

## Chapter 8

# The National Airspace System

## Introduction

The National Airspace System (NAS) is the network of United States airspace: air navigation facilities, equipment, services, airports or landing areas, aeronautical charts, information/services, rules, regulations, procedures, technical information, manpower, and material. Included are system components shared jointly with the military. The system's present configuration is a reflection of the technological advances concerning the speed and altitude capability of jet aircraft, as well as the complexity of microchip and satellite-based navigation equipment. To conform to international aviation standards, the United States adopted the primary elements of the classification system developed by the International Civil Aviation Organization (ICAO).

This chapter is a general discussion of airspace classification; en route, terminal, and approach procedures; and operations within the NAS. Detailed information on the classification of airspace, operating procedures, and restrictions is found in the Aeronautical Information Manual (AIM).

Entry Requirements

Minimum Pilot  
QualificationsTwo-Way Radio  
Communications

Special VFR Allowed

VFR Visibility Minimum

VFR Minimum  
Distance from Clouds

VFR Aircraft Separation

Traffic Advisories

Airport Application

PINE BLUFF (T)  
116.0 PBF 80(Y) 72  
N36° 32' 41" W92° 28' 52"HARRISON  
112.5 HRO 72  
N36° 10'

000

P

V193

V4

## Airspace Classification

Airspace in the United States [Figure 8-1] is designated as follows:

1. Class A. Generally, airspace from 18,000 feet mean sea level (MSL) up to and including flight level (FL) 600, including the airspace overlying the waters within 12 nautical miles (NM) of the coast of the 48 contiguous states and Alaska. Unless otherwise authorized, all pilots must operate their aircraft under instrument flight rules (IFR).
2. Class B. Generally, airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports in terms of airport operations or passenger enplanements. The configuration of each Class B airspace area is individually tailored, consists of a surface area and two or more layers (some Class B airspace areas resemble upside-down wedding cakes), and is designed to contain all published instrument procedures once an aircraft enters the airspace. An air traffic control (ATC) clearance is required for all aircraft to operate in the area, and all aircraft that are so cleared receive separation services within the airspace.
3. Class C. Generally, airspace from the surface to 4,000 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower, are serviced by a radar approach control, and have a certain number of IFR operations or passenger enplanements. Although the configuration of each Class C area is individually tailored, the airspace usually consists of a surface area with a 5 NM radius, an outer circle with a 10 NM radius that extends from 1,200 feet to 4,000 feet above the airport elevation and an outer area. Each aircraft must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and thereafter maintain those communications while within the airspace.
4. Class D. Generally, that airspace from the surface to 2,500 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower. The configuration of each Class D airspace area is individually tailored and when instrument procedures are published, the airspace will normally be designed to contain the procedures. Arrival extensions for instrument approach procedures (IAPs) may be Class D or Class E airspace. Unless otherwise authorized, each aircraft must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and thereafter maintain those communications while in the airspace.
5. Class E. Generally, if the airspace is not Class A, B, C, or D, and is controlled airspace, then it is Class E airspace. Class E airspace extends upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace. When designated as a surface area, the airspace will be configured to contain all instrument procedures. Also in this class are federal airways, airspace beginning at either 700 or 1,200 feet above ground level (AGL) used to transition to and from the terminal or en route environment, and en route domestic and offshore airspace areas designated below 18,000 feet MSL. Unless designated at a lower altitude, Class E airspace begins at 14,500 MSL over the United States, including that airspace overlying the waters within 12 NM of the coast of the 48 contiguous states and Alaska, up to but not including 18,000 feet MSL, and the airspace above FL 600.
6. Class G. Airspace not designated as Class A, B, C, D, or E. Class G airspace is essentially uncontrolled by ATC except when associated with a temporary control tower.

## Special Use Airspace

Special use airspace is the designation for airspace in which certain activities must be confined, or where limitations may be imposed on aircraft operations that are not part of those activities. Certain special use airspace areas can create limitations on the mixed use of airspace. The special use airspace depicted on instrument charts includes the area name or number, effective altitude, time and weather conditions of operation, the controlling agency, and the chart panel location. On National Aeronautical Charting Group (NACG) en route charts, this information is available on one of the end panels.

Prohibited areas contain airspace of defined dimensions within which the flight of aircraft is prohibited. Such areas are established for security or other reasons associated with the national welfare. These areas are published in the Federal Register and are depicted on aeronautical charts. The area is charted as a "P" followed by a number (e.g., "P-123").

Restricted areas are areas where operations are hazardous to nonparticipating aircraft and contain airspace within which the flight of aircraft, while not wholly prohibited, is subject to restrictions. Activities within these areas must be confined because of their nature, or limitations may be imposed upon aircraft operations that are not a part of those activities, or both. Restricted areas denote the existence of unusual, often invisible, hazards to aircraft (e.g., artillery firing, aerial

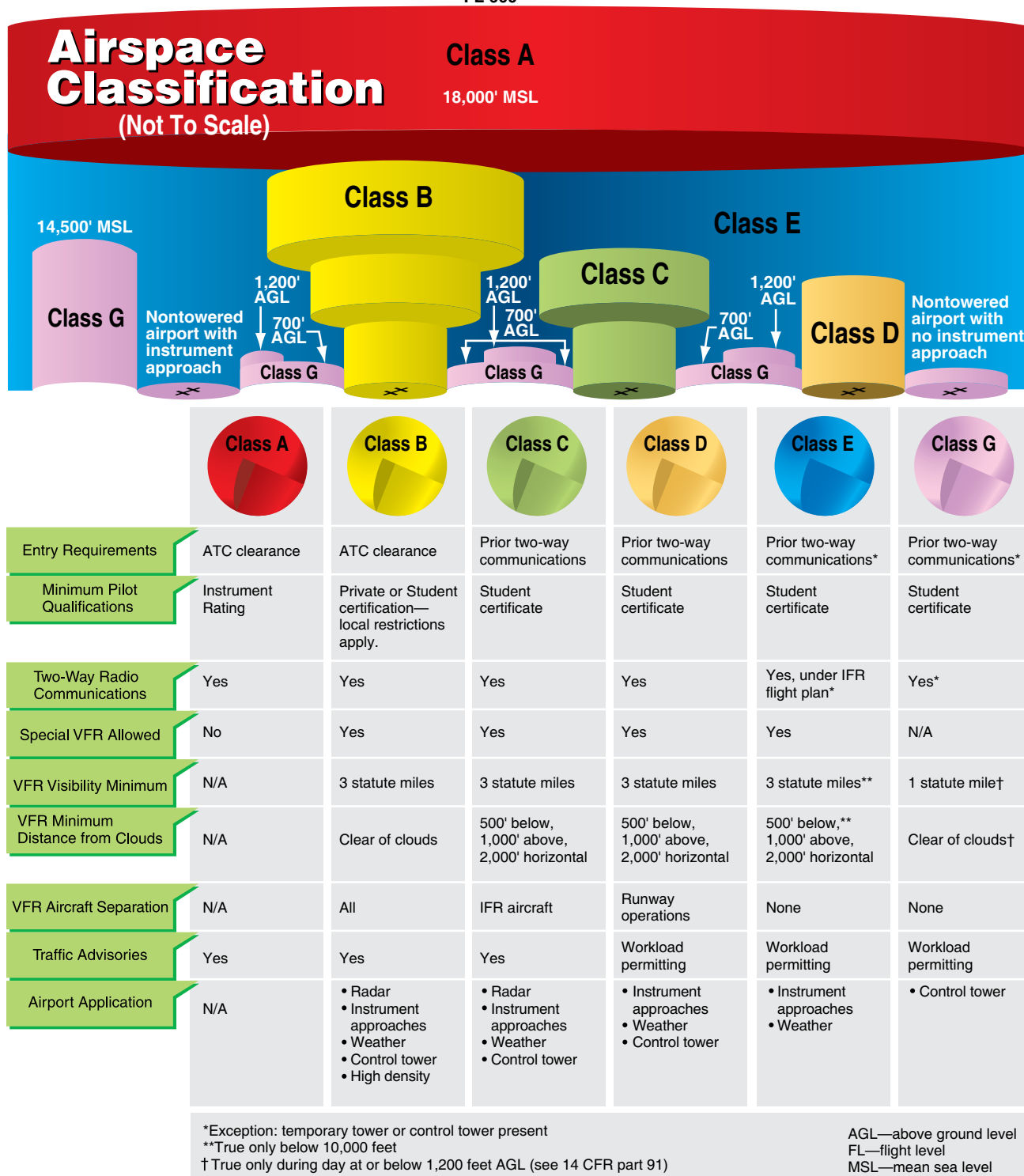


Figure 8-1. Airspace Classifications.



gunnery, or guided missiles). IFR flights may be authorized to transit the airspace and are routed accordingly. Penetration of restricted areas without authorization from the using or controlling agency may be extremely hazardous to the aircraft and its occupants. ATC facilities apply the following procedures when aircraft are operating on an IFR clearance (including those cleared by ATC to maintain visual flight rules (VFR)-On-Top) via a route that lies within joint-use restricted airspace:

1. If the restricted area is not active and has been released to the Federal Aviation Administration (FAA), the ATC facility will allow the aircraft to operate in the restricted airspace without issuing specific clearance for it to do so.
2. If the restricted area is active and has not been released to the FAA, the ATC facility will issue a clearance which will ensure the aircraft avoids the restricted airspace.

Restricted areas are charted with an “R” followed by a number (e.g., “R-5701”) and are depicted on the en route chart appropriate for use at the altitude or FL being flown.

Warning areas are similar in nature to restricted areas; however, the United States government does not have sole jurisdiction over the airspace. A warning area is airspace of defined dimensions, extending from 12 NM outward from the coast of the United States, containing activity that may be hazardous to nonparticipating aircraft. The purpose of such areas is to warn nonparticipating pilots of the potential danger. A warning area may be located over domestic or international waters or both. The airspace is designated with a “W” followed by a number (e.g., “W-123”).

Military operations areas (MOAs) consist of airspace with defined vertical and lateral limits established for the purpose of separating certain military training activities from IFR traffic. Whenever an MOA is being used, nonparticipating IFR traffic may be cleared through an MOA if IFR separation can be provided by ATC. Otherwise, ATC will reroute or restrict nonparticipating IFR traffic. MOAs are depicted on sectional, VFR terminal area, and en route low altitude charts and are not numbered (e.g., “Boardman MOA”).

Alert areas are depicted on aeronautical charts with an “A” followed by a number (e.g., “A-123”) to inform nonparticipating pilots of areas that may contain a high volume of pilot training or an unusual type of aerial activity. Pilots should exercise caution in alert areas. All activity within an alert area shall be conducted in accordance with regulations, without waiver, and pilots of participating aircraft, as well as pilots transiting the area, shall be equally responsible for collision avoidance.

Military Training Routes (MTRs) are routes used by military aircraft to maintain proficiency in tactical flying. These routes are usually established below 10,000 feet MSL for operations at speeds in excess of 250 knots. Some route segments may be defined at higher altitudes for purposes of route continuity. Routes are identified as IFR (IR), and VFR (VR), followed by a number. MTRs with no segment above 1,500 feet AGL are identified by four number characters (e.g., IR1206, VR1207, etc.). MTRs that include one or more segments above 1,500 feet AGL are identified by three number characters (e.g., IR206, VR207). IFR Low Altitude En Route Charts depict all IR routes and all VR routes that accommodate operations above 1,500 feet AGL. IR routes are conducted in accordance with IFR regardless of weather conditions.

Temporary flight restrictions (TFRs) are put into effect when traffic in the airspace would endanger or hamper air or ground activities in the designated area. For example, a forest fire, chemical accident, flood, or disaster-relief effort could warrant a TFR, which would be issued as a Notice to Airmen (NOTAM).

