JET RANGER — PART 3 —

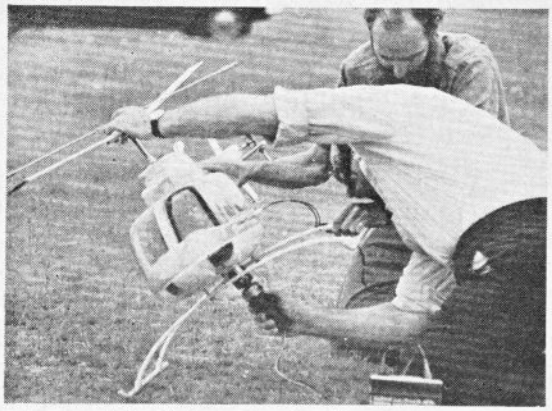
ROY YATES experiences the thrilling first moments of flight

THE moment of truth had arrived, and here I was travelling towards the pre-arranged flying ground, to be greeted by the editorial staff armed with photographic paraphernalia. Previously, I had taken the obvious step of making engine run up checks to ensure that nothing was likely to happen to curtail this day's flying attempts. I need not have worried, because this session was completely uneventful. On recommendation from other helicopter constructors, I had made and fitted an air filter to the carburettor. Previous running-in settings, without the filter, proved to be too rich and a two turn reduction on the fuel needle setting was required to bring the r.p.m. up to the desired level. The reason for fitting the air filter was to stop any dirt getting into the engine and, although it seemed a good idea at the time, and also through the early flying sessions, I am not all that convinced now that it was. More about that later, however.

Slight vibration was evident at this run up session, which proved on a later check to be an out of balance condition of the aerodynamic damping blades, which are assembled to the stabiliser see-saw. At the assembly stages I had set these at equal distances from the stabiliser mechanism fulcrum, but omitted to check, by a prop balancing method, any out of balance. This I consequently did and, by reducing the weight of the heavier end, achieved a perfect balance. On rerunning, it completely removed the oscillation and, at full bore, the model is now very smooth.

Full power and full collective pitch run ups were made on this earlier session, to make sure that the rotor blade control linkages would stand up to the excessive straining at the leash pressures and tensions. The model was anchored by its skids with crude " J " stakes in the ground during these tests. The load placed on the mechanisms is very evident by the reduction in motor rpm as the main blade incidence is progressively increased.

Earlier thoughts of rubbing, because of the minimal clearance between the fan periphery and the plywood skirt epoxied into the fuselage bottom, proved to be completely unfounded. Adequately absorbing vibration, the shock mounts retain the transmission assembly firm enough not to allow this. So, as I pulled up at the



Starting is simple, the Kavan starter pushing direct onto a cone on the prop shaft.

Other photos on these pages show progression from "hold" to "hover."

entrance of the flying ground, with Dave patiently standing there waiting for my arrival, I knew the only thing that would be likely to suddenly end this photographic session would be my own inexperience at helicopter flying.

Weather conditions were favourable for sorting out tail rotor pitch settings, as the wind was non existent, and to allow this to be carried out on a smooth surface I had brought along a suitably sized sheet of hardboard. Firstly then (with the training undercarriage fitted) as per instructions, the main rotor blades were checked for tracking just below lift off r.p.m. I must confess we couldn't bring ourselves to check this by the recommended method of a purpose made strap stick, so a visual sighting was made of the blades, by means of the red and blue tip colours that I had painted on. The lower revolving blade should have its pitch angle increased and the higher one reduced, so say the instructions. This we carried out, but although reducing the error, it did not seem possible to achieve identical tracking. So, rather than create an adverse set up with regard to different blade pitch angle setting, the blade tracking was given best, and more emphasis put on having both blade incidence settings the same.

