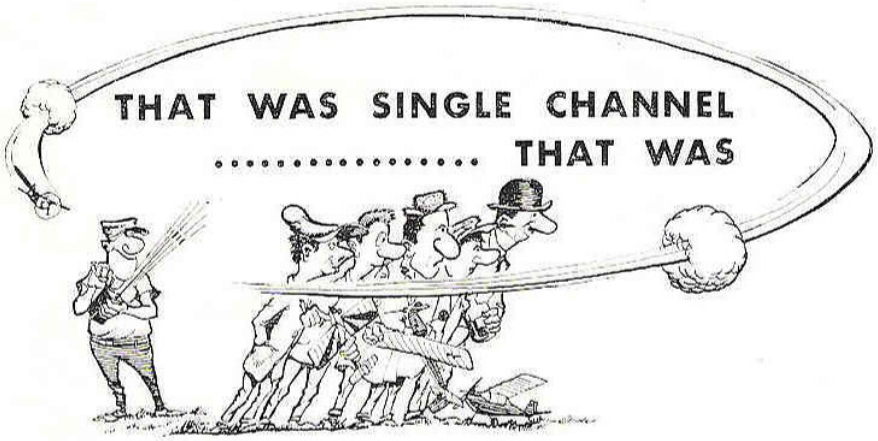



or "Getting started in Radio Control"

PART ELEVEN

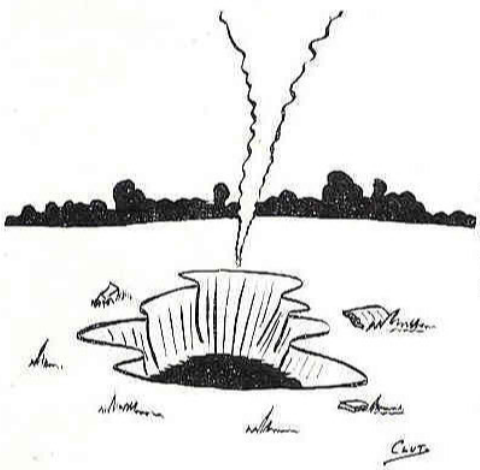
# Eric Clutton reveals in his own inimitable way an approach to small-field R/C aerobatic flying on a low budget . . . . introducing the FULL SIZE PLAN "SHARKFACE"

**for .049—.09 (.8cc—1.5cc)**

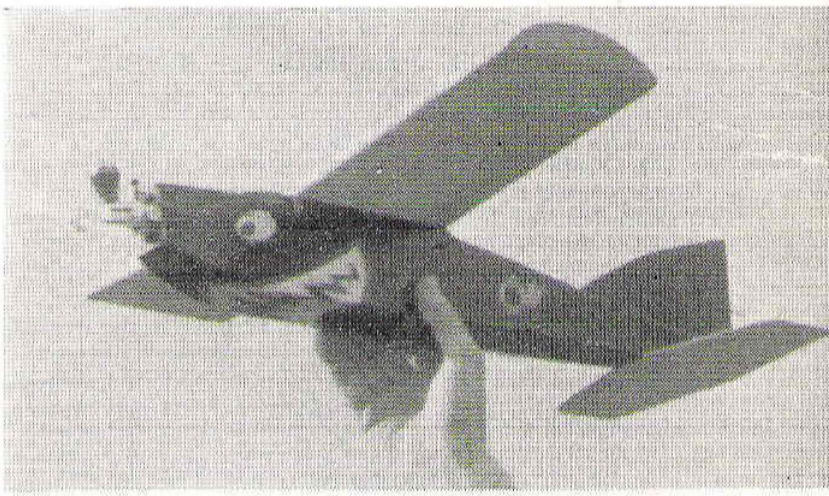
ONE UNFORTUNATE DETERRENT to radio control interest is that it is too complicated—how often do we hear, "I would have a go at radio but I can't be bothered going to all that trouble!"

I'm inclined that way myself so I have sympathy for this view!

Working on the theory that if anything can go wrong it certainly will prove the point, I decided to see what could be done about simplification of this R/C business. This becomes a matter of elimination. The first things one can eliminate are valves—those little glass bottles full of bits of wire which need a power station to operate. All-transistor receivers are now virtually indestructible and will operate off quite small batteries.



"Small batteries are an advantage when the model stops suddenly".



