How do you prepare for a flight? PAVE: Pilot, Aircraft Environment and External Pressures.

PILOT

- A pilot must continually make decisions about competency, condition of health, mental and emotional state, level of fatigue, and many other variables.

AIRCRAFT

- A pilot frequently bases decisions on evaluation of the airplane, such as performance, equipment, or airworthiness. This task will concentrate on the aircraft (ASEL – Airplane Single Engine Land). Knowledge of aircraft systems will play a key role of knowing when to continue a planned flight or terminate the flight, due to system failures.

ENVIRONMENT

- The environment encompasses many elements that are not pilot or airplane related, including such factors as weather, air traffic control (ATC), navigational aids, terrain, takeoff and landing areas and surrounding obstacles. Weather is one element that can change drastically over time and distance.

EXTERNAL PRESSURES

- The pilot must evaluate the three previous areas to decide on the desirability of under-taking or continuing the flight as planned. It is worth asking why the flight is being made, how critical it is to maintain the schedule, and if the trip is worth the risks.

P – Pilot for the Private Pilot:

Start with I'M SAFE: Illness, medication, stress, alcohol (.04), fatigue (acute and chronic) and eating/emotional factors. If any of these factors apply, you should not fly. As a private pilot, you are required to carry your pilot's certificate, medical and a government ID. As a private pilot, you are allowed to carry passengers (not for hire) – 61.113, fly when visibility is less than 3 miles (SVFR – Special VFR) and can fly without visual reference to the surface. Special requirements for the Private Pilot are: Must be a Private Pilot to take off and land within (KSFO) Class B Airspace (AIM 3-2-3) and can fly at night. Must maintain currency to carry passengers: 1.) 3 touch-n-go's during the day and 3 full stop landings at night every 90 days – 61.57. 2.) Complete a BFR (Flight Review) (minimum 1 hour of ground and 1 hour of flight – every 24 calendar months – 61.56. 3.) Have a First Class (valid for 6 months), Second Class (valid for 12 months) or Third Class (valid for 2 years if over 40 years old or 5 years if under 40 years old) medical certificate to be pilot in command.

A – Aircraft for the Private Pilot:

Remember A R O W. Airworthiness Certificate (Has the aircraft had an Annual, 100 hour, Progressive - 91.409, Pitot Static/Transponder check (24 months - 91.411, 91.413), Aircraft has the required equipment – 91.205 if NOT Special Flight Permit 21.197 & 21.199, ELT check - 91.207 and all AD's have been complied - 91.403 39.3, Registration (Every Three Years) – 47.41, Operating Limits (Section 2 of POH, Pilot's Operating Handbook) – 91.9 and Weight and Balance (Section 6 of POH). Fuel requirements for all flights (30 minutes Day, 45 minutes Night) - 91.151. The required takeoff and landing distances, runway lengths and weather forecasts - 91.103. Avionics familiarity, density altitude and a current sectional information.

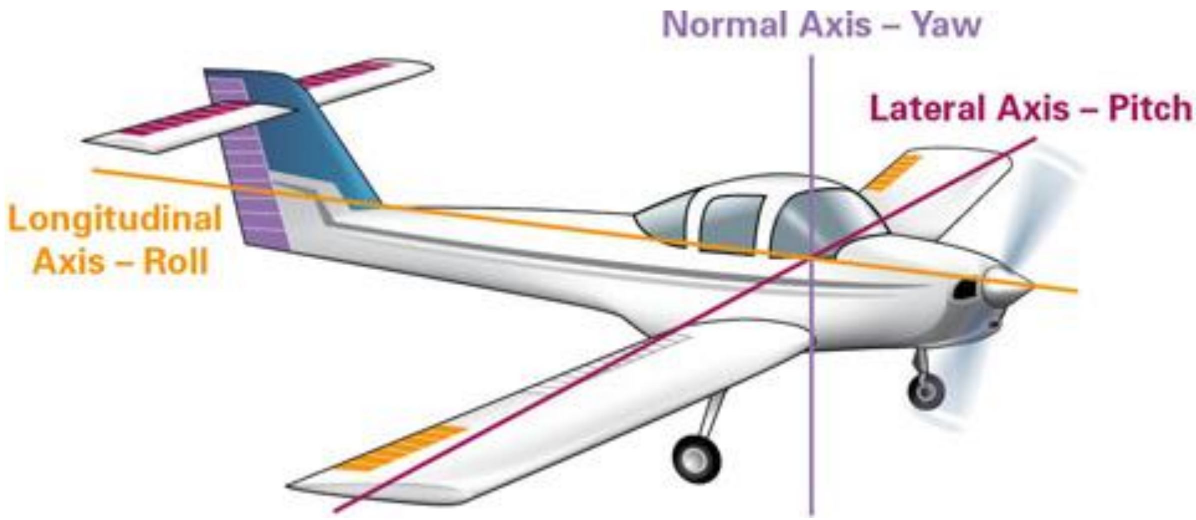
V – Environment for the Private Pilot:

Think of the Airport and weather conditions: Crosswind, Takeoff and Landing distances, Ceiling conditions, visibility and your personal minimums. Plan on the weather for your Departure, En-route and Destination. For example: Current Metar, TAF and FA (Area Forecast), surface analysis chart, radar summary chart, winds and temperature aloft, significant weather prognostic chart, convective outlook chart, Airmets and Sigmets, PIREPs, wind shear reports, icing and freezing levels and AWOS, ASOS and ATIS reports for the route and destination. The pilot wants to make a competent "go/no-go" decision based on available weather information. Reference Weather Information – Task C in RAM Study Guide.

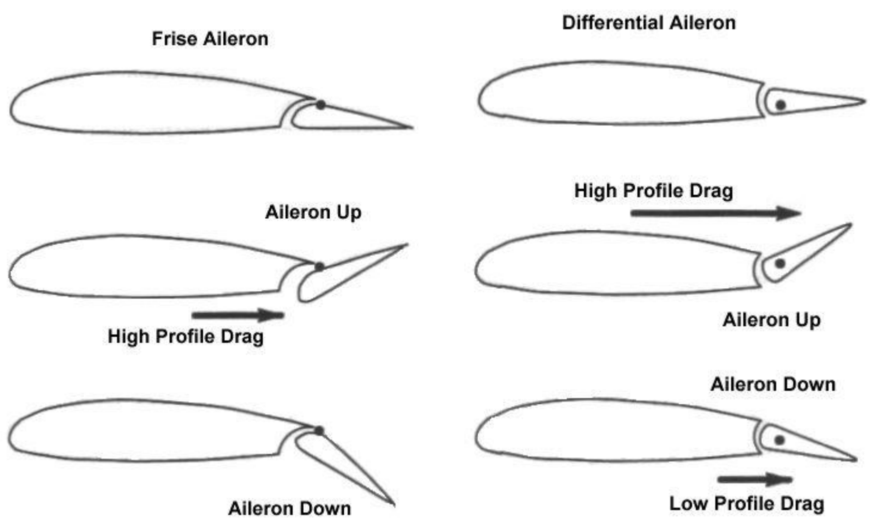
E – External Pressures for the Private Pilot:

Think about "Get there Itis." The determination to reach a destination, combined with hazardous weather, claims the lives of dozens of pilots and their passengers yearly. Think about the hazardous attitudes: Anti-authority, Impulsivity, Invulnerability, Macho and Resignation to see if they may apply to this flight. Allowance for delays and diversions, alternative plans and personal equipment. After you use the PAVE checklist (step 1), use the CARE checklist (**C**onsequences, **A**lternatives, **R**eality and **E**xternal pressures) (step 2) and determine the level and severity of the risk. (Step 3) perform the TEAM checklist. **T**ransfer Risk, **E**liminate Risk, **A**ccept Risk and **M**itigate Risk.

Primary Flight Controls:



Primary flight controls are**: Rudder** about the Vertical (Normal) Axis - **Yaw**, **Ailerons** about the Longitudinal Axis - **Roll** and **Stabilizer** about the Lateral Axis – **Pitch**. The rudder (yaw) becomes effective around 10 kts airspeed. The ailerons control roll about the longitudinal axis. There are two types of ailerons: **Frise type** and **Differential type**. Frise type are on Cessna's and differential type are on Piper aircraft.



Ailerons counter the effects of adverse yaw.

The horizontal stabilizer uses an elevator, where the stabilator uses the entire surface to control pitch about the Lateral Axis. The Tomahawk has a stabilizer.

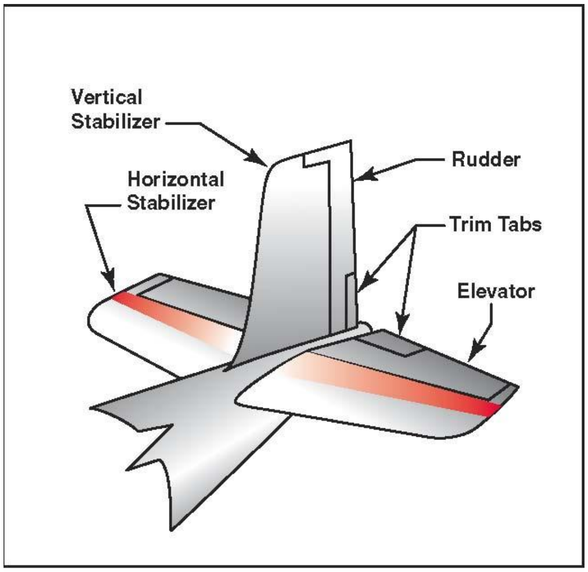


Figure 1-7. Empennage components.

