at last!... the WW-2 twin you've been waiting for!

"JUNKERS 88

RS 88"! the Ju 88A-4

by ROY SCOTT

THE *Ju*88 has been in my mind for many years as being a suitable twin-engined aircraft crying out to be modelled for radio control. There are three good reasons: firstly, the areas are good and planform and moments excellent; secondly, control surface areas more than adequate; and, thirdly, the colour schemes seemed endless.

Apart from my belief that here was an instrument with inherently good flying qualities, I often aim at designing a model that will recapture a bygone age and, after all, no more will squadrons of *Ju* 88's, *He*111's or Dornier 217's cross the English Channel searching for plum targets to bomb.

I chose the *A*4 version of the '88 however, in the colours of *Lehrgeschwader* One (code L1 + NS). This was based in North Africa and sported a sand and mottled drab green finish with light blue undersides.

Many modellers reading this, if they were either pilot or aircrew during the war, probably have a vivid picture in their minds of coming to close quarters with an '88 and therefore their own pet reasons for seeing one airborne once again, albeit a model. A fellow aeromodeller, an ex-Battle of Britain fighter pilot, remarked that the adrenalin was running quite high watching my *Ju* 88 flying, and being chased by another modeller's *Hurricane* at our club field.

The *Ju* 88 was one of Germany's most widely used aircraft during World War II, seeing battle on all fronts. A *Ju* 88 with its two Junkers Jumo 211J engines at full bore could, in a light state, outrun a *Beaufighter II*.

The model is to 1/12 scale, 72in. span, designed around the power output of two 30 size motors with 9 x 4 props. and weighs 9½ lb.—well within the limits for competition use. It is not a beginner's model, but, with a few explanations on construction, the person who has built a scale model or two will find the *Ju* no great problem.

CONSTRUCTION

Fuselage

The fuselage has two basic $\frac{3}{16}$in. sheet balsa sides with a front doubler and trebler of $\frac{5}{16}$in. ply laminated with contact cement to each other. The positions of the formers are marked off and they are then white glued between the sides. Allow these to set, than add the top and bottom $\frac{3}{16}$in. sheet, nose blocks and

nose former. When all is dry, use a sanding block approximately 7 x 5 x 1in. and sand the edges off the sheeting level with the formers. Apply the $\frac{3}{16}$in. sheeting to the four corners, hold in place with rubber bands and, when set, razor-plane and sand to the shapes shown on former drawings.

Tail unit

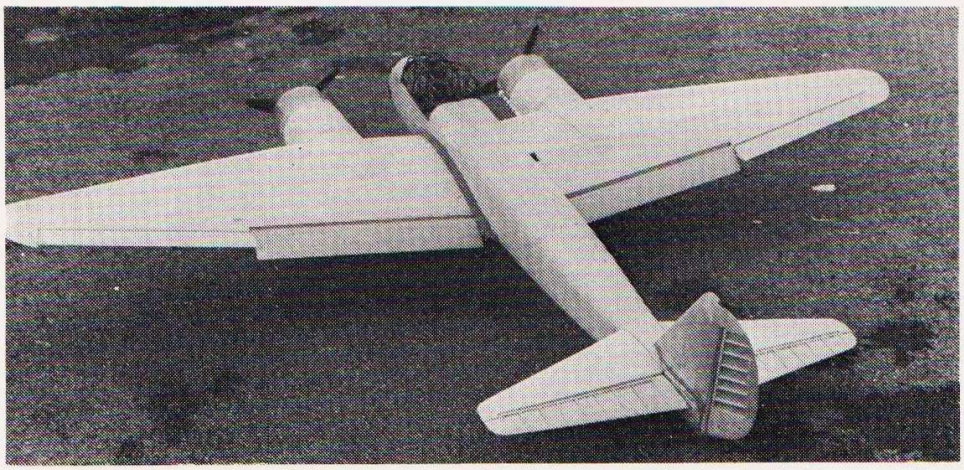
Building the fin and tailplane requires no explanation but do remember to install the tailwheel assembly before installing the tailplane to fuselage. This is built up with brass tube, brass or copper brackets and horn, the horn being silver-soldered to the leg wire. Run the servo pushrods to the tailwheel and elevator horns and then slide in the tailplane. Do not make fast until alignment with the wing is complete. Connection is made to the rudder via a cutout between the tailwheel doors.

