

SOPWITH SWALLOW 40" 1/9 SCALE

R/C SCALE MODEL INSTRUCTIONS



Designed by M.K. Bengtson

Prototype by Bert Ayers

MANUFACTURED AND DISTRIBUTED BY:

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SOPWITH SWALLOW 40" 1/9TH SCALE

Thank you for buying the AerodromeRC Sopwith Swallow 40" laser cut short kit for electric flight. For additional information and photos go to AerodromeRC Forum – <http://www.aerodromerc.com/cgi-bin/yabb2/YaBB.pl?num=1359247658>.

THE MODEL

A scale adaptation of the Sopwith Swallow, this model is designed to be easy to build and exciting to fly.



MODEL SPECIFICATIONS MORE THAN 335 LASER CUT PARTS

Scale:	1/9th
Wing span:	40 inches
Wing area:	305 square inches
Length:	26 inches
Weight:	26 ounces (model pictured above – 27.9 ounces with 2.8 oz lead on firewall)
Power:	AXI 2808/20 (model pictured above – HURC 480 [Heads Up RC]), 40 amp ESC
Channels:	R/E/A/T
Airfoil:	Flat Bottom
Wheels:	Balsa and plywood with foam tires
Designer:	M. K. Bengtson
Prototype:	Bert Ayers

FEATURES

- One piece construction with scale fuselage and tail shapes
- Fuselage built from laser cut formers and stringers
- Front of fuselage is balsa box, the rear is built up with top stringers
- Laser cut parts for built up cowl
- Laser cut sheet of stringers – 1/8" x 1/16", 1/8" & 1/4"
- Dummy motor with electric motor mount included
- Dummy machine gun kit included
- Laser cut plywood landing gear in scale outline
- Scale number of ribs
- Laser cut 1/32" plywood trailing edges included
- Balsa and plywood wheel kit with Neoprene foam rubber tire included

BUILDING THE MODEL

VERTICAL STABILIZER/RUDDER

HORIZONTAL STABILIZER/ELEVATORS

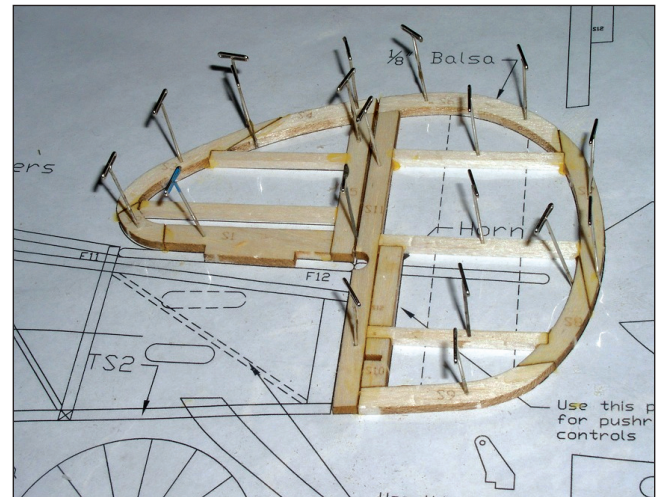
Items needed to complete these parts:

- 1/8" x 3" wood or carbon fiber dowel
- 6 hinges – your choice

Cover the plans with a clear plastic sheet. The bag the kit came in can be slit down the side and opened up to make a nice covering for the plans.

On the 1/8" balsa sheet of laser cut parts, find all the "S" parts. A sheet of 1/8" laser cut 1/8" wide strips (plus other widths) are provided in the kit. Use a glue of your choice – this builder used Titebond for most of the model. Pin down the "S" parts with 1/8" strips and glue together.

THE CONTROL HORN: either single for push rod or double for pull-pull cables are provided in the kit. The control horn can be left until after the covering is on, or glued in now.



The horizontal stabilizer and elevators are built in the same manner as the vertical stab/rudder. Find all the "H" and "E" parts in the 1/8" balsa laser cut sheet. Pin them down and glue. If you are using a push rod, you will need a 3" length of 1/8" wood or carbon fiber dowel to connect the elevators. If you are using pull-pull cables the dowel isn't necessary. This builder always connects the elevators when using pull-pull cables as it eliminates getting the pull-pull cables exact tension on both elevators.

Sand a half round radius on all outside edges of the tail surfaces.

BUILDING THE WING

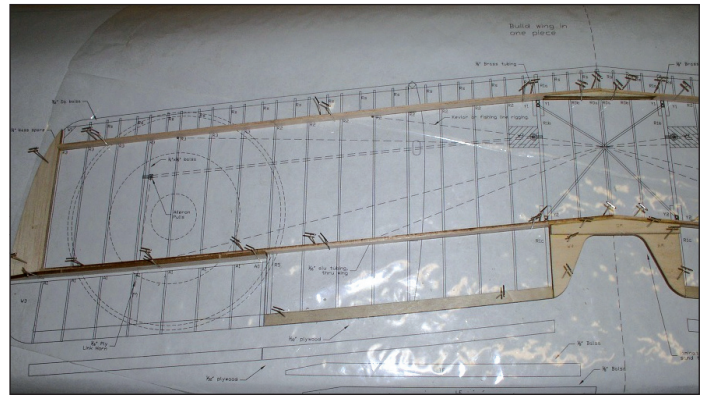
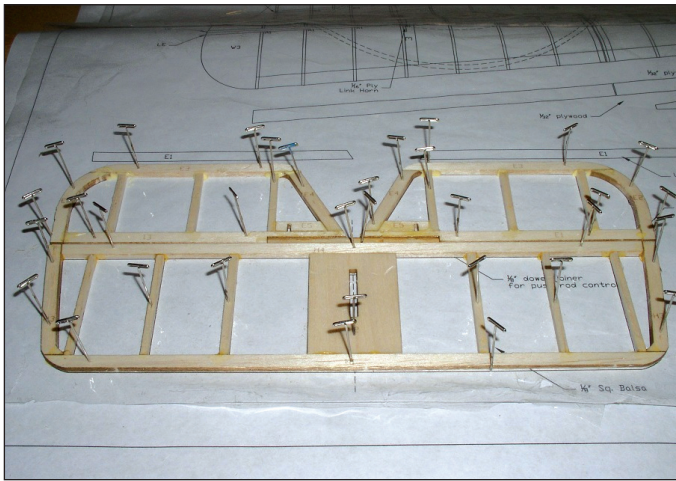
Items needed to complete the wing:

- 4 - 1/8"x1/4"x24" basswood spars
- 2 - 3/16" square hard balsa leading edges
- 1/8" and 3/32" brass tubing
- 1/16" aluminum tubing
- 6 – hinges of your choice

This wing is very easy to build as it has no dihedral. It is

built flat on the building board. If your building board is not long enough for the whole wing, build one side then let it hang over the board while you build the other side.

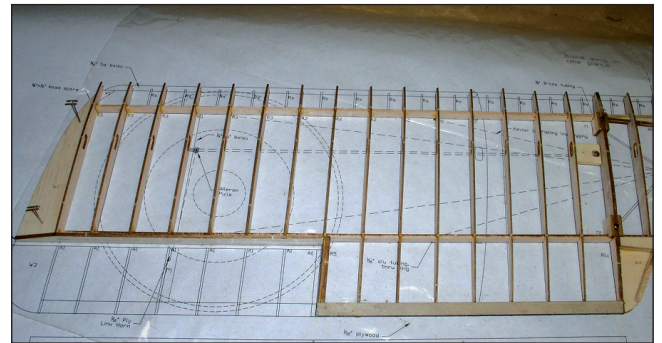
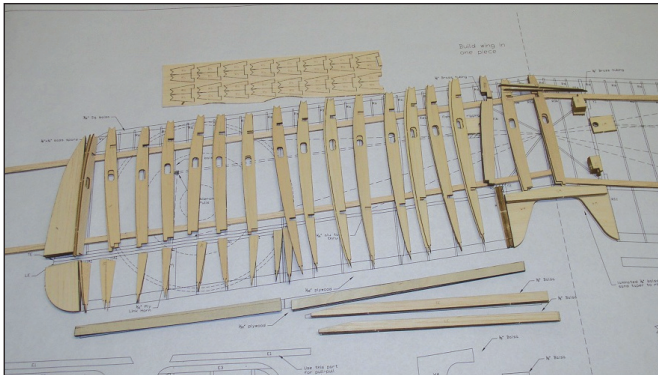
Study the plans, then find all the wing parts from the laser cut sheets and lay them out on the plans to find where everything goes.



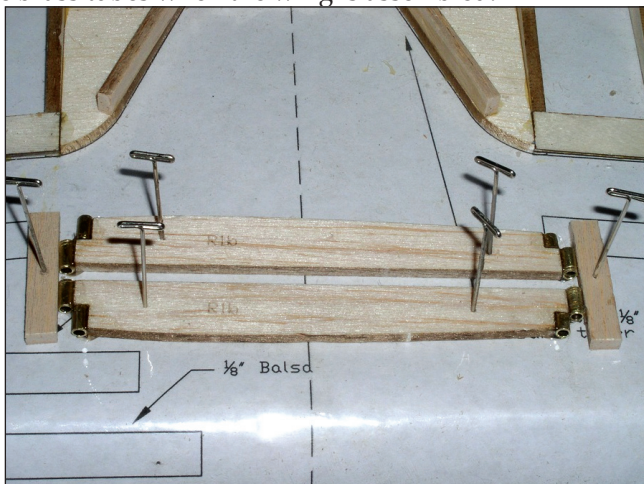
Add the ribs, the "Y1 & Y2" pieces and the "W7" aileron cable exit guides. Some thought and decision must be made as how you plan to operate the pull-pull aileron cables. The aileron servo will be in the fuselage below the "W7" exit holes. The plan suggests the use of eyelets to direct the cables. The model pictured used bent aluminum tubes.

When all glue is dry, lift the wing off the plans and glue in the 3/16" square leading edges with the "W1" gussets.

The wing may seem flimsy and twisty at this point. It will firm up with the covering and on final assembly with the flying wires it will be really stiff.



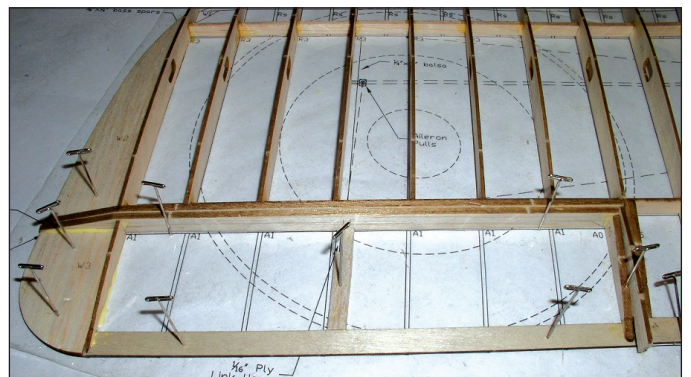
The 1/8" ribs, "Rb1" needs some prep work before assembly. Cut 8 - 1/4" lengths of brass tubing to be epoxied into the slots in Rb1. Note the spaces left for Rb1 riblette and R1c to fill later. The tube on the top of the rib will eventually have 3/32" tube inside it to mount the flying wire tower. 1/8" balsa pieces "Y1" and "Y2" will reinforce the brass tubes when the wing is assembled.



