

ROTORUTA

For Swinging Singles

I hope that you were not misled by the title of this article, and are now expecting to read something that's more appropriate to a magazine like "Playboy". Sorry about that, but after all, this is a family magazine despite some of the covers we've been seeing lately.

No, the swinging singles we mean are single channel pulse radio models, and we hope that this article will be of interest to all who enjoy this type of flying.

First of all, maybe I should introduce myself. The name is printed above, so we don't have to go into that. I've been a modeler for innumerable years, and have made all types of models --- contest types, free flights, Ukies, PAA loads --- you name it, and I've probably tried it. However, one of my main interests

By J.W. Headley

has always been sport and offbeat models, which could explain my fondness for single channel flying.

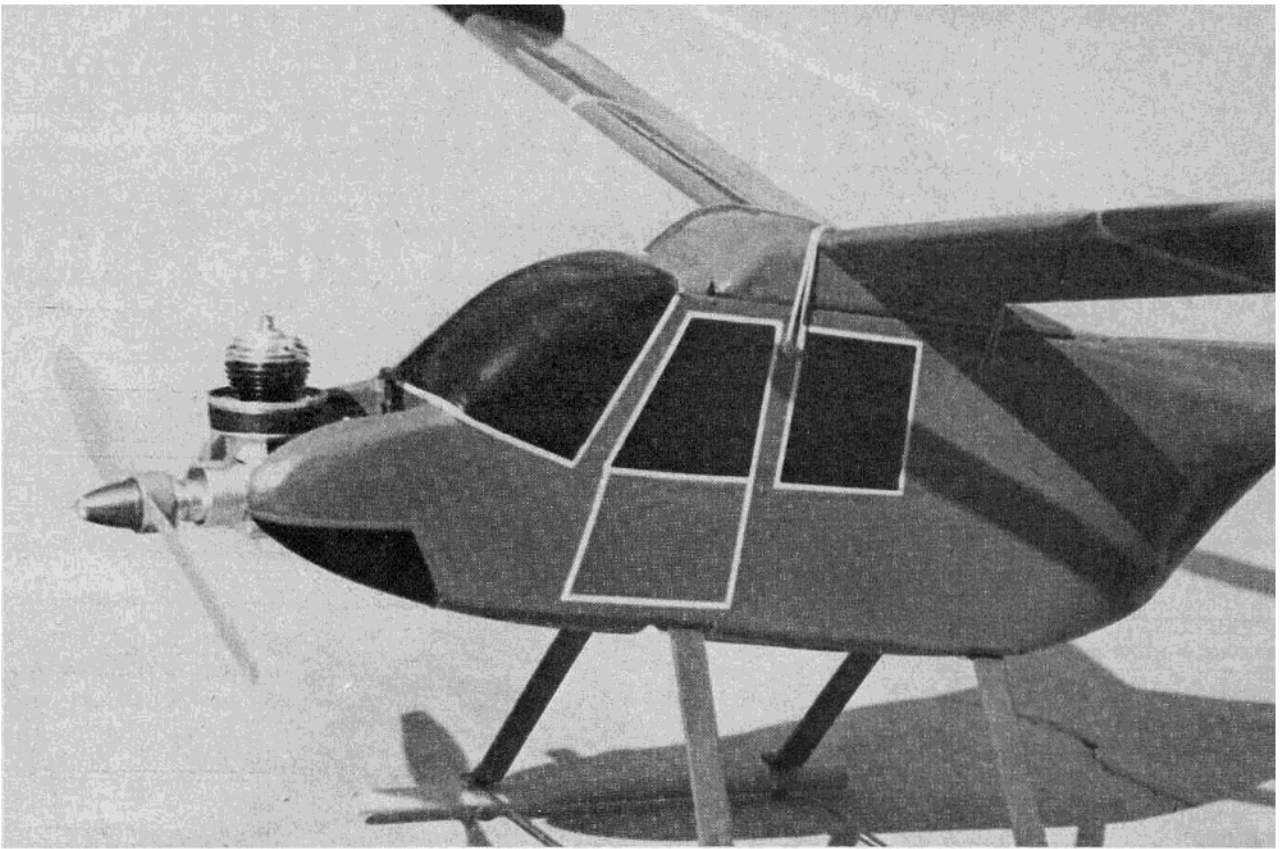
Maybe before we get too far along here, we should discuss exactly what this "single channel flying" is that we've been talking about. Pick up an old magazine and you'll find that it used to be the only way to do any radio flying. Innumerable articles were printed, all with ingenious little diagrams to show how you could do consecutive barrel rolls after a complicated series of setting up maneuvers, using rudder only control.

