



Graupner's MOSQUITO

built and flown by
NICK COOK—
with 'Elektro flug' unit

THE "impossible" rarely stays that way for long. Neither model helicopters nor electric powered flight seemed a practical proposition a few years ago, but the helicopter revolution burst on the scene and now electric flight is here to stay. The experimental stage can be said to be over when purpose-designed kits appear on the market. Here, new from Graupner, is the electric powered *Mosquito*. This model may also be built as a pure thermal soarer for tow-line or bungee launching, or for power-assisted flight with a pylon mounted .049 or a wing mounted .09 motor. This report deals only with the first mentioned variant, powered by a single electric motor mounted in the nose.

Because of the other variations, the kit comes in separate packs; one each for the model, the electric motor and propeller, the battery and finally the R/C installation pack. The contents of the kit were comprehensively described in the November '75 Trade News and the performance of the power unit was discussed in last month's "Electric Motor Suitability," Part 2. Suffice it to say that the review *Mosquito* is a 99in. span model of 798 sq.in. total surface area and is powered by a 6:1 geared

electric motor driving a 14½ in. diameter folding propeller from a 1.2 AH, 8.4V battery pack.

Documentation

This deserves a special mention because there is a great deal of it, all useful and nothing left to chance. Firstly, there are 4 booklets, one for the model and another for the electric propulsion unit, both these being in German, and an English/French/Italian translation of each. For the model, the building sequence is given in clear step-by-step stages in the translation, but one must refer back to the German text for some diagrams and photographs. Symbols appear in the margin when the step is dependent on the type of motor installation and when one must also refer to the electric propulsion booklet. Sections on covering, radio installation, trimming and flying are all included. At the back is a list of all numbered parts, giving quantity, material and size, and another list of stock material, giving the part numbers to be cut from each piece.

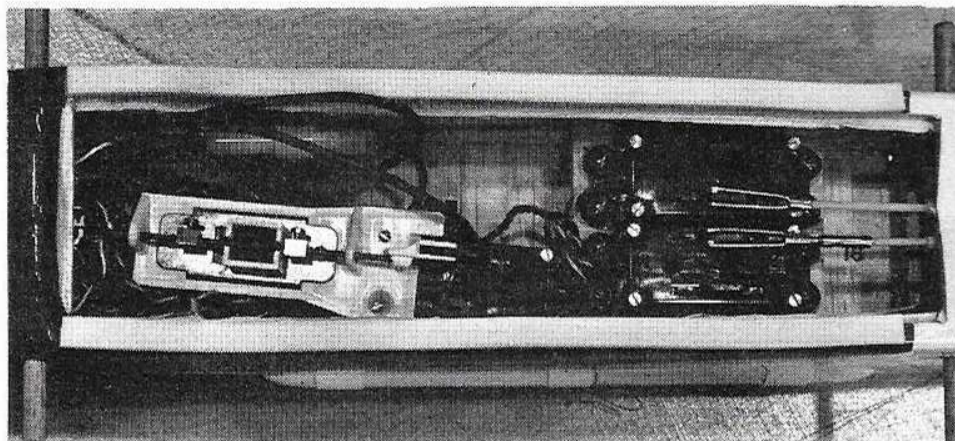
Similarly, the electric propulsion booklet describes installation, testing, charging and maintenance of the power unit, plus some flying tips; all of which will be useful informa-

tion for the tyro. As usual with Graupner kits there is an "exploded" view drawing showing every individual part. The superb main plan is sufficiently large to show the full length of each wing half as well as every wing rib shape, even though the ribs are ready die-cut parts. This makes the fabrication of replacement parts for repair work very easy. Secondary transparent overlay plans show the recommended positions for radio equipment and control runs, with and without the electric motor and battery. With all this information there's absolutely no excuse for mistakes, is there?

Construction

The *Mosquito* airframe is of absolutely conventional all-wood construction in the traditional balsa box style—4 pieces of sheet with formers and triangular section corner fillets. The wood used is light and quite thin, so the fuselage sides and bottom are cunningly ready-reinforced with obechi veneer doublers at the front. Lightness is really the key to performance with the electric powered variant, so glue must be applied sparingly. I used the Uhu cement supplied in the kit for all joints that would need to be sanded, but PVA elsewhere.

The tailplane is built up as an open framework while the fin, rudder and elevator are solid sheet in which lightening holes should be cut. The fin does not key-in to the fuselage, but is supported on the top deck by triangular-section fillets. The tailplane sits on a small ply platform under the rudder and is either 'knock-off' (retained by rubber bands and dowels like the wing) or else is glued on to save weight (and that's still 'knock-off', believe me!) Also to save weight, I chose to omit the recommended ventral, tail and 'propeller' skids, intending to fly the



model only from sites with good landing areas.

