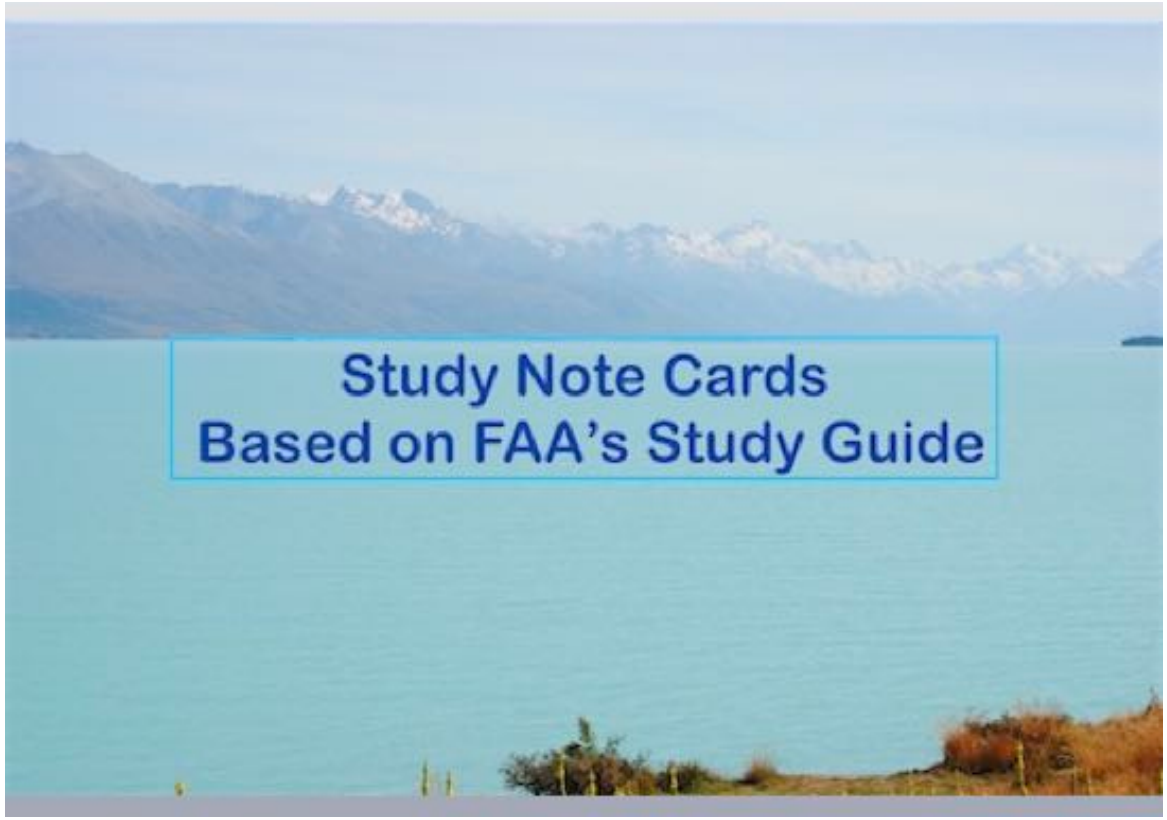


Part 107 Study Guide Notes

Aug 25, 2023

301 flashcards made with the Flashcard Hero app (Mac/iPhone/iPad).

Q: 1 **INTRODUCTION** **Test Study Notes Flashcards -** Part 1	Q: 2 **INTRODUCTION** **Test Study Notes Flashcards -** Part 2
Q: 3 **INTRODUCTION** **Test Study Notes Flashcards -** Part 3	Q: 4 **INTRODUCTION** **Test Study Notes Flashcards -** Part 4

A: 2

Remember, you can go online to download the FAA Study Guide (see link on another card below). Some additional notes are added here to supplement the study guide content.

Hyperlink list for all web addresses in these cards can be obtained at: https://www.windowview.org/zfaa/

Tip: when you study; include memorizing abbreviations and these are often times presented with **bold colored text**.

Other text appears as words in **bold text** to help focus on **keywords** or **numbers** for awareness or to remember.

These enhancements are not in the original guide and are offered here to make these note cards special for your study.

A: 1

So many nice training sources (some for $$$), videos, and web pages offer Part 107 training, but few if any suggest you read **FAA's Study Guide**! If you read the FAA document, then that is the source to study for the FAA exam. This stack of flash (note) cards is a special format for much of the information in the FAA guide.

Because the FAA document is a US government document it is not copyrighted and thus much the wording is directly from the guide.

Please help anyone else to obtain the Flashcards (Note Cards) or the Test Question Cards by referring them to the web link listed here (or YouTube video) that introduces the flashcard and test question availability:

https://www.windowview.org/zfaa/

Special Request: please don't just send the files to someone else.

First, because the option to give a donation is helpful and in recognition of the effort to make these resources available.

Second, files may be updated since you obtained these files.

A: 4

Study Recommendation:

1. Read and Review these Study Notes Cards.
2. Go online to learn about sectional charts and testing (examples are offered later in this set of cards)
3. Try the flashcard multiple choice example test questions (many questions come with informational comments)
4. Consider another review of the Notes Cards or review the example questions that have added explanations
5. Additional flashcards, also provided, cover topics needing study for the test
6. Review example questions just before taking the Part 107 test!

A: 3

If someone sent you a copy of the **Flashcard Hero formatted files** for the note cards and study test questions, *please visit the website address listed below*. Many hours were spent developing these files and updated cards may now exist.

Also, an **optional**, but not required, **donation** is requested for the development of these flashcards. If you use the cards for a while and value them, you can make a donation at any time. The request is modest ($5.00; use web address below).

Flashcards and example test questions availability:

https://www.windowview.org/zfaa/part107.html

Q: 5 **INTRODUCTION** Test Study Notes Flashcards - Part 5	Q: 6 **>>> How to contact the FAA**
Q: 7 >>> What and where are reference materials for the student, as well as the advanced civil aviation pilot ...	Q: 8 **>>> What is the online source for Part 107?**

A: 6

… by phone, Internet / e-mail, or mail.

To talk to the FAA toll-free 24 hours a day, call

1-866-TELL-FAA (1-866-835-5322).

To visit the FAA's website, go to www.faa.gov

Individuals can also e-mail an FAA representative at a local **Flight Standards District Office (FSDO)** by accessing the staff e-mail address available via the "Contact FAA" link at the bottom of the FAA home page.

Letters can be sent to:

Federal Aviation Administration,

800 Independence Ave, SW, Washington, DC 20591

A: 5

Flashcard Version (this set of cards): June 2023 - v1.0

Hyperlinks Listing: Obtain the PDF document with links from the flashcard download page.

Encouragements and Input Opportunity:

If you wish to provide a comment, suggest additional and helpful information, you can send an email to:

[redacted]

(remove the spaces when typing the address in your email client 'email to')

A: 8

Electronic Code of Federal Regulations (eCFR)

eCFR 14 Part 107

https://www.ecfr.gov/current/title-14/chapter-I/subchapter-F/part-107

(**Recommendation**: The content of the CFR is like an outline and an important to expand and read through in addition to these note cards)

A: 7

Almost all reference material is available online at www.faa.gov in downloadable format.

- Aeronautical Information Manual (AIM)
- Handbooks
- Advisory Circulars (ACs)
- Airman Certification Standards
- 14 CFR part 107

This set of flashcards is based on the **August 2016 Remote Pilot – Small Unmanned Aircraft Systems Study Guide** (document) which you can download at:

https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/media/remot

NOTE: **See flashcards "Part 107 Study Notes 2" for current 2023 listing of documents and added cards to cover topics you need to study for the test.**

Q: 9 **>>> Part 107 Updates:**	Q: 10 **Chapter 2: Airspace Classification, Operating Requirements, and Flight Restrictions**
Q: 11 **Airspace Diagram**	Q: 12 The **two categories** of airspace are ...

A: 10

- Introduction ...
- Controlled Airspace
- Uncontrolled Airspace
- Special Use Airspace
- Other Airspace Areas
- Air Traffic Control and the National Airspace System
- Visual Flight Rules (VFR) Terms & Symbols
- Notices to Airmen (NOTAMs)

A: 9

operations over people

https://www.faa.gov/uas/commercial_operators/operations_ove here “Part 107 Study Guide Notes flashcards]

updates to the night rule - flying at night

https://www.faa.gov/newsroom/night-authorization-available-part-107-drone-pilots [See “Part 107 Study Guide Notes flashcards]

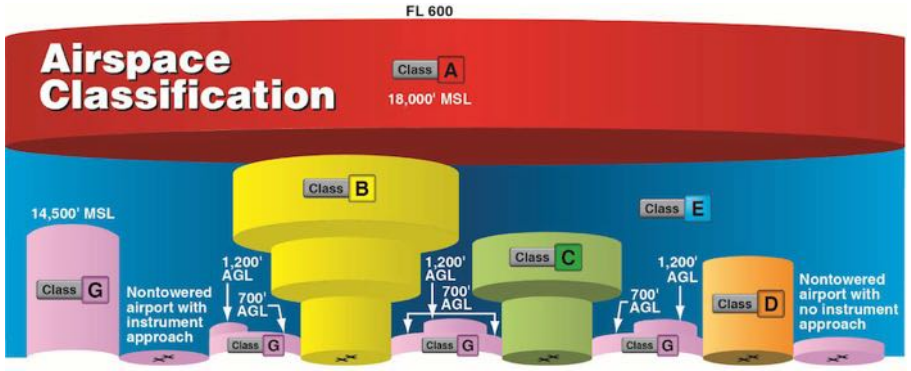
Remote Identification

https://www.faa.gov/uas/getting_started/remote_id/drone_pilots [See this topic covered in "Part 107 Study Notes 2" flashcards]

A: 12

regulatory
&
nonregulatory

A: 11



profile view of the dimensions of various classes of airspace

Q: 13 What are the **four types** of airspace?	Q: 14 The categories and **types of airspace** are dictated by ...
Q: 15 The different **classifications** of airspace and defined dimensions within which air traffic control (ATC) service include:	Q: 16 **Class B** airspace is generally airspace …

A: 14

… the complexity or density of **aircraft movements**,

nature of the operations conducted within the airspace,

the level of **safety** required,

and **national** and **public** interest

A: 13

- controlled
- uncontrolled
- special use
- other airspace

A: 16

... from the **surface to 10,000 feet mean sea level (MSL)**

surrounding the nation's busiest airports in terms of airport operations or passenger enplanements.

[**enplanement:** The act or process of boarding an aircraft.]

The configuration of each **Class B** airspace area is individually tailored, consists of a surface area and **two or more layers**

[MSL is the surface height above sea level (e.g., over lake water level or land surface), where as **AGL** is the height going up from the surface at any **MSL]**

A: 15

Controlled airspace that is of concern to the remote pilot is:

• Class B
• Class C
• Class D
• Class E

[Take a look now and refer back to the Airspace Diagram!]

Q: 17 What does a **Pilot in Command (PIC)** need to fly in Class B, C, D airspace?	Q: 18 **Class C** airspace is generally airspace …
Q: 19 **Class D** airspace is generally airspace	Q: 20 **Class E** airspace is the ...

A: 18

... from the **surface to 4,000 feet** above the airport elevation (charted in MSL) surrounding those airports that have an operational **control tower**,

are serviced by a radar approach control,

and have a certain number of **instrument flight rules (IFR)** operations or passenger enplanement.

Although the configuration of each **Class C** area is individually tailored, the airspace usually consists of a **surface area** with a **5** nautical mile (NM) radius, and **outer circle** with a **10** NM radius that extends from **1,200** feet to **4,000** feet above the airport elevation

A: 17

A r**emote pilot in command (RPIC)** must receive authorization from **Air Traffic Control (ATC)** before operating in the Class **B**, **C**, **D** airspace.

In most cases, a remote pilot will not need ATC authorization to operate in Class **E** airspace.

[Remember … important abbreviations to learn are in text that is bold and in color]

What is **LAANC**? LAANC is the **Low Altitude Authorization and Notification Capability**, a collaboration between FAA and Industry. It directly supports UAS integration into the airspace. LAANC provides: Drone pilots with access to controlled airspace at or below 400 feet.

A: 20

… is controlled airspace not classified as Class A, B, C, or D airspace.

A large amount of the airspace over the United States is designated as **Class E** airspace.

This provides sufficient airspace for the safe control and separation of aircraft during **instrument flight rules (IFR)** operations.

A: 19

… from the **surface to 2,500 feet** above the airport elevation (charted in MSL) surrounding those airports that have an operational **control tower.**

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

Arrival extensions for **instrument approach procedures (IAPs)** may be Class **D** or Class **E** airspace

Q: 21 **Low Altitude Authorization and Notification Capability (LAANC)**	Q: 22 **FAA Info Page on LAANC**
Q: 23 What is **Aeronautical Information Manual (AIM)**?	Q: 24 **Note on Chapter 3 of AIM** (includes):

A: 22

Access the FAA info page at:

https://www.faa.gov/uas/getting_started/laanc

LAANC automates the application and approval process for airspace authorizations. Through automated applications developed by an FAA Approved UAS Service Suppliers (USS) pilots apply for an airspace authorization.

A: 21

LAANC is the **Low Altitude Authorization and Notification Capability**, a collaboration between FAA and Industry. It directly supports UAS integration into the airspace. LAANC provides: Drone pilots with access to controlled airspace at or below 400 feet.

Flight APPs and online access will help with this ...

While LAANC is not cited in 14 CFR Part 107, or found in the 2016 version of the Study Guide ...

… the September 13, 2022 edition of the FAA Authorization publication states:

"Hold a valid airspace authorization for operations in controlled airspace under 400 feet issued through the FAA Drone Zone or the Low Altitude Authorization and Notification Capability (**LAANC**)."

A: 24

AIM Chapter 3. Airspace

Section 1. General

Section 2. Controlled Airspace

Section 3. Class G Airspace

Section 4. Special Use Airspace

Section 5. Other Airspace Areas

Chapter 3 of the **Aeronautical Information Manual (AIM)** explains the various types of Class E airspace

A: 23

The **AIM** manual is designed to provide the aviation community with basic flight information and air traffic control (**ATC**) procedures for use in the National Airspace System (**NAS**) of the United States.

Obtain a copy at:

https://www.faa.gov/air_traffic/publications/media/aim.pdf

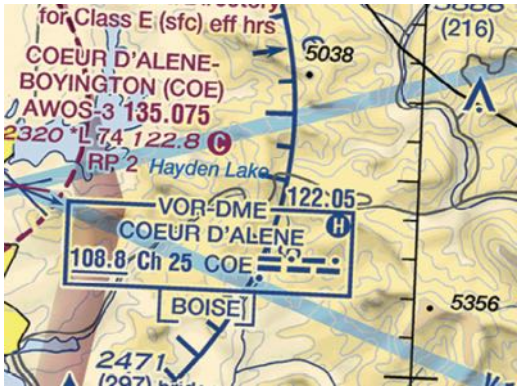
Q: 25 Sectional and other charts depict all locations of **Class E** airspace as ...	Q: 26 **Federal Airways** ...
Q: 27 **Uncontrolled airspace** is class __ ?	Q: 28 **Special use airspace** or **Special Area of Operation (SAO)**

A: 26

… are shown as **blue lines** on a sectional chart

are usually found **within Class E** airspace.

Federal Airways start at **1,200' AGL** and go up to, but, not including 18,000' MSL



A: 25

… with bases below 14,500 feet MSL.

In areas where charts do not depict a **class E base**, class E **begins at 14,500 feet MSL**.

***In most areas**, the Class E airspace base is* **1,200 feet above ground level (AGL)**.

In many other areas, the Class E airspace base is either the **surface** or **700** feet AGL.

Some Class E airspace begins at an MSL altitude depicted on the charts, instead of an AGL altitude.

Class E airspace typically extends up to, but not including, **18,000** feet MSL (the lower limit of Class A airspace). All airspace up to **flight level** (**FL**) **600** (60,000 feet) is Class A airspace.

A: 28

... is the designation for airspace in which certain activities must be confined, or

… where limitations may be imposed on aircraft operations that are not part of those activities.

Certain **special use airspace** areas can create limitations on the mixed use of airspace. The special use airspace depicted on instrument charts includes the area name or number, effective altitude, time and weather conditions of operation, the controlling agency, and the chart panel location.

A: 27

Class G airspace

… is the portion of the airspace that has not been designated as Class A, B, C, D, or E.

It is therefore designated **uncontrolled** airspace.

Class G airspace extends from the **surface to the base of the overlying Class E** airspace. A remote pilot will **not** need ATC authorization to operate in Class G airspace.

Q: 29 **Special use airspace** usually consists of:	Q: 30 **Prohibited areas** are ...
Q: 31 **Prohibited areas on a sectional chart look like:**	Q: 32 **Restricted areas** are areas where …

A: 30

… airspace of defined dimensions within which the flight of aircraft is **prohibited**.

Such areas are established for **security** or other reasons associated with the national welfare.

for example:

Camp David

National Mall in Washington, D.C.,

White House

Congressional buildings

A: 29

• Prohibited areas

• Restricted areas

• Warning areas

• Military operation areas (MOAs)

• Alert areas

• Controlled firing areas (CFAs)

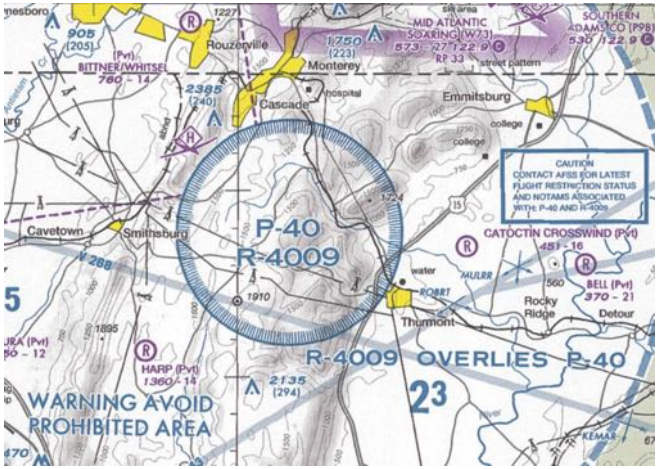
A: 32

… operations are **hazardous** to nonparticipating aircraft and contain airspace within which the flight of aircraft,

while not wholly prohibited, is **subject to restrictions**.

Activities within these areas must be confined because of their nature, or limitations may be imposed upon aircraft operations that are not a part of those activities, or both.

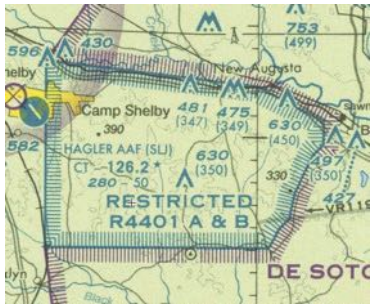
A: 31



Notice the "**P-40**" designation.

Q: 33 **Examples** of what occurs in **Restricted Areas**:	Q: 34 Sectional chart of **Resticted Area** looks like:
Q: 35 What if the restricted area is **not active** and has been released to the FAA?	Q: 36 **Warning areas** are similar in nature to restricted areas; however ...

A: 34



Note the **R** plus number designation ID for the area.

A: 33

unusual, often invisible, hazards to aircraft

(e.g., artillery firing, aerial gunnery, or guided missiles).

Penetration of restricted areas without **authorization** from the **using or controlling agency** may be extremely hazardous to the aircraft.

A: 36

... the United States government does not have sole jurisdiction over the airspace.

A **warning area** is airspace of defined dimensions, extending from **3 NM outward from the coast of the United States**, containing activity that may be hazardous to nonparticipating aircraft.

The purpose of such areas is to warn nonparticipating pilots of the potential danger.

Nautical mile (NM) = 1.1508 mile

A: 35

… the **ATC** facility allows the aircraft to operate in the restricted airspace without issuing specific clearance for it to do so.

How would (you or) a pilot know … by **contacting ATC for clearance!**

If the restricted area is **active** and has **not been released** to the FAA, the ATC facility issues a clearance that ensures the aircraft **avoids** the restricted airspace.

Q: 37 What does a **Warning** look like on a sectional chart?	Q: 38 **Military Operation Areas (MOAs)** are ...
Q: 39 What does an **MOA** look like on a sectional chart?	Q: 40 **How would you know** it's ok to fly in an MOA area?

