



## FAA PART 107 Study Guide

Regulations: (15-25%)

### Subpart A – General

#### Definitions

- Control Station: Device used by pilot to control aircraft
- Corrective Lenses: Spectacles
- Small Unmanned Aircraft: <55 lbs.
- Visual Observer: Assists PIC (pilot in command)

#### Falsification

- No person can falsely claim or make false record claiming compliance
  - If caught doing this you could:
    - Be denied application for remote pilot certification
    - Suspension or revocation of waiver
    - Civil penalty

#### Inspection/Testing

- Owner/PIC must make available to administrator:
  - Remote pilot certification and any other document required

#### Accident Reporting

- If the below criteria is met, you must report accident to the FAA within 10 days.
  - Serious injury to any person or loss of consciousness
  - Damage to any property, other than UAS, greater than \$500

### Subpart B – Operating Rules

#### Requirement for pilot certificate with small UAS rating

- No person may operate flight controls unless...
  - Person has remote pilot certificate
  - Person is under direct supervision of a remote PIC and the remote PIC has ability to take controls

#### Remote (PIC) Pilot in Command

- PIC must be designated for each flight
- PIC directly responsible for aircraft
- PIC must ensure aircraft poses no danger to people or property

#### In Flight Emergency

- In the event of an emergency, PIC can deviate from any rule in order to meet emergency
- Upon request, PIC must send written report to FAA

#### Operation from moving vehicle or aircraft



- NO operation from moving aircraft
- NO operation from land or water vehicle, UNLESS flown over sparsely populated area and is not transporting another persons property for compensation or hire

#### Daylight Operations

- NO operation at night
- NO operation during civil twilight UNLESS UAS has anti collision lighting that is visible for 3 statute miles.
  - Civil Twilight = 30 minutes before official sunrise and 30 minutes after official sunset. (Except for Alaska)

#### Visual Line of Sight (LOS) aircraft operation

- Either PIC and the person manipulating the controls OR the visual observer, must be able to do the following:
  - Know aircraft location
  - Know aircraft attitude, altitude, direction
  - Observe airspace for traffic hazards
  - Observe no danger to life or property

#### Operation Near Aircraft

- Yield to all other aircraft

#### Operation over human

- No operation over human unless...
  - Directly participating
  - Located under covered structure or vehicle

#### Operation in Certain Airspace

- No operation in class B,C,D, or within lateral boundaries of the surface of class E airspace, unless authorization from ATC
- No operation that interferes with traffic patterns
- No operation in Restricted Areas, unless authorization from FAA

#### Operating limits for UAS

- Not exceed 87 knots (100mph)
- Altitude no higher than 400ft, unless you are flying within 400ft of structure
- Minimum flight visibility no less than 3 statute miles
- Minimum 500ft below clouds

### Subpart C – Remote Pilot Certificate

#### Drug/Alcohol Offenses

- Denial of application for up to 1 year

#### Eligibility

- At least 16 years old
- Read/Speak/Write English
- No mental illness

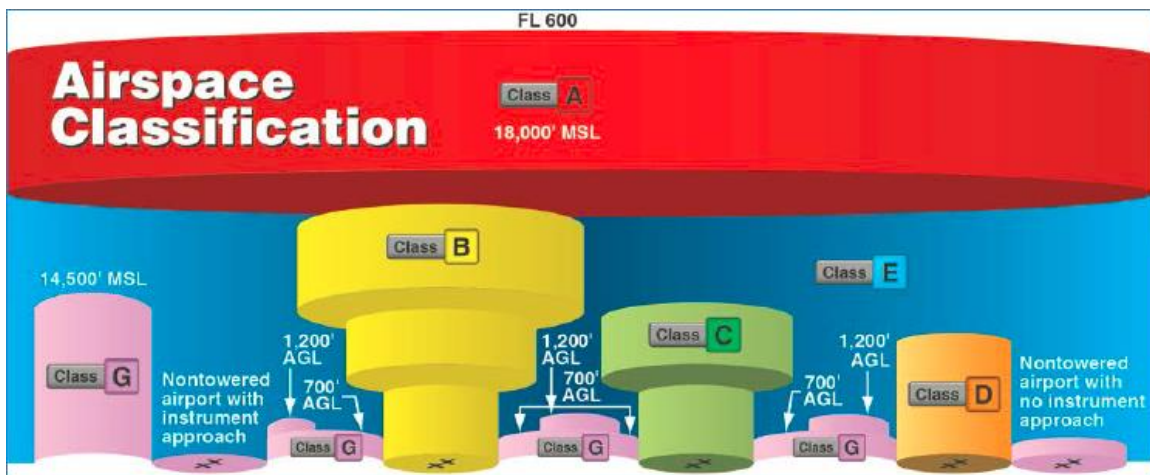


- Demonstrate Aeronautical knowledge by
  - Pass 107 test
  - Pilot Certificate (test taken every 24 months)

### Waiver

- If you would like an exemption from any regulation, you can file a waiver here : [https://www.faa.gov/uas/request\\_waiver/](https://www.faa.gov/uas/request_waiver/)

## Airspace Classification and Requirements



### Controlled Airspace

- Class B: (Shown as solid blue line) Surface to 10,000' MSL, surrounding busy airports. Must receive authorization from ATC to enter.
- Class C: (Shown as solid Magenta Line) Surface to 4,000' MSL. Above medium sized airports with control tower. Must receive ATC authorization to enter.
- Class D: (Dashed blue line) 0 to 2,500' MSL. Must receive authorization from ATC to enter.
- Class E: (Dashed magenta Line) typically extends to 18,000' MSL. Federal airways are usually shown in class E airspace. Most cases will not need ATC approval.

