

RO8

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Designed By : Dick Odle

TYPE AIRCRAFT

Two Meter Sailplane

WINGSPAN

78.8 Inches

WING CHORD

8.76 Inches

TOTAL WING AREA

690 Square Inches

WING LOCATION

High Wing

AIRFOIL

12% Semi-symmetrical

WING PLANFORM

Constant Chord Center Panel

Tapered Tips

POLYHEDRAL, EACH TIP

2½" Center Panel, 3¾" Tip

OVERALL FUSELAGE LENGTH

36 Inches

RADIO COMPARTMENT AREA

(L) 7¾" x (W) 1¼" (Max.) x (H) 1¼"

STABILIZER SPAN

20.6 Inches

STABILIZER CHORD

5.3" Average

STABILIZER AREA

103 Square Inches

STAB AIRFOIL SECTION

5% Symmetrical

STABILIZER LOCATION

Top of Fin

VERTICAL FIN HEIGHT

6.5 Inches

VERTICAL FIN WIDTH (incl. rud.)

7.0" Average

REC. NO. OF CHANNELS

2

CONTROL FUNCTIONS

Rudder & Flying Stab

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage Balsa & Ply

Wing Balsa & Ply

Empennage Balsa

Wt. Ready-To-Fly 20 Ounces

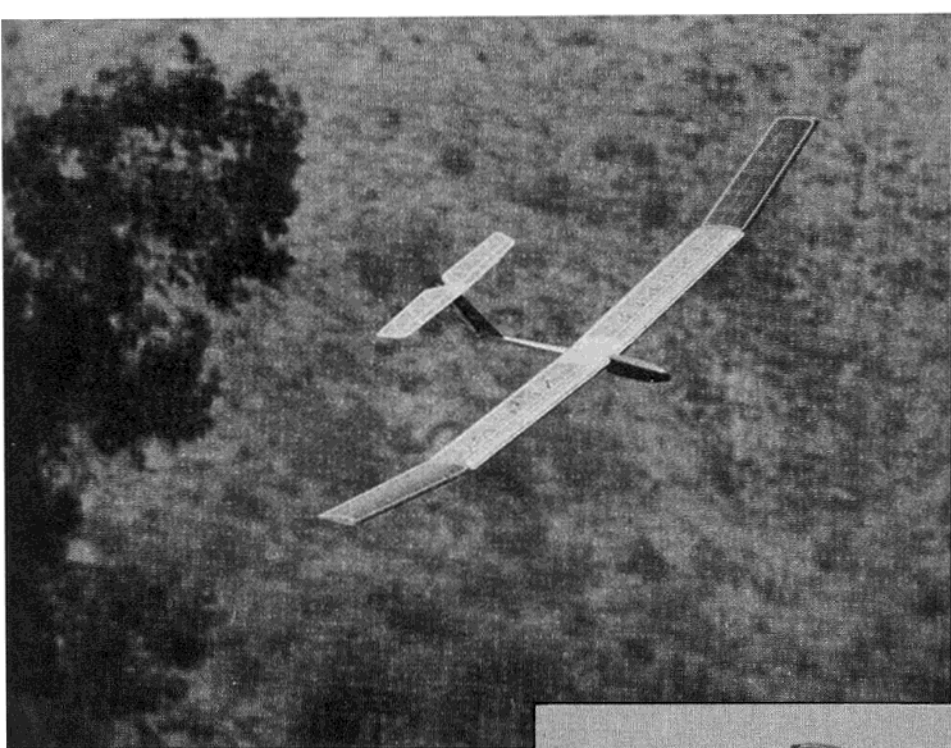
Wing Loading 4.2 Oz./Sq. Ft.

The RO8 may not be the utopia of the two meter class, but so far it has yet to finish out of the money.

By Dick Odle

Having long cooked my simple brain by over exposure to the sun while flying sailplanes, I have found it necessary to number each of my designs. You will note that the sailplane presented here is Number 8. To assist in remembering who I am (should someone ask) the number has been preceded by my initials. By placing the above information on my sailplane, and given a little luck, I am usually able to locate the thing in time to launch with my flight group.

The RO8 follows a general design concept started 18 months ago with the RO4, my first two meter design. The RO4 was intended to be light, durable, fast, and easy to fly. With a 5.2 ounce per foot wing loading, it was light. It was durable. It had a 8% thick flat bottom airfoil section and was only fair in the speed department. Even though I managed to place in both contests entered with the RO4, it was not what I wanted and it was not particularly easy



durability to withstand the rigors of competition.

