Pre-Solo Progress Check Primer

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Introduction

East Coast Aero Club require all student pilots to complete a Pre-Solo Progress check with a PCIP Progress Check Instructor Pilot (PCIP) prior to being authorized to fly solo. The progress check includes a ground portion and a flight portion.
The progress check ensures that the requirements of FAR 61.87(d) have been successfully completed by the student pilot.

FAR 61.87(d) requirements include:

Pre-Flight Engine Starting and Taxi

- Proper flight preparation procedures
- Preflight planning and preparation
- Power plant operation
- Aircraft systems
- Taxiing or surface operations, including run-ups

Takeoff and Landings

- Normal Takeoff & Climb
- Normal Approach & Landing
- Crosswind Takeoff & Climb
- Crosswind Approach & Landing

Basic Flight Maneuvers

- Straight and level flight
- Turns in both directions
- Climbs and climbing turns
- Descents, with and without turns, using high and low drag configurations.

Introduction

Airport Operations and Traffic Patterns

- Airport traffic patterns, including entry and departure procedures.
- Collision avoidance
- Wind shear avoidance, and Wake turbulence avoidance.

Takeoff and Landings

- Flight at various airspeeds from cruise to slow flight.

Stalls

- Stall entries from various flight attitudes and power combinations
- Recovery initiated at the first indication of a stall
- Recovery from a full stall

Emergency Procedures

- Emergency procedures and equipment malfunctions
- Approaches to a landing area with simulated engine malfunctions.

Ground Reference Maneuvers

- Rectangular Course (Traffic Pattern)
- S-Turns (across a road)
- Turns around a point

Ground Reference Maneuvers

- Slips to a landing
- Go-arounds.

Introduction

Required Documents

In order to comply with regulations and requirements for solo flight you will need to ensure that you have and carry upon your person when flying solo, the following required documents:

- Student Pilot Certificate
- Government Issued Photo ID
- Medical Certificate
- Logbook with required endorsements

Additionally you are required to have and use (as applicable):

- Approved Airplane Checklist
- Airport Diagram
- Passenger / Takeoff / Emergency Briefing Sheets
- VFR Sectional Chart(s)

Endorsements (ref AD 61-65)

You must be endorsed to fly solo in order to comply with the FARs that authorize student pilots to fly solo.

- A.14 - Endorsement of U.S. citizenship recommended by the Transportation Security Administration (TSA):
- A.3 - Pre-solo aeronautical knowledge: § 61.87(b).
- A.4 - Pre-solo flight training: § 61.87©(1) and (2).
- A. 6 - Solo flight (first 90 calendar-day period): § 61.87(n).
- A. 7 - Solo flight (each additional 90 calendar-day period): § 61.87(p).

Parking Procedures

Parking Procedures

General

- Unless directed (by ECAC office staff) aircraft will be parked on the West Ramp area. In the winter follow the ECAC winter operations procedures for parking guidance (to allow for maximum heating by the sun to melt ice / frost)
- Aircraft parking spots are marked on the surface by a yellow T marking.
- On the T spots there are ropes and chains. The ropes are used to tie down the wings, the chain locks the airplane at the tail loop.
- The aircraft (unless directed) otherwise must be shutdown as per the ECAC checklist.
- Ailerons must be secured, wings tied down, tail locked using the lock that is supplied.
- All personal equipment, clothing, trash etc must be removed from the aircraft after parking and shutting the aircraft. You must Prevent Pens frommarking interior. DO NOT place items on painted surfaces.
- Cockpit Covers must be placed over the aircraft and secured before leaving the ramp area.

Dealing with ruts

- Before beginning your pre-flight inspection, check to see if the airplane is parked in a rut on the ramp surface.
- After performing the safety check, pull the aircraft through the rut to a point it does not roll backwards into the rut. (safety check = magnetos off, mixture idle cut-off, throttle idle),
- DO NOT move / rotate the prop when pulling
- The safety check shall be accomplished before touching the prop every time.
- Call the ECAC office if you need help pulling it out of the rut.
- Upon returning to the Warrior ramp, taxi through the rut. This requires a bit of extra speed, but not much. Slow taxi until aligned with the parking spot, then add only enough power to allow the aircraft to taxi just beyond the rut.
- If the aircraft ends up too far for the tail chain to reach, perform the safety check and push the aircraft so the main wheels are in front of the rut.

Care of ECAC Aircraft

When renting an East Coast Aero Club aircraft, for either training or as a rental, it is essential to treat it with care and respect to ensure its longevity and maintain its condition for future pilots.

- After each flight, be sure to remove all interior waste such as paper, water bottles, and other trash to keep the cabin clean and presentable.
- Avoid using or placing pens in areas where they might leave marks on the interior surfaces, as these can be difficult to remove and detract from the aircraft's appearance.
- Pay close attention to the exterior as well—never place any items on painted surfaces, as this can cause scratches or paint damage.
- Finally, after shutdown, always secure the flight controls with a seat belt or control lock to prevent unnecessary strain or damage from wind gusts or movement.

By caring and showing respect for shared resources we all rely on - the aircraft that you are flying - you can help keep costs down and the aircraft from being grounded unnecessarily ensuring they are available to all pilots who need to use them for their own training and rental requirements.

Maintenance Inspections

Maintenance Inspections

It is the **responsibility of owner** for maintaining airworthiness

The Pilot in Command (PIC) is responsible for ensuring airworthiness before each flight including the following has been carried out and is up to date!

The PIC must ensure that the following inspections are completed and up to date:

- Annual Inspection, (§91.409(a))
- 100hr Inspection (§91.409(b))
- ELT inspections, must be inspected every 12 calendar months (§91.207(d))
- Transponder inspection must carried out, within the preceding 24 calendar months. (§91.215(a))
- Airworthiness Directives, must be complied with
- A test flight must carried out prior to returning the aircraft to service
- Appropriate preventative maintenance must have been carried out.
    - The pilot (PIC) must review maintenance logs, approved docs showing inspections, each log must include:
    - Description of work,
    - Date,
    - Signature of technician,
    - Certificate number

Maintenance - Progressive Inspections

Most General Aviation (GA) aircraft require an annual inspection according to 14 CFR 91.409
It must be completed and approved by a mechanic with an inspection authorization (IA) once every 12 calendar-months.

A **progressive inspection** program is a tailored inspection plan that breaks the annual inspection into smaller, more frequent inspections, often monthly or hourly.

- Designed for operators who fly frequently (like flight schools, busy charters).
- Requires FAA approval and a detailed, custom inspection plan.
- Aircraft must be inspected at regular intervals (e.g., every 25 hours).
- The entire aircraft is inspected over a defined period (usually annually).
- Offers minimal downtime, ideal for high-utilization aircraft.

ECAC implements a progressive maintenance plan.

The ECAC maintenance department operates a progressive maintenance program, which means that our aircraft receive preventative maintenance more frequently than the typical flight school.

Under FAR §91.409(d), the FAA allows an aircraft to be maintained under a progressive inspection program instead of the standard annual (and often 100-hour) inspections.

Maintenance - 100 Hour Inspection (FAR 91.409)

The 100-hour inspection is required for aircraft:

- That carry any person (other than a crew member) for hire; or
- That are provided by any person giving flight instruction for hire.
- The phrase "for hire" refers to the person, not the aircraft. An FAR Part 91 example of a person carried for hire is an aerial photography flight.

If a flight instructor provides an aircraft, or any operation that supplies both flight instruction and an aircraft, that aircraft is subject to the 100-hour inspection.

- An aircraft provided by the (student) pilot, who is receiving instruction, is not subject to the 100-hour inspection.
- The 100-hour limit may be exceeded by 10 hours for the purposes of flying to a place where the inspection can be done.
- The excess time must be included in computing the next 100 hours of time in service.

Maintenance Issues

All ECAC aircraft are maintained on a strict schedule. All maintenance requirements, inspections and AD's are met and kept up to date on an ongoing basis

- All pilots who encounter any issues arising with aircraft must report them to the ECAC office in a timely manner. .
- Before flying pilots are responsible to check squawks. (issues noted that do not compromise the aircraft safety). Squawks are kept in the office (small box on the counter) before all flights.
- While you are completing a pre-flight inspection on any aircraft, prior to flying - look for reasons NOT to fly.
- If you encounter maintenance / safety issues during pre-flight - contact a CFI / Office staff for further info / advice.
- If you are at a remote airport (non ECAC) call in to the ECAC office - report any issues and seek guidance.
- If in doubt - don't fly and seek assistance

Maintenance Issues

After each flight pilots will ensure that fuel is requested to replenish the aircraft for for fuel used during their flight.

- Fuel will be requested from Signature Flight Support after **EVERY flight**.
- Once the aircraft is positioned in its final parking spot (West Ramp / T-hangars etc) tune to appropriate frequency **(130.8)** Signature at Hanscom Airport)
- Make fuel request (Typically) “Signature, Warrior [call sign] , [current location], Requesting a [top-off] -or- [Fuel to the tabs]”
- Signature will respond confirming they have the request .

When flying to another airport you will need to make arrangements (if required) to obtain fuel from the local FBO. It is advisable to do this prior to making a cross country flight

Ground Operations

Minimum Fuel Requirements

14 CFR § 91.151 - Fuel requirements for flight in VFR conditions.

(a) No person may begin a flight in an airplane under VFR conditions unless (considering wind and forecast weather conditions) there is enough fuel to fly to the first point of intended landing and, assuming normal cruising speed -

(1) During the day, to fly after that for at least 30 minutes; or

(2) At night, to fly after that for at least 45 minutes.

For local flying in the vicinity of the airport or in a local practice area you must ensure that the fuel is at least **to the tabs on Piper Warrior / Archer aircraft.**

- Fuel to the tabs = 34 gallons

If the fuel level is lower than the tabs you must call Signature 130.8 / 781-274-0010 (info on checklists) and request fuel!

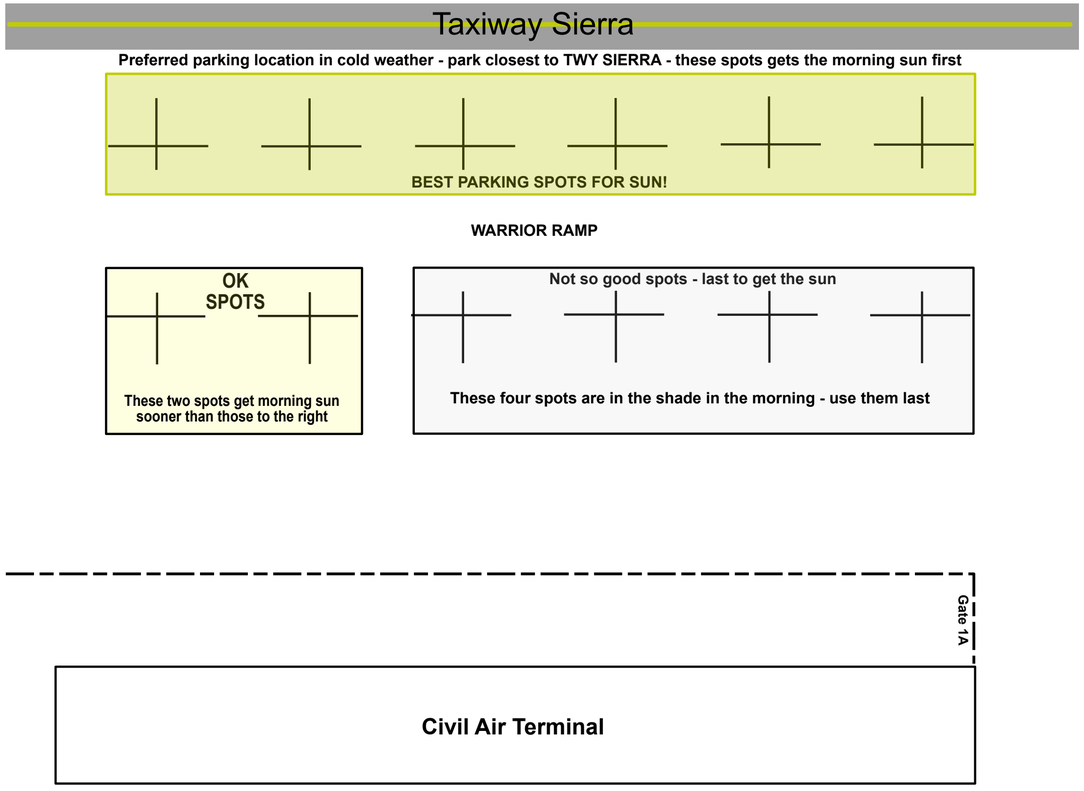
Winter Operations

Winter Operations - Preheating

- **Aircraft engine preheats are required under 40°F** – if in doubt, ASK! Call Dispatch for more information:
- Preheat can be requested by calling or texting **781-354-0077** on the day of your flight:
- Provide - Your name, Aircraft Engine start time (The time you plan to turn the key to start -NOT the time your reservations starts.)
- Aircraft **will not be dispatched** when temperatures are at or **below 10°F** or within **2 hours of 10°F**
- Students and instructors are encouraged to wait until after their flight to go over ground materials so they may start their preflight ASAP.
- Please make every effort to keep the office up to date if you are delayed from your original start time

Winter Operations & Snow Removal

- When parking in the winter months - pay attention to where you park your aircraft when returning from a flight.
- Use the parking spots closest to Taxiway Sierra first - this will help with melting ice and frost from the aircraft. (over night / next morning)
- **Scraping ice and frost from aircraft surfaces is not permitted**



Winter Operations - Icy Conditions

Moving aircraft on slippery surfaces

Care must be taken when moving aircraft on slippery surfaces as there are many potential way to injure yourself, others, and damage the aircraft, vehicles, and other property.

Taxiing on slippery surfaces

- Taxiing on slippery taxiways or runways at **excessive speed** or with strong crosswinds may cause the airplane to skid. (and crash)
- Use smaller nose-wheel steering and rudder inputs.
- **Limit thrust** to the minimum required.
- **Limit** excessive **breaking action**
- Only use enough speed to safely move you forward
- **Slow down** and take care in turns not to skid off the taxiway
- Stay away from visible icy patches
- Break check - **use minimum power.**

Pre-Flight Planning

Pre-Flight Planning - FAR 91.103 / AIM 5-1-1

§ 91.103 Preflight action.

Each pilot in command shall, before beginning a flight, become familiar with all available information concerning that flight. This information must include:

- For a flight not in the vicinity of an airport, weather reports and forecasts, fuel requirements, alternatives available if the planned flight cannot be completed, and any known traffic delays of which the pilot in command has been advised by ATC;
- For any flight, runway lengths at airports of intended use, and the following takeoff and landing distance information:
- For civil aircraft for which an approved Airplane Flight Manual (POH) containing takeoff and landing distance data is required, the takeoff and landing distance data contained therein.

Use the acronym NWKRAFT to ensure you don't miss any items when conducting your pre-flight planning

- **N**OTAMs
- **W**eather
- **K**nown ATC Delays
- **R**unway Lengths
- **A**lternates Available
- **F**uel Requirements (VFR: (14 CFR 91.151) enough fuel to reach destination plus 30 minutes cruise speed flight - day VFR
- **T**akeoff and Landing Distances

Pre-Flight Planning - IMSAFE

The “**IMSAFE**” checklist can be used to determine a pilot’s physical and mental readiness for flying.

I = Illness: Even a minor illness can severely impair performance as a pilot. The safest rule is not to fly while suffering from any illness.

M = Medication: Pilot performance can be severely impaired by both prescribed and over-the-counter medications.

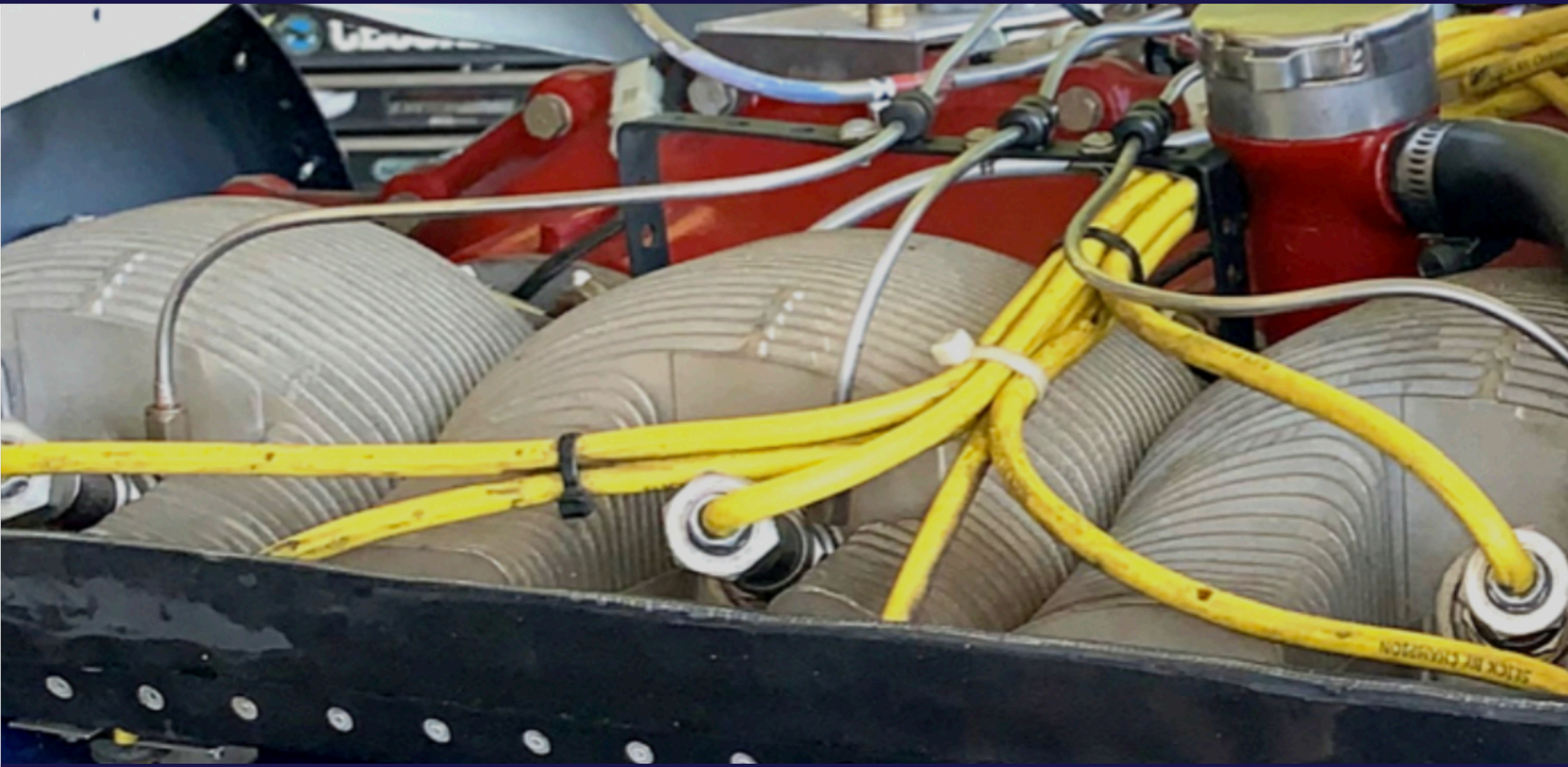
S = Stress: Stress is a term to describe the body’s nonspecific response to demands placed upon it.

A = Alcohol: A pilot may not use alcohol within 8 hours of a flight and cannot have a blood alcohol content above 0.04%.

F = Fatigue: Fatigue can be treacherous because it may not be apparent until serious errors are made.

E = Emotion: Emotionally upsetting events may render a pilot unable to fly an airplane safely. Anger and depression will decrease alertness and lead to the pilot taking self-destructive risks.

Piper Warrior - Powerplant



Powerplant

The Piper Warrior, (PA-28-161) is powered by a Lycoming O-320-D3G engine, producing **160 horsepower @ 2700 RPMs**

This **four-cylinder**, **horizontally opposed**, **air-cooled engine** is **normally aspirated** and equipped with a **carburetor**.

The Lycoming O-320-D3G engine is a direct-drive engine, meaning the propeller is directly connected to the engine crankshaft.

Two engine driven **magnetos** produce a high voltage current to fire the aircraft spark plugs. This device requires no external electrical source to operate. A magneto is an electrical generator that uses permanent magnets and coils to create the charge

Each magneto has a wire known as the **"P" lead**. This wire connects the **primary winding** of a magneto to ground through the ignition switch. When connected to ground the magneto is prevented from creating the current needed to fire the spark plug. The magneto is turned off by the key which grounds the P-lead

Each magneto connects to one of two spark plugs in each cylinder. (2 spark plugs per cylinder - 2 x 4 cylinders = 8 spark plugs)

The ECAC **Oil Capacity** requirements is **6.0 quarts** for all flights. (The Piper Warrior holds a maximum of 8 Quarts Total.