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'Sharkfa

Next, it is possible to fling out those chattering little relays. These are fairly reliable but they are not crashproof (not for the sort of crashes I have anyway!)

## Saving Weight

All-transistor, relayless receivers can be obtained which work off three volts—these are the ultimate at present, the battery weight of two pencells or even two subminiature pencells being very low indeed.

Switches can easily cause trouble so out they go. The receiver will simply plug into a three pin socket when required. These sockets can be cut down quite a lot if they are not mounted on a bulkhead.

If we are to operate off a single 3 volt battery supply the motorized actuators are excluded. Escapements come in two kinds—compound and sequence.

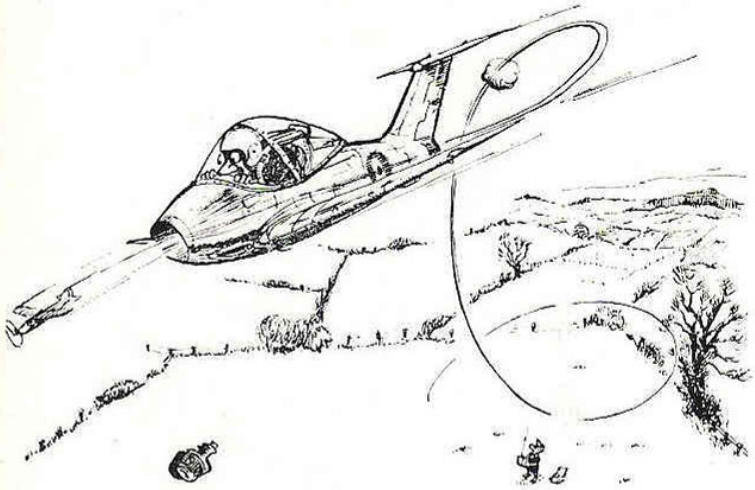
Compound escapements are light and they work very well, but they are more complicated (that word again) than the ultra-simple sequence type which are also more crashproof. This is really a matter of choice but I plump for the sequence escapements because of simplicity—the escapements, not me!

The escapement should pull in on 1½ volts to be safe, and some escapements, e.g., the Elmic Conquest may require slight adjustment of the armature spring for reliable operation on 1½ volts. Don't overdo this or vibration will affect it.

## Batteries

That practically takes care of selection of the radio gear: All-transistor, relayless and with a simple escapement, all operating off 3 volts. The use of these small batteries is a great advantage and if the model stops suddenly (as when trying to bore to Australia) the heavy parts just keep on going, and the "lighter" these heavy units are, the better! This equipment could be installed in an average type of radio-cum-sports flying model and some pleasant flying is possible—whenever the weather is suitable! This is unfortunately not very often as the average single channel model tends to disappear downwind at a fast rate on a normal windy Sunday. To "penetrate" into the wind and make all-weather flying possible the model *must* fly fast—there is simply no other way to do it.

To fly fast we must have plenty of power. A heavy model will not penetrate unless it has a powerful engine fitted—it will just cock its nose up and woofle



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along! The engine doesn't have to be particularly powerful for its size, it's the engine capacity in relation to the model size that counts. A fast flying model will hit the ground with quite a thump if something goes wrong so it must have built in BOUNCE! One of the best ways to do this is to reduce the overall size of the model; this means that we can use a relatively small engine and the smaller models are easier, quicker and cheaper to build in case you hadn't noticed!

## Size of the Model

I decided to build mine just large enough to hold the radio equipment and this, together with a reasonable length for the escapement rubber, almost designed the fuselage automatically. An unswept fuselage nose helps to reduce landing shocks. Did someone say undercart? This unnecessary complication adds weight, drag and building time—and trips the model up when it lands. Integral tanks fitted to some motors are not really big enough for radio operating and those nasty, soggy plastic bottles make me shudder! A tin tank is much better, team-race tanks being very satisfactory. These tanks can be built in



**"If necessary — kick the model in the desired direction".**

and forgotten just like a control-liner. (Hoorah for Keil Kraft and the tank they've included in the new Mini Super kit).

