

Flight Training Manual

Introduction

Our thanks to the Omaha Hawks RC club for their efforts in producing a flight training manual from which we based our training system. Our flight training program attempts to provide an opportunity for each new comer to participate in a well structured R/C flying school that can effectively teach how to take off and land safely. This is a program that insures a safe flying environment.

Our Instructors realize that all student pilots are not cut from the same cloth. Most have had no previous flying or building experience and have no idea of the challenges ahead. It is only natural that there are some who arrive in a nervous and somewhat intimidated frame of mind. Therefore, the instructor's initial challenge is to calm his student's fears and attempt to leave him a pleasant memory of his first R/C flying experience. **A gentle approach, a properly trimmed aircraft, a reduced throttle setting and an altitude of 300 feet or more for those first flights will work wonders.**

Remember that all aircraft operating out of the Field must, without exception, remain within the boundaries of the approved airspace at all times. Once the fire is burning and the student is reasonably capable of following his teacher's instructions, the operating altitude should be lowered to a **"one error" height of about 100 to 150 feet.** Throughout the program, Instructors will emphasize the importance of concentration and following the program syllabus.

An instructor's primary responsibility must always be to maintain a safe environment for his students, other flyers and the spectators present at the Field. Secondly he will offer his students an opportunity to learn to fly and to realize what fun this hobby can really be, especially if they become builders as well as solo fliers.

A student must accept the fact that his instructor is just another R/C enthusiast who has learned to fly reasonably well and, although unpaid, is willing to go out of his way to assist newcomers to R/C. He offers no guarantees and may not be the best teacher in the world. But, he does save a LOT of airplanes. The odds are, if the student flies at least twice a week, he will solo within a reasonable amount of time and experience no major accidents. A student should also bear in mind that an instructor is not his personal mechanic or employee. His instructor is a friend who expects his students to fly on a regular schedule.

Remember, we all go out to the flying field to have a good time and the very best of those times come when we are flying comfortably all by ourselves.

The student logbook enables instructors to see what maneuvers the student has successfully completed and what items need more attention and practice. The goal is allow the student to progress at his own pace and be able to successfully take off, enjoy flight, and land without damaging his aircraft. By using more than one instructor, the student will learn additional techniques. The student logbook provides a quick reference for the instructors to provide additional training.

Program Syllabus

Lesson I

- (A) Aircraft pre-flight inspection
- (B) Introduction to flight

Lesson II

- (A) Straight & Level Flight, Left & Right Turns (Altitude of 300' or more)
- (B) Giant Circles - Left & Right (Altitude of 300' or more)

Lesson III

- (A) Oval Pattern - Left & Right
(This and all instructions which follow should be offered at 200' or less, unless noted.)
- (B) Three Point Fly-over

Lesson IV

- (A) Rectangular Pattern - Left & Right / with Throttle
- (B) Three Point Fly-over Figure Eight Pattern
- (C) Traffic Pattern & Approach

Lesson V

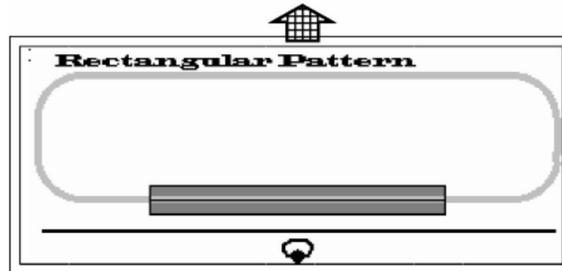
- (A) Slow Flight (at safe altitude)
- (B) Orientation Maneuvers (at safe altitude)
Loop, Climbing Roll, Stall Turn, Spin/Spiral Dive
- (C) Taxi & Take off

Lesson VI

- (A) Trim Adjustments
- (C) Normal Landings
- (B) Forced Landings

Flying Field Safety

At all flying fields there are safety rules that must be followed. The Academy of Model Aeronautics (AMA) safety rules are the minimum that should be followed. Please review and be familiar with them. In order to complete this training you will have to fly patterns that could conflict with the normal flight pattern.



The normal flight pattern is an oval shape that the upwind direction is over the landing field and the downwind is furthest from the flight line. If more than one plane is in the air the oval flight pattern must be flown. When it is required to practice the left and right turns, these can be done in a part of the sky that doesn't conflict with the normal flight pattern or when there is only one plane flying.

