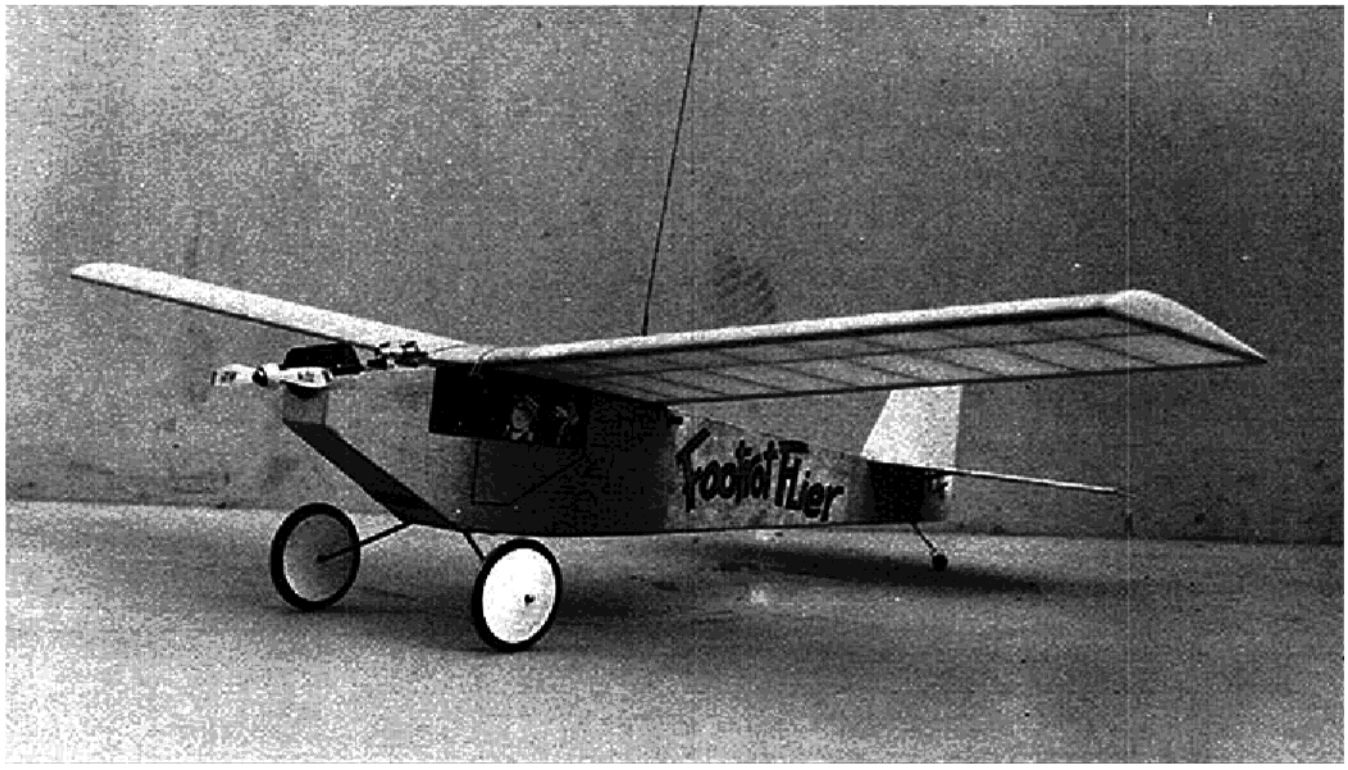


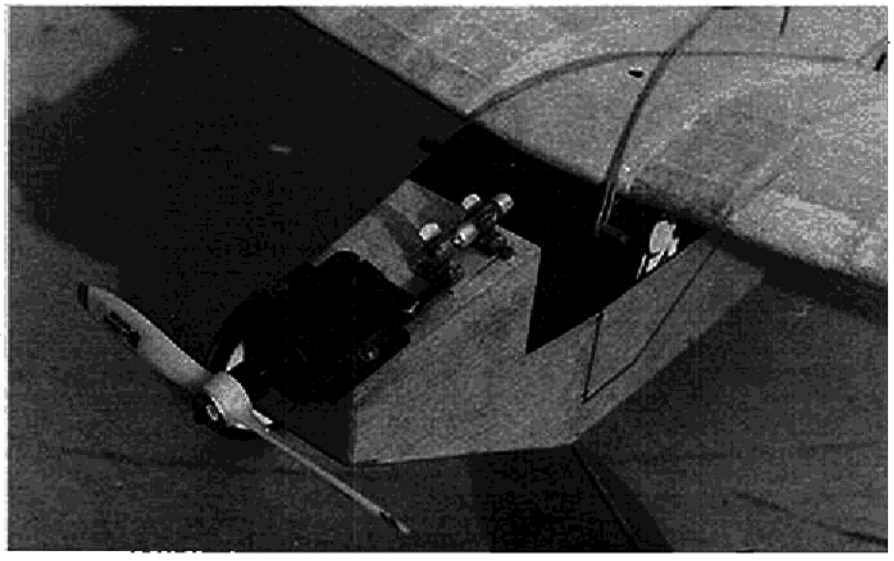
The FOOTROT FLIER

By JOHN REID. . .An extremely simple electric free flight with R/C assist through rudder control, this model comes to us from New Zealand. Its namesake is a deservedly obscure local comic strip. Why not build one?