Wing

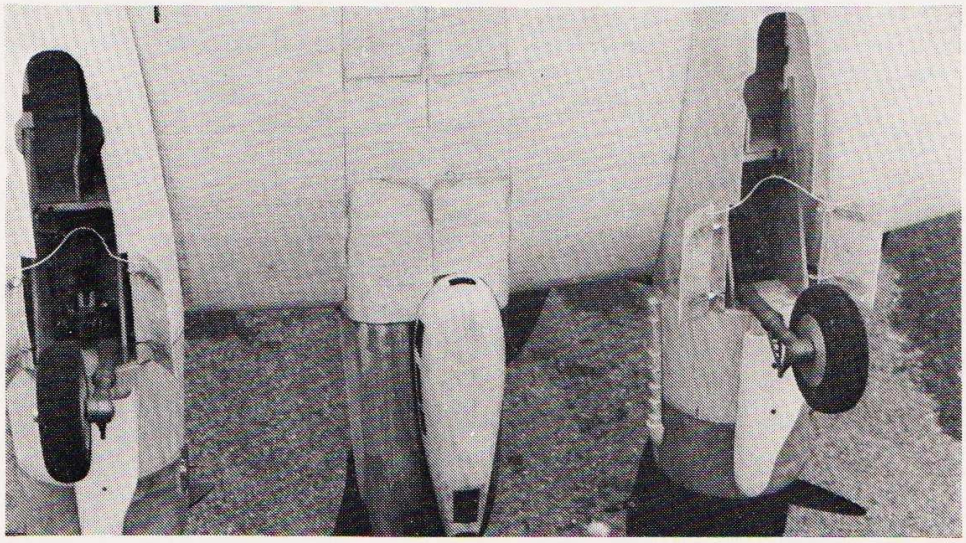
The wing needs special care in order to avoid making mistakes, so get well acquainted with the drawings. I would suggest you construct a special "wing building board" if you do not have one. Simply use two pieces of block-board 18 x 36in., hinged in the middle, then packed up to the desired dihedral. Set the angle of the board $3\frac{5}{8}$in. above level at ribs No.14 for each wing half. Cut and join the wing plan at rib No. 1, cover with plastic film and commence building by pinning down the forward $\frac{1}{4}$in. square spars and dihedral braces. Pin down a strip of $\frac{3}{4}$in. square balsa on the plan so that rib No. 1 is packed up level and rib No. 14 is $\frac{3}{16}$in. above level at its trailing edge with its nose flat on the board. This gives $\frac{3}{16}$in. progressive washout from rib No. 1. Position and glue all the remaining ribs down on to the forward spar, then add all the top spars and sub leading edge.