Other articles showed how to couple up an auxiliary elevator control, and other subsidiary functions, and there

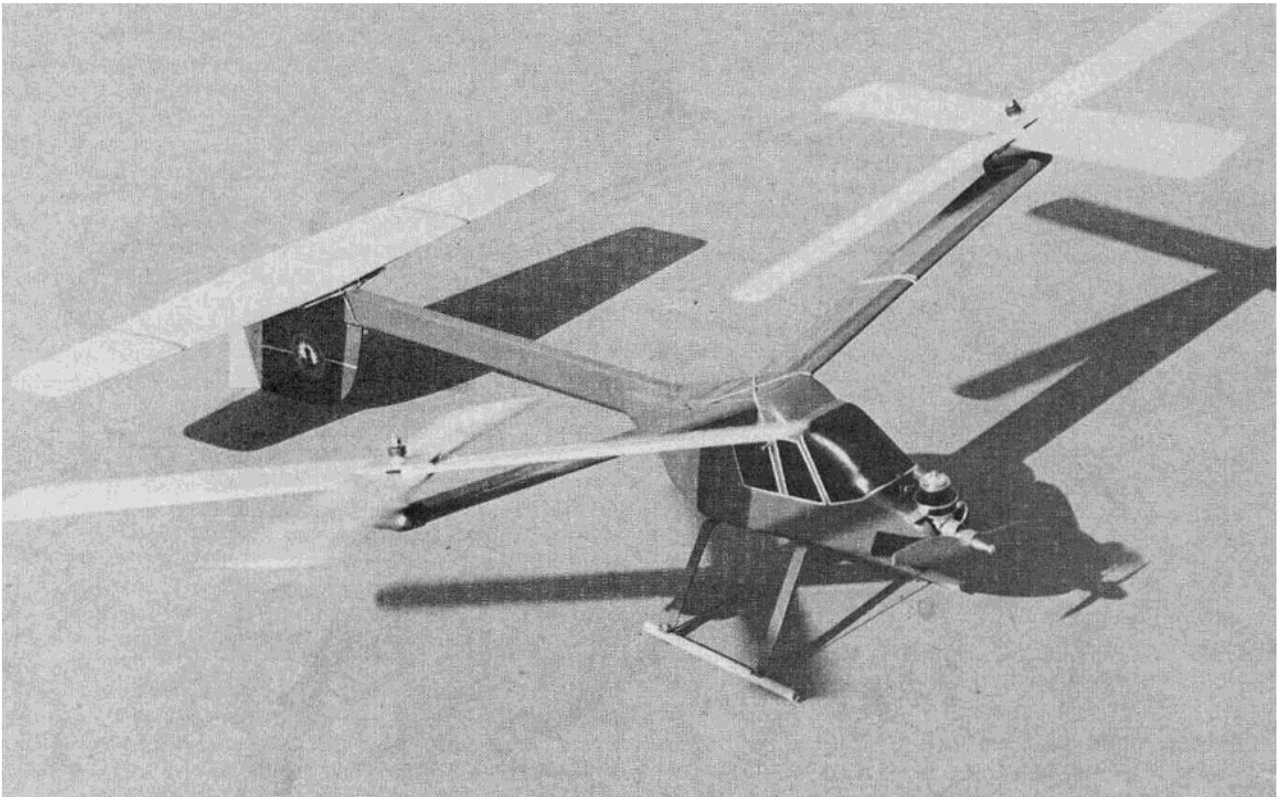
was probably one somewhere that showed how to control a B-29, with full motor control, a retracting gear, and also with bomb dropping capability. Don't think that I'm making fun of these efforts, far from it. Anyone who could do all of this with only one channel deserves much praise.