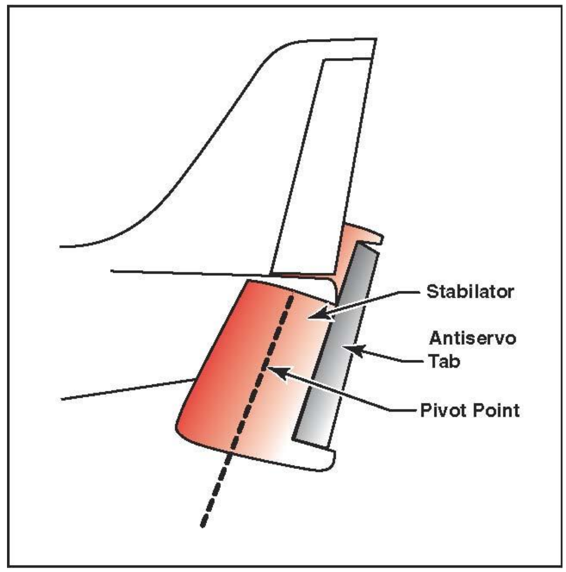


Figure 1-8. Stabilator components.

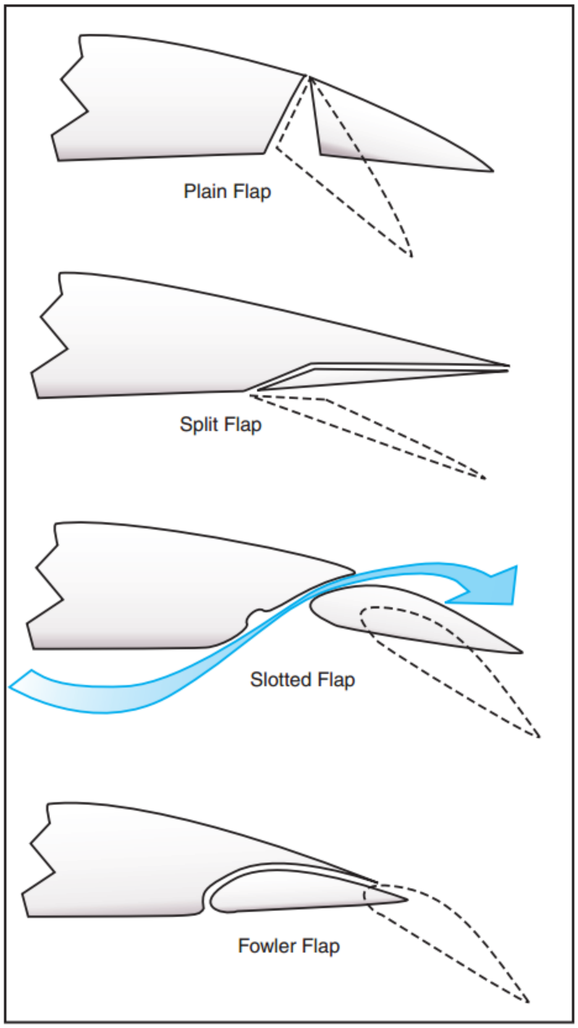
Rudder and elevator trim tabs -- These small, movable surfaces decrease control pressures and help to establish hands-off flight (i.e., when the airplane will almost fly by itself). All airplanes have elevator trim tabs controlled from the cockpit.

Aileron trim tab -- This small movable section of one or both ailerons permits adjustment so the wings remain level; i.e., you can compensate for more weight on either side of the airplane. Not all airplanes have aileron trim tabs.

Flaps -- These surfaces are located on the inside trailing edges of the wings. They can be extended to provide greater wing area at slower speeds. This provides more lift and drag and allows an airplane to land, take off, or fly at slower speeds.

There are four (4) different types of Flaps:

1. Plain: Plain flaps are typically on Piper Aircraft (PA38-112 Tomahawk).
2. Split – Split flaps are typically on high speed twin aircraft (Cessna 421).
3. Fowler – Fowler flaps are used in the airlines (Boeing 737/767/787).
4. Slotted – Slotted flaps are usually on Cessna aircraft (Cessna 172/182/210).



Piper Plain Flap: The rear portion of airfoil rotates downwards on a simple hinge mounted at the front of the flap.

Split Flap: The rear portion of the lower surface of the airfoil hinges downwards from the leading edge of the flap, while the upper surface stays immobile.

Slotted Flap: A gap between the flap and the wing forces high pressure air from below the wing over the flap helping the airflow remain attached to the flap, increasing lift compared to a split flap.

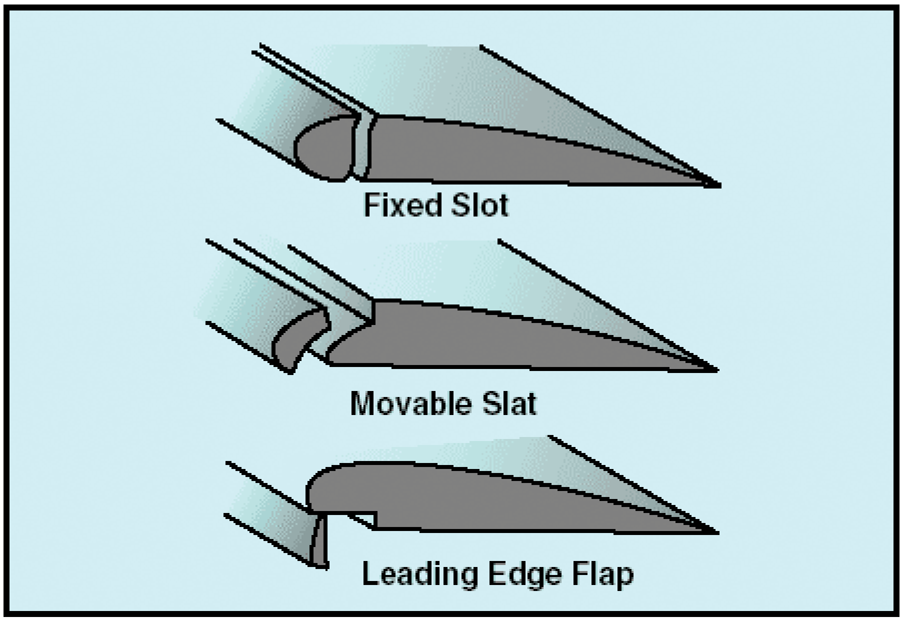
Fowler Flap: split flap that slides backward flat, before hinging downward, thereby increasing first chord, then camber.

Secondary Flight Controls:

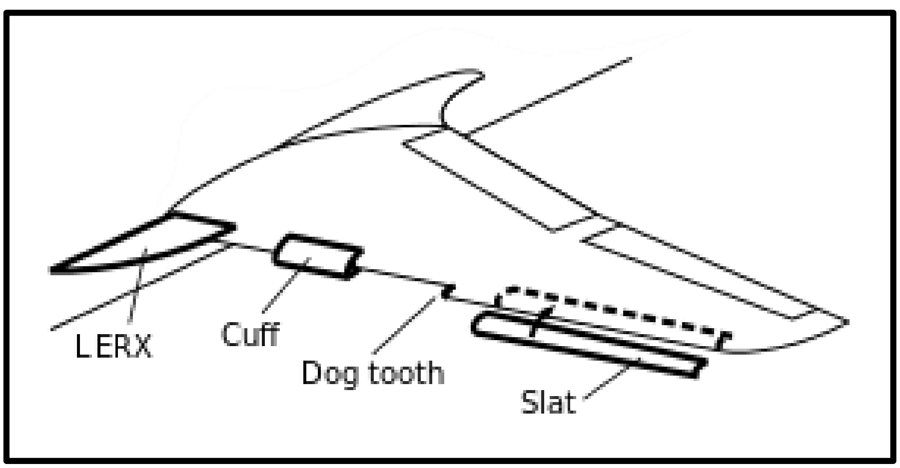
Secondary flight control systems may consist of wing flaps, leading edge devices, spoilers, and trim systems. Power, retractable gear and carb heat are considered secondary controls, due to pitch change.

Leading edge devices and spoilers:

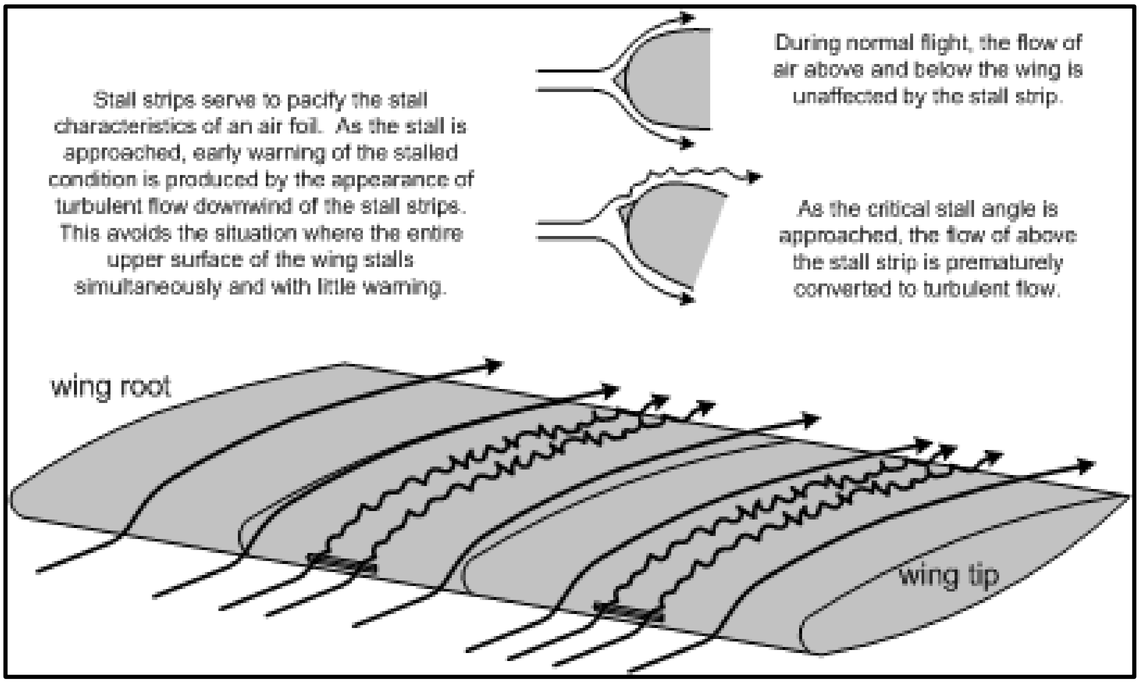
High-lift devices also can be applied to the leading edge of the airfoil. The most common types are fixed slots, movable slats, leading edge flaps, and cuffs.



