

# ECLIPSE CONSTRUCTION MANUAL

This aircraft was designed as a precision aerobatic aircraft. It is not a trainer. If you have not flown pattern aircraft before, you must have the help of a qualified instructor for test, trim and training flights.

## WING ASSEMBLY

1. Inspect the wing cores for proper sweep and sand at root to correct if necessary.
2. If not already done, cut slots for wing tube spars, landing gear plates and retracts using the measurements on drawing. NOTE: Landing gear plate cutout should be cut deep enough for the ¼” ply plate and 1/8” soft balsa on top of ply plate. It is much easier to sand the balsa to match the contour of the wing than the plywood.
3. Install 1/8” plywood wing tube spars, ¼ “ plywood landing gear plate, phenolic wing tube and 1/8” balsa gear plate top using slow cure epoxy.
4. Cut holes for mounting the two aileron servos on the bottom of the wing. The exact size of the holes depends on the size of the servos used. The finished holes, with facings in place, should be slightly larger than the servos. Cut holds with an X-Acto knife and dig out foam with a screwdriver. Face sides of holes with 1/16” balsa and add hardwood mounting rails.
5. Make a passage for the servo pigtail by cutting a slot from the servo mounting hold to the center section.
6. Sand all installed parts to match contour of wing after epoxy has cured. Fill all dents with Dap and carefully sand to original shape. Don't worry about wire marks and other minor defects.
7. Match both wing core halves by comparing them root to root, tip to tip, leading edge to leading edge and trailing edge to trailing edge. Carefully sand if necessary to match exactly for contour and size.
8. Edge glue enough 1/16” LIGHT WEIGHT MATCHED BALSA to cover both wing panels.
9. Block sand sheeting to get rid of excess glue, high spots, etc. Use 100 grit Openkote followed by 150 grit Openkote. Sand both sides.
10. Using wing cores as a pattern, cut wing skins to size. They should be about ½” larger than the core all the way around. **GRAIN MUST RUN PARALLEL TO THE TRAILING EDGE.** Failure to do this will result in a torsionally weak aileron.

11. Prepare a flat building surface. A table, workbench, etc. is fine BUT IT MUST BE FLAT.
12. Prepare wing laminating boards. You will need three flat pieces of particle board 1"x 18 "x 35".
13. You will also need a squeegee for spreading epoxy. The squeegees available in auto parts stores for spreading Bondo are inexpensive and work well.
14. About 6 oz. of slow curing epoxy is required for the wing. Mix only about ½ that amount (3 oz.) at a time.

#### NOTE FOR HONEY COMB WINGS

IF YOU HAVE A HONEY COMB WING YOU MAY WISH TO BRUSH EPOXY ON THE CORE INSTEAD OF THE WING SKINS. ALSO DO NOT FORGET THE 1/8" x ¼" BASSWOOD SPARS.

15. Lay one of the laminating boards on your flat building surface and place one wing shuck on it core side up (shucks are the remainder of the foam block after the core is removed). Using your squeegee, put epoxy on the matching wing skin and lay it, glue side up, in the shuck. (NOTE: It is very easy to get glue on the wrong side of a skin. It will be helpful to mark an X on the glue side of all skins.) Position the correct wing core on the skin, allowing 1/8" of skin to overhang the trailing edge of the foam core. Apply epoxy to the next skin and lay it on top of the core, again allowing only 1/8" of balsa to overhang the trailing edge of the core. Be sure the grain is parallel to the trailing edge. Position the top shuck and second laminating board. Shift all parts until the stack is perfectly aligned. TAKE YOUR TIME. The weight from the upper laminating board will help hold things in place, but don't get excited if this weight isn't quite enough to put the skins in perfect contact with the foam. Just get things aligned properly.
16. Repeat Step 15 with second wing assembly on top of the first stack and add the third laminating board on top.
17. Add weights to the top of the stack. You will need 120-140 pounds. You can use anything for weights (fuel or milk jugs filled with water). Don't stack jugs and be sure the weight is evenly distributed over the wing laminating boards.
18. Once all the weight is on, and before the epoxy cures, inspect for bowing or twisting of the boards or foam. Use a good metal straight edge and check each side and across the ends. DOUBLE CHECK. The stack will usually bow a little in the middle, so pry up the first wind board with a large screwdriver and insert newspaper shims as necessary. Get the wing EXACTLY STRAIGHT AND FLAT.
19. Allow assembly to cure for 24 hours before continuing construction.

