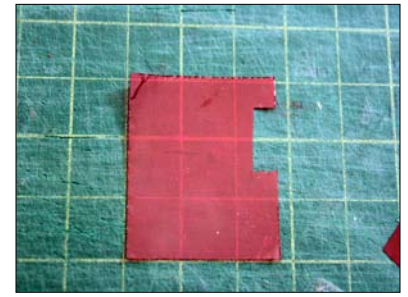


Insert the Z-bend side into the servo arm

Insert the Mini-Ez connector to the plywood control horn. Torque down the set screw enough to where you can see the push rod bend. It may even be wise to use Loctite on the wire and the screw. But be sure the have the servo arm centered and the aileron in neutral position when setting this up. Use tape on the aileron to ensure it is in neutral position.



Cut out a trim of covering material to cover the servo.

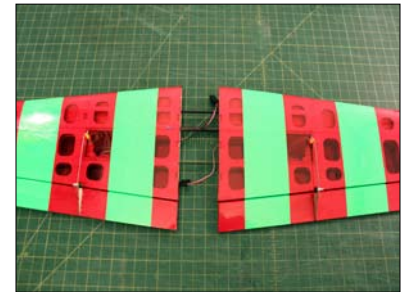


Iron on the cover over the servo bay.

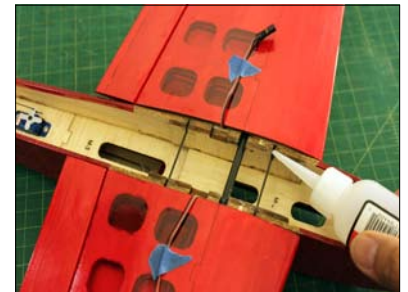
You can add scotch tape for extra security if desired.



Alternatively for the aileron push rod set up, if you don't want to use Mini-Ez connectors you can use a Z bend on one side and an L bend on the other. Then use a piece of shrink tube plus glue to lock it in place on the L bend side.



Place the main wing in position on the fuselage. Make sure it is FULLY seated in the slots. Then apply Thin CA to all the contact points, basically all over. Follow by squeezing in thick CA into all the open gaps that are visible between the wing and fuselage.

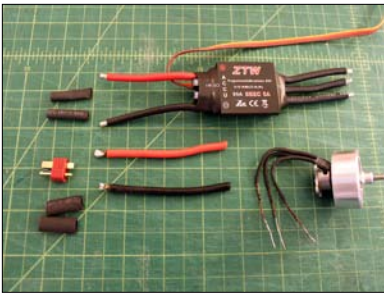


Be sure to soak the main carbon fiber spar locations with thin CA first to let it get in there deep. Watch out for your servo wires too.



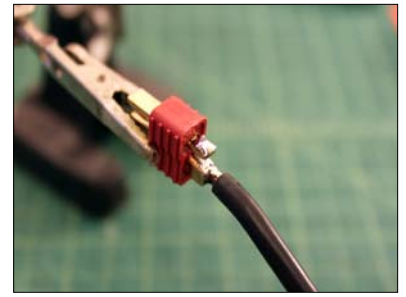
After applying liberal amounts of glue, spread the fuselage sides with your fingers. Try to full spread it and make all parts fully contact with the wing and fuselage sides.





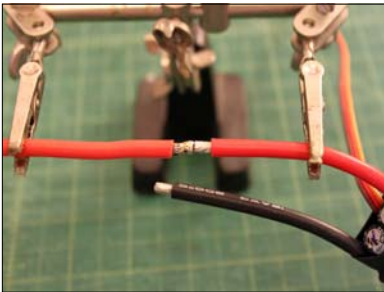
Prepare the Motor, 85 Amp ESC, and 12 AWG battery extension wires and connector of choice.

Place your shrink tube in the wire before soldering the connector. Pre tin the connector for easier soldering.



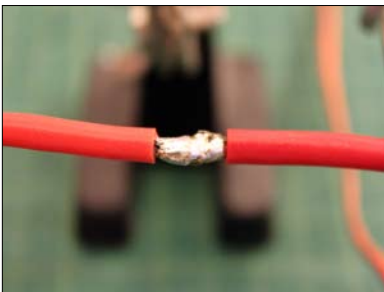
The wires should be about 3" to 3.5"
Pre tin the tips.

