Cessna 172
Training Supplement

ATPFlightSchool.com
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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.
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IMPORTANT: Aircraft information can be obtained from the Owner’s Manual, POH or POH/AFM (as appropriate for the model). Airplanes with engine modifications (and possibly increased gross weights) will have additional information in the Supplemental Airplane Flight Manual in Section 9. Refer to the official aircraft documents for ALL information.

ATP Cessna 172 aircraft models include R / S models (“Late Model”) and L through N models (“Early Model”). Over 90% of ATP’s Cessna 172 fleet are Late Model.

R-model Cessnas were introduced in 1996, and were the first to come factory-equipped with fuel-injected engines. Starting procedures are substantially different between the earlier models with carbureted engines and the later models with injected engines. Review the engine start procedures by referencing the latest ATP 172 checklist for the 172 model you will be flying.

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Year of Production</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EARLY MODELS</strong></td>
<td></td>
</tr>
<tr>
<td>172 L</td>
<td>1971–72</td>
</tr>
<tr>
<td>172 M</td>
<td>1973–76</td>
</tr>
<tr>
<td>172 N</td>
<td>1977–80</td>
</tr>
<tr>
<td><strong>LATE MODELS</strong></td>
<td></td>
</tr>
<tr>
<td>172 R</td>
<td>1996–2009</td>
</tr>
<tr>
<td>172 S</td>
<td>1998–Present</td>
</tr>
</tbody>
</table>
NOTE: R-model 172s were originally delivered with 160-horsepower engines. However, ATP’s R-model aircraft have received a propeller modification that provides for an increase to 180 horsepower (matching the S model), which in turn increases fuel burn and maximum allowable takeoff weight.

ATP’s early-model Cessna 172s have different combinations of engine horsepower and usable fuel. Some aircraft carry only 38 gallons of useable fuel, and have been modified with a 180-horsepower engine. These airplanes have an increased fuel burn and a significantly reduced endurance of approximately 3 hours in the training environment – even with full tanks.

**Calculate your fuel requirements carefully.** Reference the aircraft manuals and placards for the appropriate information.

Airworthiness and registration certificates, which list the aircraft model, can be found on the forward lower left interior cabin wall. Weight and balance information can be found in the blue aircraft maintenance logbook, as well as Section 6 of the POH.
Late Model (R&S)

System descriptions are given first for Late Model aircraft, and then differences only for Early Models.

Engine

The 172 R and 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. ATP’s minimum oil quantity for takeoff is 6 quarts.

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 gyro's. These have a normal operating range of 4.5-5.5 inches of mercury. Failure of a vacuum pump is indicated by an annunciation 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.

**NOTE:** The parking brake is not to be used in training or flight checks with ATP.

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 with ATP.

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.

**Early Model (L-N) Differences**

Early model Cessnas are generally characterized by their pre-1996 production date and carbureted engines.

**Engine**

Early model 172’s were delivered with a 320 cubic inch, O-320-E2D engine. This engine produced 150 HP at 2700 RPM. However, ATP’s early model 172s have been modified with approved aircraft engine upgrades. Modified engines have 180 HP, increased maximum takeoff weight, increased fuel burn, and significantly reduced endurance. Most of these upgrades have been performed either by Penn Yan Aero or by Air Plains.
**Vacuum System**

The system has 1 vacuum pump.

**Flaps**

Some early models have no detents for flap settings, and some have up to 40 degrees of flaps.

**Fuel System**

The fuel system has a total usable fuel capacity of as little as 38 gallons (usable fuel is placarded on the fuel selector). Typically there are 3 fuel sumps (1 under each wing and 1 under the engine cowling). There is no electrically-driven auxiliary fuel pump. There is no separate fuel shutoff valve. In lieu of a separate fuel shutoff valve, the fuel selector valve has an OFF position. Fuel is delivered to a carburetor.

**Electrical System**

The airplane is equipped with a 14-volt DC electrical system and a 12-volt lead-acid battery.

**External Lighting**

A single or dual landing/taxi light configuration is located at the front of the engine cowl.

**Carburetor Heat**

Under certain moist atmospheric conditions at temperatures of 20° to 70° F (-5° to 20° C), it is possible for ice to form in the induction system, even in summer weather. This is due to the high air velocity through the carburetor venturi and the absorption of heat from this air by vaporization of the fuel. To avoid this, the carburetor heat is provided to replace the heat lost by vaporization. The initial signs of carburetor ice can include engine roughness and a drop in engine RPM. Operated by the knob next to the throttle control, carburetor heat should be selected on if carburetor ice is expected or encountered. Adjust mixture for maximum smoothness. Carburetor heat also serves as an alternate induction air source, in case of blockage of the primary engine air intake.

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**NOTE:** Partial carburetor heat may be worse than no heat at all, since it may melt part of the ice, which will refreeze in the intake system. Therefore when using carburetor heat, always use full heat and when the ice is removed, return the control to the full cold position.
NOTE: Additional aircraft systems information can be found in Section 7 of the Cessna 172 Pilot's Operating Handbook, available in the ATP Training Library and ForeFlight Documents. ATP training videos reviewing this material are available on the Ground School Support Videos page.

Garmin G1000

Some Cessna 172s are 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)](image)

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.
**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 softkeys along the bottom edge of each display with functions that vary depending on context.

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**NOTE:** Review the G1000 Pilot’s Guide for your airplane for more information on the G1000’s features. These are available in the ATP Library and in ForeFlight Documents.

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**Standby Instruments**

Cessna 172s equipped with the G1000 also have three standby flight instruments for use in case of G1000 component failures. A conventional airspeed indicator and altimeter are connected to the pitot-static system (note that blockages of the pitot tube or static port will affect both the standby instruments and the G1000). A gyroscopic attitude indicator is powered by an engine-driven vacuum pump. Heading information is available from the magnetic compass. (There is no backup source of rate of turn or rate of climb information.)
**NOTE:** The standby flight instruments are designed to allow the pilot to safely exit instrument conditions and land the airplane in the event of instrumentation or electrical failures. They are not a replacement for the primary instrument displays on the G1000. If use of the standby instruments is required, exit IMC and land as soon as possible.

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**G1000 Failures & Partial-Panel Approaches**

**Training Considerations**

For partial-panel training and checkrides, the two most common training scenarios are PFD failures and ADAHRS failures.

- **PFD Failure:** Simulate by dimming the PFD screen. The student should respond by pushing the DISPLAY BACKUP button to activate reversionary mode and move the flight instrument displays to the MFD. All instrument procedures remain available. Use the Inset Map for situational awareness.

- **ADAHRS Failure:** The ADAHRS has various failure modes that can cause one or more instrument indications to become unavailable. To simulate a worst-case scenario in which all of the G1000’s flight instruments are unusable, dim the PFD screen and do **not** activate reversionary mode. Then, fly the airplane using the standby instruments. The MFD should remain on the moving map screen for situational awareness. GPS approach procedures remain available. Set the MFD fields to TRK, DTK, XTK, and DIS to maintain situational awareness of your position relative to the intended track (in lieu of the CDI).

Other failure modes in which some (but not all) instruments are unavailable can be simulated using paper or foam cutouts that hang from the COM and NAV knobs and cover up particular areas of the PFD screen. ATP does not provide these cutouts.

**NOTE:** The simulation of failures by pulling circuit breakers is **prohibited** in ATP aircraft. Cessna, Garmin, and the FAA all advise against pulling circuit breakers as a means of simulating failures on the G1000 system. Pulling circuit breakers, or using them as switches, has the potential to weaken the circuit breaker to a point at which it may not perform its intended function.
**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](image)

![ADC Failure](image)

**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.

**NOTE:** If the AHRS cannot provide valid heading information, the course pointer on the HSI will point straight up, effectively converting it into a standard, fixed-card course deviation indicator. As a result, pilots can still perform partial-panel instrument approach procedures following an AHRS failure. Cross-reference between heading information from the magnetic compass and course information from the PFD.

**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.
Because the IAUs are not cross-linked, any functions handled by just one IAU will be lost if its corresponding display fails. If the PFD fails, NAV1, COM1, and GPS1 will be unavailable. If the MFD fails, NAV2, COM2, and GPS2 are unavailable. Other optional avionics may also become unavailable, depending on the particular avionics configuration.

**Electrical Failure**

If the alternator fails, a red “LOW VOLTS” annunciation will appear on the PFD. All G1000 equipment will initially remain on, powered by the main battery. Follow the appropriate emergency checklist to verify the failure and attempt to reset the alternator.

If the “LOW VOLTS” annunciator remains on, the first step in the load shedding procedure is to switch Avionics Bus 1 off. This will disable optional equipment and cooling fans, but the PFD, ADC/AHRS, #1 radio, etc. remain powered by the essential bus. Continue with the checklist and prepare to land as soon as practical. The main battery will supply power to the main and essential buses until M BUS VOLTS falls below 20 volts.