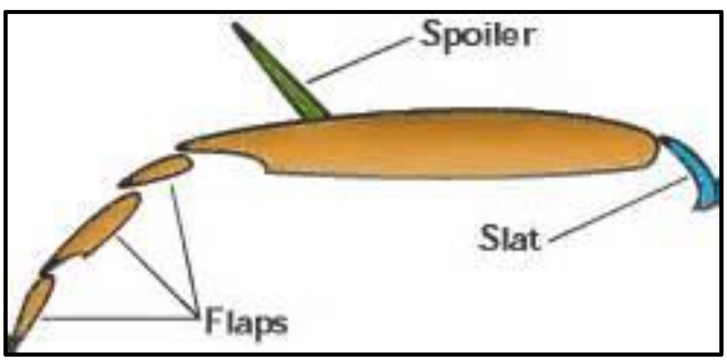
Leading Edge Devices



Stall Strip (Early Warning Device): Leading Edge Device

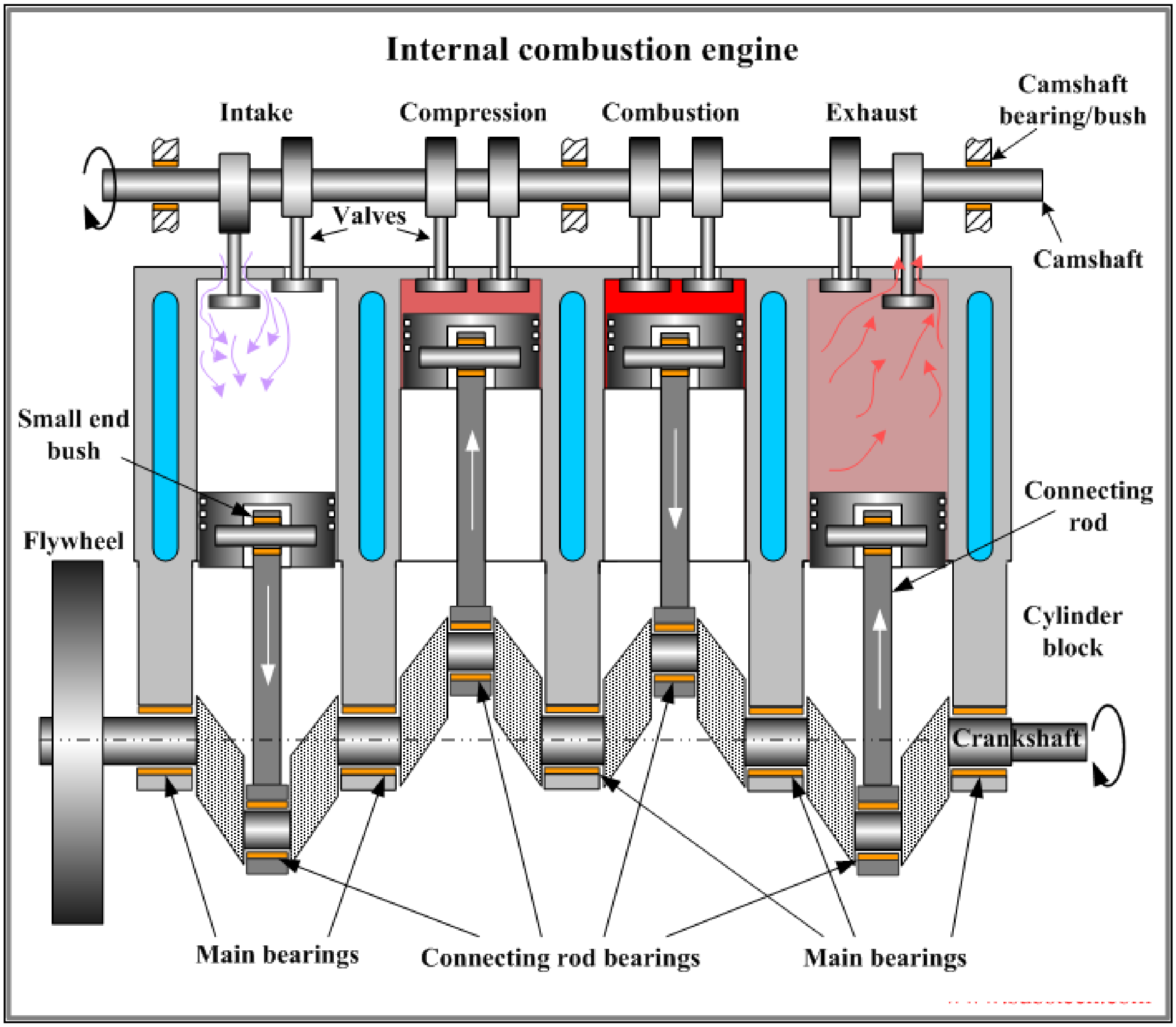


Spoilers:



Deploying spoilers on both wings at the same time allows the aircraft to descend without gaining speed. Spoilers are also deployed to help reduce ground roll after landing. By destroying lift, they transfer weight to the wheels, improving braking effectiveness.

Aircraft Power Plant: PA38-112



An aircraft engine or power plant is described in the following format: This aircraft is powered by a Lycoming O-235 four cylinder, air cooled, direct drive, horizontally opposed engine with 112 horsepower, and rated at 2600 RPM.

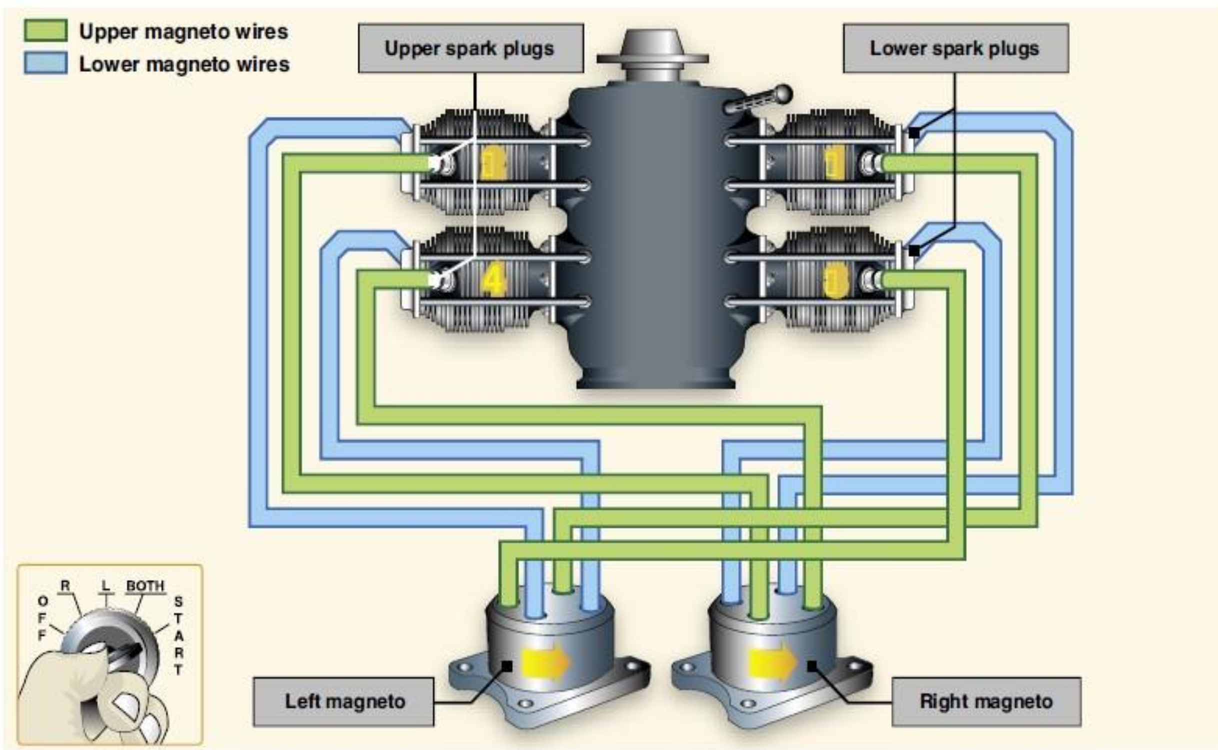
Lycoming is the engine manufacturer, O means the cylinders are opposed (across from each other), 235 is the cubic inch displacement inside the total of all four cylinders, direct drive means the propeller is attached to the crankshaft and rated at 2600 RPM is revolutions per minute (how fast the propeller is turning).

