

Phase 3

Approach and Landing

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



Phase 3

Approach and Landing

- Slow flight, stall, and recovery
- Trim at approach speed
- Instructor demo approach pattern visual cues – left
- Instructor demo approach 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

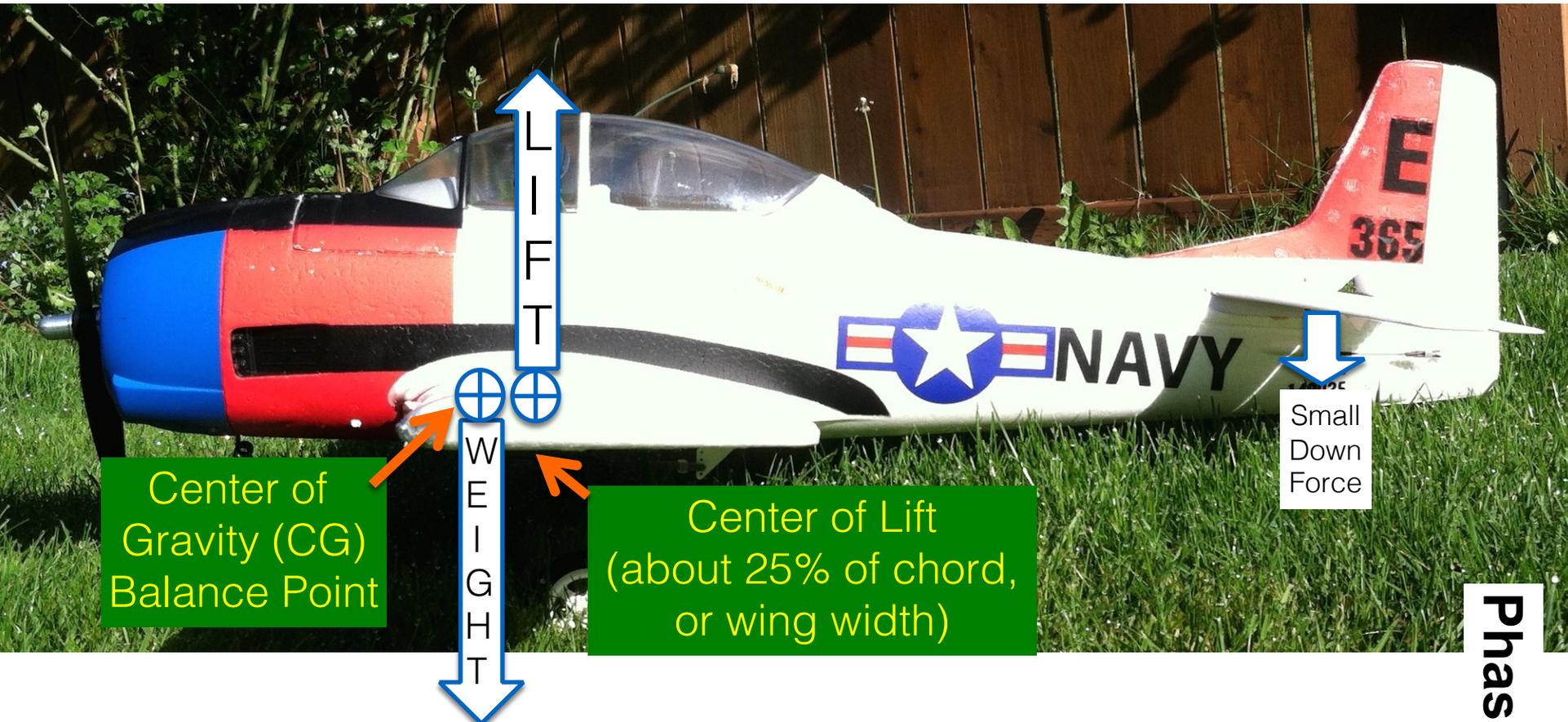
Slow Flight

- After you've mastered flying the pattern at a level altitude, learning how to fly the airplane very slowly will teach you about how pitch and power control speed and altitude
- Throttle back, and as the airplane tries to descend, counter that with some up elevator. Now your plane is flying slowly, while you hold elevator to keep altitude
- Try flying the pattern slowly. Turns will be tighter so you can use less bank angle. Whenever the plane tries to descend, smoothly add a little power while you hold the elevator. Reduce power smoothly if it tries to climb.
- Try this at different throttle settings to see how slow you can go and still maintain control of the airplane
- As you get good at this, you may find that using rudder to turn will be more effective, since the ailerons will be less effective due to slower airflow over the wings
- Don't worry, your instructor will make sure you don't stall, or recover if you do stall.

Stalls

- As you slow further in slow flight by pulling back on the elevator and reducing throttle even more, you can get up to the “critical” angle of attack.
- At this point, the wing cannot “hang on” to the air anymore. Lift will reduce and drag will increase
- Most trainers will just “mush ahead” and not drop the nose much. But with poor control because of low airspeed over the control surfaces.
- To recover, relax the elevator input and smoothly add power. The objective is to lose as little altitude as possible