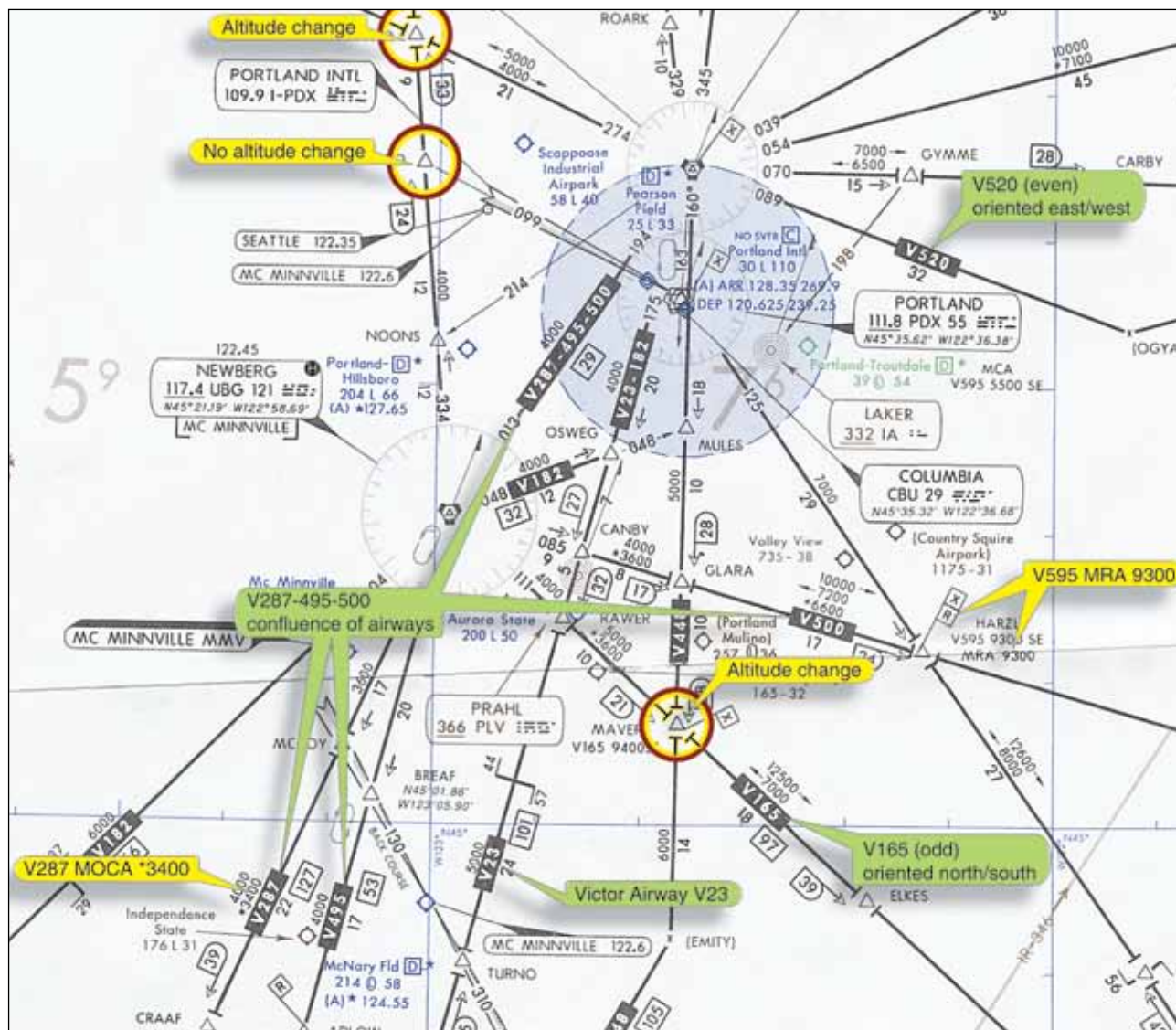
National Security Areas (NSAs) consist of airspace with defined vertical and lateral dimensions established at locations where there is a requirement for increased security and safety of ground facilities. Flight in NSAs may be temporarily prohibited by regulation under the provisions of Title 14 of the Code of Federal Regulations (14 CFR) part 99 and prohibitions will be disseminated via NOTAM.

### **Federal Airways**

The primary means for routing aircraft operating under IFR is the federal airways system.

Each federal airway is based on a centerline that extends from one NAVAID/waypoint/fix/intersection to another NAVAID/waypoint/fix/intersection specified for that airway. A federal airway includes the airspace within parallel boundary lines four NM to each side of the centerline. As in all instrument flight, courses are magnetic, and distances are in NM. The airspace of a federal airway has a floor of 1,200 feet AGL, unless otherwise specified. A federal airway does not include the airspace of a prohibited area.

Victor airways include the airspace extending from 1,200 feet AGL up to, but not including 18,000 feet MSL. The airways are designated on Sectional and IFR low altitude en route charts with the letter “V” followed by a number (e.g., “V23”). Typically, Victor airways are given odd numbers when oriented north/south and even numbers when oriented east/west. If more than one airway coincides on a route segment, the numbers are listed serially (e.g., “V287-495-500”). [Figure 8-2]



**Figure 8-2. Victor Airways and Charted IFR Altitudes.**

Jet routes exist only in Class A airspace, from 18,000 feet MSL to FL 450, and are depicted on high-altitude en route charts. The letter “J” precedes a number to label the airway (e.g., J12).

RNAV routes have been established in both the low-altitude and the high-altitude structures in recent years and are depicted on the en route low and high chart series. High altitude RNAV routes are identified with a “Q” prefix (except the Q-routes in the Gulf of Mexico) and low altitude RNAV routes are identified with a “T” prefix. RNAV routes and data are depicted in aeronautical blue.

In addition to the published routes, a random RNAV route may be flown under IFR if it is approved by ATC. Random RNAV routes are direct routes, based on area navigation capability, between waypoints defined in terms of latitude/longitude

coordinates, degree-distance fixes, or offsets from established routes/airways at a specified distance and direction.

Radar monitoring by ATC is required on all random RNAV routes. These routes can only be approved in a radar environment. Factors that will be considered by ATC in approving random RNAV routes include the capability to provide radar monitoring, and compatibility with traffic volume and flow. ATC will radar monitor each flight; however, navigation on the random RNAV route is the responsibility of the pilot.

## Other Routing

Preferred IFR routes have been established between major terminals to guide pilots in planning their routes of flight, minimizing route changes and aiding in the orderly management of air traffic on federal airways. Low and high

altitude preferred routes are listed in the Airport/Facility Directory (A/FD). To use a preferred route, reference the departure and arrival airports; if a routing exists for your flight, then airway instructions will be listed.

Tower En Route Control (TEC) is an ATC program that uses overlapping approach control radar services to provide IFR clearances. By using TEC, a pilot is routed by airport control towers. Some advantages include abbreviated filing procedures and reduced traffic separation requirements. TEC is dependent upon the ATC's workload, and the procedure varies among locales.

The latest version of Advisory Circular (AC) 90-91, North American Route Program (NRP), provides guidance to users of the NAS for participation in the NRP. All flights operating at or above FL 290 within the conterminous United States and Canada are eligible to participate in the NRP, the primary purpose of which is to allow operators to plan minimum time/cost routes that may be off the prescribed route structure. NRP aircraft are not subject to route-limiting restrictions (e.g., published preferred IFR routes) beyond a 200 NM radius of their point of departure or destination.

## IFR En Route Charts

The objective of IFR en route flight is to navigate within the lateral limits of a designated airway at an altitude consistent with the ATC clearance. Your ability to fly instruments safely and competently in the system is greatly enhanced by understanding the vast array of data available to the pilot on instrument charts. The NACG maintains and produces the charts for the United States government.


En route high-altitude charts provide aeronautical information for en route instrument navigation (IFR) at or above 18,000 feet MSL. Information includes the portrayal of Jet and RNAV routes, identification and frequencies of radio aids, selected airports, distances, time zones, special use airspace, and related information. Established Jet routes from 18,000 feet MSL to FL 450 use NAVAIDs not more than 260 NM apart. The charts are revised every 56 days.

To effectively depart from one airport and navigate en route under instrument conditions a pilot needs the appropriate IFR en route low-altitude chart(s). The IFR low altitude en route chart is the instrument equivalent of the Sectional chart. When folded, the cover of the NACG en route chart displays an index map of the United States showing the coverage areas. Cities near congested airspace are shown in black type and their associated area chart is listed in the box in the lower left-hand corner of the map coverage box. Also noted is an explanation of the off-route obstruction clearance altitude (OROCA). The effective date of the chart is printed on the

other side of the folded chart. Information concerning MTRs is also included on the chart cover. The en route charts are revised every 56 days.

When the NACG en route chart is unfolded, the legend is displayed and provides information concerning airports, NAVAIDs, communications, air traffic services, and airspace.

## Airport Information

Airport information is provided in the legend, and the symbols used for the airport name, elevation, and runway length are similar to the sectional chart presentation. Associated city names are shown for public airports only. FAA identifiers are shown for all airports. ICAO identifiers are also shown for airports outside of the contiguous United States. Instrument approaches can be found at airports with blue or green symbols, while the brown airport symbol denotes airports that do not have instrument approaches. Stars are used to indicate the part-time nature of tower operations, ATIS frequencies, part-time or on request lighting facilities, and part-time airspace classifications. A box after an airport name with a "C" or "D" inside indicates Class C and D airspace, respectively, per *Figure 8-3*. 

## Charted IFR Altitudes

The minimum en route altitude (MEA) ensures a navigation signal strong enough for adequate reception by the aircraft navigation (NAV) receiver and obstacle clearance along the airway. Communication is not necessarily guaranteed with MEA compliance. The obstacle clearance, within the limits of the airway, is typically 1,000 feet in non-mountainous areas and 2,000 feet in designated mountainous areas. MEAs can be authorized with breaks in the signal coverage; if this is the case, the NACG en route chart notes "MEA GAP" parallel to the affected airway. MEAs are usually bidirectional; however, they can be single-directional. Arrows are used to indicate the direction to which the MEA applies.

The minimum obstruction clearance altitude (MOCA), as the name suggests, provides the same obstruction clearance as an MEA; however, the NAV signal reception is ensured only within 22 NM of the closest NAVAID defining the route. The MOCA is listed below the MEA and indicated on NACG charts by a leading asterisk (e.g., "\*\*3400"—see *Figure 8-2*, V287 at bottom left).

The minimum reception altitude (MRA) identifies the lowest altitude at which an intersection can be determined from an off-course NAVAID. If the reception is line-of-sight based, signal coverage will only extend to the MRA or above. However, if the aircraft is equipped with distance measuring equipment (DME) and the chart indicates the intersection can

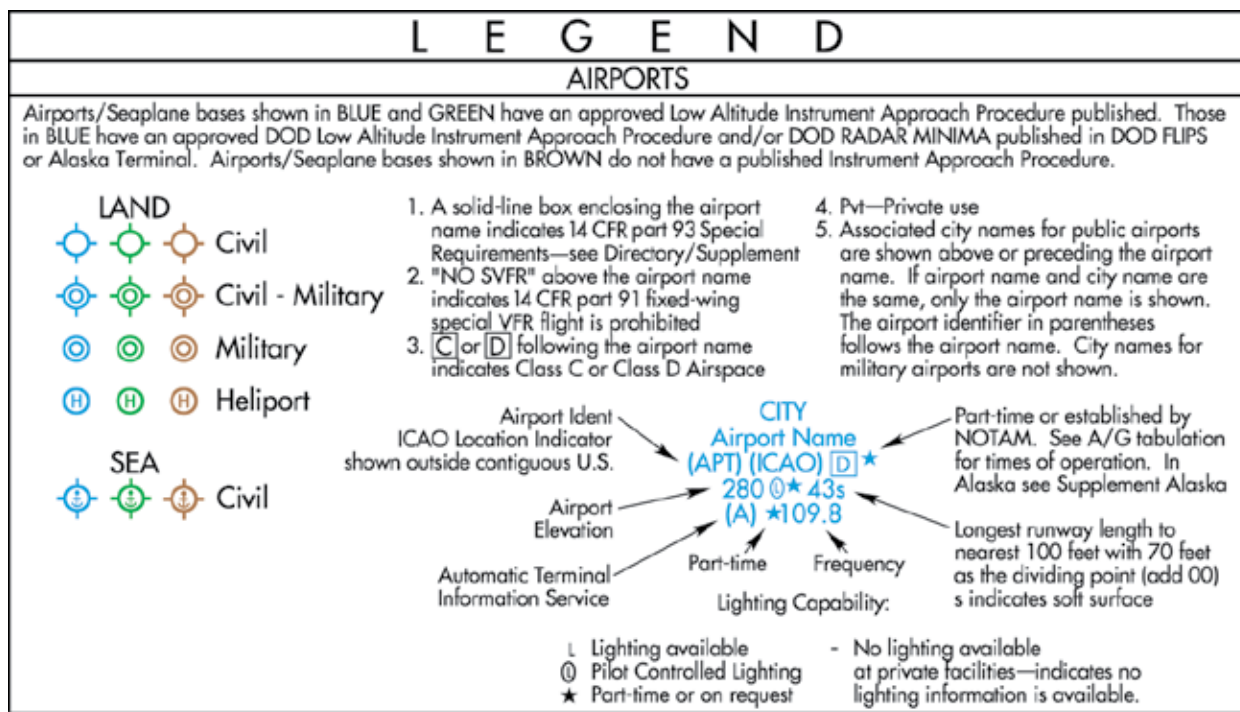


Figure 8-3. En Route Airport Legend.

be identified with such equipment, the pilot could define the fix without attaining the MRA. On NACG charts, the MRA is indicated by the symbol and the altitude preceded by "MRA" (e.g., "MRA 9300"). [Figure 8-2]

The minimum crossing altitude (MCA) will be charted when a higher MEA route segment is approached. The MCA is usually indicated when a pilot is approaching steeply rising terrain, and obstacle clearance and/or signal reception is compromised. In this case, the pilot is required to initiate a climb so the MCA is reached by the time the intersection is crossed. On NACG charts, the MCA is indicated by the symbol , and the Victor airway number, altitude, and the direction to which it applies (e.g. "V24 8000 SE").

The maximum authorized altitude (MAA) is the highest altitude at which the airway can be flown with assurance of receiving adequate navigation signals. Chart depictions appear as "MAA-15000."

When an MEA, MOCA, and/or MAA change on a segment other than at a NAVAID, a sideways "T" is depicted on the chart. If there is an airway break without the symbol, one can assume the altitudes have not changed (see the upper left area of Figure 8-2). When a change of MEA to a higher MEA is required, the climb may commence at the break, ensuring obstacle clearance. [Figure 8-4]

## Navigation Features

### Types of NAVAIDs

Very high frequency omnidirectional ranges (VORs) are the principal NAVAIDs that support the Victor and Jet airways. Many other navigation tools are also available to the pilot. For example, nondirectional beacons (NDBs) can broadcast signals accurate enough to provide stand-alone approaches, and DME allows the pilot to pinpoint a reporting point on the airway. Though primarily navigation tools, these NAVAIDs can also transmit voice broadcasts.

