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Piper Seminole

Training Supplement



Revised 2015-06-03

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Introduction

Thank you for choosing ATP for your flight program.

ATP flies over 11,000 hours per month to provide over 4,500 FAA certificates each year. ATP is committed to providing you low prices; efficient, standardized, and effective flight programs; and—most importantly—the highest level of safety.

To maximize the effectiveness of your flight program, ATP's *Piper Seminole Training Supplement* contains a condensed overview of multi-engine aerodynamics, portions of the Piper Seminole POH, and flight procedures. You must have a complete knowledge of all information contained in this supplement prior to the start of your program. This information will assist you with your training and flight check.

It is critical that you **memorize** the following:

- Emergency Engine Failure Checklists.
- V-Speeds.
- Answers to all questions contained in the "Oral Review" section in the back of the supplement.

The information in this supplement is highly condensed and serves as a good quick reference, but it must not be used as a substitute for the FAA-approved pilot's operating handbook required for safe operation of the airplane.

Thank you for giving ATP an opportunity to serve you.

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Engine-Out Aerodynamics

Aerodynamic Effects of an Engine Failure

When an engine failure occurs in a multi-engine aircraft, asymmetric thrust and drag cause the following effects on the aircraft's axes of rotation:

Pitch Down (Lateral Axis)

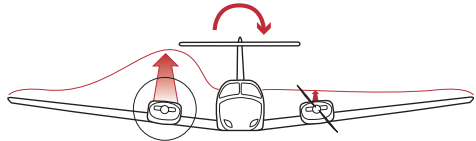
Loss of accelerated slipstream over the horizontal stabilizer causes it to produce less negative lift, causing the aircraft to pitch down. To compensate for the pitch down effect, additional back pressure is required.



The Seminole has a lesser pitch-down effect than most light twins because the T-tail configuration removes the horizontal stabilator from the accelerated slipstream.

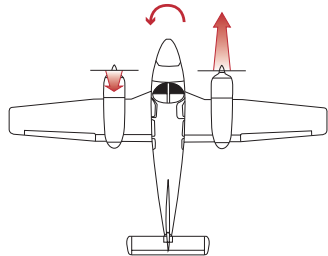
Roll Toward the Failed Engine (Longitudinal Axis)

The wing produces less lift on the side of the failed engine due to the loss of accelerated slipstream. Reduced lift causes a roll toward the failed engine and requires additional aileron deflection into the operating engine.



Yaw Toward the Dead Engine (Vertical Axis)

Loss of thrust and increased drag from the windmilling propeller cause the aircraft to yaw toward the failed engine. This requires additional rudder pressure on the side of the operating engine. "Dead foot, dead engine."



VIDEO: Visit ATPFightSchool.com/students for an interactive multi-engine aerodynamics presentation. Requires Flash Player.

Engine Inoperative Climb Performance

Climb performance depends on the excess power needed to overcome drag. When a multi-engine airplane loses an engine, the airplane loses 50% of its available power. This power loss results in a loss of approximately 80% of the aircraft's excess power and climb performance. Drag is a major factor relative to the amount of excess power available. An increase in drag (such as the loss of one engine) must be offset by additional power. This additional power is now taken from the excess power, making it unavailable to aid the aircraft in climb. When an engine is lost, maximize thrust (full power) and minimize drag (flaps and gear up, prop feathered, etc.) in order to achieve optimum single-engine climb performance.

Approximate Drag Factors per the Piper Seminole POH

1. Flaps 25°-240 FPM
2. Flaps 40°-275 FPM
3. Windmilling Prop-200 FPM
4. Gear Extended-250 FPM



ATP's experience indicates more than -200 FPM drag from the windmilling prop.

Under FAR Part 23:

The FAA does not require multi-engine airplanes that weigh less than 6,000 pounds or have a V_{SO} speed under 61 knots to meet any specified single-engine performance criteria. No single engine climb performance is required. Actual climb performance is documented by the manufacturer.



The Seminole's max TOW is 3,800 pounds and V_{SO} speed is 55 KIAS. Review the POH for single-engine climb performance for specific conditions.

Airspeeds for Max Single-Engine Performance

V_{XSE}

The airspeed for the steepest angle of climb on single-engine.

V_{YSE}

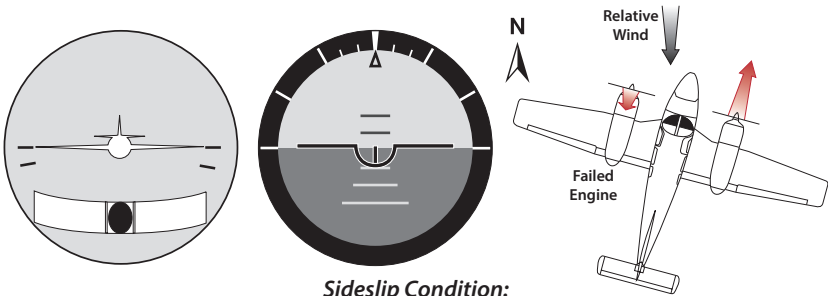
The airspeed for the best rate of climb on single-engine. (Or for the slowest loss of altitude on drift-down.) Blueline is the marking on the airspeed indicator corresponding to V_{YSE} at max weight.

Sideslip Versus Zero Sideslip

During flight with one engine inoperative, proper pilot technique is required to maximize aircraft performance. An important technique is to establish a Zero Sideslip Condition.

Sideslip Condition (Undesirable)

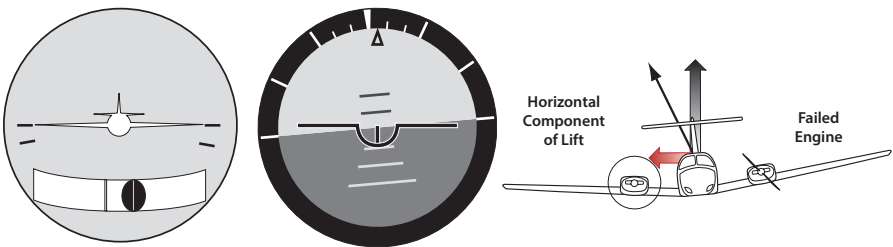
When an engine failure occurs, thrust from the operating engine yaws the aircraft. To maintain aircraft heading with the wings level, rudder must be applied toward the operating engine. This rudder force results in the sideslip condition by moving the nose of the aircraft in a direction resulting in the misalignment of the fuselage and the relative wind. This condition usually allows the pilot to maintain aircraft heading; however, it produces a high drag condition that significantly reduces aircraft performance.



Sideslip Condition:
Ball Centered & Wings Level, Aircraft Tracking North

Zero Sideslip Condition (Best Performance)

The solution to maintaining aircraft heading and reducing drag to improve performance is the Zero Sideslip Condition. When the aircraft is banked into the operating engine (usually 2° - 5°), the bank angle creates a horizontal component of lift. The horizontal lift component aids in counteracting the turning moment of the operating engine, minimizing the rudder deflection required to align the longitudinal axis of the aircraft to the relative wind. In addition to banking into the operating engine, the appropriate amount of rudder required is indicated by the inclinometer ball being "split" towards the operating engine side. The Zero Sideslip Condition aligns the fuselage with the relative wind to minimize drag and must be flown for optimum aircraft performance.



Zero Sideslip Condition:
 2° - 5° Bank into Operating Engine

Single-Engine Service Ceiling

Single-engine service ceiling is the maximum density altitude at which the single-engine best rate of climb airspeed (V_{YSE}) will produce a 50 FPM rate of climb with the critical engine inoperative.

Single-Engine Absolute Ceiling

Single-engine absolute ceiling is the maximum density altitude that an aircraft can attain or maintain with the critical engine inoperative. V_{YSE} and V_{XSE} are equal at this altitude. The aircraft drifts down to this altitude when an engine fails.

Climb Performance Depends on Four Factors

- **Airspeed:** Too little or too much will decrease climb performance.
- **Drag:** Gear, Flaps, Cowl Flaps, Flight Control Deflection, Prop, and Sideslip.
- **Power:** Amount available in excess of that needed for level flight. (Engines may require leaning due to altitude for max engine performance.)
- **Weight:** Passengers, baggage, and fuel load greatly affect climb performance.

Critical Engine

The critical engine is the engine that, when it fails, most adversely affects the performance and handling qualities of the airplane.



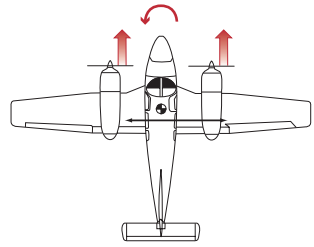
The Seminole is equipped with a counter-rotating propeller on the right engine. The failure of either engine has the same effects on performance. This is why the Seminole does not have a critical engine.

On most multi-engine aircraft, both propellers rotate clockwise as viewed from the cockpit. By understanding the following factors when flying an aircraft that has both propellers rotating clockwise, it will be apparent that a left-engine failure makes the aircraft more difficult to fly than a right-engine failure. The clockwise rotation of the props contributes to the following factors that cause the left engine to be critical:

- P** P-Factor
- A** Accelerated Slipstream
- S** Spiraling Slipstream
- T** Torque

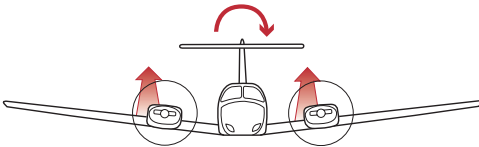
P-Factor (Yaw)

Both propellers turn clockwise as viewed from the cockpit. At low airspeeds and high angles of attack, the descending blade produces more thrust than the ascending blade due to its increased angle of attack. Though both propellers produce the same overall thrust, the descending blade on the right engine has a longer arm from the CG (or greater leverage) than the descending blade on the left engine. The left engine produces the thrust closest to center line. The yaw produced by the loss of the left engine will be greater than the yaw produced by the loss of the right engine, making the left engine critical.



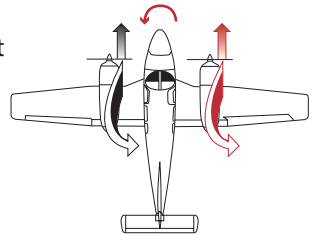
Accelerated Slipstream (Roll and Pitch)

P-Factor causes more thrust to be produced on the right side of the propeller. This yields a center of lift that is closer to the aircraft's longitudinal axis on the left engine and further from the longitudinal axis on the right engine and also results in less negative lift on the tail. Because of this, the roll produced by the loss of the left engine will be greater than the roll produced by the loss of the right engine, making the left engine critical.



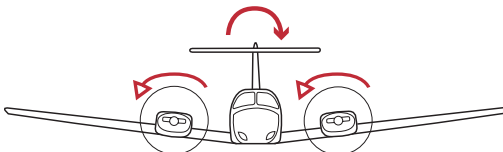
Spiraling Slipstream (Yaw)

A spiraling slipstream from the left engine hits the vertical stabilizer from the left, helping to counteract the yaw produced by the loss of the right engine. However, with a left engine failure, slipstream from the right engine does not counteract the yaw toward the dead engine because it spirals away from the tail, making the left engine critical.



Torque (Roll)

For every action, there is an equal and opposite reaction. Since the propellers rotate clockwise, the aircraft will tend to roll counterclockwise. When the right engine is lost, the aircraft will roll to the right. The right rolling tendency, however, is reduced by the torque created by the left engine. When the left engine is lost, the aircraft will roll to the left, and the torque produced by the right engine will add to the left rolling tendency requiring more aileron input, which increases drag, making the left engine critical.



Summary

On most light multi-engine aircraft when the critical engine is inoperative, both directional control and performance suffer more than when the non-critical engine is inoperative.

V_{MC}

V_{MC} is the minimum airspeed at which directional control can be maintained with the critical engine inoperative. V_{MC} speed is marked on the airspeed indicator by a red radial line. Aircraft manufacturers determine V_{MC} speed based on conditions set by the FAA under FAR §23.149:

1. Most Unfavorable Weight and Center of Gravity
2. Standard Day Conditions at Sea Level (Max Engine Power)
3. Maximum Power on the Operating Engine (Max Yaw)
4. Critical Engine Prop Windmilling (Max Drag)
5. Flaps Takeoff Position, Landing Gear Up, Trimmed for Takeoff (Least Stability)
6. Up to 5° of Bank into the Operating Engine

Any change to the above conditions changes V_{MC} speed, possibly significantly. The following summarizes how V_{MC} may be affected by the above conditions:

1. Most Unfavorable Weight and Center of Gravity

The certification test allows up to 5° bank into the operating engine. In a given bank, the heavier the aircraft, the greater the horizontal component of lift that adds to the rudder force. As weight increases, the horizontal component of lift increases, which added to the rudder, decreases V_{MC} . As the center of gravity moves forward, the moment arm between the rudder and the CG is lengthened, increasing the leverage of the rudder. This increased leverage increases the rudder's effectiveness and results in a lower V_{MC} speed.

