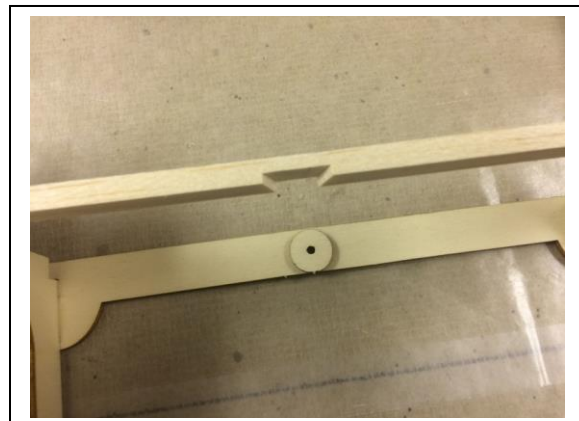
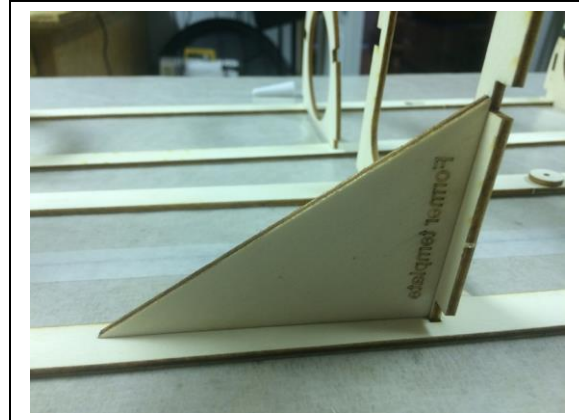
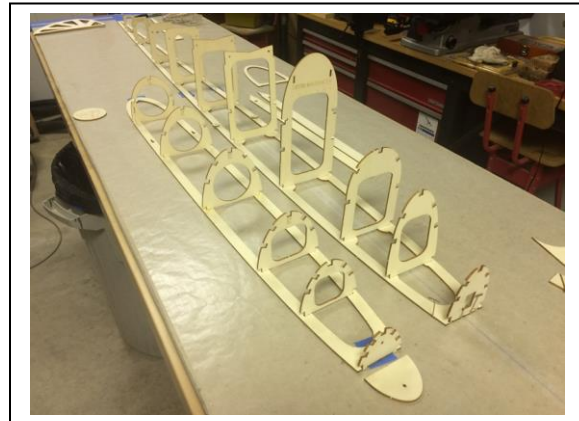


## Sapphire ~ Design and Kit by Peter Goldsmith

The Sapphire is almost entirely open structure and can be constructed with your favorite adhesive (our choice is Deluxe Materials Aliphatic Resin).

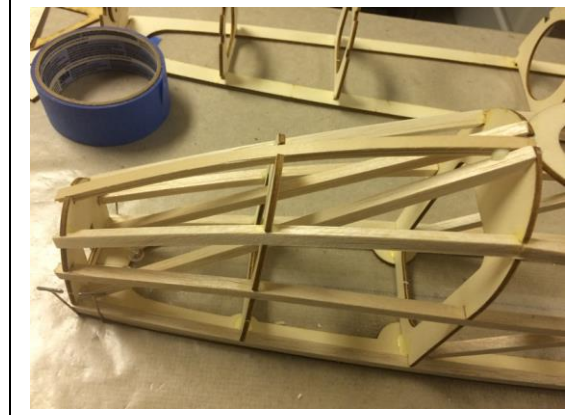
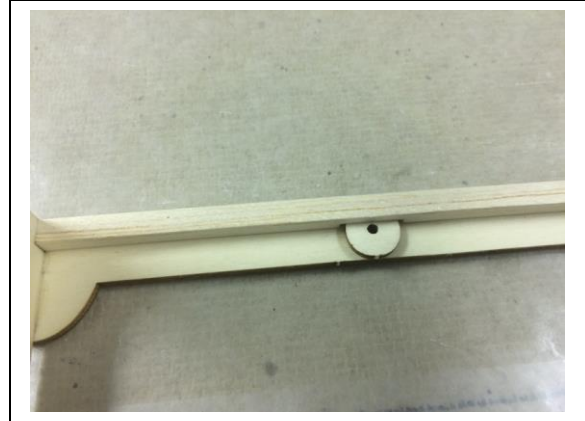
### Fuselage

