Left and below: complete and ready to go, the Lark fits the boot of practically any car—a great asset thanks to compact dimensions. Small .19 powerplant seems to lack no versatility in throttle response, etc.

Right: the laminated balsa-ply-balsa tail fin and the tail rotor blades. Far right: useful accessory eventually to be available is a set of floats which are ideal for pilot training thanks to shock absorbing quality.

KIT REVIEW

No. 68 **By Jack Barnard**

MICRO-MOLD LARK

PART 2

IN Part 1 of this review I covered the building of the major mechanical parts, and the fuselage base, up to the final assembly stage. The only parts then to be assembled were the rotor blades and the fin. The main rotor blades each consist of two parts, a ready shaped hardwood leading edge, and balsa trailing edge which are glued together on a flat surface and then shaped to aerofoil section. The rear rotor blades are made up of a centre hardwood strip and balsa leading and trailing edges while the fin is a balsa and ply sandwich.

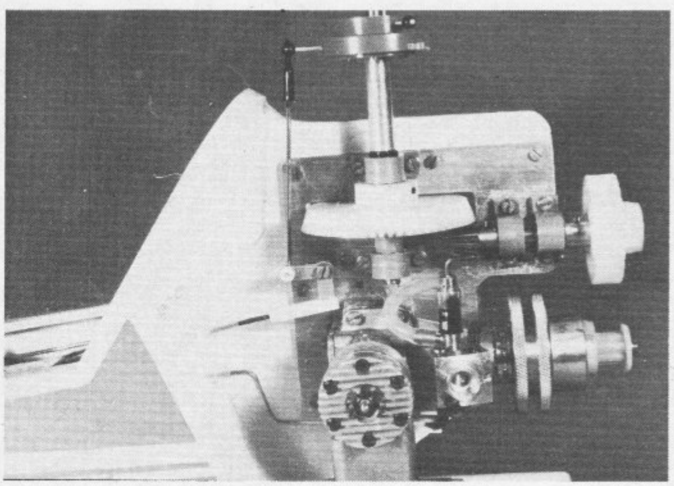
I hope that the photographs of the following building sequence show in detail the excellent design features and the fine quality of the various parts of the kit. Everything has fitted together perfectly and the instructions and diagrams were quite easy to follow. There are however, two points which I would like to bring to the notice of would-be builders of this model. First, take note of the shape of the flybar crank and its *correct* fitting, I will cover this point in a little more detail further on. The second point concerns the fitting of the weighted clutch plates which it is possible to fit the wrong way round and so spoil the smooth action of the clutch. This cannot happen if fitted as per the diagram in the instruction booklet as this is quite clear, but Murphy's Law states, etc, etc. However, if one visualises the action of the plates as the flywheel turns there should be no mistake.

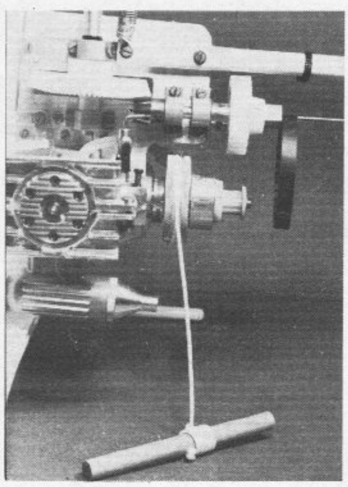
I have to admit to a slight uneasiness in my mind when I bolted into place the alloy plate which mounts the engine, drive shafts, etc. I did wonder if the tightening of the bolts which clamp the alloy plate to the 5 ply former might not cause a slight distortion of the plate and so cause the drive shafts to bind in their bearings, but although I tightened the nuts almost to the point of stripping the threads, the bearings still ran freely. The holes for the bolts are ready drilled, obviously in positions designed to prevent distortion at the critical points.

After fitting the alloy plate I turned my attention to the fitting of the radio gear, the correct positioning of which is clearly shown in the instructions. There is plenty of room for any modern four function gear which helicopter control demands.

