

NAVIGATION: CHARTS, PUBLICATIONS, FLIGHT COMPUTERS (chapters 7 & 8)

LONGITUDE AND LATITUDE

1. The location of an airport can be determined by the intersection of lines of latitude and longitude.
 - a. Lines of latitude are parallel to the equator, and those north of the equator are numbered from 0° to 90° north latitude.
 - b. Lines of longitude are lines, which extend from the North Pole to the South Pole. The prime meridian (which passes through Greenwich, England) is 0° longitude with 180° on both the east and west sides of the prime meridian.
2. The lines of latitude and longitude are printed on aeronautical charts (e.g., sectional) with each degree subdivided into 60 equal segments called minutes, i.e., 1/2° is 30' (the min. symbol is " ' ").

AIRSPACE AND ALTITUDES

Basic VFR Weather Minimums

Airspace	Flight Visibility	Distance from Clouds
Class A	Not Applicable	Not Applicable
Class B	3 statute miles	Clear of Clouds
Class C	3 statute miles	500 feet below 1,000 feet above 2,000 feet horizontal
Class D	3 statute miles	500 feet below 1,000 feet above 2,000 feet horizontal
Class E Less than 10,000 feet MSL	3 statute miles	500 feet below 1,000 feet above 2,000 feet horizontal
At or above 10,000 feet MSL	5 statute miles	1,000 feet below 1,000 feet above 1 statute mile horizontal
Class G 1,200 feet or less above the surface (regardless of MSL altitude).		
Day, except as provided in section 91.155(b)	1 statute mile	Clear of clouds
Night, except as provided in section 91.155(b)	3 statute miles	500 feet below 1,000 feet above 2,000 feet horizontal
More than 1,200 feet above the surface but less than 10,000 feet MSL.		
Day	1 statute mile	500 feet below 1,000 feet above 2,000 feet horizontal
Night	3 statute miles	500 feet below 1,000 feet above 2,000 feet horizontal
More than 1,200 feet above the surface and at or above 10,000 feet MSL.	5 statute miles	1,000 feet below 1,000 feet above 1 statute mile horizontal

1. An airplane may be operated clear of clouds in Class G airspace at night below 1,200 ft. AGL when the visibility is less than 3 SM but more than 1 SM in an airport traffic pattern and within 1/2 NM of the runway.
2. Class G airspace is all navigable airspace that is not classified as Class A, Class B, Class C, Class D, or Class E airspace.
3. The lower limits of Class E airspace
 - a. Surface around airports marked by segmented (dashed) magenta (red) lines
 - b. 700 ft. AGL in areas marked by magenta shading
 - c. 1,200 ft. AGL for areas designated as federal airways and other areas marked by blue shading
 - 1) Airways are depicted as light blue lines between VOR facilities and are labeled with the letter "V" followed by numbers, i.e., V-120.
 - 2) Federal airways extend up to 17,999 ft. MSL and are 8 NM wide.
 - d. If the lower limit of Class E airspace is other than 700 ft. AGL or 1,200 ft. AGL, the boundary will be depicted by a staggered line, and the new lower limit (expressed in MSL) will be shown.
 - 1) EXAMPLE: See Fig. 23 Appendix 1 charts and figures. North of area 3, you will see a staggered line. To the northeast of this line, the lower limit is 8,000 ft. MSL, and to the southwest of this line, the lower limit is 7,500 ft. MSL.
 - e. If none of the above applies, the floor of Class E airspace begins at 14,500 ft. MSL.
4. Class D airspace is an area of controlled airspace surrounding an airport with an operating control tower, not associated with Class B or Class C airspace areas.
 - a. Class D airspace is depicted by a segmented (dashed) blue line on sectional charts.
 - b. The height of the Class D airspace is shown in a broken box and is expressed in hundreds of feet MSL.
 - 1) EXAMPLE: $\left[\begin{array}{c} 31 \end{array} \right]$ means the height of the Class D airspace is 3,100 ft. MSL.
5. Class C airspace areas are depicted by solid magenta lines on sectional charts.
 - a. The surface area (formerly called the inner circle) of Class C airspace, the area within 5 NM from the primary airport, begins at the surface and goes up to 4,000 ft. above the airport. The shelf area (formerly called the outer circle) of a Class C airspace area, the area from 5 NM to 10 NM from the primary airport, begins at about 1,200 ft. AGL and extends to the same altitude as the surface area.
 - b. The vertical limits are indicated on the chart within each circle and are expressed in hundreds of feet MSL. The top limit is shown above a straight line and the bottom limit beneath the line.
 - 1) EXAMPLE: See Fig. 24 Appendix 1 charts and figures. At the bottom right (area 3) is the Savannah Class C airspace.
 - a) $\frac{41}{\text{SFC}}$ in the surface area means Class C airspace extends from the SFC surface (SFC) to 4,100 ft. MSL.
 - b) $\frac{41}{13}$ in the shelf area means Class C airspace extends from 1,300 ft. MSL to 4,100 ft. MSL.