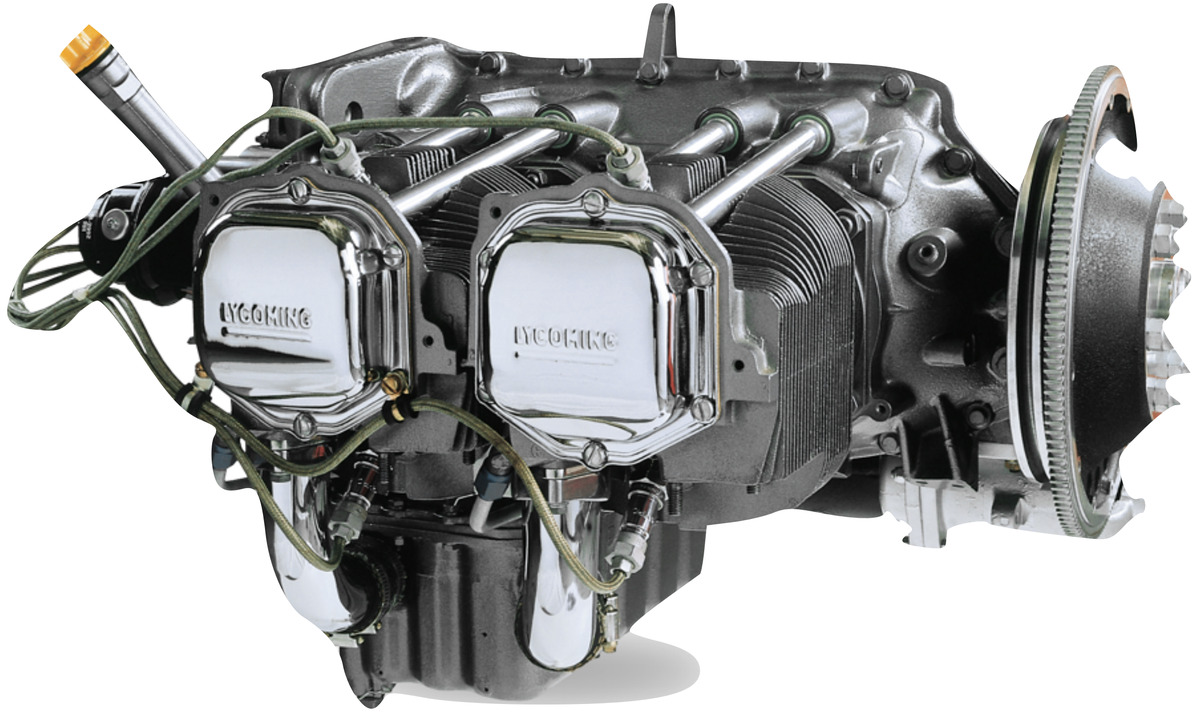
The **fuel system** consists of two vented fuel tanks, a fuel tank selector valve, fuel strainer, electric primer, engine driven fuel pump, auxiliary electric fuel pump, and carburetor. Fuel is pressure fed from the wing tanks to the fuel selector valve, through a fuel strainer to fuel pumps and then to the carburetor. From the carburetor, mixed fuel and air flows to the cylinders through intake manifold tubes. Usable capacity at the bottom of the indicator tab is 17 gallons.

Powerplant

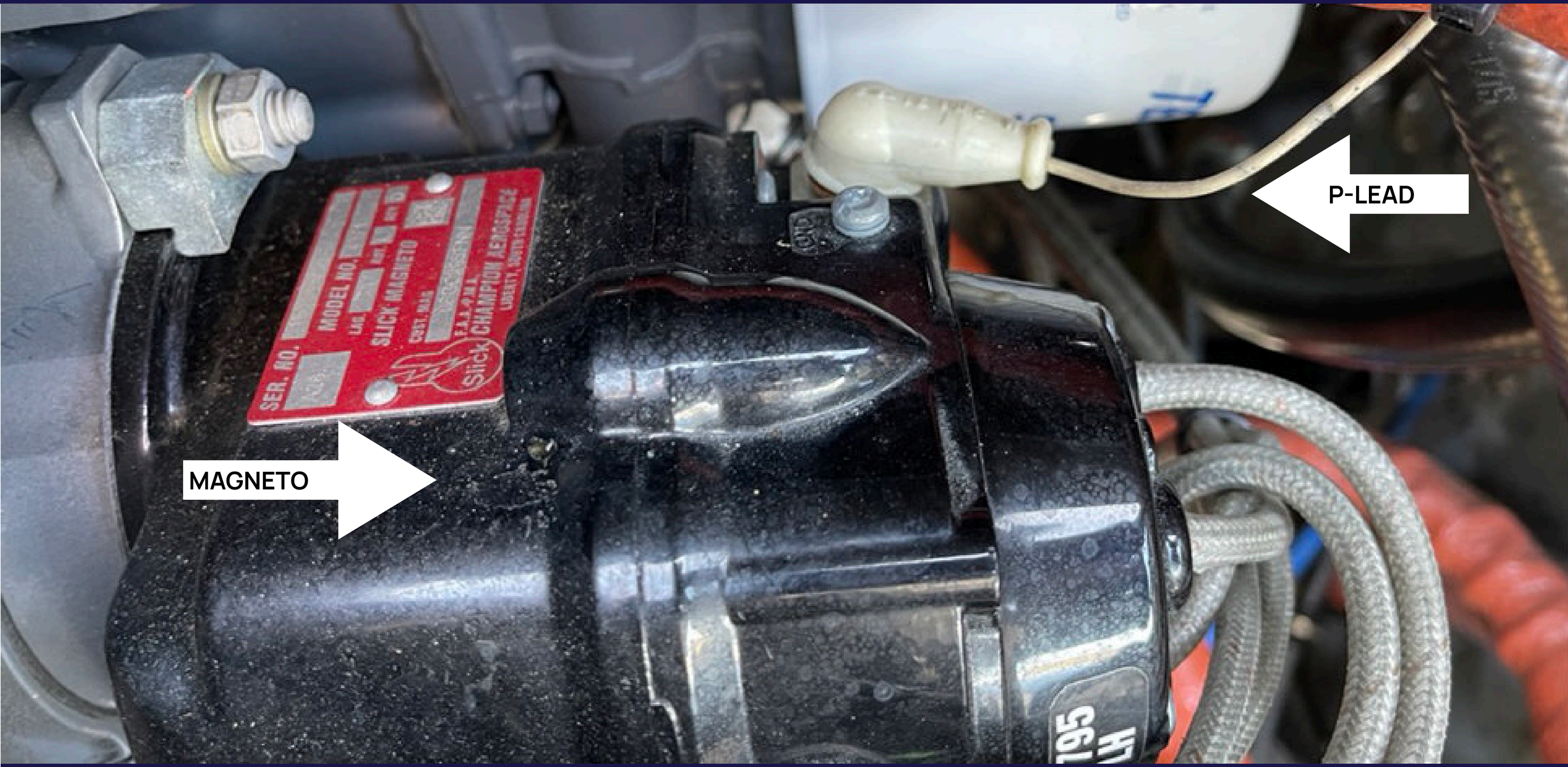
Lycoming and Continental produce designs unchanged since the 1950s (or earlier!)

In training airplanes such as Cessna or Piper:

- 4-Cylinder
- Horizontally Opposed
- Normally Aspirated
- Direct Drive
- Air/Oil-cooled
- Carburetor
- 160-180 HP



Magnetos


P-LEAD
MAGNETO
SER. NO.
MODEL NO.
SLICK MAGNETO
Slick
CHAMPION AEROSPACE

Magento

The magneto is a self-contained electrical generator that produces high-voltage electrical pulses to ignite the fuel-air mixture in the engine's cylinders.

Operates independently of the aircraft's electrical system and doesn't rely on a battery or external power source. Instead, it generates its own electricity through the principles of electromagnetic induction.

The magneto is engine driven and starts generating electrical pulses whenever the airplane's engine is cranked / running,

A magneto consists of several key components:

- Magnet: A permanent magnet is used to create a magnetic field within the magneto.
- Armature: This is a rotating coil of wire placed between the poles of the magnet. As the armature rotates, it cuts through the magnetic lines of force, inducing an electrical current in the coil.
- Distributor: The distributor is responsible for directing the high-voltage pulses to the appropriate spark plugs in the correct firing order.

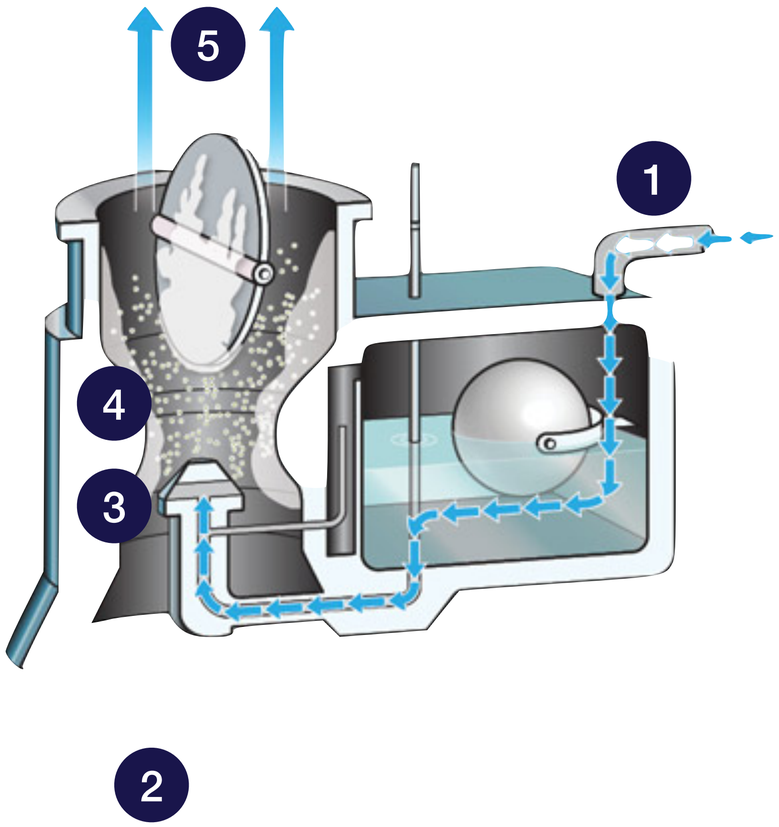
Carburetor / Carburetor heat

Carburetor

Carburetors are critical components in aircraft engines, particularly in older piston engine aircraft. They play a crucial role in mixing the right amount of air and fuel to create a combustible mixture that powers the engine.

- Fuel is pumped into the carburetor and stored in the reservoir
- Intake: The carburetor begins by drawing in air from the outside through an air filter. This air is essential for the combustion process, as it provides oxygen for the fuel to burn.
- Mixing Air and Fuel: Inside the carburetor, there are various chambers and passages. The flow of fuel is controlled by the throttle, which the pilot adjusts to regulate engine power. As the fuel is introduced, it mixes with the incoming air to create a combustible mixture.
- Venturi Effect: As the air and fuel mixture passes through a constricted area called the Venturi, its velocity increases, which lowers the pressure within the Venturi.
- Air and Fuel Mixture: The carburetor carefully controls the ratio of air to fuel to create the optimal mixture for combustion. This mixture is then delivered to the engine's cylinders through a manifold, where it is ignited to produce power.

Carburetor



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Carburetor

- When Carburetor heat is applied, hot air flows into the carburetor to melt ice that may have built up in the venturi.

- Carburetor ice is a buildup of ice or frost on the inside surfaces of the carburetor.

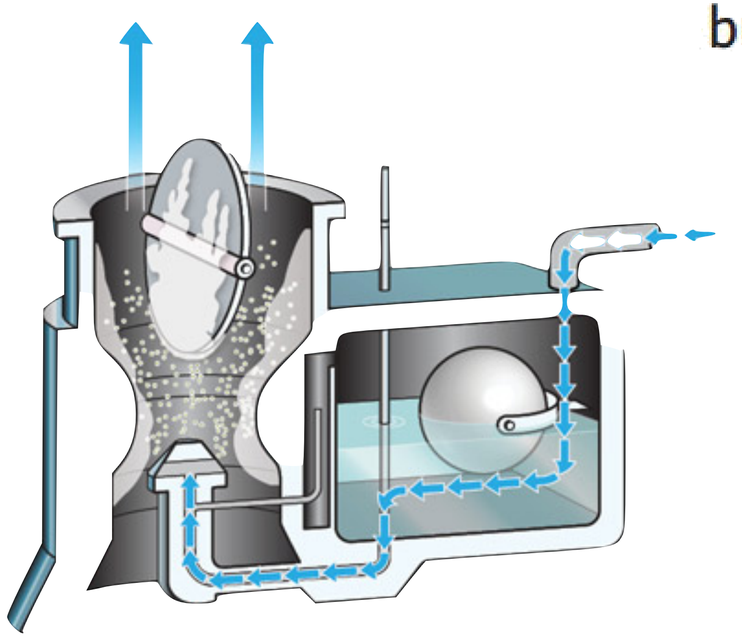
- It can form both on the inner surfaces of the tube and on and around the throttle valve inside the carburetor.
  Ice in the carburetor restricts the flow of fuel and air to the engine, reducing power and possibly leading to engine failure.

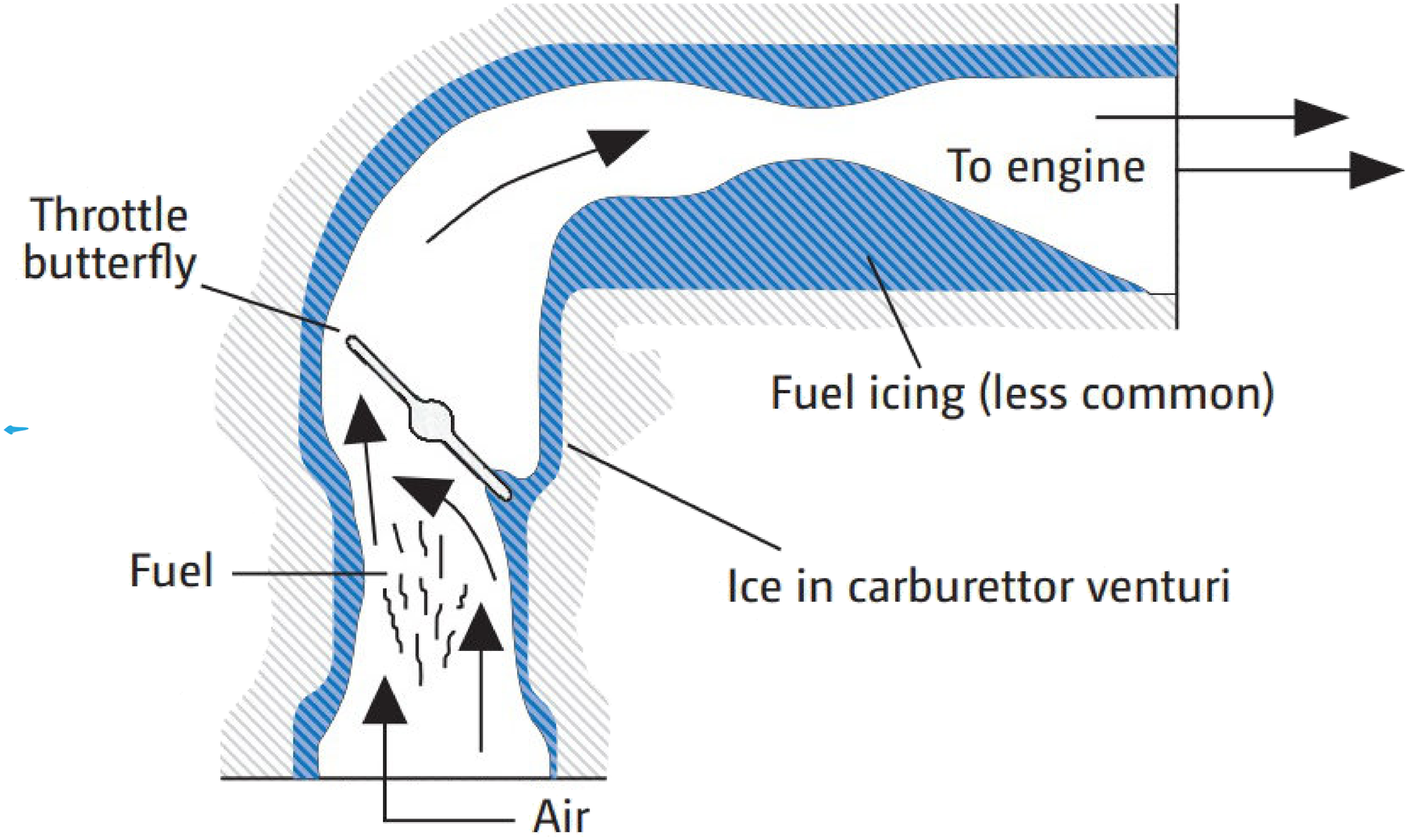
- Carb ice forms when water vapor in the air condenses inside the carburetor when the temperature is at or below freezing.

- Data from the National Transportation Safety Board show that carb ice was a cause or factor in **250 accidents** from 2000 to 2011.

- In its safety alert on the subject, the NTSB stated that accident evidence shows that many pilots "**inaccurately believe carburetor icing is only a cold -or- wet-weather problem.**"

Carburetor




Throttle butterfly
To engine
Fuel icing (less common)
Fuel
Ice in carburettor venturi
Air

Carburetor heat

- When selected (turned on) Carburetor heat preheats the air before it enters the carburetor and either prevents carburetor ice from forming or melts any ice which may have formed.

- When heat is applied, unfiltered air enters directly through the ram air inlet.

- This induction air passes through part of the exhaust system acting as the heating mechanism and continues onto the carburetor.

- By manipulating the carburetor heat control in the cockpit, you are simply opening or closing an air valve allowing unfiltered heated air in while dumping filtered cold air overboard, and vice versa.

- Hot air less dense than cold air so therefore less oxygen enters the engine cylinders when carburetor heat is applied - this means you will see a drop in power. You check for this in the engine run-up, prior to takeoff!

Induction fire on start

Induction fire on engine start

Over-priming is the leading cause for engine fires on the ground.

If your engine doesn't start, how many times are you going to re-prime? How many times does it take to over prime?

During a cold engine start, you have to prime the engine. When you prime an engine, you're putting fuel into the cylinders (or the intake manifold) so that the engine can fire. Pilots tend to over-prime the engine by priming too much or too many times.

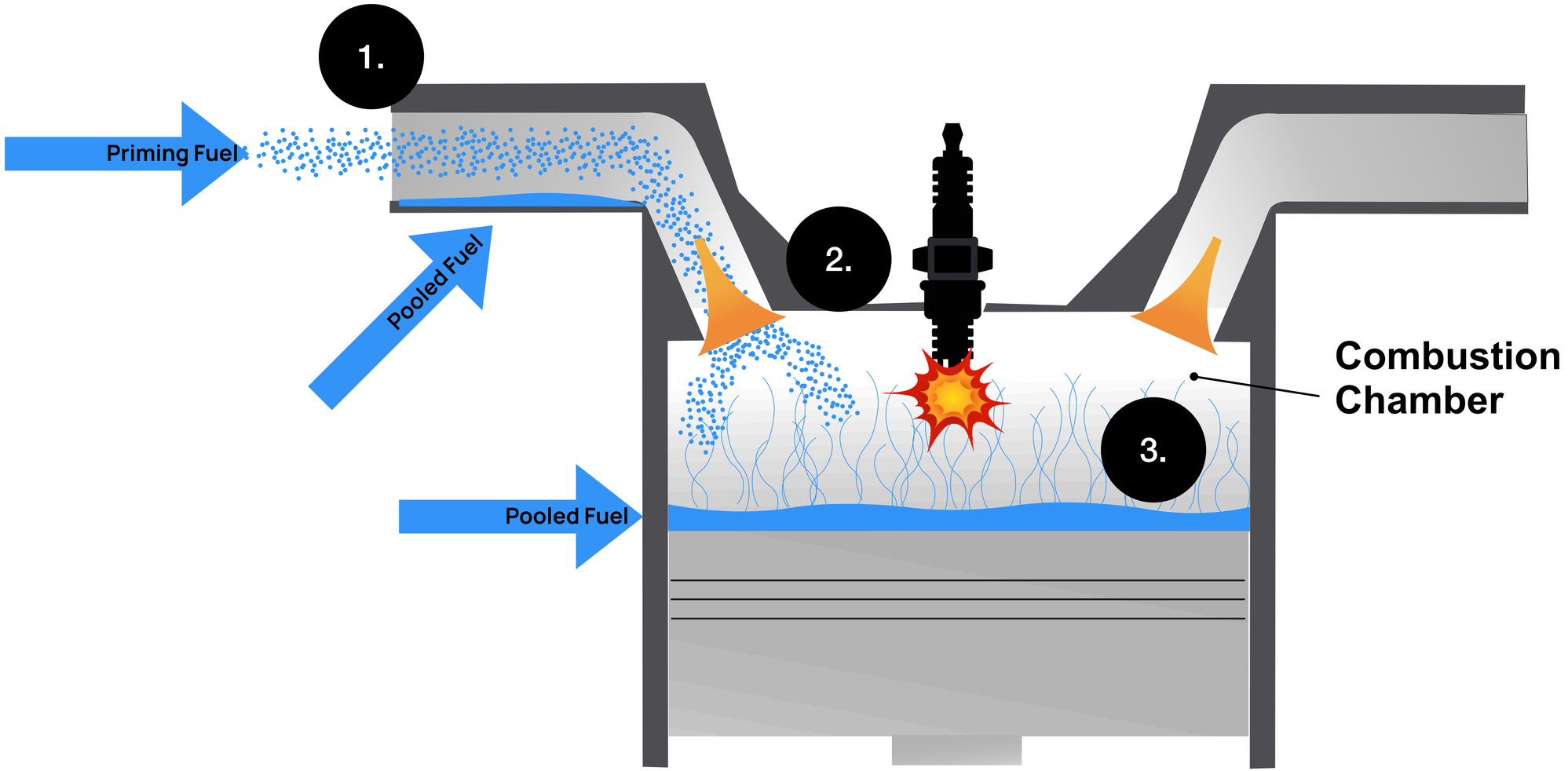
In contrast, there are very few people who prime too little.

