

## ***VULCANAIR V1.0***

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## **GENERAL OVERVIEW**

### **V1.0**

Flap extended positions	14, 28, 42
Max Demonstrated Crosswind Component	20 knots
Max Gross Weight	2546 lbs.
Max Landing Weight	2425 lbs
Engine Manufacturer	Lycoming
Model	IO-360-M1A
Type	Horizontally Opposed, Air Cooled
Displacement	361 Cubic Inches
Horsepower (BHP)	180 HP
Rated Speed (RPM)	2700 <sub>RPM</sub>
Oil	
Max	8 qts
Min	2 qts (DSU Min - 5 qts.)
Prop Length	74 Inches
Wing Span	35 Feet
Fuel Grade	100LL (Blue)
Quantity	52.8 Gal. Total, 50.2 Gal. Usable 2.6 Gal. Unusable
Electrical System	
Battery	24 Volts; 35 Amp Hour
Alternator	28 Volts; 60 Amps

There is an ammeter that measures the electrical load on the alternator.

### **V-SPEEDS**

Rotation Speed ( $V_R$ )	65 <sub>KIAS</sub>	Maneuvering Speed ( $V_A$ )	125 <sub>KIAS</sub>
Best Rate of Climb ( $V_Y$ )	80 <sub>KIAS</sub>	Flaps Extended Speed ( $V_{FE}$ )	78 <sub>KIAS</sub>
Best Angle of Climb ( $V_X$ )	70 <sub>KIAS</sub>	Never Exceed Speed ( $V_{NE}$ )	179 <sub>KIAS</sub>
Stall Speed Flaps ( $V_{S0}$ )	48 <sub>KIAS</sub>	Best Glide Speed ( $V_G$ )	80 <sub>KIAS</sub>
Stall Speed Clean ( $V_{S1}$ )	59 <sub>KIAS</sub>	Cruise Climb	90 <sub>KIAS</sub>

**Speeds are for an aircraft operating at a gross weight of 2546 lbs**

1.2 $V_{S1}$  = 71<sub>KIAS</sub>    1.2 $V_{S0}$  = 58<sub>KIAS</sub>    1.3 $V_{S0}$  = 63<sub>KIAS</sub>     $V_{NO}$  = 128<sub>KIAS</sub>

## **NORMAL TAKEOFF AND CLIMB**

**REF:** FAA-H-8083-3 (Airplane Flying handbook)

**Objective:** To safely execute a takeoff under normal conditions

1. Complete the Before Takeoff checklist
2. Set Flaps 14°
3. Center aircraft on runway centerline with nose wheel straight ahead
4. Advance the throttle smoothly forward to 2000<sub>RPM</sub>, check engine instruments
5. Advance throttle to full power, maintain aircraft on centerline
6. Call out "Airspeed alive"

### **Note**

#### **Do not force the aircraft to stay on the ground**

7. Accelerate aircraft to 65<sub>KIAS</sub> call out "*V<sub>R</sub> rotate*" and increase control yoke back pressure to pitch up until the glare shield meets the horizon (approximately 10°)
8. Accelerate to V<sub>X</sub> (70<sub>KIAS</sub>) and climb on centerline, trim as necessary
9. At safe altitude, retract flaps and accelerate to V<sub>Y</sub> (80<sub>KIAS</sub>)
10. At 1000' <sub>AGL</sub>, decrease pitch to establish and maintain 90<sub>KIAS</sub> climb and set climb power (2600<sub>RPM</sub> / 26" <sub>MP</sub>)
11. Execute a traffic pattern departure procedure
12. After leaving the traffic pattern, complete the Climb Checklist

### **IF REMAINING IN THE PATTERN**

13. At 700' <sub>AGL</sub> turn to crosswind
14. Continue climb to Traffic Pattern Altitude (1,050' <sub>MSL</sub> at 33N), check the 45° entry to the pattern and turn downwind, reduce power to 18" <sub>MP</sub> / 2400<sub>RPM</sub> trim as necessary

### **Standards:**

**Private:** Airspeed V<sub>Y</sub> +10/-5

**Commercial:** Airspeed V<sub>Y</sub> ±5

## **CROSSWIND TAKEOFF AND CLIMB**

**REF:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** To safely execute a takeoff in cross wind conditions

1. Complete the Before Takeoff checklist
2. Set Flaps 14°
3. Note wind direction and velocity and set controls for the wind conditions
4. Center aircraft on runway centerline with nose wheel straight ahead
5. Advance the throttle smoothly forward to 2000<sub>RPM</sub>, check engine instruments
6. Advance throttle to full power, maintain aircraft on centerline
7. Call out "Airspeed alive"
8. During ground roll, decrease aileron input to keep wings level
9. Accelerate aircraft to 65<sub>KIAS</sub> call out "*V<sub>R</sub> rotate*" and increase control yoke back pressure to pitch up until the glare shield meets the horizon (approximately 10°)

### **Note**

**Do not force the aircraft to stay on the ground**

### **Note**

**Rotation and liftoff should be accomplished with authority so as to leave the ground and establish a climb as quickly as possible to avoid settling back onto the runway**

10. Accelerate to  $V_X$  (70<sub>KIAS</sub>) and climb on centerline, trim as necessary
11. At safe altitude, retract flaps and accelerate to  $V_Y$  (80<sub>KIAS</sub>)
12. At 1000' AGL, decrease pitch to establish and maintain 90<sub>KIAS</sub> climb and set climb power (2600<sub>RPM</sub> / 26"MP)
13. Execute a traffic pattern departure procedure
14. After leaving the traffic pattern, complete the Climb Checklist

### **IF REMAINING IN THE PATTERN**

15. At 700' AGL turn to crosswind
16. Continue climb to Traffic Pattern Altitude (1,050' MSL at 33N), check the 45° entry to the pattern and turn downwind, reduce power to 18"MP / 2400<sub>RPM</sub> trim as necessary