Aircraft Systems:

1. **Master Switch** - Most often actually two separate switches, the Battery Master and the Alternator Master. The Battery Master activates a relay (sometimes called the battery contactor) which connects the battery to the aircraft's main electrical bus. The alternator master activates the alternator by applying power to the alternator field circuit. These two switches provide electrical power to all the systems in the aircraft.
2. **Throttle** - Sets the desired power level. The throttle controls the mass flow-rate of air (in fuel-injected engines) or air/fuel mixture (in carbureted engines) delivered to the cylinders.
3. **Mixture Control** - Sets the amount of fuel added to the intake airflow. At higher altitudes, the air pressure (and therefore the oxygen level) declines so the fuel volume must also be reduced to give the correct air/fuel mixture. This process is known as "leaning".
4. **Tachometer** - A gauge to indicate engine speed in revolutions per minute (RPM) or percentage of maximum.
5. **Oil Temperature Gauge** - Indicates the engine oil temperature.
6. **Oil Pressure Gauge** - Indicates the supply pressure of the engine lubricant.
7. **Ignition Switch** - Activates the magnetos by opening the grounding or 'p-lead' circuit; with the p-lead ungrounded the magneto is free to send its high-voltage output to the spark plugs. In most aircraft the ignition switch also applies power to the starter motor during engine start. In piston aircraft engines, the battery does not generate the spark for combustion. This is accomplished using devices called magnetos. Magnetos are connected to the engine by gearing. When the crankshaft turns, it turns the magnetos which mechanically generate voltage for spark. In the event of an electrical failure, the engine will continue to run. The Ignition Switch has the following positions:

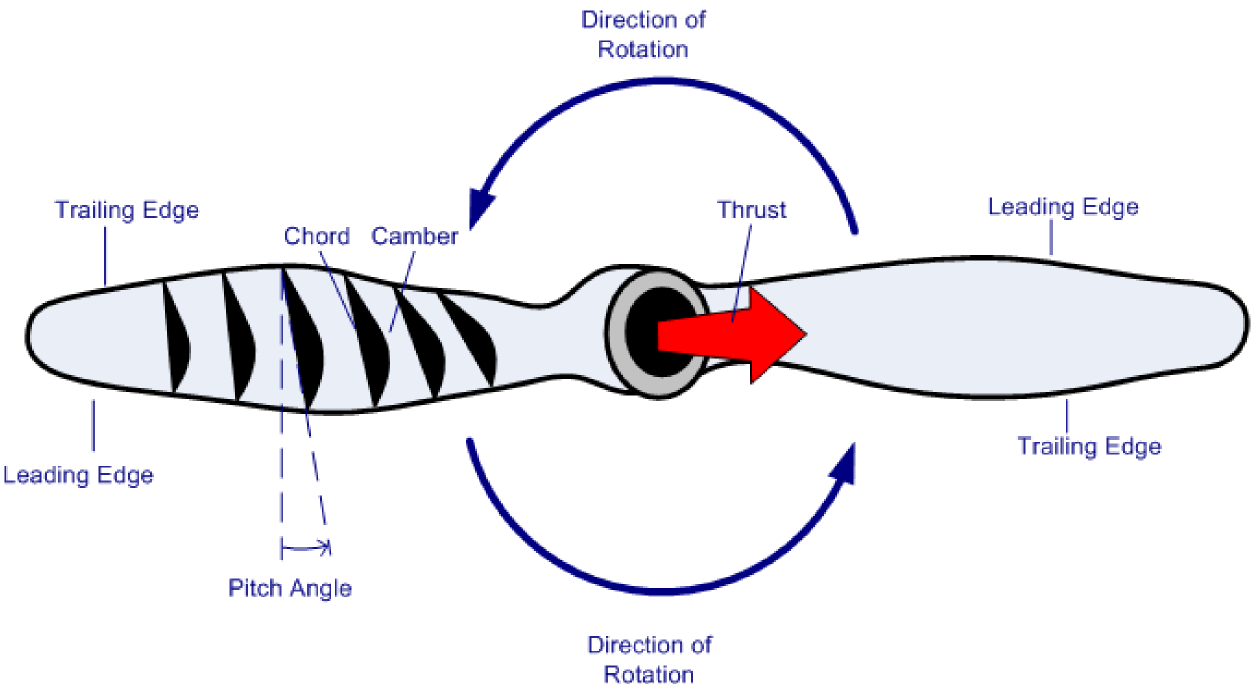
    - Off - Both magneto p-leads are connected to electrical ground. This disables both magnetos, no spark is produced.
    - Right - The left magneto p-lead is grounded, and the right is open. This disables the left magneto and enables the right magneto only.
    - Left - The right magneto p-lead is grounded, and the left is open. This disables the right magneto and enables the left magneto only.

- Both - This is the normal operating configuration, both p-leads are open, enabling both magnetos.
- Start - The pinion gear on the starter motor is engaged with the flywheel and the starter motor runs to turn the engine over. In most cases, only the left magneto is active (the right p-lead is grounded) due to timing differences between the magnetos at low RPMs.



MAGNETO'S: CREATE a Spark, BOOST and then DISTRIBUTE the spark. A pilot can fly with the master switch off, because the magnetos are self-generating.

Aircraft Propeller: PA38-112



To describe an aircraft propeller, you would say: “The aircraft has a fixed pitch, two blade, Sensenich or McCauley propeller. Sensenich and McCauley are the manufacture of the propeller. Fixed pitch can be set for a climb prop, cruise prop and neutral.

There are two basic types of propellers: Fixed Pitch and Variable Pitch

A fixed pitch propeller is the simplest of propeller designs and is associated with many light, piston engine aircraft. The angle of attack of a fixed pitch propeller is set at installation and cannot be changed during aircraft operation. The blade angle is, therefore, a compromise between the optimum pitch for takeoff, climb and cruise. In these installations, the propeller is mechanically linked to the engine and its rotational speed is directly related to the engine speed.

A controllable-pitch propeller or variable-pitch propeller is a type of propeller with blades that can be rotated around their long axis to change the blade pitch.

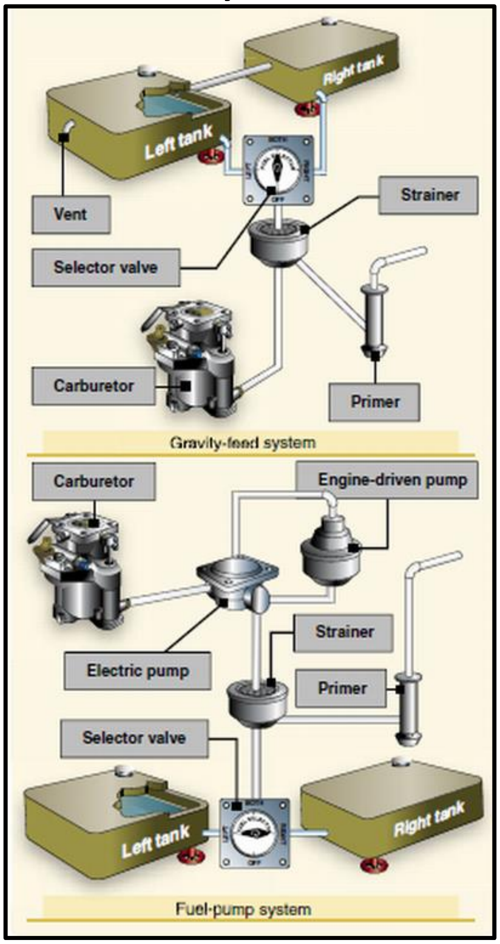
Landing Gear:

Three basic arrangements of landing gear are used: tail wheel-type landing gear (also known as conventional gear), tandem landing gear, and tricycle-type landing gear.
Tail wheel-type landing gear is also known as conventional gear because many early aircraft use this type of arrangement. The main gear are located forward of the center of gravity, causing the tail to require support from a third wheel.
Few aircraft are designed with tandem landing gear. As the name implies, this type of landing gear has the main gear and tail gear aligned on the longitudinal axis of the aircraft. Sailplanes commonly use tandem gear, although many only have one actual gear forward on the fuselage with a skid under the tail.

The most commonly used landing gear arrangement is the tricycle-type landing gear as shown below. It is comprised of main gear and nose gear with an oleo strut. Tricycle-type landing gear is used on large and small aircraft with the following benefits:
1. Allows more forceful application of the brakes without nosing over when braking, which enables higher landing speeds.
2. Provides better visibility from the flight deck, especially during landing and ground maneuvering.
3. Prevents ground-looping of the aircraft. Since the aircraft center of gravity is forward of the main gear, forces acting on the center of gravity tend to keep the aircraft moving forward rather than looping, such as with a tail wheel-type landing gear.

Landing Gear Description: Tricycle fixed gear. Main gear struts are single-leaf steel springs, connected to the main wing spar. The nose gear is an air-oil Oleo strut. Extension should be around 3 inches for proper inflation.

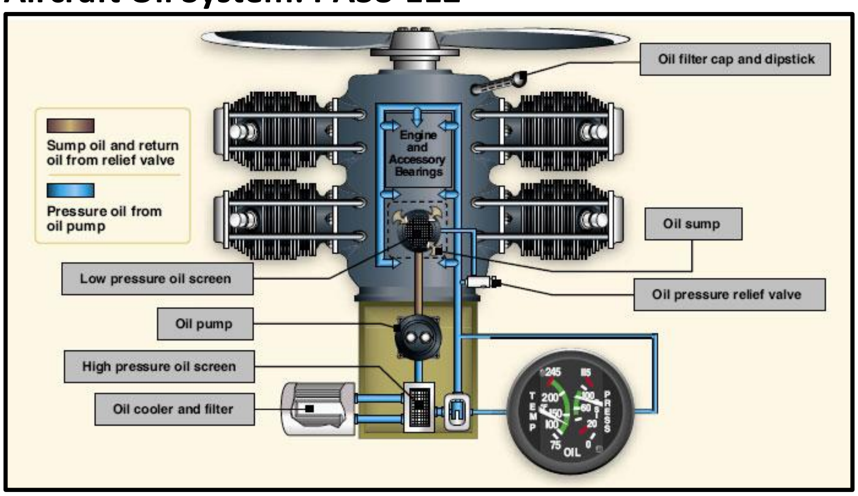
Aircraft Fuel System: PA38-112



System Description format:

32 total gallons, with 30 usable (2 gallons are left in the tanks, which are unusable.) Fuel drains from the main tanks through the fuel selector valve, strainer, to the electric fuel pump, engine driven fuel pump and carburetor. The system incorporates a primer valve (for starting) and (3) fuel drains to check debris and water. Fuel drains are located under each fuel tank and at the fuel strainer. Water is heavier than fuel. Most GA airplanes run on 100LL (Blue) and 100 (Green). Fuel is balanced by a selector valve.

