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Learning to Read the Sky

An Introduction to VFR Sectional Charts

By the end of this lesson, students will be able to:

1. Explain what a VFR sectional chart is and why pilots use it.
2. Identify major features on a sectional chart.
3. Locate airports, airspace, terrain, and landmarks.
4. Interpret basic aviation symbols and colors.
5. Use a sectional chart to plan a simple visual flight route.

Introduction Activity

Ask students:

"If your phone suddenly stopped working while you were driving somewhere you've never been, how would you find your way?"

Asking for directions, maps, landmarks and anything not technology dependent are all points of discussion.

Then ask:

"How do you think pilots navigate when flying above the ground?"

GPS, landmarks, roadways/highways, sun direction, ATC are all points of discussion. Make sure to end the discussion with the idea that pilots use specialized maps called **VFR Sectional Charts**.

Lecture

Write on the board or display overhead. Have students take notes.

What Is a VFR Sectional Chart?

First, let's understand that VFR is an acronym that stands for Visual Flight Rules.

Under VFR, pilots navigate primarily by:

- Looking outside the aircraft

- Identifying landmarks
- Using maps and navigation aids

Second, let's understand that a sectional chart is a detailed aeronautical map that shows:

- Airports
- Airspace
- Terrain
- Towers
- Navigation aids
- Cities and landmarks
- Obstructions

Think of it as a combination of a roadmap, topographic map and air traffic map all rolled into one

Make sure students understand the meaning of each of the elements, ex: terrain. Show example #1 to give students idea of what a sectional chart is, or, pass out student example charts. Continue with lecture topic and notes below.

Why Are Sectional Charts Important?

Pilots use them to:

- Stay clear of restricted airspace
- Avoid mountains and obstacles
- Find airports
- Plan routes
- Maintain situational awareness

Break students into pair and share partners/groups. Give them 5 minutes to discuss and then share out

What dangers might occur if a pilot cannot read a sectional chart correctly?

Airspace violations, getting lost, hitting obstacles/accidents and running low on fuel are all appropriate answers.

Continue lecture with the below. Make sure to utilize the attached graphics as examples of each feature.

Key Features of a Sectional Chart

1. Airports

There are two different kinds of airports; public and private.

- Public airports are shown with blue symbols.
- Private airports are shown with magenta symbols

Make sure students understand the color of magenta

Airport Information

Next to the airport symbol you'll often find:

- Tower frequency
- Elevation
- Runway information

Show graphic example #2

2. Airspace

Airspace is divided into different categories; We are going to focus on Class B, Class C, Class D, and uncontrolled airspace (Class G)

Class B

- Surrounds major airports
- Looks like layered wedding cakes
- Shown in solid blue lines

Examples:

- Los Angeles (LAX)
- Dallas/Fort Worth (DFW)

Show graphic example #3

Class C

- Medium-sized airports
- Solid magenta lines

Examples:

- Santa Barbara Municipal (SBA)
- Will Rogers World Airport (Oklahoma City OKC)

Show graphic example #4

Class D

- Smaller towered airports
- Dashed blue lines

Examples:

- Meadows Field Airport (BFL)
- Bowman Field Airport (LOU)

Show graphic example #5

Uncontrolled Airspace

Class G airspace is the least restrictive airspace in the United States. ATC does not have authority over aircraft. Pilots still MUST follow FAA regulations and pilots are responsible for seeing and avoiding other aircraft. Generally, Class G exists:

- Often around small airports that do not have a control tower
- Near the surface in rural areas where controlled airspace does not extend all the way to the ground.
- **Class G itself is not directly colored or outlined**. Instead, you determine where Class G exists by identifying the **floor of the controlled airspace above it**.

Examples:

- Modesto Municipal (MOD)
- Poteau Municipal Airport (POT)

3. Terrain and Elevation

Understanding terrain and elevation on a sectional chart is one of the most important skills for safe VFR flying. A sectional chart shows terrain in several different ways so you can quickly determine whether you'll have adequate terrain clearance.

