Cessna 172-S Training Supplement

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IMPORTANT NOTICE

Refer to POH/AFM

Do not use procedures listed without referencing the full procedures described in the approved Owner's Manual, POH, or POH/AFM specific to the airplane you are flying. Endurance and fuel capacities may vary considerably depending on the specific model / serial number being flown and any modifications it may have.

Late Model (S)

Engine

The 172 S models are equipped with a Lycoming, 4-cylinder, normally-aspirated, fuel-injected, 360 cubic inch, horizontally-opposed, air-cooled, direct-drive IO-360-L2A engine. This engine is rated at 180 HP at 2700 RPM as factory-delivered on S-models and as upgraded on R-models. (See note on page 2 regarding engine modifications.) Ignition is provided by 2 magnetos on the back of the engine which provide power to 8 spark plugs (2 per cylinder, for redundancy and more complete combustion). The engine has an 8-quart oil Sump.

Propeller

The engine drives a McCauley, 76 inch, two-blade, all-metal, fixed-pitch propeller.

Vacuum System

On aircraft with conventional flight instruments, two engine-driven vacuum pumps are located on the back of the engine, providing vacuum to the attitude and heading gyros. These have a normal operating range of 4.5-5.5 inches of mercury. Failure of a vacuum pump is indicated by an annunciator panel light. In most circumstances, failure of one pump alone will not cause the loss of any instruments, because the remaining pump should handle the entire vacuum Demand.

On aircraft with the G1000 glass cockpit, a single engine-driven vacuum pump provides vacuum to the standby attitude indicator. The normal operating range is 4.5-5.5 inches of mercury. Failure of this pump is indicated by a GYRO flag on the attitude indicator and an amber LOW VACUUM annunciation on the PFD.

Landing Gear

The landing gear is a fixed, tricycle-type gear consisting of tubular spring steel providing shock absorption for the main wheels, and an oleo (air/oil) strut providing shock absorption on the nose wheel. The nose strut extends in flight, locking it in place. The nose wheel contains a shimmy damper which damps nose wheel vibrations during ground operations at high speeds. The nose wheel is linked to the rudder pedals by a spring-loaded steering bungee which turns the nose up to 10° each side of center. Differential braking allows for up to 30° of steering either side of center.

Brakes

Brakes are hydraulically-actuated, main wheel single-disc brakes controlled by master cylinders attached to each of the left-seat pilot's rudder pedals. The right-seat rudder pedals are mechanically linked to the left-seat pedals, so depressing the tops of either set of pedals will apply the brakes. When the airplane is parked, the main wheel brakes may be set with the parking brake handle beneath the left side instrument panel. To apply the parking brake, set the brakes with the rudder pedals, pull the handle aft, and rotate it 90° down.

Flaps

The 172 has single slot-type flaps driven electrically by a motor in the right wing. A flap position selector on the instrument panel has detents at the 0°, 10°, 20° and 30° positions.

Pitot Static

The pitot-static system consists of a pitot tube on the left wing providing ram air pressure to the airspeed indicator, and a static port on the left side of the fuselage providing static pressure to the altimeter, vertical speed indicator and airspeed indicator. The pitot tube is electrically heated, and an alternate static source is located under the instrument panel.

Fuel System

The fuel system consists of 2 integral tanks in the wings with a total fuel capacity of 56 gallons, of which 53 is usable. Three gallons remain unusable because fuel is drawn from slightly above the bottom of the tanks, to avoid drawing contaminants into the engine. Usable fuel quantity is placarded on the fuel selector. Typically there are 13 fuel sumps: 5 under each wing and 3 under the engine cowling. There are 3 fuel vents: 1 under the left wing and 1 in each fuel cap.

Fuel is gravity-fed from the wing tanks to a three-position fuel selector valve labeled BOTH, RIGHT, and LEFT, and then to a reservoir tank. From the reservoir tank the fuel flows to an electrically-driven auxiliary fuel pump, past the fuel shutoff valve, through the strainer and to an engine-driven fuel pump. Fuel is then delivered to the fuel/air control unit where it is metered and passed to a manifold where it is distributed to each cylinder. The auxiliary fuel pump is used for engine priming during cold engine starts. The auxiliary fuel pump is OFF for normal takeoff and landing operations.

NOTE: The fuel selector should remain in BOTH during normal operations.

Fuel-injected engines do not have carburetor heat like early-model, carbureted engines. Alternate air is provided with a spring-loaded alternate air door in the air box. If the air induction filter should become blocked, suction created by the engine will open the door and draw unfiltered air from inside the lower cowl area. An open alternate air door will result in approximately 10% power loss at full throttle.

NOTE: Do not over-prime fuel injected engines when conducting "warm" engine starts. Doing so washes away engine lubrication and causes cylinder wall damage.

Electrical System

The airplane is equipped with a 28-volt DC electrical system and a 24-volt lead-acid battery. Electrical energy is supplied by a 60-amp alternator located on the front of the engine. An external power receptacle is located on the left side of engine cowl. Electrical power is distributed through electrical buses and circuit breakers. If an electrical problem arises, always check circuit breakers. Essential circuit breakers should be reset in flight only once, and only if there is no smoke or burning smell, and only if the affected system and equipment is needed for the operational environment. Do not reset any non-essential circuit breakers in flight. Failure of the alternator is indicated by a low voltage annunciator and a negative reading on the main battery ammeter (which indicates that the battery is discharging). If this occurs, execute the Low Volts Annunciator During Flight or Low Voltage Light During Flight checklist (depending on model) to attempt to reactivate the alternator. If alternator power cannot be restored, the main battery can supply electrical power to essential equipment for a limited time (approximately 30 minutes, depending on battery load and condition).

Exterior Lighting

Exterior lighting on all late-model aircraft includes navigation lights on the wing tips and top of the rudder, a flashing beacon mounted on the top of the vertical fin, and a strobe light on each wing tip.

Landing and taxi light configurations vary:

- Newer aircraft are equipped with combination LED landing/taxi/recognition lights on both wing leading edges. These are controlled with a three-position switch that can be set to LAND, RECOG/TAXI, or OFF. In LAND mode, all LEDs are illuminated. In RECOG/TAXI, the 6 LEDs in the center of the unit are illuminated. They shine steadily while on the ground; while in flight, they pulse alternately to provide the recognition mode.
- Older aircraft have a dual landing (inboard) / taxi (outboard) light configuration located on the left wing leading edge. Each light is controlled by a separate switch.

Environmental

Cabin heat is provided by air ducted through the exhaust shroud and into the cabin and is controlled by a knob on the instrument panel. Air flow is controlled by the Cabin Air knob on the instrument panel and additionally by ventilators near the top left and right corners of the windshield.

