"Full House" control from just two servos. That's what this experimental sailplane has to offer. Considered an aileron trainer, this standard class ship can get up and run with the big boys.

SWINGER

By Mike Hollison

Swinger is an experimental 100" thermal ship that uses the proven wingeron control system. Basically, this provides lateral control of the sailplane by twisting the entire wing instead of moving just a part of it, the aileron.

While the wingeron will never replace conventional aileron control, it does have the advantage of simplicity to recommend it. Each wing panel can be built as a single unit; there is no aileron gap to worry about, no extra servos to buy, no complicated linkages to install and no expensive extension wiring for wing-mounted servos. In fact, Swinger goes one better and gives the modeler full house control on just two servos — truly the "poor man's multi."

So, for those of you who have always wanted to try precision flying but were afraid to build an aileron ship, read on . . . Swinger may be just for you!

CONSTRUCTION

Start with the fuselage; it's the most difficult part, and even it is easy!

(1) Cut two fuselage sides from Sig 1/8" lite ply and contact cement 1/16" ply doublers inside between formers F1 and F2.

(2) Drill and slot the fuselage sides for the wing rod tube, wingeron bellcranks, wing drive pins, and wing retaining hooks.

(3) Cut the 1/4" triangular balsa longerons to length and glue to the inside of each fuselage panel as shown on the plan, sawing the kerfs into the forward bottom strips so that they follow the curve of the fuselage.

(4) Cut formers F1, F2, and F3, slot and drill as per plan and epoxy in place to one fuselage side. Add the 1/4" triangular stock supports around the formers as shown, drilling where necessary for rudder and stabilator NyRod tubes.

(5) Epoxy the second fuselage side to the formers and, when dry, pull together the

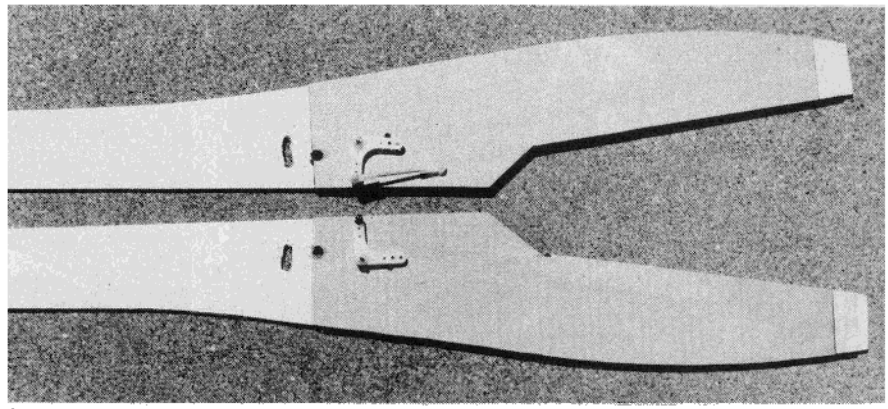
rear of the fuselage and cement a 1/4'' sq. balsa scrap spacer in place (to be removed later).

(6) Next, cut the forward fuselage bottom panel from 1/8'' ply; drill for the cut-down Airtronics adjustable tow hook mount, and epoxy the bottom panel in place between F1 and to just beyond F2.

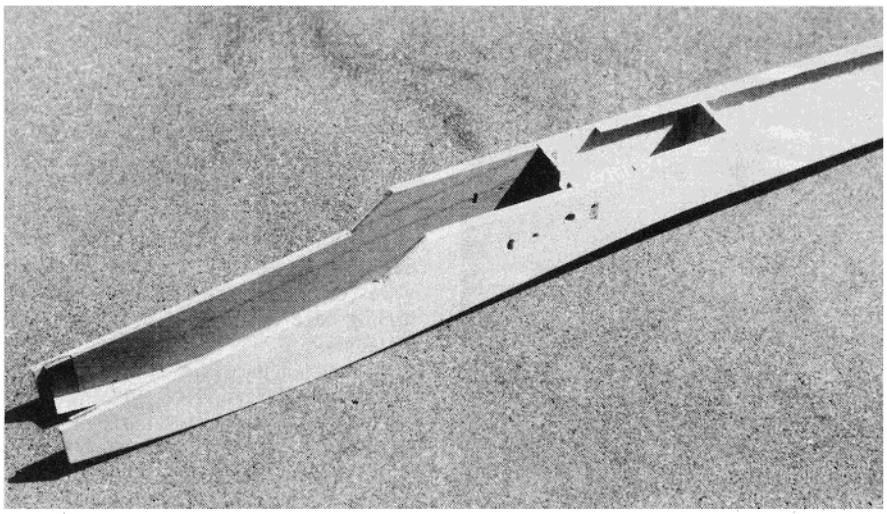
(7) Carve the nose block from a suitable piece of hardwood, using the nose template provided to shape the top of the block, and epoxy to F1 and the bottom panel.

