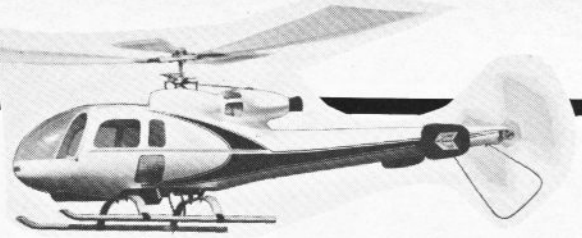


HELI-PAD

By Jack Barnard

TO ALL helicopter enthusiasts and would-be enthusiasts I wish to say — 'This is your column'. Perhaps I should also ask — 'Where are you'? I know you are somewhere out there, you have to be, or are all those helicopter kits sold each month over the model shop counters going straight into the attics? I jest of course, as you are attending the organised 'Fly-ins' in ever-increasing numbers, but we rarely hear from you at the magazine office. I hope to make this column a regular feature, but its success really depends upon you. I want your views, hints, tips, details of club events, etc., to pass on to our other readers, now worldwide. I am afraid I have very little to offer the established enthusiast this month and would ask you to bear with me while I address the newcomers to our hobby. Read on by all means if you wish —, you may disagree and your irate letters could well be the nucleus of next month's column!

Beginners' corner

Thinking of building a helicopter? Perhaps you have one — maybe you tried to go-it-alone and got fed up with repairing it — if so, why not retrieve it from the loft and have another go?

I realise, of course, that I am wasting my time when I say 'choppers are very difficult to fly' — if you have already tried, you will have discovered that for yourself and if you haven't tried the probable reason is because you believe choppers are very difficult . . .! There are those, of course, who may disagree; we have 'instant experts' in all walks of life — the 'passed my driving test after only one lesson, old boy' types.

If you are one of those persons who find it easy to pat the top of the head with the left hand while rubbing the bare tummy with a circular motion with the right, you are well on your way to become a successful R/C helicopter pilot. Never tried it? In that case don't — you could get to like it more than learning to fly helicopters and I would have lost your readership to those books normally found higher on the bookshop shelves than this magazine!

For most of us, the only way to become a successful chopper pilot is constant practice — try, try and try again. When I built my first helicopter, my old friend Dave Nieman gave me the following advice: 'Practise for at least two hours every day for two weeks and you will be able to fly it; after a month you will look back and wonder what all the fuss was about'. So why not take a couple of weeks off work and pack the wife off to the South of France? When she returns, you can proudly display your dexterity with the 'box' and you will have been too busy practising and repairing to worry about what she was doing in the South of France!

Whilst on the subject of learning: there is little doubt that 'nerve' plays a prominent part. I did hear of one raw beginner (I believe it was Roy Scott of Micro-Mold who told me the story) who, on his first flight rammed open the throttle and let the 'copter find its own way up to a couple of hundred feet then started his 'learning-how-to-fly-it' from there! I can't help feeling you would need a hefty bank balance and a goodly supply of read-built models to do it that way!

Now back to the serious side. You may quite easily become a proficient car, engine, or even steam road-roller driver without ever knowing what happens down 'in the works' when you press this button or move that lever, but one thing is for certain — you will never fly a model helicopter until you fully understand every minute detail of the aerodynamics and mechanics of your model. We will devote our first 'Beginners Corner' to taking a look at helicopter design and answering that oft asked question 'how does it fly?'

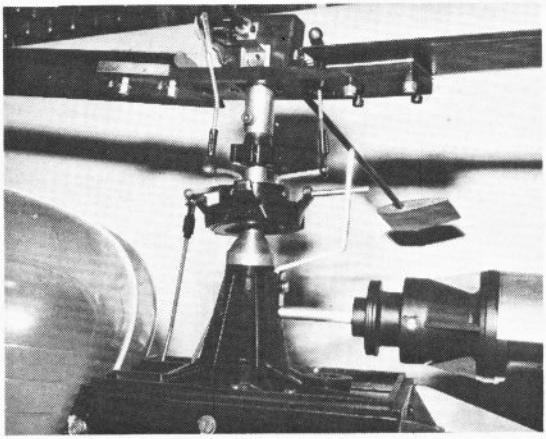
How does it fly?