The short rigid wire pushrods which pass through the bulkhead from the servos to the engine throttle and the 'pitch' and 'roll' cranks on the alloy plate, move a little, when operated, in the horizontal and vertical planes and the holes in the bulkhead have to be made large enough to allow this to occur. In order to ensure that no engine goo should enter the fuselage at these points I made the holes oversize and passed the wire rods through short lengths of nylon tube, then bedded the nylon tubes in the centre of the holes with a surrounding of silicone rubber. The silicone rubber is sufficiently flexible to allow the required movement of the rods horizontally and vertically without binding as they move back and forth through the nylon tubes.

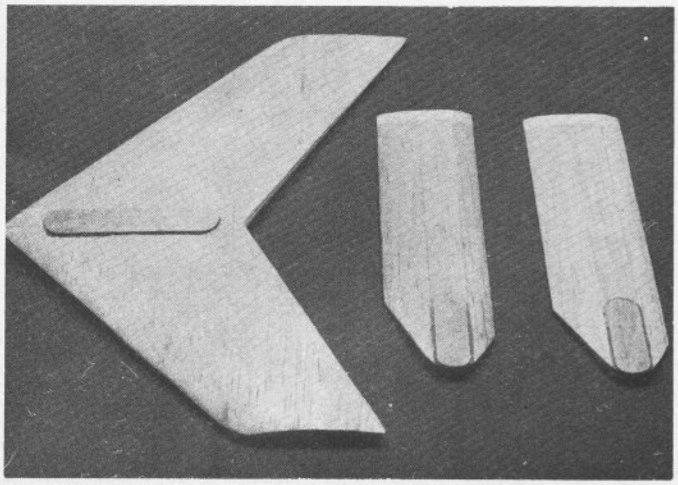
The swash plate bearing is a very tight sliding fit on the main rotor drive shaft and I advise cleaning the shaft of any protective grease,





Far left: the main drive assembly mostly complete. Note the Kavan carb on the Veco 19 motor. Left: the motor is pull started and the drive belt slipped over the pulley when the engine is running. The correct tensioning of the belt is therefore essential.

Right: the main power pod, viewed from the right hand side, showing the fuel tank installation. Far right: two views of the main rotor head assembly.



dirty finger marks, etc, and make certain it is absolutely clean and dry before attempting to fit the bearing. The tight fit is of course intentional as the bearing turns with the shaft.

The fitting of the swash plate and its pushrods require a little care in the measurement of angles and length of pushrods. The servo trims are first set in the correct positions as per the instructions and the swash plate exactly 90 degrees to the shaft before the pushrods are cut to length.

Note that the bolt which holds the main rotor head to the shaft screws through the threaded hole in the shaft. I very nearly made the mistake of easing the hole in the shaft with a file when I could not push the bolt through and only noticed the threads just in time! The bolts which hold the main rotors to the head are fitted in the same way and the nuts which are provided are for locking purposes only.

Now I made the mistake referred to earlier regarding the pitch crank on the flybar and made the mistake of fitting it to give minimum instead of maximum movement. I did not notice this error until after I had fitted the pushrod and balanced the flybar and paddles. Luckily there were sufficient threads on the ends of the pushrod to allow the adjustment to the correct length, but I still had to reposition the paddles and rebalance the flybar – Murphy at work again! I think that the only pitfall in the building of this model is that the builder may tend to get careless, as I did, purely and simply because the parts all fit together so easily. One tends to become over-confident of one's own ability and tends to skimp the reading of the instructions.

Right, after *carefully reading* the instructions turn to the tail boom. This is held in position on the alloy plate by two long bolts which pass through the boom, plate and 5 ply former, but before the front bolt is tightened, the swash plate balance spring has to be fitted. The upper end of the balance spring fits into a lug on the swash plate, while the lower end fits behind the head of the front bolt which holds the boom in position.

