Charlotte Aeromodelers, Inc.

#710

Flight Instruction Guide

January 1, 2007

Contents

Charlotte Aeromodelers, Inc

FLIGHT INSTRUCTOR and STUDENT PROGRAM

Knowing ones own limitations and abilities is the first step in becoming an instructor in any endeavor, becoming a Radio Control Instructor is no different. The Charlotte Aeromodelers RC Club is dedicated to making the introduction to Radio Control Flying as smooth and pleasurable as possible. Becoming an instructor must be done with a true willingness to help out a fellow modeler and not just to fly someone's airplane. This is a significant responsibility and can require extended time and patience. The following levels of instructor involvement are available to Charlotte Aeromodelers club members.

Instructor Levels and Responsibilities

- **Chief Instructor**: Designated by the Charlotte Aeromodelers president. Responsibilities include:
    - Maintaining the Charlotte Aeromodelers instructor program
    - Training Charlotte Aeromodelers instructors
    - Supervising all instruction at the CAM airfield

- **Deputy Chief Instructor**: Designated by the Charlotte Aeromodelers president to act in the place of the Chief instructor when required.

- **Instructors**: Designated by the Charlotte Aeromodelers president and trained by the Chief instructor or Deputy Chief Instructor. Responsibility is to train new club members.

- **Introductory Pilot Instructor:** Designated by the Charlotte Aeromodelers president and trained by the Chief Instructor or Deputy Chief Instructor to teach prospective club members through the AMA "Introductory Pilot Program".

- **Solo Check Pilot:** Club member designated by the Club President and Chief/Asst. Chief Instructor to administer the "Solo Flight Competency Test" to new or prospective Club members. While not a designated Club Instructor, this person must be familiar with the Club manual and Club Instructor program. The "Solo Check Pilot" is not an instructor and should only step in when there is a safety issue.

Instructor Pilot Requirements

Anyone desiring to become a Charlotte Aeromodelers instructor must follow the following procedures:

1. All Charlotte Aeromodelers Instructors must be read and be thoroughly familiar with the following material:

- AMA National Model Aircraft Safety Code
- CAM Handbook
- CAM Flight Instruction Program
- CAM A/C Preflight Safety Inspection, Appendix A
- CAM Glossary of Terms, Appendix B
- CAM Solo Flight Competency Test, Appendix C
- CAM Instructor Pilot Proficiency Check, Appendix D
- CAM Basic Flight Patterns Appendix E
- "One Week to Solo" by David Scott. Available in hard copy or free online at: WWW.rcflightschool.com
- "Teaching R/C Model Airplane Flying" by Mike Lynch.
- Additional recommended material:
  - "Beginner's Guide to R/C flight" by Howard Sullivan. Available free online.
  - "Getting Airborne, Vol. I and II" by Harry Higley

2. After performing the required reading make your desire to become an Charlotte Aeromodelers instructor known to the club president and/or Chief / Deputy Chief Instructor Pilot.

3. Arrange for instruction and check out with the CAM Chief Instructor or Deputy Chief Instructor, Appendix D. This instruction and check out may take some extended time. Both academic and flight instruction procedures will be verified. The prospective Instructor Pilot is expected to provide a training aircraft, radios, field box, and "buddy system" for the check out, the club will not provide these items.

CAM instructors must show proficiency in all the Student Requirements listed in this instruction. This proficiency will be verified by the Chief or Deputy Chief Instructor. There is no time limit to this verification.

While not mandatory, prospective Instructors should also show abilities in the use of "Buddy Boxes" and their set up. Charlotte Aeromodelers instructors must maintain their own proficiency; the instructor may end up being a test pilot for new members' airplanes. The instructor will make every attempt to preserve the integrity of a student's airplane but will not be liable should mishap occur as long as the instructor is abiding by the Charlotte Aeromodelers instructor program. *The destruction of a students' aircraft due to instructor non proficiency, hazardous or reckless flying is not acceptable and the instructor will arrange for the repair or replacement of the aircraft*. If the instructor has not flown in a while it is recommended that the instructor fly his own A/C until he is again comfortable and can perform all the student required solo maneuvers to proficiency prior to attempting to instruct the new member.

