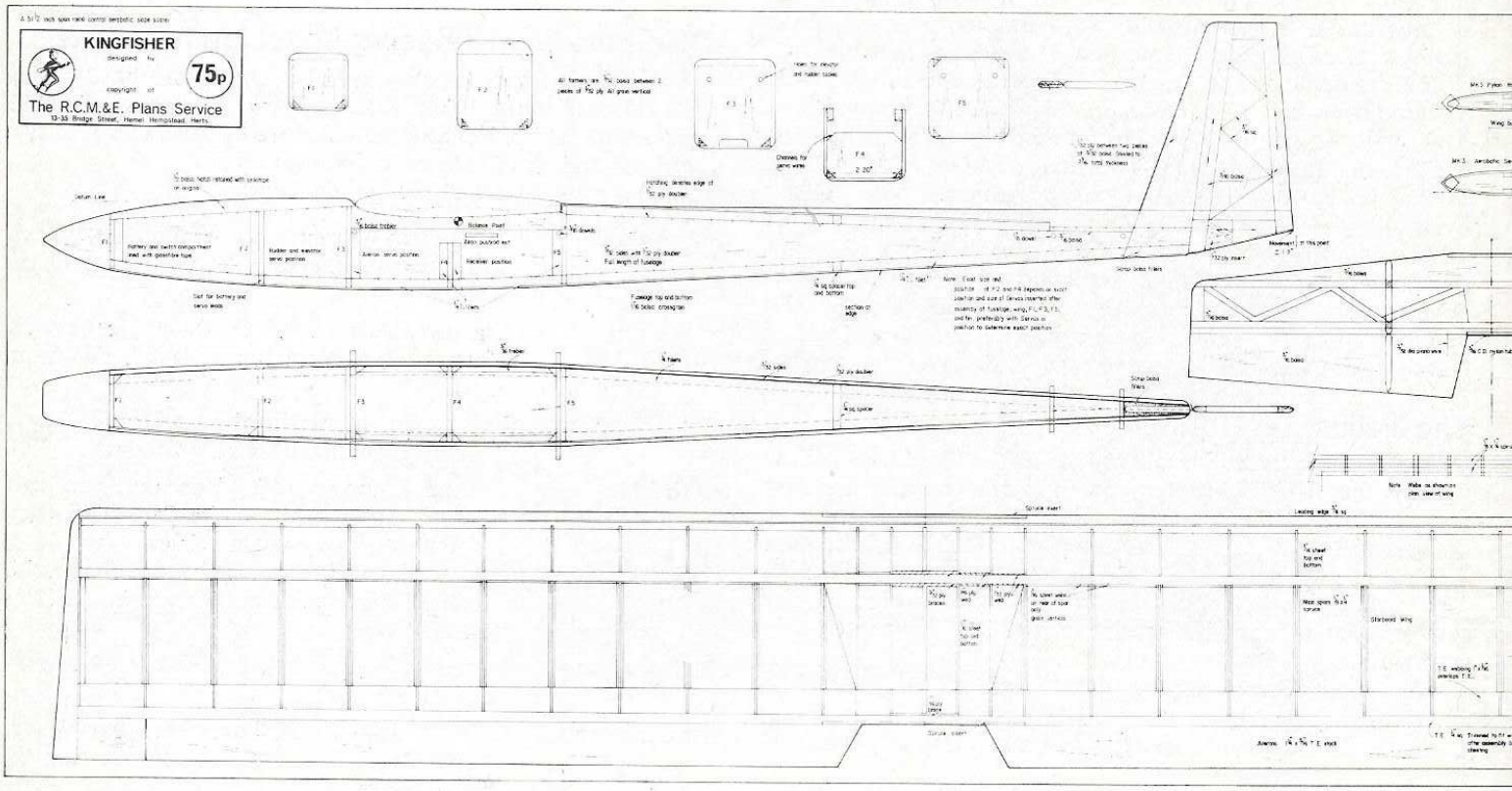
KINGFISHE



THE name Kingfisher actually refers to a series of slope soarers that I have developed over the past few years. All these derive from a single model built in the early summer of 1970. The basic requirements were for a model that would be very cheap, quick and simple to build, and with high crash resistance. It was also to be highly aerobatic and able to fly in a wide range of wind conditions. I thought that the best way to achieve this would be a small, light model of wingspan about 50 in. (to fit in my car boot in one piece) with a target weight of 2 lbs.

