IRCHA
PIT CREW

Training Manual

Bringing you the world of helicopters

Welcome to the challenging world of Radio Controlled Helicopters!!

Thank you to all contributors who have helped to make this manual possible.

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Introduction

Helicopters beat the air into submission, don't let them beat you!!!

IF someone tells you that learning to fly a radio controlled helicopter is more difficult than radio controlled airplanes, they are telling the truth. Becoming a competent helicopter pilot takes patience, attention to detail, and is a continual learning process. You will learn much about the mechanical operation of your helicopter, and you will become comfortable with the programming of the associated electronics. You will begin your process with ground school, and then basic hover training. It is our goal in this manual to provide you with an understanding of the importance of safety, a base understanding of helicopter mechanics and to take you through the basics of hover training. It is important that you seek the guidance of an experienced pilot, from a local AMA club, as they will be able to help you with the learning process.

If you are looking for help, search for IRCHA PIT (Pilots in Training) Crew members that are willing to volunteer their time. IRCHA PIT Crew members can be found at www.ircha.org .

IMPORTANT
Safety
AMA Membership
IRCHA Membership
Education
Seek local help

Joining AMA and IRCHA

A requirement to fly at any AMA chartered modeling club in the USA is membership in the Academy of Model Aeronautics. AMA membership provides many services including a monthly magazine, liability insurance, and group representation in order to protect our hobby interests at the governmental level. Another organizational membership would be IRCHA membership. IRCHA is the International Radio Controlled Helicopter Association, and a current AMA membership is required in order to become an IRCHA member. IRCHA is proud to have represented helicopter pilots for 20 years, and continues to provide members with a unified voice. You're IRCHA membership allows you to be a part of the Helicopter Special Interest Group within AMA. IRCHA represents helicopters pilots to the AMA, provides educational opportunities, and work to further the hobby. It is with your support that we are able to provide these services to the hobby community.

What is the best beginner helicopter?

If you ask this question from 100 different pilots you will get almost as many opinions and answers. The same can be said for website forums, opinions are abundant but the answers may not be right for you. The end result will be which helicopter is the best for you. You must decide upon a hobby budget, examine local shops and see which manufacturers are locally supported, determine what local pilots are flying (as they will be your best outlet for assistance), and decide if you prefer nitromethane or electric powered models.

For the purposes of the PIT Crew Manual, IRCHA has chosen to use the Gaui X5 as the program trainer. We feel the Gaui X5 is well suited for beginners, and will grow with you as you advance your skills. Photos and examples will be based upon the Gaui X5, but may be applied to any electric helicopter.

Nitro or Electric?

As in the first question you will again get as many answers and opinions as you might imagine. For many years nitro powered models were king of the hill. Technology had not yet created batteries and electronics that could provide enjoyable flight times and affordable cost of ownership. Now you will find that electric powered models provide equivalent flight times and the cost of ownership is much closer than in the past. With fuel costs rising, and battery costs dropping it is now simply a choice of what you might prefer. Both have advantages and disadvantages, the ultimate choice will be one of personal preference.

Advantages of Electrics

1. Clean and transportable
2. Smaller models are available which allow use of smaller flying sites
3. Quiet performance may help avoid noise complaints at flying sites
4. Motor/Esc setup less complex than engine/muffler/governor
5. Electric motor performance does not vary with atmospheric conditions

Nitro or Electric?-continued

Disadvantages of electrics

1. You will need approximately 3 batteries to fly successive flights
2. There are new concepts to learn with batteries and chargers
3. Battery cost may seem more expensive as you are "purchasing fuel up front"

Advantages of Nitro

1. You can in theory fly more flights daily as long as your receiver battery lasts
2. Some say less complex since you don't have to deal with batteries/chargers
3. Fuel may be purchased one gallon at a time

Disadvantages of Nitro

1. Nitro powered models are messy and must be cleaned on a regular basis
2. Much louder than electrics, may be more prone to complaints in confined area
3. Models are larger, requiring larger flying sites
4. Engines must be re-tuned based upon atmospheric condition

For the purposes of the PIT Crew Manual, IRCHA has chosen to use an electric model. IRCHA believes that an electric model such as the Gaui X5 offers a beginner the best choice based upon cost, features, and the ability of the machine to grow along with the pilot's skills.