- If one wing stalls first, the airplane will drop that wing abruptly. In this case relax the elevator and input rudder or aileron to level the wings. If your plane does this excessively, one of your wings may be twisted.

Centers of Lift and Gravity



- Center of gravity must be ahead of the center of lift for the airplane to handle easily in pitch

The CG and Pitch Trim Determine the Speed the Airplane “wants” to Fly

- If the airplane is trimmed while flying fast at high throttle, then during approach at low throttle, it will try to fly fast by nosing down
- If the airplane is trimmed while flying slower, then it will want to fly at that slower speed at low throttle settings on approach
- Before the doing approaches, trim elevator in level flight at 1/3 throttle to give a relaxed speed:
 - Produces a comfortable and consistent “hands off” approach speed
 - Also increases your precious flight time and gives you more time to think ahead of the plane
- This works well for stable trainers and scale airplanes with cambered airfoils and CG ahead of the center of lift.
- CG further aft and symmetrical wing sections on aerobatic airplanes enable them to stay trimmed at all speeds. Throttle and elevator are used to control speed and altitude on final approach. This is a different technique that experienced flyers are comfortable with.

“Down Thrust”

- If your Trainer has a down angle on the prop, then trimming at a slower speed for approaches may not be necessary.
- This is because as throttle is increased, the down thrust pulls the nose down resulting in a pitch trim state for higher speeds.
- Then when throttle is decreased, the nose comes up a little and the plane is trimmed for slower approach speeds.
- Down thrust is a common model airplane trick to avoid the need to trim for approach speed differently than trimming for higher speeds. Often used for free-flight models.