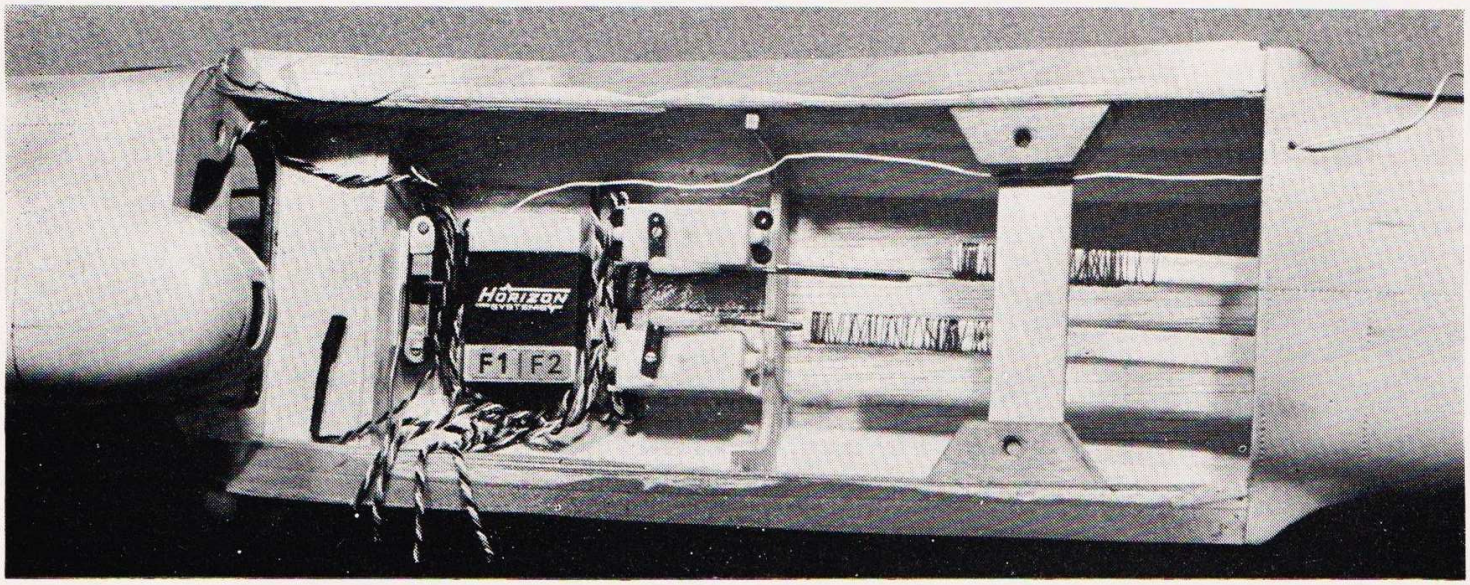
When set, turn wing over (reverse the angle of the building board) and add the remaining spars and sheet over the bottom of wing with 3/32in. sheet balsa. Turn the wing once more and the board to correct dihedral angle. Maintain the position of the $\frac{3}{8}$in. square washout strip. Sheet a 4in. width from the trailing edge after block sanding the undersheeting to rib contour at the extreme trailing edge. Sheet a 3in. width from the leading edge and allow ample time to dry out, thereby retaining the built-in washout. Add the $\frac{1}{2}$in. leading edge (but do not shape) plus bell cranks, wires and cables for motor control, one servo for both engine throttles.

