


16.687
Private Pilot Ground School
Massachusetts Institute of Technology
IAP 2019

Charts and Airspace

Instructor: Tina P. Srivastava, Ph.D.



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Section A

AERONAUTICAL CHARTS
(WHERE ARE WE GOING?)

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Electronic Charts

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Free on the Web:

- Skyvector.com
- VFRMAP.com
- [Monster PDFs from the FAA](#) (156 MB)

On your phone:

- ForeFlight (iPhone)
- Garmin Pilot (Android)

Types:

- VFR Sectional (core for a Private)
- Terminal Area (TAC, e.g., around Logan)
- Helicopter (low and slow!)
- IFR enroute low
- IFR enroute high (above 18,000')

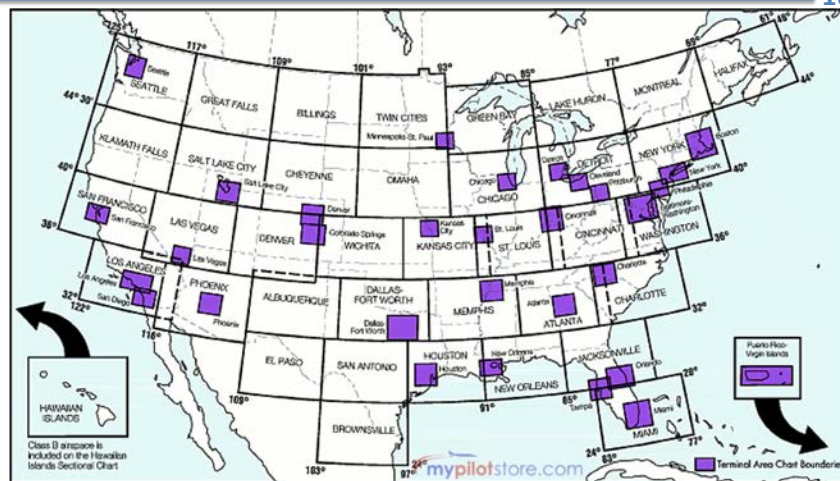
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U.S. Sectional Charts

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Sectional Charts: Airports

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AIRPORTS

-   Other than hard-surfaced runways
-   Hard-surfaced runways 1500 ft. to 8069 ft. in length
-   Hard-surfaced runways greater than 8069 ft. or some multiple runways less than 8069 ft.
-   Open dot within hard-surfaced runway configuration indicates approximate VOR, VOR-DME, or VORTAC location.

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



Source: public domain











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Sectional Charts: Airports

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AIRPORTS

-   Other than hard-surfaced runways
-   Hard-surfaced runways 1500 ft. to 8069 ft. in length
-   Hard-surfaced runways greater than 8069 ft. or some multiple runways less than 8069 ft.
-   Open dot within hard-surfaced runway configuration indicates approximate VOR, VOR-DME, or VORTAC location.

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



ADDITIONAL AIRPORT INFORMATION

-  Private "(Pvt)" - Non-public use having emergency or landmark value
-  Military - Other than hard-surfaced; all military airports are identified by abbreviations AFB, NAS, AAF, etc. DoD users, for complete airport information consult DoD FLIP.
-  Helipoint Selected
-  Unverified
-  Abandoned - paved having landmark value, 3000 ft. or greater
-  Ultralight Flight Park Selected

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

★ Rotating airport beacon in operation Sunset to Sunrise

OBJECTIONABLE - Airport may adversely affect airspace use.

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Sectional Charts: Airports

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AIRPORTS

-  Other than hard-surfaced runways
 -  Hard-surfaced runways 1500 ft. to 8069 ft. in length
 -  Hard-surfaced runways greater than 8069 ft. or some multiple runways less than 8069 ft.
 -  Open dot within hard-surfaced runway configuration indicates approximate VOR, VOR-DME, or VORTAC location.
 -  Seaplane Base
- All recognizable hard-surfaced runways, including those closed, are shown for visual identification. Airports may be public or private.



