UAS Standards, Reg, Law & Exam

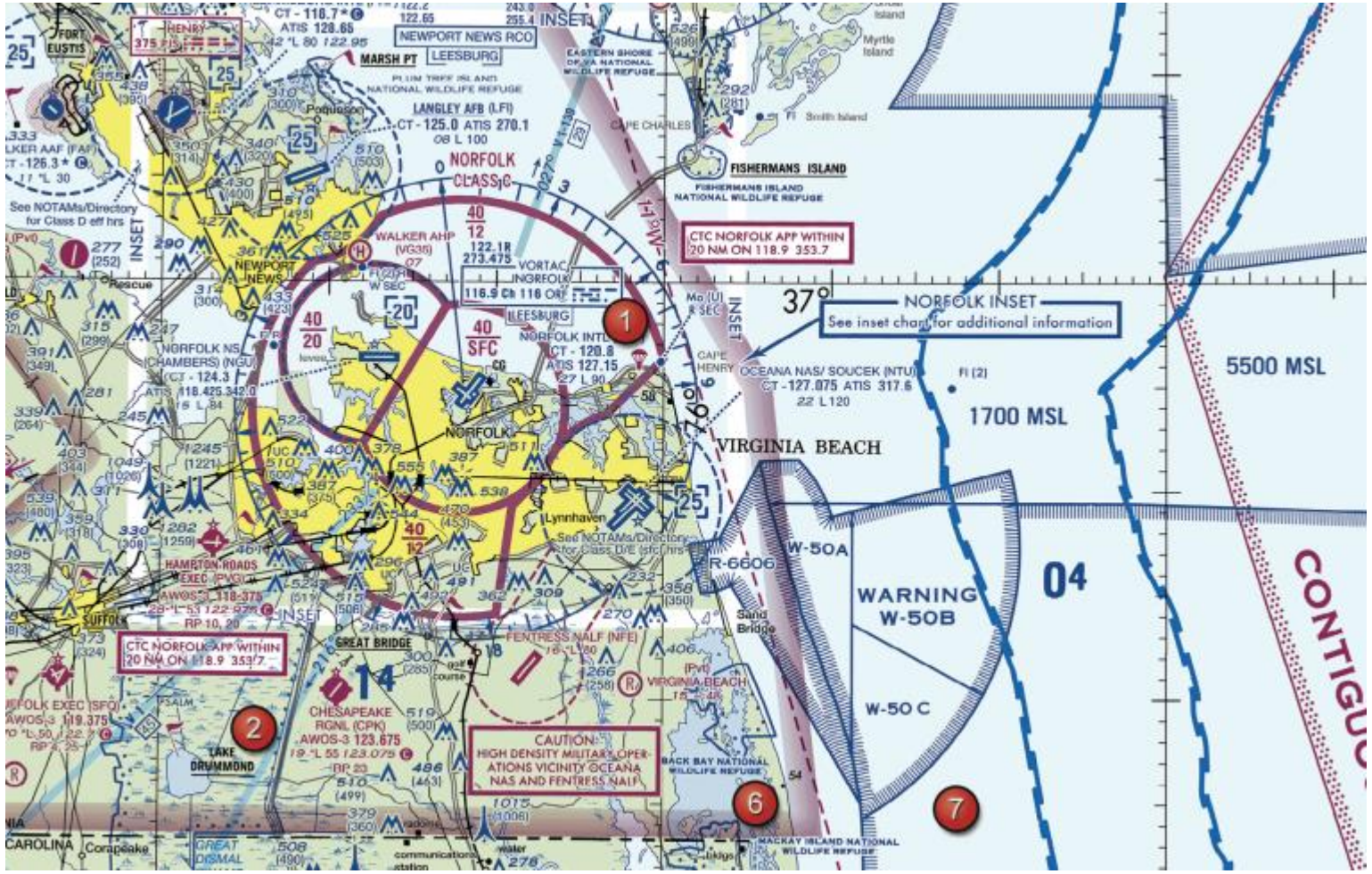
FAA Regulations: Part 107

Lesson 2a – Aeronautical Charts

Visual Flight Rules (VFR) Sectional Chart

- A Visual Flight Rules (VFR) Sectional Chart is like a road map. It shows geographical and manmade obstacles, certain airspace boundaries and lots of other important pieces of information in detail
- You need to know how to read a Sectional Chart because:
  - It is on the exam, guaranteed!
  - You need to know what is in the area where you will be flying

Example Aeronautical Chart

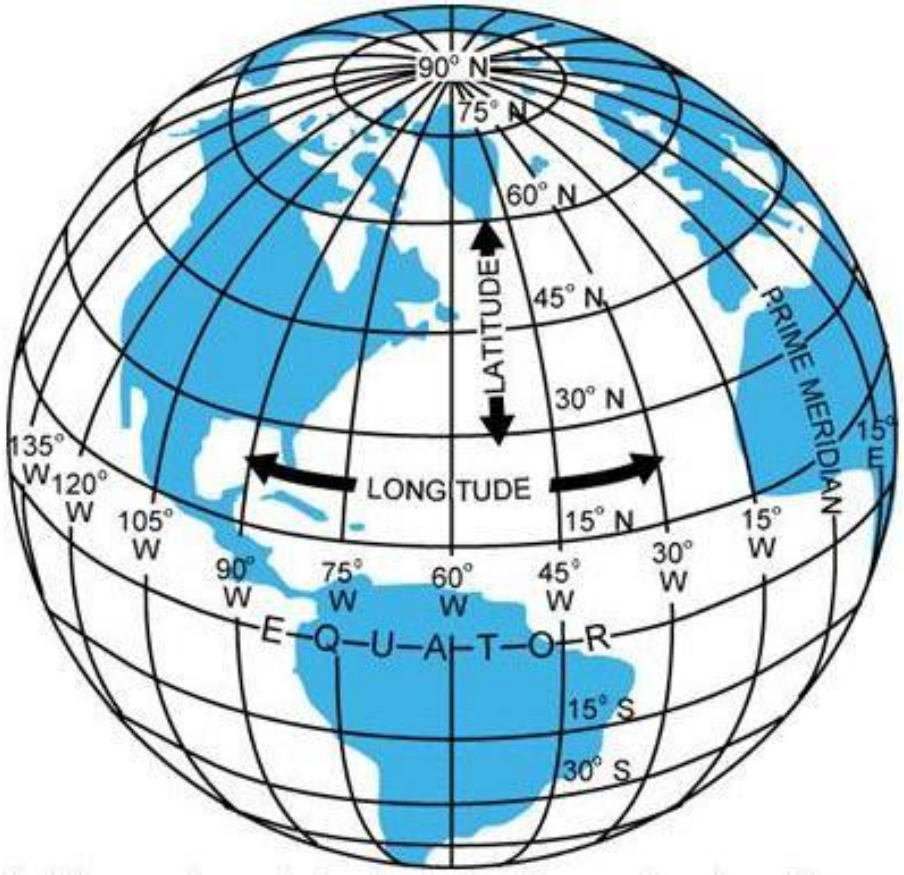


What will be on the Exam?

- Latitude & Longitude – you will need to know how to read geographic coordinates on the aeronautical chart; including how to find features on the chart by their coordinates
- Symbols – you will have to know how to read and interpret the various symbols on the aeronautical chart
- Legends – you will have to know how to read and interpret the various legends on the aeronautical chart
- During the exam, you will have access to the FAA Supplemental Charts *Airman Knowledge Testing Supplemental for Sport Pilot, Recreational Pilot, and Private Pilot* (FAA-CT-8080-2H)
- The first thing in the Supplemental Charts is the Sectional Legend. You will need to know how to read it to understand some of the questions on the exam; it is a valuable resource that you will want to review before taking the exam

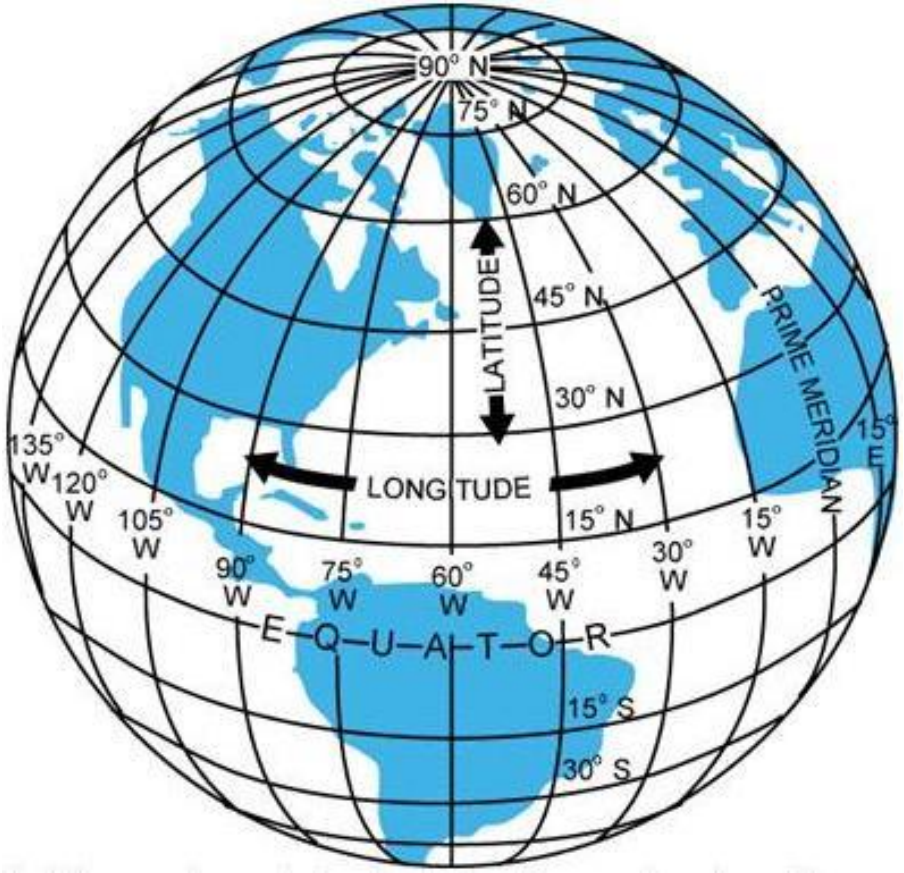
Geographic Coordinates: Latitude & Longitude

- The equator is an imaginary circle equidistant from the poles of the Earth
- Circles parallel to the equator (lines running east and west) are parallels of latitude and are used to measure degrees of latitude North (N) or South (S) of the equator from 0° to 90°
- The 48 conterminous states of the United States are located between 25° and 49° N latitude