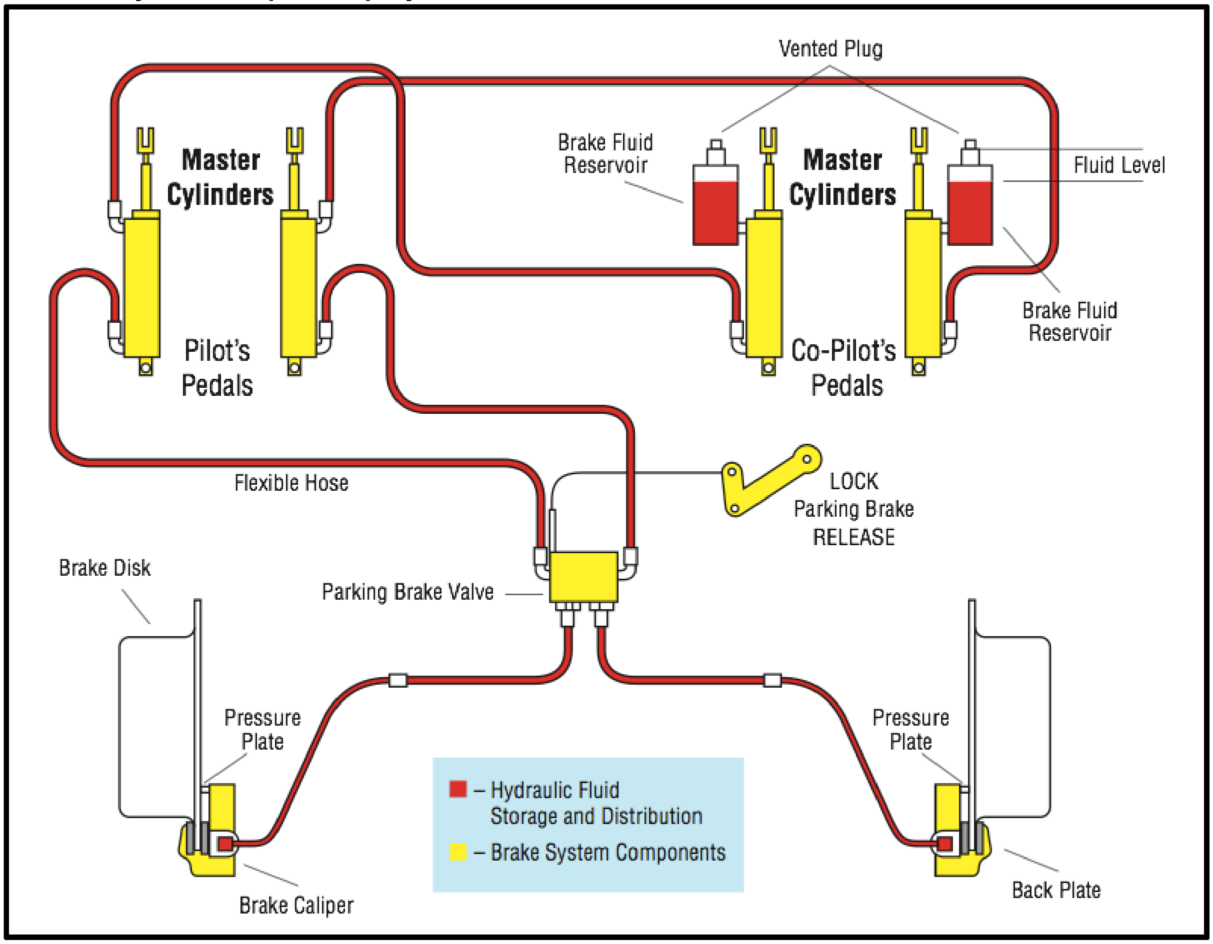
Aircraft Oil System: PA38-112



A maximum of 6 quarts and a minimum of 2 quarts. Aircraft uses 100W in the summer months and 50W in the winter months. 50 and 100 hr. oil changes required

Wet Sump System: Lubricates points inside the engine.

Aircraft Hydraulic (Brake) System: PA38-112



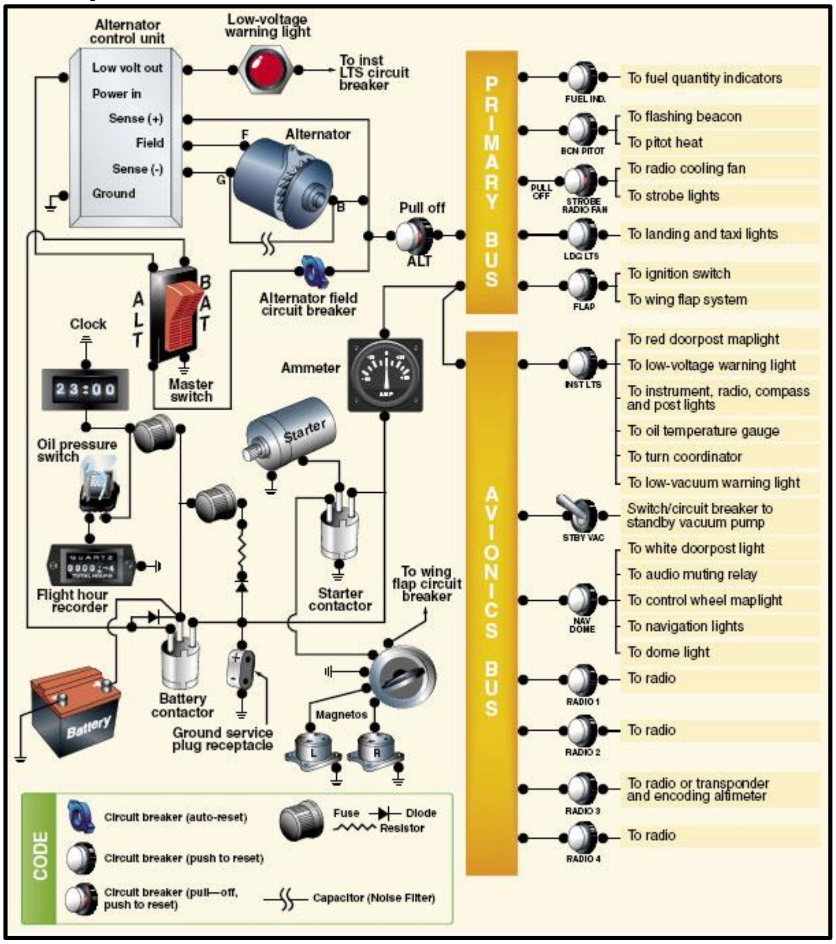
In small GA aircraft the brakes are connected to the main landing gear only and are operated independently from each other.

The brake systems are operated by hydraulic pressure and the rudder pedals have the brakes installed on top and are toe operated.

System Description Format:

Each pedal assembly incorporates a master cylinder on the top of the pedal that pushes fluid under pressure to the brake calipers, which open and close the brake pads. The typical brake fluid used is MIL 5606. The system includes a parking brake and a brake fluid reservoir, which can be checked prior to each flight for proper levels.

Aircraft Electrical System: PA38-112



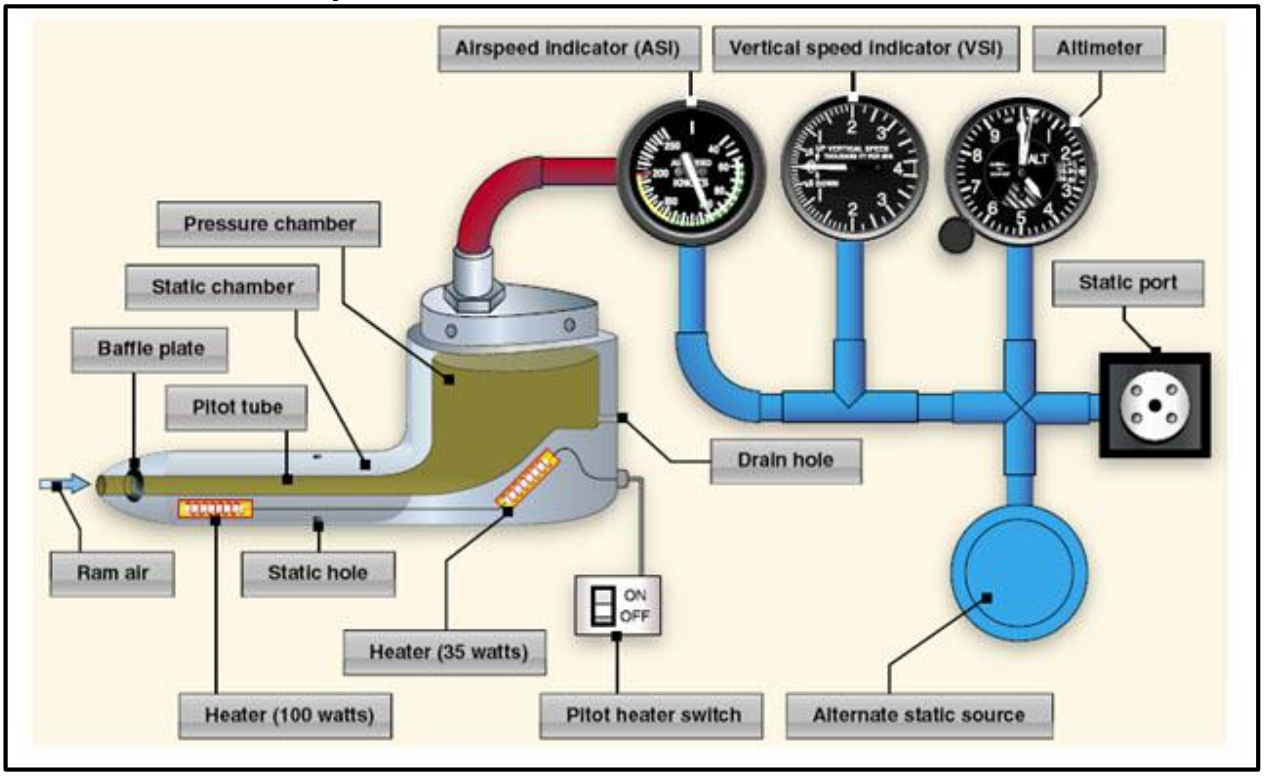
System Description format:

The electrical system includes a 14-volt, 60-amp alternator, a voltage regulator, an over voltage relay, a battery contactor and a 12-volt, 25-ampere hour battery.

