# Cincinnati Silent Flyers Training Manual

MARCH 2019

# Table of Contents

# Welcome to the Cincinnati Silent Flyers

The Cincinnati Silent Flyers (CSF) is dedicated solely to flying electric-powered radio controlled (R/C) aircraft. This is a great hobby that can be enjoyed by all ages. You may have seen others flying R/C airplanes and now would like to experience the thrill of performing turns, loops, rolls, split S's, and other maneuvers for yourself.

Our flying field is located on Springdale Road, 50 yards east of the Springdale/ Mill Road intersection. This field has a 400 foot long paved runway, flight line, covered pit area, and ample parking.

The CSF always welcomes new members and is dedicated to training new pilots. See more training information in this manual. Training is held on Wednesday nights starting in April and continues through September. All interested can stop by for a free introductory flight.

During the fall and winter months, there are indoor-flying nights at the Mt. Healthy Administration Building gym on Harrison Road. The dates and times will be posted on the CSF website: **www.silentflyers.com** in the **CSF Calendar** section

If you are interested in the excitement of flying radio controlled electric aircraft, the CSF is the club for you.

The best part of joining the CSF is the people. You will discover that there are many others that have the same interest as you and are willing to help.

## Welcome to the Cincinnati Silent Flyers!

# Training Program Introduction

As a new pilot, training is provided for you by a CSF instructor – FREE! You may not have your own plane and other equipment yet. When you come to the field to be trained, a plane will be provided for you for that evening so you do not have to own anything right away. It is a very good idea to be trained on a plane that is specifically designed to be a trainer. Learn all of the basic techniques first before moving on to more advanced aircraft. After training is complete, you may wish to purchase your own plane and associated equipment. Some options to consider can be found here on our web site at: http://electricflyers.com/WebPages/Trainers.htm or by going to our web site, selecting the Flight Instruction link, and then to the RC Trainers link.

Before you buy, have conversations with the instructors or other pilots about the right choices for you. Many have purchased advanced aircraft in the beginning, crashed, become frustrated, then have not continued with the hobby.

The training program will teach you the basics of flying and common terminology of this hobby. You will be lead through instruction to enable you to be flying competently and be safe on the flight line. You will be provided with a **Student Progress Sheet, which** you are to have at each instruction session. After you practice each task, your instructor will indicate that you have completed a task or it still needs some work. After all the tasks have been completed successfully, you will be ready to fly on your own – Solo Flying!

To become a CSF member, you will also need to become a member of the Academy of Model Aeronautics (AMA). Through this membership, you will have liability coverage for the operation of model aircraft, boats, cars, and rockets. Please visit the AMA website: http://www.modelaircraft.org, and join if you will be involved with any of these RC hobbies.

This is a hobby in which you always keep learning. Watch the other pilots. Ask for information or help. Read or subscribe to R/C flying magazines. Besides great articles, there are many advertisements on products – that is an education in itself.

## Training Program Basic Information

You will need some basic equipment to start in this great hobby:

1. Aircraft – Airplane or Helicopter
2. Motor
3. Electronic Speed Control (ESC)
4. Receiver
5. Transmitter
6. Servos
7. Battery(s)
8. Battery Charger

While that may sound a bit daunting, the good news is that many planes come as a package with everything included. As a beginner, it is recommended that you start with one of these. With most of these packages, all you have to do is put together the plane (1/2 hour) then charge the battery and you are ready to fly. With more elaborate aircraft, individual parts will have to be purchased or plane kits constructed – but that is the fun of the sport, especially as you advance.

One important consideration is the transmitter, or radio (the controller of the aircraft) and receiver system. There are many companies that manufacture these components. One type is a Spread Spectrum 2.4 GHz system and another is an older type that is an FM (frequency modulation) system. The 2.4GHz is considered better because of the advanced electronics that enables it to automatically choose between millions of frequencies. As a result, there is a very small chance of interfering with other aircraft. The FM system has a limited number of frequencies, called channels, therefore having a much higher chance of interference. When channels (or frequencies) interfere, there is a high probability of planes crashing. Most beginning packages include a 2.4GHz system.

There is a possibility that you will grow fast in this hobby. So you many not want to buy a transmitter with every new aircraft that you purchase. Some 2.4GHz systems come two ways: RTF and BNF. RTF means “Ready-To-Fly.” This package comes with everything that you need, including the transmitter (also called the radio). If you purchase many RTF packages, you will have many unneeded radios. The other option is to purchase a radio by itself, then buy aircraft that is BNF. BNF means “Bind and Fly.” The advantage is that the radio can “talk” or Bind to many aircraft so that you will only need one radio. More advanced radios can control 10 to 30 and more aircraft. These radios have internal memory and memory cards that can store individual characteristics of each aircraft, then retrieve them when you want to fly a particular model once you have it bound.

With the BNF system, the receiver in the aircraft has to be of the same type as the radio or it will not work. As an example, a Futaba transmitter will not work with a Spektrum receiver.

Another way that aircraft can be purchased is called PNP: Plug and Play. This aircraft comes with everything except a transmitter and receiver. If you have a specific type of radio, such as a Spektrum, you will need to purchase a Spektrum receiver. All you have to do then is plug the servo and motor leads into the receiver and bind it to the radio. Then you are ready to fly.

There are many variables to aircraft systems; more than can be explained here. Talk to other pilots, R/C store people, and read as much as you can. There are many fine instruction materials - DVDs, books, and magazines - that can be found on the internet, stores, and libraries.