2. Standard Day Sea Level

Standard conditions yield high air density that allows the engine to develop maximum power. An increase in altitude or temperature (a decrease in air density) will result in reduced engine performance and prop efficiency. This decreases the adverse yaw effect. V_{MC} speed decreases as altitude increases.

3. Maximum Power On The Operating Engine

When the operating engine develops maximum power, adverse yaw is increased toward the inoperative engine. The pilot must overcome this yaw to maintain directional control. Any condition that increases power on the operating engine will increase V_{MC} speed. Any condition that decreases power on the operating engine (such as power reduction by the pilot, an increase in altitude, temperature, low density, or aging engine) will decrease V_{MC} .

4. Critical Engine Prop Windmilling

When the propeller is in a low pitch position (unfeathered), it presents a large area of resistance to the relative wind. This resistance causes the engine to “windmill.” The windmilling creates a large amount of drag and results in a yawing moment into the dead engine. When the propeller is “feathered,” the blades are in a high pitch position, which aligns them with the relative wind, minimizing drag. A feathered prop will decrease drag and lower V_{MC} .

5. Flaps Takeoff Position, Landing Gear Up, Trimmed for Takeoff

When the gear is extended, the gear and gear doors have a keel effect, reducing the yawing tendency and decreasing the V_{MC} speed. Extended flaps have a stabilizing effect that may reduce V_{MC} speed.

6. Up to 5° Bank into the Operating Engine

When the wings are level, only the rudder is used to stop the yaw produced by the operating engine (sideslip condition). Banking into the operating engine creates a horizontal component of lift which aids the rudder force. With this horizontal component of lift and full rudder deflection, V_{MC} is at the lowest speed. V_{MC} increases with decreasing bank by a factor of approximately 3 knots per degree of bank angle.



At V_{MC} , the rudder pedal force required to maintain control must not exceed 150 pounds and it must not be necessary to reduce power of the operative engine(s). During the maneuver, the airplane must not assume any dangerous attitude and it must be possible to prevent a heading change of more than 20°.



Piper determined V_{MC} for the Seminole at 1,500' MSL with a weight of 2,730 lbs. and 5° bank into the operating engine. The test results were then computed to sea level conditions.

NOTE: Each aircraft is different and may be subject to different handling qualities than discussed here. Recovery from loss of directional control should always follow the guidelines of the POH and FAA Airplane Flying Handbook.

Aircraft Systems

Engines

The Seminole is equipped with two Lycoming, 4-cylinder, O-360 (opposed, 360 cubic inch) engines rated at 180 horsepower at 2700 RPM. The right engine is designated as an LO-360 due to the fact that it rotates to the left. The engines are direct drive (crankshaft connected directly to the propeller), horizontally opposed (pistons oppose each other), piston driven, carbureted and normally aspirated (no turbo or supercharging). Engine ignition is provided through the use of engine-driven magnetos which are independent of the aircraft's electrical system and each other.

- L** Lycoming
- H** Horizontally Opposed
- A** Air Cooled
- N** Normally Aspirated
- D** Direct Drive

Carburetor Icing

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 manifold pressure. Carburetor heat should be selected on if carburetor ice is encountered. Adjust mixture for maximum smoothness.

Propellers

The Seminole is equipped with Hartzell two-bladed, controllable pitch, constant speed, full feathering metal propellers.

Controllable Pitch

Controllable pitch is the ability to control engine RPM by varying the pitch of the propeller blades. When the blue propeller control handle is moved forward, oil pressure, regulated by a propeller governor, drives a piston, which moves the blades to a low pitch–high RPM (unfeathered) position. When the blue propeller control handle is moved aft, oil pressure is reduced by the propeller governor. This allows a nitrogen-charged cylinder, spring, and centrifugal counterweights to drive the blades to a high pitch–low RPM (feathered) position.

Constant Speed

After RPM setting is selected with the blue propeller control handles, the propeller governor will automatically vary oil pressure inside the propeller hub to change the propeller blade pitch in order to maintain a constant engine RPM. Because of this, changes in power setting (manifold pressure) and flight attitude will not cause a change in RPM.

Full Feathering

When the propeller blades are in alignment with the relative wind, they are feathered. Feathered propeller blades reduce the drag caused by the blade area exposed to the relative wind. Feathering the propeller blades on the Seminole is accomplished by moving the blue propeller control handle fully aft past the low RPM detent, into the “FEATHER” position. The propeller takes approximately six seconds to feather. When feathering the propeller, the mixture should be placed to cutoff to stop engine combustion and power production.

The Seminole is equipped with a centrifugal stop pin that prevents propeller feathering below 950 RPM. The purpose of this is to allow the propeller blades to remain in a low pitch upon engine shutdown. This will prevent excessive loads on the engine starter during the next engine start.

Regardless of the Prop Lever position, if oil pressure is lost, the propeller will feather when the RPM is above 950 RPM. Typically, RPM will be above 950 in flight and on takeoff roll and landing roll due to airflow over the propeller.

Propeller Overspeed

Propeller overspeed is usually caused by a malfunction in the propeller governor which allows the propeller blades to rotate to full low pitch. If propeller overspeed should occur, retard the throttle. The propeller control should be moved to full “DECREASE RPM” and then set if any control is available. Airspeed should be reduced and throttle used to maintain a maximum of 2700 RPM.

Landing Gear

The Seminole is equipped with hydraulically actuated, fully retractable, tricycle-type landing gear. Hydraulic pressure for gear operation is provided by an electrically powered, reversible hydraulic pump. The gear is held in the up position solely by hydraulic pressure. Springs assist in gear extension and in locking the gear in the down position. After the gear is down and the downlock hooks engage, springs maintain force on each hook to keep it locked until it is released by applying hydraulic pressure with the gear selector.

A gear warning system is activated under any of the following conditions:

1. The gear is not locked down with the throttle lever positioned below approximately 15" manifold pressure (MP) on one or both engines.
2. The gear is not locked down with wing flaps selected to 25° or 40°.
3. The gear handle is in the up position on the ground (tested only by authorized maintenance personnel).

Gear retraction on the ground is prevented by a squat switch located on the left main landing gear. On the ground, the switch is open, preventing electrical current from reaching the hydraulic pump. Once airborne, the strut becomes fully extended, closing the switch that allows current to reach the hydraulic pump.

In the event of a hydraulic malfunction, the landing gear may be extended by the use of the red emergency gear extension knob. After placing the gear selector in the down position, pulling the red emergency gear extension knob releases the hydraulic pressure which is holding the gear in the up position and allows the gear to free-fall down. The positive gear down indication is 3 green lights. Emergency gear extension is limited to a maximum of 100 KIAS due to air-load on the nose gear. When dealing with a suspected landing gear problem, it is important to verify the position of the navigation light switch. This switch will cause the green lights to be dimmed and, in some cases, make them impossible to see during the day. As with any emergency or abnormality, always refer to the appropriate checklist.



NOTE: If hydraulic pressure is lost with gear retracted, the gear will free-fall.

The nose wheel is steered through the use of the rudder pedals and is steerable 30 degrees either side of center.

Brakes

The Seminole is equipped with hydraulically actuated disk brakes on the main landing gear wheels. Braking is accomplished by depressing the tops of the rudder pedals. The hydraulic system for the brakes is independent of that for the landing gear. The brake fluid reservoir for servicing is located in the nose cone. To set the parking brake, hold the brakes and pull the black parking brake knob.



All ATP Seminoles are equipped with heavy duty brakes. Refer to the POH to make the required adjustment to performance calculations.

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

Flaps

The Seminole is equipped with a manual flap system. The flaps are extended with a lever located between the two pilot seats. Flap settings are 0°, 10°, 25° and 40° and are spring-loaded to return to the 0° position.



ATP operations require Flaps 25° for all landings except the short field, which requires Flaps 40°. Flaps 25° causes a gear warning indication if the gear is not down.

Vacuum Pumps

The Seminole is equipped with two engine-driven vacuum pumps. The vacuum system operates the attitude gyro and, on aircraft without slaving mechanisms installed, the HSI. Suction limits are 4.8 to 5.2 inches of mercury at 2000 RPM. The failure of a vacuum pump is indicated by an annunciator panel light and a red, pump inoperative indicator on the vacuum gauge. In most circumstances, the failure of one pump alone will not cause the loss of any instruments because the remaining pump should handle the entire vacuum demand.

Pitot Static

The heated pitot tube and static port are located underneath the left wing. An alternate static source is located inside the cabin under the left side of the instrument panel for use in the event of static port blockage. When using the alternate static source, the storm window and cabin vents must be closed, and the heater and defroster must be turned on. This will reduce the pressure differential between the cockpit and the atmosphere, reducing pitot static error. The pitot static instruments are the airspeed indicator, altimeter, and VSI.

Fuel System

The Seminole, which uses 100 low lead avgas (blue), is equipped with two 55-gallon bladder nacelle tanks. One gallon is unusable in each tank.

There are two engine-driven and two electrically driven fuel pumps. The electric fuel pumps are used for engine start, takeoff, landing, and fuel selector changes.



ATP uses the electric fuel pumps for in-flight maneuvers, except for steep turns.

The aircraft is equipped with a three-position fuel selector for each engine. The positions are "ON", "OFF", and "X-FEED" (cross feed). The fuel selectors remain in the "ON" position during normal operations, and each engine draws fuel from the tank on the same side as the engine. When "X-FEED" is selected, the engine draws fuel from the tank on the opposite side. Fuel cannot be transferred from tank to tank. Crossfeed operation is limited to straight and level flight only.

The correct procedure for crossfeed operations to supply the left engine with fuel from the right tank is:

1. Left engine electric boost pump on.
2. Left fuel selector selected to "X-FEED."
3. Check left fuel pressure.
4. Left engine electric boost pump off.
5. Check fuel pressure.

Electrical System

The Seminole is equipped with a 14-volt electrical system which utilizes push-pull type circuit breakers; a 12-volt, 35 amp hour battery; and two 70-amp, engine-driven alternators. Voltage regulators maintain constant 14-volt output from each alternator at varying engine RPMs, effectively sharing the electrical load. Loss of one alternator is indicated by an annunciator light and a zero indication on the loadmeter. The remaining alternator will normally provide adequate electrical power.

An over-voltage relay in each alternator circuit provides system protection by taking an alternator offline if its output exceeds 17-volts. If this occurs, the ALT annunciator will illuminate. The battery is used as a source of emergency electrical power and for engine starts. High drain items include the lights, vent fan, heater, gear hydraulic pump, radios, and PFD/MFD (if applicable). If an electrical problem arises, always check circuit breakers. If a circuit breaker is popped, reset only one time.

Heater

Heat to the cabin is supplied by a Janitrol gas combustion heater located in the nose compartment. Air from the heater is distributed by a manifold to the ducts along the cabin floor to outlets at each seat and to the defroster outlet. Operation of the heater is controlled by a three-position switch located on the instrument panel labeled "CABIN HEAT", "OFF", and "FAN." Airflow and temperature are regulated by the three levers to the right of the switch: "AIR INTAKE", "TEMP", and "DEF."

For cabin heat, the "AIR INTAKE" lever must be fully open and the "CABIN HEAT" switch on. This simultaneously starts fuel flow and ignites heater. During ground operation, it also activates the ventilation blower. When cabin air reaches the temperature selected on the "TEMP" lever, ignition of the heater cycles automatically to maintain the selected temperature.

Two safety switches located on the front of the heater unit prevent both fan and heater operation when the air intake lever is in the closed position. When the heater is on, a ventilation blower actuates any time the landing gear is extended. In flight, a micro switch, which actuates when the gear is retracted, turns off the ventilation blower so that the cabin air is circulated by ram air pressure only.

An overheat switch in the heater acts as a safety device to render the heater inoperative if a malfunction should occur. Should the switch deactivate the heater, the red "HEATER OVER TEMP" annunciator light on the instrument panel will illuminate. The overheat switch is located on the aft inboard end of the heater vent jacket. A red reset button is located on the heater shroud in the nose cone compartment.

To prevent activation of the overheat switch upon normal heater shutdown during ground operation, turn the three-position switch to "FAN" for two minutes with the air intake lever in the open position before turning the switch off. During flight, leave the air intake open for a minimum of 15 seconds after turning the switch to off.

Fuel is supplied to the heater at a rate of ½ gallon per hour from downstream of the left fuel selector and filter.

