CHAPTER 3
CONTENT

3.1 COMPILATION

3.1.1 General

When compiling local areas, features may be encountered that are unique to the area and are not specifically covered in these specifications. Similarly, local conditions shall exist which cannot be symbolized and should be handled by appropriate descriptive notes. In most cases, the features shall be sufficiently similar to those discussed to permit application of the standard symbol or minor modifications thereto.

3.1.2 Detail Selection and Density

Rigid rules to satisfy requirements in the selection and density of chart detail cannot be formulated in view of the multiple requirements. For this reason, the finished product may not necessarily represent an optimal portrayal of chart detail; however, the selection of criteria detailed herein should suffice to serve as general guidance in achieving the best overall balance and relativity of the chart features portrayed.

Discretion must be used in determining the quantity and selection of detail to be shown. Unnecessary information and indiscriminate selection of features is not advisable in congested areas and shall be avoided. However, all essential information required must still be retained, especially outstanding features for use as checkpoints.

3.1.2.1 Basic Rules Governing the Selection of Detail

The following basic rules governing the selection of detail should be followed:

- A firm requirement exists to provide maximum density of ground features significant in visual low level navigation without impairing chart legibility.

- Features selected for portrayal in one area may be inappropriate in another area. In areas of sparse or moderate culture, the lesser chart features assume extreme importance because of their checkpoint value. In congested areas, these same features would not be seen by the low level pilot and normally should not be shown.

- Significant recognizable topographic features relating to or aiding in the identification of airports or unique areas, specifically requested and validated by operational users, shall be shown.

- Cultural features that are so unique and outstanding that they provide instantaneous orientation of the chart to the ground shall be shown short of over-congestion.

- The visual outline of a populated place, in itself, is not necessarily of landmark significance. Checkpoint features in the near vicinity are required to ensure positive identification.

- Roads and railroads, by themselves, are not necessarily significant to the visual pilot. Their identification value can be ensured only by the inclusion of related features in the immediate vicinity which distinguishes one from the other.

- Care should be used in making the selection in congested areas to ensure a proper balance throughout the chart. Reduction of detail shall affect the whole chart and should be graduated from highest density to lowest density to give comparable value to details included throughout the chart. When reducing chart congestion, the order of elimination shall be as follows:

  1. Canal names, minor geographic names and small town names
  2. Trails
  3. Secondary roads (lacking identifying characteristics)
  4. Single-line streams
  5. Miscellaneous cultural features lacking identification value as checkpoints
  6. Descriptive words used to clarify symbols

- More specific criteria is furnished further on in these specifications under the paragraph heading designated for each chart feature.

- In order to effectively determine the types and density of checkpoints that require emphasis, the researcher and compiler must closely follow the selection and density criteria contained in these specifications.

3.1.3 Pictorialization of Checkpoint Features

3.1.3.1 General

The successful execution of a low altitude flight depends upon visual identification of ground features and a rapid visual association with their chart counterpart. Under low altitude conditions, the apparent movement of the ground is rapid and causes blurring. The angular velocity of ground features as they sweep beneath the nose of the aircraft provides little time for recognition. Depth of vision is restricted because of the closeness of the aircraft to the terrain. Ground fog, haze, and other factors affecting the visibility can further combine to reduce depth of vision. In addition, the span of vision is restricted due to the necessity of identifying checkpoint features on or near the horizon directly ahead of the aircraft and making positive visual identification as the ground objects rapidly approach at increasing angular velocities. The pilot must have a preconceived mental image of each successive checkpoint feature to facilitate recognition at first glance. He must have an appreciation of the design and basic character of these checkpoints and know when (in seconds of time) and where (relative to the speed of the aircraft) they shall be overflown. Therefore, the selection and portrayal of ground features should be based on the requirement for rapid visual recognition of significant chart detail as seen from a low perspective angle.

As visual cross referencing is precluded by the critical time factor, some means other than conventional signs and symbols is required to afford the navigator a preconceived mental image of outstanding checkpoints. For this purpose, three dimensional perspective drawings, referred to in these specifications as “Pictorial Symbols”, have been developed.

Pictorialized checkpoints are specifically designed to meet the need of the visual pilot. The basic requirement is to afford the visual pilot a preconceived mental image of outstanding checkpoint features that shall serve as a medium for instantaneous orientation of the chart to the ground.

Features selected for pictorial symbolization should be items that have visual significance and are of such unique nature that immediate recognition is possible. Indiscriminate portrayal and selection can cause confusion and possibly compromise the pilot's ability to safely navigate. Features considered for pictorialization should include prominent buildings, factories/complexes, towns and miscellaneous features.

Selection and identification of isolated features should be done with extreme care.

3.1.3.2 Selection and Density

Selection and density is largely controlled by the following considerations:

3.1.3.2.1 Density of Cultural Detail

Moderate to dense areas of cultural detail generally tend to combine with other detail to create suitable visual checkpoints. Therefore, the greatest need for pictorialized landmarks is in sparsely populated areas.

3.1.3.2.2 Area Considerations

Features selected for portrayal in one area may be inappropriate for portrayal in another area. Such determinations should be based on critical area analysis. Features like outdoor (drive-in) theaters, churches, etc., cannot be considered in the selection of pictorial symbols unless each is a unique or prominent vertical checkpoint.

3.1.3.2.3 Complementary Values

Pictorial symbols are applied effectively when they supplement or complement basic cultural and natural features. This ensures positive identification. The basic concept is not to re-create a set of ground patterns or to give the total picture by the pictorial symbol pattern, but rather to enhance the identification value of terrain characteristics by the addition of a unique feature that completes the picture and ensures identification. The pictorialized feature is meant to provide immediate recognition of a man-made feature where checkpoints, due to the nature of the terrain, are lacking. It must be emphasized: indiscriminate and too frequent application of pictorial symbols can only negate the intended purpose.

3.1.3.2.4 Relative Values

Features should be selected for pictorial portrayal based on their relative value as checkpoints considering size (vertical dimension and mass), configuration and uniqueness in the area. Uniqueness in the area cannot be over-emphasized. For example, within a series of small towns each containing a church, nothing is gained by portraying each town with a pictorialized church. Conversely, the relationship of each town to the other in the series together with the drainage, road, and railroad pattern would constitute a variety of more desirable checkpoints. Therefore, when selecting a feature for pictorialization, distinctiveness and vertical mass is of utmost importance. If the feature is duplicated within a radius of 15-25 miles, it may not satisfy the criteria for uniqueness in the area.

3.1.3.3 Controlling and Interrelated Factors

The final determination of the need for pictorially symbolized checkpoints must be based on the controlling and interrelated factors described below:

- The availability of adequate source material to support pictorialization.

- The need for pictorial symbols considering the availability and characteristics of other checkpoints in the area.

- The determination based on broad area studies in advance of production, as to which method (pictorial or conventional symbolization) more adequately satisfies operational use requirements in a particular area, a particular chart, or a portion of a chart.

3.1.3.4 Positioning of Pictorial Symbol

Extreme care must be taken to position the pictorial symbol so that no doubt exists as to its true position. When necessary, a fine leader line from the pictorial symbol may be used to pinpoint true position; however, this practice should be kept to a minimum.

- Vertically symmetrical symbols shall be oriented so that the vertical dimension is perpendicular to the parallels of latitude. Exception to the above is the transmission line pylon symbol which shall be oriented perpendicular to the transmission line.

- Elongated symbols such as bridges, dams, etc., shall be oriented along the actual line of position.

3.1.3.5 Visual Character of Pictorial Symbol

After a feature has been selected for portrayal, great care must be taken to ensure that the pictorial symbol captures the visual character of that feature. Also, significant features may be found to be unique to particular geographic areas. Development of suitable symbols should be initiated to satisfy the requirements.

3.2 NAMES AND LABELING

3.2.1 General

Names are required for planning, briefing, and relating to other charts and publications.

The application of place and feature names to aeronautical charts is controlled by policies established by the U.S. Board on Geographic Names. In general, proper names of places or features are spelled in conventional English.

Extreme care should be exercised in naming chart features. Use of technical, cartographic and/or geographic terms shall be avoided in favor of a language that is readily understood by the airman. For example, the word "karst" alone has little or no meaning to the average user, nor is its definition readily available. Appropriate, common-language descriptive terms shall be used such as "sinkholes", "distorted surface area", "area of distinctive terrain", etc., whichever most adequately describes the condition. The word "karst" (in parentheses) may be positioned below or following the descriptive text.

The Appendices and the Style Sheets combined provide guidelines for type size and style, composition and positioning.

3.2.2 Name Selection

Names shall be selected on the basis of importance. It is extremely important that care be exercised to keep the chart free of unnecessary congestion.

The following basic rules govern the selection of names:

1. Features validly selected for naming in one area may be inappropriate for naming in another area. In areas of sparse or moderate culture, the lesser chart features assume extreme importance because they pinpoint landmarks and should be named provided they can be positioned without obscuring detail pertinent to the primary use.

2. The features portrayed must be clear and legible. They must not be obscured by names which are of relatively less importance in operational use.

3. Names of aeronautical facilities are more important than the names of other chart features.

4. Topographic names have very little significance in this series of charts. Only a few of the most significant topographic features on the chart shall be named.

5. When there is doubt as to the value of a name it should be omitted.

6. In the selection of names, all base and aeronautical detail is critical and shall not be obscured by names.

7. Villages shall not be named in congested areas of the chart.

3.2.2.1 Hydrographic Features

In most cases, names shall be shown for the following features:

- Oceans
- Seas
- Bays
- Gulfs
- Sounds
- Large inlets
- Large estuaries
- Large channels and canals
- Large double-line streams

3.2.2.1.1 Hydrographic Names

Names shall be shown for the following features where they do not cause congestion or overprint more pertinent chart detail:

- Small inlets, estuaries, channels and canals
- Single-line streams of considerable length
- Springs, wells and water holes (in arid areas only)

3.2.2.2 Relief

Only names for relief features of major significance are required, such as well known mountain ranges, peaks, capes, and peninsulas.

3.2.2.3 Culture

3.2.2.3.1 Populated Places

All populated places in Categories 1 and 2 shall be named short of congestion. Selection should be based on relative importance (size) for Category 2 populated places.

Populated places in Category 3 shall be named only in: areas of sparse chart detail and areas lacking populated places of a higher classification.

Towns in close proximity to airports should be named, regardless of size.

Important isolated towns that are unnamed may be labeled “village” to avoid the possibility of the symbol being overlooked. Such labeling shall be kept to a minimum.

3.2.2.3.2 Roads

Major highways of visual navigation significance may be identified by symbolized number.

3.2.2.3.3 Railroads

Railroad names (either in full or abbreviated) are not required.

3.2.2.3.4 Miscellaneous Cultural Features

Miscellaneous cultural features shall be named only when they are the most significant feature in a local area

3.2.3 Descriptive Notes

Notes are a means of furnishing pertinent data related to the chart area. These notes may identify a symbol; describe an area or unique feature; be a note of caution; detail some valuable or unique aspect or activity of an area or be instructions the pilot should follow, such as an altitude, frequency or bearing and distance to/from a NAVAID. Size and style of a note may vary according to the importance of the activity being described.

All notes applied to the chart shall be those specified or approved by appropriate authority.

3.2.4 Basic Principles of Type Placement

Names shall be positioned so there is no ambiguity as to which feature is identified.

In the selection of a type size for a feature, proper judgment must be exercised to obtain a graduation in size which shall be in proportion to the relative importance of the feature. Careful consideration must be given to both the importance of chart detail and the name of the feature.

Generally, chart detail should take precedence over names of secondary features such as villages, small ponds, streams, etc.

Avoid positioning type over and in alignment with linear features, since this affects the continuity of a feature and legibility of the type. If type must overprint base detail, it is preferable that it be positioned to cross a linear feature.

Normally, all type shall be positioned so that the wording may be read from left to right and from the bottom of the sheet, and shall be positioned to provide a minimum of conflict with chart detail.

Type for large islands and bodies of water shall be positioned within the outlines in the approximate center of their respective features. When the feature is not large enough to accommodate the type, type shall be positioned alongside the feature.

Type for large double-line streams shall be positioned within the shorelines when space permits. Names of all double-line and single-line streams shall be shown in type sizes adjusted to their relative importance within the chart.

Names of populated places and other non-linear features shall be positioned parallel to lines of latitude.

Type for linear features, such as roads, streams, canals, etc., shall normally appear on the upper side, following the general direction and curvature of the feature. It shall be necessary to repeat type in labeling long features.

Names of extensive topographic features, such as valleys, mountain ranges, plateaus, canyons, etc., shall be extended across the center of such features in a smooth curve.

Type for capes and points should preferably appear in the open water areas aligned horizontally with the latitude parallel and slightly above or below the feature. The type shall be kept clear of the shoreline.

To indicate the elevation for a small island where the island name has been placed in open water areas, the spots may be omitted and the value centered under the island name.

The sovereign or mother country of an island or colony shall be carried in parentheses to the right of or below the name of the island or colony.

3.3 MARGIN INFORMATION

Margin information shall be shown in blue, unless otherwise noted.

3.3.1 Front Side (North Chart)

The following data shall be positioned in the extreme left panel of what shall be referred to as the front or title panel of the charts. This shall serve as the outside "fold" on all charts when completely folded.

3.3.1.1 Legend Data

3.3.1.2 Title Panel

3.3.1.3 Projection and Horizontal Datum Note

A note referencing the projection and horizontal datum shall be positioned in the margin area in 6 pt. Helvetica Condensed Bold C/L and 7 pt. Helvetica Condensed Bold Figures, e.g.,

Figure 3.1 Projection and Horizontal Datum Note

Lambert Conformal Conic Projection Standard Parallels 33° 20' and 38° 40'
Horizontal Datum: North American Datum of 1983 (World Geodetic System 1984)

3.3.1.4 QR Code

The QR Code shall be positioned on the title panel.

3.3.1.5 Barcode

The NGA barcode and the National Stock Number (NSN) shall be positioned at the bottom of the title panel.

Figure 3.2 Barcode

3.3.2 Reverse Side (South Chart)

The following data shall be positioned in the extreme back (or reverse side) left panel or in the margin area along the bottom of the chart. Exception to this is made to accommodate that provided within 2.1.1, 2nd paragraph.

3.3.2.1 Corrections and Comments Note

A boxed note denoting corrections and comments shall be shown within the margin area. This note may be shown on the Front Side (North Chart) if insufficient margin area exists on the Reverse Side (South Chart).

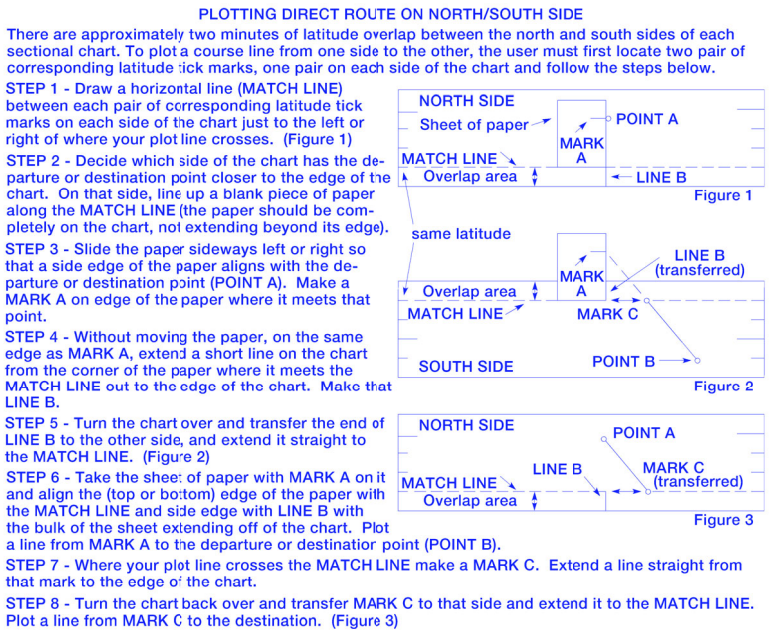
3.3.2.2 Bar Scale

A linear bar scale extending the full length of the image area of the chart shall be shown on the black plate, providing kilometers, nautical miles, and statute miles.

3.3.2.3 Plotting Instructions

A note, as illustrated, providing instructions for plotting a course line from one side to the other of a chart shall be shown normally directly beneath the cut line. (Not applicable to the VFR TAC).

Figure 3.3 Plotting Instructions



3.3.2.4 Tabulated Data

3.3.2.4.1 Airport Tower Communications Tabulation

A columnized tabulation of all tower-controlled airports that appear on the respective chart shall be shown alphabetically by airport name. Airport names will be extracted verbatim from the authoritative database.

Airport name shall be supplemented with the tower operating hours, primary VHF and UHF local control frequencies, primary VHF and UHF ground control frequencies and Automatic Terminal Information Service frequencies, when available. Frequencies shall be listed in ascending order. An asterisk shall follow the part-time tower frequency remoted to the collocated full-time FSS for use as Airport Advisory Service (AAS) during hours the tower is closed. Airport Surveillance Radar (ASR) and/or Precision Approach Radar (PAR) shall be shown when available.

3.3.2.4.2 Special Use Airspace Tabulation

A tabulation of Special Use Airspace to include Prohibited, Restricted and Warning Areas, and a tabulation to include Alert and Military Operations Areas (MOA) that appear on the chart shall be shown, listed numerically or alphabetically by number or name, and supplemented with altitude, time of use and the controlling agency/contact facility, and its frequency, when available. The controlling agency shall be shown when the contact facility and frequency data is unavailable. The MOA and Alert Area tabulations shall be shown in magenta. Restricted, Danger and Advisory Areas for other countries shall be tabulated separately. See Appendices for tabulation example.

In the list of definitions heading this tabulation, include the following:

- NOTAM - Use of this term in Restricted Areas indicates FAA and DoD NOTAM system. Use of this term in all other Special Use Areas indicates the DoD NOTAM system.

The following note shall be placed at the bottom left corner of the Special Use Airspace (SUA) Tabulation box:

- "Alert Areas do not extend into Class A, B, C and D airspace, or Class E airport surface areas."

3.3.2.5 Special Conservation Areas

Aircraft Operating Regulations of the Fish and Wildlife Service, National Forest Wilderness and Primitive Areas, Bureau of Land Management, and the National Park Service shall be shown when such areas are depicted on the respective chart. (See note provided in Section **3.9.4.18**.)

3.3.2.6 Adjoining Chart Notes (not on TAC)

Adjoining or overlapping chart notes shall be shown in blue on Sectional Charts e.g., "Joins Atlanta", "Overlaps Cincinnati".

Notes shall be shown in the margin along the west and south limits of the chart; and within the body of the chart along the north and east limits of the chart.

Two adjoining notes, one centered in the upper half, the other centered in the lower half shall be positioned on each side (east and west) of the chart. Notes shall be positioned to read up on the west side and down on the east side.

Three adjoining notes shall be shown approximately positioned along the north and south limits of the chart.

Adjoining chart notes shall be enclosed within a .010" lineweight box. Type size and style shall be 10 pt. New Century Schoolbook Italic C/L.

3.3.2.7 Chart Name

The name of the chart, e.g., ATLANTA shall be shown in the extreme left and right lower corners of the chart (except the VFR Terminal Area Chart).

3.3.2.8 Other Notes

The following note shall appear on all charts in the margin area.

3.3.2.8.1 Caution Note

Figure 3.4 Caution Note

CAUTION: This chart is primarily designed for VFR navigational purposes and does not purport to indicate the presence of all power transmission and telecommunication lines, terrain or obstacles which may be encountered below reasonable and safe altitudes.

3.3.2.8.2 Flight Following Services Note

The following note shall appear on all charts

Figure 3.5 Flight Following Services Note

Flight Following Services are available on request and highly recommended in and around Class B, C, and TRSA areas.

3.3.2.8.3 Class G Airspace Note

The following note shall appear on all charts:

Figure 3.6 Class G Airspace Note

Class G Airspace within the United States extends up to 14,500 feet MSL. At and above this altitude all airspace is within Class E Airspace, excluding the airspace less than 1500 feet above the terrain and certain special use airspace areas.

3.3.2.8.4 Procurement Note

A boxed note in blue shall appear on all charts informing the chart user where charts may be purchased.