With these objectives fresh in my mind, a blank piece of paper was taped to the drawing board and the RO8 started coming to life. Things such as surface areas, tail volume, moments, etc., were calculated and the design was roughed out on paper. Then came the true stroke of luck. My neighbor walked in to investigate what strange thing I was up to this time. I looked down and there it was, a perfect 12% thick, 2% mean camber, size 11, brown Florsheim shoe. I quickly traced the airfoil as my neighbor stood somewhat precariously upon the drafting table. This once again proves that sailplane design is in fact an exact science.

The truth is that the RO8 looked so promising that construction was started without ever finalizing the plans. Two weeks later the RO8 was given a slight

or fun to fly. Basically, it was not the utopia we all seek and never find.

Before returning "back to the drawing board" I felt that it was necessary to re-examine the design objectives and establish some very basic priorities having to do with why adults are willing to endure extreme hardships for the sake of flying a sailplane. The answer seemed simple! We fly because it is fun --- or should be. So priority one demanded a design that was easy to fly and, therefore, fun to fly.

Priority two tended toward satisfying the desire to create something a little different, a little sexy if you will --- a design that might inspire the question "I give up, what is that?"

By nature I tend to be fiercely competitive and so priority three demanded a design which could win any given two meter contest regardless of the tasks involved.

Priority four involved durability and ease of construction. I love to fly and hate to build. Repairing broken sailplanes causes my entire family to suffer unusual punishment, so the design had to be simple to build and very durable.

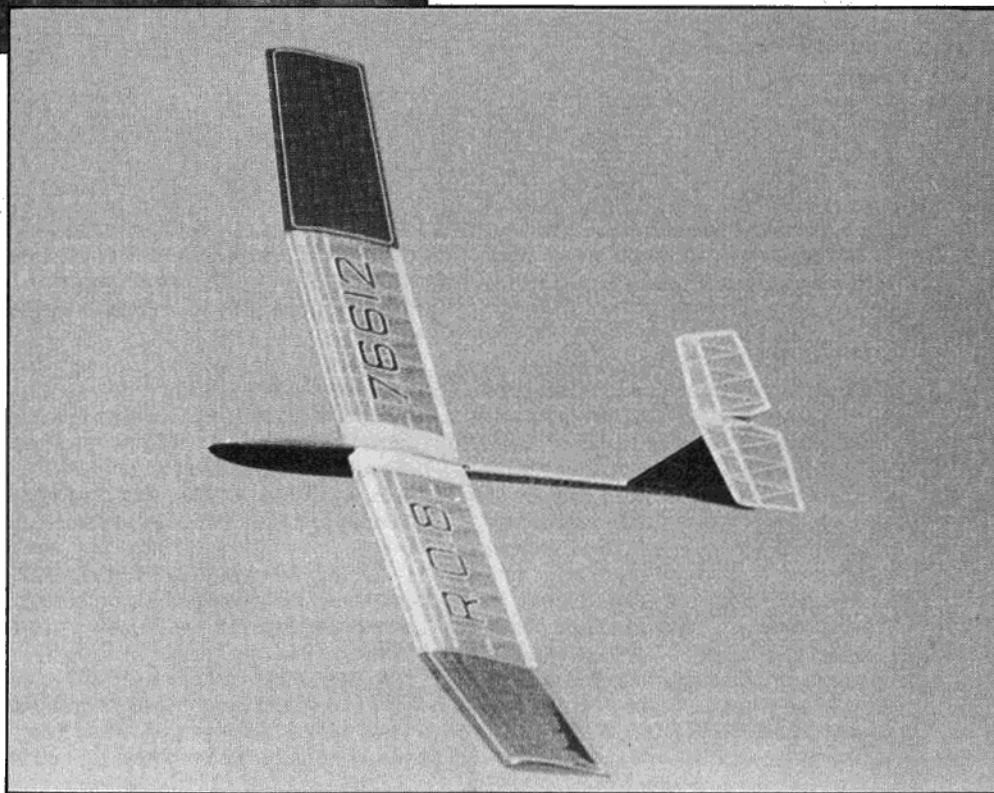
Toward these various goals the following criteria was set forth:

(1) Light wing loading for flying light lift with the limited efficiency available in a small wing.

