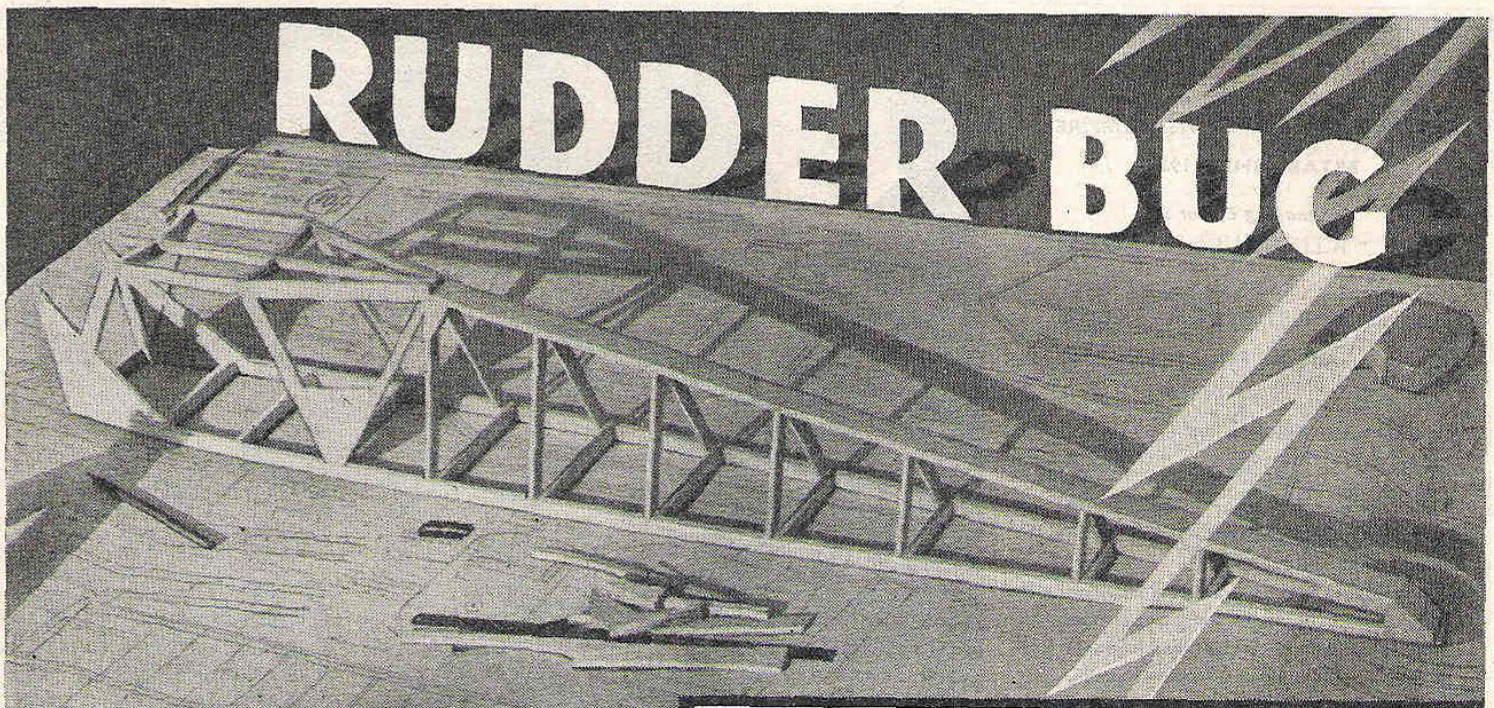
RUDDER BUG

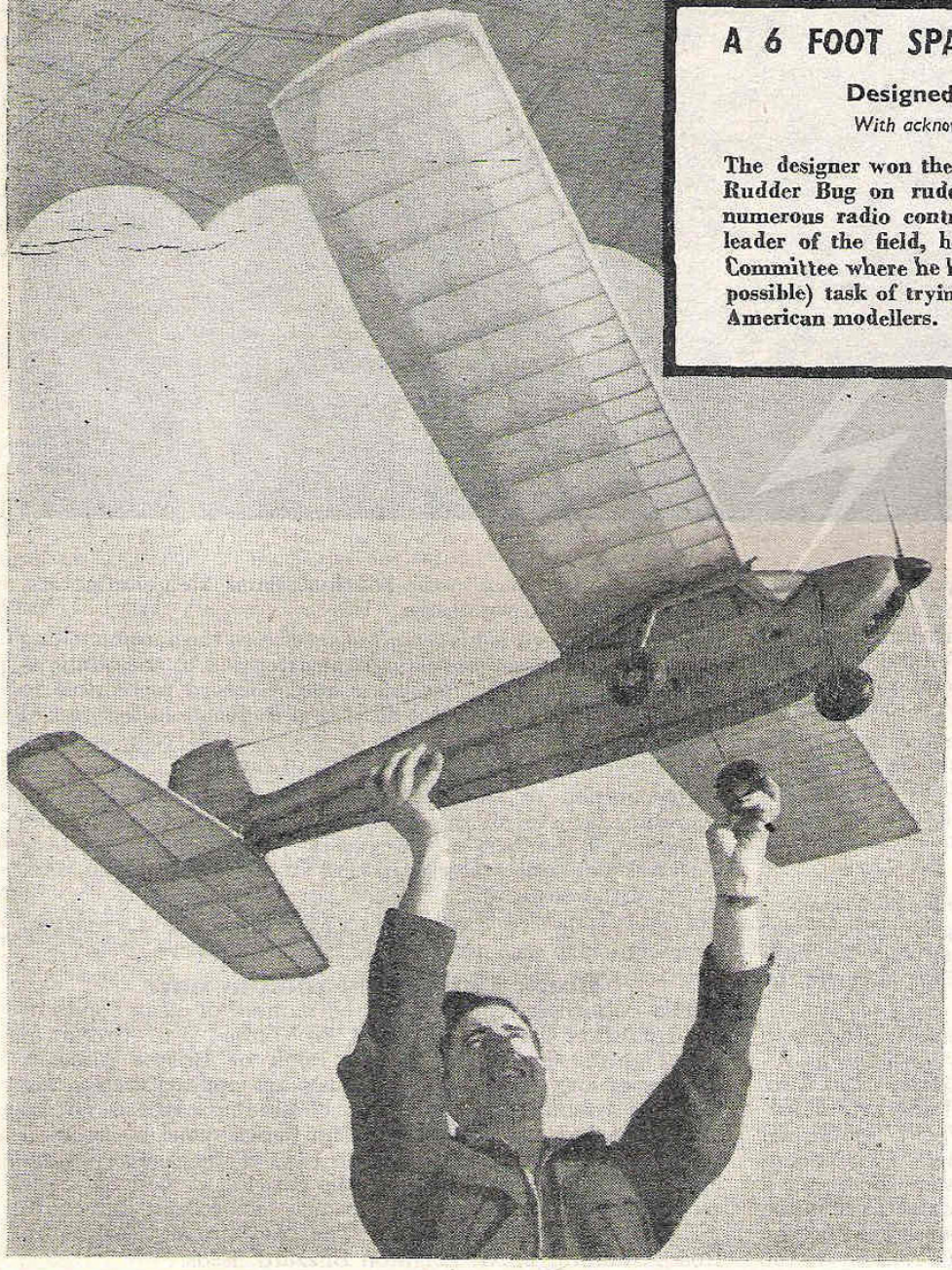


A 6 FOOT SPAN RADIO CONTROL MODEL

Designed by Doctor Walter Good.

With acknowledgment to Model Aeroplane News.

The designer won the 1949 American Nationals Contest, flying Rudder Bug on rudder control only. In addition to his numerous radio control activities, where he is acknowledged leader of the field, he is also Chairman of the A.M.A. Rules Committee where he has the unenviable (and we surmise impossible) task of trying to formulate rules to the satisfaction of American modellers.



THE Scene—A late October afternoon with a hint of winter in the air, just a vestige of wind and a small group of figures gathered anxiously around a model. Occasion—First test flight of a brand new " Rudder Bug", resplendent in blue and yellow dope.

Satisfactory glide tests having been completed we were trying our first power flight with the model unladen, not without a certain amount of trepidation on the part of the test team. A suck-in and a flip and our Yulon was cracking in its customary style. A jerk on the battery leads, a final adjustment to the motor, and the writer was cantering across the grass for a running hand-launch. The model dipped a shade as it sought its correct flying speed and then up went the nose in a steep climb. Horrors, it must stall ! ! ! But no, up comes the tail, she levels off and then more climb and still more