

Notes for Instructors **Training Curriculum and Ground School**

Marymoor R/C Club, Redmond, WA
AMA Charter 1610



General Principles to Teach

- Having fun and taking pride in accomplishment
- Taking responsibility to come regularly & use the Ground School material. (Students that want to use their own plane may be more invested in learning than those that come for the convenience of MAR/C supplied training fleet)
- Not only to fly, but to fly well.
- Ability to self-learn after solo with skills to avoid mishaps
- Safe habits, especially about propellers, batteries, the radio link, and simple checklists
- Airmanship and technique that will be important when the student later flies advanced airplanes, i.e. warbirds
- How to let the airplane fly itself mostly. Small and smooth inputs. How to “feel” what the wing feels. Not a video game.
- Relevant principles from full-scale aviation for our students that may someday pursue a pilot’s license or aviation career

Ground School Chapters

On our Website: mar-c.org

Preparation &
Knowledge

[Getting Started in Training](#)

[Selecting Your Airplane and Radio](#)

[How Tuesday Evening Summer Training Works](#)

[How Planes Fly](#)

[Flight Training Phases and Your Training Log](#)

- Phase 1 - Preflight and Taxi
- Phase 2 - Orientation and Traffic Pattern
- Phase 3 - Approach and Landing
- Phase 4 – Takeoff
- Phase 5 - Advanced Orientation and Aerobatics

Flight Training

[Flight proficiency check](#)

[Radios and Electronic Speed Controls](#)

[Your next airplane after training](#)

[Aero 101 – Aerodynamics for RC Pilots](#)

[STEM Teaching Module](#)

General
Technical
Knowledge



Notes for Instructors:

Flight Training Phases

- The curriculum is divided into 5 phases, similar to instruction in real airplanes
- Students advance to the next phase when they and the instructor think they are ready
 - Phase 1 – Pre-flight and Taxi
 - Phase 2 – Orientation and the Traffic Pattern
 - Phase 3 – Approach and Landing
 - Phase 4 – Takeoff
 - Phase 5 – Advanced Orientation and Aerobatics

Notes for Instructors: Flight Training Log

STUDENT NAME: _____ MAR/C FLIGHT TRAINING LOG

D = Demonstrated P = Practiced X = Proficient

Phase 1 – Pre Flight and Taxi	PHASE 1 - PRE-FLIGHT AND TAXI									
	Pre-flight inspection by student									
	Before Takeoff Checklist - B A T T C *									
	Taxi									
Phase 2 – Basic Orientation and Pattern	PHASE 2 - BASIC ORIENTATION and PATTERN									
	Trim for Level Flight									
	L-R Wing Rock flying toward pilot									
	Level Turns, High Oval Pattern									
	Climbing Turns (by adding power)									
	Descending Turns (by reducing power)									
	Rectangular High Pattern									
	Rectangular Low Pattern									
Phase 3 – Approach and Landing	PHASE 3 - APPROACH AND LANDING									
	Figure 8's (introduction)									
	Slow Flight, Stall, and Recovery									
	Trim at approach speed									
	Demo appch pattern visual cues - Left									
	Demo appch pattern visual cues - Right									
	Stabilized Approach									
	Go-Around - controlled, straight ahead									
	Flare and Touchdown from Left									
	Flare and Touchdown from Right									
Phase 4 – Takeoff	PHASE 4 - TAKEOFF									
	Approach in Crosswind									
	Dead Stick Landing									
	Straight line on takeoff roll									
	Controlled rotation and liftoff									
Phase 5 – Advanced Orientation	PHASE 5 - ADVANCED ORIENTATION									
	Straight ahead climb									
	Takeoff in Crosswind									
	Figure 8's with good altitude control									
	Demo ways to regain orientation									
Flight Number >>										
DATE										
INSTRUCTOR INITIALS										

* B A T T C: Battery (transmitter), Antenna position, Trim, Timer ready, Controls

PHASE 1 - PRE-FLIGHT AND TAXI

Pre-flight inspection by student									
Before Takeoff Checklist - B A T T C *									
Taxi									
Callouts									

PHASE 2 - BASIC ORIENTATION and PATTERN

Trim for Level Flight									
L-R Wing Rock flying toward pilot									
Level Turns, High Oval Pattern									
Climbing Turns (by adding power)									
Descending Turns (by reducing power)									
Rectangular High Pattern									
Rectangular Low Pattern									
Figure 8's (introduction)									

