Master of

The Flight Review

J D PRICE

CFII, MEI, ATP

This publication is for informational purposes only, and is not intended to substitute for any approved aircraft flight manual, Flight Service briefing, competent flight instruction, or regulations published by the Federal Aviation Administration. The navigational charts used herein are not current and should not be used for navigation.

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FAASafety.gov

Try to learn from the mistakes of others.

You won't live long enough to make all of them by yourself.

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The Flight Review

You need not have a flight review if, within the last two years you:

- Had a practical exam for **<u>any</u>** certificate, category or class rating, including <u>any</u> CFI practical exam.
- Had a pilot proficiency check administered by the FAA.
- Had a Part 121 or 135 pilot proficiency check.
- Had a Part 141 Chief pilot proficiency check
- Had a military pilot proficiency check.
- Had a pilot examiner annual flight check.

You have a current Flight Review if you completed any phase of the FAA Wings Program in the last 24 months. (See https://www.faasafety.gov/ for details).

Flight Review Facts

- Flight Reviews expire on the last day of the 24th month. For instance, if your flight review was flown on July 2nd, 2017, it will expire on July 31st, 2019.
- Without a current flight review, you cannot fly as PIC.
- If the flight review is unsatisfactory, the instructor does not document this as a failure.
    - You simply correct your deficiencies and either fly again with the same or different CFI.
- **One Flight Review suffices for <u>all</u> the categories and classes of aircraft that you fly.** If you have a flight review in your Goodyear Blimp, you're legal for two more years in your Cessna Citation. *(FAR 61.56, 61.57)*

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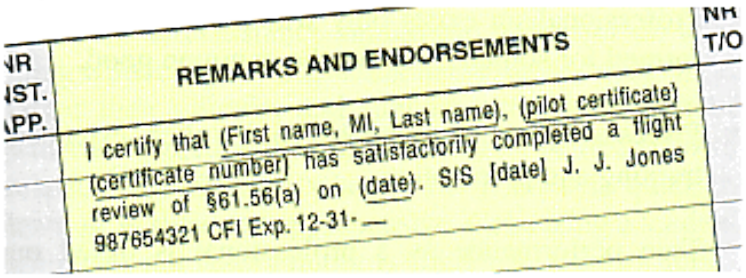
- When your logbook is endorsed by the CFI, you don't need to carry your logbook with you when you fly. However, officials from the FAA, NTSB, and law enforcement, may ask to see your logbook.


REMARKS AND ENDORSEMENTS

I certify that (First name, MI, Last name), (pilot certificate) (certificate number) has satisfactorily completed a flight review of §61.56(a) on (date). S/S [date] J. J. Jones 987654321 CFI Exp. 12-31-

- An FBO will want to see the Flight Review endorsement, if you wish to rent one of their airplanes.

A Review of Category, Class and Type

Category Examples

Class Examples

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A type rating is required in a specific make and model of aircraft if:

- It's powered by one or more turbojet engines. (This excludes turboprops like the Piper Malibu and King Air C90, 100 and 200 aircraft).

or

- ***A type rating is required if*** the aircraft's takeoff gross weight is certified for 12,500 pounds or more, similar to the larger King Air 300 (max takeoff weight, 4,000 pounds).

Flight Controls

Your Aircraft must have dual flight controls. Why? *FAR 61.56* specifies that during a flight review, "flight training" must be given. *FAR 91.109* requires that flight instruction or training is to be given in aircraft with dual controls.

Beech Pilot Proficiency Program Flight Reviews in aircraft with a throw over control wheel have an exemption from the dual flight control rule, but the pilot must be PIC. That is, he or she must have a current medical and an unexpired flight review.

Your Certified Flight Instructor (CFI) must be qualified in your airplane's **Category** and **Class**. Your CFI doesn't need to have five hours of PIC flight time in your model aircraft.

However, if you need a Flight Review in an aircraft that requires a type rating, your CFI must have a type rating in that aircraft.

He or she doesn't need a current FAA Medical if you can be the Pilot In Command (PIC). That is, you must have an unexpired flight review and current medical.

Light Sport Exception

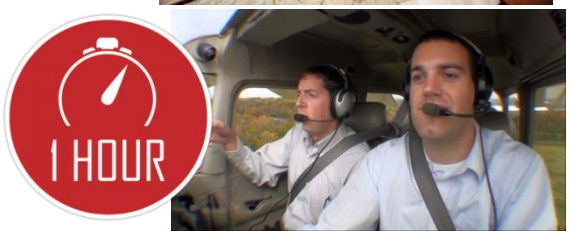
Your CFI will need at least five hours of flight time in the make and model Light Sport aircraft.

What to Expect

The flight review does not involve a written examination. However, it does require a minimum of:

- A one hour oral Which includes A review of flight Rules found in FAR Part 91

- A one hour flight.



If you fly less than 50 hours a year, or you haven't flown for a long time, you can expect a longer oral and flight.

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The Oral

To prepare for the oral, you should certainly study this review.
In addition, you could complete the "*Flight Review Prep Guide*" course available at ***www.faasafety.gov***. Bring a copy of the completion certificate to the flight review.
Your CFI may give you a short (no more than 50 nm) cross-country flight plan assignment to an unfamiliar airport. Be sure to consider runway lengths, weather, fuel requirements, terrain, NOTAMs, TRFs, etc. Your CFI could require a manual flight plan, or allow you to prepare using an online planner or table/iPad app such as ForeFlight.

The Flight

Your CFI could ask questions to determine your experience and the type of flying that you normally do, and then determine which maneuvers you'll perform. Remember that it's proficiency-based, and the CFI has discretion on how much time and how much instruction is needed to ensure that you are proficient. You must demonstrate that you can safely exercise the privileges of your certificate.
As you fly selected maneuvers, you'll be evaluated on your basic stick and rudder proficiency. If asked to fly a short cross-country, that's a good place to sample your knowledge of aircraft systems, and your ability to make good decisions when faced with unusual circumstances, (*Aeronautical Decision Making* and *Risk Management*). For instance, you may be asked to consider a mechanical problem or an unexpected weather scenario, which will require a diversion to another airfield.

Use all your tools and resources, including the GPS's "Nearest" and "Direct to" functions. For more information, see ***www.aopa.org/asf/publications/sa03.pdf.***

Also see https://www.faa.gov/pilots/training/media/flight_review.pdf

Are you Familiar with Your Aircraft?

Engine out glide speed for maximum range _____.

Make and horsepower of your engine _____.

Fuel capacity _____.

Usable gallons of fuel _____.

Minimum & maximum oil capacity _____.

Your oil type and weight _____.

Max oil temp and pressure_____.

Max demonstrated crosswind (limit) _____.

How many people will it carry with a full load of fuel? _____.

Baggage compartment limit _____.
Sea Level takeoff distance _____.

Vs _____ Clean stall speed.

Vso _____ Stall speed in the landing configuration.

Vy _____ Best rate of climb speed.

Normal climb-out speed _____.

Vx _____ Best angle of climb speed.

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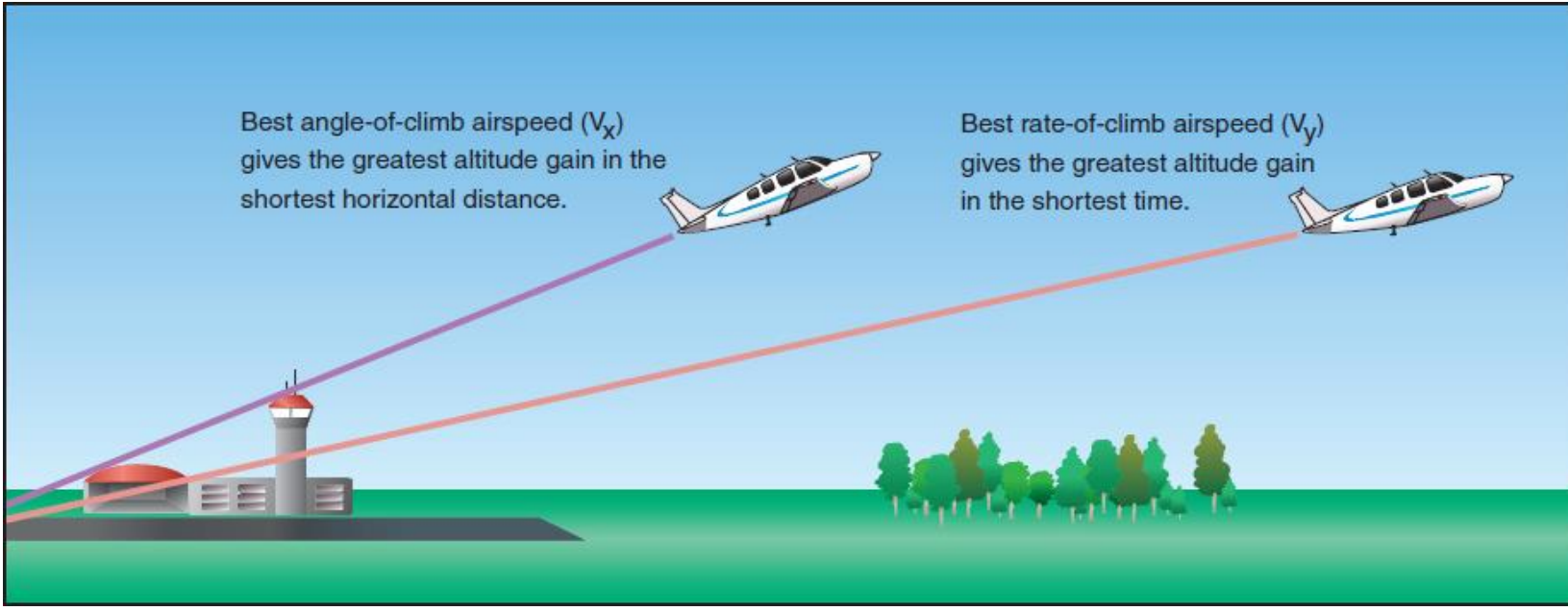

Normal approach-to land speed _____.

Vle _____ Max landing gear extended speed, or the speed it can be flown with the gear down.

Vlo _____ Max landing gear operating speed.

Do you know the backup system for lowering the gear?

Vfe _____ Max flap extension speed.

Va _____ Maneuvering speed.

Vno _____ Maximum structural cruising speed in turbulence (end of the green arc and the beginning of the yellow arc).
Yellow arc speeds are for smooth air only.

Vne _____ Never exceed speed (RED LIINE).

White arc—commonly referred to as the flap operating range. its lower limit represents the full flap stall speed and its upper limit provides the maximum flap speed. Approaches and landings are usually flown at speeds within the white arc.

Lower limit of white arc **(VS0**) —the stalling speed or the minimum steady flight speed in the landing configuration. In small aircraft, this is the power-off stall speed at the maximum landing weight in the landing configuration (gear and flaps down).

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Upper limit of the white arc **(VFE)** —the maximum speed with the flaps extended.

Green arc—the normal operating range of the aircraft. Most flying occurs within this range.

Lower limit of green arc **(VS1)** —the stalling speed or the minimum steady flight speed obtained in a specified configuration. For most aircraft, this is the power-off stall speed at the maximum takeoff weight in the clean configuration (gear up, if retractable, and flaps up).

Upper limit of green arc **(VNO)** —the maximum structural cruising speed. Do not exceed this speed except in smooth air.

Yellow arc—caution range. Fly within this range only in smooth air, and then, only with caution.

Red line **(VNE)** —never exceed speed. Operating above this speed is prohibited since it may result in damage or structural failure.

Soft Field Takeoff

Use recommended Takeoff Flaps. With the yoke as far aft as you can hold it, taxi onto the runway without stopping. Once lined up on the centerline, apply full power with the yoke still in the full aft position.
As you add power, you'll also need to add right rudder. As the nose wheel comes off the ground, you might need to reduce back pressure a bit to avoid scraping the tail.

The idea is to get unstuck from the runway at the first possible opportunity and then build up airspeed in ground effect before attempting to climb out. The main wheels will lift off at a lower airspeed than normal. As soon as all three wheels are off the ground, relax the yoke a bit to increase climb speed.

Because of the high power setting and high angle of attack, as soon as you're airborne, you'll need additional right rudder to keep the nose tracking straight. Don't try to climb out of ground effect until you're at best rate of climb speed, (Vy).

Soft Field Landing (approach no more than 1.3 x Vso)

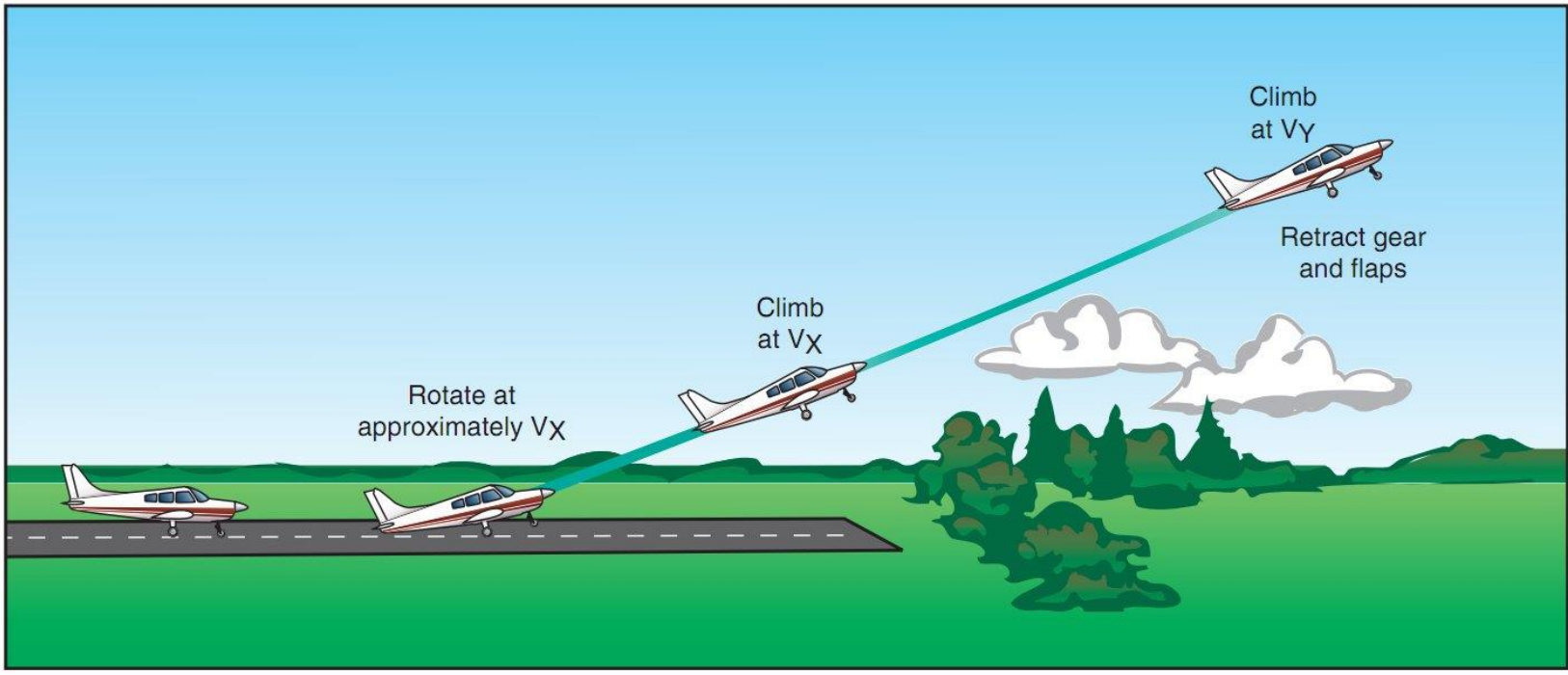
The objective is to land as gently as possible on the main gear and to keep the nose wheel off the ground as long as possible during the rollout to minimize the chances of becoming stuck, or flipping over, if the nose wheel digs in.

Fly a stabilized approach with full flaps. Just before touchdown, add a little power, (just slightly above idle), to reduce the sink rate and to provide more elevator authority, while keeping the nose wheel off the runway.

After your gentle, nose-high touchdown, maintain enough back pressure to hold the nose wheel off the runway as long as possible without scraping the tail. You won't have nose wheel steering with the nose wheel off the surface, so you'll need rudder input to maintain directional control.

Eventually, the nose wheel should touch down smoothly while holding the yoke full aft, minimizing the weight on the nose wheel.

Exit the runway with the yoke held full aft and, local conditions permitting, taxi without stopping to your tie down spot.



Short Field Takeoff

Used when you need to get off the ground in the minimum distance and climb steeply to clear obstacles. Set flaps for takeoff. When you taxi onto the runway, DON'T WASTE RUNWAY.

Hold the brakes and apply full power. Check the engine instruments and tachometer, to ensure that you have full power!

Release the brakes and rotate normally, commencing a climb out at the recommended obstacle clearance speed or best angle of climb speed, (Vx). This is a higher angle of attack than the one you see during a normally climb.

You'll need additional (more than usual) right rudder to keep the nose tracking straight.

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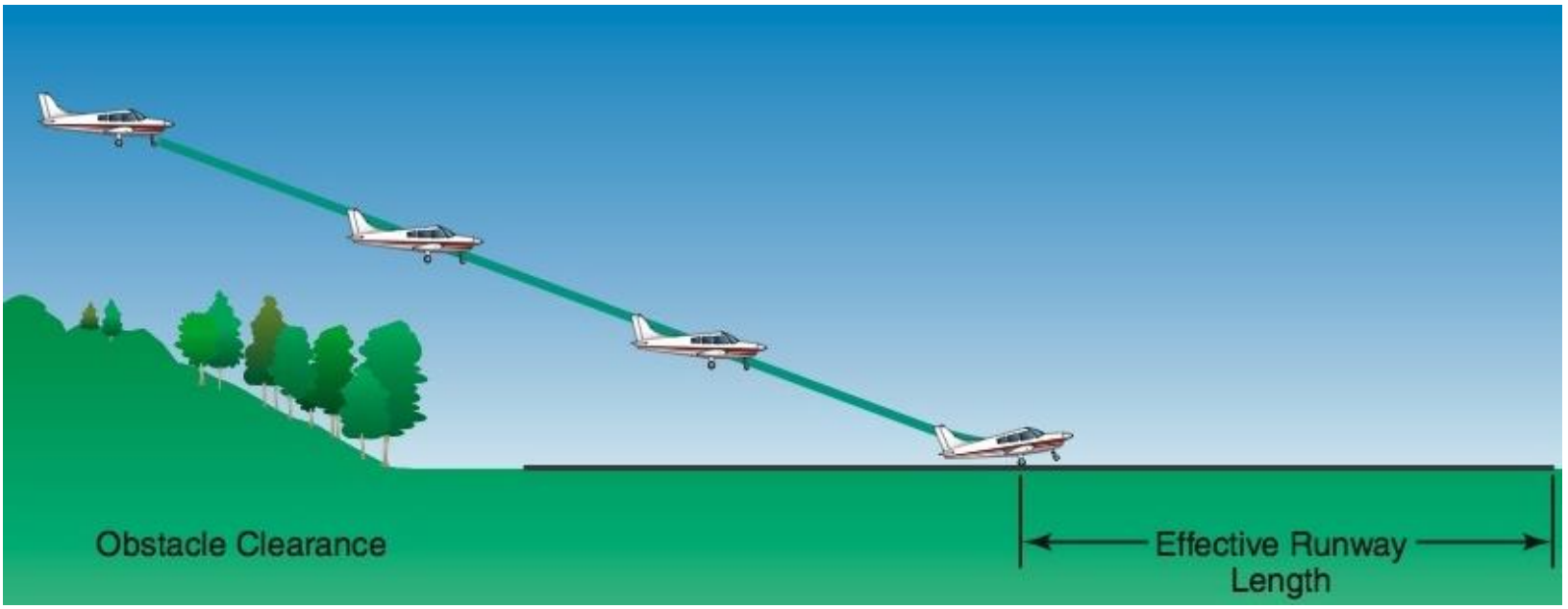
Pay attention to your airspeed indicator.

After clearing the obstacle, lower the nose slightly and accelerate to best rate of climb speed, (Vy). Now you can retract the gear and the flaps.

Short Field Landing



The objective is to clear obstacles on final, land, and stop in the minimum distance possible.

Stabilize the aircraft with full-flaps at the recommended short field approach speed for your airplane. That's usually 1.3 x Vso (stall speed configured). This is usually a few knots slower than normal approach speed.

Once obstacles have been cleared and landing is assured, reduce power to idle and continue to descend at the minimum recommended speed until you're ready to flare.

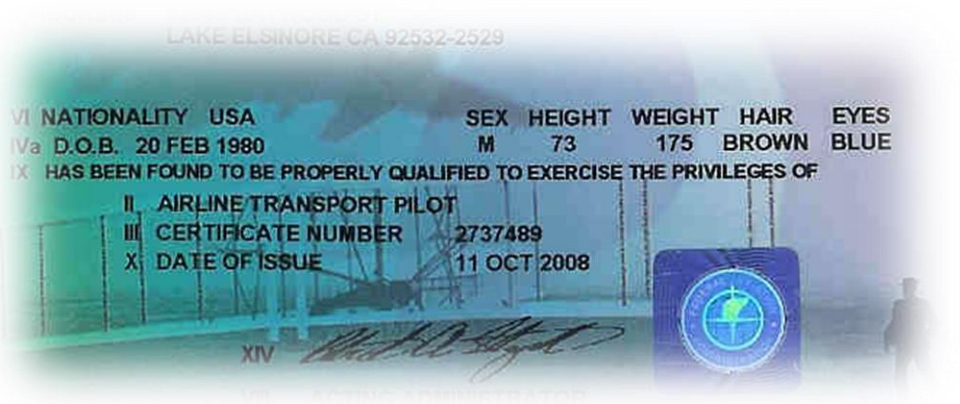
After touchdown, retract the flaps while applying maximum braking. Raising the flaps transfers the load from the wings to the wheels, and allows you to brake harder. Take care that you do not lock the wheels and skid.

Bring the airplane to a full stop before exiting the runway.

It can be a firm landing, as long as the main gear touches down first and there's no bounce.

Avoiding Wake Turbulence (AIM 7-3-6)

- All aircraft generate some wake turbulence through their wing-tip vortices. The greatest vortex is generated by a heavy, clean, and slow aircraft.
- If landing behind a large aircraft on the same runway, stay at or above its flight path. Note its touchdown point and land BEYOND that point.
- If landing behind a departing large aircraft, note its rotation point and land well BEFORE that point.
- If departing behind a large aircraft on the same runway, note its rotation point and rotate BEFORE that point. Climb ABOVE and UPWIND of its flight path.



"Airplanes are never impressed by the flying credentials in your wallet."

James Price

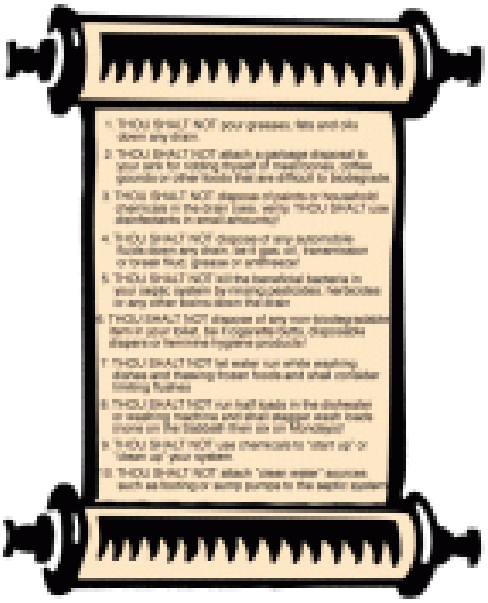
Aircraft Loading

Aft Center of Gravity (CG) Characteristics

- Less wing loading = a slower stall speed.
- Reduced drag. A smaller angle of attack is required to maintain level flight, so the cruise speed is higher.
- Less stable & less controllable.

IF THE CG IS aft of the AIRCRAFT'S AFT CG limit:

The aircraft could stall after takeoff or Go-Around. (Not enough elevator authority to recover).



RULES AND LAWS

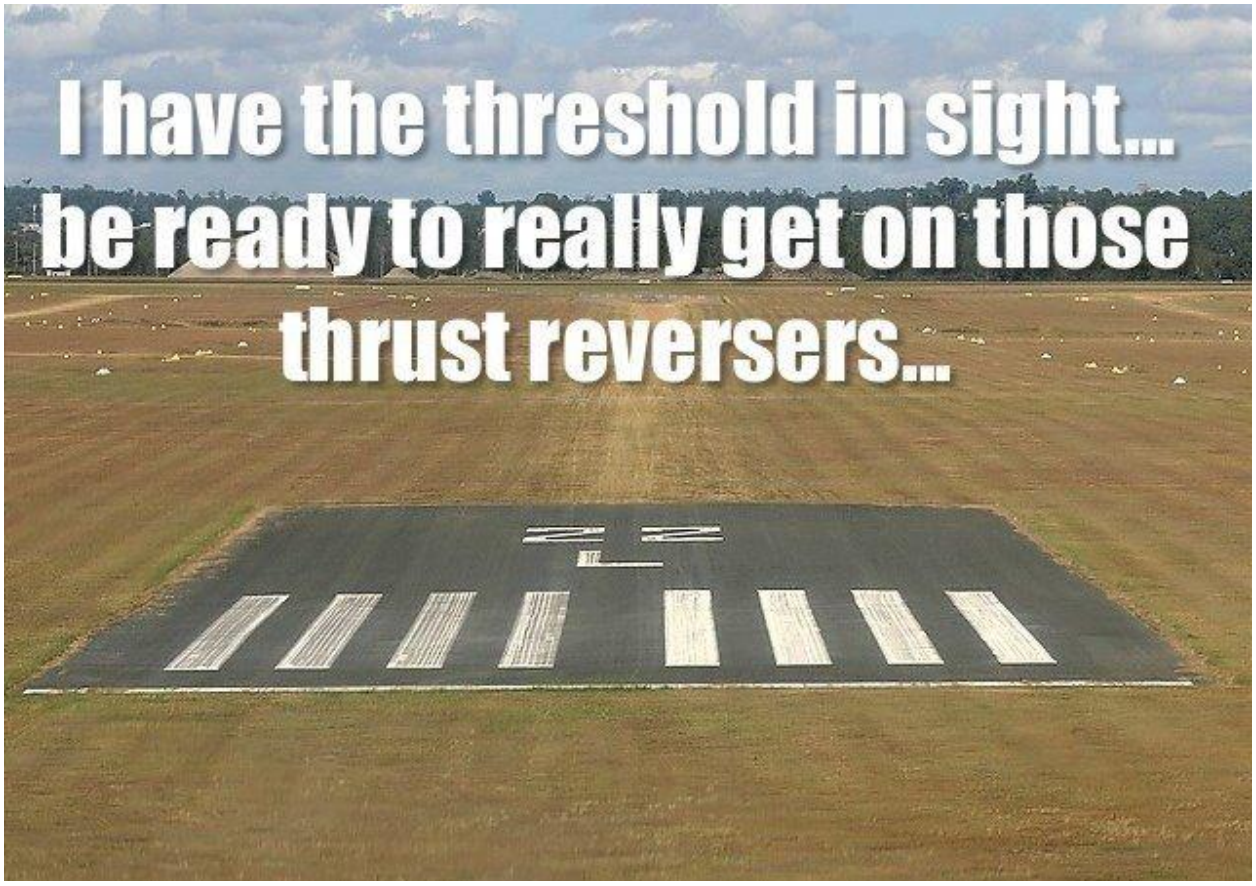
Rules are made by those who are trying to keep you safe. Laws of Physics are set by the Almighty. You may find it necessary to suspend a Rule, but you can never suspend a Law.

Forward Center of Gravity (CG) Characteristics

- Increased wing loading = a higher stall speed.
- Increased drag and a greater angle of attack to maintain level flight, so the cruise speed is slower.
- More stable & controllable.

IF THE CG IS forward of the AIRCRAFT'S FORWARD CG limit:

- It's harder to rotate, and flare.
- Takeoff rolls are longer.



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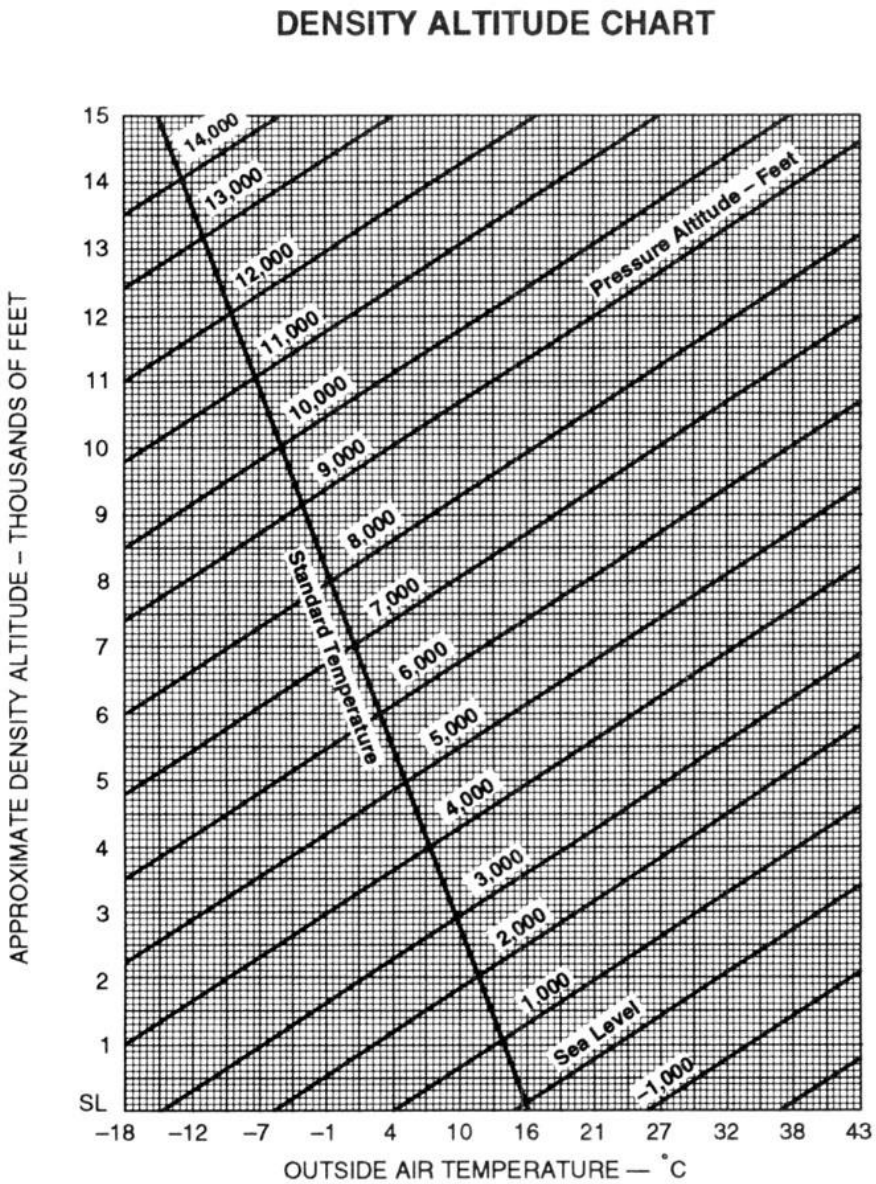
Calculating

Weight & Moment

*FORMULA: (**Weight**) **X** (**Moment Arm**) = **Moment***			
	Weight	Arm	Moment
Airplane's Basic Empty Weight			
Pilot			
Front Seat Passenger			
Rear seat Passenger(s)			
Fuel_____gal			
Cargo			
(Total moment, divided by total weight, equals the CG)			
Total Moment	/ Total Weight	= GC	

WEIGHTS	
AvGas	**6 lb / gal**
Jet A	**6.75 lb / gal**
Oil	**1.9 lb / qt**
Water	**8.3 lb / gal**

Takeoff and Landing Distances



Altimeter Setting (" Hg)	Pressure Altitude Conversion Factor
28.0	1,824
28.1	1,727
28.2	1,630
28.3	1,533
28.4	1,436
28.5	1,340
28.6	1,244
28.7	1,148
28.8	1,053
28.9	957
29.0	863
29.1	768
29.2	673
29.3	579
29.4	485
29.5	392
29.6	298
29.7	205
29.8	112
29.9	20
29.92	0
30.0	–73
30.1	–165
30.2	–257
30.3	–348
30.4	–440
30.5	–531
30.6	–622
30.7	–712
30.8	–803
30.9	–893
31.0	–983

A RULE YOU CAN LIVE WITH

AOPA Air Safety Institute recommends that you use the 50/50 rule for takeoff correction. That is:
Correcting for altitude and temperature, determine the takeoff distance that's required to clear a 50 foot obstacle.
Then, increase that number by an additional 50%.

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Higher Density Altitude

There is less thrust:

- Slower takeoff acceleration.
- Longer takeoff rolls.
- Decreased climb rate.

Higher density altitude increases the landing Ground Speed. You'll land at the same indicated airspeed, but because the true airspeed is greater, you'll have a longer landing distance.

Taking Off With a Tailwind

For every 10% of the takeoff speed, a tailwind will increase the ground run by about 21%. **FOR EXAMPLE:** Let's assume that you plan to lift off at 60 knots, and the zero-wind charted takeoff ground roll is 1,300 feet. A 6 knot tailwind, (10% of the 60 knot takeoff speed), will increase your charted 1,300 ground roll by 21%, or 273 feet.

Fickle Headwinds

Winds have a mind of their own, and can change quickly with altitude, or simply disappear. Never count on a headwind to ensure your takeoff!

Crosswinds

The required control surface deflection and tire scrubbing add extra drag, and increase the ground roll.

Exceeding Maximum Takeoff Weight (MTOW)

The Consequences of Excess Weight:

- Reduced structural load safety factor.
- Reduced acceleration, higher takeoff speed, and longer takeoff distance.
- Reduced rate and angle of climb.
- Reduced cruising speed and range.
- Lower stalling speed and reduced maneuverability.
- Higher landing speed and extended landing distance.

The aircraft may not leave the ground when you attempt a take-off.

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Logging Flight Time – PIC or Dual

You don't need a current medical to have an annual review, but if your medical has expired, you'll log the FR time as "dual". Then, once you get a medical, you can then fly log your time as PIC.
If you have a current medical or qualify under BasicMed, then you'll log the time as PIC.

How Much Should You Train?

There are flight departments of all sizes, from the largest airline, to the company that has one plane to run errands. No matter the size, they all want their pilots to be proficient and highly trained. Every passenger expects their pilot to be full of knowledge, well trained, proficient, and competent.

Is a Flight Review with a CFI every two years working for you? Perhaps that depends on how much you fly, and how much you feel challenged as an aviator. If you feel that you would like more training, please go to ***www.FAASafety.gov*** *and register for the Wings program.*

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Flight Regulations

Deviating From the Rules (*FAR 91.3*)

- If an in-flight emergency requires immediate action, the PIC may deviate from any rule necessary to deal with that emergency.
- If the PIC deviates from a rule, he or she shall, upon the request of the Administrator, send a written report of that deviation to the Administrator.

Is the Aircraft Ready?

You are directly responsible for, and are the final authority as to the operation of the aircraft. *(FAR 91.3)* ***There's a lot to consider, so here goes:***
(FAR 91.413) ***The PIC must make sure that his/her aircraft is airworthy.***
That includes checking the following:

Type	***Interval***	***Per***
AD Inspections	Per the AD. (Expires the last day of the 12th month)	***39.7***
Annual Inspection	12 Months	***91.409***
100 Hour Inspection*	Every 100 hours	***91.409***
Transponder	24 Months. (Expires the last day of the 24th month)	***91.413***
Static System, if flying IFR	24 Months. (Expires the last day of the 24th month)	***91.411***
ELT Operational	**12 Months	***91.207***
ELT Battery	*** Per Battery or 1 hour of use	***91.207***
GPS Data Base	IFR	
VOR	IFR, every 30 days	***91.171***

*A 100 Hour Inspection is required if:

- The aircraft is carrying people or property for compensation – or – is used for flight instruction.
- If you forget and have the aircraft inspection at 110 hours, the next 100 hour inspection is due 100 hours from when it was originally due. (You can't roll it forward like an Annual Inspection due date).

ELTs and Their Batteries

**** Each emergency locator transmitter must be inspected within 12 calendar months after the last inspection for:**

- Proper installation
- Battery corrosion
- Operation of the controls and crash sensor
- The presence of a sufficient signal radiated from its antenna.

*** ***ELT Batteries must be replaced:***

- If the transmitter has been in use for more than 1 cumulative hour, ***or***
- When 50% of their useful life has expired. If the batteries are rechargable, when 50% of the charge life has expired.

Expiration Date

In plain English, all of the batteries must have the same expiration date and they must be replaced upon reaching 50% of their useful life, based on the expiration date on each battery cell.

