

VULCAN

NO ONE CAN DENY that some of the large vintage designs are very attractive. They do however have some drawbacks. One is cost, fifteen or eighteen inch wing cords represent about two ribs per sheet of balsa! The other problem is posed by their size, I know from experience that transporting a 9ft. span model is a bit of a deterrent to flying it every weekend.

For the above reasons, I have already produced a half-sized 'Rudderbug' which is great fun, thus encouraged I essayed D. A. Russell's Vulcan at half-size which comes out at 49½in. span, hence the title near enough '50' and 50% the size of the original. I have attempted to retain pretty well all the features of the original 'Vulcan', but in some details points, some simplification has been desirable, whilst some detail re-design has been incorporated to simplify and speed construction. Although it looks a complex machine, taken step by step it is easy and fast to build. I built mine and test flew it in less than a fortnight. I will admit to a fair consumption of midnight oil though!

Fuselage structure

As the fuselage requires most work due to the installation of radio, motor etc. I like to get this out of the way first. Cut out the ply formers F1 to F5 inclusive and F8A, plus undercarriage beams. Lay these

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Half size version of D. A. Russell's
huge Vulcan free flight model
redesigned by Mike Whittard

to one side and build two flat side frames. These are shown shaded on the plan. I found that the top and bottom longerons needed soaking in hot water to keep the bends — after I took the frames off the board! I overcame the problem by running them under the hot water tap, pinning back on the plan and using my heat-sealing iron to 'cook' the longerons. Ten minutes or so of this treatment enabled me to remove the frames from the board with no springing out of shape. While the frames are setting, take F1 & F2, assemble

them onto the engine bearers ensuring that the bearers are square to the formers and a parallel to each other. I normally tack-glue a couple of spacers between the formers to maintain alignment. These can be cut from scrap ⅛ or ⅜in. sheet and removed after the formers have been added to the side frames. With a medium cut flat file, trim the vertical edges of the formers to allow for the nose taper. The tailwheel leg should be bent up and sewn to F8A and the sewing coated with epoxy or balsa cement. The original 'Vulcan' featured rubber-band springing, with the band looped over the tailplane retaining dowel.

I dithered somewhat over incorporating this feature, but I'm afraid laziness prevailed and I convinced myself that the torsion bar effect of the shape would be O.K. The two undercarriage band hooks should be sewn to F2 and also coated with epoxy. The basic sides can now be assembled to F3, F4 and F5 together with the undercarriage beams. This is best accomplished with the fuselage inverted over the plan. Draw in the tail adding the cross-pieces and ⅛in. sheet infill at the tail. Now *carefully* draw in the nose and fit the F1/F2 assembly. I used cyano so did not need to clamp everything in place, but if you prefer to use a slower drying adhesive, clamps will be necessary. When



Mike Whittard's pint-sized Vulcan 50 retains all the character and atmosphere of D. A. Russell's original model.

the basic fuselage box is complete, the side stringers can be added at which point you will notice a considerable increase in stiffness. Add the small $\frac{1}{8}$ in. square uprights outside the basic fuselage structure from F1 back to F3, and for the cabin window frames back to F6A. Top and bottom formers and stringers can now be added. Cut the notches in the intermediate formers on assembly to ensure they do not wave about all over the place. The fuselage should now be sanded all over, tapering the side stringers towards the tail, and the uprights tapered from the side stringers to top or bottom as shown on the plans.

This is the point at which some of the fiddly bits start. Construct the fuel tank box and fuel-proof thoroughly. Make the fuel tank from thin tin-plate. I made a hardwood pattern or dummy tank to check the size and fit, bending the metal to shape around this pattern. The feed pipe is best made from copper tube as it is much easier to bend than brass. You may be able to find a commercial tank which will fit. The tank should *not* be a tight fit in the tank-box, rather it should have a little clearance all round. I set the tank in place with clear silicone rubber sealant to give a degree of vibration absorption.

