Snelflight

Chinook

Instructions

and

Maintenance Manual

INTRODUCTION

Congratulations on purchasing your Snelflight Chinook helicopter. The model is the smallest twin rotor model helicopter produced, yet it has a realistic appearance and sound during flight.

Our unique and patented Electrocyclic control system gives the model an unmatched combination of performance and mechanical simplicity. Since it is mains powered it can fly continuously and, best of all, it comes ready to fly, right out of the box.

The only setting up needed is the adjustment of your transmitter's settings, where required. Although not strictly a beginner's model, the Snelflight Chinook is surprisingly rugged and easy to fly. However we strongly suggest that you take the time to read this manual carefully before your first flight, as the aircraft behaves a little differently from other model helicopters.

IMPORTANT NOTICE

This product is not a toy. It is an engineered model which although light in weight is capable of causing damage or injury if operated irresponsibly, primarily due to contact with the six thrust propellers. Avoid flying close to people or pets.

It may start up violently if the instructions contained in this manual are not followed, or if a fault occurs. To be sure of avoiding damage or injury always hold the aircraft firmly by grasping the sides of the rear rotor tower (keeping clear of the propellers) when switching on the mains power.

The motors become hot in use; to avoid injury do not touch until cool.

Unplug from the mains supply when not in use. Do not use in the wet.

CONTENTS

2. PACKING LIST

This Manual:	Please read it carefully before flying the model.
The Helicopter:	It comes with its thin command line already attached.
Power Adapter (with detachable cord):	This converts power from the wall into 36V d.c. to power the model.
Signal Lead:	This is used to connect the model to a suitable R/C transmitter. It is suitable for JR transmitters, as well as the transmitter supplied with the model (if applicable). Leads for other transmitter types are available from Snelflight.
Decals:	For you to customise your model.
Transmitter (if supplied):	Handset to control the model. It requires 8 AA batteries.
Pencil:	For applying graphite lubricant to the rotor brush slip-rings.

3. TRANSMITTER REQUIREMENT

Unless you purchased your model with transmitter included, you will need your own transmitter to fly the Chinook helicopter. The model is designed to operate with the following types:

FUTABA JR HITEC MULTIPLEX

Some Sanwa transmitters will also work, but please note that the newer types with **5-pin trainer socket** are not at present supported. The transmitter you use will need to meet the following minimum features:

Minimum transmitter specification

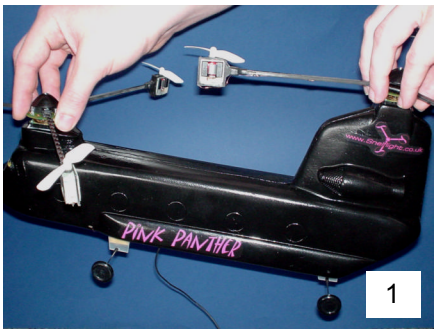
- Four control channels with two twin-axis joysticks.
- Fitted with a trainer (buddy box) socket, using PPM (pulse position modulation) signalling.
- Reversing switches on at least the first four channels.

Since the transmitter connects to the model by wire, frequency and transmission type (AM or FM) do not matter.

The signal lead included with the model is suitable for JR transmitters only. Please see your dealer or contact Snelflight to obtain leads for the other types.

4. HANDLING THE MODEL

The Chinook should be held by the rotor centres, grasping them from above by the green printed circuit discs immediately below the hubs (Photo 1). Alternatively, it can be held by firmly grasping the sides of the rear rotor tower (Photo 2). On no account should it be picked up by the body. Carefully lift the helicopter out of the box and place it on the floor.



Photos 1 and 2: How to hold the Model

Uncoil the command line, guiding it away from the model rearwards, ensuring that it doesn't get hung up on the wheel axles.

5. TRANSMITTER SET-UP

If you are using the transmitter included with the model, it will have been preset ready for use and you may skip this section. If you are using your own transmitter, you should follow these steps carefully.

a) Switch your transmitter into training (buddy box) mode: In this mode, your transmitter will send a signal to the trainer socket, but will not transmit from the antenna. This greatly extends transmitter battery life, and eliminates interference problems. On some radios, training mode is selected simply by inserting the training plug into the socket. JR transmitters typically work this way. If this is the case, the main power switch must be left in the **OFF** position. On other units the power switch must be set to **ON**, but the crystal should be removed to prevent radio transmission.

b) Signal Mode Selection: The Chinook requires PPM signalling, so if your transmitter offers PCM as well, it **must** be switched to PPM. Most inexpensive non-computer radios are PPM only, so this setting is not necessary. PCM-only transmitters cannot be used, but these are fortunately very rare.