(2) Semi-symmetrical airfoil section for penetration at a light loading and for speed when loaded up.

(3) A "thick" (12%) airfoil section to provide a wing volume sufficient to make the bird easy and responsive to fly. It also allows for a decent main spar height.

(4) A low mean camber value (2%) to keep the center of lift from wandering all over the place which again makes the



RO8 easy to fly. A side benefit is the aerobatic performance it generates.

(5) A tiny fuselage cross section to reduce parasitic drag.

(6) Symmetrical airfoil sections on the fin and stabilator to reduce drag and make control inputs smooth and progressive.

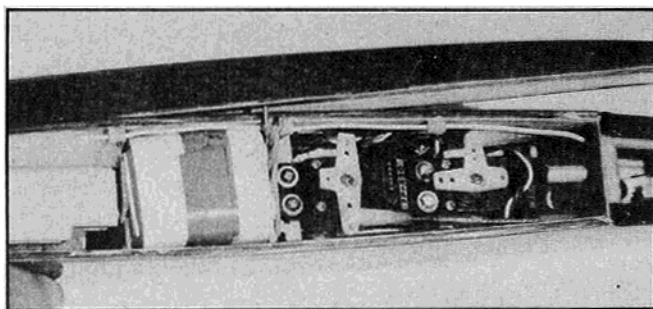
(7) A "Tee" tail configuration to assure the solid effectiveness of the stab and, perhaps, for less drag. A secondary consideration was that of removing the stab from the danger of being wiped out by my head when hand launching.

(8) And lastly, an airframe which is efficient (i.e., high strength to weight ratio), and which is fairly straightforward to build while still maintaining enough

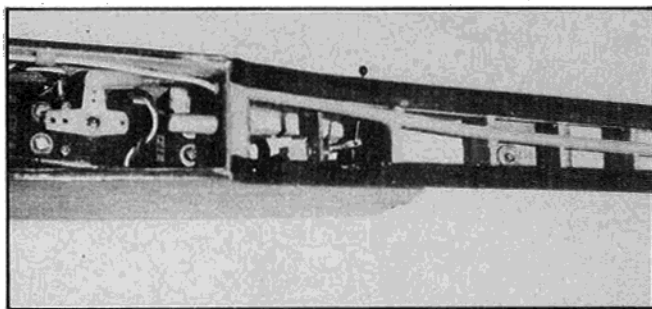
push into the wind and that's when the love affair started. That sailplane was connected to my right thumb --- I mean directly connected. Think turn and it turned right now, think penetration and it moved right out without the sink rate going completely away, think minimum sink and you would easily believe that the wing contained a lot of helium.

Was it fun to fly? Did it meet the number one priority? You bet! Was it sexy? That crowd of people looking at it thought so, and since that first day the RO8 has always had lots of people around to preen its feathers for, and that of course is very satisfying to say the least.

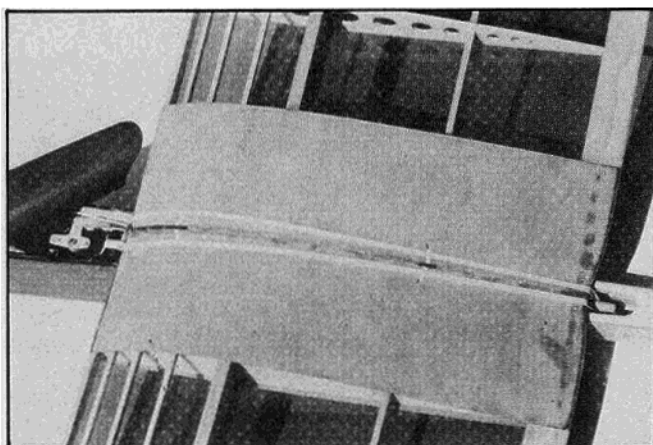
Now to the big question. Would the



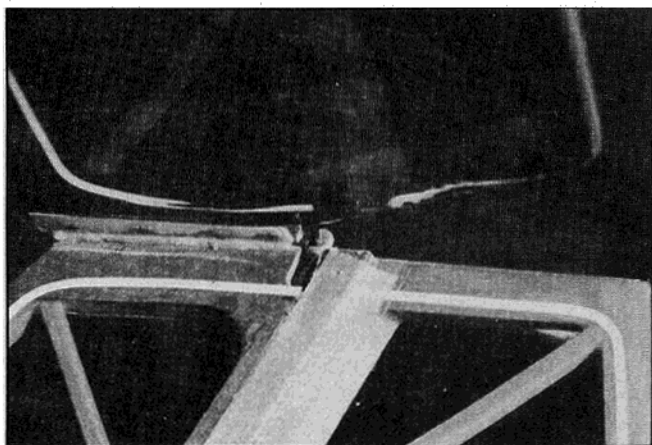
Hatch hold-down system, antenna leads, wiring is run under battery and along the sides of the servos.