To introduce outside, unheated air into the cabin during flight, the "AIR INTAKE" lever should be open and the "CABIN HEAT" off. A fresh air blower is installed to provide airflow during ground operation. It is operated by a high/low blower fan switch.

Stall Warning Horn

The Seminole is equipped with two electric stall detectors located on the left wing. The inboard detector provides stall warning at flaps 25° or 40° and the outboard at flaps 0° or 10°. The purpose of the two tabs is to provide adequate stall warning at varied angles of attack. The electric stall tabs are deactivated on the ground through the use of the squat switch on the left main landing gear.

Emergency Exit

The emergency exit is the pilot's left side window. Use this when emergency egress becomes necessary on the ground and the main entry door is unavailable due to fire, etc. The emergency exit release handle is located beneath the thermoplastic cover on the vertical post between the first and second left side windows. To exit the aircraft, remove the thermoplastic cover, pull the release handle forward and then push the window out. The window then will fall free from the fuselage.

Inoperative Instruments & Equipment per FAR 91.213

ATP's aircraft do not operate under the guidance of a minimum equipment list (MEL), and instead operate in accordance with the following FAR 91.213 subpart. Because this is only an excerpt, the complete subpart should be referred to if necessary:

- (3) The inoperative instruments and equipment are --
 - (i) Removed from the aircraft, the cockpit control placarded, and the maintenance recorded in accordance with §43.9 of this chapter; or
 - (ii) Deactivated and placarded "Inoperative." If deactivation of the inoperative instrument or equipment involves maintenance, it must be accomplished and recorded in accordance with part 43 of this chapter;
- (4) A determination is made by a pilot, who is certificated and appropriately rated under part 61 of this chapter, or by a person, who is certificated and appropriately rated to perform maintenance on the aircraft, that the inoperative instrument or equipment does not constitute a hazard to the aircraft.

Garmin G500

2012 and later model Piper Seminoles are equipped with the Garmin G500 electronic flight deck.



G500-equipped aircraft are available only at select training centers. Visit ATPFlightSchool.com/locations to find out if your training center requires you to study the following G500 information.

*PRIMARY FLIGHT
DISPLAY (PFD)*



*MULTI-FUNCTION
DISPLAY (MFD)*

G500 Differences

- The G500 powers on and off with the battery master, not the avionics master.
- There are no vacuum driven instruments, vacuum pumps, or suction gauge. Instruments are electrically powered.
- The standby attitude indicator must be erected on power-up by pulling the cage knob.
- Test the standby attitude battery as directed by the After Start Checklist by pressing and holding the “STBY PWR” button until amber LED begins flashing. A continuous green light beneath “TEST” during the full sequence indicates that the battery is good. A red light illuminated anytime during the test indicates that the battery is not charged and may require replacement.
- The standby attitude indicator warning light will blink for approximately 1 minute when the battery master switch is turned off. DO NOT press the SBY PWR button as it causes continuous operation of the gyro on its emergency battery. Exit the airplane with either a blinking LED or red flag.
- G500 equipped Seminole do not have a conventional turn coordinator. A slip-skid indicator is located at the top of the attitude indicator. Step on the “brick” instead of the “ball”. Use the reference lines and the magenta line that appears above the heading indicator to identify a standard rate or half-standard rate turn.
- Outside air temperature (OAT) displays on PFD under the airspeed tape. There is no OAT probe or analog gauge between the windows.
- Ground track can be identified on the heading indicator by a small magenta diamond near the lubber line (only visible when ground track is different than heading).
- The digital altitude and airspeed readouts are very sensitive and can cause some pilots to continuously make corrections for insignificant deviations. Pilot action - Don’t overcorrect for deviations of a few feet. Crosscheck digital and analog standby instruments to avoid the tendency to overcorrect.



Refer to the complete G500 Pilot's Guide on Student Resources at ATPFlightSchool.com/students or in the ATP Flight School App Library.

G500 Components

The G500 is comprised of 6 main components:

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

The PFD (left) shows primary flight information in place of traditional pitot-static and gyroscopic instruments and also provides an HSI for navigation. ATP procedures call for configuring the MFD (right) to display traffic information service (TIS).

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

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

The magnetometer senses the earth's magnetic field and sends data to the AHRS for processing to determine magnetic heading.

The temperature probe provides outside air temperature (OAT) data to the ADC.

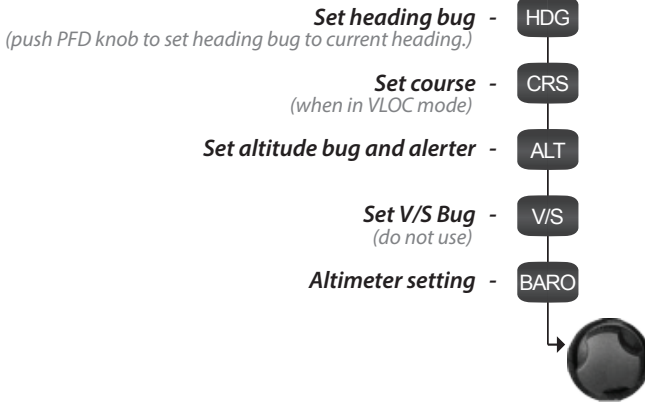
The dual Garmin GNS 430 GPSs provide input to the AHRS and PFD/MFD.



CAUTION: The GNS 430 and G500 units each have their own databases. Navigation, terrain and map information on the G500 Multi-Function Display (MFD) may not be current and is not to be used for navigation. Use the G500 MFD for traffic information.

G500 PFD Functions

These buttons toggle the function of the PFD knob.



CDI needle indicates NAV source: green for VLOC / magenta for GPS.

Standby Instruments

Standby Attitude Indicator

An electrical standby attitude indicator is powered and charged by the electrical system during normal operations. During an electrical failure, the standby attitude indicator will continue operating from its internal dedicated battery for approximately 60 seconds while an amber blinking LED prompts you to press the "STBY PWR" button, which continues operation until the internal battery is depleted. A fully charged standby attitude indicator battery should provide up to 1 hour of normal standby attitude indicator operation, however a situation requiring use of the standby attitude indicator is an emergency. Exit IMC and land as soon as possible.



If the pilot fails to activate the standby battery within 60 seconds, the STBY PWR button can still be pressed to activate the standby battery, however the gyro may not be oriented to the airplane depending on the time elapsed prior to pressing the STBY PWR button. Press the STBY PWR button while the amber LED is blinking for best results.

Standby Attitude Indicator Battery Check

Prior to flight, the electric standby indicator battery must be tested. In order to accomplish the test, aircraft electrical power must be on (Battery Master ON) and the standby attitude indicator gyro must be fully operational with the red

gyro flag out of view. Test the standby battery as called for by the After Start Checklist.

- Press and hold the “STBY PWR” button for approximately four seconds. This puts the gyro in a one-minute battery test mode. The amber LED next to STBY PWR will flash during the test sequence.
- A continuous green light illuminated beneath “TEST” during the full sequence indicates that the standby battery is good.
- A red light illuminated anytime during the test indicates that the battery is not charged and may require replacement. Contact maintenance.

Standby Attitude Indicator Shutdown

During a normal shutdown following the Shutdown Terminate Checklist, do not press the “STBY PWR” button. Doing so activates emergency operation and depletes the internal standby battery. Turn the battery master switch OFF when prompted by the checklist. Allow the amber LED to blink for approximately 60 seconds, followed by the appearance of the red gyro warning flag, which indicates the unit is powered down.

Standby Altimeter & Airspeed Indicator

The pitot-static system provides information to the standby altimeter and airspeed indicator.

G500 Failures & Partial-Panel Approaches

For partial panel training and checkrides, the two most common training scenarios are simulated AHRS failure and PFD failures.

<i>Failure Condition</i>	<i>Simulated By</i>	<i>Instrument Approaches Available</i>
AHRS Failure	Cover Attitude Indicator (ADI)	All precision and non-precision
PFD Failure	Dim PFD/MFD screens	Only GPS approach
Electrical Failure	No simulated failure available	None
ADC Failure	No simulated failure available	All precision and non-precision

Circuit breaker-simulated failures are prohibited in ATP aircraft. Piper and Garmin advise against pulling circuit breakers as a means of simulating failures on the Garmin G500 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. Also reference Advisory Circulars 120-80, 23-17B, and 43.13-1B.

Attitude and Heading Reference System (AHRS) Failure

Indications:

1. The sky/ground presentation is removed.
2. A red X appears across the Attitude Direction Indicator (ADI).
3. Yellow “ATTITUDE FAIL” and “HDG” alert messages appear on the PFD.
4. A “TRK” message appears to the right of the ground track at the top of the compass rose.
5. Rate-of-turn information is unavailable.
6. “HDG LOST”, “HDG FAULT”, and “TRK TRAFFIC” alert messages appear on the MFD.



AHRS Failure

The PFD continues displaying airspeed, altitude, vertical speed, compass rose and ground track. Ground track and compass rose indications are supplied by GPS, indicated by a “TRK” message. Any precision or non-precision approach is available using the HSI on the PFD.

Pilot Action

1. Use standby attitude indicator.
2. Continue using HSI on PFD. Verify track against magnetic compass heading.
3. Precision (ILS) and non-precision (GPS, Localizer, and VOR) approaches can be accomplished.

PFD Failure

Indications

1. PFD Screen is dark.

Pilot Action

1. Refer to the standby instruments.
2. Use the GPS CDI page for navigation and approaches.
CLR - Press and hold for 3 seconds to return to default CDI page.
3. Only GPS non-precision approaches can be accomplished.



During an MFD failure, with the PFD functioning normally, all approaches are available for use.

Electrical Failure

Indication

1. The G500 and GPS systems will be inoperative / dark.
2. The "STBY PWR" button on the standby attitude indicator will begin blinking.

Pilot Action

1. Use standby attitude indicator. Press the "STBY PWR" button right of the blinking LED to continue operating using its internal battery.
2. Use standby airspeed, altimeter and compass.
3. Declare an emergency and exit IMC as soon as practicable. The manufacturer does not specify the endurance time of the integral emergency battery.

Air Data Computer (ADC) Failure

Indications

1. Loss of data accompanied by a red X and yellow alert messages occurs over:
 - Airspeed
 - Altitude
 - Vertical speed
 - True airspeed (TAS)
 - Outside air temperature (OAT)
2. Wind calculations are unavailable

Attitude and heading references will function normally on the PFD.



ADC Failure

Pilot Action

1. Use standby airspeed indicator and altimeter.



There is no backup for the VSI, but known pitch attitudes using the attitude indicator, power settings, and airspeeds produce consistent rates.

Notable Differences Between 1979-80 & 2000-12 Seminole

	1979-80	2000-12
Engines	Left: O-360-E1A6D Right: LO-360-E1A6D	Left: O-360-A1H6 Right: LO-360-A1H6
Oil Capacity	<ul style="list-style-type: none"> • 4 to 6 Quarts • ATP Minimum 4.5 Quarts 	<ul style="list-style-type: none"> • 6 to 8 Quarts • ATP Minimum 6.5 Quarts
Minimum Oil Pressure	15 PSI	25 PSI
Landing Gear Mute Switch	N/A	Do not use.
Primer	<ul style="list-style-type: none"> • Manual/Plunger • Ports Fuel Into Cylinders 1, 2 & 4 	<ul style="list-style-type: none"> • Button/Electric • Electric Fuel Pump Must be On • Press Primer Button 2-3 Sec. before Starting Cold Engine • Ports Fuel Into Cylinders 1, 2 & 4
Recognition Lights	N/A	<ul style="list-style-type: none"> • Located on Each Wingtip • Used Instead of Landing Light for Recognition • Saves Landing Light for Night Landing/Takeoff
Fin Strobe & Strobe Light Rocker Switch	Anti-Collision Lights Only (Strobes)	<ul style="list-style-type: none"> • Rocker Switch Down for Ground Use (Fin Strobe / Rotating Beacon) • Rocker Switch Up Before Takeoff / Flight Use (Strobes)
"LO BUS" Annunciator Light	N/A	Illuminates Red when Alternators not Providing 14 V DC to the tie bus, and bus voltage drops to battery voltage, 12V DC
Unfeathering Accumulators	N/A	<ul style="list-style-type: none"> • Stores Engine Oil Under Pressure for Air-Starting the Engine • Releases Stored Pressure Back to Prop Governor when Prop Lever Moved Forward • Oil Pressure Drives the Blades from the Feathered Position Toward Low-Pitch (Windmilling) • Windmilling Prop with Addition of Fuel and Ignition will Allow the Engine to Start
Airstart	<ul style="list-style-type: none"> • Starter Only • Be Sure to Only Engage the Proper Side of the Rocker Start Switch • Pressing the Wrong Side will Cause Engine Damage to the Operating Engine 	<ul style="list-style-type: none"> • Unfeathering Accumulator <p>The 2000 Seminole utilizes a prop unfeathering accumulator which stores engine oil under pressure for airstarting the engine. The stored pressure is released back to the prop governor when the prop lever is moved forward. Oil pressure drives the blades from the feathered position toward low-pitch windmilling. When the prop is windmilling, the addition of fuel and ignition will allow the engine to start.</p>