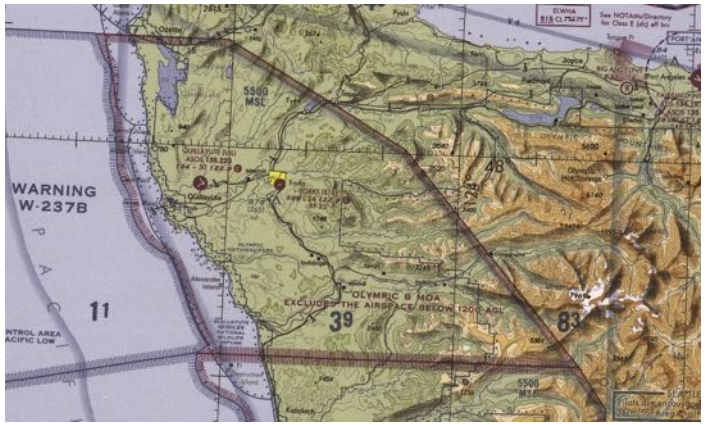
A: 38

… airspace with defined vertical and lateral limits established for the purpose of separating certain military training activities from IFR traffic.

Whenever an **MOA** is being used, nonparticipating instrument flight rules (IFR) traffic may be cleared through an MOA if IFR separation can be provided by ATC.

Otherwise, ATC reroutes or restricts nonparticipating IFR traffic.

A: 37



The airspace is designated with a "**W**" followed by a number (e.g., **W-237B**).

A: 40

The MOA is also further defined **on the back of the sectional charts** with **times of operation, altitudes affected, and the controlling agency**.

NOTE: Advice from the Web: The best way to figure out if a MOA is active is to **call Flight Service Station (FSS) or Flight Information Center (FIC)**

The FAA has established a universal toll-free telephone number for **FSS**s: **1–800–WX–BRIEF (1–800–992–7433)**

A: 39

MOAs are depicted on sectional, **Visual Flight Rules** (**VFR**) terminal area, and *en route* low altitude charts and are not numbered.

Q: 41 **Alert areas** are depicted on aeronautical charts as ...	Q: 42 **Alert Areas** are depicted on sectional charts as ...
Q: 43 **Controlled Firing Areas (CFAs)**	Q: 44 “**Other airspace areas**” is a general term refers to ...

A: 42

See the "**A**" … All activity … in accordance with regulations, **without waiver**, and pilots …shall be equally responsible for **collision avoidance** (e.g., **A-211**)

A: 41

... with an "**A**" followed by a number (e.g., **A-211**) to inform nonparticipating pilots of areas that may contain a ***high volume of pilot training or an unusual type of aerial activity***.

… exercise caution in **alert areas**.

All activity within an alert area shall be conducted in accordance with regulations, without waiver, and pilots of participating aircraft, as well as pilots transiting the area, shall be equally responsible for collision avoidance

A: 44

For Example:

- Local Airport Advisory (LAA)
- **Military training route (MTR)**
- **Temporary flight restriction (TFR)**
- Parachute jump aircraft operations
- Published VFR routes
- **Terminal radar service area (TRSA)**
- **National security area (NSA)**
- Air Defense Identification Zones (**ADIZ**) land and water based and

need for Defense VFR (**DVFR**) flight plan

A: 43

For Your Information …

CFAs contain activities that, if <u>not</u> conducted in a controlled environment, could be hazardous to nonparticipating aircraft.

The difference between CFAs and other special use airspace is that **activities must be suspended** when a **spotter aircraft, radar, or ground lookout position** indicates an aircraft might be approaching the area. There is **<u>no</u> need to chart CFAs** since they do not cause a nonparticipating aircraft to change its flight path.

Q: 45 “**Other airspace areas**” (listing continued)	Q: 46 A **Local Airport Advisory (LAA)** is ...
Q: 47 **Military Training Routes (MTRs)** are ...	Q: 48 **MTR flight levels are identified as ...**

A: 46

An advisory service provided by **Flight Service (FS)** facilities, which are located on the landing airport, using a discrete ground-to-air frequency or the tower frequency when the tower is closed.

This information includes:

Automated Surface Observing System (ASOS)

Automated Weather Observing Station (AWOS)

A: 45

• **Flight Restricted Zones (FRZ)** in vicinity of Capitol and White House

• Wildlife Areas/Wilderness Areas/National Parks and request to operate above 2,000 AGL

• National Oceanic and Atmospheric Administration (NOAA) Marine Areas off the coast with requirement to operate above 2,000 AGL

• Tethered Balloons for observation and weather recordings that extend on cables up to 60,000 (< this height is cited on Study Guide page 10, this seems like typo?)

A: 48

MTRs with **no** segment above 1,500 feet AGL are identified by **four number** characters (e.g., IR1206, VR1207).

MTRs that include one or more segments **above** 1,500 feet AGL are identified by **three number** characters (e.g., IR206, VR207).

IFR low altitude *en route* charts depict all IR routes and all VR routes that accommodate operations above 1,500 feet AGL.

A: 47

MTRs ... routes used by military aircraft to maintain proficiency in tactical flying.

These routes are usually established **below 10,000 feet** MSL for operations at speeds **in excess of 250 knots**.

Some route segments may be defined at higher altitudes for purposes of route continuity.

Routes are identified as **IFR (IR), and VFR (VR)**, followed by a number.

Q: 49 What does a sectional chart with **MTR** look like?	Q: 50 **Temporary Flight Restrictions (TFR)** are ...
Q: 51 **FYI**: What is one initial way to find out if a **NOTAM** might apply to where you want to fly your drone?	Q: 52 Some of the purposes for establishing a **TFR** are:

A: 50

A **flight data center (FDC) Notice to Airmen (NOTAM)** is issued to designate a TFR.

The **NOTAM** begins with the phrase “FLIGHT RESTRICTIONS” followed by the **location** of the temporary restriction,

effective **time period**,

area defined in statute miles, and

altitudes affected.

The NOTAM also contains the FAA coordination facility and telephone number, the reason for the restriction, and any other information deemed appropriate. The pilot should check the NOTAMs as part of flight planning.

A: 49

Gray line is flight path

A: 52

- Protect persons and property in the air or on the surface from an existing or imminent hazard.
- Provide a safe environment for the operation of disaster relief aircraft.
- Prevent an unsafe congestion of sightseeing aircraft above an incident or event, that may generate a high degree of public interest.
- Protect declared national disasters for humanitarian reasons in the State of Hawaii.
- Protect the President, Vice President, or other public figures.
- Provide a safe environment for space agency operations.

A: 51

ADDED NOTE: Download the **B4UFLY** app to your smartphone or smart tablet or access by computer at: https://b4ufly.aloft.ai/

When in effect a NOTAM will be identified as applicable for an area where you are thinking of flying your drone. B4UFLY will identify restricted no fly areas you need to be aware exist and avoid flight.

B4UFLY is a free app available for iOS, Android, and on the *web* that provides a simple and easy way for U.S. UA and drone operators to see flight status of an area and any applicable notifications.

https://www.aloft.ai/b4ufly/

IMPORTANT NOTICE: Visit the website to learn all the details on what you need to know in addition to having the APP on your smartphone. Some locations have additional restrictions or requirements!

Q: 53 **Check FAA directly for TFR by:**	Q: 54 ***Parachute Jump Aircraft Operations***
Q: 55 Published **VFR Routes** are ...	Q: 56 **TRSAs** is abbreviation for ...

A: 54

Parachute jump aircraft operations are published in the **Chart Supplement U.S.** (formerly Airport/Facility Directory). Sites that are used frequently are depicted on sectional charts.

Parachute Jumping Area
(See Chart Supplement.)

A: 53

Temporary Flight Restrictions (TFR)

One way to check is to visit the FAA website

https://tfr.faa.gov/

https://tfr.faa.gov/tfr2/list.html

and verify that there is not a TFR in the area.
(This web address is updated in 2023 from listing in the August 2016 study guide)

It is a pilot's responsibility to be aware of TFRs in their proposed area of flight.

A: 56

Terminal Radar Service Areas (TRSAs)

TRSAs are areas where participating pilots can receive additional radar services. The purpose of the service is to provide separation between all IFR operations and participating VFR aircraft.

The primary airport(s) within the TRSA become(s) **Class D** airspace. The remaining portion of the TRSA overlies other controlled airspace, which is normally Class E airspace beginning at 700 or 1,200 feet … etc see FAA Study Guide page 11 for more detail.

A: 55

… for transitioning around, under, or through some complex airspace. Terms such as

- VFR flyway,
- VFR corridor,
- Class B airspace VFR transition route, and
- terminal area VFR route

have been applied to such routes.

These routes are generally found on VFR terminal area planning charts.

Visual Flight Rules (VFR)

Q: 57 What is **NSA**?	Q: 58 What is **ATC**?
Q: 59 ***Operating Rules and*** ***Pilot / Equipment Requirements***	Q: 60 FAA's "**see and avoid**" mandate ...

A: 58

Air Traffic Control (ATC) system is to prevent a collision between aircraft operating in the system and to organize and expedite the flow of traffic.

In addition to its primary function, the ATC system has the capability to provide (with certain limitations) additional services ...

Air Traffic Control and the National Airspace System are described further on page 12 of study guide.

A: 57

National Security Areas (NSAs)

NSAs consist of airspace of defined vertical and lateral dimensions established at locations where there is a requirement for increased security and safety of ground facilities.

Flight in NSAs may be temporarily prohibited by regulation under the provisions of Title 14 of the Code of Federal Regulations **(14 CFR) part 99** and **prohibitions are disseminated via NOTAM.** Pilots are requested to voluntarily avoid flying through these depicted areas.

A: 60

… comes with FAA regulations that provide the historical foundation of the FAA regulations governing the aviation system and the individual classes of airspace.

More detailed information regarding ADM and risk mitigation can be found in Chapter 10, “Aeronautical Decision - Making and Judgment,” of the study guide (starting on page 51).

This topic is also covered later in this series of flashcards!

A: 59

All aircraft operating in today’s **National Airspace System (NAS)** has complied with the code of federal regulations (CFR) governing its certification and maintenance;

all pilots operating today have completed rigorous pilot certification training and testing.

— proper execution of preflight planning, **aeronautical decision-making (ADM)** and **risk management**.

— ADM involves a systematic approach to **risk assessment** and stress management in aviation, illustrates how **personal attitudes** can influence decision-making, and how those attitudes can be modified to enhance safety.

Q: 61 **Visual Flight Rules (VFR) Terms & Symbols**	Q: 62 **FAA Aeronautical Chart User's Guide Information**
Q: 63 What are **Notices to Airmen**?	Q: 64 **How to search for local NOTAMs**

A: 62

If you download this guide you will see much more detail as to what is in Sectional Charts.

The supplement document that you will be provided during the certification test has a **LEGEND** and other informational pages that covers basic information—the Chart User's Guide is more extensive.

Recommendation: download and do a simple review of the FAA Aeronautical Chart User's Guide, but also use the FlashCards file "Part 107 Section Chart Legend" for simple review of legend items common to most test questions.

A: 61

Remote pilots need to be familiar with the following information from the **FAA Aeronautical Chart User's Guide** website at:
https://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/aero_guide/

• All information on the *VFR Terms* tab

• The following sections under "VFR Aeronautical Chart Symbols" on the *VFR Symbols* tab:

o Airports

o Airspace Information

o Navigational and Procedural Information

o Chart Limits

o Culture

o Hydrography

o Relief

A: 64

On the web:

https://tfr.faa.gov/

Or airport related:

https://notams.aim.faa.gov/notamSearch/

you can use a local airport designation then after search use the listing feature to find the NOTAM

FYI: If you see a NOTAM referenced in the **B4UFLY** app … **use web search** (e.g. Google, Bing, DuckDuckGo, etc) to find the NOTAM by number and then the FAA NOTAM page will come up.

Recommendation: These are often not easy to read … so printing or make a PDF to yellow highlight key phases or requirements helps provide clarity!

A: 63

Notices to Airmen (NOTAMs) are time-critical aeronautical information either temporary in nature or not sufficiently known in advance to permit publication on aeronautical charts or in other operational publications.

… are considered essential to the safety of flight, for some of the following reasons:

• Hazards, such as air shows, parachute jumps, kite flying, and rocket launches

• Flights by important people such as heads of state

• Inoperable lights on tall obstructions

• Temporary erection of obstacles near airfields

• Passage of flocks of birds through airspace (a NOTAM in this category is known as a **BIRDTAM**)

Q: 65 **Chapter 3a: Aviation Weather Sources**	Q: 66 **Surface aviation weather observations ...**
Q: 67 **local weather conditions** include ...	Q: 68 **Aviation weather reports ...**

A: 66

… are a compilation of elements ... at individual ground stations across the United States.

The network is made up of government and privately contracted facilities that provide continuous up-to-date weather information.

Automated weather sources, such as the

Automated Weather Observing Systems (AWOS),

Automated Surface Observing Systems (ASOS),

as well as other automated facilities, also play a major role in the gathering of surface observations.

A: 65

- **Introduction**
- **Surface Aviation Weather Observations**
- **Aviation Weather Reports**
- **Aviation Forecasts Convective Significant Meteorological Information (WST)**

A: 68

... are designed to give accurate depictions of current weather conditions. Each report provides current information that is updated at different times. Some typical reports are **METARs** and **PIREPs**.

To view a weather report, go to:

http://www.aviationweather.gov/

… bring up the map … click on a dot near you and look at the popup box info …

this will tell you ceiling height for clouds …

and that is important information for a part 107 sUAS pilot!

(A **Pilot Report** or **PIREP** is a report of the actual weather conditions as encountered by an aircraft in flight**)**

A: 67

- station identifier,
- date and time,
- modifier (as required),
- wind,
- visibility,
- runway visual range **(RVR**),
- weather phenomena,
- sky condition,
- temperature / dew point,
- altimeter reading, and applicable remarks

Q: 69 ***Aviation Routine Weather Report (METAR)***	Q: 70 **METAR Example**
Q: 71 **Types of METAR report:**	Q: 72 **Station identifier (Airport)**

A: 70

METAR KGGG 161753Z AUTO 14021G26KT 3/4SM +TSRA BR BKN008 OVC012CB 18/17 A2970 RMK PRESFR

Take time to study what the above abbreviations mean!

One smartphone app that lists METAR information, is entitled: "**METAR**"

For example: Open the app, click on an airport listed there and you will see the METAR information plus simple display of same weather info! And there may be other apps that do the same—might be worth trying to practice deciphering weather reports.

A: 69

A METAR is an observation of current surface weather reported in a standard international format.

METARs are issued on a regularly scheduled basis unless significant weather changes have occurred.

A: 72

KGGG (see the previous flashcard with METAR example)

a four-letter code as established by the **International Civil Aviation Organization (ICAO)**.

In the 48 contiguous states, a unique three-letter identifier is preceded by the letter "**K**."

[or **PA** for Alaska; **PH** for Hawaii]

The example above is for the airport at Gregg County Airport in Longview, Texas (GGG is the letter identifier for the airport)

KGGG 161753Z AUTO 14021G26KT 3/4SM +TSRA BR BKN008 OVC012CB 18/17 A2970 RMK PRESFR

A: 71

The first is the **routine METAR** report that is transmitted on a **regular time interval**.

The second is the aviation selected **SPECI**.

This is a **special report** that can be **given at any time** to update the METAR for rapidly changing weather conditions, aircraft mishaps, or other critical information

Q: 73 **Date and time of METAR report**	Q: 74 **METAR Modifiers:**
Q: 75 **METAR Wind**	Q: 76 Additional **Wind Condition Identifiers**

A: 74

If the notation “**AUTO**” is listed in the METAR/SPECI, the report came from an automated source.

It also lists “**AO1**” (for no precipitation discriminator)

or “**AO2**” (with precipitation discriminator) in the “Remarks” section (RMK) to indicate the type of precipitation sensors employed at the automated station.

When the modifier “**COR**” is used, it identifies a **corrected** report sent out to replace an earlier report that contained an error (for example: METAR KGGG 161753Z COR).

KGGG 161753Z **AUTO** 14021G26KT 3/4SM +TSRA BR BKN008 OVC012CB 18/17 A2970 RMK PRESFR

A: 73

… depicted in a six-digit group (161753Z)

The first two digits are the **date**.

The last four digits are the **time** of the METAR/SPECI

which is always given in **coordinated universal time (UTC)**.

A “**Z**” is appended to the end of the time to denote the time is given in **Zulu time** (UTC) as opposed to local time

[NOTE: more info later on how to adjust Zulu to local time]

KGGG **161753Z** AUTO 14021G26KT 3/4SM +TSRA BR BKN008 OVC012CB 18/17 A2970 RMK PRESFR

A: 76

If the winds are **gusting**, the letter “**G**” follows the wind speed (**G26KT**).

After the letter “**G**,” the peak gust recorded is provided.

If the **wind direction varies** more than 60° and the wind speed is greater than six knots, a separate group of numbers, separated by a “**V**,” will indicate the extremes of the wind directions.

KGGG 161753Z AUTO 14021**G26KT** 3/4SM +TSRA BR BKN008 OVC012CB 18/17 A2970 RMK PRESFR

A: 75

… reported with five digits (**14021KT**)

first 3 digits indicate the direction the true wind is blowing from in tens of degrees. If the wind is **variable**, it is reported as “**VRB**.”

The **last 2 digits** indicate the **speed** of the wind in **knots** unless the wind is greater than 99 knots, in which case it is indicated by **three** digits

1 kt = 1.15 mph

Q: 77 **METAR Visibility**	Q: 78 **Weather**
Q: 79 **Weather Qualifiers** include:	Q: 80 **Weather Phenomena — Precipitation**

A: 78

— two different categories:

qualifiers and **weather phenomenon** (+TSRA BR).

First, the qualifiers of intensity, proximity, and the descriptor of the weather are given.

The **intensity** may be **light (–)**, **moderate ( )**, or **heavy (+)**.

Proximity only depicts weather phenomena that are in the airport vicinity.

The notation "**VC**" indicates a specific weather phenomenon is in the **vicinity** of five to ten miles from the airport.

KGGG 161753Z AUTO 14021G26KT 3/4SM **+TSRA BR** BKN008 OVC012CB 18/17 A2970 RMK PRESFR

A: 77

the prevailing visibility (¾ **SM**) is reported in **statute miles** as denoted by the letters "**SM**." It is reported in both miles and fractions of miles.

KGGG 161753Z AUTO 14021G26KT **3/4SM** +TSRA BR BKN008 OVC012CB 18/17 A2970 RMK PRESFR

OPTIONAL listing: **runway visual range (RVR)**

the distance a pilot can see down the runway in a moving aircraft … **R**, then the **runway number** followed by a slant, then the visual range in feet. For example, when the RVR is reported as **R17L/1400FT**

A: 80

DZ Drizzle
RA Rain
SN Snow
SG Snow Grains
IC Ice crystals (Diamond dust)
PL Ice pellets
GR Hail
GS Small hail or snow pellets
UP Unknown precipitation

A: 79

Intentity or Proximity: **-** Light. [blank] Moderate. **+** Heavy

Descriptor:

VC in the vicinity
MI Shallow
BC Patches
DR Low drifting
BL Blowing
SH Showers
TS Thunderstorms
FZ Freezing
PR Partial

Q: 81 **Weather Phenomena — Obscuration**	Q: 82 **Weather Phenomena — Other**
Q: 83 **Sky Condition**	Q: 84 **Weather**: Qualifier, Precipitation, Obstruction

A: 82

PO Dust / sand whirls
SQ Squalls
FC Funnel cloud
+FC Tornado or waterspout
SS Sandstorm
DS Dust Storm

A: 81

BR Mist
FG Fog
FU Smoke (think like this is 'fumes')
DU Dust
SA Sand
HZ Haze
PY Spray (Spray)
VA Volcanic Ash

KGGG 161753Z AUTO 14021G26KT 3/4SM +TSRA **BR** BKN008 OVC012CB 18/17 A2970 RMK PRESFR

A: 84

For this example there is:
+ (heavy)
TS (thunderstorm)
RA (rain)
BR (mist)

KGGG 161753Z AUTO 14021G26KT 3/4SM **+TSRA BR** BKN008 OVC012CB 18/17 A2970 RMK PRESFR

A: 83

… always reported in the sequence of amount, height, and type or indefinite ceiling/height (vertical visibility) (BKN008 OVC012CB, VV003).

Sky Cover	Contraction
Less than ⅛ (Clear)	SKC, CLR, FEW
⅛–⅔ (Few)	FEW
⅜–⅝ (Scattered)	SCT
⅝–⅞ (Broken)	BKN
⅞ or (Overcast)	OVC

The amount of sky coverage is reported in eighths of the sky from horizon to horizon.