Micro switch actuated by round headed pin, ballast control bulkheads.



1/64" ply center section showing holes for the use of "Hot Stuff." Index marks are for wing top ballast location.



Stab mounted on fin with baking soda fillet, stab control clevis, note recess in fin to allow for stab movement.

RO8 satisfy my need for a competitive and durable contest bird? The answer? Yes, it is a winner and I trust that you did not expect to hear anything different. The RO8 has yet to finish out of the money, with the most recent victory coming at the Western R/C Soaring Championships (June, 1979).

The RO8 may not be the utopia of the Two Meter class, but so far it has blown the shorts off every other Two Meter for the pure fun of flying, and the fun of flying should be what our hobby is all about.

CONSTRUCTION NOTES

General:

For adhesives I use Hot Stuff (HS), Wilhold aliphatic resin glue, and Sig slow cure epoxy. Use whatever equivalent you are comfortable with. When constructing the stab, fin, and rudder, I pin down all the parts, dust the joints with baking soda, and apply a small drop of HS. Turn the assembly over, dust joints with baking soda (BS), and apply HS again. For ply to ply joints in wing, fuselage, etc., I tack parts in place with HS, then make small fillets with BS and drop HS along the fillet. For the wing I tack joints with HS for the sake of speed and then follow up with at least two coats of Wilhold on all balsa to balsa and balsa to spruce joints. For laminations and overlays I drill 1/16" diameter holes on 3/8" centers in the plywood. Then dust the underlying balsa with BS sufficiently

to fill the grain. While holding the plywood in place, drop HS through the holes. This method is very quick and has proven to be adequately strong. Where localized stress is anticipated in light balsa, impregnate the area with HS.

Wing:

(1) Make wing rib templates from 1/8" ply. Make two root templates and one tip template, including all spar notches and holes.

(2) Make thirty rib blanks from 1/16" x 4" x 36" medium weight straight grained balsa. Make blanks 1.3" x 9". Each sheet will make twelve blanks.

(3) Make three rib blanks from 1/8" light balsa.

(4) Stack four 1/16" blanks and one 1/8" blank between root templates. Bolt stack with 4-40 or 6-32 bolts, washers and nuts. Shape airfoil to template. (I use belt sander.) Cut notches with fine saw and finish with "swiss" files. **Do not** cut holes in these ribs. Five ribs done! Did you forget the sub spar?

(5) Stack fourteen 1/16" blanks and two 1/18" blanks between root templates. Do same as #4 **but do not** cut holes this time. Hog out holes with Dremel Tool or drill. Keep well undersized. Finish holes with coarse, then fine, rat tail files.

(6) Stack six 1/16" blanks between one root template and the tip template. Do same as #5. Note the nasty angles

after shaping. A little hand work with a sandpaper block, "swiss" files on the notches, and a tapered grinding stone on the holes will make the ribs look right.

(7) Mark the leading and trailing edge stock for the rib locations. Notch all rib locations, **except** at the dihedral and polyhedral breaks, with fine hack saw blades taped together. Usually three blades together will produce a 1/16" slot.

(8) Pin down trailing edges on plan (use wax paper). Note flat portion of wing rib on bottom, near the trailing edge. Place this flat portion on plan and insert rib into trailing edge notch, keeping rib aligned over plan. Tack each rib as you go with HS. **Do not** install ribs marked (A) on the plan as they would prohibit the installation of the dihedral braces.

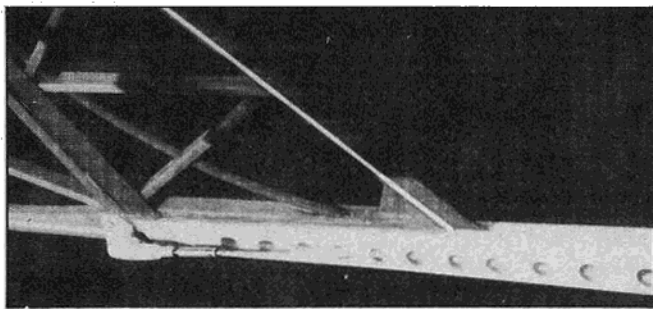
(9) Put on leading edge, tacking with HS. Yes, it is hanging in mid-air.