So what happens when you over-prime?

When you prime the engine, the extra fuel goes to one of three places:

1. The intake manifold, right in front of the intake valve.
2. The valve-chamber, where the fuel will be sucked into the cylinder.
3. Directly into the cylinder itself.

Induction fire on engine start



Induction fire on engine start

Scenario:

You're starting a cold engine, so you have to prime.

You prime the engine a little more than normal, maybe 2-3 times.

When you try to start the engine, it won’t fire up.

You figure that you haven’t primed enough, so you prime again.

This process repeats, and results in you flooding the engine.

So how do you know if you've over-primed?

And what should you do if that’s the case?

Induction fire on engine start

SECTION 3 PIPER AIRCRAFT CORPORATION

EMERGENCY PROCEDURES PA-28-161, WARRIOR III

EMERGENCY PROCEDURES CHECKLIST

ENGINE FIRE DURING START

- STARTER - CONTINUE CRANKING
- MIXTURE - CUTOFF
- THROTTLE - OPEN
- ELECTRIC FUEL PUMP - OFF
- FUEL SELECTOR - OFF (PUSH IN TAB TO TURN OFF)
- ABANDON IF FIRE CONTINUES

Electrical


PUSH
CJV
CDI
OBS
MSG
FPL
PROC
PUSH
CRSR
OFF
BATT
MASTR
OFF
ALTR
OFF
FUEL
PUMP
OFF
NAV
LIGHT
OFF
STROB
LIGHT
OFF
LDG
LIGHT
OFF
RADIO
MASTR

Electrical Master Switch & Alternator Switch

A master switch, which usually has two halves—one controlling the battery, and another for the alternator or generator

The Battery Master Switch:

- Turns on the aircraft's battery circuit.
- Powers up systems needed before engine start (like lights, fuel gauges, and radios).
- Enables the use of the starter to crank the engine.
- Note: It doesn't control the magnetos, which are part of the ignition system and work independently of the electrical system.

The Alternator Switch:

- Allows the alternator to turned on and off independently from the battery / power switch.
- This allows the alternator to be switched off in case of a malfunction without turning off the battery / electrical circuits if electrical-system troubleshooting is required.

Note: If the alternator fails (or the switch is off), all electrical power will come from the battery only — which will eventually deplete.

Electrical Malfunctions

Loss of alternator output is detected through **zero reading on the ammeter** and **alternator inop annunciator**.

NOTE: Anytime the bus voltage is below 25 dc, the Low Bus Voltage Annunciator will be illuminated. Before executing the following procedure, ensure that the reading is zero, and not merely low, by actuating an electrically powered device, such as the landing light. If no increase in the ammeter reading is noted, alternator failure can be assumed.

POH SECTION 3 EMERGENCY PROCEDURES

- ALT annunciator light illuminated:
  Ammeter ..... Check to verify inoperative alternator -
- If ammeter shows zero:
  ALT switch ...OFF -
- Reduce electrical loads to minimum:
- ALT circuit breaker ..... Check and reset as required
- ALT switch ON
- If power not restored: ALT switch ... OFF

If alternator output cannot be restored, reduce electrical loads and land as soon as practical. Anticipate complete electrical failure.

Duration of battery power will be dependent on electrical load and battery condition prior to failure.

Electrical Circuit Breaker “popped”

- Circuit breakers are used to prevent fire.
- Circuit breakers protect wire and cable from damage owing to an over-current condition.
- They protect the circuit when the temperature and time duration characteristics of the over-current condition are outside the Circuit Breaker’s design limits.
- When the heat exceeds a preset amount, the bimetallic element bends causing the spring-loaded contact to trip and open the circuit.
- A circuit breaker will usually trip (pop) when there is an electrical fault that could cause damage to the circuit. This is usually an excess of current, a power surge or a faulty component.
- The electrical load should be reduced as much as possible. Check for an open alternator field circuit breaker.
- "Do not reset a popped circuit breaker unless it is necessary for the flight, and even then, don’t push it back in more than once."

Electrical Fire

If an electrical fire is indicated (smoke in the cabin), the battery master switch should be turned OFF.

The cabin vents should be opened and the cabin heat turned OFF.

A landing should be made as soon as possible.

POH SECTION 3 EMERGENCY PROCEDURES

- Source of fire - check (Electrical fire / smoke in cabin):
- Battery Master switch - OFF
- ALTR Switch - OFF
- Vents - Open
- Cabin heat - OFF
- Land as soon as practical.

Brakes and Steering

Brakes and Steering

Rudder Pedals, the lower (black) pedals are used to steer the aircraft on the ground

Brakes are the upper (silver) pedals are used to stop the aircraft on the ground

Brake Check

The aircraft breaks must be checked by the pilot (if flying solo) and by both pilots (i.e student then CFI) when there are dual pilots- in a GA airplane. This is done by observing the following procedure.

- Pilot: I have the flight controls - I will check my brakes. (“you have the flight control, I have the flight controls”) (three way exchange of controls)
- Pilot applies enough thrust to get the aircraft moving.
- Once the aircraft begins to move, all thrust is removed, throttle fully retarded so engine is idling.
- Brakes are checked and the aircraft will come to a stand still.
- The second pilot will repeat the procedure before handing controls back to the student and / or PIC.

System failures in flight

Loss of elevator / stabilator control

FAA's Airplane Flying Handbook, (Chapter 17 Emergency Procedures) states:
A break or disconnect in only one of these cables normally does not result in a total loss of elevator control. In most airplanes, a failed cable just results in a partial loss of pitch control.

When experiencing a loss of up-elevator control, the pilot can retain pitch control by:

- Applying considerable nose-up trim
- Pushing the control yoke forward to attain and maintain desired attitude
- Increasing forward pressure to lower the nose and relaxing forward pressure to raise the nose
- Releasing forward pressure to flare for landing

When experiencing a loss of down-elevator control, the pilot can retain pitch control by:

- Applying considerable nose-down trim
- Pulling the control yoke aft to attain and maintain attitude
- Releasing back pressure to lower the nose and increasing back pressure to raise the nose
- Increasing back pressure to flare for landing

Loss of elevator / stabilator control

Trim mechanisms can be useful in the event of an in-flight primary control failure.

For example, if the linkage between the cabin and the elevator fails in flight, leaving the elevator free to weathervane in the wind, the trim tab can be used to raise or lower the elevator within limits.

The trim tabs are not as effective as normal linkage control in conditions such as low airspeed, but they do have some positive effect—usually enough to bring about a safe landing.

If an elevator becomes jammed, resulting in a total loss of elevator control movement, various combinations of power and flap extension offer a limited amount of pitch control. A successful landing under these conditions, however, can be problematic.

Loss of airspeed indicator

Checking “Airspeed Alive” on takeoff

Saying “airspeed alive” during the takeoff roll happens when the pilot completes the preflight checklist by confirming that the airspeed indicator is giving a reading which makes sense.

It means that the airspeed indicator has started to be able to indicate airspeed, i.e.: the needle on the gauge is moving.

Air is entering the pitot tube as the plane moves through the air, the air, entering the pitot registers as the air presses harder against the diaphragm, which moves the needle.

Airspeed indicator fails after takeoff (pitch and power)

It is likely that you will have some kind of blockage to the pitot static system.

Use pitot heat - if the pitot is blocked with ice this will clear the blocked pitot

Think Sight picture! Nose to the horizon = Vy 79 kts , slight lower = cruise speed 87kts

Straight and level power off = best glide 73kts

Use all available resources, PAPI, aim spot - does it move up or down / climbing, sinking. Talk to ATC - advise them that you have no ASI they will assist as much as they can

Final approach, it is better to be a little fast rather than slow - you can bleed airspeed off in ground effect.

Lost Communications (NORDO)

If you experience two-way radio communications failure during a flight, you are expected to exercise good judgment in whatever action you elect to take. (AIM 6-4-1)

- If the failure occurs in VFR conditions, continue the flight under VFR and land as soon as practicable.
- Verify Receiver Inoperative.
- Check: Electrical Power Radio Master On - Check breaker
- Check: Radio Setup (Comm1/2) - Volume - Frequencies - Headset Connections - Batteries - Squelch - Stuck Mic
- Attempt to contact another station on a different frequency, (last frequency used or 121.5 MHz (guard).

Entering Class D Airspace

- Verify Your Heading
- Remain outside or above the Class D surface area until the direction and flow of traffic has been determined.
- Squawk 7600
- Look for light signals which may be addressed to your aircraft.
- Join the airport traffic pattern.
- During hours of daylight, acknowledge light signals by rocking your wings.
- At night, acknowledge by blinking the landing or navigation lights.
- Comply with ATC light gun signals

Lost Communications Light Gun Signals

If you experience a loss of radio communications in controlled airspace

- Squawk 7600
- Continue flying at TPA in the traffic patter
- Look for light gun signals from the ATC tower
- Acknowledge light gun signals by rocking your wings (airborne) or moving rudder / ailerons (on ground).
- Night operations: Flash your landing or nav lights to acknowledge.

Light Signal	On the Ground	In the Air
Steady Green	Cleared for takeoff	Cleared to land
Flashing Green	Cleared to taxi	Return for landing (to be followed by steady green at proper time)
Steady Red	Stop	Give way to other aircraft and continue circling
Flashing Red	Taxi clear of landing area (runway) in use	Airport unsafe - Do not land
Flashing White	Return to starting point on airport	Not applicable
Alternating Red and Green	General warning signal - Exercise extreme caution	General warning signal - Exercise extreme caution

Squawk Codes

Squawk codes are entered into the aircraft transponder that allow ATC to identify your aircraft on radar.

Squawk codes also allow pilots to transmit discreet codes to allow ATC to identify aircraft in distress / lost communications / military intercept etc.

- 1200 VFR
- 7500 Hijack (75-Man with a knife)
- 7600 Lost Communications (76-Radio needs to be fixed)
- 7700 Emergency - (77 Falling from heaven)
- 7777 Military Intercept

- Mayday Mayday Mayday - Used for life threatening situations
- Pan pan - Pan pan - Pan pan - Used in non life threatening situations

Left turning tendencies

Left turning tendencies

There’s a reason your plane want to veer left when you are taking off.
Actually, there are 4 of them, and they're called **left-turning tendencies**.

- **P-factor** (Asymmetric loading of the Propeller Disc)
- **Torque Effect** (reaction from engine and propeller)
- **Spiraling Slipstream** (Corkscrewing effect of the slipstream from the propeller)
- **Precession** (Gyroscopic action of the propeller)

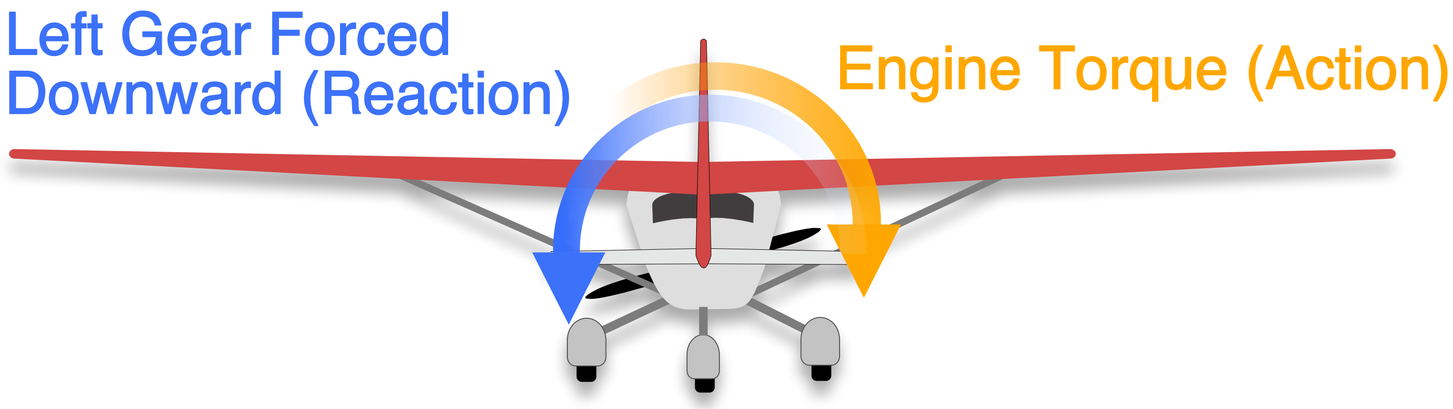
Left turning tendencies - Torque Effect

Torque is a measure of the force that can cause an object to rotate about an axis.

According to Sir Isaac Newton's Third Law… "**For every action, there is an equal and opposite reaction.**"

The propeller on a single engine airplane is driven clockwise (from the point of view of the pilot) directly by the crankshaft of the engine . As the propeller turns in the clockwise direction, the airplane will want to roll in the opposite, anti clockwise direction.

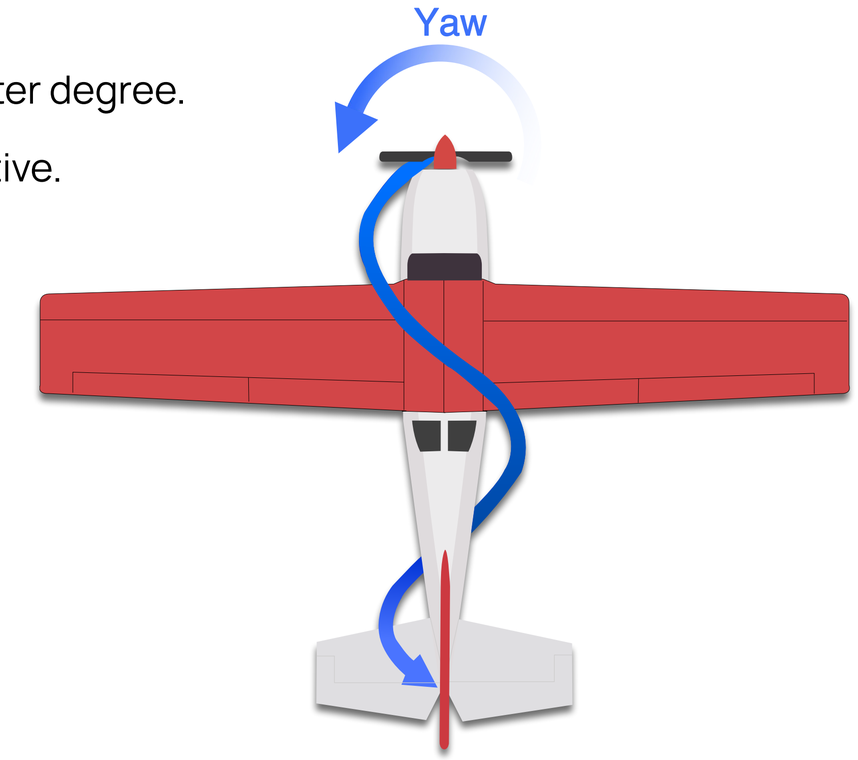
- During the takeoff roll, the engine is developing maximum power.
- The left roll forces the left side of the aircraft downward toward the runway and in turn causes the left hand side tire to have more friction with the ground than the right tire, thus turning the aircraft to turn left.
- Torque effects the airplane in ALL phases of the flight
- The way to counter spiraling slipstream is to use **right rudder**.



Left turning tendencies - Spiraling Slipstream

During takeoff, (High Propeller Power, Low Airspeed) the air accelerated behind the propeller, known as the 'slipstream', follows a corkscrew pattern.

- Wind blown aft by the propeller spirals around the aircraft, then strikes the left side of the vertical stabilizer.
- This causes the tail to swing right and the nose to yaw left around the vertical axis.
- Spiraling slipstream has its greatest effect upon the airplane when your propeller is moving fast and your plane is moving slow. Takeoff is a great example of this scenario.
- An airplane in a climb compresses the spiral causing it to be felt to a greater degree.
- As forward speed increases the spiral elongates and becomes less effective.
- The way to counter spiraling slipstream is to use **right rudder**.



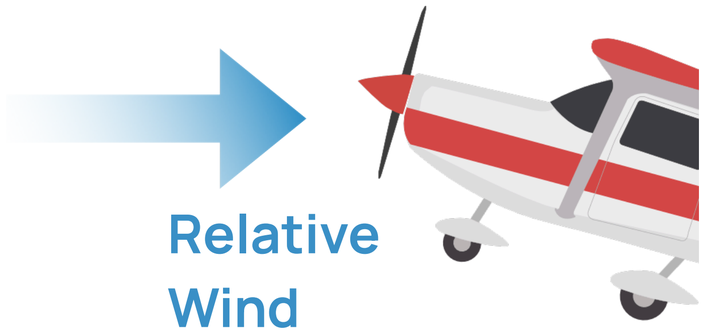
Left turning tendencies - Spiraling Slipstream

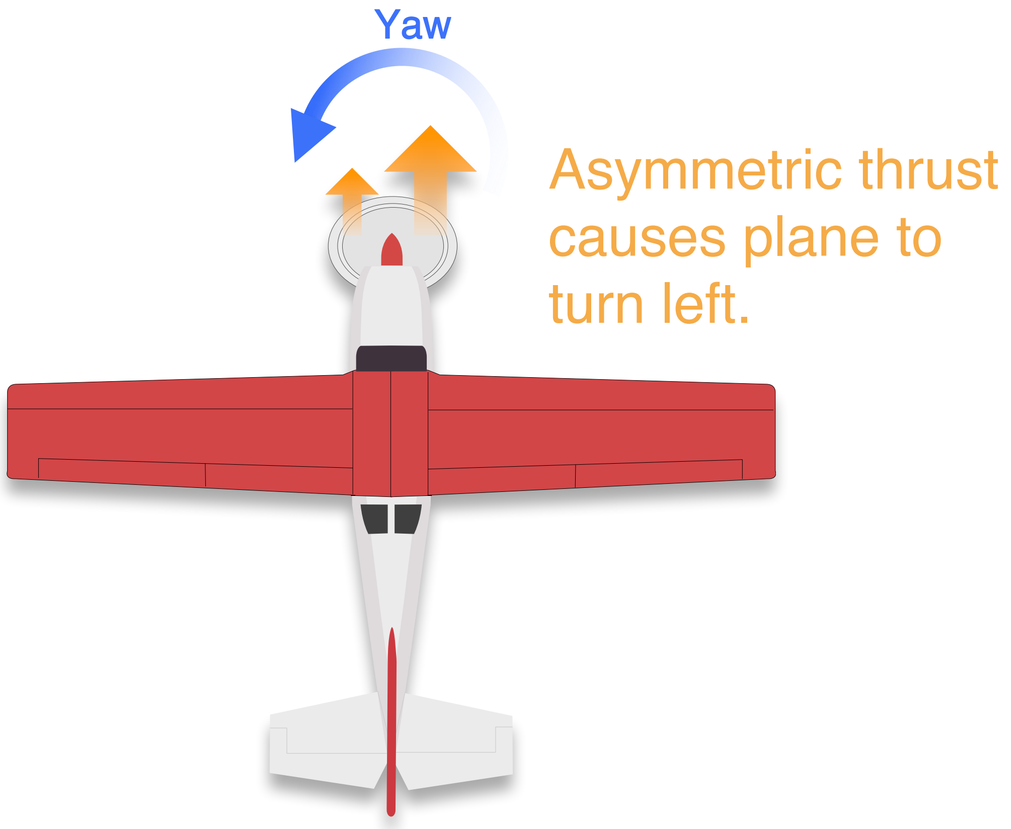
Left turning tendencies - P Factor

P-factor describes the uneven loading of a propeller (or the asymmetric loading of the propeller), which develops at anytime the airplane has a greater angle of attack than 0°

The descending blade of the propeller takes a bigger bite of air than the ascending blade in the climb (also has a greater forward velocity).

It therefore creates more thrust on the right side of the propeller than the left side, causing the airplane to turn left.





Left turning tendencies - Gyroscopic Precession

A spinning propeller is essentially a gyroscope (a spinning disc).

That means a spinning propeller takes on the two properties of a gyroscope

- Rigidity in space
- Precession.

