CRICKET — SETTING UP, TRIMMING, AND FLYING INSTRUCTIONS

Flight Performance Capability of "Cricket"

"Cricket" has been designed to be a light, economical, low noise, fun R/C helicopter. It has also been designed to be very stable and easy to fly. Complications such as collective pitch and cooling systems have been avoided, but not without considerable thought concerning the proper operation of the helicopter without these features. "Cricket" is extremely responsive, while remaining docile enough for the beginner to handle. Fast and slow forward flight is within "Cricket's" repertoire, as are stall turns, pin wheels, figure 8's and quick stops. In fact, "Cricket" will readily carry out any flight maneuver that it's full size counterparts will do. The standard version of "Cricket", however, has not been designed to be a fully "aerobatic" helicopter. And while an expert will be able to loop and roll "Cricket", it is not generally recommended for the average flyer since "Cricket" will be operating on the edge of the flight envelope for which it was designed. So we recommend that you regard "Cricket" as an easy to maintain, easy to fly, fun machine, which can be operated inexpensively and flown from very confined spaces. If you want your helicopter to fly specific and complex aerobatic pattern maneuvers, then you should move into the realm of the more complex, heavier and costly helicopter. The "Cricket" will give you plenty of fun and rewarding performance as well as opening up your flying time by enabling you to fly in many more places because of its low noise level and its ability to land and take-off from very small spaces.

Setting-Up

Now that your "Cricket" has been completed and most of the major adjustments have been made, it is time to finalize and refine some of these adjustments before starting the engine and commencing your trimming and flying.

It's wise, at this stage, to again check the pitch angles of your main blades, using the wire gauge that we constructed earlier. It is very important that both blades are set at the same angle, with respect to the flybar. The flybar will set the horizontal plane due to centrifugal force leveleing it out. The lift from each of the main rotor blades, therefore, will be proportional to their respective angles to the flybar.

Now, so far as the tail rotor is concerned, we should re-check that when the transmitter rudder lever is moved to the full left position, but center on the trim lever, the tail blade angle, with respect to the fore and aft axis of the helicopter, is zero. You will then get a small amount of negative tail blade angle when the rudder trim is set to full left also, and a maximum angle of about 20 degrees when all the rudder control is fully to the right. Please remember that some further refinement to these settings may be needed during flight testing.

Now, let's re-check the carburettor settings. You will remember we have set it so that with a fully open throttle lever on the transmitter, the carburettor barrel will be wide open. At zero throttle lever, but full throttle trim, the throttle barrel should be open just a small amount (about 1/16"). Finally, you should be able to close that small opening to zero by moving the throttle trim to zero.

Now check the swashplate settings again. But before we do let us make sure that the paddles are set in line with each other; that is to say, zero to zero angle between the two paddles, looking end on. Also check, by looking end on at the paddles, that they are parallel to the swashplate. If the swashplate is at right angles to the main shaft, then the paddles should be at the same angle. If the swashplate is tilted forward or backwards when the flybar and the paddles are lined up across the helicopter, then they should, in turn, follow the angle of the swashplate movements. The same applies for a sideways tilt of the swashplate when the flybar and paddles are lined up fore and aft of the helicopter. The swashplate should be level in pitch (at 90 degrees to the main shaft) but tilted a little to the right in roll when the transmitter pitch and roll controls are centered (main lever and trim lever). All the linkages which move the controls must be free and it is recommended that you check once again by disconnecting the links from each servo, in turn, and move the control rods backwards and forwards with your fingers to make sure that there are no restrictions or friction in the run.

It is extremely important to successful helicopter flying to have a very smooth but positive connection between the servo and the flight controls of the helicopter. Any impediment or friction here can easily make the helicopter fly badly, even to the point of being unstable. So please check the smoothness of your control runs and also that there is no 'free

play' in the controls. The slightest movement of the transmitter stick should result in a movement of the paddles, the tail rotor blades or the throttle barrel of the engine.

One final setting that we have not discussed before is that of the center of gravity of the helicopter. Please, before you fly, make sure that the center of gravity of "Cricket" falls exactly on the main shaft. If there is to be any error in your measurment, then let it be a little ahead, not behind the main shaft, but certainly do not fly "Cricket" with the CG outside the range of between an 1/8" ahead of the shaft to exactly on the shaft.