climb ! Soon the model is six to seven hundred feet up turning in leisurely circles and appearing practically stationary as it meets the almost imperceptible breeze. The writer was by then sadly reflecting on his underestimation of the Yulon's fuel consumption under free flight conditions, and Rudder Bug, a mere speck in the distance. It was eventually recovered some three miles away where it landed safely apart from a thorn-

punctured tyre in a field.

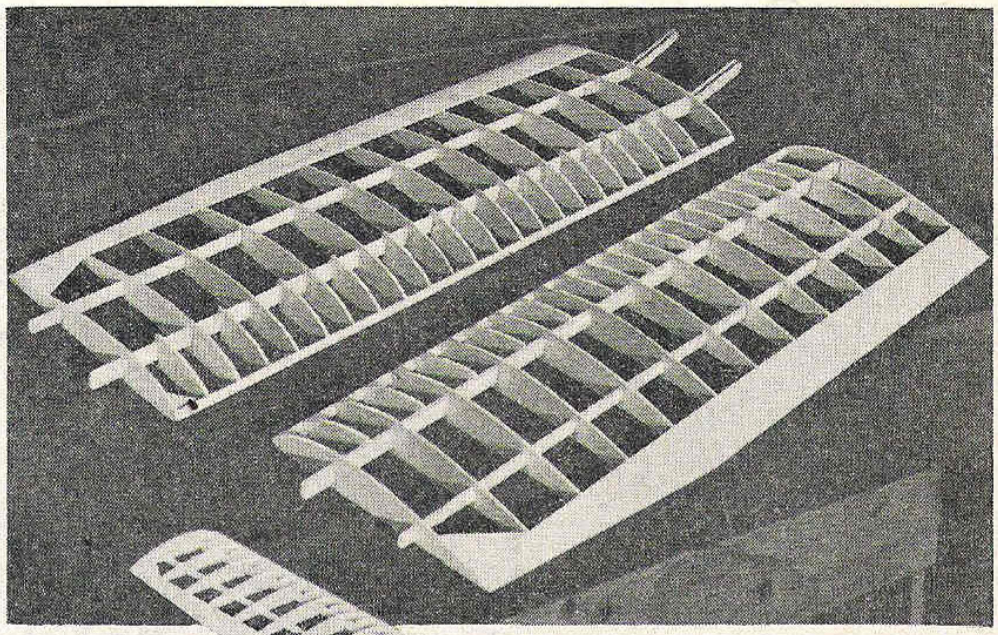
Well there it is. You have oft heard that much maligned expression "it flew straight off the board" but so help me, hand on my heart and the editorial hat raised to Doc Good, this Rudder Bug of ours certainly did. Absolutely no trimming was necessary, the model flying exactly " as per ". Laden it loses the steep climb and gains altitude at an ideal rate for R/C purposes. Almost impossible to stall it is barely influenced by torque and will fly dead straight with the minimum of trimming. Stability is first rate yet it is extremely sensitive to rudder movement and generally fulfils all the requirements the Designer intended. As far as the writer is concerned Rudder Bug has the most delightful flying characteristics of any power job he has yet flown, and although serving as a stooge for his first radio control flights has not suffered even so much as a heavy landing to date, which, as someone remarked says a helluva lot for Rudder Bug !