PHASE 3 - APPROACH AND LANDING

Slow Flight, Stall, and Recovery									
Trim at approach speed									
Demo appch pattern visual cues - Left									
Demo appch pattern visual cues - Right									
Stabilized Approach									
Go-Around - controlled, straight ahead									
Flare and Touchdown from Left									
Flare and Touchdown from Right									
Approach in Crosswind									
Dead Stick Landing									

PHASE 4 - TAKEOFF

Straight line on takeoff roll									
Controlled rotation and liftoff									
Straight ahead climb									
Takeoff in Crosswind									

PHASE 5 - ADVANCED ORIENTATION

Figure 8's with good altitude control									
Demo ways to regain orientation									
Loop									
Immelman turn & Half Cuban-eight									
Roll									

Notes for Instructors:

Ordering of the Phases

Phase 1 – Pre-flight and Taxi

Phase 2 – Orientation and the Traffic Pattern

Phase 3 – Approach and Landing

Phase 4 – Takeoff

Phase 5 – Advanced Orientation and Aerobatics

Perception is that takeoffs are "easy" and low risk.

- Experience showed many accidents when inexperienced students pitched up excessively on takeoff to the point where instructor cannot stop a crash.
- We moved takeoff to Phase 4 so it is done after practicing many missed approaches.

Phase 5 exists because students are sometimes soloed without learning to:

- recognize they are disoriented
- decide to do something about it
- have tools to diagnose the problem (rock wings)
- have skills to recover (aerobatics)

Notes for Instructors

Using the Ground School Material

The 5 phases should be taught in order, but some overlap is inevitable, and OK

Before flying,

- ask the student which phase they are in. If they don't know, familiarize them with the phases in the log sheet.
- Ask the student if they have read the ground school material for the phase they are working on. If not, encourage them to do so.
- Agree on specific maneuvers to work on during the flight

Notes for Instructors:

Using the Ground School Material

Please read the Ground School material, so that:

- You and the student both understand the phases
- You and the student agree on what you are working on today
- Common terminology
- The student doesn't feel lost when they get a different instructor
- You can find areas we can change and improve!

Notes for Instructors

Your Assigned Airplane and Transmitters

- **Use ONLY the transmitter and buddy box bound and assigned to your airplane.**
- Do not change any settings in the transmitters (except trim if needed)
- Do not use buddy boxes or transmitters assigned to other trainers. Not even to fix a problem.
- This keeps our fleet stable and consistent with far fewer problems.
- Tables might be labeled with the number of the plane being assigned to that table.
- A separate few buddy boxes may be reserved for instructors who will work with students who bring their own airplanes. These students are “invested” in the hobby and are perhaps most likely to succeed. Therefore, giving these student some specialize attention might be justified.

Notes for Instructors

Phase 1 - Preflight and Taxi

- Please emphasize the importance of testing ***Fail Safe*** and doing ***Range Checks*** for the sake of the club.
- (We need to add a row to the curriculum so this isn't forgotten)
- Check that Ground School show how to do Fail Safe and Range Checks
- Student must understand the difference between Fail Safe and SAFE modes
- These tests avoid “fly-away” accidents where a plane can fly out of our boundaries to other parts of the park.

Phase 2 – Orientation and Traffic Pattern

- First flights are critical. Don't rush. Adjust to the student's abilities
- Use a building block approach – introduce pitch, then roll
- Student should have consistent altitude control in the pattern and while flying figure 8's before going to phase 3

The First Instructed Flight

- Explain buddy box system, and that any problems will be the instructor's fault. Set them at ease.
 - Stand behind the plane and explain transmitter controls and control surfaces
 - Show how much the sticks are typically moved
 - Be sure to show which way is UP and DOWN. New students, especially with exposure to some video games can get this backwards – especially hazardous in first few flights.
 - Keep **at least one crash high** on first 3-4 flights!!
- How to do a turn:
 - Airplane is not a car, that is, we don't hold the stick left or right to turn.
 - We make an input ("one potato") for bank angle, then back to neutral, then use elevator to hold altitude.
 - Then we have to reverse the process to stop the turn

The First Instructed Flight

- Brief the plan on the ground
- Tell them it may be challenging, but praise their performance at every opportunity
- Be encouraging and calm
- Go over “my airplane / your airplane” communication about who has control.
- Fly somewhat close, with slow to medium speed. Our trainers can fly slow and close with safety.
- Observe whether student wants to use thumbs or “pinch”. Either way, emphasize using light gentle forces and not squeezing when stress level rises.