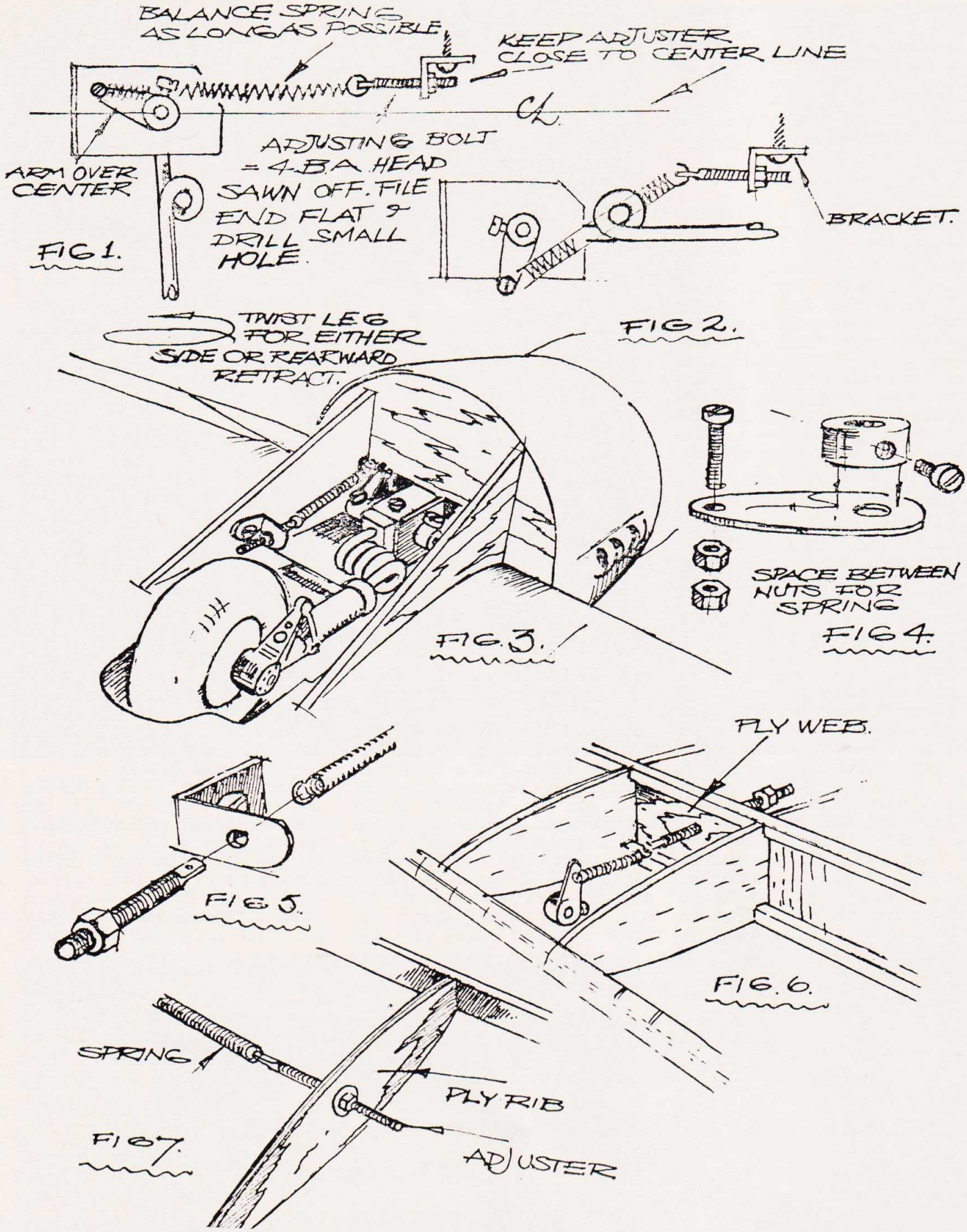
Remove wing, cut away sheeting and glue formers C5, C6 into position, together with engine bearers and formers C1, C2, C3, C4 and two C7's. Take care to reverse formers C1 to C4 on the opposite wing to give outthrust to each engine. Make sure that former C2 is glued flat to the $\frac{1}{2}$in. leading edge, which



Uncovered/unpainted view shows flaps clearly; also construction of rudder and elevators. *Below:* underview, showing original wooden gondola, plus undercarriage. (Sketches of original u/c overleaf.)

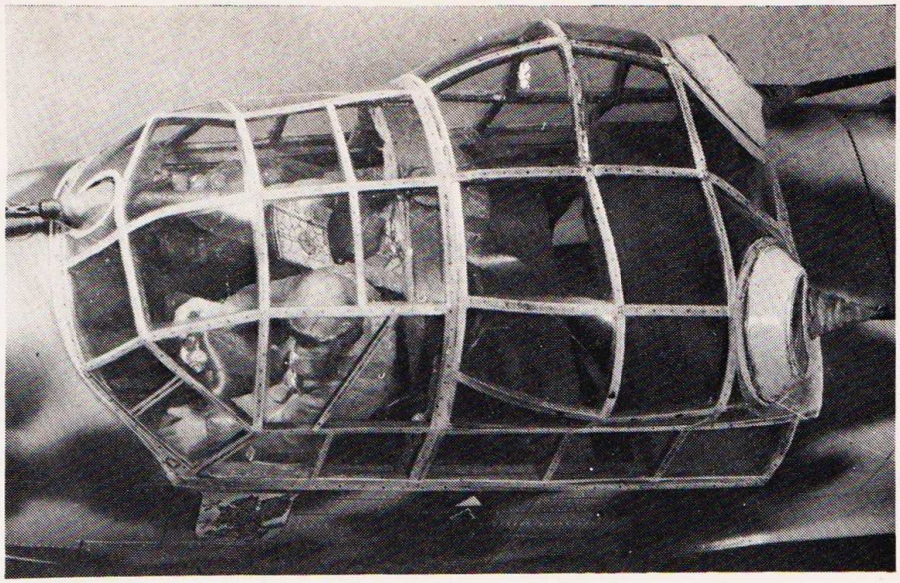






Ju 88 SKETCH-PAGE—depicting details of the retract set-up as used by Roy Scott in his original model. Two Violett retract noseleg units were employed for the rearward motion, with the steering locked, but the compensatory balance spring idea holds good for all modes of retraction, says Roy (Fig. 3).