Q: 85 **Cloud Cover**	Q: 86 **Temperature and dew point**
Q: 87 **Altimeter** setting	Q: 88 **Zulu time conversion**

A: 86

… the air **temperature** and **dew point** are always given in degrees Celsius (C) or (18/17).

Temperatures below 0 °C are preceded by the letter "**M**" to indicate **minus**.

KGGG 161753Z AUTO 14021G26KT 3/4SM +TSRA BR BKN008 OVC012CB **18/17** A2970 RMK PRESFR

A: 85

The heights of the **cloud bases** are reported with a three-digit number in hundreds of feet **AGL**.

Clouds above 12,000 feet are not detected or reported by an automated station.

The types of clouds, specifically **towering cumulus (TCU)** or **cumulonimbus (CB)** clouds, are reported with their height.

[for example: 008 = 800 ft; 012 = 1,200 ft]

KGGG 161753Z AUTO 14021G26KT 3/4SM +TSRA BR **BKN**008 **OVC**012**CB** 18/17 A2970 RMK PRESFR

A: 88

… a term used in aviation for UTC, which places the entire world on one time standard.

To convert from	To coordinated universal time
Eastern standard time	add 5 hours
Eastern daylight time	add 4 hours
Central standard time	add 6 hours
Central daylight time	add 5 hours
Mountain standard time	add 7 hours
Mountain daylight time	add 6 hours
Pacific standard time	add 8 hours
Pacific daylight time	add 7 hours

Hint: Supplement Charts U.S. at the top of the report for an airport help indicate how to adjust time, for example (in Idaho):

UTC-8 (-7 DT) (see Figure 31 in test supplement document)

Notice how the table above indicates the number of hours added to a time zone to provide the UTC and how the Supplement Chart reveals how to subtract that value from the Zulu time to correspond with local time.

A: 87

… reported as **inches of mercury ("Hg)** in a four-digit number group (A2970).

It is always preceded by the letter "**A**."

Rising or **falling** pressure may also be denoted in the "**Remarks**" sections as "PRES**R**R" or "PRES**F**R," respectively

KGGG 161753Z AUTO 14021G26KT 3/4SM +TSRA BR BKN008 OVC012CB 18/17 **A2970 RMK PRESFR**

Q: 89 **METAR Remarks**	Q: 90 **METAR Example** explained ...
Q: 91 ***Terminal Aerodrome Forecasts (TAF) Example 1***	Q: 92 **TAF Example 1** (continued)

A: 90

METAR KGGG 161753Z AUTO 14021G26KT 3/4SM +TSRA BR BKN008 OVC012CB 18/17 A2970 RMK PRESFR

Explanation:

Routine METAR for Gregg County Airport for the 16th day of the month at 1753Z automated source. Winds are 140 at 21 knots gusting to 26. Visibility is ¾ statute mile. Thunderstorms with heavy rain and mist. Ceiling is broken at 800 feet, overcast at 1,200 feet with cumulonimbus clouds. Temperature 18 °C and dew point 17 °C. Barometric pressure is 29.70 "Hg and falling rapidly.

A: 89

… the remarks section always begins with the letters "**RMK**."

Comments may or may not appear in this section of the METAR.

The information contained in this section may include

- wind data,
- variable visibility,
- beginning and ending times of particular phenomenon,
- pressure information, and
- various other information deemed necessary.

METAR KGGG 161753Z AUTO 14021G26KT 3/4SM +TSRA BR BKN008 OVC012CB 18/17 A2970 **RMK** PRESFR

A: 92

TAF KPIT 091730Z 0918/1024 15005KT 5SM HZ FEW020 WS010/31022KT FM091930 30015G25KT 3SM SHRA ...

- KPIT = Airport - ICAO location indicator
- 091730Z = Issuance time: ALL times in UTC "Z", 2-digit date, 4-digit time
- 0918/1024 = Valid period, either 24 hours or 30 hours
- 15005KT = Wind: 3 digit true-north direction , nearest 10 degrees (or VaRiaBle); next 2-3 digits for speed and unit, **KT** (KMH or MPS); as needed, **G**ust
- 5SM = Prevailing visibility; in U.S., Statute Miles & fractions
- HZ = Haze
- FEW020 = Cloud amount, height (in hundreds ft)

A: 91

A **Terminal Aerodrome Forecast (TAF)** is a report established for the **five** statute mile (SM) radius around an airport (This example is from: https://www.weather.gov/media/okx/Aviation/TAF_Card.p seems clearer than the example in the FAA Study Guide!)

TAF KPIT 091730Z 0918/1024 15005KT 5SM HZ FEW020 WS010/31022KT FM091930 30015G25KT 3SM SHRA OVC015 TEMPO 0920/0922 1/2SM +TSRA OVC008CB FM100100 27008KT 5SM SHRA BKN020 OVC040 PROB30 1004/1007 1SM -RA BR FM101015 18005KT 6SM -SHRA OVC020 BECMG 1013/1015 P6SM NSW SKC

Q: 93 **TAF Example 1** (continued)	Q: 94 **TAF Example 1** (continued)
Q: 95 **TAF Example 1** (continued)	Q: 96 **TAF Example 1** (continued)

A: 94

OVC015 TEMPO 0920/0922 1/2SM +TSRA OVC008CB FM100100 27008KT 5SM SHRA BKN020 OVC040 …

- OVC015 = Overcast 1500 feet
- TEMPO 0920/0922 = TEMPOrary: changes expected for <1 hour and in total, < half of the period between the 2-digit date and 2-digit hour beginning, and 2-digit date and 2-digit hour ending time
- 1/2SM = Visibility 1/2 statue mile
- +TSRA = Heavy Thunderstorm Rain
- OVC008CB = Overcast 800 cumulonimbus clouds

A: 93

WS010/31022KT FM091930 30015G25KT 3SM SHRA OVC015 TEMPO 0920/0922 1/2SM +TSRA OVC008CB …

- WS010/31022KT = non-convective low-level (≤ 2,000 ft) Wind Shear; 3-digit height (hundreds of ft); "/"; 3-digit wind direction and 2-3 digit wind speed above the indicated height, and unit, KT
- FM091930 = FroM: changes are expected at: 2-digit date, 2-digit hour, and 2-digit minute beginning time: indicates significant change. **Each FM starts on a new line**, indented 5 spaces
- 30015G25KT = Direction, Speed, Gusts, knots **KT**
- 3SM SHRA = Visibility, Showers, Rain

A: 96

PROB30 1004/1007 1SM -RA BR FM101015 18005KT 6SM -SHRA OVC020 BECMG 1013/1015 P6SM NSW SKC

… just a few more descriptions ...

PROB30 1004/1007 = PROBability and 2-digit percent (30 or 40): probable condition in the period between the 2-digit date & 2-digit hour beginning time, and the 2-digit date and 2-digit hour ending time

BECMG 1013/1015 = BECoMinG: change expected in the period between the 2-digit date and 2-digit hour beginning time, and the 2-digit date and 2-digit hour ending time

P6SM = above 6 miles in TAF **P**lus6SM

NSW SKC = No Significant Weather, Sky clear

A: 95

FM100100 27008KT 5SM SHRA BKN020 OVC040 PROB30 1004/1007 1SM -RA BR FM101015 18005KT ...

FM100100 = this is the next 'FroM:' changes are expected at: 2-digit date, 2-digit hour, and 2-digit minute beginning time: indicates significant change

27008KT = 270 degres direction; 8 knots

5SM = five SM visibility

SHRA = Showers, Rain

BKN020 = Broken clouds, 2000 feet

OVC040 = Overcast 4000 feet

Q: 97 **Other helpful sources to learn and interpret TAFs**	Q: 98 ***Terminal Aerodrome Forecasts (TAF) Example 2***
Q: 99 **TAF description (From Study Guide)** ***TAF Example 2* Part 1**	Q: 100 **TAF description** (From Study Guide) ***TAF Example 2* Part 2**

A: 98

A **Terminal Aerodrome Forecast** ***(TAF)*** is a report established for the five statute mile (SM) radius around an airport

NOTE: This example is from the Study Guide and does not seem to initially correspond with the designation provided here, take a look and interpret what you do see, the rest seems ok:

Example:

TAF KPIR 111130Z 1112/1212 TEMPO 1112/1114 5SM BR FM1500 16015G25KT P6SM SCT040 BKN250 FM120000 14012KT P6SM BKN080 OVC150 PROB30 1200/1204 3SM TSRA BKN030CB FM120400 1408KT P6SM SCT040 OVC080 TEMPO 1204/1208 3SM TSRA OVC030CB

A: 97

Example 1 is from:

TAF Card (FAA & NOAA):

https://www.weather.gov/media/okx/Aviation/TAF_Card.pdf

Two other (optional) sources:

Think Aviation web site:

https://www.thinkaviation.net/how-to-decode-tafs/

Wikipedia

https://en.wikipedia.org/wiki/Terminal_aerodrome_forecast

You can also search the web for other web pages!

A: 100

TAF KPIR 111130Z 1112/1212 TEMPO 1112/1114 5SM BR FM1500 16015G25KT P6SM **SCT040 BKN250 FM120000 14012KT P6SM BKN080 OVC150 PROB30 1200/1204 3SM TSRA BKN030CB FM120400** 1408KT P6SM SCT040 OVC080 TEMPO 1204/1208 3SM TSRA OVC030CB

clouds scattered at 4,000 feet and broken at 25,000 feet… from 0000Z wind from 140° at 12 knots…visibility greater than 6 SM…clouds broken at 8,000 feet, overcast at 15,000 feet…between 0000Z and 0400Z, there is 30 percent probability of visibility 3 SM…thunderstorm with moderate rain showers…clouds broken at 3,000 feet with cumulonimbus clouds…from 0400Z…

A: 99

TAF KPIR 111130Z 1112/1212 TEMPO 1112/1114 5SM BR FM1500 16015G25KT P6SM SCT040 BKN250 FM120000 14012KT P6SM BKN080 OVC150 PROB30 1200/1204 3SM TSRA BKN030CB FM120400 1408KT P6SM SCT040 OVC080 TEMPO 1204/1208 3SM TSRA OVC030CB

Routine TAF for Pierre, South Dakota…on the 11th day of the month, at 1130Z…valid for 24 hours from 1200Z on the 11th to 1200Z on the 12th…wind from 150° (?) at 12 knots… visibility greater than 6 SM…broken clouds at 9,000 feet… temporarily, between 1200Z and 1400Z, visibility 5 SM in mist…from 1500Z winds from 160° at 15 knots, gusting to 25 knots visibility greater than 6 SM

Q: 101 TAF description (From Study Guide) ***TAF Example 2* Part 3**	Q: 102 **Convective Significant Meteorological Information (WST)**
Q: 103 **Chapter 3b: Effects of Weather on Small Unmanned Aircraft Performance**	Q: 104 **Pressure and Temperature**

A: 102

Convective **SIGMETs** are issued for severe thunderstorms with surface winds greater than 50 knots, hail at the surface greater than or equal to ¾ inch in diameter, or tornadoes.

Significant Meteorological Information (SIGMET)

They are also issued to advise pilots of embedded thunderstorms, lines of thunderstorms, or thunderstorms with heavy or greater precipitation that affect 40 percent or more of a 3,000 square mile or greater region.

A remote pilot will find these weather alerts helpful for flight planning.

A: 101

TAF KPIR 111130Z 1112/1212 TEMPO 1112/1114 5SM BR FM1500 16015G25KT P6SM SCT040 BKN250 FM120000 14012KT P6SM BKN080 OVC150 PROB30 1200/1204 3SM TSRA BKN030CB FM120400 **1408KT P6SM SCT040 OVC080 TEMPO 1204/1208 3SM TSRA OVC030CB**

winds from 140° at 8 knots…visibility greater than 6 miles…clouds at 4,000 scattered and overcast at 8,000…temporarily between 0400Z and 0800Z…visibility 3 miles…thunderstorms with moderate rain showers…clouds overcast at 3,000 feet with cumulonimbus clouds…end of report (=).

A: 104

Starting on page 21 this chapter (3b) discusses the factors that affect aircraft performance, which include:

- the aircraft weight,
- atmospheric conditions,
- runway environment, and
- the fundamental physical laws governing the forces acting on an aircraft.

Since the characteristics of the atmosphere have a major effect on performance, it is necessary to review two dominant factors—**pressure** and **temperature**.

A: 103

- **Introduction …**
- **Density Altitude …**
- **Performance …**
- **Measurement of Atmosphere Pressure …**
- **Effect of Obstructions on Wind …**
- **Low-Level Wind Shear**
- **Atmospheric Stability**
- **Temperature/Dew Point Relationship**
- **Clouds**
- **Fronts**
- **Mountain Flying**
- **Structural Icing**
- **Thunderstorm Life Cycle**
- **Ceiling**
- **Visibility**

Q: 105 **Density altitude**	Q: 106 **Factors affecting air density**
Q: 107 ***Effects of Pressure on Density***	Q: 108 ***Effects of Temperature on Density***

A: 106

Air density is affected by changes in **altitude**, **temperature**, and **humidity**

high density altitude are **high elevations**, low atmospheric pressures, high temperatures, high humidity, or some combination of these factors

Lower elevations, high atmospheric pressure, low temperatures, and low humidity are more indicative of low density altitude

A: 105

… the altitude in the standard atmosphere corresponding to a particular value of air density.

Think at Lower Altitudes: As the density of the air **increases** (**lower density altitude**), aircraft performance increases. Sort of like saying the drone propellers have '**thicker air**' to work with (better for performance).

Think at Higher Altitudes: air density **decreases** (**higher density altitude**), aircraft performance decreases … because it is sort of like saying the drone propellers have '**thinner air**' to work with. (Less for performance)

The word **lower** means lower altitude and **higher** means higher altitude … **not** lower or higher density …

Note: **this wording is a bit tricky!**

A: 108

Increasing the **temperature** of a substance **decreases** its **density**.

Conversely, **decreasing the temperature increases** the **density**. Thus, the density of air varies inversely with temperature.

This statement is true only at a constant pressure.

In the atmosphere, both temperature and pressure decrease with altitude and have conflicting effects upon density … a fairly rapid drop in pressure as altitude is increased usually has the dominant effect. Hence, **pilots can expect the density to decrease with altitude**.

A: 107

Since **air is a gas**, it can be compressed or expanded.

— When air is **compressed**, a greater amount of air can occupy a given volume.

— When **pressure** on a given volume of air is **decreased**, the air expands and occupies a greater space.

That is, the original column of air at a lower pressure contains a smaller mass of air. In other words, the density is decreased.

In fact, **density is directly proportional to pressure.**

Q: 109 ***Effects of Humidity (Moisture) on Density***	Q: 110 **Relative Humidity**
Q: 111 **Performance**	Q: 112 ***Climb Performance Factors***

A: 110

... refers to the amount of water vapor contained in the atmosphere and is expressed as a **percentage of the maximum amount** of water vapor the air can hold.

Perfectly dry air that contains no water vapor has a relative humidity of **zero percent,**

while **saturated air** that cannot hold any more water vapor has a relative humidity of **100 percent.**

A: 109

While temperature and pressure have effects atmospheric air is never completely dry.

Lower Humidity: A small amount of water vapor suspended in the atmosphere may be negligible under certain conditions

However … humidity may become an important factor in the performance of an aircraft.

Higher Humidity: Water vapor is lighter than air; consequently, **moist air** is lighter than dry air. **As the water content of the air increases, the air becomes less dense**, increasing density altitude and decreasing performance. It is lightest or **least dense** when, in a given set of conditions, it contains the **maximum amount of water vapor**.

A: 112

Since weight, altitude, and configuration changes affect excess thrust and power, they also affect climb performance.

Climb performance is **directly dependent** upon the ability to produce either excess **thrust** or excess **power**.

A: 111

Performance is a term used to describe the ability of an **aircraft** to *accomplish certain things that make it useful for certain purposes*.

The **primary factors** most affected by performance are:

— takeoff and landing distance

— rate of climb

— ceiling

— payload

— range

— speed

— maneuverability

— stability

— fuel economy

Q: 113 **Weight**	Q: 114 **Change in flight weight and altitude**
Q: 115 **Measurement of Atmosphere Pressure**	Q: 116 **Weather stations** reporting pressure ...

A: 114

A change in an aircraft's weight produces a **twofold** effect on climb performance

An **increase in altitude** also increases the power required and decreases the power available. Therefore, the climb performance of an aircraft diminishes with altitude.

A: 113

… has a very pronounced effect on aircraft performance.

If weight is **added** to an aircraft, it must fly at a **higher** **angle of attack (AOA)** to maintain a given altitude and speed.

This increases the induced **drag** of the wings, as well as the parasite drag of the aircraft.

Increased drag means that **additional thrust** is needed to overcome it, which in turn means that ***less reserve thrust*** is available for climbing.

This concept may seem more appropriate for winged aircraft, but **drones** are also affected by weight factors.

(Note: ***Parasite drag*** - is when a solid object moves through a fluid medium—in this case the wing moving through atmosphere)

A: 116

Each station converts its barometric pressure by adding approximately **1 "Hg for every 1,000 feet** of elevation.

For example, a station at **5,000 feet above sea level**, with a reading of **24.92 "Hg**, reports a sea level pressure reading of **29.92 "Hg**.

For example, tracking a pattern of **rising** pressure at a single weather station generally indicates the approach of **fair weather**. ['pressure **going up is good**!"]

Conversely, **decreasing** or rapidly falling pressure usually indicates **approaching bad weather** and, possibly, severe storms. ["pressure **going down is bad**"]

A: 115

Common atmospheric pressure reference, the **International Standard Atmosphere (ISA).**

These standard conditions are the basis for most aircraft performance data.

Standard sea level pressure (SLP) is defined as

29.92 "Hg and a standard temperature of 59 °F (**15 °C**).

Atmospheric pressure is also reported in **millibars (mb)**, with **1 "Hg equal to approximately 34 mb**.

Standard sea level pressure is **1,013.2 mb**. Typical mb pressure readings range from 950.0 to 1,040.0 mb. Surface charts, high and low pressure centers, and hurricane data are reported using mb.

Q: 117 **Effect of Obstructions on Wind**	Q: 118 **Mountainous regions**
Q: 119 **Low-Level Wind Shear**	Q: 120 **Are you flying into or against wind?**

A: 118

Change in condition is even more noticeable when flying in mountainous regions. While the wind flows smoothly up the windward side of the mountain and the upward currents help to carry an aircraft over the peak of the mountain, the wind on the leeward side does not act in a similar manner

As the air flows down the **leeward side** of the mountain, the air follows the contour of the terrain and is **increasingly turbulent**. This tends to push an aircraft into the side of a mountain. The stronger the wind, the greater the downward pressure and turbulence become.

A: 117

Obstructions **on the ground** affect the flow of wind and can be an unseen danger.

Ground **topography** and large **buildings** can break up the flow of the wind and create wind gusts that change rapidly in direction and speed.

These obstructions range from man-made structures, like hangars, to **large natural obstructions**, such as mountains, bluffs, or canyons.

A: 120

A **headwind** is wind blowing **directly towards the front of the aircraft**. A headwind increases drag. (You are flying against oncoming wind and to comparatively sustain a constant speed requires more battery power or fuel!)

A **tailwind** is wind blowing directly towards the rear of the aircraft. **A tailwind is a wind that blows in the direction of travel of an object, while a headwind blows against the direction of travel**. [Again, flying into wind needs more power and thrust]

The Study Guide seems confusing becasue it states:

"A tailwind quickly changing to a headwind causes an increase in airspeed and performance. Conversely, a headwind changing to a tailwind causes a decrease in airspeed and performance. In either case, a pilot must be prepared to react immediately to these changes to maintain control of the aircraft." [this seems opposite wording]

A: 119

Wind shear is a sudden, drastic change in wind speed and/or direction over a very small area.

Wind shear can subject an aircraft to violent **updrafts** and **downdrafts**, as well as **abrupt changes** to the horizontal movement of the aircraft.

While wind shear can occur at any altitude, **low-level wind shear is especially hazardous** due to the proximity of an aircraft to the ground.

Low-level wind shear is commonly associated with passing **frontal systems, thunderstorms, temperature inversions, and strong upper level winds** (greater than 25 knots).

Q: 121 A **microburst** is ...	Q: 122 **Drone or UA in microburst**
Q: 123 **Atmospheric Stability**	Q: 124 **What factors determine the atmospheric stability?**

A: 122

During an inadvertent microburst encounter, the small Unmanned Aircraft System (sUAS) may first experience a … increasing headwind, followed by … downdrafts, followed by a rapidly increasing tailwind.

This can result in **terrain impact or flight dangerously close to the ground**.