(10) Slide sub spar through ribs, checking for correct rib alignment again. Tack with HS.

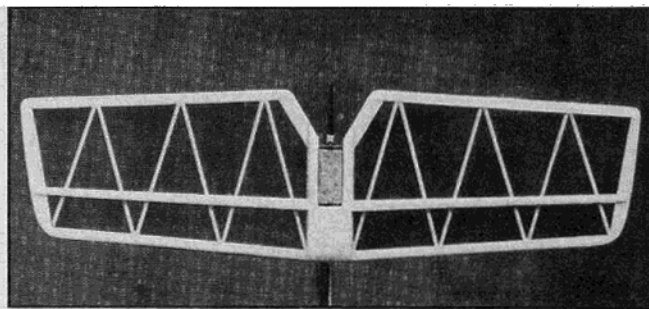
(11) Remove pins from trailing edges. Lift wing panels from plans.

(12) Lay bottom spars (1/8" x 1/8" and 1/8" x 1/4" spruce) on flat surface. Place each wing panel over appropriate spar and tack with HS.

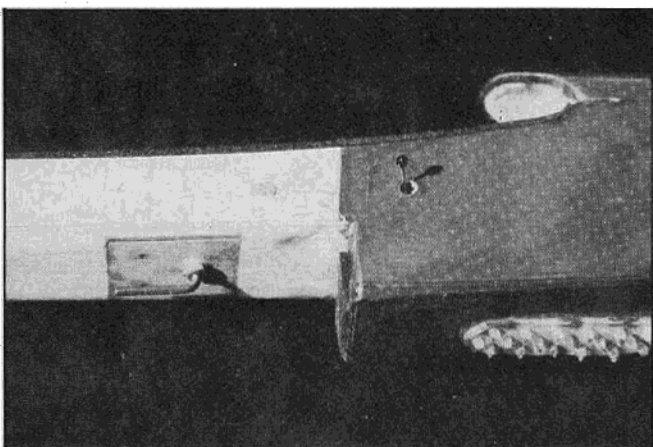
(13) Cut shear webs from 1/16" sheet and tack in place with HS. They must fit right — flush with bottom spar and flush with bottom of top spar notch. Not much



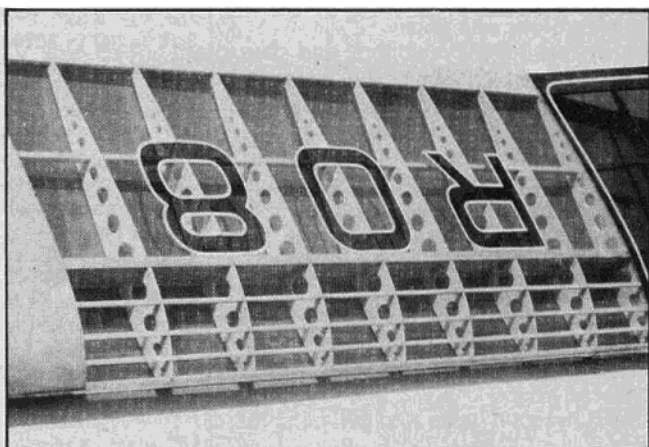
Stab control cable is centered on fin "ribs," note how rudder cable exits fuselage.



Completed stab mounted to fin, note again the holes in the 1/64" ply stab mount which are filled with baking soda and "Hot Stuffed."



Note that the switch has been moved? The plan location as shown is actually the best (trial and error!). Wing seating tape used for no-slip hand launches, skid made from car floor mat.



Wing is simple, strong and light. Holes really stop the traffic if covered with clear MonoKote and do help to keep the wing tips light.

fun, I know, but very important. The shear web grain is **vertical**, right? I'm sorry, but I had to ask.

(14) Turn the panels over and place over the remaining (top) spars. Tack with HS.

(15) Slide dihedral braces between spars and trim wing panel ends to achieve proper fit of L.E., T.E., and spars when at the correct angle of dihedral. With everything lined up, tack dihedral braces in place with HS. Tack L.E., T.E., and spars with HS.