The spring arm is made up with copper or brass strip, silver soldered to a brass collet, taking care not to let the solder run into the grub-screw hole, (Fig. 4). The spring should be as long as possible—say 2 to 3in.—and the strength of this depends on the weight and length of the leg to be lifted—a question of experiment. The adjuster may be anchored to a side panel ply web between spars, or a ply rib section—see Figs. 5-7. Builders will no doubt have their own ideas on retract methods—these are shown for interests sake.



has been cut from ½in. sheet balsa. Mount your retract units and cut away rib No. 5 to allow retraction of wheel into wing. The retract servo is not shown on the drawings because I feel this could be improved upon, *viz* two servos joined with a yoke (one output lead joining two servos for single operation) each in line and as near as possible to the units to save losing power through friction in the linkages and possible malfunction.

Once you are happy with the undercarriage, the next stage is to cut away the ailerons and flaps. Face with balsa sheet as per drawing, then razor-plane off the edges and finish off with a sanding block. Temporarily install them in the wing, epoxy the tip blocks to the wing and carve them to shape.

Nacelles

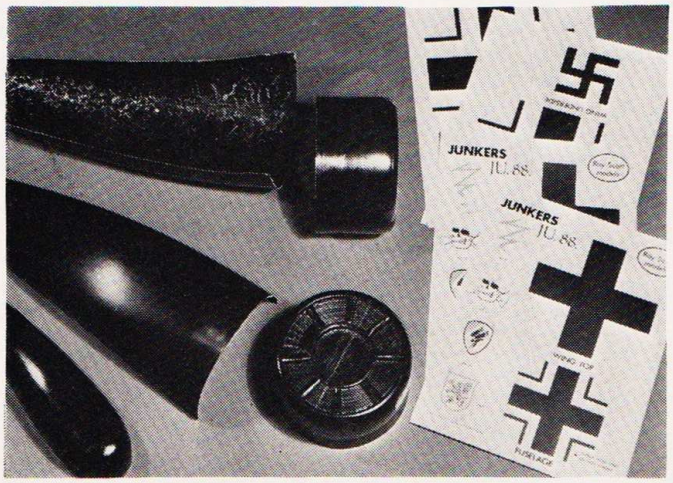
The engine nacelles forward of the wing leading edge are a laminate made of 1mm. ply and ⅛in. balsa sheet. Wrap a strip of paper around formers C1 and C2 and imprint the outer edges with your fingers. From this pattern cut 1mm. ply to shape, glue this around formers and stringers with the join at the bottom. Repeat this procedure to the other nacelle, cut 5in. pieces of 4in. x ⅛in. sheet balsa and join together with double coating of balsa cement. Mark off with the pattern, allowing ¼in. all around for trimming. Offer these over the ply, making sure of a good fit at the meeting joint. These are then contact cemented over the ply and the edges trimmed flush to the formers C1 and C2. This makes for a light but extremely strong structure. Add the nacelle to wing top fairing blocks, then carve and sand them to shape.

Epoxy into position underside of the fibreglass nacelle portions and, after cutting off the segment joined to the flap, make sure this part will rotate into the forward section when the flap is lowered. The moulded fibreglass cowlings are held in position by small woodscrews, screwed into hardwood blocks epoxied to the firewall.

