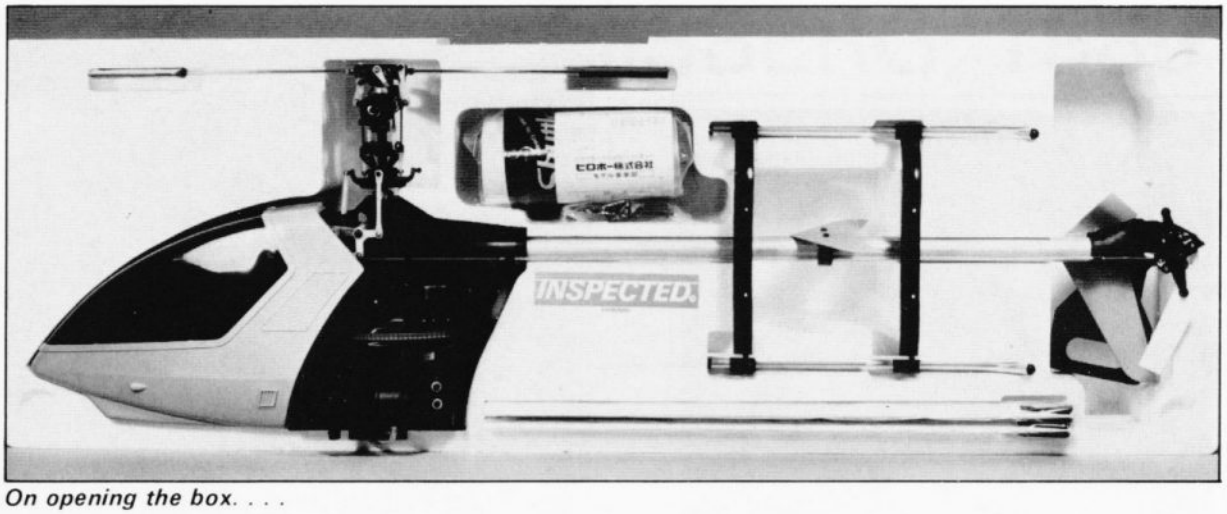
HIROBO SHUTTLE REVIEW



On opening the box. . . .

A MILESTONE IN RADIO CONTROLLED HELICOPTER DESIGN:

by Nick Papillon

I had always been fascinated by helicopters since a brief flight in a Hiller while training for my fixed-wing pilot's licence, and the arrival of the Schlüter kits followed by the Micromold Lark finally inspired me to take up radio controlled modelling some eight years ago. I have always regarded the Lark as one milestone in the development of radio controlled helicopters, offering as it did a comparatively cheap introduction to the art. At the time however there was little choice of model on which to progress and I, in common I suspect with many others, lost interest and turned to fixed-wing. Then came the more advanced designs, such as the Hirobo 505 all now equipped with collective pitch, providing a progression from trainer to fully aerobatic (or scale) model, even having autorotation on the most advanced types. Although the 505 would fly satisfactorily on a .50 motor any scale fuselage required a .60 and there was little change from £400.

I have felt for some time that there was a need for a small model which would stand up to mild abuse while learning, and preferably offer all the facilities of its bigger brethren. This need has now been admirably filled by the new .28 powered Shuttle from Hirobo.

