

J&H Aerospace/Geode Apogee Evo 48" Build Guide

Welcome to the Apogee Evo 48 build guide. This fantastic little airplane can be launched in 3 ways, will climb on absurdly light lift, and flies in pretty tight fields without a sweat. This model can be built in a few days due to the self-jigging construction, which takes out the tricky stuff typically required of a balsa airplane.

To build this model, you'll need the following:

Thin CA

Medium/Thick CA

Xacto Knife/Razor Blade

A sanding block. I use 80 grit on one side, and 240 on the other

A razor plane (Optional)

Covering iron

Pliers

Wire cutters/Dremel with cutoff wheel

To begin with, check the included materials list that came with the kit, and assure that everything listed is included.

Begin by laying out the plans on an appropriate build surface and covering them with was paper or equivalent nonstick surface.



Lay out the wing root ribs R1 and 1. These will be doubled up to provide dihedral inclination of the wing joiner and the wing spar.



The R1 ribs are laminated together, preferably angle stacked at 10 degrees to minimize sanding to get the correct dihedral interface between the wing halves. The 1 ribs can be laminated parallel. Note that the backs of the ribs need to be lined up to provide the proper sweep angle for the wing spar (line up over the plans to validate correct alignment).



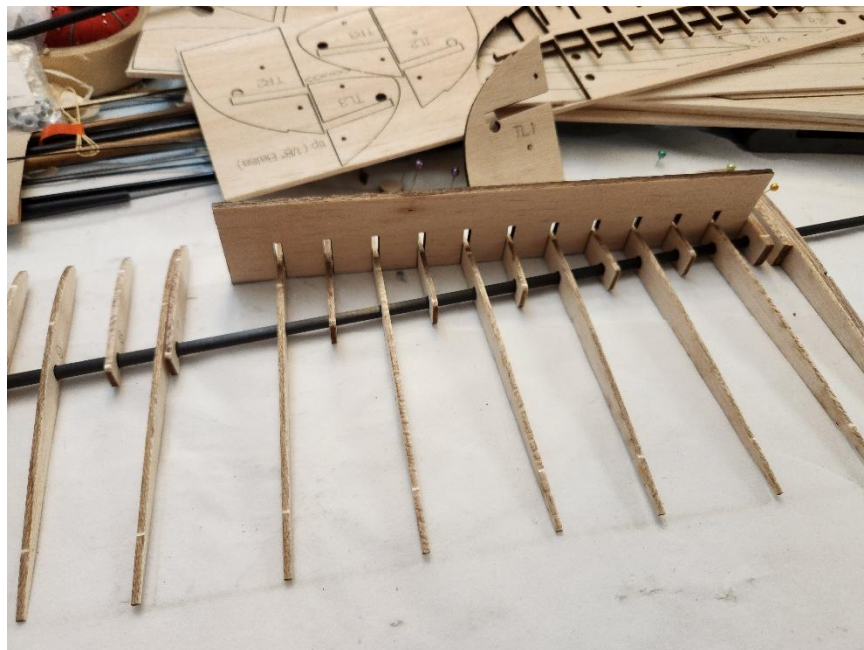
The tip ribs are also laminated together.



Thread all the ribs onto a spar.



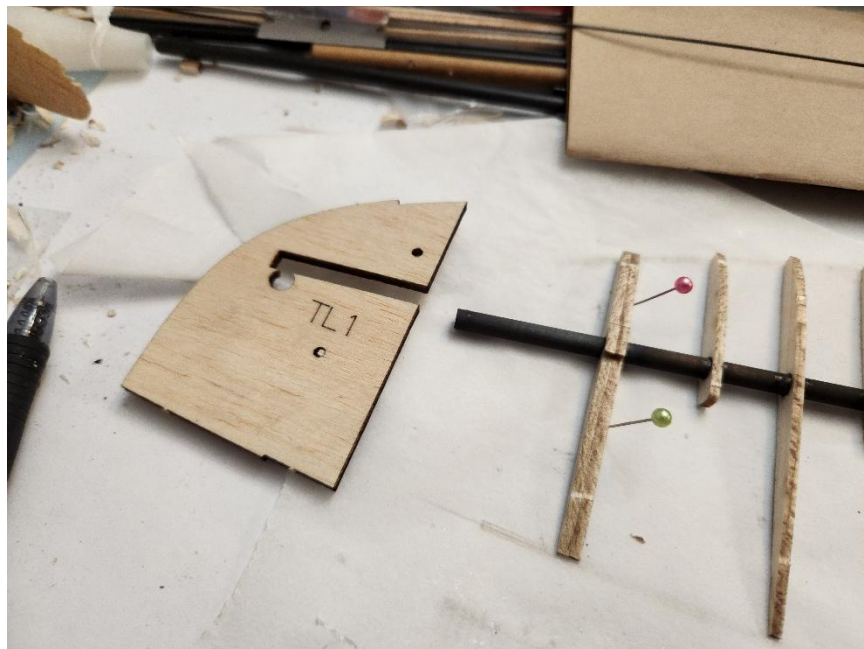
And spread the spar and ribs out onto the plans at proper spacing. Pin the root and tip ribs in place. Make sure the end of the wing spar is properly aligned with the wingtip slot (check with one of the wingtip pieces to verify). Leave excess spar length at the wing root to be trimmed later.



A rib line-up jig is supplied to provide perfect alignment as you work your way from root to tip. The ribs can be attached to the spar with thin CA.



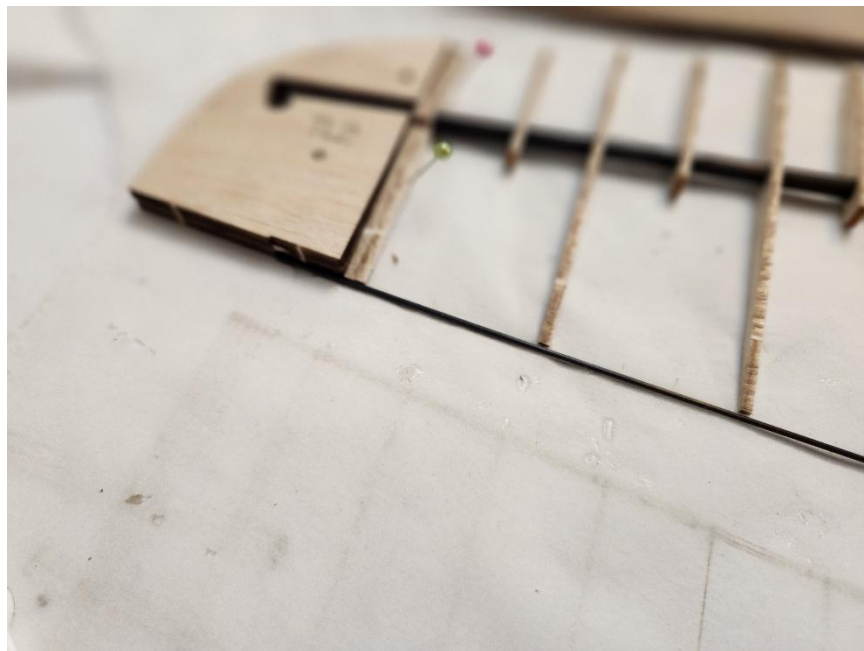
Once all the ribs are in place and bonded to the spar, it is time to attach the wingtip.





