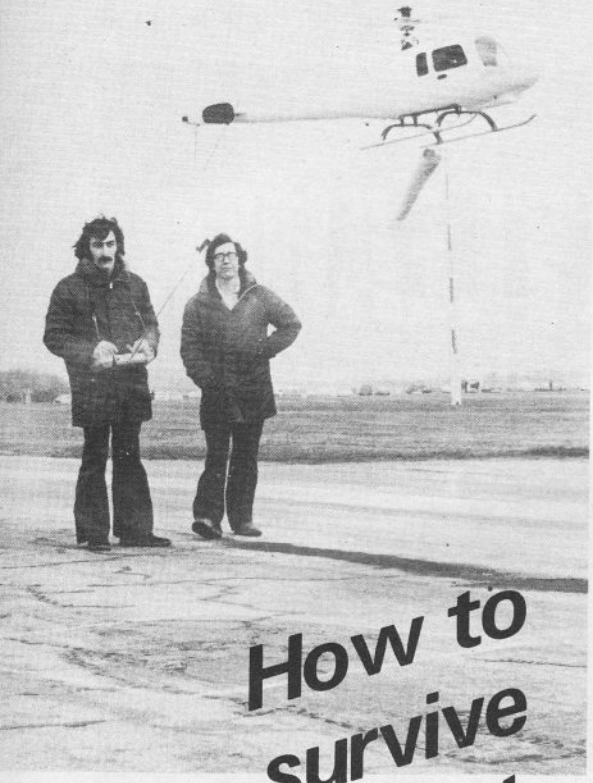


How to survive your first R/C helicopter f(r)ight!

BY DAVE NIEMAN

PART 1

WITHOUT a doubt the most exciting breakthrough in Aeromodelling since proportional Radio Control must surely be the R/C Helicopter. Although, since its introduction to this country it has been rather slow in gaining a foothold.

Why? The main obstacle to the budding chopper owner is price, even the cheapest helicopter kit is still more expensive than most fixed wing kits.

The gap has narrowed slightly due to the increasing cost of conventional building materials but the only answer I can give to this problem is 'Dig Deep' because the rewards are well worth it.

After its initial impact and novelty value, the chopper's slow rise in popularity can be attributed in many cases to feedback from owners who did not quite master the building or flying, leading to stories of short hops terminating in disastrous crashes, the wreckage being sold, slung in a corner of the workshop never to be heard of again, or a half-hearted attempt at repair ending in an even more spectacular crash.

I don't wish to oversimplify the situation and cast a shadow of gloom over the proceedings thus far, but the fact remains that although the whole scene is still very young, there have been several thousand kits sold. Where are they?

It is obvious that there are many helicopter pilots who have stayed the course and are having a ball, but I would suggest there are quite a few that have not passed the 'Build-n-Bend' stage or, at best, appear to be content with semi-controlled flights and plenty of repairs. A lot of the problems encountered during the intial stages can be alleviated with a little common sense and forethought.

To build and fly a helicopter successfully, you don't need to be an expert in Aerodynamics or have a degree in Engineering or even have flown an R/C model before. In some respects it is an asset to be a newcomer to R/C modelling because some of the bad habits picked up in one's fixed wing flying are often very hard to break. Some of the things you can get away with on a fixed wing model could prove to be a potential crash with a helicopter. On the other hand, the benefits of having flown before are obvious, *i.e.*, orientation, anticipation, familiarity with radio equipment, etc. etc.

The flying of R/C helicopters calls for a whole new set of rules and standards of building, after all we are calling for the same reliability in the model as is applied to its full size counterpart.

Still keen?

Before rushing out and buying a kit, consider carefully your choice of model. At present there are not too many to choose from. They could be grouped into three categories:

Small	—	19–25 power
Medium	—	35–40 power
Large	—	60–61 power

There are pro's and cons for all three groups so forgive me for generalising as it is difficult to analyse each individual model.

Let's take the smallest group at the cheaper end of the price scale. They are fairly quick and simple to build, take a relatively inexpensive motor and can usually be transported even fully rigged in a small car. This is an important point because a model helicopter can sustain a fair amount of damage in transit. The main point in their favour is that they are pretty durable in the hands of a novice and crash damage is inexpensive and rapidly repaired.

On the debit side, they are not quite as easy to fly as the larger models, particularly under calm weather conditions. They tend to be rather sensitive on the tail rotor and sometimes marginal on power. Their small size can also be a problem when flying circuits, as it is easy to become disorientated at a distance. Nevertheless, a good introduction to R/C choppers.