3.3.2.8.5 NORAD Procedures (Intercept) Note

The following note shall appear on all charts:

Figure 3.7 NORAD Procedures (Intercept) Note

NORTH AMERICAN AEROSPACE DEFENSE COMMAND (NORAD) PROCEDURES

All aircraft operating in the U.S. national airspace, if capable, will maintain a listening watch on guard frequencies VHF 121.5 or UHF 243.0. It is incumbent upon all aviators to know and understand their responsibilities if intercepted. Review "AIM" section 5-6-13 for intercept procedures. Additionally, if U.S. military fighter jets intercept an aircraft and flares are dispensed in the area of that aircraft, aviators will pay strict attention, contact air traffic control immediately on the local frequency or on VHF guard 121.5 or UHF 243.0 and follow the interceptor visual ICAO signals. Be advised that non-compliance may result in the use of force.

3.3.2.8.6 VFR Checkpoint Note

The following VFR Checkpoint Note shall appear in the margin area of all charts.

Figure 3.8 VFR Checkpoint Note

Features normally used as checkpoints for controlling VFR traffic are emphasized on this series of charts so they may be readily identified.

Example: POWER PLANT

The name shown is that used by the controlling personnel and is not necessarily the official name of the feature.

3.3.3 TAC Margin Information

Some margin information on TACs deviates from these specifications.

3.4 COLOR SEPARATION

Color separation of the various component parts of the chart shall consist principally of the following. Detailed specifications of color shall be found in **CHAPTER 4**, Reproduction.

3.4.1 Black - Topographical and Cultural

1. Boundary lines and names
2. Urban outline and town symbols
3. Spot elevations (symbols and type)
4. Railroads and associated type
5. Roads and associated type
6. Pipelines
7. Symbols for water, gas and oil tanks, and wells (other than water) and associated type
8. Certain features of coastal hydrography and associated type
    a. Seawalls
    b. Man-made shorelines
9. Mountain Pass symbol
10. Graticule and values
11. Base margin notes, legend and scales
12. Other symbolized miscellaneous cultural features and associated type
13. Pictorial symbols and corresponding geographical location symbols and associated type
14. Pictorial vertical obstruction symbols of outstanding visual significance and associated type
15. Transmission lines
16. Names of populated places, cultural features and associated type
17. Isolated rock symbols (bare and awash)
18. Wreck symbols
19. Descriptive labeling for “tundra” and “muskeg”
20. Descriptive labeling and symbol for peat cuttings
21. Descriptive labeling for sand dunes, when necessary
22. Unreliable relief notes
23. Names of countries, states and cities
24. Sand areas and moraine
25. Foreshore flats
26. Neatline
27. Bar scale and associated type
28. Political boundaries
29. VFR Checkpoint type when applicable
30. Contour lines and values
31. Miscellaneous relief features (hachures, levees, strip mine tailings to scale, etc.)
32. Topographical names
33. Pack ice, polar ice, shelf ice and associated type
34. Distorted surface area
35. Time Zones and conversion factors
36. Shaded relief

3.4.2 Blue - Hydrographic

1. Hydrographic features (perennial and non-perennial) except for certain features of coastal hydrography detailed in Section **3.4.1**, Item 8, Certain features of coastal hydrography and associated type.
2. Hydrographic names including descriptive type
3. Lake and stream elevations
4. Open water
5. Inland open water
6. Swamps
7. Shoreline vignette
8. Wet sand areas within and adjacent to desert areas
9. Stipple fill of non-perennial features
10. Reefs (rocky and coral)
11. Ice peaks, ice cliffs and associated type
12. Fish ponds and hatcheries

3.4.3 Magenta - Topographic and Cultural

1. Boundary overprint
2. Sand areas and moraine

3.4.4 Yellow - Urban Area Tint

1. Outlined urban areas and those symbolized by a square.

3.4.5 Blue - Aeronautical

1. Aeronautical lights and associated type
2. Marine lights and associated type
3. Obstructions and associated type (Conventional inverted "V" obstructions and wind turbine symbols)
4. Selected airports and associated type
5. High energy radiation areas and associated type
6. Special air traffic rules/airport traffic patterns (FAR Part 93) and associated type
7. Space operations areas (FAR Part 91.215) and associated type
8. Special Flight Rules Areas (SFRA) and associated type
9. National Security Special Flight Rules Areas, Temporary Flight Restrictions (TFR), Flight Restricted Zones (FRZ) and associated type
10. Special Security Notice Permanent Continuous Flight Restriction Areas
11. Flight Information Regions (FIR) and/or Control Area (CTA) and associate type
12. Class E airspace (1200' AGL and above) and associated type
13. Victor airways and associated type
14. RNAV airways and associated type
15. VHF/UHF NAVAIDs and associated type
16. Prohibited, Restricted and Warning areas and associated type
17. Class B airspace and associated type
18. Class D airspace and associated type
19. Class G airspace and associated type
20. VFR checkpoint type when applicable
21. Broadcasting Stations (commercial) and associated type
22. Compass roses
23. Special Conservation Areas and associated type
24. Adjoining chart note
25. Maximum Elevation Figures (MEF)
26. Aeronautical margin notes
27. Elevations of pictorial obstruction symbols
28. Operational Notes

3.4.6 Magenta - Aeronautical

1. Selected airports and associated type
2. LF/MF NAVAIDs and associated type
3. Military Operations Areas (MOA), Alert Areas and associated type
4. Colored airways and associated type
5. Isogonic lines and associated type
6. VFR checkpoint flags
7. VFR checkpoint type when applicable
8. Compass rosettes
9. Parachute jumping, glider operation, hang gliding, ultralight activity, unmanned aircraft activity areas, space launch activity areas, aerobatic practice areas and associate type
10. Sporting Event Temporary Flight Restriction Sites
11. National Security Areas and associated type
12. National Defense Airspace Temporary Flight Restriction (TFR) Areas and associated type
13. Mode C airspace and associated type
14. Class C airspace and associated type
15. Class E airspace (surface and 700' AGL) and associated type
16. Air Defense Identification Zones (ADIZ) and associated type
17. Operational notes

3.4.7 Black - Aeronautical

1. Military Training Routes (MTR) and associated type
2. Terminal Radar Service Areas (TRSA) and associate type
3. Special Military Activity Routes (SMAR) and associated type
4. VFR waypoints and associated type
5. Operational notes

3.4.8 Green - Relief

1. Gradient layer tint

3.4.9 Buff - Relief

1. Gradient layer tint

3.4.10 Brown - Relief

1. Gradient layer tint

3.5 PROJECTION

3.5.1 General

The limiting parallels and meridians of the chart shall be shown and graduated regardless of value.

Graduation tick marks shall extend away from Greenwich and the Equator. That is, the short tick marks shall be on the west side of the lines of west longitude and on the east side of the lines of east longitude. At 180º longitude, tick marks shall be equidistant on both sides of the line.

3.5.2 Graticule Layout

Lines of latitude and longitude, .007" lineweight, shall extend .100" beyond the trim line of the east and north sides of the chart to .070" beyond the geographic limits on the west and south sides of the chart.

3.5.3 Line Spacing

Latitude and Longitude lines shall be spaced at 30' intervals.

(TAC) On TAC spacing shall be 15' intervals.

3.5.4 Tick Intervals, Lineweights and Lengths

3.5.4.1 Line Spacing - Latitudes Between 0° and 64°

Table 3.1 Line Spacing - Latitudes Between 0° and 64°

Lines Graduated	Interval	Weight	Length
Every Line	1'	.007"	.050"
	5'	.007"	.080"
	10'	.010"	.200" centered

3.5.4.2 Line Spacing -Latitudes Between 64° and 80°

Table 3.2 Line Spacing -Latitudes Between 64° and 80°

Lines Graduated	Interval	Weight	Length
Every Line	5'	.007"	.050"
	10'	.010"	.080"

3.5.4.3 Longitude Lines Requiring Ticking

Table 3.3 Longitude Lines Requiring Ticking

Range of Lat	Line Graduated
0°-56°	Every line
56°-72°	Every degree line

3.5.4.4 Line Spacing - Longitude Lines Specified for Ticking

Table 3.4 Line Spacing - Longitude Lines Specified for Ticking

Interval	Weight	Length
1'	.007"	.050"
5'	.007"	.080"
10'	.010"	.200" centered

3.5.5 Graticule Values

Values shall be shown using 16 point Futura Medium type.

Values of all lines shall be shown .100" outside the west and south neatlines and .100" inside the trim lines on the north and east where possible. Thirty minute lines shall be identified as “30”.

When the southern neatline limit is a line of latitude, the graticule value shall be positioned on the line of latitude near the value of longitude. The 30' line shall be identified and positioned .100" outside the line of latitude or neatline and centered on the line of longitude.

Within the body of the chart, every degree line of latitude and longitude shall be labeled near their intersections thus identifying the latitude and longitude at each corner of each degree square.

Values shall be positioned adjacent to the line, on the side toward Greenwich and the Equator, as illustrated on the Style Sheets. Latitude values shall be oriented with the lines of latitude to read from the south. Meridian values shall be oriented with the lines of longitude to read from the east (the direction of the Greenwich meridian).

(TAC) Graticule values shall be shown using 7 pt. Helvetica Condensed Bold type. Value of all lines shall be shown .100" inside the neatlines. (Exception to this is the Puerto Rico-Virgin Islands chart which is identical to the sectional chart portrayal).

3.6 CULTURE

3.6.1 Railroads

References:

Appendix 1 - Topographical Information - Culture

3.6.1.1 General

Transportation lines and related features are valuable navigational checkpoints. They are used to pinpoint position by the relationship of patterns formed with other features or by a unique characteristic of their own.

In level areas, primary railroads tend to run in straight lines directly to a terminus and can be extremely valuable as navigation aids.

Railroads and related features shall be shown in conformance with **Appendix 1**.

3.6.1.2 Density and Selection

All main line railroads shall be shown except where elimination is necessary in congested areas. All other railroads shall be portrayed, compatible with the scale of the chart and operational requirements for a legible chart. Railroads alone may not be readily discernible in visual navigation. They may assume added significance in the accentuation of adjacent or associated cultural features which otherwise might have little or no checkpoint value.

In areas of sparse detail with little or no landmark value, all railroads shall be shown.

In areas of very dense cultural detail, those operating railroads which would cause undue congestion and thus negate operational requirements for a legible chart, shall not normally be shown. Generally, this shall include those railroads which:

- Lend little or no visual significance to the overall pattern.
- Are considered unimportant in regard to visual prominence.
- Are unimportant in regard to continuity, terminals and checkpoint value.

Railroads within outlined city areas and of visual significance shall be shown by a reduced lineweight (.008"), without cross ties.

3.6.1.3 Single and Multiple Track Railroads

A distinction in symbolization shall be made between single track railroads and those of more than one track (double and multiple track).

Where the number of tracks of a railroad exceed two, the information shall be shown by labeling added parallel to the railroad symbol at appropriate intervals, e.g., “5 tracks”.

Sidings which are closely parallel to a main line shall, if shown, be symbolized as sidings and shall not be counted in determining double or multiple track lines.

Electrified railroads shall be indicated with the word “electric” added parallel to the symbol.

3.6.1.4 Non-operating Railroads

Railroads that are abandoned or under construction shall be shown in the absence of more prominent landmarks. Any part of a railroad under repair or a railroad under construction which is sufficiently finished to be in use, shall be regarded as in operation.

Proposed railroads shall not be shown.

3.6.1.5 Dismantled Railroads

If the right of way of a dismantled railroad is being used as a road, it shall be symbolized only by the proper road symbol.

If there is no road but the feature is of sufficient prominence and importance to serve as a landmark, it shall be symbolized by the trail symbol. If space permits, labeling shall be added parallel to the trail symbol reading, “dismantled railroad”.

3.6.1.6 Railroads, Approximate Alignment

The label “approximate alignment” shall be spaced to indicate the extent of approximate alignment.

3.6.1.7 Spur Tracks and Sidings

Spur tracks and sidings shall be shown as scale and density of detail permit. In congested and “tinted” developed areas, spurs and sidings shall be omitted.

Normally, spur tracks and sidings shall be symbolized the same as the main track railroad. Where sidings are short, the cross ties may be omitted and if necessary the sidings may be slightly exaggerated in length.

When the distance between the main track and a parallel siding is too small to plot to scale, the symbol shall be reduced in weight and the space between exaggerated to .010".

Spur tracks and sidings shall be shown as entering the main line in a smooth curve.

3.6.1.8 Railroad Yards

Railroad yards (freight, marshalling, etc.) shall be shown wherever they are considered significant for visual navigation. In areas of dense culture the smaller and less prominent marshalling yards may be omitted.

The correct shape of the yards shall be retained insofar as it is practicable. No attempt should be made to show all tracks. Only the limiting tracks shall be plotted.

When necessary, because of severe space limitations, railroad yards may be shown by a .040" solid square as indicated in **Appendix 1**.

Railroad yards or marshalling yards shall be labeled when symbolization is not adequate identification.

3.6.1.9 Railroad Stations

Railroad stations shall be shown in areas of sparse culture. If a railroad station appears with a group of buildings, the buildings and stations shall be indicated by the proper populated place symbol. In areas where railroads are the principal means of transportation, railroad stations assume greater importance and consequently more shall be shown.

When information is available, an isolated railroad station may be positioned in its correct relation to the railroad track. A slight exaggeration in scale is permissible to achieve this.

When the correct location of a railroad station is unknown, it shall be shown centered on the railroad symbol.

Railroad stations, including those centered on the track shall be labeled “station” or with proper name, if known.

Flag stops, halts and similar stops (not portrayed as buildings) shall be omitted.

3.6.2 Roads

References:

Appendix 1 - Topographical Information - Culture

3.6.2.1 General

Highways, roads, tracks, trails, and related features are valuable navigational checkpoints. They are used to pinpoint position, by relationship of pattern formed with other features, or by a unique characteristic of their own.

In level areas, primary roads tend to run in straight lines directly to a terminus and can be extremely valuable navigation aids.

Roads and related features shall be shown in conformance with **Appendix 1**.

3.6.2.2 Density and Selection

The number of roads shown in an area depends on the number of significant checkpoints available. Roads are shown for visual value and for orientation and pinpointing aids.

In heavily populated areas, roads shall be selected which, in conjunction with other cultural and natural features, form a distinct configuration providing significant checkpoint identification.

In open areas containing few checkpoints, the road pattern assumes a greater importance and additional roads shall be selected when their relationship with other roads serve as a visual checkpoint or as an aid in identifying a checkpoint.

Roads portrayed should normally terminate at a populated place or road intersection.

Trails should normally be shown only in areas where few roads exist and the trails are prominent enough to be seen from the air.

All streets and roads shall be omitted in outlined and symbolized populated places. Dual-lane highways shall be shown within the outlined populated places on the large-scale insets.

(TAC) Dual-lane highways shall be shown within the outlined populated places.

3.6.2.3 Classification

In areas where adequate data for classification determination is available and a primary network (based on surface and width) exists, roads shall be classified on the basis of width and visual significance from the air.

On these series of charts, road classification shall be based on the following criteria:

3.6.2.3.1 Category 1 (Dual-lane Divided Highways)

Hard-surfaced, all-weather roads separated by a median between the two directions of travel.

3.6.2.3.2 Category 2 (Other Roads)

3.6.2.3.2.1 Primary Roads

Hard-surfaced, all-weather roads two or more lanes in width maintained for automobile traffic.

3.6.2.3.2.2 Secondary Roads

All other roads maintained for automobile traffic.

3.6.2.3.3 Category 3 (tracks and trails)

Not maintained for automobile traffic.

3.6.2.4 Dual-Lane Divided Highways (Category 1)

Dual-lane divided highways shall always be shown. These are interpreted as primary roads separated by a median between the two directions of travel, such as the Interstate System.

3.6.2.5 Other Roads (Category 2)

Primary roads shall be shown short of over-congestion. When the number of lanes exceeds two, the condition may be indicated by labeling. When it is necessary to make a selection of primary roads in areas of dense cultural detail, those primary roads which form a distinct configuration or provide a significant checkpoint in conjunction with distinctive natural or cultural detail in the immediate vicinity shall be retained.

Secondary roads shall be shown when they do not cause clutter. Selection of roads should be based on those which form a distinct configuration, or provide significant checkpoint identification in conjunction with distinctive natural or cultural detail in the immediate vicinity.

3.6.2.6 Tracks and Trails (Category 3)

No distinction in symbolization shall be made between tracks and trails. Tracks and trails are considered to be subordinate routes suitable only as cart tracks and foot paths.

Tracks and trails shall be shown in areas where few roads exist and only when they are easily recognizable from the air.

Winter trails shall be labeled “winter trails”.

3.6.2.7 Roads - Under Construction

Roads under construction are defined as roads on which actual construction work has been initiated.

The appropriate road symbol shall be dashed to indicate extent of construction and labeled “under construction”.

Typical of roads under construction that shall be shown are those of the Interstate System.

3.6.2.8 Roads - Under Repair

Roads under repair shall be considered as completed roads.

3.6.2.9 Roads - Proposed

Proposed roads shall not be shown.

3.6.2.10 Road Markers

Only the Interstate Highway systems and prominent Federal Highways shall be appropriately identified by road marker and number.

Significant highway names may be shown.

Significant highway interchange numbers may be identified when such numbers are plainly marked for identification from the air.

3.6.3 Related Features (to railroads and roads)

References:

Appendix 1 - Topographical Information - Culture

3.6.3.1 Bridges and Viaducts

3.6.3.1.1 General

A firm requirement exists to portray distinctive bridges and viaducts by self-identifying pictorial symbols wherever possible.

Prominent and distinctive bridges and viaducts meeting the pictorialization selection criteria shall be indicated with the appropriate pictorial symbol.

The lesser bridges and viaducts selected for portrayal shall be shown with conventional symbols.

3.6.3.1.2 Criteria for Conventional Treatment

The following criteria is established for conventional treatment:

- Where feasible, in uncongested areas, all bridges and viaducts at least 500' long shall be shown. Length may be slightly exaggerated in order to retain a minimum distance of .050" between abutment ticks.

- Railroad cross ties shall be omitted on bridges and viaducts and within .250" of the abutment ticks at the ends of the symbol.

- Stream symbols shall not be broken for the bridge or viaduct symbol; roads or railroads passing under a bridge or viaduct shall be broken .020" from either side of the symbol.

- When a bridge is used to carry both a road and a railroad whether on the same or different level, the feature shall be shown by the road bridge symbol with the railroad drawn up to the bridge end.

- Footbridges shall not be shown.

3.6.3.2 Overpasses, Underpasses

Overpasses and underpasses, unless extremely significant, shall be shown with the conventional symbol.

These shall be shown wherever possible, especially in areas of sparse culture.

Within urban or congested areas no attempt should be made to show other than those for the most significant roads. Excessive breaking of the continuity of important road systems shall be avoided.

Significant cloverleaf traffic interchanges shall be shown. Those that cannot be plotted to scale (or shown adequately with a slight exaggeration of scale) shall be symbolized with a .080" square and diagonals, both .007" lineweight. One of the diagonals shall be broken .020" on each side of the other diagonal. Entry and exit roads shall be omitted within the symbol.

3.6.3.3 Causeways

Causeways shall not be specifically symbolized. The road or railroads carried shall be shown in the normal manner.

The shoreline shall not be plotted along the causeway to augment the symbol unless the distance between the two shorelines, when plotted to scale, exceeds the width of the symbol and the road or railroad.

3.6.3.4 Tunnels, Roads and Railroads

Tunnels for roads and railroads, if possible, shall be shown wherever they exist. Very prominent tunnels shall be shown pictorially.

In conventional cartographic treatment, tunnels less than .050" in length shall be exaggerated and shown as .050" long between tunnel entrance ticks. Longer tunnels shall be plotted true to scale.

3.6.3.5 Ferries

Ferries shall be shown by the conventional symbol.

They shall be shown only in areas of sparse detail.

A ferry shall be regarded as such only where it is an established feature regularly in operation for transporting traffic between two points on opposite sides of a stream or across open water.

Ferries across single-line streams shall be indicated merely by labeling. Across double-line streams less than .100" in width, ferries shall be indicated by labeling and breaking the crossing symbol at the shorelines. Across wider double-line bodies of water, ferries shall be indicated in the same manner with a fine dashed line indicating the approximate route of the ferry.

3.6.3.6 Fords

When fords for roads are shown they shall be represented by the conventional symbol.

They shall be shown only in areas of sparse detail.

Fords across single-line streams shall be indicated by labeling.