The Shuttle comes ready built — yes ready built — equipped with an OS 28H helicopter engine for an astonishing £275 (or there abouts). It is the first ready built helicopter to be available. Features include collective pitch, and autorotation which, in combination with an advanced design flapping head similar to the DDF, give the model considerable aerobatic potential, whilst retaining the stability and predictable response so essential in a good training model. A powerful toothed-belt driven tail adds to the excellent handling. Extensive use of carbon-filled glass resin in head, side frames and elsewhere, keeps the flying weight to five and a half pounds and the powerful OS 28H helicopter engine gives a sparkling performance. The inherent strength and toughness of this material makes for a degree of damage resistance which will appeal to the beginner as will the shock absorbing undercarriage and heavy-duty long-life clutch. An attractive one piece canopy in fuel resistant material and with integral spring catch, which greatly simplifies removal, is finished in light blue, matching the moulded tail fins. The main blades are fully finished and the tail blades are moulded for maximum 'grass proofing'! the fuel tank is plumbed and installed. The integral radio platform and gyro mount and universal servo brackets greatly simplify radio installation. The radio switch mounting point is provided and, typical of the amount of thought that has gone into this design, a tube is provided attached to the undercarriage through which the aerial is passed. The Shuttle is extremely compact and with boom, undercarriage and main blades detached would fit into a large briefcase: fully assembled it should fit in the boot of any motor car. Essential tools for maintenance are provided and the instruction book is one of the best so far, with excellent diagrams.

Final Assembly

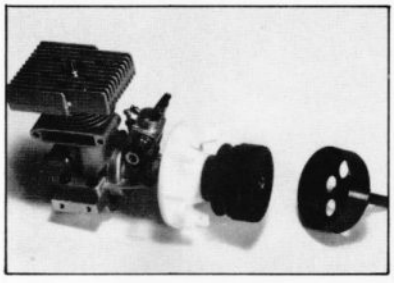
On first opening the strikingly-designed box the degree of pre-assembly is immediately apparent, the model only requiring the fitting of undercarriage, radio and main blades. Having removed the canopy, the undercarriage is bolted in place and the five servos are simply positioned in the universal mounts and secured in two groups with clamping bars (the Shuttle can be flown on four or five servos using a four channel radio, but five are necessary to make use of the facilities available with a specialist helicopter set). The control links are then set up by drilling the output disks as shown in the handbook to give the required mechanical relationships and adjusting the push rods as necessary. It will be seen that many of the intermediate connecting links are of fixed length thus simplifying alignment.

A gyro is recommended and there is a moulded platform for mounting one in front of the motor. The receiver and nicad are installed at the front and may be moved to adjust the C of G

The fuel tank is already fitted and plumbed although no filter is provided. There is a short piece of metal tubing joining two lengths of silicone and this is simply replaced with a suitable filter. I also checked the tank for cleanliness and replaced the somewhat large clunk with a smaller one to reduce the amount of unusable fuel.

A check for general tightness of nuts, bolts etc at this point revealed a small amount of play in the upper main shaft bearing housing, which I eliminated by inserting a small amount of 5-minute epoxy between the side of the bearing and its housing in the side frame. This only requires the removal of the bolts along the top of the side frames and they may then be sprung apart sufficiently to expose the bearing. Having had some experience with small-engined helicopters, I also applied Loctite sparingly to all critical nuts and bolts and to the two bolts which hold the carburettor in place. Since some plastics appear to be affected by Loctite only the minimum should be used. I dismantled the silencer in order to

The completely finished canopy, coloured blue and with tinted screen.



OS28 Helicopter engine with cooling fan, clutch and ventilated clutch bell.

seal the joint with liquid silicone (bath sealant); the silencer consists of two halves, the usual aluminium being replaced by a plastic for the half containing the exhaust outlet. The two halves are held together by a long bolt which should pass through an aluminium distance piece: this tube is essential since it prevents over-tightening of the two halves together.

The fin and tail plane are well-finished plastic mouldings, but the edges are extremely sharp and it is a worth-while precaution to round them off carefully with a piece of fine sand-paper.

A sheet of self adhesive decals is supplied. These are almost as thin as transfers although extremely strong and blend in well when cut out and positioned suitably.