An encounter during approach involves the same **sequence of wind changes and could force the small UA to the ground short of the intended landing area**

A: 121

… the most severe type of low-level wind shear, a **microburst**, is associated with **convective precipitation** (occurs when warm, moist air rises in the atmosphere**)** into dry air at cloud base.

Microburst activity may be indicated by an intense rain shaft at the surface but **virga** (i.e., light wisps which are attached to the *base* of a *cloud) ...* and a ring of blowing dust is often the only **visible clue**.

A typical microburst has a horizontal diameter of **1–2 miles** and a nominal **depth of 1,000 feet**.

The lifespan of a microburst is about **5 to 15 minutes** during which time it can produce **downdrafts of up to 6,000 feet per minute (fpm)** and **headwind losses of 30–90 knots**, seriously degrading performance. It can also produce strong **turbulence** and **hazardous wind direction changes**.

A: 124

Stability of air and the resulting weather:

Cool, dry air is very stable and resists vertical movement, which leads to good and generally clear weather.

The greatest **instability** occurs when the air is **moist** and **warm**, as it is in the tropical regions in the summer.

Typically, thunderstorms appear on a daily basis in these regions due to the instability of the surrounding air.

A: 123

Stable

The stability of the atmosphere depends on its ability to **resist vertical motion**. A stable atmosphere makes vertical movement difficult, and small vertical disturbances dampen out and disappear.

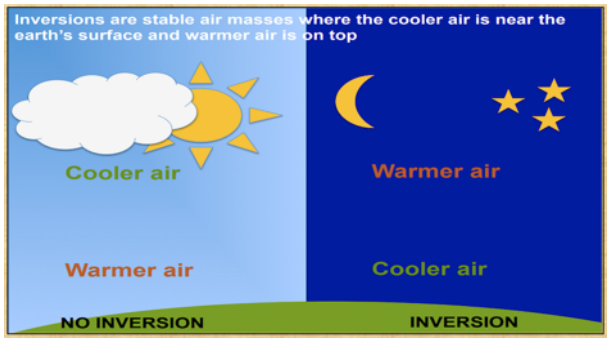
Unstable

.. small **vertical air movements** tend to become larger, resulting in turbulent airflow and convective activity. Instability can lead to significant turbulence, extensive vertical clouds, and severe weather.

Q: 125 **INVERSION**	Q: 126 **Inversion Graphic** from National Weather Service
Q: 127 **Thermal Inversion** (Images from New Zealand Government)	Q: 128 **Forming an Inversion:**

A: 126

Graphic from NOAA shows **warmer air over cooler air** causes an inversion



https://www.weather.gov/media/lzk/inversion101.pdf

A: 125

As air rises and expands in the atmosphere, the temperature decreases. There is an atmospheric anomaly that can occur; however, that changes this typical pattern of atmospheric behavior.

When the temperature of the air rises with altitude, a **temperature inversion** exists. Inversion layers are commonly shallow layers of smooth, stable air close to the ground. The temperature of the air increases with altitude to a certain point, which is the **top of the inversion.** The air at the **top of the layer acts as a lid**, keeping weather and pollutants trapped below. If the relative humidity of the air is high, it can contribute to the formation of clouds, fog, haze, or smoke resulting in diminished visibility in the inversion layer.

A: 128

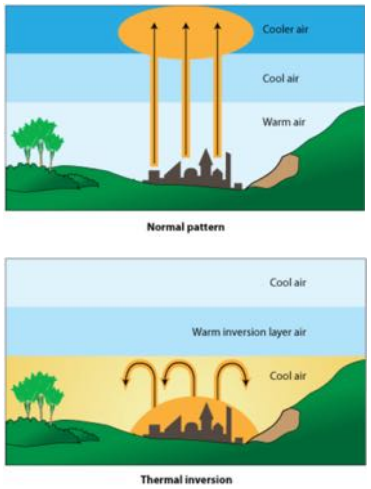
Surface-based temperature inversions occur on clear, cool nights when the air close to the ground is cooled by the lowering temperature of the ground.

The air within a few hundred feet of the surface becomes cooler than the air above it.

Frontal inversions occur when warm air spreads over a layer of cooler air, or cooler air is forced under a layer of warmer air.

Keep the “Thermal Inversion” illustration in mind as you read this description here.

A: 127



https://www.sciencelearn.org.nz/images/1883-temperature-inversion

Q: 129 **Temperature/Dew Point Relationship**	Q: 130 ***Methods by Which Air Reaches the Saturation Point***
Q: 131 **Dew and Frost**	Q: 132 **Frost Conditions** When Flying a UA (Aircraft/Drone)

A: 130

There are four methods by which air can reach the saturation point.

1) when **warm air moves over a cold surface**, the air temperature drops and reaches the saturation point.

2) the saturation point may be reached **when cold air and warm air mix**.

3) when **air cools at night** through contact with the **cooler ground**, air reaches its saturation point.

4) when **air is lifted** or is **forced upward** in the atmosphere.

A: 129

60 / 45 [current temperature / dew point (temp)]

The relationship between dew point and temperature defines the concept of relative humidity.

The dew point, given in degrees, is the temperature at which the air can hold no more moisture.

When the temperature of the air is reduced to the dew point, the air is **completely saturated and moisture begins to condense out of the air** in the form of **fog**, **dew**, **frost, clouds, rain,** or **snow.**

A: 132

Frost [conditions] poses a definite flight safety hazard.

Aircraft:

Frost disrupts the flow of air over the wing and can drastically reduce the production of lift. It also increases drag, which when combined with lowered lift production, can adversely affect the ability to take off.

A small UA must be thoroughly cleaned and free of frost prior to beginning a flight

Drone (i.e., Quadcopter):

Frost forming on propeller blades in flight is a concern.

A: 131

On cool, clear, calm nights, the temperature of the ground and objects on the surface can cause temperatures of the surrounding air to drop below the dew point.

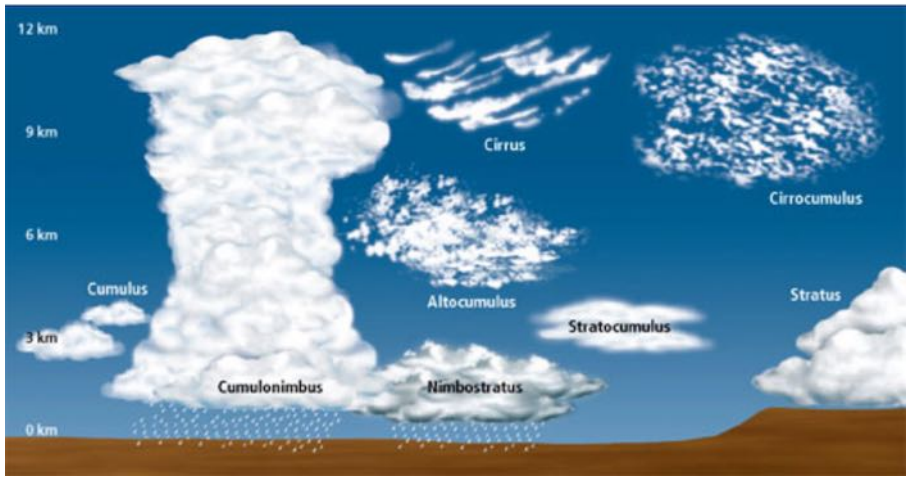
When this occurs, the **moisture in the air condenses and deposits itself** on the ground, buildings, and other objects like cars and aircraft.

Dew (wets surfaces and vegetation)

Frost (thin icy frozen on surfaces and vegetation)

Q: 133 **Clouds** - What type brings thunderstorms?	Q: 134 **Cloud Types** (Illustration)
Q: 135 **Standard Cloud Chart** on the web ...	Q: 136 **Stratus** Clouds

A: 134



https://www.weather.gov/lmk/cloud_classification

A: 133

To pilots, the **cumulonimbus** cloud is perhaps the most dangerous cloud type. It appears individually or in groups and is known as either an **air mass** or **orographic thunderstorm**.

[Note from Internet search: 'The orographic effect occurs when air masses are forced to flow over high topography.']

Heating of the air near the Earth's surface creates an air mass thunderstorm; the upslope motion of air in the mountainous regions causes orographic thunderstorms. (i.e., forcing moist air to rise)

Cumulonimbus clouds that form in a continuous line are **nonfrontal bands** of thunderstorms or **squall** lines.

A: 136

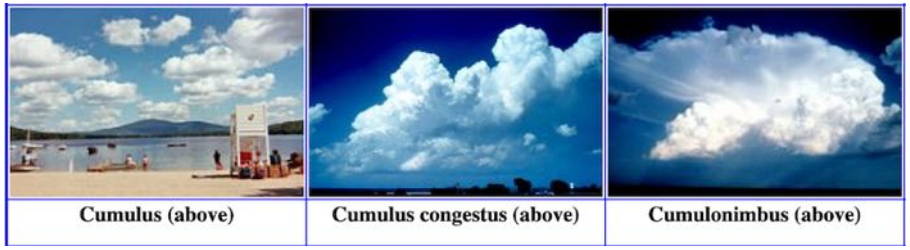
Examples:

Stratus (above)	Stratocumulus (above)

https://www.weather.gov/lmk/cloud_classification

A: 135

See chart
at: https://www.weather.gov/lmk/cloud_classification



Cumulus (above)	Cumulus congestus (above)	Cumulonimbus (above)

Sometimes you will hear the two of the most important cloud types for a Pilot In Command (PIC) flying a sUAS would be **Cumulus** and **Cumulonimbus** … see later info on keeping your distance from clouds and cloud ceiling.

Q: 137 **Danger Flying in Thunderstorm**	Q: 138 **Standing lenticular altocumulus clouds**
Q: 139 **Stability**	Q: 140 **Fronts**

A: 138

... are formed on the crests of waves created by barriers in the wind flow. The clouds show little movement, hence the name *standing*. Wind, however, can be quite strong blowing through such clouds. They are characterized by their smooth, polished edges. **The presence of these clouds is a good indication of very strong turbulence and should be avoided.**

https://www.weather.gov/abq/features_acsl

A: 137

… if a small UAS enters a **thunderstorm**, the small UA could experience **updrafts** and **downdrafts** that exceed **3,000 fpm.**

In addition, thunderstorms can produce large hailstones, damaging lightning, tornadoes, and large quantities of water, all of which are potentially hazardous to an aircraft.

A: 140

As air masses move out of their source regions, they come in contact with other air masses of different properties.

The zone between two different air masses is a **frontal zone** or **front**.

Across this zone, temperature, humidity and wind often change rapidly over short distances.

A: 139

Stability of an air mass determines its typical weather characteristics. When one type of air mass overlies another, conditions change with height. Characteristics typical of an unstable and a stable air mass are as follows:

Unstable Air	Stable Air
Cumuliform clouds	Stratiform clouds and fog
Showery precipitation	Continuous precipitation
Rough air (turbulence)	Smooth air
Good visibility (except in blowing obstructions)	Fair to poor visibility in haze and smoke

Study Guide page 26

Q: 141 **Mountain Flying**	Q: 142 **Structural Icing**
Q: 143 **Thunderstorm: Three Stages**	Q: 144 **Thunderstorm Life Cycle**

A: 142

Two conditions are necessary for [aircraft] structural icing in flight:

1. The aircraft must be flying through visible water such as rain or cloud droplets

2. The temperature at the point where the moisture strikes the aircraft must be 0° C or colder.

Aerodynamic cooling can lower temperature of an airfoil to 0° C even though the ambient temperature is a few degrees warmer.

Remember: Icing drone propellers is a concern

A: 141

When planning a flight over mountainous terrain, gather as much preflight information as possible on cloud reports, wind direction, wind speed, and stability of air.

Wind at mountain top level in excess of **25 knots** (~28 mph) suggests some turbulence. Wind in excess of **40 knots** (~46 mph) across a mountain barrier dictates **caution**.

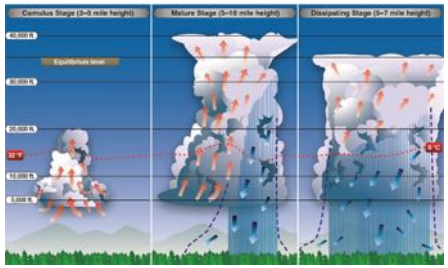
Stratified clouds mean stable air.

Standing lenticular and/or **rotor clouds** suggest a mountain wave; expect turbulence many miles to the **lee of mountains** and **relative smooth flight on the windward side**. Convective clouds on the windward side of mountains mean unstable air; expect turbulence in close proximity to and on either side of the mountain.

1 kt = 1.51078 mph

A: 144

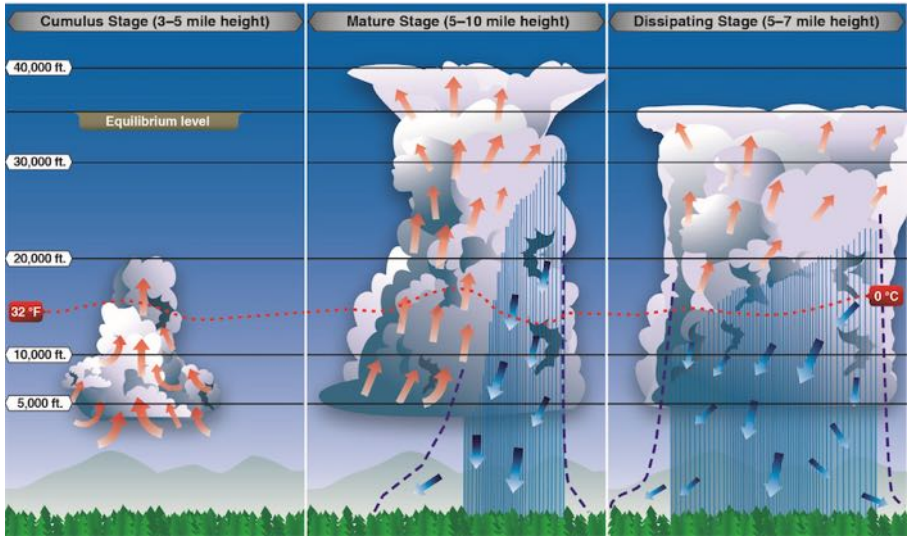
A **thunderstorm cell** during its life cycle progresses through three stages:



1) the cumulus
2) the mature
3) the dissipating

It is virtually impossible to visually detect the transition from one stage to another; the transition is subtle and by no means abrupt. Furthermore, a thunderstorm may be a **cluster of cells** in different stages of the lifecycle.

A: 143



Q: 145 ***The Cumulus Stage***	Q: 146 ***The Mature Stage***
Q: 147 ***The Dissipating Stage***	Q: 148 **Cloud Ceiling**

A: 146

Precipitation beginning to fall from the cloud base is your signal that a **downdraft** has developed and a cell has entered the mature stage.

Cold rain in the downdraft retards compressional heating, and the downdraft remains cooler than surrounding air.

Downward speed is accelerated and **may exceed 2,500 feet per minute**. The down rushing air spreads outward at the surface produces strong, gusty surface winds, a sharp temperature drop, and a rapid rise in pressure.

The surface wind surge is a "**plow wind**" and its leading edge is the "**first gust**." Meanwhile, **updrafts** reach a maximum with speeds **possibly exceeding 6,000 feet per minute**. Updrafts and downdrafts in close proximity create **strong vertical shear** and a very turbulent environment. All **thunderstorm hazards** ... greatest intensity during the mature stage.

A: 145

Although most cumulus clouds do not grow into thunderstorms, every thunderstorm begins as a cumulus.

The key feature of the cumulus stage is an **updraft** as illustrated on previous flashcard.

Growth rate of the cloud may exceed **3,000 feet per minute**, so **it is inadvisable to operate a small UA in an area of rapidly building cumulus clouds**. Early during the cumulus stage, water droplets are quite small but grow to raindrop size as the cloud grows.

The cold rain drags air with it creating a cold **downdraft** coexisting with the **updraft**; the cell has reached the mature stage.

A: 148

For aviation purposes, a **ceiling** is the lowest layer of clouds reported as being broken or overcast, or the vertical visibility into an obscuration like fog or haze.

Clouds are reported as **broken** when five-eighths (5/8) to seven-eighths (7/8) of the sky is covered with clouds.

Overcast means the entire sky is covered with clouds (8/8).

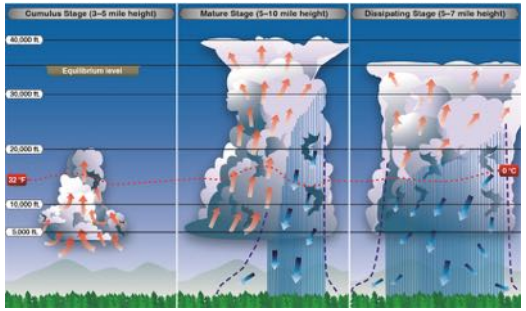
Current ceiling information is reported by the aviation routine weather report (**METAR**) and automated weather stations of various types.

A: 147

Downdrafts characterize the **dissipating stage** of the thunderstorm cell (see illustration) and the storm dies rapidly.

When rain has ended and downdrafts have abated, the dissipating stage is complete.

When all cells of the thunderstorm have completed this stage, only **harmless cloud remnants** remain.



Q: 149 **Visibility**	Q: 150 **Chapter 4: Small Unmanned Aircraft Loading**
Q: 151 **Aircraft Loading**	Q: 152 **Aircraft Flight and Weight**

A: 150

- **Introduction**
- **Weight**
- **Stability**
- **Load Factors**
- **Weight and Balance**

A: 149

Closely related to cloud cover and reported ceilings is visibility information.

Visibility refers to the **greatest horizontal distance** at which prominent objects can be viewed with the naked eye.

Example: **3 SM** (3 statute miles)

Current visibility is also reported in **METAR** and other aviation weather reports, as well as by automated weather systems.

Visibility information, as predicted by meteorologists, is available for a pilot during a preflight weather briefing.

A: 152

Although a maximum gross **takeoff weight** may be specified, the aircraft may not always safely take off with this load under all conditions. Conditions that affect **takeoff** and **climb performance**, such as high elevations, high air temperatures, and high humidity (high density altitudes) may require a reduction in weight before flight is attempted

Weight changes during flight also have a direct effect on Unmanned Aircraft performance. Fuel burn is the most common weight change that takes place during flight

Drone 'fuel' is battery strength which can drain more quickly with higher climb or greater area wind speed conditions, but battery weight remains essentially the same throughout a flight.

A: 151

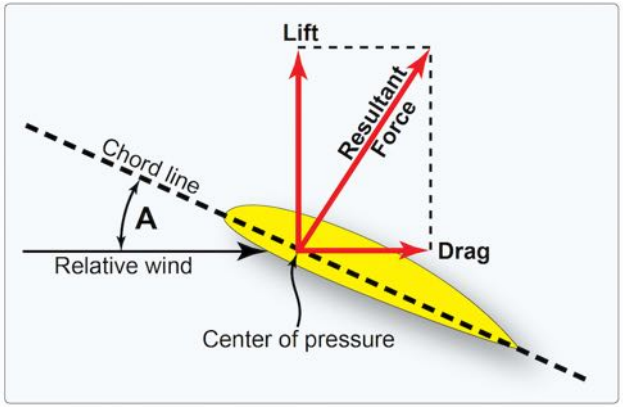
Before any flight, the remote **pilot-in-command (PIC)** should verify the aircraft is correctly loaded by determining the **weight** and **balance** condition of the **aircraft**.

An aircraft's weight and balance restrictions established by the manufacturer or the builder should be closely followed.

[**NOTE**: Some basic information follows, HOWEVER if you fly a model airplane or other UA that is not a drone, then recommendation is read this section of the Study Guide in full, for added detail, starting on page 29. General UA, drone related, and practice test questions identified topics are the focus of what follows (also, see 'Part 107 Study Notes 2' flashcards)]

Q: 153 **Performance**	Q: 154 **Lift Vector Diagram**
Q: 155 **Center of Gravity (CG)**	Q: 156 **Weight**

A: 154



This illustration is from the test supplemental handbook and related to the angle of attack (AOA) and lift of the aircraft.

A: 153

Performance is a term used to describe the ability of an aircraft to accomplish certain things that make it useful for certain purposes.

The primary factors most affected by performance are the **takeoff** and **landing distance**, **rate of climb**, **ceiling**, **payload**, **range**, **speed**, **maneuverability**, **stability**, and **fuel economy**.

Weight has a very pronounced effect on aircraft performance. If weight is added to an aircraft, it must fly at a **higher angle of attack (AOA)** to maintain a given altitude and speed. This increases the induced drag of the wings, as well as the parasite drag of the aircraft. Increased drag means that additional thrust is needed to overcome it, which in turn means that less reserve thrust is available for climbing.