Laminate T_1-3 onto the end of the wing as shown.





Starting at the wingtip, glue the carbon rod trailing edge onto the tip and then the ribs using medium CA.



Next, install the wing leading edge in the same manner, making sure the rib slots are cleaned out first so that it notches in correctly. The tip ribs may need some cutting and sanding to properly accept the leading edge.



Build the second wing in place in the same manner as the first. Note the excess wing spar length sticking out at the wing roots.



Use a Dremel cut off wheel to trim the spars to length.



Use some of the excess to make a wing joiner. This wing joiner should be about $\frac{1}{4}$ " overlength for ease of install.



Test fit the wing panels together.



Sand the root ribs as needed to achieve a perfect fit. Don't glue the halves together yet; they should be sanded first.



Use a quality block plane to begin shaping the wingtips. Note that the spar is too thick for the final shape and will limit your progress.



Use coarse sandpaper to shape the wingtip, sanding the top of the wingspar down as needed to achieve the correct profile. Use fine sandpaper to smooth out the tip.



Install the wingtip plating across the wingtip, aligned with the throwing peg hole (make sure you're doing this on the correct wingtip). This plating goes on the top and bottom.



Profile the wing plating into the wingtip.

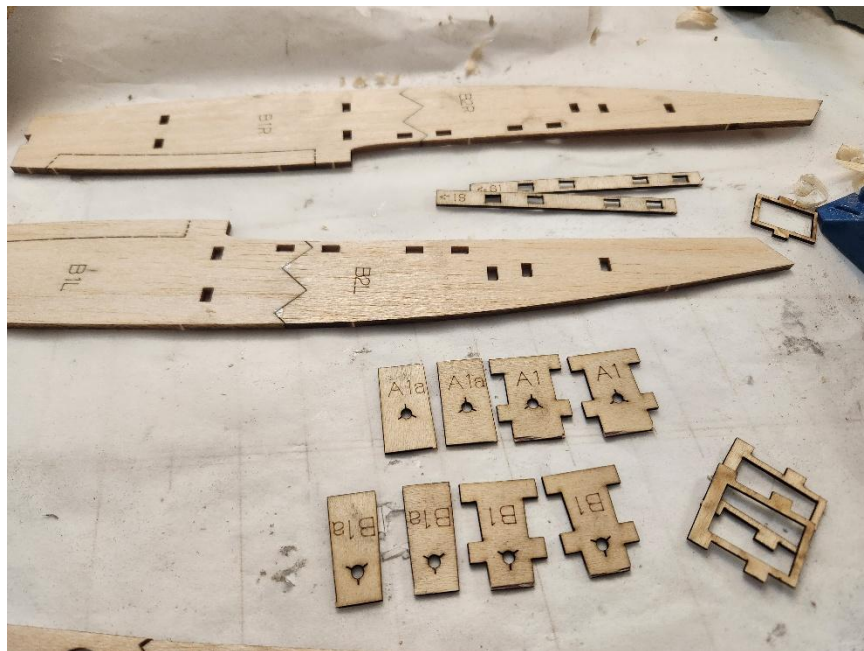




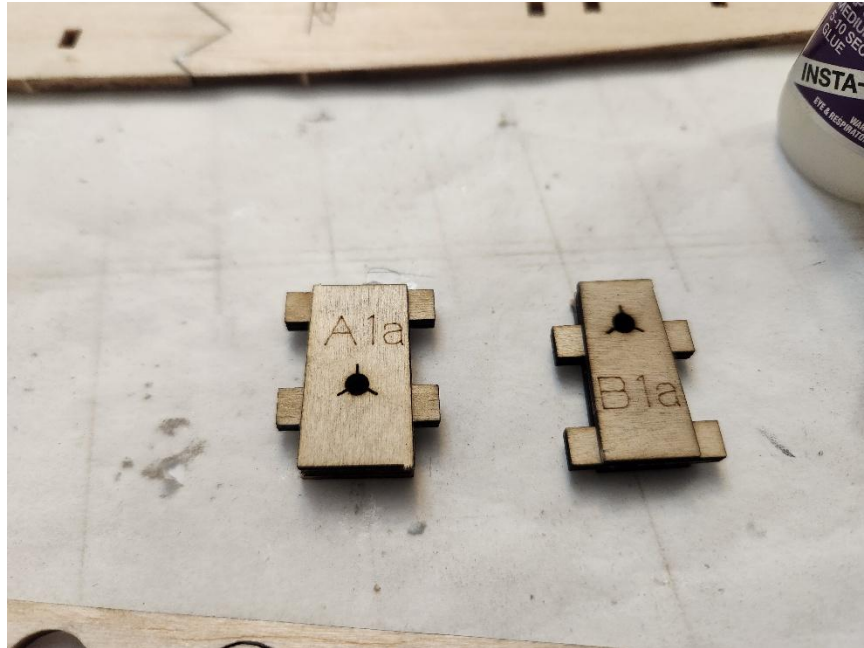
After the wing is fully sanded, glue the wing joiner into one of the wings.



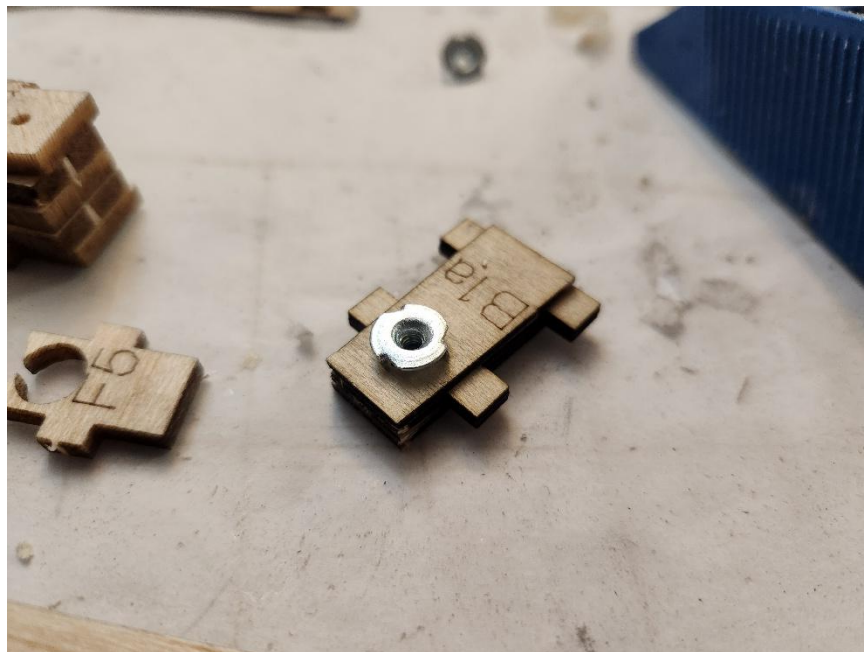
Bond the wings together, making sure the joiner is bonded to both wings.



