U.S. Department
of Transportation

**Federal Aviation
Administration**

Aeronautical Information Manual

Change 2

January 22, 2026

**DO NOT DESTROY
BASIC DATED**

February 20, 2025

Aeronautical Information Manual

Explanation of Changes

Effective: January 22, 2026

a. 3−5−5. PUBLISHED VFR ROUTES

This change adds a link to the VFR Helicopter route website.

b. 4−1−21. AIRPORT RESERVATION OPERATIONS AND SPECIAL TRAFFIC MANAGEMENT PROGRAMS

This change adds guidance regarding Prior Permission Required (PPR) when conditions exist that may affect operations at an airport.

c. 4−7−1. INTRODUCTION AND GENERAL POLICIES
4-7-2. ACCOMODATING NON-RNP 10 AIRCRAFT
4-7-5. FLIGHT PLAN REQUIREMENTS

Editorial changes were made to update Flight Information Region/Upper Control Area (FIR/UTA) and Control Area (CTA), to CTA/FIR.

d. 5−1−1. PREFLIGHT PREPARATION
7−1−2. FAA WEATHER SERVICES

This change adds a new contact telephone number for flight service stations in Alaska: 1−833−AK−BRIEF.

e. 5–3−1. ARTCC COMMUNICATIONS

This change adds new uplink and downlink messages sets in Chapter 5 of the AIM.

f. 5–3−1. ARTCC COMMUNICATIONS
APPENDIX 3. ABBREVIATIONS/ACRONYMS

This change updates references to "Initial Services" in the body of the paragraph and updates the message set tables to reflect the currently available CPDLC messages in the domestic operation. TBL 5–3–1 through 5–3–19 was added to and updated to extend to TBL 5–3–23. New abbreviations were added to Appendix 3.

g. 5−4−14. SIMULTANEOUS DEPENDENT APPROACHES
5−4−16. SIMULTANEOUS CLOSE PARALLEL PRM APPROACHES AND SIMULTANEOUS OFFSET INSTRUMENT APPROACHES (SOIA)

This change removes erroneous notes stating KSFO uses SOIA procedures.

h. 5−4−20. APPROACH AND LANDING MINIMUMS

This change clarifies pilot guidance to reinforce compliance with 14 CFR 91.126, consistent with Office of Chief Counsel interpretations.

i. 7−4−9. AIR TRAFFIC WAKE TURBULENCE SEPARATIONS
7−4−10. DEVELOPMENT AND NEW CAPABILITIES

This change aligns the Aeronautical Information Manual (AIM) with the FAA effort to recategorize the existing fleet of aircraft and modify the associated wake turbulence separation minima. All prior references to Wake RECAT are removed due to this effort.

j. 7−7−4. UNIDENTIFIED FLYING OBJECT (UFO) REPORTS

This change retitles 7−7−4 to "Unidentified Anomalous Phenomena (UAP) Reports," deletes the reference to non−governmental UFO data collection entities, and adds a link to the AARO website for reporting UAP activity.

k. 11−4−6. AIRSPACE RESTRICTIONS TO FLIGHT

This change updates and clarifies the proper balance between state, local and federal (FAA) jurisdiction to regulate aviation. This change also clarifies information related to Temporary Flight Restrictions (TFRs) and provides updated language regarding "No Drone Zones."

l. Editorial Changes

Editorial changes include several minor corrections throughout Chapter 7, Section 6; the addition of the word "known" when describing identifying obstacles associated with the Digital Obstacle File (DOF) in paragraph 9−1−4; a universal editorial change to ensure FAA Order JO 7340.2 references are accurate; and a universal editorial change to update terms from the National Aeronautical Charting office to FAA's Aeronautical Information Services (AIS) and updating National Flight Data Center (NFDC) for its replacement AIS, and the term AeroNav Products is removed for the term AIS.

m. Entire Publication

Additional editorial/format changes were made where necessary. Revision bars were not used because of the insignificant nature of these changes.

AIM Change 2
Page Control Chart
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(b) There are generally two types of RAIM fault messages. The first type of message indicates that there are not enough satellites available to provide RAIM integrity monitoring. The GPS navigation solution may be acceptable, but the integrity of the solution cannot be determined. The second type indicates that the RAIM integrity monitor has detected a potential error and that there is an inconsistency in the navigation solution for the given phase of flight. Without RAIM capability, the pilot has no assurance of the accuracy of the GPS position.

4. Selective Availability. Selective Availability (SA) is a method by which the accuracy of GPS is intentionally degraded. This feature was designed to deny hostile use of precise GPS positioning data. SA was discontinued on May 1, 2000, but many GPS receivers are designed to assume that SA is still active. New receivers may take advantage of the discontinuance of SA based on the performance values in ICAO Annex 10.

b. Operational Use of GPS. U.S. civil operators may use approved GPS equipment in oceanic airspace, certain remote areas, the National Airspace System and other States as authorized (please consult the applicable Aeronautical Information Publication). Equipage other than GPS may be required for the desired operation. GPS navigation is used for both Visual Flight Rules (VFR) and Instrument Flight Rules (IFR) operations.

1. VFR Operations

(a) GPS navigation has become an asset to VFR pilots by providing increased navigational capabilities and enhanced situational awareness. Although GPS has provided many benefits to the VFR pilot, care must be exercised to ensure that system capabilities are not exceeded. VFR pilots should integrate GPS navigation with electronic navigation (when possible), as well as pilotage and dead reckoning.

(b) GPS receivers used for VFR navigation vary from fully integrated IFR/VFR installation used to support VFR operations to hand−held devices. Pilots must understand the limitations of the receivers prior to using in flight to avoid misusing navigation information. (See TBL 1−1−6.) Most receivers are not intuitive. The pilot must learn the various keystrokes, knob functions, and displays that are used in the operation of the receiver. Some manufacturers provide computer−based tutorials or simulations of their receivers that pilots can use to become familiar with operating the equipment.

(c) When using GPS for VFR operations, RAIM capability, database currency, and antenna location are critical areas of concern.

(1) RAIM Capability. VFR GPS panel mount receivers and hand−held units have no RAIM alerting capability. This prevents the pilot from being alerted to the loss of the required number of satellites in view, or the detection of a position error. Pilots should use a systematic cross−check with other navigation techniques to verify position. Be suspicious of the GPS position if a disagreement exists between the two positions.

(2) Database Currency. Check the currency of the database. Databases must be updated for IFR operations and should be updated for all other operations. However, there is no requirement for databases to be updated for VFR navigation. It is not recommended to use a moving map with an outdated database in and around critical airspace. Pilots using an outdated database should verify waypoints using current aeronautical products; for example, Chart Supplement, Sectional Chart, or En Route Chart.

(3) Antenna Location. The antenna location for GPS receivers used for IFR and VFR operations may differ. VFR antennae are typically placed for convenience more than performance, while IFR installations ensure a clear view is provided with the satellites. Antennae not providing a clear view have a greater opportunity to lose the satellite navigational signal. This is especially true in the case of hand−held GPS receivers. Typically, suction cups are used to place the GPS antennas on the inside of cockpit windows. While this method has great utility, the antenna location is limited to the cockpit or cabin which rarely provides a clear view of all available satellites. Consequently, signal losses may occur due to aircraft structure blocking satellite signals, causing a loss of navigation capability. These losses, coupled with a lack of RAIM capability, could present erroneous position and navigation information with no warning to the pilot. While the use of a hand−held GPS for VFR operations is not limited by regulation, modification of the aircraft, such as installing a panel− or yoke−mounted holder, is governed by 14 CFR part 43. Consult with your mechanic to ensure compliance with the regulation and safe installation.

(d) Do not solely rely on GPS for VFR navigation. No design standard of accuracy or integrity is used for a VFR GPS receiver. VFR GPS receivers should be used in conjunction with other forms of navigation during VFR operations to ensure a correct route of flight is maintained. Minimize head−down time in the aircraft by being familiar with your GPS receiver's operation and by keeping eyes outside scanning for traffic, terrain, and obstacles.

(e) VFR Waypoints

(1) VFR waypoints provide VFR pilots with a supplementary tool to assist with position awareness while navigating visually in aircraft equipped with area navigation receivers. VFR waypoints should be used as a tool to supplement current navigation procedures. The uses of VFR waypoints include providing navigational aids for pilots unfamiliar with an area, waypoint definition of existing reporting points, enhanced navigation in and around Class B and Class C airspace, enhanced navigation around Special Use Airspace, and entry points for commonly flown mountain passes. VFR pilots should rely on appropriate and current aeronautical charts published specifically for visual navigation. If operating in a terminal area, pilots should take advantage of the Terminal Area Chart available for that area, if published. The use of VFR waypoints does not relieve the pilot of any responsibility to comply with the operational requirements of 14 CFR part 91.

(2) VFR waypoint names (for computer entry and flight plans) consist of five letters beginning with the letters "VP" and are retrievable from navigation databases. The VFR waypoint names are not intended to be pronounceable, and they are not for use in ATC communications. On VFR charts, stand−alone VFR waypoints will be portrayed using the same four−point star symbol used for IFR waypoints. VFR waypoints collocated with visual check−points on the chart will be identified by small magenta flag symbols. VFR waypoints collocated with visual check−points will be pronounceable based on the name of the visual check−point and may be used for ATC communications. Each VFR waypoint name will appear in parentheses adjacent to the geographic location on the chart. Latitude/longitude data for all established VFR waypoints is accessible through FAA Order JO 7350.9, Location Identifiers.

(3) VFR waypoints may not be used on IFR flight plans. VFR waypoints are not recognized by the IFR system and will be rejected for IFR routing purposes.

(4) Pilots may use the five−letter identifier as a waypoint in the route of flight section on a VFR flight plan. Pilots may use the VFR waypoints only when operating under VFR conditions. The point may represent an intended course change or describe the planned route of flight. This VFR filing would be similar to how a VOR would be used in a route of flight.

(5) VFR waypoints intended for use during flight should be loaded into the receiver while on the ground. Once airborne, pilots should avoid programming routes or VFR waypoint chains into their receivers.

(6) Pilots should be vigilant to see and avoid other traffic when near VFR waypoints. With the increased use of GPS navigation and accuracy, expect increased traffic near VFR waypoints. Regardless of the class of airspace, monitor the available ATC frequency for traffic information on other aircraft operating in the vicinity. See paragraph 7−6−3, VFR in Congested Areas, for more information.

(7) Mountain pass entry points are marked for convenience to assist pilots with flight planning and visual navigation. Do not attempt to fly a mountain pass directly from VFR waypoint to VFR waypoint—they do not create a path through the mountain pass. Alternative routes are always available. It is the pilot in command's responsibility to choose a suitable route for the intended flight and known conditions.

REFERENCE−
AIM, Para 7−6−7, Mountain Flying.

2. IFR Use of GPS

(a) General Requirements. Authorization to conduct any GPS operation under IFR requires:

(1) GPS navigation equipment used for IFR operations must be approved in accordance with the requirements specified in Technical Standard Order (TSO) TSO−C129(), TSO−C196(), TSO−C145(), or TSO−C146(), and the installation must be done in accordance with Advisory Circular AC 20−138, Airworthiness

Approval of Positioning and Navigation Systems. Equipment approved in accordance with TSO−C115a does not meet the requirements of TSO−C129. Visual flight rules (VFR) and hand−held GPS systems are not authorized for IFR navigation, instrument approaches, or as a principal instrument flight reference.

(2) Aircraft using un-augmented GPS (TSO-C129() or TSO-C196()) for navigation under IFR must be equipped with an alternate approved and operational means of navigation suitable for navigating the proposed route of flight. (Examples of alternate navigation equipment include VOR or DME/DME/IRU capability). Active monitoring of alternative navigation equipment is not required when RAIM is available for integrity monitoring. Active monitoring of an alternate means of navigation is required when the GPS RAIM capability is lost.

(3) Procedures must be established for use in the event that the loss of RAIM capability is predicted to occur. In situations where RAIM is predicted to be unavailable, the flight must rely on other approved navigation equipment, re-route to where RAIM is available, delay departure, or cancel the flight.

(4) The GPS operation must be conducted in accordance with the FAA−approved aircraft flight manual (AFM) or flight manual supplement. Flight crew members must be thoroughly familiar with the particular GPS equipment installed in the aircraft, the receiver operation manual, and the AFM or flight manual supplement. Operation, receiver presentation and capabilities of GPS equipment vary. Due to these differences, operation of GPS receivers of different brands, or even models of the same brand, under IFR should not be attempted without thorough operational knowledge. Most receivers have a built−in simulator mode, which allows the pilot to become familiar with operation prior to attempting operation in the aircraft.

(5) Aircraft navigating by IFR−approved GPS are considered to be performance−based navigation (PBN) aircraft and have special equipment suffixes. File the appropriate equipment suffix in accordance with Appendix 4, TBL 4−2, on the ATC flight plan. If GPS avionics become inoperative, the pilot should advise ATC and amend the equipment suffix.

(6) Prior to any GPS IFR operation, the pilot must review appropriate NOTAMs and aeronautical information. (See GPS NOTAMs/Aeronautical Information).

(b) Database Requirements. The onboard navigation data must be current and appropriate for the region of intended operation and should include the navigation aids, waypoints, and relevant coded terminal airspace procedures for the departure, arrival, and alternate airfields.

(1) Further database guidance for terminal and en route requirements may be found in AC 90-100, U.S. Terminal and En Route Area Navigation (RNAV) Operations.

(2) Further database guidance on Required Navigation Performance (RNP) instrument approach operations, RNP terminal, and RNP en route requirements may be found in AC 90-105, Approval Guidance for RNP Operations and Barometric Vertical Navigation in the U.S. National Airspace System.

(3) All approach procedures to be flown must be retrievable from the current airborne navigation database supplied by the equipment manufacturer or other FAA−approved source. The system must be able to retrieve the procedure by name from the aircraft navigation database, not just as a manually entered series of waypoints. Manual entry of waypoints using latitude/longitude or place/bearing is not permitted for approach procedures.

(4) Prior to using a procedure or waypoint retrieved from the airborne navigation database, the pilot should verify the validity of the database. This verification should include the following preflight and inflight steps:

[a] Preflight:

[1] Determine the date of database issuance, and verify that the date/time of proposed use is before the expiration date/time.

[2] Verify that the database provider has not published a notice limiting the use of the specific waypoint or procedure.

[b] Inflight:

[1] Determine that the waypoints and transition names coincide with names found on the procedure chart. Do not use waypoints which do not exactly match the spelling shown on published procedure charts.

[2] Determine that the waypoints are logical in location, in the correct order, and their orientation to each other is as found on the procedure chart, both laterally and vertically.

NOTE–
There is no specific requirement to check each waypoint latitude and longitude, type of waypoint and/or altitude constraint, only the general relationship of waypoints in the procedure, or the logic of an individual waypoint's location.

[3] If the cursory check of procedure logic or individual waypoint location, specified in [b] above, indicates a potential error, do not use the retrieved procedure or waypoint until a verification of latitude and longitude, waypoint type, and altitude constraints indicate full conformity with the published data.

(5) Air carrier and commercial operators must meet the appropriate provisions of their approved operations specifications.

[a] During domestic operations for commerce or for hire, operators must have a second navigation system capable of reversion or contingency operations.

[b] Operators must have two independent navigation systems appropriate to the route to be flown or one system that is suitable and a second, independent backup system that allows the operator to proceed safely to a suitable airport, complete an instrument approach; and the aircraft must have sufficient fuel (reference 14 CFR 121.349, 125.203, 129.17, and 135.165). These rules ensure the safety of the operation by preventing a single point of failure.

NOTE–
An aircraft approved for multi-sensor navigation and equipped with a single navigation system must maintain an ability to navigate or proceed safely in the event that any one component of the navigation system fails, including the flight management system (FMS). Retaining an FMS-independent VOR capability would satisfy this requirement.

[c] The requirements for a second system apply to the entire set of equipment needed to achieve the navigation capability, not just the individual components of the system such as the radio navigation receiver. For example, to use two RNAV systems (e.g., GPS and DME/DME/IRU) to comply with the requirements, the aircraft must be equipped with two independent radio navigation receivers and two independent navigation computers (e.g., flight management systems (FMS)). Alternatively, to comply with the requirements using a single RNAV system with an installed and operable VOR capability, the VOR capability must be independent of the FMS.

[d] Due to low risk of disruption or manipulation of GPS signals beyond 50 NM offshore, FAA differentiates between extended and non−extended over−water operations. To satisfy the requirement of two independent navigation systems:

[1] For all extended over−water operations (defined in 14 CFR Part 1 as greater than 50 NM from the nearest shoreline), operators may consider dual GPS−based systems to meet the "independent" criteria stipulated by regulation, e.g. §121.349, §135.165.

[2] For all "non−extended overwater" operations, if the primary navigation system is GPS−based, the second system must be independent of GPS (for example, VOR or DME/DME/IRU). This allows continued navigation in case of failure of the GPS or WAAS services. Recognizing that GPS interference and test events resulting in the loss of GPS services have become more common, the FAA requires operators conducting IFR operations under 14 CFR 121.349, 125.203, 129.17 and 135.65 to retain a non−GPS navigation capability, for example either DME/DME, IRU, or VOR for en route and terminal operations, and VOR and ILS for final approach. Since this system is to be used as a reversionary capability, single equipage is sufficient.

3. Oceanic, Domestic, En Route, and Terminal Area Operations

(a) Conduct GPS IFR operations in oceanic areas only when approved avionics systems are installed. TSO−C196() users and TSO−C129() GPS users authorized for Class A1, A2, B1, B2, C1, or C2 operations may use GPS in place of another approved means of long−range navigation, such as dual INS. (See TBL 1−1−5 and TBL 1−1−6.) Aircraft with a single installation GPS, meeting the above specifications, are authorized to operate on short oceanic routes requiring one means of long−range navigation (reference AC 20-138, Appendix 1).

(b) Conduct GPS domestic, en route, and terminal IFR operations only when approved avionics systems are installed. Pilots may use GPS via TSO−C129() authorized for Class A1, B1, B3, C1, or C3 operations GPS via TSO-C196(); or GPS/WAAS with either TSO-C145() or TSO-C146(). When using TSO-C129() or TSO-C196() receivers, the avionics necessary to receive all of the ground−based facilities appropriate for the route to the destination airport and any required alternate airport must be installed and operational. Ground−based facilities necessary for these routes must be operational.

(1) GPS en route IFR operations may be conducted in Alaska outside the operational service volume of ground−based navigation aids when a TSO−C145() or TSO−C146() GPS/wide area augmentation system (WAAS) system is installed and operating. WAAS is the U.S. version of a satellite-based augmentation system (SBAS).

[a] In Alaska, aircraft may operate on GNSS Q-routes with GPS (TSO-C129 () or TSO-C196 ()) equipment while the aircraft remains in Air Traffic Control (ATC) radar surveillance or with GPS/WAAS (TSO-C145 () or TSO-C146 ()) which does not require ATC radar surveillance.

[b] In Alaska, aircraft may only operate on GNSS T-routes with GPS/WAAS (TSO-C145 () or TSO-C146 ()) equipment.

(2) Ground−based navigation equipment is not required to be installed and operating for en route IFR operations when using GPS/WAAS navigation systems. All operators should ensure that an alternate means of navigation is available in the unlikely event the GPS/WAAS navigation system becomes inoperative.

(3) Q-routes and T-routes outside Alaska. Q-routes require system performance currently met by GPS, GPS/WAAS, or DME/DME/IRU RNAV systems that satisfy the criteria discussed in AC 90−100, U.S. Terminal and En Route Area Navigation (RNAV) Operations. T-routes require GPS or GPS/WAAS equipment.

REFERENCE−
AIM, Para 5−3−4, Airways and Route Systems.

(c) GPS IFR approach/departure operations can be conducted when approved avionics systems are installed and the following requirements are met:

(1) The aircraft is TSO−C145() or TSO−C146() or TSO−C196() or TSO−C129() in Class A1, B1, B3, C1, or C3; and

(2) The approach/departure must be retrievable from the current airborne navigation database in the navigation computer. The system must be able to retrieve the procedure by name from the aircraft navigation database. Manual entry of waypoints using latitude/longitude or place/bearing is not permitted for approach procedures.

(3) The authorization to fly instrument approaches/departures with GPS is limited to U.S. airspace.

(4) The use of GPS in any other airspace must be expressly authorized by the FAA Administrator.

(5) GPS instrument approach/departure operations outside the U.S. must be authorized by the appropriate sovereign authority.

4. Departures and Instrument Departure Procedures (DPs)

The GPS receiver must be set to terminal (±1 NM) CDI sensitivity and the navigation routes contained in the database in order to fly published IFR charted departures and DPs. Terminal RAIM should be automatically provided by the receiver. (Terminal RAIM for departure may not be available unless the waypoints are part of the active flight plan rather than proceeding direct to the first destination.) Certain segments of a DP may require some manual intervention by the pilot, especially when radar vectored to a course or required to intercept a specific course to a waypoint. The database may not contain all of the transitions or departures from all runways and some GPS receivers do not contain DPs in the database. It is necessary that helicopter procedures be flown at 70 knots or less since helicopter departure procedures and missed approaches use a 20:1 obstacle clearance surface (OCS), which is double the fixed−wing OCS, and turning areas are based on this speed as well.

5. GPS Instrument Approach Procedures

(a) GPS overlay approaches are designated non−precision instrument approach procedures that pilots are authorized to fly using GPS avionics. Localizer (LOC), localizer type directional aid (LDA), and simplified directional facility (SDF) procedures are not authorized. Overlay procedures are identified by the "name of the procedure" and "or GPS" (e.g., VOR/DME or GPS RWY 15) in the title. Authorized procedures must be retrievable from a current onboard navigation database. The navigation database may also enhance position orientation by displaying a map containing information on conventional NAVAID approaches. This approach information should not be confused with a GPS overlay approach (see the receiver operating manual, AFM, or AFM Supplement for details on how to identify these approaches in the navigation database).

NOTE−

Overlay approaches do not adhere to the design criteria described in paragraph 5−4−5m, Area Navigation (RNAV) Instrument Approach Charts, for stand−alone GPS approaches. Overlay approach criteria is based on the design criteria used for ground−based NAVAID approaches.

(b) Stand−alone approach procedures specifically designed for GPS systems have replaced many of the original overlay approaches. All approaches that contain "GPS" in the title (e.g., "VOR or GPS RWY 24," "GPS RWY 24," or "RNAV (GPS) RWY 24") can be flown using GPS. GPS−equipped aircraft do not need underlying ground−based NAVAIDs or associated aircraft avionics to fly the approach. Monitoring the underlying approach with ground−based NAVAIDs is suggested when able. Existing overlay approaches may be requested using the GPS title; for example, the VOR or GPS RWY 24 may be requested as "GPS RWY 24." Some GPS procedures have a Terminal Arrival Area (TAA) with an underlining RNAV approach.

(c) For flight planning purposes, TSO-C129() and TSO-C196()−equipped users (GPS users) whose navigation systems have fault detection and exclusion (FDE) capability, who perform a preflight RAIM prediction for the approach integrity at the airport where the RNAV (GPS) approach will be flown, and have proper knowledge and any required training and/or approval to conduct a GPS-based IAP, may file based on a GPS−based IAP at either the destination or the alternate airport, but not at both locations. At the alternate airport, pilots may plan for:

(1) Lateral navigation (LNAV) or circling minimum descent altitude (MDA);

(2) LNAV/vertical navigation (LNAV/VNAV) DA, if equipped with and using approved barometric vertical navigation (baro-VNAV) equipment;

(3) RNP 0.3 DA on an RNAV (RNP) IAP, if they are specifically authorized users using approved baro-VNAV equipment and the pilot has verified required navigation performance (RNP) availability through an approved prediction program.

(d) If the above conditions cannot be met, any required alternate airport must have an approved instrument approach procedure other than GPS−based that is anticipated to be operational and available at the estimated time of arrival, and which the aircraft is equipped to fly.

(e) Procedures for Accomplishing GPS Approaches

(1) An RNAV (GPS) procedure may be associated with a Terminal Arrival Area (TAA). The basic design of the RNAV procedure is the "T" design or a modification of the "T" (See Paragraph 5-4-5d, Terminal Arrival Area (TAA), for complete information).

(2) Pilots cleared by ATC for an RNAV (GPS) approach should fly the full approach from an Initial Approach Waypoint (IAWP) or feeder fix. Randomly joining an approach at an intermediate fix does not assure terrain clearance.

(3) When an approach has been loaded in the navigation system, GPS receivers will give an "arm" annunciation 30 NM straight line distance from the airport/heliport reference point. Pilots should arm the approach mode at this time if not already armed (some receivers arm automatically). Without arming, the receiver will not change from en route CDI and RAIM sensitivity of ±5 NM either side of centerline to ±1 NM terminal sensitivity. Where the IAWP is inside this 30 mile point, a CDI sensitivity change will occur once the approach mode is armed and the aircraft is inside 30 NM. Where the IAWP is beyond 30 NM from the airport/heliport reference point and the approach is armed, the CDI sensitivity will not change until the aircraft is within 30 miles of the airport/heliport reference point. Feeder route obstacle clearance is predicated on the receiver being in terminal (±1 NM) CDI sensitivity and RAIM within 30 NM of the airport/heliport reference point; therefore, the receiver should always be armed (if required) not later than the 30 NM annunciation.

(4) The pilot must be aware of what bank angle/turn rate the particular receiver uses to compute turn anticipation, and whether wind and airspeed are included in the receiver's calculations. This information should be in the receiver operating manual. Over or under banking the turn onto the final approach course may significantly delay getting on course and may result in high descent rates to achieve the next segment altitude.

(5) When within 2 NM of the Final Approach Waypoint (FAWP) with the approach mode armed, the approach mode will switch to active, which results in RAIM and CDI changing to approach sensitivity. Beginning 2 NM prior to the FAWP, the full scale CDI sensitivity will smoothly change from ±1 NM to ±0.3 NM at the FAWP. As sensitivity changes from ±1 NM to ±0.3 NM approaching the FAWP, with the CDI not centered, the corresponding increase in CDI displacement may give the impression that the aircraft is moving further away from the intended course even though it is on an acceptable intercept heading. Referencing the digital track displacement information (cross track error), if it is available in the approach mode, may help the pilot remain position oriented in this situation. Being established on the final approach course prior to the beginning of the sensitivity change at 2 NM will help prevent problems in interpreting the CDI display during ramp down. Therefore, requesting or accepting vectors which will cause the aircraft to intercept the final approach course within 2 NM of the FAWP is not recommended.

(6) When receiving vectors to final, most receiver operating manuals suggest placing the receiver in the non–sequencing mode on the FAWP and manually setting the course. This provides an extended final approach course in cases where the aircraft is vectored onto the final approach course outside of any existing segment which is aligned with the runway. Assigned altitudes must be maintained until established on a published segment of the approach. Required altitudes at waypoints outside the FAWP or stepdown fixes must be considered. Calculating the distance to the FAWP may be required in order to descend at the proper location.

(7) Overriding an automatically selected sensitivity during an approach will cancel the approach mode annunciation. If the approach mode is not armed by 2 NM prior to the FAWP, the approach mode will not become active at 2 NM prior to the FAWP, and the equipment will flag. In these conditions, the RAIM and CDI sensitivity will not ramp down, and the pilot should not descend to MDA, but fly to the MAWP and execute a missed approach. The approach active annunciator and/or the receiver should be checked to ensure the approach mode is active prior to the FAWP.

(8) Do not attempt to fly an approach unless the procedure in the onboard database is current and identified as "GPS" on the approach chart. The navigation database may contain information about non–overlay approach procedures that enhances position orientation generally by providing a map, while flying these approaches using conventional NAVAIDs. This approach information should not be confused with a GPS overlay approach (see the receiver operating manual, AFM, or AFM Supplement for details on how to identify these procedures in the navigation database). Flying point to point on the approach does not assure compliance with the published approach procedure. The proper RAIM sensitivity will not be available and the CDI sensitivity will not automatically change to ±0.3 NM. Manually setting CDI sensitivity does not automatically change the RAIM sensitivity on some receivers. Some existing non–precision approach procedures cannot be coded for use with GPS and will not be available as overlays.

(9) Pilots should pay particular attention to the exact operation of their GPS receivers for performing holding patterns and in the case of overlay approaches, operations such as procedure turns. These procedures may require manual intervention by the pilot to stop the sequencing of waypoints by the receiver and to resume automatic GPS navigation sequencing once the maneuver is complete. The same waypoint may appear in the route of flight more than once consecutively (for example, IAWP, FAWP, MAHWP on a procedure turn). Care must be exercised to ensure that the receiver is sequenced to the appropriate waypoint for the segment of the procedure being flown, especially if one or more fly−overs are skipped (for example, FAWP rather than IAWP if the procedure turn is not flown). The pilot may have to sequence past one or more fly−overs of the same waypoint in order to start GPS automatic sequencing at the proper place in the sequence of waypoints.

(10) Incorrect inputs into the GPS receiver are especially critical during approaches. In some cases, an incorrect entry can cause the receiver to leave the approach mode.

(11) A fix on an overlay approach identified by a DME fix will not be in the waypoint sequence on the GPS receiver unless there is a published name assigned to it. When a name is assigned, the along track distance (ATD) to the waypoint may be zero rather than the DME stated on the approach chart. The pilot should be alert for this on any overlay procedure where the original approach used DME.

(12) If a visual descent point (VDP) is published, it will not be included in the sequence of waypoints. Pilots are expected to use normal piloting techniques for beginning the visual descent, such as ATD.

(13) Unnamed stepdown fixes in the final approach segment may or may not be coded in the waypoint sequence of the aircraft's navigation database and must be identified using ATD. Stepdown fixes in the final approach segment of RNAV (GPS) approaches are being named, in addition to being identified by ATD. However, GPS avionics may or may not accommodate waypoints between the FAF and MAP. Pilots must know the capabilities of their GPS equipment and continue to identify stepdown fixes using ATD when necessary.

(f) Missed Approach

(1) A GPS missed approach requires pilot action to sequence the receiver past the MAWP to the missed approach portion of the procedure. The pilot must be thoroughly familiar with the activation procedure for the particular GPS receiver installed in the aircraft and must initiate appropriate action after the MAWP. Activating the missed approach prior to the MAWP will cause CDI sensitivity to immediately change to terminal (±1NM) sensitivity and the receiver will continue to navigate to the MAWP. The receiver will not sequence past the MAWP. Turns should not begin prior to the MAWP. If the missed approach is not activated, the GPS receiver will display an extension of the inbound final approach course and the ATD will increase from the MAWP until it is manually sequenced after crossing the MAWP.

(2) Missed approach routings in which the first track is via a course rather than direct to the next waypoint require additional action by the pilot to set the course. Being familiar with all of the inputs required is especially critical during this phase of flight.

(g) Receiver Autonomous Integrity Monitoring (RAIM)

(1) RAIM outages may occur due to an insufficient number of satellites or due to unsuitable satellite geometry which causes the error in the position solution to become too large. Loss of satellite reception and RAIM warnings may occur due to aircraft dynamics (changes in pitch or bank angle). Antenna location on the aircraft, satellite position relative to the horizon, and aircraft attitude may affect reception of one or more satellites. Since the relative positions of the satellites are constantly changing, prior experience with the airport does not guarantee reception at all times, and RAIM availability should always be checked.

(2) Civilian pilots may obtain GPS RAIM availability information for nonprecision approach procedures by using a manufacturer−supplied RAIM prediction tool, or using the Service Availability Prediction Tool (SAPT) on the FAA en route and terminal RAIM prediction website. Pilots can also request GPS RAIM aeronautical information from a flight service station during preflight briefings. GPS RAIM aeronautical information can be obtained for a period of 3 hours (for example, if you are scheduled to arrive at 1215 hours, then the GPS RAIM information is available from 1100 to 1400 hours) or a 24−hour timeframe at a particular airport. FAA briefers will provide RAIM information for a period of 1 hour before to 1 hour after the ETA hour, unless a specific timeframe is requested by the pilot. If flying a published GPS departure, a RAIM prediction should also be requested for the departure airport.

(3) The military provides airfield specific GPS RAIM NOTAMs for nonprecision approach procedures at military airfields. The RAIM outages are issued as M−series NOTAMs and may be obtained for up to 24 hours from the time of request.

(4) Receiver manufacturers and/or database suppliers may supply "NOTAM" type information concerning database errors. Pilots should check these sources when available, to ensure that they have the most current information concerning their electronic database.

(5) If RAIM is not available, use another type of navigation and approach system; select another route or destination; or delay the trip until RAIM is predicted to be available on arrival. On longer flights, pilots should consider rechecking the RAIM prediction for the destination during the flight. This may provide an early indication that an unscheduled satellite outage has occurred since takeoff.

(6) If a RAIM failure/status annunciation occurs prior to the final approach waypoint (FAWP), the approach should not be completed since GPS no longer provides the required integrity. The receiver performs a RAIM prediction by 2 NM prior to the FAWP to ensure that RAIM is available as a condition for entering the approach mode. The pilot should ensure the receiver has sequenced from "Armed" to "Approach" prior to the FAWP (normally occurs 2 NM prior). Failure to sequence may be an indication of the detection of a satellite anomaly, failure to arm the receiver (if required), or other problems which preclude flying the approach.

(7) If the receiver does not sequence into the approach mode or a RAIM failure/status annunciation occurs prior to the FAWP, the pilot must not initiate the approach nor descend, but instead, proceed to the missed approach waypoint (MAWP) via the FAWP, perform a missed approach, and contact ATC as soon as practical. The GPS receiver may continue to operate after a RAIM flag/status annunciation appears, but the navigation information should be considered advisory only. Refer to the receiver operating manual for specific indications and instructions associated with loss of RAIM prior to the FAF.

(8) If the RAIM flag/status annunciation appears after the FAWP, the pilot should initiate a climb and execute the missed approach. The GPS receiver may continue to operate after a RAIM flag/status annunciation appears, but the navigation information should be considered advisory only. Refer to the receiver operating manual for operating mode information during a RAIM annunciation.

(h) Waypoints

(1) GPS receivers navigate from one defined point to another retrieved from the aircraft's onboard navigational database. These points are waypoints (5-letter pronounceable name), existing VHF intersections, DME fixes with 5−letter pronounceable names and 3-letter NAVAID IDs. Each waypoint is a geographical location defined by a latitude/longitude geographic coordinate. These 5−letter waypoints, VHF intersections, 5−letter pronounceable DME fixes and 3−letter NAVAID IDs are published on various FAA aeronautical navigation products (IFR Enroute Charts, VFR Charts, Terminal Procedures Publications, etc.).

(2) A Computer Navigation Fix (CNF) is also a point defined by a latitude/longitude coordinate and is required to support Performance−Based Navigation (PBN) operations. The GPS receiver uses CNFs in conjunction with waypoints to navigate from point to point. However, CNFs are not recognized by ATC. ATC does not maintain CNFs in their database and they do not use CNFs for any air traffic control purpose. CNFs may or may not be charted on FAA aeronautical navigation products, are listed in the chart legends, and are for advisory purposes only. Pilots are not to use CNFs for point to point navigation (proceed direct), filing a flight plan, or in aircraft/ATC communications. CNFs that do appear on aeronautical charts allow pilots increased situational awareness by identifying points in the aircraft database route of flight with points on the aeronautical chart. CNFs are random five-letter identifiers, not pronounceable like waypoints and placed in parenthesis. Eventually, all CNFs will begin with the letters "CF" followed by three consonants (for example, CFWBG). This five-letter identifier will be found next to an "x" on enroute charts and possibly on an approach chart. On instrument approach procedures (charts) in the terminal procedures publication, CNFs may represent unnamed DME fixes, beginning and ending points of DME arcs, and sensor (ground-based signal i.e., VOR, NDB, ILS) final approach fixes on GPS overlay approaches. These CNFs provide the GPS with points on the procedure that allow the overlay approach to mirror the ground-based sensor approach. These points should only be used by the GPS system for navigation and should not be used by pilots for any other purpose on the approach. The CNF concept has not been adopted or recognized by the International Civil Aviation Organization (ICAO).

(3) GPS approaches use fly−over and fly−by waypoints to join route segments on an approach. Fly−by waypoints connect the two segments by allowing the aircraft to turn prior to the current waypoint in order to roll out on course to the next waypoint. This is known as turn anticipation and is compensated for in the airspace and terrain clearances. The missed approach waypoint (MAWP) will always be a fly−over waypoint. A holding waypoint will always be designed as a fly−over waypoint in the navigational database but may be charted as a fly−by event unless the holding waypoint is used for another purpose in the procedure and both events require the waypoint to be a fly−over event. Some waypoints may have dual use; for example, as a fly−by waypoint when used as an IF for a NoPT route and as a fly−over waypoint when the same waypoint is also used as an IAF/IF hold−in−lieu of PT. Since the waypoint can only be charted one way, when this situation occurs, the fly−by waypoint symbol will be charted in all uses of the waypoint.

(4) Unnamed waypoints for each airport will be uniquely identified in the database. Although the identifier may be used at different airports (for example, RW36 will be the identifier at each airport with a runway 36), the actual point, at each airport, is defined by a specific latitude/longitude coordinate.

(5) The runway threshold waypoint, normally the MAWP, may have a five−letter identifier (for example, SNEEZ) or be coded as RW## (for example, RW36, RW36L). MAWPs located at the runway threshold are being changed to the RW## identifier, while MAWPs not located at the threshold will have a five−letter identifier. This may cause the approach chart to differ from the aircraft database until all changes are complete. The runway threshold waypoint is also used as the center of the Minimum Safe Altitude (MSA) on most GPS approaches.

(i) Position Orientation. Pilots should pay particular attention to position orientation while using GPS. Distance and track information are provided to the next active waypoint, not to a fixed navigation aid. Receivers may sequence when the pilot is not flying along an active route, such as when being vectored or deviating for weather, due to the proximity to another waypoint in the route. This can be prevented by placing the receiver in the non-sequencing mode. When the receiver is in the non-sequencing mode, bearing and distance are provided to the selected waypoint and the receiver will not sequence to the next waypoint in the route until placed back in the auto sequence mode or the pilot selects a different waypoint. The pilot may have to compute the ATD to stepdown fixes and other points on overlay approaches, due to the receiver showing ATD to the next waypoint rather than DME to the VOR or ILS ground station.

(j) Impact of Magnetic Variation on PBN Systems

(1) Differences may exist between PBN systems and the charted magnetic courses on ground−based NAVAID instrument flight procedures (IFP), enroute charts, approach charts, and Standard Instrument Departure/Standard Terminal Arrival (SID/STAR) charts. These differences are due to the magnetic variance used to calculate the magnetic course. Every leg of an instrument procedure is first computed along a desired ground track with reference to true north. A magnetic variation correction is then applied to the true course in order to calculate a magnetic course for publication. The type of procedure will determine what magnetic variation value is added to the true course. A ground−based NAVAID IFP applies the facility magnetic variation of record to the true course to get the charted magnetic course. Magnetic courses on PBN procedures are calculated two different ways. SID/STAR procedures use the airport magnetic variation of record, while IFR enroute charts use magnetic reference bearing. PBN systems make a correction to true north by adding a magnetic variation calculated with an algorithm based on aircraft position, or by adding the magnetic variation coded in their navigational database. This may result in the PBN system and the procedure designer using a different magnetic variation, which causes the magnetic course ***displayed*** by the PBN system and the magnetic course ***charted*** on the IFP plate to be different. It is important to understand, however, that PBN systems, (with the exception of VOR/DME RNAV equipment) navigate by reference to true north and display magnetic course only for pilot reference. As such, a ***properly functioning*** PBN system, containing a ***current and accurate navigational database***, should fly the correct ground track for any loaded instrument procedure, despite differences in displayed magnetic course that may be attributed to magnetic variation application. Should significant differences between the approach chart and the PBN system avionics' application of the navigation database arise, the published approach chart, supplemented by NOTAMs, holds precedence.

(2) The course into a waypoint may not always be 180 degrees different from the course leaving the previous waypoint, due to the PBN system avionics' computation of geodesic paths, distance between waypoints, and differences in magnetic variation application. Variations in distances may also occur since PBN system distance−to−waypoint values are ATDs computed to the next waypoint and the DME values published on underlying procedures are slant−range distances measured to the station. This difference increases with aircraft altitude and proximity to the NAVAID.

(k) GPS Familiarization

Pilots should practice GPS approaches in visual meteorological conditions (VMC) until thoroughly proficient with all aspects of their equipment (receiver and installation) prior to attempting flight in instrument meteorological conditions (IMC). Pilots should be proficient in the following areas:

(1) Using the receiver autonomous integrity monitoring (RAIM) prediction function;

(2) Inserting a DP into the flight plan, including setting terminal CDI sensitivity, if required, and the conditions under which terminal RAIM is available for departure;

(3) Programming the destination airport;

(4) Programming and flying the approaches (especially procedure turns and arcs);

(5) Changing to another approach after selecting an approach;

(6) Programming and flying "direct" missed approaches;

(7) Programming and flying "routed" missed approaches;

(8) Entering, flying, and exiting holding patterns, particularly on approaches with a second waypoint in the holding pattern;

(9) Programming and flying a "route" from a holding pattern;

(10) Programming and flying an approach with radar vectors to the intermediate segment;

(11) Indication of the actions required for RAIM failure both before and after the FAWP; and

(12) Programming a radial and distance from a VOR (often used in departure instructions).

TBL 1−1−5

GPS IFR Equipment Classes/Categories

TSO−C129						
Equipment Class	**RAIM**	**Int. Nav. Sys. to Prov. RAIM Equiv.**	**Oceanic**	**En Route**	**Terminal**	**Non−precision Approach Capable**
Class A − GPS sensor and navigation capability.						
A1	yes		yes	yes	yes	yes
A2	yes		yes	yes	yes	no
Class B − GPS sensor data to an integrated navigation system (i.e., FMS, multi−sensor navigation system, etc.).						
B1	yes		yes	yes	yes	yes
B2	yes		yes	yes	yes	no
B3		yes	yes	yes	yes	yes
B4		yes	yes	yes	yes	no
Class C − GPS sensor data to an integrated navigation system (as in Class B) which provides enhanced guidance to an autopilot, or flight director, to reduce flight tech. errors. Limited to 14 CFR part 121 or equivalent criteria.						
C1	yes		yes	yes	yes	yes
C2	yes		yes	yes	yes	no
C3		yes	yes	yes	yes	yes
C4		yes	yes	yes	yes	no

TBL 1−1−6

GPS Approval Required/Authorized Use

Equipment Type[1]	**Installation Approval Required**	**Operational Approval Required**	**IFR En Route[2]**	**IFR Terminal[2]**	**IFR Approach[3]**	**Oceanic Remote**	**In Lieu of ADF and/or DME[3]**
Hand held[4]	X[5]						
VFR Panel Mount[4]	X						
IFR En Route and Terminal	X	X	X	X			X
IFR Oceanic/ Remote	X	X	X	X		X	X
IFR En Route, Terminal, and Approach	X	X	X	X	X		X

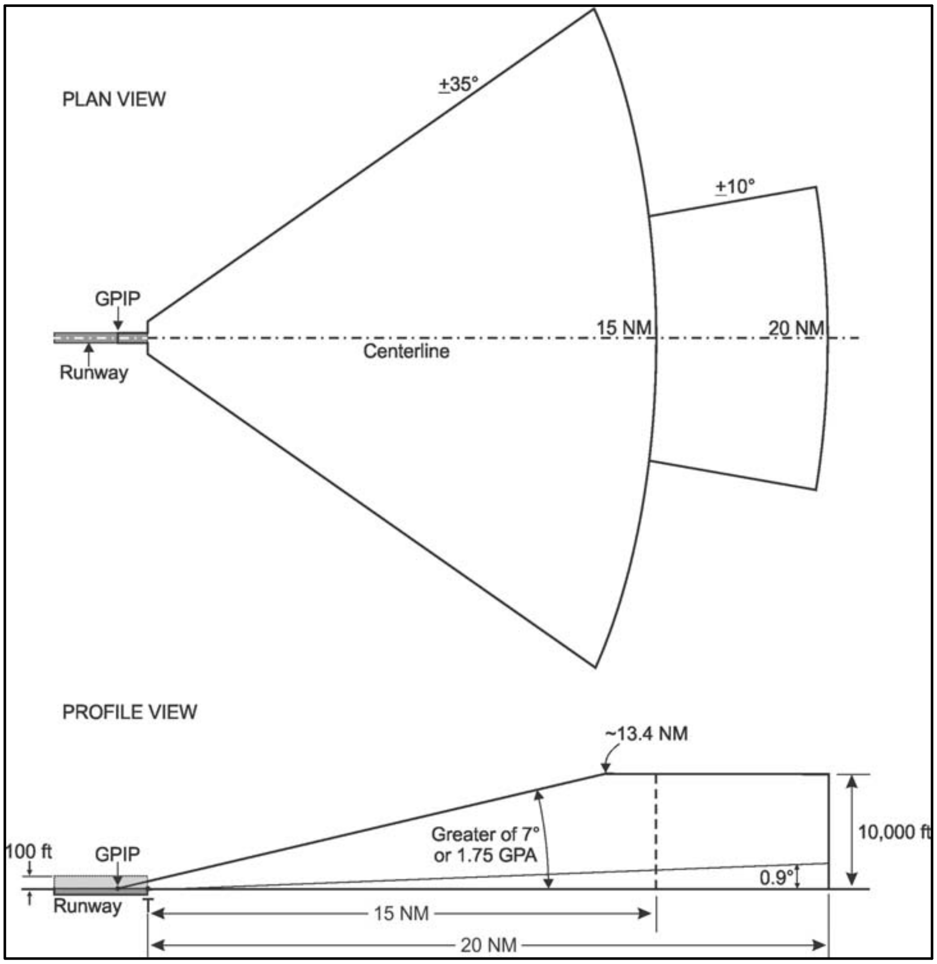
NOTE−
[1]*To determine equipment approvals and limitations, refer to the AFM, AFM supplements, or pilot guides.*
[2]*Requires verification of data for correctness if database is expired.*
[3]*Requires current database or verification that the procedure has not been amended since the expiration of the database.*
[4]*VFR and hand−held GPS systems are not authorized for IFR navigation, instrument approaches, or as a primary instrument flight reference. During IFR operations they may be considered only an aid to situational awareness.*
[5]*Hand−held receivers require no approval. However, any aircraft modification to support the hand−held receiver; i.e., installation of an external antenna or a permanent mounting bracket, does require approval.*

1−1−18. Wide Area Augmentation System (WAAS)

a. General

1. The FAA developed the WAAS to improve the accuracy, integrity and availability of GPS signals. WAAS will allow GPS to be used, as the aviation navigation system, from takeoff through approach when it is complete. WAAS is a critical component of the FAA's strategic objective for a seamless satellite navigation system for civil aviation, improving capacity and safety.

FIG 1−1−9
GLS Standard Approach Service Volume



1−1−20. Precision Approach Systems other than ILS and GLS

a. General

Approval and use of precision approach systems other than ILS and GLS require the issuance of special instrument approach procedures.

b. Special Instrument Approach Procedure

1. Special instrument approach procedures must be issued to the aircraft operator if pilot training, aircraft equipment, and/or aircraft performance is different than published procedures. Special instrument approach procedures are not distributed for general public use. These procedures are issued to an aircraft operator when the conditions for operations approval are satisfied.

2. General aviation operators requesting approval for special procedures should contact the local Flight Standards District Office to obtain a letter of authorization. Air carrier operators requesting approval for use of special procedures should contact their Certificate Holding District Office for authorization through their Operations Specification.

REFERENCE−
AIM, Para 5−4−7, Instrument Approach Procedures, Subpara i.

Pilot adherence to VFR rules must be exercised at all times. **C**ommunications must be established and maintained between your aircraft and any control tower while transiting Class C **or** Class D surface areas of airports under Class B airspace.

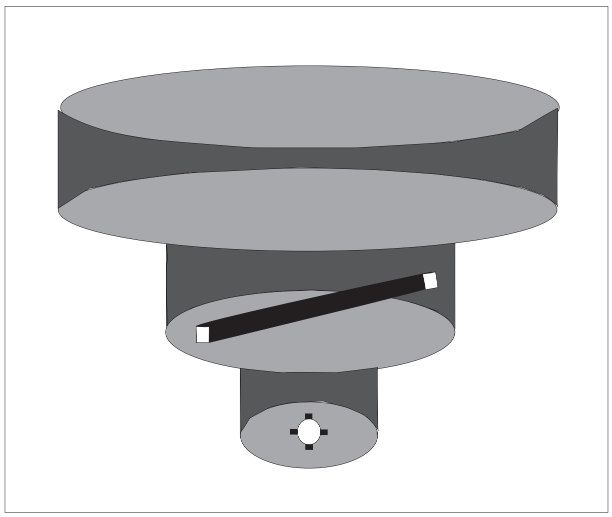
b. VFR Corridors.

1. The design of a few of the first Class B airspace areas provided a corridor for the passage of uncontrolled traffic. A VFR corridor is defined as airspace through Class B airspace, with defined vertical and lateral boundaries, in which aircraft may operate without an ATC clearance or communication with air traffic control.

2. These corridors are, in effect, a "hole" through Class B airspace. (See FIG 3−5−2.) A classic example would be the corridor through the Los Angeles Class B airspace, which has been subsequently changed to Special Flight Rules airspace (SFR). A corridor is surrounded on all sides by Class B airspace and does not extend down to the surface like a VFR Flyway. Because of their finite lateral and vertical limits, and the volume of VFR traffic using a corridor, extreme caution and vigilance must be exercised.

FIG 3−5−2

Class B Airspace



3. Because of the heavy traffic volume and the procedures necessary to efficiently manage the flow of traffic, it has not been possible to incorporate VFR corridors in the development or modifications of Class B airspace in recent years.

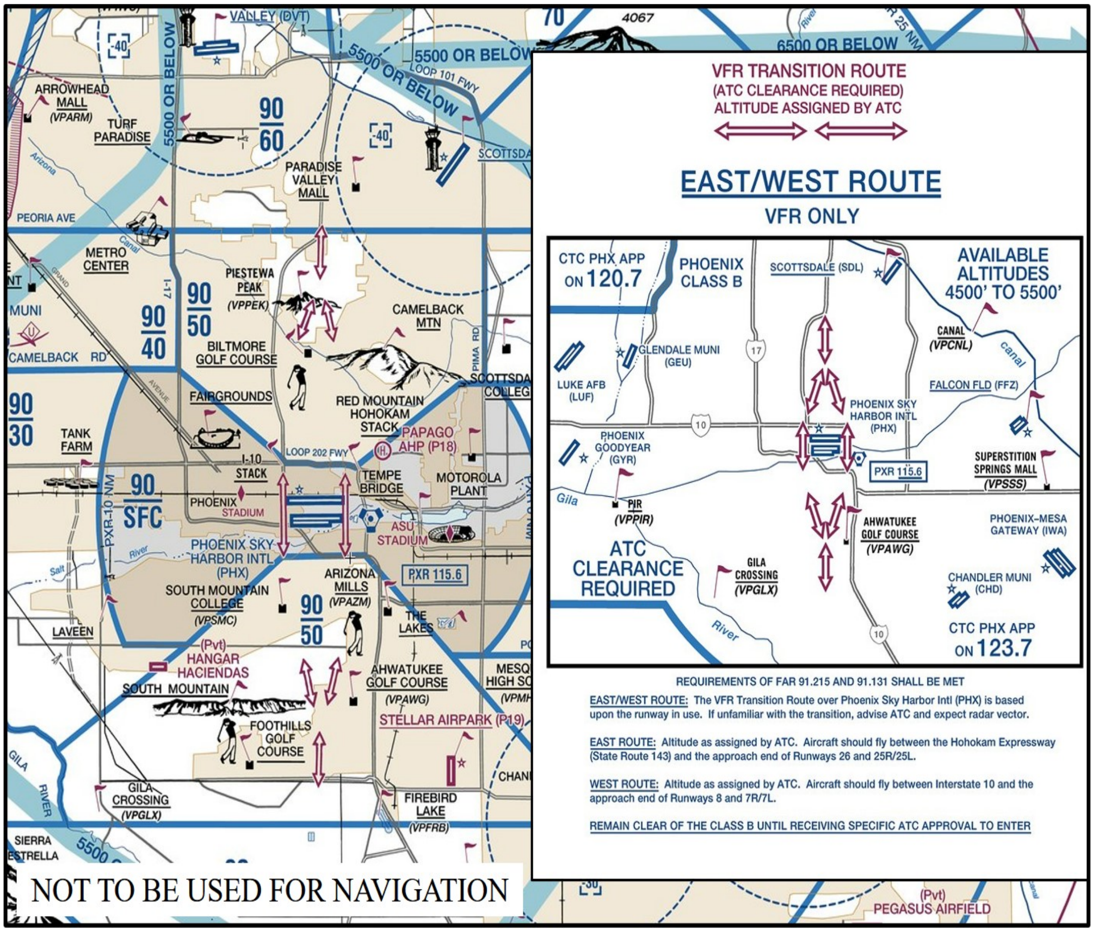
c. VFR Transition Routes.

1. To accommodate VFR traffic through terminal airspace, VFR Transition Routes were developed. A VFR Transition Route is defined as a specific flight course depicted and described on a TAC and/or VFR Flyway Planning Chart. Communication with ATC where the route transitions Class B, Class C, and/or Class D airspace is required. In addition to communication requirements, a clearance is required to operate in Class B airspace. VFR Transition Routes may include published altitudes or ATC-assigned altitudes. Per 14 CFR section 91.123, pilot compliance is expected for all route and altitude restrictions as published or assigned by ATC. VFR Transition Route and altitude assignments do not relieve pilots from their duty to comply with 14 CFR section 91.119. Pilots are expected to request an alternate clearance if necessary for compliance.

2. These routes, as depicted in FIG 3−5−3, are designed to show the pilot where to position the aircraft where an ATC assignment or clearance for the route can normally be expected with minimal or no delay. Until ATC authorization is received, pilots must remain clear of Class B airspace. On initial contact, pilots should advise ATC of their position, altitude, route name desired, and direction of flight.

3. For secondary airports underlying or in close proximity to Class B or Class C airspace, VFR Transition Routes may be developed and depicted for arrivals/departures. These arrivals/departures may be requested from or assigned by ATC.

FIG 3−5−3
VFR Transition Route



d. Helicopter Route Chart.

1. Helicopter Routes are depicted on a specialized VFR chart established for select high traffic density areas to enhance helicopter access and ease of operation. The Helicopter Route Chart depicts prominent geographical features, roads and obstructions. A Helicopter Route is a specific VFR flight course and is depicted on the Helicopter Route Chart. These routes contain specific altitudes and instructions for navigating over visual reference points as published, or as instructed by ATC.

2. Helicopter Route Charts, as depicted in FIG 3−5−4, incorporate expanded ground reference and unique symbology to improve visual navigation. The charts contain additional information such as frequencies to self−announce on and other route information. On initial contact, pilots should advise ATC of their position, altitude, and route name desired. Helicopter Routes may include published altitudes or ATC-assigned altitudes. Per 14 CFR section 91.123, pilot compliance is expected for all route and altitude restrictions as published or assigned by ATC. Helicopter Route and altitude assignments do not relieve pilots from their duty to comply with 14 CFR section 91.119 and 132.203(b). Pilots are expected to request an alternate clearance if necessary for compliance.

3. VFR Helicopter routes are available at the following website: https://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/vfr/.

(f) Transponder and ADS−B Out requirements do not apply to any aircraft that was not originally certificated with an electrical system, or that has not subsequently been certified with such a system installed, including balloons and gliders. These aircraft may conduct operations without a transponder or ADS−B Out when operating:

(1) Outside any Class B or Class C airspace area; and

(2) Below the altitude of the ceiling of a Class B or Class C airspace area designated for an airport, or 10,000 feet MSL, whichever is lower.

3. 14 CFR section 99.13 requires all aircraft flying into, within, or across the contiguous U.S. ADIZ be equipped with a Mode C or Mode S transponder. Balloons, gliders and aircraft not equipped with an engine−driven electrical system are excepted from this requirement.

REFERENCE−
AIM, Chapter 5, Section 6, National Security and Interception Procedures.

4. Pilots must ensure that their aircraft transponder/ADS−B is operating on an appropriate ATC−assigned VFR/IFR code with altitude reporting enabled when operating in such airspace. If in doubt about the operational status of either feature of your transponder while airborne, contact the nearest ATC facility or FSS and they will advise you what facility you should contact for determining the status of your equipment.

5. In−flight requests for "immediate" deviation from the transponder requirements may be approved by controllers only for failed equipment, and only when the flight will continue IFR or when weather conditions prevent VFR descent and continued VFR flight in airspace not affected by the CFRs. All other requests for deviation should be made at least 1 hour before the proposed operation by contacting the nearest Flight Service or Air Traffic facility in person or by telephone. The nearest ARTCC will normally be the controlling agency and is responsible for coordinating requests involving deviations in other ARTCC areas.

6. In−flight requests for "immediate" deviation from the ADS−B Out requirements may be approved by ATC only for failed equipment, and may be accommodated based on workload, alternate surveillance availability, or other factors. All other requests for deviation must be made at least 1 hour before the proposed operation, following the procedures contained in Advisory Circular (AC) 90−114, Automatic Dependent Surveillance−Broadcast Operations.

g. Cooperative Surveillance Phraseology. Air traffic controllers, both civil and military, will use the following phraseology when referring to operation of cooperative ATC surveillance equipment. Except as noted, the following ATC instructions do not apply to military transponders operating in other than Mode 3/A/C/S.

1. SQUAWK (number). Operate radar beacon transponder/ADS−B on designated code with altitude reporting enabled.

2. IDENT. Engage the "IDENT" feature (military I/P) of the transponder/ADS−B.

3. SQUAWK (number) AND IDENT. Operate transponder/ADS−B on specified code with altitude reporting enabled, and engage the "IDENT" (military I/P) feature.

4. SQUAWK STANDBY. Switch transponder/ADS−B to standby position.

5. SQUAWK NORMAL. Resume normal transponder/ADS−B operation on previously assigned code. (Used after "SQUAWK STANDBY," or by military after specific transponder tests).

