Bode Aviation
Remote Pilot Ground School
Edition 1.2

Welcome to Remote Pilot Ground School.

This course will prepare you for your FAA Remote Pilot Aeronautical Knowledge Written Test. During this training, you will learn everything you need to fly a Small Unmanned Aircraft (sUA) safely and legally. After passing the FAA written test, you will not only be able to fly recreationally, but commercially.

Class Schedule:
Lesson 1- Preflight Considerations: Everything you need to know before your drone leaves the ground.
Lesson 2- Operating in the National Airspace System: Everything you need to know to make sure you do not get yourself into trouble
Lesson 3- Safe Operations in the National Airspace System: How to operate safely in the National Airspace System and deal with the abnormal events that can occur while flying an sUA.
Lesson 4- Review and Final Exam

Upon completion of Remote Pilot Ground School, you will be able to schedule the FAA Remote Pilot Aeronautical Knowledge Written Test to complete the FAA training requirements.

Additional sUAS flight training is also available with a Bode Aviation DJI Phantom, RFX Simulator, or a personal drone. This additional training can be conducted at your convenience during or after the Ground School.
Manned aircraft training opportunities with Bode Aviation include:

• Private Pilot • Instrument Rating • Commercial Pilot • Upset Recovery • Mountain Flying	• Certificated Flight Instructor • Certificated Flight Instructor-Instrument • Multi-Engine

Thank you and welcome again to Remote Pilot Ground School,

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Remote Pilot Ground School

Course Goals and Objectives

- The student will have a working knowledge of how to safely, effectively, and legally employ a Small Unmanned Aerial System
- The student will be provided all information required to pass the FAA Written Knowledge Test

Enabling Objectives

Preflight Considerations

Making a Good Go/No-Go Decision and Risk Mitigation

There are two acronyms for assessing all of the risks associated with a flight, PAVE and IMSAFE.

- **P**-Pilot/Crew (IMSAFEE)
    - **I**-Illness-Are you healthy enough to fly?
    - **M**-Medication-Are you taking any medication that will negatively affect your ability to fly safely?
    - **S**-Stress-Is there any stress at home or in your environment that will negatively affect your ability to fly safely?
    - **A**-Alcohol-Have you consumed any alcohol in the last 8 hours? Are you still impacted by alcohol consumed more than 8 hours ago? Is your BAC more than 0.04?
    - **F**-Fatigue-Have you had adequate rest recently?
    - **E**-Eating-Have you eaten any food and drank water recently?
    - **E**-Emotions-Are you emotionally ready for the flight?
    - Responsibilities of the crew- Does your crew know their roles in the mission?
    - Are you current and proficient?
- **A**-Aircraft
    - Weight and balance
        - Is your sUAS within the max gross weight limits?
        - Is your sUAS within the CG limits?
    - Preflight inspection
        - Should be done in accordance with manufacturer's instructions if applicable. If there are none, start with the FAA checklist and make adjustments as needed to the specific type of SUAS
- **V**-enVironment
    - Weather-Is the weather adequate for a safe flight?
    - Terrain-Are there obstacles that would be a factor for the safety of flight?
    - Bystanders- Are there any bystanders that are close enough to the operation area to be a concern?
- **E**-External Pressures
    - Is there anything pushing you to possibly fly when it is not safe to do so?

Preflight Briefings and Inspections

- The Remote Pilot in Command has to become familiar with all available information pertaining to the flight. That information must include at least the following:
    - Weather
    - Takeoff and landing location
    - Alternate landing location
    - Local airspace and flight restrictions
    - Location of persons and property on the surface
    - Ground Hazards
    - Status of sUAS
- All crew members have to be briefed on the operation being conducted. The briefing must include at least the following:
    - Operating conditions
    - Emergency and contingency plans
    - Roles and responsibilities of everyone involved
    - Potential hazards
- See sample checklist on page 37

Weather Briefings

- Obtaining Weather Briefs

  While the “legal weather brief” that many pilots talk about is just a myth, it is incredibly important to get an official weather brief. Any source for weather can be used to get a general idea of what the weather is doing, but only aviation weather services that log your weather brief should be used for your official brief. There are three types of weather briefings that can be obtained from a variety of sources. Outlook briefings are for flight planning purposes 6 or more hours in advance of a flight. Standard briefings are used for normal flight planning leading up to a flight. Abbreviated briefings are used for a double check of the weather before a flight as well as supplementing widely distributed weather reports.
- Weather sources

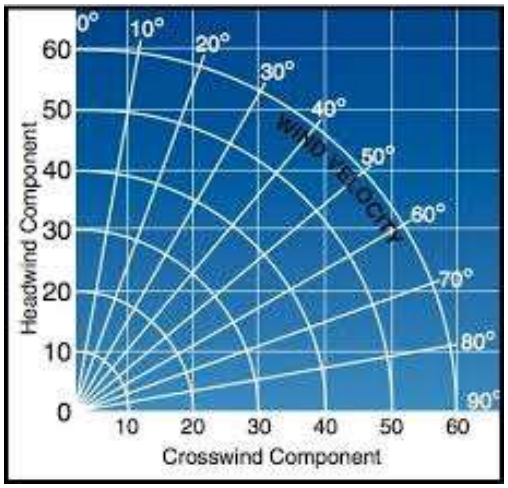
  Leidos Flight Service is the FAA recommended weather brief source. There are two ways to get a briefing from them, online at 1800wxbrief.com or their phone number 1800wxbrief (1-800-992-7433). Either way you can get one of three weather briefings, an outlook, a standard, or an abbreviated. An outlook brief will give you a forecast at least 6 hours ahead of a flight. A standard will give you the current weather and the forecasted weather for planning purposes shortly prior to a flight. The abbreviated will give you a quick update on what is happening to give you a final check.

  Usairnet.com will not log your weather briefing, but will give you the aviation version of a standard news weather forecast going out three days.

  aviationweather.gov also will not log your weather briefing, but has additional supplements to a Leidos briefing including the Graphical Forecast for Aviation.

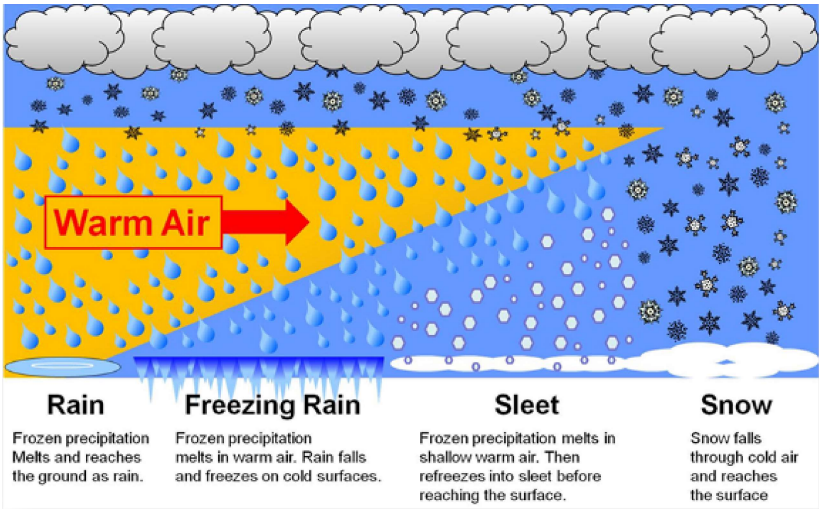
  AWOS/ASOS/ATIS are weather reports for a specific airport. ATIS are updated by Air Traffic Control at any towered airport and gives an hourly update on the weather. AWOS and ASOS give an up to the minute weather report at most airports.
- Weather is caused by unequal heating from the sun. The sun hits areas closer to the equator more directly than areas by the poles, causing more heat and lower pressure near the equator. In a local area, there is unequal heating as some surfaces more readily absorb solar energy. Nature hates differences, so it will try to bring things back into equilibrium. The result is all of the weather we see. All weather is either caused by or accompanied by a heat exchange.
- Wind obviously will cause an aircraft to move. In a fixed wing aircraft, a headwind causes an increase in airspeed at a slower ground speed, which helps shorten takeoff and landing distances. Cross winds are also a factor for fixed wing aircraft. With any sUAS, you will have a larger range when you have a tailwind and a shorter range with a head wind. If you are flying away from yourself with a tailwind, make sure you save enough battery to make it back to the home point. Be careful to not exceed the wind limits of your sUAS. Typically 10-15 knots is the most an sUA is able to safely be flown

in. Any time the wind is written, it is in True North. Wind travels from areas of high pressure to low pressure.



- Unstable air masses will have turbulence, cumulus clouds, showery rain, and good visibility. Stable air masses will have smooth air, stratus clouds, constant rain, and poor visibility.
- Standard pressure is 29.92” Hg and the standard temperature is 15 degrees C. For every 1000 feet of altitude you climb, you can expect to lose 1” Hg of pressure and 2 degrees C. Dew Point increases by 0.5 degrees C per thousand feet.
- Temperature inversions are when the air up higher is warmer than the air closer to the ground. It typically happens when terrestrial radiation heats up the air on calm, clear nights.
- As the air heats up, it is able to hold more moisture. For every 20 degrees an air mass is heated, it is able to double the amount of water being suspended. The amount of moisture being held compared to the amount it is able to hold at that temperature is called the relative humidity. There are four ways moisture can be added to or removed from an air mass. Evaporation is when a liquid turns into a gas, like when water boils. Sublimation is when a solid turns into a gas. This can be seen by putting a tray of ice into a freezer for a long period of time. Eventually the ice cubes shrink as the water sublimates. Another common way to see sublimation is dry ice, which turns directly from ice to carbon dioxide gas. Condensation is when a gas turns into a liquid, which can be seen with dew forming on the ground and water condensing on the outside of a glass. Disposition is when a gas turns directly to a solid, which can be seen with frost. The dewpoint is the temperature that dew or clouds will form if the air is cooled to that temperature. Dew point increases by 0.5 degrees celsius for every 1000 feet of altitude gained. To calculate where clouds or fog can be expected to form, subtract temperature - dewpoint, then divide by 2.5 for the rate that the temperatures change. Take that number and multiply by 1000 to get an approximate altitude above ground level for cloud formation.

- Clouds are divided into categories based on the height of the clouds. The shape is determined by the stability of the air. Cumulus clouds, which look like cotton balls, are a sign of turbulence. Stratus clouds, which are long and flat, are a sign of smooth air. Lenticular clouds, which look like a lens, are a sign of mountain wave turbulence. Nimbus means the cloud is a rain cloud. Cumulonimbus, the only cloud that is specified in weather reports (CB), means thunderstorms. Alto clouds are 6,000-18,000 feet. Cirrus clouds are above 18,000 feet. Cloud levels are classified based on how many 8ths of the sky has clouds. If zero eighths of the sky has clouds, it is considered “Sky Clear” (CLR, SKC).1/8th-2/8ths of the sky having clouds is called “Few” (FEW). 3/8th-4/8th is considered “Scattered”. 5/8th-7/8th is “Broken”. 8/8th is “Overcast” (OVC). A ceiling is the lowest level of broken or overcast clouds. When the ceiling is less than 1000 feet or the visibility is less than 3 miles, it is considered Instrument Meteorological Conditions and only pilots flying under Instrument Flight Rules (IFR) are allowed to fly. While this seems unimportant for a sUAS pilot, it is part of the required written exam.
- Fog is created any time the temperature and dewpoint meet. This can happen from the temperature being decreased to the dew point or moisture being added to the air until the dew point reaches the temperature. There are 6 main types of fog classified based on how the moisture is added to the air or temperature is decreased. Radiation fog is when the ground cools rapidly at night and cools the overlying air to the dew point. Advection, which means side to side motion, fog is created when warm, moist air over a body of water is blown over cool land by winds up to 15 knots. The land cools the air to the dew point. Steam fog is when cool air moves over a warm body of water. The water evaporates, then condenses creating a smoke-like layer of fog. Precipitation fog is when rain, or another type of precipitation, evaporates again and creates a fog layer. Ice fog is a type of radiation fog that occurs when it is -25 degrees C or colder.
- Precipitation is any type of moisture that falls from the sky. The type of precipitation depends on the temperature of the air the water is falling through. Typically, precipitation is accompanied by low levels of clouds and low visibility. It is not a good idea to fly a drone in any type of precipitation. Below is a diagram of most of the types of precipitation along with the air temperatures that create them. Ice pellets are created when there is a layer of freezing rain aloft.