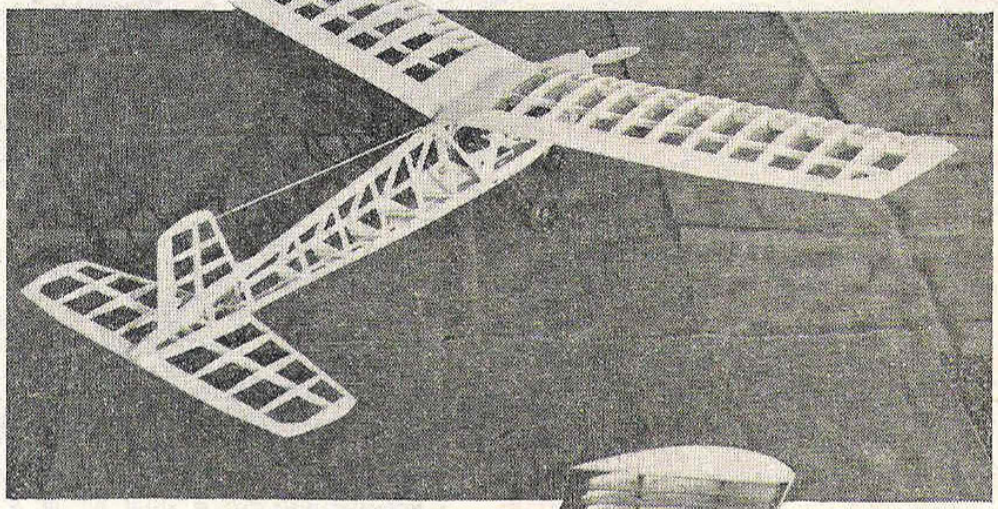
Writing in *Model Airplane News* Doc. Good says, " The general impression of radio control enthusiasts is that final performance depends on about 75 per cent. model design and 25 per cent. radio gear with lots of practice added. Thus, since model design has assumed such importance what are the design factors involved ? Briefly they are : overall size and payload, stability, number of controls, engine power, accessibility of gear, power-on, power-off characteristics, landing gear, and ruggedness ".

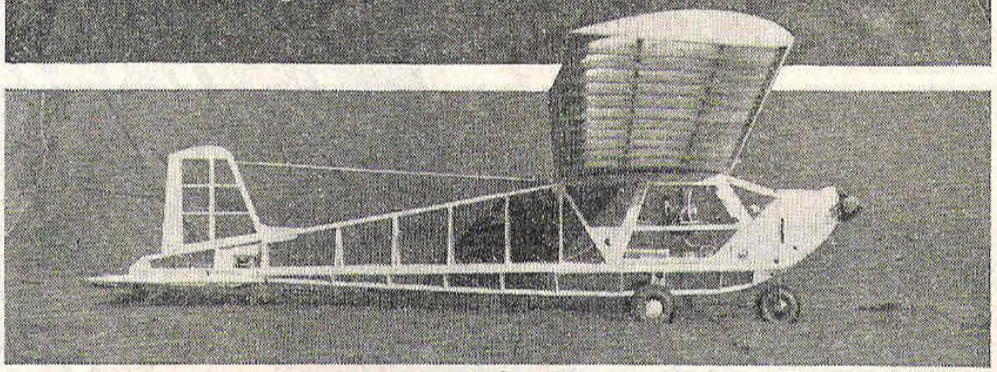
All of these factors have been faithfully met and dealt with to their best advantage in Rudder Bug, which was incidentally in the drawing stage for several years and took a year of limited spare time on the Doc's part to build. Not that the final design, as presented to our readers, involves as much labour. For we ourselves found its construction simple and straightforward and well within the capabilities of the average modeller.

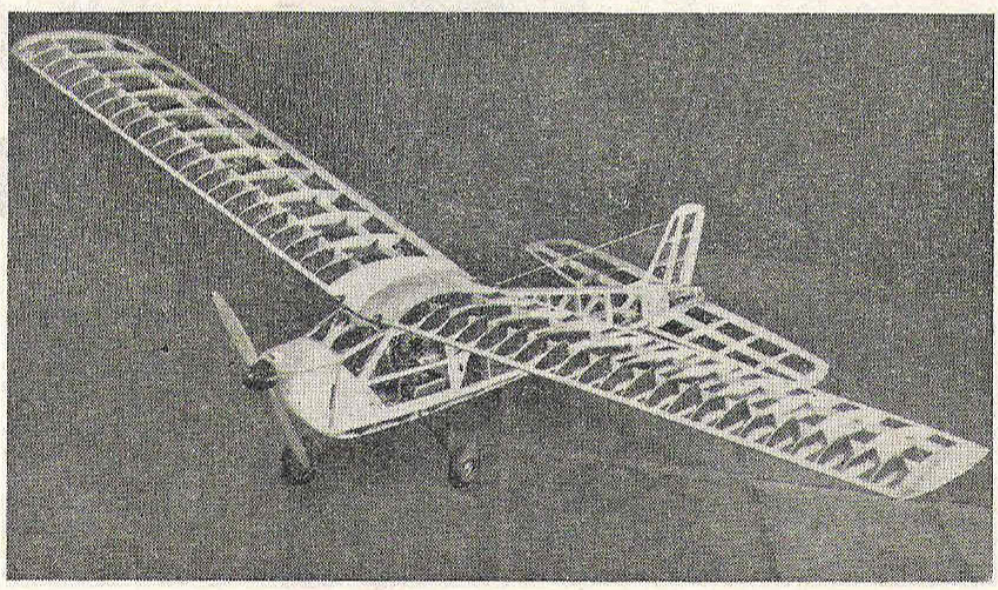
The writer would only add that he was exceedingly fortunate in choosing Rudder Bug for his first radio control efforts. It has completely eliminated any troubles as far as the model side of the question. He only wishes there was a radio control set half as reliable and laughed his head off at Bill Winter's remark in the December issue " Our experiences as beginners in the field of radio control proved that this game has reached the point of development where, barring cost, R/C is practical for all competent modellers ". Bill should have qualified this with, " in America ".