(8) Install the rudder, stabilator, and antenna lead-out NyRod tubes, then add the 1/4'' balsa sheeting to the top of the fuselage, slotting the rear section for the fin.

(9) Carve the canopy from soft balsa block, epoxy the 1/4''sheet balsa hatch cover to the rear of the canopy, then glue the 1/16'' x 1'' x 1¾'' long ply alignment tongue to the bottom of the hatch cover as shown.



Fuselage sides with 1/16 plywood doublers shown. Wingeron linkage, slots for wing rod tube, and retaining hooks are also visible.



Fuselage in mid construction. Note the knerfs sawn into the bottom of 1/4" triangular longerons.

(10) Countersink and epoxy the female part of a dress snap fastener to the 1/4'' x 1/2'' x 1⅝'' long balsa strip and epoxy it between the fuselage sides at F1. Countersink and epoxy the male part of the fastener to the bottom of the canopy and ensure that the canopy snaps shut flush with fuselage. Now add 1/8'' sheet balsa bottom (cross grain).

(11) Sand the completed fuselage smooth, rounding off the top balsa sheeting and fuselage edges to your satisfaction. Put aside and start on the fin and rudder.

Fin and Rudder

(1) First, cut two fin panels from 1/16'' ply and drill a 1/8'' diameter hole for the stabilator horn pivot. Cut a slot for the rear stabilator horn pivot. Cut a slot for the rear stabilator pin, then cement the 1/4'' sq. and 1/4'' x 1/8'' balsa strips to one of the panels.

(2) Epoxy a 3/8'' length of 1/8'' o.d. brass tubing through the hole of one panel, slide the Airtronics control horn over the tubing, and epoxy the remaining fin panel to the balsa frame.

(3) Lay the completed stabilator control box over the plan and build the rest of the fin around it. Cut the 1/4'' x 3/8'' balsa trailing edge strip to length, epoxy the Du-Bro nylon hinges in place, then cement to the rear of the stabilator box.

(4) Glue the 1/4'' x 3/8'' balsa leading edge in place, add the 3/8'' balsa top piece, and cement the 3/8'' x 1/16'' balsa fin braces as shown on the plan. Sand the fin to shape.

(5) (Remove scrap balsa spacer from fuselage now.) Next, slide the stabilator pushrod into the NyRod tube already installed in the fuselage. Add the clevis and threaded rod and connect to the stabilator horn; then epoxy the completed fin into the slot cut from the rear fuselage top decking. Make sure the fin is square to the fuselage.

(6) The rudder can now be built directly over the plan. Cut the 1/4'' sq. balsa leading edge to the correct length and slot for the rudder hinges. Cement the 1/4'' balsa top and bottom pieces in place; then the 1/4'' sq. balsa trailing edge. Glue the 1/16'' x 1/4'' balsa rudder braces in place, sand the whole unit and put aside for installation and covering.

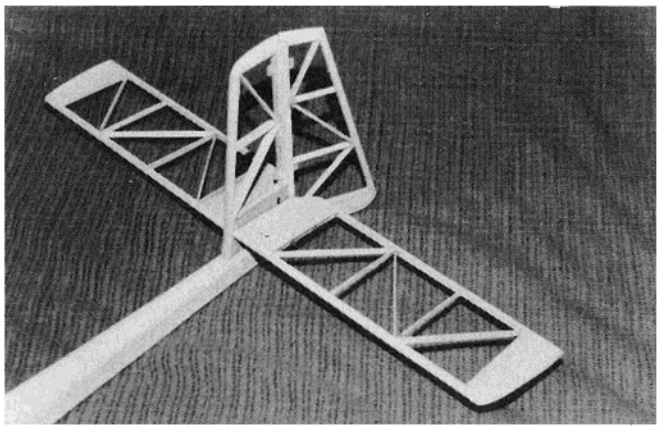
Stabilator

(1) Cut the 1/4'' sq. balsa leading and trailing edges to length and lay over the plan. Cement the shaped 1/4'' sheet tip panel in place and the 1/16'' sheet bottom center section panel.