System Description Process:

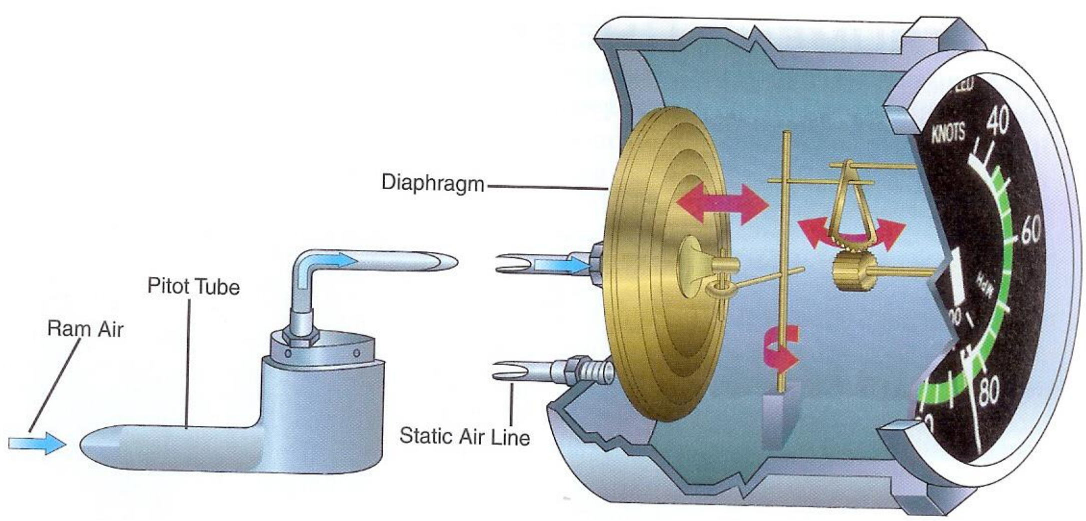
With the master switch ON, the alternator is energizer, as you turn the ignition switch, the magnetos are energized. Turning the key to the start position, the starter is engaged, turning the flywheel, which turns the propeller. Once the magnetos spark the fuel in the combustion chamber, the engine fires. Once this happens, the starter dis-engages the Bendix starter switch and the alternator starts to replenish the battery.

Aircraft Pitot-Static System:

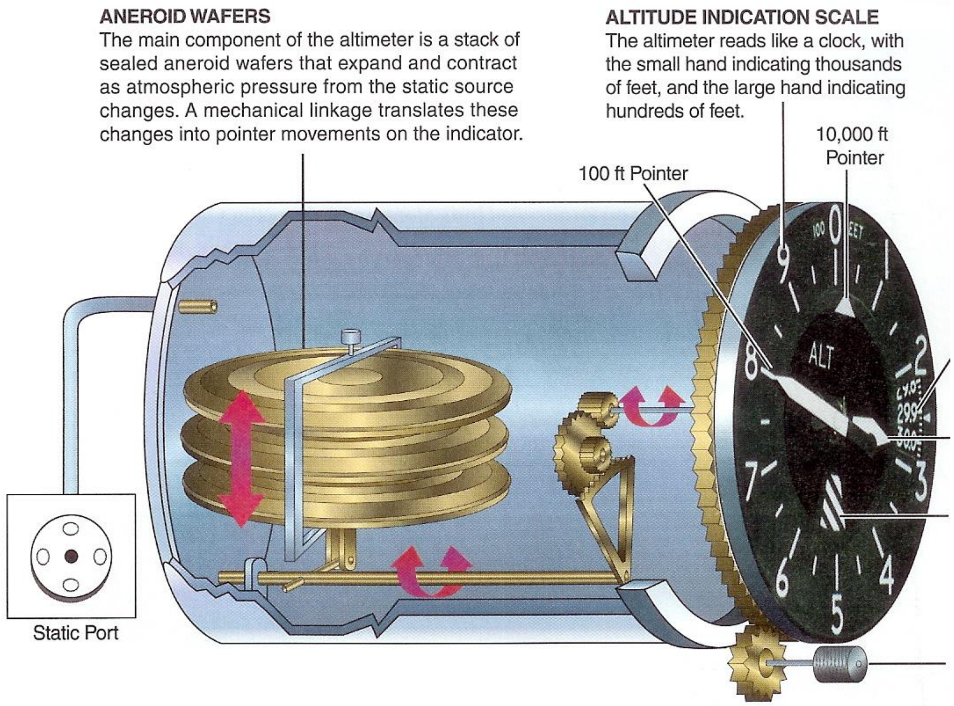


System Description Format:
RAM air goes to the Airspeed Indicator and the Static air goes to the Airspeed Indicator, Altimeter and Vertical Speed Indicator.

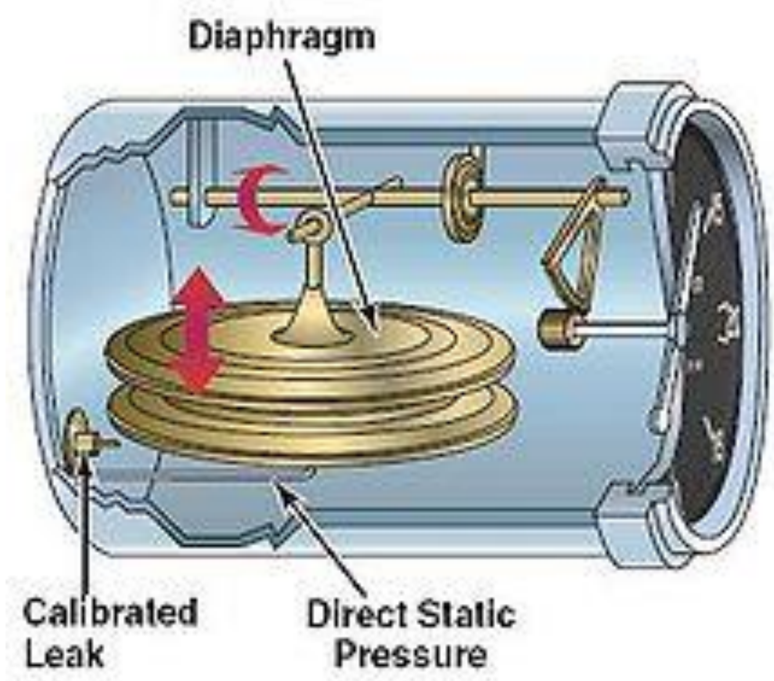
Airspeed Indicator: RAM air expands a diaphragm, as static fills the case.



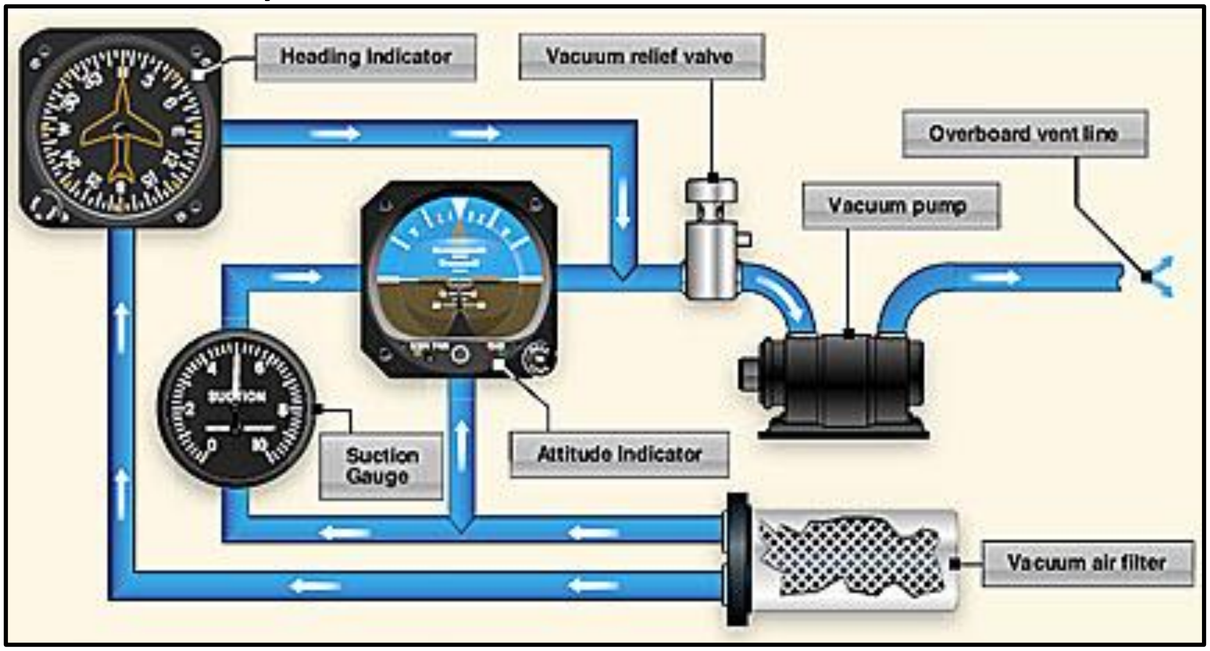
Altimeter: Static air fills the case and compresses/expands the aneroid wafers.



Vertical Speed Indicator: Static are equalizes through a calibrated leak.