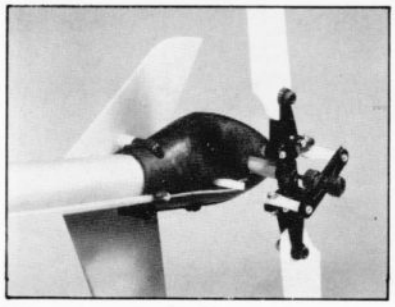
The main blades are supplied covered with what seems to be a spray-on plastic and with the end fittings already attached. After applying the coloured tape to the ends for blade identification when adjusting the tracking, I checked the balance and C of G which required slight adjustment. The amount of balancing required was minimal but I tried to eliminate any source of vibration if possible. The tail rotor blades are of moulded plastic and needed no adjustment. I bolted on the main blades leaving the bolts loose enough for the blades to be able to take up there own position in flight and then rechecked the radio installation for correct servo direction of travel. The servos should not be stalled when full stick movement plus trim is applied in either direction. When full collective (plus trim) is applied up and down the horizontal rod in the linkage which passes through the slots in the side frames should travel the full length of these slots: this ensures that the necessary pitch range is available on the main blades to absorb the full power of the engine at one extreme and to allow autorotation at the other. I also checked that the gyro was working in the correct sense and then put all the radio on charge for test flying the next day.

The glowplug on most helicopters is less accessible than on a fixed wing model and the Shuttle is no exception. Most standard glow clips will not fit but a simple lead with two crocodile clips will suffice. It is also worth remembering that a starter is required and a check on the state of the 12-volt battery is worth while before setting out. Included in the kit are a small screw-driver, two Allen keys and a small box spanner for removing the glowplug: this last item being essential since most plug spanners will not be small enough to reach the plug.

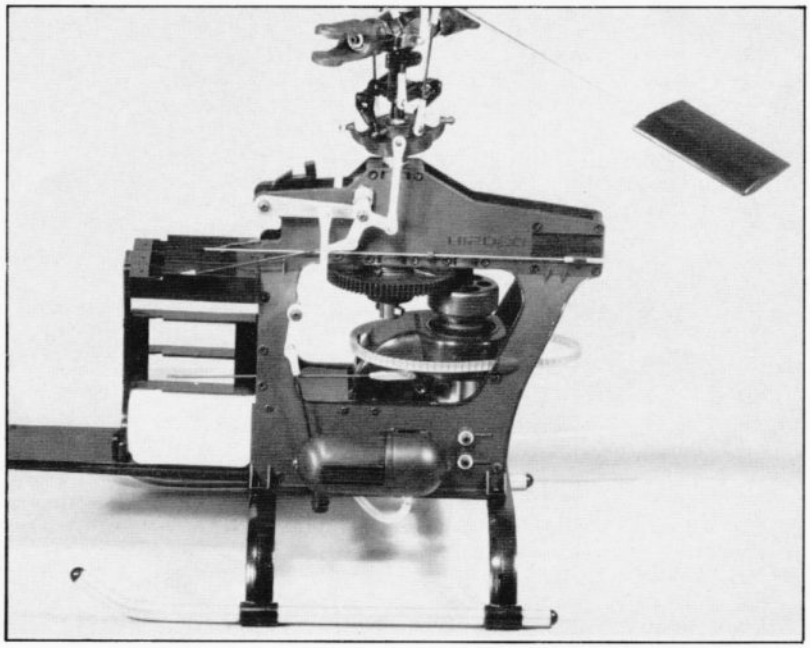
Flying

Whilst I know something of the flying of model helicopters, I am far from being an expert and I was asked to review the Shuttle in order to provide the lay-mans point of view rather than that of the expert. I therefore took the Shuttle back to Dave Nieman of Dave Nieman Models, the importers of Hirobo kits, for test flying and also so that Dave Nieman could assess my finishing of the model to get some idea of how the average Shuttle would turn out. Furthermore, whilst the model itself will require little adjustment if the instructions in the handbook have been followed, it is also helpful if the modern specialist helicopter transmitter is correctly setup to take advantage of the facilities which it offers. These however should not be used to compensate for an out-of-trim model. It is undoubtedly much better if the new comer to radio control can have his model trimmed out by an expert: at least he then knows that its peculiar behaviour is due to his flying and not his building! If he possesses a helicopter transmitter, and this can be set up at the same time, then this is an added bonus, but I would stress that the Shuttle does not require a helicopter set — *the use of one merely simplifies matters.*