### **Standards:**

**Private:** Airspeed  $V_Y +10/-5$

**Commercial:** Airspeed  $V_Y \pm 5$

## **SHORT FIELD TAKEOFF**

**REF:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** To obtain maximum obstacle clearance and /  
or minimize the runway length required during takeoff

1. Complete Before Takeoff checklists and extend flaps to 14°
2. Taxi aircraft on runway centerline using all available runway, center nose wheel
3. Firmly depress the brake pedals to hold the airplane in position during full power run-up
4. Advance the throttle forward to 2000<sub>RPM</sub>, check engine instruments
5. Smoothly advance the throttle to full power, check static power (2700<sub>RPM</sub>), and then release the brakes
6. Maintain directional control and runway centerline with the rudder pedals
7. Call out "Airspeed alive"
8. Accelerate aircraft to 60<sub>KIAS</sub> call out "*V<sub>R</sub> rotate*"
9. Accelerate and climb at V<sub>X</sub> (70<sub>KIAS</sub>) until obstacles are cleared
10. At safe altitude retract flaps and accelerate to V<sub>Y</sub> (80<sub>KIAS</sub>)
11. At 1000' AGL, decrease pitch to establish and maintain 90<sub>KIAS</sub> climb and set climb power (2600<sub>RPM</sub> / 26"MP)
12. Execute a traffic pattern departure procedure
13. After leaving the traffic pattern, complete the Climb Checklist

### **IF REMAINING IN THE PATTERN**

14. At 700' AGL turn to crosswind
15. Continue climb to Traffic Pattern Altitude (1,050' MSL at 33N), check the 45° entry to the pattern and turn downwind, reduce power to 18"MP / 2400<sub>RPM</sub> trim as necessary

**Standards:**

**Private:** Airspeed V<sub>X</sub> +10/-5 then V<sub>Y</sub> +10/-5

**Commercial:** Airspeed V<sub>X</sub> ±5, then V<sub>Y</sub> ±5

## **SOFT FIELD TAKEOFF**

**REF:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** To obtain maximum performance when departing from a soft or contaminated runway surface

1. Complete Before Takeoff checklists and extend flaps to 14°
2. Taxi toward the takeoff position with full back pressure on the yoke while using proper crosswind correction techniques
3. Without braking or stopping the airplane, smoothly and continuously apply full throttle, checking engine instruments and lifting the nose wheel clear of the runway as soon as possible (approximately 5°-8° of pitch)

### **NOTE**

**Do not allow the airplane to pitch up excessively causing a tail strike**

4. Maintain directional control and runway centerline with the rudder
5. As the aircraft's speed increases and the nose continues to rise, release a little pressure on the yoke so as to maintain that 5°-8° pitch attitude.
6. As the main wheels lift off the runway, decrease pitch attitude to establish and maintain a level flight attitude while remaining in ground effect and:

**If no obstacles are present:**

**Accelerate to and establish a positive rate of climb at  $V_X$  (70<sub>KIAS</sub>) at safe altitude, retract flaps to 0° and accelerate to  $V_Y$  (80<sub>KIAS</sub>)**

**If obstacles are present:**

**Accelerate to and establish a positive rate of climb at  $V_X$  (70<sub>KIAS</sub>) after clearing obstacles and at a safe altitude, retract flaps to 0° and accelerate to  $V_Y$  (80<sub>KIAS</sub>)**

7. Execute a traffic pattern departure procedure
8. After leaving the traffic pattern, complete the Climb Checklist

### **IF REMAINING IN THE PATTERN**

9. At 700' <sub>AGL</sub> turn to crosswind
10. Continue climb to Traffic Pattern Altitude (1,050' <sub>MSL</sub> at 33N), check the 45° entry to the pattern and turn downwind, reduce power to 18" <sub>MP</sub> / 2400 <sub>RPM</sub> trim as necessary

### **Standards:**

**Private:** Airspeed  $V_X$  or  $V_Y$  +10/-5

**Commercial:** Airspeed  $V_X$  or  $V_Y$  ±5

## **MANEUVERING DURING SLOW FLIGHT**

**REF:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** The understanding of the aerodynamics associated with slow flight in various airplane configurations, to include the relationship between angle of attack, airspeed, load factor, power setting, airplane weight and center of gravity, airplane attitude, and yaw effects

### **NOTE**

**This maneuver may be done with or without flaps  
Plan maneuver recovery at or above 2500' AGL**

1. Complete the Maneuvers Checklist
2. Reduce throttle to 15"MP, set propeller full increase and trim to maintain altitude
3. If flaps are to be used, below  $V_{FE}$  (78KIAS) incrementally extend flaps to 42°
4. Maintain heading
5. Maintain altitude with power
6. Maintain airspeed with pitch
7. Establish minimum airspeed, 5-10 knots above stall
8. (Stall warning horn must NOT be sounding)
9. Execute climbs, descents and turns

### **On Recovery:**

10. Apply full power while maintaining altitude
11. Retract flaps to 28° Establish  $V_X$  (70KIAS) and subsequently accelerate to  $V_Y$  (80KIAS)
12. Incrementally retract flaps to 0°
13. Return to normal cruise flight 2400RPM / 23"MP
14. Perform Cruise Checklist

### **Standards:**

**Private:** Altitude  $\pm 100$  ft., Heading  $\pm 10^\circ$ , Bank  $\pm 5^\circ$ , airspeed +10/-0 Kts

**Commercial:** Altitude  $\pm 50$  ft., Heading  $\pm 10^\circ$ , Bank  $\pm 5^\circ$ , airspeed +5/-0 Kts

## **POWER OFF STALLS**

**REF:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** To recognize the indications of an imminent or full stall during power off situations with the flaps down, and to make prompt, positive, and effective recoveries with a minimum loss of altitude.

