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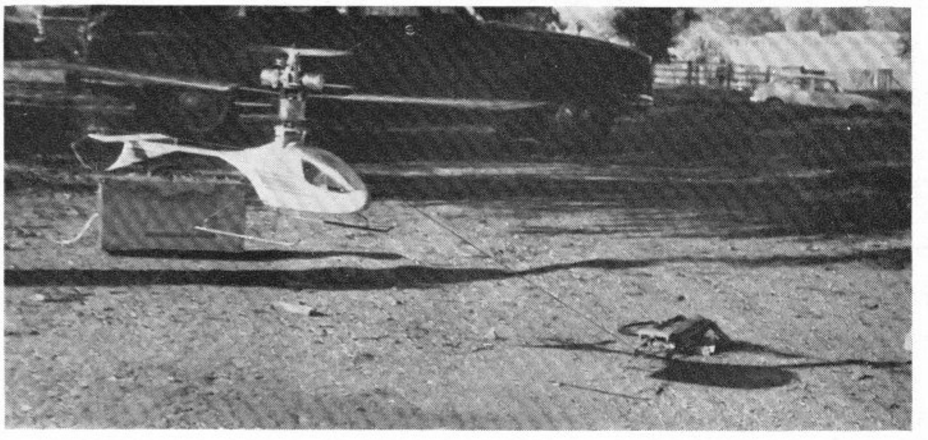
DU-BRO WHIRLYBIRD 505

by Stephen Winkworth

The author, at left, preparing the Whirlybird 505 machine for flight. Small machine uses .40-size motor and is seen below in tethered flight . . . one could hardly call it 'hovering', in gusty wind conditions.



THE Du-Bro Whirlybird was an entirely new experience for me, from the point of view of both building and flying. The kit is remarkably complicated, in that it consists of a large number of tiny parts, all sorted into little bags which are carefully labelled; yet it is largely prefabricated, in that there is very little shaping to do, and all the work consists of fitting together the various parts – mostly metal and plastic. It represents quite an achievement in kitting, not only because helicopters are still a very new and untried branch of the hobby, but because much thought has obviously been put into the design so that it can actually be built with comparative ease, and there is very little latitude for error or inaccuracy of any kind.

I found it quite fascinating to build – nothing like building an aircraft, though, since nearly all the construction involved mechanical parts which are screwed and soldered together. It took me about as long to build as a Dazzler 63 – two weeks – but then I am a slow builder. By far the longest process for me was working out how the Micro servos of my Sprengbrook radio could be fitted on to the framework, since they are attached by spring clips rather than mounted by the usual grommetted flange. This business of fitting the servos is actually the first thing that must be tackled, since it determines how the wooden chassis is built. A word of warning – if your servos are more than $\frac{3}{4}$ in. wide you will have to cut away the framework, or there won't be room between them for the throttle bellcrank.

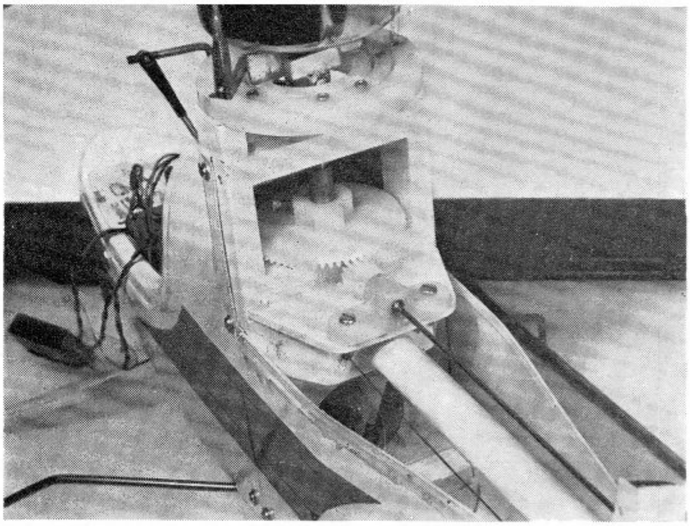
The secret of success in building the Whirlybird is simply to follow the instructions very carefully, and be sure you know what you are doing before you do it! This is not at all hard, since the instructions, which are easily the clearest I have seen in any kit, are illustrated by no less than 51 photographs, and occupy 34 pages. I could only find one fault – on page 2 (Step 6) it says the hole in the boom mounting block should be on the left as you face the nose. I found later that this should have read *right,* so I had to drill another hole later on. Apart from this minor detail, everything went like clockwork (which is just what some of the hardware *is* like, come to think of it). The most fascinating assembly is undoubtedly the variable pitch tail rotor, which is a little gem of ingenuity, as the photographs show. I found balancing the main rotor a little tricky, until it dawned on me that the needle valve was the source of the lack of balance. I placed a few washers under a suitable bolt to counterbalance it, and all was well. Perfect balance cannot be achieved, since the position of the piston in the cylinder will alter matters enough to swing the rotor on the balancing stand. I compromised by setting the piston at mid-stroke, but then found that the counterweight in the crankcase was causing the lateral balance to be upset, depending on which side of T.D.C. it was positioned.