The function of the balance spring is to take up any slack which may be present in the controls from the servos. A smaller, similar spring is fitted to the tail rotor pitch crank for the same purpose. While we are on the subject of the swash plate I will mention the swash plate steady. This is the hairpin-like fixture which is mounted on the right-hand side of the 5 ply former immediately below the swash plate and passes upwards and around the roll control arm on the lower part of the swash plate. This 'steady' prevents the lower part of the swash plate from rotating with the rotor shaft. The upper part of the swash plate does rotate with the shaft and is assisted in doing so by the nylon arm 'driver' positioned on the rotor shaft, midway between the rotor head and the swash plate. The pushrod from the swash plate to the rotor head passes through a slot in the driver. I hope all this can be seen in the photographs.

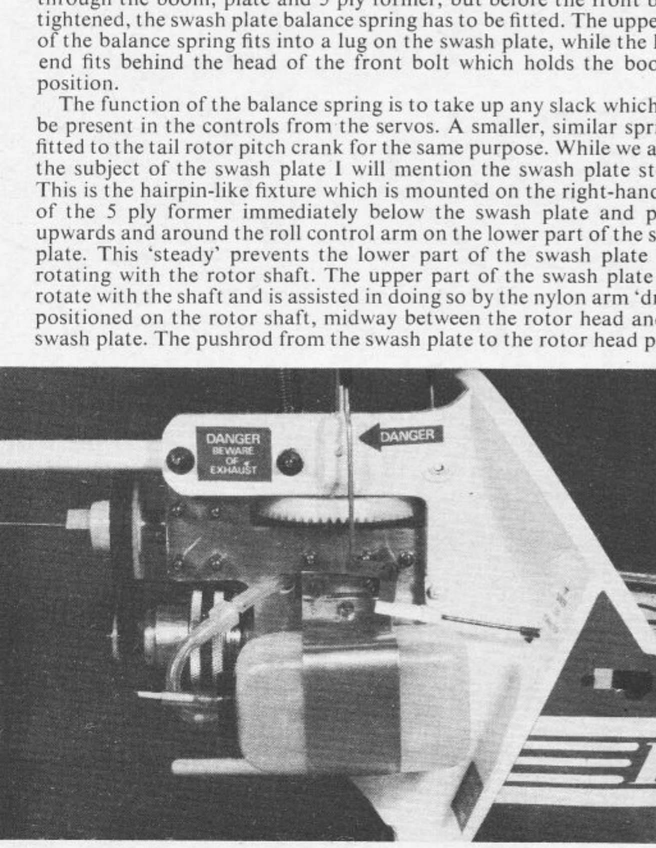
Tail rotor assembly is bolted under the boom and the drive for the rotor is taken from the rear of the large belt drive gearwheel on the main drive shaft. The 16 s.w.g. wire rear rotor drive shaft has a square shaped front coupling which fits into the square socket on the rear of the aforementioned gearwheel. The rear end of the tail rotor drive shaft fits into a coupling on the gear shaft of the rear rotor assembly. The shaft is held steady along its length by two nylon bearings fitted to the boom. The control cable from the servo to the rear rotor assembly passes through a nylon tube which has to be fitted in the exact position indicated in the instructions in order to allow clearance from the 'roll' control rods and crank, and the gearwheels, then along the boom to the slider crank. One of the two bolts (rear one) which clamp the tail rotor assembly to the boom also secures the tail skid. The skid wire is bent at 45° and the tip is bent slightly upwards.

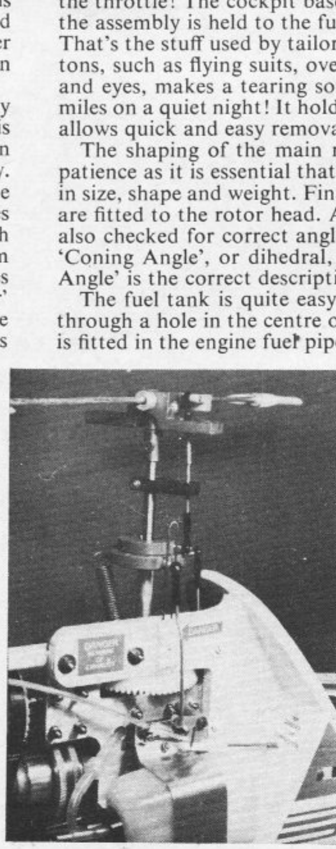
The rear rotor blades are balanced after fitting, by loosening the stud of the rotor shaft gear which allows the shaft to rotate freely. Spinning the rotor a few times will soon show up any imbalance in the blades and paint or trim strip can be added to the lighter blade until both balance as evenly as possible.