How much will it cost?

As of the printing of this manual the cost of a Gaui X5 is 699.00. Thanks to special support from Empire RC, IRCHA members may participate in the Gaui Mild 2 Wild program and receiver special pricing on this particular helicopter. Although the Gaui X5 was chosen for the Mild 2 Wild Program, pilots are of course encouraged to compare any models of interest. Please email gauim2w@ircha.org for further information. If you add to this a basic set of tools and miscellaneous items you will commit around $1000.00 to your first helicopter. When looking for your first transmitter we recommend that you choose one that offers seven channels. There are many different models, radios, and electronics, more than can be covered in the scope of this manual.

What tools will I need?

Just like any hobby you can quickly spend a small fortune on tools and support equipment. By starting with the Gaui X5 you will only need to purchase a few support items to begin the learning process. The following items will be of use as you begin your adventure:

1. Ball link pliers
2. Hex driver set
3. Small format screwdriver set
4. Blade pitch gage

*The ball link pliers are used to properly remove and replace links onto control balls of the helicopter. Proper use will increase the life of your ball links.

*A proper hex driver set will decrease frustration with assembly/disassembly of your helicopter. A good set will serve you well through all sizes of helicopters.

*Small format screwdriver sets are needed to properly fit into the screws on model helicopters. There are many that suggest the purchase of JIS (Japanese industrial standard) screwdrivers, but a good quality hobby set will work nicely.

*A blade pitch gage will allow you to set the correct amount of blade pitch for flight. Although you can set this through trail and error, it is recommended a pitch gage be used.

Do I need a flight simulator?

To many, learning to fly without a flight simulator is like taking your drivers license test without ever being behind the wheel of a car. The flight simulators available today have been an integral part of the success and growth of radio controlled helicopters. A flight simulator will give you the opportunity to practice the proper control inputs, and to learn corrections to flight conditions. There are many available learning opportunities available using a flight simulator. Most experienced pilots will tell you that the flight simulator will save you money by helping you to avoid crash situations. The IRCHA PIT Crew does recommend a flight simulator. The most commonly used simulator in the USA is the Real Flight family of simulators, and they are available at most hobby shops.

Helicopter Definitions

Before you begin learning how to fly, you must first learn what things are called. This will allow you to converse with experienced pilots when you have questions, and to follow manuals while performing maintenance and repair of you model. Please take the time to review the following illustrations and definitions as they will assist in your learning process.

Control Surface Terms

Left and Right Cyclic (Aileron)

Left and right cyclic refers to a control input given which then rotates the helicopter left or right about its center axis. This control function is referred to as Aileron on airplanes.

Left and right cyclic move the swash from left to right and right to left

Fore and Aft Cyclic (Elevator)

Fore and aft cyclic refers to a control input given to pitch the nose of the helicopter downward (fore) or upward (aft). This control function is referred to as elevator on airplanes.

Fore and Aft Cyclic Moves the swash plate from front to back and back to front

Tail (Rudder)

The tail of a helicopter is a complex mechanism. The tail blades on the end of the tail change pitch to impart a force which then rotates the nose of the helicopter left or right. This control function is referred to as the rudder on airplanes.

Tail blade pitch controls direction of nose rotation

Horizontal and Vertical Stabilizer Fins

The vertical stabilizer fin helps the tail track along with the nose in flight. The horizontal stabilizer fin aids in forward flight. With 3D flight more common these days you will see skeleton stabilizer fins which do not provide the same tracking advantages as the solid fins. If you come across FAI pilots you will almost always see solid stabilizer fins as their goal is straight and true tracking through maneuvers. An important function of the vertical stabilizer, especially for beginners, is that it aids in keeping the tail blades from hitting the ground.