1. Complete the Maneuvers Checklist and plan to recover by 2500' AGL
2. Reduce throttle to 15" MP, set propeller full increase and trim to maintain altitude
3. Below  $V_{FE}$  (78 KIAS) incrementally extend flaps to 28°
4. Maintain altitude until reaching 70 KIAS and then establish a stabilized descent (trimmed) at 70 KIAS to simulate a normal approach to landing
5. Descend 100 ft. and then reduce throttle to idle
6. Maintain altitude in straight flight or in turns with up to 20° bank. Airspeed will drop requiring additional back pressure to maintain altitude
7. Upon reaching a stall (stall horn, mushy controls, buffeting) call out "*Stalling*"
8. Simultaneously release the back pressure until impending stall indications are eliminated and apply full throttle
9. Retract flaps to 14° Establish  $V_X$  (70 KIAS) and look for positive rate climb
10. At a positive rate climb, retract flaps to 0°, accelerate to  $V_Y$  (80 KIAS) and return to assigned altitude.
11. Return to normal cruise flight 2400 RPM / 23" MP
12. Perform Cruise Checklist

**Standards:**

**Private:** If straight Heading  $\pm 10^\circ$

If banked Maintain specified bank not to exceed  $20^\circ \pm 10^\circ$

**Commercial:** If straight Heading  $\pm 10^\circ$ ,

If banked Maintain specified bank not to exceed  $20^\circ \pm 5^\circ$



## **POWER ON STALLS**

**REF:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** To recognize the indications of an imminent or full stall during power on situations and to make prompt, positive, and effective recoveries with a minimum loss of altitude.

1. Complete the Maneuvers Checklist and plan to recover by 2500' AGL
2. Reduce throttle to 15" MP, set propeller full increase and trim to maintain altitude
3. Maintain altitude until reaching 65 KIAS, then set full power and smoothly increase pitch to approximately 20°
4. On indication of a stall [stall horn, mushy controls, buffeting] call out "*Stalling*"
5. Release the back pressure until impending stall indications are eliminated
6. Maintain coordinated use of the ailerons and rudder to level the wings and prevent entering a spin
7. Adjust pitch to V<sub>X</sub> (70 KIAS) and minimize altitude loss, trim as necessary
8. Return to normal cruise flight 2400 RPM / 23" MP
9. Perform Cruise Checklist

**Standards:**

**Private:** If straight Heading  $\pm 10^\circ$

If banked Maintain specified bank not to exceed  $20^\circ \pm 10^\circ$

**Commercial:** If straight Heading  $\pm 10^\circ$ ,

If banked Maintain specified bank not to exceed  $20^\circ \pm 5^\circ$

## **SECONDARY STALL**

**REF:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** Understand the effects of improper control usage inducing another stall after initiating a recovery from the Original stall.

### **This is a demonstrated flight maneuver**

1. Complete the Maneuvers Checklist and plan to recovery by 2500'AGL
2. Reduce throttle to 15"MP, set propeller full increase and trim to maintain altitude
3. Perform a Power-Off or Power-On Stall, as directed
4. At the stall call out, "Stalling", release some back pressure to regain control effectiveness and apply full power
5. Maintain coordinated use of the ailerons and rudder to level the wings and prevent a spin
6. **Immediately** increase the backpressure to induce another (secondary) stall
7. At the stall, call out, "Stalling" and simultaneously release the back pressure until impending stall indications are eliminated
8. Maintain coordinated use of the ailerons and rudder to level the wings and prevent a spin
9. Adjust pitch to  $V_X$  (70KIAS) to minimize altitude loss and trim as necessary
10. Return to normal cruise flight 2400RPM / 23"MP
11. Perform Cruise Checklist

### **Standards:**

Student will demonstrate a basic understanding of the maneuver

## **ELEVATOR TRIM STALL**

**REF:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** This situation may occur during a go-around procedure from a normal landing approach, a simulated forced-landing approach or immediately after a takeoff with the trim set for a normal landing approach glide at idle power. The objective of the demonstration is to show the importance of making smooth power applications, overcoming strong trim forces, maintaining positive control of the airplane to maintain safe flight attitudes, and using proper and timely trim techniques.

**This is a demonstrated flight maneuver.**

1. Complete the Maneuvers Checklist and plan to recovery by 2500' <sub>AGL</sub>
2. Reduce throttle to 15" <sub>MP</sub>, set propeller full increase and trim to maintain altitude
3. Below  $V_{FE}$  (78 <sub>KIAS</sub>) incrementally extend flaps to 28°
4. Adjust trim and maintain altitude until reaching 70 <sub>KIAS</sub>, and then establish a stabilized descent to simulate a normal approach to landing
5. Descend 100 feet and apply full throttle, allowing the airplane to roll/yaw left and the pitch to increase.
6. At a pitch attitude of approx. 12°, the stall horn sounding or a bank angle of 30°. Apply nose down control pressure until impending stall indications are eliminated
7. Maintain coordinated use of the ailerons and rudder to level the wings
8. Establish  $V_X$  (70 <sub>KIAS</sub>), retract flaps to 14°, look for positive rate climb
9. At a positive rate climb, retract flaps to 0° and accelerate to  $V_Y$  (80 <sub>KIAS</sub>)
10. Return to the altitude, heading, and airspeed specified
11. Return to normal cruise flight 2400 <sub>RPM</sub> / 23" <sub>MP</sub>
12. Perform Cruise Checklist

**Standards:**

Student will demonstrate a basic understanding of the maneuver

## **CROSS-CONTROL STALL**

**REF:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** The objective of the cross-control stall demonstration is to show the effects of uncoordinated flight on stall behavior and to emphasize the importance of maintaining coordinated flight while making turns.