The wings are built-up, with a slight undercamber and with wash-out over the outermost third. Again, very light but adequately strong for general flying. Although they are webbed between the main spars and are sheeted in front at the top, there is no bottom sheeting, except near the roots, to complete a torsion box. They are therefore quite flexible and rely to some extent on the covering for additional rigidity.

One point of detail; I found that the tedious business of removing the wings from the bench and subsequently re-pinning them in order to fit the bottom spars could be avoided by sliding the spars under each wing from the root end, applying the glue and then lifting into place and securing with some small balsa wedges. Alignment of the dowel tubes in the root of the second wing, to match exactly the first, I achieved by temporarily mating them with straight rods. (The joining rods supplied in the kit are pre-bent to the dihedral angle).

There is very little else I can say, except that *all* pre-shaped components fitted exactly and *all* rough-cut components were just oversized . . . and that's what properly engineered kitting is all about. There was even some stock wood left over.

Covering

The model was covered with polyester film for durability, lightness and ease of cleaning. This is where the only real problem occurred. The lightening holes weakened the rudder so much that the cross-grain balsa between them actually crushed when the film was shrunk, warping the rudder considerably. A second rudder was quickly made up from $\frac{1}{2} \times \frac{3}{16}$ in. balsa into the form of a trussed frame. This was tapered with a razor-plane when dry.



The result was much more satisfactory, with the compressive loads of the covering and the bending loads of the control forces now being taken along the grain of the wood. The left side of the fuselage was left uncovered until after the hatch for the battery pack had been cut.

Installation—radio and electrics

As the power unit was reviewed in last month's RM, my comments will only cover its actual installation into the *Mosquito*.

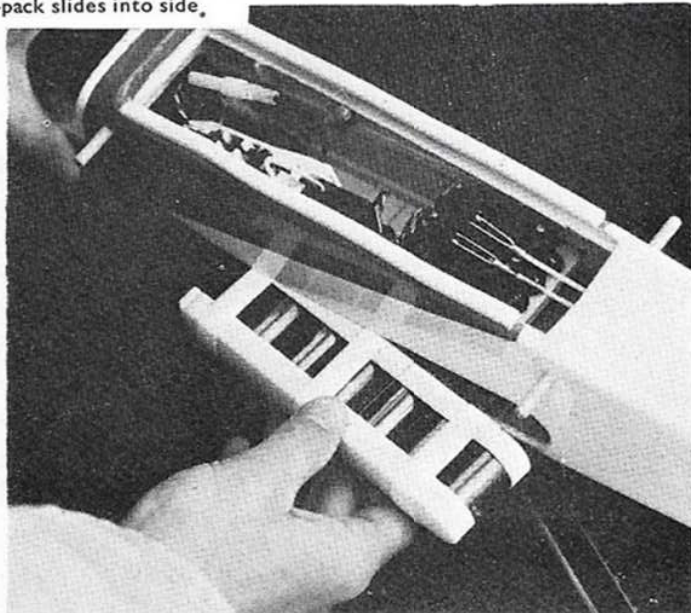
The front of the cockpit houses the flexible coupling and drive shaft and, since these are hardly bulky items, it tapers to give that sleek long-nosed look. The geared electric motor occupies the middle of the cockpit, sitting on a small hardwood block and retained by a wire strap. The block is pre-shaped to give downthrust but the sidethrust has to be set to the recommended angle by careful positioning of the block. The motor is cooled by air which is forced into the cockpit through small air-scoops. (The cooling slots in the motor should locate with the outlets vents in the fuselage sides). The cockpit continues to deepen and

At left is shown the original rudder (held), with Nick's diagonally braced replacement (fitted). At right: power-pack slides into side,

widen right up to the wing, so the rear is quite capacious and easily swallows a 500mAh nicad and the receiver.