The First Instructed Flight (cont'd)

- In flight, introduce one axis at a time with plane flying away.
 - Pitch – gentle roller coasters
 - Roll – left and right about 30-45 degrees
 - This might be as far as you get on the first flight!
- Let student try flying straight.
- Show the airplane will fly itself (mostly) in between corrections
- If student is ready and not stressed, introduce turns

Teaching Figure 8's

Before advancing to phase 3, Approach and Landing

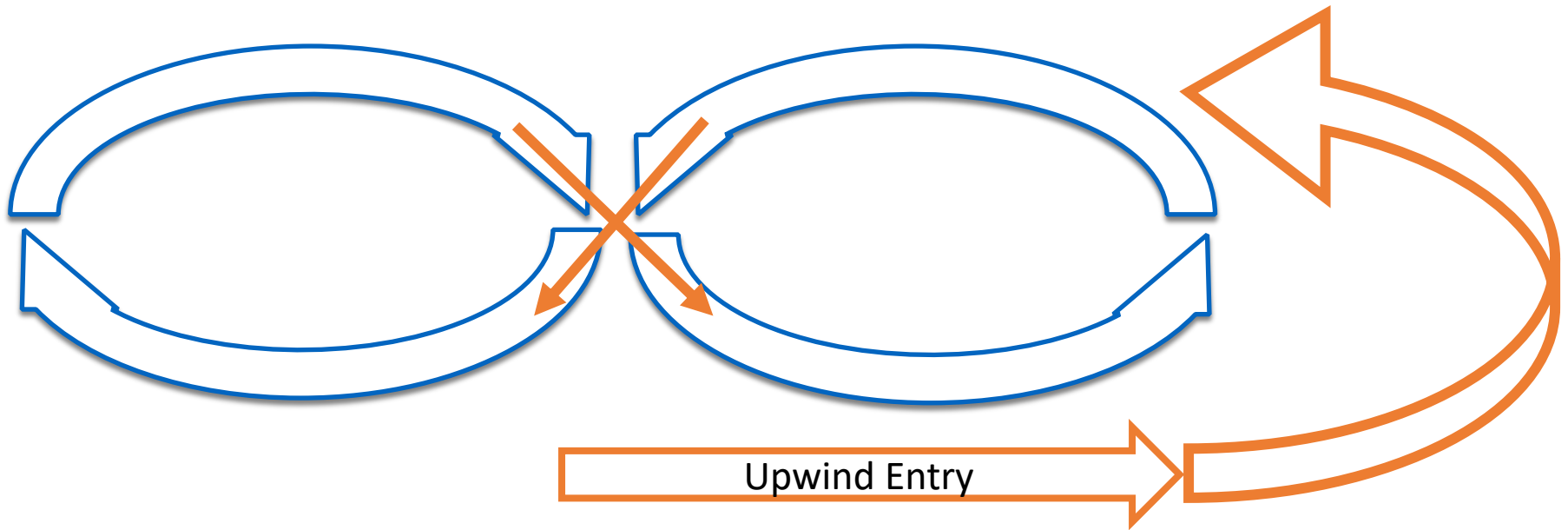
- left-right confusion should be rare
- altitude control while maneuvering should be consistent

Figure 8's teach both of these objectives

- Using the crossover point to drive out left-right confusion when the plane is coming toward the pilot.
- The figure 8 is mastered when the student can hold constant altitude and make the loops approximately the same size
- (Stable diagram of Fig 8's and Pattern to the Log Sheet)

Teaching Figure 8's

- Crossover point should be like an X, so that the plane changes direction when at a 45 degree angle toward the flight line.
- This avoids the plane directly pointed at the flight line.



