Pass Your Commercial Pilot Checkride

About the author and this book:

By purchasing this book you have begun your journey to the Commercial rating. You have made a breakthrough. You are becoming a Commercial Pilot. Each step and piece of knowledge you acquire during the reading of this book makes you a better pilot. Even though the FAA has not officially given you a certificate, "You are a Commercial Pilot."

Your process is not to commit this book to rote memory, but to understand, apply and correlate this information to your flying career, be it recreational, instructional or for hire. The questions in this book are questions asked by DPE's. It is a wealth of knowledge put in an easy to read book that will make the oral checkride enjoyable.

I have over 3,000 hours of flying and instruction in my own aviation journey. Through my own experience of many checkrides, I have interviewed and learned from many DPE's over my 32 years of being a pilot, what the DPE's are going to ask.

I live the mantra of MzeroA.com: "***A good pilot is always learning."***

Larry M. Diamond, PharmD.,CFII

Chapter 1: Making sure you are ready

What are the requirements for applying for a Commercial pilot rating?

FAR 61.123, .125, .127, .129

- Be at least 18 years of age
- Be able to read, speak, write, and understand the English language
- Have a current FAA medical certificate
- Aeronautical knowledge areas
    - Received and logged ground training from an instructor and completed a home study course to take the knowledge test
- Holds at least a private pilot certificate
- Flight proficiency in all the stated area of operations as stated in practical test standards
- Aeronautical experience

- Must log at least 250 hours of flight times as a pilot that consists of
    - 100 hours in powered airplanes
    - 100 hours of pilot in command (PIC) time
    - 50 hours in airplanes
    - 50 hours in cross-country flight
    - 20 hours of training in the flight proficiency areas of operation
    - 10 hours of instrument training using a view-limiting device including attitude instrument flying, partial panel skills, recovery from unusual flight attitudes, and intercepting and tracking navigational systems
        - 5 out of the 10 hours must be in a single engine airplane
    - 10 hours of training in a retractable landing gear, flaps, and a controllable pitch propeller, or is turbine-powered aircraft. **If you are going for a commercial seaplane rating, it must have flaps and a controllable pitch propeller.**
    - One 2-hour cross country flight in a single engine airplane in daytime conditions that consists of a total straight-line distance of more than 100 nautical miles from the original point of departure

- One 2-hour cross country flight in a single engine airplane in nighttime conditions that consists of a total straight-line distance of more than 100 nautical miles from the original point of departure

- Three hours in a single-engine airplane with an authorized instructor in preparation for the practical test with the preceding 2 calendar months from the month of the test

- Ten hours of solo flight time in a single engine airplane or ten hours of flight time as PIC with an authorized instructor on board

- One cross country flight of not less than 300 nautical miles total distance, with landings at a minimum of three points, one of which is straight line distance of at least 250 nautical miles from the original point departure point.

- 5 hours in night VFR conditions with 10 takeoffs and landings (with each landing involving a flight in the traffic pattern) at an airport with an operating control tower.

- Everything above is the same for the Commercial multi-engine rating.

What are the Commercial pilot privileges and limitations?

FAR 61.33

- **Privileges** for a person holding a Commercial pilot certificate may act as PIC of an aircraft:
    - Carrying persons or property for compensation or hire
    - For compensation or hire
- **Limitations**
    - If the holder of a Commercial pilot certificate does not hold an instrument rating the carrying of passengers for a cross-country flight for **hire** in airplanes, is **prohibited** to fly in excess of 50 nautical miles or at **night**.

What are commercial pilot operations?

FAR 61.33 discusses that you may be paid for actions as PIC engaged in carrying persons or property for compensation or hire. If you are acting by yourself, you will be a commercial operator flying under a different set of regulations. The commercial certificate only allows you to work for a commercial operator and be paid for your services. You can charge for your services with a commercial certificate for: flight instruction, nonstop sightseeing flights, ferry or training flights, aerial work including crop dusting, banner towing, aerial photography and powerline or pipeline patrol as examples. This is part of 14 CFR 119.1.

What does commercial operator mean? (14 CFR Part 1)

- A pilot who for compensation or hire uses an aircraft to carry passengers or property.

What does "common carriage" mean? (AC 120-12)

- A pilot carries passengers or property as a result of advertising of this service to the public.

What does "holding out" mean? (AC 120-12)

- A pilot carries passengers or property for hire intrastate or interstate.

What does "private carriage" mean? (AC 120-12)

- A pilot for hire for one or several selected customers usually on a long-term basis. Example: I have been hired by MzeroA.com to fly Jason Schappert, to all of his presentations throughout the country from January of 2017 through December of 2027.

Chapter 2: Certificates and Documents

What documents are required on board the aircraft prior to flight?

- **FAR 91.9 and 91.203**
    - **A –** airworthiness certificate
    - **R -** radio certificate if flying international **ONLY**
    - **R –** registration certificate
    - **O –** operating limitations which include:
        - AFM/POH
        - Placards

        - Instrument markings
        - Any combination of above
    - **W –** weight and balance data for the airplane you are flying
        - If you are going to fly two airplanes (complex and a training aircraft) you will have to do both for the checkride. Advice – fly a complex aircraft for the checkride and then the DPE's does not have to go through the logbooks and see your weight and balance for two airplanes.

Are the aircraft and engine logbooks required to be on board the airplane?

- No. It is advisable to keep in a safe and secure place.

What is the difference between a Normal and Utility Category? (14 CFR Part 23)

- **Normal category –** The aircraft structure can withstand a load factor of 3.8 Gs without structural failure.
- **Utility category –** The aircraft structure must be able to withstand a load factor of 4.4 Gs.

Define the terms "Category," "Class," and "Type." (CFR 14 Part 1)

- Category – A broad class of aircraft: airplane, rotorcraft and glider

- Class – classification within a category having similar operating characteristics: single-engine land, multiengine land

- Type – a specific make and basic model of aircraft including modifications that do not change the handling of the aircraft: DC-9, B-737, B-747

What are Special Flight Permits and when would you use them? (CFR 21.197)

- Authorization that is issued for an aircraft that does not meet airworthiness certification, but is safe to fly.

    - Flying an airplane to a base when it needs repair, alteration or maintenance.

    - Delivering or exporting an airplane.

    - Production flight testing

    - Evacuating aircraft from impending danger

    - Conducting customer demonstration flights

    - Operation of an overweight airplane for flight beyond normal range over water or land areas where adequate landing facilities or fuel is not available.

Where do you get a Special Flight Permit?

- Local FSDO

What is a Minimum Equipment List (MEL) (AC 91-67)

- It is a list of instruments, equipment and procedures that allow the aircraft to be operated with inoperative equipment. It is a specific inoperative equipment document for a particular make and model of airplane. An FAA-approved MEL will list which items of equipment the administrator has deemed can be broken and the flight can be made with an acceptable level of safety. The MEL can be obtained from the local FSDO. The MEL tells a pilot what instruments that can be INOP and the flight can be made safely.

What are the requirements to remain current as a Commercial Pilot? (CFR 61.56 and 61.57)

- A flight review within the previous 24 calendar months

- To carry passengers, must have within the last 90 days:

    - Three takeoffs and landings as the sole manipulator of the flight controls in an aircraft of the same category and class

    - If a tailwheel aircraft, the three takeoffs and landings must be to a full stop.

    - If during a period 1 hour after sunset to 1 hour before sunrise, with passengers on board you must have made three takeoffs and landings to a full stop in the same category, class, and type if type rated

What class of medical certificate is required for Commercial Pilots? (CFR 14 61.23)

- A second class medical certificate is required to exercise commercial pilot privileges.

What is the duration of a Second Class Medical Certificate?

- A second class medical certificate expires at the end of the last of the 12th month after the month of the date of the examination shown on the certificate.

What instruments and equipment are required for VFR day flight? (A TOMATO FLAMES)

- FAR 91.205
- Airspeed Indicator
- Altimeter
- Magnetic direction indicator (magnetic compass or GPS equivalent)
- Tachometer for each engine
- Oil pressure gauge for each engine
- Temperature gauge for each liquid-cooled engine
- Oil temperature gauge for each air-cooled engine
- Manifold Pressure gauge
- Fuel gauge indicating quantity of fuel
- Landing gear position indicator
- Approved aviation red or white anti-collision light system certificated after March 11, 1996

- Flotation gear (if operated for hire over water beyond power-off gliding distance from shore)
- Safety belts
- Shoulder harness
- ELT

What instruments and equipment are required for VFR night flight? (A TOMATO FLAMES plus FLAPS)(CFR 91.205)

- Instrument and equipment required for VFR day flight.
- Approved position lights (navigation lights).
- An approved aviation red or white anti-collision light system.
- If operated for hire, one electric landing light
- An adequate source of electrical energy
- One spare set of fuses, or three spare fuses of each kind required that are accessible to the pilot in light

> **Comment:** Most airplanes nowadays have circuit breakers, so this will not apply to most general aircraft we are flying.

Do aircraft registrations ever expire?

Yes, **The Re-Registration and Renewal of Aircraft Registration final rule** was published in the Federal Register on July 20, 2010. This rule

provides that aircraft registrations issued on or after October 1, 2010, will be good for three years with the expiration date clearly shown. They can be nullified though. The way to remember this is: 30 FT DUC " (30 foot Duck) FAA –H-8083-25

- 30 – 30 days after death
- F – Foreign registry (change the registry to another country)
- T- transfer of ownership
- D – Destroyed
- U – U.S. citizenship revoked
- C - Cancelled

What inspections are required for your aircraft? (CFR 91.409)

- **AVIATES**
    - A – AD's (Airworthiness Directives)
    - V – VOR check every 30 days (IFR only)
    - I – Inspections: Annual and 100 hour (if flying for hire)
    - A – Altimeter every 24 calendar months
    - T – Transponder every 24 calendar months
    - E – ELT every 12 calendar months

- S – Static System every 24 calendar months

What is the difference between a 100-hour and an Annual? (CFR 91.49)

- Annual Inspection must be done within 12 calendar months
- A 100-hour inspection must be done if carrying any person (other than a crew member) or giving flight instruction for hire.
    - If carrying any person for hire there must be a 100- hour inspection plus an annual inspection. If not for hire only an annual is required.

What is preventative maintenance?

- Simple and minor preservation operations and the replacement of small parts that are not considered complex assembly operations. Certificated pilots and sport pilots can do preventative maintenance.
- CFR Part 65 – basic items like oil changes, wheel bearing lubrication, hydraulic fluid for brakes and landing gear system refills
- The pilot who does the maintenance must make an entry into the maintenance record of the aircraft with a description of what was done, date of completion, pilot's name, signature, certificate number, and type of certificate held.

What is an Airworthiness Directive (AD)?

- A method used by the FAA to notify aircraft owners and other potentially interested persons of unsafe conditions that may exist because of design defects, maintenance, or other causes. It is also used to specify conditions in which the aircraft can be operated. It is either an emergency, in which compliance must be immediate or less urgent which requires compliance over a longer period of time. AD's are regulatory and compliance is MANDATORY. All AD's and AD Biweekly are free on the internet at http://rgl.faa.gov.

Who is responsible for ensuring the AD's are complied with?

- The aircraft owner or operator

- A record must be maintained showing the status of the AD for the aircraft.

- The record must show method of compliance, signature and certificate number of the mechanic or repair station who performed the work.

Chapter 3: Aeromedical Factors

Aeromedical Factors may make some pilots cringe, but this is a very important area because it deals with YOU. You are a physical human being. The pilot is affected by altitude, oxygen, carbon monoxide, hyperventilation, alcohol and medications. The airplane will put forces on your body that the may cause you experience uncomfortable feeling. You need to be aware of what causes these feelings.

What aeromedical factors may contribute to hinder a pilot's ability to fly? (AIM 8-1-1)

- **IMSAFE checklist**
    - **I –** Illness
    - **M –** Medications
    - **S –** Stress
    - **A –** Anxiety
    - **F –** Fatigue
    - **E –** Eating or Emotion

What are the 3 types of medical certificates and what is the one that is required for your commercial rating?

- First class medical
    - Good for 12 calendar months if under 40
    - Good for 6 calendar months if over 40
    - Required if your are an active ATP
    - Distant acuity of 20/20 each eye and near vision 20/40, with or without corrective lenses. If corrective lenses (spectacles or contact lenses) are necessary for 20/20 vision.
    - Distinguishes aviation red, green and white
    - Normal field of vision

- Normal field of hearing

- Second class medical
    - **Required for you to utilize commercial pilot privileges**
        - CFI's are not required to have a commercial rating as they are considered teachers for hire.
    - Good for 12 calendar months
    - Distant acuity of 20/20 each eye and near vision 20/40, with or without corrective lenses. If corrective lenses (spectacles or contact lenses) are necessary for 20/20 vision
    - Distinguishes aviation red, green and white
    - Normal field of vision

- Third Class medical
    - Good for 60 calendar months if less than 40
    - Good for 24 calendar months if 40 or greater
    - What every private pilot must at least hold
    - Distant acuity of 20/40 each eye, with or without corrective lenses, and near vision 20/40
    - Distinguishes aviation red, green and white

- Normal field of vision

Can a pilot take medications and still fly? (AIM 8-1-1)

- Yes, as long as the medications are on the FAA's Safe to Use Medication List and they will need to be reported at the next Medical Certificate appointment or to your physician (every 4 years) if using Basic Med.

Can the pilot take over the counter medications?

- If the OTC medication causes drowsiness or impairs the pilot's ability to perform their duties, NO.

- OTC medications are included on the FAA's Safe to Use Medication List.

What is hypoxia?

- It is the inability of the heart to deliver oxygen to the major organs. The two organs that need oxygen the most are the brain and the eyes.

What are the 4 types of hypoxia?

- *Hypoxic hypoxia* – This is the most common of the four types of hypoxia. It is seen at altitude (Maybe this can read: Also referred to as altitude hypoxia). The percentage of oxygen is the same but the molecules are less concentrated the higher the pilot goes. Less molecules taken into the lungs leads to less oxygen being delivered by the heart to the brain.

- *Histotoxic hypoxia* – Inability for the body to use oxygen. Toxic substances get into the blood and prevent oxygen getting to the organs. Examples are alcohol, narcotics (morphine, codeine, Vicodin®) and cyanide. One ounce of alcohol will add about 2000

feet of physiological altitude to the body. Narcotics in the body will decrease the function of lungs to deliver oxygen. Cyanide from smoke in a cockpit fire will prevent oxygen from being delivered.

- *Hypemic hypoxia* – Caused by anemia, disease, blood loss, deformed blood cells, or carbon monoxide (CO) poisoning and with smokers. If the pilot has anemia from giving blood or a blood loss, less oxygen can be transported by the red blood cells. Carbon Monoxide(CO) from smoking or a exhaust manifold leak will cause to hypoxia because the CO will bind first to the red blood cell and not allow oxygen to attach leading to hypoxia.

- *Stagnant hypoxia* – Oxygen deficiency in the body due to poor circulation of the blood. If pilot has a weak heart (heart failure), there will be a decrease in the amount of blood carrying oxygen being pumped to the brain. If the pilot is pulling over 2 G's the blood will be pushed into the pilot's legs and not get to the brain. In the winter time the cold temperatures will constrict the blood vessels and not allow oxygen to get to brain, legs and arms. Can lead to hyperventilation.

What are the symptoms of hypoxia?

- Euphoria, headache, dizziness, cyanosis (purple color in lips and nails), numbness, tunnel vision,

- Every pilot will be different in the order of their symptoms, but each time hypoxia sets in, it will occur in the same order for that individual.

What is hyperventilation?

- Hyperventilation is very rapid breathing due to some stressor, like pain, anxiety or stress. The pilot or passenger is getting rid of Carbon Dioxide. Carbon Dioxide is needed to stimulate the breath. The best way to stop hyperventilation is to take away the stressor. Slow the breath down, concentrate on flying the airplane, open the vents for some cool air and if that does not work, breath into a paper bag. The pilot should breath into a bag and breath back the carbon dioxide in the bag. The breathing rate will decrease. For passengers, if these measures do not work they will eventually pass out and sleep. You cannot die from hyperventilation. The symptoms of hyperventilation are the same and different than hypoxia. Hyperventilation symptoms are slow in onset and hypoxia is fast. Hyperventilation causes spasm of the limbs, in hypoxia the limbs go limp. In hyperventilation the skin is cold and clammy and in hypoxia the skin is purple.

What is Carbon Monoxide poisoning? (AIM 8-1-4)

- Carbon monoxide is colorless, odorless and tasteless. It will usually get into the cabin due to a exhaust leak. CO is a by-product of the incomplete combustion of carbon-containing materials, such as aviation fuel. It has a stronger binding capacity to blood vs. oxygen. The pilot will then become hypoxic.

What precautions should be taken before flight if you or passengers have been scuba diving? (AIM 8-1-2)

- The recommended waiting is 12 hours if going to 8,000 feet or less if a non-controlled assent was not required.

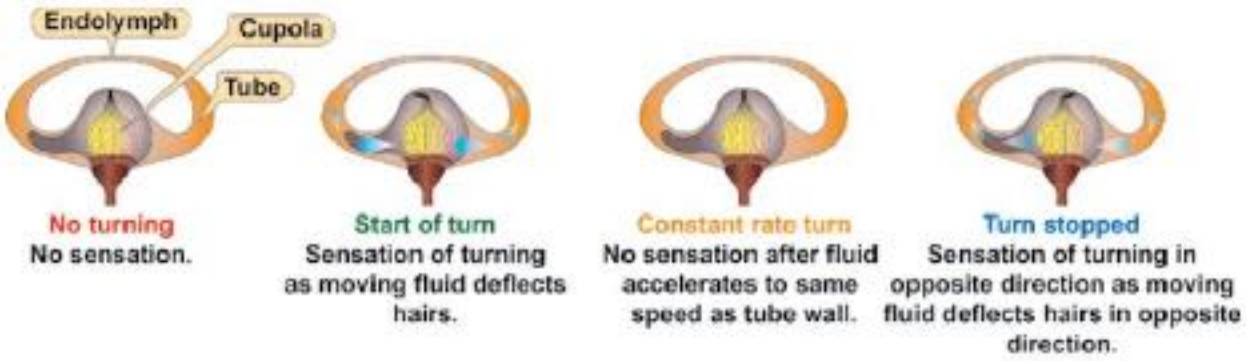
- The recommended waiting is 24 hours if going to 8,000 feet or less if a controlled ascent was not required.

- The recommended waiting is 24 hours if going above 8,000 feet after any scuba diving.

Name the 8 types of spatial disorientation?

Spatial disorientation, for the pilot is the body's inability to know where it is while in motion, in our case flying. The eyes are seeing one thing and the brain is sensing something different. The brain will get confused and create false feelings and illusions. You have a semicircular canal with that can perceive pitch, roll and yaw. The five to ten percent of all aviation accidents are due to spatial disorientation, but ninety percent are FATAL.

- **The Leans** – This is the most common type of spatial disorientation. It occurs when the pilot has been in a less than 2 degree per second prolonged or gradual turn. The pilot suddenly levels the wings and feels as if they are turning in the opposite direction of the original turn. The pilot then turns back in direction of the original turn and steepens it. (If using these images the text needs to mention inner ear. Maybe something along the lines of: An abrupt correction of bank angle which has been entered too slowly to stimulate the motion sensing system of the inner ear).



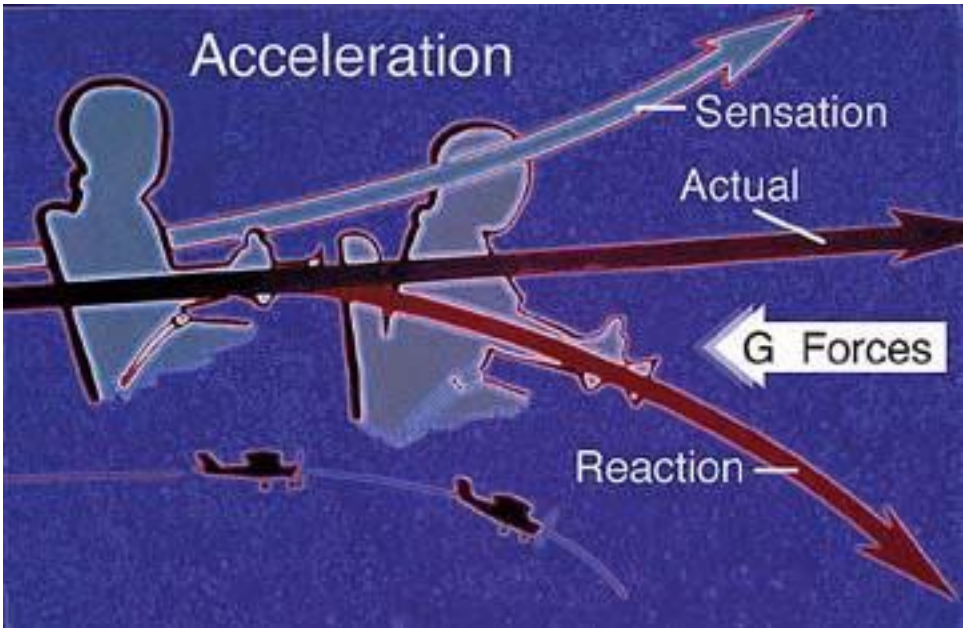
- **The Coriolis Illusion** – This illusion is due to your semicircular canal, which helps your brain pick up pitch, roll and yaw. You are in a turn and you quickly pick up that pen that dropped or need to quickly look at the IPAD on your lap at that approach plate. You quickly move your head back to level and you feel like you are pitching, rolling and yawing at the same time. It has been described as "tumbling down a hill."

- **The Graveyard Spin** – The pilot inadvertently or intentionally gets into a spin to the left. As right rudder is added to slow the spin, it will feel like you are in a right spin, so left rudder is added which makes the original spin worse. (Pilots correction to the spin can return the aircraft into the original spin).

- **The Graveyard Spiral** – The pilot is in a prolonged turn to left for greater than 20 seconds. When the pilot levels the wings, it feels like a turn to the right and the pilot turns back left and increases the roll rate, putting the pilot into a spiral. The turn will tighten, steepen and lose altitude. The pilot pulls back on the elevator putting the airplane into a spiral.

- **Somatogravic Illusion -** This is caused with a rapid acceleration (high performance aircraft) and the pilot is pushed back into the seat giving a feeling of a high pitch nose up attitude. The pilot may

push the nose low or dive attitude. A rapid deceleration by quick reduction of the throttle(s) can have the opposite effect, with the disoriented pilot pulling the aircraft into a nose-up or stall attitude



- **Inversion Illusion -** The pilot goes from a steep climb to level and this causes the pilot to feel like they are tumbling backwards. The pilot pushes the nose down which may intensify the illusion.

- **Elevator Illusion –** An abrupt upward vertical acceleration. This illusion is found on a turbulent day with extreme vertical updrafts. This will cause the pilot to continually nose over the aircraft. The opposite is true with extreme downdrafts. (An abrupt downward vertical acceleration, usually in a downdraft, has the opposite effect, with the disoriented pilot pulling the aircraft into a nose-up attitude).

- **False Horizon -** Usually this is caused by cloud formations blocking the horizon. The pilot will use the clouds as their horizon and the pilot will turn and get into an unusual attitude. Dark nights tend to eliminate reference to visual horizon.

- **Autokinesis** - This illusion will usually happen at night. The pilot will stare at an (a bright) object for 10-12 seconds. The brain will have no reference point to refer to, so the object starts to move. To prevent this illusion, focus the eyes on objects at varying distances and avoid fixating on one target. Be sure to maintain a normal scan pattern

ACRONYM – ICEFLAGS

- **I – Inversion Illusion**
- **C – Coriolis Illusion**
- **E – Elevator Illusion**
- **F – False Horizon**
- **L – Leans**
- **A – Autokinesis**
- **G – Graveyard Spin/Spiral**
- **S – Somatogravic Illusion**

Chapter 4: Weather

Weather is dynamic, constantly changing and unpredictable. If there is one subject, you must learn and understand as a pilot, it is weather. You cannot know enough. You must have a good foundation on weather information and have a motivation to keep learning more.

What is standard temperature and pressure?

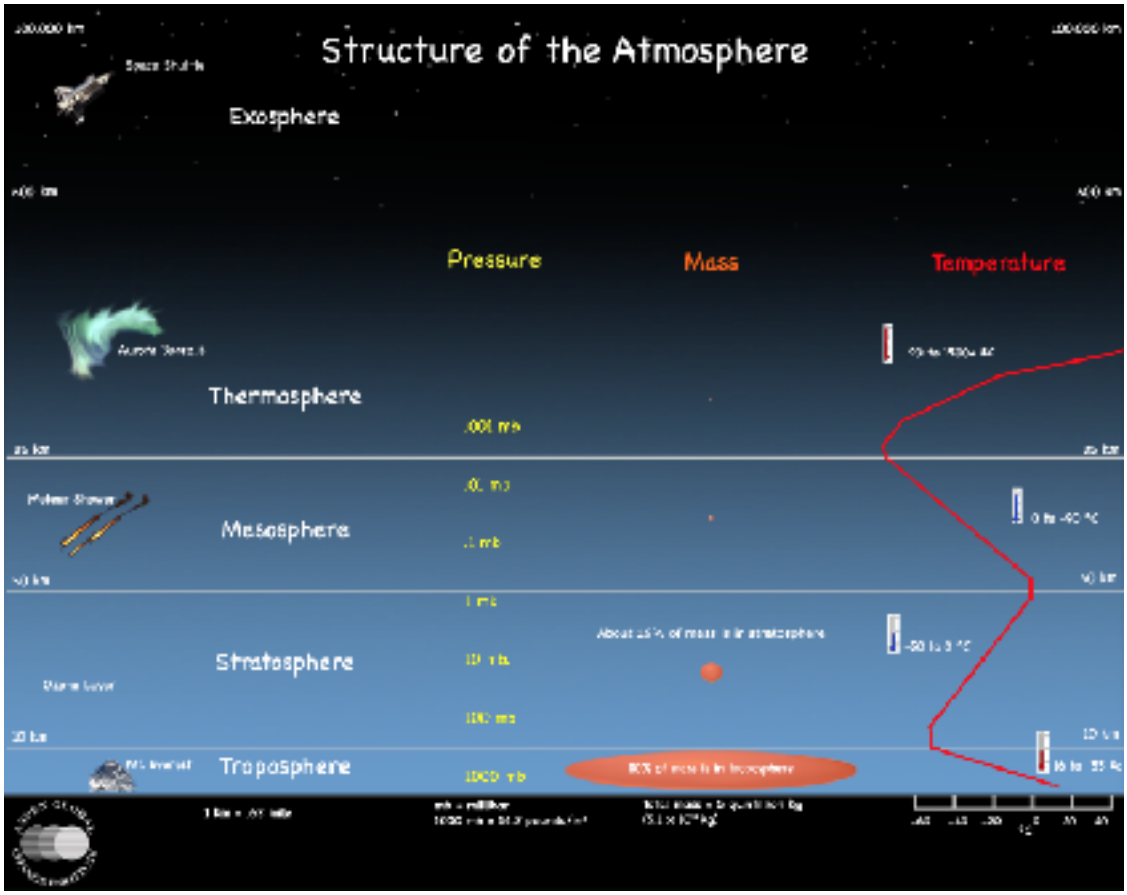
- 15 degrees C (59 degrees F)
- 29.92 inches of Hg
- 1013.2 hPa (hectopascals)

What are the 3 layers of the atmosphere?