3.6.4 Populated Places and Buildings

References:

Appendix 1 - Topographical Information - Culture

3.6.4.1 General

Cities are valuable navigational checkpoints since they are prominent and frequently can be rapidly and positively identified because of some unique element(s) which differentiates it from others in the area. The shape of a city is distorted by perspective. The short period of time an aircraft may be over a city makes it almost impossible for identification on that basis alone. Therefore, portraying a city by visual outline does not necessarily pinpoint it as a significant checkpoint for visual navigation. At a scale of 1:500,000, the smaller cities appear to have the same general outline. What is required, in addition to the visual outline, is the inclusion of cultural and natural features within or in the near vicinity which distinguishes the city from others. The general location within a city where there is a vertical build-up is extremely significant. This element provides the important properties of a good checkpoint: prominence, uniqueness and visibility from a distance, which in effect means time for identification. Furthermore, the relative simplicity of this characteristic lends itself to prior study and facilitates immediate association.

Classification of a city by population is of little significance in itself. The significance lies in a city's vertical build-up, mass design and its association with related features in close proximity. Large buildings are significant for their landmark value in differentiating otherwise similar cities or towns. When isolated, they are good checkpoints because of unique appearance or their location relative to other features. Vertical dimension, mass and design are significant factors which enable these features to be seen from the air.

Populated places and buildings shall be shown in conformance with **Appendix 1**.

3.6.4.2 Density and Selection

When information is available, cities shall be selected on a basis of area covered, visibility from the air and population. Cities of primary importance should be selected first, those of secondary importance next and so on. Towns and villages of lesser importance should be added to give a comparable representation of the area. When towns are of equal importance, those at highway junctions or at railroad centers should be given preference. Do not attempt to distribute cities, towns and villages over the chart evenly, as closer grouping in certain areas shall give a more complete picture of more densely populated sections.

In areas where the majority of cities are of sufficient size to warrant portrayal by their actual outline, the need for portrayal of villages is considerably lessened. Conversely, where few outlined cities occur, the need to portray small cities and villages increases proportionately.

3.6.4.3 Classification and Type Size and Style

Populated places shall be classified in accordance with three (3) categories. When population statistics are available, the categories shall represent three (3) ranges of population figures. The three categories of population breakdown shall vary regionally. An example of population breakdown for Northeastern U.S. follows:

Category 1 - Large cities, population more than 250,000

Category 2 - Cities and large towns, population 25,000 to 250,000

Category 3 - Towns and villages, population less than 25,000

Type sizes and styles shall be portrayed as shown in **Appendix 1**.

3.6.4.4 City Outlines

The outline (called the visual outline) shall reflect the physical shape of a developed area as viewed by the air observer. The visual outline need not conform to a political boundary nor necessarily represent the extent of building development. However, it should include those permanent features which are an integral part of a developed area such as: street pattern, buildings, industrial installations, resort structures, and fringe housing developments. Additional elements which may be considered as contributing to the visual pattern are: cemeteries, outlying buildings, parks and gardens, estates, and other features which contribute to the developed area. These elements (when included) must be of a reasonably permanent nature, must be contiguous to the developed area, must be all-seasonal in nature, and when viewed from the air must reflect a marked distinction from the surrounding terrain. Normally, garden plots shall not be included as limits of a visual outline since they do not meet the qualifications of being all-seasonal in nature when viewed from the air. If, however, the gardens around a developed area do present a marked distinction from the surrounding terrain, a permanent feature (as a road, fence, hedgerow, etc.) within the garden area may be considered as a limit of the visual outline. In the absence of a permanent feature the garden areas shall be included.

Populated places that are equal in area to .060" square or larger shall be shown by outline. Cities or towns which are slightly less than .060" square may be shown by outline if the outline area, because of unique shape, has landmark value or if the use of symbols might cause clutter in densely populated areas.

The city outline shall be broken whenever it coincides with a shoreline of an open water area or a double-line stream dividing a city area. In addition, that portion of a city outline coincident with a railroad, road, or stream shall be omitted.

Towns that merge shall be shown by a line delimiting the entire built-up area.

The visual outline of populated places shall be shown with a .006" lineweight.

Openings within city areas shall be shown when they are equivalent to a square .100" at 1:500,000 scale.

All outlined cities shall contain tint.

3.6.4.5 City Symbols - Category 2

When the enclosed area of a populated place is less than that required for an outline, a .060" square shall be used to symbolize the feature. Square towns shall appear on the finished chart with tint. When the symbol falls partially into a water area, the portion in the water shall be omitted and the shoreline shall serve as the limits.

3.6.4.6 Villages - Category 3

Normally, villages shall be symbolized by a small circle, .050" in diameter, .006" lineweight.

Villages covering extensive areas may be shown by visual outline when supported by adequate source material. Minimum size: An area equivalent to a .060" square; .006" lineweight.

Outlined villages shall appear on the finished chart with a tint. Circle symbols shall be void of tint.

3.6.4.7 Landmark Buildings

Outstanding buildings and factory complexes shall be depicted by the appropriate pictorial symbol when the selection criteria is met.

Remaining landmark buildings selected for portrayal shall be indicated with conventional symbolization detailed below:

- Landmark buildings shall normally be identified by an appropriate label. Exceptions are buildings which cannot be more specifically identified. The located object symbol without a label shall be identified as a building (bldg).

- Isolated ruins which serve as landmarks shall be shown by symbol and labeled “ruin” or “ruins” as applicable.

3.6.5 Boundaries

References:

Appendix 1 - Topographical Information - Culture

3.6.5.1 General

Boundaries which are recognized or accepted by the U.S. Government and which reflect the current situation shall be shown.

Boundaries shall be shown in their entirety except along streams where portions may be omitted provided continuity is retained.

The following boundaries are required on this series of charts:

- International
- State and Provincial
- U.S./Russia Maritime Boundary
- International Date Line

3.6.5.2 International Boundaries

All International Boundaries shall be shown, symbolized with the standard symbol, .012" weight.

All International Boundaries shall be overprinted with a continuous magenta screened line .040" wide, unless coincident with an ADIZ, and then the ADIZ shall be shown.

3.6.5.3 State and Provincial Boundaries

State and Provincial Boundaries shall be shown in the United States, Canada and Mexico.

3.6.5.4 U.S./Russia Maritime Boundary

The U.S./Russia Maritime Boundary shall be shown.

In instances where the Maritime Boundary line symbol coincides with the International Date Line, the International Date Line symbol shall be omitted.

3.6.5.5 International Date Line

The International Date Line shall be shown and labeled “INTERNATIONAL DATE LINE” on all charts where it applies.

The label “Monday” and “Sunday,” properly oriented shall be placed adjacent to the line, at least once, on the chart.

3.6.5.6 Treatment of Special Cases

Boundaries along streams do not need to be continuous. Only those portions required for continuity and clarification shall be shown.

Established boundaries in open water areas shall be shown by the appropriate boundary symbol and labels.

When a boundary coincides with the neatline or projection line, it shall be shown in its entirety, centered on the neatline or projection.

3.6.5.7 Time Zones

The Time Zones shall be shown symbolized by a screened black dotted line, and labeled, i.e., EST, CST, MST, PST, etc.

The conversion factor needed to convert local time to UTC, including Daylight Savings Time Factor, shall be shown in screened black, located on both sides of line at top and bottom of chart.

On charts where no line shall appear, a note in the margin shall state in which zone the chart lies, e.g., "Entire area of this chart is within the Central Standard Time Zone +6(+5DT)=UTC".

3.6.5.8 Country and Sovereignty Designation on Charts that Contain No Boundaries

When a chart falls entirely within a sovereign country or a state or province within the country, the locality designation in the margin shall suffice for identification.

3.6.5.9 Identification of Administrative Divisions

Appropriate locality names shall be shown along each international, state, and province boundary shown.

When the subdivision boundary is too short or does not appear on a particular chart, the state, province, etc., name shall be shown along the international boundary in conjunction with the country names.

Example: "UNITED STATES (NORTH DAKOTA)"

3.6.6 Miscellaneous Cultural Features

References:

Appendix 1 - Topographical Information - Culture

3.6.6.1 General

This section covers the cultural features to be shown which have not been previously discussed. It includes those features which are prominent or are readily identifiable because of size, location or distinctive shape.

Miscellaneous cultural features may be shown by any one of four methods detailed below:

3.6.6.1.1 Pictorial Symbols

Outstanding miscellaneous cultural features meeting the selection criteria shall be pictorialized. In general, features selected for pictorial portrayal shall include prominent buildings, factories, factory complexes, bridges, dams, towers, tanks, and related miscellaneous features. Pictorial symbols are reserved for those checkpoints that are so unique or outstanding that they serve as a medium for instantaneous orientation of the chart to the ground. Features shall be self-identifying to facilitate immediate recognition. Indiscriminate selection can only cause confusion and possibly compromise the ability of the pilot to navigate safely.

3.6.6.1.2 Conventional Symbols

Miscellaneous cultural features (those not selected for pictorialization) shall receive conventional treatment as illustrated in **Appendix 1**. In areas of sparse to moderate detail, a maximum number of conventionally symbolized cultural features shall be shown. They are also required in the vicinity of populated places when they serve as an aid in identification of populated places.

3.6.6.1.3 Located Object Symbols

Those miscellaneous cultural features for which standardized symbols are lacking shall be portrayed with the appropriate located object symbol (solid square or circle) and identifying type, e.g., “mill”, “water”, “castle”, etc.

3.6.6.2 Mining Features

Mining features such as open pit mines, quarries, strip mines, tailings, etc., shall be shown in the absence of more prominent landmark features. Where two or three mines are situated close together, a single symbol shall be sufficient to indicate them all. Large open pit mines or quarries may be depicted to scale as unusual landmark areas and labeled appropriately (see Section **3.6.6.11**).

Small strip mines, mine dumps and tailings that cannot be portrayed to scale, as illustrated by pictorial symbols, shall be shown by the square located object symbol and appropriate label.

Mining features considered too small for significance may be omitted.

3.6.6.3 Telecommunication and Power Transmission Lines (T-Lines)

3.6.6.3.1 Landmark Value

T-Lines, if depicted on charts, are shown primarily for their landmark value. Determination of whether a T-line has landmark value or what constitutes chart congestion are matters of FAA Flight Edit judgment. Flight Edit shall either delete or add T-Lines on the Flight Edit Standard. T-lines with landmark value should be shown in open country and not in congested or built-up areas. Through open country, T-lines should be shown as continuous lines, interrupted only for reasons of cartographic practices. Location of the pylon symbol is dependent upon the length of the T-line; approximately at 1" intervals on a line 3" or less in length, and approximately 2" apart on lines longer than 3".

3.6.6.3.2 Caution Notice

The type “CAUTION” in 9 pt. Helvetica 65 Medium, shall be shown in blue adjacent to the T-line symbol only when specified by the FAA.

3.6.6.4 Pipelines

Pipelines for gas, oil, etc., whether above or below the ground, shall be shown when their location or right of way may be visible from the air. They shall be omitted in developed areas.

It is extremely important that elevated portions of pipelines across valleys and canyons be shown because of the hazard presented to low-level visual flight.

No effort should be made to show pipelines as continuous features; only landmark portions need to be shown.

Aqueducts or pipelines which carry water shall be shown as specified in Section **3.7.10**.

3.6.6.5 Dams and Similar Features

Dams shall be shown except for the smaller dams in congested areas built across single-line streams and without an impounded reservoir.

No distinction shall be made between masonry dams and earth dams or dams constructed of other materials.

When exaggeration in length is necessary to show a small dam, the symbol shall be drawn .050" long. Shorelines coincident with the dam symbol shall be omitted.

When a dam is used to carry a road, the feature shall be shown by the dam symbol with the road drawn to the end of the dam.

Important or landmark passable locks shall be shown.

A weir, when used to dam water, shall be shown by a dam symbol. When used to trap fish in rivers or tidal waters or to divert water, a weir shall be symbolized similarly to a breakwater or jetty. In congested areas weirs and jetties may be omitted.

3.6.6.6 Harbor Structures

Prominent piers, breakwaters, wharfs and quays which project into the open water area from the shoreline shall be shown conforming as nearly as possible to actual shape of the object and labeled appropriately.

The coastline shall be omitted where it coincides with the seawall symbol.

3.6.6.7 Lookout Towers

Lookout towers which extend more than 200 feet above surrounding areas shall always be shown as obstructions.

When the height of the tower is not known, or is known to be 200 feet or less, it shall be shown with the conventional symbol as indicated in **Appendix 1**.

3.6.6.8 Forts

All forts of landmark importance shall be shown by the appropriate located object symbol and identified.

3.6.6.9 Stadiums, Outdoor Theaters, Race Tracks and Athletic Fields

Prominent features in this category shall be shown.

3.6.6.10 Ruins

Isolated ruins shall be shown by symbol and labeled “ruin” or “ruins” as applicable. They shall be shown only when extensive and have significance as landmarks.

3.6.6.11 Unusual Landmark Areas

Cases may exist in regions of sparse culture generally void of landmarks, where an area is so different in nature of appearance from the surrounding terrain that it serves as an outstanding landmark. Where treatment and symbolization have not been elsewhere presented, such areas shall be outlined by a dashed line and labeled appropriately to explain the nature of the area. Examples might be: areas of stunted growth in deserts; areas of dark soil surrounded extensively by light soil, or vice versa; and, cultivated areas located in primarily uncultivated areas

3.6.6.12 Landmark Objects

Landmark objects which cannot be shown to actual scale and which are not otherwise symbolized shall be indicated by the round or square located object symbol, whichever best indicates proper shape, and labeled appropriately.

3.6.6.13 Aerial Cableways, Ski Lifts, Tramways, Conveyor Belts and Similar Features

Only those that may fall in the obstruction category or have visual significance from the air shall be shown.

Included in this category are linear features other than railroads whose function is the transportation of people or materials.

3.6.6.14 Cemeteries

Those of landmark importance shall be shown by the appropriate landmark symbol and label.

3.6.6.15 House of Religious Worship

Houses of religious worship shall be shown when they have landmark value, especially those with a distinctive character.

3.6.6.16 Structures other than Buildings

Structures of landmark importance, other than buildings, shall be indicated with appropriate identification.

3.6.6.17 Wells (other than water)

Operational wells drilled for gas, oil or minerals shall be shown. Abandoned wells shall be shown in regions of sparse culture if they have landmark value.

Individual wells shall be shown wherever possible; appropriate labeling identifying the type of well shall augment the symbol, e.g., “oil”, “gas”, “salt”, etc.

Where wells exist in groups or cover a common area and are too dense to show individually, it shall be sufficient to show a representative number over the area covered. Appropriate labeling shall be applied, e.g.,”oil wells”, “gas wells”, etc.

3.6.6.18 Water Wells

Wells drilled for water shall be treated as directed in Section **3.7.17**.

3.6.6.19 Tanks - Oil, Gas, Water, etc.

Tanks used for the storage of oil, gas, water or other liquids shall be shown wherever they exist as landmark features in areas of sparse culture. They shall also be shown in other areas providing their portrayal does not conflict with the portrayal of other more prominent cultural features.

Tanks shall be shown with the tank symbol augmented with an appropriate label such as “oil”, “gas”, “water”, etc.

Where tanks exist in groups or cover a common area and are too dense to show individually, it shall suffice to show a representative number over the area covered. Common appropriate labeling shall be applied, e.g., “oil tanks”, “gas tanks”, “water tanks”, etc.

3.6.6.20 Reservoirs (other than water)

Open reservoirs used for the storage of asphalt, oil or other liquids except water shall be shown with the located object symbol and appropriate label.

Instructions for reservoirs containing water are covered in Section **3.7.7**.

3.6.6.21 Silos

Silos shall be shown when they serve as landmarks. These shall be portrayed with the located object symbol and labeled “silo”.

3.6.6.21.1 Grain Elevators

Grain elevators are particularly significant for visual navigation because of their excellent landmark value and shall be shown to the maximum extent possible with the located object symbol and appropriate label.

3.6.6.22 Coast Guard Stations

Selected Coast Guard Stations shall be shown as illustrated in **Appendix 1**.

3.7 HYDROGRAPHY

References:

Appendix 2 - Topographical Information - Hydrography

3.7.1 General

This section on hydrography includes drainage features, coastal hydrography and permanent snow and ice areas.

The term drainage encompasses all features, both natural and man-made, of which water is a constituent part. The permanent or temporary nature of the water within the feature establishes its classification within its type as perennial or non-perennial. A feature is normally perennial when it contains water throughout the major part of each year. If it contains water for a lesser period it is considered non-perennial. This latter category includes all features that may normally be found classified as either intermittent or dry.

Areas shall be encountered containing features which are either too numerous or too small to show to scale. Wells, springs and pinpoint ponds fall in this category. No attempt should be made to show all of these features. Instead, a representative pattern of the symbols shall be added to cover the area, augmented where appropriate by a descriptive note, such as: “numerous small lakes”, etc.

Isolated small lakes and ponds too small to plot to scale shall be omitted.

No special symbolization is required for streams, lakes and ponds which are frozen or partially filled with ice.

3.7.2 Water Surface Elevations

References:

Appendix 2 - Topographical Information - Hydrography

3.7.2.1 Elevation of Larger Lakes

Elevations of the larger lakes in the area shall be shown when this information is available. This should normally include all lakes that are four miles by six miles or larger and may include smaller lakes in order to retain a representative pattern of water surface elevations in an area void of large lakes.

3.7.2.2 Stream Elevations

Stream elevations shall be shown in level areas that are inadequately portrayed by elevation or contour data. Elevations shall be shown only on the major drains in an area and these should be no closer than 25-mile intervals.

3.7.3 Water Vignette

Water vignette is required along the shorelines around isolated islands of .100" or smaller location in open water, subject to cartographic judgment and discretion.

3.7.4 Distinction Between “Open Water” and “Inland Open Water”

Two tones of blue shall be used to distinguish water areas identified as “Open Water” and “Inland Open Water”.

3.7.4.1 Open Water

Open Water is defined as the limits (shorelines) of all coastal features at mean high water for oceans, seas and associated waters such as bays, gulfs, sounds, fords, large estuaries, etc. Exceptionally large lakes such as the Great Lakes, Great Salt Lake, Lake Okeechobee, etc., shall be considered as "Open Water" features.

3.7.4.2 Inland Open Water

Inland Open Water is defined as all other bodies of open water.

3.7.4.3 Extension of Open Water Tone

The Open Water tone shall be extended inland as far as deemed necessary to adjoin the Inland Open Water tone (generally where drainage lines coalesce to a width of .100" – approximate).

3.7.5 Shorelines

In tidal waters, shorelines shall be delineated as the outline of natural coastal features at mean high water except for mangrove, nipa and coastal marsh. In inland waters, shorelines shall be mapped to correspond to the normal stage of water. This may differ from shorelines appearing on aerial photography which may have been flown during periods of flood or drought. The shoreline at normal state is usually marked by a line of permanent land vegetation.

The shoreline of mangrove, nipa and coastal marsh shall be the outline of the features at the hydrographic (low water) datum. The shoreline of mangrove, nipa and coastal marsh shall be shown as unsurveyed (indefinite).

When an island is too small to show actual shape, it shall be shown by a solid dot. Where several islands tend to coalesce, only the most prominent shall be shown. The smaller (pinpoint) islands which coalesce with other islands or the coastline shall be omitted.

A distinction shall be made in symbolization between perennial, non-perennial (intermittent or dry), fluctuating, unsurveyed, indefinite or man-made shorelines. See **Appendix 2**.

3.7.6 Lakes

3.7.6.1 Perennial Lakes

The shoreline of a perennial lake or pond shall be mapped to correspond to the normal stage of water as evidenced by reliable source data or other information.

All perennial lakes and reservoirs which can be shown by outline and tint at this scale shall normally be shown. In areas where lakes are a major characteristic of the landscape, such as in Canada, it is permissible to omit the less prominent, provided a representative pattern of the drainage features is retained.

In areas where isolated groups of lakes or reservoirs occur which are significant because of their uniqueness in the area, as many as possible shall be shown including lakes or reservoirs symbolized as pinpoints.

Where marsh or other vegetation grows down to and into an inland (non-tidal) body of water, it is sometimes difficult or impossible to establish the actual shoreline. In such cases, the shoreline shall be delineated as unsurveyed.

Salt lakes shall be symbolized the same as other lakes. They shall not be identified by the label "salt".

3.7.6.2 Non-Perennial Lakes and Ponds

This category includes all features normally classified as "dry", "intermittent", or "sebkha". No distinction shall be made in symbolization.

Non-perennial lakes and ponds shall not be augmented with a descriptive label indicating its nature such as "dry", "sebkha", etc. However, if considered important the proper name shall be shown if available.

Lakes and ponds which are permanently drained under land reclamation projects shall not be treated with the non-perennial symbol. Instead, they shall be shown as depressions or other appropriate relief features or omitted entirely if unimportant.

3.7.7 Reservoirs and Pools

The shoreline of reservoirs shall be the line that represents the water surface at the normal stages of the lake as controlled by the spillway of the dam.