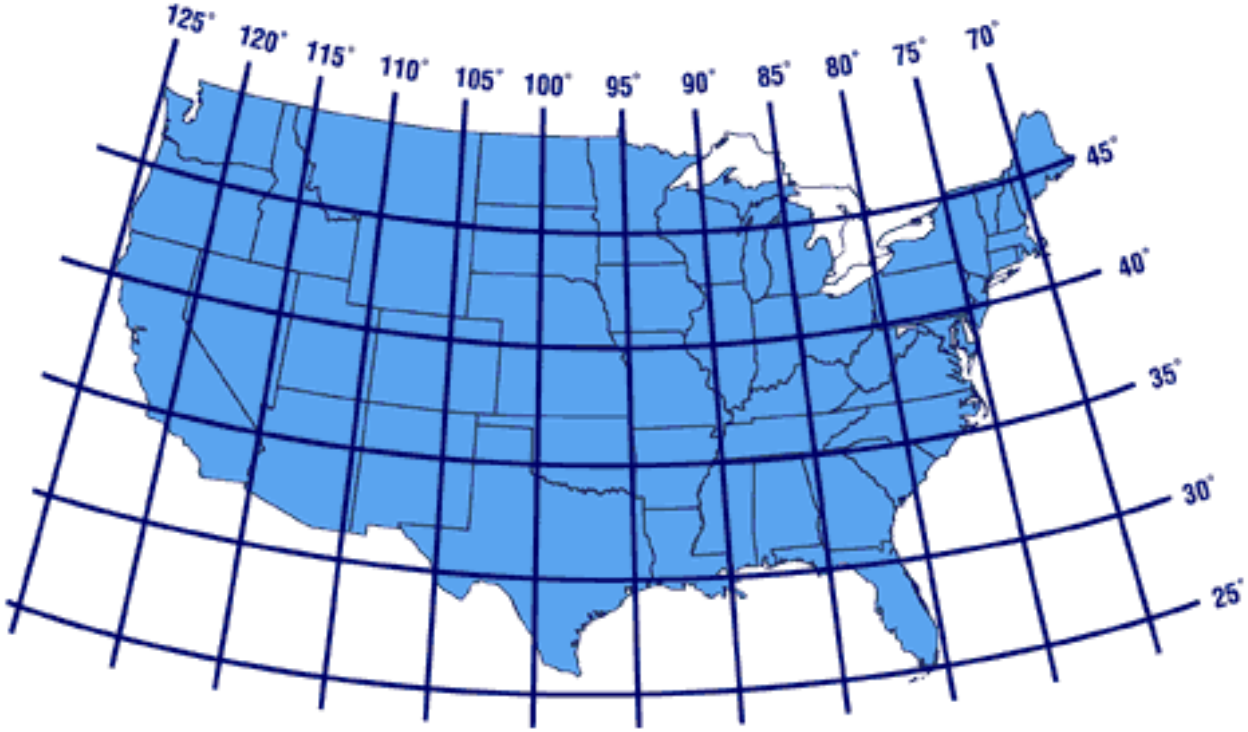
Geographic Coordinates: Latitude & Longitude

- Meridians of longitude are drawn from the North Pole to the South Pole and are at right angles to the Equator and converge at the poles
- The "Prime Meridian", which passes through Greenwich, England, is used as the zero line from which measurements are made in degree East (E) and West (W) to 180°
- The 48 conterminous states of the United States are located between 67° and 125° W longitude



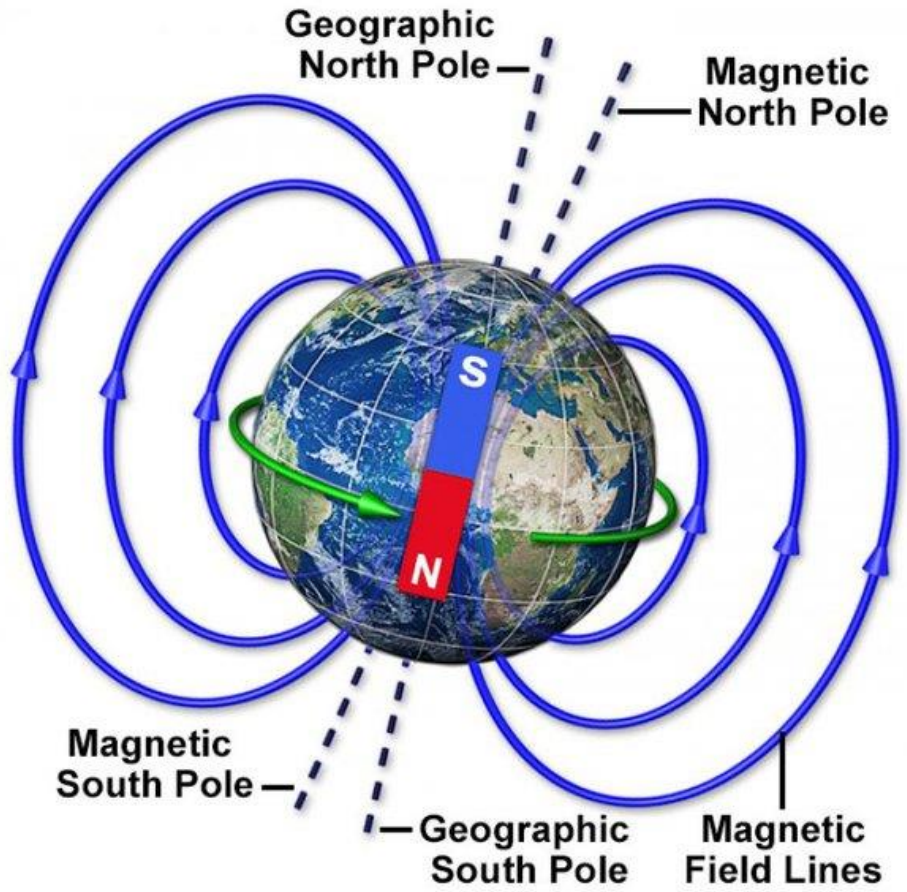
Latitude & Longitude on Aeronautical Charts

- Horizontal lines that run right and left (East and West) represent latitude
- Vertical lines that run up and down (North and South) represent longitude



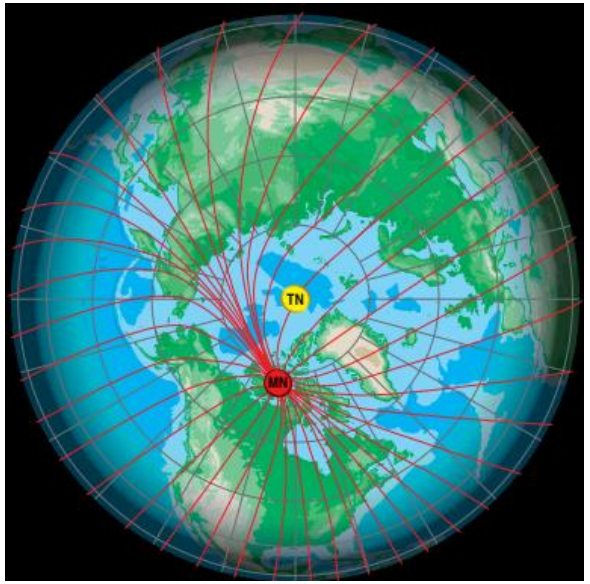
Magnetic Variation

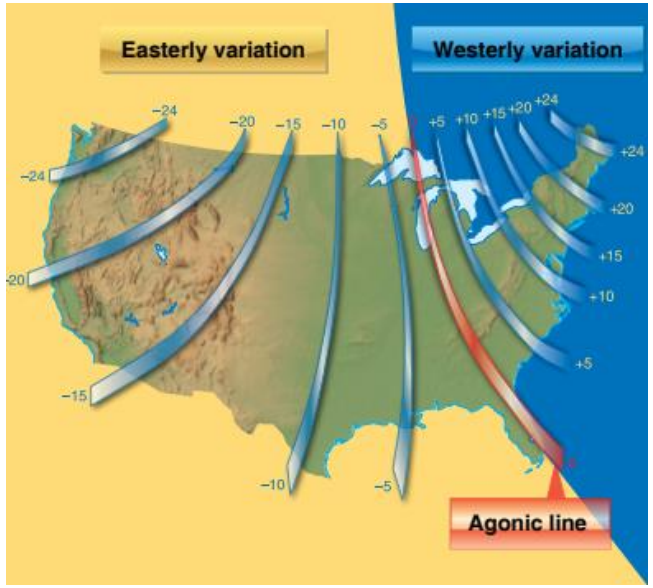
- Variation is the angle between the True North (TN) and Magnetic North (MN); it is expressed as East variation or West variation depending upon whether MN is to the East or West of TN
- The north magnetic pole is located close to 71°N latitude, 96°W longitude and is about 1,300 miles from the geographic or TN pole
- The variation of the magnetic field of the Earth from the North and South poles means that compasses seldom point to TN