Rightly or wrongly the way I have been achieving this recently is to set the blade incidences with the spirit level supplied in the kit. (This spirit level incidentally can be adjusted for true reading by rotating the slotted bung in one end. The bung has an eccentric bore locating the bubble tube which, when rotated, raises or lowers that end relative to the case base.) A suitable piece of wood the same length as the rotor blade chord, and a matching female airfoil shape in one side and flat on the other, is placed on the blade. The level is first placed on the see-saw body with the stabiliser bars running from nose to tail, and the bubble centralised by tilting the stabiliser assembly up or down. The level is then carefully removed and placed on the piece of wood and the position of the bubble noted. The rotor head is now rotated through 180deg. and the operation repeated. If the blades are at the same incidence, then the bubble should read the same.

With a little practice it is easy to carry out these sequences quite quickly. If like me you have to remove the rotor head assembly to transport your helicopter, it is advisable to reassure oneself that things are right before you fly. I do my checking just before I leave home, then, providing the long link rods are retained in between the steady wires in the ali boss, and a mark made on the ali boss showing which colour tip is positioned relative to that mark, no problems arise.

The motor was again started up, and an idle position adjusted on transmitter throttle trim to enable the blades to remain stationary. This setting has to be quite slow, otherwise the head starts to rotate. The next stage in the instructions is exhilarating to say the least. With one hand firmly grasping the tail boom slightly forward of the tail rotor, the motor is eased forward to full r.p.m. Adding to the feeling is the way in which all spectators back off as the engine and rotor blades rapidly increase rotation, with oneself hanging on as if in fear of losing it. Caution should be exercised here, and by that I mean over exhuberance in plunging the stick fully forward. Even at slightly past the half way setting, the model is hovering quite effortlessly and, at further slight collective pitch increases, will rise quite positively. So much so that one gets the feeling that should the stick be pushed to the extreme, the model would cavort like a whiplash over one's head to land upside down behind one.

Anyway, once hovering, the idea is to trim out the lateral cyclic pitch, so preventing the tendency for the helicopter to roll to the left or right. The power of the effect of cyclic pitch can again be felt if one gently eases the control column to left or right. No difficulty was experienced through this sequence and the model needed almost negligible trim adjustment to the lateral cyclic control.

The next step was to check out the tail rotor pitch. One can hardly call a grass surface a smooth one, so as I hung on to the tail boom and hovered the model Dave, in the prone position, pushed the sheet of hardboard under the skids. Throttling back, I stood clear of the whirling blades and comfortably suspending my Tx on the neck strap, made crossfingered signs to my

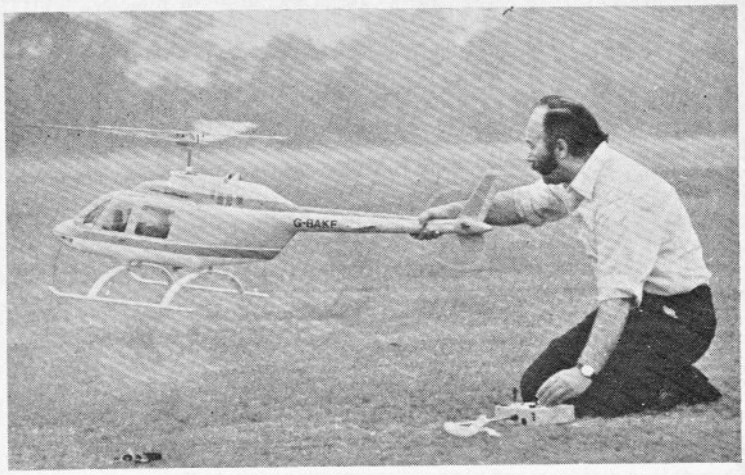
onlookers. Easing the throttle forward, by mid position the model started to become buoyant and rotate to the left. To check the rotation I had to apply right movement on the tail rotor control lever. This meant, as set, I had too much pitch on the tail rotor blades, so this was reduced by screwing out the ball link on the push rod protruding from the tail boom.

With motor restarted and again careful progression on the throttle/collective pitch lever, she lifted gracefully from the ground and moved away and rearward from me at a slow, but steady, rate. I eased the longitudinal cyclic pitch lever forward gingerly which started to arrest the rearward movement, but the model sank slightly and touched a skid into the grass and started to tilt so I quickly throttled back.