The new expiration date for replacing (or recharging) the battery must be legibly marked on the outside of the transmitter and entered in the aircraft maintenance record.

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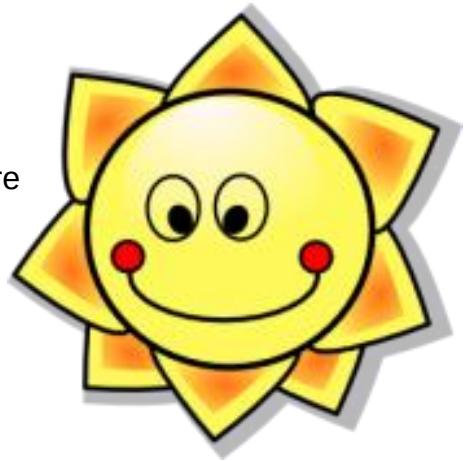
Required Equipment, VFR DAY:



T O M A T O F L A M E S

- **A**IRSPEED Indicator.
- **T**ACHOMETER, (for each engine).
- **O**IL PRESSURE gauge, (for each engine using a pressure system).
- **M**ANIFOLD PRESSURE gauge for each altitude engine, which is a turbocharged reciprocating engine. Its manifold pressure is boosted and therefore, you must be able to monitor that pressure).
- **A**LTIMETER.
- **T**EMP gauge for each liquid cooled engine.
- **O**IL TEMP gauge for each air cooled engine.
- **F**UEL gauge for each tank.
- **L**ANDING GEAR POSITION indicator, (if the aircraft has retractable gear).
- **A**NTI-COLLISION LIGHT system, if the aircraft was certified after March 11, 1996. (In the event of an Anti-collision light failure, you may continue to a location where repairs or replacement can be made).
- **M**AGNETIC DIRECTION INDICATOR (Installed in the aircraft).
- **E**LT (FAR 91.207).
- **S**EAT BELTS. If the aircraft was certified after July, 1978, you'll also need Shoulder Straps.

Required Equipment, VFR NIGHT:

F L A P S

- **F**USES; 3 of each kind required, and accessible in flight. You only need fuses if your aircraft is equipped with them. For example, if your airplane has circuit breakers, there's no need to have fuses.
- **L**ANDING LIGHT, but only if you are flying for hire.
- **A**NTI-COLLISION LIGHT SYSTEM, if certified after August 11, 1971.
  - In the event of failure, you may continue to a location where repairs or replacement can be made.
- **P**OSITION LIGHTS, on from sunset to sunrise. *(Ref. FAR 91.209).*
- **S**OURCE OF ELECTRICAL POWER (alternator or generator).

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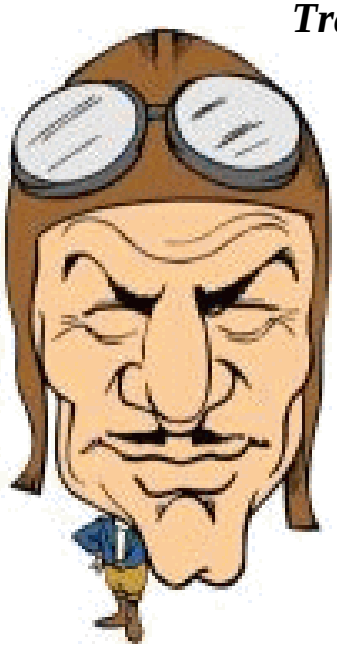
Required Equipment for an IFR Flight, in addition to the equipment required for VFR: (FAR 91.205)

- **D**IRECTIONAL GYRO (DG) or equivalent.
- **R**ATE OF TURN indicator **or** an additional attitude indicator
- **A**TTITUDE INDICATOR.
- **G**ENERATOR or Alternator with adequate capacity.
- **S**KID / SLIP Indicator
- **C**LOCK installed in the aircraft, displaying hours, minutes and seconds.
- **A**LTIMETER.
- **R**ADIOS & NAV. Two-way radios and NAV equipment appropriate to the ground facilities to be used.

Travel Tip



*You can take off with inoperative instruments or equipment that's not required by FAR 91, as long as that instrument or equipment is removed or placarded "**Inoperative"** and a pilot or mechanic determines that the loss of that instrument or equipment is not a hazard. The bad component or instrument must be unpowered/unwired.*

Required Documents in the Aircraft *(FAR 91.203, 91.9)*

- **A** irworthiness certificate.
- **R** egistration certificate.
- **R** adio license, for SOME commercial operations & if traveling outside the USA. To order online, go to http://wireless.fcc.gov/uls/index.htm?job=home
- **O** perating limitations (The Owner's Manual).
- **W** eight and balance data.

(FAR 91.103) ***If you plan to fly outside of the airport area, or file IFR, you must:***

- Study weather reports and forecasts.
- Determine fuel requirements.
- Plan alternatives if the planned flight cannot be completed.
- Check with ATC for known traffic delays.
- Determine takeoff and landing distances by evaluating:
  - Runway lengths, elevation and slope.
  - Aircraft gross weight.
  - Wind and temperature.

For Local Flights:

You should know about the airport(s) you intend to use, including the runway lengths, takeoff and landing distances for the day's conditions.

Planning Fuel Requirements *(FAR 91.151 & 167)*

- **VFR Day:** Fuel to destination + 30 minutes, assuming normal cruising speed.
- **VFR Night:** Fuel to destination + 45 minutes, assuming normal cruising speed.
- **IFR:** Fuel to destination and alternate (if required) + enough fuel to fly for another 45 minutes at normal cruising speed.

VFR or IFR, I recommend that you always plan to have 1 hour of fuel reserve! You'll thank me later.

"Any attempt to stretch fuel is guaranteed to increase headwinds."

According to AOPA's Air Safety Institute, in an average week, three general aviation aircraft crash due to improper fuel management.

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PREVENTATIVE MAINTENANCE

(CFR Part 43, Maintenance, Preventative Maintenance, Rebuilding & Alteration)

"SIMPLE OR MINOR PRESERVATION OPERATIONS AND THE REPLACEMENT OF SMALL STANDARD PARTS NOT INVOLVING COMPLEX ASSEMBLY OPERATIONS"

Examples of what an aircraft *owner, holding at least a Private Pilot Certificate, can* accomplish on his or her aircraft, as long as it's not used in commercial service*:*

- SAFETY BELTS – replace
- SEAT PARTS – replace
- BULBS, LENSES, REFLECTORS – Replace (includes the wire repair on landing lights)
- WHEEL BEARINGS – Lubricate
- OIL & FILTER – Change
- COWLING – Repair, as long as it doesn't involve the removal of the prop or flight controls
- SPARK PLUGS – Clean and gap
- HOSE CONNECTIONS – Replace, **but not** hydraulic hoses
- FUEL LINES – Replace prefabbed lines
- FUEL / OIL FILTERS / STRAINERS – Clean and replace
- BATTERY – Clean, service and replace
- RADIOS, FRONT MOUNTED – Remove and replace tray mounted radios, **but not** auto-control or transponder
- TIRES – Remove, install, and repair
- WHEELS and SKIS - Replace
- WHEEL BEARINGS – Clean and Grease
- SAFETY WIRE / COTTER PINS – Replace if defective
- HYDRAULIC FLUID – Replace/refill
- DECORATIVE COATING – Replenish, **but not** if it involves the disassembly of primary or operating system
- UPHOLSTERY – Repair and replace
- SMALL SIMPLE REPAIRS – Fairings, non-structural cover plates (with no interference to air flow)
- ELASTIC SHOCK ABSORBER CORDS - Replace
- LANDING GEAR SHOCK STRUTS – Add air, oil, or both

Before you set about performing preventive maintenance items on your airplane, you must first have the proper maintenance manuals available.

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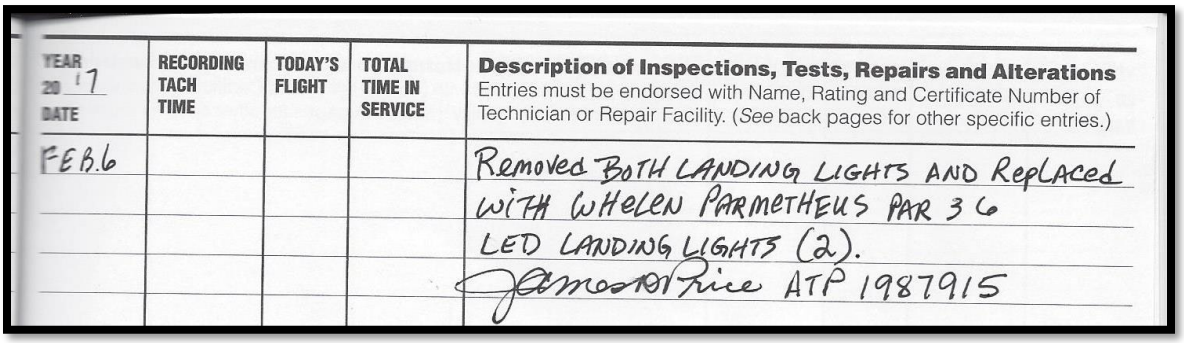
After you perform preventative maintenance:

- Make a logbook entry to include:
  - Date of completion
  - Description of work
  - Signature and type of Certificate, #

This entry will comply with the legal requirements of the FARs, and keep an accurate maintenance history of the aircraft.



YEAR 20 17 DATE	RECORDING TACH TIME	TODAY'S FLIGHT	TOTAL TIME IN SERVICE	**Description of Inspections, Tests, Repairs and Alterations** Entries must be endorsed with Name, Rating and Certificate Number of Technician or Repair Facility. (*See* back pages for other specific entries.)
FEB.6				Removed BOTH LANDING LIGHTS AND Replaced WITH WHELEN PARMETHEUS PAR 36 LED LANDING LIGHTS (2). James A Price ATP 1987915

Pilots should never exceed their personal skill level when it comes to aircraft maintenance.

(FAR 61.23)

- 3rd Class — Good for **60** months, unless you're 40 or over on the day of the examination; then it's good for 24 months.
- 2nd Class — Good for Commercial privileges the first 12 months, then it turns into a 3rd class physical.
- 1st Class — Under 40: ATP privileges 1 year. Over 40: 6 months. Progression: If **over 40**, drops to 2nd Class for next 6 months, then becomes 3rd class and is valid for only 1 more year as 3rd Class (total 2 yrs). **Under 40:** After 1 year, 1st Class reverts to 3rd Class for 3 years, (total 4yrs).

Flight Physical Expiration Table – Flight Physicals. All FAA Physicals Expire the last day of the month

	3rd Class	*2nd Class*	*1st Class*	
FLIGHT PURPOSE	**Personal & Business**	**Commercial Privileges**	**ATP, 1st Class**	**Commercial Privileges. The 1st Class reverts to a 2nd Class . . .**
If you under 40 when you take the physical	**Good for a total of 60 months.**	**Good for a total of 60 months**	**Good for a total of 12 months**	**. . . after 12 months, giving you 4 more years – a total of 60 months.**
If you are 40 or older when you take the physical	**Good for a total of 24 months**	**Good for a total of 24 months**	**Good for a total of 6 months**	**. . . after 6 months, giving another 1 ½ years – a total of 24 months**

You must submit FAA Form 8500-8 (MedXPress) before your physical. Fill out the form at:
https://medxpress.faa.gov
When completed, you'll receive a confirmation number. Save the number and give that to your Doctor or his/her office staff. This will help them retrieve your form.

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To qualify:

- You must possess a valid **U.S.** Driver's License and consent to a national driver registration check.
- You must have held a valid medical certificate at any time after July 15, 2006. Your certificate must have never been revoked and your most recent medical application must have never been denied.
    - You've never had a valid medical since July 2006? You must take a one time FAA Medical Exam.
- If you already have a Special Issuance (SI), you'll won't be required to go through that process again as long as you are under the care of your physician. If your physician finds that you have developed an adverse condition, you'll need to go through the SI process one time. **Adverse Condition examples:**
    - **Cardiovascular**, such as a Heart Attack, Cardiac Valve Replacement, Heart Transplant, etc.
    - **Neurological**, such as Epilepsy
    - **Mental Health Personality disorders**, such as psychosis, delusions, or hallucinations

More SI information can be found at
https://www.faa.gov/news/updates/media/final_rule_faa_2016_9157.pdf, pages 73 – 76.

You can fly IFR and VFR, reciprocating or turbine engine, pressurized or non-pressurized, as long as the aircraft:

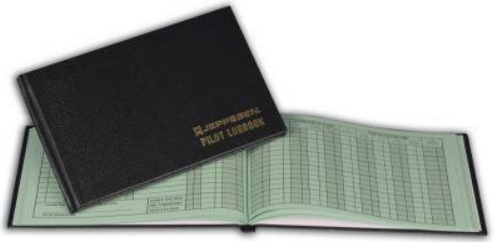
- Carries no more than five passengers (it's an aircraft designed with no more than six seats)
- Has a max certificated weight of 6,000 pounds.
- You can fly a fast aircraft, as long as you do not exceed 250 KIAS.
- You must not fly above 18,000 feet MSL
- You cannot fly for hire, except for flight instruction and as permitted by 14 CFR 61.113..
- You can fly domestically (USA), and if a foreign country accepts BasicMed, you can fly in that country, too.

If you want to operate under BasicMed, follow these steps:

- **Get a comprehensive medical exam (CME).** To do this, visit a state licensed physician and take the Comprehensive Medical Examination Checklist (CMEC) with you. You can find the CMEC at https://www.faa.gov/documentLibrary/media/Form/FAA_Form_8700-2_.pdf The exam expires four years later on the **same day of the month**.

- After completing the medical exam, **complete an online Medical Education course**, which is provided at no charge by AOPA at **https://basicmedicalcourse.aopa.org/** . The course expires two years later on the **last day of the month**.

You must have your US Driver's License with you when you fly.



You must keep the following in your logbook:

- A copy of the completed and signed physician exam checklist, and . . .
- A copy of the online Medical Education course, "Course Completion Certificate".

You don't need to have your BasicMed credentials with you when you fly. If you wish, you can keep images of the completed physician's checklist and proof of course completion on your Smartphone. If asked, you can show this to an FAA Inspector. ***CLICK HERE*** for more BasicMed information.

If you are taking advantage of BasicMed and develop an adverse medical condition, you must either ground yourself or be treated by a physician before you continue to fly.

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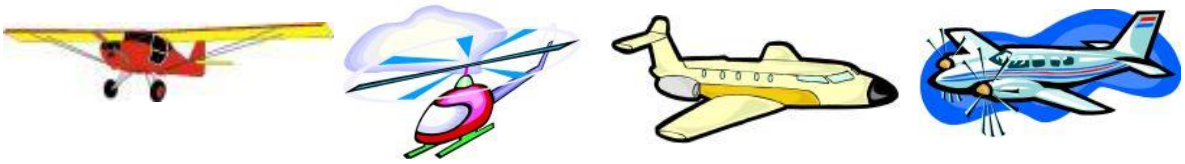
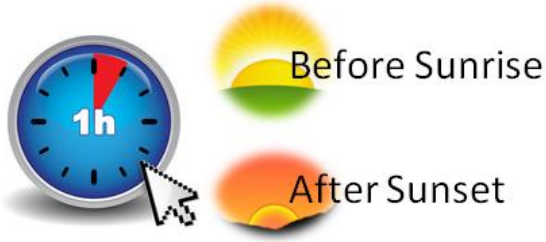
Landing Currency is Category, Class and Type Specific



If you'll be carrying passengers <u>in a particular aircraft</u>, you'll need, within the past 90 days, you'll need to have landing currency:

- **Day Landing Currency: Three** takeoffs and landings, day or night. (If it's a tail wheel aircraft, those landings need to be to a full stop).
- **Night Landing Currency**: From one hour after sunset to one hour before sunrise, **three** takeoffs and **three** landings to a **full stop**.



Sunrise and sunset

Times for 18-Feb-2017

	Local (UTC-7)	Zulu (UTC)
Morning civil twilight	06:44	13:44
Sunrise	07:09	14:09
Sunset	18:14	01:14
Evening civil twilight	18:39	01:39

You can find Sunset and Sunrise times at <u>AirNav.com</u> and on the airport page of apps like ForeFlight

Required Personal Documents *(FAR 61.3)*

When flying as a pilot, you must have with you:

- A current plastic (credit card style) pilot certificate that includes an "English Proficient" endorsement. (Required for international flying).
- An appropriate current medical.
- A photo ID (Driver's license, government ID, military ID, or passport).

Misplaced License

You can request temporary authority to exercise certificate privileges from ***www.FAA.gov***. Sign into your account, and click on ***Licenses & Certificates***. Next, click on ***Airman Online Services***. FAA will send a temporary certificate via fax or e-mail.

You can only request one temporary certificate within any six-month period.

While you're there, you can request your **replacement** certificate.

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Changed Address *(FAR 61.60)*

The FAA must be notified within **30 days** of an address change, otherwise you may not act as pilot in command. You can change your address, add “English Proficient”, or any other amendment to your status. Go to https://www.faa.gov/***,*** *and click* on the “Licenses & Certificates” TAB.

You may also make changes through the mail, at:

FAA
Airman Certification Branch
AFS-760
P.O. Box 25082
Oklahoma City, OK 73125-0082

406 MHz ELTs

On **February 1, 2009,** the international COSPAS-SARSAT satellite system discontinued satellite-based monitoring of the 121.5 and 243 MHz frequencies.

121.5 / 243 MHz distress signals are now only detected by local airport facilities, air traffic control facilities, or by overflying aircraft. **This assumes that an overflying aircraft will be monitoring 121.5**. If an aircraft crashes, especially in a remote area, a **121.5 MHz ELT** will provide extremely limited assistance**.**

The new **406 MHz ELTs** are monitored by satellites and also contain a 121.5 MHZ ELT. Optionally, they can be linked to a GPS, to provide precise coordinates to search responders.

If you don’t have a 406 ELT

Consider carrying a personal locator beacon, (PLB).
It’s your choice. Base your decision on the type of flying you do, the equipment you carry, and the type of terrain you overfly.

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Stations, Seatbelts/ Shoulder Harnesses *(FAR 91.107)*

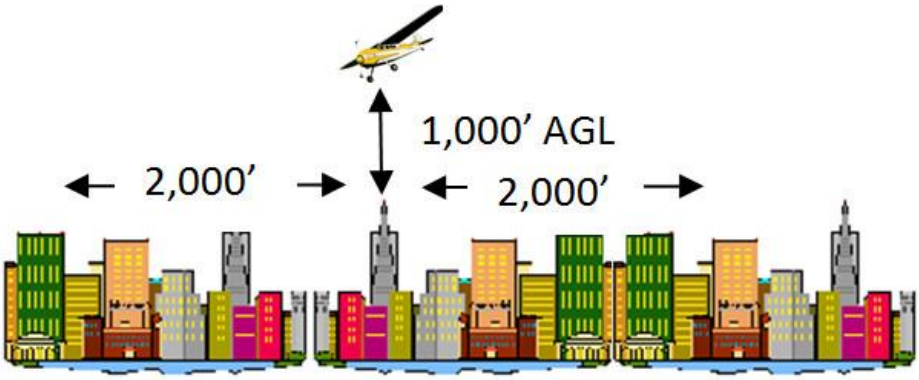
PICS must ensure that each passenger has been briefed on how to fasten and unfasten their safety belt, and if applicable, their shoulder harness.

Before and during – taxi, takeoff, and landing: Passengers and crew must be in an appropriate seat with their safety belt and shoulder harness fastened.

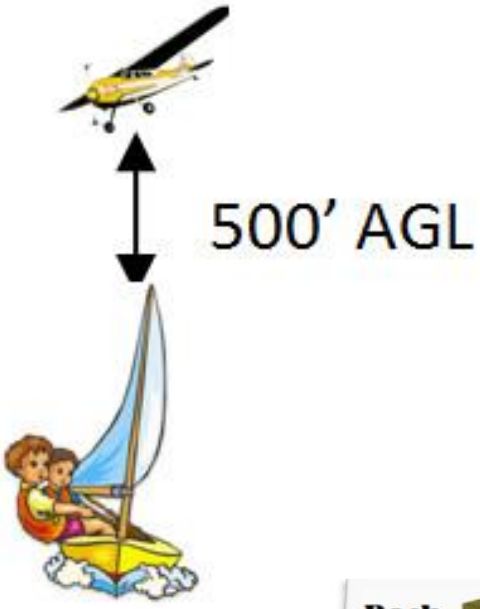
- **If the aircraft was manufactured after July, 1978:** Shoulder straps must be installed and worn.
- **If a child is less than 24 months old**: He or she can be held on a passenger's lap.
    - See *FAR 91.107* for child approved seat/restraint systems.

Minimum Safe Altitudes *(FAR 91.119)*

Anywhere – Fly at an altitude that will allow a safe emergency landing without hazard to people or property on the surface.



Congested Areas*:* Fly no closer than **1,000 feet** above the highest obstacle within **2,000 feet** of the aircraft.



Over water and non-congested, sparsely populated areas*:* Fly no closer than **500 feet** to any person, vessel, vehicle or structure.

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Acrobatic Flight, Defined

Acrobatic flight means an intentional maneuver involving an abrupt change in the aircraft's attitude, an abnormal attitude, or abnormal acceleration that is not necessary for flight. **It also means:**

- Exceeding 60º of bank.
- Exceeding 30º pitch – nose up or nose down.

Reference FAR 91.303, *Don't do Acro:*

- Over a congested area or settlement.
- Over an open air assembly.
- Within Class B, C, or D
- Within Class E <u>if it's designated for an airport.</u>
- Within 4nm of a Federal airway (Class E).
- Below 1,500 feet AGL.
- When visibility is less than 3 statute miles.

Acrobatic Flight and Parachutes *(FAR 91.307)*

Unless each occupant is wearing a parachute, no pilot carrying any person (other than a crew member) may execute acrobatic maneuvers. This does not apply to spins or other flight maneuvers required by the regulations for a certificate or rating, when given by a CFI, etc.

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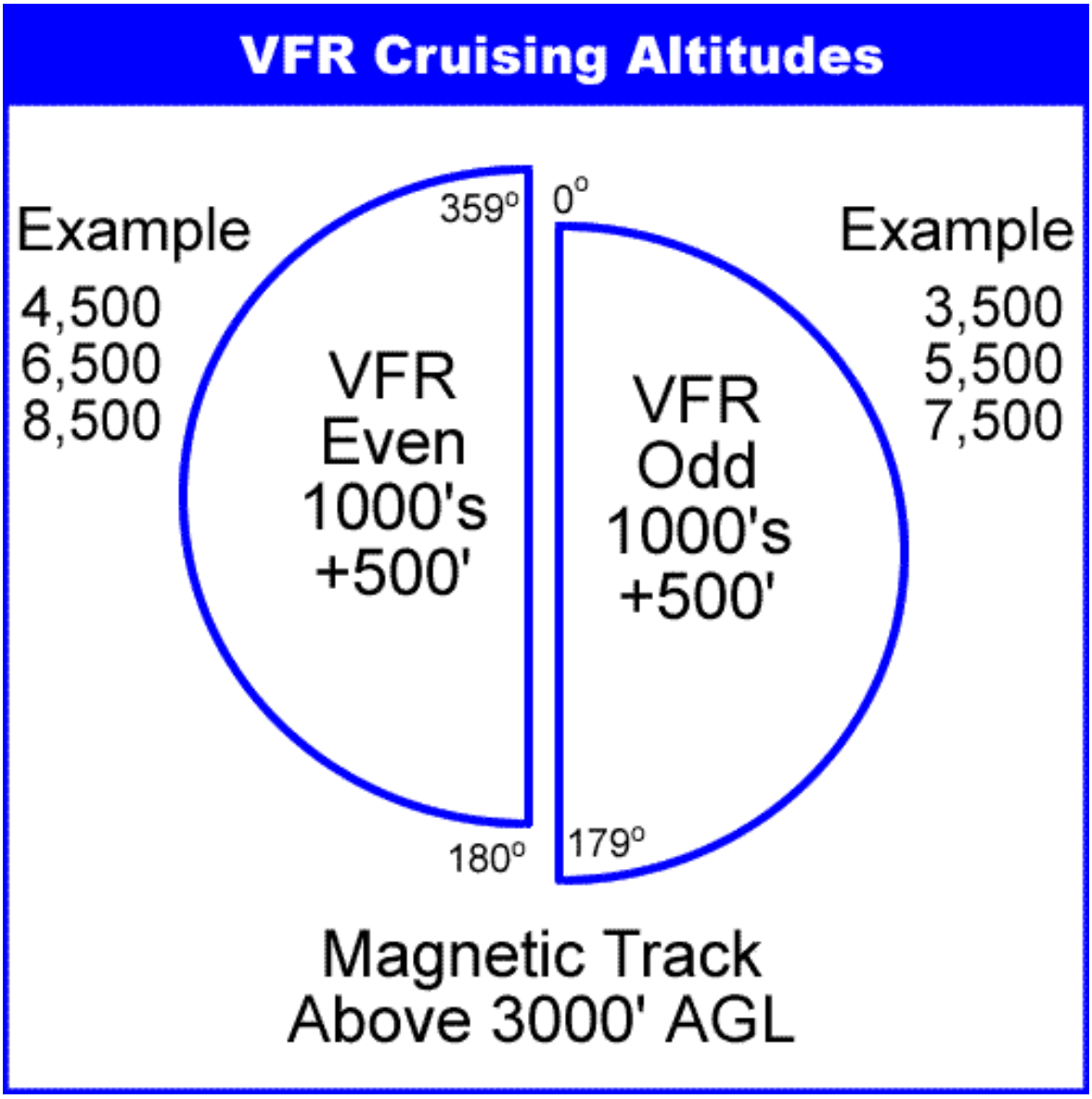
Formation Flying *(FAR 91.111)*

*It's never done w*ithout the pilots of all aircraft involved making prior arrangements.

It's also never done if you're carrying passengers for hire.

Cruising Altitudes *(FAR 91.179)*



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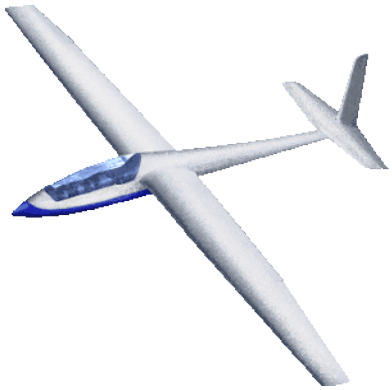
Order of Right of Way *(FAR 91.113)*

Aircraft in distress have the right-of-way over all other **aircraft**.

Balloons are the least maneuverable and have the right of way over everything.

Gliders are the next least maneuverable and have the right of way over airplanes and rotorcraft.



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

Airships are next.

Lowest Priority:

Airplane, Rotorcraft, Powered Parachute, and Weight Shift Aircraft

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Right of Way – Converging, Approaching Head-On, and Overtaking *(FAR 91.111)*

- *If converging* — an aircraft on the right has the right of way, (if it's the same category aircraft).
- *If approaching head-on* — both aircraft should alter course to the **right.**
- *If Overtaking* — the overtaken aircraft has the right of way. The pilot of the overtaking aircraft should alter course to the **right.**

Right of Way – Landing *(FAR 91.113)*

- Final approach or landing aircraft have the right of way.
- If you're at a lower altitude, you have the right of way, but you should never take advantage of your position.

Oxygen *(FAR 91.211)*

ABOVE 15,000 MSL:	**Oxygen available for everyone.**
ABOVE 14,000 MSL:	Oxygen is required for **flight crew** at all times.
14,000 MSL ⇕ 12,500 MSL	After 30 minutes, Oxygen is required for the flight crew

Travel Tip

Supplemental oxygen can help prevent hypoxia symptoms when flying:

- *At or above 5,000 feet MSL at night.*
- *At or above 10,000 feet MSL during the day*

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The Private Pilot and Flight Cost Sharing

The Pilot *and* Passengers must Share on an Equal Basis

You can share the cost of fuel and oil consumed on a flight + ramp or tie-down fees at the destination airport. If the airplane is rented from an FBO or flight school, the hourly rental fee (plus the cost of fuel, if that isn't included in the rental fee) can be shared by the pilot and passengers.

A Common Purpose

In addition to equal sharing of the cost of the flight, the FAA says the pilot and passengers must have a "common purpose" for the flight as well. That is, they must be flying to the destination for a reason, not merely so the pilot can build time and charge money.

What Can You NOT share?

Indirect expenses such as insurance, maintenance and depreciation cannot be shared.

Commercial Pilot Certificate

Got a Commerical Certificate? You must have at least a 2nd Class Medical to be a real Commercial Pilot. If you have a 3rd Class Medical, or have let your 2nd Class lapse into a 3rd Class, the ***Private Pilot Cost Sharing*** rules apply.

Judgment Creep

If a pilot pushes a limit, and gets away with it, his or her judgment creeps to the "Edge", setting a new, bolder limit. Creeping closer and closer to the edge of the safety envelope will eventually result in a Judgment Spiral.

AME

Aeromedical Concerns

Drugs and Alcohol **(FAR 91.17)**

You cannot be a crew member:

- If you're using any drug that affects your physical or mental capacities in any way.
- If you've consumed alcohol within eight hours.
  - You could be under the influence after 8 hours. Therefore, you would be wise to allow **12 to 24** hours from bottle to throttle.
  - Legally, you're under the influence if your blood alcohol is **.04%** or more.

Passengers & Substance Abuse

THE RULES: Unless there's an emergency, a pilot may not allow anyone to board his/her aircraft if they appear to be intoxicated or under the influence of drugs. The exception is a medical patient under proper care.

A FIELD SOBRIETY TEST: If your passenger(s) cannot correctly pronounce "innovative", "preliminary", "proliferation", or "cinnamon" – they may be under the influence.

What's the Cost?

Drunk passengers aboard a short charter flight near Canada's West Coast, likely caused the crash of a float-equipped Cessna 185 in May 2010. A rear-seat passenger pushed the pilot's seat forward with his or her feet and held him and the control column pinned to the panel. The chartered aircraft dove at a 45º angle into the ocean off Ahousat, an isolated community on the west coast of Vancouver Island. The pilot could have refused the charter if he thought the passengers might be drunk enough to be a safety hazard. His decision to allow the boarding of passengers under the influence of alcohol or drugs cost him his life.

Refusing to Submit to a Drug or Alcohol Test (FAR 61.14)

That's grounds for denying an application for any certificate or rating for a year, and suspension or revocation of any certificate or rating.

Carbon Monoxide is a big concern, especially in the winter. Most heaters work by air flowing over the manifold. If exhaust fumes escape, the results could be fatal. If you detect the odor of exhaust or feel drowsy, dizzy, or have a headache while using the heater, you should suspect carbon monoxide poisoning and land immediately.

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Blood Donation - All Classes

Disease/Condition	Evaluation Data
A. One unit (less than or equal to 500 ml)	After a 24 hour recovery period and the airman has no symptoms:
B. Two or more units (more than 500 ml) This includes Power Red (double red cell donation)	After a 72 hour recovery period and the airman has no symptoms:
C. Platelet OR Plasma donation	After a 4-hour recovery period and the airman has no symptoms:

Ref: Guide for Medical Examiners

Diving and Flying

The AIM tells us that a pilot should wait at least 12 hours prior to flying to altitudes up to 8,000' (MSL) if a dive has not required a "controlled ascent" (non-decompression stop diving) and at least 24 hours after diving in which a "controlled ascent" (decompression requiring) is required. Any flight above 8000' MSL should be delayed until at least 24 hours has elapsed. "These recommendations are actual flight altitudes above mean sea level (AMSL) and not pressurized cabin altitudes."

AS

Airspace

A Mode C TRANSPONDER IS REQUIRED:

- In Class A airspace
- Within 30 nm of the Class B primary airport (The CLASS B VEIL)
- In <u>and above</u> Class C
- When operating above 10,000 MSL, (excluding the airspace below 2,500 AGL).

Class A exists in all the lower 48 states the Eastern portion of Alaska.

- Starts above 18,000' MSL.
- Altimeters set to 29.92 in class A.
- Must be on an IFR flight plan with an ATC clearance. (No VFR or VFR on Top).
- Above FL600, it's now Class E airspace

Class A Exceptions

Class A does not exist in the Western portion of Alaska, nor does it exist over Hawaii. (The Hawaiian Victor Airways have no upper limit).

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Surrounds busy airports, like Los Angeles, Chicago O'Hare, Phoenix, Detroit, etc.

Certificate, Training & Endorsement Requirements:

- Pilots only need a Private Pilot certificate to operate in Class B.
- **Student Pilots** can fly in Class B, but they must have received Class B ground and flight instruction. Must have a Logbook endorsement to operate within a specific Class B, and it must be endorsed by the instructor who provided the instruction within the last 90 days. The endorsement can authorize takeoffs and landings at a specific airport in Class B airspace.
- Busy CLASS B primary airports like Chicago O'Hare (ORD) and Los Angeles (LAX) may exclude student takeoffs and landings.
- **Recreational Pilots** may fly in Class B airspace if they have an endorsement for ATC communications.

When VFR, to enter Class B: You must hear the controller say, "Cleared into class B".

Class B VFR Weather Requirements

Air Traffic Control makes Class B airspace possible by constantly monitoring and separating each flight in the airspace. This constant control is also why it has some of the most relaxed weather minimums. ATC always has eyes on you.

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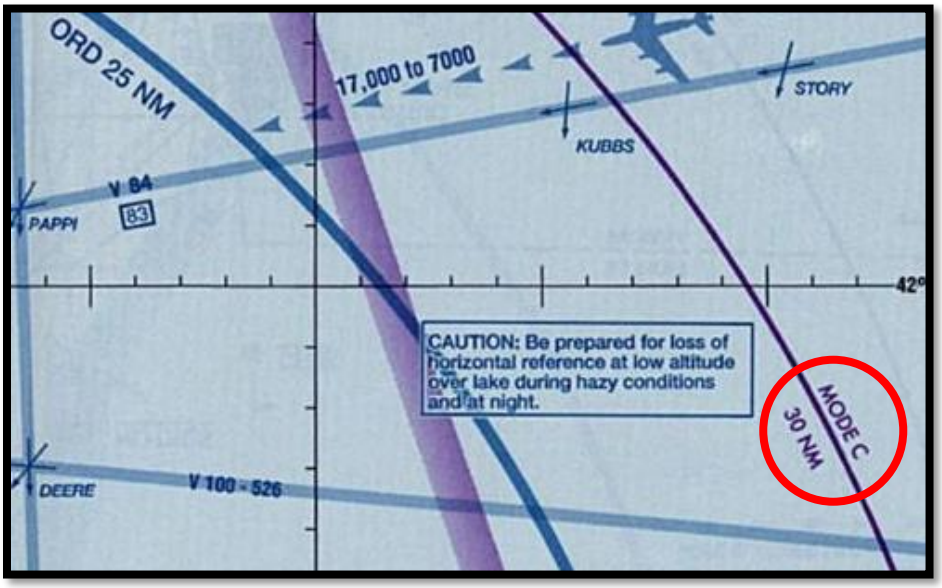
Mode C in Class B

Air Traffic Control closely monitors everything that happens inside - and around - Class B airspace. They need to have accurate altitude information on each aircraft in the area to make sure they remain separated from the Class B traffic. Because of that, all aircraft need to use a Mode-C altitude reporting transponder inside and around Class B airspace.

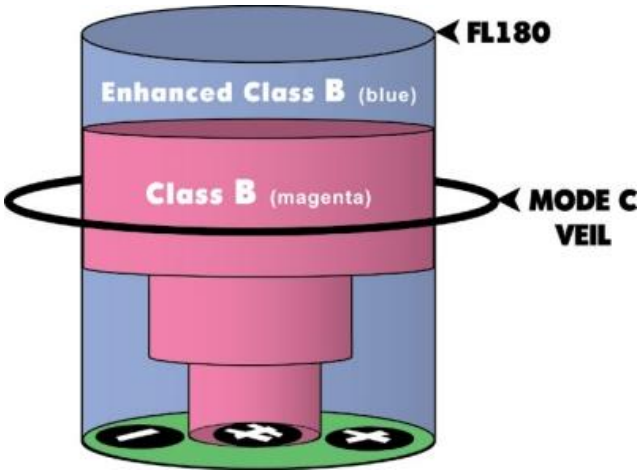
That includes airspace **inside the 30 nm mode C veil.** This veil surrounds the primary airport with a 30 mile ring.

Exception: *Aircraft not originally certificated with an engine driven electrical system, or aircraft that have not subsequently been certified with a system installed can fly within the Mode C veil, provided the aircraft remains outside Class A, B or C airspace; and below the altitude of the ceiling of a Class B or Class C airspace area designated for an airport or 10,000 feet MSL, whichever is lower.*



Is Your Transponder Broken?

No problem. You can request permission to fly in Class B one hour prior to the desired operation.