It is important to pay attention to contour lines. If lines are closely spaced, the terrain is steep. If the contour lines are widely spaced, then the terrain has gentle slopes.

Colors

Blue

- water

Green

- Lower elevations

Yellow

- Moderate elevations

Brown

- Higher elevations

Dark Brown

- Very high elevations and mountains
- Significant mountain peaks are usually labeled with elevation and peak name

Higher elevations

The darker the brown shading, the higher the terrain.

Maximum Elevation Figures (MEFs)

Large blue numbers in each grid square.

Example:

32

Means:

- Highest obstacle or terrain
- Rounded up

- 3,200 feet

Pilots use MEFs for obstacle clearance.

4. Obstacles

Obstacles on a sectional chart are depicted to help pilots identify hazards such as towers, antennas, powerlines, smokestacks, and wind turbines. Most obstacles are shown as a tower-like symbol.

Understanding how to read these symbols is essential for terrain and obstacle clearance planning.

Examples include:

- Radio towers
- Power line towers
- Wind turbines
- Tall buildings

Obstacle symbols show:

1548 (1698)

Meaning:

- Ground elevation: 1,548 ft
- Top of tower: 1,698 ft

Important because aircraft must avoid these hazards.

5. Navigation Aids

VOR Stations

- VOR = Very High Frequency Omnidirectional Range
- These are electronic beacons that help pilots determine position.
- The symbol used on the sectional chart is a compass rose with the VOR station labeled inside
- Think of a VOR as an aviation lighthouse.

6. Landmarks

Pilots often use visual checkpoints such as:

- Rivers
- Highways
- Lakes
- Railroads
- Stadiums
- Cities

Example:

- A pilot flying across California may use highways as visual references.
- A pilot flying in College Station, Tx can identify location by visual reference of the football stadium

Guided Practice Activity

Provide students with a sectional chart (printed or digital). You can pair students up or have them work individually.

Ask them to find:

1. One public airport
2. One private airport
3. One Class D airport
4. One tower
5. One city
6. The highest MEF shown on the chart

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Mini Flight Planning Challenge

Scenario

You are flying a small Cessna from Airport A to Airport B.

Using the sectional chart:

1. Draw a straight route.
2. Identify checkpoints every 10-15 miles.
3. Note any obstacles along the route.
4. Identify any controlled airspace you must avoid or contact.