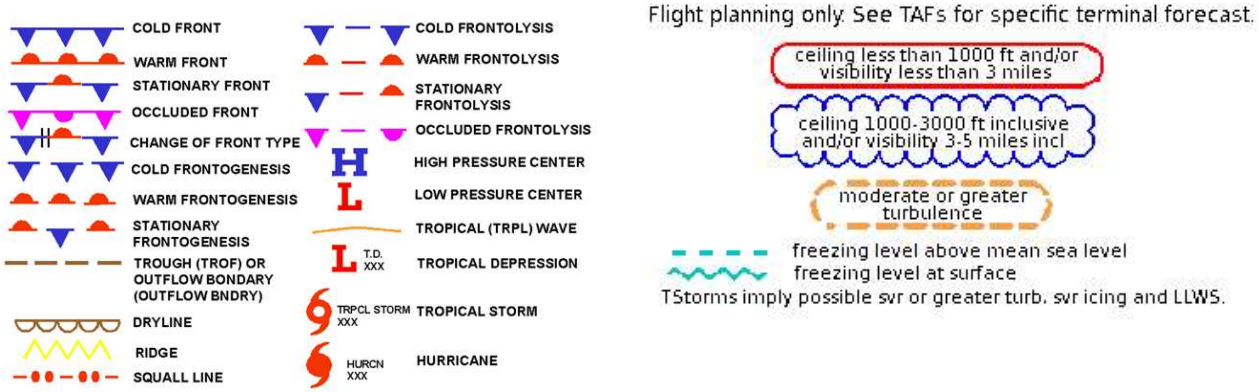
- It is never a good idea to fly within 20 miles of any thunderstorm. During a thunderstorm the air is incredibly unstable, which can damage an aircraft. Rain damages components and can cause precipitation static. It also has the additional risks of hail and freezing rain which can damage an aircraft or destroy its lift production capabilities.
- Icing occurs any time there is visible moisture between 2 and -20 degrees. There are three types of ice, rime, clear, and mixed. Rime ice forms white spikier ice crystals when there are small drops of water. Clear ice forms when there are large drops of water and creates a clear sheet of ice over the surfaces. Mixed ice is a combination of the other two. Ice is dangerous because it causes a decrease in lift and thrust and an increase in weight and drag. With enough ice, an aircraft will be unable to fly.
- Aviation routine weather reports (METAR).
    - METARs are an hourly weather report, typically coming out 53 minutes past the hour. They cover a 5 mile radius from the reporting airport.
    - The first part of a METAR is the airport identifier. In the example, the airport is Sunport.
    - The second part is the date and time in Zulu, or the time in Greenwich England. The first two numbers are the day. The third through sixth are the time. To convert from zulu time is 6 hours ahead in the summer and 7 hours ahead in the winter. In the example, the date and time are the 20th day of the month at 1953 zulu, which depending on the month would either be 1353 or 1453 local.
    - The third part is the wind. The first three numbers are the wind direction. Any remaining number is the wind speed. A G means gust, so in the example the wind is out of 240 at 15 knots gusting to 21 knots.
    - The fourth part is visibility in statute miles. The highest visibility that will ever be reported is 10SM. In the example there is ¾ mile visibility.
    - The fifth part is any remarks. In this case there is heavy rain (+ means heavy and RA means rain) from a thunderstorm (TS).
    - The sixth part is any clouds. Clouds are divided up into five levels, sky clear (SKC or CLR, 0/8ths of the sky has clouds), few (FEW, ⅛-2/8ths of the sky has clouds), scattered (SCT, 3/8 -4/8ths of the sky has clouds), broken (BKN, 6/8 -⅞

of the sky has clouds) , and overcast (OVC, the whole sky is cloudy). The number with the code is what altitude the clouds start at in hundreds of feet. In the example there is a broken layer at 800 feet above ground level (AGL) and a second overcast layer at 1500 feet AGL. The CB means the overcast layer is cumulonimbus clouds.
    - The seventh part is the temperature and dewpoint. In the example, the temperature is 26 degrees C and the dewpoint is 25 degrees C. The closer the numbers are, the lower clouds will probably be.
    - The eighth part is the barometric pressure in inches of mercury. In the example, the pressure is 29.85” Hg.
    - The ninth part is any remarks. This can include a wide variety of things like a more precise temperature and dewpoint, if there's lighting, etc. In the example the remarks are that the thunderstorm began 32 minutes past the hour and rain began 32 minutes past the hour.
    - Example:
        - METAR KABQ 201953Z 24015G21KT 3/4SM +TSRA BKN008 OVC015CB 26/25 A2985 RMK TSB32RAB32
- Terminal Aerodrome Forecasts (TAF).
    - TAFs are a daily forecast. They come out four times per day and usually show the predicted weather 24 hours in advance.
    - Decoding a TAF is very similar to decoding a METAR.
    - The first difference is the issuance time, which is the first zulu time after the airport identifier. In the example the TAF was created on the 5th day at 1130 zulu. The second set of numbers is when the TAF starts to be valid. You could start using the example TAF on the 5th day at 1212 zulu.
    - The next difference is where it says TEMPO. TEMPO means that the weather is forecast to temporarily change starting at the zulu time immediately following, in this case 1316 zulu.
    - BECMG means that at the following time the weather is supposed to change to the weather conditions after that. In the example, at 2224 zulu the wind is supposed to increase and visibility is supposed to decrease as the mist (BR) changes to rain showers (SHRA).
    - PROB means that the number attached is the probability that the weather after that is going to happen. In the example, there is a 40% chance that there will be thunderstorms and low visibility from 0000 zulu to 0600 zulu.
    - Example:
        - KAEG 051130Z 0512/0612 14008KT 5SM BR BKN030 TEMPO 1316 1 1/2SM BR FM1600 16010KT P6SM SKC BECMG 2224 20013G20KT 4SM SHRA OVC020 PROB40 0006 2SM TSRA OVC008CB=

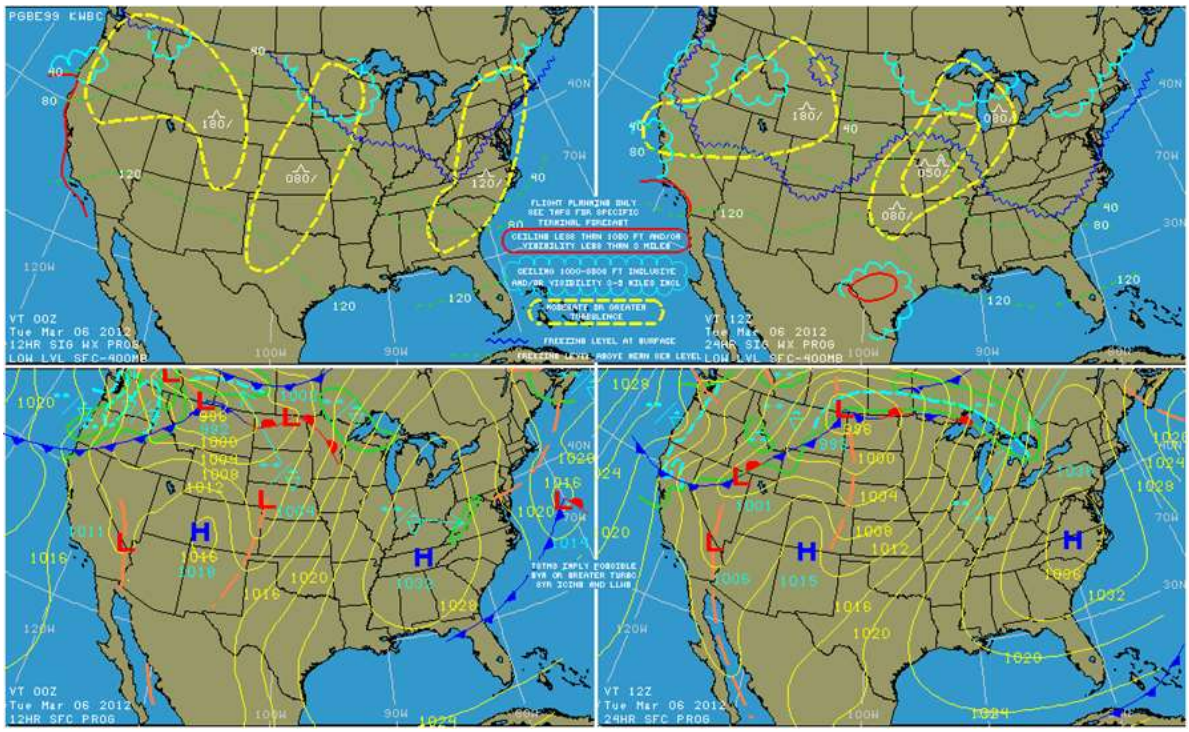
- Weather charts.

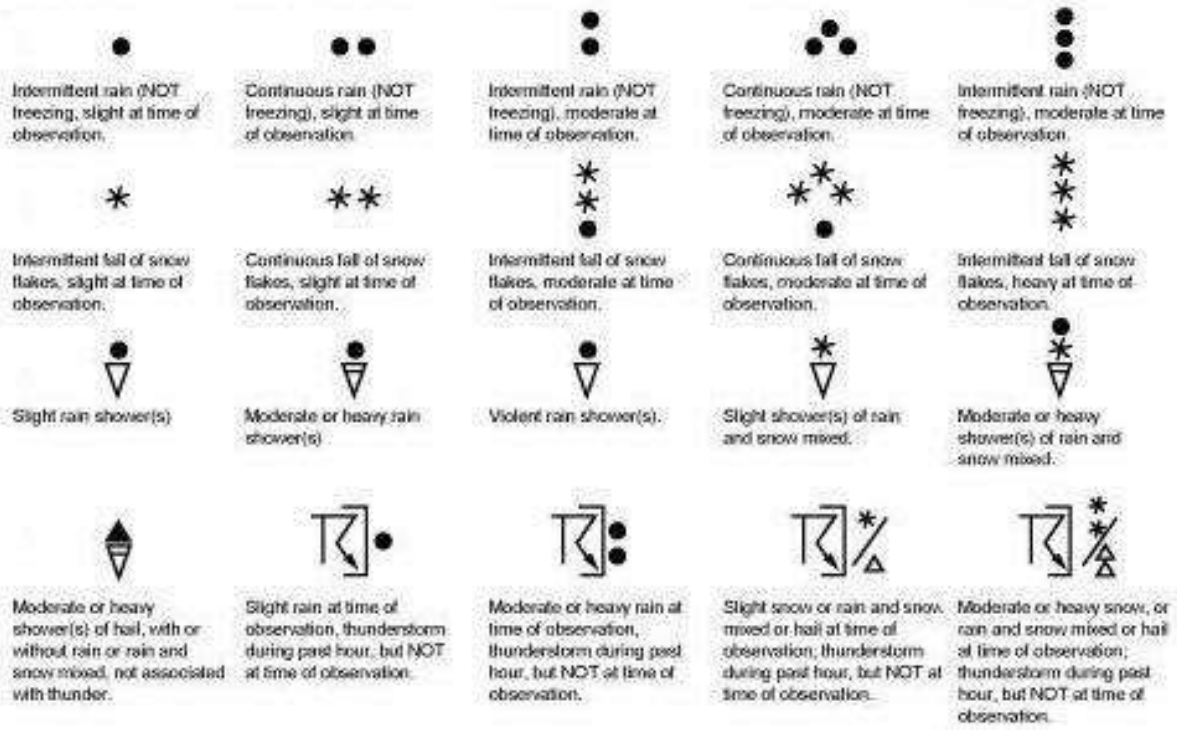
    Prog Charts and Surface Analysis Charts

- Prog Charts and Surface Analysis charts show the trends of fronts and pressure systems.
- Any time there is a front of any kind, a low pressure system, or a trough, you can expect poor weather. If there is a high pressure system, you can expect generally good weather.



- Low Level Significant Weather Prognostic Chart
  - Shows all of the things a normal prog chart shows, but also has precipitation areas





Intermittent rain (NOT freezing, slight at time of observation.

Continuous rain (NOT freezing), slight at time of observation.

Intermittent rain (NOT freezing), moderate at time of observation.

Continuous rain (NOT freezing), moderate at time of observation.

Intermittent rain (NOT freezing), moderate at time of observation.

Intermittent fall of snow flakes, slight at time of observation.

Continuous fall of snow flakes, slight at time of observation.

Intermittent fall of snow flakes, moderate at time of observation.

Continuous fall of snow flakes, moderate at time of observation.

Intermittent fall of snow flakes, heavy at time of observation.

Slight rain shower(s)

Moderate or heavy rain shower(s)

Violent rain shower(s).

Slight shower(s) of rain and snow mixed.

Moderate or heavy shower(s) of rain and snow mixed.

Moderate or heavy shower(s) of hail, with or without rain or rain and snow mixed, not associated with thunder.

Slight rain at time of observation, thunderstorm during past hour, but NOT at time of observation.

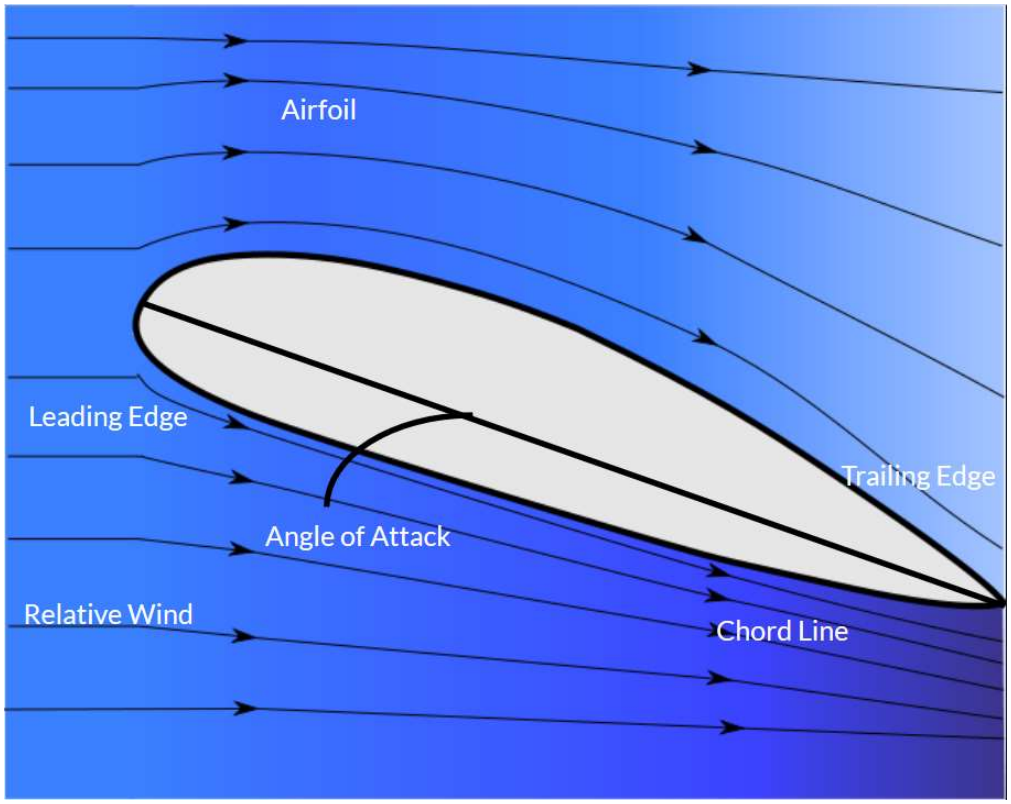
Moderate or heavy rain at time of observation, thunderstorm during past hour, but NOT at time of observation.