Class B Structure:

- Shaped like an upside down, multi-level wedding cake, with the middle layer starting at the ground and extending up.
- Tops vary from 7,000 feet MSL at some coastal airports, to 12,000 feet MSL at Denver. The average is 10,000 feet MSL. Check the chart.

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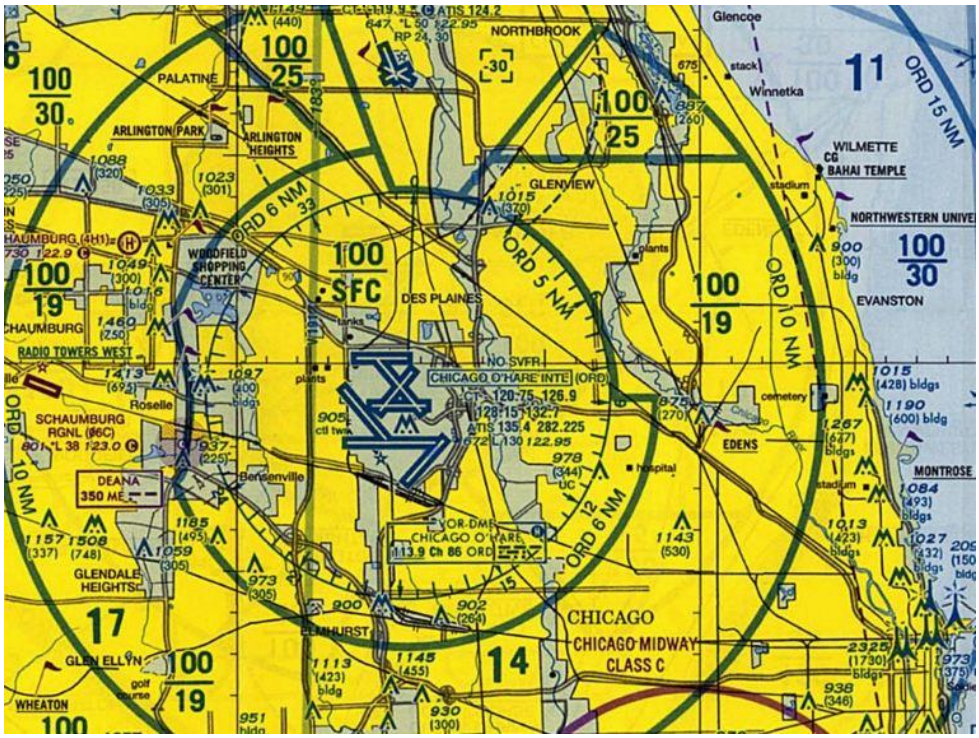
Class B airspace is depicted on WACs, Sectionals and TACs by dark blue lines.



Class B Traffic Separation Service: VFR aircraft are separated from all aircraft in Class B with traffic advisories.

Class B Special VFR: Some Class B airspaces prohibit Special VFR flights.

- Class B: Maximum 200 knots when flying **beneath** Class B airspace.
- Class B: Maximum 250 knots when flying **within** class B airspace.

(FAR 91.117)

FAASafety.gov offers an online course: ***"A Direct Approach to Class B VFR Operations".***

This course may qualify for Wings Credit.

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Mode C is required in <u>and above</u> Class C airspace.

Certificate Requirements:

- Need at least a Student Pilot Certificate.

To Enter Class C VFR:

- Establish contact with ATC, with the controller acknowledging you **by your call sign**.
  - "Cessna 7462Q, standby," is an acknowledgement.
  - "Aircraft calling Tucson approach, standby," is NOT an acknowledgement!
  - The words, "Cleared to enter Class C airspace" **<u>are not</u>** required.

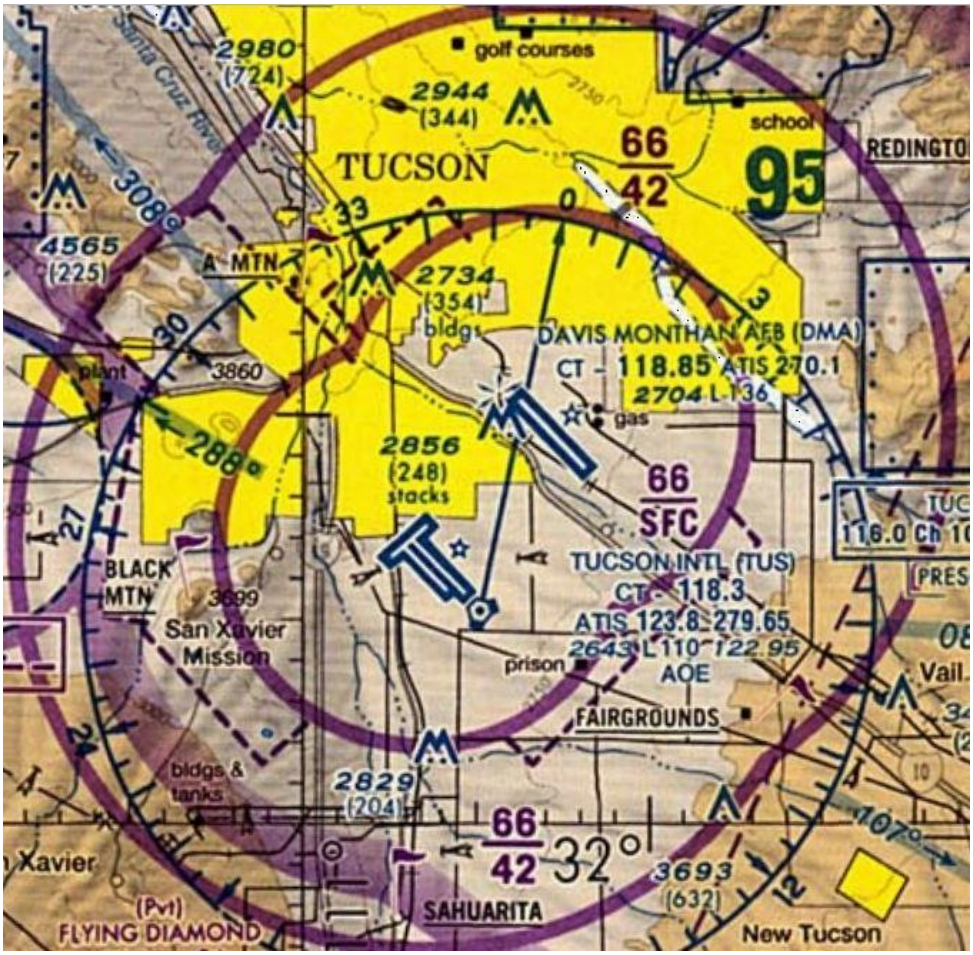
Class C VFR Weather Requirements

Class C Structure:

- The core surface area has a **radius of five nautical miles.**

- Extends from the surface to the ceiling of the Class C airspace.
- The upper "shelf" area has a **radius of ten nm** and extends from as low as 1,200 feet up to the ceiling of the airspace. *(AIM 3-2-4).*
- **An outer area**, (20 nm radius), is not depicted and it's not part of Class C. However, participating VFR aircraft in that area will receive Class C service from ATC. This is a good place to initiate contact with approach control.

Class C is depicted on WACs and Sectionals by dark magenta lines. Some TACs include Class C airspace. For instance, on the Chicago TAC, the Midway Class C exists below the Chicago O'Hare Class B airspace.



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Class C Traffic Separation Service: VFR aircraft are separated from IFR aircraft with traffic advisories.

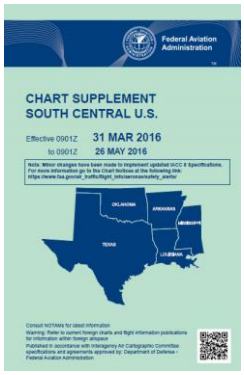
Class C Special VFR: Special VFR flights are allowed.

Class C: Max 200 knots at and below 2,500 AGL & within 4 nm. *(FAR 91.117)*

Certificate Requirements: At least a Student Pilot Certificate.

To Enter:

- Two-way communication with ATC must be established. A transponder is NOT required. If the tower controller responds to your call with your call sign and "standby", you've established two way communication. If the controller responds with "Aircraft calling tower, standby", two way communication has NOT been established.
- When the tower is closed, Class D airspace becomes Class E or class G. Check the **Chart Supplement** (formerly the Airport Facility Directory or A/FD) for actual airspace reversion.



CLNC DEL 123.725 For clnc del when twr clsd call SOCAL Apch 800–448–3724
® **SOCAL DEP CON** 119.6
AIRSPACE: CLASS D svc 1400–0500Z‡ other times CLASS G.
VOR TEST FACILITY (VOT) 109.0
RADIO AIDS TO NAVIGATION: NOTAM FILE SAN.

NOTE: A class G reversion occurs if, after the tower closes, the airport ceases to provide an official weather report.

Class D Structure:

- Generally circular in form
- Normally extends from the surface to 2,500 feet AGL.
- Outer radius generally 5 statute miles.

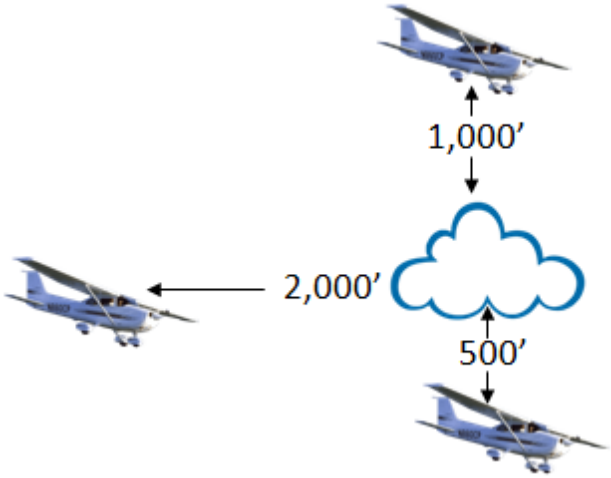
Class D is depicted on Sectional and TAC charts by blue dashed lines.

"-30" indicates Class D extends up to **<u>but not including</u>** 3,000 MSL. In this case, it's less than 2,500 feet AGL. This happens when Class D underlies Class B airspace.

"39" indicates that Class D extends to and including 3,900 feet MSL.

If the airport rotating beacon is operating in the daytime, this means that the field is below basic VFR weather minimums

Class D VFR Weather Requirements **(basic VFR minimus)**



If, during the daytime hours, the airport rotating beacon is operating, this COULD MEAN that the field is below basic VFR weather minimums.

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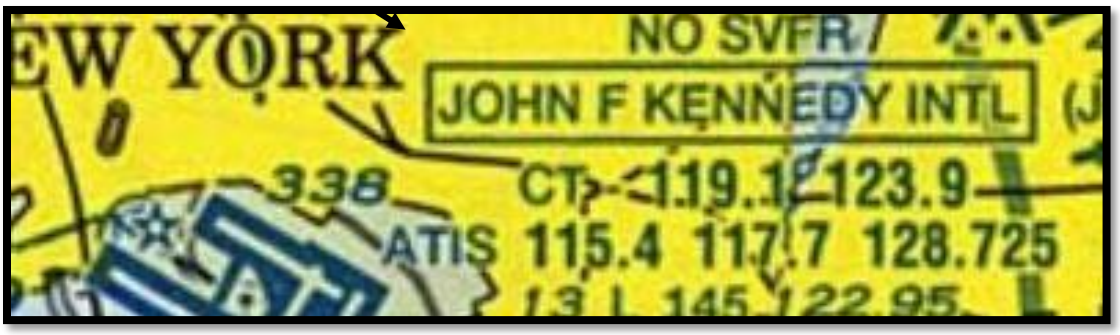
Class D: Max 200 knots at and below 2,500 AGL & 4 nm. *(FAR 91.117)*

Class D Special VFR:

Generally, Special VFR is allowed in Class D, day or night . . . unless otherwise depicted by "NO SVFR" on the chart.



When an airport name has a box around it, it means that more information is available in the Chart Supplement (formerly the Airport Facility Directory or A/FD).

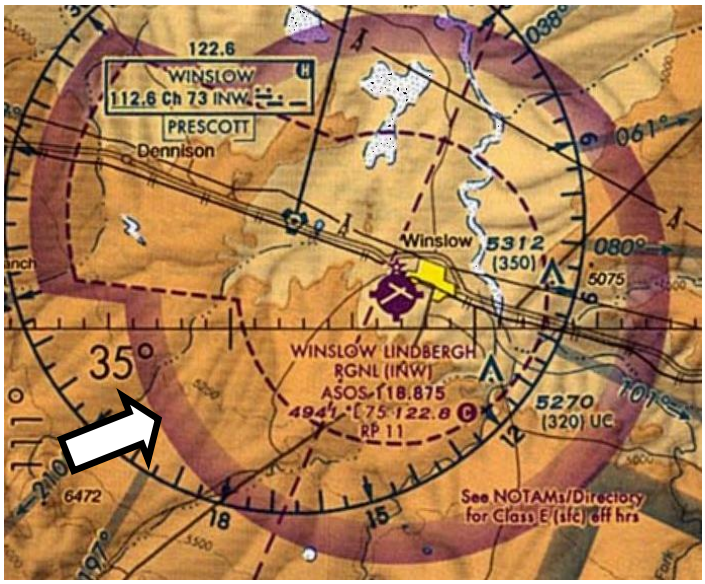
Class

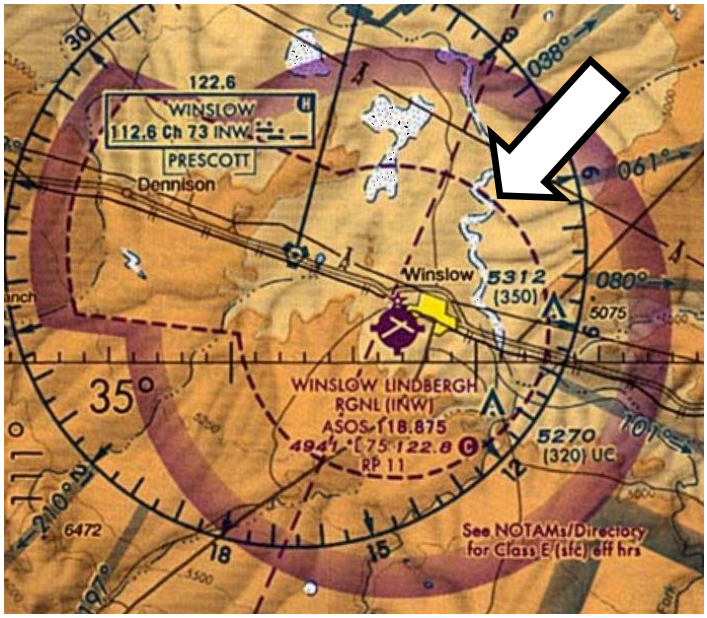
Certificate Requirements: None

Depiction: Sectional Chart

Structure: Extends to 18,000 feet MSL, (meets Class A airspace).

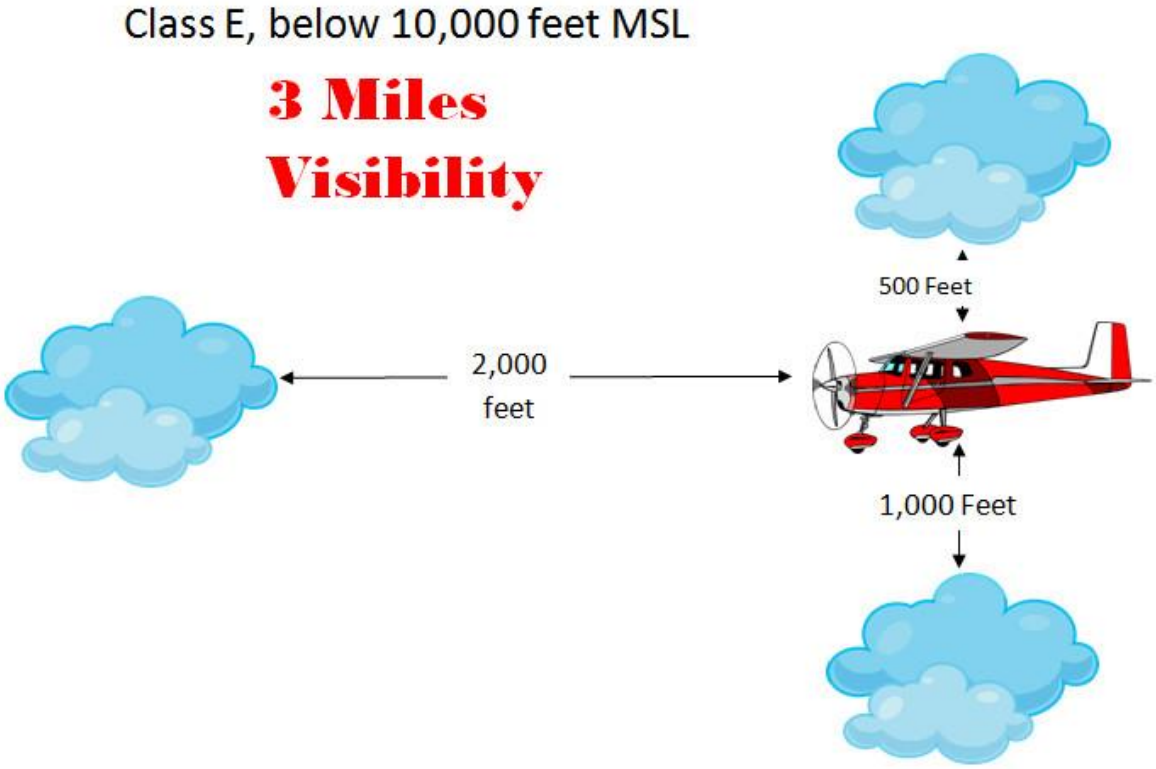
Class E starts at 700 feet AGL, when it's depicted by a magenta-tinted vignette, (continues to 18,000 feet MSL). The hard edge is the extent of Class E where it abuts Class G airspace.





At some, but not all uncontrolled airports with an instrument approach, Class E, depicted by a **magenta segmented line**, starts at the ground.

Magenta Class E areas are used to transition between the terminal and en-route environments around non-towered airports.



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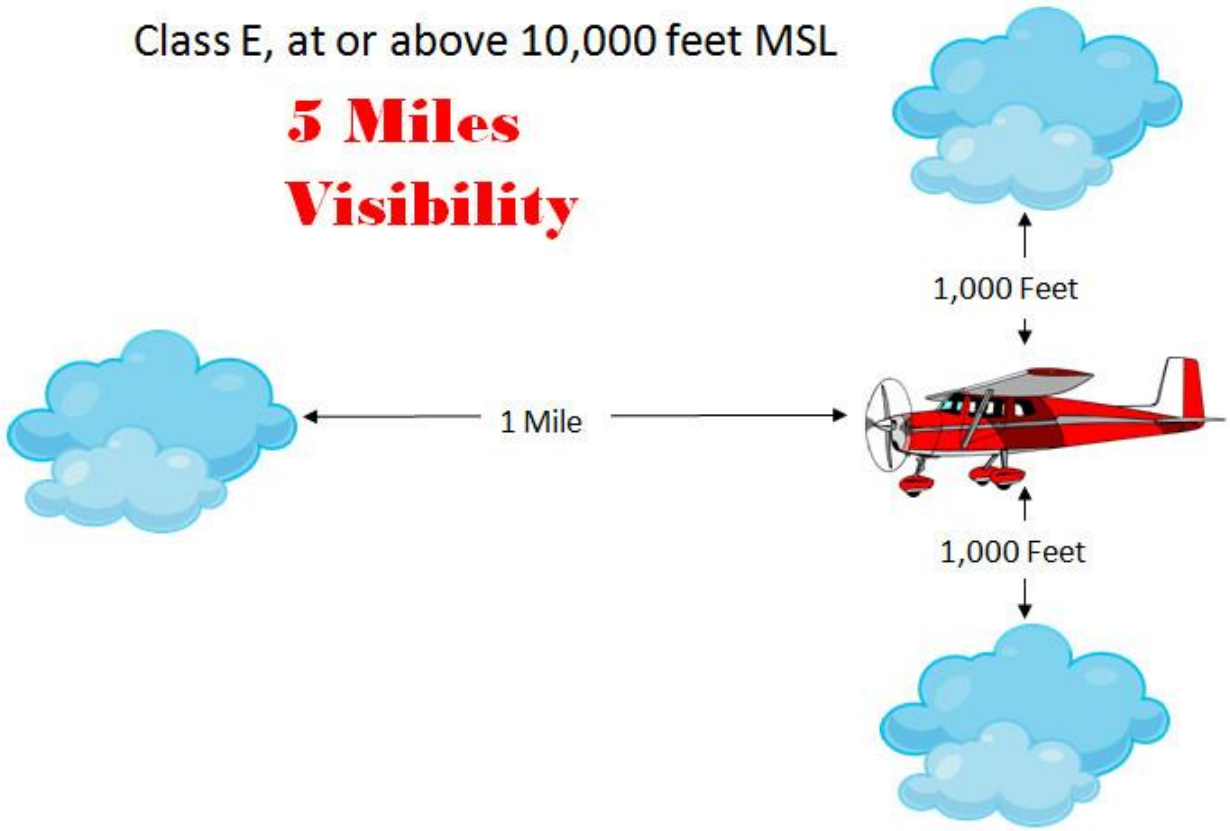

Imagine you're flying IFR and pop out of a cloud layer. Suddenly, you spot a VFR aircraft below. VFR weather minimums are designed to give both of you enough time to see and avoid each other.

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Class E starts at 1,200 feet AGL when it's depicted by a blue-tinted vignette, (continues to 18,000 feet MSL). The hard edge is the extent of Class E where it abuts Class G airspace.

This Class E, depicted in blue, is shown around a Victor airway. (Basically, Class E is four nm either side of the airway.)

Blue jagged lines differentiate Class E Airspace that starts higher than 1,200 feet AGL. In this case, it starts at 9,500 feet MSL.

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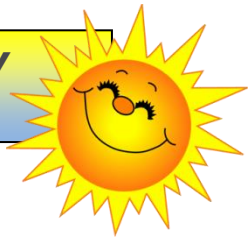
Class G *Uncontrolled Airspace*

- Class G airspace exists wherever Class A, B, C, D or E airspace *doesn't*.
- It starts at the surface and extends up until it hits Class E airspace.
- On a Sectional, the Class G ceiling is the floor of Class E airspace, and it's always exclusive. For example, if Class E starts at 700 feet AGL, Class G goes up to, but doesn't include, 700 feet AGL.
- There are no entry or clearance requirements. Radio communication is not required in Class G airspace, even for IFR operations.
- When it abuts Class E, Class G is outside of the hard edge of Class E's blue-tinted or magenta tinted vignettes. Class G airspace is most easily found on a sectional map when a fading, thick blue line appears.
- It's pretty easy to find these airspace markings in the Western US, but on the East Coast, it's rare to find airspace designated in this way

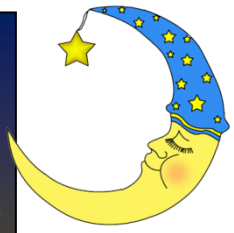
Class G Weather Requirements

Class G, 1,200 feet AGL and Lower, DAY



ALSO IN THIS WEATHER CATEGORY:

Class G, Below 1,200 feet AGL and lower, at NIGHT, within ½ mile of airport and in the traffic pattern



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Class G, 1,200 Feet AGL and Lower, NIGHT

Class G, above 1,200 feet AGL, but lower that 10,000 feet MSL, DAY

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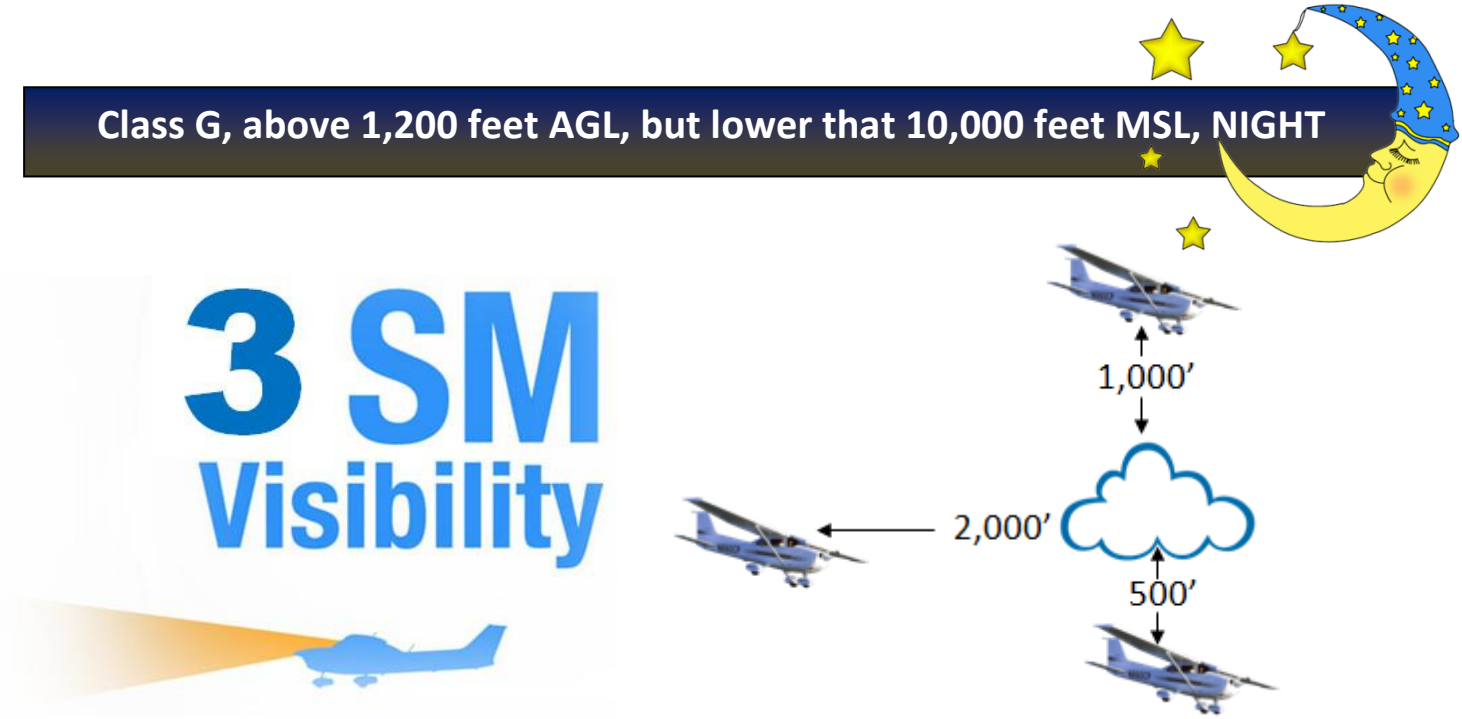
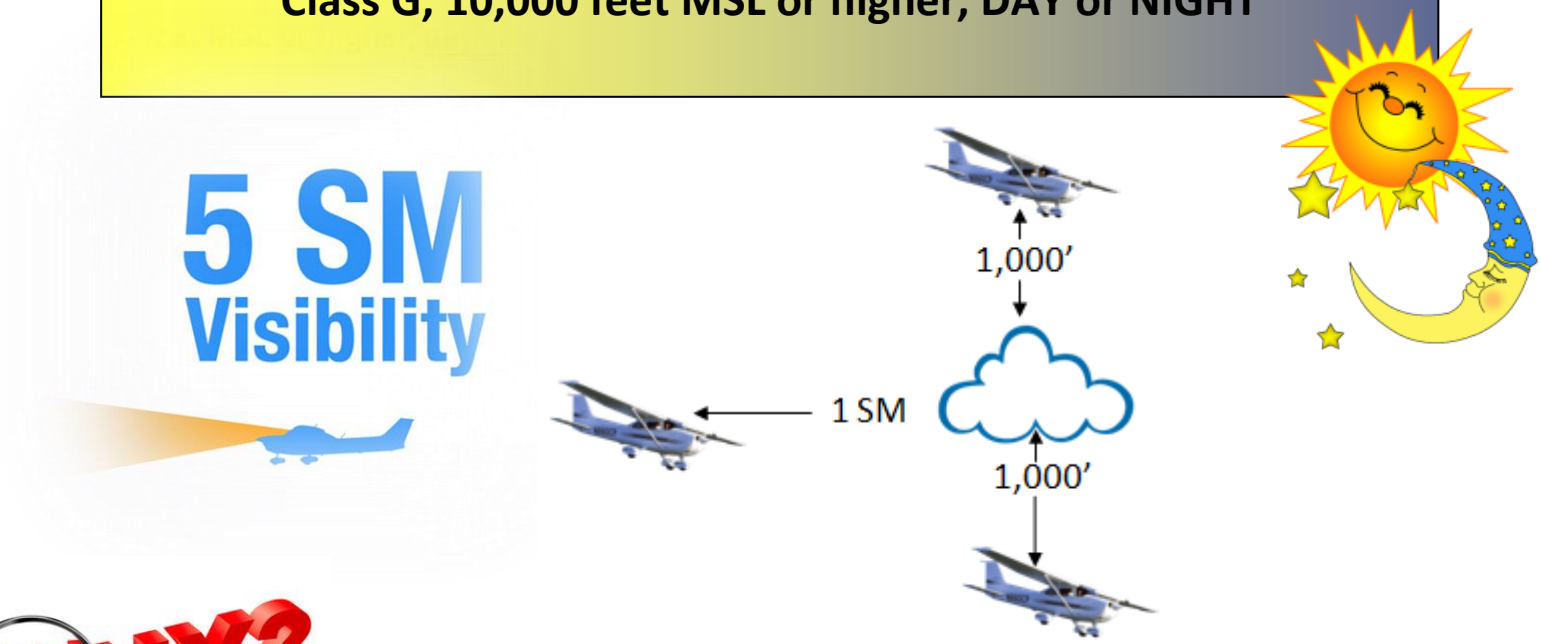
Class G, above 1,200 feet AGL, but lower that 10,000 feet MSL, NIGHT



Class G, 10,000 feet MSL or higher, DAY or NIGHT



Why is there a difference in weather minimums at different altitudes? Because at or above 10,000' MSL, aircraft can fly faster than 250 knots, and pilots will need more visibility and distance from the clouds to see and avoid other aircraft.

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Class

It's not used in the United States. **In Canada**, Class F Airspace is marked on both VFR and IFR charts. It includes alert areas, danger areas, rocket ranges, restricted areas, forest fire restrictions, and military active areas, air shows or other temporary impediments to navigation. ICAO defines it as a "hybrid" of Class E and Class G, in which ATC separation guidance is available but not required for IFR operation.

AOPA's Air Safety Institute offers a course entitled, **"Know Before You Go: Navigating Today's Airspace".** *This course qualifies for Wings Credit and AOPA Accident Forgiveness.*

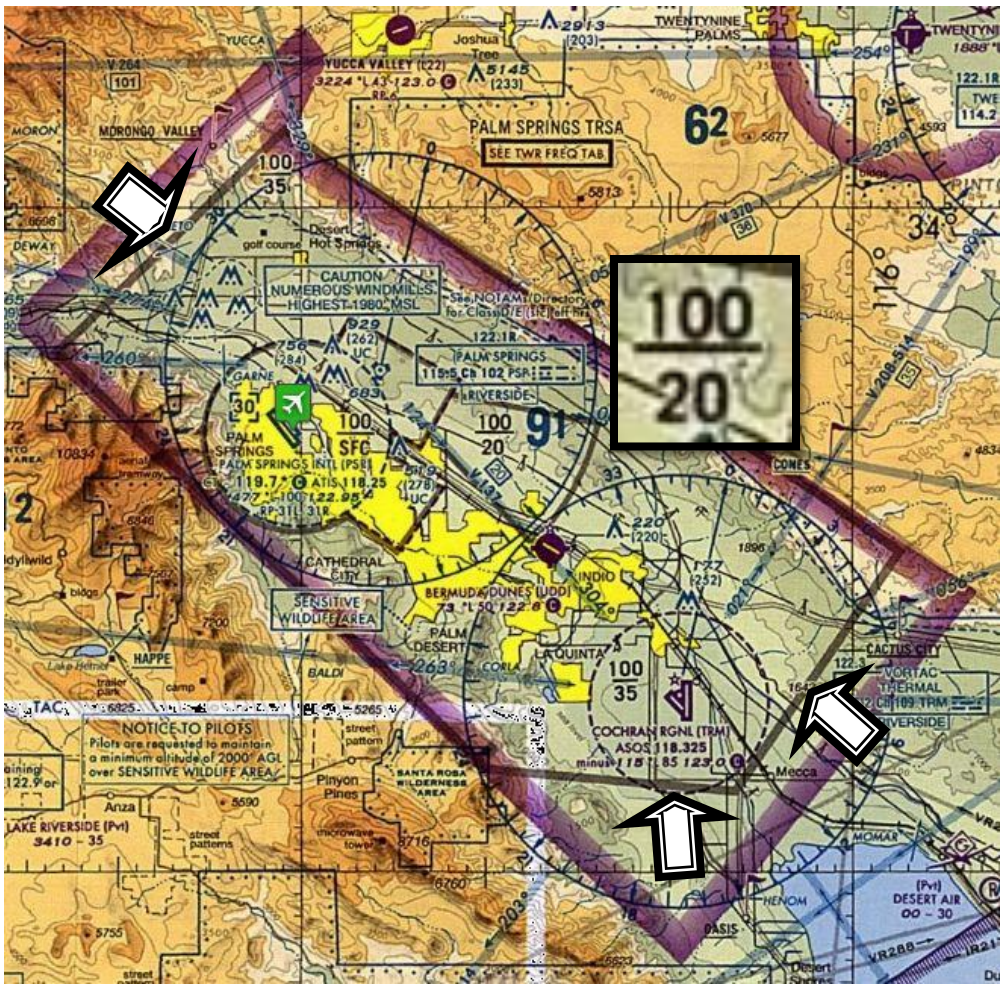
The ultimate responsibility of the pilot is to fulfill the dreams of the countless millions of earthbound ancestors who could only stare skyward and wish.

Terminal Radar Service Area (TRSA)

- Situated over some selected airports.
- Participation is VOLUNTARY.
- Depicted on **sectional charts** by solid **DARK GRAY** lines (see arrows below) and groups of numbers representing the vertical dimensions of the TRSA in hundreds of feet MSL.

Palm Springs Intl. (PSP), in this example, shows the standard depiction of class D airspace (dashed blue lines surrounding PSP), accompanied by solid black lines representing the TRSA dimensions.

The portion of TRSA extending outside the PSP surface area is delegated to radar approach control.



TRAFFIC SEPARATION SERVICE:

- VFR aircraft traffic advisories and separation by ATC.
- Arriving VFR aircraft receiving TRSA services will be handed off to tower from approach control.
- Departing VFR aircraft are assumed to want TRSA service unless the pilot states, “Negative TRSA service,” or a similar comment.

Special VFR

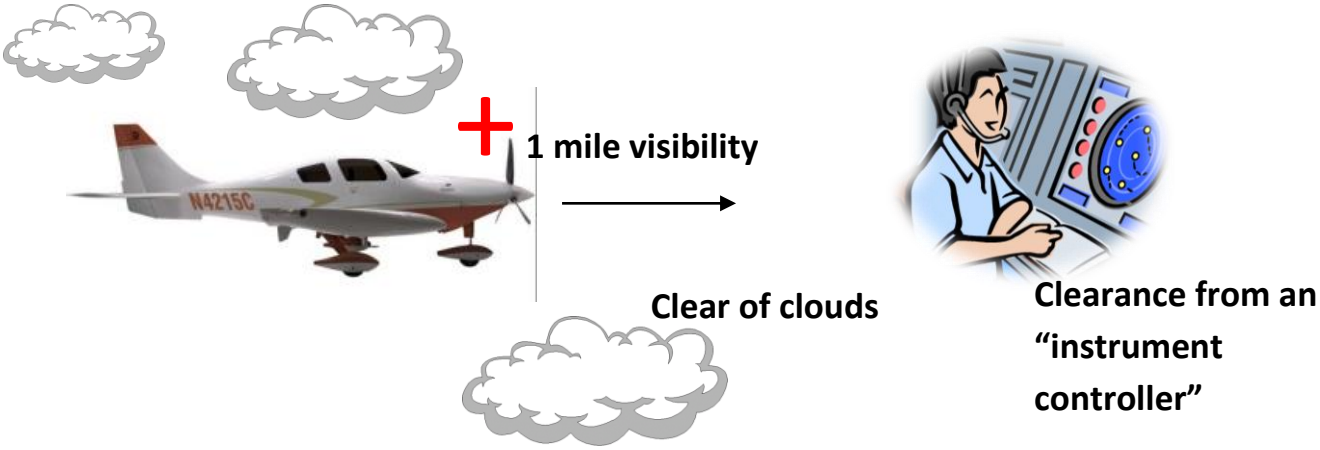
Allowed in Class C, D, E, and some Class B airspace below 10,000 feet MSL within the airspace contained by the upward extension of the lateral boundaries of the controlled airspace designated to the surface for an airport. That is, if the airspace is in the shape of a wedding cake, it’s allowed only within the inner / surface core.