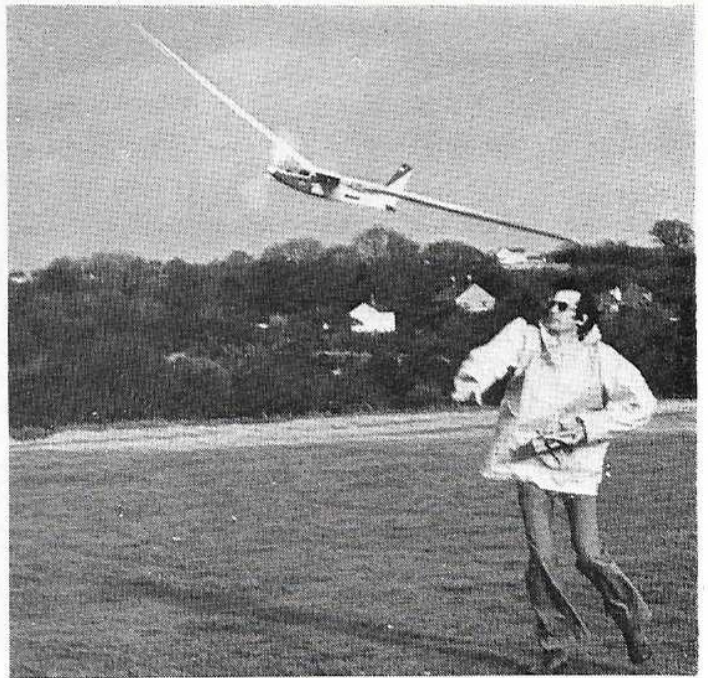
The under-wing volume is divided in half, horizontally, by a balsa sub-floor. Into the top half go the servos for rudder, elevator and motor switch, which are accessible from above with the wings removed. *Don't* omit the switch servo—the model has a potential ceiling of about 500m without any thermal assistance. Besides, the battery should not be drained below 5.6V (measured under load), so control of the switch is essential. The battery pack goes into the lower half through a large hatch in the left fuselage side. The position of the battery pack is used to control the location of the model's c.g., a trial balance check being made with the model completely assembled and with the fuselage *before* cutting the hatch. A word of warning here; the battery gives a lot of pendulum stability, so the model "almost" balances over a range of positions. The actual balance position is found when the model balances with the top deck of the fuselage horizontal.

Incidentally, I chose to put the





1. Dip nose to extend prop. 2. Switch on. 3. Airborne!



c.g. in the middle of the indicated range, 77mm behind the l.e., and the battery hatch came exactly in the plan position. All-up-weight came to 57 oz., (also exactly as per plan), giving a wing loading of 10.3 oz./sq.ft. (The instructions quote .103 oz./sq.ft!!!)

The battery and propeller may be removed for slope-soaring. This lightens the model to 42 oz. (7.6 oz./sq.ft.) and moves the c.g. forward by 4 mm., compensating for the loss in pendulum stability from the battery.

First flights—on the slope

The first test flight was actually made from the slope, in a moderate wind—unpowered. The model went out slowly and up like a rocket. Gentle application of 'down' gave better penetration, still apparently climbing quite fast. Directional control was almost non-existent, so I slowed the model down, still pointing into wind, and allowed it to drift behind the slope and land. Upon inspecting it I found, to my horror, that the nuts on the rudder horn were loose! I had forgotten to lock them with the customary drop of dope or cement and they had vibrated loose during the wind-

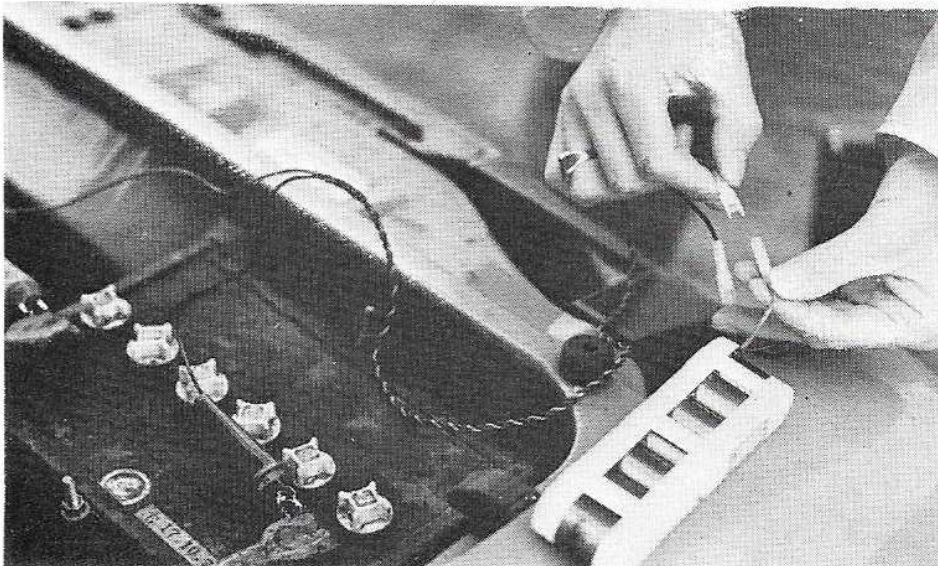
tunnel tests of the power unit done for last month's article!