ADDITIONAL AIRPORT INFORMATION

-  Private "(Pvt)" - Non-public use having emergency or landmark value
-  Military - Other than hard-surfaced; all military airports are identified by abbreviations AFB, NAS, AAF, etc. DoD users, for complete airport information consult DoD FLIP.
-  Heliport Selected
-  Unverified
-  Abandoned - paved having landmark value, 3000 ft. or greater
-  Ultralight Flight Park Selected

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

★ Rotating airport beacon in operation Sunset to Sunrise

OBJECTIONABLE - Airport may adversely affect airspace use.

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Sectional Charts: Obstacles

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OBSTRUCTIONS

-  1000 ft and higher AGL
 -  Below 1000 ft AGL
 -  Wind Turbine
 -  Group Obstruction
 -  Obstruction with high-intensity lights; may operate part-time
 -  Wind Turbine Farm
- Elevation of the top above mean sea level → 2049
Height above ground → (1149)
Under construction or reported: position and elevation unverified → UC
NOTICE: Guy wires may extend outward from structures.



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Section B

AIRSPACE

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**Airspace Categories**

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- Uncontrolled Airspace
 - Class G
- Controlled Airspace
 - Class A
 - Class B
 - Class C
 - Class D
 - Class E
- Special Use Airspace
 - Alert Area
 - Military Operating Area
 - Warning Area
 - Restricted Area
 - Controlled Firing Area
 - Prohibited Area

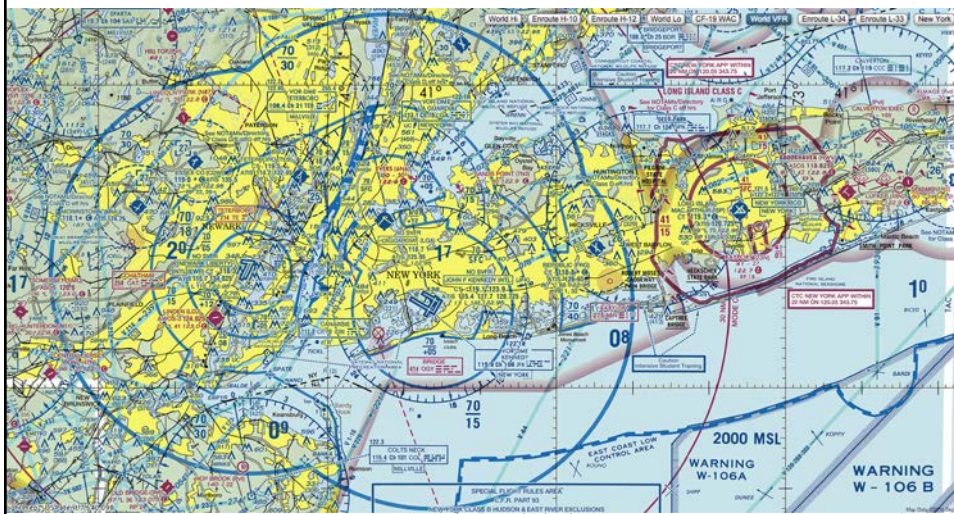
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Sectional Charts: Airspace

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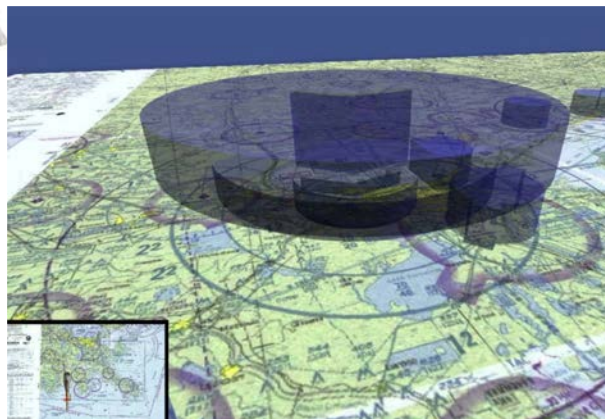
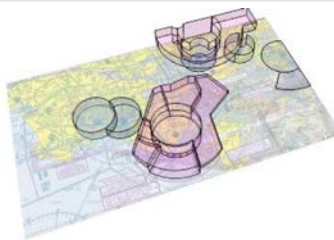
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Airspace is 3-Dimensional and (Sometimes) Overlapping