Apply your shrink tube over the soldered tabs on the connector.



Use a soldering jig to hold the wires butt to butt.

Prepare the wires of the motor. Cut the thin tips of to where the wires are 2 wires thick. Scrap off a little more of the coating below to were the bright copper wire shows up.



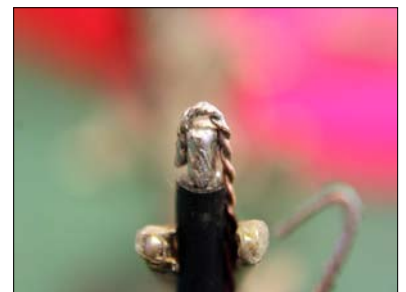
Solder them together. Make sure your soldering is of good quality and that your solder joint is not a cold connection. Use a hot iron.

Bend the motor wires into little hooks to wrap over the ESC wires.



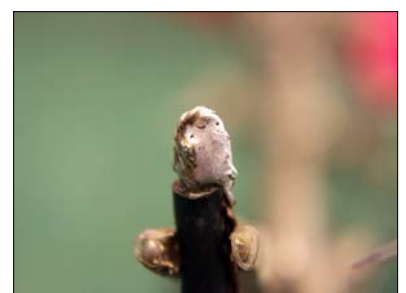
Solder both positive and negative leads.

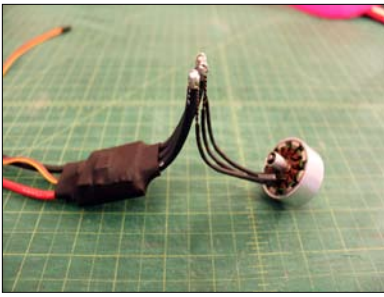
A close up shows why you needed to scrape away some more wire. Which is to allow more contact area to be made when soldering the wires together.



Apply Shrink tubing to the soldered joint

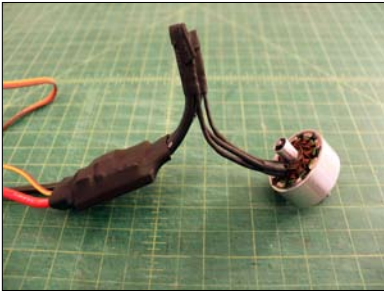
Cover the whole end with solder. Make sure you get a GOOD solder joint





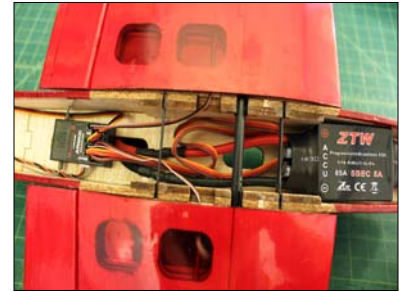
Complete all three wires. At this point you can test the direction and re-solder it if you want. OR simply use the programming feature of the ZTW ESC to reverse the spinning direction

You should be able to close the top without pressing down.



Wrap up the ends with Shrink tubing.

Install your Rx right behind the slot where the power wires with connector on it will reach into the lower battery compartment.



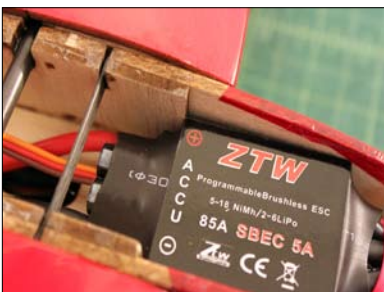
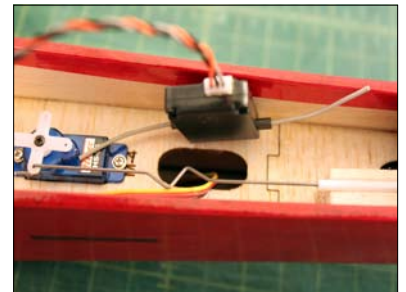
Use a Zip tie to wrap the wires directly underneath itself.

Apply some hot glue to the Rx to hold it in position. A nice big glob on the back side should do the trick.