- The Troposphere – The layer where from the earth's surface to the Tropopause where nearly all the weather takes place (The troposphere starts at the Earth's surface and extends approximately 36,000')
- The Tropopause – The layer between the troposphere and the stratosphere and is an inversion layer. This layer is where the temperature stops decreasing as the altitude increases.

(I would change the order this reads. I would have it read in the order of the actual atmosphere. Troposphere, stratosphere, mesophere, themosphere)

- The Stratosphere – This layer is above the tropopause and has colder and warmer layers. The warmer closest to the sun and the cooler closest to the tropopause. It is 20% of the atmosphere.



(I added this photo)

What is the cause of all weather?

- Uneven heating of the Earth by the Sun. (Weather processes such as wind, clouds, and precipitation are all the result of the atmosphere responding to uneven heating of the Earth by the Sun. A little more detailed answer.)

What causes wind?

- Differences in atmospheric pressure. Pressure goes from High to Low and this causes wind.

Name and explain the four types of fog.

- **Radiation Fog –** Radiation fog is usually seen in the fall and winter. (Also known as ground fog) At night, in calm winds, the air will cool and stabilize near the ground. When the air reaches its dew point fog will form. The fog will extend upward and deepen. This is most prevalent near bodies of water and in valleys where there is little wind. It is patchy and stays in one place. The sun will burn it off in a few hours. (I do not like this last sentence. Maybe could read something like: Surface temperature must rise in order for the fog to clear)

- **Advection Fog -** Advection fog is a type of fog that forms as cool (should be warm not cool) and moist air moves over cooler surfaces. Surfaces can be either land or water(sea fog), each cooler than the warm and more humid air moving horizontally above it. Wind is required for advection fog form. These fogs will often appear to *roll* into an area and have a forward movement.

- **Upslope Fog -** Warm, moist stable air will condense to form upslope fog when a light wind blows against a mountain or ridge.

- **Steam Fog -** Fog which is formed when very cold air moves over warmer water. The air temperature reaches the dew point and the for will rise like steam off the warmer water. There also must be calm winds.

(steam fog and frontal fog is a by product of evaporation fog. Do we need to add content?)

Compare stable and unstable air.

- Stable air - A *stable* atmosphere resists any upward or downward displacement.

- Characteristics of stable air: stratiform(stratus) clouds, continuous precipitation, smooth air and fair to poor visibilities.

- Unstable air – An *unstable* atmosphere allows an upward or downward disturbance to grow into a vertical or convective current.

  - Characteristics of unstable air: cumulus clouds, showery precipitation, good visibility and strong surface winds.

What is the difference between an air mass and a front?

- **Air Mass** – Is a volume of air defined by its temperature and water vapor content. Air masses cover many hundreds or thousands of square miles and will adapt to the landmass below it. They are classified according to latitude and their continental or maritime source.

- **Front –** A front is a boundary is a boundary separating two masses of air of different densities, temperature and humidity. A front is the principal cause of meteorological phenomena.

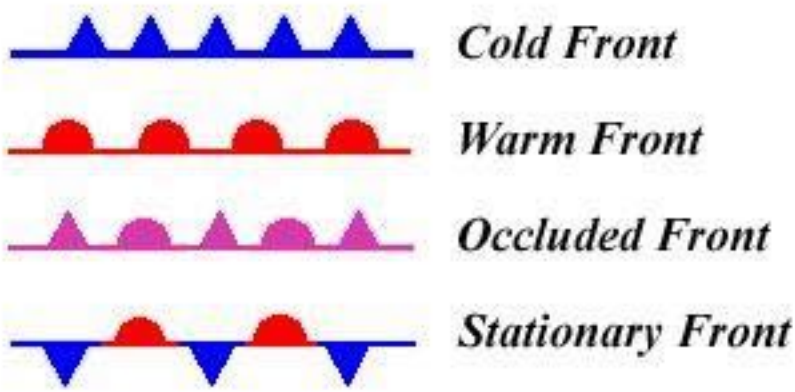
Name the 4 different kinds of fronts.

- ***Cold front*** (1) – leading edge of colder air that is replacing warmer air. Think icicles. These contain squall lines and serve weather. Precipitation always falls in the front of a cold front.

- ***Warm front*** – leading edge of warmer air that is replacing colder air. Think little suns. Typically moves at a slower rate than cold fronts. Precipitation always falls in the behind of a warm front.
- ***Stationary front –*** A front that is not moving. Icicles and suns pushing each other. No apparent movement because the opposing

forces of the two air masses are relatively balanced

- ***Occluded front -*** when a cold front overtakes a warm front. When this occurs, the warm air is separated (occluded). Think icicles and suns are too crowded to move. Occurs when a fast-moving cold front catches up to a slow-moving warm front



What causes turbulence?

- The main causes of turbulence are convective currents, obstructions to wind flow like mountains and wind shear. The convective currents we normally experience are caused from rising air due to the heating of the ground. These thermals may give the pilot a few "bumps" during the flight. Flying under cumulous clouds that are building will cause more violent turbulence.

Icing Conditions:

In order for icing to exist, there are three key factors which must exist.

Temperature:

- Icing generally forms between 0C and -20C
- Icing can form when the outside air temperature is actually above freezing, if the aircraft surface is below freezing. This may happen when an aircraft descends from cooler air temperatures.

Moisture:
- For ice to accrete on an aircraft in flight, there must be sufficient moister in the air.
- Sufficient moister is any visible moister which may be in the form of a cloud or liquid precipitation.

Droplet size:
- Small droplet will generally fall on a surface and quickly freeze causing ice build up in the area.
- Large droplets may take longer to freeze and may impact larger areas.

What are the three types of icing?

A big tip to remember about icing is you have to be flying through visible moisture in order to collect ice. The temperature has to be around 32 degrees or flying a cold airplane into visible moisture will be an "ice collector." The other tip is you cannot fly into known or forecasted icing conditions: **Sec. 91.527 — Operating in icing conditions.**

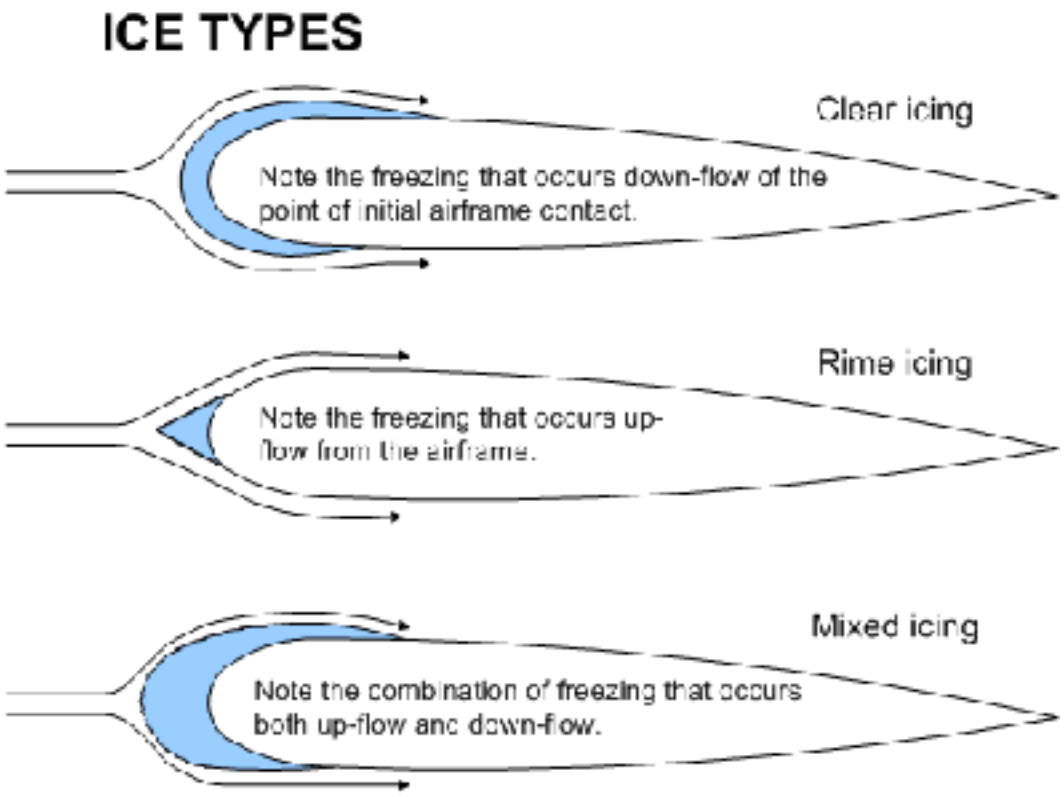
(a) No pilot may take off an airplane that has frost, ice, or snow adhering to any propeller, windshield, stabilizing or control surface; to a powerplant installation; or to an airspeed, altimeter, rate of climb, or flight attitude instrument system or wing, except that takeoffs may be made with frost under the wing in the area of the fuel tanks if authorized by the FAA.
(b) No pilot may fly under IFR into known or forecast light or moderate icing conditions, or under VFR into known light or moderate icing conditions, unless—

(1) The aircraft has functioning deicing or anti-icing equipment protecting each rotor blade, propeller, windshield, wing, stabilizing or control surface, and each airspeed, altimeter, rate of climb, or flight attitude instrument system;

- **Clear –** Clear ice is one of the most dangerous forms of icing. Supercooled water close to the 32 degree F mark will coat the airplane surfaces, especially the leading edge of the wings and the horizontal stabilizer. It will look like a sheet of ice on the wings and degrades the lift very quickly while adding a lot of weight to the airplane. It will decrease lift and increase drag. Forms between 0 and -10 degree Celsius.

- **Rime –** Rime ice looks like frost on the leading edge of the wing. It has air mixed in with ice and it gives the ice that frosty appearance. Rime will cause decreased lift and increased drag. Formed by the instantaneous or very rapid freezing of super-cooled droplets as they strike the aircraft. Low temperatures, lesser amounts of liquid water, low velocities, and small droplets are conducive to the formation of rime ice. Forms between -10 and -20 degrees C

- **Mixed –** This type of icing is a combination of rime and clear ice. You will normally see clear in the middle of the sheet of ice and rime on the edges. As above, mixed ice will decrease lift and increase drag. Forms between -8 and -15 degrees celsius



Based on depiction found in Fig. 9-5 of *Air Command Weather Manual*

What three elements do you need for a thunderstorm to form?

- Water vapor
- Unstable lapse rate
- Uplifting
    - In my way of learning: Juice, heat and lift.

What are the three stages of a thunderstorm?

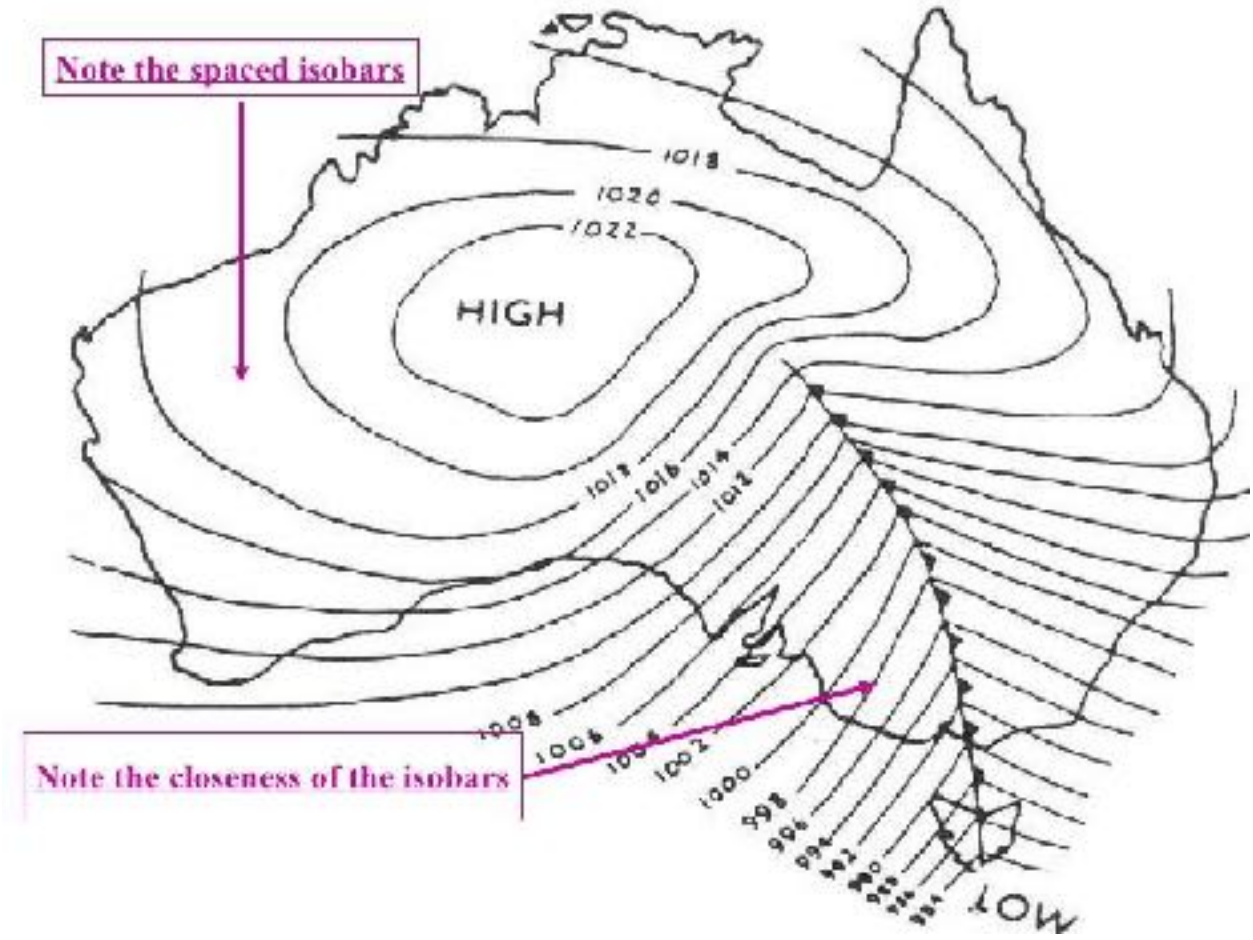
- **The Cumulous Stage** is characterized by updrafts. High winds moving up and down that may extend above thunderstorms.

- **The Mature Stage** is characterized by rain (maybe should read precipitation begins to fall). This stage has both updrafts and downdrafts.

- **The Dissipating Stage** is characterized by downdrafts and the thunderstorm "rains itself out." (Storm weakens)

What are isobars?

- Isobars are lines of equal pressure on a weather chart. If the lines are close together expect strong winds and turbulence. If the lines are far apart expect nice and calm weather.



Chapter 5: Textual Weather

A big part of the alphabet soup is the weather abbreviations used in METARS, TAFS, and PIREPS. This is the only way NOAA (government weather) can get it all to you in a simple and concise way. It may look daunting, but after practicing looking at weather since the beginning of your private pilot training, you already have a good working knowledge. Make it a habit to look at 2 TAFS and METARS everyday and compare this information to what really happened throughout the day.

What are METARS?

- **METARS -** Meteorological Terminal Aviation Routine Weather Report

How long are they valid for?

- one hour unless the weather dramatically changes and a Special (SPECI) will be issued.

When are they issued?

- Usually at 50 minutes past the hour

Practice

METAR KRDU 0101502 10009KT 10SM SHRA - OVC050 23/15 A2982 RMK RAB40 FQT LTG DSNT SW SLP094 TO2250149 56012

KRDU – station ID: Raleigh-Durham Airport
0101502 – first day of the month at 0150Z
Wind – 100 @ 9 knots
Visibility – 10 statute miles
Conditions – Light rain showers
Sky Conditions – overcast 5000 feet (AGL)
Temperature – 23 C
Dew point - 15 C
Barometric Pressure – 29.82
Remarks – Rain began 40 minutes after the hour frequent lightning in the distance SW of the airport
Sea level pressure – 1009.4 Hectopasquals/millibarH. Add a 9 or 10 to the number to get the number closest to 1000.
Exact temperature and dewpoint – 22.5 C and 14.9 C

Atmospheric Trend – Atmospheric pressure in lower since taken 3 hours previously. The number "5" signifies atmospheric pressure. If the next number is a 1,2,3, the atmospheric pressure has increased in the last 3 hours. If next number is 4, it has stayed the same. If the number is 5,6,7,8, the atmospheric pressure has decreased. In our example it is a "6" followed by 012. Thus, the pressurehas decreased by 0.12 inches of Hg.

If you want a nice review: https://www.faa.gov/documentlibrary/media/advisory_circular/ac_00-45h.pdf

What are TAF's?

- **TAF –** Terminal Aerodrome Forecast

How long are they valid for?

- 24 hours

When are they issued?

- Four times a day

Practice

TAF
KPIT 091730Z 091818 22020KT 3SM -SHRA BKN020
FM2030 30015G25KT 3SM SHRA OVC015 WS015/30045KT
TEMPO 2022 1/2SM TSRA OVC008CB
FM2300 27008KT 5SM -SHRA BKN020 OVC040 PROB40 0407 00000KT 1SM -RA BR
FM1000 22010KT 5SM -SHRA OVC020 BECMG 1315 20010KT P6SM NSW SKC
KPIT 091730Z 091818 22020KT

Where:

KPIT is the ICAO station identifier. The usual 3 letter identifiers are preceded by a "K" for the
contiguous United States. Alaska and Hawaii use 4 letter identifiers beginning with "PA" and
"PH" respectively.
When: 091730Z This is the forecast for the 9th day of the month with an issuance time of 1730Z or UTC. This is a 2 digit date and 4 digit time.
091818 is the valid period with the first two digits containing the day of the month (09).
09**18**18 the second two digits specify the hour beginning the forecast period (1800Z).
0918**18** the last two digits are the hour ending the forecast period (1800Z on the next day the 10th).
Wind: 22020KT
WS015/30045KT means at 1500 feet we expect wind to be 300 degrees at 45 KT. This indicates **low level wind shear**, not associated with convective activity.
Time Periods:
FM2030 From 2030Z or UTC time. Indicates hours and minutes.
TEMPO 2022 Temporary changes expected between 2000Z and 2200Z.
FM2300 FROM 2300Z.
PROB40 0407 There is a 40 percent probability of this condition occurring between 0400Z and 0700Z.
FM1000 FROM 1000Z.
BECMG 1315 Conditions Becoming as described between 1300Z and 1500Z.
Once the specific time periods can be discerned, the sequence of wind, visibility, significant weather, cloud cover and cloud height follows and is repeated for each time block. The only exception is after qualifiers such as PROB40, TEMPO, and BECMG, some of the components may be omitted if these are not expected to change. Notice after **TEMPO 2022**, there is **no** wind given and after PROB40 0407, there is no cloud cover listed.

Note: When No Significant Weather (NSW) appears it only indicates obstruction to visibility or precipitation previously noted has ended.

What are PIREP's?

PIREP – Pilot Report

When are PIREPS issued?

- PIREPS are initiated by the pilot, when either in the air or after landing.

What is the necessary data that is required to make a PIREP?

- **UA –** routine or **UUA –** urgent
- **/OV –** location of the PIREP
- **/TM –** time the PIREP was received from the pilot
- **/FL –** flight level or altitude above sea level of the PIREP
- **/TP –** type of aircraft
- **Optional:**
    - **/SK –** sky cover
    - **/TA –** temperature
    - **/WV –** wind velocity
    - **/TB –** turbulence
    - **/IC –** icing

- **/RM –** remarks

Practice: KCRW UV /OV KBKW 360015-KCRW/TM 1815/FL120// TP BE99/
SK IMC/WX RA/TA M08 /WV 290030/TB LGT-MDT/IC LGT RIME/RM MDT MXD ICG DURC KROA NWBND FL080-100 1750Z

From 15 miles north of the Beckley VOR to Charleston VOR; Time 1815 Z; Altitude – 12,000 feet; Type of aircraft – BE-99; sky conditions IMC with rain; Temperature -8 C; Wind 290@30K; Turbulence – light to moderate; icing – light rime with moderate mixed icing during climb NW bound from Roanoke, VA between 8,000 and 10,000 feet at 1750Z.

What are Area Forecasts?

- **Area Forecasts**
    - Area forecasts are 12-hour aviation forecasts plus a 6 hour categorical outlook. They are prepared three times a day, with each section amended as needed.

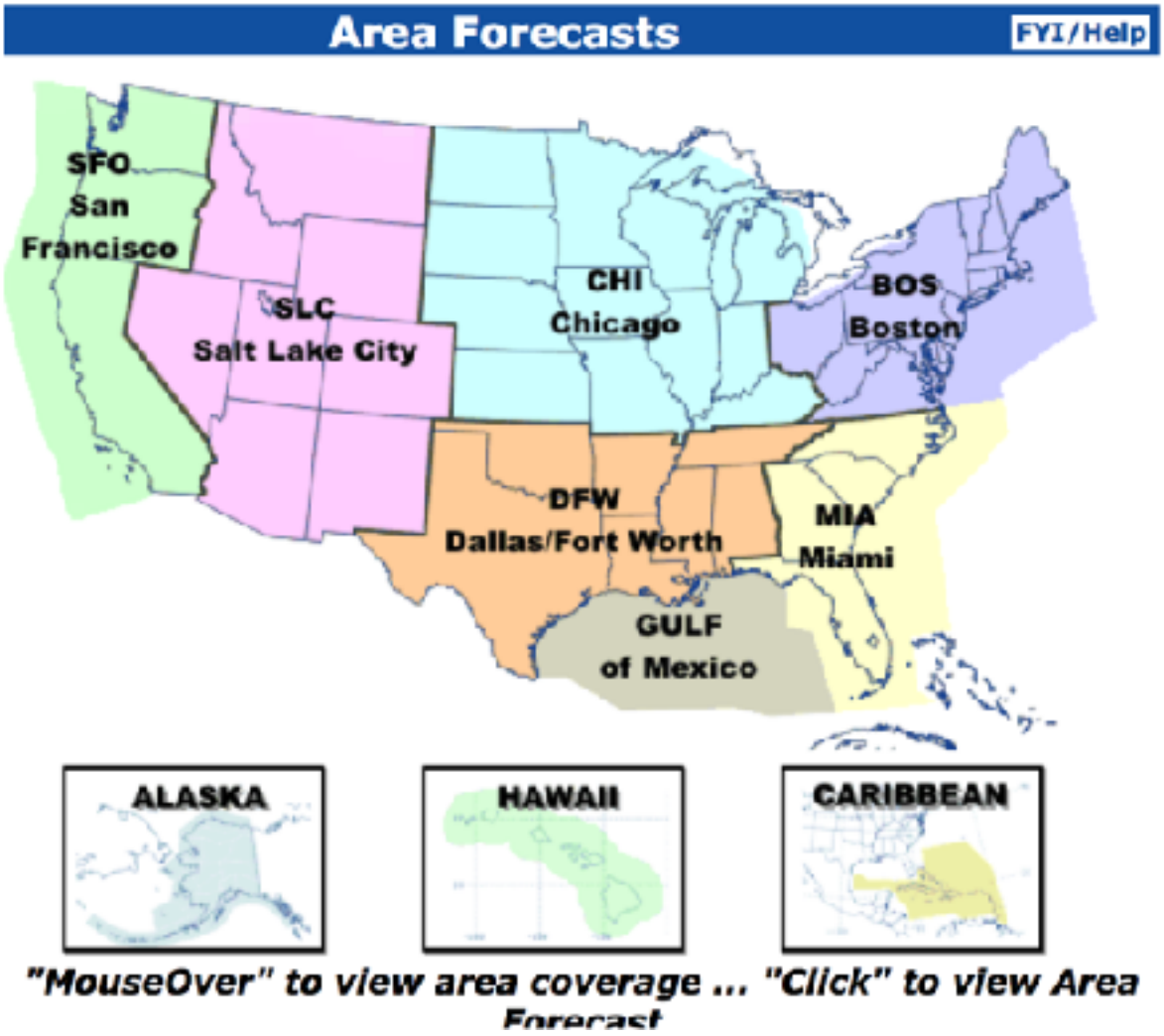
What is the purpose of and how are Area Forecasts displayed?

