Private Pilot Checkride Oral Prep

(May 7th, 2026)

Certificates & Documents

Pilot

What documents must you have with you to fly the airplane as a private pilot? (61.3)

Pilot certificate, medical, and government issued photo ID

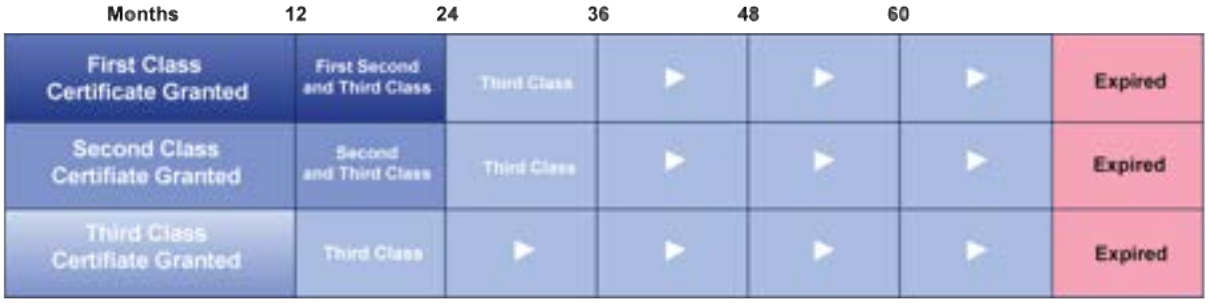
*As a student pilot, these documents in addition to your logbook (to show endorsements) are only required when acting as PIC (solo flight)

When does your pilot certificate expire? (61.19)

It never expires

What kind of medical do you have and when does it expire?

Under 40



Over 40

- **What class medical do you need to exercise the <u>privileges</u> of a private pilot? Another option?**

  Third class medical or BasicMed

*Remember: It is the privileges that change, not the medical itself. For example, if you are under 40 and have a first class medical, after 12 months you can only exercise the privileges of third class medical.

- **What are the BasicMed privileges and limitations?**

  BasicMed lets you fly without a third-class medical if you:
  - Have a valid pilot certificate and driver's license
  - Held any FAA medical after July, 15th 2006
  - Complete a physical every 4 years and an online course every 2

  Limitations
  - Aircraft ≤ 12,500 lbs
  - The aircraft is not certified to carry more than 7 occupants (6 passengers)
  - Fly in the US only, under FL180 at less than 250 kts
  - Cannot fly for compensation or hire

What do we need to consider when making a decision on our health before the flight? (IMSAFE)

Illness – Am I sick?

Medicine – Am I taking any medication? If so, have I discussed it with my AME if it is safe for flight?

Stress – Am I under psychological stress? School/Work? Money? Health? Family/Social Life?

Alcohol – Have I been drinking within the previous 8 hours? Am I still experiencing the effects of alcohol?

Fatigue – Have I gotten adequate rest?

Emotions (or eating) – How is my emotional state? Have I had enough food/water today?

- **Can we fly if we have just taken melatonin? How do you know?**

  Yes, it is not an antihistamine. There is an FAA approved list of OTC medications for pilots (https://www.faa.gov/pilots/medical_certification/media/OTCMedicationsforPilots.pdf)

- **Federal alcohol regulations?**

8 hours bottle to throttle, less than .04% BAC, and no symptoms of hangover/intoxication

What does it mean to be current vs. proficient? Why is that important? Personal minimums?

Currency = are you legal to fly?
Proficiency = should you fly?

Currency confirms that you're legally allowed to fly, but proficiency keeps you safe and ready to fly confidently.

- **Currency requirements? (61.57)**
  - Flight review – every 24 months (at least 1 hr flight + 1 hr ground with a CFI)
  - Passenger currency – last 90 days (same category/class/type of aircraft to be flown)
    - Day: 3 takeoffs & landings
    - Night/Tailwheel: 3 full-stop landings

Night definition? When can you log required night landings for passenger currency? When do our lights need to be on? (61.57)

Night = end of evening civil twilight to beginning of morning civil twilight

Night landings = 1 hour after sunset to 1 hour before sunrise

Position/Anti-collision lights = sunset to sunrise

Do you need to take your logbook with you? (61.51)

No. Only student pilots with the proper endorsements acting as PIC need to carry their logbook.

What privileges and limitations apply to private pilots? (61.113) (91.146)

Privileges

1. Act as PIC
2. Carry passengers
3. Conduct search and rescue operations
4. Fly for charitable, non-profit, or community event

Limitations

1. Cannot fly for hire
2. Must pay no less than pro rata share

- **If we go on this XC today and I offer to pay for just the fuel and other miscellaneous rental or operational fees, but not pay you since you are a private pilot, can you accept that? Why or why not?**
    - Common purpose (own independent reason for going to a destination, not just transporting passengers), pro rata share, etc.

If a pilot changes his permanent mailing address, how long can the pilot continue to exercise the privileges of their PPL without notifying the FAA? (61.60)

30 days

With respect to the certification, privileges, and limitations of airmen, what do category, class, and type mean? (61.5)

Category: airplane, rotorcraft, glider, lighter-than-air, etc.

Class: single engine land/sea, multi engine land/sea

Type: specific to aircraft
*Only required for aircraft with a max gross weight equal or greater than 12,500 lbs, turbojet, or any aircraft specified by the FAA to require one (61.31)

Airworthiness Considerations

What documents should be in the a/c before flight? ARROW (91.9, 91.203)

Airworthiness Certificate – must be visible to all passengers

Registration – state (if required) and federal

Radio License – required for international flights

Operating limitations – found in the POH

Weight and Balance information – current

When will an a/c registration certificate expire? Airworthiness certificate?

State – 1 year
Federal – 7 years

Airworthiness certificate never expires.

Who says we have to follow the POH? (91.9)

FAR 91.9 states, "...no person may operate a civil aircraft without complying with the operating limitations specified in the approved Airplane or Rotorcraft Flight Manual…"

In other words, the FAA.

Who is responsible for ensuring an a/c is maintained in an airworthy condition? (91.403)

The owner/operator

Required Inspections? AVIATE

Airworthiness Directives and Service Bulletins

VOR Check – every 30 days if using the VOR as a primary source of navigation

Inspections – Annual and 100 hour
**100 hr is for aircraft used for flight training or hire. The annual can substitute the 100 hr, but not the other way around.

Altimeter/Pitot Static system – 24 calendar months; required for IFR flight **(91.411)**

Transponder – 24 calendar months **(91.413)**

ELT – 12 calendar months

What is an AD? Is it mandatory? What are the different kinds? How about Service Bulletins?

FAA-issued order to fix a known issue. It is mandatory. Owners and operators are legally required to ensure an aircraft is maintained in accordance with all applicable ADs per 14 CFR Part 39.

Emergency – Require immediate compliance before flight

One Time – After the AD is compiled with once, there is no further need to address the specified issue

Recurring – Must be complied with at the specified interval

Service Bulletins are issued by manufacturers as an advisory or "recommendation", but can become mandatory if an AD requires compliance with the instructions in a specific bulletin.

Can you overfly an annual? 100 hr? (91.409)

The only way to overfly an annual is to obtain a special flight permit from the FSDO.

A 100-hr inspection may be overflown by no more than 10 hrs and **only** if enroute to the place where the inspection will be done.

Does the aircraft need a transponder inspection to do local maneuvers around KOKK? When would we need to do one? (91.413)

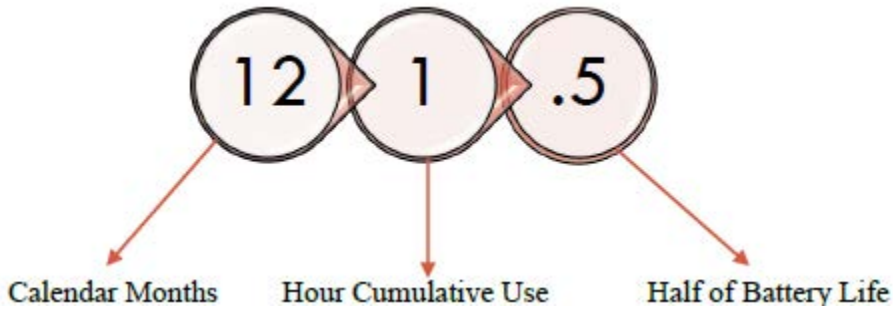
Yes, the aircraft needs a transponder test/inspection every 24 calendar months, regardless of local maneuver intentions.

Do you need to have an ELT in the airplane today? (91.207)

Not needed for training within 50 nm of home airport

When does an ELT battery have to be replaced or recharged? (91.207)

ELT battery must be inspected after 1 hr cumulative use or if it has reached ½ of its useful life.