Non-Charlotte Aeromodelers Certified Instruction

In the same venue that one is able to teach their own spouse or children how to drive, there will be occasions where Charlotte Aeromodelers members will teach someone how to fly. The member and the person he is teaching must be aware that they are not within the flight

instruction guidelines. However, this instruction should follow the Charlotte Aeromodelers instruction procedures. *Both individuals must realize that the "student" must receive a "Solo Flight Competency Test" from a club Certified Instructor before they may fly unsupervised at the Charlotte Aeromodelers airfield.* If this instruction takes place at the club airfield, then the "Student" must be an AMA and Charlotte Aeromodelers member.

Student Requirements for Instruction

- Students must show proof of AMA and club membership
- Student must provide all field support equipment at the airfield, fuel, starter battery, etc., and everything fully charged the night before arriving

Ground School Instruction

The following must be completed prior to the student being recommended for a solo check recommendation:

_____ Basic Aerodynamics/terminology
_____ AMA Safety Rules
_____ Club Rules
_____ Transmitter Impound and Frequency Board Use
_____ Transmitter Control Explanation
_____ Battery check and Maintenance Procedures
_____ Aircraft Pre-Flight Inspection
_____ Center of Gravity Check
_____ Range of Checking of Aircraft
_____ The Relative Wind
_____ Pit Area Safety and Etiquette
_____ Propeller Safety
_____ Engine Stating Procedures
_____ Engine Carburetor Settings and Run-Up Procedures
_____ Pre-Flight Aircraft Controls Direction Check
_____ Trimming the Aircraft
_____ Field Communications. (Man on Field, field clear, taking off, landing, etc.)
_____ Use of a spotter for safety purposes. Protect that pilot; he cannot be looking out for himself when he is flying his plane. REMEMBER that models can be dangerous.

Flight Instruction

_____ Instructor demonstrates take off, landing, and trimming of the aircraft

Student Flight Drills

_____ Large circles and maintaining altitude
_____ Figure eight and understanding engine torque
_____ Maneuvers on command
_____ Left and right turns away from the student

_____ Left and right turns towards the student

_____ Throttle work

_____ Flying various maneuvers at different throttle settings

_____ Changing throttle settings on command

_____ Slow flight

_____ Landing drills with gradually reducing altitudes

_____ Approaches from left

_____ Approaches from right

_____ Emergency landing procedures (simulated engine-out landing)

_____ Landing traffic pattern

_____ Crosswind entry

_____ Downwind

_____ Base leg

_____ Final

_____ Crosswind landing

_____ Landing

_____ Take off drills

_____ Tricycle gear

_____ Tail dragger

_____ SOLO per Solo Checklist

_____ Basic aerobatics

_____ Stalls

_____ Loops

_____ Aileron rolls

_____ Split "S"

_____ Immelmann

_____ Spins & spin recovery

REMINDERS

- **ALWAYS** do a pre-flight check before flight. Fix it **BEFORE** you fly it!
- If you cannot verify the required CG of the airplane- do not fly the A/C.
- If you cannot verify the required control throws of the airplane-do not fly the A/C.
- If the engine is not operating properly, do not fly the A/C.
- Do not let it get too far away or you cannot see what it is doing.
- If you lose sight of the model because it is too far away to see clearly, start making left turns until you can tell what it is doing and then make appropriate control moves to bring it back.
- Keep it out of the sun.
- **DO NOT** fly over the pits or spectators! **FLY SAFELY!!**
- Take care of the batteries; make sure they are fully charged before flight.
- Maintain airspeed or you lose control authority.
- Be considerate of fellow modelers. Our club is as good an organization as you help make it. **FLY FRIENDLY!!**
- Do not ignore the wind direction. Fly traffic pattern with other pilots, dependent on the wind

Appendix A

Preflight and Safety Inspection

The Preflight and Safety Inspection is a necessary final inspection of the model aircraft before flight to assure the best possible chances for success.