There are several ways of checking the CG. One natural reaction is to hold the helicopter up by the flybar, with the flybar set to be 'across' the helicopter and notice if the helicopter tilts forward or backwards. This, however, is a very inaccurate way of checking and does not show the position of the CG to within much less than about 1/4". A better way to check CG is to straddle the helicopter with your hands, put your forefingers underneath the main gear edge, exactly opposite each other, on the outside of the helicopter. Position the fingers so that they are in line with the main shaft, and then lift the helicopter. You can then, by moving your fingers forward or back, accurately locate the center of gravity. Adjustment of the center of gravity (which will usually be in the 'tail heavy' sense) can easily be made by adding a small amount of lead to the nose of the helicopter. You can glue it in the nose of the canopy or on to the front edge of the lower servo tray. Before you add weight, however, make sure that your battery is located as far forward as you can get it. Remember we suggested earlier that the battery of the radio could be fitted onto an extra piece of plywood with rubber bands to keep it located well forward. If you fit a miniature pilot and, perhaps, cabin detail, then you will find that "Cricket's" CG will fall in the proper place.

Now all of these measurements are made with the fuel tank empty. "Cricket's" fuel tank has been designed to be on or slightly ahead of the CG of the helicopter. This is the best place since the center of gravity will then not vary during flight.

Now that we have made the initial setting-up, let's get the helicopter out onto a flat surface and commence our trimming and hovering lessons.

Trimming and Flying

Try and find a quiet spot, certainly away from pets and children, and a smooth surface such as concrete or asphalt. Have somebody with you when you are testing a helicopter in case there is an accident and you need immediate assistance.

Now follow the engine manufacturer's instructions to set the idle and the top end carburettor adjustments of your engine. With a new, non-ringed engine, it is advisable to have at least half an hour of bench running. This will also help you to familiarize yourself with the carburettor settings of your engine.

Use a fuel with about 12% nitro in it and, if you wish to ensure a slow 'break in', use some Castor oil in your fuel. Start the engine and, with the transmitter idle trim at full, the engine should run at a 'fast idle'. The clutch will engage at around 1,500 RPM. It cannot be stressed too highly that when starting the engine, and until you are actually ready to hover the helicopter, the rotor head should be held firmly in one hand. If you watch any expert flying his machine, you'll see that he does this and it is simply to cover the possible cases of the engine being started at full throttle by accident, or your radio not being switched on, or somebody else's radio is interferring with you, or a link is missing from your helicopter, etc., etc. Any one of a number of things could cause the engine to start at high speed and, if you are not holding the rotor head firmly, then the helicopter, at best, could start off violently and hurt you or anybody near. At the worst, it could take-off, out of control, and unless you were able to regain control quickly, you would lose your helicopter and possibly hazard other people's property or even life. So please observe the 'Golden Rule' for all good helicopter flyers - - - HOLD THE ROTOR HEAD FIRM LY WITH YOUR HAND ALL THE WHILE THE HELICOPTER IS NOT ACTUALLY IN POSITION FOR FLYING! AND, AS SOON AS THE HELICOPTER HAS LANDED AND THE BLADES HAVE COME TO REST, HOLD THE HEAD AGAIN FIRMLY BEFORE YOU DO YOUR SHUTTING-DOWN OF THE ENGINE! AND NEVER AIR-TAXI OUT FROM THE PITS OR NEAR PEOPLE OR PROPERTY!

So now on to the first phase of learning to fly.

There certainly are some flyers who are so well co-ordinated that they can hover a helicopter successfully after a very few attempts. These people fall in the same category, we believe, as those fixed wing flyers who can take-off, fly around and land fixed

wing planes with little or no effort and in a very short time. This section of the "Cricket" manual, however, is intended for the 'average modeller' who eventually has a heck of a lot of fun flying model aircraft, but takes a little time (and effort) to achieve this result. So, unless you possess more than average coordination, or you have a lot of money and time, we offer the following method of simplifing the process and learning to fly with little or no damage to your machine and your ego.