Tail Fin is important for keeping the tail blades "out of the dirt"

Collective

On a helicopter, the main rotor blades change pitch to create either positive or negative lift. The throttle and pitch of the helicopter work collectively to create the lift needed.

When the throttle stick is advanced power increases along with an increase or decrease in main blade pitch

Flight Condition Terms

Autorotation

A maneuver performed after engaging throttle hold. This may be performed as a regular part of your flight, or it may be performed in response to an engine/motor failure. *It is recommended that all pilots learn to perform auto-rotations in order to ensure the safe landing of their helicopter if there is an engine/motor failure.

Flybarless Control Unit

A flybarless control unit is an electronic control unit that performs the functions of the standard flybar mixing system .

Ground Effect

Ground effect refers to the increased hovering efficiency of a helicopter when it is within close proximity to the ground. This distance of efficiency is usually ½ rotor blade diameter.

Nose-In

A nose-in hover occurs when the pilot has turned the nose of the helicopter toward himself and the proceeds to maintain a stable hover. This is a more advanced maneuver as many controls are reversed causing confusion to beginning pilots.

Pirouette

A pirouette occurs a tail rotor input is given which makes the helicopter spin 360 degrees. This maneuver may be done quickly or slowly depending upon the amount of input given to the rudder.

Transitional Lift

When in forward flight, the spinning rotor disc produces more lift than in a hover.

Helicopter Mechanics

The basics of understanding the way your helicopter flies begins with an understanding of basic helicopter mechanics. As you read below refer to your helicopter for a better visual understanding.

Ball Links and Link Balls

Control surfaces on a helicopter are controlled by link rods that join a servo and the surface to be controlled. This creates a secure control situation. The link balls are attached to the servo control arm and the controllable surface, the link rods are then snapped on the link balls with the help of ball-link pliers.

Bell and Hiller

A control system commonly used for r/c helicopters that allow the pitch of the blades to change depending on where they are in their rotation with the aid of paddles to take a substantial load off the control system. Bell is the control system that involves the swash-plate and linkages to adjust the pitch. Hiller is the process that uses a fly-bar or fly-bar paddle to make the cyclic more responsive.

Linkage Binding

This is a condition in which the servo is pushing the control surface past its available range of movement. This can be correct with proper mechanical adjustment or with sub-trim.

Boom Strike

A boom strike is event where the rotor blades actually come into contract with the tail boom. For new pilots this may occur when you pull the collective stick downward too fast while on the ground. For this reason, an instructor pilot will typically limit the negative pitch travel for a beginner pilot.

Clutch

Nitro powered helicopters use a clutch so that the engine can idle without the rotor blades spinning. The clutch will engage the clutch bell when rotating at the proper rpm. This allows you to start the engine in a nitro model without the head spinning. In an electric model there is no clutch system. The electric motor provides direct drive to the rotor head.

Feathering Shaft

A rod which helps support the rotor blades and give them more ridged strength. A flapping head has two feathering shafts (one for each blade) and a sea-saw head has one feathering shaft (running the span of the head)

Jesus Bolt

The Jesus bolts are the bolts that hold the main mast to the frame, and the head to the main mast. If you lose either one of these bolts your entire rotor head will separate from your helicopter. They're called a "Jesus Bolt" because when they break the pilot was known to say "Oh Jesus!" It is recommended that these bolts be examined regularly for any signs of wear. It is much cheaper to replace the Jesus bolts than to repair the damage from a malfunction.

Fly-bar Paddles

The fly-bar paddles are attached to the flybar and aid main rotor blade control, reduce servo stresses and provide for a measure of gyroscopic stability. Lighter paddles increase aerobatic ability and heavier paddles increase overall stability.