Another good way to learn flight basics or advanced flying is on an R/C Flight Simulator (sim). Many sims have multiple types of aircraft, airports, landing fields, weather conditions and more with which to improve your skill level. Some sims have the exact type of plane that you may be training on or want to advance to. This is a good choice, especially when you crash a plane on a sim, it does not cost anything in repairs and you are up and flying again in seconds! Some aircraft come with their own sim for training.

**Above all, talk to our club members for help. They are a valuable resource.**

It really is a good way to learn the Right Stuff more quickly!

# CSF Training Program

The goal of the training program is to develop a pilot that is safe and competent flying on our field, or any AMA sanctioned field.

Training is held on Wednesday nights starting in April and continues through September. If you do not have a plane yet, the members of the CSF will provide one on the training night**. The instructors are volunteers.** As a student, you need to appreciate that Instructors are **using their own equipment** for training. Treat them and their equipment accordingly.

If you will be at a Wednesday training session, please email Steve Harness at harness2017@gmail.com, or call him at (513)520-6398 by the Monday evening prior to the Wednesday session to inform him you will be attending. Mr. Harness will contact the instructors to determine their availability. If there is no instructor available, the student will be contacted back, otherwise at least one instructor will be present.

On the first night of training, the student will be given the **CSF Training Manual**. Please read and become familiar with all of the concepts and information. Please do not hesitate to ask the instructor, Training Coordinator or other club member if you have any questions about the content.

Included in this manual is a **Student Progress Sheet.** After each flight, the instructor will indicate your progress and sign the appropriate task box(s). **It is imperative that the student brings the CSF Training Manual with the included Student Progress Sheet with him/her to each training session.**

On training nights, there will be a **Student Sign-Up Sheet**. Please be sure to sign in when you arrive at the field. Students will be trained on a first-come, first-served basis.

After each flight, the student should ensure that the instructor grades, dates, and initials the **Student Progress Sheet**. On training nights, instructors are busy, but do not leave the field without them indicating what you have accomplished – it only takes a few seconds. You need to have your record of training before you are signed-off to solo!

After you have completed all of the tasks, you will be ready to solo!

The Cincinnati Silent Flyers looks forward to training you!

# Your First Plane

A GREAT resource for information concerning the purchase of your first plane is the **Club Members**! They will steer you in the right direction. Other resources are the internet and hobby stores. Many hobby companies sell planes that are good trainers. Do some research and learn as much as you can before buying. Getting a proper first aircraft is important because a positive initial experience can influence the rest of your flying career. Please review some options for your first plane here: **http://electricflyers.com/content/trainer-planes** or by going to our web site, selecting the **Flight Instruction** link, and then to the **R/C Trainers** link.

Many instructors agree that a good first plane is of the high-wing type with a tricycle landing gear. A high-wing is inherently more stable in flight. Planes of this type will fly slower, which enables the new pilot to get used to the feel of controlling an aircraft.

There are basically two types of landing gear: the tricycle type, which has a nose gear and two wing gears, and the tail-dragger type, which has two wing gears and a wheel under the rudder. For training, a tricycle gear type of plane is easier to learn on because it is easier to steer on take-off. Many training planes are of the tail-dragger type. These are good planes to fly as well, but take-offs are a little more difficult.

Most hobby shops and on-line stores carry complete training plane packages: plane, battery, charger, motor, ESC, servos, etc. As mentioned in the **Training Program Introduction**, a 2.4 GHz spread spectrum radio system is the best choice to date. After purchasing an all-inclusive training plane package, you can be flying quickly – put the plane together (1/2 hour), charge the battery, and you are ready to fly. Expect to spend about $180 - $300.
You can always spend more! If you are an experienced model builder, your aircraft can be built from kits and all parts purchased separately then assembled. Of course, building a model will take some time, but the results can be most satisfying.

Another way to purchase your first plane, especially if you know that you will continue in the hobby, is to buy a Bind-N-Fly (BNF) plane. This comes without a radio (transmitter), but with everything else that is needed. Then purchase a separate more advanced multi-aircraft-memory radio. As your aircraft inventory increases, that radio can be used to control them – up to its memory limit (10-30 and more aircraft) – instead of getting a new radio with each plane purchased and wasting money. BNF systems are less expensive than Ready-To-Fly (RTF) systems because the transmitter is not included.

**Above all, please talk to our club members for advice. They are your BEST resource!**

# Electricity Basics

Some electricity background is needed to understand some of the terms that are used in the radio controlled aircraft hobby.

You will see terms such as: voltage, current, amperage (amps or milliamps), series, parallel, capacity, C-Rating and others used in a variety of places. As an RC pilot, you need to know what these mean and how they are used to get the full potential from your aircraft.

## Voltage

Another name for voltage is Electro-Motive Force or EMF. You will not hear that much around the flight line, but notice the word "force." Voltage is the force, or pressure, behind the movement in electricity. An analogy would be comparing it to water flowing in a river. The force that makes water move is gravity. In a battery's case, the force is caused by a chemical reaction of the elements that make up the battery. Different chemicals cause reactions that create more or less force. So **voltage** indicates force. Some batteries create 1.5 volts of force and others make 12 volts. An individual LiPo cell creates 3.7 volts.