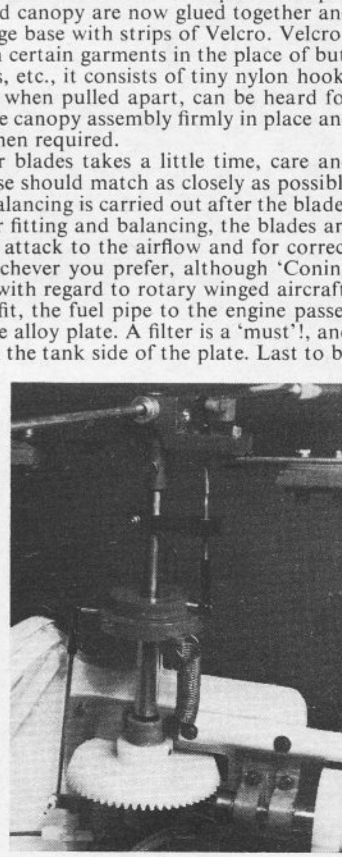
Return now to the Cockpit area and join the Cockpit base to the canopy. A little painting has to be done first on the cockpit base although the pilot's head comes ready painted, so we choose our own colours for his flying suit and the cockpit interior. A stick-on dummy instrument panel adds a touch of realism and I could not resist adding a boom microphone to at least give him a chance to shout for help when I open the throttle! The cockpit base and canopy are now glued together and the assembly is held to the fuselage base with strips of Velcro. Velcro? That's the stuff used by tailors on certain garments in the place of buttons, such as flying suits, overalls, etc., it consists of tiny nylon hooks and eyes, makes a tearing sound when pulled apart, can be heard for miles on a quiet night! It holds the canopy assembly firmly in place and allows quick and easy removal when required.

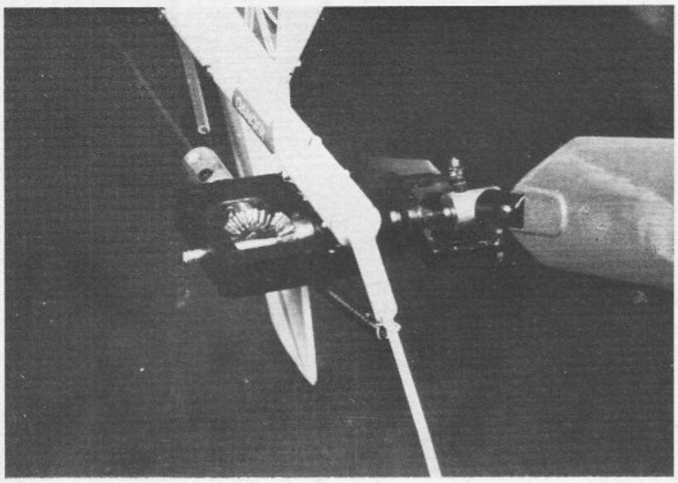
The shaping of the main rotor blades takes a little time, care and patience as it is essential that these should match as closely as possible in size, shape and weight. Final balancing is carried out after the blades are fitted to the rotor head. After fitting and balancing, the blades are also checked for correct angle of attack to the airflow and for correct 'Coning Angle', or dihedral, whichever you prefer, although 'Coning Angle' is the correct description with regard to rotary winged aircraft.