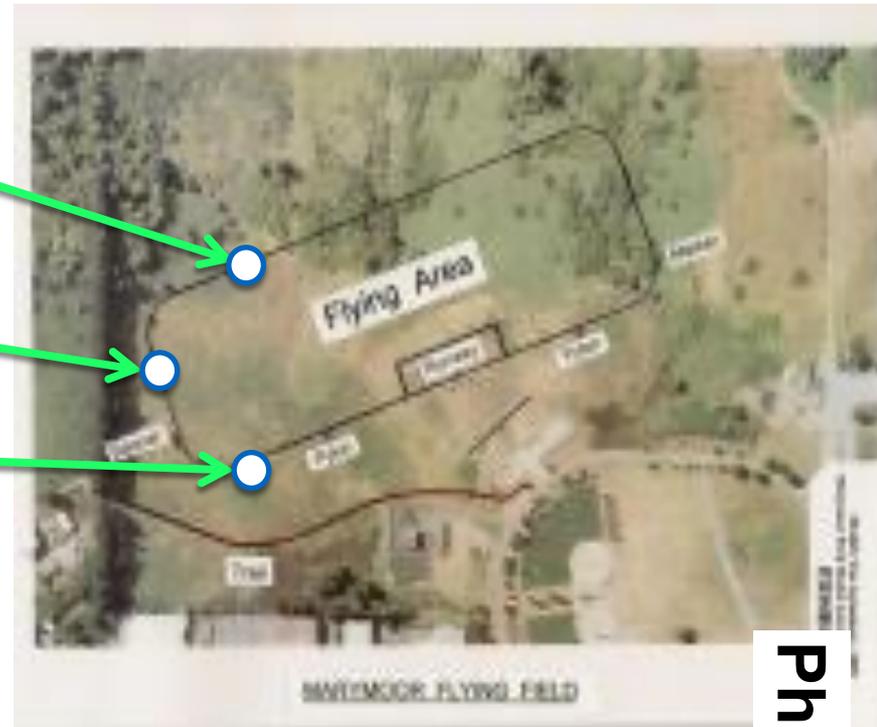
Getting Ready for Landings

- Thinking Ahead of the Plane

- Think WHERE you want the plane to be in 10, 20, and 30 seconds from now.
- What STATE you want the airplane to be in 10, 20, and 30 seconds from now, i.e. high and fast or low and slow?
- Make a plan in your head to get you there
- Use the same landmarks and visual cues every time

Low Pattern – Getting Ready for Landings

- Reduce power a little on late downwind, starting at the same altitude and location every time. Consistency is key here.
- Turn to the base leg and level the wings
- Make another power reduction. Keep a little daylight between your airplane and the trees.
- Turn onto final. Ensure the right landmarks are behind the airplane, so that it approaches the runway on centerline. If you turn too late, just continue the turn until you get to the centerline. Don't rush or increase the bank angle!
- Fly straight at yourself (initially), shallow descent, relaxed speed.
- At about 10 feet high, do a missed approach (“Go-around”). Smoothly add power and climb to that same altitude and repeat the process



○ Power Reductions
(for approach from your left)

Phase 3

Approach Pattern Visual Cues at Marymoor

- From the Left
 - Base leg just above the tree line
 - Turn final just before the gap in the trees where you can see the apartment buildings. This will line you up right over the checkerboard
- From the Right:
 - Judge the height of the base leg from your experience approaching from the left
 - Turn final so that you are above the “airplane sign” boundary marker

The Stabilized Approach

Key to a Good Landing

A stabilized approach is:

- Flying in a straight line, wings level, toward the landing zone, on the runway centerline. Your airplane appears above the boundary marker.
- Descending steadily toward the landing zone – your airplane appears a bit below the top of the trees
- Make shallow turns to stay on the centerline. (more about crosswinds later)
- When landing from the left, you want the plane to be about 1/3 of a tree below the top of the tree line on Final Approach



Phase 3

The Stabilized Approach

Key to a Good Landing

(continued)



- If low, add a little power. If high, reduce power
- Changing altitude with elevator at this point will de-stabilize the approach and change your speed. You will find yourself “hunting” up and down with elevator.
- If you trimmed your plane earlier to fly at a relaxed pace (about 1/3 throttle), the airplane will tend to seek a nice steady not-too-fast approach speed, and not much elevator will be needed.

The Missed Approach or Go-Around

- You will practice many go-arounds before learning to land
- go-arounds also prepare you for takeoff skills
- If the approach is un-stabilized, the landing will be lousy too
- Go-around if the approach doesn't look stable
- **Go-arounds are free. Bad landings are expensive!**
- Full scale pilots train the same way.

Executing the Go-Around

- During the approach, don't stare only at the plane. This can cause you to forget where the plane is with respect to the runway while you focus on control.
- Quickly glance at the runway end now and then to enhance your awareness of the overall situation.
- Know where on the approach (height and position) you will decide to continue to land, or go-around
- Then....to go-around,
 - Smoothly but promptly add about $\frac{1}{2}$ power.
(Since you are slow (at approach speed) DON'T add full power rapidly. A rapid roll to the left might be the result.)
 - Fly the airplane
 - Establish a shallow, steady climb. Add more power as needed
 - The plane will want to turn left – don't let it!
 - Force it to go straight on the runway heading

The Touchdown (Finally!!)

