



DA20 C1 Eclipse Training Manual



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1 Aircraft Systems

1.1 Engine

The DA20-C1 is equipped with a Continental, 4-cylinder, IO-240-B (fuel injected, opposed, 239.8 cubic inch) engine rated at 125 horsepower at 2800 RPM. The engine is direct drive (crankshaft connected directly to the propeller), horizontally opposed (pistons oppose each other), piston driven, fuel injected and normally aspirated (no turbo or supercharging). Engine ignition is provided through the use of engine-driven magnetos, which are independent of the aircraft's electrical system and each other and utilize impulse coupling.

- C** Continental IO-240-B
- H** Horizontally Opposed 4-cylinder
- A** Air Cooled
- N** Normally Aspirated
- D** Direct Drive

1.2 Oil

The acceptable range for oil in the DA20-C1 is 4-6 quarts. Never depart with the oil indicating below 4 quarts. Use only oil approved by the flight school, never use open oil containers and risk contamination. The engine has high pressure wet sump lubrication. The oil is pumped by a mechanical, engine driven pump. An oil dipstick indicates the level of oil in the tank. The dipstick is marked for US quarts.

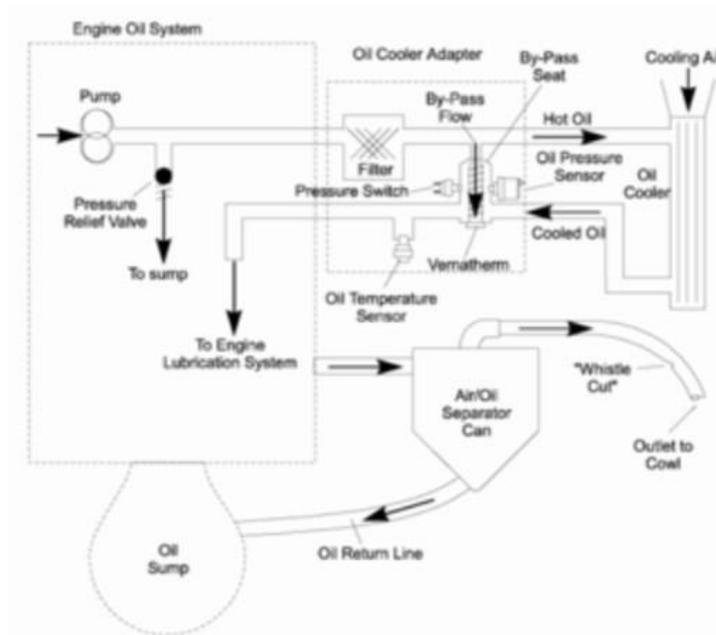


Figure 1: Diamond DA20 C1 oil system diagram

1.3 Propeller

The DA20-C1 is equipped with a Sensenich two-bladed, Fixed pitch, Wood Propeller with a Copyright © 2019 by Midwest Air LLC

diameter of 76 inches. Maximum RPM (red line) is 2800 RPM.

1.4 Landing Gear

The DA20-C1 is equipped with Fixed tricycle type landing gear. The main gear is mounted to aluminum spring struts mounted to the fuselage below the wings. A castering nose wheel mounted on the front of the aircraft steers 60 degrees either side.

Instructor's Note: Castering means the nose gear is not connected to the rudder pedals, it simply turns when we apply rudder or brake pressure.

1.5 Brakes

The hydraulically operated disc brakes act on the wheels of the main landing gear. The wheel brakes are operated individually using the toe-brake pedals either on the pilot's or on the copilot's side. If either the left or right wheel brake system on the pilot's side fail, the copilot's brakes fail too. If the co-pilots brake master cylinder or input lines to the pilots master cylinder fails the pilots brakes will still operate.

The parking brake knob is located on the center console in front of the throttle quadrant, and is pushed up when the brakes are to be released. To set the parking brake, pull the knob down to the stop. Repeated pushing of the toe-brake pedals will build up the required brake pressure, which will remain in effect until the parking brake is released.

1.6 Flaps

The DA20-C1 is equipped with Electric Plain flaps with 3 positions 0, Take off, Landing controlled by a three position flap operating switch on the instrument panel. The electric flap actuator is protected by a circuit breaker (5 Amp), located on the right side of the instrument panel, which can be manually tripped to disable the system.

1.7 Pitot Static System

The pitot pressure is measured on the leading edge of a pitot mast below the left wing. The static pressure is measured by the same mast. For protection against water and humidity, water sumps are installed within the line. These water sumps are accessible beneath the left seat shell.

1.8 Stall Warning Horn

A stall warning horn, located in the left instrument panel, will operate at a minimum airspeed of 5kts before a stall. The horn grows louder as the speed approaches the stall speed. The horn is activated by air from a suction hose that connects to a hole in the leading edge of the left wing. The hole has a red circle around it. The stall warning hole should be plugged whenever the aircraft is parked to prevent contamination and subsequent malfunction of the stall warning system.

1.9 Fuel System

The aluminum tank is located behind the seats, below the baggage compartment. It holds a total of 24.5 gallons of 100LL, 24 of which are usable. A grounding stud is located on the underside of the fuselage near the trailing edge of the left hand wing. The tank vent line runs

from the filler neck through the fuselage bottom skin to the exterior of the airplane. The vent line is the translucent plastic hose adjacent to the left wing root. The tank has an integral sump which must be drained prior to each flight, by pushing up on the brass tube which protrudes through the underside of the fuselage.

Fuel is gravity fed from these outlets to a filter bowl (gascolator) and then to the electric fuel pump. The filter bowl must be drained prior to each flight, by pushing up on the black rubber tube that protrudes through the underside of the fuselage. An electric fuel pump primes the engine for engine starting (Prime ON) and is used for low throttle operations (Fuel Pump ON). When the pump is OFF, fuel flows through the pump internal bypass. From the electric pump, fuel is delivered to the engine's mechanical fuel pump by the fuel supply line. Fuel is metered by the fuel control unit.

The DA20-C1 is equipped with a DUKES constant flow, vane type, two speed, and electric fuel pump. This pump emits an audible whine when it is switched on. The pump's high speed setting is used for priming the engine prior to engine start. The prime setting is selected by turning the FUEL PRIME switch ON. An amber annunciator indicates that FUEL PRIME ON is selected. The pump's low speed setting is required for maintaining positive fuel supply system pressures at low throttle settings (approx. 1000RPM and less). Turning the priming pump on while the engine is running, will enriches the mixture considerably. which may cause rough engine operation or engine stoppage. It is therefore recommended that for normal operations, the FUEL PRIME be turned OFF.

Instructor's Note: Never dump sumped fuel back into the aircraft unless your strainer has been cleaned prior to taking a fuel sample.

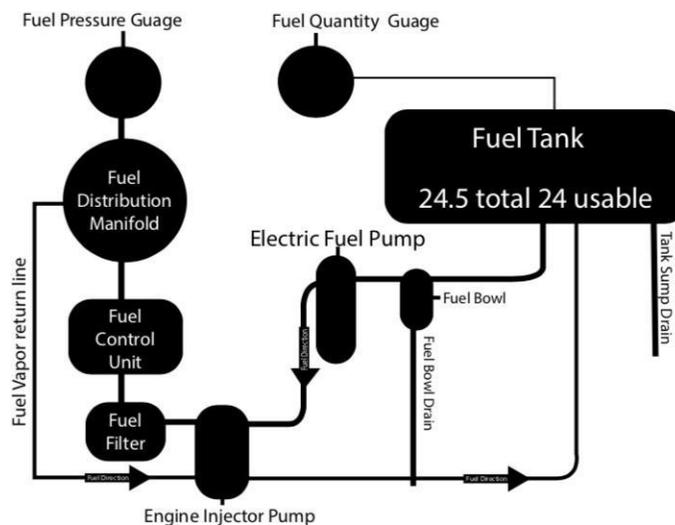


Figure 2: Diamond DA20-C1 fuel system diagram

1.10 Electrical System

A 12 V battery is connected to the master bus via the battery circuit breaker (50 amps). The 40 amp alternator is attached to the engine near the propeller hub. The alternator feeds the main bus via the generator circuit breaker (50 Amps). Both circuit breakers can be triggered manually. The GEN warning light is activated by an internal voltage regulator monitoring circuit and illuminates when a generator fault occurs.

The voltmeter indicates the status of the electrical bus. It consists of a dial that is marked numerically from 8-16 volts in divisions of 2. The scale is divided into three colored arcs to indicate the seriousness of the bus condition. These arcs are:

| | |
|------------------|-----------------------|
| Red | for 8.0 - 11.0 volts |
| Yellow | for 11.0 - 12.5 volts |
| Green | for 12.5 - 16.0 |
| volts Redline | at 16.1 volts |

The ammeter indicates the charging (+) and discharging (-) of the battery. It consists of a dial, which is marked numerically from -60 to 60 amps. The GEN warning light (red) illuminates during alternator failure; with no output from the generator the **only remaining power source is the battery (20 amps for 30 minutes)**

1.11 Ignition System

The engine is provided with two independent ignition systems. The two engine driven magnetos are independent from the power supply system, and are in operation as soon as the propeller is turning and the ignition switch is not off. This ensures safe engine operation even in case of an electrical power failure.

1.12 Garmin G500 System

The G500 is comprised of six main components:

- Primary Flight Display (PFD, left) and Multi-Function Display (MFD, right)
- Attitude Heading Reference System (AHRS)
- Air Data Computer
- (ADC) Magnetometer
- Temperature Probe
- Garmin GNS 430 GPS

The PFD (left) shows primary flight information in place of traditional pitot-static and gyroscopic instruments, and also provides an HSI for navigation.

The Attitude Heading Reference System (AHRS) contains tilt sensors, accelerometers, and rate sensors similar to our modern cell phones to provide attitude and heading information on the PFD.

The Air Data Computer (ADC) compiles information from the pitot-static system and an outside air temperature sensor to provide pressure altitude, airspeed, vertical speed, and outside air temperature on the PFD.

The magnetometer senses the earth's magnetic field and sends data to the AHRS for

processing to determine the aircraft's magnetic heading.

The temperature probe provides outside air temperature (OAT) data to the ADC. The Garmin GNS 430 GPS provides input to the AHRS and PFD/MFD.