A: 156

Gravity is the pulling force that tends to draw all bodies to the center of the Earth.

The CG may be considered as a point at which all the weight of the aircraft is concentrated.

If the **aircraft** were supported at its exact CG, it would balance in any **attitude**. **It will be noted that CG is of major importance in a small UA, for its position has a great bearing upon stability**. The allowable location of the CG is determined by the general design of each particular aircraft. … The designers determine how far the **center of pressure (CP)** will travel. … designers fix the aft limit of the CG forward of the CP for the corresponding flight speed in order to retain flight equilibrium.

A: 155

Adverse balance conditions (i.e., weight distribution) may affect flight characteristics in much the same manner as those mentioned for an excess weight condition.

Limits for the location of the **center of gravity (CG)** may be established by the manufacturer.

The CG is not a fixed point marked on the aircraft; its location depends on the distribution of aircraft weight.

Q: 157 FAA Handbook Quote on CG	Q: 158 **Lift**
Q: 159 **Aircraft Stability**	Q: 160 **Load Factors**

A: 158

Weight has a definite relationship to lift.

This relationship is simple, but important in understanding the aerodynamics of flying.

Lift is the upward force on the **wing** acting perpendicular to the relative wind and perpendicular to the aircraft's lateral axis. Lift is required to counteract the aircraft's weight

A **drone** (quadcopter) design does not use wings, but **lift** is supplied by the upward pull of propellers.

… when the lift force is **equal** to the weight force, the **aircraft** is in a state of equilibrium and neither accelerates upward or downward. If lift becomes **less than** weight, the vertical speed will decrease. When lift is **greater** than weight, the vertical speed will increase.

A: 157

"The aft CG limit is the most rearward position at which the CG can be located for the most critical maneuver or operation. **As the CG moves aft**, a less stable condition occurs, which decreases the ability of the aircraft to right itself after maneuvering or turbulence."

Pilot's Handbook of Aeronautical Knowledge (Chapter 10: Weight and Balance) Page 10-3
https://www.faa.gov/sites/faa.gov/files/2022-03/pilot_handbook.pdf

A: 160

In aerodynamics, the maximum load factor (at given bank angle) is a proportion between lift and weight and has a trigonometric relationship.

The **load factor** is measured in **Gs (acceleration of gravity)**, a unit of force equal to the force exerted by gravity on a body at rest and indicates the force to which a body is subjected when it is accelerated.

Any force applied to an aircraft to deflect its flight from a straight line produces a stress on its structure. The amount of this force is the load factor.
[You may encounter a test question about the load factor stress when an aircraft makes a turn.]

A: 159

Stability in an **aircraft** affects two areas significantly:

Maneuverability—the quality of an aircraft that permits it to be maneuvered easily and to withstand the stresses imposed by maneuvers. It is governed by the aircraft's weight, inertia, size and location of flight controls, structural strength, and power plant. It too is an aircraft design characteristic.

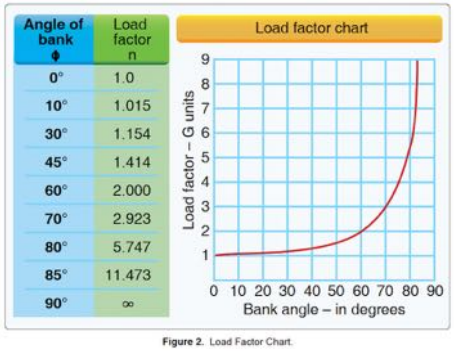
Controllability—the capability of an aircraft to respond to the pilot's control, especially with regard to flight path and attitude. It is the quality of the aircraft's response to the pilot's control application when maneuvering the aircraft, regardless of its stability characteristics.

Q: 161 ***Load Factors in Steep Turns***	Q: 162 **Test Question** Using the Handbook Info!
Q: 163 **The load factor increases**	Q: 164 ***Load Factors and Stalling Speeds***

A: 162

If an unmanned airplane weighs 33 pounds, what approximate weight would the airplane structure be required to support during a 30° banked turn while maintaining altitude?

A.34 pounds. B. 47 pounds. C. 38 pounds.



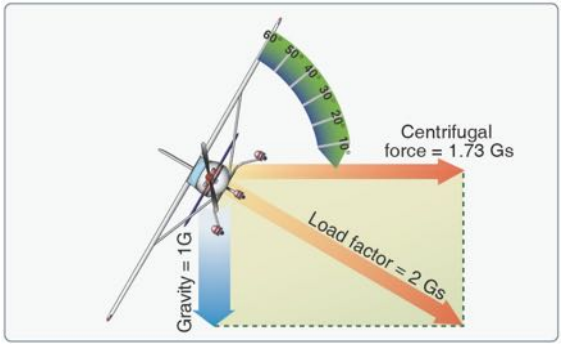
Angle of bank ϕ	Load factor n
0°	1.0
10°	1.015
30°	1.154
45°	1.414
60°	2.000
70°	2.923
80°	5.747
85°	11.473
90°	∞

Figure 2. Load Factor Chart.

So look at the 30 degrees as a factor of 1.154 and multiply that times the aircraft weight …

A: 161

At a constant altitude, during a coordinated turn in any aircraft, the load factor is the result of two forces: **centrifugal force** and **weight**.



For any given bank angle, the rate-of-turn varies with the airspeed—the **higher** the speed, the **slower** the **rate-of-turn (ROT)**.

[On the test you can look in the provided handbook to determine a weigh factor for the degree angle of a turn.]

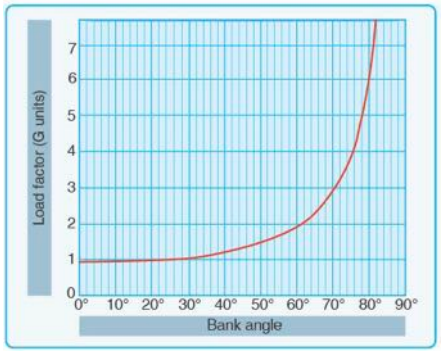
A: 164

Any aircraft, within the limits of its structure, may be **stalled** at any airspeed.

When a sufficiently high **angle of attack (AOA)** is imposed, the smooth flow of air over an airfoil breaks up and separates, producing an abrupt change of flight characteristics and a **sudden loss of lift**, which results in a **stall**.

A: 163

… the load factor increases at a terrific rate after a bank has reached 45° or 50°. The load factor for any aircraft in a coordinated level turn at 60° bank is **2 Gs**.



[see Study Guide page 30 for related added info]

Q: 165 **Stall Speed and Load Factor Relationship**	Q: 166 **Weight and Balance**
Q: 167 **Weight — Impacts and Effects on flight**	Q: 168 **Excessive weight ...**

A: 166

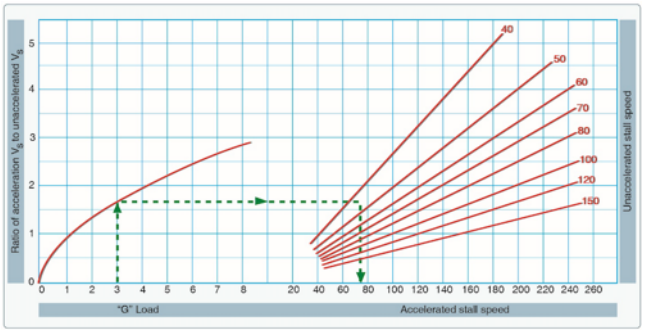
Compliance with the **weight and balance limits** of any aircraft is critical to flight safety.

Operating **above** the **maximum weight limitation** compromises the **structural integrity** of an aircraft and adversely affects its performance.

Operation with the **center of gravity (CG) outside** the approved limits results in **control difficulty**.

A: 165

A study of this effect has revealed that an aircraft's stalling speed increases in proportion to the square root of the load factor.



… **the load factor is squared as the stalling speed doubles**, tremendous loads may be imposed on structures by stalling an aircraft at relatively high air speeds.

[added info on Study Guide pages 31-32]

A: 168

… **reduces the flight performance** in almost every respect. For example, the most important performance **deficiencies** of an overloaded aircraft are:

• Higher takeoff speed • Longer takeoff run

• Reduced rate and angle of climb

• Lower maximum altitude • Shorter range

• Reduced cruising speed • Reduced maneuverability

• Higher stalling speed • Longer landing roll

• Higher approach and landing speed

The pilot must be knowledgeable about the effect of weight on the performance of the particular aircraft being flown.

A: 167

Weight Control Weight is the force with which gravity attracts a body toward the center of the Earth. It is a product of the mass of a body and the acceleration acting on the body. Weight is a major factor in aircraft construction and operation and demands respect from all pilots

Effects of Weight Any item aboard an aircraft that increases the total weight is undesirable for performance. Manufacturers attempt to make an aircraft as light as possible without sacrificing strength or safety. The pilot should always be aware of the consequences of overloading. An overloaded aircraft may not be able to leave the ground, or if it does become airborne, it may exhibit unexpected and unusually poor flight characteristics.

Q: 169 **Chapter 5: Emergency Procedures**	Q: 170 **Inflight Emergency**
Q: 171 **Before every flight ...**	Q: 172 **Emergency Example ...**

A: 170

A remote pilot is responsible for the safe operation of the small UA at all times.

A remote pilot must ensure:

- that the aircraft is in a **safe operating condition** before flight,
- that there is **not any hazard** to persons or property, and
- that all required crew members are **properly briefed** on the operation and emergency procedures.

A: 169

An inflight emergency is usually an unexpected and unforeseen event that can have serious consequences for an unprepared remote pilot.

During an emergency, a **remote pilot is permitted** to **deviate** from any part of 14 CFR part 107 to respond to the emergency.

When a remote pilot does deviate from a rule due to an emergency, the **remote [pilot] will report the emergency if asked to do so by the FAA** (also referred to as "the Administrator").

Important: see next card on inflight emergency!

A: 172

When might you need to go outside of Part 107 guidance?

FAA Example: When a remote pilot does experience an inflight emergency, the pilot may take any action to ensure that there is not a hazard to other people or property.

For example, if during a flight the small UA experiences as **battery fire**, the remote pilot may need to climb the small UA above 400' AGL to maneuver to a safe landing area. In this instance, a report will need to be made only if asked to do so by the FAA.

Add to this example when a drone battery fails and the drone crashes. If it just lands away from anything or anyone, okay. But if there is injury or damage, then that is a serious scenario and may require a report to FAA.

A: 171

- Remote pilot will conduct a preflight inspection of the aircraft.
- If any irregularities' are found in the inspection, they must be corrected before the small UA is operated.
- Some small UA manufacturers will provide the remote pilot with preflight inspection items.
- If **no** UA manufacturer checklist, the remote should develop a checklist that will provide enough information that the aircraft will be operated in a safe condition

[NOTE: Some web pages and YouTube videos help to address what a drone checklist might include, also, after flying your UA you may think of additional items to add to a checklist. See flashcards: "Recreational and Part 107 Notes" for helpful checklist info]

Q: 173 **Additional Emergency and Flight information:**	Q: 174 **Chapter 6: Crew Resource Management**
Q: 175 **Chapter 7: Radio Communication Procedures**	Q: 176 **Radio communications ...**

A: 174

- There is no section list

This chapter only includes the following FAA study guide note: "For information on Crew Resource Management (CRM), refer to Chapter 10, “**Aeronautical Decision-Making and Judgment**,” of this study guide."

Note cards for this topic appear here later ...

A: 173

When other crew members are used during a flight, all of those crew members must be briefed on the flight and the planned emergency procedures for the flight. The briefing will be given to any **visual observers (VO)** that might be used and any non-certificated person who is allowed to manipulate the flight controls of the small UA.

For more information about emergencies, refer to 14 CFR part 107 and AC 107-2.

https://www.ecfr.gov/current/title-14/chapter-I/subchapter-F/part-107

ADVISORY CIRCULAR (download the PDF):
https://www.faa.gov/documentLibrary/media/Advisory_Circular_107-2.pdf

A: 176

… are an important aspect for the safe operation of aircraft in the NAS. It is through radio communications that pilots give and receive information before, during, and at the conclusion of a flight. This information aids in the flow of aircraft in highly complex airspace areas as well as in less populated areas. Pilots can also send and receive important safety of flight issues such as unexpected weather conditions, and inflight emergencies. Although **small UA pilots are <u>not</u> expected to communicate over radio frequencies, it is important for the UA pilot to understand “aviation language” and the different conversations they will encounter if the UA pilot is using a radio to aid them in situational awareness when operating in the NAS**. Although much of the information provided here is geared toward manned aircraft.

A: 175

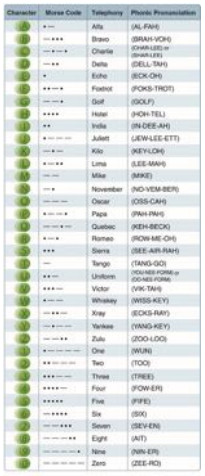
- **Introduction**
- **Understanding Proper Radio Procedures**
- **Traffic Advisory Practices at Airports without Operating Control Towers**

Q: 177 **Understanding Proper Radio Procedures**	Q: 178 **ICAO** (International Civil Aviation Organization)
Q: 179 Telephony - Code Words:	Q: 180 **Traffic Advisory Practices at Airports without Operating Control Towers**

A: 178

ICAO has adopted a phonetic alphabet that should be used in radio communications. When communicating with ATC, pilots should use this alphabet to identify their aircraft.

Fig 7-1 on page 39 is a listing of Alphabet characters, morse code, telephony (a=alpha, b=bravo, c=Charlie, etc.)



A: 177

A review of the Pilot/Controller Glossary contained in the AIM assists a pilot in understanding standard radio terminology. The AIM also contains many examples of radio communications. An online link to sections of the **Aeronautical Information Manual - AIM** is:
https://www.faa.gov/air_traffic/publications/atpubs/aim_html

A **remote pilot is not expected to communicate** with other aircraft in the vicinity of an airport, and should **not** do so unless there is an emergency situation. However, in the interest of safety in the NAS, it is important that a remote pilot understands the aviation language and the types of aircraft that can be operating in the same area as a small UA.

A: 180

There is no substitute for alertness while in the vicinity of an airport. … To achieve the greatest degree of safety, it is essential that all radio-equipped aircraft transmit/receive on a common frequency and **small UA pilots** monitor other aircraft identified for the purpose of airport advisories.

An airport may have a full or part-time tower or **flight service station (FSS)** located on the airport, a full or part-time **universal communications (UNICOM) station** or no aeronautical station at all.

NOTE: Be aware … UNICOM radio frequencies are listed on sectional charts.

A: 179

A = **A**lfa/Alpha	N = **N**ovember
B = **B**ravo	O = **O**scar
C = **C**harlie	P = **P**apa
D = **D**elta	Q = **Q**uebec
E = **E**cho	R = **R**omeo
F = **F**oxtrot	S = **S**ierra
G = **G**olf	T = **T**ango
H = **H**otel	U = **U**niform
I = **I**ndia	V = **V**ictor
J = **J**uliett	W = **W**hiskey
K = **K**ilo	X = **X**-ray
L = **L**ima	Y = **Y**ankee
M = **M**ike	Z = **Z**ulu

Q: 181 **UNICOM features**	Q: 182 ***Communication / Broadcast Procedures***
Q: 183 ***Recommended Traffic Advisory Practices***	Q: 184 A **digital Chart Supplement** Example:

A: 182

A **MULTICOM frequency of 122.9** will be used at an airport that is non-towered and does not have a FSS or UNICOM.

A: 181

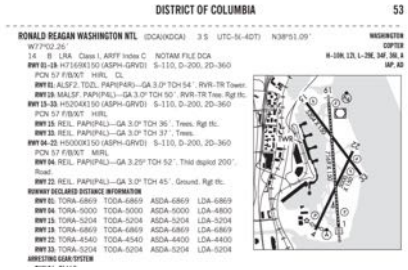
Many airports are now providing completely automated weather, radio check capability and airport advisory information on an automated UNICOM system.

The **Common Traffic Advisory Frequency (CTAF)**, is synonymous with this program. A **CTAF** is a frequency designated for the purpose of carrying out **airport advisory practices** while operating to or from an airport without an operating control tower. The CTAF may be a **UNICOM, MULTICOM, FSS**, or **tower frequency** and is identified in appropriate aeronautical publications.

[Again, this will come up when studying Sectional Charts]

A: 184

A chart supplement looks like (partial image as example):


DISTRICT OF COLUMBIA 53

RONALD REAGAN WASHINGTON NTL (DCA)(KDCA) 3 S UTC-5(-4DT) N38°51.09' WASHINGTON COPTER

W77°02.26'

14 B LRA Class I, ARFF Index C NOTAM FILE DCA H-10K, 12L, L-29E, 34F, 36L, A

RWY 01-19: H7169X150 (ASPH-GRVD) S-110, D-200, 2D-360

PCN 57 F/B/X/T HIRL CL

RWY 01: ALSF-2, TDZL, PAPI(P4R)—GA 3.0° TCH 54'. RVR-TR Tower.

RWY 19: MALSF. PAPI(P4L)—GA 3.0° TCH 50'. RVR-TR Tree. Rgt tfc.

RWY 15-33: H5204X150 (ASPH-GRVD) S-110, D-200, 2D-360

PCN 57 F/B/X/T HIRL

RWY 15: REIL. PAPI(P4L)—GA 3.0° TCH 36'. Trees. Rgt tfc.

RWY 33: REIL. PAPI(P4L)—GA 3.0° TCH 37'. Trees.

RWY 04-22: H5000X150 (ASPH-GRVD) S-110, D-200, 2D-360

PCN 57 F/B/X/T MIRL

RWY 04: REIL. PAPI(P4L)—GA 3.25° TCH 52'. Thld displ 200'. Road.

RWY 22: REIL. PAPI(P4L)—GA 3.0° TCH 45'. Ground. Rgt tfc.

RUNWAY DECLARED DISTANCE INFORMATION

RWY 01:	TORA-6869	TODA-6869	ASDA-6869	LDA-6869
RWY 04:	TORA-5000	TODA-5000	ASDA-5000	LDA-4800
RWY 15:	TORA-5204	TODA-5204	ASDA-5204	LDA-5204
RWY 19:	TORA-6869	TODA-6869	ASDA-6869	LDA-6869
RWY 22:	TORA-4540	TODA-4540	ASDA-4400	LDA-4400
RWY 33:	TORA-5204	TODA-5204	ASDA-5204	LDA-5204

ARRESTING GEAR/SYSTEM

A: 183

Although a **remote pilot-in-command** is **not required** to communicate with manned aircraft when in the vicinity of a non-towered airport, **safety in the National Airspace System requires that remote pilots are familiar with traffic patterns, radio procedures, and radio phraseology**.

When a remote pilot plans to operate close to a non-towered airport, the first step in radio procedures is to identify the appropriate frequencies. Most non-towered airports will have a **UNICOM** frequency, which is usually **122.8**; however, you should always check the [digital] Chart Supplements U.S. or sectional chart for the correct frequency.

Chart Supplement PDFs online at:
https://www.faa.gov/air_traffic/flight_info/aeronav/Digital_Products/dafd/

Q: 185 **Aircraft Radio**	Q: 186 **Call Sign Language**
Q: 187 **Chapter 8: Determining the Performance of Small Unmanned Aircraft**	Q: 188 **Introduction on Manufacturer Info**

A: 186

Aviation has unique communication procedures that will be foreign to a **remote pilot** who has not been exposed to “aviation language” previously.

One of those is aircraft **call signs**. All aircraft that are registered in the United States will have a unique registration number, or “**N**” number. For example, **N123AB**, which would be pronounced in aviation terms by use of the phonetic alphabet as, “November One-Two-Three-Alpha-Bravo.”

Usually, when the aircraft is a light **general aviation (GA)** aircraft, the manufacturer’s name will be used. In this case, if **N123AB** is a Cessna 172, the call sign would be “**Cessna, One-Two-Three-Alpha-Bravo**.”

Also: Southwest Airlines flight 711, would be said as, “Southwest- Seven-One-One.”

A: 185

The FAA Study Guide covers what an **aircraft pilot** does by radio when aproaching a runway with and without ay Air Traffic Control tower.

See Study Gude pages 40-41 for aircraft pilot details.

Drone Pilots: Although 14 CFR part 107 only requires the **remote pilot** to **receive authorization to operate in certain airport areas**, it can be a good operating practice to have a radio that will allow the remote pilot to monitor the appropriate frequencies in the area. **The remote pilot should refrain from transmitting over any active aviation frequency** unless there is an emergency situation.