Areas surrounding reservoirs, flooded by the use of movable dam crests or flash board, shall be regarded as land subject to inundation. (See Section **3.7.16**)

The term "reservoir" shall not be used to label reservoirs with natural shorelines, unless it is used in conjunction with a proper name.

Reservoirs and pools which are too small to be shown by actual outline may be shown by the located object symbol and labeled "reservoir".

Special symbolization is required for dams that are "under construction".

When a dam is reported under construction and the height of the spillway is known, the back-up area shall be outlined by the unsurveyed shoreline symbol and labeled appropriately.

When exact limits are unknown, the features shall be symbolized by an unsurveyed shoreline and labeled "probable extent of reservoir". All chart detail and tint shall be retained.

3.7.8 Streams

3.7.8.1 Perennial Streams

Perennial streams shall be shown, scale permitting. In well watered areas, it is permissible to omit the shorter and less prominent branches. Wherever perennial drainage is heavy, their importance becomes minor and only those whose size or configuration makes them valuable as landmarks shall be shown. In arid areas it is important to include as much of the drainage pattern as possible.

Extended drains should be cut back slightly when the points of origin of two or more are in close proximity and direction of flow could be misinterpreted.

Streams measuring .015" in overall width shall be shown as double-line streams. Streams less than .015" overall width shall be shown as single-line streams. A gradual taper shall be shown and shall be proportional to the number, length and distribution of tributaries, except where large scale source material indicates variance in width.

3.7.8.2 Non-Perennial Streams

This category includes all features classified in such descriptive terms as “dry”, “intermittent”, “dry wash”, “dry riverbed”, “wadi”, “gulch”, and “arroyo”. No distinction between them shall be made in symbolization.

In arid areas, non-perennial streams shall be shown wherever they exist, scale permitting.

Non-perennial streams which in flood measure .050" or more in width shall be shown by the double-line symbol and dot fill. Non-perennial streams less than .050" in width shall be shown by the single-line symbol.

3.7.8.3 Seasonally Fluctuating Drainage

Broad streams offer a perplexing problem since periodic fluctuation cause their widths to vary considerably.

The limits (highwater stage) shall be outlined with the unsurveyed shoreline symbol and a dot fill. The normal channel of streams within the outline shall be shown with the appropriate perennial/ non-perennial symbol.

In certain areas, the overflow area is confined within high banks which are distinctive and extremely significant as landmarks. In these isolated instances, the solid-line perennial shoreline symbol shall be used to delineate the limits of the overflow area in lieu of the unsurveyed shoreline symbol.

3.7.8.4 Disappearing Streams

Underground portions of streams shall not be shown but the points of disappearance and reappearance shall be symbolized.

3.7.8.5 Fanned-Out Streams

Streams that fan out and disappear in sandy areas shall be shown.

An arrow shall be added at the end of disappearing streams to indicate the approximate point of disappearance and direction of flow.

3.7.8.6 Sand Deposits

Sand deposits in and along river beds shall be shown when information is available.

3.7.8.7 Wet Sand Areas

Areas of wet sand shall be shown when they are landmark significant or necessary to preserve the characteristic pattern of an area, especially within and adjacent to a desert area.

3.7.8.8 Deltas

In mapping deltas, all double-line and main flow distributaries shall be shown. Single-line distributaries shall be added to represent the characteristic pattern of the delta.

3.7.9 <u>Falls and Rapids</u>

Falls and rapids shall be shown in uncongested areas when they have landmark value. Major falls and rapids shall always be shown, labeled when necessary for clarity.

3.7.10 Aqueducts

No distinction in symbolization shall be made between aqueducts and pipelines carrying water. Only the prominent trunk lines shall be shown; small feeder lines to houses or small villages shall generally be omitted. Only the most prominent shall be named.

Aqueducts that are abandoned, under construction or underground shall be specially symbolized.

Tunnels and tunnel outlets or shafts shall be indicated wherever this information is available.

It is a common practice in aqueduct construction to build a conduit of brick or concrete on or near the surface of the ground and to cover this structure with an earth fill which resembles a levee in cross section. The levee-like features shall not be indicated. The buried aqueduct shall be indicated by a dashed line. However, if a trail or road exists on top of fill, the dashed line shall not be shown. Instead, the proper symbol shall be used to show the traveled way and the presence of the buried feature indicated by parallel labeling, reading: "underground aqueduct".

Where a pipeline or aqueduct is elevated or overpasses another feature, winged ticks shall be added to the symbol to indicate the elevated part. Where misinterpretation would otherwise result, the overpassed feature shall be broken at the point of intersection of the overpassing feature.

Kanats (qanat, karex underground irrigation systems with air vents) shall be shown in areas of the chart lacking more prominent detail.

3.7.11 Flumes, Penstocks and Similar Features

Flumes, penstocks and similar features shall be shown when they are significant as landmarks to aid in visual navigation.

No distinction shall be made in symbolization between flumes, penstocks and similar features except that the nature of the feature shall be indicated by labeling, added parallel to the symbol. If the feature is shorter and its nature is obvious, labeling may be omitted.

3.7.12 Canals and Ditches

Major canals shall be shown. Minor canals and ditches shall be omitted except where they form a distinctive pattern or are uncommon to an area.

In areas where the canals and ditches are too numerous to delineate, the area shall be labeled "numerous canals and ditches".

3.7.13 Artificial Bodies of Water

Features such as salt pans and salt evaporators shall be shown where they are significant as landmarks.

3.7.14 Swamps and Marshes

Normally, all marshes and swamps which are equivalent to or exceed an area of one inch square at 1:500,000 scale shall be shown. Conversely, clearings in areas of less than equivalent size shall be omitted.

No distinction shall be made between freshwater and saltwater marshes.

Land subject to inundation shall not be regarded as marshland (see Section **3.7.16**).

Marshes occurring within the limits of inland bodies of water shall be shown by the marsh symbol in the open water.

3.7.14.1 Coastal Marshes

Coastal marshes occurring in tidal waters differ from ordinary marshes in that they cover and uncover with the tide. For purposes of mapping, they shall be regarded as land features rather than water features even though they physically fall within the foreshore area. They shall be treated as ordinary marshes with the shoreline defining their seaside limits.

3.7.14.2 Mangroves and Nipas

Mangroves and nipas shall be shown with the swamp symbol and appropriately labeled.

3.7.14.3 Peat Bogs

Peat bogs shall be symbolized the same as swamps and marshes except that they shall be labeled "peat bog".

3.7.14.4 Tundras

Swamps and marshes occurring in the permafrost areas of the world shall not be shown with the swamp symbol. The nature of the terrain shall merely be indicated by labeling; i.e., "tundra".

3.7.15 Rice Fields and Cranberry Bogs

Rice fields, cranberry bogs and similarly flooded areas shall be shown only when they are unique or distinctive features in areas void of landmark detail.

3.7.16 Land Subject to Inundation

Areas that have become permanently and distinctively marked due to frequent inundation by floods shall be shown by the flood marked symbol. Areas of general floods and overflows or those that are so vast that they have no significance shall not be shown.

3.7.17 Springs, Wells and Waterholes

Springs, wells, and waterholes shall be shown only in arid or exceptionally open country. The symbol may be shown with name if available. They shall not be labeled as "spring", etc.

3.7.18 Fish Ponds and Hatcheries

Fish ponds and hatcheries shall be shown if of landmark value.

3.7.19 Desert Areas

Drainage features assume unusual importance in desert areas. Many features rarely contain water but due to their characteristic appearance serve as outstanding landmarks. There follows a brief summary of the features most likely to be encountered.

3.7.19.1 Wadis

A wadi is a natural channel or bed of a watercourse which is dry except in the rainy season. It is similar in appearance to a dry wash or dry riverbed.

3.7.19.2 Sebkhas

A sebkha is a natural depression whose bed may be covered with sand or mud. It is often salt encrusted and marshy after a rain. Depending upon the degree of wetness, it may contain more or less scattered marsh-like growths. In aerial photography, sebkhas show up very clearly as depression areas (with a definite outline) darker than the surrounding sand.

3.7.19.3 Dry Lakes

Dry lakes occurring in desert areas normally include “alkali spots” and “salt wastes”.

3.7.20 Permanent Snow and Ice Areas

3.7.20.1 Glaciers

Glaciers are difficult or impossible to contour accurately, nor would a high degree of accuracy be warranted since they usually are slowly but constantly changing in shape.

Glaciers shall be indicated with a fine dashed line.

The delineating line shall be omitted at the heads of glaciers where they meet snowfields or ice fields. Where the glacier extends into ice or open water areas the delineating line shall replace the shoreline.

Shaded relief shall be shown when information is available.

All tints shall be omitted in the area.

3.7.20.2 Snowfield, Ice Fields and Ice Caps

Large snowfields, ice fields and ice caps shall be completely void of interior flow lining.

3.7.20.3 Glacial Moraines

Glacial moraines shall be shown when they have definite landmark value.

3.7.20.4 Permanent Snow and Ice Area Contours

Contours in permanent snow and ice areas shall be shown as approximate and shall be portrayed only when adequate contour information exists.

3.7.20.5 Ice Peaks

An ice peak is a pinnacle rising above the surrounding area perpetually covered with snow or ice. Prominent ice peaks shall be indicated by hachuring.

3.7.20.6 Ice Cliffs

Ice cliffs that are prominent landmark features shall be shown.

3.7.20.7 Shelf Ice

Shelf ice is defined as a solid, thick glacial ice formation extending into the sea from the land but attached thereto. It may be afloat or aground. It is one source of most sea ice features which are formed by “calving” from the shelf ice.

3.7.20.8 Pack Ice

Pack ice is a large area of floating ice driven closely together. It is made up of icebergs and fragments broken away from the shelf ice. Pack ice does not stand as high as shelf ice, nor is it solid. It is normally penetrable by ice cutters.

3.7.20.9 Polar Ice Pack

The polar ice pack is permanent ice. Although there may be some shifting, it is relatively stable.

3.7.20.10 Interiors of Shelf and Pack Ice Areas

The interiors of the shelf ice and pack ice areas shall be labeled "shelf ice" or "pack ice" as often as necessary for clarity. The outer limits of the pack ice shall be labeled "Approximate maximum limits of pack ice" with the date (month of observation). When the limits are unknown, the general limits of the known formation shall be labeled "limits of available shelf (pack) ice formation". The limits of the polar ice pack shall also be appropriately labeled, with date if available and if important, as an index to reliability.

3.7.21 Coastal Hydrography

References:

Appendix 2 - Topographical Information - Hydrography

3.7.21.1 General

The term "coastal hydrography" includes all natural and relatively permanent cultural features on the seaward side of the shoreline which affect the navigability of the area.

Coastal hydrography shall include foreshore and offshore features and notes as directed in the following paragraphs. When omission is necessary because of congestion, items selected for charting should be those most significant from a landmark standpoint.

3.7.21.1.1 Foreshore

The foreshore is defined as being that area between the high water shoreline and the low water shoreline or any area along the coast that covers at high tide and uncovers at low tide. The extent of the foreshore area shall depend upon the amount of tidal fluctuation and the slope of the shore. In nontidal waters, the horizontal extent of the foreshore area is too small to plot even on a large scale chart.

3.7.21.1.2 Offshore

The offshore area is defined as being that zone which extends from the low water mark to an indefinite distance seaward or that area which never uncovers.

3.7.21.1.3 Descriptive Notes

Descriptive notes should be added only when they convey pertinent information to the user or when required to clarify situations which otherwise would be confusing or liable to misinterpretation.

Careful consideration must be given to the placement of lettering, especially notes. Clarity is highly important and there must be no question as to which feature is being labeled.

3.7.21.2 Foreshore Flats

Foreshore flats (flats that cover and uncover with the tide) shall be shown when they are large enough to plot to scale.

3.7.21.3 Sand Bars

Sand bars are found in rivers, at river mouths or in inland waters. Those that have significance as landmarks shall be shown.

3.7.21.4 Salt Pans and Salt Evaporators

Features such as salt pans and salt evaporators shall be shown where they are significant as landmarks.

3.7.21.5 Reefs - Coral and Ledges

Reefs are interpreted as any area of coral or rock that is awash at low tide. If the area of a reef or ledge is small or is generally submerged, the reef symbol shall be omitted and the rock symbol shall be used to symbolize actual protrusions.

3.7.21.6 Rocks - Bare or Awash

Rocks, bare or awash, shall be individually symbolized. In congested areas, only the most prominent shall be shown. Very large rocks which are above mean water may be shown as islands. The elevation of prominent rocks shall be shown whenever significant.

3.7.21.7 Sunken Rocks

A rock which is submerged at the sounding datum shall not be shown by the rock symbol. An isolated area of numerous submerged rocks which is visible from the air may be portrayed as an unusual underwater feature. (See Section **3.7.21.9**)

3.7.21.8 Wrecks

Exposed or stranded wrecks having any portion of the hull exposed at the low water datum shall be shown if prominent enough to aid pilotage. Symbol shall be positioned to indicate direction and position of wreck. Sunken wrecks shall not be shown.

3.7.21.9 Unusual Hydrographic Features

As a rule, objects below the surface of the water shall not be shown. In exceptional cases, a dashed line shall be used to delineate unusual submerged features such as shoals and reefs which are visible from the air. The use of this symbol is recommended for large water expanses where they are often the only distinguishable features. Each such feature shall be appropriately labeled. Extensive reefs below the low water datum may be shown for unusual underwater features.

3.8 RELIEF

References:

Appendix 3 - Topographical Information - Relief

3.8.1 General

Basic relief is depicted by use of:

- contours
- spot elevations
- shaded relief
- gradient (layer) tints

3.8.1.1 Significance of Contours

Contours have significance for a low level, high speed navigation during both the pre-flight planning and enroute navigational phases. The function of the contour differs with each:

- In pre-flight planning, the major concern is to determine a route of flight based on clearance of terrain and man-made objects. The contour interval should express significant changes in the elevations at regular intervals.

- For the enroute phase, precise navigation is of primary concern.

3.8.1.2 Depiction of Relief

Relief shall be shown in conformance with **Appendix 3**.

3.8.2 Contours

References:

Appendix 3 - Topographical Information - Relief

3.8.2.1 General

The principles detailed herein apply equally to “contours” and “approximate contours”. Wherever the term contour is used it shall be interpreted to read “accurate contour” or “approximate contour”.

Basis for contour system consists of: basic contours, intermediate contours, and auxiliary contours. Definitions as used in the specifications follow:

- Basic contours are the fundamental contour framework at 500 foot intervals.

- Intermediate contours are lines which are shown between the basic contours to portray form, degree of slope and elevation not shown by the basic contours.

- Auxiliary contours are lines used to portray configuration and relative significance of additional unique landforms not shown by the selected intermediate contour interval.

A contour shall be classified as reliable (accurate) when it is evaluated to be accurate to one-half a contour interval or better.

A contour shall be classified approximate when it does not fulfill the accuracy standard specified for a reliable contour. An approximate contour may be either basic or intermediate.

Contours which coincide with the datum plane shall be designated as “sea level” or by “0” when space is limited. Contours which fall below the datum plane shall be designated with their values prefixed by a minus sign.

Small depressions, not adequately portrayed by shaded relief, shall be portrayed by depression contours. Depressions, too small to portray to scale, shall be exaggerated slightly when considered significant to low altitude visual flights.

3.8.2.2 Contour Symbolization

3.8.2.2.1 Reliable (Accurate) Contours

Basic - a solid line, .006" lineweight.

Intermediate - a solid line, .006" lineweight.

Auxiliary - a solid line, .006" lineweight.

3.8.2.2.2 Approximate Contours

Basic - a broken line, approximately .300" dash, .020" space .006" lineweight.

Intermediate - a broken line, approximately .300" dash, .020" space, .006" lineweight.

Auxiliary - a broken line, approximately .150" dash, .020" space, .006" lineweight.

3.8.2.3 Contour Values

Contour values, denoting the elevation above sea level, shall be inserted in basic contours, intermediates and auxiliaries as often as necessary to afford instantaneous readability and value identifications.

Values shall be portrayed in a systematic, step-like pattern, positioned on the northwest side of relief formations, wherever practical, to improve legibility. Each formation should have its own set of contour numbers.

Values shall always be added to all basic contours except in those extreme situations where physical limitations are imposed. Normally, intermediate contours shall be labeled at all elevation levels on the chart except in those areas where the addition of contour values might tend to create undue congestion. However, it is of extreme importance that intermediate contours be adequately labeled in those areas where dropped intermediates necessitate the addition of values to the retained intermediate, to facilitate the interpretation of elevation levels between basic contours. Auxiliary contours shall be labeled when space permits or adequately expressed in the legend, whichever is more feasible.

3.8.2.4 Basic Criteria

3.8.2.4.1 Basic Contours

Basic contours shall be drawn continuously throughout the chart even if they coalesce. (The existence of unusual relief features in certain areas may require an exception to this rule).

Normally, change in interval should only occur at the limits of the geographic area of immediate concern in order to maintain match and continuity.

A "skipped interval" on the same chart is objectionable and should be avoided as much as possible. An indiscriminate use of contours may well serve to distort topographic formations and convey an erroneous impression to the user.

Distance between contours should become progressively smaller from the flats to apex of hills or mountains. This factor should be kept in mind when there is a change in the contour interval.

3.8.2.4.2 Intermediate Contours

Normally, the selected interval should be retained throughout the chart at all elevation levels, being dropped when the lines tend to coalesce.

In view of scale limitation and under certain aspects of terrain conditions, it may not be feasible to always maintain a constant interval on the chart. In these instances intermediate contours may be dropped when:

- The distance between basic contours is uniform.
- The slope is both steep and uniform.
- The space between basic contours is too small to adequately portray intermediates.

Entry and re-entry of "dropped contours" should be at those points where they align and split the interval of the retained contours.

Normally, intermediate contours shall be retained (space permitting) where:

- They cross double-line drainage features.
- They are needed to clearly define the positions of significant changes in slope.
- A uniform interpretation cannot be made.

The most effective treatment is one that accomplishes a change in interval at the sheet edge and possibly over several sheets in order to maintain match and continuity.

3.8.2.4.3 Auxiliary Contours

Auxiliary contours shall be used only when they are necessary to adequately portray unique ground forms not adequately portrayed by the selected intermediate contour interval.

Auxiliary contours need not be continuous. However, consideration should be given to the maintenance of continuity in relation to the expressed contour interval.

Auxiliary contours need not be shown in the exact position when severe physical limitations are encountered. A slight to moderate displacement may be necessary to maintain the configuration of a specific relief feature or of a series of low-flying connected ground forms.

An indiscriminate use of auxiliary contours is not implied in these specifications. It must be emphasized that auxiliary contours shall be shown only when required to depict small terrain features considered to have significant landmark value during visual navigation flights.

3.8.2.5 Contour Interval

3.8.2.5.1 Basic Contours

The basic contour interval shall be 500 feet. This interval shall be retained throughout the chart at all elevation levels wherever possible.

However, in areas of high elevations and in deep ravines, it becomes physically impossible to maintain this interval. In these instances it may be necessary to increase the interval to 1,000 feet or even a multiple of 1,000 feet in certain rare instances.

3.8.2.5.2 Intermediate Contours

Intermediate contours shall be shown at intervals of 250 feet in moderately level or gently rolling areas.

Selection is dependent upon the nature of the terrain.

3.8.2.5.3 Auxiliary Contours

Auxiliary contours shall be portrayed in intervals of 50, 100 or 125/150 feet, whichever most adequately portrays the smaller relief features required for portrayal.

Auxiliaries have specific application in extensive areas of relatively low relief (with elevations of approximately 250 feet and under) and in extensive areas where minor significant graduations of terrain cannot be properly represented by the selected intermediate contour interval.

3.8.2.6 Contour Interval Note

A note shall be added in the margin explaining the basic contour interval with intermediate and/or auxiliaries tailored to the relief information depicted on the individual chart.

3.8.2.7 The Unit of Measurement

The "foot" shall be the basic unit of measurement of relief.

3.8.3 <u>Gradient (Layer) Tints</u>

Gradient (layer) tints are required in areas of reliable relief. Areas of unreliable relief, unsurveyed areas and areas covered by permanent ice and snow shall be void of all tints.

Gradient (layer) tints shall be shown for the interval listed below:

3.8.3.1 Format

Below Sea Level	5000' – 7000'
0' – 1000'	7000' – 9000'
1000' – 2000'	9000' – 12000'
2000' – 3000'	12000' Up
3000' – 5000'	

Gradient (layer) tints shall be broken for open water areas, dry or intermittent lakes, glaciers, and urban area tints.