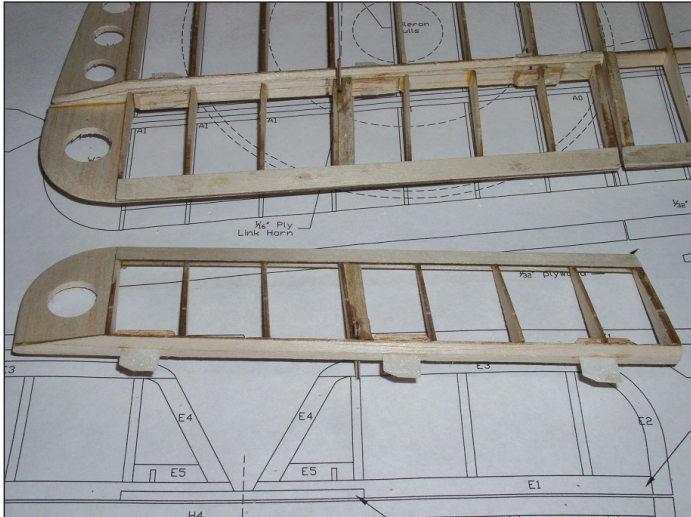
The ailerons are a pretty straight forward build. Pin down the leading edge, wing tip and "A0". Note that "R5" is added to rib "R2" to strengthen that area. Add ribs "A1" and "m" for control horn mount.

After all the ribs are glued on the wing and ailerons, the 1/32" plywood trailing edge top strips can be added.

Place the 8 - 1/16" aluminum tubes (cut to size) at the locations noted on the plans for the flying wires to pass thru the wing.



Double bevel "<" the leading edge of the ailerons. Use hinges of your choice. This builder used CA hinges with an additional piece of 1/8" balsa added for gluing area. The control horn can also be added at this time, or after covering. Other options would be to sand a half round on the leading edge with center hinge or top hinge with bevel "/\" on both trailing and leading edges.



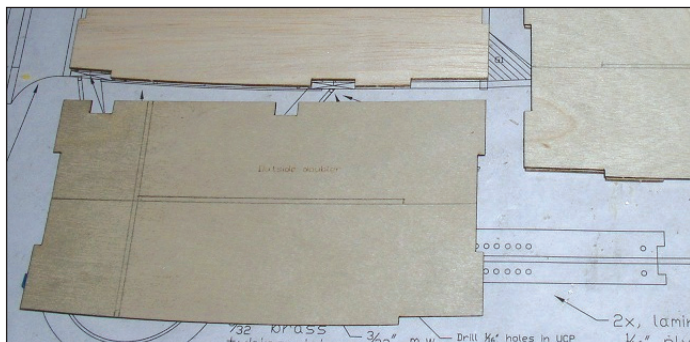
FUSELAGE CONSTRUCTION

Items needed to complete the fuselage:

- 5 – 2-56 blind nuts
- 1/8" brass tube, 2- 3"

All longerons, stringers and 1/16" balsa sheeting furnished in the kit.

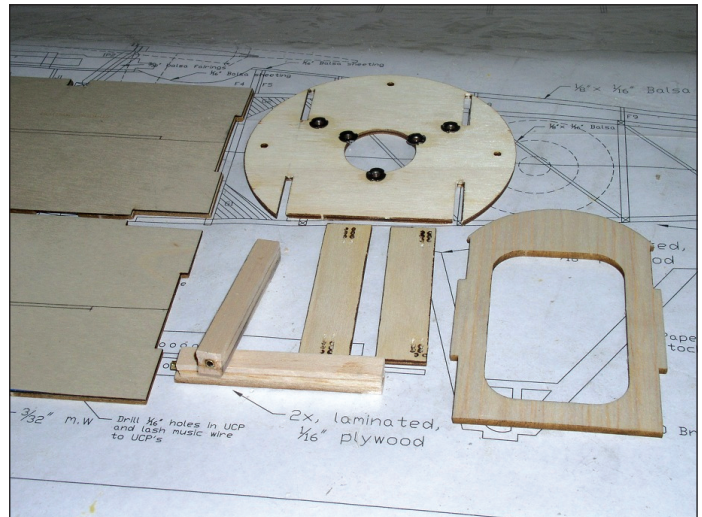
The fuselage is built in two sections; a front box section and a rear strip balsa section. Some prep work needs to be done before building the front section. Join the top and bottom 1/8" balsa box pieces (no label), then laminate the 1/32" plywood doubler onto the balsa pieces. These plywood doublers will go on the OUTSIDE of the box, so be sure to make a left and a right sides. This modeler added the datum line and position of formers from the plans on both sides of the pieces for later reference.