But all this was then, and now we have multi-channel radios to take care of all aerobatics, or dropping bombs from a B-36, so what's left for the single channel fan?

Well, it's really what was there all the time, and that's fun flying, with small and compact models that can be flown locally, and none of the problems of "... fiberglass the cast titanium main spar to the epoxy coated foam wing, then install the helium powered retracting U/C ..."



For swinging singles, try this twenty-four inch span single channel autogyro. With a total rotor area of 552 square inches, this Half-A machine is definitely for the sport flyer looking for something easy-to-build and out of the ordinary.



sort of thing. None of the budget worries of launching a custom made Schnuerle ported ABCDEFG \$110 engine into outer space. In short, in the words of the great Don D., "Single channel can give you many hours of flying fun between those weekend sessions with the larger more exotic ships." This is surely what it's all about.

As this is our first article in quite a while on single channel, I thought it might be a good idea to spring something a little out of the ordinary on you in terms of a building project.

The model shown here is based on a simple profile prototype constructed intermittently with a friend last year (I went on vacation, then he went on vacation). The original model was free-flight (dare I say that here?) and showed such remarkable stability and ease of trimming that it was rather crudely converted to single channel. Essentially, I stuck the Ace radio on the side of the 1/4" sheet fuselage, and sewed an 1/8" sheet rudder to the back of the fin. (This idea of attaching the radio to a profile body is, itself, quite useful.)

The extra weight seemed to make little difference to the excellent performance; the model would still climb almost out of sight when we used a nice new prop and a shot of racing fuel.

This model, crude as it was, flew weekend after weekend, utterly reliable (a change from my usual models) and it's still flying when I can spare the radio equipment for it. With all this great success, it was only natural to make a second, and improved, version all prettied up with the radio on the inside this time, and real dope on the balsa, rather than the protective coat of used engine oil that graced the prototype.

I should have stayed in bed. With all the wonderful improvements I thought up (better rotors, more elegant fuselage, etc.), the magic went out of the configuration, and none of the prototype's performance was transferred to the second version. After a few mediocre flights, Ole' No. 2 (it became old very quickly) was shelved, and it was back to the No. 1, with not quite as many improvements this time. This version, No. 1A, got us back to the original flying patterns, and this is the model we show here.

CONSTRUCTION NOTES

Construction of our model is really quite simple, and so we'll only deal with any points that need special attention and run lightly through the other features.

Fuselage: Begin by making the tail boom, which is simply two strips of hard 1/4" square sandwiched between two pieces of 1/16" sheet. The fuselage pod is next, this being mainly 1/8" sheet for the sides, bottom, and frames, with an 1/8" plywood firewall. Doublers made from 3/16" sheet help to locate the firewall, and allow some roundness to be

ROTORUTA

Designed By: Jack Headley

TYPE AIRCRAFT

Single Channel Autogyro

WINGSPAN

24 Inches

WING CHORD

2 Inches

TOTAL WING AREA

48 Square Inches

WING LOCATION

High Wing

AIRFOIL

Flat Bottom

WING PLANFORM

Constant Chord

DIHEDRAL, EACH TIP

2 Inches

ROTOR DIAMETER

18 3/4"

ROTOR CHORD

1 3/4"

TOTAL ROTOR AREA

552 Sq. In.

ROTOR LOCATION

1 At Each Wing Tip

ROTOR AIRFOIL

Flat

ROTOR PLANFORM

4 Blade Constant Chord

O.A. FUSELAGE LENGTH

29 1/2 Inches

RADIO COMPARTMENT AREA

(L) 4 1/2" X (W) 1 1/2" X (H) 3"

STABILIZER SPAN

17 7/8 Inches

STABILIZER CHORD

4" (Avg.)