Performance / Weight & Balance

Piper Seminole V-Speeds

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

<i>V-Speed</i>	<i>KIAS</i>	<i>Description</i>	<i>Airspeed Indicator Marking</i>
V _{SO}	55	Stall speed in landing configuration	Bottom of White Arc
V _{MC}	56	Minimum controllable airspeed	Red Line
V _S	57	Stall speed with zero flaps	Bottom of Green Arc
V _R	75	Rotation speed (start rotation)	
V _X	82	Best angle of climb	
V _{XSE}	82	Best angle of climb single-engine	
V _{SSE}	82	Safe speed for intentional engine failure	
V _Y	88	Best rate of climb	
V _{YSE}	88	Best rate of climb single-engine	Blue Line
V _{FE}	111	Maximum flap extension speed	Top of White Arc
V _{LO (Up)}	109	Maximum gear retraction speed	
V _{LO (Down)}	140	Maximum gear extension speed	
V _{LE}	140	Maximum speed with gear extended	
V _{NO}	169	Max Structural Cruising Speed	Top of Green Arc
V _{NE}	202	Never exceed speed	Red Line
V _A	135	Maneuvering speed at 3800 pounds	
V _A	112	Maneuvering speed at 2700 pounds	
Maximum demonstrated crosswind 17			

Performance Charts

All performance charts will be covered by the instructor and are not limited to the following:

- Takeoff Distance to Clear a 50' Obstacle
- Accelerate Stop Distance (Piper does not provide an Accelerate Stop Distance chart for 2000/2001 models.)
- Single Engine Rate of Climb
- Single Engine Service Ceiling
- Landing Distance

Sample Weight & Balance Problem

Complete the following sample weight and balance problem.

Conditions

- Basic Empty Weight: **2,540.5 lbs.**
(Remember to use actual aircraft BEW for flight check.)
- Front Pilots: **370 lbs.**
- Rear Passengers: **170 lbs.**
- Baggage: **3 Bags @ 75 lbs. and 2 Bags @ 50 lbs.**
(May need to relocate some baggage to rear passenger seats.)
- Max Ramp Weight: **3,816 lbs.**
- Max Takeoff/Landing Weight: **3,800 lbs.**
- Max Baggage Weight: **200 lbs.**
- Max Usable Fuel: **108 gal.**

		Weight	×	Arm	=	Moment
<i>Basic Empty Weight</i>				86.13		
<i>Front Pilots</i>	+			80.50	+	
<i>Rear Passengers</i>	+			118.10	+	
<i>Baggage 200 lbs. Max</i>	+			142.80	+	
<i>Zero Fuel Weight</i>	=				CG =	
					CG = Moment / Weight	
<i>Usable Fuel</i>	+			95.00	+	
<i>Ramp Weight</i>	=					
<i>Taxi Fuel (2.65 Gal.)</i>	-	16		95.00	-	1,520
<i>Takeoff Weight</i>	=				CG =	
					CG = Moment / Weight	
<i>Fuel Burn</i>	-					
<i>Landing Weight</i>	=				CG =	
					CG = Moment / Weight	

Calculate the Following

1. Zero Fuel CG
2. Usable Fuel
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?

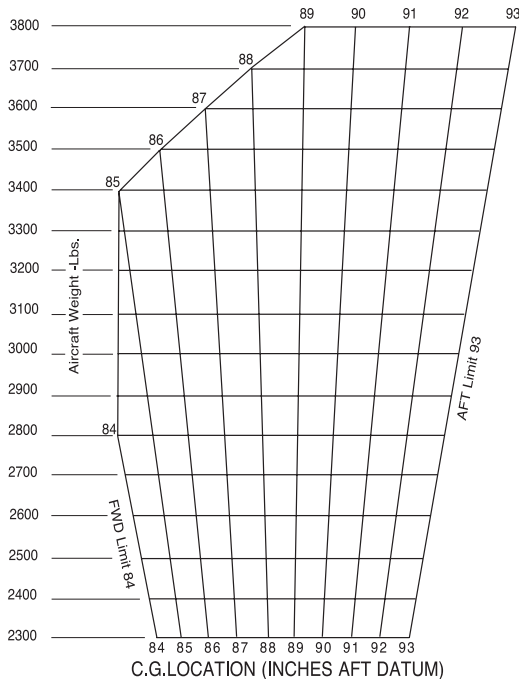
Plot Zero Fuel CG and Takeoff CG on the CG Envelope Graph Below

Answers: (1) 91.6 (2) 68.4 gal. (3) 3,800 lbs. (4) 91.9 (5) Forward

Formulas

- $\text{Weight} \times \text{Arm} = \text{Moment}$
- $\text{Total Moment} \div \text{Total Weight} = \text{CG}$
- $\text{Max Ramp Weight} - \text{Zero Fuel Weight} = \text{Usable Fuel Weight}$
- $\text{Fuel Weight} \div 6 = \text{Fuel Gallons}$
- 100 LL (Blue) Fuel Weighs 6 lbs./gal.; Oil Weighs 7.5 lbs./gal.
- 2 Gallons of unusable fuel and oil at full capacity are Included in Basic Empty Weight

CG Envelope Graph



Flight Check Tasks & Procedures

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 - Throttles immediately closed
- Brake as required - Stop straight ahead

If not enough runway to stop:

- Mixture to cutoff
- Fuel selectors, Magnetos, & Battery Master Off
- Maintain directional control, avoid obstacles

Engine failure after rotation with gear down & sufficient runway remains for a complete stop:

- Maintain directional control
- Throttles immediately closed
- Land straight ahead, brake as required

Engine failure after rotation with gear up and decision made to continue:

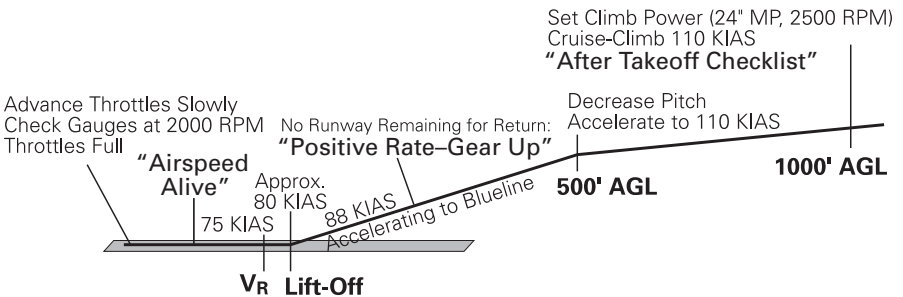
- Maintain directional control/Pitch Attitude/Airspeed
- Mixtures, Props, Throttles Full Forward
- Flaps and Gear Up
- Identify with dead foot, Verify by closing the throttle
- Feather Prop
- Mixture to cutoff
- Climb at 88 KIAS/Blueline
- Declare an Emergency and Land

Normal Takeoff (Flaps 0°)

Do not delay on runway.

1. Increase throttles to 2000 RPM.
2. Check engine gauges.
3. Increase throttles to full power.
4. "Airspeed Alive."
5. Start slow rotation at 75 KIAS.
(Main gear should lift off at approximately 80 KIAS. 75 KIAS is V_R , not VLOF.)
6. Accelerate to 88 KIAS/Blueline (V_Y).
7. Establish a positive rate of climb and retract the gear if no runway remains.
(When taking off from runways 4,000' or less, no runway usually remains after a positive rate of climb has been established.)
8. Climb at 88 KIAS/Blueline (V_Y) until 500' AGL.
9. Climb at 110 KIAS after passing through 500' AGL.
(100-110 KIAS provides better visibility and engine cooling. Density altitude, terrain, obstacles, etc. may require a climb speed from 82-100 KIAS.)
10. Reduce throttles to 24" MP, 2500 RPM at 1,000' AGL.
11. "After Takeoff Checklist" out of 1,000' AGL.

Normal Takeoff Profile



Some ATP aircraft are equipped with Traffic Information System (TIS). TIS is not intended to be used as a collision avoidance system and does not relieve the pilot of responsibility to "see and avoid" other aircraft.

Engine Failure Procedure

After Takeoff with No Runway Remaining and Gear Up

Should an engine failure occur after takeoff and gear-up in a light twin, the following three second, step-by-step technique is suggested. For liability purposes, the following procedure does not cover all situations due to aircraft weight, OAT, density altitude, and aircraft performance. Refer to aircraft POH for additional information.

Engine Failure Occurs – Perform the following in 3 seconds.

One Thousand One: Decrease pitch attitude to horizon or slightly above – approximately 1° on AI. (If the Seminole is trimmed flying out at 88 KIAS and engine failure occurs, the airplane nose will drop towards the horizon due to loss of lift.)

One Thousand Two: Input aileron to bank 2° to 5° into the operating engine. This will assist in directional control and assist in stopping the torque roll effect.

One Thousand Three: Input rudder towards the operating engine. Inputting the rudder after accomplishing the above steps in the first two seconds will help alleviate stomping on the wrong rudder, creating a situation of directional control loss, airspeed loss, and possible altitude loss. Immediately accomplish memory items on “In-Flight Engine Failure” checklist.

In-Flight Engine Failure

(After Takeoff)

(For ATP, Inc. training and checkrides only perform Troubleshoot Checklist at or above 3000' AGL. If an actual engine failure occurs, perform Troubleshoot Checklist only if altitude permits.)

**MAINTAIN DIRECTIONAL CONTROL / PITCH
ATTITUDE / AIRSPEED**

MIXTURES..... FULL FORWARD

PROPS..... FULL FORWARD

THROTTLES..... FULL FORWARD

FLAPS UP

GEAR..... UP

IDENTIFY DEAD FOOT

VERIFY/THROTTLE..... CLOSE

PROP INOP ENG FEATHER

MIXTURE INOP ENG CUTOFF

CLIMB* 88 KIAS/BLUELINE

DECLARE AN EMERGENCY WITH ATC

LAND AT NEAREST SUITABLE AIRPORT

EMERGENCY

Approach Briefing

IFR

Field Elevation
Type of Approach
NAV Frequency
Course
Glideslope Intercept or FAF Altitude
Minimums
Missed Approach Procedure

VFR

Field Elevation
Pattern Altitude
Type of Landing
Brief 400' AGL altitude for
"Gear Down–Stabilized" call

Announced Calls on Approach

"Gear Down 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 or just prior to FAF.

"Blueline–GUMP" "Gas, Undercarriage, Mixtures, Props."

- Visual: On base or turning final.
- Instrument: Descending through 1,000' AGL.



The GUMP check is a backup before landing checklist that must be demonstrated to ensure pilots are familiar with its use when flying light complex aircraft.

"Gear Down–Stabilized."

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

"100 To Go."

- Instrument: Prior to MDA or DH.

"Minimums."

- Instrument: at MDA or DH.

Stabilized Approach Corridor

The stabilized approach corridor is required during visual and instrument approaches in ATP aircraft. The aircraft 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.

A "Gear Down–Stabilized" call and verification are required for all approaches at 400' AGL or when descending from MDA.

General Conditions for a Stabilized Approach

- Aircraft in landing configuration. (Gear down and final flaps set.)
- Engines must be steady at the proper approach power setting.
- 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.
- Airspeed must be stable and within range of target speed plus 10 KIAS.
- The aircraft will touch down in the first 1,000' of the landing runway. If this is not assured, a go-around must be executed.

Conditions for a Seminole Stabilized Approach (Normal & Single-Engine)

- Gear Down, Flaps 25°.
- Power Set Approx. 15" MP (2-engine) or 20" MP (1-engine).
- Approx. 500 FPM Descent.
- Airspeed 88 KIAS at 400' AGL or Descending from MDA.
- "Gear Down–Stabilized" Announced & Verified.

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.

A go-around must be accomplished if at 400' AGL the aircraft is not stabilized with gear down.

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.

Normal Landing

- Verify and announce at 400' AGL: "Gear Down–Stabilized."
- Maintain a stabilized descent angle.
- Reduce throttles slowly over approach end, slow to 80 KIAS
- Touch down at approx. 75 KIAS on centerline within the first 1,000' of the runway.
- Maintain back pressure on control wheel to prevent slamming the nose wheel onto the runway.