Discussion

1. Is the route safe?

2. What landmarks would help navigation?

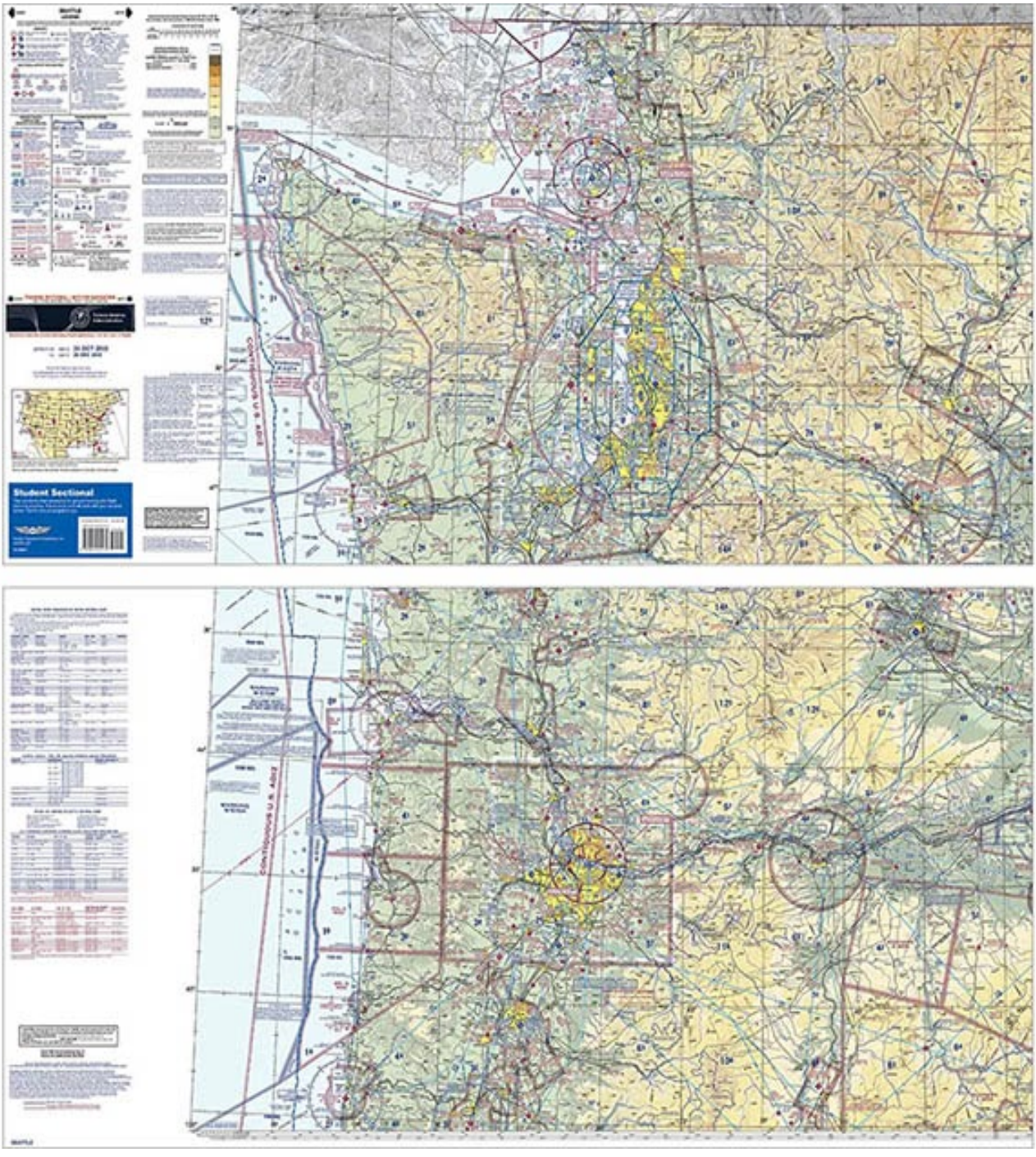
3. What hazards exist?

Wrap-Up

Have students work in groups to discuss why every safe flight begins with understanding the map before leaving the ground.

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Example #1



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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 approximate VOR, VOR-DME, or VORTAC location.

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

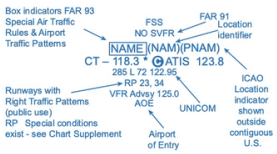
ADDITIONAL AIRPORT INFORMATION

- (R) 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.
- (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).
(T) – 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 character is replaced by a dash. Lighting codes refer to runway edge lights and may not represent the longest runway or full length lighting.

AIRPORT TRAFFIC SERVICE AND AIRSPACE INFORMATION

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

- Class B Airspace
- Class C Airspace (mode C See FAR 91.215/AIM.)
- Class D Airspace
- 40 Ceiling of Class D Airspace in hundreds of feet. (A minus ceiling value indicates surface up to but not including that value).
- Class E (sfc) Airspace
- Class E Airspace with floor 700 ft. above surface.
- Class E Airspace with floor 1200 ft. or greater above surface that abuts Class G Airspace.
- 2400 MSL / 4500 MSL Differentiates floors of Class E Airspace greater than 700 ft. above surface.

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

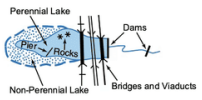
- 132° V 69 — Total mileage between NAVAID, on direct Airways
- 169
- Class E Airspace low altitude RNAV routes are indicated by center line.
- T319 TK313 (helicopter only) RNAV waypoint

- 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

TOPOGRAPHIC INFORMATION

- 95 / 40 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).



