Micro-Mold 'Wallis' Autogyro

Written for 'RCM&E' November 1982.

Having been an autogyro 'nut' for as long as I can remember, I have followed with interest the various attempts to produce a practical single rotor R/C model.

Lest anyone should be confused, let's point out right away that the difference between an autogyro and a helicopter is that the rotor of an autogyro is not driven by an engine. The autogyro is, in fact, a conventional aeroplane which has a freely rotating (autorotating) wing.

Indeed, the early full-size machines were nothing more than an existing fuselage and tail (usually an Avro 504) with a rotor added on top of a pylon mounted at the CG position. Initially, control was provided by the rudder and elevator together with ailerons mounted on outriggers. However, it was found that the ailerons and elevators could be dispensed with and pitch and roll control obtained by tilting the rotor axis. The resulting aircraft was, therefore, a very simple machine and, allegedly very easy to fly.

Previous attempts to produce an R/C model along similar lines have not been conspicuously successful. Quite why this should be so is not really clear but one reason which has been given is the difficulty of obtaining a servo with sufficient power and a fast enough response to tilt the rotor. One way of solving this problem is to use a stabiliser/servo paddle system as used in R/C helicopters. This has been done in all of the kitted autogyros, of which the Wallis autogyro from Micro-Mold is the latest and first British example.

One other problem with full-size machines lies in the length of take-off run required to 'spin-up' the rotor to flying speed. Many methods were tried to overcome this, culminating in a clutch and drive system from the engine to accelerate the rotors up to speed before the take-off commenced.

A similar system is used in the Micro-Mold autogyro, though here we have a slight variation in that the full-size Wallis machine does not use a spin-up device. The aircraft is so small and light that a manual 'swing' suffices for this purpose.

The Kit

This is to the usual high Micro-Mold standard, being very similar to the well-proven 'Lark' kit. Indeed many of the mechanical components are either based upon, or the same as used in 'the Lark' thus providing production continuity.

Packaging is excellent with all major subassemblies in numbered polythene bags which tie up with numbered sections in the instruction manual. The rotor blades are of hardwood, matched for weight, and only require finish sanding.

Ply and balsa parts are ready shaped and all metal and plastic parts are, apart from trimming the fuselage mouldings, ready for assembly.

Construction

There are no problems here. It is essential that the main shaft and drive assembly is free and a tip from designer Roy Sturman is to spin the whole assembly with an electric drill after adding a small quantity of metal polish to each of the bearings.

One problem with the review model was of my own making. Initial attempts to turn the assembled clutch by hand revealed no tendency to slip whatsoever and it was difficult to see how it might be possible to start the motor without being beaten to death by the rotor blades. Consultation with Micro-Mold's John Dean revealed that one customer had found it necessary to radius the leading edge of the clutch shoes to obtain satisfactory operation.

The clutch was modified accordingly and when the motor was started - yes, you guessed, no drive to the rotors! In fact, my fears were groundless - the moral? *Leave it alone*.

Having had various 'moments' with a 'Lark' due to loosening grub Screws, it seems prudent to take particular care when tightening screws, applying thread lock where necessary, when using the same system to transmit the power of a .60 sized motor to a much bigger rotor. The rotor is freewheeling by the time the model leaves the ground so a failure would not be disastrous.

The transfers are beautifully reproduced but are *very* thin. This very fact means that they will fit themselves nicely to the fuselage curves, but actually transferring them from the backing to the fuselage is not to be tackled lightly. I used clear polyurethane as per instructions to protect them.

Flying

Apart from the self-inflicted clutch problem already mentioned, flying revealed another problem. When the starter was applied to the spinner, the prop, spinner, etc. immediately flew off. "Fool", I thought, "you didn't tighten it enough". Two repeat performances later, I managed to tighten the nut sufficiently to keep the propeller on.

Once the engine was running, there was no real problem in getting it into the air. I did find that take-off's were much easier if there is a reasonable breeze blowing. In calm conditions, a fairly long run is required and there temptation to pull it off too soon. The problem here is that if you leave the ground at too steep an angle, the usual result is that the rotor revs go very high which produces a sharp increase in drag and the model literally stops dead. If you have plenty of speed (and rotor revs), a smart application of down coupled with some fast work on the rudder will get you out of trouble. However, if you took off with insufficient speed or revs, it will fall out of the sky. Don't worry about this too much, as it usually survives with little or no damage.

The lesson is: don't pull it off *too steeply* or too soon.

When airborne, it flies like a fixed wing aircraft, except for what appears to be a degree of pitch instability. However, it does say in the instructions that it should not be flown around on full throttle. Reduce power to a point where there is a gentle climb eliminates the problem.

Lesson number two: don't fly it too fast.

Having got it airborne and under control there comes the small problem of landing. There are two obvious ways of doing this:
(1) Close the throttle and let it autorotate down to the ground. In an emergency, this is the easy way to get out of trouble. The rate of descent, however, is such that the actual landing will probably break something. Here the answer is to hold on 'down' stick to give forward speed and then 'flare' for landing. Like helicopter autorotation, you must get it right!
(2) Make a fixed wing approach on reduced throttle, this will give a high rate of descent and needs a combination of back-stick and throttle to 'flare' out. Don't apply too much throttle at this stage or you may reach the point where the freewheel re-engages and converts the machine into a helicopter. Keeping a helicopter straight without a tail rotor can be difficult.

Lesson number three: don't apply too much power at low speeds.

Lest you should have been frightened away by now; it is much easier to fly than a helicopter, but it does have its own idiosyncrasies which you must learn. If you enjoy a challenge, you will have fun which, after all, is what the whole game is about.

Postscript

The instructions state that the leading shoe clutch should be oiled but the amount of oil is extremely critical. I have had greater success by changing the shoes over to a trailing shoe arrangement and running it dry. Obviously one should follow manufacturer's instructions at all times, but this is a tip worth falling back on.

Specification

Manufacturer:	Micro-Mold Ltd., Station Road, East Preston, Littlehampton, Sussex.
Distributed by:	Micro-Mold
Engine:	0.45 to 0.60 cu. in.
Rotor diameter:	63 in.
Weight:	6.25 lb.
Control requirements:	4 function R/C, fore and aft cyclic, left and right cyclic, rudder and throttle.