## Current

Current is defined as the flow of electrons, or electric charge, in a conductor. Electron current is analogous to our water flow example. If a pipe has water flowing at the rate of 10 gallons a second, that means that 10 gallons are flowing past a point in one second. Electric current is basically the same. A given number, or quantity, of electrons moving past a point in one second determines current flow. But what is that quantity? In our example, the quantity of water was a gallon or gallons. In electricity the quantity unit is termed a coulomb. A coulomb is an electric charge made up of a group of electrons that numbers in the trillions and trillions. It is not necessary to know that number here! Current flow is measured in **amperage** (amps). The definition of 1 ampere is: 1 coulomb (quantity) moving past a point in one second. You will see some specifications for motors that commonly indicate that a motor will draw 20, 40, 60 or higher amps of current…a lot of current! As a comparison, a 100 watt household light draws about 0.9 amps on the 110 volt house service. Many times a term called milliamps will be seen. 1 milliamp (ma, MA, or mA) = one thousandth of an amp (i.e.: .001A = 1 milliamp).

## Capacity

Capacity is the amount of energy a battery can store. A battery may have a rating of 1800mAh. The "h" stands for one hour. That rating indicates that battery can provide 1800 milliamps, or 1.8A, for an hour.

## Series

This term is most commonly found with battery usage in the RC world. A series connection means batteries that are connected end-to-end, positive to negative terminals - like sliding batteries in a flashlight. When this type of connection is used, the voltages of the batteries in the circuit add up. If three 3.7 volt, 800 mAh LiPo batteries are connected in series, the total voltage available is 11.1 volts. The current rating stays the same though. The benefit is that this type of battery connection will produce higher voltage. The current will remain the same at 800 mA.

## Parallel

With batteries, a parallel connection means that the positive terminals of **equal voltage** the batteries are connected together and the negative terminals of the batteries are connected together. As an example, three equal voltage batteries, such as an 11.1v at 1300mAh, are connected in parallel. The voltage output is 11.1v, but the current rating is tripled to 3900mAh. The benefit is that this type of battery connection is capable of producing a higher current at the same voltage. That is good for higher current motors.

# Lithium Polymer (LiPo) Battery Basics

LiPo batteries are produced in various physical sizes, voltage, current, and energy capacity. As R/C electric pilots we need to understand how these batteries work and how to handle them safely. While there are other kinds of batteries used, LiPos are the most common.

LiPo Batteries can be used as single cell or multiple cell units. The rated voltage for a LiPo cell is 3.7 volts. Cells can be wired in **series** to create battery packs with higher voltages. A two-cell battery pack will create 7.4 volts; a three-cell battery pack will have 11.1 volts, and so on. This series type of connection has a special terminology: 1S, 2S, 3S, 4S…
1S = 3.7v (one cell battery)
2S = 7.4v (two cell battery)
3S = 11.1v (three cell battery)
4S = 14.8v (four cell battery)
And so on…

LiPo batteries have a few terms printed on their case such as: voltage rating, current capacity, cell number, and C-Rating. As an example, a battery may have these terms: 1800mAh, 11.1 Volts, 3S, 25C Continuous/40C Burst. Let us look at what these terms mean.

**Capacity** and **Voltage** were covered in the **Electricity Basics** section. This battery will provide 1800 milliamps for an hour at 11.1 volts of force (or pressure). **3S** means it is a 3 cell, 11.1volt battery.

**C-Rating**
The C-Rating is a term used to describe the battery's ability to provide current, or to take current while charging. Typically, there are two C ratings indicated on the battery. One is a **continuous** rating and the second is a **burst** rating.

An important term is "1C". 1C is defined as the amount of current (amps) that the battery can supply in 1 hour. Using our example in the **Capacity** section, 1C for an 1800mAh battery is 1800mA (or 1.8amps). This is an important concept to remember, especially when LiPo batteries are charged. Typically, with most LiPos, the battery should be charged at no more than a 1C rate, in this example - 1.8 amps. Many advanced chargers will select the correct settings for you, but it is always good to check the charge rate manually so that the settings are correct and no damage to the battery will occur.

The right size of battery is needed for an aircraft. One factor of battery selection is based on how much current will be drawn. The **Continuous/Burst ratings** define how much current can be drawn from a battery. Our example above indicates that the battery can provide 25C continuous. We need to know how many amps that is so that we have the correct size battery for the aircraft. To find the maximum continuous current, multiply the C-rating by the current shown on the battery. On the example battery this would be:
25 x 1800mAh = 45000mAh or 45 amps. (45000mA x .001 = 45amps)

The second rating is the burst rating. This is the maximum current that can be drawn for a short amount of time (10-15 seconds) and not damage the battery. On the example battery this would be: 40 x 1800mAh = 72000mAh or 72 amps. (72000mA x .001 = 72 amps)

**More About LiPo Voltage**
Any battery drains under load, or in use. This means that the voltage that a battery can produce is reduced. A LiPo could start with 4.2 volts, then after a flight, drain to 3.6 volts. LiPo batteries have a voltage printed on the cover such as 3.7v, 7.4v, 11.1v, etc. This voltage indication is termed **Nominal Voltage**. The nominal voltage is defined as the midpoint voltage of its useful range. One LiPo battery cell has a nominal voltage of 3.7 volts. That's the value used to calculate multi-cell battery packs: a 2-cell pack = 7.4 volts; 3 cell pack = 11.1 volts, etc.

Another rating is the **Peak Voltage**: the maximum voltage to which a battery can charge. A fully charged 1 cell LiPo is about 4.2 volts. A fully charged 2 cell pack would read 8.4 volts, a 3-cell pack would produce 12.6 volts, and so on.

When in flight, many ESCs (electronic speed controls) are programmed to cut voltage to the motor at 3.0 volts. However, 3.0 volts per cell is the lowest that a LiPo battery should be discharged. Continually draining a LiPo pack to the 3.0 volts level will shorten its life span, could damage the pack, or could cause a fire. Any pack that is drained to below 3.0 volts per cell should be treated with caution since the cells may be damaged.