Wing Check

1. Aileron servo shock mounted and secure
2. Aileron linkages and devices secured and clamped close with a piece of fuel tubing or equivalent
3. Aileron hinges secure, pull test
4. Wing dowels not loose or cracked
5. Check for wing warps
6. Aileron servo plugged into correct receiver channel
7. Wing hold down screws tight or rubber bands in good condition
8. If required, proper number of rubber bands installed and correctly positioned. (Approximately 2x the engine displacement, i.e., 40 size = 8; 60 size = 12)
9. Center of Gravity within limits

Fuselage and Engine Check

1. All engine and motor mount screws tight
2. Muffler securely mounted
3. Propeller in good condition, tips not nicked, blades not cracked
4. Spinner, safety nut or prop nut securely tightened
5. Fuel tank hoses not punctured or pinched and Klunk moves freely
6. Fuel tank compartment fuel proofed, recommended
7. Servos shock mounted and securely fastened
8. Pushrods and control surfaces move freely, no binding (proper strength, material and design). Also, clevises closed and secured with a piece of fuel tubing or equivalent.
9. Servo plugs clean and plugged into correct receiver channel
10. Switch assembly properly secured
11. Batteries recently fully charged
12. Receiver antenna fully extended, not broken and of correct length
13. Control surface hinges secured, pull test
14. Wheel collars tight and wheels rotate freely
15. Receiver and battery packed in foam and securely held in place

Radio Check

1. AMA card in frequency board (synthesized radios set frequency after acquiring frequency pin)
2. Transmitter batteries recently charged
3. Control surfaces move in proper direction; correct model designation in transmitter)
4. Range check performed in accordance with manufactures directions
5. Pilot identification in/on the A/C as per AMA requirements

Appendix B

Glossary of Terms

- **Aileron:** the hinged movable surface on the trailing (back) edge of the wing which controls movement around the "roll" axis of the aircraft.
- **Airfoil:** the shape of the top and bottom wing surface when viewed as cross sections cut from leading edge to trailing edge.
- **Anhedral:** opposite of dihedral. Sometimes called negative dihedral.
- **Angle of Attack:** regardless of aircraft attitude, the angle between the chord line and the instantaneous relative wind.
- **Angle of Incidence:** angle between the chord of the wing/horizontal stabilizer and the fuselage "zero" datum/reference line.
- **Base Leg:** the turn from downwind to intercept the extension of the runway heading for landing (final).
- **Center of Gravity/ CG:** location fore and aft along the fuselage/wing cord datum at which point the aircraft will balance.
- **Chord :** straight line distance from the most forward point of the leading edge of a wing section to the trailing edge of that same section.
- **Control Surface:** the moveable part of the aircraft that controls its operation; Rudder, Elevator and ailerons.
- **Crosswind:** wind not parallel to the flight direction. The turn from upwind to downwind in traffic pattern.
- **Dead Stick:** flight without power in an engine powered aircraft. Usually caused by engine failure or running out of gas.
- **Dihedral:** the upward angle in the wing when looking at it from front or rear, "V" shape of the wing. The more dihedral, the more roll stable and self correcting.
- **Downwind:** with the wind, with the direction the wind is blowing. Tailwind
- **Elevator:** moveable control surface on the trailing (back) edge of the horizontal stabilizer which controls movement around the "pitch" axis of the aircraft.
- **Fin:** the vertical stabilizer or fixed part of the tail section that helps keep the aircraft going straight ahead.
- **Final:** lined up with the runway heading for landing.
- **Firewall:** the part that separates the engine compartment from the fuel tank section of the aircraft. The engine mounts to the firewall.
- **Flare:** to ease back on the elevator control in order to raise the nose of the aircraft and reduce the descent rate just prior to touchdown.
- **Flat bottom Airfoil.** airfoil design where the lower surface of the airfoil is flat. Produces lift at negative angles of attack. Stable and forgiving. Excellent for trainers.
- **Go Around :** *See Wave Off*
- **Headwind:** See *upwind*
- **High Wing:** wing position is on Top of the fuselage. Most stable position. Excellent for trainers.
- **Horizontal Stabilizer :** stationary part of the elevator/