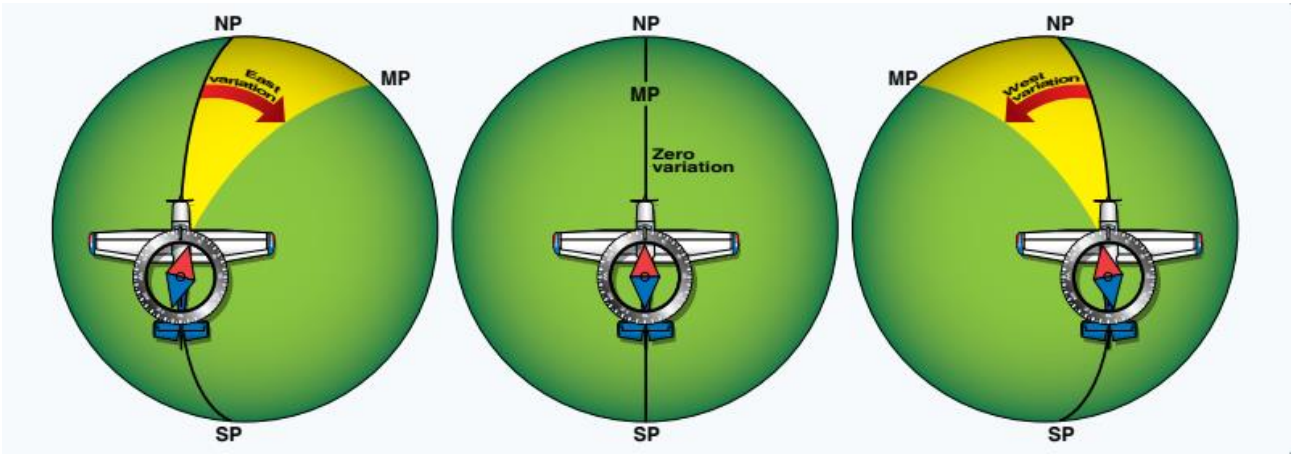


Magnetic Variation

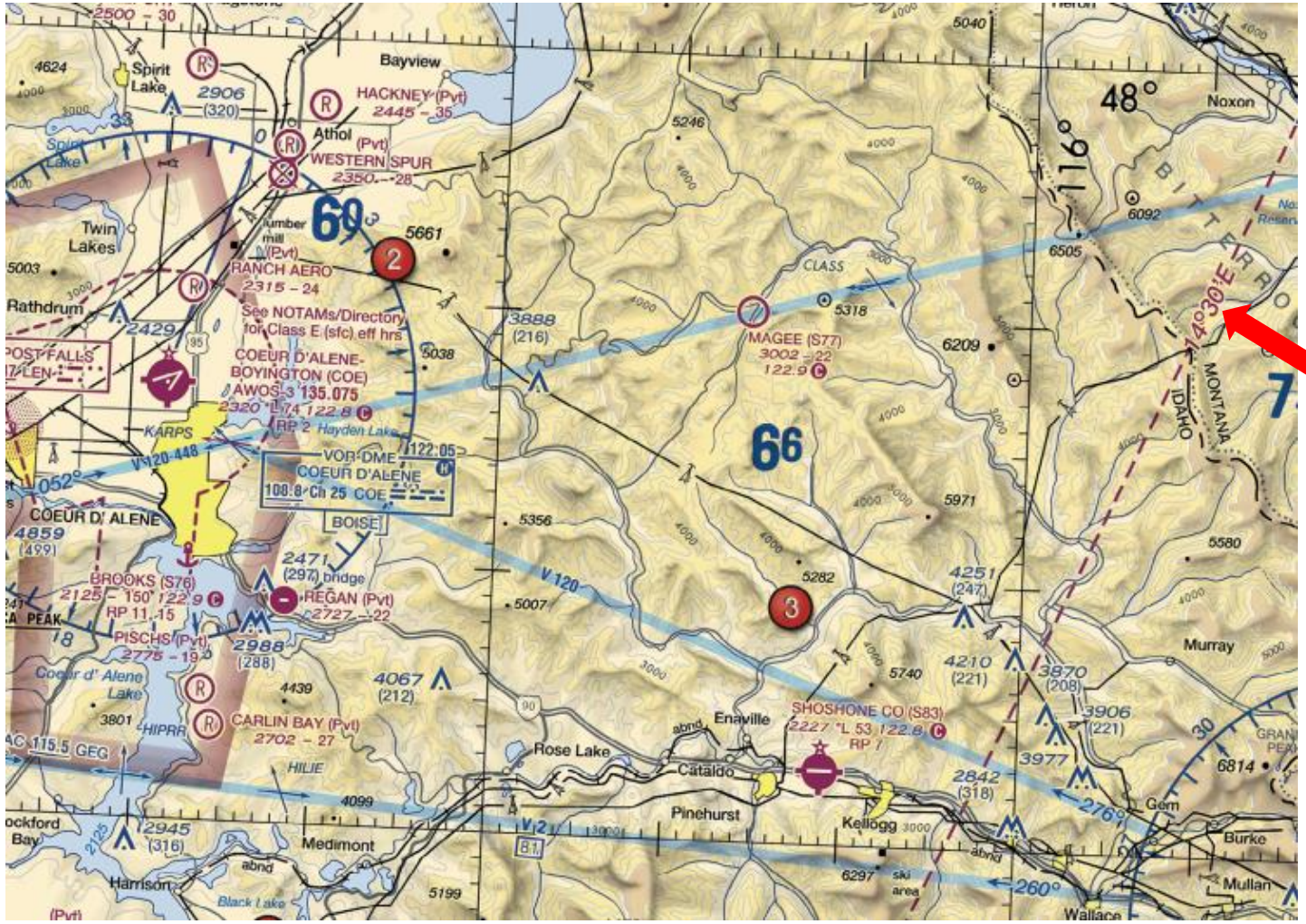
- In the United States, the needle usually points in the general direction of the magnetic pole, but it may vary as much as several degrees East or West of TN
- The amount and the direction of variation, which change slightly from time to time, are shown on most aeronautical charts as broken magenta lines called isogonic lines that connect points of equal magnetic variation
- The line connecting points at which there is no variation between TN and MN is the agonic line; isogonic charts is shown on the right; minor bends and turns in the isogonic and agonic lines are caused by unusual geological conditions affecting magnetic forces in these areas





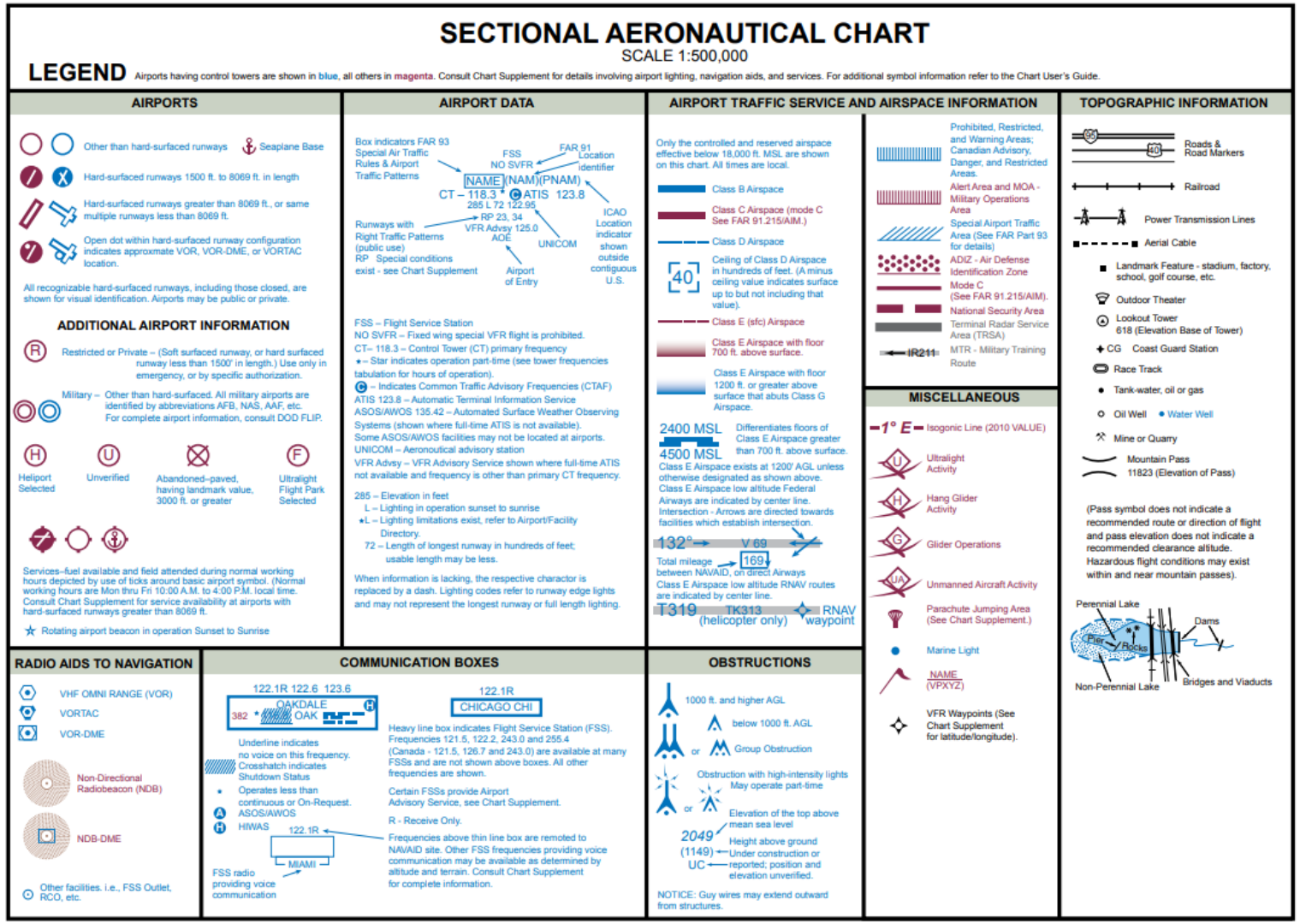


Isogonic Lines on Sectional Chart



Isogonic Line

Sectional Aeronautical Chart Legend



SECTIONAL AERONAUTICAL CHART

SCALE 1:500,000

LEGEND Airports having control towers are shown in blue, all others in magenta. Consult Chart Supplement for details involving airport lighting, navigation aids, and services. For additional symbol information refer to the Chart User's Guide.

AIRPORTS

Other than hard-surfaced runways

Seaplane Base

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

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

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

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

ADDITIONAL AIRPORT INFORMATION

Restricted or Private – (Soft surfaced runway, or hard surfaced runway less than 1500' in length.) Use only in emergency, or by specific authorization.

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

Heliport Selected

Unverified

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

Ultralight Flight Park Selected

Services–fuel available and field attended during normal working hours depicted by use of ticks around basic airport symbol. (Normal working hours are Mon thru Fri 10.00 A.M. to 4.00 P.M. local time. Consult Chart Supplement for service availability at airports with hard-surfaced runways greater than 8069 ft.

★ Rotating airport beacon in operation Sunset to Sunrise

AIRPORT DATA

Box indicators FAR 93 Special Air Traffic Rules & Airport Traffic Patterns

FSS

FAR 91 Location identifier

NO SVFR

NAME (NAM)(PNAM)

CT – 118.3 * C ATIS 123.8

285 L 72 122.95

RP 23, 34

VFR Advsy 125.0

AOE

UNICOM

ICAO Location indicator shown outside contiguous U.S.

Runways with Right Traffic Patterns (public use)

RP Special conditions exist - see Chart Supplement

Airport of Entry

FSS – Flight Service Station

NO SVFR – Fixed wing special VFR flight is prohibited.

CT– 118.3 – Control Tower (CT) primary frequency

★ – Star indicates operation part-time (see tower frequencies tabulation for hours of operation).

C – Indicates Common Traffic Advisory Frequencies (CTAF)

ATIS 123.8 – Automatic Terminal Information Service

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

UNICOM – Aeronautical advisory station

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

285 – Elevation in feet

L – Lighting in operation sunset to sunrise

•L – Lighting limitations exist, refer to Airport/Facility Directory.

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

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

AIRPORT TRAFFIC SERVICE AND AIRSPACE INFORMATION

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

Class B Airspace

Class C Airspace (mode C See FAR 91.215/AIM.)

Class D Airspace

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

Class E (sfc) Airspace

Class E Airspace with floor 700 ft. above surface.

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

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

Class E Airspace exists at 1200' AGL unless otherwise designated as shown above. Class E Airspace low altitude Federal Airways are indicated by center line. Intersection - Arrows are directed towards facilities which establish intersection.