6. SQUAWK ALTITUDE. Activate Mode C with automatic altitude reporting.

7. STOP ALTITUDE SQUAWK. Turn off automatic altitude reporting.

8. STOP SQUAWK (Mode in use). Stop transponder and ADS−B Out transmissions, or switch off only specified mode of the aircraft transponder (military).

9. SQUAWK MAYDAY. Operate transponder/ADS−B in the emergency position (Mode A Code 7700 for civil transponder. Mode 3 Code 7700 and emergency feature for military transponder.)

10. SQUAWK VFR. Operate radar beacon transponder/ADS−B on Code 1200 in the Mode A/3, or other appropriate VFR code, with altitude reporting enabled.

4−1−21. Airport Reservation Operations and Special Traffic Management Programs

This section describes procedures for obtaining required airport reservations at airports designated by the FAA and for airports operating under Special Traffic Management Programs.

a. Slot Controlled Airports.

1. The FAA may adopt rules to require advance reservations for unscheduled operations at certain airports. In addition to the information in the rules adopted by the FAA, a listing of the airports and relevant information will be maintained on the FAA website www.fly.faa.gov/ecvrs.

2. The FAA has established an Airport Reservation Office (ARO) to receive and process reservations for unscheduled flights at the slot controlled airports. The ARO uses the Enhanced Computer Voice Reservation System (e−CVRS) to allocate reservations. Reservations will be available beginning 72 hours in advance of the operation at the slot controlled airport. Standby lists are not maintained. Flights with declared emergencies do not require reservations. Refer to the website for the current listing of slot controlled airports, limitations, and reservation procedures.

3. For more detailed information on operations and reservation procedures at a Slot Controlled Airport, please see 14 CFR part 93, Subpart K – High Density Traffic Airports.

b. Special Traffic Management Programs (STMP).

1. Special programs may be established when a location requires special traffic handling to accommodate above normal traffic demand (for example, NFL Super Bowl, EAA AirVenture Oshkosh, SUN ’n FUN Aerospace Expo) or reduced airport capacity (for example, significant airport runway closures for airport construction). The special programs may remain in effect until the problem has been resolved or until local traffic management procedures can handle the volume and a need for special handling no longer exists.

2. If an STMP is used to accommodate a special event, a domestic notice will be issued relaying the website address: www.fly.faa.gov/estmp. Domestic notice information includes: what airports are included in the STMP, the dates and times reservations are required, the time limits for reservation requests, the point of contact for reservations, and any other instructions.

c. Making Reservations. Detailed information and User Instruction Guides for using the Web reservation systems are available on the websites for the slot controlled airports (e−CVRS), www.fly.faa.gov/ecvrs; and STMPs (e−STMP), www.fly.faa.gov/estmp.

NOTE−
Users may contact the ARO at (540) 422−4246 if they have a problem with their reservation.

d. Prior Permission Required (PPR).

1. A PPR may be required at locations where air traffic demand does not require an STMP, but operations may be impacted by on−airport activity or by a nearby event.

2. Events that may require a PPR include, but are not limited to:

(a) Construction on or near an active runway requiring time to remove personnel and equipment.

(b) Limited ramp space for parking aircraft.

(c) Snow removal at airports without an operating control tower.

(d) General aviation operations into military airports.

3. Pilots are responsible for coordinating operations related to the PPR. Controllers may be aware of the PPR, but they do not enforce or otherwise oversee compliance. Operations contrary to a PPR could result in a safety hazard to persons or property on the ground.

4. PPRs are disseminated via NOTAM or published in the airport remarks section of the Chart Supplement and typically includes a phone number or frequency to coordinate operations. An identification number may be issued that is to be included in the Remarks section of the flight plan. Major airports with PPRs are listed on the FAA's National Airspace System Status website (https://nasstatus.faa.gov).

4−1−22. Requests for Waivers and Authorizations from Title 14, Code of Federal Regulations (14 CFR)

a. Requests for a Certificate of Waiver or Authorization (FAA Form 7711−2), or requests for renewal of a waiver or authorization, may be accepted by any FAA facility and will be forwarded, if necessary, to the appropriate office having waiver authority.

b. The grant of a Certificate of Waiver or Authorization from 14 CFR constitutes relief from specific regulations, to the degree and for the period of time specified in the certificate, and does not waive any state law or local ordinance. Should the proposed operations conflict with any state law or local ordinance, or require permission of local authorities or property owners, it is the applicant's responsibility to resolve the matter. The holder of a waiver is responsible for compliance with the terms of the waiver and its provisions.

c. A waiver may be canceled at any time by the Administrator, the person authorized to grant the waiver, or the representative designated to monitor a specific operation. In such case either written notice of cancellation, or written confirmation of a verbal cancellation will be provided to the holder.

4−1−23. Weather Systems Processor

The Weather Systems Processor (WSP) was developed for use in the National Airspace System to provide weather processor enhancements to selected Airport Surveillance Radar (ASR)−9 facilities. The WSP provides Air Traffic with warnings of hazardous wind shear and microbursts. The WSP also provides users with terminal area 6−level weather, storm cell locations and movement, as well as the location and predicted future position and intensity of wind shifts that may affect airport operations.

Section 7. Operational Policy/Procedures for the Gulf of America 50 NM Lateral Separation Initiative

4−7−1. Introduction and General Policies

a. Air traffic control (ATC) may apply 50 nautical mile (NM) lateral separation (i.e., lateral spacing) between airplanes authorized for Required Navigation Performance (RNP) 10 or RNP 4 operating in the Gulf of America. 50 NM lateral separation may be applied in the following airspace:

1. Houston Oceanic Control Area (CTA)/Flight Information Region (FIR).

2. Gulf of America portion of the Miami Oceanic CTA/FIR.

3. Monterrey CTA.

4. Merida High CTA within the Mexico CTA/FIR.

b. Within the Gulf of America airspace described above, pairs of airplanes whose flight plans indicate approval for PBN and either RNP 10 or RNP 4 may be spaced by ATC at lateral intervals of 50 NM. ATC will space any airplane without RNP 10 or RNP 4 capability such that at least 90 NM lateral separation is maintained with other airplanes in the Miami Oceanic CTA/FIR, and at least 100 NM separation is maintained in the Houston, Monterrey, and Merida CTA/FIRs.

c. The reduced lateral separation allows more airplanes to fly on optimum routes/altitudes over the Gulf of America.

d. 50 NM lateral separation is not applied on routes defined by ground navigation aids or on Gulf RNAV Routes Q100, Q102, or Q105.

e. Useful information for flight planning and operations over the Gulf of America, under this 50 NM lateral separation policy, as well as information on how to obtain RNP 10 or RNP 4 authorization, can be found in the West Atlantic, Gulf of America, and Caribbean Resource Guide for U.S. Operators located at: https://www.faa.gov/headquartersoffices/avs/wat−gulf−and−caribbean−resource−guide.

4−7−2. Accommodating Non−RNP 10 Aircraft

a. Operators not authorized for RNP 10 or RNP 4 may still file for any route and altitude within the Gulf of America CTAs. However, clearance on the operator's preferred route and/or altitude will be provided as traffic allows for 90 or 100 NM lateral separation between the non−RNP 10 aircraft and any others. Priority will be given to RNP 10 or RNP 4 aircraft.

b. Operators of aircraft not authorized RNP 10 or RNP 4 must include the annotation "RMK/NONRNP10" in Item 18 of their ATC flight plan.

c. Pilots of non−RNP 10 aircraft are to remind ATC of their RNP status; i.e., report "negative RNP 10" upon initial contact with ATC in each Gulf CTA/FIR.

d. Operators will likely benefit from the effort they invest to obtain RNP 10 or RNP 4 authorization, provided they are flying aircraft equipped to meet RNP 10 or RNP 4 standards.

4−7−3. Obtaining RNP 10 or RNP 4 Operational Authorization

a. For U.S. operators, AC 90−105, Approval Guidance for RNP Operations and Barometric Vertical Navigation in the U.S. National Airspace System and in Oceanic and Remote Continental Airspace, provides the aircraft and operator qualification criteria for RNP 10 or RNP 4 authorizations. FAA personnel at flight standards district offices (FSDO) and certificate management offices (CMO) will use the guidance contained in AC 90−105 to evaluate an operator's application for RNP 10 or RNP 4 authorization. Authorization to conduct RNP operations in oceanic airspace is provided to all U.S. operators through issuance of Operations Specification (OpSpec), Management Specification (MSpec), or Letter of Authorization (LOA) B036, as applicable to the nature of the operation; for example, part 121, part 91, etc. Operators may wish to review FAA Order 8900.1, Flight Standards Information Management System, volume 3, chapter 18, section 4, to understand the specific criteria for issuing OpSpec, MSpec, and/or LOA B036.

b. The operator's RNP 10 or RNP 4 authorization should include any equipment requirements and RNP 10 time limits (if operating solely inertial−based navigation systems), which must be observed when conducting RNP operations. RNP 4 requires tighter navigation and track maintenance accuracy than RNP 10.

4−7−4. Authority for Operations with a Single Long−Range Navigation System

Operators may be authorized to take advantage of 50 NM lateral separation in the Gulf of America CTAs when equipped with only a single long−range navigation system. RNP 10 with a single long−range navigation system is authorized via OpSpec, MSpec, or LOA B054. Operators should contact their FSDO or CMO to obtain information on the specific requirements for obtaining B054. Volume 3, chapter 18, section 4 of FAA Order 8900.1 provides the qualification criteria to be used by FAA aviation safety inspectors in issuing B054.

4−7−5. Flight Plan Requirements

a. In order for an operator with RNP 10 or RNP 4 authorization to obtain 50 NM lateral separation in the Gulf of America CTAs/FIRs, and therefore obtain preferred routing available to RNP authorized aircraft, the international flight plan form (FAA 7233−4) must be annotated as follows:

1. Item 10a (Equipment) must include the letter "R."

2. Item 18 must include either "PBN/A1" for RNP 10 authorization or "PBN/L1" for RNP 4 authorization.

b. Indication of RNP 4 authorization implies the aircraft and pilots are also authorized RNP 10.

c. Chapter 5, Section 1, of this manual includes information on all flight plan codes. RNP 10 has the same meaning and application as RNAV 10. They share the same code.

4−7−6. Contingency Procedures

Pilots operating under reduced lateral separation must be particularly familiar with, and prepared to rapidly implement, the standard contingency procedures specifically written for operations when outside ATC surveillance and direct VHF communications (for example, the oceanic environment). Specific procedures have been developed for weather deviations. Operators should ensure all flight crews operating in this type of environment have been provided the standard contingency procedures in a readily accessible format. The margin for error when operating at reduced separation mandates correct and expeditious application of the standard contingency procedures. These internationally accepted procedures are published in ICAO Document 4444, chapter 15. The procedures are also reprinted in the U.S. Aeronautical Information Publication (AIP), En Route (ENR) Section 7.3, Special Procedures for In−flight Contingencies in Oceanic Airspace; and AC 91−70.

Chapter 5. Air Traffic Procedures

Section 1. Preflight

5−1−1. Preflight Preparation

a. Prior to every flight, pilots should gather all information vital to the nature of the flight, assess whether the flight would be safe, and then file a flight plan. Pilots can receive a regulatory compliant briefing without contacting Flight Service. Pilots are encouraged to use automated resources and review Advisory Circular AC 91−92, Pilot's Guide to a Preflight Briefing, for more information. Pilots who prefer to contact Flight Service are encouraged to conduct a self−brief prior to calling. Conducting a self−brief before contacting Flight Service provides familiarity of meteorological and aeronautical conditions applicable to the route of flight and promotes a better understanding of weather information. Pilots may access Flight Service through www.1800wxbrief.com or by calling 1−800−WX−BRIEF (1−800−992−7433) in the CONUS, Hawaii, and U.S. territories; or 1–833–AK–BRIEF (1–833–252–7433) in Alaska. Flight planning applications are also available for conducting a self−briefing and filing flight plans.

NOTE−
Alaska only: Pilots filing flight plans via "fast file" who desire to have their briefing recorded, should include a statement at the end of the recording as to the source of their weather briefing.

b. The information required by the FAA to process flight plans is obtained from FAA Form 7233−4, International Flight Plan. Only DoD users, and civilians who file stereo route flight plans, may use FAA Form 7233−1, Flight Plan.

NOTE−
FAA and DoD Flight Plan Forms are equivalent. Where the FAA specifies Form 7233−1, Flight Plan and FAA Form 7233−4, International Flight Plan, the DoD may substitute their Form DD 175, Military Flight Plan and Form DD−1801, DoD International Flight Plan as necessary. NAS automation systems process and convert data in the same manner, although for computer acceptance, input fields may be adjusted to follow FAA format.

c. FSSs are required to advise of pertinent NOTAMs if a *standard* briefing is requested, but if they are overlooked, do not hesitate to remind the specialist that you have not received NOTAM information. Additionally, FSS briefers do not provide FDC NOTAM information for special instrument approach procedures unless specifically asked. Pilots authorized by the FAA to use special instrument approach procedures must specifically request FDC NOTAM information for these procedures. Pilots who receive the information electronically will receive NOTAMs for special IAPs automatically.

NOTE−
Domestic Notices and International Notices are not provided during a briefing unless specifically requested by the pilot since the FSS specialist has no way of knowing whether the pilot has already checked the Federal NOTAM System (FNS) NOTAM Search website external links prior to calling. Airway NOTAMs, procedural NOTAMs, and NOTAMs that are general in nature and not tied to a specific airport/facility (for example, flight advisories and restrictions, open duration special security instructions, and special flight rules areas) are briefed solely by pilot request. Remember to ask for these notices if you have not already reviewed this information, and to request all pertinent NOTAMs specific to your flight.

REFERENCE−
AIM, Para 5−1−3, Notice to Airmen (NOTAM) System.

d. Pilots are urged to use only the latest issue of aeronautical charts in planning and conducting flight operations. Aeronautical charts are revised and reissued on a regular scheduled basis to ensure that depicted data are current and reliable. In the conterminous U.S., Sectional Charts are updated every 56 days, IFR En Route Charts every 56 days, and amendments to civil IFR Approach Charts are accomplished on a 56−day cycle with a change notice volume issued on the 28−day midcycle. Charts that have been superseded by those of a more recent date may contain obsolete or incomplete flight information.

REFERENCE−
AIM, Para 9−1−5, General Description of Each Chart Series.

e. When requesting a preflight briefing, identify yourself as a pilot and provide the following:

1. Type of flight planned; e.g., VFR or IFR.

2. Aircraft's number or pilot's name.

3. Aircraft type.

4. Departure Airport.

5. Route of flight.

6. Destination.

7. Flight altitude(s).

8. ETD and ETE.

f. Prior to conducting a briefing, briefers are required to have the background information listed above so that they may tailor the briefing to the needs of the proposed flight. The objective is to communicate a "picture" of meteorological and aeronautical information necessary for the conduct of a safe and efficient flight. Briefers use all available weather and aeronautical information to summarize data applicable to the proposed flight. Pilots who have briefed themselves before calling Flight Service should advise the briefer what information has been obtained from other sources.

REFERENCE−
AIM, Para 7−1−5, Preflight Briefings, contains those items of a weather briefing that should be expected or requested.

g. FAA by 14 CFR part 93, Subpart K, has designated High Density Traffic Airports (HDTA) and has prescribed air traffic rules and requirements for operating aircraft (excluding helicopter operations) to and from these airports.

REFERENCE−
Chart Supplement, Special Notices Section.
AIM, Para 4−1−21, Airport Reservation Operations and Special Traffic Management Programs.

h. In addition to the filing of a flight plan, if the flight will traverse or land in one or more foreign countries, it is particularly important that pilots leave a complete itinerary with someone directly concerned and keep that person advised of the flight's progress. If serious doubt arises as to the safety of the flight, that person should first contact the FSS.

REFERENCE−
AIM, Para 5−1−11, Flights Outside the U.S. and U.S. Territories.

i. Pilots operating under provisions of 14 CFR part 135 on a domestic flight without having an FAA assigned 3−letter designator, must prefix the normal registration (N) number with the letter "T" on flight plan filing; for example, TN1234B.

REFERENCE−
AIM, Para 4−2−4, Aircraft Call Signs.
FAA Order JO 7110.65, Para 2−3−5, Aircraft Identity, Subpara a.
FAA Order JO 7110.10, Appendix B, FAA Form 7233−1, Flight Plan

5−1−2. Follow IFR Procedures Even When Operating VFR

a. To maintain IFR proficiency, pilots are urged to practice IFR procedures whenever possible, even when operating VFR. Some suggested practices include:

1. Obtain a complete preflight briefing and check NOTAMs. Prior to every flight, pilots should gather all information vital to the nature of the flight. Pilots can receive a regulatory compliant briefing without contacting Flight Service. Pilots are encouraged to use automated resources and review AC 91−92, Pilot's Guide to a Preflight Briefing, for more information. NOTAMs are available online from the Federal NOTAM System (FNS) NOTAM Search website (https://notams.aim.faa.gov/notamSearch/), private vendors, or on request from Flight Service.

Section 3. En Route Procedures

5−3−1. ARTCC Communications

a. Direct Communications, Controllers and Pilots.

1. ARTCCs are capable of direct communications with IFR air traffic on certain frequencies. Maximum communications coverage is possible through the use of Remote Center Air/Ground (RCAG) sites comprised of both VHF and UHF transmitters and receivers. These sites are located throughout the U.S. Although they may be several hundred miles away from the ARTCC, they are remoted to the various ARTCCs by land lines or microwave links. Since IFR operations are expedited through the use of direct communications, pilots are requested to use these frequencies strictly for communications pertinent to the control of IFR aircraft. Flight plan filing, en route weather, weather forecasts, and similar data should be requested through FSSs, company radio, or appropriate military facilities capable of performing these services.

2. An ARTCC is divided into sectors. Each sector is handled by one or a team of controllers and has its own sector discrete frequency. As a flight progresses from one sector to another, the pilot is requested to change to the appropriate sector discrete frequency.

3. Controller Pilot Data Link Communications (CPDLC) is a system that supplements air/ground voice communications. The CPDLC's principal operating criteria are:

(a) Voice remains the primary and controlling air/ground communications means.

(b) Participating aircraft will need to have the appropriate CPDLC avionics equipment in order to receive uplink or transmit downlink messages.

(c) En Route CPDLC offers many services including the following: Altimeter Setting (AS), Transfer of Communications (TOC), Initial Contact (IC), route assignments, including airborne reroutes (ABRR), altitude assignments, speed assignments, crossing constraints, holding, and advisory and emergency messages.

(1) Altimeter settings will be uplinked automatically when appropriate after a Monitor TOC. Altimeter settings will also be uplinked automatically when an aircraft receives an uplinked altitude assignment below FL 180. A controller may also manually send an altimeter setting message.

NOTE−
When conducting instrument approach procedures, pilots are responsible to obtain and use the appropriate altimeter setting in accordance with 14 CFR section 97.20. CPDLC issued altimeter settings are excluded for this purpose.

(2) Initial contact is a safety validation transaction that compares a pilot's initiated altitude downlink message with an aircraft's stored altitude in the ATC automation system. When an IC mismatch or Confirm Assigned Altitude (CAA) downlink time−out indicator is displayed in the Full Data Block (FDB) and Aircraft List (ACL), the controller who has track control of the aircraft must use voice communication to verify the assigned altitude of the aircraft, and acknowledge the IC mismatch/time−out indicator.

(3) Transfer of communications automatically establishes data link contact with a succeeding sector.

(4) Menu text transmissions are scripted nontrajectory altering uplink messages.

(5) The CPDLC Message Elements used in domestic en route operations are contained in TBL 5−3−1 through TBL 5−3−23, CPDLC Message Elements.

(6) For CPDLC Message Elements used in FAA oceanic control areas (KZWY, KZAK, and PAZA), please refer to the U.S. AIP, ENR 7.2.

NOTE−
The FAA is not implementing ATN B1.

TBL 5-3-1

Response Attribute of CPDLC Message Element

Response Attribute	Description
For Uplink Message	
W/U	Response required. Valid responses. WILCO, UNABLE, STANDBY, NOT CURRENT DATA AUTHORITY, NOT AUTHORIZED NEXT DATA AUTHORITY, LOGICAL ACKNOWLEDGEMENT (only if required), ERROR *Note – WILCO, UNABLE, NOT CURRENT DATA AUTHORITY, NOT AUTHORIZED NEXT DATA AUTHORITY and ERROR will close the uplink message. FANS 1/A.– WILCO, UNABLE, STANDBY, ERROR, NOT CURRENT DATA AUTHORITY.*
A/N	Response required. Valid responses. AFFIRM, NEGATIVE, STANDBY, NOT CURRENT DATA AUTHORITY, NOT AUTHORIZED NEXT DATA AUTHORITY, LOGICAL ACKNOWLEDGEMENT (only if required), ERROR *Note – AFFIRM, NEGATIVE, NOT CURRENT DATA AUTHORITY, NOT AUTHORIZED NEXT DATA AUTHORITY and ERROR will close the uplink message. FANS 1/A.– AFFIRM, NEGATIVE, STANDBY, ERROR, NOT CURRENT DATA AUTHORITY.*
R	Response required. Valid responses. ROGER, UNABLE, STANDBY, NOT CURRENT DATA AUTHORITY, NOT AUTHORIZED NEXT DATA AUTHORITY, LOGICAL ACKNOWLEDGEMENT (only if required), ERROR *Note – ROGER, NOT CURRENT DATA AUTHORITY, NOT AUTHORIZED NEXT DATA AUTHORITY and ERROR will close the uplink message.* FANS 1/A.– ROGER, STANDBY, ERROR, NOT CURRENT DATA AUTHORITY. FANS 1/A aircraft do not have the capability to send UNABLE in response to an uplink message containing message elements with an "R" response attribute. For these aircraft, the flight crew may use alternative means to UNABLE the message. These alternative means will need to be taken into consideration to ensure proper technical and operational closure of the communication transaction.
Y	Response required. Valid responses: Any CPDLC downlink message, LOGICAL ACKNOWLEDGEMENT (only if required).
N	No response required unless logical acknowledgement is required. Valid Responses (only if LOGICAL ACKNOWLEDGEMENT is required). LOGICAL ACKNOWLEDGEMENT, NOT CURRENT DATA AUTHORITY, NOT AUTHORIZED NEXT DATA AUTHORITY, ERROR FANS 1/A.– "N" is defined as "no response is required," but not used. Under some circumstances, an ERROR message will also close an uplink message.

NE	[Not defined in Doc 4444] FANS 1/A.– The WILCO, UNABLE, AFFIRM, NEGATIVE, ROGER, and STANDBY responses are not enabled (NE) for flight crew selection. An uplink message with a response attribute NE is considered to be closed even though a response may be required operationally. Under some circumstances, a downlink error message may be linked to an uplink message with a NE attribute.
For Downlink Message	
Y	Response required. Yes Valid responses. Any CPDLC uplink message, LOGICAL ACKNOWLEDGEMENT (only if required).
N	Response required. No, unless logical acknowledgement required. Valid responses (only if LOGICAL ACKNOWLEDGEMENT is required). LOGICAL ACKNOWLEDGEMENT, SERVICE UNAVAILABLE, FLIGHT PLAN NOT HELD, ERROR FANS 1/A.– Aircraft do not have the capability to receive technical responses to downlink message elements with an "N" response attribute (other than LACK or ERROR for ATN B1 aircraft). In some cases, the response attribute is different between FANS 1/A aircraft and Doc 4444. As an example, most emergency messages have an "N" response attribute for FANS 1/A whereas Doc 4444 defines a "Y" response attribute for them. As a consequence, for FANS 1/A aircraft, ATC will need to use alternative means to acknowledge to the flight crew that an emergency message has been received.

TBL 5−3−2

Route Uplink Message Elements (RTEU)

CPDLC Message Sets		Operational Definition in PANS−ATM (Doc 4444)		
FANS 1/A	**Response**	**Message Element Identifier**	**Message Element Intended Use**	**Format for Message Element Display**
UM74 PROCEED DIRECT TO (*position*)	W/U	RTEU−2	Instruction to proceed directly to the specified position.	PROCEED DIRECT TO (*position*)
UM75 WHEN ABLE PROCEED DIRECT TO (*position*) *Note – This message element is equivalent to SUPU−5 plus RTEU−2 in Doc 4444.*	W/U	RTEU−2	Instruction to proceed, when able, directly to the specified position.	PROCEED DIRECT TO *(position)*
UM77 AT (*position*) PROCEED DIRECT TO (*position*)	W/U	RTEU−4	Instruction to proceed, at the specified at position, directly to the next specified position.	AT *(position)* PROCEED DIRECT TO *(position)*
UM78 AT (*altitude*) PROCEED DIRECT TO (*position*)	W/U	RTEU−5	Instruction to proceed, upon reaching the specified level, directly to the specified position.	AT *(level)* PROCEED DIRECT TO *(position)*
UM79 CLEARED TO (*position*) via (*route clearance*)	W/U	RTEU−6	Instruction to proceed to the specified position via the specified route.	CLEARED TO *(position)* VIA *(departure data[O]) (en−route data)*

UM80 CLEARED *(route clearance)*	W/U	RTEU−7	Instruction to proceed via the specified route.	CLEARED *(departure data[O]) (en−route data) (arrival approach data)*
UM83 AT *(position)* CLEARED *(route clearance)*	W/U	RTEU−9	Instruction to proceed from the specified position via the specified route.	AT *(position)* CLEARED *(en−route data) (arrival approach data)*
UM91 HOLD AT *(position)* MAINTAIN *(altitude)* INBOUND TRACK *(degrees) (direction)* TURN LEG TIME *(leg type)*	W/U	RTEU−11	Instruction to enter a holding pattern at the specified position in accordance with the specified instructions. *Note– RTEU−13 EXPECT FURTHER CLEARANCE AT TIME (time) is appended to this message when an extended hold is anticipated.*	AT *(position)* HOLD INBOUND TRACK *(degrees)(direction)* TURNS *(leg type)* LEGS
UM92 HOLD AT *(position)* AS PUBLISHED MAINTAIN *(altitude)*	W/U	RTEU−12	Instruction to enter a holding pattern at the specified position in accordance with the published holding instructions. *Note – RTEU−13 EXPECT FURTHER CLEARANCE AT TIME (time) is appended to this message when an extended hold is anticipated.*	AT *(position)* HOLD AS PUBLISHED
UM93 EXPECT FURTHER CLEARANCE AT *(time)*	W/U	RTEU−13	Notification that an onwards clearance may be issued at the specified time	EXPECT FURTHER CLEARANCE AT *(time)*
UM137 CONFIRM ASSIGNED ROUTE *Note – NE response attribute.*	W/U	RTEU−15	Request to confirm the assigned route.	CONFIRM ASSIGNED ROUTE

TBL 5−3−3

Route Downlink Message Elements (RTED)

CPDLC Message Sets		**Operational Definition in PANS−ATM (Doc 4444)**		
FANS 1/A	**Response**	**Message Element Identifier**	**Message Element Intended Use**	**Format for Message Element Display**
DM22 REQUEST DIRECT TO (*position*)	Y	RTED−1	Request for a direct clearance to the specified position.	REQUEST DIRECT TO (*position*)
DM23 REQUEST (procedure name)	Y	RTED−2	Request for the specified procedure or clearance name	REQUEST (named instruction)

DM24 REQUEST (route clearance)	Y	RTED−3	Request for the specified route.	REQUEST CLEARANCE (departure data[O]) (en−route data) (arrival approach data[O])
DM40 ASSIGNED ROUTE (route clearance)	N	RTED−9	Confirmation that the assigned route is the specified route.	ASSIGNED ROUTE (departure data[O]) (en−route data) (arrival approach data[O])

TBL 5−3−4

Lateral Uplink Message Elements (LATU)

FANS 1/A	Response	Message Element Identifier	Message Element Intended Use	Format for Message Element Display
UM82 CLEARED TO DEVIATE UP TO (distance offset) (direction) OF ROUTE	W/U	LATU−10	Instruction allowing deviation up to the specified distance(s) from the cleared route in the specified direction(s).	CLEARED TO DEVIATE UP TO (lateral deviation) OF ROUTE
UM127 REPORT BACK ON ROUTE *Note – R response attribute.*	W/U	LATU−18	Instruction to report when the aircraft is back on the cleared route.	REPORT BACK ON ROUTE

TBL 5−3−5

Lateral Downlink Message Elements (LATD)

CPDLC Message Sets		Operational Definition in PANS−ATM (Doc 4444)		
FANS 1/A	Response	Message Element Identifier	Message Element Intended Use	Format for Message Element Display
DM27 REQUEST WEATHER DEVIATION UP TO *(specified distance) (direction)* OF ROUTE	Y	LATD−2	Request for a weather deviation up to the specified distance off track in the specified direction.	REQUEST WEATHER DEVIATION UP TO *(specified distance) (direction)* OF ROUTE
DM41 BACK ON ROUTE	N	LATD−4	The aircraft has regained the cleared route.	BACK ON ROUTE
DM59 DIVERTING TO *(position)* VIA *(route clearance)* *Note 1. − H alert attribute* *Note 2. − N response attribute*	N See Note	LATD−5	Report indicating diverting to the specified position via the specified route, which may be sent without any previous coordination done with ATC.	DIVERTING TO *(position)* VIA *(en−route data) (arrival approach data[O])*

DM60 OFFSETTING *(distance offset) (direction)* OF ROUTE *Note 1. – H alert attribute* *Note 2. – N response attribute*	N See Note	LATD–6	Report indicating that the aircraft is offsetting to a parallel track at the specified distance in the specified direction off from the cleared route.	OFFSETTING *(specified distance) (direction)* OF ROUTE
DM80 DEVIATING *(deviation offset) (direction)* OF ROUTE *Note 1. – H alert attribute* *Note 2. – N response attribute*	N See Note	LATD–7	Report indicating deviating specified distance or degrees in the specified direction from the cleared route.	DEVIATING *(specified Deviation) (direction)* OF ROUTE

NOTE–
ICAO Document 10037, Global Operational Data Link (GOLD) Manual, has these values set to Y in their table.

TBL 5–3–6
Level Uplink Message Elements (LVLU)

CPDLC Message Sets		**Operational Definition in PANS–ATM (Doc 4444)**		
FANS 1/A	**Response**	**Message Element Identifier**	**Message Element Intended Use**	**Format for Message Element Display**
UM19 MAINTAIN *(altitude)* *Note – Used for a single level*	W/U	LVLU–5	Instruction to maintain the specified level or vertical range.	MAINTAIN *(level)*
UM20 CLIMB TO AND MAINTAIN *(altitude)* *Note – Used for a single level*	W/U	LVLU–6	Instruction that a climb to the specified level or vertical range is to commence and once reached is to be maintained.	CLIMB TO (*level*)
UM23 DESCEND TO AND MAINTAIN *(altitude)* *Note – Used for a single level*	W/U	LVLU–9	Instruction that a descent to the specified level or vertical range is to commence and once reached is to be maintained.	DESCEND TO (*level*)
UM30 MAINTAIN BLOCK *(altitude)* TO *(altitude)* *Note – Used for a vertical range*	W/U	LVLU–5	Instruction to maintain the specified level or vertical range.	MAINTAIN *(level)*
UM31 CLIMB TO AND MAINTAIN BLOCK *(altitude)* TO *(altitude)* *Note – Used for a vertical range*	W/U	LVLU–6	Instruction that a climb to the specified level or vertical range is to commence and once reached is to be maintained.	CLIMB TO *(level)*

UM32 DESCEND TO AND MAINTAIN BLOCK *(altitude)* TO *(altitude)* *Note – Used for a vertical range*	W/U	LVLU−9	Instruction that a descent to the specified level or vertical range is to commence and once reached is to be maintained.	DESCEND TO *(level)*
UM36 EXPEDITE CLIMB TO *(altitude)* *Note − This message element is equivalent to SUPU−3 plus LVLU−6 in Doc 4444.*	W/U	LVLU−6	Instruction that a climb to the specified level or vertical range is to commence and once reached is to be maintained.	CLIMB TO (*level*)
UM37 EXPEDITE DESCEND TO *(altitude)* *Note – This message element is equivalent to SUPU−5 plus LVLU−9 in Doc 4444.*	W/U	LVLU−9	Instruction that a descent to the specified level or vertical range is to commence and once reached is to be maintained.	DESCEND TO (*level*)
UM38 IMMEDIATELY CLIMB TO *(altitude)* *Note − This message element is equivalent to EMGU−2 plus LVLU−6 in Doc 4444.*	W/U	LVLU−6	Instruction that a climb to the specified level or vertical range is to commence and once reached is to be maintained.	CLIMB TO (*level*)
UM39 IMMEDIATELY DESCEND TO *(altitude)* *Note − This message element is equivalent to EMGU−2 plus LVLU−9 in Doc 4444.*	W/U	LVLU−9	Instruction that a descent to the specified level or vertical range is to commence and once reached is to be maintained.	DESCEND TO (*level*)
UM135 CONFIRM ASSIGNED ALTITUDE *Note − NE response attribute*	Y	LVLU−27	Request to confirm the assigned level.	CONFIRM ASSIGNED LEVEL
UM177 AT PILOTS DISCRETION	NE	See Note	An instruction used in conjunction with altitude assignments, means that ATC has offered the pilot the option of starting climb or descent whenever they wish and conducting the climb or descent at any rate they wish. The pilot may temporarily level off at any intermediate altitude. However, once the aircraft has vacated an altitude, it may not return to that altitude.	

NOTE−
ICAO Document 10037, Global Operational Data Link (GOLD) Manual, does not include this in its tables.

TBL 5−3−7
Level Downlink Message Elements (LVLD)

CPDLC Message Sets		**Operational Definition in PANS−ATM (Doc 4444)**		
FANS 1/A	**Response**	**Message Element Identifier**	**Message Element Intended Use**	**Format for Message Element Display**
DM6 REQUEST *(altitude)* *Note − Used for a single level*	Y	LVLD−1	Request to fly at the specified level or vertical range.	REQUEST *(level)*
DM7 REQUEST BLOCK *(altitude)* TO *(altitude)* *Note – Used for a vertical range.*	Y	LVLD−1	Request to fly at the specified level or vertical range.	REQUEST (*level*)
DM9 REQUEST CLIMB TO *(altitude)*	Y	LVLD−2	Request for a climb to the specified level or vertical range.	REQUEST CLIMB TO (*level*)
DM10 REQUEST DESCENT TO *(altitude)*	Y	LVLD−3	Request for a descent to the specified level or vertical range.	REQUEST DESCENT TO (*level*)
DM38 ASSIGNED LEVEL *(altitude)* *Note − Used for a single level*	N	LVLD−11	Confirmation that the assigned level or vertical range is the specified level or vertical range.	ASSIGNED LEVEL (*level*)
DM61 DESCENDING TO *(altitude)* *Note − urgent alert attribute*	N	LVLD−14	Report indicating descending to the specified level.	DESCENDING TO (*level single*)
DM77 ASSIGNED BLOCK (*altitude*) TO (*altitude*) *Note– Used for a vertical range*	N	LVLD−11	Confirmation that the assigned level or vertical range is the specified level or vertical range.	ASSIGNED LEVEL *(level)*

TBL 5−3−8

Crossing Constraint Message Elements (CSTU)

CPDLC Message Sets		Operational Definition in PANS−ATM (Doc 4444)		
FANS 1/A	**Response**	**Message Element Identifier**	**Message Element Intended Use**	**Format for Message Element Display**
UM46 CROSS (*position*) AT (*altitude*) *Note – Used for a single level.*	W/U	CSTU−1	Instruction that the specified position is to be crossed at the specified level or within the specified vertical range.	CROSS *(position)* AT *(level)*
UM49 CROSS (*position*) AT AND MAINTAIN (*altitude*) *Note 1. − A vertical range cannot be provided.* *Note 2. − This message element is equivalent to CSTU−1 plus LVLU−5 in Doc 4444.*	W/U	CSTU−1	Instruction that the specified position is to be crossed at the specified level or within the specified vertical range.	CROSS *(position)* AT *(level)*
UM51 CROSS (*position*) AT (time)	W/U	CSTU−4	Instruction that the specified position is to be crossed at the specified time.	CROSS *(position)* AT TIME *(time)*
UM52 CROSS (*position*) AT OR BEFORE (*time*)	W/U	CSTU−5	Instruction that the specified position is to be crossed before the specified time.	CROSS *(position)* BEFORE TIME *(time)*
UM53 CROSS (*position*) AT OR AFTER (*time*)	W/U	CSTU−6	Instruction that the specified position is to be crossed after the specified time.	CROSS *(position)* AFTER TIME *(time)*
UM55 CROSS *(position)* AT *(speed)*	W/U	CSTU−8	Instruction that the specified position is to be crossed at the specified speed.	CROSS *(position)* AT *(speed)*
UM56 CROSS *(position)* AT OR LESS THAN *(speed)*	W/U	CSTU−9	Instruction that the specified position is to be crossed at or less than the specified speed.	CROSS *(position)* AT *(speed)* OR LESS
UM57 CROSS *(position)* AT OR GREATER THAN *(speed)*	W/U	CSTU−10	Instruction that the specified position is to be crossed at or greater than the specified speed.	CROSS *(position)* AT *(speed)* OR GREATER
UM61 CROSS *(position)* AT AND MAINTAIN *(altitude)* AT *(speed)* *Note 1. − A vertical range cannot be provided.* *Note 2. − This message element is equivalent to CSTU−14 plus LVLU−5 in Doc 4444.*	W/U	CSTU−14	Instruction that the specified position is to be crossed at the level or within the vertical range, as specified, and at the specified speed.	CROSS *(position)* AT *(level)* AT *(speed)*

TBL 5−3−9

Speed Uplink Message Elements (SPDU)

CPDLC Message Sets		Operational Definition in PANS−ATM (Doc 4444)		
FANS 1/A	**Response**	**Message Element Identifier**	**Message Element Intended Use**	**Format for Message Element Display**
UM106 MAINTAIN (*speed*)	W/U	SPDU−4	Instruction to maintain the specified speed.	MAINTAIN *(speed)*
UM107 MAINTAIN PRESENT SPEED	W/U	SPDU−5	Instruction to maintain the specified speed.	MAINTAIN PRESENT SPEED
UM108 MAINTAIN (*speed*) OR GREATER	W/U	SPDU−6	Instruction to maintain the specified speed or greater.	MAINTAIN *(speed)* OR GREATER
UM109 MAINTAIN (*speed*) OR LESS	W/U	SPDU−7	Instruction to maintain the specified speed or less.	MAINTAIN PRESENT *(speed)* OR LESS
UM116 RESUME NORMAL SPEED	W/U	SPDU−13	Instruction to resume a normal speed. The aircraft no longer needs to comply with a previously issued speed restriction.	RESUME NORMAL SPEED
UM134 CONFIRM SPEED *Note – NE response attribute.*	Y	SPDU−15	Request to report the speed defined by the speed type(s).	REPORT *(speed types)* SPEED

TBL 5−3−10

Speed Downlink Message Elements

CPDLC Message Sets		Operational Definition in PANS−ATM (Doc 4444)		
FANS 1/A	**Response**	**Message Element Identifier**	**Message Element Intended Use**	**Format for Message Element Display**
DM34 PRESENT SPEED (*speed*)	N	SPDD−3	Report indicating the speed defined by the specified speed types is the specified speed.	*(speed types)* SPEED *(speed)*

TBL 5−3−11

Air Traffic Advisory Uplink Message Elements

CPDLC Message Sets		Operational Definition in PANS−ATM (Doc 4444)		
FANS 1/A	**Response**	**Message Element Identifier**	**Message Element Intended Use**	**Format for Message Element Display**
UM154 RADAR SERVICES TERMINATED	R	ADVU−2	*Advisory that the ATS surveillance service is terminated.*	SURVEILLANCE SERVICE TERMINATED

TBL 5−3−12

Voice Communications Uplink Message Elements (COMU)

CPDLC Message Sets		Operational Definition in PANS−ATM (Doc 4444)		
FANS 1/A	**Response**	**Message Element Identifier**	**Message Element Intended Use**	**Format for Message Element Display**
UM117 CONTACT *(ICAO unit name) (frequency)*	W/U	COMU−1	Instruction to establish voice contact with the specified ATS unit on the specified frequency.	CONTACT *(unit name) (frequency)*
UM120 MONITOR *(ICAO unit name) (frequency)*	W/U	COMU−5	Instruction to monitor the specified ATS unit on the specified frequency. The flight crew is not required to establish voice contact on the frequency.	MONITOR *(unit name) (frequency)*

TBL 5−3−13

Voice Communications Downlink Message Elements (COMD)

CPDLC Message Sets		Operational Definition in PANS−ATM (Doc 4444)		
FANS 1/A	**Response**	**Message Element Identifier**	**Message Element Intended Use**	**Format for Message Element Display**
DM20 REQUEST VOICE CONTACT *Note − Used when a frequency is not required.*	Y	COMD−1	Request for voice contact on the specified frequency.	REQUEST VOICE CONTACT *(frequency)*

TBL 5−3−14

Emergency/Urgency Uplink Message Elements (EMGU)

CPDLC Message Sets		Operational Definition in PANS−ATM (Doc 4444)		
FANS 1/A	**Response**	**Message Element Identifier**	**Message Element Intended Use**	**Format for Message Element Display**
UM38 IMMEDIATELY CLIMB TO (*altitude*) Used in combination with LVLU−6 and LVLU−9, which is implemented in FANS 1/A as above	N	EMGU−2	Instruction to immediately comply with the associated instruction to avoid imminent situation.	Immediately
UM39 IMMEDIATELY DESCEND TO (*altitude*) Used in combination with LVLU−6 and LVLU−9, which is implemented in FANS 1/A as above	N	EMGU−2	Instruction to immediately comply with the associated instruction to avoid imminent situation.	Immediately

TBL 5-3-15

Emergency/Urgency Downlink Message Elements (EMGD)

CPDLC Message Sets		Operational Definition in PANS-ATM (Doc 4444)		
FANS 1/A	**Response**	**Message Element Identifier**	**Message Element Intended Use**	**Format for Message Element Display**
DM55 PAN PAN PAN *Note – N response attribute*	Y	EMGD-1	Indication of an urgent situation.	PAN PAN PAN
DM56 MAYDAY MAYDAY MAYDAY *Note – N response attribute*	Y	EMGD-2	Indication of an emergency situation.	MAYDAY MAYDAY MAYDAY
DM57 (*remaining fuel*) OF FUEL REMAINING AND (*remaining souls*) SOULS ON BOARD *Note – N response attribute*	Y	EMGD-3	Report indicating fuel remaining (time) and number of persons on board.	*(remaining fuel)* ENDURANCE AND *(persons on board)* PERSONS ON BOARD
DM58 CANCEL EMERGENCY *Note – N response attribute*	Y	EMGD-4	Indication that the emergency situation is canceled.	CANCEL EMERGENCY

TBL 5-3-16

Standard Response Uplink Message Elements (RSPU)

CPDLC Message Sets		Operational Definition in PANS-ATM (Doc 4444)		
FANS 1/A	**Response**	**Message Element Identifier**	**Message Element Intended Use**	**Format for Message Element Display**
UM0 UNABLE	N	RSPU-1	Indication that the message cannot be complied with.	UNABLE
UM1 STANDBY	N	RSPU-2	Indication that the message will be responded to shortly.	STANDBY
UM3 ROGER	N	RSPU-4	Indication that the message is received.	ROGER

TBL 5-3-17

Standard Response Downlink Message Elements (RSPD)

CPDLC Message Sets		Operational Definition in PANS-ATM (Doc 4444)		
FANS 1/A	**Response**	**Message Element Identifier**	**Message Element Intended Use**	**Format for Message Element Display**
DM0 WILCO	N	RSPD-1	Indication that the instruction is understood and will be complied with.	WILCO

DM1 UNABLE	N	RSPD−2	Indication that the message cannot be complied with.	UNABLE
DM2 STANDBY	N	RSPD−3	Indication that the message will be responded to shortly.	STANDBY
DM3 ROGER *Note − ROGER is the only correct response to an uplink free text message.*	N	RSPD−4	Indication that the message is received.	ROGER

TBL 5−3−18

Supplemental Uplink Message Elements (SUPU)

CPDLC Message Sets		Operational Definition in PANS−ATM (Doc 4444)		
FANS 1/A	**Response**	**Message Element Identifier**	**Message Element Intended Use**	**Format for Message Element Display**
UM166 DUE TO TRAFFIC	N	SUPU−2	Indication that the associated message is issued due to the specified reason.	DUE TO *(specified reason uplink)*
UM167 DUE TO AIRSPACE RESTRICTION	N	SUPU−2	Indication that the associated message is issued due to the specified reason.	DUE TO *(specified reason uplink)*

TBL 5−3−19

Supplemental Downlink Message Elements (SUPD)

CPDLC Message Sets		Operational Definition in PANS−ATM (Doc 4444)		
FANS 1/A	**Response**	**Message Element Identifier**	**Message Element Intended Use**	**Format for Message Element Display**
DM65 DUE TO WEATHER	N	SUPD−1	Indication that the associated message is issued due to the specified reason.	DUE TO *(specified reason uplink)*
DM66 DUE TO AIRCRAFT PERFORMANCE	N	SUPD−1	Indication that the associated message is issued due to the specified reason.	DUE TO *(specified reason downlink)*

TBL 5−3−20

Free Text Uplink Message Elements (TXTU)

CPDLC Message Sets		Operational Definition in PANS−ATM (Doc 4444)		
FANS 1/A	**Response**	**Message Element Identifier**	**Message Element Intended Use**	**Format for Message Element Display**
UM169 (*free text*)	R	TXTU−1	A message or part of a message that does not conform to any standard message element in the PANS−ATM (Doc 4444).	(*free text*) *Note−M alert attribute.*
UM169 Advisory (*free text*)	R	TXTU−1		(*free text*)
UM169 (*free text*) CPDLC NOT IN USE UNTIL FURTHER NOTIFICATION	R	See Note		(*free text*)
UM169 (*free text*) “[facility designation]” LOCAL ALTIMETER (for Altimeter Reporting Station)	R	See Note		(*free text*)
UM169 (*free text*) “[facility designation] LOCAL ALTIMETER MORE THAN ONE HOUR” OLD	R	See Note		(*free text*)
UM169 (*free text*) DUE TO WEATHER	R	See Note		(*free text*)
UM169 (*free text*) REST OF ROUTE UNCHANGED	R	See Note		(*free text*)
UM169 (*free text*) TRAFFIC FLOW MANAGEMENT REROUTE	R	See Note		(*free text*)
UM169 (free text) DUE TO SPACING	R	See Note		(*free text*)
UM169 (*free text*) ATC HAS YOUR REQUEST	R	See Note		(*free text*)
UM169 (*free text*) ATC ADVISORY	R	See Note		(*free text*)

NOTE−
These are FAA scripted free text messages with no GOLD equivalent.

TBL 5−3−21
Free Text Downlink Message Elements (TXTD)

CPDLC Message Sets		Operational Definition in PANS−ATM (Doc 4444)		
FANS 1/A	**Response**	**Message Element Identifier**	**Message Element Intended Use**	**Format for Message Element Display**
DM68 *(free text)* *Note 1. − Urgency or Distress Alr (M)* *Note 2. − Selecting any of the emergency message elements will result in this message element being enabled for the flight crew to include in the emergency message at their discretion.*	Y	TXTD−1		(*free text*) *Note − M alert attribute.*

TBL 5−3−22
System Management Uplink Message Elements (SYSU)

CPDLC Message Sets		Operational Definition in PANS−ATM (Doc 4444)		
FANS 1/A	**Response**	**Message Element Identifier**	**Message Element Intended Use**	**Format for Message Element Display**
UM159 ERROR *(error information)*	N	SYSU−1	System−generated notification of an error.	ERROR *(error information)*
UM160 NEXT DATA AUTHORITY *(ICAO facility designation)* *Note − The facility designation is required.*	N	SYSU−2	System−generated notification of the next data authority or the cancellation thereof.	NEXT DATA AUTHORITY *(facility designation [O])*

TBL 5−3−23
System Management Downlink Message Elements (SYSD)

CPDLC Message Sets		Operational Definition in PANS−ATM (Doc 4444)		
FANS 1/A	**Response**	**Message Element Identifier**	**Message Element Intended Use**	**Format for Message Element Display**
DM62 ERROR *(error information)*	N	SYSD−1	System−generated notification of an error.	SYSD−1

DM63 NOT CURRENT DATA AUTHORITY	N	SYSD−3	System−generated rejection of any CPDLC message sent from a ground facility that is not the current data authority.	SYSD−3
DM64 *(ICAO facility designation)* *Note − Use by FANS 1/A aircraft in B1 environments.*	N	SYSD−5	System−generated notification that the ground system is not designated as the next data authority (NDA), indicating the identity of the current data authority (CDA). Identity of the NDA, if any, is also reported.	SYSD−5

b. ATC Frequency Change Procedures.

1. The following phraseology will be used by controllers to effect a frequency change:

EXAMPLE−
(Aircraft identification) contact (facility name or location name and terminal function) (frequency) at (time, fix, or altitude).

NOTE−
Pilots are expected to maintain a listening watch on the transferring controller's frequency until the time, fix, or altitude specified. ATC will omit frequency change restrictions whenever pilot compliance is expected upon receipt.

2. The following phraseology should be utilized by pilots for establishing contact with the designated facility:

(a) When operating in a radar environment: On initial contact, the pilot should inform the controller of the aircraft's assigned altitude preceded by the words "level," or "climbing to," or "descending to," as appropriate; and the aircraft's present vacating altitude, if applicable.

EXAMPLE−
1. *(Name) CENTER, (aircraft identification), LEVEL (altitude or flight level).*

2. *(Name) CENTER, (aircraft identification), LEAVING (exact altitude or flight level), CLIMBING TO OR DESCENDING TO (altitude of flight level).*

NOTE−
Exact altitude or flight level means to the nearest 100 foot increment. Exact altitude or flight level reports on initial contact provide ATC with information required prior to using Mode C altitude information for separation purposes.

(b) When operating in a nonradar environment:

(1) On initial contact, the pilot should inform the controller of the aircraft's present position, altitude and time estimate for the next reporting point.

EXAMPLE−
(Name) CENTER, (aircraft identification), (position), (altitude), ESTIMATING (reporting point) AT (time).

(2) After initial contact, when a position report will be made, the pilot should give the controller a complete position report.

EXAMPLE−
(Name) CENTER, (aircraft identification), (position), (time), (altitude), (type of flight plan), (ETA and name of next reporting point), (the name of the next succeeding reporting point), AND (remarks).

REFERENCE−
AIM, Para 5−3−2, Position Reporting.

3. At times controllers will ask pilots to verify that they are at a particular altitude. The phraseology used will be: "VERIFY AT (altitude)." In climbing or descending situations, controllers may ask pilots to "*VERIFY ASSIGNED ALTITUDE AS (altitude)*." Pilots should confirm that they are at the altitude stated by the controller or that the assigned altitude is correct as stated. If this is not the case, they should inform the controller of the actual altitude being maintained or the different assigned altitude.

CAUTION−
Pilots should not take action to change their actual altitude or different assigned altitude to the altitude stated in the controllers verification request unless the controller specifically authorizes a change.

c. ARTCC Radio Frequency Outage. ARTCCs normally have at least one back-up radio receiver and transmitter system for each frequency, which can usually be placed into service quickly with little or no disruption of ATC service. Occasionally, technical problems may cause a delay but switchover seldom takes more than 60 seconds. When it appears that the outage will not be quickly remedied, the ARTCC will usually request a nearby aircraft, if there is one, to switch to the affected frequency to broadcast communications instructions. It is important, therefore, that the pilot wait at least 1 minute before deciding that the ARTCC has actually experienced a radio frequency failure. When such an outage does occur, the pilot should, if workload and equipment capability permit, maintain a listening watch on the affected frequency while attempting to comply with the following recommended communications procedures:

1. If two-way communications cannot be established with the ARTCC after changing frequencies, a pilot should attempt to recontact the transferring controller for the assignment of an alternative frequency or other instructions.

2. When an ARTCC radio frequency failure occurs after two-way communications have been established, the pilot should attempt to reestablish contact with the center on any other known ARTCC frequency, preferably that of the next responsible sector when practicable, and ask for instructions. However, when the next normal frequency change along the route is known to involve another ATC facility, the pilot should contact that facility, if feasible, for instructions. If communications cannot be reestablished by either method, the pilot is expected to request communications instructions from the FSS appropriate to the route of flight.

NOTE−
The exchange of information between an aircraft and an ARTCC through an FSS is quicker than relay via company radio because the FSS has direct interphone lines to the responsible ARTCC sector. Accordingly, when circumstances dictate a choice between the two, during an ARTCC frequency outage, relay via FSS radio is recommended.

d. Oakland Oceanic FIR. The use of CPDLC and ADS−C in the Oakland Oceanic FIR (KZAK) is only permitted by Inmarsat and Iridium customers. All other forms of data link connectivity are not authorized. Users must ensure that the proper data link code is filed in Item 10a of the ICAO FPL in order to indicate which satellite medium(s) the aircraft is equipped with. The identifier for Inmarsat is J5 and the identifier for Iridium is J7. If J5 or J7 is not included in the ICAO FPL, then the LOGON will be rejected by KZAK and the aircraft will not be able to connect.

e. New York Oceanic FIR. The use of CPDLC and ADS−C in the New York Oceanic FIR (KZWY) is only permitted by Inmarsat and Iridium customers. All other forms of data link connectivity are not authorized. Users must ensure that the proper data link code is filed in Item 10a of the ICAO FPL in order to indicate which satellite medium(s) the aircraft is equipped with. The identifier for Inmarsat is J5 and the identifier for Iridium is J7. If J5 or J7 is not included in the ICAO FPL, then the LOGON will be rejected by KZWY and the aircraft will not be able to connect.

5−3−2. Position Reporting

The safety and effectiveness of traffic control depends to a large extent on accurate position reporting. In order to provide the proper separation and expedite aircraft movements, ATC must be able to make accurate estimates of the progress of every aircraft operating on an IFR flight plan.

a. Position Identification.

1. When a position report is to be made passing a VOR radio facility, the time reported should be the time at which the first complete reversal of the "to/from" indicator is accomplished.

2. When a position report is made passing a facility by means of an airborne ADF, the time reported should be the time at which the indicator makes a complete reversal.

3. When an aural or a light panel indication is used to determine the time passing a reporting point, such as a fan marker, Z marker, cone of silence or intersection of range courses, the time should be noted when the signal is first received and again when it ceases. The mean of these two times should then be taken as the actual time over the fix.

4. If a position is given with respect to distance and direction from a reporting point, the distance and direction should be computed as accurately as possible.

5. Except for terminal area transition purposes, position reports or navigation with reference to aids not established for use in the structure in which flight is being conducted will not normally be required by ATC.

b. Position Reporting Points. CFRs require pilots to maintain a listening watch on the appropriate frequency and, unless operating under the provisions of subparagraph c, to furnish position reports passing certain reporting points. Reporting points are indicated by symbols on en route charts. The designated compulsory reporting point symbol is a solid triangle ▲ and the "on request" reporting point symbol is the open triangle △. Reports passing an "on request" reporting point are only necessary when requested by ATC.

c. Position Reporting Requirements.

1. Flights Along Airways or Routes. A position report is required by all flights regardless of altitude, including those operating in accordance with an ATC clearance specifying *"VFR−on−top,"* over each designated compulsory reporting point along the route being flown.

2. Flights Along a Direct Route. Regardless of the altitude or flight level being flown, including flights operating in accordance with an ATC clearance specifying "*VFR−on−top,"* pilots must report over each reporting point used in the flight plan to define the route of flight.

3. Flights in a Radar Environment. When informed by ATC that their aircraft are in "Radar Contact," pilots should discontinue position reports over designated reporting points. They should resume normal position reporting when ATC advises "*RADAR CONTACT LOST"* or "*RADAR SERVICE TERMINATED."*

4. Flights in an Oceanic (Nonradar) Environment. Pilots must report over each point used in the flight plan to define the route of flight, even if the point is depicted on aeronautical charts as an "on request" (non-compulsory) reporting point. For aircraft providing automatic position reporting via an Automatic Dependent Surveillance-Contract (ADS-C) logon, pilots should discontinue voice position reports.

NOTE−
ATC will inform pilots that they are in "radar contact":

(a) *when their aircraft is initially identified in the ATC system; and*

(b) *when radar identification is reestablished after radar service has been terminated or radar contact lost.*

Subsequent to being advised that the controller has established radar contact, this fact will not be repeated to the pilot when handed off to another controller. At times, the aircraft identity will be confirmed by the receiving controller; however, this should not be construed to mean that radar contact has been lost. The identity of transponder equipped aircraft will be confirmed by asking the pilot to "ident," "squawk standby," or to change codes. Aircraft without transponders will be advised of their position to confirm identity. In this case, the pilot is expected to advise the controller if in disagreement with the position given. Any pilot who cannot confirm the accuracy of the position given because of not being tuned to the NAVAID referenced by the controller, should ask for another radar position relative to the tuned in NAVAID.

d. Position Report Items:

1. Position reports should include the following items:

(a) Identification;

(b) Position;

(c) Time;

(d) Altitude or flight level (include actual altitude or flight level when operating on a clearance specifying VFR−on−top);

(e) Type of flight plan (not required in IFR position reports made directly to ARTCCs or approach control);

(f) ETA and name of next reporting point;

(g) The name only of the next succeeding reporting point along the route of flight; and

(h) Pertinent remarks.

5−3−3. Additional Reports

a. The following reports should be made to ATC or FSS facilities without a specific ATC request:

1. ***At all times.***

(a) When vacating any previously assigned altitude or flight level for a newly assigned altitude or flight level.

(b) When an altitude change will be made if operating on a clearance specifying VFR−on−top.

(c) When *unable* to climb/descend at a rate of a least 500 feet per minute.

(d) When approach has been missed. (Request clearance for specific action; i.e., to alternative airport, another approach, etc.)

(e) Change in the average true airspeed (at cruising altitude) when it varies by 5 percent or 10 knots (whichever is greater) from that filed in the flight plan.

(f) The time and altitude or flight level upon reaching a holding fix or point to which cleared.

