An aerial photograph of a vast agricultural landscape. In the foreground, a field has been recently tilled, showing distinct dark brown furrows. To the left, a green field with a grid-like irrigation or drainage pattern is visible. The background features a dense line of trees under a clear blue sky.

Part 107 Remote Pilot knowledge test study materials

Adapted from content from PLS 198: Drones in Agriculture
Slides and course by Travis Parker; UC Davis

https://www.faa.gov/uas/commercial_operators/become_a_drone_pilot

United States Department of Transportation

 Federal Aviation Administration

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Aircraft Air Traffic Airports Pilots & Airmen Data & Research Regulations Space Drones

Home / Unmanned Aircraft Systems (UAS) / Certificated Remote Pilots including Commercial Operators / Become a Drone Pilot

Overview

Getting Started

Recreational Flyers & Community-Based Organizations

Certificated Remote Pilots including Commercial Operators

Overview

Become a Drone Pilot

Operations Over People

Part 107 Waiver

UAS Facility Maps

Part 107 Airspace Authorizations

Public Safety and Government

Educational Users

Drones Events

Become a Certificated Remote Pilot

In order to fly your drone under the FAA's Small UAS Rule (Part 107), you must obtain a Remote Pilot Certificate from the FAA. This certificate demonstrates that you understand the regulations, operating requirements, and procedures for safely flying drones.

Are you a [first time pilot](#) or an [existing Part 61 Certificate holder](#)?

Do you need to [keep your Remote Pilot Certificate current](#)?

Not sure [what type of drone flyer you are](#)? We can help you!

First-Time Pilots

Eligibility

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: "Unmanned Aircraft General – Small (UAG)"

Outline

- I. FAA regulations
- II. Airspace and VFR sectionals
- III. Weather
- IV. Aerodynamics and performance
- V. Traffic, risk management, and other important information

Part 107 Remote Pilot in Command (RPIC) certification

- To get certified, you must pass a **60 question knowledge test**
 - Multiple choice
 - Three answers/question
 - 70% needed to pass (but seriously... let's do better than that)
- Required for ***commercial***, but ***not hobby/recreational*** operations
 - Anything related to your source of income, that is not intended as a form of relaxation, is “commercial”. This includes all university research

I. FAA regulations

- Who is eligible?
- Must be **16+ years old**
- Must **read, write, speak, and understand the English language** (certain medical exceptions)
- **Physical/mental state** that does not interfere with UAS operation
- **Pass test** (then apply)
- Certificate valid for two years
- Already a pilot? Separate free course → safetyfaa.gov

Crew-related vocabulary

- **Remote Pilot in Command:** Person holding current remote pilot certificate, final responsibility for all operations
 - Test hint: If you ever get a question regarding “who is responsible for...”, the answer is almost always the remote RPIC!
- **Visual observer (VO):** Crewmember that assists with see-and-avoid policy, extra eyes on the sky and objects on the ground
- **Person manipulating the controls:** Person operating the craft under direct RPIC supervision
- **Flight crew:** All of the above
- Flight crew can be made of just one RPIC, but more people increases situational awareness



Responsibilities for the RPIC

- **See and avoid:** the RPIC is responsible for avoiding *all* obstacles and aircraft. **Manned aircraft *always* have priority**, including while taxiing on runway. No exceptions!
- **No member of crew may be intoxicated** or in any way under the influence of drugs, including alcohol
- **Ensuring aircraft is airworthy**
- **Visual line of sight (VLOS):** Visual line of sight must be maintained at all times. Binoculars may only be used in passing. Very brief exceptions (e.g. drone passing behind telephone pole) and glasses are acceptable. First person viewer (FPV) goggles unacceptable without VO!

Responsibilities for the RPIC (cont'd)

- **Maintain awareness of surroundings:** Know where aircraft is and what airports, activity and property may affect your flight
- **Airspace:** Know airspace class and obtain approval if needed
- **Waiver:** If activity cannot be conducted within standard Part 107 regulatory framework, RPIC is responsible for obtaining waiver

Documents

- Basic
 - Pilot certificate
 - Aircraft registration
 - Waivers, authorization, or other documentation
- Modifications
 - Have a record of modifications, repairs, and other aircraft service
 - Firmware must be up-to-date, otherwise aircraft is deemed non-airworthy
- Log time
- Unique aircraft identifier on aircraft
 - Accessible without tools
- These can be kept electronically

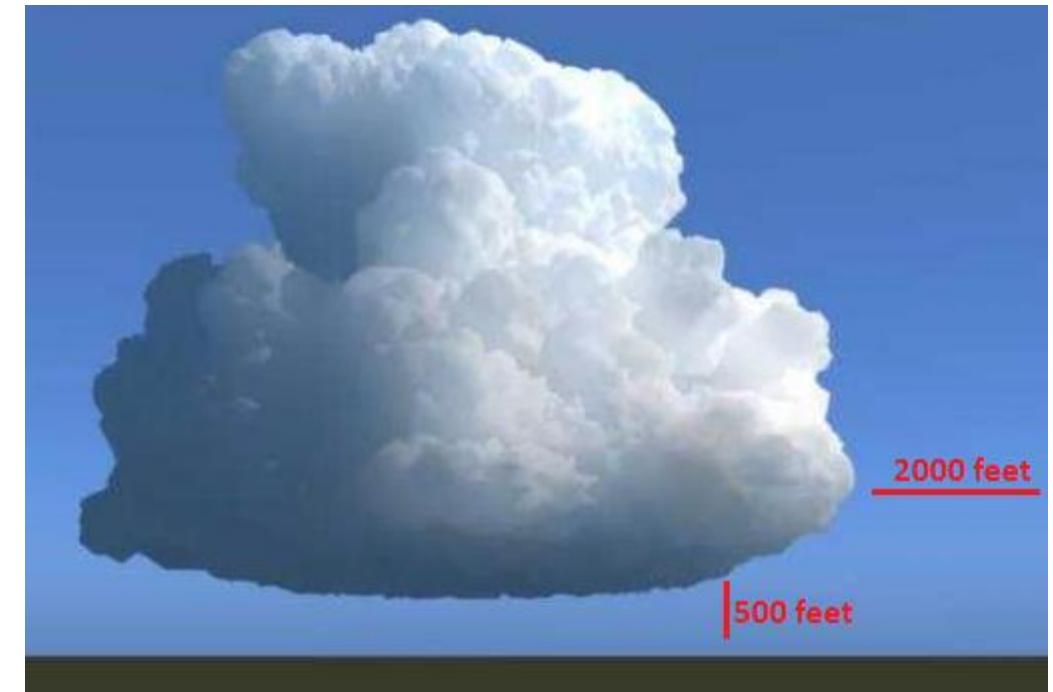


Night flights

- No night flights
- Specifically, no flights between end of evening civil twilight (=30 mins after sunset) and beginning of morning civil twilight (=30 mins before sunrise)
 - As published in the Federal Air Almanac and converted to local time
- For operations during civil twilight, anti-collision lights visible for 3 miles required (although intensity can be adjusted)

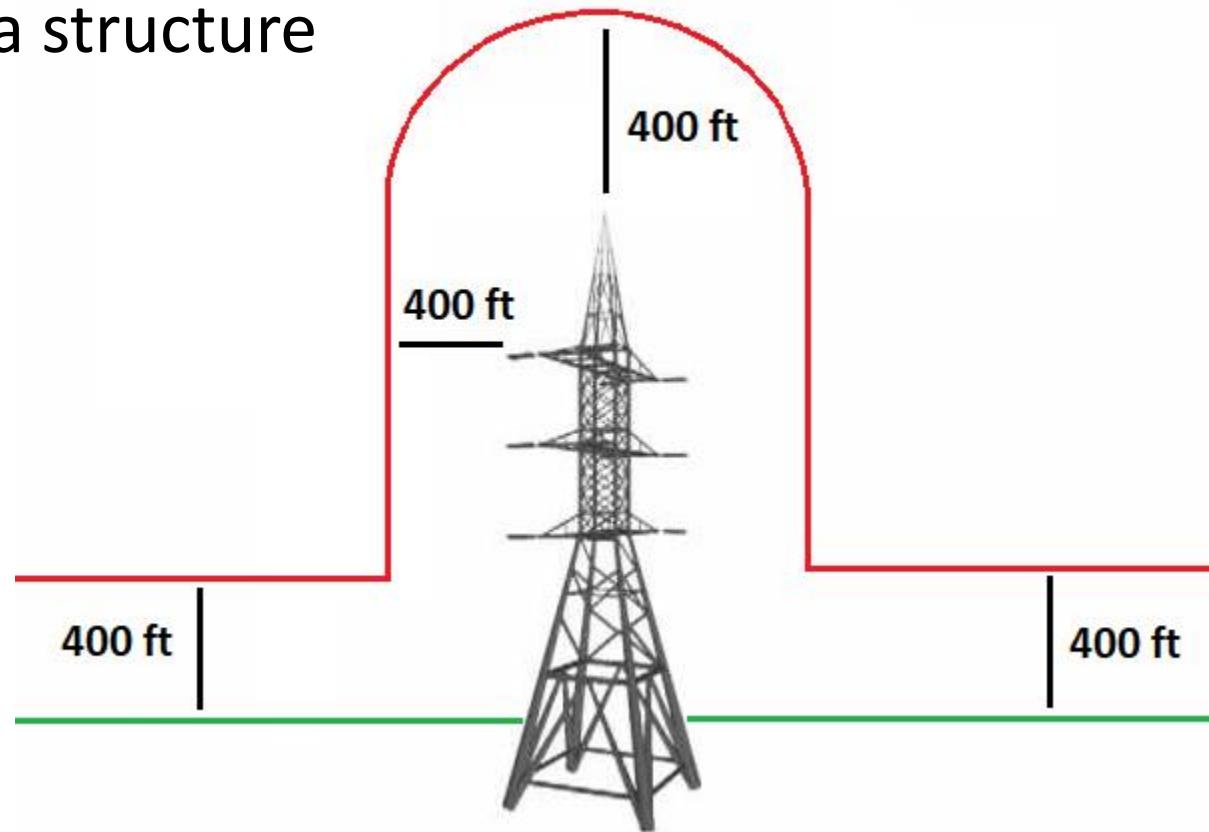
Visibility

- Visibility from ground station must be ≥ 3 statute miles
- No flights near clouds: **2000 feet horizontally, 500 feet vertically**
- **Unassisted VLOS** (except glasses)
- Binoculars and other vision aids may only be used momentarily to increase awareness



Flight restrictions

- Max groundspeed: **100mph = 87 knots**
- Max altitude: Maximum altitude of **400 feet above ground level (AGL)** *unless* within 400 feet of a structure



Weight

- sUAS = **0.55lbs up to but NOT INCLUDING 55lbs**
- You have a UAS that weighs exactly 55 pounds. Can you fly it with a Part 107 remote pilot certificate?
- ... NO!

Right-of-way

- Absolutely **no interference with operations of airports, heliports, or seaplane bases.**
- If a manned aircraft modifies its course because of a UAS, the RPIC can be held accountable
- RPIC must yield right-of-way to ***all*** other aircraft.

No flights over people

- Conduct operations in sparsely populated areas whenever possible
- Develop **crowd control plan**
- Take reasonable precautions to **keep non-participants out of operating area**

Operations from moving vehicles

- Operating from a **car**? 
- **OK!**
- Operating from a **boat**? 
- **OK!**
- Operating from an **aircraft**?
• ...not such a good idea





Operations from moving vehicles

- Operating from a **car**? 
- **OK!**
- Operating from a **boat**? 
- **OK!**
- Operating from an **aircraft**?
 - ...not such a good idea
 - BUT... operations from boats and cars must be done in **sparsely populated areas** and with a plan to keep non-participants clear of aircraft
 - No using UAS flights from moving vehicle to move other persons property





Hino Electric Vehicle

USCGOT 021800

However...

- **Moving other people's property is legal** as long as:
 - It is **not done from a moving vehicle**
 - The property is **not dropped**
 - Total weight of UAS and cargo <55 lbs
 - Done **within state lines**
 - No “undue hazards”



Certificate of waiver and airspace authorization

- **Waivers** allow you to get around most of these rules if approved by the FAA
- You need to demonstrate your ability to conduct the operation safely
- Start waiver process **90 days in advance.**
- **Authorization** allows you to fly in airspace where UAS are not allowed to be flown
- Must also apply to the FAA
- Issued up to 6 months
- Need it for more than 6 months? You can get a waiver for that (strange technicality)
- If approved, **bring your paperwork when you fly!**
- Airspace Authorization, Waive a rule

Hobbyist:

-Governed by **AC 91-57A**, “Advisory circular”

-Simple restrictions:

- <400 feet AGL

- “aircraft operates in accordance with a community-based set of guidelines” and “does not interfere with manned aircraft” i.e. don’t do anything crazy

- <55lbs

- No flying in TFRs

- Prior notice given to airports within 5 miles

- Again, *cannot be related to one’s source of income*

- Do not have to register aircraft as of May 2017 (some FAA web pages conflict with this!)