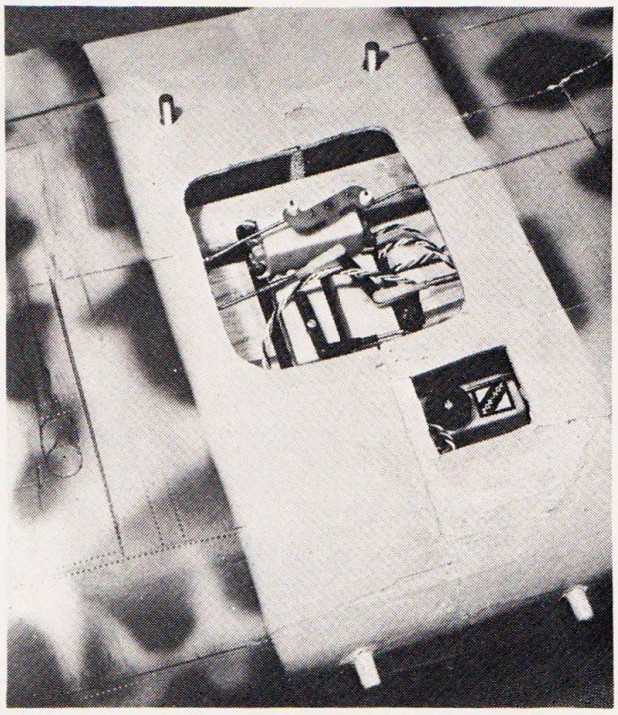
The wing-to-fuselage fairing is quite shallow so I achieved this by applying Sellotape over the area of the wing joined to the fuselage (approximately 1½in. width), mounted the wing and applied "micro balloons" mix with a piece of curved acetate sheet. When set, sand smooth, remove the wing and straighten the edges with further sanding.

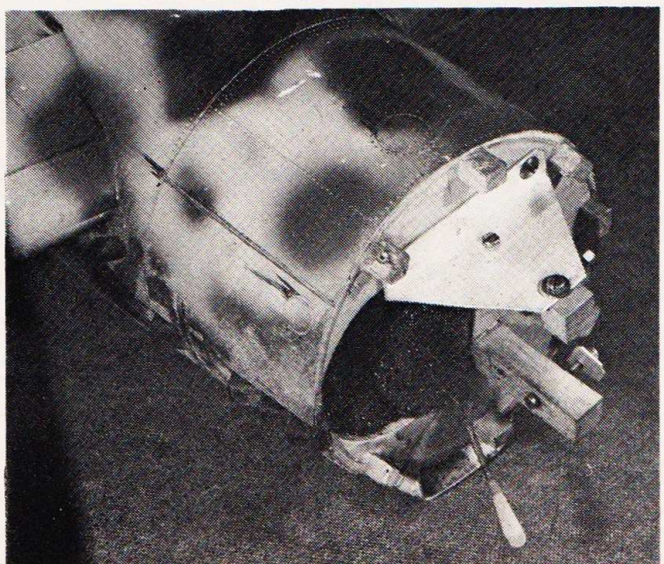
Canopies

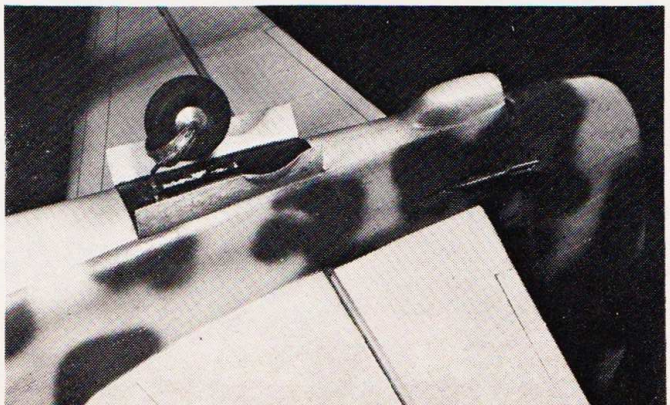
The canopies for this model will be available in due course, but those who may prefer an item built-up,

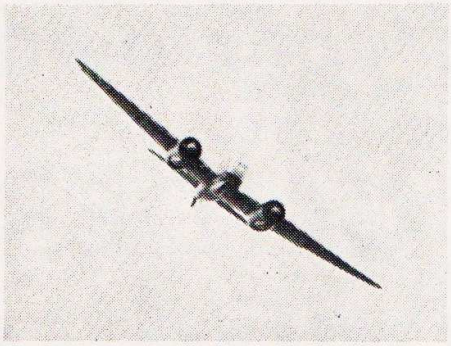


Designer can supply set of moulded fibreglass parts, plus transfers—see Classified Ads. *Right:* centre-section, showing aileron, flap, throttle and retract servos. *Below:* motor mount.

