



a 60 in. span semi-scale control line stunter, featuring a detachable wing, for use with 0.35-0.40 cu. in. motors, designed by ROBIN WOODHEAD

HAVING BEEN an aeromodeller for many years, I have always held the belief that models should at least look *something* like the real thing, but when you study most stunt models, what do you see? A wing out of proportion to the fuselage and a model that bears little resemblance to an aeroplane. Possibly this is a direct result of the exclusion of design, detail and finish points from the FAI schedule, but whatever the reason, this should not be an excuse for not trying to design and build better models.

Deciding which aircraft would be most suitable as a basis for a stunter was not easy, as it had to fit several requirements i.e.: low wing, monoplane, single engine and most important of all, it had to be one that nobody else had 'done'! Eventually the choice lay between the Martin Baker MB5 and the Bell Airacobra: I chose the Airacobra because it has a slightly longer nose movement.

The removable wing was decided upon as the resulting model was just too big to fit in my car in one piece! This posed a new problem: how to make a quick, simple linkage between bellcrank and elevator? I personally don't think the method I evolved can be bettered as it is simple, cheap, positive, free moving and easy to assemble on the flying field. There are two other benefits with this set up, namely that it is simple to adjust the ratio of movement between the flaps and elevator, and secondly trim between flaps and elevator is possible by fitting an adjustable link to the flap horn. The only disadvantage seems to be a slight increase in weight.

For those of you who have not used nylon engine mounts, I can strongly recommend that you give them a try. They are quite expensive but their convenience far outweighs their cost: for example it's far easier to replace an engine mount than strip the

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model to replace broken bearers, while it is also far handier having a common system of mounting engines which allows switching of engines between models, instead of peppering the engine bearers full of holes!

In building models, I have used a number of techniques, but have found the easiest is to use a jig. This does not have to be very complex, in fact the simpler the better (see sketches on plan). I also cut out as many pieces of the model as possible before starting to build as this saves a lot of time later.

Construction is started with the wing. Make the trailing edge assembly by bonding together two lengths of $\frac{1}{4}$ in. sq. balsa, $\frac{1}{4}$ in. beech centre section and the tip forms WT2; then place in jig. Next make the leading edge by bonding two lengths of $\frac{1}{4}$ in. sq. to the $\frac{5}{16}$ in. beech centre section, and again place in jig. (Note: both beech centre sections are drilled before assembly, and this is best done in conjunction with their mating parts). The next stage is to add the ribs. Starting at W12 work inboard to W4 then fit the undercarriage mounting plates and continue adding ribs W3, W2 and W1. Do not forget the bellcrank mount at this stage.

Glue in both top spars, and when set, remove wing from jig and add bottom spars. By this time, you should have a fairly light, rigid wing structure which can now be sheeted.

Finish off the wing by adding the tips WT1 together with the tip formers TR1, TR2 and TR3, (note the latter part is only on the inboard underside). Add $\frac{3}{8}$ in. soft block top and bottom on L.E. of tips also $\frac{3}{8}$ in. sheet at the T.E., then sand entire wing smooth. Produce the flat on the centre section L.E. and secure sheeting if necessary. Bond in both $\frac{1}{4}$ in. diameter dowels, then add flap horn. Cut out flaps, carve and sand to shape, slot as required to suit controls and hinges, then fit and bond in position. Check for any binding.

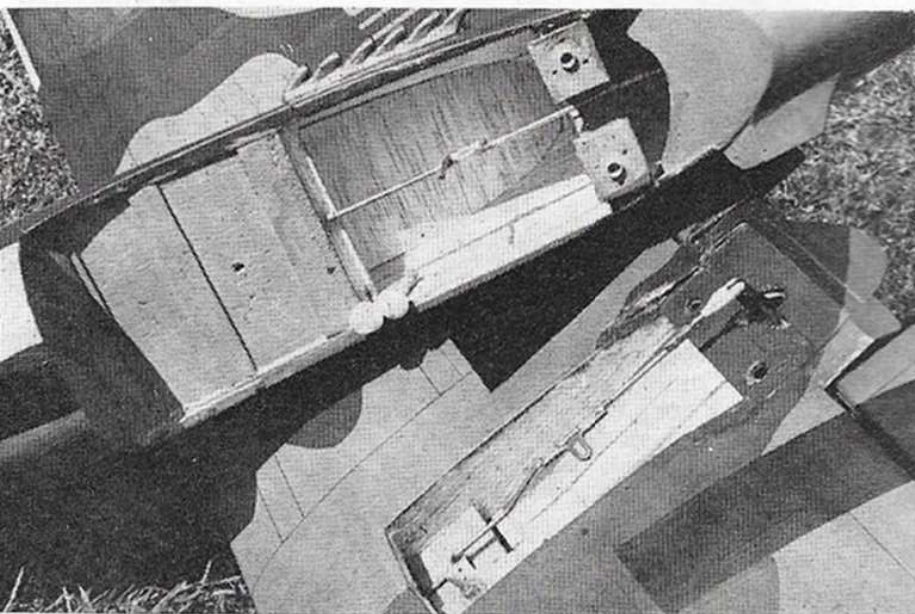
The first thing to do in making the fuselage is to steam bend the two main $\frac{1}{4}$ in. x 1 in. balsa crutch members. This is not very difficult provided you keep your fingers out of the steam (I use the electric kettle). Get the entire length of balsa nice and soggy then clamp in the jig and let set. If you haven't got a jig, carefully form the strip over the plan while soggy and either pin or hold until set.