The Whirlybird works by torque reaction – in other words the engine carries a normal airscrew, and is mounted vertically on top of the rotor, so that the engine and rotor assembly spins round in the opposite direction to the airscrew. This is a comparatively crude way of achieving helicopter action, but it does do away with a great deal of complication, in the way of clutch, gears, transmission, etc. As a result, the Whirlybird kit is a lot cheaper than a 'true' helicopter kit, and a lot easier to build. It is also, I suspect, less easy to fly in a successful controlled manner, and it is certainly noisier, messier, and has a shorter duration (the tank lasts about six minutes).

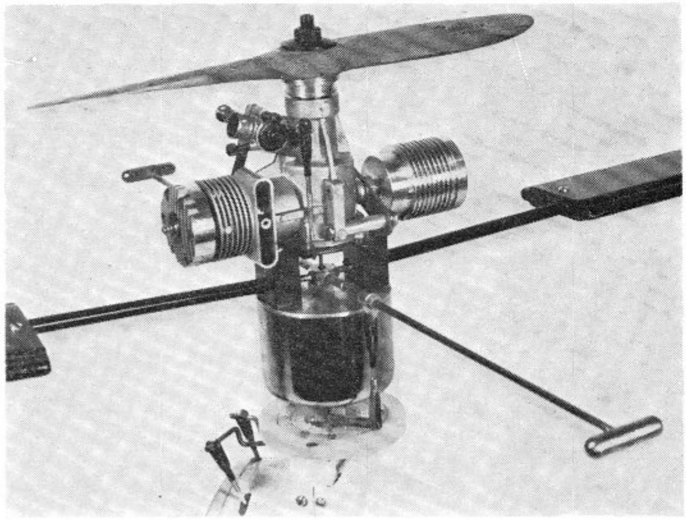
How does it work? Well, frankly, even after building and testing it (more of that later) I don't feel I fully understand all the principles involved. However, the main rotor, which is made to revolve by engine torque as I have just described, is geared to the tail rotor, in the ratio of about 1:11. The tail rotor is controlled by the rudder control on the transmitter, which causes its pitch to alter, thus blowing air sideways in the appropriate direction, and causing the tail to swing sideways. It is extremely sensitive (I drilled an extra hole on the servo to reduce the throw) and has to be watched the whole time, or before you know what you are doing the whole machine is suddenly pointing the wrong way.

Vertical control is by throttle only – increase throttle to go up, back off to start a descent. Lateral control (aileron) and fore and aft (elevator) are accomplished via swash plates. The flybar and rotor blades form one rigid assembly, with the blades set at a predetermined positive angle (there is a jig in the kit to ensure this angle is accurate). However, the whole assembly itself may be tilted in any direction by means of the swash plates, whose function is therefore to incline the spinning rotor disc, rather than to effect cyclic pitch changes as in most full-sized helicopters. To take some of the load off the servos, and to permit some degree of automatic stability, the swash plates are not rigidly connected to the servos, but linked by means of small springs.