A: 188

The manufacturer may provide operational and performance information that contains the operational performance data for the aircraft such as data pertaining to takeoff, climb, range, endurance, descent, and landing.

The use of this data in flying operations is essential for safe and efficient operation.

If manufacturer-published performance data is unavailable, it is advisable to **seek out performance data** that may have already been **determined and published by other users** of the same small UA manufacturer model and use that data as a starting point.

NOTE: Drone pilots can obtain some info from a manufacturer’s manual or web page **however** even more detail from various YouTube videos that feature a particular drone.

A: 187

- **Introduction**
- **Effect of Temperature on Density**
- **Effect of Humidity (Moisture) on Density**

Q: 189 **Effect of Temperature on Density**	Q: 190 **Density and Altitude**
Q: 191 **Effect of Humidity (Moisture) on Density**	Q: 192 **Humidity**

A: 190

"In the atmosphere, both temperature and pressure decrease with altitude and have conflicting effects upon density. However, a fairly rapid drop in pressure as altitude increases usually has a dominating effect. Hence, pilots can expect the density to decrease with altitude."

Example 2: So, air at much higher altitudes is atmospherically less dense even though typically colder and the drone 'works harder' to fly in less dense air. This makes for a bit **tricky test questions** regarding **High Density Altitude** (read that term as high altitude and then what the density is at high altitudes (yes it is **less dense air**)!

A: 189

- Increasing the temperature of a substance decreases its density.
- Conversely, decreasing the temperature increases the density.
- Thus, the density of air varies inversely with temperature. This statement is true only at a constant pressure.

Example 1: At ground level, warmer air is less dense than colder air.

A: 192

Humidity (**relative humidity**) = amount of water vapor contained in the atmosphere (expressed as a **percentage of the maximum** amount of water vapor the air can hold).

This amount **varies with temperature. Warm air holds more water vapor,** while cold air holds less.

Perfectly dry air that contains no water vapor has a relative humidity of **zero** percent, while saturated air, which cannot hold any more water vapor, has a relative humidity of **100 percent**.

Humidity alone is usually not considered an important factor in calculating density altitude and aircraft performance, but it is a contributing factor.

A: 191

The preceding [note card] refers to air that is perfectly dry.

In reality, it is never completely dry.

The small amount of **water vapor** suspended in the atmosphere may be almost negligible under certain conditions, but in other conditions **humidity** may become an important factor in the performance of an aircraft.

Water vapor is lighter than air; consequently, **moist air is lighter than dry air**. Therefore, **as the water content of the air increases, the air becomes less dense**, increasing density altitude and decreasing performance.

It is **lightest or least dense** when, in a given set of conditions, it **contains the maximum amount of water vapor**.

Q: 193 **Chapter 9: Physiological Factors (Including Drugs and Alcohol) Affecting Pilot Performance**	Q: 194 **Not to fly when ...**
Q: 195 **Impaired when ...**	Q: 196 **Physiological/Medical Factors that Affect Pilot Performance**

A: 194

… a small UA remote PIC, the person manipulating the controls, or Visual Observer (VO) is unable to safely carry out his or her responsibilities.

It is the remote PIC's responsibility to ensure all crewmembers are **not** impaired.

While drug and alcohol use are known to impair judgment, certain over-the-counter (**OTC**) medications and medical conditions could also affect the ability to safely operate a small UA.

A: 193

- **Introduction**
- **Physiological/Medical Factors that Affect Pilot Performance**
- **Vision and Flight**

A: 196

Important medical factors that a pilot should be aware of include the following:

• hyperventilation

• stress

• fatigue

• dehydration

• heatstroke

• the effects of alcohol and drugs

A: 195

For example, certain antihistamines and decongestants may cause drowsiness.

Part 107 **prohibits** a person from serving as a remote PIC, person manipulating the controls, VO, or other crewmember if he or she:

• Has consumed any alcoholic beverage within the preceding **8 hours**

• Is under the influence of alcohol

• Has a blood alcohol concentration of **.04 percent** or greater

• Is using a **drug** that affects the person's mental or physical capabilities.

There are certain medical conditions, such as epilepsy, may also create a risk to operations.

It is the remote PIC's responsibility to determine that their medical condition is under control and they can safely conduct a small UA operation.

Q: 197 ***Hyperventilation***	Q: 198 **Common symptoms of hyperventilation**
Q: 199 ***Stress***	Q: 200 **Acute stress**

A: 198

... includes:

- Visual impairment
- Unconsciousness
- Lightheaded or dizzy sensation
- Tingling sensations
- Hot and cold sensations
- Muscle spasms

The treatment for hyperventilation involves restoring the proper carbon dioxide level in the body. **Breathing normally** is both the best prevention and the best cure for hyperventilation. In addition to slowing the breathing rate, **breathing into a paper bag or talking aloud helps** to overcome **hyperventilation**. Recovery is usually rapid once the breathing rate is returned to normal.

A: 197

Hyperventilation is the **excessive rate and depth of respiration** leading to abnormal loss of carbon dioxide from the blood.

This condition occurs more often among pilots than is generally recognized. It seldom incapacitates completely, but it causes disturbing symptoms that can alarm the uninformed pilot.

In such cases, **increased breathing rate** and **anxiety** further aggravate the problem. Hyperventilation can lead to **unconsciousness** due to the respiratory system's overriding mechanism to regain control of breathing. Pilots encountering an unexpected stressful situation may subconsciously increase their breathing rate.

A: 200

Acute stress involves an immediate threat that is perceived as danger.

This is the type of stress that triggers a "**fight or flight**" response in an individual, whether the threat is real or imagined.

Normally, a healthy person can cope with acute stress and prevent stress overload.

However, ongoing acute stress can develop into chronic stress.

A: 199

Stress is the body's response to physical and psychological demands placed upon it. The **body's reaction to stress** includes releasing chemical **hormones** (such as adrenaline) into the blood and **increasing metabolism** to provide more energy to the muscles.

Blood sugar, heart rate, respiration, blood pressure, and perspiration all increase.

The term "**stressor**" is used to describe an element that causes an individual to experience stress. **Examples** of stressors include **physical stress** (noise or vibration), **physiological** stress (**fatigue**), and **psychological** stress (**difficult work or personal situations**).

Q: 201 **Chronic stress**	Q: 202 **Fatigue**
Q: 203 **Acute fatigue**	Q: 204 **Skill fatigue**

A: 202

… is frequently associated with pilot error.

Some of the effects of fatigue include **degradation of attention and concentration, impaired coordination, and decreased ability to communicate**.

These factors seriously influence the ability to make effective decisions.

Physical fatigue results from sleep loss, exercise, or physical work.

Factors such as stress and prolonged performance of cognitive work result in **mental fatigue**.

A: 201

... a level of stress that presents an intolerable burden, exceeds the ability of an individual to cope, and causes individual performance to fall sharply.

Unrelenting psychological pressures, such as loneliness, financial worries, and relationship or work problems can produce a cumulative level of stress that exceeds a person's ability to cope with the situation.

When stress reaches these levels, **performance falls off rapidly**.

Pilots experiencing this level of stress are **not safe** and should not exercise their airman privileges. Pilots who suspect they are suffering from chronic stress should **consult a physician**.

A: 204

This type of fatigue has **two main effects on performance**:

• **Timing disruption**—appearing to perform a task as usual, but the timing of each component is slightly off. This makes the pattern of the operation less smooth because the pilot performs each component as though it were separate, instead of part of an integrated activity.

• **Disruption of the perceptual field**—concentrating attention upon movements or objects in the center of vision and neglecting those in the periphery. This is accompanied by loss of accuracy and smoothness in control movements.

A: 203

... is short term and is a normal occurrence in everyday living.

It is the kind of **tiredness** people feel after a period of **strenuous effort**, **excitement**, or **lack of sleep**.

Rest after exertion and **8 hours of sound sleep** ordinarily cures this condition.

Q: 205 **Acute fatigue has many causes** ...	Q: 206 **Chronic fatigue ...**
Q: 207 ***Dehydration***	Q: 208 **Prevent Dehydration - added suggestions**

A: 206

… extending over a long period of time, usually has **psychological roots**, although an underlying disease is sometimes responsible.

Continuous **high-stress** levels produce chronic fatigue.

Chronic fatigue is not relieved by proper diet and adequate rest and sleep and **usually requires treatment** by a physician.

An individual may experience this condition in the form of weakness, tiredness, palpitations of the heart, breathlessness, headaches, or irritability.

Sometimes chronic fatigue even creates stomach or intestinal problems and generalized aches and pains throughout the body. When the condition becomes serious enough, it leads to **emotional illness**.

A: 205

... but the following are among the most important for the pilot:

• Mild hypoxia (oxygen deficiency)

• Physical stress

• Psychological stress

• Depletion of physical energy resulting from psychological stress

• Sustained psychological stress

Acute fatigue can be prevented by proper diet and adequate rest and sleep.

If suffering from acute fatigue, a remote pilot should not operate a small UA.

A: 208

The key for pilots is to be continually aware of their condition. Most people become thirsty with a 1.5 quart deficit or a loss of 2 percent of total body weight.

[Additional] steps to prevent dehydration include:

• Carrying a container in order to measure daily water intake.

• Staying ahead—not relying on the thirst sensation as an alarm. If plain water is not preferred, add some sport drink flavoring to make it more acceptable.

• Limiting daily intake of caffeine and alcohol (both are diuretics and stimulate increased production of urine).

A: 207

... is the term given to a critical loss of water from the body.

Causes of dehydration are hot temperatures, wind, humidity, and diuretic drinks—coffee, tea, alcohol, and caffeinated soft drinks.

Some common **signs** of dehydration are headache, fatigue, cramps, sleepiness, and dizziness.

The first noticeable **effect** of dehydration is fatigue, which in turn makes top physical and mental performance difficult, if not impossible.

Flying a small UA for long periods in hot summer temperatures or at high altitudes increases the susceptibility to dehydration because these conditions tend to increase the rate of water loss from the body.

To help **prevent dehydration**, **drink** two to four quarts of **water** every 24 hours.

Q: 209 ***Heatstroke***	Q: 210 ***Drugs***
Q: 211 **U.S. Food and Drug Administration (FDA)**	Q: 212 **Over The Counter (OTC) drugs**

A: 210

The Federal Aviation Regulations include no specific references to medication usage. **Title 14 of the CFR prohibits acting as PIC** or in any other capacity as a required pilot flight crewmember, while that person:

1. Knows or has reason to know of any medical condition that would make the person unable to meet the requirement for the medical certificate necessary for the pilot operation, or

2. Is taking medication or receiving other treatment for a medical condition that results in the person being unable to meet the requirements for the medical certificate necessary for the pilot operation.

Further, 14 CFR part 107 and 14 CFR **part 91**, sections **91.17** and **91.19** prohibit the use of any drug that affects the person's faculties in any way contrary to safety.

A: 209

Heatstroke is a condition caused by any inability of the body to control its temperature.

Onset of this condition may be recognized by the symptoms of dehydration, but also has been known to be recognized only upon complete collapse.

To prevent these symptoms, it is recommended that an **ample supply of water be carried and used at frequent intervals**, whether thirsty or not.

Individuals should drink one quart per hour for severe heat stress conditions or one pint per hour for moderate stress conditions.

A: 212

Some of the most commonly used , **antihistamines** and **decongestants**, have the potential to cause noticeable adverse side effects, including **drowsiness** and **cognitive** deficits.

The symptoms associated with common upper respiratory infections, including the common cold, often suppress a pilot's desire to fly, and treating symptoms with a drug that causes adverse side effects only compounds the problem.

Particularly, medications containing diphenhydramine (e.g., Benadryl) are known to cause drowsiness and have a prolonged half-life, meaning the drugs stay in one's system for an extended time, which lengthens the time that side effects are present.

A: 211

Virtually all medications have the potential for adverse side effects in some people.

Additionally, herbal and dietary supplements, sport and energy boosters, and some other "natural" products are derived from substances often found in medications that could also have **adverse side effects**. While some individuals experience no side effects with a particular drug or product, others may be noticeably affected. **The FAA regularly reviews FDA and other data to assure that medications found acceptable for aviation duties do not pose an adverse safety risk**.

Q: 213 **Prior to each and every flight**	Q: 214 **Added Medication Precautions and Considerations:**
Q: 215 ***Alcohol***	Q: 216 **Lower but Significant Blood Alcohol Levels ...**

A: 214

For any new medication, OTC or prescribed, you should **wait at least 48 hours** after the first dose before flying to determine you do not have any adverse side effects that would make it unsafe to operate an aircraft.

In addition to medication questions, pilots should also **consider the following:**

- Do not take any unnecessary or elective medications
- Make sure you eat regular balanced meals
- Bring a snack
- Maintain good hydration - bring plenty of water
- Ensure adequate sleep the night prior to the flight
- Stay physically fit

A: 213

... all pilots must do a proper **physical self-assessment** to ensure safety.

A great mnemonic is **IMSAFE**, which stands for

Illness,

Medication,

Stress,

Alcohol,

Fatigue, and

Emotion.

ask yourself, “Am I taking any medicines that might affect my judgment or make me drowsy?

A: 216

0.01–0.05% (10–50 mg)	average individual appears normal
0.03–0.12%* (30–120 mg)	mild euphoria, talkativeness, decreased inhibitions, decreased attention, impaired judgment, increased reaction time
0.09–0.25% (90–250 mg)	emotional instability, loss of critical judgment, impairment of memory and comprehension, decreased sensory response, mild muscular incoordination
0.18–0.30% (180–300 mg)	confusion, dizziness, exaggerated emotions (anger, fear, grief), impaired visual perception, decreased pain sensation, impaired balance, staggering gait, slurred speech, moderate muscular incoordination

DO NOT FLY if your blood alcohol level is 0.04 percent or higher!

A: 215

Alcohol impairs the efficiency of the human body. *[Figure 9-1 see Study Guide page 49; sections are pictured below]*

Studies have shown that consuming alcohol is closely linked to performance deterioration.

Pilots must make hundreds of decisions, some of them time-critical, during the course of a flight. The safe outcome of any flight depends on the ability to make the correct decisions and take the appropriate actions during routine occurrences, as well as abnormal situations.

The influence of alcohol drastically reduces the chances of completing a flight without incident.

Type Beverage	Typical Serving (oz)	Pure Alcohol Content (oz)
Table wine	4.0	.48
Light beer	12.0	.48
Aperitif liquor	1.5	.38
Champagne	4.0	.48
Vodka	1.0	.50
Whiskey	1.25	.50

DO NOT FLY if your blood alcohol level is **0.04 percent or higher**!

Q: 217 **Significant Blood Alcohol Levels**	Q: 218 **Alcohol Consequences**
Q: 219 **0.04 Percent**	Q: 220 **Vision and Flight**

A: 218

Even in small amounts, alcohol can:

- impair judgment,
- decrease sense of responsibility,
- affect coordination,
- constrict visual field,
- diminish memory,
- reduce reasoning ability,
- lower attention span.

As little as one ounce of alcohol can decrease the speed and strength of muscular reflexes, lessen the efficiency of eye movements while reading, and increase the frequency at which errors are committed. Impairments in vision and hearing can occur from consuming as little as one drink.

A: 217

0.27–0.40% (270–400 mg)	apathy, impaired consciousness, stupor, significantly decreased response to stimulation, severe muscular incoordination, inability to stand or walk, vomiting, incontinence of urine and feces
0.35–0.50% (350–500 mg)	unconsciousness, depressed or abolished re exes, abnormal body temperature, coma, possible death from respiratory paralysis (450 mg or above)

* Legal limit for motor vehicle operation in most states is 0.08 or 0.10% (80–100 mg of alcohol per dL of blood).

DO NOT FLY if your blood alcohol level is 0.04 percent or higher!

A: 220

The more a pilot understands about the eyes and how they function, the easier it is to use vision effectively and compensate for potential problems.

Scanning Techniques

To **scan effectively**, pilots must look from right to left or left to right. They should begin scanning at the greatest distance an object can be perceived (top) and move inward toward the position of the aircraft (bottom).

For each stop, an **area approximately 30° wide** [think of this as a **segment** of the view, not moving your eyes constantly] should be scanned. The duration of each stop is based on the degree of detail that is required, but **no stop should last longer than 2 to 3 seconds**.

A: 219

Intoxication is determined by the amount of alcohol in the bloodstream.

This is usually measured as a percentage by weight in the blood. 14 CFR part 91 requires that blood alcohol level be less than **.04 percent** and that **8 hours** pass between drinking alcohol and piloting an aircraft.

- A pilot with a blood alcohol level of .04 percent **or greater** after 8 hours cannot fly until the blood alcohol falls below that amount.
- Even though blood alcohol may be well below .04 percent, a pilot cannot fly sooner than 8 hours after drinking alcohol.

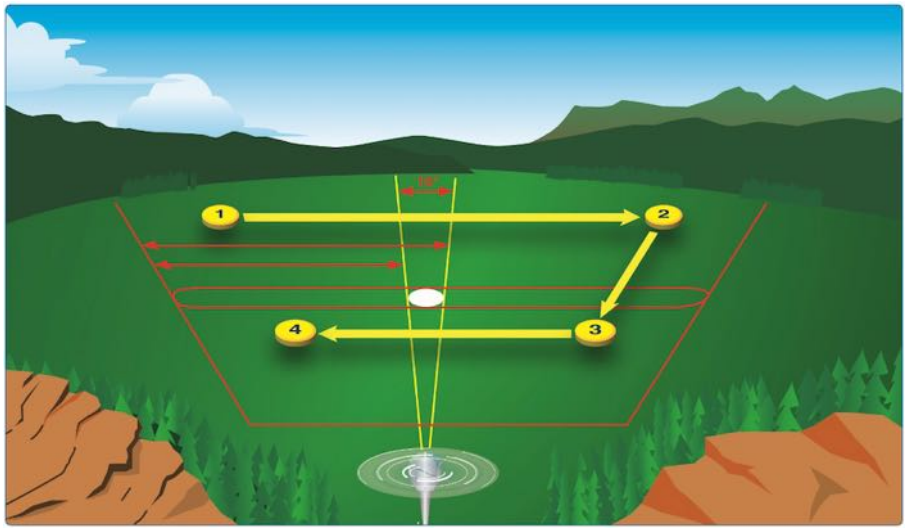
Q: 221 **Positioning the view, further then closer**	Q: 222 **Chapter 10: Aeronautical Decision-Making and Judgment**
Q: 223 **Aeronautical decision-making (ADM)**	Q: 224 **History of ADM**

A: 222

- Introduction
- History of ADM
- Risk Management
- Crew Resource Management (CRM) and Single-Pilot Resource Management
- Hazard and Risk
- Human Factors
- The Decision-Making Process
- Decision-Making in a Dynamic Environment
- Situational Awareness

A: 221

When moving from one viewing point to the next, pilots should overlap the previous field of view by 10°.



A: 224

For over 25 years, the importance of good pilot judgment, or **aeronautical decision-making (ADM)**, has been recognized as critical to the safe operation of aircraft, as well as accident avoidance. (see Study Guide pages 51 - 52 for complete text on history).

Contrary to popular opinion, good judgment can be taught.

Steps for good decision-making are:

1. Identifying personal attitudes hazardous to safe flight.
2. Learning behavior modification techniques.
3. Learning how to recognize and cope with stress.
4. Developing risk assessment skills.
5. Using all resources.
6. Evaluating the effectiveness of one's ADM skills.

A: 223

… is decision-making in a unique environment—aviation.

It is a systematic approach to the mental process used by pilots to consistently determine the **best course of action in response to a given set of circumstances**. It is what a pilot intends to do ... The importance of learning and understanding effective ADM skills cannot be overemphasized.

While progress is continually being made in the advancement of pilot training methods, aircraft equipment and systems, and services for pilots, accidents still occur.

One factor remains the same: **the human factor which leads to errors**.

ADM is a systematic approach to **risk assessment** and **stress management.**

Q: 225 **Risk Management**	Q: 226 **Risk Management Illustrated:**
Q: 227 **Fundamental principles of risk management**	Q: 228 **Crew Resource Management (CRM) & Single-Pilot Resource Management**

A: 226

A: 225

…is to proactively identify safety-related hazards and mitigate the associated risks.

Risk management is an important component of ADM.

When a pilot follows good decision-making practices, the inherent risk in a flight is reduced or even eliminated.

The ability to make good decisions is based upon direct or indirect experience and education.

See illustration on risk management **process**

on next card ...

A: 228

Many CRM principles have been successfully applied to single-pilot aircraft and led to the development of **Single-Pilot Resource Management (SRM)**.

SRM is defined as the art and science of managing all the resources available to a single pilot (prior to and during flight) to ensure the successful outcome of the flight.