Once the main battery is depleted, the standby battery system will supply power to the essential bus for approximately 30 minutes. The standby battery does not power the equipment on Avionics Bus 2, including the MFD, transponder, COM2 / NAV2 radios, and audio panel. COM1 MIC and NAV1 must be selected on the audio panel before power to Avionics Bus 2 is lost, or the radios cannot be tuned.

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**NOTE:** If you are not in IMC, turn off Avionics Bus 2 at the end of the Electrical Load Reduction checklist to further reduce the draw on the main battery.
GPS Setup

Garmin G1000

Enroute

**PFD:** Active with appropriate nav source (needles) active.

**MFD:** Map page with Traffic Information active. Range selected to view two future fixes.

![G1000 Standard Configuration](image)

Full Panel Approaches

**PFD:** Active with appropriate nav source (needles) active.

**MFD:** Map page with Traffic Information active. Range selected to view one or two future fixes.

Partial Panel Approaches

**PFD:** Dimmed.

**MFD:** Reversionary Mode.

**Map Overlay:** On with Traffic Information active.

![G1000 Partial Panel Configuration](image)
**Enroute**

**GPS:** Moving Map page (Nav 2), orientation set to TRACK UP.

**VLOC Button:** Selected to appropriate nav source.

**Course Guidance:** Nav 1 OBS or HSI, CDI Scaling - Auto.

**Map Settings**
- MENU > Restore Defaults? > ENT
- MENU > Setup Map? > ENT
- ORIENTATION Track up ENT
- Push To Remove Cursor

**CDI Scaling**
- AUX Chapter Page 3
- CDI / Alarms > ENT
- Selected CDI AUTO
- ILS CDI AUTO

(This verifies that CDI scaling uses standard GPS ranges for all modes of flight.)

**Full Panel Approaches:**

**GPS:** Moving Map page (Nav 2), orientation set to TRACK UP.

**VLOC Button:** Selected to appropriate nav source.

**Course Guidance:** Nav 1 OBS and Heading Indicator.

**Partial Panel Approaches:**

**GPS:** CDI page (Nav 1).

**VLOC Button:** Selected to appropriate nav source.

**Course Guidance:** Nav 1 OBS and TRK information

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**Cessna 172 Partial Panel Configuration**
V-Speeds (KIAS) & Limitations for R & S Models

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

<table>
<thead>
<tr>
<th>Description</th>
<th>Airspeed (KIAS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Horsepower</td>
<td>180hp</td>
</tr>
<tr>
<td>Max GTW (Normal)</td>
<td>2,550lbs</td>
</tr>
<tr>
<td>Max GTW (Utility)</td>
<td>2,200lbs</td>
</tr>
<tr>
<td>Max Ramp</td>
<td>2,558lbs</td>
</tr>
<tr>
<td>$V_{SO}$ Stall speed</td>
<td>40</td>
</tr>
<tr>
<td>$V_{S}$ Stall speed</td>
<td>48</td>
</tr>
<tr>
<td>$V_{X}$ Best angle of climb</td>
<td>62</td>
</tr>
<tr>
<td>$V_{Y}$ Best rate of climb</td>
<td>74</td>
</tr>
<tr>
<td>$V_{A}$ Maneuvering speed</td>
<td>105 @ 2,550lbs</td>
</tr>
<tr>
<td>$V_{R}$ Rotation speed</td>
<td>55</td>
</tr>
<tr>
<td>$V_{FE 10^°}$ Maximum flap</td>
<td>110</td>
</tr>
<tr>
<td>$V_{FE 20-30^°}$ Maximum flap</td>
<td>85</td>
</tr>
<tr>
<td>$V_{NO}$ Maximum structural</td>
<td>129</td>
</tr>
<tr>
<td>$V_{NE}$ Never exceed speed</td>
<td>163</td>
</tr>
<tr>
<td>$V_{G}$ Best glide speed</td>
<td>68</td>
</tr>
</tbody>
</table>

Maximum demonstrated crosswind 15 knots with full flaps, 20 knots with flaps 10°
NOTE: Due to the diversity of the early models, it is not possible to have a condensed section of systems and V-speeds. Review the POH and applicable supplements for the specific aircraft to be flown to determine maximum takeoff weights, horsepower, V-speeds, and systems information. Pay close attention to the airspeed indicator as some are calibrated in both KIAS and MPH. Which indication is on the outer scale of the airspeed indicator varies by airplane.

**Sample Weight & Balance Problem**

Complete the following sample weight and balance problem for an S model.

**Conditions**

<table>
<thead>
<tr>
<th>Weight Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Empty Weight</td>
<td>1676.3 lbs.</td>
</tr>
<tr>
<td><em>(Remember to use actual aircraft BEW for flight check.)</em></td>
<td></td>
</tr>
<tr>
<td>Front Pilots</td>
<td>350 lbs.</td>
</tr>
<tr>
<td>Rear Passengers</td>
<td>50 lbs.</td>
</tr>
<tr>
<td>Baggage <em>3 Bags @ 50 lbs. each</em></td>
<td></td>
</tr>
<tr>
<td>Max Ramp Weight</td>
<td>2,558 lbs.</td>
</tr>
<tr>
<td>Max Takeoff/Landing Weight</td>
<td>2,550 lbs.</td>
</tr>
<tr>
<td>Max Baggage Weight</td>
<td>120 lbs.</td>
</tr>
<tr>
<td>Max Usable Fuel</td>
<td>53 gal.</td>
</tr>
<tr>
<td>Fuel Burn</td>
<td>10 gal.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weight</th>
<th>Arm</th>
<th>=  Moment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Empty Weight</td>
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<td></td>
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<tr>
<td>Front Pilots</td>
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</tr>
<tr>
<td>Rear Passengers</td>
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<tr>
<td>Baggage 120 lbs. Max</td>
<td>95.00</td>
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<tr>
<td>Zero Fuel Weight</td>
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<tr>
<td>Usable Fuel</td>
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<td>Ramp Weight</td>
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<tr>
<td>Taxi Fuel (1.33 Gal.)</td>
<td>8</td>
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</tr>
<tr>
<td>Takeoff Weight</td>
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<tr>
<td>Fuel Burn</td>
<td>48.00</td>
<td></td>
</tr>
<tr>
<td>Landing Weight</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*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
Passenger Briefing

1. Safety Belt/Harness Usage
2. Cockpit Door Operation
3. Emergency Exit Operation
4. Fire Extinguisher Location/Usage
5. No Smoking
6. PIC Authority/Training/Checkride

Pre-Takeoff Briefing (Standard Procedures)

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 selector, 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 selector, magnetos, and battery master off
- Touchdown at lowest speed possible
Normal Takeoff (Flaps 0°)

Do not delay on runway.

1. Line up on centerline positioning controls for wind
2. Hold brakes
3. Increase throttle to 2000 RPM
4. Check engine gauges
5. Release brakes
6. Increase throttle to full power
7. “Airspeed Alive”
8. Start slow rotation at 55 KIAS
   \textit{(Main gear should lift off at approx. 60 KIAS. 55 KIAS is } V_R \text{, not } V_{LOF})
9. Accelerate to 74 KIAS \((V_Y)\)
   \textit{(}V_Y\text{ may vary depending on model. Refer to POH/AFM)}
10. “After Takeoff Checklist” out of 1,000' AGL

Normal Takeoff Profile

\textbf{Lined Up on Runway Centerline}
\begin{itemize}
\item Hold Brakes
\item Check Gauges at 2000 RPM
\item Release Brakes
\item Full Throttle
\end{itemize}

\textit{“Airspeed Alive”}

\begin{itemize}
\item 55 KIAS
\item Approx. 60 KIAS
\item Accelerating to } V_Y \text{ (if departing traffic pattern)
\item } V_R \text{ Lift-Off
\item 1,000’ AGL
\end{itemize}
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 climb at 56 KIAS over 50' obstacle
9. When clear of obstacle, accelerate to $V_Y$
10. Flaps 0° (above 60 KIAS)
11. “After Takeoff Checklist” out of 1,000' AGL

Short-Field Takeoff Profile

Lined Up on Runway Centerline
- Flaps 10°
- Use All Available Runway
- Hold Brakes
- Full Throttle
- Check Engine Gauges
- At Full Power – Release Brakes

“After Takeoff Checklist” if departing traffic pattern

Clear of obstacle — accelerate to $V_Y$

“Airspeed Alive”

Rotate to climb at 56 KIAS

Flaps 0°

1,000' AGL
**Soft-Field Takeoff**

1. Flaps 10°
2. Roll onto runway with full aft yoke – minimum braking – do not stop
3. Smoothly apply full power – check engine gauges
4. "Airspeed Alive"
5. As nose lifts off, ease back pressure *(Nose wheel must remain off ground - do not strike tail!)*
6. Lift off at lowest possible airspeed – remain in ground effect
7. In ground effect – accelerate to 62 KIAS ($V_x$) – begin climb
8. Accelerate to 74 KIAS ($V_y$)
9. At safe altitude, retract flaps
10. “After Takeoff Checklist” out of 1,000' AGL

**Soft-Field Takeoff Profile**

- Roll Onto Runway with Full Aft Yoke
  - Flaps 10°
  - Minimum Braking - Do Not Stop
  - Smoothly Apply Full Power – Check Engine Gauges

Lift off at lowest possible airspeed

"Airspeed Alive"

Begin climb at $V_x$

Remain in ground effect

"After Takeoff Checklist" if departing traffic pattern

Accelerate to $V_y$

Retract flaps at safe altitude

1,000' AGL
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.