Next bond the $\frac{1}{16}$ in. ply strips to the crutch members using epoxy and when set start adding the formers F1 to F10. Don't forget the chamfer on the crutch at the tail position F8. The structure now looks like the sketch on the plan, and at this point the model really starts to take shape.

Place the fuselage mounting pads in position on the wing, fit nylon bolts and tighten, align wing dowels in former F3 and slide fuselage into position. It may be necessary to trim the crutch slightly to clear the wing sheeting and allow F5 to fit closely onto the mounting pads. Before glueing the pads to F5 make sure the fuselage centre line is square to the wing. When set, remove fuselage from wing, then start sheeting it with $\frac{1}{8}$ in. balsa. This is easier than it looks: just cut 1 in. wide strips of $\frac{1}{8}$ in. balsa and steam the twist and bend into them before glueing to the fuselage. When sheeting is complete trim the areas where the $\frac{1}{2}$ in. and $\frac{3}{8}$ in. sheet fits, then tack glue these parts in position. Carve and sand these latter pieces to shape, remove and hollow out, reposition and glue to fuselage.

Turn the fuselage over and carefully cut the angle at the rear of the wing position. Add $\frac{1}{4}$ in. sheet end plate and the $\frac{1}{4}$ in. sheet fillets to complete the wing seat. Fill all cracks and imperfections with *Polyfilla*, then sand thoroughly until smooth all over. Cut out the cockpit position and fit the two cockpit floors from $\frac{1}{16}$ in. balsa. Carve and fit intake.

Both the tailplane and fin follow conventional construction and it is hardly necessary to tell you how



Method of making the wing detachable is extremely easy to re-assemble - no fiddling around with screwdrivers to fit the elevator pushrod to the bellcrank here! Wing is retained by dowels at the front, nylon bolts at rear, as per R/C practice.

Upright mounted Fox 40 has plenty of cooling and is easy to operate - no need to invert the model when starting. The cockpit is a prominent feature of this model - it's well worth 'equipping' it with pilot, instruments, etc. Cockpit mouldings may be obtained from the designer, address on plan.

to make them, just follow the plan. A word of warning however: the hinge system shown is very free and should not be changed unless you can make an alternative just as free.

The undercarriage too is a straightforward job, provided you have a wire bending machine for the noseleg. If you haven't, then use a commercial leg. The main legs only require a vice and large hammer to bend them.

Now for the controls: carefully bend the flap pushrod to shape and fit to bellcrank together with flexible leadouts, then install in wing. Solder commercial adjustable end to pushrod and connect to flap horn. Next, turn to the fuselage. Make a hole in F4 and bond in short length of tube as a pushrod bearing. Slot rear of fuselage to accept tailplane and slide complete tailplane pushrod unit into fuselage. It is a good idea to fit the wing to make sure that everything is square before glueing the tailplane in place.

With the wing still in position, turn the model over, clamp the flaps and elevator in the neutral position and mark both pushrods for the connecting linkage. Remove wing and fit linkage to both pushrods, refit wing and check system is free from tight spots and binding.

With the model assembled once more, build bottom of fuselage across centre of wing being careful not to bond the wing to the fuselage! Carefully mark and cut bolt holes and fit tubes from card or an old cigar tube. Remove wing, fit fin and fill-in slot at rear of tailplane, add fillets at root of fin and around root of tailplane. Sand all over and cover with tissue.

Carefully cut out engine cowl and tank hatch, then reinforce with a layer of glass cloth on inside. Make and fit both hatch fasteners. Cut out a nut-plate from tin and solder the four 4BA engine mount nuts to it, align with bolts through F2 and bond in position on back of F2. When set, install nylon engine mount and fit engine. Now make and fit fuel tank floor, fit tank on centre line of engine spray bar, and secure with a strip of ply held in position by wood screws. During this stage it will be necessary to bend the copper pipes to suit the installation. 'Dress' interior of cockpit as required, paint and add canopy.

Fit and bolt main undercarriage legs to the wing, bind and bond securely. Remove engine mount, fit noseleg and clamp in position by re-fitting engine mount, secure free end of noseleg with small 'P' clip.

Assemble the entire model and fit wheels, check position of CG, and make any corrections at this

point before covering the model. Cover the wing, tailplane and fin with nylon, but use only tissue on the flaps. When dry, sand off any rough edges then mask and prepare for painting. I chose the English markings of 601 Sqn., which can be found in *Camouflage and Markings No. 12*. For the actual painting I used Humbrol Matt Enamel proofed with TRANSLAC eggshell polyurethane varnish.

The original tipped the scales at 62 oz. less fuel, and balanced as shown on the plan, rather on the heavy side! First flight was approached with a great amount of caution, not only was it a new untried model but a brand new and unrun engine (Fox 40).

Eventually, after blowing a head gasket (thinks: I will check head screws on new engines in future) we got the engine running and with trembling knees I gave the signal to release. The model accelerated rapidly and by the time I had eased on a bit of 'up' three-quarters of a lap was completed. Take-offs are very smooth and line tension in all manoeuvres is more than sufficient, besides it can be controlled by the adjustable lead outs. Unfortunately my flying ability does not match that of the model and consequently up to now I have only attempted loops, bunts, wingovers, and inverted flight, but the response from the controls indicates that the model will do the full schedule. However, as the model was intended primarily as a sports stunter rather than a competition machine, I am more than satisfied. Landings are a dream; when the engine cuts, hold the model level on the glide and just before touch-down, apply a little 'up' in order to hold the nose-wheel off until the main wheels are down.