Medium 35-40 power

Still fairly economical, offering a much better power-to-weight ratio and there's not too much building. Both these and the smaller models are usually of the open frame or bubble and boom construction. A practical size – a little easier to see.

Large 60-61 power

Top end of the price range.

This being the most popular size, there is a wider selection to choose from. Unlike the smaller models, most of this group employ a glassfibre fuselage of semi-scale appearance. With this type and size of structure a bit more time and effort is needed to finish it, but the end result, when flying, could well be taken for full size. Depending on the motor used, they generally have a good reserve of power.

Damage during the early stages of learning is usually confined to rotor blades, shafts, and superficial digs and scrapes but a crash from any height could mean a time-consuming and more expensive repair with the larger model.

Although transporting a 5 foot helicopter can be a problem, at least it's a genuine excuse to leave the missus at home!

The trend with the larger models is towards the use of collective pitch on the main rotors. All of the 61 powered helicopters currently available in this country feature this refinement.

A word of explanation for the uninitiated.

Fixed pitch helicopters have the main rotor blades set at a pre-determined angle of attack. In order to gain lift, the speed of the rotors must be increased. However, there is an inevitable control lag with this system because the motor must first accelerate all the moving parts of the transmission and rotor head, etc., before the rotors produce more lift. Get rid of this delay and that's one less headache for the novice to overcome. Collective pitch does just this. Helicopters with collective pitch have

the pitch control of the main blades coupled with the throttle. As power is increased, so too is the pitch. This gives a much faster response to height adjustments as lift is gained or lost instantaneously.

The delay with fixed pitch calls for quite a lot of anticipation when hovering in gusty conditions. Also when landing in a strong wind, very little power is required. The resultant low rotor speed slows response and things can get rather untidy. Collective pitch virtually eliminates this problem because the rotor speed remains fairly constant, giving good response even at low throttle settings. When landed, all lift can be dumped by closing the throttle with no danger of the model being blown over. There is a bit more work involved with collective, but careful setting up can produce a model which is a lot easier to fly.

The motor

Having decided on a particular model, one must now choose a suitable motor, as *this is the heart of an R/C chopper.*

The large brown lump that you chisled out of the front of your fixed wing model won't do even though it may have dragged your 'Super Swooper' around the sky at a great rate of knots. We are not looking for the motor that will turn a prop a couple of hundred r.p.m. more than the next. for in a helicopter, the motor spends most of its time at between half and two thirds throttle and full power is seldom used. What is required of a motor is good throttling characteristics, especially with fixed pitch models where the motor opening up cleanly can save a lot of hard landings. Remember that delay!! Other essentials are easy start, cool running and, above all, **reliability**. I would personally trade a little power for a motor that throttles well, is reliable and not continually seizing up.

Most of the modern Schnuerle ported motors fit the bill admirably. One of the most popular 61 motors used in helicopters, the Webra Speed 61 is manufactured in a version specifically for helicopters. Rumour has it that other manufacturers are following suit.

Radio Equipment

Most helicopters are flown Mode II, that is, throttle and tail rotor on the left hand stick (throttle pushed forward for full power), and Cyclic, left and right – forwards and back on the right hand stick.

If you are already flying using another Mode, then it's probably better to carry on with it. In most cases it's too much to expect to learn to fly a chopper and fly with a strange stick configuration. The one disadvantage to using a 'foreign' Mode is that you may have difficulty in finding someone who can trim your model, help you to fly or take over in an emergency.

Any good four function proportional set will suit, so if you already own a set of gear and it gives you good service, then that's the gear for you. It is a good idea though to have it checked out by the manufacturer's service department before installing it in a chopper as two or three seasons of flying can produce a lot of wear and tear on sticks, servos, plugs, etc.

If you are looking for your first set of gear, it may help to visit your local flying field and talk to the lads who are flying choppers.

As there is usually plenty of space in even the smallest helicopter for radio installation, there is no need to use servos the size of an oxo cube. In fact, I go to the other extreme and use the Futaba FD 17 M Servo which is sturdy, powerful, fast and waterproof. Intended mainly for use in boats, the waterproof feature makes it ideal for helicopter use, where there is always a danger of dirt and oil mist entering the servos.

Putting it all together

Building your helicopter can give as much pleasure as flying it. Many flyers treat building as a necessary evil but if you take your time and don't be too impatient to see it fly, the result will be a far nicer model.

Before starting any building, read the instructions carefully. Study the plan to identify the components now as it will save mistakes later on. Most instructions have some reference to the theory of helicopter flight, read this also as it will help you to know the function of each part before assembly.