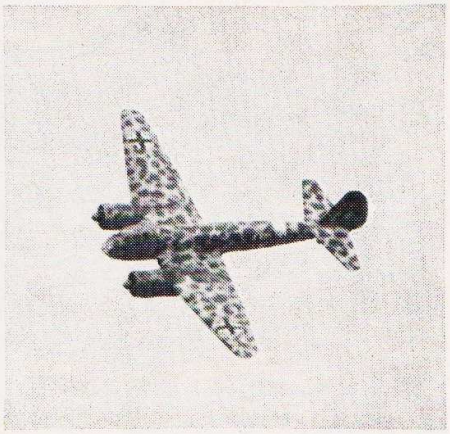








Some typical flight attitudes of the model. (Centre probably not typical of full-size!)



as I do, will find the blister on the main cockpit the only problem. This I made up from segments of commercially available canopies. A tip here is worth remembering—apply balsa cement to the framework, let this dry, cut and position the segment of canopy to be fitted, load a small brush with acrylic thinners and touch an edge of the canopy segment to frame join; a capillary action will take place giving an almost immediate bond. To avoid finger-marks, hold the piece to be applied, which is in contact with the frame in the centre with a small stick. Finish all the joins with 3/32in. strips of masking tape. Cut with a straight-edge, on a sheet of glass.

Finish

The finish is tissued and doped over all with sprayed colour and fuel proofed. Everyone has his own ideas on finishing and painting, so this I will not detail further.

Trimming and flying

There is no magic formula for "setting up" a twin for flying; more often than not it is a question of trial and error but, having designed and built nine different twins to date, any knowledge I have gained is incorporated in the *Ju* 88.

There are one or two points of interest that I feel will be of help to those who intend to build the *Ju*, not having built a twin before. Side-thrust is one—the idea being that with one motor stopped, the running motor will be pulling away from the induced drag. Remember—*never* try to effect control with aileron. *Yaw* is the problem, so *opposite rudder* is the answer. Too much side thrust (over 7 degrees) will cut down the forward thrust considerably. Always remember, the more powerful the motor, the more side thrust is needed. The amount shown on the plan, or a fraction more, is enough for a .30 size motor.

Another point relative to side thrust is balance. All the side-thrust in the world will not help a heavy opposing wing panel! Balance the wing along the root centre line, adding weight to the light panel by drilling a $\frac{1}{4}$in. diameter hole into the tip block and adding lead shot or round split fishing weights until balanced. Then plug the hole. Do this when the wing is finished and painted.

Another point is *vibration*. Photographs of my model show side-mounted motors and you may wonder why the plan shows them differently installed. Well, all but one of my other twins had the motors upright or inverted. The odd man out was the Pilatus *Twin Porter*, which had side-mounted motors when severe vibration was evident, but I put this down to the fact that the motors were mounted on top of the wing of a "high wing" type model.

Brian Taylor had seen the photos in the April 1975 *RM* and remarked that he had experienced vibration in a twin with side-mounted motors and had cured it by mounting them upright and, in his opinion, I would experience the same problem. He was right!! I don't fully understand why this should be so; however, I do have pet theories about it and I will endeavour to research why side-mounted motors on a twin should vibrate the way they do.

There are plenty of motors suitable for the *Ju*, amongst them the HB25, Enya 29, OS 30 and Fox 29. Buy them new and run them in carefully. Tune your motors by running one until reliable throttle control is obtained, run up to peak revs and then open needle valve one notch rich. Start the other motor, adjust the main needle valve until peak revolution harmonics synchronize with the first motor—an unmistakable sound. Not altering the main needle, set the slow range of the second motor with the idle screw until compatible idle is matched with the first motor. Don't be prompted to fly your model until both motors are running perfectly; if one "plays up," my advice is change it.

The *Ju* 88 is a dream to fly and looks fantastic in the air. The control response is positive but not so that it overcontrols. The rate of roll is fairly fast and spin recovery is immediate. The take-off run is quite short on grass because of the light loading (this is the only twin I have felt confident to roll 15 feet off the ground on its second flight).

To coin a phrase(!) "it flew off the board.".

Poor light conditions give the *Ju 88* a menacing appearance in this low-run shot—quite reminiscent of many wartime photographs!