Under normal use, only approximately 75% of the capacity (milliamp-hours) should be drained from of a LiPo pack, leaving 25% of the milliamp-hours rating. For an 1800mAh pack, this means using a capacity of 1350mAh, and leaving 450mAh. Since milliamp-hours cannot be measured while flying, this can be measured during the charging process. Most good chargers will indicate on their readouts how many milliamp-hours are being put back in the pack during the charge process.

Why is this important to the pilot? This determines approximately how long an aircraft can be flown. For the 1800mAh example, putting in less than 1350mAh means that flight time can be extended. Putting in more than 1350mAh means that the flight time should be shortened.

**Charging and Balancing a LiPo Battery**
LiPo batteries require their own special type of charger. **DO NOT USE ANY OTHER TYPE OF CHARGER**. If a non-LiPo battery charger is used, this can cause the battery to overheat and possibly catch on fire.

If you buy an all-inclusive type of aircraft - a package with a battery and charger - read the battery charging directions carefully! Some come with generic chargers, so the charge current and cell count needs to set. As an example, your aircraft may come with a 3S, 1300mAh battery. The charger with it may have a dial setting that enables you to charge from 0.3 amps to 2.0 amps. To charge at the recommended 1C rate, dial in no more than 1.3 amps (1300mA). Also, there may be a cell count selection switch. Choose the correct cell number. In this case - select to charge a 3-cell battery.

More advanced chargers have electronics that determine everything for you so that all you have to do is plug in your battery and hit start. Even with this type of charger, it's a clever idea to check through their readouts to ensure that it is charging correctly. Check that the cell count, voltage, and charge rate are correct.

LiPo batteries need to be balanced. Balancing means that all the cells' voltages are equalized when being charged. When charged, each cell should read approximately 4.2 volts. On more advanced chargers, there is a voltage readout for each cell. A separate voltage tester may be used to check the LiPo as well. An extremely out-of-balance pack will cause damage to the cells and could cause a fire. Balancing is important because it prolongs the battery pack life and makes it safer.

LiPos don't develop a memory or voltage depression characteristics such as Ni-Cd batteries. These can be charged without the worry of cycling or discharging.

**Storage**

When not in use for a long time, LiPos should be stored with a **Storage Charge.** More advanced chargers will have a function that allows you to set the battery voltage at approximately 3.85 volts per cell. This will keep the pack stable for storage through the months of non-use. If a full battery is not used for a long time, the cells can discharge, although slowly, and an out-of-balance condition can occur. Do not let the cells drop below 2.5 volts or go completely dead as the battery can be damaged and possibly not come back to life. Charge the battery again before use.

**Disposal of LiPo Batteries**

There are several ways to safely dispose LiPo batteries when they are no longer useful. One way is to place the battery in a salt water solution for at least 2 weeks. The electrolytic chemical action will completely destroy the cells and render them inert. After the two-week period, simply rinse and dry the pack, wrap in newspaper, and dispose normally.

Another way to dispose a LiPo battery is to completely discharge it by connecting the pack to a 12-volt lamp, such as a 4 or 7-watt automobile tail light, until the cells register zero volts. As with using and charging LiPo packs, keep monitoring the pack during the discharge process. If it starts to get warm, disconnect it, wait until it cools, then reconnect it to the lamp.

Keep the pack connected to the lamp for a few days after reading zero volts, then solder the leads together. This will render the pack inert and it can be disposed normally.

**Safety**

Unfortunately, things can go wrong with LiPo batteries unexpectedly. They can swell, smoke, or catch fire. When treated well, most of the time there will be no problems. Being knocked around and dropped can cause internal damage that cannot be seen externally. If an electric short occurs, the battery can swell, smoke, then catch on fire. A safe practice is to use a **LiPo Safe Charging Bag**. When charging, the battery is placed in the bag then sealed with a Velcro strip. If swelling, smoke, or fire occurs, it will be contained safely in this bag. Use these bags at home and at the field. Never leave batteries that are being charged unattended – even when using a LiPo safe charging bag.

If the battery is damaged in a crash, do not put it in your car or house. It's possible that a chemical reaction could take place in the damaged battery that could cause a fire. Put it in a safe place for a least an hour.
It is now a **requirement** at the CSF airfield that LiPo Safe bags are used when charging batteries.

**Be safe for yourself and your fellow pilots!**

# Flight Check List

Every time that you are getting ready to fly, some checks need to be performed before take-off.

1. Check the Center-of-Gravity (CG) with the battery pack installed. Consult your aircraft's manual for the proper point of CG. If the CG is off substantially, the plane might be nose-heavy or tail-heavy making it difficult, if not impossible, to control in the air.
2. Balance the propeller. Special equipment is needed to balance the prop. It will need to be removed to perform the balance. Many times after a scrape on landing or take-off, the prop will need to be rebalanced. An out-of-balance prop sometimes can be heard while flying. A severely out of balance prop can cause damage to the motor or other electronics.
3. Check the control surfaces and all parts of the aircraft for proper alignment. After power-up, ensure that ailerons, flaps, rudder and elevator are in line with their respective surfaces. Ensure that the wing is properly attached and aligned. Wings that are attached by rubber bands need to be aligned to the center line of the plane.
4. Do a walk-around of your aircraft. Ensure that all parts are where they should be, all glued surfaces are together, hinges and control horns/arms are secure, and all other bolts, screws and nuts are tight.
5. Fully charge the radio (transmitter) battery. If your battery is low, there is the potential of your plane not receiving the radio's signal, therefore no control, and flying into oblivion.
6. Fully charge the aircraft's battery pack.
7. Perform a radio range check. Follow procedures found in the radio's manual. This check is done with reduced transmitter power at a relatively close range. When successful, you should be able to fly within the range stated in the manual.
8. For FM flying, ensure the radio antenna is fully extended. For 2.4 GHz spread spectrum operation, check your receiving antenna in the aircraft to ensure it is extended. If the receiver has two antenna leads, make sure the antennas are not tangled and installed according to the manufacturer's instructions.
9. After the radio is turned on and the battery pack has energized the aircraft, check that all control surfaces are operating in the correct direction. When you move the aileron stick to the left, the left aileron goes up and the right aileron goes down and vice versa; when you move the rudder stick to the left, the rudder moves left and vice versa; when you move the elevator stick backwards, the elevator moves upward and vice versa.