(g) When leaving any assigned holding fix or point.

NOTE−
The reports in subparagraphs (f) and (g) may be omitted by pilots of aircraft involved in instrument training at military terminal area facilities when radar service is being provided.

(h) Any loss, in controlled airspace, of VOR, TACAN, ADF, low frequency navigation receiver capability, GPS anomalies while using installed IFR−certified GPS/GNSS receivers, complete or partial loss of ILS receiver capability or impairment of air/ground communications capability. Reports should include aircraft identification, equipment affected, degree to which the capability to operate under IFR in the ATC system is impaired, and the nature and extent of assistance desired from ATC.

NOTE−
1. *Other equipment installed in an aircraft may effectively impair safety and/or the ability to operate under IFR. If such equipment (e.g., airborne weather radar) malfunctions and in the pilot's judgment either safety or IFR capabilities are affected, reports should be made as above.*

2. *When reporting GPS anomalies, include the location and altitude of the anomaly. Be specific when describing the location and include duration of the anomaly if necessary.*

(i) Any information relating to the safety of flight.

2. When not in radar contact.

(a) When leaving final approach fix inbound on final approach (nonprecision approach) or when leaving the outer marker or fix used in lieu of the outer marker inbound on final approach (precision approach).

(b) A corrected estimate at anytime it becomes apparent that an estimate as previously submitted is in error in excess of 2 minutes. For flights in the North Atlantic (NAT), a revised estimate is required if the error is 3 minutes or more.

b. Pilots encountering weather conditions which have not been forecast, or hazardous conditions which have been forecast, are expected to forward a report of such weather to ATC.

REFERENCE−
AIM, Para 7−1−18, Pilot Weather Reports (PIREPs).
14 CFR Section 91.183(B) and (C).

5−3−4. Airways and Route Systems

a. Three fixed route systems are established for air navigation purposes. They are the Federal airway system (consisting of VOR and L/MF routes), the jet route system, and the RNAV route system. To the extent possible, these route systems are aligned in an overlying manner to facilitate transition between each.

1. The VOR and L/MF (nondirectional radio beacons) Airway System consists of airways designated from 1,200 feet above the surface (or in some instances higher) up to but not including 18,000 feet MSL. These airways are depicted on IFR Enroute Low Altitude Charts.

NOTE−
The altitude limits of a victor airway should not be exceeded except to effect transition within or between route structures.

(a) Except in Alaska, the VOR airways are: predicated solely on VOR or VORTAC navigation aids; depicted in black on aeronautical charts; and identified by a "V" (Victor) followed by the airway number (for example, V12).

NOTE−
Segments of VOR airways in Alaska are based on L/MF navigation aids and charted in brown instead of black on en route charts.

(1) A segment of an airway which is common to two or more routes carries the numbers of all the airways which coincide for that segment. When such is the case, pilots filing a flight plan need to indicate only that airway number for the route filed.

NOTE−
A pilot who intends to make an airway flight, using VOR facilities, will simply specify the appropriate "victor" airway(s) in the flight plan. For example, if a flight is to be made from Chicago to New Orleans at 8,000 feet, using omniranges only, the route may be indicated as "departing from Chicago−Midway, cruising 8,000 feet via Victor 9 to Moisant International." If flight is to be conducted in part by means of L/MF navigation aids and in part on omniranges, specifications of the appropriate airways in the flight plan will indicate which types of facilities will be used along the described routes, and, for IFR flight, permit ATC to issue a traffic clearance accordingly. A route may also be described by specifying the station over which the flight will pass, but in this case since many VORs and L/MF aids have the same name, the pilot must be careful to indicate which aid will be used at a particular location. This will be indicated in the route of flight portion of the flight plan by specifying the type of facility to be used after the location name in the following manner: Newark L/MF, Allentown VOR.

(2) With respect to position reporting, reporting points are designated for VOR Airway Systems. Flights using Victor Airways will report over these points unless advised otherwise by ATC.

(b) The L/MF airways (colored airways) are predicated solely on L/MF navigation aids and are depicted in brown on aeronautical charts and are identified by color name and number (e.g., Amber One). Green and Red airways are plotted east and west. Amber and Blue airways are plotted north and south.

(c) The use of TSO−C145 (as revised) or TSO−C146 (as revised) GPS/WAAS navigation systems is allowed in Alaska as the only means of navigation on published air traffic service (ATS) routes, including those Victor, T−Routes, and colored airway segments designated with a second minimum en route altitude (MEA) depicted in blue and followed by the letter G at those lower altitudes. The altitudes so depicted are below the minimum reception altitude (MRA) of the land−based navigation facility defining the route segment, and guarantee standard en route obstacle clearance and two−way communications. Air carrier operators requiring operations specifications are authorized to conduct operations on those routes in accordance with FAA operations specifications.

2. The jet route system consists of jet routes established from 18,000 feet MSL to FL 450 inclusive.

(a) These routes are depicted on Enroute High Altitude Charts. Jet routes are depicted in black on aeronautical charts and are identified by a "J" (Jet) followed by the airway number (e.g., J12). Jet routes, as VOR airways, are predicated solely on VOR or VORTAC navigation facilities (except in Alaska).

NOTE–
Segments of jet routes in Alaska are based on L/MF navigation aids and are charted in brown color instead of black on en route charts.

(b) With respect to position reporting, reporting points are designated for jet route systems. Flights using jet routes will report over these points unless otherwise advised by ATC.

3. Area Navigation (RNAV) Routes.

(a) Published RNAV routes, including Q−routes, T−routes, and Y−routes, can be flight planned for use by aircraft with RNAV capability, subject to any limitations or requirements noted on en route charts, in applicable Advisory Circulars, NOTAMs, etc. RNAV routes are normally depicted in blue on aeronautical charts and are identified by the letter "Q," "T," or "Y" followed by the airway number (for example, Q13, T205, and Y280). Published RNAV routes are RNAV 2 except when specifically charted as RNAV 1. Unless otherwise specified, these routes require system performance currently met by GPS, GPS/WAAS, or DME/DME/IRU RNAV systems that satisfy the criteria discussed in AC 90−100A, U.S. Terminal and En Route Area Navigation (RNAV) Operations.

(1) Q−routes are available for use by RNAV equipped aircraft between 18,000 feet MSL and FL 450 inclusive. Q−routes are depicted on Enroute High Altitude Charts.

NOTE–
Aircraft in Alaska may only operate on GNSS Q-routes with GPS (TSO-C129 (as revised) or TSO-C196 (as revised)) equipment while the aircraft remains in Air Traffic Control (ATC) radar surveillance or with GPS/WAAS which does not require ATC radar surveillance.

(2) T−routes are available for use by GPS or GPS/WAAS equipped aircraft from 1,200 feet above the surface (or in some instances higher) up to but not including 18,000 feet MSL. T−routes are depicted on Enroute Low Altitude Charts.

NOTE–
Aircraft in Alaska may only operate on GNSS T-routes with GPS/WAAS (TSO-C145 (as revised) or TSO-C146 (as revised)) equipment.

(3) Y−routes generally run in U.S. offshore airspace, however operators can find some Y−routes over southern Florida. Pilots must use GPS for navigation and meet RNAV 2 performance requirements for all flights on Y−routes. Operators can find additional Y−route requirements in the U.S. Aeronautical Information Publication (AIP), ENR 7.10, available on the FAA website.

(b) Unpublished 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 unpublished RNAV routes, except for GNSS−equipped aircraft cleared via filed published waypoints recallable from the aircraft's navigation database.

(c) Magnetic Reference Bearing (MRB) is the published bearing between two waypoints on an RNAV/GPS/GNSS route. The MRB is calculated by applying magnetic variation at the waypoint to the calculated true course between two waypoints. The MRB enhances situational awareness by indicating a reference bearing (no−wind heading) that a pilot should see on the compass/HSI/RMI, etc., when turning prior to/over a waypoint en route to another waypoint. Pilots should use this bearing as a reference only, because their RNAV/GPS/GNSS navigation system will fly the true course between the waypoints.

b. Operation above FL 450 may be conducted on a point-to-point basis. Navigational guidance is provided on an area basis utilizing those facilities depicted on the enroute high altitude charts.

c. Radar Vectors. Controllers may vector aircraft within controlled airspace for separation purposes, noise abatement considerations, when an operational advantage will be realized by the pilot or the controller, or when requested by the pilot. Vectors outside of controlled airspace will be provided only on pilot request. Pilots will be advised as to what the vector is to achieve when the vector is controller initiated and will take the aircraft off a previously assigned nonradar route. To the extent possible, aircraft operating on RNAV routes will be allowed to remain on their own navigation.

d. When flying in Canadian airspace, pilots are cautioned to review Canadian Air Regulations.

1. Special attention should be given to the parts which differ from U.S. CFRs.

(a) The Canadian Airways Class B airspace restriction is an example. Class B airspace is all controlled low level airspace above 12,500 feet MSL or the MEA, whichever is higher, within which only IFR and controlled VFR flights are permitted. (Low level airspace means an airspace designated and defined as such in the Designated Airspace Handbook.)

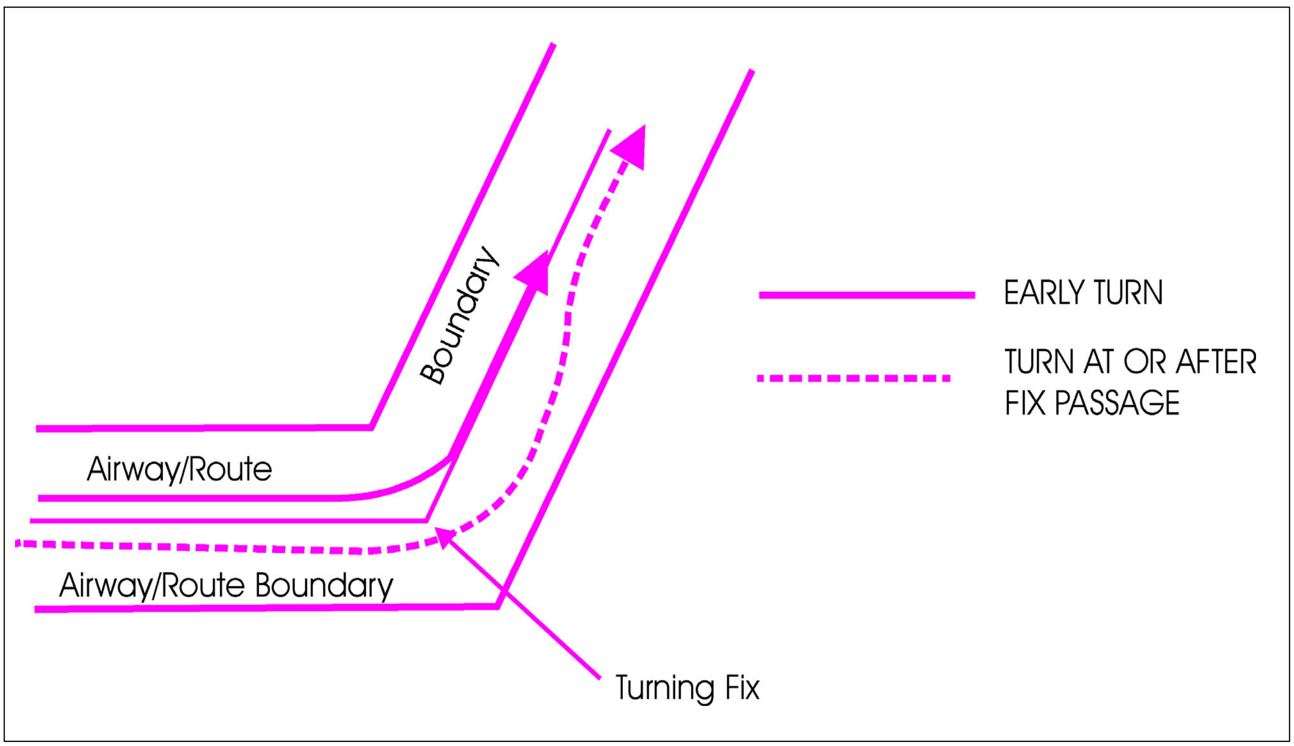
(b) Unless issued a VFR flight clearance by ATC, regardless of the weather conditions or the height of the terrain, no person may operate an aircraft under VMC within Class B airspace.

(c) The requirement for entry into Class B airspace is a student pilot permit (under the guidance or control of a flight instructor).

(d) VFR flight requires visual contact with the ground or water at all times.

2. Segments of VOR airways and high level routes in Canada are based on L/MF navigation aids and are charted in brown color instead of blue on en route charts.

FIG 5-3-1
Adhering to Airways or Routes



5-3-5. Airway or Route Course Changes

a. Pilots of aircraft are required to adhere to airways or routes being flown. Special attention must be given to this requirement during course changes. Each course change consists of variables that make the technique applicable in each case a matter only the pilot can resolve. Some variables which must be considered are turn radius, wind effect, airspeed, degree of turn, and cockpit instrumentation. An early turn, as illustrated below, is one method of adhering to airways or routes. The use of any available cockpit instrumentation, such as Distance Measuring Equipment, may be used by the pilot to lead the turn when making course changes. This *is consistent* with the intent of 14 CFR section 91.181, which requires pilots to operate along the centerline of an airway and along the direct course between navigational aids or fixes.

b. Turns which begin at or after fix passage may exceed airway or route boundaries. FIG 5−3−1 contains an example flight track depicting this, together with an example of an early turn.

c. Without such actions as leading a turn, aircraft operating in excess of 290 knots true air speed (TAS) can exceed the normal airway or route boundaries depending on the amount of course change required, wind direction and velocity, the character of the turn fix (DME, overhead navigation aid, or intersection), and the pilot's technique in making a course change. For example, a flight operating at 17,000 feet MSL with a TAS of 400 knots, a 25 degree bank, and a course change of more than 40 degrees would exceed the width of the airway or route; i.e., 4 nautical miles each side of centerline. However, in the airspace below 18,000 feet MSL, operations in excess of 290 knots TAS are not prevalent and the provision of additional IFR separation in all course change situations for the occasional aircraft making a turn in excess of 290 knots TAS creates an unacceptable waste of airspace and imposes a penalty upon the preponderance of traffic which operate at low speeds. Consequently, the FAA expects pilots to lead turns and take other actions they consider necessary during course changes to adhere as closely as possible to the airways or route being flown.

5−3−6. Changeover Points (COPs)

a. COPs are prescribed for Federal airways, jet routes, area navigation routes, or other direct routes for which an MEA is designated under 14 CFR part 95. The COP is a point along the route or airway segment between two adjacent navigation facilities or waypoints where changeover in navigation guidance should occur. At this point, the pilot should change navigation receiver frequency from the station behind the aircraft to the station ahead.

b. The COP is normally located midway between the navigation facilities for straight route segments, or at the intersection of radials or courses forming a dogleg in the case of dogleg route segments. When the COP is NOT located at the midway point, aeronautical charts will depict the COP location and give the mileage to the radio aids.

c. COPs are established for the purpose of preventing loss of navigation guidance, to prevent frequency interference from other facilities, and to prevent use of different facilities by different aircraft in the same airspace. Pilots are urged to observe COPs to the fullest extent.

5−3−7. Minimum Turning Altitude (MTA)

Due to increased airspeeds at 10,000 ft MSL or above, the published minimum enroute altitude (MEA) may not be sufficient for obstacle clearance when a turn is required over a fix, NAVAID, or waypoint. In these instances, an expanded area in the vicinity of the turn point is examined to determine whether the published MEA is sufficient for obstacle clearance. In some locations (normally mountainous), terrain/obstacles in the expanded search area may necessitate a higher minimum altitude while conducting the turning maneuver. Turning fixes requiring a higher minimum turning altitude (MTA) will be denoted on government charts by the minimum crossing altitude (MCA) icon ("x" flag) and an accompanying note describing the MTA restriction. An MTA restriction will normally consist of the air traffic service (ATS) route leading to the turn point, the ATS route leading from the turn point, and the required altitude; e.g., MTA V330 E TO V520 W 16000. When an MTA is applicable for the intended route of flight, pilots must ensure they are at or above the charted MTA not later than the turn point and maintain at or above the MTA until joining the centerline of the ATS route following the turn point. Once established on the centerline following the turning fix, the MEA/MOCA determines the minimum altitude available for assignment. An MTA may also preclude the use of a specific altitude or a range of altitudes during a turn. For example, the MTA may restrict the use of 10,000 through 11,000 ft MSL. In this case, any altitude greater than 11,000 ft MSL is unrestricted, as are altitudes less than 10,000 ft MSL provided MEA/MOCA requirements are satisfied.

5−3−8. Holding

a. Whenever an aircraft is cleared to a fix other than the destination airport and delay is expected, it is the responsibility of ATC to issue complete holding instructions (unless the pattern is charted), an EFC time and best estimate of any additional en route/terminal delay.

NOTE−
Only those holding patterns depicted on U.S. government or commercially produced (meeting FAA requirements) low/high altitude en route, and area or STAR charts should be used.

b. If the holding pattern is charted and the controller doesn't issue complete holding instructions, the pilot is expected to hold as depicted on the appropriate chart. When the pattern is charted on the assigned procedure or route being flown, ATC may omit all holding instructions except the charted holding direction and the statement *AS PUBLISHED;* for example, *HOLD EAST AS PUBLISHED*. ATC must always issue complete holding instructions when pilots request them.

c. If no holding pattern is charted and holding instructions have not been issued, the pilot should ask ATC for holding instructions prior to reaching the fix. This procedure will eliminate the possibility of an aircraft entering a holding pattern other than that desired by ATC. If unable to obtain holding instructions prior to reaching the fix (due to frequency congestion, stuck microphone, etc.), then enter a standard pattern on the course on which the aircraft approached the fix and request further clearance as soon as possible. In this event, the altitude/flight level of the aircraft at the clearance limit will be protected so that separation will be provided as required.

d. When an aircraft is 3 minutes or less from a clearance limit and a clearance beyond the fix has not been received, the pilot is expected to start a speed reduction so that the aircraft will cross the fix, initially, at or below the maximum holding airspeed.

e. When no delay is expected, the controller should issue a clearance beyond the fix as soon as possible and, whenever possible, at least 5 minutes before the aircraft reaches the clearance limit.

f. Pilots should report to ATC the time and altitude/flight level at which the aircraft reaches the clearance limit and report leaving the clearance limit.

NOTE−
In the event of two-way communications failure, pilots are required to comply with 14 CFR section 91.185.

g. When holding at a VOR station, pilots should begin the turn to the outbound leg at the time of the first complete reversal of the to/from indicator.

h. Patterns at the most generally used holding fixes are depicted (charted) on U.S. Government or commercially produced (meeting FAA requirements) Low or High Altitude En Route, Area, Departure Procedure, and STAR Charts. Pilots are expected to hold in the pattern depicted unless specifically advised otherwise by ATC.

NOTE−
Holding patterns that protect for a maximum holding airspeed other than the standard may be depicted by an icon, unless otherwise depicted. The icon is a standard holding pattern symbol (racetrack) with the airspeed restriction shown in the center. In other cases, the airspeed restriction will be depicted next to the standard holding pattern symbol.

REFERENCE−
AIM, Para 5−3−8 j2, Holding.

i. An ATC clearance requiring an aircraft to hold at a fix where the pattern is not charted will include the following information: (See FIG 5−3−2.)

1. Direction of holding from the fix in terms of the eight cardinal compass points (i.e., N, NE, E, SE, etc.).

2. Holding fix (the fix may be omitted if included at the beginning of the transmission as the clearance limit).

3. Radial, course, bearing, airway or route on which the aircraft is to hold.

4. Leg length in miles if DME or RNAV is to be used (leg length will be specified in minutes on pilot request or if the controller considers it necessary).

5. Direction of turn if left turns are to be made, the pilot requests, or the controller considers it necessary.

6. Time to expect further clearance and any pertinent additional delay information.

FIG 5−3−2
Holding Patterns

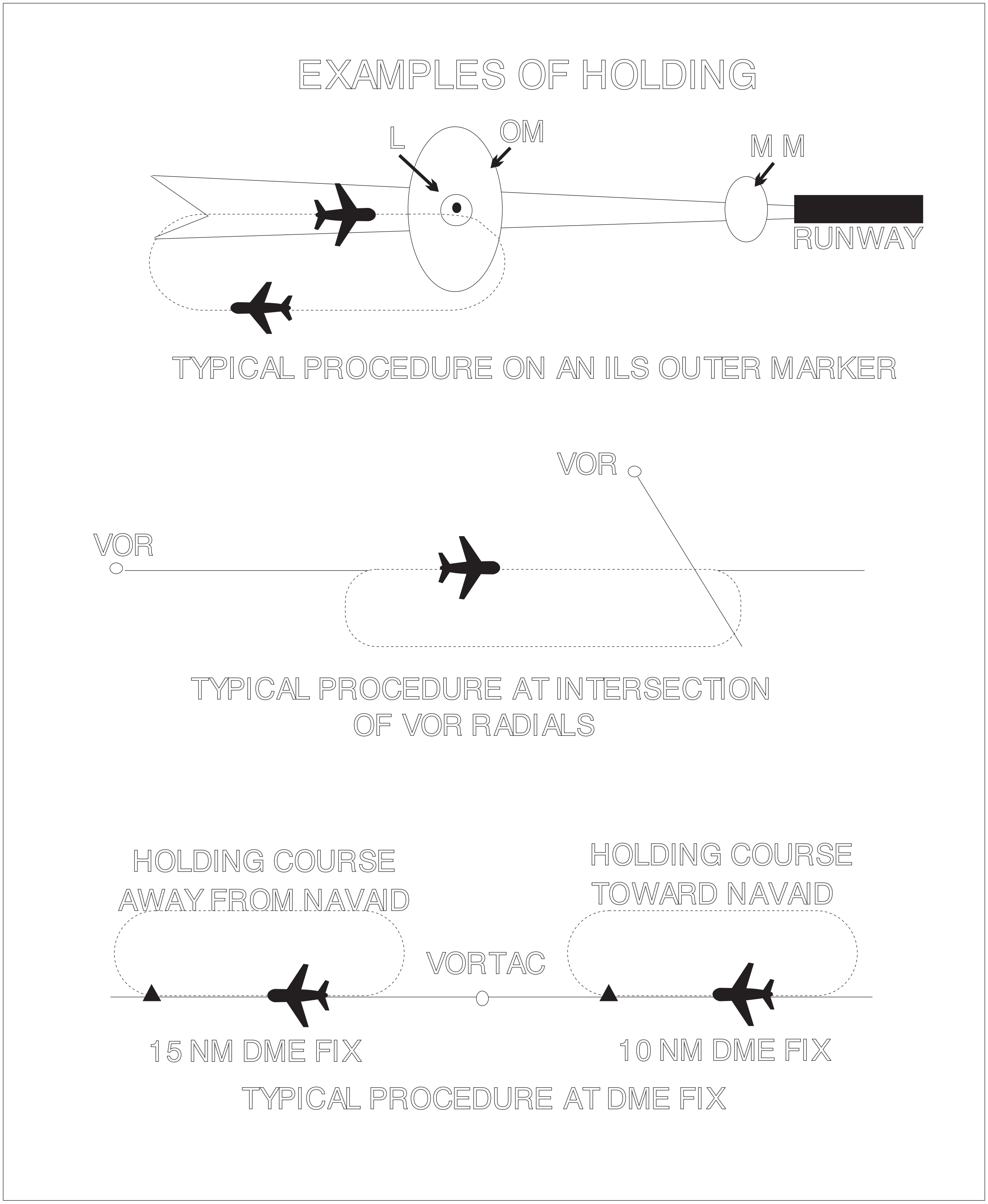
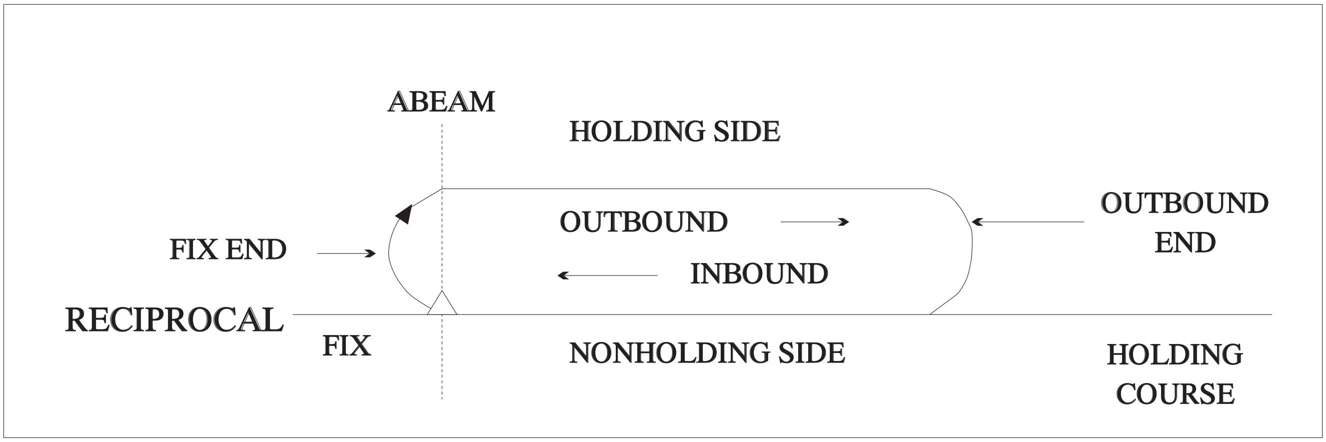


FIG 5−3−3
Holding Pattern Descriptive Terms



j. Holding pattern airspace protection is based on the following procedures.

1. Descriptive Terms.

(a) Standard Pattern. Right turns (See FIG 5−3−3.)

(b) Nonstandard Pattern. Left turns

2. Airspeeds.

(a) All aircraft may hold at the following altitudes and maximum holding airspeeds:

TBL 5−3−24

Altitude (MSL)	Airspeed (KIAS)
MHA − 6,000’	200
6,001’ − 14,000’	230
14,001’ and above	265

NOTE−
These are the maximum indicated air speeds applicable to all holding.

(b) The following are exceptions to the maximum holding airspeeds:

(1) Holding patterns from 6,001’ to 14,000’ may be restricted to a maximum airspeed of 210 KIAS. This nonstandard pattern will be depicted by an icon.

(2) Holding patterns may be restricted to a maximum speed. The speed restriction is depicted in parenthesis inside the holding pattern on the chart: e.g., (175). The aircraft should be at or below the maximum speed prior to initially crossing the holding fix to avoid exiting the protected airspace. Pilots unable to comply with the maximum airspeed restriction should notify ATC.

(3) Holding patterns at USAF airfields only − 310 KIAS maximum, unless otherwise depicted.

(4) Holding patterns at Navy fields only − 230 KIAS maximum, unless otherwise depicted.

(5) All helicopter/power lift aircraft holding on a “COPTER” instrument procedure is predicated on a minimum airspeed of 90 KIAS unless charted otherwise.

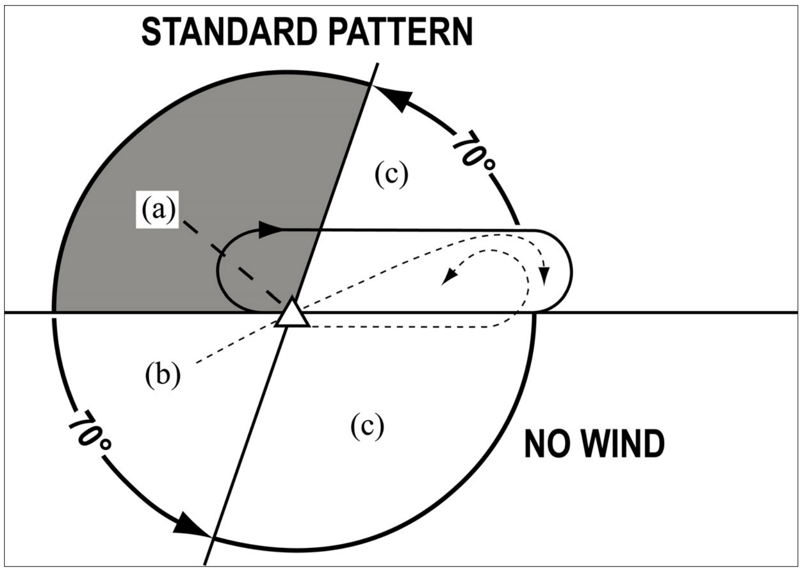
(6) When a climb−in hold is specified by a published procedure (for example, “Climb−in holding pattern to depart XYZ VORTAC at or above 10,000.” or “All aircraft climb−in TRUCK holding pattern to cross TRUCK Int at or above 11,500 before proceeding on course.”), additional obstacle protection area has been provided to allow for greater airspeeds in the climb for those aircraft requiring them. A maximum airspeed of

310 KIAS is permitted in Climb−in−holding, unless a maximum holding airspeed is published, in which case that maximum airspeed is applicable. The airspeed limitations in 14 CFR section 91.117, Aircraft Speed, still apply.

(c) The following phraseology may be used by an ATCS to advise a pilot of the maximum holding airspeed for a holding pattern airspace area.

PHRASEOLOGY−
(AIRCRAFT IDENTIFICATION) (holding instructions, when needed) MAXIMUM HOLDING AIRSPEED IS (speed in knots).

FIG 5−3−4
Holding Pattern Entry Procedures



3. Entry Procedures. Holding protected airspace is designed based in part on pilot compliance with the three recommended holding pattern entry procedures discussed below. Deviations from these recommendations, coupled with excessive airspeed crossing the holding fix, may in some cases result in the aircraft exceeding holding protected airspace. (See FIG 5−3−4.)

(a) Parallel Procedure. When approaching the holding fix from anywhere in sector (a), the parallel entry procedure would be to turn to a heading to parallel the holding course outbound on the nonholding side for one minute, turn in the direction of the holding pattern through more than 180 degrees, and return to the holding fix or intercept the holding course inbound.

(b) Teardrop Procedure. When approaching the holding fix from anywhere in sector (b), the teardrop entry procedure would be to fly to the fix, turn outbound to a heading for a 30 degree teardrop entry within the pattern (on the holding side) for a period of one minute, then turn in the direction of the holding pattern to intercept the inbound holding course.

(c) Direct Entry Procedure. When approaching the holding fix from anywhere in sector (c), the direct entry procedure would be to fly directly to the fix and turn to follow the holding pattern.

(d) While other entry procedures may enable the aircraft to enter the holding pattern and remain within protected airspace, the parallel, teardrop and direct entries are the procedures for entry and holding recommended by the FAA, and were derived as part of the development of the size and shape of the obstacle protection areas for holding.

(e) Nonstandard Holding Pattern. Fix end and outbound end turns are made to the left. Entry procedures to a nonstandard pattern are oriented in relation to the 70 degree line on the holding side just as in the standard pattern.

4. Timing.

(a) Inbound Leg.

(1) At or below 14,000 feet MSL: 1 minute.

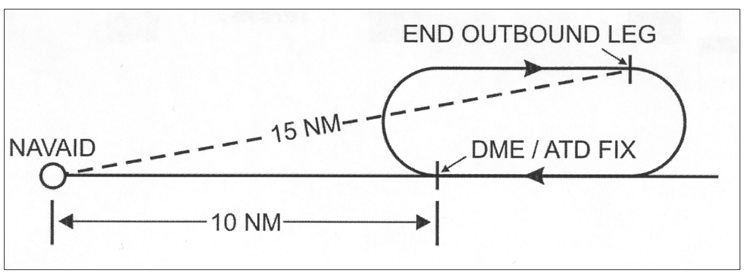
(2) Above 14,000 feet MSL: $1^1/_2$ minutes.

NOTE−
The initial outbound leg should be flown for 1 minute or $1\ ^1/_2$ minutes (appropriate to altitude). Timing for subsequent outbound legs should be adjusted, as necessary, to achieve proper inbound leg time. Pilots may use any navigational means available; i.e., DME, RNAV, etc., to ensure the appropriate inbound leg times.

(b) Outbound leg timing begins *over/abeam* the fix, whichever occurs later. If the abeam position cannot be determined, start timing when turn to outbound is completed.

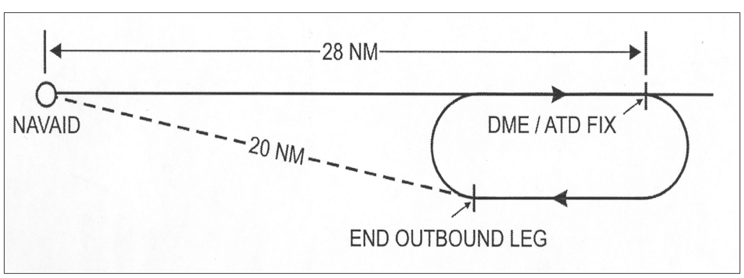
5. Distance Measuring Equipment (DME)/ GPS Along−Track Distance (ATD). DME/GPS holding is subject to the same entry and holding procedures except that distances (nautical miles) are used in lieu of time values. The outbound course of the DME/GPS holding pattern is called the outbound leg of the pattern. The controller or the instrument approach procedure chart will specify the length of the outbound leg. The end of the outbound leg is determined by the DME or ATD readout. The holding fix on conventional procedures, or controller defined holding based on a conventional navigation aid with DME, is a specified course or radial and distances are from the DME station for both the inbound and outbound ends of the holding pattern. When flying published GPS overlay or stand alone procedures with distance specified, the holding fix will be a waypoint in the database and the end of the outbound leg will be determined by the ATD. Some GPS overlay and early stand alone procedures may have timing specified. (See FIG 5−3−5, FIG 5−3−6 and FIG 5−3−7.) See paragraph 1−1−17, Global Positioning System (GPS), for requirements and restriction on using GPS for IFR operations.

FIG 5−3−5
Inbound Toward NAVAID



NOTE−
When the inbound course is toward the NAVAID, the fix distance is 10 NM, and the leg length is 5 NM, then the end of the outbound leg will be reached when the DME reads 15 NM.

FIG 5−3−6
Inbound Leg Away from NAVAID

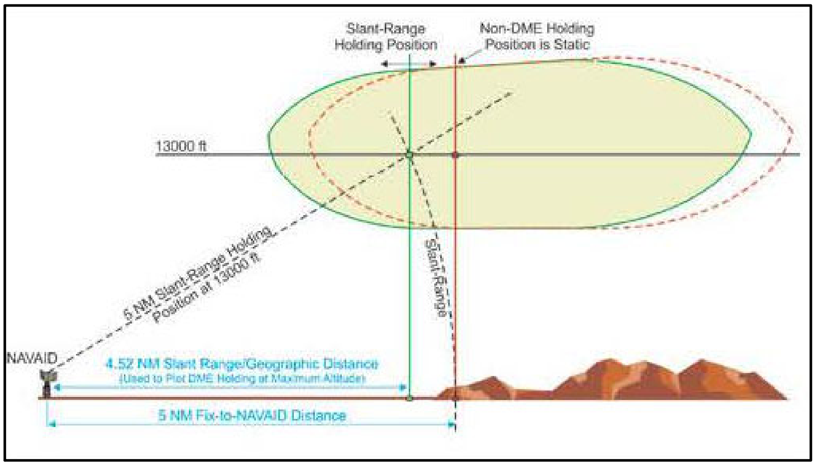


NOTE−
When the inbound course is away from the NAVAID and the fix distance is 28 NM, and the leg length is 8 NM, then the end of the outbound leg will be reached when the DME reads 20 NM.

6. Use of RNAV Distance in lieu of DME Distance. Substitution of RNAV computed distance to or from a NAVAID in place of DME distance is permitted when holding. However, the actual holding location and pattern flown will be further from the NAVAID than designed due to the lack of slant range in the position solution (see FIG 5−3−7). This may result in a slight difference between RNAV distance readout in reference to the NAVAID and the DME readout, especially at higher altitudes. When used solely for DME substitution, the difference between RNAV distance to/from a fix and DME slant range distance can be considered negligible and no pilot action is required.

REFERENCE−
AIM, Para 1−2−3, Use of Suitable Area Navigation (RNAV) Systems on Conventional Procedures and Routes.

FIG 5−3−7
Difference Between DME Distance From NAVAID & RNAV Computed Distance From NAVAID



7. Use of RNAV Guidance and Holding. RNAV systems, including multi−sensor Flight Management Systems (FMS) and stand−alone GPS receivers, may be used to furnish lateral guidance when executing a hold. The manner in which holding is implemented in an RNAV system varies widely between aircraft and RNAV system manufacturers. Holding pattern data may be extracted from the RNAV database for published holds or may be manually entered for ad−hoc ATC−assigned holds. Pilots are expected to be familiar with the capabilities and limitations of the specific RNAV system used for holding.

(a) All holding, including holding defined on an RNAV or RNP procedure, is based on the conventional NAVAID holding design criteria, including the holding protected airspace construction. There are differences between the holding entry and flight track assumed in conventional holding pattern design and the entry and track that may be flown when RNAV guidance is used to execute holding. Individually, these differences may not affect the ability of the aircraft to remain within holding pattern protected airspace. However, cumulatively, they can result in deviations sufficient to result in excursions up to limits of the holding pattern protected airspace, and in some circumstances beyond protected airspace. The following difference and considerations apply when an RNAV system furnishes the lateral guidance used to fly a holding pattern:

(1) Many systems use ground track angle instead of heading to select the entry method. While the holding pattern design allows a 5 degree tolerance, this may result in an unexpected entry when the winds induce a large drift angle.

(2) The holding protected airspace is based on the assumption that the aircraft will fly−over the holding fix upon initial entry. RNAV systems may execute a "fly−by" turn when approaching the holding fix prior to entry. A "fly−by" turn during a direct entry from the holding pattern side of holding course may result in excursions beyond protected airspace, especially as the intercept angle and ground speed increase.

(3) During holding, RNAV systems furnish lateral steering guidance using either a constant bank or constant radius to achieve the desired inbound and outbound turns. An aircraft's flight guidance system may use reduced bank angles for all turns including turns in holding, especially at higher altitudes, that may result in exceeding holding protected airspace. Use of a shallower bank angle will expand both the width and length of the aircraft track, especially as wind speed increases. If the flight guidance system's bank angle limit feature is pilot−selectable, a minimum 25 degree bank angle should be selected regardless of altitude unless aircraft operating limitations specify otherwise and the pilot advises ATC.

(4) Where a holding distance is published, the turn from the outbound leg begins at the published distance from the holding fix, thus establishing the design turn point required to remain within protected airspace. RNAV systems apply a database coded or pilot−entered leg distance as a maximum length of the *inbound* leg to the holding fix. The RNAV system then calculates a turn point from the outbound leg required to achieve this inbound leg length. This often results in an RNAV−calculated turn point on the outbound leg beyond the design turn point. (See FIG 5−3−8). With a strong headwind against the outbound leg, RNAV systems may fly up to and possibly beyond the limits of protected airspace before turning inbound. (See FIG 5−3−9.) This is especially true at higher altitudes where wind speeds are greater and ground speed results in a wider holding pattern.

FIG 5−3−8

RNAV Lateral Guidance and Holding − No Wind

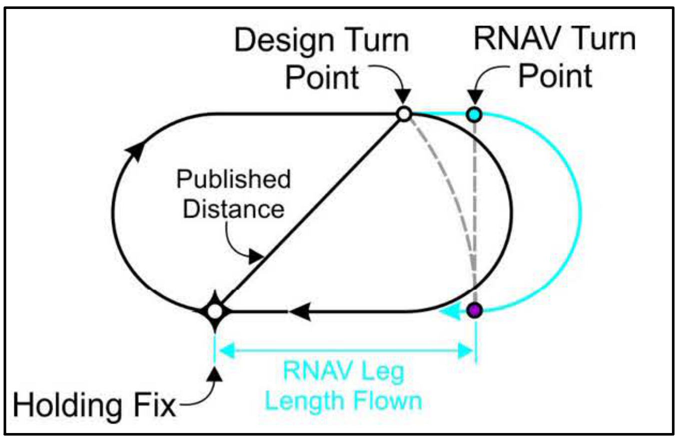
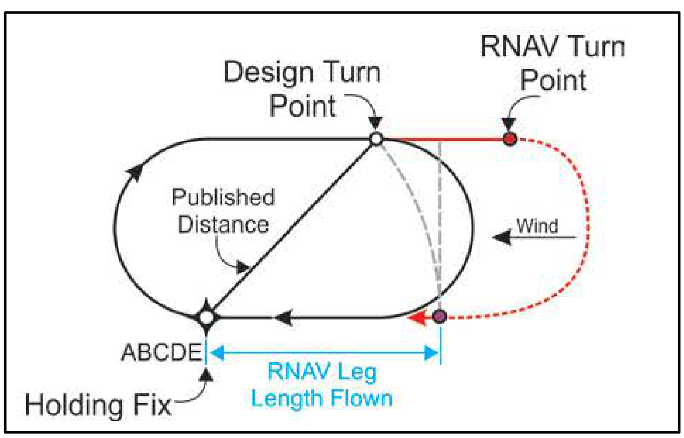


FIG 5−3−9

RNAV Lateral Guidance and Holding − Effect of Wind



(5) Some RNAV systems compute the holding pattern based on the aircraft's altitude and speed at a point prior to entering the hold. If the indicated airspeed is not reduced to comply with the maximum holding speed before this point, the computed pattern may exceed the protected airspace. Loading or executing a holding pattern may result in the speed and time limits applicable to the aircraft's current altitude being used to define the holding pattern for RNAV lateral guidance. This may result in an incorrect hold being flown by the RNAV system. For example, entering or executing the holding pattern above 14,000 feet when intending to hold below 14,000 feet may result in applying 1 ½ minute timing below 14,000 feet.

NOTE−
Some systems permit the pilot to modify leg time of holding patterns defined in the navigation database; for example, a hold−in−lieu of procedure turn. In most RNAV systems, the holding pattern time remains at the pilot−modified time and will not revert back to the coded time if the aircraft descends to a lower altitude where a shorter time interval applies.

(b) RNAV systems are not able to alert the pilot for excursions outside of holding pattern protected airspace since the dimensions of this airspace are not included in the navigation database. In addition, the dimensions of holding pattern protected airspace vary with altitude for a charted holding pattern, even when the hold is used for the same application. Close adherence to the pilot actions described in this section reduce the likelihood of exceeding the boundary of holding pattern protected airspace when using RNAV lateral guidance to conduct holding.

(c) Holding patterns may be stored in the RNAV system's navigation database and include coding with parameters defining how the RNAV system will conduct the hold. For example, coding will determine whether holding is conducted to manual termination (HM), continued holding until the aircraft reaches a specified altitude (HA), or holding is conducted until the holding fix is crossed the first time after entry (HF). Some systems do not store all holding patterns, and may only store patterns associated with missed approaches and hold−in−lieu of procedure turn (HILPT). Some store all holding as standard patterns and require pilot action to conduct non−standard holding (left turns).

(1) Pilots are cautioned that multiple holding patterns may be established at the same fix. These holding patterns may differ in respect to turn directions and leg lengths depending on their application as an en route holding pattern, a holding pattern charted on a SID or STAR, or when used on an instrument approach procedure. Many RNAV systems limit the database coding at a particular fix to a single holding pattern definition. Pilots extracting the holding pattern from the navigation database are responsible for confirming that the holding pattern conforms to the assigned charted holding pattern in terms of turn direction, speed limit, timing, and distance.

(2) If ATC assigns holding that is not charted, then the pilot is responsible for programming the RNAV system with the assigned holding course, turn direction, speed limit, leg length, or leg time.

(3) Changes made after the initial execution may not apply until the next circuit of the holding pattern if the aircraft is in close proximity to the holding fix.

8. Pilot Action. The following actions are recommended to ensure that the aircraft remains within holding protected airspace when holding is performed using either conventional NAVAID guidance or when using RNAV lateral guidance.

(a) Speed. When ATC furnishes advance notice of holding, start speed reduction to be at or below the maximum holding speed allowed at least 3 minutes prior to crossing the holding fix. If advance notice by ATC is not provided, begin speed reduction as expeditiously as practical. It is acceptable to allow RNAV systems to determine an appropriate deceleration point prior to the holding fix and to manage the speed reduction to the RNAV computed holding speed. If the pilot does not permit the RNAV system to manage the deceleration from the computed point, the actual hold pattern size at holding entry may differ from the holding pattern size computed by the RNAV system.

(1) Aircraft are expected to enter holding at or below the maximum holding speed established in paragraph 5−3−8j2(a) or the charted maximum holding speed.

[a] All fixed wing aircraft conducting holding should fly at speeds at or above 90 KIAS to minimize the influence of wind drift.

[b] When RNAV lateral guidance is used in fixed wing airplanes, it is desirable to enter and conduct holding at the lowest practical airspeed consistent with the airplane's recommended holding speed to address the cumulative errors associated with RNAV holding and increase the probability of remaining within protected airspace. It is acceptable to allow RNAV systems to determine a recommended holding speed *that is at or below the maximum holding speed.*

[c] Helicopter holding is based on a minimum airspeed of 90 KIAS.

(2) Advise ATC immediately if unable to comply with the maximum holding airspeed and request an alternate clearance.

NOTE−
Speeds above the maximum or published holding speed may be necessary due to turbulence, icing, etc. Exceeding maximum holding airspeed may result in aircraft excursions beyond the holding pattern protected airspace. In a non−radar environment, the pilot should advise ATC that they cannot accept the assigned hold.

(3) Ensure the RNAV system applies the proper time and speed restrictions to a holding pattern. This is especially critical when climbing or descending to a holding pattern altitude where time and speed restrictions are different than at the present aircraft altitude.

(b) Bank Angle. For holding not involving the use of RNAV lateral guidance, make all turns during entry and while holding at:

(1) 3 degrees per second, or

(2) 30 degree bank angle, or

(3) 25 degree bank angle, provided a flight director system is used.

NOTE−
Use whichever requires the least bank angle.

(4) When using RNAV lateral guidance to conduct holding, it is acceptable to permit the RNAV system to calculate the appropriate bank angle for the outbound and inbound turns. Do not use flight guidance system bank angle limiting functions of less than 25 degrees unless the feature is not pilot−selectable, required by the aircraft limitations, or its use is necessary to comply with the aircraft's minimum maneuvering speed margins. If the bank angle must be limited to less than 25 degrees, advise ATC that additional area for holding is required.

(c) Compensate for wind effect primarily by drift correction on the inbound and outbound legs. When outbound, triple the inbound drift correction to avoid major turning adjustments; for example, if correcting left by 8 degrees when inbound, correct right by 24 degrees when outbound.

(d) Determine entry turn from aircraft heading upon arrival at the holding fix; +/− 5 degrees in heading is considered to be within allowable good operating limits for determining entry. When using RNAV lateral guidance for holding, it is permissible to allow the system to compute the holding entry.

(e) RNAV lateral guidance may execute a fly−by turn beginning at an excessively large distance from the holding fix. Reducing speed to the maximum holding speed at least 3 minutes prior to reaching the holding fix and using the recommended 25 degree bank angle will reduce potential excursions beyond protected airspace.

(f) When RNAV guidance is used for holding, pilots should be prepared to intervene if the turn from outbound leg to the inbound leg does not begin within a reasonable distance of the charted leg length, especially when holding is used as a course reversal HILPT. Pilot intervention is not required when holding in an ATC−assigned holding pattern that is not charted. However, notify ATC when the outbound leg length becomes excessive when RNAV guidance is used for holding.

k. When holding at a fix and instructions are received specifying the time of departure from the fix, the pilot should adjust the aircraft's flight path within the limits of the established holding pattern in order to leave the fix at the exact time specified. After departing the holding fix, normal speed is to be resumed with respect to other governing speed requirements, such as terminal area speed limits, specific ATC requests, etc. Where the fix is associated with an instrument approach and timed approaches are in effect, a procedure turn must not be executed unless the pilot advises ATC, since aircraft holding are expected to proceed inbound on final approach directly from the holding pattern when approach clearance is received.

l. Radar surveillance of holding pattern airspace areas.

1. Whenever aircraft are holding, ATC will usually provide radar surveillance of the holding airspace on the controller's radar display.

2. The controller will attempt to detect any holding aircraft that stray outside the holding airspace and will assist any detected aircraft to return to the assigned airspace.

NOTE–
Many factors could prevent ATC from providing this additional service, such as workload, number of targets, precipitation, ground clutter, and radar system capability. These circumstances may make it unfeasible to maintain radar identification of aircraft to detect aircraft straying from the holding pattern. The provision of this service depends entirely upon whether controllers believe they are in a position to provide it and does not relieve a pilot of their responsibility to adhere to an accepted ATC clearance.

3. ATC is responsible for traffic and obstruction separation when they have assigned holding that is not associated with a published (charted) holding pattern. Altitudes assigned will be at or above the minimum vectoring or minimum IFR altitude.

4. If an aircraft is established in a published holding pattern at an assigned altitude above the published minimum holding altitude and subsequently cleared for the approach, the pilot may descend to the published minimum holding altitude. The holding pattern would only be a segment of the IAP *if* it is published on the instrument procedure chart and is used in lieu of a procedure turn.

m. For those holding patterns where there are no published minimum holding altitudes, the pilot, upon receiving an approach clearance, must maintain the last assigned altitude until leaving the holding pattern and established on the inbound course. Thereafter, the published minimum altitude of the route segment being flown will apply. It is expected that the pilot will be assigned a holding altitude that will permit a normal descent on the inbound course.

(b) Pilots cleared for vertical navigation using the phraseology "descend via" must inform ATC upon initial contact with a new frequency, of the altitude leaving, "descending via (procedure name)," the runway transition or landing direction if assigned, and any assigned restrictions not published on the procedure.

EXAMPLE−

1. *Delta 121 is cleared to descend via the Eagul Five arrival, runway 26 transition: "Delta One Twenty One leaving flight level one niner zero, descending via the Eagul Five arrival runway two-six transition."*

2. *Delta 121 is cleared to descend via the Eagul Five arrival, but ATC has changed the bottom altitude to 12,000: "Delta One Twenty One leaving flight level one niner zero for one two thousand, descending via the Eagul Five arrival, runway two-six transition."*

3. *(JetBlue 602 is cleared to descend via the Ivane Two arrival, landing south): "JetBlue six zero two leaving flight level two one zero descending via the Ivane Two arrival landing south."*

b. Pilots of IFR aircraft destined to locations for which STARs have been published may be issued a clearance containing a STAR whenever ATC deems it appropriate.

c. Use of STARs requires pilot possession of at least the approved chart. RNAV STARs must be retrievable by the procedure name from the aircraft database and conform to charted procedure. As with any ATC clearance or portion thereof, it is the responsibility of each pilot to accept or refuse an issued STAR. Pilots should notify ATC if they do not wish to use a STAR by placing "NO STAR" in the remarks section of the flight plan or by the less desirable method of verbally stating the same to ATC.

d. STAR charts are published in the Terminal Procedures Publications (TPP) and are available from FAA's Aeronautical Information Services (AIS).

e. PBN STAR.

1. Public PBN STARs are normally designed using RNAV 1, RNP 1, or A−RNP NavSpecs. These procedures require system performance currently met by GPS or DME/DME/IRU PBN systems that satisfy the criteria discussed in AC 90−100A, U.S. Terminal and En Route Area Navigation (RNAV) Operations. These procedures, using RNAV 1 and RNP 1 NavSpecs, must maintain a total system error of not more than 1 NM for 95% of the total flight time. Minimum values for A−RNP procedures will be charted in the PBN box (for example, 1.00 or 0.30).

2. In the U.S., a specific procedure's PBN requirements will be prominently displayed in separate, standardized notes boxes. For procedures with PBN elements, the "PBN box" will contain the procedure's NavSpec(s); and, if required: specific sensors or infrastructure needed for the navigation solution, any additional or advanced functional requirements, the minimum RNP value, and any amplifying remarks. Items listed in this PBN box are REQUIRED for the procedure's PBN elements.

5−4−2. Local Flow Traffic Management Program

a. This program is a continuing effort by the FAA to enhance safety, minimize the impact of aircraft noise and conserve aviation fuel. The enhancement of safety and reduction of noise is achieved in this program by minimizing low altitude maneuvering of arriving turbojet and turboprop aircraft weighing more than 12,500 pounds and, by permitting departure aircraft to climb to higher altitudes sooner, as arrivals are operating at higher altitudes at the points where their flight paths cross. The application of these procedures also reduces exposure time between controlled aircraft and uncontrolled aircraft at the lower altitudes in and around the terminal environment. Fuel conservation is accomplished by absorbing any necessary arrival delays for aircraft included in this program operating at the higher and more fuel efficient altitudes.

b. A fuel efficient descent is basically an uninterrupted descent (except where level flight is required for speed adjustment) from cruising altitude to the point when level flight is necessary for the pilot to stabilize the aircraft on final approach. The procedure for a fuel efficient descent is based on an altitude loss which is most efficient for the majority of aircraft being served. This will generally result in a descent gradient window of 250−350 feet per nautical mile.

c. When crossing altitudes and speed restrictions are issued verbally or are depicted on a chart, ATC will expect the pilot to descend first to the crossing altitude and then reduce speed. Verbal clearances for descent will normally permit an uninterrupted descent in accordance with the procedure as described in paragraph b above. Acceptance of a charted fuel efficient descent (Runway Profile Descent) clearance requires the pilot to adhere to the altitudes, speeds, and headings depicted on the charts unless otherwise instructed by ATC. PILOTS RECEIVING A CLEARANCE FOR A FUEL EFFICIENT DESCENT ARE EXPECTED TO ADVISE ATC IF THEY DO NOT HAVE RUNWAY PROFILE DESCENT CHARTS PUBLISHED FOR THAT AIRPORT OR ARE UNABLE TO COMPLY WITH THE CLEARANCE.

5−4−3. Approach Control

a. Approach control is responsible for controlling all instrument flight operating within its area of responsibility. Approach control may serve one or more airfields, and control is exercised primarily by direct pilot and controller communications. Prior to arriving at the destination radio facility, instructions will be received from ARTCC to contact approach control on a specified frequency.

b. Radar Approach Control.

1. Where radar is approved for approach control service, it is used not only for radar approaches (Airport Surveillance Radar [ASR] and Precision Approach Radar [PAR]) but is also used to provide vectors in conjunction with published nonradar approaches based on radio NAVAIDs (ILS, VOR, NDB, TACAN). Radar vectors can provide course guidance and expedite traffic to the final approach course of any established IAP or to the traffic pattern for a visual approach. Approach control facilities that provide this radar service will operate in the following manner:

(a) Arriving aircraft are either cleared to an outer fix most appropriate to the route being flown with vertical separation and, if required, given holding information or, when radar handoffs are effected between the ARTCC and approach control, or between two approach control facilities, aircraft are cleared to the airport or to a fix so located that the handoff will be completed prior to the time the aircraft reaches the fix. When radar handoffs are utilized, successive arriving flights may be handed off to approach control with radar separation in lieu of vertical separation.

(b) After release to approach control, aircraft are vectored to the final approach course (ILS, RNAV, GLS, VOR, ADF, etc.). Radar vectors and altitude or flight levels will be issued as required for spacing and separating aircraft. *Therefore, pilots must not deviate from the headings issued by approach control.* Aircraft will normally be informed when it is necessary to vector across the final approach course for spacing or other reasons. If approach course crossing is imminent and the pilot has not been informed that the aircraft will be vectored across the final approach course, the pilot should query the controller.

(c) The pilot is not expected to turn inbound on the final approach course unless an approach clearance has been issued. This clearance will normally be issued with the final vector for interception of the final approach course, and the vector will be such as to enable the pilot to establish the aircraft on the final approach course prior to reaching the final approach fix.

(d) In the case of aircraft already inbound on the final approach course, approach clearance will be issued prior to the aircraft reaching the final approach fix. When established inbound on the final approach course, radar separation will be maintained and the pilot will be expected to complete the approach utilizing the approach aid designated in the clearance (ILS, RNAV, GLS, VOR, radio beacons, etc.) as the primary means of navigation. Therefore, once established on the final approach course, pilots must not deviate from it unless a clearance to do so is received from ATC.

(e) After passing the final approach fix on final approach, aircraft are expected to continue inbound on the final approach course and complete the approach or effect the missed approach procedure published for that airport.

2. ARTCCs are approved for and may provide approach control services to specific airports. The radar systems used by these centers do not provide the same precision as an ASR/PAR used by approach control

c. A minimum of 1.0 NM radar separation (diagonal) is required between successive aircraft on the adjacent final approach course when runway centerlines are at least 2,500 feet but no more than 3,600 feet apart. A minimum of 1.5 NM radar separation (diagonal) is required between successive aircraft on the adjacent final approach course when runway centerlines are more than 3,600 feet but no more than 8,300 feet apart. When runway centerlines are more than 8,300 feet but no more than 9,000 feet apart a minimum of 2 NM diagonal radar separation is provided. Aircraft on the same final approach course within 10 NM of the runway end are provided a minimum of 3 NM radar separation, reduced to 2.5 NM in certain circumstances. In addition, a minimum of 1,000 feet vertical or a minimum of three miles radar separation is provided between aircraft during turn on to the parallel final approach course.

d. Whenever parallel approaches are in use, pilots are informed by ATC or via the ATIS that approaches to both runways are in use. The charted IAP also notes which runways may be used simultaneously. In addition, the radar controller will have the interphone capability of communicating with the tower controller where separation responsibility has not been delegated to the tower.

NOTE−
ATC will not specifically identify these operations as being dependent when advertised on the ATIS.