- Enter the figure 8 the same way every time to avoid confusion
- Keep bank angles less than 45 degrees – not an aerobatic maneuver

Notes for Instructors

Phase 3: Approach and Landing

Before advancing to approaches:

- Student should be proficient holding constant altitude in the pattern, figure 8's, and a "low pattern".
- Left-right confusion should be rare

Teaching Approaches:

- First, teach stalls and slow flight so that the student knows what the stick forces feel like as the plane approaches stall, and how to recover from stall.
- Teach using rudder for better control when slow
- Use progressively lower patterns, eventually getting down to an approach and missed approach.
- Consistency – flying the pattern the same way every time
 - Trimming the plane for approach speed helps every approach feel the same (airplanes with "down thrust" may not need this)
 - Stabilized approach is the most important thing. Smooth landings will be the result.
 - Go-arounds straight ahead. "Don't let the airplane turn left"
 - Smooth use of all controls, including throttle

Phase 3: Approaches and Go-Arounds

- Teaching go-arounds first ensures that the student knows how to smoothly pitch up, and fly a straight-ahead climb in wind
- If the student over-rotates, or rotates on takeoff while steering with a rudder input, the plane might not have enough power and the instructor may not have enough time to save the plane.
- Teach the student to fly intentionally – to force the plane straight along runway heading. Teach not letting the plane turn left on go-around doing what it wants to do, but instead what the pilot wants to do.
- At altitude, let student practice using rudder only. Show that it makes the trainer roll – this is preparation for takeoff.

Notes for Instructors

Phase 3: Approach and Landing

Crosswind technique:

- Ordinary small turns during approach to establish a crab angle relative to the ground, to control left or right drift.
- On a grass runway, no special use of rudder, side slip, or kicking out the side slip during flare is needed
- Use of rudder in an RC trainer results in a powerful roll command that must be countered by opposite aileron. Difficult to learn.
- Go-arounds teach skills used later for safe takeoffs
- During this phase, instructor may teach dead stick landing. No use of power from “high key” position on downwind leg.

Notes for Instructors

Phase : Takeoff

- Teaching go-arounds first ensures that the student knows how to smoothly pitch up, and fly a straight-ahead climb in wind
 - If the student over-rotates, or rotates on takeoff while steering with a rudder input, the plane might not have enough power and the instructor may not have enough time to save the plane.
- Takeoff is likely to be first time student uses rudder at speed
- Student is making many control inputs at once for the first time. Can be confusing at first
- Practice taxiing toward pilot as plane taxis from pits to runway to train use of rudder.
- Teach “nudging” rudder when needed as opposed to continuous use, to avoid getting in the air with a large rudder input.
- Teach advancing throttle gradually, while steering with rudder, while holding a little UP elevator, while holding some aileron into the wind.
- Teach student to let the plane fly off the ground with moderate elevator, rather than pulling it off the ground when they think they are fast enough.
- Be sure the student knows not to get into the air with any rudder input.

Notes for Instructors

Phase 5:

Advanced Orientation and Aerobatics

Teach techniques to:

Prevent loss of orientation by flying with intention

- Always flying with a plan
- Think “what I’m doing now” every second
- Reduce left-right confusion by practicing aggressive figure 8’s
- Note that Marymoor pilots must face the sun, so planes become silhouettes very quickly

Detect loss of Orientation

- Realize quickly you are not on plan or not flying with intention

Regain orientation

- Act immediately as soon as you are not flying with intention
- Moderate left-right roll to re-orient the brain. Enough to see, not much more
- Regain orientation or quickly decide to turn back before getting too far away

Recover from extreme attitudes

- Help student be comfortable with basic aerobatics
- Teach rolling to wings level before pulling UP

Notes for Instructors

Phase 5:

Advanced Orientation and Aerobatics

Exercises:

1. First, get student comfortable doing Immelman, loop, and roll.
 2. With safe altitude, have student close their eyes while you put the plane into an extreme attitude. Then have them open their eyes and recover.
 3. With safe altitude, unexpectedly take control of the plane and change its attitude without saying anything to student. Then return control to them and watch them ***Detect, Regain, and Recover.***
- Teach rolling to wings level before pulling UP
 - Teach cutting throttle if plane is pointed down
 - Be ready to take over quickly if student's initial response is in the wrong direction
 - *Do all of this at least 1 ½ crashes high !!!*
 - *Control reversals are likely, especially in roll at top of immelman or bottom of split S. Beware of panic tendency to "pull" when half way trough a roll.*