Teaching Guide

Lesson I

Pre-flight inspection

All student aircraft must be thoroughly inspected prior to the initial test flight by an Instructor or other qualified R/C pilot and any deficiencies corrected. An additional formal inspection will be required after any major modification or repair of the aircraft or at the request of the student. While examining the aircraft the instructor should discuss the reason for each portion of the inspection and the remedy for any deficiencies found. The importance of an ongoing inspection and maintenance program should be emphasized.

Prior to each flight the instructor should call the students attention to the items he is checking before take off, such as carburetor setting, transmitter antenna extension, trim lever settings and control movements.

Introduction to flight

Before a student's first serious flying lesson, a qualified instructor should sit down with him (transmitter in hand) and discuss what "Left", "Right", "Up" & "A Little" means, plus the mechanical process of "The Turn". Let's all agree that "Left" always refers to both the student's left and the left side of the aircraft. Similarly a "Right" command always requires that the student move the control stick to his Right. An "Up" command asks the student to pull the elevator control stick back (toward the bottom of the transmitter). "A little Left, Right, or Up" does not refer to a small increment of stick movement, it means a small amount of left or right roll or up pitch to the aircraft. This can be most readily accomplished by a decisive stick movement but for only a small increment of time.

Smooth aileron turns of various Radii, at a constant altitude and over a pre-determined ground path can be accomplished only with a considerable amount of practice. A student needs a simple 1,2,3 starting point. Here it is:

- (1) Lower the wing tip in the direction of the turn about 25°. Allow the stick to return to neutral.
- (2) Maintain altitude with the application of small amounts of up elevator, as required.

(3) To complete the turn, allow the elevator to return to neutral, level the wing with a brief decisive stick movement in the opposite direction and allow the stick to return to neutral. "Smooth" will come with practice.

Lesson II

The first order of business of any flying session is to check the trim of the aircraft, making certain that straight and level flight is maintained (hands off) at the reduced throttle setting required of that particular training flight. The amount of maximum control surface movement should always be set to fit the student's comfort level with dual rates deactivated.

Straight & Level Flight - Left & Right Turns

The student's initial flight experience should be enjoyed at a comfortable altitude, restricted only by satisfactory visibility. It is essential that during any and all training sessions equal numbers of **left and right** turns be included. Attempt 90° turns first and concentrate on maintaining a constant altitude. Then start to work on controlling the headings and finally attempt to vary the size (radius) of the turns which will be even more demanding. Bank angles of 30° to 45° should not be exceeded. Please refer to the **Flying Field Safety** section when performing these maneuvers.

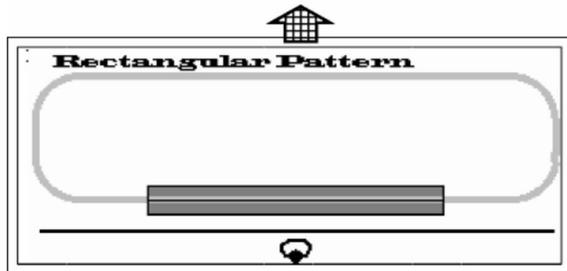
Giant Circles - Left & Right

This is an exercise to prove that there is no way that one can learn to fly mechanically from a book. It is also an introduction to the "Three Point Fly-Over" found in Level III. Flying large 360° turns is not easy. Correcting for drift is even more difficult. It requires the Pilot to constantly add incremental control inputs (in all directions) in order to follow the round path which he wishes to follow. Remember that Level 2 is only the first step in the flying program and **Perfection is not required or expected.**

Lesson III

Both lesson III and IV should be flown at a “One Screw Up & Save” height. If one is to successfully set an airplane down where he wants to, he must be **capable of following a predetermined ground path**.

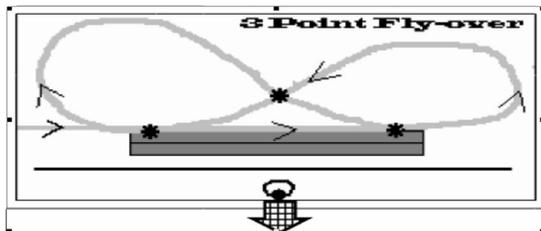
Oval Pattern - Left & Right



The student will attempt to trace a ground path which runs down the center line of the runway. At about 100' beyond the end of the runway the path should turn slowly 180° (away from the pit area) and then run in the opposite direction (parallel to the runway).