### Uncontrolled Airspace

- Class G: Portion of airspace not B,C,D,E. Extends from surface to base of class E airspace. Will not need ATC approval.

### Special Use Airspace

- Prohibited areas: Defined dimensions where flight is prohibited. Areas are published in federal register and are depicted on aeronautical charts as (P[numbers])



- Restricted areas: Operations are hazardous to non-participating aircrafts. These are unusual and often invisible hazards.
  - If restricted area is not active, no ATC clearance needed.
- Warning Areas: Similar to restricted, however, U.S. does not have sole jurisdiction.
- Military Operation Areas (MOA): Defined vertical and lateral limits. Training routes are usually below 10,000' MSL for speeds greater than 250 knots. Defined by IR or VR followed by route number.
- Alert Areas: Depicted on Aeronautical charts with an (A[numbers]). High volume of aerial activity.
- Controlled firing areas (CFA): Activities in this area must be suspended when a spotter sees approaching aircraft.

### Visual Flight Rules (VFR) Terms and Symbols

#### Water features

- Open water = Light Blue
- Inland Water = Dark Blue

#### Land Features

- Contour Lines: Widely spaced contours represent gentle slopes
- Shaded Relief: Shows how terrain may appear from the air
- Obstruction Symbols:

OBSTRUCTION	Less than 1000' AGL	1159 (553) stack
	Under Construction or reported and position / elevation unverified	607 UC
	1000' AGL and higher	2967 (1697)
	Wind Turbine	1400 UC WAC
GROUP OBSTRUCTION	Less than 1000' AGL	1524 (267)
	1000' AGL and higher	3483 (1534)
	At least two in group over 1000' AGL	4892 (1372)
	Wind Turbines	1600 UC WAC

- Max Elevation Figure : 12<sup>5</sup> = 12,500'

Radio Aids to Navigation: On VFR Charts, info about radio aids to navigation is boxed.

#### Airport Symbols



- ✳️ 4 Hard-surfaced runways greater than 8069' or some multiple runways less than 8069'
- ✳️ X Hard-surfaced runways 1500' to 8069'
- Other than hard-surfaced runways
- ⚓ Seaplane bases

**Military airports:**

- ○ Other than hard-surfaced runways

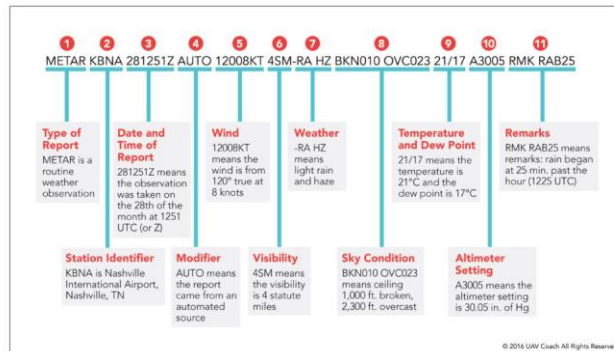
Notices to Airmen (NOTMA): time critical Aeronautical info that alerts of any hazards.

- Available in printed form through superintendent of documents or online at pilotweb.

Aviation Weather Sources

Weather Reports:

- Aviation weather reports = METAR -> observation of current weather, issued on a regular basis.



○

Effects of Weather on Small UAS

Density Altitude: altitude in standard atmosphere corresponding to a particular value of air density.

- As density of air increases (lower density altitude), aircraft performance increases.
- Density decreases = performance increases
- High density altitude refers to thin air, which is bad for aircraft performance.
  - High density altitude is made up of high elevation, low atmospheric pressure, high temp/humidity. These all create low density, which is bad for flight performance.

Performance



- Climb performance – directly related to creating enough or excess thrust.
  - If weight is added, must fly at higher angle of attack (AOA).
  - Climb performance diminishes with altitude.

Measurement of Atmospheric Pressure

- Standard sea level pressure is 29.92” Hg and temp of 59 degrees.
- Convert weather stations pressure to seal level = add 1Hg for every 1,00 ft.
  - Ex. Station 5,000’ above sea level with reading of 24.92 = 29.92.

Effects of Obstruction on Wind

- Ground topography and large building can create unexpected turbulence.
- Backside of mountain can be especially dangerous.