Despite the fact that I am generally a very slow builder, the model was designed and built in 6 days, working full time, and at a total cost of £3. Of course it would cost more now, and I should think it would take the average builder about a fortnight of evenings to build.

Since then I have never built another complete Kingfisher, but instead have made a variety of wings, tailplanes and fuselages that have always been interchangeable with earlier ones. The general size and weight of the models have remained the same, but a number of modifications have been made which have significantly improved the performance. The most important of these are a change from a semi-symmetrical to a thinner fully-symmetrical wing with no dihedral, a slimmer fuselage, smaller tailplane, more rearward C.G. position and most recently, an alternative very thin almost-flat-bottomed wing. The structure has also been improved to correct weak points which have shown up after a great deal of flying. By making only one change at a time it has been possible to see clearly the effect of each and to arrive at a design that now meets the original requirements very well.

The results of all this are the Mk3 (aerobatic) and Mk5 (pylon racing) versions shown on the plan, which differ only in their wing sections. As a matter of interest. I also have a V-tail version. The only difference here is that the fin is left off, the tailplane moved back 1½ in., broken in two and stuck back together with an angle of 140° between the two halves. This makes an attractive model for use with 2-function gear.

Wings

The wings are best built in one piece on a perfectly flat building board. The ribs can be cut out by the usual sandwich method, taking care to make all the ribs identical, as this makes the subsequent assembly very easy. The spruce spars should first be joined at the centre and double spars added. Lay the bottom spar and ¼ sq. T.E. (also joined) on the board as shown on the plan and rest several ribs in place to obtain the exact spacing between spar and T.E. After gluing all the ribs, add the top spar and ⅜ sq. L.E. When dry, the assembly can be removed from the board, T.E. carved to fit the rib section, and braces, sheeting, etc., added. Be careful throughout not to introduce warps, and try to use equal grade balsa on either side of the centre of the wing. With a bit of planning before starting, 3×36 in. balsa sheet can be used with the minimum of wastage.

The centre section braces may seem a bit complicated, but are intended to spread the load out evenly in high-G manoeuvres and avoid any sudden changes in strength where breakages would occur. Don't forget the 1/16 in. balsa webs between spars, as they greatly increase resistance of the wing to twisting with hardly any increase of weight.

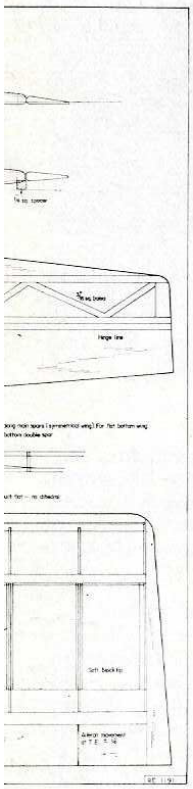
Fuselage

Extensive use is made of balsa-ply laminates which I find give a good strength/weight ratio. I use P.V.A. glue and clamp the pieces between two building boards to dry, although it would probably be simpler to use a contact adhesive, especially for the full-length ply doubler on the fuselage sides.

Radio Installation

In order to reduce weight and drag, the radio installation and fuselage dimensions have been arranged for my gear to fit exactly and the C.G. position to be correct with hardly any ballast. However, most people are now using radios of about the same size, so no problems should be encountered. Before starting the fuselage it would be a good idea to draw on the plan the positions of your servos, Rx. and battery, and decide on control runs, polarity of the servos, etc.

I use cables for the rudder and elevator because they take up very little room, and are quite satisfactory here provided they



Full-size copies of the plan shown left at 1/6th full size are available from R.C.M.&E. Plans Service, price 75p. Quote plan R/C/1191.