EXAMPLE−
Simultaneous ILS Runway 19 right and ILS Runway 19 left in use.

e. At certain airports, simultaneous dependent approaches are permitted to runways spaced less than 2,500 feet apart. In this case, ATC will provide no less than the minimum authorized diagonal separation with the leader always arriving on the same runway. The trailing aircraft is permitted reduced diagonal separation, instead of the single runway separation normally utilized for runways spaced less than 2,500 feet apart. For wake turbulence mitigation reasons:

1. Reduced diagonal spacing is only permitted when certain aircraft wake category pairings exist; typically when the leader is either in the large or small wake turbulence category, and

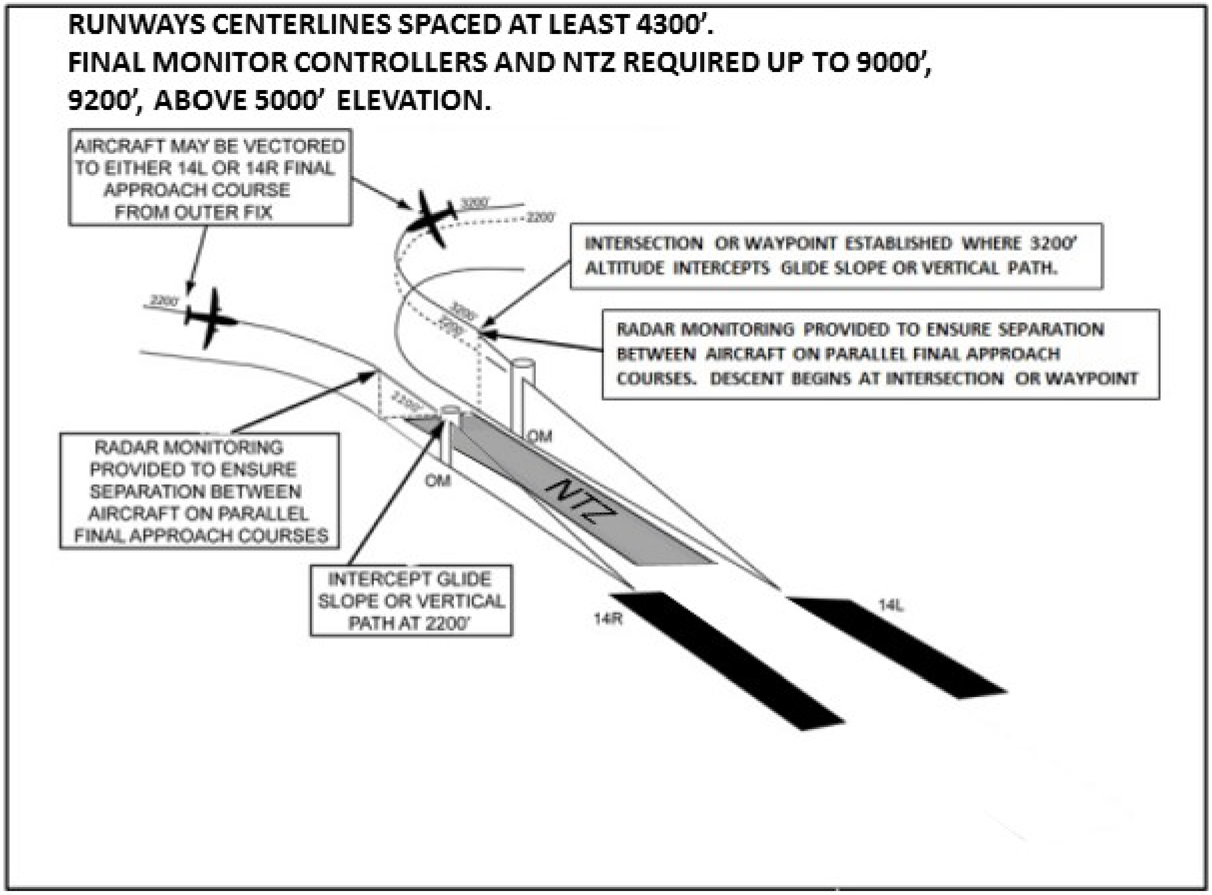
2. All aircraft must descend on the glideslope from the altitude at which they were cleared for the approach during these operations.

When reduced separation is authorized, the IAP briefing strip indicates that simultaneous operations require the use of vertical guidance and that the pilot should maintain last assigned altitude until intercepting the glideslope. No special pilot training is required to participate in these operations.

REFERENCE−
AIM, Para 5−4−16, Simultaneous Close Parallel PRM Approaches and Simultaneous Offset Instrument Approaches (SOIA).

5−4−15. Simultaneous Independent ILS/RNAV/GLS Approaches

FIG 5−4−22
Simultaneous Independent ILS/RNAV/GLS Approaches



a. System. An approach system permitting simultaneous approaches to parallel runways with centerlines separated by at least 4,300 feet. Separation between 4,300 and 9,000 feet (9,200' for airports above 5,000') utilizing NTZ final monitor controllers. Simultaneous independent approaches require NTZ radar monitoring to ensure separation between aircraft on the adjacent parallel approach course. Aircraft position is tracked by final monitor controllers who will issue instructions to aircraft observed deviating from the assigned final approach course. Staggered radar separation procedures are not utilized. Integral parts of a total system are radar, communications, ATC procedures, and ILS or other required airborne equipment. A chart note identifies that the approach is authorized for simultaneous use.

When simultaneous operations are in use, it will be advertised on the ATIS. When advised that simultaneous approaches are in use, pilots must advise approach control immediately of malfunctioning or inoperative receivers, or if a simultaneous approach is not desired. Although non−precision minimums may be published, pilots must only use those procedures specifically authorized by chart note. For example, the chart note "LNAV NA during simultaneous operations," requires vertical guidance. When given a choice, pilots should always fly a precision approach whenever possible.

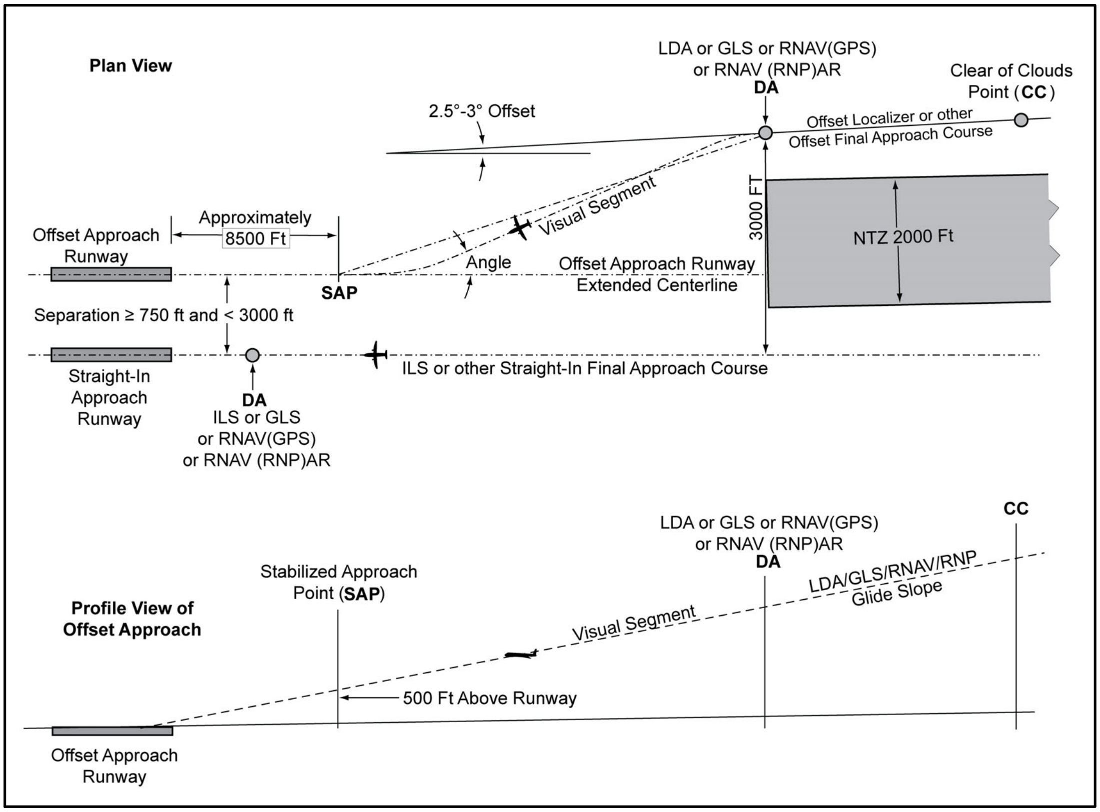
NOTE−
ATC does not use the word independent or parallel when advertising these operations on the ATIS.

EXAMPLE−
Simultaneous ILS Runway 24 left and ILS Runway 24 right approaches in use.

b. Radar Services. These services are provided for each simultaneous independent approach.

FIG 5−4−25

SOIA Approach Geometry



NOTE−

SAP	*The stabilized approach point is a design point along the extended centerline of the intended landing runway on the glide slope/glide path at 500 feet above the runway threshold elevation. It is used to verify a sufficient distance is provided for the visual maneuver after the offset course approach DA to permit the pilots to conform to approved, stabilized approach criteria. The SAP is not published on the IAP.*
Offset Course DA	*The point along the LDA, or other offset course, where the course separation with the adjacent ILS, or other straight-in course, reaches the minimum distance permitted to conduct closely spaced approaches. Typically that minimum distance will be 3,000 feet without the use of high update radar; with high update radar, course separation of less than 3,000 ft may be used when validated by a safety study. The altitude of the glide slope/glide path at that point determines the offset course approach decision altitude and is where the NTZ terminates. Maneuvering inside the DA is done in visual conditions.*
Visual Segment Angle	*Angle, as determined by the SOIA design tool, formed by the extension of the straight segment of the calculated flight track (between the offset course MAP/DA and the SAP) and the extended runway centerline. The size of the angle is dependent on the aircraft approach categories (Category D or only selected categories/speeds) that are authorized to use the offset course approach and the spacing between the runways.*
Visibility	*Distance from the offset course approach DA to runway threshold in statute mile.*

Procedure	*The aircraft on the offset course approach must see the runway-landing environment and, if ATC has advised that traffic on the straight-in approach is a factor, the offset course approach aircraft must visually acquire the straight-in approach aircraft and report it in sight to ATC prior to reaching the DA for the offset course approach.*
CC	*The Clear of Clouds point is the position on the offset final approach course where aircraft first operate in visual meteorological conditions below the ceiling, when the actual weather conditions are at, or near, the minimum ceiling for SOIA operations. Ceiling is defined by the Aeronautical Information Manual.*

6. SOIA PRM approaches utilize the same dual communications procedures as do other PRM approaches.

(a) SOIA utilizes the same AAUP format as do other PRM approaches. The minimum weather conditions that are required are listed. Because of the more complex nature of instructions for conducting SOIA approaches, the "Runway Specific" items are more numerous and lengthy.

(b) Examples of SOIA offset runway specific notes:

(1) Aircraft must remain on the offset course until passing the offset MAP prior to maneuvering to align with the centerline of the offset approach runway.

(2) Pilots are authorized to continue past the offset MAP to align with runway centerline when:

[a] the straight−in approach traffic is in sight and is expected to remain in sight,

[b] ATC has been advised that "traffic is in sight." (ATC is not required to acknowledge this transmission),

[c] the runway environment is in sight. Otherwise, a missed approach must be executed. Between the offset MAP and the runway threshold, pilots conducting the offset PRM approach must not pass the straight−in aircraft and are responsible for separating themselves visually from traffic conducting the straight−in PRM approach to the adjacent runway, which means maneuvering the aircraft as necessary to avoid that traffic until landing, and providing wake turbulence avoidance, if applicable. Pilots maintaining visual separation should advise ATC, as soon as practical, if visual contact with the aircraft conducting the straight−in PRM approach is lost and execute a missed approach unless otherwise instructed by ATC.

(c) Examples of SOIA straight−in runway specific notes:

(1) To facilitate the offset aircraft in providing wake mitigation, pilots should descend on, not above, the glideslope/glidepath.

(2) Conducting the straight−in approach, pilots should be aware that the aircraft conducting the offset approach will be approaching from the right/left rear and will be operating in close proximity to the straight−in aircraft.

7. Recap.

The following are differences between widely spaced simultaneous approaches (at least 4,300 feet between the runway centerlines) and Simultaneous PRM close parallel approaches which are of importance to the pilot:

(a) Runway Spacing. Prior to PRM simultaneous close parallel approaches, most ATC−directed breakouts were the result of two aircraft in−trail on the same final approach course getting too close together. Two aircraft going in the same direction did not mandate quick reaction times. With PRM closely spaced approaches, two aircraft could be alongside each other, navigating on courses that are separated by less than 4,300 feet and as close as 3,000 feet. In the unlikely event that an aircraft "blunders" off its course and makes a worst case turn of 30 degrees toward the adjacent final approach course, closing speeds of 135 feet per second could occur that constitute the need for quick reaction. A blunder has to be recognized by the monitor controller, and breakout instructions issued to the endangered aircraft. The pilot will not have any warning that a breakout is imminent because the blundering aircraft will be on another frequency. It is important that, when a pilot receives breakout instructions, the assumption is made that a blundering aircraft is about to (or has penetrated the NTZ) and is heading toward his/her approach course. The pilot must initiate a breakout as soon as safety allows. While conducting PRM approaches, pilots must maintain an increased sense of awareness in order to immediately react to an ATC (breakout) instruction and maneuver (as instructed by ATC) away from a blundering aircraft.

(b) Communications. Dual VHF communications procedures should be carefully followed. One of the assumptions made that permits the safe conduct of PRM approaches is that there will be no blocked communications.

(c) Hand−flown Breakouts. The use of the autopilot is encouraged while flying a PRM approach, but the autopilot must be disengaged in the rare event that a breakout is issued. Simulation studies of breakouts have shown that a hand−flown breakout can be initiated consistently faster than a breakout performed using the autopilot.

(d) TCAS. The ATC breakout instruction is the primary means of conflict resolution. TCAS, if installed, provides another form of conflict resolution in the unlikely event other separation standards would fail. TCAS is not required to conduct a closely spaced approach.

The TCAS provides only vertical resolution of aircraft conflicts, while the ATC breakout instruction provides both vertical and horizontal guidance for conflict resolutions. Pilots should always immediately follow the TCAS Resolution Advisory (RA), whenever it is received. Should a TCAS RA be received before, during, or after an ATC breakout instruction is issued, the pilot should follow the RA, even if it conflicts with the climb/descent portion of the breakout maneuver. If following an RA requires deviating from an ATC clearance, the pilot must advise ATC as soon as practical. While following an RA, it is extremely important that the pilot also comply with the turn portion of the ATC breakout instruction unless the pilot determines safety to be factor. Adhering to these procedures assures the pilot that acceptable "breakout" separation margins will always be provided, even in the face of a normal procedural or system failure.

5−4−17. Simultaneous Converging Instrument Approaches

a. ATC may conduct instrument approaches simultaneously to converging runways; i.e., runways having an included angle from 15 to 100 degrees, at airports where a program has been specifically approved to do so.

b. The basic concept requires that dedicated, separate standard instrument approach procedures be developed for each converging runway included. These approaches can be identified by the letter "V" in the title; for example, "ILS V Rwy 17 (CONVERGING)". Missed Approach Points must be at least 3 miles apart and missed approach procedures ensure that missed approach protected airspace does not overlap.

c. Other requirements are: radar availability, nonintersecting final approach courses, precision approach capability for each runway and, if runways intersect, controllers must be able to apply visual separation as well as intersecting runway separation criteria. Intersecting runways also require minimums of at least 700 foot ceilings and 2 miles visibility. Straight in approaches and landings must be made.

d. Whenever simultaneous converging approaches are in use, aircraft will be informed by the controller as soon as feasible after initial contact or via ATIS. Additionally, the radar controller will have direct communications capability with the tower controller where separation responsibility has not been delegated to the tower.

5−4−18. RNP AR (Authorization Required) Instrument Procedures

a. RNP AR procedures require authorization analogous to the special authorization required for Category II or III ILS procedures. All operators require specific authorization from the FAA to fly any RNP AR approach or departure procedure. The FAA issues RNP AR authorization via operations specification (OpSpec), management specification (MSpec), or letter of authorization (LOA). There are no exceptions. Operators can find comprehensive information on RNP AR aircraft eligibility, operating procedures, and training requirements in AC 90−101, Approval Guidance for RNP Procedures with AR.

b. Unique characteristics of RNP AR Operations Approach title. The FAA titles all RNP AR instrument approach procedures (IAP) as "RNAV (RNP) RWY XX." Internationally, operators may find RNP AR IAPs titled “RNP RWY XX (AR).” All RNP AR procedures will clearly state “Authorization Required” on the procedure chart.

c. RNP value. RNP AR procedures are characterized by use of a lateral Obstacle Evaluation Area (OEA) equal to two times the RNP value (2 x RNP) in nautical miles. No secondary lateral OEA or additional buffers are used. RNP AR procedures require a minimum lateral accuracy value of RNP 0.30. Each published line of minima in an RNP AR procedure has an associated RNP value that defines the procedure’s lateral performance requirement in the Final Approach Segment. Each approved RNP AR operator’s FAA−issued authorization will identify a minimum authorized RNP approach value. This value may vary depending on aircraft configuration or operational procedures (e.g., use of flight director or autopilot).

d. Radius−to−fix (RF) legs. Many RNP AR IFPs contain RF legs. Aircraft eligibility for RF legs is required in any authorization for RNP AR operations.

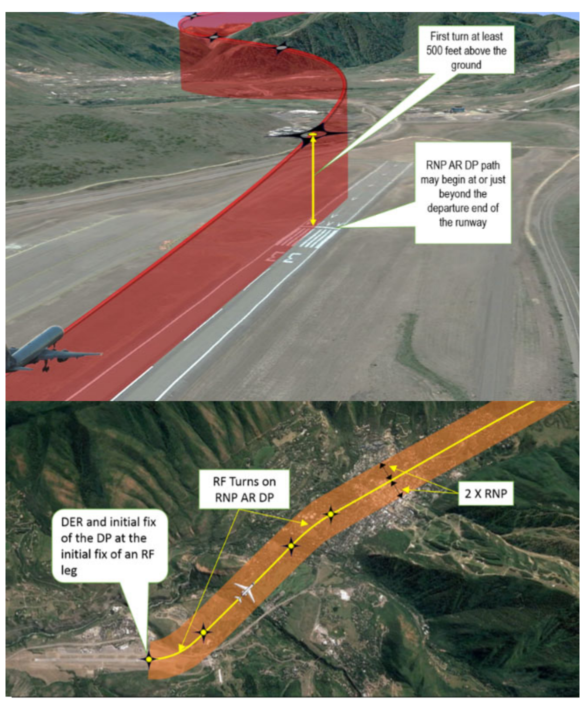
e. Missed Approach RNP value less than 1.00 NM. Some RNP AR IFPs require an RNP lateral accuracy value of less than 1.00 NM in the missed approach segment. The operator’s FAA−issued RNP AR authorization will specify whether the operator may fly a missed approach procedure requiring a lateral accuracy value less than 1.00 NM. AC 90−101 identifies specific operating procedures and training requirements applicable to this aspect of RNP AR procedures.

f. Non−standard speeds or climb gradients. RNP AR approaches may require non−standard approach speeds and/or missed approach climb gradients. RNP AR approach charts will reflect any non−standard requirements and pilots must confirm they can meet those requirements before commencing the approach.

g. RNP AR Departure Procedures (RNP AR DP). RNP AR approach authorization is a mandatory prerequisite for an operator to be eligible to perform RNP AR DPs. RNP AR DPs can utilize a minimum RNP value of RNP 0.30, may include higher than standard climb gradients, and may include RF turns. Close in RF turns associated with RNP AR DPs may begin as soon as the departure end of the runway (DER). For specific eligibility guidance, operators should refer to AC 90−101.

FIG 5−4−26

Example of an RNP AR DP



5−4−19. Side−step Maneuver

a. ATC may authorize a standard instrument approach procedure which serves either one of parallel runways that are separated by 1,200 feet or less followed by a straight−in landing on the adjacent runway.

b. Aircraft that will execute a side−step maneuver will be cleared for a specified approach procedure and landing on the adjacent parallel runway. Example, "cleared ILS runway 7 left approach, side−step to runway 7 right." Pilots are expected to commence the side−step maneuver as soon as possible after the runway or runway environment is in sight. Compliance with minimum altitudes associated with stepdown fixes is expected even after the side−step maneuver is initiated.

NOTE−
Side−step minima are flown to a Minimum Descent Altitude (MDA) regardless of the approach authorized.

c. Landing minimums to the adjacent runway will be based on nonprecision criteria and therefore higher than the precision minimums to the primary runway, but will normally be lower than the published circling minimums.

5−4−20. Approach and Landing Minimums

a. Landing Minimums. The rules applicable to landing minimums are contained in 14 CFR section 91.175. TBL 5−4−1 may be used to convert 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.

b. Obstacle Clearance. Final approach obstacle clearance is provided from the start of the final segment to the runway or missed approach point, whichever occurs last. Side−step obstacle protection is provided by increasing the width of the final approach obstacle clearance area.

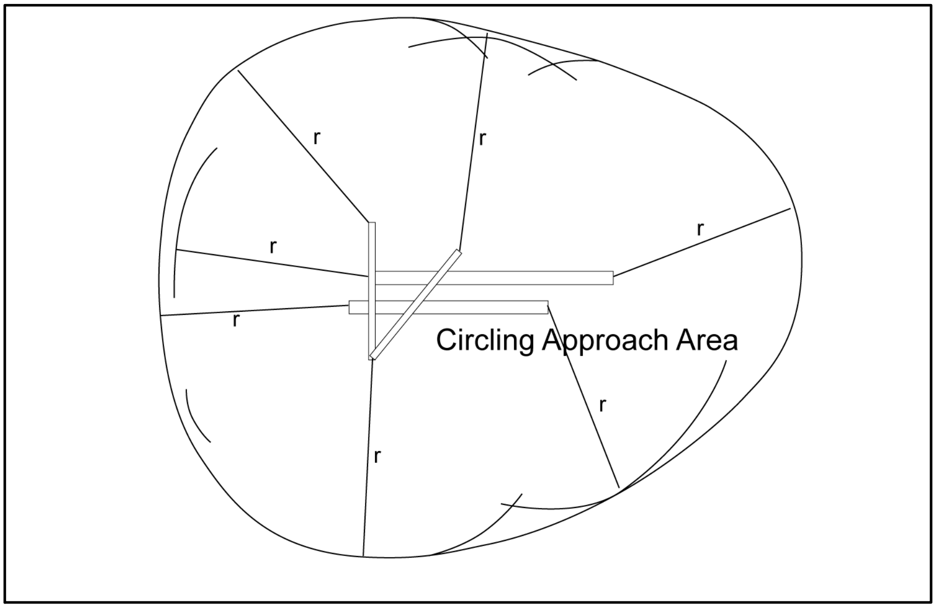
TBL 5−4−1
RVR Value Conversions

RVR	Visibility (statute miles)
1600	$^1/_4$
2400	$^1/_2$
3200	$^5/_8$
4000	$^3/_4$
4500	$^7/_8$
5000	1
6000	1 $^1/_4$

1. Circling approach protected areas are defined by the tangential connection of arcs drawn from each runway end (see FIG 5−4−27). Circling approach protected areas developed prior to late 2012 used fixed radius distances, dependent on aircraft approach category, as shown in the table on page B2 of the U.S. TPP. The approaches using standard circling approach areas can be identified by the absence of the "negative C" symbol on the circling line of minima. Circling approach protected areas developed after late 2012 use the radius distance shown in the table on page B2 of the U.S. TPP, dependent on aircraft approach category, and the altitude of the circling MDA, which accounts for true airspeed increase with altitude. The approaches using expanded circling approach areas can be identified by the presence of the "negative C" symbol on the circling line of minima (see FIG 5−4−28). Because of obstacles near the airport, a portion of the circling area may be restricted by a procedural note; for example, "Circling NA E of RWY 17−35." Obstacle clearance is provided at the published minimums (MDA) for the pilot who makes a straight−in approach, side−steps, or circles. Once below the MDA the pilot must see and avoid obstacles. Executing the missed approach after starting to maneuver usually places the aircraft beyond the MAP. The aircraft is clear of obstacles when at or above the MDA while inside the circling area, but simply joining the missed approach ground track from the circling maneuver may not provide vertical obstacle clearance once the aircraft exits the circling area. Additional climb inside the circling area may be required before joining the missed approach track. See paragraph 5−4−21, Missed Approach, for additional considerations when starting a missed approach at other than the MAP.

FIG 5−4−27

Final Approach Obstacle Clearance



NOTE−

Circling approach area radii vary according to approach category and MSL circling altitude due to TAS changes—see FIG 5−4−28.

FIG 5−4−28

Standard and Expanded Circling Approach Radii in the U.S. TPP

STANDARD CIRCLING APPROACH MANEUVERING RADIUS

Circling approach protected areas developed prior to late 2012 used the radius distances shown in the following table, expressed in nautical miles (NM), dependent on aircraft approach category. The approaches using standard circling approach areas can be identified by the absence of the C symbol on the circling line of minima.

Circling MDA in feet MSL	Approach Category and Circling Radius (NM)				
	CAT A	CAT B	CAT C	CAT D	CAT E
All Altitudes	1.3	1.5	1.7	2.3	4.5

C EXPANDED CIRCLING APPROACH MANEUVERING AIRSPACE RADIUS

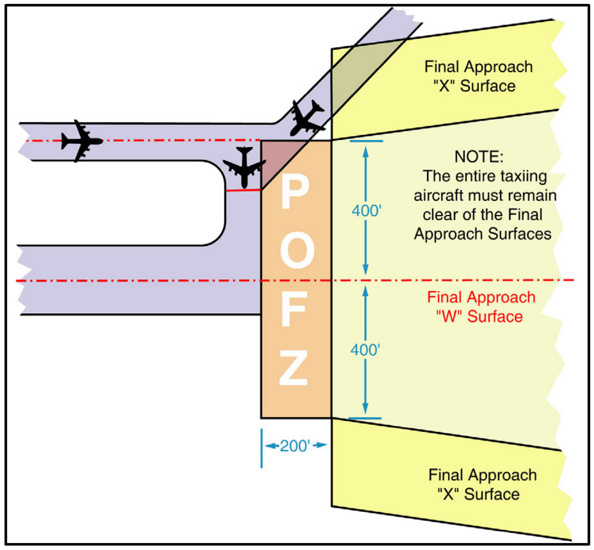
Circling approach protected areas developed after late 2012 use the radius distance shown in the following table, expressed in nautical miles (NM), dependent on aircraft approach category, and the altitude of the circling MDA, which accounts for true airspeed increase with altitude. The approaches using expanded circling approach areas can be identified by the presence of the C symbol on the circling line of minima.

Circling MDA in feet MSL	Approach Category and Circling Radius (NM)				
	CAT A	CAT B	CAT C	CAT D	CAT E
1000 or less	1.3	1.7	2.7	3.6	4.5
1001-3000	1.3	1.8	2.8	3.7	4.6
3001-5000	1.3	1.8	2.9	3.8	4.8
5001-7000	1.3	1.9	3.0	4.0	5.0
7001-9000	1.4	2.0	3.2	4.2	5.3
9001 and above	1.4	2.1	3.3	4.4	5.5

2. Precision Obstacle Free Zone (POFZ). A volume of airspace above an area beginning at the runway threshold, at the threshold elevation, and centered on the extended runway centerline. The POFZ is 200 feet (60m) long and 800 feet (240m) wide. The POFZ must be clear when an aircraft on a vertically guided final approach is within 2 nautical miles of the runway threshold and the official weather observation is a ceiling below 250 feet or visibility less than $^3/_4$ statute mile (SM) (or runway visual range below 4,000 feet). If the POFZ is not clear, the MINIMUM authorized height above touchdown (HAT) and visibility is 250 feet and $^{3}/_{4}$ SM. The POFZ is considered clear even if the wing of the aircraft holding on a taxiway waiting for runway clearance penetrates the POFZ; however, neither the fuselage nor the tail may infringe on the POFZ. The POFZ is applicable at all runway ends including displaced thresholds.

FIG 5−4−29

Precision Obstacle Free Zone (POFZ)



c. Straight−in Minimums are shown on the IAP when the final approach course is within 30 degrees of the runway alignment and a normal descent can be made from the IFR altitude shown on the IAP to the runway surface. When either the normal rate of descent or the runway alignment factor of 30 degrees is exceeded, a straight−in minimum is not published and a circling minimum applies. The fact that a straight−in minimum is not published does not preclude pilots from landing straight−in if they have the active runway in sight and have sufficient time to make a normal approach for landing. Under such conditions and when ATC has cleared them for landing on that runway, pilots are not expected to circle even though only circling minimums are published. If they desire to circle, they should advise ATC.

d. Side−Step Maneuver Minimums. Landing minimums for a side−step maneuver to the adjacent runway will normally be higher than the minimums to the primary runway.

e. Published Approach Minimums. Approach minimums are published for different aircraft categories and consist of a minimum altitude (DA, DH, MDA) and required visibility. These minimums are determined by applying the appropriate TERPS criteria. When a fix is incorporated in a nonprecision final segment, two sets of minimums may be published: one for the pilot that is able to identify the fix, and a second for the pilot that cannot. Two sets of minimums may also be published when a second altimeter source is used in the procedure. When a nonprecision procedure incorporates both a stepdown fix in the final segment and a second altimeter source, two sets of minimums are published to account for the stepdown fix and a note addresses minimums for the second altimeter source.

f. Circling Minimums. In some busy terminal areas, ATC may not allow circling and circling minimums will not be published. Published circling minimums provide obstacle clearance when pilots remain within the appropriate area of protection. Pilots should remain at or above the circling altitude until the aircraft is continuously in a position from which a descent to a landing on the intended runway can be made at a normal rate of descent using normal maneuvers. Circling may require maneuvers at low altitude, at low airspeed, and in marginal weather conditions. Pilots must use sound judgment, have an in−depth knowledge of their capabilities, and fully understand the aircraft performance to determine the exact circling maneuver since weather, unique airport design, and the aircraft position, altitude, and airspeed must all be considered. The following basic guidance applies to the circling maneuver:

1. A portion of the circling area may be restricted. The restriction will be described by a chart note with reference to a direction relative to a runway or runways, and no circling maneuvers may be made in that restricted area. The restrictions may be applicable only to certain aircraft approach categories, and circling restrictions may differ between day and night. Pilots must carefully review and comply with circling restrictions during all circling operations.

2. At towered airports, follow specific instruction from the controller during the circling maneuver; however, an ATC clearance does not negate published circling area restrictions.

3. At non−towered airports, pilots must utilize the turn direction specified by 14 CFR § 91.126(b) unless a published circling area restriction requires the pilot to make turns in the opposite direction. It may be desirable to fly over the airport to observe wind and turn indicators and other traffic that may be on the runway or flying in the vicinity of the airport.

4. Remain vigilant for other traffic and remain within the circling approach maneuvering airspace radius distance as shown in the table on page B2 of the U.S. TPP. Maneuver to a base or downwind leg, as appropriate, considering existing weather conditions, VFR traffic flow, altitude to be lost while using normal descent rates/maneuvers, and any circling restrictions.

REFERENCE−
AC 90−66, Non−Towered Airport Flight Operations.

5. The missed approach point (MAP) varies depending upon the approach flown. For vertically guided approaches, the MAP is at the decision altitude/decision height. Non−vertically guided and circling procedures share the same MAP, and the pilot determines this MAP by timing from the final approach fix, by a fix, a NAVAID, or a waypoint. Circling from a GLS, an ILS without a localizer line of minima, or an RNAV (GPS) approach without an LNAV line of minima is prohibited.

g. Instrument Approach at a Military Field. When instrument approaches are conducted by civil aircraft at military airports, they must be conducted in accordance with the procedures and minimums approved by the military agency having jurisdiction over the airport.

5−4−21. Missed Approach

a. When a landing cannot be accomplished, advise ATC and, upon reaching the missed approach point defined on the approach procedure chart, the pilot must comply with the missed approach instructions for the procedure being used or with an alternate missed approach procedure specified by ATC.

b. Obstacle protection for missed approach is predicated on the missed approach being initiated at the decision altitude/decision height (DA/DH) or at the missed approach point and not lower than minimum descent altitude (MDA). A climb gradient of at least 200 feet per nautical mile is required, (except for Copter approaches, where a climb of at least 400 feet per nautical mile is required), unless a higher climb gradient is published in the notes section of the approach procedure chart. When higher than standard climb gradients are specified, the end point of the non−standard climb will be specified at either an altitude or a fix. Pilots must preplan to ensure that the aircraft can meet the climb gradient (expressed in feet per nautical mile) required by the procedure in the event of a missed approach, and be aware that flying at a higher than anticipated ground speed increases the climb rate requirement (feet per minute). Tables for the conversion of climb gradients (feet per nautical mile) to climb rate (feet per minute), based on ground speed, are included on page D1 of the U.S. Terminal Procedures booklets. Reasonable buffers are provided for normal maneuvers. However, no consideration is given to an abnormally early turn. Therefore, when an early missed approach is executed, pilots should, unless otherwise cleared by ATC, fly the IAP as specified on the approach plate to the missed approach point at or above the MDA or DH before executing a turning maneuver.

c. If visual reference is lost while circling−to−land from an instrument approach, the missed approach specified for that particular procedure must be followed (unless an alternate missed approach procedure is specified by ATC). To become established on the prescribed missed approach course, the pilot should make an initial climbing turn toward the landing runway and continue the turn until established on the missed approach course. Inasmuch as the circling maneuver may be accomplished in more than one direction, different patterns will be required to become established on the prescribed missed approach course, depending on the aircraft position at the time visual reference is lost. Adherence to the procedure will help assure that an aircraft will remain laterally within the circling and missed approach obstruction clearance areas. Refer to paragraph h concerning vertical obstruction clearance when starting a missed approach at other than the MAP. (See FIG 5−4−30.)

d. At locations where ATC radar service is provided, the pilot should conform to radar vectors when provided by ATC in lieu of the published missed approach procedure. (See FIG 5−4−31.)

e. Some locations may have a preplanned alternate missed approach procedure for use in the event the primary NAVAID used for the missed approach procedure is unavailable. To avoid confusion, the alternate missed approach instructions are not published on the chart. However, the alternate missed approach holding pattern will be depicted on the instrument approach chart for pilot situational awareness and to assist ATC by not having to issue detailed holding instructions. The alternate missed approach may be based on NAVAIDs not used in the approach procedure or the primary missed approach. When the alternate missed approach procedure is implemented by NOTAM, it becomes a mandatory part of the procedure. The NOTAM will specify both the textual instructions and any additional equipment requirements necessary to complete the procedure. Air traffic may also issue instructions for the alternate missed approach when necessary, such as when the primary missed approach NAVAID fails during the approach. Pilots may reject an ATC clearance for an alternate missed approach that requires equipment not necessary for the published approach procedure when the alternate missed approach is issued after beginning the approach. However, when the alternate missed approach is issued prior to beginning the approach the pilot must either accept the entire procedure (including the alternate missed approach), request a different approach procedure, or coordinate with ATC for alternative action to be taken, i.e., proceed to an alternate airport, etc.

f. When approach has been missed, request clearance for specific action; i.e., to alternative airport, another approach, etc.

g. Pilots must ensure that they have climbed to a safe altitude prior to proceeding off the published missed approach, especially in nonradar environments. Abandoning the missed approach prior to reaching the published altitude may not provide adequate terrain clearance. Additional climb may be required after reaching the holding pattern before proceeding back to the IAF or to an alternate.

h. A clearance for an instrument approach procedure includes a clearance to fly the published missed approach procedure, unless otherwise instructed by ATC. The published missed approach procedure provides obstacle clearance only when the missed approach is conducted on the missed approach segment from or above the missed approach point, and assumes a climb rate of 200 feet/NM or higher, as published. If the aircraft initiates a missed approach at a point other than the missed approach point (see paragraph 5−4−5b), from below MDA or DA (H), or on a circling approach, obstacle clearance is not necessarily provided by following the published missed approach procedure, nor is separation assured from other air traffic in the vicinity.

FIG 5-4-30

Circling and Missed Approach Obstruction Clearance Areas

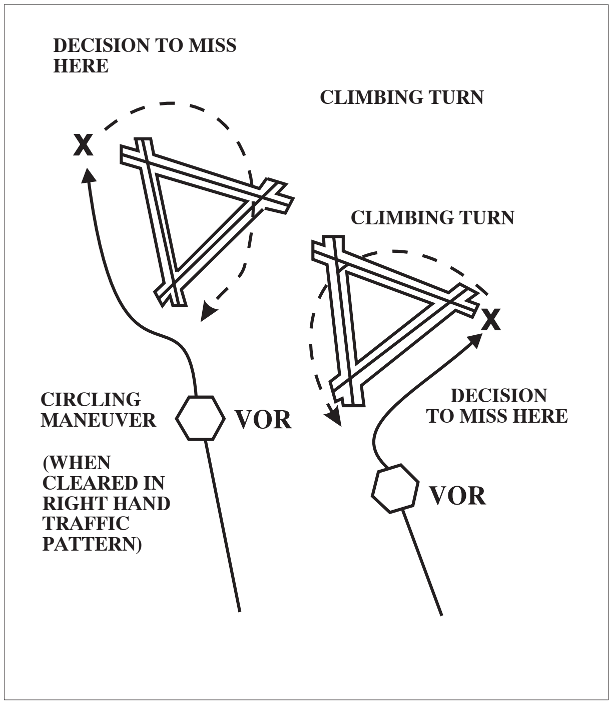
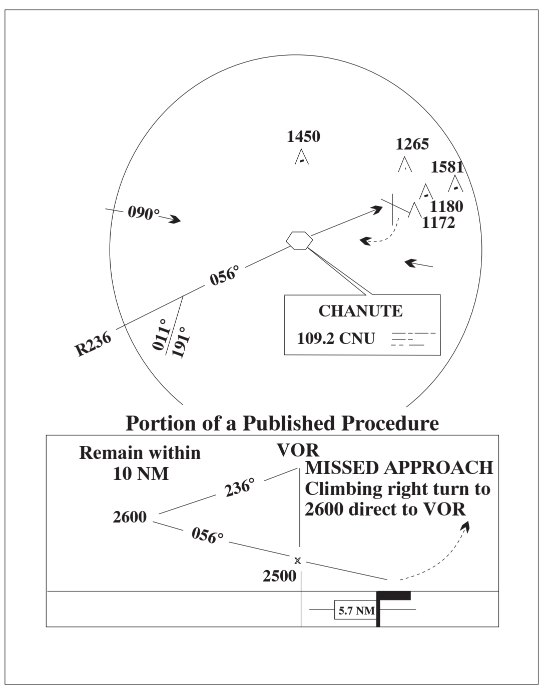


FIG 5-4-31

Missed Approach



In the event a balked (rejected) landing occurs at a position other than the published missed approach point, the pilot should contact ATC as soon as possible to obtain an amended clearance. If unable to contact ATC for any reason, the pilot should attempt to re-intercept a published segment of the missed approach and comply with route and altitude instructions. If unable to contact ATC, and in the pilot's judgment it is no longer appropriate to fly the published missed approach procedure, then consider either maintaining visual conditions if practicable and reattempt a landing, or a circle−climb over the airport. Should a missed approach become necessary when operating to an airport that is not served by an operating control tower, continuous contact with an air traffic facility may not be possible. In this case, the pilot should execute the appropriate go−around/missed approach procedure without delay and contact ATC when able to do so.

Prior to initiating an instrument approach procedure, the pilot should assess the actions to be taken in the event of a balked (rejected) landing beyond the missed approach point or below the MDA or DA (H) considering the anticipated weather conditions and available aircraft performance. 14 CFR 91.175(e) authorizes the pilot to fly an appropriate missed approach procedure that ensures obstruction clearance, but it does not necessarily consider separation from other air traffic. The pilot must consider other factors such as the aircraft's geographical location with respect to the prescribed missed approach point, direction of flight, and/or minimum turning altitudes in the prescribed missed approach procedure. The pilot must also consider aircraft performance, visual climb restrictions, charted obstacles, published obstacle departure procedure, takeoff visual climb requirements as expressed by nonstandard takeoff minima, other traffic expected to be in the vicinity, or other factors not specifically expressed by the approach procedures.

5−4−22. Use of Enhanced Flight Vision Systems (EFVS) on Instrument Approaches

a. Introduction. During an instrument approach, an EFVS can enable a pilot to see the approach lights, visual references associated with the runway environment, and other objects or features that might not be visible using natural vision alone. An EFVS uses a head−up display (HUD), or an equivalent display that is a head−up presentation, to combine flight information, flight symbology, navigation guidance, and a real−time image of the external scene to the pilot. Combining the flight information, navigation guidance, and sensor imagery on a HUD (or equivalent display) allows the pilot to continue looking forward along the flightpath throughout the entire approach, landing, and rollout.

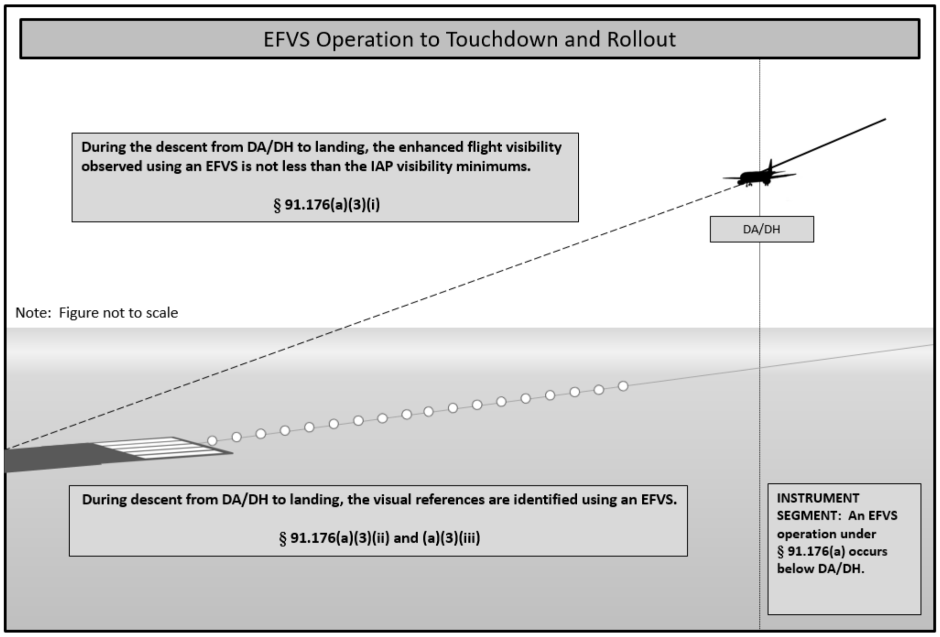
An EFVS operation is an operation in which visibility conditions require an EFVS to be used in lieu of natural vision to perform an approach or landing, determine enhanced flight visibility, identify required visual references, or conduct a rollout. There are two types of EFVS operations:

1. EFVS operations to touchdown and rollout.

2. EFVS operations to 100 feet above the touchdown zone elevation (TDZE).

b. EFVS Operations to Touchdown and Rollout. An EFVS operation to touchdown and rollout is an operation in which the pilot uses the enhanced vision imagery provided by an EFVS in lieu of natural vision to descend below DA or DH to touchdown and rollout. (See FIG 5−4−32.) These operations may be conducted only on Standard Instrument Approach Procedures (SIAP) or special IAPs that have a DA or DH (for example, precision or APV approach). An EFVS operation to touchdown and rollout may not be conducted on an approach that has circling minimums. The regulations for EFVS operations to touchdown and rollout can be found in 14 CFR § 91.176(a).

FIG 5−4−32
EFVS Operation to Touchdown and Rollout



c. EFVS Operations to 100 Feet Above the TDZE. An EFVS operation to 100 feet above the TDZE is an operation in which the pilot uses the enhanced vision imagery provided by an EFVS in lieu of natural vision to descend below DA/DH or MDA down to 100 feet above the TDZE. (See FIG 5−4−33.) To continue the approach below 100 feet above the TDZE, a pilot must have sufficient flight visibility to identify the required visual references using natural vision and must continue to use the EFVS to ensure the enhanced flight visibility meets the visibility requirements of the IAP being flown. These operations may be conducted on SIAPs or special IAPs that have a DA/DH or MDA. An EFVS operation to 100 feet above the TDZE may not be conducted on an approach that has circling minimums. The regulations for EFVS operations to 100 feet above the TDZE can be found in 14 CFR § 91.176(b).

Chapter 7. Safety of Flight

Section 1. Meteorology

7-1-1. National Weather Service Aviation Weather Service Program

a. Weather service to aviation is a joint effort of the National Oceanic and Atmospheric Administration (NOAA), the National Weather Service (NWS), the Federal Aviation Administration (FAA), Department of Defense, and various private sector aviation weather service providers. Requirements for all aviation weather products originate from the FAA, which is the Meteorological Authority for the U.S.

b. NWS meteorologists are assigned to all air route traffic control centers (ARTCC) as part of the Center Weather Service Units (CWSU) as well as the Air Traffic Control System Command Center (ATCSCC). These meteorologists provide specialized briefings as well as tailored forecasts to support the needs of the FAA and other users of the NAS.

c. Aviation Products

1. The NWS maintains an extensive surface, upper air, and radar weather observing program; and a nationwide aviation weather forecasting service.

2. Airport observations (METAR and SPECI) supported by the NWS are provided by automated observing systems.

3. Terminal Aerodrome Forecasts (TAF) are prepared by 123 NWS Weather Forecast Offices (WFOs) for over 700 airports. These forecasts are valid for 24 or 30 hours and amended as required.

4. Inflight aviation advisories (for example, Significant Meteorological Information (SIGMETs) and Airmen's Meteorological Information (AIRMETs)) are issued by three NWS Meteorological Watch Offices (MWOs); the Aviation Weather Center (AWC) in Kansas City, MO, the Alaska Aviation Weather Unit (AAWU) in Anchorage, AK, and the Weather Service Forecast Office (WFO) in Honolulu, HI. The AWC, the AAWU, and WSFO Honolulu issue area forecasts for selected areas. In addition, NWS meteorologists assigned to most ARTCCs as part of the Center Weather Service Unit (CWSU) provide Center Weather Advisories (CWAs) and gather weather information to support the needs of the FAA and other users of the system.

5. Several NWS National Centers for Environmental Production (NCEP) provide aviation specific weather forecasts, or select public forecasts which are of interest to pilots and operators.

(a) The Aviation Weather Center (AWC) displays a variety of domestic and international aviation forecast products over the Internet at aviationweather.gov.

(b) The NCEP Central Operations (NCO) is responsible for the operation of many numerical weather prediction models, including those which produce the many wind and temperature aloft forecasts.

(c) The Storm Prediction Center (SPC) issues tornado and severe weather watches along with other guidance forecasts.

(d) The National Hurricane Center (NHC) issues forecasts on tropical weather systems (for example, hurricanes).

(e) The Space Weather Prediction Center (SWPC) provides alerts, watches, warnings and forecasts for space weather events (for example, solar storms) affecting or expected to affect Earth's environment.

(f) The Weather Prediction Center (WPC) provides analysis and forecast products on a national scale including surface pressure and frontal analyses.

6. NOAA operates two Volcanic Ash Advisory Centers (VAAC) which issue forecasts of ash clouds following a volcanic eruption in their area of responsibility.

7. Details on the products provided by the above listed offices and centers is available in FAA−H−8083−28, Aviation Weather Handbook.

d. Weather element values may be expressed by using different measurement systems depending on several factors, such as whether the weather products will be used by the general public, aviation interests, international services, or a combination of these users. FIG 7−1−1 provides conversion tables for the most used weather elements that will be encountered by pilots.

7−1−2. FAA Weather Services

a. The FAA provides the Flight Service program, which serves the weather needs of pilots through its flight service stations (FSS). Pilots may access weather information through www.1800wxbrief.com. To contact Flight Service in the CONUS, Hawaii, and U.S. territories; call 1−800−WX−BRIEF (1−800−992−7433); in Alaska call 1−833−AK−BRIEF (1−833−252−7433).

b. The FAA maintains an extensive surface weather observing program. Airport observations (METAR and SPECI) in the U.S. are provided by automated observing systems. Various levels of human oversight of the METAR and SPECI reports and augmentation may be provided at select larger airports by either government or contract personnel qualified to report specified weather elements that cannot be detected by the automated observing system. The requirements to issue SPECI reports are detailed in TBL 7−1−1.

TBL 7−1−1

SPECI Issuance Table		
1	**Wind Shift**	Wind direction changes by 45° or more, in less than 15 minutes, and the wind speed is 10 kt or more throughout the wind shift.
2	**Visibility**	The surface visibility (as reported in the body of the report): • Decreases to less than 3 sm, 2 sm, 1 sm, ½ sm, ¼ sm or the lowest standard instrument approach procedure (IAP) minimum.[1] • Increases to equal to or exceed 3 sm, 2 sm, 1 sm, ½ sm, ¼ sm or the lowest standard IAP minimum.[1] [1] As published in the U.S. Terminal Procedures. If none published, use ½ sm.
3	**RVR**	The highest value from the designated RVR runway decreases to less than 2,400 ft during the preceding 10 minutes; or, if the RVR is below 2,400 ft, increases to equal to or exceed 2,400 ft during the preceding 10 minutes. U.S. military stations may not report a SPECI based on RVR.
4	**Tornado, Funnel Cloud, or Waterspout**	• Is observed. • Disappears from sight or ends.
5	**Thunderstorm**	• Begins (a SPECI is not required to report the beginning of a new thunderstorm if one is currently reported). • Ends.
6	**Precipitation**	• Hail begins or ends. • Freezing precipitation begins, ends, or changes intensity. • Ice pellets begin, end, or change intensity. • Snow begins, ends, or changes intensity.

7	**Squalls**	When a squall occurs. (Wind speed suddenly increases by at least 16 knots and is sustained at 22 knots or more for at least one minute.)
8	**Ceiling**	The ceiling changes[1] through: • *3,000 ft.* • *1,500 ft.* • *1,000 ft.* • *500 ft.* • *The lowest standard IAP minimum.*[2] [1] "Ceiling change" means that it forms, dissipates below, decreases to less than, or, if below, increases to equal or exceed the values listed. [2] As published in the U.S. Terminal Procedures. If none published, use 200 ft.
9	**Sky Condition**	A layer of clouds or obscurations aloft is present below 1,000 ft and no layer aloft was reported below 1,000 ft in the preceding METAR or SPECI.
10	**Volcanic Eruption**	When an eruption is first noted.
11	**Aircraft Mishap**	Upon notification of an aircraft mishap,[1] unless there has been an intervening observation. [1] "Aircraft mishap" is an inclusive term to denote the occurrence of an aircraft accident or incident.
12	**Miscellaneous**	Any other meteorological situation designated by the responsible agency of which, in the opinion of the observer, is critical.

c. Other Sources of Weather Information

1. Weather and aeronautical information are available from numerous private industry sources on an individual or contract pay basis. Prior to every flight, pilots should gather all information vital to the nature of the flight. Pilots can receive a regulatory compliant briefing without contacting Flight Service. Pilots are encouraged to use automated resources and review AC 91−92, Pilot's Guide to a Preflight Briefing, for more information.

2. Pilots can access Leidos Flight Services via the Internet at http://www.1800wxbrief.com. Pilots can receive preflight weather data and file VFR and IFR flight plans.

7−1−3. Use of Aviation Weather Products

a. Air carriers and operators certificated under the provisions of 14 CFR part 119 are required to use the aeronautical weather information systems defined in the Operations Specifications issued to that certificate holder by the FAA. These systems may utilize basic FAA/National Weather Service (NWS) weather services, contractor− or operator−proprietary weather services and/or Enhanced Weather Information System (EWINS) when approved in the Operations Specifications. As an integral part of this system approval, the procedures for collecting, producing and disseminating aeronautical weather information, as well as the crew member and dispatcher training to support the use of system weather products, must be accepted or approved.

b. Operators not certificated under the provisions of 14 CFR part 119 are encouraged to use FAA/NWS products through Flight Service Stations, Leidos Flight Service, and/or Flight Information Services−Broadcast (FIS−B).

c. The suite of available aviation weather product types is expanding, with the development of new sensor systems, algorithms and forecast models. The FAA and NWS, supported by various weather research laboratories and corporations under contract to the Government, develop and implement new aviation weather product types. The FAA's NextGen Aviation Weather Research Program (AWRP) facilitates collaboration between the NWS, the FAA, and various industry and research representatives. This collaboration ensures that user needs and technical readiness requirements are met before experimental products mature to operational application.

d. The AWRP manages the transfer of aviation weather R&D to operational use through technical review panels and conducting safety assessments to ensure that newly developed aviation weather products meet regulatory requirements and enhance safety.

FIG 7-1-1
Weather Elements Conversion Tables

TIME

STANDARD TO UTC

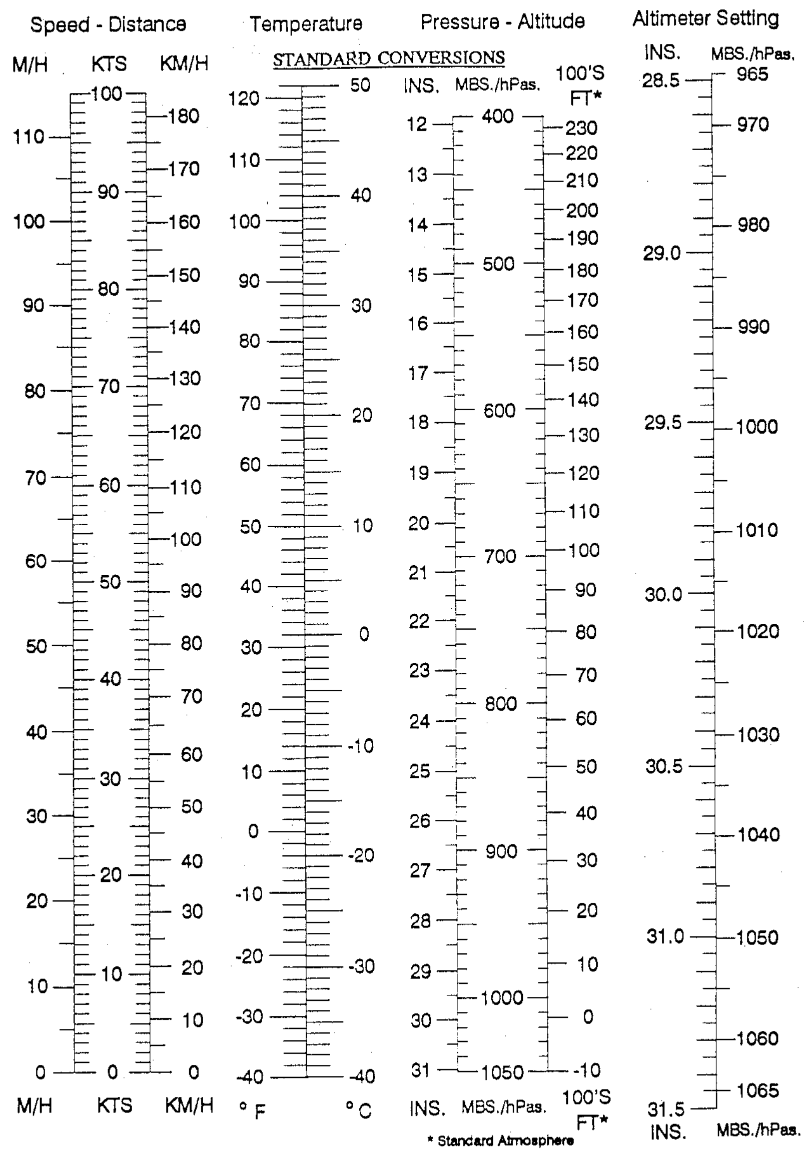
Eastern	+ 5 hr	= UTC
Central	+ 6 hr	= UTC
Mountain	+ 7 hr	= UTC
Pacific	+ 8 hr	= UTC
Alaskan	+ 9 hr	= UTC
Hawaii & Aleutian Islands	+ 10 hr	= UTC

Subtract one hour for Daylight Time

WINDSPEED

MPH	KNOTS
1-2	1-2
3-8	3-7
9-14	8-12
15-20	13-17
21-25	18-22
26-31	23-27
32-37	28-32
38-43	33-37
44-49	38-42
50-54	43-47
55-60	48-52
61-66	53-57
67-71	58-62
72-77	63-57
78-83	68-72
84-89	73-77
119-123	103-107

Knots x 1.15 = Miles Per Hour
Miles Per Hour x 0.869 = Knots



e. The AWRP review and decision-making process applies criteria to weather products at various stages . The stages are composed of the following:

1. Sponsorship of user needs.

2. R & D and controlled testing.

3. Experimental application.

4. Operational application.

f. Pilots and operators should be aware that weather services provided by entities other than FAA, NWS, or their contractors may not meet FAA/NWS quality control standards. Hence, operators and pilots contemplating using such services should request and/or review an appropriate description of services and provider disclosure. This should include, but is not limited to, the type of weather product (for example, current weather or forecast weather), the currency of the product (that is, product issue and valid times), and the relevance of the product. Pilots and operators should be cautious when using unfamiliar products, or products not supported by FAA/NWS technical specifications.

NOTE−
When in doubt, consult with a FAA Flight Service Station Specialist.

g. In addition, pilots and operators should be aware there are weather services and products available from government organizations beyond the scope of the AWRP process mentioned earlier in this section. For example, governmental agencies such as the NWS and the Aviation Weather Center (AWC), or research organizations such as the National Center for Atmospheric Research (NCAR) display weather "model data" and "experimental" products which require training and/or expertise to properly interpret and use. These products are developmental prototypes that are subject to ongoing research and can change without notice. Therefore, some data on display by government organizations, or government data on display by independent organizations may be unsuitable for flight planning purposes. Operators and pilots contemplating using such services should request and/or review an appropriate description of services and provider disclosure. This should include, but is not limited to, the type of weather product (for example, current weather or forecast weather), the currency of the product (i.e., product issue and valid times), and the relevance of the product. Pilots and operators should be cautious when using unfamiliar weather products.