- Requires 1 mile visibility
- You must remain clear of clouds.

Special VFR requires a clearance from an instrument controller, usually arranged through the airport’s tower. You need to be in contact with a controller who can advise you about, and keep you separated from the IFR traffic that’s flying through the clouds – the very same clouds that you’ll be dodging.

Don’t expect a Special VFR Clearance at a very busy airport. At many class B airspace airports “No special VFR” is specified on the chart.

Smart pilots would never try this at night, although it’s legal for instrument rated pilots if they’re flying an instrument capable aircraft.



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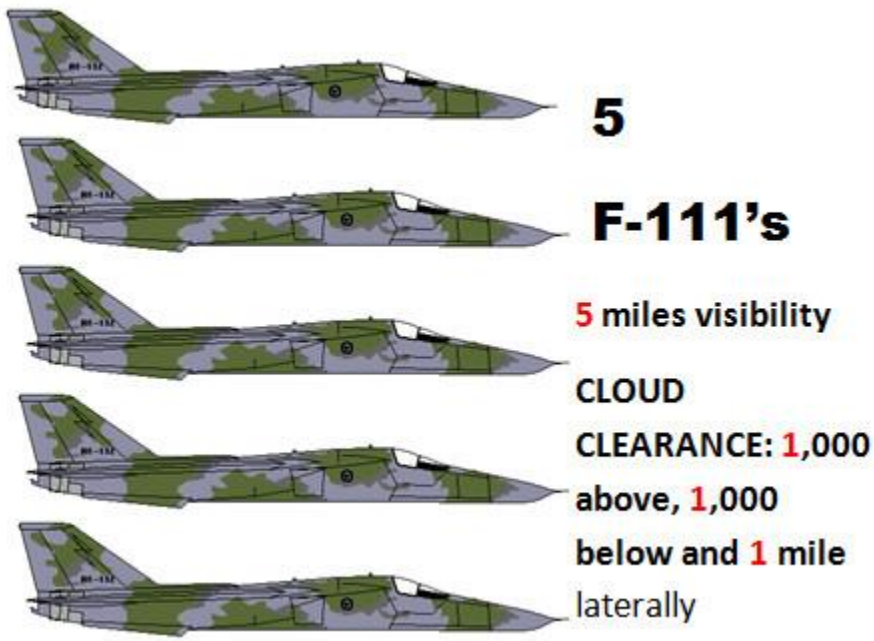
3 152's and 5 F-111's are great Visibility and Cloud Clearance Memory Helpers



Here are some simple rules that, if committed to long-term memory, will simplify airspace visibility & Cloud Clearance:

- When flying above 10,000 feet MSL, Weather = 5-F111's
- When flying below 10,000 feet MSL, Weather = 3-152's*

Even though a transponder is not required to fly in:

- Class E airspace below 10,000 feet
- Class E airspace that is not above Class C or B airspace (except when within the Mode C Veil), or
- Class D airspace

14 CFR 91.215(c) requires a pilot operating an aircraft equipped with a transponder, to **use it in *all* controlled airspace.**

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Special Use Airspace, Military Airspace and TFRs

Prohibited Airspace – Never violate it.

Established for security or other reasons associated with the national welfare.

Check a Flying app, the Sectional, TAC or WAC “Frequency Panel” for altitudes affected, time of use, controlling agency and frequency.

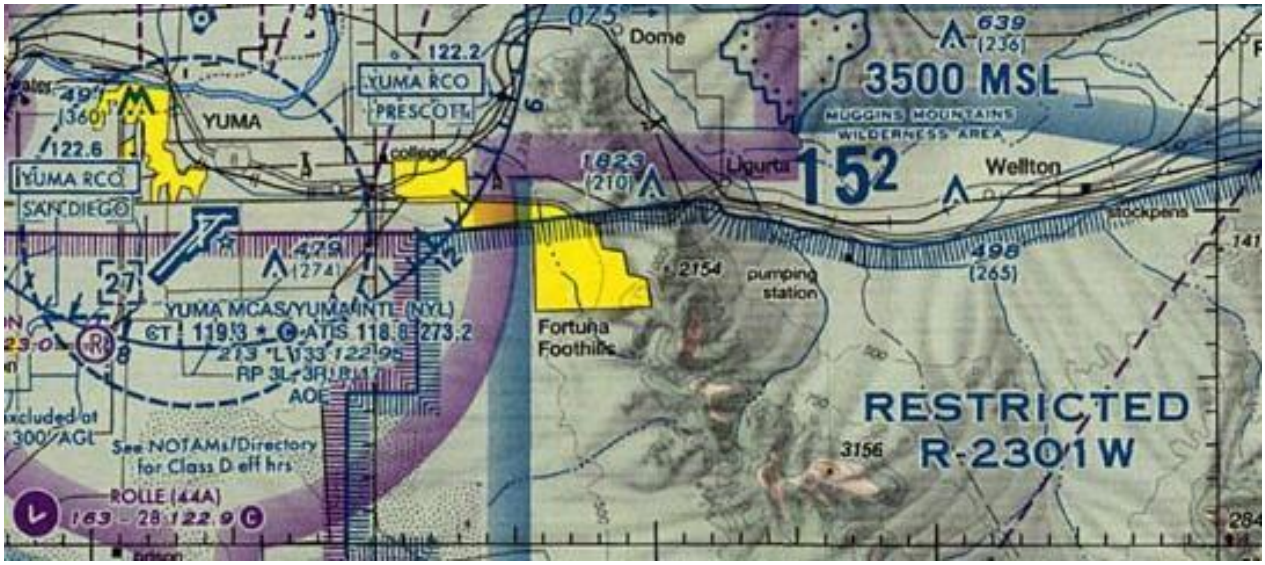
TFR Travel Tip

Check NOTAMS Prohibited airspace can grow. For example: If the President is at Camp David, MD, P-40 expands (by NOTAM) from a 6 nm radius to 20 nm.

Violating prohibited airspace may result in military interception and/or the possibility of an attack upon the violating aircraft. Aircraft violating or about to violate prohibited airspace will often be warned beforehand on 121.5 MHz.

Restricted Airspace

- Denotes the existence of unusual, often invisible hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles.
- Penetration without authorization from the using or controlling agency may be extremely hazardous to your health.



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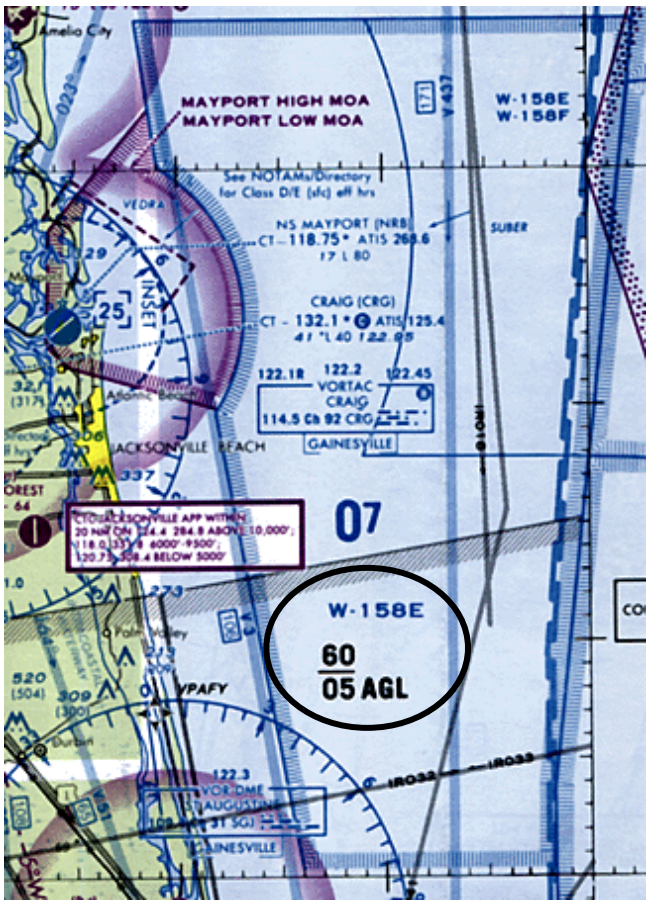
Restricted Airspace is depicted by dark blue lines with thin blue lines perpendicular to the outer boundary line.

ATC will allow aircraft to operate in the restricted airspace if the restricted area is not active and it has been released to the controlling agency.

Check the Sectional, TAC or WAC frequency panel for altitudes affected, time of use, controlling agency and frequency.

R-2510A	TO 15,000	0700-2300 †24 HRS IN ADVN	LOS ANGELES CNTR	128.6



In the Frequency Panel example above, R-2310A can be active with 24 hours notice. Always check with the controlling agency before flying in a Restricted Area, even if you believe it is NOT ACTIVE.

Warning Areas

- Extend from three nautical miles outward from the coast of the U.S.
- They contain activity that may be hazardous to nonparticipating aircraft, but because Warning areas are over international waters, they cannot be designated a Restricted Area.

Check the Sectional, TAC or WAC "Frequency Panel" for altitudes affected, time of use, controlling agency and frequency.

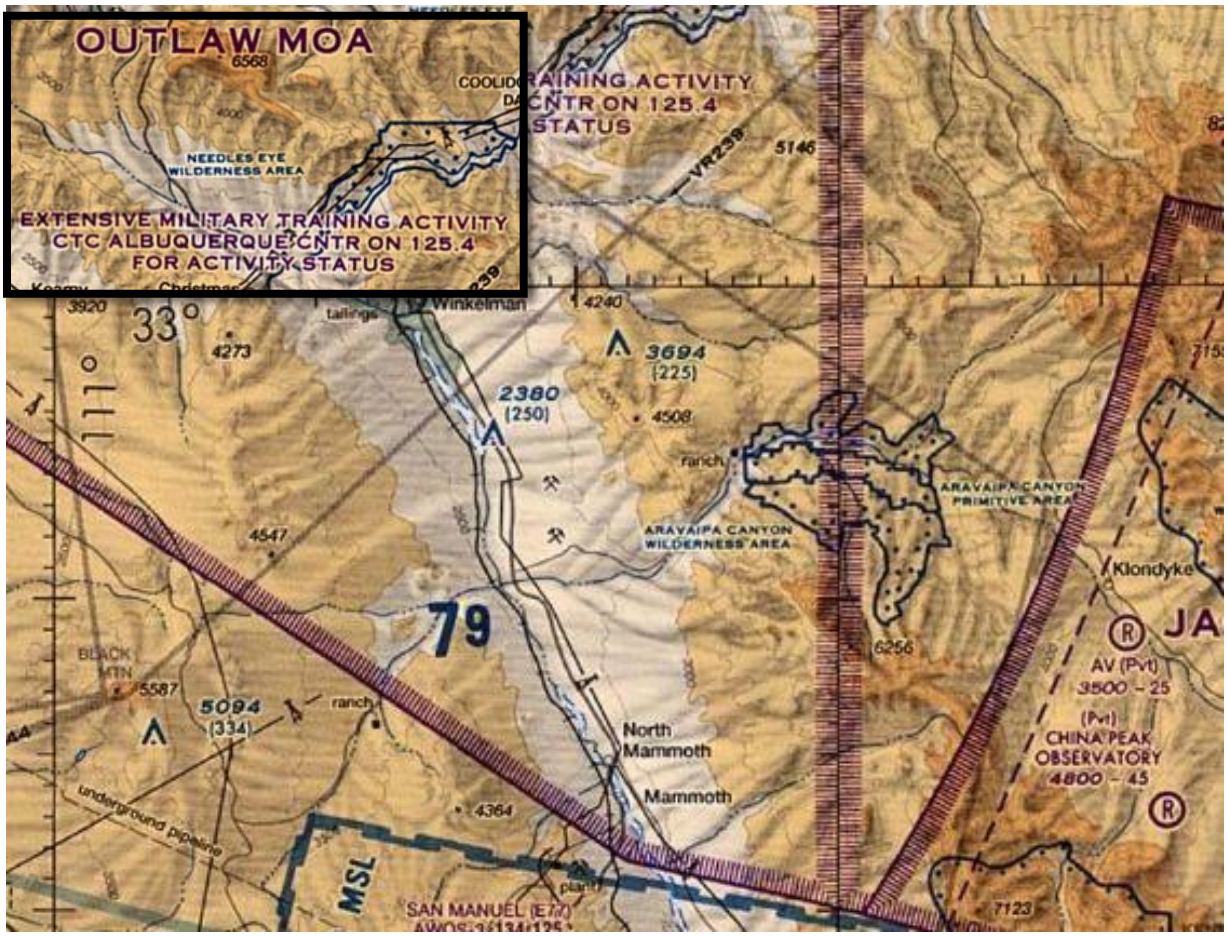
Military Operating Areas (MOAs)

- Separates military training activities from IFR traffic.
- Pilots operating VFR should exercise extreme caution while flying within a MOA.
- Contact any FSS within 100 miles of the area to obtain the MOA's hours of operation.
- Prior to entering an active MOA, contact the controlling agency for traffic advisories.

Check the Sectional, TAC or WAC frequency panel for altitudes affected, time of use, controlling agency and frequency.

MOA NAME	ALTITUDE*	TIME OF USE†	CONTROLLING AGENCY/ CONTACT FACILITY	FREQUENCIES
AUSTIN 1	200 AGL	0800-2100 MON-FRI	OAKLAND CNTR SALT LAKE CITY CNTR	128.8 285.5 132.25 338.35

MOA's and the controlling agency's frequency, are depicted on Sectional, VFR Terminal Area, and Enroute Low Altitude charts.



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Alert Areas

- Contain a high volume of pilot training or an unusual type of aerial activity.
- Pilots of participating aircraft as well as pilots transiting the area are **equally responsible** for collision avoidance.

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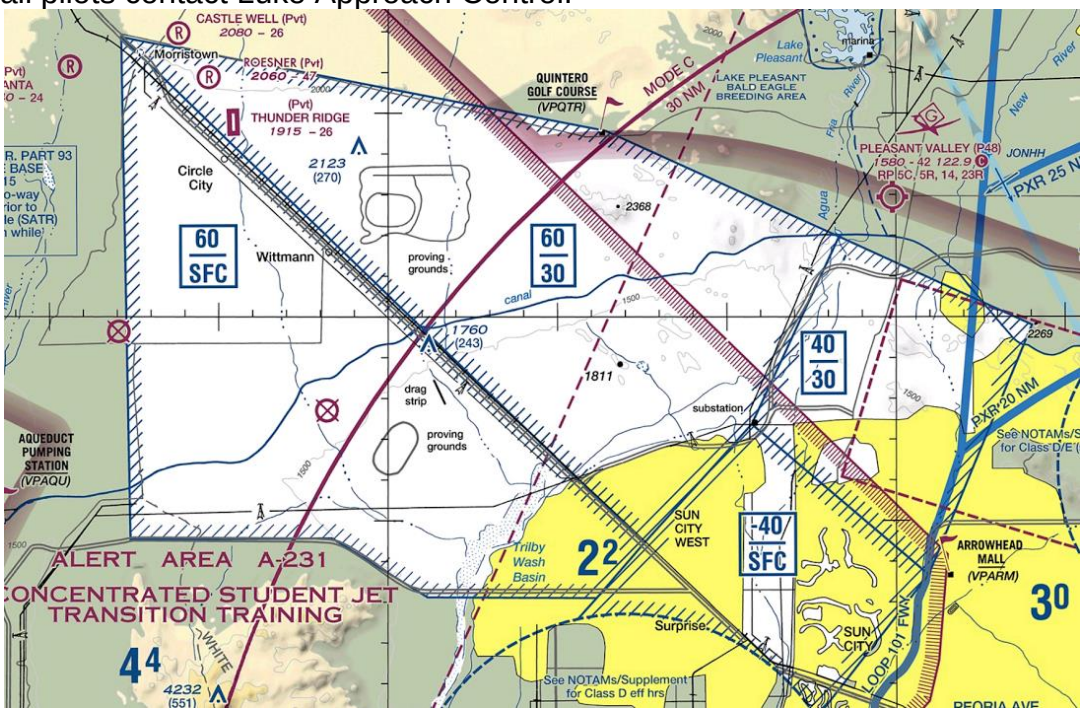
Special Air Traffic Rule (SATR) in an Alert Area

In the Phoenix, AZ area, a SATR has been inserted into Luke AFB's Alert Area. While contacting ATC in an Alert Area is usually voluntary, the Luke AFB SATR **requires** that all pilots contact Luke Approach Control.



Special Military Activity

You'll find these in a few places in the US. This one, which covers Florida from the Gulf Coast to the Atlantic Ocean, is used for cruise missile testing, as well as supporting aircraft.

These areas may be rarely used, but it's always a good idea to talk to Flight Service to make sure the area isn't active. That is, unless you like Cruise Missiles.

Controlled Firing Areas (CFAs)

- Controlled firing area activities are suspended immediately when spotter aircraft, radar, or ground lookout positions indicate an aircraft might be approaching the area.
- No need to chart CFA's since they do not cause nonparticipating aircraft to change their flight paths.

CFA locations can be located in the Chart Supplement (formerly the Airport Facility Directory or A/FD) “Special Notices” section.

Military Training Routes

- Military aircraft operating below 10,000 feet, sometimes faster than 250 knots.
- Military Training Routes are divided into Instrument Routes (**IR**), and Visual Routes (**VR**).
- IR routes are flown under Air Traffic control, while VR routes are not.

Each route is identified by either "IR" or "VR", followed by either:

- Four digits for routes below 1,500 feet AGL, such as: **VR1422**.
- Three digits for routes with at least one leg above 1,500 ft AGL, such as: **IR418**.

An arrow by an IR or VR route designation indicates the direction of flight on the route.

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Special Flight Rules Areas (SFRAs) or *Part 93 Areas*

This is an area in which the normal regulations of flight do not apply, especially those concerning airspace classification, altitude, course, and speed restrictions, etc.

Part 93 Areas involve:

- Anchorage, Alaska, Terminal Area
- Vicinity of Niagara Falls, New York
- Valparaiso, Florida, Terminal Area
- Vicinity of Los Angeles International Airport
- Mandatory Use of the New York North Shore Helicopter Route
- Lorain County Regional Airport Traffic Rule (Ohio, KLPR))
- Ketchikan International Airport Traffic Rule
- Pearson Field (Vancouver, WA) Airport Traffic Rule
- Vicinity of Luke AFB, AZ
- Ronald Reagan Washington National Airport Traffic Rules
- Vicinity of Grand Canyon National Park, AZ
- Washington, DC Metropolitan Area Special Flight Rules Area
- New York Class B Airspace Hudson River and East River

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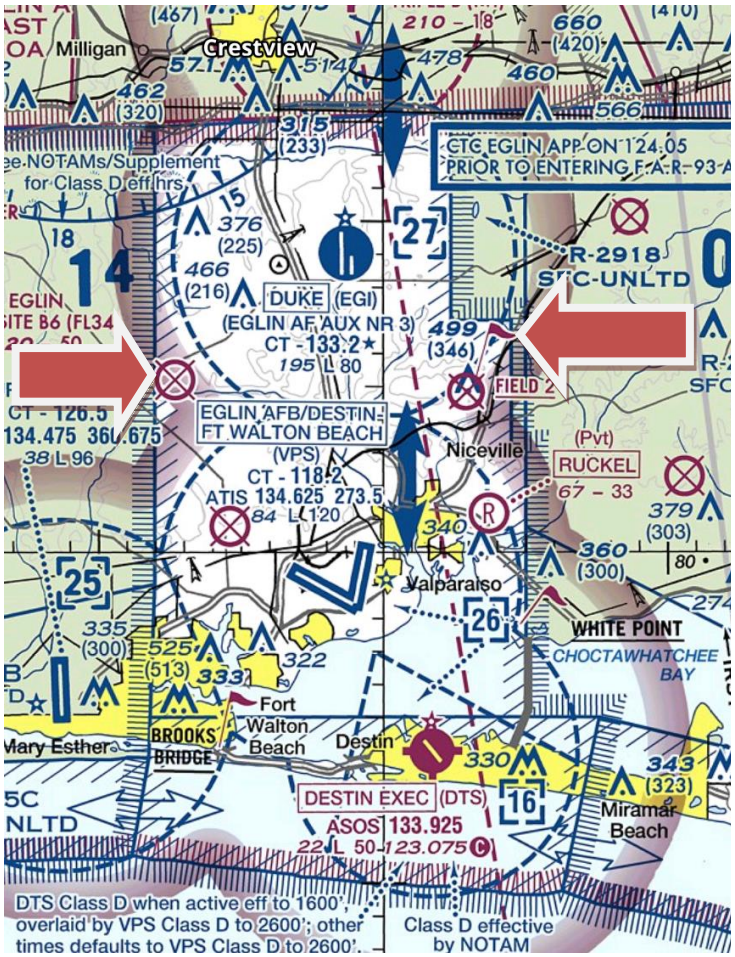
Part 93 Airspace

Shown below is the Eglin AFB / Valparaiso FAR Part 93 area. Associated information is found on the Sectional.



To avoid deviations in the air, plan your routes around airspace and terrain while on the ground (before takeoff).

Some combinations of airspace and mountainous terrain offer pilots little room for mistakes. For example, North Las Vegas, and East Phoenix

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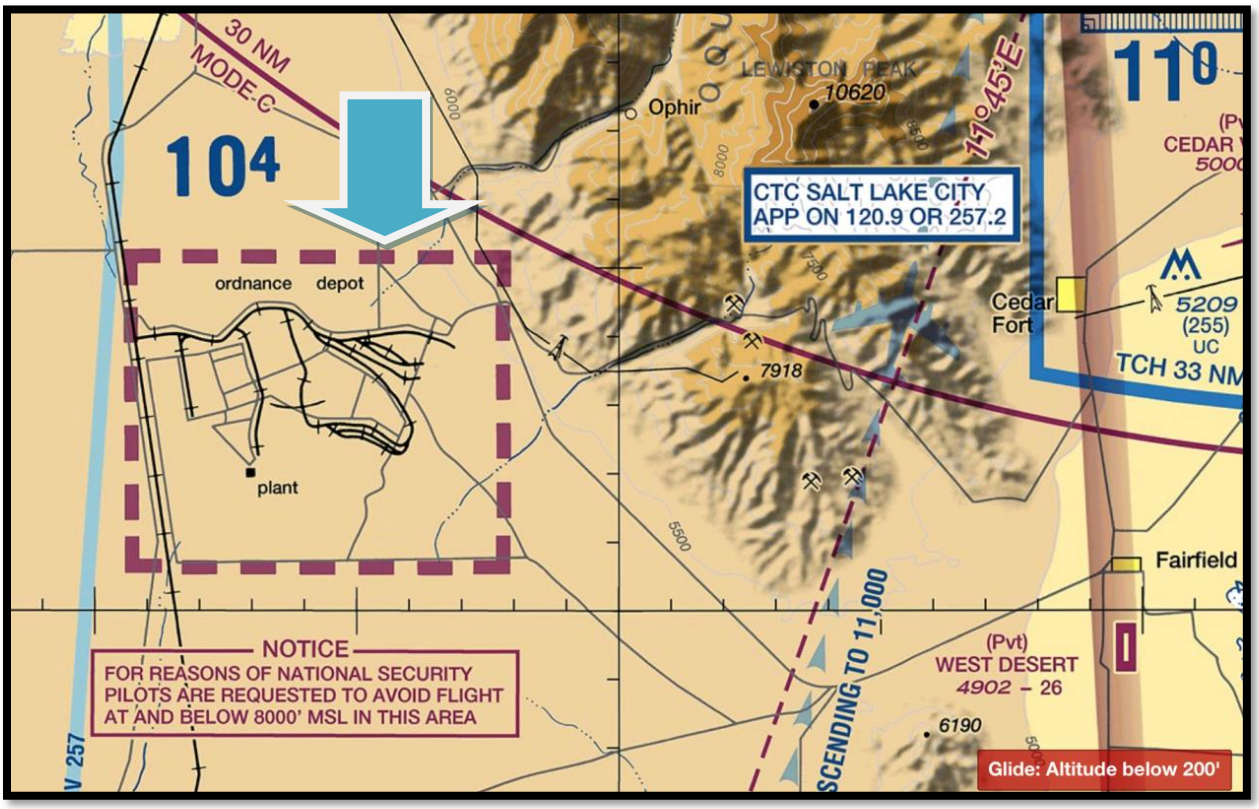
National Security Areas



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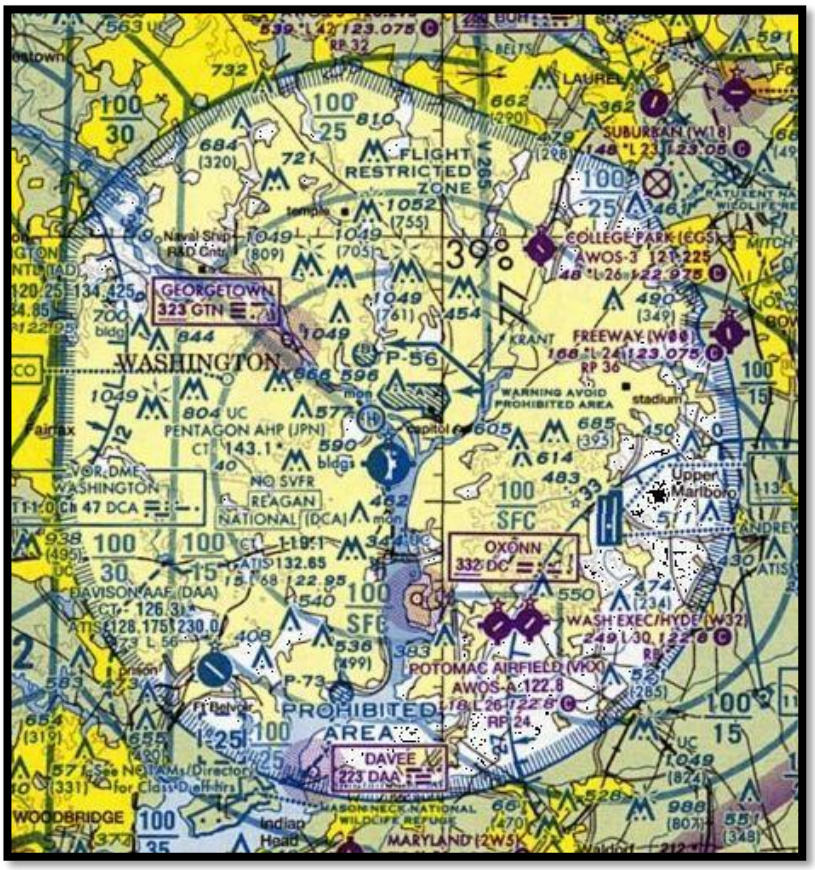
Washington, DC Special Procedures

Flying into the Washington, D.C. SFRA requires special training, available at FAASafety.gov. Log in and search the "Course Catalogue" for **ALC-55: Washington, DC Special Flight Rules Area (SFRA).** After you complete the training, print the certificate of achievement, and keep it with you. You may be required to show it to an official.



AOPA's Air Safety Institute offers a course entitled ***"Mission Impossible – Navigating Today's Special-Use Airspace".***

This course qualifies for Wings Credit and AOPA Accident Forgiveness.

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Temporary Flight Restrictions (TFRs)

Check ***TFR.FAA.gov*** for active TFRs, which are displayed with the FDC NOTAMS. For the latest information, you should call your local Flight Service Station at 1-800-WX-BRIEF. Most iPad or Tablet aviation apps, such as ForeFlight, graphically display proposed (depicted in yellow) and active (red) TFRs.

Disaster and Fire TFRs

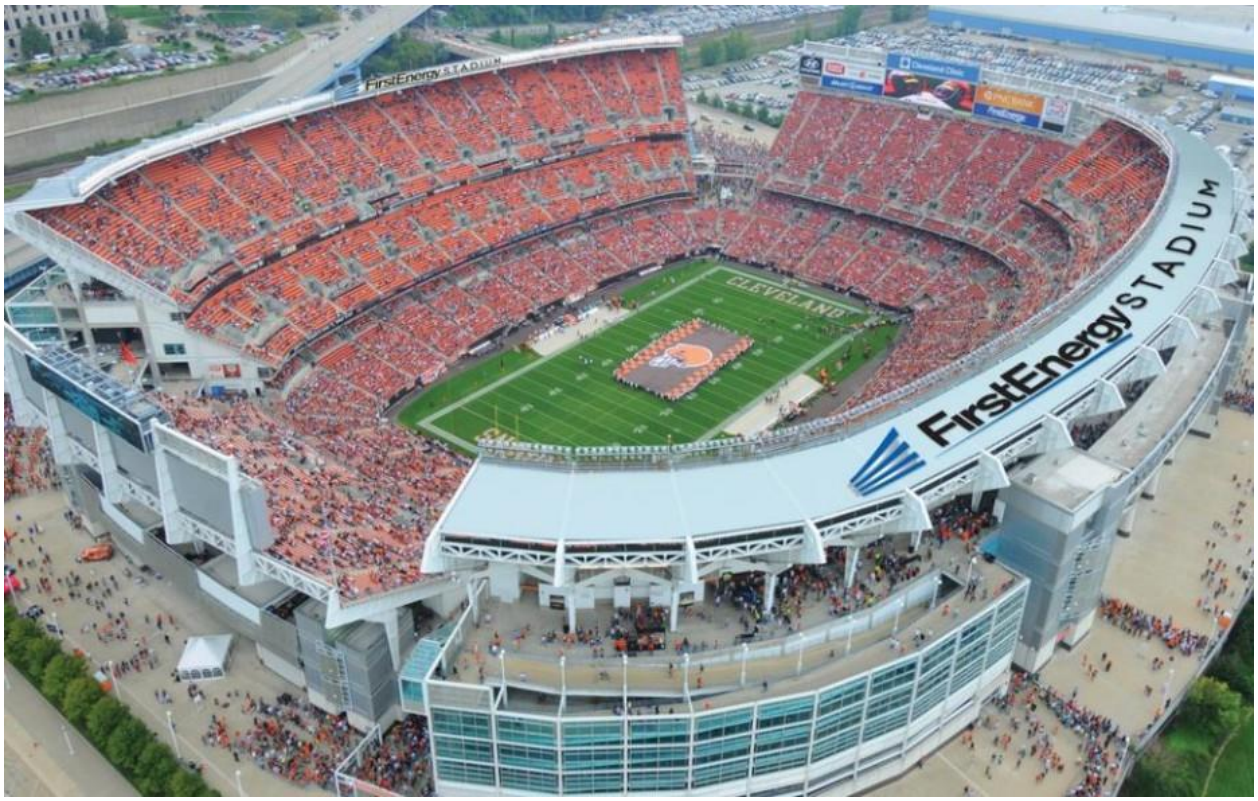
- Protect persons and property in the air and on the surface.
- Provide a safe environment for the operation of disaster relief aircraft.
- Prevent the unsafe congestion of sightseeing aircraft above an incident or event.

Stadium and Racetrack TFRs

- During an event, avoid these by **3,000 feet AGL and 3 nm**.

DISCLAIMERS:

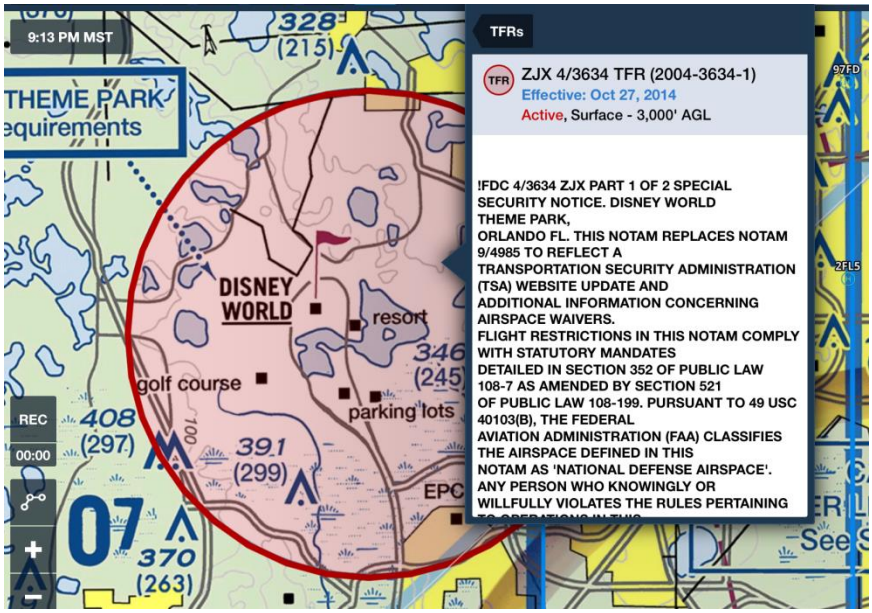
- Flight Service has no way of knowing if games have been delayed, are in overtime, or have been cancelled.
- Pilots are responsible to ensure that their flight does not violate these TFRs
- ATC ensures IFR flights are clear of TFR airspace, but unless VFR pilots ask, they are only advised on a time permitting basis,.



Presidential TFRs

- Airspace bubbles around the President, Vice President, and other public officials.
- Very secret, so no advanced notice is required.
- It's your responsibility to know the TFR is there.
- The TFR could involve several airports.

Disney (Security) TFRs protect Disneyland and Disney World, surface to 3,000 **AGL**



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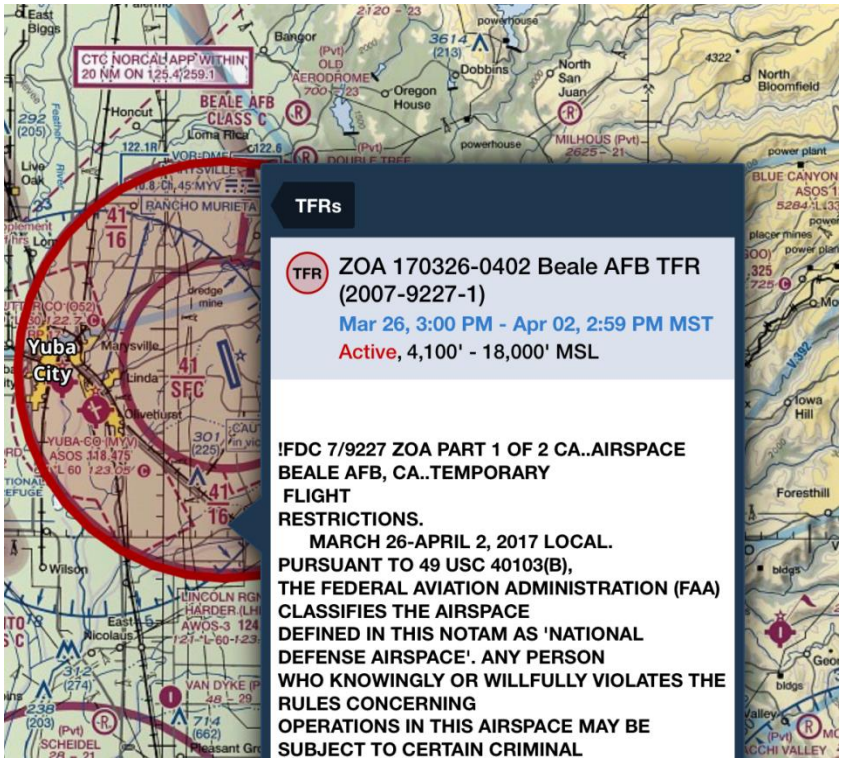
Missile Launch TFRs are designated to protect:

- Aircraft
- Space crews.