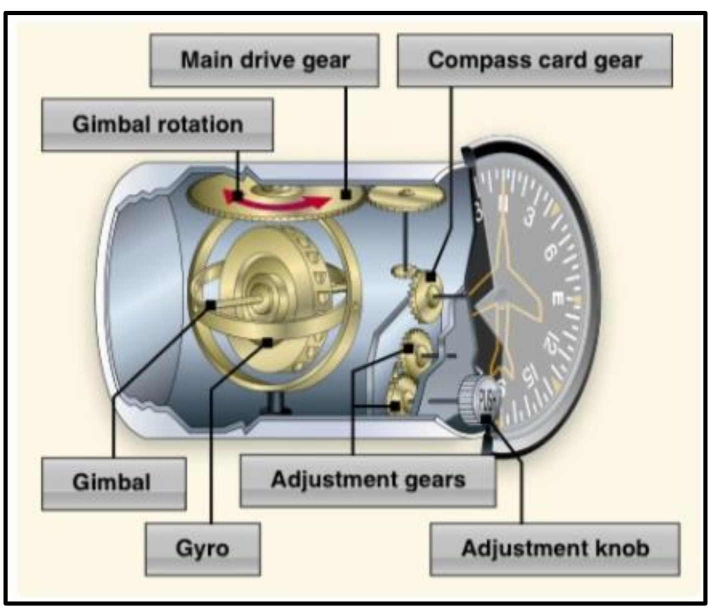


Aircraft Vacuum System:

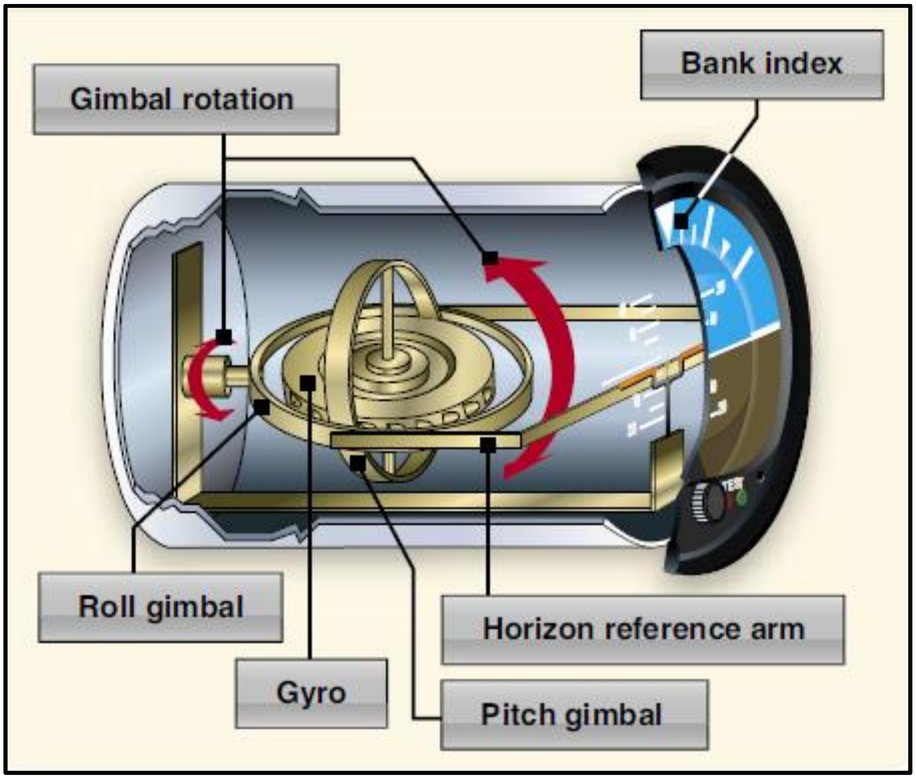


System Description Format:
Air is sucked through a filter, located inside under the instrument panel, through the Heading Indicator and Attitude Indicator to a pump located on the back of the engine and vented overboard. There is a suction gauge to read pump output.

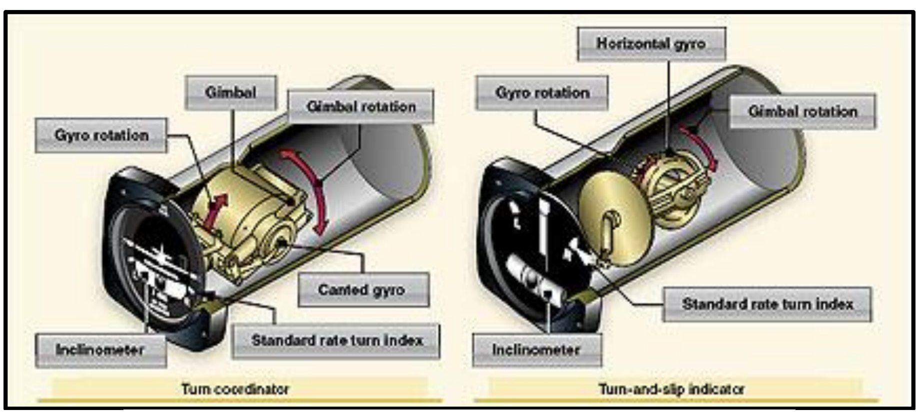
Heading Indicator: Gyro spins on the vertical.

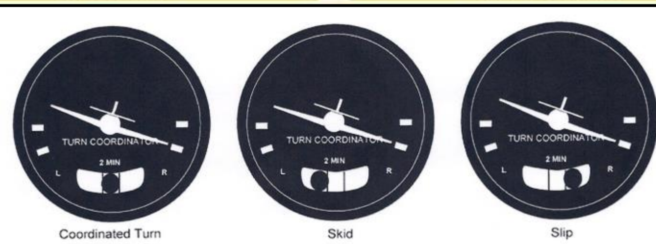


Attitude Indicator: Gyro spins on the horizontial.

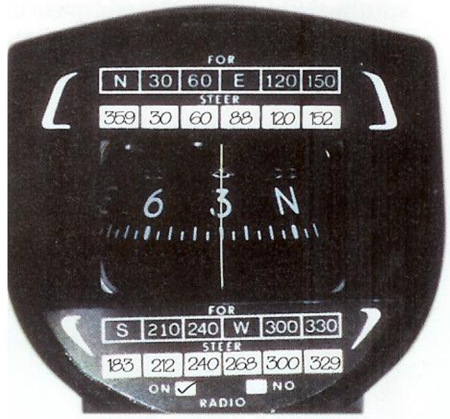


Turn Coordinator (Electric):





Magnetic Compass:



Remember: VD MONA

Variation: The difference between True North and Magnetic North.

Lines of Variation are depicted on the Sectional. Subtract Easterly / Add Westerly.

Deviation: Magnetic deficiencies (Avionics) found in the aircraft. Compass Card.

Magnetic Dip: The angle made with the horizontal by the Earth's magnetic field lines. This angle varies at different points on the Earth's surface.

Oscillation: An error that occurs as the compass encounters turbulence.

Northerly Turning Error: Turns from North, the compass LAGS, turns from South, the compass LEADS.

Remember: UNOS for the Northerly Turning Error. Undershoot north, overshoot south. Undershoot or overshoot about 35 degrees in Northern California.

Acceleration Error: In the Northern Hemisphere where the magnetic field has a downward component, this causes the north-seeking tip of the compass needle to swing downward.

Remember: ANDS for the Acceleration Error. Accelerate North, Decelerate South.

Aircraft Environmental System:
System Description Format:

Heat for the cabin interior and defroster system is provided by a heater shroud attached to the exhaust.

Fresh air intakes are located on each side of the fuselage. Adjustable outlets allow fresh air to be admitted and directed.

Aircraft Deicing and Anti-icing Systems:
System Description Format:

Carburetor heat, Pitot heat and window defrost are the only form of Deicing or anti-icing equipment. Deicing is letting ice accumulate, then activating the system and anti-icing is the active process of turning on equipment prior to entering icing conditions. We prefer anti-ice.

Airfoil Anti-Ice and Deice
Inflatable deicing boots consist of a rubber sheet bonded to the leading edge of the airfoil. When ice builds up on the leading edge, an engine-driven pneumatic pump inflates the rubber boots. Many turboprop aircraft divert engine bleed air to the wing to inflate the rubber boots. Upon inflation, the ice is cracked and should fall off the leading edge of the wing. Deicing boots are controlled from the flight deck by a switch and can be operated in a single cycle or allowed to cycle at automatic, timed intervals.
Another type of leading edge protection is the thermal anti-ice system. Heat provides one of the most effective methods for preventing ice accumulation on an airfoil. High performance turbine aircraft often direct hot air from the compressor section of the engine to the leading edge surfaces. The hot air heats the leading edge surfaces sufficiently to prevent the formation of ice. A newer type of thermal anti-ice system referred to as thermawing uses electrically heated graphite foil laminate applied to the leading edge of the wing and horizontal stabilizer. Thermawing systems typically have two zones of heat application. One zone on the leading edge receives continuous heat; the second zone further aft

receives heat in cycles to dislodge the ice allowing aerodynamic forces to remove it. Thermal anti-ice systems should be activated prior to entering icing conditions. An alternate type of leading edge protection that is not as common as **thermal anti-ice** and **deicing boots** is known as a **weeping wing**. The weeping-wing design uses small holes located in the leading edge of the wing to prevent the formation and build-up of ice. An antifreeze solution is pumped to the leading edge and weeps out through the holes. Additionally, the weeping wing is capable of deicing an aircraft. When ice has accumulated on the leading edges, application of the antifreeze solution chemically breaks down the bond between the ice and airframe, allowing aerodynamic forces to remove the ice.

Windscreen Anti-Ice

There are two main types of windscreen anti-ice systems. The first system directs a flow of alcohol to the windscreen. If used early enough, the alcohol will prevent ice from building up on the windscreen. The rate of alcohol flow can be controlled by a dial in the flight deck according to procedures recommended by the aircraft manufacturer. Another effective method of anti-icing equipment is the electric heating method. Small wires or other conductive material is imbedded in the windscreen. The heater can be turned on by a switch in the flight deck, causing an electrical current to be passed across the shield through the wires to provide sufficient heat to prevent the formation of ice on the windscreen. The heated windscreen should only be used during flight. Do not leave it on during ground operations, as it can overheat and cause damage to the windscreen. Warning: the electrical current can cause compass deviation errors by as much as 40°.

Propeller Anti-Ice

Propellers are protected from icing by the use of **alcohol** or **electrically heated elements**. Some propellers are equipped with a discharge nozzle that is pointed toward the root of the blade. Alcohol is discharged from the nozzles, and centrifugal force drives the alcohol down the leading edge of the blade. The boots are also grooved to help direct the flow of alcohol. This prevents ice from forming on the leading edge of the propeller. Propellers can also be fitted with propeller anti-ice boots. The propeller boot is divided into two sections—the inboard and the outboard sections. The boots are imbedded with electrical wires that carry current for heating the propeller. The prop anti-ice system can be monitored for proper operation by monitoring the prop anti-ice ammeter. During the preflight inspection, check the propeller boots for proper operation. If a boot fails to heat one blade, an unequal blade loading can result, and may cause severe propeller vibration.