- Cover an area the size of several states
- Divided into 6 geographic sections
- Visibility is always stated in statute miles (SM)
- Times are issued in UTC (Coordinated Universal Time)

- Comprise four sections
    - Issue time of forecast
        - Valid times of the synopsis and the visual flight rules (VFR) CLOUDS/WX sections
        - Area of coverage
    - A precautionary statement section
        - AIRMET Sierra will supply IFR conditions
        - Check the AIRMET section for IFR and/or mountain obscuration
        - Describes the hazards associated with all thunderstorm
        - Reminds users that all altitudes are given in MSL, unless noted as AGL or CIG (ceiling)
    - A synopsis section
        - Brief summary of the location and movement of fronts, pressure systems and circulation patterns for an 18-hour period
        - References to low ceilings, reduced visibility and/or strong winds may be included
    - A VFR CLOUDS/WX section

    - Contains a 12-hour specific forecast, followed by a 6-hour categorical outlook
    - Broken down into geographical areas, and/or states
    - Describes cloud and weather affecting VFR flight operations, including precipitation, thunderstorms, and sustained surface winds 20 Kts or greater. Also includes visibility when the forecast to visibility is between 3 and 6 SM and/or obstructions to visibility

- Some abbreviations that are used in FA's include:
- OCNL Occasional >50% chance for <1/2 of the forecast period
- ISOLD Isolated Single cells
- WDLY SCT Widely scattered <25% of the area affected
- SCT Scattered Areas of 25% to 54% of the area affected
- NMRS Numerous >55% of the area affected
- WDSPRD Widespread >55% of the area affected



Practice:

```
FL
WRN 1/2 PNHDL...SCT030 BKN060 TOP FL250. ISOL -SHRA/-TSRA.
  CB TOP ABV FL450. 00Z SCT030 BKN100. OTLK...VFR.
ERN 1/2 PNHDL...SCT050 WITH BKN CI ABV. ISOL -SHRA/-TSRA. CB TOP
  ABV FL450. 01Z BKN CI. OTLK...VFR.
WRN PEN...SCT040. 02Z SCT CI. OTLK...VFR.
CNTRL-SRN FL...SCT040. 02Z SKC OR SCT CI. OTLK...VFR.
FL KEYS...SCT020. ISOL -SHRA. OTLK...VFR.
```

Western half of the Florida Panhandle – Scattered 3,000, Broken 6,000, Tops 25,000. Isolated light rain and thunderstorms with light rain. Cumulonimbus cloud tops above 45,000. At 00Z Scattered clouds 3,000, Broken 10,000. Outlook VFR

Eastern half of Panhandle - Scattered 5,000 with broken Cirrus clouds above. Isolated light rain and thundershowers with light rain. Cumulonimbus tops above 45,000. At 01Z Scattered clouds 3,000, Broken 10,000. Outlook VFR.

Northern Peninsula – Scattered 4,000, 02Z Scattered Cirrus Outlook VFR

Central southern FL – Scattered 4,000, 02Z Sky clear or scattered Cirrus Outlook VFR

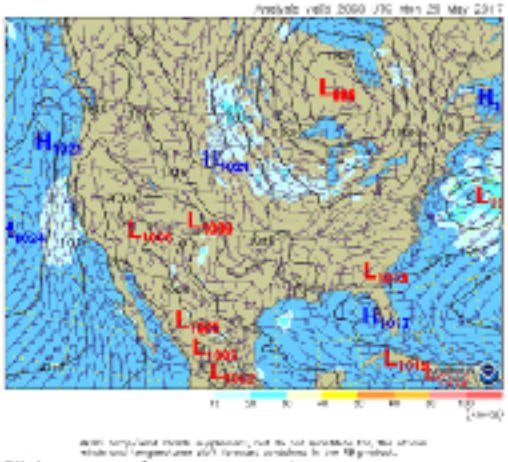
FL keys – Scattered 2,000, Isolated light rain showers Outlook VFR

Winds and Temperature Aloft

Winds and temperatures aloft forecasts are come out every 6, 12 and 24 hours. These are forecast of the winds to the nearest 10 degrees based on true north and speed in knots for selected altitudes. Forecast temperatures aloft are included in all altitudes EXCEPT the 3,000 feet level.

Wind/Temp Plots

Sea level pressure (mb) / surface wind speed (kts)



Click on map for access to plots

Wind/Temp Data

Click on map to access text data for each region

NCEP Wind Aloft Forecasts

WindTemp Home | Plot | Data

Level: Low High 202-03Z Southeast (Miami) Print

```
 (Extracted from FBUS31 KWNO 292002)
FD1US1
DATA BASED ON 291800Z
VALID 300000Z   FOR USE 2000-0300Z. TEMPS NEG ABV 24000

FT  3000    6000    9000   12000   18000   24000  30000  34000  39000
ETW 1312 1711+17 1713+11 1912+05 2010-05 9900-17 321334 291445 282256
JAX 2311 2513+17 2716+12 2320+06 2129-08 2426-20 232033 222144 250855
MIA 1811 1707+16 1807+11 1911+06 1418-09 0615-18 340532 300942 301755
MLB 9900 2710+17 1905+13 1608+05 1917-07 2311-19 250834 221144 252356
PFN 2616 2818+17 2718+11 2417+04 2328-08 2227-19 223033 223543 263056
PIE 9900 9900+18 9900+12 1807+05 2118-06 2317-19 221434 211844 281055
TLH 2512 2811+16 2820+11 2421+05 2228-08 2329-19 232833 232543 272855
ATL 2610 2518+14 2622+09 2628+03 2545-10 2341-19 223934 235144 255557
CSG 2508 2623+15 2729+10 2635+04 2444-11 2240-19 224033 234443 264457
SAV 2310 2413+16 2626+10 2542+06 2138-09 2433-20 222933 242444 252356
HAT 2205 2811+14 2623+12 2723+05 2550-10 2649-20 264133 273444 282656
ILM 2608 2812+15 2821+12 2730+04 2447-10 2643-20 263433 273244 283656
RDU 2207 2310+14 2522+09 2627+02 2460-10 2554-19 265934 255344 274956
CAE 2314 2419+16 2324+09 2440+03 2452-08 2442-19 253634 253945 263856
CHS 2511 2718+17 2620+11 2541+06 2241-09 2533-20 243134 252944 273056
FLO 2311 2619+17 2622+10 2535+04 2351-09 2441-19 253834 254145 284256
GSP 2621 2522+14 2528+08 2431+02 2538-09 2440-19 235035 234746 266057
2XG 2208 2609+19 2513+14 2315+07 2122-09 2517-19 271235 310945 361656
```

Practice

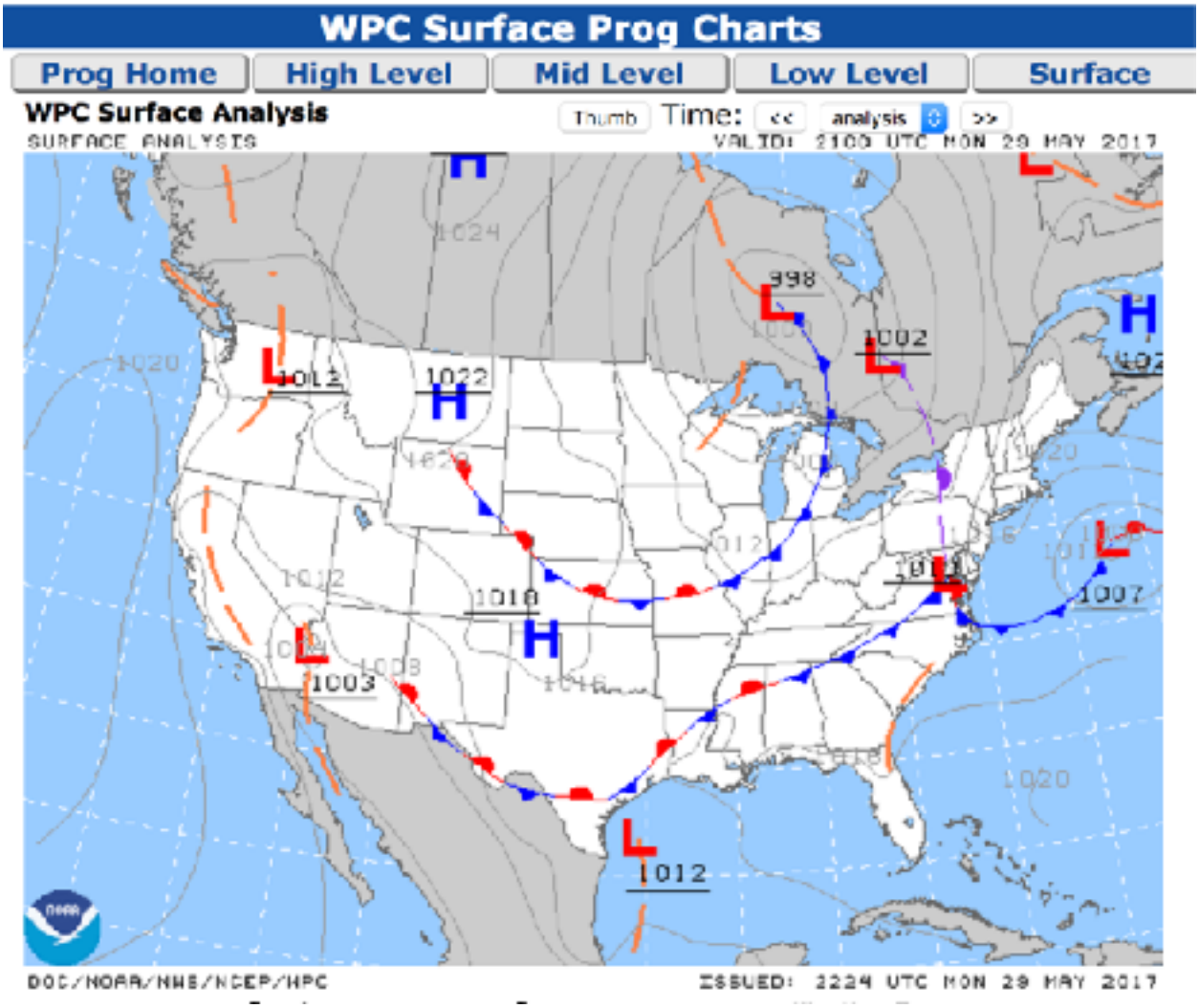
DATA BASED ON 291800Z VALID 300000Z FOR USE 2000-0300Z. JAX 3000 2311, 6000 2513+17, 9000 2716+12, 12000 2320+06, 18000 2129-08

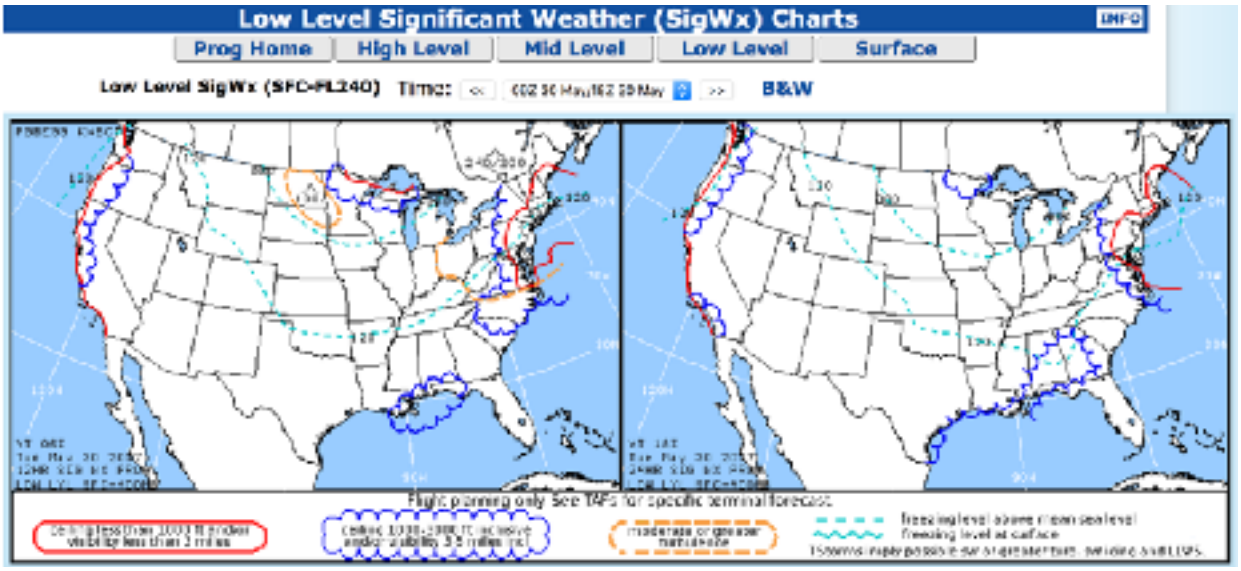
Data is based on the 29th of this month at 1800Z. It is valid on the 30th at 0000Z

At KJAX at 3,000 feet winds forecasted for 230/11, at 6,000 250/13, temp 17C, 9,000 270/16 12C, 12,000 230/20 temp 6C, 18,000 210/29 temp -8C

What is a prognostic chart?

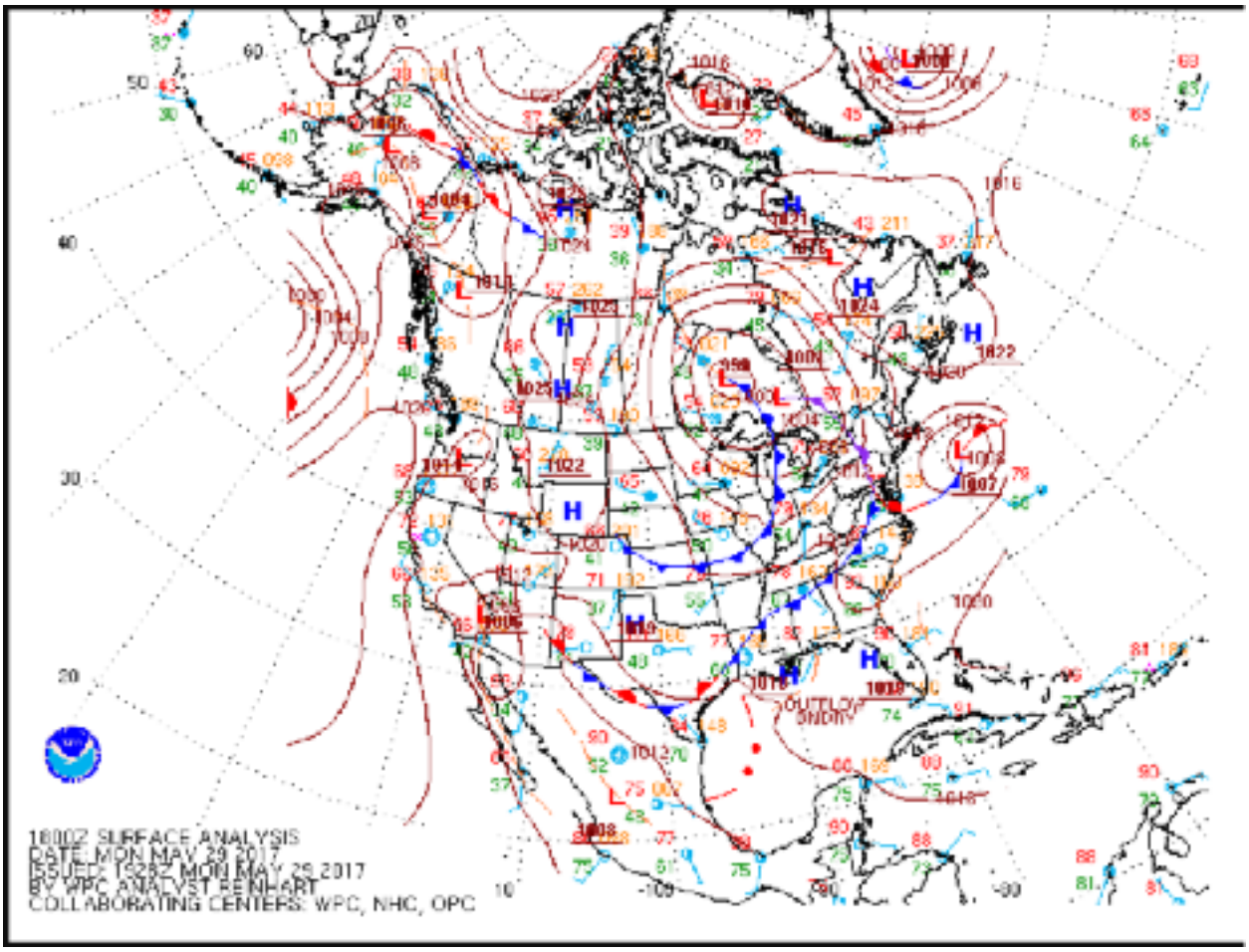
A prognostic chart is a map displaying the likely weather forecast for a future time. There is a variety of information such as temperature, wind, precipitation and weather fronts. The "prog" chart is issued four times a day and gives a 12 hour and 24 hour weather forecast for a particular region. It covers from the surface up to 24,000 feet. It is a very chart to read and easy to understand.


WPC Surface Prog Charts
Prog Home
High Level
Mid Level
Low Level
Surface
WPC Surface Analysis
Thumb
Time:
<<
analysis
>>
SURFACE ANALYSIS
VALID: 2100 UTC MON 29 MAY 2017
1024
998
1002
1020
1012
1022
1016
1003
1007
1012
DOC/NOAA/NWS/NCEP/WPC
ISSUED: 2224 UTC MON 29 MAY 2017



What is surface analysis chart?

A surface analysis chart depicts weather from a few before to the time depicted on the top of the chart. The **surface analysis chart** is a computer-generated **chart**, with frontal **analysis** by forecasters, transmitted every 3 hours covering the contiguous 48 states and adjacent areas. Included in the chart are isobars, pressure systems, fronts, troughs and ridges. There are tables for the meaning of the symbols.



What is a weather depiction chart?

A weather depiction chart details surface conditions as derived from METARS and other surface observations. The weather depiction chart is prepared and transmitted by computer every 3 hours beginning at 0100Z. It is valid at the time of the plotted data. It is used for flight planning by giving you an overall picture of the weather across the U.S.

What is the difference between an AIRMET, SIGMET and Convective SIGMET?

An AIRMET (Airman's Meteorological Information) advises weather that mays be hazardous, other than convective activity, to single engine and VFR pilots. AIRMETS are issued by the NWS for: IFR, ceilings < 1000 feet and visibilities < three miles over 50% of the area, turbulence,

moderate turbulence, mountain obscuration, sustained winds of 30 knots or more, icing, moderate icing and freezing levels. AIRMETS are issued for 6 hour periods starting at 0045 Eastern Daylight time and 0145 Eastern Standard time.

SIGMET advises of weather potentially hazardous to all aircraft. The weather-impacted reasons for a SIGMET are: severe icing, severe or extreme turbulence, duststorms and sandstorms and volcanic ash. A SIGMET must affect an areal of at least 3000 square miles. SIGMETs are issued for 6 hours periods for hurricane conditions and 4 hours for all other events.

CONVECTIVE SIGMETs are issued for: severe surface weather including: surface winds greater than or equal to 50 knots, hail at the surface greater than or equal to ¾ inches, tornadoes, embedded thunderstorms, line of thunderstorms, thunderstorms greater than or equal to VIP(Video Integretor and Processor) level 4(this show radar reflectivity) affecting 40% or more of at least a 3000 square miles area. Any convective SIGMET implies severe or greater turbulence, severe icing and low level wind shear. Convective SIGMET is issued any time the forecaster feels is may be hazardous to all categories of aircraft. They are released at Hour +55. The forecast is valid for 2 hours.

What are the 3 types of AIRMETs?

AIRMET TANGO – Turbulence and surface winds greater than 30 knots.

Think: **T stands for Turbulence**

AIRMET SIERRA – Instrument conditions or mountain obstructions

Think: **I cannot SEE**

AIRMET ZULU – Icing conditions

Think: **freeZing. For us more of a mature age group, I think Ice Station Zulu which as a movie about a scientific mission in the Arctic.**

Define the term ceiling?

The lowest BKN(broken) or OVC(overcast) layer of clouds. It is measured in AGL.

Chapter 6: Performance and Limitations

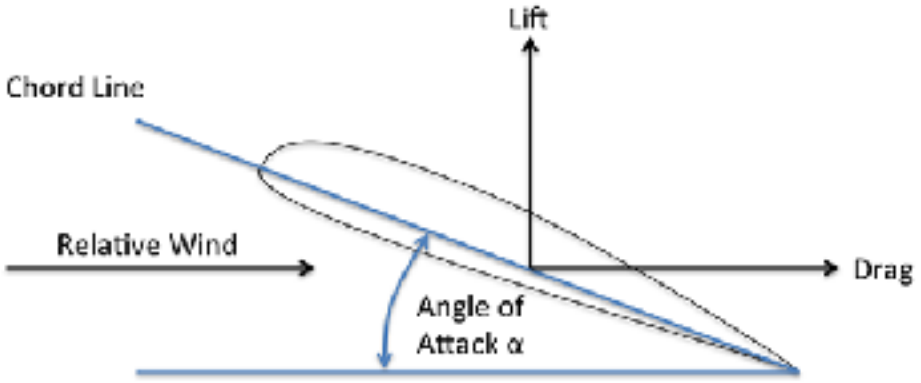
Performance and limitations include aerodynamics, weight and balance and density altitude. The commercial pilot certificate is a rating of carrying passengers and their baggage from one point to another while following the FAR's concerning the flight. This is a review of the basics areas of performance and some additional information to enhance your education in this very important area of aviation.

What are the 4 forces acting on the aircraft?

- Lift
- Weight
- Thrust
- Drag
    - In level flight, two forces are equal, while thrust is greater than drag.

What is Angle of Attack (AOA)?

- It is the angle between the chord line of the wing and direction of the wind that strikes the wing (relative wind).



What is relative wind?

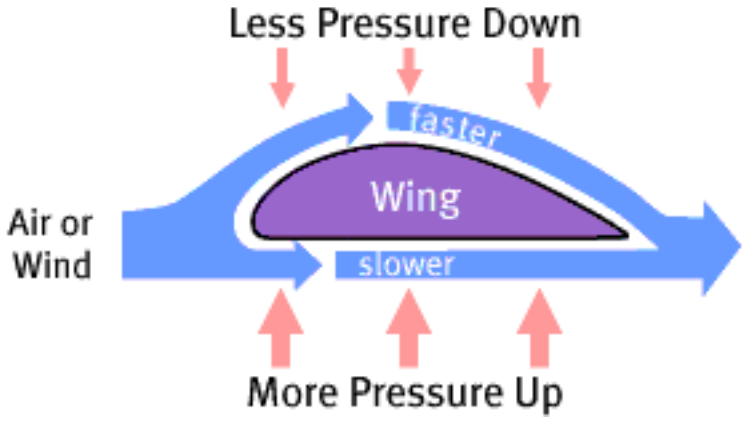
- **Relative wind** is the direction of movement of the atmosphere **relative** to an aircraft or an airfoil. It is opposite to the

direction of movement of the aircraft or airfoil **relative** to the atmosphere.

- It is how the wind IMPACTS the wing while it is moving through the atmosphere.

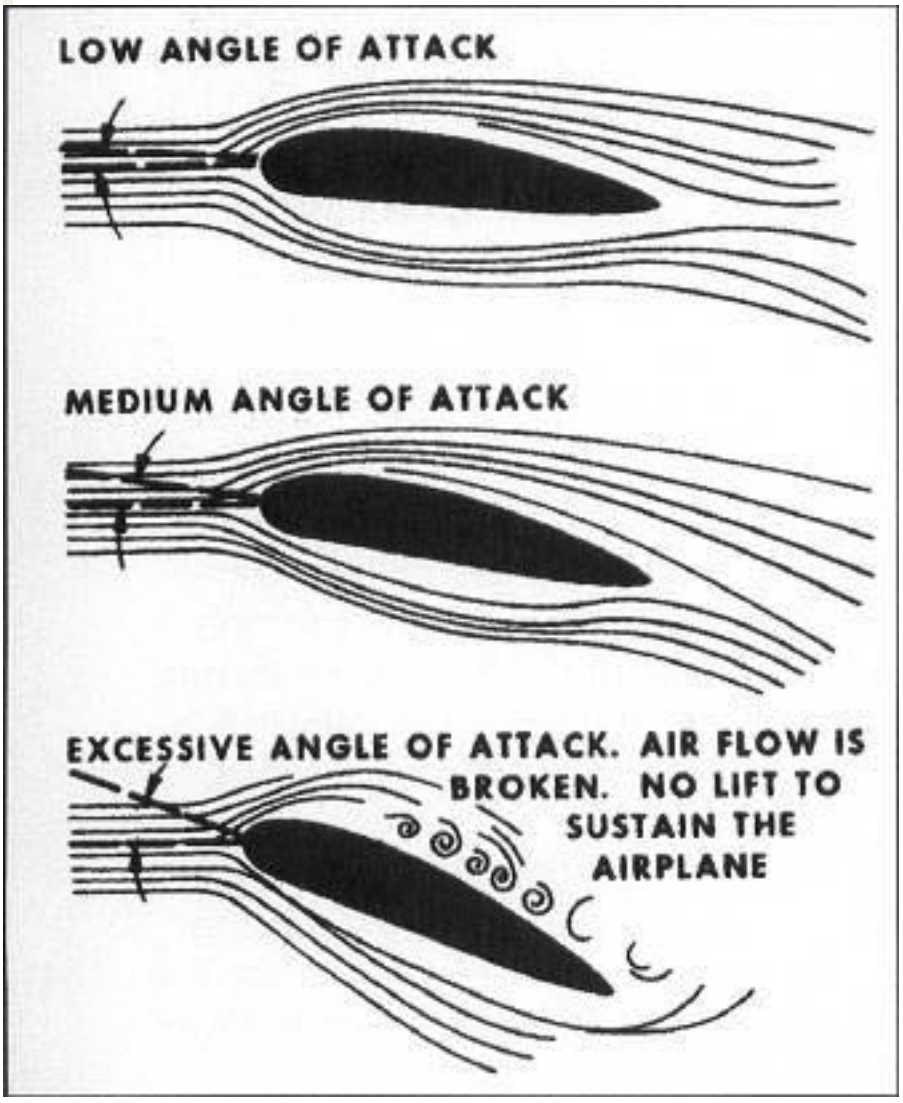
What is Bernoulli's Principle?