What equipment and instruments do you need to have in the a/c for today's flight? At night ATOMATOFLAMES & FLAPS (91.205)

Altimeter

Tachometer (each engine)

Oil pressure gauge (each engine)

Manifold pressure (for each engine, if applicable)

Airspeed indicator

Temperature gauge (for each liquid-cooled engine)

Oil temperature gauge (each engine)

Fuel gauge

Landing gear position indicator (if applicable)

Anti-collision lights

Magnetic compass

ELT

Seatbelts

Fuses

Landing light

Anti-collision lights

Position lights

Source of electrical power (alternator or generator)

What if we walk out to the a/c and find that the landing light is inoperative. Can we fly? Walk me through the process to fly with inop equipment.

Cannot fly at night per the FARs – During the day you would deactivate or remove the component and placard it inoperative (deactivating could be as simple as pulling the circuit breaker out). You can fly an airplane with known inoperative equipment if it is not included in 91.205 and has been deactivated/removed and placarded inoperative.

MEL → 91.205 → KOEL → A/C equipment list → PIC decision

Placard, deactivate, log (Can we deactivate?)

Is there any way that you can fly the airplane if it is not airworthy?

Special Flight Permit (Do's and Don'ts)

You can obtain a Special Flight Permit through your local FSDO (whichever one has jurisdiction over your departure point) if the aircraft is not airworthy for authorized purposes such as flying to a maintenance base, delivering an aircraft, or production flight testing. You must adhere to any specific restrictions listed on the permit such as altitudes or routes.

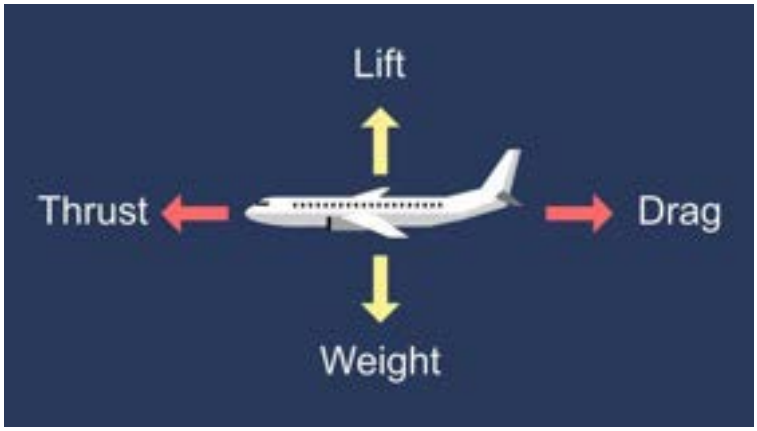
Do we have an MEL? What do we follow?

MEL = minimum equipment list (FAA approved list of equipment that can be inoperative)

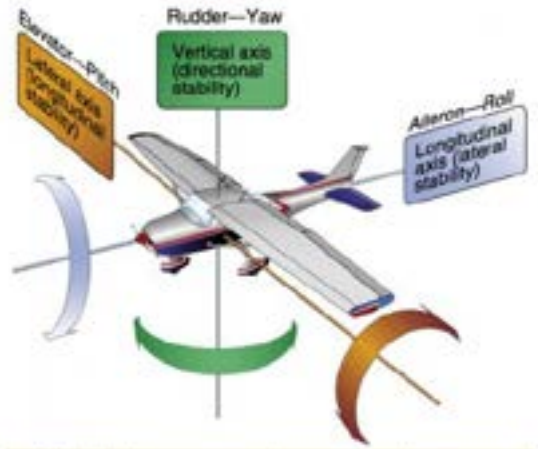
No. We adhere to the regulations in 91.205 and 91.213(d)

Performance & Limitations

What are the 4 forces of flight?



What are the primary flight controls? About what axis does each control the plane? Secondary flight controls?



Primary Control Surface	Airplane Movement	Axes of Rotation	Type of Stability
Aileron	Roll	Longitudinal	Lateral
Elevator/ Stabilator	Pitch	Lateral	Longitudinal
Rudder	Yaw	Vertical	Directional

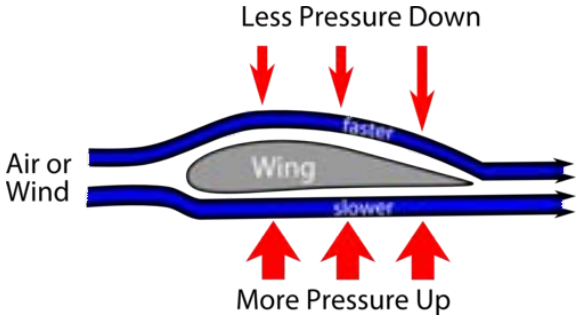
Secondary: Flaps, Trim (anti-servo tab), autopilot?

- Spoilers, Leading edge devices

How is lift created?

Bernoulli's Principle – As the velocity of a fluid or gas increases, the pressure decreases. High speed air over the upper surface creates low pressure while the slower air beneath the wing creates high pressure, producing an upward force on the wing.

Newton's 3rd Law – Airfoils accelerate airflow downward. The equal and opposite reaction, as described by Newton, forces the airfoil upwards.



Explain the different types of drag.

Parasite – increases with speed
Some types of parasite drag include **form, skin friction, and interference drag**.

- Form Drag – is caused by the shape of the a/c and the airflow around it. Anything that sticks out from the fuselage as well as the fuselage itself contributes to this (e.g. antennas, pitot mast, engine cowling, etc.)

- Skin Friction – caused by air slowing down as it moves across the surface of the a/c (e.g. rivets, dirt, or anything that makes the surface less smooth adds to this type of drag).

- Interference – caused by intersecting airstreams from different parts of the a/c. For example, the area where the wing is attached to the fuselage. Since the wing accelerates the relative wind, this airstream will be relatively faster than the wind moving over the fuselage. When these two airstreams meet, turbulent eddies form and produce drag.

Induced – byproduct of lift, decreases with speed

- High pressure airflow from beneath the wing has the tendency to spill over the wingtips to equalize the lower pressure above. When this happens, turbulent whirlpools called **wingtip vortices**, form and create drag.

Discuss V-speeds.
* speeds listed are for C-172N N6426F

Vne (never exceed speed) - **158;** speed that you should never venture under any circumstances.

Vno (maximum structural cruising speed) - **127;** highest speed that you can safely fly in smooth air. Marked by upper limit of the green arc on the airspeed indicator.

Va (maneuvering speed) - **80-97;** It is the speed above which you risk damaging the aircraft's structure if you make a full deflection of a flight control (ex. Full-up elevator).

If you make a full deflection of a flight control at or below Va, the aircraft will stall before the structure is damaged. Va isn't a fixed figure; it varies with weight. If the aircraft's weight decreases, Va decreases as well, and vice versa.

Vfe (flaps extended speed) - **110 (10* flaps), 85 (20-30* flaps);** highest speed permissible with the flaps extended. Anything above that could cause structural damage.

Vx (best angle of climb) - 59

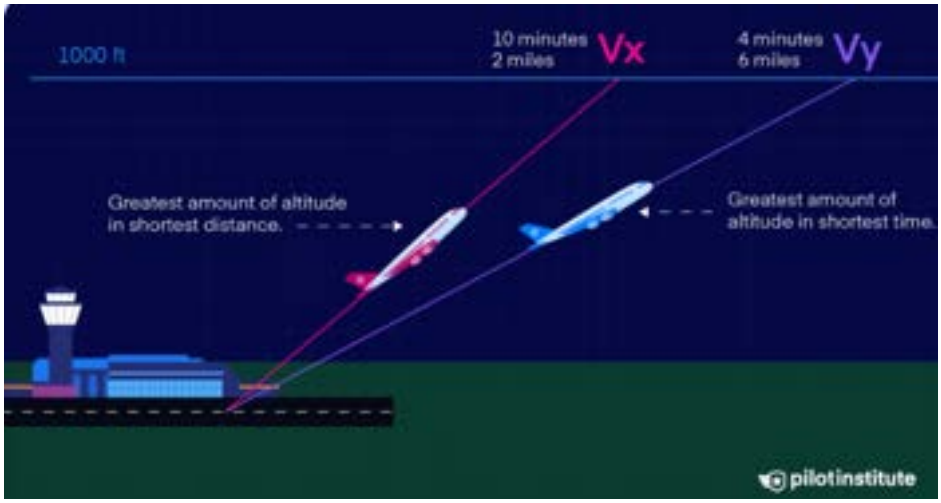
Vy (best rate of climb) - 73

*How do you find Vso & Vs1?

What is the difference between Vx and Vy?

Vx is used to clear an obstacle.