Tactical air navigation (TACAN) channels are represented as the two- or three-digit numbers following the three-letter identifier in the NAVAID boxes. The NACG terminal procedures provide a frequency-pairing table for the TACAN-only sites. On NACG charts, very-high frequencies and ultra-high frequencies (VHF/UHF) NAVAIDs (e.g., VORs) are depicted in black, while low frequencies and medium frequencies (LF/MF) are depicted as brown. [Figure 8-5]

### Identifying Intersections

Intersections along the airway route are established by a variety of NAVAIDs. An open triangle indicates the location of an ATC reporting point at an intersection. If the triangle is solid, a report is compulsory. [Figure 8-4]







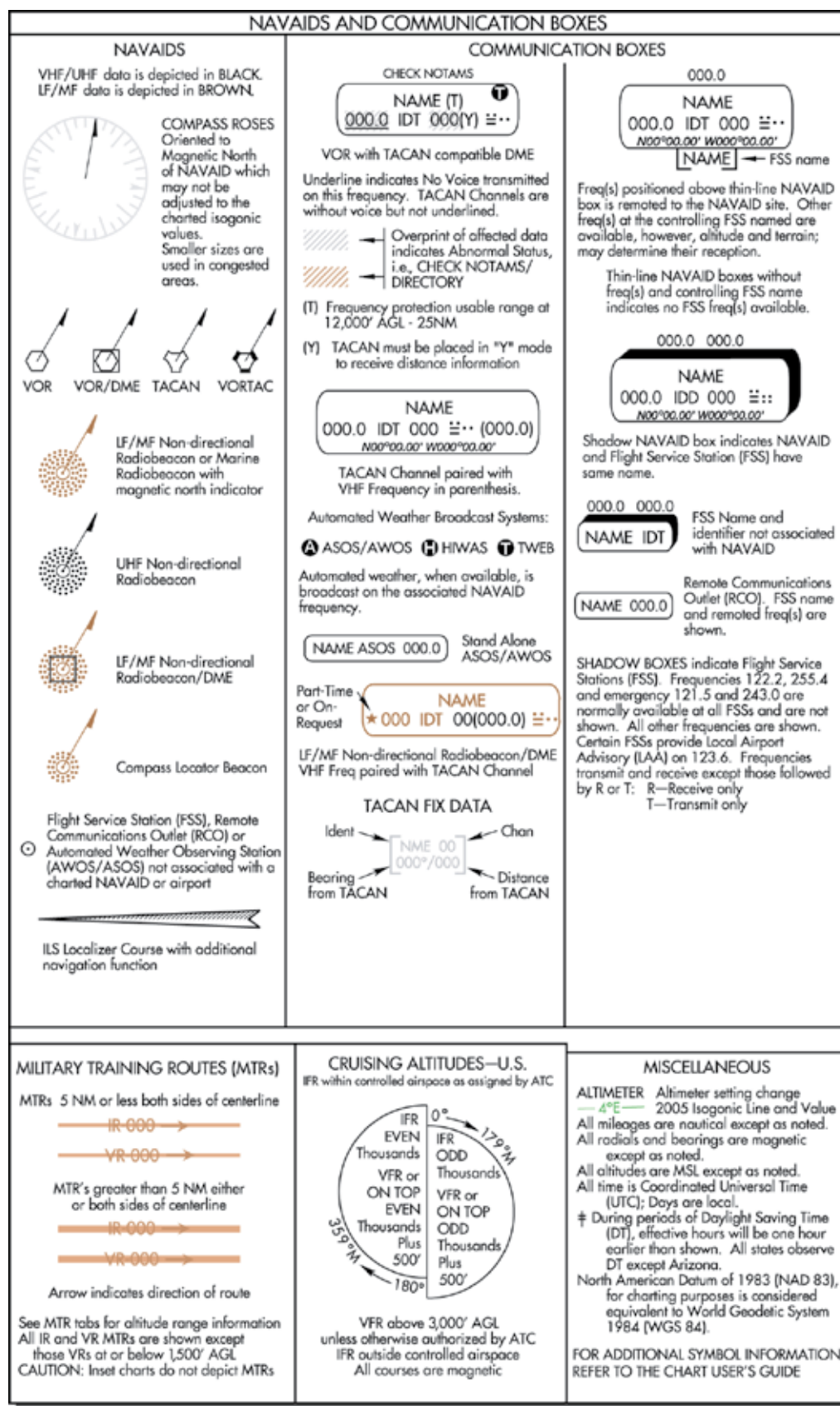
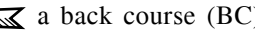







Figure 8-5. Legend From En Route Low Altitude Chart.


NDBs, localizers, and off-route VORs are used to establish intersections. NDBs are sometimes collocated with intersections, in which case passage of the NDB would mark the intersection. A bearing to an off-route NDB also can provide intersection identification. A localizer course used to identify an intersection is depicted by a feathered arrowhead symbol on the en route chart.

If feathered markings appear on the left-hand side of the arrowhead,  a back course (BC) signal is transmitted. On NACG en route charts, the localizer symbol is only depicted to identify an intersection.

Off-route VORs remain the most common means of identifying intersections when traveling on an airway. Arrows depicted next to the intersection  indicate the NAVAID to be used for identification. Another means of identifying an intersection is with the use of DME. A hollow arrowhead  indicates DME is authorized for intersection identification. If the DME mileage at the intersection is a cumulative distance of route segments, the mileage is totaled and indicated by a D-shaped symbol with a mileage number inside.  [Figure 8-4] Approved IFR GPS units can also be used to report intersections.

### Other Route Information

DME and GPS provide valuable route information concerning such factors as mileage, position, and groundspeed. Even without this equipment, information is provided on the charts for making the necessary calculations using time and distance. The en route chart depicts point-to-point distances on the airway system. Distances from VOR to VOR are charted with a number inside of a box.  To differentiate distances when two airways coincide, the word “TO” with the three-letter VOR identifier appear to the left of the distance boxes. TO PDX 


VOR changeover points (COPs) are depicted on the charts by this symbol:  The numbers indicate the distance at which to change the VOR frequency. The frequency change might be required due to signal reception or conflicting frequencies. If a COP does not appear on an airway, the frequency should be changed midway between the facilities. A COP at an intersection may indicate a course change.

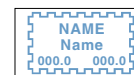
Occasionally an “x” will appear at a separated segment of an airway that is not an intersection. The “x” is a mileage breakdown or computer navigation fix and may indicate a course change.

Today’s computerized system of ATC has greatly reduced the need for holding en route. However, published holding patterns are still found on charts at junctures where ATC has deemed it



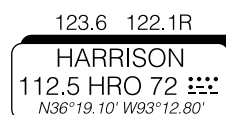
necessary to enable traffic flow. When a holding pattern is charted, the controller may provide the holding direction and the statement “as published.” [Figure 8-4]

Boundaries separating the jurisdiction of Air Route Traffic Control Centers (ARTCC) are depicted on charts with blue serrations.  The name of the controlling facility is printed on the corresponding side of the division line. ARTCC remote sites are depicted as blue serrated boxes and contain the center name, sector name, and the sector frequency. [Figure 8-4]



### Weather Information and Communication Features

En route NAVAIDs also provide weather information and serve communication functions. When a NAVAID is shown as a shadowed box, an automated flight service station (AFSS) of the same name is directly associated with the facility. If an AFSS is located without an associated NAVAID, the shadowed box is smaller and contains only the name and identifier. The AFSS frequencies are provided above the box. (Frequencies 122.2 and 255.4, and emergency frequencies 121.5 and 243.0 are not listed.)



A Remote Communications Outlet (RCO) associated with a NAVAID is designated by a thin-lined box with the controlling AFSS frequency above the box, and the name under the box. Without an associated facility, the thin-lined RCO box contains the AFSS name and remote frequency.



Automated Surface Observing Station (ASOS), Automated Weather Observing Station (AWOS), Hazardous Inflight Weather Advisory Service (HIWAS) and Transcribed Weather Broadcast (TWEB) are continuously transmitted over selected NAVAIDs and depicted in the NAVAID box. ASOS/AWOS are depicted by a white “A”, HIWAS by a “H” and TWEB broadcasts by a “T” in a solid black circle in the upper right or left corner.



### New Technologies

Technological advances have made multifunction displays and moving maps more common in newer aircraft. Even older aircraft are being retrofitted to include “glass” in the flight deck. [Figure 8-6] Moving maps improve pilot situational awareness by providing a picture of aircraft location in



**Figure 8-6.** Moving Map Display.

relation to NAVAIDS, waypoints, airspace, terrain, and hazardous weather. GPS systems can be certified for terminal area and en route use as well as approach guidance.

Additional breakthroughs in display technology are the new electronic chart systems or electronic flight bags that facilitate the use of electronic documents in the general aviation flight deck. [Figure 8-7] An electronic chart or flight bag is a self-powered electronic library that stores and displays en route charts and other essential documents on a screen. These electronic devices can store the digitized United States terminal procedures, en route charts, the complete airport facility directory, in addition to Title 14 of the Code of Federal Regulations (14 CFR) and the AIM. Full touch-screen based computers allow pilots to view airport approach and area charts electronically while flying. It replaces paper charts as well as other paper materials including minimum equipment lists (MELs), standard operating procedures (SOPs), standard instrument departures (SIDs), standard terminal arrival routes (STARs), checklists, and flight deck manuals. As with paper flight publications, the electronic database needs to be current to provide accurate information regarding NAVAIDS, waypoints, and terminal procedures. Databases are updated every 28 days and are available from various commercial vendors. Pilots should be familiar with equipment operation, capabilities, and limitations prior to use.



**Figure 8-7.** Example of an Electronic Flight Bag.



## Terminal Procedures Publications

While the en route charts provide the information necessary to safely transit broad regions of airspace, the United States Terminal Procedures Publication (TPP) enables pilots to guide their aircraft in the airport area. Whether departing or arriving, these procedures exist to make the controllers' and pilots' jobs safer and more efficient. Available in booklets by region (published by NACG), the TPP includes approach procedures, STARs, Departure Procedures (DPs), and airport diagrams.

### Departure Procedures (DPs)

There are two types of DPs, Obstacle Departure Procedures (ODP) and SIDs. [Figure 8-8] Both types of DPs provide obstacle clearance protection to aircraft in instrument meteorological conditions (IMC), while reducing communications and departure delays. DPs are published in text and/or charted graphic form. Regardless of the format, all DPs provide a way to depart the airport and transition to the en route structure safely. When possible, pilots are strongly encouraged to file and fly a DP at night, during marginal visual meteorological conditions (VMC) and IMC.

All DPs provide obstacle clearance provided the aircraft crosses the end of the runway at least 35 feet AGL; climbs to 400 feet above airport elevation before turning; and climbs at least 200 feet per nautical mile (FPNM), unless a higher climb gradient is specified to the assigned altitude. ATC may vector an aircraft off a previously assigned DP; however, the 200 FPNM or the FPNM specified in the DP is required.

Textual ODPs are listed by city and airport in the IFR Take-Off Minimums and DPs Section of the TPP. SIDs are depicted in the TPP following the approach procedures for the airport.

### Standard Terminal Arrival Routes (STARs)

STARs depict prescribed routes to transition the instrument pilot from the en route structure to a fix in the terminal area from which an instrument approach can be conducted. If a pilot does not have the appropriate STAR, write "No STAR" in the flight plan. However, if the controller is busy, the pilot might be cleared along the same route and, if necessary, the controller will have the pilot copy the entire text of the procedure.

STARs are listed alphabetically at the beginning of the NACG booklet. Figure 8-9 shows an example of a STAR, and the legend for STARs and DPs printed in NACG booklets.

## Instrument Approach Procedure (IAP) Charts

The IAP chart provides the method to descend and land safely in low visibility conditions. The FAA establishes an IAP after thorough analyses of obstructions, terrain features, and navigational facilities. Maneuvers, including altitude changes, course corrections, and other limitations, are prescribed in the IAP. The approach charts reflect the criteria associated with the United States Standard for Terminal Instrument Approach Procedures (TERPs), which prescribes standardized methods for use in designing instrument flight procedures.

In addition to the NACG, other governmental and corporate entities produce approach procedures. The United States military IAPs are established and published by the Department of Defense and are available to the public upon request. Special IAPs are approved by the FAA for individual operators and are not available to the general public. Foreign country standard IAPs are established and published according to the individual country's publication procedures. The information presented in the following sections will highlight features of the United States Terminal Procedures Publications.

The instrument approach chart is divided into six main sections, which include the margin identification, pilot briefing (and notes), plan view, profile view, landing minimums, and airport diagram. [Figure 8-10] An examination of each section follows.

### Margin Identification

The margin identification, at the top and bottom of the chart, depicts the airport location and procedure identification. The civil approach plates are organized by city, then airport name and state. For example, Orlando Executive in Orlando, Florida is alphabetically listed under "O" for Orlando. Military approaches are organized by airport name first.

The chart's amendment status appears below the city and state in the bottom margin. The amendment number is followed by the five-digit julian-date of the last chart change. "05300" is read, "the 300th day of 2005". At the center of the top margin is the FAA chart reference number and the approving authority. At the bottom center, the airport's latitude and longitude coordinates are provided.