G500 equipped Diamonds do not have a conventional turn coordinator. A slip-skid indicator is located at the top of the attitude indicator. Step on the "brick" instead of the "ball". Use the reference lines and the magenta line that appears above the heading indicator to identify a standard rate or half-standard rate turn. Outside air temperature (OAT) displays on PFD under the airspeed tape. Ground track can be identified on the heading indicator by a small magenta diamond near the lubber line (only visible when ground track is different than heading). The digital altitude and airspeed readouts are very sensitive and can cause some pilots to continuously make corrections for insignificant deviations.



Figure 3: Garmin G500

2 Performance, Weight & Balance

2.1 Airspeed Limitations

| Speed | KIAS | Remarks |
|--|------|---|
| V _A Maneuvering Speed | 106 | Do not make full or abrupt control movement above this speed. Under certain conditions the airplane may be overstressed by full control movement. |
| V _{FE} (Takeoff) | 100 | Do not exceed this speed with flaps in takeoff position. |
| V _{FE} (Landing) | 78 | Do not exceed this speed with flaps in landing position. |
| V _{NO} Maximum Structural Cruising Speed | 118 | Do not exceed this speed except in smooth air, and then only with caution. |
| V _{NE} Never Exceed Speed | 164 | Do not exceed this speed in any operation. |
| V _{SO} Stall Speed (Landing Configuration) | 34 | Minimum steady flight speed at which the airplane is controllable in the landing configuration. |
| V _S Stall Speed (Clean Configuration) | 42 | Minimum steady flight speed at which the airplane is controllable in the clean configuration. |
| V _G Best Glide | 73 | Airspeed for best glide angle Wing Flaps in CRUISE position. |
| V _X | 57 | Best Angle of Climb. |
| V _Y | 68 | Best Rate of Climb. |

2.2 Weight & Balance

| | |
|---------------------------|---|
| Reference Datum (RD): | An imaginary vertical plane from which all horizontal distances for the center of gravity calculations are measured. It is the plane through the leading edge of the wing root rib, perpendicular to the longitudinal axis of the airplane. |
| Station: | A defined point along the longitudinal axis which is generally presented as a specific distance from the reference datum. |
| Lever Arm: | The horizontal distance from the reference datum to the center of gravity (of a component). |
| Moment: | The weight of a component multiplied by its lever arm. |
| Center of Gravity (CG): | Point of equilibrium for the airplane weight. |
| CG position: | Distance from the reference datum to the CG. It is determined by dividing the total moment (sum of the individual moments) by the total weight. |
| Center of Gravity Limits: | The CG range within which an airplane with a given weight must be operated. |
| Usable Fuel: | The amount of fuel available for the flight plan calculation. |
| Unusable Fuel: | The amount of fuel remaining in the tank, which cannot be safely used in flight. |
| Empty Weight: | Weight of the airplane including unusable fuel, all operating fluids and maximum amount of oil. |
| Useful Load: | The difference between take-off weight and empty weight. |
| Maximum Take-off Weight: | Maximum weight permissible for take-off. |

| | |
|---------------------------------------|--------------------|
| Maximum Ramp Weight | :1770 lbs (803 kg) |
| Maximum Takeoff Weight | :1764 lbs (800 kg) |
| Maximum Landing Weight | :1764 lbs (800 kg) |
| Maximum Weight in Baggage Compartment | :44 lbs (20 kg) |
| Weight of 100LL Per Gallon | :6 lbs |
| Weight of Oil Per Gallon | :7.5 lbs |

3 DA20 Procedures guide

3.1 Passenger Briefing

- S** Safety belt / harness usage
- A** Air vents – location and usage
- F** Fire extinguisher – location and usage
- E** Exits – canopy operation
- T** Talking – when to quiet and listen to radio
- Y** "Your questions?" – anything they want to ask

Other notes:

- **NO SMOKING**
- Discuss pilot-in-command (PIC) authority, training/checkride

3.2 Flight Instrument Check

- Airspeed – reading zero
- Attitude indicator – blue over brown within 5 degrees in 5 minutes
- Altimeters – set & crosscheck (current baro setting) within 75 feet of field elevation
- VSI – reading zero (up to 100' deviations are approved but must be taken into account during flight)
- Turn coordinator – wings level ball in the center
- HSI/DG – aligned with the compass
- Compass – no cracks no leaks no bubbles, deviation card present

3.3 Flight instrument Check During Taxi

- Turn coordinator indicating a turn
- Inclinometer (Ball) indicating a skid
- Compass swinging freely
- HSI/DG turning freely

3.4 Pre-Takeoff Briefing

Engine failure or abnormality prior to rotation:

- Abort takeoff – throttle immediately closed Brake as required stop straight ahead

- If not enough runway to stop: Mixture to cutoff, fuel shut off, magnetos, and battery master off avoid obstacles

Engine failure after rotation with sufficient runway remaining for a complete stop:

- Throttle immediately closed
- Land straight ahead, brake as required

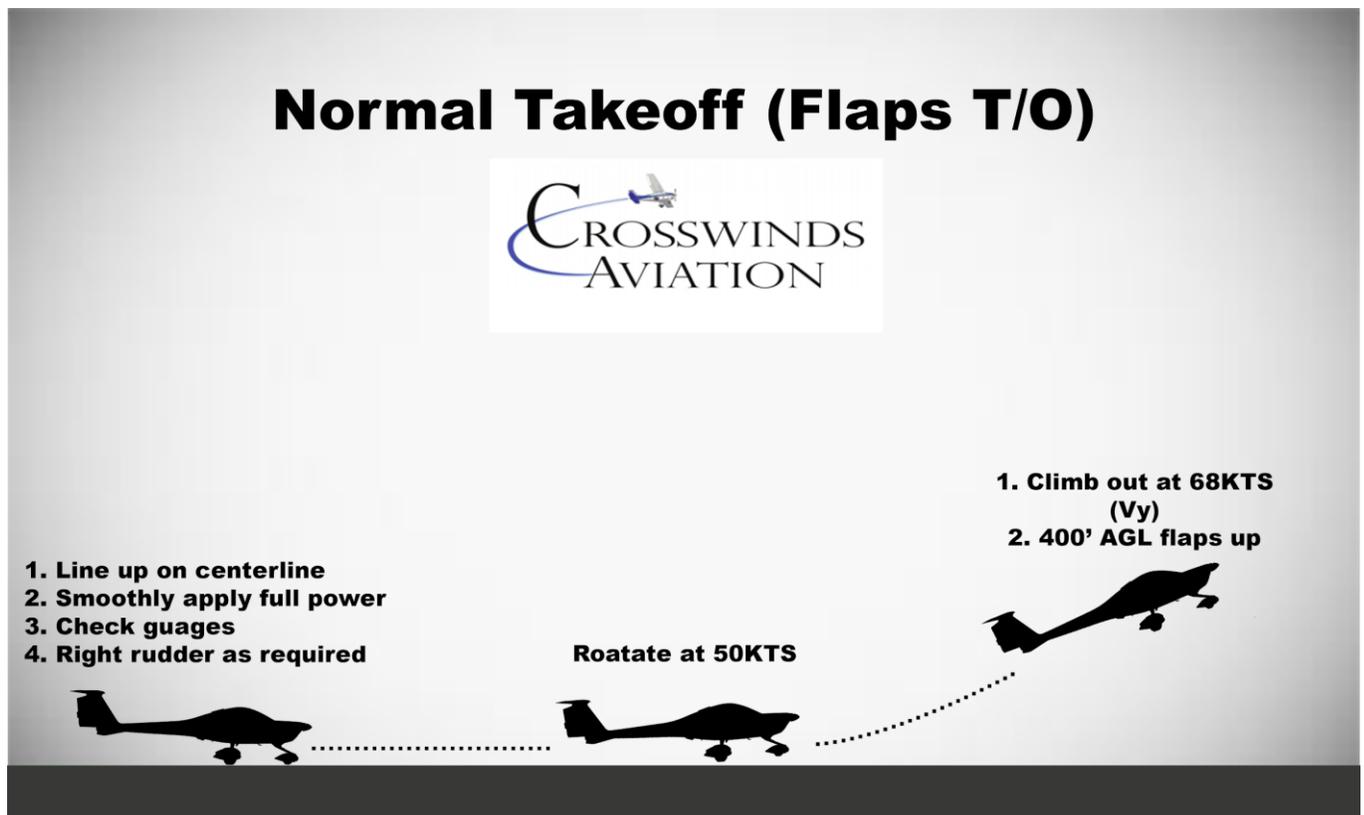
Engine failure after rotation with no runway remaining:

- Maintain control/pitch for best glide
- Only shallow turns to avoid obstacles
- Flaps as necessary for safe touchdown
- Throttle closed
- Mixture to cutoff
- Fuel shut off, magnetos, and battery master off
- Touchdown at lowest speed possible