SRM includes the concepts of **ADM**, **risk management (RM)**, **task management (TM)**, **automation management (AM)**, **controlled flight into terrain (CFIT) awareness**, and **situational awareness (SA)**.

A: 227

As you work through the ADM cycle, it is important to remember the four fundamental principles of risk management. **Accept no unnecessary risk**.

1. Flying is not possible without risk, but unnecessary risk comes without a corresponding return.

2. Make risk decisions at the appropriate level. Risk decisions should be made by the person who can develop and implement risk controls.

3. Accept risk when benefits outweigh dangers (costs).

4. Integrate risk management into planning at all levels. Because risk is an unavoidable part of every flight, safety requires the use of appropriate and effective risk management not just in the preflight planning stage, but in all stages of the flight.

While poor decision-making in everyday life does not always lead to tragedy, the **margin for error in aviation is thin.** All pilots should become familiar with and employ ADM.

Q: 229 **Hazard and Risk**	Q: 230 ***Hazardous Attitudes and Antidotes***
Q: 231 **Hazards - Thoughts - Antidotes**	Q: 232 **Anti-Authority**

A: 230

Attitude is a motivational predisposition to respond to:

- people,
- situations, or
- events in a given manner.

Studies have identified **five hazardous attitudes** that can interfere with the ability to make sound decisions and exercise authority properly (likely on the part 107 test):

- **anti-authority**
- **impulsivity**
- **invulnerability**
- **macho**
- **resignation**

A: 229

Two defining elements of ADM are **hazard** and **risk**.

Hazard is a real or perceived condition, event, or circumstance that a pilot encounters.

When faced with a **hazard**, the pilot makes an **assessment** of that hazard based upon various factors.

The pilot assigns a value to the potential impact of the hazard, which qualifies the pilot's assessment of the hazard —**risk**.

Risk is an assessment of the single or cumulative hazard facing a pilot; however, different pilots see hazards differently.

A: 232

"Don't Tell Me."

This atitude is found in people who do not like anyone telling them what to do. In a sense, they are saying, "**no one can tell me what to do**." They may be resentful of having someone tell them what to do, or may regard rules, regulations, and procedures, as silly or unnecessary. However, it is always your prerogative to question authority if you feel it is in error.

Antidote:

Follow the rules. They are usually right.

A: 231

Recognition of hazardous thoughts is the first step toward neutralizing them.

After recognizing a thought as hazardous, the pilot should label it as hazardous, then state the corresponding antidote.

Antidotes should be memorized for each of the hazardous attitudes so they automatically come to mind when needed.

Q: 233 **Impulsivity**	Q: 234 **Invulnerability**
Q: 235 **Macho (Machismo)**	Q: 236 **Resignation**

A: 234

“It won’t happen to me.”

Many people falsely believe that accidents happen to others, but never to them. They no accidents can happen, and they know that anyone can be affected. However, they never really feel or believe that they will be personally involved. Pilots who think this way are more likely to take chances and increase risk

Antidote:

It Could happen to me

A: 233

“Do it quickly.”

This is the attitude of people who frequently feel the need to do something, anything, immediately. They do not stop to think about what they are about to do, they do not select the best alternative, and they **do** the first thing that comes to mind.

Antidote:

Not so fast. Think First.

A: 236

“What’s the use?”

Pilots who think: “**What’s the use?**” do not see themselves as being able to make a great deal of difference in what happens to them. When things go well, the pilot is apt to think that it is good luck. When things go badly, the pilot may feel that someone is out to get them or attribute it to bad luck. The pilot will leave the action to others, for better or worse. Sometimes, such pilots will even go along with the unreasonable request just to be a "nice guy.”

Antidote:

I’m not helpless. I can make a difference.

A: 235

“I can do it.”

Pilots who are always trying to prove that they are better than anyone else think, "**I can do it – I'll show them.**” Pilots with this type of attitude will try to prove themselves by taking risks in order to impress others. While this pattern is thought to be a male characteristic, women are equally susceptible.

Antidote:

Taking chances is foolish

Q: 237 ***Assessing Risk***	Q: 238 ***Mitigating Risk (card 1 of 2)***
Q: 239 ***Mitigating Risk (card 2 of 2)***	Q: 240 ***The PAVE Checklist***

A: 238

One of the best ways single pilots can mitigate risk is to use the **IMSAFE** checklist to determine physical and mental readiness for flying:

1. **I**llness—Am I sick? Illness is an obvious pilot risk.

2. **M**edication—Am I taking any medicines that might affect my judgment or make me drowsy?

3. **S**tress—Am I under psychological pressure from the job? Do I have money, health, or family problems? Stress causes concentration and performance problems. While the regulations list medical conditions that require grounding, stress is not among them. The pilot should consider the effects of stress on performance.

A: 237

For the single pilot, assessing risk is not as simple as it sounds. For example, the pilot acts as his or her own quality control in making decisions. If a **fatigued** pilot who has flown 16 hours is asked if he or she is too tired to continue flying, the answer may be “no.”

Study guide examples include emergency services (ES) helicopter pilots and make flight decisions that ... add weight to intangible factors (the patient in this case) and fail to appropriately quantify actual hazards, such as fatigue or weather, when making flight decisions.

Added Note: **Drone PICs** need to assess themselves, the location, weather conditions, etc., in ways seemingly different from what aircraft pilots must consider when assessing risk.

A: 240

Another way to mitigate risk is to perceive hazards. By incorporating the **PAVE** checklist into **preflight planning**, the pilot divides the risks of flight into four categories:

Pilot-in-command (PIC),

Aircraft,

en**V**ironment, and

External pressures

(PAVE) which form part of a pilot’s decision-making process.

Pilot, **A**ircraft, en**V**irnoment, **E**xternal pressures

A: 239

4. **A**lcohol—Have I been drinking within 8 hours? Within 24 hours? As little as one ounce of liquor, one bottle of beer, or four ounces of wine can impair flying skills. Alcohol also renders a pilot more susceptible to disorientation and hypoxia.

5. **F**atigue—Am I tired and not adequately rested? Fatigue continues to be one of the most insidious hazards to flight safety, as it may not be apparent to a pilot until serious errors are made.

6. **E**motion—Am I emotionally upset?

Illness, **M**edication, **S**tress, **A**lcohol, **F**atigue, **E**motion

"I am safe"

Q: 241 ***P = Pilot-in-Command (PIC)***	Q: 242 ***A = Aircraft***
Q: 243 ***V = EnVironment Weather***	Q: 244 **EnVironment**

A: 242

What limitations will the aircraft impose upon the trip? Ask the following questions:

- Is this the right aircraft for the flight?
- Am I familiar with and current in this aircraft?
- Can this aircraft carry the planned load?

Added Note: Drones are (sometimes) rated differently to handle wind velocities (and this would be important in making a decsion to fly with a particular model drone). Takeof and landing is best in lighter wind conditions.

A: 241

The pilot is one of the risk factors in a flight. The pilot must ask, “Am I ready for this flight?” in terms of experience, recency, currency, physical, and emotional condition.

The **IMSAFE** checklist provides the answers.

A: 244

Terrain

Evaluation of terrain is another important component of analyzing the flight environment.

Airspace

Check the airspace and any **temporary flight restriction (TFRs)**.

A: 243

Weather is a major environmental consideration.

Earlier it was suggested pilots set their own personal minimums, especially when it comes to weather. As pilots evaluate the weather for a particular flight, they should consider the following:

- What is the current ceiling and visibility?
- Consider the possibility that the weather may be different than forecast.
- Are there any thunderstorms present or forecast?
- If there are clouds, is there any icing, current or forecast?

What is the temperature/dew point spread and the current temperature at altitude?

Q: 245 ***E = External Pressures***	Q: 246 ***Managing External Pressures***
Q: 247 **Human Factors**	Q: 248 ***Single-Pilot Resource Management (SRM)***

A: 246

Management of external pressure is the **single most important key to risk management** because it is the one risk factor category that can cause a pilot to ignore all the other risk factors.

The use of **personal standard operating procedures (SOPs)** is one way to manage external pressures.

The **goal** is to supply a release for the external pressures of a flight.

A: 245

External pressures are **influences external to the flight** that create a sense of pressure to complete a flight—often at the expense of safety.

Factors that can be external pressures include the following:

• The desire to demonstrate pilot qualifications

• The desire to impress someone (Probably the two most dangerous words in aviation are "Watch this!")

• The pilot's general goal-completion orientation

• Emotional pressure associated with acknowledging that skill and experience levels may be lower than a pilot would like them to be. Pride can be a powerful external factor!

A: 248

Single-Pilot Resource Management (SRM) is about how to **gather information**, **analyze** it, and **make decisions**. Learning how to identify problems, analyze the information, and make informed and timely decisions is not as straightforward as the training involved in learning specific maneuvers.

Perceive, Process, Perform (3P) Model

The **Perceive, Process, Perform (3P)** model for **ADM** offers a simple, practical, and systematic approach that can be used during all phases of flight. To use it, the pilot will:

• **Perceive** the given set of circumstances for a flight

• **Process** by evaluating their impact on flight safety

• **Perform** by implementing the best course of action

A: 247

Fatigue, complacency, and stress, along with many others, are called **human factors**.

Human factors directly cause or contribute to many aviation accidents and have been documented as a primary contributor to **more than 70 percent of aircraft accidents**.

… FAA has made the study and research of human factors a top priority by working closely with engineers, pilots, mechanics, and ATC to apply the latest knowledge about human factors in an effort to help operators and maintainers improve safety and efficiency in their daily operations.

The entire aviation community benefits greatly from human factors research and development as it helps better understand how humans can most safely and efficiently perform their jobs and improve the tools and systems in which they interact. (systems are listed on page 56)

Q: 249 **Risk management processing** can take place in any of three timeframes.	Q: 250 **Checklists**
Q: 251 ***PAVE Checklist: Identify Hazards and Personal Minimums***	Q: 252 **Decision-Making in a Dynamic Environment**

A: 250

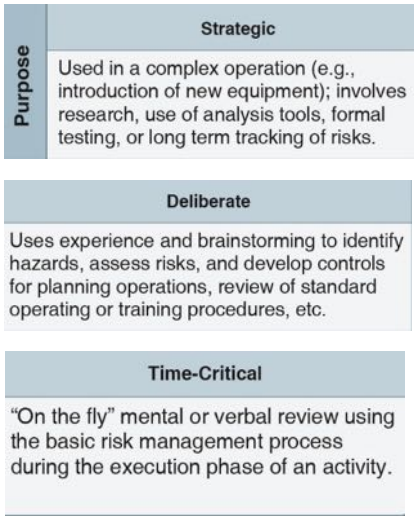
The six steps of risk management can be combined into an easy-to-remember **3P model** for practical risk management: **Perceive, Process, Perform** with the PAVE, CARE and TEAM checklists.

Pilots can help perceive hazards by using the **PAVE** checklist of: **Pilot, Aircraft, enVironment, and External pressures**.

They can process hazards by using the **CARE** checklist of: **Consequences, Alternatives, Reality, External factors**.

Finally, pilots can perform risk management by using the **TEAM** choice list of: **Transfer, Eliminate, Accept, or Mitigate**.

A: 249



A: 252

A solid approach to decision-making is through the use of analytical models, such as the **5 Ps** [not in Study Guide], **3P**, and **DECIDE** [see next card].

Good decisions result when pilots gather all available information, review it, analyze the options, rate the options, select a course of action, and evaluate that course of action for correctness

A: 251

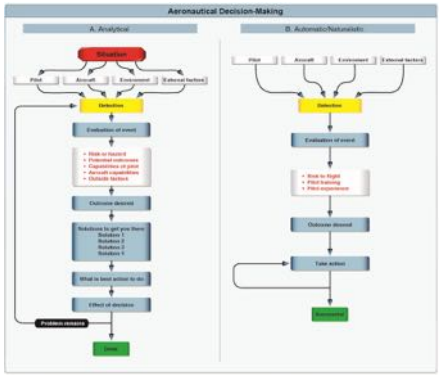
Examples on Study Guide page 58 look at a pilot scenario.

All four [PAVE] elements combine and interact to create a unique situation for any flight. {**Aircraft Pilots** are asked to] Pay special attention to the pilot-aircraft combination, and consider whether the combined "pilot-aircraft team" is capable of the mission you want to fly.

Added Note: The approach and perspectives may differ for a s**UAS** pilot but it is worth a moment to consider how each topical area relates to drone / UA PIC and flight.

Q: 253 **The DECIDE model**	Q: 254 **Aeronautical Decision Making** (flow chart page 60)
Q: 255 ***Automatic Decision-Making***	Q: 256 ***Operational Pitfalls***

A: 254



A: 253

1. **Detect**. The decision maker detects the fact that change has occurred.
2. **Estimate**. The decision maker estimates the need to counter or react to the change.
3. **Choose**. The decision maker chooses a desirable outcome (in terms of success) for the flight.
4. **Identify**. The decision maker identifies actions which could successfully control the change.
5. **Do**. The decision maker takes the necessary action.
6. **Evaluate**. The decision maker evaluates the effects of his/her action countering the change.

A: 256

Although more experienced pilots are likely to make more automatic decisions, there are tendencies or **operational pitfalls** that come with the development of pilot experience. These are classic behavioral traps into which pilots have been known to fall. More experienced pilots, as a rule, try to complete a flight as planned. The desire to meet these goals can have an adverse effect on safety and contribute to an unrealistic assessment of piloting skills. These dangerous tendencies or behavior patterns, which must be identified and eliminated, include the operational pitfalls shown in *Figure 10-6.*

The figure is on page 62 and a list of figure topics appears on the next card

A: 255

- For the past several decades, research into how people actually make decisions has revealed that when pressed for time, experts faced with a task loaded with uncertainty first assess whether the situation strikes them as familiar.
- Rather than comparing the pros and cons of different approaches, they quickly imagine how one or a few possible courses of action in such situations will play out.
- Experts take the first workable option they can find. While it may not be the best of all possible choices, it often yields remarkably good results.

Q: 257 **Operational Pitfalls (list)**	Q: 258 ***Stress Management***
Q: 259 **Situational Awareness**	Q: 260 ***Workload Management***

A: 258

Everyone is stressed to some degree almost all of the time. A certain amount of stress is good since it keeps a person alert and prevents complacency. Effects of stress are cumulative and, if the pilot does not cope with them in an appropriate way, they can eventually add up to an intolerable burden.

Stressors

Environmental: Conditions associated with the environment, such as temperature and humidity extremes, noise, vibration, and lack of oxygen.

Physiological stress: Physical conditions, such as fatigue, lack of physical fitness, sleep, loss, missed meals (leading to low blood sugar levels), and illness.

Psychological stress: Social or emotional factors, such as a death in the family, a divorce, a sick child, or a demotion at work. This type of stress may also be related to mental work load, such as analyzing a problem, navigating an aircraft, or making decisions.

A: 257

Peer Pressure

Mindset

Get-there-itis

Duck-under syndrome

Scud running

Continuous visual flight rules (VFR) into instrument conditions

Getting behind the aircraft

Loss of positional or situational awareness

Operating without adequate fuel reserves

Descent below the minimum en route altitude

Flying outside the envelope

Neglect of flight planing, preflight inspections, and checklists

Each topic comes with brief explanation

A: 260

Effective workload management ensures essential operations are accomplished by planning, prioritizing, and sequencing tasks to **avoid work overload**.

In addition, a pilot should listen to **Automated Terminal Information Service (ATIS)**, **Automated Surface Observing System (ASOS),** or **Automated Weather Observing System (AWOS)**, if available, and then monitor the tower frequency or **Common Traffic Advisory Frequency (CTAF)** to get a good idea of what traffic conditions to expect.

When a work overload situation exists, a pilot needs to **stop, think, slow down, and prioritize**. It is important to understand how to decrease workload.

A: 259

Situational awareness is the **accurate perception and understanding of all the factors and conditions** within the **five fundamental risk elements** (**flight, pilot, aircraft, environment, and type of operation** that comprise any given aviation situation) that affect safety before, during, and after the flight.

Maintaining situational awareness requires an understanding of the relative significance of all flight related factors and their future impact on the flight.

When a pilot understands what is going on and has an overview of the total operation, he or she is not fixated on one perceived significant factor.

Not only is it important for a pilot to know the aircraft's geographical location, it is also important he or she understand what is happening.

Q: 261 **Chapter 11: Airport Operations**	Q: 262 **Types of Airports**
Q: 263 ***Towered Airport***	Q: 264 ***Non-towered Airport***

A: 262

There are two types of airports:

Towered and **Non-towered**.

These types can be further subdivided to:

• **Civil Airports**—airports that are open to the general public.

• **Military/Federal Government airports**—airports operated by the military, National Aeronautics and Space Administration (NASA), or other agencies of the Federal Government.

• **Private Airports**—airports designated for private or restricted use only, not open to the general public.

A: 261

- **Introduction**
- **Types of Airports**
- **Sources for Airport Data**
- **Latitude and Longitude (Meridians and Parallels)**

A: 264

A non-towered airport does not have an operating control tower.

Two-way radio communications are not required, although it is a good operating practice for pilots to monitor other aircraft on the specified frequency for the benefit of other traffic in the area.

The **key to monitoring traffic** at an airport without an operating control tower is selection of the correct common frequency. The acronym **CTAF**, which stands for **Common Traffic Advisory Frequency**, is synonymous with this program … purpose of carrying out airport advisory practices while operating to or from an airport without an operating control tower.

A: 263

A towered airport has an operating control tower.

Air traffic control (ATC) is responsible for providing the safe, orderly, and expeditious flow of air traffic at airports where the type of operations and/or volume of traffic requires such a service.

Q: 265	Q: 266
Aircraft approach to non-towered field ...	**Sources for Airport Data**
Q: 267	Q: 268
Chart Supplement U.S. (formerly Airport/Facility Directory)	***Notices to Airmen (NOTAM)***

A: 266

When a remote pilot operates in the vicinity of an airport, it is important to review the current data for that airport. This data provides the pilot with information, such as communication frequencies, services available, closed runways, or airport construction. Three common sources of information are:

- **Aeronautical Charts**
- **Chart Supplement U.S. (formerly Airport/Facility Directory)**
- **Notices to Airmen (NOTAMs)**
- **Automated Terminal Information Service (ATIS)**

Added Note: the link to digital Chart Supplements appears on another card along with an example portion of a supplement.

A: 265

Non-towered airport traffic patterns are always entered at pattern altitude.

How you enter the pattern **depends upon the direction of arrival**.

The preferred method for entering from the downwind side of the pattern is to approach the pattern on a course 45 degrees to the downwind leg and join the pattern at midfield.

(Added Note - Visualize this before taking the test: Airplane pilots sit on left side and flying downwind typically look left to see the landing field ... thus the plane would be flying to the right of the landing strip; then turn left to land the plane (in upwind direction))

A: 268

Time-critical aeronautical information, which is of a temporary nature or not sufficiently known in advance to permit publication, on aeronautical charts or in other operational publications, that receives immediate dissemination by the NOTAM system. The NOTAM information could affect your decision to make the flight.

Added Note: As noted previously, a NOTAM may not have an expiration date and may prevent drone flights in specified areas.

A: 267

The **Chart Supplement U.S.** (formerly Airport/Facility Directory) provides the most comprehensive information on a given airport.

It contains information on airports, heliports, and seaplane bases that are open to the public.

The Chart Supplement U.S. is published in **seven books**, which are organized by regions and are **revised every 56 days**

Note: An example chart appears in the Airman Knowledge Testing Supplement document

Q: 269 ***Automated Terminal Information Service (ATIS)***	Q: 270 ***Aeronautical Charts***
Q: 271 ***Sectional Charts***	Q: 272 **Best Approach to Study Sectional Charts**

A: 270

An aeronautical chart is the road map for a pilot.

The chart provides information that allows remote pilots to obtain information about the areas where they intend to operate.

The two aeronautical charts used by VFR pilots are:

- **Sectional**
- **VFR Terminal Area**

A listing of aeronautical charts can be found at:

https://www.faa.gov/air_traffic/flight_info/aeronav/productcatalo

A: 269

The **ATIS** is a **recording** of the **local weather conditions and other pertinent non-control information** broadcast on a local frequency in a looped format. It is normally **updated once per hour** but is updated **more often** when changing local conditions warrant.

Important information is broadcast on ATIS including weather, runways in use, specific ATC procedures, and any airport construction activity that could affect taxi planning.

When the ATIS is recorded, it is **given a code**. This code is changed with every ATIS update. For example, ATIS **Alpha** is replaced by ATIS **Bravo**. The next hour, ATIS **Charlie** is recorded, followed by ATIS Delta and progresses down the alphabet.