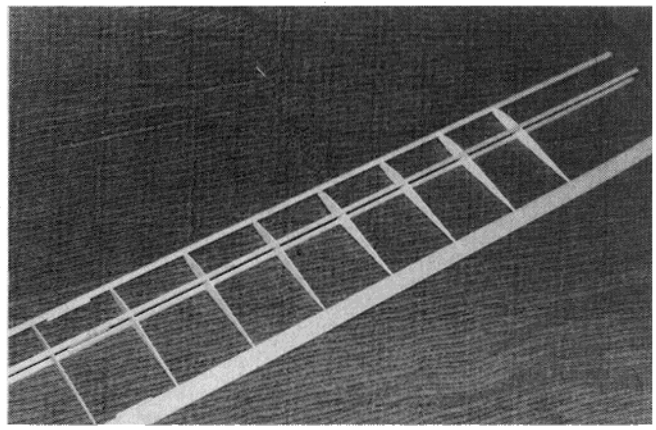
SWINGER

Designed By:
Mike Hollison
TYPE AIRCRAFT
Sport Sailplane
WINGSPAN
100 Inches
WING CHORD
7¾ Inches
TOTAL WING AREA
775 Sq. In.
WING LOCATION
Shoulder Wing
AIRFOIL
Semi-Symmetrical
WING PLANFORM
Constant Chord
DIHEDRAL EACH TIP
1 Inch
OVERALL FUSELAGE LENGTH
49¼ Inches
RADIO COMPARTMENT SIZE
(L) 10'' x (W) 1½'' x (H) 2¼''
STABILATOR SPAN
24 Inches
STABILATOR CHORD (incl. elev.)
4 Inches
STABILATOR AREA
96 Sq. In.
STAB AIRFOIL SECTION
Flat
STABILATOR LOCATION
Mid-Fin
VERTICAL FIN HEIGHT
10 Inches
VERTICAL FIN WIDTH
6 Inches
REC. ENGINE RANGE
NA
FUEL TANK SIZE
NA
LANDING GEAR
NA
REC. NO. OF CHANNELS
2
CONTROL FUNCTIONS
Rudder, Elevator, Wingeron
BASIC MATERIALS USED IN CONSTRUCTION

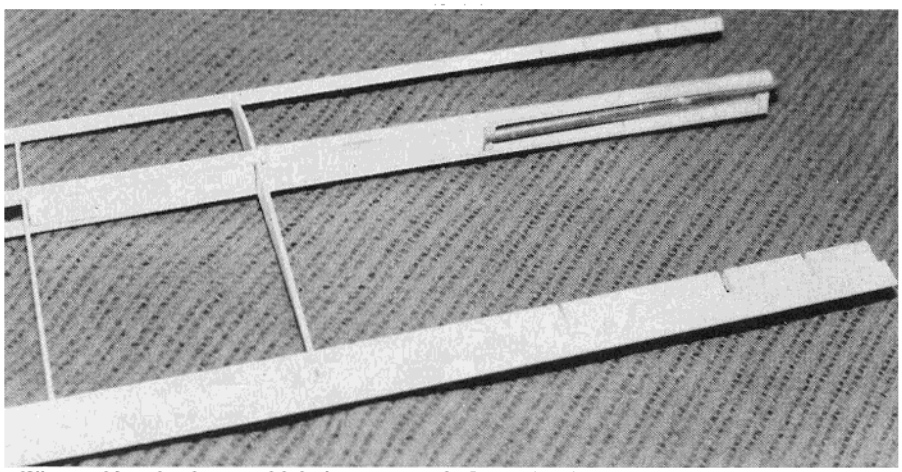
Fuselage	Balsa & Ply
Wing	Balsa & Spruce
Empennage	Balsa
Wt. Ready To Fly	47 Oz. (2.9 Lbs.)
Wing Loading	8.73 Oz./Sq. Ft.