132° V 69

Total mileage between NAVAID, on direct Airways 169

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

T319 TK313 (helicopter only) RNAV waypoint

Prohibited, Restricted, and Warning Areas; Canadian Advisory, Danger, and Restricted Areas.

Alert Area and MOA - Military Operations Area

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

ADIZ - Air Defense Identification Zone

Mode C (See FAR 91.215/AIM).

National Security Area

Terminal Radar Service Area (TRSA)

IR211 MTR - Military Training Route

MISCELLANEOUS

–1° E– Isogonic Line (2010 VALUE)

Ultralight Activity

Hang Glider Activity

Glider Operations

Unmanned Aircraft Activity

Parachute Jumping Area (See Chart Supplement.)

Marine Light

NAME (VPXYZ)

VFR Waypoints (See Chart Supplement for latitude/longitude).

TOPOGRAPHIC INFORMATION

Roads & Road Markers

Railroad

Power Transmission Lines

Aerial Cable

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

Outdoor Theater

Lookout Tower 618 (Elevation Base of Tower)

CG Coast Guard Station

Race Track

Tank-water, oil or gas

Oil Well • Water Well

Mine or Quarry

Mountain Pass 11823 (Elevation of Pass)

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

Perennial Lake

Dams

Piers

Rocks

Non-Perennial Lake

Bridges and Viaducts

RADIO AIDS TO NAVIGATION

VHF OMNI RANGE (VOR)

VORTAC

VOR-DME

Non-Directional Radiobeacon (NDB)

NDB-DME

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

COMMUNICATION BOXES

122.1R 122.6 123.6

OAKDALE

382 * OAK H

Underline indicates no voice on this frequency.

Crosshatch indicates Shutdown Status

• Operates less than continuous or On-Request.

A ASOS/AWOS

H HIWAS

122.1R

MIAMI

FSS radio providing voice communication

122.1R

CHICAGO CHI

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

Certain FSSs provide Airport Advisory Service, see Chart Supplement.

R - Receive Only.

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

OBSTRUCTIONS

1000 ft. and higher AGL

below 1000 ft. AGL

or Group Obstruction

Obstruction with high-intensity lights May operate part-time

or

2049 Elevation of the top above mean sea level

(1149) Height above ground

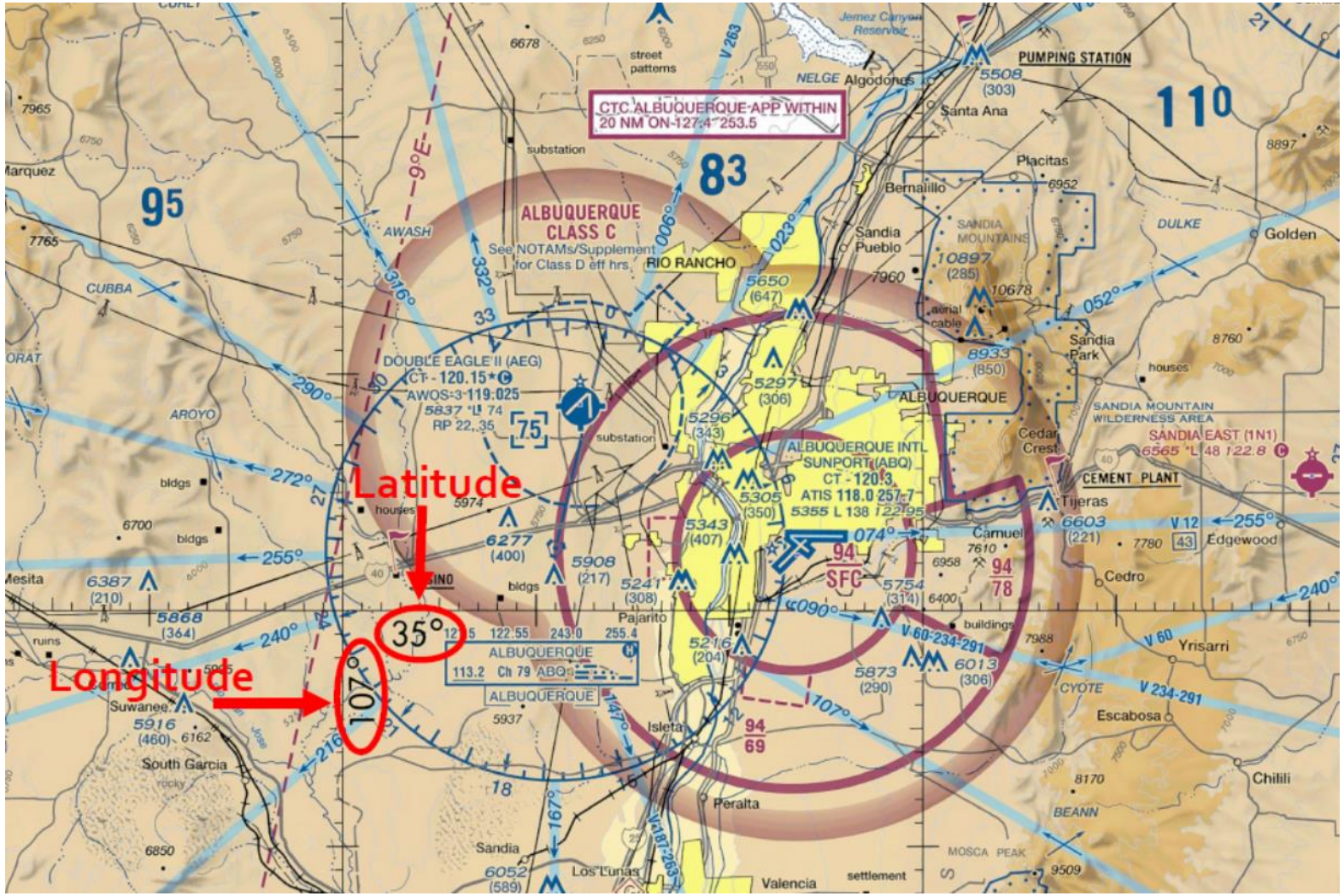
UC Under construction or reported; position and elevation unverified.

NOTICE: Guy wires may extend outward from structures.

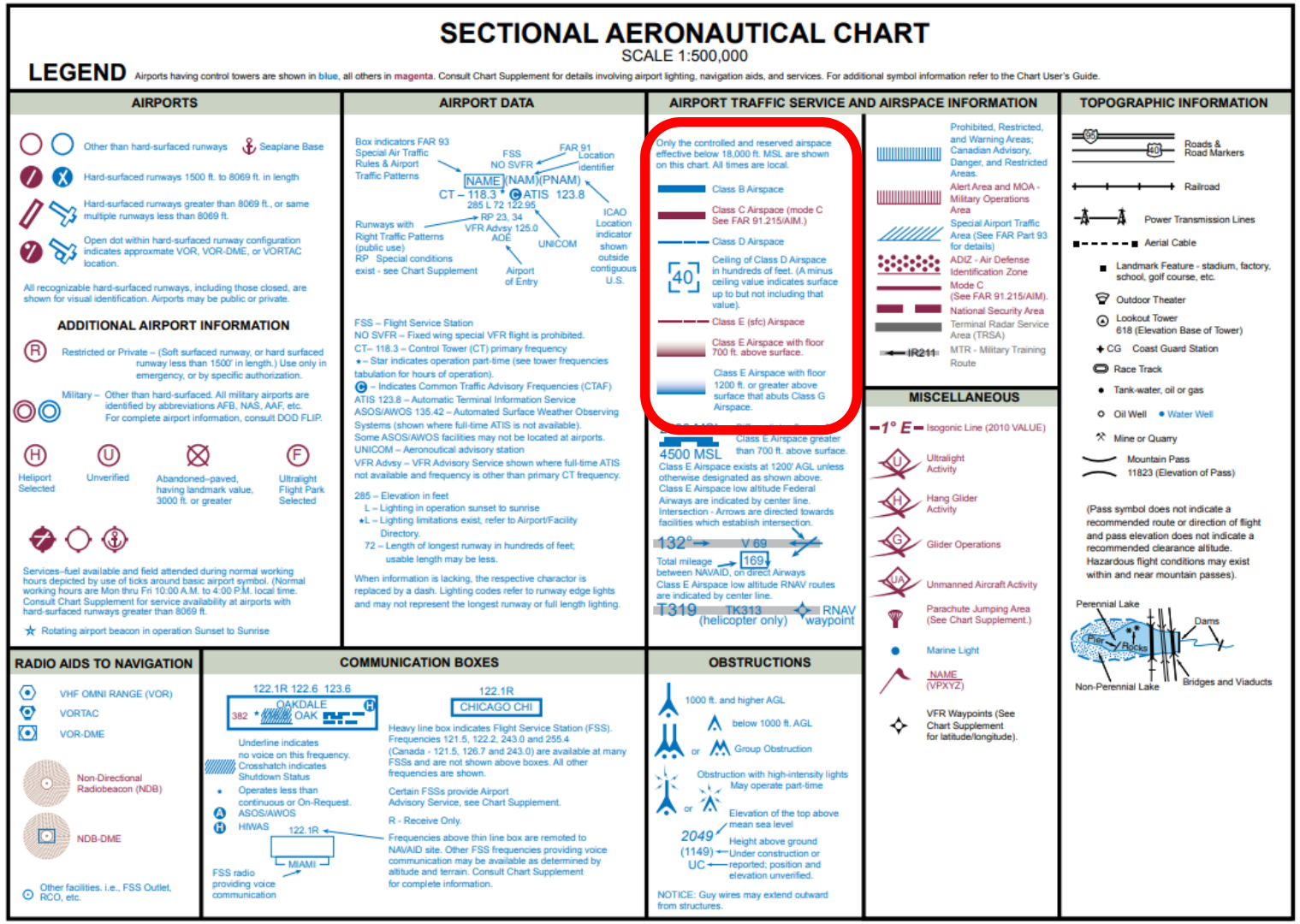
Measuring Latitude & Longitude on a Sectional Chart

- The main unit of measurement for longitude and latitude is a degree, marked by a °; there are 360° of longitude (180° East and 180° West), and 180° of latitude (90° North and 90° South)
- Each degree is a made up of 60 units called minutes and marked as a '; **each adjacent longitudinal or latitudinal line on the chart is marked 30 minutes fro each other, which means they are half degree apart**
- Each small tic in the line represents one minute; each minute can be broken up into 60 units called seconds marked as a "