c) Servo Reverse Switches: These should be set according to the table below:

Channel >>	1	2	3	4
Futaba	Normal	Normal	Normal	Normal
Hitec	Normal	Reversed	Reversed	Normal
JR	Reversed	Reversed	Reversed	Reversed
Multiplex	Reversed	Reversed	Reversed	Reversed

d) Servo Travel: If your transmitter has adjustable servo travels (endpoint adjustments), set the first four channels to 100% in both directions of throw. Exponential joystick response can be selected if you wish.

e) Channel Centres: If your transmitter has channel centre adjustments, these should be set to zero (centred) on the first four channels. The external trim tabs should also be centred.

f) Mixing Functions: If your transmitter has mixing functions such as Throttle to Rudder mixing, these should be switched off, or set to zero.

g) Throttle Curve: If your transmitter has a throttle curve feature, it should be set up to give a full range, linear throttle response. Make sure that the Throttle Hold switch is turned off. Some transmitters have an Aeroplane mode, in which these functions are omitted. It is usually easier to use this mode with the Chinook.

6. *PREPARING FOR FLIGHT*

Before flying the model, you should carry out the following procedure:

a) Stand the helicopter on the floor, facing away from you. Feed the command line rearwards, ensuring that it doesn't catch on the wheel axles.

b) Connect the power adapter to the wall, and plug its 2.1mm output jack into the matching socket at the bottom end of the command line. The helicopter's white searchlight should illuminate, under the nose. You should now wait about 3 seconds before touching the aircraft, to allow the onboard heading-lock gyro to self-calibrate.

c) Connect the signal cord to the transmitter and switch on (if necessary). Ensure that the throttle stick is set to minimum.

d) Now connect the other end of the signal cord to the matching phono socket on the command line. WHILST DOING THIS, HOLD THE AIRCRAFT FIRMLY BY THE SIDES OF THE REAR ROTOR TOWER (PHOTO 2) IN CASE IT STARTS SUDDENLY. KEEP CLEAR OF THE PROPELLERS!

e) During the next two seconds, the helicopter will configure itself to the type of transmitter being used. The correct channel order will be set (this varies between brands), and each control's zero position will be set to match the state of the relevant channel. It is important not to move the joysticks during this process.

f) If all is well, the helicopter's red & green navigation lights will start to blink. If they don't, please read the suggestions in the panel below.

After maintenance, a crash or a heavy landing, please check the following:

g) Check that the aircraft canopy is properly seated below each rotor.

h) Inspect the motors to ensure they are properly seated in their plastic brackets.

If the navigation lights don't start to blink: Something is wrong. The problem will usually be caused by one of the following:

1) No signal from transmitter: Ensure that the lead is properly connected at each end, and that the power switch is in the required position (Section 5a).

2) Transmitter in PCM mode: The transmitter must be set to PPM mode.

3) Throttle not at zero: To prevent accidents, the helicopter won't start if the throttle stick is above minimum. This will be the case if the reverse switch is set incorrectly (see table in Section 5). On computer radios, incorrect setting of throttle travel or the throttle curve can also cause this problem. **The throttle needs to be set to give a linear, +/-100% output, as on a basic transmitter.**

4) Wrong type of transmitter: Please see Section 3 for supported brands.

7. YOUR FIRST FLIGHT

If you are new to helicopters, we recommend that you gain experience on a single rotor trainer such as the Hoverfly before flying the Chinook. Although quite easy to fly, the Chinook is not intended for beginners. Experienced pilots should read this section, since the Chinook behaves slightly differently from other models.

For your first flights, choose a room with as much unobstructed space as possible. Do not attempt to fly outdoors. Place the helicopter on the floor in the centre of the available flying area, facing away from you. Position yourself about a metre behind it. After a final check to ensure that the command line will not snag on either wheel axle, begin to advance the throttle (collective) gradually, allowing the rotors time to rev-up as you do so. The motors will not all start simultaneously (please see the next section for an explanation of why this is so), and as a result the helicopter will shake slightly (just like the real thing!) whilst revving up. Keep raising the throttle until the aircraft starts to seem light on its wheels; at this point the throttle will be at roughly mid-stick. **It should not take less than 5 seconds to reach this stage.** Please note that it is crucial to give the rotors time to speed up prior to take-off.

Once revved-up and ready, advance the throttle smartly for a decisive lift-off. This is the easiest way to begin the first few flights. Once in the air you will find that the aircraft is docile, with good heading-hold. Controls should be made smoothly and early, since twin-rotor helicopters respond more slowly than single-rotor types.