Slight snow or rain and snow mixed or hail at time of observation; thunderstorm during past hour, but NOT at time of observation.

Moderate or heavy snow, or rain and snow mixed or hail at time of observation; thunderstorm during past hour, but NOT at time of observation.

Aerodynamics

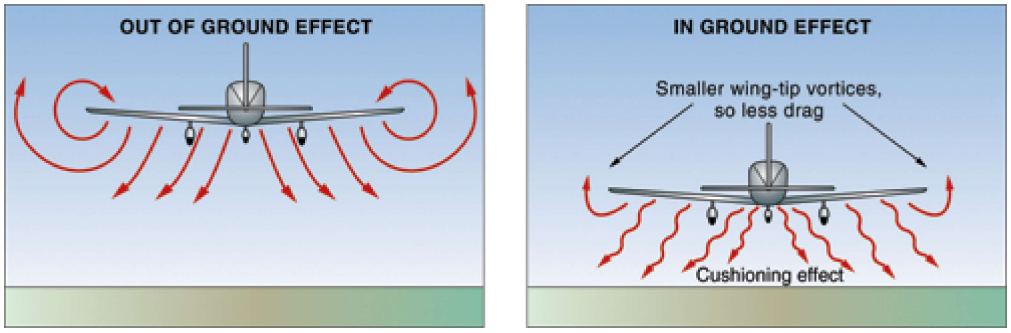
- Airfoils are a shape that when it moves through fluid creates lift.
- The front, typically rounded part of an airfoil is called the leading edge.
- The back, typically pointed part of an airfoil is called the trailing edge.
- The line connecting the leading and trailing edge of the airfoil is called the leading edge.
- Directly opposite the path of the airfoil is the relative wind. It is the wind that is felt because of the airfoil moving through a fluid.
- The angle between the relative wind and the chord line is called the angle of attack. The greater the angle of attack, the more lift is produced by the airfoil.



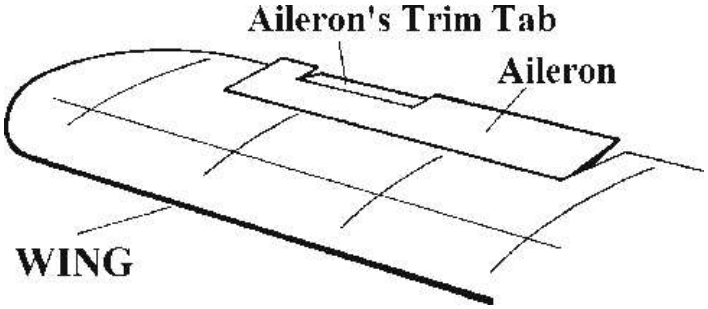
- A stall is a loss in lift due to air separating after exceeding the “Critical Angle of Attack”.
- Lift is produced by two main principles, Bournulli’s principle and Newton’s third law. Bournulli’s principle says that as a fluid accelerates, the pressure decreases. The air over the top of the wing has to move faster, so there is lower pressure on top and high pressure below, which pushes the airfoil up. Newton’s third law says that for every action, there is an equal and opposite reaction. Air is pushed down by the wing. The air in turn pushes the wing up.
- Weight is the combination of the weight of the aircraft and the tail down force.
- Thrust is lift being produced forward by the propeller.
- There are two main categories of drag, induced and parasite. Induced drag is caused by lift being bent backwards by the actual relative wind being in a different place than it theoretically would be. Parasite drag has three types. Form drag is caused by something

trying to move through something else. Skin friction drag is caused by the air rubbing on the airfoil. Interference drag is caused by the airflow around one component of the aircraft interfering with the airflow around a different part.

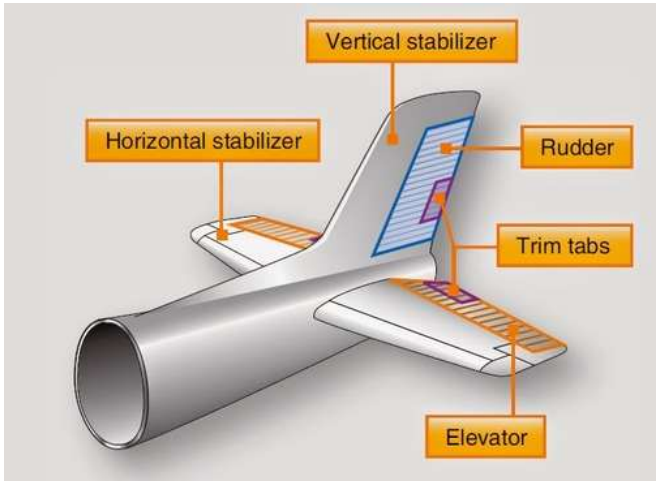
- Ground effect is a decrease in induced drag due to being within roughly a wingspan from the ground. It causes aircraft that are traveling quickly to float excessively and can cause them to become airborne at speeds below stall speed.



- There are three types of primary control surfaces. Ailerons are typically on the trailing edge of the wings near the wing tips. They cause the airplane to bank.



Elevators are typically on the trailing edge of the horizontal stabilizer on the back of the airplane and are used to pitch the airplane.



The rudder is typically on the trailing edge of the vertical stabilizer and is used to yaw the airplane.

Secondary control surfaces are used to make flying easier for a pilot. Trim is used to cause the airplane to want to stay in a desired attitude by forcing the control surfaces to stay in a specific place without the pilot needing to hold them there.

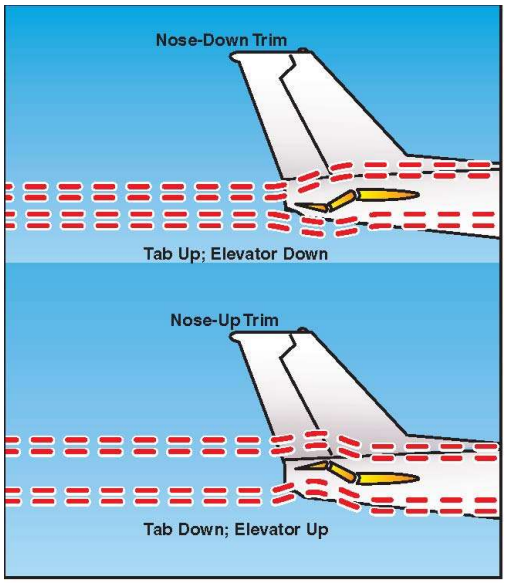


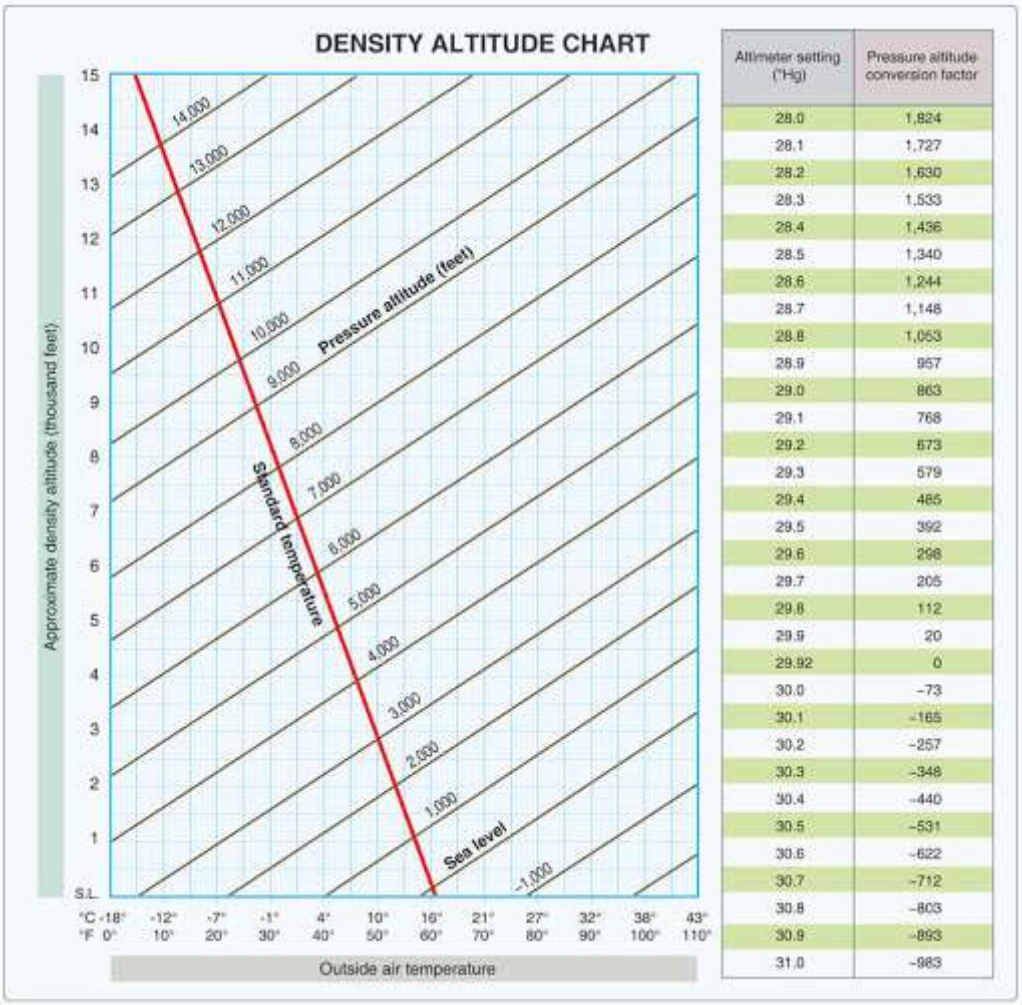
Figure 4-16. The movement of the elevator is opposite to the direction of movement of the elevator trim tab.

Flaps, which are typically on the trailing edge of the wing closer to the wing root, increase the lift and drag being created by the aircraft allowing pilots to have steeper climb and descent angles and shorter takeoff and landing distances.

- Stability
    - Static stability is the initial tendency of the aircraft after there is a disruption.
        - Positive static stability is when the aircraft initially returns in the direction of the original position.
        - Neutral static stability is when the aircraft stays in the new position after an upset.
        - Negative static stability is when an aircraft continues to move in the direction of the upset.
    - Dynamic stability is the tendency of the aircraft over time. To have any type of dynamic stability, an aircraft has to have positive static stability.
        - Positive dynamic stability is when the oscillations of the aircraft get smaller with time.
        - Neutral dynamic stability is when the oscillations remain the same size with time.
        - Negative dynamic stability is when the oscillations get bigger with time.

Aircraft Loading and Performance

- Pressure altitude is the altitude above sea level corrected for non standard pressure.
  29.92
  -Current altimeter setting
  X1000
  +Airport elevation
- Density altitude is pressure altitude corrected for non standard temperature. High density altitude=the density of high altitude air=bad performance.



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

- Weather factors and their effects on performance:
  - There are three main factors that affect an aircraft's performance, temperature, air pressure, and humidity. High temperatures, high humidity, and high altitude all have a negative impact on the performance of an aircraft because there is less air in a given volume of air. These factors are included in density altitude or the altitude the aircraft will act as if it is flying at. The higher the density altitude, the lower the density of the air and the worse the performance will be.

- Aircraft Loading:
    - Effects of Weight
        - A heavier sUAS will have worse performance. An increase in lift is necessary to carry the weight and extra power is necessary to create the lift. This will cause a greater fuel burn or faster discharge of the battery. Because there is a lower amount of excess lift, climbs will also be slower with a heavier aircraft and it will not be able to move as quickly. Check if the advertised flight time with the sUAS is with payload or empty weight.
        - A heavier sUAS will be less stable. Stability is the tendency for an aircraft to return to its original position after a disruption.
        - It is extremely important to make sure the sUAS does not exceed the weight limits to limit the amount of force being applied. Excessive load can break critical components.
        - Max weight should be no more than half of the maximum thrust for the number of motors. The Mavic E310 motor produces 350 grams of thrust per motor. A quadcopter using this motor should have a total weight no more than 1600 g or 3.5 lbs.
    - Effects of Balance
        - An unbalanced sUAS will be unable to evenly produce thrust in a hover, decreasing performance. The flight controller will use differential thrust to correct for an imbalance, so some of the motors can only produce partial thrust. If it did not correct for it, the sUAS would flip over as more power was applied.
    - Load factor is the increased perceived weight of an aircraft due to inertia measured in G's. Load factor is increased by banking an aircraft, sudden control inputs, and turbulence.
    - Calculating balance
        - Weight x arm = moment (perceived weight)
        - Total moment / Total weight = CG
- Aircraft Performance:
    - Importance and use of performance data to calculate the effect on the aircraft's performance of an sUAS.

Maintenance

- Basic maintenance.
    - There are two main types of maintenance for a UAS, scheduled and unscheduled. Scheduled maintenance, if any, will be in the operator's manual for the UAS. Unscheduled maintenance is anytime you discover that there is something wrong with your sUAS or the manufacturer comes out with an unscheduled update In these situations, the sUAS is not airworthy until the repair or update is made.
- Safe use of lithium batteries
    - Safe transportation
        - Prior to use, you should ensure that your batteries are not visibly damaged or bulging. Some batteries will not show damage prior to a serious issue. Get a battery tester like the hobby king hk-010 to test the batteries for damage that is not visible from the outside. Each cell needs to be within 0.1v of the rest.
        - Keep them in a padded case where they won't bounce around or get damaged.
    - Safe charging
        - Statistically, the most dangerous period of time when it comes to the batteries during the charging. Do not charge it like your phone and walk away.
        - The safest practice is to charge your batteries outside and away from flammable materials. If you are going to charge it inside, like most remote pilots, place the batteries in a cinder block or unsealed ammo can or other unsealed fireproof container. Keep water or sand nearby to extinguish any flames that may start.
    - Safe usage
        - If you do not intend to use a given battery in the next 10 days, drain it to reduce the stress on the battery. If there isn't any visible damage or bulging and they aren't overheating, they should be safe to store, but spontaneous battery fires do occur.
        - Be careful to protect the batteries from extreme heat. Drones should only be flown in temperatures ranging from 14 to 104 degrees f and should not be flown for long periods of time at full throttle. Flying it at full throttle rapidly drains the battery, which causes it to heat up faster and causes a potential for thermal runaway.
    - Returning batteries
        - You can not safely throw away a lithium battery due to the fire risk. With these batteries, drain them to as close as possible to 0% and take them to a specialized recycling center.