National Defense (Security) TFRs



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TFRs are also issued for:

- Laser demonstrations,
- Special security,
- Air shows,
- Power plants, (nuclear, hydroelectric, and coal),
- Dams,
- Refineries,
- Industrial complexes, and more

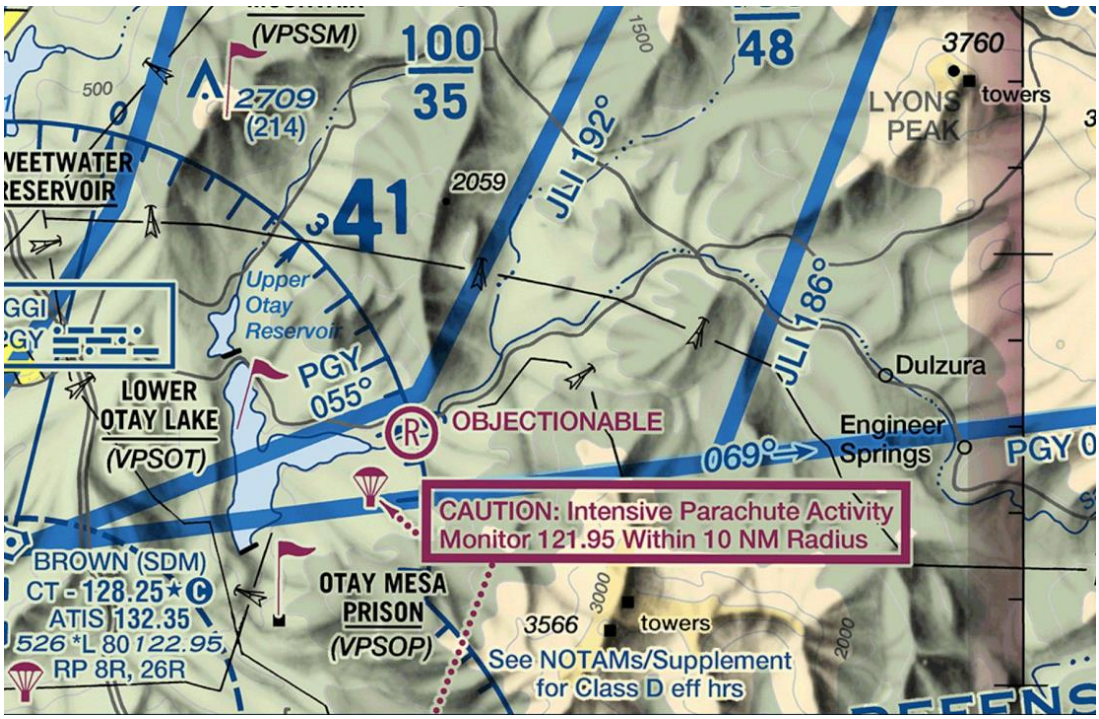
Pilots should avoid these areas and never loiter above them.

SUA.FAA.gov *depicts Special Use Airspace on a map*

tfr.faa.gov *lists and graphically depicts the TFRs.*

Unusual Chart Symbols

Objectionable Airspace



Objectionable airspace determinations can be based upon a number of factors, including conflicting traffic patterns with another airport, hazardous runway conditions, or natural or man-made obstacles in close proximity to the landing area. Private airports can be labeled Objectionable when they potentially conflict with their surrounding airspace. In the case above, Nichols Field, is located under the San Diego Class B shelf. The problem? They drop skydivers through the Class B from 13,000 feet. That's above the Class B, but they enter the Class B from the top.

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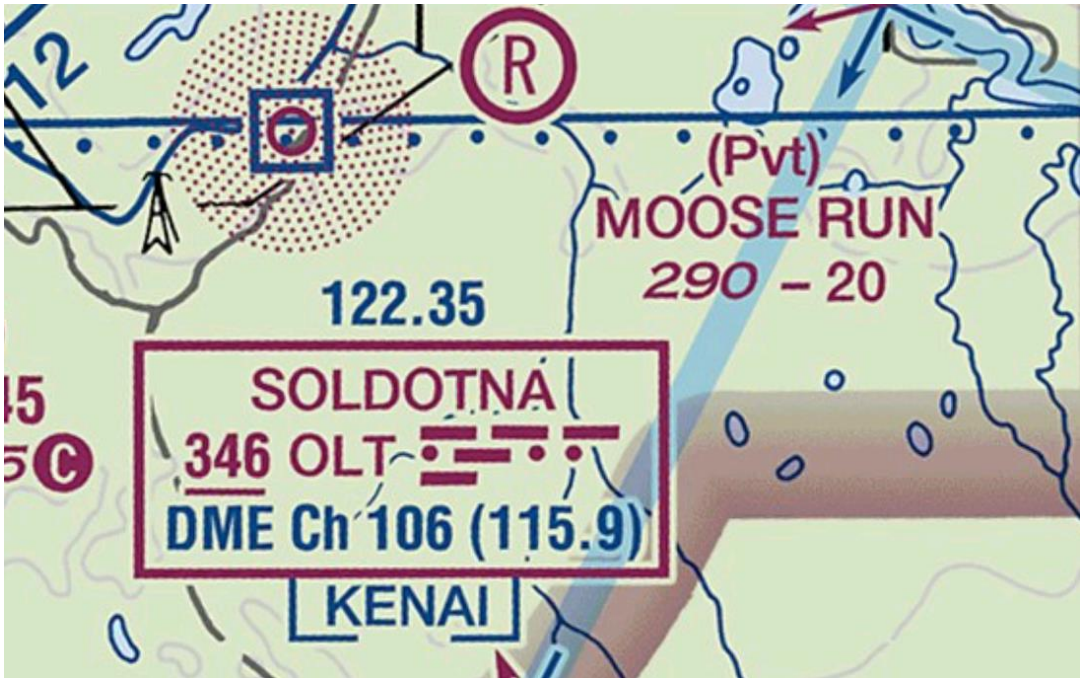
An NDB with DME



An NDB symbol with a blue square around it is very rare. This symbol means it's an NDB with a DME.

To use it, dial the NBD frequency in your ADF. Then, dial the VOR frequency in your NAV radio. You won't get a VOR signal on your CDI, but if you have a DME receiver, you'll receive the DME.

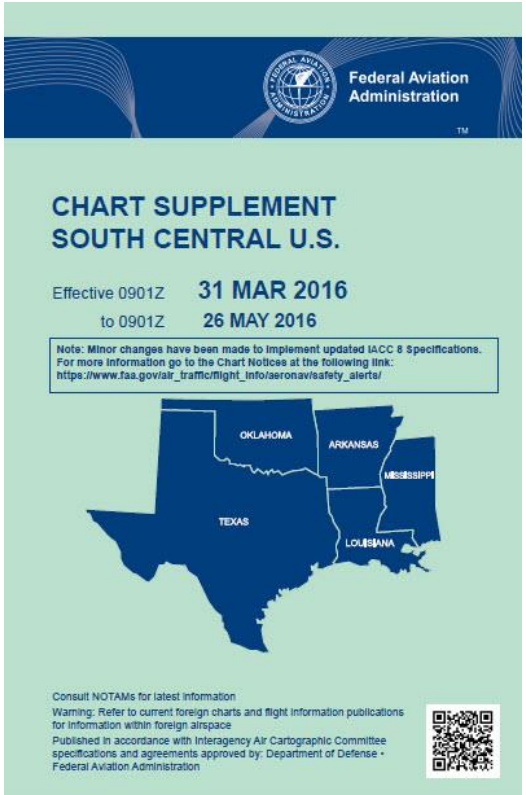
AC

Aeronautical Charts

Electronic Flight Bags (EFBs)

A current EFB is a legal replacement for paper charts and you are not required to carry backup if you are operating as part 91 single engine piston. Advisory Circular 120-76B is in reference to part 91F (Large and Turbine-Powered Multiengine Airplanes).
AC 91-78 is aimed at Part 91 operators, VFR or IFR and states that EFBs can be used in all phases of flight in lieu of paper.
A backup data source is suggested, but is not required. Note that your backup can be another electronic device.

Always fly with a current chart, either paper or an EFB.

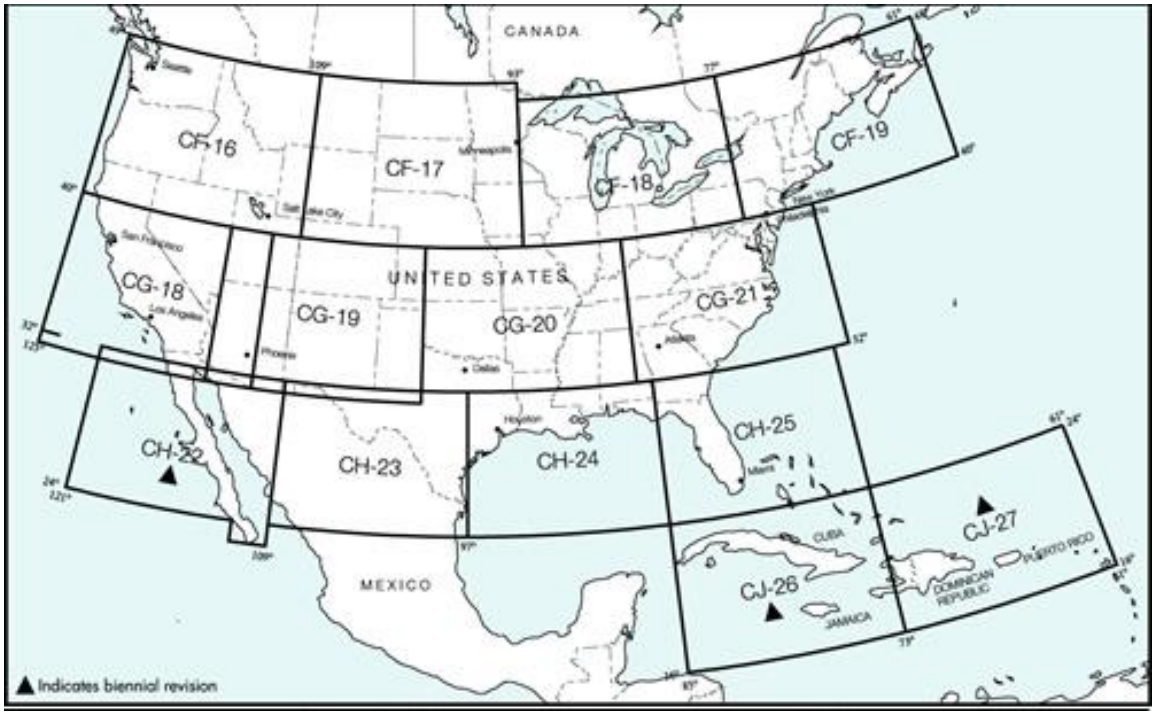


The Chart Supplement

The Chart Supplement (formerly the Airport Facility Directory or A/FD):

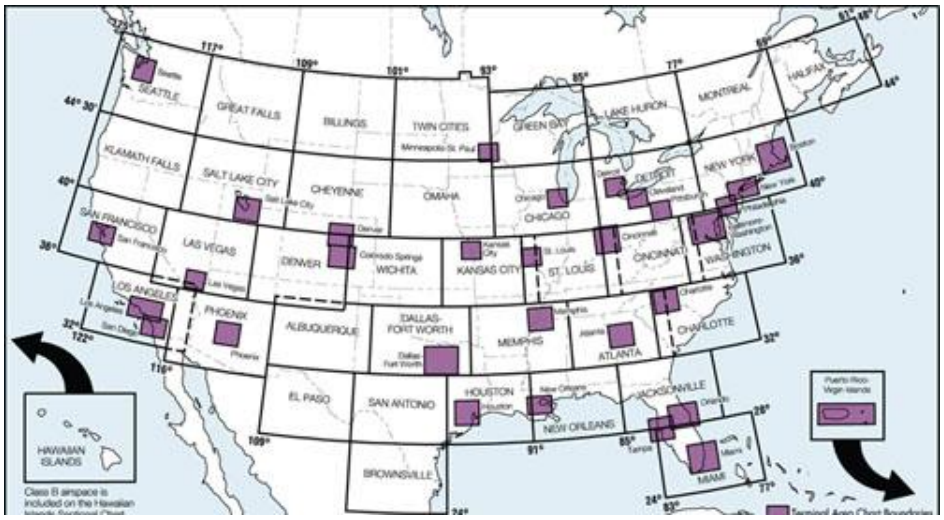
- Contains **Aeronautical Chart Bulletins** and changes to current charts.
- FAA NOTAMS contain changes that may have occurred since a CURRENT chart was published.
- The Chart Supplement is available FREE online at https://www.faa.gov/, (or search online for “Chart Supplement”).

World Aeronautical Charts (WAC)



- Revised annually,
- Designed for moderate speed aircraft and visual navigation.
- Some Alaskan, Mexican, and Caribbean WACs are revised every two years.

Sectional Charts



- Revised every six months,
- Designed for slow or medium speed aircraft and visual navigation.
- They're named after a major city on the chart.

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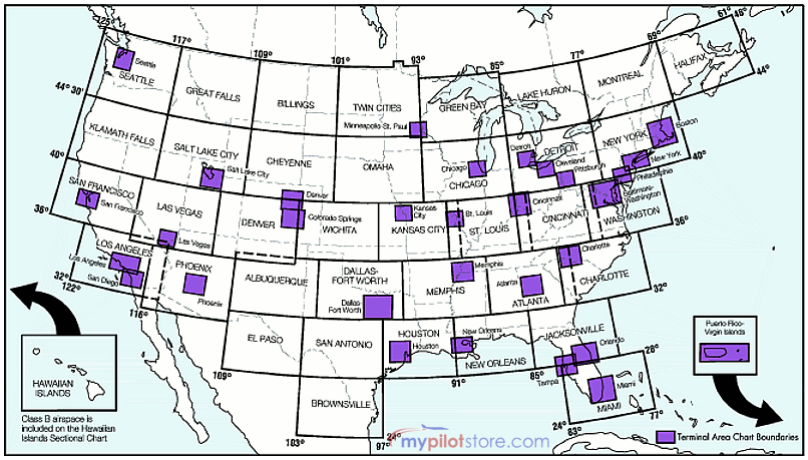
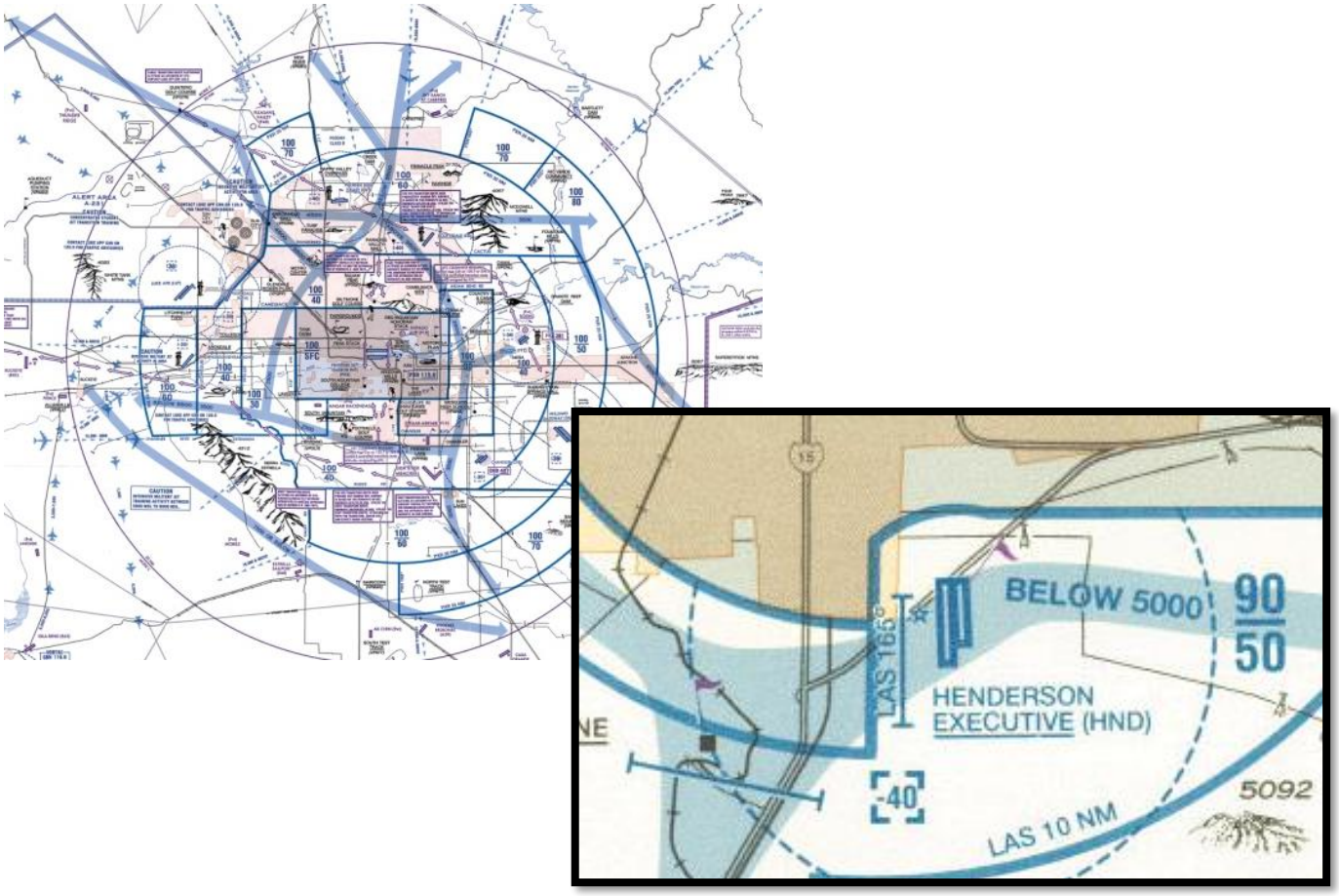
Terminal Area Chart (TAC)



- Revised every six months,
- TACs are designed for slow or medium speed aircraft and visual navigation.
- Greater detail and perfect for use in congested areas.

The TAC's VFR Flyway Planning Chart depicts flight paths to help you remain clear of busy traffic. (Printed on the back of the TAC)



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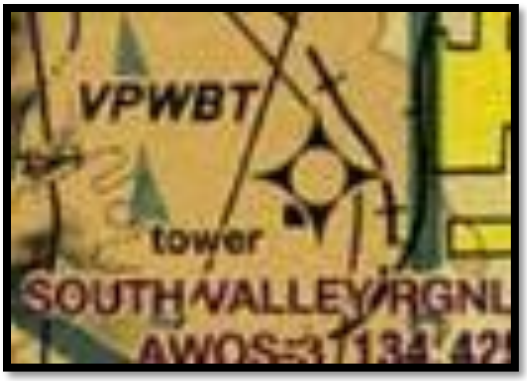
VFR waypoints are found on the TAC.

- They are named using five letter fixes that start with **VP**, such as **VP**GLX. These waypoints are handy because they can be entered in your GPS.
- They are depicted by either a magenta flag symbol or a black waypoint circle star symbol.



Correcting for Magnetic Variation

Measure the TRUE heading, and using the magnetic variation shown on the chart:

- Add a West variation to the true heading for a MAG Heading
- Subtract an East variation from the true heading for a MAG Heading.

East is least

West is best

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Chart Quiz

Questions: On the below Phoenix Sectional, Chandler (CHD) has a part time tower. (1) This is indicated by _____. The tower uses two frequencies. (2) The frequency _____ is used for CTAF when the tower is closed.
(3) The _____ indicates CTAF. (4) Do you fly a Left or Right pattern for runway 4L?

Answers:

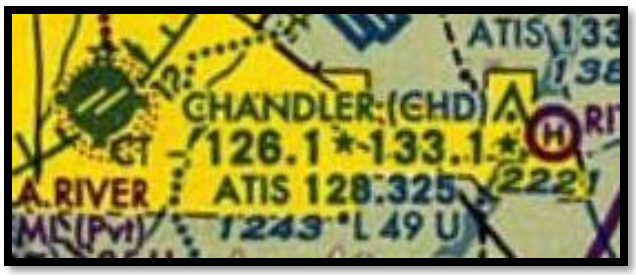
(1) The star ★

(2) 126.1 – the frequency to the left of the circled C is the CTAF.

(3) Circled C

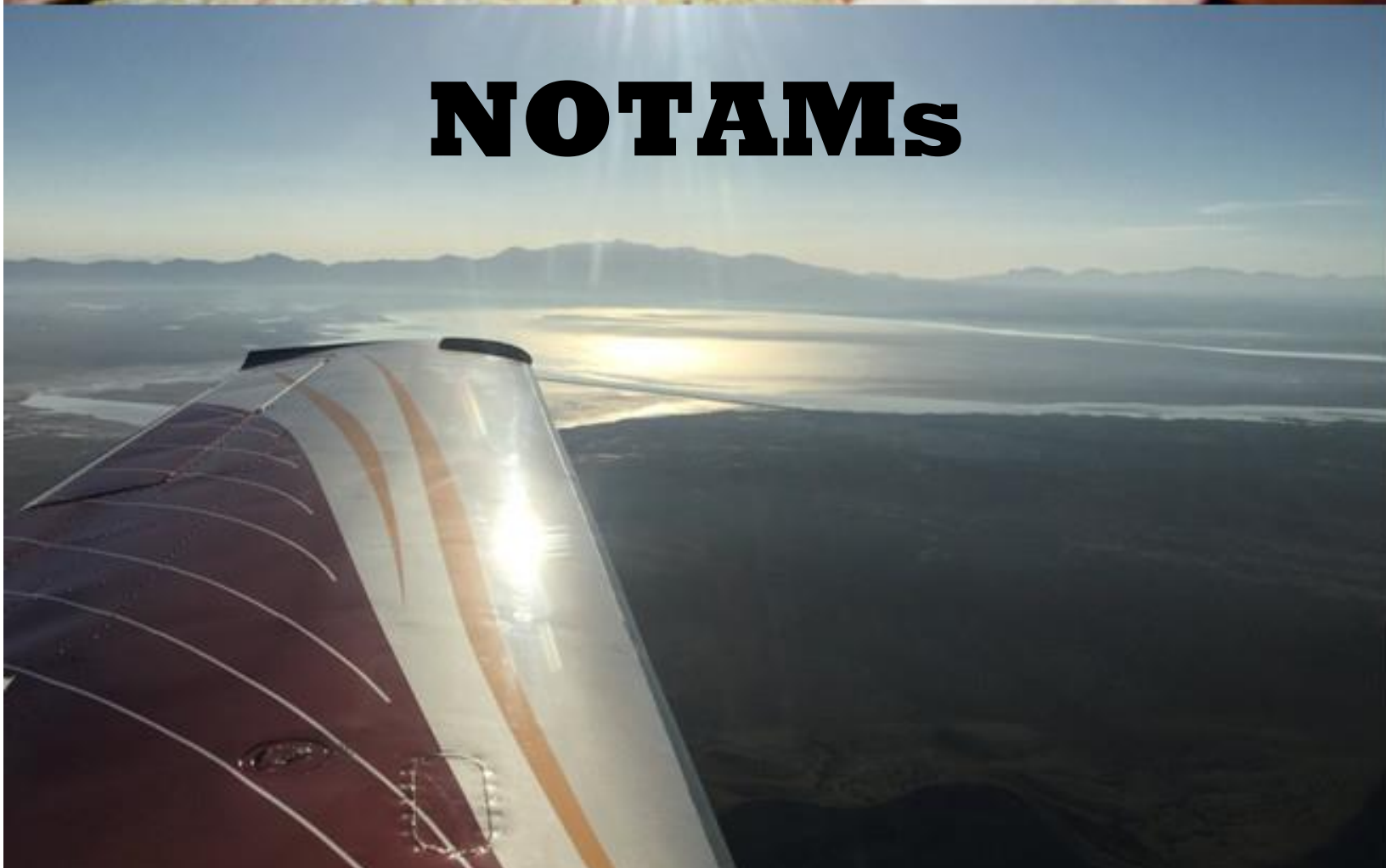
(4) Left. 4R and 22R use a right pattern.

The WAC Chart covering the same area does not indicate the after- hours CTAF frequency, the UNICOM frequency, nor the non-standard pattern directions.



NOT

NOTAMs



FAA posts NOTAMS at https://notams.aim.faa.gov/notamSearch/

Distant, or "D" NOTAMs include:

Time critical information that may affect safety, such as:

- Airport closure
- NAVAID Status
- Runway Conditions
- Radar Service Capability
- Personnel and Equipment near runways
- Key words within the first part of the text specifying what the NOTAM concerns. For instance:
    - RWY (Runway)
    - TWY (Taxiway)
    - SVC (Services

D NOTAM examples:

- LAX NAV RWY 24R ILS OTS WEF 1106132100-1106132300
- LAX TWY C CLSD BTN TWY P,C12 WEF 1106111400-1106131400
- CDC 01/044 DXZ RWY 19 MALSR CMSN

New changes to the NOTAM System were implemented on June 30, 2011. **UAR** NOTAMs, and **USD** NOTAMs, (applying to departure and arrival procedures), previously listed in the Airspace NOTAMS section, now appear in the **FDC NOTAMs** section with the keywords of SID, ODP and STARS.

FDC NOTAMS (Flight Data Center) *are regulatory and include:*

- Amendments to Instrument Approach Procedures, Standard instrument departures (SIDs), Graphic obstacle clearance departures (ODPs) and Standard terminal arrivals (STARs)
- Airspace usage.
- TFRs and permanently closed airports.

FDC NOTAM example:

FDC **1/3124** (KLAX A1338/11) LAX FI/T SID LOS ANGELES INTL, LOS ANGELES, CA. GABRE SIX DEPARTURE DEPARTURE ROUTE DESCRIPTION: EXPECT ATC CLEARANCE AT 12,000.

SAA NOTAM (Special Activity Airspace)

These are issued when Special Activity Airspace will be active outside the published schedule times and when required by the published schedule.

SAA NOTAM example:

!ABQ 10/061 ABQ AIRSPACE PJE WITHIN AREA DEFINED AS 5NM RADIUS OF ABQ1000017 SFC-6500FT 1310090230-1310090630

GPS NOTAMs

GPS NOTAMs can be located online at https://notams.aim.faa.gov/notamSearch/

From the “NOTAM Functions” menu, select “View All GPS NOTAMs

Example: GPS **05/016** (KNMH A0037/11) GPS NAV PRN 30 OTS

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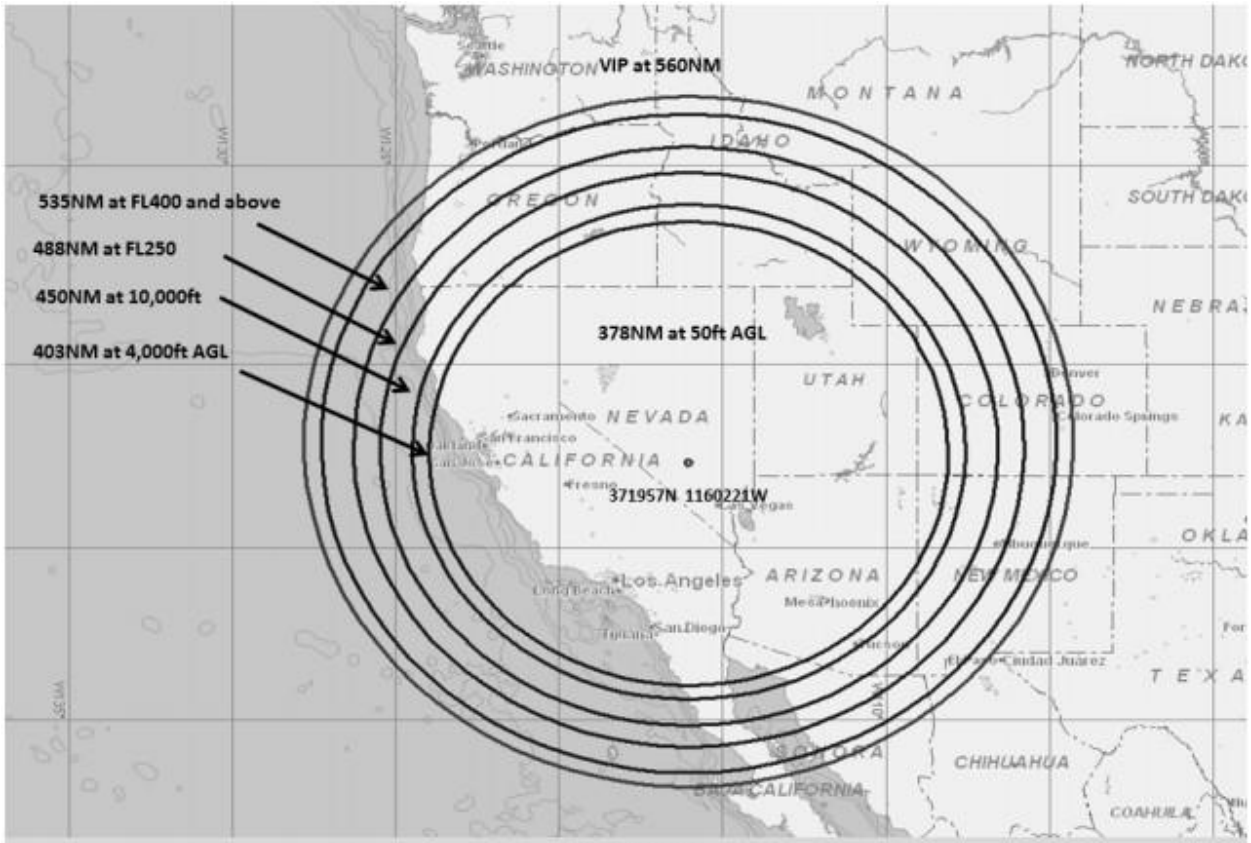
Here's a NOTAM for GPS Interference Testing at ZLA LOS ANGELES (ARTCC) PALMDALE, CA:

!GPS 04/050 (KZLA A0965/17) ZLA NAV (NTTR GPS 17-04) GPS (INCLUDING WAAS, GBAS, AND ADS-B) MAY NOT BE AVBL WI A 535NM RADIUS CENTERED AT 371957N1160221W (BTY033047) FL400-UNL, 488NM RADIUS AT FL250, 450NM RADIUS AT 10000FT, 403NM RADIUS AT 4000FT AGL, 378NM RADIUS AT 50FT AGL. 1704161830-1704162230

This NOTAM sounds terrible and you wonder, "How am I going to receive the necessary GPS signals flying through that area? Actually, the biggest threat (emphasized in red) is an area with a 378 nm radius. However, in this area, you'd need to be cruising at 50 feet AGL and below to be affected. There are also small bands affecting aircraft at 4,000 feet AGL and 10,000 feet AGL.



NTTR 17-04
GPS INTERFERENCE TESTING

Why does the military introduce GPS interference testing? GPS is great, but they never want to rely entirely on GPS in time of war. These exercises are held to test their ability to operate should GPS not be available.

AO

AIRPORT OPERATIONS

Taxiway and Runway Operations

"Taxi To . . ."

ATC Ground Controllers are required to provide explicit taxi instructions to cross or hold short of each runway that intersects the taxi route . . . ("Cessna XYZ, taxi to runway 21 Left via Alpha and Lima. Cross runway 05, hold short of Runway 21 Right.")

Land and Hold Short Operations (LAHSO)

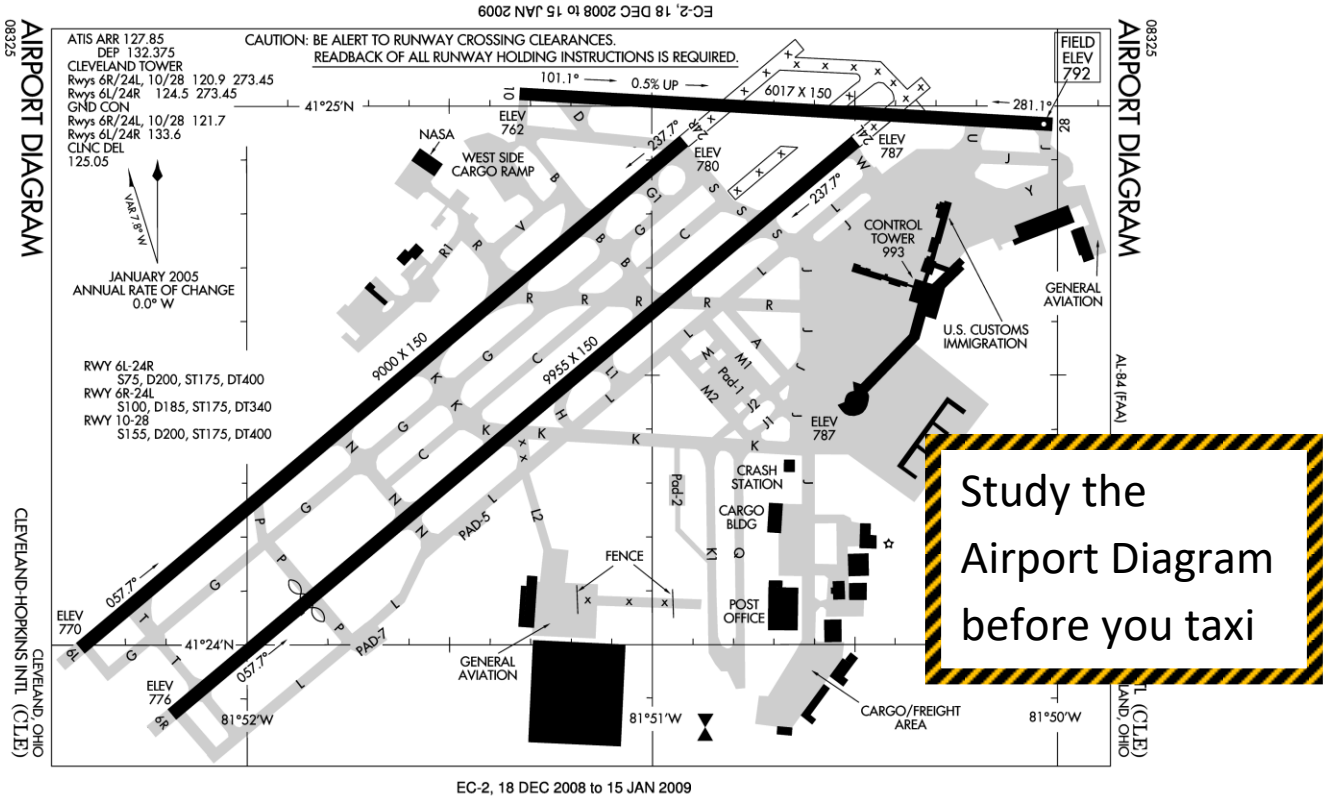
Requires ceiling and visibility of 1000 & 3 (AIM 4-3-11)

- ATC may clear a pilot to land and hold short, and if the PIC believes there's enough available landing distance (ALD), he or she can accept a LAHSO clearance.
- ALD data can be found in the Chart Supplement (formerly the Airport Facility Directory or A/FD)
- . Controllers will also provide ALD data upon request.
- Student pilots and pilots not familiar with the airport should not accept "Land and Hold Short" clearances.

Safe Taxi Tips

Before You Taxi for Takeoff:

- Study the airport diagram, noting potential hot spots and areas of confusion.
- Plan your taxi using the airport diagram.
- When ATC provides taxi instructions, don't rely on your memory. Write it down.
- Focus on ATC's instructions, and not on how you may have done it a thousand times before. This time it might be different.
- Resolve questions about your clearance with ATC before you move your aircraft. If you're taxiing, stop! It's much easier to ask ATC now, than to explain yourself later.
- Program the flight navigational and communication equipment on the ramp prior to taxi, or while in the run up area – never while the aircraft is in motion.



Study the Airport Diagram before you taxi

Taxiing for Takeoff

- Keep a mental map of other traffic.
- All taxi operations are VFR –see and avoid".
- Observe a sterile cockpit while taxiing. Keep your conversation professional and operationally focused.
- Always monitor the assigned frequency.

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- When you're on the runway, holding in position, the controller will advise you of other aircraft that are on final for your runway, or those that are taking off or landing on intersecting runways. Mentally map other aircraft and their positions.
- When cleared to "line up and wait", note the time. If the tower controller has not cleared you for takeoff in 30 seconds, ask the controller, "How much longer?" (The controller may have forgotten you).
- Verify compass headings, comparing them to taxiways and to the assigned runway. This will help ensure that you don't wander onto the wrong taxiway, or take off on the wrong runway.
- At night, use the edge lighting to distinguish between taxiways and runways.

Always read back "hold short" instructions

For a chilling video of what can happen when pilots and controllers are confused, the video is on YouTube. Search for "Runway Incursion Providence"

Runways 2/20 & 13/31

Some runways make it easy to transpose the numbers. Take extra care.

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A Fighting Chance for the Controller

When ATC gives you a crossing clearance, read back the clearance, and then wait a few seconds. If the controller does not change his/her mind, (retracting the clearance), then start your taxi.
This technique gives the controller a “fighting chance” to stop you if you misunderstood a clearance, answered for another aircraft, or if the controller made a mistake.

“Read back- Hear back” is a method used by pilots and ATC. When the pilot reads back the clearance and the controller hears back the response, he or she is checking for the correct pilot understanding.

Before You Land

- Review the airport diagram, noting potential hot spots and areas of confusion.
- An early landing clearance is a cause for alert. The controller might forget you and focus on other aircraft.
- *Plan your taxi using the airport diagram, asking yourself:*
  - What runway exit will I probably use?
  - What’s my goal? Left or right to the FBO, fuel pumps, hangar, or tie downs?
  - Which runways will I need to cross (with clearance, of course)?

After Landing

- Clear the runway’s protected area, ensuring your entire aircraft is beyond the runway hold line, then stop your aircraft.
- Obtain taxi clearance before proceeding.