Good Planning = Good Landing

A good landing is a result of good planning. When planning an approach and landing, decide on the type of approach and landing (visual or instrument, short-field, soft-field, etc.). Decide on the flap setting, the final approach speed, the aiming point, and where the airplane will touch down on the runway surface.
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 20° 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 70 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.

TIP: When approaching any airport for landing, have the airport diagram available prior to landing and familiarize yourself with your taxi route based on your destination on the field and the landing runway.

TIP: Do not allow briefing the approach to distract you from ATC calls and traffic reports. Pilots must maintain situational awareness of the position of all traffic in the pattern.
Announced Calls on Approach

“Before Landing Checklist”

- Visual: Prior to descending from Traffic Pattern Altitude (TPA) *(abeam approach end on downwind)*
- ILS: ½ dot below glideslope intercept
- Non-Precision: At FAF

“1,000 To Go”

- Instrument: 1,000’ above MDA or DA

“Stabilized”

- Visual or ILS: At 400’ AGL
- Non-Precision: Descending from MDA

---

If the approach is not stabilized, execute a go-around / missed approach.

“100 To Go”

- Instrument: Prior to MDA or DA

“Minimums”

- Instrument: at MDA or DA

Stabilized Approach

Definition: A stabilized approach is one in which the pilot establishes and maintains a constant-angle glidepath 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-8083-3B, p. 8-9).*

A stabilized approach is required during visual and instrument approaches in all ATP airplanes. The airplane must be stabilized by:

- 1,000’ AGL for an ILS approach
- Descending from MDA for a non-precision approach
- 500’ AGL for a visual approach
General Conditions for a Stabilized Approach

• Constant-angle glidepath. Proper descent angle and rate of descent must be established and maintained. All available landing aids (ILS, VASI, PAPI, etc.) must be used. Non-precision approaches may require a slightly steeper angle until reaching MDA.

• Aircraft in final landing configuration (flaps and trim set). Engine power must be steady at the proper approach power setting.

• Airspeed must be stable and within range of target speed plus 10 KIAS.

• The aircraft will touch down in the first $\frac{1}{3}$rd of the landing runway. If this is not assured, a go-around must be executed.

The procedures and parameters listed above are not merely targets, they are mandatory conditions and limits. Any deviation occurring at or beyond the beginning of the stabilized approach corridor requires a mandatory go-around.

Aiming Point

The Airplane Flying Handbook defines aiming point as "the point on the ground at which, if the airplane maintains a constant glidepath, and was not flared for landing, it would contact the ground."

AIM 2-3-3 – The "Runway Aiming Point Markings" consist of a broad white stripe located on each side of the runway centerline, approximately 1,000' from the landing threshold.

ATP requires all landings to occur within the first third of the landing runway. When flying a visual approach and landing in a 172, the (visual) aiming point chosen by the pilot is often an earlier point on the runway than the AIM-defined "aiming point markings" to account for the flare. This technique ensures that the airplane touches down no farther than one-third down the runway.

Managing Energy

Managing energy means the pilot controls the airplane’s glidepath, speed, and power setting so that altitude and airspeed are depleted simultaneously on the intended touchdown point.

Pitch & Power

Pitch

Maintain a constant angle glidepath to the aiming point by making pitch adjustments to keep the point stationary in the windshield. If the aiming point moves lower in the windshield, lower the pitch until the aiming point is back in the correct, stationary position. If the aiming point moves toward the top of
the windshield, increase the pitch until the aiming point is back in the correct, stationary position.

**TIP:** During a visual approach and landing, if the airplane is trimmed for the correct approach speed with the correct power set, much of the pilot’s attention can be on maintaining a constant angle glidepath to the aiming point. A majority of the pilot’s scan should be outside the airplane, devoted to the aiming point and looking for traffic, with periodic instrument checks.

**Power**

During a stabilized approach and landing, use power to control deviations from the desired approach speed while maintaining a constant angle glidepath to the aiming point. If the airspeed is fast, reduce power while maintaining the constant angle glidepath. If the airspeed is slow, add power while maintaining the constant angle glidepath.

Since a constant angle glidepath is a requirement for a stabilized approach, airspeed deviations should be corrected by adjusting power. Changing pitch to correct airspeed deviations during a stabilized approach will cause an excursion from the constant angle glidepath, resulting in an unstable approach.

**TIP:** For training purposes, landing is considered assured when the aircraft is lined up and will make the paved runway surface in the current configuration without power.

**Go Around Philosophy**

The decision to execute a go-around is both prudent and encouraged anytime the outcome of an approach or landing becomes uncertain. ATP considers the use of a go-around under such conditions as an indication of good judgement and cockpit discipline on the part of the pilot.

Instructors should vigilantly monitor student approaches and landings, and should command go-arounds if any of the stabilized approach conditions are not met. Instructors should make every effort to avoid allowing a student to take an unstabilized approach close to the ground, requiring the instructor to take the controls and initiate a go-around.
**Gust Factor**

Slightly higher approach speeds should be used under turbulent or gusty wind conditions. Add ½ 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 ½ the gust factor, 5 knots in this example, to the normal approach speed.

**Flap Setting**

The POH/AFM states: “Normal landing approaches can be made with power on or power off with any flap setting within the flap airspeed limits. Surface winds and air turbulence are usually the primary factors in determining the most comfortable approach speeds.”

Students must be able to determine the best flap configuration and approach speed given the landing conditions. Slower approach speeds and increased flap settings allow for shorter landings, while faster approach speeds and reduced flap settings are preferred in turbulent/gusty conditions or with strong crosswinds.

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**ATP**

At ATP, students are trained to perform normal landings using the Standardized Flaps 20° Landing profile, located on page 31. Short-field and soft-field landings require flaps 30°. Flap settings on power-off 180° approaches will vary depending on the current conditions.

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**Seat Position**

Correctly positioning the seat exactly the same for each flight improves landing performance and safety.

The fore-aft adjustment is correct when the heels are on the floor with the balls of the feet on the rudder pedals, not on the brakes. The feet should be at a 45° angle from the floor to the pedals and the pilot should be able to apply full rudder inputs without shifting their body weight. When braking is required, lift the foot from the floor rather than keeping the leg suspended in the air or resting the feet on the upper portion of the pedals.

The seat height should be adjusted so the pilot can see the curvature of the cowling for the best sight picture during landing.

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**ATP**

**TIP:** Proper foot position helps prevent inadvertent brake application during landings and ground operations.
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

At TPA
- Reduce Power — Maintain 90 KIAS (Approx. 2000 RPM)

Established on Downwind
- Pattern Briefing

Abeam Touchdown Point
- "Before Landing Checklist"
- Resume Landing Profile (following pages)

300' Below TPA
- Turn Crosswind

Vx, Vy Climb
Standardized Flaps 20° 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, on extended base, or on extended final (when ready to descend out of pattern altitude): Reduce power to approx. 1500 RPM and select flaps 10°
6. Descend out of TPA at 70-80 KIAS
7. On base leg, select flaps 20°. Slow to and trim for 70 KIAS
8. Maintain 70 KIAS until short final when landing is assured, then slow to 65 KIAS until 10’ to 20’ above the runway

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!

Before Landing Checklist

FUEL SELECTOR.................................................................BOTH
MIXTURE ...........................................................................FWD
CARB HEAT (carbureted models) ..............................................ON
**TIP:** The power settings in this supplement are approximate and can change depending on prevailing conditions. A common mistake is to spend too much time trying to set exact power settings. This diverts the pilot’s attention from more important things. During landings, limit attention to the gauges to a few seconds at a time so ample attention remains on flying the proper course and glidepath.