Slop

The term slop refers to natural slack in the control system. This may sometimes occur from natural wear, or may exist from the beginning depending upon the manufacturing process. Slop can make the helicopter more unpredictable and less responsive to control input. During regular maintenance, try to observe in changes in your control systems and work to rid the system of slop when possible.

Swash-Plate

The swash-plate is the device that receives the control input from the servos. This control input then travels from the swash up the head to create the desired response.

Blade Tracking

If the pitch of both rotor blades is not exact, one rotor blade will be slightly off plane of the other blade and it will look like one blade is higher than the other.

Helicopter Electronics

If the mechanics are the soul of your helicopter, your electronics are the heart. Without a proper understanding of your electronics setup and successful flight will be very difficult. Please take the time to learn and understand how your transmitter, gyro, servos, receiver, and batteries work in harmony to provide you with the safe enjoyment of your helicopter.

Receiver (Rx)

Abbreviation for Receiver, the portion of the radio system that is mounted in the helicopter and adjusts the servos according to the transmission from the Tx..

Servo

A servo is a mechanical device that provides the control of your helicopters. When you move the stick of your transmitter the receiver turns the signal into a movement on the servo arm. You typically have 4 servos on an electric helicopter and 5 servos on a nitro powered model.

ATV

ATV stands for the actual travel volume of a servo. This simply means that it allows you to adjust the maximum and minimum throws of your servo. This helps to prevent servo binding. Your goal is to use as little ATV compensation as possible, and to try and use equal numbers when possible.

Gyro

A device used to help stabilize the yaw of a helicopter. Most gyros in use today are known as heading hold gyros. When the gyro initializes, it senses its current position as the set point. The only way the tail will move from that position is if you give the gyro a tail input command from the transmitter. When you let go of the transmitter stick the gyro senses this as the new center position.

Gain

Gain is associated with sensitivity of the gyro. If you have more gain than necessary you will notice the tail wag back and forth. If you have the gain set too low the tail will not seem hold very well. A simple way to set the gain is by adjusting the gain upward until your see a tail wag and then reducing the gain by a few points.

Binding

Binding is the process of connecting a 2.4 transmitter to its receiver. This must be done before you can control the helicopter as it allows the transmitter and receiver to properly identify each other..

Buddy Box

When working with an IRCHA Pit Crew team member, the use of a buddy box will allow a margin of safety when you are first learning to fly. The Pit Crew (or other instructor) team member will connect his transmitter to your transmitter with a trainer cord. This will allow the instructor to assume control if you begin to lose control of the model. Although buddy boxing is not 100% perfect, it does offer benefits not available by simply trying to hand off a transmitter if losing control.

CCPM

CCPM stands for cyclic-collective-pitch-mixing. In a CCPM system, the servo's pushrods directly to the swash plate, like an equilateral triangle. With these three servo's the swash plate can be tilted in any direction, and when they all move in the same direction the swash plate can be raised and

lowered. All the mixing is done electronically by the transmitter, which means you MUST have a ccpm compatible transmitter.

Dual Rates

Any computer radio sold today features the ability to set to different rates for flight. The rates will allow for more or less response from your helicopter.

Sub-trim

This is a feature that allows you to adjust the beginning position of control surfaces while still having the manual trim control on the transmitter centered. Sub-trim is usually used during initial model setup.

Throttle Curve / Pitch Curve

The throttle and pitch curves deal with the amount of servo travel going to your throttle servo and your pitch servo. As previously mentioned, the throttle and pitch servos work together to create the lift needed for flight. If you are in normal mode and move your collective stick above mid point on the transmitter you will receive an increase in both throttle and positive blade pitch. If you are in stunt mode and move your collective stick below mid point on the transmitter you will be increasing negative pitch and increasing throttle.

Throttle Hold

Throttle Hold is a switch activated process that inhibits the throttle. The recommended starting procedure of a model helicopter is with the Throttle Hold engaged. This will help to prevent accidental increases of throttle when starting the helicopter, or when plugging in a battery. Throttle hold is also used when practicing auto-rotations or when a failure has occurred in flight. If a failure occurs in flight, it is recommended that the pilot engage throttle hold as a safety precaution. An out of control helicopter will have less energy potential if the throttle has been disengaged.