## Fix the Tailplane

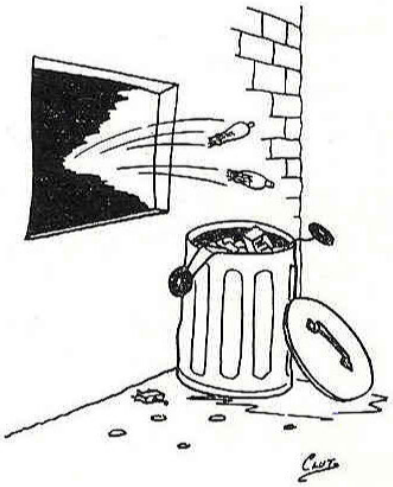
We never use a detachable tailplane on a control-liner so why use them on a 6 ft. 6 in. span R/C slope soarer.

On "Sharkface" the sheet tailplane is simply stuck to the bottom of the fuselage—another way is to do away with the tailplane altogether and produce a tail-less model *R.C.M. & E.* has featured a tail-less design (*Tadpole*) of mine which was a parallel development to "Sharkface". It has many advantages, but for those of you who prefer the relatively orthodox ————!

Wings are a necessary evil on radio controlled models, they are often tricky to build and are the first component to break, so my wings will be as small as possible—consistent with a reasonable glide. Sheet wings are good and experiments indicate that they give better performance in strong wind because of their low drag (the tail-less design has sheet wings), but the lift is poor from a flat plate section and with the small wing fitted to "Sharkface" this may make the vital difference. Built-up wings do not have to be flimsy. A glance at the "Sharkface" plan will convince you of this! The prototype was covered with heavyweight tissue and has yet to receive *any* structural damage apart from the odd scrape when it has clobbered the runway.

When mounting the escapement the accent is on "bounceability" and all torque arm fittings should have slop in them to avoid any chance of binding.

(*Continued on next page*)



**"Valves, relays, switches are OUT".**

# Single Channel R/C

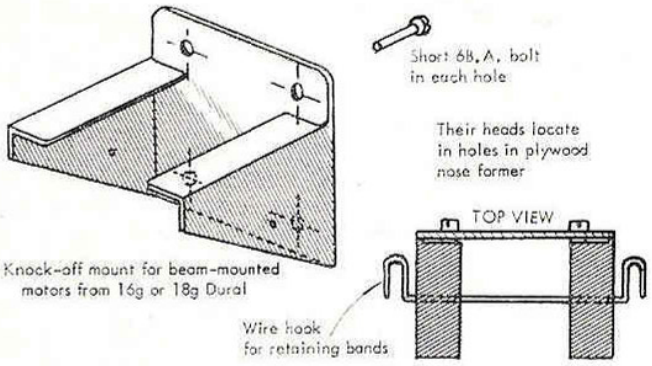
(*Continued from p. 323*)

Fins are functional devices which must also supply a reasonable hinge for the rudder and possibly location for the receiver aerial. A major point of consideration when designing the fin is to try to keep it out of the way of the wing in a crash! Even pencells have some inertia so a plywood bulkhead is fitted for them to push against, and the area between this bulkhead and the nose former is stuffed with tank and block balsa. The tank is arranged to give suction feed—I had endless trouble when I fitted a motor with an intake below the crankshaft. This resulted in gravity feed from the fuel tank and I never did get that motor to run properly.

The design has left no room for engine bearers. These clumsy great lumps of timber take up more room than they are worth and a radial mount is simpler (that magic word!). This mount is detachable and held in place by rubber bands. The arrangement is almost completely crashproof and another great advantage is that different motors can easily be tried. "Sharkface" has had two different Cox .049s a vintage Arden .009 and a Frog 150 diesel up front—all at different times of course!

## Use .8 c.c. to Start With

For the cautious flyer an .049 is advised. This will give quite a snappy performance and will probably be sufficient power for most button pushers. For those who like to live dangerously the 1.5 c.c. diesel is the obvious choice, but be warned—you need hair on your chest for this one! "Sharkface" does not become vicious however, and things happen only



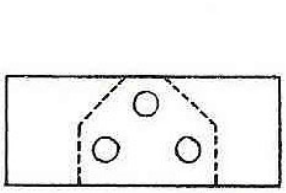

**Engine bearer for beam mountings and knock-off attachment.**

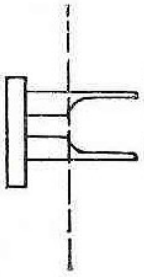
slightly faster. Rudder movement may have to be reduced for the less intrepid.

I am inclined to favour the diesel because it is much cheaper to run. There is also no chance of a burned out plug or a flat glow battery.