Low Level Wind Shear

- Wind shear = sudden, drastic change in wind speed and direction.
  - Low level wind shear is especially dangerous. Commonly associated with frontal systems, thunder storms, temp inversions, and strong upper level winds.
- Micro Burst = Most sever level of low level wind sheer

Atmospheric Stability

- Stable atmosphere makes vertical movement difficult = GOOD
- Unstable atmosphere makes vertical movement easy = BAD
  - Combination of moisture and temperature determine stability of air.
    - Greater moisture and higher temperature = GREATER Instability.

Temperature/Dew Point Relationship

- When temperature of air is reduced to the Dew Point, air is completely saturated. This causes fog, clouds and precipitation.
- DEW poses no threat, frost can be bad.
  - Frost comes from temps below freezing

Clouds

- Cumulonimbus = most dangerous. Caused by rising air currents, therefore high turbulence.

<u>Unstable Air</u>	<u>Stable Air</u>
Cumuliform Clouds	Strati form Clouds
Showery Precipitation	Continuous Precipitation
Rough Air	Smooth Air
Good Visibility	Fair to poor visibility



Fronts: zone between two different air masses. Temperature and humidity change rapidly.

#### Thunderstorm Lifecycle: 3 Stages

- Cumulus Stage: First stage, causes strong updraft, creating large raindrops and potential icing. 3-5 mile height.
- Mature Stage: Precipitation begins falling. Downdraft. Temperature decrease. 5-10 mile height.
- Dissipating Stage: Downdrafts. Storm dies rapidly. 5-7 mile height.

#### Small UAS Loading

- Conditions that affect takeoff and climb performance =high elevations, high temp, high humidity
- Center of gravity (CG) depends on distribution of aircraft weight. Lift is required to counteract aircraft weight.
- Stability effects both maneuverability and controllability

Load Factor: any force applied to aircraft to effect flight. Measured in G's.

- Load factor of 3 means total load on aircraft is 3x its weight
- Increased load factor increases stalling speed
- Load factor increases on banks, especially banks reaching 45-50 degrees.

#### Emergency Procedures

- PIC allowed to deviate from any part of 14 CFR 107. PIC will report emergency if asked to do so.
- PIC ensure no hazard to person or property
- PIC conduct preflight inspection

#### Radio Communications

- 3 ways to communicate while operating at airport without central tower.
  - Communication with FSS
  - UNICOM operator
  - Make self-announcement broadcast
- Key to communication is selection of correct common frequency. Frequency of 122.9 will be used at non towered airports. Other frequencies to be used can be found on sectional charts.
- Example of aircraft entering traffic pattern.
  - "Town and country traffic, Cessna 123 Bravo Foxtrot is entering pattern, mid field left downwind of runway 18, town and country traffic"



### Physiological factors affecting pilot

- Prohibited from operating controls if:
  - Consumed alcohol in proceeding 8 hours
  - Under influence of alcohol
  - Bac > .04%
  - Using drug that affects mental capacity
- Physiological factors that affect pilot's performance
  - Hyperventilation
  - Stress
  - Fatigue
  - Dehydration
  - Heatstroke
  - Alcohol/drugs
- Vision and flight: Scan effectively left to right, right to left. Stop every 30 degrees, no longer than 2-3 seconds.

### Aeronautical Decision Making (ADM)

- Systemic approach to determining best course of action
- 80% of all accidents are human error

#### Crew Resource Management - Effective us of ALL available resources

- Had been adapted to UAS pilots as SRM (single pilot resource management)

#### Steps for Good Decision Making

- Identify personnel attitudes that are dangerous to flight
- Learn behavior modification techniques
- Learn to recognize and cope with stress
- Develop risk assessment skills
- Use all resources
- Evaluate ones ADM skills

Risk Management: is an important part of ADM and can be learned directly or indirectly.

- Identify hazard
- Assess risk
- Analyze controls
- Make central decision
- Use controls
- Monitor results





#### 4 fundamental principles

1. Accept no unnecessary risk
2. Make decisions at appropriate level
3. Accept risk when benefit > danger
4. Integrate risk management into all levels

#### Hazard vs. Risk

- Hazard = real or perceived condition
- Risk = assessment of the hazard. Pilot assigns a value to the risk of the hazard.

#### Attitudes affects pilot's ability to assess risk

- 5 dangerous attitudes
  - Anti-authority (Don't tell me)
  - Impulsivity (Do quickly)
  - Invulnerability (Won't happen to me)
  - Macho (I can do it)
  - Resignation (what's the use)

#### Mitigate Risk – check for...

- Illness
- Medication
- Stress
- Alcohol fatigue
- Emotion

#### PAVE checklist – divide risk into 4 categories

- Pic (pilot in command)
- Aircraft
- environment
- External pressure

#### Airport operations

Towered – (blue color) – has operating control tower. ATC responsible for safe operation.

Non towered- (red color) – radio communication not required. Important to select correct common frequency in order to monitor traffic.

Latitude – runs parallel to equator. Measures degrees of latitude north and south.

Longitude- runs parallel to prime meridian.