- If your approach has been stable, continue the glide
- Glance at the ground quickly as the plane approaches the runway threshold to orient yourself and prevent hitting the tall grass
- Cut the power to idle at the runway threshold, if it is not there already
- When the plane is 1-2 feet above the runway, raise the nose slightly, just enough to slow the descent
- As the plane slows, it will descend again. Raise the nose a little once more, and wait for it to touch down.
- Don't forget to steer the plane with rudder after touching down!

Recovering from a bad Landing

- If you flare too high and the plane is nose up and losing speed, add power and go-around to avoid a stall
- If you bounce a little, and the nose is up less than about 10 degrees, just hold it there and wait for the next touchdown
- If you bounce a lot – if the nose goes up, smoothly add power and go-around to avoid a stall
- Flare and touchdown are difficult if you fly the approach too fast or too slow. This is why we trimmed the elevator for lower speeds earlier.

Approach and Landing in Crosswind

- RC flying techniques based on full scale flying are described in articles and online requiring use of rudder and opposite aileron to produce a “forward slip” to counter the crosswind while keeping the fuselage parallel to the runway. For landing on narrow, paved runways with larger RC planes, these techniques might be necessary – but they are difficult to master.
- At Marymoor, we have a huge, wide, grass runway. You still want the discipline to land on the centerline, but an easier technique can be used.
- Simply make small turns (with no special use of rudder) during the approach to achieve a **crab angle relative to the ground** (see slide in Phase 2) that results in the airplane following an imaginary extended runway centerline on the ground.
- In the flare and touchdown.
 - Very close to the ground, the airplane flies into the “boundary layer”, and the wind usually decreases.
 - Grass is tolerant to the airplane landing a little sideways, so don’t worry about a crab angle
 - Hold aileron into the wind after touchdown to counter the wind “picking up” the upwind wing
- In high winds, flying a somewhat faster approach might help provide needed control, and some margin to stall in case a gust comes from behind and robs your airspeed (known as windshear)

Notes for Instructors

Approach and Landing

Before advancing to approaches:

- Proficiency holding constant altitude in the pattern and figure 8's is needed.
- Left-right confusion should be rare
- Teach stalls and slow flight so that the student knows what the stick forces feel like as the plane approaches stall

Teaching Approaches:

- Consistency – flying the pattern the same way every time
- Trimming the plane for approach speed helps every approach feel the same
- Stabilized approach is the most important thing. Smooth landings will be the result.
- Go-arounds that fly straight ahead. “Don’t let the airplane turn left”
- Ordinary small turns to establish a crab angle relative to the ground, to control left or right drift due to crosswinds
- Go-arounds teach skills used later for safe takeoffs

Disclaimers

MAR/C provides advice. After you gain solo flight privileges, *only you* are responsible for your model aircraft readiness, your actions, and abilities

Any instructions provided by the manufacturers of equipment such as but not limited to aircraft, radio controls, batteries, motors or engines and anything installed in your airplane have precedence over any advice provided by instructors, this document, or the mar-c website..

Flying and teaching techniques vary widely in our hobby, and vary from one instructor to another.

The goal of this document is to encourage some standardization and provide a practical minimum amount of knowledge.

Version Information

Version	Author	Date	Description
1.5	Brian Kelly	April 2017	Aligned Flight Training Syllabus with new flight log. Misc corrections and refinements
1.6	Brian Kelly	4/19/2017	Misc edits, repaired links, to prepare for website update
1.7	Brian Kelly	4/26/2017	Corrections and misc edits
1.8	Brian Kelly	9/28/2017	Updated Proficiency Check and misc edits
2.0	Brian Kelly	Nov 2018	Broken into separate standalone chapters for quicker access on the website.
3.0	Brian Kelly	April 2023	Updated to reflect club-owned fleet of electric training planes and miscellaneous improvements