- 20 Remove wings and trim sheeting to the edge of the core. Match panels so that they have the same chord at the root and tips. It is more important that the panels are exactly alike than that they conform to a particular dimension.
21. On a FLAT table, lay wing panels trailing edge to trailing edge and leading edge to leading edge to check for warps. Flip panels over and check again. If this test does indicate a warp and is it less than 1/16", careful sanding will remove it. If the wing has more 1/16" warp, the cure becomes more drastic. Cut a diagonal slit through the sheeting and cut so that when the panel is straightened the slit will open. Squeegee epoxy into the slit while holding corrective pressure to remove the warp. Proceed carefully!! This procedure will straighten even horribly bungled jobs. Use multiple slits on both sides if necessary. Sometimes, just wiping the sheeting with a damp cloth and repeating the weight and aligning process will correct a bow or a warp. TAKE IT EASY ON THE WATER.
22. Using white glue (don't use yellow carpenter's glue such as Titebond) add leading edges, trailing edges and tips. Masking tape will hold things in place while the glue dries.
23. When the glue had dried completely, shape leading edge, trailing edge and tips so as to continue the contour of the airfoil. Don't round leading edge yet.
24. Compare tip to tip and root to root. Sand as necessary for an exact match. Repeat the procedure outlined in Step 18 to check for and correct any problems during shaping.
25. Establish matched center-lines on tips. Centerlines should still be visible on the foam at the root. Extend center-lines down leading and trailing edges.
26. Round leading edge and make final contour of trailing edges and tips. Don't remove the center-lines. Use a long sanding block.
27. Using a straight edge, check your work for dips and variations.
28. Mark aileron positions on the wing skin and cut them out using a jigsaw or bandsaw. The panels should be centered and taped to a wing shuck to keep everything straight during cutting. If you do have a bandsaw, the ailerons can be cut quickly and accurately by clamping a rip fence to the saw table. When cutting the aileron free, be sure to allow for aileron facings. See wing plan.
29. Trim ailerons to accept 1/4" facings and face using epoxy and firm balsa. Pin and weight if necessary but make sure they are straight.
30. Face wing cutout with medium 1/4" balsa and white glue. Wipe off excess glue and tape in place until dry.
31. Trim and sand facings when dry. Use a long block for sanding.

32. Instead of using molded nylon control horns, mount the ail/elev/rud linkage in a 1/2" diameter hardwood dowel located as shown on the layout diagrams. The dowel is later drilled for a 4-40 steel bolt to accept linkage. To cut holes for the dowel, use a piece of sharpened 1/2" o.d. brass tubing and twist it carefully. Epoxy dowels in place and sand flush with surface after epoxy has cured. Don't worry about differential in the linkage, but be certain that the bolts are at the same angle to their respective control surfaces.

33. Final sand wing, being careful not to alter airfoil.

### STAB CONSTRUCTION

Use the same procedure as used for the wings except for the following:

1. Using CA adhesive, edge glue enough matched weight 1/16<sup>th</sup> balsa to cover both stab panels.
2. See stab drawing for all dimensions.
3. Before joining the two stab halves use the root section to make a template for use in cutting out the fuselage.
4. The center section is reinforced with 2" wide 4 oz. fiberglass tape and slow curing epoxy. Gently warm epoxy with a hair dryer and squeegee smooth.

### RUDDER CONSTRUCTION

Use the same procedure as used for the wings and stab except for the following.

1. Using one piece of 1/16 X 4 X 36, cut it into two pieces of 1/16 X 4 X 16. Using CA adhesive, edge glue these 2 pieces together.
2. Using the foam rudder as a template mark and cut out skins for rudder.
3. Using slow cure epoxy apply skins to foam rudder.
4. Using 1/4" balsa cap all 4 sides of rudder and sand to final shape.

### FINAL ASSEMBLY INSTRUCTIONS ENGINE AND FIREWALL

1. Make cutout in fuselage for engine using a Dremel tool with 1/2" sanding drum.
2. Tack glue 1/16" balsa to front of fuselage to act as spacer for spinner. Sand balsa spacer to fuselage shape and remove center to match fuselage.