3.8.3.2 Gradient (Layer) Tint Diagram

A diagram representing the intervals of the gradient (layer) tints with colors identical to colors and screens employed in the body of the chart shall be portrayed in the margin of the charts.

3.8.4 Elevations

3.8.4.1 General

An adequate pattern of spot elevations should be distributed throughout the various elevation levels, specifically including the highest points in each area and significant lower points. Elevations which are not considered significant shall normally be omitted. Determinations as to what constitutes a significant elevation or a significant lower point are matters of cartographic judgment and discretion. In addition, surface elevations of such hydrographic features as lakes, ponds and inland seas are required. Spot elevations shall not be shown indiscriminately on sides of slopes, or in those areas where they cannot be readily identified with a topographic or cultural feature.

Where an island is too small to show a spot elevation, the elevation value shall be centered under the island name, or if the island name is not shown, just outside the island limits.

The basic unit of measurement and the highest elevation on the chart shall be indicated in the margin with a note that shall read as follows:

HIGHEST TERRAIN elevation is (or is under) ----* feet
located at ---------*---------
*Insert correct value and geographic coordinates.

3.8.4.2 Spot Elevations

Spot elevations shall be symbolized with the “dot” or “x” symbol. Normally, spot elevations shall be shown for:

- The highest spot on the chart.
- The highest spot in the area which controls the determination of the maximum elevation figure. (In relatively flat terrain, spot elevations shall be shown based on cartographic judgment and discretion).
- Very significant or distinctive highs of mountain ranges or major relief. (Determinations as to what constitutes significant or distinctive highs are matters of cartographic judgment and discretion).

Interpolated and/or manufactured elevations (regardless of the method of determination) shall be symbolized by the “dot” symbol when they meet the accuracy requirement specified in Section 3.8.4.3. Otherwise the “x” symbol shall be used.

± elevations shall not be shown.

3.8.4.3 Accuracy Criteria

Spot elevations symbolized by a dot indicate accurate position and elevation within 100 feet. Those symbolized by the “x” symbol indicate accurate position and a vertical error greater than 100 feet.

3.8.4.4 Symbolization

3.8.4.4.1 Spot Elevations

Spot elevations shall be symbolized as specified in **Appendix 3** using a larger size type for the highest elevation value on a chart.

3.8.4.4.2 Highest Spot Elevation on Chart

The value of the highest spot elevation on the chart shall have the shaded relief, hypsometric and city tints masked to increase visibility.

3.8.4.5 Notes

The determination between expressing possible gross error by "generalized text" or as a "vertical dimension in feet" is necessarily dependent upon adequacy and reliability of available source material. The latter method is preferred and is especially applicable with large scale source material compiled by photogrammetric methods or other means utilizing high order field control.

3.8.4.6 Interpolated Elevations

When verified spot elevations are not available, values may be interpolated using either or both methods described below, depending on reliability and scale:

- Elevations may be manufactured by using the value of the next higher contour on the largest scale source material available. If contours on basic source are in meters, the value of the next higher contour in meters is to be used. The results are then converted to feet.

- Other approved methods for approximating elevations may be used as an alternate approach provided they have an accuracy approximately equal to or greater than the above.

3.8.5 Unreliable Relief

Form lines shall not be used.

3.8.5.1 Hachures

Hachures shall not be shown unless specifically requested.

Hachures merely serve to accentuate the prominent relief features which occur in the area. They are not intended to present a complete picture of the terrain.

In delineating hachures, only ridge lines and peaks need to be shown.

Hachures may be used in areas of reliable relief to supplement contours.

Weight, gauges and design cannot be strictly prescribed herein.

3.8.5.2 Pictorial Relief

Within the unreliable relief area, pictorial relief shall be used to portray prominent relief features (See Section **3.8.6**).

3.8.5.3 When Relief and Planimetric Data are Unavailable

Where both relief and planimetric data are unavailable, the area shall be void of tint and labeled "Unsurveyed". Lettering shall be positioned to indicate the extent of the unsurveyed area.

3.8.5.4 Spot Elevations

Spot elevations, where available, shall be added in accordance with Section 3.8.4.2.

3.8.5.5 Labeling Areas of Unreliable Relief

Where relief information is unreliable (not adequate for the portrayal of contours), the land area (void of all tints) shall be appropriately labeled. The note "Relief data incomplete" shall be centered in the area and/or the note "Limits of reliable relief information" shall be positioned adjacent to the limits of reliable relief coverage.

3.8.6 Terrain Portrayal (Shaded Relief)

The overprinting of contours with the halftones of the terrain portrayal shadings precludes interpretation of the contours. Therefore, a very singular responsibility for the accuracy and effectiveness of the portrayal rests with the expertise of the cartographer who interprets and renders the digital images. For this reason, expertise and rendition are part of these specifications.

3.8.6.1 Technical Standards for Reproducible Halftones

Since the halftone shadings are combined with other features and printed in black certain digital image standards and reproduction technologies are in order to ensure the reproducible halftones are compatible with these chart specifications. These standards are as follow:

1. Terrain digital renderings shall be a grayscale Tagged Image File Format (TIFF), with a resolution of 400 Dots Per Inch (DPI). The grayscale image will contain shading and highlighting with graduated tones that create a three-dimensional appearance, which is achieved by determining a gray tone at each point, calculating the steepness of the slope combined with illumination from a light source in the northwest.

2. Shadowing of slopes shall be digitally rendered in graduated tones, so that the top 1/3 of the slope contains a tonal value no more than 70%, the intermediate 1/3 of the slope contains an average tonal value of 40% and the lower 1/3 of the slope tapers to a tonal value of 2-5% in level valley floors. The tonal value of valley floors and other nearly level areas with grades less than 3% are "dropped out" and do not print.

3. Highlighting shall be digitally rendered in large level areas, such as valley floors or coastal plains, to enhance the three-dimensional effect.

3.8.6.2 Terrain Portrayals

The terrain portrayals shall be rendered in such a manner that all significant terrain features are displayed. This not only includes high relief which casts shadows, but also includes low relief which reflects light. Small, low-lying forms may be slightly exaggerated if considered significant as landmarks or pertinent to the visual pilot.

On certain charts, specifically those comprised entirely of relatively level or gently rolling terrain, shaded relief rendition normally shall fail to effectively accentuate the basic relief portrayal expressed by contours. In these instances, the shaded relief may be omitted from the body of the chart.

Consideration should be given to improving the relationship between contours, shaded relief and spot elevations in order to provide the necessary degree of correlation.

3.8.6.3 Miscellaneous Terrain Features

Miscellaneous terrain features such as escarpments, bluffs, depressions, levees, volcanoes, fault scarps, etc., may sometimes be more effectively expressed in shaded relief rather than by standard symbolization.

3.8.7 Area Relief Features

Normally, the following "Area Relief Features", which are not indicated by contouring, shall be shown by appropriate symbolization wherever such areas are considered important to area identifications:

- Distorted surface areas such as rocky areas, stratified rock outcrop and lava
- Lava flows
- Sand or gravel areas
- Sand ridges
- Sand dunes
- Strip mines, dumps and tailings (to scale)

3.8.8 Miscellaneous Relief Features

3.8.8.1 Craters

Prominent volcanoes and craters shall be shown, especially in areas of sparse culture. In absence of lava flow, descriptive note "crater" shall be carried.

3.8.8.2 Mountain Passes

Those of prominence shall be shown by symbol and elevation.

3.8.8.3 Eskers

Eskers, when prominent, shall be shown in the same manner as levees and labeled "eskers".

3.8.8.4 Escarpments, Bluffs, Cliffs, Depressions, Etc.

These features shall be shown wherever possible in view of their extreme importance in visual flight during low ceiling and visibility, either on the shaded relief file or by standard symbol. When specified by appropriate authority, a descriptive note such as "RAPIDLY RISING TERRAIN" shall be carried to further emphasize the area.

3.8.8.5 Levees

Prominent levees shall be shown and shall be named or labeled when clarification is necessary.

3.9 AERONAUTICAL INFORMATION

References:

Appendix 5 - Aeronautical Information - Airports
Appendix 6 - Aeronautical Information - Radio Aids to Navigation
Appendix 7 - Aeronautical Information - Airspace Information
Appendix 8 - Aeronautical Information - Chart Limits
Appendix 9 - Aeronautical Information - Navigational & Procedural Information

3.9.1 General

Aeronautical information portrayed is limited to that normally used during VFR flight.

Visual reference data essential to the purpose of the chart must not be obscured by aeronautical overprint, while vital aeronautical information must also be readable. Each symbol shall be clearly evident and visible.

Aeronautical information shall be plotted at its true geographic position whenever possible. Should it become necessary to displace aeronautical symbols to improve readability in congested areas, preference shall be given to the accurate plotting of NAVAIDs. Where two or more NAVAIDs cannot be accurately plotted because of proximity, preference shall be given to NAVAIDs having airway functions. When a facility cannot be placed in the correct position relative to the surrounding base detail, revise the base detail while maintaining the correct relative locations.

Identify radials with the magnetic outbound value from VHF/UHF NAVAIDs.

Bearings and radials shall be depicted by three digit figures; e.g., 001, 012, 123. A degree symbol (°) shall be shown with all bearing/radial values. Place the numbers so as to preclude the possibility of pilots misreading the values. This is especially critical with numbers which may be read upside down; e.g., 161, for 191, 090 for 060, etc.

Boxes encompassing data shall be of a size consistent with the data contained therein. Avoid unnecessary enlargement of the boxes by allowing data positioned on and breaking the lines (top or bottom) of the boxes to extend beyond the limits of the boxes.

Textual data shall be positioned relative to true north unless otherwise specified.

Identifications and data notes shall be positioned adjacent to or as near symbols as possible unless this results in obliteration of other detail.

A sense of proportion, balance, and artistic value is essential in preparing a chart representing the ultimate in readability and user appeal. Therefore, rules concerning type placement must be flexible and unconfining. The cartographer must evaluate portrayal techniques for each area before making the decision on type placement. When there is equal congestion surrounding a facility, the preferred type location is to the NE, thence counterclockwise around the symbol.

Dotted leader lines may be used when necessary for clarity of detail or to effect the correct relationship between type and symbols.

Operational notes, e.g., hours of operation, shall be shown in local time. “0000” shall be used to denote the beginning of the day and “2400” the end of the day.

Avoid placing symbol and textual identifications, including airway identification data, along or on the folds, so as to maintain the symbol and its identification within the same chart panel.

Aeronautical information shall be shown in blue unless otherwise indicated to be shown in black or magenta. Normally, all LF/MF information shall be shown in magenta.

3.9.2 Airports

References:

Appendix 5 - Aeronautical Information - Airports

3.9.2.1 Charting Criteria

Airports published in the FAA National Flight Data Digest (NFDD) shall be charted. Unverified airports provided by the AVN Flight Edit Program shall be charted. Airports of lesser importance may be omitted in congested areas or when other airports with better facilities are nearby.

Subject to the above restriction, airports within the following criteria shall be charted:

- Public-use airports
- Military airports without charting restrictions
- Non-public-use airports having emergency or landmark value
- Abandoned airports with at least a 3,000 foot paved runway and/or landmark value
- Public-use heliports not associated with an existing airport, non-public-use heliports that have controlled airspace predicated on them, and selected U.S. Forest Service Heliports
- Ultralight flight parks when of landmark value
- Unverified airports

3.9.2.2 Plotting of Airports (Landplane and Seaplane)

Airports (landplane and seaplane) shall be plotted to true geographic position unless they conflict with a NAVAID at the same location. In such cases, the airport shall be displaced from or superimposed upon the NAVAID. In displacing, the positional relationship between the airport and the NAVAID shall be retained. When depicting a seaplane base, the eye of the anchor symbol should be as close to the docking area as possible, with the remainder of the symbol in the water (orientation is not an issue).

3.9.2.3 Airport Symbology and Criteria

Airports shall be symbolized in accordance with **Appendix 5** and classified by the following criteria:

- Landplane or seaplane
- Civil, military or civil-military
- Fuel availability indicated by tick marks around the airport symbol as show in the Appendices. Military airports do not advertise fuel.
- Airports with at least one 1,500 foot long hard-surfaced runway shall be shown by a pattern. Runways may be exaggerated as necessary to clearly portray the pattern. Only hard-surfaced runways that exist in the authoritative source database shall be shown. Nondirectional radio beacon symbols which cover an airport, or part of a runway, shall be broken.
- All other airports with and without services.

3.9.2.4 Airport Names

Airports shall be identified by the designated airport name extracted verbatim from the authoritative database and may be further abbreviated or truncated only in extremely congested areas.

When the airport name is the same name as a NAVAID or adjacent city or town and no misinterpretation shall result, the NAVAID or adjacent city or town name can suffice for the airport name.

The type "(Pvt)" shall be shown at non-military private fields, positioned above or immediately after the airport name.

Associated city names for public-use airports shall be shown only when the airport name differs from the associated city name. The associated city name shall be shown in all caps, using the same font and size as the airport name, either in front of or above the airport name. If shown in front of the airport name, the two names shall be separated by a 'slash'. Associated city names shall not be shown for military or private airports.

3.9.2.5 Airport Data Block

Airport names shall be supported by the following coded data, positioned as indicated in **Appendix 5**. Substitute a dash for the elevation, lighting, or runway length when not shown.

3.9.2.5.1 Flight Service Stations (FSS)

Flight Service Stations (FSS) located on an airport shall be indicated by the letters "FSS" positioned above the airport name.

3.9.2.5.2 Airport Identifiers

Airports shall be identified by name. Public-use, joint civil-military, and military airports shall include the three/four character alpha-numeric FAA airport identifier immediately after the name in parenthesis. The number zero shall be identified as Ø or Ø in order to differentiate from the letter "O". Airports outside the contiguous United States shall be charted with both FAA airport identifier and ICAO location indicator. When an ICAO indicator does not exist for an airport, only the FAA-designated airport identifier shall be used.

3.9.2.5.3 Control Tower

Indicate control towers by adding the letters "CT" with the primary VHF local control tower frequency after the airport name. A five-pointed star following the frequency indicates part-time operation. Hours of operation shall be shown in the tabulation in the margin.

3.9.2.5.4 Automatic Terminal Information Service (ATIS)

Automatic Terminal Information Service (ATIS) shall be shown by the letters "ATIS", with the primary arrival VHF/UHF frequency/ies following the tower frequency.

3.9.2.5.5 Automatic Flight Information Service (AFIS)

(AK only) Automatic Flight Information Service (AFIS) shall be shown by the letters "AFIS" with the associated frequency/ies, following the tower frequency.

3.9.2.5.6 Automated Weather Observing System (AWOS)/Automated Surface Observing System (ASOS)

Automated Weather Observing System (AWOS)/Automated Surface Observing System (ASOS) shall be shown at public-use and military airports by the letters "AWOS" or "ASOS" followed by the number/letter indicating the type of system and the frequency, e.g., 135.625. This shall be shown below the tower frequency. AWOS/ASOS transmitted through an NDB shall be depicted with the frequency followed by the abbreviation for kilohertz (kHz). If full-time ATIS (or AFIS in Alaska) is available, AWOS or ASOS shall not be shown.

3.9.2.5.7 Airport Elevation

The elevation of an airport is the highest point of the usable portion of the landing areas based on the most reliable information available. The elevation, in feet above mean sea level, shall be positioned immediately below the airport name. Show sea level elevations as "00". When elevation is below sea level, the word "minus" shall precede the figure.

3.9.2.5.8 Runway Lighting System

Runway lighting is a system of lights defining the usable runway surface. Lighting symbolization indicates availability of runway lighting at military and public-use airports and shall be shown below the airport name following the elevation. Lighting in operation sunset to sunrise shall be indicated by the letter "L". Lighting with limitations such as: available on request (by radio call, letter, phone, FAX), part-time lighting, or pilot/airport-controlled lighting shall be shown by an asterisk (*) preceding the letter "L". Portable lighting, temporary lighting, and "emergency use only" lighting (for airports outside the U.S.) shall be considered as an absence of runway lighting, i.e., not available. When lighting is not available, a dash shall be shown. Availability of runway lights at private airports shall not be shown; a short dash in lieu of the letter "L" shall be shown.

3.9.2.5.9 Runway Length

Runway length is the length of the longest active runway (pavement, end to end), including displaced thresholds, but excluding overruns. The runway length shall be positioned below the airport name following the lighting. Runway length shall be shown to the nearest 100 feet using 70 as the division point; e.g., 59 shall be used to indicate a runway of 5,870 feet.

3.9.2.5.10 Aeronautical Advisory Stations (UNICOM)

Aeronautical Advisory Stations (UNICOM) shall be indicated by frequency assigned.

3.9.2.5.11 Common Traffic Advisory Frequency (CTAF)

The Common Traffic Advisory Frequency (CTAF) shall be indicated by Ⓒ or Ⓒ . When the frequency is already charted (e.g., tower or UNICOM), add the symbol behind the frequency. If the frequency is different, add the frequency and the symbol where the UNICOM is normally shown; or if the UNICOM is already shown, place it immediately following the UNICOM or below and centered on the airport data block.

3.9.2.5.12 Non-standard Traffic Patterns

Non-standard traffic patterns shall be indicated at public-use and joint-use airports by using the abbreviation "RP" (for Right Pattern), followed by the appropriate runway number(s), at the bottom of the airport data block. For example: RP 9, 18, 22R. *RP indicates special conditions exist and refers pilots to the Chart Supplement. Non-standard traffic patterns are not shown at airports with full-time control towers.

3.9.2.5.13 Non-radar VFR Advisory Service

Non-radar VFR Advisory Service shall be shown at locations where Automatic Terminal Information Service (ATIS) or Automatic Flight Information Service (AFIS) is not available full-time and the frequency is other than the primary CT frequency; e.g., "VFR Advsy 120.1".

3.9.2.5.14 On-Airport Alaska Weather Camera Locations

Weather cameras in Alaska, when located on-airport, shall be identified by the text "WX CAM", placed below the airport elevation, lighting and runway information, and above the AOE designator.

3.9.2.5.15 Airport of Entry (AOE)

Airports of entry shall be identified by the term "AOE" below the airport elevation, lighting, and runway information.

3.9.2.6 Color Depiction of Airports with or without ATC Towers

Airports with air traffic control towers shall be shown in blue. All other airports shall be shown in magenta. Associated data shall be shown in the same color as the airport symbol.

3.9.2.7 Airports Governed by SFAR Part 93

Airports for which a special air traffic rule is designated in FAR Part 93 shall be indicated by placing a box (.006" lineweight) around the airport name.

3.9.2.8 Heliports

Heliports shall be shown with name, three/four character alpha-numeric FAA identifier, elevation, and tower frequency (if applicable). Common Traffic Advisory Frequency (CTAF) and symbol, and UNICOM frequency if applicable, shall be shown as indicated in **3.9.2.5.10** and **3.9.2.5.11**. AWOS/ASOS frequency, if applicable, shall be shown as indicated in **3.9.2.5.6**. USFS heliports shall be identified by the type "USFS". If applicable the type "Emerg Only" shall be shown beneath the elevation.

3.9.2.9 Ultralight Flight Parks

Ultralight flight parks shall be identified by name only and type "(Pvt)" if applicable.

3.9.2.10 Unverified Airports

Unverified airports shall be depicted as shown in **Appendix 5** by symbol only. The facility name shall be added upon special request by appropriate authority.

3.9.2.11 Charting Airports with Objectionable Airspace Determinations

Charted public-use airports (and private-use airports having emergency or landmark value) that have received an "Objectionable" airspace determination from the FAA Office of Airports shall be shown with standard airport symbology, with the annotation "OBJECTIONABLE" placed in close proximity to the airport symbol. No additional airport data (including airport name or identifier) shall be provided.

3.9.3 <u>Radio Aids to Navigation (NAVAIDs)</u>

References:

Appendix 6 - Aeronautical Information - Radio Aids to Navigation

3.9.3.1 General

Public-use (and outside of U.S. airspace, private-use when utilized in the definition of an airway) operational and commissioned LF/MF and VHF/UHF NAVAIDs shall be shown as illustrated in **Appendix 6**.

3.9.3.2 NAVAID Data

NAVAID data shall be boxed.

Arrangement of NAVAID data within the box shall be in the following sequence: Name, frequency/ies, channel (if applicable), identification letters and Morse code. The NAVAID name shall be centered above the frequency, channel, identification letters and Morse code within the box.

The FSS or FSS Radio name providing the voice communication shall be shown in brackets parallel to and below the bottom line of the box.