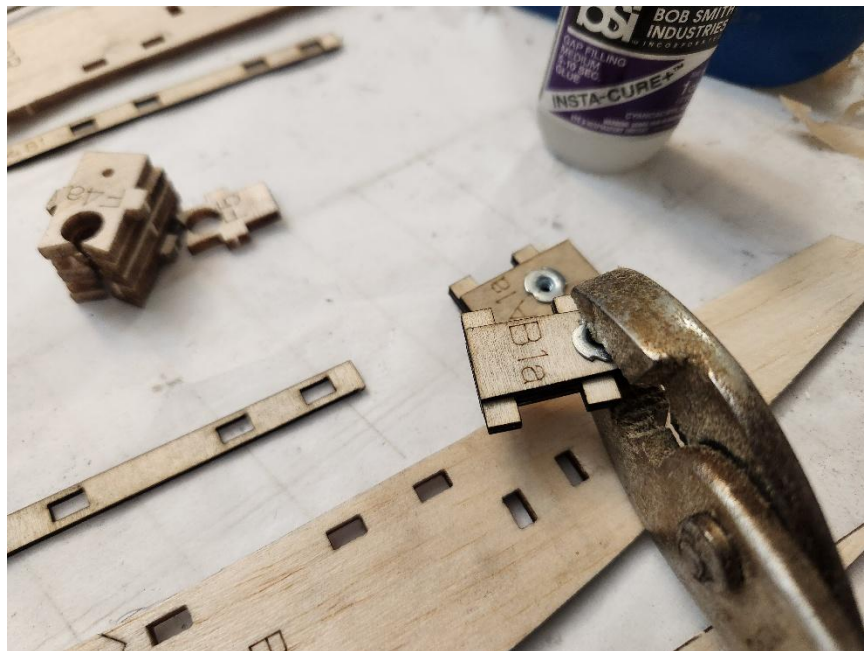
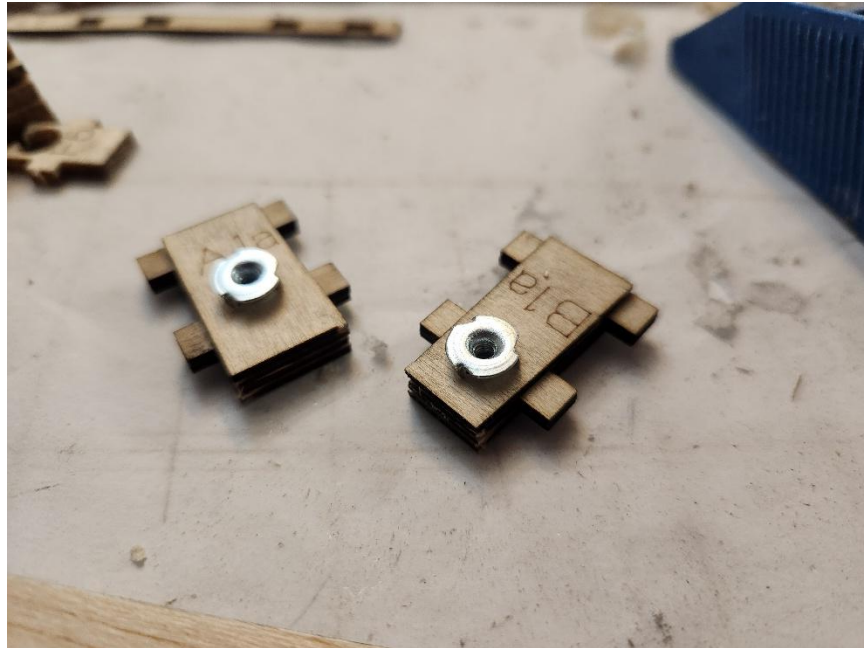
Assemble the fuselage sides and get out the A1 and B1 wing mount plate parts



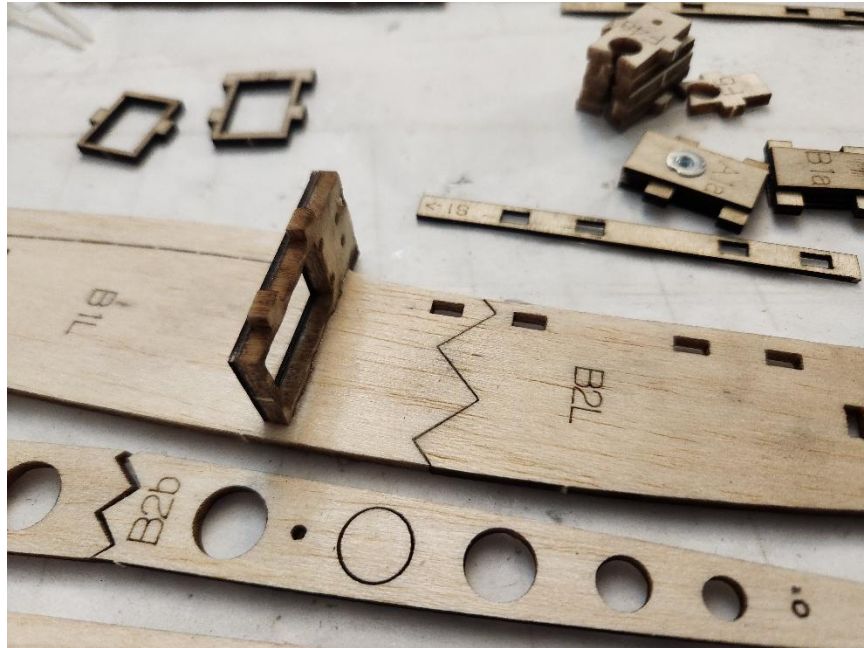
The A1 plates are glued together, then the A1a plates top and bottom. The same is true of the B parts



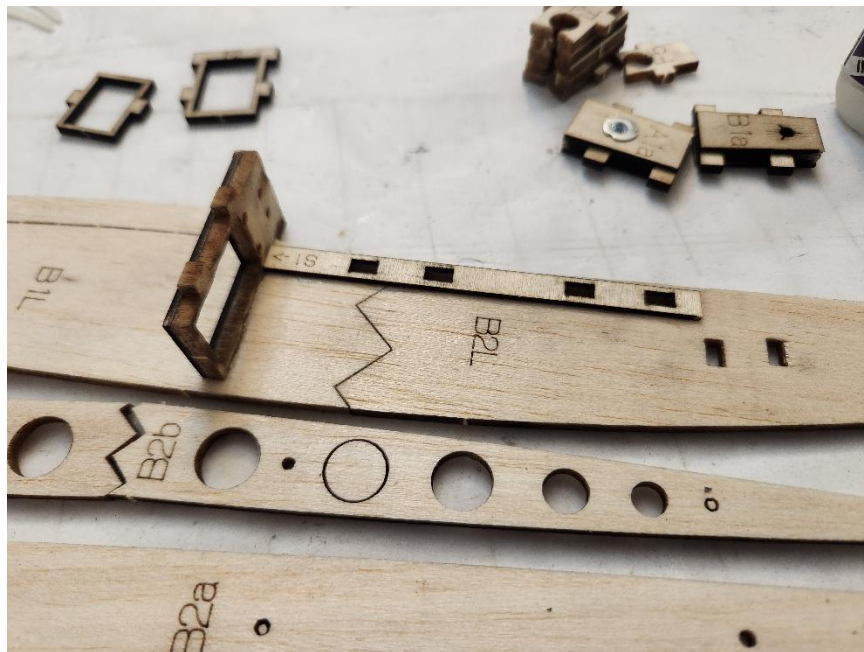
Add glue to the 4-40 blind nuts...