NOTE−
When in doubt, consult with a FAA Flight Service Station Specialist.

h. With increased access to weather products via the public Internet, the aviation community has access to an overwhelming amount of weather information and data that support self−briefing. the *Aviation Weather Handbook*, FAA−H−8083−28 (current edition), describes the weather products distributed by the NWS. Pilots and operators using the public Internet to access weather from a third party vendor should request and/or review an appropriate description of services and provider disclosure. This should include, but is not limited to, the type of weather product (for example, current weather or forecast weather), the currency of the product (i.e., product issue and valid times), and the relevance of the product. Pilots and operators should be cautious when using unfamiliar weather products and when in doubt, consult with a Flight Service Specialist.

i. The development of new weather products, coupled with the termination of some legacy textual and graphical products may create confusion between regulatory requirements and the new products. All flight−related, aviation weather decisions must be based on all available pertinent weather products. As every flight is unique and the weather conditions for that flight vary hour by hour, day to day, multiple weather products may be necessary to meet aviation weather regulatory requirements. Many new weather products now have a Precautionary Use Statement that details the proper use or application of the specific product.

j. The FAA has identified three distinct types of weather information available to pilots and operators.

1. Observations. Raw weather data collected by some type of sensor suite including surface and airborne observations, radar, lightning, satellite imagery, and profilers.

2. Analysis. Enhanced depiction and/or interpretation of observed weather data.

3. Forecasts. Predictions of the development and/or movement of weather phenomena based on meteorological observations and various mathematical models.

k. Not all sources of aviation weather information are able to provide all three types of weather information. The FAA has determined that operators and pilots may utilize the following approved sources of aviation weather information:

1. Federal Government. The FAA and NWS collect raw weather data, analyze the observations, and produce forecasts. The FAA and NWS disseminate meteorological observations, analyses, and forecasts through a variety of systems. In addition, the Federal Government is the only approval authority for sources of weather observations; for example, contract towers and airport operators may be approved by the Federal Government to provide weather observations.

2. Enhanced Weather Information System (EWINS). An EWINS is an FAA authorized, proprietary system for tracking, evaluating, reporting, and forecasting the presence or lack of adverse weather phenomena. The FAA authorizes a certificate holder to use an EWINS to produce flight movement forecasts, adverse weather phenomena forecasts, and other meteorological advisories. For more detailed information regarding EWINS, see FAA−H−8083−28, Aviation Weather Handbook, and the Flight Standards Information Management System 8900.1.

3. Commercial Weather Information Providers. In general, commercial providers produce proprietary weather products based on NWS/FAA products with formatting and layout modifications but no material changes to the weather information itself. This is also referred to as "repackaging." In addition, commercial providers may produce analyses, forecasts, and other proprietary weather products that substantially alter the information contained in government−produced products. However, those proprietary weather products that substantially alter government−produced weather products or information, may only be approved for use by 14 CFR part 121 and part 135 certificate holders if the commercial provider is EWINS qualified.

NOTE−
Commercial weather information providers contracted by FAA to provide weather observations, analyses, and forecasts (e.g., contract towers) are included in the Federal Government category of approved sources by virtue of maintaining required technical and quality assurance standards under Federal Government oversight.

7−1−4. Graphical Forecasts for Aviation (GFA)

a. The GFA website is intended to provide the necessary aviation weather information to give users a complete picture of the weather that may affect flight in the continental United States (CONUS). The website includes observational data, forecasts, and warnings that can be viewed from 14 hours in the past to 15 hours in the future, including thunderstorms, clouds, flight category, precipitation, icing, turbulence, and wind. Hourly model data and forecasts, including information on clouds, flight category, precipitation, icing, turbulence, wind, and graphical output from the National Weather Service's (NWS) National Digital Forecast Data (NDFD) are available. Wind, icing, and turbulence forecasts are available in 3,000 ft increments from the surface up to 30,000 ft MSL, and in 6,000 ft increments from 30,000 ft MSL to 48,000 ft MSL. Turbulence forecasts are also broken into low (below 18,000 ft MSL) and high (at or above 18,000 ft MSL) graphics. A maximum icing graphic and maximum wind velocity graphic (regardless of altitude) are also available. Built with modern geospatial information tools, users can pan and zoom to focus on areas of greatest interest. Target users are commercial and general aviation pilots, operators, briefers, and dispatchers.

b. Weather Products.

1. The Aviation Forecasts include gridded displays of various weather parameters as well as NWS textual weather observations, forecasts, and warnings. Icing, turbulence, and wind gridded products are three−dimensional. Other gridded products are two−dimensional and may represent a "composite" of a three−dimensional weather phenomenon or a surface weather variable, such as horizontal visibility. The following are examples of aviation forecasts depicted on the GFA:

(a) Terminal Aerodrome Forecast (TAF)

(b) Ceiling & Visibility (CIG/VIS)

from the main rotor(s) in all directions. Pilots of small aircraft should avoid operating within three rotor diameters of any helicopter in a slow hover taxi or stationary hover. In forward flight, departing or landing helicopters produce a pair of strong, high−speed trailing vortices similar to wing tip vortices of larger fixed wing aircraft. Pilots of small aircraft should use caution when operating behind or crossing behind landing and departing helicopters.

7−4−8. Pilot Responsibility

a. Research and testing have been conducted, in addition to ongoing wake initiatives, in an attempt to mitigate the effects of wake turbulence. Pilots must exercise vigilance in situations where they are responsible for avoiding wake turbulence.

b. Pilots are reminded that in operations conducted behind all aircraft, acceptance of instructions from ATC in the following situations is an acknowledgment that the pilot will ensure safe takeoff and landing intervals and accepts the responsibility for providing wake turbulence separation.

1. Traffic information.

2. Instructions to follow an aircraft; and

3. The acceptance of a visual approach clearance.

c. For operations conducted behind **super** or **heavy** aircraft, ATC will specify the word "**super**" or "**heavy**" as appropriate, when this information is known. Pilots of **super** or **heavy** aircraft should always use the word "**super**" or "**heavy**" in radio communications.

d. Super, heavy, and large jet aircraft operators should use the following procedures during an approach to landing. These procedures establish a dependable baseline from which pilots of in−trail, lighter aircraft may reasonably expect to make effective flight path adjustments to avoid serious wake vortex turbulence.

1. Pilots of aircraft that produce strong wake vortices should make every attempt to fly on the established glidepath, not above it; or, if glidepath guidance is not available, to fly as closely as possible to a "3−1" glidepath, not above it.

EXAMPLE−
Fly 3,000 feet at 10 miles from touchdown, 1,500 feet at 5 miles, 1,200 feet at 4 miles, and so on to touchdown.

2. Pilots of aircraft that produce strong wake vortices should fly as closely as possible to the approach course centerline or to the extended centerline of the runway of intended landing as appropriate to conditions.

e. Pilots operating lighter aircraft on visual approaches in−trail to aircraft producing strong wake vortices should use the following procedures to assist in avoiding wake turbulence. These procedures apply only to those aircraft that are on visual approaches.

1. Pilots of lighter aircraft should fly on or above the glidepath. Glidepath reference may be furnished by an ILS, by a visual approach slope system, by other ground−based approach slope guidance systems, or by other means. In the absence of visible glidepath guidance, pilots may very nearly duplicate a 3−degree glideslope by adhering to the "3 to 1" glidepath principle.

EXAMPLE−
Fly 3,000 feet at 10 miles from touchdown, 1,500 feet at 5 miles, 1,200 feet at 4 miles, and so on to touchdown.

2. If the pilot of the lighter following aircraft has visual contact with the preceding heavier aircraft and also with the runway, the pilot may further adjust for possible wake vortex turbulence by the following practices:

(a) Pick a point of landing no less than 1,000 feet from the arrival end of the runway.

(b) Establish a line−of−sight to that landing point that is above and in front of the heavier preceding aircraft.

(c) When possible, note the point of landing of the heavier preceding aircraft and adjust point of intended landing as necessary.

EXAMPLE−
A puff of smoke may appear at the 1,000−foot markings of the runway, showing that touchdown was that point; therefore, adjust point of intended landing to the 1,500−foot markings.

(d) Maintain the line−of−sight to the point of intended landing above and ahead of the heavier preceding aircraft; maintain it to touchdown.

(e) Land beyond the point of landing of the preceding heavier aircraft. Ensure you have adequate runway remaining, if conducting a touch−and−go landing, or adequate stopping distance available for a full stop landing.

f. During visual approaches pilots may ask ATC for updates on separation and groundspeed with respect to heavier preceding aircraft, especially when there is any question of safe separation from wake turbulence.

g. Pilots should notify ATC when a wake event is encountered. Be as descriptive as possible (i.e., bank angle, altitude deviations, intensity and duration of event, etc.) when reporting the event. ATC will record the event through their reporting system. You are also encouraged to use the Aviation Safety Reporting System (ASRS) to report wake events.

7−4−9. Air Traffic Wake Turbulence Separations

a. Because of the possible effects of wake turbulence, controllers are required to apply no less than minimum required separation to all aircraft operating behind a Super or Heavy, and to Small aircraft operating behind a B757, when aircraft are IFR; VFR and receiving Class B, Class C, or TRSA airspace services; or VFR and being radar sequenced.

1. Typical separation applied to aircraft operating directly behind a super or heavy at the same altitude or less than 1,000 feet below, and to small aircraft operating directly behind a B757 at the same altitude or less than 500 feet below:

(a) **Heavy** behind **super −** 5 miles.

(b) **Large** behind **super −** 7 miles.

(c) **Small** behind **super −** 8 miles.

(d) **Heavy** behind **heavy** −3 miles.

(e) **Small/large** behind **heavy −** 5 miles.

(f) **Small** behind **B757 −** 4 miles.

2. Also, separation, measured at the time the preceding aircraft is over the landing threshold, is provided to small aircraft:

(a) **Small** landing behind **heavy −** 6 miles.

(b) **Small** landing behind **large, non−B757 −** 4 miles.

REFERENCE−
Pilot/Controller Glossary Term− Aircraft Classes.

b. Additionally, appropriate time or distance intervals are provided to departing aircraft when the departure will be from the same threshold, a parallel runway separated by less than 2,500 feet with less than 500 feet threshold stagger, or on a crossing runway and projected flight paths will cross:

1. Three minutes or the appropriate radar separation when takeoff will be behind a super aircraft;

2. Two minutes or the appropriate radar separation when takeoff will be behind a heavy aircraft.

3. Two minutes or the appropriate radar separation when a small aircraft will takeoff behind a B757.

NOTE−
Controllers may not reduce or waive these intervals.

c. A 3−minute interval will be provided when a **small** aircraft will takeoff:

1. From an intersection on the same runway (same or opposite direction) behind a departing **large** aircraft (except B757), or

2. In the opposite direction on the same runway behind a large aircraft (except B757) takeoff or low/missed approach.

NOTE−
This 3−minute interval may be waived upon specific pilot request.

d. A 3−minute interval will be provided when a small aircraft will takeoff:

1. From an intersection on the same runway (same or opposite direction) behind a departing B757, or

2. In the opposite direction on the same runway behind a B757 takeoff or low/missed approach.

NOTE−
This 3−minute interval may not be waived.

e. A 4−minute interval will be provided for all aircraft taking off behind a super aircraft, and a 3−minute interval will be provided for all aircraft taking off behind a heavy aircraft when the operations are as described in subparagraphs c1 and c2 above, and are conducted on either the same runway or parallel runways separated by less than 2,500 feet. Controllers may not reduce or waive this interval.

f. Pilots may request additional separation (i.e., 2 minutes instead of 4 or 5 miles) for wake turbulence avoidance. This request should be made as soon as practical on ground control and at least before taxiing onto the runway.

NOTE−
14 CFR section 91.3(a) states: "The pilot−in−command of an aircraft is directly responsible for and is the final authority as to the operation of that aircraft."

g. Controllers may anticipate separation and need not withhold a takeoff clearance for an aircraft departing behind a **large, heavy,** or **super** aircraft if there is reasonable assurance the required separation will exist when the departing aircraft starts takeoff roll.

safety risks. At and below 200 feet AGL there are numerous power lines, antenna towers, etc., that are not marked and lighted and/or charted as obstructions and, therefore, may not be seen in time to avoid a collision. Notices to Airmen (NOTAMs) are issued on those lighted structures experiencing temporary light outages. However, some time may pass before the FAA is notified of these outages, and the NOTAM issued, thus pilot vigilance is imperative. Additionally, new obstructions may not be on current charts because the information was not received prior to the FAA publishing the chart.

b. Antenna Towers. Extreme caution should be exercised when flying less than 2,000 feet AGL because of numerous skeletal structures, such as radio and television antenna towers, that exceed 1,000 feet AGL with some extending higher than 2,000 feet AGL. Most skeletal structures are supported by guy wires which are very difficult to see in good weather and can be invisible at dusk or during periods of reduced visibility. These wires can extend about 1,500 feet horizontally from a structure; therefore, all skeletal structures should be avoided horizontally by at least 2,000 feet.

c. Overhead Wires. Overhead transmission and utility lines often span approaches to runways, natural flyways such as lakes, rivers, gorges, and canyons, and cross other landmarks pilots frequently follow such as highways, railroad tracks, etc. As with antenna towers, these power transmission and/or utility lines and the supporting structures of these lines may not always be readily visible. The wires may be virtually impossible to see under certain conditions. Spherical markers may be used to identify overhead wires and catenary transmission lines and may be lighted. In some locations, the supporting structures of overhead transmission lines are equipped with unique sequence flashing white strobe light systems to indicate that there are wires between the structures. The flash sequence for the wire support structures will be middle, top, and bottom with all lights on the same level flashing simultaneously. However, not all power transmission and/or utility lines require notice to the FAA as they do not exceed 200 feet AGL or meet the obstruction standard of 14 CFR part 77 and, therefore, are not marked and/or lighted. All pilots are cautioned to remain extremely vigilant for power transmission and/or utility lines and their supporting structures when following natural flyways or during the approach and landing phase. This is particularly important for seaplane and/or float equipped aircraft when landing on, or departing from, unfamiliar lakes or rivers.

d. Wind Turbines. The number, size, and height of individual wind turbines and wind turbine farms have increased over time. The locations of wind turbine farms have also expanded to areas more commonly flown by VFR pilots and to all regions of the United States. VFR pilots should be aware that many wind turbines are exceeding 499 feet AGL in height, which may affect minimum safe VFR altitudes in uncontrolled airspace. In addition, many wind turbines are encroaching on the 700−foot AGL floor of controlled airspace (Class E). Pilots are cautioned to maintain appropriate safe distance (laterally, vertically, or both). Wind turbines are typically charted on Visual Flight Rules (VFR) Sectional Charts and/or Terminal Area Charts. For a description of how wind turbines and wind turbine farms are charted, refer to the FAA Aeronautical Chart User's Guide. Wind turbines are normally painted white or light gray to improve daytime conspicuity. They are typically lit with medium−intensity, flashing red lights, placed as high as possible on the turbine nacelle (not the blade tips), that should be synchronized to flash together; however, not all wind turbine units within a farm need to be lighted, depending on their location and height. Sometimes, only the perimeter of the wind turbine farm and an arrangement of interior wind turbines are lit. Some wind turbine farms use Aircraft Detection Lighting Systems (ADLS), which are proximity sensor−based systems designed to detect aircraft as they approach the obstruction. This system automatically activates the appropriate obstruction lights until they are no longer needed based on the position of the transiting aircraft. This technology reduces the impact of nighttime lighting on nearby communities and migratory birds and extends the life expectancy of the obstruction lights. For more information on how obstructions such as wind turbines are marked and lighted, refer to Advisory Circular 70/7460−1, Obstruction Marking and Lighting. Pilots should be aware that wind turbines in motion could result in limitations of air traffic services in the vicinity of the wind turbine farms.

REFERENCE−
AIM, Para 4-5-1, Radar.

e. Meteorological Towers. Meteorological towers are used by wind energy companies to determine feasible sites for wind turbines. Some of these towers are less than 200 feet AGL. These structures are portable, erected in a matter of hours, installed with guyed wires, and constructed from a galvanized material often making them difficult to see in certain atmospheric conditions. Markings for these towers include alternating bands of aviation orange and white paint, and high−visibility sleeves installed on the outer guy wires. However, not all Meteorological towers follow these guidelines, and pilots should be vigilant when flying at low altitude in remote or rural areas.

f. Other Objects/Structures. There are other objects or structures that could adversely affect your flight such as temporary construction cranes near an airport, newly constructed buildings, new towers, etc. Many of these structures do not meet charting requirements or may not yet be charted because of the charting cycle. Some structures do not require obstruction marking and/or lighting, and some may not be marked and lighted even though the FAA recommended it. VFR pilots should carefully review NOTAMs for temporary or permanent obstructions along the planned route of flight during their preflight preparations. Particular emphasis should be given to obstructions in the vicinity of the approach and departure ends of the runway complex or any other areas where flight below 500 feet AGL is planned or likely to occur.

7−6−5. Avoid Flight Beneath Unmanned Balloons

a. The majority of unmanned free balloons currently being operated have, extending below them, either a suspension device to which the payload or instrument package is attached, or a trailing wire antenna, or both. In many instances these balloon subsystems may be invisible to the pilot until the aircraft is close to the balloon, thereby creating a potentially dangerous situation. Therefore, good judgment on the part of the pilot dictates that aircraft should remain well clear of all unmanned free balloons and flight below them should be avoided at all times.

b. Pilots are urged to report any unmanned free balloons sighted to the nearest FAA ground facility with which communication is established. Such information will assist FAA ATC facilities to identify and flight follow unmanned free balloons operating in the airspace.

7−6−6. Unmanned Aircraft Systems

a. Unmanned Aircraft Systems (UAS), formerly referred to as "Unmanned Aerial Vehicles" (UAVs) or "drones," are having an increasing operational presence in the NAS. Once the exclusive domain of the military, UAS are now being operated by various entities. Although these aircraft are "unmanned," UAS are flown by a remotely located pilot and crew. Physical and performance characteristics of unmanned aircraft (UA) vary greatly and unlike model aircraft that typically operate lower than 400 feet AGL, UA may be found operating at virtually any altitude and any speed. Sizes of UA can be as small as several pounds to as large as a commercial transport aircraft. UAS come in various categories including airplane, rotorcraft, powered−lift (tilt−rotor), and lighter−than−air. Propulsion systems of UAS include a broad range of alternatives from piston powered and turbojet engines to battery and solar−powered electric motors.

b. To ensure segregation of UAS operations from other aircraft, the military typically conducts UAS operations within restricted or other special use airspace. However, UAS operations are now being approved in the NAS outside of special use airspace through the use of FAA−issued Certificates of Waiver or Authorization (COA) or through the issuance of a special airworthiness certificate. COA and special airworthiness approvals authorize UAS flight operations to be contained within specific geographic boundaries and altitudes, usually require coordination with an ATC facility, and typically require the issuance of a NOTAM describing the operation to be conducted. UAS approvals also require observers to provide "see−and−avoid" capability to the UAS crew and to provide the necessary compliance with 14 CFR section 91.113. For UAS operations approved at or above FL180, UAS operate under the same requirements as that of manned aircraft (i.e., flights are operated under instrument flight rules, are in communication with ATC, and are appropriately equipped).

c. UAS operations may be approved at either controlled or uncontrolled airports and are typically disseminated by NOTAM. In all cases, approved UAS operations must comply with all applicable regulations and/or special provisions specified in the COA or in the operating limitations of the special airworthiness areas of Canada and Alaska. Alaska State Department of Transportation and Canadian Ministry of Transport officials can provide specific information on survival gear requirements. The kit should be assembled in one container and be easily reachable and preferably floatable.

TBL 7−6−1

Jurisdictions Controlling Navigable Bodies of Water

Authority to Consult For Use of a Body of Water		
Location	**Authority**	**Contact**
Wilderness Area	U.S. Department of Agriculture, Forest Service	Local forest ranger
National Forest	USDA Forest Service	Local forest ranger
National Park	U.S. Department of the Interior (USDI), National Park Service	Local park ranger
Indian Reservation	USDI, Bureau of Indian Affairs	Local Bureau office
State Park	State government or state forestry or park service	Local state aviation office for further information
Canadian National and Provincial Parks	Supervised and restricted on an individual basis from province to province and by different departments of the Canadian government; consult Canadian Flight Information Manual and/or Water Aerodrome Supplement	Park Superintendent in an emergency

e. The FAA recommends that each seaplane owner or operator provide flotation gear for occupants any time a seaplane operates on or near water. 14 CFR section 91.205(b)(12) requires approved flotation gear for aircraft operated for hire over water and beyond power-off gliding distance from shore. FAA-approved gear differs from that required for navigable waterways under USCG rules. FAA-approved life vests are inflatable designs as compared to the USCG's noninflatable PFD's that may consist of solid, bulky material. Such USCG PFDs are impractical for seaplanes and other aircraft because they may block passage through the relatively narrow exits available to pilots and passengers. Life vests approved under Technical Standard Order (TSO) TSO−C13E contain fully inflatable compartments. The wearer inflates the compartments (AFTER exiting the aircraft) primarily by independent CO2 cartridges, with an oral inflation tube as a backup. The flotation gear also contains a water-activated, self-illuminating signal light. The fact that pilots and passengers can easily don and wear inflatable life vests (when not inflated) provides maximum effectiveness and allows for unrestricted movement. It is imperative that passengers are briefed on the location and proper use of available PFDs prior to leaving the dock.

f. The FAA recommends that seaplane owners and operators obtain Advisory Circular (AC) 91−69, Seaplane Safety for 14 CFR part 91 Operations, free from the U.S. Department of Transportation, Subsequent Distribution Office, SVC−121.23, Ardmore East Business Center, 3341 Q 75th Avenue, Landover, MD 20785; fax: (301) 386−5394. The USCG Navigation Rules International−Inland (COMDTINSTM 16672.2B) is available for a fee from the Government Publishing Office by facsimile request to (202) 512−2250, and can be ordered using Mastercard or Visa.

7−6−10. Flight Operations in Volcanic Ash

a. Severe volcanic eruptions which send ash and sulphur dioxide (SO_2) gas into the upper atmosphere occur somewhere around the world several times each year. Flying into a volcanic ash cloud can be exceedingly dangerous. A B747−200 lost all four engines after such an encounter and a B747−400 had the same nearly catastrophic experience. Piston−powered aircraft are less likely to lose power but severe damage is almost certain to ensue after an encounter with a volcanic ash cloud which is only a few hours old.

b. Most important is to avoid any encounter with volcanic ash. The ash plume may not be visible, especially in instrument conditions or at night; and even if visible, it is difficult to distinguish visually between an ash cloud and an ordinary weather cloud. Volcanic ash clouds are not displayed on airborne or ATC radar. The pilot must rely on reports from air traffic controllers and other pilots to determine the location of the ash cloud and use that information to remain well clear of the area. Additionally, the presence of a sulphur-like odor throughout the cabin may indicate the presence of SO_2 emitted by volcanic activity, but may or may not indicate the presence of volcanic ash. Every attempt should be made to remain on the upwind side of the volcano.

c. It is recommended that pilots encountering an ash cloud should immediately reduce thrust to idle (altitude permitting), and reverse course in order to escape from the cloud. Ash clouds may extend for hundreds of miles and pilots should not attempt to fly through or climb out of the cloud. In addition, the following procedures are recommended:

1. Disengage the autothrottle if engaged. This will prevent the autothrottle from increasing engine thrust;

2. Turn on continuous ignition;

3. Turn on all accessory airbleeds including all air conditioning packs, nacelles, and wing anti-ice. This will provide an additional engine stall margin by reducing engine pressure.

d. The following has been reported by flightcrews who have experienced encounters with volcanic dust clouds:

1. Smoke or dust appearing in the cockpit.

2. An acrid odor similar to electrical smoke.

3. Multiple engine malfunctions, such as compressor stalls, increasing Exhaust Gas Temperature (EGT), torching from tailpipe, and flameouts.

4. At night, St. Elmo's fire or other static discharges accompanied by a bright orange glow in the engine inlets.

5. A fire warning in the forward cargo area.

e. It may become necessary to shut down and then restart engines to prevent exceeding EGT limits. Volcanic ash may block the pitot system and result in unreliable airspeed indications.

f. If you see a volcanic eruption and have not been previously notified of it, you may have been the first person to observe it. In this case, immediately contact ATC and alert them to the existence of the eruption. If possible, use the Volcanic Activity Reporting form (VAR) depicted in Appendix 2 of this manual. Items 1 through 8 of the VAR should be transmitted immediately. The information requested in items 9 through 16 should be passed after landing. If a VAR form is not immediately available, relay enough information to identify the position and nature of the volcanic activity. Do not become unnecessarily alarmed if there is merely steam or very low-level eruptions of ash.

g. When landing at airports where volcanic ash has been deposited on the runway, be aware that even a thin layer of dry ash can be detrimental to braking action. Wet ash on the runway may also reduce effectiveness of braking. It is recommended that reverse thrust be limited to minimum practical to reduce the possibility of reduced visibility and engine ingestion of airborne ash.

h. When departing from airports where volcanic ash has been deposited, it is recommended that pilots avoid operating in visible airborne ash. Allow ash to settle before initiating takeoff roll. It is also recommended that flap extension be delayed until initiating the before takeoff checklist and that a rolling takeoff be executed to avoid blowing ash back into the air.

7-6-11. Emergency Airborne Inspection of Other Aircraft

a. Providing airborne assistance to another aircraft may involve flying in very close proximity to that aircraft. Most pilots receive little, if any, formal training or instruction in this type of flying activity. Close proximity flying without sufficient time to plan (i.e., in an emergency situation), coupled with the stress involved in a perceived emergency can be hazardous.

b. The pilot in the best position to assess the situation should take the responsibility of coordinating the airborne intercept and inspection, and take into account the unique flight characteristics and differences of the category(s) of aircraft involved.

c. Some of the safety considerations are:

1. Area, direction and speed of the intercept;

2. Aerodynamic effects (i.e., rotorcraft downwash);

3. Minimum safe separation distances;

4. Communications requirements, lost communications procedures, coordination with ATC;

5. Suitability of diverting the distressed aircraft to the nearest safe airport; and

6. Emergency actions to terminate the intercept.

d. Close proximity, inflight inspection of another aircraft is uniquely hazardous. The pilot−in−command of the aircraft experiencing the problem/emergency must not relinquish control of the situation and/or jeopardize the safety of their aircraft. The maneuver must be accomplished with minimum risk to both aircraft.

7−6−12. Precipitation Static

a. Precipitation static is caused by aircraft in flight coming in contact with uncharged particles. These particles can be rain, snow, fog, sleet, hail, volcanic ash, dust; any solid or liquid particles. When the aircraft strikes these neutral particles the positive element of the particle is reflected away from the aircraft and the negative particle adheres to the skin of the aircraft. In a very short period of time a substantial negative charge will develop on the skin of the aircraft. If the aircraft is not equipped with static dischargers, or has an ineffective static discharger system, when a sufficient negative voltage level is reached, the aircraft may go into "CORONA." That is, it will discharge the static electricity from the extremities of the aircraft, such as the wing tips, horizontal stabilizer, vertical stabilizer, antenna, propeller tips, etc. This discharge of static electricity is what you will hear in your headphones and is what we call P−static.

b. A review of pilot reports often shows different symptoms with each problem that is encountered. The following list of problems is a summary of many pilot reports from many different aircraft. Each problem was caused by P−static:

1. Complete loss of VHF communications.

2. Erroneous magnetic compass readings (30 percent in error).

3. High pitched squeal on audio.

4. Motor boat sound on audio.

5. Loss of all avionics in clouds.

6. VLF navigation system inoperative most of the time.

7. Erratic instrument readouts.

8. Weak transmissions and poor receptivity of radios.

9. "St. Elmo's Fire" on windshield.

c. Each of these symptoms is caused by one general problem on the airframe. This problem is the inability of the accumulated charge to flow easily to the wing tips and tail of the airframe, and properly discharge to the airstream.

d. Static dischargers work on the principal of creating a relatively easy path for discharging negative charges that develop on the aircraft by using a discharger with fine metal points, carbon coated rods, or carbon wicks rather than wait until a large charge is developed and discharged off the trailing edges of the aircraft that will interfere with avionics equipment. This process offers approximately 50 decibels (dB) static noise reduction which is adequate in most cases to be below the threshold of noise that would cause interference in avionics equipment.

e. It is important to remember that precipitation static problems can only be corrected with the proper number of quality static dischargers, properly installed on a properly bonded aircraft. P−static is indeed a problem in the all weather operation of the aircraft, but there are effective ways to combat it. All possible methods of reducing the effects of P−static should be considered so as to provide the best possible performance in the flight environment.

f. A wide variety of discharger designs is available on the commercial market. The inclusion of well−designed dischargers may be expected to improve airframe noise in P−static conditions by as much as 50 dB. Essentially, the discharger provides a path by which accumulated charge may leave the airframe quietly. This is generally accomplished by providing a group of tiny corona points to permit onset of corona−current flow at a low aircraft potential. Additionally, aerodynamic design of dischargers to permit corona to occur at the lowest possible atmospheric pressure also lowers the corona threshold. In addition to permitting a low−potential discharge, the discharger will minimize the radiation of radio frequency (RF) energy that accompanies the corona discharge, in order to minimize effects of RF components at communications and navigation frequencies on avionics performance. These effects are reduced through resistive attachment of the corona point(s) to the airframe, preserving direct current connection but attenuating the higher−frequency components of the discharge.

g. Each manufacturer of static dischargers offers information concerning appropriate discharger location on specific airframes. Such locations emphasize the trailing outboard surfaces of wings and horizontal tail surfaces, plus the tip of the vertical stabilizer, where charge tends to accumulate on the airframe. Sufficient dischargers must be provided to allow for current−carrying capacity which will maintain airframe potential below the corona threshold of the trailing edges.

h. In order to achieve full performance of avionic equipment, the static discharge system will require periodic maintenance. A pilot knowledgeable of P−static causes and effects is an important element in assuring optimum performance by early recognition of these types of problems.

7−6−13. Light Amplification by Stimulated Emission of Radiation (Laser) Operations and Reporting Illumination of Aircraft

a. Lasers have many applications. Of concern to users of the National Airspace System are those laser events that may affect pilots, e.g., outdoor laser light shows or demonstrations for entertainment and advertisements at special events and theme parks. Generally, the beams from these events appear as bright blue−green in color; however, they may be red, yellow, or white. However, some laser systems produce light which is invisible to the human eye.

b. FAA regulations prohibit the disruption of aviation activity by any person on the ground or in the air. The FAA and the Food and Drug Administration (the Federal agency that has the responsibility to enforce compliance with Federal requirements for laser systems and laser light show products) are working together to ensure that operators of these devices do not pose a hazard to aircraft operators.

c. Pilots should be aware that illumination from these laser operations are able to create temporary vision impairment miles from the actual location. In addition, these operations can produce permanent eye damage. Pilots should make themselves aware of where these activities are being conducted and avoid these areas if possible.

d. Recent and increasing incidents of unauthorized illumination of aircraft by lasers, as well as the proliferation and increasing sophistication of laser devices available to the general public, dictates that the FAA, in coordination with other government agencies, take action to safeguard flights from these unauthorized illuminations.

e. Pilots should report laser illumination activity to the controlling Air Traffic Control facilities, Federal Contract Towers or Flight Service Stations as soon as possible after the event. The following information should be included:

1. UTC Date and Time of Event.

2. Call Sign or Aircraft Registration Number.

3. Type Aircraft.

4. Nearest Major City.

5. Altitude.

6. Location of Event (Latitude/Longitude and/or Fixed Radial Distance (FRD)).

7. Brief Description of the Event and any other Pertinent Information.

f. Pilots are also encouraged to complete the Laser Beam Exposure Questionnaire located on the FAA Laser Safety Initiative website at http://www.faa.gov/about/initiatives/lasers/ and submit electronically per the directions on the questionnaire, as soon as possible after landing.

g. When a laser event is reported to an air traffic facility, a general caution warning will be broadcasted on all appropriate frequencies every five minutes for 20 minutes and broadcasted on the ATIS for one hour following the report.

PHRASEOLOGY−
UNAUTHORIZED LASER ILLUMINATION EVENT, (UTC time), (location), (altitude), (color), (direction).

EXAMPLE−
"Unauthorized laser illumination event, at 0100z, 8 mile final runway 18R at 3,000 feet, green laser from the southwest."

REFERENCE−
FAA Order JO 7110.65, Para 10−2−14, Unauthorized Laser Illumination of Aircraft.
FAA Order JO 7210.3, Para 2−1−27, Reporting Unauthorized Laser Illumination of Aircraft.

h. When these activities become known to the FAA, Notices to Airmen (NOTAMs) are issued to inform the aviation community of the events. Pilots should consult NOTAMs or the Chart Supplement for information regarding these activities.

7−6−14. Flying in Flat Light, Brown Out Conditions, and White Out Conditions

a. Flat Light. Flat light is an optical illusion, also known as "**sector or partial white out**." It is not as severe as "white out" but the condition causes pilots to lose their depth−of−field and contrast in vision. Flat light conditions are usually accompanied by overcast skies inhibiting any visual clues. Such conditions can occur anywhere in the world, primarily in snow covered areas but can also occur in dust, sand, mud flats, or on glassy water. Flat light can completely obscure features of the terrain, creating an inability to distinguish distances and closure rates. As a result of this reflected light, it can give pilots the illusion that they are ascending or descending when they may actually be flying level. However, with good judgment and proper training and planning, it is possible to safely operate an aircraft in flat light conditions.

b. Brown Out. A brownout (or *brown−out*) is an in−flight visibility restriction due to dust or sand in the air. In a brownout, the pilot cannot see nearby objects which provide the outside visual references necessary to control the aircraft near the ground. This can cause spatial disorientation and loss of situational awareness leading to an accident.

1. The following factors will affect the probability and severity of brownout: rotor disk loading, rotor configuration, soil composition, wind, approach speed, and approach angle.

2. The brownout phenomenon causes accidents during helicopter landing and take−off operations in dust, fine dirt, sand, or arid desert terrain. Intense, blinding dust clouds stirred up by the helicopter rotor downwash during near−ground flight causes significant flight safety risks from aircraft and ground obstacle collisions, and dynamic rollover due to sloped and uneven terrain.

3. This is a dangerous phenomenon experienced by many helicopters when making landing approaches in dusty environments, whereby sand or dust particles become swept up in the rotor outwash and obscure the pilot's vision of the terrain. This is particularly dangerous because the pilot needs those visual cues from their surroundings in order to make a safe landing.

4. Blowing sand and dust can cause an illusion of a tilted horizon. A pilot not using the flight instruments for reference may instinctively try to level the aircraft with respect to the false horizon, resulting in an accident. Helicopter rotor wash also causes sand to blow around outside the cockpit windows, possibly leading the pilot to experience an illusion where the helicopter appears to be turning when it is actually in a level hover. This can also cause the pilot to make incorrect control inputs which can quickly lead to disaster when hovering near the ground. In night landings, aircraft lighting can enhance the visual illusions by illuminating the brownout cloud.

c. White Out. As defined in meteorological terms, white out occurs when a person becomes engulfed in a uniformly white glow. The glow is a result of being surrounded by blowing snow, dust, sand, mud or water. There are no shadows, no horizon or clouds and all depth−of−field and orientation are lost. A white out situation is severe in that there are no visual references. Flying is not recommended in any white out situation. Flat light conditions can lead to a white out environment quite rapidly, and both atmospheric conditions are insidious; they sneak up on you as your visual references slowly begin to disappear. White out has been the cause of several aviation accidents.

d. Self Induced White Out. This effect typically occurs when a helicopter takes off or lands on a snow −covered area. The rotor downwash picks up particles and re−circulates them through the rotor downwash. The effect can vary in intensity depending upon the amount of light on the surface. This can happen on the sunniest, brightest day with good contrast everywhere. However, when it happens, there can be a complete loss of visual clues. If the pilot has not prepared for this immediate loss of visibility, the results can be disastrous. Good planning does not prevent one from encountering flat light or white out conditions.

e. Never take off in a white out situation.

1. Realize that in flat light conditions it may be possible to depart but not to return to that site. During takeoff, make sure you have a reference point. Do not lose sight of it until you have a departure reference point in view. Be prepared to return to the takeoff reference if the departure reference does not come into view.

2. Flat light is common to snow skiers. One way to compensate for the lack of visual contrast and depth−of−field loss is by wearing amber tinted lenses (also known as blue blockers). Special note of caution: Eyewear is <u>not</u> ideal for every pilot. Take into consideration personal factors—age, light sensitivity, and ambient lighting conditions.

3. So what should a pilot do when all visual references are lost?

(a) Trust the cockpit instruments.

(b) Execute a 180 degree turnaround and start looking for outside references.

(c) Above all − fly the aircraft.

f. Landing in Low Light Conditions. When landing in a low light condition − use extreme caution. Look for intermediate reference points, in addition to checkpoints along each leg of the route for course confirmation and timing. The lower the ambient light becomes, the more reference points a pilot should use.

g. Airport Landings.

1. Look for features around the airport or approach path that can be used in determining depth perception. Buildings, towers, vehicles or other aircraft serve well for this measurement. Use something that will provide you with a sense of height above the ground, in addition to orienting you to the runway.

2. Be cautious of snowdrifts and snow banks − anything that can distinguish the edge of the runway. Look for subtle changes in snow texture or shading to identify ridges or changes in snow depth.

h. Off−Airport Landings.

1. In the event of an off−airport landing, pilots have used a number of different visual cues to gain reference. Use whatever you must to create the contrast you need. Natural references seem to work best (trees, rocks, snow ribs, etc.)

(a) Over flight.

(b) Use of markers.

(c) Weighted flags.

(d) Smoke bombs.

(e) Any colored rags.

(f) Dye markers.

(g) Kool−aid.

(h) Trees or tree branches.

2. It is difficult to determine the depth of snow in areas that are level. Dropping items from the aircraft to use as reference points should be used as a visual aid only and not as a primary landing reference. Unless your marker is biodegradable, be sure to retrieve it after landing. Never put yourself in a position where no visual references exist.

3. Abort landing if blowing snow obscures your reference. Make your decisions early. Don't assume you can pick up a lost reference point when you get closer.

4. Exercise extreme caution when flying from sunlight into shade. Physical awareness may tell you that you are flying straight but you may actually be in a spiral dive with centrifugal force pressing against you. Having no visual references enhances this illusion. Just because you have a good visual reference does not mean that it's safe to continue. There may be snow−covered terrain not visible in the direction that you are traveling. Getting caught in a no visual reference situation can be fatal.

i. Flying Around a Lake.

1. When flying along lakeshores, use them as a reference point. Even if you can see the other side, realize that your depth perception may be poor. It is easy to fly into the surface. If you must cross the lake, check the altimeter frequently and maintain a safe altitude while you still have a good reference. Don't descend below that altitude.

2. The same rules apply to seemingly flat areas of snow. If you don't have good references, avoid going there.

j. Other Traffic. Be on the look out for other traffic in the area. Other aircraft may be using your same reference point. Chances are greater of colliding with someone traveling in the same direction as you, than someone flying in the opposite direction.

k. Ceilings. Low ceilings have caught many pilots off guard. Clouds do not always form parallel to the surface, or at the same altitude. Pilots may try to compensate for this by flying with a slight bank and thus creating a descending turn.

l. Glaciers. Be conscious of your altitude when flying over glaciers. The glaciers may be rising faster than you are climbing.

7−6−15. Operations in Ground Icing Conditions

a. The presence of aircraft airframe icing during takeoff, typically caused by improper or no deicing of the aircraft being accomplished prior to flight has contributed to many recent accidents in turbine aircraft. The General Aviation Joint Steering Committee (GAJSC) is the primary vehicle for government−industry cooperation, communication, and coordination on General Aviation (GA) accident mitigation. The Turbine Aircraft Operations Subgroup (TAOS) works to mitigate accidents in turbine accident aviation. While there is sufficient information and guidance currently available regarding the effects of icing on aircraft and methods for deicing, the TAOS has developed a list of recommended actions to further assist pilots and operators in this area.

While the efforts of the TAOS specifically focus on turbine aircraft, it is recognized that their recommendations are applicable to and can be adapted for the pilot of a small, piston powered aircraft too.

b. The following recommendations are offered:

1. Ensure that your aircraft's lift−generating surfaces are COMPLETELY free of contamination before flight through a tactile (hands on) check of the critical surfaces when feasible. Even when otherwise permitted, operators should avoid smooth or polished frost on lift−generating surfaces as an acceptable preflight condition.

2. Review and refresh your cold weather standard operating procedures.

3. Review and be familiar with the Airplane Flight Manual (AFM) limitations and procedures necessary to deal with icing conditions prior to flight, as well as in flight.

4. Protect your aircraft while on the ground, if possible, from sleet and freezing rain by taking advantage of aircraft hangars.

5. Take full advantage of the opportunities available at airports for deicing. Do not refuse deicing services simply because of cost.

6. Always consider canceling or delaying a flight if weather conditions do not support a safe operation.

c. If you haven't already developed a set of Standard Operating Procedures for cold weather operations, they should include:

1. Procedures based on information that is applicable to the aircraft operated, such as AFM limitations and procedures;

2. Concise and easy to understand guidance that outlines best operational practices;

3. A systematic procedure for recognizing, evaluating and addressing the associated icing risk, and offer clear guidance to mitigate this risk;

4. An aid (such as a checklist or reference cards) that is readily available during normal day−to−day aircraft operations.

d. There are several sources for guidance relating to airframe icing, including:

1. http://aircrafticing.grc.nasa.gov/index.html

2. Advisory Circular (AC) 91−74, Pilot Guide, Flight in Icing Conditions.

3. AC 135−17, Pilot Guide Small Aircraft Ground Deicing.

4. AC 135−9, FAR Part 135 Icing Limitations.

5. AC 120−60, Ground Deicing and Anti−icing Program.

6. AC 135−16, Ground Deicing and Anti−icing Training and Checking. The FAA Approved Deicing Program Updates is published annually as a Flight Standards Information Bulletin for Air Transportation and contains detailed information on deicing and anti−icing procedures and holdover times. It may be accessed at the following website by selecting the current year's information bulletins: https://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/deicing/.

7−6−16. Avoid Flight in the Vicinity of Exhaust Plumes (Smoke Stacks and Cooling Towers)

a. Flight Hazards Exist Around Exhaust Plumes. Exhaust plumes are defined as visible or invisible emissions from power plants, industrial production facilities, or other industrial systems that release large amounts of vertically directed unstable gases (effluent). High temperature exhaust plumes can cause significant air disturbances such as turbulence and vertical shear. Other identified potential hazards include, but are not necessarily limited to: reduced visibility, oxygen depletion, engine particulate contamination, exposure to gaseous oxides, and/or icing. Results of encountering a plume may include airframe damage, aircraft upset,

7−7−3. Near Midair Collision Reporting

a. Purpose and Data Uses. The primary purpose of the Near Midair Collision (NMAC) Reporting Program is to provide information for use in enhancing the safety and efficiency of the National Airspace System. Data obtained from NMAC reports are used by the FAA to improve the quality of FAA services to users and to develop programs, policies, and procedures aimed at the reduction of NMAC occurrences. All NMAC reports are thoroughly investigated by Flight Standards Facilities in coordination with Air Traffic Facilities. Data from these investigations are transmitted to FAA Headquarters in Washington, DC, where they are compiled and analyzed, and where safety programs and recommendations are developed.

b. Definition. A near midair collision is defined as an incident associated with the operation of an aircraft in which a possibility of collision occurs as a result of proximity of less than 500 feet to another aircraft, or a report is received from a pilot or a flight crew member stating that a collision hazard existed between two or more aircraft.

c. Reporting Responsibility. It is the responsibility of the pilot and/or flight crew to determine whether a near midair collision did actually occur and, if so, to initiate a NMAC report. Be specific, as ATC will not interpret a casual remark to mean that a NMAC is being reported. The pilot should state "I wish to report a near midair collision."

d. Where to File Reports. Pilots and/or flight crew members involved in NMAC occurrences are urged to report each incident immediately:

1. By radio or telephone to the nearest FAA ATC facility or FSS.

2. In writing, in lieu of the above, to the nearest Flight Standards District Office (FSDO).

e. Items to be Reported.

1. Date and time (UTC) of incident.

2. Location of incident and altitude.

3. Identification and type of reporting aircraft, aircrew destination, name and home base of pilot.

4. Identification and type of other aircraft, aircrew destination, name and home base of pilot.

5. Type of flight plans; station altimeter setting used.

6. Detailed weather conditions at altitude or flight level.

7. Approximate courses of both aircraft: indicate if one or both aircraft were climbing or descending.

8. Reported separation in distance at first sighting, proximity at closest point horizontally and vertically, and length of time in sight prior to evasive action.

9. Degree of evasive action taken, if any (from both aircraft, if possible).

10. Injuries, if any.

f. Investigation. The FSDO in whose area the incident occurred is responsible for the investigation and reporting of NMACs.

g. Existing radar, communication, and weather data will be examined in the conduct of the investigation. When possible, all cockpit crew members will be interviewed regarding factors involving the NMAC incident. Air traffic controllers will be interviewed in cases where one or more of the involved aircraft was provided ATC service. Both flight and ATC procedures will be evaluated. When the investigation reveals a violation of an FAA regulation, enforcement action will be pursued.

7−7−4. Unidentified Anomalous Phenomena (UAP) Reports

a. Persons wanting to report UAP/unexplained phenomena activity should visit the All−Domain Anomaly Resolution Office (AARO) website at https://www.aaro.mil/.

b. If concern is expressed that life or property might be endangered by unidentified anomalous phenomena (UAP) activity, report the activity to the local law enforcement department.

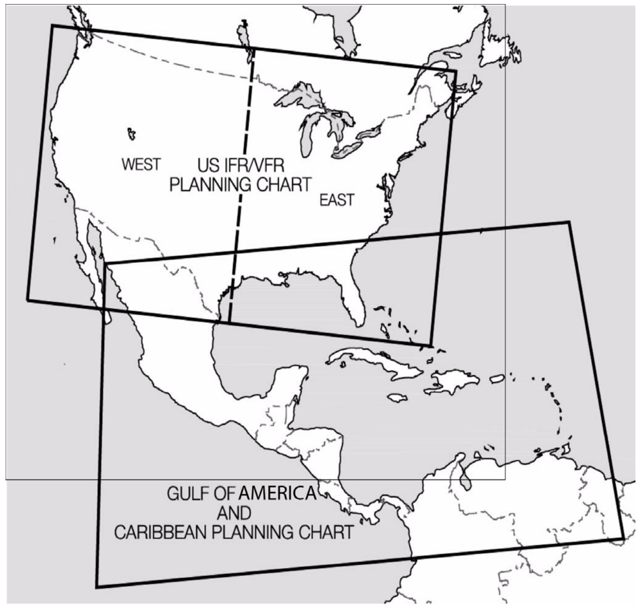
7–7–5. Safety Alerts For Operators (SAFO) and Information For Operators (InFO)

a. SAFOs contain important safety information that is often time-critical. A SAFO may contain information and/or recommended (non-regulatory) action to be taken by the respective operators or parties identified in the SAFO. The audience for SAFOs varies with each subject and may include: Air carrier certificate holders, air operator certificate holders, general aviation operators, directors of safety, directors of operations, directors of maintenance, fractional ownership program managers, training center managers, accountable managers at repair stations, and other parties as applicable.

b. InFOs are similar to SAFOs, but contain valuable information for operators that should help them meet administrative requirements or certain regulatory requirements with relatively low urgency or impact in safety.

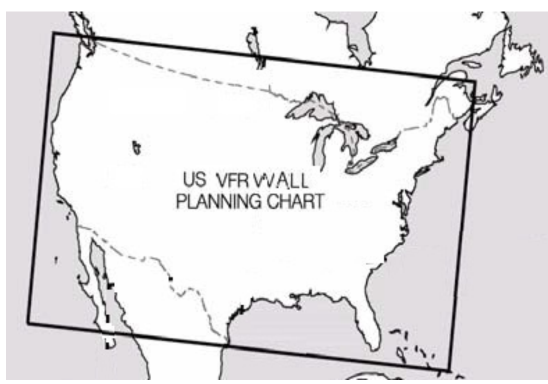
c. The SAFO and InFO system provides a means to rapidly distribute this information to operators and can be found at the following website:
http://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/safo and
http://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/info or search keyword FAA SAFO or FAA INFO. Free electronic subscription is available on the "ALL SAFOs" or "ALL InFOs" page of the website.

FIG 9−1−10
Planning Charts



4. U.S. VFR Wall Planning Chart. This chart is designed for VFR preflight planning and chart selection. It includes aeronautical and topographic information of the conterminous U.S. The aeronautical information includes airports, radio aids to navigation, Class B airspace and special use airspace. The topographic information includes city tint, populated places, principal roads, drainage patterns, and shaded relief. Scale 1 inch = 43 nm/ 1:3,100,000. The one−sided chart is 59 x 36 inches and ships unfolded for wall mounting. Revised annually. (See FIG 9−1−11.)

FIG 9−1−11
U.S. VFR Wall Planning Chart



5. VFR Flyway Planning Charts. This chart is printed on the reverse side of selected TAC charts. The coverage is the same as the associated TAC. Flyway planning charts depict flight paths and altitudes recommended for use to bypass high traffic areas. Ground references are provided as a guide for visual orientation. Flyway planning charts are designed for use in conjunction with TACs and sectional charts and are not to be used for navigation. VFR Transition Routes may be depicted and/or described on this chart. Chart scale 1 inch = 3.43 nm/1:250,000.

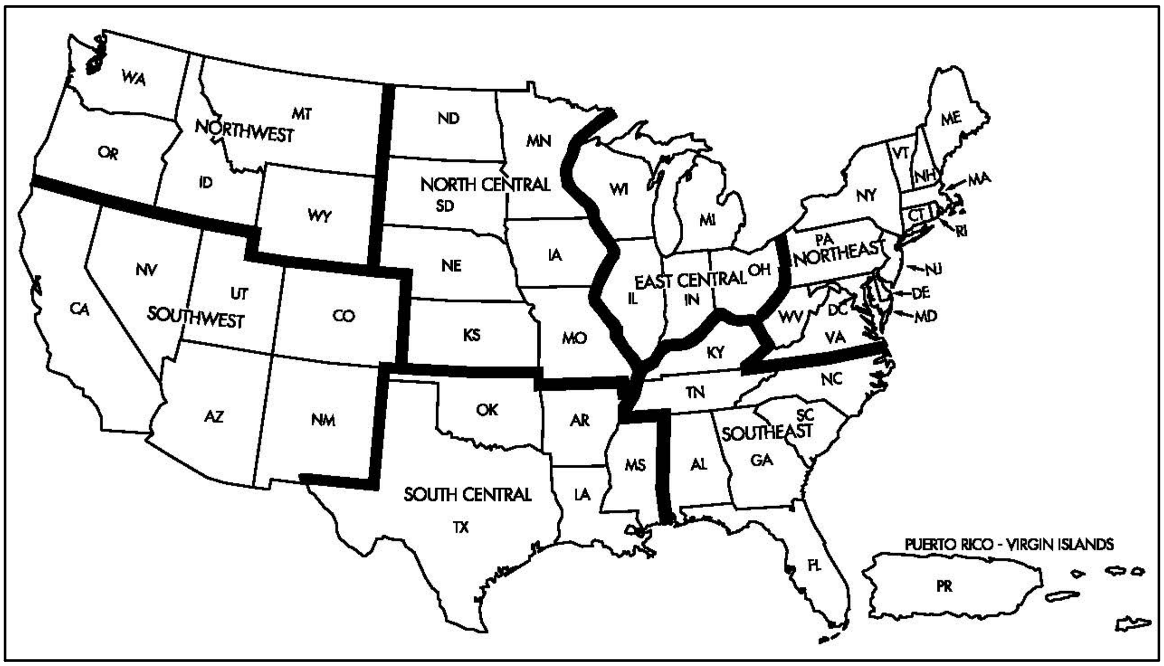
d. Supplementary Charts and Publications.

1. Chart Supplement refers to a series of civil/military flight information publications issued by FAA every 56 days consisting of the Chart Supplement U.S., Chart Supplement Alaska, and Chart Supplement Pacific.

2. Chart Supplement U.S. This is a civil/military flight information publication. This 7−volume book series is designed for use with appropriate IFR or VFR charts and contains data including, but not limited to, airports, NAVAIDs, communications data, weather data sources, special notices, non−regulatory operational procedures, and airport diagrams. Coverage includes the conterminous U.S., Puerto Rico, and the Virgin Islands. The Chart Supplement U.S. shows data that cannot be readily depicted in graphic form; for example, airport hours of operations, types of fuel available, run widths, and lighting codes. (See FIG 9−1−12.)

FIG 9−1−12

Chart Supplement U.S. Geographic Areas

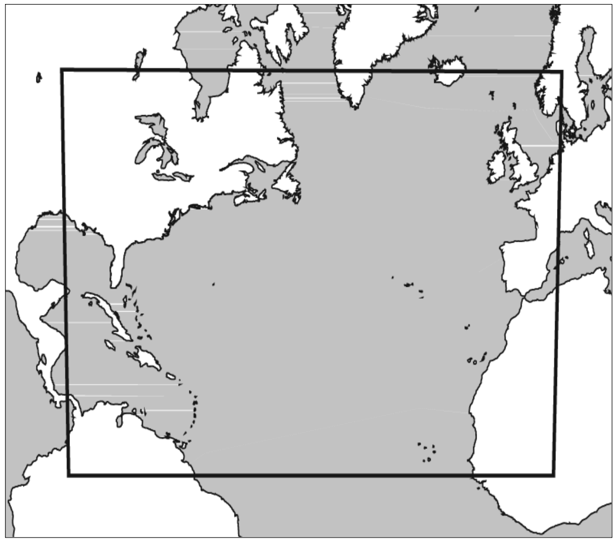


3. Chart Supplement Alaska. This is a civil/military flight information publication. This single−volume book is designed for use with appropriate IFR or VFR charts. The Chart Supplement Alaska contains data including, but not limited to, airports, NAVAIDs, communications data, weather data sources, special notices, non−regulatory operational procedures, and airport diagrams. The publication also includes uniquely geographical operational requirements as area notices and emergency procedures.

4. Chart Supplement Pacific. This is a civil/military flight information publication. This single volume book is designed for use with appropriate IFR or VFR charts. The Chart Supplement Pacific contains data including, but not limited to, airports, NAVAIDs, communications data, weather data sources, special notices, non−regulatory operational procedures, and airport diagrams. The publication also includes airspace, navigational facilities, non−regulatory Pacific area procedures, Instrument Approach Procedures (IAP), Departure Procedures (DP), Standard Terminal Arrival (STAR) charts, radar minimums, supporting data for the Hawaiian and Pacific Islands, and uniquely geographical operational requirements as area notices and emergency procedures.

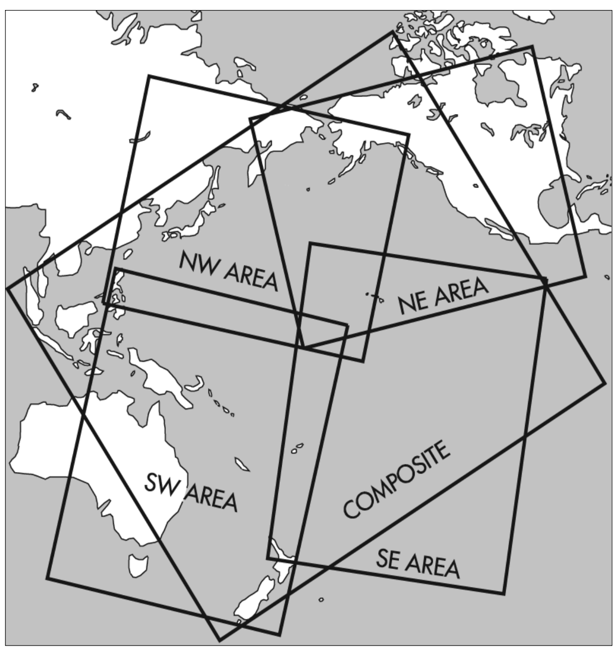
5. North Atlantic Route Chart. Designed for FAA controllers to monitor transatlantic flights, this 5−color chart shows oceanic control areas, coastal navigation aids, oceanic reporting points, and NAVAID geographic coordinates. Full Size Chart: Scale 1 inch = 113.1 nm/1:8,250,000. Chart is shipped flat only. Half Size Chart: Scale 1 inch = 150.8 nm/1:11,000,000. Chart is 29−3/4 x 20−1/2 inches, shipped folded to 5 x 10 inches only. Chart revised every 56 days. (See FIG 9−1−13.)

FIG 9−1−13
North Atlantic Route Charts



6. North Pacific Route Charts. These charts are designed for FAA controllers to monitor transoceanic flights. They show established intercontinental air routes, including reporting points with geographic positions. Composite Chart: Scale 1 inch = 164 nm/1:12,000,000. 48 x 41−1/2 inches. Area Charts: Scale 1 inch = 95.9 nm/1:7,000,000. 52 x 40−1/2 inches. All charts shipped unfolded. Charts revised every 56 days. (See FIG 9−1−14.)

FIG 9−1−14
North Pacific Oceanic Route Charts



7. Airport Obstruction Charts (OC). The OC is a 1:12,000 scale graphic depicting 14 CFR part 77, Objects Affecting Navigable Airspace, surfaces, a representation of objects that penetrate these surfaces, aircraft movement and apron areas, navigational aids, prominent airport buildings, and a selection of roads and other planimetric detail in the airport vicinity. Also included are tabulations of runway and other operational data.

8. FAA Aeronautical Chart User's Guide. A booklet designed to be used as a teaching aid and reference document. It describes the substantial amount of information provided on FAA's aeronautical charts and publications. It includes explanations and illustrations of chart terms and symbols organized by chart type. The users guide is available for free download at the AIS website.

e. Digital Products.

1. The Digital Aeronautical Information CD (DAICD). The DAICD is a combination of the NAVAID Digital Data File, the Digital Chart Supplement, and the Digital Obstacle File on one Compact Disk. These three digital products are no longer sold separately. The files are updated every 56 days and are available by subscription only.

(a) The NAVAID Digital Data File. This file contains a current listing of NAVAIDs that are compatible with the National Airspace System. This file contains all NAVAIDs including ILS and its components, in the U.S., Puerto Rico, and the Virgin Islands plus bordering facilities in Canada, Mexico, and the Atlantic and Pacific areas.

(b) The Digital Obstacle File. This file describes all known obstacles of interest to aviation users in the U.S., with limited coverage of the Pacific, Caribbean, Canada, and Mexico. The obstacles are assigned unique numerical identifiers, accuracy codes, and listed in order of ascending latitude within each state or area.