3. Drill and tap motor mount to accept your engine. (Suggest CB 80 motor mount and 6-32 or 8-32 allen head bolts.)
4. Put motor mount into fuselage opening you cut out in Step One. Bolt engine to motor mount and install spinner, prop and prop nut on the engine.
5. Hold fuselage vertically, nose up and trial fit firewall to rear of motor mount, Sand if necessary to obtain snug but not tight fit.
6. When satisfied with firewall fit, apply a thin coating of 5 minute epoxy to rear of motor mount and sides of firewall. Working quickly, with fuselage vertical, install firewall to rear of motor mount, keeping spinner aligned with front of fuselage. Hold everything in place while the epoxy sets up. The idea here is to tack glue the motor mount to the firewall and the firewall to the fuselage.
7. Check to insure that everything is lined up properly, then remove spinner and engine, taking care not to break loose the motor mount that is tack glued to the firewall.
8. Using a long reach drill or sharpened piece of music wire the proper size, drill through the motor mount holes. Break loose the motor mount and enlarge the holes to accept 6/32 blind nuts. Make a mixture of slow curing epoxy and chopped fiber glass. Use the mixture to make a fillet on back side of the firewall, between firewall and fuselage.

#### THROTTLE CONTROL AND FUEL TANK

1. Drill 1/8" hole in firewall for throttle linkage using long reach drill or sharpened music wire. Install length of nylon tubing as linkage guide.
2. Drill two 1/4" holes in firewall, centered in the motor mount. Space them for fuel tank fittings. When installing fuel tank slip fittings through firewall as this will help locate the fuel tank solidly. Using 1/4" balsa make a bulkhead to support the rear of the fuel tank. Epoxy bulkhead to fuselage side to insure the fuel tank is level.

#### INSTALLING WING TO FUSELAGE

1. Trial fit wing to the fuselage. You may have to cut the aluminum wing tube to fit. Also notice that only one side of the fiberglass tube inside of the fuselage is attached. The other side is left loose for alignment later.
2. Remove wing and prepare the 1/8" lite ply wing root plates. Using the wing root as a template draw the outline of the wing root on the lite ply. Using the outline as a guide increase the size of the outline by 1/2" all around, then cut the increased outline and make 2 plates.

3. Using the wing as a guide locate and mark the location of the wing tube on the lite ply plates. If you have at least 1/8" of the phenolic tube extending from the wing then drill a 1" hole in the wing root plates. Otherwise, drill a 7/8" hole.
4. Using the plan as a guide mark the location of the wing alignment pins on the fuselage sides. Drill the holes using a drill size to match your alignment pins (1/4, 5/16, dowels or arrow shafts).
5. Install the aluminum wing tube and oversize lite ply root plates. Tack glue one plate to the fuselage and with a long reach drill from the opposite side drill the alignment pin holes in the lite ply plate. When satisfied, tack glue the opposite side and drill it. Install your alignment pins in the lite ply plates only.
6. Insert the wing tube and install the wings on the fuselage. Double check alignment by triangulating. For triangulation, use string or fishing line that does not stretch and T pins. Drill a 1/16" hole at the rear of fuselage and in front of the wing on center line. Wrap a piece of masking tape around the string about where it will touch the wing or stab, then mark with a fine line pen. When triangulating, get alignment with 1/64" or the width of the fine line pen mark. **THIS IS MOST IMPORTANT!**
7. When satisfied, using 5 minute epoxy, tack glue the loose side of the fiberglass wing tube. Install wing and check alignment again. If you are satisfied, using a mixture of micro balloons and epoxy, finish gluing the fiberglass wing tube. Install the wing and check alignment again. Correct as necessary.
8. Using an incidence meter set each wing panel +.5 degrees and epoxy to the lite ply root plates.
9. Remove the wing panels and sand the lite ply root plates to the shape of the wing.
10. Install a method of securing the wings to the fuselage during flight that will also allow for removal.