• The Footrot Flier is designed for rudder-only, radio-assist, "freeflight."

It is possible to add a rudder to most free flight power models, but the dream of steering serenely about the sky in search of thermals isn't always realized. Rudder-only models tend to nose up after a turn. For many converted free flight designs, this can be the beginning of a series of stalls. An expert knows to turn again out of the stall but the result is still an untidy flight pattern. The most common compromise is a nose-heavy trim that looks anything but serene.

Power stalling was reduced in early R/C designs like the Rudderbug and Trixter Beam, by a high thrust line/low C.G. This is not quite the same as just adding downthrust! The effect of the low C.G. increases as the nose rises and speed drops—when a stall threatens, in fact. The Footrot Flier copies this layout. It can be trimmed to fly quite slowly and won't stall under power unless severely provoked.



Motor is an Astro 020, connected to the circuit by a 10-amp fuse. This makes a simple on-off switch, and protects the motor armature as well. A simple and clever solution.

Some rudder-only models simply refuse to turn out of a stall. The rudder seems to stop working at the crucial moment. The cause is usually blanketing of the rudder by the turbulent slipstream from the nearly stalled center part of the wing. Washout only makes this condition worse, locking the aircraft into straight flight earlier. The rudder of the Footrot Flier is carried well down into the clean air beneath the tailplane. There is always plenty of rudder response. A "Findragger" layout would make even more sense, I suppose.

Rudder-only landings are a bit firm at the best of times. Wind velocity gradient near the ground is the reason. (Downwind landings are smooth with a nice flare-out!) So, to avoid bent landing gear and reduce loads on the fuselage (thus allowing lighter structure), a torsion-bar spring is incorporated. This sounds sophisticated but is the simplest, wire-bent landing gear you can imag-

The Footrot Flier passes its torture test with flying colors. . .landing gear is capable of sustaining considerable force when subjected to the Adidas stress test, standard procedure in New Zealand.

ine. Look at the plan. This landing gear is so flexible that, earlier in its career, when the motor switch was located under the fuselage, the Footrot Flier would sometimes turn itself off when landing.

The model in the photos is over five years old. The tissue is faded and patched, but no structural repairs have ever been needed. After hundreds of flights, it still climbs up to thermal height on the original Astro 020 and cells. As far as my eyesight permits. Not that I manage to find thermals very often, but the Footrot Flier does 5 to 6 minutes anyway.

Construction is very simple, but you must always keep weight in mind as with any electric aircraft. Wood sections are fairly small so medium density balsa is O.K., except for the tail surfaces, which should be light, and the wing top and bottom mainspars, which should be very firm (or spruce if you intend to add elevator control). Please order some tissue before you start. It really is the only suitable covering material for this type of aircraft.

Be sparing with glue, which is heavy. If you use cyano the building sequence doesn't matter. Otherwise follow the sequence below to avoid delays while glue hardens.

CONSTRUCTION

Cut all the bits out first. Note that the fuselage sides fit very economically on a four-inch wide sheet. The tailplane mount triangles are added later so that the top edge of the sides can be aligned with opposite edges of the sheet. If the front ends of each side are at opposite ends of the sheet, the bottom rear edge of each side forms a common line. Think about it and save balsa! Just take care that there is not too much variation in density across the sheet, which will result in unbalanced sides.

Glue the tailplane mount triangles and the three 1/8-square rear stiffeners on each fuselage side. Make the bulkheads (ice cream sticks will probably be right for F1), and glue on the stiffeners for the tailplane and fin. Put all this aside to dry and turn to the wing.

WING

Make 18-inch washout templates with a straight taper from 3/16-inch to zero. This raises the rear of the outer ribs. Washout isn't usually needed with a low aspect ratio, rectangular wing planform. But it does make the stall even more gentle, which is welcome if the rudder is placed where it won't be blanketed!

Fasten the leading edges, the center bottom sheeting (leaving a gap for the lower mainspars which go in later), and the ribs to the building board. Tilt the center ribs using the dihedral template. The trailing edges glue to the top of the ribs; make sure that they are sitting right down on the washout template and the ribs. Now add the top spars, the main extending to the center rib, the small ones only to the edge of the sheeting. Fit the top sheeting now and let everything harden for a while.