And punch them in place with pliers.



Laminate the F3 plywood and balsa parts together and install them on a fuselage side with the plywood facing forward.



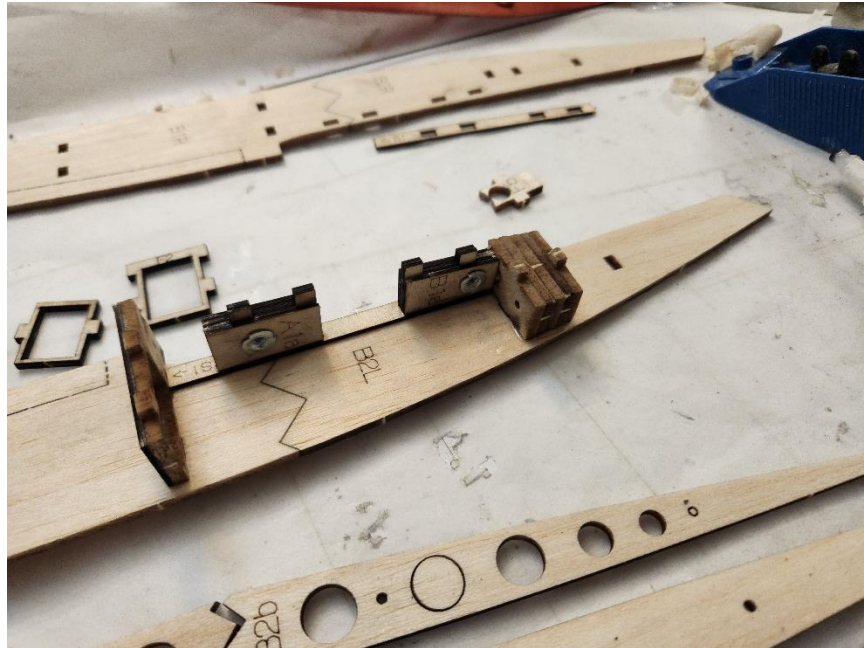
Laminate the wing mount reinforcement strips onto the inside of face of the fuselage side, carefully aligning the slots.



Now install the wing mounts; Locate the F4 parts...



And assemble them in order, keeping the tailboom hole lined up for all of the layers.



Install in the fuselage side.



Install F5.



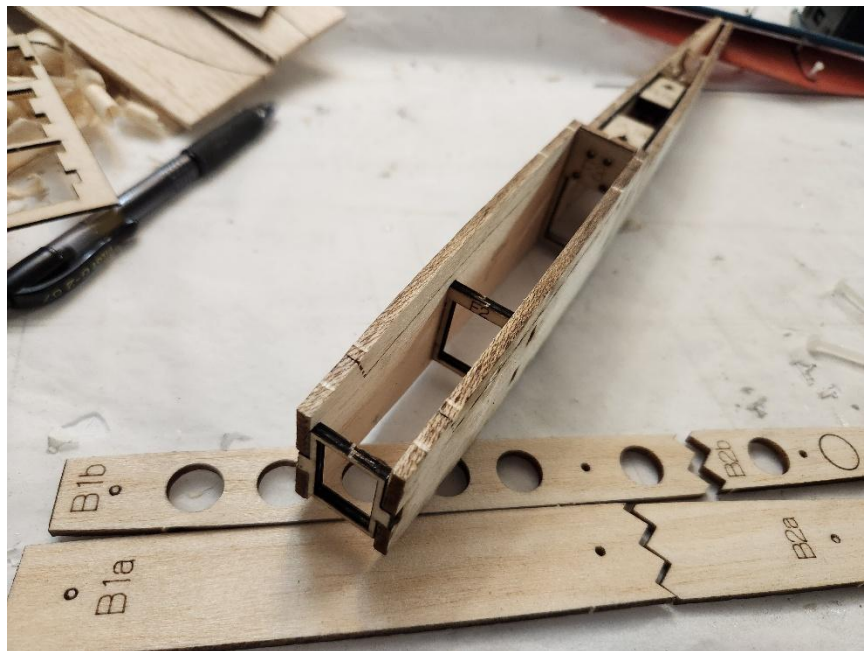
Laminate the plywood layers for F1 and F2 and install. F1 is not labelled; it does have a top and a bottom!

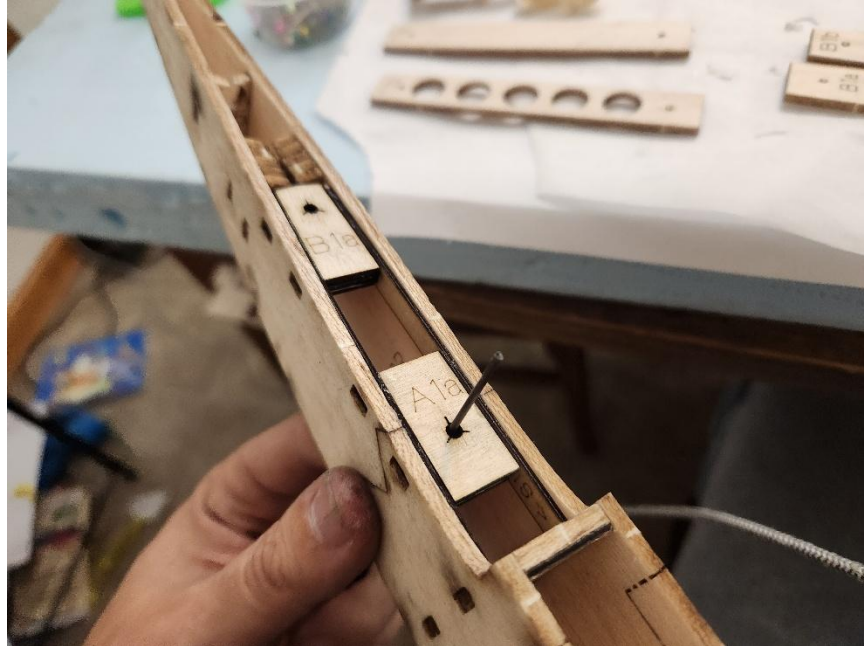


Install the wing mount reinforcement plate in the other fuselage side (remember the fuselage sides must mirror each other!)