Follow the building sequence and don't be tempted to take short-cuts. When building the fuselage, keep the motor and mechanics well out of the reach of wood and fibre glass dust. I keep a vacuum cleaner in the shop and give the fuselage a good clean after each operation, particularly after cutting out windows and before offering up mechanics for aligning bearers, etc. Rather than glue the woodwork in the fuselage, I tack it in with five minute epoxy, check that it is positioned properly, then bond it in with lightweight glass tape and resin. This distributes the load more evenly and gives a strong permanent shock resistant fixing. Don't be tempted to add gussets, braces or any other reinforcements as they only put the weight up and often do little for the strength of the model.

Prior to assembly of the mechanics, all parts should be thoroughly cleaned and protected. Take care with solvents such as thinners and acetone, which should not be used on sealed bearings and plastic parts. Use masking tape to wrap around the exhaust port and carb. on the motor and keep it in the box until required, have a dummy run at assembly, check for a good fit, removing all burrs and swarf from metal parts. Take your time lining up the motor, clutch, drive-shafts, etc. Time spent eliminating friction and vibration in transmission will give you a sweeter running model and give your radio gear a smoother ride.

It is best to paint the fuselage after all the holes have been cut for shafts, push-rods, and windows, before fitting any mechanics. This saves a lot of masking up. There is much to be said for not putting too much effort into a super scale paint job on your first helicopter for obvious reasons, but let's not be pessimistic.

It is nice to put a prop. on your motor and give it a run before fitting, but it's not essential to do so as it is quite in order to run the motor in and carry out any adjustments with it fitted in the model. Fit a silencer that gets the exhaust gases away from the motor and out of the fuselage as directly as possible. Don't use yards of silicone tubing as this creates back pressure and can cause loss of power and overheating.

Mount the fuel tank securely, make sure the clunk can reach all corners of the tank and does not get hung up on the fill or vent pipes. I always run on manifold pressure as I find it gives a reliable and consistent engine run, irrespective of tank position. In some of my experimental models, the tank has been fitted as much as 3 in. directly above the motor with no adverse effects.

Use a filter in the fuel system. A well-known competition flyer was recently overheard telling a group of admirers that he wouldn't use a filter because they were always getting 'blocked up'. If you don't use a filter, the next stop for any muck is the carburettor. If the fuel tube has to pass through a former or the side of the fuselage, use a grommet to prevent possible chafing. I don't use any fuel level warning device as I feel it means relying on yet another electrical gadget and there is also the extra weight involved. If they are

Below left: an upright field box which will raise the model well off the ground is ideal for setting the motor while it is running. Below: ease of accessibility to mechanics is essential if model is to be kept in good running order.

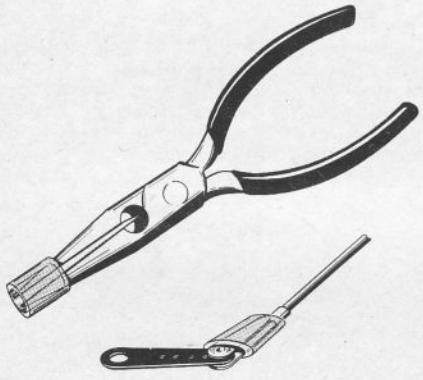
fitted correctly, they are obviously useful and I have not heard of any failures as yet.

Radio installation

The interior of an R/C chopper can be a pretty unhealthy environment for your radio gear. It has to contend with vibration, shock, oil, dirt and heat to name but a few. So the more comfortable you make it, the better are your chances of avoiding a failure. The receiver should be contained in plastic foam or one of the special packing materials available for this purpose, preferably away from the motor and exhaust, CG permitting. I say 'contained'. So many modellers put the receiver in a piece of foam, bind it tightly with tape and cram it hard into the smallest space they can find. This could be termed as 'solid state'! Anchor the aerial and route it out of the fuselage through a grommet. It can run along the fuselage and be secured to the stabilizer or any other convenient fixing. If the radio objects to this and shows signs of glitching, then it's best just to let it hang down from the front of the model. Be careful not to tread on the aerial when picking up the model and to check it for damage after flying! The battery pack should also be insulated and secured against moving around in flight. The servos, or servo tray should be mounted on grommets which are supplied with most radio systems. Don't over-tighten the mounting screws so as to compress the grommets too far, otherwise you are defeating the object. Vibration and electronic components are natural enemies.