Vy is used to get to altitude in the shortest amount of time. Compared to Vx, you'll use more horizontal distance.



What is Va? Practical application of this V speed?

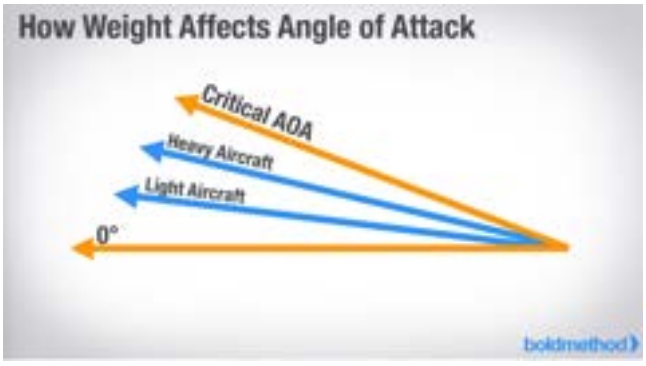
Va is the aircraft's design maneuvering speed. Primary application of Va is for pilots to know the limit for performing maneuvers safely and for protecting the aircraft from structural failure in turbulent air.

Does Vg change? Why?

Yes.

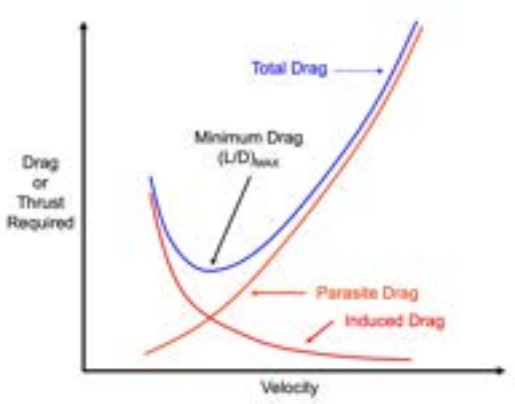
How weight affects maneuvering speed:

- Lighter weight = Lower maneuvering speed: When an aircraft is lighter, it requires less lift to maintain level flight. This means it is closer to its stall angle of attack at a given speed. Therefore, if the pilot makes a hard control input, the aircraft will stall before the wings exceed their structural load limits.
- Heavier weight = Higher maneuvering speed: A heavier aircraft requires a higher angle of attack to stay level. This means the aircraft is farther from its critical angle of attack at a given speed. Thus, it can withstand a larger increase in load factor before stalling, allowing for a higher maneuvering speed



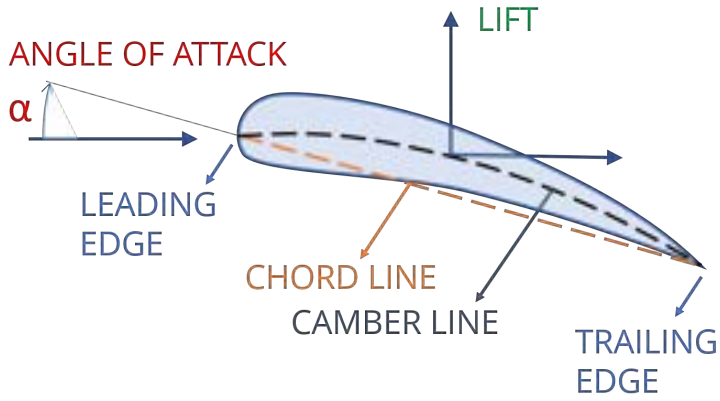
What is the airspeed where Induced and Parasite drag meet?

Vg – best glide speed



*Also described as the L/D Max or maximum lift to drag ratio.

Describe the various components of an airfoil. (PHAK 3-8 Fig. 3-6)



What is a camber? Can we change it?

Curvature of the wing – it can be changed by extending/retracting flaps

Angle of incidence? Can it be changed?

The angle between the wing chord line and the fuselage – it cannot be changed

Describe center of gravity and what happens when it moves forward/aft. (PHAK 4-38)

CG is the point where the aircraft is balanced or the place where the entire weight is concentrated

Forward CG	**Aft CG**
Better Stability ⬆️ (reference door hinge) - CG is farther away from the control surfaces	Worse Stability ⬇️ - CG is closer to the control surfaces, makes stall recovery harder
Cruise Speed ⬇️ - Aircraft is at a higher pitch to maintain level flight (aircraft wants to pitch down with more airspeed)	Cruise Speed ⬆️
High Stall Speed ⬆️ - Wing flies at a higher angle of attack to create more lift to counter the tail down force, so it produces more induced drag	Lower Stall Speed ⬇️

What causes a wing to stall?

Anytime the critical angle of attack is exceeded.

**You can stall in straight & level flight and at any airspeed

How does temperature change T/O distance? Weight? Air density?

High temperatures = less dense air

Less dense air exerts less force on airfoils (wings and propeller) making them less efficient and also deprives the engine of power. This leads to longer takeoff rolls and decreased climb performance.

Higher weight also leads to longer takeoff rolls and increased landing distance because it takes more engine power to accelerate a heavy aircraft to Vr and more braking power to slow the aircraft down.

What are the different types of airspeeds? Altitudes? (PHAK 7-6 and 10-17)

IAS - indicated; read right off the airspeed indicator

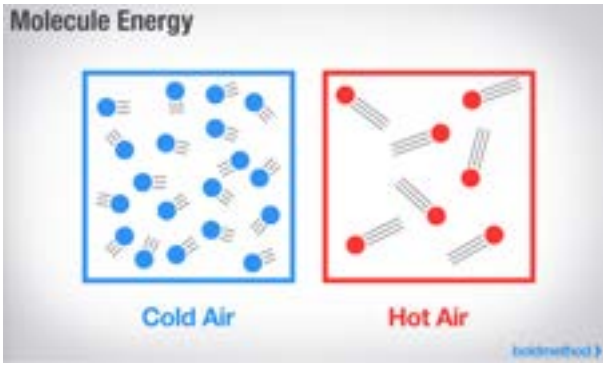
CAS - calibrated; indicated AS corrected for instrument and positional errors. At certain airspeeds and with certain flap settings, the installation and instrument errors may total several knots. This error is generally greatest at low airspeeds, with nose high pitch attitudes.

TAS - true; speed of the aircraft relative to the air it's flying through. As you climb, true AS is higher than your indicated AS. Pressure decreases with higher altitudes, so for any given true AS, as you climb, fewer and fewer air molecules will enter the pitot tube. Because of that, indicated airspeed will be less than true airspeed. In fact, for every thousand feet above sea level, true airspeed is about 2% higher than indicated airspeed. **So at 10,000 feet, true airspeed is roughly 20% faster than what you read off your airspeed indicator.**

GS - groundspeed; the movement of the airplane relative to the ground. It's true airspeed corrected for wind. With a true airspeed of 100 knots and a tailwind of 20 knots, you'd be flying a groundspeed of 120 knots. If you shot a police radar gun at a plane flying by, you'd be measuring groundspeed of the airplane, assuming the officer was stationary.
Indicated altitude - read straight off the altimeter

Pressure altitude - When you set your altimeter to 29.92, you're flying at standard pressure altitude. This is the altitude of the aircraft above the standard datum plane, the theoretical location where at 15 degrees Celsius the altimeter setting will equal 29.92 inches of mercury. Many of the calculations you'll find in your POH require knowledge of what pressure altitude you'll be flying at.

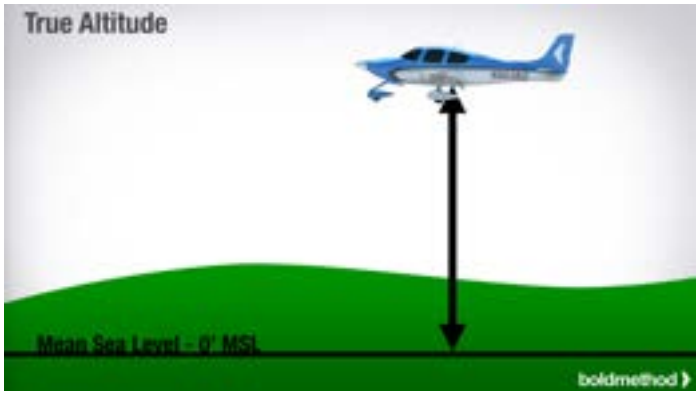
Density altitude - pressure altitude corrected for non-standard temperature. When it's hot outside, your airplane doesn't perform as well. Your takeoff distance is longer, and you don't climb as fast. That's because when it's hot, density altitude increases, and your airplane "feels" like it's flying at a higher altitude.