As you can see it is a tight fit but it will all go in there fine as is. It just needs a little bending and twisting.

If you use a satellite Rx then the hole right behind the elevator servo is a great spot for it.



The 85Amp will sit perfectly right up inside the front nose upper compartment.

You may need to widen the hole to accommodate the satellite Rx.

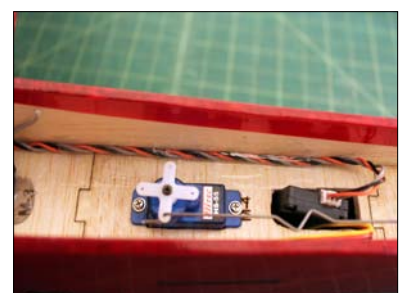


You may need to sand down the Naca duct a bit to allow for clearance.

It tucks in nicely.

You can also apply scotch tape to the wire for a clean install.

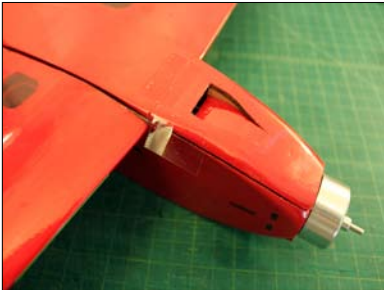
This may also help the satellite Rx stay in place.





The center top hatch will be simply scotch taped in place.

Tape the center piece to the front piece as well.



Then tape the front piece carefully to the fuselage with short sections at a time to prevent unsightly wrinkles.



Use the hard back end of a tool like tweezers to press the scotch tape down and it will apply cleaner than using your finger. It also applies bubble free if you do it right.



Shown here it was applied with 3 short pieces to reduce wrinkling. This being the 3rd final piece of tape.

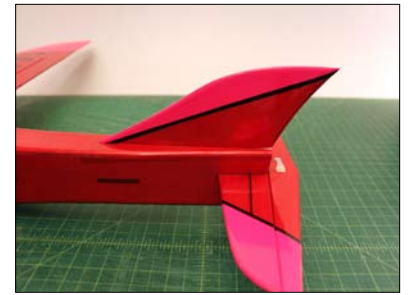


You can hardly see the tape if done carefully.

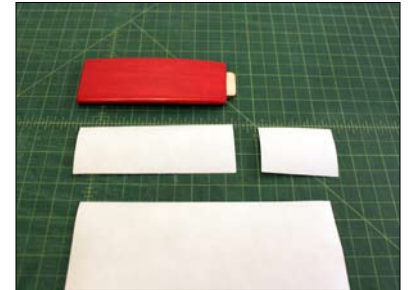


Check one final time to ensure everything is in place nice and square.

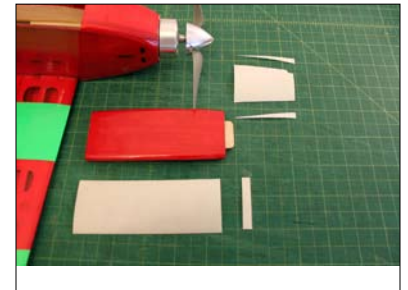
Now is a good time to go ahead and glue in the rudder in place.



Optional: Use Team Associated Chassis Protective Sheets to make a skid plate which will allow you to safely land on the dirt, concrete, or asphalt runway at your flying field.



Trim the material to fit over your battery hatch as well as the front bottom nose area. Make a small strip also for the tail and 2 small triangle strips to cover the wing tips



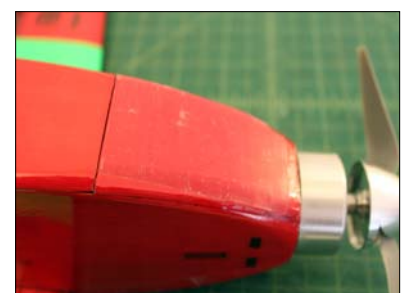
Cover the front bottom of the nose. Line it up carefully and lightly lay it on.