3.9.3.3 Part-Time NAVAIDs

NAVAIDs operating part-time or on-request shall be indicated by the placement of a small five-pointed star to the left of the frequency, within the box.

3.9.3.4 Shutdown NAVAIDs

The operational status of "Shutdown" NAVAIDs shall by symbolized as illustrated in **Appendix 6**.

The frequency and/or channel shall be overprinted with diagonal lines in NE to SW direction in same color as frequency and channel.

3.9.3.5 NAVAIDs "Without Voice"

NAVAIDs "without voice" shall be indicated by underlining the frequency of the NAVAID. DME frequencies shall not be underlined.

3.9.3.6 Multiple NAVAIDs with Same Name, Different Identification

When multiple NAVAIDs have the same name with different frequencies, or channels, or identification letters and no misinterpretation shall result, the name of the NAVAID shall be indicated once within the identification box. VHF/UHF NAVAID names and identification boxes shall take precedence in same name NAVAID situations. The frequency only (or the frequency, identification and Morse code, when different from the same name NAVAID) shall be positioned below the associated VHF/UHF NAVAID identification within the common identification box.

Leader lines may be shown for clarity of information. If necessary, leader lines from combined NAVAID identifications may be individually portrayed.

Separate boxes may be used where, because of distance between NAVAIDs or chart congestion, it is impractical to use a combined box. Choice of separate or combined boxes shall be made on the basis of economy of space and clear identification of the NAVAIDs.

3.9.3.7 NAVAIDs Collocated on Airports

A NAVAID collocated on an airport depicted by a pattern shall be plotted to its true geographic position and depicted by a .032" diameter circle (TAC) or .025" diameter circle (Sectional). A smaller diameter circle may be used if excessive runway displacement prohibits the use of the larger circle. The NAVAID type, e.g., VOR, VORTAC, etc., shall be positioned on and breaking the top line of the identification box.

3.9.3.8 Compass Roses

Compass roses, as illustrated in **Appendix 6**, shall be shown centered on all VHF NAVAIDs, with the exception of DME facilities, when space allows.

Preference shall be given to those serving enroute functions or located in areas not served by other VHF NAVAIDs.

Compass roses shall be properly oriented to the slaved magnetic variation on record of the NAVAID.

Where two or more compass roses overlap, the overlapping portions of one or more roses may be omitted.

Airway radials shall normally be shown approximately .250" outside the compass rose but may be placed farther out or within the compass rose to relieve congestion around the compass rose.

Sizes of compass roses may be adjusted as necessary to avoid overprinting other important data, e.g., Class C airspace boundaries.

A compass rosette, as illustrated in **Appendix 6**, may be shown in areas having few NAVAIDs. These compass rosettes shall not be associated with a NAVAID and shall be shown in magenta. They shall be oriented to the local magnetic variation (i.e., isogonic).

3.9.3.9 NAVAIDs Utilized as FSS or FSS Radio A/G or RCO

FSS or FSS Radio A/G voice communications frequencies remoted to NAVAIDs (i.e., RCOs) or frequencies of RCOs collocated with a NAVAID (within 10 nautical miles) of the same name serving the same FSS or FSS Radio, may be indicated above the top line of the NAVAID identification box.

The FSS or FSS Radio providing voice communication shall be shown parallel to and below the bottom line of the boxes.

“L” shaped brackets shall be positioned .050” to the right and left of the FSS or FSS Radio name. When the FSS or FSS Radio name is longer than the box, the bottom line of the box may be extended left/right.

3.9.3.9.1 Canadian Dial-up Remote Communication Outlets (DRCOs)

Canadian Dial-up Remote Communication Outlets (DRCOs) shall be identified by placing the type “DRCO” below or immediately adjacent to the FSS or FSS Radio name.

3.9.3.10 NAVAIDs for VFR Use Only

NAVAIDs for “VFR Use Only” shall be so identified on the chart, outside and adjacent to the identification box.

3.9.3.11 Automated Weather Broadcast Service

Automated Surface Observing Station (ASOS) and Automated Weather Observing Station (AWOS) broadcasts associated with a NAVAID shall be indicated by a A or A. These icons shall be placed in the upper right corner inside the NAVAID box, as indicated in **Appendix 6**. The icon shall be the same color as the associated NAVAID. If two NAVAIDs share a common frequency box and both have weather broadcasts, the color shall indicate which broadcast service is associated with which NAVAID.

3.9.3.12 NAVAID Types

References:

Appendix 6 - Aeronautical Information - Radio Aids to Navigation

3.9.3.12.1 VHF Omnidirectional Radio Range Stations (VOR)

VHF omnidirectional radio range stations (VOR) shall be shown as illustrated in **Appendix 6**.

VORs shall be identified by name, frequency, identification letters, and Morse code.

VORs with TACAN DME shall be shown with the symbol illustrated in **Appendix 6** around and encompassing the VOR symbol.

3.9.3.12.2 VHF Omnidirectional Radio Range – Tactical Air Navigation (VORTAC)

VORTACs shall be shown as illustrated in **Appendix 6**.

VORTACs shall be identified by name, VOR frequency, TACAN channel, identification letters and Morse code.

3.9.3.12.3 Distance Measuring Equipment (DME)

DME facilities shall be shown as illustrated in **Appendix 6**.

DMEs shall be identified by name, channel, identification letters, Morse code, and paired frequency in parentheses.

DMEs shall not be depicted outside the United States unless utilized in the definition of an airway.

3.9.3.12.4 Nondirectional Radio Beacons (NDB)

NDBs shall be shown as illustrated in **Appendix 6**.

NDBs shall be identified by name, frequency, identification letters and Morse code. When DME is available at a NDB, the paired VHF frequency shall be shown in parentheses following the DME/TACAN channel.

The NDB center symbol (circle and dot) shall be deleted when used in conjunction with marker beacons and airports.

Selected low-powered NDBs without voice (MHW facilities) may be omitted in congested areas.

3.9.3.12.5 (TAC) NAVAIDs Used to Define Airspace

NAVAIDs used in official descriptions of Class B airspace to define an airspace limit, and not otherwise charted (e.g., LOM, ILS, ILS/DME, etc.), shall be charted.

The name, identification, frequency, and channel shall be symbolized as shown in **Appendix 6**. In the case of two ILS/DME systems which utilize a single, shared DME antenna, a single facility box shall be shown, with the location identifiers of both ILS systems listed, separated by a slash.

3.9.3.13 Broadcasting Stations (Commercial)

Commercial broadcasting stations shall be shown when specifically requested by appropriate authority.

Broadcasting stations shall be plotted in their true geographical location.

3.9.3.14 Flight Service Stations

All flight service stations (FSS), except those with the same name as a NAVAID, shall be shown, symbolized and identified by name and identification letters, and enclosed within an identification box.

FSSs with the same name as a NAVAID but with a different identifier shall be shown independently of the NAVAID, i.e., separate identification box with name and identifier.

Part time FSSs shall be annotated with hours of operation.

NAVAIDs having the same name as the FSS and not designated as a remote communications outlet (RCO) shall be considered as the FSS. The NAVAID identification box shall be augmented with the heavy line.

FSS A/G voice communications frequencies available at the FSS shall be shown positioned above the top line of the FSS identification box. FSS frequencies 122.2 and 255.4 (Conterminous U.S.); 121.5, 122.2, 243.0 and 255.4 (Alaska); and 121.5, 126.7, and 243.0 (Canada) will not be shown.

FSS outlets - FSS Radio outlets (RCOs) when not associated with a NAVAID shall be shown as illustrated in **Appendix 6** and identified by name and the letters “RCO” or “DRCO” within an identification box. Where FSS outlets - FSS Radio outlets (RCOs) are associated with or collocated (within 10 nautical miles) with a NAVAID of the same name and serving the same FSS or FSS Radio, the frequencies may be positioned above the NAVAID box. All published RCO frequencies shall be shown.

FSS outlets or FSS Radio outlets (RCOs) not associated with a NAVAID shall be show as illustrated in **Appendix 6** and identified by name and the letters “RCO” or “DRCO” within an identification box.

3.9.3.15 International Flight Service Stations

International FSS (IFSS) frequencies and the station name and identifier letters shall be enclosed in a .015" lineweight box positioned offshore in the general area of the station.

3.9.3.16 Off-Airport Automated Weather Broadcast Services

Automated Weather Observing System (AWOS) and Automated Surface Observing System (ASOS) not associated with a charted public-use airport or NAVAID shall be shown as illustrated in **Appendix 6** and identified by name, type of facility, e.g., AWOS/ASOS, frequency and FAA identifier.

3.9.3.17 Off-Airport Alaska Weather Camera Locations

Alaska Weather Camera Locations not located on an airport, shall be shown as illustrated in **Appendix 6** and identified as “SITE NAME WX CAM”.

3.9.4 Airspace Information

References:

Appendix 7 - Aeronautical Information - Airspace Information

3.9.4.1 Class B Airspace

Class B airspace shall be shown and plotted in its entirety, symbolized by outlines of the areas and internal sectors. A note referencing the appropriate VFR Terminal Area Chart (TAC) and/or Canadian VFR Terminal Area Chart (VTA)/VFR Navigation Chart shall be shown.

Ceiling and floor sector altitudes above mean sea level (MSL) shall be shown in blue.

Show ceiling values above floor values separated by horizontal lines. Eliminate the last two digits and show surface as SFC, e.g.,

Figure 3.9 Ceiling Value

70
SFC

Floors extending "upward from above" a certain altitude are preceded by a plus symbol "+".

Position altitude values within each sector at appropriate intervals. Use leader lines if the altitude value must, because of limited space, be placed outside its sector.

Type size shall vary dependent upon space limitations.

(TAC) The following boxed note shall be shown in designated sectors outside the Class B airspace boundary. The note will contain the approach call sign of the facility. The note shall have the shaded relief, hypsometric, hydrographic and city tints masked to increase visibility.

Figure 3.10 (TAC) Class B Contact Information Box

CTC LAS VEGAS APP
ON 121.1 OR 257.8

The Class B airspace name shall be shown in blue at or near the north position, outside the boundary; e.g.,

Figure 3.11 Class B Airspace Name

LAS VEGAS CLASS B

(TAC) All radials used to define a boundary of Class B airspace shall be identified by the NAVAID identifier and magnetic bearing from the NAVAID. All arcs shall be identified by the NAVAID identifier and nautical miles from the NAVAID. (In cases where a DME antenna shared by more than one ILS system defines the arc, both ILS location identifiers shall be shown separated by a slash.) Arcs and radials from geographic positions other than NAVAIDs shall be identified by magnetic bearings and nautical mileages when requested by appropriate authority.

3.9.4.2 Class C Airspace

Class C airspace shall be shown by a magenta line.

Only the core areas, normally 5 and 10 nautical mile circles centered on the airport, and internal sectors shall be shown.

Ceiling and floor sector altitudes above mean sea level (MSL) shall be shown in magenta.

Show ceiling values above floor values separated by horizontal lines. Eliminate the last two digits and show surface as SFC, e.g.,

Position altitude values within each sector at appropriate intervals. Use leader lines if the altitude value must, because of limited space, be placed outside its sector.

A ceiling value of "T" indicates the ceiling is to but not including the floor of the overlying Class B airspace.

Type size shall very dependent upon space limitations.

The Class C airspace name shall be shown in magenta at or near the north position, outside the boundary; e.g.,

Figure 3.12 Class C Airspace Name

BURBANK CLASS C

The following note shall be shown in designated sectors outside the Class C airspace boundary. The note will contain the approach call sign of the facility. The note shall have the shaded relief, hypsometric, hydrographic and city tints masked to increase visibility.

Figure 3.13 Class C Contact Information Box

CTC BURBANK APP WITHIN
20 NM ON 124.6 395.9

Class C airspace identified in the legal description as operating less than continuous shall be shown with the following note:

Figure 3.14 Class C 'See NOTAMs/Supplement' Note

See NOTAMs/Supplement
for Class C eff hrs

3.9.4.3 Class D Airspace

Class D airspace shall be shown in its entirety by the blue dashed symbol illustrated in **Appendix 7**.

Class D airspace shall be depicted in its true position regardless of the necessity to offset the airport symbol. Exclusion areas within the Class D limits shall be depicted with a blue line.

Class D airspace identified in the legal description as operating less than continuous shall be shown with the following note:

Figure 3.15 Class D 'See NOTAMs/Supplement' Note

See NOTAMs/Supplement
for Class D eff hrs

Ceilings (MSL) shall be shown in hundreds of feet dropping the last two digits. A minus in front of the figure shall be used to indicate "from surface to but not including…" The figure size shall vary and be enclosed within a dashed box. Leader lines may be used when the ceiling value must, because of space limitations, be placed outside the respective area.

Figure 3.16 Class D Ceilings

3.9.4.4 Class E Airspace

Lateral limits of Class E airspace up to but not including 18,000' MSL (excluding the Hawaiian Islands Sectional Chart which has no upper limit) shall be shown by narrow vignettes or by the dashed magenta symbol illustrated in **Appendix 7**.

Class E airspace shall be depicted in its true position regardless of the necessity to offset the airport symbol.

Individual units of designated airspace are not necessarily shown; instead, the aggregate lateral and vertical limits shall be defined by the following:

Class E airspace beginning at the surface shall be shown by the magenta dashed line as illustrated in **Appendix 7**. Class E airspace shall be depicted in its true position regardless of the necessity to offset the airport symbol. Exclusion areas shall be depicted with a magenta line.

3.9.4.4.1 Floors 700 Feet AGL

Floors 700 feet AGL shall be defined by a magenta vignette.

3.9.4.4.2 Class E Airspace with a Floor of 700 Feet AGL that Abuts Class G Airspace Below 14,500 Feet MSL

Class E airspace with a floor of 700 feet AGL that laterally abuts Class G (uncontrolled) airspace below 14,500 feet MSL shall have the type "CLASS G" placed outside the 700 feet AGL area to prevent confusion with 1200 feet AGL or higher Class E airspace (Not applicable where the 700' AGL airspace abuts the international boundary with Mexico). Use leader lines if the type, because of limited space must be outside the area.

3.9.4.4.3 Floors Other Than 700 Feet AGL

Floors other than 700 feet that abut uncontrolled airspace shall be defined by a blue vignette.

3.9.4.4.4 Floors Greater Than 1200 Feet AGL

Floors greater than 1200 feet shall be annotated by the number indicating the floor. Occasions may occur when "1200 AGL" type is required for clarification (e.g., along projection lines).

3.9.4.4.5 Class E Airspace 14,500 Feet and Above

Class E airspace 14,500 feet and above, formerly the Continental Control Area, shall not be shown. Refer to **Appendix 7**

3.9.4.4.6 Class E Airspace when Ceiling is Less Than 18,000 Feet - Ceiling Values

When the ceiling is less than 18,000 feet MSL, the value prefixed by the word "ceiling" shall be shown along the limits in blue. MSL (mean sea level) or AGL (above ground level) shall follow the value.

3.9.4.4.7 Changes in Floors Not Otherwise Defined by a Vignette.

Changes in floors not otherwise defined by a vignette shall be defined by a screened line symbol as illustrated in **Appendix 7**.

3.9.4.4.8 Lateral Limits of Class E Airways, Control Airways, Etc.

The lateral limits of Class E airways, control areas, etc., which lie above the floor of other Class E airspace and exists within the vertical limits of that airspace, shall not be depicted. Only the maximum extent of the lateral and vertical limits of all Class E airspace shall be depicted.

3.9.4.4.9 Offshore Control Areas

Boundaries of offshore control areas shall be shown as illustrated in **Appendix 7** and identified by name, e.g., ATLANTIC LOW CONTROL AREA, positioned within the area, adjacent to and parallel to the symbol.

3.9.4.4.10 Additional Offshore Control Areas

Additional offshore control areas shall be symbolized as illustrated in **Appendix 7** and shall be identified by name, e.g., CONTROL AREA 1148L, positioned immediately within and parallel to the limits of the areas.

3.9.4.4.11 Class E Airspace Notes

Class E airspace identified in the legal description as operating less than continuous shall be shown with the notes:

Figure 3.17 Class E 'See NOTAMs/Supplement' Note

See NOTAMs/Supplement
for Class E (sfc) eff hrs

Figure 3.18 Class E 'See NOTAMs/Supplement for 700' Note

See NOTAMs/Supplement
for 700' Class E eff hrs

3.9.4.5 Airspace Outside the United States

3.9.4.5.1 Canadian Airspace

Canadian airspace shall be depicted as illustrated in **Appendix 7**.

3.9.4.5.2 Canadian Airspace Notes

The following notes shall be charted near the border and once in the margin area of the chart:

Figure 3.19 Airspace Classification Note - Canada

AIRSPACE CLASSIFICATION (SEE CANADA FLIGHT SUPPLEMENT) AND
OPERATIONAL REQUIREMENTS (DOD USERS, SEE DOD AREA
PLANNING AP/1) MAY DIFFER BETWEEN CANADA AND UNITED STATES

Figure 3.20 Charts and Publications Note - Canada

NOTE: REFER TO CURRENT CANADIAN CHARTS AND FLIGHT INFORMATION PUBLICATIONS FOR INFORMATION WITHIN CANADIAN AIRSPACE

Type shall be 6 pt Helvetica 65 Medium. Box lineweight shall be .015".

3.9.4.5.3 Canadian VFR Airspace Restrictions Note

Canadian airspace shall be depicted with the following note charted near the border.

Figure 3.21 Canadian VFR Airspace Restrictions Note

VFR AIRSPACE RESTRICTIONS
No VFR flight within Canadian Class B Airspace is permitted above 12,500' MSL, or MEA, whichever is higher, to but not including 18,000' MSL without being controlled by ATC. For additional details see appropriate Canadian publications.

Type shall be 6 pt Helvetica 65 Medium. Box lineweight shall be .010".

3.9.4.5.4 Mexican Airspace Notes

Mexican airspace shall be depicted with the name/designator and the equivalent domestic symbol. The following notes shall be charted near the border and once in the margin area of the chart:

Figure 3.22 Airspace Classification Notes - Mexico

AIRSPACE CLASSIFICATION/OPERATIONAL REQUIREMENTS MAY DIFFER BETWEEN MEXICO AND UNITED STATES (DOD USERS, SEE DOD AREA PLANNING AP/1)

Figure 3.23 Charts and Publication Notes - Mexico

NOTE: REFER TO CURRENT MEXICAN CHARTS AND FLIGHT INFORMATION PUBLICATIONS FOR INFORMATION WITHIN MEXICAN AIRSPACE

Figure 3.24 Airspace Note

NOTE: DOD USERS, REFER TO CURRENT DOD (NGA) FLIGHT INFORMATION PUBLICATIONS FOR INFORMATION OUTSIDE OF U.S. AIRSPACE

Type shall be 6 pt Helvetica 65 Medium. Box lineweight shall be .015".

3.9.4.5.5 Airspace Outside of the United States Notes

Airspace outside of the U.S., with the exception of Canadian airspace, shall be depicted with the name/designator and the equivalent domestic symbol. The following boxed note shall be depicted in non U.S. airspace, with the exception of Canada near the border, and in the margin:

Figure 3.25 Airspace Note

NOTE: DOD USERS, REFER TO CURRENT DOD (NGA) FLIGHT INFORMATION PUBLICATIONS FOR INFORMATION OUTSIDE OF U.S. AIRSPACE

Type shall be 6 pt Helvetica 65 Medium. Box lineweight shall be .015".

3.9.4.5.6 FAA ATC Services Outside the U.S. Airspace Note

The following note shall be positioned in an open water area on all charts depicting airspace assignments beyond the territorial limits of the United States:

Figure 3.26 FAA ATC Services Outside the U.S. Airspace Note

FAA air traffic service outside U.S. airspace is provided in accordance with Article 12 and Annex 11 of ICAO Convention. ICAO Convention not applicable to state aircraft but compliance with ICAO standards and practices is encouraged.

Type shall be 6 pt Helvetica 65 Medium. Box lineweight shall be .006".

3.9.4.6 Flight Information Regions (FIRs)/Control Areas (CTAs)

FIRs shall be identified by name and positioned within the area, adjacent to and parallel to the boundary, as indicated below and in **Appendix 7**. Boundaries of FIRs (including FIRs coincident with CTAs) shall be indicated with a blue line with tick marks.

Figure 3.27 FIR

MEXICO FIR MMFR

Figure 3.28 CTA/FIR

OAKLAND OCEANIC CTA/FIR KZAK

CTAs shall be identified by name positioned within the area, adjacent to and parallel to the boundary, as indicated below and in **Appendix 7**. CTA boundaries shall be indicated with a blue line.