Cut the undercarriage legs to length, clamp them together and drill for pivot bolt and axles. Bend the legs to shape and temporarily fit them with the 2BA bolt and nut. Cut and fit the triangular section guide pieces and trim to allow free



movement of the legs. There should be approx. 2in. of movement on each leg. Remove the legs and shape the outer surfaces of the guides to conform to the fuselage contour. The $\frac{1}{64}$ in. ply skins can now be added. Start with the sides, add the top pieces, cut this a little oversize and make the hole for the filler pipe and glue in place, trimming back when the glue is set. Making holes in thin ply or balsa is easy if you use a piece of tube of the appropriate size sharpened at the end. No need to use a drill just rotate the tube and apply pressure — hey presto; nice neat holes! The bottom sheeting has fairly tight curves, so once again the heat-sealing iron came into play. Using it to apply heat, the ply can be easily pushed around the curves, and a spot of cyano holds it in place. The cabin window frames are best cut out completely before adding to the fuselage. Make and fit the

NGA transfer (National Guild of Aeromodeller) gives period charm to the Vulcan 50. Model covered in 'Antique' Solartex with limited colour trim as befits a vintage model of the 1940's.

rudder hinge pin to the rear fuselage again epoxy in place. Make the small balsa fairing, fit and sand to shape.

Now add the $\frac{1}{64}$ in. ply skin at the rear. Once again, heat is required to persuade the ply around the tight curves. Don't forget the small ply pieces for the tailplane dowel. Make and fit the servo rails and their support strips. Glaze the windscreen, but leave the side windows for now. Finally, drill the engine bearers to suit your engine, allowing for a degree or two of right sidethrust if you are using a high power motor. Build the cowl up and sand to shape. Laminate the undercarriage leg fairings around the

alloy legs. Re-fit to the beam and trim the top end of the fairings to a snug fit against the fuselage, at the same time ensure that they have sufficient clearance to allow free movement. When satisfied, the legs can be tapered and shaped to a streamline section.

Tailplane

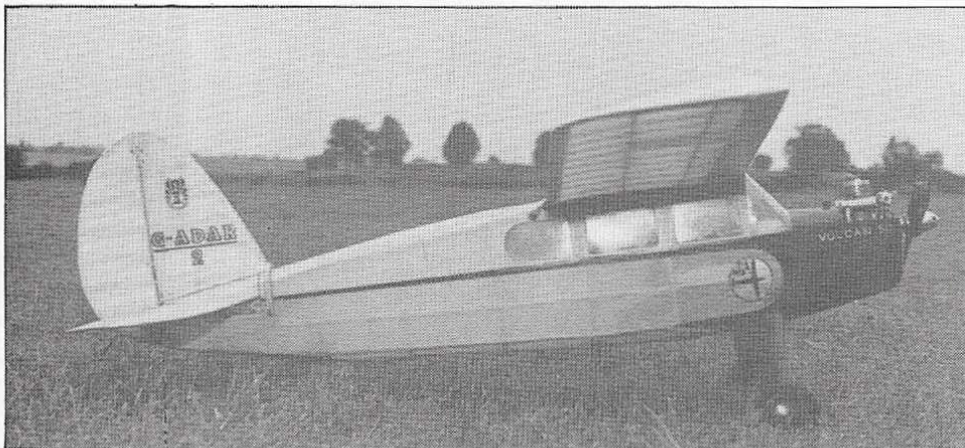
Next bit is the tail, for when that is complete, a 'dry fit' of the radio gear is possible. All the tail ribs are cut from $\frac{3}{16}$ in. \times $\frac{1}{16}$ in. balsa strip. Pack the tailplane L.E. and elevator T.E. $\frac{1}{32}$ in. off the board. The same applies to the $\frac{1}{8}$ in. sheet tips. When dry, remove from the board and sand them to a symmetrical aerofoil section. Add the cap strips and centre section sheeting. Note that these are glued onto the top and bottom of the spanwise members. I made the tailplane and elevators as one piece and cut them apart after sanding down the cap strips at L.E. and T.E. Make up and dry fit the wire elevator joiners and hinge the elevators temporarily. I fitted small $\frac{1}{8}$ in. sheet key pieces beneath the tailplane to ensure accurate relocation. The soft balsa fairing is glued to the top of the tailplane and shaped to match fuselage.

The fin and rudder are constructed in a similar manner except for the outline. Reed or cane is specified, but I actually laminated mine from $\frac{1}{4}$ in. wide strips of $\frac{1}{32}$ in. balsa. By soaking under hot water tap and gluing in place with cyano the job can be completed in about 10 minutes. The heat-sealing iron was used here once more. When dry, remove from the board, sand to section add capstrips and sand again.

Drill the tailplane and fairing for the fin dowels — continue into the fin to ensure accurate alignment. I used $\frac{1}{8}$ in. bore tubes in the tailplane to accept the dowels. Make and fit the small wire hooks for the retaining bands one at the fin L.E. and one each side of the fin T.E. The bottom of the rudder should have a short length of plastic tube let into to accept the hinge pin on the fuselage. Hinge the rudder.