        - To drain the battery hook it up to a light bulb from a car tail light. Some people recommend soaking it in salt water, but for that to be effective you have to puncture the battery, which can cause it to explode. Same thing with the nail method.
        - Put non conductive tape over the ends to make sure no current is able to flow through the battery. Place it in a plastic or cardboard box for shipping so if there is any discharge it is not conducted to the outside.
- Appropriate record keeping.
    - Records should be kept of the flight time for each component and when there is an inspection, overhaul, repair, or replacement of any part of the sUAS. It is also a good idea to log all flight time and a general description of the conditions of the flight including wind speeds and type of operation.
- Persons that may perform maintenance on an sUAS.
    - Maintenance should be performed by the manufacturer or someone authorized to perform that maintenance including repair stations and people holding repair certificates.

Operations in the National Airspace System

Regulations Pertaining to Unmanned Aerial System Operations

- Federal Aviation Regulations are all in the “FAR/AIM” book, which comes out each year in September. It is divided into chapters called “Parts”. Each part covers a specific area of law. Part 1 covers definitions. Part 61 covers training for pilots. Part 91 covers all of the general operating rules. Part 107 covers all of the regulations pertaining to Small Unmanned Aircraft.
- Applicability of 14 CFR part 107 to small unmanned aircraft operations.
    - 14 CFR 107.1
    - Applies to all Small Unmanned Aircraft Systems (UAS) except:
        - Air carrier ops
        - Any aircraft controlled by 14 CFR 101
            - Kites
            - Moored balloons
            - Amateur rockets
            - Recreational model aircraft
        - Any aircraft controlled by the 333 of public law 112-95 exception
            - UAS weighing more than 55 lbs at takeoff
        - Any commercial operations of sUAS are regulated by part 107 including:
            - Aerial photography for compensation
            - Flying for business
            - Aerial surveying for compensation
        - Part 107 does not apply to:
            - Flying for fun
            - Aerial photography for personal use
            - Assisting with search and rescue
- Training Requirements
    - To become a pilot you must:
        - Be at least 16 years old
        - Be able to read, speak, write, and understand English
        - Be in a physical and mental condition to safely fly a drone
        - Pass the initial aeronautical knowledge exam
    - Requirements for a Remote Pilot Certificate:
        - Must be easily accessible by the remote pilot during all UAS operations
        - Valid for 2 years. Certificate holders must pass a recurrent knowledge test every two years
    - Training Requirements
        - Applicable regulations relating to small unmanned aircraft system rating privileges, limitations, and flight operation
        - Airspace classification and operating requirements, and flight restrictions affecting small unmanned aircraft operation

        - Aviation weather sources and effects of weather on small unmanned aircraft performance
        - Small unmanned aircraft loading and performance
        - Emergency procedures
        - Crew resource management
        - Radio communication procedures
        - Determining the performance of small unmanned aircraft
        - Physiological effects of drugs and alcohol
        - Aeronautical decision-making and judgment
        - Airport operations
        - Maintenance and preflight inspection procedures
- Definitions used in 14 CFR part 107.
    - 14 CFR 107.3
    - Control station
        - The device used by the pilot to control the flight path of the UAS
    - Corrective lenses
        - Glasses or contacts
    - Remote Pilot In Command (RPIC)
        - The person who is ultimately responsible for the safe operations of a UAS
    - Small unmanned aircraft
        - An unmanned aircraft that weighs less than 55 lbs including anything on board or attached to the aircraft
    - Small unmanned aircraft system (UAS)
        - A small unmanned aircraft plus any other equipment necessary for safe operation
    - Unmanned aircraft
        - Any aircraft operated without the possibility of direct human intervention from within or on the aircraft
    - Visual observer
        - Anybody assigned by the RPIC to help the RPIC and manipulator of the controls to see and avoid traffic and objects aloft and on the ground
- The ramifications of falsification, reproduction, or alteration of a certificate, rating, authorization, record, or report.
    - 14 CFR 107.5
    - Any attempt to forge a certificate, rating, authorization, record, or report will result in:
        - Denial of an application for a remote pilot certificate
        - Denial of an application for a certificate of waiver
        - Suspension of revocation of any certificate or waiver issued under Part 107
        - Civil penalty
- Inspection, testing, and demonstration of compliance
    - 14 CFR 107.7

    - If the FAA wants to inspect the remote pilot certificate or any other required document, record, or report, the RPIC must allow them to
    - If the FAA wants to inspect the UAS, the RPIC must allow them to
- Accident Reporting.
    - 14 CFR 107.9
    - Within 10 days of any operation meeting the criteria, the RPIC must send a report to the administrator. The criteria are:
        - Serious injury or loss of consciousness
        - Damage to any property other than the sUAS unless the cost of repair including materials and labor or the fair market value does not exceed 500 dollars
- Registration requirements for sUAS.
    - 14 CFR 107.13 and 91.203(a)(2)
    - 107.13 refers you to 91.203(a)(2), which requires you to register your UAS. Registration costs 5 dollars and is valid for 3 years.
- The requirement for the sUAS to be in a condition for safe operation.
    - 14 CFR 107.15
    - You must perform a preflight inspection of your sUAS prior to the flight
    - If you know or have reason to know that the sUAS is no longer safe to fly, you can not continue the flight
- Medical condition(s) that would interfere with the safe operation of an sUAS.
    - 14 CFR 107.17
    - If you know that you have a medical condition that would interfere with the safe operation of the flight, you may not act as the RPIC, visual observer, manipulator of the controls, or be directly involved in the flight
- Responsibility and authority of the remote PIC.
    - 14 CFR 107.19
    - The RPIC must be determined prior to the beginning of the flight
    - The RPIC is the final authority for the flight
    - The RPIC must determine that there is no undue risks to people, other aircraft, or property in the event of a loss of control
    - The RPIC is responsible to make sure all regulations are followed
- Hazardous operations.
    - 14 CFR 107.23
    - You may not operate a sUAS in a careless or reckless way
    - You may not drop any objects from a sUAS if it creates an undue hazard to persons or property
- Operating from a moving aircraft or moving land- or water-borne vehicles.
    - 14 CFR 107.25
    - You can not operate a sUAS from a moving aircraft
    - You may only operate a sUAS from a moving watercraft or land vehicle if you are in a sparsely populated area and are not carrying the property for anybody else for compensation or hire

- Alcohol or drugs and the provisions on the prohibition of use.
    - 14 CFR 107.27, 91.17, and 91.19
    - The person manipulating the controls of the UAS, acting as RPIC, or visual observer may not have consumed alcohol within 8 hours, have a BAC of 0.04 or greater, or be under the influence of alcohol or any drug that affects the person's faculties in a way that affects safety. If they are asked by law enforcement to take a drug or alcohol test, they have to do it. Unless you are working for the government, you are not allowed to knowingly carry any drugs.
- Daylight operation.
    - 14 CFR 107.29
    - UAS is not allowed to be operated at night
    - You can only operate a sUAS from sunset to a half-hour after sunset or 30 minutes before sunrise to sunrise (civil twilight) if you have anti-collision lighting that is visible for 3 miles
- Visual line of sight (VLOS) aircraft operations.
    - 14 CFR 107.31
    - All people involved in the flight must be able to maintain visual contact of the sUAS without any aid other than corrective lenses. At any given moment, either the RPIC and manipulator of the controls or a visual observer must be in visual contact with the UAS.
- Requirements when a visual observer is used.
    - 14 CFR 107.33
    - The RPIC must remain in contact with the visual observer
    - The RPIC has to make sure the visual observer can see the UAS
    - The RPIC and visual observer need to coordinate scanning the airspace and awareness of the sUAS position
- Prohibition of operating multiple sUAS.
    - 14 CFR 107.35
    - You can not be the RPIC or visual observer for more than one sUAS at a time
- Prohibition of carrying hazardous material.
    - 14 CFR 107.36 and 49 CFR 171.8 and 172.101
    - You can not carry anything deemed hazardous
    - The references for what is considered hazardous are in 49 CFR 171.8 and 172.101
- Staying safely away from other aircraft and right-of-way rules.
    - 14 CFR 107.37
    - UAS must yield the right of way to all aircraft, airborne vehicles, launch, and reentry vehicles. This means they can not fly above, below, or in front of any of them unless well clear
    - You may not operate a sUAS so close to any other aircraft as to create a collision hazard
- Operations over human beings.
    - 14 CFR 107.39

    - You may not fly over anyone unless they are directly involved in the operation of the sUAS or are under a structure or in a stationary vehicle that can reasonably protect them from a falling UAS
- Prior authorization required for operation in certain airspace.
    - 14 CFR 107.41
    - Unless you get prior permission from ATC, you can not fly a sUAS within any controlled airspaces
- Operating in the vicinity of airports.
    - 14 CFR 107.43
    - You can not operate a sUAS in a way that interferes with any airports, helipads, or seaplane bases
- Operating in prohibited or restricted areas.
    - 14 CFR 107.45
    - You can not operate a sUAS in a prohibited or restricted airspace unless given permission by the controlling agency
- Flight restrictions in the proximity of certain areas designated by notice to airmen (NOTAM).
    - 14 CFR 107.47, 91.137, 91.145, 99.7
    - You can not fly a sUAS in a TFR
- Preflight familiarization, inspection, and actions for aircraft operations.
    - 14 CFR 107.49
    - The RPIC must familiarize themselves with the local weather, airspace, flight restrictions, locations of persons or property, and any other ground hazards prior to the flight
    - The RPIC has to brief anyone directly involved in the operation of the sUAS on the conditions, emergency procedures, contingency procedures, roles and responsibilities, and any potential hazards
    - The RPIC has to confirm that the control links are working, there is adequate power, and anything carried is secure and does not adversely affect flight characteristics and controllability
- Operating limitations for sUAS.
    - 14 CFR 107.51
    - Maximum ground speed
        - 87 knots
    - Altitude limitations
        - 400 feet AGL unless you are within 400 feet of any structure
    - Minimum visibility
        - 3 miles
    - Cloud clearance requirements
        - 500 feet below clouds and 2000 feet horizontally from them
- Offenses involving alcohol or drugs.
    - 14 CFR 107.57, 91.17(a), 91.19(a)

    - Convictions involving drugs and alcohol are grounds for denial of an application, suspension, or revocation of a remote pilot certificate or rating
- The consequences of refusing to submit to a drug or alcohol test or to furnish test results.
    - 14 CFR 107.59
    - If you do not submit to a drug or alcohol test of furnish the test results, that is grounds for denial of an application, suspension, or revocation of a remote pilot certificate or rating
- The eligibility requirements for a Remote Pilot Certificate with an sUAS rating.
    - 14 CFR 107.61
    - To be able to be a remote pilot, you need to be at least 16 years old, be able to read, write, speak, and understand English, not know or have reason to know about any medical conditions that would cause the flight to be unsafe, and pass a written knowledge test or have a current pilot license under part 61
- Aeronautical knowledge recency
    - 14 CFR 107.65
    - The remote pilot certificate is current for 24 calendar months. After 24 months, you need to either pass an initial knowledge test covering part 107.74, pass a recurrent knowledge test covering part 107.74, or have a pilot certificate issued under part 61 and pass a training course covering part 107.74
- Requirements for a Remote Pilot Certificate with an sUAS rating.
    - 14 CFR 107.73
    - Areas that have to be covered for a remote pilot certificate include:
        - Applicable regulations relating to small unmanned aircraft system rating privileges, limitations, and flight operation, Airspace classification, operating requirements, and flight restrictions affecting small unmanned aircraft operation, Aviation weather sources and effects of weather on small unmanned aircraft performance, Small unmanned aircraft loading, Emergency procedures, Crew Resource Management, Radio communication procedures, Determining the performance of small unmanned aircraft, Physiological effects of drugs and alcohol, Aeronautical decision-making and judgment, Airport Operations and Maintenance and preflight inspection procedures.
- Waiver policy and requirements.
    - 14 CFR 107.200, 107.205
    - The FAA can issue a waiver for the following:
        - Section 107.25 - Operation from a moving vehicle or aircraft. However, no waiver of this provision will be issued to allow the carriage of property of another by aircraft for compensation or hire.
        - Section 107.29 - Daylight operation.
        - Section 107.31 - Visual line of sight aircraft operation. However, no waiver of this provision will be issued to allow the carriage of property of another by aircraft for compensation or hire.

        - Section 107.33 - Visual observer.
        - Section 107.35 - Operation of multiple small unmanned aircraft systems.
        - Section 107.37(a) - Yielding the right of way.
        - Section 107.39 - Operation over people.
        - Section 107.41 - Operation in certain airspace.
        - Section 107.51 - Operating limitations for small unmanned aircraft.
    - To get a waiver, you have to request it with a description of the operation and justification that shows that the operation can be completed safely. The FAA can add any limitations they see fit.