Figure 3.29 CTA

MAZATLAN CTA SECTOR 1

MAZATLAN CTA SECTOR 2

When FIRs (including FIRS coincident with CTAs) adjoin one another, show alternating tick marks on both sides of the common delimiting line.

Figure 3.30 Adjoining FIRs

WINNIPEG FIR CZWG

EDMONTON FIR CZEG

Figure 3.31 Adjoining FIR and CTA/FIR Boundaries

WINNIPEG FIR CZWG

NEW YORK OCEANIC CTA/FIR KZNY

References:

Appendix 7 - Aeronautical Information - Airspace Information

3.9.4.7 Air Defense Identification Zones (ADIZ, CADIZ, etc.)

ADIZs shall be shown as illustrated in **Appendix 7**. The continuous line indicates the limits of the area with the dots within the area.

When an international boundary, projection line, or other linear feature coincides with the limits of the ADIZ, the linear feature symbol shall suffice for the delimiting line of the ADIZ.

When a FIR boundary coincides with the limits of the ADIZ, the ADIZ symbol, without the line, shall be positioned adjacent to and in conjunction with the FIR symbol.

ADIZs and defense areas shall be identified adjacent to and parallel to the symbol, within the respective areas.

ADIZs shall be identified at sufficient intervals to facilitate identification by users.

Defense areas shall be identified by name only outside the ADIZ boundary symbol.

References:

Appendix 7 - Aeronautical Information - Airspace Information

3.9.4.8 Airways and Airway Data (Class E)

References:

Appendix 7 - Aeronautical Information - Airspace Information

3.9.4.8.1 Class E Airways

All Class E airways shall be shown by an airway center strip as illustrated in **Appendix 7**. The term airways in these specifications applies to this center strip. VOR airways, both direct and alternate, are shown in blue; LF/MF airways (colored airways) are shown in magenta.

VOR airways shall normally be shown to the outside edge of the compass rose but may be extended within, e.g., when two NAVAIDS are very close and the airway between them could not otherwise be shown.

3.9.4.8.2 Airway Data

Position airway data (identification and radial values) on the airway centerline; however, data may be displaced to avoid overprinting.

3.9.4.8.2.1 Victor Airways (VOR Airways)

VOR airway identifiers shall be a “V” and a number, in blue. When two or more VOR airways are designated over the same airspace, all identifiers shall be shown on one line in numerical order, eliminating repetition of the “V”, e.g. “V10-132-280”. When space is limited, the identifiers may be stacked.

Radial values for VOR airways shall be shown on the outbound radial from the NAVAID, positioned on the airway centerline, normally immediately outside the compass rose.

3.9.4.8.2.2 Colored Airways

Colored airway identifiers shall be an identifying color letter (i.e., G, green; A, amber; R, red; or B, blue) and number, in magenta. When two or more colored airways are designated over the same airspace, all identifiers shall be shown on one line with the primary airway identifier (G, A, R, or B) first. When space is limited, the identifiers may be stacked.

3.9.4.8.2.3 Intersections

Intersections used as reference points shall be indicated by two or more short intersecting lines, with arrowheads pointing toward the NAVAIDs forming the intersection, and identified by name. Only intersections that are used to define the airway's legal description shall be charted. VOR and LF/MF intersections with the same name shall be identified only once, with preference given to the VOR name. Intersections on airways in extremely congested areas may be omitted.

Additional intersections shall be charted when specifically requested by appropriate authority.

3.9.4.8.2.4 Airway Total Mileage

The "total mileage" between NAVAIDs on direct Victor and Colored airways, both controlled and uncontrolled, shall be shown as illustrated in **Appendix 7**.

3.9.4.8.2.5 Area Navigation (RNAV) "T" and "TK" Routes

All RNAV routes identified by the FAA shall be shown, symbolized by a blue airway center strip as illustrated in **Appendix 7**. Joint LF/MF/RNAV routes shall retain the magenta LF/MF linework depiction with addition of the RNAV route designator in blue, adjacent to the LF/MF route designator.

Waypoints used to define the legal description of the RNAV route shall be shown in blue using a four-pointed star icon as illustrated in **Appendix 7**. The assigned 5 letter waypoint name shall be charted adjacent to the waypoint icon in blue type, all capitals.

Additional waypoints shall be charted when specifically requested by appropriate authority.

RNAV routes shall be identified by a "T" or "TK" (helicopter only) prefix, followed by a three number route identifier, i.e., T201, TK313. Joint Victor/RNAV routes shall be identified adjacent to the Victor route identification as illustrated in **Appendix 7**.

3.9.4.9 Miscellaneous Air Routes

Other routes such as Air Traffic Service (ATS), Oceanic, Bahama and Atlantic Routes shall be shown in areas identified by FAA as illustrated in **Appendix 7**. LF/MF routes shall be depicted within .250" of the NAVAID. VOR routes shall normally be shown to the outside edge of the compass rose but may be extended within where necessary. These routes shall be supplemented with the appropriate route identifications. VOR routes shall be identified with the outbound bearing from the NAVAID. The bearing shall normally be positioned immediately outside and adjoining the compass rose.

Waypoints used to define a Miscellaneous Air Route shall be shown in blue using a four pointed star icon as illustrated in **Appendix 7**. The assigned 5 letter waypoint name shall be charted adjacent to the waypoint icon in blue type, all capitals.

References:

Appendix 7 - Aeronautical Information - Airspace Information

3.9.4.9.1 Oceanic and ATS Routes

Oceanic and ATS routes shall be identified by the appropriate designator, e.g., A 301

3.9.4.9.2 Bahama Routes

Bahama Routes shall be shown with the prefix "BR" preceding the route number, e.g., BR 63V

3.9.4.9.3 Atlantic Routes

Atlantic Routes shall be shown with the prefix "AR" preceding the route number, e.g., AR 5

3.9.4.9.4 LF/MF Route and VOR Route Portrayal

LF/MF routes shall be portrayed and identified in magenta. VOR routes shall be portrayed and identified in blue.

3.9.4.9.5 Class G Routes

Class G routes shall be illustrated as shown below and in **Appendix 7**:

Figure 3.32 Class G Routes

Class G Route

3.9.4.10 (TAC) Arrival and Departure Routes

IFR arrival/departure routes outside the limits of Class B airspace, requested by the FAA, shall be depicted in blue.

References:

Appendix 7 - Aeronautical Information - Airspace Information

3.9.4.10.1 Arrival Routes

Arrival routes shall be shown with arrowheads in the direction of flight with aircraft silhouettes positioned every one to three inches. Altitudes shall be shown in descending order.

3.9.4.10.2 Departure Routes

Departure routes shall be shown with arrowheads in the direction of flight. Altitudes shall be shown in ascending order.

3.9.4.10.3 Arrival/Departure Routes

Arrival/Departure routes shall be shown with arrowheads in both directions of flight. Altitudes associated with arrival routes shall be shown in descending order. Altitudes associated with departure routes shall be shown in ascending order. Identification type shall be shown to differentiate the associated altitude for the arrival and departure routes.

3.9.4.10.4 Altitude Values

Altitudes shown with routes climbing through the Class B airspace ceiling shall be the Class B ceiling, e.g., ABOVE 10 000 , where 10,000 is the Class B ceiling.

3.9.4.11 Special Use Airspace (SUA)

SUAs (e.g., prohibited, restricted, danger, alert, military operations, warning areas, and flight restricted zones) shall be shown in their entirety even when areas overlap or are designated within other areas (except as noted below). SUA with floors of 18,000 feet MSL or above shall not be shown (except on the Hawaiian Islands Sectional Chart, which has no upper limit). Military Operations Areas (MOAs) and Alert Areas shall be shown in magenta.

SUAs shall be portrayed as illustrated in **Appendix 7**. Should an area be too small to portray the specified band, the band may be proportionately reduced in size.

SUAs shall be identified by the designated letter and number, e.g., R-6401, positioned either inside or immediately outside and adjacent to the area. The type of area shall also be spelled out, e.g., RESTRICTED, when space permits. MOAs shall be identified by name. Alert areas shall also indicate the type of activity conducted.

When SUA areas are not shown due to congestion, a note shall indicate which SUA is not shown. Exclusion areas within the SUA limits shall be depicted with a line. When exclusions cannot be adequately portrayed, they shall be incorporated into the SUA tabulations. Do not depict Class airspace exclusions common to all Alert Areas and described in the Legend and SUA Tabulated data table.

References:

Appendix 7 - Aeronautical Information - Airspace Information

3.9.4.12 Military Training Routes (MTR)

References:

Appendix 7 - Aeronautical Information - Airspace Information

3.9.4.12.1 General

All IFR (IR) and VFR (VR) MTRs (not including alternate entry and exit tracks) shall be shown by a .030" continuous line, screened 25%/15°/120L, in black.

3.9.4.12.2 MTR Route Designators

MTRs shall be identified by route designators, e.g., IR 123, VR 321, or VR 1123 in solid black on the unbroken route centerline, placed along the route to effect continuity.

- Do not repeat the IR or VR when several routes have the same centerline, e.g., VR269 - 692 - 926 .
- Routes numbered 001 to 099 shall be shown as IR1 or VR99, eliminating the zero digit/s.
- Direction of flight shall be indicated by small arrowheads adjacent to the designators.

3.9.4.12.3 MTR Note - Conterminous U.S. (Excluding Hawaiian Islands Sectional)

Place the following note in the margin area of sectional aeronautical charts and VFR terminal area charts:

Figure 3.33 MTR Note - Conterminous U.S. (Excluding Hawaiian Islands Sectional)

MILITARY TRAINING ROUTES (MTRs)

All IR and VR MTRs are shown, and may extend from the surface upwards. Only the route centerline, direction of flight along the route, and the route designator are depicted - route widths and altitudes are not shown.

DoD users refer to Area Planning AP/1B Military Training Routes North and South America for current routes.

3.9.4.12.4 MTR Note - Hawaiian Islands Sectional

Place the following note in the margin area of the Sectional Aeronautical Chart:

Figure 3.34 MTR Note - Hawaiian Islands Sectional

MILITARY TRAINING ROUTES (MTRs)

All IR and VR MTRs are shown, and may extend from the surface upwards. Only the route centerline, direction of flight along the route, and the route designator are depicted - route widths and altitudes are not shown.

DoD users refer to Area Planning AP/1B Military Training Routes North and South America or AP/3 Pacific-Australasia-Antarctica for current routes.

3.9.4.13 Special Military Activity Routes (SMARs)

SMARs required by the FAA shall be shown as in **Appendix 7**. Route widths and segments shall be shown, as well as altitudes (floor and ceiling) of each segment. Where multiple routes exist, the lowest floor and highest ceiling shall be shown.

The symbol shall have the pattern lines in a NE to SW direction within a .015" delimiting line. Line pattern shall be a band .100" in width.

References:

Appendix 7 - Aeronautical Information - Airspace Information

3.9.4.13.1 Lateral Limits and Segments Lines

Lateral limits and segment lines shall be shown in black, screened 45%/biangle/200L. Segment lines shall be .030" lineweight.

- When the limits are the same on either side of the centerline, the limit lines shall join at the bisector line.
- When the limits are not the same on either side of the centerline, extend the wider portion of the route to meet the narrower portion on the inside angle (i.e., less than 180 degrees).
- When the limits are not the same on either side of the centerline, extend the narrower portion to meet the wider portion on the outside angle (i.e., greater than 180 degrees).

3.9.4.13.2 Segment MSL Ceiling and Floor Altitudes

Segment MSL ceiling and floor altitudes shall be shown, eliminating the last two digits.

Figure 3.35 Segment MSL Ceiling and Floor Altitudes

$\frac{40}{05}$ AGL

Values shall be positioned within each segment at appropriate intervals. Use leader lines if the altitude value must, because of limited space, be placed outside its sector.

Altitude changes at turning points shall be shown by a line bisecting the turning point angle.

3.9.4.13.3 MTRs within SMARs

MTRs within SMARs shall be shown as otherwise specified.

3.9.4.13.4 SMAR Notes

Notes within .015" lineweight boxes showing facilities and frequencies to contact shall be within or adjacent to the SMAR.

Figure 3.36 SMAR Note

SPECIAL MILITARY ACTIVITY
CONTACT MOBILE RADIO
ON 123.6
FOR ACTIVITY STATUS

Additionally, the following note shall be placed in the margin of each affected chart:

Figure 3.37 SMAR Margin Note

SPECIAL MILITARY ACTIVITY

The chart identifies IFR Military Training Routes and Military Operations Area within which the Department of Defense conducts periodic operations involving Unmanned Aircraft Systems. These aircraft may be accompanied by military or other aircraft which provide the pilots of the Unmanned Aircraft Systems visual observation information about other aircraft operations near them. Status of these routes and areas may be obtained by contacting the FAA/DoD facility on designated frequencies along the routes and as depicted on this chart. The lateral limits of these specified routes are shown by the Special Use Airspace symbol. Altitudes for these route segments are also shown.

3.9.4.13.5 SMARs Within SUA

SMARs within SUA shall not be shown.

3.9.4.14 Special Air Traffic Rules/Airport Traffic Patterns (FAR Part 93) and Fixed Wing Special VFR Operations Prohibited (FAR Part 91)

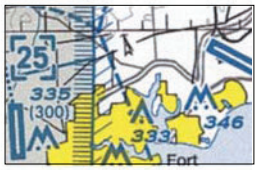
3.9.4.14.1 FAR Part 93 Airports and Areas

Airports with a special air traffic rule designated in FAR Part 93 shall be indicated by placing a box around the airport name if applicable.

Special traffic pattern areas designated in FAR Part 93 shall be shown by the line pattern illustrated in **Appendix 7**, positioned in a 45 degree angle. Hypsometric tint shall be masked within the area.

The line pattern shall normally be .100" wide, but it may be proportionately reduced if the area is too small for the specified band.

Figure 3.38 FAR Part 93 Airports and Areas



An appropriate boxed note shall be shown adjacent to the area when requested by appropriate authority. Hypsometric and hydrographic tints within the boxed note shall be masked when requested by appropriate authority.

3.9.4.14.2 FAR Part 91 No SVFR Airports

Airports where fixed wing special visual flight rules operations are prohibited (FAR Part 91) shall show the notation “NO SVFR” immediately above the airport name.

3.9.4.15 Space Operations Areas (FAR 91.143)

Boundaries of space operations areas shall be shown with a continuous blue line. The outlined area shall contain a blue screen. Show the following note in the area:

Figure 3.39 Space Operations Areas Note (FAR 91.143)

DARKER TINT IS
FAR 91.143 AREA

Type shall be 6 to 11 point, dependent upon space limitations.

When space operations areas are depicted on an inset, a note on the main chart body should direct users to the inset.

Figure 3.40 Space Operations Area ‘See Inset’ Note

See (NAME) Inset
for FAR 91.143 Space Operations

3.9.4.16 Mode C Airspace

When the lateral limits of Mode C required airspace are not otherwise shown by Class C airspace symbol, the Mode C limits shall be shown by a magenta line and shall be labeled “MODE C”. Mode C symbols shall stop at the U.S. International Boundary.

In Canada, altitude requirements associated with Mode C shall be shown along the inner edge of the airspace limit, i.e. 6500.

References:

Appendix 7 - Aeronautical Information - Airspace Information

3.9.4.17 Special Activity Areas

References:

Appendix 7 - Aeronautical Information - Airspace Information

3.9.4.17.1 Parachute Jumping Areas

When specified by the FAA, parachute jumping areas shall be shown as illustrated in **Appendix 7**. When available, the ATC frequency for coordination of parachute operations shall be shown together with the parachute jumping area symbol.

3.9.4.17.2 Glider Operations Areas

When specified by the FAA, glider operations areas shall be shown as illustrated in **Appendix 7**.

3.9.4.17.3 Hang Gliding Activity Areas

When specified by the FAA, hang gliding activity areas shall be shown as illustrated in **Appendix 7**. Hang gliding activity shall include paragliding activity.

3.9.4.17.4 Ultralight Activity Areas

When specified by the FAA, ultralight activity areas not associated with airports shall be shown as illustrated in **Appendix 7**.

3.9.4.17.5 Unmanned Aircraft Activity Areas

When specified by the FAA, Unmanned Aircraft activity areas shall be shown as illustrated in **Appendix 7**.

3.9.4.17.6 Aerobatic Practice Areas

When specified by the FAA, Aerobatic Practice areas shall be shown as illustrated in **Appendix 7** - Aeronautical Information - Airspace Information.

3.9.4.17.7 Space Launch Activity Areas

When specified by the FAA, Space Launch activity areas shall be shown as illustrated in **Appendix 7**.

3.9.4.18 Special Conservation Areas

Special conservation areas such as National Parks, Wildlife Refuges, Primitive and Wilderness areas (also Alaskan State Refuges, Critical Habitat Areas and Sanctuaries), requested by appropriate Federal authority, shall be shown by the symbol illustrated in **Appendix 7** and identified by name. The following note shall be shown in the margin of all relevant charts, excluding Alaskan charts:

Figure 3.41 Special Conservation Area Note

REGULATIONS REGARDING FLIGHTS OVER CHARTED NATIONAL PARK SERVICE AREAS,
U.S. FISH AND WILDLIFE SERVICE AREAS, BUREAU OF LAND MANAGEMENT AREAS AND U.S. FOREST SERVICE AREAS

The landing of aircraft is prohibited on lands or waters administered by the National Park Service, U.S. Fish and Wildlife Service, Bureau of Land Management or U.S. Forest Service (hereafter referred to as Agency/Agencies) without authorization from the respective agency. Exceptions include: 1) when forced to land due to an emergency beyond the control of the operator, 2) at officially designated landing sites, or 3) on approved official business of the Federal Government. All aircraft are requested to maintain a minimum altitude of 2,000 feet above the surface of the following: National Parks, Monuments, Seashores, Lakeshores, Recreation Areas, Scenic Riverways, Wildlife Refuges, Big Game Refuges, Game Ranges, Wildlife Ranges, Conservation Areas, Wild and Scenic Rivers, Wilderness Areas and Primitive Areas administered by the Agencies. FAA Advisory Circular (AC) 91-36, "Visual Flight Rules (VFR) Flight Near Noise-Sensitive Areas," defines the surface as: the highest terrain within 2,000 feet laterally of the route of flight, or the upper-most rim of a canyon or valley. Federal regulations also prohibit airdrops by parachute or other means of persons, cargo, or objects from aircraft on lands administered by the four agencies without authorization from the respective agency. Exceptions include: 1) emergencies involving the safety of human life, or 2) threat of serious property loss.

• • • • • • • • Boundary of Agency Areas

The Alaskan charts shall show a note that is chart specific as determined by the FAA Alaska Regional Office.

3.9.4.19 National Oceanic and Atmospheric Administration (NOAA) Regulated National Marine Sanctuary Designated Areas

NOAA Regulated National Marine Sanctuary Designated Areas shall be shown by the symbol illustrated in **Appendix 7**. Boxed notes shall be depicted as requested by appropriate authority. An explanatory example as illustrated in **Appendix 7** shall be depicted in the vicinity of the marine sanctuary.

The following example and text shall be shown in the margin of all relevant charts below the Special Conservation Area Note:

Figure 3.42 NOAA Regulated National Marine Sanctuary Designated Area Note

3.9.4.20 National Security Areas (NSA)

National Security Areas designated by the FAA shall be shown in magenta by a dashed line. Exclusions shall be shown with .030" continuous lines.

The following, or a similar note, shall appear within or adjacent to the area.

Figure 3.43 National Security Area Note

A National Security Area too small to be depicted with the conventional symbol will be depicted with screened magenta (45%/45°/200L) over the entire area. A solid line leader shall be added extending from the boxed note to the area.

3.9.4.21 Special Flight Rules Areas (SFRA)

The limits of Special Flight Rules Areas shall be depicted as illustrated in **Appendix 7**. Appropriate operational notes may be shown.

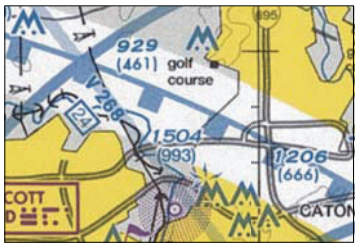
Because of the unique nature of these areas, data shown may include any information deemed important to flight safety.

3.9.4.22 National Security SFRA

National Security Special Flight Rules Areas (SFRA) shall be shown as illustrated in **Appendix 7**.

Shaded relief, hypsometric, hydrographic and city tints shall be masked .250" (TAC)/.150" (Sectional) either side of the centerline of the National Security SFRA boundary.