**VIDEO:** For more information about proper landing technique, watch "Land Like a Pro" available in the ATP Flight School Training Library.
**No-Flap Approach & Landing**

*Steps 1-4 are identical to a normal approach and landing procedure.*

5. When abeam touchdown point, on extended base, or on extended final (when ready to descend out of pattern altitude): Reduce power to approx. 1300 RPM

6. Descend out of TPA at 70-80 KIAS

7. On base leg, slow to and trim for 70 KIAS

8. Maintain 70 KIAS until landing is assured, then slow to 65 KIAS until 10' to 20' above the runway

---

**TIP:** A no-flap approach has a different sight picture than a normal, flaps 20° approach. Don’t add airspeed beyond profile speeds to compensate for the different sight picture. This will lead to excessive float in ground effect.
**Short-Field Approach & Landing**

*Steps 1-7 are identical to a normal approach and landing procedure.*

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

**Short-Field Approach & Landing Profile**

**Touchdown**
- On intended touchdown point with little or no float
- Within the first third of the runway
- At minimum controllable airspeed
- Nose-high pitch attitude

**Rollout**
- Maintain Centerline Until Taxi Speed
- Increase Crosswind Control Inputs
- as Airplane Slows

**Aiming Point & Touchdown Point**

**On Final**
- Select Flaps Full (landing assured)
- Maintain 61 KIAS until 10° to 20° above the runway

**On Base**
- Select Flaps 20°
- Slow to 70 KIAS

**Approx 10 Mi. from Airport**
- Begin Slowing to 90 KIAS
- Plan Descent to Enter Traffic Pattern in Level Flight at TPA (or Overflight Altitude as Appropriate)

**Approx 5 Mi. from Airport**
- Maintain 90 KIAS

**When Ready to Descend Out of Pattern Altitude**
- Complete the “Before Landing Checklist”
- Reduce Power to Approx. 1500 RPM
- Select flaps 10°
- Descend out of TPA at 70-80 KIAS

**No Later Than 15 Mi. from Airport**
- “Approach Checklist”
- Verify Traffic Pattern Altitude (Usually 1,000’ above field elevation)
Arrival Procedures • 35

Soft-Field Approach & Landing

Steps 1-7 are identical to a normal approach and landing procedure.

8. On short final when landing is assured, select flaps 30° and slow to 65 KIAS
9. Fly the airplane onto the ground, slowly transferring the weight from the wings to the main landing gear
10. Touch down on intended touchdown point at minimum speed with a nose-high pitch attitude
11. Keep the nosewheel off the ground as airplane slows by increasing elevator pressure
12. Prevent nosewheel from rapidly falling by maintaining aft elevator pressure

Soft-Field Approach & Landing Profile

When Ready to Descend Out of Pattern Altitude
• Complete the “Before Landing Checklist”
• Reduce Power to Approx. 1500 RPM
• Select flaps 10˚
• Descend out of TPA at 70-80 KIAS

No Later Than 15 Mi. from Airport
• “Approach Checklist”
• Verify Traffic Pattern Altitude (Usually 1,000’ above field elevation)

Approx 10 Mi. from Airport
• Begin Slowing to 90 KIAS
• Plan Descent to Enter Traffic Pattern in Level Flight at TPA (or Overflight Altitude as Appropriate)

Approx 5 Mi. from Airport
• Maintain 90 KIAS
• Complete the “Before Landing Checklist”
• Reduce Power to Approx. 1500 RPM
• Select flaps 10˚
• Descend out of TPA at 70-80 KIAS

On Base
• Select Flaps 20˚
• Maintain 70 KIAS

On Final
• Select Flaps 30˚ (landing assured)
• Maintain 65 KIAS until 10˚ to 20˚ above the runway

Slowly transfer weight from wings to main landing gear

Aiming Point

Touchdown Point

Touchdown
• Smoothly on intended touchdown point
• Within the first third of the runway
• At minimum controllable airspeed
• Nose-high pitch attitude

Rollout
• Maintain nose-high pitch attitude with nosewheel off the ground as airplane slows
• Prevent nosewheel from rapidly falling by maintaining aft elevator pressure

Increase Crosswind Control Inputs as Airplane Slows
Power-Off 180° Accuracy Approach and Landing

Steps 1-4 are identical to a normal approach and landing procedure.

5. Fly parallel to the runway, correcting for crosswind, with the runway about halfway up the wing strut.

6. When abeam touchdown point, smoothly reduce power to idle.

7. Maintain altitude while slowing to 75 KIAS, then descend out of TPA.

8. At approximately 10% below TPA (100 feet, for the standard 1,000’ TPA), turn base.

9. Begin evaluating distance from runway and wind conditions. Dissipate energy by:
   A. Squaring the base-to-final turn / lengthening the ground track.
   B. Increasing the flap setting.
   C. Slipping the aircraft.

10. Aim to be aligned with the runway by around 400’ to 500’ AGL. Stronger headwinds on final will require this to occur closer to the runway.

11. On final, maintain a constant descent angle (which will be steeper than for a power-on approach) to the aiming point, and an appropriate speed based on the flap setting:
   A. 0°: 75 KIAS.
   B. 10° to 30°: 65 KIAS.

12. When landing is assured, slow to 65 KIAS until 10’ to 20’ above the runway.
   A. Because the descent rate is higher than with power, begin the roundout slightly earlier to avoid hard landings

---

**TIP:** A slip can be increased or reduced throughout the approach to fine-tune the descent rate. By contrast, retracting flaps after they have been deployed is not recommended, as this often results in high sink rates as the lift the flaps generate is lost. When slipping, use aileron into the crosswind (if present), and monitor/maintain the desired airspeed. Avoid slipping the aircraft with full flaps, as this can lead to elevator oscillation.

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**TIP:** The aiming point and the touchdown point are NOT the same point. Aim about 200’ before the touchdown point to dissipate enough speed for a proper landing.

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Arrival Procedures

**Power-Off 180° Accuracy Approach and Landing Profile**

- **Rollout**
  - Maintain Centerline Until Taxi Speed
  - Increase Crosswind Control Inputs as Airplane Slows

- **Touchdown**
  - On Intended Touchdown Point
  - At Minimum Controllable Airspeed

- **On Final (400-500' AGL)**
  - Maintain Constant Descent Angle to Aiming Point
  - Evaluate:
    - **High**
      - Apply Slip as Needed
      - Flaps 30°
    - **Low**
      - Slow to Best Glide
      - If Still Low - GO AROUND!

- **When Established on Downwind**
  - Trim for 90 KIAS
  - Maintain Distance from Runway (halfway up wing strut)

- **Abeam Touchdown Point**
  - “Before Landing Checklist”
  - Reduce Power to Idle
  - Maintain Altitude, Slow to 75 KIAS
  - Begin Descent, Maintain 75 KIAS

- **Turning Final - Evaluate...**
  - **High**
    - Flaps 20°
    - Apply Slip
    - Maintain Speed
  - **Low**
    - Maintain Flap Setting
    - Slow to Best Glide

- **Key Position - Evaluate...**
  - **High**
    - Square Base/Final Flaps 10°
    - Apply Slip
  - **Low**
    - Turn to Numbers
    - Maintain Flap Setting

- **Rollout - Evaluate...**
  - **High**
    - Widen Base Leg Flaps 10°
  - **Low**
    - Tighten Base Leg No Flaps
    - Slow to Best Glide

- **10% Below TPA**
  - (900 AGL, for standard TPA)
  - Turn Base

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Cessna 172
Emergency Approach and Landing (Simulated)

1. Reduce power to idle.
2. Pitch for and then trim to maintain best glide speed (68 KIAS)
3. Select an appropriate emergency landing site.
4. Begin flying directly towards landing site.
6. Evaluate glide performance to confirm landing site can be reached.
7. Upon reaching landing site, spiral downwards at best glide.
8. Evaluate wind direction to determine best direction of approach.
9. Roll out of spiral heading downwind, abeam “midfield,” at approximately 1,500’ AGL.
10. Pass abeam intended touchdown point at approximately 1,000’ AGL.
11. Execute Power-Off 180° Accuracy Approach and Landing procedure as previously described.
13. If landing site is not an airport, or does not meet ATP runway requirements, add power and break off the approach no lower than 500’ AGL.

TIP: Keep the engine warm and cleared by occasionally advancing the throttle. If the simulated emergency approach will be taken to a landing on a runway, ensure that either the instructor or the student has complete control of the throttle during the landing, should a go-around become necessary.

Crosswind Approach & Landing

Carefully planned adjustments must be made to the normal approach and landing procedure to safely complete a crosswind approach and landing.

Planning

Before entering the traffic pattern, brief how your approach and landing will be different by acknowledging the wind direction, crosswind component, planned flap setting, and how your traffic pattern ground track will differ as a result of the winds.
Flap Setting

The Cessna POH/AFM recommends using the “minimum flap setting required for the field length. If flap settings greater than 20° are used in sideslips with full rudder deflection, some elevator oscillation may be felt at normal approach speeds.” It is highly recommended that flap settings be limited to no more than 20° during crosswind operations. Strong crosswinds may require reduced flap settings. While the maximum demonstrated crosswind component with full flaps is 15 knots, this increases to 20 knots at flaps 10°.