- We started by separating the parts from their parts sheets. Sort out the fuselage, wing, stab/elevator, and fin/rudder parts.
- Locate the base plates for the top and bottom fuselage sections and pin them in place on a flat surface.
- Sort the formers and place them in order along their respective base plate locations. Note that the formers are not perpendicular to these base plates. Look at the plans and you will see that they angle slightly relative to the base plates. Use the included angle gauge to set the formers in place. The formers have tabs and the base plates have slots that these tabs fit into, so the placement is easy. Once all the formers are glued into place,  $\frac{1}{4}$ " balsa stick is added around the perimeter of the base plates and these  $\frac{1}{4}$ " sticks fit into the notches of the formers.
- The top and bottom fuselage sections are joined together using flat head screws that screw into the fuselage top half. A round piece of plywood acts as a reinforcement for these screw locations. The fuselage bottom fuselage half has slots that these screws fit into and the bottom fuselage half then slides forward over these screw heads and is thereby captured and held together. There is a metal pin glued into the front former of the fuselage bottom (note top picture) and this pin inserts into a hole on the back side of the fuselage nose block. For the  $\frac{1}{4}$ " balsa stick to fit over this reinforcing ring,



cut a notch in the ¼" stick to allow it to fit over the ring. Additional pieces of ¼" stick is added to the appropriate notches in the formers. Make certain that the angle of the formers is not changed as these pieces are added.

- Use weights to keep the base plates flat on the building board as the ¼" balsa stringers are added.
- Study the plan carefully to check where these ¼" balsa stringers start and stop. Add the canopy base frame. The canopy is made from a thin sheet of clear plastic material. There is a doubler for the canopy base that can be added, but Peter did not use it on his prototype.
- The top of the nose does not have a ¼" balsa stringer, but rather is made from three laminations of basswood. Glue these basswood strips in place one at a time to get a nice curved shape. The excess ends can be cut off with a razor saw once the glue has set. The center stringer of the bottom fuselage section also uses strips of basswood added a layer at a time.
- The internal diagonal ¼" square balsa braces can now be added. Study the plan for correct placement of these.



- Install the wing saddle parts, note the slot and tab that locks them into the former. Note the added diagonal braces.

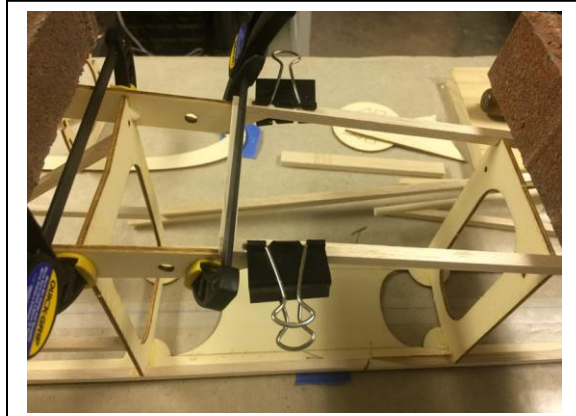


- A rubber band around the aft end of the wing saddle parts helps maintain correct position while glue cures.

- Paver bricks make great weights for holding things flat on the building board.



- The 1/4" balsa stringers can now be added to the top rear fuselage section. These fit into the notches in the aft end of the wing saddle parts. Binder clips make great clamps!



- Add the thick balsa filler blocks to the sides of the wing saddle pieces and carve them to the contour of the former. Using a razor plane makes this job easier.



- Glue the balsa nose blocks together and fill the voids in them with ballast weight. Glue them to the front fuselage former then carve and sand to final shape.



### Wings

- Glue the plywood wing joiners together with epoxy. Insert T-Pins in the small holes to align the parts and clamp until epoxy sets.
- Organize all the wing ribs, shear webs, leading and trailing edge parts and spars.
- Establish a straight reference line down your work bench and align the bottom spar against it. Draw a perpendicular reference line at one end for the root rib W1 to align with. Set W1 in place using the S1 parts to establish the dihedral angle. The S1 and S2 parts fit between the top and bottom spars and between the W1 & W2 ribs and the W2 & W3 ribs. There are two each of the S1 and S2 parts for each wing half. One each of the S1 & S2 shear webs sit flush with the rear of the spar edge and the other pair S1 & S2 sit flush with the front of the spars. You can use the wing joiner wrapped in wax paper to assist with setting this spacing. The point is to make a box that the spar joiner will slide into.
- Once this spar “box” is established at the wing root, progress out the spar adding the ribs and shear webs.