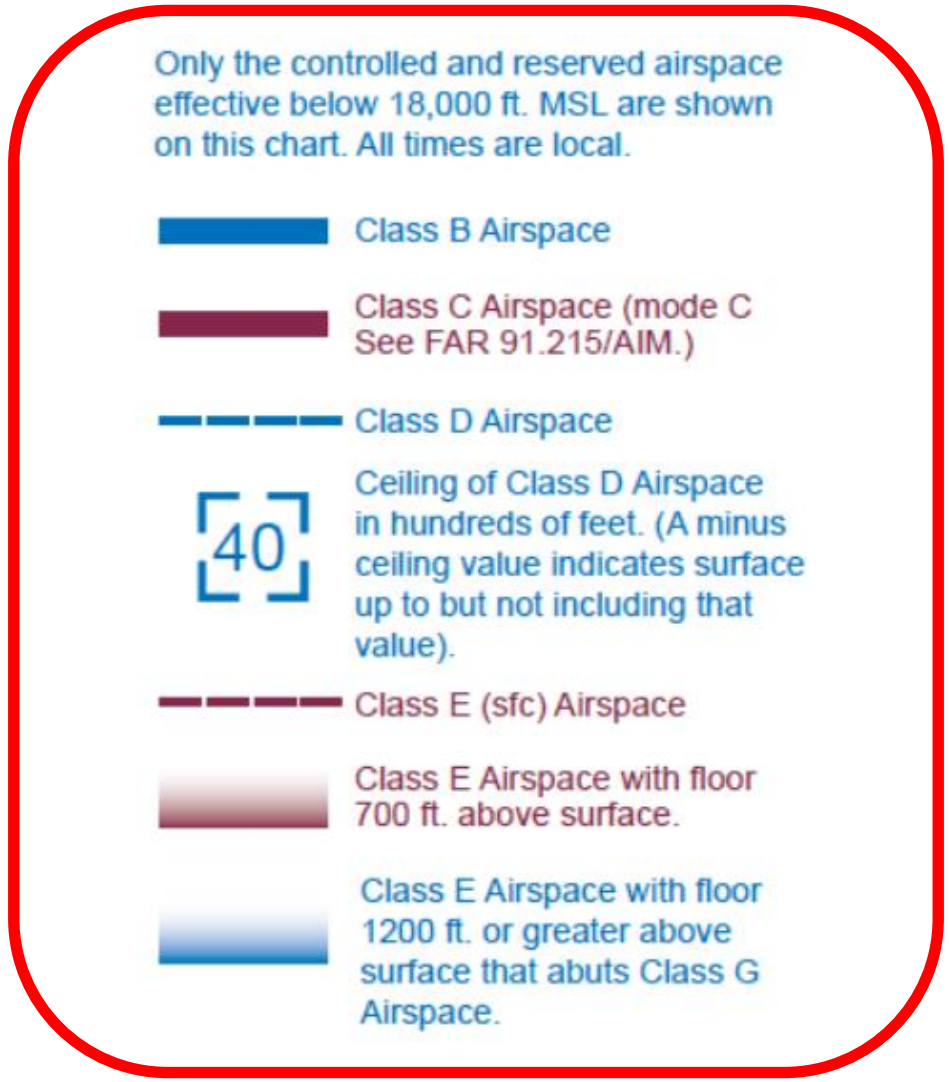
Latitude & Longitude on a Sectional Chart



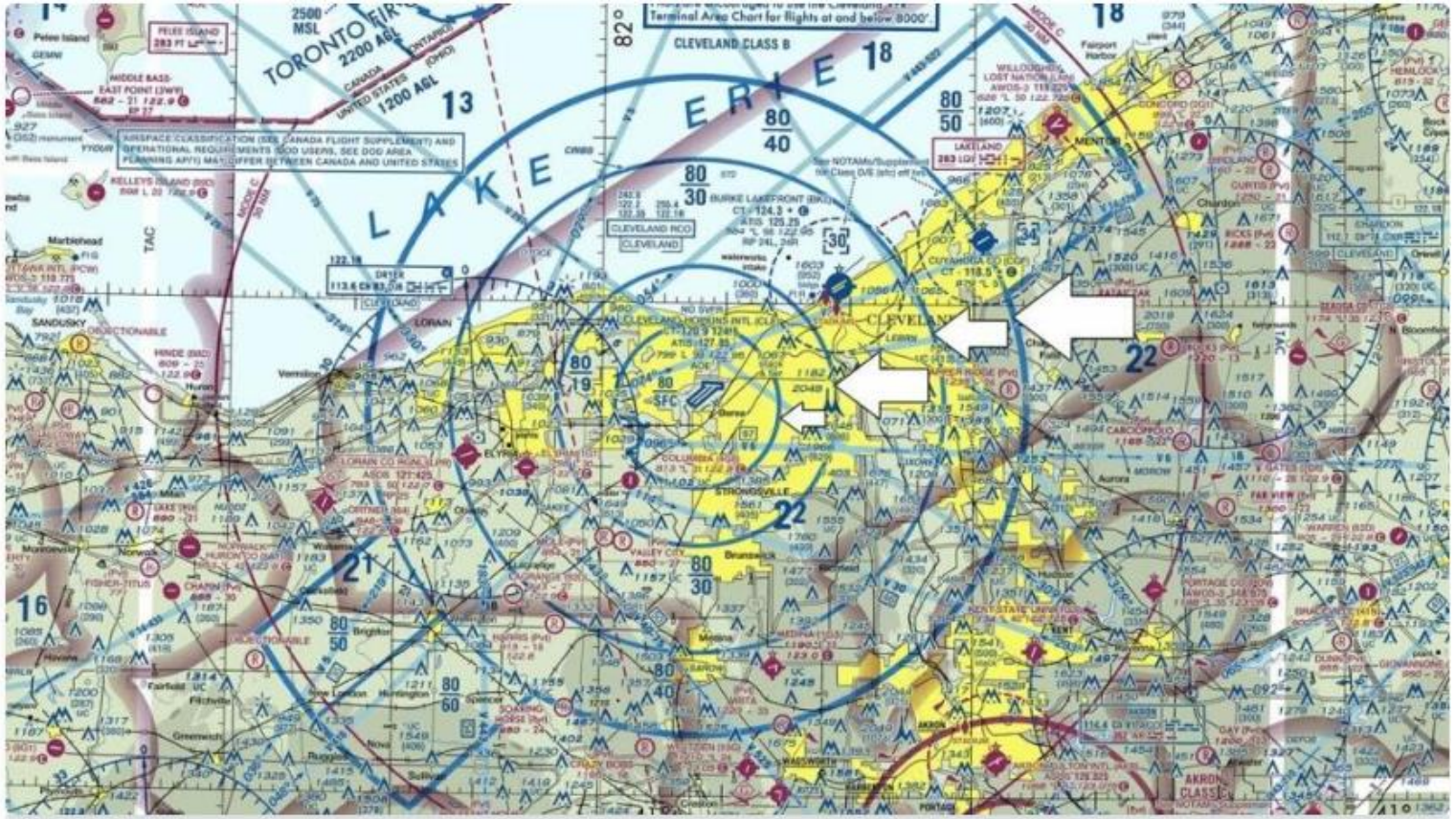
Sectional Aeronautical Chart Legend



Sectional Aeronautical Chart Legend



Airspace Examples – Airports with Classes B, C, D, and E

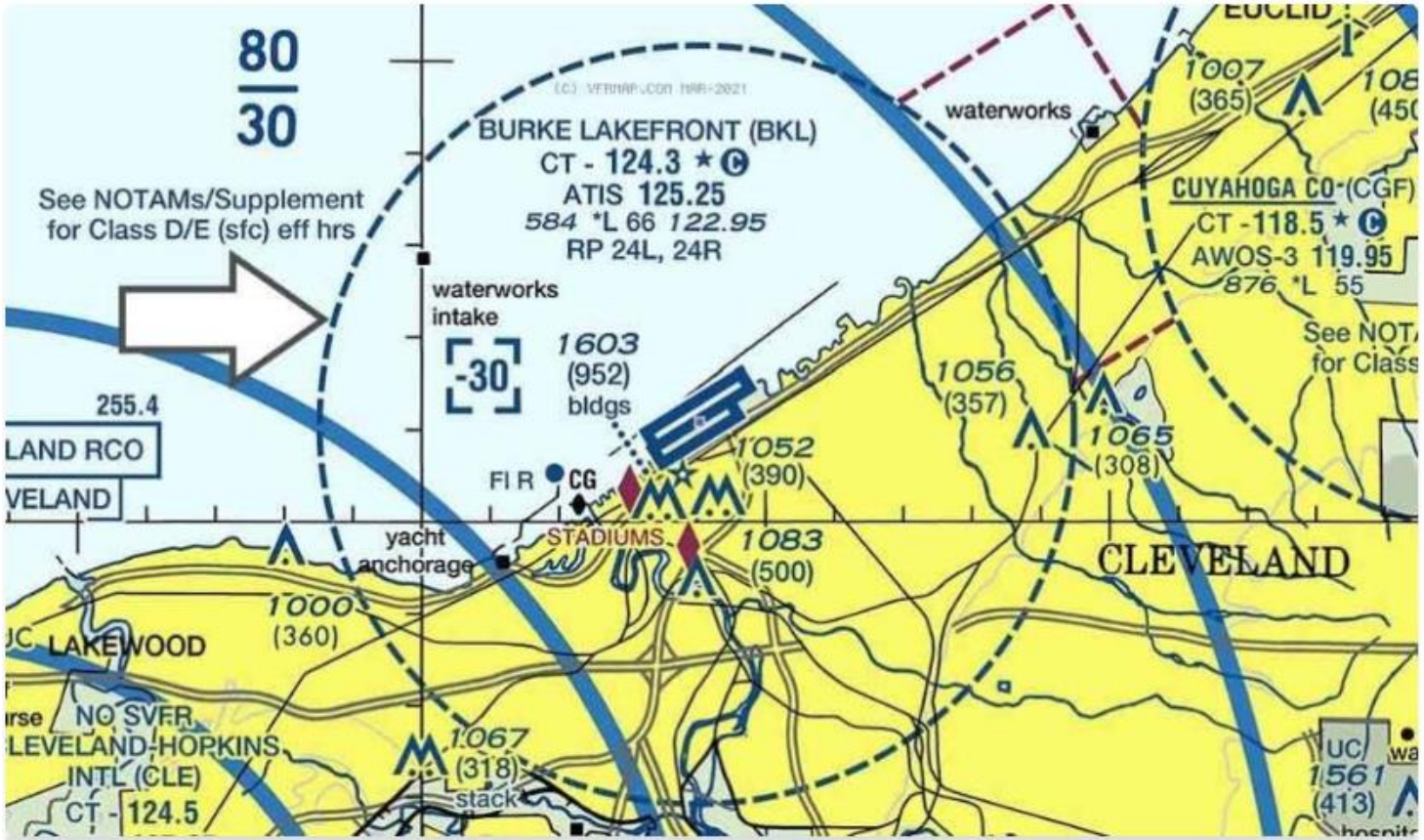


Class B Airspace, indicated by a solid blue line.