Flap Setting

ATP always recommends landing with flaps 25°. The approach speeds used for flaps 25° are the same as flaps 40° for normal landings. Flaps 25° places

the airplane in the best configuration for go-arounds and crosswind landings. Note: Flaps 25° also introduces a secondary gear warning. Use pilot discretion for situations requiring a different setting, such as short field landings, single-engine maneuvering or high winds. The revised PA-44-180 operation manual, section 4.31a states: “landing may be made with any flap setting.”



The gear horn is an action horn. The gear warning horn should never be heard below 1,000' AGL on arrivals. Take immediate action by extending the landing gear or by going around.

Normal Visual Approach & Landing

1. Complete the “*Approach Checklist*” before entering the traffic pattern; devote full attention to aircraft control and traffic avoidance.
2. Slow to 100 KIAS prior to entering downwind or traffic pattern.
3. Enter traffic pattern at published TPA (typically 1,000' AGL).
4. Announce when abeam approach end, on extended base, or on extended final (When ready to descend out of pattern altitude): “*Gear Down Before Landing Checklist.*”
5. Extend flaps 25°.
6. Descend out of TPA at 88 KIAS/Blueline.
7. Announce on base leg or turning final: “*Blueline–GUMP.*”
“*Gas, Undercarriage, Mixtures, Props.*”
8. Maintain 88 KIAS/Blueline with flaps 25° on base and final.
9. Announce at 400' AGL: “*Gear Down–Stabilized.*”



Whenever leaving TPA you should verify that the “*Gear Down Before Landing Checklist*” has been accomplished.

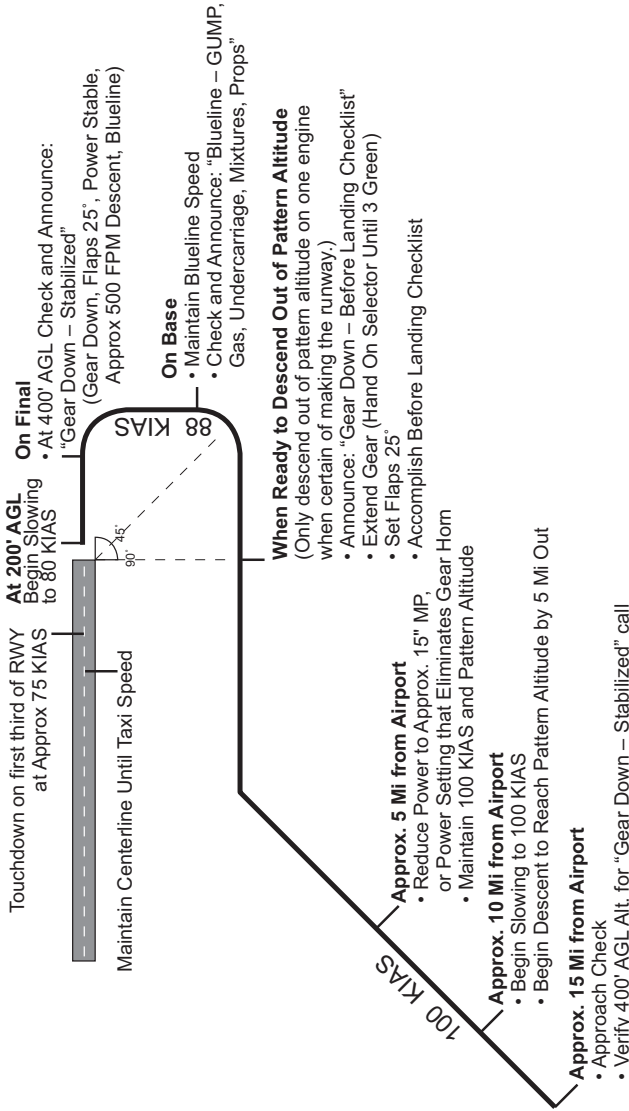
Gear Down Before Landing Checklist

(ATP, Inc. Max Gear Speed 120 KIAS)

GEAR..... (Hand on Selector Until) **3 GREEN**
FUEL SELECTORS..... **ON**
FLAPS (Vfe 111 KIAS) **25°**
MIXTURES..... **FWD**
PROPS..... **FWD**
FUEL PUMPS..... **ON**

Checklist Complete

Normal Visual Approach & Landing Profile





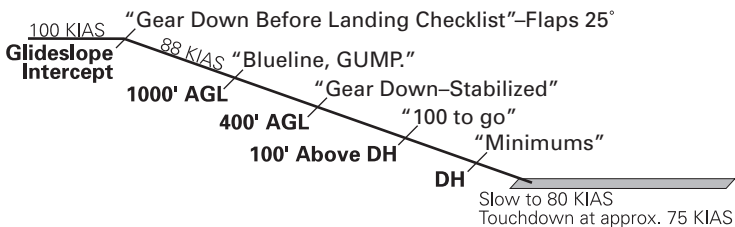
VIDEO: Visit ATPFlightSchool.com/students to watch an ILS approach, non-precision approach, and missed approach using ATP procedures.

ILS Approach One or Two Engines

ATP recommends initially setting flaps 25° at glideslope intercept for both one and two-engine ILS precision approaches. When conducting a one-engine ILS down to minimums it is assumed that a landing is assured. Flaps 25° allows for a stabilized approach to touchdown for both one and two-engine operations. ATP does not recommend a one-engine go around below 400' AGL.

1. Complete the *"Approach Checklist"* and identify localizer when able.
2. Set the published inbound course on the HSI.
3. The aircraft is considered established inbound when the course is alive.
4. Check for flags at glideslope intercept altitude and marker.
5. Maintain 100 KIAS until glideslope intercept.
6. ½ dot below glideslope intercept: *"Gear Down Before Landing Checklist."*
7. Extend flaps 25°.
8. Descend on glideslope at 88 KIAS/Blueline (or 100 KIAS considering traffic).
9. Announce out of 1,000' AGL: *"Blueline–GUMP"*
"Gas, Undercarriage, Mixtures, Props."
10. Maintain 88 KIAS/Blueline from 1,000' AGL inbound.
11. Announce at 400' AGL: *"Gear Down–Stabilized."*
12. Announce at 100' above minimums: *"100 To Go."*
13. *"Minimums."*

ILS Approach One or Two Engines Profile



Non-Precision Straight-In Approach One or Two Engines

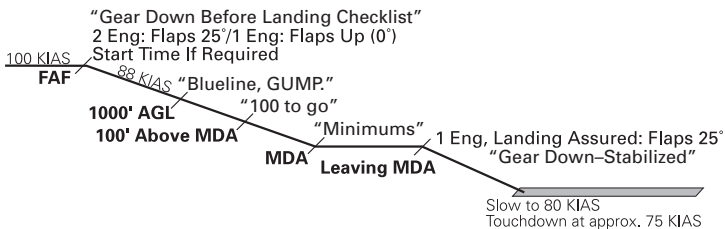
For simulated single-engine non-precision straight-in approach: “Gear Down Before Landing Checklist” at FAF; maintain 100 KIAS approach speed and flaps 0°; Flaps 25° descending from MDA, followed by the “Gear Down–Stabilized” call. If the airplane will not maintain MDA on a simulated one-engine approach with full power on the operating engine, terminate the approach and use both engines.



During simulated single-engine training ATP prohibits gear retraction at MDA unless a missed approach is being demonstrated. With an actual engine failure, you may be required to retract the gear to maintain MDA.

1. Complete the “Approach Checklist” and identify the NAV aid when able.
2. Maintain 100 KIAS clean (gear up, flaps up) during procedure turn outbound and inbound to the FAF.
3. Set the published inbound course on the HSI.
4. The aircraft is considered established inbound when the course is alive.
5. Check for flags.
Note: On two-engine non-precision approaches it is recommended that the Gear Down Before Landing Checklist is accomplished while inbound just prior (approx. 2 miles) to the FAF. Single-engine non-precision approaches require the gear to be extended no earlier than the FAF due to the drag introduced.
6. At FAF: Start time, “Gear Down Before Landing Checklist.”
7. Flaps 0° (one engine) Flaps 25° (two engines).
8. Descend at 88-100 KIAS.
9. Descend at 600-800 FPM at 88 KIAS/Blueline.
10. Announce out of 1,000' AGL: “Blueline–GUMP.”
“Gas, Undercarriage, Mixtures, Props.”
11. Maintain 88 KIAS/Blueline from 1,000' AGL inbound.
12. Announce at 100' above minimums: “100 To Go.”
13. “Minimums.”
14. Maintain MDA (plus 50' minus 0').
15. Runway in sight: descend at predetermined VDP or maintain MDA to MAP.
16. Do not leave MDA until landing is assured.
17. When descending from MDA:
Flaps 25° (single-engine), verify and announce: “Gear Down–Stabilized.”

Non-Precision Straight-In Approach One or Two Engines Profile



Circle to Land Approaches Two Engines

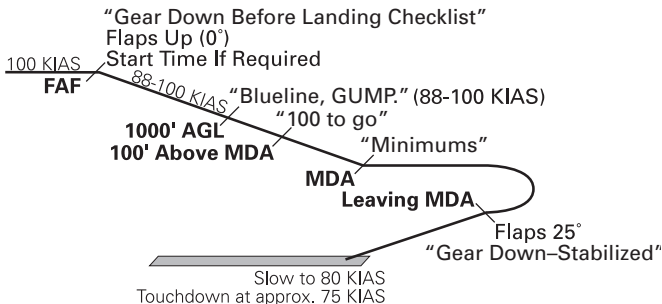


ATP prohibits engine-out (actual or simulated) circle to land approaches in the training environment.

ATP requires 88 to 100 KIAS approach speed and flaps 0° for circle to land approaches. Unlike straight-in approaches, maintain 88 to 100 KIAS out of 1,000' AGL, descending to MDA. Approach category B is used for minimums. Category B speed ranges from 91 KIAS to 120 KIAS. When leaving MDA, set flaps 25° and verify and announce *"Gear Down–Stabilized."* Do not exceed 111 KIAS (V_{FE}) during approach.

1. Complete the approach checklist and identify the NAV aid when able.
2. Maintain 100 KIAS clean (gear up, flaps up) during procedure turn outbound and inbound to the FAF.
3. Set the published inbound course on the HSI.
4. The aircraft is considered established inbound when the course is alive.
5. Check for flags.
6. At FAF: Start time, *"Gear Down Before Landing Checklist."*
7. Flaps 0°.
8. Descend at 88-100 KIAS.
9. Descend at 600-800 FPM at 88-100 KIAS.
10. Announce out of 1,000' AGL: *"Blueline–GUMP."*
"Gas, Undercarriage, Mixtures, Props."
(You may maintain up to 100 KIAS for circle maneuver at MDA.)
11. Announce at 100' above minimums: *"100 To Go."*
12. *"Minimums."*
13. Maintain MDA during circling maneuver (plus 50' minus 0').
14. When turning onto final and descending from MDA: Flaps 25°, verify and announce: *"Gear Down–Stabilized."*

Circle to Land Approaches Two Engines Profile



Go Around / Missed Approach

1. Simultaneously increase throttles to full power and pitch for climb.
2. Retract flaps slowly to 0°. *(Slowly to preclude excessive sink.)*
3. Retract landing gear upon acquiring positive rate of climb.
4. Climb at 88 KIAS/BlueLine (V_Y) until 500' AGL.
5. Climb at 110 KIAS after passing through 500' AGL (provides better visibility and engine cooling) unless V_X or V_Y is needed for obstacle clearance.
6. Reduce power to 24" MP, 2500 RPM at 1,000' AGL.
7. Announce and perform "After Takeoff Checklist" out of 1,000' AGL.

Holding

Max speeds:

Up to 6,000' MSL **200 KIAS**

6,001' to 14,000' MSL..... **230 KIAS**

1. Slow to 100 KIAS holding speed 3 minutes prior to fix.
2. Acquire EFC.
3. Hold at 100 KIAS, with 1 minute leg to the inbound fix once established.
4. Report altitude and time at holding fix.
5. Make proper entry.

Approach, Procedure Turn & Holding Power Settings

The following suggested power settings are approximations only.

	<i>Speed</i>	<i>2-Eng.</i>	<i>1-Eng.</i>
<i>ILS</i>	88 KIAS (Configured)	15"	20"
<i>Non-Precision</i>	88 KIAS (Configured)	13"	15" (600-800 FPM Descent)
<i>Level at MDA</i>	88 KIAS (Configured)	20"	Full or As Necessary
<i>Holding/PT</i>	100 KIAS (Clean)	18"	Full or As Necessary
<i>Traffic Pattern</i>	100 KIAS (Clean)	18"	Full or As Necessary

In-Flight Maneuvers

The following maneuvers (except for the V_{MC} Demo unless CLT restricted) are required for all ratings. Additional procedures required for the specific rating sought are listed in the following sections for Airline Transport Pilot, Commercial Multi-Engine Add-On, CFI Multi-Engine Add-On and Private Multi-Engine Add-On.