- c. The minimum equipment needed to operate in Class C airspace
 - 1) 4096-code transponder
 - 2) Mode C (altitude encoding) capability
 - 3) Two-way radio communication capability
 - d. You must establish and maintain two-way radio communication with ATC prior to entering Class C airspace.
6. Class B airspace areas are depicted by heavy blue lines on sectional charts.
- a. The vertical limits are shown on the chart in the same manner as the vertical limits for Class C airspace discussed in item 5.b.
 - b. The minimum equipment needed is,
 - 1) A 4096-code transponder
 - 2) Mode C capability
 - 3) Two-way radio communication capability
7. When overlapping airspace designations apply to the same airspace, the more restrictive designation applies. Remember that Class A airspace is the most restrictive, and Class G is the least restrictive.
- a. **EXAMPLE:** The primary airport of a Class D airspace area underlies Class B airspace. The ceiling of the Class D airspace is 3,100 ft. MSL, and the floor of the Class B airspace is 3,000 ft. MSL. Since Class B is more restrictive than Class D, the overlapping airspace between 3,000 ft. and 3,100 ft. MSL is considered to be Class B airspace.
8. Special use airspace includes prohibited, restricted, warning, military operations, alert, national security, and controlled firing areas.
- a. **Restricted areas** denote the existence of unusual, often invisible hazards to aircraft such as military firing, aerial gunnery, or guided missiles.
 - b. **Warning areas** contain activity that may be hazardous to nonparticipating aircraft, e.g., aerial gunnery, guided missiles, etc.
 - 1) Warning areas extend from 3 NM outward from the U.S. coast.
 - 2) A warning area may be located over domestic air or international waters or both.
 - c. **Military operations areas (MOAs)** denote areas of military training activities.
 - 1) Pilots should contact any FSS within 100 NM to determine the MOA hours of operation.
 - 2) If it is active, the pilot should contact the controlling agency prior to entering the MOA for traffic advisories because of high-density military training.
 - 3) When operating in an MOA, exercise extreme caution when military activity is being conducted.
9. **Military training routes (MTR)** are established below 10,000 ft. MSL for operations at speeds in excess of 250 kt.
- a. IR means the routes are made in accordance with IFRs.
 - 1) VR means the routes are made in accordance with VFRs.
 - b. MTRs that include one or more segments above 1,500 ft. AGL are identified by a three-digit number.
 - 1) MTRs with no segment above 1,500 ft. AGL are identified by a four-digit number.

10. Information about parachute jumping areas and glider operations is contained in the Airport/Facility Directory (A/FD). Parachute jumping areas are marked on sectional charts with a parachute symbol.

11. Over national wildlife refuges, pilots are requested to maintain a minimum altitude of 2,000 ft. AGL.

12. Airport data on sectional charts include the following information:

a. The name of the airport

b. The elevation of the airport, followed by the length of the longest hard-surfaced runway. An L between the altitude and length indicates lighting.

1) EXAMPLE: 1008 L 70 means 1,008 ft. MSL airport elevation, L is for lighting sunset to sunrise, and the length of the longest hard-surfaced runway is 7,000 ft.

2) If the L has an asterisk beside it, airport lighting limitations exist, and you should refer to the A/FD for information.

c. The UNICOM frequency if one has been assigned (e.g., 122.8) is shown after or underneath the runway length.

d. At controlled airports, the tower frequency is usually under the airport name and above the runway information. It is preceded by CT.

1) If not a federal control tower, NFCT precedes the CT frequency.

e. A small, star-shaped symbol immediately above the airport symbol indicates a rotating beacon from sunset to sunrise.

f. The notation "NO SVFR" above the airport name means that fixed-wing special VFR operations are prohibited.

13. Obstructions on sectional charts

a. Obstructions of a height less than 1,000 ft. AGL have the symbol 

1) A group of such obstructions has the symbol. 

b. Obstructions of a height of 1,000 ft. or more AGL have the symbol. 

1) A group of such obstructions has the symbol. 

c. Obstructions with high-intensity lights have arrows, or lightning bolts, projecting from the top of the obstruction symbol.

d. The actual height of the top of obstructions is listed near the obstruction by two numbers: one in bold print over another in light print with parentheses around it.

1) The bold number is the elevation of the top of the obstruction in feet above MSL.