Airspace Examples – Airports with Classes B, C, D, and E

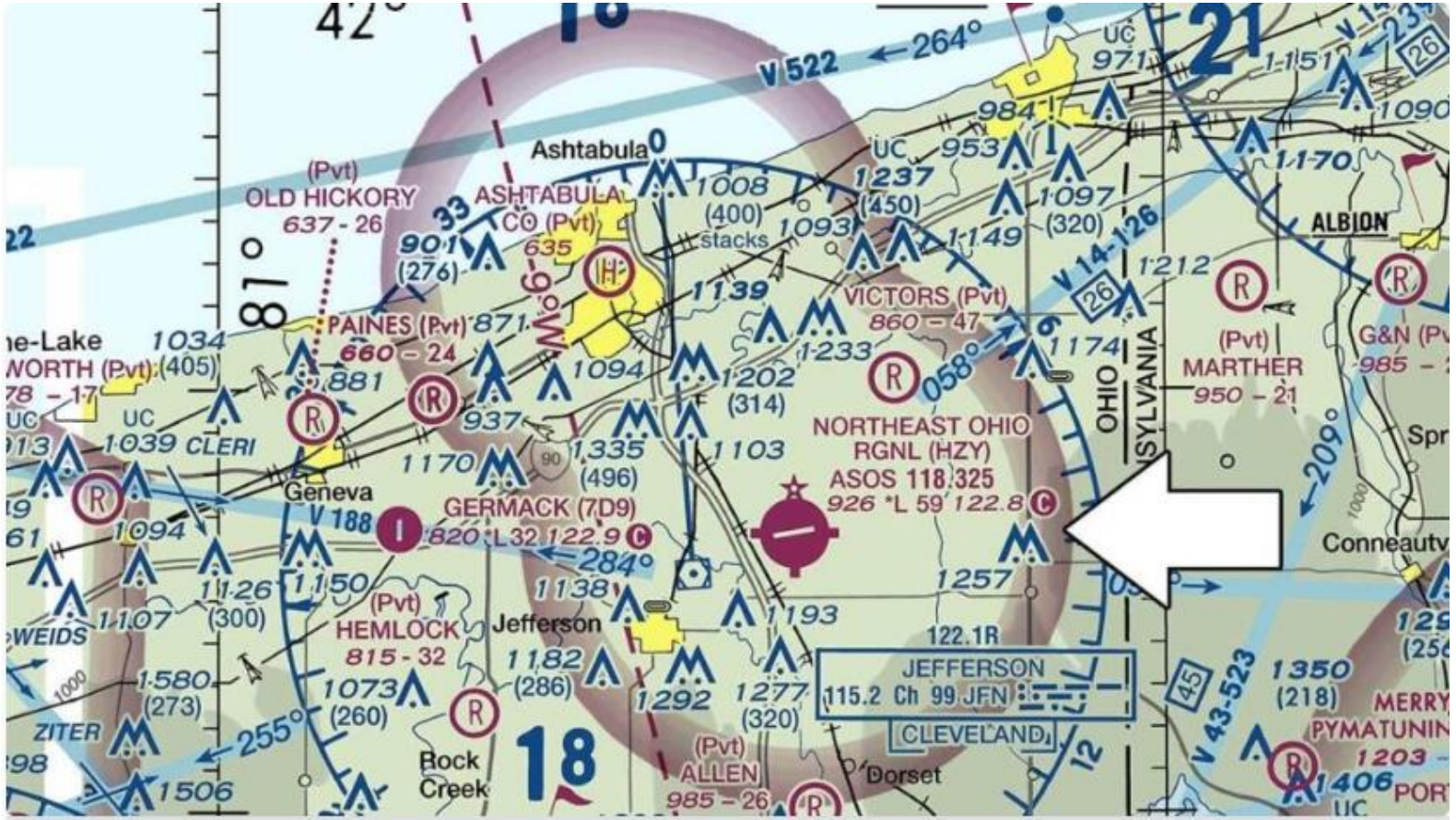
Class C Airspace, indicated by a solid magenta line.

Airspace Examples – Airports with Classes B, C, D, and E



Class D Airspace, indicated by the dashed blue line.

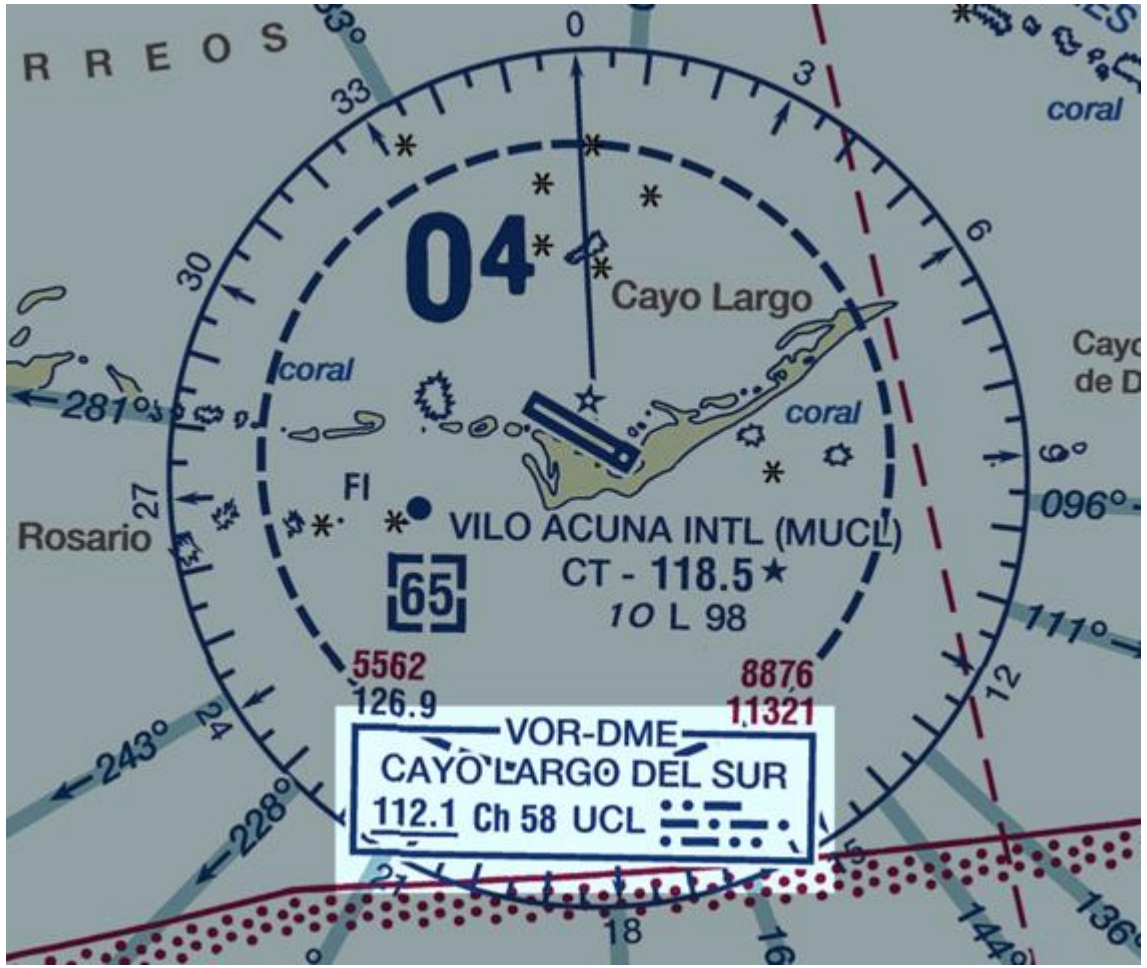
Airspace Examples – Airports with Classes B, C, D, and E



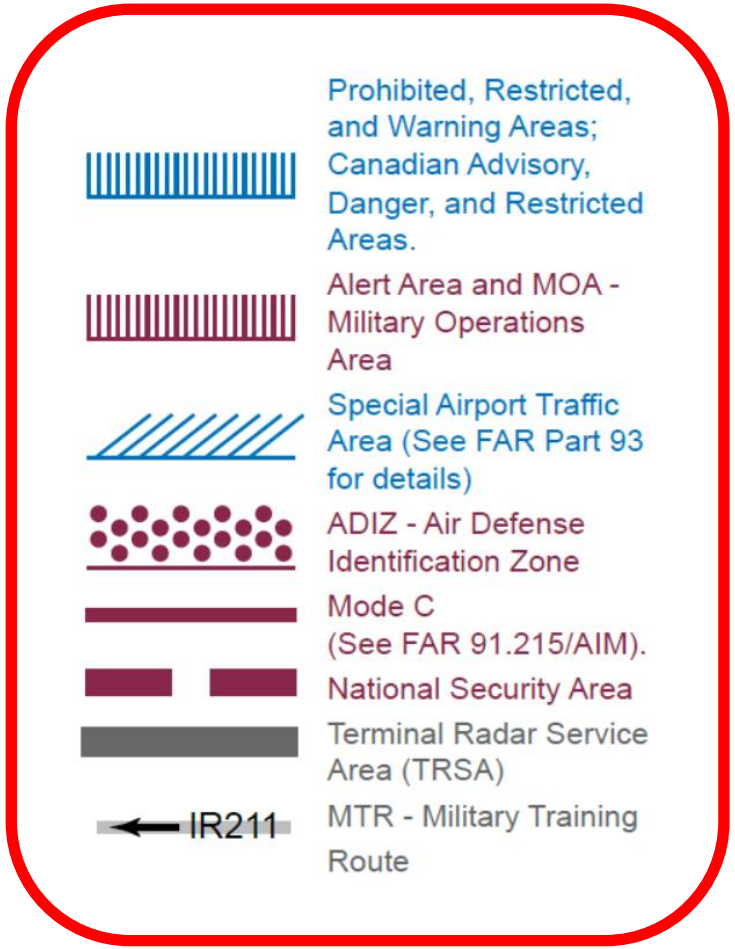
Class E Airspace, indicated by the faded magenta line.