- It is one of theories on how lift occurs on an airplane wing. Air does not like to be separated once it is moving over a surface. A wing is curved on the top and flat on the bottom. The top surface is longer than the bottom. The air will travel faster on top of the wing than the bottom. A lower pressure will occur on the top of the wing. The bottom of the wing will have a higher pressure. Pressure goes from high to low causing the wing to lift.



What is a stall?

- A stall occurs when the air over the top part of the wing separates and lift no longer occurs. A stall in coordinated flights will nose over and drop until enough air is flowing over the wing again. This is seen at an angle of attack of 18- 20 degrees



What factors affects stall speed?

- Weight and center of gravity.

How CG Effects Aircraft Performance

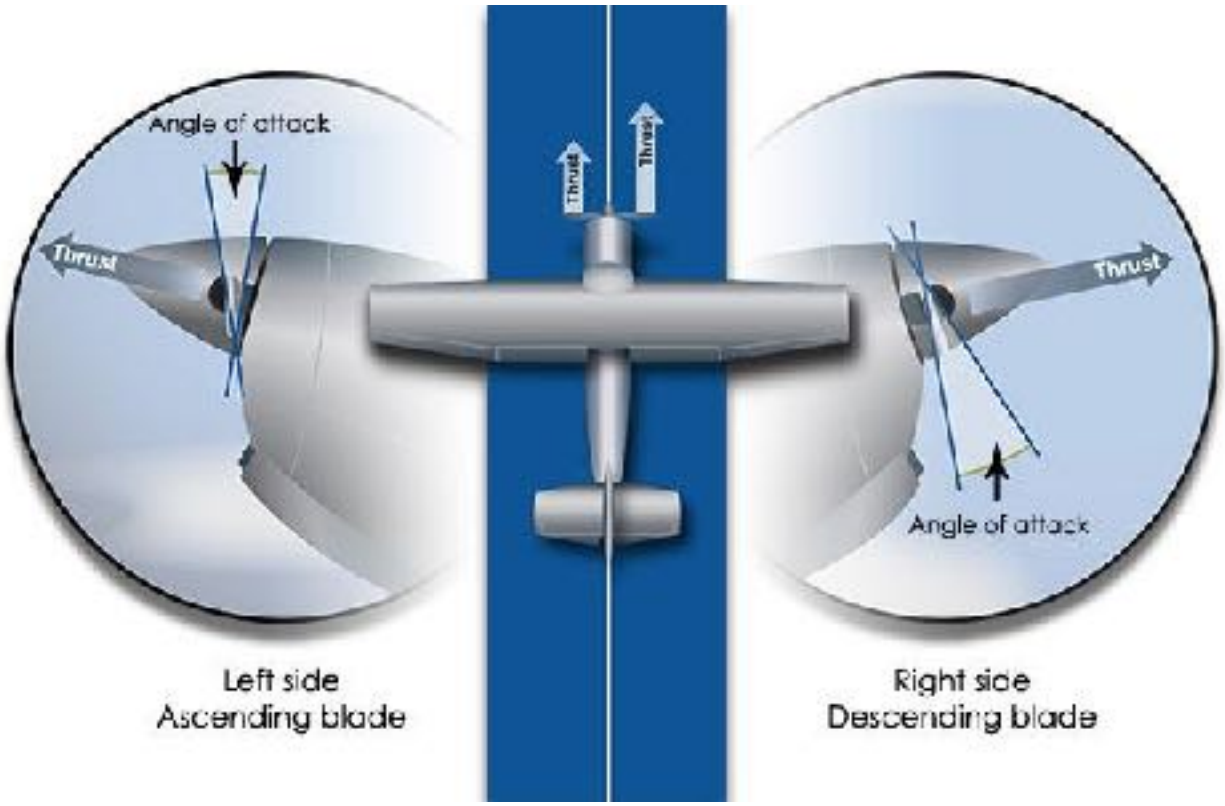
	Aft CG	Forward CG
Stability	Less stable, because the center of gravity is closer to the center of pressure, which causes longitudinal instability. It also makes stall and spin recovery more difficult	More stable, because the center of gravity is further from the center of pressure. This increases longitudinal stability.
Cruise Speed	Higher cruise speed, due to reduced drag and a smaller angle of attack required to maintain altitude	Slower cruise speed, an increase in drag and a greater angle of attack is required to maintain altitude.
Stall Speed	Lower stall speed because there is less wing loading.	Higher stall speed, due to increased wing loading. Our critical angle of attack is reached at a higher speed.

MzeroA.com

What is P-factor?

- P-factor, also known as asymmetric blade effect and asymmetric disc effect, is an aerodynamic phenomenon caused by a moving propeller moving counterclockwise at higher angle of attack.

- When an airplane is nose-high, its propeller is tilted a few degrees upward with respect to the direction of its travel through the air, and a downgoing blade has a greater angle of attack than an upgoing one. The downgoing blade is on the right side, and so it tends to pull the nose of the airplane to the left.



What are the 2 types of drag?

- Parasite drag
    - Parasite drag is simply caused by the aircraft's shape, construction-type, and material. For instance, an airplane with a rough surface creates more parasite drag than one with a smooth surface. And there are three basic types of parasite drag:
        - **Skin surface drag –** This type of drag is due to exposed rivets and how flaps, rudder and ailerons are reinforced
        - **Form drag –** This is drag that the aerodynamic shape of the airplane causes when flying through the air. Compare the aerodynamics of a Cessna 172 versus and

F-16 or 747, the F-16 and the 747 are much more aerodynamically clean than a Cessna 172, which would have more form drag.

- **Interference Drag –** This type of drag is air interference caused by structures attached to the fuselage and wing. Examples are where the wing attaches to fuselage and the areas where struts are attached.

- Induced drag
    - Induced Drag is an inevitable consequence of lift and is produced by the passage of an aerofoil (e.g. wing or tailplane) through the air.
    - A force that occurs whenever a moving object redirects the airflow coming at it.

What is Load Factor?

- Load factor is the load the wings are supporting divided by the weight of the airplane.
- Forces acting on an aircraft during a level coordinated turn. Load factor is a very important structural design parameter of an aircraft. It indicates the amount of the load the structure of an aircraft can bear. For this reason, maximum load factor is a maneuvering and performance limit
    - Normal Category
    - Utility Category

What effect does an increase in load factor have on stall speed?

- An airplane that has a higher load put on it will have a higher stall speed. The airplanes stall speed is in direct relationship to the square root of the load. Let's say at 1 G an airplane will stall at 50 knots. At 4 G's it will stall at 100 knots. The square root of 4 equals 2. Two times 50 = 100.

Define Maneuvering Speed.

- It is the maximum speed where the pilot can make abrupt control changes without damaging the airplane.

- VA or maneuvering speed is the speed calculated by the manufacturer at which the aircraft will stall before exceeding maximum G loading, thus preventing damage to the airframe.

- Maneuvering speed is usually determined by multiplying the flaps-up, power-off stall speed by the square root of 3.8 Gs, which is **1.95**.

    - Stall speed 55 knots

    - 55 x 1.95 = 107 knots

What is the relationship between maneuvering speed and weight?

- Maneuvering speed will decrease as the weight of the aircraft decrease. Va is based on maximum gross weight.

- A simple calculation would be for every 2% decrease in weight there is a 1% decrease in Va.

- I picture it this way. If you are going at100 knots and weight 2500 lbs this may require a 4 degree angle of attack for straight and level. You will be at 1 G. If a gust of wind causes the nose to raise to 8 degrees it will be at 2 G. So at 16 degrees you will be at 4 G's your max. Now lets take an airplane at 1800 pounds, at 100 knots and will be flying at 3 degrees angle of attack for straight and level. Remember it weighs less. A gust of wind comes along and pushes the nose up to 15 degrees. Yes it will cause the airplane to be at 5 G's. You must slow the plane to 95 knots which will cause a higher angle of attack in straight and level and that will fix the potential problem.

What causes a spin?

- A spin occurs when one wing is stalled more than the other wing. More stalled the bigger the drop in wing which will cause the airplane to spin in the direction of the most stalled wing.

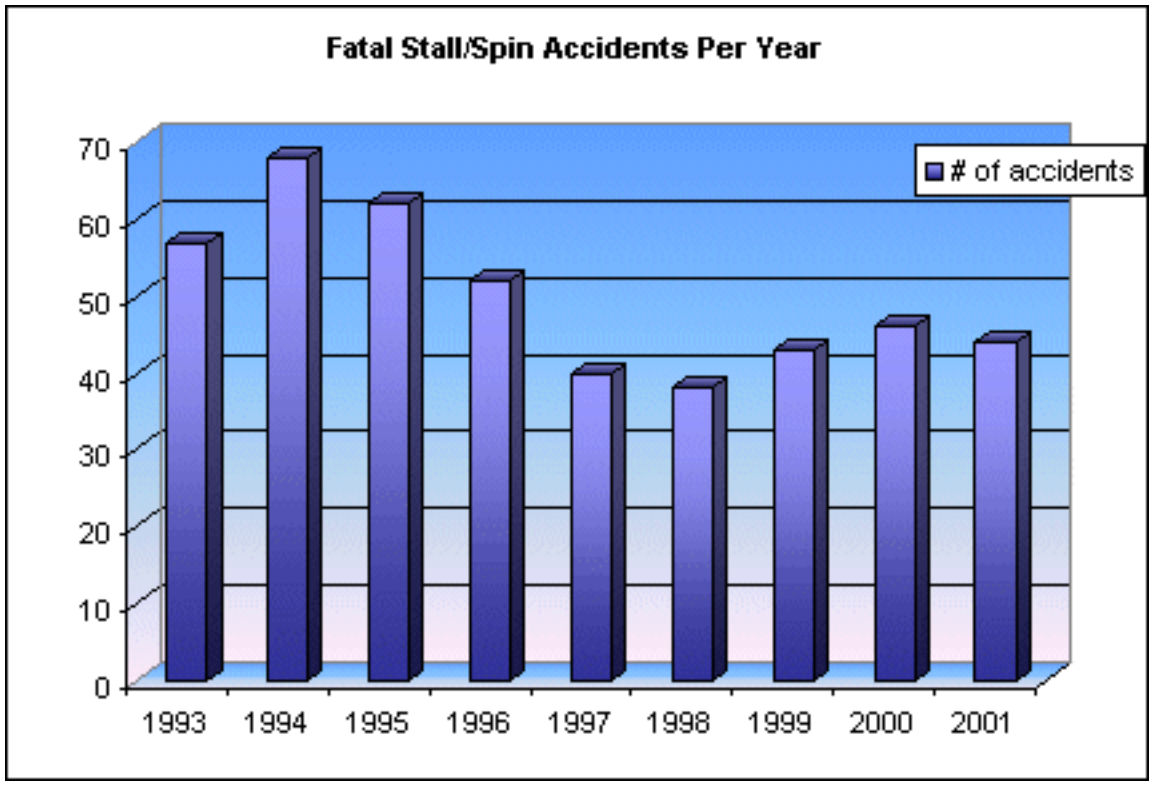
What is the recommended spin recovery?

- PARE(D)
    - P – **P**ower to idle
    - A – **A**ilerons neutral
    - R – **R**udder full in the opposite direction of the spin
    - E – **E**levator forward (Remember the airplane is still stalled)
    - D – **D**ive recovery

When are spins likely to occur?

- Anytime you can stall the airplane in an unequal manner.

- Statistics show that the most likely area of flight are while maneuvering and turning base to final.



Define ground effect.

- Ground effect is the increased lift (force) and decreased aerodynamic drag that an aircraft's wings generate when they are close to a fixed surface.[1] When landing, ground effect can give the pilot the feeling that the aircraft is "floating". When taking off, ground effect may temporarily reduce the stall speed. The pilot can then fly just above the runway while the aircraft accelerates in ground effect until a safe climb speed is reached

- The wingtip vortices do not form and that air is forced down as well as the relative wing hitting the bottom of the wing being forced down. Also when the wing is less than one wingspan above the runway there is an increase in lift due to a higher pressure under the wing.

What is adverse yaw?

- Adverse yaw is the natural and undesirable tendency for an aircraft to yaw in the opposite direction of a roll. It is caused by the drag created by the down deflection of the aileron in a turn.
    - In a right turn the left aileron goes down creating a drag force pushing the nose of the aircraft to the left while rolling right.

Define these weight and balance terms.

Standard Weight Empty: The weight of the airframe and engine with all the standard equipment installed in the aircraft. Unusable fuel and oil are included in this weight.

Optional or Extra Equipment: Any and all additional instruments, radio equipment, and other add-ons that were installed but not included as standard equipment. This weight is added to the standard empty weight to equal the basic empty weight. It will include fixed ballast, full engine coolant and hydraulic and deicing fluid.

Basic Empty Weight: This is the weight of the airplane with all the optional equipment that has been added. In most modern aircraft, the manufacturer includes the full oil weight in the basic empty weight.

Useful load (Disposable load): Useful load is the difference between gross takeoff weight and basic empty weight. It is the load that can be removed from the aircraft and is not a permanent part of the plane. Examples of useful load are: usable fuel, the pilot, crew, passengers, baggage and freight being hauled.

Payload: This is load available for passengers, baggage and freight. It is calculated after the weight of the crew, pilot and usable fuel have been subtracted from the useful load. You know this term very well from the Space Shuttle missions. Payload is what weight load was available to carry the experiments and supplies for the International Space Station.

Operational Weight Empty: This term equals the basic weight and the weight of the aircraft plus the pilot, excluding payload and usable fuel.

Usable fuel: This is fuel that is available for flight planning.

Unusable fuel: This is the fuel remaining in the tanks after a run-out test has been completed according to the governmental regulations.

Maximum Gross Weight: This is the maximum permissible weight that the aircraft can be to fly.

Maximum Takeoff Weight: This is the maximum weight approved for the start of the takeoff roll.

Maximum Ramp Weight: This is the maximum weight approved for ground maneuvering. It includes the weight of the fuel used for start, taxi and run up.

Zero Fuel Weight: This is the weight of the airplane minus the usable fuel.

Passenger Weights: This is the weight of the passengers. This weight will vary due to the season of the year. A passenger that live in Minnesota in the winter will weight more that a passenger in the summer.

Answer the this weight shift problem

Your airplane weighs 3,000 pounds and its CG is at station 60. It takes off and consumes 25 gallons (150 pounds) of fuel. The fuel CG is at station 65. Find the new CG.

The formula to use for this question is:

$$\frac{M_1 \pm \Delta M}{W_1 \pm \Delta W}$$

Our original moment (M_1) is 3000 x 60 minus our change in moment (ΔM) 150 x 65, divided by original weight (W_1) 3000 minus change in weight (ΔW) 150

$$\frac{3000 \times 60 - (150 \times 65)}{3{,}000 - 150} = 59.74$$ this is our new CG.

Define the different types of altitude

- **True altitude –** This is the altitude that is read off of the altimeter when the local barometric pressure is set into the altimeter.

- **Absolute altitude –** The airplanes height above the terrain.

- **Pressure altitude –** The altitude read off the altimeter when 29.92 is inserted into the altimeter.

- **Density altitude –** This altitude is pressure altitude corrected for non-standard temperature.

What is density altitude and how do you calculate it?

- This is the altitude the airplane "feels" it is flying at. The formula is this to calculate density altitude. I recommend know how to calculate density altitude rather than hearing if off the ATIS or putting the numbers into an app. They all can run out of power or break, then what?
    - Pressure altitude = (standard pressure – current pressure) x 1000 + field elevation
    - Density Altitude = Pressure altitude + {120 x (OAT – standard temperature)}
        - Let us do a sample calculation
            - Standard pressure – 29.92
            - Current pressure – 30.1,
            - Field elevation – 1000 feet
            - OAT – 28
            - Standard temperature – 15
                - (29.92 – 30.1) x 1000 + 1000 = 820
                - 820 + (120 x 13) = 2,380 feet is our new altitude the airplane feels it is at. That is a

pretty significant change.

- Density altitude will be very important on days with a high temperature, like over 85 degrees. This will affect performance in every aspect of flight. Your takeoff roll will be longer as well as your landing distance.

What factors affect density altitude?

- Humidity – A high humidity will increase density altitude. The water vapor is a gas and takes up space in the atmosphere. The water vapor when mixed with oxygen will make the air less dense.

- Temperature – At higher temperatures, the air is now "separated" from each other (the molecules are farther apart) and there will be less air flowing over the wings. There will also be less air that the propeller can take a "bite" out of for thrust. I always ask myself, " Do the air molecules look like Medicine Balls, Basketballs or ping pong balls. At higher temperatures, they are ping pong balls.

- Altitude – The higher the altitude the less dense (volume) of air molecules there are.

Define Vspeeds.

- **Va –** design maneuvering speed

- **V_{FE} –** Maximum flaps extended speed

- **V_{LE}** – Maximum landing gear extended speed

- **V_{LO} –** Maximum landing gear operating speed

- $\mathbf{V_{NE}}$ – Never exceed speed
- $\mathbf{V_{NO}}$ **–** Maximum structure cruising speed
- $\mathbf{V_{SO}}$ – Stalling speed in the landing configuration
- $\mathbf{V_{S1}}$ **–** Stalling speed in the clean configuration
- $\mathbf{V_{X}}$ – Best angle of climb speed
- $\mathbf{V_{Y}}$ **–** Best rate of climb speed

Define the different types of airspeeds?

- **Indicated airspeed (IAS)** is the airspeed read off of the airspeed indicator.
- **Calibrated airspeed (CAS)** is the indicated airspeed that is calibrated for instrument and installation error.
- **True airspeed (TAS)** is the airspeed the airplane is flying through the air. The airspeed is only TRUE if it is at sea level and standard temperature. To calculate true airspeed you must take into account the standard temperature, the current pressure altitude and the outside air temperature.

Chapter 7: Flying at Night

If you are going to be flying for hire, night flying will become a normal way of life. Taking passengers and freight does not occur only from 9 to 5 each day. As a commercially rated pilot, you must know the differences in what phenomena occur at night versus the daytime. This

subject includes what happens on the ground as well as in the air. Eyesight accommodation, preflight, taxiing, lights in the cockpit, loss of landmarks and optical illusions are subjects that must be learned for night flight.

Do we use our cones or rods to see at night?

- We use our rods at night. The rods perceive low-level light intensity and are more sensitive to white light. They are also all over retina but not in the middle of the retina. The middle of retina are where the cones are. They pick up high intensity light of day. They are our color receptors. I remember is C in cones stands for Color.

- The rods have a receptor protein in them called Rhodopsin (also called visual purple). This protein is activated by lower intensity light. It takes about 30 minutes for the rhodopsin to activate. Hence, the reason for you to get out to airport at twilight before a night flight. The twilight will get the rods to wake up and they will need a thirty minute runup to be at peak efficiency.

What can you do to prevent night blindness?

- Once full darkness hits try to stay away from bright white light. Bright light will photobleach the rods and create night blindness. If you see a bright light you can cover one eye and look off to the side. You can use a red light flashlight which does not affect the rods. You should turn down the brightness of the GPS onboard. If you accidently while flying get exposed to white light, you can trim the airplane for straight and level and then put your palms over both eyes for 5-10 seconds. The night blindness will go away. Otherwise it may take 20 minutes before the rods come back for use.

When are the position lights required for night flight? (14 CFR 91.205)

- The position lights are required at all times during night flight.

When are the anti-collision lights required for night flight? (14 CFR 91.205)

- They are required at all times if your aircraft was manufactured after August 11, 1971.

What color are taxiway lights?

- Blue

What are REIL's?

- Runway End Identifier Lights

What are the colors that differentiate different types of airports? (AIM 2-1-8)

- White and Green – Lighted land airport.
- Green alone* – Lighted land airport.
- White and Yellow – Lighted water airport.
- Yellow alone* – Lighted water airport.
- Green, Yellow and White – Lighted heliport.
- White, White, Green** - Military airport.

- White, Green and Red – Hospital and /or Emergency Services Heliport

  *Green alone or yellow alone is used only in connection with a white and green or white and yellow beacon display

  ** Military airport beacons flash alternately white and green, but are differentiated from civil beacons by two quick white flashes between the green flashes.

How do you activate airport lights at night? (AIM 2-1-7)

- **Pilot-controlled lighting** (**PCL**), also known as **aircraft radio control of aerodrome lighting** (**ARCAL**) or **pilot-activated lighting** (**PAL**), is a system which allows aircraft pilots to control the lighting of an airport or airfield's approach lights, edge lights, and taxiways via radio.

- Many nontower airports have pilot-controlled lighting (PCL), which allows pilots to turn on the runway lights and to select the desired intensity. Within a five-mile radius of the airport, pilots activate PCL by keying the microphone button with the radio tuned to Unicom/CTAF frequency. Once activated, the lights remain illuminated for 15 minutes. Pilots set the lights intensity by keying the microphone button a specific number of times: three for low, five for medium, and seven for high intensity. Changing the intensity by clicking the transmit button the requisite number of times not only resets the intensity, it restarts the 15-minute timer.

- In addition to the runway lights, PCL may also activate visual approach slope indicators (VASI), precision approach path indicators (PAPI), and runway end identifier lights (REIL) lights.

What other considerations must be taken while doing the preflight?

- Ensure before leaving home that you 3-4 working flashlights with the capability of the Red light option.

- Check the outside and inside cockpit lights

- Take more time and slow the pace during your nighttime preflight. Double-check everything.

What procedures are recommended during an engine failure at night?

- Land in well lit areas.

- Roads are options, but be aware of power lines.

- Plan your route over as many airports as possible.

- Dark areas are dangerous unless you know the area well enough to know what is there.

    - Dark areas could be trees, water or mountains.

What considerations should be taken when taxiing concerning the strobe lights?

- The biggest consideration is not blinding other pilots with your strobe lights on. This could blind the other pilot, who is also planning on taking off or taxiing back to the hanger. Use as little

lighting as you can. Turn off that landing light and strobes if you see pilots along the taxiways. I recommend turning on the strobes right before takeoff. I also recommend if you are pointed towards the final approach to turn on the landing lights after entering the runway and beginning the takeoff process.

What are some optical illusions at night?

- Autokinesis
- False horizon
- Black-hole Approach: Occurs when the landing is made from over water or non-lighted terrain where the runway lights are the only source of light.
    - The general problem with the black-hole approach is the pilot can have trouble orienting themselves relative to the earth.
    - The runway may seem to be upsloping or downsloping.
        - Counter this illusion by using available approach aids such as VASIs or PAPIs.
- Bright Runway Lights: Bright runway lights advance the runway, making it appear closer than it actually is.
    - In this situation, the pilot who does not recognize this illusion may fly a higher than normal approach.

    - Counter this illusion by using available approach aids such as VASIs or PAPIs.

- Ground Lighting Illusion: Lights along a road or even trains can be mistaken for runway and approach lights.

    - Counter this illusion by using available approach aids such as VASIs or PAPIs as well as maintaining proximity/situational awareness to the airport and surroundings.

Chapter 8: Aircraft Systems

Knowing the aircraft systems of the aircraft you have brought to the checkride is one of the major areas of knowledge that you must know well. You have brought a complex aircraft that has many different systems than that Cessna 152 your brought to your private pilot checkride. Some new systems you must be comfortable with are the landing gear system and controlled pitch propeller system. The electrical is the same. Know the schematics of your electrical system. I am not a mechanical type person. I had to ask many questions to my A&P and engineer flight instructor. I drew out every system and got to know how it works. I highly recommend you do the same.

What are the four control surfaces of the airplane?

- Ailerons
- Elevator
- Rudder
- Flaps

What is the function of the flaps?

- The flaps are your speed brakes. The first two "notches" of flaps are creating drag to slow the airplane and creating some lift. The last notch of flaps will create all drag to allow the pilot to land at the slowest airspeed.

How do the rudders work in your airplane?

- Use the POH and make a copy of the rudder system. Know how the cables are attached and what mechanical process is going on when you press on each rudder pedal. There are two processes that are occurring, a ground portion for steering and a flight portion to turn the aircraft and decrease adverse yaw.

What type of engine does your aircraft have?

I took a Piper Arrow PA 28-180. It has a Lycoming O-360, which is a four-cylinder, direct-drive, horizontally opposed, air-cooled, piston aircraft engine. The basic O-360 produces 180 hp.

- Horizontally opposed – the pistons rest horizontally as opposed to vertical

- Air cooled – air passes over the engine via engine baffles and cooling fins.

- Normally aspirated – the engine in which air intake depends solely on atmospheric pressure without a turbocharger.

- Direct Drive – The movement of the piston turns the crankshift which turns the propeller

- Lycoming – the manufacturer of the engine

- Go to your POH and know your engine.

- I added it to my personal checklist. I recommend you make your own checklists that include the engine specs and where all the navigational equipment antennas are located. I took a picture of the exterior of the plane and labeled it. The Examiner really like that idea and it sure saved me a lot of questions on the oral checkride.

What are the four cycles of the engine?

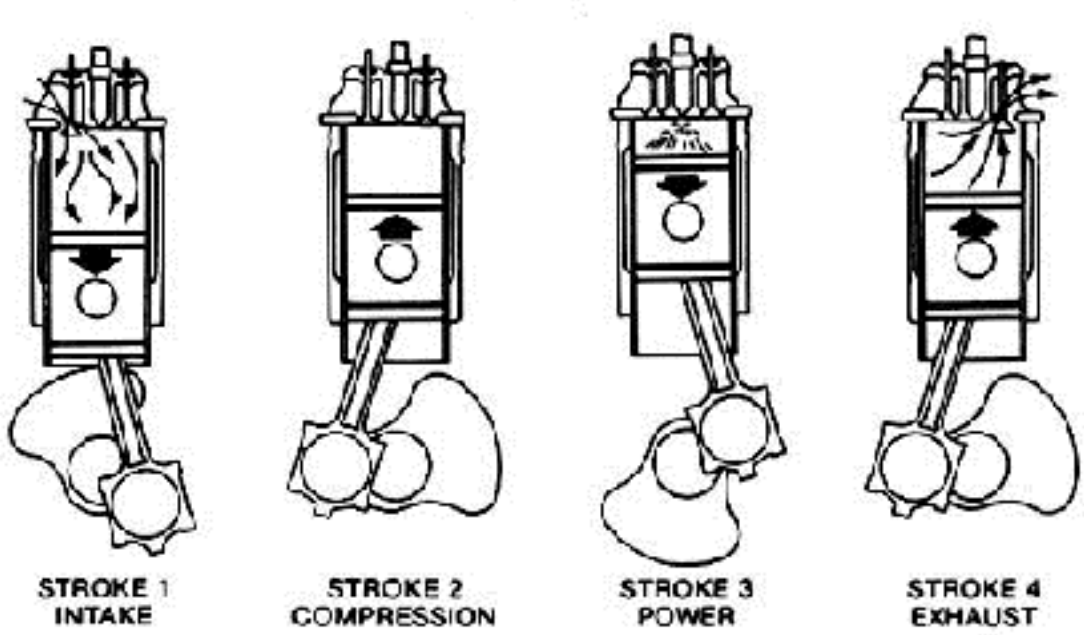
- Intake

- Compression

- Power

- Exhaust

I remember: Suck, Squeeze, Bang, Blow.