I hope you used a length of cellulose tape on the plan at the leading edge, and along the washout template so that you can remove the wings from the board. If so, add the bottom mainspars (right to the center ribs), and the outer part of the wingtip ribs, which are not cut out for spars. Fasten the wings to the board and washout template again, while the glue hardens.

Sand the wings to remove glue lumps that would show through the covering. Cover each individual wing at this stage. Water shrink and apply three coats of thinned dope, elasticised with Castor oil. Fasten down the wings, for the last time, and leave until the rest of the construction is finished. Those wings won't warp. The two wings are epoxied together at the correct dihedral with no further bracing. The center section of the original model was a bit different, but the way shown here is lighter and simpler.

FUSELAGE

Now the fuselage. Join the sides at the bulkheads squaring carefully. Join the rear of the fuselage sides and sheet the bottom from 1/4-inch behind F1 (so that the landing gear can be fitted later), to the back, grain cross-ways.

RADIO

This is the time to install the radio. I used the smallest Ace Pulse Commander outfit, for an installed weight of 2-1/2 oz. This gear is a delight, but I'm not sure whether it's still available. My disrespectful comrades at the flying field swear that the propeller is cosmetic; the flapping rudder providing the thrust.

The installation details on the plan are for this outfit. It is made into a "brick" which can be transfered from one model to another, in moments. The aerial plugs into a Fahnstock clip, that is epoxied to the inside of the cabin. A lump of plastic foam, under the wing, holds the whole thing in place. The slide switch is mounted sideways on

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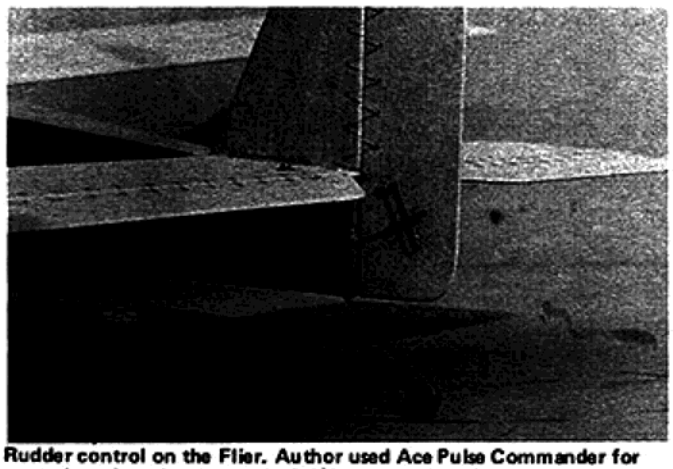
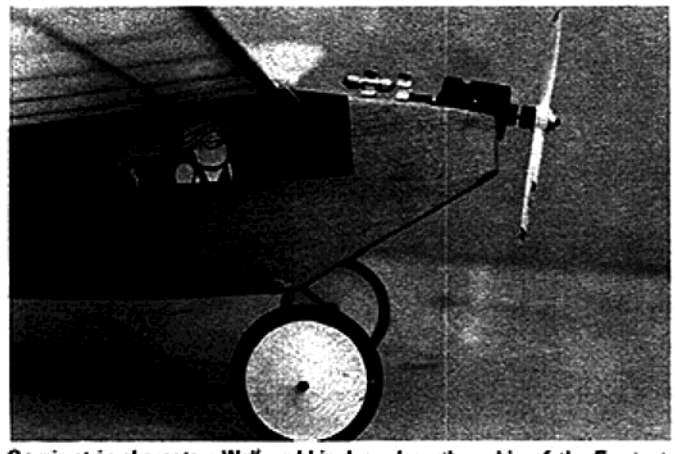


Rudder control on the Flier. Author used Ace Pulse Commander for control, on-board weight only 2-1/2 ounces. Keep it light!



Comic strip characters Wal' and his dog adorn the cabin of the Footrot Flier. Author taught himself to fly R/C with similar model.

Footrot Flier. . *Continued from page 21*

the "brick" and is operated by pull threads that poke out of holes in the fuselage sides.

I don't think you should consider using radio equipment weighing more than say 3 oz., unless you are somehow still able to keep the overall weight under about 17 oz. In particular, the linkages to the rear must be light. Perhaps you're thinking that an Astro 035 would handle more weight. But then you would have to reinforce the structure which would add even further to the weight. Then more wing area would be desirable. You've designed a new model! Not that I'm trying to put you off. It might turn out very nice!