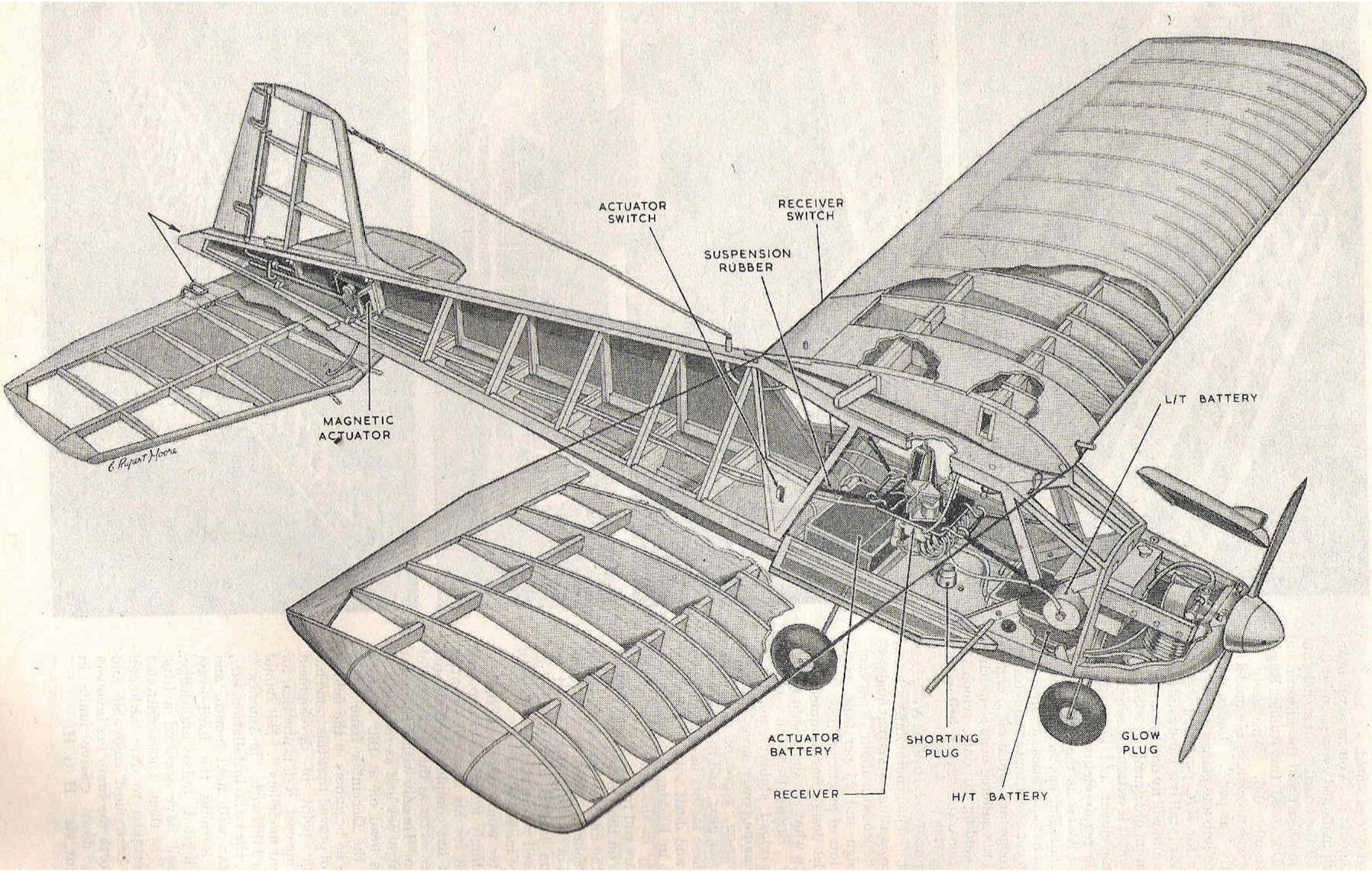
However, the radio installation, etc., is being dealt with next month, and necessarily learning the hard way, with my limited radio knowledge, maybe I shall have acquired a little more " gen " by then. Those controlled flights undertaken to date, although rare, have been most enjoyable and certainly worth the brain fag involved in tracking down elusive faults in anode current, etc. H. G. H.