Aircraft registration

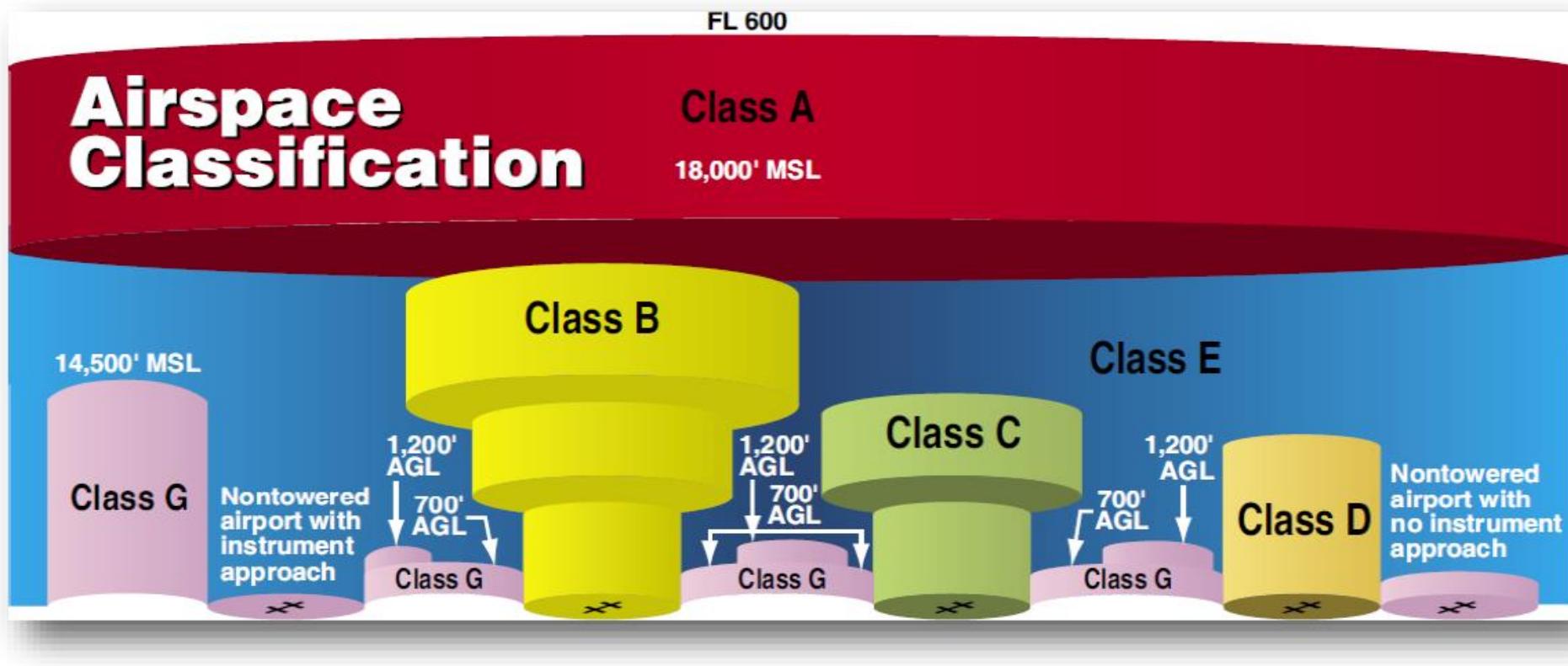
- Registration is simple and easy
 - **\$5/aircraft**
 - Takes two minutes
 - Card with registration info is available immediately
- The FAA wants this to be a simple process
- [registermyuas.faa.gov](https://registermyuas.faa.gov/electricUAS/organization)
- **Display the registration number on the UAS** so that it can be seen/accessed “without tools,” e.g. in the battery compartment is okay

The screenshot shows a web browser window titled "UAS Registration - Organization". The URL is https://registermyuas.faa.gov/electricUAS/organization. The page has a "PROFILE" tab selected. It displays a form for "Complete Your Profile" with fields for First Name, Middle Initial, Last Name, Suffix, Title, Alt Email, Phone, and Phone Ext. Below this is a section for "Organization Information" with fields for Organization Name and DBA. To the right, there is a sidebar titled "MARK YOUR AIRCRAFT!" containing two bullet points: "When you register, you will receive a unique registration number valid for 3 years. After 3 years, you must renew your aircraft registration." and "You must mark each aircraft with the assigned unique registration number before it is operated."



II. Airspace & Sectional Charts

How do I find out the class of airspace I want to fly in?



A - Above



Wedding Cakes:

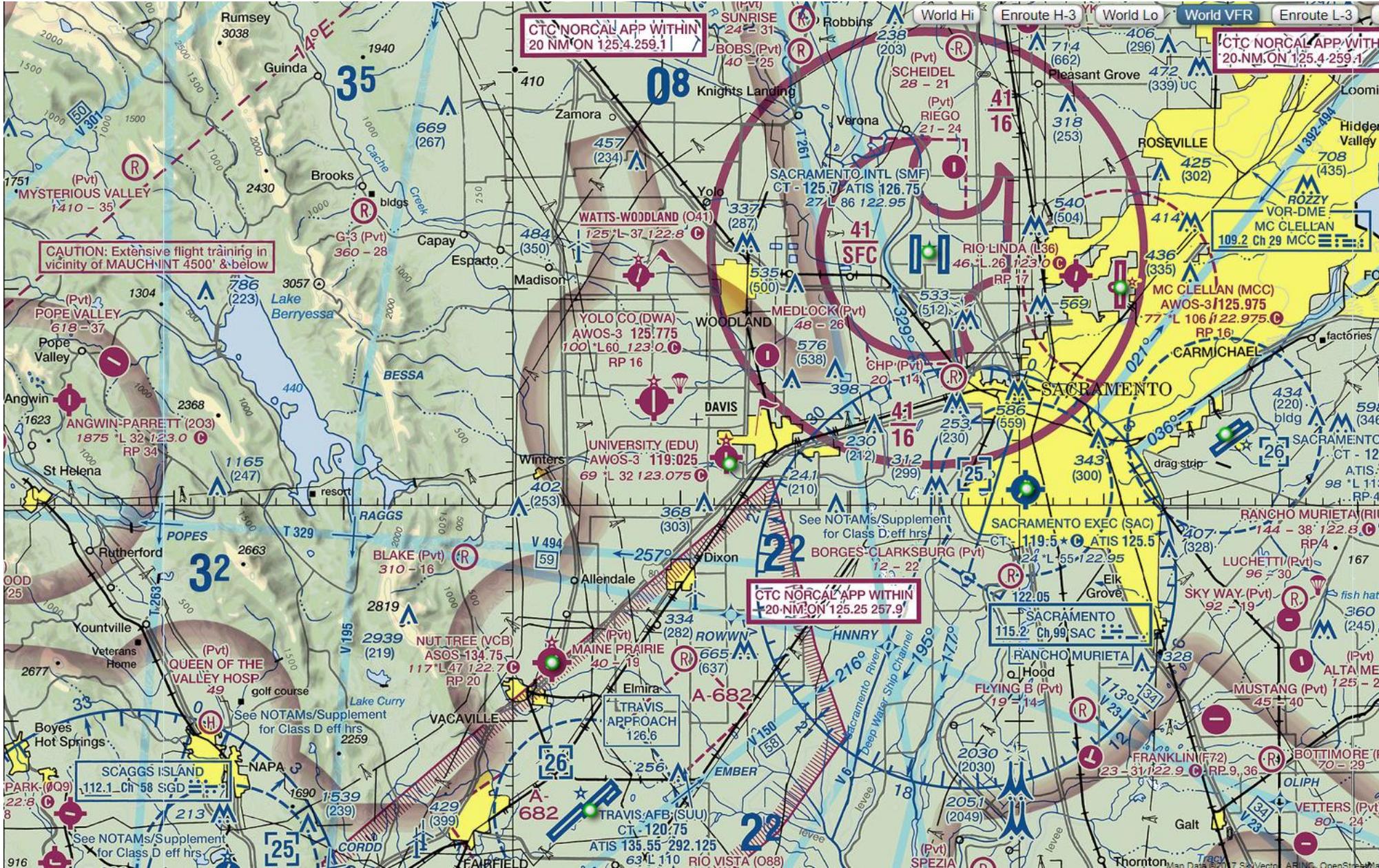
- B - Big
- C - Classy
- D - Dinky

G - Ground

E - Everywhere Else



Skyvector.com

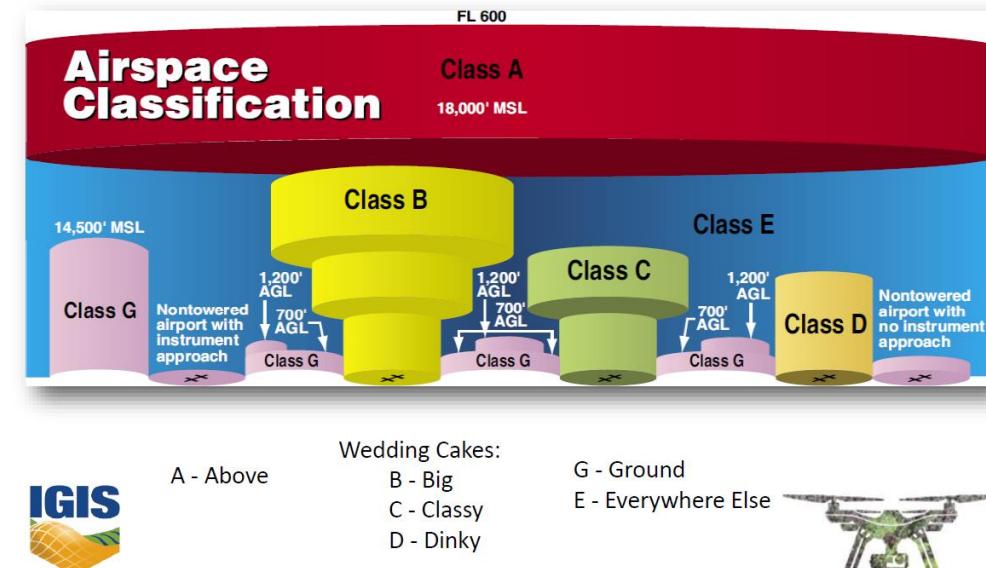


How are airspace boundaries shown on VFR sectionals?

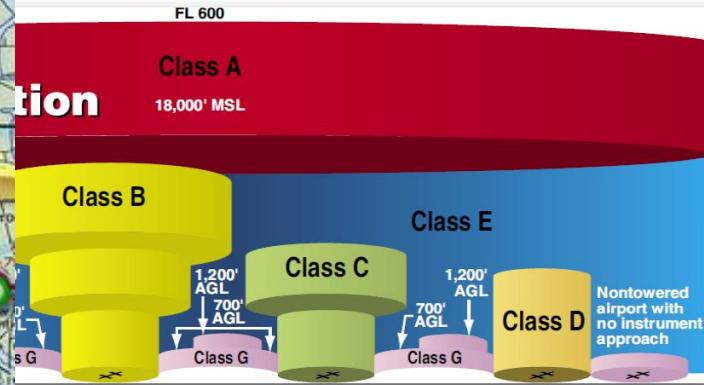
- Class B: Thick Blue line
- Class C: Thick Crimson/red line
- Class D: Dashed blue line
- Class E: Red dashed line (When it extends to surface) or red hazy line (700 feet AGL)
- Notice: alternating Blue/Red/Blue/Red with size of airport

Class A airspace

- Airliners cruise here
- Extends from 18,000 MSL to 60,000 ft
(above Mean Sea Level (MSL))
 - Way above where you can fly a sUAS, so less common on knowledge test



pace & Sectional Charts



Wedding Cakes:

- B - Big
- C - Classy
- D - Dinky

G - Ground
E - Everywhere Else



You want to fly your sUAS here. Will you need authorization?