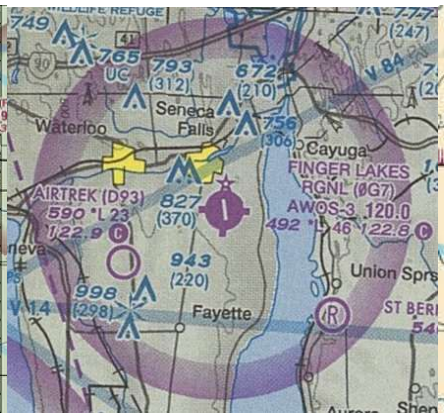
Airspace

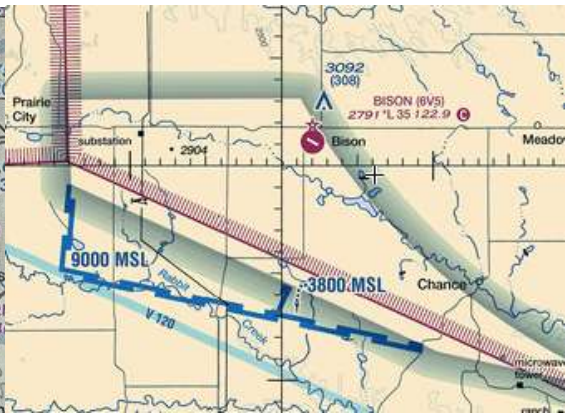
- Types of Airspace
    - Controlled Airspace
        - Airspace where Air Traffic Control is responsible for all aircraft
    - Uncontrolled Airspace
        - Airspace where Air Traffic Control is not responsible for aircraft
    - Special Use Airspace (SUA)
        - Airspace that is used for nonstandard purposes
    - Other Airspace
- General airspace
    - Class B
        - Around the biggest airports
        - Depicted with a dark blue line

        - Dimensions vary, but typically go to 10,000 MSL with multiple shelves
        - UAS not authorized without permission from ATC and a waiver
    - Class C
        - Around large airports including Sunport
        - Depicted with 2 solid magenta circles with a mushroom shape.
            - The surface area is usually 5 miles with a second 5-mile shelf area.
        - UAS not authorized without permission from ATC and a waiver.

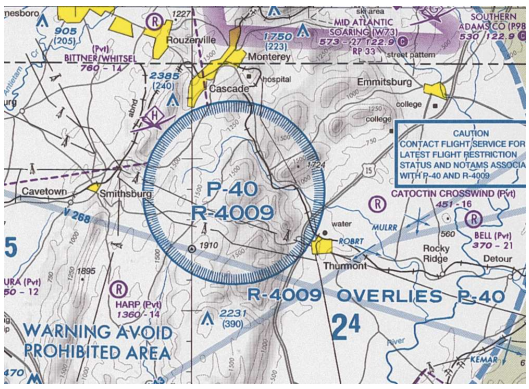
- Class D
  - Around smaller towered airports including Double Eagle II
  - Depicted by a dashed blue circle

  - Surface area is usually 4-5 miles and 2500 feet tall
  - UAS not authorized without permission from ATC and a waiver.
- Some Class C and Class D airports have part time towers, which are not always active. When a tower is part time, the tower frequency will have a star next to it and a C in a blue circle indicating the frequency for the CTAF when the tower is closed. The chart supplement will have the active hours. When a tower is not active, the airspace reverts to Class E or Class G or some combination of the two.
- Class E
  - All other controlled airspaces
  - Has various depictions and sizes. Class E is anywhere above 14500 MSL to 18000 MSL. Inside of the fuzzy blue, it goes to 1200 AGL. Inside of vignette (fuzzy) magenta, it goes to 700 feet. Inside of magenta dashes, it goes to the surface.
  - UAS not authorized without permission from ATC and a waiver.



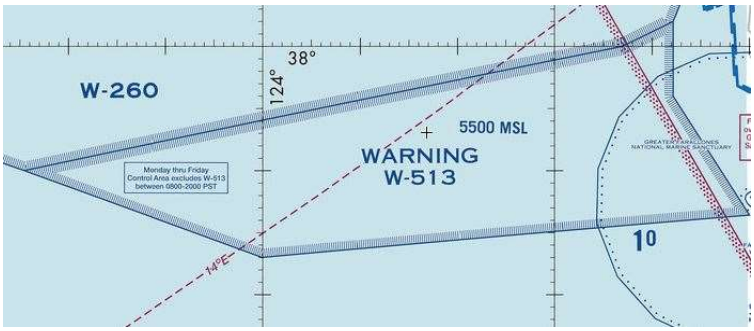


    - Class G
        - Uncontrolled airspace
        - Below all other airspace
- Special-use airspace
    - Prohibited
        - For national security reasons, nobody can fly there

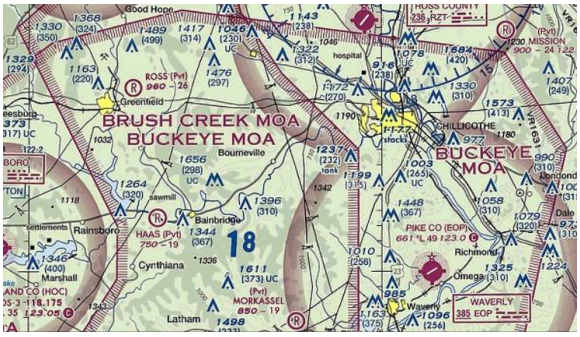


    - Restricted
        - Due to military training and other reasons dangerous to pilots, you can only go in this airspace when it is not in use

    - Warning Areas
        - These are areas that are like a restricted area, but they are over international waters, so the government can't forbid flight there



- Military Operation Areas (MOA)
  - This is an area where the military is training and it is recommended to avoid due to the types of high-speed maneuvering being done, but it is not banned



- Alert Areas
  - These are areas with high levels of training or other things the FAA thought you might want to know about

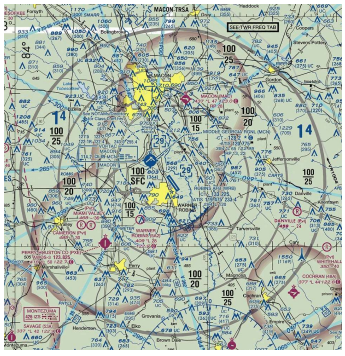
- Controlled Firing Areas.
  - These areas are not depicted because there are spotters looking for planes and they stop the shooting before we get close enough to be an issue

- Other airspace areas
  - Airport Advisory Services
    - If an FSS is located at an airport, they will sometimes give traffic advisories

- Military Training Routes (MTRs)
  - There are a few different types of military training routes. VR means the route is a visual route, IR is an instrument route. The number of numbers in the identifier tells you where to expect the traffic to be. 4 numbers means the whole route is below 1500 AGL and 3 means there are segments above 1500 AGL.

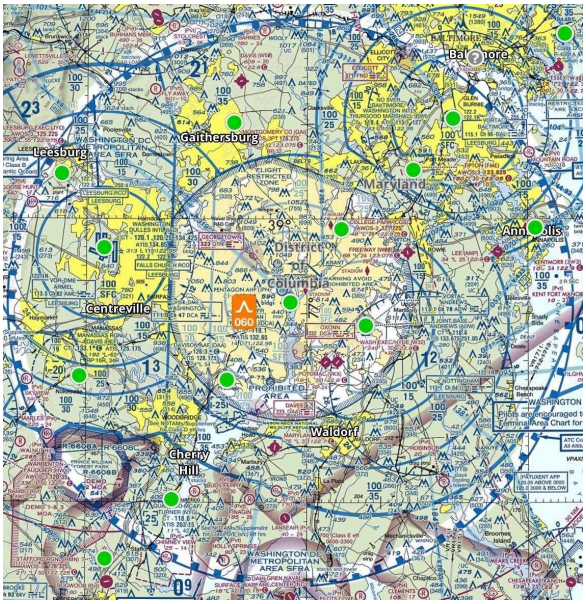
- Temporary Flight Restrictions (TFRs)
  - TFRs are temporary areas where pilots can't fly. They are put in place because of events that would cause a lot of public interest or to protect people involved in certain events. They are created for things like airshows, forest fire ops, the President being in town, and sports games.
- Parachute Jump Operations
  - Areas with a lot of parachute activities are depicted in the chart supplement and on the sectional chart

- Terminal Radar Service Areas (TRSAs)
  - TRSAs are essentially an optional Class C airspace. The middle part is a Class D and inside of the grey circles, you can get radar coverage as if it was a Class C if you want.

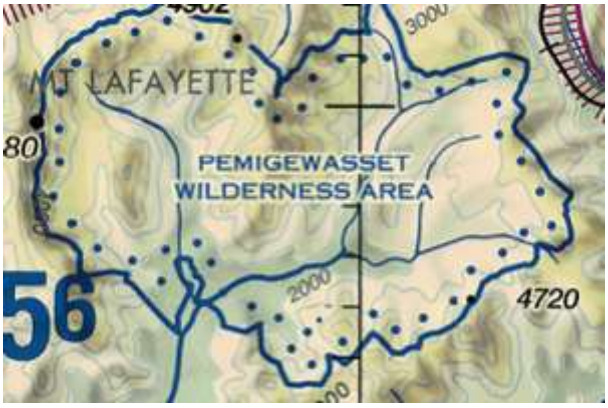


- National Security Areas (NSA)
  - Areas that pilots are requested to avoid for security reasons.

- Washington DC, Metropolitan Area Special Flight Rules Area
  - To fly within 60 miles of the DCA VOR, you need to take a special flight rules area online class and stay clear of the SFRA
  - To fly within 30 miles of the DCA VOR, you need to have a flight plan filed
  - To fly within 15 miles of the DCA VOR, you need to get a background check in DC and a DC Flight Restricted Zone flight plan



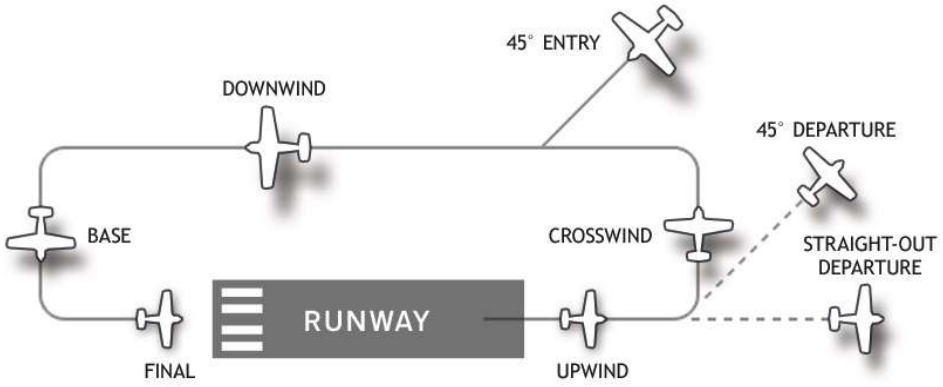
- Wildlife Area/Wilderness Area
  - UAS are not authorized



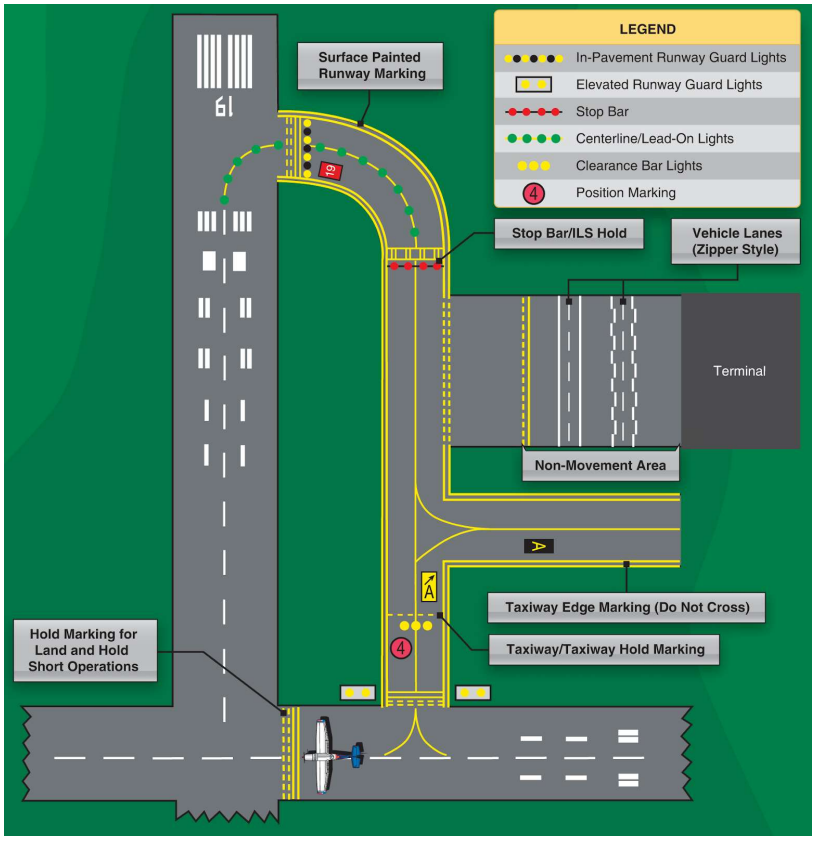
- Air Traffic Control (ATC) and the NAS.
    - The primary purpose of ATC to prevent aircraft collisions and to expedite the flow of traffic. They can provide additional services if time permits including weather updates.
- Basic weather minimums.
    - Weather minimums are 3-mile visibility with 500 feet below and 2000 feet horizontally from clouds

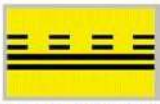
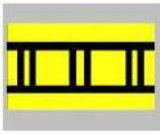
Airport Operations

- Types of airports
    - Towered airports are directly controlled by an ATC tower. These airports are blue on the sectional chart and are usually inside of a Class B, C, or D airspace.
    - Non-Towered airports are not controlled by air traffic control. They are magenta on sectional charts. Since ATC is not directly supervising the use of these airports, pilots are responsible for position reports and communication with other pilots. It is not required for pilots at a non towered airport to have a radio or to use one if they have it, so do not rely on people actually advising you on their position.
- Traffic patterns used by manned aircraft pilots.