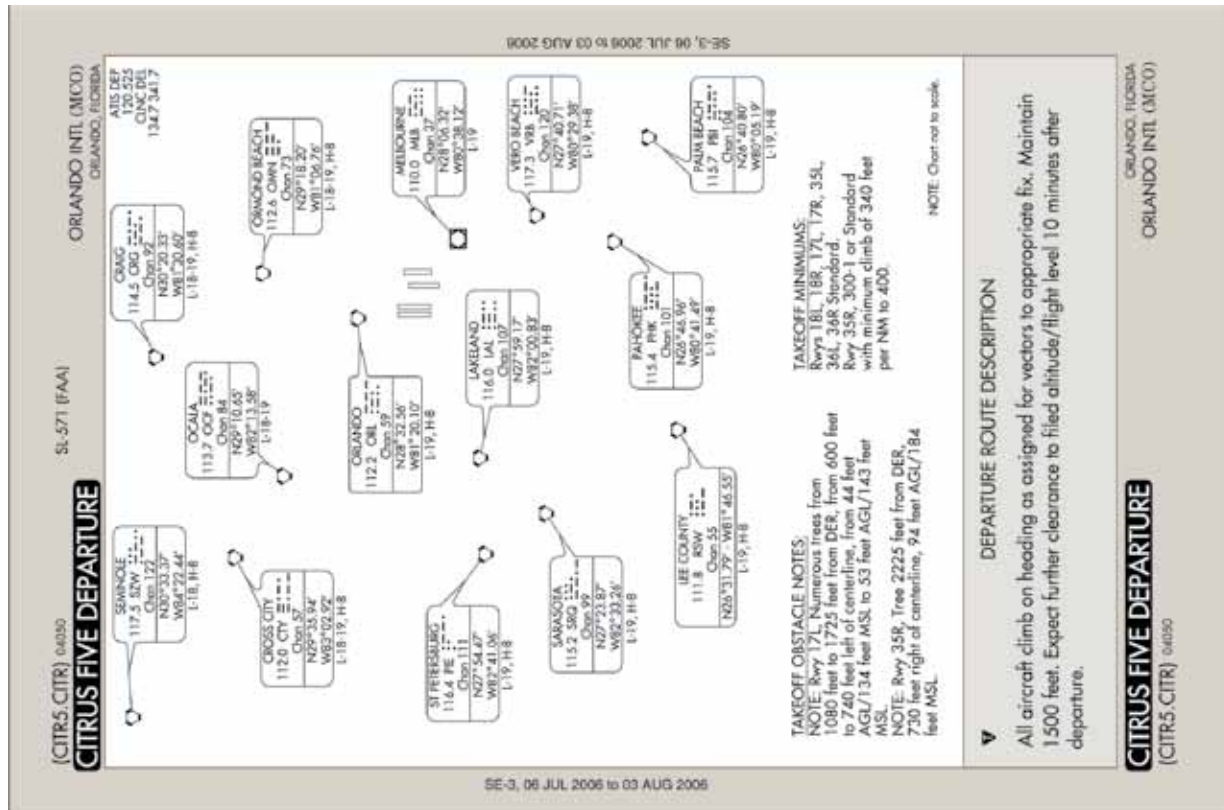
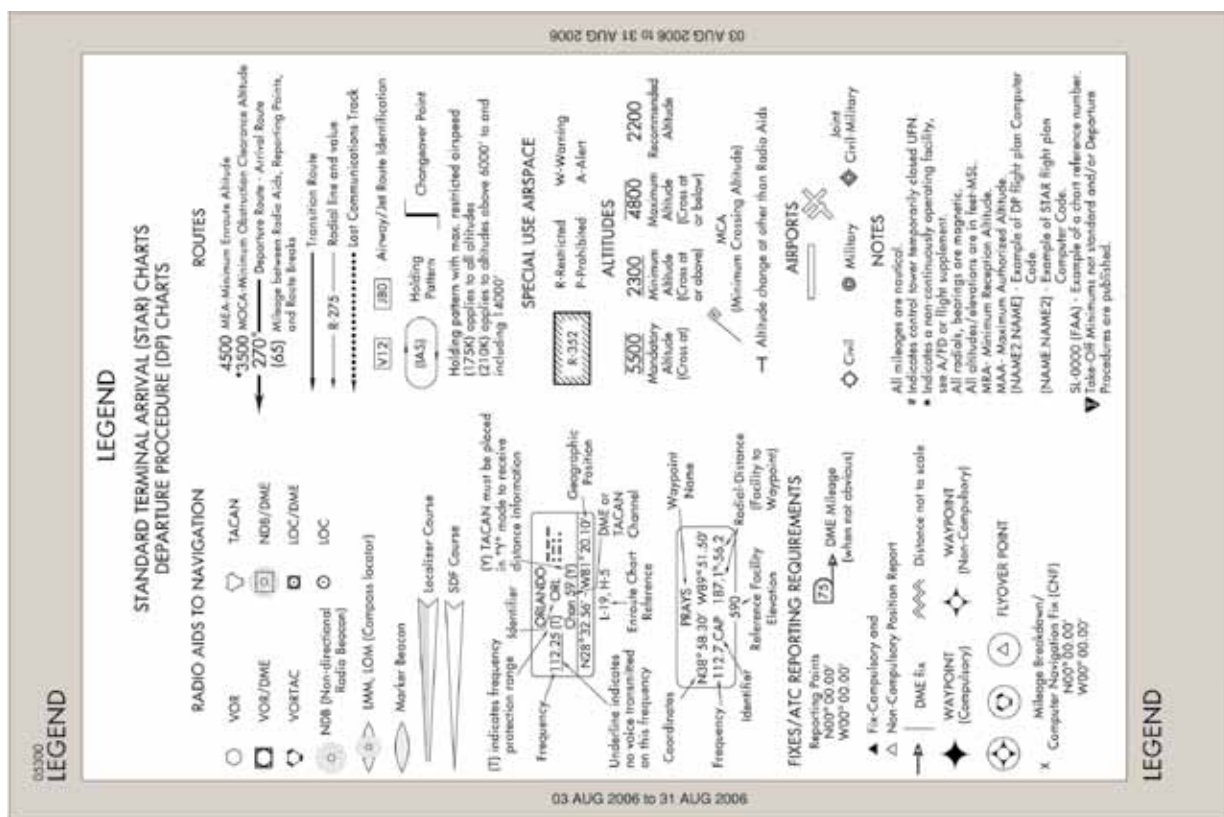
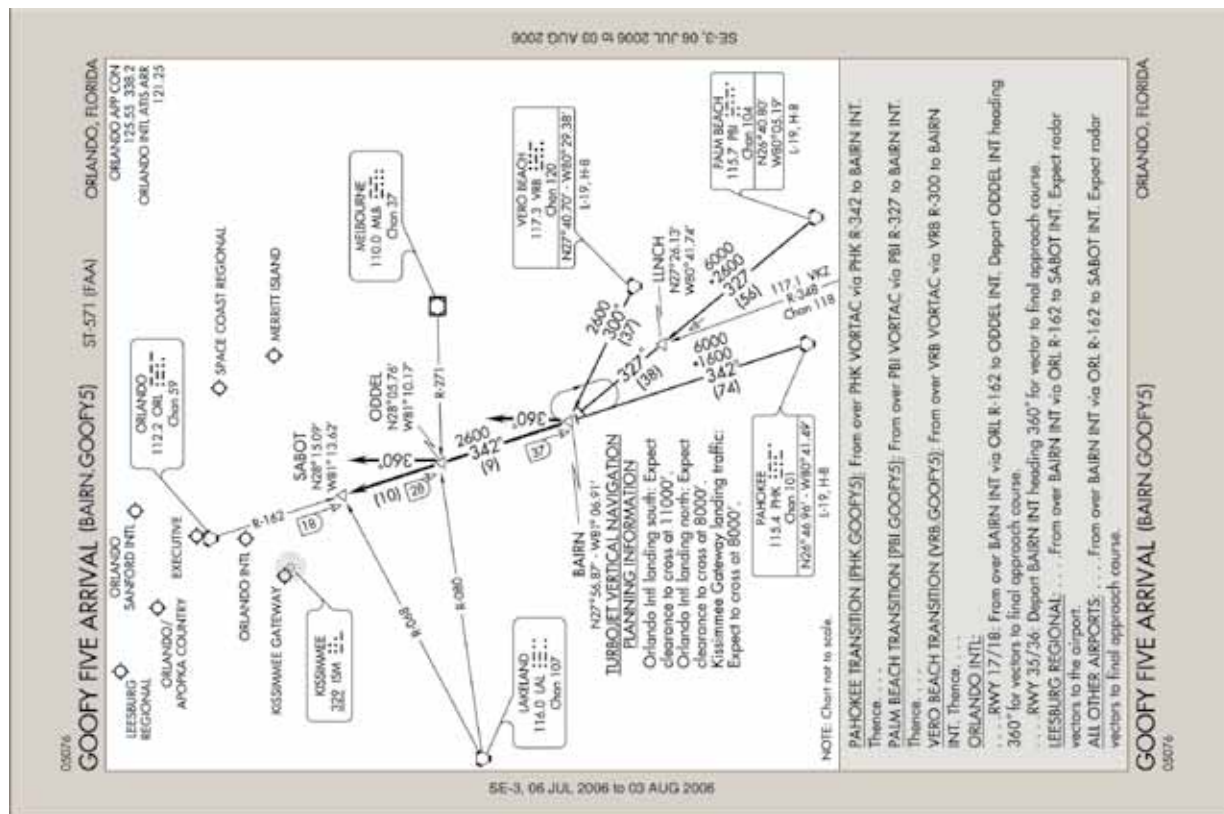


Figure 8-8. Obstacle Departure Procedures (ODP) and Standard Instrument Departures (SID).



**Figure 8-9. DP Chart Legend and STAR.**





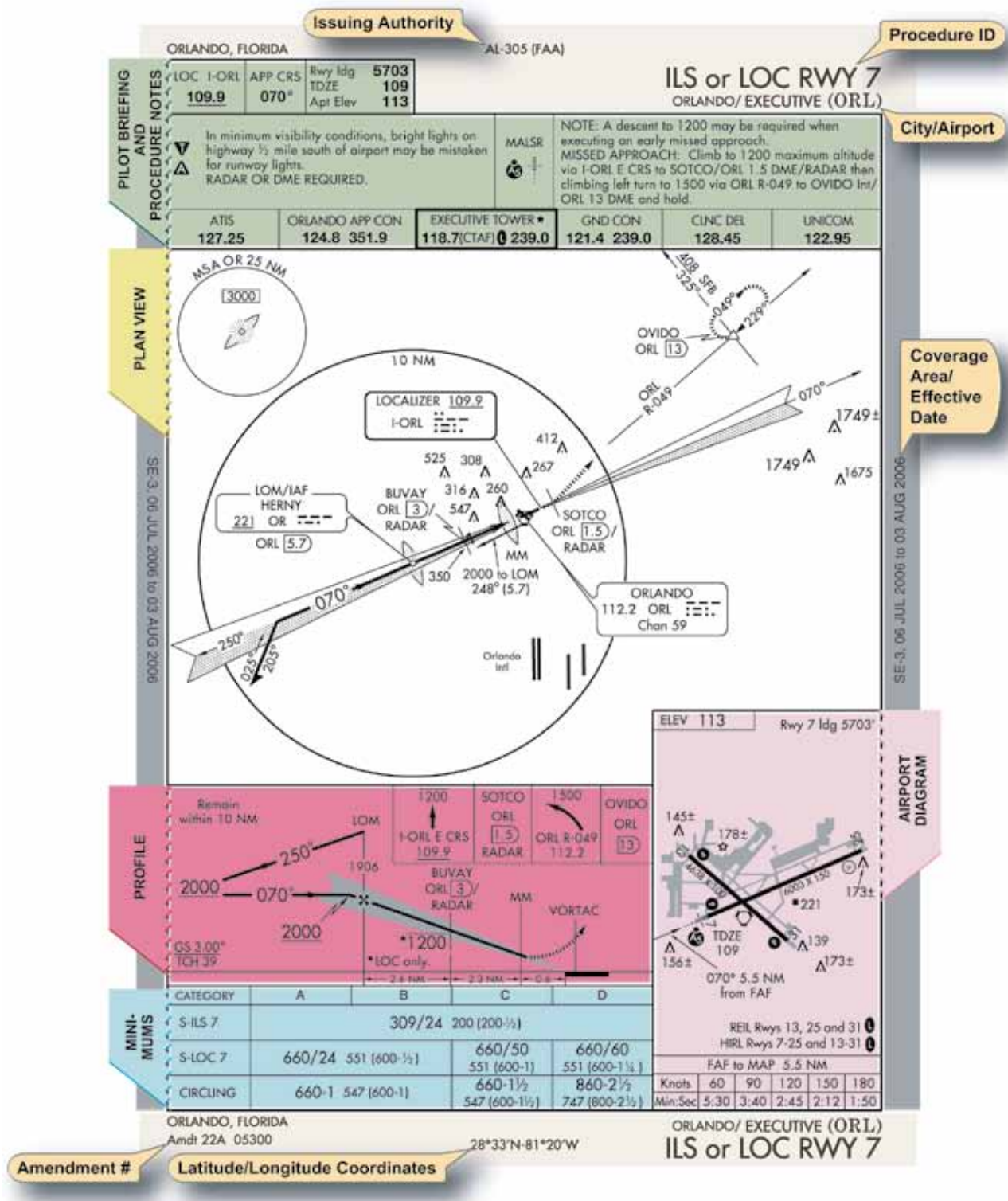


Figure 8-10. Instrument Approach Chart.