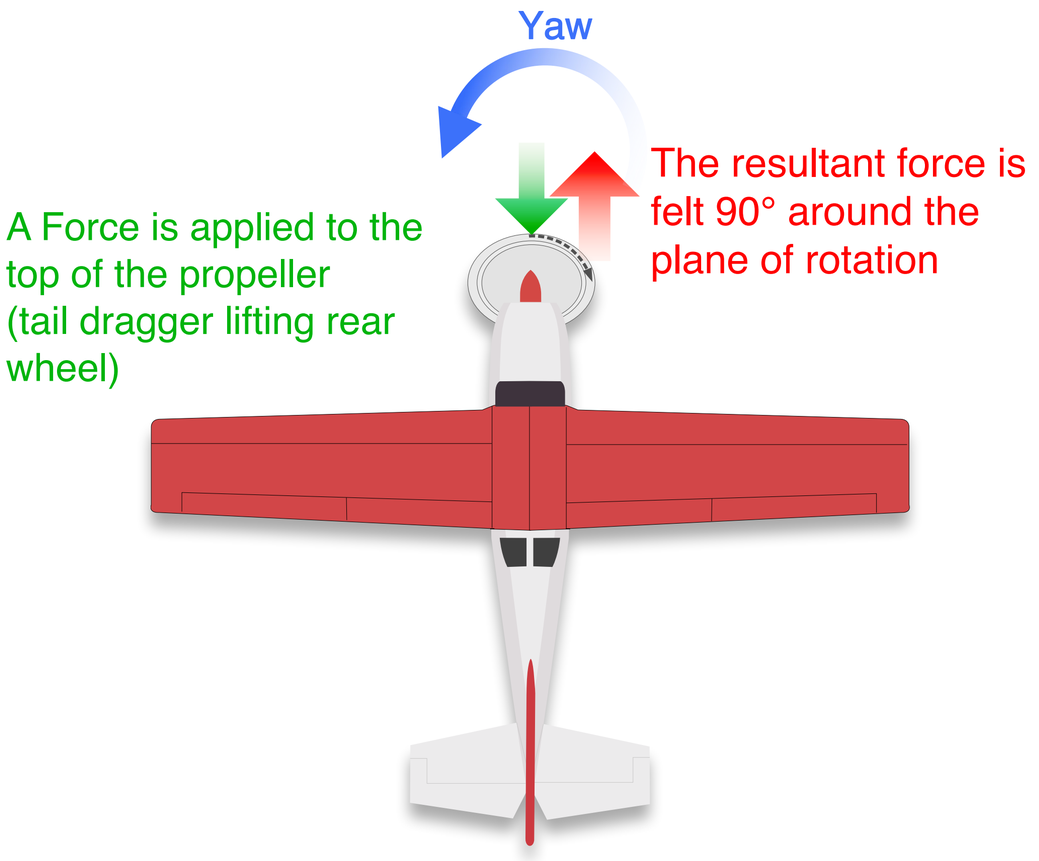
Precession is what causes the left turning tendency and happens when you apply force to a spinning disc. (In the case of an airplane you will change the pitch of the airplane.

When you apply a force to part of the disc, and the effect of that force (the resultant force) is felt 90° in the direction of rotation of the disc.

This, for the most part, only applies to tailwheel airplanes when they lift their tail off the runway during takeoff.

As the tail comes up, a force is applied to the top of the propeller. And since the propeller is spinning clockwise, that force is felt 90 degrees to the right.

That forward moving force, on the right side of the propeller, creates a yawing motion to the left.



The way to counter Gyroscopic Precession is to use **right rudder**.

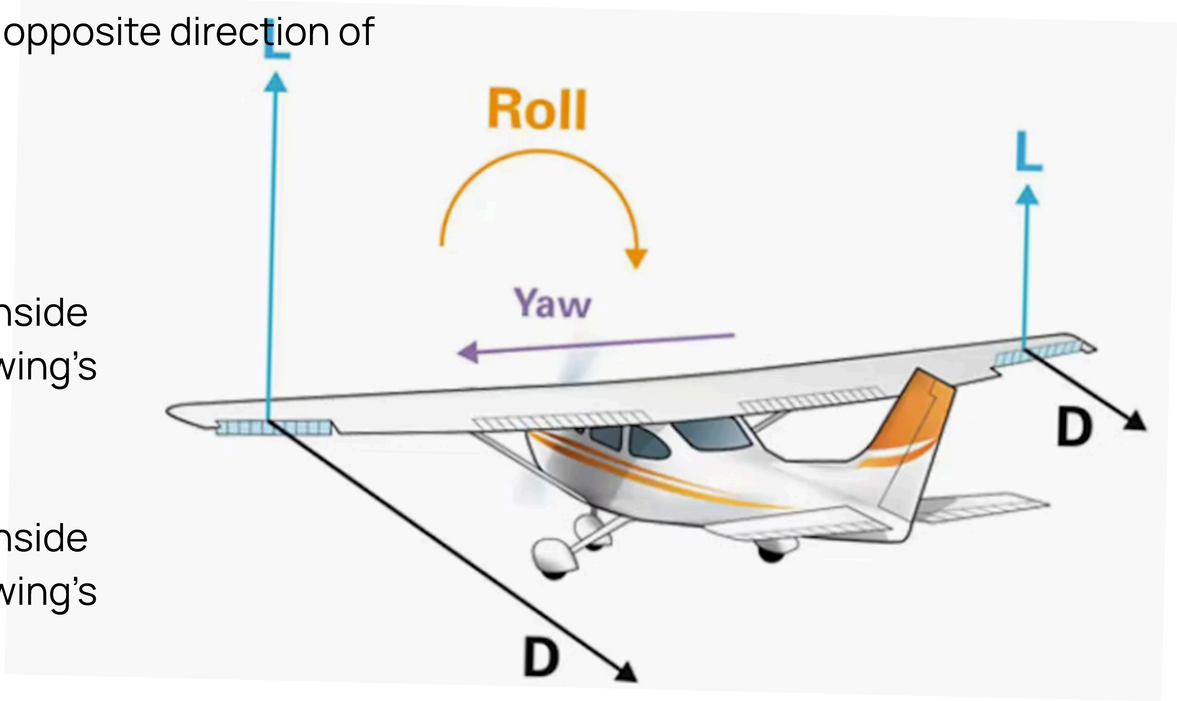
Adverse Yaw

Adverse Yaw

To make an airplane turn, it is necessary to change the direction of lift by banking the wings.

Adverse yaw is the natural and undesirable tendency for an aircraft to yaw in the opposite direction of a roll.

Adverse yaw during a turn entry is caused by decreased induced drag on the lowered wing and **increased induced drag on the raised wing**. The aileron that is deflected down increases the drag on the airleron and in effect pulling the wing in the opposite direction of the turn)



Adverse yaw is corrected with correct rudder input.

When rolling out of a steep-banked turn, the lowered aileron (on the inside wing) creates more drag than when rolling into the turn because the wing's angle of attack is greater as the rollout is started.

When rolling out of a steep-banked turn, the lowered aileron (on the inside wing) creates more drag than when rolling into the turn because the wing's angle of attack is greater as the rollout is started.

Spin Avoidance

Spins

A spin is a “stall with a yaw” which results in rotation about the spin axis.

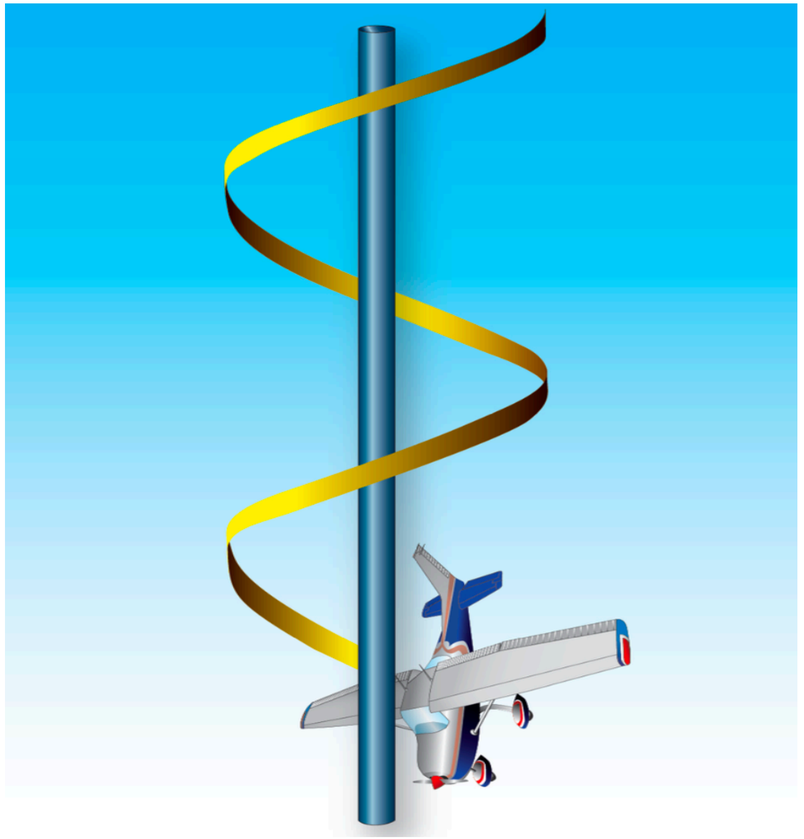
This means that if you stall the aircraft while in a **cross-coordinated** state you risk entering a spin.

Mishandling of yaw control during a stall increases the likelihood of a spin entry.

A spin results in the airplane following a downward corkscrew path.

During a spin, the airplane rotates around its vertical axis affected by different lift and drag forces on each wing, and the airplane descends due to gravity, rolling, yawing, and pitching in a spiral path.

Spins can be entered, either intentionally or unintentionally, from any flight attitude and at practically any airspeed.



Spins

- An airplane stalls when the critical angle of attack is exceeded.
- The critical angle of attack remains constant regardless of gross weight.
- The critical angle of attack is independent of the speed of airflow over the wings.
- A spin occurs when, after a full stall, the wing that drops continues in a stalled condition while the rising wing regains and continues to produce some lift, causing the rotation.
  (The difference between a spin and a steep spiral is that in a spin, the wings are stalled.)
- A stalled wing is a prerequisite of a spin. If the aircraft is allowed to become excessively slow and a stall is induced with an uncoordinated attitude, a spin will develop.
- Even though both wings are stalled, they are still producing “some” lift, the wing producing more lift than the other, will raise, while the wing producing less lift will drop. After the wing drops, the spin enters the incipient phase, and auto-rotation will begin

Spins - Common Causes

Traffic Pattern

A common cause for a spin to develop is in the traffic pattern, during the **base-to-final turn**.

In this scenario, the aircraft is uncoordinated (improper pilot technique) due to the pilot not using proper control inputs at low speeds, then attempts a base-to-final turn.

Overshooting final approach: if you have missed the base to final turn and try to turn back toward the runway you will be typically have a lot of left control to fly back to the runway heading. the nose will be pointing left.

Right rudder is applied to bring the nose to the right. If you stall at this point you will be at high risk of stalling the airplane.

Engine Out

When encountering an engine out - pilots will look for a spot to land, often too far away.

Trying to stretch the subsequent glide, will result in the pilot pitching the aircraft up (anything other than best glide airspeed will cause the airplane to descend faster)

If in the process the aircraft becomes uncoordinated and if the airplane stalls an inadvertent spin will begin.

Spins - The four phases & recovery

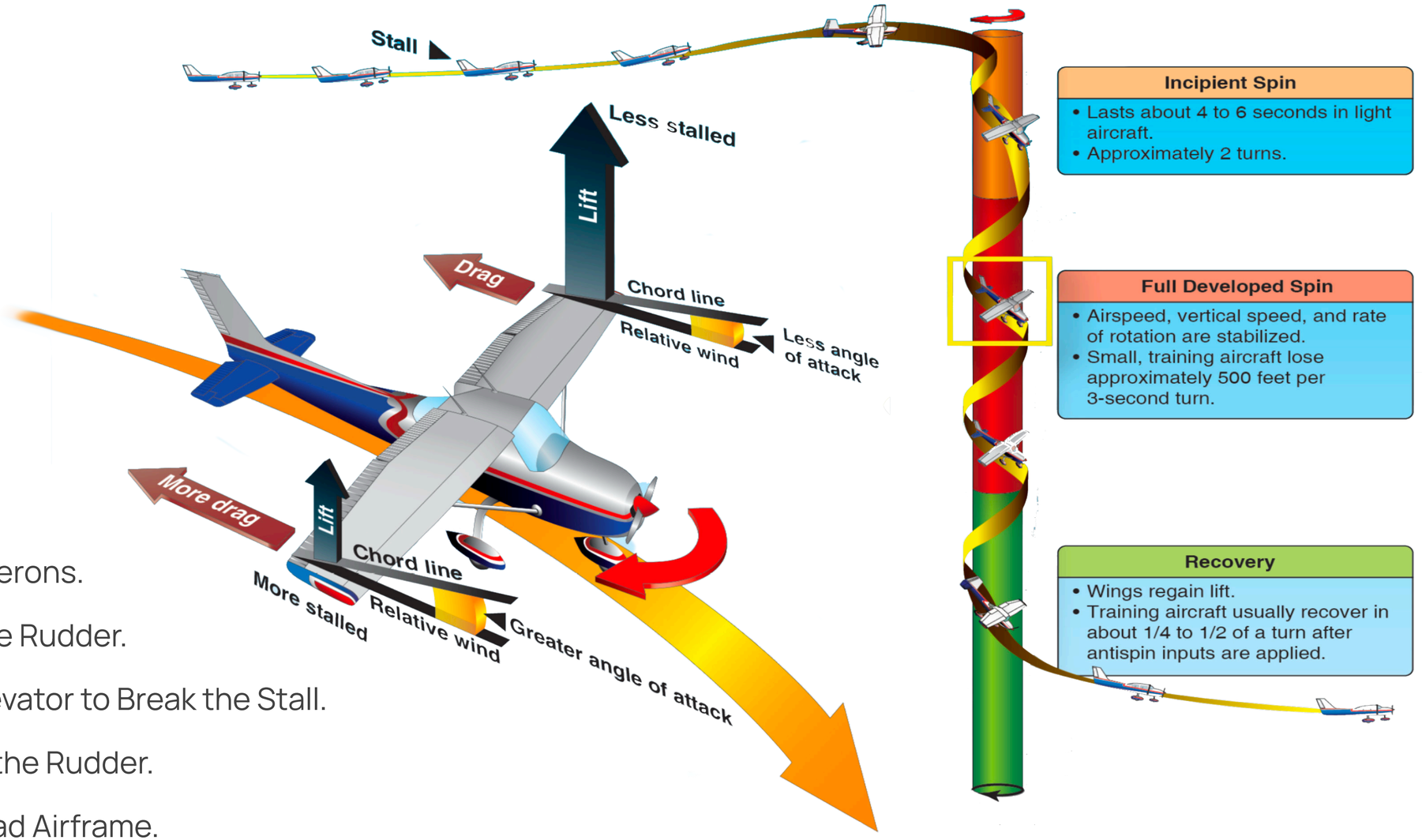
The four phases of a spin..

1.Entry

2.Incipient Spin

3.Fully Developed Spin

4.Recovery



To recover from a spin (**PARE**)

- **P**ower - Throttle to Idle.
- **A**ilerons - Neutralize the Ailerons.
- **R**udder - Apply Full Opposite Rudder.
- **E**levator - Apply Forward Elevator to Break the Stall.

As Rotation Stops, Neutralize the Rudder.

Slowly Recover, Do Not Overload Airframe.

Slips

Intentional Slips

Intentional Slips (Used for Maneuvering)

A slip is often intentionally performed to:

- Lose altitude without increasing airspeed
- Improve visibility during landing approaches
- Counteract a crosswind during landing

There are two types of slips:

- **Forward Slip**

The aircraft is banked and opposite rudder is used to maintain heading.

Used to increase drag and descend rapidly without gaining speed (e.g., if too high on approach).

- **Sideslip**

The aircraft is banked into the wind, and opposite rudder is applied to prevent turning.

Commonly used during crosswind landings to keep the aircraft aligned with the runway.

Forward Slips

A forward slip is an intentional maneuver where the aircraft is made to descend rapidly without increasing airspeed significantly.

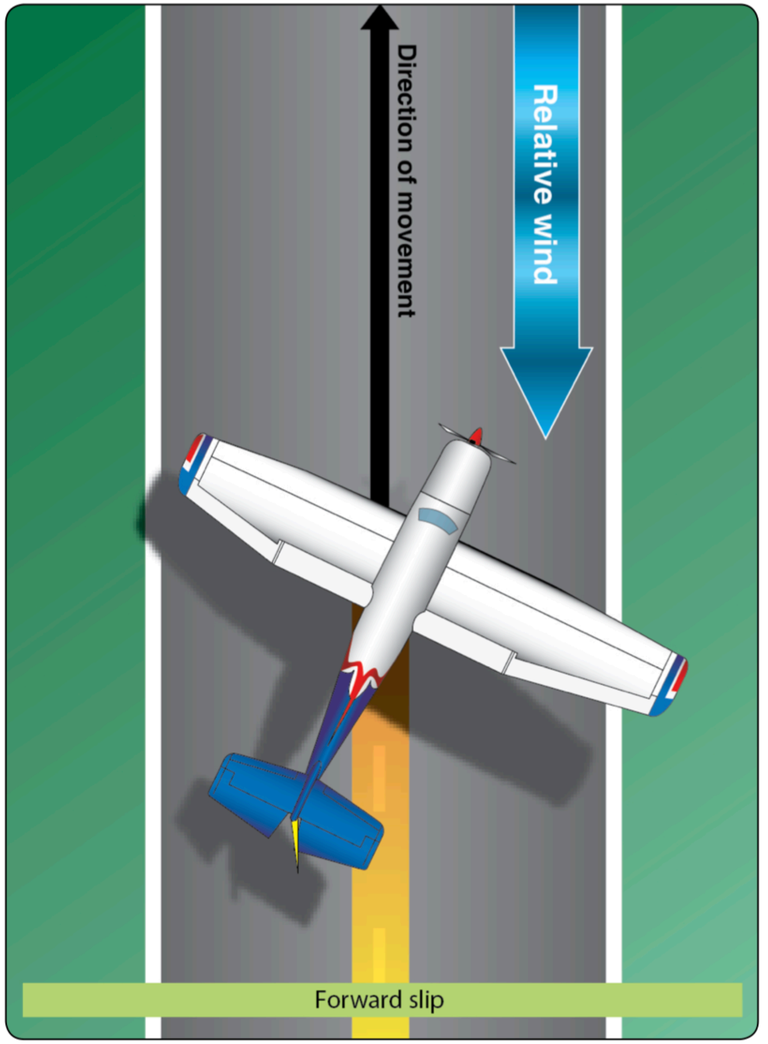
It's commonly used when the pilot is too high on final approach and needs to lose altitude quickly without overshooting the runway.

Performing a Forward Slip

- Bank the aircraft to one side (left or right).
- Apply opposite rudder to keep the nose of the aircraft pointed in the original direction of travel.
- This results in the aircraft presenting more of its fuselage to the relative wind, increasing drag.
- The aircraft will descend steeply while maintaining a low forward speed.

Cautions

- Don't exceed cross-control limits—excessive slips can stress the airframe.
- Watch for airspeed indication errors (pitot tube may be affected).
- Some aircraft prohibit slips with full flaps due to reduced elevator authority or structural concerns (check the POH/AFM).



Sideslips

A sideslip is an intentional maneuver where the aircraft is banked into the wind, and opposite rudder is applied to maintain a straight ground track.

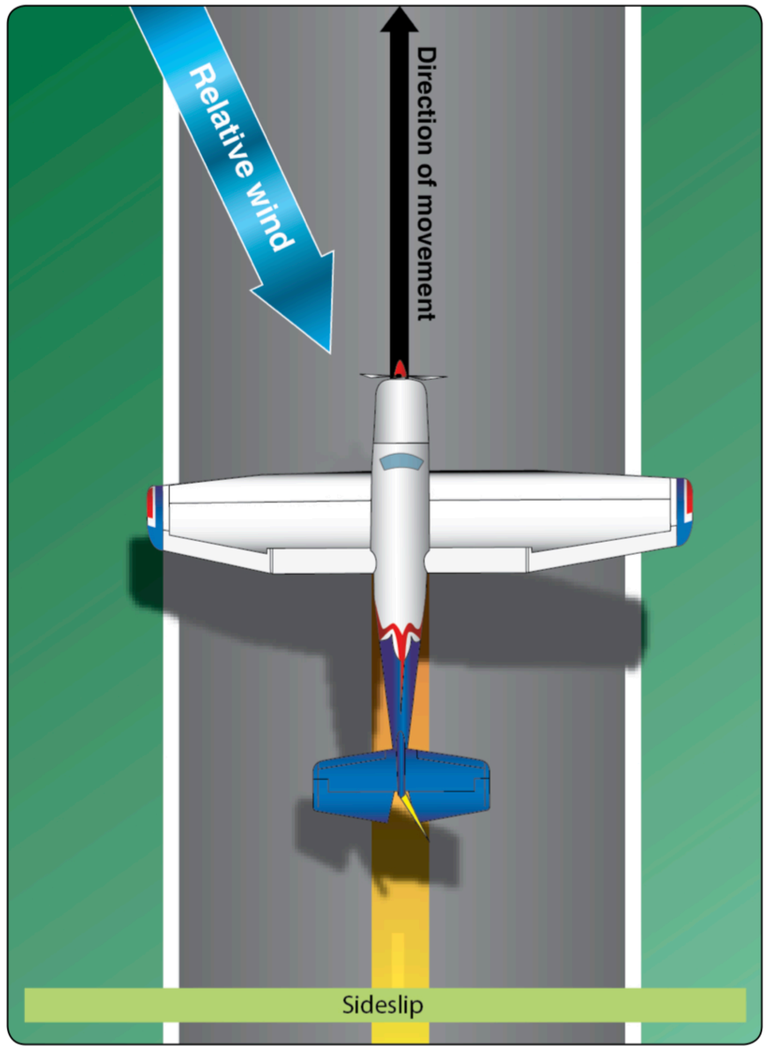
It's mainly used during crosswind landings to keep the aircraft aligned with the runway while compensating for wind drift.