Note: Terminal Aeronautical Charts (TACs) useful for busiest areas



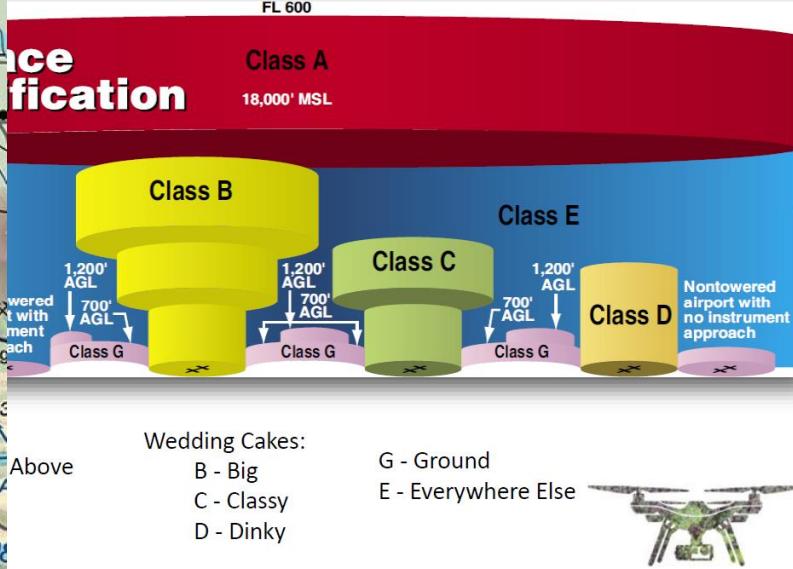
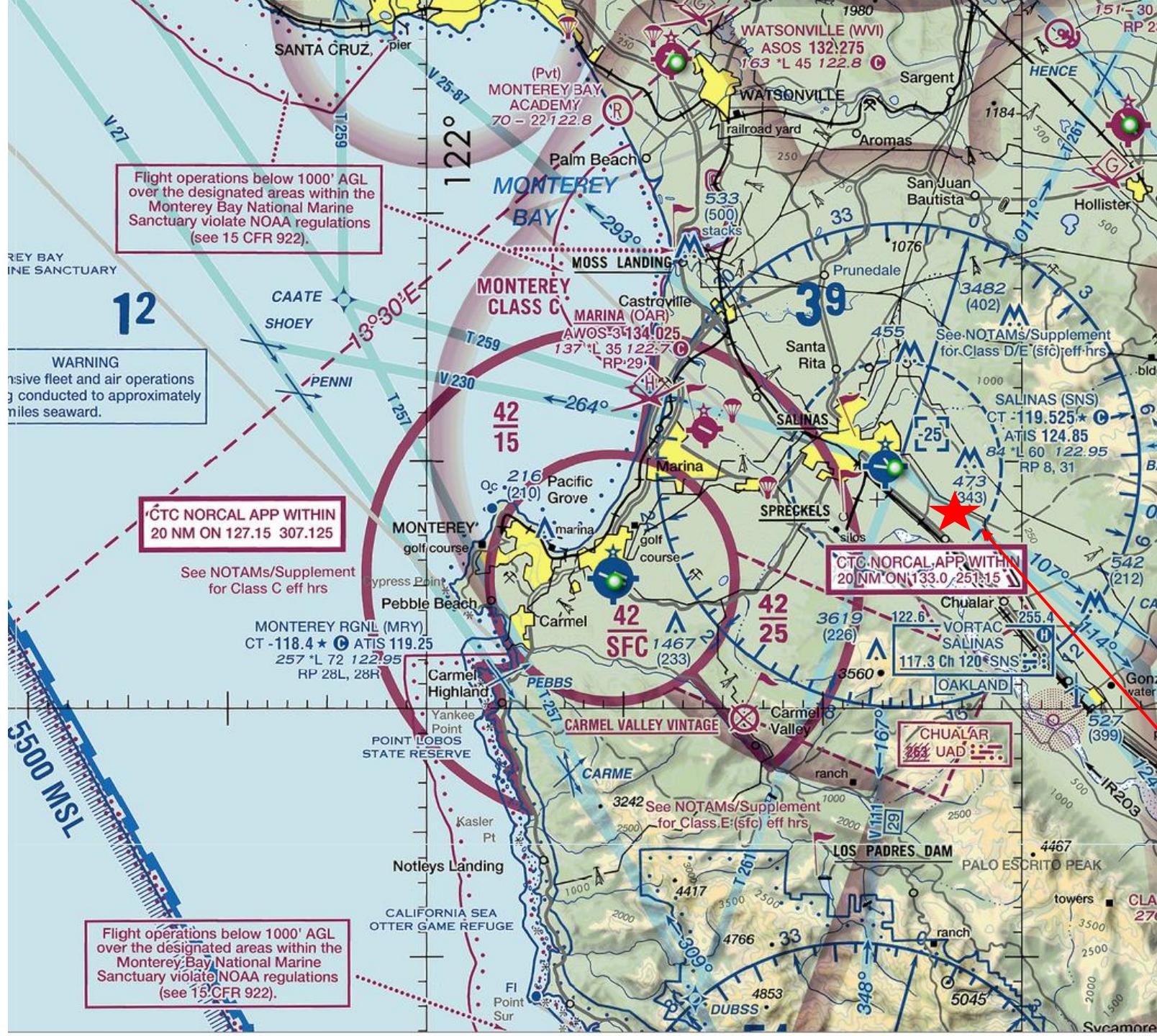
airspace & Sectional Charts



st two digits

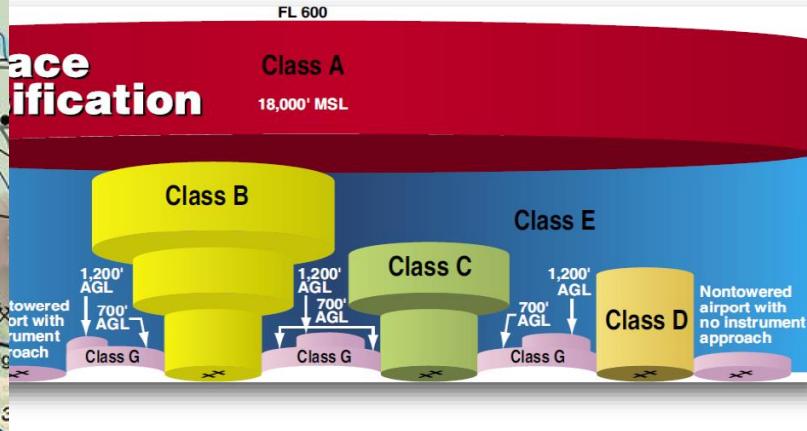
You want to fly your sUAS here. Will you need authorization?

Airspace & Sectional Charts



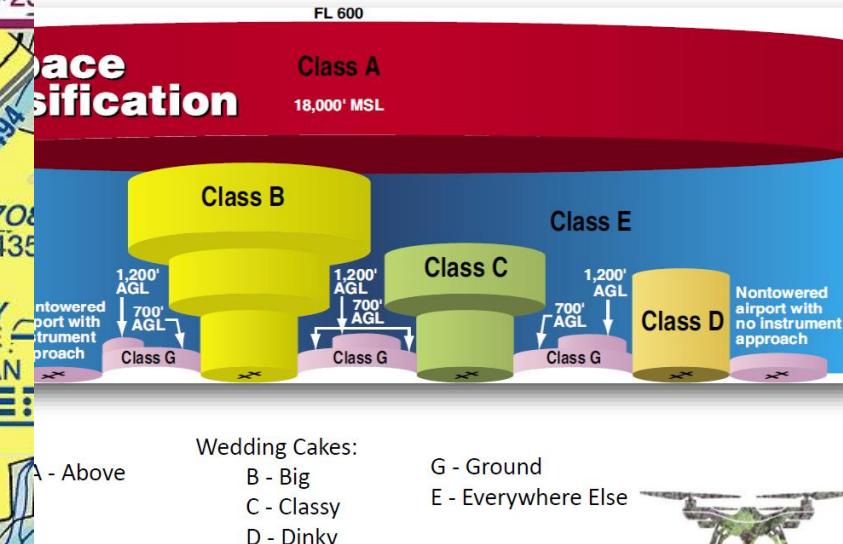
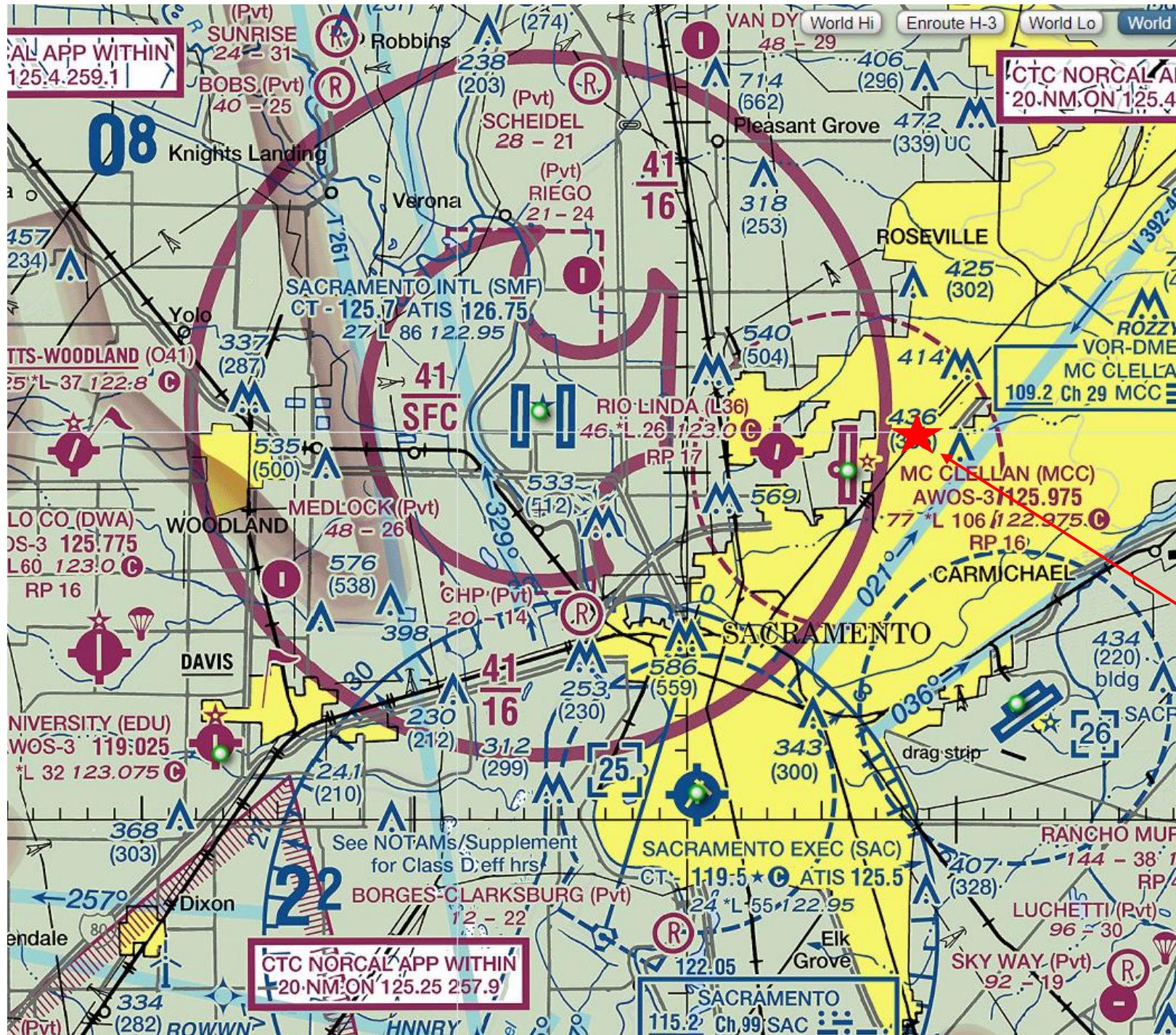
You want to fly your sUAS here. Will you need authorization?

Airspace & Sectional Charts



You want to fly your sUAS here. Will you need authorization?