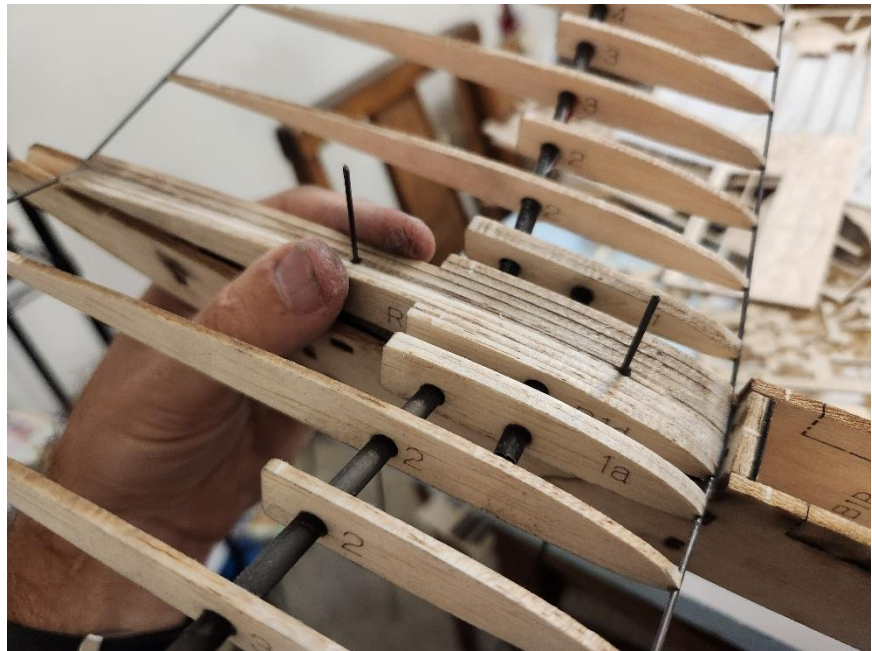
Join the second fuselage side in place; thin CA is definitely the preferred adhesive for this task.

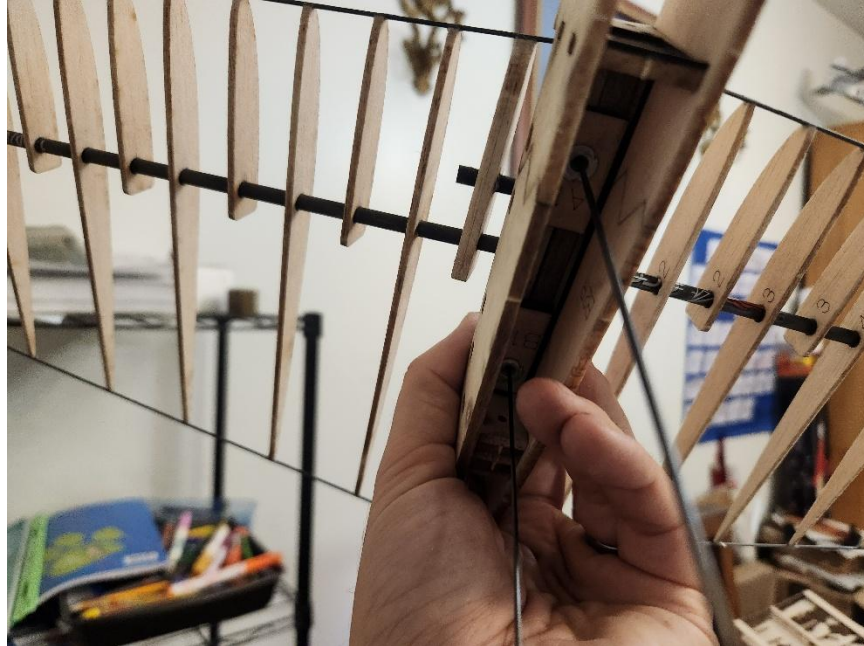




Use carbon or steel rods or small drill bits to punch into the bottom of the wing to establish the wing mounting holes in the wing.







Drill these holes out to 1/8" diameter.



Laminate the fuselage top layers together.



And glue in place. There will be some excess exposed. This will be taken care of later.



Slide the small end of the tailboom into the fuselage.



And wrap sandpaper around it. Rotate as needed to sand away and relieve the fuselage sides to accommodate the fat end of the tailboom.



Insert the fat end of the tailboom into the fuselage. Leave a 1/8" gap between the front of the boom and the back of the B1 wing mount.



Glue the bottom inner layer to the fuselage.



Laminate the fuselage bottom outer layer in place.



Laminate the nose inner layers together.





And then add the outer layers.

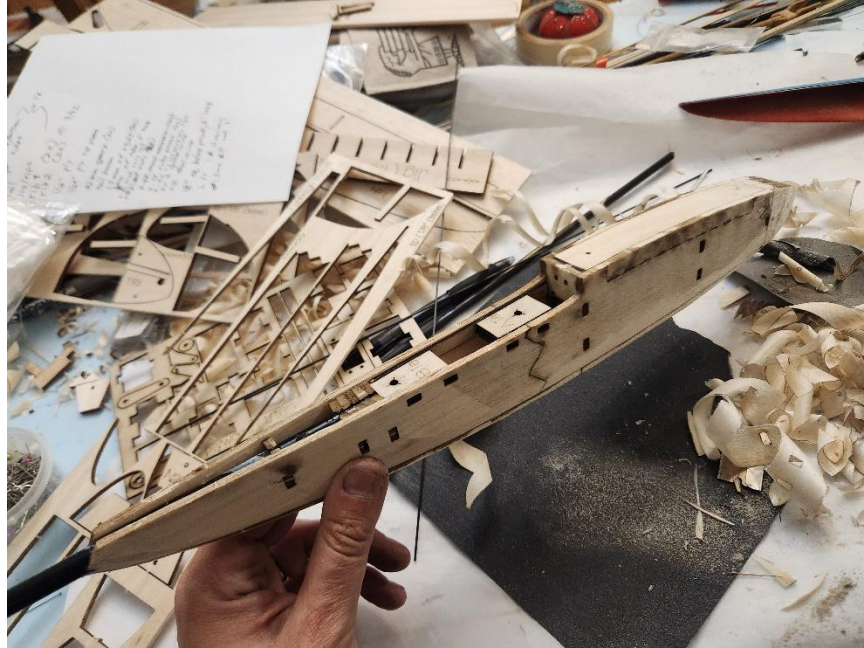




Sand the back of the nose block and the front of the fuselage.



Glue the nose block in place.



Add the filler block to the top of the fuselage over the tailboom. Plane and sand the fuselage as needed to get a pleasing, rounded shape. The top and bottom are $\frac{1}{4}$ " thick, so you can do considerable rounding and profiling without compromising the structure.



At the wing bolt reinforcement places to the top of the wing. The further you can recess these into the wing center, the better, as they do interfere with covering the wing.