Stall Warning

The aircraft's pneumatic-type stall warning system consists of an inlet on the left wing leading edge, which is ducted to a horn near the top left of the windshield. As the aircraft approaches a stall, the lower pressure on top of the wing shifts forward, drawing air through the warning horn. This results in an audible warning at 5 to 10 knots above the stall.

Garmin G1000

Cessna 170RB is equipped with the Garmin G1000 electronic flight deck.

G1000 Components

The G1000 is comprised of several main components, called Line Replaceable Units (LRUs):

- Primary Flight Display (PFD)
- Multi Function Display (MFD)
- Integrated Avionics Units
- Attitude and Heading Reference System (AHRS)
- Air Data Computer (ADC)
- Engine/Airframe Unit
- Magnetometer
- Audio Panel
- Transponder

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

The MFD (right screen) provides a GPS-enabled moving map with traffic and weather information. It can also be used to display waypoint/airport information, flight plans, instrument procedures, trip planning utilities, and system setup/configuration information.

The two Integrated Avionics Units each contain a GPS receiver, a VHF nav/comm radio, and a flight director. They also serve as communications hubs to relay information from the other LRUs to the PFD and MFD. For redundancy, one IAU is connected to each display, and they do not communicate with each other directly.

The Attitude and Heading Reference System uses accelerometers and rate sensors, along with magnetic field readings from the magnetometer and GPS information from the IAUs, to provide aircraft attitude and heading information to the flight displays and IAUs.

The Air Data Computer processes data from the pitot/static system as well as the OAT probe to provide pressure altitude, airspeed, vertical speed, and air temperature data to the system.

NOTE: In newer aircraft equipped with the G1000 NXi system, the functions of the AHRS and ADC are combined into a single LRU called an ADAHRS.

-The Engine/Airframe Unit receives and processes signals from the engine and airframe sensors (engine RPM and temperatures, fuel quantity, etc.).

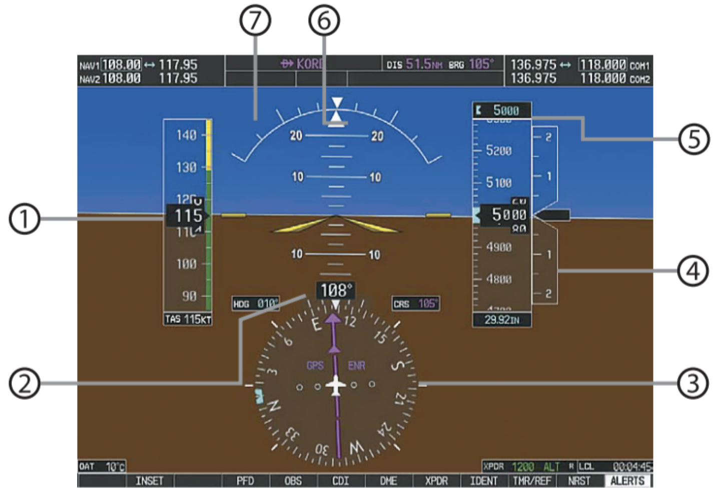
-The magnetometer measures the local magnetic field and sends data to the

-AHRS to determine the aircraft's magnetic heading.

-The audio panel is installed between the two display screens and integrates controls for the nav/com audio, intercom system, and marker beacon receiver.
-It also controls manual display reversionary mode (which can shift the primary flight instruments to the MFD).

-The transponder is a Mode S device, controlled via the PFD, that may provide ADS-B In/Out capability, depending on the particular model of transponder.

G1000 Flight Instruments



Primary Flight Display (Default)

① Airspeed Indicator
② Turn Rate Indicator
③ Horizontal Situation Indicator (HSI)
④ Vertical Speed Indicator (VSI)
⑤ Altimeter
⑥ Slip/Skid Indicator
⑦ Attitude Indicator

The G1000 PFD displays the same flight information as the conventional "six-pack", but pilots should be aware of the following considerations.

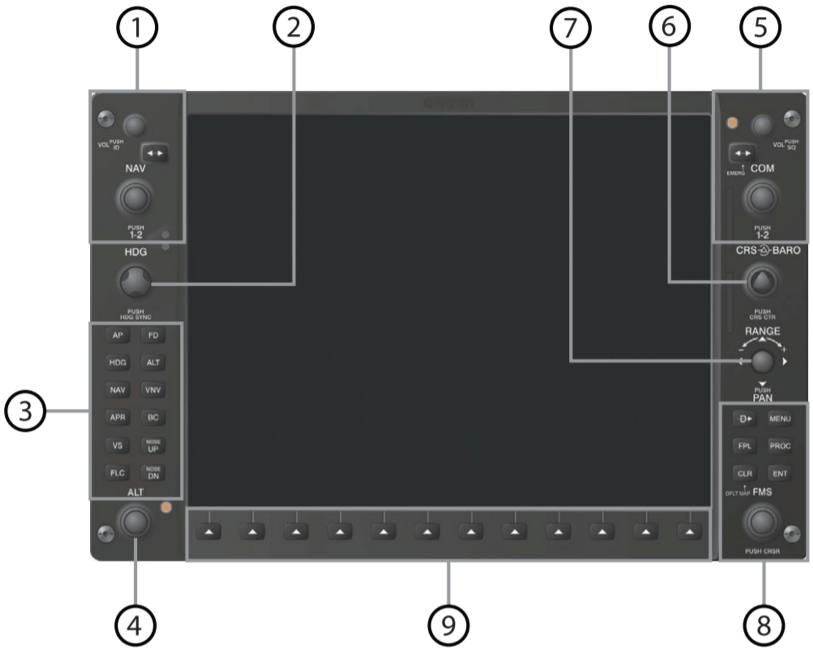
Airspeed and altitude information are displayed with moving tapes and a digital readout of the current airspeed and altitude to the nearest knot / 20 feet, respectively. This precision leads some pilots to overcontrol the aircraft, continuously making corrections for insignificant deviations. Be sure not to overcorrect for deviations of a few feet or knots.

The information traditionally displayed on the turn coordinator is split between two locations on the screen. The inclinometer ("ball") is replaced with a white "brick" under the pointer at the top of the attitude indicator. "Step on the brick" to center it and maintain coordinated flight. The rate of turn indication is provided by a magenta trend vector at the top of the HSI. Tick marks are provided for half-standard and standard rate turns.

On the HSI, a small magenta diamond indicates the aircraft's current ground track. (This diamond may not be visible if crosswinds are minimal and the track is nearly equal to the heading.) Also, pilots should note the color of the CDI needle to determine the current navigation source. Magenta needles indicate GPS, while green needles indicate VOR or LOC.