(16) Cut remaining ribs (marked (A) on plan) to allow for dihedral braces. Cut 1/8" gap between ends of sub spar. Slide remaining ribs over sub spars to proper position. Tack with HS. All the ribs are now in position.

(17) Tack turbulators in place with HS. Tack tip gussets in place.

(18) Glue dihedral braces with baking soda fillets and HS or slow curing epoxy. I prefer the BS & HS method for reasons of speed, strength and weight.

(19) Glue all other joints with a minimum of two coats of Wilhold or equal. Pay particular attention to the shear web/spar joints. They must be slightly better than perfect.

(20) Glue on wing tips (1/4" sheet).

(21) Shape leading edge and tips. It is advisable to use a leading edge template to assure a consistent radius. Keep leading edge fairly blunt.

(22) Overlay the 1/64" ply center section on top of wing. I dust the balsa wood with baking soda, drill 1/16" holes in the 1/64" ply, then drop HS through the holes while holding the overlay in place with my sweaty little fingers. Quick, light, and strong!

(23) Turn wing over and add glue fillets (lots of BS & HS) at the leading edge, trailing edge, and along the three most center ribs. This will provide support for the wing bands and wing top ballast.

(24) Overlay the 1/64" ply center section on bottom of wing. Inlet trailing edge for wing bands.

(25) Finish sand the wing until all is flush and smooth. See covering note found later on.

Fuselage:
(Read caution note on plan — please!)

(1) Cut 1/32" ply fuselage sides. Tack together with rubber cement and cut holes (if you like). I mark center of holes using plan, then draw holes with circle template. Start with drill or Dremel Tool and finish with long tapered grinding stone.

(2) Cut fuselage top and bottom from light but strong 3/16" sheet. Glue the top and bottom to the **right** fuselage side using epoxy.

(3) Cut the outlet holes for the rudder and stabilator cable leads. Place these

two cable leads through their outlet holes and position them, along with the antenna lead, in place on the fuselage bottom. Leave the cable leads plenty long at this time.

(4) Install 1/16" sheet bulkheads (cable lead retainers) aft of the wing trailing edge.

(5) Install the tow hook doubler on the inside of the fuselage.

(6) Glue the **left** fuselage side in place with epoxy. Be sure to position antenna lead outlet.

(7) Make up bulkheads 1, 2, 3 and 4, including the wing band dowels. If you cut all the required access holes in the bulkheads at this time you will be a happy person later on.

(8) Slide bulkhead 4 over cable leads and glue in place. Cut wing seats from 3/16" sheet and glue in place.

(9) Glue 3/16" triangle stock to bottom inside of fuselage and box in finger hold area with the same stock.

(10) Slide bulkhead 3 over cable leads and glue in place. Also glue 1/32" ply ballast deck in place if you decide to go that way.

(11) Glue 1/16" ply fuselage doublers in place, followed by bulkheads 2 and then 1.

(12) Decide upon the type of switch you will use and tackle that installation now. I use a micro-toggle switch actuated by a push-pull wire which

hooks through a hole in the end of the toggle handle and exits the fuselage on the side that I can see when launching. A mini slide switch also works well.

(13) Glue 1/32" ply finger hold in place. Sand bottom of fuselage components flush and glue fuselage bottom in place. I use epoxy for this by leaving fuselage bottom oversized and use rubber bands to hold bottom in place while epoxy cures.

(14) Tack 1/2" hatch block in place. Rough size is 1/2" x 1 1/2" x 9" for now. Drill 1/16" hole for hatch pin from front side of bulkhead 1.

(15) Sand front of fuselage flush. Glue on nose block with epoxy.

(16) Inlet fuselage bottom and glue bottom tow hook doubler in place. Install one or more 1/16" sheet bulkheads under wing. Suit yourself. These bulkheads end up being tiny after allowing for the wing seat and various cable leads. Maybe your buddy has smaller fingers. If you use these for ballast control, impregnate each one with HS for strength.

(17) Run this whole mess by the belt sander a time or two and finish with a little hand work. Should look like a fuselage now.

(18) Remove hatch and set aside for now.

Fin And Rudder:

(1) Pin down fin leading edge on 1/32" shims. Pin down all the various 1/4" stuff and glue it. I use BS & HS. Hate to waste time with that contest coming up. If you like, cut holes for stab cable lead as you assemble the "ribs." Note that the fin post extends to fuselage bottom. Glue in leading edge gusset.