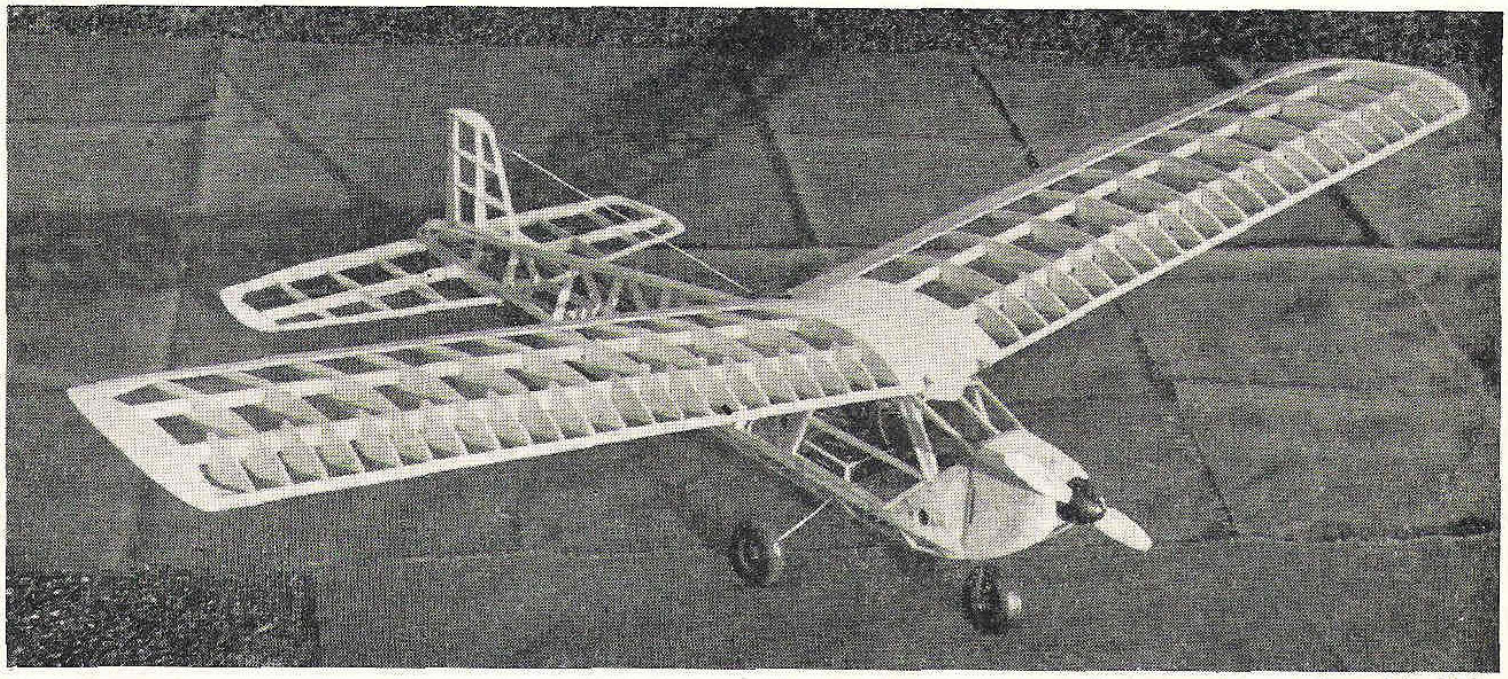









ACTUATOR SWITCH
RECEIVER SWITCH
SUSPENSION RUBBER
MAGNETIC ACTUATOR
L/T BATTERY
ACTUATOR BATTERY
SHORTING PLUG
GLOW PLUG
RECEIVER
H/T BATTERY



Aeromodeller Photos.

CONSTRUCTION of the Rudder Bug is fairly straightforward, and although in some ways it may appear to be rather unconventional to British eyes, it follows accepted practice in the U.S.A.

Fuselage. The fuselage is designed around a battery platform and 2 large access doors. Those of you who have already dabbled in Radio Control will appreciate the size of these doors. They really do allow all round access to the Radio Control equipment, and engine batteries, etc., where a spark ignition engine is used. Most of the fuselage may be built on the plan as you will notice in some of the accompanying photos.

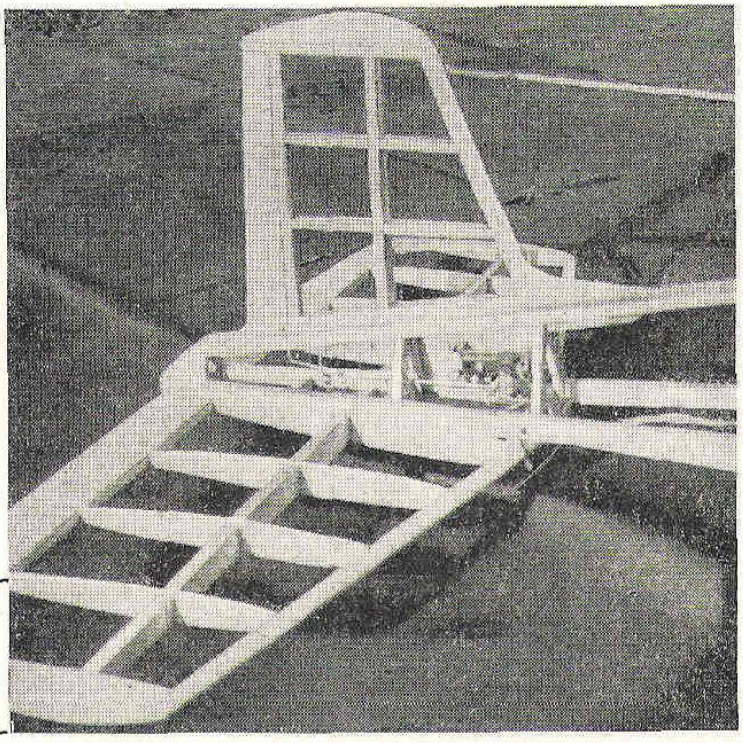
First, the "crutch" is built flat on the plan using $\frac{1}{2}\times\frac{1}{4}$ in. hard balsa. The longerons will need to be spliced unless you can obtain 4 ft. lengths locally. Before pinning down the longerons, it is wise to carve the cut-outs for the tailplane, and care should be taken to ensure that you get the correct negative incidence angle of $-2\frac{1}{2}°$. The uprights lettered E to K are cut from $\frac{1}{2}\times 3/16$ in. balsa and cemented to the crutch, each upright being cemented to the longerons and the front face of the corresponding crosspiece. It is advisable to make card templates to check the angles of each upright, so that they line up fore and aft. The top longeron of $\frac{1}{4}\times 1$ in. balsa is cemented in place and then the $\frac{1}{4}$ sq. diagonals from the top of upright E to the crutch at D. While the cement is setting, the block in the extreme tail can be shaped and fitted.