Now, learning just one function at a time is really impractical unless a training rig to 'tether' the helicopter is used. Learning the functions two at a time, however, is quite easy and many people have learned (with no damage to the helicopter) in this way. So why not try the one hand (two function) at a time method?

One pre-requisite to learning, in any event, is to have a well trimmed helicopter. Even an experienced flyer, if the helicopter is not trimmed, can find it difficult to maintain a stable hover, and you will normally find that the experienced flyer will land the machine again, several times, after very short experimental lift-offs, if necessary, to get the trim right. So, before you learn to hover, it is extremely important to seek the help of an expert or a reasonably accomplished flyer, if one is available in your vicinity, to hover your helicopter for you and to make sure that it is properly and accurately trimmed. The helicopter blade angle setting in pitch (main and tail) must be correct. The 'tracking' of the blades must be right and the helicopter drive elements and engine must be running smoothly and well. If all of these things are not correct, then don't continue. Once the helicopter is in trim and running smoothly then, and only then, should you commence your learning to hover. If the drive elements are not operating properly, re-check all the clearances and settings. If the blades are 'out of track' and you do not have any expert help available, then you should proceed as follows.

First we must stress that you should not, repeat not, track your main blades by holding your helicopter by the tail boom while lifting it into the air. This is an extremely dangerous practice and is strongly discouraged by "Cricket's" manufacturer. However, tracking the blades is certainly a difficult procedure for the beginner since it requires the actual hovering of the helicopter for a short period in order to be able to observe which blade is higher than the other. We will, however, describe this procedure for you and, even if you cannot observe the blades yourself, you should try to lift the helicopter to a hover just for a second or two while a friend or somebody else kneels down, as a safe distance of course, and observes the 'tracking'.

'Tracking' is a measure of the lift of each of the blades, which should be equal. If the lift of one blade is greater than the other, then the tracking is wrong and there will be vibration and a loss of control. You may remember we colored the tip of one blade with a piece of colored paper during the building phase and the idea behind this will become apparent now. If you look at the edge of the blades while they are running and the helicopter is just lifting off the ground, you will notice that if the blades are tracking you will see only one blade at the tip, but if they are not tracking you will be able to clearly see one blade higher than the other. Because the blades are marked individually you should then be able to judge which of the blades is the higher. Now, to correct this tracking, you must change the pitch of one of the blades.

Before we do, however, we should also note one other factor and that is that the main blade speed of the "Cricket" should be around 1,500 RPM at lift-off with a throttle setting of about half. If the speed is higher than this, then, in order to adjust the tracking, we should increase the blade that is lower of the two. If "Cricket's" blade speed is lower than 1,500 RPM, then we should lower the pitch of the blade which was higher. This means that by adjusting the pitch of one of the main blades we can make one blade run higher than the other, or by adjusting both together we can lower the rotor speed of the helicopter.

If you find that you need much more tail blade pitch angle than has been suggested in the instructions and the helicopter's nose is always trying to turn to the left, then you are probably running with too much pitch on the main blades. If, however, you find the helicopter blades are running very fast and the nose always appears to be wanting to go to the right, then

you are probably running with too little pitch on the main blades. You will soon become accustomed to being able to adjust both the speed of the main rotor blades and the tracking of the blades by adjusting one of them. This is normally done, by the way, by carrying a small 'Crescent' wrench in your pocket and by holding the rotor head tilted against the main mast while twisting the blade straps with the 'Crescent' wrench, just a small amount up or down, to change the blade pitch angle.

So now we have all the setting of the radio, controls and blade angles right and we can proceed with our learning to hover.

Place the helicopter on a smooth and level surface and start the engine. Stand back and to one side, about 6-10 feet away from the machine. The reason for this is that you will now have the best view of the fore-and-aft and side-to-side movements of the helicopter if you are looking at it from 45 degrees. For instance, if you stand directly behind the helicopter, then the fore-and-aft movements are harder to detect. The secret of accurate hovering is to make control inputs at the instant that the helicopter starts to move and maximum anticipation is helped by the best and earliest visual information.