G1000 Controls

The G1000 has duplicate sets of controls on the PFD and MFD bezels. Using the controls towards the center of the aircraft (on the right side of the PFD and the left side of the MFD) helps to ensure that both student and instructor can see each other's inputs.



PFD/MFD Controls

Left Side - Top to Bottom

1. NAV Radio Controls: Use the NAV knob, along with the frequency transfer key, to tune NAV receiver frequencies. Turn the VOL knob to control the volume, and press the knob to toggle the Morse code identifier on/off.
2. HDG Knob: Sets the heading bug on the HSI.
3. AFCS Keys: Used to program the Garmin GFC 700 Automatic Flight Control System. (Not installed on all aircraft.)
4. ALT Knob: Sets the altitude bug on the altimeter.

Right Side - Top to Bottom

5. COM Radio Controls: Use the COM knob, along with the frequency transfer key, to tune COM receiver frequencies. Turn the VOL knob to control the volume, or press to turn the automatic squelch on or off.
6. CRS/BARO Knobs: Turn the outer, large knob to set the barometric pressure setting for the altimeter. Turn the small, inner knob to select a course on the HSI when in VOR or OBS mode.

7. RANGE Joystick: Turn to adjust map range. Press to activate the map pointer.

8. FMS Keys/Knob: Use these to program flight plans, enter waypoints, select instrument procedures, etc.

Bottom Edge

9. Softkeys: There are 12 soft keys along the bottom edge of each display with functions that vary depending on context.

LRU Failures

If an LRU or an LRU function fails, a red or amber X is displayed over the window(s) corresponding to the failed data. If this occurs, follow the appropriate emergency checklist. Generally, this involves checking the circuit breaker for the affected LRU, then (if the problem is not fixed by resetting the breaker) using the standby instruments to exit IFR conditions and land as soon as practical.

AHRS Failure

ADC Failure

AHRS Modes

The AHRS uses GPS, magnetometer, and air data to assist in attitude/heading calculations, in addition to the data from its internal sensors. Loss of this external data can affect the availability of attitude and heading information, even if the AHRS itself is functional. Either GPS or air data must be available for the AHRS to provide attitude information. Additionally, loss of magnetometer data will result in invalid heading information.

Display Failures

If either display fails, the G1000 should automatically enter reversionary mode, in which important flight information is presented in a condensed format on the remaining display(s). Reversionary mode can also be activated manually by pressing the red DISPLAY BACKUP button on the audio panel. Engine Indication System readings appear on the left edge of the screen, and the inset map appears at lower right.

Reversionary Mode (Failed PFD)

Performance / Weight & Balance

-V-Speeds (KIAS) & Limitations for R & S Models

-Speeds listed below are in Knots Indicated Airspeed (KIAS).

	S	***Description***	***Airspeed Indicator Marking***
Max Horsepower	180hp		
Max GTW (Normal)	2,550lbs		
Max GTW (Utility)	2,200lbs		
Max Ramp	2,558lbs		
VSO	40	Stall speed in landing conf.	Bottom of White Arc
VS	48	Stall speed in clean conf.	Bottom of Green Arc
VX	62	Best angle of climb	
VY	74	Best rate of climb	
VA	90 @ 1,900lbs		
	105 @ 2,550lbs	Maneuvering speed	
VR	55	Rotation speed	
VFE 10°	110	Max. flap exten. with 10 degrees of flaps	
VFE 20°-30°	85	Max flap exten. With 20°-30° of flaps	Top of White Arc
VNO	129	Max Structural Cruising Speed	Top of Green Arc
VNE	163	Never Exceed Speed	Red Line
VG	68	Best Glide Speed	

**Max demonstrated crosswind 15 knots with full flaps, 20kts with flaps 10

Sample Weight and Balance Problem

Conditions

Basic Empty Weight .... **1676.3 lbs.**

(Remember to use actual aircraft BEW for flight check.)

Front Pilots .... **350 lbs.**
Rear Passengers .... **50 lbs.**
Baggage .... **3 Bags @ 50 lbs. each**

(May need to relocate some baggage to rear passenger seats.)

Max Ramp Weight .... **2,558 lbs.**
Max Takeoff/Landing Weight .... **2,550 lbs.**
Max Baggage Weight .... **120 lbs.**
Max Usable Fuel .... **53 gal.**
Fuel Burn .... **10 gal.**

		Weight ×	Arm =		Moment
Basic Empty Weight					68358.0
Front Pilots	+		37.00	+	
Rear Passengers	+		73.00	+	
Baggage 120 lbs. Max	+		95.00	+	
Zero Fuel Weight	=		CG CG = Moment / Weight	=	
Usable Fuel	+		48.00	+	
Ramp Weight	=				
Taxi Fuel (1.33 Gal.)	–	8	48.00	–	384
Takeoff Weight	=		CG CG = Moment / Weight	=	
Fuel Burn	–		48.00	–	
Landing Weight	=		CG CG = Moment / Weight		

Calculate the Following

1. Zero Fuel Weight
2. Zero Fuel CG
3. Takeoff Weight
4. Takeoff CG
5. From comparing the Takeoff CG and Zero Fuel CG, which direction does

the CG move as fuel is burned off?

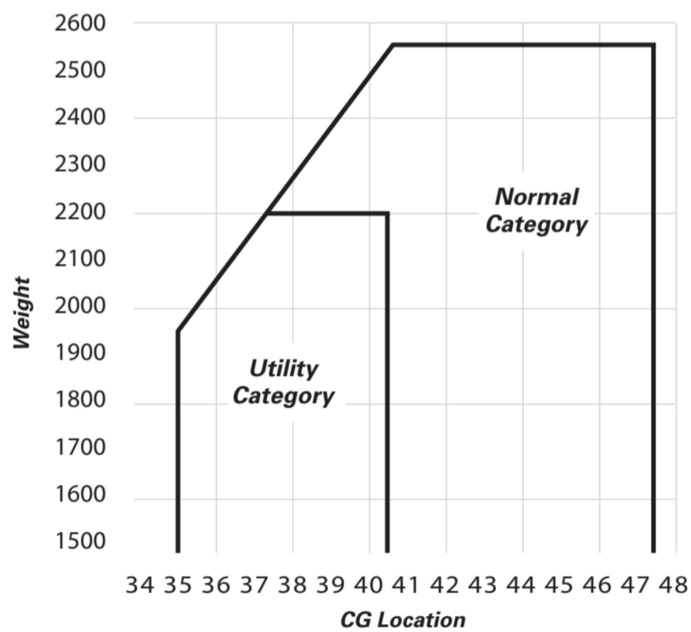
Plot Zero Fuel CG and Takeoff CG on the CG Envelope Graph Below.