2. The Coded Instrument Flight Procedures (CIFP) (ARINC 424 [Ver 13 & 15]). The CIFP is a basic digital dataset, modeled to an international standard, which can be used as a basis to support GPS navigation. Initial data elements included are: Airport and Helicopter Records, VHF and NDB Navigation aids, en route waypoints and airways. Additional data elements will be added in subsequent releases to include: departure procedures, standard terminal arrivals, and GPS/RNAV instrument approach procedures. The database is updated every 28 days. The data is available by subscription only and is distributed on CD−ROM or by ftp download.

3. digital−Visual Charts (d−VC). These digital VFR charts are geo−referenced images of FAA Sectional Aeronautical, TAC, and Helicopter Route charts. Additional digital data may easily be overlaid on the raster image using commonly available Geographic Information System software. Data such as weather, temporary flight restrictions, obstacles, or other geospatial data can be combined with d−VC data to support a variety of needs. The file resolution is 300 dots per inch and the data is 8−bit color. The data is provided as a GeoTIFF and distributed on DVD−R media and on the AIS website. The root mean square error of the transformation will not exceed two pixels. Digital−VCs are updated every 56 days and are available by subscription only.

REFERENCE−
14 CFR Part 135, Operating Requirements: Commuter and on Demand Operations and Rules Governing Persons on Board Such Aircraft.
14 CFR p107, Small Unmanned Aircraft Systems.
14 CFR Part 11, General Rulemaking Procedures.
FAA Order JO 7210.3, Chapter 5, Section 5, 14 CFR Part 91, UAS Operations.

2. Generally, UAS cannot comply with certain 14 CFR regulations originally written for a manned aircraft environment and therefore require relief. UAS operators obtain relief from the requirements of these regulations through exemptions, waivers, and deviations. The relief document lists conditions and limitations which provide a level of safety at least equal to that provided by the rule from which relief is needed. Additionally, UAS operators must obtain a Certificate of Waiver or Authorization (COA) from the FAA Air Traffic Organization (ATO). Applicants for 14 CFR part 135 certification should begin the process by contacting their local FAA Flight Standards District Office (FSDO).

NOTE−
Examples of such regulations include requirements for the provision of seat belts for aircrew and passengers, on−board carriage of an aircraft manual, etc.

(a) Application for a 14 CFR part 135 certificate. Application for a 14 CFR part 135 air carrier certificate for UAS operations uses the same process as that for manned 14 CFR part 135 applicants. For information on how to apply for an air carrier certificate issued under 14 CFR part 135, see the FAA 14 CFR part 135 Air Carrier and Operator Certification website.

NOTE−
The FAA 14 CFR part 135 Air Carrier and Operator Certification website may be reviewed at: https://www.faa.gov/licenses_certificates/airline_certification/135_certification/ .

(b) Advisory Circular 120−49A, parts 121 and 135 Certification is available to aid an applicant in Part 135 certification.

REFERENCE−
AC 120−49, Parts 121 and 135 Certification.

(c) Exemptions and COAs. Additional information on how to petition for an exemption and obtain a COA is available on the FAA Advanced Operations website.

NOTE−
The FAA's Advanced Operations website may be reviewed at: https://www.faa.gov/uas/advanced_operations/ .

b. 14 CFR part 137, Agricultural Aircraft Operations:

1. Civil and public operators of UAS may conduct agricultural aircraft operations, as defined in 14 CFR part 137.3, Definition of Terms. These operations must be conducted in accordance with an agricultural aircraft operator certificate issued under 14 CFR part 137, and an exemption from certain federal aviation regulations granted under 14 CFR part 11, General Rulemaking Procedures. Operators of sUAS, weighing less than 55 pounds MGOW may conduct agricultural aircraft operations under 14 CFR part 107, sUAS, and 14 CFR part 137. Operators of large UAS, weighing 55 pounds MGOW or more may conduct agricultural aircraft operations under 14 CFR parts 91, UAS operations, and 14 CFR part 137.

REFERENCE−
14 CFR Part 137, Agricultural Aircraft Operations.
14 CFR Part 11, General Rulemaking Procedures.
14 CFR Part 107, Small Unmanned Aircraft Systems.
FAA Order JO 7210.3, Chapter 5, Section 5, 14 CFR Part 91, UAS Operations.

2. Generally, as is the case with 14 CFR part 135 standard cargo operations, UAS cannot comply with certain 14 CFR regulations, and therefore require relief. For example, sUAS require relief from carriage of hazardous material (§107.36), aircraft certification (§137.19(d)), carriage of agricultural aircraft operator certificate (§137.33(a)), and, for large UAS, certain aircraft airworthiness requirements (14 CFR parts 21 and 91). UAS operators obtain relief from the requirements of these regulations through an exemption. The exemption lists conditions and limitations which provide a level of safety at least equal to that provided by the rule. Additionally, large UAS operators must obtain a COA from the FAA ATO.

(a) Obtaining an exemption for 14 CFR part 137 operations. For additional information on how to petition for an exemption and obtain a COA, go to the FAA's Advanced Operations website.

NOTE–
The FAA's Advanced Operations website may be viewed at: https://www.faa.gov/uas/advanced_operations/ .

(b) Advisory Circular 137–1, Certification Process for Agricultural Aircraft Operators, provides additional information on how to apply for an agricultural aircraft operator certificate issued under 14 CFR part 137.

REFERENCE–
AC 137–1, Certification Process for Agricultural Aircraft Operators.

c. Hazardous Materials (HAZMAT):

1. A hazardous material also known as HAZMAT, or dangerous goods is any substance or material that is capable of posing an unreasonable risk to health, safety, and property when transported in commerce. For example, lithium batteries, dry ice, and aerosol whipped cream are considered dangerous goods. These products may seem harmless, but when transported by air they can be very dangerous. Vibrations, static electricity, temperature and pressure variations can cause items to leak, generate toxic fumes, start a fire, or even explode if these products are not packaged and handled properly. More detailed information is located on the FAA's What are Dangerous Goods website.

NOTE–
The FAA's What are Dangerous Goods website may be viewed at: https://www.faa.gov/hazmat/what_is_hazmat/ .

2. The carriage/transportation of hazardous materials under 14 CFR part 107, sUAS, is strictly prohibited at all times, and is not subject to waiver. In order to transport hazardous materials, UAS operators must follow the 14 CFR part 135 certification regulatory path and must develop dangerous goods training programs and manuals as part of the 14 CFR part 135 Air Carrier and Operator Certificates process, described on the FAA website and subparagraph 11–4–5a, and 14 CFR part 135, Operating Requirements. A brief description of applicable regulations as they apply to UAS can be found on the FAA's UAS website.

NOTE–
The FAA's Unmanned Aircraft System (UAS) website may be viewed at:
https://www.faa.gov/hazmat/air_carriers/operations/dr ones/.

REFERENCE–
14 CFR Part 107, Small Unmanned Aircraft Systems.
14 CFR Part 135, Operating Requirements: Commuter and on Demand Operations and Rules Governing Persons on Board Such Aircraft.

11–4–6. Airspace Restrictions To Flight

a. General. The FAA has the exclusive authority to regulate the areas of aviation safety and the efficient use of the airspace by aircraft. Attempts by state and local governments to regulate in those areas are preempted. Outside of those areas, the States are generally free to regulate as long as their laws do not conflict with FAA regulations or relate to the prices, routes, or services of commercial air carriers. The NAS extends from the ground to above 60,000 feet MSL and includes various classifications of airspace, both controlled and uncontrolled. sUAS remote pilots and recreational flyers are generally permitted access to uncontrolled airspace without special permission. However, this changes when access to controlled airspace is desired. All access to controlled airspace by unmanned aircraft must be granted by ATC.

NOTE–
1. *While the NAS is divided into controlled and uncontrolled airspace, users must remember that all airspace is regulated, and certain rules apply throughout the NAS.*

2. *Recreational flyers are limited to no higher than 400 feet AGL in Class G airspace, without prior authorization.*

3. *sUAS remote pilots operating under 14 CFR part 107 are limited to no higher than 400 feet AGL unless the small UA is (1) Flown within a 400–foot radius of a structure; and (2) Does not fly higher than 400 feet above the structure's immediate uppermost limit, or when a waiver has been issued to 14 CFR § 107.51(b).*

b. Controlled airspace is a generic term that covers the different classification of airspace (Class A, Class B, Class C, Class D, and Class E airspace) and defined dimensions within which air traffic control services can be provided to Instrument Flight Rules (IFR) flights and to Visual Flight Rules (VFR) flights, in accordance with the airspace classification.

c. Special Use Airspace (SUA). SUA consists of that airspace wherein flight activities must be confined because of their nature, or wherein limitations are imposed upon aircraft operations that are not a part of those activities, or both. These areas are generally depicted on aeronautical charts and will be indicated on the B4UFly and LAANC applications for UAS.

d. Temporary Flight Restrictions:

1. Temporary Flight Restrictions (TFRs) are non−permanent airspace restrictions issued by the FAA via the U.S. NOTAM System, and are created to protect persons and property in the air or on the surface from an existing or imminent hazard associated with an incident on the surface, when the presence of low flying aircraft would magnify, alter, spread, or compound that hazard (14 CFR Section 91.137(a)(1)). TFRs can exist to protect aircraft from hazards, and also to protect people/objects on the ground from aircraft hazards. Examples of TFRs include natural disaster areas especially forest fires, floods, congested flight areas, the area around spacecraft launches and recoveries, certain stadium sporting events, and the security of national public figures.

2. UAS operators should be aware that substantial fines and penalties can be levied on UAS remote pilots or recreational flyers violating a TFR.

e. Special Restrictions over Critical Infrastructure:

1. The FAA restricts UAS operations over certain locations, including military sites and installations, in the interest of national security using Special Security instructions.

2. UAS operations may be permitted in these areas under limited circumstances. Operators should review established NOTAMS for permitted operations and seek authorization prior to operating in these areas.

3. UAS remote pilots and recreational flyers must carefully consider where they are operating and determine the legality of doing so, infractions may result in fines and legal actions.

REFERENCE−
14 CFR Section 99.7, Special Security Instructions.

f. Special Flight Rules Area (SFRA). SFRAs are airspaces of defined dimensions, above land areas or territorial waters, within which the flight of aircraft is subject to special rules, established after the September 11, 2001, attacks. Examples include the Washington, DC, Los Angeles, and Hudson River SFRAs. All aircraft are highly regulated within SFRAs. The inner area of some SFRAs, the Flight Restricted Zone (FRZ) is very highly restricted and prohibits all but previously vetted aircrew and aircraft from entering. Refer to VFR Sectional Charts or the FAA's Restricted Airspace website for information on specific airspace limitations and instructions for requesting entry.

NOTE−
The FAA's Restricted Airspace website may be viewed at: https://www.faa.gov/newsroom/restricted-airspace-0.

g. State or local governments may generally enact laws applying to UAS that (1) are aimed at objectives other than aviation safety or airspace efficiency, and (2) do not impair the reasonable use by UAS of the airspace, including laws addressing land use or zoning; harassment of individuals or groups; privacy; voyeurism; photography or imaging from UAS; trespass on property; the exercise of other police powers; reckless endangerment; law enforcement; delivery of prison contraband; and taking photographs or videos. Restrictions on how UAS are utilized (i.e., conduct), instead of where they may operate in the airspace, is more consistent with Federal preemption principles. UAS restrictions applied to the lower UAS altitudes—that would still permit overflight at the higher UAS altitudes—are less likely to raise preemption concerns.

h. Other Restrictions & Provisions:

1. Flight over or near natural habitat or nature preserves. See paragraph 11−8−6, Environmental Best Practices, for a discussion of UAS flight restrictions over or near wildlife.

2. "No Drone Zone:" To promote safe and responsible use of UAS, the FAA uses the term "No Drone Zone" to help operators identify areas where they cannot operate UAS. The effort assists landowners (private and public) with designating their land off−limits for UAS take−offs and landings. The outreach allows landowners who wish to avoid UAS interactions on their property to state this preference in advance of UAS take−offs or landings. The “No Drone Zone” concept does not empower State or local governments to enact airspace restrictions or to regulate the airspace. A “No Drone Zone” sign posted by a State or local government, or private person, only applies to the ground, not the airspace. Furthermore, the sign solely designates an area where UAS may not takeoff or land. Generally speaking, for a “No Drone Zone” in a public place to be legally enforceable, there must exist underlying land use or zoning authority (ordinance, law, etc.). If the property in question is privately−owned, the landowner’s right to prohibit UAS landing areas on their property is generally enforceable through trespass law.

3. Flight over or near people and manned aircraft. In general, UAS remote pilots and recreational flyers should avoid flying over or near people or manned aircraft operations, and in any manner that could be construed as reckless or dangerous. See paragraph 11−8−3, Precautions: Flight Over or Near People, Manned Aircraft, and Night Flight, for specific information on flight over or near people.

4. Correctional Institutions. Flight over some federal prisons is restricted under 14 CFR section 99.7, Special Security Instructions. Flight near other correctional institutions may be prohibited by other federal, state or local statutes. Subparagraph 11−4−6e, Special Restrictions over Critical Infrastructure, contains additional information regarding restrictions over critical infrastructure.

REFERENCE−
14 CFR Section 99.7, Special Security Instructions.

11−4−7. UAS Traffic Management (UTM)

a. UTM Operations. UTM is predicated on layers of information sharing and data exchange amongst a range of stakeholders including UAS operators, service providers, and the FAA to achieve safe operations. Operators share their flight intent with each other and coordinate to de−conflict and safely separate trajectories. The primary means of communication and coordination between operators, the FAA, and other stakeholders is through a distributed information network, rather than between pilots and air traffic controllers via traditional voice communications. The FAA makes real−time airspace constraints available to UAS operators, who are responsible for managing their own operations safely within these constraints without receiving ATC services from the FAA. However, the FAA does have access to applicable UTM operational information as necessary.

b. UAS operators not receiving ATC separation services are required to participate in UTM at some level using applicable services to meet the performance requirements of their operations. See FIG 11−4−2 for UTM in the context of Air Traffic Management operations. The number and type of services required varies based on the type and location of the intended operation and the associated communication, navigation, surveillance (CNS), and other operational needs.

Appendix 3. Abbreviations/Acronyms

As used in this manual, the following abbreviations/acronyms have the meanings indicated.

Abbreviation/ Acronym	Meaning
AAWU	Alaskan Aviation Weather Unit
AAS	Airport Advisory Service
AAM	Advanced Air Mobility
ABRR	Airborne Reroutes
AC	Advisory Circular
ACAR	Aircraft Communications Addressing and Reporting System
ACL	Aircraft List
ADCUS	Advise Customs
ADDS	Aviation Digital Data Service
ADF	Automatic Direction Finder
ADIZ	Air Defense Identification Zone
ADS−B	Automatic Dependent Surveillance−Broadcast
AFB	Air Force Base
AFCS	Automatic Flight Control System
AFIS	Automatic Flight Information Service
AFM	Aircraft Flight Manual
AGL	Above Ground Level
AHRS	Attitude Heading Reference System
AIM	Aeronautical Information Manual
AIRMET	Airmen's Meteorological Information
AIS	Aeronautical Information Services
ALD	Available Landing Distance
ALDARS	Automated Lightning Detection and Reporting System
ALS	Approach Light Systems
AMSL	Above Mean Sea Level
ANP	Actual Navigation Performance
AOCC	Airline Operations Control Center
AP	Autopilot System
APV	Approach with Vertical Guidance
AR	Authorization Required
ARENA	Areas Noted for Attention
ARFF IC	Aircraft Rescue and Fire Fighting Incident Commander
ARINC	Aeronautical Radio Incorporated
ARO	Airport Reservations Office
ARSA	Airport Radar Service Area
ARSR	Air Route Surveillance Radar
ARTCC	Air Route Traffic Control Center
AS	Altimeter Setting
ASDE−X	Airport Surface Detection Equipment − Model X
ASOS	Automated Surface Observing System
ASR	Airport Surveillance Radar
ASRS	Aviation Safety Reporting System
ASSC	Airport Surface Surveillance Capability
ATC	Air Traffic Control
ATCRBS	Air Traffic Control Radar Beacon System
ATCSCC	Air Traffic Control System Command Center
ATCT	Airport Traffic Control Tower
ATD	Along−Track Distance
ATIS	Automatic Terminal Information Service
ATO	Air Traffic Organization
ATT	Attitude Retention System
AWC	Aviation Weather Center
AWOS	Automated Weather Observing System
AWTT	Aviation Weather Technology Transfer
AWW	Severe Weather Forecast Alert
BAASS	Bigelow Aerospace Advanced Space Studies
BBS	Bulletin Board System
BC	Back Course
BECMG	Becoming group
BVLOS	Beyond Visual Line of Sight
C/A	Coarse Acquisition
CAA	Confirm Assigned Altitude
CAT	Clear Air Turbulence
CBO	Community−Based Organization
CD	Controller Display
CDI	Course Deviation Indicator
CDR	Coded Departure Route
CERAP	Combined Center/RAPCON
CFA	Controlled Firing Area
CFIT	Controlled Flight into Terrain
CFR	Code of Federal Regulations
COA	Certificate of Waiver or Authorization
CPDLC	Controller Pilot Data Link Communications
CTAF	Common Traffic Advisory Frequency
CVFP	Charted Visual Flight Procedure
CVRS	Computerized Voice Reservation System
CWA	Center Weather Advisory
CWSU	Center Weather Service Unit
DA	Decision Altitude

Abbreviation/ Acronym	Meaning
DCA	Ronald Reagan Washington National Airport
DCP	Data Collection Package
DER	Departure End of Runway
DH	Decision Height
DME	Distance Measuring Equipment
DME/N	Standard DME
DME/P	Precision DME
DoD	Department of Defense
DP	Instrument Departure Procedure
DPU	Data Processor Unit
DRT	Diversion Recovery Tool
DRVSM	Domestic Reduced Vertical Separation Minimum
DVA	Diverse Vector Area
DVFR	Defense Visual Flight Rules
DVRSN	Diversion
EDCT	Expect Departure Clearance Time
EFAS	En Route Flight Advisory Service
EFV	Enhanced Flight Visibility
EFVS	Enhanced Flight Vision System
ELT	Emergency Locator Transmitter
EMAS	Engineered Materials Arresting System
EPE	Estimate of Position Error
ESV	Expanded Service Volume
ETA	Estimated Time of Arrival
ETD	Estimated Time of Departure
ETE	Estimated Time En Route
EWINS	Enhanced Weather Information System
EWR	Newark International Airport
FA	Area Forecast
FAA	Federal Aviation Administration
FAF	Final Approach Fix
FAWP	Final Approach Waypoint
FB	Fly−by
FCC	Federal Communications Commission
FD	Flight Director System
FDB	Full Data Block
FDC	Flight Data Center
FDE	Fault Detection and Exclusion
FIR	Flight Information Region
FIS	Flight Information Service
FISDL	Flight Information Services Data Link
FLIP	Flight Information Publication
FMS	Flight Management System
FO	Fly−over
FPA	Flight Path Angle

Abbreviation/ Acronym	Meaning
FPV	Flight Path Vector
FPNM	Feet Per Nautical Mile
FRIA	FAA−Recognized Identification Area
FSDO	Flight Standards District Office
FSS	Flight Service Station
GBAS	Ground Based Augmentation System
GEO	Geostationary Satellite
GLS	GBAS Landing System
GNSS	Global Navigation Satellite System
GNSSP	Global Navigation Satellite System Panel
GPS	Global Positioning System
GRI	Group Repetition Interval
GSD	Geographical Situation Display
GUS	Ground Uplink Station
HAT	Height Above Touchdown
HAZMAT	Hazardous Material
HDTA	High Density Traffic Airports
HEMS	Helicopter Emergency Medical Services
HIRL	High Intensity Runway Lights
HRR	Helicopter Rapid Refueling Procedures
HUD	Head−Up Display
Hz	Hertz
IAF	Initial Approach Fix
IAP	Instrument Approach Procedure
IAS	Indicated Air Speed
IAWP	Initial Approach Waypoint
IC	Initial Contact
ICAO	International Civil Aviation Organization
IF	Intermediate Fix
IFR	Instrument Flight Rules
ILS	Instrument Landing System
ILS/PRM	Instrument Landing System/Precision Runway Monitor
IM	Inner Marker
IMC	Instrument Meteorological Conditions
InFO	Information For Operators
INS	Inertial Navigation System
IOC	Initial Operational Capability
IR	IFR Military Training Route
IRU	Inertial Reference Unit
ITWS	Integrated Terminal Weather System
JFK	John F. Kennedy International Airport
kHz	Kilohertz
LAA	Local Airport Advisory
LAANC	Low Altitude Authorization and Notification Capability

Abbreviation/ Acronym	Meaning
LAAS	Local Area Augmentation System
LAHSO	Land and Hold Short Operations
LAWRS	Limited Aviation Weather Reporting Station
LDA	Localizer Type Directional Aid
LDA/PRM . .	Localizer Type Directional Aid/Precision Runway Monitor
LGA	LaGuardia Airport
LIRL	Low Intensity Runway Lights
LLWAS	Low Level Wind Shear Alert System
LLWAS NE .	Low Level Wind Shear Alert System Network Expansion
LLWAS−RS .	Low Level Wind Shear Alert System Relocation/Sustainment
LNAV	Lateral Navigation
LOC	Localizer
LOP	Line−of−position
LORAN	Long Range Navigation System
LP	Localizer Performance
LPV	Localizer Performance with Vertical Guidance
LUAW	Line Up and Wait
LZ	Landing Zone
MAHWP . . .	Missed Approach Holding Waypoint
MAP	Missed Approach Point
MAWP	Missed Approach Waypoint
MDA	Minimum Descent Altitude
MEA	Minimum En Route Altitude
MEARTS . . .	Micro En Route Automated Radar Tracking System
METAR	Aviation Routine Weather Report
MGOW	Maximum Gross Operating Weight
MHz	Megahertz
MIRL	Medium Intensity Runway Lights
MM	Middle Marker
MOA	Military Operations Area
MOCA	Minimum Obstruction Clearance Altitude
MRA	Minimum Reception Altitude
MRB	Magnetic Reference Bearing
MSA	Minimum Safe Altitude
MSAW	Minimum Safe Altitude Warning
MSL	Mean Sea Level
MTI	Moving Target Indicator
MTOS	Mountain Obscuration
MTR	Military Training Route
MVA	Minimum Vectoring Altitude
MWA	Mountain Wave Activity
MWO	Meteorological Watch Office

Abbreviation/ Acronym	Meaning
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NAVAID	Navigational Aid
NAVCEN . . .	Coast Guard Navigation Center
NCWF	National Convective Weather Forecast
NDB	Nondirectional Radio Beacon
NEXRAD . . .	Next Generation Weather Radar
NGA	National Geospatial−Intelligence Agency
NM	Nautical Mile
NMAC	Near Midair Collision
NOAA	National Oceanic and Atmospheric Administration
NOPAC	North Pacific
NoPT	No Procedure Turn Required
NPA	Nonprecision Approach
NRS	Navigation Reference System
NSA	National Security Area
NSW	No Significant Weather
NTSB	National Transportation Safety Board
NTZ	No Transgression Zone
NWS	National Weather Service
OAT	Outside Air Temperature
OBS	Omni−bearing Selector
ODP	Obstacle Departure Procedure
OIS	Operational Information System
OIS	Obstacle Identification Surface
OM	Outer Marker
OOP	Operations Over People
ORD	Chicago O'Hare International Airport
P/CG	Pilot/Controller Glossary
PA	Precision Approach
PAO	Public Aircraft Operation
PAPI	Precision Approach Path Indicator
PAR	Precision Approach Radar
PAR	Preferred Arrival Route
PC	Personal Computer
PDC	Pre−departure Clearance
PFD	Personal Flotation Device
PIC	Pilot−in−Command
PinS	Point−in−Space
PIREP	Pilot Weather Report
POB	Persons on Board
POFZ	Precision Obstacle Free Zone
POI	Principal Operations Inspector
PPS	Precise Positioning Service

Abbreviation/ Acronym	Meaning
PRM	Precision Runway Monitor
PT	Procedure Turn
QICP	Qualified Internet Communications Provider
RA	Resolution Advisory
RAA	Remote Advisory Airport
RAIM	Receiver Autonomous Integrity Monitoring
RAIS	Remote Airport Information Service
RBDT	Ribbon Display Terminals
RC	Radio−Controlled
RCAG	Remote Center Air/Ground
RCC	Rescue Coordination Center
RCLS	Runway Centerline Lighting System
RCO	Remote Communications Outlet
RID	Remote Identification
RPIC	Remote Pilot−in−Command
TAF	Aerodrome Forecast
RD	Rotor Diameter
REIL	Runway End Identifier Lights
REL	Runway Entrance Lights
RFM	Rotorcraft Flight Manual
RLIM	Runway Light Intensity Monitor
RMI	Radio Magnetic Indicator
RNAV	Area Navigation
RNP	Required Navigation Performance
ROC	Required Obstacle Clearance
RPAT	RNP Parallel Approach Runway Transitions
RVR	Runway Visual Range
RVSM	Reduced Vertical Separation Minimum
RWSL	Runway Status Light
SAA	Sense and Avoid
SAFO	Safety Alerts For Operators
SAM	System Area Monitor
SAR	Search and Rescue
SAS	Stability Augmentation System
SATR	Special Air Traffic Rules
SBAS	Satellite−based Augmentation System
SDF	Simplified Directional Facility
SFL	Sequenced Flashing Lights
SFR	Special Flight Rules
SFRA	Special Flight Rules Area
SGI	Special Government Interest
SIAP	Standard Instrument Approach Procedure
SID	Standard Instrument Departure
SIGMET	Significant Meteorological Information
SM	Statute Mile

Abbreviation/ Acronym	Meaning
SMGCS	Surface Movement Guidance Control System
SNR	Signal−to−noise Ratio
SOIA	Simultaneous Offset Instrument Approaches
SOP	Standard Operating Procedure
SPC	Storm Prediction Center
SPS	Standard Positioning Service
STAR	Standard Terminal Arrival
STARS	Standard Terminal Automation Replacement System
STMP	Special Traffic Management Program
sUAS	Small UAS
TA	Traffic Advisory
TAA	Terminal Arrival Area
TAC	Terminal Area Chart
TACAN	Tactical Air Navigation
TAS	True Air Speed
TCAS	Traffic Alert and Collision Avoidance System
TCH	Threshold Crossing Height
TD	Time Difference
TDLS	Tower Data Link System
TDWR	Terminal Doppler Weather Radar
TDZ	Touchdown Zone
TDZE	Touchdown Zone Elevation
TDZL	Touchdown Zone Lights
TEC	Tower En Route Control
THL	Takeoff Hold Lights
TIS	Traffic Information Service
TIS−B	Traffic Information Service−Broadcast
TLS	Transponder Landing System
TOC	Transfer of Communications
TPP	Terminal Procedures Publications
TRSA	Terminal Radar Service Area
TRUST	The Recreational UAS Safety Test
TSO	Technical Standard Order
TWIB	Terminal Weather Information for Pilots System
U.S.	United States
UA	Unmanned Aircraft
UAM	Urban Air Mobility
UAS	Unmanned Aircraft System
UASFM	UAS Facility Map
UAV	Unmanned Aerial Vehicle
UFO	Unidentified Flying Object
UHF	Ultrahigh Frequency

Abbreviation/ Acronym	Meaning
USCG	United States Coast Guard
UTC	Coordinated Universal Time
UTM	UAS Traffic Management
UWS	Urgent Weather SIGMET
UWS	Urgent Weather SIGMET
VAR	Volcanic Activity Reporting
VASI	Visual Approach Slope Indicator
VCOA	Visual Climb Over the Airport
VDA	Vertical Descent Angle
VDP	Visual Descent Point
VFR	Visual Flight Rules
VGSI	Visual Glide Slope Indicator
VHF	Very High Frequency
VIP	Video Integrator Processor
VLOS	Visual Line of Sight
VMC	Visual Meteorological Conditions
V_{MINI}	Instrument flight minimum speed, utilized in complying with minimum limit speed requirements for instrument flight
VNAV	Vertical Navigation
V_{NE}	Never exceed speed
V_{NEI}	Instrument flight never exceed speed, utilized instead of V_{NE} for compliance with maximum limit speed requirements for instrument flight
VO	Visual Observer
VOR	Very High Frequency Omni−directional Range
VORTAC . . .	VHF Omni−directional Range/Tactical Air Navigation
VOT	VOR Test Facility
VR	VFR Military Training Route

Abbreviation/ Acronym	Meaning
V_{REF}	The reference landing approach speed, usually about 1.3 times V_{so} plus 50 percent of the wind gust speed in excess of the mean wind speed.
V_{SO}	The stalling speed or the minimum steady flight speed in the landing configuration at maximum weight.
VTF	Vector to Final
VV	Vertical Visibility
VVI	Vertical Velocity Indicator
V_{Y}	Speed for best rate of climb
V_{YI}	Instrument climb speed, utilized instead of V_{Y} for compliance with the climb requirements for instrument flight
WA	AIRMET
WAAS	Wide Area Augmentation System
WFO	Weather Forecast Office
WGS−84	World Geodetic System of 1984
WMO	World Meteorological Organization
WMS . .	Wide−Area Master Station
WMSC	Weather Message Switching Center
WMSCR	Weather Message Switching Center Replacement
WP	Waypoint
WRA	Weather Reconnaissance Area
WRS	Wide−Area Ground Reference Station
WS	SIGMET
WSO	Weather Service Office
WSP	Weather Systems Processor
WST	Convective Significant Meteorological Information
WW	Severe Weather Watch Bulletin

There is no U.S. requirement to file the aircraft Mode S Code in Item 18.

6. SELCAL code (Item 18 SEL/)

(a) Flights with HF radio and Selective Calling capability should include their 4−letter SELCAL code. Per the U.S. AIP, GEN 3.4, Paragraph 9, Selective Calling System (SELCAL) Facilities Available.

(b) The SELCAL is a communication system that permits the selective calling of individual aircraft over radio−telephone channels from the ground station to properly equipped aircraft, to eliminate the need for the flight crew to constantly monitor the frequency in use.

EXAMPLE−
SEL/CLEF

7. Performance Category (Item 18 PER/)

Include the appropriate single−letter Aircraft Approach Category as defined in the Pilot/Controller Glossary.

EXAMPLE−
PER/A

TBL 4−20

Flight Routing Information

Item	International Flight Plan (FAA Form 7233−4)	Domestic U.S. Requirements	Equivalent Item on Domestic Flight Plan (FAA Form 7233−1)
Departure Airport	Item 13	Required	Item 2
Departure Time	Item 13	Required	Item 1
Cruise Speed	Item 15	Required	N/A
Requested Altitude	Item 15	Required	Item 3
Route	Item 15	Required	N/A
Delay En Route	Item 15, Item 18 DLE/	Required	N/A
Destination Airport	Item 16	Required	Item 11
Total Estimated Elapsed Time	Item 16	Required	Item
Alternate Airport	Item 16 Item 18 ALTN/ (Destination Alternate). RALT/ (En route Alternate); TALT/ (Take−off Alternate)	If necessary No need to file for domestic U.S. flight	N/A
Estimated Elapsed Times	Item 18 EET/	Include when filing flight plan with center other than departure center	N/A

f. Instructions for Flight Routing Items

1. Departure Airport (Item 13, Item 18 DEP/)

(a) Enter the departure airport. The airport should be identified using the four−letter location identifier accessible through FAA Order JO 7350.9, Location Identifiers, or from ICAO Document 7910. FSS and FAA contracted flight plan filing services will allow up to 11 characters in the departure field. This will permit entry of non−ICAO identifier airports, and other fixes such as an intersection, fix/radial/distance, and latitude/longitude coordinates. Other electronic filing services may require a different format.

NOTE−
While user interfaces for flight plan filing are not specified, all flight plan filing services must adhere to the appropriate Interface Control Document upon transmission of the flight plan to the control facility.

(b) When the intended departure airport (Item 13) is outside of domestic U.S. airspace, or if using the paper version of FAA Form 7233−4, or DoD equivalent, if the chosen flight plan filing service does not allow non−ICAO airport identifiers in Item 13 or Item 16, use the following ICAO procedure. Enter four Z's (ZZZZ) in Item 13 and include the non−ICAO airport location identifier, fix, or waypoint location in Item 18 DEP/. A text description following the location identifier is permissible in Item 18 DEP/.

NOTE−
Use of non−ICAO identifiers in Item 13 and Item 16 is only permissible when flight destination is within U.S. airspace. If the destination is outside of the U.S., then both Item 13 and Item 16 must contain either a valid ICAO airport identifier or ZZZZ. Use of non−ICAO departure point is not permitted in Item 13 if destination in Item 16 is outside of U.S.

EXAMPLE−
DEP/MD21
DEP/W29 BAY BRIDGE AIRPORT
DEP/EMI211017
DEP/3925N07722W

2. Departure Time (Item 13)

Indicate the expected departure time using 4 digits, 2 digits for hours and 2 digits for minutes. Time is to be entered as Coordinated Universal Time (UTC).

3. Requested Cruising Speed (Item 15)

(a) Include the requested cruising speed as True Airspeed in knots using an N followed by four digits.

EXAMPLE−
N0450

(b) Indicate the requested cruising speed in Mach using an M followed by three digits.

EXAMPLE−
M081

4. Requested Cruising Altitude or Flight Level (Item 15)

(a) Indicate a Requested Flight Level using the letter F followed by 3 digits.

EXAMPLE−
F350

(b) Indicate a Requested Altitude in hundreds of feet using the letter A followed by 3 digits.

EXAMPLE−
A080

5. Route (Item 15)

Provide the requested route of flight using a combination of published routes, latitude/longitude, and/or fixes in the following formats.

(a) Consecutive fixes, lat/long points, NAVAIDs, and waypoints should be separated by the characters "DCT", meaning direct.

EXAMPLE−
FLACK DCT IRW DCT IRW12503
4020N07205W DCT MONEY

(b) A published route should be preceded by a fix that is published on the route, indicating where the route will be joined. The published route should be followed by a fix that is published as part of the route, indicating where the route will be exited.

EXAMPLE−
DALL3 EIC V18 MEI LGC4

(c) It is acceptable to specify intended speed and altitude changes along the route by appending an oblique stroke followed by the next speed and altitude. However, note that FAA ATC systems will neither process this information nor display it to ATC personnel. Pilots are expected to maintain the last assigned altitude and request revised altitude clearances from ATC.

EXAMPLE−
DCT APN J177 LEXOR/N0467F380 J177 TAM/N0464F390 J177

6. Delay En Route (Item 15, Item 18 DLE/)

(a) ICAO defines Item 18 DLE/ to provide information about a delay en route. International flights with a delay outside U.S. domestic airspace should indicate the place and duration of the delay in Item 18 DLE/. The delay is expressed by a fix identifier followed by the duration in hours (H) and minutes (M), HHMM.

EXAMPLE−
DLE/EMI0140

(b) U.S. ATC systems will accept but not process information in DLE/. Therefore, for flights in the lower 48 states, it is preferable to include the delay as part of the route (Item 15). Delay in this format is specified by an oblique stroke (/) followed by the letter D, followed by 2 digits for hours (H) of delay, followed by a plus sign (+), followed by 2 digits for minutes (M) of delay: /DHH+MM.

EXAMPLE−
DCT EMI/D01+40 DCT MAPEL/D00+30 V143 DELRO DCT

7. Destination Airport (Item 16, Item 18 DEST/)

(a) Enter the destination airport. The airport should be identified using the four−letter location identifier accessible through FAA Order JO 7350.9, Location Identifiers, or from ICAO Document 7910. FSS and FAA contracted flight plan filing services will allow up to 11 characters in the destination field. This will permit entry of non−ICAO identifier airports, and other fixes such as an intersection, fix/radial/distance, and latitude/longitude coordinates. Other electronic filing services may require a different format.

NOTE−
While user interfaces for flight plan filing are not specified, all flight plan filing services must adhere to the appropriate Interface Control Document upon transmission of the flight plan to the control facility.

(b) When the intended destination (Item 16) is outside of domestic U.S. airspace, or if using the paper version of FAA Form 7233−4, or if the chosen flight plan filing service does not allow non−ICAO airport identifiers in Item 13 or Item 16, use the following ICAO procedure. Enter four Z's (ZZZZ) in Item 13 and include the non−ICAO airport location identifier, fix, or waypoint location in Item 18 DEP/. A text description following the location identifier is permissible in Item 18 DEP/.

EXAMPLE−
DEST/06A MOTON FIELD
DEST/4AK6
DEST/MONTK
DEST /3925N07722W

8. Total Estimated Elapsed Time (Item 16)

All flight plans must include the total estimated elapsed time from departure to destination in hours (H) and minutes (M), format HHMM.

9. Alternate Airport (Item 16, Item 18 ALTN/)

(a) When necessary, specify an alternate airport in Item 16 using the four−letter location identifier from FAA Order 7350.9 or ICAO Document 7910. When the airport does not have a four−letter location identifier, include ZZZZ in Item 16c and file the non−standard identifier in Item 18 ALTN/.

(b) While the FAA does not require filing of alternate airports in the flight plan provided to ATC, rules for establishing alternate airports must be followed.

(c) Adding an alternate may assist during Search and Rescue by identifying additional areas to search.

(d) Although alternate airport information filed in a flight plan will be accepted by air traffic computer systems, it will not be presented to controllers. If diversion to an alternate airport becomes necessary, pilots are expected to notify ATC and request an amended clearance.

EXAMPLE−
ALTN/W50 2W2

10. Estimated Elapsed Times (EET) at boundaries or reporting points (Item 18 EET/)

EETs are required for international or oceanic flights when crossing a Flight Information Region (FIR) boundary. The EET will include the ICAO four−letter location identifier for the FIR followed by the elapsed time to the FIR boundary (e.g., KZNY0245 indicates 2 hours, 45 minutes from departure until the New York FIR boundary).

EXAMPLE−
EET/MMFR0011 MMTY0039 KZAB0105

11. Remarks (Item 18 RMK/)

Enter only those remarks pertinent to ATC or to the clarification of other flight plan information. Items of a personal nature are not accepted.

NOTE−
1. *"DVRSN" should be placed in Item 11 only if the pilot/company is requesting priority handling to their original destination from ATC as a result of a diversion as defined in the Pilot/Controller Glossary.*
2. *Do not assume that remarks will be automatically transmitted to every controller. Specific ATC or en route requests should be made directly to the appropriate controller.*

g. Flight Specific Supplemental Information (Item 19)

1. Item 19 data must be included when completing FAA Form 7233−4. This information will be retained by the facility/organization that transmits the flight plan to Air Traffic Control (ATC), for Search and Rescue purposes, but it will not be transmitted to ATC as part of the flight plan.

2. Do not include Supplemental Information as part of Item 18. The information in Item 19 is retained with the flight plan filing service for retrieval only if necessary.

NOTE−
Supplemental Information within Item 19 will be transmitted as a separate message to the destination FSS for VFR flight plans filed with a FSS or FAA contracted flight plan filing service. This will reduce the time necessary to conduct SAR actions should the flight become overdue, as this information will be readily available to the destination Flight Service Station.

3. Minimum required Item 19 entries for a domestic flight are Endurance, Persons on Board, Pilot Name and Contact Information, and Color of Aircraft. Additional entries may be required by foreign air traffic services, or at pilot discretion.

(a) After E/ Enter fuel endurance time in hours and minutes.

(b) After P/ Enter total number of persons on board using up to 30 alphanumeric characters. Enter TBN (to be notified) if the total number of persons is not known at the time of filing.

EXAMPLE−
P/005
P/TBN
P/ON FILE CAPEAIR OPERATIONS

(c) R/ (Radio) Cross out items not carried

(d) S/ (Survival Equipment) Cross out items not carried.

(e) J/ (Jackets) Cross out items not carried.

(f) D/ (Life Raft/Dinghies) Enter number carried and total capacity. Indicate if covered and color.

(g) A/ (Aircraft Color and Markings) Enter aircraft color(s).

EXAMPLE−
White Yellow Blue

4. N/ (Remarks. Not for ATC) select N if no remarks. Enter comments concerning survival equipment and information concerning personal GPS locating service, if utilized. Enter name and contact information for responsible party to verify VFR arrival/closure, if desired. Ensure party will be available for contact at ETA. (for example; FBO is open at ETA)

PILOT/CONTROLLER GLOSSARY

PURPOSE

a. This Glossary was compiled to promote a common understanding of the terms used in the Air Traffic Control system. It includes those terms which are intended for pilot/controller communications. Those terms most frequently used in pilot/controller communications are printed in ***bold italics***. The definitions are primarily defined in an operational sense applicable to both users and operators of the National Airspace System. Use of the Glossary will preclude any misunderstandings concerning the system's design, function, and purpose.

b. Because of the international nature of flying, terms used in the Lexicon, published by the International Civil Aviation Organization (ICAO), are included when they differ from FAA definitions. These terms are followed by "[ICAO]." For the reader's convenience, there are also cross references to related terms in other parts of the Glossary and to other documents, such as the Code of Federal Regulations (CFR) and the Aeronautical Information Manual (AIM).

c. Terms used in this glossary that apply to flight service station (FSS) roles are included when they differ from air traffic control functions. These terms are followed by "[FSS]."

d. This Glossary will be revised, as necessary, to maintain a common understanding of the system.

EXPLANATION OF CHANGES

e. Terms Added:
APPROACH RUNWAY VERIFICATION
CONNECTION
DEPARTURE CLEARANCE (DCL) APPLICATION
DOWNLINK
ELIGIBILITY
PILOT INITIATED DOWNLINK (PID)
PRIOR PERMISSION REQUIRED (PPR)
TRAJECTORY ALTERING CLEARANCE (TAC)
TRANSFER OF COMMUNICATION (TOC)
UNIDENTIFIED ANOMALOUS PHENOMENA (UAP)
UPLINK

f. Terms Deleted:
CONSOLIDATED WAKE TURBULENCE (CWT)
WAKE RE-CATEGORIZATION (RECAT)

g. Terms Modified:
AIRCRAFT CLASSES
AIRCRAFT WAKE TURBULENCE CATEGORIES
NAVIGATION REFERENCE SYSTEM (NRS)
TERMINAL DATA LINK SYSTEM (TDLS)
TIE-IN FACILITY
WAKE TURBULENCE

h. Editorial/format changes were made where necessary. Revision bars were not used due to the insignificant nature of the changes.

AIR TRAFFIC CONTROL SYSTEM COMMAND CENTER (ATCSCC)− An Air Traffic Tactical Operations facility responsible for monitoring and managing the flow of air traffic throughout the NAS, producing a safe, orderly, and expeditious flow of traffic while minimizing delays. The following functions are located at the ATCSCC:

a. Central Altitude Reservation Function (CARF). Responsible for coordinating, planning, and approving special user requirements under the Altitude Reservation (ALTRV) concept.
(See ALTITUDE RESERVATION.)

b. Airport Reservation Office (ARO). Monitors the operation and allocation of reservations for unscheduled operations at airports designated by the Administrator as High Density Airports. These airports are generally known as slot controlled airports. The ARO allocates reservations on a first come, first served basis determined by the time the request is received at the ARO.
(Refer to 14 CFR part 93.)
(See CHART SUPPLEMENT.)

c. U.S. Notice to Airmen (NOTAM) Office. Responsible for collecting, maintaining, and distributing NOTAMs for the U.S. civilian and military, as well as international aviation communities.
(See NOTICE TO AIRMEN.)

d. Weather Unit. Monitor all aspects of weather for the U.S. that might affect aviation including cloud cover, visibility, winds, precipitation, thunderstorms, icing, turbulence, and more. Provide forecasts based on observations and on discussions with meteorologists from various National Weather Service offices, FAA facilities, airlines, and private weather services.

e. Air Traffic Organization (ATO) Space Operations and Unmanned Aircraft System (UAS); the Office of Primary Responsibility (OPR) for all space and upper class E tactical operations in the National Airspace System (NAS).

AIR TRAFFIC SERVICE− A generic term meaning:

a. Flight Information Service.

b. Alerting Service.

c. Air Traffic Advisory Service.

d. Air Traffic Control Service:

1. Area Control Service,

2. Approach Control Service, or

3. Airport Control Service.

AIR TRAFFIC ORGANIZATION (ATO) − The FAA line of business responsible for providing safe and efficient air navigation services in the national airspace system.

AIR TRAFFIC SERVICE (ATS) ROUTES − The term "ATS Route" is a generic term that includes "VOR Federal airways," "colored Federal airways," "jet routes," and "RNAV routes." The term "ATS route" does not replace these more familiar route names, but serves only as an overall title when listing the types of routes that comprise the United States route structure.

AIRBORNE− An aircraft is considered airborne when all parts of the aircraft are off the ground.

AIRBORNE DELAY− Amount of delay to be encountered in airborne holding.

AIRBORNE REROUTE (ABRR)− A capability within the Traffic Flow Management System used for the timely development and implementation of tactical reroutes for airborne aircraft. This capability defines a set of aircraft−specific reroutes that address a certain traffic flow problem and then electronically transmits them to En Route Automation Modernization (ERAM) for execution by the appropriate sector controllers.

AIRCRAFT− Device(s) that are used or intended to be used for flight in the air, and when used in air traffic control terminology, may include the flight crew. The term is inclusive of all types, including but not limited to, airplane, glider, lighter-than-air, powered-lift, and rotorcraft.
(See ICAO term AIRCRAFT.)

AIRCRAFT [ICAO]− Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.

AIRCRAFT APPROACH CATEGORY− A grouping of aircraft based on a speed of 1.3 times the stall speed in the landing configuration at maximum gross landing weight. An aircraft must fit in only one category. 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 category for that speed must be used. For example, an aircraft which falls in Category A, but is circling to land at a speed in excess of 91 knots, must use the approach Category B minimums when circling to land. The categories are as follows:

a. Category A− Speed less than 91 knots.

b. Category B− Speed 91 knots or more but less than 121 knots.

c. Category C− Speed 121 knots or more but less than 141 knots.

d. Category D− Speed 141 knots or more but less than 166 knots.

e. Category E− Speed 166 knots or more.

(Refer to 14 CFR part 97.)

AIRCRAFT CLASSES− For the purposes of Wake Turbulence Separation Minima, ATC classifies aircraft as Super, Heavy, Large, and Small as follows:

a. Super− The Airbus A−380−800 (A388) is classified as a super aircraft. A super aircraft is a Category A for terminal wake turbulence separation purposes.

b. Heavy− Aircraft capable of takeoff weights of 300,000 pounds or more whether or not they are operating at this weight during a particular phase of flight. Heavy aircraft are Category B, C, or D for terminal wake turbulence separation purposes.

c. Large− Aircraft of more than 41,000 pounds, maximum certificated takeoff weight, up to but not including 300,000 pounds. Large aircraft are Category F and G for terminal wake turbulence separation purposes.

d. Small− Aircraft of 41,000 pounds or less maximum certificated takeoff weight. Small aircraft are Category H and I for terminal wake turbulence separation purposes.

(Refer to AIM.)

AIRCRAFT CONFLICT− Predicted conflict, within EDST of two aircraft, or between aircraft and airspace. A Red alert is used for conflicts when the predicted minimum separation is 5 nautical miles or less. A Yellow alert is used when the predicted minimum separation is between 5 and approximately 12 nautical miles. A Blue alert is used for conflicts between an aircraft and predefined airspace.

(See EN ROUTE DECISION SUPPORT TOOL.)

AIRCRAFT HAZARD AREA (AHA)− Used by ATC to segregate air traffic from a launch vehicle, reentry vehicle, amateur rocket, jettisoned stages, hardware, or falling debris generated by failures associated with any of these activities. An AHA is designated via NOTAM as either a TFR or stationary ALTRV. Unless otherwise specified, the vertical limits of an AHA are from the surface to unlimited.

(See CONTINGENCY HAZARD AREA.)
(See REFINED HAZARD AREA.)
(See TRANSITIONAL HAZARD AREA.)

AIRCRAFT LIST (ACL)− A view available with EDST that lists aircraft currently in or predicted to be in a particular sector's airspace. The view contains textual flight data information in line format and may be sorted into various orders based on the specific needs of the sector team.

(See EN ROUTE DECISION SUPPORT TOOL.)

AIRCRAFT SURGE LAUNCH AND RECOVERY− Procedures used at USAF bases to provide increased launch and recovery rates in instrument flight rules conditions. ASLAR is based on:

a. Reduced separation between aircraft which is based on time or distance. Standard arrival separation applies between participants including multiple flights until the DRAG point. The DRAG point is a published location on an ASLAR approach where aircraft landing second in a formation slows to a predetermined airspeed. The DRAG point is the reference point at which MARSA applies as expanding elements effect separation within a flight or between subsequent participating flights.

b. ASLAR procedures must be covered in a Letter of Agreement between the responsible USAF military ATC facility and the concerned Federal Aviation Administration facility. Initial Approach Fix spacing requirements are normally addressed as a minimum.

AIRCRAFT WAKE CATEGORIES− For the purposes of Terminal Wake Turbulence Separation Minima, ATC classifies aircraft as Category A through Category I as follows:

a. CATEGORY A. The Airbus A−380−800 (A388) is classified as a super aircraft.

b. CATEGORY B, C, and D. Aircraft capable of takeoff weights of 300,000 pounds or more whether or not they are operating at this weight during a particular phase of flight. These are categorized as heavy aircraft.

c. CATEGORY E. All B757 aircraft.

d. CATEGORY F, and G. Aircraft weighing 41,000 pounds or more maximum certificated takeoff weight, up to but not including 300,000 pounds.

e. CATEGORY H and I. Aircraft of less than 41,000 pounds maximum certificated takeoff weight.

(Refer to AIM.)

AIRMEN'S METEOROLOGICAL INFORMATION (AIRMET)− A concise description of an occurrence or expected occurrence of specified en route weather phenomena that may affect the safety of aircraft operations, but at intensities lower than those that require the issuance of a SIGMET. An AIRMET may be issued when any of the following weather phenomena are occurring or expected to occur:

a. Moderate turbulence

b. Low−level windshear

c. Strong surface winds greater than 30 knots

d. Moderate icing

e. Freezing level

f. Mountain obscuration

g. IFR

(See CONVECTIVE SIGMET.)
(See CWA.)
(See GRAPHICAL AIRMEN'S METEOROLOGICAL INFORMATION.)
(See SAW.)
(See SIGMET.)
(Refer to AIM.)

AIRPLANE− An engine-driven fixed-wing aircraft heavier than air that is supported in flight by the dynamic reaction of the air against its wings.

AIRPORT− An area on land or water that is used or intended to be used for the landing and takeoff of aircraft and includes its buildings and facilities, if any.

AIRPORT ADVISORY AREA− The area within ten miles of an airport without a control tower or where the tower is not in operation, and on which a Flight Service Station is located.

(See LOCAL AIRPORT ADVISORY.)
(Refer to AIM.)

AIRPORT ARRIVAL RATE (AAR)− A dynamic input parameter specifying the number of arriving aircraft which an airport or airspace can accept from the ARTCC per hour. The AAR is used to calculate the desired interval between successive arrival aircraft.

AIRPORT DEPARTURE RATE (ADR)− A dynamic parameter specifying the number of aircraft which can depart an airport and the airspace can accept per hour.

AIRPORT ELEVATION− The highest point of an airport's usable runways measured in feet from mean sea level.
(See TOUCHDOWN ZONE ELEVATION.)
(See ICAO term AERODROME ELEVATION.)

AIRPORT LIGHTING− Various lighting aids that may be installed on an airport. Types of airport lighting include:

a. Approach Light System (ALS)− An airport lighting facility which provides visual guidance to landing aircraft by radiating light beams in a directional pattern by which the pilot aligns the aircraft with the extended centerline of the runway on his/her final approach for landing. Condenser-Discharge Sequential Flashing Lights/Sequenced Flashing Lights may be installed in conjunction with the ALS at some airports. Types of Approach Light Systems are:

1. ALSF-1− Approach Light System with Sequenced Flashing Lights in ILS Cat-I configuration.

2. ALSF-2− Approach Light System with Sequenced Flashing Lights in ILS Cat-II configuration. The ALSF-2 may operate as an SSALR when weather conditions permit.

3. SSALF− Simplified Short Approach Light System with Sequenced Flashing Lights.

4. SSALR− Simplified Short Approach Light System with Runway Alignment Indicator Lights.

5. MALSF− Medium Intensity Approach Light System with Sequenced Flashing Lights.

6. MALSR− Medium Intensity Approach Light System with Runway Alignment Indicator Lights.

7. RLLS− Runway Lead-in Light System Consists of one or more series of flashing lights installed at or near ground level that provides positive visual guidance along an approach path, either curving or straight, where special problems exist with hazardous terrain, obstructions, or noise abatement procedures.

8. RAIL− Runway Alignment Indicator Lights− Sequenced Flashing Lights which are installed only in combination with other light systems.

9. ODALS− Omnidirectional Approach Lighting System consists of seven omnidirectional flashing lights located in the approach area of a nonprecision runway. Five lights are located on the runway centerline extended with the first light located 300 feet from the threshold and extending at equal intervals up to 1,500 feet from the threshold. The other two lights are located, one on each side of the runway threshold, at a lateral distance of 40 feet from the runway edge, or 75 feet from the runway edge when installed on a runway equipped with a VASI.
(Refer to FAA Order JO 6850.2, Visual Guidance Lighting Systems.)

b. Runway Lights/Runway Edge Lights− Lights having a prescribed angle of emission used to define the lateral limits of a runway. Runway lights are uniformly spaced at intervals of approximately 200 feet, and the intensity may be controlled or preset.

c. Touchdown Zone Lighting− Two rows of transverse light bars located symmetrically about the runway centerline normally at 100 foot intervals. The basic system extends 3,000 feet along the runway.

d. Runway Centerline Lighting− Flush centerline lights spaced at 50-foot intervals beginning 75 feet from the landing threshold and extending to within 75 feet of the opposite end of the runway.

e. Threshold Lights− Fixed green lights arranged symmetrically left and right of the runway centerline, identifying the runway threshold.

f. Runway End Identifier Lights (REIL)− Two synchronized flashing lights, one on each side of the runway threshold, which provide rapid and positive identification of the approach end of a particular runway.

g. Visual Approach Slope Indicator (VASI)− An airport lighting facility providing vertical visual approach slope guidance to aircraft during approach to landing by radiating a directional pattern of high intensity red and white focused light beams which indicate to the pilot that he/she is "on path" if he/she sees red/white, "above path" if white/white, and "below path" if red/red. Some airports serving large aircraft have three-bar VASIs which provide two visual glide paths to the same runway.

h. Precision Approach Path Indicator (PAPI)− An airport lighting facility, similar to VASI, providing vertical approach slope guidance to aircraft during approach to landing. PAPIs consist of a single row of either two or four lights, normally installed on the left side of the runway, and have an effective visual range of about 5 miles during the day and up to 20 miles at night. PAPIs radiate a directional pattern of high intensity red and white focused light beams which indicate that the pilot is “on path” if the pilot sees an equal number of white lights and red lights, with white to the left of the red; “above path” if the pilot sees more white than red lights; and “below path” if the pilot sees more red than white lights.

i. Boundary Lights− Lights defining the perimeter of an airport or landing area.

(Refer to AIM.)

AIRPORT MARKING AIDS− Markings used on runway and taxiway surfaces to identify a specific runway, a runway threshold, a centerline, a hold line, etc. A runway should be marked in accordance with its present usage such as:

a. Visual.

b. Nonprecision instrument.

c. Precision instrument.

(Refer to AIM.)

AIRPORT REFERENCE POINT (ARP)− The approximate geometric center of all usable runway surfaces.

AIRPORT RESERVATION OFFICE− Office responsible for monitoring the operation of slot controlled airports. It receives and processes requests for unscheduled operations at slot controlled airports.

AIRPORT ROTATING BEACON− A visual NAVAID operated at many airports. At civil airports, alternating white and green flashes indicate the location of the airport. At military airports, the beacons flash alternately white and green, but are differentiated from civil beacons by dualpeaked (two quick) white flashes between the green flashes.

(See INSTRUMENT FLIGHT RULES.)
(See SPECIAL VFR OPERATIONS.)
(See ICAO term AERODROME BEACON.)
(Refer to AIM.)

AIRPORT SURFACE DETECTION EQUIPMENT (ASDE)− Surveillance equipment specifically designed to detect aircraft, vehicular traffic, and other objects, on the surface of an airport, and to present the image on a tower display. Used to augment visual observation by tower personnel of aircraft and/or vehicular movements on runways and taxiways. There are three ASDE systems deployed in the NAS:

a. ASDE−3− a Surface Movement Radar.

b. ASDE−X− a system that uses an X−band Surface Movement Radar, multilateration, and ADS−B.

c. Airport Surface Surveillance Capability (ASSC)− A system that uses Surface Movement Radar, multilateration, and ADS−B.

AIRPORT SURVEILLANCE RADAR− Approach control radar used to detect and display an aircraft’s position in the terminal area. ASR provides range and azimuth information but does not provide elevation data. Coverage of the ASR can extend up to 60 miles.

AIRPORT TAXI CHARTS−
(See AERONAUTICAL CHART.)

AIRPORT TRAFFIC CONTROL SERVICE− A service provided by a control tower for aircraft operating on the movement area and in the vicinity of an airport.

(See MOVEMENT AREA.)
(See TOWER.)
(See ICAO term AERODROME CONTROL SERVICE.)

AIRPORT TRAFFIC CONTROL TOWER−
(See TOWER.)

AIRSPACE CONFLICT− Predicted conflict of an aircraft and active Special Activity Airspace (SAA).

AIRSPACE FLOW PROGRAM (AFP)− AFP is a Traffic Management (TM) process administered by the Air Traffic Control System Command Center (ATCSCC) where aircraft are assigned an Expect Departure Clearance Time (EDCT) in order to manage capacity and demand for a specific area of the National Airspace System (NAS). The purpose of the program is to mitigate the effects of en route constraints. It is a flexible program and may be implemented in various forms depending upon the needs of the air traffic system.