Other Anti-Ice and Deice Systems

Pitot and static ports, fuel vents, stall-warning sensors, and other optional equipment may be heated by electrical elements. Operational checks of the electrically heated systems are to be checked in accordance with the AFM /POH. Operation of aircraft anti-icing and deicing systems should be checked prior to encountering icing conditions. Encounters with structural ice require immediate action. Anti-icing and deicing equipment are not intended to sustain long-term flight in icing conditions.

Top 10 Pilot Errors – By Plane and Pilot Magazine

1 Weather. The more a pilot knows about it, the better. **While thunderstorms, icing and winds claim their share of airplanes, the real weather gadfly are those serene, innocent-looking clouds and their cousin, fog.** Clouds and fog aren't inherently dangerous; it's just that when pilots fly into them, they don't know how to fly on instruments. They fly into a cloud, lose control and crash. Accident gurus call this flying "VFR into IFR." Well over 80% of such accidents are fatal.

Even though these accidents are referred to as "inadvertent flight into instrument meteorological conditions (IMC)," only 24% of them are inadvertent. The remaining cases show pilots who continue into poor weather. Why is this? Overconfidence is one. Some believe that they don't need to stay current or that their hour under the hood is good enough. Social pressure also plays a role. Passengers want to get there and pressure the pilot to continue. Last, there's "get-there-itis." Pilots are mission-oriented, sometimes too much so.

2 CFIT. Another common pilot error that often involves weather is controlled flight into terrain (CFIT). **A simplified definition of CFIT is "flying a perfectly good airplane into the ground."** If a pilot is in a cloud or in fog, he or she can't see the ground. If the pilot isn't doing a good job of keeping up with the terrain, an unpleasant meeting with the ground is more likely. Another time when CFIT can be a factor independent of weather is at night. Pilots seem to have a knack of flying into trees and hills after the sun goes down. Again, if pilots allow themselves to be lulled into neglecting to constantly compare their present altitude to that of surrounding terrain, the outcome is likely to be nasty. If you can't see the terrain, you must be able to point to your position on a sectional, en route chart, approach plate, etc., or you shouldn't be flying.

3 Poor Commnication. Another boo-boo pilots seem to have an affinity for involves deficient communication. **This difficulty of communicating comes in several forms.** When dealing with air traffic control (ATC), pilots tend to hear what they want to hear. Good pilots anticipate what is coming next, including ATC instructions; however, this profound skill can trick the mind into "hearing" what is expected regardless of what actually filters into one's headset. Also, misunderstandings between ATC and pilots happen all the time. This plays into the most knotty communication quandary of all: the lack of communication. It's silly that a pilot would rather keep quiet than ask for help or clarification. If there is any question on what was said, ask for elucidation. It's amazing how shy pilots can be when it comes to this simple task. Don't fall into this trap. It's better to find out you've misheard something immediately rather than finding out your license is going to be suspended later.

4 Low-Level Maneuvering. If you ever hear the words "watch this" from a pilot, look out! **Pilots are notorious show-offs.** How many times have you heard about the pilot who performs an impromptu air show for friends and significant others? A few low-level maneuvers later, and the plane is falling out of the sky. Some air show. The problem isn't just that pilots are flying low to the ground; it's this combination of flying too slow and in too tight of a turn that causes crashes. Of course, adherence to the minimum safe altitudes laid out in the *FAR*s is a much smarter practice. If you do actually find a legitimate reason to fly close to the ground, fly the plane like you do when you're close to the ground at other times, like during landing. Monitor your speed and your bank angle. You certainly wouldn't try a 60-degree bank turn with no flaps at a very slow speed when turning base to final, so why do it over your parents' or friend's house?

5 Inadequate Preflight Inspections. It's amazing how many pilots mess up preflight inspections. **A cursory walk around simply to "kick the tires" so you can hurry up and "light the fires" is beckoning for trouble.** Take your time during your preflight. If you find yourself inspecting in haste, slow down. Take a comprehensive look at everything, with checklist in hand, to make sure you don't miss anything. When you finish, scrutinize the details. Take one last waltz around the airplane, looking for anything that jumps out as being amiss. Perhaps a door isn't flush with the fuselage or there is still a red, waving flag-looking apparatus on the pitot tube. It might sound funny, but there was actually an occasion when a pilot neglected to unhook a tail tiedown, which was connected to a concrete block. The pilot wondered why the plane required so much power to taxi and why it had an inexplicably aft center of gravity in flight. Luckily for this pilot, he was able to live to tell his story.

6 Inadequate Preflight Planning. Renowned classical novelist Miguel de Cervantes wisely said "forewarned forearmed." **Those who are prepared are equipped to deal with the tasks at hand.** Typically, the level of preflight preparation is proportional to how smoothly the flight goes. Think about a time when you rushed your flight planning and how it came back to haunt you later. Often, pilots take off with no planning whatsoever. That's when they have a tendency to get tangled in temporary flight restrictions or nasty weather. Countless pilots neglect to check density altitude, even though they're planning a departure from a short strip with a field elevation of 6,000 feet on a 100-degree F day. Weight and balance also is something that often is dismissed. But how can you know for sure you're in limits if you don't even bother to check?

7 Failure to Use a Checklist. Lots of pilots get into the mindset that flying is like riding a bike—something you can do easily out of memory. **While it's true that 99% of the time, you'll remember to do everything required of the checklist, it's that remaining 1% of the time when you forget to do something that will bite.** You can make sure you complete everything you need to all the time if you consistently use a checklist. Sure, you can do cockpit flows or whatever other technique you like, but back up your actions with a checklist. And don't just blindly read it. As you go through each item, verify that the handle is in the right position or something has actually been accomplished. Just think of the number of gear-up accidents that could have been avoided if the pilots actually ran the before-landing checklist (hint: all of them!).

8 Failure to Perform the "I'M SAFE" Checklist. Another common error of pilots is forgetting to use the "I'M SAFE" checklist. **For those who have forgotten what the letters stand for, here's a reminder: Illness, Medication, Stress, Alcohol,**

Fatigue and Emotion (some say E is for Eating). Sick pilots have no place in a cockpit. Can you fly with a cold? Maybe, but you're more susceptible to spatial disorientation, you could have a painful run-in with a blocked eustachian tube or just feel so blah you make stupid mistakes. And don't be tempted to hide your illness with medication and then go flying. There are lots of over-the-counter medications that can make you a zombie. Of course, illegal medications shouldn't be in anyone's blood, let alone a pilot's. You've got to make a choice—fly or take drugs—you can't do both.

Stress is commonplace in our fast-paced world, but there is a point at which it becomes so intense that it's a distraction. If you've got to go to divorce or bankruptcy court in the morning, it's probably a good idea to reschedule today's flight. When your mind is outside the cockpit, you're bound to make mistakes. And there certainly is no time that your mind is farther outside the cockpit than if you've been drinking. The effects of alcohol obviously are detrimental to good cockpit decision making, and alcohol can affect your flying ability, even though you don't have any booze left in your blood. Hangovers are essentially just like any other illness; if you have one, don't fly.

Fatigue is a somewhat underrated no-go item. Many of us have flown when we're not at our peak performance level. Alas, fatigue goes hand in hand with red eyes and transoceanic flights. But there are things that pilots can do to mitigate fatigue. Being well rested by planning ahead makes a big difference. If you know you've got a 5 a.m. flight, you need to go to bed early. It's a no-brainer, but pilots weaken their minds through a lack of sleep all the time. Emotion, just like stress, is something that everyone has to deal with, but there are times when this, too, is at a level that is intolerable in a cockpit. If a loved one just died, cancel your flight. Your mind won't be in the cockpit, so keep the rest of your body out of it, too. Finally, make sure you've eaten something and stay well hydrated. A physiologically sound pilot makes better decisions than a hungry, thirsty one.

9 Running Out of Fuel. It truly is unbelievable how many pilots run out of fuel every year. It's interesting to note that most of these incidents occur not because, say, the fueler didn't put enough gas on board. **Instead, pilots try to push it just a little bit too far, running out of gas just short of their destination.** That darned "get-there-itis" bug tends to afflict pilots all too often when it comes to fuel. Who wants to make an extra stop, anyway? But that 30-minute fuel stop is better than the one you'll have to make when your tanks go dry.

The problem with fuel management is pilot mentality. Pilots think of fuel in terms of distance, particularly if, during their planning, they determined the flight could be made with the amount of fuel on board. Instead, fuel should be thought of in terms of time. The best way to implement this philosophy is to determine how much fuel will be available once you're airborne, in hours and minutes. Of course, an allotment of fuel should be set aside for time to divert, then a little more for reserve. Upon departure, a countdown timer should be started. When the clock expires, you land. No ifs, ands or buts about it. This alleviates the problem of changed groundspeed due to wind and helps give pilots a mental excuse to land short of the destination.

10 Mismanagement of Technology. Scientist and novelist C.P. Snow once said that "technology is a peculiar thing. It brings you great gifts in one hand and stabs you in the back with the other." **The mismanagement of technology is a pilot error that has come under particular scrutiny lately, as glass instrumentation has quickly been invading the cockpits of general aviation aircraft.** There is much debate concerning whether modern cockpits augment or diminish safety. But the fancy equipment is not to blame; it's the pilots who don't manage their resources properly that cause exigency. What often happens is that pilots don't take the time to learn the equipment thoroughly. When the glass does something a pilot hasn't seen before or something needs to be changed quickly, too much concentration is focused on the avionics. What suffers is situational awareness and, more alarmingly, aircraft control.

The accident data says it all. According to the statistics, pilots have the cards stacked against them. But they don't have to sit idle. Alternatively, pilots can be proactive to reduce risks. They can immunize themselves against common mistakes. Keeping a careful watch, pilots can intercept error chains before they go too far. As President George Washington wisely said, "timely disbursements to prepare for danger frequently prevent much greater disbursement to repel it." With each bit of extra effort, pilots will, no doubt, increase the safety of flight.