SunBird

Can't Decide on Your Next Sailplane Project? Why Not Give This Quick Building, Great Thermaling 2m Flying Wing a Shot.

By Mike Hollison

ABOUT THE AUTHOR

Mike Hollison is a resident of Ontario, Canada, and is an avid sailplane modeler. The Sunbird is Mike's sixth sailplane design published in RCM in the past 10 years, and like his others, is sure to be an outstanding performer.

Previously published designs:

#904 Slingsby T49B Capstan, 1/84; #997 P-51 Mustang (Slope Soarer), 7/87; #1051 Schweyer Rhonsperber, 9/89; #1093 Swinger, 5/91; #1131 SZD-30 Pirat, 11/92.

Sunbird is a 2 meter flying wing, designed expressly for thermal soaring. It uses a reflex airfoil for pitch stability and elevons for precise lateral control. Anyone who has built at least one aileron controlled sailplane should have no difficulty with this model.

CONSTRUCTION

Wing:

1. Lay the 1/4" sq. spruce leading edge and the 1/8" x 1/4" spruce bottom main spar over the plan, and epoxy ribs W2 and W7 in place.

2. Cut the trailing edge from 1/4" x 1" tapered stock balsa, slot for the wing ribs and epoxy to W2 and W7, propping the T.E. up with 1/4" scrap to provide the necessary reflex angle.

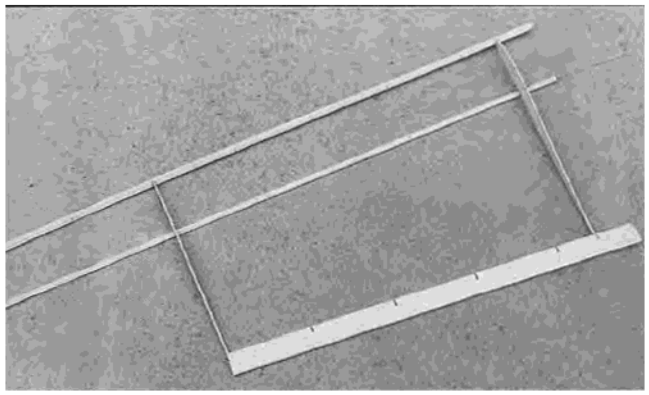
3. Glue ribs W3 to W6 in position.

4. Next, cut the elevon support spar from 1/4" balsa, slot for ribs W8 through W11, lay over the plan and epoxy to rib W7. Epoxy rib W11 in position.

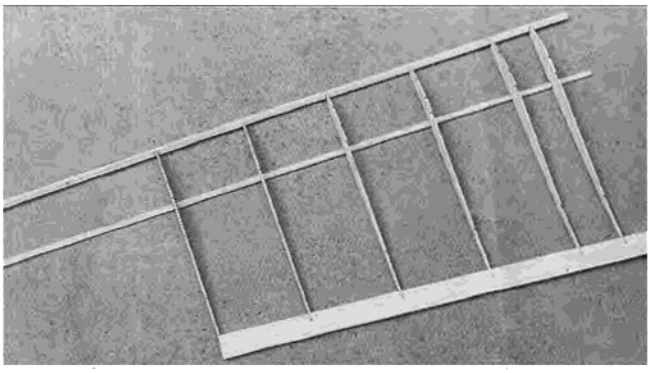
5. Cement ribs W8 to W10 in place, and add the top wing spar.

6. Glue a piece of 1/4" balsa between W2 and W3 and the two wing spars. Add the 1/16" sheet balsa webbing between ribs W2 through W8 on each side of the spars, forming a box.

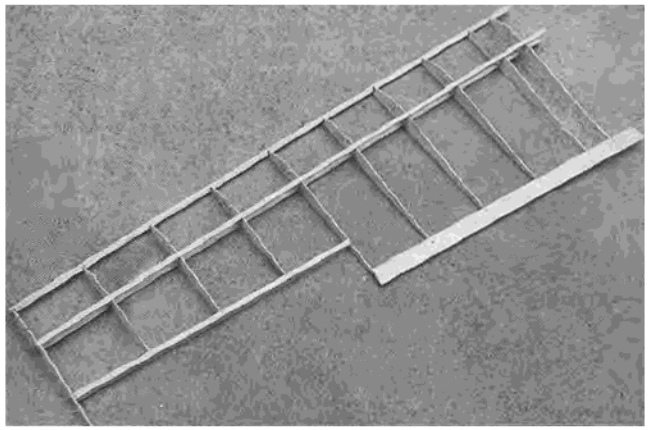
7. Cement sheet webbing between W8, W9, and W10 to the rear of the spars only. There is no webbing between ribs W10 and W11.