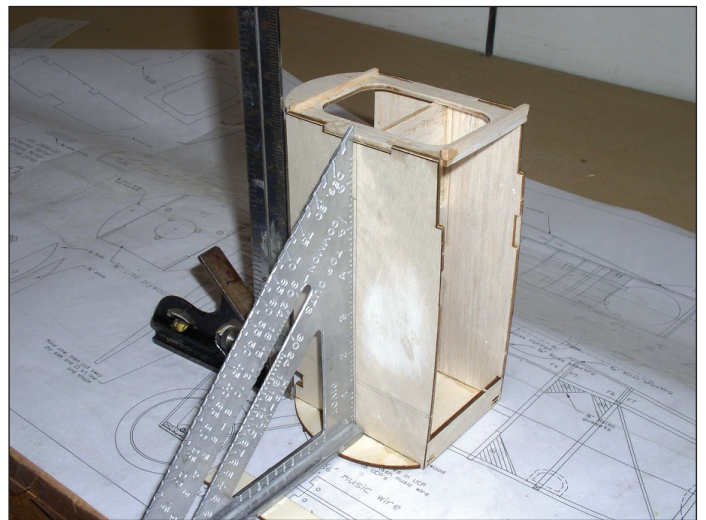
Find the plywood firewall "F1" and put in the 2-56 blind nuts for the dummy motor and for securing the cowl. This is a good time to check the firewall with cowl ring "C1". Make sure all holes line up and the birch dowels fit the holes (do not glue the dowels yet). Note that the cowl will be secured to the fuselage with two 2-56 machine screws,

so magnets or other securing devices are not needed.

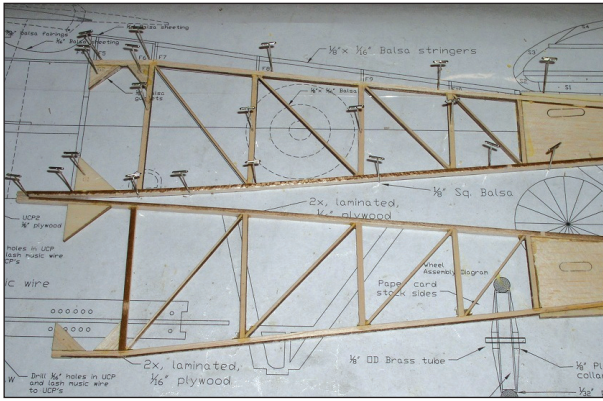
Find the 3/8" strip on the 1/8" hard balsa stringer sheet. Make two cabane strut holders 3" wide with 3/8", 1/8" square and 1/8" brass tube (see the plan side view for profile). Prepare the landing gear mounting plates (clean out the holes). This builder added a 1/8" square balsa cross piece to former "F4" at the bottom and inside top where top longeron will go (not in the photo) to give additional support to the vertical balsa grain.



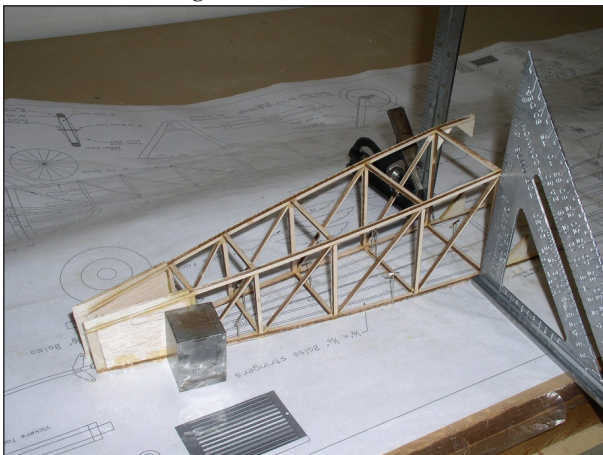
The front box section square in all aspects. When gluing, be sure the sides are square to the firewall in both dimensions. Epoxy on the firewall for sure, other places, your choice. This builder also added a cockpit bottom at this time.



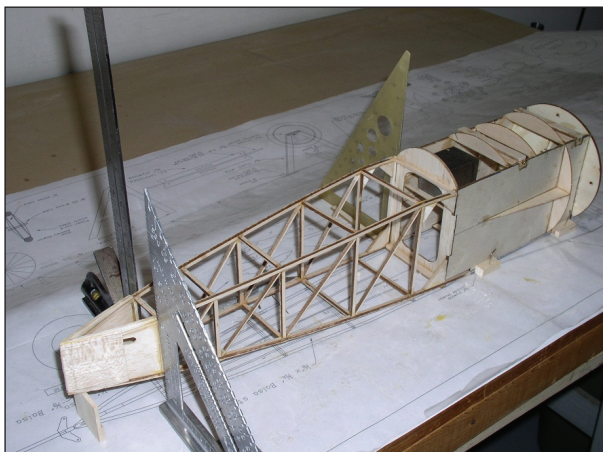
The rear section is made from 1/8" square hard balsa longerons and cross pieces with 1/16"x1/8" hard balsa bracing pieces. Pin the strips down to the plan side view, with corner pieces "G1, 2 and 3". Do not glue in the 1/16" pieces used for push rod method. Later, after the rear area is curved and glued together, they can be added. This builder erred in putting them in. Be sure to add piece "F12" over the tail post as this gives the proper incidence to the horizontal stab. Make a left and a right section.



Pin down the side sections to the plan top view and glue in the cross pieces. Square everything! This is an extremely important step. Square! Square! Find 1/8" balsa piece "TS2" and pin it to the plan and pull in the tail post. **Note:** this builder soaked the rear section of the longerons in water so they would be pliable enough to make the bend. Square the tail post! After the section is dry, the two pieces for the push rod exits can be glued in. If you are using pull-pull cables, you will need to determine the exit locations and provide some sort of covering attachment for the 6 exits.