The main cabin structure is cut from $\frac{1}{2}\times\frac{1}{4}$ in. balsa together with the 2 $\frac{1}{4}$ in. sheet shaped crosspieces. The front upright and bracing members are cemented together on the plan so that the angles are correct when they are attached to the crutch. After cementing the front uprights to the crutch, one of the shaped crosspieces should be joined to the top rear faces, and the $\frac{1}{4}$ in. sq. central member glued to the crosspiece and to the upright E. Then assemble the rest of the cabin in following order: cement the 2nd crosspiece to the central member, the 2 side members which connect the cross pieces, the uprights at D and the 2 side members which connect the tops of D and E. (These last 2 should be cut to size on the plan elevation.) Then fit the 2 pieces of $\frac{1}{4}$ in. sq. balsa at D and the 1/8th sheeting at D and C. The fuselage may now be lifted from the plan.

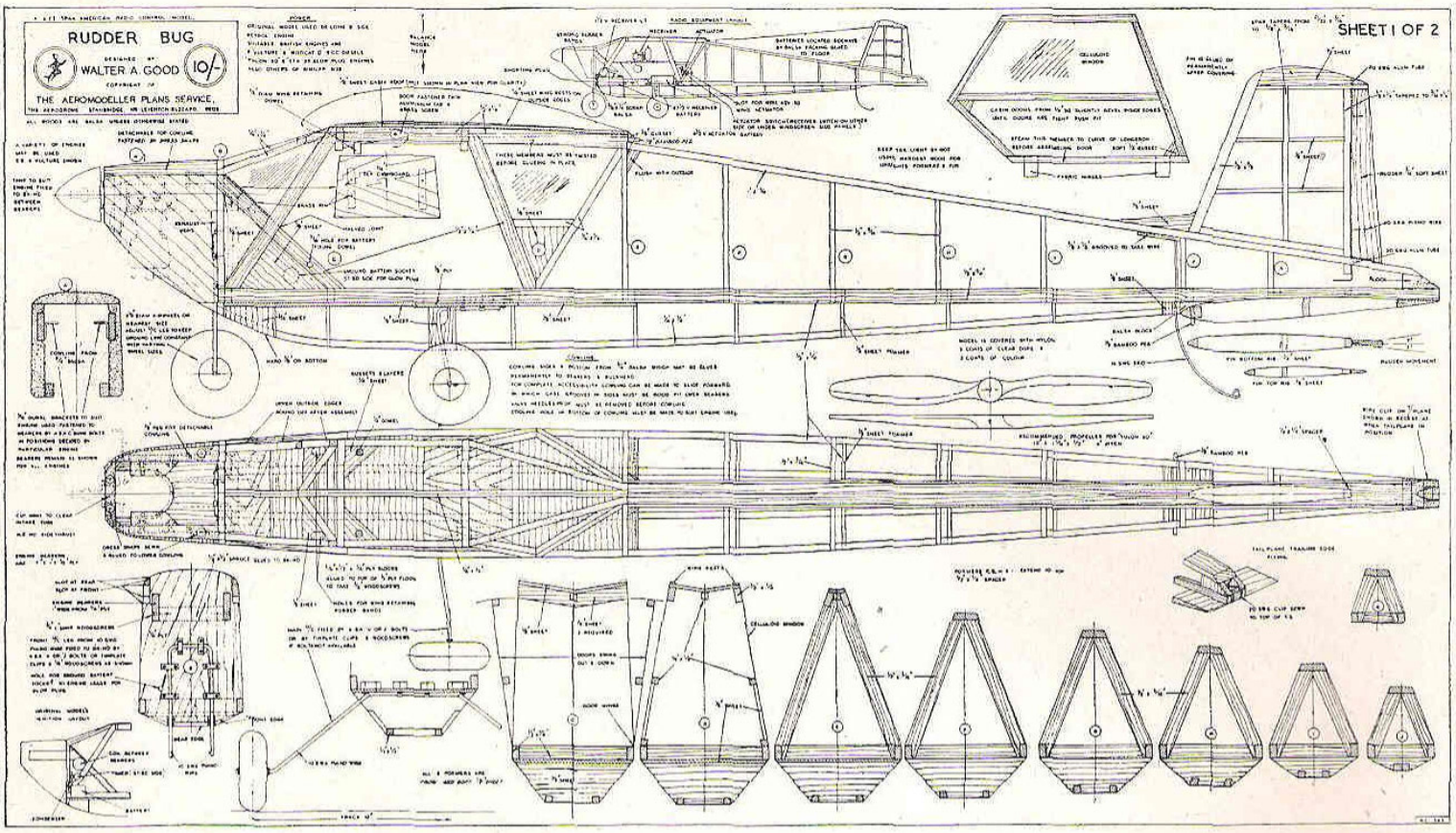
The next step is to cut out the $\frac{1}{4}$ in. ply bulkhead at B and fit the $\frac{1}{4}\times 1$ in. ply engine bearers. The bulkheads may then be glued to the crutch, and the cabin and windscreen structure completed. When this has set, the roof of the cabin should be covered with 1/8th sheet balsa and the wing-fixing pegs cemented in place. Note that the front pegs are located in $\frac{1}{4}$ in. sheet balsa gussets and that 1/8th sheet gussets are cemented in each side at the top of the windscreen. A hole is cut in each of the 1/8th gussets through which the rubber bands pass from pegs inside the cabin to those on the leading-edge of the wing.

