**A 24 in. wingspan all-sheet balsa free flight biplane sportster to suit .5 c.c. to .8 c.c. engines. Designed by S. REDFERN**

# FULL SIZE PLAN OF THE MONTH... GRASSHOPPER

GRASSHOPPER was designed to make use of a very ancient Frog 100 Mk. 1 engine and the flight characteristics were initially very lively, but glide non-existent! Eventually, it was modified and a Wen-Mac Hustler fitted. With this power, a more sedate performance with flatter glide made it suitable for small field flying. When trimmed to fly in circles of 70 to 80 ft. diameter, Grasshopper gains only 25 ft. altitude after four circuits.

Construction is possible from just one sheet of ¼ in. and two sheets of ⅛ in. balsa plus a few scraps of ⅛ in. and $\frac{1}{16}$ in. ply, if one is careful with the lay-out of parts on the sheet to be cut. The fuselage sides are cut from ¼ in. sheet, hollowed out on the inside to the chain dot line on plan or from two sheets of ⅛ in. cut away as shown in section B-B. Flute the sides forward of the cockpit for the wind-screens and taper off the inside faces of the sides in the tailplane platform area. Commence assembly of the fuselage by cementing the two sides together at the tail end and former F3 at the front, then clamp with bulldog clips until set. Add F5. If a beam mount engine is to be fitted add the additional ¼ in. former to take the rear end of the bearer.

Cut out the ¼ in. fuselage top and bottom sheets and cement between sides as shown. Before cementing the bottom forward sheet into the fuselage bend the 16 s.w.g. piano wire u/c to shape then bolt and cement to ¼ in. block. When dry, bend u/c legs to 5½ in. wheel track and cement into fuselage to ¼ in.

**Side mounted version is seen in title picture and an inverted engine variation here.**

sheet bottom and $\frac{1}{16}$ in. plywood former F2. Cut former F1 and vary the thickness of F2 to suit the engine installed, a Cox Babe Bee is shown on plan. Then screw motor on to fuselage with ½ in. wood screws. Cut sheet for cowling and cement together around the engine, making sure it does not stick to the fuselage and the hole in the front of the cowl is big enough for the prop driver to pass through. Remove the cowl and engine and spot cement the cowl back on. Sand the fuselage and cowl to shape, rounding off all corners and the front of the wing pylon. Cut away the fuselage bottom for the lower wing seat. Do not make a vee seating as a flat base gives a more stable fitting than a vee seating that is not perfect. Fit tail skid, drill fuselage sides, and fit ⅛ in. dowels for wing retaining bands, then make up and fit 20 s.w.g. cowl retaining clips. If the cowl is a good fit, two clips, one each side should be enough, though more can be used if necessary.

The wings, fin and tailplane are sheet surfaces cut to shape and sanded to section. Reinforce the dihedral joint with a 1½ in. wide strip of nylon, and cement celluloid around the leading and trailing edges to prevent the rubber bands cutting in.

## Finishing

Give the whole model three or four coats, of sanding sealer, rubbing down between each and cover with heavyweight tissue, followed by two more coats of sealer. Finish off with coloured dope or enamel, and a coat of fuel proofer.

Re-fit the engine to the fuselage after dipping the woodscrews in fuel proofer. Fit pilot and wind-screens, assemble the model, check C of G and ballast with Plasticine in the fuselage to correct if necessary.

Trim the glide by packing the tailplane. The prototype did not require any side thrust, just a piece of $\frac{1}{32}$ in. sheet slipped between the top of the engine and the bulkhead to cure a slight mushing under power. Fix the rudder with a spot of cement each side when directional trim is satisfactory.

The prototype has been flown for several hours on the local cricket field, and though it has scored a few "sixes" it has not suffered a smash hit!