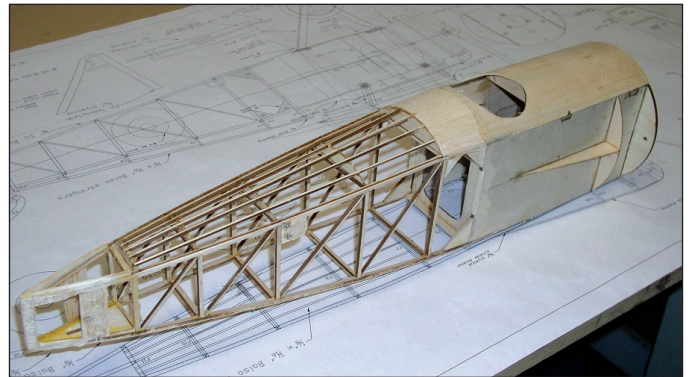


Join the two fuselage sections. Pin the front box section to the plan top view. Keeping everything on the center line. Join up the rear section. This builder blocked up the tail post 1 3/16". Square everything, tail post on the center line, square!



Add the formers "F5 thru 11" and the 1/16" hard balsa

stringers. Add the 3 "J1" and 2 "f2b" formers. The 1/16" balsa sheeting for the forward panel is furnished in the kit. This builder preformed the radius by wetting the sheet then taping it to a quart paint can. When dry, it was fitted to the fuselage box. The side panels were left until the cowl was made to be sure they matched the cowl radius.

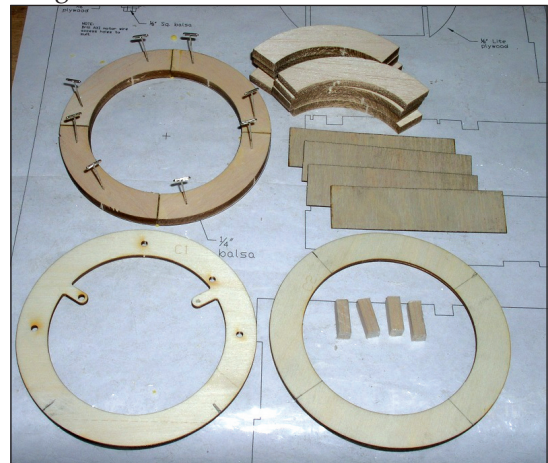


COWL CONSTRUCTION

Items needed to complete the cowl:

- 3 - 1/8" wood or carbon fiber dowels
- 4 - 1/4" square by 3/4" long scrap balsa

Glue the 4 "C1" sections together into 3 rings. Find the 4 1/32" plywood strips and butt glue them together. CA glue the joint, then put masking tape over the joints (remove tape after glued to the barrel). On the plywood ring "C2" mark off every 90 degrees then glue on a 1/4" square by 3/4" balsa stand off. Make sure the stand off is square to the outside ring radius.

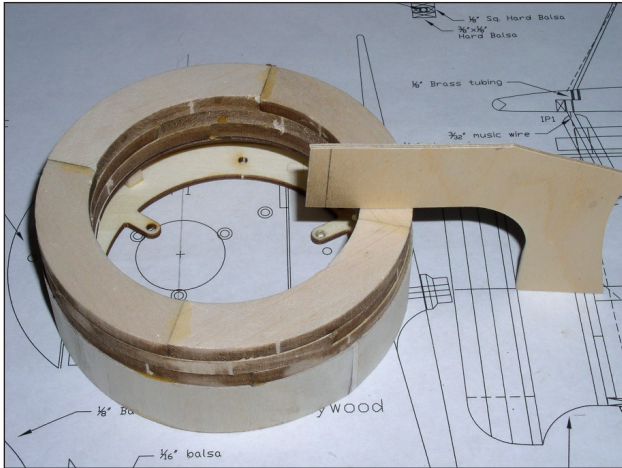


Laminate the 3 "C3" rings together. On plywood ring "C1" notice the broken line on the bottom opposite the top dowel hole. That area will be cut away later. Do not put the stand offs in that quadrant. Glue the plywood rings together at the standoffs. Make sure the rings are square all the way around.

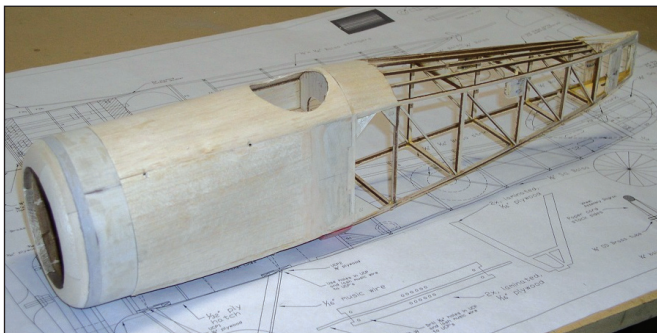


Glue the 1/32" plywood strip around the plywood barrel. Put the butt joints on the balsa standoffs. Use lots of masking tape to get a tight round fit. When the glue has dried, glue on the "C3" lamination.

Sand the cowl round and use the radius indicated on the plans for the "C3" lamination. This builder likes to make a profile piece (taken from the plans) to sand the radius on the cowl front. Later the cowl is covered and primed. This builder used 1 oz. fiberglass and finish epoxy then cut out the bottom area as per the plans.



The dowel pins can be glue in and the cowl fit to the front section of the fuselage. Add the 1/16" cowl sheeting to formers "F2a and b". That should complete the fuselage.

