

# HIGHLY 'UNLIKELY'



*Forty one years ago, when he first joined the RAF, the editor (that's him on the right) bought a half finished enlarged Unlimited with an Amco 35 installed. It did not work too well so now he has had another go.*

**The editor has  
built  
and flown this  
unlikely development  
of the famous  
Unlimited**

**M**y first encounter with an Elfin powered Unlimited was in 1949 at Eaton Bray. It was unlike anything I had seen before and over long grass virtually indestructible. A darn sight better than my Frog 100 model. The owner, who I assume was W R Smith the designer, let me fly it a good few times and I got round my first loop. In 1951 I bought an Amco 3.5 attached to a half-built enlarged Unlimited. It flew OK but the motor did not seem happy with the tank position. Not until 1980 did I build an Unlimited myself to do a revival feature in *Aeromodeller*. I beefed it up a bit for modern motors but left the aerodynamics alone. With more airspeed than the original it was quite lively and rather intimidated the youngsters I was teaching. It would fly smooth round figures, but not go square. It did a funny wobble if given too much elevator movement. A characteristic I thought was useful but frightened the youngsters.

## Unlikely is born

When I became editor last year I felt I would like something unusual to take to meetings. An enlarged Unlimited came to mind but I could not make my mind up on how big and what engine? At the Model Engineering Exhibition I got my hands on a PAW 60TBR and immediately fell for it. What is it about some

motors that make them irresistible? To control my appetite for motors I will not buy a motor I do not intend to use, so the basis for Unlikely was born.

## Design considerations

With 22 ozs of motor a rearward CG was not going to be a problem. The quoted 1 bhp output should be enough. Wood normally comes in 36" lengths, so calculations were made to see what area that would allow. The original is 20" span and about 200 sq ins. A 37" version would be roughly 650 sq ins and that seemed about right. To stiffen the structure the LE ought to be sheeted. The other change I would suggest now is to move the bellcrank to an inboard bay out of the way of the tank, as shown on the plan. The original had a strange little tank of a shape no longer considered necessary.

## Construction

Detailed instructions will not be required by the modellers I envisage will be attracted to Unlikely. It has not been tested yet, but I suspect it is a one crash model as opposed to the indestructible original. The 70+ mph airspeed and the laws of physics will see to that.

Cut the ten centre ribs and R2s and R3s out from medium 3/32" balsa. I left the R2 and R3 slightly oversize at this stage with the notches undersize. The ply tip ribs R4 need to be the exact shape. Put all the ribs together in a block with the noses flush. Mark the top of each rib

and then sand the noses flat and true with each other. In this way any slight inaccuracy will not matter during later assembly. Select the inboard ribs and make the holes for the leadouts. Cut out the bellcrank mounting box from 1/8 ply and glue it together. Select a piece of brass tubing which is a running fit over a 4BA bolt. Cut the tube to fit between the mounting plates and araldite a suitable bellcrank to the centre employing a good fillet. Mount the bellcrank inside the box and cut away the clearance to allow free movement. Glue the box between its two ribs.

## Building upright

Cut the sub leading edge from 1/8" sheet balsa. Carefully mark on it the rib positions. (My prejudice still makes me arrange to have in inboard wing slightly longer than the outboard.) With the sub LE flat on a building board position and glue the ribs on it vertically. By using a set square and keeping all the top marks to the top, this is much easier than it may sound. When the structure is dry add the trailing edge and spars in easy stages. Allow the glue to dry between stages and make sure it stays true. Ease the notches in R2 and R3 were necessary when fitting the swept forward



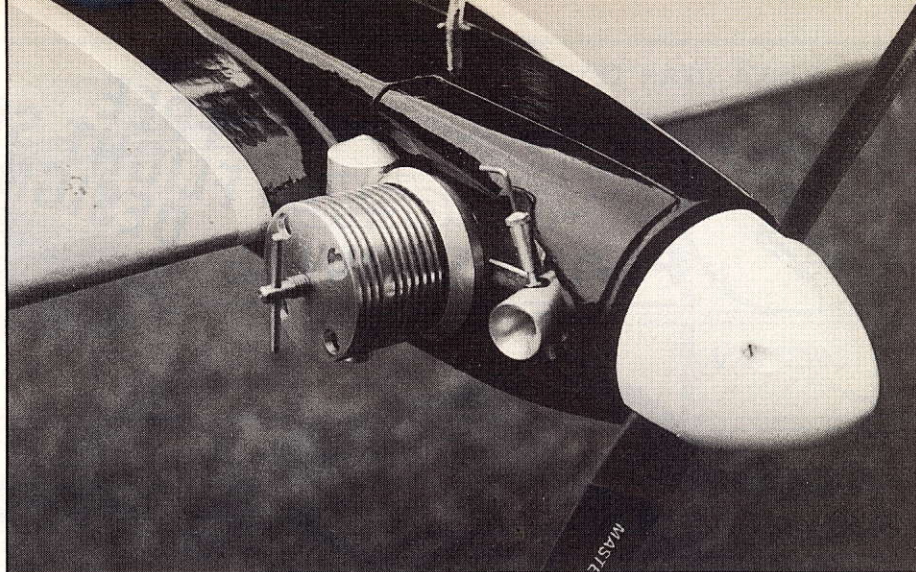
spars. Install the control system and the 1/8" balsa web inboard of the mounting box. With sandpaper on a large block, sand the wing carefully and make sure to get the correct angle on the top and bottom of the sub LE. Wet a suitable piece of 1/16" sheet on one side to make it curl and start by sheeting the bottom leading edge only. Install a suitable tank for your motor. I made one of about 100 cc for the PAW but now think 120 cc would have been better. Finish sheeting and capping the ribs. Add the tip blocks with their leadout tubes inboard and a 1 oz weight in the outboard one. Finally add the 1/2" sheet leading edge and trailing edge capping. Carve and sand the LE to shape, leaving it square for F1 in the centre.