- **Left & Right:** pertaining to the left or right of the student and left or right of the aircraft (if one was sitting in the pilot seat).
- **Left Hand Traffic Pattern:** opposite of the right hand traffic pattern. All turns are to the left.
- **Low Wing:** wing position on the bottom of the fuselage, least stable position.
- **Mid Wing:** wing position where the wing is mounted in the middle of the fuselage. Neutral stability, seen on many aerobatic aircraft.
- **Nose Heavy:** an out of trim condition where there is excessive weight in the nose of the aircraft.
- **P-Factor:** (Simply said) the unequal thrust or torque of the propeller. During power on, climbing the right side of the propeller produces more thrust.
- **Relative Wind:** direction of airflow over the wing.
- **Right Hand Traffic Pattern:** aircraft takes off and lands from the right side of the airfield toward the left side of the airfield. All turns are to the right.
- **Rudder:** moveable surface on the trailing edge (back) of the vertical stabilizer which controls the "Yaw" of the aircraft.
- **Semi-Symmetrical Airfoil:** Airfoil Design where the curvature on the top of the airfoil is more dramatic than the lower side. Good intermediate airfoil. Seen quite often on military aircraft.
- **Symmetrical Airfoil.** airfoil design where the top and bottom surface of the airfoil has the same shape. Produces the same lift at equal positive or negative angles of attack. Least stable. Excellent for aerobatics and more experienced flyers.
- **Stall:** when the angle of attack becomes excessive, the airflow over the wing becomes severely turbulent and no longer produces effective lift. Usually the nose of the aircraft will fall. Normally caused by insufficient airspeed for current conditions.
- **Tail Heavy:** an out of trim condition where there is excessive weight in the tail of the aircraft.
- **Tailwind:** *See downwind*
- **Throttle/Thrust:** engine throttle control or thrust varies the energy the aircraft. It is the pulling power of the engine/propeller combination. Down thrust may be required to compensate for the aircraft tendency to pitch up with increased power. Right thrust may be required to compensate for the aircraft tendency to turn/ roll to the left (*see torque*).
- **Torque:** force applied to the aircraft by the engine which tends to cause the aircraft to roll/turn in the opposite direction of the propeller rotation. For most aircraft this is left.
- **Upwind:** into the wind, as in a takeoff which should be accomplished into the wind.
- **Vertical Stabilizer:** stationary part of the Rudder/Fin assembly.
- **Wave Off:** an aborted landing approach accomplished by the addition of power (throttle).
- **Wing:** a surface used to produce an aerodynamic force perpendicular to the direction of motion.

Appendix C

Solo Flight Competency Test

Student Name:_____ AMA_____
Instructor/Solo Check Name:_____ AMA_____
Date of Solo Test:_____

Instructor's Observations	**Y**	**N**
1. Did the student impound the transmitter upon arriving at the field?		
2. Did the student perform a pre-flight safety inspection, including a range check?		
3. Was the A/C properly restrained during engine start and run up?		
4. Upon preparing to takeoff, did the student loudly announce it?		
5. Was the takeoff made into the proper wind direction?		
6. Was the first turn made away from the pit area?		
7. Did the student demonstrate proper control throughout the procedure turn maneuver?		
8. Did the student demonstrate proper control throughout the horizontal figure eight maneuver?		
9. Did the student demonstrate proper control throughout the square eight maneuver?		
10. Did the applicant demonstrate proper control throughout the slow flight maneuver?		
11. Was the recovery from uncontrolled flight successful?		
12. Was the simulated engine failure properly executed?		
13. Throughout each of the maneuvers flown, was the student capable of maintaining a satisfactory heading and altitude?		
14. Throughout the maneuvers did the student fly behind the flight line?		
15. Upon preparing for landing did the student loudly announce it?		
16. Did the model land into the proper wind direction?*****		
17. Did the student turnoff and return the transmitter to the impound area?		
18. Throughout the entire flight, did the student maintain satisfactory safe control over the model?		

***** Complete three (3) take offs and landings to a full stop

Comments:_____
_____

Instructor/Solo Check Signature_____
Status: _____Pass _____Fail

Upon passing the Solo Flight Competency Test, the student should bring the test (with the instructor signature) to the next regularly scheduled club meeting and present it to the club president for change in club membership status (provisional to general membership).

Appendix D

Instructor Pilots' Proficiency Check

Basics of Flight (Oral)

- What is the Center of Gravity (CG) and what is its importance?
- What can be done to change an aircrafts CG location?
- Why is a high wing aircraft preferred for training?
- What is dihedral and what is its importance in trainer aircraft?
- What is the difference between flat bottom, semi-symmetrical and fully symmetrical airfoils?
- Why take-off and land into the wind?
- What are the advantages and disadvantages of tail dragger and tricycle landing gear configured aircraft?
- What are the pros and cons of 2-stroke vs. 4-stroke model engines?
- Effects of nitro %
- Differences between air bleed carburetors and twin needle carburetors
- What do the two numbers (9x6), (12x4) and (13 x 5) on a prop mean and how do they affect engine performance?
- Approximately how many flights can you expect on a battery charge?
- What does "Dual Rate" mean as it relates to RC control?
- What does "Exponential" mean as it relates to RC control?
- What does "End Point Adjustment" mean as it relates to RC control?
- What does "Mixing" mean as it relates to RC control?
- What does "Differential" mean as it relates to RC control?
- Describe 2 reasons that propeller driven aircraft exhibit a left turning tendency.
- Describe the difference between angle of attack and angle of incidence.
- Describe the characteristics of airflow around a wing during a stall.
- Define ground effect.
- Describe crosswind take-off and landing techniques.
- Describe emergency procedures for primary flight control failure (aileron, elevator).
- Describe emergency procedures for secondary flight control failure (ruder, throttle).