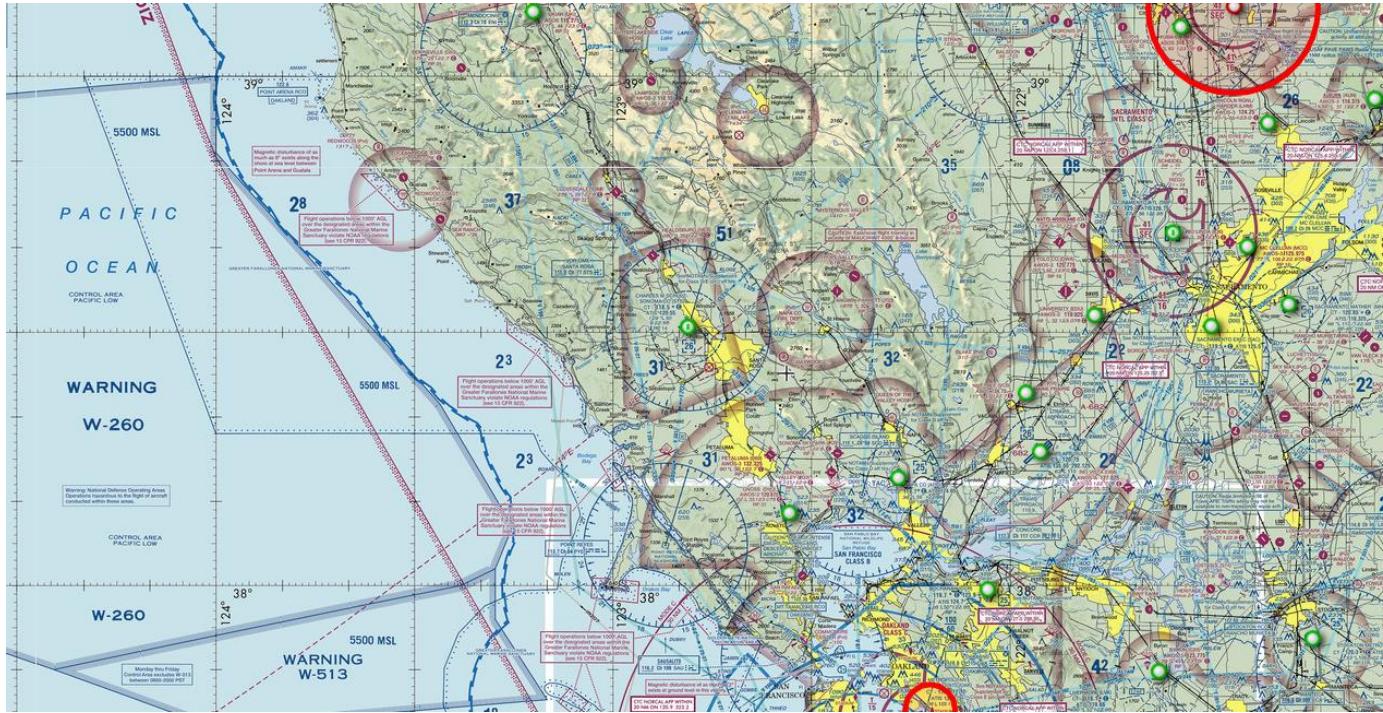
Airspace & Sectional Charts



You want to fly your sUAS here. Will you need authorization?

Special-use airspace

- **Prohibited airspace**
 - Highly restricted, no flights (few nationally)
 - Blue hashmarks, P-##
- **Restricted airspace**
 - Blue hashmarks, R-####
 - Think artillery, missiles, military bombardment
 - “Hot” = in use that day. No chance of flight approval
 - “Cold” = not in use. Possible approval.
- **Military operations area (MOA)**
 - Magenta hashmarks
 - Often involves aerial acrobatics
 - Use extreme caution
- **Warning area**
 - Blue hashmarks, W-###
 - Off the coasts, could be goofballs out there
- **Alert area**
 - Okay to fly, just be aware of common activities (e.g. skydiving site)
 - A-###



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 F.A.R. 93
Special Air Traffic Rules & Airport Traffic Patterns
Airport Surveillance Radar

R	NAME (NAM)	F.A.R. 91 Location Identifier
---	------------	----------------------------------

CT -118.3 ★ Ⓜ ATIS 123.8
Runways with Right Traffic Patterns (public use) → 285 L 72 122.95 ← UNICOM
RP * (See Airport/Facility Directory) → RP 23,34 ← UNICOM
VFR Advsy 125.0
Airport of Entry

FSS - Flight Service Station

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

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

NFCT - Non-Federal Control Tower

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

Ⓜ - Indicates Common Traffic Advisory Frequencies (CTAF)

ATIS 123.8 - Automatic Terminal Information Service

ASOS/ AWOS 135.42 - Automated Surface Weather Observing Systems. Some ASOS/AWOS facilities may not be located at airports.

UNICOM - Aeronautical advisory station

VFR Advsy - VFR Advisory Service shown where 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 facility or information is lacking, the respective character is replaced by a dash. All lighting codes refer to runway lights. Lighted runway may not be the longest or lighted full length. All times are local.

SECTIONAL AERONAUTICAL CHART

SCALE 1:500,000

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		AIRPORT DATA	AIRPORT TRAFFIC SERVICE AND AIRSPACE INFORMATION	TOPOGRAPHIC INFORMATION
	All recognizable hard-surfaced runways, including those closed, are shown for visual identification. Airports may be public or private	Box indicators FAR 93 Special Air Traffic Rules & Airport Traffic Patterns Runways with Right Traffic Patterns (public use) RP - Special conditions exist - see A/FD Airport of Entry	Only the controlled and reserved airspace effective below 18,000 ft. MSL are shown on this chart. All times are local. 40 Ceiling of Class D Airspace in hundreds of feet. (A minus ceiling value indicates surface up to but not including that value). 2400 MSL Differentiates floors of Class E Airspace greater than 700 ft. above surface. 4500 MSL 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 Total mileage 169 between NAVADA, on direct Airways Class E Airspace low altitude RNAV routes are indicated by center line. T319 TK313 RNAV (helicopter only) waypoint	
	Services-fuel available and field attended 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.)	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 - Indicates 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 is not available). Some ASOS/AWOS facilities may not be located at airports. UNICOM - Aeronomical 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.	2400 MSL Differentiates floors of Class E Airspace greater than 700 ft. above surface. 4500 MSL 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 Total mileage 169 between NAVADA, on direct Airways Class E Airspace low altitude RNAV routes are indicated by center line. T319 TK313 RNAV (helicopter only) waypoint	MISCELLANEOUS
RADIO AIDS TO NAVIGATION <ul style="list-style-type: none"> VHF OMNI RANGE (VOR) VORTAC VOR-DME Non-Directional Radiobeacon (NDB) NDB-DME Other facilities. i.e., FSS Outlet, RCO, etc. 	COMMUNICATION BOXES Underline indicates no voice on this frequency. Crosshatch indicates Shutdown Status. * Operates less than continuous or On-Request. ASOS/AWOS HIWAS 122.1R MIAMI FSS radio providing voice communication	OBSTRUCTIONS 2049 Height above ground (1149) ← Under construction or UC ← reported; position and elevation unverified. NOTICE: Guy wires may extend outward from obstructions.		

We have already spent time covering this, but study it a little more on your own

There is also the US chart supplement that provides more information about airports

OBSTRUCTIONS



1000 ft. and higher AGL



below 1000 ft. AGL

or



Group Obstruction



Obstruction with high-intensity lights
May operate part-time



Elevation of the top above
mean sea level

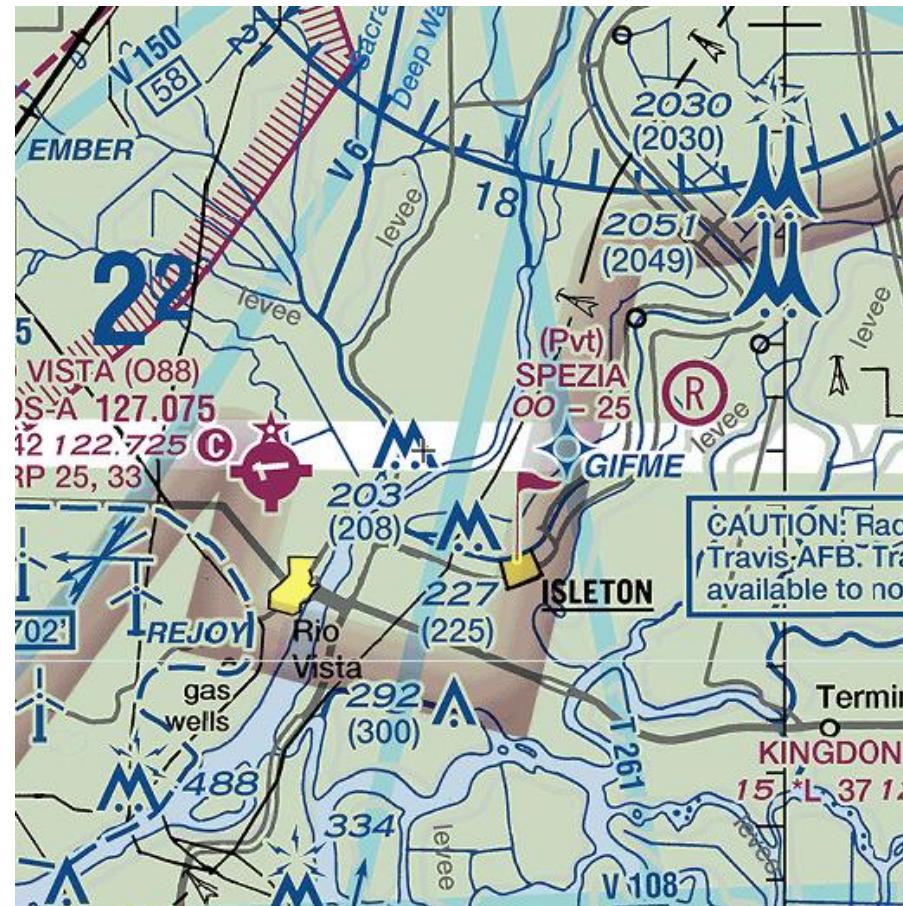
2049

Height above ground

(1149) ← Under construction or

UC ← reported; position and
elevation unverified.

NOTICE: Guy wires may extend outward
from structures.



Avoid skeletal structures by 2000 feet

A few other important VFR Symbols



=From 1500 to Top (meaning bottom of next layer)



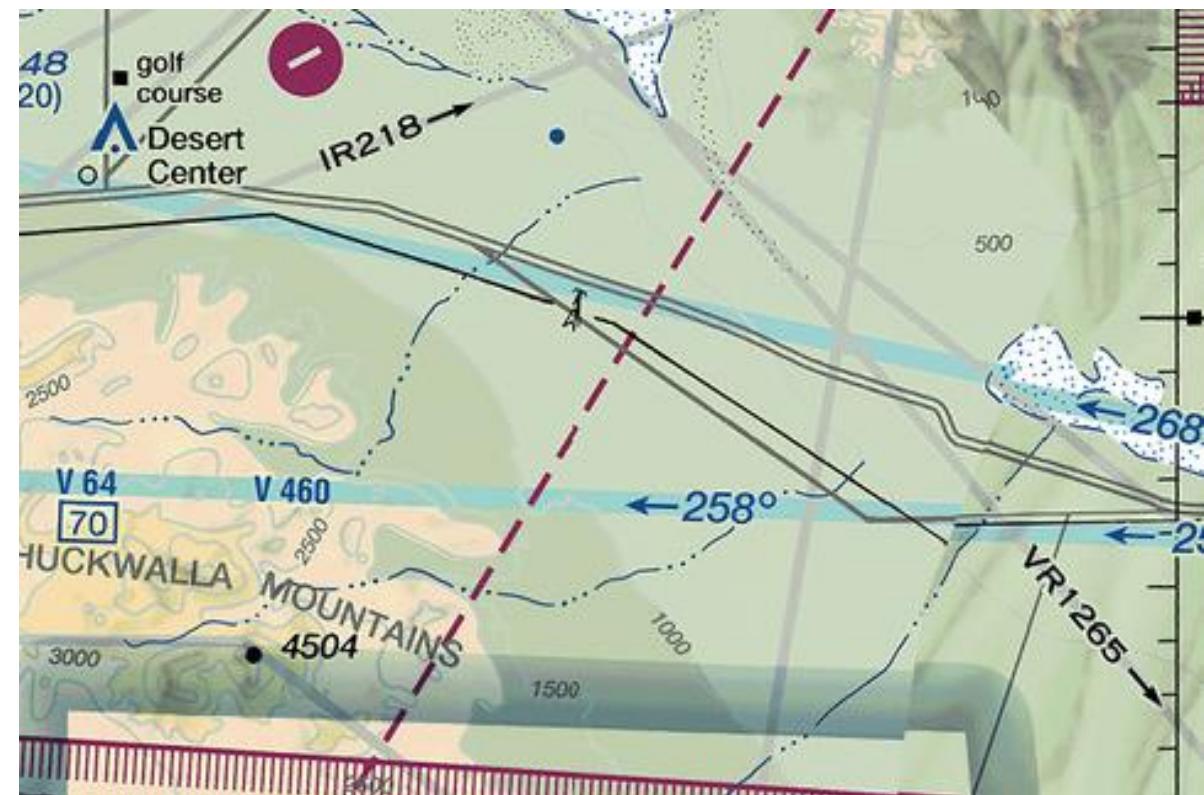
=VOR, navigational aid for manned aircraft