A: 272

Reading the note cards is great, but watching instructional videos on how to use a Sectional Chart and answering test questions is really a Must Do!

The next card contains a set of links to some YouTube videos … just examples, you might find others using a search on YouTube.

Seeing the chart image and hearing an instructor is the optimal way to prepare for questions on the Part 107 test.

Example Test Questions referring to sectional charts are included in the flashcard file: "Part 107 Example Questions"

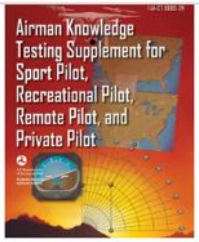
A: 271

... are the most common charts used by pilots today. The charts have a scale of 1:500,000 (1 inch = 6.86 nautical miles (NM) or approximately 8 statute miles (SM)), which allows for more detailed information to be included on the chart.

IMPORTANT: Part 107 Test will require you to answer questions when looking at a Sectional Chart.

You will be given a copy of a supplement book that contains the charts … **you can download a PDF of the document here**:

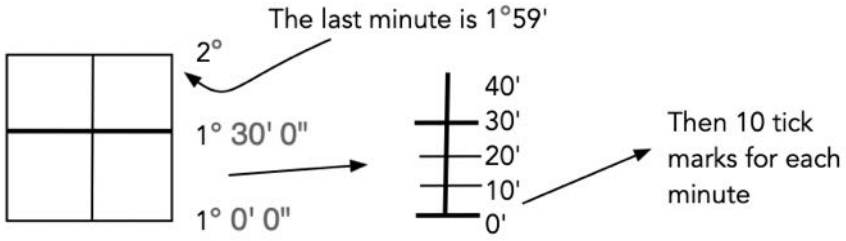
https://www.faa.gov/sites/faa.gov/files/training_testing/testing/supplements/sport_rec_priva



Q: 273 **Section Chart Grids** (degrees, minutes, seconds)	Q: 274 **Diagram depicting tick marks on example latitude grid**
Q: 275 **Example Chart:**	Q: 276 **YouTube Video Links for Sectional Chart learning:**

A: 274

The square on left below covers **one degree** in each direction. Each has a degree has a midway 30 minute line. If you start at 1 degree there will be 60 minute units up to the next degree. When taking a test you will need to be able to figure out where degree and minute numbers align.



A: 273

You will need to know how to interpret the **latitude** grid going North and the **longitude** going West on the test charts (for questions on the FAA test!).

For example: Latitude lines are equidistant from one another. One degree of latitude is divided into 60 minutes (‘). A minute of latitude is 1.15 miles or 1 nautical mile.

Example: 27° 12’ 28” N

degrees, minutes, seconds

North (+) or South (-)

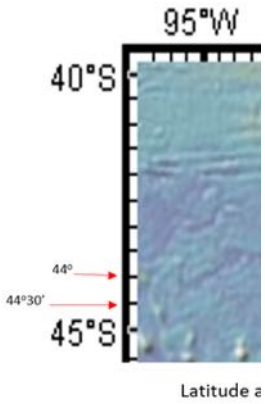
A: 276

1) https://www.youtube.com/watch?v=-6bJdn5FlMQ
2) https://www.youtube.com/watch?v=X332nZgVYh4
3) https://www.youtube.com/watch?v=21b9hODOhGc
4) https://www.youtube.com/watch?v=m0WYsgBnkjE
5) https://www.youtube.com/watch?v=eI0Z-G2VHH8
6) https://www.youtube.com/watch?v=razDbDdBTyQ
7) https://www.youtube.com/watch?v=Sr1FMwUF6kI

These are just a sampling of videos online ...

To find other videos try doing your own web search inside YouTube for ‘section chart’ or ‘sectional chart’ or Part 107 charts ...

A: 275



This image simply reveals main degree marker and the midway 30 minute mark (i.e., 30’). This example is South of the Equator.

If you were to blow up the diagram then you would see smaller tick marks for each ten minutes and then smaller tick marks for each minute.

Generally, seconds per minute are less often referred to or illustrated on an FAA test.

Illustration credit: https://datalab.marine.rutgers.edu/ooi-lab-exercises/lab-1-the-collection-of-oceanographic-data/lab-1-3/#:~:text=Latitude%20lines%20are%20equidistant%20from,miles%20or%201%20

Q: 277 **Sectional Chart Description**	Q: 278 **Sectional Chart (example image)**
Q: 279 **Latitude and Longitude (Meridians and Parallels)**	Q: 280 **Parallels and Meridians**

A: 278

A: 277

The charts provide an abundance of information, including airport data, navigational aids, airspace, and topography. *Figure 11-2 [see image on next card]* is an excerpt from the legend of a sectional chart.

By referring to the chart legend, a pilot can interpret most of the information on the chart. A pilot should also check the chart for other legend information, which includes air traffic control (ATC) frequencies and information on airspace.

These charts are **revised semiannually** except for some areas outside the conterminous United States where they are revised annually.

A: 280

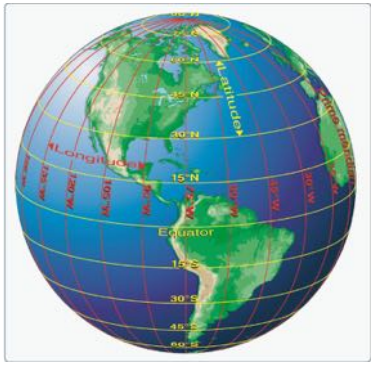
Circles parallel to the equator (lines running east and west) are **parallels** of latitude.

They are used to measure degrees of latitude north (N) or south (S) of the equator. The angular distance from the equator to the pole is one-fourth of a circle or 90°. The 48 conterminous states of the **United States are located between 25° and 49° N latitude**.

Meridians of longitude are drawn from the North Pole to the South Pole and are at right angles to the Equator. The "**Prime Meridian**," which passes through **Greenwich, England,** is used as the zero line from which measurements are made in degrees east (E) and west (W) to 180°.

The 48 conterminous states of the United States are between **67° and 125° W longitude**

A: 279



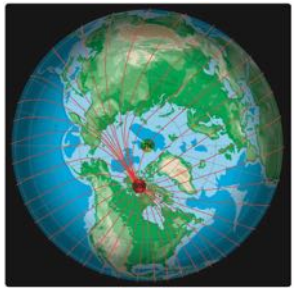
Be aware that the yellow lines look like **rungs on a ladder** and those are **Latitudes** marked on the globe.

The red lines going from **north to south pole** are **Longitude** (like "Long Lines!").

The equator is an imaginary circle equidistant from the poles of the Earth.

Q: 281 ***Variation***	Q: 282 **Magnetic Pole / True North**
Q: 283 **When viewing a Sectional Chart**	Q: 284 **Antenna Towers**

A: 282

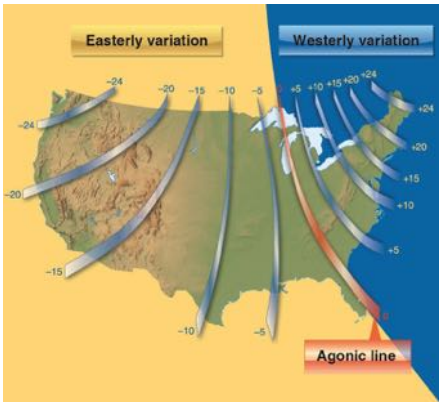


If the Earth were uniformly magnetized, the compass needle would point toward the **magnetic pole** … which is the dark circle in this diagram!

The gray dot in the center is **True North** (TN)

A: 281

Variation is the angle between **true north (TN)** and **magnetic north (MN)**. It is expressed as east variation or west variation depending upon whether MN is to the east or west of TN.



A: 284

Extreme caution should be exercised when flying less than **2,000** feet AGL because of numerous skeletal structures, such as radio and television antenna towers, that exceed **1,000** feet AGL with some very difficult to see in good weather and can be invisible at dusk or during periods of reduced visibility.

Wires can extend about **1,500** feet horizontally from a structure; therefore, all skeletal structures should be avoided horizontally by at least 2,000 feet. Additionally, new towers may not be on your current chart because the information was not received prior to the printing of the chart.

A: 283

Actually, the Earth is not uniformly magnetized. In the United States, the needle usually points in the general direction of the magnetic pole, but it may **vary in certain geographical localities by many degrees**. Consequently, the exact amount of variation at thousands of selected locations in the United States has been carefully determined.

NOTE: Pay attention when looking at a chart you may see ...

The amount and the direction of variation, which change slightly from time to time, are shown on most aeronautical charts as broken magenta lines called isogonic lines that connect points of equal magnetic variation.

Q: 285 **Additional Study Info:** Certified RPIC and Registration Required for UAS	Q: 286 **Additional Study Info:** **14 CFR Part D** covers the following:
Q: 287 **Additional Study Info:** Full Category Descriptions	Q: 288 **Additional Study Info:** Directional heading of aircraft

A: 286

Simply for awareness … here is the listing for … **14 CFR Subpart D - Operations Over Human Beings**

1. § 107.100 Applicability.
2. § 107.105 Limitations on operations over human beings.
3. § 107.110 Category 1 operations.
4. § 107.115 Category 2 operations: Operating requirements.
5. § 107.120 Category 2 operations: Eligibility of small unmanned aircraft and other applicant requirements.
6. § 107.125 Category 3 operations: Operating requirements.
7. § 107.130 Category 3 operations: Eligibility of small unmanned aircraft and other applicant requirements.
8. § 107.135 Labeling by remote pilot in command for Category 2 and 3 operations.
9. § 107.140 Category 4 operations.
10. § 107.145 Operations over moving vehicles.
11. § 107.150 Variable mode and variable configuration of small unmanned aircraft systems.
12. § 107.155 Means of compliance.
13. § 107.160 Declaration of compliance.
14. § 107.165 Record retention.

See below for more details on this topic

A: 285

While it is common to understand a sUAS need only be registered if 0.55 to 55 pounds (pre-2020 policy; for recreational use) if you visit the following FAA web page at:

https://www.faa.gov/uas/getting_started

FAA states regarding Certified Remote Pilot:

- If you fly for commercial, government, or any other non-recreational purposes you must:
  - Learn the regulations for certificated remote pilots
  - Become a certificated remote pilot
  - **Register <u>all</u> drones less than 55 pounds at FAA DroneZone**

A: 288

The FAA Study Guide does not seem focus on '**true course**' of '**ground track**.' Both would indicate something about direction of the aircraft ...

Looking for some intended meanings online: from Wikipedia "In air navigation, ground tracks typically approximate an arc of a great circle, this being the shortest distance between two points on the Earth's surface. In order to follow a specified ground track, a pilot must adjust their heading in order to compensate for the effect of wind. Aircraft routes are planned to avoid restricted airspace and dangerous areas, and to pass near navigation beacons."

"In navigation, the **course** of a watercraft or aircraft is the cardinal direction in which the craft is to be steered. The course is to be distinguished from the *heading*, which is the direction where the watercraft's bow or the aircraft's nose is pointed."

A: 287

The FAA published the following document in 2020:

Executive Summary Final Rule on Operation of Small Unmanned Aircraft Systems Over People

December 28, 2020

Which you can download here:

https://www.faa.gov/news/media/attachments/OOP_Executive_

While Category 4 seems most applicable to sUAS or UA without propeller guards, it may be worth a review of this document prior to taking the certification test.

See below for more details on this topic

Q: 289 **§ 107.29 Operation at night.**	Q: 290 **Operation at night**
Q: 291 **Operation at night - Added Considerations**	Q: 292 **Additional Study Info:** Subpart D - Operations Over Human Beings - **Category 1**

A: 290

No person may operate a small unmanned aircraft system during periods of civil twilight unless the small unmanned aircraft has lighted anti-collision lighting visible for at least 3 statute miles that has a flash rate sufficient to avoid a collision. The remote pilot in command may reduce the intensity of, but may not extinguish, the anti-collision lighting if he or she determines that, because of operating conditions, it would be in the interest of safety to do so.

Drone pilots operating under Part 107 may fly at night, over people and moving vehicles without a waiver as long as they meet the requirements defined in the rule.

A: 289

Except as provided in paragraph (d) of this section, no (Part 107) person may operate a small unmanned aircraft system at night unless—

(1) The remote pilot in command of the small unmanned aircraft has completed an **initial knowledge test** or **training**, as applicable, under § 107.65 after April 6, 2021; and

(2) The small unmanned aircraft has lighted **anti-collision lighting** visible for at least 3 statute miles that has a flash rate sufficient to avoid a collision. The remote pilot in command may reduce the intensity of, but may not extinguish, the anti-collision lighting if he or she determines that, because of operating conditions, it would be in the interest of safety to do so.

A: 292

Category 1 eligible small unmanned aircraft must weigh less than 0.55, including everything on board or otherwise attached, and contain **no exposed rotating parts** that would lacerate human skin. No FAA-accepted Means of Compliance (MOC) or Declaration of Compliance (DOC) required.

Operations Over People:

Small unmanned aircraft must weigh less than 0.55, including everything on board or otherwise attached, and contain no exposed rotating parts that would lacerate human skin. Remote pilots are prohibited from operating a small unmanned aircraft as a Category 1 operation in sustained flight over open-air assemblies unless the operation meets the requirements for standard remote identification or remote identification broadcast modules established in the Remote ID Final Rule.

From:
https://www.faa.gov/news/media/attachments/OOP_Executive_Summary.pdf

A: 291

Note: Additional considerations important to night flight include:

- Provide half an hour in darkness for eyes to adjust
- Use blue light while eyes are adjusted
- Pre-check a site in daytime to be aware of obstructions, topography, and help conduct a safe night flight
- Avoid any physical, optical, or medical stresses that may impact your PIC performance when conducting a night flight. Learn about night vision in relation to observing objects in view to avoid misinterpreting direction of motion (approaching or departing from your location, or the impression a stationary object is moving).

Q: 293 **Additional Study Info:** Subpart D - Operations Over Human Beings - **Category 2**	Q: 294 **Additional Study Info:** - Subpart D - Operations Over Human Beings - **Category 3**
Q: 295 **Additional Study Info:** Subpart D - Operations Over Human Beings - **Category 4**	Q: 296 **Additional Study Info:** Chart Supplements (part 1)

A: 294

Small unmanned aircraft must not cause injury to a human being that is equivalent to or greater than the severity of injury caused by a transfer of 25 foot-pounds of kinetic energy upon impact from a rigid object, does **not contain any exposed rotating parts** that could lacerate human skin upon impact with a human being, and does not contain any safety defects. Requires FAA-accepted means of compliance and FAA-accepted declaration of compliance.

Operations over people:

o Must not operate the small unmanned aircraft over open-air assemblies of human beings.

o May only operate the small unmanned aircraft above any human being if operation meets one of the following conditions:

 The operation is within or over a closed- or restricted-access site and all human beings located within the closed- or restricted-access site must be on notice that a small unmanned aircraft may fly over them

 The small unmanned aircraft does not maintain sustained flight over any human being unless that human being is directly participating in the operation of the small unmanned aircraft; or located under a covered structure or inside a stationary vehicle that can provide reasonable protection from a falling small unmanned aircraft.

From: https://www.faa.gov/news/media/attachments/OOP_Executive_Summary.pdf

A: 293

Small unmanned aircraft must not cause injury to a human being that is equivalent to or greater than the severity of injury caused by a transfer of 11 foot-pounds of kinetic energy upon impact from a rigid object, does **not contain any exposed rotating parts** that could lacerate human skin upon impact with a human being, and does not contain any safety defects. Requires FAA-accepted means of compliance and FAA-accepted declaration of compliance.

Operations Over People

Remote pilots are prohibited from operating a small unmanned aircraft as a Category 2 operation in sustained flight over open-air assemblies unless the operation meets the requirements for standard remote identification or remote identification broadcast modules established in the Remote ID Final Rule.

o Requires means of compliance and declaration of compliance by applicant.

From:
https://www.faa.gov/news/media/attachments/OOP_Executive_Summary.pdf

A: 296

If you want to **see a Chart Supplement** for an airport or a state-wide listing, go to the search page and provide input:

https://www.faa.gov/air_traffic/flight_info/aeronav/digital_produ

What the chart supplements include:

Chart Supplements are a listing of data on record with the FAA on all open-to-the-public airports, seaplane bases, heliports, military facilities and selected private use airports specifically requested by the Department of Defense (DOD) for which a DOD instrument approach procedure has been published in the U.S. Terminal Procedures Publication, airport sketches, NAVAIDs, communications data, weather data sources, airspace, special notices, VFR waypoints, Airport Diagrams and operational procedures.

A: 295

Small unmanned aircraft **must have an airworthiness certificate** issued under Part 21 of FAA regulations. Must be operated in accordance with the operating limitations specified in the approved Flight Manual or as otherwise specified by the Administrator. The operating limitations must not prohibit operations over human beings. Must have maintenance, preventive maintenance, alterations, or inspections performed in accordance with specific requirements in the final rule.

(Note: this wording seems contrary to what may appear on a certification test … where only participating flight crew members or protected persons (under cover) are allowable for over flight)

Operations over people:

- Must have an airworthiness certificate issued under part 21.
- Must be operated in accordance with the operating limitations specified in the approved Flight Manual or as otherwise specified by the Administrator. The operating limitations must not prohibit operations over human beings.
- Must have maintenance, preventive maintenance, alterations, or inspections performed in accordance with specific maintenance requirements detailed in the final rule.
- Remote pilots are prohibited from operating a small unmanned aircraft as a Category 4 operation in sustained flight over open-air assemblies unless the operation meets the requirements of standard remote identification or remote identification broadcast modules established in the Remote ID Final Rule.

From: https://www.faa.gov/news/media/attachments/OOP_Executive_Summary.pdf

Q: 297 **Additional Study Info:** Chart Supplements (part 2)	Q: 298 **Additional Flashcard Files**
Q: 299 **Additional Flashcards to study for the FAA test ...**	Q: 300 **Additional Flashcards to study for the FAA test ...**

A: 298

Other files to help prepare for the exam include:

1) Example test questions

2) Definitions of terms and abbreviations

3) Map legend and symbols

4) Part 107 Study Notes 2

These are available for you at the web page where you obtained this file at:

https://www.windowview.org/zfaa/

A: 297

Seven volumes cover the conterminous United States, Puerto Rico, and the Virgin Islands.

The supplements include data that cannot be readily depicted in graphic form; e.g., airport hours of operation, types of fuel available, runway data, lighting codes, etc.

The supplements are designed to be used in conjunction with charts and is published every 56 days. Volumes are side-bound 5 3/8 x 8 1/4 inches.

[Some online researching, in 2023, for this flashcard did not come up with Chart Supplements US as providing information for Restricted

See full information on chart supplements at:

https://www.faa.gov/air_traffic/flight_info/aeronav/productcatalo
###]

A: 300

Flashcards covering the following documents are located in "**Part 107 Study Notes 2**"

- AC 107-2 Small Unmanned Aircraft Systems (sUAS)
- AIM Aeronautical Information Manual
- FAA-H-8083-2 Risk Management Handbook
- FAA-H-8083-25 Pilot's Handbook of Aeronautical Knowledge
- SAFO 09013 Fighting Fires Caused By Lithium Type Batteries in Portable Electronic Devices
- SAFO 10015 Flying in the wire environment
- SAFO 10017 Risks in Transporting Lithium Batteries in Cargo by Aircraft
- SAFO 15010 Carriage of Spare Lithium Batteries in Carry-on and Checked Baggage

A: 299

Flashcards covering the following documents are located in "**Part 107 Study Notes 2**"

- 14 CFR part 47 Title Aircraft Registration
- 14 CFR part 48 Registration and Marking Requirements for Small Unmanned Aircraft Systems
- 4 CFR part 71 Designation of Class A, B, C, D and E Airspace Areas; Air Traffic Service Rotes; and Reporting Points
- 14 CFR part 107 Operation and Certification of Small Unmanned Aircraft Systems
- AC 00-6 Aviation Weather
- AC 150/5200-32 Reporting Wildlife Aircraft Strikes

(List continues next card)

Q: 301 **LAST CARD**	

	A: 301 **Yes**, this is the last card in the series that covers the text of the **FAA Study Guide**. As noted elsewhere, it will be important to watch a few videos about sectional charts. **Optionally**, review the content of the Airman Knowledge Testing Supplement for Sport Pilot, Recreational Pilot, Remote Pilot, and Private Pilot booklet (you can page through the PDF file). **And go through the example test questions!** The wording of questions may be a bit tricky … so when taking the test … read each question twice before looking at the multiple choice answers!