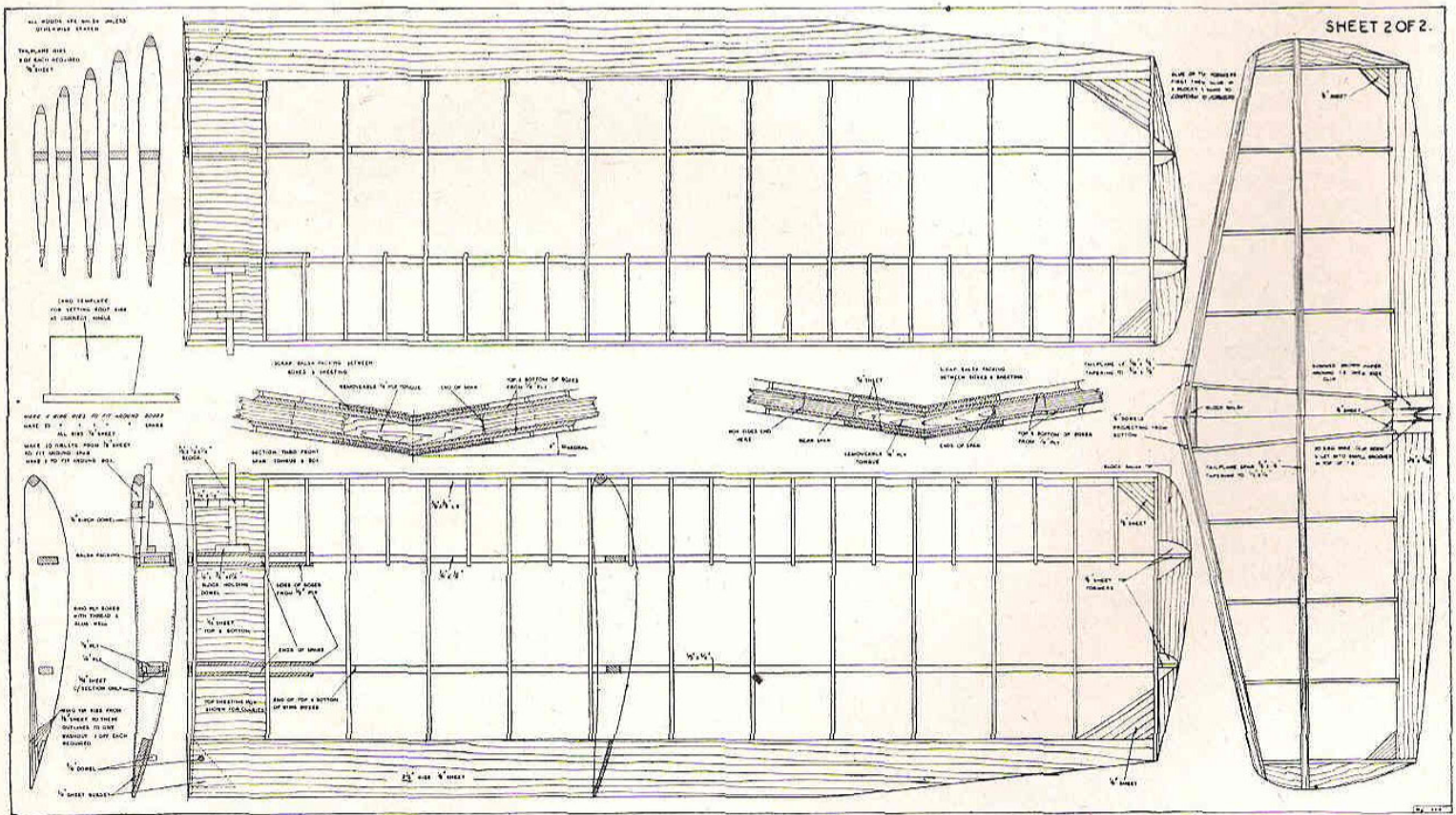
The floor of the cabin is covered with 1/8th sheet balsa from the bulkhead B to Former E, except where the main U/C legs are fixed, where it is covered with 1/8th ply. The main U/C legs should next be bent to shape, using 10 s.w.g. wire, and either screwed or bolted to the ply floor of the cabin.

The formers for the underside of the fuselage are cut from 1/8th sheet balsa. Formers B to E are glued directly onto the cabin floor, while formers F to J are cemented to the rear faces of the crosspieces. When they have set, the 2 $\frac{1}{4}$ in. sq. longerons should be cemented into place. You can either steam them to shape at the front or use the continental



The constructional photographs on this and previous pages, together with the cut-away drawing, give an indication of the simple yet efficient design of this outstanding model. Close-up of tail unit shows installation of the magnetic actuator (Prov. Patent No. 29978) used on the "Aeromodeller" Rudder Bug, brain child of our old friend Howard Boys.





List of Materials

STRIP

5 @ $\frac{1}{16}$" × $\frac{1}{4}$" × 36"
3 @ $\frac{1}{16}$" × $\frac{3}{16}$" × 36"
8 @ $\frac{1}{16}$" × $\frac{1}{4}$" × 36"
3 @ $\frac{1}{16}$" × $\frac{3}{8}$" × 36"

SHEET

1 @ $\frac{1}{16}$" × 2" × 36"
2 @ $\frac{1}{16}$" × 3" × 36"
1 @ $\frac{3}{64}$" × 4$\frac{1}{2}$" × 18"
1 @ $\frac{3}{16}$" × 2" × 12"
13 @ $\frac{1}{64}$" × 2" × 36"
2 @ $\frac{1}{16}$" × 3" × 36"
1 @ $\frac{1}{16}$" × 2" × 12"
1 @ $\frac{1}{16}$" × 1$\frac{1}{2}$" × 30"

BLOCK

2 @ 1$\frac{1}{2}$" × 1$\frac{1}{2}$" × 12"

PLY

1 @ $\frac{1}{16}$" × 2$\frac{1}{2}$" × 4"
1 @ $\frac{1}{16}$" × 4" × 15"
1 @ $\frac{1}{16}$" × 4" × 18"

MISC.