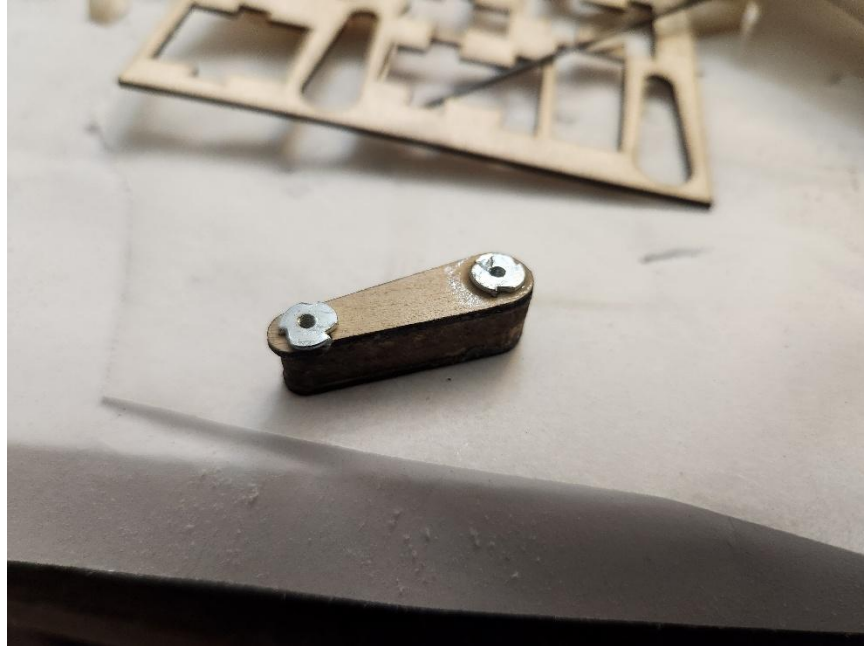
The tail pylon has 5 layers as shown. The top and second to the bottom layers are 1/16" plywood, and the bottom layer is parallel grain balsa.



Assemble all of the pylon except for the bottom layer.



Press the 2-56 blind nuts into the bottom plywood layer.



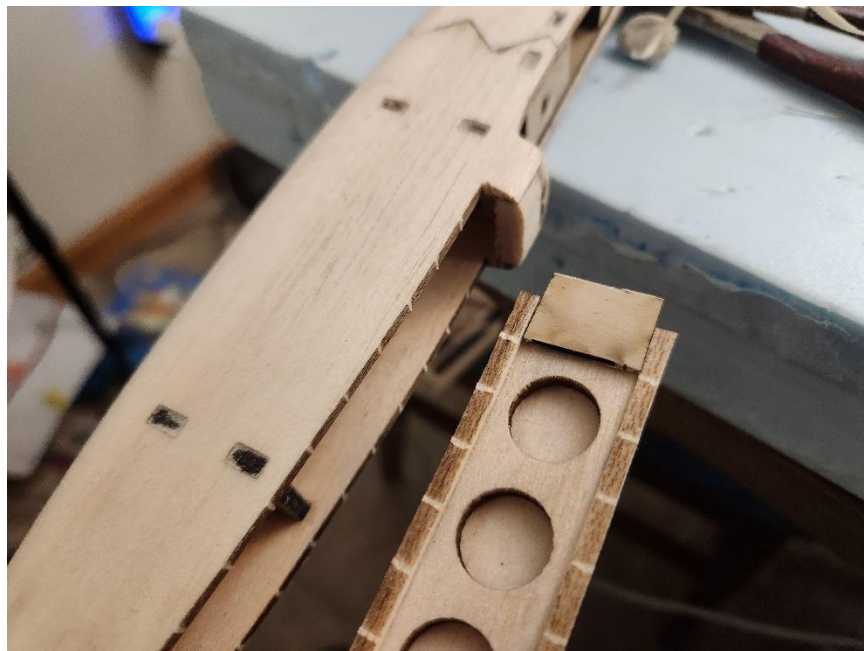
Relieve the bottom layer as needed to mate against the blind nuts. Be careful to avoid getting glue into the threads of the nuts during assembly.



Wrap sandpaper around the tailboom and use it to profile the bottom layer of the pylon so that it will mate correctly to the tailboom.



Cut the canopy hatch loose. Take your time with this task.



Add a small piece of 1/16" plywood to the back of the canopy to form a hold down tongue.



Attach a length of carbon rod to the canopy, protruding about $\frac{1}{4}$ " forward. Before gluing, press this rod into the canopy so it forms a groove and rests in it. Only glue the aft half of the rod.



Reinforce the rod with a piece of scrap $\frac{1}{8}$ " balsa. You can now install the canopy by snagging the rod on the front end of the canopy opening, sliding the canopy forward, and then dropping the back of it down so that the tongue can be slide into the fuselage, dropping the canopy in place. This will take some practice, but it makes for a strong, streamlined, reliable canopy attachment.



Cut two pieces of 1/8" sq balsa a little longer than the servo tray chosen for your servos.



Glue them in place on the bottom of the servo tray so they are flush with the edges.



Profile the tail surfaces to a good airfoil and bevel their hinge faces to accommodate 60 degrees closure travel. They should only be beveled on one side because the hinges are surface mounted, not centerline. **For right handed throwers, the hinge will be on the left side of the fin! The horizontal tail hinge will be on the top of the horizontal tail.**



Glue the horizontal tail bolt reinforcement plate in place.



Varnish the tail surfaces with one very thin coat of **oil based** varnish. Do not use water based varnish or dope because those materials will not prevent your tails from warping!



Let the tail surfaces dry, then give them a **light coat** of paint of the desired color. Do not attempt an opaque paint layer as this will add too much weight!



Cut some $\frac{3}{4}$ "-1" wide strips of doculam for use as tail hinges. You will be double hinging the tails for extra strength.



Iron a doculam hinge strip to the top of the horizontal tail.



Make sure it is fully bonded.



Fold the elevator all the way around onto the top of the stab.



Iron another hinge strip into the hinge line as shown; Then iron it down onto the rest of the stab and elevator. In the hinge line, the two layers should be in contact and bonded to each other.



Trim away excess film in the control horn slots



The elevator control horn has a slot in it so that it can be disconnected. Glue this horn in place.



Repeat the above steps for the vertical tail. If you are right handed, the surface hinge will be on the left side and the control horn on the right side.



Weigh down the fuselage on its left side (for right handed fliers) and stage the fin in place. The part that inserts into the boom may need some profiling.



Glue the fin permanently into place.