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FAR 91.135 Class A

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- All airspace from 18,000' MSL to FL600 (60,000')
- To enter Class A you must
 - Be equipped and rated for instrument flying
 - Be on an instrument flight rules plan ("IFR")
 - Set altimeter to 29.92 in. Hg. (in U.S.)
- Memory aid: "Altitude"

Pro tip: Nobody calls this "Class Alpha".

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91.131: Class B (“Bravo”)

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- Surrounds and protects our **busiest** airports (BOS, JFK, ATL, DFW, ORD, SFO, LAX, etc.)
- Everyone in Class B must have a clearance; wait until you hear “Cleared to enter Bravo airspace”
- Pilot must have Private certificate OR a student pilot certificate with logbook endorsement
- Aircraft needs Mode C transponder within 30 nm (“Mode C veil”)
- Shape: upside-down wedding cake, typically surface to 10,000’ MSL; solid blue lines on chart
- AIM prohibits actual landings by students at BOS, JFK, LAX, ORD, etc. OTOH there is an actual flight school at SLC!
- Goal: Don’t let the Piper Warriors hit JetBlue

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Class B

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AIRPORT TRAFFIC SERVICE AND AIRSPACE INFORMATION
Only the controlled and reserved airspace effective below 18,000 ft. MSL are shown on this chart.

- Class B Airspace
- Class C Airspace (Mode C - see FAR 91.215(a)(4))
- Class D Airspace
- Ceiling of Class D Airspace in hundreds of feet (A minus ceiling value indicates surface up to but not including that value.)
- Class E (600) Airspace
- Class E Airspace with floor 700 ft. above surface that laterally abuts Class G Airspace.
- Class E Airspace with floor 700 ft. above surface that laterally abuts 1200 ft. or higher Class E Airspace
- Class E Airspace with floor 1200 ft. or greater above surface that laterally abuts Class G Airspace
- 2400 MSL Differentiates floors of Class E Airspace greater than 700 ft. above surface.
- 4500 MSL

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AIRPORT TRAFFIC SERVICE AND AIRSPACE INFORMATION

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

 <p>CLASS A</p>	<p>Class A Airspace</p> <p>Class C Airspace (Mode C) see FAR 91.215(A)(1).</p> <p>Class D Airspace</p> <p>Celling of Class D Airspace in hundreds of feet (h) minus ceiling value indicates surface up to but not including value (h).</p> <p>Class E (etc) Airspace</p>
 <p>CLASS E</p>	<p>Class E Airspace with floor 700 ft. above surface, laterally about Class G Airspace.</p> <p>Class E Airspace with floor 700 ft. above surface, laterally about 1200 ft. or higher.</p> <p>Class E Airspace with floor 1200 ft. or greater above surface, laterally about Class G Airspace.</p>
 <p>CLASS G</p>	<p>Differentiates towers of Class E Airspace greater than 700 ft. above surface.</p>

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FAR 91.129: Class D (“Delta”)

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- Surrounds airports with control towers
- As with Class C, must establish 2-way radio communication before entering
- Dashed blue lines on chart
- Usually surface to 2,500 ft AGL, 4 nm in radius
- Usually 4 nautical mile radius
- Dimensions tailored to airport
- Memory aid: “Dialogue”