Empennage assembly before covering. Wingeron and rudder are coupled together. Stabilator linkage is hidden inside the fin.



Skeleton of wing shows splicing of spars, leading edge, and trailing edge to achieve the 45¾" length.



Wing rod box is shown with balsa spacers before microballoon epoxy mixture and 1/16" plywood spar brace are applied.

(2) Mark the position of the 1/8" o.d. brass tubing, then cement the 1/8" balsa sheet core around the outlines.

(3) Cut two 1/8" o.d. x 2" long brass tubes to length, crimping them at one end and epoxying them between the core sheets. Now glue the top 1/16" balsa sheet in place, add the 1/16" x 1/4" balsa braces and then set aside the completed stabilator panel for covering.

Repeat steps 1-3 for the second stabilator panel.

Wing

This is the easy part, thanks to the wingeron control.

(1) Unless you are lucky enough to have a supply of spruce strips and trailing edge stock about 48" in length, you will have to splice some standard size strips to the correct length. Using 1/8" x 1/4" x 2" long spruce joiner strips, make one 1/4" sq. spruce leading edge, two 1/8" x 1/4" spruce spars and one 1/4" x 1" tapered balsa trailing edge.

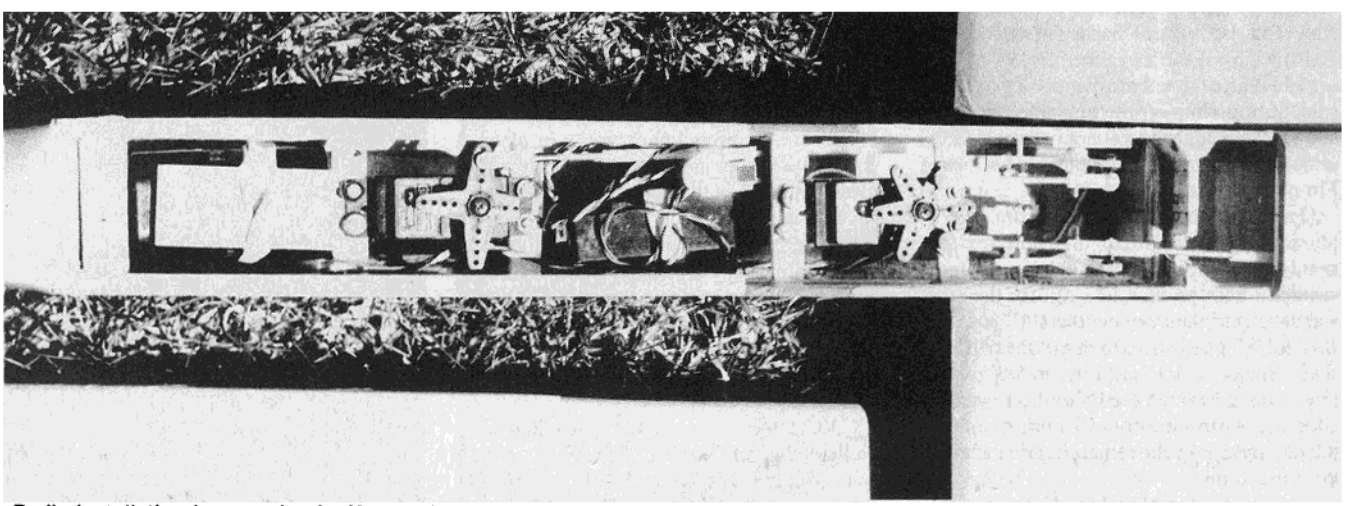
(2) Notch the trailing edge stock for the wing ribs, and lay over the plan along with the leading edge and the bottom wing spar, ensuring that the spar splice is face up on the plan.

(3) Cut ribs W2 as shown and glue in place. Cement the top wing spar in position, ensuring that the splice is facing downwards. Slide a scrap of 1/4" balsa under the trailing edge tip to build in the wing tip washout.