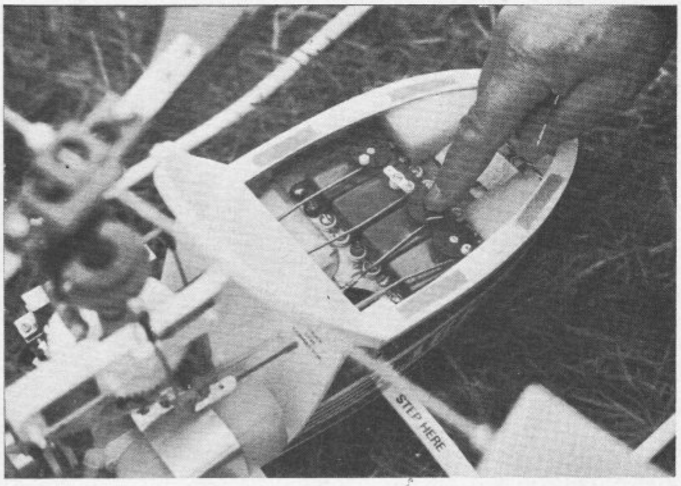
The fuel tank is quite easy to fit, the fuel pipe to the engine passes through a hole in the centre of the alloy plate. A filter is a 'must'!, and is fitted in the engine fuel pipe on the tank side of the plate. Last to be











Above left: the complete tail rotor assembly. The tail skid has been extended a few inches to prevent the tail rotors chewing grass. Above: the radio installation showing four servos of Swan R/C system side-by-side in fuselage pod.

fitted is the heat sink on the engine cylinder head and after a thorough check over on the tightness of all nuts, angles of blades, freedom of movement of all controls, etc, we are ready to run the engine and adjust the throttle for an even tickover and smooth open up to full power.

I tied the model down on the top of a large wooden crate, high enough off the ground for reasonable access to the mixture controls when the rotor was turning, to avoid damaging the blades with my head (or *vice versa* – Ed.) and using a nylon cord, started the engine. I won't say it started first pull, *my* engines rarely do, but I soon got used to using the starter cord, and once the mixture had been set correctly, starting on a low throttle setting as advised became quite simple. The safest way to start the motor is to remove the drive belt and let it hang free on the rear drive shaft, then start the motor on a low throttle setting, throttle back to tickover, replace the belt then stand clear and slowly open the throttle until the clutch operates and drives the rotors. The instructions contain hints on engine operation and some good flying hints. If the clutch plate spring has been tensioned correctly (and the plates assembled the right way round), quite a fast tickover can be set below the r.p.m. at which the clutch engages. I didn't get up to full throttle on the engine runs, in fact, I didn't get up to half throttle, as the model seemed about ready to lift the crate off the ground! I don't really think it would be advisable with a helicopter to open up too much with the model tethered, there must be a devil of a strain on the rotors under such conditions.

Well, I'm ready for the flying field. The construction of this model has given me a great deal of pleasure. The kit is very complete, apart of course from engine and radio gear. This will be the first helicopter I have flown, and I feel it is the ideal model to learn on. Every part can be seen working. It takes only a few minutes to check that things are as they should be before each flying session. Spare parts are inexpensive and easy to replace. There are the favourable considerations as to its small size for transportation, small engine with economy on fuel consumption, easy starting without an electric starter, etc, and last but by no means least, the low initial outlay in the cost of the kit, which has been a tremendous breakthrough and has brought model helicopter flying within the reach of so many more of us. I am sure we shall soon see many 'LARKS' joining their feathered namesakes on the flying fields. If only a manufacturer could now produce a really quiet engine, what fun could be had in the back garden, but first I have to learn to fly it, and that will be in the middle of a full size airfield. I hoped to have pictures of it in the air for this copy of the R.C.M. & E., but I am sure I will be forgiven if I don't, as I need the right weather conditions for my first flights, and those of us who have seen the prototypes in the air at most of the major model shows since last May already know how well it does fly. Unfortunately we have no helicopter pilots in our club, so I am on my own, however the instructions say that if I read the flying hints at the end of the book a hundred times and concentrate really hard I stand a good chance of getting it down in one piece. I like it!