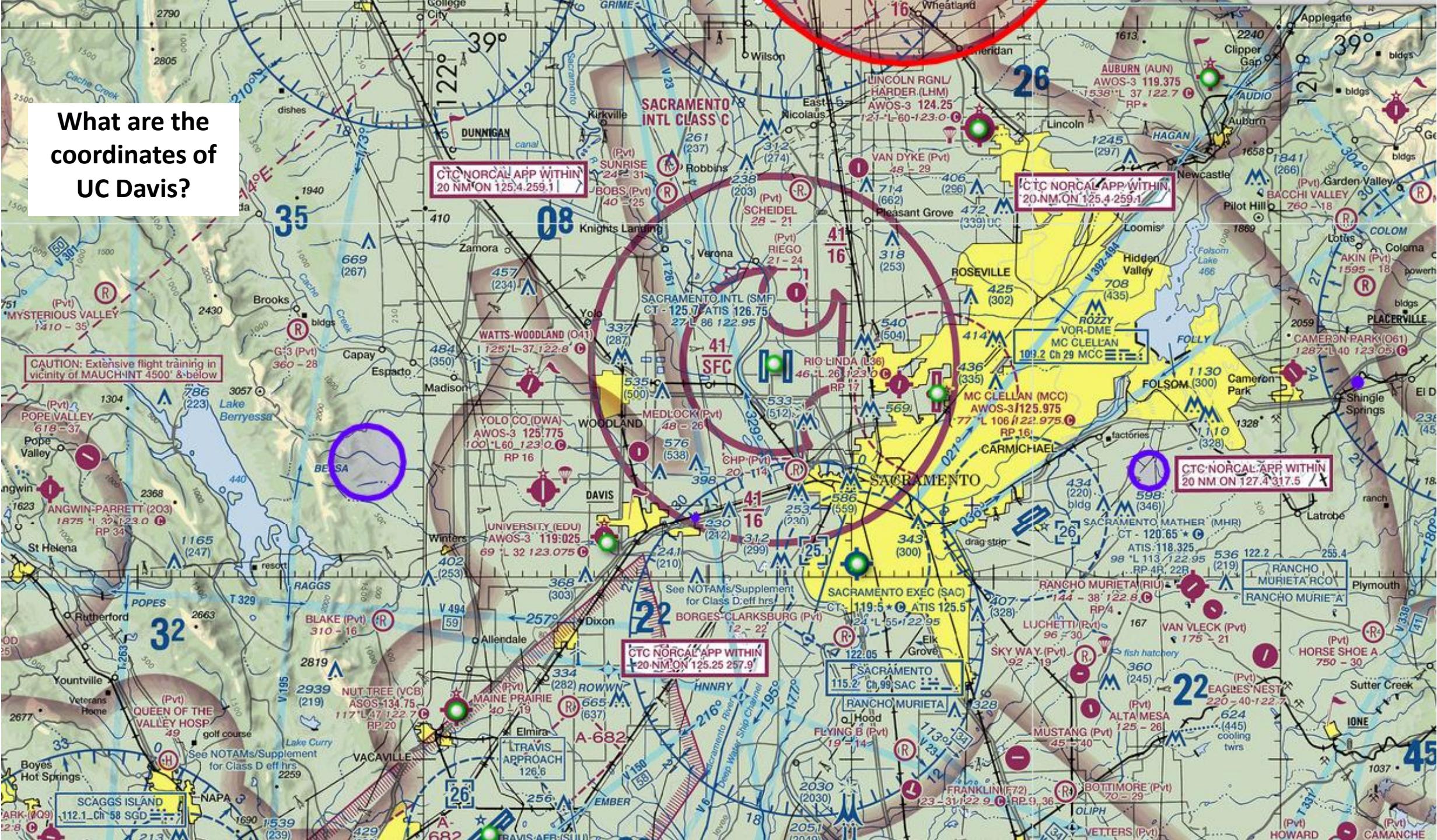
=Mode C veil for manned aircraft, doesn't affect airspace or sUAS

Military training routes and civilian routes

What does IR218 represent?
What does VR1265 represent?



What are the coordinates of UC Davis?



TFRs and NOTAMs

- **Temporary Flight Restrictions (TFRs):** Flying over certain areas prohibited, including major public events (including UCD football games), appearances by public figures, natural disasters, and military activity
 - **It is extremely important to not fly in a TFR!!!** Easy way to lose certificate!
 - I recommend Skyvector for these, tfr.faa.gov also works
- **Notices to Airmen (NOTAM):** These let you know about unusual activity or circumstances that might affect flight, such as other sUAS use or aerial acrobatics
 - Can be accessed at pilotweb.nas.faa.gov

III. Weather

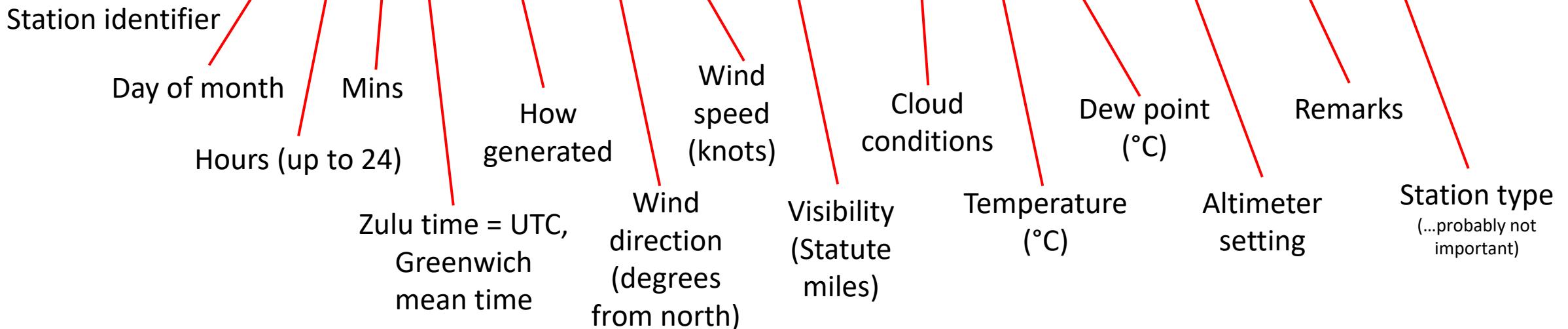
- We will learn to read:
 - METARs
 - Terminal Aerodrome Forecasts
- Stable vs. unstable air
- Clouds and fog

METAR

- **Almost guaranteed to be on test!**
- Can be found on most weather websites, including aviationweather.gov
- Check it out! KEDU = UC Davis airport

METARs (example 1)

- KEDU 012335Z AUTO 00000KT 10SM CLR 25/08 A2983 RMK AO1



So what does this mean?

At KEDU (UC Davis airport) on the first day of the month at 23:35 Zulu time, the auto-generated report showed wind coming from 0 degrees from north at 0 knots. Visibility was 10 statute miles with clear skies. The temperature was 25°C and dew point was 8°C. The pressure correction was 29.83 in. Hg and the station type was A01

METARs (example 2)

KEDU 122155Z COR 13510KT 15SM FEW030 SCT070 BKN110 OVC150
12/M09 A2998 RMK LAST COR 2215

COR = Corrected

FEW030 SCT070 BKN110 OVC150 = Few clouds at 3000 AGL, scattered clouds at 7000 AGL, broken clouds at 11000 AGL, and overcast at 15000 AGL

CLR = Clear (automated report);

FEW = Few (1/8 to 2/8 of sky covered);

SCT = Scattered (3/8 to 4/8 of sky covered);

BKN = Broken (5/8 to 7/8 of sky covered);

OVC = Overcast (total sky coverage).

“Ceiling” is lowest broken or overcast cloud layer

M09 = Dew points is -09 degrees C

LAST COR 0015 = Last corrected 15 minutes past the hour

Intensity	-	Light intensity	blank	Moderate intensity
Intensity	+	Heavy intensity	VC	In the vicinity
Descriptor	MI	Shallow (French: <i>Mince</i>)	PR	Partial
Descriptor	BC	Patches (French: <i>Bancs</i>)	DR	Low drifting
Descriptor	BL	Blowing	SH	Showers
Descriptor	TS	Thunderstorm	FZ	Freezing
Precipitation	RA	Rain	DZ	Drizzle
Precipitation	SN	Snow	SG	Snow Grains
Precipitation	IC	Ice Crystals	PL	Ice Pellets
Precipitation	GR “ G <u>R</u> itty rain”	Hail (French: <i>Grêle</i>)	GS “ G <u>R</u> itty Snow”	Small Hail and/or Snow Pellets (French: <i>Grésil</i>)
Precipitation	UP	Unknown Precipitation		
Obscuration	FG	Fog	VA	Volcanic Ash
Obscuration	BR “ B <u>B</u> aby Rain”	Mist (French: <i>Brume</i>)	HZ	Haze
Obscuration	DU	Widespread Dust	FU “ F <u>u</u> mes”	Smoke (French: <i>Fumée</i>)
Obscuration	SA	Sand	PY	Spray
Other	SQ	Squall	PO	Dust or Sand Whirls
Other	DS	Duststorm	SS	Sandstorm
Other	FC	Funnel Cloud		
Time	B	Began At Time	E	Ended At Time
Time	2 digits	Minutes of current hour	4 digits	Hour/Minutes Zulu Time

Terminal aerodrome forecast

- General weather conditions for an area within 6 statute mile radius
- Like a METAR, but for 24 hours

KSMF 012341Z 0200/0224 16008KT P6SM SCT250
FM021300 34009KT P6SM SCT250
FM021800 33012G20KT P6SM SCT250

0200/0224 = From the second at midnight until the following midnight

P6SM = Visibility 6 statute miles plus

FM021300 = from the second at 1300Z

33012G20KT= winds from 330 degrees at 12 knots gusting to 20 knots

Weather briefs

- Manned aircraft are encouraged to call flight service station for weather briefs
- Can be done online or by calling 1-800-wx-brief
- Three kinds of weather briefing
 - Standard: Most complete weather information, plus notices about temporary activities that may affect flight
 - Abbreviated: updates for those who already have had standard briefing
 - Outlook: For forecast 6+ hours in the future

AWOS, ASOS, ATIS

- Airport information broadcasts, shown on VFR sectionals, provide weather and other airport info
- **AWOS** (Automated Weather Observing System)
- **ASOS** (Automated Surface Observing System)
- **ATIS** (Automatic Terminal Information Service)

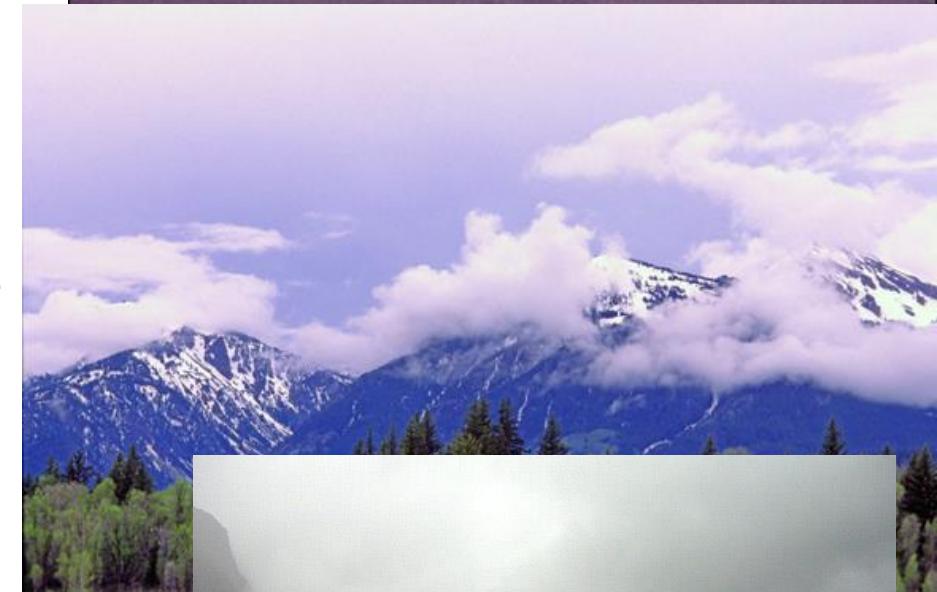
Stable vs. unstable air

- Very common test questions!
- **Stable air:**
 - Stratiform (horizontal-layered) clouds
 - Lower visibility (think smog, fog, haze)
 - Slow, steady precipitation
- **Unstable air**
 - Vertical clouds, cumulus/cumulonimbus
 - Higher visibility (think of thunderstorms clearing away haze, smog)
 - Inconsistent rain, as in thunderstorm



Fog types

- **Radiation fog**
 - As heat **radiates** into space (especially at night), water in air near ground precipitates, fog radiates more heat away causing deepening of fog layer
- **Advection fog**
 - **Warm air blows over cool surface:** here as air the cool rock is causing fog to form
- **Upslope fog**
 - Warm air **cools as it moves up** mountain
- **Precipitation fog**
 - When warm rain falls through cool air, evaporates and re-condenses



Clouds

- Low:
 - Stratus
 - Cumulus
 - Nimbostratus
 - Cumulonimbus
- Middle:
 - Altostratus
 - Altocumulus
- High:
 - Cirrus
 - Cumulus



Cumulus Stage (3–5 mile height)

Mature Stage (5–10 mile height)

Dissipating Stage (5–7 mile height)

40,000 ft.