Airspace Examples – Airports with VOR

- Very High Frequency (VHF) Omni-Directional Range (VOR)
- VOR is a short-range radio navigation system used by aircraft to determine their position and navigate along airways
- VOR stations transmit radio signals that aircraft can use to determine their radial from station, providing directional information
- On sectional charts, VOR is presented as a blue solid line with radial marks (compass rose)



Other Classes on Sectional Chart



Military Training Routes (MTR)

- MTRs are routes used by military aircraft to maintain proficiency in tactical flying
- These routes are usually established below 10,000 feet mean sea level (MSL) for operations at speeds in excess of 250 knots
- Routes are identified as IFR or IR (Instrument Flight Rules) and VFR or VR (Visual Flight Rules), followed by a number
- MTRs with NO segments above 1,500 feet above ground level (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 2 or 3 number characters (e.g., IR206; VR207)

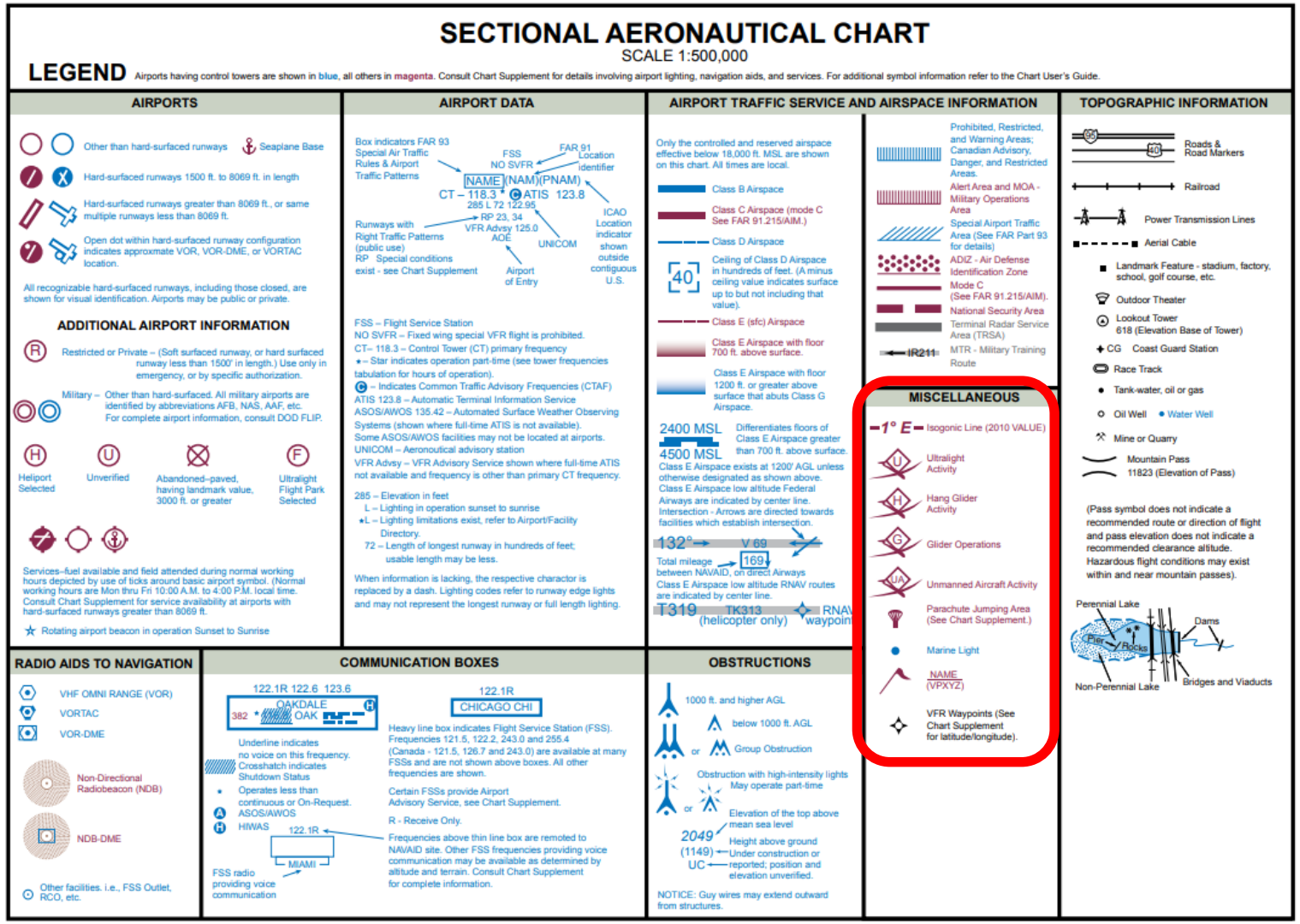
In the example above the VFR military training route has segments both below 1,500 feet AGL (1059) and segments above 1,500 feet AGL (97)

In the context of MTRs, the number character typically does not directly indicates altitude; instead, the number in the route designation generally serves to differentiate between different routes or segments within a route network

Military Training Routes (MTR)

- This information matters to the RPIC because military aircraft flying an MTR below 1,500 feet may enter airspace in which you are flying
- Manned aircraft by FAA regulations are not supposed to fly below 500 feet AGL; but the military is not required to follow FAA regulations so may fly lower
- If you were flying an inspection of the tower at Hilltonia (see the graphic on top right), for example, you could be flying up to 749 feet AGL (349 feet + 400 feet) which puts your sUAS in airspace where there may be military aircraft flying in excess of 250 knots (288 mph)

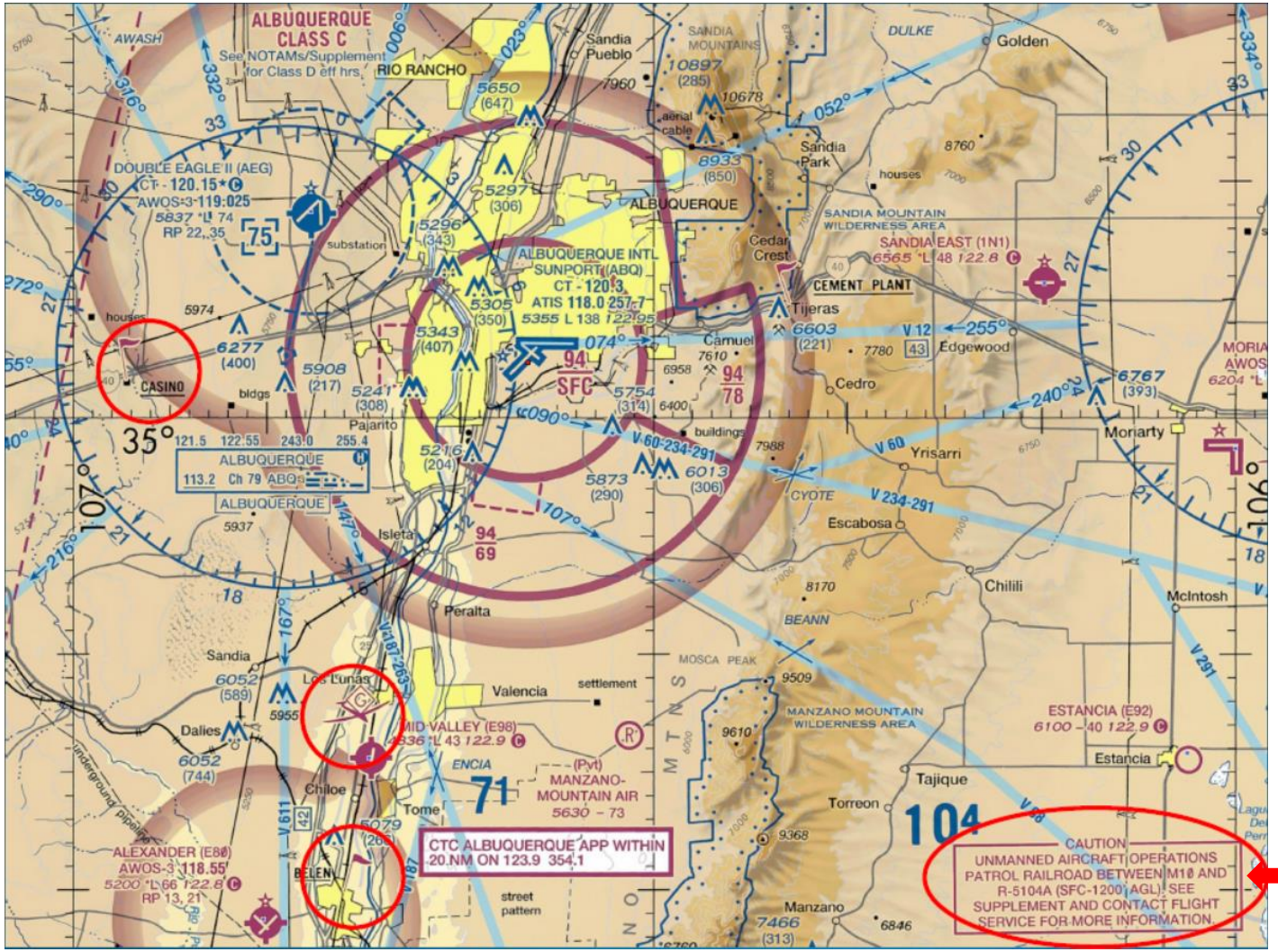
Other Classes on Sectional Chart



Other Classes on Sectional Chart

Represent VFR checkpoints, which are prominent landmarks or buildings that are easy to identify from the air for manned aircraft; expect a higher volume of manned aircraft at this location

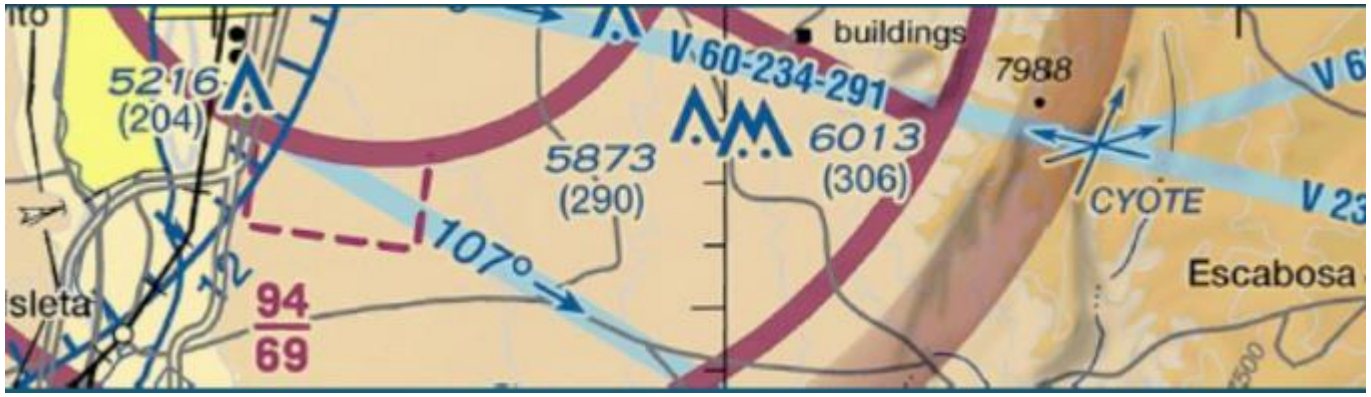
What Symbols are on This Chart?