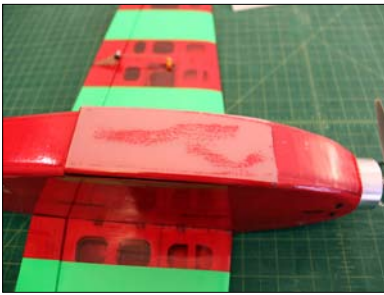


Use a hard plastic item like the scotch tape to press down the adhesive firmly to the fuselage. Using a tool will allow a bubble free adhesion.

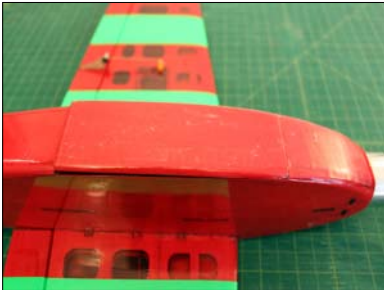


Looks nice and blends in well.





Line up the battery hatch sheet.



Pressed down nice it almost disappears.



Cover the tip of the tail



Again press it down.

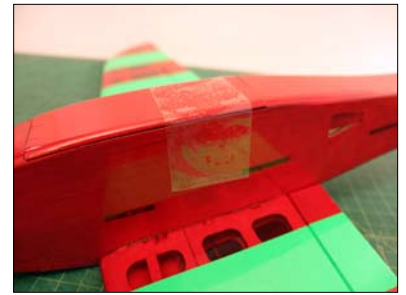


The wing tips will require you to bend the triangle strip to form around the tips

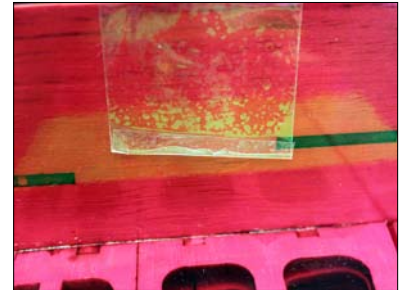


Press it down well and it will hold.

To hold the battery hatch down use a piece of packing tape. For each and every flight use a new piece of tape.



Folding over a little tab on the tape will allow easy removal after your flight. When removing the tape pull it off 180 degrees by pulling up, not out. This will help keep the covering material on better and not pull off the wood.



Put your balanced prop and spinner on the motor and your done.

Congratulations you are finally finished!!



IT IS VERY IMPORTANT TO PROPERLY SET UP YOUR CONTROL SETTINGS AND THROWS. PLEASE READ ALL THE INFORMATION ON THE PAGE BELOW.

PLEASE FOLLOW THE RECOMMENDED CONTROL THROW SET UP. VERY IMPORTANT!!!

Center of Gravity: 1 7/8" - 1 13/16" from the leading edge at the wing root.

PLEASE ENSURE ABSOLUTELY THAT YOUR PLANE IS NOT TAIL HEAVY. START AT 1 7/8" FOR FIRST FLIGHTS AND ADJUST IF DESIRED AFTER COMPLETING SUCCESSFUL FLIGHTS.

Aileron Throw:

Up and Down = 1/4" ~ 5/16"

Dual Rates for 50% low, 60% high

Expo is at your preference 0% to 30%

Elevator Throw:

Up and Down = 5/32" ~ 3/16"

Dual Rates 50% low, 60% high

Expo is highly recommended at 50% to 60%

OUR RECOMMENDED SET UP:

Very Fast 3S:

Motor: MicroDAN 2510 Speed 2700 kv Motor

ESC: ZTW 60 Amp

Battery: 1900mAh - 2200 11.1v 45C

Prop: APC 6x4 or 5.25x6.25

30mm Diameter Spinner

Extremely Fast 4S:

Motor: MicroDAN 2510 Speed 2700 kv Motor

ESC: ZTW 85 Amp

Battery: 1900mAh - 2200 14.8v 45C

Prop: APC 5x5 or 5.5x4.5

30mm Diameter Spinner

Warning! This aircraft is for experienced pilots only. This is not a PARKFLYER. Although it weighs under 2LBS, its speed can exceed 60mph. Therefore, it does not qualify as a "Parkflyer" as per AMA rules and regulations. It should be flown only in fields specifically reserved for RC aircraft which have been approved by the AMA. It is highly recommended that you join the AMA if you are not already a member. If built or flown incorrectly, this plane can cause damage property or injury to people. User assumes all responsibility and risk.