The procedure chart title (top and bottom margin area of *Figure 8-10*) is derived from the type of navigational facility providing final approach course guidance. A runway number is listed when the approach course is aligned within 30° of the runway centerline. This type of approach allows a straight-in landing under the right conditions. The type of approach followed by a letter identifies approaches that do not have straight-in landing minimums. Examples include procedure titles at the same airport, which have only circling minimums. The first approach of this type created at the airport will be labeled with the letter A, and the lettering will continue in alphabetical order (e.g., “VOR-A or “LDA-B”). The letter designation signifies the expectation is for the procedure to culminate in a circling approach to land. As a general rule, circling-only approaches are designed for one of the two following reasons:

- The final approach course alignment with the runway centerline exceeds 30°.
- The descent gradient is greater than 400 feet per NM from the FAF to the threshold crossing height (TCH). When this maximum gradient is exceeded, the circling-only approach procedure may be designed to meet the gradient criteria limits.

Further information on this topic can be found in the Instrument Procedures Handbook, Chapter 5, under Approach Naming Conventions.


To distinguish between the left, right, and center runways, an “L,” “R,” or “C” follows the runway number (e.g., “ILS RWY 16R”). In some cases, an airport might have more than one circling approach, shown as VOR-A, VOR/DME-B, etc.


More than one navigational system separated by a slash indicates more than one type of equipment is required to execute the final approach (e.g., VOR/DME RWY 31). More than one navigational system separated by “or” indicates either type of equipment may be used to execute the final approach (e.g., VOR or GPS RWY 15). Multiple approaches of the same type, to the same runway and using the same guidance, have an additional letter from the end of the alphabet, number, or term in the title (e.g., ILS Z RWY 28, SILVER ILS RWY 28, or ILS 2 RWY 28). VOR/DME RNAV approaches are identified as VOR/DME RNAV RWY (runway number). Helicopters have special IAPs, designated with COPTER in the procedure identification (e.g., COPTER LOC/DME 25L). Other types of navigation systems may be required to execute other portions of the approach prior to intercepting the final approach segment or during the missed approach.


## The Pilot Briefing

The pilot briefing is located at the top of the chart and provides the pilot with information required to complete the

published approach procedure. Included in the pilot briefing are the NAVAID providing approach guidance, its frequency, the final approach course, and runway information. A notes section contains additional procedural information. For example, a procedural note might indicate restrictions for circling maneuvers. Some other notes might concern a local altimeter setting and the resulting change in the minimums. The use of RADAR may also be noted in this section. Additional notes may be found in the plan view.

When a triangle containing a “T” () appears in the notes section, it signifies the airport has nonstandard IFR takeoff minimums. Pilots should refer to the DPs section of the TPP to determine takeoff minimums.

When a triangle containing an “A” () appears in the notes section, it signifies the airport has nonstandard IFR alternate minimums. Civil pilots should refer to the Alternate Minimums Section of the TPP to determine alternate minimums. Military pilots should refer to appropriate regulations.

When a triangle containing an “A” NA () appears in the notes area, it signifies that Alternate Minimums are Not Authorized due to unmonitored facility or the absence of weather reporting service.

Communication frequencies are listed in the order in which they would be used during the approach. Frequencies for weather and related facilities are included, where applicable, such as automatic terminal information service (ATIS), automated surface observing system (ASOS), automated weather observation system (AWOS), and AFSSs.

## The Plan View

The plan view provides a graphical overhead view of the procedure, and depicts the routes that guide the pilot from the en route segments to the initial approach fix (IAF). *[Figure 8-10]* During the initial approach, the aircraft has departed the en route phase of flight and is maneuvering to enter an intermediate or final segment of the instrument approach. An initial approach can be made along prescribed routes within the terminal area, which may be along an arc, radial, course, heading, radar vector, or a combination thereof. Procedure turns and high altitude teardrop penetrations are initial approach segments. Features of the plan view, including the procedure turn, obstacle elevation, minimum safe altitude (MSA), and procedure track, are depicted in *Figure 8-11*. Terrain will be depicted in the plan view portion of all IAPs if the terrain within the plan view exceeds 4,000 feet above the airport elevation, or if within a 6 nautical mile radius of the airport reference point the terrain rises at least 2,000 feet above the airport elevation.

## INSTRUMENT APPROACH PROCEDURES (CHARTS)

## PLANVIEW SYMBOLS

## TERMINAL ROUTES

## NO AIDS TO NAVIGATION

110.1 Underline indicates No Voice transmitted on this frequency

☐ VGR ☐ VGR/DME ☐ TACAN ☐ VORTAC  
☐ NDB ☐ NDB/DME

 IDM/IMM Company located at Cyber Market / Mobile Market  
 Market Beacon

Localizer (LOC/IDA) Course  
Right side shading: Front course; left side shading: Back Course

1000

(T) TACAN must be in "Y" mode to receive distance information.

MICROWAVE

Chen S14

M-VDS

Glideslope 6.20°

DME 111.5 (Class A)

MLS Identifier

SCOTT  
Chan 59  
SKE  
1112.21

- Ⓢ LOC/DME
- Ⓢ LOC/LDA/SDY/MIS Transmitter (shown when installation is other than its normal position at the end of the runway)

Waypoint Data

Waypoint Name
PLAYS
230000N 1000000E

Coordinates

Frequency	Identifier	Radial Distance (facility to facility)
112.7 CAP	187.156.2	590

Primary Navoid  
with Coordinate Values.

Secondary Navoid

Chen 92	2.68 NT
512*00 80	
W77*07 00	

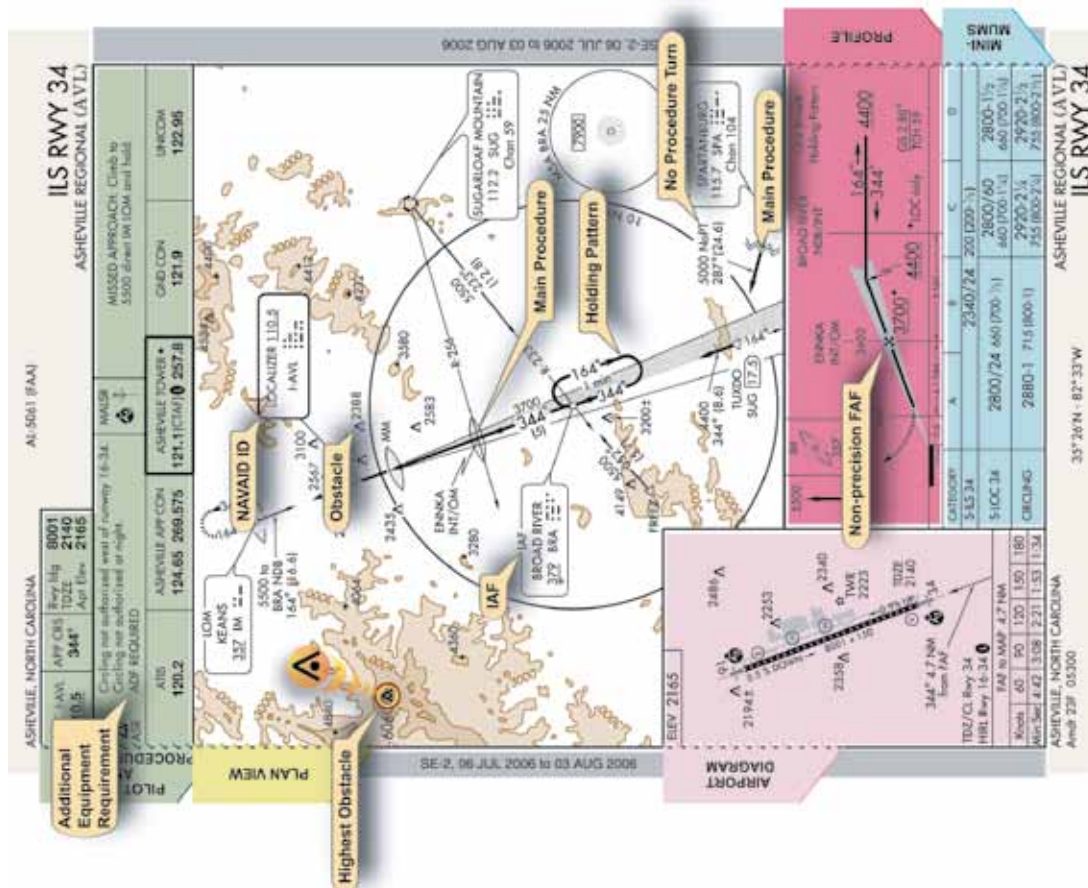
CONSTITUTIVE

VOIE Changover Point

Distance not to scale  
International Boundary

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## LEGEND



**Figure 8-11. IAP Plan View and Symbol Legends.**



Some NACG charts contain a reference or distance circle with a specified radius (10 NM is most common). Normally, approach features within the plan view are shown to scale; however, only the data within the reference circle is always drawn to scale.

Concentric dashed circles, or concentric rings around the distance circle, are used when the information necessary to the procedure will not fit to scale within the limits of the plan view area. They serve as a means to systematically arrange this information in its relative position outside and beyond the reference circle. These concentric rings are labeled en route facilities and feeder facilities.

The primary airport depicted in the plan view is drawn with enough detail to show the runway orientation and final approach course alignment. Airports other than the primary approach airport are not normally depicted in the NACG plan view.

Known spot elevations are indicated on the plan view with a dot in MSL altitude. The largest dot and number combination indicates the highest elevation. An inverted “V” with a dot in the center depicts an obstacle. ▲ The highest obstacle is indicated with a bolder, larger version of the same symbol. [Figure 8-11]

The MSA circle appears in the plan view, except in approaches for which the Terminal Arrival Area (TAA) format is used or appropriate NAVAIDs (e.g., VOR or NDB) are unavailable. The MSA is provided for emergency purposes only and guarantees 1,000 feet obstruction clearance in the sector indicated with reference to the bearings in the circle. For conventional navigation systems, the MSA is normally based on the primary omnidirectional facility (NAVAID) on which the IAP is predicated. The MSA depiction on the approach chart contains the facility identifier of the NAVAID used to determine the MSA altitudes. For RNAV approaches, the MSA is based on the runway waypoint for straight-in approaches, or the airport waypoint for circling approaches. For GPS approaches, the MSA center header will be the missed approach waypoint. The MSL altitudes appear in boxes within the circle, which is typically a 25 NM radius unless otherwise indicated. The MSA circle header refers to the letter identifier of the NAVAID or waypoint that describes the center of the circle.

NAVAIDs necessary for the completion of the instrument procedure include the facility name, letter identifier, and Morse code sequence. They may also furnish the frequency, Morse code, and channel. A heavy-lined NAVAID box depicts the primary NAVAID used for the approach. An “T” in front

of the NAVAID identifier (in *Figure 8-11*, “T-AVL”) listed in the NAVAID box indicates a localizer. The requirement for an ADF, DME, or RADAR in the approach is noted in the plan view.

Intersections, fixes, radials, and course lines describe route and approach sequencing information. The main procedure or final approach course is a thick, solid line. — A DME arc, which is part of the main procedure course, is also represented as a thick, solid line. — A feeder route is depicted with a medium line — and provides heading, altitude, and distance information. (All three components must be designated on the chart to provide a navigable course.) Radials, such as lead radials, are shown by thin lines. — The missed approach track is drawn using a thin, hash marked line with a directional arrow. .....► A visual flight path segment appears as a thick dashed line with a directional arrow. — Visual Flight Path IAFs are charted IAF when associated with a NAVAID or when freestanding.

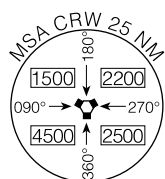
The missed approach holding pattern track is represented with a thin-dashed line. When collocated, the missed approach holding pattern and procedure turn holding pattern are indicated as a solid, black line. Arrival holding patterns are depicted as thin, solid lines.

## Terminal Arrival Area (TAA)

The design objective of the TAA procedure is to provide a transition method for arriving aircraft with GPS/RNAV equipment. TAAs will also eliminate or reduce the need for feeder routes, departure extensions, and procedure turns or course reversal. The TAA is controlled airspace established in conjunction with the standard or modified RNAV approach configurations.

The standard TAA has three areas: straight-in, left base, and right base. The arc boundaries of the three areas of the TAA are published portions of the approach and allow aircraft to transition from the en route structure direct to the nearest IAF. When crossing the boundary of each of these areas or when released by ATC within the area, the pilot is expected to proceed direct to the appropriate waypoint IAF for the approach area being flown. A pilot has the option in all areas of proceeding directly to the holding pattern.