Exponential (expo)

Exponential may be thought of as dynamic dual rates that apply to the stick's center. If no expo is set then your stick movements give a proportional output at the servo. If you have programmed an expo figure in your transmitter you will have more or less movement at the servo with each increase in stick movement.

If you examine the figure below you will see that we can increase of decrease the amount of servo movement around center stick by adding positive or negative exponential.

No expo: 1mm of stick movement=1 degree of servo movement

Positive expo: 5mm of stick movement=1 degree of servo movement

Negative expo: 5mm of stick movement=10 degree of servo movement

As you can see, adding some positive expo may help to smooth out the control inputs around center stick. Please keep in mind that positive and negative actions may vary between radio manufacturers, so please ready your radio manual to determine whether you should use a positive or negative value.

Failsafe

Failsafe is a feature in transmitters that allows you to set certain parameters that become active if the receiver loses communication with the transmitter. Please read your radio manual to determine if this feature is available on your transmitter.

Stunt Mode or Idle up

There are two to three modes of flight with a helicopter radio. Normal mode is used when upright and in basic forward flight. Stunt 1 or 2 (also called Idle-up) is used when you are going to perform aerobatics which will take the helicopter to inverted positions.

Programmable Mixes

Most computer radios used for helicopters provide the ability to mix control functions together to accomplish a goal. An example of this would be to program a mix so that when doing a roll, throttle will increase slightly to compensate for the increased load on the power system.

The basis of pilot training for many years has been the IRCHA Pilot Proficiency Program. It is separated into many different levels from beginner to advanced aerobatics. The PIT Crew manual will take you through the first two levels of this program. Following the following lessons will provide you with enough confidence and ability to enter forward flight. It is important to adhere to safe rules of operation and to seek help before it is needed.

IMPORTANT
Safety
Seek local help
Perform a preflight check of equipment
Maintain a 25ft safety distance from heli
Take breaks in between flights
Most of all have fun

Level I PIT Crew Training is the most basic of the program and is characterized by the pilot becoming ***safe*** and ***proficient*** in basic hover and its related phases. Pilot position for most of the maneuvers shall be from the position of Tail-in towards the pilot.

Hover Training

Pilot should begin hover training behind the helicopter

Take-Off

The take-off should be performed straight up from the landing area, at a constant rate of climb, with little lateral deviations. Come to a complete stop without any vertical bounce or dip, and little to no lateral wobble or drifting. The landing area is defined as a 36"/(1meter) diameter circle.

Stationary Hover

1. After the take-off, coming to a complete stop with little to no vertical bounce, dip, lateral drifting, or wobble.
2. Hold in the Stationary Hover for one (1) minute.
3. The Stationary Hover should give the appearance of being under total control.

Lateral Hovering

1. From take-off area hover forward ten (10) feet, hold for ten (10) seconds.
2. From there hover backward twenty (20) feet, hold for ten (10) seconds.
3. From there hover forward ten (10) feet until you are over the landing area, then hover to the left ten (10) feet, hold for ten (10) seconds.
4. From there hover to the right twenty (20) feet, hold for ten (10) seconds.
5. From there hover back to the left ten (10) feet until you are over the landing area.
6. Land with the skids completely within the landing area.

Multiple Level Hovering

1. Take-off, hover for five (5) seconds.
2. Climb straight up two (2) meters; hold for five (5) seconds.
3. Descend vertically two (2) meters; hold for five (5) seconds.
4. Land with the skids completely within the landing area.

Rear View Hovering ¾ Position

1. Take-off to Hover, Hold for five (5) seconds.
2. Rotate the nose of the Helicopter either left or right forty-five (45) degrees, hold for five (5) seconds.
3. Rotate the nose of the Helicopter back to straight ahead, hold for five (5) seconds.
4. Continue rotating the nose of the helicopter forty-five (45) degrees to the other side, hold for five (5) seconds.
5. Rotate the nose back to straight ahead, hold for five (5) seconds.
6. Land with the skids completely within the landing area.