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Class D

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AIRPORT TRAFFIC SERVICE AND AIRSPACE INFORMATION

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

- Class B Airspace
- Class C Airspace (Mode C - see FAR 91.215(AM))
- Class D Airspace
- Ceiling of Class D Airspace in hundreds of feet (A minus ceiling value indicates surface up to but not including that value.)
- Class E (f) Airspace
- Class E Airspace with floor 700 ft. above surface that laterally abuts Class G Airspace.
- Class E Airspace with floor 700 ft. above surface that laterally abuts 1200 ft. or higher Class E Airspace
- Class E Airspace with floor 1200 ft. or greater above surface that laterally abuts Class G Airspace
- 2400 MSL Differentiates floors of Class E Airspace greater than 700 ft. above surface.
- 4500 MSL

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Class E

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- All other controlled airspace in United States
 - From 14,500 ft MSL to 18,000 MSL everywhere (lower 48)
 - Sometimes starts from 700' AGL, 1200' AGL, or other (specified on chart)
- VFR operations are not “controlled” in the same sense as in A-D: No need to communicate or obtain permission
- Rationale: higher weather minimums so that VFR aircraft don't hit IFR aircraft coming out of the clouds; disallow operations inside or near clouds without an IFR clearance
- Memory aid: “Elsewhere” (in terms of controlled airspace)

Pro Tip: Seldom referred to as “Class Echo.”

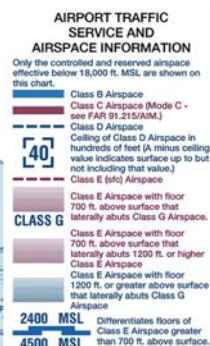
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Class E

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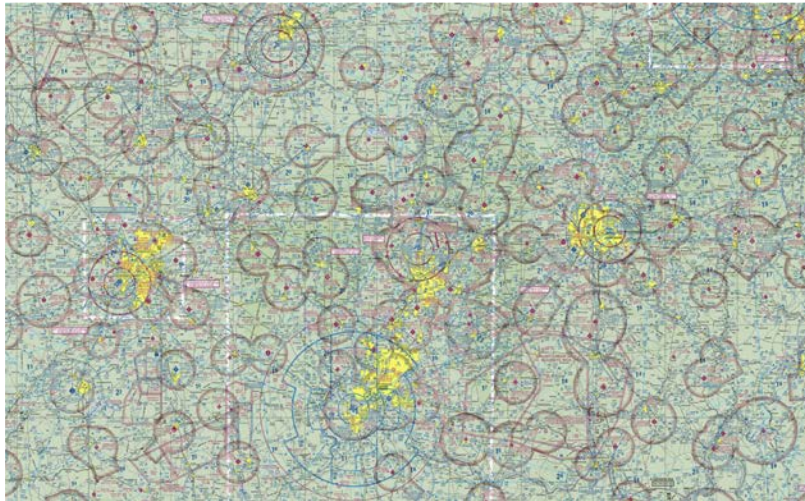
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Big Picture

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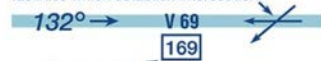
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Airways

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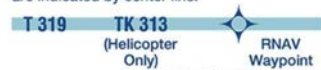
- “Victor Airways” - Class E
- 4 nautical miles each side of centerline
- 1,200 AGL up to 18,000 MSL

Class E Airspace low altitude Federal Airways are indicated by center line. Intersection - Arrows are directed towards facilities which establish intersection.



Total mileage between NAVAIDs on direct Airways

Class E Airspace low altitude RNAV 2 Routes are indicated by center line.