4 Takeoff Procedures

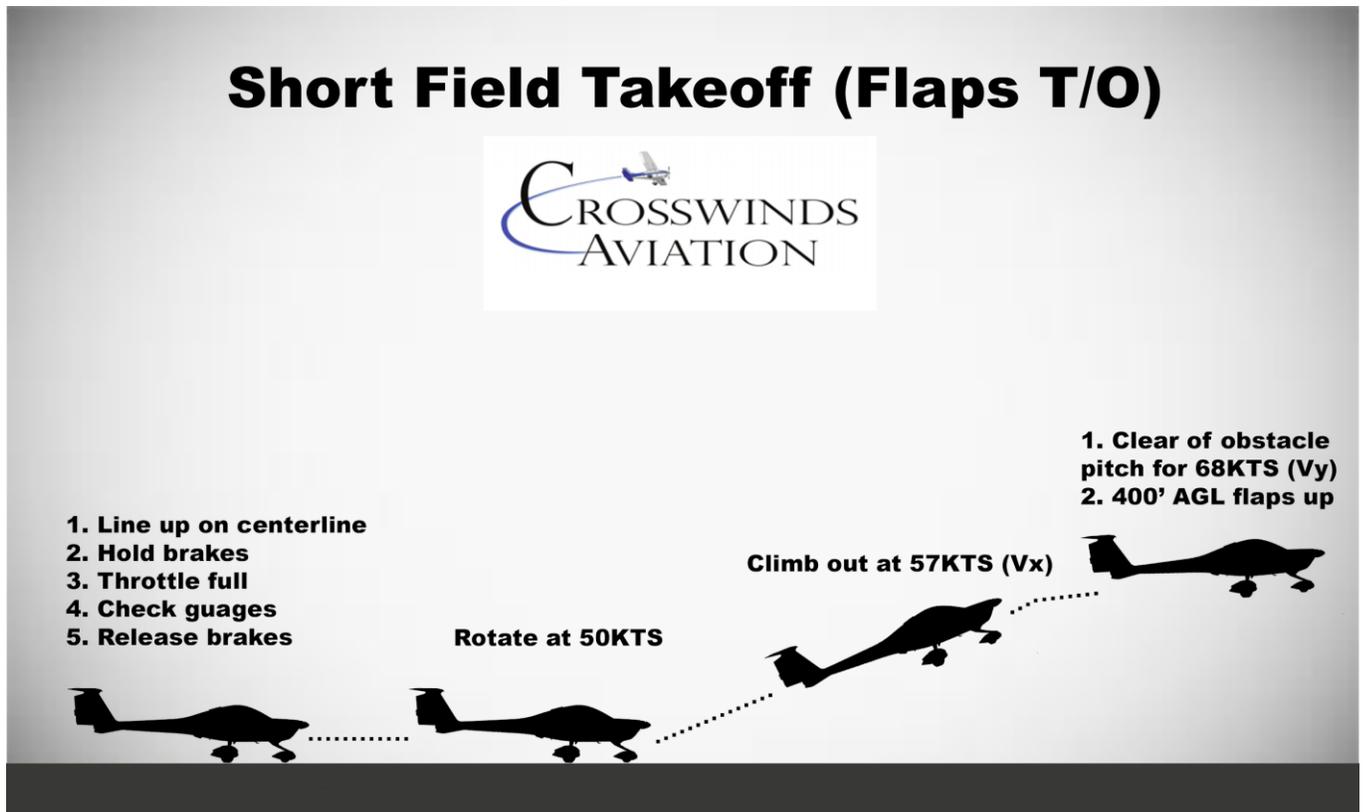
4.1 Normal Takeoff (Flaps T/O)

1. Select Flaps T/O°
2. Line up on centerline positioning controls for wind
3. Smoothly apply full power
4. Check engine gauges
5. Right rudder as required for turning tendencies
6. *“Airspeed Alive”*
7. Start slow rotation at 44 KIAS
8. Accelerate to 68 KIAS (V_Y)
9. 400' AGL – Flaps cruise.
10. 1,000' AGL – *“After Takeoff Checklist”*



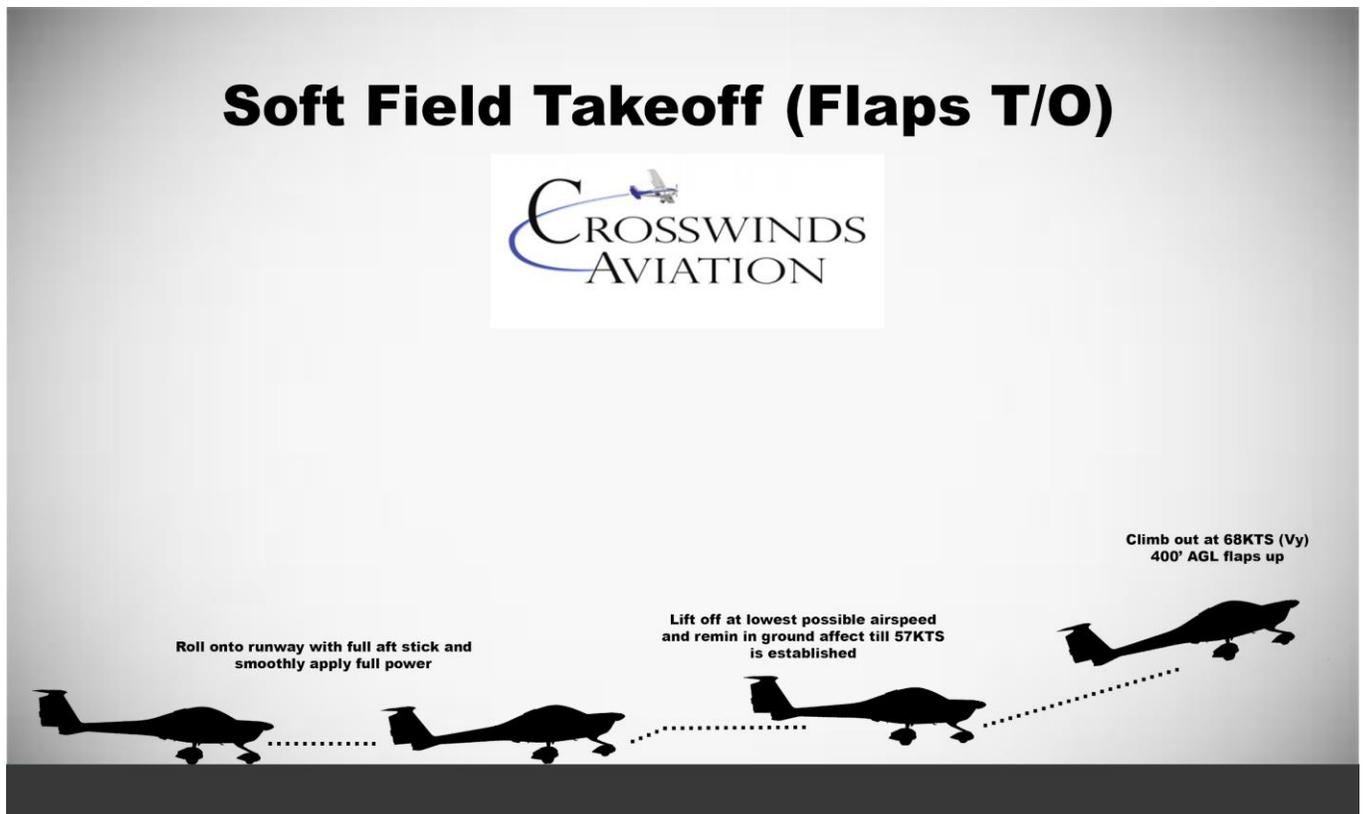
4.2 Short Field Takeoff (Flaps T/O)

1. Select Flaps T/O°
2. Line up on centerline positioning controls for wind
3. Hold brakes
4. Smoothly apply full power
5. Check engine gauges
6. Release brakes
7. *“Airspeed Alive”*
8. Briskly rotate at 51 KIAS
9. Accelerate to 57 KIAS (V_x)
10. When clear of obstacles, accelerate to 68 KIAS (V_y)
11. 400' AGL – Flaps cruise.
12. 1,000' AGL – *“After Takeoff Checklist”*



4.3 Soft Field Takeoff (Flaps T/O)

1. Select Flaps T/O°
2. Roll onto runway with full AFT stick – minimum braking – do not stop
3. Smoothly apply full power holding full AFT on the stick – check engine gauges
4. As nose lifts off, ease back pressure (keep nose wheel off the ground)
5. Lift off at the lowest possible airspeed – remain in ground effect
6. In ground effect, accelerate to 57 KIAS (V_x), then begin climb
7. When clear of obstacles, accelerate to 68 KIAS (V_y)
8. 400' AGL – Flaps cruise.
9. 1,000' AGL – “After Takeoff Checklist”



5 Landing Procedures

5.1 VFR Landing Briefing Procedure

Announce verbally:

1. Type of Approach & Landing Runway
2. Aiming & Touchdown Point
3. Wind Direction & Speed Pattern Altitude
4. Go-Around Criteria & Plan

Example: “This will be a normal flaps full landing on runway 13 with an intended touchdown point of the one thousand foot markers, aiming point will be 3 stripes prior, we can expect a left crosswind of 5 knots”.

Stabilized Approach

Definition: A stabilized approach is one in which the pilot establishes and maintains a constant angle glide-path towards a predetermined point on the landing runway. It is based on the pilot’s judgment of certain visual cues, and depends on a constant final descent airspeed and configuration (FAA-H-8083-3A, p.8-7).

Approach Gust factors:

Slightly higher approach speeds should be used under turbulent or gusty wind conditions. Add $\frac{1}{2}$ the gust factor to the normal approach speed. For example, if the wind is reported 8 gusting to 18 knots, the gust factor is 10 knots. Add $\frac{1}{2}$ the gust factor, 5 knots in this example, to the normal approach speed.

5.2 Before Landing Checklist

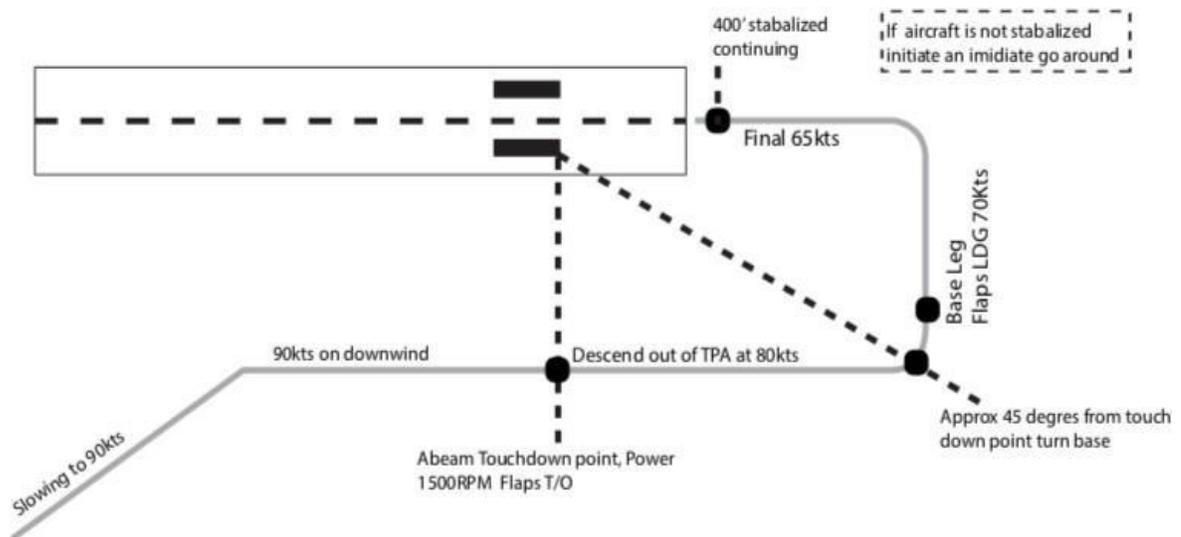
This is a memory item that needs to get memorized.