As I had hoped, the first flights were totally uneventful and Dave Nieman soon had the Shuttle showing off its full potential with loops, rolls and autorotations. Since the model was fitted with five servos and a gyro and only a 500 mAh Nicad flying was limited to three tankfuls or thirty five minutes and in that time the Shuttle performed flawlessly. Use of a larger and therefore heavier Nicad than a 500 will result in the C of G being further forward than ideal, which will require the addition of ballast to the tail, resulting in a further increase in weight. The best solution at present seems to carry a spare 500 Nicad and to change over



The simple moulded tail gearbox assembly.



Mainframe assembly as supplied, with canopy removed and landing gear fitted.

Nick Papillon with the Shuttle on which he reviewed for this issue.

Nick with the Shuttle in a steady hover. Due to it's excellent stability, beginners should reach the hovering stage quite quickly.

A very pretty little model that is bound to attract a lot of newcomers to the hobby.

One certainly gets the impression of speed in this photo, as the model shuttles along.

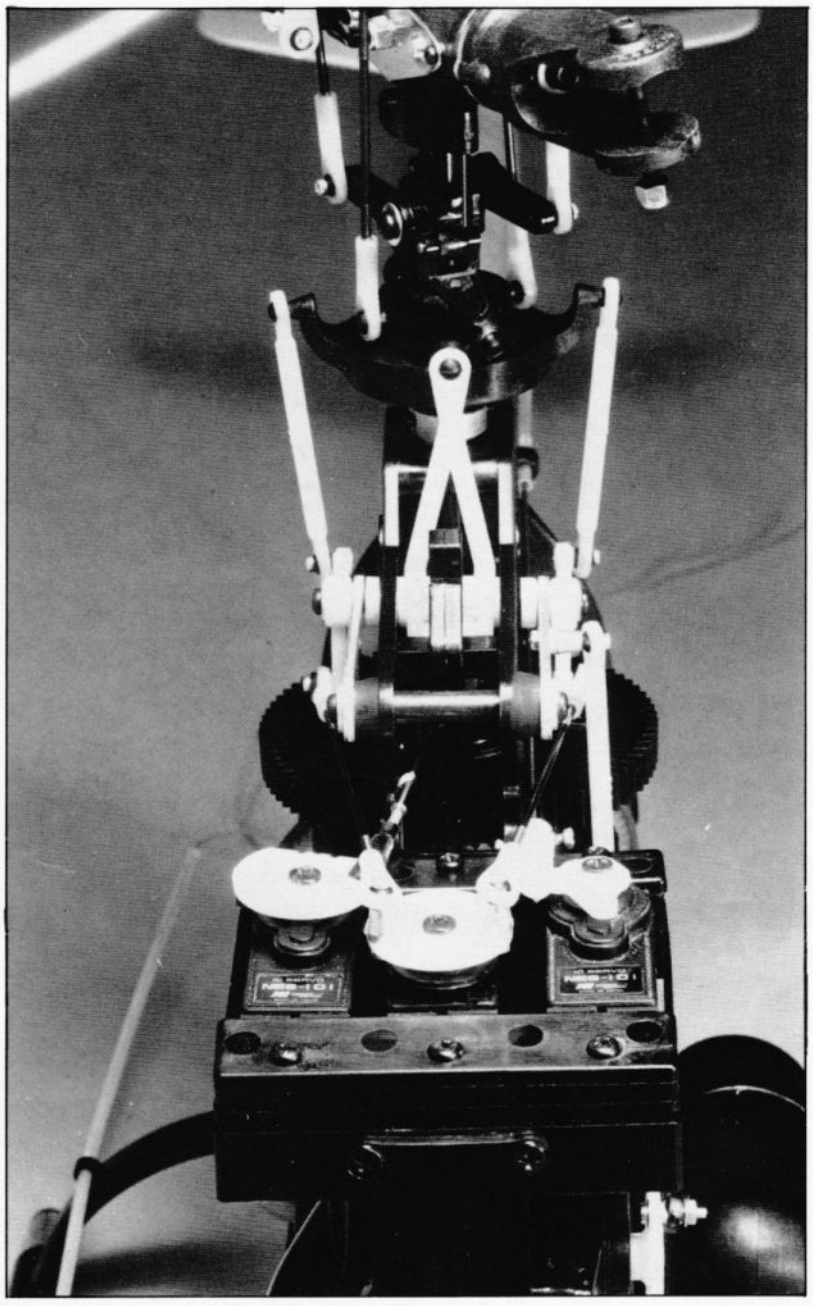
after about thirty minutes.