Next attempt, I had pushed full forward trim on longitudinal cyclic pitch, and she rose vertically, but this time she started to rotate, so I corrected with tail rotor pitch but not enough, then a bit more, and she started to climb. I must have pushed the collective pitch forward a notch unbeknown, and she was still rotating. So more, tail rotor correction and ease back on collective pitch, whereupon she started to sink and rotate the other way. Alarm stations! Throttle back, and she dropped like a stone.

A realisation that the ratchet on the throttle lever would have to go was by now apparent, finer adjustment than the notches would allow was needed. A restart and a fresh attempt was made. Without the encumbrance of the ratchet I must have been a bit too forceful, she rose quite steadily at a continuous rate, and was holding steady, so I eased back slightly, she stopped climbing now at about 30ft. I was feeling confident. Rotation started, I checked it, she started to drift backwards, I pushed forward cyclic, she started to sink, I eased forward on throttle, she was rotating again still drifting backwards. Adjust tail thrust, wrong way! She's rotating harder. Opposite tail pitch. She stops rotating, but starts to go the other way, oh! she's sinking fast. "Open up" they're all shouting. So what do I do? Throttle back! The model lands hard and breaks the undercart. End of the flying session.

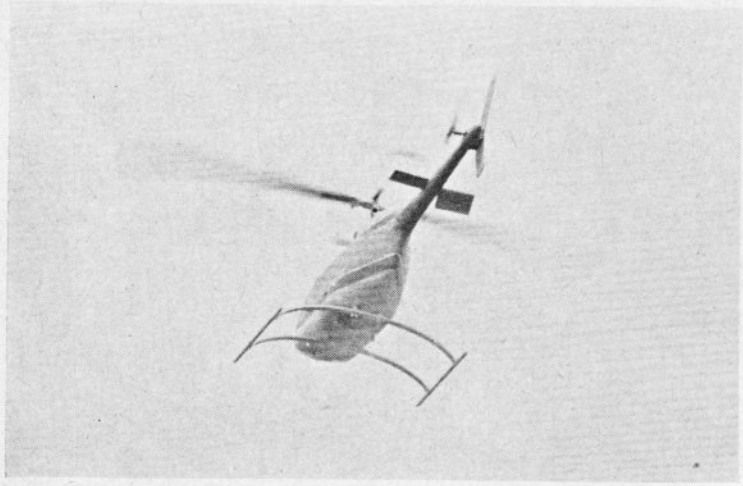
This is a quite ridiculous set up, I think to myself, a totally inexperienced helicopter pilot reviewing the first collective pitch model in Britain for its flying capabilities. (*And who was there with more experience at that juncture?—Eds.*) Since that session, however, I have gone through about two gallons of fuel, and gained much more experience, although, I hasten to add, I still have a long way to go before I become an efficient helicopter pilot. After that first day's flying attempt, the undercarriage was replaced with a slightly wider based home made one, and 30in. long × 20swg., $\frac{5}{8}$in. dia. ali tubing used, to enable a castoring $1\frac{1}{2}$in. dia. wheel to be used at the four extremities. This enables me to land the helicopter whilst travelling in any direction, without fear of the skids digging in and the helicopter tipping.



The amount of dirt that had collected around the swashplate bearing on that very dry day gave concern, and, as a result of this, I made my first bad mistake. I very cleverly, as I thought, made up a shield from .010in. plasticard and trapped it between the inner swash plate and the ball race. On the next flying session, after a brief minute or so's hovering, the inner swash plate pulled free of the ball race with a sharp bang as it hit the ali connecting link guide, and the model went up like a rocket. Again, I hasten to add, I alarmedly throttled back and it came down even faster. Result, another broken undercarriage.

From these related experiences you are no doubt way ahead of me when I say, "When in trouble, DON'T throttle back." It may be the sensible thing to do when flying fixed wing, but oh boy it's not so clever on helicopters. Of course, there is one consolation, the fibreglass fuselage has withstood all three heavy landings (yes, I did it again) without any reinforcing additional to that built-in as supplied. The swash plate inner has now been epoxied in position in the bearing inner, without the plasticard disc, and no more problems have been experienced.