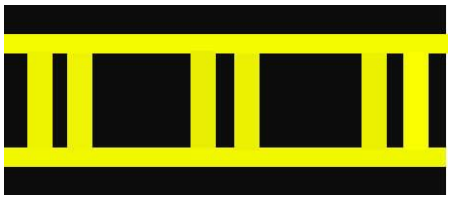
Airport Signage

“Yellow on black.
It’s where you’re at.”

Location Sign

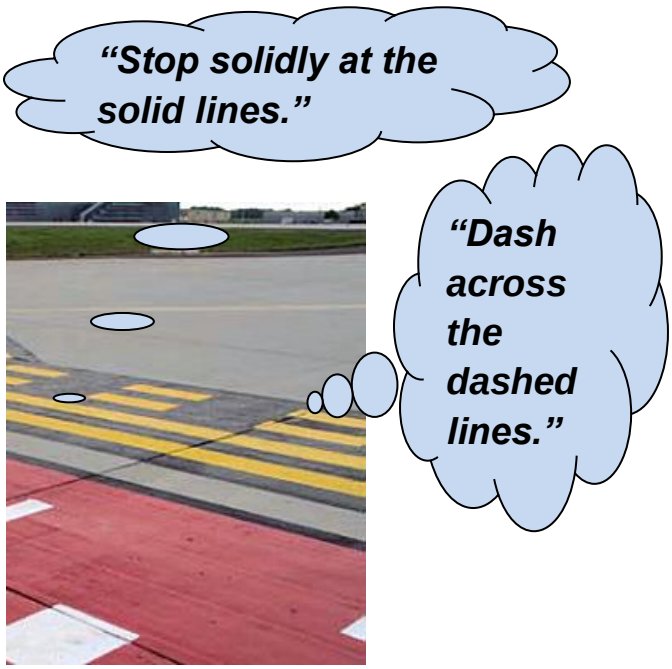
ILS Hold Sign and its associated Taxiway Markings:

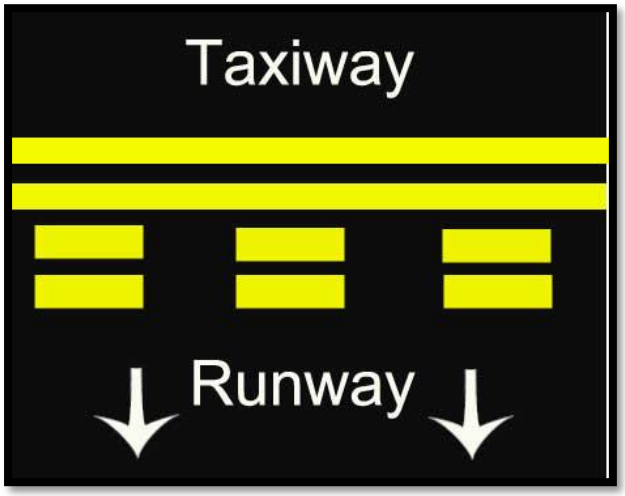
Hold here when instructed by ATC, because approaches are being conducted with ceilings and visibility less than 800' and 2.



Taxiing beyond the taxiway markings can interfere with aircraft on the ILS approach.

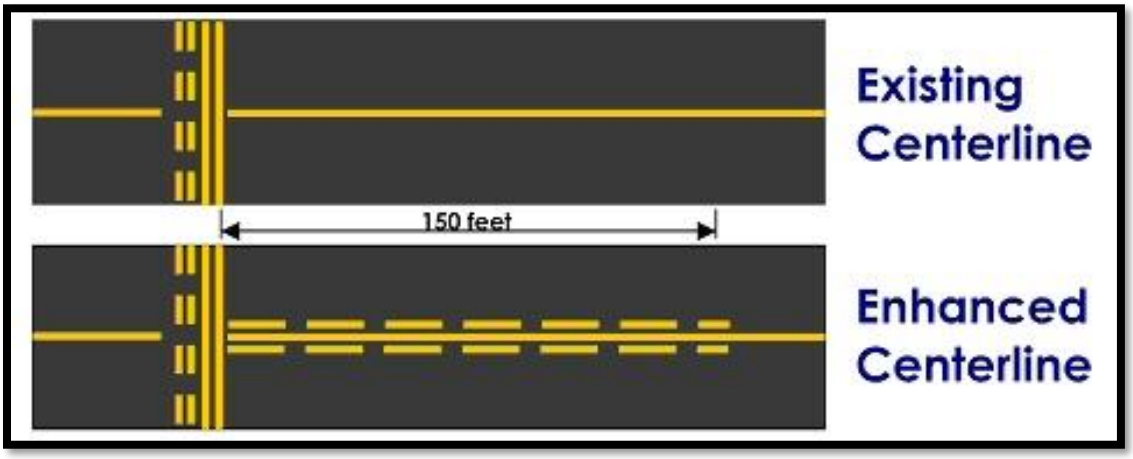
Edge of the Runway's Protected Area Marking: *(Yellow on black).*





Enhanced Centerline

Yellow dashes placed on both sides of the taxiway centerline within 150 feet of the runway hold-short line. These dashed llines alert pilots that they are approaching a runway holding position.



Edge of the Non-Movement Area (Ramp) and Taxiways Marking (Controlled, Movement Area): (Yellow on black)

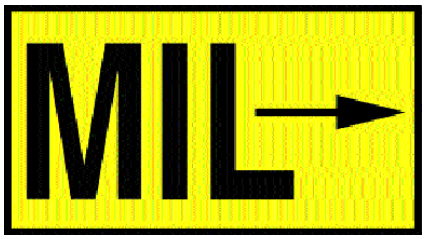
STOP and get a clearance before you taxi beyond the solid line.

<u>Common</u> Taxi Route to Multiple Destinations / Runways:

(Black on yellow separated by a “dot”). In this instance, runways 27 **and** 33 are to your right.

<u>Different</u> Taxi Routes to Multiple Destinations / Runways:

(Black on yellow separated by a vertical line). Two or more destinations reached by different routes.



Inbound Destination Sign:

(Black on yellow). In this instance, the military installation is to your right. Other examples are *Cargo*, *Term* (Terminal), *Ramp*, etc.

No Entry Sign:

(White on red). Aircraft are prohibited. This sign would be found at the entrance to a one-way taxiway, or at the intersection of a road intended for vehicles.

Approach and Hold Sign:

(White on red). Hold here unless instructed by ATC.
At an uncontrolled airport, proceed when a traffic conflict does not exist.

Mandatory Instruction Signs:

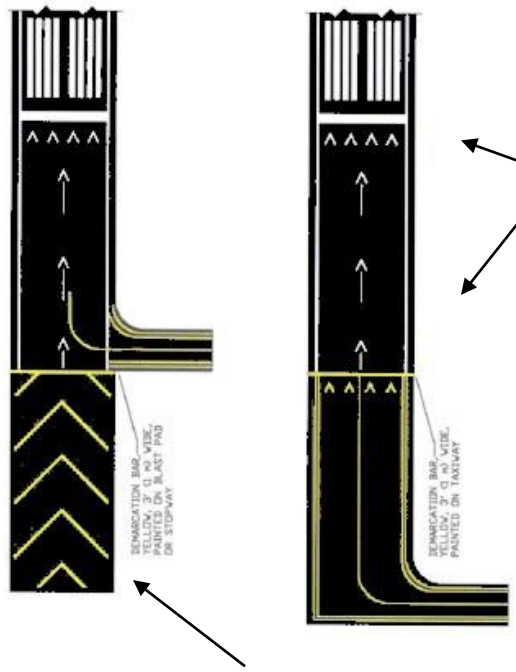
These are white on red and denote an entrance to a runway, ILS critical area, or a prohibited area. This sign indicates that you are on taxiway Alpha and are about to cross (or hold short of) runway 18/36.

Closed Runway Marking

*AOPA's Air Safety Institute offers a course entitled **"Runway Safety".***

Displaced Thresholds & EMAS

Displacement of a threshold reduces the length of runway available for landings.
The portion of the runway behind a displaced threshold **is available for takeoffs** - in either direction and for **landing rollouts from the opposite direction.**



A displaced threshold.

E**ngineered **M**aterials **A**rresting **S**ystem **(EMAS)

Areas **unusable for taxiing, takeoff or landing**, are marked with yellow chevrons. It could be constructed with solid material, or EMAS material. EMAS has the appearance of a full strength pavement, but it's actually designed to help *bog down* an aircraft before it runs off the runway.

A/FD example: ARRESTING GEAR/SYSTEM RWY 28L: EMAS

Airport Lighting

Runway Threshold Lights at the end of the runway are marked with green lights.

Some airports have bi-color lights – green when viewed when you are on approach for landing, and red when viewed while you are rolling out after landing.

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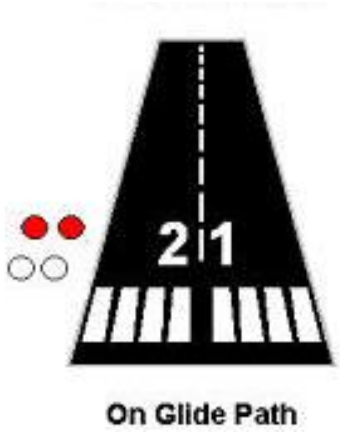
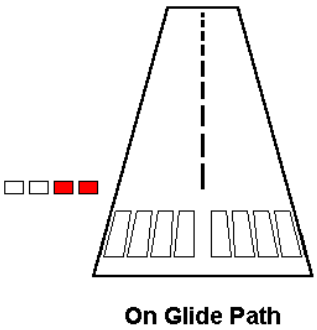


Visual Approach Slope Indicator (VASI)

The VASI provides safe obstacle clearance within +/- 10 degrees of the extended runway centerline and out to 4 nautical miles from the runway threshold. VASI glide paths are normally set at 3º. To ensure obstacle clearance, some locations are as steep as 4.5º. Three-bar VASI systems provide two visual glide paths, an upper and a lower. The near and middle bar represents a 3º glide path, used by most general aviation pilots. The far and middle are for "high cockpit aircraft", like a B-747. VASIs provide safe obstruction clearance within plus or minus 10 degrees of the extended runway centerline out to 4 NM from the runway threshold.

The Tricolor VASI System has a single light: Below glide path – red, above glide path – amber, and on glide path – green.



Precision Approach Path Indicator (PAPI)

PAPIs are visible from about 5 miles during the day and up to 20 miles or more at night. (AIM section 2-1-2). Two white and two red lights indicate that you are on the glide path. Three or more red lights and you're below the glide path. Three or more white lights and you're above the glide path. PAPIs provide obstacle clearance within plus or minus 10 degrees of the extended runway centerline out to 3.4 NM from the runway threshold.

Runway End Identifier Lights (REILs) are pulsating strobe lights on each side of the runway threshold. These help to distinguish or highlight the runway:

- In areas with high levels of non-airport lighting.
- In areas with low contrast with the surrounding terrain.
- In reduced visibility conditions.

Instrument Approach Runway Lights

When landing on a runway served by an Instrument approach, the runway edge lights change from white to yellow the last 2,000 feet, (or the last half of the runway if it's shorter than 4,000 feet.)

Runway Guard Lights or "Wigwag Lights" are found only at runway/taxiway intersections. *They are either:*

- Elevated flashing lights on both sides of the taxiway, or
- A row of flashing yellow in-pavement lights.

Clearance Bar Lights are yellow *steady*-burning, in-pavement lights at taxiway holding positions, making those positions more visible.

Stop Bar Lights are a row of **red**, *steady*-burning in-pavement lights installed across the entire taxiway at the runway holding position. Following an ATC clearance to proceed, ATC turns the stop bar lights off and the taxiway centerline lead-on lights are then turned on, guiding you to the takeoff position.

Airport Rotating Beacon *(AIM 2-1-8)*

- Civilian airport beacon lights flash green and white.
- A military airport's rotating beacon flashes green followed by two quick flashes of white.
- A heliport can be identified by its green, yellow, and white beacon.
- A seaplane base's beacon flashes white and yellow.

Pilot Controlled Lighting (PCL)

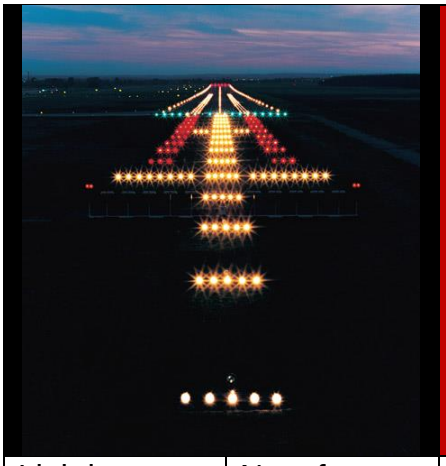
While the CTAF is commonly used to activate pilot-controlled lighting, the <u>proper frequency</u>, if different from the CTAF, can be found in the Chart Supplement (formerly the Airport Facility Directory or A/FD) and on standard instrument approach procedure charts.

Chart Supplement, (formerly the Airport Facility Directory or A/FD) sample:
"When twr clsd ACTIVATE HIRL Rwy 10-26 – CTAF".
Clicking seven times in five seconds should give you the highest intensity.

L next to the frequency on the Approach Chart indicates PCL

BAKERSFIELD TOWER ★
118.1 (CTAF) L 257.8

PCL – Runways with Approach Lights and those without



Runways with Approach Lights

Lighting System	No. of Intensity Steps	Status During Non-use Periods	Intensity Step Selected Per No. of Mike Clicks		
			3 Clicks	5 Clicks	7 Clicks
Approach Lights (Medium Intenstity)	2	OFF	Low	Low	High
Approach Lights (Medium Intensity)	3	OFF	Low	Med	High
MIRL	3	Off or Low	[1]	[1]	[1]
HIRL	5	Off of Low	[1]	[1]	[1]
VASI	2	OFF	[2]	[2]	[2]

NOTES:
[1] Predetermined intensity step
[2] Photocell Controlled – Low intensity at night; High intensity during day

Pilot Controlled Lighting may use a frequency other than the CTAF. Check the Chart Supplement (formerly the Airport Facility Directory or A/FD) for the **PCL Frequency**.

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Runways without Approach Lights

Lighting System	No. of Intensity Steps	Status During Non-use Periods	Intensity Step Selected Per No. of Mike Clicks		
			3 Clicks	5 Clicks	7 Clicks
MIRL	3	Off or Low	Low	Med	High
HIRL	5	Off or Low	Step 1 or 2	Step 3	Step 5
LIRL	1	OFF	On	On	On
VASI [2]	2	OFF	[1]	[1]	[1]
REIL [2]	1	OFF	OFF	ON/OFF	ON
REIL [2]	3	OFF	Low	Med	High

NOTES:
[1] Photocell Controlled – Low intensity at night; High intensity during day.[2] The control of VASI and/or REIL may be independent of other lighting systems.

Pilot Controlled Lighting may use a frequency other than the CTAF. Check the Chart Supplement (formerly the Airport Facility Directory or A/FD) for the **PCL Frequency**.

When either type of system is activated, a 15-minute countdown starts, after which the lights turn off unless someone makes the appropriate amount of clicks on the appropriate frequency.

Always initially key the mike 7 times to assure that all controlled lights are turned on to the maximum available intensity. If desired, an intensity adjustment can then be made, (where the capability is provided).

Even when the lights are on, always key the mike as directed when overflying an airport of intended landing, or just prior to entering the final segment of an approach. This will make sure that the aircraft is close enough to activate the system and a full 15 minutes of lighting duration will be available.

Runway Threshold Stripes

Number of Stripes	Runway Width
4	60 feet
6	75 feet
8	100 feet
12	150 feet
16	200 feet

This runway has 12 threshold stripes, so it's . . . 150 feet wide.

Traffic Patterns – No Tower *(FAR 91.126—127)*

Unless indicated otherwise, all standard turns are to the left. 1,000 feet AGL is the normal pattern altitude, but there may be different altitudes specified for turbines, jets, helicopters, gliders, etc. Check the Chart Supplement (formerly the Airport Facility Directory or A/FD). *(AIM 4-3-4)*

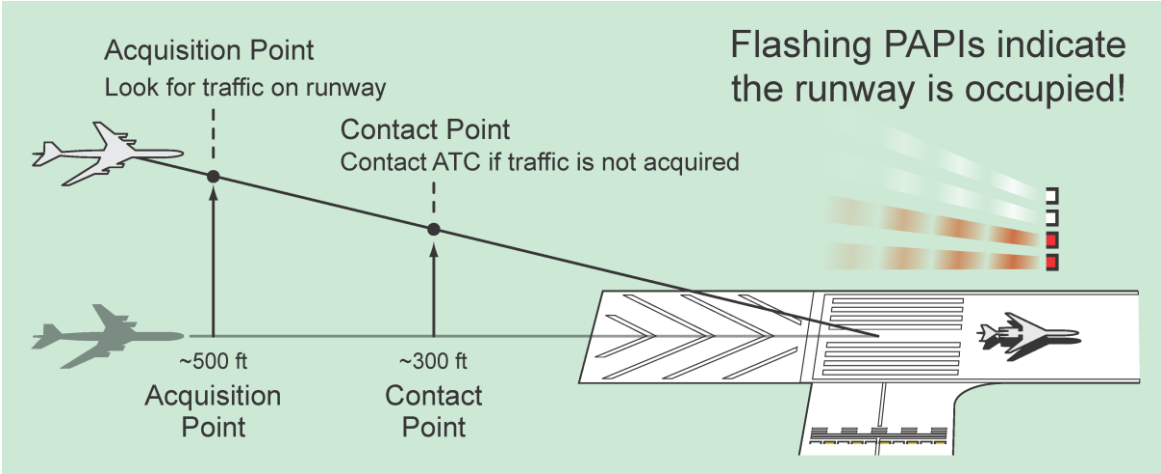
Some aircraft don't have a radio, so don't assume that everyone hears you. Standard entry is a 45 to downwind, but some people won't do that. Fly defensively and clear like your life depends on it.

Final Approach Runway Occupancy Signal (FAROS)

This system can detect an aircraft when it's on the departure end of the runway. The system will flash the PAPI lights as a visual alert to an aircraft on final that the runway is occupied.

When the pilot on approach sees a flashing PAPI, he or she must:

- At 500 feet AGL – look for traffic on the runway
- At 300 feet AGL –contact ATC for resolution
- If no resolution – execute a go-around



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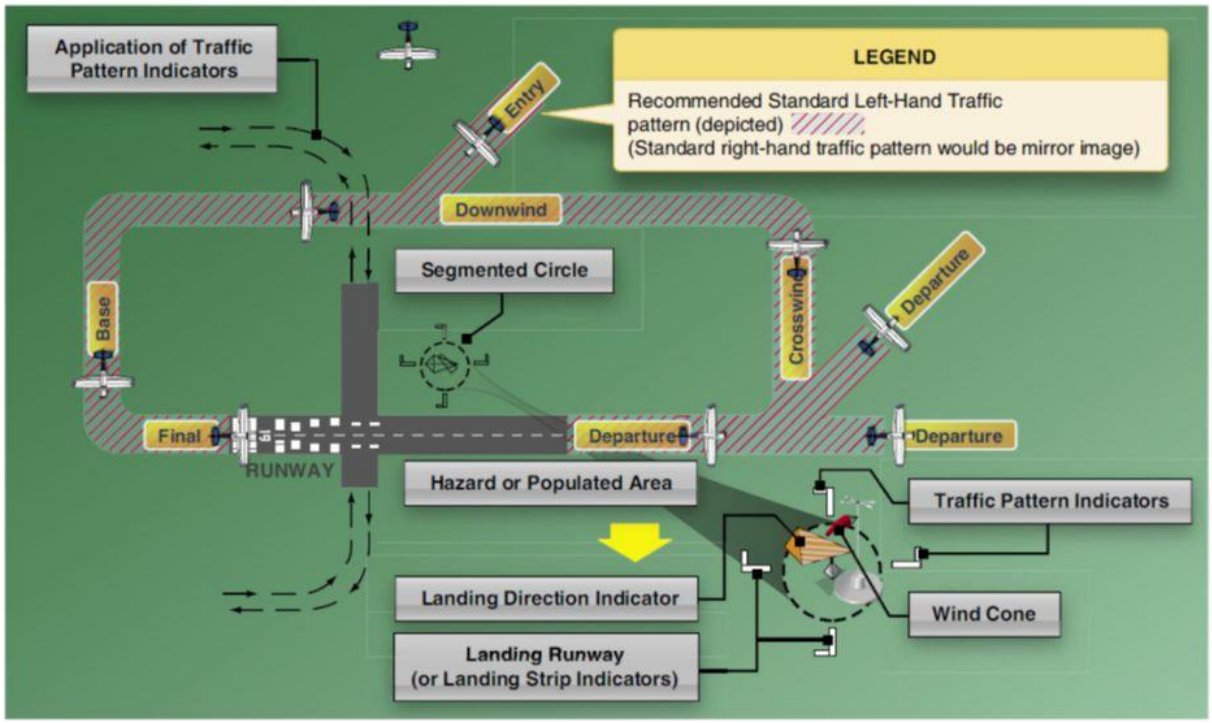
Airport Traffic Pattern



Tetrahedrons can be manually set to show the preferred runway.

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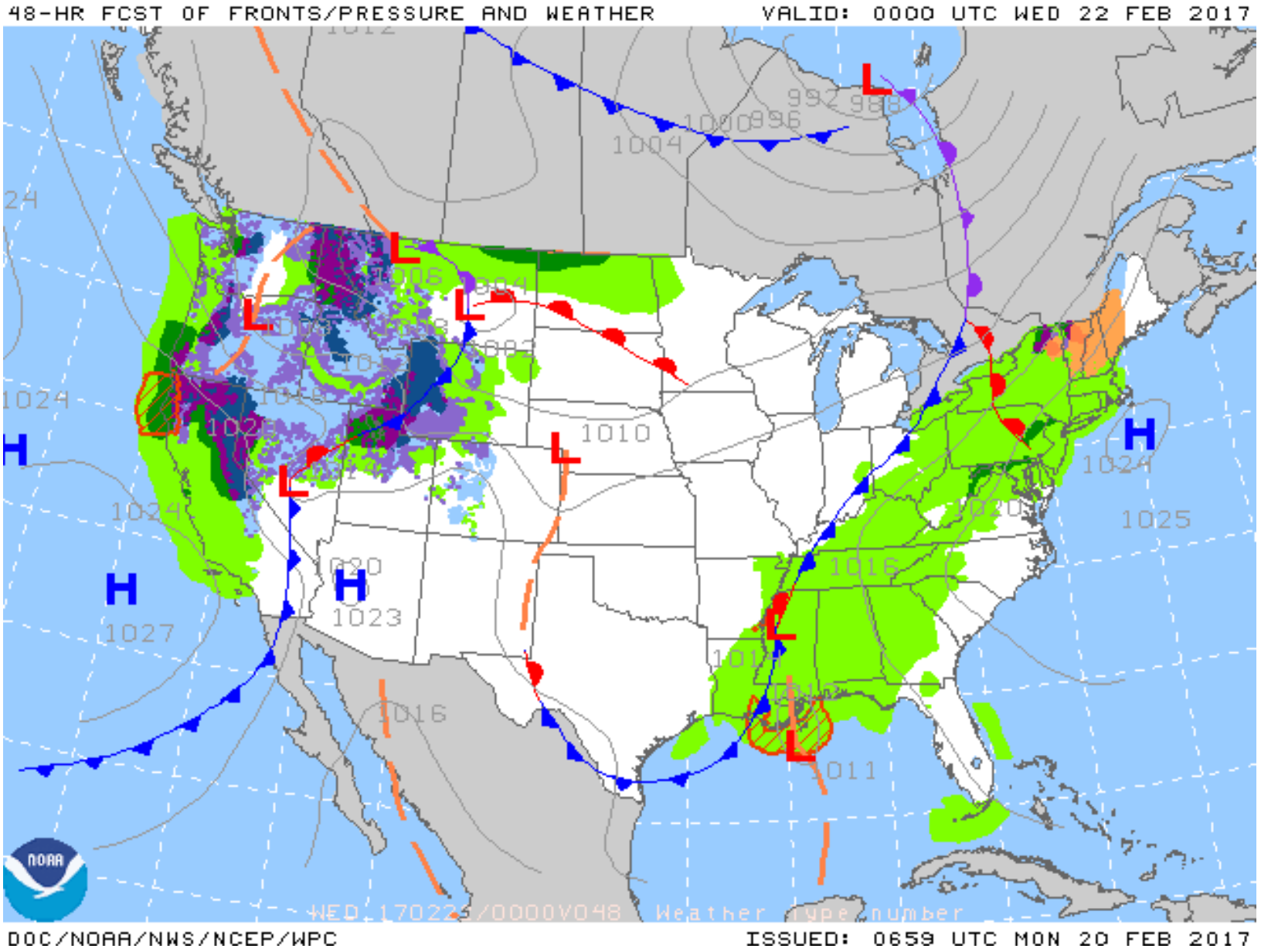
WX

Weather



When you are planning a flight, a good place to begin is with the Surface Analysis or Prog Chart (shown above)

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Next, consider:

- National forecast charts
- Radar/satellite imagery
- Local observations

This flow uses a building block approach, so each new piece of data, like a METAR, fits into a larger theme.

METAR is derived from the French phrase, "*message d'observation **mét**éorologique pour l'**a**viation **r**égulière".* A **SPECI**, short for "Special", is a METAR that is issued because the weather conditions changed significantly prior to the planned next routine reporting cycle.

METARs are Reported using:

- VISIBILITY – Statute miles.
- CLOUD HEIGHTS - AGL.
- WIND DIRECTION - True.
- WIND SPEEDS - Knots

METAR Example:

METAR KLGA 051853Z 04011KT 1/2SM VCTS SN FZFG BKN003 OVC010 M02/M02 A3006 RMK AO2 TSB40 SLP176 P0002 T10171017=

METAR Example Decoded:

KLGA – weather reported at LaGuardia Airport, NY
051853Z indicates the day of the month is the **5th** and the time of day is **1853** Zulu time.
04011KT indicates the wind direction (true) and speed – **040 at 11 knots**. **(00000** would indicate calm winds). (**150V210** = direction is variable between 150º to 210º).
(**VRB005KT** = direction is variable and wind speed is less than 6 knots)
1/2SM indicates the prevailing visibility is ½ statute mile (SM).
VCTS indicates there is a thunderstorm in the **vicinity**, (within 10SM, but beyond 5SM).
SN indicates **snow** is falling at a moderate intensity. **+SN** = heavy. **–SN** = light. **(RA** would indicate rain).
FZFG indicates the presence of **freezing fog**.
BKN003 indicates a **broken** cloud layer at **300 feet AGL**.
OVC010 indicates an **overcast** cloud layer at **1,000 feet AGL**.
M02/M02 indicates the temperature is **minus 2° Celsius** and the dew point is **minus 2°** Celsius. (**M02/** A3006 would indicate that the dewpoint is missing).
A3006 indicates the altimeter setting is **30.06**
RMK indicates the **remarks section follows**.

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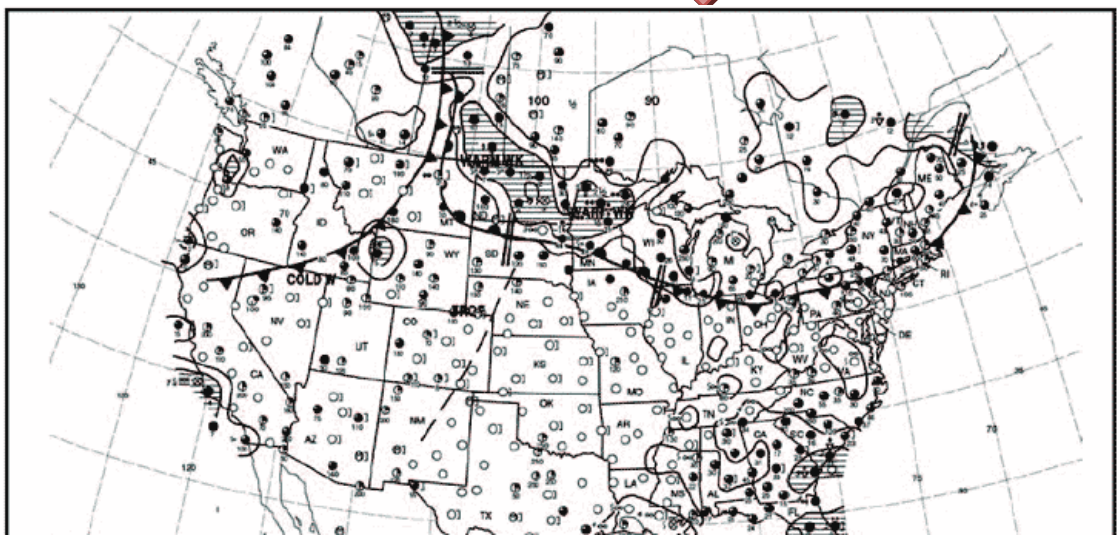
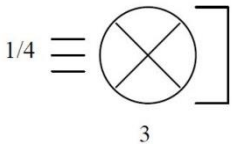
AO2 indicates that the station has an **automated precipitation sensor. (AO1** sensors cannot discriminate between freezing & non-freezing precipitation. **AO2** sensors <u>can</u> discriminate).
TSB40 indicates the **thunderstorm began 40 minutes after the top of the hour at 1840 Zulu time.**
SLP176 indicates the current barometric pressure extrapolated to sea level is **1017.6 millibars**
P0002 indicates that **0.02 of precipitation** accumulated during the last hour.
T10171017 indicates the temperature is 29°F, (converted to minus 1.7° Celsius), and the dew point is 29°F, (converted to minus 1.7° Celsius).
= indicates the **end** of the METAR report.

All the METARs in the United States are graphically displayed on the "Weather Depiction Chart"



Weather Depiction Chart Symbols

Few clouds (no cloud height is given for "few".



Total obscuration. Vertical vis: 300 feet. ¼ mile fog. The bracket to the right indicates that the report is from an automated system.

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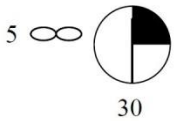
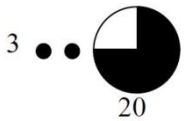
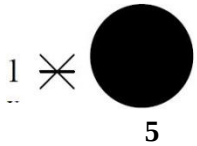
Scattered clouds at 2,500 ASL.



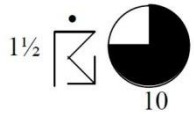
Scattered clouds at 3,000 AGL with 5 miles visibility and haze.



Broken clouds at 2,000 AGL with 3 miles visibility and continuous rain.

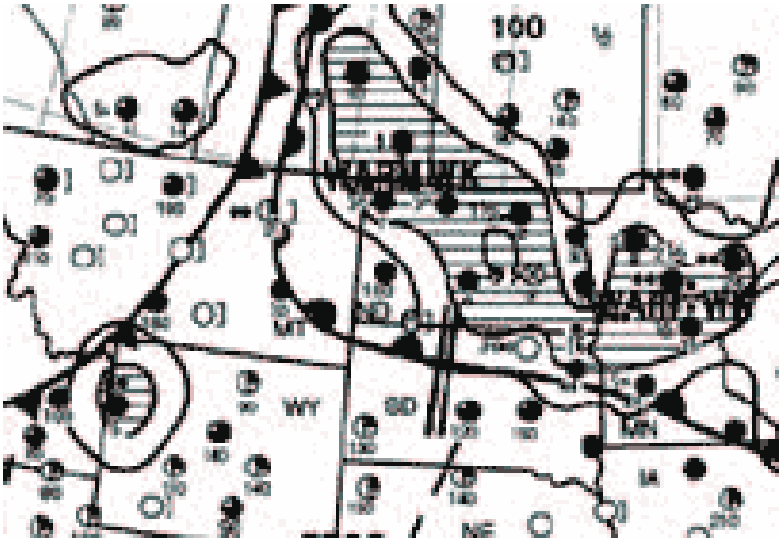


Overcast clouds at 500 AGL with 1 mile visibility and intermittent snow.



Broken clouds at 1000 AGL with 1 ½ mile visibility and there is also a thunderstorm with rain shower.

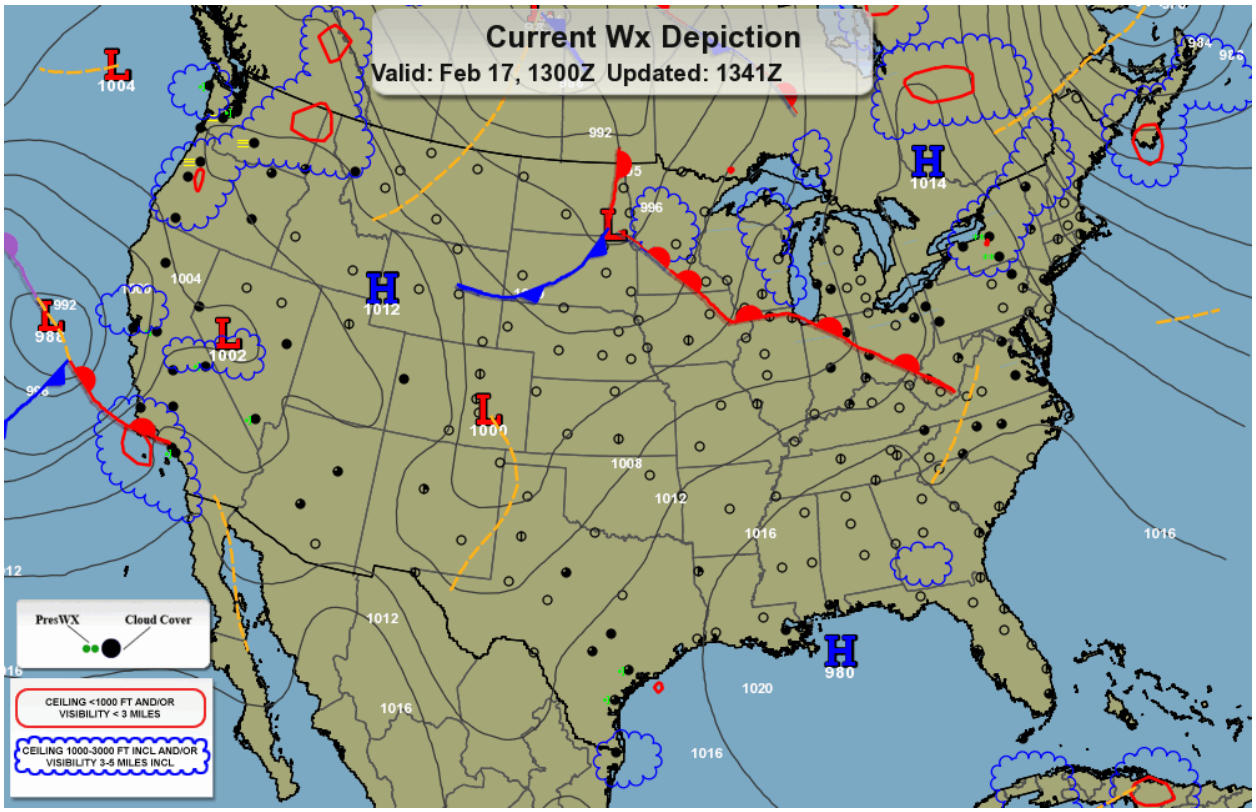
Missing cloud cover or partial obscuration.

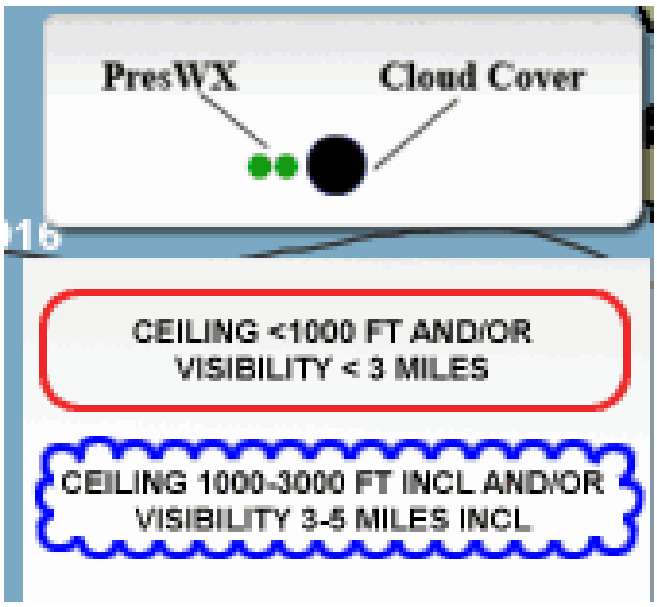


IFR areas are depicted by shading inside the contours. Contours without shading depict Marginal VFR (MVFR). Good VFR is reported outside the contours.

Color Weather Depiction Charts are presented at

https://www.1800wxbrief.com/





IFR areas are depicted inside the red areas. Marginal VFR is inside the blue cloud-like areas.

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Forecasts

Graphic Area Forecast

The Area Forecast has been officially discontinued for the contiguous United States, so now we use use the Graphic Area Forecast (GFA).