**To Recap:**

Check CG
Balance the Propeller
Check Control Surface Alignment
Perform Walk-Around – All Parts Tight
Charge Radio Battery
Charge Aircraft Battery Pack
Radio Range Check
Check Antennas
Ensure All Control Surfaces Move in the Correct Direction

# Cincinnati Silent Flyers
# Flying Field Rules of Conduct

1. All pilots must comply with the AMA Safety Code. This can be found in the AMA Membership Application.
2. Pilots must be a member in good standing of the CSF and/or the AMA to fly aircraft in association with the CSF.
3. No consumption of alcohol at the field during flying sessions.
4. No loud noises or boisterous behavior.
5. Treat visitors in the best and most courteous way possible.
6. For sanctioned contests, the Contest Director's instructions and rules override the printed rules.
7. Carry out everything that you carry in, and more. Leave no trash, bottles, cans or broken planes.
8. New members and guest pilots will be required to demonstrate flight proficiency.
9. Members without previous R/C flying experience must undergo flight training before flying unsupervised at the field.
10. A pilot about to make a maiden flight, or the first flight after repair, must inform the others on the flight line and in the pit area. This ensures that everyone is alert in the event of a problem.
11. All pilots will announce take offs, landings, and when on, or crossing the runway.
12. Pilots should stand on the flight line (paving blocks), away (west) from the runway.
13. Runway priority is:
    1. Dead stick or emergency landings
    2. Powered landings
    3. Take offs
14. All spectators must remain behind the spectator line at all times. All small children must be accompanied by and under the control of a supervising adult.
15. Your name and address or your AMA membership number must be displayed on your model.

# Frequency Control and Safety Rules

1. Use of the **Frequency Board for FM Transmitters** must be obeyed at all times.
2. **<u>All pilots are required to check for frequency conflicts before turning on an FM transmitter</u>**. DO NOT turn your transmitter on unless you have checked that no one else is on the same frequency.
3. NO motor testing in the pit area. Motor testing may be done on the south end of the pit area, with the aircraft pointed away from the pits.
4. NO battery should be connected in the pit area, unless the throttle or motor is
5. disabled.
6. Pilots must stand on designated spots on the flight line.
7. Pilots must announce all take offs and landings.
8. NEVER take off towards the flight line.
9. NEVER reach over a propeller while the motor is powered on. All aircraft adjustments shall be made from BEHIND the propeller if tractor-configuration, or in FRONT of the propeller if pusher-configuration.
10. Always keep your thumb on the throttle stick in the down position when transporting aircraft to and from the runway.
11. All powered flight should be EAST of the runway. Flying west of the runway may be permitted for sailplanes above 50 feet (tree top).

## Electric Ducted Fans (EDFs) and High RPM Pushers

1. The flying of EDFs and high rpm pusher props are limited to:
    - Thursday Evenings: 6 PM until 9 PM
    - Saturday Mornings: 9AM until 12 Noon
    - Sunday Mornings: 9AM until 12 Noon

.

2. All flying MUST be done EAST of the runway.
3. Pilots MUST avoid using full throttle beyond the south end of the runway.
4. When an activity is planned at Stonebridge on a specified day, flying EDFs for that day will be suspended.
5. Club members are responsible for policing themselves.
6. Failure to comply with these rules may result in suspension of flying privileges and/or expulsion from the CSF.

# Cincinnati Silent Flyers Training Manual Appendix

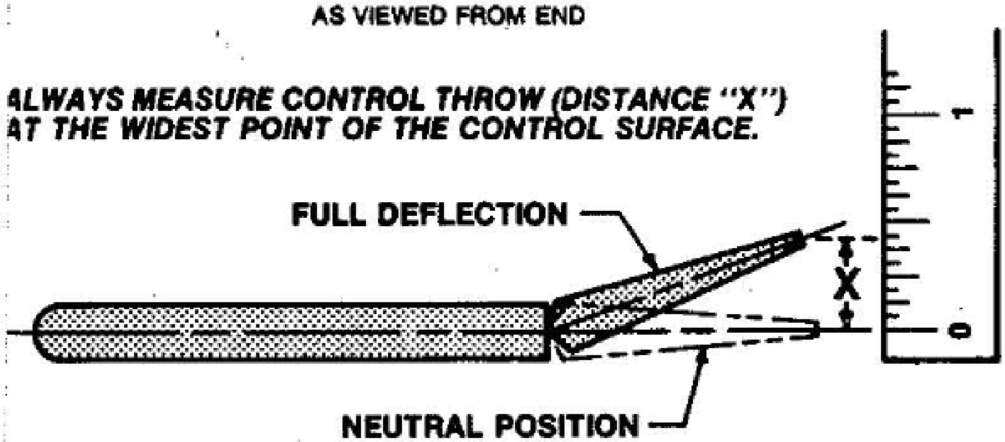
- Control Surface Changes
- Landing Pattern
- Basic Aerobatics
- Specific Field Restrictions
- Glossary
- Student Progress Sheet

# Control Surface Changes

## TYPICAL CONTROL SURFACE

AS VIEWED FROM END

***ALWAYS MEASURE CONTROL THROW (DISTANCE "X") AT THE WIDEST POINT OF THE CONTROL SURFACE.***




**TO INCREASE CONTROL THROW:**

MOVE R/C LINK "IN" ON CONTROL HORN (USE THE NEXT HOLE CLOSER TO THE CONTROL SURFACE).