#### INSTALLING STAB TO FUSELAGE

1. Fit the stab to fuselage opening. Enlarge cutout as required using 100 grit sandpaper and a sharp knife. The fit must be absolutely loose or you will distort the fin. Using tiny slivers of balsa as shims, make the stab parallel with the wing and triangulate using the 1/16" hole forward of the wing, string, masking tape and felt tip pen as you did with the wing.
2. Use small dabs of hot stuff to tack the stab in place. Stand behind the aircraft and check to insure the stab is **EXACTLY PARALLEL** with the wing, check the triangulation again. Remember 1/16" accuracy. Use an incidence meter to insure the stab is 0 degrees relative to the wing. When satisfied all is correct, make a small fillet inside fuselage around the stab with 5 minute epoxy and chopped fiber glass.

5. Trial fit the vertical tailpost and horizontal fin cap. When satisfied with fit, install with 5 minute epoxy.

### INSTALLING WING PAN

1. Install wing, engine, header and tuned pipe. Then trial fit the pan to the fuselage. If needed, relieve the flange for the wing hold down bolts and engine clearance. Provide air hole in front of the pan.
2. Install hardwood blocks as shown on plans and mount pan to fuselage.

### RECOMMENDED CONTROL SURFACE THROWS

Rudder	Low Rate	Left 1-3/4"	Right 1-3/4"
	High Rate	Left 2"	Right 2"
ELEVATOR	Low Rate	Up 3/8"	Down 3/8"
	High Rate	Up 1/2"	Down 1/2"
AILERON	Low Rate	Up 3/8"	Down 3/8"
	High Rate	Up 1/2"	Down 1/2"

### ADDITIONAL NOTES

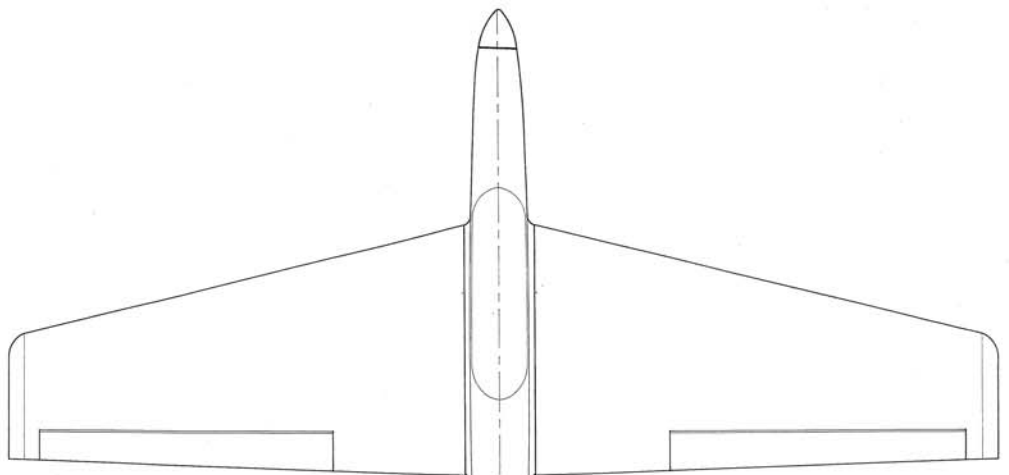
1. Be sure to balance the aircraft static before finishing. Hang the aircraft upside down with everything installed using string from behind the spinner and from the rear of the aircraft. Add small lead weights to the wing tip at the CG location until the aircraft will hang level. When satisfied, bury the weights in the wing tip at the CG location.
2. If you Monokote to finish the wing and stab, flying weight should be under 8 pounds. With mechanical retracts, careful selection of sheeting and minimum paint you could end up at 7-1/2 pounds. The lighter the weight, the better the vertical performance will be.
3. To insure being able to trim properly, all control surfaces should be sealed.

Optional Cut  
out for fuel  
tank (Sullivan  
16oz)

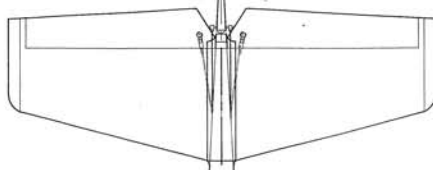
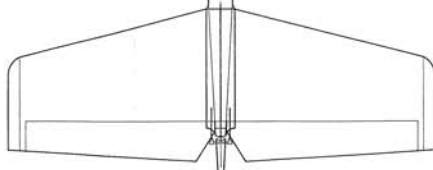
1.25"

Engine cut  
out

Fuse  
Stiffener  
1/4"  
Balsa



TOP VIEW



BOTTOM VIEW