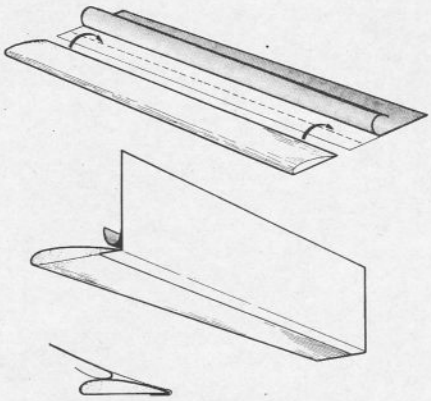
Control linkages

Push-rods are best kept as short and direct as possible. On the larger models, make them from aluminium or glass fibre tube rather than balsa. Push-rods up to the swash plate are usually of metal and supplied in the kits. Use good fitting Kwik links and bell cranks and try to eliminate any free play in the linkage between the servos and the swash plate. A good way of ensuring that Kwik links stay put is to cut a piece of silicone fuel tubing about $\frac{3}{4}$ in. long, spread it with a pair of long-nosed pliers and slip it over the link before connecting to the servo or bell crank.



The rotors

Cover the rotor blades carefully. Start by peeling off the backing paper of the covering sheet for about 1 in. and mark on to the adhesive side of the covering the amount that will overlap the trailing edge on the underside of the blade. Lay the covering on a clean flat surface and place the lower trailing edge of the blade onto the covering up to your mark and press firmly. Turn the whole over and smooth the covering over the trailing edge, peeling off the backing paper as you go until the whole blade is covered. Using this method you can go at your own pace and there is less chance of any mishaps or bubbles than if you peel all the backing paper off at once. While you are building one set of blades, it's as well to make a spare pair as it does not take that much longer.



Take your time balancing rotor blades – read the instructions thoroughly. I prefer to add extra covering to the light blade, rather than lead weights or screws in the tip, it is far safer. What you must aim for is that both blades must be the same weight, and the centre of gravity of each blade must be in the same position. That is, they both balance in the same place along their length. Don't forget to mark the tips with contrasting colours for tracking purposes. I leave one tip white and cover the other with self-adhesive 'Day-Glo' material. The tail rotor blades should also be carefully balanced. Treat your blades with care and take the whole balancing procedure seriously because any static imbalance is amplified many times at high r.p.m.

Nothing to chance

When the model is completed, assemble it fully and check the CG. Instead of balancing on the main rotor shaft, it is an advantage to have the model slightly nose heavy. A chopper coming back at you with its tail down can be quite difficult to stop, especially during the early stages of learning.

Check all nuts and bolts, main and tail rotor fixings, couplings, rotor head and stabilizer blades. Make sure all the rotor blades and the stabilizer blades are facing in the correct direction of rotation. Sounds silly, but the model *will* fly with the stabilizer blades facing the wrong way, though not for long. Check all the ball links on the rotor heads and tail rotor pitch change. If it's a Schluter model, don't forget to fill the gearbox with oil. I add a drop of *Wynns* or *STP* to mine as insurance. Lubricate all the other parts where called for in your instructions.

Switch on the radio and check that you have the required amount of movement on the swash plate and the tail rotor pitch change. Make sure the throttle opens and closes fully with no binding and set the pitch on the main and tail rotor blades. If the model has collective pitch, ensure that it moves the correct amount. Ensure also that the stabilizer blades and the swash plate are parallel to one another when the swash plate is in the horizontal position. All controls must operate in the correct direction, and should not bind up even with full trim movement.

Fill the tank and check the plumbing for any leaks. The undercarriage skids supplied with most models are not really suitable for the novice and some form of training gear is needed. Inflatable floats, though cumbersome and a little heavy are probably the best to start on. They absorb an awful lot of the thumping and more important, allow the model to slide around without tripping over. In the absence of floats, or when you can land a little better, a pair of wider skids will help until you progress to the standard ones. There is a real danger of the model tipping over whilst training, so if you make a pair of wider skids, make them as low as possible consistent with keeping the tail rotor out of harms way.

Just a few more points before you hot-foot it to the flying field. Many of the larger models come out at over 5 Kg. (11.023 lbs.) so officially if your model is over this weight, one should apply to the Civil Aviation Authority for an exemption certificate before flying. You must have a licence to operate an R/C model and don't fly without proper Third Party Insurance cover. Your pride and joy could do quite a bit of damage to both people and property should it run amok.

If I have missed anything out, I hope you don't. The success or failure of your first outing hinges on this moment and this we will cover next month.

Hienz Paellmann and Dieter Ziegler prepare Graupner Bell 47 helicopters for demonstration flight at recent S.M.A.E. chopper meeting. Accurate hovering flight is one of the first essential lessons to learn.