Equilibrium level

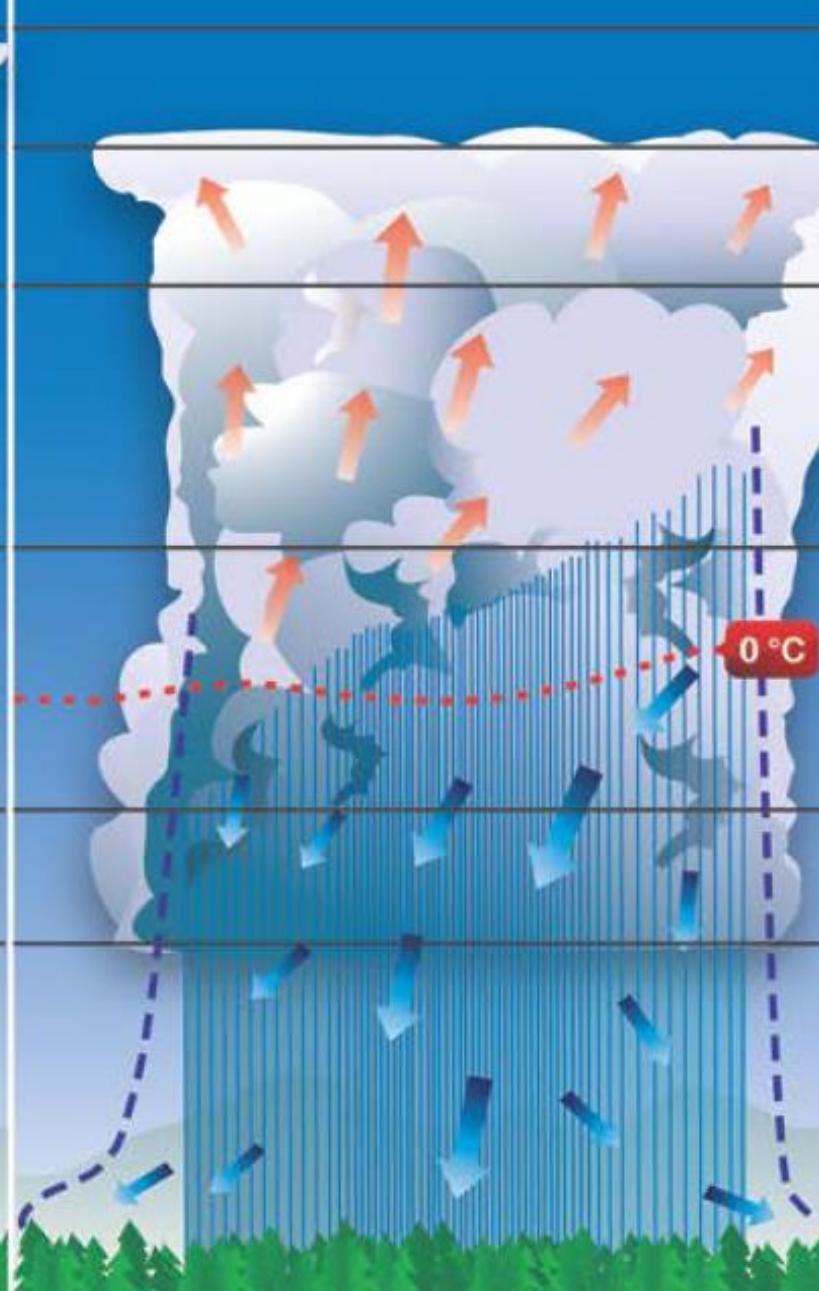
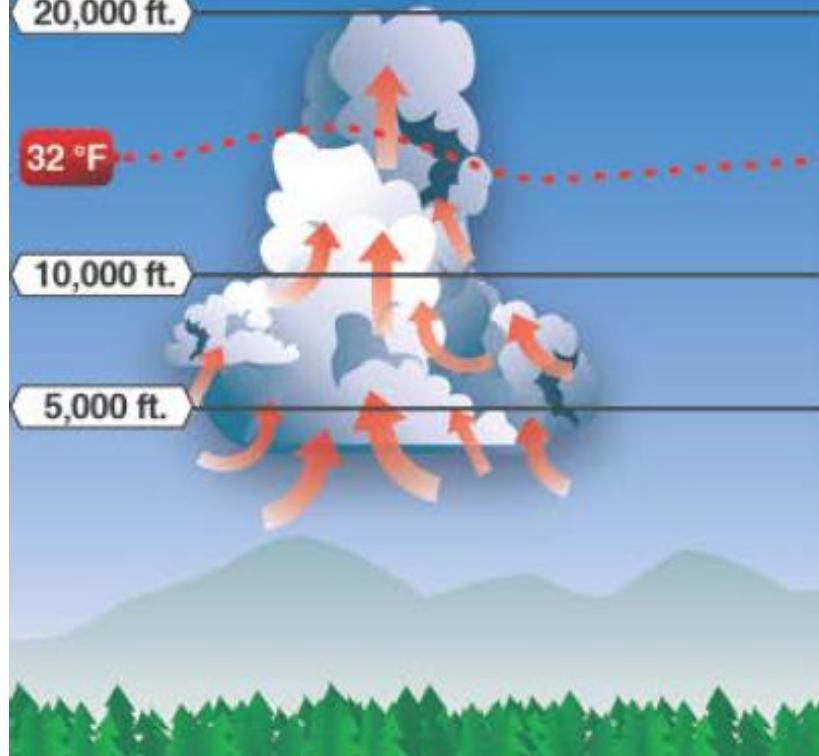
30,000 ft.

20,000 ft.

32 °F

10,000 ft.

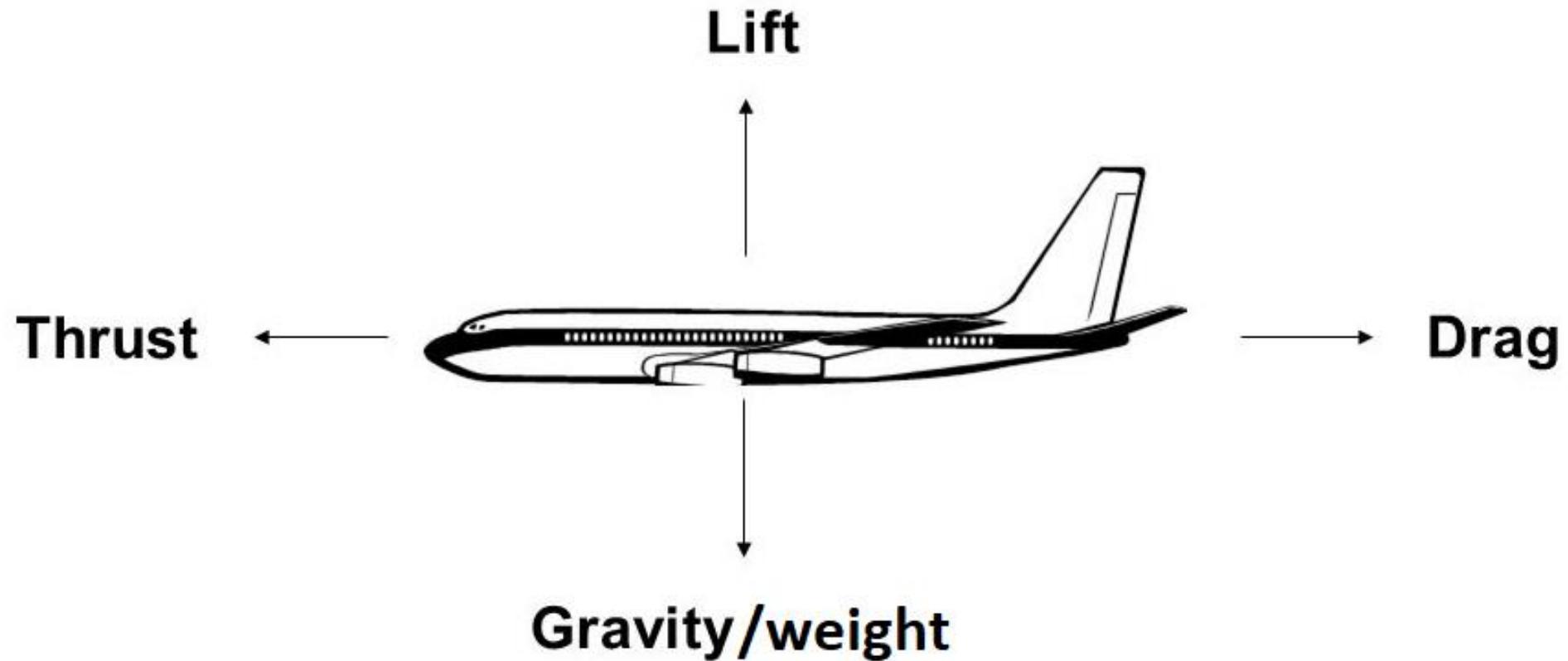
5,000 ft.



IV. Aerodynamics and performance



Aerodynamics vocabulary



Performance

- High performance corresponds with
 - High speed
 - High rate of climb
 - Higher maximum altitude
 - High maneuverability
 - Long endurance



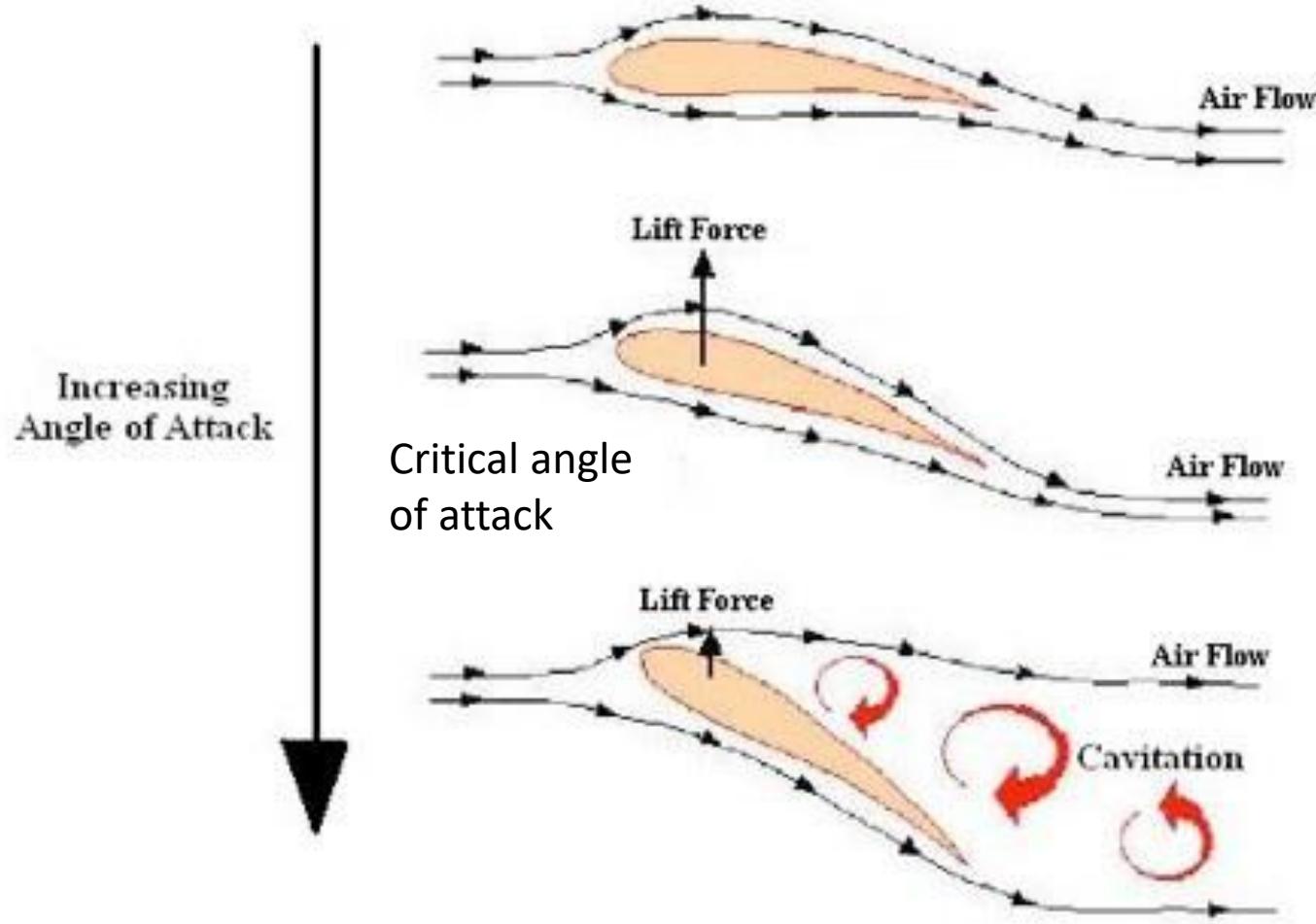
Factors that decrease performance

- Weight
- High altitude*
- High density altitude*
 - Air density as far as performance is concerned
 - High density altitude is like flying at high altitude
 - Low density altitude is like flying at low altitude
 - High temperature*
 - High humidity*
 - Water vapor is lighter on average than air, props have less to “push against”
 - Low pressure *
- Wind
- Obstacles