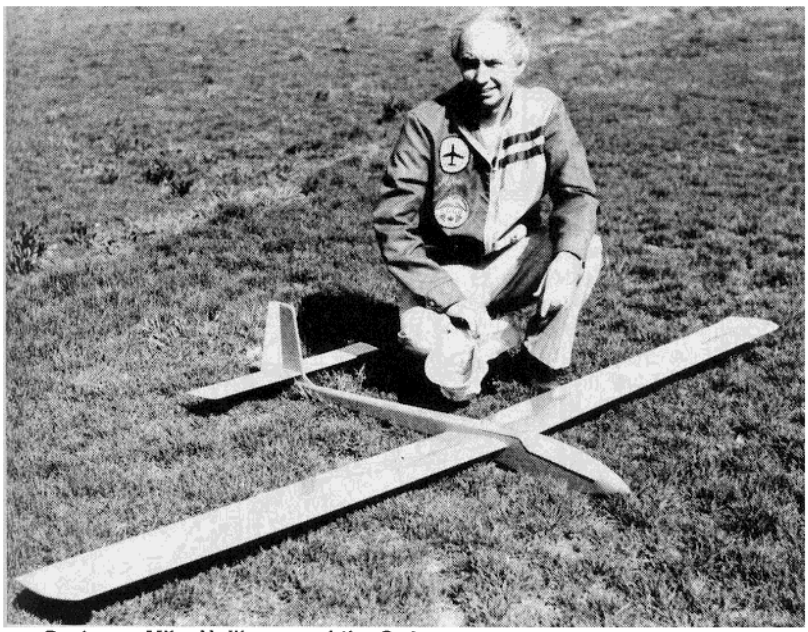
(4) Add lengths of 1/4" sheet balsa filler between the spars and between the first four ribs marked W2 closest to the wing center section (see plan).

(5) Now cut two panels W3 from 1/16" ply and epoxy the front one in place as shown. Cut the 1/4" o.d. x 5 3/16" wing rod tubing to length, and using scrap balsa supports as shown, epoxy it at the correct dihedral angle to the inside of W3 between the spars. Fill the gap between the tubing and the spars with a mixture of epoxy and micro-balloons and epoxy the rear W3 panel in position.

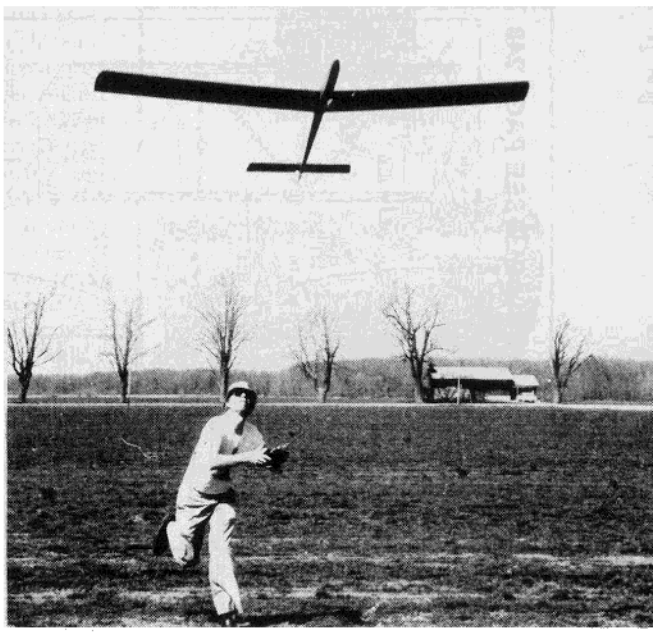
(6) Cut ribs W1 from 3/32" sheet balsa. Slice them in half and epoxy in place as shown. Next, add a piece of scrap balsa block to the inside of root rib W1 between the leading edge and W3. This will serve as a base for the drive pin when it is epoxied



Radio installation is very simple. Note rudder coupling linkage to the wingeron servo.



Designer, Mike Hollison, and the Swinger.



Swinger being launched with the hi-start.

into the wing.

(7) Cement the 1/16'' sheet balsa shear webbing between the wing ribs as shown on the plan with the grain running vertically for maximum strength.

(8) Sheet the top of the wing between the leading edge and the spar with medium weight 1/16'' balsa, then add the rest of the 1/16'' balsa center section sheeting top and bottom as shown.