**This is a demonstrated flight maneuver.**

1. Complete the Maneuvers Checklist and plan to recover by 2500' AGL
2. Reduce throttle to 15"MP, set propeller full increase and trim to maintain altitude

### **NOTE**

**Because of the possibility of exceeding  $V_{FE}$ , flaps are not extended.**

3. Maintain altitude until reaching 80KIAS and then establish a stabilized descent to simulate a normal No Flap approach to landing
4. Descend 100 feet and reduce power to idle
5. Pick a reference point off the left or right wing tip
6. Turn towards the reference point using a 25°-30° bank
7. Simultaneously apply excessive rudder pressure in the direction of the turn
8. Use opposite aileron to prevent the bank from increasing
9. While maintaining a constant 25°-30° bank during the turn, increase control back-pressure to keep the nose from dropping.
10. At imminent stall call out, "*Stalling*", reduce pitch to regain control effectiveness, and apply full power.

### **NOTE**

**Completion of the maneuver should occur by the 90° reference point and before full deflection of the rudder and aileron.**

11. Maintain coordinated use of the ailerons and rudder to level the wings and prevent entering into a spin.
12. Adjust pitch to  $V_X$  (70KIAS) and minimize altitude loss.
13. Return to the altitude, heading, and airspeed specified.
14. Return to normal cruise flight 2400RPM / 23"MP
15. Perform Cruise Checklist

### **Standards:**

Student will demonstrate a basic understanding of the maneuver

## **ACCELERATED STALL**

**REF:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** The objectives of demonstrating an accelerated stall are to determine the stall characteristics of the airplane, experience stalls at speeds greater than the +1G stall speed, and develop the ability to instinctively recover at the onset of such stalls.

**This is a demonstrated flight maneuver.**

1. Complete the Maneuvers Checklist and plan to recover by 2500' AGL
2. Reduce throttle to 15" MP, set propeller full increase and trim to maintain altitude below maneuvering speed  $V_A$  (125 KIAS)

### **NOTE**

**The flaps must be in the 0° (Up) position.**

3. Establish a 45°-50° bank to the left or right
4. After the bank and turn are established, smoothly and steadily increase elevator back-pressure.
5. As the airspeed reaches 20 knots above the unaccelerated stall speed  $V_{S1}$  (71 KIAS), firmly increase elevator back-pressure to induce a stall condition.
6. At imminent stall (buffet and/or stall warning horn):
  - A. Note the indicated airspeed, Call out, "*Stalling*"
  - B. Release the back pressure until impending stall indications are eliminated
  - C. Add power as necessary.
7. Maintain coordinated use of the ailerons and rudder to level the wings and prevent entry into a spin while minimizing altitude loss
8. Return to the altitude, heading, and airspeed specified.
9. Return to normal cruise flight 2400 RPM / 23" MP
10. Perform Cruise Checklist

### **Standards:**

Student will demonstrate a basic understanding of the maneuver

## **STEEP TURNS**

**REF:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** To develop smoothness, coordination, orientation, division of attention, and control techniques while executing high performance turns.

1. Complete the Maneuvers Checklist and plan to recover by 1500' AGL
2. Establish airspeed below  $V_A$  (125 KIAS), trim as necessary
3. Choose a prominent landmark or note the heading
4. Roll into a 45° bank (private) or 50° bank (commercial) and begin a 360° turn
5. Rolling through 30° bank, add power as necessary to maintain altitude and airspeed
6. Begin roll out half the bank angle before the originating landmark or heading
7. Roll wings level and then immediately roll into a 360° turn the opposite direction
8. Complete the maneuver and return to straight and level flight
9. Return to normal cruise flight 2400 RPM / 23" MP
10. Complete the Cruise Checklist

**Standard:**

**Private:** Altitude  $\pm 100$  ft., Airspeed  $\pm 10$  Kts, Bank  $\pm 5^\circ$ , Heading  $\pm 10^\circ$ .

**Commercial:** Altitude  $\pm 100$  ft., Airspeed  $\pm 10$  Kts, Bank  $\pm 5^\circ$ , Heading  $\pm 10^\circ$

## **EMERGENCY DESCENT**

**REF:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** To descend the airplane as rapidly as possible, within the operating limitations of the airplane.

1. Complete the maneuvers checklist and complete the maneuver by 1500' <sub>AGL</sub>
2. Brief all passengers
3. Pick a visual landmark off the wing tip in the direction of turn
4. Throttle to Idle, reduce speed below maximum flap speed  $V_{FE}$  (78<sub>KIAS</sub>), extend flaps to 42°
5. Simultaneously roll into a 30° - 45° bank in direction of planned turn and adjust pitch to maintain 70<sub>KIAS</sub>
6. Roll out on the 180° point in the turn and make shallow S-turns to continue checking for other traffic while descending
7. Approaching the target altitude, begin to level off by increasing pitch to reduce the descent rate
8. At target altitude, adjust pitch and power to maintain level flight
9. Return to normal cruise flight 2400<sub>RPM</sub> / 23" <sub>MP</sub>
10. Perform Cruise Checklist

**Standards:**

**Private:** Airspeed +0/-10 Kts, Bank Angle 30° - 45° Maintains positive load factors during the descent, Altitude,  $\pm 100$  ft

**Commercial:** Airspeed +0/-10 Kts, Bank Angle 30° - 45° Maintains positive load factors during the descent, Altitude,  $\pm 100$  ft

## **EMERGENCY APPROACH AND LANDING**

**REF:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** To execute a safe approach and landing in the event of an engine failure