STABILIZER AREA

71.5 Sq. In.

STAB AIRFOIL SECTION

Flat

STABILIZER LOCATION

Top of Fuselage

SUB FIN HEIGHT

3 1/2 Inches

SUB FIN WIDTH (incl. rudder)

5 Inches

REC. ENGINE SIZE

.049-.051 Cu. In.

FUEL TANK SIZE

Tank Mount

LANDING GEAR

Skids

REC. NO. OF CHANNELS

1

CONTROL FUNCTIONS

Rudder Only

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Balsa & Ply
Rotors	Balsa & Ply
Empennage	Balsa
Wt. Ready-To-Fly	15 Oz.

sanded into the nose. At the back of the firewall, 3/8" triangular strips provide additional bracing. After the basic box is completed, cement the boom into place carefully, making sure that it's aligned correctly. Add the fairing pieces around the boom, then sand to the final contours. An additional block is required for the canopy, which can also be sanded to its final shape now.

Complete the fuselage by adding the remaining doublers at the wing station, also the additional sheeting on the fuselage bottom. More sanding now until the final shape is obtained.

The Wings: The wings, which are really the rotor holder-uppers, are cut from a length of 3/8" x 2" trailing edge strip (which is also called "aileron stock" in some places).

This comes with a full radius leading edge, so the first thing to do is sand a better airfoil onto the strip, such as that shown on the plans. Next, cut a couple of 3/4" wide slices of the strip, and cement these in place backwards on the wings tips to provide a pad for the rotor supports. A set of 1/16" ply plates are cemented top and bottom at the wing tips also for additional reinforcement.