Ground Track

Plan a crab angle on downwind to maintain a uniform distance from the runway. Begin the base turn so the airplane is established on base at the appropriate distance from the runway. Do not allow the winds to blow the airplane off the intended ground track. Turning final, adjust for the winds to not over- or undershoot the runway centerline.

Control Technique

ATP standardized landing technique for the 172 and the 172 POH/AFM recommend the wing-low method for best control. Establish a crab angle to maintain the proper ground track on final, then transition to the wing-low sideslip technique by no later than 200’ AGL. Maintain the wing-low technique until touchdown and throughout the landing roll. After landing, increase aileron input into the wind as the airplane slows to prevent the upwind wing from rising, reduce side-loading tendencies on the landing gear, and minimize the risk of roll-over accidents due to the upwind wing lifting.

Judgment

The demonstrated crosswind component in the 172 is 15 knots. Regardless of reported winds, if the required bank to maintain drift control is such that full opposite rudder is required to prevent a turn toward the bank, the wind is too strong to safely land the airplane. Select another runway or airport and go-around any time the outcome of an approach or landing becomes uncertain.

TIP: During windy conditions, adjust turns in the traffic pattern as necessary to maintain the correct ground track and distance from the runway. For example, a strong tailwind during the downwind leg will blow the airplane too far from the runway if the pilot waits until the 45° point to turn base. Instead, plan the base turn early to remain the correct distance from the runway.
Crosswind Approach & Landing Profile

**When Ready to Descend Out of Pattern Altitude**
- Complete the Before Landing Checklist
- Reduce Power to Approx. 1500 RPM
- Select flaps 10°
- Descend out of TPA at 70-80 KIAS

**Approx 10 Mi. from Airport**
- Begin Slowing to 90 KIAS
- Plan Descent to Enter Traffic Pattern in Level Flight at TPA (or Overflight Altitude as Appropriate)

**Approx 5 Mi. from Airport**
- Maintain 90 KIAS

**On Base**
- Select Flaps 20° (as required)
- Maintain 70 KIAS
- Crab as necessary to maintain consistent ground track

**When Established on Downwind**
- Crab as necessary to maintain consistent ground track

**By 200’ AGL**
- Transition from crab to wing-low sideslip technique

**On Final**
- Crab as necessary to maintain extended centerline until 200’ AGL
- Maintain 70 KIAS + 1/2 gust factor until 10’ to 20’ above the runway

**When Ready to Descend Out of Pattern Altitude**
- Complete the Before Landing Checklist
- Reduce Power to Approx. 1500 RPM
- Select flaps 10°
- Descend out of TPA at 70-80 KIAS

**Approx 10 Mi. from Airport**
- Begin Slowing to 90 KIAS
- Plan Descent to Enter Traffic Pattern in Level Flight at TPA (or Overflight Altitude as Appropriate)

**Approx 5 Mi. from Airport**
- Maintain 90 KIAS

**On Base**
- Select Flaps 20° (as required)
- Maintain 70 KIAS
- Crab as necessary to maintain consistent ground track

**When Established on Downwind**
- Crab as necessary to maintain consistent ground track

**By 200’ AGL**
- Transition from crab to wing-low sideslip technique

**On Final**
- Crab as necessary to maintain extended centerline until 200’ AGL
- Maintain 70 KIAS + 1/2 gust factor until 10’ to 20’ above the runway

**Rollout**
- Maintain Centerline Until Taxi Speed
- Increase Crosswind Control Inputs as Airplane Slows

**TIP:** Develop the habit of applying full, proper crosswind control inputs as the airplane slows during every landing rollout and all taxi operations, regardless of how light the winds. Resist the tendency to release the control inputs to neutral after touchdown.

**Go-Around**
A go-around procedure must be initiated any time the conditions for a safe approach and landing are not met. Some examples of unsatisfactory approach and landing conditions are:

- Unstable approach path or airspeed.
- Improper runway alignment.
Any time unsafe or unsatisfactory conditions are encountered, a go-around must be immediately executed and another approach and landing should be made under more favorable conditions.

**TIP:** Flaps should always be retracted in 10° increments.
- Flaps 20° immediately (if flaps > 20°).
- Flaps 10° accelerating through 60 KIAS.
- Flaps 0° at 65 KIAS and clear of obstacles.

**Missed Approach**

A missed approach is a maneuver conducted by a pilot when an instrument approach cannot be completed to a landing. The pilot’s initial actions when initiating a missed approach are the same as a go-around procedure.

**Go-Around / Missed Approach Procedure**

1. Increase throttle to full power
2. Retract flaps to 20° (if > 20°) while simultaneously
3. Increase pitch to establish climb
4. Retract flaps to 10° when airspeed is greater than 60 KIAS
5. Establish \( V_X \) or \( V_Y \) as appropriate
6. Retract flaps to 0° at 65 KIAS and clear of obstacles
7. “After Takeoff Checklist” out of 1,000’ AGL if departing the traffic pattern

*If the go-around or missed approach is due to conflicting traffic, maneuver as necessary during the climb to clear and avoid conflicting traffic (usually to the side, flying parallel to the runway).*

---

**Decision to Go Around**

- Increase throttle to full power.
- Retract flaps to 20° (if > 20°) while simultaneously, increase pitch to establish climb.
Rejected or Balked Landing

A rejected or balked landing occurs when the airplane is very low to the ground and usually occurs after the roundout (flare) has begun. Airspeed may be very low – well below $V_X$ or $V_Y$ in some cases – and the pilot must be very careful to establish and maintain a safe airspeed during the transition to a climb. At slow airspeeds, retracting the flaps too early or abruptly can result in a significant loss of lift. The pilot must also factor in ground effect when initiating a rejected or balked landing close to the ground.

Rejected or Balked Landing Procedure

1. Increase throttle to full power
2. Retract flaps to 20° (if > 20°) while simultaneously
3. Accelerate to 60 KIAS (if slower) then
4. Increase pitch to establish climb
5. Retract flaps to 10° accelerating through 60 KIAS
6. Accelerate to $V_X$ or $V_Y$ as appropriate
7. Retract flaps to 0° at 65 KIAS and clear of obstacles
8. “After Takeoff Checklist” out of 1,000’ AGL if departing the traffic pattern

If the rejected landing is due to conflicting traffic, maneuver as necessary during the climb to clear and avoid conflicting traffic (usually to the side, flying parallel to the runway).

The terms go-around, missed approach, rejected landing, and balked landing are often used interchangeably, but there are differences.
Precision Approach (ILS Approach or RNAV Approach to LPV Minimums)

1. Complete the “Approach Checklist” and identify the localizer as early as possible
2. Slow to 90 KIAS on vectors or when on final approach course inbound
3. Announce “Localizer Alive” when localizer begins moving toward center
4. Announce “Glideslope Alive” when glideslope begins moving toward center
5. Verify no flags at glideslope intercept altitude and marker
6. 1/2 dot below glideslope intercept: “Before Landing Checklist”
7. Reduce power to approx. 1500 RPM, and select flaps 10°.
8. Descend on glideslope at 80 KIAS.
9. Announce at 1,000' above DA: “1,000 to go”
10. Announce at 100' above DA: “100 to go”
11. “Minimums”
12. If runway is in sight: descend and slow to 70 KIAS
13. On short final, slow to 65 KIAS until 10’ to 20’ above the runway

**TIP:** The airplane is considered established inbound when the localizer is alive.
Non-Precision Approach (VOR, LOC Approach; RNAV Approach to LNAV Minimums)

1. Load the approach into the GPS, and select appropriate nav source, and frequency if required.

Within 30 NM of the airport, if flying an RNAV approach, the GPS will display "TERM."

2. When direct to the IAF or on vectors, set the desired course on the Nav 1 OBS or HSI.

3. Complete the "Approach Checklist."

4. Slow to 90 KIAS when on a published segment of the approach or if on vectors.

At 2 NM prior to the FAF on an RNAV approach, verify the GPS has switched to an Approach mode. If it does not, DO NOT DESCEND at the FAF.

5. At the FAF, complete "Before Landing Checklist." Select flaps 10° and slow to 80 KIAS. Start time if required.

6. Descend at 400-500 FPM (unless a steeper descent is required) at 80 KIAS.

7. Announce at 100' above MDA: "100 to go."

8. Increase power 50' prior to reaching MDA to maintain 80 KIAS at level-off.

9. "Minimums."