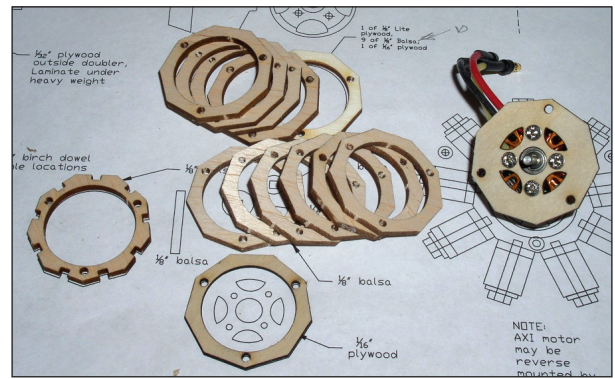


MOTOR MOUNT - DUMMY ENGINE

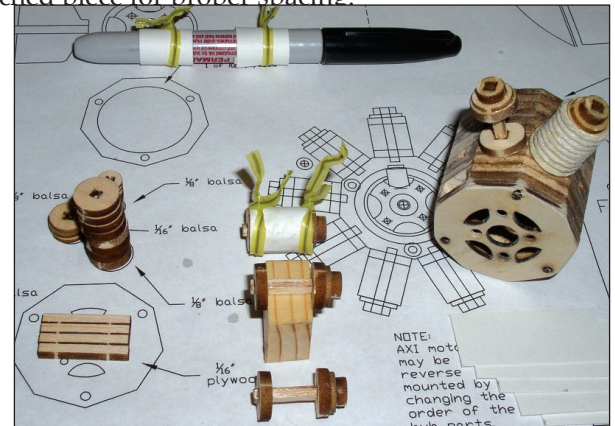
Items needed to complete the Motor Mount:

- The motor that will power this model
- 3 – 2-56 x 2" machine screws
- Heavy Card Stock paper
- String
- 1/32" music wire, for push rods

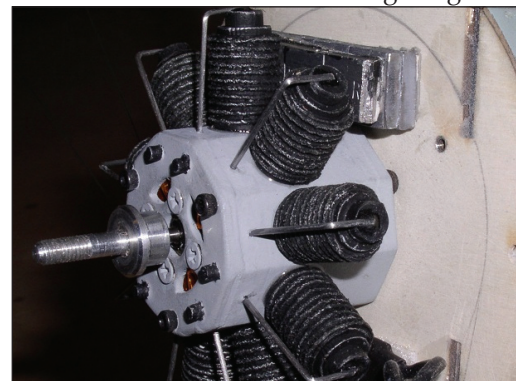
Find the two 1/16" plywood motor mount plates. Compare the four screw hole mounting pattern on the plate to your motor. Adjust the holes if necessary. Laminate the plates together. Mount the motor to be sure it can be secured easily. Find the 10 1/8" balsa motor core pieces and the one 1/8" lite plywood piece. Check the diagram at the upper left hand corner of the plans for the proper arrangement and laminate the core pieces together. This builder waxed the machine screws and used them to line up the mounting holes. When the glue is dry, clean out the holes with a drill. A hole for the three motor wires to exit the core will need to be fashioned.



To make the nine cylinders, find the three different sized circular pieces that make the core of the cylinders. Also find the 1/8" square center piece. This builder made a small fixture to glue the pieces square and proper distance apart. Assemble the 9 cylinder cores. Cut 9 pieces of heavy card stock from the pattern on the plans. Cut the paper so the grain allows the paper to be rolled. Glue the rolled paper around the cylinder cores. Cut two pieces of string to length (wrap one cylinder first to find the proper length of string – leave extra length to work with). Wind both pieces of string around the cylinder, glue both ends of one string, unwind the other string. You will have evenly spaced cylinder fins. After the first one, you will get the technique. Paint with dope, polycrylic or thinned white glue to seal the fins. Glue the cylinders on to the motor core using the notched piece for proper spacing.



Paint the motor unit and add whatever detail you wish. Add some push rods (1/32" music wire) to finish off the motor. Add the 1/32" plywood washers furnished in the kit, to the top left screw to get the proper down and right thrust for the motor. There will be lots of room behind the cylinder to mount the ESC and balancing weights.

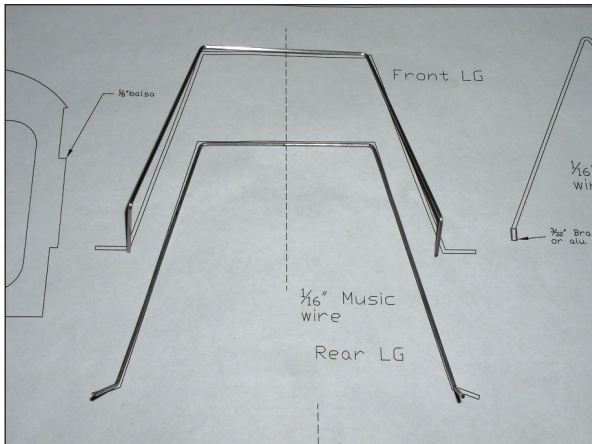


LANDING GEAR

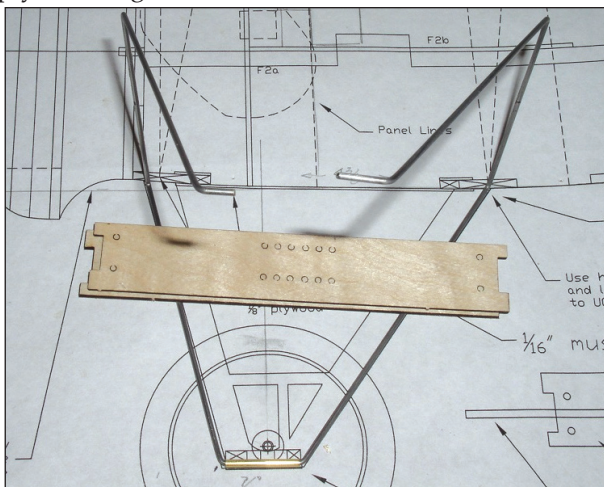
Items needed to complete the undercarriage:

- 1 – 3/32" music wire 10" long (trimmed to length later)
- 2 – 1/16" music wire, approx. 20" long
- 2 – 1/8" brass tube, approx. 7/8" long
- Heavy thread or fishing line
- Elastic cord, approx. 36"

Bend the 1/16" music wire as per the plans. Note that the lower ends do not bend out, but back in the case of the front legs; and forward for the rear legs. Drawing in 3 D not possible on the plans, but the length at the bend is important.