*— OR —*

CONNECT PUSHROD FURTHER "OUT" ON SERVO OUTPUT ARM (NEXT HOLE FURTHER OUT FROM CENTER).

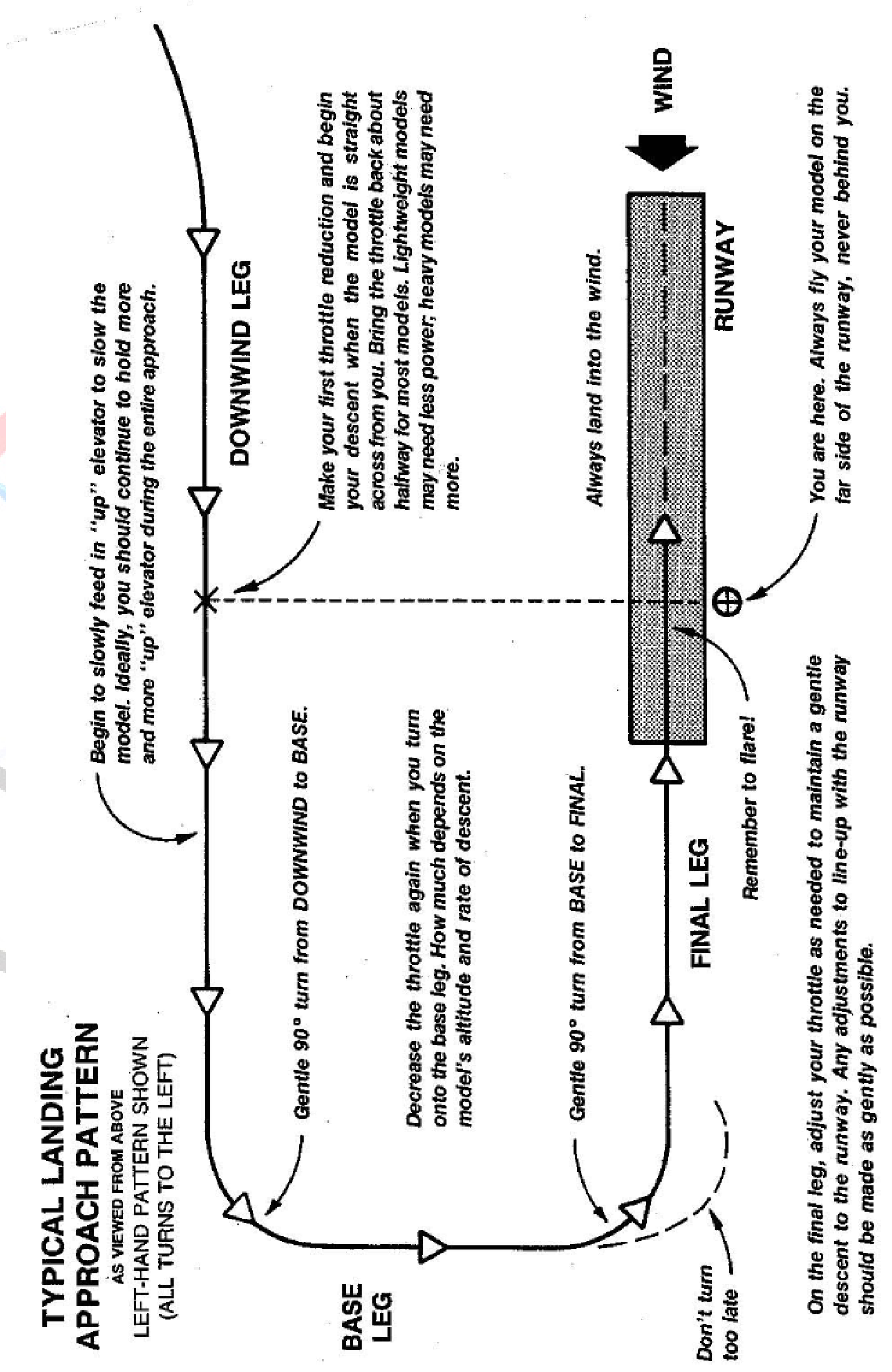
**TO DECREASE CONTROL THROW:**

MOVE R/C LINK "OUT" ON CONTROL HORN.

*— OR —*

CONNECT PUSHROD FURTHER "IN" ON SERVO OUTPUT ARM.

# Landing Pattern



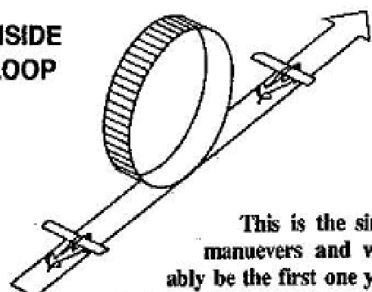
# Basic Aerobatics

## PRIMARY AEROBATICS

Every R/C pilot at one time or another gets the urge to see his model do something besides droning around the sky straight and level. If you are a brand new pilot, try to hold back those urges until you've become fairly confident in your ability to fly. That doesn't mean you can't learn to do a loop before you learn how to land, but you should at least be at the stage where you can do nice turns and make the model go where you want.