Very occasionally, you may wish to make small adjustments to aircraft trim during flight, using the transmitter trim controls. If you do so, please be sure to return the trims to centre before connecting the transmitter next time, otherwise the helicopter will self-calibrate to the new trim settings, treating these as the centre positions. You will then need to add even more trim to restore correct flight. Most trim issues can be resolved without use of the transmitter trims and this is preferable: Please see the Maintenance section.

8. PRINCIPLES OF OPERATION

The Chinook generates the lift necessary for flight by means of the six small, rapidly spinning rotor-tip propellers. The rotors themselves do not provide any lift. The outboard positioning of the motors gives each rotor a large moment of inertia, thereby imparting a high degree of gyroscopic

stability to the aircraft. At the same time, the rapid movement of the motors through the air keeps them comparatively cool during operation.

Cyclic control is provided by varying the speeds of the motors as they move around their circular path. For example, to provide a left-hand roll force, the motors slow down as they enter the left-hand semicircle, and speed up as they enter the right hand semicircle. This patented control method requires no actuation servos and few moving parts, resulting in an extremely small, lightweight and mechanically simple aircraft.

Uniquely, both the aircraft's rotors turn in the same direction. This is possible because the rotors are driven by their on-board motors, rather than by an engine mounted within the fuselage. There are therefore no torque reactions produced. Furthermore the rotors have no mechanism for tilting independently of each another; their gyroscopic behaviours are therefore combined. If the rotors turned in opposite directions these behaviours would cancel each other out, making the aircraft very unstable.

Owing to the large combined gyroscopic reaction from the two rotors, the helicopter's attitude control inputs get shifted a full 90 degrees clockwise during actuation. To make the aircraft pitch (forwards or backwards), a roll force must be applied. This is done by operating the two rotors' roll cyclics in unison. To make the aircraft roll, a pitch force must be applied. This is done by changing the front and rear *collective* controls in opposition, i.e. the overall lift of one rotor is increased while that of the other is reduced.

To make the aircraft yaw, the two rotors' roll cyclics are operated in opposition. The two gyroscopic reactions try to *pitch* the aircraft in both directions at once and as a result, the aircraft as a whole doesn't tilt. Instead, the front rolls one way and the back rolls the other way! This causes the fuselage to twist along its length; the airframe is designed to allow this. In the twisted state, the two ends of the aircraft are pulled sideways in opposite directions, resulting in a yaw motion.

Although there are no torque reactions from driving the rotors, bearing friction does tend to turn the fuselage in a clockwise direction. To prevent this, a continuous anticlockwise yaw input is required. This is provided by the cyclic controls as described above, and is the reason why the aircraft's propellers start at different instants as the throttle is raised from minimum.

9. MAINTENANCE

A. DISASSEMBLY

1) Remove the rotors. To remove a rotor:

a) Unplug the power cord from the command line.

b) Pull the black plastic dome off the shaft.

c) Carefully lift the rotor off, taking care not to bend the brushes on the underside of the hub. Don't mix up the two rotors!

2) Lift off the helicopter body, carefully easing it over the slip-ring panels at the base of each rotor shaft. The interior parts will now be fully revealed.

3) To remove the electronic circuit board, first unplug the two connectors. Next, detach the board by cutting through the double-sided foam adhesive along the top edge, using a sharp knife. The foam can then be peeled off.

B. REASSEMBLY

Reassembly is the reverse of disassembly. Please note the following:

a) When replacing the body, take care to position the navigation lights.

b) When replacing each black plastic dome, it should push the rotor down against spring pressure from the brushes. The correct position is reached when there is about 0.5mm of clear shaft visible below the circuit board disc (Photo 3)

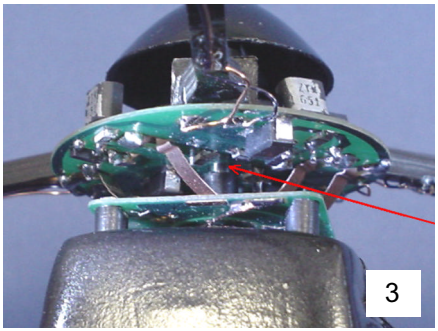


Photo 3: Rotor Clearance

C: SLIP-RING LUBRICATION

Each rotor receives power to drive its motors via a system of slip-rings etched onto a small circuit board at the base of the shaft. Brushes on the rotor hub run on the slip-rings, and from time to time they need lubrication. This is done by applying graphite (a good electrically conductive lubricant) using an ordinary pencil. Please note the following:

a) **Always** disconnect the power before lubrication.

b) The path of the brush contacts on each slip-ring can be clearly seen (Photo 4). Apply graphite sparingly to these areas.

c) Take **great care** to avoid getting graphite between the slip rings, as it will create a short circuit. Remove any that does get in the cracks, using a cotton tip dampened with alcohol or nail polish remover. An eraser is also quite effective!

d) Apply graphite **very sparingly** to the innermost slip-ring.

e) Lubrication should be carried out after every **3-4** hours of flight, or if brush running noise increases (spin the rotor by hand and listen).