With the higher powered motors response to control is very rapid indeed and flick rolls or reversals can be executed quite easily. Sometimes these are even intentional. With an .049 the response to control is still rapid and a turn is produced by simply blipping the button. This will kick the model in the required direction. Rudder is only held on when you are brave enough to attempt a spiral—don't worry though — the model recovers instantly when your palsied hand releases the button.

Blipping for control is very economical on both transmitter receiver batteries. I bought my Futaba



**Socket modifications at left, simple circuit opposite.**

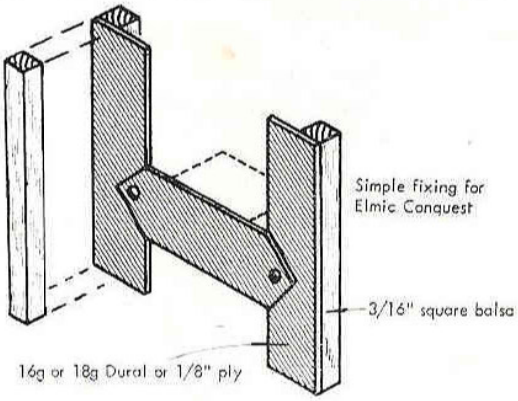
transmitter early in 1964 it was secondhand then *and* with the original eight pencells installed. I am just thinking of changing these batteries (May 1965)! The Rx batteries last quite well too—last summer I flew almost every day for six weeks on two sub-miniature U-16s and I finally changed them when they dropped to just over 2 volts. The six week period included losing the model twice (at dusk!), resulting in it being left out and switched on for two whole nights! A pair of normal pencells should last a whole season but much depends upon the escapement used.

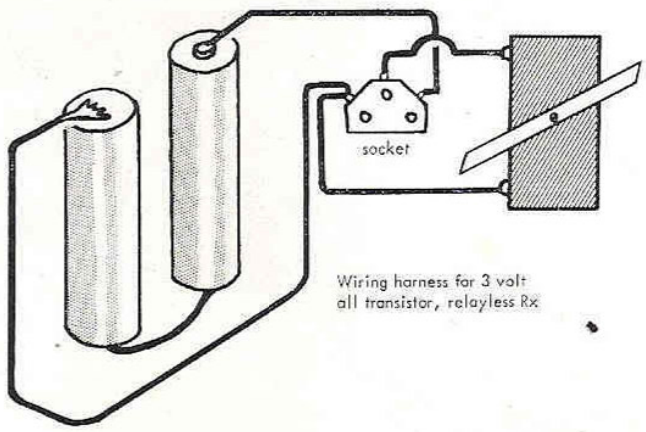
## The Escapement

Small models do not require any elaborate fixing for the escapement; in fact they are better off without this and should have as few complications as possible. Some escapements must be mounted on a ply bulkhead and the Citizenship is of this variety, but many can be simply glued straight into the fuselage with a reinforcing strip on each side. The new O.S. escapements are excellent in this respect. The Elmic Conquest may offer a problem, but the system shown in the sketch works very well and is SIMPLE with a capital 'S'! Whichever escapement is used it should be aligned in the fuselage so that the rudder motor exerts a straight pull on the escapement hook.

Wiring an all-transistor relayless equipped model is the height of simplicity, particularly if no switch is used. Even plugs and sockets should be kept to a minimum and my wiring method is shown in the sketch. The batteries are soldered in position as frequent replacements are not necessary. Do *not* be tempted to use the thinnest wire for your circuit —this is very attractive and has many uses but it will not stand the rough and tumble of a small radio model I use the thickest wire available, which results in practically no voltage drop and does not fracture in a heavy landing (a heavy landing is when rudder sticks on at 500 ft.).

The response of the Rx and escapement to a Tx signal must be utterly reliable and I usually run the escapement motor down while testing. If the rudder





Wiring harness for 3 volt all transistor, relayless Rx

sticks or skips just *once* this is not good enough. This testing is done at home so that only a quick check is needed on the field.

Test flights are simple if a compound escapement is fitted—just make certain that the model will turn to the left under power! A slight bias to left rudder will ensure this, but don't overdo it. With CG in the correct position check for glide, and if all is well chuck it into the air with the motor going flat out. A fairly hefty heave will be necessary.