AIRSPACE HIERARCHY− Within the airspace classes, there is a hierarchy and, in the event of an overlap of airspace: Class A preempts Class B, Class B preempts Class C, Class C preempts Class D, Class D preempts Class E, and Class E preempts Class G.

AIRSPEED− The speed of an aircraft relative to its surrounding air mass. The unqualified term "airspeed" means one of the following:

a. Indicated Airspeed− The speed shown on the aircraft airspeed indicator. This is the speed used in pilot/controller communications under the general term "airspeed."
(Refer to 14 CFR part 1.)

b. True Airspeed− The airspeed of an aircraft relative to undisturbed air. Used primarily in flight planning and en route portion of flight. When used in pilot/controller communications, it is referred to as "true airspeed" and not shortened to "airspeed."

AIRSPACE RESERVATION− The term used in oceanic ATC for airspace utilization under prescribed conditions normally employed for the mass movement of aircraft or other special user requirements which cannot otherwise be accomplished. Airspace reservations must be classified as either "moving" or "stationary."
(See MOVING AIRSPACE RESERVATION)
(See STATIONARY AIRSPACE RESERVATION.)
(See ALTITUDE RESERVATION.)

AIRSTART− The starting of an aircraft engine while the aircraft is airborne, preceded by engine shutdown during training flights or by actual engine failure.

AIRWAY− A Class E airspace area established in the form of a corridor, the centerline of which is defined by radio navigational aids.
(See FEDERAL AIRWAYS.)
(See ICAO term AIRWAY.)
(Refer to 14 CFR part 71.)
(Refer to AIM.)

AIRWAY [ICAO]− A control area or portion thereof established in the form of corridor equipped with radio navigational aids.

AIRWAY BEACON− Used to mark airway segments in remote mountain areas. The light flashes Morse Code to identify the beacon site.
(Refer to AIM.)

AIS−
(See AERONAUTICAL INFORMATION SERVICES.)

AIT−
(See AUTOMATED INFORMATION TRANSFER.)

ALERFA (Alert Phase) [ICAO]− A situation wherein apprehension exists as to the safety of an aircraft and its occupants.

ALERT− A notification to a position that there is an aircraft-to-aircraft or aircraft-to-airspace conflict, as detected by Automated Problem Detection (APD).

ALERT AREA−
(See SPECIAL USE AIRSPACE.)

ALERT NOTICE (ALNOT)− A request originated by a flight service station (FSS) or an air route traffic control center (ARTCC) for an extensive communication search for overdue, unreported, or missing aircraft.

ALERTING SERVICE− A service provided to notify appropriate organizations regarding aircraft in need of search and rescue aid and assist such organizations as required.

ALNOT−
(See ALERT NOTICE.)

ALONG−TRACK DISTANCE (ATD)− The horizontal distance between the aircraft's current position and a fix measured by an area navigation system that is not subject to slant range errors.

ALPHANUMERIC DISPLAY− Letters and numerals used to show identification, altitude, beacon code, and other information concerning a target on a radar display.

ALTERNATE AERODROME [ICAO]− An aerodrome to which an aircraft may proceed when it becomes either impossible or inadvisable to proceed to or to land at the aerodrome of intended landing.

Note: The aerodrome from which a flight departs may also be an en-route or a destination alternate aerodrome for the flight.

ALTERNATE AIRPORT− An airport at which an aircraft may land if a landing at the intended airport becomes inadvisable.
(See ICAO term ALTERNATE AERODROME.)

ALTIMETER SETTING− The barometric pressure reading used to adjust a pressure altimeter for variations in existing atmospheric pressure or to the standard altimeter setting (29.92).
(Refer to 14 CFR part 91.)
(Refer to AIM.)

ALTITUDE− The height of a level, point, or object measured in feet Above Ground Level (AGL) or from Mean Sea Level (MSL).
(See FLIGHT LEVEL.)

a. MSL Altitude− Altitude expressed in feet measured from mean sea level.

b. AGL Altitude− Altitude expressed in feet measured above ground level.

c. Indicated Altitude− The altitude as shown by an altimeter. On a pressure or barometric altimeter it is altitude as shown uncorrected for instrument error and uncompensated for variation from standard atmospheric conditions.
(See ICAO term ALTITUDE.)

ALTITUDE [ICAO]− The vertical distance of a level, a point or an object considered as a point, measured from mean sea level (MSL).

***ALTITUDE READOUT*−** An aircraft's altitude, transmitted via the Mode C transponder feature, that is visually displayed in 100-foot increments on a radar scope having readout capability.
(See ALPHANUMERIC DISPLAY.)
(Refer to AIM.)

ALTITUDE RESERVATION (ALTRV)− Airspace utilization under prescribed conditions normally employed for the mass movement of aircraft or other special user requirements which cannot otherwise be accomplished. ALTRVs are approved by the appropriate FAA facility. ALTRVs must be classified as either "moving" or "stationary."
(See MOVING ALTITUDE RESERVATION.)
(See STATIONARY ALTITUDE RESERVATION.)
(See AIR TRAFFIC CONTROL SYSTEM COMMAND CENTER.)

ALTITUDE RESTRICTION− An altitude or altitudes, stated in the order flown, which are to be maintained until reaching a specific point or time. Altitude restrictions may be issued by ATC due to traffic, terrain, or other airspace considerations.

ALTITUDE RESTRICTIONS ARE CANCELED− Adherence to previously imposed altitude restrictions is no longer required during a climb or descent.

ALTRV−
(See ALTITUDE RESERVATION.)

AMVER−
(See AUTOMATED MUTUAL-ASSISTANCE VESSEL RESCUE SYSTEM.)

APB−
(See AUTOMATED PROBLEM DETECTION BOUNDARY.)

APD−
(See AUTOMATED PROBLEM DETECTION.)

APDIA−
(See AUTOMATED PROBLEM DETECTION INHIBITED AREA.)

APPROACH CLEARANCE− Authorization by ATC for a pilot to conduct an instrument approach. The type of instrument approach for which a clearance and other pertinent information is provided in the approach clearance when required.
(See CLEARED APPROACH.)
(See INSTRUMENT APPROACH PROCEDURE.)
(Refer to AIM.)
(Refer to 14 CFR part 91.)

APPROACH CONTROL FACILITY− A terminal ATC facility that provides approach control service in a terminal area.
(See APPROACH CONTROL SERVICE.)
(See RADAR APPROACH CONTROL FACILITY.)

APPROACH CONTROL SERVICE− Air traffic control service provided by an approach control facility for arriving and departing VFR/IFR aircraft and, on occasion, en route aircraft. At some airports not served by an approach control facility, the ARTCC provides limited approach control service.
(See ICAO term APPROACH CONTROL SERVICE.)
(Refer to AIM.)

APPROACH CONTROL SERVICE [ICAO]− Air traffic control service for arriving or departing controlled flights.

APPROACH GATE− An imaginary point used within ATC as a basis for vectoring aircraft to the final approach course. The gate will be established along the final approach course 1 mile from the final approach fix on the side away from the airport and will be no closer than 5 miles from the landing threshold.

APPROACH/DEPARTURE HOLD AREA− The locations on taxiways in the approach or departure areas of a runway designated to protect landing or departing aircraft. These locations are identified by signs and markings.

APPROACH LIGHT SYSTEM−
(See AIRPORT LIGHTING.)

APPROACH RUNWAY VERIFICATION− A STARS functionality that provides audible and visual alerts to tower and/or TRACON controllers when an aircraft is on its final approach course but *not* aligned with its assigned landing runway, or if the runway is closed.

APPROACH SEQUENCE− The order in which aircraft are positioned while on approach or awaiting approach clearance.
(See LANDING SEQUENCE.)
(See ICAO term APPROACH SEQUENCE.)

APPROACH SEQUENCE [ICAO]− The order in which two or more aircraft are cleared to approach to land at the aerodrome.

APPROACH SPEED− The recommended speed contained in aircraft manuals used by pilots when making an approach to landing. This speed will vary for different segments of an approach as well as for aircraft weight and configuration.

APPROACH WITH VERTICAL GUIDANCE (APV)– A term used to describe RNAV approach procedures that provide lateral and vertical guidance but do not meet the requirements to be considered a precision approach.

APPROPRIATE ATS AUTHORITY [ICAO]− The relevant authority designated by the State responsible for providing air traffic services in the airspace concerned. In the United States, the "appropriate ATS authority" is the Program Director for Air Traffic Planning and Procedures, ATP-1.

APPROPRIATE AUTHORITY−

a. Regarding flight over the high seas: the relevant authority is the State of Registry.

b. Regarding flight over other than the high seas: the relevant authority is the State having sovereignty over the territory being overflown.

APPROPRIATE OBSTACLE CLEARANCE MINIMUM ALTITUDE− Any of the following:
(See MINIMUM EN ROUTE IFR ALTITUDE.)
(See MINIMUM IFR ALTITUDE.)
(See MINIMUM OBSTRUCTION CLEARANCE ALTITUDE.)
(See MINIMUM VECTORING ALTITUDE.)

APPROPRIATE TERRAIN CLEARANCE MINIMUM ALTITUDE− Any of the following:
(See MINIMUM EN ROUTE IFR ALTITUDE.)
(See MINIMUM IFR ALTITUDE.)
(See MINIMUM OBSTRUCTION CLEARANCE ALTITUDE.)
(See MINIMUM VECTORING ALTITUDE.)

APRON− A defined area on an airport or heliport intended to accommodate aircraft for purposes of loading or unloading passengers or cargo, refueling, parking, or maintenance. With regard to seaplanes, a ramp is used for access to the apron from the water.
(See ICAO term APRON.)

APRON [ICAO]− A defined area, on a land aerodrome, intended to accommodate aircraft for purposes of loading or unloading passengers, mail or cargo, refueling, parking or maintenance.

ARC− The track over the ground of an aircraft flying at a constant distance from a navigational aid by reference to distance measuring equipment (DME).

AREA CONTROL CENTER [ICAO]− An air traffic control facility primarily responsible for ATC services being provided IFR aircraft during the en route phase of flight. The U.S. equivalent facility is an air route traffic control center (ARTCC).

AREA NAVIGATION (RNAV)− A method of navigation which permits aircraft operation on any desired flight path within the coverage of ground− or space−based navigation aids or within the limits of the capability of self-contained aids, or a combination of these.

Note: Area navigation includes performance−based navigation as well as other operations that do not meet the definition of performance−based navigation.

AREA NAVIGATION (RNAV) APPROACH CONFIGURATION:

a. STANDARD T− An RNAV approach whose design allows direct flight to any one of three initial approach fixes (IAF) and eliminates the need for procedure turns. The standard design is to align the procedure on the extended centerline with the missed approach point (MAP) at the runway threshold, the final approach fix (FAF), and the initial approach/intermediate fix (IAF/IF). The other two IAFs will be established perpendicular to the IF.

b. MODIFIED T− An RNAV approach design for single or multiple runways where terrain or operational constraints do not allow for the standard T. The "T" may be modified by increasing or decreasing the angle from the corner IAF(s) to the IF or by eliminating one or both corner IAFs.

c. STANDARD I− An RNAV approach design for a single runway with both corner IAFs eliminated. Course reversal or radar vectoring may be required at busy terminals with multiple runways.

d. TERMINAL ARRIVAL AREA (TAA)− The TAA is controlled airspace established in conjunction with the Standard or Modified T and I RNAV approach configurations. In the standard TAA, there are 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. TAAs will also eliminate or reduce feeder routes, departure extensions, and procedure turns or course reversal.

1. STRAIGHT-IN AREA− A 30 NM arc centered on the IF bounded by a straight line extending through the IF perpendicular to the intermediate course.

2. LEFT BASE AREA− A 30 NM arc centered on the right corner IAF. The area shares a boundary with the straight-in area except that it extends out for 30 NM from the IAF and is bounded on the other side by a line extending from the IF through the FAF to the arc.

3. RIGHT BASE AREA− A 30 NM arc centered on the left corner IAF. The area shares a boundary with the straight-in area except that it extends out for 30 NM from the IAF and is bounded on the other side by a line extending from the IF through the FAF to the arc.

AREA NAVIGATION (RNAV) GLOBAL POSITIONING SYSTEM (GPS) PRECISION RUNWAY MONITORING (PRM) APPROACH–
A GPS approach, which requires vertical guidance, used in lieu of another type of PRM approach to conduct approaches to parallel runways whose extended centerlines are separated by less than 4,300 feet and at least 3,000 feet, where simultaneous close parallel approaches are permitted. Also used in lieu of an ILS PRM and/or LDA PRM approach to conduct Simultaneous Offset Instrument Approach (SOIA) operations.

ARMY AVIATION FLIGHT INFORMATION BULLETIN− A bulletin that provides air operation data covering Army, National Guard, and Army Reserve aviation activities.

ARO−
(See AIRPORT RESERVATION OFFICE.)

ARRESTING SYSTEM− A safety device consisting of two major components, namely, engaging or catching devices and energy absorption devices for the purpose of arresting both tailhook and/or nontailhook-equipped aircraft. It is used to prevent aircraft from overrunning runways when the aircraft cannot be stopped after landing or during aborted takeoff. Arresting systems have various names; e.g., arresting gear, hook device, wire barrier cable.
(See ABORT.)
(Refer to AIM.)

ARRIVAL CENTER− The ARTCC having jurisdiction for the impacted airport.

ARRIVAL DELAY− A parameter which specifies a period of time in which no aircraft will be metered for arrival at the specified airport.

ARRIVAL/DEPARTURE WINDOW (ADW)− A depiction presented on an air traffic control display, used by the controller to prevent possible conflicts between arrivals to, and departures from, a runway. The ADW identifies that point on the final approach course by which a departing aircraft must have begun takeoff.

ARRIVAL SECTOR (En Route)− An operational control sector containing one or more meter fixes on or near the TRACON boundary.

ARRIVAL TIME− The time an aircraft touches down on arrival.

ARSR−
(See AIR ROUTE SURVEILLANCE RADAR.)

ARTCC−
(See AIR ROUTE TRAFFIC CONTROL CENTER.)

ASDA−
(See ACCELERATE-STOP DISTANCE AVAILABLE.)

ASDA [ICAO]−
(See ICAO Term ACCELERATE-STOP DISTANCE AVAILABLE.)

ASDE−
(See AIRPORT SURFACE DETECTION EQUIPMENT.)

ASLAR−
(See AIRCRAFT SURGE LAUNCH AND RECOVERY.)

ASR−
(See AIRPORT SURVEILLANCE RADAR.)

ASR APPROACH−
(See SURVEILLANCE APPROACH.)

ASSOCIATED− A radar target displaying a data block with flight identification and altitude information.
(See UNASSOCIATED.)

ATC−
(See AIR TRAFFIC CONTROL.)

ATC ADVISES− Used to prefix a message of noncontrol information when it is relayed to an aircraft by other than an air traffic controller.
(See ADVISORY.)

ATC ASSIGNED AIRSPACE− Airspace of defined vertical/lateral limits, assigned by ATC, for the purpose of providing air traffic segregation between the specified activities being conducted within the assigned airspace and other IFR air traffic.
(See SPECIAL USE AIRSPACE.)

ATC CLEARANCE−
(See AIR TRAFFIC CLEARANCE.)

ATC CLEARS− Used to prefix an ATC clearance when it is relayed to an aircraft by other than an air traffic controller.

ATC INSTRUCTIONS− Directives issued by air traffic control for the purpose of requiring a pilot to take specific actions; e.g., “Turn left heading two five zero,” “Go around,” “Clear the runway.”
(Refer to 14 CFR part 91.)

ATC PREFERRED ROUTE NOTIFICATION− EDST notification to the appropriate controller of the need to determine if an ATC preferred route needs to be applied, based on destination airport.
(See ROUTE ACTION NOTIFICATION.)
(See EN ROUTE DECISION SUPPORT TOOL.)

ATC PREFERRED ROUTES− Preferred routes that are not automatically applied by Host.

ATC REQUESTS− Used to prefix an ATC request when it is relayed to an aircraft by other than an air traffic controller.

ATC SECURITY SERVICES− Communications and security tracking provided by an ATC facility in support of the DHS, the DoD, or other Federal security elements in the interest of national security. Such security services are only applicable within designated areas. ATC security services do not include ATC basic radar services or flight following.

ATC SECURITY SERVICES POSITION− The position responsible for providing ATC security services as defined. This position does not provide ATC, IFR separation, or VFR flight following services, but is responsible for providing security services in an area comprising airspace assigned to one or more ATC operating sectors. This position may be combined with control positions.

ATC SECURITY TRACKING− The continuous tracking of aircraft movement by an ATC facility in support of the DHS, the DoD, or other security elements for national security using radar (i.e., radar tracking) or other means (e.g., manual tracking) without providing basic radar services (including traffic advisories) or other ATC services not defined in this section.

ATS SURVEILLANCE SERVICE [ICAO]− A term used to indicate a service provided directly by means of an ATS surveillance system.

ATC SURVEILLANCE SOURCE− Used by ATC for establishing identification, control and separation using a target depicted on an air traffic control facility's video display that has met the relevant safety standards for operational use and received from one, or a combination, of the following surveillance sources:

a. Radar (See RADAR.)

b. ADS-B (See AUTOMATIC DEPENDENT SURVEILLANCE−BROADCAST.)

c. WAM (See WIDE AREA MULTILATERATION.)

(See INTERROGATOR.)
(See TRANSPONDER.)
(See ICAO term RADAR.)
(Refer to AIM.)

ATS SURVEILLANCE SYSTEM [ICAO]− A generic term meaning variously, ADS−B, PSR, SSR or any comparable ground−based system that enables the identification of aircraft.

Note: A comparable ground−based system is one that has been demonstrated, by comparative assessment or other methodology, to have a level of safety and performance equal to or better than monopulse SSR.

ATCAA−
(See ATC ASSIGNED AIRSPACE.)

ATCRBS−
(See RADAR.)

ATCSCC−
(See AIR TRAFFIC CONTROL SYSTEM COMMAND CENTER.)

ATCT−
(See TOWER.)

ATD−
(See ALONG−TRACK DISTANCE.)

ATIS−
(See AUTOMATIC TERMINAL INFORMATION SERVICE.)

ATIS [ICAO]−
(See ICAO Term AUTOMATIC TERMINAL INFORMATION SERVICE.)

ATO−
(See AIR TRAFFIC ORGANIZATION.)

ATPA−
(See AUTOMATED TERMINAL PROXIMITY ALERT.)

ATS ROUTE [ICAO]− A specified route designed for channeling the flow of traffic as necessary for the provision of air traffic services.

Note: The term "ATS Route" is used to mean variously, airway, advisory route, controlled or uncontrolled route, arrival or departure, etc.

ATTENTION ALL USERS PAGE (AAUP)- The AAUP provides the pilot with additional information relative to conducting a specific operation, for example, PRM approaches and RNAV departures.

AUTOLAND APPROACH−An autoland system aids by providing control of aircraft systems during a precision instrument approach to at least decision altitude and possibly all the way to touchdown, as well as in some cases, through the landing rollout. The autoland system is a sub-system of the autopilot system from which control surface management occurs. The aircraft autopilot sends instructions to the autoland system and monitors the autoland system performance and integrity during its execution.

AUTOMATED EMERGENCY DESCENT−
(See EMERGENCY DESCENT MODE.)

AUTOMATED INFORMATION TRANSFER (AIT)− A precoordinated process, specifically defined in facility directives, during which a transfer of altitude control and/or radar identification is accomplished without verbal coordination between controllers using information communicated in a full data block.

AUTOMATED MUTUAL-ASSISTANCE VESSEL RESCUE SYSTEM− A facility which can deliver, in a matter of minutes, a surface picture (SURPIC) of vessels in the area of a potential or actual search and rescue incident, including their predicted positions and their characteristics.
(See FAA Order JO 7110.65, Para 10−6−4, INFLIGHT CONTINGENCIES.)

AUTOMATED PROBLEM DETECTION (APD)− An Automation Processing capability that compares trajectories in order to predict conflicts.

AUTOMATED PROBLEM DETECTION BOUNDARY (APB)− The adapted distance beyond a facilities boundary defining the airspace within which EDST performs conflict detection.
(See EN ROUTE DECISION SUPPORT TOOL.)

AUTOMATED PROBLEM DETECTION INHIBITED AREA (APDIA)− Airspace surrounding a terminal area within which APD is inhibited for all flights within that airspace.

AUTOMATED SERVICES–Services delivered via an automated system (that is, without human interaction). For example, flight plans, Notices to Airmen (NOTAMs), interactive maps, computer-generated text-to-speech messages, short message service, or email.

AUTOMATED TERMINAL PROXIMITY ALERT (ATPA)− Monitors the separation of aircraft on the Final Approach Course (FAC), displaying a graphical notification (cone and/or mileage) when a potential loss of separation is detected. The warning cone (Yellow) will display at 45 seconds and the alert cone (Red) will display at 24 seconds prior to predicted loss of separation. Current distance between two aircraft on final will be displayed in line 3 of the full data block of the trailing aircraft in corresponding colors.

AUTOMATED WEATHER SYSTEM− Any of the automated weather sensor platforms that collect weather data at airports and disseminate the weather information via radio and/or landline. The systems currently consist of the Automated Surface Observing System (ASOS) and Automated Weather Observation System (AWOS).

AUTOMATED UNICOM− Provides completely automated weather, radio check capability and airport advisory information on an Automated UNICOM system. These systems offer a variety of features, typically selectable by microphone clicks, on the UNICOM frequency. Availability will be published in the Chart Supplement and approach charts.

AUTOMATIC ALTITUDE REPORT−
(See ALTITUDE READOUT.)

AUTOMATIC ALTITUDE REPORTING− That function of a transponder which responds to Mode C interrogations by transmitting the aircraft’s altitude in 100-foot increments.

AUTOMATIC CARRIER LANDING SYSTEM− U.S. Navy final approach equipment consisting of precision tracking radar coupled to a computer data link to provide continuous information to the aircraft, monitoring capability to the pilot, and a backup approach system.

AUTOMATIC DEPENDENT SURVEILLANCE (ADS) [ICAO]− A surveillance technique in which aircraft automatically provide, via a data link, data derived from on−board navigation and position fixing systems, including aircraft identification, four dimensional position and additional data as appropriate.

AUTOMATIC DEPENDENT SURVEILLANCE−BROADCAST (ADS-B)− A surveillance system in which an aircraft or vehicle to be detected is fitted with cooperative equipment in the form of a data link transmitter. The aircraft or vehicle periodically broadcasts its GNSS−derived position and other required information such as identity and velocity, which is then received by a ground−based or space−based receiver for processing and display at an air traffic control facility, as well as by suitably equipped aircraft.
(See AUTOMATIC DEPENDENT SURVEILLANCE−BROADCAST IN.)
(See AUTOMATIC DEPENDENT SURVEILLANCE−BROADCAST OUT.)
(See COOPERATIVE SURVEILLANCE.)
(See GLOBAL POSITIONING SYSTEM.)
(See SPACE−BASED ADS−B.)

AUTOMATIC DEPENDENT SURVEILLANCE−BROADCAST IN (ADS−B In)− Aircraft avionics capable of receiving ADS−B Out transmissions directly from other aircraft, as well as traffic or weather information transmitted from ground stations.
(See AUTOMATIC DEPENDENT SURVEILLANCE−BROADCAST OUT.)
(See AUTOMATIC DEPENDENT SURVEILLANCE−REBROADCAST.)
(See FLIGHT INFORMATION SERVICE−BROADCAST.)
(See TRAFFIC INFORMATION SERVICE−BROADCAST.)

AUTOMATIC DEPENDENT SURVEILLANCE−BROADCAST OUT (ADS−B Out)− The transmitter onboard an aircraft or ground vehicle that periodically broadcasts its GNSS−derived position along with other required information, such as identity, altitude, and velocity.
(See AUTOMATIC DEPENDENT SURVEILLANCE−BROADCAST.)
(See AUTOMATIC DEPENDENT SURVEILLANCE−BROADCAST IN.)

AUTOMATIC DEPENDENT SURVEILLANCE−CONTRACT (ADS−C)− A data link position reporting system, controlled by a ground station, that establishes contracts with an aircraft's avionics that occur automatically whenever specific events occur, or specific time intervals are reached.

AUTOMATIC DEPENDENT SURVEILLANCE- REBROADCAST (ADS-R)− A datalink translation function of the ADS−B ground system required to accommodate the two separate operating frequencies (978 MHz and 1090 MHz). The ADS−B system receives the ADS−B messages transmitted on one frequency and ADS−R translates and reformats the information for rebroadcast and use on the other frequency. This allows ADS−B In equipped aircraft to see nearby ADS−B Out traffic regardless of the operating link of the other aircraft. Aircraft operating on the same ADS−B frequency exchange information directly and do not require the ADS−R translation function.

AUTOMATIC DIRECTION FINDER− An aircraft radio navigation system which senses and indicates the direction to a L/MF nondirectional radio beacon (NDB) ground transmitter. Direction is indicated to the pilot as a magnetic bearing or as a relative bearing to the longitudinal axis of the aircraft depending on the type of indicator installed in the aircraft. In certain applications, such as military, ADF operations may be based on airborne and ground transmitters in the VHF/UHF frequency spectrum.
(See BEARING.)
(See NONDIRECTIONAL BEACON.)

AUTOMATIC FLIGHT INFORMATION SERVICE (AFIS) − ALASKA FSSs ONLY− The continuous broadcast of recorded non−control information at airports in Alaska where a FSS provides local airport advisory service. The AFIS broadcast automates the repetitive transmission of essential but routine information such as weather, wind, altimeter, favored runway, braking action, airport NOTAMs, and other applicable information. The information is continuously broadcast over a discrete VHF radio frequency (usually the ASOS/AWOS frequency).

AUTOMATIC TERMINAL INFORMATION SERVICE− The continuous broadcast of recorded noncontrol information in selected terminal areas. Its purpose is to improve controller effectiveness and to relieve frequency congestion by automating the repetitive transmission of essential but routine information; e.g., "Los Angeles information Alfa. One three zero zero Coordinated Universal Time. Weather, measured ceiling two thousand overcast, visibility three, haze, smoke, temperature seven one, dew point five seven, wind two five zero at five, altimeter two niner niner six. I-L-S Runway Two Five Left approach in use, Runway Two Five Right closed, advise you have Alfa."

(See ICAO term AUTOMATIC TERMINAL INFORMATION SERVICE.)
(Refer to AIM.)

AUTOMATIC TERMINAL INFORMATION SERVICE [ICAO]− The provision of current, routine information to arriving and departing aircraft by means of continuous and repetitive broadcasts throughout the day or a specified portion of the day.

AUTOROTATION− A rotorcraft flight condition in which the lifting rotor is driven entirely by action of the air when the rotorcraft is in motion.

a. Autorotative Landing/Touchdown Autorotation. Used by a pilot to indicate that the landing will be made without applying power to the rotor.

b. Low Level Autorotation. Commences at an altitude well below the traffic pattern, usually below 100 feet AGL and is used primarily for tactical military training.

c. 180 degrees Autorotation. Initiated from a downwind heading and is commenced well inside the normal traffic pattern. "Go around" may not be possible during the latter part of this maneuver.

AVAILABLE LANDING DISTANCE (ALD)− The portion of a runway available for landing and roll-out for aircraft cleared for LAHSO. This distance is measured from the landing threshold to the hold-short point.

AVIATION WATCH NOTIFICATION MESSAGE− The Storm Prediction Center (SPC) issues Aviation Watch Notification Messages (SAW) to provide an area threat alert for the aviation meteorology community to forecast organized severe thunderstorms that may produce tornadoes, large hail, and/or convective damaging winds as indicated in Public Watch Notification Messages within the Continental U.S. A SAW message provides a description of the type of watch issued by SPC, a valid time, an approximation of the area in a watch, and primary hazard(s).

AVIATION WEATHER SERVICE− A service provided by the National Weather Service (NWS) and FAA which collects and disseminates pertinent weather information for pilots, aircraft operators, and ATC. Available aviation weather reports and forecasts are displayed at each NWS office and FAA FSS.

(See TRANSCRIBED WEATHER BROADCAST.)
(See WEATHER ADVISORY.)
(Refer to AIM.)

COMMUNITY−BASED ORGANIZATION (CBO)− A membership−based entity, described under Section 501(a,c), whose mission is the furtherance of model aviation. (see also, 49 United States Code (USC) §44809 (h) and Advisory Circular (AC) 91−57).

COMPASS LOCATOR− A low power, low or medium frequency (L/MF) radio beacon installed at the site of the outer or middle marker of an instrument landing system (ILS). It can be used for navigation at distances of approximately 15 miles or as authorized in the approach procedure.

a. Outer Compass Locator (LOM)− A compass locator installed at the site of the outer marker of an instrument landing system.

(See OUTER MARKER.)

b. Middle Compass Locator (LMM)− A compass locator installed at the site of the middle marker of an instrument landing system.

(See MIDDLE MARKER.)
(See ICAO term LOCATOR.)

COMPASS ROSE− A circle, graduated in degrees, printed on some charts or marked on the ground at an airport. It is used as a reference to either true or magnetic direction.

COMPLY WITH RESTRICTIONS− An ATC instruction that requires an aircraft being vectored back onto an arrival or departure procedure to comply with all altitude and/or speed restrictions depicted on the procedure. This term may be used in lieu of repeating each remaining restriction that appears on the procedure.

COMPOSITE FLIGHT PLAN− A flight plan which specifies VFR operation for one portion of flight and IFR for another portion. It is used primarily in military operations.

(Refer to AIM.)

COMPULSORY REPORTING POINTS− Reporting points which must be reported to ATC. They are designated on aeronautical charts by solid triangles or filed in a flight plan as fixes selected to define direct routes. These points are geographical locations which are defined by navigation aids/fixes. Pilots should discontinue position reporting over compulsory reporting points when informed by ATC that their aircraft is in "radar contact."

COMPUTER NAVIGATION FIX (CNF)− A Computer Navigation Fix is a point defined by a latitude/longitude coordinate and is required to support Performance−Based Navigation (PBN) operations. A five−letter identifier denoting a CNF can be found next to an "x" on en route charts and on some approach charts. Eventually, all CNFs will be labeled and begin with the letters "CF" followed by three consonants (e.g., 'CFWBG'). CNFs are not recognized by ATC, are not contained in ATC fix or automation databases, and are not used for ATC purposes. Pilots should not use CNFs for point−to−point navigation (e.g., proceed direct), filing a flight plan, or in aircraft/ATC communications. Use of CNFs has not been adopted or recognized by the International Civil Aviation Organization (ICAO).

(REFER to AIM 1−1−17b5(i)(2), Global Positioning System (GPS).

CONDITIONS NOT MONITORED− When an airport operator cannot monitor the condition of the movement area or airfield surface area, this information is issued as a NOTAM. Usually necessitated due to staffing, operating hours or other mitigating factors associated with airport operations.

CONFIDENCE MANEUVER− A confidence maneuver consists of one or more turns, a climb or descent, or other maneuver to determine if the pilot in command (PIC) is able to receive and comply with ATC instructions.

CONFLICT ALERT− A function of certain air traffic control automated systems designed to alert radar controllers to existing or pending situations between tracked targets (known IFR or VFR aircraft) that require his/her immediate attention/action.

(See MODE C INTRUDER ALERT.)

CONFLICT RESOLUTION− The resolution of potential conflictions between aircraft that are radar identified and in communication with ATC by ensuring that radar targets do not touch. Pertinent traffic advisories must be issued when this procedure is applied.

Note: This procedure must not be provided utilizing mosaic radar systems.

CONFORMANCE− The condition established when an aircraft's actual position is within the conformance region constructed around that aircraft at its position, according to the trajectory associated with the aircraft's Current Plan.

CONFORMANCE REGION− A volume, bounded laterally, vertically, and longitudinally, within which an aircraft must be at a given time in order to be in conformance with the Current Plan Trajectory for that aircraft. At a given time, the conformance region is determined by the simultaneous application of the lateral, vertical, and longitudinal conformance bounds for the aircraft at the position defined by time and aircraft's trajectory.

CONNECTION− A virtual connection between the ground system and the aircraft for the exchange of CPDLC messages.

CONSOLAN− A low frequency, long-distance NAVAID used principally for transoceanic navigations.

CONSTRAINT SATISFACTION POINT (CSP)− Meter Reference Elements (MREs) that are actively scheduled by TBFM. Constraint satisfaction occurs when the Scheduled Time of Arrival generated for each metered flight conforms to all the scheduling constraints specified at all the applicable CSPs.

CONTACT−

a. Establish communication with (followed by the name of the facility and, if appropriate, the frequency to be used).

b. A flight condition wherein the pilot ascertains the attitude of his/her aircraft and navigates by visual reference to the surface.

(See CONTACT APPROACH.)
(See RADAR CONTACT.)

CONTACT APPROACH− An approach wherein an aircraft on an IFR flight plan, having an air traffic control authorization, operating clear of clouds with at least 1 mile flight visibility and a reasonable expectation of continuing to the destination airport in those conditions, may deviate from the instrument approach procedure and proceed to the destination airport by visual reference to the surface. This approach will only be authorized when requested by the pilot and the reported ground visibility at the destination airport is at least 1 statute mile.

(Refer to AIM.)

CONTAMINATED RUNWAY− A runway is considered contaminated whenever standing water, ice, snow, slush, frost in any form, heavy rubber, or other substances are present. A runway is contaminated with respect to rubber deposits or other friction-degrading substances when the average friction value for any 500-foot segment of the runway within the ALD fails below the recommended minimum friction level and the average friction value in the adjacent 500-foot segments falls below the maintenance planning friction level.

CONTERMINOUS U.S.− The 48 adjoining States and the District of Columbia.

CONTINENTAL UNITED STATES− The 49 States located on the continent of North America and the District of Columbia.

CONTINGENCY HAZARD AREA (CHA)− Used by ATC. Areas of airspace that are defined and distributed in advance of a launch or reentry operation and are activated in response to a failure.

(See AIRCRAFT HAZARD AREA.)
(See REFINED HAZARD AREA.)
(See TRANSITIONAL HAZARD AREA.)

CONTINUE− When used as a control instruction should be followed by another word or words clarifying what is expected of the pilot. Example: "continue taxi," "continue descent," "continue inbound," etc.

CONTROL AREA [ICAO]− A controlled airspace extending upwards from a specified limit above the earth.

CONTROL SECTOR− An airspace area of defined horizontal and vertical dimensions for which a controller or group of controllers has air traffic control responsibility, normally within an air route traffic control center or an approach control facility. Sectors are established based on predominant traffic flows, altitude strata, and

D

D−ATIS−
(See DIGITAL-AUTOMATIC TERMINAL INFORMATION SERVICE.)

D−ATIS [ICAO]−
(See ICAO Term DATA LINK AUTOMATIC TERMINAL INFORMATION SERVICE.)

DA [ICAO]−
(See ICAO Term DECISION ALTITUDE/DECISION HEIGHT.)

DAIR−
(See DIRECT ALTITUDE AND IDENTITY READOUT.)

DANGER AREA [ICAO]− An airspace of defined dimensions within which activities dangerous to the flight of aircraft may exist at specified times.

Note: The term "Danger Area" is not used in reference to areas within the United States or any of its possessions or territories.

DAS−
(See DELAY ASSIGNMENT.)

DATA BLOCK−
(See ALPHANUMERIC DISPLAY.)

DATA LINK AUTOMATIC TERMINAL INFORMATION SERVICE (D−ATIS) [ICAO]− The provision of ATIS via data link.

DCL–
(See DEPARTURE CLEARANCE APPLICATION.)

DCT−
(See DELAY COUNTDOWN TIMER.)

DEAD RECKONING− Dead reckoning, as applied to flying, is the navigation of an airplane solely by means of computations based on airspeed, course, heading, wind direction, and speed, groundspeed, and elapsed time.

DEBRIS RESPONSE AREA (DRA)− Used by ATC. Areas of airspace that may be activated in response to unplanned falling debris in the NAS.

DECISION ALTITUDE/DECISION HEIGHT [ICAO Annex 6]- A specified altitude or height (A/H) in the precision approach at which a missed approach must be initiated if the required visual reference to continue the approach has not been established.
1. Decision altitude (DA) is referenced to mean sea level and decision height (DH) is referenced to the threshold elevation.
2. Category II and III minima are expressed as a DH and not a DA. Minima is assessed by reference to a radio altimeter and not a barometric altimeter, which makes the minima a DH.
3. The required visual reference means that section of the visual aids or of the approach area which should have been in view for sufficient time for the pilot to have made an assessment of the aircraft position and rate of change of position, in relation to the desired flight path.

DECISION ALTITUDE (DA)− A specified altitude (mean sea level (MSL)) on an instrument approach procedure (ILS, GLS, vertically guided RNAV) at which the pilot must decide whether to continue the approach or initiate an immediate missed approach if the pilot does not see the required visual references.

DECISION HEIGHT (DH)− With respect to the operation of aircraft, means the height at which a decision must be made during an ILS or PAR instrument approach to either continue the approach or to execute a missed approach.
(See ICAO term DECISION ALTITUDE/DECISION HEIGHT.)

DECODER− The device used to decipher signals received from ATCRBS transponders to effect their display as select codes.
(See CODES.)
(See RADAR.)

DEFENSE AREA− Any airspace of the contiguous United States that is not an ADIZ in which the control of aircraft is required for reasons of national security.

DEFENSE VISUAL FLIGHT RULES− Rules applicable to flights within an ADIZ conducted under the visual flight rules in 14 CFR part 91.
(See AIR DEFENSE IDENTIFICATION ZONE.)
(Refer to 14 CFR part 91.)
(Refer to 14 CFR part 99.)

DELAY ASSIGNMENT (DAS)− Delays are distributed to aircraft based on the traffic management program parameters. The delay assignment is calculated in 15−minute increments and appears as a table in Traffic Flow Management System (TFMS).

DELAY COUNTDOWN TIMER (DCT)− The display of the delay that must be absorbed by a flight prior to crossing a Meter Reference Element (MRE) to meet the TBFM Scheduled Time of Arrival (STA). It is calculated by taking the difference between the frozen STA and the Estimated Time of Arrival (ETA).

DELAY INDEFINITE (REASON IF KNOWN) EXPECT FURTHER CLEARANCE (TIME)**−** Used by ATC to inform a pilot when an accurate estimate of the delay time and the reason for the delay cannot immediately be determined; e.g., a disabled aircraft on the runway, terminal or center area saturation, weather below landing minimums, etc.
(See EXPECT FURTHER CLEARANCE (TIME).)

DEPARTURE CENTER− The ARTCC having jurisdiction for the airspace that generates a flight to the impacted airport.

DEPARTURE CLEARANCE (DCL) APPLICATION– The DCL application provides up to nine Selectable Fields for the tower controller to enter all other clearance information.

DEPARTURE CONTROL− A function of an approach control facility providing air traffic control service for departing IFR and, under certain conditions, VFR aircraft.
(See APPROACH CONTROL FACILITY.)
(Refer to AIM.)

DEPARTURE SEQUENCING PROGRAM− A program designed to assist in achieving a specified interval over a common point for departures.

DEPARTURE TIME− The time an aircraft becomes airborne.

DEPARTURE VIEWER− A capability within the Traffic Flow Management System (TFMS) that provides combined displays for monitoring departure by fixes and departure airports. Traffic management personnel can customize the displays by selecting the departure airports and fixes of interest. The information displayed is the demand for the resource (fix or departure airport) in time bins with the flight list and a flight history for one flight at a time. From the display, flights can be selected for route amendment, one or more at a time, and the Route Amendment Dialogue (RAD) screen automatically opens for easy route selection and execution. Reroute options are based on Coded Departure Route (CDR) database and Trajectory Options Set (TOS) (when available).

DESCEND VIA– An abbreviated ATC clearance that requires compliance with a published procedure lateral path and associated speed restrictions and provides a pilot-discretion descent to comply with published altitude restrictions.

DESCENT SPEED ADJUSTMENTS− Speed deceleration calculations made to determine an accurate VTA. These calculations start at the transition point and use arrival speed segments to the vertex.

DESIGNATED COMMON TRAFFIC ADVISORY FREQUENCY (CTAF) AREA− In Alaska, in addition to being designated for the purpose of carrying out airport advisory practices while operating to or from an airport without an operating airport traffic control tower, a CTAF may also be designated for the purpose of carrying out advisory practices for operations in and through areas with a high volume of VFR traffic.

DESIRED COURSE−

a. True− A predetermined desired course direction to be followed (measured in degrees from true north).

b. Magnetic− A predetermined desired course direction to be followed (measured in degrees from local magnetic north).

DESIRED TRACK− The planned or intended track between two waypoints. It is measured in degrees from either magnetic or true north. The instantaneous angle may change from point to point along the great circle track between waypoints.

DETRESFA (DISTRESS PHASE) [ICAO]− The code word used to designate an emergency phase wherein there is reasonable certainty that an aircraft and its occupants are threatened by grave and imminent danger or require immediate assistance.

DEVIATION−

a. A departure from a current clearance, such as an off course maneuver to avoid weather or turbulence.

b. Where specifically authorized in the CFRs and requested by the pilot, ATC may permit pilots to deviate from certain regulations.

DH−
(See DECISION HEIGHT.)

DH [ICAO]−
(See ICAO Term DECISION ALTITUDE/ DECISION HEIGHT.)

DIGITAL-AUTOMATIC TERMINAL INFORMATION SERVICE (D-ATIS)− The service provides text messages to aircraft, airlines, and other users outside the standard reception range of conventional ATIS via landline and data link communications to the cockpit. Also, the service provides a computer−synthesized voice message that can be transmitted to all aircraft within range of existing transmitters. The Terminal Data Link System (TDLS) D-ATIS application uses weather inputs from local automated weather sources or manually entered meteorological data together with preprogrammed menus to provide standard information to users. Airports with D-ATIS capability are listed in the Chart Supplement U.S.

DIGITAL TARGET− A computer−generated symbol representing an aircraft's position, based on a primary return or radar beacon reply, shown on a digital display.

DIGITAL TERMINAL AUTOMATION SYSTEM (DTAS)− A system where digital radar and beacon data is presented on digital displays and the operational program monitors the system performance on a real−time basis.

DIGITIZED TARGET− A computer−generated indication shown on an analog radar display resulting from a primary radar return or a radar beacon reply.

DIRECT− Straight line flight between two navigational aids, fixes, points, or any combination thereof. When used by pilots in describing off-airway routes, points defining direct route segments become compulsory reporting points unless the aircraft is under radar contact.

DIRECTLY BEHIND− An aircraft is considered to be operating directly behind when it is following the actual flight path of the lead aircraft over the surface of the earth except when applying wake turbulence separation criteria.

DISCRETE BEACON CODE−
(See DISCRETE CODE.)

DISCRETE CODE− As used in the Air Traffic Control Radar Beacon System (ATCRBS), any one of the 4096 selectable Mode 3/A aircraft transponder codes except those ending in zero zero; e.g., discrete codes: 0010, 1201, 2317, 7777; nondiscrete codes: 0100, 1200, 7700. Nondiscrete codes are normally reserved for radar facilities that are not equipped with discrete decoding capability and for other purposes such as emergencies (7700), VFR aircraft (1200), etc.

(See RADAR.)
(Refer to AIM.)

DISCRETE FREQUENCY− A separate radio frequency for use in direct pilot-controller communications in air traffic control which reduces frequency congestion by controlling the number of aircraft operating on a particular frequency at one time. Discrete frequencies are normally designated for each control sector in en route/terminal ATC facilities. Discrete frequencies are listed in the Chart Supplement U.S. and the DoD FLIP IFR En Route Supplement.

(See CONTROL SECTOR.)

DISPLACED THRESHOLD− A threshold that is located at a point on the runway other than the designated beginning of the runway.

(See THRESHOLD.)
(Refer to AIM.)

DISTANCE MEASURING EQUIPMENT (DME)− Equipment (airborne and ground) used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigational aid.

(See TACAN.)
(See VORTAC.)

DISTRESS− A condition of being threatened by serious and/or imminent danger and of requiring immediate assistance.

DIVE BRAKES−

(See SPEED BRAKES.)

DIVERSE VECTOR AREA− In a radar environment, that area in which a prescribed departure route is not required as the only suitable route to avoid obstacles. The area in which random radar vectors below the MVA/MIA, established in accordance with the TERPS criteria for diverse departures, obstacles and terrain avoidance, may be issued to departing aircraft.

DIVERSION (DVRSN)− Flights that are required to land at other than their original destination for reasons beyond the control of the pilot/company, e.g. periods of significant weather.

DME−

(See DISTANCE MEASURING EQUIPMENT.)

DME FIX− A geographical position determined by reference to a navigational aid which provides distance and azimuth information. It is defined by a specific distance in nautical miles and a radial, azimuth, or course (i.e., localizer) in degrees magnetic from that aid.

(See DISTANCE MEASURING EQUIPMENT.)
(See FIX.)

DME SEPARATION− Spacing of aircraft in terms of distances (nautical miles) determined by reference to distance measuring equipment (DME).

(See DISTANCE MEASURING EQUIPMENT.)

DoD FLIP− Department of Defense Flight Information Publications used for flight planning, en route, and terminal operations. FLIP is produced by the National Geospatial−Intelligence Agency (NGA) for world-wide use. United States Government Flight Information Publications (en route charts and instrument approach procedure charts) are incorporated in DoD FLIP for use in the National Airspace System (NAS).

DOMESTIC AIRSPACE− Airspace which overlies the continental land mass of the United States plus Hawaii and U.S. possessions. Domestic airspace extends to 12 miles offshore.

DOMESTIC NOTICE− A special notice or notice containing graphics or plain language text pertaining to almost every aspect of aviation, such as military training areas, large scale sporting events, air show information, Special

Traffic Management Programs (STMPs), and airport−specific information. These notices are applicable to operations within the United States and can be found on the Domestic Notices website.

DOWNBURST− A strong downdraft which induces an outburst of damaging winds on or near the ground. Damaging winds, either straight or curved, are highly divergent. The sizes of downbursts vary from 1/2 mile or less to more than 10 miles. An intense downburst often causes widespread damage. Damaging winds, lasting 5 to 30 minutes, could reach speeds as high as 120 knots.

DOWNLINK– CPDLC message sent from the flight deck to ATC.

DOWNWIND LEG−
(See TRAFFIC PATTERN.)

DP−
(See INSTRUMENT DEPARTURE PROCEDURE.)

DRA–
(See DEBRIS RESPONSE AREA.)

DRAG CHUTE− A parachute device installed on certain aircraft which is deployed on landing roll to assist in deceleration of the aircraft.

DROP ZONE− Any pre-determined area upon which parachutists or objects land after making an intentional parachute jump or drop.
(Refer to 14 CFR §105.3, Definitions)

DSP−
(See DEPARTURE SEQUENCING PROGRAM.)

DTAS−
(See DIGITAL TERMINAL AUTOMATION SYSTEM.)

DUE REGARD− A phase of flight wherein an aircraft commander of a State-operated aircraft assumes responsibility to separate his/her aircraft from all other aircraft.
(See also FAA Order JO 7110.65, Para 1−2−1, WORD MEANINGS.)

DUTY RUNWAY−
(See RUNWAY IN USE/ACTIVE RUNWAY/DUTY RUNWAY.)

DVA−
(See DIVERSE VECTOR AREA.)

DVFR−
(See DEFENSE VISUAL FLIGHT RULES.)

DVFR FLIGHT PLAN− A flight plan filed for a VFR aircraft which intends to operate in airspace within which the ready identification, location, and control of aircraft are required in the interest of national security.

DVRSN−
(See DIVERSION.)

DYNAMIC− Continuous review, evaluation, and change to meet demands.

DYNAMIC RESTRICTIONS− Those restrictions imposed by the local facility on an "as needed" basis to manage unpredictable fluctuations in traffic demands.

E

E-MSAW–
(See EN ROUTE MINIMUM SAFE ALTITUDE WARNING.)

EAS–
(See EN ROUTE AUTOMATION SYSTEM.)

EDCT–
(See EXPECT DEPARTURE CLEARANCE TIME.)

EDST–
(See EN ROUTE DECISION SUPPORT TOOL)

EFC–
(See EXPECT FURTHER CLEARANCE (TIME).)

ELIGIBILITY– Designates which sector is eligible to exchange CPDLC messages with a specific aircraft.

ELT–
(See EMERGENCY LOCATOR TRANSMITTER.)

EMBEDDED ROUTE TEXT– An EDST notification that an ADR/ADAR/AAR has been applied to the flight plan. Within the route field, sub−fields consisting of an adapted route or an embedded change in the route are color−coded in cyan with cyan brackets around the sub−field.
(See EN ROUTE DECISION SUPPORT TOOL.)

EMERGENCY– A distress or an urgency condition.

EMERGENCY AUTOLAND SYSTEM– This system, if activated, will determine an optimal airport, plot a course, broadcast the aircraft's intentions, fly to the airport, land, and (depending on the model) shut down the engines. Though the system will broadcast the aircraft's intentions, the controller should assume that transmissions to the aircraft will not be acknowledged.

EMERGENCY DESCENT MODE– This automated system senses conditions conducive to hypoxia (cabin depressurization). If an aircraft is equipped and the system is activated, it is designed to turn the aircraft up to 90 degrees, then descend to a lower altitude and level off, giving the pilot(s) time to recover.

EMERGENCY LOCATOR TRANSMITTER (ELT)– A radio transmitter attached to the aircraft structure which operates from its own power source on 121.5 MHz and 243.0 MHz. It aids in locating downed aircraft by radiating a downward sweeping audio tone, 2-4 times per second. It is designed to function without human action after an accident.
(Refer to 14 CFR part 91.)
(Refer to AIM.)

ENHANCED FLIGHT VISION SYSTEM (EFVS)– An EFVS is an installed aircraft system which uses an electronic means to provide a display of the forward external scene topography (the natural or man−made features of a place or region especially in a way to show their relative positions and elevation) through the use of imaging sensors, including but not limited to forward−looking infrared, millimeter wave radiometry, millimeter wave radar, or low−light level image intensification. An EFVS includes the display element, sensors, computers and power supplies, indications, and controls. An operator's authorization to conduct an EFVS operation may have provisions which allow pilots to conduct IAPs when the reported weather is below minimums prescribed on the IAP to be flown.

ENHANCED SPECIAL REPORTING SERVICE (eSRS)– An automated service used to enhance search and rescue operations that provides flight service specialists in Alaska direct information from the aircraft's registered tracking device.

EN ROUTE AIR TRAFFIC CONTROL SERVICES− Air traffic control service provided aircraft on IFR flight plans, generally by centers, when these aircraft are operating between departure and destination terminal areas. When equipment, capabilities, and controller workload permit, certain advisory/assistance services may be provided to VFR aircraft.

(See AIR ROUTE TRAFFIC CONTROL CENTER.)
(Refer to AIM.)

EN ROUTE AUTOMATION SYSTEM (EAS)− The complex integrated environment consisting of situation display systems, surveillance systems and flight data processing, remote devices, decision support tools, and the related communications equipment that form the heart of the automated IFR air traffic control system. It interfaces with automated terminal systems and is used in the control of en route IFR aircraft.

(Refer to AIM.)

EN ROUTE CHARTS−
(See AERONAUTICAL CHART.)

EN ROUTE DECISION SUPPORT TOOL (EDST)− An automated tool provided at each Radar Associate position in selected En Route facilities. This tool utilizes flight and radar data to determine present and future trajectories for all active and proposal aircraft and provides enhanced automated flight data management.

EN ROUTE DESCENT− Descent from the en route cruising altitude which takes place along the route of flight.

EN ROUTE HIGH ALTITUDE CHARTS−
(See AERONAUTICAL CHART.)

EN ROUTE LOW ALTITUDE CHARTS−
(See AERONAUTICAL CHART.)

EN ROUTE MINIMUM SAFE ALTITUDE WARNING (E−MSAW)− A function of the EAS that aids the controller by providing an alert when a tracked aircraft is below or predicted by the computer to go below a predetermined minimum IFR altitude (MIA).

EN ROUTE TRANSITION−
(See SEGMENTS OF A SID/STAR.)

EN ROUTE TRANSITION WAYPOINT
(See SEGMENTS OF A SID/STAR.)

eSRS−
(See ENHANCED SPECIAL REPORTING SERVICE.)

EST−
(See ESTIMATED.)

ESTABLISHED− To be stable or fixed at an altitude or on a course, route, route segment, heading, instrument approach or departure procedure, etc.

ESTABLISHED ON RNP (EoR) CONCEPT– A system of authorized instrument approaches, ATC procedures, surveillance, and communication requirements that allow aircraft operations to be safely conducted with approved reduced separation criteria once aircraft are established on a PBN segment of a published instrument flight procedure.

ESTIMATED (EST)−When used in NOTAMs "EST" is a contraction that is used by the issuing authority only when the condition is expected to return to service prior to the expiration time. Using "EST" lets the user know that this NOTAM has the possibility of returning to service earlier than the expiration time. Any NOTAM which includes an "EST" will be auto−expired at the designated expiration time.

ESTIMATED ELAPSED TIME [ICAO]− The estimated time required to proceed from one significant point to another.

(See ICAO Term TOTAL ESTIMATED ELAPSED TIME.)

ESTIMATED OFF-BLOCK TIME [ICAO]− The estimated time at which the aircraft will commence movement associated with departure.

ESTIMATED POSITION ERROR (EPE)−
(See Required Navigation Performance)

ESTIMATED TIME OF ARRIVAL− The time the flight is estimated to arrive at the gate (scheduled operators) or the actual runway on times for nonscheduled operators.

ESTIMATED TIME EN ROUTE− The estimated flying time from departure point to destination (lift-off to touchdown).

ETA−
(See ESTIMATED TIME OF ARRIVAL.)

ETE−
(See ESTIMATED TIME EN ROUTE.)

EXECUTE MISSED APPROACH− Instructions issued to a pilot making an instrument approach which means continue inbound to the missed approach point and execute the missed approach procedure as described on the Instrument Approach Procedure Chart or as previously assigned by ATC. The pilot may climb immediately to the altitude specified in the missed approach procedure upon making a missed approach. No turns should be initiated prior to reaching the missed approach point. When conducting an ASR or PAR approach, execute the assigned missed approach procedure immediately upon receiving instructions to "execute missed approach."
(Refer to AIM.)

EXPECT (ALTITUDE) AT (TIME) or (FIX)− Used under certain conditions to provide a pilot with an altitude to be used in the event of two-way communications failure. It also provides altitude information to assist the pilot in planning.
(Refer to AIM.)

EXPECT DEPARTURE CLEARANCE TIME (EDCT)− The runway release time assigned to an aircraft in a traffic management program and shown on the flight progress strip as an EDCT.
(See GROUND DELAY PROGRAM.)

EXPECT FURTHER CLEARANCE (TIME)− The time a pilot can expect to receive clearance beyond a clearance limit.

EXPECT FURTHER CLEARANCE VIA (AIRWAYS, ROUTES OR FIXES)− Used to inform a pilot of the routing he/she can expect if any part of the route beyond a short range clearance limit differs from that filed.

EXPEDITE− Used by ATC when prompt compliance is required to avoid the development of an imminent situation. Expedite climb/descent normally indicates to a pilot that the approximate best rate of climb/descent should be used without requiring an exceptional change in aircraft handling characteristics.

N

NAS−
(See NATIONAL AIRSPACE SYSTEM.)

NAT HLA–
(See NORTH ATLANTIC HIGH LEVEL AIRSPACE.)

NATIONAL AIRSPACE SYSTEM− The common network of U.S. airspace; air navigation facilities, equipment and services, airports or landing areas; aeronautical charts, information and services; rules, regulations and procedures, technical information, and manpower and material. Included are system components shared jointly with the military.

NATIONAL BEACON CODE ALLOCATION PLAN AIRSPACE (NBCAP)− Airspace over United States territory located within the North American continent between Canada and Mexico, including adjacent territorial waters outward to about boundaries of oceanic control areas (CTA)/Flight Information Regions (FIR).
(See FLIGHT INFORMATION REGION.)

NATIONAL FLIGHT DATA DIGEST (NFDD)− A daily (except weekends and Federal holidays) publication of flight information appropriate to aeronautical charts, aeronautical publications, Notices to Airmen, or other media serving the purpose of providing operational flight data essential to safe and efficient aircraft operations.

NATIONAL SEARCH AND RESCUE PLAN− An interagency agreement which provides for the effective utilization of all available facilities in all types of search and rescue missions.

NATIONAL SECURITY AREA (NSA)–
(See SPECIAL USE AIRSPACE.)

NAVAID−
(See NAVIGATIONAL AID.)

NAVAID CLASSES− VOR, VORTAC, and TACAN aids are classed according to their operational use. The three classes of NAVAIDs are:

a. T− Terminal.

b. L− Low altitude.

c. H− High altitude.

Note: The normal service range for T, L, and H class aids is found in the AIM. Certain operational requirements make it necessary to use some of these aids at greater service ranges than specified. Extended range is made possible through flight inspection determinations. Some aids also have lesser service range due to location, terrain, frequency protection, etc. Restrictions to service range are listed in the Chart Supplement.

NAVIGABLE AIRSPACE− Airspace at and above the minimum flight altitudes prescribed in the CFRs including airspace needed for safe takeoff and landing.
(Refer to 14 CFR part 91.)

NAVIGATION REFERENCE SYSTEM (NRS)− The NRS is a system of waypoints for use within the United States for flight planning and navigation without reference to ground based navigational aids. These waypoints are located in a grid pattern along defined latitude and longitude lines and are available for use at or above FL180 by aircraft capable of point-to-point navigation.

NAVIGATION SPECIFICATION [ICAO]− A set of aircraft and flight crew requirements needed to support performance−based navigation operations within a defined airspace. There are two kinds of navigation specifications:

a. RNP specification. A navigation specification based on area navigation that includes the requirement for performance monitoring and alerting, designated by the prefix RNP; e.g., RNP 4, RNP APCH.

b. RNAV specification. A navigation specification based on area navigation that does not include the requirement for performance monitoring and alerting, designated by the prefix RNAV; e.g., RNAV 5, RNAV 1.

Note: The Performance−based Navigation Manual (Doc 9613), Volume II contains detailed guidance on navigation specifications.