Clearing Turns for In-Flight Maneuvers

1. Maintain selected altitude.
2. Set bug to entry heading.
3. Perform 90° clearing turn to left or right.
4. Reduce power to approximately 15" MP, as specified for the maneuver, or just above the gear horn sounding to slow airplane. (A higher MP setting may be required so the gear horn will not sound during the clearing turn.)
5. Perform 90° clearing turn back to original heading.



When slowing for maneuvers or approaches, maintain a power setting that eliminates the gear horn. This may increase the target speed to maintain gear horn silence.

V_{MC} Demonstration

Not required for ATP rating, unless CLT restricted. The V_{MC} Demo is to be accomplished at or above 4,000' AGL, or as specified by Examiner.

In the Piper Seminole, V_{MC} occurs at a lower airspeed than stall speed. The Seminole will lose power as altitude increases because of the reduced density of the air entering the induction system of the engine. Increase the pitch attitude slowly to reduce the airspeed at approximately 1 knot per second while applying rudder pressure to maintain directional control until full rudder is applied. As the speed decreases, additional aileron input will be required to maintain a maximum of 5° bank toward the operating engine. Recover at the first indication of loss of directional control, stall horn, or buffet.

1. Clearing turns.
2. Flaps-up, gear-up.
3. Mixtures–Enrichen, Props–Fwd, Fuel Pumps–On.
4. Slowly close left throttle while maintaining heading and altitude.
5. Slow to 100 KIAS (approx. 10 KIAS above V_{YSE}).
6. Slowly increase right throttle (operating engine) to full power. Use rudder to maintain directional control and bank up to 5° towards the operating engine.
7. Increase pitch attitude slowly, decrease airspeed at approximately 1 knot per second until full rudder is applied to maintain directional control.
8. Recover at first sign of:
 - A. Loss of directional control.
 - B. First indication of stall (stall horn or buffet).
9. Recover promptly by simultaneously reducing power sufficiently on the operating engine while decreasing the angle of attack as necessary to regain directional control within 20° of entry heading.

10. Continue recovery by increasing power slowly on operating engine while maintaining an AOA that allows for airspeed to increase to a point where directional control can be maintained with a minimum loss of altitude.
11. Accelerate to 82-88 KIAS.
12. Bring throttles slowly together to 20" MP.
13. "Cruise Checklist."

Recovery shall not be attempted by increasing the power on the simulated failed engine for demonstration.



During the V_{MC} Demo, the gear horn will sound due to the left throttle being closed. Do not confuse the gear horn, which beeps at 90 cycles per minute, with the steady stall warning horn—typically the first indication of a stall at which to begin recovery.

Maneuvering with One Engine Inoperative

The maneuver shall be performed above 4,000' AGL and in a position where a safe landing at an airport can be accomplished in the event the engine cannot be restarted. Maintain altitude $\pm 100'$ unless a minimum sink is required due to airspeed at blue line and extremely high density altitude. Maintain heading $\pm 10^\circ$.



Below 3,000' AGL, engine failures may be simulated with the throttle only. At 3,000' AGL or higher, engine failures may also be simulated with the mixture. **Never use the fuel selector to simulate an engine failure.**

In-Flight Engine Failure (Shutdown-Secure) Demo

1. Instructor or examiner simulates engine failure with the mixture.
2. Complete the In-Flight Engine Failure Checklist.
3. Complete the Troubleshoot Checklist above 3,000' AGL (if no obvious damage).
4. If no re-start, continue the In-Flight Engine Failure Checklist and complete the Engine Failure Secure Checklist.
5. Maneuver as specified by instructor or examiner.

When maneuvering with one engine inoperative is complete, perform an airstart (separate maneuver) using the Airstart Checklist.



Perform an actual engine shutdown on either engine only above 4,000' AGL. When performing the engine shutdown and secure maneuver as part of a training event (as opposed to an actual emergency), the items on the Engine Failure Secure Checklist are to be **simulated** (touched but **not** actuated).

EMERGENCY

In-Flight Engine Failure

MAINTAIN DIRECTIONAL CONTROL / PITCH ATTITUDE / AIRSPEED
 MIXTURES..... FULL FORWARD
 PROPS..... FULL FORWARD
 THROTTLES..... FULL FORWARD
 FLAPS UP
 GEAR..... UP
 IDENTIFY DEAD FOOT
 VERIFY/THROTTLE..... CLOSE

Troubleshoot Checklist

THROTTLE 1/4"
 FUEL PUMPS ON
 MAGNETOS ON/CHECK
 FUEL SELECTORS ON
 CARB HEAT ON, CHECK, OFF
 FUEL QTY/PRESSURE CHECK
 OIL PRESSURE/TEMP..... CHECK

(If engine inop continue In-Flight Engine Failure Checklist & Engine Failure Secure.)

PROP INOP ENG FEATHER
 MIXTURE INOP ENG CUTOFF

Engine Failure Secure

OPERATING ENG MIXTURE LEAN AS REQ
 TRIM..... AS REQUIRED
 INOP ENG MAGNETOS OFF
 INOP ENG FUEL PUMP OFF
 INOP ENG ALTERNATOR OFF
 INOP ENG FUEL SELECTOR OFF
 INOP ENG COWL FLAP CLOSED
 REC/BLOW OFF

Example Single-Engine Drift Down Scenario

Inoperative Engine at 8,000' MSL, 20° C, and 3,400 lbs. (This is the approximate weight for two people, bags, and half fuel.) The following computations are based on the "Climb Performance - One Engine Operating - Gear Up" chart in the Seminole POH.

Associated Conditions: Flaps 0°, Operating Engine Cowl Flap Open, Inoperative Engine Cowl Flap Closed, Landing Gear Up, Mixture Full Rich, Inoperative Engine Prop Feathered, Full Throttle, 2700 RPM, 88 KIAS/Blueline. (To achieve maximum single-engine performance, the operating engine mixture should be leaned as required.)

<i>Altitude</i> (Feet MSL)	<i>Temp</i> (°C) / (°F)	<i>Rate of Climb</i> (FPM)	<i>Distance at 88 KIAS/Blueline</i> (Approx. 1.5 NM per minute)
8,000	20 / 68	-120	From 8,000 to 7,000: 13 NM
7,000	22 / 72	-80	From 7,000 to 6,000: 19 NM
6,000	24 / 75	-40	From 6,000 to 5,000: 37 NM
5,000	26 / 79	0	Single Engine Absolute Ceiling
4,000	28 / 82	50	Single Engine Service Ceiling

All figures are approximate.

Airstart Procedure

The airstart procedure varies between the 1979 and 2000 model Seminoles since the 2000 models are equipped with an unfeathering accumulator.

1979 Model Seminole

Airstart	
INOP ENG FUEL SELECTOR	ON
INOP ENG CARB HEAT	OFF
INOP ENG MIXTURE	FULL FORWARD
INOP ENG PROP	FULL FORWARD
INOP ENG FUEL PUMP	ON
INOP ENG ALTERNATOR	ON
INOP ENG MAGNETOS	ON
AVIONICS MASTER	(If Conditions Permit) OFF
INOP ENG THROTTLE	TWO FULL STROKES
INOP ENG THROTTLE	1/4" OPEN
INOP ENG STARTER.....	(ATP 8 Seconds Max) ENGAGE
Prop Windmilling	
INOP ENG STARTER.....	RELEASE
When Engine Begins to Run	
THROTTLE	INCREASE SLOWLY TO 15" MP
MAINTAIN 15" MP UNTIL CHT GREEN	
AVIONICS MASTER	ON
PERFORM CRUISE CHECKLIST (Next Page)	

EMERGENCY

Airstart	
INOP ENG THROTTLE	CLOSED
INOP ENG FUEL SELECTOR	ON
INOP ENG CARB HEAT	OFF
INOP ENG MAGNETOS	ON
INOP ENG FUEL PUMP	ON
INOP ENG ALTERNATOR	ON
INOP ENG MIXTURE	FULL FORWARD
INOP ENG PROP	FULL FORWARD
AIRSPPEED	(Suggested) 120 KIAS
INOP ENG THROTTLE	1/4" OPEN
(The prop may not easily come out of feather unless airspeed is at least 100 KIAS. It may take up to 20 seconds for prop to windmill. If prop does not windmill verify that there is no prop movement, then engage starter for 2 seconds.)	
When Engine Begins to Run	
THROTTLE	INCREASE SLOWLY TO 15" MP
MAINTAIN 15" MP UNTIL CHT GREEN	
PERFORM CRUISE CHECKLIST	

EMERGENCY

Emergency Descent

1. Throttles—Slowly reduce to idle.
2. Props—Full Forward.
3. Mixtures—Adjust.
4. Gear—Down, accelerate up to a max speed of 140 KIAS (For training at ATP use 120 KIAS unless specified by examiner to go up to the max of 140 KIAS.)
5. Cowl Flaps—As Required.
6. Maintain 140 KIAS (ATP 120 KIAS) during descent.
7. Notify ATC as appropriate.



When recovering from the Emergency Descent, verify airspeed at or below 109 KIAS (maximum gear retraction speed) before retracting the gear.

Recovery from Unusual Attitudes

Nose High—Climbing
(Airspeed Decreasing)

1. Increase power.
2. Pitch level.
3. Bank 0°.
4. "Cruise Checklist."

Nose Low—Descending
(Airspeed Increasing)

1. Reduce power.
2. Bank 0°.
3. Pitch smoothly level.
4. "Cruise Checklist."

Spin Awareness

Aerodynamic Factors

All spins are preceded by a stall on at least part of the wing. The primary cause of an inadvertent spin is exceeding the critical AOA while applying excessive or insufficient rudder and, to a lesser extent, aileron. Asymmetrical power could contribute to a spin.

Flight Situations when Unintentional Spins may Occur

- During a V_{MC} Demonstration, when at the point of reaching both V_{MC} and stall simultaneously.
- It may also occur while maneuvering during slow flight.

Procedure for Recovery from Unintentional Spins

This procedure is taken directly from the Piper Seminole POH.

1. Throttles—Retard to idle.
2. Rudder—Full opposite to direction of spin.
3. Control Wheel—Release back pressure.
4. Control Wheel—Full forward if nose does not drop.
5. Ailerons—Neutral.
6. Rudder—Neutralize when rotation stops.
7. Control Wheel—Smooth back pressure to recover from dive.



Intentional spins are prohibited in multi-engine aircraft. For further reference concerning stall and spin awareness, consult AC 61-67C.

Private Pilot Multi-Engine Add-On

Specific Tasks & Procedures

Steep Turns

Steep turns are to be accomplished above 3,000' AGL. Roll into a coordinated 360° steep turn with at least 45° of bank. The applicant is required to maintain entry altitude $\pm 100'$, airspeed ± 10 KIAS, and bank angle $\pm 5^\circ$, roll out on the entry heading $\pm 10^\circ$.

1. Clearing turns as specified by the Examiner.
2. Set power 20" MP, 2300 RPM.
3. Set bug to entry heading.
4. Maintain selected altitude $\pm 100'$.
5. Maintain 120 KIAS or a safe airspeed not to exceed V_A .
6. Adjust power as necessary during maneuver.
7. Perform 360° turn to the left maintaining at least 45° bank $\pm 5^\circ$.
8. Roll out on entry heading $\pm 10^\circ$.
9. Perform 360° turn to the right maintaining at least 45° bank $\pm 5^\circ$.
10. Roll out on entry heading $\pm 10^\circ$.

Maneuvering During Slow Flight

Slow flight is to be accomplished above 4,000' AGL. As specified by the Examiner, this maneuver may be accomplished in any configuration while demonstrating coordinated straight-and-level flight, climbs, turns, and descents. The airspeed selected is that at which any further increase in angle of attack, increase in load factor, or reduction in power would result in an immediate stall. The applicant is required to maintain selected altitude $\pm 100'$, heading $\pm 10^\circ$, airspeed $+10/-0$ KIAS, and bank angle $\pm 10^\circ$.

1. Clearing turns.
2. *"Gear Down Before Landing Checklist."*
3. Extend full flaps 40°.
4. Slow to just above stall (approximately 60 KIAS).
5. Adjust power as necessary (approximately 20" MP) to maintain airspeed while maneuvering.
6. Accomplish straight-and-level flight, climbs, turns, and descents as required.