If a sequence escapement is fitted the above drill still applies. "Sharkface" will probably turn left anyway, but a *very slight* touch of left rudder bias will ensure this. Start the motor, check that the next control will be right rudder and launch. If the model is trimmed for maximum "penetration" it will probably sink slightly after launching, but a quick dab or right rudder will point the nose up and it will climb away.

## Flying

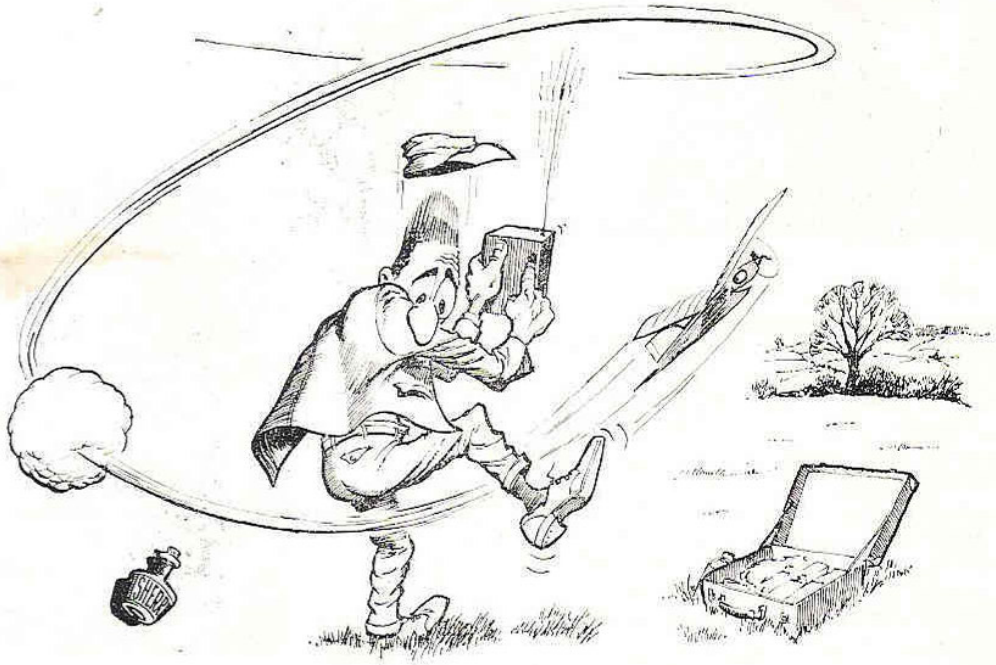
The sequence flying of a fast R/C model is an art and must be acquired by practice. If our model has a built in slight left-hand turn and a wide right hand circle is desired, a quick blip of right rudder will start this off. The model will gradually straighten up and if left alone would commence to turn left. Before this happens get rid of the unwanted left rudder signal by means of a very quick blip and continue the right turn by giving a dab of right rudder when it appears necessary. I prefer the model to have a slight turn built into it—with the larger engines. "Sharkface" can be out of sight *upwind* in a very short time indeed! A built in turn means that it will eventually reappear!

These small models should not be allowed to stray too far downwind in spite of their excellent penetration. They are not easy to see, and a wrong control can lead to confusion followed by crunch! Vivid paint work is of some help but the best insurance is to zip about within a reasonable distance from the transmitter—it is fairly easy and far more satisfactory.

## Extra Tips

A few final thoughts: All dowels are simply inserted and *not* glued in position. If a 1.5 c.c. motor is fitted to "Sharkface", move the wing forward to compensate for the extra weight. The excellent 'Terrytone' Rx is far too bulky for small models and the printed circuit board is a little vulnerable because of its size. This board can be cut across the middle, the components placed face to face with 6 B.A. bolts holding the two halves of board together and at the right distance apart. Use three wires to bridge the cut P.C. lands and we have a "double-decker Terrytone" more compact and crashproof and suitable for quite small models (but not, unfortunately, "Sharkface").

Try slope-soaring a powered radio model—I have done this off the Shropshire hills and spiralled the model down into the valley, well below my feet. It is quite a sight to look down on to the model and the speed appears to be fantastic! (*Thinks,* "Must take a control-liner and try wing-unders"). An obvious application for my type of radio model is a form of pylon racing around a small course and this might easily give the multi-boys a run for their money in spectator appeal. Of course all spectators should be issued with protective head-gear! P.S.—and don't forget that SILENCER!



**"Keep the model close to you — or it will soon disappear from view — control response is very rapid indeed".**