A second 180° turn is initiated at a point such that when completed it will be tangent to the runway center line, at a point beyond the end of the runway. If headings are missed or the aircraft drifts, attempt corrections immediately. The airplane should never fly the pilot.

Three Point Fly-Over

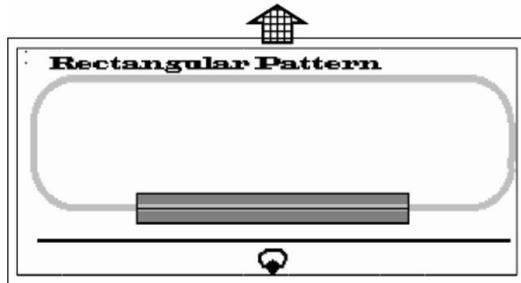


This is the **single most demanding and beneficial exercise in the entire program**, requiring constant control inputs and changing with every variation in wind direction or velocity. Three ground points form a triangle. The base of the triangle lies on the opposite edge of the runway directly in front of the pilot and is centered on him. The apex of the isosceles triangle is the third point and is located directly in front of the pilot. It marks the center intersection of a figure eight flight path whose two lobes just touch the far side of the runway at the first two points of our triangle. The positioning of the triangle is fixed. However, the size should be set to accommodate the student. Extremely sharp turns should not be required and (for this exercise) the shape of the eight is immaterial. **The goal is only to pass over the three points.** Please refer to the **Flying Field Safety** section when performing these maneuvers.

If other pilots are using the traffic pattern, the student should not attempt the 3 point fly-over pattern. Instead, practice the Oval Pattern (Lesson III) or Traffic Pattern & Approach (Lesson IV) or practice simple figure eight turns in a remote part of the sky. The 3 point fly-over should only be practiced when the flight line is free of other flyers.

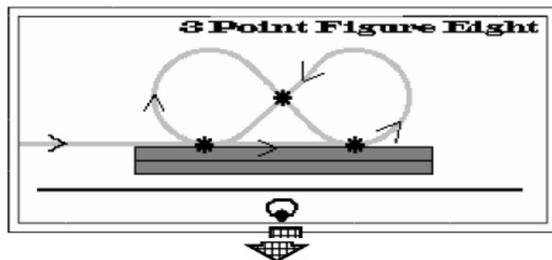
Lesson IV

Rectangular Pattern - Left & Right with Throttle



This segment is a refinement of the "Oval Pattern" - substituting two 90° turns for each 180° turnaround, the introduction of throttle control and (at the instructor's discretion) rudder control. It introduces the left stick and initiates the use of both hands in the process of controlling the aircraft. As he flies the pattern, the student will reduce or increase power as requested by his instructor. Since rudder function is not absolutely necessary to fly an aileron equipped model aircraft, its introduction is left to the discretion of the instructor or the student. **From this point on the student will be expected to maintain Physical contact with both control sticks when he is in control of the aircraft**

Three Point Fly-Over / Figure Eight



Passing over the "points" is essential. Flying perfect figure eights, under all wind conditions at the same time will require a lot of future practice. Once the student has proven that he can nail the "points", he's reached his immediate goal and can move on to level V. Please refer to the **Flying Field Safety** section when performing these maneuvers.

Again, if other pilots are using the traffic pattern, the student should not attempt the 3 point fly-over pattern or 3 point figure eight. These maneuvers should only be practiced when the flight line is free of other flyers.

Taxi & Take-Off

Any problem on the take-off must be resolved in a split second. There is no time to ponder a solution. An instructor (even with a buddy box) offers no guarantee. Therefore the student should have emergency responses firmly planned in advance. Here are a few suggestions. (1) The escape route must be indelibly engraved in the mind of the pilot. Taking off to the right? Turn Left ! Taking off to the left? Turn Right ! (2) Assuming a take-off to the right, start the procedure from a stationary position on the center line of the runway. Advance the throttle slowly. When the aircraft is holding the proper heading, decisively advance the throttle to full power. (3) From this point on only one directional correction should be attempted. If any problem is encountered before lift-off, chop the throttle and turn left. After lift-off, if there is any type of emergency other than engine failure, turn left and fly away. If the take-off is successful, fly down the entire length of the runway and climb out at 10° to 15°. A take-off to the left is simply reversed. It is not necessary to tie up a club field for taxi practice. After a student's first successful "take-off", he should be capable of practicing taxiing by himself in any suitable area with the aircraft's wing removed.