Afterthoughts

Before I drool over my first flight, I have one or two points which may be of some help to builders. These have arisen during the flight tests and in conversation with other builders.

The main rotor blades have to be adjusted after fitting to the correct angle of attack to the airflow. In the instruction book is a diagram showing how to go about making up a template for easy adjusting of, and checking after a knock. The correct angle is 6°. Don't be lazy, make the template as instructed, don't cut the diagram out of the book or you will get a nasty shock when you try to fly the model as the angle shown on the diagram is nowhere near 6°.

Next point concerns the adjustment of the Drive Belt. Don't try to get this nice and tight, allow a good ¼ in. slack when adjusting as shown in the diagram. I set mine to a tight 3/16 in. and had a little difficulty in re-positioning it after starting the engine on the cold flying field. The model is much easier to fly if the C.G. is spot on. My model was slightly nose heavy, but so little that I did not bother about it, but when I came to fly it, I found that it would tilt forward very slightly on lift off and by so doing gave me the wrong impression as to the correct flight path of the model. Don't bother to work that one out, just get the C. of G. spot on. I extended the rear rotor blades to the maximum diameter. However, if you are a learner, I advise the minimum measurement stated, as mine, at the maximum, are a little too sensitive for a learner's twitchy fingers; if you use the maximum size, use the min. servo throw position. Lastly, the Oilite bearings need oil. Don't overdo it, a couple of drops on each one before flying sessions.

First Solo

It was also my first solo on any R/C helicopter! I was lucky in that I had already seen my model flying, as a member of the Nene Valley Club had kindly carried out its test flight, in weather conditions which, although really unfair to both model and pilot, certainly proved the model's ability, and the pilot's as the wind was gusting to well over 30 m.p.h. So I started my solo with a lot of confidence in the model. I listened to a lot of good advice from the test pilot and I think I remembered it all up to the point of opening the throttle. Then I found it was so very easy to do all the things I had been told not to do! However, the cheering of a couple of clubmates helped a lot, I don't think! Seriously though, I did follow the helpful hints I had been given and the advice must have been good because as after four tankfuls of fuel had been used, I flew the model up to about six feet and safely back to earth. As advised, I concentrated initially on mastering the rear rotor control and did this by facing the model into wind, standing behind it and opening the throttle until the main rotor lift was supporting the model but with the undercarriage still touching the ground. Then I operated the rear rotor control to keep the nose of the model heading into wind. After about 20 minutes of this, when I had the rear rotor control nicely trimmed, I opened the throttle a little more and moved the model forward in a straight line, or at least that was my intention! It took about another 20 minutes to do that with the model about an inch or so at most above the ground. No, I haven't fitted a ten gallon tank, I did stop to refuel between attempts! I carried on like this for a couple of hours, gaining confidence until I had the model flying at about six feet.

After two solo flying sessions, the second in a very blustery 20 mph wind, I have nothing but praise for this excellent model. I noticed during my first solo that the receiver aerial tended to get itself trapped under the undercarriage skids when I skidded the model around on the grass while getting the hang of the rotor control, so I fixed a length of Nylo-Rod to hold the aerial clear, and can recommend the fixture to learners. The rod is flattened at the rear and fixed by one small screw to the front of the model on the top of the ply fuselage strengthener. The end of the aerial can be left coiled on the forward tip of the rod for the 'ground control' practice and initial low level flights, as one is standing so close to the model, but a range check is of course advisable. I have also extended the tail skid a couple of inches as I am flying off three inch long grass and was getting a lot of green on the tail rotor.

I have to repeat that I have nothing but praise for this model. It is easy to build, and I feel sure that any modeller who has flown multi R/C models would very quickly learn to handle this helicopter. The Veco .19 with Kavan carb turned out to be a very good choice, giving more than enough power. (I haven't had mine open beyond half throttle yet), and the throttle control is excellent.