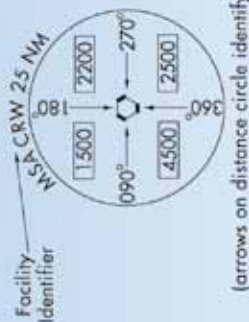
The TAA has a “T” structure that normally provides a NoPT for aircraft using the approach. [Figure 8-12] The TAA provides the pilot and air traffic controller with an efficient method for routing traffic from the en route to the terminal structure. The basic “T” contained in the TAA normally aligns the procedure on runway centerline, with the missed



## INSTRUMENT APPROACH PROCEDURES (CHARTS)

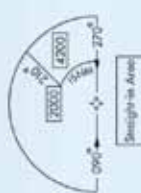
## PLANVIEW SYMBOLS

## MINIMUM SAFE ALTITUDE (MSA)



(arrows on distance circle identify sectors)

TERMINAL ARRIVAL AREA (TAA)



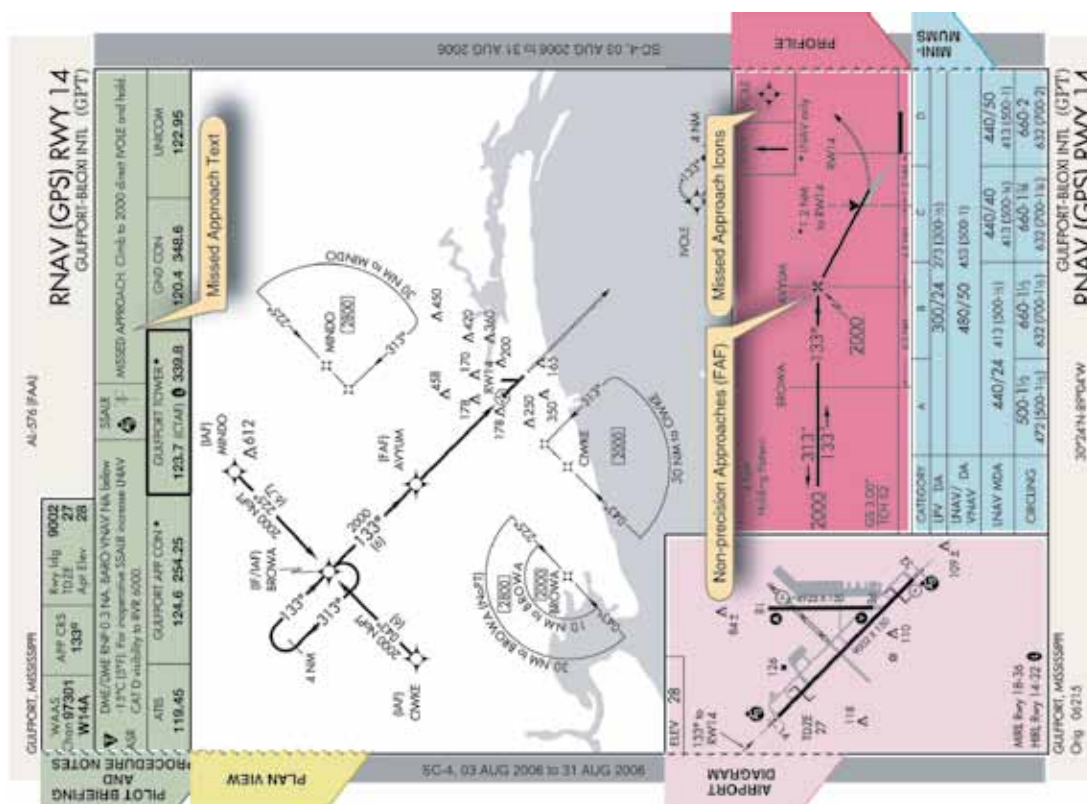
## SPECIAL USE AIRSPACE

- |                          |  |
|--------------------------|--|
| <b>OBSTACLES</b>         | <b>AIRPORTS</b>                                |
| • Spot Elevation         | ✕ Primary and Secondary Normal (in planimetry) |
| △ Obstacle               | — Secondary Base                               |
| △ Highest Obstacle       |  |
| • Highest Spot Elevation |  |
| M Group of Obstacles     |  |
| ± Doubtful accuracy      |  |

## AIRPORTS

## LEGEND

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**Figure 8-12. Basic “T” Design of Terminal Arrival Area (TAA) and Legend.**

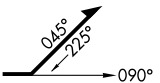
approach point (MAP) located at the threshold, the FAF 5 NM from the threshold, and the intermediate fix (IF) 5 NM from the FAF.

In order to accommodate descent from a high en route altitude to the initial segment altitude, a hold in lieu of a procedure turn provides the aircraft with an extended distance for the necessary descent gradient. The holding pattern constructed for this purpose is always established on the center IAF waypoint. Other modifications may be required for parallel runways, or special operational requirements. When published, the RNAV chart will depict the TAA through the use of icons representing each TAA associated with the RNAV procedure. These icons are depicted in the plan view of the approach, generally arranged on the chart in accordance with their position relative to the aircraft's arrival from the en route structure.

### Course Reversal Elements in Plan View and Profile View

Course reversals included in an IAP are depicted in one of three different ways: a 45°/180° procedure turn, a holding pattern in lieu of procedure turn, or a teardrop procedure. The maneuvers are required when it is necessary to reverse direction to establish the aircraft inbound on an intermediate or final approach course. Components of the required procedure are depicted in the plan view and the profile view. The maneuver must be completed within the distance and at the minimum altitude specified in the profile view. Pilots should coordinate with the appropriate ATC facility relating to course reversal during the IAP.

#### Procedure Turns

A procedure turn barbed arrow  indicates the direction or side of the outbound course on which

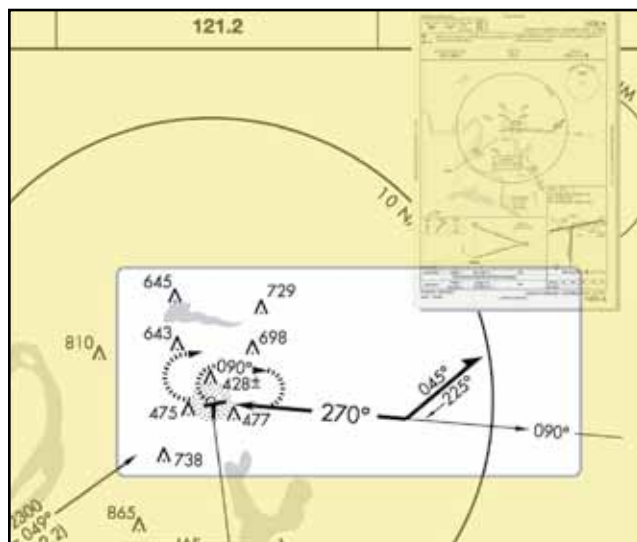


Figure 8-13. 45° Procedure Turn.

the procedure turn is made. [Figure 8-13] Headings are provided for course reversal using the 45° procedure turn. However, the point at which the turn may be commenced, and the type and rate of turn is left to the discretion of the pilot. Some of the options are the 45° procedure turn, the racetrack pattern, the teardrop procedure turn, or the 80°/260° course reversal. The absence of the procedure turn barbed arrow in the plan view indicates that a procedure turn is not authorized for that procedure. A maximum procedure turn speed of not greater than 200 knots indicated airspeed (KIAS) should be observed when turning outbound over the IAF and throughout the procedure turn maneuver to ensure staying within the obstruction clearance area. The normal procedure turn distance is 10 NM. This may be reduced to a minimum of 5 NM where only Category A or helicopter aircraft are operated, or increased to as much as 15 NM to accommodate high performance aircraft. Descent below the procedure turn altitude begins after the aircraft is established on the inbound course.

The procedure turn is *not* required when the symbol “NoPT” appears, when radar vectoring to the final approach is provided, when conducting a timed approach, or when the procedure turn is not authorized. Pilots should contact the appropriate ATC facility when in doubt if a procedure turn is required.

#### Holding in Lieu of Procedure Turn

A holding pattern in lieu of a procedure turn may be specified for course reversal in some procedures. [Figure 8-14] In such cases, the holding pattern is established over an intermediate fix or a final approach fix (FAF). The holding pattern distance

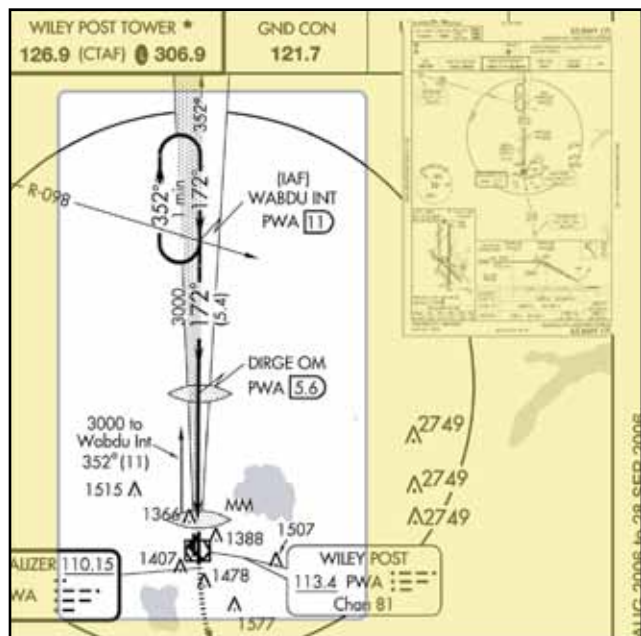


Figure 8-14. Holding in Lieu of Procedure Turn.



### *Teardrop Procedure*

### *The Profile View*

The precision approach glide slope (GS) intercept altitude is a minimum altitude for GS interception after completion of the procedure turn, illustrated by an altitude number and “zigzag” line. It applies to precision approaches, and except where otherwise prescribed, also applies as a minimum altitude for crossing the FAF when the GS is inoperative or not used. Precision approach profiles also depict the GS angle of descent, threshold-crossing height (TCH), and GS altitude at the outer marker (OM).

Stepdown fixes in nonprecision procedures are provided between the FAF and the airport for authorizing a lower minimum descent altitude (MDA) after passing an obstruction. Stepdown fixes can be identified by NAVAID, NAVAID fix, waypoint or radar, and are depicted by a hash marked line. Normally, there is only one stepdown fix between the FAF and the MAP, but there can be several. If the stepdown fix cannot be identified for any reason, the minimum altitude at the stepdown fix becomes the MDA for the approach. However, circling minimums apply if they are higher than the stepdown fix minimum altitude, and a circling approach is required.

The MAP varies depending upon the approach flown. For the ILS, the MAP is at the decision altitude/decision height (DA/DH). For nonprecision procedures, the pilot determines



**Figure 8-15. Teardrop Procedure.**



the MAP by timing from FAF when the approach aid is away from the airport, by a fix or NAVAID when the navigation facility is located on the field, or by waypoints as defined by GPS or VOR/DME RNAV. The pilot may execute the MAP early, but pilots should, unless otherwise cleared by ATC, fly the IAP as specified on the approach plate to the MAP at or above the MDA or DA/DH before executing a turning maneuver.

A complete description of the missed approach procedure appears in the pilot briefing section. [Figure 8-16] Icons indicating what is to be accomplished at the MAP are located in the profile view. When initiating a missed approach, the pilot will be directed to climb straight ahead (e.g., “Climb to 2,000”) or commence a turning climb to a specified altitude (e.g., “Climbing right turn to 2,000”). In some cases, the procedure will direct the pilot to climb straight ahead to an initial altitude, then turn or enter a climbing turn to the holding altitude (e.g., “Climb to 900, then climbing right turn to 2,500 direct ABC VOR and hold”).

When the missed approach procedure specifies holding at a facility or fix, the pilot proceeds according to the missed approach track and pattern depicted on the plan view. An alternate missed approach procedure may also be issued by ATC. The textual description will also specify the NAVAID(s) or radials that identify the holding fix.

The profile view also depicts minimum, maximum, recommended, and mandatory block altitudes used in approaches. The minimum altitude is depicted with the altitude underscored, 2500. On final approach, aircraft are required to maintain an altitude at or above the depicted altitude until reaching the subsequent fix. The maximum altitude will be depicted with the altitude overscored, 4300 and aircraft must remain at or below the depicted altitude. Mandatory altitudes will be depicted with the altitude both underscored and overscored, 5500 and altitude is to be maintained at the depicted value. Recommended altitudes are advisory altitudes and are neither over- nor underscored. When an over- or underscore spans two numbers, a mandatory block altitude is indicated, and aircraft are required to maintain altitude within the range of the two numbers. [Figures 8-11 and 8-12]

The Vertical Descent Angle (VDA) found on nonprecision approach charts provides the pilot with information required to establish a stabilized approach descent from the FAF or stepdown fix to the threshold crossing height (TCH). [Figure 8-17] Pilots can use the published angle and estimated or actual ground speed to find a target rate of descent using the rate of descent table in the back of the TPP.

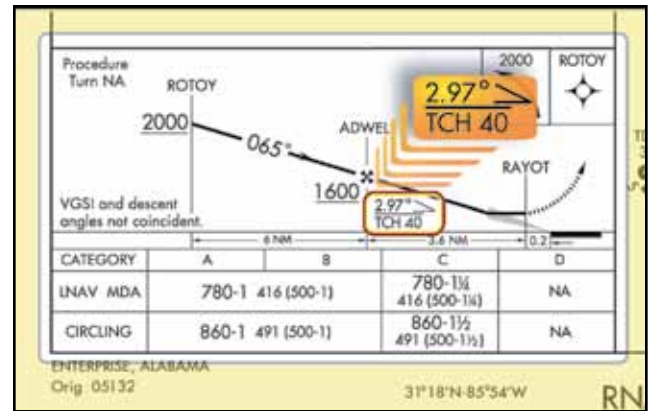


Figure 8-17. Vertical Descent Angle (VDA).

## Landing Minimums

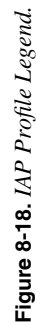
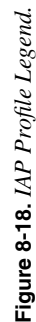
The minimums section sets forth the lowest altitude and visibility requirements for the approach, whether precision or nonprecision, straight-in or circling, or radar vectored. When a fix is incorporated in a nonprecision final segment, two sets of minimums may be published, depending upon how the fix can be identified. Two sets of minimums may also be published when a second altimeter source is used in the procedure. The minimums ensure that final approach obstacle clearance is provided from the start of the final segment to the runway or MAP, whichever occurs last. The same minimums apply to both day and night operations unless different minimums are specified in the Notes section of the pilot briefing. Published circling minimums provide obstacle clearance when pilots remain within the appropriate area of protection. [Figure 8-18]

Minimums are specified for various aircraft approach categories based upon a value 1.3 times the stalling speed of the aircraft in the landing configuration at maximum certified gross landing weight. If it is necessary to maneuver at speeds in excess of the upper limit of a speed range for a category, the minimums for the next higher category should be used. For example, an aircraft that falls into category A, but is circling to land at a speed in excess of 91 knots, should use approach category B minimums when circling to land. [Figure 8-19]

The minimums for straight-in and circling appear directly under each aircraft category. [Figure 8-19] When there is no solid division line between minimums for each category on the rows for straight-in or circling, the minimums apply to the two or more categories.