Full Lateral View Hovering

1. Same as 3/4 View Hovering, but in steps 2 and 4 rotate ninety (90) degrees instead of forty-five (45) degrees.

Diagonal Hovering

1. After take-off from the landing area within center of a 10 meter/yard box, from Stationary Hover, maintaining a constant heading, move the helicopter diagonally to a corner of the box, hold for five (5) seconds, then return to the center of the box.
2. Repeat with the remaining 3 corners of the box.
3. Land with the skids completely within the landing area.

Circular Hovering

1. Tail-in Circle
    a. Take-off, hold hover for five (5) seconds.
    b. Move the helicopter to the right; keeping the tail pointed at the pilot, in a circle around the pilot, until the helicopter is hovering over the take-off point.
    c. Move the Helicopter to the left, repeating step b above.
    d. Land with the skids completely within the landing area.

2. Constant Heading Circle
    a. Take-off, hold hover for five (5) seconds.
    b. Move the helicopter to the right, keeping the tail pointed in the same direction; complete a ten (10) meter circle in front of the pilot until the helicopter is hovering over the take-off point.
    c. Move the Helicopter to the left, repeating step b above.
    d. Land with the skids completely within the landing area

Transition from Hover to Forward Flight

The next phase of flight will be building upon the maneuvers of Level one and progressing into forward flight. It is very important to take your time progressing to Level 2. A solid basis of flight will be based upon your ability to hover your helicopter in all attitudes and to maintain control. Helicopter flight is most like learning match in that your ability to perform more advanced maneuvers will depend upon your ability to perform more simplistic maneuvers such as controlled hovering.

IMPORTANT
Safety
Seek local help
Perform a preflight check of equipment
Maintain a 25ft safety distance from heli
Take breaks in between flights
Most of all have fun
Complete Level 1 before beginning

A smooth transition from hover to flight is important in the early stages of flight

Taxi out

1. Take-off from the landing area to an eye-level hover; hold momentarily.
2. Hover forward slowly for no less than ten (10) meters.
3. Turn into the prevailing wind direction and continue straight and level for no less than ten (10) meters.
4. Proceed to Climb-Out or Land within the landing area circle.

Climb Out

1. After Taxi Out, begin ascent by gradually increasing power/collective.
2. Continue to climb until an altitude of approximately fifty (50) feet.
3. Climb out should be parallel to flight path and at a moderate speed.

90 Degree Turns

1. After climb out, turn 90 degrees in a direction away from pilot and spectators.
2. After completing the Climb out and first 90 degree turn continue to fly straight and level.
3. Execute another 90 degree turn, same direction as before.
4. Continue as before until a box or rectangle has been formed.

180 Degree Turns

1. While flying straight and level, execute a turn hold this turn until the helicopter has come around back to the same direction it has just come from, straighten out and continue in straight and level flight.
2. Turns should be made turning away from the pilot to the right and left.
3. Turns should be made turning toward the pilot to the right and left.

Straight and Level Flight

1. Fly from the Left to the Right.
2. Fly from the Right to the Left.

Figure of Eight-Constant Heading and Hovering

1. Take-off to eye-level, hold momentarily.
2. While maintaining constant altitude, speed and heading begin a forward hovering circle to either the right or the left.
3. As the helicopter reaches the take off point continue hovering forward and complete a circle in the opposite direction from before.
4. Stop over take off point, descend vertically and land completely within the landing circle.

Figure of Eight-The Lazy Eight

1. With the helicopter flying straight and level after it passes the pilot make a turn that is greater than 180 degrees away from the pilot.
2. After the helicopter passes in front of the pilot, execute another turn that is greater than 180 degrees, away from the pilot.
3. This maneuver must be done flying from both left to right (first turn to the left, counter-clockwise) and right to left (first turn to the right, clockwise).