Announce verbally:

1. Seat belts – fastened
2. Mixture set – RICH
3. Fuel pump – ON
4. Gen/Bat Master – ON
5. Magnetos – BOTH
6. Lights – as required
7. Flaps – as required

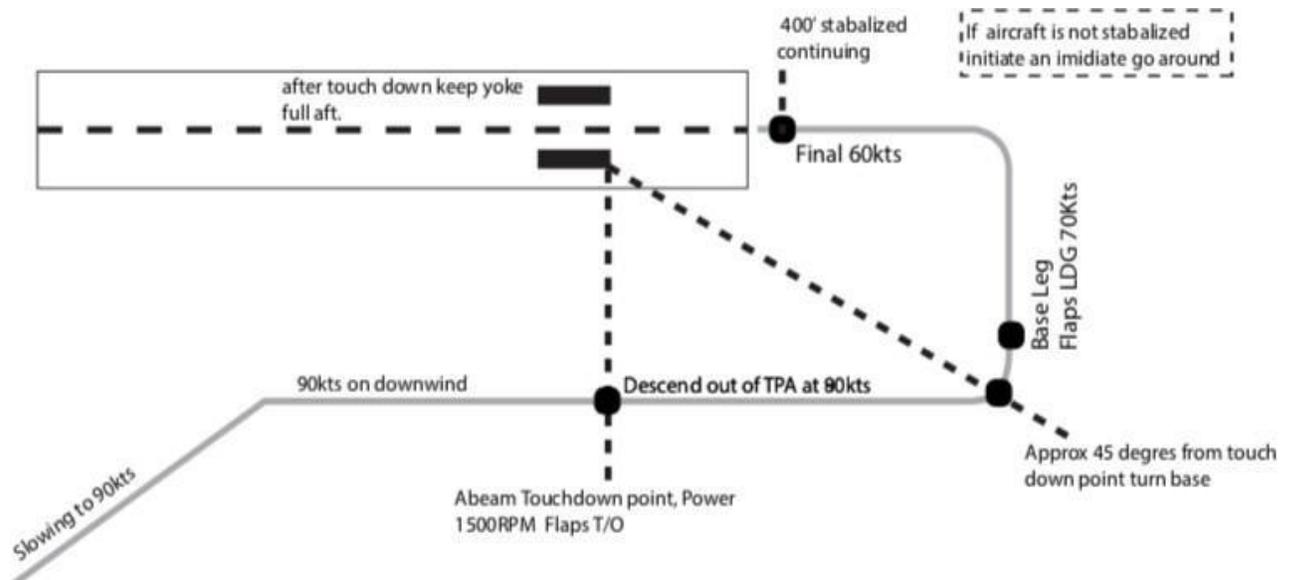
5.3 Normal Landing (Flaps LDG)

1. Complete the “*Approach Checklist*” before entering the airport; devote full attention to aircraft control and traffic avoidance
2. Slow to 90 KIAS prior to entering downwind or traffic pattern and complete the before landing checklist
3. Enter traffic pattern at published TPA (typically 1,000’ AGL)
4. Complete the “*VFR Landing Brief*” when established on the downwind
5. When abeam touchdown point, or on extended base, or on extended final (when ready to descend out of pattern altitude) – Reduce power to 1500 RPM and select Flaps T/O°
6. Descend out of pattern altitude at 80 KIAS
7. Turn from downwind to base when touchdown point is approx. 45 degrees behind (over the shoulder)
8. On base, select Flaps LDG° and slow to 70 KIAS
9. Maintain 65 KIAS on final
10. Smoothly reduce power when approaching aiming point



5.4 Short Field Landing (Flaps LDG)

1. Complete the “*Approach Checklist*” before entering the airport; devote full attention to aircraft control and traffic avoidance
2. Slow to 90 KIAS prior to entering downwind or traffic pattern and complete the before landing checklist
3. Enter traffic pattern at published TPA (typically 1,000’ AGL)
4. Complete the “*VFR Landing Checklist*” when established on the downwind
5. When abeam touchdown point, or on extended base, or on extended final (when ready to descend out of pattern altitude) – Reduce power to 1500 RPM and select Flaps T/O°
6. Descend out of pattern altitude at 80 KIAS
7. Turn from downwind to base when touchdown point is approx. 45 degrees behind (over the shoulder)
8. On base, select Flaps LDG° and slow to 70 KIAS
9. Maintain 60 KIAS on final
10. Smoothly reduce power when approaching aiming point
11. Touch down with minimal floating
12. Hold the stick full AFT, announce “simulate max braking and flaps up” (DO NOT SKID THE TIRES)



Short Field Landing (Flaps LDG)

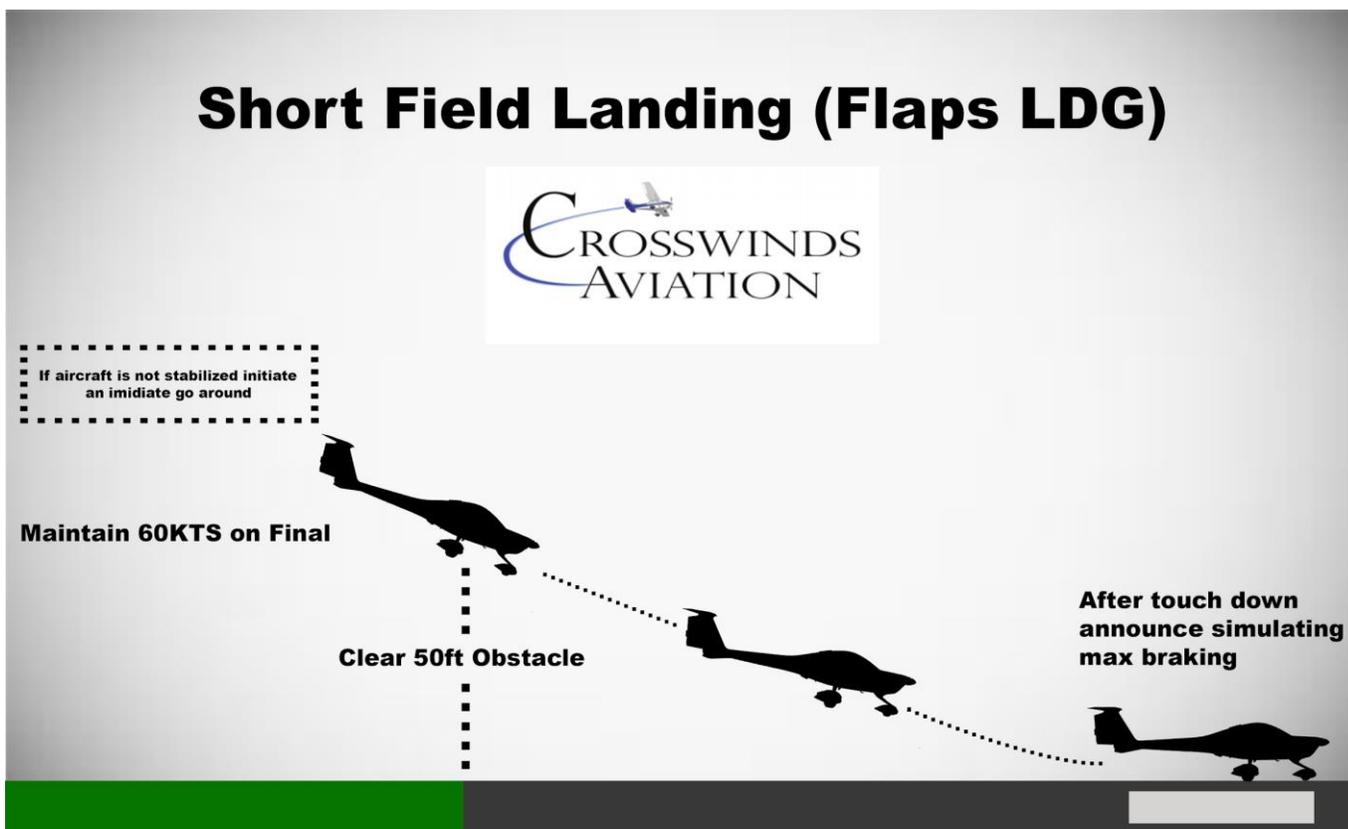


If aircraft is not stabilized initiate an imidiate go around

Maintain 60KTS on Final

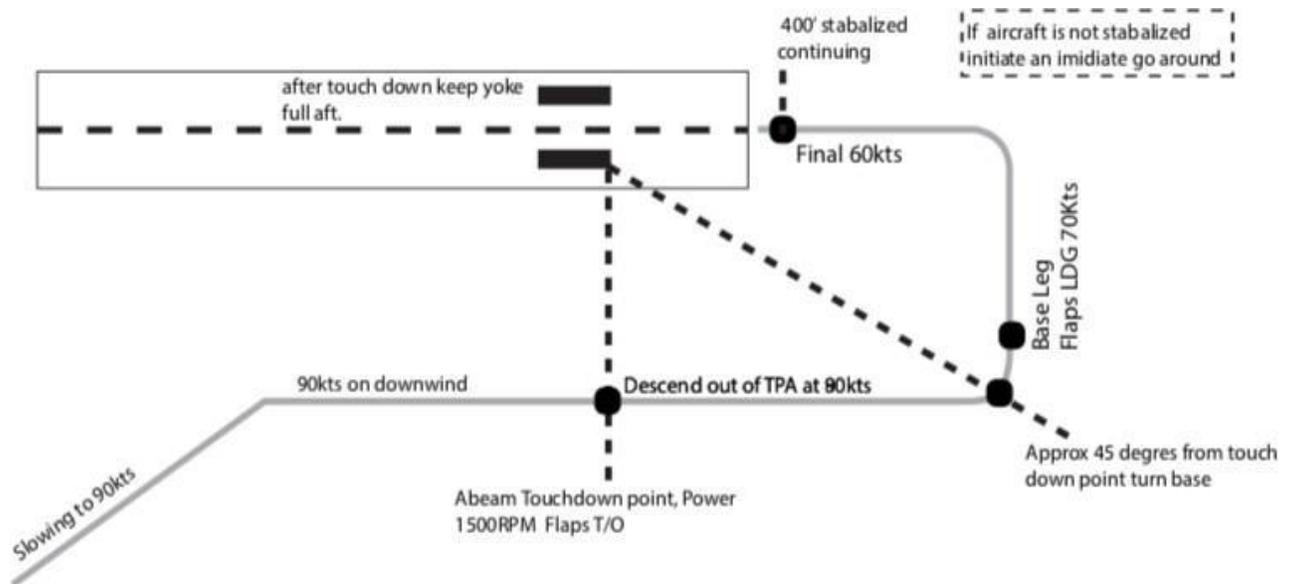
Clear 50ft Obstacle

After touch down announce simulating max braking



5.5 Soft Field Landing (Flaps LDG)

1. Complete the “*Approach Checklist*” before entering the airport; devote full attention to aircraft control and traffic avoidance
2. Slow to 90 KIAS prior to entering downwind or traffic pattern and complete the before landing checklist
3. Enter traffic pattern at published TPA (typically 1,000’ AGL)
4. Complete the “*VFR Landing Brief*” when established on the downwind
5. When abeam touchdown point, or on extended base, or on extended final (when ready to descend out of pattern altitude) – Reduce power to 1500 RPM and select Flaps T/O°
6. Descend out of pattern altitude at 80 KIAS
7. Turn from downwind to base when touchdown point is approx. 45 degrees behind (over the shoulder)
8. On base, select Flaps LDG° and slow to 70 KIAS
9. Maintain 60 KIAS on final
10. Smoothly reduce power when approaching aiming point
11. After touchdown – Gently apply full AFT stick to keep weight off the nose wheel