The terms used to describe the minimum approach altitudes differ between precision and nonprecision approaches.





## DESCENT TABLE 99028

### RATE OF DESCENT TABLE

A rule of descent table is provided for use in planning and sequencing precision elements under known or approximate ground speed conditions. It will be especially useful for approaches with the localizer only used for course guidance. A best speed, power, and altitude combination can be programmed which will result in a stable glide ramp and slope favorable for achieving a landing. Elements may be extended or truncated to meet minimum descent altitude and missed approach point criteria upon breakout. Care should always be exercised so that minimum descent altitude and missed approach point are extended.

TABLET OR PRECINCT (degrees and north)	GROUND SPEED (knot)											
	30	45	60	75	90	105	120	135	150	165	180	
2.0	210	160	210	265	320	370	425	475	530	585	635	
2.5	265	130	200	265	330	395	465	530	595	665	795	
2.7	287	143	215	287	358	430	501	573	645	716	788	
2.8	297	149	223	297	371	446	520	594	669	743	891	
2.9	308	154	231	308	383	462	539	616	693	769	923	
3.0	318	159	239	318	398	478	557	637	716	796	955	
3.1	329	166	247	329	411	494	576	658	740	823	987	
3.2	340	170	255	340	425	510	594	679	764	849	934	
3.3	350	175	263	350	438	526	613	701	788	876	963	
3.4	361	180	271	361	451	541	632	722	812	902	993	
3.5	370	185	280	370	465	555	650	740	835	925	1020	
4.0	425	210	315	425	530	635	740	845	955	1060	1165	
4.5	475	240	355	475	595	715	835	955	1075	1190	1310	
5.0	530	265	395	530	660	795	925	1060	1190	1325	1455	
5.5	580	290	435	580	730	875	1020	1165	1310	1455	1600	
6.0	635	315	475	635	795	955	1110	1270	1430	1590	1745	
6.5	690	345	515	690	860	1030	1205	1375	1550	1720	1890	
7.0	740	370	555	740	925	1110	1295	1480	1665	1850	2035	
7.5	795	395	595	795	990	1190	1390	1585	1785	1985	2180	
8.0	845	425	635	845	1055	1270	1480	1690	1905	2115	2325	
8.5	900	450	675	900	1120	1345	1570	1795	2020	2245	2470	
9.0	950	475	715	950	1190	1425	1665	1900	2140	2375	2615	
9.5	1005	500	760	1005	1255	1505	1755	2005	2255	2510	2760	
10.0	1055	530	790	1055	1320	1585	1845	2110	2375	2640	2900	
10.5	1105	555	830	1105	1385	1660	1940	2215	2490	2770	3045	
11.0	1160	580	870	1160	1450	1740	2030	2320	2610	2900	3190	
11.5	1210	605	910	1210	1515	1820	2120	2425	2725	3030	3335	
12.0	1260	630	945	1260	1575	1895	2205	2520	2835	3155	3465	

## DESCENT TABLE 99028

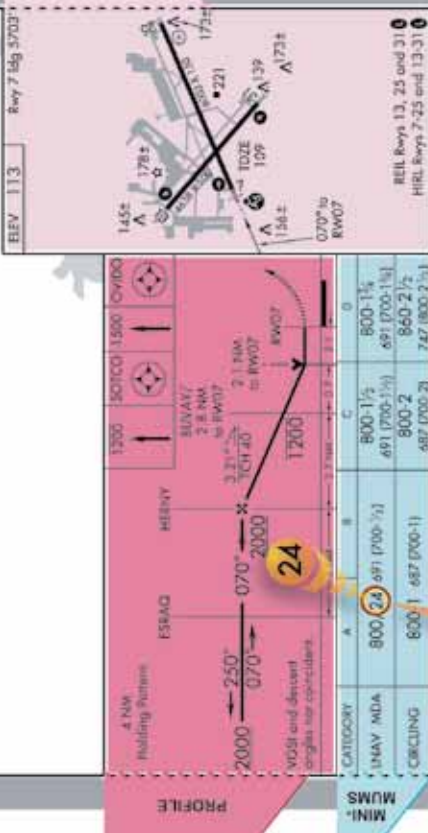
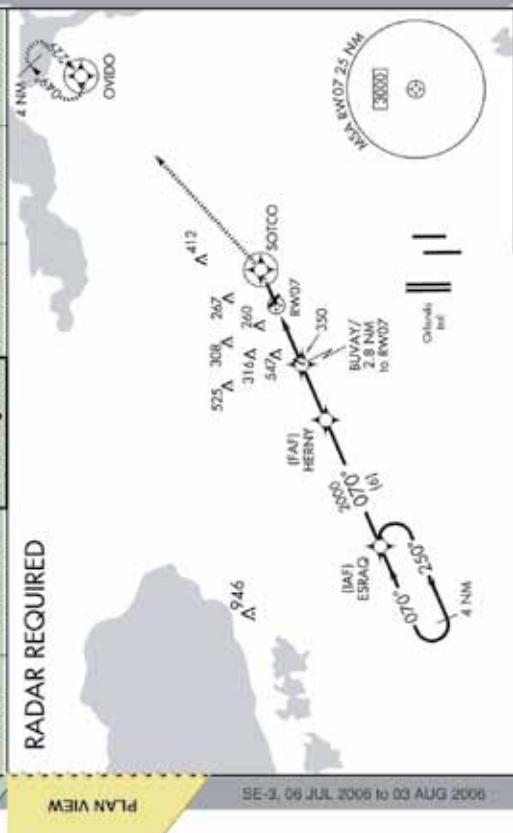
ORLANDO, FLORIDA  
AI-305 (FAA)RNAV (GPS) RWY 7  
ORLANDO/EXECUTIVE (ORL)

Notes	Buy Idg	5703
APP C85	TDZE	109
070*	Agst Elev	113

<p>PILOT BRIEFING AND PROCEDURE NOTES</p> <p><b>▲</b> GPS or RNP-0.3 Required. DME/DME RNP-0.3 NA. In minimum visibility conditions, bright lights on highway <math>\frac{1}{2}</math> mile south of airport may be mistaken for runway lights.</p> <p><b>▲</b> NA</p>	<p><b>MALE</b></p> <p> </p>	<p>NOTE:</p> <p>excluded MISSED obstacle element</p>
--	---	--

ATIS	ORLANDO AIRPORT	EXECUTIVE TOWER *	GRND CON	CLNC DEL	UNICOM
127.25	134.8 351.9	118.7/CTAF 0 239.0	121.4 239.0	126.45	122.95

RADAR REQUIRED

ORLANDO/EXECUTIVE (ORL)  
RNAV (GPS) RWY 7

ORLANDO, FLORIDA  
Orig-B 05300  
RVR  
28-53'N 81-53'W

10

03 AUG 2006 to 31 AUG 2006

02 AUG 2008 10:11:05

**Figure 8-19. Descent Rate Table.**



05300

## TERMS/LANDING MINIMA DATA

### IFR LANDING MINIMA

The United States Standard for Terminal Instrument Procedures (TERPS) is the approved criteria for formulating instrument approach procedures. Landing minima are established for all aircraft approach categories (ABCDE and COPTER). In the absence of COPTER MINIMA, helicopters may use the Cat A minima of other procedures. The standard format for RNAV minima and landing minima portrayal follows:

### RNAV (GPS) MINIMA

CATEGORY	A	B	C	D
LPV DA	1540/24	258 (300-1)		
UNAV/VNAV DA	1600/24	318 (400-1)	1600/40	
UNAV MDA	1840/24	558 (600-1)	1840/50	1840/60
CIRCLING	1840-1	545 (600-1)	1840-1½	1840-2
			545 (600-1½)	545 (600-2)

NOTE: The  symbol indicates outages of the WAAS vertical guidance may occur daily at this location due to initial system limitations. WAAS NOTAMS for vertical outages are not provided for this approach. Use UNAV minima for flight planning at these locations, whether as a destination or alternate. For flight operations at these locations, when the WAAS outages indicate that UNAV/VNAV or LPV service is available, then vertical guidance may be used to complete the approach using the displayed level of service. Should an outage occur during the procedure, reversion to UNAV minima may be required. As the WAAS coverage is expanded, the  will be removed.

RNAV minima are dependent on navigation equipment capability, as stated in the applicable AFM, AFMS, or other FAA approved document, and as outlined below.

GLS (Global Navigation Satellite System (GNSS) Landing System)

The GLS (NA) minima line will be removed from existing RNAV (GPS) approach charts when LPV minima is published.

LPV (An Approach Procedure with Vertical Guidance (APV) based on WAAS lateral and vertical guidance)

Must have WAAS avionics approved for LPV approach.

UNAV/VNAV (lateral navigation/vertical navigation)

Must have either:

- WAAS avionics approved for UNAV/VNAV approach, or
- A certified Baro-VNAV system with an IFR approach approved GPS, or
- A certified Baro-VNAV system with an IFR approach approved WAAS, or
- An approach certified RNP-0.3 system with barometric vertical guidance (Baro-VNAV).

NOTES:

- UNAV-VNAV minima not applicable for Baro-VNAV equipment if chart is annotated "Baro-VNAV NA" or when below the minimum published temperature, e.g., Baro-VNAV NA below -17°C (2°F).
- DME/DME based RNP-0.3 systems may be used only when a chart note indicates DME/DME availability, e.g., "DME/DME RNP-0.3 Authorized." Specific DME facilities may be required, e.g., "DME/DME RNP-0.3 Authorized, ABC, XYZ required."

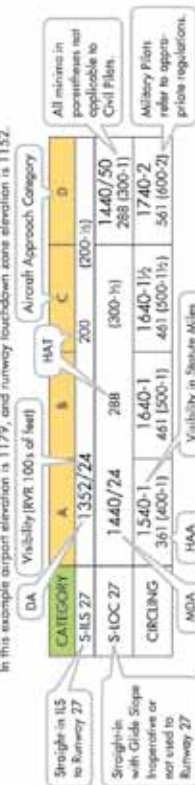
### UNAV (Lateral navigation)

Must have IFR approach approved GPS, WAAS, or RNP-0.3 system. Other RNAV systems require special approval.

NOTE: DME/DME based RNP-0.3 systems may be used only when a chart note indicates DME/DME availability, e.g., "DME/DME RNP-0.3 Authorized." Specific DME facilities may be required, e.g., "DME/DME RNP-0.3 Authorized, ABC, XYZ required."

### LANDING MINIMA FORMAT

In this example airport elevation is 1179, and runway touchdown zone elevation is 1152.



## TERMS/LANDING MINIMA DATA

Figure 8-20. Terms/Landing Minima Data.

05300

## TERMS/LANDING MINIMA DATA

### COPTER MINIMA ONLY

CATEGORY	680-½	343	(400-½)
H <sub>1</sub> 176°			
Copter Approach Direction			
Height of MDA/DA Above Landing Area (HAA)			

No landing minima are provided.

### RADAR MINIMA

PAR (c)	10	2.5"/42/1000	ABCE	185/16	100	(100-½)	Visibility (RVR 100s of feet)
(d)	28	2.5"/48/1068	ABCE	187/16	100	(100-½)	
ASR	10		ABC	560/40	463	(500-1)	D
			E	560/60	463	(500-1½)	
	28		AB	600/50	513	(600-1)	C
			DE	600/11½	513	(600-1½)	
	10		AB	560/11½	463	(500-1½)	C
	28		AB	600/11½	503	(600-1½)	C
	10, 28		DE	660-2	563	(600-2)	

All minima step in parentheses not applicable to Civil Pilots. Military Pilots refer to appropriate regulations.

Visibility in Statute Miles

Radar Minima:

1. Minima shown are the lowest permitted by established criteria. Pilots should consult applicable directives for their category of aircraft.

2. The circling MDA and weather minima to be used are those for the runway to which the final approach is flown - not the landing runway. In the above RADAR MINIMA example, a category C aircraft flying a radar approach to runway 10, circling to land on runway 28, must use an MDA of 540 feet with weather minima of 500-1½.

- ▲ Alternate Minima not standard. Civil users refer to tabulation. USA/USN/USAF pilots refer to appropriate regulations.
  - ▲ NA Alternate minima are Not Authorized due to unmonitored facility or absence of weather reporting service.
  - ▼ Take-off Minima not standard and/or Departure Procedures are published. Refer to tabulation.
- AIRCRAFT APPROACH CATEGORIES**
- Aircraft approach category indicates a grouping of aircraft based on a speed of VREF, if specified, or if VREF not specified, 1.3 VSO at the maximum certificated landing weight. VREF, VSO, and the maximum certificated landing weight are those values as established for the aircraft by the certification authority of the country of registry. Helicopters are Category A aircraft. An aircraft shall fit in only one category. However, if it is necessary to operate at a speed in excess of the upper limit of the speed range for an aircraft's category, the minimums for the category for that speed shall be used. For example, an airplane which fits into Category B, but is circling to land at a speed of 145 knots, shall use the approach Category D minima. As an additional example, a Category A airplane (or helicopter) which is operating at 130 knots on a straight-in approach shall use the approach Category C minima. See following category limits.