### **NOTE**

**When simulating an engine failure, the Instructor Pilot will call out "Simulated Engine Failure"**

1. Establish the best glide speed  $V_G$  (80<sub>KIAS</sub>), trim as necessary
2. Determine wind direction and select a suitable landing site, checking the area in the immediate vicinity of the aircraft's position
3. Turn the airplane towards the selected landing site
4. Go through the Right to Left memorization checklist. (Alternate Air on, Mixture, Throttle, Fuel pump, Magnetos, Fuel Selector)
5. If altitude permits, complete the emergency checklist
6. If engine restart is unsuccessful, maneuver the aircraft as necessary for the approach and landing, squawk transponder code 7700 and transmit mayday on 121.5

### **NOTE**

**Prolonged idle power may result in excessive engine cooling or spark plug fouling, especially during cold weather. The engine should be cleared periodically by briefly advancing the throttle to cruise power. This should be done with a headwind to minimize groundspeed variation**

**How to maneuver the aircraft for the pattern and the approach and landing will depend on many variables, including location of the closest suitable landing site to the aircraft's current position, altitude, wind direction, landing direction, obstructions, etc. All variables must be considered when developing a maneuvering plan Unless the approach is made to an airport runway, the simulated emergency approach and landing should be terminated as soon as it can be determined that a safe landing could have been made, or 500' AGL, whichever occurs first**

7. Complete the Power Off Landing checklist:
8. When appropriate, maneuver the aircraft to arrive at a point abeam the point of intended landing at 1000' AGL
9. Turn onto the base leg and determine if adjustment of the flight path of the base leg is necessary to ensure reaching the desired landing point

### **Standards:**

**Private:** Best Glide  $\pm 10$  Kts

**Commercial:** Best Glide  $\pm 10$  Kts



## **RECTANGULAR COURSE**

**REF:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** To maneuver the airplane over a predetermined ground path while dividing attention inside and outside the airplane.

1. Determine the wind direction
2. Perform clearings turns and plan to execute the maneuver between 600'- 1000'<sub>AGL</sub>
3. Select a forced landing area
4. Establish and maintain a speed below  $V_A$  (125<sub>KIAS</sub>)
5. Enter either left or right pattern on a 45° angle to the mid-field downwind leg
6. Establish a crab angle as necessary to maintain a uniform distance from the area boundaries for each leg of the maneuver

### **NOTE**

**The airplane should be flown parallel to and at a uniform distance  $\frac{1}{4}$  to  $\frac{1}{2}$  mile away from the field boundaries**

### **Standards:**

**Private:** Airspeed  $\pm 10$  Kts, Altitude  $\pm 100$

## **S-TURNS ACROSS A ROAD**

**REF:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** To teach the student to maneuver the airplane over a predetermined ground path while dividing attention inside and outside the airplane

1. Determine the wind direction
2. Perform clearing turns and maneuver must be executed between 600-1000' <sub>AGL</sub>
3. Pick an area that includes an emergency landing field
4. Establish and maintain a speed below  $V_A$  (125<sub>KIAS</sub>)
5. Enter on a downwind heading to cross perpendicular across reference line
6. When directly over the reference line (highest groundspeed), roll into the steepest bank (not to exceed 45°) to initiate and maintaining a constant radius ground track
7. As the turn continues (groundspeed decreases), begin to shallow the bank as necessary to continue maintaining a constant radius ground track
8. Level the wings when crossing the reference line (lowest groundspeed) and immediately begin a turn back in the opposite direction with a shallow bank
9. As the turn continues (groundspeed increases), begin to steepen the bank as necessary to continue maintaining a constant radius ground track
10. Level the wings when crossing the reference point (highest groundspeed)

### **NOTE**

**The rollouts must be timed in order to be straight and level directly over and perpendicular to the reference line or road**

11. Continue as directed by Instructor / Examiner
12. Return to normal cruise flight 2400<sub>RPM</sub> / 23" <sub>MP</sub>
13. Perform Cruise Checklist

### **Standards:**

**Private:** Airspeed  $\pm 10$  Kts, Altitude  $\pm 100$  ft.

## **URNS AROUND A POINT**

**REF:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** To learn to maneuver the airplane over a predetermined ground path while dividing attention inside and outside the airplane.

1. Determine the wind direction
2. Perform clearing turns and plan to execute the maneuver between 600-1000' <sub>AGL</sub>
3. Select a forced landing area
4. Establish and maintain a speed below  $V_A$  (125<sub>KIAS</sub>)
5. Enter the maneuver at cruise speed on downwind to one side of the selected reference point at a distance equal to the desired radius of turn
6. On entry downwind (highest groundspeed) and abeam the reference point, roll into the steepest bank (not to exceed 45°) to initiate and maintain a constant radius
7. As the turn continues (groundspeed decreases), begin to shallow the bank as necessary to continue maintaining a constant radius
8. Directly upwind (lowest groundspeed), the bank angle should be at its shallowest
9. As the turn continues (ground speed increases), begin to steepen the bank as necessary to continue maintaining a constant radius
10. Complete two complete circles, or as directed, and depart on the entry heading
11. Return to normal cruise flight 2400<sub>RPM</sub> / 23" <sub>MP</sub>
12. Perform Cruise Checklist

**Standards:**

**Private:** Airspeed  $\pm 10$  Kts, Altitude  $\pm 100$  ft.

## **CHANDELLES**

**Ref:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** To develop the pilot's coordination, orientation, planning, and feel for maximum performance flight, and to develop positive control techniques at varying airspeeds and attitudes.