Figure of Eight-The Flying Eight

1. With the helicopter flying straight and level after it passes the pilot make a 270 degree turn away from the pilot; the helicopter will now be pointed directly at the pilot.
2. After the helicopter is pointing at the pilot, execute a 360 degree turn in the opposite direction. The helicopter will again be pointing directly at the pilot.
3. After the helicopter is pointing at the pilot again, execute a 90 degree turn, in the same direction as the first 270 degree turn.
4. This maneuver must be done starting from both left to right (first 270 degree turn to the left, counter-clockwise) and right to left (first 270 degree turn to the right, clockwise).

Traffic Pattern Approach to Landing

1. From straight and level flight, after the helicopter passes the pilot execute a 180 degree turn away from the pilot.
2. Start to reduce speed and power.
3. After the helicopter passes the pilot execute a 180 degree turn towards; continue to reduce power/collective so as to descend at a gradual angle to the landing zone.
4. This must be done starting from both the right and the left.

Translational Descent

1. This is similar to the Traffic Pattern Approach, but the descent angle should be much greater (about 45 degrees) and the descent continues all the way to the landing.
2. This must be done starting from both the right and the left.

Landing

1. This landing is to be completed as part of a Translational Descent, but this has the added requirement that both the take off and landing must be within a one (1) meter circle. The skids must be completely within the landing circle.
2. This must be done starting from both the right and the left.

IMPORTANT
Safety
Seek local help
Perform a preflight check of equipment
Maintain a 25ft safety distance from heli
Take breaks in between flights
Most of all have fun
Complete Level 2 before beginning

Beginning Aerobatics

The next phase of flight will be building upon the maneuvers of Level 3 and progressing into basic aerobatics. It is very important to take your time progressing to Level 3 . A solid basis of aerobatic flight will be based upon your ability to maintain your helicopter in all attitudes. Helicopter aerobatics are very different from fixed wing aircraft aerobatics. A helicopter by its nature can perform maneuvers in all dimensions of flight. Due to this 3D capable flight envelop you must be comfortable with all attitudes of your helicopter before beginning basic aerobatics.

Stall Turn

1. Starting from straight and level flight after the helicopter passes the pilot the helicopter is smoothly pulled vertical (Aft Cyclic).

2. When the vertical climb stops, the helicopter is rotated 180 degrees about the yaw axis.
3. The helicopter is allowed to fall the same distance that it climbed at the beginning of the maneuver before pulling the helicopter back to straight and level flight.
4. This maneuver must be done both to the right and the left of the pilot.

Inside Loop

1. Starting from straight and level flight after the helicopter passes the pilot the helicopter is smoothly pulled through a loop (Aft Cyclic).
2. As the helicopter is "on its back" the pilot should reduce collective so as to keep the loop as round as possible.

3. This maneuver must be done starting from both the right and the left of the pilot.

Pirouette

1. From a stationary hover, execute a tail rotor only turn of 360 degrees to either the right or the left.
2. This maneuver must be done in both directions, to the right (clockwise) and the left (counter-clockwise).

Best of Luck

This brings us to the close of the IRCHA Pit Crew Manual. We hope that the information contained in this manual helped to get you started, and find your way. More importantly, we hope you have made many new friends along your journey. This wonderful hobby is meant to be shared among friends, many of who you will know for life. Treat your models and your friends the same, check on them from time to time, don't yell at them when they let you down, and most importantly never tell your wife just how much money is spent when you are together. Visit us at www.ircha.org if you need more help and we will try to be of service. If you ever feel the need to spend a week flying helicopters join us some year in Muncie, IN for the greatest helicopter gathering in the world, the IRCHA Jamboree.

The Gaui X5, a great all around helicopter and part of the IRCHA Mild 2 Wild Program thanks to the support from Empire Hobby. Email gauim2w@ircha.org for further information on the program.