If you're still building the Footrot Flier, the top sheeting goes on between wing and tailplane, grain crossways again. The top forward sheeting has the grain fore and aft and incorporates a 1/64-inch ply doubler to reinforce the motor mount. This will break in a crash, of course, but is easily fixed, and your motor will survive. Add the little bit of 1/16-inch sheet across the nose, the built in headwind, and cut a hole for the motor.

LANDING GEAR

Bend up the landing gear. You may wish to change it from the plan, to bring the wheels back in-line with the wing leading edge. As shown, there is a slight tendency to ground loop if there is no wind at all. I wouldn't change it myself. The low C.G. and side stance mean no tipping, even in a moderate crosswind. The long tailskid lowers the ground angle, which helps to reduce the ground looping tendency induced by the forward position of the wheels.

Bind and glue the landing gear wire to the forward hardwood crosspiece (another ice cream stick). Set it in place in the fuselage, notched into the fuselage sides, and prop everything up to check alignment. The inner end of each axle should be off the ground about 1/8 inch, and toe-in should be 2 to 3 degrees. Thanks to Euclid, the toe-in should just appear automatically, if you bend the landing gear according to the plan.

Glue the forward crosspiece in place followed by a further crosspiece (yet another ice cream stick), beneath F1, to retain the landing gear. Complete the bottom sheeting.

Cover fuselage and tail surfaces with tissue, give three coats of thinned and elasticised dope and decorate to taste. Only odds and ends left to do now.

Fasten the elevators temporarily in place with masking tape to maintain alignment and join with dowel or the bamboo sold as kebab skewers. Then sew in place to form a hinge. The adjustment device shown on the plan is fiddly to make, but aids trimming. Complete tail-surfaces, tail-wheel or skid, fit main-wheels and wing retaining dowels. The prototype Footrot Flier used home-made balsa main-wheels, but I think the Williams Bros. type would be fine.

Motor (not engine) bearers are made of hardwood (something a little more substantial than ice cream sticks this time) and epoxied to the sides of the motor. Epoxy nuts under the mounting plate and install motor with sidethrust as shown on the plan.

The wiring shown on the plan is effective and light, though somewhat crude. The charger is connected by alligator clips to the apropriate terry clip and motor terminal. If you use the neat, but heavy, charger socket and switch supplied with the Astro 020, fit these to a 1/64-inch ply panel under the forward part of the fuselage. In any case, do make provision for a 10-amp. fuse. Mitch Poling has recommended this on many occasions. The fuse will save your motor armature when you run off into the long grass during takeoff.

May I remind you to stick the wings together now? Fit small 3/32-inch sheet locating pieces under the wing center section. These should fit neatly into the corners of the fuselage opening to prevent the wing moving in flight. In case you think the structure looks a bit flimsy about the wing opening, remember that when the wing bands are in place, the wing center section becomes part of the fuselage.

I think that's all. Now the trick is not to destroy the whole thing during initial trimming.

TRIMMING FOR FLIGHT

Support the Footrot Flier with a finger under each mainspar, near the fuselage. In ready-to-fly condition, with batteries discharged, it MUST balance with the top rear edge of the fuselage level. Move motor batteries to achieve this.

The procedure for trimming a free flight model, which the Footrot Flier basically is, has been published thousands of times. However, I would suggest before going to the flying field, some hand glides in the back yard from a kneeling position are in order. This devout pose will probably not bring you divine assistance, but you will find out if anything is horribly wrong, and the model has less distance to fall. Leave the propeller off for the hand glides, so that the motor shaft won't get bent if you drop the whole thing on its nose.

FLYING

At the flying field, if you have a smooth runway, the following procedure seems to minimize the risk of damage to the model: Set the elevator about 1/16 inch down, with the adjuster. Now give the motor batteries a short charge, sufficient for a run of about 15 seconds. Gradually increase charges, and keep each hop strictly straight ahead. At first the down elevator will probably prevent take-off and will certainly prevent a stall. Reduce the down elevator and increase the charge until you are ready to go for broke. I taught myself to fly R/C this way, with one of the Footrot Flier's ancestors.

Here is the geneology of the Footrot Flier. Overall appearance is my hazy recollection of a sweet little, Bostonian-like, rubber-powered design by Sherman Gillespie. I wish I had access to the plan now. It appeared in *MAN* in 1948, I think, and was called "Yard Bird." That name really meant something then, to jazz fans anyway. Surface outlines are more or less Pietenpol.

The name and crew members are from a comic strip farm created by New Zealander, Murray Ball. This may be a local curiosity and hard to find at the newsagent, but you are in for a treat if you do stumble on it.

I would like to hear from anyone who tries the Footrot Flier, and help if any problems arise. If you write, please enclose a self-addressed envelope and International Reply Coupon.