Lay the bent wires on the plan side view to make the final adjustment of the bends. Use the 7/8" length of brass tube to join the front and rear legs together. This builder used CA glue to join the parts. Later they will be epoxied to the plywood legs.



Find the 4 pieces of 1/16" hard plywood landing gear legs and 2 pieces of the cross support. Laminate the pieces together to make a left and right landing gear legs. This builder filed a groove in the front and back areas where the music wire will be epoxied. This builder also made a simple fixture to hold everything while the epoxy cured. Prepare the cross piece by sanding the area that fit into the gear legs. Clean and sand the music wire and epoxy to the plywood pieces.



WHEELS

Items needed to complete the wheels:

- 2 – 1/8" brass tube, approx. 3/4" long
- 4 – 3/32" wheel collars (or solder on washers)
- Heavy Card Stock paper

Find the 1/4" balsa wheel cores, 1/32" plywood wheel rims and the 1/8" liteply reinforcing collars. Find the 2 Neoprene foam lengths used for the tires (they are already cut to the proper length). Laminate the 1/32" ply rims to the 1/4" balsa cores. Use the 1/8" brass tubes to center the rims, avoid gluing the brass tubes to the assembly. When the glue has dried, add the 1/8" reinforcing collars to each side of the rims. Center the brass tube in the collars and glue it. File ends to just clear the ply collars.

Neoprene loves CA glue, so when you join the ends of the Neoprene with the CA, it is final. Get it right the first time. Massage the Neoprene into a donut shape before using the CA. Medium CA is ideal for this join, but thin CA can be used. When you are ready, apply CA to one end of the Neoprene then quickly join the ends together and hold for a minute or so until the CA cures. Give the CA several minutes to thoroughly cure. The tires can be rolled onto the wheel rims. Apply thin CA around the rims or apply medium CA to 1/4" balsa cores then roll on the tires.

Copy the wheel cone pattern from the plans onto the heavy card stock. Cut out and score the lines for the spokes. Cut one of the spoke lines and overlap one division to create the cone shape. Cut a 5/16" hole in the center of the inside cone (to slide onto the axle and wheel collar). Glue on the inside cones. If you use wheel collars, do the same for the outside cones. If you solder on a washer to hold the wheel on the axle, the cone (no center hole) will cover the soldered washer.

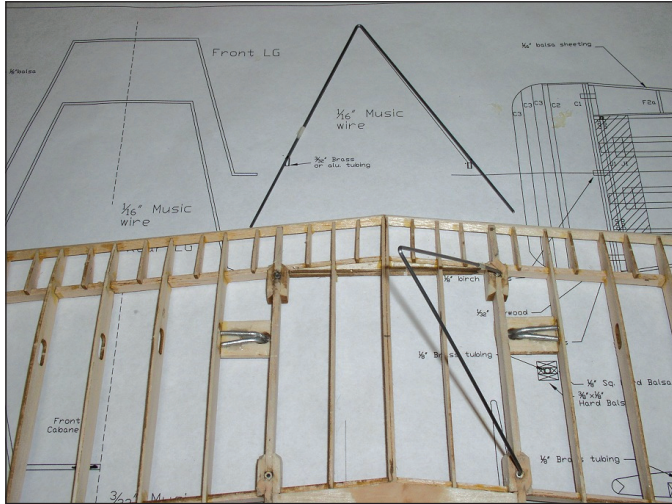
Slide the 3/32" axle thru the provided notch in the gear legs on top of the cross piece. Center the axle. Lace the center of the axle to the cross piece in the holes provided. Trim the axle ends to the wheel collars. Add the elastic cord on the inside of the gear legs. Use the provided holes to secure the cord.

FLYING WIRES TOWER

Items needed to complete the tower:

- 1/16" music wire – approx. 18"
- 4 - 3/32" brass tube – 1/4" long

Bend the 1/16" wire as per the plan. Note that the front leg is shorter than the rear leg. The fuselage side view is more descriptive. Once again, these are dual bends so that the apex meets on the center of the wing. Cut four 1/4" lengths of brass or aluminum tube to go into the 1/8" brass tube that is already epoxied into the "Rb1" wing ribs. If your wing is already covered, you can CA the legs in place. Wrap the top with heavy thread and CA. This builder made a small brass piece and soldered the top in place.



FINAL ASSEMBLY

Cover the model parts with material of your choice. This builder used Cream Litespan on the bottom areas and Polyspan with dope on the top surfaces. Everything was painted before final assembly. Do not mount the landing gear until the last step. You need to set the fuselage on the table. Also note that the wing is mounted very close to the fuselage. Put in the machine guns, cockpit combing and the windscreen before mounting the wing. It will be very difficult to add any details after the wing is secured. Once again, tape on the wing fixture and do all the measurements to square, level and center the wing. When all is perfect, CA or use slow cure epoxy to glue the cabane struts in place.