- Air Operating Areas (AOA) and Security Identification Display Areas (SIDA).
    - AOA and SIDA areas are the parts of an airport that the general public are not allowed to go. Many AOA and all SIDA require special training for the specific airport being used and a badge to be allowed there. If you need to go into an AOA or SIDA for any mission, contact the airport manager for more information on the required training.
- Sources for airport data:
    - Aeronautical charts
        - The main chart used for sUAS operations is the VFR sectional chart. Sectional charts include airport data, navigational aids, airspace, and topography.



	**ILS critical area holding position sign** When the ILS is in use ATC may hold you short of this sign so your aircraft does not interfere with the ILS signal.		**Runway boundary sign** This sign faces the runway and is visible to pilots exiting the runway. Taxi past this sign to be sure you are clear of the runway.
	**Runway approach area holding position sign** You must hold at this sign until cleared to cross the runway, to avoid interference with runway operations.		**Taxiway ending marker** This sign indicates the termination of the taxiway. It is located at the far end of the intersection.
	**Taxiway location sign** This sign indicates which taxiway you're on. It may be posted next to direction or holding position signs.		**Closed runway and taxiway marking** Located at both ends of permanently closed runways and at 1,000-foot intervals. It is also placed at taxiway entrances if they are permanently closed.
	**Runway holding position sign** Until cleared onto the runway you must hold at this sign. In this example, the runway 15 threshold is to the left and the runway 33 threshold is to the right.		**Direction sign for runway exit** This sign will indicate the approaching taxiway while on the runway. In this example, taxiway Bravo is approaching to the left.
	**Destination signs and location sign** This sign indicates current position and direction to other taxiways. In this example, you are on taxiway Alpha. Taxiway Charlie passes from right to left and Alpha continues ahead to the right.		**ILS critical area boundary sign** Indicates when you are safely clear of the ILS critical area. It is located directly beside the ILS holding position markings. While ILS approaches are in use, taxi past the sign before stopping on the taxiway.
	**Outbound destination sign** This sign indicates directions to common taxi routes. In this example, runway 27 and 33 are to the right. The dot in the middle separates destinations identified on the sign.		**Holding position and location signs** In this example you are on taxiway Alpha; runway 5-23 passes perpendicular to your position. Runway 9-27 passes at an angle starting ahead and left of your position to behind and right of your position.
	**Inbound destination sign** This sign directs pilots to destinations on the airport. This example indicates that the military installation is to the right.		**Runway location sign** This sign identifies the runway on which your aircraft is located.

LEGEND

Airports having Control Towers are shown in Blue, all others in Magenta. Consult Airport/Facility Directory (A/FD) for details involving airport lighting, navigation aids, and services. For additional symbol information refer to the Chart User's Guide.

AIRPORTS

Other than hard-surfaced runways

Seaplane Base

Hard-surfaced runways 1500 ft. to 8069 ft. in length

Hard-surfaced runways greater than 8069 ft. or some multiple runways less than 8069 ft.

Open dot within hard-surfaced runway configuration indicates approximate VOR, VOR-DME, or VORTAC location.

All recognizable hard-surfaced runways, including those closed, are shown for visual identification. Airports may be public or private.

ADDITIONAL AIRPORT INFORMATION

Private "(Pvt)" - Non-public use having emergency or landmark value

Military - Other than hard-surfaced; all military airports are identified by abbreviations AFB, NAS, AAF, etc. For complete airport information consult DoD FLIP.

Heliport Selected

Unverified

Abandoned - paved having landmark value, 3000 ft. or greater

Ultralight Flight Park Selected

Services - fuel available and field tended during normal working hours depicted by use of ticks around basic airport symbol. (Normal working hours are Mon thru Fri 10:00 A.M. to 4:00 P.M. local time.) Consult A/FD for service availability at airports with hard-surfaced runways greater than 8069 ft.

Rotating airport beacon in operation Sunset to Sunrise

AIRPORT DATA

Box indicates FAR 93 Special Air Traffic Rules & Airport Traffic Patterns.

FSS — FAR 91

NO SVFR — Location Identifier

NAME (NAM) (PNAM) — ICAO Location Indicator shown outside contiguous U.S.

Runways with Right Traffic Patterns (public use)

CT - 118.3 * C ATIS 123.8

285 L 72 122.95

RP 23, 34

RP * Special conditions exist - see A/FD.

VFR Advsy 125.0 — UNICOM

AOE — Airport of Entry

FSS - Flight Service Station

NO SVFR - Fixed-wing special VFR flight is prohibited.

CT - 118.3 - Control Tower (CT) - primary frequency

★ - Star indicates operation part-time. See tower frequencies tabulation for hours of operation.

C - Common Traffic Advisory Frequencies (CTAF)

ATIS 123.8 - Automatic Terminal Information Service

ASOS/AWOS 135.42 - Automated Surface Weather Observing Systems (shown where full-time ATIS not available). Some ASOS/AWOS facilities may not be located at airports.

UNICOM - Aeronautical advisory station

VFR Advsy - VFR Advisory Service shown where full-time ATIS not available and frequency is other than primary CT frequency.

285 - Elevation in feet

L - Lighting in operation Sunset to Sunrise

*L - Lighting limitations exist; refer to Airport/Facility Directory.

72 - Length of longest runway in hundreds of feet; usable length may be less.

When information is lacking, the respective character is replaced by a dash. Lighting codes refer to runway edge lights and may not represent the longest runway or full length lighting.

AIRPORT TRAFFIC SERVICE AND AIRSPACE INFORMATION

Only the controlled and reserved airspace effective below 18,000 ft. MSL are shown on this chart. All times are local.

Class B Airspace

Class C Airspace (Mode C - see FAR 91.215/AIM.)

Class D Airspace

40 — Ceiling of Class D Airspace in hundreds of feet (A minus ceiling value indicates surface up to but not including that value.)

Class E (sfc) Airspace

Class E Airspace with floor 700 ft. above surface

Class E Airspace with floor 1200 ft. or greater above surface that abuts Class G Airspace

2400 MSL / 4500 MSL — Differentiates floors of Class E Airspace greater than 700 ft. above surface.

Class E Airspace exists at 1200' AGL unless otherwise designated as shown above.

Class E Airspace low altitude Federal Airways are indicated by center line. Intersection - Arrows are directed towards facilities which establish intersection.

132° — V 69 — 169

Total mileage between NAVAIDs on direct Airways

Class E Airspace low altitude RNAV Routes are indicated by center line.

GRANT — T 319

RNAV waypoint and name

Prohibited, Restricted, Warning and Alert Areas; Canadian Advisory and Restricted Areas

MOA - Military Operations Area

Special Airport Traffic Area (See FAR 93 for details.)

ADIZ - Air Defense Identification Zone

MODE C (See FAR 91.215/AIM.)

National Security Area

Terminal Radar Service Area (TRSA)

IR211 — MTR - Military Training Route

COMMUNICATION BOXES

122.1R 122.6 123.6

OAKDALE T

362 * 116.8 OAK

Underline indicates no voice on this frequency.

★ - Operates less than continuous or On-Request.

T - TWEB

H - HIWAS

A - ASOS/AWOS

122.1R

CHICAGO CHI

Heavy line box indicates Flight Service Station (FSS). Frequencies 121.5, 122.2, 243.0 and 255.4 (Canada - 121.5, 126.7 and 243.0) are normally available at all FSSs and are not shown above boxes. All other frequencies are shown.

For Local Airport Advisory use FSS frequency 123.6.

R - Receive only

122.1R

MIAMI

FSS providing voice communication

Frequencies above thin line box are remoted to NAVAID site. Other frequencies at FSS providing voice communication may be available as determined by altitude and terrain. Consult Airport/Facility Directory for complete information.

RADIO AIDS TO NAVIGATION

VHF OMNI RANGE (VOR)

VORTAC

VOR-DME

Other facilities, i.e., FSS Outlet, RCO, etc.

Non-Directional Radiobeacon (NDB)

NDB - DME

OBSTRUCTIONS

1000 ft. and higher AGL

below 1000 ft. AGL

or — Group Obstruction

or — Obstruction with high-intensity lights; may operate part-time.

2049 — Elevation of the top above mean sea level

(1149) — Height above ground

UC — Under construction or reported: position and elevation unverified

NOTICE: Guy wires may extend outward from structures.

MISCELLANEOUS

1°E — Isogonic Line (2005 VALUE)

U — Ultralight Activity

H — Hang Glider Activity

G — Glider Operations

Parachute Jumping Area (See Airport/Facility Directory.)

VPXYZ — VFR Waypoints (See Airport/Facility Directory for latitude/longitude.)

NAME (VPXYZ)

Fl ☆ Flashing Light

● Marine Light

TOPOGRAPHIC INFORMATION

95 / 40 — Roads & Road Markers

Railroad

Power Transmission Line

Aerial Cable

Landmark Feature - stadium, factory, school, golf course, etc.

Outdoor Theater

Lookout Tower P-17 (Site Number) 618 (Elevation Base of Tower)

CG — Coast Guard Station

Race Track

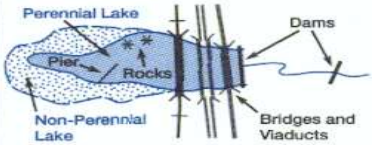
Tank - water, oil or gas

Oil Well ● Water Well

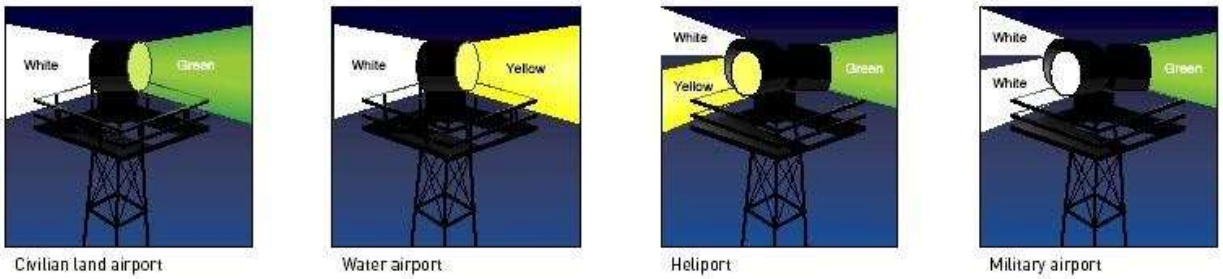
Mine or Quarry

Mountain Pass 11823 (Elevation of Pass)

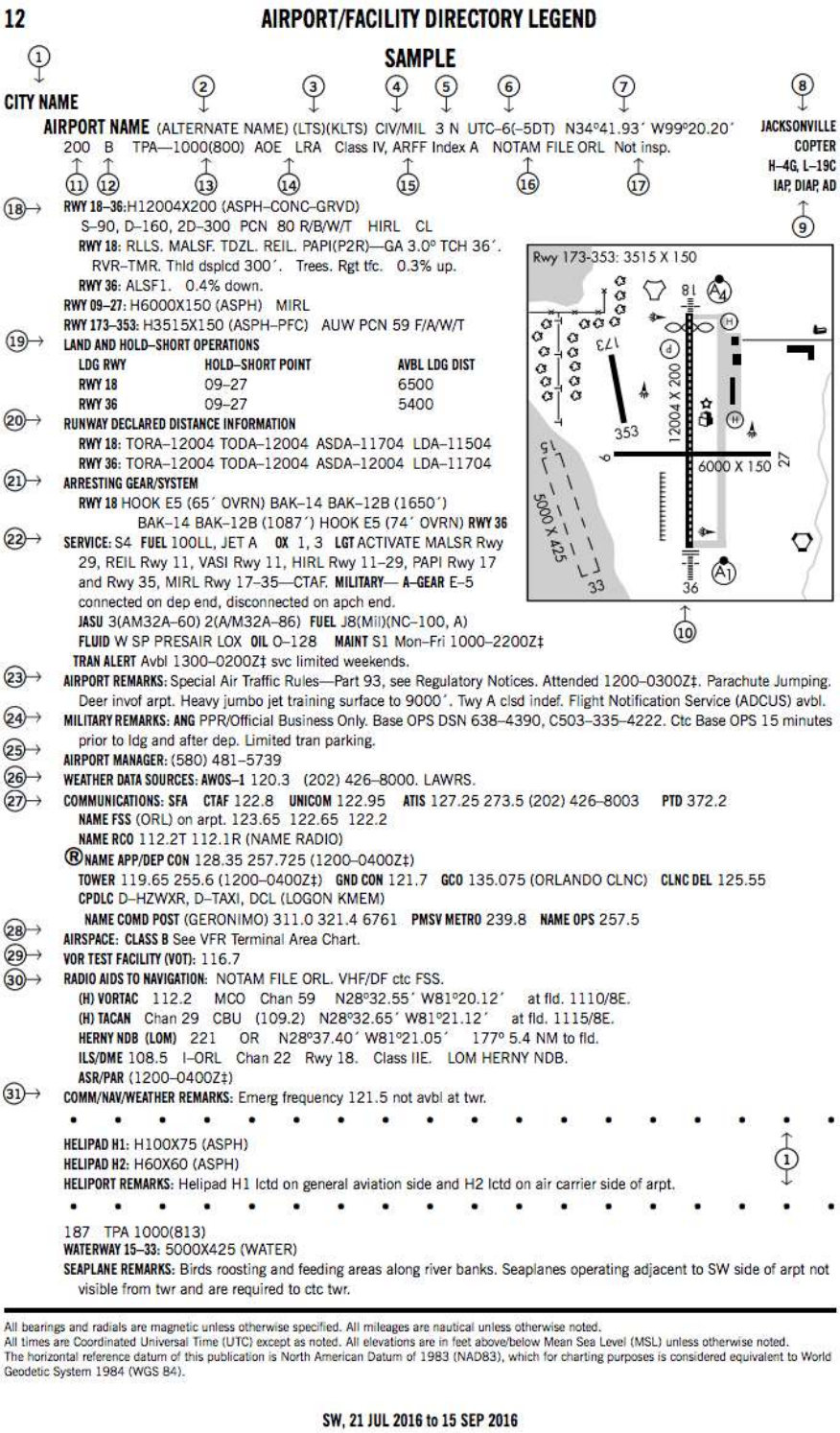
(Pass symbol does not indicate a recommended route or direction of flight and pass elevation does not indicate a recommended clearance altitude. Hazardous flight conditions may exist within and near mountain passes.)