How does carburetor heat work?

- Is unfiltered air that is pulled off the exhaust manifold that will melt the ice in a carburetor. To be used when the engine is running rough and it is felt there is carb ice occurring. Initially turning on carb heat the RPM's will go down (hot air, less dense, less performance) and when the heat starts to melt the ice the engine will start to run normally.

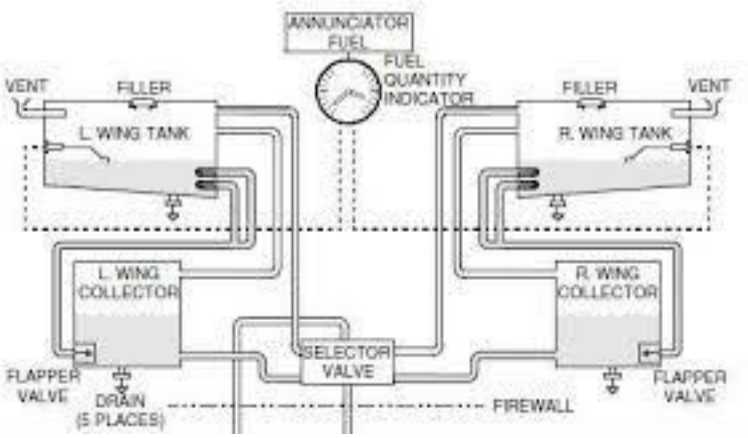
What is the function of the mixture control?

- The mixture controls the air/fuel ratio. The mixture becomes very important in high altitude, high density altitude flying. The volume of air decreases in these conditions. You need to decrease the richness or amount of fuel mixing with less dense air. This applies not just in the air, but on the ground also during the high density

altitude flight days.

Explain the fuel system in your aircraft.

- Get the schematic of the fuel system from the POH.



- Know how much total fuel the airplane holds
- Usable fuel
- Know how it is vented
- Where the selector valve is and how it works
- How much fuel is available at tabs. Usually there will be a acknowledgement on the a decal on the wing of how much fuel there is at tabs.

What is the purpose of the fuel pump and does your aircraft have one?

- If the plane a Cessna 172 or gravity fed it will not have a fuel pump
- If it is a low wing aircraft like a Piper Arrow is has a fuel pump fed system
- Know that there is an electric and a mechanical fuel pump and what the differences are.
    - The mechanical fuel pump runs when the prop is spinning.
        - The electrical fuel pump is a backup in flight and is used to get the engine started in the low wing aircraft. You must push that fuel up and across in those low wing aircraft.

What are the grades of fuel?

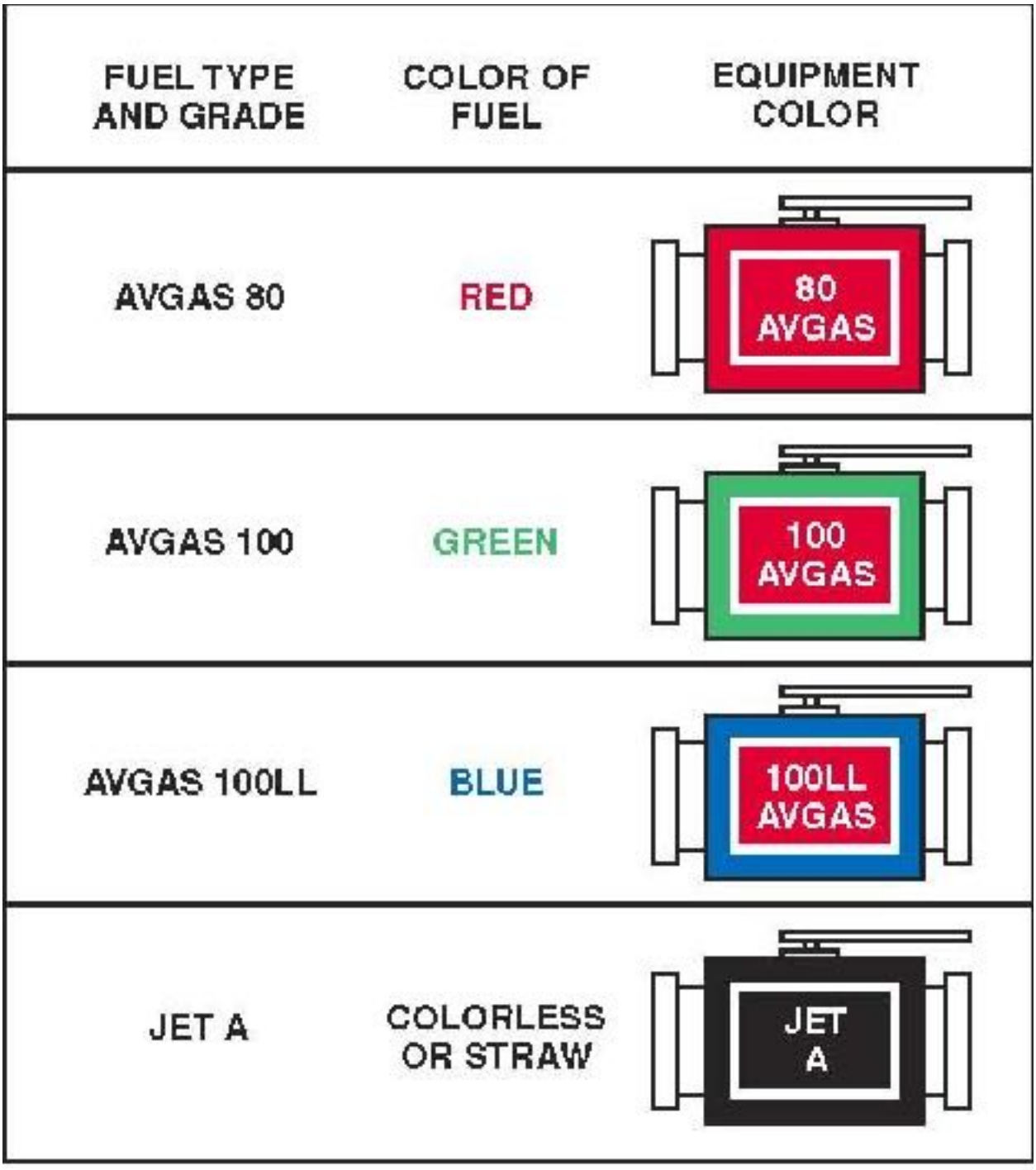


Figure 5-17. Aviation fuel color-coding system.

Pilots Handbook of Aeronautical Knowledge

If your airplane runs on 80 Grade fuel and the airport is out of 80 grade, what can you do?

- You can go up in Grade of fuel, but never down in Grade.

Explain the electrical system of your aircraft?

- Go to your POH and find the electrical system of your airplane and make a copy of it.

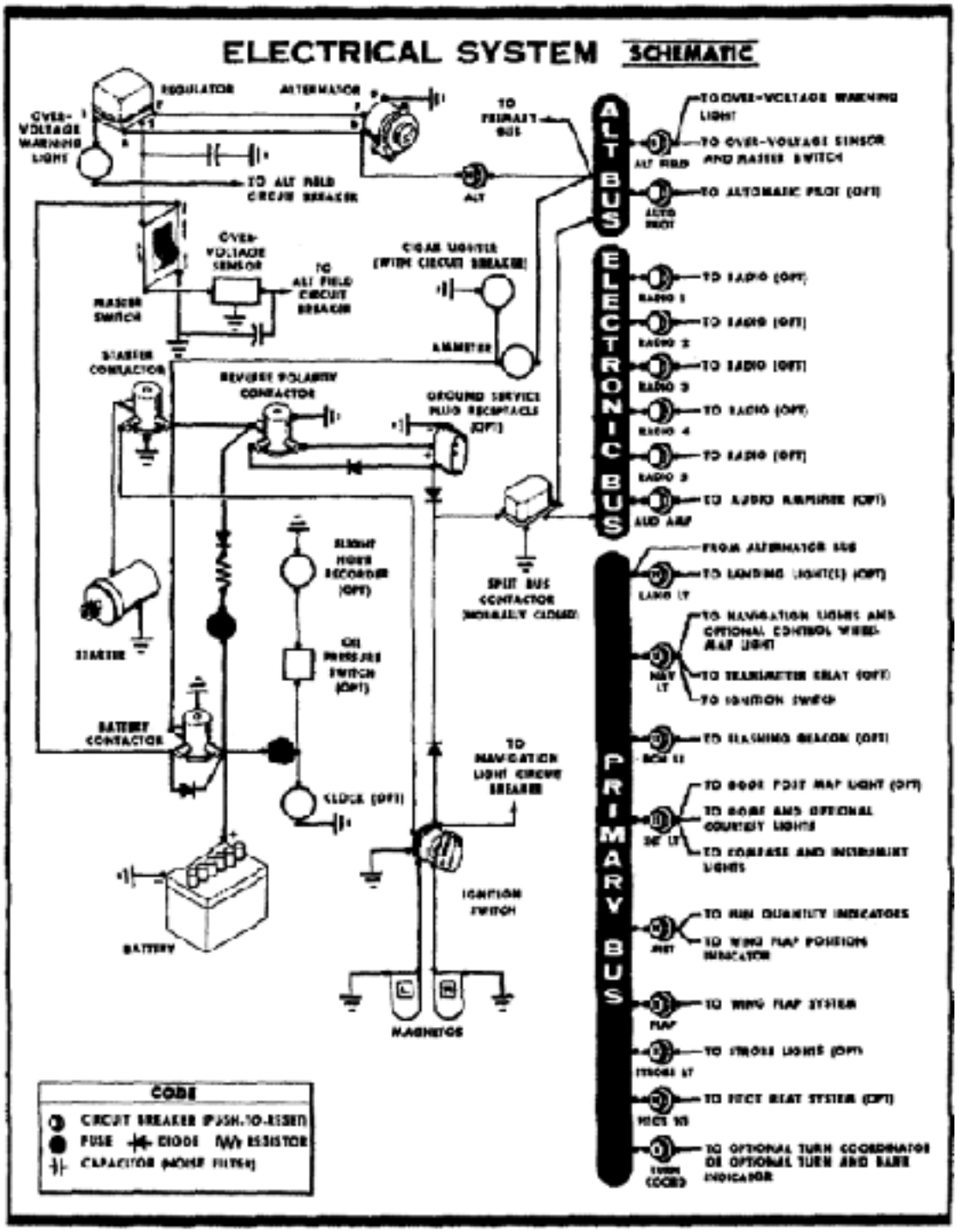
- Know the volt direct current it runs on.

- Know the voltage of the battery.

- Know the amps of the alternator

    - I have in my airplane a 28 volt direct current system with a 24 volt battery, driven by a 60 amp alternator.

This is the electrical system schematic of a Cessna 172



Why is the battery less voltage than the system?

- The reason for the difference between the battery and normal electrical operating system is because the battery will charge unless the system has an extra couple of volts to use. If it was a 24-volt system the battery will not charge. A 28-volt system is enough to charge the battery and keep the system running efficiently. Usable electrical power is a combination of volts and amps.

- You need to be able to power lights, flaps if electric driven, radios and avionics and interior cabin lighting.

What does the Ammeter do?

- It indicates if the battery is taking a charge from the alternator, a positive indication or if it is draining the battery, a negative indication.

What does the voltage regulator do?

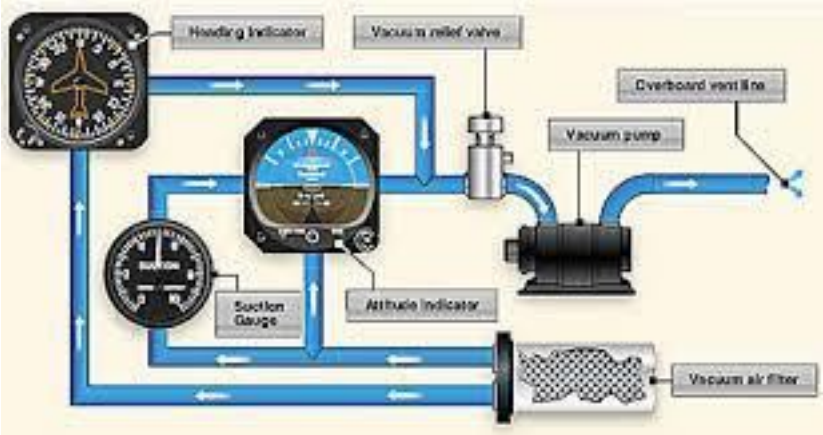
- The voltage regulator is the "supervisor" of the aircrafts alternator system. It ensures the voltage is getting to the proper instruments and it protects the system from an overvoltage problem.

Which of the instruments are driven by the Vacuum System?

- Attitude Indicator

- Heading Indicator

- Turn Coordinator



What are the two main fundamentals of a gyroscope?

- *Rigidity in Space*
    - This is based on Sir Isaac Newton's First Law – "A body in motion tends to move at a constant speed and direction unless it is disturbed by an external force. The gyroscope likes to stay erect at a constant attitude and not be have any external forces changing that "erectness."

- *Precession*

- Precession is the tilting or turning of the rotor axis as a result of external forces. When a deflective force is applied to a stationary gyro rotor, the rotor will move in the direction of the force. However, when the same force is applied to the rim of a spinning rotor, the force causes the rotor to move as though the force had been applied to a point 90 degrees around the rim in the direction of rotation.

- Precession is caused by both friction within the gyro and by aircraft maneuvering inclusive of turns, acceleration and deceleration. Precession causes a slow "drift" in the gyro and results in erroneous readings. Crosschecking the heading indicator

or directional gyro with the magnetic compass and making the appropriate corrections should be accomplished on a regular basis

What are the errors that can affect an attitude indicator?

- Turn error – During a normal coordinated turn, centrifugal force causes the gyro to precess toward the inside of the turn. This precession increases as the bank angle increases. The error disappears when the airplane rolls out after a 180 degree turn at a normal roll out rate.
    - When doing steep turns use the attitude indicator for rolling in and out of the turn and use the Vertical Speed Indicator and Altimeter for maintaining pitch control and holding your altitude.

- Acceleration error – When the airplane accelerates, it caused the horizon line on the attitude indicator to move down giving the indication the airplane is climbing. If you were taking off in very bad visual conditions and had to use your instruments, use your altimeter as a pitch instrument for climb. If it is going up, so are you.

- Deceleration error – When the airplane is decelerating the horizon line moves up giving the indication of a descent.

- If you are doing spins the attitude indicator will tumble.

What are the limitations of the heading indicator (HI)?

- May tumble if limits are exceeded

- The earth rotates (15° per hour) and because of small accumulated errors caused by friction, the HI will drift over time and must be

reset from the magnetic compass periodically

- You must reset the HI every 15 minutes due to drift, friction or low suction.

What are the compass errors?

- **UNOS**
    - Undershoot North
        - If you are in a right hand turn from 270 to 360 you need to undershoot by your latitude you are in. For instance if you are at the 30 degree latitude you undershoot by 30 degrees, in this case 330 degrees.
    - Overshoot South
        - If you are in a left hand turn from 270 to 180 you need to overshoot by your latitude you are in. In this case you need to turn to 150 degrees.

The turns must be at standard rate.

What are the dip errors of the compass?

- Due to the magnetic north dip error it would be **ANDS**
    - Accelerate North
    - Decelerate South

What is the purpose of the Alternate Static Source?

- If the primary static source on the outside of the airplane gets clogged with debris or ice, the Alternate static source must be used for the Pitot Static system instruments.

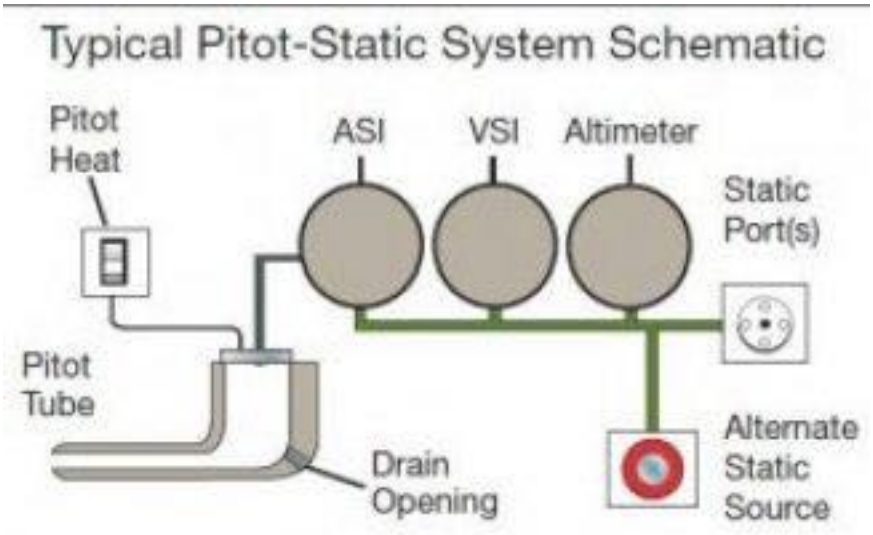
- The alternate static source is normally found inside the cockpit. You can break the glass of the instrument and allows the pitot static system to work.

- Because there is a venturi effect of the air flowing around the fuselage, the air pressure inside the airplane is lower than the exterior. This causes:

    - The altimeter indicates a slightly higher altitude than actual.

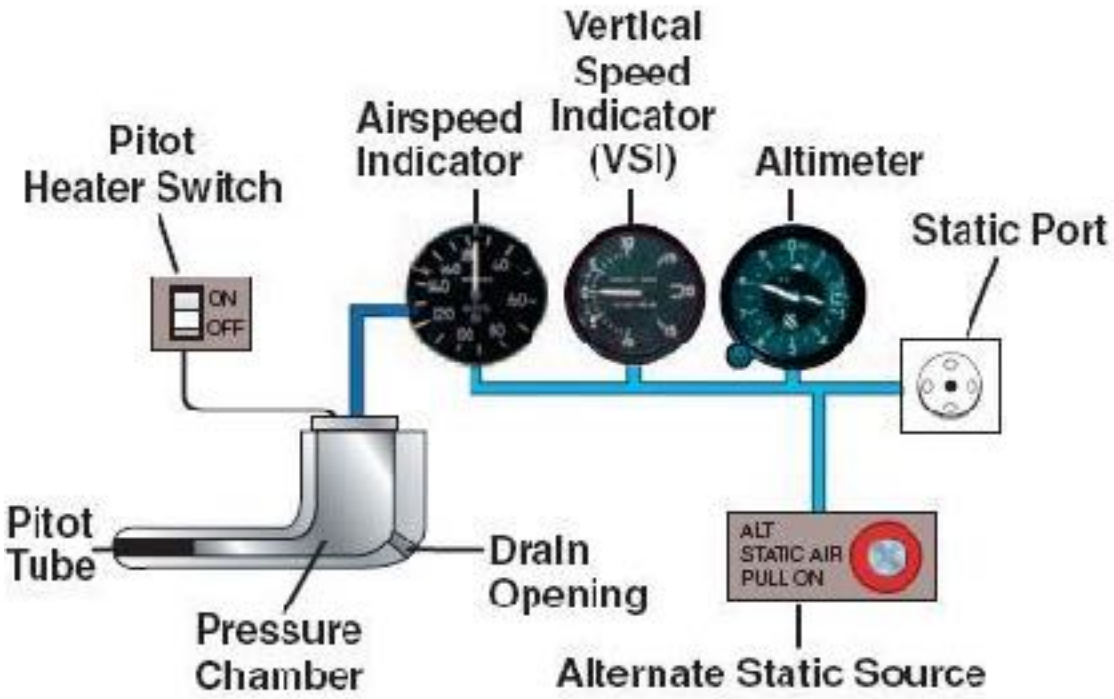
    - The ASI indicates an airspeed greater than actual.

    - The VSI show a momentary climb and will then stabilize.



How does the pitot static system work?

- The pitot static system operates via pressure. It senses changes of pressure when climbing and descending. The pressure changes at different altitudes are sensed by aneroid wafers in the instruments. that use the pitot static system to operate.



What instruments operate off of the pitot static system?

- Airspeed indicator
- Altimeter
- Vertical Speed Indicator

What are some of the oxygen systems in the aircraft? (FAA-H-8083-31)

- Diluter demand
- Pressure-demand
- Continuous-flow

What kind of oxygen is used in aviation versus medical? (FAA-H-8083-31)

- Oxygen used for medical purposes contain water for humidification. Medical oxygen with water could freeze at altitude in the oxygen lines. The specifications for aviation oxygen are 99.5% pure oxygen with not more than 2 millimeters of water per liter of oxygen.

How does continuous-flow oxygen operate?

- This is the oxygen system for passengers. The passenger mask will have a reservoir bag that collects oxygen from the continuous flow system while the passenger is exhaling. Cabin air is added to the reservoir bag while the passenger is inhaling. The exhaled air is released to the cabin.

What is a pressurized cabin?

- In a pressurized cabin the cabin, flight compartment and baggage compartment are put into a sealed state. The cabin is then put into a lower pressure than the outside atmospheric pressure. Pressurized air is pumped into the cabin by cabin superchargers which deliver a constant volume of air at the designated cabin pressure. Air is released by a device called an outflow valve. Regulation of the air exit is the major controlling step in a pressurized system.

What are some of the components of cabin pressure control system?

- Cabin pressure regulator
- Cabin air pressure safety valve
- Dump valve
- Instrumentation
    - Cabin differential gauge
    - Cabin altimeter
    - Cabin-rate-of-climb

What is the difference between a deice and anti-ice system?

- A de-ice system is used to eliminate ice that has formed. An anti-ice system is used to prevent icing.

What types of systems are used for prevention and elimination of ice on the airframe?

- Pneumatic – inflatable boots attached to the leading edges of the wings and tail section. Compressed air from the vacuum pump is sent through the boots to inflate them.
- Hot air – Found on turboprops and jets. Hot air is directed from the engine to the leading edges of the wings.

What systems are available for de-icing of the propeller?

- Electrically heated boots

- Fluid system

What system is available for de-icing of the windshield?

- Fluid system – uses alcohol that is sprayed by the prop spinner

- Electrical system – heating elements in the windshield are engaged and heat the windshield, thus eliminating ice.

> **Note: Do not let the ice accumulate too fast and too much as once it gets thick, no de-ice system can work to rid the airplane of ice.**

What are static dischargers?

- These devices on installed on the aircraft to reduce radio receiver interference due to static electricity caused by precipitation. This phenomena is sometimes called: St. Elmos Fire. Another term used is static wicks. They are mounted on the trailing edges of control surfaces and vertical stabilizer. They allow the static electricity to be discharged from the surface of the airplane

Chapter 9: System Malfunctions and Emergency Procedures

> This chapter puts your knowledge of the aircraft systems and how you correlate what can go wrong and what do you do to fix it. If the problem becomes unfixable, then the next step would be to declare an emergency. This section of the oral checkride gives the Examiner a really good picture of what you know and do not know. It also correlates to your skills in Single Pilot Resource Management (SPRM) and Aerodynamic Decision Making (ADM).

What would happen if there is a failure of one of the GPS flight displays (PFD or MFD)?

- Some systems will offer a reversion capability to the primary flight instruments and engine instruments on the remaining operative display.

What is the first indication of carburetor ice?

- The first indication is a RPM drop and a rough running engine. Carburetor ice is due to carburetor design, relative humidity and temperature. Whenever there is humidity (usually 60%) and 50-70 degree drop in temperature due to the venture effect carb ice can form. The is remedy is always the same: carb heat. Consult your airplane's POH or flight manual for specifics on using carb heat, but remember this general rule: It's better to use full carb heat too soon, than to wait until it's too late. When carb heat is applied, unfiltered air that's been heated by the exhaust manifold is routed into the carburetor, melting any ice that may have formed. As the ice melts, water is intermixed with the air/fuel mixture, causing the engine to run rough. Be patient: This increased engine roughness may last several seconds to a few minutes as the ice melts. Once the ice is clear and the engine is operating normally, be sure to turn off the carb heat to restore full power.

Define detonation and pre-ignition.

- Detonation – Detonation is the uncontrolled firing of the fuel/air mixture with the cylinder. When the cylinder temperature becomes very high, detonation can occur. Let us say you airplane runs on 100LL and the only gas available is 80LL. You fill up your airplane with 80LL and that will increase the temperature running on too low of a lead content causing detonation.

- Pre-ignition – Pre-ignition occurs when the fuel/air mixture ignites before it should in the cylinder (remember your four cycles – suck, squeeze, **bang,** burn). It is caused by a hot spot in the combustion

chamber most often due to a lead deposit on the spark plug.

What should you do if on the ground or in the air and detonation or pre-ignition occurs?

- Discontinue the flight. If on the ground, shut down the engine, if in the air land as soon as possible. Both of these conditions cause huge damage to the engine. You will not be happy with the maintenance bill.

During your pre-takeoff checklist, you check your magnetos and get a big RPM drop. What should you do to fix this problem?

- Run up the engine to a higher RPM than specified in the POH (3-5,000 RPM plus normal). If you do your run-up at 2000, run it up at 2,300 RPMs.