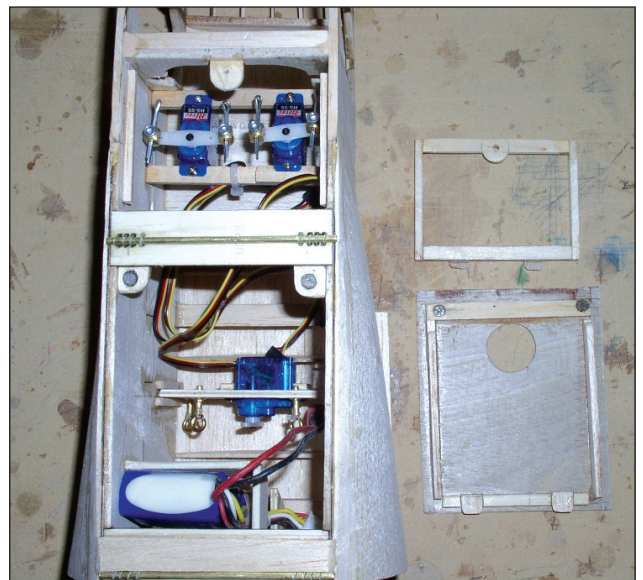
Remove the wing fixture and glue on the 3/32" balsa strut fairings.

Square up the model again and put the horizontal stab/elevator in position. Center the stab, then measure from the wing to the stab hinge line to get it perpendicular to the center line. Measure from the table up to the stab tips so that it is parallel to the table. Also sight it to the wing to be sure it is on the same plane as the wing. Glue it in place.



Lace the landing gear to the mounting plates in the bottom of the fuse. Heavy thread or fishing line is normally used. This builder laced 3/32" brass tubes to the mounting plate during fuselage construction. The land gear wires were then slipped into the tubes and CA'ed.

This builder omitted several details from these instructions. Assuming the builder would use his own methods. The next photo shows this builders solution to bottom hatches, servo positions and battery placement. It is offered as an example not the final solution.



FLYING WIRES

The flying wires are a must for this model. They not only give strength to the wing, but are an aesthetic enhancement to this airplane. Kevlar or fishing line can be used – this builder used coated .022" stainless steel beading wire, 1/16"

beading crimps on one end and 3/32" x 5/8" aluminum tube for the turnbuckles.

To be sure the flying wires do not warp the wings, but to keep them flat on the bottoms, two fixtures were made of cardboard. The tail was raised until the wings were parallel to the table at the cabane struts. A measurement at the leading and trailing edges was made. A square of cardboard was fitted under the wing to hold it the same level as the cabane struts. The midwing flying wire from the landing gear wire thru the aluminum tube to the tower can be secured with CA. Front and back wires keep the wing even on the fixture.



The outboard flying wires are done in the same manner, keeping the bottom of the wing even on the fixture. This builder used small cotter pin eyes in the aluminum tube ends. Instead of running the lines thru the wing, each line was secured to the eyes. The only reason for this was to simulate the turnbuckles. To reiterate, the flying wires are a must. Whichever way you choose to do them, the important thing is to keep the wing straight – no warps!

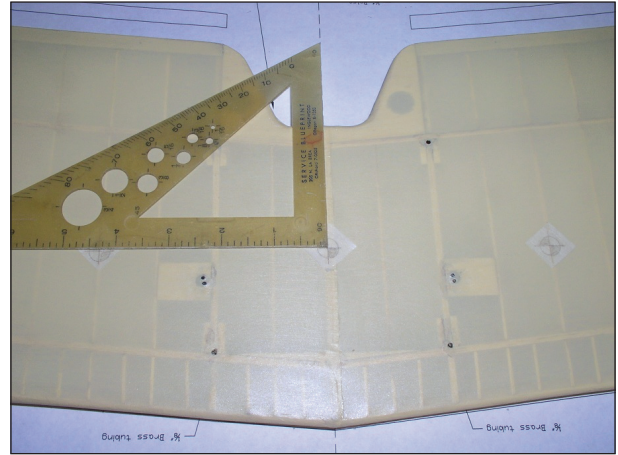


FLYING THE MODEL

As with most short nose airplanes, weight will usually have to be added to the nose. The model pictured above required 2.8 oz. of lead on the firewall. The Graupner prop is also 1/2 oz. heavier than APC props.

Balance the model as per the CG mark on the plan side view – 3 1/4" back from the leading edge at the wing center line. As the wing tapers back, the CG mark will be closer

to the leading edge as you go out toward the wing tip. This builder chose the 4th rib from the center, on both sides, to balance the model. A masking tape mark was used, then removed after flying.



The control surface movements on the model above are more than necessary:

- Elevator – 1/2" - use only 1/4"
- Ailerons – 1/2" - use only 1/4" - this model turns better with added rudder
- Rudder – 3/4"

For down and right thrust, this model is flying with 4 1/32" ply washers furnished in the kit. The washers are behind the upper right screw (looking at the dummy motor). The 1/32" ply washers were soaked in CA to prevent squashing.

The model should ROG on grass, pavement or hard surfaces. The model may require coordinated turns using both ailerons and rudder control. This is due to adverse yaw. Halving the aileron down throw may reduce the yaw. This effect can be accomplished by rotating the control arm of the aileron servo forward about 20 degrees.

Let the model gain altitude slowly off the runway. Applying too much elevator at slow speeds risks a stall. Make your turns gently as tight turns risk tip stalling in any model. Don't expect the elevator to make the model climb. Think of the elevator as a device to change the attitude of the model. The wing and airspeed ultimately make the model climb. Often down elevator applied at stalling can avoid a major crash. The most important details for proper flight operations are:

- CG location. Tail heavy models never fly well or at all.
- Down and right thrust
- Straight and non warped wings

CONTACT INFORMATION

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