Figure 3.44 National Security Special Flight Rules Area (SFRA)



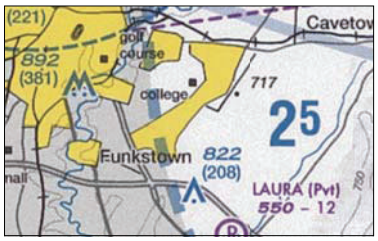
The name of the National Security SFRA shall be shown.

Boxed operational notes may be shown when requested by appropriate authority. Chart the boxed operational notes with shaded relief, hypsometric, hydrographic and city tints masked.

3.9.4.23 National Security Temporary Flight Restriction (TFR) Areas

National Security Temporary Flight Restriction (TFR) Areas shall be outlined as in **Appendix 7**. Within the charted area, mask the hypsometric tint.

Figure 3.45 National Security Temporary Flight Restriction (TFR) Areas



Appropriate boxed notes may be shown. Chart the boxed TFR notes with shaded relief, hypsometric, hydrographic and city tints masked. A TFR may have a leader line from the boxed note to the TFR area as necessary to call attention to it.

When a TFR is too small to adequately depict the TFR symbol, then all shaded relief, hypsometric, hydrographic and city tints shall masked, leaving the entire area void of color while retaining line features. If a TFR qualifies for complete shaded relief, hypsometric, hydrographic and city tint masking, a leader shall be used from the boxed note to the TFR area.

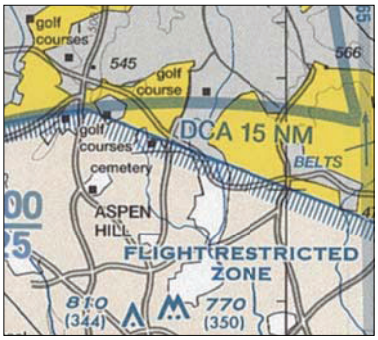
The cartographer shall be responsible for determining when a TFR shall qualify for shaded relief, hypsometric, hydrographic and city tint masking. Any TFR without symbology must have a leader from the boxed note to the TFR area.

If a Terminal Area Chart (TAC) has an associated Flyway Planning Chart, then TFR symbology must be used on the Flyway Planning Chart regardless of the size of the TFR.

3.9.4.24 National Security Flight Restricted Zones (FRZ)

National Security Flight Restricted Zones (FRZ) shall be shown using standard Special Use Airspace (SUA) symbology as illustrated in **Appendix 7**. Label FLIGHT RESTRICTED ZONE within the area. Within the FRZ, mask the hypsometric tint, and screen the city tint by 20%. Within the FRZ, depict Class B symbology screened 25%/45°/200L, and Class B floor and ceiling values screened 45%/45°/200L.

Figure 3.46 National Security Flight Restricted Zones (FRZ)

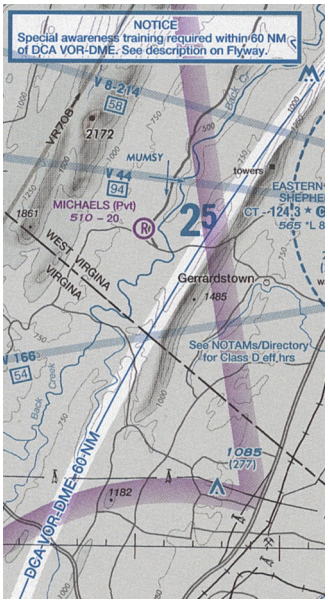


3.9.4.25 Special Awareness Training Area

Special Awareness Training Areas shall be shown as illustrated in **Appendix 7**. Shaded relief hypsometric, hydrographic and city tints shall be masked .150" (TAC)/.120" (Sectional) centered on the boundary.

Boxed operational notes shall be shown when requested by appropriate authority. Chart the notes with the shaded relief, hypsometric, hydrographic and city tints masked.

Figure 3.47 Special Awareness Training Area

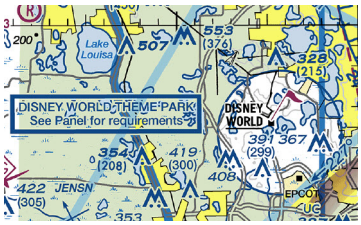


3.9.4.26 Special Security Notice Permanent Continuous Flight Restriction Areas

Special Security Notice Permanent Continuous Flight Restriction Areas shall be outlined as illustrated in **Appendix 7**. Within the charted area, mask the hypsometric tint, and screen the city tint by 20%.

Boxed notes shall be shown when requested by appropriate authority.

Figure 3.48 Special Security Notice Permanent Continuous Flight Restriction Area



3.9.4.27 Sporting Event Temporary Flight Restriction Sites

Sporting Event Temporary Flight Restriction Sites shall be shown as illustrated in **Appendix 7**.

3.9.4.28 National Defense Airspace Temporary Flight Restriction (TFR) Areas

National Defense Airspace Temporary Flight Restriction (TFR) Areas will be outlined as in **Appendix 7**.

Figure 3.49 National Defense Airspace Temporary Flight Restriction (TFR) Areas

Appropriate boxed notes will be shown. A TFR may have a leader line from the boxed note to the TFR area as necessary to call attention to it.

Figure 3.50 National Defense Airspace Temporary Flight Restriction (TFR) Areas Boxed Note

3.9.4.29 High-Energy Radiation Areas/Permanent Laser Light Activity Areas

Areas of high energy radiation/permanent laser light activity designated by the FAA shall be shown by the symbol illustrated in **Appendix 7**.

Notes shall identify the area and provide the affected altitudes and/or other pertinent information.

Permanent laser light activity locations, as designated by the FAA, shall be identified with a note, as provided by the appropriate authority, positioned as close to the location as possible.

3.9.4.30 Terminal Radar Service Area (TRSA)

Terminal Radar Service Areas shall be shown and plotted in their entirety, symbolized by outlines of the areas and internal sectors illustrated in **Appendix 7**.

Lines shall be centered on the boundary and sector lines.

3.9.4.30.1 Ceiling and Floor Sector Altitudes

Ceiling and floor sector altitudes above mean sea level (MSL) shall be shown in solid black.

Show ceiling values above floor values separated by horizontal lines. Eliminate the last two digits and show surface as SFC, e.g.,

Figure 3.51 TRSA Ceiling Values

70
SFC

Position altitude values within each sector at appropriate intervals. Use leader lines if the altitude value must, because of limited space, be placed outside its sector.

3.9.4.30.2 TRSA Name

The TRSA name shall be shown in solid black at or near the north position, outside the boundary, e.g.,

Figure 3.52 TRSA Name

PALM SPRINGS TRSA

3.9.4.30.3 TRSA Advisory Note

A note advising where to obtain information, e.g., SEE TWR FREQ TAB shall be shown adjacent to the TRSA.

3.9.5 Areas on Sectional Charts for Which There are Terminal Area Charts Published

These areas shall be defined by an outline that will mask the shaded relief, hypsometric, hydrographic and city tints. The type “TAC” shall be placed within the outline.

These areas shall be identified by a note with terminal area name centrally positioned on and breaking the top line of the box.

References:

Appendix 8 - Aeronautical Information - Chart Limits

3.9.6 Areas on Sectional Charts for Which There are Insets

These areas shall be defined by an outline that will mask the shaded relief, hypsometric, hydrographic and city tints. The type "INSET" shall be placed within the outline.

These areas shall be identified by a note with the inset name centrally positioned on and breaking the top line of the box.

References:

Appendix 8 - Aeronautical Information - Chart Limits

3.9.7 Areas on Sectional and Terminal Area Chart for Which There are Special Charts Published

These areas shall be defined by an outline that will mask the shaded relief, hypsometric, hydrographic and city tints. The special chart name text shall be placed within the outline, e.g., GRAND CANYON CHART.

These areas shall be identified by a boxed note with the special chart name centrally positioned on and breaking the top line of the box.

References:

Appendix 8 - Aeronautical Information - Chart Limits

3.9.8 Navigational and Procedural Information

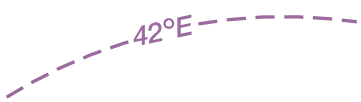
References:

Appendix 9 - Aeronautical Information - Navigational & Procedural Information

3.9.8.1 Lines of Equal Magnetic Variation (Isogonic Lines)

Isogonic lines shall be shown extending through the charted area at intervals of no less than 30' and symbolized as illustrated below by a generalized smooth curve, in magenta:

Figure 3.53 Lines of Equal Magnetic Variation (Isogonic Lines)



(TAC) Isogonic lines shall be shown at intervals of not less than 15'.

When the total isogonic difference on the chart is large, the isogonic interval between the lines should be increased proportionately. Line spacing closer than approximately five inches should be avoided. A minimum of two (2) isogonic lines shall be shown on each chart except when the value of the magnetic variation is the same over all areas of the chart. In this case, the isogonic lines shall be omitted and the variation value shown by a note. Intervals on adjoining charts shall be consistent except that intermediate lines may be used to portray unusual patterns.

The value of each isogonic line, e.g., *42°E* shall be shown centered on and near the ends of each line, with at least one dash between the margin and the value. The value shall read with the line and shall normally appear at least once in each fold of the chart.

Isogonic data shall be based on the five (5) year epoch.

References:

Appendix 9 - Aeronautical Information - Navigational & Procedural Information

3.9.8.2 Aeronautical Lights

Rotating beacons, on or adjacent to a public, joint-use or military-use airport, operating continuously throughout the hours of darkness and other navigation lights when specifically requested by appropriate authority, shall be depicted as indicated in **Appendix 9**. When located at an airport, the symbol shall normally be shown in a break in the top of the airport symbol. The light symbol shall be portrayed in its true location (within scale limitations) at airports with hard surface runways depicted with a non-circular pattern. When the location of the light is not known, it shall be positioned by convention on the north limit.

References:

Appendix 9 - Aeronautical Information - Navigational & Procedural Information

3.9.8.3 Marine Navigational Lights

A selection of marine navigation lights may be shown subject to the following criteria:

- Only lights operating year round and maintained by the United States Coast Guard, or appropriate authority in foreign waters, shall be shown.
- Range of lights, including any sectors, must be 10 NM or more.
- Lights must be omnidirectional, i.e., range lights, directional lights, or lights obscured in any sector shall not be shown.
- Sources for marine lights are the National Geospatial-Intelligence Agency Notice to Mariners, the Coast Guard Light List, and appropriate foreign publications.

References:

Appendix 9 - Aeronautical Information - Navigational & Procedural Information

3.9.8.4 VFR Checkpoints

Visual checkpoints in terminal areas designated and commonly used by controllers in the conduct of VFR flight, as provided by the FAA, shall be shown by the magenta flag symbol illustrated in **Appendix 9**. Normally, visual checkpoints associated with Class B airspace shall only be shown on Terminal Area Charts.

The flag symbol shall be associated with the feature.

The name used by the FAA shall be underlined and depicted in the same color as the feature.

References:

Appendix 9 - Aeronautical Information - Navigational & Procedural Information

3.9.8.5 VFR Waypoints

VFR waypoints, when specified by the FAA, shall be shown as illustrated in **Appendix 9**. VFR-waypoint names consist of five letters beginning with the letters "VP" in black type.

Stand-alone VFR waypoints shall be depicted using the standard four-pointed waypoint star symbol. The VFR waypoint name shall be placed adjacent to the symbol.

VFR waypoints collocated with VFR checkpoints shall not be depicted with the four-pointed waypoint star symbol. The associated VFR checkpoint flag shall be used. The VFR waypoint name shall be shown in parenthesis below the VFR checkpoint name.

References:

Appendix 9 - Aeronautical Information - Navigational & Procedural Information

3.9.8.6 Obstructions

References:

Appendix 9 - Aeronautical Information - Navigational & Procedural Information

3.9.8.6.1 Cultural Features Extending More than 200 Feet Above the Surrounding Terrain

Cultural features extending more than 200 feet above the surrounding terrain (300 feet or more above the surrounding terrain in built-up areas – yellow tint) are "vertical obstructions".

Obstruction symbols shall normally be shown for obstructions such as TV or radio towers more than 200 feet above the terrain (300 feet or more in built-up areas - yellow tint). A group obstruction symbol shall be shown when two or more obstructions are in close proximity. The highest MSL value shall be shown. The highest AGL value shall be shown only if it corresponds to the highest MSL value. Minor obstructions which are not in critical locations may be omitted in congested areas.

Examples of features over 200 feet AGL (300 feet or more in built-up areas - yellow tint) considered hazardous to low level flight are tanks, factories, lookout towers, and smokestacks.

Horizontal cultural features (e.g., T-lines, pipelines, and aerial cables) shall be charted as described in Section **3.6.6**.

3.9.8.6.2 Vertical Obstructions Which Have Outstanding Visual Significance

Vertical obstructions which have outstanding visual significance as checkpoints may be represented with pictorial symbols. The symbols are shown in black with the required elevation data in aeronautical blue.

3.9.8.6.3 Vertical Obstructions Not Having Sufficient Visual Significance

Vertical obstructions not having sufficient visual significance to meet the requirements for pictorialization shall be represented with the inverted "V" symbol. The obstruction may be labeled, e.g., "stack", "tank", etc.(do not label towers).

3.9.8.6.4 Height of the Structure Above Ground Level

The height of the structure above ground level, as well as the elevation of the top of the obstruction above mean sea level, shall be shown when known or when it can be reliably estimated. Elevation values shall be positioned alongside the obstruction symbol, to the right of the symbol when possible. The height above ground shall be shown in parenthesis below the elevation of the top of the obstruction above mean sea level. Deviations from this positioning are permissible when necessary to avoid registration problems or undue congestion. In congested areas where confusion could result from the interpretation of multiple obstruction values, the above ground level (AGL) value may be omitted.

3.9.8.6.5 Obstruction Portrayal

Obstructions shall be portrayed to the maximum extent possible, compatible with the scale of the chart. However, portrayal of all obstructions within the immediate vicinity of city complexes shall, in many instances, severely impair chart readability. Use the following general rules to control the selection and density of obstruction information in or near populated places:

- Only the highest obstructions in each of the four quadrants shall be selected for portrayal.

- In built-up areas (yellow tint), only obstructions extending 300 feet or more above terrain shall be shown.

- The elevation of the top of the obstruction above mean sea level shall always be shown when it is known or when it can be reliably estimated for:

  1. The most critical obstructions in each of the four quadrants.
  2. All other obstructions that can accommodate the type without creating undue congestion.

3.9.8.6.6 Obstruction Symbology

Obstructions shall be shown with a pictorial symbol or the inverted “V” symbols.

- Obstructions up to 999 feet AGL shall be shown by the conventional inverted “V” symbol illustrated in **Appendix 9**.

- Obstructions 1000 feet AGL and higher shall be shown by the elongated inverted “V” symbol illustrated in **Appendix 9**.

3.9.8.6.7 Pictorial Symbols for Vertical Obstructions of Outstanding Visual Significance

Pictorial symbols for vertical obstructions of outstanding visual significance shall be shown in black with the elevation data in blue.

3.9.8.6.8 Use of Conventional Obstruction Symbol

The conventional and elongated inverted “V” obstruction symbols, including the elevation data, shall be shown in blue.

3.9.8.6.9 Obstructions Under Construction

Obstructions under construction shall be indicated by the letters "UC" positioned immediately adjacent to the symbol. If available, the eventual height (AGL) of the obstruction shall be shown, in parentheses; e.g. (757) UC. The letters "UC" may also be used to indicate obstructions reported with unverified position and elevation.

3.9.8.6.10 Obstructions with High Intensity Obstruction Lights

Obstructions with high intensity obstruction lights (i.e., strobes) shall be shown by the obstruction symbol with the lightning bolt staffs attached, as illustrated in **Appendix 9**.

3.9.8.6.11 Wind Turbines

Individual wind turbines shall be indicated by the wind turbine symbol, accompanied by the required elevation data, as illustrated in **Appendix 9**.

3.9.8.6.11.1 Two or More Wind Turbines

Two or more wind turbines in close proximity shall be indicated by the group wind turbine symbol, accompanied by the required elevation data, as illustrated in **Appendix 9**.

3.9.8.6.11.2 Wind Turbines with High Intensity Lights

Wind turbines with high intensity lights (i.e. strobes) shall be indicated by the lighted wind turbine symbol, accompanied by the required elevation data, as illustrated in **Appendix 9**.

3.9.8.6.11.3 Concentrated Groups or "Farms" of Wind Turbines

Concentrated groups or "farms" of wind turbines shall be portrayed by one or more wind turbine symbols outlined by a dashed line representing the approximate parameters of the farm. A boxed elevation figure, representing the elevation of the highest wind turbine within the area, shall be placed within the dashed area or, if space is limited, just outside and if necessary, leadered to the area, as illustrated in **Appendix 9**.

3.9.8.7 Maximum Elevation Figures (MEF)

References:

Appendix 9 - Aeronautical Information - Navigational & Procedural Information

3.9.8.7.1 General

MEFs are required over all land masses (including areas of unreliable relief) and open water areas containing man-made obstructions (e.g., oil rigs).

The MEF represents the highest possible elevation of both terrain and vertical obstructions (towers, trees, etc.) in an area bounded by ticked lines of graticule. MEFs shall be shown by 1,000 foot digits and smaller 100 foot digits. The last two digits of the number are not shown. MEFs shall be shown centered in the area bounded by ticked lines of graticule, as illustrated in **Appendix 9**.

In areas of unreliable relief, or over water where no known obstructions exceed 200 feet, a note spaced across the area is used (instead of individual MEFs in each quadrangle), e.g.,

Figure 3.54 MEF Note - Unreliable Relief

MAXIMUM ELEVATION FIGURES ARE
BELIEVED NOT TO EXCEED 7600 FEET.

The note shall be positioned in such a manner as to imply a general condition.

More than one note may be necessary where terrain characteristics vary considerably.

If it is obvious that an area of reliable relief in the quadrangle represents the highest elevation, that value shall be applied. For example: the quadrangle containing Mt. Everest also contains an area of unreliable relief. Since the summit of Mt. Everest is obviously the highest point in the quadrangle, the MEF shown would not be affected by the unreliable relief area.

3.9.8.7.2 Calculating MEFs

When calculating MEFs, increase them only to the point that it is assured that they represent the minimum clearance altitude based on the source material. Use the following procedure to calculate MEFs:

3.9.8.7.2.1 Man-Made Obstruction Greater Than 200'

When a man-made obstruction is more than 200 feet above the highest terrain within the area bounded by ticked lines of graticule:

1. Determine the elevation of the top of the obstruction (above mean sea level).
2. Add the possible vertical error of the source material to the above figure (100 feet or ½ the contour interval when interval on source exceeds 200 feet).
3. Round the resultant figure up to the next higher hundred foot level and this final figure is the MEF.

Example: Elevation of obstruction top (MSL) is 2424'	
Possible vertical error	+ 100'
	= 2524'
Round to the next higher 100 foot level	= 2600'
Maximum Elevation Figure (MEF)	26

3.9.8.7.2.2 Natural Terrain Feature

When a natural terrain feature (spot elevation, manufactured elevation, or contour) or a natural vertical obstruction (trees) is the controlling figure within the area bounded by ticked lines of graticule:

1. Determine the elevation of the feature.

2. Add the possible vertical error of the source material to the above figure (100 feet or ½ the contour interval when interval on source exceeds 200 feet).

3. Add 200 feet to allow for natural or man-made obstructions which are not portrayed because they are below the minimum height at which the chart specification requires their portrayal by an obstruction symbol.

4. Round the resultant figure up to the next higher hundred foot level and this final figure is the MEF.

Example: Highest terrain elevation (MSL) is	2424'
Possible vertical error	+ 100'
Allowance for uncharted obstructions	+ 200'
	= 2724'
Round to the next higher 100 foot level	= 2800'
Maximum Elevation Figure (MEF)	2^{8}

3.9.8.7.2.3 MEF Depiction in Overlap Areas

Maximum elevation figures shall be shown in overlap areas. In those areas consisting of less than a full quadrangle, the MEF value shall be shown except where the area is too small to accommodate the MEF type. Quadrangles on overlapping and adjoining charts shall contain identical MEF values.

An explanatory boxed note shall be shown in the margin and shall read as follows:

Figure 3.55 MEF Note

ATTENTION

THIS CHART CONTAINS MAXIMUM ELEVATION FIGURES (MEF). The Maximum Elevation Figures shown in quadrangles bounded by ticked lines of latitude and longitude are represented in THOUSANDS and HUNDREDS of feet above mean sea level. The MEF is based on information available concerning the highest known feature in each quadrangle, including terrain and obstructions (trees, towers,antennas,etc.).

Example: 12,500 feet ..... 12^{5}