MISCELLANEOUS

- −1° E− Isogonic Line (2010 VALUE)
- (U) Ultralight Activity
- (H) Hang Glider Activity
- (G) Glider Operations
- (UA) Unmanned Aircraft Activity
- Parachute Jumping Area (See Chart Supplement.)
- Marine Light
- NAME (VPXYZ)
- VFR Waypoints (See Chart Supplement for latitude/longitude).

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



Underline indicates no voice on this frequency.
Crosshatch indicates Shutdown Status
* Operates less than continuous or On-Request.
A ASOS/AWOS
H HIWAS



FSS radio providing voice communication



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

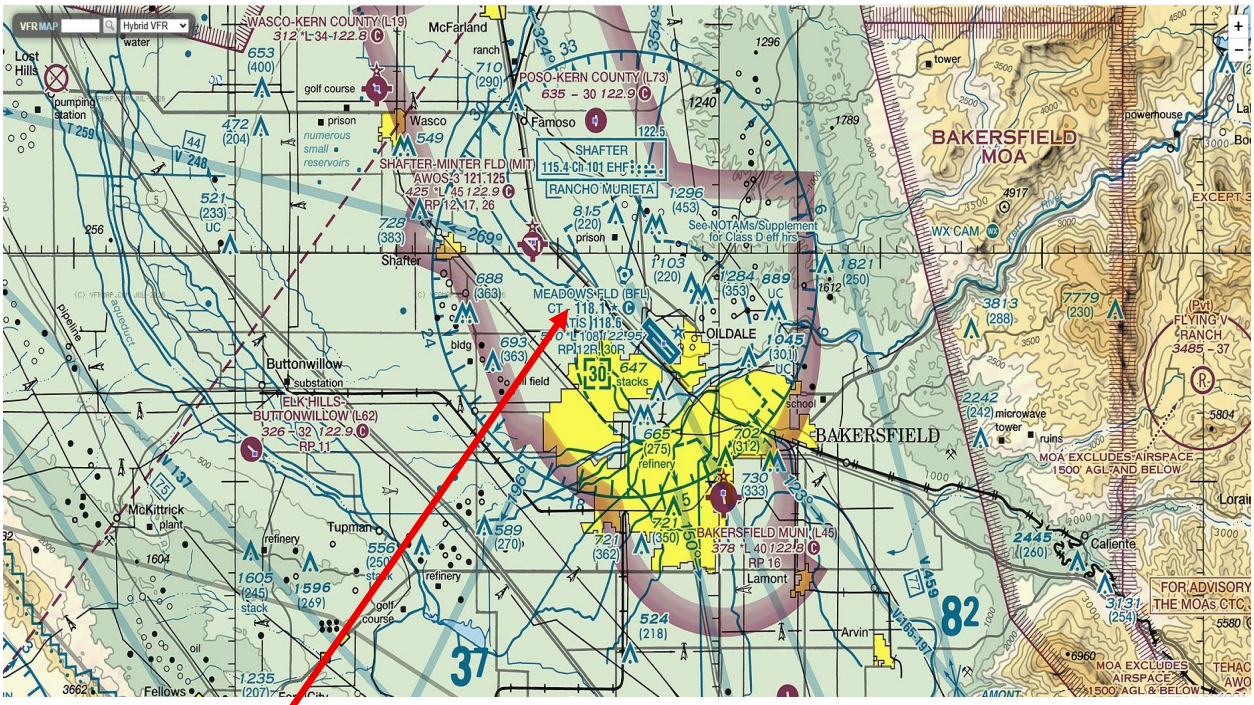
- 1000 ft. and higher AGL
- below 1000 ft. AGL
- or Group Obstruction
- Obstruction with high-intensity lights May operate part-time
- or Elevation of the top above mean sea level
- 2049 / (1149) Height above ground
- UC Under construction or reported; position and elevation unverified.

NOTICE: Guy wires may extend outward from structures.