### MANEUVERING TABLE

Approach Category	A	B	C	D	E
Speed (Knots)	0-90	91-120	121-140	141-165	166-185

Comparable Value of RVR and Visibility

The following table shall be used for converting RVR to ground or flight visibility. For converting RVR values that fall between listed values, use the next higher RVR value; do not interpolate. For example, when converting 1800 RVR, use 2400 RVR with the resultant visibility of 1/2 mile.

RVR (feet)	Visibility (statute miles)	RVR (feet)	Visibility (statute miles)
1600	¼	4500	¾
2400	½	5000	1
3200	¾	6000	1½
4000	1		

## TERMS/LANDING MINIMA DATA

03 AUG 2006 to 31 AUG 2006


03 AUG 2006 to 31 AUG 2006



Precision approaches use decision height (DH), which is referenced to the height above threshold elevation (HAT). Nonprecision approaches use MDA, referenced to “feet MSL.” The MDA is also referenced to HAT for straight-in approaches, or height above airport (HAA) for circling approaches. On NACG charts, the figures listed parenthetically are for military operations and are not used in civil aviation.

Visibility figures are provided in statute miles or runway visual range (RVR), which is reported in hundreds of feet. RVR is measured by a transmissometer, which represents the horizontal distance measured at points along the runway. It is based on the sighting of either high intensity runway lights or on the visual contrast of other targets, whichever yields the greater visual range. RVR is horizontal visual range, not slant visual range, and is used in lieu of prevailing visibility in determining minimums for a particular runway. It is illustrated in hundreds of feet if less than a mile (i.e., “24” is an RVR of 2,400 feet). [Figures 8-19 and 8-20]

Visibility figures are depicted after the DA/DH or MDA in the minimums section. If visibility in statute miles is indicated, an altitude number, hyphen, and a whole or fractional number appear; for example, 530-1, which indicates “530 feet MSL” and 1 statute mile visibility. This is the descent minimum for the approach. The RVR value is separated from the minimum altitude with a slash, such as “1065/24,” which indicates 1,065 feet MSL and an RVR of 2,400 feet. If RVR is prescribed for the procedure, but not available, a conversion table is used to provide the equivalent visibility in this case, of 1/2 statute mile visibility. [Figure 8-20] The conversion table is also available in the TPP.

When an alternate airport is required, standard IFR alternate minimums apply. For aircraft other than helicopters, precision approach procedures require a 600-foot ceiling and two statute miles visibility; nonprecision approaches require an 800-foot ceiling and two statute miles visibility. Helicopter alternate minimums are a ceiling that is 200 feet above the minimum for the approach to be flown and visibility of at least one statute mile, but not less than the minimum visibility for the approach to be flown. When a black triangle with a white “A” appears in the notes section of the pilot briefing, it indicates non-standard IFR alternate minimums exist for the airport. If an “NA” appears after the “A,” NA then alternate minimums are not authorized. This information is found in the beginning of the TPP.

In addition to the COPTER approaches, instrument-equipped helicopters may fly standard approach procedures. The required visibility minimum may be reduced to one-half the published visibility minimum for category A aircraft, but

in no case may it be reduced to less than 1/4 mile or 1,200 feet RVR.


Two terms are specific to helicopters. Height above landing (HAL) means height above a designated helicopter landing area used for helicopter IAPs. “Point in space approach” refers to a helicopter IAP to a MAP more than 2,600 feet from an associated helicopter landing area.

### Airport Sketch /Airport Diagram

The airport sketch, located on the bottom right side of the chart, includes many helpful features. IAPs for some of the larger airports devote an entire page to an airport diagram. Airport sketch information concerning runway orientation, lighting, final approach bearings, airport beacon, and obstacles all serve to guide the pilot in the final phases of flight. See *Figure 8-21* for a legend of airport diagram/airport sketch features (see also *Figure 8-10* for an example of an airport diagram).

The airport elevation is indicated in a separate box at the top left of the airport sketch. The touchdown zone elevation (TDZE), which is the highest elevation within the first 3,000 feet of the runway, is designated at the approach end of the procedure’s runway.

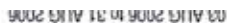
Beneath the airport sketch is a time and speed table when applicable. The table provides the distance and the amount of time required to transit the distance from the FAF to the MAP for selected groundspeeds.

The approach lighting systems and the visual approach lights are depicted on the airport sketch. White on black symbols  are used for identifying pilot-controlled lighting (PCL). Runway lighting aids are also noted (e.g., REIL, HIRL), as is the runway centerline lighting (RCL). [Figure 8-22]

The airport diagram shows the paved runway configuration in solid black, while the taxiways and aprons are shaded gray. Other runway environment features are shown, such as the runway identification, dimensions, magnetic heading, displaced threshold, arresting gear, usable length, and slope.

### Inoperative Components

Certain procedures can be flown with inoperative components. According to the Inoperative Components Table, for example, an ILS approach with a malfunctioning Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR = MALS with RAIL) can be flown if the minimum visibility is increased by 1/4 mile. [Figure 8-23] A note in this section might read, “Inoperative Table does not apply to ALS or HIRL Runway 13L.”

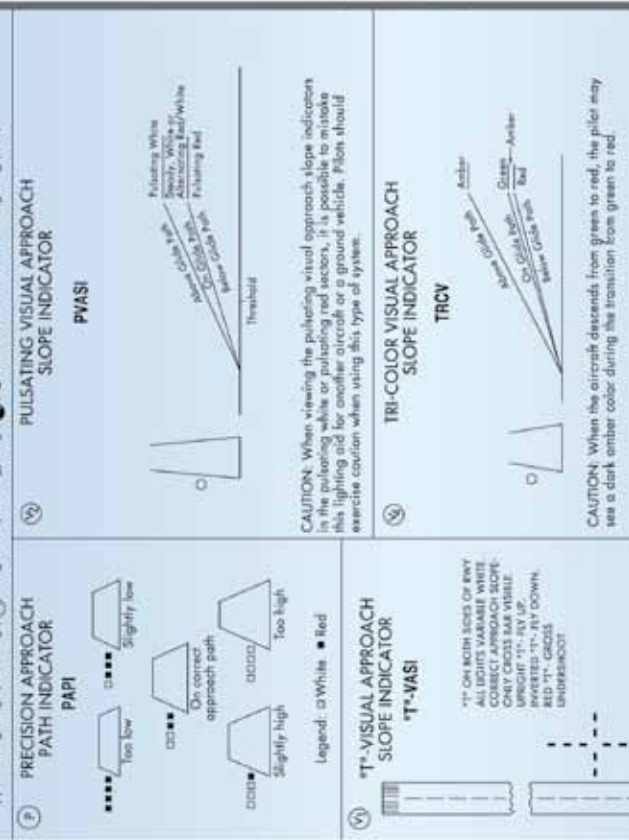


**Figure 8-21. Airport Legend and Diagram.**

## INSTRUMENT APPROACH PROCEDURES (CHARTS)

APPROACH LIGHTING SYSTEM - UNITED STATES

Approach lighting and visual glide slope systems are indicated on the airport sketch by an identifier, e.g.   etc. A dot "\*" portrayed with approach lighting letter identifier indicates sequenced flashing lights (IF) installed with the approach lighting system (e.g.,                       ).   indicates Pilot Controlled Lighting (PCL).



ALIGNMENT OF ELEMENTS SYSTEMS



Pointed panels which may be lighted at night. To use the system the pilot positions the aircraft so the elements are in alignment.

**Figure 8-22.** Approach Lighting Legend.



# INOP COMPONENTS

06215

## INOPERATIVE COMPONENTS OR VISUAL AIDS TABLE

Landing minimums published on instrument approach procedure charts are based upon full operation of all components and visual aids associated with the particular instrument approach chart being used. Higher minimums are required with inoperative components or visual aids as indicated below. If more than one component is inoperative, each minimum is raised to the highest minimum required by any single component that is inoperative. ILS glide slope inoperative minimums are published on the instrument approach charts as localizer minimums. This table may be amended by notes on the approach chart. Such notes apply only to the particular approach category(ies) as stated. See legend page for description of components indicated below.

### (1) ILS, MLS, PAR, and RNAV (RNP; LPV; LNAV/VNAV lines of minima)

Inoperative Component or Aid	Approach Category	Increase Visibility
ALSF 1 & 2, MALSR, & SSALR	ABCD	1/4 mile

### (2) ILS with visibility minimum of 1,800 RVR

ALSF 1 & 2, MALSR, & SSALR	ABCD	To 4000 RVR
TDZL RCLS	ABCD	To 2400 RVR
RVR	ABCD	To 1/2 mile

### (3) VOR, VOR/DME, TACAN, LOC, LOC/DME, LDA, LDA/DME, SDF, SDF/DME, GPS, ASR and RNAV (LNAV line of minima)

Inoperative Visual Aid	Approach Category	Increase Visibility
ALSF 1 & 2, MALSR, & SSALR	ABCD	1/2 mile
SSALS, MALS, & ODALS	ABC	1/4 mile

### (4) NDB

ALSF 1 & 2, MALSR, & SSALR	C	1/2 mile
MALS, SSALS, ODALS	ABD	1/4 mile
	ABC	1/4 mile

## CORRECTIONS, COMMENTS AND/OR PROCUREMENT

FOR CHANGES, ADDITIONS, OR RECOMMENDATIONS ON PROCEDURAL ASPECTS CONTACT:

FAA, Aeronautical Information Services, ATO-R  
800 Independence Avenue, SW  
Washington, DC 20591  
Telephone 1-866-295-8236

FOR CHARTING ERRORS CONTACT:

FAA, National Aeronautical Charting Office, ATO-W  
SSMC-4, Sta. #2335  
1305 East West Highway  
Silver Spring, MD 20910-3281  
Telephone 1-800-626-3677  
Email 9-AMC-Aerochart@faa.gov

FOR PROCUREMENT CONTACT:

FAA, National Aeronautical Charting Office  
Distribution Division, ATO-W  
10201 Good Luck Road  
Glenn Dale, MD 20769-9700  
Online at [www.naco.faa.gov](http://www.naco.faa.gov)  
Email 9-AMC-Chartsales@faa.gov  
Telephone 1-800-638-8972  
Fax 301-436-6829  
or any authorized chart agent

Frequently asked questions (FAQ) are answered on our website at [www.naco.faa.gov](http://www.naco.faa.gov). See the FAQs prior to contact via toll free number or email.

Request for the creation or revisions to Airport Diagrams should be in accordance with FAA Order 7910.4.

# INOP COMPONENTS

06215

Figure 8-23. IAP Inoperative Components Table.



## RNAV Instrument Approach Charts

To avoid unnecessary duplication and proliferation of approach charts, approach minimums for unaugmented GPS, Wide Area Augmentation System (WAAS), Local Area Augmentation System (LAAS), will be published on the same approach chart as lateral navigation/vertical navigation (LNAV/VNAV). Other types of equipment may be authorized to conduct the approach based on the minima notes in the front of the TPP approach chart books. Approach charts titled “RNAV RWY XX” may be used by aircraft with navigation systems that meet the required navigational performance (RNP) values for each segment of the approach.

*[Figure 8-24]*

The chart may contain as many as four lines of approach minimums: global landing system (GLS), WAAS and LAAS, LNAV/VNAV, LNAV, and circling. LNAV/VNAV is an instrument approach with lateral and vertical guidance with integrity limits similar to barometric vertical navigation (BARO VNAV).

RNAV procedures that incorporate a final approach stepdown fix may be published without vertical navigation on a separate chart also titled RNAV. During a transition period when GPS procedures are undergoing revision to a new title, both RNAV and GPS approach charts and formats will be published. ATC clearance for the RNAV procedure will authorize a properly certificated pilot to utilize any landing minimums for which the aircraft is certified.

Chart terminology will change slightly to support the new procedure types:

1. DA replaces the term DH. DA conforms to the international convention where altitudes relate to MSL and heights relate to AGL. DA will eventually be published for other types of IAPs with vertical guidance, as well. DA indicates to the pilot that the published descent profile is flown to the DA (MSL), where a missed approach will be initiated if visual references for landing are not established. Obstacle clearance is provided to allow a momentary descent below DA while transitioning from the final approach to the missed approach. The aircraft is expected to follow the missed approach instructions while continuing along the published final approach course to at least the published runway threshold waypoint or MAP (if not at the threshold) before executing any turns.

2. MDA will continue to be used only for the LNAV and circling procedures.
3. Threshold crossing height (TCH) has been traditionally used in precision approaches as the height of the GS above threshold. With publication of LNAV/VNAV minimums and RNAV descent angles, including graphically depicted descent profiles, TCH also applies to the height of the “descent angle,” or glide path, at the threshold. Unless otherwise required for larger type aircraft, which may be using the IAP, the typical TCH will be 30 to 50 feet.

The minima format changes slightly:

1. Each line of minima on the RNAV IAP will be titled to reflect the RNAV system applicable (e.g., GLS, LNAV/VNAV, and LNAV). Circling minima will also be provided.
2. The minima title box will also indicate the nature of the minimum altitude for the IAP. For example: DA will be published next to the minima line title for minimums supporting vertical guidance, and MDA will be published where the minima line supports only lateral guidance. During an approach where an MDA is used, descent below MDA is not authorized.
3. Where two or more systems share the same minima, each line of minima will be displayed separately.

For more information concerning government charts, the NACG can be contacted by telephone, or via their internet address at:

National Aeronautical Charting Group  
Telephone 800-626-3677  
<http://naco.faa.gov/>