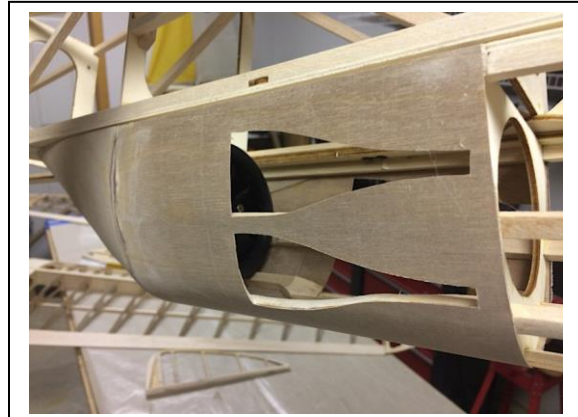
- With the ribs in place, fit the ¼" balsa rear spar and the bottom trailing edge sheeting in place. Make sure all of the ribs are perpendicular to the spar and then glue in place. Add the tip parts, the leading-edge dowel, top spar, top trailing edge sheeting and wing root sheeting. Repeat for the other wing half.



- Stab can be built over the plan as reference for rib spacing. Elevator halves are built on the bottom sheeting using the etch marks to locate ribs. Top sheeting is then added to complete. Elevator halves are joined by a basswood stick. Leading edge of elevator is beveled to make a bottom hinge line using covering material for the hinge.



- The EDF unit gets installed in the bottom rear section of the fuselage. 1/64" plywood is provided to make the exhaust tube. It is helpful if you wet the plywood, wrap it around a cylinder, and let it dry. you can then fit it around the EDF and into the former without fighting it. 1/16" balsa sheeting is included in the kit to cover the exterior fuselage and exhaust tube. Use the included paper template to cut out the rear cover for the exhaust tube and it will fit perfectly.



- We had some 1/64" plywood on hand and used it in place of the balsawood. Problem is the covering doesn't apply to it very well, so we painted the rear section.



- One of the stringers in the lower fuselage runs through the NACA inlet, so we added a balsa stick beside that stringer and cut out the opening fully.
- A 4-40 socket head bolt through the aft end of the lower fuselage section keeps it from sliding backward and off the pan head screw anchors. The socket head screw threads into a 4-40 T-nut is installed in the upper fuselage section. Add epoxy to keep the T-nut firmly in place.
- Initially, we located the Speed Control in the upper fuselage as per the plans. The three motor wires that connect between the Speed Control and the EDF motor cannot be easily disconnected, so the upper and lower fuselage sections cannot be separated by very much. The second issue we had was overheating of the Speed Control.
- The Speed Control was relocated into the lower fuselage section and the top side of the lower fuselage was covered over with UltraCote. The wire between the receiver and the Speed Control was cut and a connector installed. Now the upper and lower fuselage sections can be easily separated. In addition, cooling air inlets were cut in between the stringers at the front of the lower fuselage section. This allows cooling air to flow over the battery, ESC, and out through the EDF fan. Overheating issue resolved!



- The 3-cell 3,200 mAh LiPo flight battery attaches to the upper fuselage section and extends down into the lower section. The cross members of the formers need to be removed to make room for the battery.
- Flight battery is held in place by a strip of Velcro plus a Velcro security strap. Connect the flight battery, slide the lower fuselage section forward to lock in place and tighten 4-40 bolt. Ready to go fly!
- This model was built from the first kit produced after the prototype model was completed. Several revisions were made between the prototype and this model. Main change was the addition of another row of ¼" stringers in both the top and bottom fuselage sections.
- Model is covered with Transparent White and Yellow UltraCote with Orange and Purple accent stripes. Other items used:  
 FMS 64mm EDF (FM MDF004)  
 FMS 40-amp ESC (FM MPAC113)  
 Spektrum (2) A5060 servos (SPMSA5060)  
 E-flite 3-cell 11.1 volt LiPo Battery (EFLB32003S40)

All products are available through your local Hobby Shop or Horizon Hobby Dealer

Our model balances in the middle of the range shown on the plan and weighs 4 lbs. 10 oz. (including flight battery).