- Airport beacons allow pilots flying at night to easily locate an airport and see what type of airport it is.



- Chart Supplements
  - Chart supplements, previously known as Airport/Facility Directory (A/FD), have the most complete information about an airport.



12 AIRPORT/FACILITY DIRECTORY LEGEND

SAMPLE

CITY NAME

AIRPORT NAME (ALTERNATE NAME) (LTS)(KLTS) CIV/MIL 3 N UTC-6(-5DT) N34°41.93′ W99°20.20′
200 B TPA—1000(800) AOE LRA Class IV, ARFF Index A NOTAM FILE ORL Not insp.

JACKSONVILLE
COPTER
H-4G, L-19C
IAP, DIAP, AD

RWY 18–36: H12004X200 (ASPH–CONC–GRVD)
S–90, D–160, 2D–300 PCN 80 R/B/W/T HIRL CL
RWY 18: RLLS. MALSF. TDZL. REIL. PAPI(P2R)—GA 3.0° TCH 36′. RVR–TMR. Thld dsplcd 300′. Trees. Rgt tfc. 0.3% up.
RWY 36: ALSF1. 0.4% down.
RWY 09–27: H6000X150 (ASPH) MIRL
RWY 173–353: H3515X150 (ASPH–PFC) AUW PCN 59 F/A/W/T
LAND AND HOLD–SHORT OPERATIONS

LDG RWY	HOLD–SHORT POINT	AVBL LDG DIST
RWY 18	09–27	6500
RWY 36	09–27	5400

RUNWAY DECLARED DISTANCE INFORMATION
RWY 18: TORA–12004 TODA–12004 ASDA–11704 LDA–11504
RWY 36: TORA–12004 TODA–12004 ASDA–12004 LDA–11704
ARRESTING GEAR/SYSTEM
RWY 18 HOOK E5 (65′ OVRN) BAK–14 BAK–12B (1650′)
BAK–14 BAK–12B (1087′) HOOK E5 (74′ OVRN) RWY 36
SERVICE: S4 FUEL 100LL, JET A OX 1, 3 LGT ACTIVATE MALSR Rwy 29, REIL Rwy 11, VASI Rwy 11, HIRL Rwy 11–29, PAPI Rwy 17 and Rwy 35, MIRL Rwy 17–35—CTAF. MILITARY— A–GEAR E–5 connected on dep end, disconnected on apch end.
JASU 3(AM32A–60) 2(A/M32A–86) FUEL J8(Mil)(NC–100, A)
FLUID W SP PRESAIR LOX OIL O–128 MAINT S1 Mon–Fri 1000–2200Z‡
TRAN ALERT Avbl 1300–0200Z‡ svc limited weekends.

Rwy 173-353: 3515 X 150
12004 X 200
6000 X 150
5000 X 425
173
353
81
27
9
33
36

AIRPORT REMARKS: Special Air Traffic Rules—Part 93, see Regulatory Notices. Attended 1200–0300Z‡. Parachute Jumping. Deer invof arpt. Heavy jumbo jet training surface to 9000′. Twy A clsd indef. Flight Notification Service (ADCUS) avbl.
MILITARY REMARKS: ANG PPR/Official Business Only. Base OPS DSN 638–4390, C503–335–4222. Ctc Base OPS 15 minutes prior to ldg and after dep. Limited tran parking.
AIRPORT MANAGER: (580) 481–5739
WEATHER DATA SOURCES: AWOS–1 120.3 (202) 426–8000. LAWRS.
COMMUNICATIONS: SFA CTAF 122.8 UNICOM 122.95 ATIS 127.25 273.5 (202) 426–8003 PTD 372.2
NAME FSS (ORL) on arpt. 123.65 122.65 122.2
NAME RCO 112.2T 112.1R (NAME RADIO)
® NAME APP/DEP CON 128.35 257.725 (1200–0400Z‡)
TOWER 119.65 255.6 (1200–0400Z‡) GND CON 121.7 GCO 135.075 (ORLANDO CLNC) CLNC DEL 125.55
CPDLC D–HZWXR, D–TAXI, DCL (LOGON KMEM)
NAME COMD POST (GERONIMO) 311.0 321.4 6761 PMSV METRO 239.8 NAME OPS 257.5
AIRSPACE: CLASS B See VFR Terminal Area Chart.
VOR TEST FACILITY (VOT): 116.7
RADIO AIDS TO NAVIGATION: NOTAM FILE ORL. VHF/DF ctc FSS.
(H) VORTAC 112.2 MCO Chan 59 N28°32.55′ W81°20.12′ at fld. 1110/8E.
(H) TACAN Chan 29 CBU (109.2) N28°32.65′ W81°21.12′ at fld. 1115/8E.
HERNY NDB (LOM) 221 OR N28°37.40′ W81°21.05′ 177° 5.4 NM to fld.
ILS/DME 108.5 I–ORL Chan 22 Rwy 18. Class IIE. LOM HERNY NDB.
ASR/PAR (1200–0400Z‡)
COMM/NAV/WEATHER REMARKS: Emerg frequency 121.5 not avbl at twr.

HELIPAD H1: H100X75 (ASPH)
HELIPAD H2: H60X60 (ASPH)
HELIPORT REMARKS: Helipad H1 lctd on general aviation side and H2 lctd on air carrier side of arpt.

187 TPA 1000(813)
WATERWAY 15–33: 5000X425 (WATER)
SEAPLANE REMARKS: Birds roosting and feeding areas along river banks. Seaplanes operating adjacent to SW side of arpt not visible from twr and are required to ctc twr.

All bearings and radials are magnetic unless otherwise specified. All mileages are nautical unless otherwise noted.
All times are Coordinated Universal Time (UTC) except as noted. All elevations are in feet above/below Mean Sea Level (MSL) unless otherwise noted.
The horizontal reference datum of this publication is North American Datum of 1983 (NAD83), which for charting purposes is considered equivalent to World Geodetic System 1984 (WGS 84).

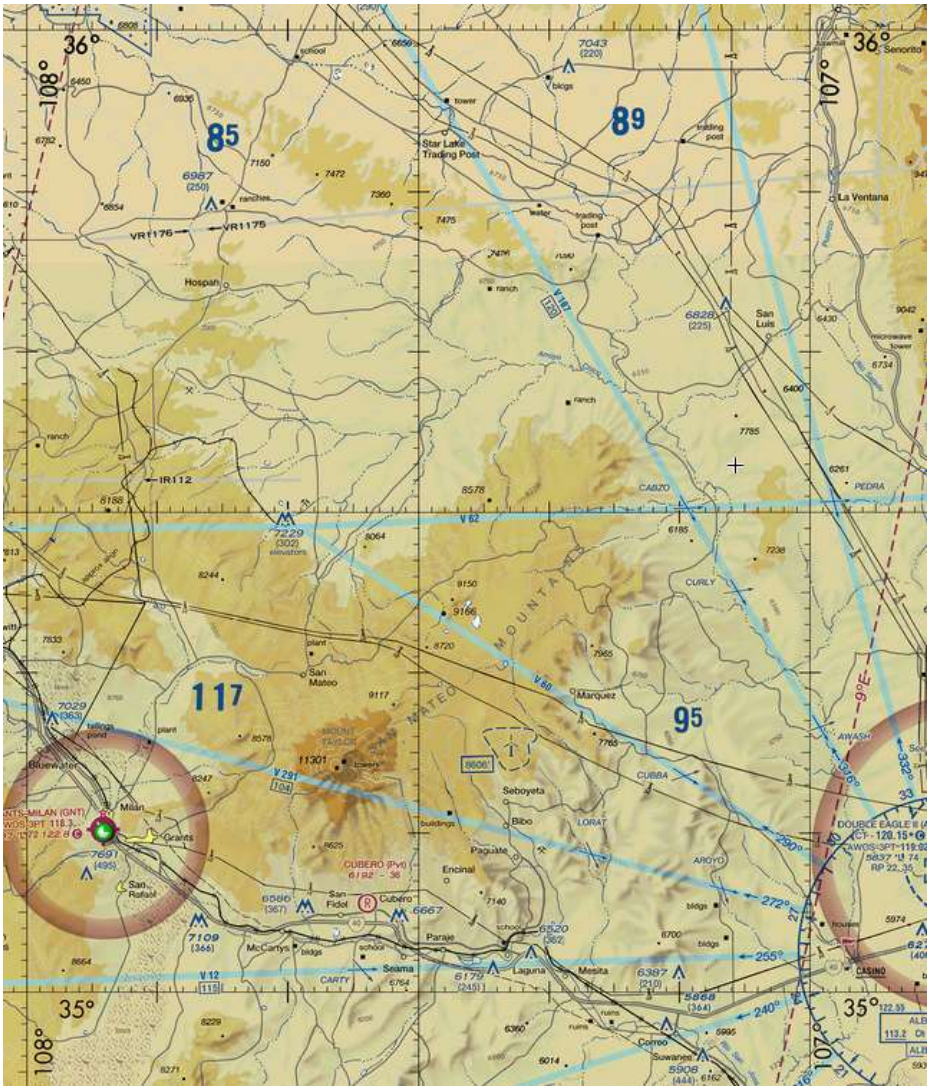
SW, 21 JUL 2016 to 15 SEP 2016

- NOTAMS
  - Notices to Airmen (NOTAMS) alert pilots to changes in the rules for an area, updates on obstacles, Temporary Flight Restrictions (TFR), etc.

Keyword	Definition
CHART . . . . . *Example*	**Chart** !FDC 2/9997 DAL IAP DALLAS LOVE FIELD, DALLAS, TX. ILS OR LOC RWY 31R, AMDT 5... CHART NOTE: SIMULTANEOUS APPROACH AUTHORIZED WITH RWY 31L. MISSED APPROACH: CLIMB TO 1000 THEN CLIMBING RIGHT TURN TO 5000 ON HEADING 330 AND CVE R-046 TO FINGR INT/CVE 36.4 DME AND HOLD. CHART LOC RWY 31L. THIS IS ILS OR LOC RWY 31R, AMDT 5A. 1305011200-PERM
DATA . . . . . . *Example*	**Data** !FDC 2/9700 DIK ODP DICKINSON - THEODORE ROOSEVELT RGNL, DICKINSON, ND. TAKEOFF MINIMUMS AND (OBSTACLE) DEPARTURE PROCEDURES AMDT 1... DEPARTURE PROCEDURE: RWY 25, CLIMB HEADING 250 TO 3500 BEFORE TURNING LEFT. ALL OTHER DATA REMAINS AS PUBLISHED. THIS IS TAKEOFF MINIMUMS AND (OBSTACLE) DEPARTURE PROCEDURES, AMDT 1A. 1305011200-PERM
IAP . . . . . . *Example*	**Instrument Approach Procedure** !FDC 2/9997 DAL IAP DALLAS LOVE FIELD, DALLAS, TX. ILS OR LOC RWY 31R, AMDT 5... CHART NOTE: SIMULTANEOUS APPROACH AUTHORIZED WITH RWY 31L. MISSED APPROACH: CLIMB TO 1000 THEN CLIMBING RIGHT TURN TO 5000 ON HEADING 330 AND CVE R-046 TO FINGR INT/CVE 36.4 DME AND HOLD. CHART LOC RWY 31L. THIS IS ILS OR LOC RWY 31R, AMDT 5A. 1305011200-PERM
VFP . . . . . . *Example*	**Visual Flight Procedures** !FDC X/XXXX JFK VFP JOHN F KENNEDY INTL, NEW YORK, NY. PARKWAY VISUAL RWY 13L/R, ORIG...WEATHER MINIMUMS 3000 FOOT CEILING AND 3 MILES VISIBILITY. 1303011200-1308011400EST
ROUTE . . . . . *Example*	**Route** !FDC x/xxxx ZFW OK..ROUTE ZFW ZKC. V140 SAYRE (SYO) VORTAC, OK TO TULSA (TUL) VORTAC, OK MEA 4300. 1305041000-1306302359EST
SPECIAL . . . *Example*	**Special** !FDC x/xxxx PAJN SPECIAL JUNEAU INTERNATIONAL, JUNEAU, AK. LDA-2 RWY 8 AMDT 9 PROCEDURE TURN NA. 1305011200-1312111200EST
SECURITY . . *Example*	**Security** !FDC ZZZ SECURITY..SPECIAL NOTICE..THIS NOTICE IS TO EMPHASIZE THAT BEFORE OPERATING IN OR ADJACENT TO IRANIAN AIRSPACE ALL U.S. AIRMEN AND OPERATORS SHOULD BE FAMILIAR WITH CURRENT CONDITIONS IN THE MIDDLE EAST. THE U.S. DEPARTMENT OF STATE HAS ISSUED A TRAVEL WARNING FOR IRAN ADVISING, IN PART, THAT THE U.S. GOVERNMENT DOES NOT CURRENTLY MAINTAIN DIPLOMATIC OR CONSULAR RELATIONS WITH THE ISLAMIC REPUBLIC OF IRAN. ANY U.S. OPERATOR PLANNING A FLIGHT THROUGH IRANIAN AIRSPACE SHOULD PLAN IN ADVANCE AND HAVE ALL CURRENT NOTAMS AND AERONAUTICAL INFORMATION FOR ANY PLANNED FLIGHT 1311011200-1403301800EST
U	Unverified Aeronautical Information *(for use only where authorized by Letter of Agreement)**
O	Other Aeronautical Information**

    - You can file a NOTAM to inform other pilots about your drone operations on 1800wxbrief.com or on the phone by calling 877-487-6867. Waivers will require you to file the NOTAM.
    - Current (D) NOTAMS and FDC NOTAMS can be found in the Notice to Airmen Publication (NTAP), which is issued every 28 days.
- Latitude and Longitude
    - Latitude lines measure distance North or South of the Equator with lines that move East and West.
    - Longitude lines measure distance East and West of the Equator with lines that move North and South.