Answers: (1) 2226.3 lbs. (2) 44.07" (3) 2536.3 lbs. (4) 44.55" (5) Forward

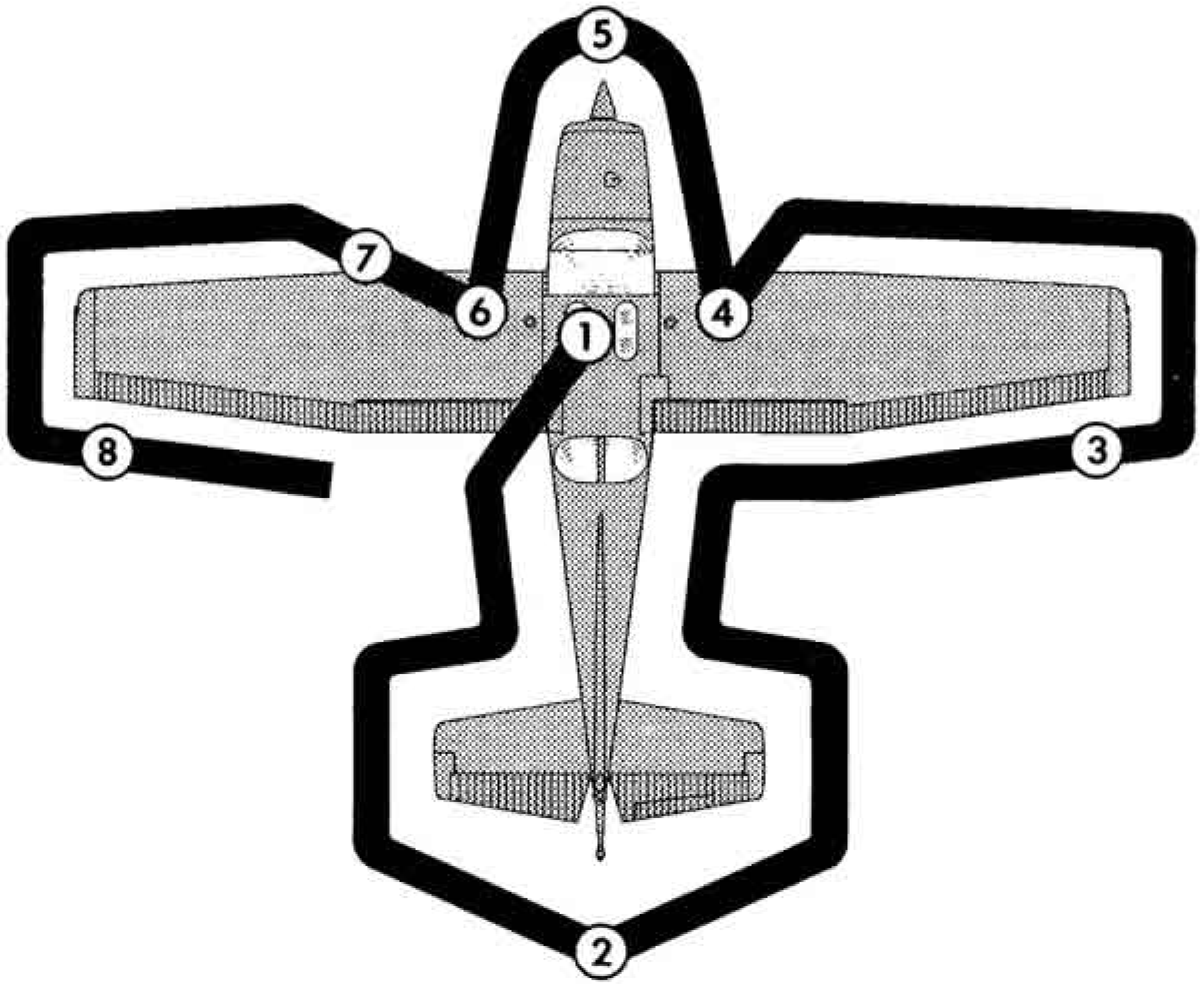
Formulas

- Weight × Arm = Moment
- Total Moment ÷ Total Weight = CG
- Max Ramp Weight – Zero Fuel Weight = Usable Fuel Weight
- Fuel Weight ÷ 6 = Fuel Gallons
- 100LL fuel weighs 6 lbs./gal.; oil weighs 7.5 lbs./gal.
- 3 Gallons of unusable fuel and oil at full capacity are included in Basic Empty Weight

CG Envelope Graph



Proper Preflight Walkaround



Departure Procedures

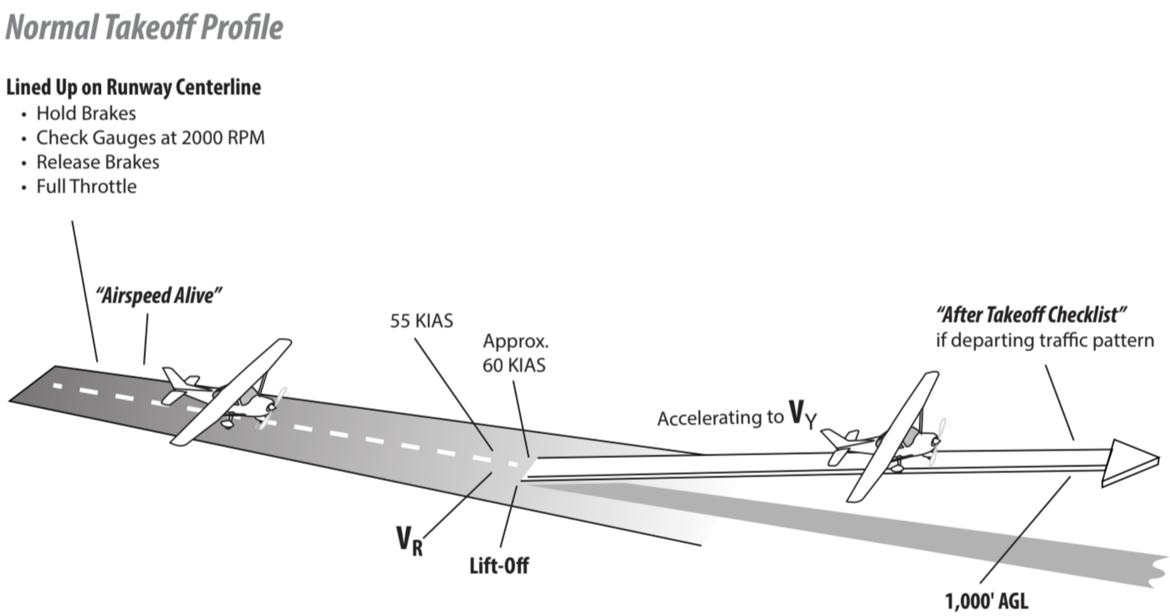
Normal Takeoff (Flaps 0°)

Do not delay on the runway.