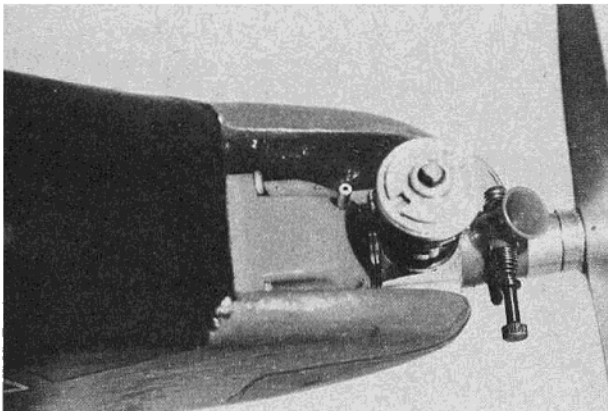
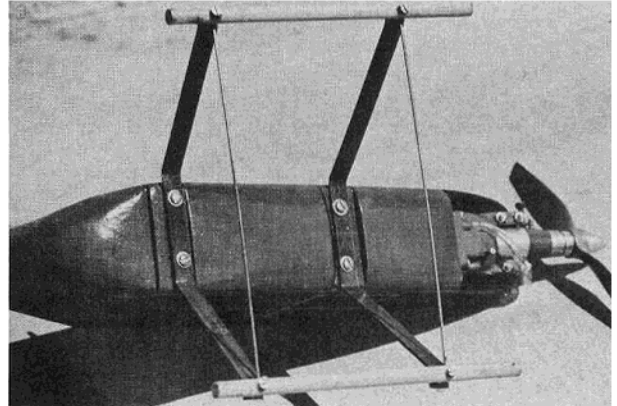
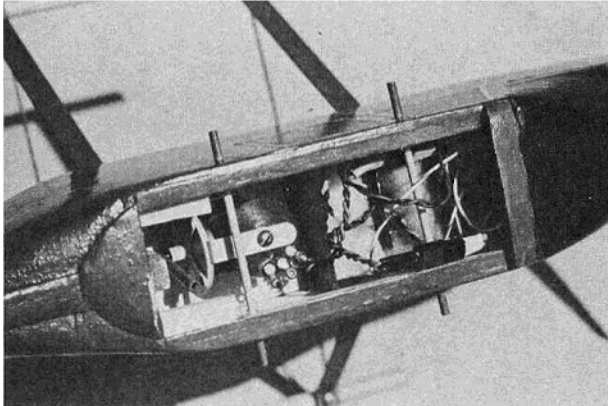
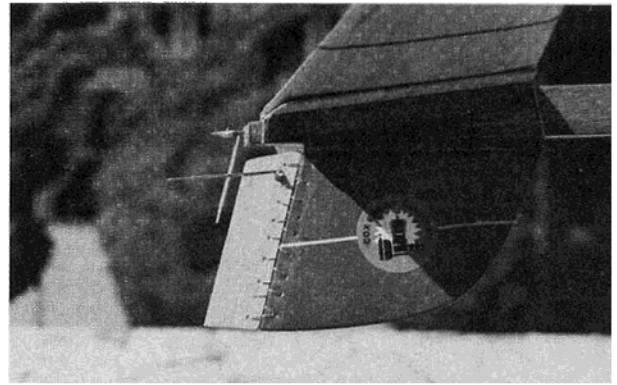
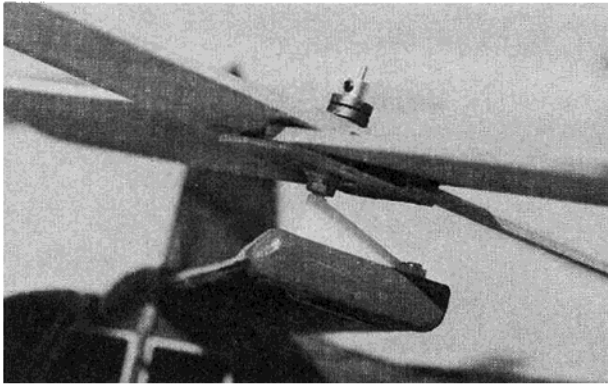
Cut the wings in the center, remove a piece of the leading edge to make space for the ply brace, sand the wing roots to the correct bevel, and epoxy the wing, plus the ply brace, back together at the correct dihedral angle. The wing support and center section fairing is attached after the fuselage is completed.

Rotors: After playing around with all types of rotor blades and construction schemes, I went back to the very simplest of all, the overlapping hub with parallel chord blades, the blade angle of attack being controlled by the amount of overlap at the hub.

Make up two rotor sets, one left and one right as shown on the plans, then epoxy the top and bottom 1/16" ply hub plates into place. Don't spend too much time on rotor blade airfoils; a simple piece of sheet with rounded edges works just as well as a carefully sanded airfoiled rotor.

Rotor Assembly: Drill the hubs for the rotor bushings and install these (I used some old rubber model prop bushes here, but anything similar, brass or nylon, will do).

Screw the tailwheel brackets onto the wing tips, then drill through the wing tips, using the bracket as a drilling guide, for the rotor masts. Bend up the rotor masts from 1/16" piano wire and epoxy them into place. Now install the rotor on the mast, add the thrust bearing (Sig Ball Bearing Washer 475 can be used) and secure with a Du-Bro wheel collar. Make quite sure that this collar is on tight, as it's the only thing holding the rotors onto the model. When complete, take the wing/rotor assembly outside, and hold it at right angles to the wind, whereupon



TOP ROW, LEFT: Close-up of simple rotor blade installation. TOP ROW, RIGHT: Designer uses sewn hinge on rudder for the most flexible hinge possible. ABOVE, LEFT: View showing Ace R/C's standard actuator. Room for one of the small micro servos. ABOVE: Bottom view showing landing gear skids and spreader bars screwed in place. LEFT: Close-up of Cox's tank mount with .049 Medallion installed.

the rotors should spin quite briskly. If they don't, disassemble and reduce the friction until they do rotate freely.