10. Maintain MDA (plus 50', minus 0').

11. Descend at predetermined VDP (if runway is in sight), or maintain MDA to MAP.

12. Do not leave MDA until landing is assured.

13. When descending from MDA: select Flaps 20° and slow to 70 KIAS.

14. On short final, slow to 65 KIAS until 10’ to 20’ above the runway.
**Circling Approach**

When conducting a circling approach (precision or non-precision), fly the normal approach profile to the published circling minimums.

Maintain circling minimums at 80 KIAS, within 1.3 NM of the runway (the Category A circling radius), until in a position from which a normal landing can be made. Circling minimums are usually lower than traffic pattern altitude, so the descent will begin closer to the runway than in a standard traffic pattern.

When descending from MDA (circling minimums), select flaps 20° and slow to 70 KIAS. On short final, slow to 65 KIAS until 10' to 20' above the runway.

**Circling Approach Profile**

1. Slow to 100 KIAS holding speed 3 minutes prior to fix
2. Make proper entry
3. Report altitude and time at holding fix
4. Hold at 100 KIAS, with 1 minute leg to the inbound fix (unless otherwise specified)
Required maneuvers for the Commercial Pilot Single-Engine checkride are performed the same as those for Private Pilot, with two exceptions:

- Commercial steep turns are accomplished with at least 50° of bank. Private steep turns are performed at 45° of bank.
- Stall recovery at the commercial level is performed either at the first indication of an impending stall or after a full stall has occurred, as specified by the evaluator. Private stalls must be continued to a full stall.

Commercial Pilot Single Engine completion standards allow for lower tolerances than Private Pilot standards on maneuvers. Refer to the ACS.

**Clean Configuration Flow**

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

**Landing Configuration Flow**

1. Fuel selector – both
2. Mixture – enrichen
3. Carburetor heat – on (carbureted models)
4. Flaps full
**PVT**

**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 (2000 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. 1-200 RPM)
6. Roll out ½ 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 ½ bank angle prior to entry heading

<table>
<thead>
<tr>
<th>ACS</th>
<th>Airspeed</th>
<th>Altitude</th>
<th>Bank</th>
<th>Heading</th>
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<tbody>
<tr>
<td></td>
<td>±10 KIAS</td>
<td>±100’</td>
<td>45°±5° (PVT)</td>
<td>±10°</td>
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<td>50°±5° (COM)</td>
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**Maneuvering During Slow Flight**

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. 1500 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
   ATP - max 30° bank
7. Recover – max power/maintain altitude/reduce flaps
8. Above V\(_\text{X}\), retract flaps to 0°

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<tr>
<td></td>
<td>+10/-0 KIAS (PVT)</td>
<td>±100’ (PVT)</td>
<td>±10° (PVT)</td>
<td>±10°</td>
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<tr>
<td></td>
<td>+5/-0 KIAS (COM)</td>
<td>±50’ (COM)</td>
<td>±5° (COM)</td>
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**PVT**

**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. 1500 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 V_X or V_Y as appropriate
14. Retract flaps to 0° when accelerating through V_X
15. Return to specified altitude, heading, and airspeed
16. “Cruise Checklist.”

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<thead>
<tr>
<th>ACS</th>
<th>Bank</th>
<th>Heading</th>
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<tbody>
<tr>
<td></td>
<td>±10° (PVT)</td>
<td>±10°</td>
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<tr>
<td></td>
<td>±5° (COM)</td>
<td>±10°</td>
</tr>
</tbody>
</table>

Not to exceed 20°
**PVT**

**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. 1500 RPM (maintain altitude)
3. Clean configuration flow
4. At 60 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

**ACS**

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<tr>
<th>Bank</th>
<th>±10°</th>
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<tbody>
<tr>
<td>Heading</td>
<td>±10°</td>
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</table>

**Not to exceed 20°**

**PVT**

**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 V_NO or V_NE, as appropriate)
6. Notify ATC/Traffic as appropriate

**ACS**

<table>
<thead>
<tr>
<th>Airspeed</th>
<th>+0/-10 KIAS</th>
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<tbody>
<tr>
<td>Altitude</td>
<td>±100’</td>
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**NOTE:** Emergency descents are often performed in response to a specific emergency (actual or simulated), such as smoke/fire, acute passenger illness, etc. In addition to the maneuver, be sure to complete the appropriate checklist for the emergency situation.
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

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<tr>
<th>ACS</th>
<th>Airspeed</th>
<th>Altitude</th>
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<tbody>
<tr>
<td></td>
<td>±10 KIAS</td>
<td>±100’</td>
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50 • In-Flight Maneuvers
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.”

### ACS

| Airspeed  | ±10 KIAS |
| Altitude  | ±100’   |
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

### ACS

<table>
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<tr>
<th>Airspeed</th>
<th>Altitude</th>
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<tr>
<td>±10 KIAS</td>
<td>±100 feet</td>
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</table>
Chandelles consist of a maximum performance, 180° climbing turn in which the pilot gains as much altitude as possible while reversing course, ending with the aircraft traveling just above stall speed. It develops the pilot’s advanced airmanship skills, combining a precise, coordinated turn with a demonstration of energy management principles. Enter the chandelle no lower than 1,500’ AGL.

1. Perform two 90° clearing turns
2. 105 KIAS (2200 RPM), maintain altitude
3. Clean configuration flow
4. Choose a reference point off wing
5. Establish / maintain 30° bank
6. Full throttle - gradually increase pitch to attain approx. 10-12° pitch up at 90° point
   - 1st 90° of turn, Bank = constant 30°, Pitch = increasing to 10-12° pitch up
7. 90° point - maintain pitch - gradually reduce bank angle to attain wings-level at 180° point
   - 2nd 90° of turn, Pitch = constant 10-12° pitch up, Bank = decreasing to level
8. 180° point - wings level - minimum controllable airspeed
9. Momentarily maintain an airspeed just above a stall
10. Accelerate to resume straight-and-level flight with minimum loss of altitude
11. “Cruise Checklist.”

**Airspeed**

Just above stall

**Heading**

Rollout at 180° point ±10°
Lazy eights consist of a pair of 180° turns where, during the first 90°, the pilot climbs while increasing bank angle, and during the second 90°, the pilot descends while decreasing bank angle. It is the only standard flight training maneuver in which no flight control pressure is ever held constant. As such, it develops the pilot’s ability to maintain proper coordination of the flight controls across a wide range of airspeeds and attitudes. Enter the lazy eight no lower than 1,500’ AGL.

1. Perform two 90° clearing turns
2. 105 KIAS (2200 RPM), maintain altitude
3. Clean configuration flow
4. Choose a reference point off of the wing
5. Simultaneously increase pitch and bank (slowly)
6. 45° point – 15° pitch up and 15° bank
7. Reduce pitch / increase bank
8. 90° point – level pitch, 30° bank - min. speed (5-10 knots above stall)
9. Continue reducing pitch and reduce bank
10. 135° point – 15° pitch down, 15° bank
11. 180° point – level flight, entry airspeed and altitude
12. Repeat in opposite direction
13. “Cruise Checklist.”

*Pitch and bank reference numbers approximate.*

<table>
<thead>
<tr>
<th>Point</th>
<th>90° Point</th>
<th>135° Point</th>
<th>180° Point</th>
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<tbody>
<tr>
<td></td>
<td>1. Bank 30° (approx.)</td>
<td>1. Max. Pitch-down (approx. 15°)</td>
<td>1. Level Flight</td>
</tr>
<tr>
<td></td>
<td>2. Minimum Speed</td>
<td>2. Bank 15° (approx.)</td>
<td>2. Entry Airspeed</td>
</tr>
<tr>
<td></td>
<td>(5-10 kts above stall)</td>
<td></td>
<td>3. Altitude Same as Entry Altitude</td>
</tr>
<tr>
<td></td>
<td>3. Maximum Altitude</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Level Pitch Attitude</td>
<td></td>
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</tbody>
</table>

**At 180° Points:**

- **Airspeed:** ±10 KIAS
- **Altitude:** ±100'
- **Heading:** ±10°

Approx. 30° bank at steepest point
Constant change of pitch and roll rate and airspeed
Eights on pylons consist of a figure-eight pattern flown around two ground reference points (or “pylons”) such that the line of sight from the pilot’s eyes, parallel to the airplane’s lateral axis, remains fixed on the pylon. This develops the pilot’s ability to maneuver the airplane accurately while dividing attention between the flightpath and the ground reference. To hold the pylon, the airplane must be flown at the pivotal altitude, found by squaring the groundspeed (in knots) and then dividing by 11.3. The pivotal altitude will change throughout the maneuver as groundspeed changes. Maintain a distance from the pylon such that the angle of bank at the steepest point is 30–40°.