NAVIGATIONAL AID− Any visual or electronic device airborne or on the surface which provides point-to-point guidance information or position data to aircraft in flight.
(See AIR NAVIGATION FACILITY.)

NAVSPEC-
(See NAVIGATION SPECIFICATION [ICAO].)

NBCAP AIRSPACE−
(See NATIONAL BEACON CODE ALLOCATION PLAN AIRSPACE.)

NDB−
(See NONDIRECTIONAL BEACON.)

NEGATIVE− "No," or "permission not granted," or "that is not correct."

NEGATIVE CONTACT− Used by pilots to inform ATC that:

a. Previously issued traffic is not in sight. It may be followed by the pilot's request for the controller to provide assistance in avoiding the traffic.

b. They were unable to contact ATC on a particular frequency.

NFDD−
(See NATIONAL FLIGHT DATA DIGEST.)

NIGHT− The time between the end of evening civil twilight and the beginning of morning civil twilight, as published in the Air Almanac, converted to local time.
(See ICAO term NIGHT.)

NIGHT [ICAO]− The hours between the end of evening civil twilight and the beginning of morning civil twilight or such other period between sunset and sunrise as may be specified by the appropriate authority.

Note: Civil twilight ends in the evening when the center of the sun's disk is 6 degrees below the horizon and begins in the morning when the center of the sun's disk is 6 degrees below the horizon.

NO GYRO APPROACH− A radar approach/vector provided in case of a malfunctioning gyro-compass or directional gyro. Instead of providing the pilot with headings to be flown, the controller observes the radar track and issues control instructions "turn right/left" or "stop turn" as appropriate.
(Refer to AIM.)

NO GYRO VECTOR−
(See NO GYRO APPROACH.)

NO TRANSGRESSION ZONE (NTZ)− The NTZ is a 2,000 foot wide zone, located equidistant between parallel runway or SOIA final approach courses, in which flight is normally not allowed.

NONAPPROACH CONTROL TOWER− Author-izes aircraft to land or takeoff at the airport controlled by the tower or to transit the Class D airspace. The primary function of a nonapproach control tower is the sequencing of aircraft in the traffic pattern and on the landing area. Nonapproach control towers also separate aircraft operating under instrument flight rules clearances from approach controls and centers. They provide ground control services to aircraft, vehicles, personnel, and equipment on the airport movement area.

NONCOMMON ROUTE/PORTION− That segment of a North American Route between the inland navigation facility and a designated North American terminal.

NON−COOPERATIVE SURVEILLANCE− Any surveillance system, such as primary radar, that is not dependent upon the presence of any equipment on the aircraft or vehicle to be tracked.
(See COOPERATIVE SURVEILLANCE.)
(See RADAR.)

P

P TIME–
(See PROPOSED DEPARTURE TIME.)

P-ACP–
(See PREARRANGED COORDINATION PROCEDURES.)

PAN-PAN– The international radio-telephony urgency signal. When repeated three times, indicates uncertainty or alert followed by the nature of the urgency.
(See MAYDAY.)
(Refer to AIM.)

PAO–
(See PUBLIC AIRCRAFT OPERATION.)

PAR–
(See PRECISION APPROACH RADAR.)

PAR [ICAO]–
(See ICAO Term PRECISION APPROACH RADAR.)

PARALLEL ILS APPROACHES– Approaches to parallel runways by IFR aircraft which, when established inbound toward the airport on the adjacent final approach courses, are radar-separated by at least 2 miles.
(See FINAL APPROACH COURSE.)
(See SIMULTANEOUS ILS APPROACHES.)

PARALLEL OFFSET ROUTE– A parallel track to the left or right of the designated or established airway/route. Normally associated with Area Navigation (RNAV) operations.
(See AREA NAVIGATION.)

PARALLEL RUNWAYS– Two or more runways at the same airport whose centerlines are parallel. In addition to runway number, parallel runways are designated as L (left) and R (right) or, if three parallel runways exist, L (left), C (center), and R (right).

PBCT–
(See PROPOSED BOUNDARY CROSSING TIME.)

PBN–
(See ICAO Term PERFORMANCE–BASED NAVIGATION.)

PDC–
(See PRE–DEPARTURE CLEARANCE.)

PDRR–
(See PRE–DEPARTURE REROUTE.)

PERFORMANCE–BASED NAVIGATION (PBN) [ICAO]– Area navigation based on performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in a designated airspace.

Note: Performance requirements are expressed in navigation specifications (RNAV specification, RNP specification) in terms of accuracy, integrity, continuity, availability, and functionality needed for the proposed operation in the context of a particular airspace concept.

PERMANENT ECHO– Radar signals reflected from fixed objects on the earth's surface; e.g., buildings, towers, terrain. Permanent echoes are distinguished from "ground clutter" by being definable locations rather than large areas. Under certain conditions they may be used to check radar alignment.

PERTI−
(See PLAN, EXECUTE, REVIEW, TRAIN, IMPROVE.)

PGUI−
(See PLANVIEW GRAPHICAL USER INTERFACE.)

PHOTO RECONNAISSANCE− Military activity that requires locating individual photo targets and navigating to the targets at a preplanned angle and altitude. The activity normally requires a lateral route width of 16 NM and altitude range of 1,500 feet to 10,000 feet AGL.

PILOT BRIEFING− The gathering, translation, interpretation, and summarization of weather and aeronautical information into a form usable by the pilot or flight supervisory personnel to assist in flight planning and decision−making for the safe and efficient operation of aircraft. These briefings may include, but are not limited to, weather observations, forecasts, and aeronautical information (for example, NOTAMs, military activities, flow control information, and temporary flight restrictions [TFR]).
(Refer to AIM.)

PILOT IN COMMAND− The pilot responsible for the operation and safety of an aircraft during flight time.
(Refer to 14 CFR part 91.)

PILOT INITIATED DOWNLINK (PID)− Any message exchange that originates from the flight deck.

PILOT WEATHER REPORT− A report of meteorological phenomena encountered by aircraft in flight.
(Refer to AIM.)

PILOT'S DISCRETION− When used in conjunction with altitude assignments, means that ATC has offered the pilot the option of starting climb or descent whenever he/she wishes and conducting the climb or descent at any rate he/she wishes. He/she may temporarily level off at any intermediate altitude. However, once he/she has vacated an altitude, he/she may not return to that altitude.

PIREP−
(See PILOT WEATHER REPORT.)

PITCH POINT− A fix/waypoint that serves as a transition point from a departure procedure or the low altitude ground−based navigation structure into the high altitude waypoint system.

PLAN, EXECUTE, REVIEW, TRAIN, IMPROVE (PERTI)− A process that delivers a one−day detailed plan for NAS operations, and a two−day outlook, which sets NAS performance goals for high impact constraints. PLAN: Increase lead time for identifying aviation system constraint planning and goals while utilizing historical NAS performance data and constraints to derive successful and/or improved advance planning strategies. EXECUTE: Set goals and a strategy. The Air Traffic Control System Command Center (ATCSCC), FAA field facilities, and aviation stakeholders execute the strategy and work to achieve the desired/planned outcomes. REVIEW: Utilize post event analysis and lessons learned to define and implement future strategies and operational triggers based on past performance and outcomes, both positive and negative. TRAIN: Develop training that includes rapid and continuous feedback to operational personnel and provides increased data and weather knowledge and tools for analytical usage and planning. IMPROVE: Implement better information sharing processes, technologies, and procedures that improve the skills and technology needed to implement operational insights and improvements.

PLANS DISPLAY− A display available in EDST that provides detailed flight plan and predicted conflict information in textual format for requested Current Plans and all Trial Plans.
(See EN ROUTE DECISION SUPPORT TOOL)

PLANVIEW GRAPHICAL USER INTERFACE (PGUI)− A TBFM display that provides a spatial display of individual aircraft track information.

POFZ−
(See PRECISION OBSTACLE FREE ZONE.)

POINT OUT−
(See RADAR POINT OUT.)

POINT-TO-POINT (PTP)− A level of NRR service for aircraft that is based on traditional waypoints in their FMSs or RNAV equipage.

POLAR TRACK STRUCTURE− A system of organized routes between Iceland and Alaska which overlie Canadian MNPS Airspace.

POSITION REPORT− A report over a known location as transmitted by an aircraft to ATC.
(Refer to AIM.)

POSITION SYMBOL− A computer-generated indication shown on a radar display to indicate the mode of tracking.

POSITIVE CONTROL− The separation of all air traffic within designated airspace by air traffic control.

POWERED-LIFT− A heavier-than-air aircraft capable of vertical takeoff, vertical landing, and low-speed flight that depends principally on engine-driven lift devices during these flight regimes and on nonrotating airfoil(s) for lift during horizontal flight. Powered-lift aircraft can operate on routes or altitudes specifically prescribed for powered-lift by the FAA.

PRACTICE INSTRUMENT APPROACH− An instrument approach procedure conducted by a VFR or an IFR aircraft for the purpose of pilot training or proficiency demonstrations.

PRE−DEPARTURE CLEARANCE− An application with the Terminal Data Link System (TDLS) that provides clearance information to subscribers, through a service provider, in text to the cockpit or gate printer.

PRE−DEPARTURE REROUTE (PDRR)− A capability within the Traffic Flow Management System that enables ATC to quickly amend and execute revised departure clearances that mitigate en route constraints or balance en route traffic flows.

PREARRANGED COORDINATION− A standardized procedure which permits an air traffic controller to enter the airspace assigned to another air traffic controller without verbal coordination. The procedures are defined in a facility directive which ensures approved separation between aircraft.

PREARRANGED COORDINATION PROCEDURES− A facility's standardized procedure that describes the process by which one controller must allow an aircraft to penetrate or transit another controller's airspace in a manner that assures approved separation without individual coordination for each aircraft.

PRECIPITATION− Any or all forms of water particles (rain, sleet, hail, or snow) that fall from the atmosphere and reach the surface.

PRECISION APPROACH−
(See PRECISION APPROACH PROCEDURE.)

PRECISION APPROACH PROCEDURE− A standard instrument approach procedure in which an electronic glideslope or other type of glidepath is provided; e.g., ILS, PAR, and GLS.
(See INSTRUMENT LANDING SYSTEM.)
(See PRECISION APPROACH RADAR.)

PRECISION APPROACH RADAR− Radar equipment in some ATC facilities operated by the FAA and/or the military services at joint-use civil/military locations and separate military installations to detect and display azimuth, elevation, and range of aircraft on the final approach course to a runway. This equipment may be used to monitor certain nonradar approaches, but is primarily used to conduct a precision instrument approach (PAR) wherein the controller issues guidance instructions to the pilot based on the aircraft's position in relation to the final approach course (azimuth), the glidepath (elevation), and the distance (range) from the touchdown point on the runway as displayed on the radar scope.
(See GLIDEPATH.)
(See PAR.)
(See ICAO term PRECISION APPROACH RADAR.)
(Refer to AIM.)

PRECISION APPROACH RADAR [ICAO]− Primary radar equipment used to determine the position of an aircraft during final approach, in terms of lateral and vertical deviations relative to a nominal approach path, and in range relative to touchdown.

PRECISION OBSTACLE FREE ZONE (POFZ)− An 800 foot wide by 200 foot long area centered on the runway centerline adjacent to the threshold designed to protect aircraft flying precision approaches from ground vehicles and other aircraft when ceiling is less than 250 feet or visibility is less than 3/4 statute mile (or runway visual range below 4,000 feet.)

PRECISION RUNWAY MONITOR (PRM) SYSTEM− Provides air traffic controllers monitoring the NTZ during simultaneous close parallel PRM approaches with precision, high update rate secondary surveillance data. The high update rate surveillance sensor component of the PRM system is only required for specific runway or approach course separation. The high resolution color monitoring display, Final Monitor Aid (FMA) of the PRM system, or other FMA with the same capability, presents NTZ surveillance track data to controllers along with detailed maps depicting approaches and no transgression zone and is required for all simultaneous close parallel PRM NTZ monitoring operations.
(Refer to AIM.)

PREDICTIVE WIND SHEAR ALERT SYSTEM (PWS)− A self-contained system used on board some aircraft to alert the flight crew to the presence of a potential wind shear. PWS systems typically monitor 3 miles ahead and 25 degrees left and right of the aircraft's heading at or below 1200' AGL. Departing flights may receive a wind shear alert after they start the takeoff roll and may elect to abort the takeoff. Aircraft on approach receiving an alert may elect to go around or perform a wind shear escape maneuver.

PREFERRED IFR ROUTES− Routes established between busier airports to increase system efficiency and capacity. They normally extend through one or more ARTCC areas and are designed to achieve balanced traffic flows among high density terminals. IFR clearances are issued on the basis of these routes except when severe weather avoidance procedures or other factors dictate otherwise. Preferred IFR Routes are listed in the Chart Supplement U.S., and are also available at https://www.fly.faa.gov/rmt/nfdc_preferred_routes_database.jsp. If a flight is planned to or from an area having such routes but the departure or arrival point is not listed in the Chart Supplement U.S., pilots may use that part of a Preferred IFR Route which is appropriate for the departure or arrival point that is listed. Preferred IFR Routes may be defined by DPs, SIDs, or STARs; NAVAIDs, Waypoints, etc.; high or low altitude airways; or any combinations thereof. Because they often share elements with adapted routes, pilots' use of preferred IFR routes can minimize flight plan route amendments.
(See ADAPTED ROUTES.)
(See CENTER'S AREA.)
(See INSTRUMENT APPROACH PROCEDURE.)
(See INSTRUMENT DEPARTURE PROCEDURE.)
(See STANDARD TERMINAL ARRIVAL.)
(Refer to CHART SUPPLEMENT U.S.)

PRE-FLIGHT PILOT BRIEFING−
(See PILOT BRIEFING.)

PREVAILING VISIBILITY−
(See VISIBILITY.)

PRIMARY RADAR TARGET− An analog or digital target, exclusive of a secondary radar target, presented on a radar display.

PRIOR PERMISSION REQUIRED (PPR)– Prior Permission Required (PPR) means prior permission required to have full operational use of a runway, taxiway, apron, or airport facility/service. Means of communication to the airport can be telephone and/or radio. If PPR and another exception are used in same NOTAM, the PPR should come first.

PRM−
(See AREA NAVIGATION (RNAV) GLOBAL POSITIONING SYSTEM (GPS) PRECISION RUNWAY MONITORING (PRM) APPROACH.)
(See PRM APPROACH.)
(See PRECISION RUNWAY MONITOR SYSTEM.)

PRM APPROACH− An instrument approach procedure titled ILS PRM, RNAV PRM, LDA PRM, or GLS PRM conducted to parallel runways separated by less than 4,300 feet and at least 3,000 feet where independent closely spaced approaches are permitted. Use of an enhanced display with alerting, a No Transgression Zone (NTZ), secondary monitor frequency, pilot PRM training, and publication of an Attention All Users Page are required for all PRM approaches. Depending on the runway spacing, the approach courses may be parallel or one approach course must be offset. PRM procedures are also used to conduct Simultaneous Offset Instrument Approach (SOIA) operations. In SOIA, one straight−in ILS PRM, RNAV PRM, GLS PRM, and one offset LDA PRM, RNAV PRM or GLS PRM approach are utilized. PRM procedures are terminated and a visual segment begins at the offset approach missed approach point where the minimum distance between the approach courses is 3000 feet. Runway spacing can be as close as 750 feet.
(Refer to AIM.)

PROCEDURAL CONTROL [ICAO]– Term used to indicate that information derived from an ATS surveillance system is not required for the provision of air traffic control service.

PROCEDURAL SEPARATION [ICAO]– The separation used when providing procedural control.

PROCEDURE TURN− The maneuver prescribed when it is necessary to reverse direction to establish an aircraft on the intermediate approach segment or final approach course. The outbound course, direction of turn, distance within which the turn must be completed, and minimum altitude are specified in the procedure. However, unless otherwise restricted, the point at which the turn may be commenced and the type and rate of turn are left to the discretion of the pilot.
(See ICAO term PROCEDURE TURN.)

PROCEDURE TURN [ICAO]− A maneuver in which a turn is made away from a designated track followed by a turn in the opposite direction to permit the aircraft to intercept and proceed along the reciprocal of the designated track.

Note 1: Procedure turns are designated "left" or "right" according to the direction of the initial turn.

Note 2: Procedure turns may be designated as being made either in level flight or while descending, according to the circumstances of each individual approach procedure.

PROCEDURE TURN INBOUND− That point of a procedure turn maneuver where course reversal has been completed and an aircraft is established inbound on the intermediate approach segment or final approach course. A report of "procedure turn inbound" is normally used by ATC as a position report for separation purposes.
(See FINAL APPROACH COURSE.)
(See PROCEDURE TURN.)
(See SEGMENTS OF AN INSTRUMENT APPROACH PROCEDURE.)

PROFILE DESCENT− An uninterrupted descent (except where level flight is required for speed adjustment; e.g., 250 knots at 10,000 feet MSL) from cruising altitude/level to interception of a glideslope or to a minimum altitude specified for the initial or intermediate approach segment of a nonprecision instrument approach. The profile descent normally terminates at the approach gate or where the glideslope or other appropriate minimum altitude is intercepted.

PROGRESS REPORT−
(See POSITION REPORT.)

PROGRESSIVE TAXI− Precise taxi instructions given to a pilot unfamiliar with the airport or issued in stages as the aircraft proceeds along the taxi route.

PROHIBITED AREA−
(See SPECIAL USE AIRSPACE.)
(See ICAO term PROHIBITED AREA.)

PROHIBITED AREA [ICAO]− An airspace of defined dimensions, above the land areas or territorial waters of a State, within which the flight of aircraft is prohibited.

PROMINENT OBSTACLE– An obstacle that meets one or more of the following conditions:

a. An obstacle which stands out beyond the adjacent surface of surrounding terrain and immediately projects a noticeable hazard to aircraft in flight.

b. An obstacle, not characterized as low and close in, whose height is no less than 300 feet above the departure end of takeoff runway (DER) elevation, is within 10 NM from the DER, and that penetrates that airport/heliport's diverse departure obstacle clearance surface (OCS).

c. An obstacle beyond 10 NM from an airport/heliport that requires an obstacle departure procedure (ODP) to ensure obstacle avoidance.

(See OBSTACLE.)
(See OBSTRUCTION.)

PROPELLER (PROP) WASH (PROP BLAST)− The disturbed mass of air generated by the motion of a propeller.

PROPOSED BOUNDARY CROSSING TIME− Each center has a PBCT parameter for each internal airport. Proposed internal flight plans are transmitted to the adjacent center if the flight time along the proposed route from the departure airport to the center boundary is less than or equal to the value of PBCT or if airport adaptation specifies transmission regardless of PBCT.

PROPOSED DEPARTURE TIME− The time that the aircraft expects to become airborne.

PROTECTED AIRSPACE− The airspace on either side of an oceanic route/track that is equal to one-half the lateral separation minimum except where reduction of protected airspace has been authorized.

PROTECTED SEGMENT- The protected segment is a segment on the amended TFM route that is to be inhibited from automatic adapted route alteration by ERAM.

PT−
(See PROCEDURE TURN.)

PTP−
(See POINT−TO−POINT.)

PTS−
(See POLAR TRACK STRUCTURE.)

PUBLIC AIRCRAFT OPERATION (PAO)− A UAS operation meeting the qualifications and conditions required for the operation of a public aircraft.
(See AC−1.1)
(See AIM)

PUBLISHED INSTRUMENT APPROACH PROCEDURE VISUAL SEGMENT− A segment on an IAP chart annotated as "Fly Visual to Airport" or "Fly Visual." A dashed arrow will indicate the visual flight path on the profile and plan view with an associated note on the approximate heading and distance. The visual segment should be flown with flight instrumentation (when advisory lateral and vertical guidance is provided) and/or pilotage or dead reckoning navigation techniques while maintaining visual conditions.

PUBLISHED ROUTE− A route for which an IFR altitude has been established and published; e.g., Federal Airways, Jet Routes, Area Navigation Routes, Specified Direct Routes.

PWS−
(See PREDICTIVE WIND SHEAR ALERT SYSTEM.)

TEMPORARY FLIGHT RESTRICTION (TFR)− A TFR is a regulatory action issued by the FAA via the U.S. NOTAM System, under the authority of United States Code, Title 49. TFRs are issued within the sovereign airspace of the United States and its territories to restrict certain aircraft from operating within a defined area on a temporary basis to protect persons or property in the air or on the ground. While not all inclusive, TFRs may be issued for disaster or hazard situations such as: toxic gas leaks or spills, fumes from flammable agents, aircraft accident/incident sites, aviation or ground resources engaged in wildfire suppression, or aircraft relief activities_following a disaster. TFRs may also be issued in support of VIP movements, for reasons of national security; or when determined necessary for the management of air traffic in the vicinity of aerial demonstrations or major sporting events. NAS users or other interested parties should contact a FSS for TFR information. Additionally, TFR information can be found in automated briefings, NOTAM publications, and on the internet at https://www.faa.gov. The FAA also distributes TFR information to aviation user groups for further dissemination.

TERMINAL AREA− A general term used to describe airspace in which approach control service or airport traffic control service is provided.

TERMINAL AREA FACILITY− A facility providing air traffic control service for arriving and departing IFR, VFR, Special VFR, and on occasion en route aircraft.
(See APPROACH CONTROL FACILITY.)
(See TOWER.)

TERMINAL AUTOMATION SYSTEMS (TAS)− TAS is used to identify the numerous automated tracking systems including STARS and MEARTS.

TERMINAL DATA LINK SYSTEM (TDLS)− A system that provides Digital Automatic Terminal Information Service (D−ATIS) both on a specified radio frequency and, for subscribers, in a text message via data link to the cockpit or to a gate printer. TDLS also provides the CPDLC Departure Clearance Application (DCL) and Pre-departure Clearances (PDC), at selected airports, to subscribers, through a service provider, in text to the cockpit or to a gate printer. In addition, TDLS will emulate the Flight Data Input/Output (FDIO) information within the control tower.

TERMINAL FLIGHT DATA MANAGER (TFDM)− An integrated tower flight data automation system to provide improved airport surface and terminal airspace management. TFDM enhances traffic flow management data integration with Time−Based Flow Management (TBFM) and Traffic Flow Management System (TFMS) to enable airlines, controllers, and airports to share and exchange real−time data. This improves surface traffic management and enhances capabilities of TFMS and TBFM. TFDM assists the Tower personnel with surface Traffic Flow Management (TFM) and Collaborative Decision Making (CDM) and enables a fundamental change in the Towers from a local airport-specific operation to a NAS−connected metering operation. The single platform consolidates multiple Tower automation systems, including: Departure Spacing Program (DSP), Airport Resource Management Tool (ARMT), Electronic Flight Strip Transfer System (EFSTS), and Surface Movement Advisor (SMA). TFDM data, integrated with other FAA systems such as TBFM and TFMS, allows airlines, controllers, and airports to manage the flow of aircraft more efficiently through all phases of flight from departure to arrival gate.

TERMINAL RADAR SERVICE AREA− Airspace surrounding designated airports wherein ATC provides radar vectoring, sequencing, and separation on a full-time basis for all IFR and participating VFR aircraft. The AIM contains an explanation of TRSA. TRSAs are depicted on VFR aeronautical charts. Pilot participation is urged but is not mandatory.

TERMINAL SEQUENCING AND SPACING (TSAS)− Extends scheduling and metering capabilities into the terminal area and provides metering automation tools to terminal controllers and terminal traffic management personnel. Those controllers and traffic management personnel become active participants in time-based metering operations as they work to deliver aircraft accurately to Constraint Satisfaction Points within terminal airspace to include the runway in accordance with scheduled times at those points. Terminal controllers are better able to utilize efficient flight paths, such as Standard Instrument Approach Procedures (SIAPs) that require a

Navigational Specification (NavSpec) of RNP APCH with Radius−to−Fix (RF) legs, or Advanced RNP (A−RNP), through tools that support the merging of mixed−equipage traffic flows. For example, merging aircraft flying RNP APCH AR with RF, A−RNP, and non−RNP approach procedures. Additional fields in the flight plan will identify those flights capable of flying the RNP APCH with RF or A−RNP procedures, and those flights will be scheduled for those types of procedures when available. TSAS will schedule these and the non−RNP aircraft to a common merge point. Terminal traffic management personnel have improved situation awareness using displays that allow for the monitoring of terminal metering operations, similar to the displays used today by center traffic management personnel to monitor en route metering operations.

TERMINAL VFR RADAR SERVICE− A national program instituted to extend the terminal radar services provided instrument flight rules (IFR) aircraft to visual flight rules (VFR) aircraft. The program is divided into four types service referred to as basic radar service, terminal radar service area (TRSA) service, Class B service and Class C service. The type of service provided at a particular location is contained in the Chart Supplement.

a. Basic Radar Service− These services are provided for VFR aircraft by all commissioned terminal radar facilities. Basic radar service includes safety alerts, traffic advisories, limited radar vectoring when requested by the pilot, and sequencing at locations where procedures have been established for this purpose and/or when covered by a letter of agreement. The purpose of this service is to adjust the flow of arriving IFR and VFR aircraft into the traffic pattern in a safe and orderly manner and to provide traffic advisories to departing VFR aircraft.

b. TRSA Service− This service provides, in addition to basic radar service, sequencing of all IFR and participating VFR aircraft to the primary airport and separation between all participating VFR aircraft. The purpose of this service is to provide separation between all participating VFR aircraft and all IFR aircraft operating within the area defined as a TRSA.

c. Class C Service− This service provides, in addition to basic radar service, approved separation between IFR and VFR aircraft, and sequencing of VFR aircraft, and sequencing of VFR arrivals to the primary airport.

d. Class B Service− This service provides, in addition to basic radar service, approved separation of aircraft based on IFR, VFR, and/or weight, and sequencing of VFR arrivals to the primary airport(s).

(See CONTROLLED AIRSPACE.)
(See TERMINAL RADAR SERVICE AREA.)
(Refer to AIM.)
(Refer to CHART SUPPLEMENT U.S.)

TERMINAL-VERY HIGH FREQUENCY OMNIDIRECTIONAL RANGE STATION (TVOR)− A very high frequency terminal omnirange station located on or near an airport and used as an approach aid.

(See NAVIGATIONAL AID.)
(See VOR.)

TERRAIN AWARENESS WARNING SYSTEM (TAWS)− An on−board, terrain proximity alerting system providing the aircrew ‘Low Altitude warnings’ to allow immediate pilot action.

TERRAIN FOLLOWING− The flight of a military aircraft maintaining a constant AGL altitude above the terrain or the highest obstruction. The altitude of the aircraft will constantly change with the varying terrain and/or obstruction.

TETRAHEDRON− A device normally located on uncontrolled airports and used as a landing direction indicator. The small end of a tetrahedron points in the direction of landing. At controlled airports, the tetrahedron, if installed, should be disregarded because tower instructions supersede the indicator.

(See SEGMENTED CIRCLE.)
(Refer to AIM.)

TF−

(See TERRAIN FOLLOWING.)

TFDM−

(See TERMINAL FLIGHT DATA MANAGER.)

TGUI−
(See TIMELINE GRAPHICAL USER INTERFACE.)

THAT IS CORRECT− The understanding you have is right.

THA−
(See TRANSITIONAL HAZARD AREA.)

THE RECREATIONAL UAS SAFETY TEST (TRUST)− The electronically administered free test required for all recreational UAS operators referred to as the aeronautical knowledge and safety test, under 49 USC §44809 (g).

THREE-HOUR TARMAC RULE– Rule that relates to Department of Transportation (DOT) requirements placed on airlines when tarmac delays are anticipated to reach 3 hours.

360 OVERHEAD−
(See OVERHEAD MANEUVER.)

THRESHOLD− The beginning of that portion of the runway usable for landing.
(See AIRPORT LIGHTING.)
(See DISPLACED THRESHOLD.)

THRESHOLD CROSSING HEIGHT− The theoretical height above the runway threshold at which the aircraft's glideslope antenna would be if the aircraft maintains the trajectory established by the mean ILS glideslope or the altitude at which the calculated glidepath of an RNAV or GPS approaches.
(See GLIDESLOPE.)
(See THRESHOLD.)

THRESHOLD LIGHTS−
(See AIRPORT LIGHTING.)

TIE-IN FACILITY– The FSS primarily responsible for providing FSS services, including telecommunications services for landing facilities or navigational aids located within the boundaries of a flight plan area (FPA). Three-letter identifiers are assigned to each FSS/FPA and are annotated as tie-in facilities in the Chart Supplement and accessible through FAA Order JO 7350.9, Location Identifiers. Large consolidated FSS facilities may have many tie-in facilities or FSS sectors within one facility.
(See FLIGHT PLAN AREA.)
(See FLIGHT SERVICE STATION.)

TIME-BASED FLOW MANAGEMENT (TBFM)− A foundational Decision Support Tool for time−based management in the en route and terminal environments. TBFM's core function is the ability to schedule aircraft within a stream of traffic to reach a defined constraint point (e.g., meter fix/meter arc) at specified times, creating a time-ordered sequence of traffic. The scheduled times allow for merging of traffic flows, efficiently utilizing airport and airspace capacity while minimizing coordination and reducing the need for vectoring/holding. The TBFM schedule is calculated using current aircraft estimated time of arrival at key defined constraint points based on wind forecasts, aircraft flight plan, the desired separation at the constraint point and other parameters. The schedule applies spacing only when needed to maintain the desired separation at one or more constraint points. This includes, but is not limited to, Single Center Metering (SCM), Adjacent Center Metering (ACM), En Route Departure Capability (EDC), Integrated Departure/Arrival Capability (IDAC), Ground−based Interval Management−Spacing (GIM−S), Departure Scheduling, and Extended/Coupled Metering.

TIME-BASED MANAGEMENT (TBM)− A methodology for managing the flow of air traffic through the assignment of time at specific points for an aircraft. TBM applies time to manage and condition air traffic flows to mitigate demand/capacity imbalances and enhance efficiency and predictability of the NAS. Where implemented, TBM tools will be used to manage traffic even during periods when demand does not exceed capacity. This will sustain operational predictability and assure the regional/national strategic plan is maintained. TBM uses capabilities within TFMS, TBFM, and TFDM. These programs are designed to achieve a specified interval between aircraft. Different types of programs accommodate different phases of flight.

TIME GROUP− Four digits representing the hour and minutes from the Coordinated Universal Time (UTC) clock. FAA uses UTC for all operations. The term "ZULU" may be used to denote UTC. The word "local" or the time zone equivalent must be used to denote local when local time is given during radio and telephone communications. When written, a time zone designator is used to indicate local time; e.g., "0205M" (Mountain). The local time may be based on the 24-hour clock system. The day begins at 0000 and ends at 2359.

TIMELINE GRAPHICAL USER INTERFACE (TGUI)− A TBFM display that uses timelines to display the Estimated Time of Arrival and Scheduled Time of Arrival of each aircraft to specified constraint points. The TGUI can also display pre−departure and scheduled aircraft.

TIS−B−
(See TRAFFIC INFORMATION SERVICE−BROADCAST.)

TMI−
(See TRAFFIC MANAGEMENT INITIATIVE.)

TMPA−
(See TRAFFIC MANAGEMENT PROGRAM ALERT.)

TMU−
(See TRAFFIC MANAGEMENT UNIT.)

TOD−
(See TOP OF DESCENT.)

TODA−
(See TAKEOFF DISTANCE AVAILABLE.)
(See ICAO term TAKEOFF DISTANCE AVAILABLE.)

TOI−
(See TRACK OF INTEREST.)

TOP ALTITUDE− In reference to SID published altitude restrictions, the charted "maintain" altitude contained in the procedure description or assigned by ATC.

TOP OF DESCENT (TOD)− The point at which an aircraft begins the initial descent.

TORA−
(See TAKEOFF RUN AVAILABLE.)
(See ICAO term TAKEOFF RUN AVAILABLE.)

TORCHING− The burning of fuel at the end of an exhaust pipe or stack of a reciprocating aircraft engine, the result of an excessive richness in the fuel air mixture.

TOS−
(See TRAJECTORY OPTIONS SET)

TOTAL ESTIMATED ELAPSED TIME [ICAO]− For IFR flights, the estimated time required from takeoff to arrive over that designated point, defined by reference to navigation aids, from which it is intended that an instrument approach procedure will be commenced, or, if no navigation aid is associated with the destination aerodrome, to arrive over the destination aerodrome. For VFR flights, the estimated time required from takeoff to arrive over the destination aerodrome.
(See ICAO term ESTIMATED ELAPSED TIME.)

TOUCH-AND-GO− An operation by an aircraft that lands and departs on a runway without stopping or exiting the runway.

TOUCH-AND-GO LANDING−
(See TOUCH-AND-GO.)

TOUCHDOWN−

a. The point at which an aircraft first makes contact with the landing surface.

b. Concerning a precision radar approach (PAR), it is the point where the glide path intercepts the landing surface.

(See ICAO term TOUCHDOWN.)

TOUCHDOWN [ICAO]− The point where the nominal glide path intercepts the runway.

Note: Touchdown as defined above is only a datum and is not necessarily the actual point at which the aircraft will touch the runway.

TOUCHDOWN RVR−
(See VISIBILITY.)

TOUCHDOWN ZONE− The first 3,000 feet of the runway beginning at the threshold. The area is used for determination of Touchdown Zone Elevation in the development of straight-in landing minimums for instrument approaches.
(See ICAO term TOUCHDOWN ZONE.)

TOUCHDOWN ZONE [ICAO]− The portion of a runway, beyond the threshold, where it is intended landing aircraft first contact the runway.

TOUCHDOWN ZONE ELEVATION− The highest elevation in the first 3,000 feet of the landing surface. TDZE is indicated on the instrument approach procedure chart when straight-in landing minimums are authorized.
(See TOUCHDOWN ZONE.)

TOUCHDOWN ZONE LIGHTING−
(See AIRPORT LIGHTING.)

TOWER− A terminal facility that uses air/ground communications, visual signaling, and other devices to provide ATC services to aircraft operating in the vicinity of an airport or on the movement area. Authorizes aircraft to land or takeoff at the airport controlled by the tower or to transit the Class D airspace area regardless of flight plan or weather conditions (IFR or VFR). A tower may also provide approach control services (radar or nonradar).
(See AIRPORT TRAFFIC CONTROL SERVICE.)
(See APPROACH CONTROL FACILITY.)
(See APPROACH CONTROL SERVICE.)
(See MOVEMENT AREA.)
(See TOWER EN ROUTE CONTROL SERVICE.)
(See ICAO term AERODROME CONTROL TOWER.)
(Refer to AIM.)

TOWER EN ROUTE CONTROL SERVICE− The control of IFR en route traffic within delegated airspace between two or more adjacent approach control facilities. This service is designed to expedite traffic and reduce control and pilot communication requirements.

TOWER TO TOWER−
(See TOWER EN ROUTE CONTROL SERVICE.)

TRACEABLE PRESSURE STANDARD− The facility station pressure instrument, with certification/calibration traceable to the National Institute of Standards and Technology. Traceable pressure standards may be mercurial barometers, commissioned ASOS or dual transducer AWOS, or portable pressure standards or DASI.

TRACK− The actual flight path of an aircraft over the surface of the earth.
(See COURSE.)
(See FLIGHT PATH.)
(See ROUTE.)
(See ICAO term TRACK.)

TRACK [ICAO]− The projection on the earth's surface of the path of an aircraft, the direction of which path at any point is usually expressed in degrees from North (True, Magnetic, or Grid).

TRACK OF INTEREST (TOI)− Displayed data representing an airborne object that threatens or has the potential to threaten North America or National Security. Indicators may include, but are not limited to: noncompliance with air traffic control instructions or aviation regulations; extended loss of communications; unusual transmissions or unusual flight behavior; unauthorized intrusion into controlled airspace or an ADIZ; noncompliance with issued flight restrictions/security procedures; or unlawful interference with airborne flight crews, up to and including hijack. In certain circumstances, an object may become a TOI based on specific and credible intelligence pertaining to that particular aircraft/object, its passengers, or its cargo.

TRACK OF INTEREST RESOLUTION− A TOI will normally be considered resolved when: the aircraft/object is no longer airborne; the aircraft complies with air traffic control instructions, aviation regulations, and/or issued flight restrictions/security procedures; radio contact is re−established and authorized control of the aircraft is verified; the aircraft is intercepted and intent is verified to be nonthreatening/nonhostile; TOI was identified based on specific and credible intelligence that was later determined to be invalid or unreliable; or displayed data is identified and characterized as invalid.

TRAFFIC−

a. A term used by a controller to transfer radar identification of an aircraft to another controller for the purpose of coordinating separation action. Traffic is normally issued:

1. In response to a handoff or point out,

2. In anticipation of a handoff or point out, or

3. In conjunction with a request for control of an aircraft.

b. A term used by ATC to refer to one or more aircraft.

TRAFFIC ADVISORIES− Advisories issued to alert pilots to other known or observed air traffic which may be in such proximity to the position or intended route of flight of their aircraft to warrant their attention. Such advisories may be based on:

a. Visual observation.

b. Observation of radar identified and nonidentified aircraft targets on an ATC radar display, or

c. Verbal reports from pilots or other facilities.

Note 1: The word “traffic” followed by additional information, if known, is used to provide such advisories; e.g., “Traffic, 2 o’clock, one zero miles, southbound, eight thousand.”

Note 2: Traffic advisory service will be provided to the extent possible depending on higher priority duties of the controller or other limitations; e.g., radar limitations, volume of traffic, frequency congestion, or controller workload. Radar/ nonradar traffic advisories do not relieve the pilot of his/her responsibility to see and avoid other aircraft. Pilots are cautioned that there are many times when the controller is not able to give traffic advisories concerning all traffic in the aircraft’s proximity; in other words, when a pilot requests or is receiving traffic advisories, he/she should not assume that all traffic will be issued.

(Refer to AIM.)

TRAFFIC ALERT (aircraft call sign), TURN (left/right) IMMEDIATELY, (climb/descend) AND MAINTAIN (altitude).

(See SAFETY ALERT.)

TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM (TCAS)− An airborne collision avoidance system based on radar beacon signals which operates independent of ground-based equipment. TCAS-I generates traffic advisories only. TCAS-II generates traffic advisories, and resolution (collision avoidance) advisories in the vertical plane.

TRAFFIC INFORMATION−

(See TRAFFIC ADVISORIES.)

TRAFFIC INFORMATION SERVICE−BROADCAST (TIS−B)− The broadcast of ATC derived traffic information to ADS−B equipped (1090ES or UAT) aircraft. The source of this traffic information is derived from ground−based air traffic surveillance sensors, typically from radar targets. TIS−B service will be available throughout the NAS where there are both adequate surveillance coverage (radar) and adequate broadcast coverage from ADS−B ground stations. Loss of TIS−B will occur when an aircraft enters an area not covered by the GBT network. If this occurs in an area with adequate surveillance coverage (radar), nearby aircraft that remain within the adequate broadcast coverage (ADS−B) area will view the first aircraft. TIS−B may continue when an aircraft enters an area with inadequate surveillance coverage (radar); nearby aircraft that remain within the adequate broadcast coverage (ADS−B) area will not view the first aircraft.

TRAFFIC IN SIGHT− Used by pilots to inform a controller that previously issued traffic is in sight.
(See NEGATIVE CONTACT.)
(See TRAFFIC ADVISORIES.)

TRAFFIC MANAGEMENT INITIATIVE (TMI)− Tools used to manage demand with capacity in the National Airspace System (NAS.) TMIs can be used to manage NAS resources (e.g., airports, sectors, airspace) or to increase the efficiency of the operation. TMIs can be either tactical (i.e., short term) or strategic (i.e., long term), depending on the type of TMI and the operational need.

TRAFFIC MANAGEMENT PROGRAM ALERT− A term used in a Notice to Airmen (NOTAM) issued in conjunction with a special traffic management program to alert pilots to the existence of the program and to refer them to a special traffic management program advisory message for program details. The contraction TMPA is used in NOTAM text.

TRAFFIC MANAGEMENT UNIT− The entity in ARTCCs and designated terminals directly involved in the active management of facility traffic. Usually under the direct supervision of an assistant manager for traffic management.

TRAFFIC NO FACTOR− Indicates that the traffic described in a previously issued traffic advisory is no factor.

TRAFFIC NO LONGER OBSERVED− Indicates that the traffic described in a previously issued traffic advisory is no longer depicted on radar, but may still be a factor.

TRAFFIC PATTERN− The traffic flow that is prescribed for aircraft landing at, taxiing on, or taking off from an airport. The components of a typical traffic pattern are departure, upwind leg, crosswind leg, downwind leg, base leg, and final approach.

a. Upwind Leg− A flight path that begins after departure and continues straight ahead along the extended runway centerline. Upwind leg is an extension of departure and is used when issuing control instructions for separation, spacing or sequencing.

b. Crosswind Leg− A flight path at right angles to the landing runway off its upwind end.

c. Downwind Leg− A flight path parallel to the landing runway in the direction opposite to landing. The downwind leg normally extends between the crosswind leg and the base leg.

d. Base Leg− A flight path at right angles to the landing runway off its approach end. The base leg normally extends from the downwind leg to the intersection of the extended runway centerline.

NOTE−
ATC may instruct a pilot to report a "2-mile left base" to Runway 22. This instruction means that the pilot is expected to maneuver their aircraft into a left base leg that will intercept a straight-in final 2 miles from the approach end of Runway 22 and advise ATC.

REFERENCE−
Pilot's Handbook of Aeronautical Knowledge, FAA−H−8083−25, Chapter 14, Airport Operations, Traffic Patterns.

e. Final Approach− A flight path in the direction of landing along the extended runway centerline. The final approach normally extends from the base leg to the runway. An aircraft making a straight-in approach VFR is also considered to be on final approach.

NOTE−
ATC may instruct a pilot to report "5-mile final" to Runway 22. This instruction means that the pilot should maneuver their aircraft onto a straight-in final and advise ATC when they are five miles from the approach end of Runway 22.

f. Departure− The flight path that begins after takeoff and continues straight ahead along the extended runway centerline. The departure climb continues until reaching a point at least 1/2 mile beyond the departure end of the runway and within 300 feet of the traffic pattern altitude.

REFERENCE−
Pilot's Handbook of Aeronautical Knowledge, FAA−H−8083−25, Chapter 14, Airport Operations, Traffic Patterns.

(See STRAIGHT-IN APPROACH VFR.)
(See TAXI PATTERNS.)
(See ICAO term AERODROME TRAFFIC CIRCUIT.)
(Refer to 14 CFR part 91.)
(Refer to AIM.)

TRAFFIC SITUATION DISPLAY (TSD)− TSD is a computer system that receives radar track data from all 20 CONUS ARTCCs, organizes this data into a mosaic display, and presents it on a computer screen. The display allows the traffic management coordinator multiple methods of selection and highlighting of individual aircraft or groups of aircraft. The user has the option of superimposing these aircraft positions over any number of background displays. These background options include ARTCC boundaries, any stratum of en route sector boundaries, fixes, airways, military and other special use airspace, airports, and geopolitical boundaries. By using the TSD, a coordinator can monitor any number of traffic situations or the entire systemwide traffic flows.

TRAJECTORY− A EDST representation of the path an aircraft is predicted to fly based upon a Current Plan or Trial Plan.
(See EN ROUTE DECISION SUPPORT TOOL.)

TRAJECTORY ALTERING CLEARANCE (TAC)– A clearance that alters altitude, speed, heading, or route.

TRAJECTORY−BASED OPERATIONS (TBO)− An Air Traffic Management method for strategically planning and managing flights throughout the operation by using Time−Based Management (TBM), information exchange between air and ground systems, and the aircraft's ability to fly trajectories in time and space. Aircraft trajectory is defined in four dimensions – latitude, longitude, altitude, and time.

TRAJECTORY MODELING− The automated process of calculating a trajectory.

TRAJECTORY OPTIONS SET (TOS)– A TOS is an electronic message, submitted by the operator, that is used by the Collaborative Trajectory Options Program (CTOP) to manage the airspace captured in the traffic management program. The TOS will allow the operator to express the route and delay trade-off options that they are willing to accept.

TRANSFER OF COMMUNICATION (TOC)– A CPDLC uplink that instructs the pilot to either contact or monitor the next air traffic radio frequency.

TRANSFER OF CONTROL− That action whereby the responsibility for the separation of an aircraft is transferred from one controller to another.
(See ICAO term TRANSFER OF CONTROL.)

TRANSFER OF CONTROL [ICAO]− Transfer of responsibility for providing air traffic control service.

TRANSFERRING CONTROLLER− A controller/facility transferring control of an aircraft to another controller/facility.
(See ICAO term TRANSFERRING UNIT/CONTROLLER.)

TRANSFERRING FACILITY−
(See TRANSFERRING CONTROLLER.)

TRANSFERRING UNIT/CONTROLLER [ICAO]− Air traffic control unit/air traffic controller in the process of transferring the responsibility for providing air traffic control service to an aircraft to the next air traffic control unit/air traffic controller along the route of flight.
Note: See definition of accepting unit/controller.

TRANSITION− The general term that describes the change from one phase of flight or flight condition to another; e.g., transition from en route flight to the approach or transition from instrument flight to visual flight.

TRANSITION POINT− A point at an adapted number of miles from the vertex at which an arrival aircraft would normally commence descent from its en route altitude. This is the first fix adapted on the arrival speed segments.

TRANSITIONAL AIRSPACE− That portion of controlled airspace wherein aircraft change from one phase of flight or flight condition to another.

TRANSITIONAL HAZARD AREA (THA)− Used by ATC. Airspace normally associated with an Aircraft Hazard Area within which the flight of aircraft is subject to restrictions.
(See AIRCRAFT HAZARD AREA.)
(See CONTINGENCY HAZARD AREA.)
(See REFINED HAZARD AREA.)

TRANSMISSOMETER− An apparatus used to determine visibility by measuring the transmission of light through the atmosphere. It is the measurement source for determining runway visual range (RVR).
(See VISIBILITY.)

TRANSMITTING IN THE BLIND− A transmission from one station to other stations in circumstances where two-way communication cannot be established, but where it is believed that the called stations may be able to receive the transmission.

TRANSPONDER− The airborne radar beacon receiver/transmitter portion of the Air Traffic Control Radar Beacon System (ATCRBS) which automatically receives radio signals from interrogators on the ground, and selectively replies with a specific reply pulse or pulse group only to those interrogations being received on the mode to which it is set to respond.
(See INTERROGATOR.)
(See ICAO term TRANSPONDER.)
(Refer to AIM.)

TRANSPONDER [ICAO]− A receiver/transmitter which will generate a reply signal upon proper interrogation; the interrogation and reply being on different frequencies.

TRANSPONDER CODES−
(See CODES.)

TRANSPONDER OBSERVED − Phraseology used to inform a VFR pilot the aircraft's assigned beacon code and position have been observed. Specifically, this term conveys to a VFR pilot the transponder reply has been observed and its position correlated for transit through the designated area.

TRIAL PLAN− A proposed amendment which utilizes automation to analyze and display potential conflicts along the predicted trajectory of the selected aircraft.

TRSA−
(See TERMINAL RADAR SERVICE AREA.)

TRUST−
(See THE RECREATIONAL UAS SAFETY TEST.)

TSAS−
(See TERMINAL SEQUENCING AND SPACING.)

TSD−
(See TRAFFIC SITUATION DISPLAY.)

TURBOJET AIRCRAFT− An aircraft having a jet engine in which the energy of the jet operates a turbine which in turn operates the air compressor.

TURBOPROP AIRCRAFT− An aircraft having a jet engine in which the energy of the jet operates a turbine which drives the propeller.

TURBULENCE− An atmospheric phenomenon that causes changes in aircraft altitude, attitude, and or airspeed with aircraft reaction depending on intensity. Pilots report turbulence intensity according to aircraft's reaction as follows:

a. Light − Causes slight, erratic changes in altitude and or attitude (pitch, roll, or yaw).

b. Moderate− Similar to Light but of greater intensity. Changes in altitude and or attitude occur but the aircraft remains in positive control at all times. It usually causes variations in indicated airspeed.

c. Severe− Causes large, abrupt changes in altitude and or attitude. It usually causes large variations in indicated airspeed. Aircraft may be momentarily out of control.

d. Extreme− The aircraft is violently tossed about and is practically impossible to control. It may cause structural damage.

(See CHOP.)
(Refer to AIM.)

TURN ANTICIPATION− (maneuver anticipation).

TVOR−
(See TERMINAL-VERY HIGH FREQUENCY OMNIDIRECTIONAL RANGE STATION.)

TWO-WAY RADIO COMMUNICATIONS FAILURE−
(See LOST COMMUNICATIONS.)

U

UAM–
(See URBAN AIR MOBILITY.)

UAP–
(See UNIDENTIFIED ANOMALOUS PHENOMENA.)

UAS FACILITY MAP (UASFM)– Defined grid squares showing maximum altitudes around airports where the FAA may authorize part 107 sUAS operations without additional safety analysis. The maps should be consulted prior to conducting UAS operations (part 91, part 107 or section 44809) in controlled airspace. The UASFM will aid in determining if the airspace authorization or waivers are necessary. UASFM(s) are charted on the UAS Data Delivery System (UDDS) at the following website address: https://faa.maps.arcgis.com/apps/webappviewer/index.html?id=9c2e4406710048e19806ebf6a06754ad.

UAS TEST SITE– Independently owned UAS test & research sites, recognized by the FAA.

UAS TRAFFIC MANAGEMENT (UTM)–The unmanned aircraft traffic management ecosystem that will allow multiple low altitude BVLOS operations and which is separate from, but complementary to, FAA's Air Traffic Control System.

UASFM–
(See UAS FACILITY MAP.)

UHF–
(See ULTRAHIGH FREQUENCY.)

ULTRAHIGH FREQUENCY (UHF)– The frequency band between 300 and 3,000 MHz. The bank of radio frequencies used for military air/ground voice communications. In some instances this may go as low as 225 MHz and still be referred to as UHF.

ULTRALIGHT VEHICLE– A single-occupant aeronautical vehicle operated for sport or recreational purposes which does not require FAA registration, an airworthiness certificate, or pilot certification. Operation of an ultralight vehicle in certain airspace requires authorization from ATC.
(Refer to 14 CFR part 103.)

UNABLE– Indicates inability to comply with a specific instruction, request, or clearance.

UNASSOCIATED– A radar target that does not display a data block with flight identification and altitude information.
(See ASSOCIATED.)

UNCONTROLLED AIRSPACE– Airspace in which aircraft are not subject to controlled airspace (Class A, B, C, D, or E) separation criteria.

UNDER THE HOOD– Indicates that the pilot is using a hood to restrict visibility outside the cockpit while simulating instrument flight. An appropriately rated pilot is required in the other control seat while this operation is being conducted.
(Refer to 14 CFR part 91.)

UNFROZEN– The Scheduled Time of Arrival (STA) tags, which are still being rescheduled by the time–based flow management (TBFM) calculations. The aircraft will remain unfrozen until the time the corresponding estimated time of arrival (ETA) tag passes the preset freeze horizon for that aircraft's stream class. At this point the automatic rescheduling will stop, and the STA becomes "frozen."

UNICOM– A nongovernment communication facility which may provide airport information at certain airports. Locations and frequencies of UNICOMs are shown on aeronautical charts and publications.
(See CHART SUPPLEMENT.)
(Refer to AIM.)

UNIDENTIFIED ANOMALOUS PHENOMENA (UAP)– For aviation reporting purposes, a UAP may be airborne objects or other detected/observed objects that are not immediately identifiable, such as balloons, aircraft, or natural known phenomena, that demonstrate behaviors that are not readily understood by sensors or observers. A UAP may consist of one or more unidentified anomalous objects and may persist over an extended period of time. The full definition of UAP may be found on the All-Domain Anomaly Resolution Office (AARO) website at https://www.aaro.mil.

UNMANNED AIRCRAFT (UA)- A device used or intended to be used for flight that has no onboard pilot. This device can be any type of airplane, helicopter, airship, or powered-lift aircraft. Unmanned free balloons, moored balloons, tethered aircraft, gliders, and unmanned rockets are not considered to be a UA.

UNMANNED AIRCRAFT SYSTEM (UAS)- An unmanned aircraft and its associated elements related to safe operations, which may include control stations (ground, ship, or air based), control links, support equipment, payloads, flight termination systems, and launch/recovery equipment. It consists of three elements: unmanned aircraft, control station, and data link.

UNPUBLISHED ROUTE– A route for which no minimum altitude is published or charted for pilot use. It may include a direct route between NAVAIDs, a radial, a radar vector, or a final approach course beyond the segments of an instrument approach procedure.
(See PUBLISHED ROUTE.)
(See ROUTE.)

UNRELIABLE (GPS/WAAS)– An advisory to pilots indicating the expected level of service of the GPS and/or WAAS may not be available. Pilots must then determine the adequacy of the signal for desired use.

UNSERVICEABLE (U/S)
(See OUT OF SERVICE/UNSERVICEABLE.)

UPLINK– CPDLC message sent from ATC to the flight deck.

UPWIND LEG–
(See TRAFFIC PATTERN.)

URBAN AIR MOBILITY (UAM)– A subset of Advanced Air Mobility (AAM), referring to an air transportation system utilizing highly automated aircraft to transport passengers or cargo in urban/suburban areas.

URGENCY– A condition of being concerned about safety and of requiring timely but not immediate assistance; a potential distress condition.
(See ICAO term URGENCY.)

URGENCY [ICAO]– A condition concerning the safety of an aircraft or other vehicle, or of person on board or in sight, but which does not require immediate assistance.

USAFIB–
(See ARMY AVIATION FLIGHT INFORMATION BULLETIN.)

UTM–
(See UAS TRAFFIC MANAGEMENT.)

W

WA–
(See AIRMET.)
(See WEATHER ADVISORY.)

WAAS–
(See WIDE-AREA AUGMENTATION SYSTEM.)

WAKE TURBULENCE– A phenomenon that occurs when an aircraft develops lift and forms a pair of counter-rotating vortices.
(See AIRCRAFT CLASSES.)
(See AIRCRAFT WAKE CATEGORIES.)
(See VORTICES.)
(Refer to AIM.)

WARNING AREA–
(See SPECIAL USE AIRSPACE.)

WAYPOINT– A predetermined geographical position used for route/instrument approach definition, progress reports, published VFR routes, visual reporting points or points for transitioning and/or circumnavigating controlled and/or special use airspace, that is defined relative to a VORTAC station or in terms of latitude/longitude coordinates.

WEATHER ADVISORY– In aviation weather forecast practice, an expression of hazardous weather conditions not predicted in the Aviation Surface Forecast, Aviation Cloud Forecast, or area forecast, as they affect the operation of air traffic and as prepared by the NWS.
(See AIRMET.)
(See GRAPHICAL AIRMEN'S METEOROLOGICAL INFORMATION.)
(See SIGMET.)

WEATHER RADAR PRECIPITATION INTENSITY– Existing radar systems cannot detect turbulence, however, there is a direct correlation between turbulence intensity and precipitation intensity. Controllers must issue all precipitation displayed on their user display systems. When precipitation intensity is not available, controllers will report intensity as UNKNOWN. When precipitation intensity levels are available, they will be described as follows:

a. LIGHT (< 26 dBZ)

b. MODERATE (26 to 40 dBZ)

c. HEAVY (> 40 to 50 dBZ)

d. EXTREME (> 50 dBZ)

WEATHER RECONNAISSANCE AREA (WRA)– A WRA is airspace with defined dimensions and published by Notice to Airmen, which is established to support weather reconnaissance/research flights. Air traffic control services are not provided within WRAs. Only participating weather reconnaissance/research aircraft from the 53rd Weather Reconnaissance Squadron and National Oceanic and Atmospheric Administration Aircraft Operations Center are permitted to operate within a WRA. A WRA may only be established in airspace within U.S. Flight Information Regions outside of U.S. territorial airspace.

WHEN ABLE–

a. In conjunction with ATC instructions, gives the pilot the latitude to delay compliance until a condition or event has been reconciled. Unlike "pilot discretion," when instructions are prefaced "when able," the pilot is expected to seek the first opportunity to comply.

b. In conjunction with a weather deviation clearance, requires the pilot to determine when he/she is clear of weather, then execute ATC instructions.

c. Once a maneuver has been initiated, the pilot is expected to continue until the specifications of the instructions have been met. "When able," should not be used when expeditious compliance is required.

WIDE-AREA AUGMENTATION SYSTEM (WAAS)− The WAAS is a satellite navigation system consisting of the equipment and software which augments the GPS Standard Positioning Service (SPS). The WAAS provides enhanced integrity, accuracy, availability, and continuity over and above GPS SPS. The differential correction function provides improved accuracy required for precision approach.

WIDE AREA MULTILATERATION (WAM)– A distributed surveillance technology which may utilize any combination of signals from Air Traffic Control Radar Beacon System (ATCRBS) (Modes A and C) and Mode S transponders, and ADS-B transmissions. Multiple geographically dispersed ground sensors measure the time-of-arrival of the transponder messages. Aircraft position is determined by joint processing of the time-difference-of-arrival (TDOA) measurements computed between a reference and the ground stations' measured time-of-arrival.

WILCO− I have received your message, understand it, and will comply with it.

WIND GRID DISPLAY− A display that presents the latest forecasted wind data overlaid on a map of the ARTCC area. Wind data is automatically entered and updated periodically by transmissions from the National Weather Service. Winds at specific altitudes, along with temperatures and air pressure can be viewed.

WIND SHEAR− A change in wind speed and/or wind direction in a short distance resulting in a tearing or shearing effect. It can exist in a horizontal or vertical direction and occasionally in both.

WIND SHEAR ESCAPE− An unplanned abortive maneuver initiated by the pilot in command (PIC) as a result of onboard cockpit systems. Wind shear escapes are characterized by maximum thrust climbs in the low altitude terminal environment until wind shear conditions are no longer detected.

WING TIP VORTICES−
(See VORTICES.)

WORDS TWICE−

a. As a request: "Communication is difficult. Please say every phrase twice."

b. As information: "Since communications are difficult, every phrase in this message will be spoken twice."

WS−
(See SIGMET.)
(See WEATHER ADVISORY.)

WST−
(See CONVECTIVE SIGMET.)
(See WEATHER ADVISORY.)

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