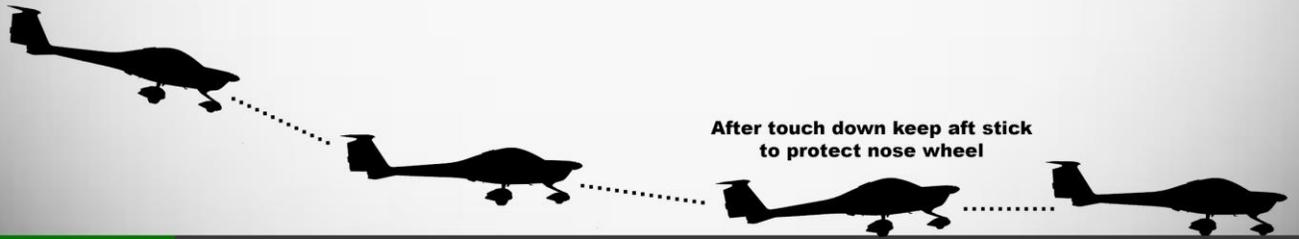


Soft Field Landing (Flaps LDG)



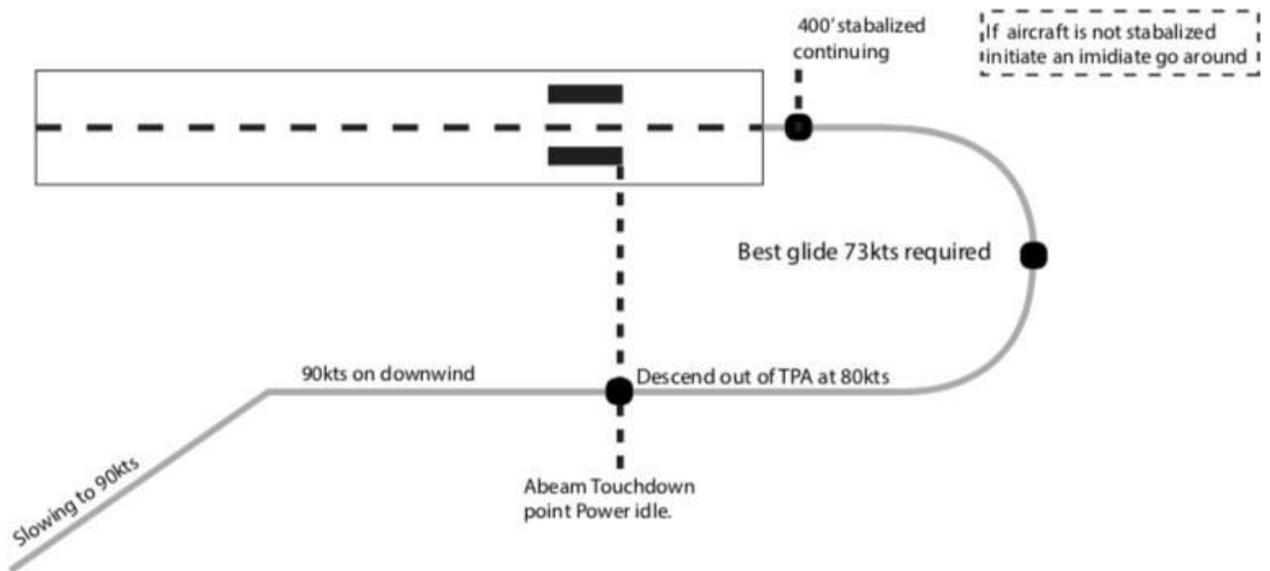
If aircraft is not stabilized initiate an imidiate go around

Maintain 60KTS on Final



5.6 Power Off 180 Procedure

1. Complete the “*Approach Checklist*” before entering the airport; devote full attention to aircraft control and traffic avoidance
2. Slow to 90 KIAS prior to entering downwind or traffic pattern and complete the before landing checklist
3. Enter traffic pattern at published TPA (typically 1,000’ AGL)
4. Complete the “*VFR Landing Brief*” when established on the downwind
5. When abeam touchdown point, or on extended base, or on extended final (when ready to descend out of pattern altitude) – Power to idle
6. Adjust pitch to maintain appropriate glide speed
7. Plan and maneuver to execute a safe approach and landing
8. Use Flaps 0, T/O°, or LDG° as necessary
9. Touchdown in normal landing attitude, at or within 200 feet beyond the specified landing point
10. After nose wheel is down, gently apply brakes



6 Emergency Procedures

6.1 Emergency Descent

1. Close the throttle and set mixture Full Forward
2. Get air speed below 118 kts
3. Roll into a 45 degree bank, allowing the nose to drop and initiating a descent
4. Allow the airspeed to stabilize at V_{NO} , execute medium bank 90 degree turns
5. Stop the emergency descent no lower than 1000' AGL and prepare for landing

Instructor's Note: The primary reason for making an emergency descent in a non-pressurized aircraft would be engine or cabin fire. While making the descent, the pilot should make an effort to perform the appropriate non-normal checklist. (Flap settings and descent speeds may change. Ask your CFI)

7 Performance Maneuvers

7.1 Steep Turns

Private ACS Requirements:

ALT +/- 100' Bank 45° +/- 5° HDG +/- 10° Speed +/- 10kts

NOTE: Minimum safe altitude for this maneuver is 1,500' AGL.

Establish **cruise** configuration and complete the pre-maneuver check.

1. Perform clearing turns
2. Set power to 2000 RPM
3. Starting speed 90-95 KIAS
4. Select a heading or reference point for rollout
5. From straight and level coordinate aileron and rudder to roll into a 45° bank.
6. Add a small amount of power (100 – 200 RPM) as you roll through 30° of bank
7. Maintain altitude and airspeed
8. Reference the horizon to assist with maintaining altitude and bank angle
9. Maintain bank angle with aileron, coordinate with rudder
10. Apply opposite aileron to counter overbanking tendency
11. Anticipate rollout by half the angle of bank (20-25 degrees)
12. Roll out using coordinated aileron and rudder pressures to straight and level flight
13. Repeat in the other direction
14. Exit at the the same altitude, airspeed, and heading at which the maneuver was started
15. Adjust power to 90-95 KIAS

7.2 Slow Flight

Private ACS Requirements:

ALT +/- 100' Bank +/- 5° HDG +/- 10° Speed 5-10kts above V_{S0}

NOTE: Minimum safe altitude for this maneuver is 1,500' AGL.

Slow flight is performed in the **landing** configuration.

1. Perform clearing turns
2. Reduce throttle to 1500 RPM
3. As airspeed decreases a gradual increase in back elevator pressure will be required to maintain altitude
4. Trim off control pressure as necessary
5. Below 78 KIAS (white arc)
6. Flaps T/O – watch for ballooning tendency, increase forward elevator as necessary to maintain altitude
7. Flaps LDG
8. Trim to relieve control pressures
9. Maintain altitude and heading
10. Slow to an airspeed that is 5 to 10 knots above published V_{S0}
11. Maintain directional control using outside visual references and inside instrument references
12. Practice gentle climbs, descents, and turns at constant airspeed

Recovery procedure

1. Gradually apply full power
2. Lower nose at a rate that will maintain altitude (0 VSI)
3. Retract flaps to T/O
4. Maintain level altitude (0 VSI)
5. Approaching 65 KIAS, retract flaps to CRUISE
6. Approaching cruise airspeed, trim as necessary
7. Complete CRUISE checklist

7.3 Power On Stalls

Private ACS Requirements:

ALT +/- 100' Bank not more than 20° HDG +/- 10°

NOTE: Minimum safe altitude for this maneuver is 1,500' AGL.

Power on stalls are performed in the **takeoff** configuration.

1. Perform clearing turns
2. Set power to 1500 RPM
3. Below 100 KIAS (white arc)
4. Flaps T/O (or flaps up)
5. Slow to 50 KIAS
6. Add 15° of bank if performing turning stalls
7. Simultaneously pitch up and increase to full power
8. Maintain coordination at all times
9. Recognize and announce symptoms of approaching stall
10. Sight, sound, feel
11. Stall warning horn activates
12. Aerodynamic buffeting

Recovery procedure

1. Reduce the Angle of Attack (AOA)
2. Release enough back pressure to break the stall
3. Level wings
4. Apply full power
5. Establish a shallow climb (100 – 200 FPM)
6. At positive rate of climb and approaching 65 KIAS retract flaps to CRUISE
7. Climb at 68 KIAS to initial altitude
NOTE: This stall may not cause any loss of altitude. In this case, lower the nose and establish a pitch attitude for a stabilized shallow climb (100 – 200 fpm) and level off at a determined altitude.
8. Complete both CLIMB and CRUISE checklists after leveling off

7.4 Power Off Stalls

Private ACS Requirements:

ALT +/- 100' Bank not more than 20° HDG +/- 10°

NOTE: Minimum safe altitude for this maneuver is 1,500' AGL.

Power off stalls are performed in the **landing** configuration.