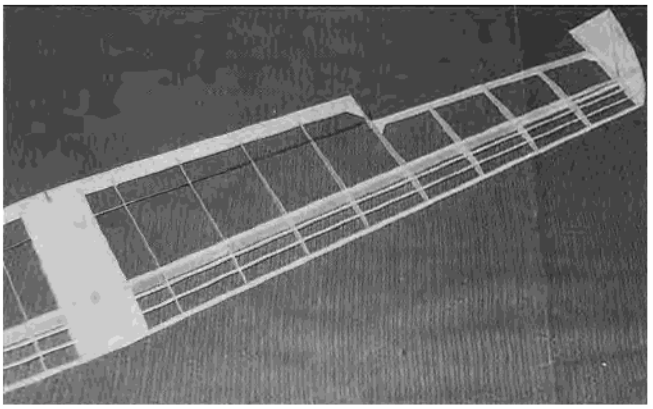
Wing is simple built-up balsa with spruce spars.



Center section trailing edge is reflexed up 1/4". Note that wing ribs are notched into the trailing edge.



Basic wing structure. Elevons are built separate from wing.



Wing assembly with turbulator spars, main spar, shear webbing, and elevon torque rods installed.

8. Next, cement the 1/8" sq. balsa turbulator spars to the wing as shown; then, cut the shaped balsa tip panels from 1/16" balsa and glue to W11. Add the 1/16" balsa supports to W11 and W7 as illustrated on the plan.

9. Repeat steps 1 to 8 for the second half of the wing.

10. Cut the center section filler from 1/4" ply and epoxy between the wing spars on one wing panel.

11. Now, cut two B1 braces from 1/16" plywood and epoxy the forward brace to the wing panel. Align the second wing half and epoxy to the first, making sure that there is 1" dihedral under each wingtip at W11. Epoxy the rear brace (B1) in position.

12. Cut ribs W1 into two and epoxy to the wing. Sheet the bottom of the wing center section between ribs W2 with 1/16" balsa.

13. Now, cut the elevon torque rods from 3/32" diameter piano wire, remembering to slide on the 1/8" outside diameter brass tube sleeves **before** bending the ends! Drop the rods into the slotted ribs and epoxy the three sleeves to ribs W2, W5, and W7 as shown. A little Vaseline jelly smeared onto the wire at these locations will help ensure that the torque rods won't stick to the epoxy.

14. Finally, cement two pieces of scrap balsa at the wing bolt location to prevent crushing, and sheet the top of the wing center section with 1/16" balsa between ribs W2. This completes the basic wing construction.

Elevon:

1. Cut the elevon trailing edge from 1" balsa stock and slot for ribs E7 to E11.

2. Cut the tapered leading edge from 1/8" balsa, place over the plan and epoxy ribs E7 and E11 in place. Add ribs E8 through E10. Notice that the elevon is built flat on the plan; any "reflex" action needed can be added electronically when flying.

3. Repeat the above procedures for the second elevon.

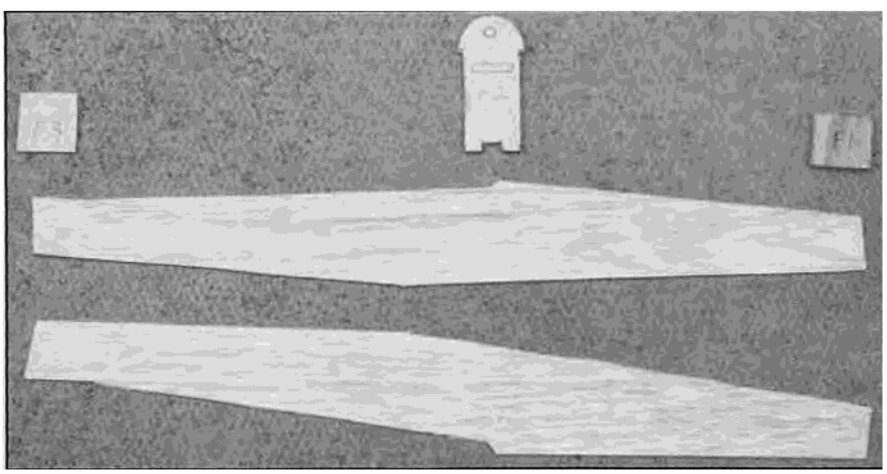
Fuselage:

1. Cut two fuselage sides from 1/16" balsa and sheet the inside of each with 1/32" ply.

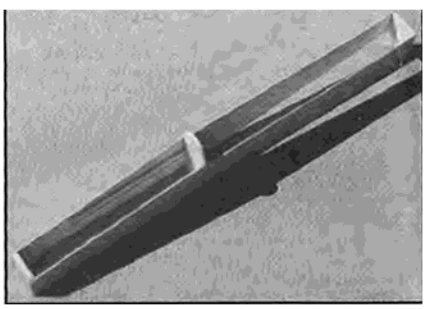
2. Cut out all formers and drill F2 for the lead-out wires, wing mounting dowel, and pushrods as shown, and epoxy to one of the fuselage sides.

3. If the "sliding tray" method of elevon control is to be used, cement the 1/8" x 1/4" spruce rails to the inside of each fuselage as shown on the plan.

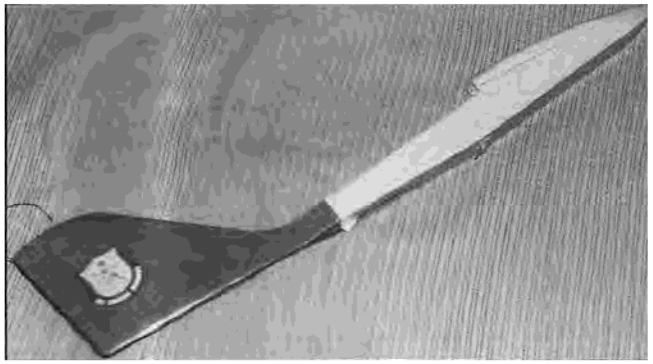
4. Now, epoxy the second fuselage side to the formers, then sheet the bottom with 1/16" plywood from F1 to approximately 1/4" behind the tow hook position. Sheet the



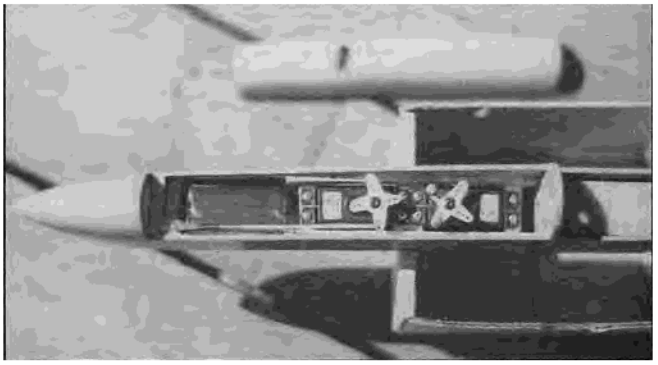
Fuselage sides and formers, ready to begin assembly. 1/32" plywood doublers are used full length on the balsa sides.



Fuselage is a simple box construction with plywood formers. Hardwood nose section is added and shaped later.



Completed fuselage with vertical fin and nose sections in place. Construction is very simple and quick building.



Simple "sliding tray" servo installation is shown on plans, so transmitter mixing is not required.

rest of the fuselage bottom with 1/16" balsa.

5. Carve the nose block from a piece of hardwood, and the canopy from soft balsa.

6. Finally, epoxy the 1/8" ply wing mounting block in place.

Fin:

1. From soft 1/4" balsa, cut, shape, and sand F3 to an airfoil shape. Epoxy the fin to F3, adding the 1/4" triangular balsa stock as shown. Build up the fuselage fairing around the fin joint with 1/16" sheet balsa.

Finishing The Model:

1. Before covering the wing, bolt it onto the fuselage and carve the balsa wing fairing to shape, then glue it to the top of the wing center section. Mark the position of the 1/4" diameter wing retaining dowel and the wing mounting bolt, remove the wing, epoxy the dowel in place, and drill the wing for the mounting bolt.

2. Sunbird should be covered in a high visibility color scheme for those "almost out of sight" flights that are certain to occur! Hinge the elevons to the top of the wing with iron-on covering, then add the 1/2" balsa end ribs to F7, slotting them for the torque rods and epoxying the rods in place. Cover the end ribs to hide the joint.