The only ajustment required after test flying was to the carburettor throttle stop to allow the motor to be stopped from the transmitter by use of the trim.

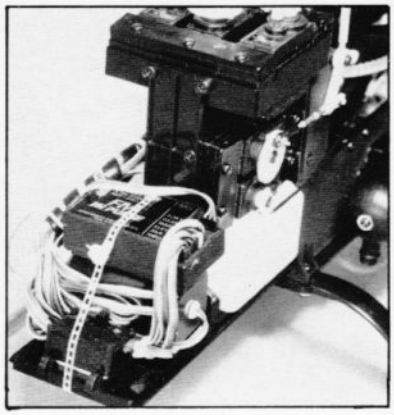
I have since flown the Shuttle several times and it is a delight. It behaves in a very similar manner to its bigger brethren and would make an ideal first helicopter, but with no problems for anyone wishing to change to larger examples later on: since however I believe scale fuselages should be soon available many people will find the Shuttle an end in itself. It does pay to watch the fuel level however — it is easy to get carried away when flying the Shuttle. Hopefully you will have perfected autorotations if it does ever run out!

After Thoughts

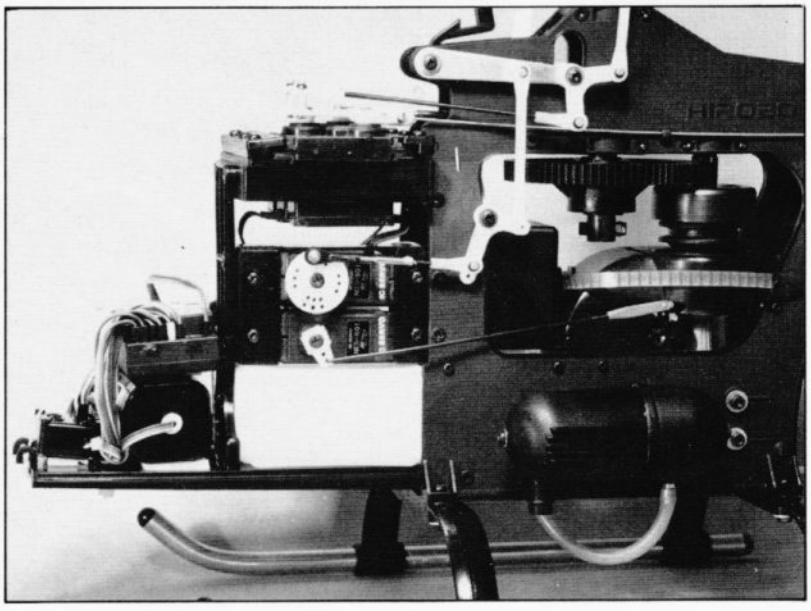
I viewed the prospect of a ready built helicopter with some suspicion, for I believe that there is no substitute for having built a model, in particular a helicopter, from scratch for teaching one the function and purpose of each of the component parts. In the case of the Shuttle my doubts were unjustified for if "a picture is worth a thousand words" a fully assembled model is worth at least a book, and it is simplicity itself to follow the construction and workings of the model. Furthermore the assembly is so straight forward that anyone wishing to explore such hidden mysteries as the the interior of the tail rotor gear box can readily do so and no difficulty should ever be experienced in carrying out any maintenance or repair. The engine is removed complete with mount simply by undoing four bolts and the needle valve, making the replacement of starter belts, should one break, a five-minute job. The tail boom is clamped between the side frames and loosening the four bolts enables the belt tension for the tail rotor drive to be adjusted; removing the belt enables the boom to be withdrawn complete with tail rotor assembly. Undoing one bolt