1. Line up on centerline positioning controls for wind
2. Hold brakes
3. Increase throttle to full open
4. Check engine gauges
5. Release brakes
7. "Airspeed Alive"
8. Start slow rotation at 55 KIAS

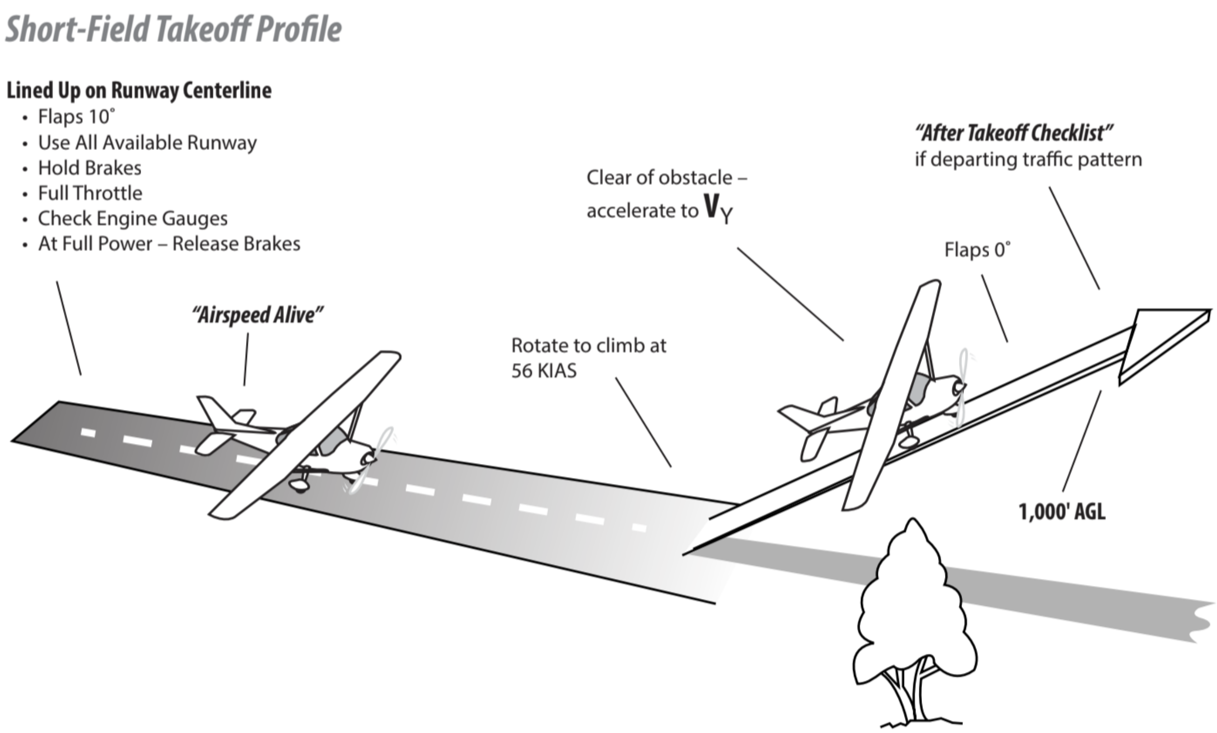
(Main gear should lift off at approx. 60 KIAS. 55 KIAS is VR , not VLOF)

9. Pitch to VY sight picture and accelerate to 74 KIAS (VY)
10. "After Takeoff Checklist" out of 1,000' AGL



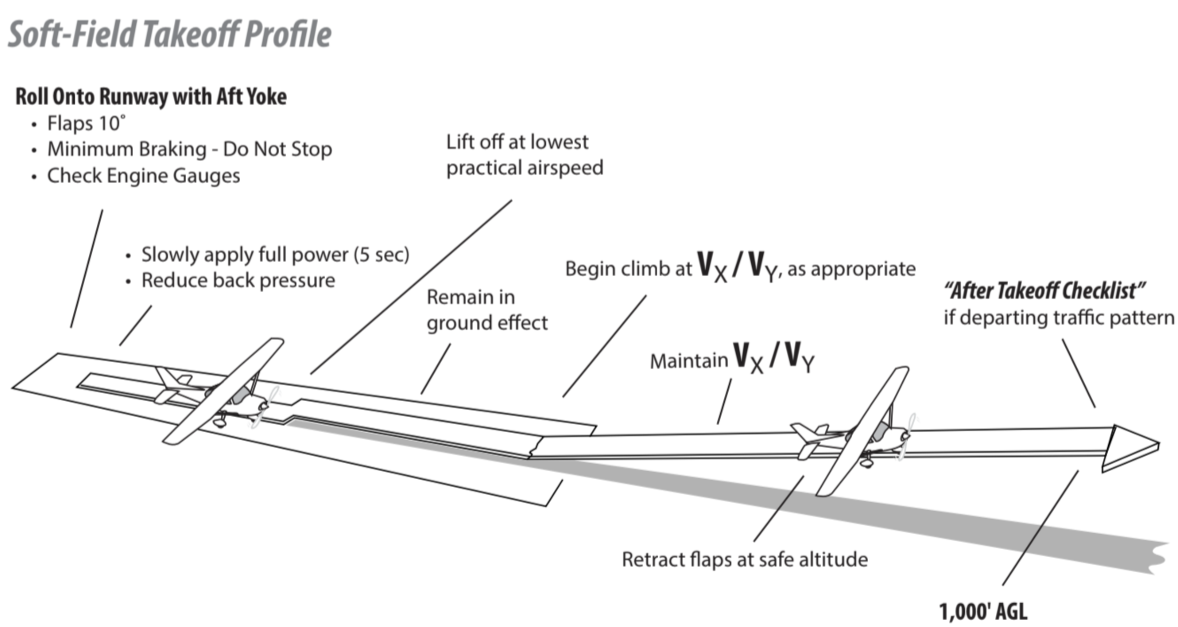
Short-Field Takeoff

1. Flaps 10°
2. Use all available runway
3. Hold brakes
4. Full throttle
5. Check engine gauges
6. At full power – release brakes
7. "Airspeed Alive"
8. Rotate to lift off at 51 KIAS, then pitch to VX sight picture and climb at 56 KIAS over 50' obstacle
9. When clear of obstacle, decrease pitch to VY sight picture and accelerate to VY
10. Flaps 0° (above 60 KIAS)
11. "After Takeoff Checklist" out of 1,000' AGL