Now take a deep breath and try to relax. Run up the engine with the throttle lever until the helicopter is 'light on its skids', so that it apparently weighs perhaps only a pound or less instead of its normal weight. Under these conditions, it is then quite easy, by using the transmitter tail control lever, to move the nose of the helicopter to the right and to the left, back to the center again, to the left, to the right, back to the center again. All the while you are doing this, you will make small adjustments in throttle in order to keep that one pound of weight constant.

Soon your reflexes will learn how to coordinate the sideways movements of your left hand with the movements of the helicopter rotating to the left and to the right and the up and down movement of the left hand to vary the 'lift' of the helicopter. Do not make any right hand or cyclic movements when practicing this exercise.

It's hard to say how long you should keep up this practice, but certainly you should continue until you can do it without feeling strained during and after each session. When your left hand has been trained to keep the tail straight and the altitude constant, you can now commence to learn coordination of the helicopter's lateral movements with your movement of the right hand stick. So now the next step is to open the throttle so that the helicopter rises in a positive manner to a position between 3 and 5 feet off the ground. It's hard to believe this when you first begin to learn, but if a hovering helicopter is well trimmed and adjusted, there really is plenty of time to maintian, or to correct, the helicopter's movements sideways, backwards adn forwards.

An analogy which reflects this argument and that beginners seem to understand, is that you can regard the helicopter as a large balloon floating a few feet off the ground. The balloon can wander around as a result of small gusts of wind from different directions. We can keep the balloon stationary in front of us by 'patting' it at the right place and at the right time. If it moves away from us and we pat it towards us it may need another pat to stop it coming and position it where we want it. Except, of course, it will drift off again after a short while and we will have a continuous task of providing the right control inputs to keep the balloon stationary in front of us.

Well, the hovering helicopter behaves much in the same manner as our balloon, but the restoring force in this case is the lateral force changes from the main rotor system, caused by our moving the right hand stick in the right direction at the right time. These forces have a similar result on the helicopter as you would get by patting the balloon with your hand to move it around, and keep it in one position. The idea of 'pulsing' (or 'patting') the stick against the direction of movement of the helicopter appears to have been successful in explaining the lateral control of an R/C helicopter for many people.

Once you have learned to fly the helicopter, then the 'pulsing' will blend into smooth, but still very small control commands. However, at the early stages, remember to think of the helicopter as a balloon which, let's say, is drifting towards you. You 'pulse' the stick towards it, you pat it back. As it starts to drift back, you'll need a small input in the opposite direction to pat it and stop its motion so that it settles in the spot that you want it. Don't forget that you can start a helicopter moving in one direction with the force produced by the right hand stick,

but you will probably, unless you have given exactly the right force at the right time, have to give an opposite force in order to slow it down and to settle it in the position required. Please remember that the foregoing applies only when the helicopter is well designed and, most importantly, well trimmed.

So try these hovering techniques and see if it doesn't help to speed up and ease up the learning process. Make each 'flight' only a few seconds and then land. Each successful 'flight', however short, will place you higher up the learning curve. We have seen people learn by this method and be hovering confidently for five to ten seconds at a time in less than a single morning. So don't give up - you can fly an R/C helicopter if you really want to. Good luck with your hovering sessions.

For The Expert

You should find, as we did, that "Cricket" handles very naturally and its response time coordinates well with most people's requirements. Near the ground 'flying' is very easy to do - "Cricket" will do fast stall turns in a very small space and tight pylon turns also. Many of us who have flown the "Cricket" find that 'nose in' and 'tail in' hovering is easier than with any other machine. Perhaps this is because we instinctively feel it can do us less harm if it 'charges' at us!

In forward flight, "Cricket" needs - like any other helicopter - some left tail rotor trim to make turns symetrically and to feel comfortable. 540 degree stall turns are a 'snap' and perhaps "Cricket's" most spectacular characteristic is its ability to 'pin wheel' around and around in one spot. If trimmed for slightly climbing forward flight, "Cricket" will fly around for minutes without you touching the transmitter controls. Loops it will do but allow plenty of air space. Rolls (very barrel!) it will also do but you'll get the most fun by just 'tooling' around the sky, making tight turns, stall turns, climbing and diving. If you don't ask too much from it "Cricket" will probably become your most favored sports helicopter and the one which you can take on family trips without using up most of the back seat of the family car!

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