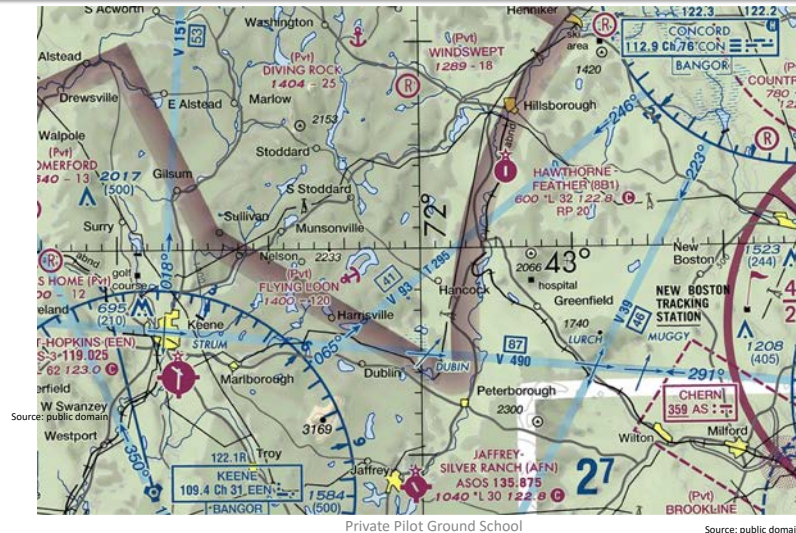
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Airways

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Class G (“Golf”)

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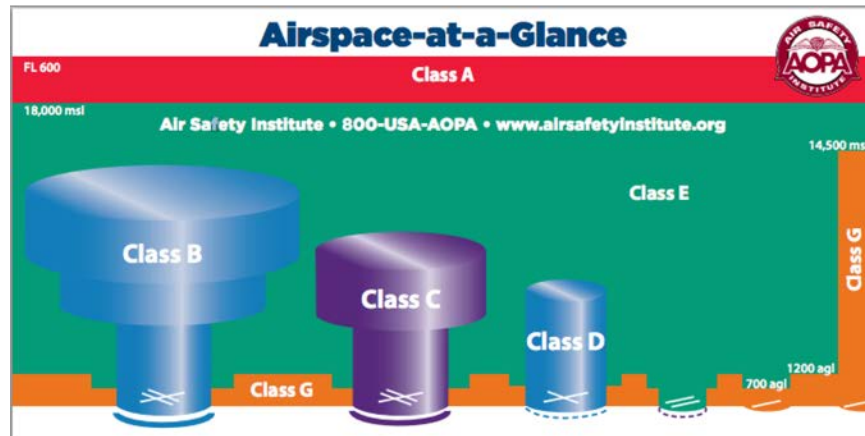
- Uncontrolled airspace
- Below 14,500’ MSL unless specified as:
 - Starting below 700’ AGL
 - Starting below 1200’ AGL
 - Starting below a different, non-standard altitude
 - See sectional chart for altitudes
- ATC exercises no control in Class Golf
- Practical Class G cruising in an airplane is limited to the western U.S. and Alaska
- Memory aid: “Go For It”

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Airspace Diagram

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Airspace Diagram

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Communication Requirements and Weather Minimums						
Features	Class A	Class B	Class C	Class D	Class E	Class G
Minimum Pilot Qualifications	Instrument Rating	Student*	Student*	Student*	Student*	Student
Entry Requirements	IFR: ATC Clearance VFR: Operations Prohibited	ATC Clearance	IFR: ATC Clearance VFR: Two-Way Communication w/ ATC	IFR: ATC Clearance VFR: Two-Way Communication w/ ATC	IFR: ATC Clearance VFR: None	None
VFR Visibility Below 10,000 msl**	N/A	3 Statute Miles	3 Statute Miles	3 Statute Miles	3 Statute Miles	Day: 1 Statute Mile Night: 3 Statute Miles
VFR Cloud Clearance Below 10,000 msl***	N/A	Clear of Clouds	500 Below 1,000 Above 2,000 Horizontal	500 Below 1,000 Above 2,000 Horizontal	500 Below 1,000 Above 2,000 Horizontal	500 Below 1,000 Above 2,000 Horizontal
VFR Visibility 10,000 msl and Above**	N/A	3 Statute Miles	3 Statute Miles	3 Statute Miles	5 Statute Miles	5 Statute Miles
VFR Cloud Clearance 10,000 msl and Above	N/A	Clear of Clouds	500 Below 1,000 Above 2,000 Horizontal	500 Below 1,000 Above 2,000 Horizontal	1,000 Below 1,000 Above 1 Statute Mile Horizontal	1,000 Below 1,000 Above 1 Statute Mile Horizontal