1. Complete the Maneuvers Checklist and plan to recover by 1500' AGL
2. Establish airspeed below  $V_A$  (125<sub>KIAS</sub>), trim as necessary
3. Select a reference point directly off the left or right wing tip
4. Roll into a coordinated 30° bank and neutralize rudder and ailerons.
5. After the bank is established, smoothly initiate a climbing turn and apply full power while maintaining a 30° bank, continue increasing the pitch attitude at a constant rate so as to attain the highest pitch (approx. 13°-15°) at the 90° point in the turn
6. At the 90° point in the turn, maintain pitch attitude by continuing to increase elevator backpressure (due to decreasing airspeed) and initiate a slow rate of rollout
7. Maintain constant roll out rate with aileron while increasing right rudder to keep ball centered and increase back pressure to maintain pitch attitude, decrease bank 10° by each 30° heading change
8. Arrive at the 180° point with airspeed about 5-7 knots above stall, wings level, and coordinated flight. Maintain pitch for about 3 seconds.
9. Decrease pitch attitude to level flight and increase airspeed without altitude loss.
10. Return to normal cruise flight 2400<sub>RPM</sub> / 23"MP
11. Complete the Cruise Checklist

**Standard:**

**Commercial:** Complete rollout at the 180° point,  $\pm 10^\circ$  just above a stall airspeed, and maintaining that airspeed momentarily avoiding a stall. Resume a straight-and-level flight with minimum loss of altitude.

## **STEEP SPIRAL**

**REF:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** To improve pilot technique for airspeed and wind drift control, planning, orientation, and division of attention.

1. Determine wind direction
2. Establish an altitude that will allow at least 3 -360° turns before rollout
3. Select a forced landing area where an emergency landing can be made if necessary
4. Approach a prominent reference point to spiral around so as to enter on downwind
5. Close throttle and adjust pitch to establish and maintain  $V_G$  (80<sub>KIAS</sub>), trim as necessary
6. Maintain a constant radius around the reference point adjusting the bank angle as necessary not to exceed 60°

### **NOTE**

**Prolonged idle power may result in excessive engine cooling or spark plug fouling, especially during cold weather. The engine should be cleared periodically by briefly advancing the throttle to cruise power. This should be done with a headwind to minimize groundspeed variation**

7. Complete at least three 360° turns
8. Complete the maneuver on entry heading

### **NOTE**

**Recover no lower than 1500' <sub>AGL</sub> unless combining the maneuver with a simulated Emergency Approach and Landing**

9. Return to normal cruise flight 2400<sub>RPM</sub> / 23" <sub>MP</sub>
10. Perform Cruise checklist

### **Standards:**

**Commercial:** Bank angle  $\leq 60^\circ$ , Altitude sufficient to complete three 360°, Airspeed  $\pm 10$  Kts, Heading  $\pm 10^\circ$

## **LAZY EIGHT**

**REF:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** To develop the pilot's feel for varying control forces, and the ability to plan and remain oriented while maneuvering the plane with positive and accurate control.

1. Complete the Maneuvers Checklist and complete the maneuver by 1500' <sub>AGL</sub>
2. Select a forced landing area and set power to cruise below  $V_A$
3. Select 45°, 90°, and 135° reference points on or out toward the horizon
4. From straight and level flight, initiate a shallow climbing turn by simultaneously increasing bank and pitch slowly, planning to achieve maximum pitch (approx. 13°-15°) and 15° bank angle at the 45° reference point. If the Original turn is to the left, a slight amount of right rudder and neutral aileron will be required to maintain coordination. If the Original turn is to the right, more right rudder will be required and slight opposite aileron at the 45° reference to prevent over-banking
5. From the 45° reference point allow the bank angle to continue increasing, and pitch to decrease so that at the 90° reference point the maximum bank angle (30°) is achieved and the pitch attitude is passing through level flight at minimum airspeed
6. From the 90° reference point, allow the pitch attitude to continue decreasing and initiate a slow decrease in bank angle while continuing a descending turn in the direction of the 135° reference point where the maximum pitch down attitude (approx. 10°-12°) should be achieved with a 15° bank angle
7. From the 135° reference point, continue decreasing the bank angle while allowing the pitch to increase so that the airplane returns to the entry airspeed and altitude by the 180° reference point

### **NOTE**

**The airspeed should not exceed the entry airspeed during the turn from the 90° reference point to the 180° reference point**

8. Proceed through the 180° point with no hesitation and begin a shallow climbing turn in the opposite direction, repeating the steps outlined above
9. Complete the maneuver at entry heading, airspeed and altitude
10. Return to normal cruise flight 2400<sub>RPM</sub> / 23"<sub>MP</sub>
11. Perform Cruise Checklist

### **Standards:**

**Commercial:** Bank  $\leq 30^\circ$ , Altitude  $\pm 100$  ft., Airspeed  $\pm 10$  Kts, Heading  $\pm 10^\circ$ .

## **EIGHTS ON PYLONS**

**REF:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** To learn how to maneuver the airplane over a predetermined ground path while dividing attention inside and outside the airplane.

1. Determine the wind direction
2. Perform clearing turns and determine the pivotal altitude

### **NOTE**

**To determine the pivotal altitude, use the following calculation:**

$$\text{Pivotal Altitude} = \frac{(\text{GS Knots})^2}{13} \quad \frac{(\text{GS MPH})^2}{15}$$

3. Select a forced landing area that will allow an emergency landing from any position in the maneuver, and establish and maintain an entry speed below  $V_A$  (125<sub>KIAS</sub>)
4. Enter the maneuver on a 45° to the downwind and at a distance from the pylons that will require up to approximately 30° angle of bank at the steepest point
5. At the position where the pylon appears to be just ahead of a line extending from the pilot's eye and parallel to the airplane's lateral axis, lower the upwind wing to place the pilot's line of sight on the pylon
6. As the turn is continued, the groundspeed of the airplane will decrease as the wind changes from a tailwind to a crosswind. To keep the pylon on the reference line, the pilot must lower the altitude by pitching down. As the airplane continues to turn, the wind changes to a headwind, ground speed decreases, requiring a lower pivotal altitude to maintain the reference line on the pylon. The pilot adjusts by pitching down if necessary

### **NOTE**

**The effects of the wind on the airplane's groundspeed should be anticipated so as to smoothly adjust pitch to maintain the line of sight reference with the pylon**

7. As the airplane turns toward a downwind heading, plan to roll out to maintain a 45° ground track across the road / line in straight and level flight for 3 to 5 seconds
8. Lead the roll in on the second pylon as in the first and maintain the reference point with pitch changes to continue the maneuver
9. Maintain division of attention away from the ground reference point to continue collision avoidance as well as inside the airplane to check flight instruments for accuracy and engine instruments for proper operation

### **Standards:**

**Commercial:** Maximum bank angle 40°. Maintain pylon position using appropriate pivotal altitude, avoiding slips and skids.