A sideslip allows the aircraft to:

- Remain aligned with the runway centerline during crosswinds
- Drift laterally into the wind, cancelling out wind drift
- Touch down with the aircraft's longitudinal axis (nose) pointed straight down the runway

Performing a Sideslip

- Bank into the wind (the wing into the crosswind).
- Apply opposite rudder to keep the nose pointed straight at the runway (prevent turning).
- Adjust bank/rudder as needed to track straight down the runway centerline.



CROSSWIND CORRECTION

Crosswind Correction

Crosswind correction is the technique used by pilots to compensate for wind blowing across the runway or flight path, especially during takeoff, approach, and landing. Without correction, the wind will cause the aircraft to drift sideways, leading to off-center approaches, unstable landings, or even runway excursions.

When an aircraft is pointed in one direction but moving in another direction, it is said to be using the crab method ("Crabbing")

- The means you are intentionally pointing the aircraft's nose into the wind to maintain a straight ground track.
- The aircraft flies at a slight angle (crab angle) to counteract wind drift.
- Used during approach, especially in high crosswinds.

Pros: Comfortable and stable in strong crosswinds.

Cons: Not suitable for touchdown unless using a crab-capable landing gear (e.g., airliners).
Must be transitioned into a sideslip or straight alignment just before landing.

The crab method can be utilized to correct for crosswind conditions during landing is by purposefully establishing a crab angle, using the rudder and ailerons to angle the aircraft's nose into the direction of the wind while keeping the wings level.

Using a crab angle is useful for:

- Tracking towards a runway to stay on course with the final approach direction
- Staying on a course / heading during cruise flight
- Tracking to a VOR on a radial

Crosswind Correction

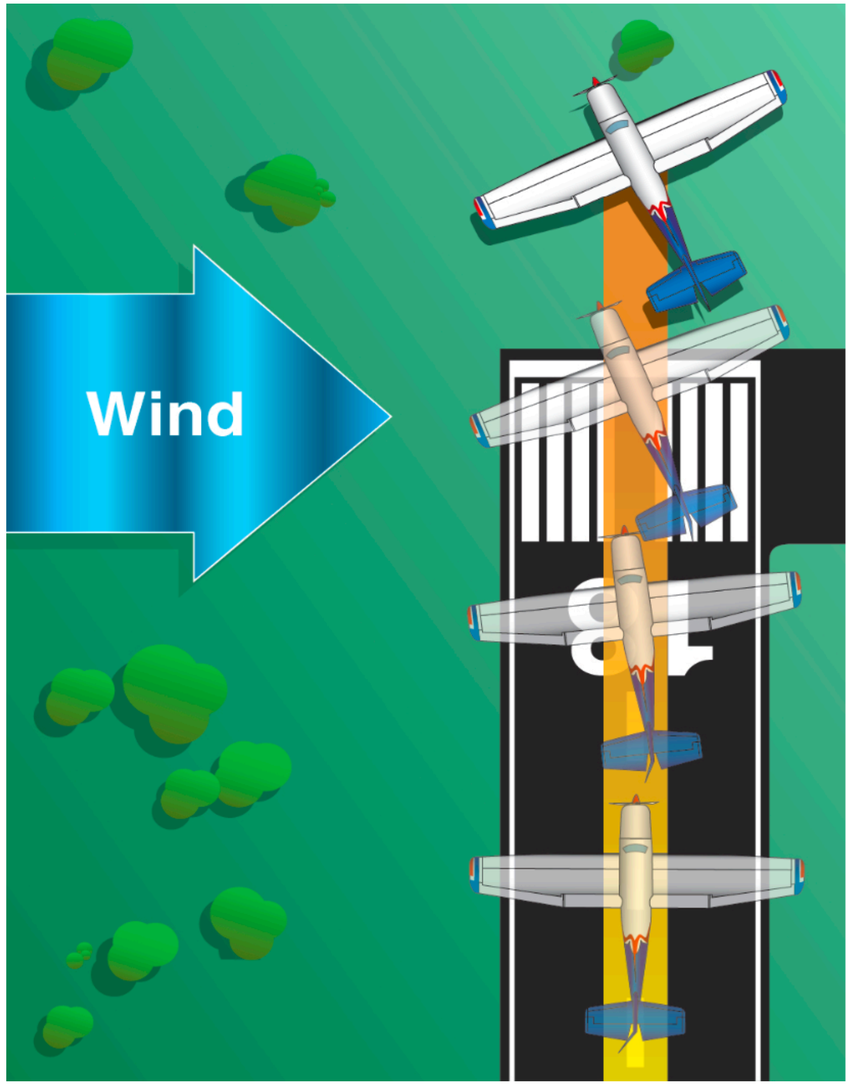
Crosswind Correction During Takeoff

A crosswind affects the airplane during takeoff so the pilot should ensure that the technique for crosswind correction during takeoffs is executed to maintain the desired ground track.

- Aileron into the wind to keep the upwind wing from lifting prematurely.
- Rudder input to maintain directional control as the aircraft weather-vanes into the wind.

As speed increases:

- Reduce aileron input gradually.
- Maintain centerline with rudder.
- Rotate and allow the airplane to weather vane (point) into the wind sufficiently to maintain the desired ground track.



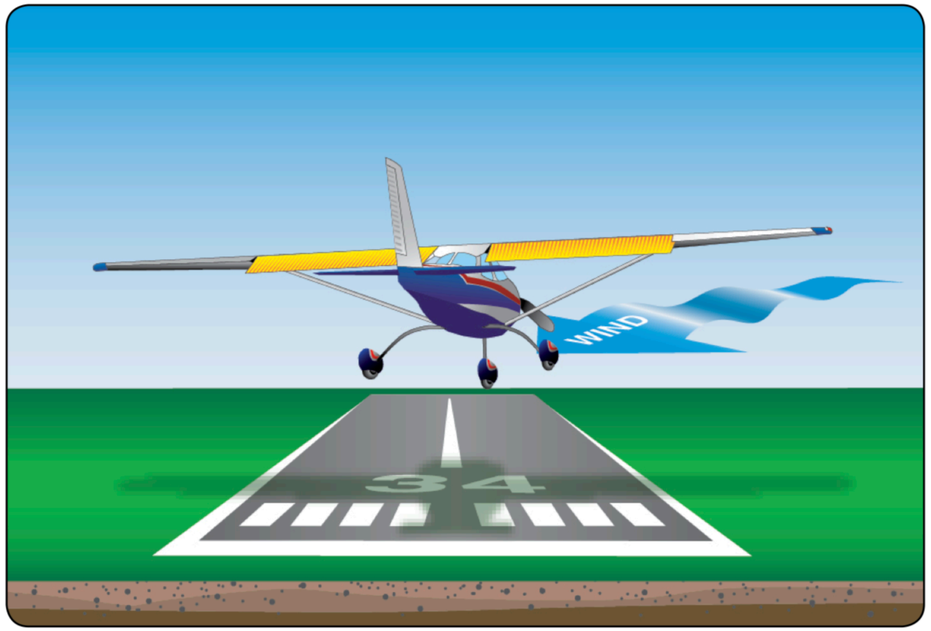
Crosswind Correction

Crosswind Correction During Landing

When landing in a crosswind, the goal is to maintain alignment with the runway while preventing sideways drift caused by wind blowing across the runway. There are two main techniques to correct for crosswind during landing:

Crab Method (Crabbing into the Wind)

- The aircraft's nose is pointed into the wind during final approach to offset drift.
- The aircraft maintains a straight ground track toward the runway.
- Just before touchdown, the pilot "kicks out" the crab using rudder to align the nose with the runway to avoid landing in a side-loaded condition.
- **Failing to remove the crab before touchdown can lead to side-loading the landing gear and possible damage.**



Sideslip Method (Wing Low Technique)

- Bank into the crosswind and apply opposite rudder to keep the nose aligned with the runway.
- The aircraft remains aligned with the centerline and drifts into the wind, compensating for crosswind without sideways movement.
- Throughout the final approach and touchdown in light aircraft.
- Especially effective in moderate crosswinds.

Incursions

Runway Incursion

Runway Incursion:
Any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and takeoff of aircraft.

Surface Incident:
Any unauthorized or unapproved movement within the designated movement area (excluding runway incursions)

- or -

An occurrence in that same area associated with the operation of an aircraft that affects or could affect the safety of flight.

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or
- An occurrence in that same area associated with the operation of an aircraft that affects or could affect the safety of flight.

Approximately three runway incursions occur each day at towered airports within the USA

Pilot Deviations:
- Crossing a runway hold marking without clearance from ATC
- Taking off without clearance
- Landing without clearance

Operational Incidents (OI):
- Clearing an aircraft onto a runway while another aircraft is landing on the same runway
- Issuing a takeoff clearance while the runway is occupied by another aircraft or vehicle

Vehicle (Driver) Deviations:
- Crossing a runway hold marking without ATC clearance

Incursions while taxiing

Avoiding Incursions while taxiing

- **Make taxi route planning an integral part of pre-flight planning.**
- Be current with your knowledge of airport signage
- Understand what mandatory hold points are
- Make a note of mandatory hold points.
- **Review airport layout(s) as part of pre-flight planning**
- Make a note of **hot spots**.
- Listen to ATIS to understand runway(s) in use.
- Know the traffic patterns for un-towered airports
- **Ensure you have (and use) Airport Diagram(s) during taxiing**

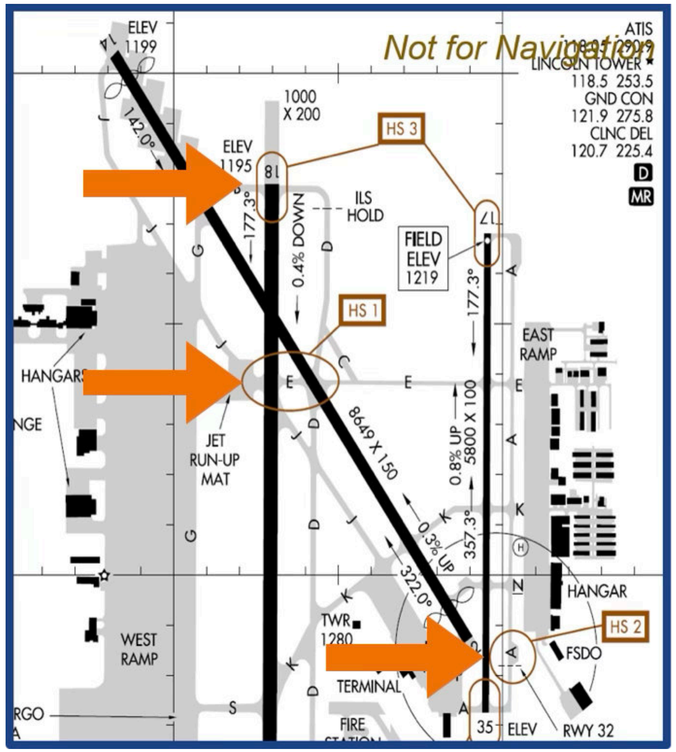
Prior to taxiing

- Know where you are on the airport and what the location is called.
- You will need to tell ATC so they can issue you a taxi clearance.
- Pickup ATIS / Runway information.
- Be ready to taxi when you call ATC. (they will be looking for you)

Airport Hot Spots

Airport Hot Spots

- Hot spots are generally a complex or confusing taxiway or taxiway and runway intersection.
- Hot spots have a history or potential risk of collision or runway incursion, and require heightened attention by pilots and drivers.
- **Heightened attention by pilots, drivers and controllers is necessary.**



The FAA have standardized symbols to three shapes with two distinct meanings:

A **circle or ellipse** will depict these hot spots, which include issues such as:

- Hold short line infractions
- Approach hold issues
- Complex taxiway configurations
- Movement-non movement boundary area issues
- Tower line of sight problems

A **cylinder** for wrong surface hot spots.

- Wrong surface hot spots depict locations where an aircraft has inadvertently attempted to or actually departed or landed on the wrong surface. A cylinder will depict these hot spots.

Communications (Towered Airport)

- Know and use standard ATC phraseology **at all times** to facilitate clear and concise communication
- On initial contact with any controller, state: what you are, who you are, where you are and, what you want.
- Focus on the ATC clearance / Don't perform any nonessential tasks while communicating with ATC
- Write down all clearances from ATC
- Read back taxi instructions including any runway crossing or hold instructions (mandatory)
- Understand the route and the clearance before beginning to taxi
- If in doubt ask for clarification.
- When taxiing up to the runway hold short line be ready to communicate with the tower - stating your intentions. READ BACK ALL HOLD SHORT INSTRUCTIONS
- If the controller does not explicitly clear you for take of or to line up and wait DO NOT cross the runway hold short line.
- IF IN DOUBT ASK AND CONFIRM!

Communications (Un-Towered Airport)

Maintain situational awareness

- Be familiar with the local traffic pattern direction and pattern altitude
- Be aware of the routes into and out of the airport and know where you are and other aircraft are operating at all times
- Know that other aircraft may be using an IAP to runways other than the runway in use for VFR operations
- During calm wind conditions, be aware that flight operations may occur at more than one runway at the airport

Departing

- Remember not all aircraft are radio-equipped; therefore, before entering or crossing a runway, listen on the CTAF for inbound aircraft information.
- Scan the full length of the runway, including the final approach and departure paths of the runways you intend to enter or cross.

Communication

- Be alert and communicate your intentions on the common traffic advisory frequency (CTAF), and listen for other aircraft operating on, to, and from the airport.
- Be your own controller - clear yourself to enter taxiways and runways the same way a ATC controller would. Check and double check to ensure that you only enter runway areas when it is completely safe to do so

Incursions - General Rules

- Always give 100% attention to taxiing
- Don’t follow other aircraft - their clearance will be different to yours
- Ensure that the clearance you heard is for you - if in doubt ask!
- Don’t ever cross a runway or other mandatory hold boundary unless you are 100% sure you are cleared - don’t assume - clarify!
- Don’t ever cross a runway or other mandatory hold boundary without checking left / right that it is clear to do so. (even if you have a clearance)
- Use all available resources to ensure you do not enter protected areas without a clearance
- Turn on and use all lights when crossing a runway - make yourself visible.
- Expedite all crossings of runway areas

Aborted Landing / Go Arounds

Aborted Landing / Go Arounds

Whenever landing conditions are not satisfactory, a go-around is warranted. There are many factors that can contribute to unsatisfactory landing conditions.

Note: The go-around is not strictly an emergency procedure. It is a normal maneuver that is also used in an emergency situation.

When to execute a go-around

- Anytime you believe safety is (or could be) compromised and that there is a risk to the you or other's safety is at risk.
- You've floated well past your touchdown point - If you are landing too far down the runway to stop safely. The rule of thumb says that if the aircraft isn't on the ground in the first third of the runway — go around.
- If you are not stabilized for the approach by 500' AGL (VFR) i.e the speed or the alignment isn't right, go around (including no landing clearance)
- If there is the presence of another aircraft, vehicle or person on the runway.
- Experiencing severe wind shear
- Air traffic control requests / requires a go-around
- After a hard bounce, go-around to avoid porpoising
- You overshoot your base to final turn
- You realize you forgot to complete your checklists or you're not configured for landing.
- It just doesn't "feel right."

Performing a Go Around

When the decision to go around is made the following steps should be carried out:

Power

The instant a pilot decides to go around, **full or maximum allowable takeoff power** must be applied smoothly and without hesitation and held until flying speed and controllability are restored.

Attitude

Attitude is critical when close to the ground, and when power is added, a deliberate effort on the part of the pilot is required to **prevent the nose from pitching up prematurely**. An attitude is maintained that permits a buildup of airspeed well beyond the stall point before any effort is made to gain altitude or to execute a turn.

Configuration

After establishing the proper climb attitude flaps must be configured to remove high drag. (and secondly landing gear if retractable - in case the airplane inadvertently touches down as the go-around is initiated

Communications

You must notify ATC / CTAF of your intentions to go around. This is the last step. Safety of the airplane is the priority - Once you have completed the previous step you may nofify others of your intention to go aound

Performing a Go Around

The 5 C's of a Go-Around

- Cram - Full Power
- Climb - At Vx or Vy as Appropriate
- Clean - Retract Flaps and Landing Gear
- Cool - Open Cowl Flaps (if applicable)
- Call - Inform ATC of Go-Around Decision

Collision Avoidance

Collision Avoidance

It is the PIC's responsibility to "see and avoid" other aircraft, as laid out in FAR 91.113(b)

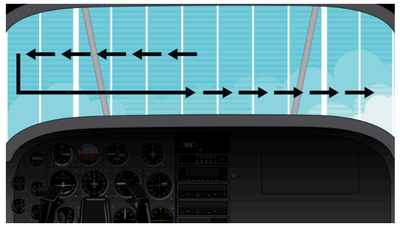
- Clean - Retract Flaps and Landing Gear
- Proper clearing before any turns or maneuvers
- Adjusting focus
  - A proper scan optimizes our vision for collision avoidance. A scan implies a sweep of the eyes, while the correct scan for conflicting traffic is actually a sequence of intense, fixated observations. The eyes need one to two seconds to adjust before they can focus; a continuous sweep blurs the vision.
- Rights of way rules
- Pursuit Curves Lead, Lag, Pure (Lag preferred to miss traffic)
- Right of way rules
- Flight Following

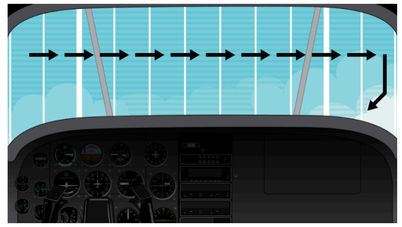
Collision Avoidance

It is the PIC's responsibility to "see and avoid" other aircraft, as laid out in FAR 91.113(b)

Utilizing proper clearing techniques before any turns or maneuvers

A proper scan optimizes our vision for collision avoidance. A scan implies a sweep of the eyes, while the correct scan for conflicting traffic is actually a sequence of intense, fixated observations. The eyes need one to two seconds to adjust before they can focus; a continuous sweep blurs the vision.





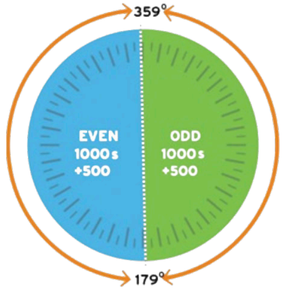
Adjusting focus: The eyes tend to relax to an intermediate focal distance. To counteract this tendency, the eyes must periodically refocus on the farthest object within sight—a cloud on the horizon, another aircraft at a distance, or a point on the ground.

Flight Following: Requesting and receiving flight following provides realtime traffic updates and advisories while flying cross country

Using technology: Connecting an iPad with Foreflight to your airplane's ADS-B equipment will provide realtime air traffic information

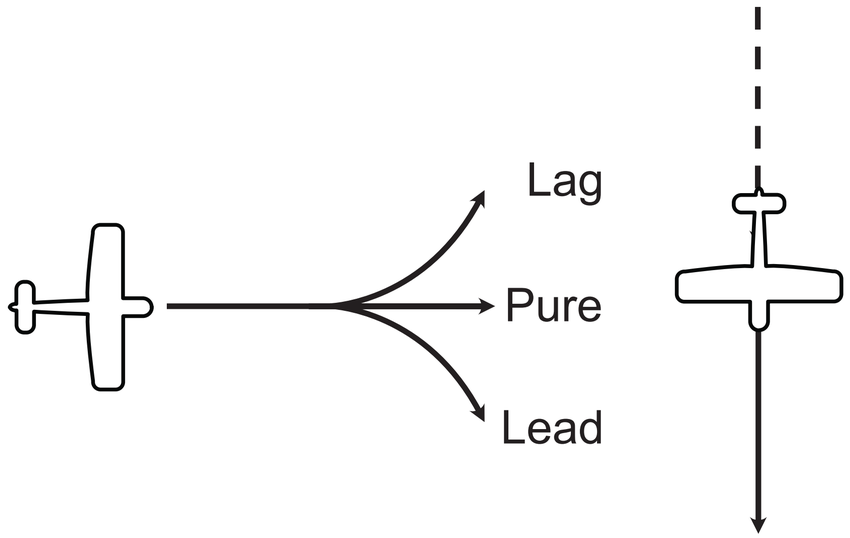
Collision Avoidance

- Fly at expected **VFR altitudes** - be predictable
- Right of way rules: FAR 91.113
  - Aircraft in distress have the right of way over all other aircraft
  - When two airplanes are approaching head-on, both pilots should turn right to avoid a collision
  - When two aircraft of different categories are approaching each other, the less maneuverable has the right of way.
  - When approaching another aircraft at the same altitude, the aircraft to the right has the right of way
  - When two aircraft are approaching for landing, the aircraft that is lower has the right of way (except this is not to be taken advantage of, i.e. diving lower to make you be that aircraft with the “right of way”)
  - An aircraft towing or refueling another aircraft has the right of way over all engine driven aircraft
- Use Technology: If you have a traffic awareness technology such as ADS-B, include it in your scan and practice correlating targets on the screen to what you see out the windscreen. Technology can improve your situational awareness, but it’s not a substitute for looking outside: Don’t fixate on the screen, and remember not all aircraft will appear on the display.
- Use aircraft lights as required to be seen.



Collision Avoidance

- **Pursuit Curves** - **Lead, Lag, Pure** (lag preferred to miss traffic)
- Pursuit curves describe where you point your aircraft relative to other aircraft.
- **Lead** pursuit points ahead of the other aircraft current flight path.
- **Pure** pursuit points at the other aircraft. Like lead pursuit it can reduce distance to the other aircraft but not as quickly.
- **Lag** pursuit points behind the other aircraft. Lag helps you align flight paths to put you into position behind the other aircraft. Lag pursuit maintains or increases the distance to the other aircraft.