- Lean the mixture to peak EGT

- Run the engine for 60 seconds

- Go back to run-up RPM's and recheck the bad magneto.

What does a low oil pressure reading mean?

- Something is dramatically wrong with the oil system.
    - Defective oil pump
    - Worn bearings
    - Problem with the oil pressure relief valve

    - Clogged line
    - Loss of oil
    - Cold oil

- Land as soon as possible at the closest airport.

What should you do if you get a partial loss of power in the air?

- Land as soon as possible. Treat it like a full loss of power. If you have time and altitude, announce your intentions and troubleshoot the problem.

What if your situation develops into a complete loss of power?

- Initiate your emergency landing procedure.
- **ABC**
    - **A: Airspeed** – best glide speed (Vg)
    - **B: Best Field** – look all around and pick out a field and stick to it. Always look below and behind and I will draw a circle around the airplane and everything below, in front, behind and around is where I want to land.
    - **C: Checklist – First put to memory a flow checklist.** If you have time use the checklist in the POH as a reminder tool. I have a copy in my own airplane checklist that I have made for all the airplanes I fly. I put it on Red Paper so I can find it fast. If time make a call to the last controller you were talking too, if you were talking and give the Mayday, Mayday,

Mayday.

- **AFARS**
    - Another option is
        - A: Airspeed
        - F: Field
        - A: air restart
        - R: radio – 7700, Call ATC and let them know where you are
        - S: Safety – belts, open doors, land in the best configuration

What is the procedure for an engine fire in flight?

- Mixture – CUTOFF
- Fuel Shutoff valve – OFF stop any flow of fuel to the engine
- Master – OFF
- Cabin air/heat – OFF
- Airspeed – Emergency Decent maneuver

What is the Emergency Descent procedure? (check the POH)

- Power to idle

- If constant speed prop – put into a High RPM configuration for aerodynamic braking

- ASAP extend landing gear and flaps

- Establish a 30-45 degree bank while descending.

What procedures should you engage in if there is an engine fire on the ground?

- There is a higher likelihood of this happening during very cold weather starts. Too much priming leads to a saturated engine, leading to fire on start.

- Always know where the closest fire extinguisher is (one that is not expired).

- **If the engine does not start** – continue cranking to suck the flames into the engine. Evacuate and then extinguish the flames with an approved fire extinguisher.

- **If the engine does start –** Run the engine for a minute and shutdown. If there is a mechanic available ask for help and check the engine, if not check the engine after everything cools down.

What is CFIT?

- **C**ontrolled **F**light **I**nto **T**errain. It is an accident in which an airworthy aircraft, under pilot control, is unintentionally flown into the ground, a mountain, a body of water or an obstacle.

- CFIT usually happens in low visibility conditions, but does happen in good visibilities especially mountain flying.

What would happen if you have an alternator failure?

- Since the alternator charges your battery and runs the electrical system, if you lost the alternator, the battery is the only electrical source. Your battery if in good condition will only provide electrical power for about 30 minutes. Shut down all non-essential electrical systems and use your hand held radio for communications and if at night for pilot controlled lighting of the airport. Be aware if you have electronic flaps you will be doing a no-flap landing.

How would you interpret an ammeter that is indicating a right or left deflection?

- Right
    - After starting – the battery is being replenished by the alternator. If full deflection the starter is still engaged and you need to shutdown.
    - During flight – A faulty voltage regulator is causing the alternator to overcharge the battery.
- Left
    - After starting – normal after start. Other occasions it may be the alternating is overloading.
    - During flight – the alternator is not working or overloaded. The battery is not receiving a charge.

What would happen if the vacuum pump fails?

- You would lose the attitude indicator and the heading indicator. Use your compass and turn coordinator since they run of magnetic fields and electricity.

What is the recommendation for a tripped circuit breaker? (FAA-H-8083-30,, AC 120-80)

- A tripped circuit breaker should not be reset in flight unless doing so is consistent with procedures in the AFM or judgment of the PIC for a safe completion of the flight. Repeated resetting of a circuit breaker can lead to circuit or component damage, or worse and the possibility of a fire or explosion.

What instruments are affected if the pitot tube is blocked?

- Pitot tube is blocked and the drain hole is open – Airspeed goes to **zero**, altimeter and vertical speed read **normal.**

- Pitot tube and drain hole are blocked – Airspeed acts like altimeter, high in the climb and low in descent. Altimeter and VSI read normal.

What instruments are affected if the static port freezes or is blocked?

- Airspeed indicator – will only be accurate at the altitude the static port got blocked at. Climbing or descending it will be inaccurate. If descending it will read high because the outside pressure is greater than the pressure it was blocked at, in a climb the airspeed will read lower, outside air pressure is lower than the blocked pressure.

- Altimeter – indicates the altitude it was blocked

- Vertical speed indicator – indicates level flight.

Is there a protection device for the pitot tube?

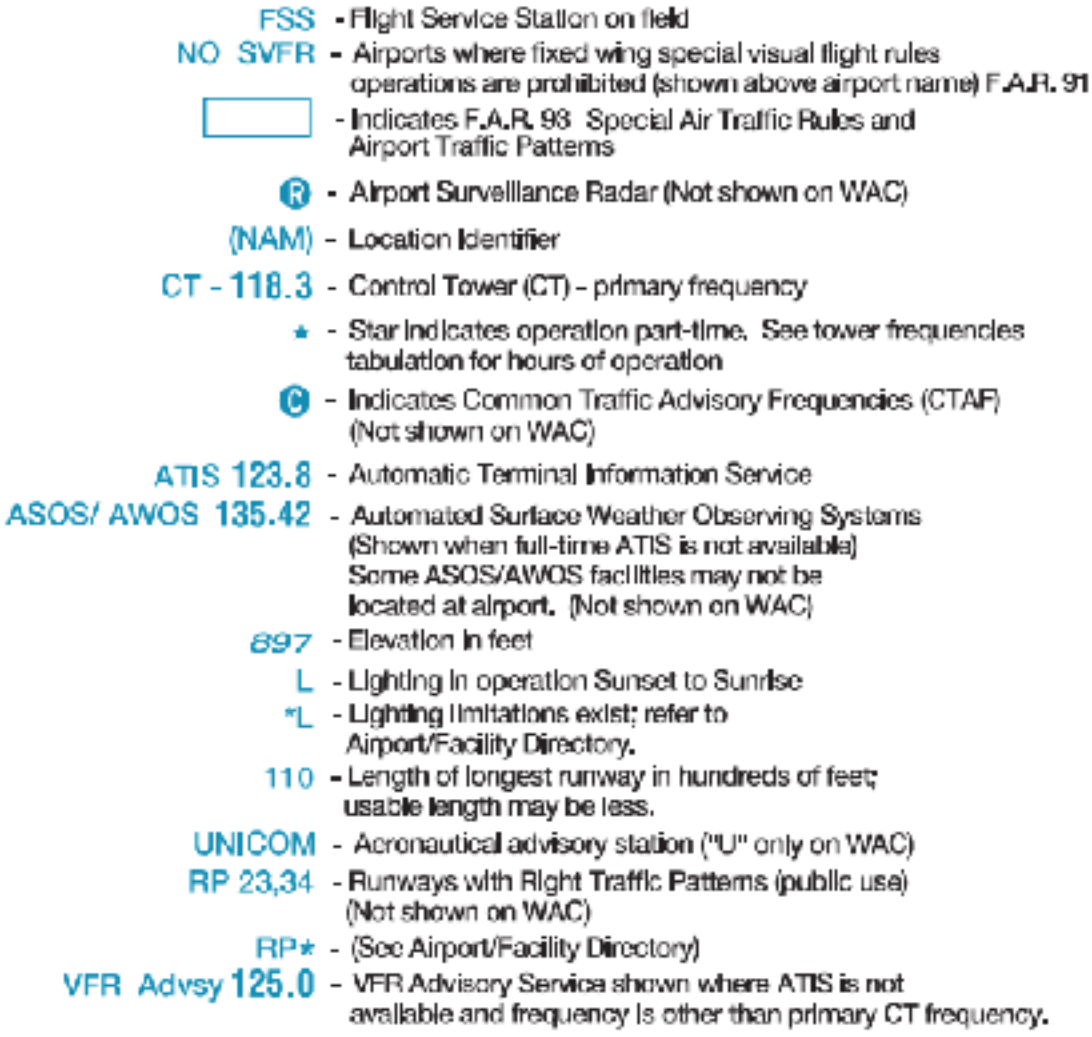
- Pitot heat – heating element in the pitot tube
    - There is a pitot heat rocker switch.
    - 10 amp push-to-reset circuit breaker.
- On the ground a pitot tube cover can be used to protect the pitot tube from insects and dirt clogging the tube.

> **Once bit of advice, after the airplane comes out of a 100-hour, annual inspection or painting, make sure the static source does not have any tape over it.**

Chapter 10: Airspace

The Commercial pilot certification confers that are a seasoned pilot pursuing flying in a commercial operation or going on to be a CFI. You have many hours of cross country time and many experiences in the aviation airspace system. Knowing where you are and in what airspace, at all times is extremely important, as the skies get busier. Your knowledge of airspace is important and imperative. I will first speak on areas of questions that are relatively new to the sectional chart and then proceed to the standard areas of airspace. Here is a link where you download from the FAA all the aeronautical chart symbols. Aeronautical Chart User's Guide. It is free and here is the link. https://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/aero_guide/media/Chart_Users_Guide_12thEd.pdf

FSS
NO SVFR
Ⓡ NAME (NAM)
CT - 118.3★ Ⓒ
ATIS - 123.8
ASOS/ AWOS 135.42
897 L 110 122.95 — UNICOM
RP 23,34
VFR Advsy 125.0



What does the star mean after the CT mean?

- The star after the CT frequency tells you that the control tower is only part time. The times it is open is found in your trusty AFD.

What does the *L mean?

- *L is pilot controlled lighting is a huge help at night to find airports that are not tower controlled.

What does the RP mean?

- RP will tell you that there is a right hand pattern.

What are VFR Waypoints?

- VFR Waypoints were established to provide VFR pilots with a supplemental tool to assist with position awareness while navigating visually in aircraft equipped with area navigation (RNAV) receivers. The program's purpose is to enhance safety, reduce pilot deviations, and provide navigation aids for pilots unfamiliar with an area in or around Class B, Class C, and Special Use Airspace (SUA). The use of VFR waypoints does not relieve the pilot of any responsibility to comply with the requirements of 14 CFR Part 91.

What is the definition of a VFR waypoint?

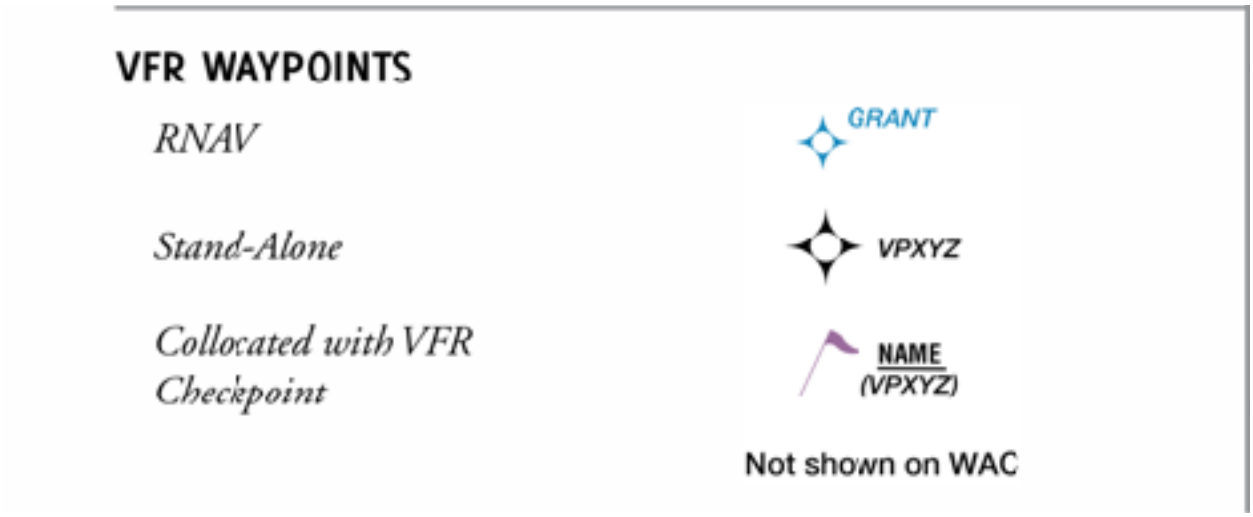
- VFR waypoints are navigational tools and they are to be used with your sectional chart, which is your primary navigation tool.

- A VFR waypoint is a predetermined geographical point depicted on a chart for transitioning and/or circumventing controlled and/or SUA, that is defined relative to a visual reporting point or in terms of latitude/longitude coordinates.

- If you have an aircraft equipped with Global Positioning System (GPS), you will be able to more accurately fly over a specific point and this should be considered when developing VFR waypoints. VFR waypoints can help avoid Class B airspace and Special Use

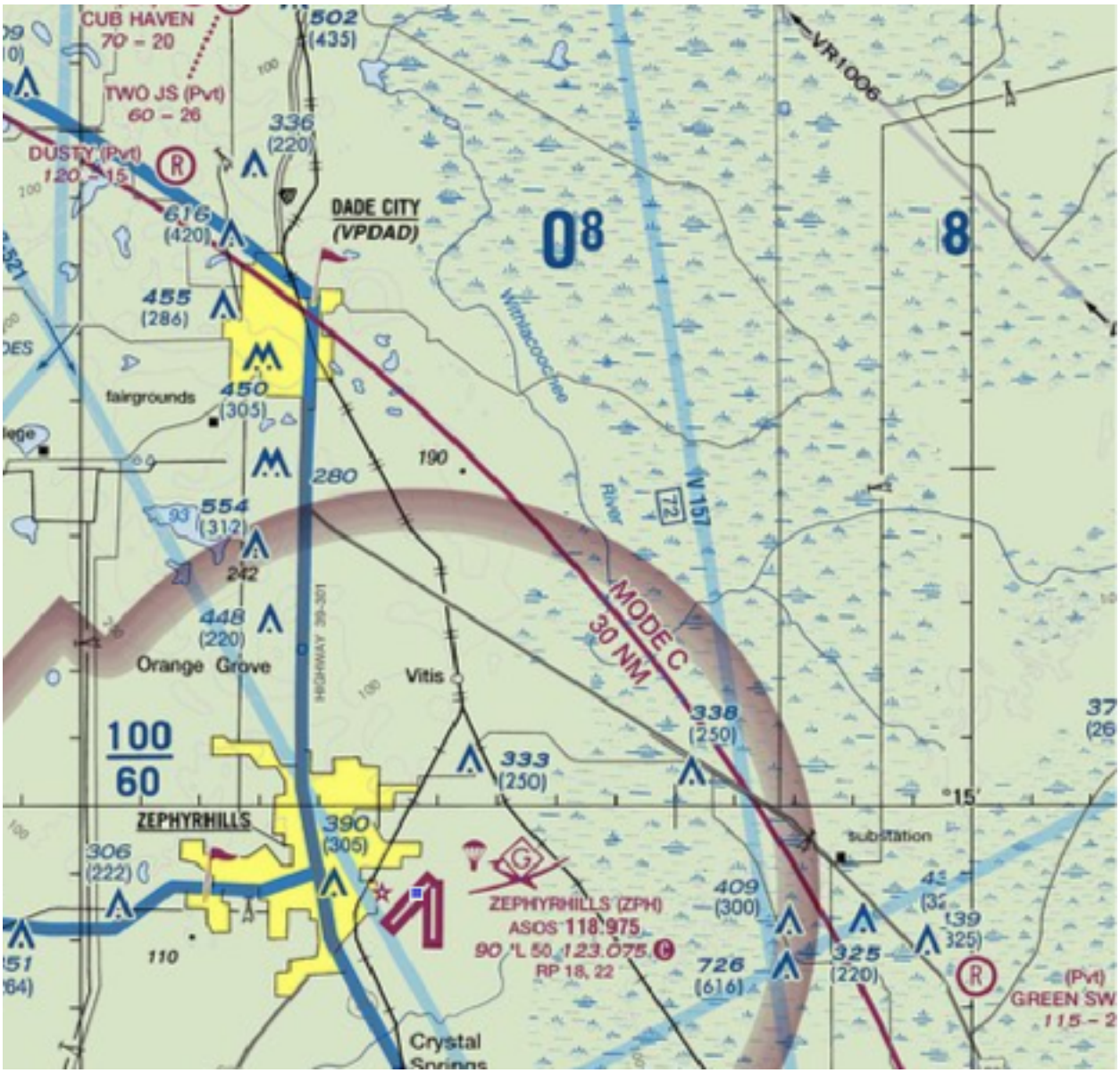
Airspace (SUA).

- VFR waypoint names (for computer-entry and flight plans) consist of five letters beginning with the letters VP and are retrievable from navigation databases. If you are speaking to ATC use a VFR Reporting point for position reporting.



Below are two VFR waypoints south of the New Smyrna Beach airport (KEVB)

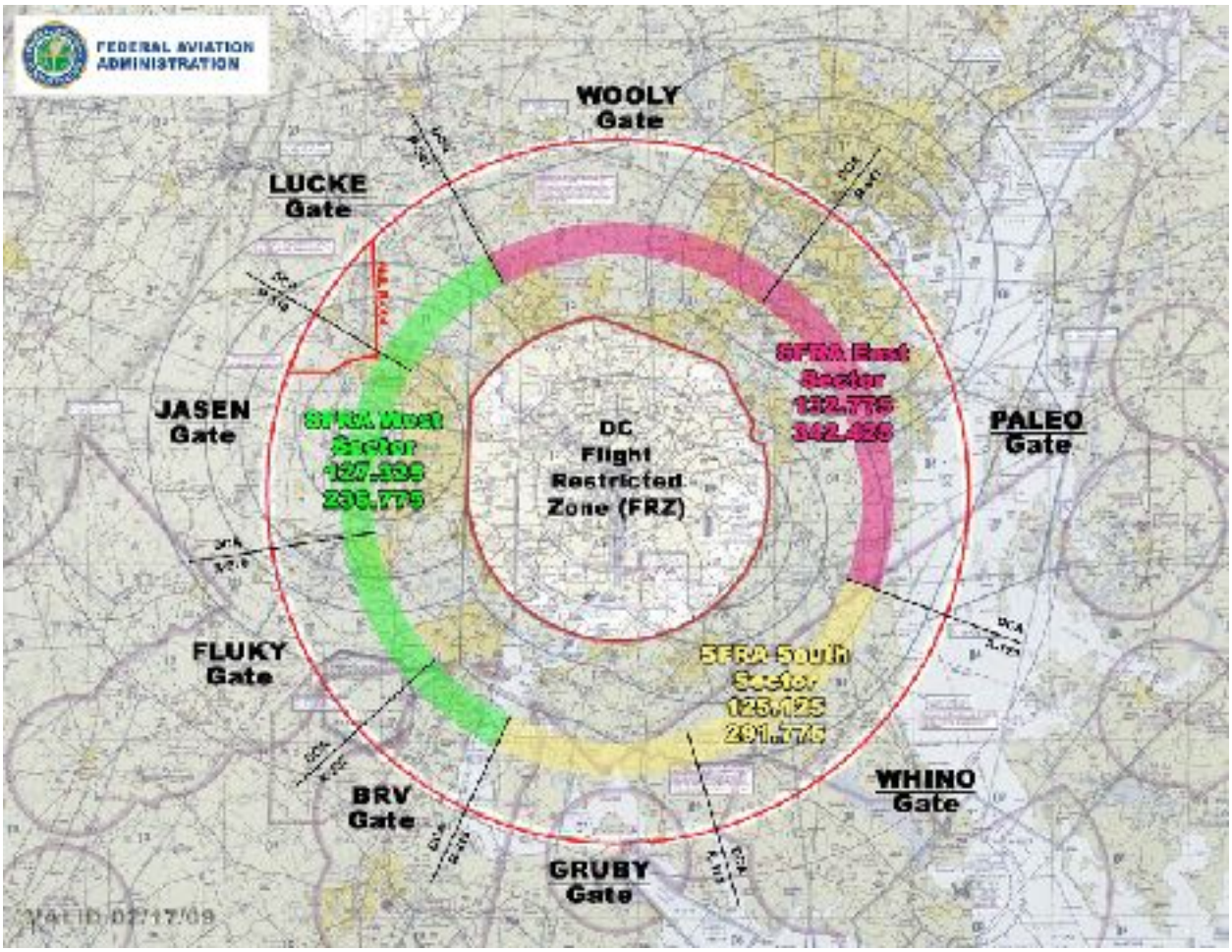
Below Dade City is both a VFR Waypoint and VFR reporting point (the burgundy flag) and could be used in an ATC communication: Orlando Approach 7159Q over Dade City.


CUB HAVEN
70 – 20
TWO JS (Pvt)
60 – 26
DUSTY (Pvt)
120 – 15
502
(435)
336
(220)
616
(420)
DADE CITY
(VPDAD)
08
8
VR1006
455
(286)
450
(305)
fairgrounds
Withlacoochee
River
V 157
72
280
190
554
(312)
242
448
(220)
Orange Grove
Vitis
MODE C
30 NM
338
(250)
333
(250)
100
60
ZEPHYRHILLS
390
(305)
306
(222)
110
ZEPHYRHILLS (ZPH)
ASOS 118.975
90 °L 50 123.075 C
RP 18, 22
409
(300)
726
(616)
325
(220)
substation
(Pvt)
GREEN SW
115 – 2
Crystal
Springs

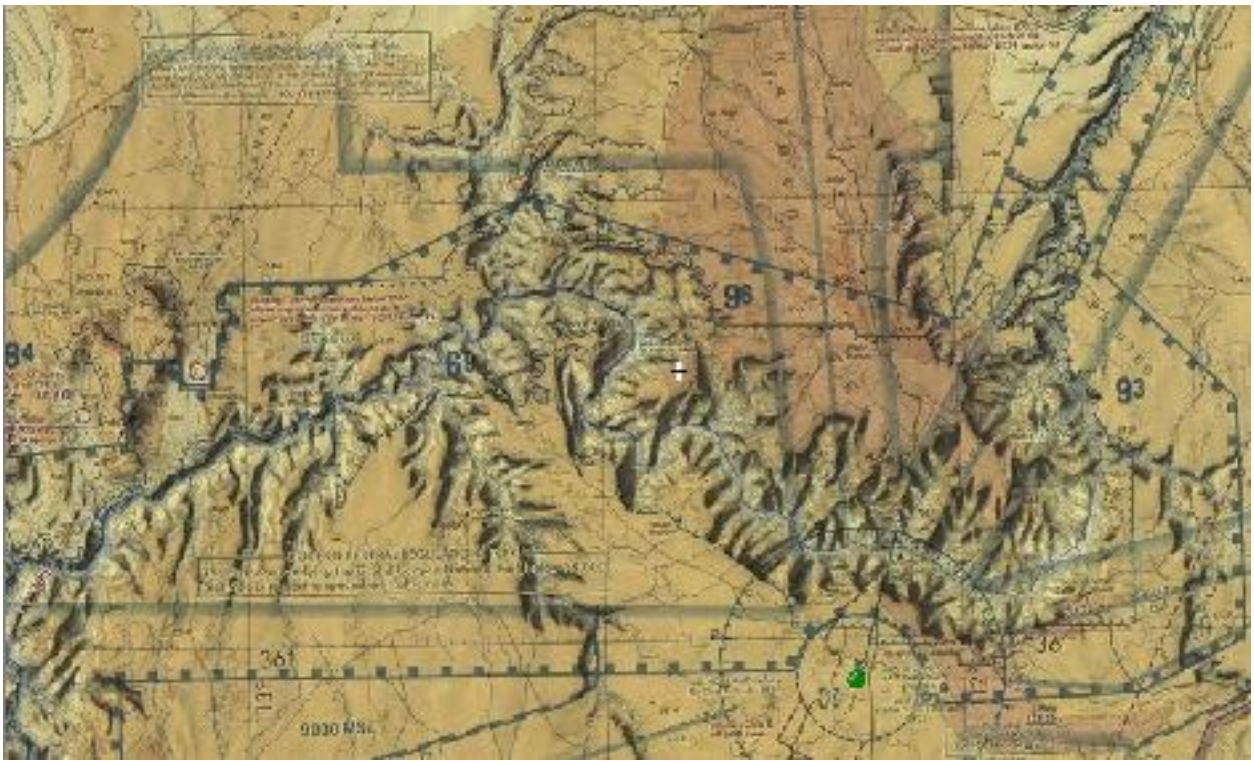
What is a SFRA?

- SFRA – Special Flight Rules area. This is something new since 9/11/2001. SFRA is a region in which the normal regulations of flight do not apply in whole or in part, especially regulations concerning airspace classification, altitude, course, and speed restrictions, and the like. Examples are the Washington DC area, Grand Canyon, Valpraiso FL, KLAX, Ketchikan, AK and NYC Class B airspace.

The FAA has a great website on SFRA's and how to get your certificate to be qualified to fly into the SFRA. I have personal experience with taking the test and getting my certificate to fly into the Washington DC SFRA. Jason Schappert and I flew from Hampton VA to Manassas VA. You first file an IFR flight plan, when flying VFR, with certain SFRA instructions on where you are going. All of this information is put together very nicely on the presentation from the FAA. Once you get airborne you will receive a specific squawk code if flying VFR. If you are flying IFR, which we did, you just follow the ATC directions very carefully. Of course that is exactly how you fly anyway, right?
You are flying into and out of gates with really funny names. We came in through FLUKY and left via the LUCKE gates.



Here is the Grand Canyon SFRA



AIRSPACE INFORMATION

SPECIAL FLIGHT RULES AREA (SFAR)

CAUTION

Pilots should not attempt flight in the Grand Canyon Special Flight Rules area (GCN SFRA) below 18,000 feet using this chart as their primary navigational reference. Pilots intending to fly within the Grand Canyon SFRA should refer to the Grand Canyon VFR Aeronautical Chart for detailed information. Chart is available from the Federal Aviation Administration (phone 1-800-638-9972) or authorized agents.