Head-on view showing servo installation and fixed links to swash plate, a very simple set-up.



Simple radio installation, servos just clamp in with ample room.



Battery installed for optimum C. of G. position. Starting belt held in heat moulded clips.

and three ball joints enables the head, complete with main shaft, to be removed and so on.

Now that I have flown the Shuttle for a while, and have become familiar with it, a few points have emerged which may help future owners. Although repeated tightening of those screws which go into the plastic components has caused no damage, it should be remembered that excessive force will strip the threads and furthermore may distort the mouldings. Similarly the bolts attaching the undercarriage should not be over-tightened since this creates unnecessary stresses in the areas of the holes.

The canopy is fitted by sliding it rearwards on runners until the catch engages and although held securely fore and aft, it may vibrate sideways: this may be prevented by waxing the runners and applying liquid silicone to the canopy tracks and then fitting the canopy. When the silicone has cured the canopy may be removed, the wax preventing the silicone from sticking to the runners. A small blob of silicone at the lower corners of the fuel tank will similarly prevent vibration — the silicone may simply be squeezed in without removing the tank.

When installing the servos the pre-bent push rods may not suit the out-put disks. I fitted a clevis to the fore and aft cyclic (elevator) and ball-joints to the collective and throttle. Depending upon the servos used there may be too much movement and the servos may be stalled at the extremes of travel: the measurements given in the manual are for guidance and the holes may need to be drilled nearer to the centres of the out-put disks.

The tail rotor push rod should be removed, cleaned and checked for straightness before being refitted. All moving parts, both rotating and sliding should be sprayed with Triflon and plastic ball joints such as those on the swash plate should be treated with a plastic lubricant to minimise wear. Before connecting each function to its servo disk it should be operated to check for excess friction or roughness.

The engine alignment may be checked by sighting the clutch bell against the starter pulley: there is provision for adjustment if the bolts holding the engine mount to the side frames are loosened. The fly bar control arms must be checked for alignment and tightened and the fly bar balance may be adjusted at the same time.

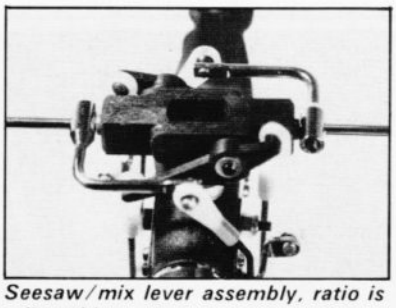
The canopy may be painted if so desired. I used enamel paint to fill in such areas as the air grills, and did not bother to fuel proof since there is little exposure to raw fuel. Do test any other type of paint on a hidden areas in case it affects the canopy material.

Whilst there is ample room for a gyro the platform is some way forward of the main shaft, and too much weight will therefore upset the C of G which should be at the main shaft (this may be checked by placing a rod such as a screwdriver or a piece of strong piano wire under the end of the main shaft and slightly lifting the model). I used the K.O. gyro which is compact and light and very competitively priced. It is also the only gyro which I have found whose response is stick-proportional: that is to say the further the transmitter stick is away from central, the more the gyro signal is inhibited. When central the gyro signal is at a maximum. This gives optimum stability, but allows full use of the powerful tail when required.