(2) Shape the fin right now. Slide fin over stab cable lead and place fin on fuselage. What progress! Mark cable lead 1 1/2" from top of fin. Remove fin. So much for progress. Cut cable lead off at the mark.

(3) Slide fin back over cable lead and position on fuselage. Check cable lead length. Strap something on the wing seat (the wing?) and pin the fin in a "vertical" position relative to the wing. Does everything look right? Glue it!

(4) Apply 1/64" ply overlays on both sides of fin post and ends of fuselage top and bottom. Finish shaping fin and fuselage.

(5) Pin down rudder trailing edge on 1/16" shims over plan. Cut 1/8" sheet lengthwise on a 45° angle to make the rudder leading edge. You need only cut one side at this time to get it pinned down. Cut the various 1/4" stock for the "ribs," top, bottom, etc., and go totally nuts trying to make the compound angles fit properly.

(6) Give up yet? Shape the thing and call it good. Impregnate control horn area with HS.

Stabilator:

(1) Fit and glue 1/8" leading edge, trailing edge, tip piece, and 1/8" x 3/8"

Material List

1/64" ply — 6" x 24", 1 req'd	.....	wing center section, fin post, misc.
1/32" ply — 6" x 36", 1 req'd	.....	fuselage, bulkheads
1/16" ply — 3" x 12", 1 req'd	.....	doublers, dihedral braces
3/32" ply — 2" x 12" 1 req'd	.....	dihedral brace, bulkhead
1/8" ply — 4" x 9", 1 req'd	.....	rib templates, misc.
1/8" x 1/8" x 36" spruce, 2 req'd	.....	outer wing spars
1/8" x 1/4" x 36" spruce 4 req'd	.....	inner wing spars
1/16" x 3" x 36" med., 1 req'd	.....	shear webs, misc.
1/16" x 4" x 36" med., 3 req'd	.....	wing ribs
3/32" x 1/8" x 36", 9 req'd	.....	turbulators
3/32" x 2" x 36", 1 req'd	.....	stab
1/8" x 1/8" x 36" med., 2 req'd	.....	stab ribs
1/8" x 1/4" x 36", 4 req'd	.....	sub spar, fin ribs
1/8" x 3/8" x 36" hard 1 req'd	.....	stab
1/8" x 1/2" x 36", 2 req'd	.....	stab, misc.
1/8" x 2" x 36", 1 req'd	.....	wing ribs, fin, misc.
3/16" x 3/8" x 36" med, 3 req'd	.....	wing and fin L.E.
3/16" x 2" x 36", 1 req'd	.....	fuselage, bulkheads, misc.
3/16" x 3/4" x 36", 3 req'd	.....	wing T.E.
1/4" x 2" x 36" 1 req'd	.....	wing tips, rudder, misc.
1/2" x 2" x 9" 1 req'd	.....	hatch
1/2" x 2" x 9" hard 1 req'd	.....	laminates for nose block

Various other bits and pieces hopefully found in your scrap bin.

Accessories required:

Control cables — Sullivan #508, 0.058 dia. or equivalent, 2 req'd

Cable housing for antenna lead, 1 req'd

Small control horn, 1 req'd

Small nylon clevis, 3 req'd

Small tow hook, 1 req'd

1/16" music wire

1/16" I.D. brass tube

3/32" I.D. brass tube

Hint — I have been buying bulk quantities of balsa and plywood from Balsa USA as advertised in RCM, etc., and save 50% to 70% on construction costs.

root piece over plan. Fit and glue 1/8" square "ribs" in place. Note that the leading edges join at stab centerline, but **do not** glue this joint yet.

(2) Mark location of 1/16" wires on root pieces. Lift panels from plans and drill 1/16" holes for the wires.

(3) Cut 1/16" music wire to length and slide stab panels onto wire. **Do not glue.**

(4) Pin down stab on plan. Adjust holes if necessary to allow stab to lie flat.

Do not glue wires.

(5) Fit and glue 1/8" filler, top spars, and 3/32" overlays in place.

(6) Turn stab over. Fit and glue bottom spars and 3/32" overlays in place. **Do not glue wires.**

(7) Make clevis for stab from 1/16" and 3/32" I.D. brass tubes as shown on plan. Solder together.