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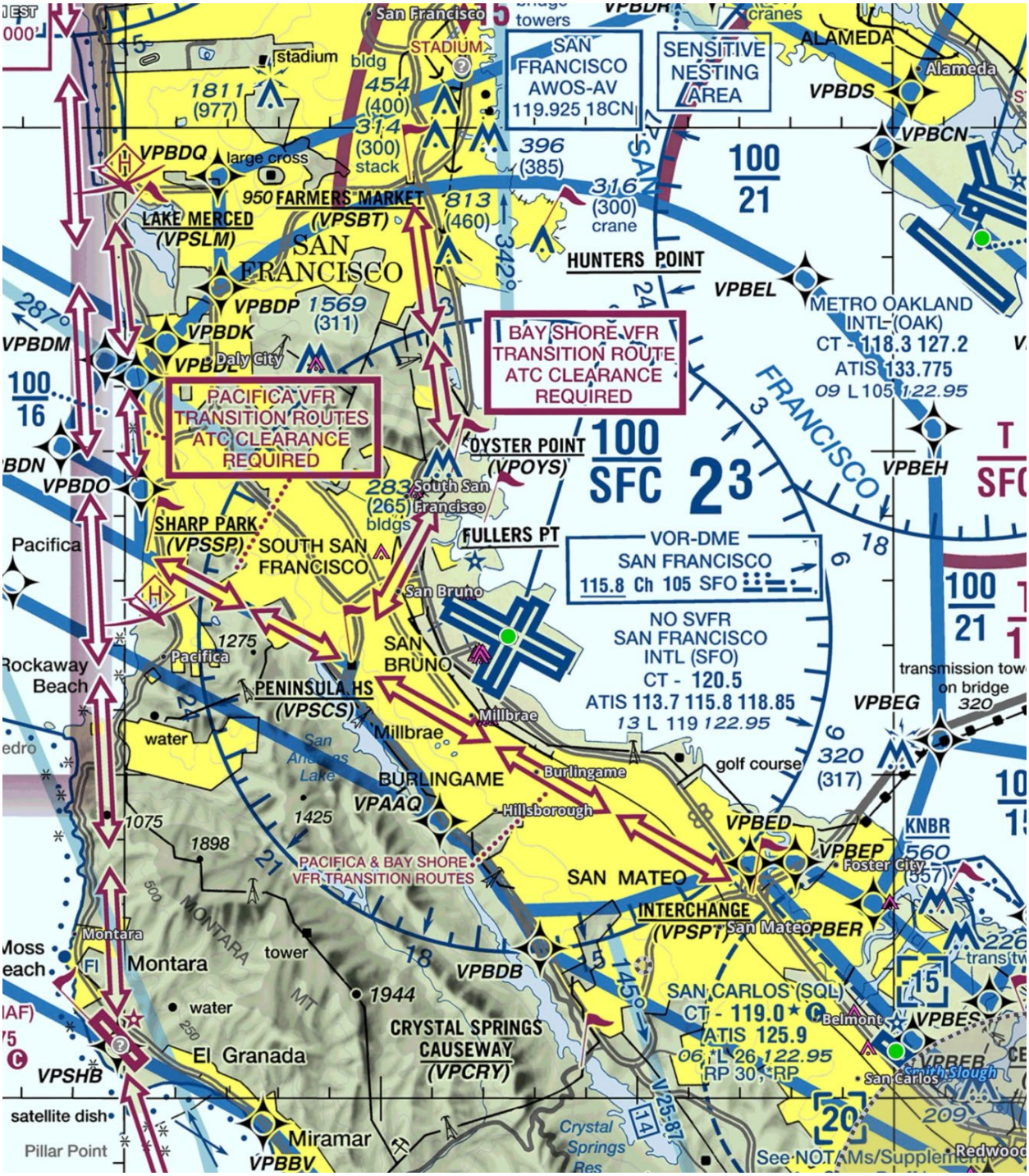
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Example #2