Terminal Airdrome Forecasts (TAFs) are valid for an area within a 5 mile radius of the airport.TAFs are issued four times daily and amended as necessary. The terminal forecast is an invaluable tool for pilots, whether IFR or VFR. Remember, the age of the TAF says a lot about its accuracy. A four-hour old TAF is worth less than a brand new one. Read and understand the terminal forecast, but don't give it too much weight – a good option is to read the forecast discussions found in many apps these days, which try to quantify the uncertainty found in most TAFs.

TAF Example

KXYZ **AMD** 241732Z **2418/2524** 11006KT 4SM -SHRA BKN030
FM242300 22006KT 3SM -SHRA OVC030
PROB30 2504/2506 VRB20G35KT 1SM +TSRA BKN015CB
FM 250600 250010KT 4SM -SHRA OVC050
TEMPO 2508/2511 2SM -SHRA OVC030=

TAF Example Decoded

AMD means that this is an amended forecast.
2418/25: Indicates the valid time of the 30-hour TAF, where 2418 is the 24th day at 1800 UTC, and 2524 is the 25th day at 2400 UTC, (or 0000 UTC on the 26th).

FM242300: Indicates a significant and rapid change to a new set of prevailing conditions, in this case starting at 2300 UTC on the 24th.

PROB30: Indicates the probability of the occurrence of a thunderstorm or other precipitation event. In this case, occurring during the two-hour period between **0400 UTC and 0600 UTC on the 25th.**

TEMPO 2508/2511: Indicates a temporary fluctuation in forecast conditions. In this case, during the two-hour period between 0800 UTC and 0011 UTC on the 25th. TEMPO conditions are predicted to occur less than an hour at a time, and total less than ½ the time between 0800 UTC and 0011 UTC.

Visibility usually matters more than ceilings.

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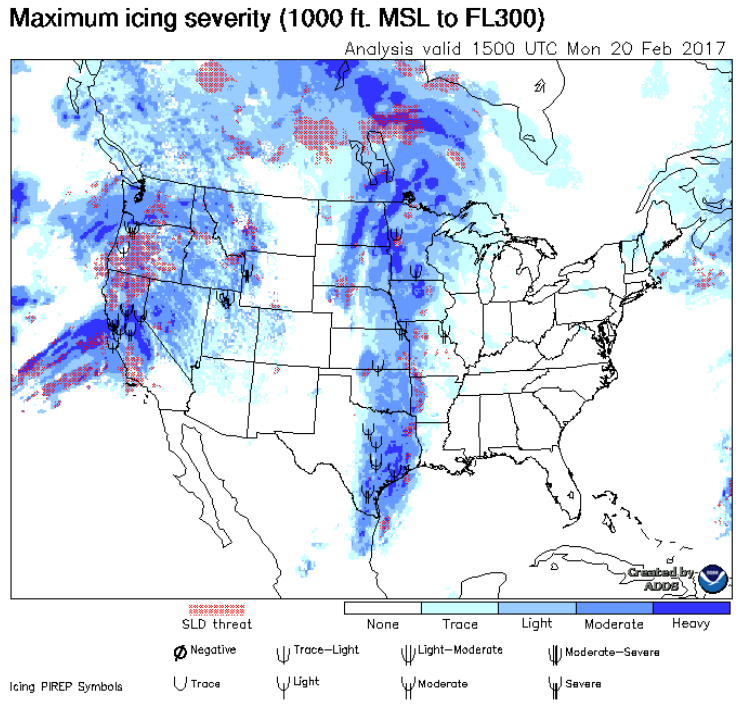
Would you rather have ten miles of visibility and 1500 overcast or three miles of visibility in rain under a 5000 foot broken ceiling? There's no definitive answer, but in most cases I would take the ten miles. That marginal three or four miles can quickly become hard IFR (one or two miles) if precipitation increases, and even three miles is very demanding flying for VFR pilots.

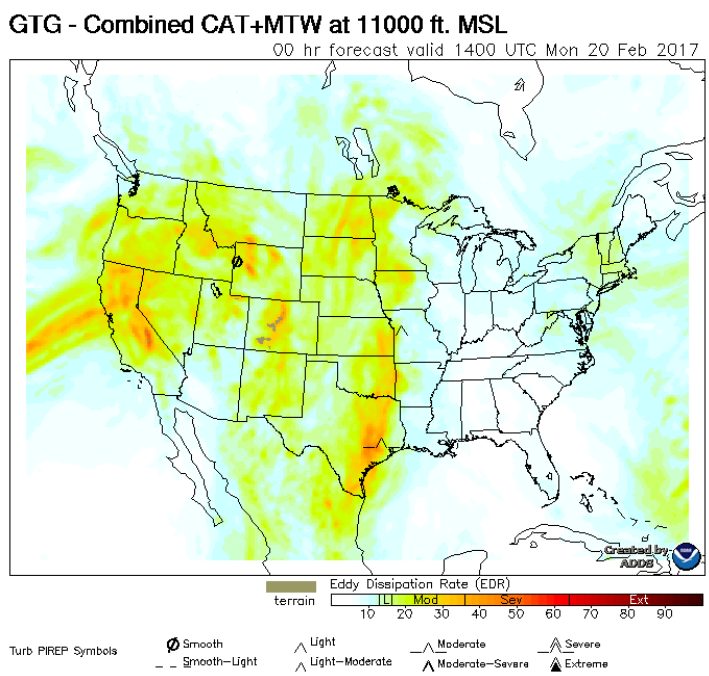
Icing – CIP/FIP Charts

These charts show forecast icing conditions at **various altitudes and times in the future**. It's not flawless, but it's becoming very good, and when combined with a big picture overview it can help you avoid the worst icing.

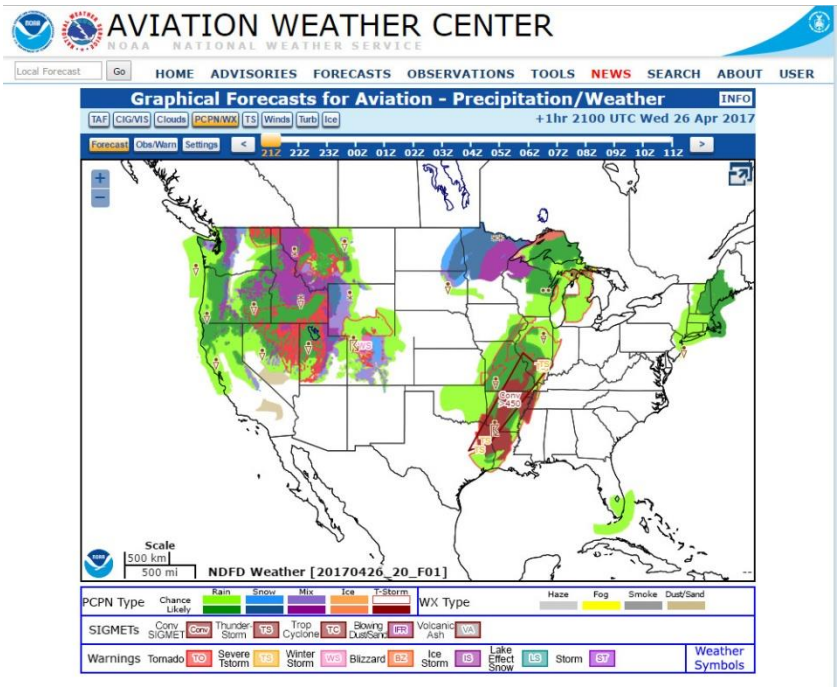


Turbulence – Graphical Turbulence Guidance (GTG) Chart

Like the icing forecast, the GTG chart shows forecast turbulence at **different altitudes and times**. This was previously only available for high altitudes, but it now goes all the way down to 1000 ft.



FAA Graphical Current Weather and Forecasts



The National Weather Service provides a new product, **Graphical Forecasts for Aviation**, which is intended to provide a complete picture of the weather that may impact flight in the continental U.S. It's available at http://aviationweather.gov/gfa

To learn how to use it, click here for a 2 minute YouTube Instructional Video

Forecast and Obs/Warn (Current Weather) buttons are shown here.

Weather Briefing Sources

http://aviationweather.gov/

Flight Service: ***https://www.1800wxbrief.com/***

https://www.aviationweather.gov/adds

AVIATION WEATHER CENTER
NOAA NATIONAL WEATHER SERVICE

https://www.duats.com/

DUATS is under contract with the FAA to provide authorized weather briefings.

ForeFlight
Intelligent Apps for Pilots™

FltPlan.com

Both ForeFlight and FltPlan.com provide valid FAA approved weather briefings

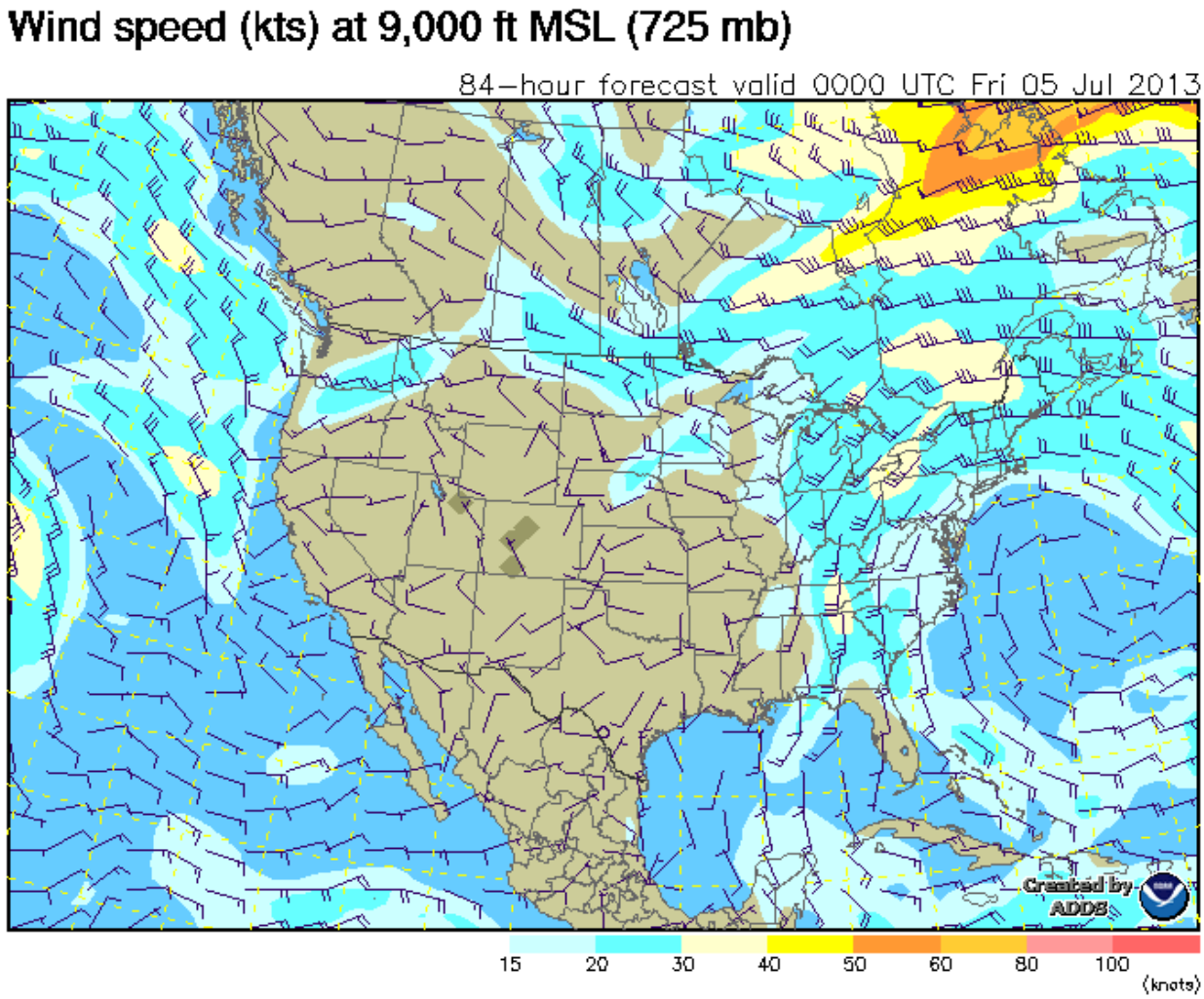
Winds Aloft and Temperatures *– Winds are reported in True – not MAG. By studying Winds Aloft, you can discover:*

- Temperature inversions.
- The most favorable cruising altitude.
- Areas of possible icing, (temps +2º to –20º C).
- Possible turbulence if there is an abrupt change in wind direction and speed at different altitudes.

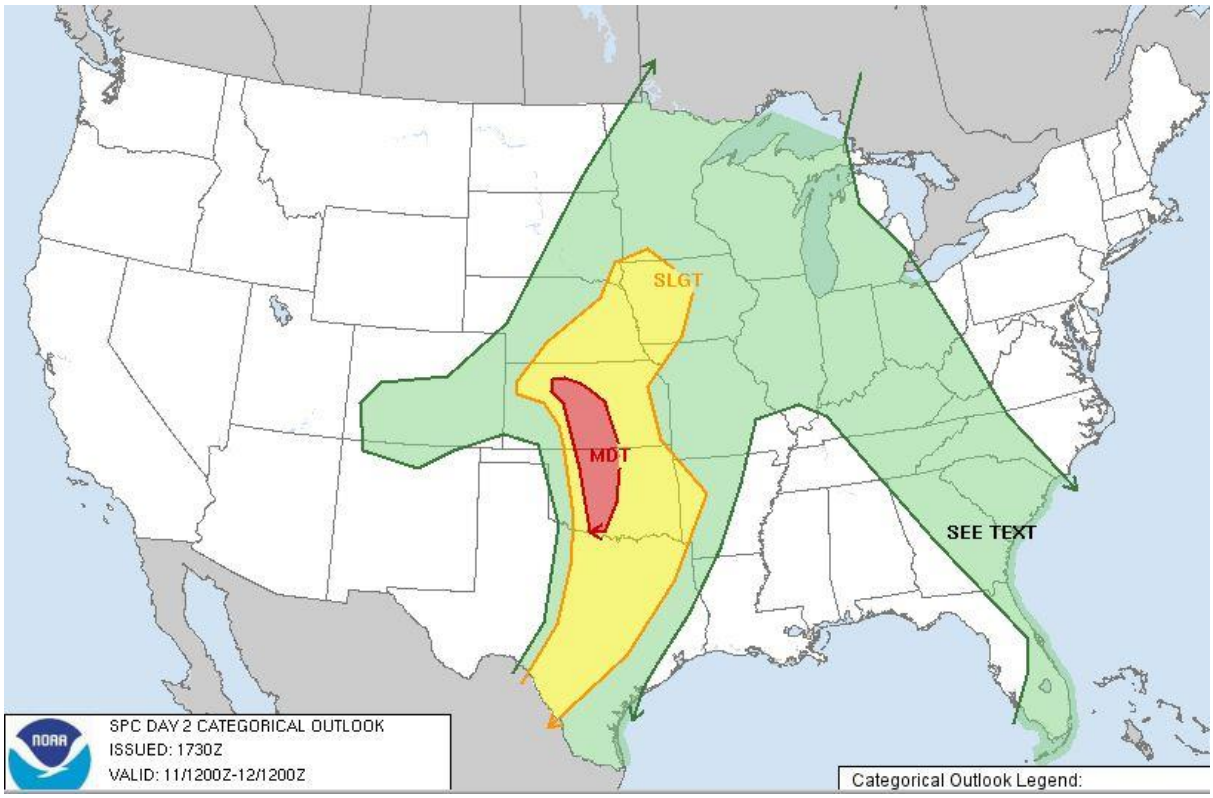
```
000
FDUW01 KWBC 110159
DATA BASED ON 110000Z
VALID 110600Z   FOR USE 0500-0900Z. TEMPS NEG ABV 24000

FT  3000    6000   9000    12000   18000   24000  30000  34
PHX 2712 2916+08 3015-01 2913-08 3030-21 3236-34 304642 285
PRC              3113-01 3016-08 3225-21 3443-34 335144 313
TUS      3115+07 2714-01 2617-06 2839-18 2759-31 257638 268
ALS                      1714+00 1758-16 1960-30 198843 207
DEN              0214+01 0708-04 1532-15 1744-27 205743 206
GJT              0509+01 0505-07 1722-20 1755-32 166848 184
PUB              9900+11 1817+02 1841-16 2056-29 207142 205
BOI      3605+10 9900+02 9900-06 3611-19 3522-30 353446 343
```

- Over DEN at 12,000 feet, the wind is from 070º at 8 knots; temp -4ºC.
- Winds are not forecast for levels less than 1,500 feet above a station. For instance the high stations such as PRC, DEN, GJT and PUB don't forecast winds until 9,000 feet, and the ALS wind forecast starts at 12,000 feet.
- **EXCEPTOINS:** Temperatures are not forecast for the 3,000' level and winds are not forecast for levels less than 1,500' above a station..
- Over GJT at 18,000 feet, the wind is from 170º at 22 knots; -20º C.
- Over BOI at 9,000 feet, **"9900"** = Wind is light and variable.
- **7510-41** – The **seven** indicates winds over 100 knots. (One subtracts 5 from the first number and inserts a 1 in front of the 3rd number) = Wind from 250º @ 110knots; temp is -41º C
- At and above 24,000 feet, the minus sign is not used. One is to assume a negative temperature at and above 24,000 feet MSL.

Winds aloft can also be presented graphically



Convective Outlook



A Convective Outlook is issued five times daily, and forecasts the chances of thunderstorms as either:

- General (shaded areas which are not labeled),
- Slight (Labeled SLGT),
- Moderate (Labeled MDT)
- High.
    - Day 1 outlook – issued 5 times daily. (1st 24 hours)
    - Day 2 outlook – issued 2 times daily (2nd 24 hours)
    - Day 3 outlook
    - Day 4 – 8 outlook

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SIGMETs *(**SIG**nificant **Met**eorological Information)*

Convective SIGMETs (For Thunderstorms) are issued every hour at 55 minutes past the hour, in the continental US. If no convective SIGMET is forecast, the region issues "CONVECTIVE SIGMET NONE". They are valid a maximum of two hours.
Convective SIGMETs include:

- Lines of thunderstorms or areas of thunderstorms covering 40% or more of a 3,000 square mile or larger area.
- Embedded thunderstorms (obscured), and severe thunderstorms, if they are expected to endure more than 30 minutes.

Severe thunderstorms include tornadoes, thunderstorms, hail, and wind gusts greater or equal to 50 knots.

SIGMETs warn of significant weather, other than convective activity, that is hazardous **to all aircraft**. SIGMETs may be issued at any time, and have a maximum forecast period of 4 hours.

SIGMETs are issued for:

- Severe icing.
- Severe turbulence.
- Clear air turbulence.
- Sand and dust storms.

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- Volcanic ash (valid up to six hours).
- Large areas of IFR conditions and possible mountain obscuration, or sustained surface winds greater or equal to 30 knots.
- In Alaska and Hawaii, SIGMETs are also issued for tornadoes, a line of thunderstorms, embedded thunderstorms, or hail greater than or equal to 3/4 inch.

AIRMETs *- (**AIR**man's **MET**eorological Information)*

These advise of weather that is potentially hazardous to all aircraft, but not meeting SIGMET criteria.

AIRMETs are *widespread, affecting* an area of at least 3,000 square miles at any one time. That's the combined size of Rhode Island and Delaware.

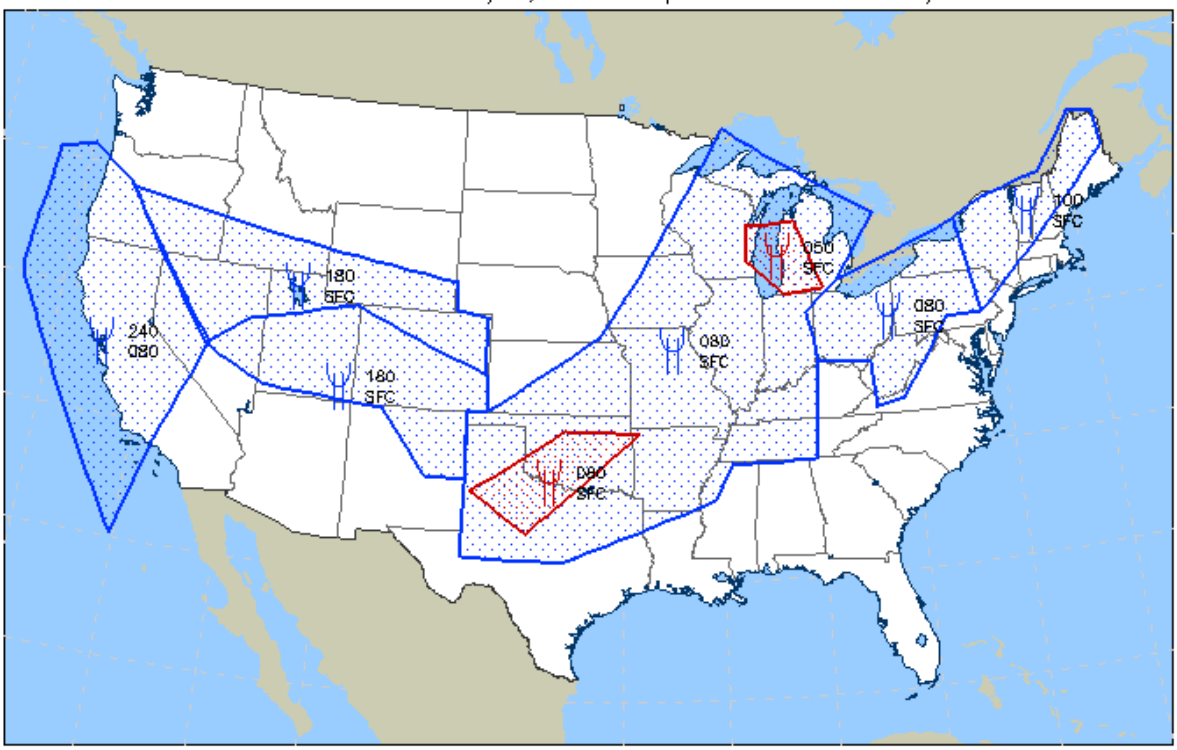
An AIRMET is a "time smeared forecast" valid for a six hour period. If the total area to be affected during the forecast period is very large, it could be that only a small portion of the total area would be affected at any one time.

AIRMETs **expire in 6 hours and indicate weather that is applicable to VFR and light aircraft pilots. They are issued for:**

- **Instrument Flight Rules (IFR) or Mountain Obscuration**
  - That means that ceilings that are less than 1000 feet and/or visibility that is less than 3 miles is affecting over 50% of the area at one time.
  - Extensive mountain obscuration.
- **Turbulence**
  - **Moderate** Turbulence.
  - Sustained surface winds of greater than 30 knots at the surface.
- **Icing**
  - **Moderate** icing.
  - Freezing levels.

Icing AIRMETs (blue) and SIGMETs (red)

chart created at 0451 UTC Thu 07 Jan 2010
AIRMETs valid until 0900z/7th, SIGMETs expire at or before 0830z/7th



Weather Resources that can be RECEIVED INFLIGHT

ADS-B

With an appropriate iPad/Tablet app and an ADS-B "In" receiver (ForeFlight and Stratus are shown here), you can receive and display the following information in flight:

- Radar Imagery (NEXRAD)
- METARs
- TAFs
- Winds Aloft
- PIREPs
- AIRMETs and SIGMETs
- NOTAMs and TFRs

With the right receiver, SiriusXM Aviation "packages" can be displayed on a Garmin GPS, Aspen, ForeFlight, etc.

AWOS and ASOS

Automated Weather Observing Systems (AWOS) & Automated Weather Surface Observing Systems (ASOS) facts:

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AWOS and ASOS, continued

- If AWOS or ASOS information is broadcast on a VOR frequency, it is designated by a circled “A” in the NAVAID’s frequency box.
- Otherwise, its frequency is listed on the chart by the airport data.
  - **AWOS-A:** Simply reports the altimeter setting.
  - **AWOS-1:** Reports altimeter setting, wind data, temperature/dew point, and density altitude, (when it exceeds the field elevation by more than 1,000 feet).
  - **AWOS-2:** Like AWOS-1, plus visibility.
  - **AWOS-3:** Like AWOS-2, plus cloud/ceiling data, (below 12,000 feet AGL).
  - **ASOS:** Like AWOS-3, plus precipitation.

When checking in with an approach controller for landing at an airport with ASOS or AWOS, simply include that you have the landing airport’s “one minute weather”.

PIREPs – Pilot Reports

Sample PIREP
UA / OV BOS / TM 1444 / FL DURC / TP B787 SK 023 SCT 030 OVC / WX IMC 100
UA = PIREP. Location: **Ov**er Boston. **Tim**e: 1444Z. Altitude: **F**light **L**evel - **Dur**ing **C**limb. Aircraft **Ty**pe: **B**oeing **787**. **Sk**y Cover: **Sc**a**t**tered at 2,300’ (MSL) and **Ov**er**c**ast at 3,000’ (MSL). **W**eather: **I**nstrument **M**eterorolical **C**onditions at 10,000’ (MSL).

Sample Urgent PIREP
UUA / OV GTF180030 / TM 1550 / FL 100-110
TP C310 / WX FZRA / IC LGT RIME
UUA = URGENT PIREP. Location: **Ov**er the 180º radial, 30 NM from the Great Falls VOR. Time: **1550** Zulu. Altitude: Between 10,000’ & 11,000 MSL. Aircraft Type: **C**essna **310**. Weather: Freezing Rain. Icing Conditions: Light rime ice.

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Turbulence PIREPs

- NIL
- Smooth-Light
- Light
- Light-Moderate
- Moderate
- Moderate-Severe
- Severe
- Extreme

Icing PIREPs

- NIL
- Trace
- Trace-Light
- Light
- Light-Moderate
- Moderate
- Moderate-Severe
- Severe

To Provide a PIREP to Flight Service, here's the right stuff.

First, get the controller's attention – give him or her a chance to listen. "Washington Center, NXXXX has a pilot report when you're ready." Pause and let controller tell you when they're ready to copy.

- Always use your full aircraft identification on initial call-up.
  - If you are calling FSS, include the frequency and your current location using NAVAIDs or airport references.

The Essential PIREP Format

- **LOCATION** (Nearest VOR or Airport).
- **TIME**—ZULU or minutes ago.
- **ALTITUDE** (MSL).
- **A/C TYPE.**

PIREP – The Optional Stuff

- **CLOUD COVERAGE -** (CLR, FEW, SCT, BKN, OVC), **TYPE -** (Cirrus, Cumulus, Stratus), & **HEIGHT -** (Bases & Tops should be expressed in feet MSL).
- **VISIBILITY -** (in statute miles), & **RESTRICTIONS -** (Haze, Mist, Fog, Dust, Sand, Smoke, Spray, Volcanic Ash).
- **PRECIP TYPE -** (Rain, drizzle, snow, and hail), & **INTENSITY -** (Light, moderate, or heavy).
- **TEMP** - (Celsius).
- **WIND** - (Direction & Speed in knots)
- **TURBULENCE -** (Light, light chop, moderate, moderate chop, severe, or extreme).
- **ICING** - (Trace, light, moderate, or severe).
- **REMARKS.**

You Don't Need To Include Everything In A PIREP. For example, "Denver Center, NXXXX is 18 miles east of the Red Table VOR, light rime ice at 17,0000', temperature -14C." With that one simple line, ATC knows where you are, and what you're experiencing. If they need any more info, they'll ask.

*AOPA's Air Safety Institute offers a course entitled, **"Sky Spotter"*** and several of their Aviation Weather series courses, entitled "***Weather Wise"***. *These courses qualify for Wings Credit and AOPA Accident Forgiveness.*

Hazardous In-flight Weather Advisory Service (HIWAS)

- Available on select VOR frequencies.
- Designated by a circled "H" in the NAVAID's frequency box.

In areas serviced by HIWAS, centers (ARTCC), tower facilities and flight service stations will not broadcast in-flight weather advisories. They will, however, broadcast that an advisory has been published, and tell you to tune in to HIWAS for details.

Radio Calls to Flight Service

Reference an article by Debby Colvin, Lockheed Martin Quality Assurance Specialist.

To ensure a quick radio response from flight service, here are some suggestions:

- First, get the controller's attention – give him or her a chance to listen. "Washington Center, NXXXX has a pilot report when you're ready." Pause and let controller tell you when they're ready to copy.
- Always use your full aircraft identification on initial call-up.
    - If you are calling FSS, include the frequency and your current location using NAVAIDs or airport references.
- If you are unsure of the name of your nearest flight service station, provide the geographical area of your position. Rather than broadcasting for "Any Radio, N12345," you should transmit, "Radio near Greenwood, Mississippi, N12345."

The Bard VORTAC frequency box Indicates that you can talk with San Diego Flight Service by transmitting on 122.1 and receiving (R) on 116.8.

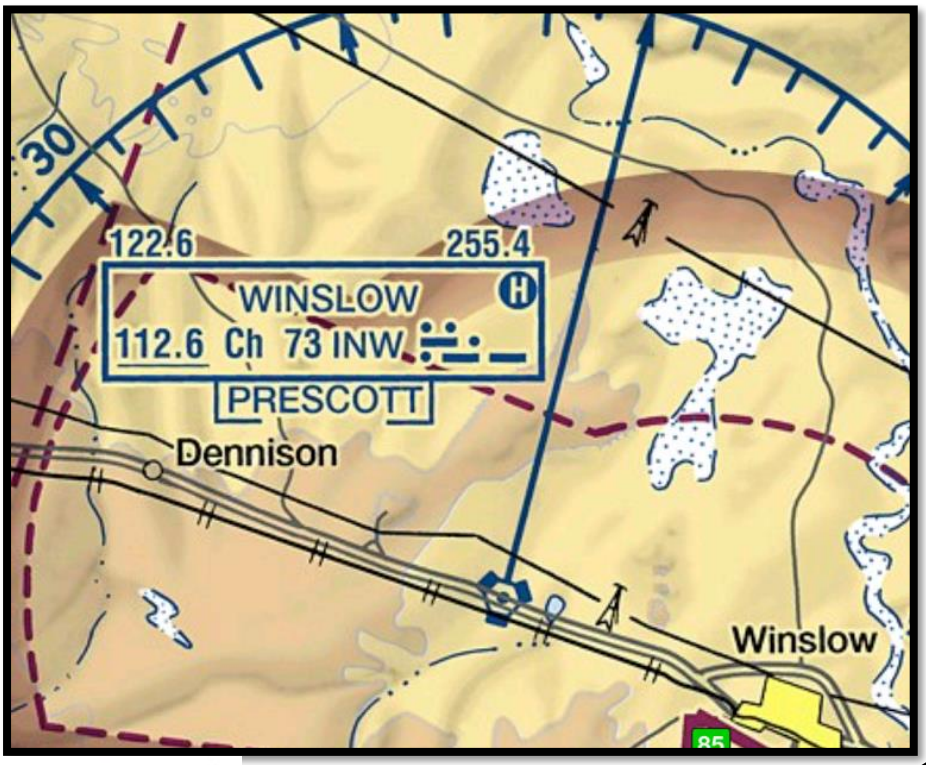
There are two stand alone remote communication outlets (RCO) in the area.

On 122.6, you can transmit and receive communications with San Diego FFS.

Using 122.2, you can communicate with Prescott FFS.

In the Winslow VORTAC frequency box, the frequency 112.6, is underlined. The underline indicates that you cannot receive voice on that frequency.

However, at the top of the box, VHF frequency 122.6 indicates that you can use that frequency to communicate (transmit and receive) with Prescott FSS.



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Flight Planning

(Formerly *Lockheed Martin)*

1-800 WX-BRIEF

The briefer will need to know the following:

1) VFR or IFR.
2) Registration Number.
3) Aircraft Type.
4) Departure airport's ID.
5) Departure time (ZULU).
6) Altitude.
7) Route.
8) Destination airport's ID.
9) Time en route.

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Flight Service Briefings

An Outlook Briefing is a synopsis. Its forecast range is more than 6 hours out and up to 5 days ahead.

Standard (6 Hours or Less from Takeoff)

- Current and forecast weather.
- Adverse conditions.
- Winds aloft.
- NOTAMS & TFRs.
- "VFR not recommended".

Abbreviated Briefing updates a previously received **Standard briefing**.

***You must ask for specific*:**

- Weather forecasts.
- NOTAMS.
- TFRs.

Picking up IFR clearance via telephone (National Clearance Delivery) and departing IFR

Call 888 SPOT-BOT **(888-766-8267)**

Briefing Tips

"Early morning hours, 06:00-10:00, are our busiest times. If your schedule permits, call before or after this time.

File your flight plan with flight service during off hours, well in advance of your scheduled departure. (If you plan to depart at 07:00 local time, file your flight plan the night before)."

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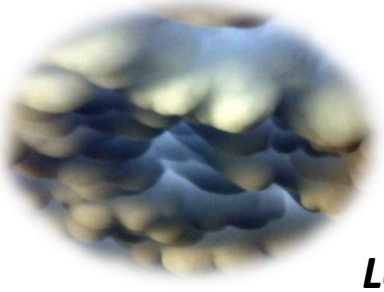
Clouds and What to Expect

Nimbostratus: Diffused, generally grey, shapeless, and very low, (less than 1,500 feet AGL). Think of a dreary day. Expect poor visibility, unstable air and light mist or drizzle.



Mammatus: Good visibility, wind shear; showers and thunderstorms.

Lenticular: When near a mountain, expect up and down drafts, (mountain waves).

Cumulonimbus: Unstable air and good visibility. Associated with a thunderstorm, so expect a rough ride.

Cirrus: Thin, wispy clouds composed of ice and blown by high winds into long streamers. Cirrus clouds are usually white and indicate fair to pleasant weather. Expect Stable air.

Virga: This is precipitation that evaporates before reaching the ground. Expect unstable air and microbursts; down and updrafts.

Weather Codes		
BC Patches	FZ Freezing	SA Sand
BL Blowing	GR Hail	SG Snow Grains
BR Mist	GS Hail/Snow Pellets	SH Showers
CB Cumulonimbus	HZ Haze	SN Snow
DR Low Drifting	IC Ice Crystals	+SN Heavy Snow
DS Dust Storm	MI Shallow	SQ Squall
DU Dust	PE Ice Pellets	SS Sand Storm
DZ Drizzle	PO Dust/Sand Whirls	TC Towering CB
+FX Tornado	PR Partial	TS Thunderstorms
FC Funnel Cloud	PY Spray	UP Unknown Precip.
FG Fog	RA Rain	VA Volcanic Ash
FU Smoke	-RA Light Rain	

Estimating the Freezing Level

The average lapse rate per thousand feet is 2ºC.

If XYZ airport has a field elevation of 1,000 feet MSL, and the current temperature at XYZ is 10ºC, then the freezing level can be found at 6,000 feet MSL.

6,000 feet MSL	**0ºC**
5,000 feet MSL	**2ºC**
4,000 feet MSL	**4ºC**
3,000 feet MSL	**6ºC**
2,000 feet MSL	**8ºC**
XYZ Airport, 1,000 feet MSL	**10ºC**

Induction Icing

Flying in snow showers can create it, blocking air filters, static ports, and the air ducts that provide engine cooling.
Less engine air flow suffocates the engine and the fuel/air mixture becomes richer.

*Go to **http://aircrafticing.grc.nasa.gov** or perform an internet search for "NASA aircraft icing training".*

Carburetor Ice is most likely to form when the temps are -5ºC to 15ºC, and as warm as 30ºC if the air is humid. The temperature of the air passing through the carburetor can drop as much as 60º in a nanosecond, squeezing water vapor out of the air. When the temperature in the carburetor reaches 0º C or below, frost or ice forms.
How do you know if you have Carburetor ice?

- A fixed pitch propeller's RPM drops.
- A constant speed propeller's manifold pressure drops.

USE CARB HEAT when you have a rough running engine.
DON'T USE CARB HEAT when taking off or climbing. It causes detonation.

All the Frost, Snow & Ice Must Go

Don't expect loose snow to blow off. Rough frost on a wing spoils the flow of air, causing the airflow to slow. This causes early airflow separation and a loss of lift. The smallest amount of frost can prevent an aircraft from becoming airborne. Even if you manage to take off, your aircraft could stall in the climb.

Reducing the Risk of Airframe Icing

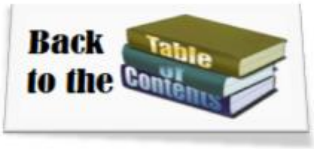
Avoid FZRA (freezing rain) and FZDZ (freezing drizzle). Convective SIGMETs imply severe icing potential. A 50% relative humidity may imply a high probability of icing.
As you get closer to the center of a low pressure system, moisture moves upwards faster, resulting in icing conditions at higher altitudes.