7. Recover with max power.
8. Retract flaps slowly to 0°.
9. Accelerate to 82 KIAS (V_X), maintain altitude or climb as specified by Examiner.
10. Retract gear, accelerate to 88 KIAS (V_Y).
11. *“Cruise Checklist.”*

Stall Recovery

When practicing recovery from a fully developed stall in a multi-engine aircraft, immediately reduce the AOA by aggressively moving the elevator control forward to ensure recovery without worrying about a specific loss of altitude. This is not an approach to stall—it is a stall that has broken and an aggressive reduction in AOA is critical. The PTS places no emphasis on maintaining altitude or limiting loss of altitude.



CAUTION: Fully developed stalls may lead to inadvertent, unrecoverable spins.

“Stall training (in multi-engine airplanes) should be limited to approaches to stalls and when a stall condition occurs. Recoveries should be initiated at the onset, or decay of control effectiveness, or when the first physical indication of the stall occurs.” (AFH 12-26)

“No multi-engine airplane is approved for spins, and spin recovery characteristics are generally very poor. It is therefore necessary to practice spin avoidance and maintain high awareness of situations that can result in an inadvertent spin.” (AFH 12-27)

Fully developed stalls in a multi-engine airplane is a situation that can “result in an inadvertent spin”.

“In order to spin any airplane, it must first be stalled. At the stall, a yawing moment must be introduced. In a multi-engine airplane, the yawing moment may be generated by rudder input or asymmetrical thrust.” (AFH 12-27)

When recovering with max power, advance throttles smoothly. This assists with symmetrical power increases.

Power-Off Stall

Stalls are to be accomplished above 4,000' AGL, with a stabilized descent approximating a 3° final approach glidepath (400 FPM). Private requires prompt recovery after a fully developed stall occurs. As specified by the Examiner, this stall may be accomplished on a selected heading $\pm 10^\circ$ or in a 15°-bank turn (max bank 20°).



Always reduce throttles slowly to avoid damage to engines.

When recovering with max power, advance throttles smoothly.
This assists with symmetrical power increases.

1. Clearing turns.
2. *"Gear Down Before Landing Checklist."*
3. Extend full flaps 40°.
4. Establish a stabilized 400 FPM descent at 75 KIAS.
5. Maintain selected heading, or establish 15°-bank turn as specified by Examiner.
6. Slowly reduce power to idle.
7. Slowly increase pitch attitude to induce a stall.
8. Recover immediately after a fully developed stall occurs.
Simultaneously:
 - Reduce AOA – Lower nose. **Do not attempt to maintain altitude.**
 - Smoothly apply max power.
 - Level wings.
9. Retract flaps slowly to 0°.
10. Accelerate to 82 KIAS (V_X), establish a positive rate of climb.
11. Retract gear, accelerate to 88 KIAS (V_Y).
12. *"Cruise Checklist."*

Power-On Stall

Stalls are to be accomplished above 4,000' AGL. Private requires recovery after a fully developed stall occurs. As specified by the Examiner, this stall may be accomplished in the takeoff configuration (Gear Down, Flaps 0°) or the departure configuration (Gear Up, Flaps 0°) while on a selected heading $\pm 10^\circ$ or in a 15°-bank turn (max bank 20°) $\pm 10^\circ$.

1. Clearing turns.
2. Set takeoff or departure configuration as specified by the Examiner:
 - A. Takeoff configuration (Gear Down, Flaps 0°).
 - B. Departure configuration (Gear Up, Flaps 0°).
3. Mixtures–Enrichen, Props–Fwd, Fuel Pumps–On.
4. Slow to 80 KIAS, liftoff speed.

5. Maintain selected heading or establish a 15°-bank turn, as specified by the Examiner.
6. Transition smoothly to approx. 15° pitch-up while increasing power to 18" MP.
7. Recover immediately after a fully developed stall occurs.
Simultaneously:
 - Reduce AOA – Lower nose. ***Do not attempt to maintain altitude.***
 - Smoothly apply max power.
 - Level wings.
8. Accelerate to 82 KIAS (V_X), establish a positive rate of climb.
9. Retract gear (if extended), accelerate to 88 KIAS (V_Y).
10. *"Cruise Checklist."*

Commercial Multi-Engine Add-On

Specific Tasks & Procedures

Steep Turns

Steep turns are to be accomplished above 3,000' AGL. Roll into a coordinated 360° steep turn with at least 50° of bank. The applicant is required to maintain entry altitude $\pm 100'$, airspeed ± 10 KIAS, and bank angle $\pm 5^\circ$, roll out on the entry heading $\pm 10^\circ$.

1. Clearing turns as specified by the Examiner.
2. Set power 20" MP, 2300 RPM.
3. Set bug to entry heading.
4. Maintain selected altitude $\pm 100'$.
5. Maintain 120 KIAS or a safe airspeed not to exceed V_A .
6. Adjust power as necessary during maneuver.
7. Perform 360° turn to the left maintaining at least 50° bank $\pm 5^\circ$.
8. Roll out on entry heading $\pm 10^\circ$.
9. Perform 360° turn to the right maintaining at least 50° bank $\pm 5^\circ$.
10. Roll out on entry heading $\pm 10^\circ$.

Maneuvering During Slow Flight

Slow flight is to be accomplished above 4,000' AGL. As specified by the Examiner, this maneuver may be accomplished in any configuration while demonstrating coordinated straight-and-level flight, climbs, turns, and descents. The airspeed selected is that at which any further increase in angle of attack, increase in load factor, or reduction in power would result in an immediate stall. The applicant is required to maintain selected altitude $\pm 50'$, heading $\pm 10^\circ$, airspeed $+5/-0$ KIAS, and bank angle $\pm 5^\circ$.

1. Clearing turns.
2. *"Gear Down Before Landing Checklist."*
3. Extend full flaps 40°.
4. Slow to just above stall (approximately 60 KIAS).
5. Adjust power as necessary (approximately 20" MP) to maintain airspeed while maneuvering.
6. Accomplish straight-and-level flight, climbs, turns, and descents as required.

7. Recover with max power.
8. Retract flaps slowly to 0°.
9. Accelerate to 82 KIAS (V_X), maintain altitude or climb as specified by Examiner.
10. Retract gear, accelerate to 88 KIAS (V_Y).
11. *"Cruise Checklist."*

Power-Off Stall

Stalls are to be accomplished above 4,000' AGL, with a stabilized descent approximating a 3° final approach glidepath (400 FPM). Commercial requires prompt recovery at the onset (buffeting) stall condition. As specified by the Examiner, this stall may be accomplished on a selected heading $\pm 5^\circ$ or in a 15°-bank turn (max bank 20°).



Always reduce throttles slowly to avoid damage to engines.

When recovering with max power, advance throttles smoothly.
This assists with symmetrical power increases.

1. Clearing turns.
2. *"Gear Down Before Landing Checklist."*
3. Extend full flaps 40°.
4. Establish a stabilized 400 FPM descent at 75 KIAS.
5. Maintain selected heading, or establish 15°-bank turn as specified by Examiner.
6. Slowly reduce power to idle while increasing pitch attitude to induce stall (approx. 12°).
7. Recover promptly at the "onset" (buffeting) stall condition.
8. Simultaneously reduce angle-of-attack, set max power, and level wings.
9. Retract flaps slowly to 0°.
10. Accelerate to 82 KIAS (V_X), establish a positive rate of climb.
11. Retract gear, accelerate to 88 KIAS (V_Y).
12. *"Cruise Checklist."*

Power-On Stall

Stalls are to be accomplished above 4,000' AGL. Commercial requires recovery at the onset (buffeting) stall condition. As specified by the Examiner, this stall may be accomplished in the takeoff configuration (Gear Down, Flaps 0°) or the departure configuration (Gear Up, Flaps 0°) while on a selected heading $\pm 10^\circ$ or in a 15° -bank turn (Max bank 20°) $\pm 10^\circ$.

1. Clearing turns.
2. Set takeoff or departure configuration as specified by the Examiner:
 - A. Takeoff configuration (Gear Down, Flaps 0°).
 - B. Departure configuration (Gear Up, Flaps 0°).
3. Mixtures–Enrichen, Props–Fwd, Fuel Pumps–On.
4. Slow to 80 KIAS, liftoff speed.
5. Maintain selected heading or establish a 15° -bank turn, as specified by the Examiner.
6. Transition smoothly to approx. 15° pitch-up while increasing power to 18" MP.
7. Recover promptly at the "onset" (buffeting) stall condition.
8. Simultaneously reduce angle-of-attack, set max power, and level wings.
9. Accelerate to 82 KIAS (V_X), establish a positive rate of climb.
10. Retract gear (if extended), accelerate to 88 KIAS (V_Y).
11. "Cruise Checklist."

Accelerated Stall

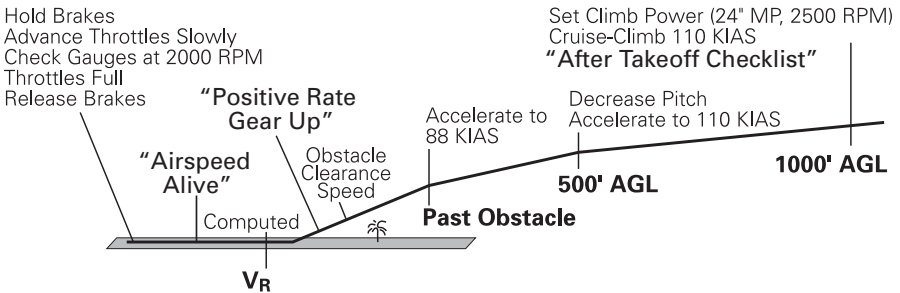
Accelerated stalls are accomplished at an altitude that allows the maneuver to be completed no lower than 4,000 feet AGL. Transition smoothly from cruise attitude to a bank angle of 45° , maintaining coordinated turning flight, while increasing elevator back pressure steadily to induce the stall.

1. Clearing turns.
2. Slow to approximately 120 KIAS (during clearing turns).
3. Flaps-up, gear-up.
4. Mixtures–Enrichen, Props–Fwd, Fuel Pumps–On.
5. Establish a coordinated 45° bank turn.
6. Slowly reduce power to idle.
7. Maintain altitude to induce stall.
8. Recover at the onset (buffeting) stall condition.
9. Simultaneously reduce angle-of-attack, set max power, and level wings.
10. "Cruise Checklist."

Short Field Takeoff & Climb (Flaps 0°)

1. Hold brakes at departure end of runway.
2. Increase throttles to 2000 RPM.
3. Check engine gauges.
4. Increase throttles to full power.
5. Release brakes.
6. "Airspeed Alive."
7. Rotate at speed per Short Field Effort Chart (POH section 5) for Flaps 0° and actual weight.
8. Climb through obstacle height at speed per Short Field Effort Chart (POH section 5) for Flaps 0° and actual weight.
9. Establish a positive rate of climb and retract the gear.
10. Climb at 88 KIAS/Blue line (V_Y) when clear of obstacles until 500' AGL.
11. Climb at 110 KIAS after passing through 500' AGL.
12. Reduce power to 24" MP, 2500 RPM at 1,000' AGL.
13. "After Takeoff Checklist" out of 1,000' AGL.

Short Field Takeoff & Climb Profile



Perform all training flight takeoffs with flaps up. ATP prohibits a flaps 25° short field takeoff for training and flight checks due to critically low airspeeds in the event of an actual engine failure.

Short Field Visual Approach & Landing

1. Complete the *“Approach Checklist”* before entering the traffic pattern; devote full attention to aircraft control and traffic avoidance.
2. Slow to 100 KIAS prior to entering downwind or traffic pattern.
3. Enter traffic pattern at published TPA.
4. Announce when abeam approach end, on extended base, or on extended final (When ready to descend out of pattern altitude): *“Gear Down Before Landing Checklist Short Field.”*
5. Extend flaps 25°.
6. Descend out of TPA at 88 KIAS/Blueline.
7. Announce: (On Base Leg or Turning to Final) *“Blueline–GUMP:”*
“Gas, Undercarriage, Mixtures, Props.”
8. On final, extend flaps 40°.
9. Reduce airspeed to speed per Landing Distance Over 50 Ft. Obstacle Short Field Effort Chart (POH section 5) for actual weight. Maintain constant power, airspeed, and angle of descent.
10. Announce at 400' AGL: *“Gear Down–Stabilized.”*
11. Close throttles slowly in the flare – touch down with little or no floating.
12. Maintain back pressure on control wheel to prevent slamming the nose wheel onto the runway.
13. Retract flaps after touchdown.
14. Simulate and announce *“max braking”* for training and checkride purposes.



Use 75 KIAS (max weight speed) on final as a minimum speed for training and flight checks, unless specified by the Examiner to use computed speed for actual weight.