3. Finally, add the nylon tail skid, tow hook mounting block and tow hook, and install the radio equipment.

Radio Installation:

1. The author used the old "sliding tray" method of elevon control as illustrated on the plan. The 1/16" diameter threaded pushrods are slipped through the slot in F2 and secured to the aileron servo by E-Z connectors, while the elevator rod is attached to the servo by a simple "Z" bend. Radios with electronic mixing need no sliding tray, of course, and the modeler can, therefore, arrange the equipment to suit.

2. Aileron differential (more up than down) should be incorporated in the elevon movement; with the aileron function on high throw and the elevator on low. The recommended range of control movement is 3/4" up aileron measured at the trailing edge and 1/4" down, while the elevator movement should be about 3/8" up and down.

3. When installing the radio, try to position the equipment so that the model balances at the Center of Gravity shown on the plans, without the need for any additional ballast. A reflexed airfoil is not as efficient as a conventional airfoil, so any reduction in weight is to the model's advantage.

Flying:

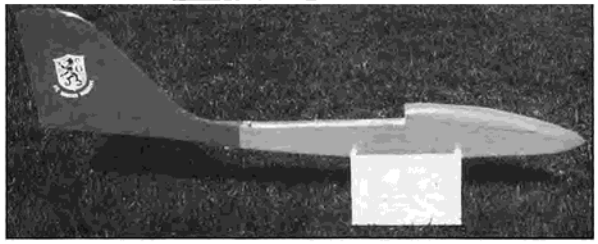
Hand-launch your Sunbird over long grass to provide a soft landing, and aim for a long flat glide. Feed in a little up elevator and launch on a good hi-start. Sunbird is very stable and should climb without any tendency to rotate on the line. Trim for straight and level flight and begin searching for a thermal. The model is very light and will indicate the presence of lift in the time-honored fashion by turning out of the thermal. Simply turn back into the center of lift, crank in some aileron and a little up elevator and watch Sunbird live up to its name!

Postscript: Elevon Control

A few words of advice on the use of elevons on a "plank" type flying wing. Because the moment arm between the control surfaces and the C.G. is so small (less than 6" on the Sunbird) the **"down"** effect of the elevons is very slight. In fact, lowering the elevon reduces the reflex action of the airfoil on the outer half of the wing, thus making the airfoil at that point more efficient, and therefore providing more lift, just at the moment you're trying to lose it!

The result is that in a thermal, slight application of "down" elevator makes Sunbird **climb**! More down increases the speed without any appreciable loss of height, while full down elevator, at low rate, causes the model to descend with little or no change in the pitch mode; i.e., it refuses to dive! In other words, the elevons operate more like flaps than elevator. Of course, flipping the elevator mode to high rate will increase the dive angle greatly, and it may be necessary to do this when Sunbird threatens to disappear on you in a thermal. Happy winging!

NAME
SUNBIRD
Designed by:
Mike Hollison
TYPE AIRCRAFT
Flying Wing Sailplane
WINGSPAN
78 Inches
WING CHORD
10 Inches (Avg.)
TOTAL WING AREA
780 Sq. In. (Approx.)
WING LOCATION
NA
AIRFOIL
Reflex
WING PLANFORM
Double Tapered
DIHEDRAL, EACH TIP
1 Inch
OVERALL FUSELAGE LENGTH
23 Inches
RADIO COMPARTMENT SIZE
(L) 18" x (W) 1-1/4" x (H) 2"
STABILIZER CHORD (inc. elev.)
NA
STABILIZER AREA
NA
STAB AIRFOIL SECTION
NA
STABILIZER LOCATION
NA
VERTICAL FIN HEIGHT
7-3/4 Inches
VERTICAL FIN WIDTH (inc. rud.)
7-1/2 Inches (Avg.)
REC. ENGINE SIZE
None
FUEL TANK SIZE
NA
LANDING GEAR
NA
REC. NO. OF CHANNELS
2
CONTROL FUNCTIONS
Combined elev./ail. (elevon)
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa and Ply
Wing ..... Balsa and Spruce
Empennage ..... Balsa
Wt. Ready To Fly ..... 32 Oz. (2 Lbs.)
Wing Loading ..... 5.9 Oz./Sq. Ft.



When covering your Sunbird, it's best to use contrasting high visibility colors.

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