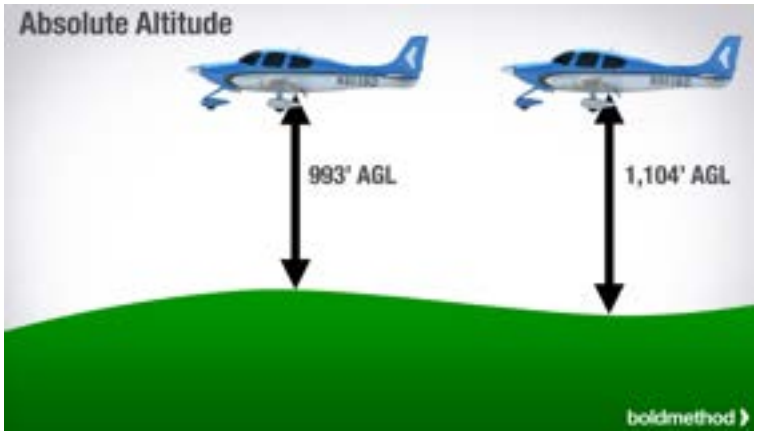
Less air mass flowing over your wings prevents you from generating as much lift, and less oxygen mass in your cylinders prevents you from burning as much fuel, meaning less power. Decreasing air density decreases performance, so be careful on hot days at high altitudes.

True altitude - vertical distance of your airplane above sea level. Commonly expressed as "feet MSL" (feet above mean sea level), many of the airspace altitudes, terrain figures, airways, and

obstacles you'll find on aeronautical charts are expressed in true altitude (MSL), feet above sea level.



Absolute altitude - Constantly changing, absolute altitude is the distance measurement of your airplane above the ground. Expressed in "feet AGL" (above ground level), you can also find many obstacles and airspace classifications that exist in feet above the ground.



Calculate pressure/density altitude.

PA = Altitude (field elevation) + (29.92 - current altimeter setting) x 1000
DA = PA + [120 x (outside air temp.in degrees Celsius – standard temp. for that altitude)]

What are the 3 dominant factors in performance?

Pressure, density, and humidity.
As air becomes less dense it reduces:

- Power, because the engine takes in less air
- Thrust, because the propellor is less efficient in thin air
- Lift, because thin air exerts less force on the airfoils

Limitations of your airplane?
*C-172N (N6426F, POH 2-5)

http://indianapilotsclub.org/aircraft/N6426F

Max Ramp Weight: 2307 lbs
Max T/O Weight: 2300 lbs
Max baggage compartment weight: 120 lbs
Max demonstrated crosswind: 15 kts
Max window open speed: 158 kts

Max Oil temperature: 245*F
Oil Pressure:
Minimum: 25 psi
Maximum: 115 psi

What does the difference in max ramp and T/O weight account for?

Fuel burned during ground operations.

*1 gallon of 100LL weighs 6 lbs

Explain left turning tendencies. TGAS (PHAK 4-26)

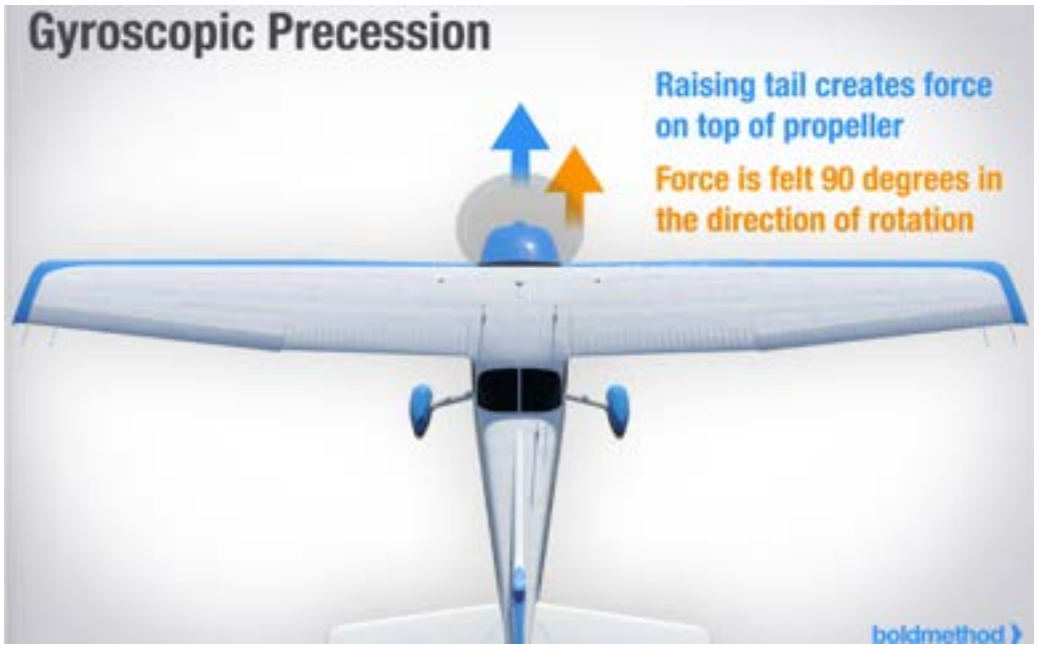
Torque – clockwise spinning prop causes airplane to roll left about the longitudinal axis. This is an example of Newton's 3rd law.

On the ground, this left rolling tendency causes more weight to be on the left main gear thereby increasing the friction and inducing a left yawing tendency.

Gyroscopic Precession – During a descent the tail rises and causes a force to be felt on the top of the propeller. The resultant force is therefore 90 degrees ahead in the direction of the rotation

(RIGHT SIDE of propeller) causing a left yawing tendency. This is mostly associated with tailwheel aircraft because on their takeoff roll the tail has to be raised and this creates a left turning tendency.

*This is otherwise a right turning tendency in a climb because the effective force would now be at the bottom of the propeller and thus the effective force would be on the LEFT SIDE. The other left turning tendencies, however, make this effect negligible.



Asymmetrical Thrust (P-Factor)– In a climb, the descending propeller blade (RIGHT SIDE) has a greater angle of attack and therefore creates more lift. This causes a left yawing tendency.

Spiraling Slipstream – Propeller wash strikes the aircraft of the left side of the vertical stabilizer causing a left yawing tendency.

*The slipstream also strikes the right wing from above causing a right rolling tendency. The left rolling tendency from torque, however, makes this effect negligible.

All of these tendencies are more pronounced at low airspeeds, high angles of attack, and high power settings.

Explain stability (PHAK 4-13)

Lateral Stability – Resistance to roll

- Wing dihedral is what gives our aircraft lateral stability. The soft V shape means that during a side slip, the lower wing has a greater angle of attack and this helps return it to equilibrium.
- Effectively managing fuel can also influence this because if the fuel load is imbalanced, one wing will be lower than the other

Longitudinal Stability – Resistance to pitch

- Flying "inside of the envelope" is the greatest factor here. CG must be within limits to maintain longitudinal stability.

Vertical Stability – Resistance to yaw

- The size of the vertical stabilizer and the area of the fuselage aft of the CG contribute to vertical stability. The bigger and farther aft the vertical stabilizer is, the greater the stability.

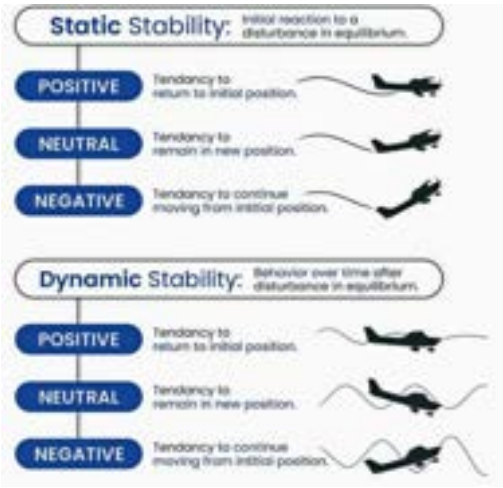
<u>Positive Stability –</u> Tendency to return to equilibrium (ex. C172s or other training aircraft)

<u>Neutral Stability –</u> Tendency to stay in a new position (ex. Aerobatic aircraft)

Negative Stability – Tendency to continue to move away from equilibrium (ex. Fighter Jets)

Static Stability – Initial response to a control input

Dynamic Stability – Response over time to a control input



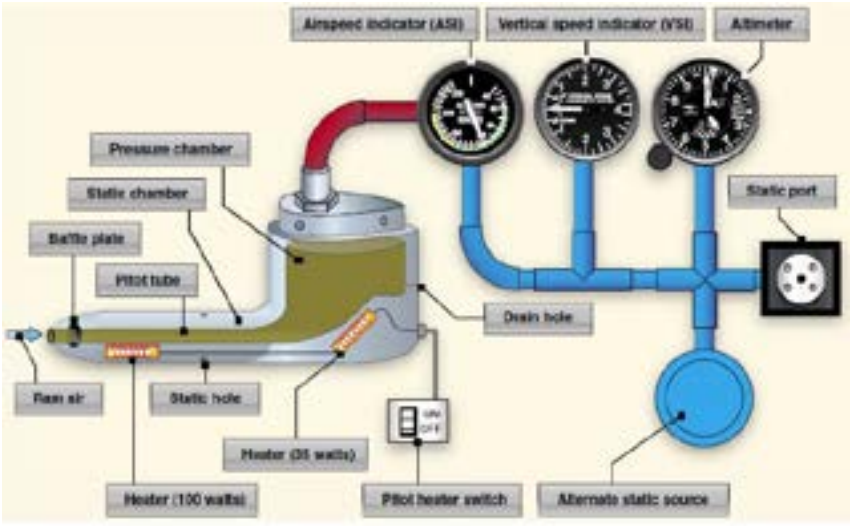
Operations of Systems

Describe the pitot-static flight instruments.