(8) Make stabilator mount, making sure that there is 1/32" minimum clearance between stab and stab mount. Groove leading edge of stab mount and glue 1/16" I.D. brass tube in place. I use BS & HS, and impregnate the forward portion of the mount with HS. A strong joint here is mandatory or you may suffer the embarrassment of having your RC sailplane "dethermalize" at 60 mph.

(9) Shape and sand the stab and stab mount.

(10) Slide the 1/16" stab wires one way or the other sufficient to clear the stab mount opening for the hinge wire and sufficient to slip on the clevis for the actuating wire. Slip on the clevis and

return that wire to position. Place stab mount in position and slide wire back into position. **Now** glue the wires. Glue the hinge wire only on the outboard side of the 1/8" x 3/8" root pieces and at the 1/8" square "rib." Should you allow the hinge wire and brass tube to become tacked together you will probably kick your dog and nobody needs another vet bill.

Covering And Assembly:

(1) Cover wing with Super MonoKote as the skin is a part of the structure and lots of torsional strength is required to prevent flutter during speed runs. Tack skin on perimeter of wing structure with as few wrinkles as possible. Shrink the skin just enough to remove wrinkles and straighten the wing panels. Now tack the skin to each rib, both top and bottom. Complete the tightening of the skin and straighten wing. I do not use any tip washout and firmly believe that none is necessary or desired with this wing configuration. Suit yourself.

(2) Cover fin and rudder, overlapping skin around trailing edge of fin and leading edge of rudder.

(3) Cover fuselage. Not fun, but lighter than most other finishes. Trim rudder and antenna leads to length. Cover wing seat with foam seating tape.

(4) Hinge rudder to fin with MonoKote or tape and check for rudder movement of 35° each direction.

(5) Cover stabilator and stabilator mount assembly. Check for free

**By H.E
RCModeler
Oct. 1979**

movement of stab on hinge. Trim covering away on top of fin and bottom center of stab mount.

(6) Solder stab cable into stab clevis and check for free rotation of clevis on wire.

(7) Slide stab cable into cable lead and position stab on top of fin. Check for free movement of stab by use of servo end of cable. Everything okay? Strap on wing, align stab and glue it. Again, I use BS & HS.

(8) Leave wing in place. Go find the hatch (which is by now buried under a huge pile of scraps) and cut the aft portion to clear the wing and wing bands. Hollow the hatch (optional) and install the hatch pin and hatch hook. Impregnate the hatch front end grain with HS. Impregnate the hook area with the same. The hatch/hatch hook joint should be ultra strong if you like your radio gear much at all and fly a little crazy like I do.

(9) Glue on 1/16" ply hatch tabs on bottom rear of hatch. They key into the inside of the fuselage. Hit the hatch with a little sandpaper and cover it.

(10) Install servo mounts of your choice. I use that strangely shaped front mount for the hatch hold-down bands. It is light and simple.

(11) In mounting the servos, I bolt the servos together in the middle and mount them only at the extreme ends. Suit yourself.

(12) Install a tow hook and nose skid of your choice.

(13) Hook up all of the electrics and control stuff and let's fly the thing.

Flying:

(1) Set up rudder for 35° deflection in each direction (about 2 5/8" measured at bottom part of rudder). Set stab for minimum travel.

(2) Align stab parallel with top of fuselage at neutral trim. This produces fast flat flite.

(3) Balance sailplane within C.G. range shown on plan. The prototype balanced at the aft location without the addition of any weight.

(4) Balance the sailplane laterally by addition of weight to the light wing tip.

(5) Check for freedom of control movement, clevis snapped closed, radio stuff packed in so it will stay put, battery charge level, etc., and head for the field.

(6) Turn on radio, trim rudder to neutral, and trim stab **up** one half way toward full up trim. Wipe the sweat from your palms and have at it.

(7) For hand launching, speed, and other games, I prefer the C.G. at the aft location. For windy weather thermalling you may want to move the C.G. forward to improve pitch stability. The C.G. is not

too critical as the airfoil only has a 2% mean camber which keeps the center of lift fairly stationary.

(8) Once you become familiar with the little beast, set up the rudder and stab deflections to suit your style. I do not ballast the RO8 for thermalling until the wind velocity exceeds about 6 mph, but trial and error will find the most comfortable weight for your local conditions. In any event, the RO8 will provide a maximum of flexibility for the various soaring tasks while maintaining a reasonable amount of durability. Where is the next contest? Good luck and most important of all — **Have Fun!** □