1. Perform clearing turns
2. Set power to 1500 RPM
3. Below 100 KIAS Flaps T/O
4. Stabilize
5. Flaps LDG below 78 KIAS
6. Stabilize the aircraft in a descent at approach speed (65 KIAS)
7. After descending approx 200', reduce power to idle (Not less than 1,000 RPM)
8. Simulate landing flare by raising the nose to the horizon.
9. maintain pitch by applying constant back pressure
10. Maintain coordination at all times
11. Recognize and announce symptoms of approaching stall
12. Sight, sound, feel
13. Stall warning horn activates
14. Aerodynamic buffeting

Recovery procedure

1. Reduce the Angle of Attack
2. Level the wings using coordinated rudder and aileron
3. Gradually apply full power
4. Stop Descent
5. Retract flaps to T/O
6. Establish a shallow climb (100-200 FPM)
7. At positive rate of climb and approaching 65 KIAS
8. Retract flaps to CRUISE
9. Climb at 75 KIAS to initial altitude
10. Complete both CLIMB and CRUISE checklists after leveling off

NOTE: At any time if engine appears to drop below 1,000 RPM, add throttle to ensure engine will not stop.

8 Ground Reference Maneuvers

All ground reference maneuvers are performed at 1,000' AGL and 90 kts mimicking the traffic pattern. They are started on a downwind leg simulating traffic pattern entry and are performed in the "clean" configuration. Before descending for the maneuver it is important to visually scan the area for obstructions and a safe landing spot in case an emergency landing is necessary.

Clean

Configuration:

Flaps - 0

Mixture - Full RICH

Fuel Pump - ON

Landing Light - ON

Private ACS Requirements:

ALT +/- 100' Speed +/- 10 kts

8.1 Rectangular Course

1. Set power to maintain an airspeed of 90 KIAS
2. Maneuver is performed 1,000 AGL
3. Enter the maneuver 45 to the downwind with the first circuit to the left

Downwind

1. Roll wings level, parallel to the boundary
2. Maintain distance (about 1/2 mile) from boundary
3. At field boundary edge, turn first crosswind leg
4. Start with steep bank
5. Reduce bank angle gradually during the turn

First Crosswind Leg (Base)

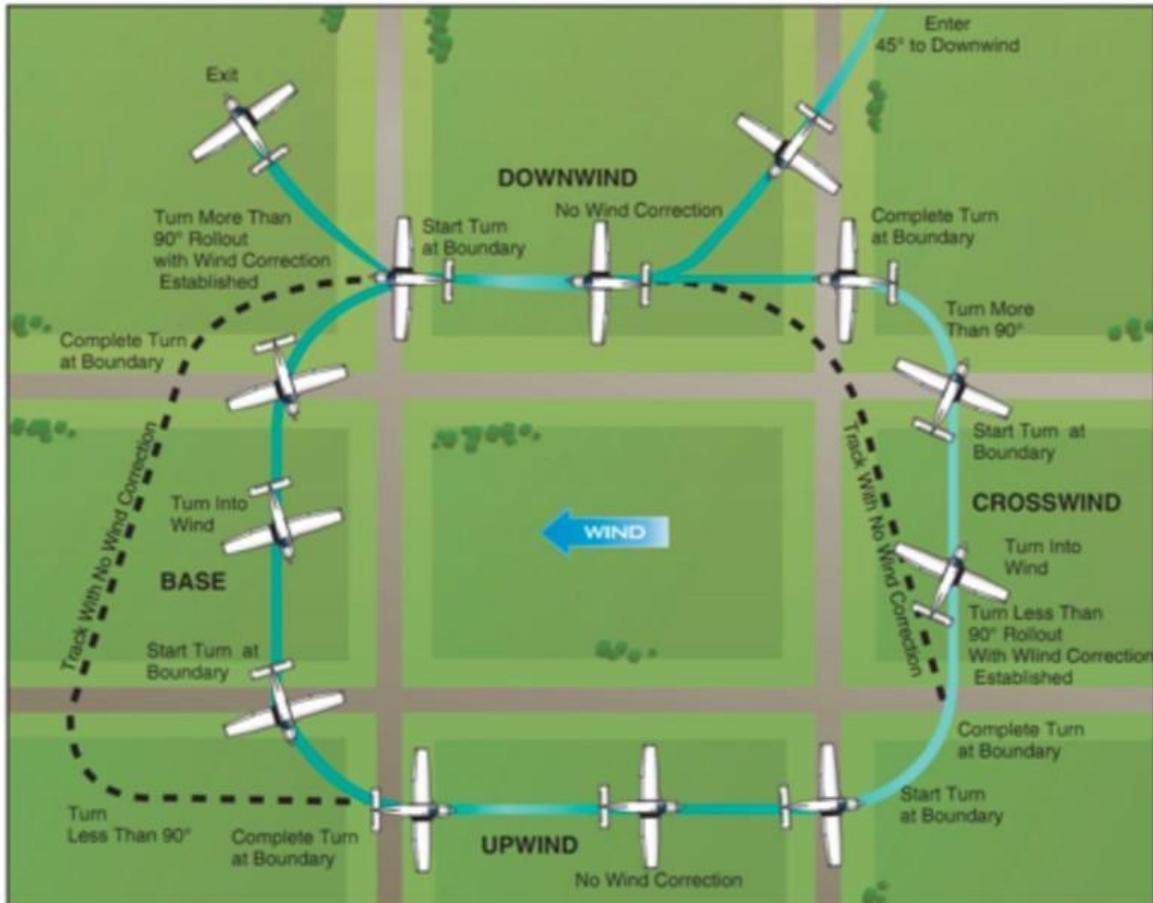
1. Roll out, wings level crabbing toward the boundary
2. Manage crab angle to maintain 1/2 mile distance from boundary
3. At field boundary edge, turn upwind
4. Start with medium bank
5. Reduce bank angle gradually during the turn as ground speed decreases

Upwind

1. Roll wings level, parallel to the boundary
2. At field boundary edge, turn second crosswind leg
3. Start with shallow bank
4. Increase bank angle gradually during the turn as ground speed increases

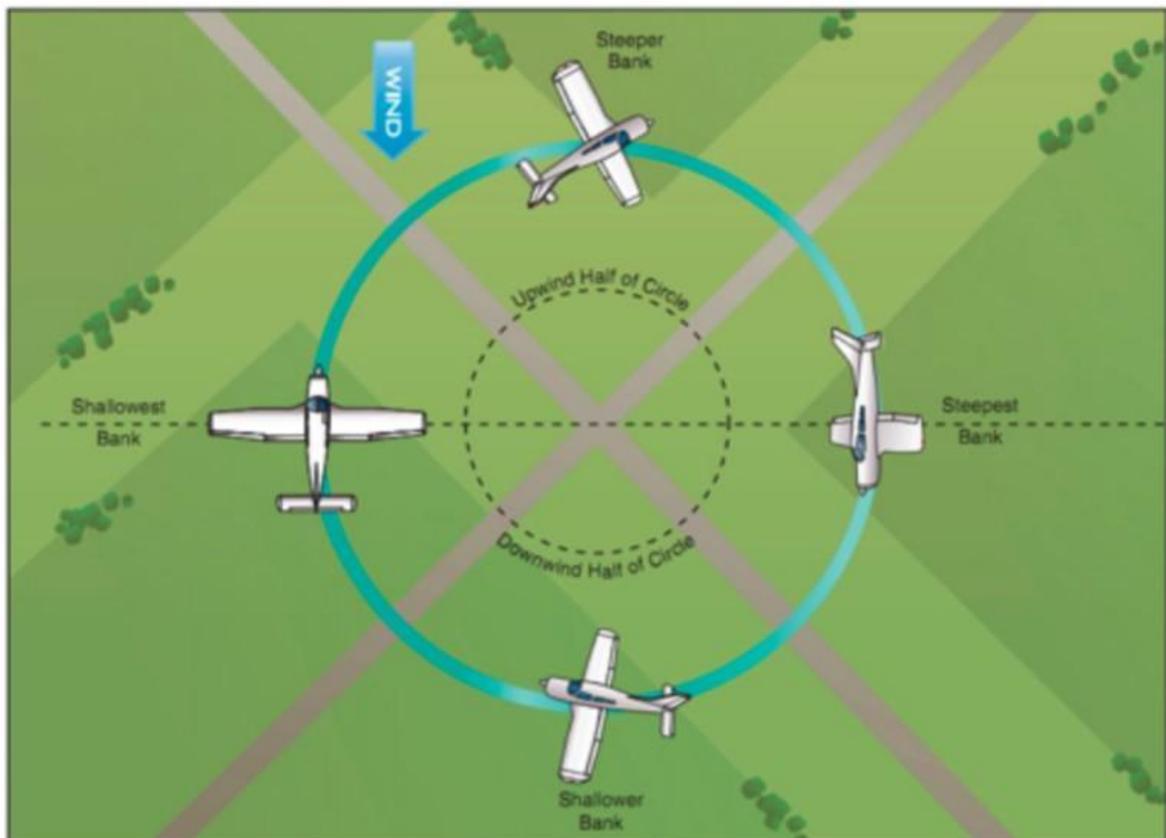
Second Crosswind Leg (Crosswind)

1. Roll out wings level, crabbing away from the boundary
2. Manage crab angle to maintain 1/2 mile distance from boundary
3. At field boundary edge, turn downwind
4. Start with moderate bank
5. Increase bank angle gradually during the turn as ground speed increases