Measures airspeed, altitude, and vertical speed using air pressure differences.

Dynamic pressure = happens when the airplane moves through the air. The faster it goes, the stronger this pressure gets.

Static pressure = caused by the weight of the air above everything. If you fly higher, there's less air above you and so less static pressure.



Airspeed Indicator – the only instrument that uses **both** the pitot tube and static port. It measures speed using ram air from the pitot tube and static air from the static line. Static pressure fills the ASI case, while the pitot tube sends total pressure to the diaphragm. The difference between these pressures creates dynamic pressure, causing the diaphragm to move. This movement drives the needle, showing airspeed.

Altimeter – The altimeter measures altitude by comparing static pressure to a fixed pressure in aneroid wafers (29.92 inHg; standard sea-level pressure). As the aircraft climbs and static pressure decreases, the pressure difference moves the diaphragm, which turns the altimeter's needles. Since atmospheric pressure changes with weather, pilots must adjust the altimeter using the local barometric pressure shown in the Kollsman window.

Vertical Speed Indicator – measures climb or descent rates using static pressure. A pressure delay between the diaphragm and case moves the needle, with faster changes causing larger movements. It shows the rate of climb or descent in feet per minute. When you're flying at a constant altitude, it should indicate zero. In the VSI's case, the static pressure enters the instrument through the static pressure line. The static line also has a calibrated leak, so when the aircraft climbs or descends, the static pressure will change instantly in the unrestricted opening, but the case pressure will take longer to adjust because of the restricted opening.

How do the pitot static instruments respond to blockages?

Blocked pitot tube

- ASI shows zero; If the pitot tube is blocked but the drain hole stays open, air escapes, and the ASI drops to zero as pressures equalize

Blocked pitot tube and drain hole

- Trapped pressure prevents the ASI from measuring airspeed. At a steady altitude, it will display a constant, unchanging speed.
- During a climb, it shows increasing airspeed; during descent, it shows decreasing airspeed, regardless of actual speed.

Blocked static port

- VSI shows zero
- Altimeter freezes
- ASI gives false readings; the farther you fly from the blockage altitude, the greater the ASI error – showing higher speeds during descent and lower speeds during climbs

Describe gyroscopic instruments.

https://www.youtube.com/watch?v=giiRLMesFFA

The gyroscopic instruments are powered by an engine driven vacuum pump with the exception of the turn coordinator which is electrically powered. The two principles that gyroscopes operate off of are:

- Rigidity in space: while spinning, a gyroscope will tend to stay fixed in its plane of rotation. Think of a bicycle wheel. With enough momentum, you are able to stay naturally balanced.
- Precession: when a force is applied to a gyroscope, the resultant force is felt 90° ahead in the direction of the rotation.

Attitude Indicator – Rotates in the horizontal plane and operates off of the principle of rigidity in space. The aircraft pitches and rolls around the erect gyroscope. The effects of precession are not felt because pendulous vanes attached to the base of the gyro duct high pressure air from the vacuum through small doors that open and close by the force of gravity to keep the gyro in its original position.

Heading Indicator – Rotates in the vertical plane and operates off of rigidity in space as well. As the aircraft yaws around the gyro, a gear inside of the instrument case rotates the compass card to show the magnetic direction. Precession caused from aircraft movement and friction causes errors that must be corrected by resetting the heading indicator to the magnetic compass approximately every 15 minutes.

Turn Coordinator – This electrically powered gyro rotates in the vertical plane and it uses precession to measure rate of turn and rate of roll. When the aircraft yaws, the gyro precesses and the airplane on the face of the instrument indicates the direction and rate of the turn. Notice

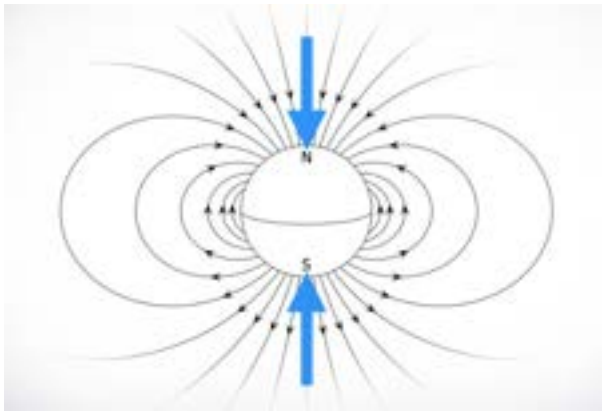
in the diagram of the instrument that it is slightly canted upwards. This is so the rate of roll can be indicated as well. When the aircraft begins a bank the aircraft will also indicate the direction of the bank. If it is a rapid roll the airplane will respond by banking more steeply. Once the turn is established it will properly indicate the rate of the turn.

Explain the errors associated with the magnetic compass.

Deviation - Instruments in your airplane cause interference that affects your compass, and that interference is called deviation. Inside the compass, there are compensating magnets to counteract these fields of interference. A compass card is normally attached, showing what error correction to add for different headings, although the changes are normally just a few degrees.

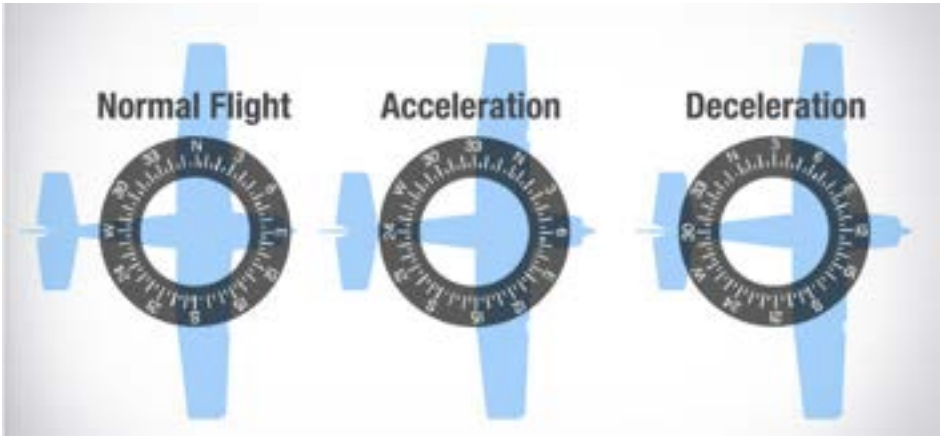
Variation - To find your magnetic course (in no wind, the heading you see on your compass), you'll either subtract easterly variation or add westerly variation. A great memory tool for this is "East is least, West is best."

Dip - Magnetic dip creates the most substantial errors in a compass. As you get closer to the North or South Pole, magnetic flux lines point downwards towards the poles, and your compass magnets dip towards the low side of a turn. When magnetic dip is pronounced, it's difficult to get actual readings. This error isn't much of a problem near the equator, where your compass points more or less horizontally and magnetic dip isn't a concern.