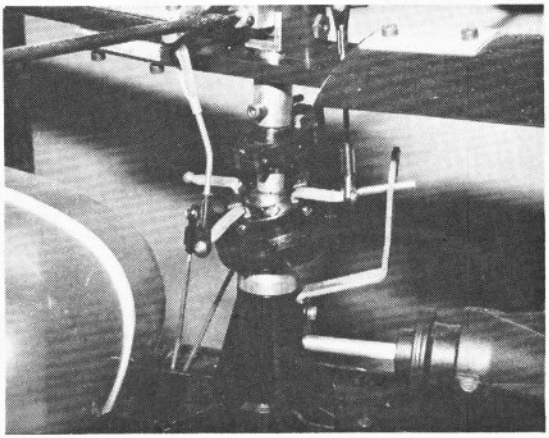
The standard Music Hall comedian type answer would be 'with great difficulty'! I will assume that the reader fully understands the principles of flight; or at least how an aerofoil section produces lift as it moves through the air — as with the wing of a conventional aircraft. In the case of the helicopter, the lifting wings are the main rotor blades which are driven, via the clutch, reduction gears and drive shaft, by the helicopters engine.

Let us imagine our model helicopter, 'all systems go', at rest on the ground. A centrifugal clutch allows us to start the motor at low r.p.m. and it is ticking over nicely as we pick up the Tx and move to a position about ten yards behind the model. As we open the throttle, the centrifugal clutch engages and the rotors start to turn. If we now increase the rotor speed until the lift generated by the rotor blades is greater than the model's weight, it will rise into the air.

Torque

As the helicopter becomes free of ground contact, we are faced with our first control problem, torque — that equal and opposite reaction. The fuselage of the model will now commence to rotate about the rotor axis in the





Above; swash plate and rotor head of Kavan Alouette; note that the lower part of the swash plate is prevented from turning by the brace at the rear. Fore-and-aft tilt is controlled by the servo rod attached to the front of the plate. Above right; the swash plate is shown tilted forward, producing the required cyclic pitch variation mentioned in text. The rod which controls the lateral tilt of the swash plate can also be seen here, its upper connection is unfortunately hidden behind the plate.

opposite direction from which the rotor blades are turning.

Rear Rotor

This is our torque control. Connected via a geared drive from the engine, it turns at speed to produce 'lift' from its aerofoil section blades in the same manner as the main rotor blades. As the 'lift' of the 'tail' rotor is inclined horizontally, we refer to it not as 'lift', but as 'thrust'. The angle of attack of the tail rotor blades can be controlled by the helicopter pilot to produce the exact amount of thrust required to overcome the main rotor torque and stop the rotation of the fuselage.

Hovering

We now have our helicopter in the air with the fuselage under control directionally, and will assume that we have adjusted the speed of the main lifting rotor, by using the engine throttle as required, to produce just sufficient lift to balance the weight of the helicopter; so that, in still air conditions, the model is hovering at a fixed point above the ground.

Directional movement

This is the next step and, in order to obtain directional movement, a force must be produced in the direction in which we wish the model to move. Remember your simple aerodynamics? Lift is acting at right angles to the aerodynamic shaped main rotor blades — vertically upwards and the weight is acting vertically downwards.

If we now tilt the rotor, the lift, which is still acting at right angles to the rotor blades, is also tilted, producing a horizontal force to move the helicopter in the direction of the tilt. The plane of rotation of the rotor can be changed either by tilting the rotor axis itself relative to the helicopter fuselage; or by varying the angle at which the individual blades of the rotor meet the airflow through certain sectors of their plane of rotation. The second method is most common in use and, by this means, the rotor blades, which are hinged at the centre of the rotor head, can be made to rise at one part of their rotation, or circuit, and sink on the opposite side, producing the effect of tilting the rotor: this is known as cyclic pitch variation.

Cyclic pitch — Swash Plate

Cyclic pitch variation is effected by means of a swash plate which is mounted on a universal joint at a point on the main rotor driveshaft between the power unit of the helicopter and the main rotor. It is constructed of two linked plates: the lower plate remaining in orbit, but under control of the helicopter pilot, can be tilted toward any point of the circle of rotation of the main rotor. The upper plate of the swash plate unit is connected to the rotor head and rotates with the main rotor, but tilts with the lower plate. This is so arranged to alter the angle of the main rotor blades as required to produce a horizontal force in any selected direction.

I am afraid that is all we have space for this month; in next month's 'Beginners Corner' we will discuss 'Collective Pitch' and take a look at some of the problems encountered in the development of the helicopter. Oh, I almost forgot, better close that throttle and get the model back on the ground!

Below; rear rotor pitch control of the Alouette. The rotor blades are free to rotate, operated by the 'U' section which can be moved 'to-and-fro' along the drive shaft by the servo rod.