By
D. WILLIAMSON

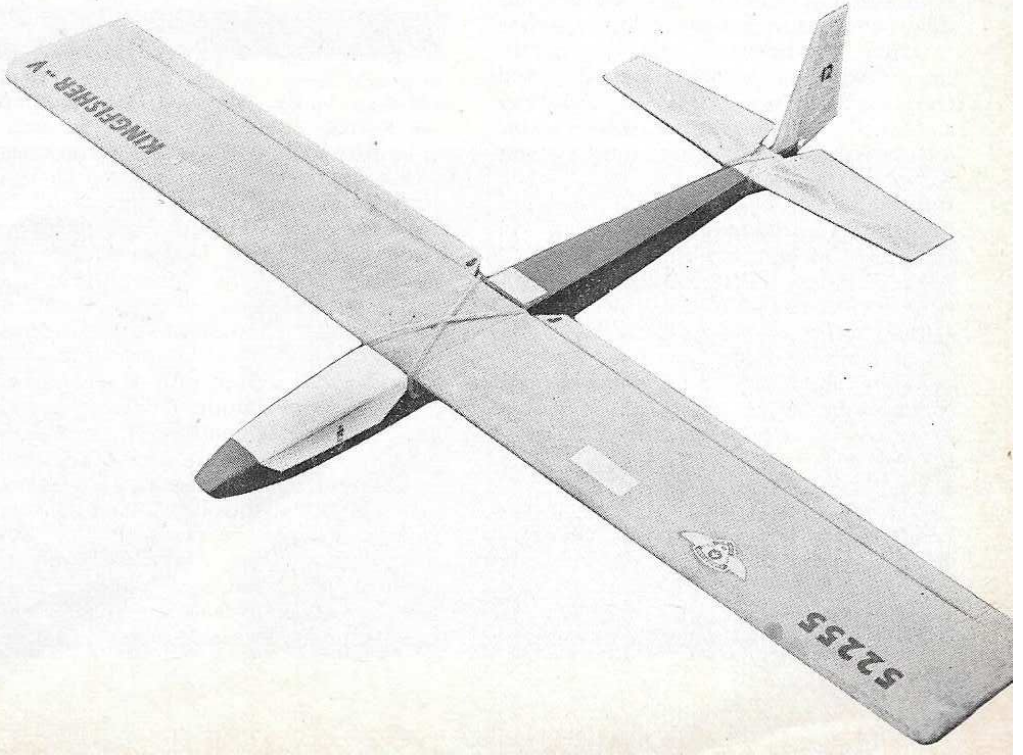
FOR STUNT OR RACING, THIS 51½in. SPAN COMPACT R/C SLOPE SOARER IS IDEAL - BUILD ONE AND HANGAR IT PERMANENTLY IN THE CAR, JUST IN CASE!

are well anchored. The aileron servo is in the fuselage for several reasons. Firstly, the servo is less likely to be damaged, since it is too thick to be totally enclosed in the wing. Secondly, the direct short pushrod connection is very simple and free of the friction and backlash that are especially critical on ailerons and difficult to avoid with bellcranks or steeply curved cables. Finally, it is not necessary to change a servo when changing wings. It is advisable to use nylon horns and quick links which will jump out, or at worst break the nylon pin, in the event of the wing skewing sideways or coming off in a heavy landing. Also, check that the wing is central before each flight and use foam-plastic draught-excluder-strip for seating the wing to stop it moving in violent manoeuvres.

Whichever method of hinging you use, it is important that the two surfaces should be in contact, as any gap reduces the effect of the surface and introduces a lot of drag. Needless to say, the hinges should be as free as possible, without being sloppy. I find the old-fashioned nylon cloth wrap-over hinges (applied before covering) very good in this respect, and strong enough for this size of model.