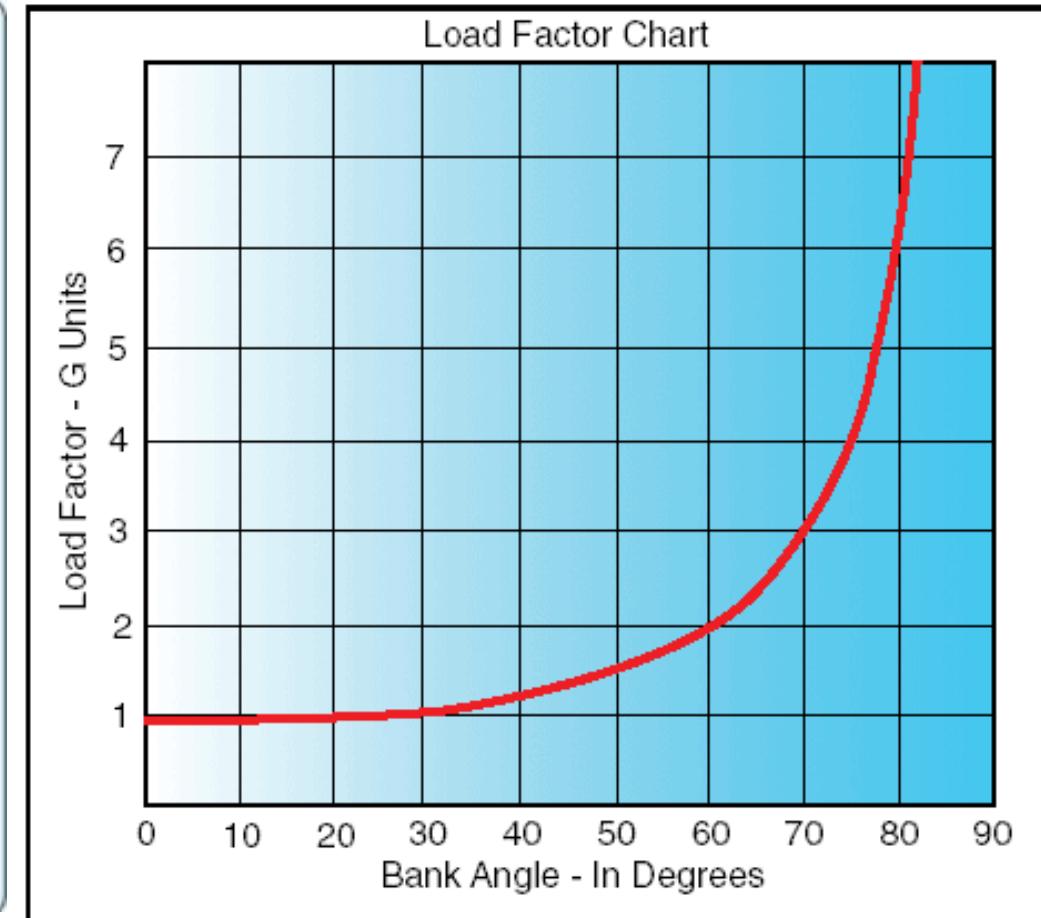
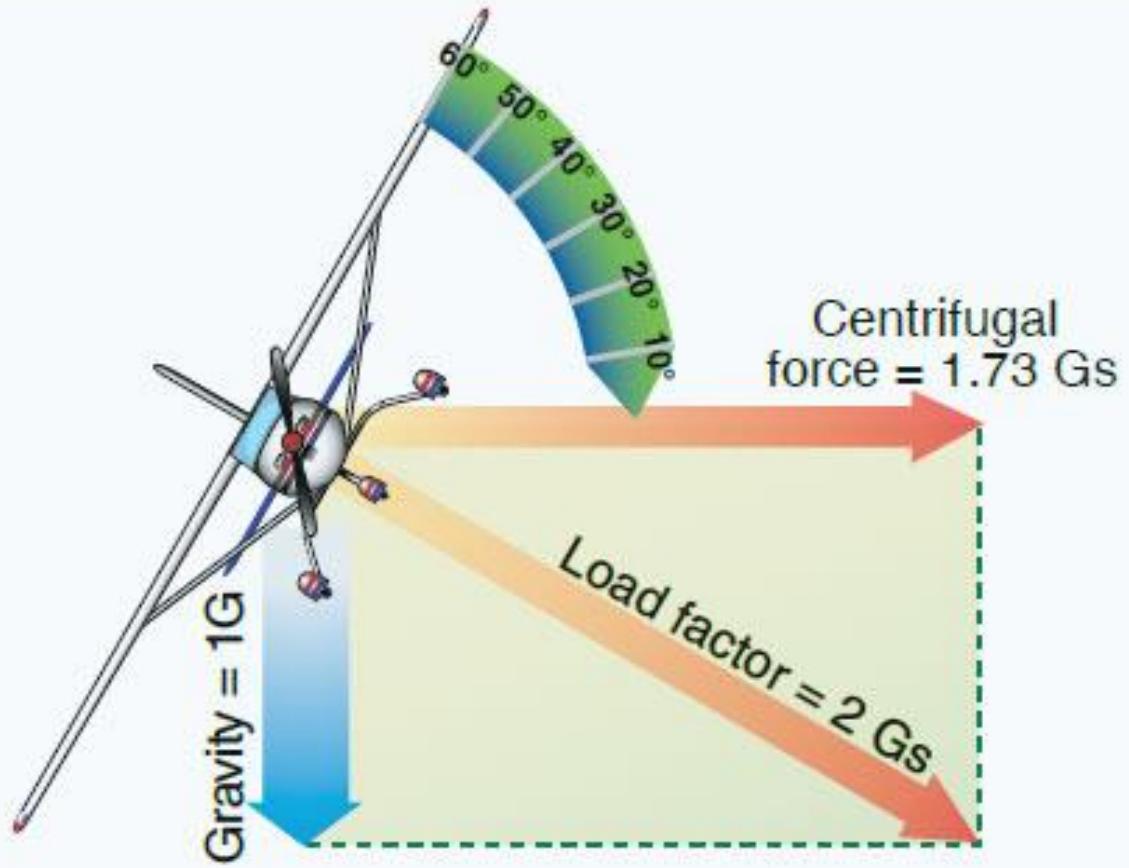
*reduces air density. Note that this reduces drag, but also reduces lift

Stalls

- All aircraft can stall
- Critical angle of attack is the point at which a stall begins



Load factor



Payloads

- No hazardous payloads
- Before each flight, RPIC must determine whether payloads are within limits allowed by craft, effects on **center of gravity** and performance will be, and consider effects of fuel burn if applicable



V. Traffic, risk management, and other important information

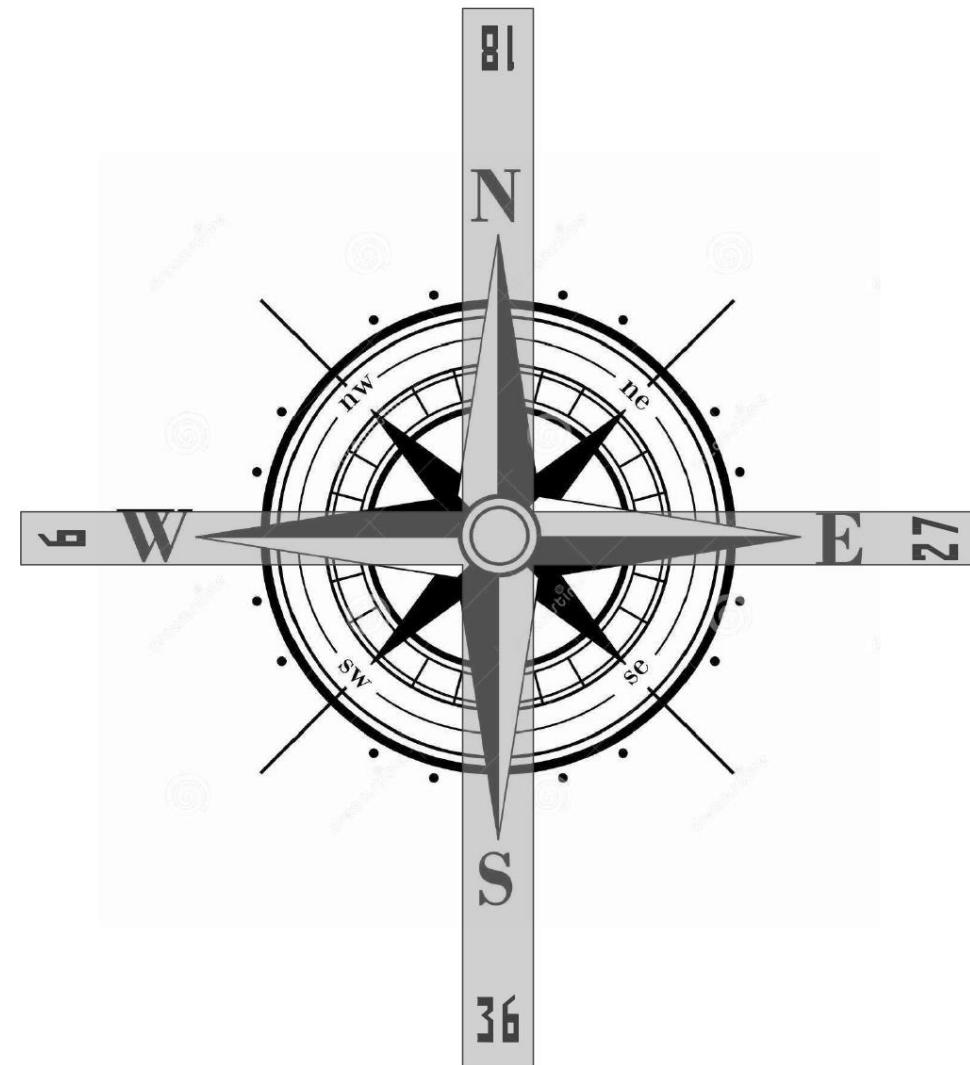


Airport traffic

- Numbered by direction they face relative to north, in tens of degrees
 - Runway 00 faces due north, runway 09 faces due west (090 degrees)