2) The light number in parentheses is the height of the obstruction in feet AGL.

3) The elevation (MSL) at the base of the obstruction is the bold figures minus the light figures.

a) Use this computation to compute terrain elevation.

b) Terrain elevation is also given in the airport identifier for each airport and by the contour lines and color shading on the chart.

- e. You must maintain at least 1,000 ft. above obstructions in congested areas and 500 ft. above obstructions in other areas.
14. Navigational facilities are depicted on sectional charts with various symbols depending on type and services available: These symbols are shown in Legend 1.
- a. A VORTAC is depicted as a hexagon with a dot in the center and a small solid ~ rectangle attached to three of the six sides.
 - b. A VOR/DME is depicted as a hexagon within a square.
 - c. A VOR is depicted as a hexagon with a dot in the center.

IDENTIFYING LANDMARKS

1. On aeronautical charts, magenta (red) flags denote prominent landmarks which may be used as visual reporting checkpoints for VFR traffic when contacting A TC.
2. The word "CAUTION" on aeronautical charts usually has an accompanying explanation of the hazard.
3. Airports with a rotating beacon will have a star at the top of the airport symbol on sectional charts.
4. Airports attended during normal business hours and having fuel service are indicated on airport symbols by the presence of small solid squares at the top and bottom and on both sides (9 o'clock and 3 o'clock) on the airport symbol.

RADIO FREQUENCIES

1. At airports without operating control towers, you should use the Common Traffic Advisory Frequency (CTAF), marked with a letter C in the airport data on the sectional chart-
 - a. The control tower (CT) frequency is usually used for CT AF when the control tower is closed.
 - b. At airports without control towers but with FSS at the airport, the FSS airport advisory frequency is usually the CTAF.
 - c. At airports without a tower or FSS, the UNICOM frequency is the CTAF.
 - d. At airports without a tower, FSS, or UNICOM, the CTAF is MULTICOM, i.e., 122.9.
 - e. Inbound and outbound traffic should communicate position and monitor CTAF within a 10-NM radius of the airport and give position reports when in the traffic pattern.
 - f. At airports with operating control towers the UNICOM frequency listed on the sectional chart and A/FD can be used to request services such as fuel, phone calls, and catering.
2. Flight Watch is the common term for En Route Flight Advisory Service (EFAS). It specifically provides en route aircraft with current weather along their route of flight.
 - a. Flight Watch is available throughout the country on 122.0 between 5,000 ft. MSL and 18,000 ft. MSL.
 - b. The name of the nearest Flight Watch facility is sometimes indicated in communications boxes.
3. Hazardous Inflight Weather Advisory Service (HIWAS) is available from navigation facilities that have a small square inside the lower right corner of the navigation aid identifier box.

FAA ADVISORY CIRCULARS

1. The FAA issues advisory circulars to provide a systematic means for the issuance of nonregulatory material of interest to the aviation public.
2. The circulars are issued in a numbered system of general subject matter areas to correspond with the subject areas in Federal Aviation Regulations (e.g., 60 Airmen, 70 Airspace, 90 Air Traffic Control and General Operation).
3. FAA Advisory Circulars are available from the FAA and the U.S. Government Printing Office.
 - a. An Advisory Circular Checklist (AC 00-2) is available by writing the U.S. Department of Transportation, Subsequent Distribution Office, SVC-121.23, Ardmore East Business Center, 3341 Q 75th Ave., Landover, MD, 20785.

AIRPORT/FACILITY DIRECTORY

1. *Airport/Facility Directories (A/FDs)* are published by the U.S. Department of Commerce every 56 days for each of seven geographical districts of the United States.
 - a. *A/FDs* provide information on services available, runways, special conditions at the airport, communications, navigation aids, etc.
2. The airport name comes first.
3. The third item on the first line is the number of miles and direction of the airport from the city.
 - a. EXAMPLE: **4 NW** means 4 NM northwest of the city.
4. Right-turn traffic is indicated by "Rgt tic" following a runway number.
5. When a control tower is not in operation, the CT AF frequency (found in the section titled **Communications**) should be used for traffic advisories.
6. Initial communication should be with Approach Control if available where you are landing. The frequency is listed following "APP/DEP CON."
 - a. It may be different for approaches from different headings.
 - b. It may be operational only for certain hours of the day.
7. In Class C airspace, VFR aircraft are provided the following radar services:
 - a. Sequencing to the primary Class C airport
 - b. Approved separation between IFR and VFR aircraft
 - c. Basic radar services, including safety alerts, limited vectoring, and traffic advisories
8. A sample *A/FD* legend and explanations are available in Appendix 1 of the charts and figures Testing Supplement.