Covering

Either heavyweight tissue or very lightweight nylon should be used, with as little paint as possible. Tissue has the advantage of being cheap and easily repaired, although it is easily torn and the colour fades after a while. Nylon, of course, is



much more durable and, providing a grade is used which doesn't absorb too much dope, is no heavier. If preferred, the fuselage can be covered with a plastic iron-on film. However, I don't recommend this for the wings as it has been found to drastically reduce the roll response. This is probably due to the fact that it adds no rigidity to the structure so, not only do the ailerons twist and move less at the tip than the root, but also the wing tends to twist in the opposite direction and partly cancels out their effect. Also it is thought that the slightly rough finish of nylon or tissue creates a turbulent layer of air next to the surface which improves the efficiency of the wing.

Trimming and Flying

Providing the model has been built accurately, weighs not more than about 2 lb., and balances at the point shown on the plan, the trim should be about right. However, no two models are exactly the same, so a little adjustment of the C.G. may be desirable after a few flights (preferably with the symmetrical wing).

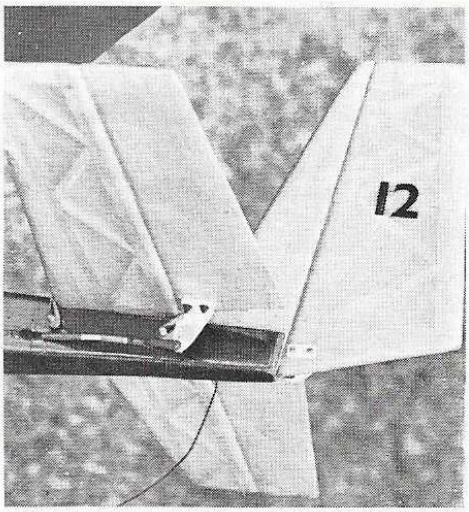
The model is nose-heavy if it requires some up-elevator in level flight, even more 'up' in turns, is stable in the pitching plane (i.e. if put into a dive and the stick neutralised it tends to pull out of the dive), and requires a lot of 'down' when inverted. The reverse is true if it is tail-heavy, when it becomes unstable and feels 'soggy'. When correct, it is neutrally stable, so that it 'grooves' round inside and outside loops, requires only a slight forward pressure on the stick when inverted and needs slight backward pressure in upright turns. This trim will then also be right for the flat-bottomed wing, although a little adjustment of the wing incidence may be worthwhile here. I just sit the wing on the fuselage with $\frac{1}{16}$ in. packing under the T.E., the gap being taken up by the aforementioned foam-plastic tape, although it would obviously be better to make a little platform to stick on the bottom of the wing, filling the gap.

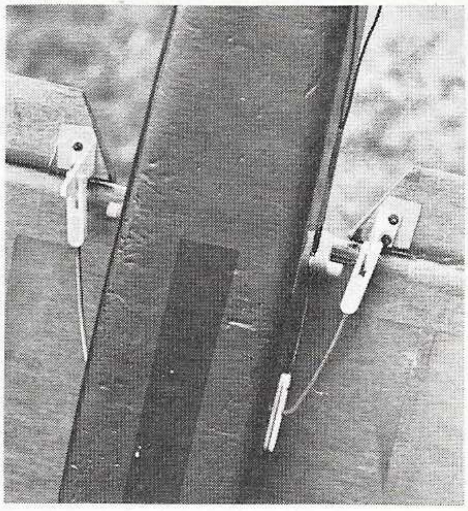
Once arrived at, the trim need never be altered, although a little ballasting at the C.G. is sometimes beneficial in windy weather.

The precise, light and rapid control response make the model very pleasant and easy to fly, provided the sticks are not stirred about too much to begin with. Although I would not recommend it to an absolute beginner, it would suit someone who has flown a slope soarer or two before, or even any fliers of power models who would like to sample the delights of aerobatic slope soaring.