Aircraft Preflight Inspection (discuss critical set-up, integrity and operation)

- Transmitter trims at neutral/software settings – (check initial settings at zero; final settings may require trim indications not at the neutral position and this is acceptable).
- Control linkage installation considerations, mechanical/software adjustments, binding/servo stall avoidance.
- Control surface security, hinges, and neutral positions.
- Wing attachment (number/type of rubber bands or bolt security).
- Landing gear attachment, nose/tail steering setup.
- Engine/muffler/prop/spinner security.

Radio System

- Range and battery checks.
- Buddy-box system setup and trimming.

Engine and Fuel Systems

- Engine run-up, adjustments and troubleshooting (emphasis on safety. Holdbacks prop awareness and nose high check).

Final Checks

- Controls – cycle. Verify correct deflection.
- Transmitter "switchology" check.

Ground Handling

- Crosswind taxi techniques.
- Tail dragger taxi techniques.

Basic Flight Maneuvers (discuss common student mistakes during basic flight maneuvers)

- Take-off/maintain runway Center (± 3').
- Demonstrate ground track corrections on initial climb-out prior to turn.
- Demonstrate comfort in performing left/right circuits at constant altitude, compensating for wind.
- Perform slow flight and approach to stall.
- Demonstrate proficiency in left/right landing patterns including wave-offs and touch and goes.
- Demonstrate out-of-trim take-off (induced by Instructor).
- Perform simulated dead and stick approach.
- Figure eights (symmetrical constant radius both sides/centered on mid-field/constant altitude).
- Split "S" (centered on mid-field).
- 2 consecutive loops (symmetrical/centered on mid-field).
- 2 consecutive horizontal rolls (constant heading/altitude/centered on mid-field.
- Stalls/stall recovery (power-on/off).
- Spin recovery.
- Recovery from unusual attitudes (induced by Instructor Check-out Pilot).

Field Rules, Etiquette and Safety Considerations

- Instructor candidate should have a thorough knowledge of field rules.
- Instructor candidate should understand the use of frequency coordination procedures, transmitter impound area and rules, and show awareness and consideration for other modelers that may be operating on the same frequency.
- Emphasize that landing aircraft have runway priority.
- Emphasize that ALL pilots are expected to announce intentions including take-off, landing, dead stick and "on the field".

Appendix D

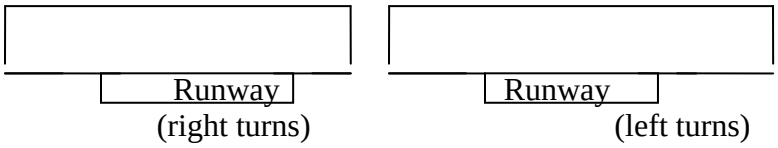
CAM Basic Flight Patterns

One cannot learn this hobby/sport from reading books or utilizing computer flight simulators. While these tools may help in supplementing your learning experience, one masters aeromodeling through practice and patience. The Solo Flight Competency Test demonstrates the new pilot's ability to maintain adequate control over a model at all times. The test's flight maneuvers are intended to prove the new pilot's ability to make the model go in an intended direction. It is not a test of precision flying ability. Successfully passing the Solo Flight Competency Test entitles the CAM member to full flying privileges. While the test is being administered, the new pilot must demonstrate proper safety and field etiquette procedures. The instructor administering the test should note any unsatisfactory performance and provide a written record for the new pilot's ongoing training.

The new pilot must be taught basic "patterns" in order to learn controlled flight. They include Landing Approach, Procedure Turn, Horizontal Figure Eight, Square Eight, and Slow Flight. While these patterns are being mastered, the new pilot will be taught to land and takeoff.