## **NORMAL APPROACH AND LANDING**

**REF:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** To safely and accurately establish and maintain a stabilized approach to a landing in a designated area.

1. Complete the Landing Checklist
2. At least 2 nm from the runway, enter the traffic pattern at traffic pattern altitude on a 45° entry to the downwind, maintaining ½ mile distance from the runway on the downwind leg
3. Abeam the point of intended landing, reduce throttle to 14"MP
4. Below  $V_{FE}$  (78<sub>KIAS</sub>) extend flaps to 14°
5. Maintain 75<sub>KIAS</sub> and 300-500 ft./min descent
6. When the touchdown point is 45° to the rear of the wing root (or as appropriate for wind conditions), commence a turn to the base leg
7. Extend flaps to 28° and slow the aircraft to 70<sub>KIAS</sub>
8. Visually verify that the final approach (including the extended final and the opposite base leg) is clear, and then turn to final
9. When on short final, begin slowing so as to touch down at 51<sub>KIAS</sub> (+1/2 gust factor if appropriate). Trim as necessary

### **NOTE**

**The approach must be stabilized by 200 feet. If not, execute a go-around**

10. At the round out, commence reducing power to idle, continuing the flare to touch down on the main wheels first, holding the nose wheel off with back pressure throughout the rollout; allow settling of nose wheel gently.
11. Maintain directional control throughout the rollout, slowing sufficiently before turning onto a taxiway

### **Standards:**

**Private:** Airspeed +10/-5 Kts. Touch Down: 400 ft.

**Commercial:** Airspeed ±5 Kts. Touch Down 200 ft.



## **CROSSWIND APPROACH AND LANDING**

**REF:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** To safely and accurately establish and maintain a stabilized approach to a landing, correcting for a crosswind during the approach, touchdown, and rollout.

1. Complete the Landing Checklist
2. At least 2 nm from the runway, enter the traffic pattern at traffic pattern altitude on a 45° entry to the downwind, maintaining ½ mile distance from the runway on the downwind leg
3. Abeam the point of intended landing, reduce throttle to 14"MP
4. Below  $V_{FE}$  (78<sub>KIAS</sub>) extend flaps to 14°
5. Extend flaps to 28° and slow the aircraft to 75<sub>KIAS</sub>
6. Visually verify that the final approach (including the extended final and the opposite base leg) is clear, and then turn to final
7. When landing is assured, establish and maintain 70<sub>KIAS</sub> (+1/2 gust factor if appropriate). Trim as necessary

### **Note**

**In gusty wind conditions, consider using no more than 28° of flaps**

**The approach must be stabilized by 200 feet. If not, execute a go-around**

### **Use the wing-low method (side slip) for drift control**

8. At the round out, reduce power to idle and continue the flare to touch down on the upwind main wheel first, followed with the downwind main wheel touchdown while holding the nose wheel off with back pressure throughout the rollout, allow settling gently
9. Increase aileron deflection into the wind while maintaining directional control throughout the rollout, slowing sufficiently before turning onto a taxiway

### **Standards:**

**Private:** Airspeed +10/-5 Kts. Within 400 ft. of intended landing point

**Commercial:** Airspeed ±5 Kts. Within 200 ft. of intended landing point

## **SHORT-FIELD APPROACH AND LANDING**

**REF:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** To safely and accurately establish and maintain a stabilized approach to a landing, obtaining maximum performance by stopping in a minimum distance

1. Complete the Landing Checklist
2. At least 2 nm from the runway, enter the traffic pattern at traffic pattern altitude on a 45° entry to the downwind, maintaining ½ mile distance from the runway on the downwind leg
3. Abeam the point of intended landing, reduce throttle to 14"MP
4. Below  $V_{FE}$  (78<sub>KIAS</sub>) extend flaps to 14°
5. Maintain 75<sub>KIAS</sub> and 300-500 ft./min descent
6. When the touchdown point is 45° to the rear of the wing root (or as appropriate for wind conditions), commence a turn to the base leg
7. Extend flaps to 28° and slow the aircraft to 70<sub>KIAS</sub>
8. Visually verify that the final approach (including the extended final and the opposite base leg) is clear, and then turn to final
9. When landing is assured, extend flaps to 42° establish and maintain 65<sub>KIAS</sub> (+1/2 gust factor if appropriate). Trim as necessary

### **NOTE**

**The approach must be stabilized by 200 feet. If not, execute a go-around**

10. Before the round out, begin smoothly reducing power, continuing the power reduction during the round out while increasing pitch to maintain a constant glide path to the desired touchdown point

### **NOTE**

**Avoid closing the throttle rapidly, which may result in an immediate increase in the rate of decent and a hard landing**

11. Touch down at minimum controllable airspeed, with the throttle at idle position, on the main wheels first, plan for minimum float
12. Immediately after touchdown, apply maximum aerodynamic braking
13. Applying heavy braking when nose wheel is on runway.

### **Standards:**

**Private:** Airspeed +10/-5 Kts. Within 200 ft. of intended landing point

**Commercial:** Airspeed  $\pm 5$  Kts. Within 100 ft. of intended landing point

## **SOFT-FIELD APPROACH AND LANDING**

**REF:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** To develop the student's ability to safely and accurately maintain a stabilized approach to land the airplane obtaining maximum performance by touching down at the slowest possible airspeed.