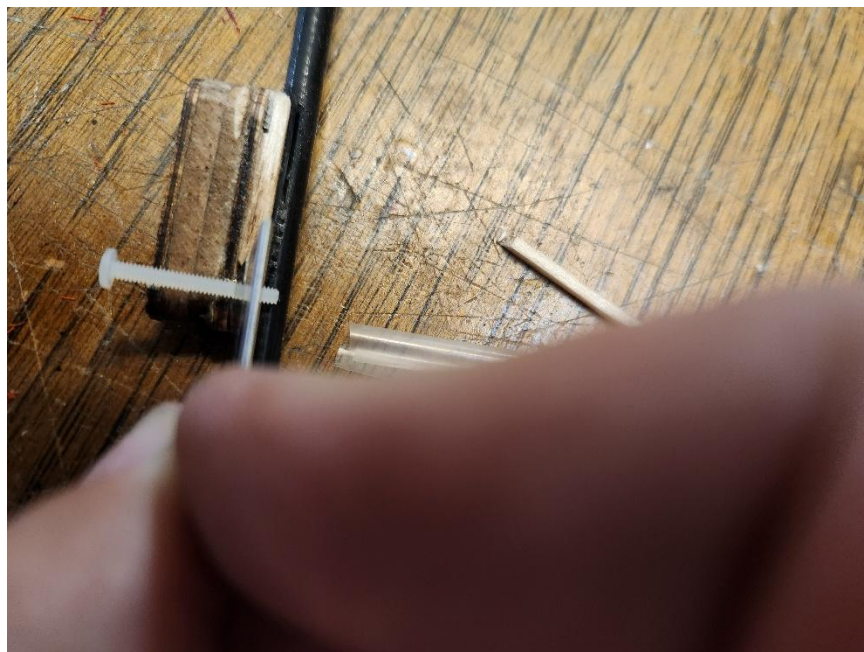
Prop the fuselage onto a flat surface against the wing mount rails. Stage the stab in place to help locate the correct position for the pylon. Once you have located the correct position, glue the pylon in place, being careful to avoid getting glue into the blind nuts.



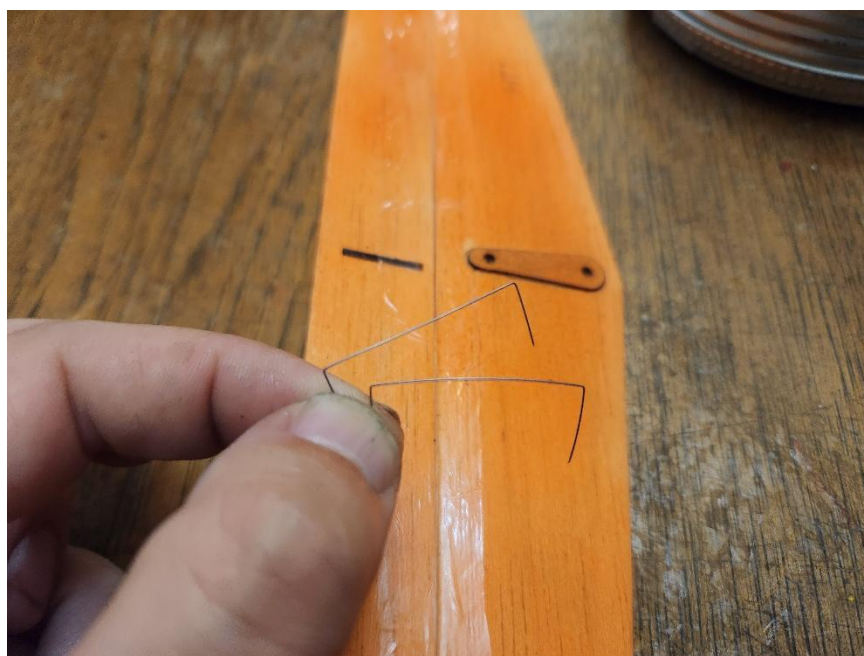
Cut a slot about $\frac{3}{4}$ " long in the side of the tailboom at the back on the same side as the control horn so that the pull string will clear better.



The right side of the tailboom needs to be slotted toward the front of the pylon to accommodate the elevator pull string.



Use the pylon as a gauge to cut the 2-56 elevator mount screws to size. Remember that the stab in the mount area is about $\frac{3}{16}$ " thick.



Bend a pair of control surface return springs from the supplied wire. The main straight sections should be about 2" long, and the insert sections about $\frac{1}{2}$ " long.



Fold the elevator/stab in half and carefully insert a spring into the stab on one side and the elevator on the other.



This spring need only be friction fit in place provided it is fully inside and doesn't protrude through the surface (Sometimes this takes a few tries).



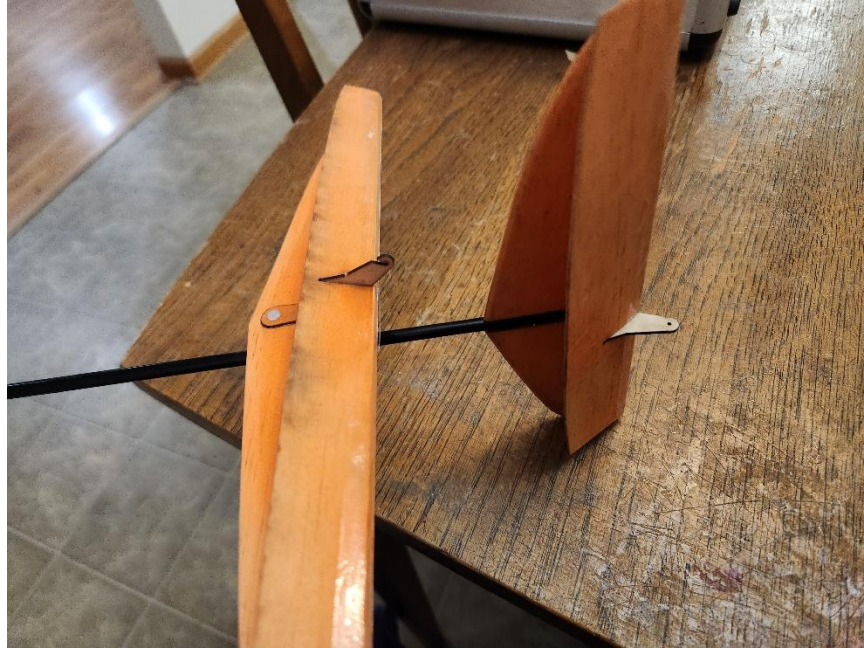
The elevator will now tend to flop onto the top of the stab.



Bolt the stab in place.