* Prior to operating within Class B, C, or D airspace (or Class E airspace with an operating control tower), student, sport, and recreational pilots must meet the applicable FAR Part 61 training and endorsement requirements. Solo student, sport, and recreational pilot operations are prohibited at those airports listed in FAR Part 91, appendix D, section 4.

** Student pilot operations require at least 3 statute miles during the day and 5 statute miles visibility at night.

*** Class G VFR cloud clearance at 1,200 agl and below (day): clear of clouds. See FAR 91.155(b) through (e) for additional regulations.

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FAR 91.133 Special Use Airspace

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- Don't go into:
 - Restricted Area –hazardous activities when active (“hot”), but ATC may let you in if “cold”
 - Prohibited Area, e.g., over George H.W. Bush’s house in Kennebunkport
 - Temporary Flight Restrictions (TFR) – complex and follow the President
- Proceed with caution:
 - Alert Area
 - Training, other unusual activities
 - Military Operations Area (MOA)
 - Warning Area
 - Hazardous military operations (overwater, sometimes international)

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Special Use Airspace

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Unpublished TFRs

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From AOPA: “The so-called “stadium TFR” prohibits all aircraft and parachute operations at or below 3,000 AGL within a 3 nm radius of any stadium with a seating capacity of 30,000 or more people when there is a **major league baseball** game, **NFL** game, **NCAA division one football** game, or major motor speedway event occurring. This TFR applies to the entire US domestic national airspace system, and takes effect from one hour before the scheduled event time until one hour after the event concludes.”

The stadiums in question are not designated on FAA charts. The schedule of the events that trigger this TFR are not known to briefers nor available via automated pilot briefing services.

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Resources

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- Interactive set of US sectionals
 - www.skyvector.com
 - www.vfrmap.com
- Check for TFRs and SUA status
 - <http://tfr.faa.gov>
 - <http://sua.faa.gov>
- Online airport information
 - www.airnav.com
- Sporty's Study Buddy and Sample Tests
 - <http://www.sportys.com/pilotshop/learn-to-fly/study-buddy.html>
- Online quizzes (choose topics/subjects)
 - www.exams4pilots.org

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Practice Question

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Which statement about longitude and latitude is true?

- A. Lines of longitude are parallel to the Equator.
- B. Lines of longitude cross the Equator at right angles.
- C. The 0 degree line of latitude passes through Greenwich, England.

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Practice Question

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Which statement about longitude and latitude is true?

- A. Lines of longitude are parallel to the Equator.
- B. Lines of longitude cross the Equator at right angles.**
- C. The 0 degree line of latitude passes through Greenwich, England.

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Practice Question

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Which is true concerning the blue and magenta colors used to depict airports on Sectional Aeronautical Charts?

- A. Airports with control towers underlying Class A, B, and C airspace are shown in blue; Class D and E airspace are magenta.
- B. Airports with control towers underlying Class C, D, and E airspace are shown in magenta.
- C. Airports with control towers underlying Class B, C, D, and E airspace are shown in blue.

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Practice Question

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Which is true concerning the blue and magenta colors used to depict airports on Sectional Aeronautical Charts?

- A. Airports with control towers underlying Class A, B, and C airspace are shown in blue; Class D and E airspace are magenta.
- B. Airports with control towers underlying Class C, D, and E airspace are shown in magenta.
- C. Airports with control towers underlying Class B, C, D, and E airspace are shown in blue.**

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