3' 10 s.w.g. piano wire.

1' 16 s.w.g. piano wire
1' 20 " " "
1" 11 " aluminium tube
1 sq. foot celluloid
3 3$\frac{1}{2}$" dia. airwheels
1 2" dia. spinner
1' $\frac{1}{4}$" dowel
1' $\frac{1}{8}$" "
1 block spruce or other hardwood 2$\frac{1}{2}$" × $\frac{1}{2}$" × $\frac{1}{2}$"

method of making 2 or 3 cuts along the grain, flooding the cuts with cement when bending to shape. The 1/8th sheet balsa around the U/C and the 1/8th and 1/16 sheeting at the nose should now be cemented into place. The balsa block on the underside, at J, should be shaped and fitted, and also the 16 s.w.g. tailskid, which passes through the joint of the 2 ¼ in. sq. longerons and is held in place by a piece of balsa cemented to the ¼ in. ×1 in. top longeron. The tailskid, although not fitted to the original model, has been incorporated in the light of recent experience, which shows that despite the tricycle U/C the model is liable to write-off its tailplane when landing on rough ground. Probably the reason we found a tailskid necessary, and Walt. Good did not, is because so few of us in this country enjoy the wide open spaces which are the lot of our more fortunate cousins across the " herring-pond ".

Turning again to the front of the fuselage, the nose wheel may now be fitted, bolting or screwing the 10 s.w.g. wire leg securely to the ¼ in. ply bulkhead. It had better be secure, as the poor nose wheel takes nearly all the bumps !

If you are going to use a spark ignition engine, now is the time to fit the batteries, coil and condenser, as per the layout on the drawing. They should be sandwiched between the engine bearers and 1/16th ply dashboard, so that you get the neatest possible installation, bearing in mind the fact that you also have a whole heap of Radio Control equipment and batteries to go in the same locality. The AEROMODELLER Rudder Bug is fitted with a glow-plug engine and in order that starting may be effected with the least number of lacerated fingers (due to fishing about in the cowling for battery leads) a battery plug is fitted on the starboard side of the cabin. One lead goes to the glow-plug, and the other is earthed on the crankcase.

The shape and construction of the cowling depends on the engine installation and personal whims of the builder. The original by Walt. Good consisted of 2 sides and a detachable top, whereas the AEROMODELLER version is completely cowled-in, the whole cowling being detachable.

The doors are constructed of ¼ in. sq. balsa. They should not be built flat on the plan, but on the model, as they are twisted, and the bottom member is curved. All that remains is to chamfer all the edges that should be chamfered, and sand the sheeting flush.

Wings and Tail. The wings can be built flat on the plan in the usual way. The 2½° washout on the tips can be automatically built in, using one of two methods. One way is to cut the 4 outer ribs on each, to the outlines shown on the drawing, and block up the trailing edge to give the correct washout. The other, and possibly more accurate method, is to build the wing entirely flat, with " square " tips, the outer ribs being the same section as the rest of the ribs. Then slice off the trailing edge to the correct outline, shaping the bottom camber of the ribs to fair smoothly into the trailing edge. The tips are made from soft block balsa, sanded to shape.

The tailplane section is symmetrical and has a full depth spar of ¾×¼ in. hard balsa. The spar should be pinned flat on the plan and the rear halves of all but the two centre ribs, cemented vertically to the spar.

Make sure they are all at right angles in every direction, and that they line up at the trailing edge. While the cement is setting, cut the trailing edge from 5/16th medium balsa, slotting it to receive the ribs. Sand to the correct section and cement in place on the ribs, then add the rear halves of the centre ribs. When the cement has set, remove from the drawing, attach the front halves of the ribs to the spar, again leaving out the centre ribs, and make sure that all the ribs line up fore and aft, and along their leading edges. When dry, add the leading edge, the centre ribs and the balsa block between them. The tips are made from soft balsa block and sanded to shape.

The fin is built in the same manner as the tail-plane, and is cemented to the fuselage after covering. The movable rudder is made from soft 3/16th balsa, and is intentionally left thick to operate effectively. Make absolutely sure that the rudder moves very easily without any sign of stickiness. You will find that if the rudder is not perfectly free, your actuator will not work reliably, if at all.

Covering. Walt. Good's original Rudder Bug was covered with nylon, but as our girl friends " borrowed " ours, the AEROMODELLER version is covered with lightweight parachute silk. You will find that 5 panels will be sufficient if you go carefully, but don't forget to cover only with the grain running along the length. After first water shrinking the entire covering, give the whole model 3 coats of clear dope, and the rest is up to you ! The AEROMODELLER Rudder Bug colour scheme is : Blue fuselage, fins and rudder, and yellow wings and tailplane. The dope was sprayed on very thin giving a translucent effect, and finally the model was given one coat of fuel-proof dope. Naturally, if you are using a diesel or petrol engine, there is no need to fuel proof the whole model. A word of warning here about the fuel-proof dope. Do not expect to fly the model the day after applying it. Ours took 4 days to dry out thoroughly, despite the advice to " leave for 2 to 4 hours for dope to dry completely ".

Aeromodeller Photo.

Rudder Bug takes the air at Eaton Bray on its first test hop.
The reproductions opposite are 1/6th scale of the full sized drawings, which are available price 10/– post free from the "Aeromodeller" Plans Service. Start building your model now, ready for the radio installation instructions which follow next month.