Landing Pattern:

The Landing Pattern maneuver utilizes a "box-shaped" flight pattern with four 90-degree turns done at about 150' of altitude. The first leg of the pattern is flown over the runway. A 90-degree turn is made away from the runway to begin the second leg of the pattern. Another 90 degree turn is made to begin the third leg of the pattern and this is flown parallel to the runway. Once the model reaches the opposite end of the runway, another 90-degree turn is made in the direction of the runway for the fourth and final leg of the pattern. The new pilot should work toward: 1) maintaining a heading which doesn't drift, 2) making crisp 90 degree turns in each of the four corners, 3) avoiding flight over the pit or spectator areas, and 4) repeating the pattern in opposite directions (i.e. fly the first five passes using right turns and the next five passes with left turns). The Landing Pattern looks like this:

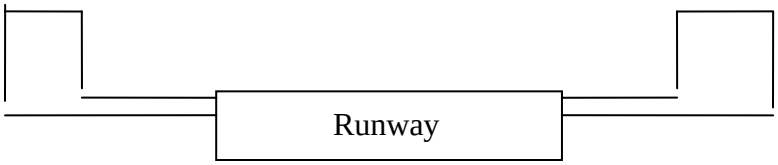


(right turns) (left turns)

Procedure Turn:

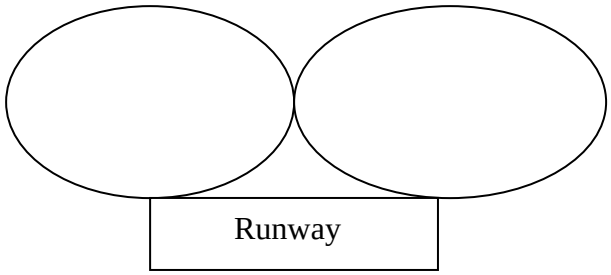
The Procedure Turn maneuver utilizes a "P-shaped" flight pattern with one 90-degree turn followed immediately by a 270-degree turn in the opposite direction. Both straight legs of the pattern are flown over the runway at about 150' of altitude. The 90-degree turn is in the direction away from the runway and the 270-degree turn brings the model back in the direction over the runway. The new pilot should work toward: 1) maintaining a heading which doesn't

drift, 2) making a wide 270 degree turn so that the end of the procedure turn overlaps the beginning, 3) avoiding flight over the pit or spectator areas, and 4) repeating the pattern. The Procedure Turn pattern looks like this:



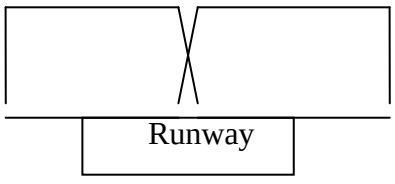
Horizontal Figure Eight:

The Horizontal Figure Eight maneuver utilizes an "8-shaped" flight pattern at about 150' of altitude. Once the model passes over the runway, it starts a turn away from the pit area. The model then continues to makes a large level circular turn ,"bubble", back in the direction of the runway. As the model approaches 45 degrees of the center of the runway it reverses the turn and begins to make another large circular turn, "bubble", again back in the direction of the runway. The new pilot should work toward: 1) maintaining a heading which doesn't drift, 2) avoiding flight over the pit or spectator areas, and 3) repeating the pattern. The Horizontal Figure Eight pattern looks like this:



Square Eight:

The Square Eight maneuver utilizes an "8-shaped" flight pattern with 90 degree turns at each corner at about 150' of altitude. It is similar to the Landing Pattern maneuver. The straight legs of the pattern are flown either over or parallel to the runway. The new pilot should work toward: 1) maintaining a heading which doesn't drift, 2) making crisp 90 degree turns, 3) avoiding flight over the pit or spectator areas, and 4) repeating the pattern. The Square Eight pattern looks like this:



Slow Flight / Landing Approach:

The Slow Flight maneuver utilizes a “box-shaped” flight pattern with four 90-degree turns similar to the Landing Pattern maneuver. However, the leg of the pattern that is flown over the runway is done so at a slow rate of speed and at an altitude of about 15 - 20 feet. The intent of this maneuver is to prepare the new pilot to learn how to land. The new pilot should work toward: 1) maintaining a heading which doesn’t drift, 2) making crisp 90 degree turns, 3) avoiding flight over the pit or spectator areas, 4) avoiding a slow speed stall, and 5) repeating the pattern.