Horizontal Stabilizer: The horizontal stabilizer is shown on the plans as a built-up structure, mainly 1/16" sheet and 1/8" strips, with soft 1/4" sheet added front and back, but, if you prefer and have enough 3/16" sheet available, a simpler solid sheet version can be substituted.

To build the stabilizer, begin by making the central box, which uses 3" wide skins top and bottom. When dry, sand the edges smooth and flat, then add the 1/4" sheet. A final sanding to the correct contours finishes off this item.

Fin and Rudder: These are cut from reasonable quality 1/8" sheet, the rudder being attached to the fin with carpet thread hinges. Be sure that this hinge is

very free. Cement the fin underneath the boom, and reinforce this joint with a couple of 1/8" triangular strips.

The horizontal tail mount is now made from 3/32" sheet, then cemented to the top of the boom, together with its own 3/8" triangular reinforcing strips.

Undercarriage: The undercarriage is made up of 1/16" sheet aluminum legs onto which some short lengths of 1/4" diameter arrow shafts are bolted. To prevent the whole thing from collapsing after the first landing, the legs are cross braced with a couple of 1/16" wire spreaders. When the model is complete and painted, the unit is screwed onto the fuselage bottom, plywood plates being provided for this purpose.

Engine: The photos mainly show the model equipped with a Cox .049 QZ R/C engine, and this was the motor that I

used for some of the early test flying. However, it soon became apparent that more urge was required, so the QZ was replaced by a Medallion with a Cox tank mount, and this cured all the flying problems. So, that's the engine you see drawn on the plans, plus the aforementioned tank mount. (I still wonder why Cox uses a different mounting hole pattern on this tank unit than the regular Bee engine hole array?)

If you prefer a separate tank, then move the firewall forward, use an Ace mount, and fit the tank behind the new firewall.

Radio: My old faithful Ace was used in the prototype, with a standard actuator. The fuselage has plenty of room for all the goodies, and these can be well wrapped with foam rubber before instal-

lation. The actuator is bolted to a small platform in the aft compartment, which is angled slightly downhill to align the actuator to the torque rod. This torque rod is not located at the front end, but is attached directly to the actuator arm with a tight plastic sleeve. At the aft end, a small "L" shaped wire is soldered to the main torque rod to provide the rudder actuation.

(Although the Ace radio is shown on the plans, there's no reason why a single servo set couldn't be used. The only real revision would, of course, be to substitute a pushrod for the torque wire.)

Finishing: It hardly seemed worthwhile to warm up the iron to cover the model with plastic film, as it's all corners and bends, so the prototype was painted with Super Poxylite all over, except the horizontal, which was clear doped, and the blades, which were lightly sprayed with silver.

FLYING

The model is, of course, hand launched, and the technique for hand launching is a little different from the usual model, i.e., you must not throw it! The first step in the launch process is to get the rotors spinning up to speed, and this is done by holding the model at right angles to the wind (if there's no wind, you have to run and make some). Then, when the rotors are really spinning well, bring the model attitude down to the horizontal quickly, and let it more or less fly out of your hand. The model might then sink a little before climbing out, but once flying speed is reached, it should climb away briskly. Maybe a small push will be required, but no throwing. The engine should be set for "all-out". Use the best prop and racing fuel to get a good climb performance and, in good trim, the model should reach at least 300-400 ft., then circle until the fuel runs out. At this stage, the model should glide back to earth in a fully controllable manner but, by changing the C.G. a little a completely vertical descent can be made.

If the model doesn't climb well, it's either a lack of power, or the wing hasn't enough incidence, so first, check the engine. Then, try a small shim between the wing and the fuselage, which should tilt the rotor backwards, or pack up the rear of the tailplane.

Try to avoid too much rudder control, as the model might go into a waltzing motion, which is quite safe, but looks a little funny.

That's about all for the flying bit; it's really quite a simple model to fly after the initial steps of getting a good launch have been mastered. □

From RCModeler Jan. 1978