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Example #3

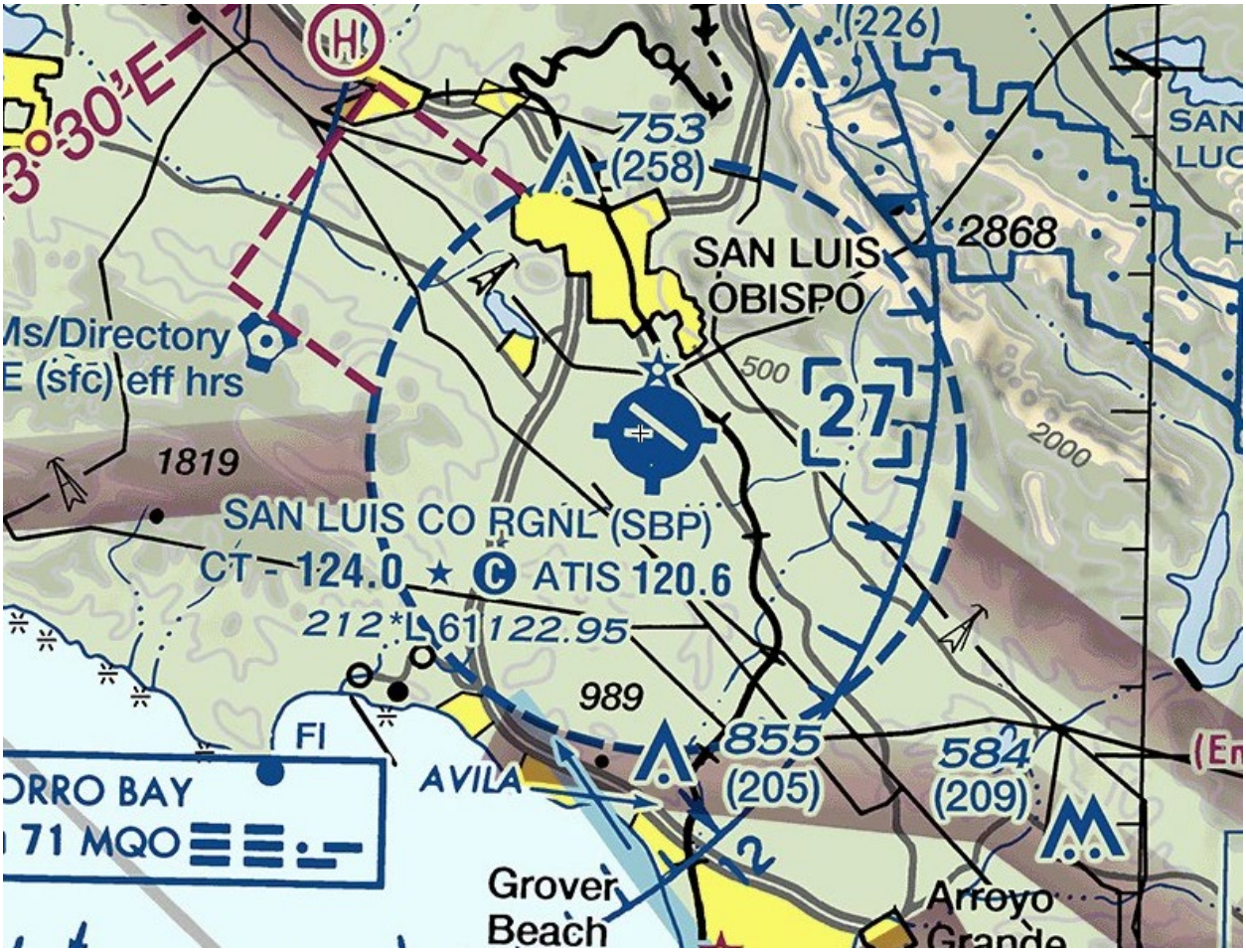


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Example #4



Example #5


(226)
753
(258)
SAN LUIS
OBISPO
2868
500
27
2000
1819
SAN LUIS CO RGNL (SBP)
CT - 124.0 ★ C ATIS 120.6
212*L61 122.95
989
855
(205)
584
(209)
AVILA
Grover
Beach
Arroyo
Grande