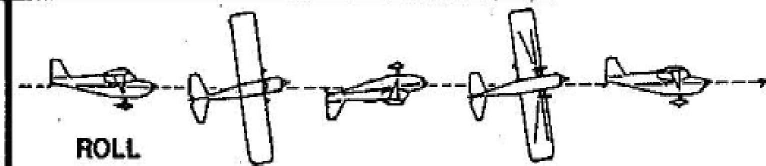
Of course, some models perform aerobatics better than others. Trainers are designed to be stable and forgiving, so don't expect them to be able to fly inverted well or perform snap rolls and spins. Three-channel trainers that use rudder control to turn generally have difficulty doing rolls, although almost any airplane will do nice inside loops. As your flying skills improve and you step up to more maneuverable airplanes, the stunts shown here will be fairly easy to perform.

### INSIDE LOOP



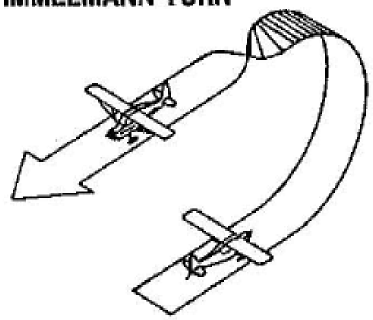
This is the simplest of manuevers and will probably be the first one you learn. Hold up elevator until the loop is complete. Slow-flying models may need to perform a shallow dive to build up some extra speed before pulling up into the loop. Be sure your wings are level before entering the loop or it may end up looking more like a corkscrew than a circle.

### ROLL



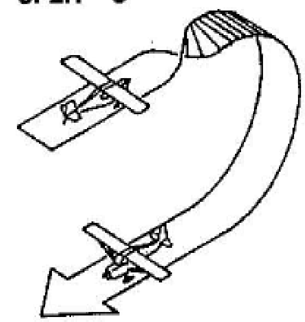
Hold full aileron in the direction of the roll until the model rotates all the way around back to level. Usually a model will lose a little bit of altitude during a roll and come out of it slightly nose down. Beginners may want to compensate for this by pulling the nose up slightly (about 10°) before starting the roll.

### IMMELMANN TURN



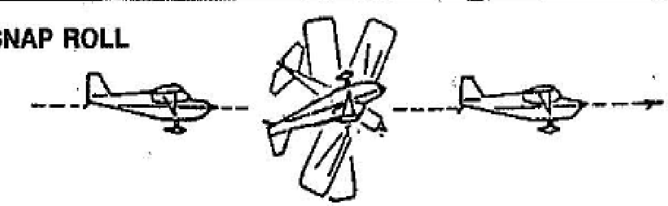
Once you can loop and roll, the Immelmann Turn will be easy. Do a half inside loop to inverted, then half roll back to level flight.

### SPLIT "S"



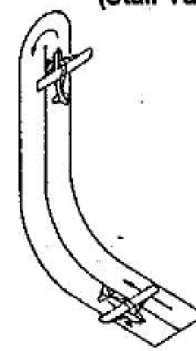
This is really an Immelmann Turn in reverse. Perform a half roll to inverted, followed by half of an inside loop, back to level flight.

### SNAP ROLL



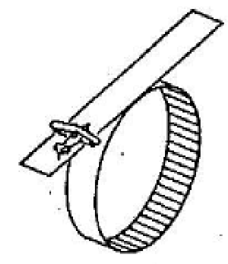
This is a pretty violent maneuver, but one of the most spectacular to watch. With the model flying level or slightly nose up, pull in full up elevator, plus full aileron and rudder (in the same direction) all at the same time. Release the controls to stop the snap roll.

### HAMMERHEAD (Stall Turn)



Pull the model straight up, and as it slows down, close the throttle and kick in full left or right rudder. The model should pivot around and fly back on the same path.

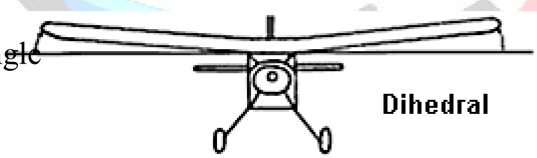
### OUTSIDE LOOP



Hold down elevator until the loop is complete, using ailerons as necessary to keep the wings level.

# Glossary

**Aerodynamics:** To fly, an airplane's wing has to overcome gravity by developing lift greater than the weight of the plane. Since it can't do that standing still, airplanes use thrust - force directed backwards - to drive the wing forward through the air to generate lift. However, thrust has its own opposition to overcome in the form of drag - the resistance of the air to a body moving through it. If lift and thrust are greater than gravity and drag, there is the potential for flight. This is an involved subject. For more information, use your web browser to search on "aerodynamics."
**Ailerons:** Hinged control surfaces located on the trailing edge of the wing, one on each side, which provide control of the airplane about the roll axis. For a right roll or turn, the right hand aileron is moved upward and the left hand aileron downward, and vice versa for a left roll or turn.
**Airfoil:** If you face the wing tip of the plane and cut it from front to back, the cross section exposed would be the wing's airfoil. The flat-bottom airfoil will develop the most lift at low speeds and helps return the model to upright when tilted. This is ideal for training planes and first-time pilots. A symmetrical airfoil's top and bottom have the same shape, allowing it to produce lift equally whether right side up or upside down and to transition between the two smoothly. This is recommended for advanced pilots. Finally, a semi-symmetrical airfoil is a combination of the other two and favored by intermediate and sport pilots.
**CG - Center of Gravity:** For modeling purposes, this is usually considered the point at which the airplane balances fore to aft. This point is critical in regards to how the airplane reacts in the air. A tail-heavy plane will be very snappy but generally very unstable and susceptible to more frequent stalls. If the airplane is nose heavy, it will tend to track better and be less sensitive to control inputs but will generally drop its nose when the throttle is reduced to idle. This makes the plane more difficult to land since it takes more effort to hold the nose up. A nose heavy airplane will have to come in faster to land safely.
**Dihedral:** Dihedral angle is the upward angle of the bottom of the wings to the fuselage. More of a dihedral angle (up to a point) increases stability, but decreases aerobatic stability.