- Each big line measures 30 minutes. Every 2 big lines is 1 degree. Each small line is 1 minute. Each medium line is 10 minutes.



- ATC authorizations and related operating limitations.
    - If you would like an exception made to any of the flight rules, you can submit a waiver to faadronezone.faa.gov. Once you create an account, click on part “create part 107 waiver/authorization” and follow the instructions. It can take up to 90 days for a waiver to be approved depending on how complicated the request.
- Avoid flight beneath unmanned balloons
- Precipitation static
    - Precipitation static is the static that is created by flying through rain, snow, ice, or dust. It is never a good idea to fly a sUAS through any precipitation due to the risk of damage to the components.
- Light Amplification by Stimulated Emission of Radiation (laser) Operations and Reporting Illumination of Aircraft

    - Due to the risks of blinding, it is illegal for anybody to shine a laser at any aircraft. Additionally, lasers are able to disrupt the flight controls of a sUAS and can cause it to crash. If you see someone shining a laser at any aircraft, report it to the FAA
- Avoiding Flight in the Vicinity of Thermal Plumes, such as Smokestacks and Cooling Towers
    - Avoid flights in the environment of extreme thermals. Any surface that is hotter than the surrounding air will cause updrafts and downdrafts around them. Areas with smoke or steam will have some of the most intense drafts above them.
- Flying in the Wire Environment
    - Be careful when flying near towers or powerlines. Towers usually have guy lines to support them and cables can be extremely difficult to see in low light or low visibility.

Radio Communication

- The description and use of a Common Traffic Advisory Frequency (CTAF) to monitor manned aircraft communications.
    - Each airport has a designated radio frequency associated with it. At non towered airports, the frequency is known as the common traffic advisory frequency (ctaf) or Unicom . Pilots using their radios on the ctaf frequency should give their distance from the airport, direction, and intentions starting around 10 nm from the airport and should stay above 1000 feet until they are in the traffic pattern. There are set legs in the traffic pattern that pilots should follow (explain pattern).
- Automatic Terminal Information Service (ATIS).
    - ATIS is a weather briefing recorded for towered airports. There is also an ASOS or ASOS at non towered airports. You can listen to these weather reports with an aviation band handheld radio or on your phone by calling the number for the ASOS. KAEG ASOS 505-842-2009. KABQ ASOS 505-242-4044.
- Aircraft call signs and registration numbers.
    - Calls over frequency always have who the aircraft is. In the identification, pilots will usually say what kind of aircraft they are and their tail number. If you need to call an aircraft over the radio, make sure to use their call sign and or the area they are in so they know it is important for them.
- It is highly recommended to order an aviation band radio and broadcast your intentions and position as you are flying. They can be purchased from Sporty's for around $200-$400.

Safe Operations Factors

Aeronautical Decision Making

- Common aircraft accident causal factors
    - 80% of aircraft accidents are due to pilot error. Accidents rarely occur due to a single issue. In most cases, there is some sort of chain of poor decisions that cause the accident.
- Effective team communication
    - All crew members are responsible for very clear communication.
    - Do not “Hint and Hope”
- Task management
    - The order of priorities is aviate, navigate, communicate. The most important thing to do is to fly the aircraft. Once you have it under control, then worry about your course. Only after you are flying the aircraft and it is going where you want it to should you worry about talking to people.
- Crew Resource Management (CRM).
    - CRM is the effective use of all resources available to the crew
    - Do all crew members know their job and how to do it effectively?
    - Do all crew members know how to use all of the resources available to them?
- Situational awareness.
    - Be aware of what is going on around you. It is not uncommon for a remote pilot to back up their sUAS into a tree or a building.
- Hazardous attitudes.

Hazardous Attitude	Symptoms	Response
Anti Authority	Don’t tell me what to do	Follow the rules. They are usually right.
Impulsivity	Do something! Quick!	Not so fast. Think first.
Invulnerability	It can’t happen to me	It can happen to me.
Macho	I’ve got this	Taking risks is foolish
Resignation	What’s the point?	I can do something

Emergencies

- In the event of an emergency, the RPIC can deviate from any regulation necessary to meet the extent of the emergency. If you do deviate from the regulations, the FAA may request a written report on the situation and why you deviated
- Emergency planning and communication.
    - Review and brief all crew on manufacturers emergency procedures prior to flight
    - Common abnormal procedures and emergencies:
        - Lost Link:
            - Disconnect between controllers and UAS
        - CFIT
            - Controlled flight into terrain
            - The best thing to do is to avoid CFIT. Be aware of your surroundings. Never rely on the obstacle sensors on the UAS.
        - Loss of GPS
            - Loss of GPS assist on the flight of the UAS
            - Always check for GPS NOTAMS prior to flight
        - Battery Fire/Thermal Runaway
            - Thermal runaway occurs when a lithium battery is overcharged or gets damaged. When this happens, the excess heat causes a chain reaction where the battery heats itself up, causing more damage, which causes it to heat up more, in an unstoppable chain. This ultimately results in fire, explosion, and the release of toxic gases.
            - Find a safe place to land and land ASAP
        - Fly Away
            - Try to re-establish connection
            - Advise ATC if in or near controlled airspace
            - The sUAS should return to home automatically
        - Emergency Flight Termination
            - If it is determined that you will not be able to fully reestablish control of the UAS, find the area that is least likely to cause significant damage

Aeromedical Factors

- Dehydration and heatstroke.
    - Causes
        - Hot and/or dry air, wind, diuretic drinks including coffee, tea, alcohol, and pop, diarrhea, vomiting, perspiration, excessive urination
    - Symptoms
        - Headache, fatigue, cramps, sleepiness, dizziness, weakness, nausea, tingling hands and feet, and thirst (if you are thirsty, you are already dehydrated to the point of having decreased performance)
    - Effects
        - Decreased performance
    - Corrective Actions
        - Drink water and lots of it. The average person needs between 2-4 quarts/liters of water per day. Stay ahead and if you do feel thirsty, drink more than it takes to not feel thirsty. Limit caffeine and alcohol.
- Drug and alcohol use.
    - Causes
        - Alcohol and drugs, legal and illegal. This includes, but is not limited to alcohol, nicotine, amphetamines, CAFFEINE, antacids, antihistamines, aspirin.
    - Symptoms
        - Ranging from fatigue to decreased mental processing and slow motor and reaction responses to hallucinations and withdrawal effects. For alcohol, it includes impaired judgment, decreased sense of responsibility, coordination problems, tunnel vision, diminished memory, reduced reasoning, and reduced attention span. Altitude increases the potency of alcohol. Two drinks can have the same effect as three or four.
    - Effects
        - Decreased mental processing, slow reaction times
    - Corrective Actions
        - DO NOT DRINK OR DO DRUGS AND FLY
        - The legal limit is 8 hours from bottle to throttle, but it is wise to wait at least 24 hours as alcohol can take a long time to fully get out of the system. The legal limit is 0.04%, but if there is any noticeable effect, including hangovers, you are still not allowed to fly. You aren't even allowed to be the passenger, let alone the pilot
        - It is a good practice to not fly while taking medication, including prescription medication, unless it was approved by the FAA. If you are sick enough to need medicine, you are probably too sick to fly.
- Hyperventilation.
    - Causes

        - Too little Co2 in your body as a result of breathing too rapidly or too deeply
    - Symptoms
        - Drowsiness, dizziness, shortness of breath, feeling of suffocation, pale, clammy appearance, and muscle spasms.
    - Effects
        - Can lead to unconsciousness
    - Corrective Actions
        - Consciously slow your breathing, talk out loud, or breath into a paper bag
- Stress
    - Causes
        - The bodies response to the physical and psychological demands placed on it
    - Symptoms
        - Increased heart rate, breathing, sweating, and blood pressure as the body prepares to fight or flee
    - Effects
        - Small amounts of stress help you focus, but too much stress interferes with your ability to focus and cope with a situation
    - Corrective Actions
        - If experiencing chronic stress, talk to a physician
        - Avoid flying when stressed or tired
    -
- Fatigue.
    - Causes
        - Inadequate rest, excess physical and mental work, stress, mild hypoxia, noise, and vibrations
    - Symptoms
        - Weakness, tiredness, heart palpitations, breathlessness, headaches, irritability, stomach problems, and generalized aches and pain
    - Effects
        - Decrease in concentration and attention, impaired coordination, and decreased ability to communicate
    - Corrective Actions
        - Get adequate rest on a regular basis prior to the flight. Not treatable during flight
- Factors affecting vision.
    - Relationship between a pilot's physical condition and vision
        - Anything that affects the pilot's physical or mental well being can affect their vision or perception (Illness, medication, stress, alcohol, fatigue, emotion, hypoxia, etc)
        - Eye anatomy

        - While we have ~200 degrees visible to our eyes, only a space about the size of a postage stamp at arm's length is actually clear and in focus.
- Day procedure
    - Because of how small this area is, we need to use a series of short, regularly spaced eye movements that search each successive area. Each eye movement should not exceed 10 degrees and should last at least 1 second to allow time to detect anything in that area.
    - Lack of color contrast and brightness makes it difficult to locate aircraft during the day
- Blind spot (demonstration on PHAK 17-21)
    - In the retina, there is a section that has no rods or cones because the optic nerve is connected there. We typically don't notice this area, but it is possible for things to not be visible if they are in this area of your vision.
    - At night, the blind spot is drastically increased to include the fovea as well due to the absence of rods.
- Empty Field Myopia
    - Empty field myopia is the tendency for the eyes to fixate on nothing if there is nothing to focus on. This causes the pilot to look without seeing, which can be very dangerous. To prevent this, use proper scanning procedures including looking into the cockpit at the instruments regularly as part of your scan or looking at distant light sources

Sample sUAS Preflight Checklist

- **Pilot**:
    - Illness
    - Medication
    - Stress
    - Alcohol
    - Fatigue
    - Eating/emotions
    - Are you current and proficient?
    - Crew Briefing
        - Responsibilities
        - Use of resources
        - Communication
        - Emergency Procedures
- **Aircraft**
    - Weight and Balance
- **Environment**
    - Weather Brief
- **External Pressures**
    - Is there anything pushing you to complete the mission if there are significant risks
- **Preflight Inspection**
    - Condition of components
    - Airframe structure: undercarriage, flight control surfaces, and linkages
    - Registration markings, pilots certificate, photo ID
    - Inspect moveable control surface(s), including airframe attachment point(s)
    - Servo motor(s), including attachment point(s)
    - Propulsion system, including power plant(s), propeller(s), rotor(s), ducted fan(s)
    - Batteries
    - Avionics and antennas
    - Calibrate sUAS compass
    - Display panel
    - Ground support equipment, including takeoff and landing systems
    - Controls connected to sUAS
    - Controls free and correct
    - Onboard navigation and communication data links
    - Flight termination system, if installed
    - Check battery levels for the aircraft and control station
    - Equipment and cargo secure
    - GPS connection adequate
    - Start the sUAS propellers to inspect for any imbalance or irregular operation
    - Verify all controller operation for heading and altitude
    - At a controlled low altitude, fly within range of any interference and recheck all controls and stability

Text of the Memorandum Clarifying Class E Airspace

Date: January 10, 2018

To: AJV-115From: Scott J. Gardner, Acting Manager, Emerging Technologies, AJV-115

Subject: 14 CFR 107.41 Class E Surface Area Authorizations

In reviewing Class E Surface Area authorization requirements, we determined that the Class E authorization requirement only pertains to Class E surface areas for an airport, not the Class E extensions to Class D, C and E airspaces. 14 CFR 107.41 states: “No person may operate a small unmanned aircraft in Class B, Class C, or Class D airspace or within the lateral boundaries of the surface area of Class E airspace designated for an airport unless that person has prior authorization from Air Traffic Control (ATC)”. FAA Order 7400.11B identifies the different types of Class E airspace. The only type of Class E airspace that matches the language in 107.41 is paragraph 6002, which states: “The Class E airspace areas listed below are designated as a surface area for an airport.” The others are as follows:

E1 – Class E Airspace at and above 14,500 feet MSL

E2 – Class E airspace areas designated as a surface area for an airport

E3 – Class E Airspace Areas Designated As An Extension To A Class C Surface Area

E4 – Class E Airspace Areas Designated as an Extension to a Class D or Class E Surface Area

E5 – Class E Airspace Areas Extending Upward From 700 Feet Or More Above The Surface of The Earth

E6 – En route Domestic Airspace Areas

E7 – Offshore Airspace Areas

E8 – Class E Airspace Areas Designated As Federal Airways

Therefore, effective immediately, we only need to provide authorizations for Class E airspace if the airport itself is a Class E airport. When processing applications verify that the requested airspace is listed in FAA Order 7400.11, paragraph 6200 or is indicated on a VFR sectional chart as indicated in the attachments. If the requested airspace is not listed or depicted then an authorization is not required under 14 CFR Part 107.41. The request can be cancelled and inform the applicant that an authorization is not needed for Class E extensions to Class D/C airspace.

Filing a NOTAM

877-487-6867

Aircraft ID:_____

Nearest NAVAID:_____

Distance from NAVAID (NM):_____

Direction from NAVAID:_____

Radius of flight area:_____

Altitude (AGL or MSL):_____

Start Time:_____

End Time:_____

RPIC Name:_____

RPIC Contact Info:_____

Additional Resources

- Pilot's Handbook of Aeronautical Knowledge
- AC 107-2
- 14 CFR 107
- Remote Pilot Airman Certification Standards
- Operations at Non Towered Airports by AOPA
- Operations at Towered Airports by AOPA
- https://www.faa.gov/uas/commercial_operators/part_107_waivers/