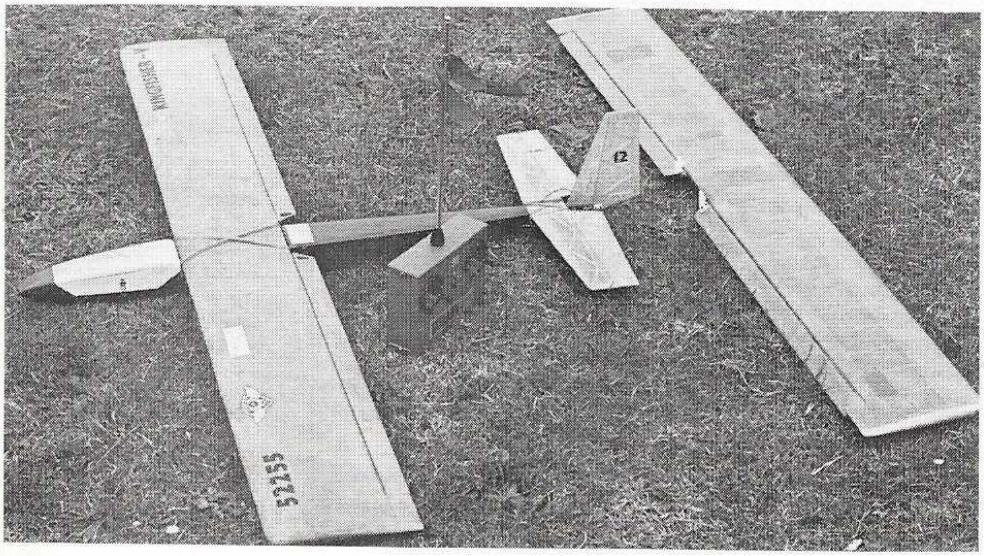
The Kingfisher is unusually docile at low speeds, maintaining good aileron control right down to the stall, and dropping into a spin only when pushed with aileron and rudder (it also does nice inverted spins incidentally). It accelerates quickly in a dive and maintains its speed well through manoeuvres, again provided it is not over-controlled. All the usual manoeuvres may be performed, as well as any unusual ones you are likely to think of. Its small size makes it very manoeuvreable, a feature which is important for the increasingly popular free-style aerobatic events. With the flat-bottomed wing, it makes a quite competitive model for pylon-racing, turning very tightly with no fears of it falling apart (unless hit by another model!)

In general, the model will fly if there is wind of any strength blowing up a reasonable slope (unfortunately a condition not often satisfied at competitions). The light wind performance depends very much on the quality of the hill, weather conditions such as the stability of the air and other obscure factors. I have never been unable to fly it because the wind was too strong.



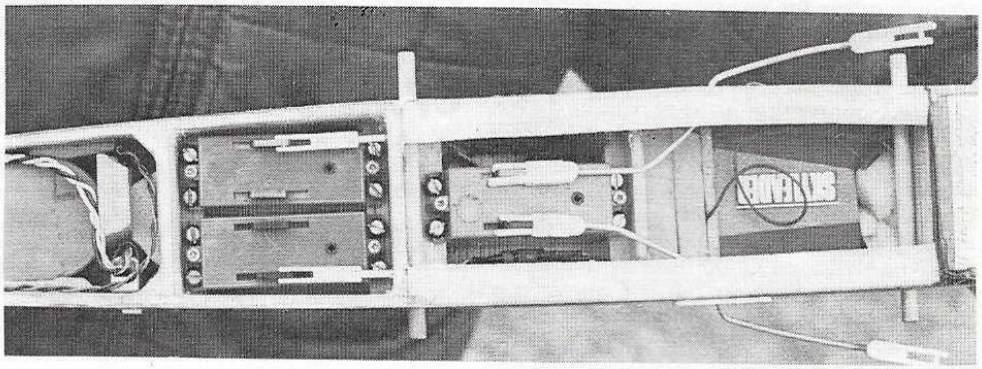


Above left: the tail cone showing the large rudder, tailplane seat and the elevator linkage. Above: detail of the strip aileron linkage showing Quick-link connections from fuselage.



Left: the Kingfisher, designed for aerobatics and pylon racing on the hill slopes, features purpose-designed wing for each class. Both wing sections are shown on the plan. Wings are easily interchangeable.

Below: the radio installation, showing the servo layout, with aileron servo inside the fuselage and links protruding through the fuselage sides. Note that the battery pack is placed at the front, and the receiver at the very rear of the radio compartment.



Acknowledgements

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