1. Complete the Landing Checklist
2. Execute a Traffic Pattern Entry
3. Abeam the point of intended landing, reduce throttle to 14"MP
4. Below VFE (78<sub>KIAS</sub>) extend flaps to 14°
5. Maintain 75<sub>KIAS</sub> and 300-500 ft./min descent
6. When the touchdown point is 45° to the rear of the wing root (or as appropriate for wind conditions), commence a turn to the base leg
7. Extend flaps to 28° and slow the aircraft to 70<sub>KIAS</sub>
8. Visually verify that the final approach (including the extended final and the opposite base leg) is clear, and then turn to final
9. When landing is assured, establish and maintain 65<sub>KIAS</sub> (+1/2 gust factor if appropriate). Trim as necessary

### **NOTE**

**The approach must be stabilized by 200 feet. If not, execute a go-around**

10. Power may be used to slow the rate of descent and soften the touchdown
11. Touchdown on the main wheels first, holding the nose wheel off with back pressure throughout the rollout
12. Taxi off runway without stopping and with the use of little or no brakes.

### **NOTE**

**Conduct all taxi operations with the control wheel fully aft. On softer surfaces, additional power may be needed to maintain taxi speed and to avoid becoming stuck. Avoid the use of brakes to prevent imposing a heavy load on the nose gear, causing the nose gear to "dig" into the soft surface.**

### **Standards:**

**Private:** Airspeed +10/-5 Kts

**Commercial:** Airspeed ±5 Kts

## **POWER-OFF 180° ACCURACY**

### **APPROACH AND LANDING**

**REF:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** To demonstrate the judgment, technique, and skill necessary for accurately flying the airplane, without power, to a safe landing.

1. Complete the Landing Checklist
2. At least 2 nm from the runway, enter the traffic pattern at pattern altitude on a 45° entry to the downwind, maintaining ½ mile distance from the runway on the downwind leg
3. Abeam the point of intended landing, reduce throttle to idle, slowing to  $V_G$  (80<sub>KIAS</sub>), flaps retracted (0°), and then commence a descent at 80<sub>KIAS</sub>, Trim as necessary
4. At a point appropriate for wind conditions, commence a turn to the base leg using a medium to steep bank angle (20°-30°)

#### **NOTE**

**Establish and then adjust the base leg toward, perpendicular, or away from the intended touchdown point, considering altitude and wind conditions, so as to conserve or dissipate altitude as necessary to reach the intended touchdown point**

5. On base leg, maintain glide (80<sub>KIAS</sub>). The base leg turn is not a fixed point on the ground and may be adjusted to accommodate varying wind conditions
6. Visually verify that the final approach (including the extended final and the opposite base leg) is clear, and then turn to final
7. When landing is assured, slow below  $V_{FE}$  (78<sub>KIAS</sub>) and extend flaps to 42° establish and maintain 65<sub>KIAS</sub> (+1/2 gust factor if appropriate). Trim as necessary

#### **NOTE**

**The approach must be stabilized by 200 feet. If not, execute a go-around**

8. At the round out, continue the flare to touch down on the main wheels first, holding the nose wheel off with back pressure throughout the rollout; allow settling gently
9. Maintain directional control throughout the rollout, slowing sufficiently before turning onto a taxiway

#### **Standards:**

**Private:** Airspeed +10/-5 Kts. Touch Down: 400 ft.

**Commercial:** Airspeed ±5 Kts. Touch Down 200 ft.

## **NO FLAP APPROACH AND LANDING**

**REF:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** To safely and accurately establish and maintain a stabilized NO FLAP approach to a landing in a designated area.

1. Complete the Landing Checklist
2. Execute a Traffic Pattern Entry
3. Abeam the point of intended landing, reduce throttle to 14" MP
4. Maintain 90<sub>KIAS</sub> and 300-500 ft./min descent
5. When the touchdown point is 45° to the rear of the wing root (or as appropriate for wind conditions), commence a turn to the base leg
6. Visually verify that the final approach (including the extended final and the opposite base leg) is clear, and then turn to final and slow to 75<sub>KIAS</sub>

### **NOTE**

**The approach must be stabilized by 200 feet. If not, execute a go-around**

7. At the round out, commence reducing power to idle, continuing the flare to touch down on the main wheels first, holding the nose wheel off with back pressure throughout the rollout; allow settling of nose wheel gently.
8. Maintain directional control throughout the rollout, slowing sufficiently before turning onto a taxiway

## **GO-AROUND / REJECTED LANDING**

**REF:** FAA-H-8083-3 (Airplane Flying Handbook)

**Objective:** To develop the ability to safely transition at a critical time from the approach and landing phase to the climb.

1. Upon deciding to go-around:
2. Smoothly advance the throttle to full power with propeller full forward
3. Maintain directional control and runway centerline with the rudder
4. Accelerate to and climb at  $V_X$  (70<sub>KIAS</sub>) until obstacles are cleared
5. At safe altitude retract flaps and accelerate to  $V_Y$  (80<sub>KIAS</sub>)
6. At 1000' AGL, decrease pitch to establish and maintain 90<sub>KIAS</sub> climb and set climb power (2600<sub>RPM</sub> / 26"MP)
7. Maintain directional control and proper wind-drift correction throughout the climb
8. Execute an appropriate departure procedure, or remain in the traffic pattern as appropriate
9. After leaving the traffic pattern, complete the Climb Checklist

### **IF REMAINING IN THE PATTERN**

10. At 700' AGL turn to crosswind
11. Continue climb to TPA (1,050 feet at 33N) and turn downwind, reduce power to 18"MP / 2400<sub>RPM</sub> trim as necessary
12. Complete the Go Around Checklist

### **Standards:**

**Private:** Airspeed  $V_Y + 10/-5$  Kts.

**Commercial:** Airspeed  $V_Y \pm 5$  Kts.