R/C equipment installation

This point is probably the best time to 'dry fit' the radio, servos, push-rods, etc., after which some of it can be removed for covering. I used $\frac{3}{16}$ in. dia. dowel push-pull rods with threaded wire ends. These exit from the fuselage just below and behind the tailplane L.E. Small pieces of $\frac{1}{8}$ in. square are arranged to support the



Vulcan 50

Fifty per cent scale model of the original free flight model designed by D. A. Russell and featured in Aeromodeller in 1942. Copies of the original drawing of the Vulcan (96in. span for 10-15cc engines and suitable for R/C conversion are still available from the MAP Plans Service - address below. Order Plan No. PET 206, price £7.20 plus 50p postage.

The Vulcan 50, designed by Mike Whittard, has a wingspan of 48in. and is suitable for 1.5cc engines (or '20' size four-stroke engines). Construction follows closely the original methods, resulting in an easy to transport replica of a classic vintage model.

covering around these exits, but details will depend on your own personal arrangement. By crossing the control rods, they can be kept absolutely straight. Small inserts of ply or spruce should be arranged to carry the control horns, once again, these details are dependent upon your own control hook-up.

The 450mA Ni-Cads are stowed beneath the fuel tank, the receiver goes between F2 and F3, with the servos as shown on the plan. The throttle servo is mounted on a standard commercial plastic bracket cyano'd in place.

And so to the wing . . .

Construction of the wing is quite straightforward. Taking one panel at a time, lay down the front and centre spars, packing them $\frac{1}{16}$ in. off the board. Pin down the pre-notched T.E., packing the front edge up $\frac{1}{32}$ in. Add the wing tips, packing them $\frac{1}{16}$ in. as required. Fit the wing ribs, followed by the three top spars, L.E. and spar extension pieces. T1, T2 and T3. Note that the outer ribs of the centre section are angled to allow for the dihedral. Cut the $\frac{1}{32}$ in. ply dihedral braces, and fit these by cutting right through ribs R1 and R2. Block the wingtips to attain 2in. dihedral under each tip. Sand the wing at L.E., T.E. and tips to accept the sheeting. Add the sheeting and cap strips. Finally sand down smooth, taking the cap strips down to the T.E. The original Vulcan had a three-piece wing, but in this smaller size, it was felt that the extra weight and complication were not worthwhile.

Well, now all that remains is to cover and finish the model, glaze the cabin windows after covering and doping. Mine is covered with 'Antique Solartex', given one coat of clear dope and some red trim confined to the fuselage. Fitting the rubber band shock absorbers is a bit fiddly, but with some stout hooks and a couple of pieces of $\frac{1}{4}$ in. dowel, it can be accomplished. Fit all the radio gear, push-



1.5cc diesel was fitted to Mike's prototype, silencer not only cuts down the noise level but also helps with the throttling characteristics of the engine.

rods, etc., and check that the controls operate freely and in the correct direction. Control surface movements on mine are $\frac{1}{2}$ in. up and down on the elevator, $\frac{3}{4}$ in. left and right on the rudder. The model balances $1\frac{3}{4}$ in. from the L.E. at the centre section. No downthrust is required on the motor, but a degree or so of side thrust is helpful. Finished flying weight is 2lbs. 3ozs.

The long awaited moment arrives

I am fortunate in being able to fly off tarmac, so initial flight tests — in fact all flights — have been R.O.G. The take-off is no problem, just open the throttle, and unless there is no wind at all, 'Vulcan' just takes off on its own. In flat, calm conditions, you may need to tap right rudder just to keep it straight until speed has built up a little. The climb out is shallow and gentle, but she will climb quite steeply with the application of a touch of up elevator. Loops are no problem, rolls are a bit slow. The stall is gentle, with a tendency to drop the left wing. The model will spin, fast and nose well down. Recovery takes about $\frac{1}{2}$ turn. Mine has done fifteen turn spins and still recovered within half a turn by neutralising the sticks. Landings are a dream. Throttled right back, there is a gentle sink. The model can be flared out to a three-point landing with no trouble at all. Deadstick landings are just the same. Touch and go's have been made at all speeds from full idle to full throttle, with the rubber band shock absorbers allowing for any slight mis-judgement on the part of the pilot.

With this type of model some form of pseudo registration is a must. I cast around for suitable form of registration letters, G-MIKE no. G-AHSV (G-A half-sized Vulcan) — no, even G-VULC. In the end it had to be G-ADAR what else?