Soft-Field Takeoff

1. Flaps 10°
2. Roll onto runway with aft yoke – minimum braking – do not stop
3. Check engine gauges, then direct complete attention outside of cockpit
4. Slowly add power. At approximately 50% power, begin reducing back pressure on yoke. Maintain less than full back pressure while increasing throttle to full power.
5. With back pressure reduced to avoid a tail strike, establish and maintain a pitch attitude that will transfer the weight of the airplane from the wheels to the wings as rapidly as practical
(do not deliberately hold nose-wheel off runway, and do not strike tail!)
6. Lift off at lowest practical airspeed, then lower the nose to level off while remaining in ground effect
7. While in ground effect, accelerate to 62 KIAS (VX) or 74 KIAS (VY) as appropriate for the climb
8. Pitch to VX or VY sight picture and climb at VX/VY
9. At safe altitude, retract flaps
10. "After Takeoff Checklist" out of 1,000' AGL



****Power should be increased from idle to full over approximately 5 seconds, to give the pilot time to adjust back pressure on the yoke as the airplane accelerates. This method will prevent tail strikes. It also keeps the aircraft from lifting off too abruptly and climbing out of ground effect with insufficient airspeed.
Do not deliberately hold the nose wheel off the runway during the takeoff roll, as this is not an ACS requirement.****

Cessna 172 Landing Criteria

• Plan and brief each landing carefully.
• Enter the traffic pattern at TPA trimmed for 90 KIAS in level flight. (Landing profiles depend on this.)
• Maintain a constant angle glidepath.
• Whenever possible, fly the traffic pattern at a distance from the airport that allows for a power off landing on a safe landing surface in the event of an engine failure.
• Maintain final approach speed until roundout (flare) at approx. 10' to 20' above the runway.
• Reduce throttle to touch down with the engine idling and the airplane at minimum controllable airspeed within the first third of the runway.
• Touch down on the main gear, with the wheels straddling the centerline.
• Manage the airplane's energy so touchdown occurs at the designated touchdown point.
• Maintain a pitch attitude after touchdown that prevents the nosewheel from slamming down by increasing aft elevator as the airplane slows.
• Maintain centerline until taxi speed is reached and increase crosswind control inputs as the airplane slows.
• Adjust crosswind control inputs as necessary during taxi after leaving the runway.

Approach Briefing – Verbalize the Plan

During the Approach Checklist, conduct an approach briefing. This organizes the plan and ensures effective communication between pilots. The briefing should be specific to each approach and landing, but presented in a standard format that makes sense to other pilots and instructors.

Planning considerations:

- Flap Setting
- Type of Approach & Landing (visual, instrument, short-field, soft-field)
- Landing Runway
- Field Elevation
- Traffic Pattern Altitude
- Winds (left or right crosswind? tailwind on downwind or base?)
- Final Approach Speed
- Aiming Point
- Touchdown Point

Example VFR Briefing

Review the flap setting, aiming point, and touchdown point when established on downwind.

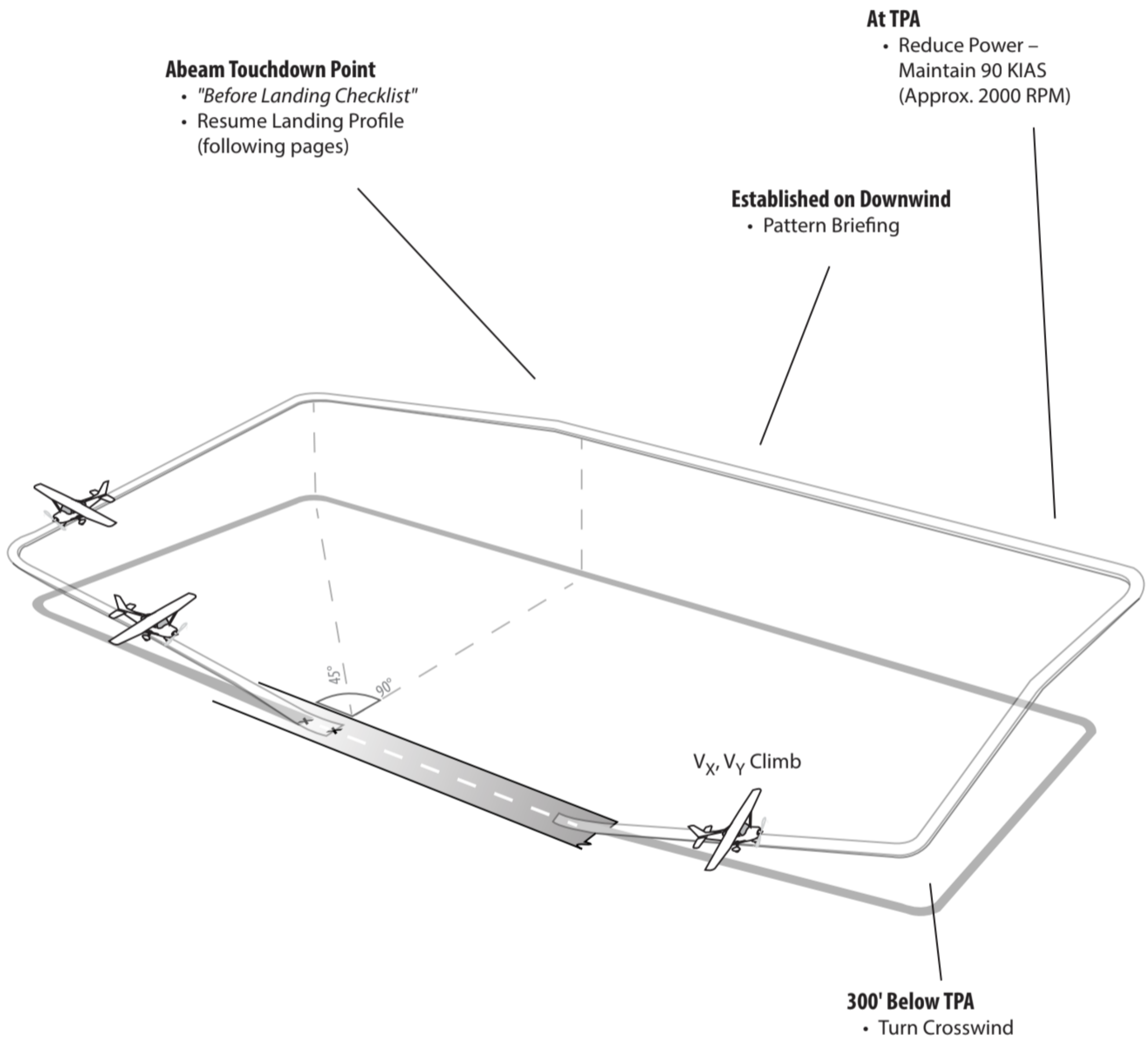
"This will be a normal flaps 30° landing on Runway 16. Field elevation 600 feet, pattern altitude 1,600 feet. Aiming at the 3rd stripe before the 1,000' markings, touching down on the 1,000' markings. Winds are 180 at 10, slight right crosswind. Final approach speed 65 knots. If the approach becomes unstable, we'll go around and expect left traffic.