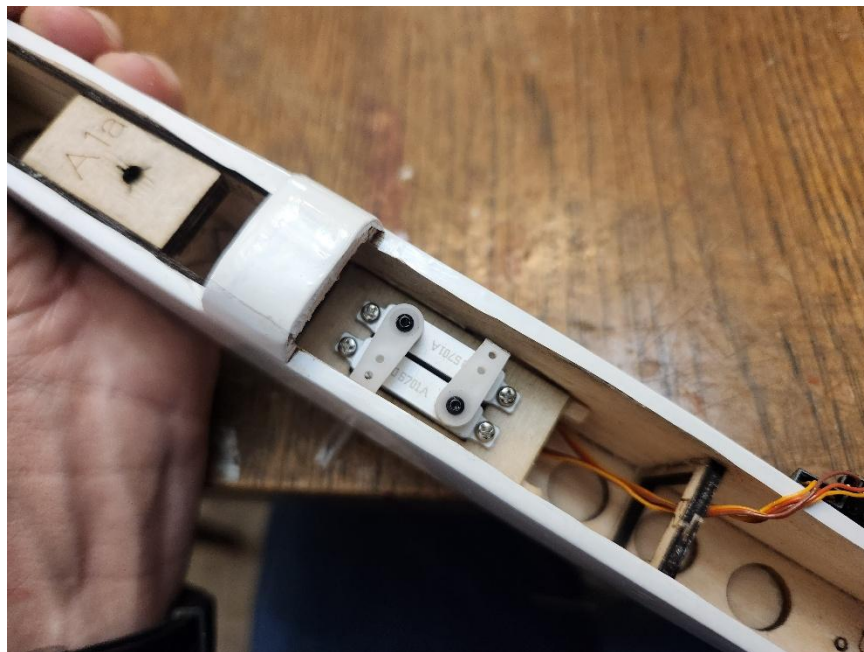


Repeat these steps for the fin/rudder.



Oh look! Your tails automatically fold up!

Before proceeding, cover your fuselage with doculam, Monokote, or Neucover. The latter is our preference as it is extremely resilient and easy to use.



Install your servo tray at the back of the main fuselage compartment such that they are as far back as possible while still being accessible and are low enough to fully clear the canopy. Make sure the servos are centered and that the horns are just under the limit permitted by the fuselage. DLGs need lots of control surface travel! If your throws feel like those of a 3-D plane, you have what you need.



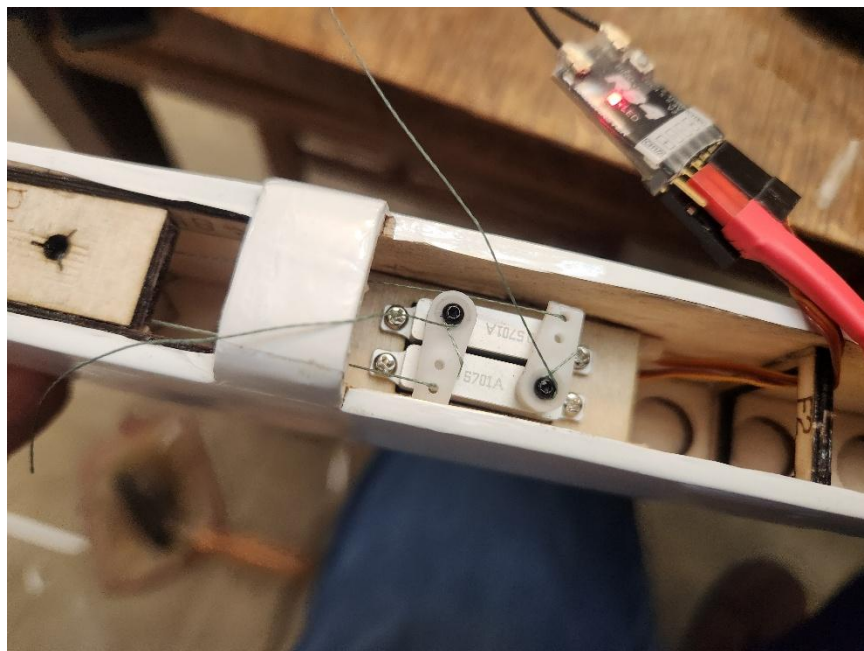
Measure off a length of spiderwire which will leave about 10" excess between when strung between the fin and rudder servo. Tie off the string in the rudder horn with a fishing knot.



This step takes some patience. Thread the line down the inside of the tailboom, into the fuselage, under the wing mounts, through the bulkhead holes, and to a servo.



Make up another piece of spiderwire and tie a 1" loop in the end. Glue the knot so it doesn't slip. Make a second 1" loop of spiderwire around the boom and into the end loop of the other line. This second loop prevents the elevator string from disappearing into the tailboom which the elevator is removed. Now, slot the end loop into the control horn and thread the line inside the tube like you did with the rudder string. Take your time. It can be done.



With the servos energized, thread the lines through the outermost servo horn holes and then around the mount screws, with the rudder and elevator centered. Tighten the screws down

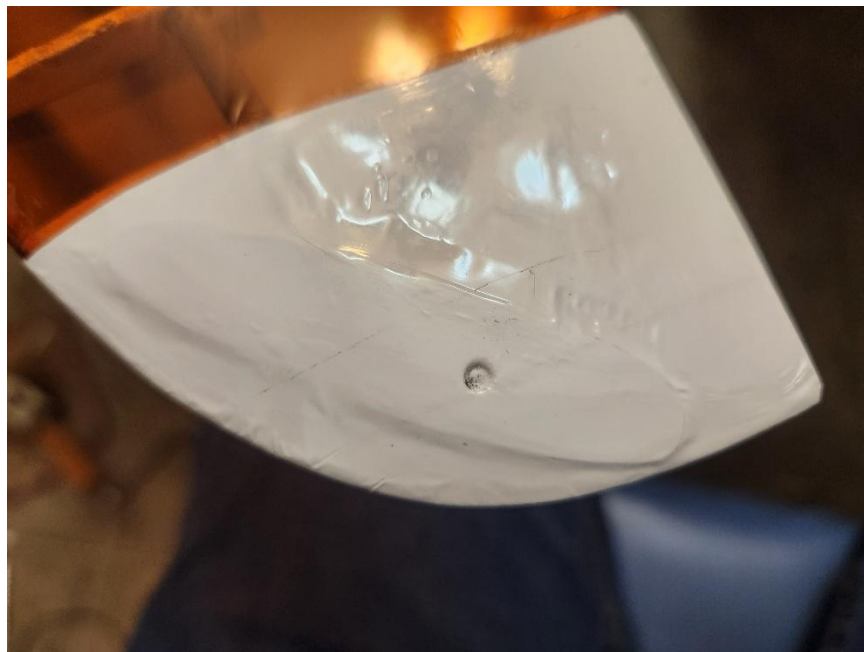
enough to lock the lines in place. We recommend wrapping the lines clockwise so that the screws will tighten the lines slightly rather than loosening them uncontrollably.



Cut the wing screws to length with the screws installed in the wing so that they have about $\frac{1}{2}$ " of working length.



Cover the wing with a stiff covering material. 1.4-1.6 mil Doculam works. Neucover and old style Monokote are better. Make sure the wings are washed out equally about 2 degrees.



Clean out the hole in the throwing side wingtip to receive the throwing peg.



Glue the peg in place.

You're done!!!!



Flying instructions:

Use a 450-650mah 1s lipo with no regulator, directly into the receiver. Use a low profile 4 channel receiver. Balance your model at 50% root chord to start. You can adjust as needed later. With the controls centered, the model should glide smoothly. Adjust the trim so that the model slowly pitches up into a vertical climb on a sidearm launch. Adjust the washout as needed to ensure the model tracks straight on launch.

We really hope you enjoy this fantastic airplane as much as we do!

If you have any questions or comments, please contact us through our contact form:
<http://jhaerospace.com/contact/>