Windshear and Turbulence Avoidance

Windshear and Turbulence Avoidance

Wind shear is a change in wind speed and/or direction over a short distance.

It can occur either horizontally or vertically and is most often associated with strong temperature inversions or density gradients. Wind shear can occur at high or low altitude

Wind shear can change a routine approach into an emergency recovery in a matter of seconds. An aircraft is affected by the change in wind direction/velocity because the wind also changes the aircraft motion relative to the ground.

How To Cope with wind shear

- Don't takeoff if the airport is reporting low-level wind shear. Wait for the wind to change or fly another day.
- If you are approaching an airport that is reporting low level wind shear.
  - Understand the magnitude of the change.
  - Be prepared to correct or go around immediately.
- If you are committed to landing and you encounter low level wind shear.
  - As the aircraft passes through the shear level, airspeed and lift are lost. The aircraft starts to sink and drops below the glide path. You must recognize this and correct with increased pitch and power.
  - Keep your airspeed up (if a wind gust drops you will lose life rapidly)
  - Be prepared to correct or go around immediately.
  - If necessary divert to a nearby airport.
- For more information see FAA document Wind Shear

Wake Turbulence Avoidance

Wake Turbulence Avoidance

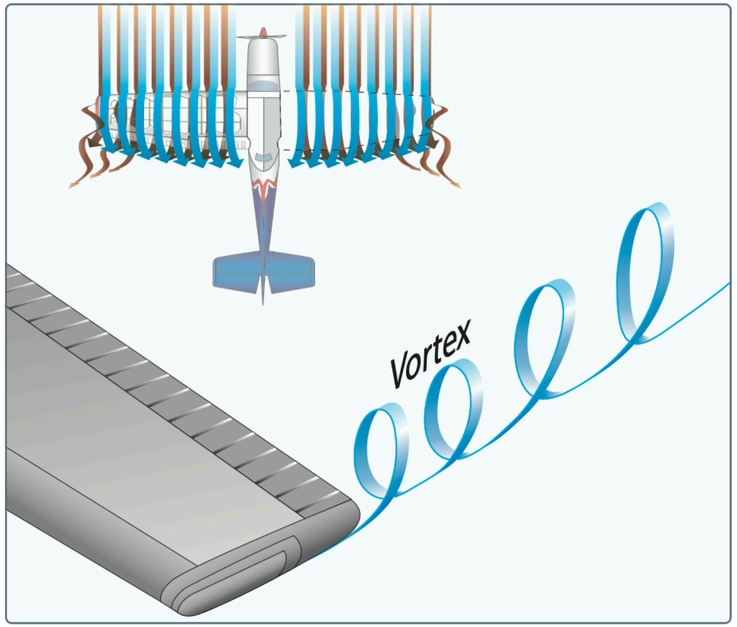
Wake turbulence refers to the disturbed air left behind an aircraft, especially by the wingtip vortices generated when lift is produced. These can be dangerous to following aircraft, particularly small ones flying behind or below large aircraft.

When an aircraft generates lift, air flows from high pressure under the wing to low pressure above, creating rotating vortices at the wingtips.

These vortices trail behind the aircraft, slowly descending and spreading outwards.

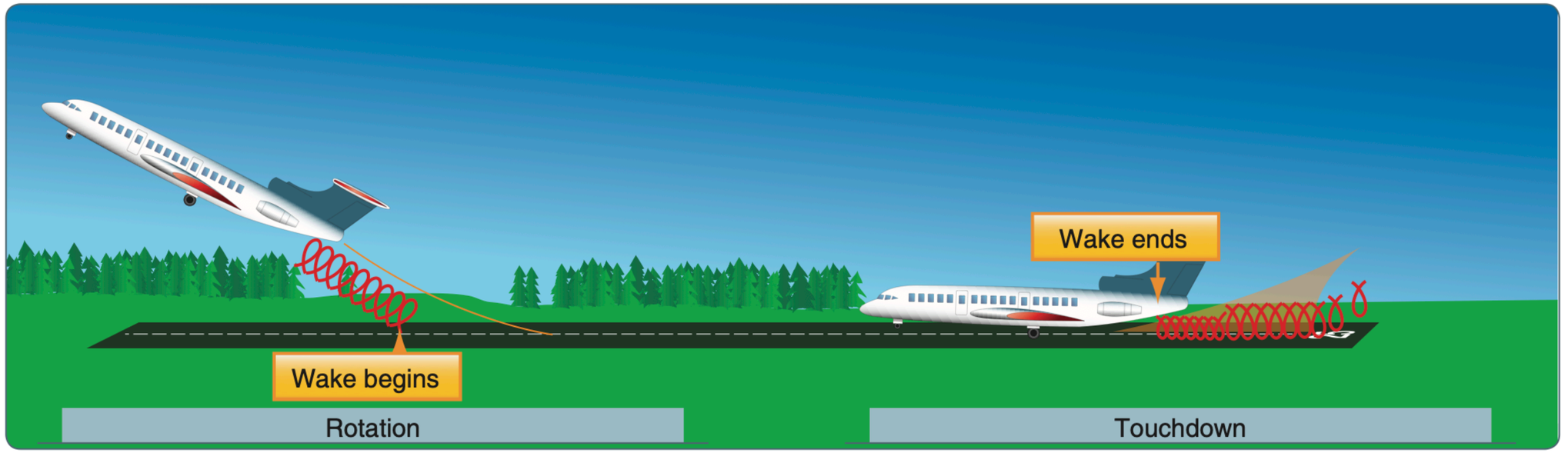
Most Dangerous Wake Turbulence is produced by **slow, heavy, clean,** aircraft:

- **Heavy**: More lift → stronger vortices
- **Clean:** No flaps/spoilers → less drag, tighter vortex
- **Slow**: Vortices linger longer in the air



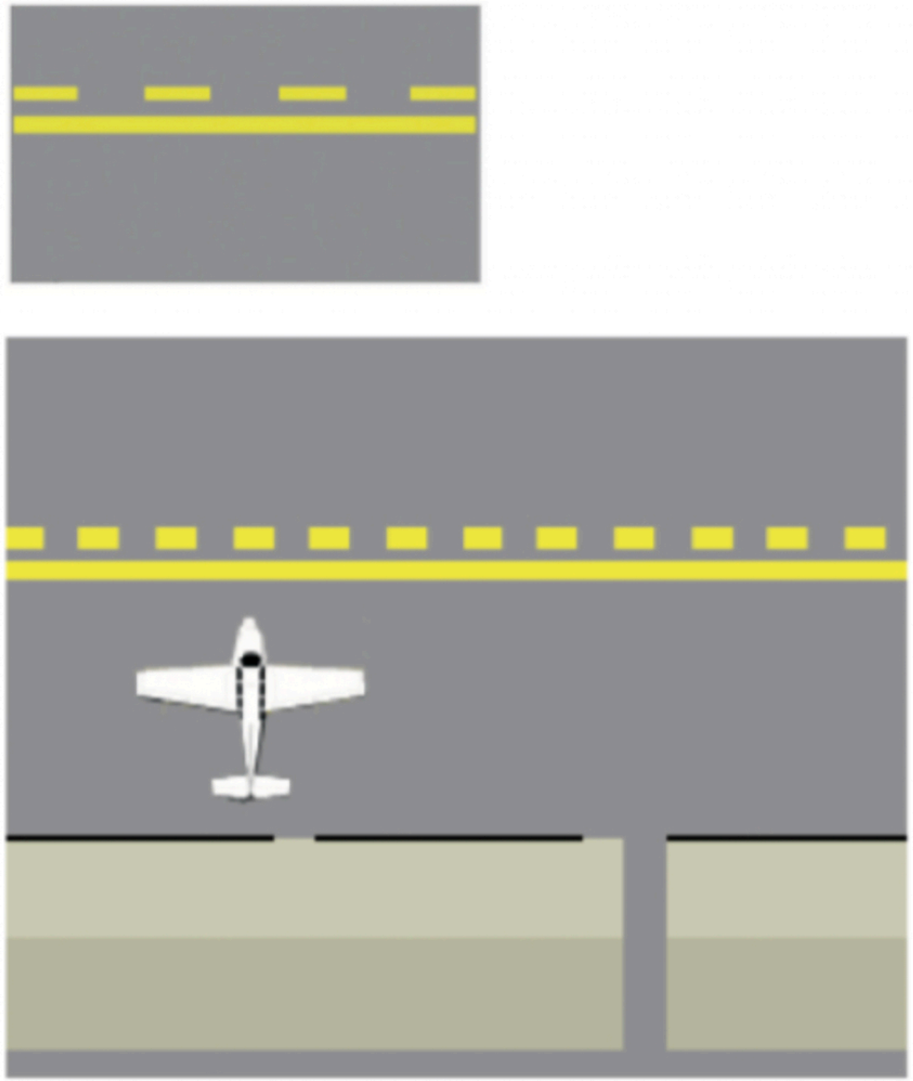
Wake Turbulence Avoidance

- Avoid flying through another aircraft's flight path.
- **Rotate prior to the point** at which the preceding aircraft rotated when taking off behind another aircraft.
- Avoid following another aircraft on a similar flight path at an altitude within 1,000 feet.
- Approach the runway above a preceding aircraft's path when landing behind another aircraft and **touch down after the point** at which the other aircraft wheels contacted the runway.



Airport Signage and Markings

Airport Signage and Markings

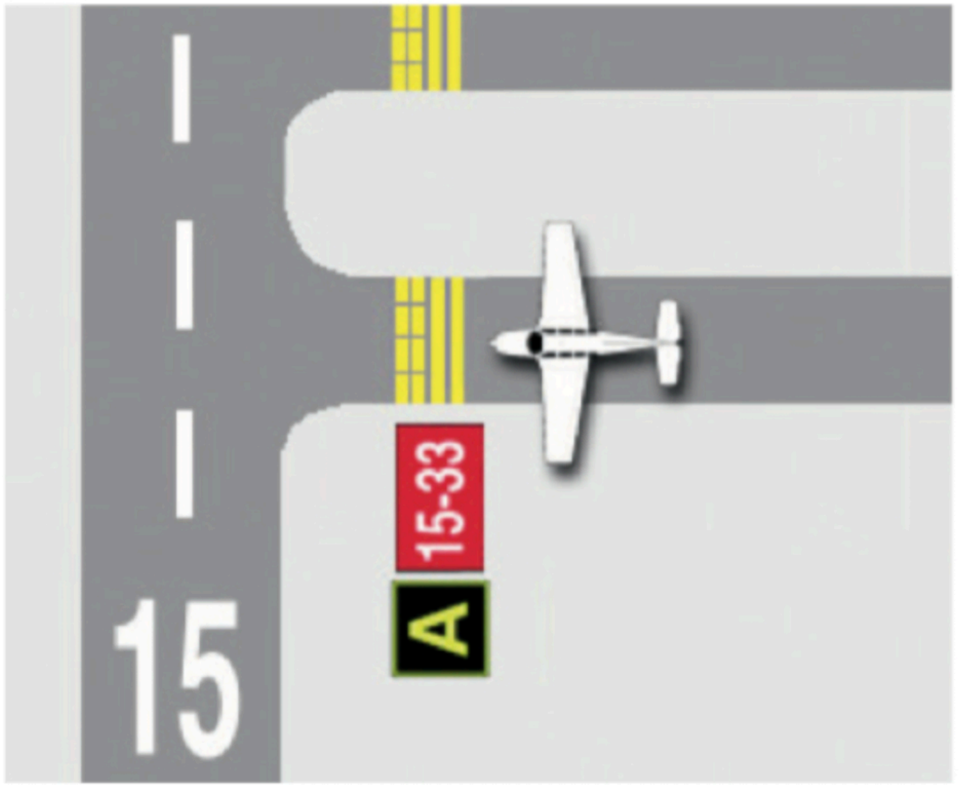


Movement Area Boundary Markings

These markings can be seen at tower-controlled airports where hangar or apron areas are located adjacent to a taxiway. The solid side of the line indicates the non-movement area, which is not under ATC control, and the dashed side indicates the movement area, which is under ATC control.

Ref. AIM Para. 2-3-6-c

Airport Signage and Markings

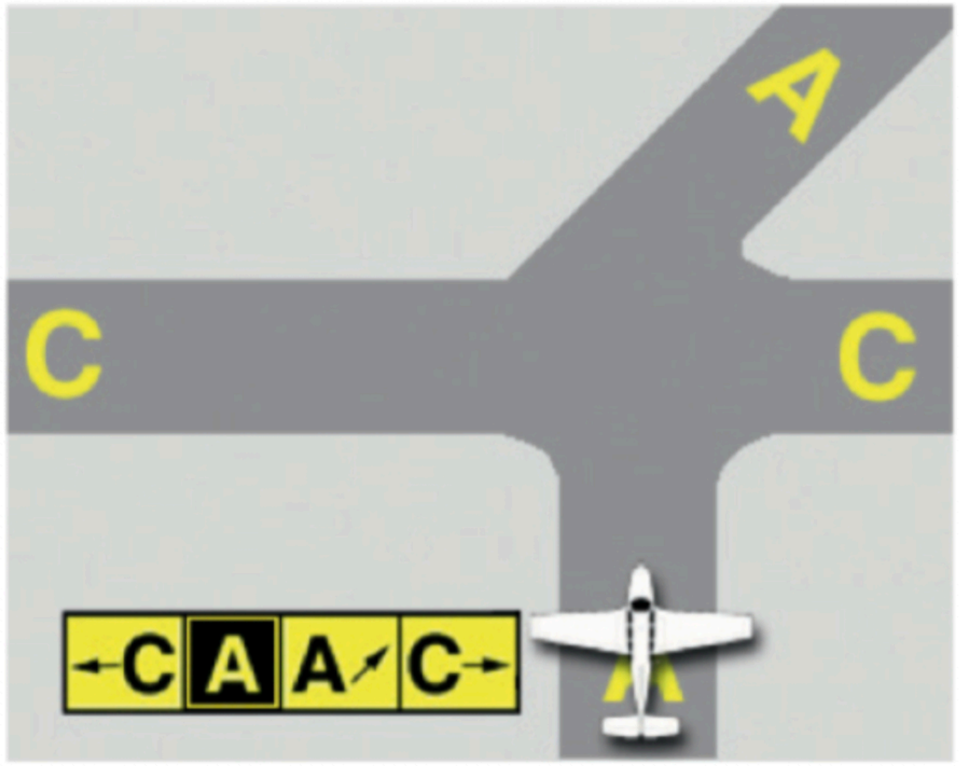


Taxiway Location Sign

Indicates the taxiway on which the aircraft is located. May be co-located with direction signs or runway holding position signs, as shown in graphic.

Ref. AIM Para. 2-3-9-a-1

Airport Signage and Markings

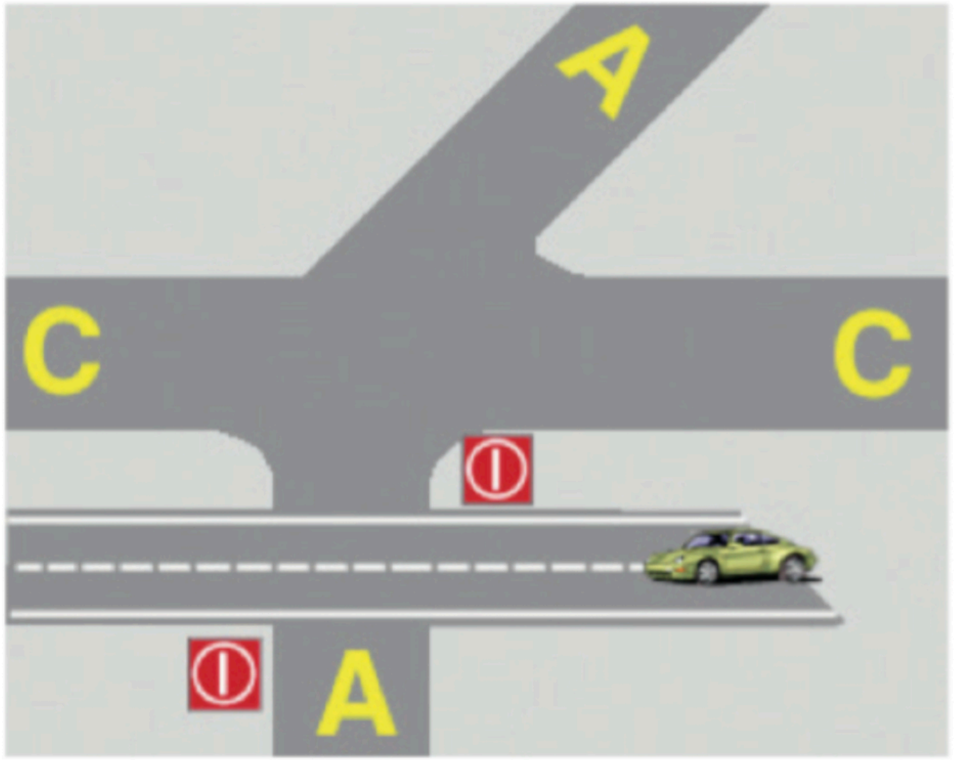


Taxiway Direction Sign

Usually located next to or in an array with a taxiway location sign, these yellow signs indicate the name and direction of intersecting taxiways. In this example, taxiway Charlie is to the left and right, and Alpha is ahead and to the right.

Ref. AIM Para. 2-3-10/11

Airport Signage and Markings



No Entry Sign

Prohibits an aircraft from entering an area, such as a one-way taxiway or the intersection of a road intended for vehicles.

Ref. AIM Para. 2-3-8-b-4

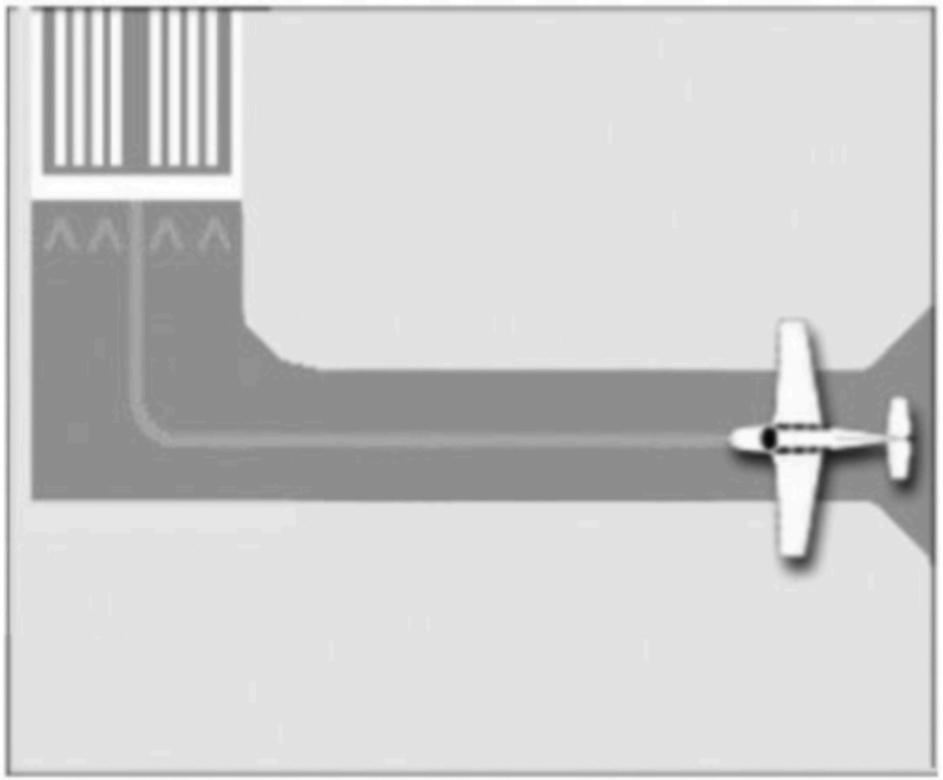
Airport Signage and Markings

Taxiway Ending Marker

Indicates the taxiway does not continue. Located on the far side of the intersection.