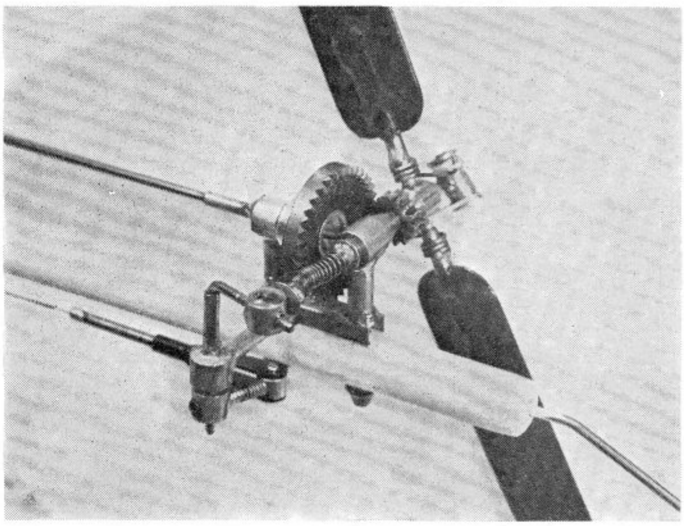
The last six pages of the instructions

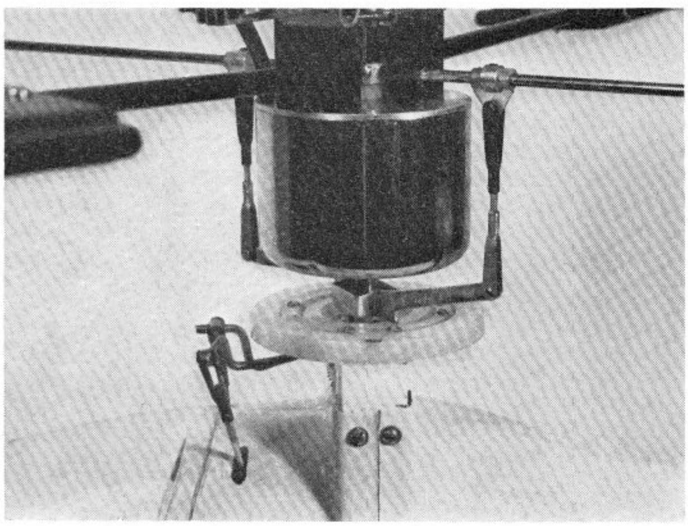


Above: the fuselage with hatch removed to reveal the main rotor shaft and gear arrangement used to transmit drive to the tail rotor mechanism, latter seen below.



Above: the main rotor head showing the O.S. .40 motor installed, complete with fuel tank and counter-weight. Below: close-up of the rotor head showing the control linkages.





book are devoted to a description of how to fly the Whirlybird, so this will give some idea how hard it is. It is, at any rate, quite unlike flying any other form of model aircraft, and in fact one's normal reactions are probably more of a hindrance than a help. For instance, if in difficulties, you should open the throttle to full power rather than cut it. In horizontal flight (which I have yet to achieve) stalling occurs if you go too *fast,* because the retreating blade is moving too slowly relative to the air, and the result of a stall is to cause the helicopter to roll over.

The instructions recommend about two hours of practice flying on a tether before graduating to 'free' flight. The tether consists simply of two strings tied to the top of the fuselage. The other ends of the strings are supposed to be controlled by helpers holding sticks to which the strings are tied. Alternatively, and with less risk to the life and limb of one's friends, the strings can be tied to a couple of bricks, arranged so that the helicopter cannot lift high enough to turn over and crash. So far, I have only accumulated about one hour's flying on the tethers. My impression is that successful controlled flight *can* be achieved, but the best I have done so far is to hold the tail pointing in the right direction for about one full minute, with the Whirlybird tugging urgently at its strings in a vertical direction. Then a slight lapse of concentration, or an unseen gremlin, suddenly causes the tail to swing hard round to one side or the other to become entangled in the strings.

Another characteristic vice is a sort of oscillating dance forwards and backwards as it hits the limits of the tether in either direction. It is possible to stop this oscillation by applying opposite control at the appropriate point, since with my machine the rate of oscillation was quite slow. However, I hear from Geoff Franklin of Leicester club, which has two of these machines, that they had much more difficulty with this problem, and were only able to stop it by cutting the throttle and landing. This brings up another point: apparently the weight of the finished machine has an important bearing on stability, and my machine, which is an ounce or two overweight, seems less prone to instability than theirs, which are apparently below the recommended limit.

Attempting to fly the Whirlybird is certainly fascinating – the gradually increasing whine of the rotors as they pick up speed, to the accompaniment of the full-throated roar of the *O.S. 40*, the increasing lightness of the skids as they start to lose contact with the ground, and then the sensation of balancing on an ever-changing cushion of air, trying to remember to keep that tail pointing the same way. . . . But there is certainly a lot to learn.

Once the model can be safely hovered on its tether, untethered hovering is the next step, and not before you can fly for the duration of the tank (about 6 minutes) without moving from one spot can you risk gentle forward motion. You then progress to learning how to descend gracefully from gradually increasing heights. Finally, you learn how to fly in wind, which sounds hardest of all. It all sounds a lot of work, and maybe I would have been happier sticking to slope soarers; but I suppose it *is* a new challenge, and that, after all, is what this hobby is all about.