1. Enter pivotal altitude (approximately 900’ AGL at 100 KIAS - 2200 RPM)
2. Perform two 90° clearing turns
3. Clean configuration flow
4. Select two pylons to allow for minimal time spent wings level between the two
5. Enter maneuver on a 45° midpoint downwind
6. Apply appropriate pitch corrections to compensate for changes in groundspeed and to maintain line of sight reference with the pylon (pitch forward if point moves toward nose and pitch back if point moves toward tail)
7. Begin rollout to allow the airplane to proceed diagonally between the pylons at a 45° angle
8. Begin second turn in the opposite direction of the first
9. Exit maneuver on entry heading
10. “Cruise Checklist.”

**NOTE:** Hold the pylon by changing altitude, **not** slipping or skidding.
**Steep Spirals**

Steep spirals consist of a series of constant-radius gliding turns around a ground reference point. This trains similar skills as turns around a point, and also provides a way to lose altitude while remaining over a selected spot (as might be necessary in an emergency). Enter the maneuver high enough to execute three 360° turns and complete the maneuver no lower than 1,500' AGL (this will typically be at least 3,000' AGL).

1. Perform two 90° clearing turns
2. 80 KIAS (1700 RPM), maintain altitude
3. Clean configuration flow
4. Choose visual reference point
5. Reduce throttle to idle
6. Track at least three constant radius circles around reference point
7. Airspeed – constant
8. Bank angle – adjust for winds to maintain radius, not to exceed 60°
9. Clear engine once every 360° turn
10. Recover – roll out on specified heading (visual reference)
11. Adjust DG/HSI to compass
12. “Cruise Checklist.”

**Accelerated Stall**

The accelerated stall consists of a stall from a steep turn. It allows the pilot 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. Begin the accelerated stall at an altitude that allows stall recovery to be completed no lower than 3,000' AGL.

1. Perform two 90° clearing turns
2. Slow to approximately 80 KIAS (during clearing turns)
3. Clean configuration flow
4. Establish a coordinated 45° bank turn
5. Slowly reduce power to idle
6. Increase elevator back pressure to maintain altitude and induce stall
7. Recover at the first indication of an impending stall (e.g., aircraft buffet, stall horn, etc.). Reduce AOA, level the wings, and apply max power
8. Return to specified altitude, heading, and airspeed
Secondary Stall (Power-On)

The secondary stall demonstration consists of two stalls performed in sequence. The pilot first stalls the airplane (power-on or power-off); then, during stall recovery, they attempt to raise the nose too quickly, causing a second stall. This demonstrates the importance of proper stall recovery technique that focuses on reducing AOA and regaining flying speed, rather than minimizing altitude loss. Begin the secondary stall at an altitude that allows stall recovery to be completed no lower than 3,000' AGL.

1. Perform two 90° clearing turns
2. 1500 RPM (maintain altitude)
3. Clean configuration flow
4. At 60 KIAS, simultaneously increase pitch (slowly) and apply full power
5. Increase pitch attitude to induce stall
6. At stall, recover – reduce AOA, level the wings, and apply max power
7. When stall horn silences, increase pitch to induce a secondary stall
8. At stall, recover – reduce AOA, level the wings, and apply max power

Secondary Stall (Power-Off)

1. Perform two 90° clearing turns
2. 1500 RPM (maintain altitude)
3. Landing configuration flow
4. Stabilized descent at 65 KIAS
5. Throttle idle (slowly)
6. Maintain altitude to induce stall
7. At stall, recover – reduce AOA and level the wings (do not add power)
8. When stall horn silences, increase pitch to induce a secondary stall
9. At stall, recover – reduce AOA, level the wings, and 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 $V_X$ or $V_Y$ as appropriate.
14. Retract flaps to 0° when accelerating through $V_X$
15. “Cruise Checklist.”
The elevator trim stall is a power-on stall induced by trimming the aircraft nose-up for a low-airspeed descent, then applying full power without retrimming or applying nose-down elevator. It demonstrates what can occur if the pilot fails to maintain positive aircraft control during a go-around. Begin the elevator trim stall at an altitude that allows stall recovery to be completed no lower than 3,000' AGL.

1. Perform two 90° clearing turns
2. 1500 RPM (maintain altitude)
3. Landing configuration flow
4. Trim for stabilized descent at 65 KIAS
5. Apply full power (slowly)
6. Allow the nose to rise and turn left
7. When stall is approaching (high AOA) recover – reduce AOA, level the wings, and apply max power
8. Retract flaps to 20° (immediately)
9. Retract flaps to 10° when airspeed is greater than 60 KIAS
10. Eliminate stall warning, then return to normal climb attitude
11. Adjust trim while accelerating to \( V_Y \)
12. Retract flaps to 0° when accelerating through \( V_X \)
13. “Cruise Checklist.”

The cross-control stall is a stall entered with the aircraft in a skidding, uncoordinated condition. It demonstrates the effects of uncoordinated flight on stall behavior and emphasizes the importance of maintaining coordinated flight while making turns. In particular, it shows the potential outcome of a poorly executed base-to-final turn in which the pilot attempts to tighten a turn by applying excessive rudder. Begin the cross-control stall at an altitude that allows recovery to be completed no lower than 3,000' AGL.

**CAUTION:** Cross-control stalls can lead to loss of control or spins. Recover at the first indication of the stall, and review spin recovery procedures.

1. Perform two 90° clearing turns
2. 1500 RPM (maintain altitude)
3. Clean configuration flow
4. Stabilized descent at 65 KIAS
5. Establish a 30° banked turn
6. Smoothly apply excessive rudder pressure in the direction of the turn
7. As rudder pressure increases, apply opposite aileron to maintain constant bank angle
8. Increase aft elevator pressure
9. At first indication of stall, recover – reduce AOA, remove excessive rudder input, level the wings, and apply max power
10. “Cruise Checklist.”
Answer The Following Sample Oral Questions Prior To Arriving For Training

1. Recite the V-speeds and their definitions.
2. (True/False) Engines on all ATP 172s are identical.
3. Identify the range of useable fuel available in the ATP 172 fleet.
4. Describe the engine on an S-model Cessna 172:
   A. How many cylinders?
   B. Who is the manufacturer?
   C. What is the horsepower rating?
   D. Does it have fuel injectors or a carburetor?
   E. Is the engine turbocharged or normally aspirated?
   F. How are the cylinders arranged?
   G. What are the minimum and maximum oil capacities?
5. Describe the propeller system.
   A. Who makes the propeller?
   B. How is propeller RPM adjusted?
   C. Define "fixed pitch".
6. Be able to identify the various engine sizes and specifications for the various model 172s.
7. What type of flaps does the 172 have? What are the flap settings?
8. Describe the 172 landing gear.
   A. How is steering accomplished on the ground?
   B. What is the range of travel on the nose wheel?
9. Describe the electrical system, including differences between early and late model electrical systems.
10. What are the indications of a failed alternator?
11. Will the engine continue to run with the alternator and battery master switches turned off?
12. Describe the ignition system.
13. What type of stall warning system does the 172 have?
14. (True / False) There are different checklists for early and late model 172s.
15. Describe the fuel system, including differences between early and late model fuel systems.
   A. What is the fuel capacity? How many gallons are unusable?
   B. What grade fuel is to be used in the 172?
   C. How many fuel pumps are on the aircraft?
   D. When is the electric fuel pump to be used?
   E. What are the positions on the fuel selector control, and when is it appropriate to change selections?
16. What type of braking system is used by the 172?
17. What are the maximum taxi, takeoff, and landing weights?
18. What is the maximum baggage capacity?
19. Explain the pitot-static system.
   A. Does the 172 have an alternate static source? If so, how is it activated and what actions are necessary to obtain the most accurate reading?
   B. What instruments are pitot-static?
   C. Where are the pitot and static ports located?
20. By memory, be able to recite and write down all of the profiles contained in this supplement.
21. What is the first step in accomplishing a good landing?
22. Whenever possible, at what distance from the runway should the traffic pattern be flown in a single-engine airplane?
23. For training and testing purposes, what speed should the airplane be flown on short final when landing is assured?
24. What is the typical approximate altitude above the landing surface to begin the roundout (flare)?
25. At what speed should the touchdown occur in a 172?
26. Define “managing energy”.
27. After landing, how long should the centerline be maintained?
28. After touchdown, what should be done with the aileron controls as the airplane slows? Why? 

29. What information should a visual approach briefing include? 

30. What does an approach briefing accomplish? 

31. Be able to articulate an example visual approach and landing briefing using the example provided in the Supplement. 

32. Define stabilized approach according to the Airplane Flying Handbook. 

33. What are the general conditions for a stabilized approach? 

34. What should a pilot do if the general conditions for a stabilized approach don’t exist during an approach? What if an instructor is on board? 