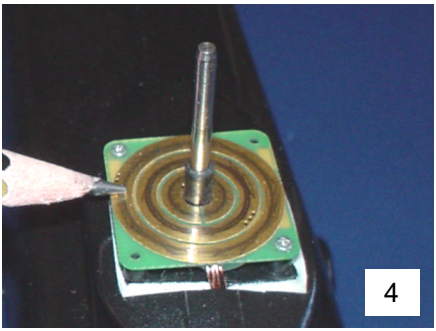


Photo 4: Slip-ring Lubrication

D. AIRCRAFT TRIM

When the control signal is connected to the Chinook, the aircraft automatically configures itself to suit the particular transmitter being used. This process includes precise adjustment of electrical control trims, making further trimming of the aircraft unnecessary most of the time. There are two exceptions when it becomes necessary to make manual adjustments:

1) Yaw Trim: In order to prevent rotor bearing friction from causing an unwanted yaw movement, the helicopter has a continuous anticlockwise bias built into its yaw control electronics. This is generally successful in producing a "neutral" yaw trim, but the electonics are unable to completely compensate for *variations* in bearing friction caused by wear, and by changes in atmospheric temperature and humidity. If the aircraft has a tendency to drift either clockwise or anticlockwise, this can often be cured by taking steps to alter the bearing friction deliberately:

a) If the aircraft is drifting clockwise (right-hand yaw), then there is too much bearing friction. Friction can be reduced by lubricating the slip-rings, or lubricating the rotor bearings with a **tiny** amount of light oil. Increasing the rotor clearance (up to 1mm, see Photo 3) by lifting the black dome slightly, will also reduce friction.

b) If the aircraft is drifting anticlockwise, then there is too little bearing friction. This is rare. However friction can be increased if necessary by reducing the rotor clearance.

2) Roll Trim: Owing to the large combined gyroscopic reaction from the two rotors, the helicopter is very sensitive to any difference in lift between the two rotors. Some difference is inevitable due to motor and propeller performance tolerances, and if uncorrected it will give rise to a roll trim error. Correction is done simply by adding a small weight to either the front or the back of the aircraft body. The weight needed will generally be under two grams, and a small ball of Blu-Tack is ideal. A new Chinook will often have this correction applied during factory testing:- the weight will be just inside the body at either the front or rear end of the underbelly opening.

This weight may need to be modified after propeller replacement, or if the two rotors are interchanged. In the latter instance it is usually enough just to transfer the weight from one end of the aircraft to the other.

1) **If the aircraft rolls to the left:** It is tail heavy. Add weight to the front, or remove it from the back.
2) **If the aircraft rolls to the right:** It is nose heavy. Add weight to the back, or remove it from the front.

E. PROPELLER REMOVAL AND RE-FITTING

The propellers are a tight push-fit onto the motor shafts. To remove, the motor should be grasped at the sides between thumb and forefingers, so as to clamp the armature, preventing it from turning. The propeller can then be twisted back and forth whilst pulling in order to remove it. Re-fitting is done in much the same way, taking care to offer the propeller up to the motor shaft as squarely as possible. Take extra care when fitting a new propeller, to hold the motor armature very firmly, otherwise the downward force of fitting can dislodge the lower motor bearing, damaging the motor's plastic back-plate (Photo 5).

Propellers are grouped for thrust, because it is important that they perform equally. The packaging carries a thrust group letter, and all three propellers fitted to a rotor should match.

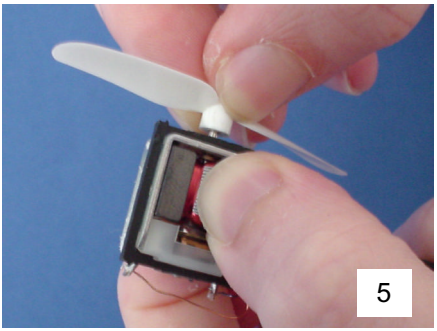


Photo 5: Propeller Removal/Refitting

10. SPECIFICATIONS

Aircraft weight	156 grams
Rotor diameter	284mm measured to motor shafts
Rotor speed at hover	250rpm
Tip propeller speed at hover	22,000 rpm
Power consumption at hover	70W
Aircraft supply voltage	36V
Signalling system	4-channel PPM, 1.52ms centre

Approximate ratings

For spares please contact your supplier, or apply direct to Snelflight at:-

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