Technique: Fly proper speed and maintain some power for round out, close throttles in flare.

CFI Multi-Engine Add-On

Specific Tasks & Procedures

Required maneuvers for the CFI Multi-Engine Add-On are the same as for the Commercial Add-On except for the addition of the Airspeed Drag Demonstration.

Airspeed Drag Demonstration

Note power required for each drag item and VSI changes throughout each step.

1. Clearing turns.
2. Mixtures–Enrichen, Props–Fwd, Fuel Pumps–On.
3. Slow to 88 KIAS/Blueline.
4. Extend gear.
5. Add power to maintain 88 KIAS and altitude.
6. Extend flaps 25°.
7. Add power to maintain 88 KIAS and altitude.
8. Extend flaps 40°.
9. Add power to maintain 88 KIAS and altitude.

Above steps are for knowledge of drag to required-power relationships

PTS-Required Tasks Below

10. Close left throttle. (Windmilling prop)
11. Add max power on right engine, maintain 88 KIAS and heading. (Note VSI.)
12. Left Cowl Flap–As Required.
13. Flaps up, maintain 88 KIAS. (Note VSI.)
14. Gear up, maintain 88 KIAS. (Note VSI.)
15. Left throttle to 12" MP simulated feather power, maintain 88 KIAS. (Note VSI.)
16. Pitch for 82 KIAS. (Note VSI.)
17. Pitch for 100 KIAS. (Note VSI.)
18. Bring throttles slowly together to 20" MP.
19. Left cowl flap: open or as required.
20. "Cruise Checklist."

Airline Transport Pilot

Specific Tasks & Procedures

Steep Turns

Steep turns are to be accomplished above 3,000' AGL and may be performed with two 180° turns or one 360° turn. Roll into a coordinated 45°-bank steep turn. Roll into and out of turns at approximately the same rate. The applicant is required to maintain entry altitude $\pm 100'$, airspeed ± 10 KIAS, and bank angle $\pm 5^\circ$, roll out on the entry heading $\pm 10^\circ$.

1. Clearing turns as specified by the Examiner.
2. Set power 20" MP, 2300 RPM.
3. Set bug to entry heading.
4. Maintain selected altitude $\pm 100'$.
5. Maintain 120 KIAS or a safe airspeed not to exceed V_A .
6. Adjust power as necessary.
7. Perform 180° turn to the left maintaining 45° bank $\pm 5^\circ$.
8. Roll out at 180° point $\pm 10^\circ$.
9. Perform 180° turn to the right maintaining 45° bank $\pm 5^\circ$.
10. Roll out on entry heading $\pm 10^\circ$.

Approach to Stall in Approach Configuration (Clean)

Stalls are to be accomplished above 3,000' AGL. ATP rating requires the pilot to announce the first indication of an impending stall (stall horn). As specified by the Examiner, this stall may be accomplished on a selected heading $\pm 5^\circ$ or in a 15 to 30°-bank turn.

1. Clearing turns.
2. Flaps-up, gear-up.
3. Mixtures–Enrichen, Props–Fwd, Fuel Pumps–On.
4. Pitch to maintain altitude.
5. Maintain selected heading, or establish a 20°-bank turn as specified by Examiner.
6. Announce first indication of impending stall (stall horn).
7. Initiate recovery using max power or as specified by Examiner.
8. Recover and maintain selected altitude (and heading if selected).
9. "Cruise Checklist."

Approach to Stall in Landing Configuration

Stalls are to be accomplished above 3,000' AGL. ATP rating requires the pilot to announce the first indication of an impending stall (stall horn). As specified by the Examiner, this stall may be accomplished on a selected heading $\pm 5^\circ$ or in a 15 to 30°-bank turn.



Always reduce throttles slowly to avoid damage to engines.

When recovering with max power, advance throttles smoothly.
This assists with symmetrical power increases.

1. Clearing turns.
2. "Gear Down Before Landing Checklist."
3. Set Flaps 40°.
4. Pitch to maintain altitude.
5. Maintain selected heading, or establish a 20°-bank turn as specified by Examiner.
6. Announce first indication of impending stall (stall horn).
7. Initiate recovery using max power or as specified by Examiner.
8. Recover and maintain selected altitude (and heading if selected).
9. Retract flaps slowly to 0°.
10. Accelerate to 82 KIAS (V_X).
11. Retract gear, accelerate to 88 KIAS (V_Y).
12. "Cruise Checklist."

Oral Review

Lost Comm Procedure (FAR 91.185)

If in VFR conditions, or if VFR conditions are encountered, squawk 7600, remain VFR and land as soon as practicable.

If in IFR conditions, squawk 7600 and Fly:

Route

(First that applies.)

Altitude

(Whichever is highest until descent is required for landing.)

Assigned

Minimum IFR Altitude

Vectored

Expected

Expected

Assigned

Filed

FAR Review

1. To maintain instrument currency, a pilot must have made six approaches and demonstrated proper holding procedures as well as radial and bearing tracking in the last six months.
2. An alternate is not required if the weather at your destination is forecast to be at least a 2,000' ceiling and visibility of at least three miles. The forecast must be from one hour before to one hour after your estimated time of arrival.
3. If an alternate airport is needed, forecasted weather at ETA must be at least 600' ceiling and 2 miles visibility for a precision approach; an alternate airport that offers only a non-precision approach must be at least 800' ceiling and 2 miles visibility. An alternate cannot be based on a GPS approach.
4. Reserve fuel of 45 minutes is required for IFR flights; 30 minutes for VFR day flights; and 45 minutes for VFR night flights. This reserve is required in addition to the fuel required to fly to your destination and alternate.

5. VOR limits: 4 degrees for VOT, ground checkpoint and dual check. 6 degrees for an airborne check.
6. VOR equipment must be checked every 30 days.
7. Transponders must be checked every 24 calendar months.
8. Pitot static systems must be checked every 24 calendar months.
9. ELT equipment must be checked every 12 months, after half of the battery life, or after 1 hour of cumulative use.
10. An aircraft used for hire must have a 100 hour and an annual inspection.
11. In order to descend below the DH or MDA, all of the following conditions must exist:
 - C. The required flight visibility is met.
 - D. The aircraft is in a normal position to land.
 - E. (1) The runway environment is in sight – descend to land.
(2) Approach lights in sight – descend to 100' above touch down zone until runway environment is in sight.
(3) Descend and land if red terminating bars or red side row bars are in sight.
12. Multi-engine aircraft with a V_{SO} of 61 knots or less, or a gross weight under 6,000 pounds do not have to demonstrate positive single-engine climb performance per FAR 23.
13. The minimum equipment list includes a list of equipment that may be inoperative for a particular phase of flight. If not required to have a MEL, comply with the minimum equipment prescribed by the FAR's.
14. Standard Traffic Pattern Altitude (TPA) for multi-engine aircraft is 1,000' AGL.

Answer The Following Sample Oral Questions Prior To Arriving For Training

1. Recite the V speeds.
2. What is the maximum demonstrated crosswind component?
3. Describe the Seminole PA-44-180 engine.
 - 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 turbo-charged or normally aspirated?
 - F. Why is the right engine labeled LO-360?
 - G. How are the cylinders arranged?

- H. How is ignition provided?
 - I. What are the minimum and maximum oil capacities in the 1979 and 2000 model Seminoles?
4. Describe the propeller system.
- A. Who makes the propellers?
 - B. What does oil pressure do to the propeller?
 - C. Which lever manipulates oil pressure to the propeller?
 - D. Which unit regulates oil pressure to the propeller?
 - E. What is the function of the nitrogen cylinder?
 - F. What is the purpose of the spring in the prop dome?
 - G. Define constant speed.
 - H. What unit adjusts the propeller to maintain a constant RPM and how does it do it?
 - I. Define full feathering.
 - J. Will the propeller always feather?
 - K. What are centrifugal stop pins?
 - L. What is the true purpose of the centrifugal stop pins?
5. What is the correct action for a propeller overspeed?
6. Describe the electrical system.
7. What are the indications of a failed alternator?
8. Will the engines continue to run with the alternator and battery master switches turned off?
9. Describe the vacuum system.
- A. Which instruments are vacuum operated?
 - B. What are the normal vacuum operating limits?
 - C. How many vacuum pumps does the PA-44 have?
 - D. What indications would occur in the event of a vacuum pump failure?
10. Describe the stall warning system.
11. Describe the fuel system.
12. Explain how to cross feed fuel.
13. Describe the landing gear system.
- A. How is the landing gear actuated? Describe the pump.
 - B. What keeps the gear in the up position?
 - C. What keeps the gear in the down position?
 - D. If Hydraulic pressure is suddenly lost in flight, what indication, if any, would you have?
 - E. In what three situations will the landing gear horn activate?
 - F. What unit will not allow the gear to be retracted on the ground?

- G. What is the procedure to extend the gear manually (Emergency Gear Extension)?
 - H. What airspeed is of importance during manual gear extension?
 - I. Are the brake and the landing gear hydraulics interconnected?
 - J. If you lose gear hydraulics, will you still have brakes?
 - K. What indicates that the gear is in transit and the hydraulic pump is activated?
14. What type of braking system is used by the Seminole? Where is the brake fluid serviced?
 15. What type of flaps does the Seminole have?
 - A. What are the flap settings on the Seminole?
 16. What are the maximum taxi, takeoff, and landing weights?
 17. What is the maximum baggage capacity?
 18. Define V_{SSE} .
 19. What are the drag factors on light twins?
 20. Who determines V_{MC} for a particular aircraft?
 21. Define V_{MC} .
 22. Why is an aft CG used in determining V_{MC} ?
 23. What are the factors in determining V_{MC} ?
 24. Define critical engine and list the factors used to determine it.
 25. What causes an aircraft to sideslip with the loss of an engine, and what action is required to correct this?
 26. How much climb performance is lost when an engine fails?
 27. What aircraft equipment checks are required under FAR part 91?
 28. Define absolute and single-engine service ceiling.
 29. What documents are required to be on the aircraft?
 30. Explain lost communications procedures.
 31. Will the propeller feather below 950 RPM. Why or why not?
 32. Explain the pitot static system.
 - A. Does the PA-44 have an alternate static source? If so, how is it activated and what actions are necessary to acquire the most accurate reading?
 - B. What instruments are pitot static?
 - C. Where is the pitot static port located?
 33. How do you prevent a heater overheat?
 34. What is the fuel capacity? How many gallons are unusable?

35. What grade fuel is to be used in the PA-44?
36. How many fuel pumps are on the aircraft?
37. When are the electric fuel pumps to be used?
38. What are the various positions on the fuel selector control?
39. Explain the procedure for cross feeding fuel when operating the right engine from the left tank.
40. If an engine failure occurred at 5,000' MSL, or a high density altitude, what would you do to get max performance from the operating engine after performing the In-Flight Engine Failure Checklist?
41. If the cylinder head temp and oil temp approach the caution range, what can be done to assist in cooling?
42. Why does manifold pressure decrease approximately 1" every 1,000' during climb?
43. When an engine is inoperative or feathered, what indication will be observed on the manifold pressure gauge?
44. Why is the manifold pressure gauge not necessarily a good indicator in determining an inoperative engine?

Additional Questions Specific to G500-Equipped Aircraft

1. In the event of an electrical failure, what pilot actions are necessary to ensure continued operation of the standby attitude indicator?
2. If the standby power button on the attitude indicator is not pressed within one minute of electrical failure, what will happen?
3. How do you determine a standard rate turn on an aircraft with a G500 system?
4. 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?
5. Which approaches can be accomplished with an AHRS failure?
6. What instrument approaches are available with the PFD inoperative? With the MFD inoperative? With a total PFD/MFD failure?
7. How long does the internal battery last when providing power to the standby attitude indicator?
8. With the loss of the ADC, which lost instrument does not have a backup? What should you do to compensate for the lack of information?

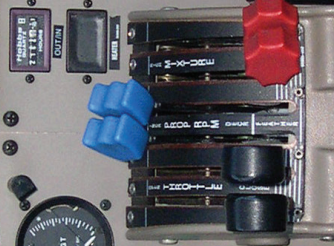
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ATP

CAUTION
PROPAGATION
PROTECTIVE
EYEWEAR



N245AT

SWITCH LIGHTS

POWER PORTS



LEFT MAIN FUEL

RIGHT MAIN FUEL

LEFT MAIN FUEL

RIGHT MAIN FUEL



LEFT MAIN FUEL

RIGHT MAIN FUEL

LEFT MAIN FUEL

RIGHT MAIN FUEL



HEAT-ON
COWL FLAP

OFF
CABIN HEAT
ON

GEAR
TO LOW RATE

SWITCH LIGHTS

POWER PORTS



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