## Engine mounting

Of the engines which might be used the PAW is probably the easiest to mount. With other engines the silencer will stick out underneath and may cause a problem. It might be worth considering modifying it to an upright engine or an inboard side winder. My method was to get some large bearers and cut out F1 to suit the PAW. The bearers were glued to F1 whilst held in a vice to ensure they are parallel. The back end of the bearers were carefully shaped to make them a snug fit over the wing. If you are using a PAW it is worth taking a lot of trouble to get it as far back as possible. By letting the silencer into the LE I could have got back further. With 22 ozs it would have been worth it. While fitting the engine at this stage incorporate the two or three degrees offset. When the bearer assembly has been firmly glued to the wing, make up the rest of the pod with block balsa and cowl the engine if you wish. I did, and fitted a spinner, but it added weight where it was not wanted.

## Final touches

Cut the elevator out, shape, and fit the control horn. Use your favourite hinge but I have a preference for sewn antique Solartex. It is virtually invisible and makes an excellent hinge. Cut out and add the fin and under fin with the offset as shown. Bend up the leadout connectors and remember the strain they will take. Cover the model with any suitable material and fuel proof in all the usual places. I used doped tissue on the centre section and Fibafilm on the wings. The black part is ordinary domestic polyurethane paint with a thin coat of clear poly



**One horse power is on tap at the front end. The launcher can just let go of it and it pulls away.**

all over to seal the edges. Mine checked out at this stage at 48 ozs.

## Flying

The model was first flown on my longest lines at the time, 60 ft. These proved to be far too short and the pull was extremely uncomfortable. I then found enough line to make up some at 67 ft and these were much better – but still a bit too much pull. Now I have a set of 75 ft lines and things are OK although I have yet to fly in a high wind. I think I might prefer 67 ft then. As finished the CG was a little in front of the design position and first flights were flown with no ballast. Subsequent flights have been with two oz under the back end. This has moved the CG to the design position with only a slight change in flight characteristics. I think I know what it will be like if it goes too far back – the Unlimited was awful.

The two props used have been a 12x8 and a 14x7. I have not put them both on the stopwatch but there does not seem to be much difference. Airspeed is 70 mph and on 75 ft lines gives a fraction under 5 secs a lap. Aerodynamically it is a step back to 1949 and manoeuvres are better if large, fast and smooth. If I try to go too tight it buffets about in warning and slows down a little just like the original. With a different engine one could easily knock quite a

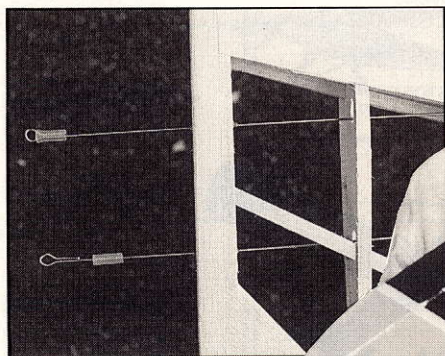
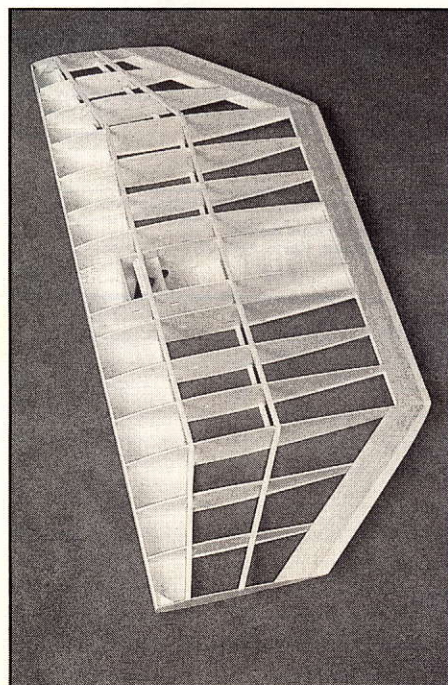
bit off the weight. I wonder what that would fly like?

## The engine

I have really fallen for the PAW 60TBR. It feels good, sounds good and by golly, it does me good. It has character and just purrs out lots and lots of power. When running very badly it pulled the model round manoeuvres on 60 ft lines. (Unscrewed backplate and muck in the fuel – my fault.) Total running time must be coming up to three hours but it does not seem fully run in yet. When running leaned out at full speed on the ground, it still tends to overheat, so there is some more to come. When run in I shall start playing about with different fuels and prop sizes. To keep within the rules of my club I have left the silencer on although without the silencer it could not be called noisy.

If you want a model that stops them in their tracks then build an Unlikely and leave it around. In the air, from a distance, it is no big deal. The size is not apparent, it is easy and safe to fly and has a lazy sounding engine purring round at about 10,000 rpm. It is only when they see it close up that the eyes light up and the conversation starts. The difficult parts are trying to get someone to launch for you and whipping it on 75 ft lines after the engine cuts.

**First flown at the Inaugural MPA Meeting it showed promise but had problems with muck in the fuel and an unscrewed backplate.**



**Make a good job of the connections for the lines. This idea works well and holds the 50oz model at 70mph.**

**The model under construction. Note that I put the bell crank in the centre but it would be much better in the outboard bay as on the plan. Then there is room for a larger tank.**