Lesson V

Slow Flight

The purpose of this exercise is to demonstrate that "Slow" is not "Safe". An aircraft in "slow flight" is operating at the lowest possible airspeed without losing altitude and is on the very edge of the beginning of the stall. Controls are normally very soft and ineffective and the slightest turn requires immediate additional power to avoid a complete stall. At a safe altitude, the student should attempt to fly both straight and circular flight paths in a "slow flight" mode. As he reduces the throttle setting and slowly comes back on the control stick (in order to maintain altitude), he will discover that a delicate balance between throttle and elevator is required to maintain true slow flight. He will also find that coordinating the rudder with the ailerons of considerable benefit in the turns. Flown properly, the aircraft (with the stick full back) will experience partial stalls in straight and level flight and probably a full stall from a turn that is too tight or too slow. There is no need to fear the stall at safe altitudes. The pilot needs only to return the stick to neutral, allow the nose to drop, add a little power, regain flying speed, level off and climb back up to altitude to try again.

Orientation Maneuvers (Optional)

There will be plenty of time in the future for the student to practice and learn various aerobatic maneuvers. The sole purpose of this segment is to offer the student an opportunity to become disoriented and practice recovery procedures. Since there is a certain amount of unnecessary risk involved, both instructor and student have the option of excluding this segment from their training.

Traffic Pattern & Approach

The ground path is similar to the rectangular pattern introduced in Level IV with the exception of perhaps a longer approach. The maximum altitude should be about 150'. Power is reduced during the cross-wind leg or the final approach, at the discretion of the student or instructor and the aircraft allowed to descend to approximately 50'. Full power should then be applied and the aircraft returned to its original altitude along the flight path. The aircraft should always pass over the entire length of the runway. Remember, "No Slow Flight". The aircraft should be trimmed so that (at idle and with no control input) a reasonable rate of descent and safe airspeed is maintained. Optionally, the instructor may teach the "military" 360° overhead traffic pattern, allowing a 180° base turn from the inside downwind position

Lesson VI

It is recommended that a concentrated effort be made to complete this program within 10 days of the time that Lesson VI is introduced. The student should make arrangements with an instructor (or instructors) for additional flying time as required

Trim adjustments

This segment of the program should be flown at a safe altitude and if a trainer system is not being employed, great care should be exercised. The purpose is to allow the student an opportunity to experience operating an aircraft which is out of trim and resolve the problem. The student will first be required to make minor trim adjustments about both single and double axes. After which major trim problems will be introduced by the instructor and corrected.

The Landings

If the instructors have been doing their job and student has been doing his, this last step to graduation should be a piece of cake. As the "take-off", the first landings (to be safe) require a little preplanning. Planned escape routes are most important and are identical to those used for take-off emergencies. If anything unforeseen occurs during the final approach or landing, one simply initiates an "escape turn" and either flies or taxis away to the opposite side of the runway. Remember, as long as the airplane is under power, only a good approach is acceptable. The best time to practice landings from bad approaches is after a power failure has occurred.

The first landing or two will probably be under the verbal control of the instructor. The landing pattern and approach will be identical to those already accomplished, except about 50' lower. When the instructor feels that the threshold of a safe landing has been reached, rather than advising the student to add power and go around, he will quietly suggest that the student start the flair and hold the heading down the runway until the aircraft rolls to a complete stop. Only then is the flight complete.

Forced Landing Procedures

Engine failure on take-off and at altitude will be replicated and landing approaches attempted. Before the flying session begins, the instructor should be prepared to discuss wind velocity, drift, penetration and flying speed as they relate to recovery from sudden power loss. Special emphasis should be placed on engine failure procedures during climb-out.

These exercises should be initiated at a minimum altitude of 200' (including engine loss on take off) and be terminated at the instructor's discretion.