**Elevator:** Hinged control surface located at the trailing edge of the horizontal stabilizer, which provides control of the airplane about the pitch axis and causes the airplane to climb or dive. The correct direction of control is to pull the transmitter elevator control stick back, toward the bottom of the transmitter, to move the elevator upward, which causes the airplane to climb, and vice versa to dive.
**Flaps:** Hinged control surface located at the trailing edge of the wing, inboard of the ailerons. The flaps are lowered to produce more aerodynamic lift from the wing, allowing a slower takeoff and landing speed. Flaps are often found on scale models, but usually not on basic training planes.
**Flutter:** A phenomenon whereby the elevator or aileron control surface begins to oscillate violently in flight. This can sometimes cause the surface to break away from the aircraft and cause a crash. There are many reasons for this, but the most common are excessive hinge gap or excessive play in the pushrod connections and control horns. If you ever hear a low-pitched buzzing sound, reduce throttle and land immediately.

**Fuselage:** The body of an airplane.
**Horizontal Stabilizer:** This is the horizontal tail surface at the back of the fuselage which provides aerodynamic pitch stability to the airplane.

**Landing Gear Types:** Tricycle gear is one type that includes a nose gear and two wing (main) gears, making takeoffs and landings easier - ideal for beginners. Another type is termed a tail-dragger. This type includes the two wing gears and a wheel at the rear, usually under the rudder. With this kind of arrangement, it is more difficult to take-off.
**Pitch:** The pitch axis is perpendicular to the fuselage and is parallel to the body of the wings with its origin at the center of gravity. A pitch motion is an up or down movement of the nose of the aircraft.
**Roll:** The roll axis passes through the fuselage, front to back, with its origin at the center of gravity. A rolling motion is an up and down movement of the wing tips of the aircraft.
**Rudder:** Hinged control surface located at the trailing edge of the vertical stabilizer, which provides control of the airplane about the yaw axis and causes the airplane to yaw left or right. Left rudder movement causes the airplane to yaw left, and right rudder movement causes it to yaw right.
**Vertical Fin:** This is the non-moving surface that is perpendicular to the horizontal stabilizer that provides yaw stability. This is the surface to which the rudder attaches.
**Wing:** The main lifting surface of an airplane.
**Wing Area/Wing Loading:** Wing area is the amount of wing surface available to create lift. Wing loading is the weight that a given area of the wing must lift and is usually measured in ounces per square foot. Generally, a light wing loading is best for beginners. The plane will perform better and be easier to control.
**Wing Location:** Wing placement, for the most part, falls into two major categories: high-wing design and low-wing design. In a high-wing design, the weight of the model is suspended below the wing. When the model tilts, the model's weight tries to return it to a level position. As a result, high-wing models tend to be more stable, easier to fly and are good choices for a training plane. A low-wing model is just the opposite. With its weight above the wing, it tends to be less stable - excellent for advanced fliers who want to perform rolls, loops and another aerobatic maneuver.
**Wing Thickness:** Wing thickness, measuredfrom top to bottom, determines how much drag is created. A thick wing creates more drag, causing slower speeds and gentler stalls, and is ideal for beginners. A thin wing permits higher speeds and sudden stalls, desirable for racing and certain aerobatic maneuvers.
**Yaw:** The yaw axis is defined to be perpendicular to the fuselage with its origin at the center of gravity. A yaw motion is a movement of the nose of the aircraft from side to side.

# Student Progress Sheet

| | |
|---|---|
| NAME: | |
| AMA#: | |

| | Grade | Date/ Instructor Initials | Grade | Date/ Instructor Initials | Grade | Date/ Instructor Initials | Grade | Date/ Instructor Initials | Grade | Date/ Instructor Initials | Grade | Date / Instructor s | Grade | Date/ Instructor Initials |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oval Pattern – Clockwise (maintain altitude and pattern) | | | | | | | | | | | | | | |
| Oval Pattern – Counter Clockwise (maintain altitude and pattern) | | | | | | | | | | | | | | |
| Stalls & Recovery (enter stall and recover to normal flight) | | | | | | | | | | | | | | |
| Take Off – (climb out and enter counter clockwise pattern) | | | | | | | | | | | | | | |
| Landing (downwind leg, base leg, upwind leg) | | | | | | | | | | | | | | |
| Dead Stick (power OFF, establish glide slope and approach) | | | | | | | | | | | | | | |
| Out of Trim Flight (elevator, rudder and ailerons) | | | | | | | | | | | | | | |

- **It is paramount that at all times the safety of the flight line and pit area is first!**
- **Flying beyond the western edge of runway below tree-top level will be considered "out of control".**
- Always stay in the designated fly zone and alert bystanders if an issue develops during the flight.
- When using an FM frequency transmitter, verify your channel is not in use **before** turning on the radio (Not applicable for 2.4GHZ systems).
- Clearly call out each takeoff, landing, and emergency.