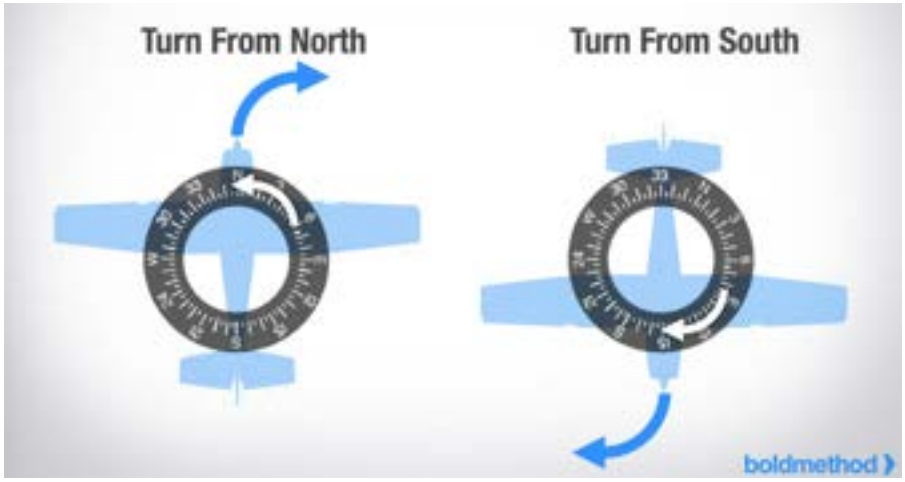


Acceleration and Deceleration Error - Another major problem with magnetic compasses in airplanes is acceleration error. In the Northern Hemisphere, as you accelerate, your compass will show a turn to the North. And as you decelerate, your compass will show a turn to the South. When the speed stabilizes, the compass returns to normal. This error is greatest on East or West headings.

ANDS = Accelerate - North, Decelerate - South



Turning Errors - During a turn from a Northerly heading, the compass briefly indicates a turn in the *opposite* direction. As for aircraft turning from a Southerly heading, the compass indicates a turn in the correct direction, but at a faster rate than is actually being turned.



Tell me about the engine in this aircraft (1-3)
*C-172N, N6426F

Engine: Avco Lycoming O-320-H2AD, 160 HP at 2700 RPM

- Horizontally opposed, four cylinder, air cooled, carbureted engine with a wet sump oil system

What does “normally aspirated” mean?

The engine draws air for combustion solely through atmospheric pressure, without the help of a supercharger or turbocharger.

What is used to cool the engine?

Air flowing over the cooling fins or cylinders, or by oil

What are the 4 main functions of oil in the engine?

Lubricate, Cool, Clean, and Seal

What are the 4 strokes of a piston engine?

Intake, Compression, Combustion, Exhaust

What type of propeller do you have?

Propeller: McCauley, 2 blades, fixed-pitch
Maximum: 75 inches
Minimum: 74 inches

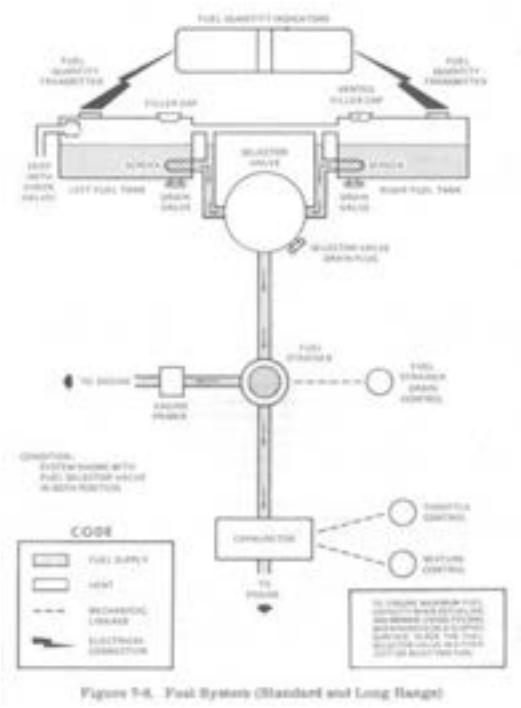
What does the mixture control do? Throttle? (PHAK 6-8)

Mixture control: controls the fuel/air ratio entering the engine

Throttle: controls the flow of the fuel/air mixture

Describe the fuel system. (POH 7-20)

Fuel flows by gravity from the two wing tanks (43 total, 40 usable gal) to the selector valve, then flows through the strainer to the carburetor. From the carburetor, mixed fuel and air flows to the cylinders through intake manifold tubes, and the primer draws its fuel from the fuel strainer and injects it into the cylinder intake ports. Fuel quantity is measured by two float-type quantity transmitters.



***Bonus !! Why are both the L & R fuel caps vented?**

Provide redundancy, ensuring air enters the tanks to replace consumed fuel and prevent a vacuum that would starve the engine of fuel.

What color is 100LL? How about other types of fuel? What happens when they are mixed together? (PHAK 6-27)

Aviation fuel dyes are designed to cancel their colors when mixed, so the mixture could come out clear.

(Red 80 not common; used in light/older aircraft)

Why do you drain a sample of fuel before each flight?

To detect and remove contaminants such as water, dirt, or debris that may have settled to the lowest point in the fuel system, and ensure the correct fuel type is used.

How does the vacuum system operate? (PHAK 8-16)

Air is drawn into the vacuum system by an engine-driven vacuum pump, goes through a filter, moves through attitude and heading indicators where it causes the gyros to spin, and a relief valve prevents the vacuum pressure from exceeding the prescribed limits.

Describe the electrical system. (7-10)

28-volt, direct current electrical system powered by a belt-driven, 60 amp alternator and a 24-volt battery located on the left forward side of the firewall.

Power is supplied to most general electrical and all avionics circuits through the primary bus bar and the avionics bus bar, which are interconnected by the avionics power switch.

National Airspace System

What is the difference between controlled and uncontrolled airspace?

Class G is the only uncontrolled airspace. ATC has no jurisdiction.

What are the different classes of airspace? Requirements? Weather minimums?

A – FL 180 to FL 600 – Instrument Rating and IFR flight plan needed – Mode C Transponder and 2-way radio communication

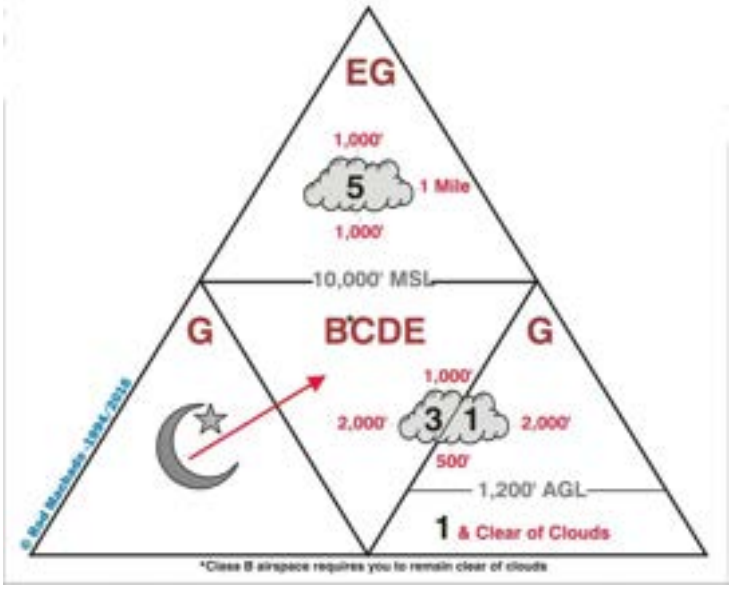
B – Upside down wedding cake design up to 10,000 MSL – Endorsement needed if student pilot – Clearance from ATC required to enter – Mode C Transponder required any time within 30 nm (mode C veil)

C – Inner core 5 nm radius and from surface to 4500 AGL – outer core 10 nm radius and from 1200' AGL to 4000' AGL – Mode C Transponder and 2 way radio communication

D – 4 nm radius and from surface to 2500' AGL – 2 way radio communications

E – Can start at the surface, 700' AGL, or 1200' AGL and may extend up to but not including FL 180 – Class E also exists above FL 600 – No equipment requirements

G – uncontrolled airspace – may start at the surface and can go as high as 14,500' MSL or 1200' AGL – no equipment requirements



What airspace are we in right now?

OKK → Class E airspace with a floor of 700 ft above the surface.

What are the different types of Special Use Airspace? MCWRAP (AIM 3-4-1)

Military Operation Area – Military training such as aerial intercepts, formation flying, and low altitude tactics is conducted in these areas. Contact FSS to obtain hours of operation and it is advised to contact the controlling agency for traffic advisories. Permission is not needed to enter, but pilots must exercise extreme caution.

Controlled Firing Areas (does not appear on charts) – Activities that could be hazardous are suspended immediately when a spotter detects an aircraft.

Warning Areas – Extends from 3nm outward from the U.S. coast – invisible hazardous to non-participating aircraft. Do not need permission to enter, but exercise extreme caution

Restricted – Unusual and oftentimes invisible hazards such as artillery or missile firing. When the restricted area is active, pilots will need to get permission from the controlling authority to enter.

Alert – May contain a high volume of pilot training or unusual aerial activity. No clearance is needed to enter but all pilots should be very alert.