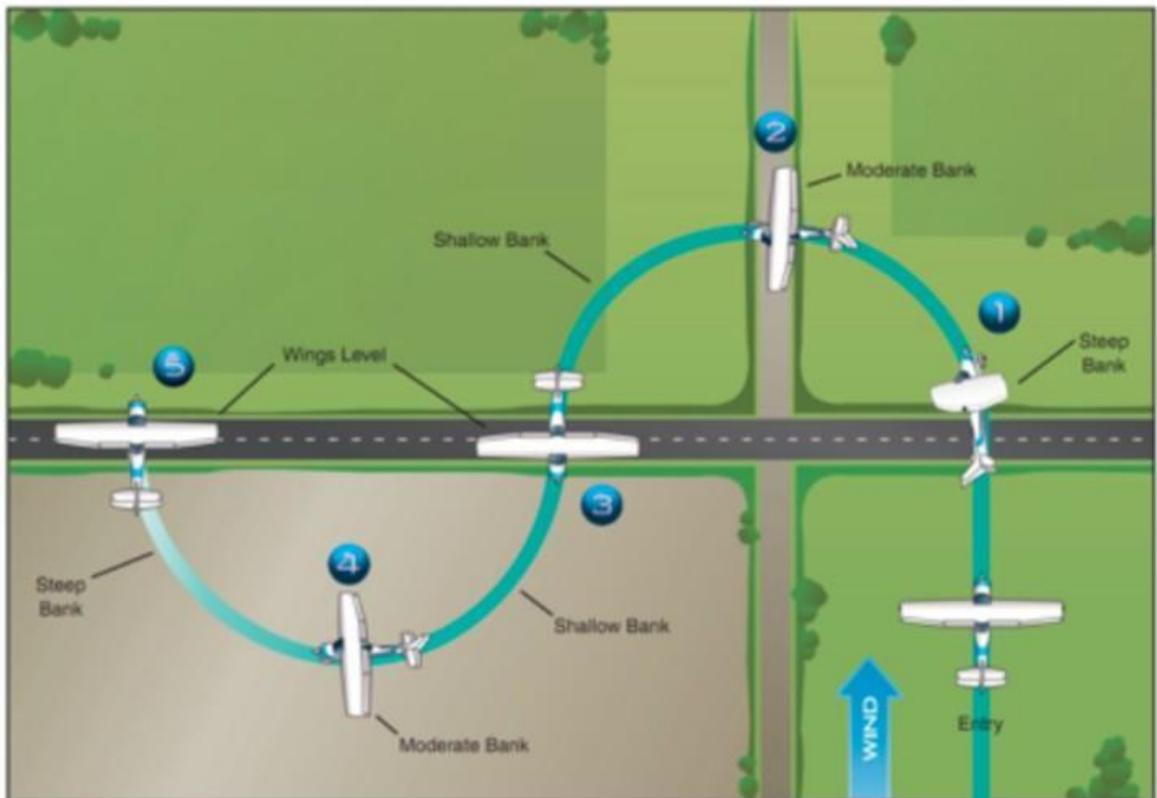
8.2 Turns Around a Point

1. Select a reference point
2. Set power to maintain an airspeed of 90 KIAS
3. Maintain 1000' AGL
4. Clear the area of other aircraft
5. Trim the airplane for level flight
6. First turn to the left at the highest ground speed and steepest bank angle (max 45 degrees)
7. Bank angle will gradually need to be decreased to the upwind point (slowest ground speed)
8. From the upwind point, bank angle will need to gradually increase to the
9. Downwind point (fastest ground speed)



8.3 S-Turns

1. Select a line feature that lies crosswind (road, etc.)
2. Set power to maintain an airspeed of 90 KIAS
3. Maintain 1000' AGL
4. Trim the airplane for level flight
5. Approach the line feature downwind
6. Cross the line feature wings level
7. Initial turn is to the left at the fastest ground speed and steepest bank angle (not to exceed 30 degrees)
8. Directly crosswind; moderate bank angle and decrease as the airplane turns upwind
9. Maintain coordinated flight throughout
10. Cross the line feature while rolling wings level
11. Upwind turn begins in the opposite direction with a shallow bank angle
12. Increase bank angle to moderate at the crosswind position
13. Continue to increase bank angle through the turn to downwind
14. Cross the line feature with wings level
15. Exit the maneuver at the same altitude and airspeed



Chandelles Maneuver

Configuration: Clean configuration. NOTE: Minimum safe altitude for this maneuver is 1500' AGL. Crosswinds Aviation requires a minimum altitude of 3,500' AGL.

1. Clearing turns
2. Set power to start maneuver around 90 KIAS. (POH recommends 116 KIAS)
3. Pick a 90 degree reference point off your wing tip.
4. Roll into a 30 degree bank.
5. After the bank is established, smoothly and continuously increase the pitch and simultaneously add climb power so as to arrive at the 90 degree point with maximum pitch up.
6. Upon reaching the 90 degree point, begin rolling out slowly so as to arrive at the 180 degree point with maximum pitch up, wings level, and the airspeed at approximately 50-55 KIAS.
7. At the 180 degree point of the maneuver, Complete the cruise checklist.

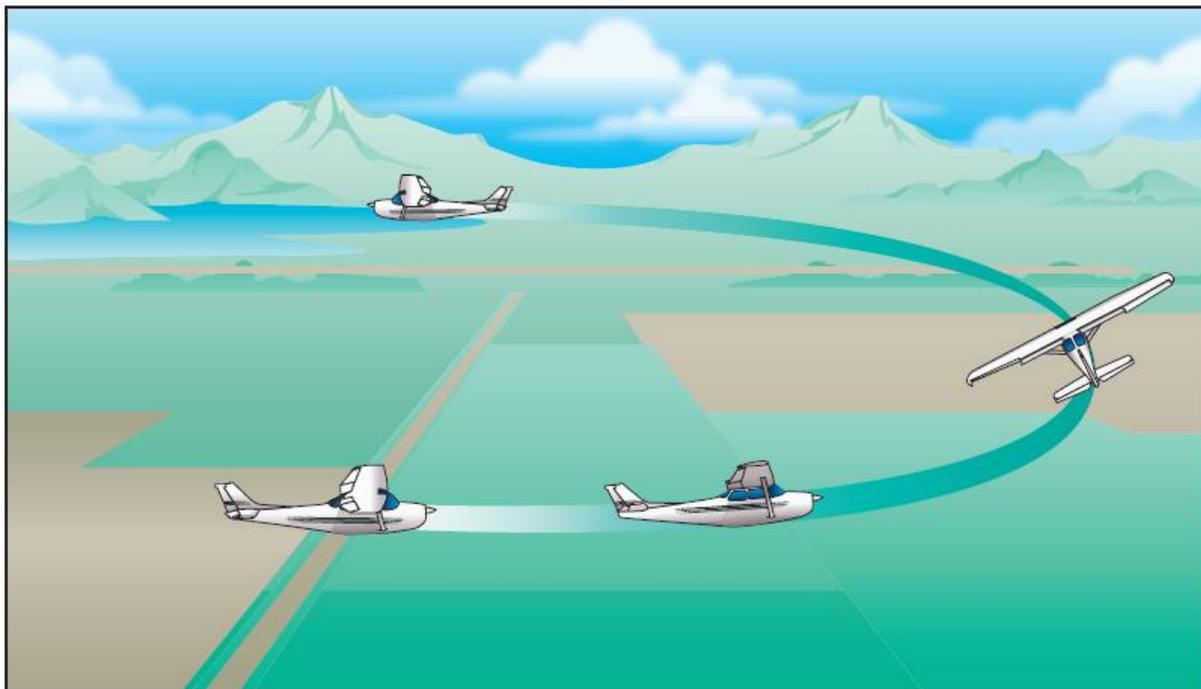
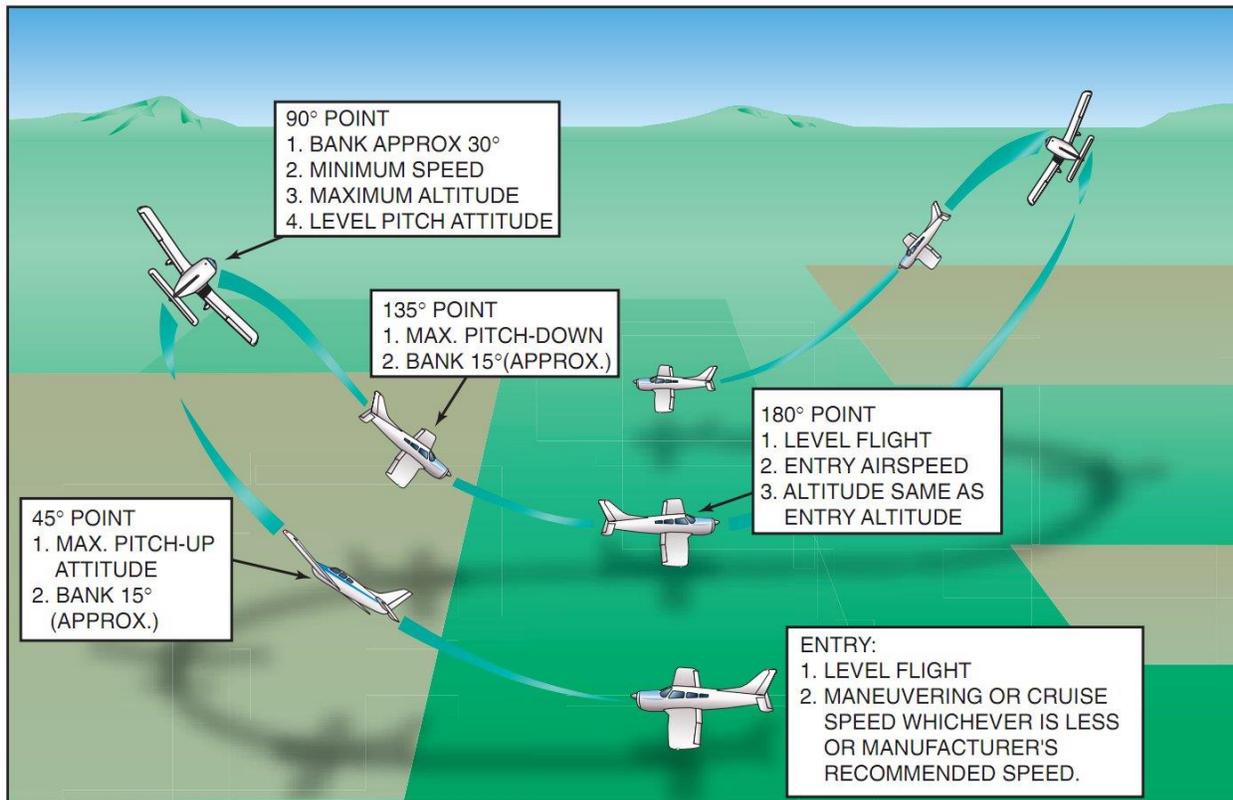


Figure 9-3. Chandelle.

Lazy 8's Maneuver

Configuration: Clean configuration. NOTE: Minimum safe altitude for this maneuver is 1500' AGL. Crosswinds Aviation requires a minimum altitude of 3,000' AGL.