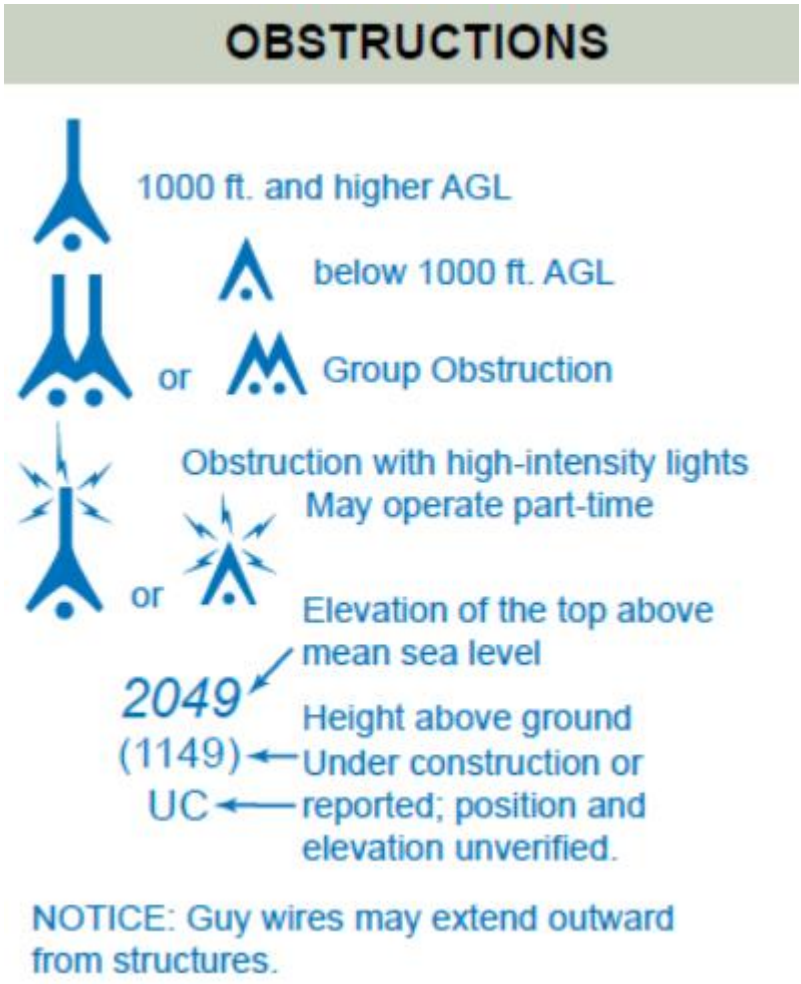


Notification Boxes – contact Flight Service for information

General Notes on Sectional Charts

- All altitudes on the Sectional Charts are denoted in MSL, unless they are in parentheses; parentheses denote AGL; remember this – IT IS IMPORTANT!
- Remember under Part 107, you can fly up to 400 feet above the topmost part of the tower





Airports on Sectional Charts

AIRPORTS

Other than hard-surfaced runways

Seaplane Base

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

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

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

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ADDITIONAL AIRPORT INFORMATION

(R) Restricted or Private – (Soft surfaced runway, or hard surfaced runway less than 1500' in length.) Use only in emergency, or by specific authorization.

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(H) Heliport Selected

(U) Unverified

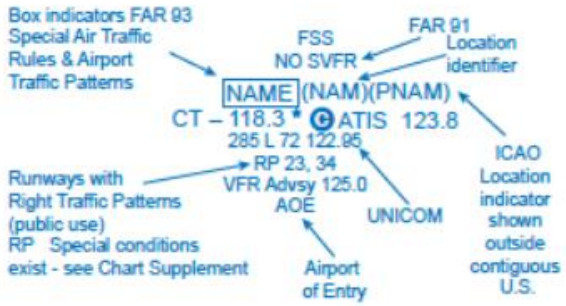
Abandoned–paved, having landmark value, 3000 ft. or greater

(F) Ultralight Flight Park Selected

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

☆ Rotating airport beacon in operation Sunset to Sunrise

AIRPORT DATA



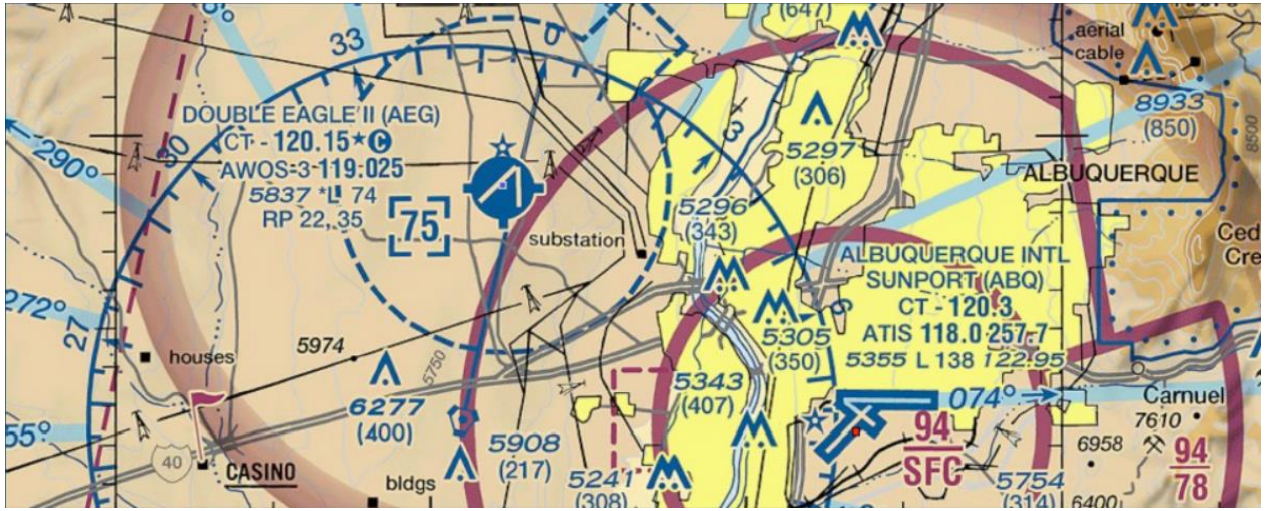
FSS – Flight Service Station
NO SVFR – Fixed wing special VFR flight is prohibited.
CT– 118.3 – Control Tower (CT) primary frequency
*– Star indicates operation part-time (see tower frequencies tabulation for hours of operation).
(C) – Indicates Common Traffic Advisory Frequencies (CTAF)
ATIS 123.8 – Automatic Terminal Information Service
ASOS/AWOS 135.42 – Automated Surface Weather Observing Systems (shown where full-time ATIS is not available).
Some ASOS/AWOS facilities may not be located at airports.
UNICOM – Aeronautical advisory station
VFR Advsy – VFR Advisory Service shown where full-time ATIS not available and frequency is other than primary CT frequency.

285 – Elevation in feet
L – Lighting in operation sunset to sunrise
*L – Lighting limitations exist, refer to Airport/Facility Directory.
72 – Length of longest runway in hundreds of feet; usable length may be less.

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

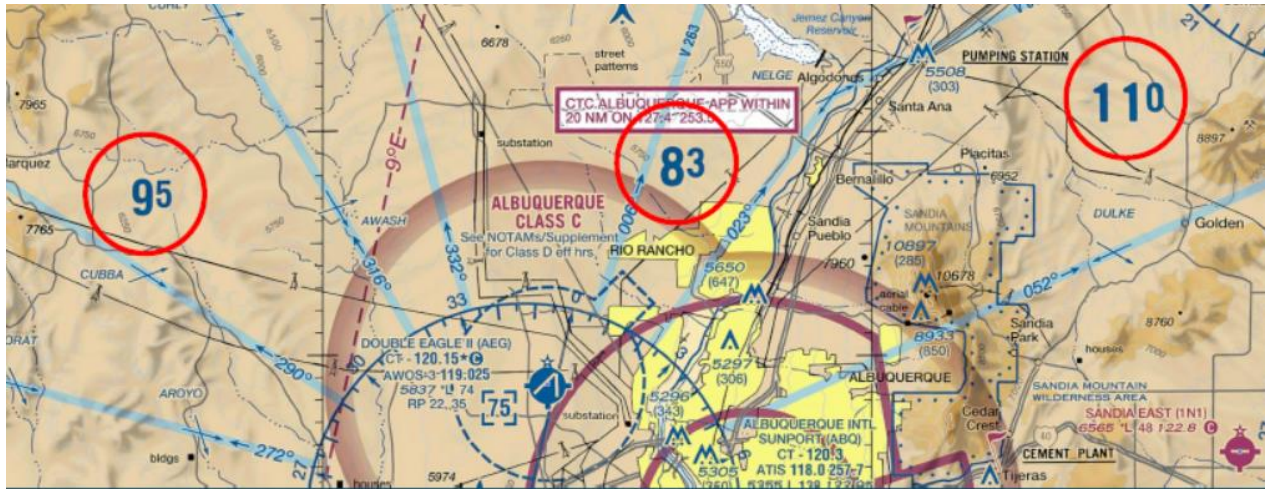
Airports on Sectional Charts Example – Double Eagle II

- AWOS-3 – this is the type of automated weather service available for the airport
- 119.025 – this is the UNICOM frequency (the frequency on which we would communicate our intentions)
- 5837 – this is the altitude of the airport (noting that this is MSL)
- *L – this refers to the lighting limitations at the airport (for nighttime use) – refer to Airport Directory
- 74 – this is the length of the longest runway (in hundreds of feet)
- 120.15*C – this indicates that 120.15 is the common Traffic Advisory Frequency
- RP Runways with Right Traffic Patterns 22.35 (Runway designations in Degree Right 22 = 220° and 35 = 350°)



Airports on Sectional Charts Maximum Elevation Figures (MEF)

- These are maximum elevations of terrain and obstructions, rounded up to next 100 feet with another 100 feet added
- Provided for each quadrangle (30 minutes x 30 minutes area) on Sectional Charts
- Example – highest terrain = 8,115 feet then rounded up to 8,200 feet and add 100 feet = 8,300 feet
- Display as 83
- But if there is a 200 feet Cell Tower on that highest point = 8,315 feet, then round up to the next higher 100 feet = 8,400 feet and add 100 feet = 8,500 feet
- Display as 85



Note on Exam

- The Cooperstown Sectional Chart is used on FAA RPIC Certification Exam
- It would be a good idea to familiarize yourself with the Sectional Charts in the Airman Knowledge Testing Supplemental for Sport Pilot, Recreational Pilot, and Private Pilot (FAA-CT-8080-2H) and on one of the following portals before taking the exam
  - https://vfrmap.com/
  - https://skyvector.com/
  - https://www.1800wxbrief.com/Website/#!/