Prohibited – Areas designated for national security or welfare. Flight in this area is prohibited.

Tell me about the different types of "other airspace" areas. (AIM 3-5-1)

Local Airport Advisory – service is available only in Alaska and is operated within 10 SM or airport with FSS but no operating control tower. At such locations, the FSS provides a complete local airport advisory service to arriving and departing aircraft.

Military Training Routes – Military aircraft travelling in excess of 250kts

- Routes designated by (IR) are IFR
- Routes designated by (VR) are VFR when visibility is 5sm or greater and ceilings are at least 3000'

Routes with no segment above 1500' AGL are identified by 4 numbers.

- For example (VR) 1205
- If there is a segment above 1500, the route will be identified by only 3 numbers.

Temporary Flight Restriction – Established to protect the President or other VIPs, provide a safe environment for disaster relief, or to prevent aircraft from sight-seeing over public events.

Parachute Jump Zones – check A/FD for details

Published VFR Routes – Published on TACs to provide VFR aircraft with a means to transition around, under, or through complex airspace. (SkyVector.com FLY map)

- These charts identify VFR flyways designed to help VFR pilots avoid major controlled traffic flows. They may further depict multiple VFR routings throughout the area which may be used as an alternative to flight within Class B airspace. The ground references provide a guide for improved visual navigation. These routes are not intended to discourage requests for VFR operations within Class B airspace but are designed solely to assist pilots in planning for flights under and around busy Class B airspace without actually entering Class B airspace
    - For example, Coastal Route, Mini Route, Special Flight Rule, Hollywood Park Route or Coliseum Route

Terminal Radar Service Areas – Pilots can voluntarily receive radar services from TRACON so that IFR and VFR traffic can have separation. Participation is encouraged.

- It can be identified on the chart by a heavy grey line (see Palm Springs)

National Security Areas – They exist where there is a need for heightened security and safety of ground facilities. Sometimes flight in this area is prohibited but otherwise pilots are encouraged to stay away from these areas.

Weather Theory & Information (AC 00-6A)

What are the standard temp & pressure values at sea level?
15C or 59F – 29.92” Hg or 1013.2 mb

Discuss isobars. What does it mean when the isobars are close together?

Isobars connect equal lines of pressure. Closely spaced isobars means that there is a strong pressure gradient and winds will be strong.

How do surface winds flow in relationship to isobars? Why? Winds aloft?

Surface: winds flow at an angle to the isobars due to surface friction

Aloft: winds flow more or less parallel due to the Coriolis force

What type of clouds, visibility, and precipitation would you expect from stable air? Unstable?

Stable air: stratiform clouds, poor visibility, smooth air, steady or continuous precipitation

Unstable: Cumuliform clouds or clouds with vertical development, good visibility, turbulence, and showery precipitation

Describe the characteristics of low/high pressure systems.

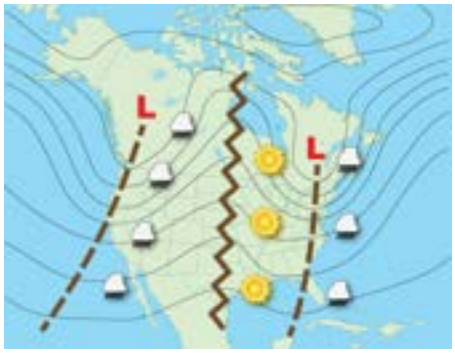
Low – Cyclone – counterclockwise and rising air

High – Anti Cyclone – clockwise and descending air

What is a ridge? Trough?

Ridge – extended area of high pressure – descending air

Trough – extended area of low pressure – rising air



What must be present in order for a thunderstorm to form?

Unstable atmosphere – an unstable atmosphere can be noted by the ambient lapse rate. We know that the standard lapse rate is about 2 degrees Celsius per 1000' of altitude. If the ambient lapse rate is greater than the standard lapse rate (i.e. the temperature is decreasing rapidly as you climb), this means the atmosphere is unstable.

Sufficient Moisture – the temperature/dew point spread can be used to determine how moist the air is. The closer the temperature and dew point spread, the closer the air is to becoming saturated or so full of moisture that it can hold no more. Warmer air can hold more moisture than cooler air.

Lifting Action – Some of these lifting actions may include heating from below (rising warm air called thermals), orographic lifting (wind pushing a moist unstable air mass upslope), or frontal lifting (a fast moving cold front displacing warm, moist, and unstable warmer air for example).

What are the 3 stages of a thunderstorm?

Cumulus – the building stage of a thunderstorm characterized by updrafts only. All thunderstorms begin as cumulus clouds but not all cumulus clouds become thunderstorms.

Mature – Updrafts and downdrafts both occur at this point. Violent turbulence can be experienced if flight is attempted beneath a cumulonimbus cloud because of this shear zone. The mature stage can be recognized by the beginning of rainfall.

Dissipating – At this point the cloud is only giving off downdrafts and the thunderstorm is dissipating. During this stage, large cumulonimbus clouds may have a recognizable "anvil top" that is a portion of the cloud that has been sheared off by the jet stream. The direction in which the anvil top is facing also shows the direction in which the storm is moving.

What is windshear? Why is it an operational hazard?

Rapid change in wind direction or velocity – it can cause dramatic changes in indicated airspeed and causes severe turbulence within the shear zone

What does dew point mean?

The temperature at which the air becomes saturated

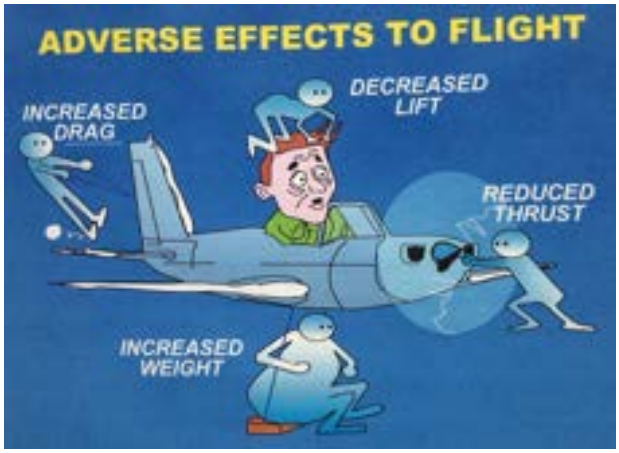
Discuss the types of fog. Advection, Radiation, Upslope, Precipitation-induced

Advection: moist warm air moves over colder land or water

Radiation: forms on clear nights with little or no wind and only over land

Upslope: moist unstable air is cooled as wind pushes it up a slope
Precipitation Induced: warm rain falls through cool air. Evaporation from the rain saturates the cool air and fog forms.

How does icing affect a/c performance?



Discuss the types of icing.

Induction Icing – This includes any icing that impedes that process of air entering the intake manifold to be mixed with fuel. Ice that builds up on the air intakes is an obvious form of this. Carburetor ice is also a form of induction icing. This can be attributed to the incomplete vaporization of fuel in combination with the pressure decrease inside of the venturi. Even on a day as warm as 70°F, carburetor ice can begin to form with adequate moisture in the air.

Instrument Icing – Icing of the pitot tube or static ports can cause the instruments to give inaccurate readings or to fail completely.

Structural Icing – Ice that forms on the surface of the aircraft. Since airfoils create lift by decreasing the pressure and thus the temperature of the air around them, icing on the propeller, horizontal and vertical tail surfaces, and wings can form at ambient temperatures that are above the freezing level. Structural icing includes:

- Rime Ice – Small rain drops found in stratified clouds or drizzle freeze upon impact with the airfoil. Air that is trapped between the droplets give the ice a white or opaque appearance. It builds up typically at the leading edge only and has an irregular shape. This makes it more easily recognizable to the pilot and easier to remove by deicing equipment.

- Clear Ice – Large super-cooled water droplets found in either heavy rain or in cumuliform clouds strike the airfoil but do not freeze immediately. Instead they slide backwards across the surface as they freeze. Clear ice is smooth and glossy making it very difficult to see from the cockpit. Because it adheres to the surface beyond the leading edge it can be difficult to remove.

- Mixed Ice – Occurs when drops vary in size.

What types of weather briefings can you get from a FSS brief?

Standard – Should be requested when planning a flight and no previous weather information has been gathered

Abbreviated – Used to supplement mass disseminated data or to update a previous briefing

Outlook – Request when proposed departure time is 6 or more hours away.

What is a METAR? Types, issues, and valid times? (AIM 7-1-31)

Aviation Routine Weather Report

Routine or special

Issued hourly

Valid for the hour

What is a TAF? Issue, valid times, area of coverage? (AIM 7-1-31)

Terminal Aerodrome Forecast

3 types: Routine (TAF) Amended (TAF AMD) or Corrected (TAF COR)

Issued 4 times a day (every 6 hours)

Valid for 24-30 hours

Forecast for area within 5sm of airport

What is the definition of a ceiling?