(9) Now add the 1/4'' x 1/16'' balsa capping strips top and bottom; then carve the tip from soft balsa, cement to the wing and sand to a shape similar to that indicated by the template.

(10) Finally, cut the wing root rib from 1/8'' ply and drill a 1/4'' diameter hole for the wing rod tube plus a 1/16'' diameter hole for the wing drive pin. Epoxy to root rib W1. Sand the whole wing panel smooth, rounding off the spruce leading edge, and put aside for covering.

Repeat steps 1 - 10 for the second wing panel.

Covering and Radio Installation

(1) Cover your Swinger with your favorite brand of heat shrink covering. The fin and rudder may be covered separately before being connected.

(2) Bolt a pair of Du-Bro 90° aileron bellcranks to the inside of the fuselage as shown on the plan, countersinking the screw heads so that they lie flush with the fuselage sides.

(3) Cut the 13½'' long wing rod from a piece of 7/32'' diameter steel and slide into the fuselage.

(4) Install the wingeron/rudder servo as shown on the plan, positioning it so that the rear servo ply mount acts as a fuselage anti-crush brace at the wing root leading edge. If this isn't possible, glue a separate 1/8'' ply brace between the fuselage sides at this position; it will help protect the fuselage from any backlash of the wing panel in the event of a hard landing!

(5) Drill through the ply root ribs into the drive pin balsa mount and slide each wing panel onto the wing rod, making sure that the wing roots are parallel to the fuselage sides. There should be no gap between wing root and fuselage.

(6) Install the Du-Bro ball links and threaded coupling rods as shown, ensuring that differential throw (more up-wing trailing edge than down) is incorporated as per plan.

(For those readers who wish to install a separate rudder servo and mix their wingeron/rudder controls electronically, simply replace the double take-off ball link with a single ball link.)

At this point I'm sure the reader will ask, ''But if I incorporate differential throw in the wings and operate the rudder off the same control, won't I get differential throw on the rudder?'' The answer, of course, is yes, you will, but don't worry about it — it makes no difference to the turning ability of the model. Swinger turns equally both left and right! The differential **is** necessary, however, to prevent reverse wingeron drag, and must be incorporated in the radio installation.

(7) Set the leading edge of each wing panel at about 3° positive incidence, and slide the 1/16'' diameter x 2¼'' long drive pins through the second hole of the wingeron control horn, then through the fuselage wingeron slot and epoxy them **firmly** into the wing roots. Eyeball the model from the nose and make sure that each wing half has the same angle of incidence.

(8) Install the rest of the radio as shown on the plan and then add sundry items such as tow hook block, nose skid and tail skid, rudder control horn, and balance the sailplane as indicated. Epoxy the 1/2'' screw eyes into each wing root for the wing retaining bands and Swinger is ready for the flying field.

Flying

Now comes the moment of truth. Slide the wings onto the wing rod, engage the drive pins into the wingeron bellcrank holes, and bolt a wheel collar to the end of each drive pin.

Eyeball the model from the nose and make sure the leading edges are level and at the correct incidence angle with the aileron function at neutral. The coupled rudder should also be at neutral.

Loop a couple of small rubber bands between the wing retaining screw eyes, using just enough tension to hold the wings against the fuselage, but not too much that it binds the controls. Do **not** omit the wing retaining bands. Check the wingeron movement at this point; each wing should rotate freely around the wing rod pivot.

Now make sure the wings are moving in the right direction. For a right-hand turn, the **right** wing trailing edge must go **up**, the left **down**, and the rudder should turn to the **right**! There should also be more up than down on the wing movements, owing to the differential set-up at the servo. Now, test for proper Center of Gravity.

Launch Swinger on either a hi-start or a winch; the sailplane should climb straight up and release itself smoothly at the top of the launch. A little stick movement to the left and she'll turn gently to the left; a little more stick and the turn will steepen; a touch of right stick will straighten her up. A tad of down increases her speed and she begins to cruise across the sky at just the right speed.

Swinger flies like a beginner's aileron sailplane should; it has a slow to medium airspeed, executes gentle turns, but is fully responsive to your commands.

All in all, a fine flier on just two channels; now, if some enterprising modeler could only devise a simple method of installing spoilers on an all-moving wing.

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