Ref. AC 150-5340-18F, Chapter 1-9

Airport Signage and Markings

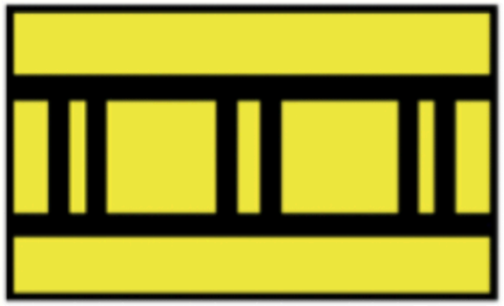


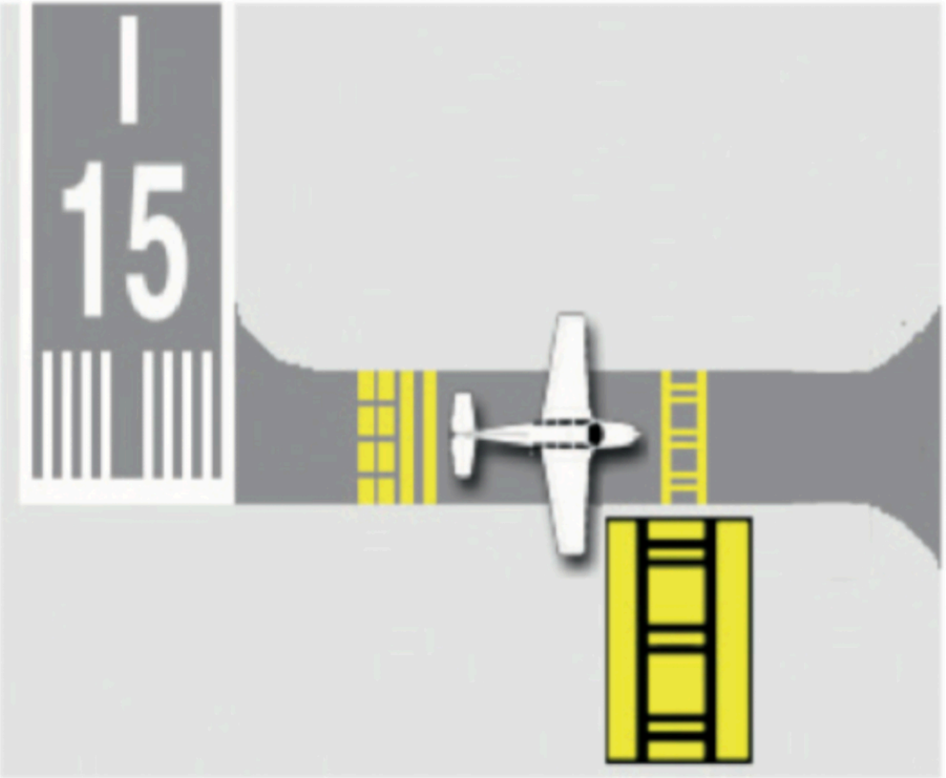
Relocation of a Threshold

Yellow line and arrowhead surface markings indicate that a portion of the runway has been closed and that the threshold has been moved. Possible causes for the relocation include construction or other airport maintenance. The closed area is not available for takeoffs or landings.

Ref. AIM Para. 2-3-3-h-1

Airport Signage and Markings



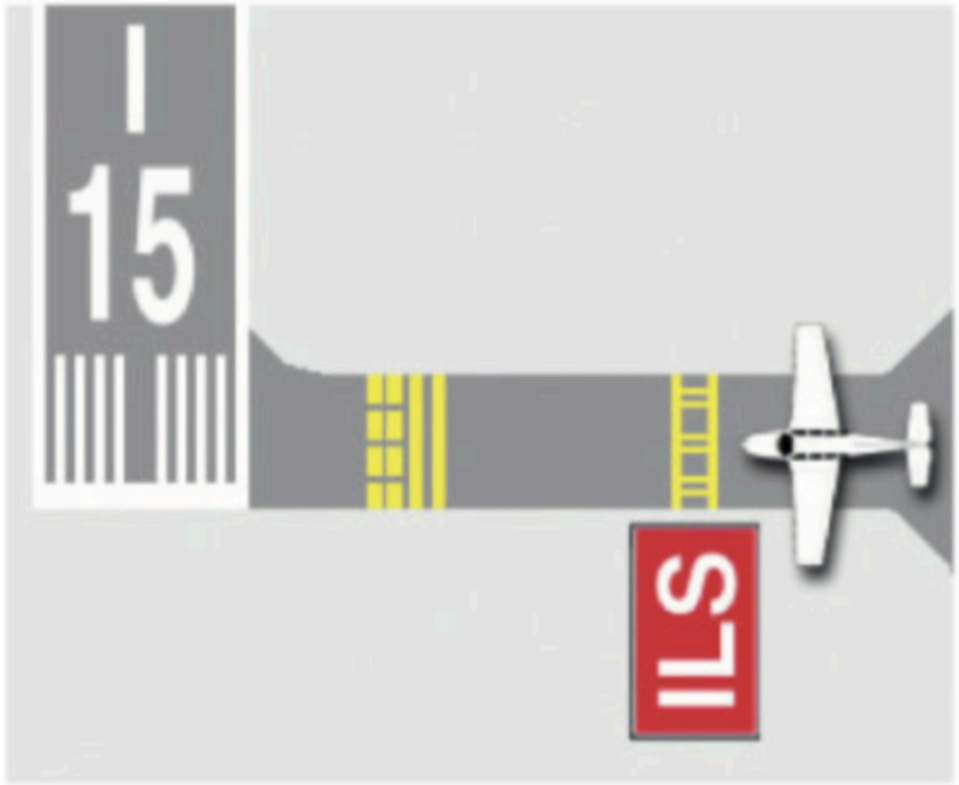


ILS Critical Area Boundary Sign

Positioned in conjunction with the ILS holding position markings, but seen only when taxiing or driving away from the runway. Aircraft or vehicles exiting the runway are clear of the ILS critical area when they move beyond the holding position marking.

Ref. AIM Para. 2-3-9-a-4

Airport Signage and Markings

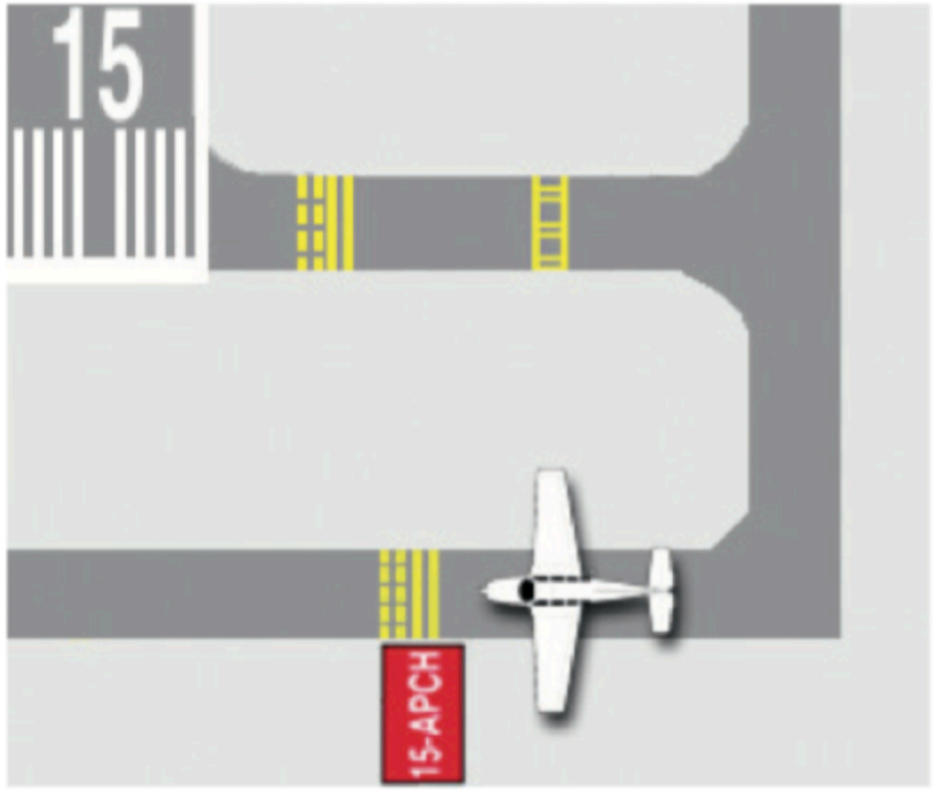


ILS Critical Area Holding Position Sign

Located next to the yellow surface-painted ILS critical area marking. Aircraft taxiing beyond this point may interfere with the ILS signal. Hold short of this location when instructed by ATC.

Ref. AIM Para. 2-3-8-b-3; 4-3-18-a-8

Airport Signage and Markings

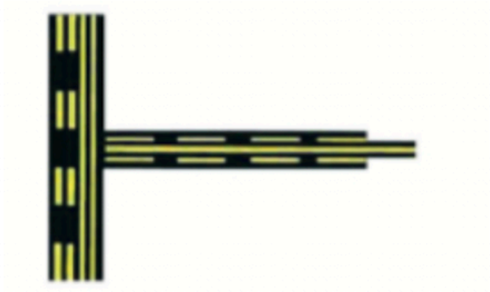


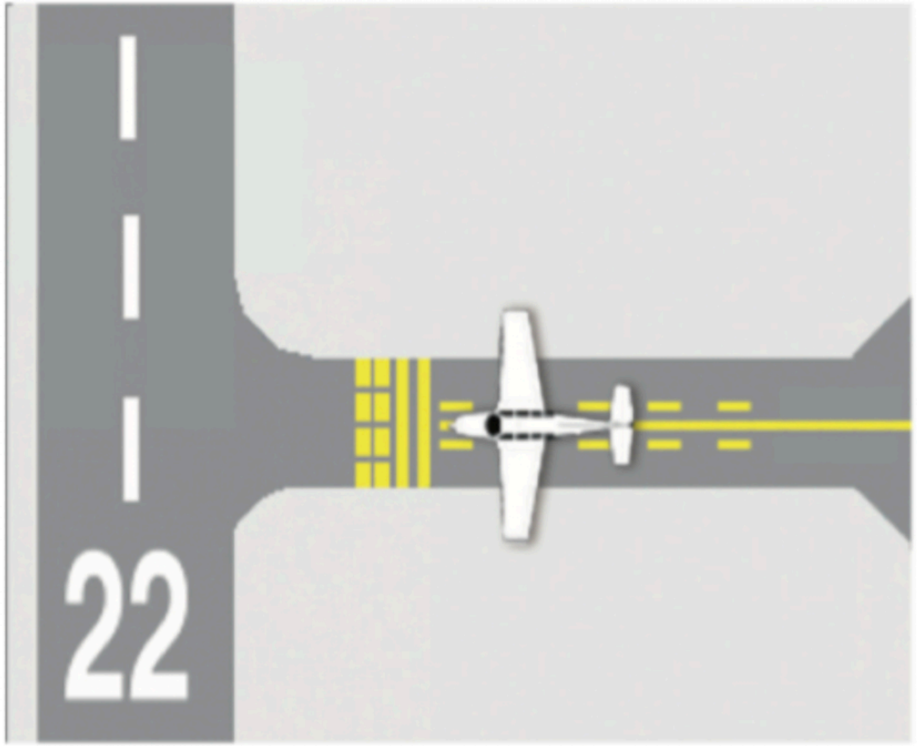
Runway Approach Area Holding Position Sign

Located next to the yellow holding position surface markings. Taxiing past this sign may interfere with arriving or departing aircraft. Hold short of this location when instructed by ATC.

Ref. AIM Para. 2-3-8-b-2; 4-3-18-a-8

Airport Signage and Markings



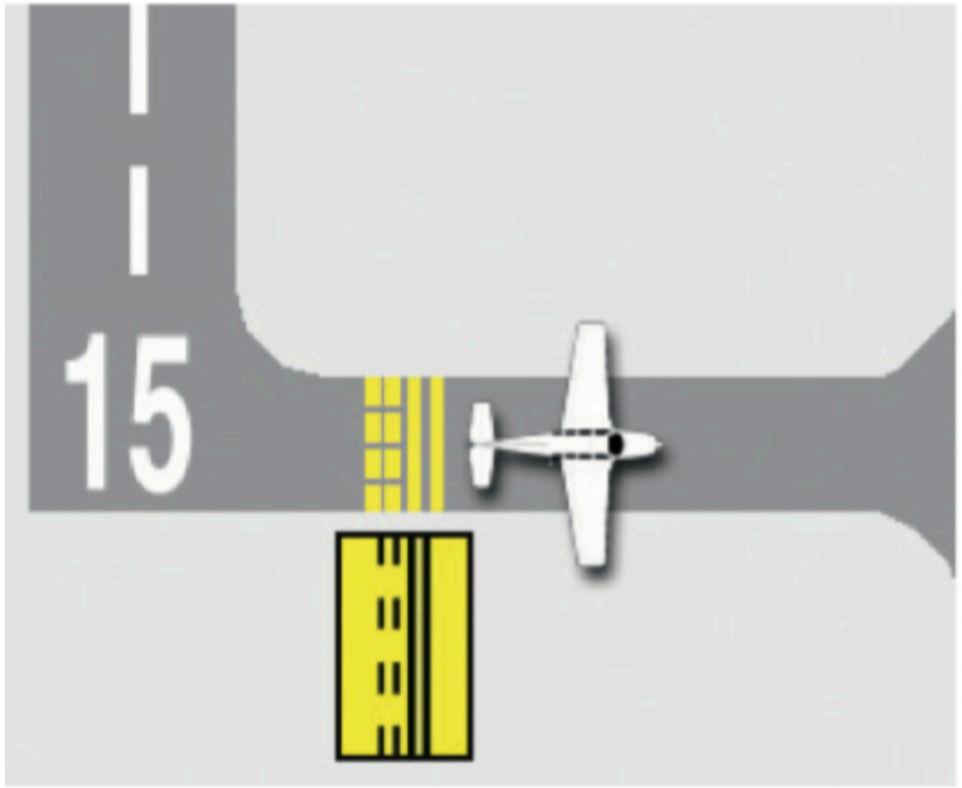


Enhanced Taxiway Centerline Markings

Used mostly at larger airports, these markings indicate that the aircraft is approaching a runway. Prior to a runway holding position marking, the taxiway centerline will be "enhanced" to include a set of yellow dashed lines. Installed at more than 500 airports throughout the U.S., these dashed yellow markings extend 150 feet from the runway holding position on either side of taxiway centerlines.

Ref. AIM Para. 2-3-4-b-2

Airport Signage and Markings

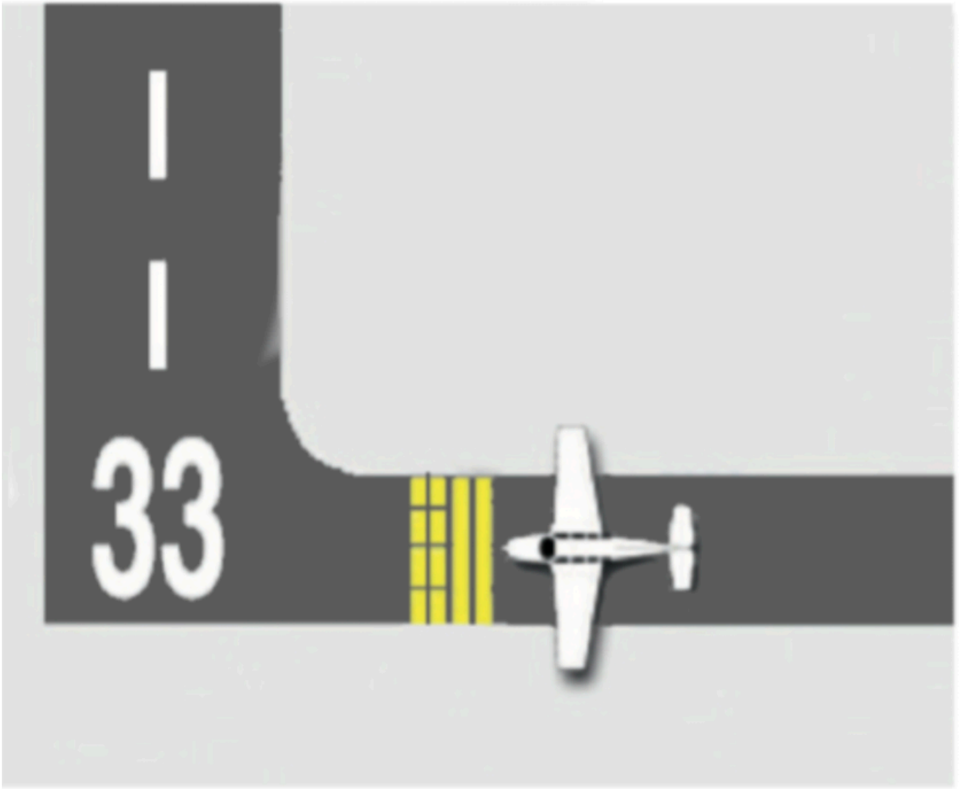


Runway Boundary Sign

This sign faces the runway and is visible to pilots exiting the runway. It is located next to the yellow holding position markings painted on the taxiway pavement. Taxi past this sign to be sure you are clear of the runway.

Ref. AIM Para. 2-3-9-a-3

Airport Signage and Markings

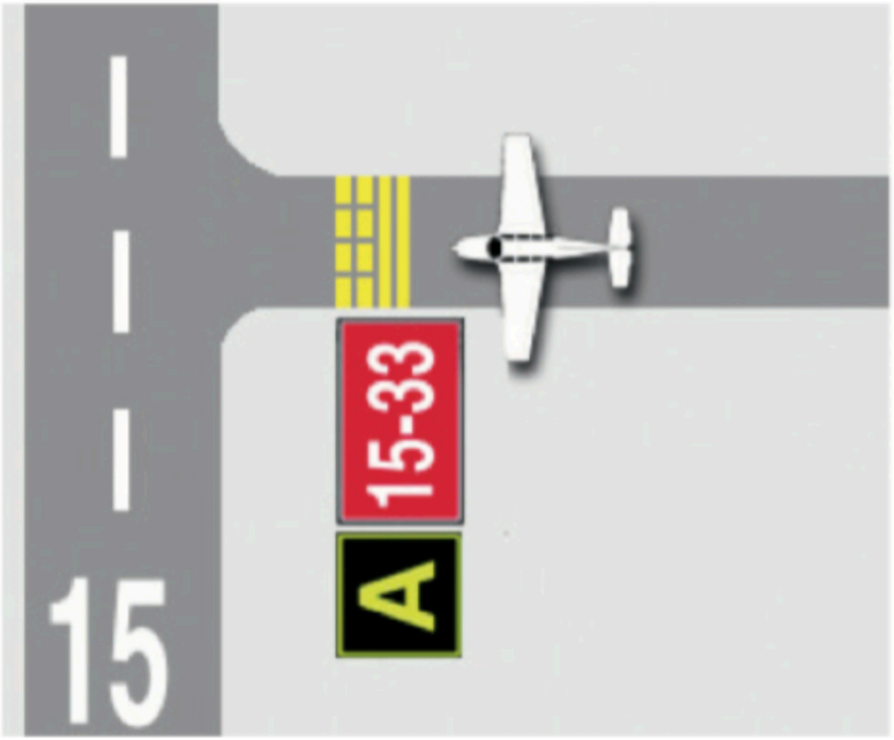


Runway Holding Position Markings

A yellow surface-painted marking on a taxiway, typically collocated with a red and white runway holding position sign, indicates that an aircraft or vehicle must stop at the double solid lines until cleared to cross by ATC. This marking may also be seen on a runway, or with a taxiway approach hold sign, in which case ATC will provide appropriate hold short instructions.

Ref. AIM Para. 2-3-5

Airport Signage and Markings

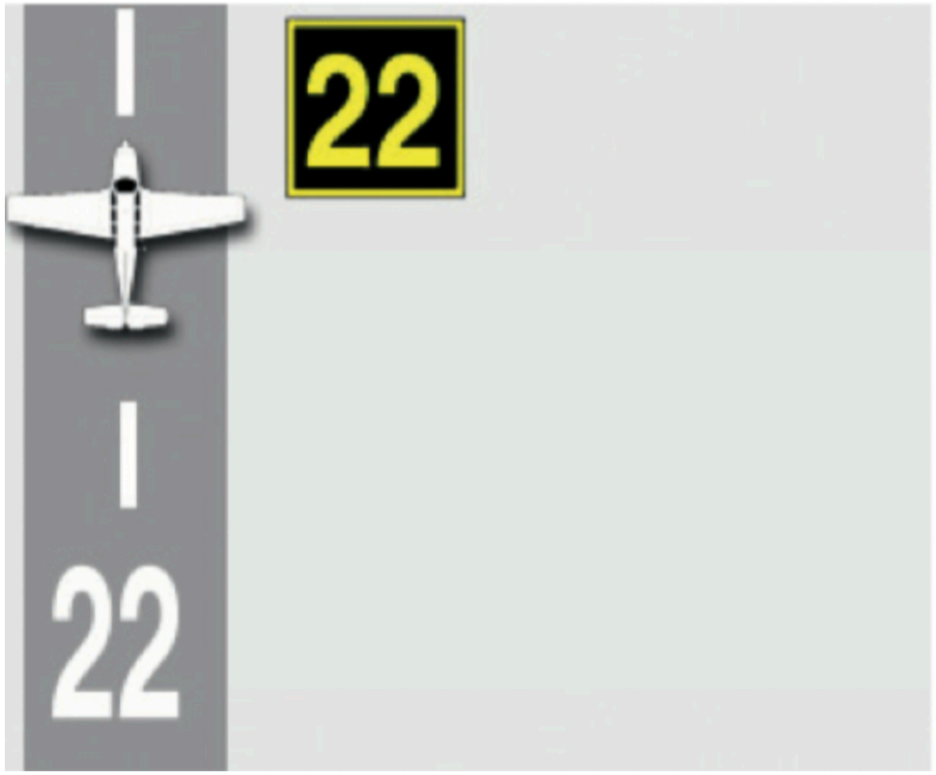


Runway Approach Area Holding Position Sign

Located next to the yellow holding position surface marking on taxiwaysor runway intersections. In this example, the threshold for Runway 15 is to the left and the threshold for Runway 33 is to the right. Aircraft may not move beyond this sign/marking unless instructed by ATC at towered airports, or by ensuring adequate separation of aircraft at non-towered airports.