Lack of Ice Protection

If you don't have an ice removal / prevention system, then you must seek warmer air. How warm? At 3ºC, the ice will slowly dissipate. An OAT of 4ºC or more will rapidly melt the ice!

Encountering Freezing Rain?

Since freezing rain requires a temperature inversion, you might find warmer air if you initiate a climb.



Most Common General Aviation Special Equipment Suffixes	
/X	No Transponder
/T	Transponder, but no Altitude Encoding (Mode C)
/U	Transponder with Mode C
/D	DME, no Transponder
/B	DME& Transponder but no Altitude Encoding (Mode C)
/A	DME & Transponder with Mode C
/I	RNAV or LORAN or INS & Transponder with Mode C
/G	GPS – Enroute & Approach, & Transponder with Mode C

AOPA's Air Safety Institute offers courses entitled ***"Accident Case Study: Cross Country Crisis"*** *and* ***"Accident Case Study: VFR into IMC".***

These courses qualify for Wings Credit and AOPA Accident Forgiveness.

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When Things Go Wrong

Pilot Priorities

KEEP
CALM
AND
AVIATE, NAVIGATE,
COMMUNICATE

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Ammeter, Positive Indication

AFTER STARTING - POSSIBLE CAUSES:

- The battery may be in the process of recharging after starting (That's normal).
- If you see a full scale charge for more than one minute, then the starter is probably still engaged. (That's not normal).

SOLUTION: Shut down the engine.

DURING FLIGHT - PROBABLE CAUSE:

- Faulty voltage regulator, allowing the alternator to overcharge the battery.

SOLUTION: Reset the system by turning the Master Switch OFF, and then ON.

If the problem continues, the battery could explode and you could damage your electrical system.

- Pull the Alternator Field CB.
- Turn all non-essential equipment OFF.
- Get the aircraft on the ground as soon as possible because the battery is now the only source of electrical power.

Ammeter, Negative Indication

AFTER STARTING OR IN FLIGHT – POSSIBLE CAUSES:

- The alternator isn't working.
- The system is overloaded.
- The battery is not charging.

SOLUTION:

Check Master Switch ON and Alternator Circuit Breaker IN.

If THE Master Switch is ON and the Alternator CB is IN, and still there's a problem:

- Turn the alternator OFF and pull the Alternator Field CB.
- All non-essential equipment OFF.
- Get the aircraft on the ground as soon as possible because the battery is now the only source of electrical power.

Oil Temp Normal, Oil Pressure Low

POSSIBLE CAUSES:

- Insufficient oil.
- If oil temps remain normal, it could be a clogged oil pressure relief valve or malfunctioning oil pressure gauge.

SOLUTION: Land as soon as possible and have it checked.

Engine Fire on the Ground

Continue to crank the engine. (Flames and excess fuel will be sucked into the carburetor).

IF THE ENGINE STARTS:

Add power for a few seconds, and then, shut it down.

IF THE ENGINE DOES NOT START:

- Throttle – Full OPEN.
- Mixture – CUTOFF.
- Continue to crank the engine.

IF THE FIRE CONTINUES:

- Ignition – OFF.
- Master Switch – OFF.
- Fuel Selector – OFF.

Engine Fire in Flight

- Mixture – CUTOFF.
- Fuel selector – OFF.
- Master Switch – OFF.
- Cabin heat & air vents – OFF & CLOSED.
- Execute a forced landing.

Partial Engine Loss of Power

1) Attain and maintain glide airspeed.
2) Select an emergency landing area or airfield, and remain over it.
3) ***CHECK:***
   - Carburetor Heat.
   - Fuel – If necessary, switch tanks.
   - Mixture.
   - Primer, (if installed) – Ensure that it's all the way in and locked.
   - Magnetos – check in all three positions.

Forced Landing, Engine Failure

Do you know the glide ratio for your airplane? If you're 3,000 feet AGL, how far can you glide?

Establish best glide speed, then Check:

- Fuel selector
- Mixture RICH
- Carb Heat – ON
- Magnetos

If the engine fails to start, select a landing site and:

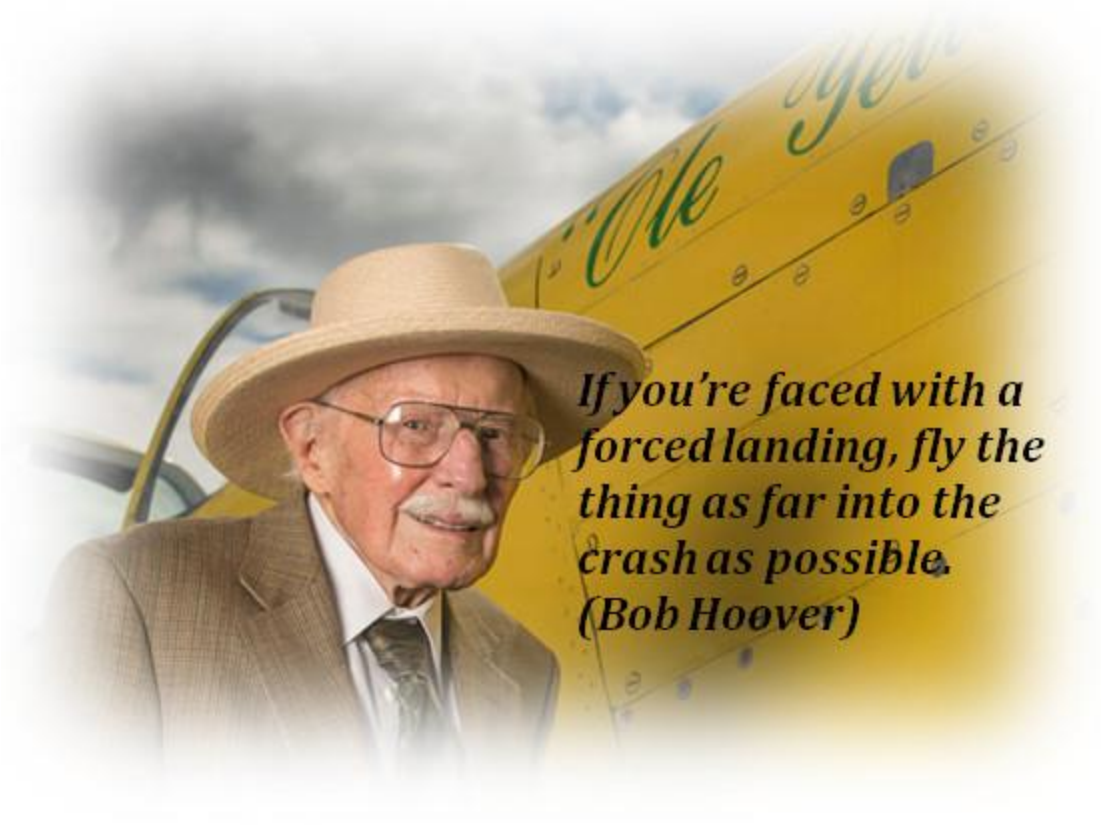
- Variable pitch props – full decrease
- Transmit on 121.5 or current controller
- Squawk 7700
- Seat belts – Secure
- Fuel – OFF
- Mixture – Cutoff
- Flaps and gear as needed. If it's a soft field, you may want to consider landing gear up
- Door – Ajar

The Impossible Turn

If your engine fails after takeoff, consider this: Unless you are at 1,000 feet AGL, or you have already started a turn, it's safer to forget about trying *"The Impossible Turn"* and landing at the airport. What you see outside your windscreen is a safer place to land. See "The Impossible Turn" at YouTube.

Most maneuvering related crashes are fatal. But only about 10% of forced landing accidents involve a fatality. (Reference the AOPA Air Safety Institute Nall Report). You're better off maintaining control of the aircraft all the way to the ground, even if you're landing off airport. This greatly increases the chances of surviving.

See: **http://flash.aopa.org/asf/pilotstories/impossibleturn/**



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How do you know if you have Carburetor Ice?

- Fixed pitch propeller – RPM drops.
- Constant speed propeller – Manifold pressure drops.

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When to Notify the NTSB (NTSB 830)

You should notify the NTSB if:

- You've had an aircraft accident.
- You've had a flight control system malfunction.
- A crew member is unable to perform normal duties.
- A turbine engine has a failure of its structural components.
- You've had an in-flight fire.
- You've experienced an aircraft collision in flight.
- You've had property damage, (other than the aircraft), estimated to exceed $25,000.
- There is an overdue aircraft and you believe that it has been in an accident.

Should You Notify NTSB?

This *iPhone app may help you make your decision.*

Lost Communications, Landing VFR at a Controlled Airport

- Remain outside or above Class D airspace until you determine the direction of traffic and runway in use.
- Squawk 7600 before entering Class D airspace.
- Enter the traffic pattern downwind on "a 45", and fly a typical pattern for landing.
- Look for Tower's light gun signals.

ATC Light Signals (FAR 91.125)

COLOR & SIGNAL TYPE	ON THE GROUND	IN FLIGHT
STEADY GREEN	**Cleared for T.O.**	**Cleared to land**
FLASHING GREEN	Cleared to taxi	Return for landing (to be followed by a STEADY GREEN LIGHT)
STEADY RED	**Stop**	**Give way to other aircraft and continue circling**
FLASHING RED	Taxi clear of runway in use	Airport is UNSAFE – Do not land
FLASHING WHITE	Return to starting point	N/A
ALTERNATING RED & GREEN	**GENERAL WARNING – USE EXTREME CAUTION**	

To acknowledge a light signal:

- Day, in flight – Rock wings.
- Day, on ground – Move aileron or rudder.
- Night – Flash landing light or nav lights.

Lost Communications, Landing VFR at an Uncontrolled Airport

- Overfly the airport 500 feet above pattern altitude.
- Look for traffic, wind direction, and runway in use.
- Enter the traffic pattern downwind on “a 45”, and fly a typical pattern for landing.

“Mistakes are inevitable in aviation, especially when one is still learning new things.

The trick is to not make the mistake that will kill you.”

Stephen Coonts, Author

More Thoughts on a Forced Landing

"You absolutely have to be sure that you don't stall the airplane. I've been to many aircraft accident scenes, I've evaluated hundreds and hundreds of accidents and pilots are not killed when they fly their airplane to the ground under control. They are killed when they stall an airplane into the ground. So maintaining airspeed safely above stall speed right on down to the ground is so very, very important." *– Bob Martens, nationally known speaker, consultant and aviation safety expert; Pilot Workshops contributor.*

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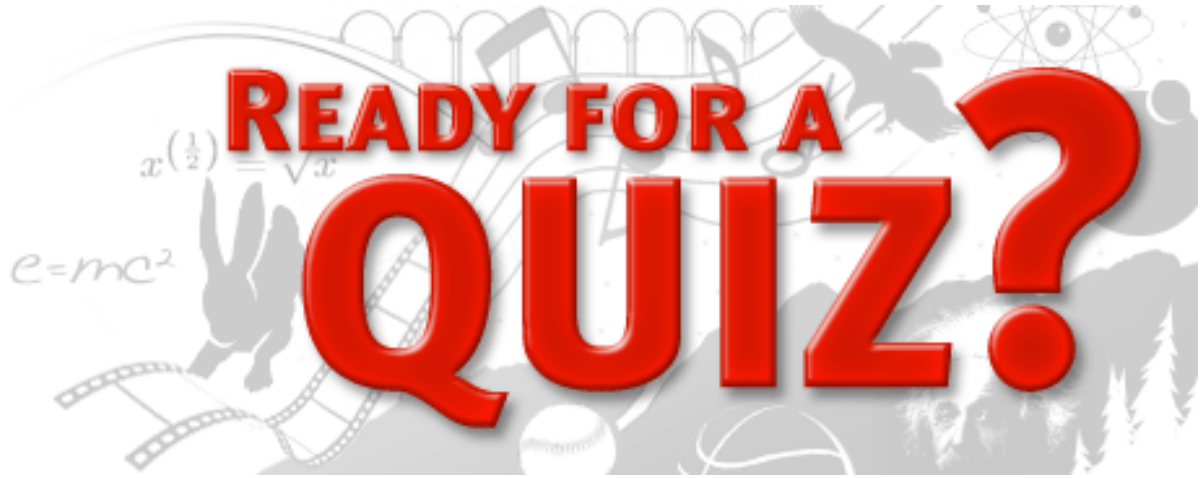

You're flying your 172 in cruise flight when an engine oil line breaks and starts draining oil into the cowling. Your oil pressure starts dropping as you divert to an airport, and by the time you enter the traffic pattern, all oil has drained from your engine, but it's still running. When you touch down, will your hydraulic brakes work?

Your hydraulic brakes will work just fine, because they are powered by a completely separate system. They use brake fluid stored in a dedicated reservoir.

You're caught in a down draft near terrain. What airspeed will give you the best angle of climb over the distance between you and the terrain?

Vx will give you the best angle of climb.

You are in cruise flight when your carbureted engine RPM starts dropping. You suspect carb ice is the problem, and you turn your carb heat on. Your engine drops another 200 RPM when you turn it on, and runs roughly for about 5 minutes. After that, the RPM increases 100 RPM and the engine smooths out. You wait a few more minutes, turn your carb heat off, and the RPM increases 100 RPM. Did you have carb ice?

You probably had carb ice. When you turn carb heat on, the RPM drops because you are introducing warmer air into the engine, and you are melting ice from the carburetor and running it through the engine. Eventually, the ice melts and the engine smooths out. And when you turn carb heat off, you're running cooler air into the engine, and RPM will increase again.

You're flying your Piper Arrow when the alternator fails. You've planned your landing at a non-towered airport, so you turn off your battery master to conserve battery power. As you approach the airport, you select your gear handle down to extend the gear. Will your magnetos power the gear down if your battery master is still off?

Magnetos only power the spark plugs in your plane. Everything else runs off the alternator or battery.

You're flying into a towered airport when your mic sticks and continuously transmits. You turn your radio off so you aren't stepping on other aircraft. What transponder code should you squawk to let ATC know your radio failed?

7600 is the lost comm squawk code.

You're flying a VFR cross country when you accidentally fly into a cloud. What should you do?

You should always maintain altitude and fly out the same way you flew in. You don't know what's below you, how high the cloud goes, or how long it continues.

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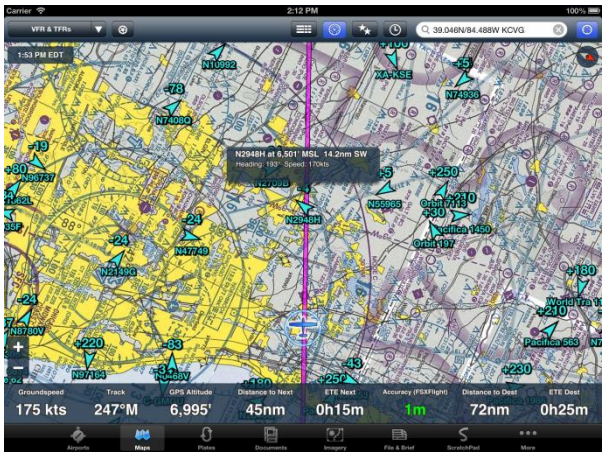
Lost and Found

To Avoid Becoming Lost:



- **Use your GPS.**
- Have spare batteries near you, and <u>not</u> in the baggage area.
- Keep a chart open, and continually update your position.
- Use the VOR receivers <u>and</u> the GPS. Not one or the other.
- Note the time that you're over checkpoints.
- Note the difference between forecast and actual winds.
- Practice pilotage, using your eyes to check for landmarks.

Lost? Don't Panic and Check Your Fuel. If you have lots of it, reorient yourself and regain situational awareness.

If You're Hopelessly Lost:

- Gain altitude if possible so you can get a better look at the ground. You'll also have better VOR reception.
- Note your compass heading. Write it down, and note the time.
- Locate your last known position on the chart.
- What heading were you flying that took you there? Was the landmark on, or off your course? How long ago did you pass the landmark?
- Draw a line from your last known position on the heading you're on — out to where you should be now. If you're flying 120 knots, (that's 2 nm per minute). If you've been flying for 10 minutes, you're 20 nm past the last known position.
- Draw a 45° arc each side of the new position, and try to figure out where you are.

You Can Also:

Tune in two VORs, and cross the radials to determine your location. If you only find one VOR, don't panic. Fly to it, and then you'll know your exact location.
If your iPad has not overheated, the easiest way to locate your position is to simply check ForeFlight!!

Minimum Fuel vs. Emergency Fuel

- ***Minimum fuel:*** An indication that an aircraft's fuel supply has reached a state where, upon reaching the destination, it can accept little or no delay. Minimum fuel advisory is not an emergency; it is only an advisory that an emergency situation is possible should any undue delay occur. ATC does not provide you priority. (AIM). Upon initial contact, add "Minimum Fuel" to your call sign.
- ***Emergency fuel:*** Priority handling is required and expected. Upon initial contact, add "Emergency Fuel" to your call sign, along with the fuel remaining in minutes.

If Lost and Fuel is Low:

Taking QUICK action is very important. If there's any doubt, declare an emergency and get help.

Call a known ATC frequency or 121.5, (the emergency frequency). Flight Service, civilian and military control towers, approach controls and centers – all monitor 121.5.

Set your power to best economy and maximum endurance.

Surrounding terrain, obstacles ahead and the amount of daylight remaining, all play a role in determining the best response.

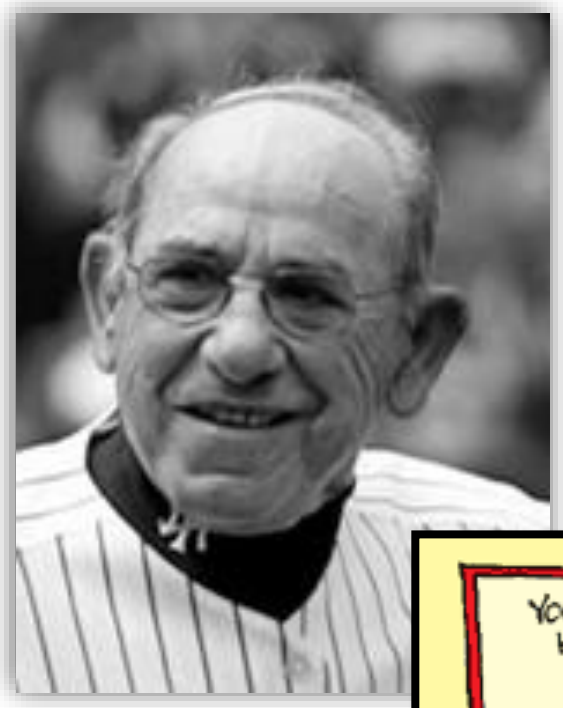
Get it on the ground. Any port in a storm!

The 4 C's

If you *climb*, you'll *have* better signal reception and you can now *communicate and c*all for help. You don't need to declare an emergency. You can call the Emergency Frequency, 121.5, or you can contact a control tower in the vicinity, and ask for the frequency of the controlling ATC facility, (center, approach, or departure control). You can also call flight service.
*Confess and a*sk for a position confirmation.
Lastly, comply with ATC's directions.
When you know where you are, make sure you have enough fuel to continue to your destination. If not, land and refuel.

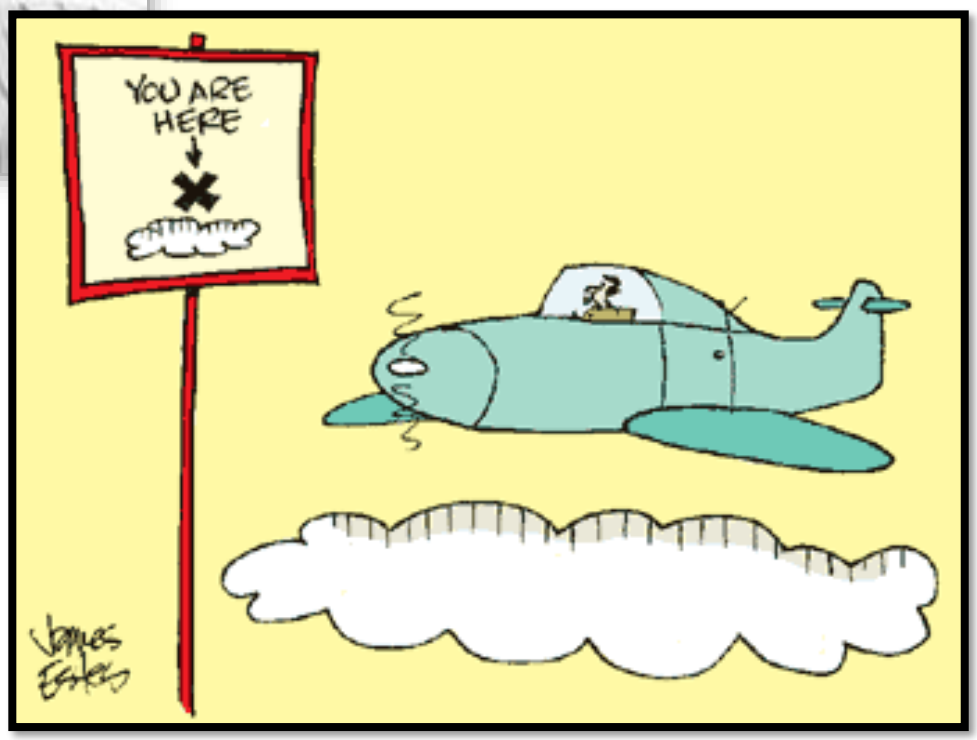
"You've never been lost until you've been lost at Mach 3."

Paul F. Crickmore, Author, *"SR-71 Blackbird - Lockheed's Mach 3 Hot Shot"*



"If you don't know where you are going, chances are you will end up someplace else."

Yogi Berra



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Correcting Mag Compass Errors

Mag Compass Turning Errors

Undershoot North, and **Overshoot SOUTH**

- **UN** - When turning to the NORTH, the magnetic compass UNDERSHOOTS. You should roll out BEFORE the desired heading. If you're turning from a NORTHERLY heading, the compass LAGs, and actually starts a turn in the opposite direction.
- **OS** - When turning to the SOUTH, the compass OVERSHOOTS. You should roll out PAST the desired heading. If you're turning from a SOUTHERLY heading, the compass LEADs, and starts a turn more rapidly in the correct direction.

When turning to an EAST or WEST heading, there's no lagging or leading. You should roll out on the desired heading.

Acceleration and Deceleration Errors

Accelerate **N**orth & **D**ecelerate **S**outh

- **AN** - If you're flying EASTERLY or WESTERLY, and airspeed is **ACCELERATING,** the compass will indicate a turn to the **NORTH**.
- **DS** - If you're flying EASTERLY or WESTERLY, and airspeed is **DECELERATING,** the compass will indicate a turn to the **SOUTH**.

MAG DIP

This causes compass errors when you turn, accelerate, and decelerate. The rollout correction for Northerly and Southerly turns is approximately equal to your latitude.
If you are flying in the southern half of the United States, use 30º as a rollout correction. If flying in the northern half, use 40º. Refine it when you roll out of your turn.

Nice 2 Know

Section

Aviation Safety Reporting System (ASRS)

You and ATC

Mountain Flying

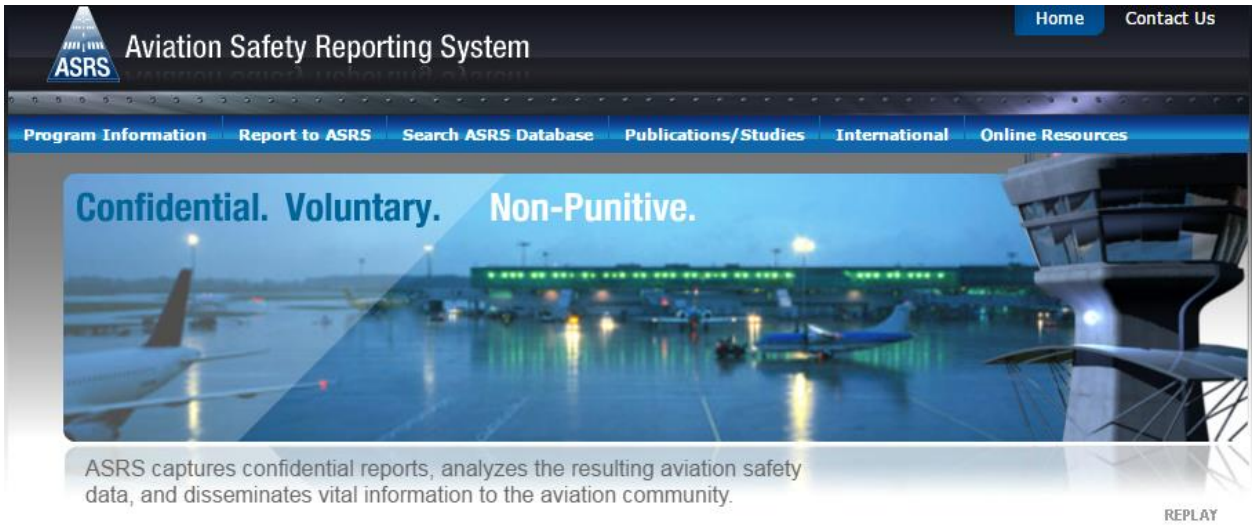
Winter Flying

Hot Weather

Aviation Safety Reporting System (ASRS) https://asrs.arc.nasa.gov/

PROTECT YOURSELF AND YOUR CERTIFICATE

ASRS collects aviation safety incident and situation reports from pilots and controllers. These reports are submitted voluntarily and with anonymity. Reports can be submitted electronically or mailed.



If you file a NASA report after an incident or occurrence, the FAA considers you to have a “constructive attitude”. This most likely means that you’ll try to prevent further violations. Although a finding of violation may be made, **neither a civil penalty nor certificate suspension will be imposed if:**

- The violation was inadvertent and not deliberate;
- The violation did not involve a criminal offense, or accident, or action under 49 U.S.C. Section 44709 which discloses a lack of qualification or competency, which is wholly excluded from this policy;
- The person has not been found in any prior FAA enforcement action to have committed a violation of 49 U.S.C. Subtitle VII, or any regulation promulgated there **for a period of 5 years prior** to the date of occurrence; &

The person proves that**, within 10 days after the violation**, he or she completed and delivered or mailed a written report of the incident or occurrence to NASA under **ASRS**.

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You and ATC

Radio Frequencies

Emergency Frequency – 121.5

This is monitored by Flight Service, civilian and military control towers, approach controls, and centers.

MULTICOM – 122.9

Used at airports without an operating control tower, Flight Service or UNICOM (122.8).

Local Airport Advisory Service

Flight Service will provide this service when they are located at an airport that doesn't have a control tower, or when the control tower is not in service. The Common Traffic Advisory Frequency (CTAF) at an uncontrolled airport is usually 123.6.

Getting Along With ATC

Initial call, use your model instead of make – "Cherokee 7482J". This helps ATC understand your performance capability.

ATC "sizes up" pilots and their abilities as soon as they check in on frequency. If you are clear, concise, and use proper phraseology, this gives controllers confidence that you'll understand and do a good job when given ATC instructions. *Here's some phraseology that will send you directly to the penalty box:*

- Saying things like "sugar" (instead of "sierra") "nickel" (instead of "fife"), or "pop" (instead of "papa").
- Starting a transmission with, "and" or "ahh". If you're not ready to talk, don't press the button. Try not to sound distracted and bumbling.
- Initiating a call to ATC by saying, ". . . with you." It wastes radio time. Beside, the controller knows that you're "with" him or her!
- "Tally ho". It's not a fox hunt! "Negative contact", or "Traffic in sight", is fine.
- "I've got 'em on the fish finder". If you have a traffic alert system in your aircraft, that phrase doesn't help ATC and you sound like a hick at a fishin' hole.
- Aviation slang or CB lingo. Leave it in the truck.
- "Roger" means I've received your transmission. It doesn't me yes, no, or I'll do it.

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Check in Like a Pro

- ***Departure Control*** — First call, report the altitude you're passing and the altitude assigned.
- ***Center*** — First call, report the altitude you're passing and the altitude assigned.
- There are only three ways to report an altitude: "CLIMBING", "DESCENDING", and "LEVEL." Never use decimals, like "2.6" for 2,600 feet.
- ***The Approach Controller*** — Always check-in with the ATIS letter.
- ***The Tower Controller*** — If VFR, give tower your bearing and distance from the airport, plus the ATIS letter. Never say, ". . . with the numbers."

At Uncontrolled Airports

"Taking the active" or "clearing the active" confuses inbound pilots. The runway has a name, so use it.

Don't Make Controllers Wonder, "Which frequency is that guy on?"

- If you're in the run-up area, stay on Ground Control. Switch to Tower frequency when you're ready to depart.
- After landing, don't switch to *Ground* control unless you've cleared the runway hold short line and the Tower Controller has told you to switch to Ground. If you have questions, ask.

AOPA's Air Safety Institute offers a course entitled ***"Say it Right".*** *This course qualifies for Wings Credit and AOPA Accident Forgiveness.*

Mountain Flying

Travel Tips

- Approach a ridge line on a 45º angle and depart it on a 90º angle. If you encounter a dangerous downdraft, and you're on a 45, instead of turning 180 degrees, you'll only need to turn 45 degrees to become parallel to the ridge, and on your way to safety.
- Mountain winds greater than 20 knots: Fasten your seat belt.
- Mountain winds greater than 30 knots: Consider flying another day.
- Density Altitude INCREASES when temperatures INCREASE and altimeter settings DECREASE.

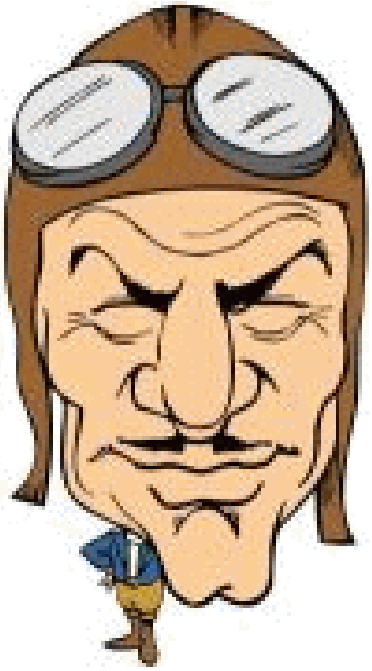
Lenticular Clouds are just like mountains. They come in different shapes and sizes. Lens shaped clouds form on the lee side (downwind) of the mountains. As the air is forced upward, it cools enough for water vapor to condense. While the cloud appears stationary, the winds can be impressive.

Cap Clouds are similar to Lenticular Clouds. They form directly over a mountain, (mostly on the windward side), as humid air is forced to flow over the mountain, condensing into a cloud. Although appearing motionless, the wind is anything but stationary.

Wave Clouds form on the lee side (downwind) of the ridge line. The corkscrew appearance is attributed to the wave pattern being nearly parallel with the upper level airflow.

Kelvin-Helmholtz Cloud

waves form on the lee side of mountains. Expect a strong vertical sheer.



Airspeed, altitude and brains:

Two of them are always needed to successfully complete the flight.

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Mountain Waves

When the air meets the mountain on the windward side, it's fairly smooth. As it "climbs" the mountain, lifting develops and the wind speed increases, reaching its maximum speed at the summit. As it passes the crest, the flow becomes more complicated, with lots of downdrafts. Further downwind, some five to ten miles from the summit, the airflow begins to climb in a definite wave pattern. Additional waves, generally less intense than the primary wave, may also develop downwind.

Depending on the wind speed and the atmosphere's stability, the distance between following waves can be from two to ten miles. Wave lengths up to 20 miles have been reported.

Sometimes, (not always), you can look at the clouds, and predict mountain waves.

Smooth clouds generally have smoother airflow, and with light turbulence. Clouds appearing ragged or irregular indicate more turbulence.

WARNING: <u>it is possible</u> for wave action to take place when the air is too dry to form clouds. This makes identifying and forecasting mountain waves more difficult.

*AOPA's Air Safety Institute offers a course entitled "**Mountain Flying**"*

This course qualifies for Wings Credit and AOPA Accident Forgiveness.

Winter Flying

Preflight

Ensure that you check the lights and pitot heat; ports, static ports, oil breather, stall warning horn, etc.
Ice can melt in the control surface hinges and re-freeze. Ensure that antennas, probes, and access doors are firmly attached. Make sure the top of each wing and tail is free of ice, both visually and by touch. Clear ice can be very hard to see, but a tactile inspection with a flashlight can find it.

All the Snow & Ice Must Go

Don't expect loose snow to blow off. The smallest amount of frost on an airfoil slows the air flow and can prevent an aircraft from becoming airborne. Even if you manage to make it off the ground, your aircraft could stall in the climb.

Preheating (Below 32oF)

Warm batteries just crank better, and instruments are happier when they're warm. Forced air heat can have an amazing effect on your instruments and engine start.
NOTE: If you run the battery down in freezing temps, be sure to charge it immediately.
Taxiing in Slush and Ice? Taxi slow. If slush is sprayed onto your gear, you can bet that it will freeze solid at altitude. If you have retractable gear, you might have a problem getting the gear down when you land.

Water in the Fuel Supply can freeze and block fuel lines, so keep fuel tanks full to prevent water condensation.
Change your fuel cap seals every year, and lubricate them often to keep them pliable. Make sure that the fuel selector operates smoothly.

When Starting you'll need more fuel in the fuel/air mixture.
Add at least one more priming stroke than you would on a warm day.
Observe the starter's limitations. Don't overwork it. Check oil pressure after engine start.
*To prevent spark plug fouling, do not idle lower than 1,000 RPM and lean your engine as much as possible.
During the run-up, make sure you're not slipping and skidding.

Switch Tanks every 30 minutes. If the fuel selector freezes, you'll still have fuel to find an airport.

Exercise the Propeller when you switch tanks. This helps prevent congealing hub oil.

Carbon Monoxide is a Big Concern in the Winter. . If you detect the odor of exhaust or feel drowsy, dizzy, or have a headache while using the heater, you should suspect carbon monoxide poisoning.

High Oil Temps are Great! The higher the better, because this helps vaporize the moisture.

AOPA's Air Safety Institute offers a course entitled ***"Weather Wise: Precipitation & Icing."***

This course qualifies for Wings Credit and AOPA Accident Forgiveness.

Hot Weather

When it gets hot, Density Altitude and many other things change dramatically. But if you know what to expect, you can mitigate the risk. Here are some rules of thumb that can give you a quick idea of how your plane is going to perform, even before you open up your aircraft book.

1) Density altitude increases or decreases about 120 feet for each 1°C from ISA

If the temperature rises 1 degree from ISA (ISA=15°C at sea level), your density altitude goes up about 120 feet. So if it's 30°C at sea level, your density altitude is going to be about 1,800'. (30°C-15°C = 15°C above ISA, 15 X 120 = 1,800)

ISA *decreases* 2°C per thousand feet. This is important for airports that *aren't* at sea level.
Let's take Denver Centennial, for example, at 5,885' field elevation. To make the math easy, we'll round up to 6,000'.

Altitude in feet	ISA in degrees Centigrade
7,000	1
6,000	3
5,000	5
4,000	7
3,000	9
2,000	11
1,000	13
Sea Level	15

At 6,000', ISA isn't 15°C, it's actually 3°C. So if it's 30°C at Denver Centennial, you're 27°C above ISA, and the density altitude is roughly 9,240'. That's an increase of more than 3,200' over field elevation.

The higher your airport, the bigger the difference a hot day makes.

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2) Takeoff roll increases about 10% for every additional 1,000 feet of density altitude ***(Most normally-aspirated GA airplanes)***

At Denver, with an increase of 3,200' of density altitude, we'll increase our takeoff roll by about 32%.
So if we have a 1,500' takeoff roll on a standard day in Denver (3°C), we'll increase that roll to almost 2,000' on a 30°C day.

3) True airspeed increases about 2% per thousand feet of density altitude

Let's use a threshold speed of 61 KIAS at Sea Level. Your indicated speed doesn't change based on DA, but your *true* airspeed does.
On a standard day at sea level, your indicated and true airspeed will be basically be the same.
What if you're in Denver on a 30°C day. With a density altitude of 9,240', your true airspeed will be high, too.

True Airspeed Increase	Density Altitude
None	Sea Level
2%	1,000 feet
4%	2,000 feet
6%	3,000 feet
8%	4,000 feet
10%	5,000 feet
12%	6,000 feet
14%	7,000 feet
16%	8,000 feet
18%	9,000 feet
20%	10,000 feet
22%	11,000 feet

Let's say the DA at Denver is 9,000' DA. Your landing true airspeed at 50 feet is going to be 72 knots true. That means that your airspeed indicator will read 61 knots, but you're actually going 72 knots through the air.
The extra 11 knots can make a big difference when it comes to floating and the distance required for landing.

"There's a big difference between a pilot and an aviator.

One is a technician. The other is an artist in love with flight."

— Captain Elrey Jeppesen

Fly Safe and have a great Flight Review

Jim Price

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