This solidifies the plan between the student and instructor while visually identifying the aiming and touchdown points.

Traffic Pattern Operations

Pattern Briefings should include:

- Flap Setting
- Type of Approach & Landing (Short-Field, Soft-Field, etc.)
- Final Approach Speed
- Aiming Point
- Touchdown Point



Normal Approach & Landing

1. Complete the "Approach Checklist" before entering the airport area; devote full attention to aircraft control and traffic avoidance
2. Slow to 90 KIAS prior to entering downwind or traffic pattern
3. Enter the traffic pattern at published TPA (typically 1,000' AGL)
4. Complete the "Before Landing Checklist" when abeam the touchdown point
5. When abeam touchdown point, reduce power (approx. 1600 RPM) and select flaps 10˚
6. Descend out of TPA at 85 KIAS
7. On the base leg, select flaps 20°. Slow to and trim for 75 KIAS
8. When wings-level on final, select flaps 30° and slow to 65 KIAS.
9. Make the stabilized approach vs. go-around decision no lower than 200' AGL.

****TIP: Getting the ATIS, briefing the approach, and the Approach Checklist should be completed no later than 15 miles from the airport. Accomplishing these tasks as early as possible creates more time to focus on aircraft control and collision avoidance in the busy airport environment. During training flights when maneuvering near an airport, get the ATIS, brief, and complete the Approach Checklist as soon as the decision is made to return to the airport. Don't wait!*

Short-Field Approach & Landing

*Steps 1-9 are identical to the normal approach and landing procedure.

10. Select flaps FULL and slow to 61 KIAS on final when landing is assured
11. Close throttle slowly during flare – touch down on intended touchdown point with little or no floating
12. Prevent the nosewheel from slamming onto the runway
13. Retract the flaps after touchdown
14. Simulate and announce "Heavy Braking" for training and checkride purposes (while applying braking as required)

Soft-Field Approach & Landing

Steps 1-9 are identical to the normal approach and landing procedure.

10. Select flaps FULL and slow to 61 KIAS on final when landing is assured
11. Upon roundout, slowly close the throttle while maintaining a few feet above the runway surface in ground effect.
12. Smoothly let the airplane settle from ground effect and touch down at minimum controllable airspeed (typically with the stall horn on). This allows for a slow transfer of weight from the wings to the main landing gear.
13. Maintain enough back pressure to keep the nose wheel slightly off the runway. (Excessive back pressure will result in an excessively nose-high attitude, which will cause a tail strike. The objective is to keep the weight off the nose wheel while slowing down.)
14. Continue to increase back pressure through the rollout while applying minimal braking.

In Flight Maneuvers

Clean Configuration Flow

1. Fuel selector – both
2. Mixture – enrichen
3. Flaps 0°

Landing Configuration Flow

1. Fuel selector – both
2. Mixture – enrichen
3. Flaps full

Steep Turns

Steep turns consist of two coordinated 360° turns, one in each direction, using a bank angle of 45-50°. They develop the pilot's skill in smooth and coordinated use of the flight controls, awareness of the airplane's orientation relative to outside references, and division of attention. Complete steep turns no lower than 1,500' AGL. Use a similar roll rate when rolling into and out of both turns.

1. Perform two 90° clearing turns
2. 95 KIAS (2200-2300 RPM), maintain altitude
3. Cruise checklist
4. Perform a 360° turn with 45° of bank
5. Maintain altitude and airspeed (add back pressure, add approx. 100-200 RPM)
6. Roll out 1⁄2 bank angle prior to entry heading
7. Look for traffic, then perform a 360° turn with 45° of bank in the opposite direction
8. Roll out 1⁄2 bank angle prior to entry heading
9. "Cruise Checklist."

Maneuvering during Slow Flight

consists of flight (straight-and-level, climbs, turns, and descents) at an angle of attack just below that which will cause an aerodynamic buffet or stall warning. It teaches the pilot
to understand the airplane's flight characteristics and flight control feel at high AOA and low airspeed. Complete the slow flight maneuver no lower than 1,500' AGL. During slow flight, establish and maintain an airspeed at which any further increase in angle of attack, increase in load factor, or reduction in power would result in a stall warning (e.g., airplane buffet, stall horn, etc.).

1. Perform two 90° clearing turns
2. 1600 RPM (maintain altitude)
3. Landing configuration flow
4. Maintain altitude – slow to just above stall warning activation

(approximately 45-50 KIAS)

5. Power as required to maintain airspeed
6. Accomplish level flight, climbs, turns, and descents as required without activating a stall warning
7. Recover – max power/maintain altitude/reduce flaps
8. Above VX, retract flaps to 0°

Power-Off Stall

The power-off stall consists of a stall from a stabilized descent in the landing configuration with the throttle at idle, simulating a stall during an approach to landing. It develops the pilot's ability to recognize and recover from an inadvertent stall in this phase of flight. Begin the power-off stall at an altitude that allows stall recovery to be completed no lower than 1,500' AGL.

1. Perform two 90° clearing turns
2. 1600 RPM (maintain altitude)
3. Landing configuration flow
4. Stabilized descent at 65 KIAS
5. Throttle idle (slowly)
6. Wings level or up to 20° bank as assigned
7. Raise nose to an attitude that induces a stall
8. Acknowledge cues of the impending stall
9. At full stall / first indication of impending stall (as required), recover – reduce AOA, level wings, apply max power
10. Retract flaps to 20° (immediately)
11. Retract flaps to 10° when airspeed is greater than 60 KIAS
12. Increase pitch to arrest descent
13. Establish VX or VY as appropriate
14. Retract flaps to 0° when accelerating through VX
15. Return to specified altitude, heading, and airspeed
16. “Cruise Checklist.”

Power-On Stall

The power-on stall consists of a stall from a climb in the takeoff configuration with the throttle at full power, simulating a stall during a departure climb or go-around. It develops the pilot's ability to recognize and recover from an inadvertent stall in this phase of flight. Begin the power-on stall at an altitude that allows stall recovery to be completed no lower than 1,500' AGL.

1. Perform two 90° clearing turns
2. 1600 RPM (maintain altitude)
3. Clean configuration flow
4. At 55 KIAS, simultaneously increase pitch (slowly) and apply full power
5. Increase pitch attitude to induce stall
6. Acknowledge cues of the impending stall
7. At full stall / first indication of impending stall (as required), recover – reduce AOA, level wings, apply max power
8. Return to specified altitude, heading, and airspeed
9. “Cruise Checklist.”