SPECIAL AIRSPACE AREAS

SPECIAL FLIGHT RULES AREA (SFRA) RELATING TO NATIONAL SECURITY

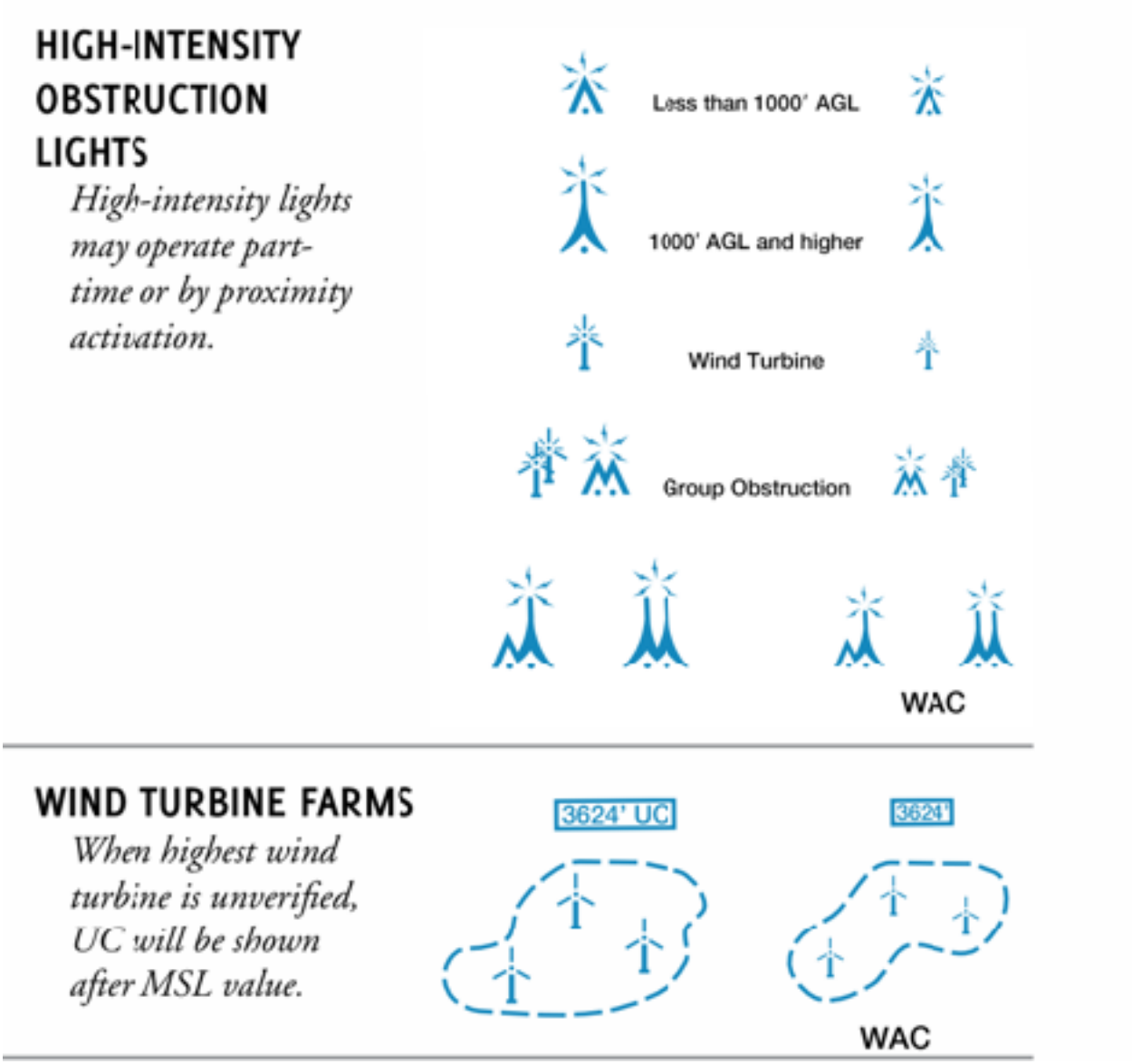
Example: Washington DC

Appropriate notes as required may be shown.
Note: Delimiting line not shown when it coincides with International Boundary, projection lines or other linear features.

Washington DC Metropolitan Area Special Flight Rules Area/Flight Restricted Zone restrictions are in effect.
Special regulations apply to all aircraft operations from the surface to but not including Flight Level 180 in the Washington DC Metropolitan Area. Pilots should contact a local FSS for NOTAM information prior to flight in the Washington DC Metropolitan Area.

What is this symbol?

- Wind Turbine



What is UAS?

- UAS – Unmanned Aircraft Systems

- Drones have hit the news invading our privacy and filming our weddings (hopefully you only have one wedding that lasts forever). Drones have been used by the military for a very longtime. Now unmanned aircraft have hit our sectionals.

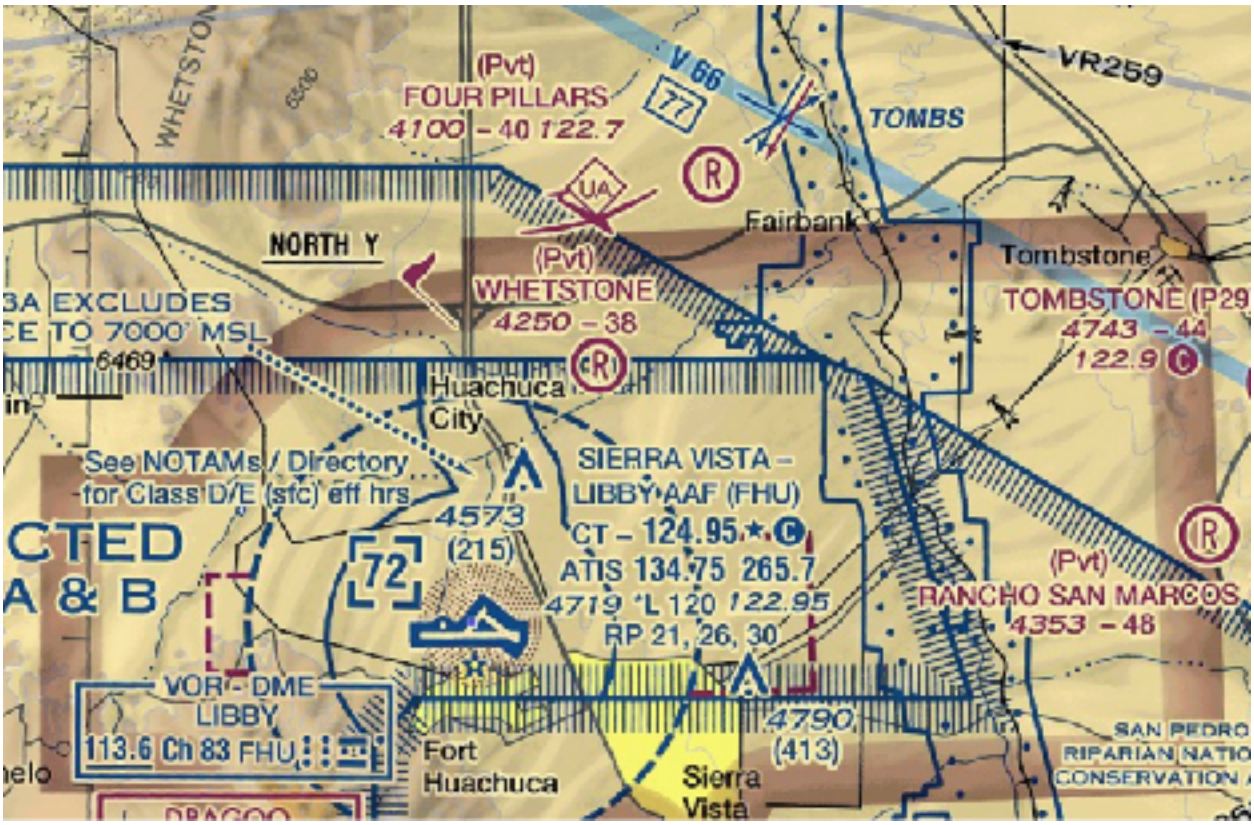
- Areas with a preponderance of unmanned aircraft systems (UAS) activity are typically noted on sectional charts with a small airplane symbol, similar to that used for glider operating areas but with the letters “UA” instead of “G.”

- Expect UAS activity in nearby restricted or other special-use airspace and military installations.

- You will need to pay attention to any NOTAMS with TFR’s over UAS areas, if any UA areas are along your route, outside of controlled airspace with no TFR issued, the altitudes and times the UA are flying.

Parachute Jumping Area with Frequency	122.9
Glider Operating Area	
Ultralight Activity	
Hang Glider Activity	
Unmanned Aircraft Activity	

Not shown on WAC



Public use airports:

- Hard-surfaced runways greater than 8069' or some multiple runways less than 8069'
- Hard-surfaced runways 1500' to 8069'
- Other than hard-surfaced runways
- Seaplane bases

Services available:

Tick marks around the basic airport symbol indicate that fuel is available and the airport is tended during normal working hours. (Normal working hours are Monday through Friday 10:00 A.M. to 4:00 P.M. local time.)

What is meaning of the tick marks around the airport symbol above?

- Fuel is available. You do not want to get caught going to an airport and there is no fuel available. One day ahead of your trip, check out your airport you want to fuel at, check for the tick marks and call ahead to see if they have fuel. Maybe the tanker did not arrive that day.

What is a MEF?

- MEF – maximum elevation figures.

- The Maximum Elevation Figure (MEF) represents the highest elevation of the highest feature, including terrain and other vertical obstacles (towers, trees, etc.), within a quadrant. The term features includes terrain, trees, towers, and other obstacles.

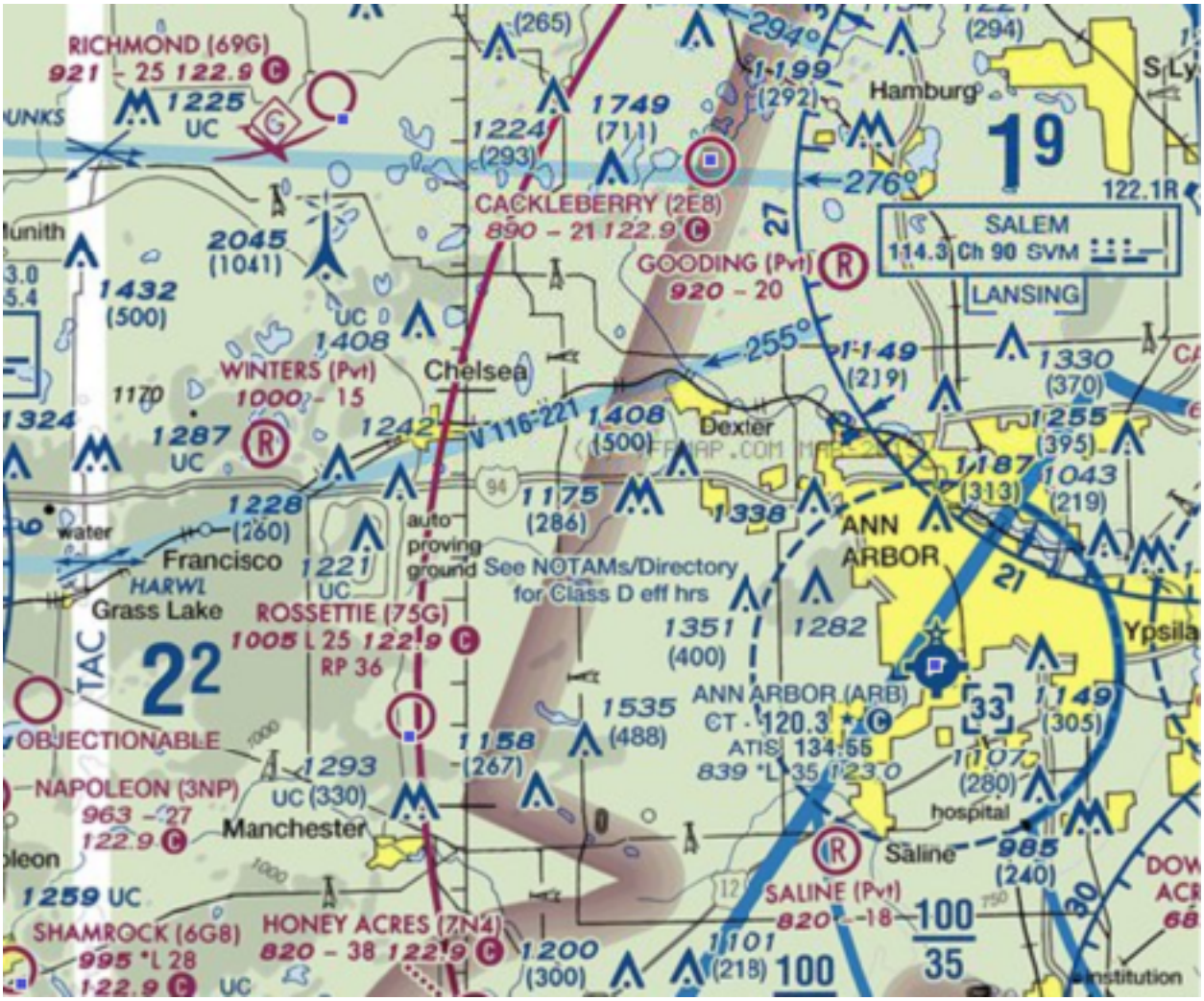
- A quadrant on Sectionals is the area bounded by ticked lines dividing each 30 minutes of latitude and each 30 minutes of longitude. MEF figures are depicted to the nearest 100' value.

    - The last two digits of the number are not shown. MEFs are shown over land masses as well as over open water areas containing man-made obstacles such as oil rigs.

- In the determination of MEFs, extreme care is exercised to calculate the values based on the existing elevation data shown on source material.

- MEF **does not** include any margin of error for aircraft clearance **above** the terrain nor for altimeter error.

- This is different in the IFR world as MSA gives us a safe clearance above an obstacle.



This is the MEF, flying out of KARB. It is 2,200 feet MSL. This is due to the tower that raises to 2045 feet MSL and 1041 AGL. I want to be at 3,500 feet MSL in case the winds at 3,000 feet are from 180 at 60 knots if flying in the area of the tower.

What is Class A (Alpha) airspace?

- Class A Airspace Class A airspace is generally the airspace from 18,000 feet mean sea level (MSL) up to and including flight level (FL) 600, including the airspace overlying the waters within 12 nautical miles (NM) of the coast of the 48 contiguous states and Alaska. Unless otherwise authorized, all operation in Class A airspace is conducted under instrument flight rules (IFR).

- Always use 29.92 on the altimeter

- Is not noted on a sectional chart

What are the VFR cloud clearances requirements in Class A airspace?

- Must be under a IFR flight plan

What is Class B (Bravo) airspace?

- Class B airspace is generally airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports in terms of airport operations or passenger enplanements.

- The configuration of each Class B airspace area is individually to the area it is in, consists of a surface area and two or more layers (some Class B airspace areas resemble upside-down wedding cakes), and is designed to contain all published instrument

procedures once an aircraft enters the airspace.

    - Class B airspace is like snowflakes, no two are alike, so check you sectional carefully.

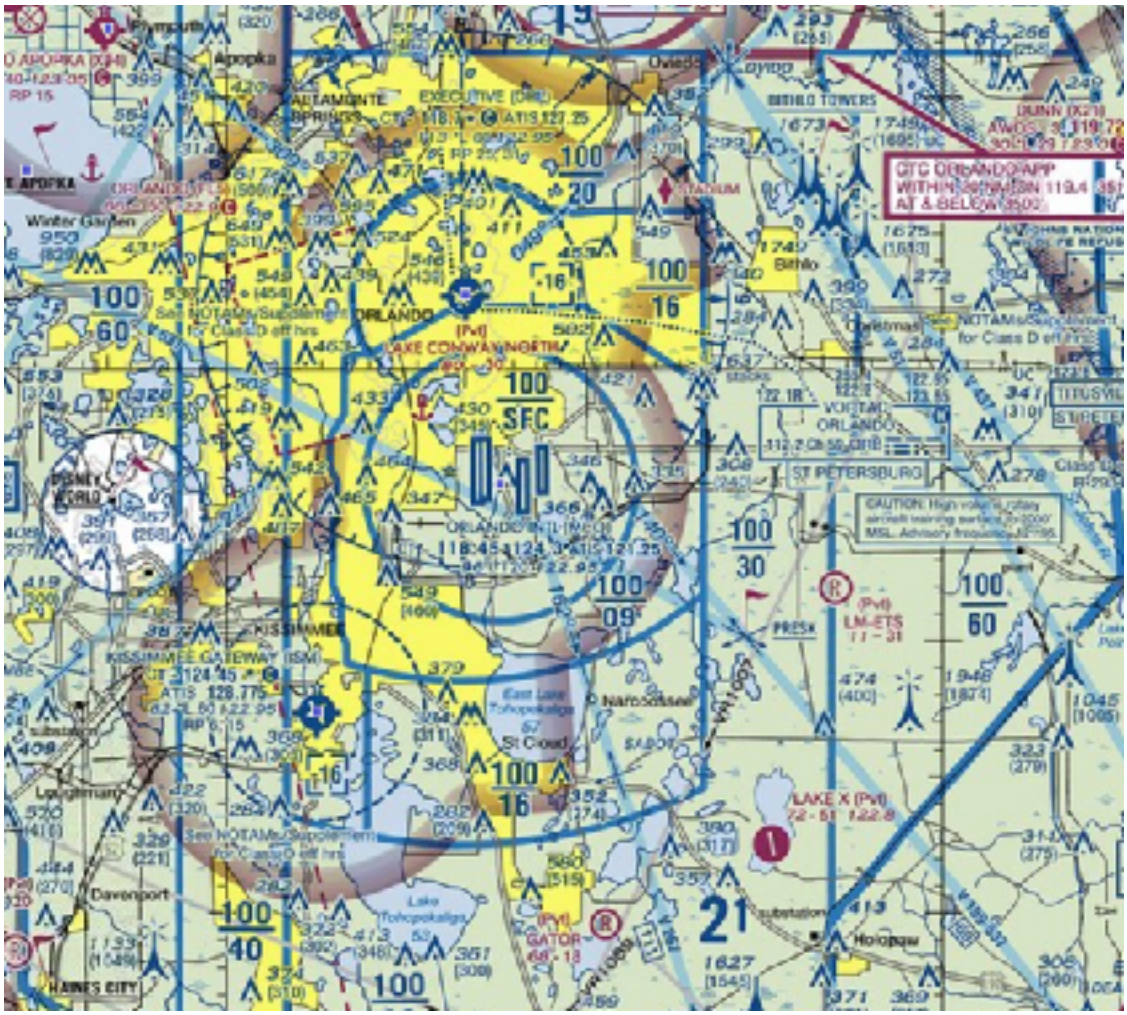
- ATC clearance is required for all aircraft to operate in the area, and all aircraft that are so cleared receive separation services within the airspace.

- Class Bravo airspace is depicted on a sectional as multiple solid blue lines, with altitudes depicted for each area of the blue line.

- Mode C transponder is required.

- Some Class Bravo airspace will have a 30 mile Mode C veil.

- Visibility and cloud clearance is 3 statute miles and clear of clouds



What is Class C airspace?

- Class C airspace is generally airspace from the surface to 4,000 feet above the airport elevation (charted in MSL) surrounding those airports.

- Have an operational control tower and are serviced by a radar approach control

- They have a certain number of IFR operations or passenger enplanements.

- Although the configuration of each Class C area is individually tailored, the airspace usually consists of a surface area with a five NM radius and an outer circle with a ten NM radius that extends from 1,200 feet to 4,000 feet above the airport elevation.

- Each aircraft must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and thereafter must maintain those communications while within the airspace.

- Mode C required inside and above Class C airspace

- VFR visibility and cloud clearance – 3 statute miles, 1000 feet above the clouds, 500 feet below and 2,000 feet horizontal for the clouds (3 152's)

What is Class D airspace?

- Class D airspace is generally airspace from the surface to 2,500 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower.

- The configuration of each Class D airspace area is individually tailored and, when instrument procedures are published, the airspace is normally designed to contain the procedures.

- Arrival extensions for instrument approach procedures (IAPs) may be Class D or Class E airspace. Unless otherwise authorized, each aircraft must establish two-way radio communications with the

ATC facility providing air traffic services prior to entering the airspace and thereafter maintain those communications while in the airspace.

- A mode C transponder is not required unless the Class D airport is within a 30 mile veil of a Class B airport.

- VFR visibility and cloud clearance – 3 statute miles, 1000 feet above the clouds, 500 feet below and 2,000 feet horizontal for the clouds (3 152's)

What is Class E airspace?

- Class E airspace is the controlled airspace not classified as Class A, B, C, or D airspace.

- A large amount of the airspace over the United States is designated as Class E airspace.
    - An example of a prohibited area, P-40 around Camp David. This provides sufficient airspace for the safe control and separation of aircraft during IFR operations.
    - Chapter 3 of the Aeronautical Information Manual (AIM) explains the various types of Class E airspace.
- Sectional and other charts depict all locations of Class E airspace with bases below 14,500 feet MSL.
- In areas where charts do not depict a class E base, class E begins at 14,500 feet MSL.
- In most areas, the Class E airspace base is 1,200 feet AGL.
- In many other areas, the Class E airspace base is either the surface or 700 feet AGL.
- Some Class E airspace begins at an MSL altitude depicted on the charts, instead of an AGL altitude. Class E airspace typically extends up to, but not including, 18,000 feet MSL (the lower limit of Class A airspace).
- All airspace above FL 600 is Class E airspace
- VFR visibility and cloud clearance – 3 statute miles, 1000 feet above the clouds, 500 feet below and 2,000 feet horizontal for the clouds (3 152's)

- If above 10,000 feet the requirements are 5 statute miles, 1,000 feet above, 1,000 feet below and 1 mile horizontally (5 F-111's)

What are the 5 different types of Class E airspace?

- **SETVODA**
  - **S- Surface:** Class E airspace from the surface of the airport. It is depicted as dashed magenta lines surrounding the airspace.
  - **E – Extension:** Class E surface extension airspace, normally used to protect an instrument approach. You will see them as rectangles extending out from the airport with dashed magenta lines.
  - **T – Transition**: areas of Class E airspace that start at 700 feet AGL and are depicted by a faded magenta circle. The color fades from outside to in.
  - **O – Offshore:** As the name implies these are Class E areas off of the coast of a state and is depicted by a blue zipper line. Altitudes of the airspace will be shown along the zipper lines.
  - **D – Domestic Enroute:** This is the Class E airspace that you will not see on the sectional. It starts at 1200 feet and is the "Everywhere Else" Class E airspace.
  - **A – Above 14,500 MSL** Class E airspace.

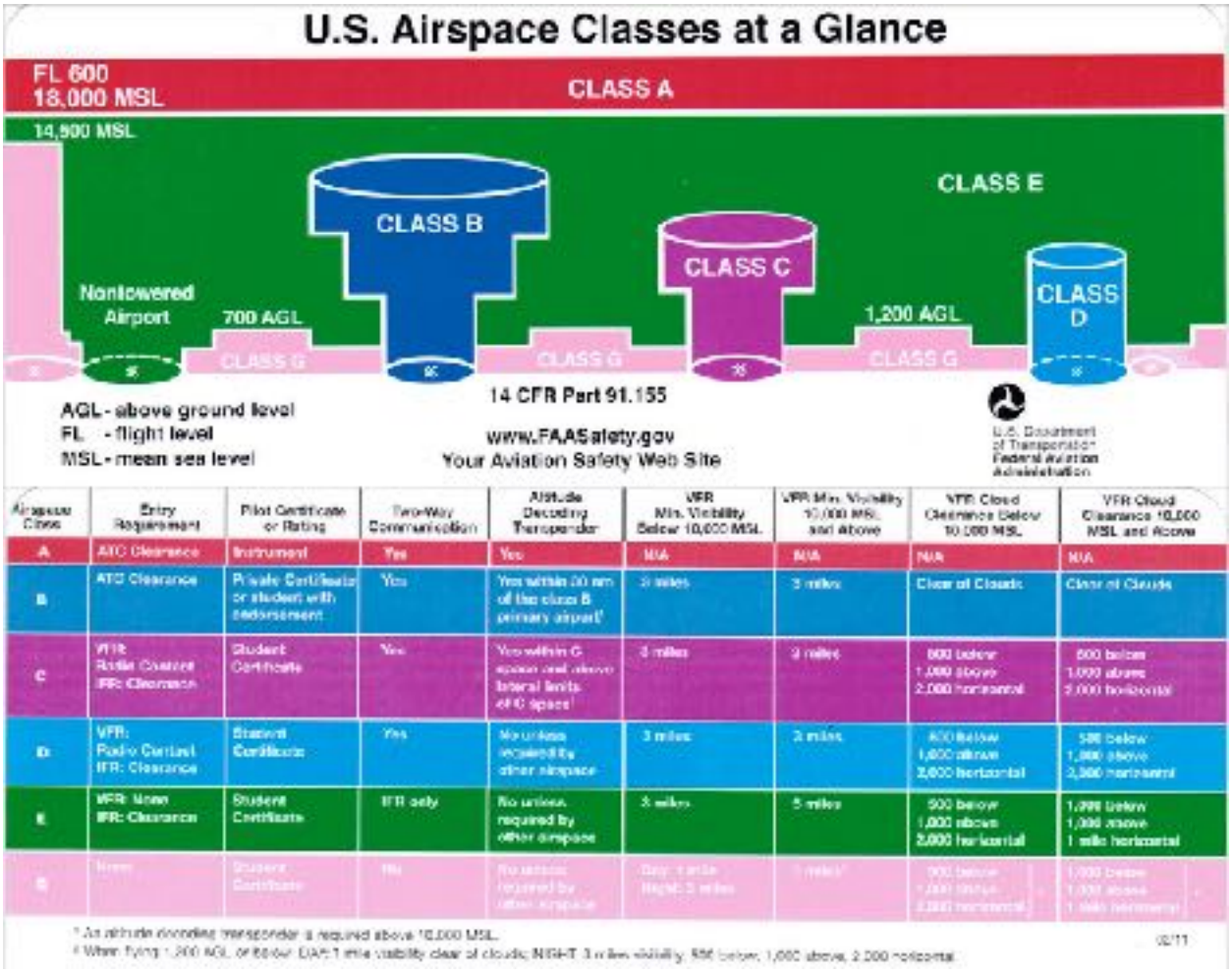
What is Class G airspace?