35. What action should be taken if a pilot at 1,000’ AGL maintaining a constant angle glidepath is 10 knots too fast? 

36. While maintaining a stabilized approach, what control input should the pilot use to correct for airspeed deviations, change the pitch or change the power? 

37. Define “aiming point” according to the Airplane Flying Handbook. 

38. While maintaining a stabilized approach, what control input should the pilot use to correct for the aiming point moving up in the windshield, change the pitch or change the power? 

39. If the aiming point is moving up in the windshield, is the airplane moving lower or higher relative to the constant angle glidepath? 

40. What does it mean if a pilot flying in level flight has to physically keep the airplane from climbing by applying forward pressure on the yoke? 

41. What does it mean if a pilot flying in level flight has to physically keep the airplane from descending by applying aft pressure on the yoke? 

42. According to Cessna, what is the best flap setting for a normal landing a 172? 

43. How should the approach speed be adjusted for gusty winds? 

44. Calculate the correct approach speed until short final given the following conditions. 
   - Flaps 20˚ 
   - Winds 240 @ 8, gusting to 18 

45. Why is correctly adjusting the seat position before each flight important? 

46. When should the pilot get ATIS, brief the approach, and complete the Approach Checklist?
47. Are the power settings listed on the landing profiles exact or approximate?

48. Is the aiming point also the touchdown point? If not, what is the difference?

49. What is the maximum recommended flap setting for crosswinds?

50. Does ATP recommend the crab method or wing-low sideslip method during a crosswind approach and landing?

51. When using the wing-low sideslip technique, will left or right rudder be required during a strong right crosswind?

52. Which control surface, aileron or rudder, corrects for wind drift during a crosswind landing?

53. During crosswind landings, which control surface, aileron or rudder longitudinally aligns the airplane with the runway centerline?

54. What is the max demonstrated crosswind in the 172?

55. When flying the downwind leg with a strong tailwind, where should the turn to base be started?
   • At the 45° angle to the intended touchdown point
   • Before reaching the 45° point
   • After reaching the 45° point

56. What control inputs, if any, should the pilot apply after the airplane touches down?

57. What is the difference between a go-around/missed approach and a rejected landing?

58. How do you determine a standard-rate turn on an aircraft with a G1000 system?

59. In the event of an AHRS failure, which indications will no longer be displayed on the PFD? Which indications will still be visible on the PFD?

60. Which instrument approaches are available with the PFD inoperative? An AHRS failure?

61. How does the aircraft provide basic flight instrument information in the event of a total electrical failure?
### 172 & Archer Differences

<table>
<thead>
<tr>
<th>172 (180 HP R&amp;S Models)</th>
<th>PA-28</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fuel Selector</strong></td>
<td>Must be switched to appropriate tank (L or R) every 30 minutes in flight, or when appropriate.</td>
</tr>
<tr>
<td></td>
<td>Timer can be set on GNS 430 and transponder. POH does not provide a limitation on fuel imbalance.</td>
</tr>
<tr>
<td></td>
<td>See the Piper Archer Training Supplement, page 4, for guidance and timing for fuel selector changes.</td>
</tr>
<tr>
<td><strong>Landing Profile</strong></td>
<td>Flaps 25 abeam as part of before landing checklist</td>
</tr>
<tr>
<td></td>
<td>GNS 430 have removable NavData cards. Do not remove the SD card from G500. The G500 SD card is not to be updated. NavData information displayed on the G500 resides on the GNS 430 card. See guidance atpintra.net/navdata Terrain data is not updated.</td>
</tr>
<tr>
<td><strong>Database Updates</strong></td>
<td>GNS 430 have removable NavData cards.</td>
</tr>
<tr>
<td></td>
<td>G1000 have internal memory and must be updated with external SD card. Installed SD cards are Terrain database, are specific to the equipment by serial number and must not be removed. See guidance atpintra.net/navdata Terrain data is not updated.</td>
</tr>
<tr>
<td><strong>Climb Performance</strong></td>
<td>Noticeably lower. May affect ability to comply with DP</td>
</tr>
<tr>
<td><strong>Landing</strong></td>
<td>Requires much less flare, closer to a Seminole</td>
</tr>
<tr>
<td><strong>Fuel System</strong></td>
<td>Carbureted. Be aware of signs of carb ice.</td>
</tr>
<tr>
<td></td>
<td>Pipper Archer Training Supplement, page 1</td>
</tr>
<tr>
<td><strong>V Speeds</strong></td>
<td>Pipper Archer Training Supplement, page 13</td>
</tr>
<tr>
<td>40 (Bottom of white arc)</td>
<td>$V_{SO}$ 45 (Bottom of white line)</td>
</tr>
<tr>
<td>55</td>
<td>$V_R$ 60</td>
</tr>
<tr>
<td>62</td>
<td>$V_X$ 64</td>
</tr>
<tr>
<td>74</td>
<td>$V_Y$ 76</td>
</tr>
<tr>
<td>90 (1900 lbs)</td>
<td>$V_A$ 89 (1634 lbs)</td>
</tr>
<tr>
<td>105 (2550 lbs)</td>
<td>$V_A$ 113 (2550 lbs)</td>
</tr>
<tr>
<td>110 (10 degrees)</td>
<td>$V_{FE}$ 102 (Top of white line)</td>
</tr>
<tr>
<td>85 (20-30 degrees)</td>
<td>$V_{NO}$ 125 (Top of green line)</td>
</tr>
<tr>
<td>74 (Top of white arc)</td>
<td>$V_{NE}$ 154 (Red line)</td>
</tr>
<tr>
<td>129 (Top of green arc)</td>
<td></td>
</tr>
<tr>
<td>163 (Red line)</td>
<td></td>
</tr>
</tbody>
</table>

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**GNS 430 have removable NavData cards.**

**G1000 have internal memory and must be updated with external SD card. Installed SD cards are Terrain database, are specific to the equipment by serial number and must not be removed.**

See guidance atpintra.net/navdata Terrain data is not updated.

**Cessna 172 Training Supplement**

**Piper Archer Training Supplement**

**Fuel Injected**

**Cessna 172 Training Supplement**

**Landing Profile**

**PA-28**

**Climb Performance**

**Landing**

**Fuel System**

**V Speeds**

**APPENDIX A**

**172 & Archer Differences**

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**PA-28**

**Fuel Selector**

**Landing Profile**

**Database Updates**

**Climb Performance**

**Landing**

**Fuel System**

**V Speeds**

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**Cessna 172 Training Supplement**

**Piper Archer Training Supplement**
<table>
<thead>
<tr>
<th></th>
<th>BEW</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Ramp Weight</td>
<td>1690</td>
<td>1640</td>
</tr>
<tr>
<td>Max Baggage Weight</td>
<td>2558</td>
<td>2558</td>
</tr>
<tr>
<td>Max TOW</td>
<td>120</td>
<td>200</td>
</tr>
<tr>
<td>Fuel Capacity</td>
<td>55</td>
<td>50</td>
</tr>
<tr>
<td>(Usable Fuel)</td>
<td>53</td>
<td>48</td>
</tr>
<tr>
<td>Approx Fuel Burn</td>
<td>10 GPH</td>
<td>10 GPH</td>
</tr>
</tbody>
</table>

**Short Field Takeoff**

- Flaps 10
  - [Cessna 172 Training Supplement](#) page 22

**Soft Field Takeoff**

- Flaps 10
  - [Cessna 172 Training Supplement](#) page 23

**Short Field Approach Speed**

- 61

**General**

- Rudder Trim Installed
- Stall horn tested during preflight
- Step only on non-skid surface when entering & exiting aircraft.
- Do not lean or hang on door, hinges will bend or break easily.
- Most performance charts displayed as a table
- Most performance charts displayed as graphs

**Flaps**

- Electrically actuated; 0°, 10°, 20° & 30°
- Manual; 0°, 10°, 25° & 40°
  - [Piper Archer Training Supplement](#) page 3

**Standby Power**

- The Standby Attitude Indicator will operate for approximately one hour with the internal battery, depending on battery condition at the time of power failure.
  - (Piper Archer III Manual, pg 9-141)
  - [Piper Archer Training Supplement](#) page 8

**Standby Instruments**

- Altimeter & Airspeed Indicator - Pitot Static
- Attitude Indicator - Vacuum
- Altimeter & Airspeed Indicator - Pitot Static
- Attitude Indicator - Standby Battery
  - [Piper Archer Training Supplement](#) pages 8 & 9

**Endurance @ 55% Power**

- Approx 4.5 hrs with 45 Minute Reserve
- Endurance chart
  - [Piper Archer III Manual](#), page 5-28

*(55 Gallon Fuel Capacity) Approx 5.5 hrs with 45 Minute Reserve

Endurance Profile

Cessna 172S NAV III - Model Years 2008+

Manual, page 5-23