Broken or overcast layer

Does a TAF report cloud ceilings in MSL or AGL?

AGL

Describe FROM, BECMG, TEMPO on a TAF.

FROM – Rapid change occurring within 1 hour

BECMG – Gradual change to take place over the course of 1 hour

TEMPO – Between the predicted period, this weather will only occur for less than an hour

PROB – number placed afterwards is the probability of the weather forecasted to occur

AIRMETs? Types and how do you see them?

S: widespread IFR conditions and mountain obscurations

T: moderate turbulence and surface winds greater than 30 kts

Z: moderate icing

Valid for 6 hours

**AIRMETs are still issued, but the FAA is transitioning to graphical AIRMETs (G-AIRMETs) as a way to replace the traditional text-based AIRMETs.

SIGMET? Issued? Valid? Why are they issued?

Significant Weather Information

Issued for: Severe Turbulence not associated with T-storms

Widespread dust storms and volcanic ash

Severe Icing

Valid for 4 hours

Convective SIGMET? Issued? Valid? Why are they issued?

Issued for thunderstorm (convective) activity

Winds greater than 50 kts

Hail greater than ¾"

Winds and temperatures aloft forecast?

Issued twice a day every 12 hours and provides wind and temperature information for specific areas within the U.S.

Example of a Winds and Temperature Aloft Forecast

DATA BASED ON 151200Z
VALID 151800Z FOR USE 1700-2100Z TEMPS NEG ABV 24000

FT	3000	6000	9000	12000	18000	24000	30000	34000	39000
ALA			2420	2635-08	2535-18	2444-30	245945	246755	246862
AMA		2714	2725-00	2625-04	2531-15	2542-27	265842	256352	256762
DEN			2321-04	2532-08	2434-19	2441-31	235347	236056	236262
HLC		1707-01	2113-03	2219-07	2330-17	2435-30	244145	244854	245561
MKC	0507	2006-03	2215-01	2322-06	2338-17	2348-29	236143	237252	238160
STL	2113	2325-07	2332-02	2339-04	2356-16	2373-27	239440	730649	731960

Decoding

1. A four-digit group shows wind direction, in reference to true north, and wind speed.
   a. The first two digits give direction in tens of degrees, and the second two digits are the wind speed in knots.
   b. Look at the St. Louis (STL) forecast for 3,000 ft. The group 2113 means the wind is from 210° true at 13 kt.
2. A six-digit group includes forecast temperatures.
   a. In the STL forecast, the coded group for 9,000 ft. is 2332-02. The wind is from 230° true at 32 kt., and the temperature is plus 2°C.
3. If the wind speed is forecast to be from 100 to 199 kt., the forecaster will add 50 to the wind direction and subtract 100 from the wind speed. To decode, you must subtract 50 from the wind direction and add 100 to the wind speed.
   a. In the STL forecast, the coded group at 39,000 ft. is 731960. The wind is from 230° true (73 - 50 = 23) at 119 kt. (100 + 19 = 119), and the temperature is -60°C.
   b. If the wind direction is between 51 and 86, the wind speed will be 100 kt. or more.
4. If the wind speed is forecast to be 200 kt. or greater, the wind group is coded at 199 kt.
   a. EXAMPLE: 7799 is decoded as 270° true at 199 kt. or greater.
5. When the forecast speed is less than 5 kt., the coded group is 9900 and is read "LIGHT AND VARIABLE."

How are temperatures above 24,000 identified?

Negative

What does 710556 mean on a winds and temps aloft forecast at FL300?

Winds are from 210 @ 105 kts and temperature is -56C

Cross-Country Flight Planning

Stage 1 Scenario: 1 passenger @ 120 lbs and 5 lbs of baggage

Stage 2 Scenario: 1 passenger @ 150 lbs and 15 lbs baggage – VFR flight plan to XXX

What are the items that we are legally required to become familiar with before a flight? NWKRAFT (91.103)

NOTAMS – Notice to Airmen; time critical information that is not known in advance enough to be published on an aeronautical chart

- NOTAM (D) – for local/distant airport info (runways, lights)
- FDC NOTAM – for regulatory changes (TFRs, procedures)
- Pointer NOTAMs – highlight other important NOTAMs

Weather

Known ATC delays

Runway lengths – Where can you find this? A/FD

Alternates – a second option for landing in case you cannot land at your planned destination

Fuel – what are the fuel requirements?

- Day VFR: to the destination + 30 minutes
- Night VFR: to the destination + 45 minutes
- FTC requires 1 hour of fuel remaining when you return from a XC

Takeoff and landing distances

Walk me through how you get your magnetic heading.

1. Determine True Course (TC) – use sectional and plotter, measuring the angle from true north
2. Find WCA & True Heading – set wind direction under the true index, mark wind speed up from center, rotate to true course, then slide until true airspeed aligns to read WCA (left = subtract, right = add)
    a. TC + WCA = TH
3. Find Variation – use isogonic lines (East is Least, West is Best)
    a. TH + Variation = MH

<u>enVironment</u>

Why don't we need to calculate the amount of fuel we are going to burn before every local maneuver flight?

Flight is “within the vicinity of an airport”

What is the importance of personal minimums?

They establish a safety margin above regulatory minimums, showing a key difference between what’s *legal* and what’s *safe for you*. They cover areas like wind limits, visibility, ceiling, and currency (takeoffs/landings). They act as a “contract with yourself” for no-go or divert calls.

* Risk Management – ADM, risk mitigation, PAVE

Types of weather briefings?

Standard – any time you are planning a flight and have not received a previous briefing

- Adverse conditions, VFR flight not recommended, synopsis (type, location, and movement of weather systems/air masses), current conditions, enroute forecast, destination forecast, winds aloft, NOTAMs

Abbreviated – to get an updated briefing, in need of 1-2 specific items, or need information to supplement mass disseminated data

- Be sure to give the briefer the approximate time/information previously received; details on certain conditions only provided upon request

Outlook – when proposed time of departure is 6 or more hrs from the time of the briefing

- Provided for planning purposes only

<u>External Pressures</u>

What are the hazardous attitudes? (AC 60-22)

Which of these do you feel the most thus far in your training? Which do you think is the most dangerous?

What do you think are the biggest threats of today's flight? How can we mitigate those threats?

Human Factors

Say you are on a night flight cruising at 9,500 ft. You are carrying two of your friends as passengers the night after your private pilot checkride pass. One of your friends starts acting very bubbly and loose. Your other friend then, 10 minutes later, says he has a headache. What should you do?

- **What could be the problem?**
  They are starting to experience hypoxia → descend to lower altitude
- **Why did he get hypoxic hypoxia at such a low altitude?**
  Night flying increases your chances of hypoxia at night because your eyes require more oxygen to function in the dark; oxygen issues start around 5,000 ft at night.

What are the 4 different types of Hypoxia?

Hypoxic (lungs) – lack of oxygen available to the body

- Cause: High altitudes

Hypemic (blood) – blood cannot transport enough oxygen to the cells throughout the body

- Blood's hemoglobin can't bind with and transport oxygen
- Cause: Carbon monoxide poisoning, recent blood donation, severe bleeding

Histotoxic (blood transport) – alcohol and drugs can affect the body's ability to use oxygen

- Cause: Consumption of alcohol or narcotics

Stagnant (cells) – lack of movement of oxygen-rich blood through the lungs

- High G-forces or heart problems

Describe Hyperventilation and how to mitigate it.

Too much oxygen entering the body (not enough CO2). Rapid breathing with symptoms similar to hypoxia caused by stress or anxiety, and you can remedy it with breathing into a paper bag or talking aloud.

What are the different senses that help us orient ourselves in flight?

Visual, Vestibular (inner ear organs), and somatosensory (body/nerves)

Why are we advised not to fly if we have ear or sinus infections/issues?

Ear and sinus passages help equalize pressure between the body and the changing atmospheric pressure during climbs and descents. When congested, the pressure cannot equalize properly.

Describe carbon monoxide poisoning.

CO = colorless, odorless, and tasteless; “the silent killer”

CO is dangerous because it binds to the hemoglobin much more effectively than oxygen, reducing oxygen delivery to the body, and typically enters the cabin through exhaust leaks while the cabin heat is on. If you suspect CO poisoning: turn off the cabin heat, open fresh air/vents, use supplemental oxygen if you have it, and land as soon as practical.

Describe these illusions:

- **The leans**
- **Coriolis illusion**
- **Graveyard spin**
- **Graveyard spiral**
- **False horizon**