Emergency Descent

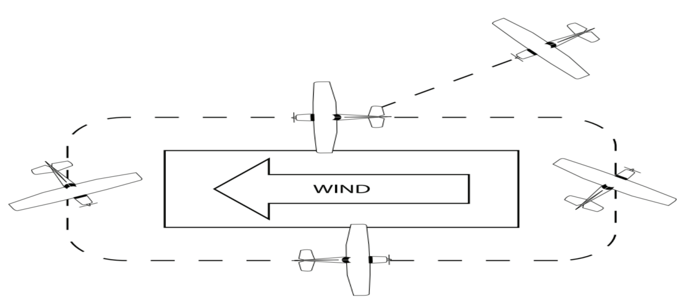
The emergency descent consists of a high-drag, high-airspeed, idle-power descent. It teaches the pilot how to descend rapidly and safely in emergency situations requiring an immediate landing. Pilots must maintain situational awareness, appropriate division of attention, and positive load factors throughout the descent.

1. Perform two 90° clearing turns
2. Clean configuration flow
3. Reduce throttle to idle
4. Initiate turning descent (bank angle 30°-45°), while clearing for traffic
5. Maintain 120 KIAS (in training - actual emergencies may require acceleration to VNO or VNE, as appropriate)
6. Notify ATC/Traffic as appropriate

Rectangular Course

The rectangular course consists of a pattern around a rectangular ground reference that maintains an equal distance from all sides of the reference. It develops the pilot's ability to maintain a specified ground track by applying wind drift correction in straight and turning flight. The maneuver also trains the pilot to correctly divide their attention between flightpath, ground references, control inputs, outside hazards, and instrument indications. Additionally, it prepares the pilot to fly accurate airport traffic patterns. Fly the rectangular course at an altitude between 600' AGL and 1,000' AGL.

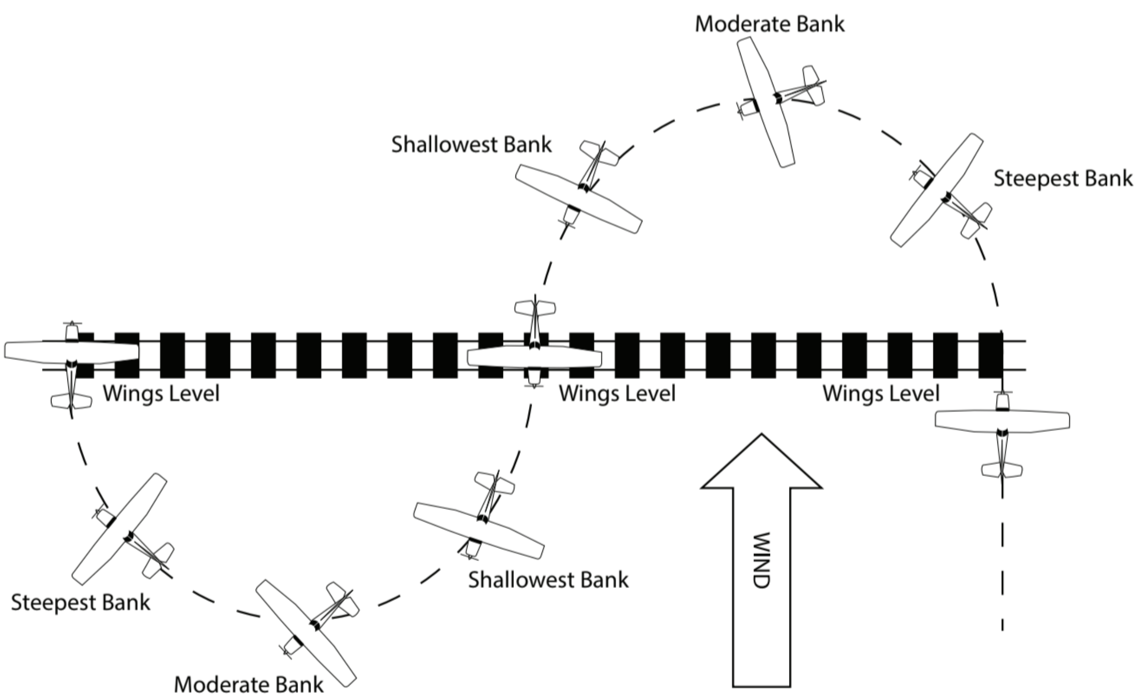
1. Perform two 90° clearing turns
2. Select a suitable ground reference area
3. 90 KIAS (approx. 2000 RPM), maintain selected altitude
4. Clean configuration flow
5. Enter at a 45° angle to the downwind leg (right or left traffic)
6. Apply adequate wind-drift correction during straight and turning flight to maintain a constant ground track around a rectangular pattern. Remain 1/2 to 3/4 of a mile from the boundary of the reference area.
7. Maintain altitude and airspeed
8. Recover when re-established on downwind
9. “Cruise Checklist.”



S-Turns

S-turns consist of two half-circle turns, one in each direction, on either side of a straight-line ground reference. It develops the pilot's ability to apply wind-drift correction to fly constant-radius turns. The maneuver also trains the pilot to correctly divide their attention between flightpath, ground references, control inputs, outside hazards, and instrument indications. S-turns are flown at an altitude between 600' AGL and 1,000' AGL.

1. Perform two 90° clearing turns
2. Select a suitable ground-based reference line
3. 90 KIAS (approx. 2000 RPM), maintain selected altitude
4. Clean configuration flow
5. Enter on the downwind
6. Adjust bank angle throughout the turn to fly a constant radius turn
7. Maintain altitude and airspeed
8. Wings level crossing over reference line
9. Repeat in opposite direction
10. Recover once across the reference line again
11. "Cruise Checklist."



Turns around a point

Turns around a point consists of a 360° constant radius turn around a ground-based reference point. It develops the pilot's ability to apply wind-drift correction to fly a constant-radius turn, with the wind direction changing throughout the maneuver. The maneuver also trains the pilot to correctly divide their attention between flightpath, ground references, control inputs, outside hazards, and instrument indications. Turns around a point are flown at an altitude between 600' AGL and 1,000' AGL.

1. Perform two 90° clearing turns
2. Select a suitable ground-based reference point
3. 90 KIAS (approx. 2000 RPM), maintain selected altitude
4. Clean configuration flow
5. Enter on the downwind
6. Adjust bank angle to maintain a constant radius turn around chosen point
7. Maintain altitude and airspeed
8. Recover once 360° turn is complete
9. "Cruise Checklist."