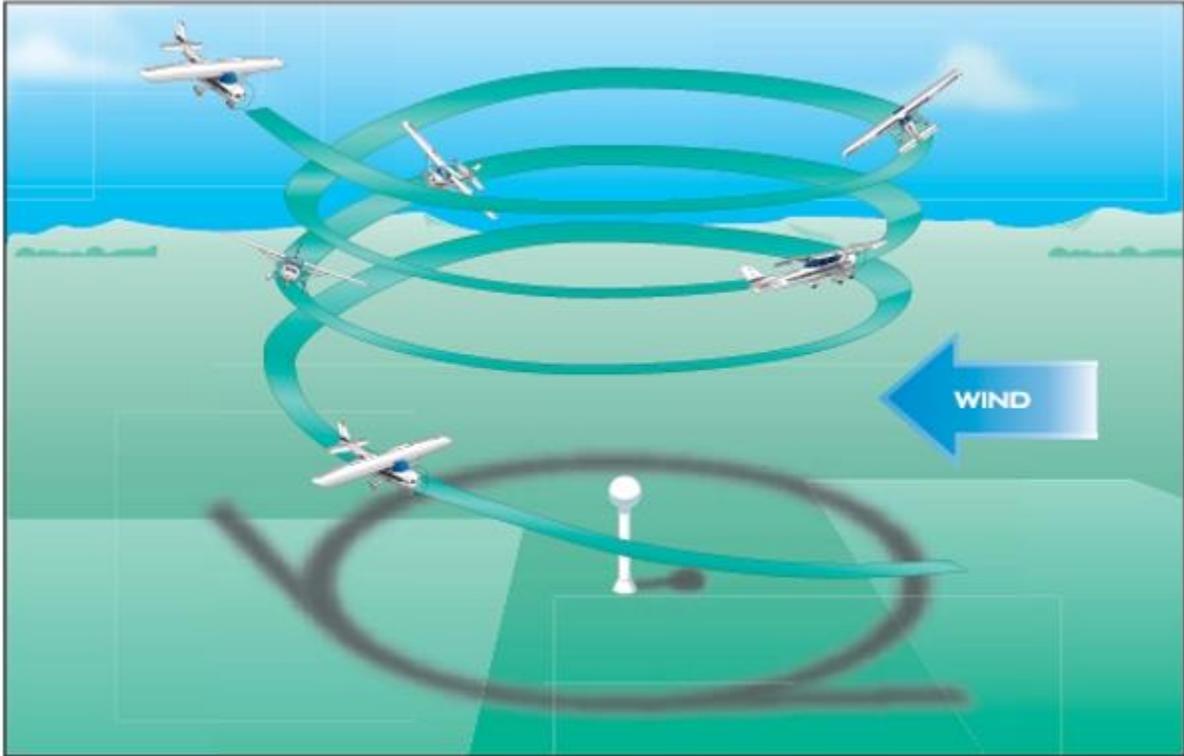
1. Clearing turns.
2. Set power to start maneuver around 90 KIAS. (POH recommends 116 KIAS)
3. Select a heading that will establish the aircraft perpendicular to a well defined reference line. Select visual references at the 45 and 135 degree points relative to the direction of the maneuver.
4. Initiate the maneuver by slowly increasing the pitch while simultaneously rolling into a bank so as to arrive at the 45 degree point with maximum pitch up and 15 degrees of bank.
5. Passing the 45 degree point, increase the bank and decrease the pitch so as to arrive at the 90 degree point with 30 degrees of bank and pitch attitude passing through level.
6. As the aircraft passes through the 90 degree point, continuously decrease the pitch and decrease the bank so as to reach maximum pitch down and 15 degrees of bank at the 135 degree point.
7. Passing the 135 degree point, continuously decrease the bank and increase the pitch so the aircraft is straight and level upon reaching the 180 degree point.
8. After completion of the first 180 degree circuit, perform the maneuver in the opposite direction
9. Upon completion of the maneuver, Complete the Cruise configuration.



Steep Spirals Maneuver

Configuration: Cruise configuration. NOTE: Minimum safe altitude to start this maneuver is 4000' AGL. Crosswinds Aviation requires recovery at a minimum altitude of 1,500' AGL.

1. Select an altitude that will allow for 3-360 degree descending turns (4000'MSL)
2. Select a suitable ground references point.
3. Enter the maneuver downwind.
4. Before reaching the abeam point on downwind reduce power to idle and hold altitude.
5. Time maneuver so as to reach the abeam point at best glide speed (73 KIAS)
6. Abeam the reference point roll into a bank(~45degrees)
7. Begin a constant radius turn around a point,compensating for wind drift by continuously changing the wind correction angle and bank (using a maximum of 60 degrees of bank.)
8. Adjust pitch to maintain best glide speed.
9. Divide attention between aircraft control and maintaining ground track.
10. During descent occasionally apply power to keep engine warm.
11. Make 3 constant radius turns around the reference point.
12. Exit maneuver on downwind, no lower than 1,500' AGL
13. Upon completion of the maneuver, re-establish training cruise and complete the post-maneuver check.

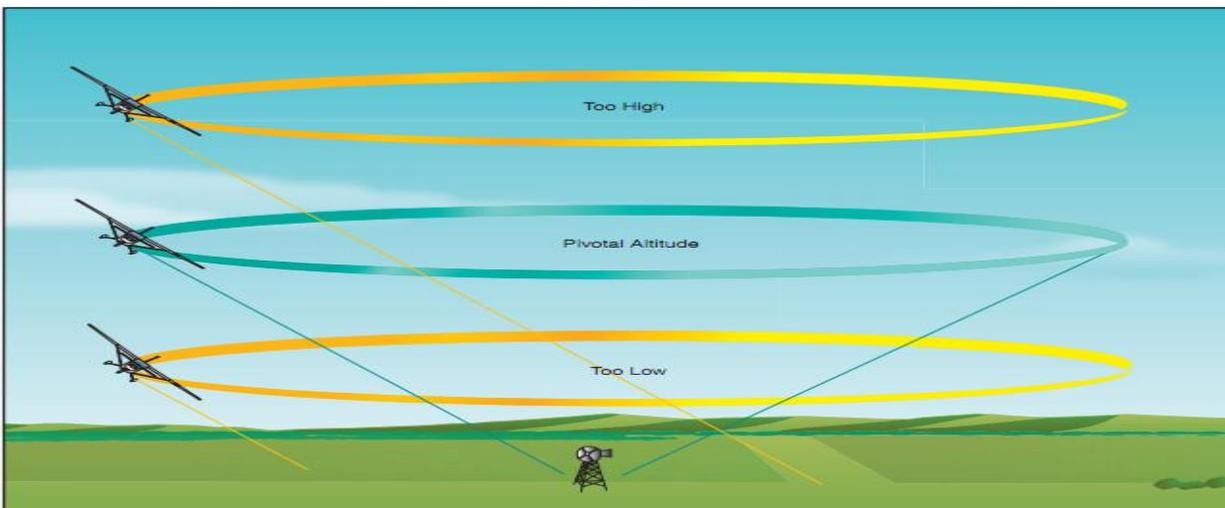
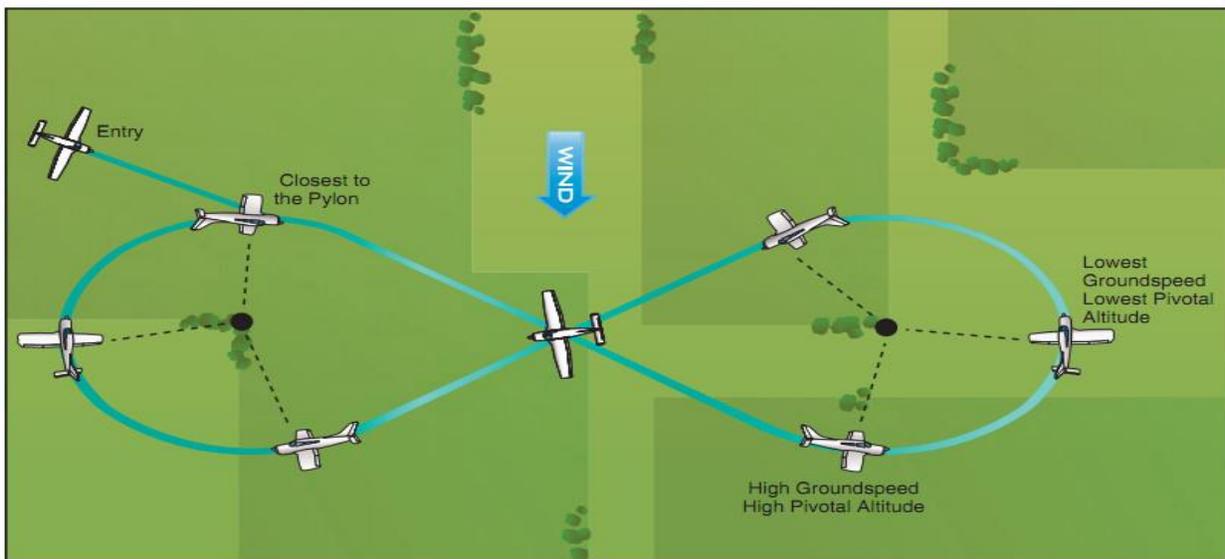


Eights On Pylons Maneuver

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Calculate pivotal altitude prior to flight, ($PA = \text{Ground speed squared} \div 11.3$)

1. Clearing turns
2. Increase to 90 KIAS
3. Select suitable reference points ("pylons") and position the aircraft so the maneuver can be entered on a heading 45 degrees to downwind.
4. When the pylon passes below the wing, smoothly roll into a turn using coordinated aileron and rudder so that the pylon maintains a constant position relative to the wingtip.
5. As the turn around the pylon progresses, make pitch changes to compensate for variations in ground speed and maintain the pylons position relative to the wingtip.
 - a. Pylon forward- control forward- reduce bank
 - b. Pylon rearward- control rearward- increase bank.



Accelerated Stall Maneuver

Configuration: Takeoff configuration. NOTE: Minimum safe altitude for this maneuver is 1500' AGL. Crosswinds Aviation requires a minimum altitude of 3,500' AGL.

1. Clearing Turns
2. Clean configuration
3. Mixture forward
4. Fuel pump on
5. Throttle idle
6. Maintain 73 KIAS
7. Establish a 45 degree bank
8. Immediately pull back hard on the yoke
9. Maintain alt in turn

Recover at the buffet

1. Full power
2. Simultaneously reduce bank and reduce angle of attack
3. Cruise configuration