- This is uncontrolled airspace and goes from the surface up any other airspace above it.

- Visibility requirements are:

    - Day: 1 miles, clear of clouds.

    - Night: 3 statute miles, 1,000 feet above, 500 feet below and 2,000 feet horizontal (3- 152's)



What are the different types of Special Use Airspace?

- **MCPRAWN**

- **M –** Military Operations Area
- **C –** Controlled Firing
- **P –** Prohibited Area
- **R –** Restricted Area
- **A –** Alert Area
- **W –** Warning Area
- **N –** National Security Area

What are some other airspace categories?

- **TRSA's –** Terminal Radar Service Areas – are areas of airport space that comes from the 70's and 80's before Class A, B, C, D, E, and G
  - They are the last remnants of the old airspace system.
  - I consider them Class C minus or D plus airspace.
  - There are very few of them left and are recognized by two black rings around the TRSA.
- Military Training Routes
  - Have both IFR and VFR routes seen on the sectional
- Wildlife Refuge

Chapter 11: The National Transportation and Safety Board (NTSB)

Every aspect of transportation from walking to flying has a danger level involved. That is life. The NTSB is the agency that investigates accidents, incidents, injuries and major transportation disasters. A good working informational knowledge of the system is important, not just for the checkride, but for your aviation journey.

Define an aircraft accident. (NTSB Part 830.2)

- An aircraft accident means an occurrence associated with the operation of an aircraft which takes place between **the time any person boards the aircraft with the intention of flight and all such persons have disembarked,** and which **any person suffers death or serious injury, or in which the aircraft receives substantial damage.**

What is an aircraft incident? (NTSB Part 830.2)

- An occurrence other than an accident, associated with the operation of the aircraft, which **affects or could affect the SAFETY of operations.**

When is the immediate notification of the NTSB required? (NTSB Part 830)

- The operator of the aircraft must immediately notified the nearest NTSB office, when an accident occurs or any of the following:
    - Flight control system malfunction.
    - Crewmember unable to perform normal duties.
    - Turbine engine failure of structural components.

- In-flight fire.
- Aircraft collision-in-flight
- Property damage, other than the aircraft, estimated to exceed $25,000
- Overdue aircraft (believed to be in an accident)
- Release of all or a portion of a propeller blade from an aircraft.
- Complete loss of information (excluding flickering) from more than 50 percent of an aircraft's EFIS cockpit displays.

What is the NTSB definition of a serious injury?

- Requires hospitalization for more than 48 hours, commencing from 7 days from the date the injury was received.
- Fracture of any bone (except simple fractures of fingers, toes or nose)
- Injury causes severe hemorrhages (severe bleeding), nerve, muscle or tendon damage
- Involves any internal organ
- Involves second or third-degree burns affecting more than 5% of the body surface.

Define the term substantial damage.

- Damage or failure which adversely affects the performance or flight characteristics of the aircraft, structural strength and which requires major repair or replacement of the affected component.

Chapter 12: FAR/AIM

The Federal Aviation Regulations (FAR) and the Aeronautical Information Manual is a fantastic reference source. Yes, the rules can be daunting, but their intention is to educate and keep us safe. We will go over the most important FAR's for the Commercial Pilot rating. Keep in mind every FAR that you learned about for the Private Pilot Certificate is your foundation to be added to by the Commercial rating.

Define FAR 135.19, "Emergency Operations."

- In the event of an emergency involving the safety of passengers or property, the pilot may deviate from the rules that govern the aircraft, equipment and weather minimums to ensure the safety of the passengers or property.

- A deviation from a rule of this part must within 10 days, excluding Saturdays, Sundays and Federal Holidays, after the deviation send to the FAA Flight Standards District Office (FSDO) a complete report of the operation involved, description of the deviation and reasons for it.

What preflight actions must a pilot do before a flight, as stated in FAR 91.103?

- **NWKRAFT**

- **N – N**OTAMS
- **W – W**eather
- **K – K**nown traffic delays
- **R – R**unway lengths of intended use
- **A - A**lternates
- **F – F**uel requirements
- **T – T**akeoff and Landing distances

Define FAR 91.107 concerning the use of safety belts, shoulder harnesses and child restraint systems.

- No pilot may take off a U.S. registered aircraft unless the PIC ensures that each person knows how to fasten and unfasten their seat belt and shoulder harness if installed for passengers.

- No pilot can move and aircraft on the ground, takeoff or land with passengers unless they have been briefed that they must have their seatbelts fastened.

- A person may be held by a passenger occupying a seat, up to the age of two years of age and does not occupy a seat or use a safety belt.

- Approved child restraint systems manufactured after February 26, 1985, must bear two labels:

- This child restraint system conforms to all applicable Federal motor vehicle safety standards

- This restraint is certified for use in motor vehicles and aircraft in RED LETTERS

- Forward-facing seat

What is the right-of-way rule, FAR 91.113?

- Regardless if the flight is VFR or IFR, vigilance shall be maintained by the operator of the aircraft so as to see and avoid other aircraft.

- In distress – aircraft in distress had the right of way over everyone

- Converging – if converging at the same altitude, the aircraft to the other's right shall have the right-of-way.

- Balloon > glider > airship > powered parachute, weight-shift-control > airplane or rotorcraft.

- Aircraft towing or refueling other aircraft has the right of way over all other engine-driven aircraft.

- Approaching head-on – each pilot shall alter their course to the right.

- Overtaking – the aircraft that is being overtaken has the right-of-way.

    - Overtaking aircraft shall alter course to the right to pass well clear.

- Landing – aircraft on final approach have the right of way

    - When two or more aircraft are approaching an airport for landing, the aircraft at the lower altitude has the right-of-way.

What are the minimum safe altitudes, FAR 91.119?

- Anywhere – An altitude allowing, if a power unit fails, an emergency landing that does not cause hazards to persons or property on the surface.

- Over congested areas – city, town, or settlement, open air assembly of persons, an altitude 1,000 feet above the highest obstacle and within a horizontal radius of 2,000 feet.

- Over other than congested areas – 500 feet above the surface, except over open water or sparely populated areas. May not operate closer than 500 feet to any person, vessel, vehicle, or structure.

What are the fuel requirements for flight in VFR conditions, FAR 91.151?

- No person can begin a flight under VFR unless there is enough fuel o fly to the first point of intended landing and at normal cruise.

    - During the day, to fly after that for at least 30 minutes

    - At night, to fly after that for at lease 45 minutes.

What are Special VFR Weather Minimums, FAR 91.157?

- Special VFR may only be conducted:

- With an ATC clearance
- Clear of clouds
- Flight visibility is at least 1 statute mile

What portable electronic devices can be used in an aircraft, FAR 91.21?

- Portable voice recorders
- Hearing aids
- Heart pacemakers
- Electric shavers
- Or any portable devices the PIC has determined will not cause interference with the navigational of communication system.

Define FAR 91.17 on alcohol or drugs.

- No person can act or attempt to act as a crewmember:
  - Within 8 hours after consumption of alcohol
  - While under the influence
  - Using any drug that affects the faculty of the pilot
  - Alcohol concentration in the blood of 0.04 or greater

- Any person who appears intoxicated to be carried in the aircraft

What is the supplemental oxygen requirement, FAR 91.211?

- At cabin pressures above 12,500 feet (MSL) up to and including 14,000 if the crewmember has been at these altitudes for longer than 30 minutes.

- Above 14,000 feet up to and including 15,000 feet, the required minimum flight crew is provided oxygen and must use for the entire time they are at these altitudes.

- At cabin pressures above 15,000 feet each occupant of the aircraft is provided supplemental oxygen.

- Pressurized aircraft

    - If above FL 250, at least a 10-minute supple of supplemental oxygen is provided in event of a descent is necessary due to cabin pressure loss

    - Above FL 350 at least one crewmember at the controls is wearing and using an oxygen mask that is secured and sealed.

Can objects be dropped from the aircraft, FAR 91.15?

- No object can be dropped out of the airplane if the operator of the aircraft feels it creates a hazard to persons or property.

- Objects can be dropped if reasonable precautions are taken to avoid injury or damage to persons or property.

When is an ELT not required, FAR 91.207?

- Aircraft engaged in scheduled flights by scheduled air carriers

- Aircraft engaged in training operations conducted entirely within a 50 nautical mile radius of the airport from which the flight began.

- Flights engaged in aerial application of chemicals and other substances for agricultural purposes

- Airplanes equipped to carry not more than one person.

What is LAHSO?

- Land and hold short operations. This operation means that aircraft and landing and holding short of intersecting runways or some other designated point on the runway.

- Helps at airports with increased capacity and system efficiency that is consistent with safety.

- ATC may clear a pilot to land and hold short. The pilot may accept only if the PIC determines that the aircraft can land and stop within the Available Landing Distance (ALD).

- The PIC has the final authority to accept or decline any LAHSO.

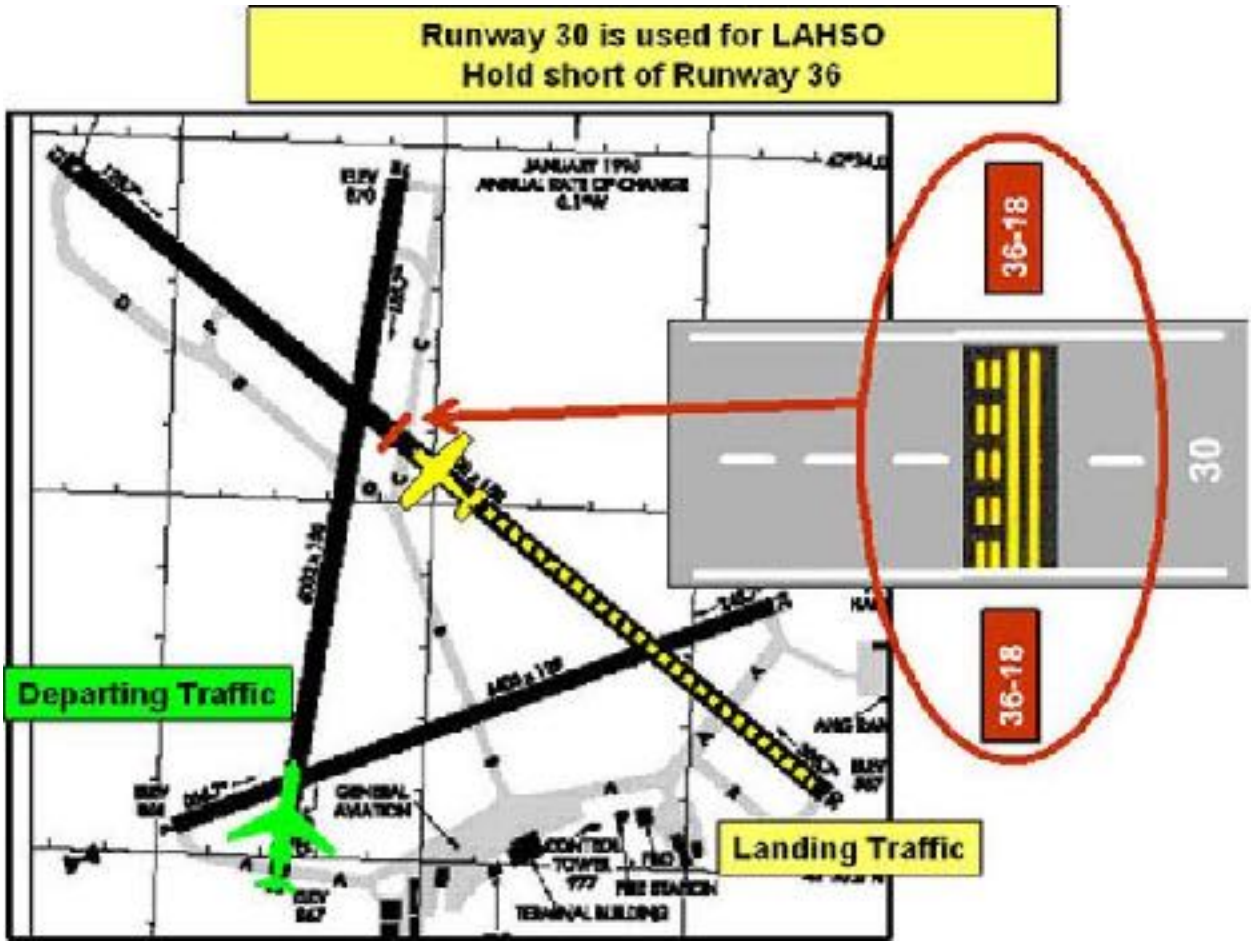
ORLANDO

EXECUTIVE (ORL) 3 E UTC–5(–4DT) N28°32.73′ W81°19.98′
113 B S4 **FUEL** 100, 100LL, JET A OX 4 NOTAM FILE ORL
RWY 07–25: H6004X150 (ASPH–GRVD) S–45, D–100, 2S–82, 2D–115 HIRL
RWY 07: MALSR. PAPI(P2L)—GA 3.0° TCH 40′.
RWY 25: REIL. PAPI(P4R)—GA 3.0° TCH 46′. Rgt tfc.
RWY 13–31: H4625X100 (ASPH–GRVD) S–35, D–60 HIRL
RWY 13: REIL. PAPI(P2L)—GA 3.0° TCH 28′. Trees.
RWY 31: REIL. PAPI(P2L)—GA 3.0° TCH 28′. Trees. Rgt tfc.

LAND AND HOLD–SHORT OPERATIONS

LDG RWY	HOLD–SHORT POINT	AVBL LDG DIST
RWY 25	13–31	4150

RUNWAY DECLARED DISTANCE INFORMATION
RWY 07: TORA–6004 TODA–6004 ASDA–6004 LDA–5704
RWY 25: TORA–6004 TODA–6004 ASDA–6004 LDA–6004



Chapter 13: Single Pilot Resource Management

Single-Pilot Resource Management (SRM) is an adaptation of Crew Resource Management (CRM) training to single pilot operations. The purpose of SRM is to reduce the number of aviation accidents caused by human error by teaching pilots about their own human limitations and how to maximize their performance. There are some wonderful checklists that will help keep you and the flight safe.

What is the 5 P checklist?

- This checklist helps the pilot make key decisions points from preflight to landing.

- Key decision points
    - Preflight
    - Pre-takeoff
    - Hourly or at the midpoint of the flight
    - Pre-descent
    - Prior to entering the pattern or if flying IFR prior to the FAF
    - During an emergency
- **Plan**
- **Plane**
- **Pilot**
- **Passengers**
- **Programming**

What is Aeronautical Decision Making? (FAA-H-8083-9)

- Systematic approach to the mental process of evaluating a given set of circumstances and determining the best course of action.
- **DECIDE Checklist**
- **3P Checklist**

What is the DECIDE checklist?

- **D –** Detect a change needing attention
- **E –** Estimate the need to counter or react to a change
- **C** – Choose the desirable outcome for the flight
- **I –** Identify actions to successfully control the change
- **D –** Do something to adapt to the change
- **E –** Evaluate the effect of the action countering the change

What is the 3P Checklist?

- **P**erceive hazards by using the **PAVE checklist**
    - **P** – **P**ilot: experience, currency, physical and emotional conditions.
    - **A – A**ircraft: fuel reserves, performance, experience in type, aircraft equipment.
    - **V –** en**V**ironment: airport conditions, weather, runways, lighting, terrain
    - **E – E**xternal pressures: allowance for delays and diversions, alternative plans, personal equipment
- **P**rocess hazards by using the **CARE checklist** to evaluate the level and severity of risk

- **C**onsequences – evaluate consequences that could arise due to each hazard

- **A**lternatives – evaluate all available options and alternatives

- **R**eality – acknowledge and address what is really happening and not use wishful thinking. " I sure do wish that thunderstorm I flying in dissipates quickly."

- **E**xternal Pressures – be aware of external pressures like "get-homeitis."

- **P**erform risk management by using the **TEAM checklist**

    - **T**ransfer – can I transfer any responsibilities to someone else like ATC or consult another pilot or crewmember?

    - **E**liminate – can I eliminate the hazard?

    - **A**ccept – do the BENEFITS outweigh the RISKS?

    - **M**itigate – what can I do to reduce the risk?

Name the five hazardous attitudes that can affect the decision making process of the pilot.

- **Anti-authority –** Don't tell me. **Antidote –** follow the rules.

- **Impulsivity –** Do it quickly. **Antidote –** Think first and not so fast.

- **Invulnerability –** It won't happen to me. **Antidote –** It could happen to me.

- **Macho –** I can do it. **Antidote –** Taking chances is foolish.

- **Resignation –** What is the use. **Antidote –** I can make a difference.

Define risk management.

- Risk management is the identification, analysis and elimination (and/or mitigation to an acceptable or tolerable level) of those hazards, as well as the subsequent **risks** that occur during flight.

- It is the logical process of potential cost of the risks versus the possible benefits of allowing those risks to continue.

What is the IMSAFE checklist?

- **Illness –** Do I have symptoms?

- **Medication –** am I experiencing any side effects like drowsiness?

- **Stress –** Am I experiencing any pressure due to job, family or money?

- **Alcohol –** have I had a "drink" in the last 8 hours, within the last 24 hours?

    - **All people metabolize alcohol differently, so please do not use the 8 hours "rule", follow the 24 hour period of abstinence before flight. It is not worth it.**

- **Fatigue –** Did I get a good night's sleep for your body?

- **Eating or Emotion –** Did I have a good breakfast before flight?

What are two common methods of checklist usage?

- **Do-Verify (DV) method –** Once the checklist is completed, it is then verified again. The crew uses a flow pattern from memory to accomplish the checklist quickly and efficiently.

- **Challenge-Do-Verify method –** this is the most effective two-pilot way to perform the checklist. One crewmember issues the challenge and the second crewmember take the action and responds to the first crewmember, verify that the action was taken. **For example: copilot reading the checklist: Fuel Pump ON, Pilot touches and toggles switch to turn on the fuel pump and verifies that the fuel pump is on. Pilot – Fuel Pump ON.**

Chapter 14: Flight Planning

The commercial rating puts the pilot at a higher level of planning for a cross country flight. You are gathering weather, information on the destination airport, evaluating your personal and company minimums if for hire and flying in more complex aircraft. The basics are now automatic and your proficiency and efficiency in planning the flight are more crucial. You will need to know the capabilities of your GPS system and how it works. RNAV, RNP and RAIM are terms you should be familiar with and can explain to the examiner. This information will be vital, if you will be going on to become a CFI.

When is the pilot required to file a flight plan?

- If for compensation or hire – ALWAYS

- The pilot will be required to file a flight plan through the various facilities available to the pilot:

    - Call 1-800-WXBRIEF
    - www.1800wxbrief.com
    - www.duats.com
    - All of the Cellphone apps: Foreflight, FlyQefb, Garmin Pilot and FltPlan

- File the flight plan at least an hour in advance of the flight. I used the term at least. Sometimes ATC may have delays in their systems and it is best to plan ahead many hours in advance to ensure your flight plan gets to the proper place.

How do you decide on the best route selection of your flight?

- File preferred routes as those will be the most efficient way to get from point A to B. These are routes preferred by the FAA. It makes their work a lot easier. I highly suggest you use these routes.

- Preferred routes can be found in the U.S. Chart Supplements (formally know as the Airport Facility Directory)

- Pick easy to identify checkpoints. If you cannot see them, then you are now on an IFR flight plan.

- Use the most favorable altitudes based on winds aloft and if flying at higher altitudes the equipment necessary to fly there.

- Always have an alternate airport in mind if the destination does not work out.

How do you know if the sectional charts you are using are current?

- If you are using paper sectionals check on the top for the expiration date.

- Check your GPS system upon start up to ensure your system is not expired

- **Remember: the use of IPADs, Android devices and other handheld systems can only be used for backup.** Check your device the night before your flight to ensure your sectional charts are current.

What are the preflight requirements of the pilot before flight? (Review of the FAR/AIM section)

- **FAR 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 –

    - **(a)** For a flight under **IFR** or 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;

    - **(b)** For any flight, runway lengths at airports of intended use, and the following takeoff and landing distance information:

- **(1)** For civil aircraft for which an approved Airplane or Rotorcraft Flight Manual containing takeoff and landing distance data is required, the takeoff and landing distance data contained therein; and

- **(2)** For civil aircraft other than those specified in paragraph (b)(1) of this section, other reliable information appropriate to the aircraft, relating to aircraft performance under expected values of airport elevation and runway slope, aircraft gross weight, and wind and temperature.

- Remember **NWKRAFT**
  - **NOTAMS**
  - **Weather**
  - **Known delays**
  - **Runway lengths of your departure airport and destination**
    - **Also know for your alternates**
  - **Alternate airports**
  - **Fuel requirements**
  - **Takeoff and landing distances**
- **Calculate your Weight and Balances (see aircraft performance)**

What is RNAV?

- **RNAV**(Random Navigation) is a method of navigation which permits the operation of an aircraft on any desired flight path; it allows its position to be continuously determined wherever it is rather than only along tracks between individual ground navigation aids

- Provides enhanced navigational capability to pilot by calculating the airplane position, track, ground speed and meaningful information on the route of flight to the pilot. Presently the GPS is the primary RNAV equipment.

What is RAIM?

- Receiver autonomous integrity monitoring (**RAIM**) is a technology developed to assess the integrity of global positioning system (GPS) signals in a GPS receiver system. It is of special importance in safety-critical GPS applications, such as in aviation or marine navigation.

What is GPS?

- Global Positioning System is a satellite based radio navigation that broadcast a signal used by receivers to determine the precise position of the aircraft anywhere in the world. The receiver tracks multiple satellites and determines an almost exact measurement (within a few feet) that is used to determine location.

- Per GPS.gov the official U.S governmental agency in charge of satellites: The United States is committed to maintaining the availability of at least 24 operational GPS satellites, 95% of the time.

- In normal situations you should have 4 working satellites for GPS use.
    - 3 to triangulate with the 4th satellite to verify the other 3.
- As of June 30, 2017, there were a total of **31 operational satellites** in the GPS constellation, not including the decommissioned, on-orbit spares.

What is RNP?

- Required Navigation Performance(RNP) is RNAV with onboard navigation monitoring and alerting.
- RNP is also a statement of navigation performance necessary for operation within a defined airspace.
- A critical component of RNP is the ability of the aircraft navigation system to monitor its achieved navigation performance, and to identify for the pilot whether the operational requirement is, or is not, being met during an operation.
- This onboard performance monitoring and alerting capability therefore allows a lessened reliance on air traffic control intervention, via radar monitoring, automatic dependent surveillance (ADS)and/or route separation to achieve the overall safety of the operation.
- RNP capability of the aircraft is a major component in determining the separation criteria to ensure that the overall containment of the operation is met.
- The RNP capability of an aircraft will vary depending upon the aircraft equipment and the navigation infrastructure. For example,

an aircraft may be equipped.

Chapter 15: Physical and Mental preparation for the Oral Checkride

Your instructor has deemed you ready to pass the checkride via the signature in the logbook and the IACRA application. The instructor would not sign you off if they felt you were not ready. I, like most other pilots are always seeking to reach the level of perfection. If we were perfect we would not need to train and have instructors. Your goal is to be able take the facts (rote memory) and then apply and correlate this information to the scenario based question of the examiner. You will do great. You are ready to not just pass but to excel. I can share some real facts and tips, based on my research and experience of participating in many checkrides.

You have heard Jason speak on "Chair Flying" a maneuver. I have used this method since 1984. I have used with great success, chair flying the oral exam. You put the positive experience into your subconscious mind ahead of time as if it has already happened. The subconscious mind takes up 92% of your brain capacity. The subconscious mind has no ego and it digests and puts into place positive experiences, as well as negative thoughts. If you put stress, worry and anxiety into it, the subconscious says OK if that is what you want you got it. *Chair fly* the questions and see yourself giving all the right answers to the examiner. After 33 years of flying, my oral checkrides have gone phenomenally well. I do this before I go to sleep. Why then? Because that is when the subconscious takes over, during sleep. Think of it as a hardrive. It processes for the next day all the positive stuff you put into it. For example, I was having a bit of confusion with the Minimum Equipment list definition. Is this the minimum I need to fly, is this the minimum I need to be broken to fly or am I completely missing it? I found the definition and put it to memory and said to my subconscious, "the MEL

is a list of what can be broken and still fly." The first question on my oral checkride was: 'Larry (before I became Uncle Larry) what is the MEL and how do we use it." I busted out laughing and the examiner looked at me funny. I told him exactly what I said before sleep and he said that was the best explanation he heard.

Most of my students will ask when do I stop studying, one, two or three days before. I tell to stop studying 24 hours before or if they are like me at 6pm the night before. I have a good meal and get whatever your body's best sleep time is. We are all different, as most people require 7-8 hours. The morning of the checkride, I recommend oatmeal and blueberries with 8 ounces of your favorite morning beverage. I love coffee for its antioxidant effects, increase lung function and awakens the brain. Tea or water works just as well as your brain is 80% water. Before breakfast I do my prayers and meditation and then have breakfast. I then go on a 30 minute walk to quiet my mind and be in awe of nature and of course to fly. Going into the checkride, you are prepared, confident and energized to do well.

I appreciate this opportunity to share with the MzeroA Community my experience, knowledge and teaching. The information that is presented in all of Jason's books are priceless and my hope for this book is also to be helpful. I present this information with the love and passion of aviation. I leave you with my mantra as presented by Jason: *"and remember, A GOOD PILOT IS ALWAYS LEARNING!"*

Thank you,
Larry M. Diamond, PharmD, CFII and eternal MzeroA member.

References

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