In windy conditions the model is far easier to hold on a heading into wind because the weather cocking effect tends to dampen down any fuselage movement due to tail rotor pitch changes. Slow forward flight also becomes easier, which is the way in which the instruction book advises one to initially learn control.



I have rapidly learnt that under controlling is the biggest self imposed handicap that has to be overcome.

Anticipation is a very important part of learning to fly a fixed wing model, it is even more essential in learning to fly helicopters. Whereas, on fixed wing, one can virtually forget the rudder stick once airbourne, on the helicopter it is just as important as all the others. Controlling a helicopter, to put it crudely, is a bit like the old party gimmick of rubbing your tummy in a circular motion with one hand and tapping the top of your head with the other, and then changing hands.

Pulsing on the sticks, with the exception of throttle/collective movement, is almost acceptable while learning, which tends to break one away from undercontrolling. However, overcontrolling will get you into deep water even quicker, when you are nearer the brink so to speak. So really it's a case of being patient and satisfied with steady progress.

On no account be tempted to fly around in forward flight until you have experience at hovering and transition to hover then landing from slow forward flight. This I did and hence the third heavy landing. The forward flight is relatively easy to master, but it's the slowing down and hover before landing that requires the experience.

The tail rotor spindle is very prone to bending, causing the bevel gears to lock in mesh, on blade impact with the ground and on each heavy landing this has happened. The tail fin and wire skid, although scale, do not afford enough protection to the tail rotor shaft with these sort of mishaps. As a consequence of this, the long drive shaft from the transmission bevel gear output has become twisted near the drive end. Also, the large main shaft nylon gear has sheered odd teeth in two or three places, causing mesh problems with the small metal spur gear on the clutch drive shaft. All of these problems could be avoided if, whilst learning, a suitably large protective wire or laminated plywood skid could be fixed to prevent tail rotor blade impact.

Up and away (top photo), the Jet Ranger remaining stable and fully controllable despite stabiliser having vibrated loose and drooped.

Left: proud owner satisfied with progress to date!

Having dismantled the innards of the *Jet Ranger* several times now to make running repairs, it is surprising how quickly that this can be done, and the thing reassembled. The air filter on the carburettor mentioned earlier is causing doubt as to its worth. Each time on removing the power unit, the filter appears to be quite clean, although oil saturated. Recent flying sessions have shown engine r.p.m. fluctuations as well as a couple of dead spots. My thoughts are that this can be attributed to an oil saturated filter. So, although not in time for this final instalment, I intend to remove the air filter and note the effects. Main rotor r.p.m. fluctuations are highly undesirable whilst airborne whatever the flight attitude. The building instructions do not make mention or advise a filter, incidentally.

For those readers acquiring a later kit only minor changes have taken place, just one in construction which calls for the phosphor bronze bushes that support the stabiliser see-saw fulcrum to be soldered in position instead of epoxied as in our review kit, although no problem has been experienced with ours.

The other change, which may have been a translation error, but certainly affects the setting up of the rotor head mechanism, is the introduction of the word " trim," with regard to longitudinal cyclic pitch. The later book now says, " With full reverse cyclic pitch *trim*, the swash plate should be perfectly perpendicular to the main rotor shaft." On the review model I had set up this movement as the later book indicates. As previously instructed, I should imagine it would be very hard to achieve rearward flight.

If my brief experiences give me any qualification to assess this helicopter from the flying point of view, then I would say this. The response (even through complicated linkages) of controls is most rapid and positive. The amount of stability that helicopter aerodynamics will allow, small though it is, is present in the *Jet Ranger*. Both of these help one along the way to becoming a capable pilot, of which I am enjoying every minute.

Helicopter flying is a completely new challenge and the *Jet Ranger* makes it such a pleasant one. Any future review that I may do will see me far more qualified to assess the pro's and cons of the airborne tests, so I look forward to the helicopter that will top the Kavan—it will have to be a good one!