Ref. AIM Para. 2-3-8-b-1

Airport Signage and Markings

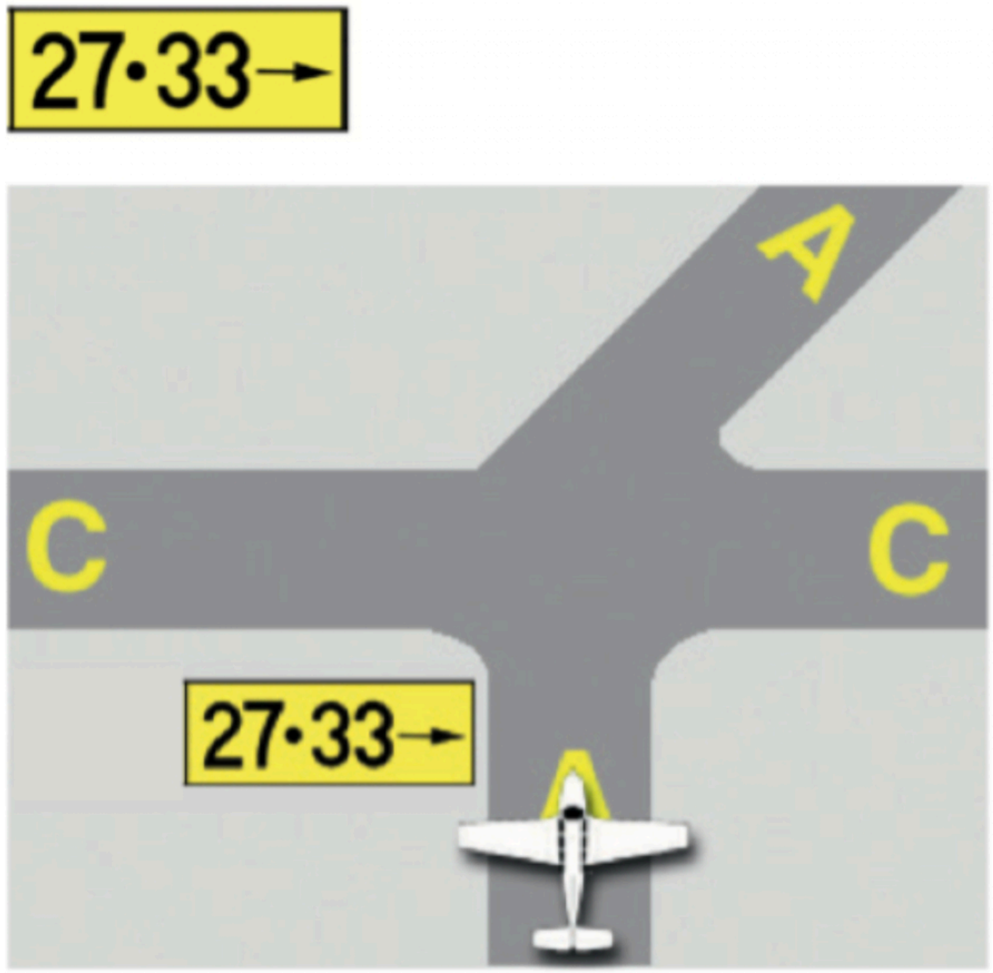


Runway Location Sign

Identifies the runway on which the aircraft is located.

Ref. AIM Para. 2-3-a-2

Airport Signage and Markings

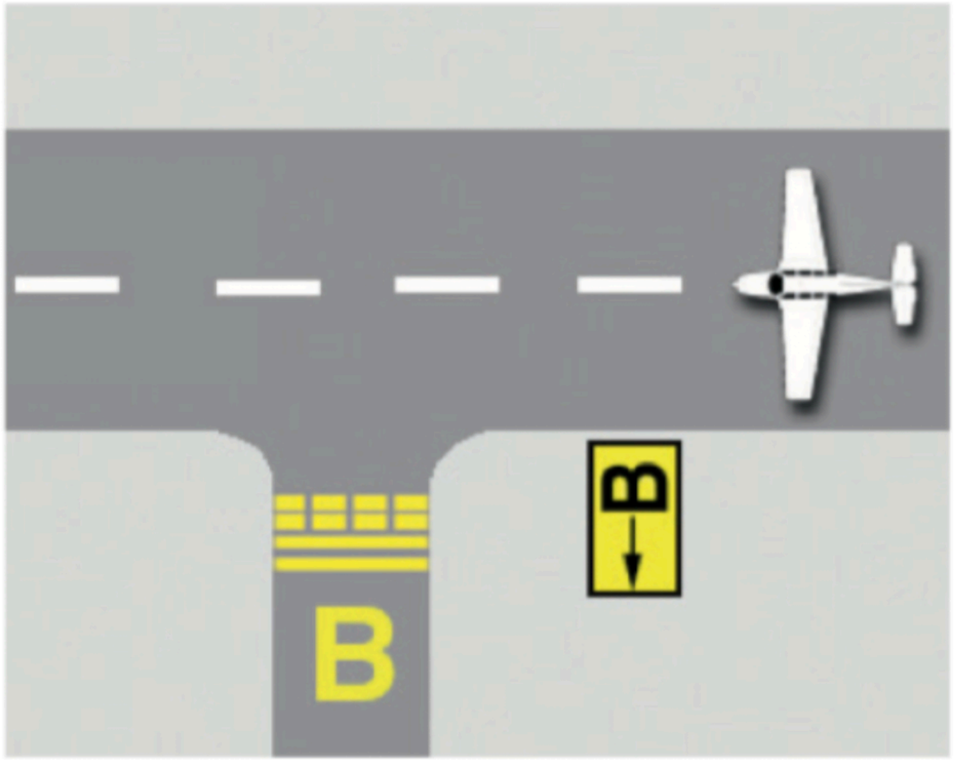


Destination Sign

Indicates the direction of a taxi route to a runway(s) or other location. In this example, Runways 27 and 33 are to the immediate right.

Ref. AIM Para. 2-3-10/11

Airport Signage and Markings

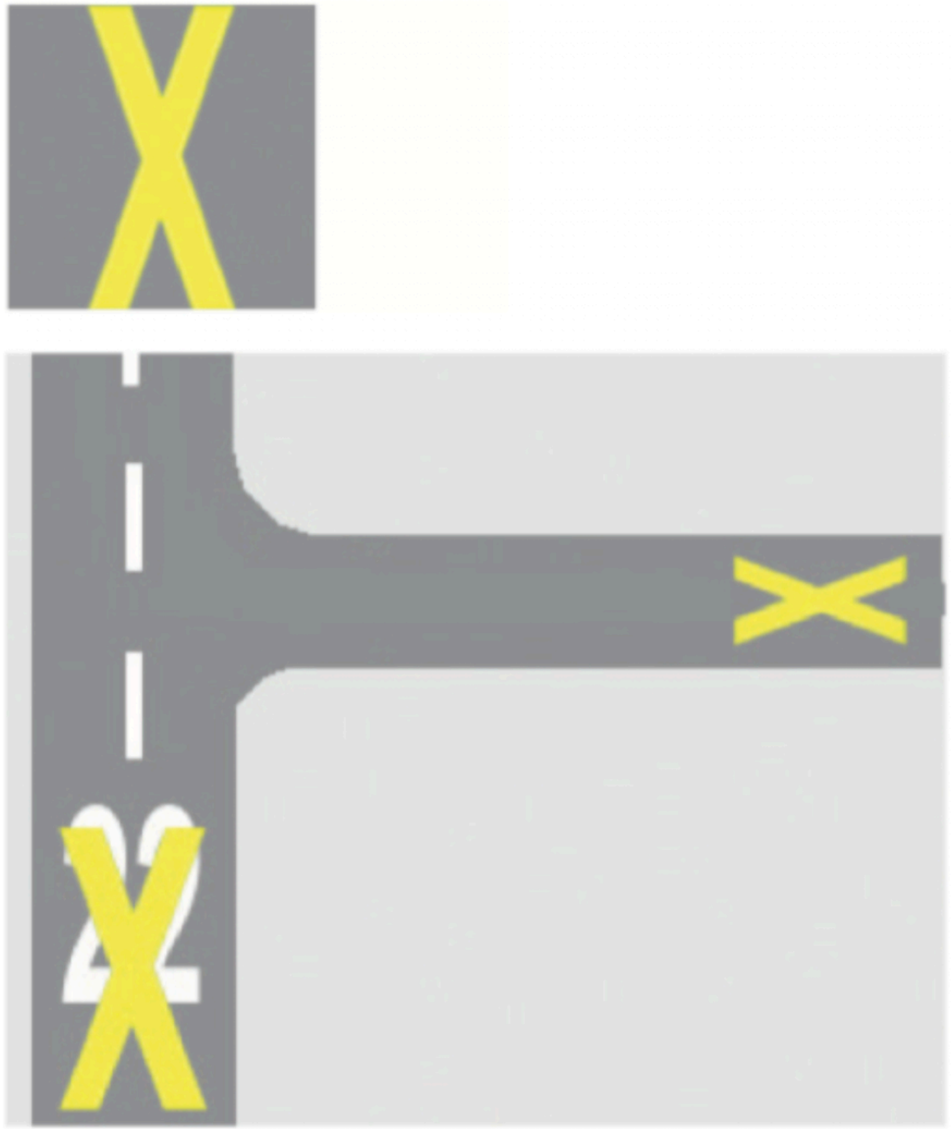


Direction Sign for Runway Exit

Indicates a taxiway exit from a runway. Located just prior to the intersection on the same side of the runway as the taxiway exit.

Ref. AIM Para. 2-3-10/11

Airport Signage and Markings

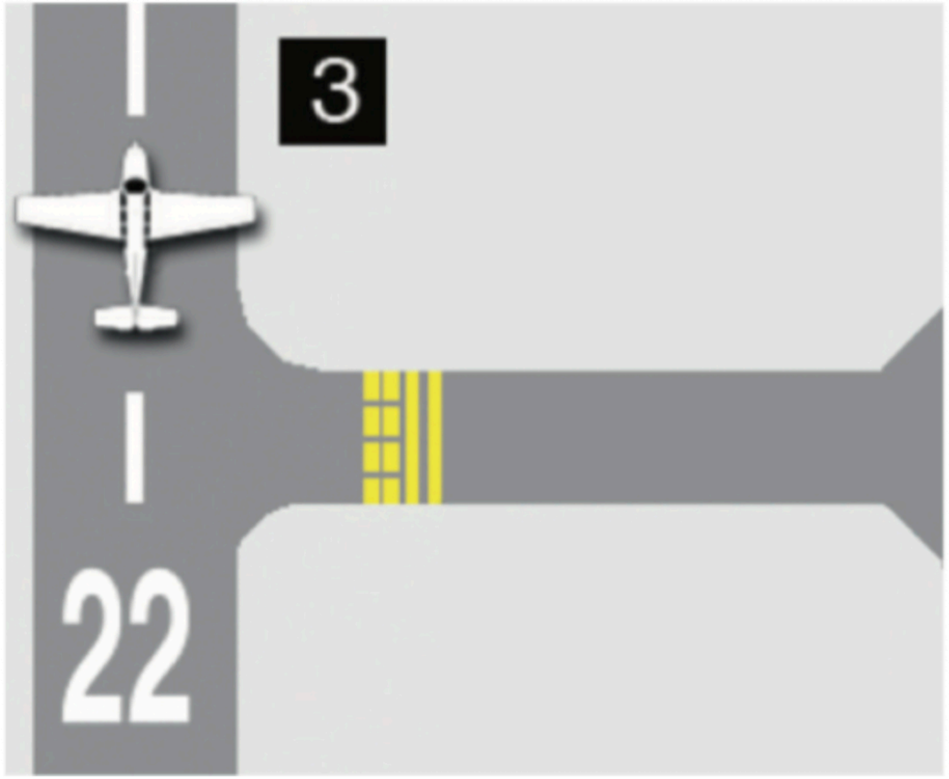


Closed Runway and Taxiway Marking

Indicates a closed runway or taxiway. It will also be placed at each entrance to a permanently closed runway or taxiway. A raised-lighted **X** may be used in lieu of, or in addition to, a pavement marking.

Ref. AIM Para. 2-3-6-d/e

Airport Signage and Markings

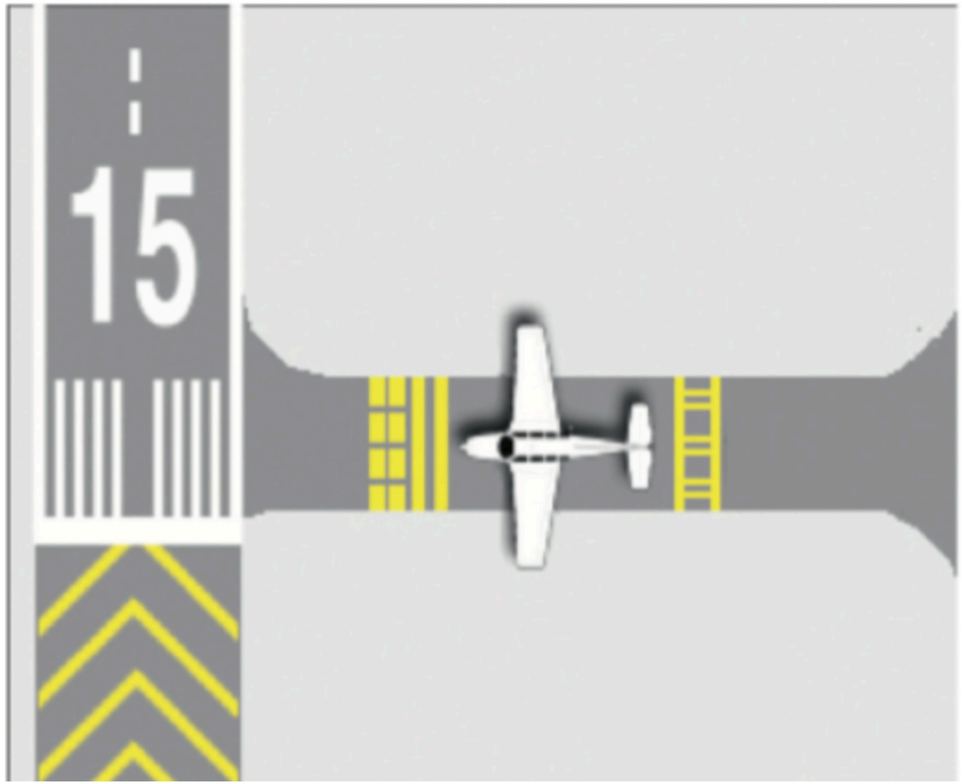


Runway Distance Remaining Sign

Indicates the distance of runway remaining in thousands of feet. In this example, 3,000 feet remain on the landing runway.

Ref. AIM Para. 2-3-13

Airport Signage and Markings

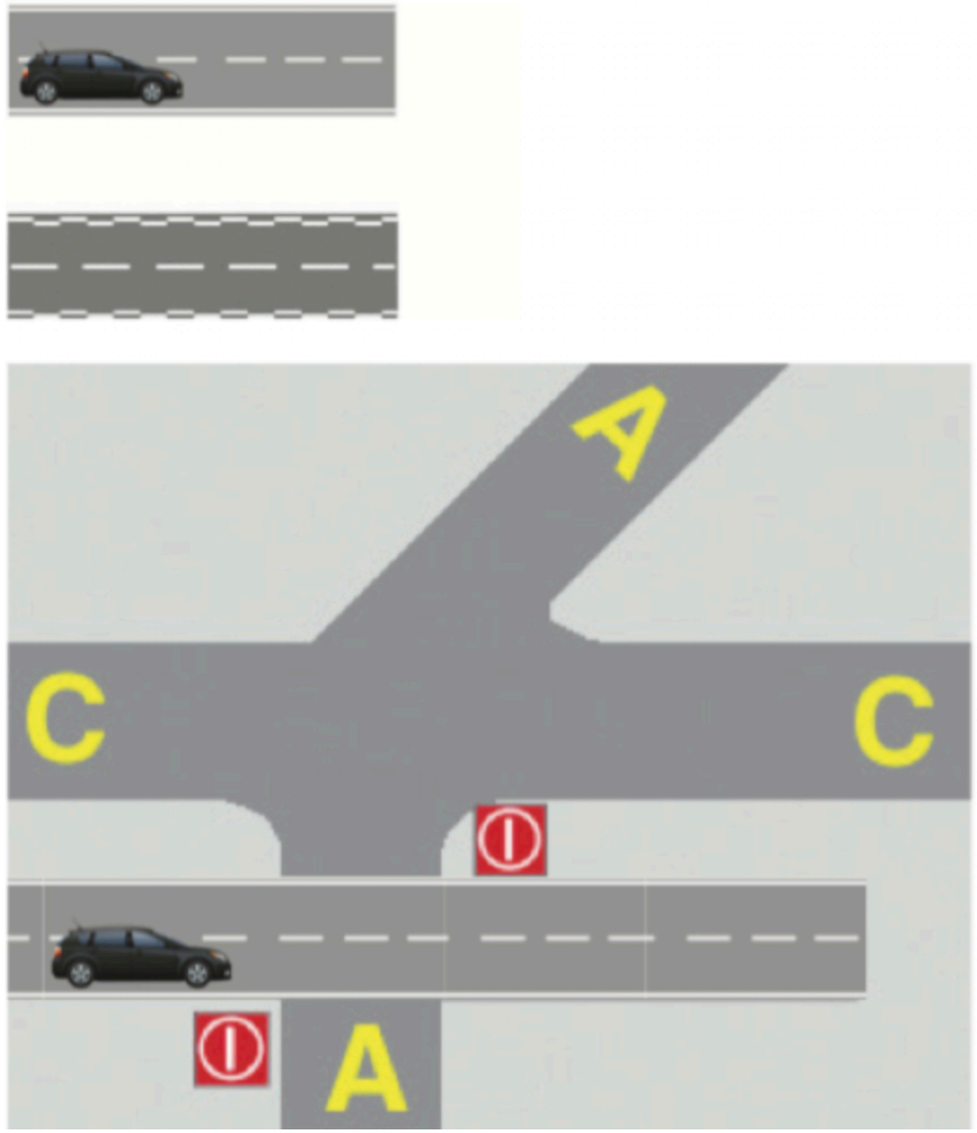


Chevron Markings

Indicate areas of pavement aligned with the runway that are unusable for taxi, takeoff, or landing. Chevrons cover blast pads or stopways, which are constructed to protect areas from erosion caused by jet blast and to provide extra stopping distance for aircraft (stopways).

Ref. AIM Para. 2-3-3-i-1

Airport Signage and Markings

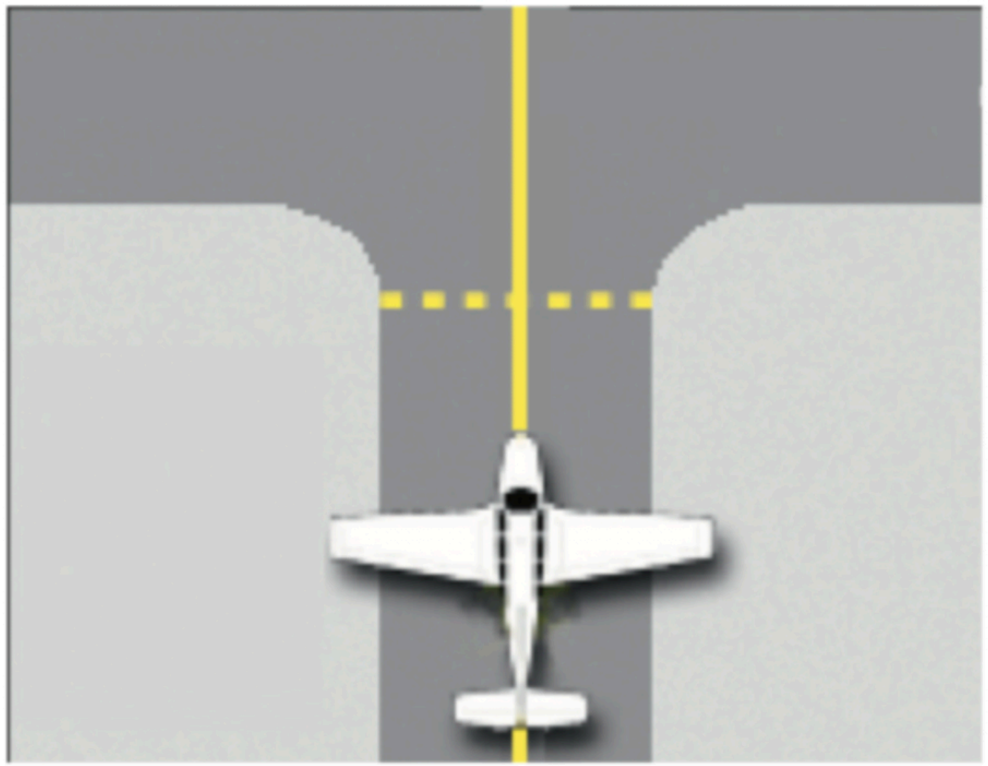


Vehicle Roadway Markings

Used to define a vehicle pathway (non-aircraft) that is on, or crossing, an area also used by aircraft. The outer boundaries will consist of either a single solid white line or white and black “zippered” lines.

Ref. AIM Para. 2-3-6-a

Airport Signage and Markings



Holding Position Markings for Taxiway/Taxiway Intersections

Extending across the width of a taxiway, this yellow dashed line indicates where an aircraft should stop if instructed to do so by ATC. When the marking is not present, stop the aircraft to provide adequate clearance from an aircraft on the intersecting taxiway.

Ref. AIM Para. 2-3-5-c