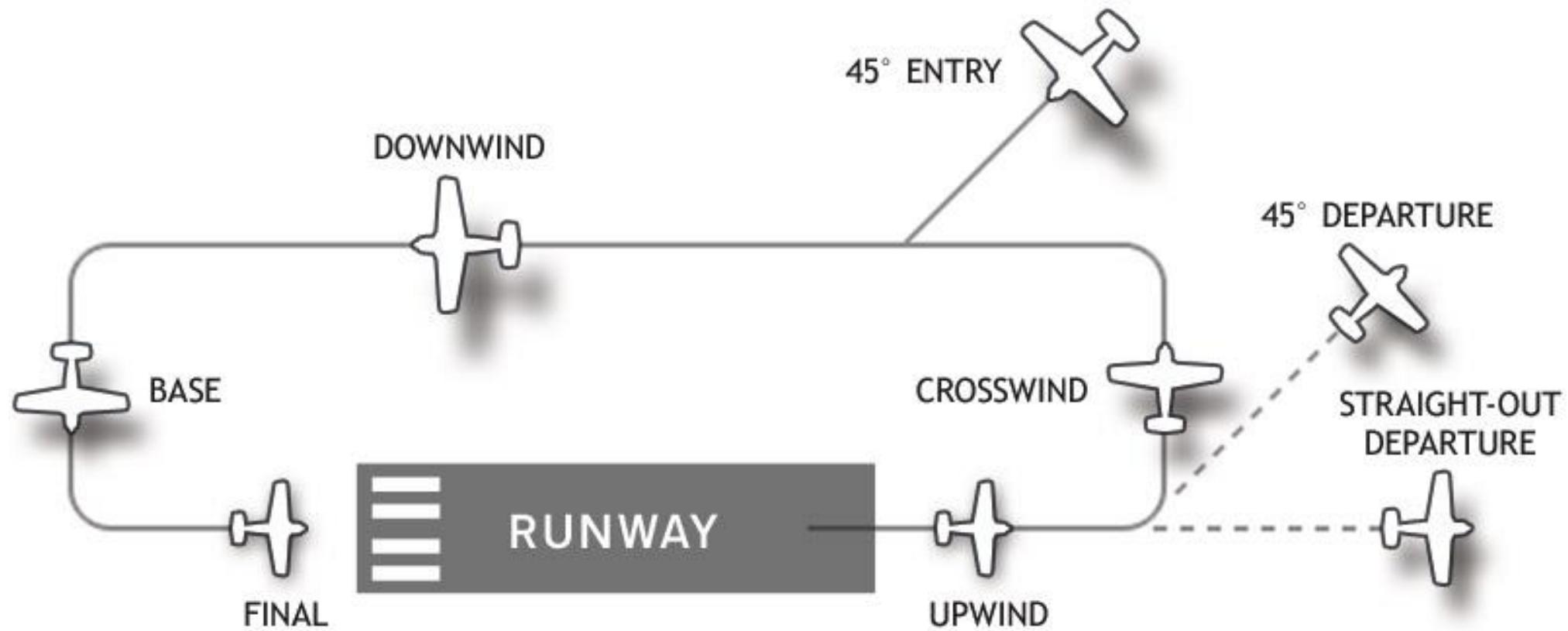


Compass Rose/Runway Orientation Overlay



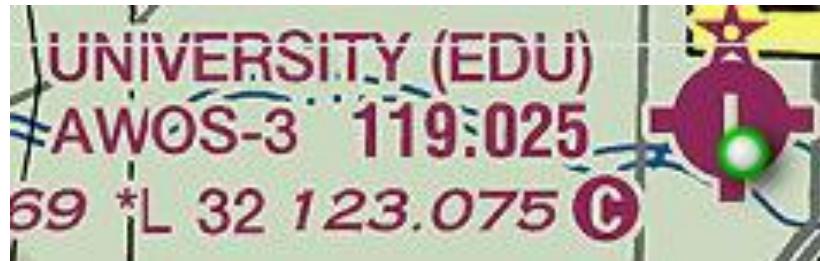
Airport traffic patterns

- This is *suggested* for manned aircraft by the FAA
- Very important for monitoring radio



Radio traffic

- sUAS users should not report their activities via radio/CTAF
- Often it is a good idea to monitor the actions of manned aircraft to yield them the right-of-way
- **Common Traffic Advisory Frequency (CTAF)** for an airport indicated by a ©:



- The FCC regulates radio traffic. Many sUAS use 5.8 GHz for control and 2.4 GHz for imagery transmission. Lost links/flyaways may be due to interference in these wavelengths (WiFi)

Hazardous attitudes

- ON EVERY TEST!
- Impulsivity
 - “Do it quickly!”
- Invulnerability
 - “It won’t happen to me”
- Macho
 - “Watch this!”
- Anti-authority
 - “Don’t tell me...”
- Resignation
 - “What’s the use?”



Drugs/alcohol

- You may not serve as ANY crewmember for an sUAS flight if you:
- Consumed any alcoholic beverage within the last **eight hours**
- Have a blood alcohol concentration of **0.04%** or greater
- Are **under the influence** of alcohol
- Are **using a drug** that affects your mental or physical capabilities
- FAA understanding is that it takes 3 hours for a standard drink to be metabolized fully

Risk Management 1

- Consider if any of the following may influence your ability to fly:
 - 1) Illness
 - 2) Medication
 - 3) Stress
 - 4) Alcohol
 - 5) Fatigue
 - 6) Emotional state

Risk Management 2

- **PAVE** is an acronym for things to consider before flight:
- Pilot
 - See previous slides
- Aircraft
 - Consider your familiarity with the aircraft, and its maintenance and firmware status
- en**V**ironment
 - Weather, airspace, terrain
- External pressure
 - The need to impress is a particularly powerful motivator, be careful not to take on a project unless you are confident you can conduct it safely

Accidents

- You are required to **tell the FAA within 10 days** if an accident has occurred that:
 - Has caused serious injury
 - Loss of consciousness
 - Head trauma
 - Broken bones
 - Lacerations that require sutures
 - Others (unspecified)
 - Greater than \$500 in damages, excluding cost of sUAS
- FAA has accident reporting portal online, can also call

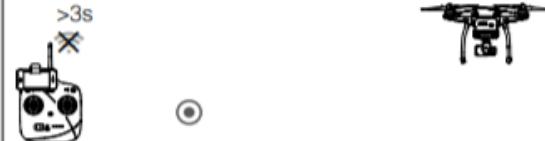
Failsafe RTH Illustration

① Record the Home Point



Aircraft Status Indicator:
Flashing Yellow → Flashing Green

④ Signal Lost > 3s, Return-to-Home



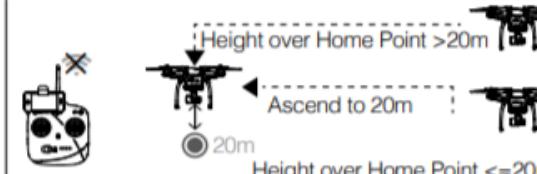
Aircraft Status Indicator:
Flashing Yellow

② Flying



Aircraft Status Indicator:
Flashing Green

⑤ Return to the Home Point



Aircraft Status Indicator:
Flashing Yellow

③ Remote Controller Signal Lost



Aircraft Status Indicator:
Flashing Yellow

⑥ Auto Landing after Hovering for 15s



Aircraft Status Indicator:
Flashing Yellow

1 Record Home Point (HP)



Flashing Green

2 Confirm Home Point



Flashing Green

3 Remote Controller Signal Lost



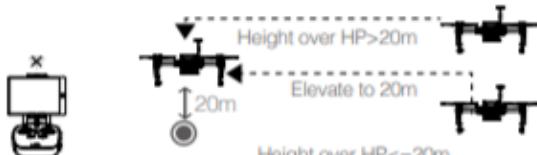
Flashing Yellow Rapidly

4 Signal Lost Lasts 3secs.



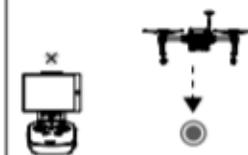
Flashing Yellow Rapidly

5 Go Home(20m can be set)



Flashing Yellow Rapidly

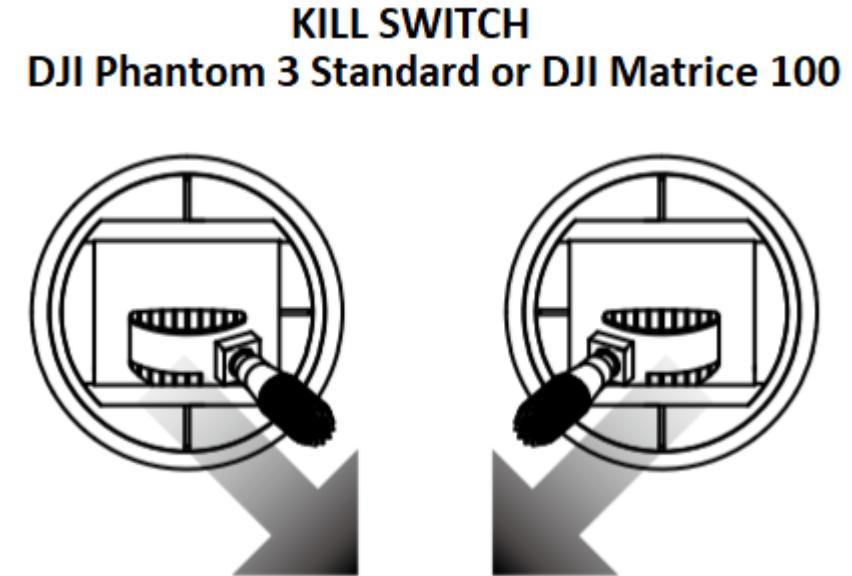
6 Landing after Hovering 15secs



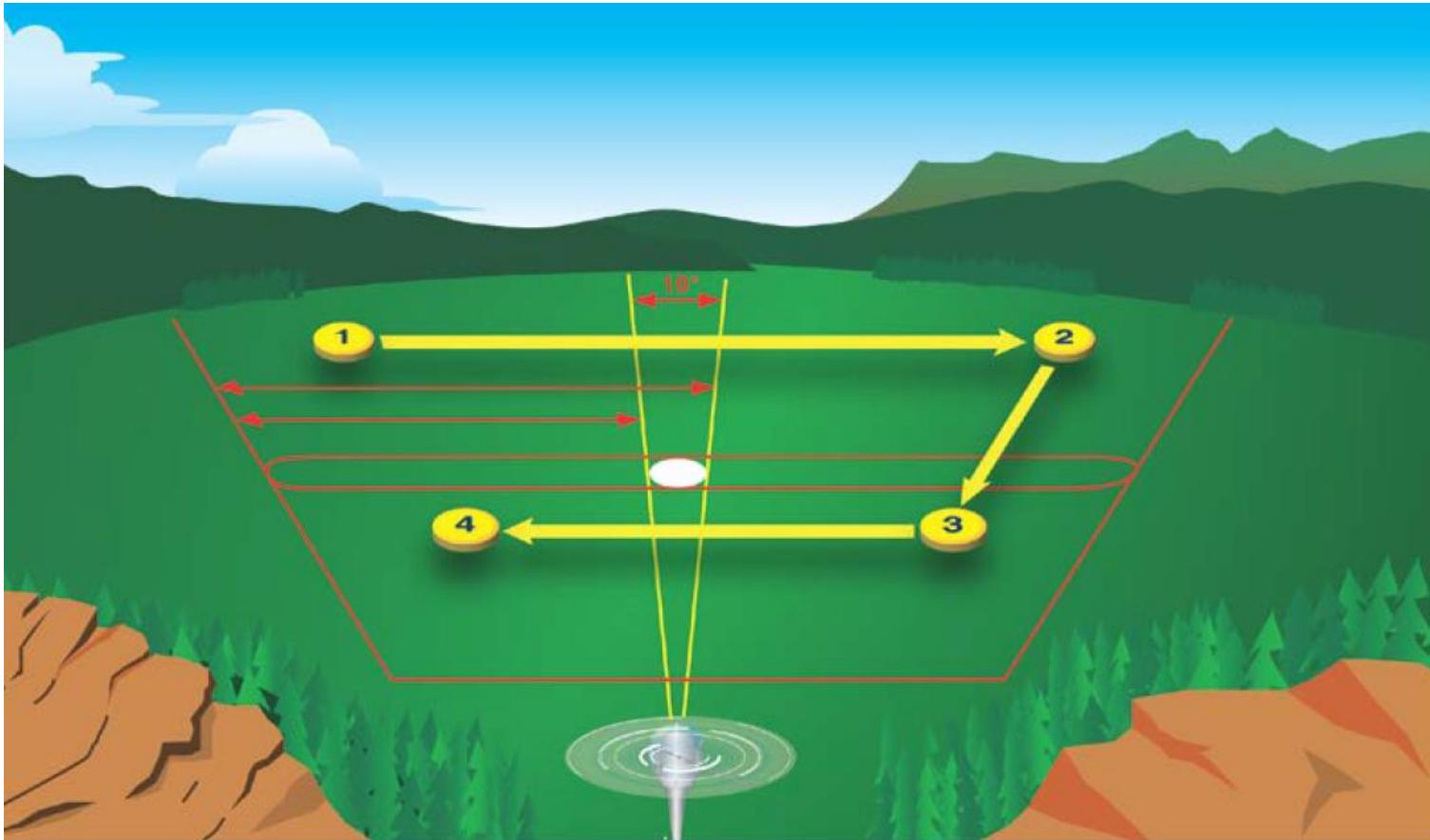
Flashing Yellow Rapidly

Flyaways

- Begins as lost link
- The pre-set procedure is not executed properly
- To reduce the chance of a flyaway:
 - Check home point before flight
 - Calibrate compass
 - Consider interference from metal objects and powerlines
- Know how to switch flight modes, know kill switch control
- If flying with FAA authorization, you are required to notify ATC about the flyaway immediately!



Scanning techniques



View 30 degrees at time for 2-3 seconds, scanning from far away to closer, overlapping by 10 degrees

Summary

- I. FAA regulations
- II. Airspace and VFR sectionals
- III. Weather
- IV. Aerodynamics and performance

Part 107 knowledge test study groups

Consider taking practice exams online with real test questions... I will include some on the midterm and final!