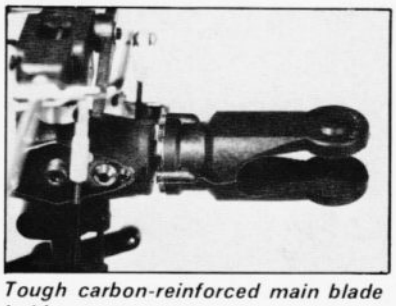
Whilst the Shuttle will fly literally "straight out of the box", it is at its best if the head r.p.m. is correct. If no expert help is available, as a guide the model should lift off with the tail rotor pitch lever on the gear box in the centre of its travel. If the model turns left or right, then this is a sign that the head r.p.m. is wrong: if the model turns left and full right trim will not hold it, then the head r.p.m. is too low and vice versa. This is corrected by adjusting the length of the blade pitch control rods to the head. If the head r.p.m. is too low and the blades are out of track, first bring down the higher blade by shortening that rod. If the track is correct then both rods should be shortened equally until the model no longer swings. If the head r.p.m. is too high, then the lower blade is brought up by lengthening its rod until the track is correct, and then adjusting further as necessary.

Whilst the Shuttle makes an ideal first helicopter for the beginner, it will never disappoint the expert. The combination of advanced head design with semi-symmetrical blades, powerful tail, and high power to weight ratio ensure a lively performance. Close inspection reveals that the Bell-Hiller mixing ratio is variable on the control arms on the wash-out and on the mixing levers on the see-saw so there is room for experiment too.

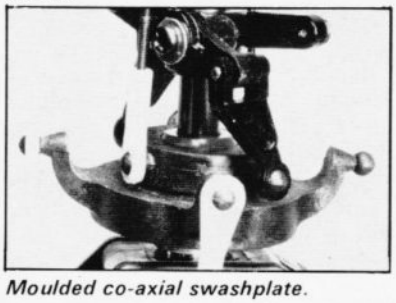
All in all the Shuttle is a fascinating arrival on the helicopter scene and a real break-through in design and construction methods — is this the first of a new range from Hirobo? — I hope so.



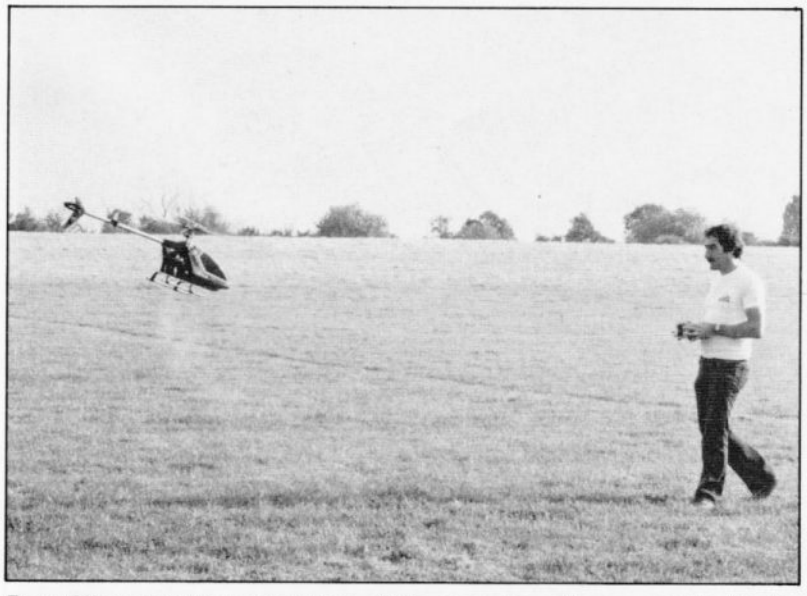
Seesaw/mix lever assembly, ratio is adjustable.



Tough carbon-reinforced main blade holder.



Moulded co-axial swashplate.



Dave Nieman taking advantage of the exceptionally powerful tail to fly a nose-in hovering circle.