The fault was quickly rectified and then directional control was very positive. Lateral stability was checked by allowing the model to pull out from a gentle dive, which it did smoothly and without zooming/ballooning. This was with the c.g. in the middle of the indicated range and with the propeller and battery installed (although the power unit was not used). The function of these first slope flights was to prove that the model was in trim, stable and controllable. Having done this, I went home to wait for the wind to drop.

Flying—electric fashion!

It didn't—so the first few flat-field flights under power were made in a breeze, about 8-10 mph. Launching procedure is simple . . . hold model at shoulder height, drop the nose slightly to unfold the propeller, operate motor switch via transmitter to start motor . . . raise nose level again . . . two steps and shove. The *Mosquito* climbs slowly and steadily

Below: Varta battery being charged from 12v. car battery, using special Graupner leads.



away and . . . surprise! . . . three minutes later it's about 150m high. The sound it makes is a combination of a low pitch hum from the propeller and a high pitch whine from the motor. At the launch position it is rather like having a small vacuum cleaner next to your ear, but up in the air, the propeller hum is soon lost though the whine is still audible at 150m provided one is flying alone. That's the point; alone it sounds quite loud because it's the only sound, but as soon as an i.c. motor starts up one realises how really quiet the *Mosquito* is in comparison!

Launching can be tricky in gusty conditions. With towline or bungee launches, a model will clear the ground in a few seconds, but the *Mosquito* is vulnerable to surface gusts for a little longer—say 20 sec or so. This was embarrassingly proven during the photo session when I succeeded in knocking off the glued-on tailplane at the very first attempt. The limiting wind strength depends on the site. At an open flat field the wind could be quite strong but steady, and still be safe to fly, whereas a "lumpy" sort of field with surrounding trees would be quite turbulent. The folding prop can be a good indicator of gustiness since, with the nose dropped about 40 deg. ready to switch on the motor, the prop should stay open. If it folds up intermittently, then it's probably too turbulent to launch safely.

There was a distinct trim change between powered and gliding flight which indicated that the recommended amount of downthrust was insufficient. I required about $\frac{1}{4}$ of my trim range more 'down' when under power to maintain the same airspeed as in the glide. There was no tendency to turn, so sidethrust was correct.

MOSQUITO

Having trimmed-out the model to my satisfaction (that "mystical process" I discussed last month), the *Mosquito* will now consistently give flights of 25 min. duration from a full (slow) charge and flights of 20 min. duration from the 80 per cent (quick) field-charge with no thermal assistance. I took the opportunity offered by two calm, slightly misty and quite "flat" days to check the actual performance against last month's predictions. I flew large smooth circuits, chopped the motor after a run of exactly 180 sec. and measured the total flight duration. Four attempts gave times of 460, 465, 430 and 460 sec. The prediction for a 180 sec. motor run

was 457 sec. I repeated the test without the trim adjustment mentioned earlier, so that the model flew just above the stall while under power, and recorded times of 330 and 320 sec.—nowhere near as good as before. Moral . . . mustn't prop-hang; let the wings do the work!

The available height gain is equivalent to three good launches from a 150m line, but that's not the most efficient way to use it up. A better plan would be to patrol between 100-150m, searching for thermals and topping-up the height as required. Unfortunately, it has not been good weather recently for assessing thermalling performance, but I am happy with this model's ability to soar in very light slope lift. It compares very favourably with my late *Cirrus* (10 oz/sq.ft.) and penetrates better but is out-floated by my current model (7.5 oz/sq.ft.). This seems to bear out my long-held conviction that a model is as good as

its wing loading (easily measureable) and its L/D ratio (measureable with some effort) . . . but let's not go into that now!

Summary

The *Mosquito* model and its electric powerplant are a balanced combination and a superb example of properly engineered kitting. Construction and installation are straightforward and uncomplicated. Flights of 25 minutes can be consistently obtained, without thermal assistance, and a fast recharge from a car battery takes only 30 min. I think you will find this a "sweet ship", without detectable vices or environmental pollution. The *Mosquito* promises to start a quiet revolution—dB, or not dB—that is the option!
Manufacturer: Johannes Graupner, Kirkheim-Teck, W. Germany.
Importer/Distributor: Ripmax Models, Ripmax Corner, Green Street, Enfield, Middx.